รายงานผลการประชุมคณะทำงาน 5A ครั้งที่ ๑๒ และ ผลการประชุมกลุ่มศึกษาที่ ๕ ครั้งที่ ๘ ของภาควิทยุคมนาคม สหภาพโทรคมนาคมระหว่างประเทศ ณ นครเจนีวา ประเทศสวิตเซอร์แลนด์

๑๘ พฤศจิกายน – ๓ ธันวาคม ๒๕๕๖

ภารกิจภูมิภาค และบูรณการ
กลุ่มงานบริหารความถี่วิทยุ
สำนักงานคณะกรรมการกิจการกระจายเสียง กิจการโทรทัศน์ และกิจการโทรคมนาคมแห่งชาติ
เลขที่ ๘๗ ถนนพหลโยธิน ซอย ๘ แขวงสามเสนใน เขตพญาไท กรุงเทพมหานคร ๑๐๔๐๐

<u>รายงานผลการประชุมคณะทำงาน 5A ครั้งที่ ๑๒</u>

ITU-R the 12nd Meeting of Working Party 5A
(Land mobile service above 30 MHz (excluding IMT); wireless access in the fixed service; amateur and amateur satellite service)

๑. รายละเอียดการประชุม

การประชุมคณะทำงาน 5A ครั้งที่ ๑๒ ของภาควิทยุคมนาคม จัดขึ้นโดยสหภาพโทรคมนาคมระหว่างประเทศ ระหว่างวันที่ ๑๘ – ๒๘ พฤศจิกายน ๒๕๕๖ ณ นครเจนีวา ประเทศสวิตเซอร์แลนด์ โดยมีหน้าที่รับผิดชอบครอบคลุม เรื่อง กิจการเคลื่อนที่ทางบกที่ใช้ความถี่วิทยุสูงกว่า ๓๐ MHz (ยกเว้น IMT) การเชื่อมต่อไร้สายในกิจการประจำที่ กิจการวิทยุสมัครเล่นและกิจการวิทยุสมัครเล่นผ่านดาวเทียม

๒. ผู้เข้าร่วมประชุม

ผู้เข้าร่วมประชุมประกอบด้วยผู้แทนจากรัฐสมาชิก (Member States) สมาชิกสมทบ (Associates) องค์การระหว่างประเทศและองค์กรภูมิภาค (Regional and Other International Organizations) ผู้ประกอบกิจการโทรคมนาคมที่เป็นที่รู้จัก (Recognized Operating Agencies) สหภาพโทรคมนาคมระหว่างประเทศInternational Telecommunication Union: ITU) และหน่วยงานด้านวิทยาศาสตร์หรืออุตสาหกรรม (Scientific or Industrial Organizations) รวมทั้งสิ้นจำนวน ๒๑๒ คน โดยมี Mr. Jose Costa จากประเทศแคนนาดา ทำหน้าที่ประธานที่ประชุม

๓. หน้าที่ความรับผิดชอบของคณะทำงานที่เกี่ยวข้องภายใต้กลุ่มศึกษาที่ ๕

๓.๑ กลุ่มศึกษาที่ ๕ (Study Group 5) ของภาควิทยุคมนาคม จัดตั้งขึ้นตามมติของที่ประชุมสมัชชาว่าด้วยการวิทยุคมนาคม ค.ศ. ๒๐๐๗ (Radio Assembly 2007: RA-07) ของสหภาพโทรคมนาคมระหว่างประเทศ โดยให้มีหน้าที่รับผิดชอบการศึกษาเกี่ยวกับระบบและโครงข่ายสำหรับกิจการประจำที่ กิจการเคลื่อนที่ กิจการวิทยุตรวจการณ์และตรวจค้นหา กิจการวิทยุสมัครเล่น และกิจการวิทยุสมัครเล่นผ่านดาวเทียม

๓.๒ เพื่อให้ครอบคลุมหน้าที่ความรับผิดชอบตามข้อ ๓.๑ กลุ่มศึกษาที่ ๕ จึงได้จัดตั้งคณะทำงานขึ้นอีก ๕ คณะทำงาน ประกอบด้วย

- ๓.๒.๑ <u>คณะทำงาน 5A (Working Party 5A)</u> มีหน้าที่ รับผิดชอบการจัดทำคู่มือ (Handbook) และข้อเสนอแนะต่างๆที่เกี่ยวข้องกับกิจการเคลื่อนที่ทางบกที่ใช้ความถี่วิทยุสูงกว่า ๓๐ MHz (ยกเว้น IMT) การเข้าถึงแบบไร้สายในกิจการประจำที่ กิจการวิทยุสมัครเล่นและกิจการวิทยุสมัครเล่นผ่านดาวเทียม
- ๓.๒.๒ <u>คณะทำงาน 5B (Working Party 5B)</u> มีหน้าที่ รับผิดชอบการจัดทำคู่มือ (Handbook) และข้อเสนอแนะต่างๆที่เกี่ยวข้องกับกิจการเคลื่อนที่ทางน้ำ รวมถึง GMDSS กิจการเคลื่อนที่ทางการบินและกิจการวิทยุตรวจการณ์และตรวจค้นหา
- ๓.๒.๓ <u>คณะทำงาน 5C (Working Party 5C)</u> มีหน้าที่ รับผิดชอบการจัดทำข้อเสนอแนะและรายงานเกี่ยวกับระบบเชื่อมโยงแบบไร้สาย ย่าน HF และระบบอื่นๆที่มีความถี่วิทยุต่ำกว่า ๓๐ MHz ในกิจการประจำที่และกิจการเคลื่อนที่ทางบก
- ๓.๒.๔ <u>คณะทำงาน 5D (Working Party 5D)</u> มีหน้าที่ รับผิดชอบการจัดทำข้อเสนอแนะและรายงานเกี่ยวกับระบบ IMT

๓.๒.๕ <u>คณะทำงาน JTG 5-6 (Working Party JTG 4-5-6-7)</u> มีหน้าที่ ศึกษาการใช้งานของ Mobile Applications และระบบอื่นๆ ในย่านความถี่วิทยุ ๗๙๐ – ๘๖๒ MHz

๓.๓ วัตถุประสงค์ของการจัดตั้งคณะทำงาน 5A (Working Party 5A) ตามข้อ ๓.๒.๑ เพื่อ

๓.๓.๑ สนับสนุน การเข้าถึงการใช้ความถี่วิทยุอย่างเท่าเทียมกัน เพื่อให้เกิดประโยชน์สูงสุด

๓.๓.๒ พัฒนาและสร้างมาตรฐานเทคโนโลยีให้กับกิจการเคลื่อนที่ทางบก

๓.๓.๓ ให้ความสำคัญลักษณะและเทคนิคของกิจการวิทยุสมัครเล่น และเพื่อเตรียมความพร้อมในประเด็นที่เกี่ยวข้องกับระเบียบวาระของ WRC

๓.๓.๔ เผยแพร่ความรู้ที่เกี่ยวข้องกับการวางแผนทางวิศวกรรมและการพัฒนากิจการเคลื่อนที่ทางบกในรูปแบบของ Handbook

และเพื่อให้ครอบคลุมหน้าที่ความรับผิดชอบของคณะทำงาน 5A ที่ประชุมคณะทำงาน 5A เห็นชอบให้กำหนดโครงสร้างของคณะทำงาน 5A ซึ่งแบ่งได้เป็น ๕ กลุ่มทำงานหลัก ดังนี้

Group	Chairman
WG 5A-1: *พิจารณาประเด็นต่างๆที่เกี่ยวข้องกับกิจการวิทยุสมัครเล่น*	Dale Hughes : ประเทศ ออสเตรเลีย
WG 5A-2 : *พิจารณาประเด็นต่างๆที่เกี่ยวข้องกับระบบและมาตรฐาน*	Lang Baozhen: ประเทศจีน
WG 5A-3 : *พิจารณาประเด็นต่างๆที่เกี่ยวข้องกับ PPDR*	Amy Sanders: ประเทศ สหรัฐอเมริกา
WG 5A-4 : *พิจารณาประเด็นต่างๆที่เกี่ยวข้องกับการใช้ความถี่วิทยุกันร่วมและการรบกวนความถี่วิทยุ*	Michael Kraemer: ประเทศ เยอรมัน
WG 5A-5 : *พิจารณาประเด็นต่างๆที่เกี่ยวข้องกับเทคโนโลยีใหม่*	Hitoshi Yoshino: ประเทศ ญี่ปุ่น

๓.๔ เป้าหมายของการประชุมคณะทำงาน 5A (Working Party 5A) แยกตามโครงสร้างของคณะทำงาน ในการประชุมครั้งนี้ มีดังนี้

๓.๔.๑ <u>วิทยุสมัครเล่น และ วิทยุสมัครเล่นผ่านดาวเทียม (Agenda item 1.4)</u>

- รวบรวมผลการศึกษาและการแลกเปลี่ยนข้อมูล ข้อเสนอแนะจากคณะทำงานต่างๆให้แล้วเสร็จ
- จัดเตรียมร่างรายงานผลการศึกษาให้เหมาะสม และจัดส่งให้กลุ่มงานที่เกี่ยวข้องพิจารณาให้ความเห็น
- ปรับปรุงร่าง CPM ส่วนที่ ๕ และ ๖ ตามผลการศึกษาจากคณะทำงานที่เกี่ยวข้องและจัดส่งให้กลุ่มงานที่เกี่ยวข้องพิจารณาให้ความเห็น
- พิจารณาทบทวนและปรับปรุงเพิ่มเติม ข้อเสนอแนะของ ITU-R รายงาน และ คู่มือที่เกี่ยวข้องกับกิจการวิทยุสมัครเล่น และ วิทยุสมัครเล่นผ่านดาวเทียม ตามความเหมาะสม
- ทบทวน ITU-D Question, ข้อเสนอแนะ, รายงาน และคู่มือที่เกี่ยวข้องกับกิจการวิทยุสมัครเล่น และ วิทยุสมัครเล่นผ่านดาวเทียม รวมถึงจัดทำเอกสารประสานงานไปยังคณะทำงานที่เกี่ยวข้องด้วย

๓.๔.๒ <u>ระบบและมารตรฐาน</u>

- ปรับปรุงร่างข้อเสนอแนะ ITU-R M.1076
- ปรับปรุงร่างข้อเสนอแนะ ITU-R M.2003
- ปรับปรุงร่างข้อเสนอแนะ ITU-R M.2227
- ปรับปรุงการจัดทำข้อแนะนำ/แนวทางการใช้ Mobile Broadband ความถี่วิทยุต่ำกว่า 6 GHz

๓.๔.๓ <u>PPDR</u>

- พิจารณาข้อเสนอของประเทศสมาชิกต่างๆ เกี่ยวกับการจัดทำรายงาน narrowband, wideband and broadband PPDR
- ปรับปรุงร่างข้อเสนอแนะของ ITU-R M.2009 โดยพิจารณาจากข้อเสนอของประเทศสมาชิกแต่ละประเทศ
- ปรับปรุงร่างข้อเสนอแนะของ ITU-R M.2015 โดยพิจารณาจากข้อเสนอของประเทศสมาชิกแต่ละประเทศ และ
- ปรับปรุงร่าง CPM ที่เกี่ยวข้องกับ Agenda item 1.3 ของที่ประชุม WRC-15 ตามผลการศึกษาและข้อเสนอของประเทศสมาชิกต่างๆ เพื่อให้ได้ร่าง CPM ฉบับสุดท้ายในการประชุมครั้งนี้

๓.๔.๔ <u>ประเด็นที่เกี่ยวข้องกับปัญหาการรบกวนจากการใช้ความถี่วิทยุและการใช้ความถี่วิทยุร่วม</u>

- ปรับปรุงร่างข้อเสนอแนะของ ITU-R M.1824 ซึ่งเกี่ยวข้องกับ television outside broadcast, electronic news gathering and electronic field production in the mobile service for use in sharing studies
- พัฒนาแผนงานในอนาคตของร่างรายงาน/ข้อเสนอแนะ ITU-R M.[MS 14.5-15.35 CHAR] on characteristics of and protection criteria for systems operating in the mobile service in the frequency range 14.5-15.35 GHz
- ทบทวนรายงาน ITU-R M.2116 ซึ่งเกี่ยวข้องกับ characteristics of broadband wireless access systems operating in the land mobile service for use in sharing studies
- พิจารณาข้อเสนอใหม่ของคณะทำงาน 5C ที่เกี่ยวกับ base station antenna modelling for land mobile systems

๓.๔.๕ <u>ประเด็นเทคโนโลยีใหม่</u>

- ปรับปรุงร่างรายงาน ITU-R M.[LMS.CRS2] on cognitive radio systems in the land mobile service in accordance with Question ITU-R 241-2/5 and Resolution ITU-R 58 โดยจะให้แล้วเสร็จในการประชุม WP 5A ครั้งที่ ๑๓ ซึ่งจะมีขึ้นในเดือน พฤษภาคม ๒๕๕๗
- ปรับปรุงร่างรายงาน ITU-R M.2228 ซึ่งเกี่ยวข้องกับ Intelligent Transport System (ITS) และกระบวนการทำงานที่เกี่ยวข้องกับร่างข้อเสนอแนะ ITU-R M.[V2X]

- ดำเนินงานร่วมกับ WP 5B เพื่อร่วมกันจัดทำร่างข้อเสนอนะใหม่ ITU-R M.[AUTO] on systems characteristics of automotive radars operating in the frequency band 76–81 GHz for ITS applications ซึ่งอยู่ในระเบียบวาระที่ ๑.๑๘ ของที่ประชุม WRC-15

๓.๔.๖ <u>คู่มือกิจการเคลื่อนที่ทางบก</u>

- ปรับปรุงคู่มือกิจากรเคลื่อนที่ทางบกที่ประกอบด้วย ๕ ประเด็นหลัก รวมถึงการเชื่อมต่อแบบไร้สาย (wireless access)

๓.๔.๗ <u>คำศัพท์</u>

- ปรับปรุงและพัฒนาคำศัพท์เกี่ยวกับกิจการเคลื่อนที่ทางบก (Annex 25 to Doc. 5A/79) เป็นร่างข้อเสนอแนะใหม่ หรือปรับปรุงจากข้อเสนอแนะที่มีอยู่เดิม ITU-R M.1797

๔. การดำเนินการประชุม แบ่งเป็น ๓ ส่วน ดังนี้

๔.๑ การประชุมเต็มคณะ (Plenary Session) เพื่อพิจารณารายงานความคืบหน้าในการศึกษาของแต่ละกลุ่มทำงาน พิจารณาให้ความเห็นชอบอย่างเป็นทางการ (consent) ต่อร่างข้อเสนอแนะใหม่และที่มีการแก้ไข รวมทั้งพิจารณาให้ความเห็นชอบเอกสารติดต่อประสานงาน (Liaison Statement) ที่ออกโดยคณะทำงาน 5A ไปยังหน่วยงานอื่นที่เกี่ยวข้อง

๔.๒ การประชุมกลุ่มทำงาน (Working Groups) จำนวน ๕ กลุ่ม (WG 5A-1, WG 5A-2, WG 5A-3,WG 5A-4 และ WG 5A-5) เพื่อพิจารณาความคืบหน้าของการศึกษาในหัวข้อต่าง ๆ ที่อยู่ในความรับผิดชอบ

๔.๓ การประชุมกลุ่มทำงานย่อย (Sub-Working Groups) เพื่อศึกษาหัวข้อต่างๆ ที่อยู่ในความรับผิดชอบ (CRS, ITS, WASN และ SDR) ของกลุ่มทำงานแต่ละกลุ่มตามข้อ ๔.๒

๕. ผลการประชุมกลุ่มทำงาน (Working Group)

คณะทำงาน 5A ได้ดำเนินการประชุมกลุ่มทำงาน ๕ กลุ่ม แบบควบคู่และขนานกัน ซึ่งในแต่ละกลุ่มทำงานมีหน้าที่ความรับผิดชอบที่แตกต่างกันไปในแต่ละกลุ่ม ดังมีรายละเอียด ดังนี้

๕.๑ <u>กลุ่มทำงาน 5A-1 (WG 5A-1)</u> : ระเบียบวาระที่เกี่ยวข้อง คือ ระเบียบวาระที่ ๑.๔ (WRC-15)

กลุ่มทำงาน 5A-1 มีหน้าที่รับผิดชอบในการพิจารณาประเด็นต่างๆที่เกี่ยวข้องกับกิจการวิทยุสมัครเล่น และกิจการวิทยุสมัครเล่นผ่านดาวเทียม โดยประเด็นหลักที่อยู่ในความรับผิดชอบของกลุ่มทำงานนี้ คือ การกำหนดความถี่วิทยุให้กับกิจการวิทยุสมัครเล่น เป็นกิจการรอง ในช่วงความถี่วิทยุ 5300 kHz ซึ่งถูกระบุไว้เป็นระเบียบวาระที่ ๑.๔ ของการประชุม WRC-15

ซึ่งในการประชุมครั้งนี้ มีข้อเสนอจากประเทศสมาชิกที่สนใจและกลุ่มทำงานอื่นๆภายใต้ ITU รวมทั้งสิ้น ๑๕ ข้อเสนอ โดยแบ่งการพิจารณาออกเป็น ๓ ประเด็นหลักๆ ดังนี้

๕.๑.๑ <u>ระเบียบวาระที่ ๑.๔ (WRC-15) เรื่อง การกำหนดความถี่วิทยุให้กับกิจการวิทยุสมัครเล่นเป็นกิจการรอง ในย่านความถี่วิทยุ 5250 - 5450 kHz</u>

ที่ประชุมร่วมกันพิจารณาร่าง CPM ที่เกี่ยวข้องกับ การกำหนดความถี่วิทยุให้กับกิจการวิทยุสมัครเล่นเป็นกิจการรอง ในย่านความถี่วิทยุ 5250 - 5450 kHz โดยที่ประชุมมีมติ

เห็นชอบร่วมกันในการกำหนดวิธี (Method) เพื่อพิจารณาเรื่องนี้ ตามข้อเสนอของประเทศสมาชิกต่างๆ เช่น ประเทศสหรัฐอเมริกา แคนาดา รัสเซีย ทั้งนี้สามารถสรุปเป็นภาพรวมแยกออกเป็น ๒ วิธี ดังนี้

Method A: กำหนดกิจการวิทยุสมัครเล่นเป็นกิจการรอง ในย่านความถี่ 5275 – 5450 kHz โดยอาจกำหนดช่วงความถี่ใดความถี่หนึ่งหรือหลายช่วงความถี่ก็ได้

Method B: ไม่ปรับปรุงตารางกำหนดคลื่นความถี่ในข้อบังคับวิทยุที่เกี่ยวข้องกับ ย่านความถี่ 5250 - 5450 kHz

๕.๑.๒ การพิจารณาทบทวน ปรับปรุง รายงาน “การศึกษาผลกระทบที่อาจจะเกิดขึ้นระหว่างกิจการวิทยุสมัครเล่นกับกิจการประจำที่ กิจการเคลื่อนที่ทางบก กิจการเคลื่อนที่ทางทะเล และกิจการวิทยุหาตำแหน่ง ในย่านความถี่ 5250 – 5450 kHz และกิจการเคลื่อนที่ทางการบิน ในย่านความถี่ข้างเคียง

ในการประชุมครั้งนี้ ที่ประชุมได้พิจารณาข้อเสนอจากประเทศสมาชิก(สหรัฐอเมริกา รัสเซีย สาธารณรัฐประชาชนจีน และแคนนาดา) ในเรื่องของการการศึกษาผลกระทบที่อาจจะเกิดขึ้นกับกิจการประจำที่ ในย่านความถี่ 5250 – 5450 kHz หากมีการใช้ความถี่สำหรับกิจการวิทยุสมัครเล่นในย่านความถี่เดียวกันนี้ (ซึ่งเป็นประเด็นที่อยู่ในความรับผิดชอบของกลุ่มทำงาน 5C ด้วย) โดยสามารถสรุปได้ ๓ ทางเลือก ตามข้อเสนอแนะของ ITU-R ฉบับต่างๆ ไม่ว่าจะเป็น ITU-R F.1761 , ITU-R F.1762, ITU-R F.1821 และ ITU-R F.339 ทั้งนี้ ๑ ใน ๓ ทางเลือกนี้ จะถูกนำไประบุไว้ในรายงานฉบับสมบูรณ์ ซึ่งจะต้องมีการพิจารณาว่าทางเลือกไหนเหมาะสมและปรับปรุงให้มีความสอดคล้องตามความเห็นของประเทศสมาชิกในการประชุมคณะทำงาน 5A ครั้งต่อไป โดยมีรายละเอียดปรากฏตาม Document 5A/TEMP/195-E

๕.๑.๓ เป้าหมายของกลุ่มทำงาน 5A-1 ในการประชุมคณะทำงาน 5A ครั้งต่อไป (ครั้งที่ 13)

- จัดทำร่าง CPM ในส่วนที่เกี่ยวข้องให้แล้วเสร็จ โดยพิจารณาจากข้อเสนอของประเทศสมาชิกต่างๆ และกลุ่มศึกษาอื่นที่เกี่ยวข้อง แล้วส่งต่อไปยัง chapter rapporteur
- จัดทำร่างรายงานผลการศึกษาผลกระทบที่อาจจะเกิดขึ้นระหว่างกิจการวิทยุสมัครเล่นกับกิจการประจำที่ กิจการเคลื่อนที่ทางบก กิจการเคลื่อนที่ทางทะเล และกิจการวิทยุหาตำแหน่ง ในย่านความถี่ 5250 – 5450 kHz และกิจการเคลื่อนที่ทางการบิน ในย่านความถี่ข้างเคียง รวมทั้งคู่มือที่เกี่ยวข้องกับกิจการวิทยุสมัครเล่นและกิจการวิทยุสมัครเล่นผ่านดาวเทียม (ถ้าจำเป็น) ตามข้อเสนอของประเทศสมาชิกต่างๆ และกลุ่มศึกษาอื่นที่เกี่ยวข้อง ให้แล้วเสร็จ แล้วนำเสนอต่อที่ประชุมกลุ่มศึกษาที่ ๕

๕.๒ กลุ่มทำงาน 5A-2 (WG 5A-2) :

กลุ่มทำงาน 5A-2 มีหน้าที่รับผิดชอบในการพิจารณาประเด็นที่เกี่ยวข้องกับ มาตรฐานและระบบ โดยในการประชุมครั้งนี้ มีข้อเสนอจากประเทศสมาชิก ๒๓ ข้อเสนอ ซึ่งที่ประชุมได้ร่วมกันพิจารณาในประเด็นต่างๆที่เกี่ยวข้อง และสามารถสรุปผลการพิจารณาออกเป็นประเด็นต่างๆ ดังนี้

๕.๒.๑ Wireless Gigabits networks

เนื่องจากในการประชุมครั้งนี้ ไม่มีข้อเสนอจากประเทศสมาชิกที่เกี่ยวข้องกับประเด็นของร่างข้อเสนอแนะ ITU-R M.2003 และร่างรายงาน ITU-R M.2227 ที่ประชุมจึงมีมติเห็นชอบให้มีการพิจารณาทั้ง ๒ ประเด็นดังกล่าว ให้สอดคล้องกับข้อเสนอของประเทศสมาชิกและคณะทำงานอื่นที่เกี่ยวข้องให้แล้วเสร็จ ในการประชุมคณะทำงาน 5A ครั้งต่อไป

๕.๒.๒ Broadband Wireless Access

ที่ประชุมได้ร่วมกันพิจารณาข้อเสนอของประเทศสมาชิกต่างๆ โดยเห็นชอบให้มีการกำหนดเรื่อง Broadband Wireless Access ไว้ในคู่มือ Land Mobile Handbook สอดคล้องตามข้อเสนอของที่ประชุมคณะทำงาน 5C ซึ่งเป็นกลุ่มทำงานที่ริเริ่มการจัดทำร่างรายงานฉบับใหม่ ITU-R F.[FS.IMT/BB] “Fixed service backhaul networks for IMT and other terrestrial mobile broadband systems”

ที่ประชุมยังได้ร่วมกันพิจารณาข้อเสนอของประเทศญี่ปุ่น ในการจัดทำร่างข้อเสนอแนะฉบับใหม่ เรื่อง “Operational guidelines for the deployment of broadband mobile systems for local coverage in the frequency bands below 6 GHz” แต่อย่างไรก็ตามในการประชุมครั้งนี้ ที่ประชุมไม่เห็นด้วยที่จะให้มีการจัดทำเป็นร่างข้อเสนอแนะ จึงมีมติเห็นชอบให้จัดทำเป็นร่างเอกสารโดยมีรายละเอียดตามข้อเสนอของประเทศญี่ปุ่น และให้มีการพิจารณาอีกครั้งในการประชุมครั้งต่อไป

๕.๒.๓ ATG

ที่ประชุมได้ร่วมกันพิจารณาข้อเสนอของประเทศสมาชิกต่างๆ และเห็นชอบร่างรายงาน ITU-R M.[LMS.ATG] “Systems for public mobile communications with aircraft” ตามข้อเสนอของประเทศฝรั่งเศสและญี่ปุ่น เนื่องจากเป็นการปรับปรุงจากร่างฉบับเดิม ให้มีความทันสมัยสอดคล้องกับสภาวการณ์ในปัจจุบันที่เปลี่ยนแปลงไป จึงทำให้ที่ประชุมมีมติเห็นชอบให้ยกเลิก รายงาน ITU-R M.1051 “Public mobile telephone service with aircraft” โดยมีรายละเอียดร่างรายงานฉบับใหม่ ปรากฏตามเอกสารแนบ ๑

๕.๒.๔ Update of Rec. ITU-R M.1450: Characteristics of broadband radio local area networks

เนื่องจากในการประชุมครั้งนี้ ไม่มีข้อเสนอจากประเทศสมาชิกในเรื่องการจัดทำข้อเสนอแนะ ITU-R M.1450 : Characteristics of broadband radio local area networks ที่ประชุมจึงเห็นควรเสนอร่างข้อเสนอแนะดังกล่าวต่อที่ประชุมคณะทำงาน 5A เพื่อพิจารณาต่อไป โดยมีรายละเอียดปรากฏตามเอกสารแนบ ๒

๕.๒.๕ Update of Recommendation ITU-R M.1763 : Radio interface standards for broadband wireless access systems in the fixed service operating below 66 GHz

ที่ประชุมได้มีการพิจารณาข้อเสนอจากประเทศสมาชิกในเรื่อง การปรับปรุงร่างข้อเสนอแนะ ITU-R M.1763 และเห็นชอบให้เสนอร่างฉบับนี้ต่อที่ประชุม คณะทำงาน 5A เพื่อพิจารณาต่อไป โดยมีรายละเอียดปรากฏตามเอกสารแนบ ๓

๕.๒.๖ เป้าหมายของกลุ่มทำงาน 5A-2 ในการประชุมคณะทำงาน 5A ครั้งต่อไป (ครั้งที่ 13)
เป้าหมายของกลุ่มทำงาน 5A-2 ในการประชุมคณะทำงาน 5A ครั้งต่อไป จะมีการปรับปรุง แก้ไข ITU-R Recommendation Report Question ต่างๆ ตามข้อเสนอของประเทศสมาชิก หรือ กลุ่มงานที่เกี่ยวข้อง ประกอบด้วย

- Recommendation ITU-R M.1076
- Recommendation ITU-R M.2003
- Report ITU-R M.2227
- ร่างเอกสารเรื่อง Operational guidelines for the deployment of broadband mobile systems for local coverage in the frequency bands below 6 GHz.

๕.๓ กลุ่มทำงาน 5A-3 (WG 5A-3) : ระเบียบวาระที่เกี่ยวข้อง คือ ระเบียบวาระที่ ๑.๓ และ ๑.๑๐(WRC-15)

กลุ่มทำงาน 5A-3 มีหน้าที่รับผิดชอบในการพิจารณาประเด็นที่เกี่ยวข้องกับการป้องกันและบรรเทาสาธารณภัย (Public Protection and Disaster relief: PPDR) ซึ่งสอดคล้องตามระเบียบวาระการประชุมที่ ๑.๓ และ ๑.๑๐ ของการประชุม WRC-15 โดยในการประชุมครั้งนี้ มีข้อเสนอจากประเทศสมาชิก ๑๖ ข้อเสนอ เพื่อเสนอความเห็นหลากหลายประเด็นที่เกี่ยวข้องกับ PPDR ซึ่งที่ประชุมได้ร่วมกันพิจารณาและให้ความเห็นชอบในประเด็นต่างๆ ดังนี้

๕.๓.๑ การพิจารณาจัดทำร่างข้อเสนอแนะ ITU-R M.2015: Frequency arrangements for public protection and disaster relief radiocommunication systems in UHF bands in accordance with Resolution 646 (Rev.WRC-12)
ในการประชุมครั้งนี้ ไม่มีข้อเสนอใดๆเพิ่มเติมจากประเทศสมาชิก ที่ประชุมจึงเห็นชอบให้มีการพิจารณาเรื่องนี้อีกครั้งในการประชุมกลุ่มทำงานครั้งต่อไป รายละเอียดร่างข้อเสนอแนะที่ได้จากการประชุมคณะทำงาน 5A ครั้งที่ ๑๒ ปรากฏตามเอกสารแนบ ๔

๕.๓.๒ การพิจารณาปรับปรุง ร่างรายงาน ITU-R M.2033: Radiocommunication objectives and requirements for public protection and disaster relief (2003) ซึ่งในการประชุมครั้งนี้ ที่ประชุมได้ร่วมกันจัดทำร่าง PDNR ITUR-M.[PPDR] Broadband public protection and disaster relief communications ที่ประกอบด้วยข้อมูลทางด้านเทคนิคและการใช้งานที่เกี่ยวข้องกับ Broadband PPDR แนวโน้มทางด้านเทคโนโลยีต่างๆในอนาคตของ Broadband PPDR รวมไปถึง ความต้องการของกลุ่มประเทศกำลังพัฒนาที่เกี่ยวข้องกับ Broadband PPDR ซึ่งสอดคล้องตาม Resolution 648 (WRC-12) โดยแบ่งออกเป็น ๔ ส่วน ดังนี้

- ส่วนที่ ๑ : บททั่วไป , จุดประสงค์และความต้องการของ PPDR
- ส่วนที่ ๒ : จุดประสงค์และความต้องการสำหรับเทคโนโลยี Broadband
- ส่วนที่ ๓ : จุดประสงค์และความต้องการสำหรับเทคโนโลยี Narrow/Wideband
- ส่วนที่ ๔ : ความต้องการเกี่ยวกับ PPDR ในประเทศกำลังพัฒนา

ทั้งนี้ รายละเอียดของแต่ละส่วนยังอยู่ในขั้นตอนของการพิจารณาของกลุ่มทำงาน 5A-3 โดยเฉพาะอย่างยิ่งรายละเอียดในส่วนที่ ๓ ซึ่งที่ประชุมได้มีการกำหนดกลุ่มงานย่อย Correspondence Group (CG) และขอบเขตงานเป็นการภายใน เพื่อพิจารณาจัดทำรายละเอียดในส่วนนี้ โดยอ้างอิงจากรายงาน ITU-R M.2033 และจะต้องจัดทำรายงาน CG เพื่อเสนอต่อกลุ่มทำงาน 5A อย่างน้อย ๒๑ วันก่อนวันกำหนดส่งข้อเสนอของคณะทำงาน 5A พร้อมกันนี้จะได้มีการพิจารณาการจัดทำร่าง PDNR ITUR-M.[PPDR] อีกครั้ง ในการประชุมคณะทำงาน 5A ครั้งต่อไป

๕.๓.๓ ที่ประชุมร่วมกันพิจารณาข้อเสนอของประเทศสมาชิก เพื่อจัดทำร่าง CPM สำหรับระเบียบวาระที่ ๑.๓ โดยรายละเอียดร่าง CPM ดังกล่าว จะประกอบด้วย ผลการศึกษาทางเทคนิคที่เกี่ยวข้อง ข้อเสนอแนะอ้างอิงจากหน่วยงานต่างๆที่เป็นสากล ตลอดจนการนำเสนอทางเลือก ผลดี ผลเสียต่อการพิจารณาแก้ไข Resolution 646 (Rev.WRC-12) (เพื่อเป็นข้อมูลพื้นฐานที่สำคัญต่อการพิจารณาให้ความเห็นของประเทศสมาชิกต่างๆในการประชุม WRC-15) ซึ่งในการประชุมครั้งนี้ ที่ประชุมได้จัดทำข้อเสนอเบื้องต้นในการพิจารณาประเด็นที่เกี่ยวข้องภายใต้ระเบียบวาระนี้ ๒ วิธี (Method)

Method A : ไม่มีการปรับปรุงในส่วนที่เป็นสาระสำคัญของข้อมมติ ๖๔๖ (Resolution 646(Rev.WRC-12)) โดยจะแก้ไขเฉพาะคำผิดในข้อมตินี้เท่านั้น

ข้อดี: ครอบคลุมตามวัตถุประสงค์ของข้อมมติ ๖๔๖ (Rev.WRC-12)

ข้อเสีย: ไม่ครอบคลุมตามวัตถุประสงค์ความต้องการของข้อมมติ ๖๔๘ (Rev.WRC-12)

Method B : ปรับปรุงสาระสำคัญของข้อมมติ ๖๔๖ (Resolution 646(Rev.WRC-12)) อยู่ในระหว่างการพิจารณาจัดทำภายใต้คณะทำงาน 5A ในการประชุมครั้งต่อไป

ทั้งนี้ รายละเอียดที่เกี่ยวข้องภายใต้ประเด็นดังกล่าวนี้ปรากฏตามเอกสารแนบ ๕

๕.๓.๔ เป้าหมายของกลุ่มทำงาน 5A-3 ในการประชุมคณะทำงาน 5A ครั้งต่อไป ประกอบด้วย

- พิจารณารายงานของ CG และข้อเสนอของประเทศสมาชิก เกี่ยวกับการจัดทำร่างรายงาน Broadband public protection and disaster relief communications ฉบับใหม่
- พิจารณาจัดทำร่าง CPM on review and revision of Resolution 646 ให้แล้วเสร็จ ซึ่งรวมถึงทางเลือก ผลดี ผลเสียต่อการพิจารณาแก้ไขข้อมติ ๖๔๖ (Rev.WRC-12) ด้วย
- พิจารณาขั้นตอนการดำเนินงานเกี่ยวกับการจัดทำ ร่างรายงาน Broadband public protection and disaster relief communications ฉบับใหม่ และการดำเนินการที่จำเป็นต่อระเบียบวาระที่ ๑.๓ พร้อมทั้งยกเลิกการใช้รายงาน ITU-R M.2033 ด้วย โดยมีลำดับขั้นตอนการดำเนินงานพอสังเขป ดังนี้
  a. จัดทำร่างรายงาน Broadband public protection and disaster relief communications ส่วนที่ ๓ (จุดประสงค์และความต้องการสำหรับเทคโนโลยี Narrow/Wideband) ให้แล้วเสร็จ
  b. จัดทำบทสรุปของผลการศึกษาที่สำคัญ ๆที่ปรากฏในรายงาน Broadband public protection and disaster relief communications ฉบับใหม่นี้ เพื่อ

นำไปใช้ประกอบการจัดทำร่าง CPM ที่เกี่ยวข้องกับระเบียบวาระที่ ๑.๓ (sections 1/1.3/3 and 1/1.3/4)

c. สนับสนุนการดำเนินงานของ CG ที่เกี่ยวกับ การจัดทำรายงานในส่วนของ Narrow/Wideband ไว้ในร่างรายงาน Broadband public protection and disaster relief communications ฉบับใหม่นี้ ตามความเหมาะสม

d. พิจารณาจัดทำเอกสารประสานงานไปยังกลุ่มทำงานต่างๆที่เกี่ยวข้อง เพื่อให้ความเห็นในเรื่องดังกล่าวนี้ตามความจำเป็นและเหมาะสม

- พิจารณาปรับปรุงและทบทวนแผนการดำเนินงานตามความเหมาะสม

๕.๔ กลุ่มทำงาน 5A-4 (WG 5A-4) :

กลุ่มทำงาน 5A-4 มีหน้าที่รับผิดชอบในการพิจารณาประเด็นที่เกี่ยวข้องกับการใช้ความถี่วิทยุร่วมกันและการรบกวนความถี่วิทยุ โดยในการประชุมครั้งนี้ มีข้อเสนอจากประเทศสมาชิก ๓๘ ข้อเสนอ ซึ่งที่ประชุมได้ร่วมกันพิจารณาและให้ความเห็นชอบในประเด็นที่สำคัญๆ ดังนี้

๕.๔.๑ การพิจารณาปรับปรุงรายงาน ITU-R M.2116: Characteristics of broadband wireless access systems operating in the land mobile service for use in sharing studies

สืบเนื่องจากการประชุมกลุ่มทำงาน 5A ครั้งที่ ๑๐ – ๑๒ ไม่มีข้อเสนอใดๆเพิ่มเติมในการพิจารณาปรับปรุงรายงาน ITU-R M.2116 เรื่อง คุณลักษณะของระบบ Broadband Wireless System ที่ใช้ในกิจการเคลื่อนที่ทางบก เพื่อใช้เป็นกรณีศึกษาของการใช้ความถี่ร่วมกันระหว่างกิจการภาคพื้นดิน ที่ใช้ BWA กับ กิจการประจำที่หรือกิจการเคลื่อนที่อื่นๆในย่านความถี่เดียวกัน ซึ่งที่ประชุมจึงเห็นชอบให้เสนอเรื่องนี้เข้าสู่ที่ประชุมกลุ่มศึกษา 5 เพื่อพิจารณาให้ความเห็นชอบต่อไป รายละเอียดปรากฏตามเอกสารแนบ ๖

๕.๔.๒ การพิจารณาคู่มือการประสานงานตามบริเวณชายแดน (Cross-border coordination handbook)

กลุ่มทำงาน 5A ร่วมประชุมกับคณะทำงาน 5C เพื่อพิจารณาประเด็นนี้ โดยมีข้อเสนอจากประเทศรัสเซีย ซึ่งเสนอให้มีการปรับปรุง เกี่ยวกับการประสานงานตามบริเวณชายแดนของกิจการประจำที่ในอนาคต และไม่พิจารณาการประสานงานตามบริเวณชายแดนของกิจการเคลื่อนที่ทางบกไว้ในคู่มือฉบับนี้ ซึ่งที่ประชุมคณะทำงาน 5C จะรับไปพิจารณาในการประชุมครั้งต่อไปของคณะทำงาน 5C

๕.๔.๓ การพิจารณาปรับปรุงข้อเสนอแนะ ITU-R M.1824: System characteristics of television outside broadcast, electronic news gathering and electronic field production in the mobile service for use in sharing studies

ที่ประชุมได้ร่วมกันพิจารณาข้อเสนอของประเทศแคนนาดา ในการพิจารณาเพิ่มเติมการดำเนินการและคุณลักษณะทางเทคนิคที่ควรจะใช้ในการใช้ความถี่ร่วมระหว่างกิจการเคลื่อนที่ (Mobile Broadband Network used for ENG application) และกิจการอื่นๆ ทั้งนี้ ที่ประชุมเห็นควรมีการพิจารณาในการประชุมคณะทำงาน 5A ครั้งต่อไป เพื่อรอข้อเสนอจากประเทศสมาชิกอื่นๆ รายละเอียดปรากฏตามเอกสารแนบ ๗

๕.๔.๔ การพิจารณาปรับปรุงข้อเสนอแนะ ITU-R M. .[MS 14.5-15.35 CHAR] Characteristics of and protection criteria for systems operating in the mobile service in the frequency range 14.5-15.35 GHz

ที่ประชุมได้ร่วมกันพิจารณาข้อเสนอของประเทศสหรัฐอเมริกา ในการปรับปรุง แก้ไขข้อเสนอแนะเกี่ยวกับข้อกำหนดหรือหลักเกณฑ์ในการป้องกันสำหรับกิจการเคลื่อนที่ที่ใช้งานในย่านความถี่ 14.5-15.35 GHz ทั้งนี้ ที่ประชุมเห็นควรมีการพิจารณาในการประชุมคณะทำงาน 5A ครั้งต่อไป เพื่อรอข้อเสนอจากประเทศสมาชิกอื่นๆ รายละเอียดปรากฏตามเอกสารแนบ ๘

๕.๔.๕ แผนการดำเนินงานและเป้าหมายของการประชุม WG 5A-4 ในการประชุมครั้งต่อไป (ครั้งที่ ๑๓) ประกอบด้วย

- พิจารณาปรับปรุง ข้อเสนอแนะ ITU-R M.1824: System characteristics of television outside broadcast, electronic news gathering and electronic field production in the mobile service for use in sharing studies
- พิจารณาปรับปรุง ร่างข้อเสนอแนะ ITU-R M.[MS 14.5 – 15.35 CHAR] ซึ่งเกี่ยวข้องกับคุณสมบัติและมาตรการการป้องกันสำหรับกิจการเคลื่อนที่ในย่านความถี่วิทยุ ๑๔.๕ – ๑๕.๓๕ GHz
- พิจารณาข้อเสนอจากประเทศสมาชิกต่างๆ เกี่ยวกับ โมเดลสายอากาศของสถานีฐานในกิจการเคลื่อนที่ทางบก ตามข้อเสนอจากกลุ่มทำงาน 5C

๕.๕ กลุ่มทำงาน 5A-5 (WG 5A-5) :

กลุ่มทำงาน 5A-5 มีหน้าที่รับผิดชอบในการพิจารณาประเด็นต่างๆที่เกี่ยวข้องกับเทคโนโลยีใหม่ ซึ่งที่ประชุมกลุ่มทำงาน 5A-5 พิจารณาแล้ว เห็นควรมีการแบ่งกลุ่มการพิจารณา เพื่อให้ครอบคลุมหน้าที่ความรับผิดชอบของกลุ่มทำงาน 5A-5 ซึ่งประกอบด้วย Cognitive Radio Systems (CRS) , Intelligent Transport System (ITS), Wireless Access Sensor Network (WASN) และ Software Defined Radio (SDR) รวมถึงระเบียบวาระที่ ๑.๑๘ ซึ่งเกี่ยวข้องกับกลุ่มทำงาน 5A-5 ด้วย โดยในการประชุมครั้งนี้ มีข้อเสนอจากประเทศสมาชิกรวม ๓๑ ข้อเสนอ ซึ่งที่ประชุมได้ร่วมกันพิจารณาและให้ความเห็นชอบในประเด็นต่างๆ ดังนี้

๕.๕.๑ Cognitive Radio Systems (CRS)

ที่ประชุมร่วมกันปรับปรุงร่าง Report (PDNR) M.[LMS.CRS2] โดยอยู่บนพื้นฐานของข้อเสนอของประเทศสมาชิกต่างๆ เพื่อให้สามารถครอบคลุมเป็นร่างรายงานฉบับเดียวกัน ทั้งนี้ ที่ประชุมเห็นชอบให้จัดทำเอกสารประสานงานไปยังกลุ่มงานต่างๆเพื่อขอความร่วมมือจัดทำข้อเสนอเข้าสู่ที่ประชุมครั้งต่อไป เพื่อให้ร่างฉบับดังกล่าวแล้วเสร็จภายในการประชุมคณะทำงาน 5A ครั้งต่อไปด้วย รายละเอียดร่างรายงานฉบับดังกล่าวปรากฏตาม Document 5A/TEMP/192-E

๕.๕.๒ Intelligent Transport System (ITS)

ที่ประชุมร่วมพิจารณาร่างข้อเสนอของประเทศสมาชิก จำนวน ๑๒ ข้อเสนอ ในการปรับปรุงร่าง Report/Recommendation ต่างๆที่เกี่ยวข้อง ตลอดจนประเด็นที่เกี่ยวกับระเบียบวาระที่ ๑.๑๘ (WRC-15) โดยมีรายละเอียดดังนี้

- ที่ประชุมร่วมกันปรับปรุงร่าง Recommendation ITU-R M.[V2X] และ แผนการดำเนินงานในการ กำหนดมาตรฐานวิทยุคมนาคมสำหรับ เครื่องยนต์-เครื่องยนต์ และ เครื่องยนต์-โครงสร้างพื้นฐานอื่นๆ สำหรับระบบ ITS โดยอยู่บนพื้นฐานของข้อเสนอของประเทศสมาชิกต่างๆ ทั้งนี้ ที่ประชุมเห็นชอบให้จัดทำเอกสาร

ประสานงานไปยังกลุ่มงานต่างๆเพื่อขอความร่วมมือจัดทำข้อเสนอเข้าสู่ที่ประชุมครั้งต่อไป เพื่อให้ร่างฉบับดังกล่าวแล้วเสร็จภายในการประชุมคณะทำงาน 5A ครั้งต่อไป รายละเอียดร่างข้อเสนอแนะฉบับดังกล่าวปรากฏตามเอกสารแนบ ๙

- ในส่วนของร่าง รายงาน ITU-R M.2228 : Advanced ITS radiocommunication นั้น เนื่องจากการประชุมครั้งนี้ไม่มีข้อเสนอจากประเทศสมาชิกใดๆเพิ่มเติม จึงเห็นควรมีการพิจารณาร่างฉบับดังกล่าว ในการประชุมคณะทำงาน 5A ครั้งต่อไป
- ปรับปรุงร่าง Recommendation ITU-R M.[AUTO] ที่เกี่ยวข้องกับระบบเรดาร์อัตโนมัติ ในย่านความถี่วิทยุ ๗๖-๘๑ GHz ซึ่งที่ประชุมเห็นชอบให้นำเสนอร่างฉบับดังกล่าวนี้ เสนอต่อที่ประชุมกลุ่มศึกษา 5 ต่อไป

๕.๕.๓ แผนการดำเนินงานและเป้าหมายของการประชุม WG 5A-5 ในการประชุมครั้งต่อไป (ครั้งที่ ๑๓) ประกอบด้วย

- ปรับปรุง Report (PDNR) M.[LMS.CRS2] ให้สอดคล้องกับ ITU-R 241-1/5 และ Resolution ITU-R 58 ตามข้อเสนอของประเทศสมาชิกต่างๆ โดยร่างรายงานฉบับนี้ จะต้องแล้วเสร็จภายในการประชุมคณะทำงาน 5A ครั้งที่ ๑๓ ด้วย
- ปรับปรุงร่าง Recommendation ITU-R M.[V2X] และรายงาน ITU-R M.2228 : Advanced ITS radiocommunication
- ปรับปรุงร่าง Recommendation ITU-R M.[AUTO] ที่อ้างอิงอยู่ในระเบียบวาระที่ ๑.๑๘ (WRC-15)

๖. การประชุมคณะทำงานครั้งต่อไป

กำหนดการประชุมของคณะทำงาน 5A ครั้งต่อไป (ครั้งที่ ๑๓) ระหว่างวันที่ ๑๙ – ๒๙ พฤษภาคม ๒๐๑๔ ณ นครเจนีวา ประเทศสวิตเซอร์แลนด์

<u>รายงานผลการประชุมกลุ่มศึกษาที่ ๕ ครั้งที่ ๘</u>

ITU-R the 7th Meeting of Study Group 5 (Terrestrial Services)
Systems and networks for fixed, mobile, radio determination,
Amateur and amateur-satellite services

๑. รายละเอียดการประชุม

การประชุมกลุ่มศึกษาที่ ๕ ครั้งที่ ๘ ของภาควิทยุคมนาคม จัดขึ้นโดยสหภาพโทรคมนาคมระหว่างประเทศ ระหว่างวันที่ ๒ – ๓ ธันวาคม ๒๕๕๖ ณ นครเจนีวา ประเทศสวิตเซอร์แลนด์ โดยมีหน้าที่พิจารณาและให้ความเห็นชอบผลการดำเนินงานต่าง ๆ ของคณะทำงานที่อยู่ภายใต้กลุ่มศึกษานี้จำนวน ๔ คณะ ซึ่งมีหน้าที่ความรับผิดชอบที่แตกต่างกันไปในแต่ละคณะทำงาน (5A, 5B, 5C, 5D)

๒. ผู้เข้าร่วมประชุม

ผู้เข้าร่วมประชุมประกอบด้วยผู้แทนจากรัฐสมาชิก (Member States) สมาชิกสมทบ (Associates) องค์การระหว่างประเทศและองค์กรภูมิภาค (Regional and Other International Organizations) ผู้ประกอบกิจการโทรคมนาคมที่เป็นที่รู้จัก (Recognized Operating Agencies) สหภาพโทรคมนาคมระหว่างประเทศInternational Telecommunication Union: ITU) และหน่วยงานด้านวิทยาศาสตร์หรืออุตสาหกรรม (Scientific or Industrial Organizations) โดยมี Dr. Akira Hashimoto จากประเทศญี่ปุ่นทำหน้าที่ประธานที่ประชุม

๓. หน้าที่ความรับผิดชอบของคณะทำงานที่เกี่ยวข้องภายใต้กลุ่มศึกษาที่ ๕

กลุ่มศึกษาที่ ๕ (Study Group 5) ของภาควิทยุคมนาคม จัดตั้งขึ้นตามมติของที่ประชุมสมัชชาว่าด้วยการวิทยุคมนาคม ค.ศ. ๒๐๐๗ (Radio Assembly 2007: RA-07) ของสหภาพโทรคมนาคมระหว่างประเทศ โดยให้มีหน้าที่รับผิดชอบการศึกษาเกี่ยวกับระบบและโครงข่ายสำหรับกิจการประจำที่ กิจการเคลื่อนที่ กิจการวิทยุตรวจการณ์และตรวจค้นหา กิจการวิทยุสมัครเล่น และกิจการวิทยุสมัครเล่นผ่านดาวเทียม

๔. ผลการประชุม

๔.๑ <u>คณะทำงาน 5A</u>

ในปี พ.ศ.๒๕๕๖ คณะทำงาน 5A มีการประชุมร่วมกันทั้งสิ้นจำนวน ๒ ครั้ง เมื่อวันที่ ๒๐ - ๓๐ พฤษภาคม ๒๕๕๖ (ครั้งที่ ๑๑) และ เมื่อวันที่ ๑๘ – ๒๘ พฤศจิกายน ๒๕๕๖ (ครั้งที่ ๑๒) โดยมี Mr. Jose Costa จากประเทศแคนนาดา ทำหน้าที่ประธานที่ประชุม ทั้งนี้ คณะทำงาน 5A ได้เสนอเอกสารให้ที่ประชุมกลุ่มศึกษาที่ ๕ พิจารณา ดังนี้

๔.๑.๑ ร่างข้อเสนอแนะ จำนวน ๓ ฉบับ ประกอบด้วย

๑) ร่างข้อเสนอแนะ ITU-R M.1450-4 – Characteristics of broadband radio local area networks

๒) ร่างข้อเสนอแนะฉบับใหม่ ITU-R F.1763 – Radio interface standards for broadband wireless access systems in the fixed service operating below 66 GHz

๓) ร่างข้อเสนอแนะ ITU-R M.[AUTO] – Systems characteristics of automotive radars operating in the frequency band 76-81 GHz for intelligent transport systems applications

๔.๑.๒ ร่างรายงาน จำนวน ๓ ฉบับ ประกอบด้วย

๑) ร่างรายงาน ITU-R M.[5 MHz CHAR] – Characteristics of amateur radio stations in the range 5 250-5 450 kHz for sharing studies

๒) ร่างรายงาน ITU-R M.[LMS.ATG] – Systems for public mobile communications with aircraft

๓) ร่างรายงาน ITU-R M.2116-1 – Characteristics of broadband wireless access systems operating in the land mobile service for use in sharing studies

๔.๑.๓ ยกเลิกข้อเสนอแนะฉบับเดิม จำนวน ๒ ฉบับ ประกอบด้วย

๑) Recommendation ITU-R M.1740 (2006): Guide to the application of ITU-R texts related to the amateur and amateur-satellite services

๒) Recommendation ITU-R M.1222(1997): Transmission of data messages on shared private land mobile radio channels

๔.๑.๔ ยกเลิกรายานฉบับเดิม จำนวน ๓ ฉบับ ประกอบด้วย

๑) รายงาน ITU-R M.741 (1990): Multi-channel land mobile systems for dispatch traffic (with or without PSTN interconnection)

๒) รายงาน ITU-R M.901 (1990): Frequency assignment methods for trunked mobile radio systems

๓) รายงาน ITU-R M.1051 (1990): Public mobile telephone service with aircraft

โดยมีรายละเอียดผลการประชุมคณะทำงาน 5A ปรากฏตาม<u>เอกสารแนบ ๑๐</u>

๔.๒ <u>คณะทำงาน 5B</u>

ในปี พ.ศ.๒๕๕๖ คณะทำงาน 5A มีการประชุมร่วมกันทั้งสิ้นจำนวน ๒ ครั้ง เมื่อวันที่ ๒๐ - ๓๑ พฤษภาคม ๒๕๕๖ (ครั้งที่ ๑๑) และ เมื่อวันที่ ๑๘ – ๒๙ พฤศจิกายน ๒๕๕๖ (ครั้งที่ ๑๒) ทั้งนี้ คณะทำงาน 5B ได้เสนอเอกสารให้ที่ประชุมกลุ่มศึกษาที่ ๕ พิจารณา ดังนี้

๔.๒.๑ ร่างข้อเสนอแนะ จำนวน ๕ ฉบับ ประกอบด้วย

๑) ร่างข้อเสนอแนะฉบับใหม่ : Operational and technical characteristics and protection criteria of radio altimeters utilizing the frequency band 4 200 – 4 400 MHz

๒) ร่างข้อเสนอแนะ ITU-R M.2008-0: Characteristics and protection criteria for radars operating in the aeronautical radionavigation service in the frequency band 13.25 – 13.40 GHz

๓) ร่างข้อเสนอแนะ ITU-R M.1371-4: Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile band

๔) ร่างข้อเสนอแนะ ITU-R M.1796-1: Characteristics of and protection criteria for terrestrial radars operating in the radiodetermination service in the frequency band 8 500-10 680 MHz

๕) ร่างข้อเสนอแนะฉบับใหม่ ITU-R M.[NAVDAT-HF]: Characteristics of a digital system, named navigational data for broadcasting maritime safety and security related information from shore-to-ship in the maritime HF frequency band

๔.๒.๒ ร่างรายงาน จำนวน ๖ ฉบับ ประกอบด้วย

๑) ร่างรายงานฉบับใหม่ ITU-R M.[5 MHz CHAR]: ITU-R M.[WAIC_CHAR_SPEC]: Technical characteristics and spectrum requirements of Wireless Avionics Intra-Communications systems to support their safe operation

๒) ร่างรายงานฉบับใหม่ Compatibility of radionavigation satellite service (space-to-Earth) Systems and Radars Operating in the frequency band 1 215-1 300 MHz

๓) ร่างรายงานฉบับใหม่ ITU-R M.[MAN OVERBOARD SYSTEMS]: Maritime survivor locating systems and devices (man overboard systems) - An overview of systems and their mode of operation

๔) ร่างรายงานฉบับใหม่ /TU-R M.[TELE-CHAR]: Operational characteristics of aeronautical mobile telemetry systems

๕) ร่างรายงานฉบับใหม่ ITU-R M.[VDL-LOADING]: Automatic identification system VHF data link loading

๖) ร่างรายงานฉบับใหม่ ITU-R M.[VOICE-DATA]: Digital voice communication system on MF/HF radio channels of the maritime mobile service for shore-to-ship/ship-to-shore applications

โดยมีรายละเอียดผลการประชุมคณะทำงาน 5B ปรากฏตามเอกสารแนบ ๑๑

๔.๓ คณะทำงาน 5C

ในปี พ.ศ.๒๕๕๖ คณะทำงาน 5C มีการประชุมร่วมกันทั้งสิ้นจำนวน ๒ ครั้ง เมื่อวันที่ ๒๐-๒๙ พฤษภาคม ๒๕๕๖ (ครั้งที่ ๑๑) และ เมื่อวันที่ ๑๘ – ๒๗ พฤศจิกายน ๒๕๕๖ (ครั้งที่ ๑๒) โดยมี Mr. Charles Glass จากประเทศสหรัฐอเมริกา ทำหน้าที่ประธานที่ประชุม ทั้งนี้ คณะทำงาน 5C ได้เสนอเอกสารให้ที่ประชุมกลุ่มศึกษาที่ ๕ พิจารณา ดังนี้

๔.๓.๑ ร่างข้อเสนอแนะ จำนวน ๔ ฉบับ ประกอบด้วย

๑) ร่างข้อเสนอแนะ ITU-R F.557-4: Availability objective for radio-relay systems over a hypothetical reference circuit and a hypothetical reference digital path

๒) ร่างข้อเสนอแนะ ITU-R F.1336-3: Reference radiation patterns of omnidirectional, sectoral and other antennas for the fixed and mobile services for use in sharing studies in the frequency range from 400 MHz to about 70 GHz

๓) ร่างข้อเสนอแนะ ITU-R F.1497-1: Radio-frequency channel arrangements for fixed wireless systems operating in the band 55.78-59 GHz

๔) ร่างข้อเสนอแนะ ITU-R F.1105-2: Fixed wireless systems for disaster mitigation and relief operations

๔.๓.๒ ร่างรายงาน จำนวน ๑ ฉบับ

ITU-R F.[ANALOG]: List of ITU-R Recommendations on analogue systems in the fixed service

๔.๓.๓ ยกเลิกข้อเสนอแนะฉบับเดิม จำนวน ๒ ฉบับ ประกอบด้วย

๑) Recommendation ITU-R SF.357-4

๒) Recommendation ITU-R SF.356-4

โดยมีรายละเอียดผลการประชุมคณะทำงาน 5C ปรากฏตามเอกสารแนบ ๑๒

๔.๔ คณะทำงาน 5D

ในปี พ.ศ.๒๕๕๖ คณะทำงาน 5D มีการประชุมร่วมกันทั้งสิ้นจำนวน ๓ ครั้ง เมื่อวันที่ ๓๐ มกราคม – ๖ กุมภาพันธ์ ๒๕๕๖ (ครั้งที่ ๑๕), ๙ – ๑๖ กรกฎาคม ๒๕๕๖(ครั้งที่ ๑๖) และ เมื่อวันที่ ๙ – ๑๖ ตุลาคม ๒๕๕๖ (ครั้งที่ ๑๗) ทั้งนี้ คณะทำงาน 5D ได้เสนอเอกสารให้ที่ประชุมกลุ่มศึกษาที่ ๕ พิจารณา ดังนี้

๔.๔.๑ ร่างข้อเสนอแนะ จำนวน ๓ ฉบับ ประกอบด้วย

๑) ร่างข้อเสนอแนะ ITU-R M.2012 - Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-Advanced (IMT-Advanced)

๒) ร่างข้อเสนอแนะ ITU-R M.1580-4 - Generic unwanted emission characteristics of base stations using the terrestrial radio interfaces of IMT-2000

๓) ร่างข้อเสนอแนะ ITU- M.1581-4 - Generic unwanted emission characteristics of mobile stations using the terrestrial radio interfaces of IMT-2000

๔.๔.๒ ร่างรายงานฉบับใหม่ จำนวน ๔ ฉบับ ประกอบด้วย

๑) ร่างรายงาน ITU-R M.[IMT.2020.INPUT] - Future radio aspect parameters for use with the terrestrial IMT spectrum estimate methodology of Recommendation ITU-R M.1768-1 (from the WP 5D 16th meeting)

๒) ร่างรายงาน ITU-R M.[IMT.2020.ESTIMATE] - Future spectrum requirements estimate for terrestrial IMT

๓) ร่างรายงาน ITU-R M.[IMT.BROAD.PPDR] - The use of International Mobile Telecommunications (IMT) for broadband public protection and disaster relief (PPDR) applications

๔) ร่างรายงาน ITU-R M.[IMT.ADV.PARAM] - Characteristics of terrestrial IMT-Advanced systems for frequency sharing/interference analyses

โดยมีรายละเอียดผลการประชุมคณะทำงาน 5D ปรากฏตามเอกสารแนบ ๑๓

๕. การประชุมคณะทำงานครั้งต่อไป

กำหนดการประชุมของกลุ่มศึกษาที่ ๕ ครั้งต่อไป (ครั้งที่ ๙) ระหว่างวันที่ ๑๐ – ๑๑ พฤศจิกายน ๒๕๕๗ หรือ ๒๔ – ๒๕ พฤศจิกายน๒๕๕๗ ณ นครเจนีวา ประเทศสวิตเซอร์แลนด์

เอกสารแนบ ๑

PRELIMINARY DRAFT NEW REPORT ITU-R m.[LMS.ATG]
Systems for public mobile communications with aircraft

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English only

Working Party 5A

PRELIMINARY DRAFT NEW REPORT ITU-R M.[LMS.ATG]

Systems for public mobile communications with aircraft

1 Introduction

This Report deals with the general principles, technical characteristics and operational features of terrestrial systems for public mobile communications with aircraft.

2 General operational considerations

2.1 The system should be fully compatible and capable of interfacing with the international public switched telephone network, public data network, the Internet, or any combinations thereof.

2.2 The system should have adequate bandwidth to meet the foreseeable demand for the services.

2.3 The Quality of Service should be that which meets the objectives of the system. For example, if the objective is to provide high quality voice service, then the Quality of Service should be comparable to that of the public switched network (voice and data). If the objective is to provide best-effort Internet type traffic, then typically there are no Quality of Service mechanisms being used, at least for the best-effort traffic.

2.4 The system should provide, in so far as possible, uninterrupted coverage throughout the designated service areas with the capability of coordinated operation across national borders.

2.5 The airborne equipment must be electromagnetically compatible with other aircraft systems in accordance with appropriate regulatory requirements and should have minimal impact on aircraft engineering, maintenance and operations.

2.6 The system must have no adverse influence on the safe operation of the aircraft.

2.7 The system should not cause harmful interference to other terrestrial communication systems.

3 System technical characteristics and operational features

3.1 Technical characteristics and operational features of the systems for public communications with aircraft in some countries in Region 1 are given in Annex 1.

3.2 Technical characteristics and operational features of the system for public communications with aircraft in some countries in Region 2 are given in Annex 2.

3.3 Technical characteristics and operational features of the system for public communications with aircraft in some countries in Region 3 are given in Annex 3.

3.4 Channel propagation effects on a terrestrial air-to-ground system are given in Recommendation ITU-R P.528-3 “Propagation curves for aeronautical mobile and radionavigation services using the VHF, UHF and SHF bands,” which provides useful information for design of systems for public mobile communications with aircraft.

Annexes: 3

ANNEX 1

Systems for public communications with aircraft in some countries in Region 1

1 Introduction

1.1 Broadband Direct- Air-to-Ground Communications (DA2GC) systems within CEPT

A Broadband Direct-Air-to-Ground Communications (DA2GC) system constitutes an application for various types of telecommunications services, such as internet access and mobile multimedia services, during flights. It aims to provide access to broadband communications services during continental flights on a Europe-wide basis. The connection with the flight passengers' user terminals on-board aircraft is to be realised by already available mobile communication systems on-board aircraft.

The main application field would be Air Passenger Communications (APC). In addition, a Broadband DA2GC system could also support Airline Administrative Communications services (AAC) and thus improve aircraft operation, resulting, in particular, in reduced OPEX for the airlines. Safety-relevant communications such as Air Traffic Control (ATC) and related services are not intended to be covered.

Currently, there is no spectrum designated for Broadband DA2GC within CEPT. In order to allow European citizens and airlines to profit from the social and economic benefits of the implementation of such a radio application (intended to provide broadband connectivity between the aircraft and a terrestrial based network), a harmonised spectrum designation within CEPT is important .

Although CEPT has not yet finalised analyses aiming to identify the most suitable frequency band(s) to implement such a system, extensive studies have been carried out on the bands 1 900-1920 MHz, 2010-2025 MHz and 5855-5875 MHz.

By taking into account the three systems aiming to provide Broadband DA2GC and described in the sections below, CEPT intends to conclude its work by the end of 2014.

2 System 1 identified in ETSI TR 103 054

2.1 System architecture

This Broadband DA2GC system is based on 3GPP LTE Rel. 8+ specifications. In particular synchronization algorithms as well as the maximum Tx power of the On-board Unit (OBU) are to be modified compared to terrestrial mobile radio usage in order to cope with the high Doppler frequency shift caused by aircraft speed and large cell sizes. In addition the Ground Station (GS) antenna adjustment has to be matched to cover typical aircraft altitudes between 3 and 12 km by adaptation of vertical diagrams including antenna up-tilt. When commercial, this solution will be able to provide in-flight mobile voice and broadband data communications services.

The major building blocks (see Figure 1 below) of the end-to-end system architecture are:

– service access network infrastructure on-board the aircraft, e.g. WiFi coverage and GSM on-board aircraft (both already standardised and certified for on-board implementation);

– Broadband DA2GC network infrastructure on-board aircraft, e.g. modem (OBU), interface to on-board network(s), external antenna, cabling;

– terrestrial radio access network for Broadband DA2GC with broadband backhaul links, which would preferably be based on existing infrastructure, but with modifications (e.g. with regard to antenna types and base station implementation) to establish high-performance radio links to aircraft in DA2GC environment;

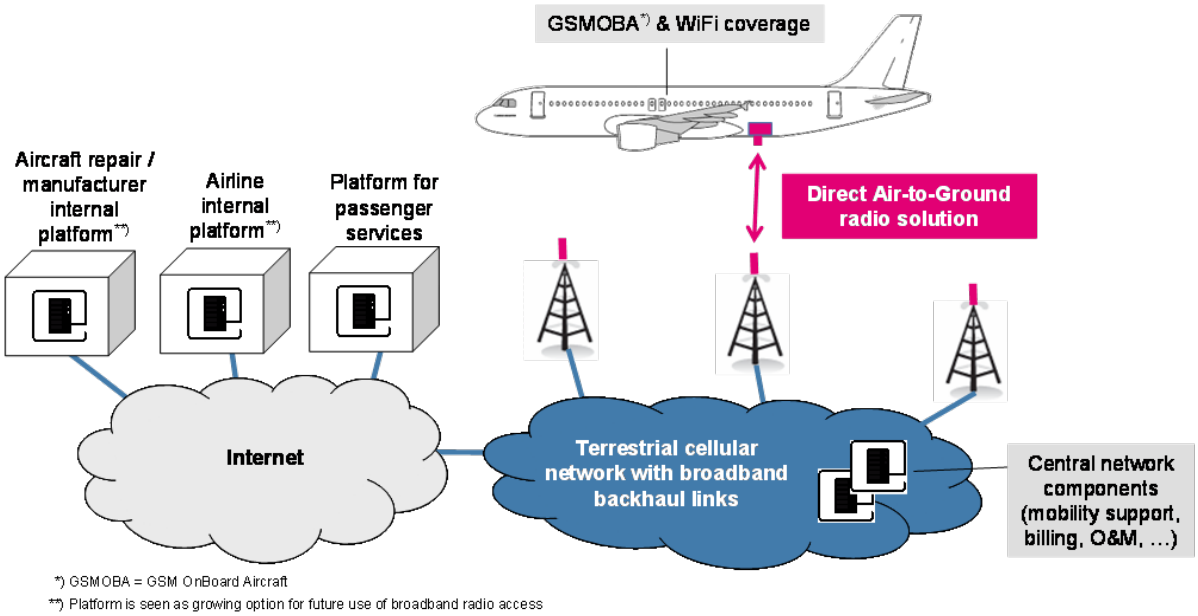
– mobile core network for session, mobility, subscriber and security management providing IP connectivity to external packet data networks (e.g. intranet, internet, IMS);

– central network components required for O&M, billing, etc. in the DA2GC network;

– various IP-based service delivery platforms e.g. for passenger services or for airline or aircraft repair / manufacturer internal applications.

FIGURE 1

System architecture for the Broadband DA2GC system as described in ETSI TR 103 054



2.2 Spectrum aspects

Paired spectrum of 2 x 10 MHz for FDD operation is considered necessary to cope with short- to medium-term demand. Unpaired spectrum of 20 MHz for TDD operation would also be an option, but system performance would slightly suffer due to guard time intervals required for large cell sizes.

Spectrum above 6 GHz is not viewed as appropriate for such an application due to wave propagation aspects (e.g. increased path loss, Doppler shift).

2.3 Test flights

For this system trial flights with prototype equipment were successfully performed in Germany within the 2.6 GHz FDD bands (useable only for trial, but not available for deployment of DA2GC due to planned LTE-deployment for terrestrial cellular mobile) with a signal bandwidth of 2 x 10 MHz.

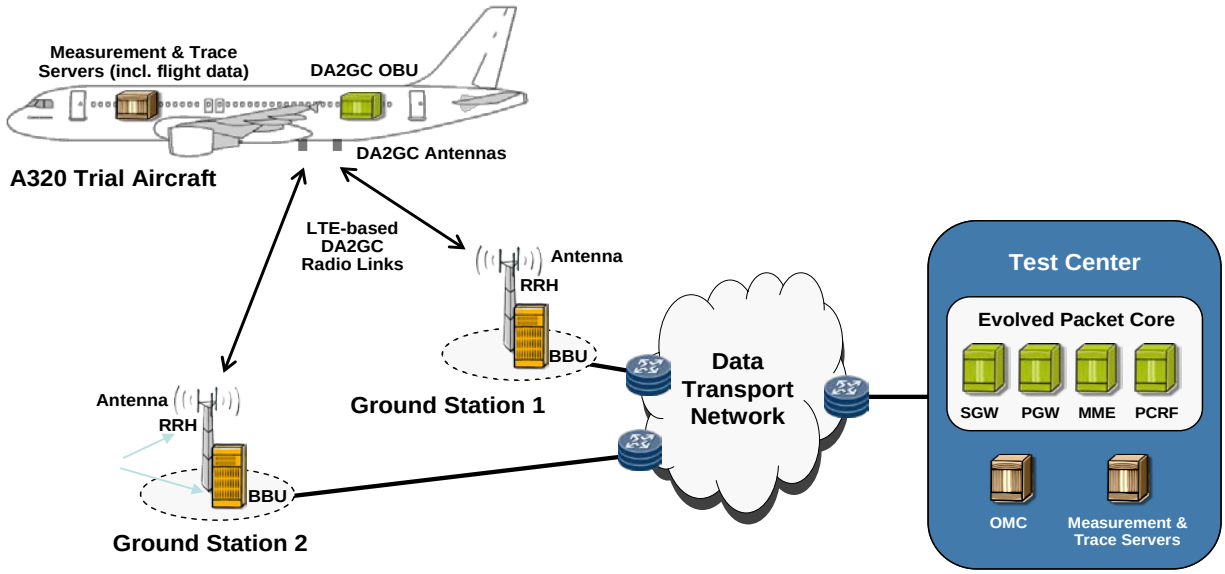
Trial set-up details (see Fig. 2):

– Two sites with an inter-site distance of about 100 km were equipped with LTE-based DA2GC GSs consisting of baseband unit (BBU) and remote radio head (RRH) and with antennas with three sectors (up-tilt), connected with an LTE evolved packet core (EPC) and measurement & data trace servers via a broadband data transport network.

– An Airbus A320 aircraft was equipped with a DA2GC OBU with maximum Tx power of 37 dBm and with two DA2GC antennas below the aircraft fuselage (2 Rx / 1 Tx).

FIGURE 2

Trial flight set-up for the Broadband DA2GC system as described in ETSI TR 103 054



During a 3 hours trial flight the aircraft flew with speeds between 500 and more than 800 km/h at different altitudes between 4 000 m and 10 000 m. The flight maneuvers included phases with inter- and intra-site (sector) handovers as well as phases with large distances to the sites.

Trial results:

– The radio link between the GS and Aircraft Station (AS) was established at distances of more than 100 km from the sites to the aircraft flying at speeds of more than 800 km/h and altitudes up to 10,000 m.

– Peak data rates of up to 30 Mbit/s in the forward link (ground-to-air) and 17 Mbit/s in the reverse link (air-to-ground) were achieved.

– In addition to high background data traffic a video conference was established between the teams in the aircraft and the test center which allowed to follow the flight phases in real time and to demonstrate the low latency of the overall DA2GC system (round trip time < 50 ms) compared to satellite-based systems.

It should be noted that the GS equipment used (except of antenna adjustment) was basically state of the art LTE-equipment for 2.6 GHz terrestrial cellular mobile deployment. Only the OBU was modified to allow the overall system to work in the aeronautical environment with large cell ranges and high aircraft speeds. The trials showed the very high performance and flexibility of the LTE based technology even in this early release state.

3 System 2 identified in ETSI TR 101 599

3.1 System architecture

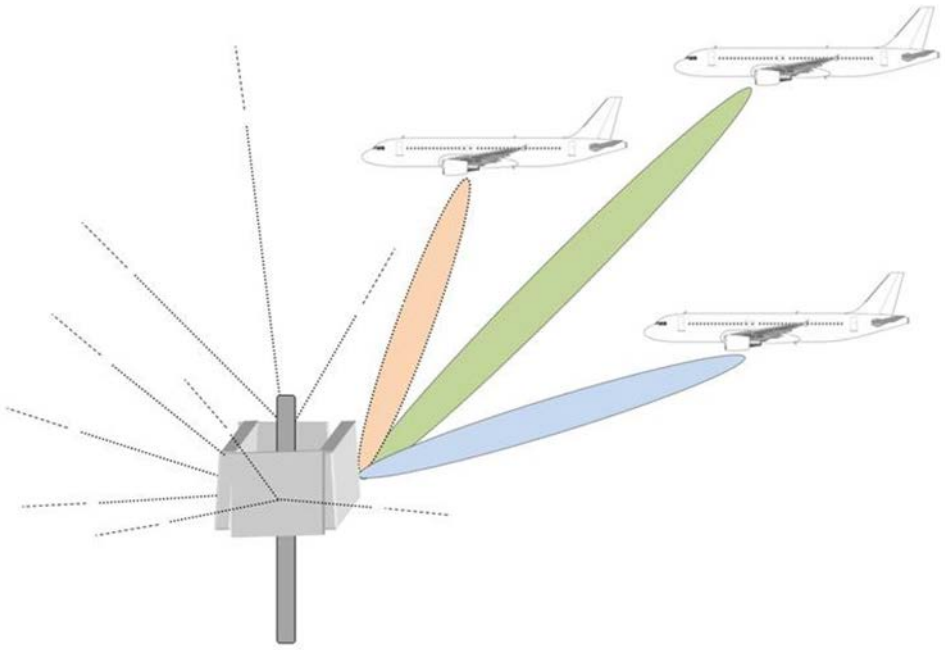
This Broadband DA2GC system makes use of adaptive beamforming antennas in order to achieve the desired system performance whilst maintaining lower transmit power levels than would otherwise be necessary. This feature eases co-frequency sharing with other systems by minimising interference into other services and, at the same time, reducing the impact of incoming interference on the achievable link performance. The decision to use beamforming technology in this Broadband DA2GC system implementation was also influenced by the current policy drive in Europe and elsewhere. This recognises the increasing demand on finite spectrum resources and encourages spectrum sharing through the use of smart technologies etc.

The overall system connectivity also enables the facility to provide non-safety relevant airline information services whilst maintaining complete isolation between such data and the various internet and infotainment services available to passengers in the aircraft cabin.

A feature of this Broadband DA2GC system is the simultaneous use of four separate integrated radio transceivers/phased array antenna assemblies at the ground station. Such an arrangement enables each ground station to cover the entire visible air space, from horizon to horizon, at all azimuths. Each integrated 8-element antenna array is capable of simultaneously producing multiple co-frequency shaped beams which need to maintain sufficient spatial separation to avoid self-interference, such that three simultaneous beams per sector (or quadrant), or twelve beams per ground station can be assumed operationally. This is shown diagrammatically in Figure 3 below.

FIGURE 3

Typical Ground Station antenna arrangement showing three beams per quadrant (simplified depiction)



The use of beamforming permits the production of shaped and dynamically steerable beams in both the forward link (ground-to-air) and reverse link (air-to-ground) directions, thereby enabling the desired system performance objectives to be maintained as the aircraft traverses its route whilst, at the same time, minimising interference into other co-frequency systems. This is achieved through the benefits of tailored radiation patterns which can be optimised to reduce interference and allow operation at lower transmit powers (on the ground and in the air) than would otherwise be necessary if more conventional fixed antennas were deployed.

In respect of the underlying modulation and coding schemes used, etc., the system uses OFDM/TDMA and has much in common with other existing and proposed mobile broadband backhaul technologies.

3.2 Spectrum aspects

This Broadband DA2GC system is currently optimised for use in the frequency bands around 2.4 GHz and 5.8 GHz. However, the technology is capable of operating in any frequency band within the range from 790 MHz to 6 GHz and the system can operate with variable bandwidths in any sub-band within the relevant frequency range. For optimum performance, in time-division-duplex (TDD) mode, the system would require a contiguous block of spectrum of 20 MHz. These spectrum requirements are driven by the need to supply sufficient capacity to serve passengers and crew on-board the aircraft with the desired range of broadband services.

3.3 Test flights

This system has already undergone initial flight testing in the 2.4 GHz and 5.8 GHz bands.

4 System 3 identified in ETSI TR 103 108

4.1 System architecture

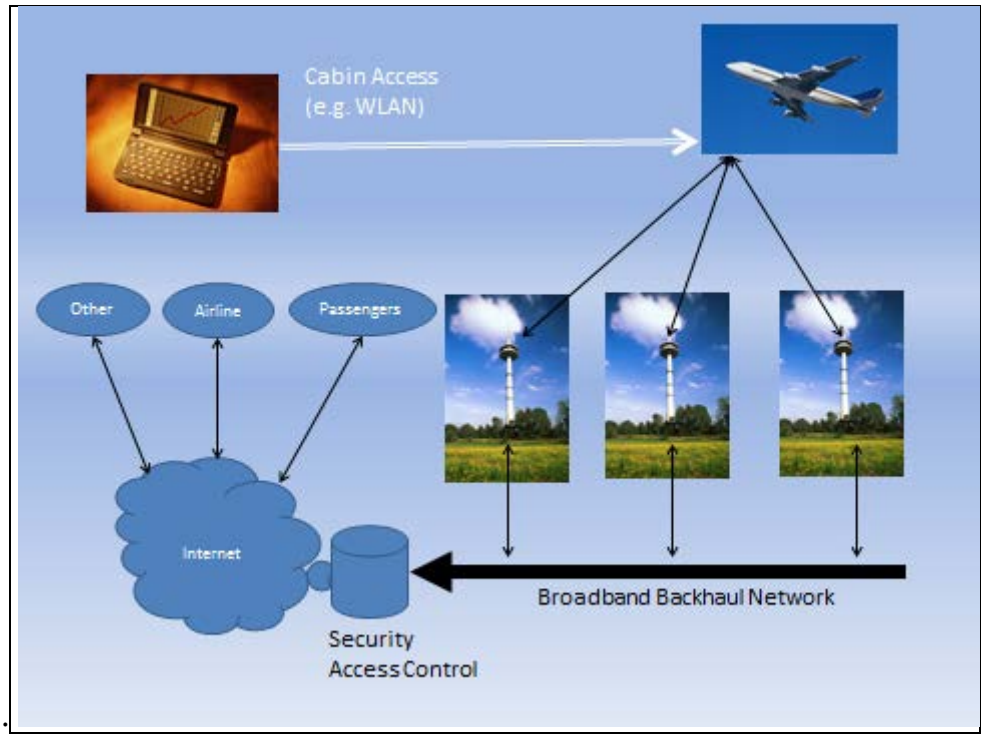
This Broadband DA2GC system is a UMTS TDD system based on commercial off the shelf equipment that complies with the 3GPP Release 7 standards. A separate frequency converter is used to support operation in the 5 855-5 875 MHz band although operation in other bands has been demonstrated. Signal-in-space characteristics conform to these standards apart from the operating frequency band, Doppler shift compensation, and extended timing advance to accommodate increased range.

Any co-channel interference is minimised using ground station antenna control whereby sectors not required by aircraft at a given time are not illuminated. (i.e., the transmitter is inhibited).

The overall end-to-end system architecture of the Broadband DA2GC system is illustrated in Figure 4.

FIGURE 4

System architecture for the Broadband DA2GC system as described in ETSI TR 103 108



The major building blocks of the end-to-end system architecture, similar to those described in section 2.1, include flight deck and cabin WLAN access, dedicated air/ground IP backhaul and a network control function providing, among other things, security.

4.2 Spectrum aspects

The system can use switch-selectable bandwidths of 5 or 10 MHz. Although single channel operation is possible, the use of additional channels reduces potential inter-cell interference and also any interference to other systems.

The required spectrum is 20 MHz thereby enabling 2 x 10 MHz or 4 x 5 MHz channels. The system does not require contiguous spectrum.ETSI TR 103 108 proposes that this system operates in the band 5 855-5 875 MHz. However, the system may operate within the extended band of 790 MHz to 6 GHz, e.g. in the bands 1 900-1 920 MHz and 2 010-2 025 MHz which were designated for terrestrial mobile systems based on UMTS-TDD technology.

4.3 Test flights

A series of test flights using 3G technology have been completed using two turbojet aircraft types. These demonstrated a robust air-to-ground link in different spectrum bands, namely VHF (aeronautical communications), 2 GHz and 5 GHz. Live video from the flight deck and cabin was transmitted to the ground. Simultaneously an international voice call was made by one passenger while another browsed the internet and watched a streaming video from a ground server. Ranges in excess of 250 km were achieved which is operationally important to maintain coverage over, for example, the Mediterranean Sea.

For certain 5 GHz flights, a modified aircraft marker antenna was used. This included two 5 GHz antenna elements in addition to the marker element itself. This new antenna had the same form and fit as the original, thereby simplifying installation.

ANNEX 2

System for public communications with aircraft in some countries in Region 2

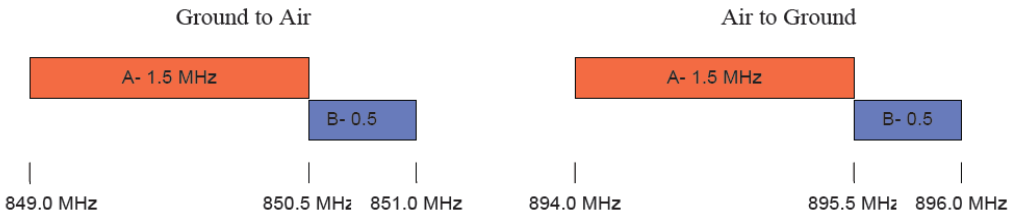
1 System for public communications with aircraft in Canada and United States

In Canada[1] and the United States[2], the band pair 849-851 MHz and 894-896 MHz is allocated to the aeronautical mobile service for public correspondence with aircraft. These bands are designated for paired nationwide exclusive assignment to the licensee or licensees of systems providing radio telecommunications service, including voice telephony, broadband Internet and data transmission service, to persons on-board aircraft. However, fixed services and ancillary land mobile services are not permitted.

In Canada and the United States, the band plan, described below in Figure 1, is based on two block pairs: 849-850.5/894-895.5 MHz and 850.5-851/895.5-896 MHz. The band 849-851 MHz is limited to transmissions from ground stations and the use of the band 894-896 MHz is limited to transmissions from airborne stations.

FIGURE 1

The band plan for aeronautical mobile service in Canada and the United States



The technical rules for certification and systems deployment in the band in the United States and Canada are technology neutral. The maximum ERP limits for ground stations and airborne stations are as follows:

Ground station	500 W ERP
Airborne station	12 W ERP

In the United States, the air-to-ground radiotelephone service falls under the U.S. Federal Communications (FCC) Part 22 rules, Subpart G. Commercial aviation air-ground systems may use any type of emission or technology that complies with these technical rules.

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1 Refer to http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09134.html.

2 Refer to: http://www.gpo.gov/fdsys/pkg/CFR-2010-title47-vol2/pdf/CFR-2010-title47-vol2-part22-subpartG-subjectgroup-id140.pdf

2 Safety-of-flight considerations

In addition to the administrations rules governing air-to-ground services, national aviation administration and aircraft operator rules and policies restrict the use of personal electronic devices (PEDs) on aircraft. The use of PEDs, which include wireless telephones, pagers, personal digital assistants, portable music players, video games and laptop computers, remains subject to national aviation administration and aircraft operator authority over in-flight safety. Providers of in-flight wireless broadband and other communications services for transmission using the air-to-ground frequencies must coordinate with airlines and comply with any national administration rules in order to offer such services. Aircraft operators undertake extensive testing and adhere to stringent safety certification protocols when installing and operating communications equipment to ensure that all avionics systems are protected from interference in accordance with national administration rules.

3 An example commercial aviation air-to-ground system operating in the United States consistent with IMT-2000 CDMA multi-carrier as described in Recommendation ITU-R M.1457

3.1 Introduction

This air-to-ground system is currently deployed and operational in continental United States and part of Alaska[3]. It operates in the 849-850.5 MHz and 894-895.5 MHz bands and offers in-flight broadband services to all Wi-Fi enabled laptops, notebooks and smartphones. It uses a modified version of the IMT-2000 CDMA[4] Multi-Carrier network to provide a high-speed connection directly from the aircraft to the ground. Some of the characteristics features of this network are: high capacity of 300 kbps to 500 kbps with peak rates of 3.1 Mbps, very large cell size (up to 400 km radius), modifications made to the IMT-2000 CDMA Multi-Carrier1xEV-DO air interface to accommodate extended cell coverage and airplane speed, deployment using off the shelf components such as Radio Access Networks (RANs) and Radio Network Controllers (RNCs).

3.2 System architecture

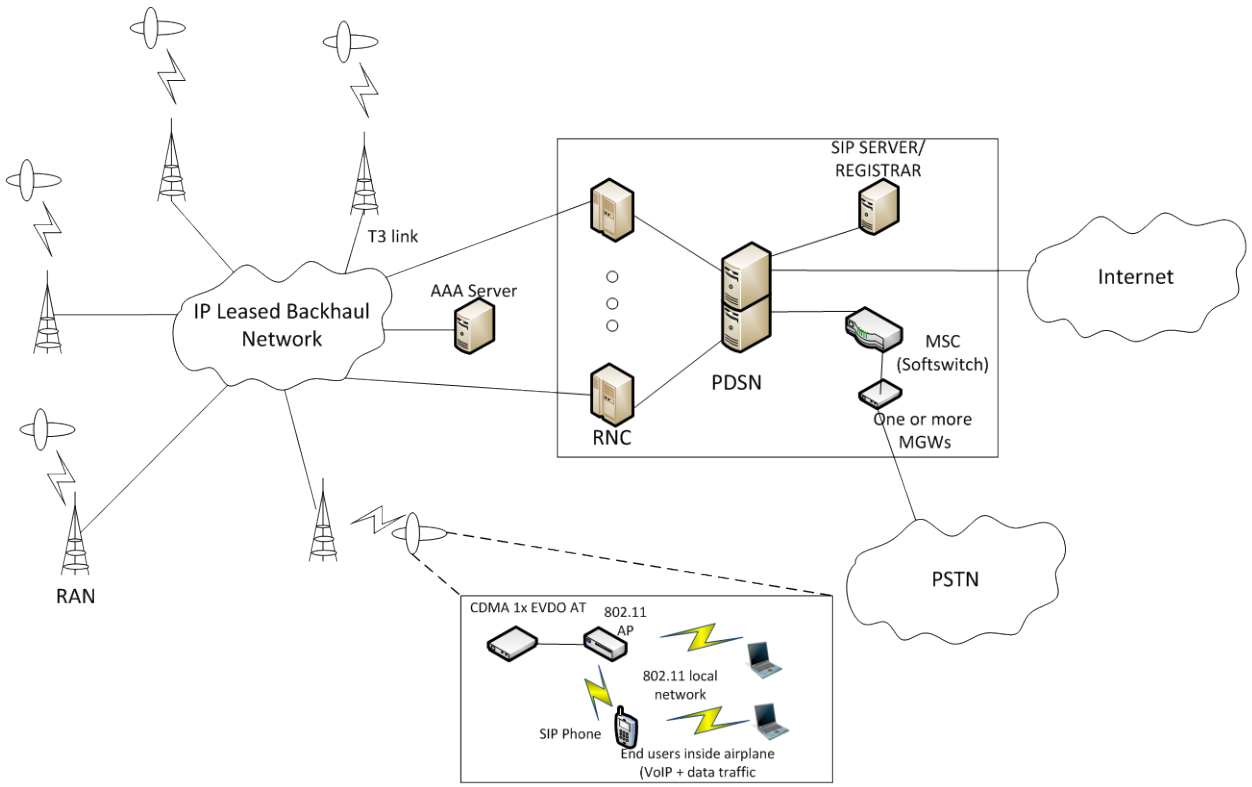
The overall end-to-end system architecture of this air-to-ground system is illustrated in Figure 2.

[3] http://www.gogoair.com/gogo/cms/work.do

[4] CDMA2000 High Rate Packet Data Interface Specifications, 3GPP2 C.S0024-A Version 1.0, March

FIGURE 2

IMT-2000 CDMA multi-carrier air-to-ground system network architecture



Each Radio Access Network (RAN) supports 1 carrier and 6 sectors. Each sector can generate about 2.2 Mbps peak throughput. The end users inside the airplane are on a local 802.11 access network connected to an access point (AP). The AP is connected to a 1x EV-DO card, which is the access terminal (AT) for the 1xEV-DO network and a point-to-point protocol (PPP) session is setup between the AT and the PDSN. In addition to data, VoIP can be supported as well. A cabin 2G/3G Picocell can be deployed to allow passengers place and receive voice calls on their own personal cellular phones. The authentication, authorization and accounting (AAA) server, one or more RNCs, packet data serving node (PDSN), media gateways (MGW), Softswitch which controls the MGWs, SIP Server/Registrar can all be co-located in one location.

3.3 Modifications to the IMT-2000 CDMA multi-carrier air-interface

The following sections describe the various enhancements made to the IMT-2000 CDMA multi-carrier 1xEV-DO air interface in order to enable its application as a viable air interface technology for air-to-ground communication.

3.3.1 Expanded range of Doppler shifts

Airplanes travel at speeds far greater than is usual for the operation of cellular mobile units, including high speed trains. For the worst case orientation of a plane traveling at 340 m/s and at a carrier frequency of 850 MHz, the Doppler frequency shift seen by the airborne access terminal is approximately 964 Hz. When the terminal transmits, the Doppler shift perceived by the base station

is approximately doubled to 1 928 Hz. The different searching operations at both the base station and the access terminal needed to be modified to accommodate the extended range of the observed Doppler shifts.

At the base station, the access channel searching algorithm is extended to additional frequency bins that cover the expected Doppler range of the airborne system. Furthermore, in case of handoff searching, when a sector gets added to the access terminal's (AT) active set, the newly added sector needs to search and start demodulating the AT's signal. However, the newly added sector may not be managed by the same base station that was already demodulating the access terminal, and hence the new base station needs to perform the same search procedure that is used for the access channel. When the access terminal tracks one sector and monitors other sectors for handoff, there could be a frequency offset differential due to different Doppler shifts between the serving sector and the candidate sectors. This means that there is an underestimation of the true SINR of the candidate pilot, because the SINR estimator suffers from phase coherence loss due to frequency error. SINR estimation for non-serving sectors needs to be compensated using estimates of Doppler frequency shifts.

3.3.2 Expanded cell radius

The airborne system supports cell radii of up to 400 km. The cell radii for a typical terrestrially-based cellular system are in the order of a few kilometers. In order to cope with large cells, modifications to the baseline reverse link demodulation algorithms are needed. A larger traffic search window is required to search for multipath components, and the multipath search window is extended to 256 chips. The reasoning for this is that the existence of strong multipath components are much more unlikely in the airborne system than in typical terrestrial cellular systems due to radio propagation conditions. Nevertheless, if a signal multipath component were to exist, then the lag difference between the main line-of-sight path and the multipath will most likely be much greater than the few chips (normally less than 10) that is typical in terrestrial communications. For this reason the search window sizes should be extended to 256 chips, corresponding to ~64 kilometers. Furthermore, due to larger cell radii as compared to the conventional terrestrial cellular systems, a much bigger access channel search window is required. If the cell radius is assumed to be R km, then the maximum possible time of arrival difference between two airplanes inside the cell (measured in chips) is given by the following equation.

$$\Delta = 2R * 10^3 \frac{1.2288 * 10^6}{c}$$

where c is the speed of light in m/s. For R=400 km we obtain $\Delta \sim 3\,333$ chips. This quantity is how large the total access channel search window needs to be.

Changes to some search parameters are also needed on the AT side to support large cell radii. In order for the AT to find neighboring sectors and correctly perform active and candidate set management, the neighbor search windows have to be increased. This is because with large cell radii, the differential delay between the serving sector and transmissions from candidate sectors can be quite large. Given the geometry of the network, it should be sufficient for the neighbor search windows to be expanded by a factor of 8, and this can be accomplished by reinterpreting the search window size field in the neighbor list message (section 9.7.6.2.5 in [1]).

Additional changes need to be made for increasing the data rate control (DRC) length. In the IMT-2000 CDMA multi-carrier 1xEV-DO system, the access terminal continuously send their desired forward link data rate on the DRC to the base station. The DRC word can extend 1, 2, 4 or 8 reverse link slots. Right after the access terminal has finished sending a given DRC, it expects that the next forward link slot directed to it will be encoded according to its last DRC request.

The reverse link timing of the DRC channel is advanced by one-half slot with respect to the forward link timing for the base station to allow the base station enough time to process the last DRC sent by each AT. This 1 024-chip budget is more than enough for regular terrestrial communications since the cell radii are of the order of a few km. However, for the airborne system, this is insufficient since the one-way propagation delay to the edge of a base station covering 250 km is already around 1 024 chips. The solution lies in choosing a long DRC length and, at the base station side, decoding the DRC word before the whole length of it has been received.

3.3.3 Handoff

The IMT-2000 CDMA Multi-Carrier 1xEV-DO airborne system uses multiple transmit and receive antennas on the access terminal side. The system uses four antennas, two sets of cross-polarization pairs. The access terminal has two antenna ports and a switch matrix to control multiplexing of the four antenna inputs into the two antenna ports on the access terminal. To provide spatial diversity in demodulation of the serving sector, the system combines the two antenna inputs belonging to the best or strongest polarization. Occasionally, the access terminal needs to search other antenna ports for possible transmissions from other sectors. To do so without breaking the connection to the serving sector, the access terminal effectively switches to single antenna demodulation. At the same time, the antenna port connected to the antenna with weaker input is switched to other antenna inputs to search for pilot transmissions from sectors on the AT’s neighbor list. When this brief search is done, the AT resumes dual antenna demodulation.

The purpose of the the IMT-2000 CDMA multi-carrier 1xEV-DO airborne system handoff procedure is to ensure that the access terminal is communicating with the access network (AN) through the best or strongest serving sector while using its best polarization pair of antennas for forward link demodulation. At the same time, the access terminal should transmit on the reverse link using its best antenna in orientation and polarization. The complexities of the airborne handoff procedure arise from the fact that as the serving sector changes, so does the concept of best antennas on the forward and reverse links.

4 System for general aviation air-to-ground radiotelephone within the United States of America

4.1 General aviation air-to-ground radiotelephone service

This service operates in the 454-459 MHz band and can provide a variety of telecommunications services to private aircraft such as small single engine planes and corporate jets. CFR47 § 22.805 contains the channel allocations for the general aviation air-to-ground service. These channels have a bandwidth of 20 kHz and are designated by their center frequencies in megahertz.

TABLE 1

Signalling channel pair for general aviation air-ground systems

Ground	Airborne mobile
454.675	459.675

Communication channel pairs

Ground	Airborne mobile
454.700	459.700
454.725	459.725
454.750	459.750
454.775	459.775
454.800	459.800
454.825	459.825
454.850	459.850
454.875	459.875
454.900	459.900
454.925	459.925
454.950	459.950
454.975	459.975

Notes on Table 1:

a) Channel 454.675 MHz is assigned to each and every ground station, to be used only for automatically alerting airborne mobile stations of incoming calls.

b) All airborne mobile channels are assigned for use by each and every airborne mobile station.

The transmitting power of ground and airborne mobile transmitters operating in the general aviation air-ground radiotelephone service on the channels listed in CFR47 § 22.805 must not exceed:

a) *Ground station transmitters.* The effective radiated power of ground stations must not exceed 100 Watts and must not be less than 50 Watts, except as provided in CFR47 § 2.811.

b) *Airborne mobile transmitters.* The transmitter power output of airborne mobile transmitters must not exceed 25 Watts and must not be less than 4 Watts.

ANNEX 3

System for public communications with aircraft in some countries in Region 3[5]

1 Introduction

In some countries in Region 3, there are currently two systems aiming to provide broadband DA2GC. These are described in the sections below.

2 Air-to-ground communication system in China

2.1 Introduction

To meet the growing demand of the current and future airborne broadband communication, China has made significant effort on planning, developing, and deploying the air-to-ground (ATG) communication systems with aircraft. The system is based on the SCDMA broadband wireless access standard in Recommendation ITU-R M.1801. The SCDMA ATG wireless broadband access system contains base stations and terminals. The base stations deployed to cover the entire flight course and communicate with the airborne terminals to achieve broadband communication between the ground and airplanes. The prototype systems have been successfully tested in trial flights at the frequency range of 1.785-1.805 GHz. The system's ATG broadband communication capability has been successfully tested in China.

2.2 Operational features

The system operational features are as follows:

– Automatically connecting to the terrestrial broadband wireless network to provide air-to-ground communications.

– Supporting the voice, trunked voice and broadband data communication services such as providing backhaul of the on-board WiFi, cellular pico-cells, and on-board wireline voice calls and Internet access.

– Supporting the seamless communication roaming and handoff on the complete flight course.

2.3 System architecture

The basic system architecture is shown in Figure 1.

The system functions are as follows:

– The system includes base stations (BTS) on the ground connected to PTSN, Internet and airborne terminals with interfaces to other on-board devices such as wireline hubs, WiFi routers, pico-cells, among others.

– The radio access layer provides the radio access functions between the BTS and airborne terminals. The radio access layer performs basic radio access functions such random access, paging, voice communications, data communications and trunked voice functions.

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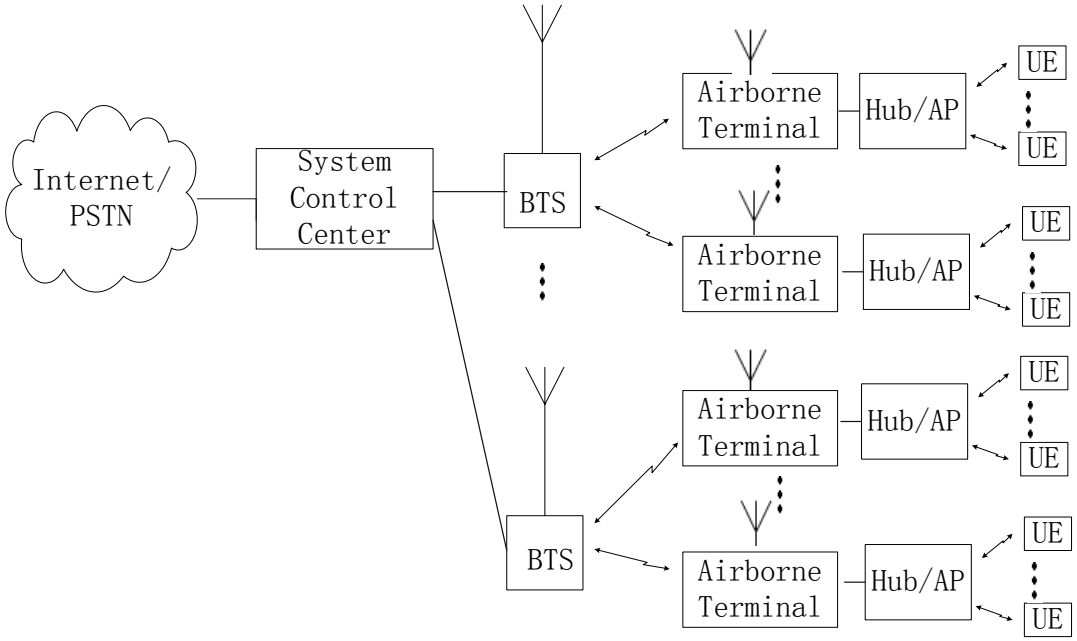
[5] APT has developed a guideline on the maximum permitted power for cellular base stations onboard aircraft. See APT/AWF/OP-02(Rev. 2): APT Guideline on "Technical conditions for the use of mobile phones on-board aircraft".

– The core control layer provides the control functions, such as handoff, roaming, terminal and user authentication, voice call switching, and data routing. It is between the BTS and other core network equipment such as data switches and routers, soft switches, media gateways, AAA (Authentication, Authorization, and Accounting) servers, billing servers, and HLR (Home Location Register).

– This entire ATG communication network including all layers supports separation of different data flows and also provides adequate protection on the data.

FIGURE 1

System architecture



2.4 Channelization scenario

The SCDMA radio interface supports a channel bandwidth of a multiple of 1 MHz up to 5 MHz. Subchannelization and code spread, specially defined inside each 1 MHz bandwidth, provides frequency diversity and interference observation capability for radio resource assignment with bandwidth granularity of 8 kbit/s. The channelization also allows coordinated dynamic channel allocations among cells to efficiently avoid mutual interference. The system employs TDD to separate uplink and downlink transmission.

3 Air-to-ground communication system in Japan

3.1 Background

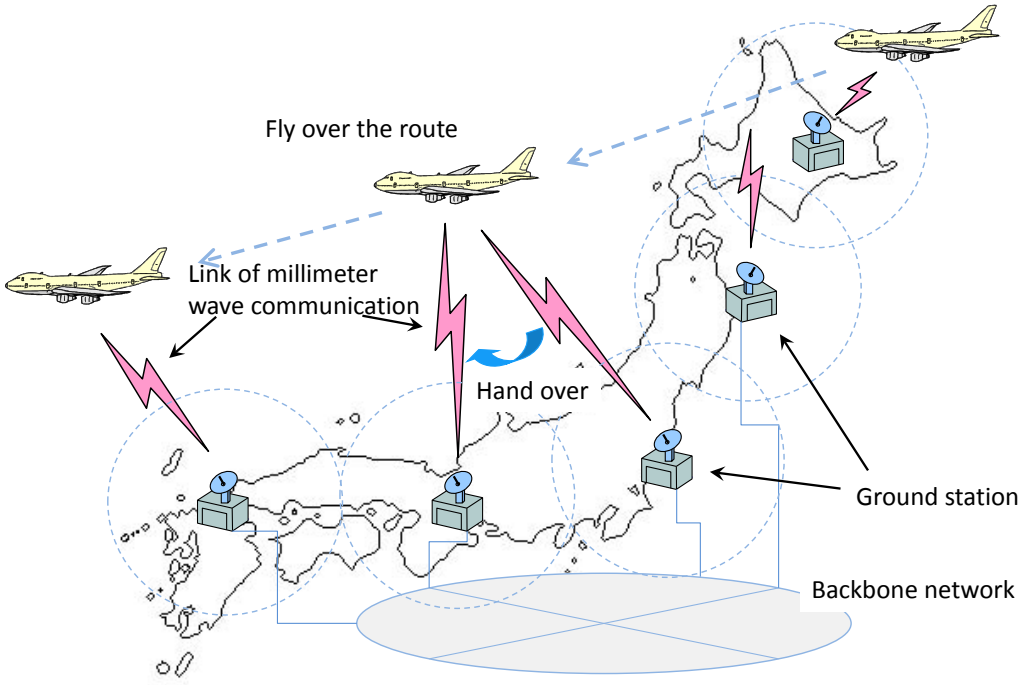
Demand has increased for better mobile phone and wireless local area network (LAN) access for people on-board aircraft. Now, several airlines have started cabin use of cellular phones with a system involving satellites. Meanwhile, in Japan, the air-to-ground (ATG) communication system with aircraft, which achieves over 100 Mbit/s transmission speed, is also being studied. In the system, the 40 GHz band facilitates broadband wireless communications on airplanes and on the

ground. As shown in Figure 2, airplanes fly over ground tracking antennas arranged at regular intervals.

As the aircraft passes overhead, the antennas hand over service one after another to the aircraft. The 40 GHz band is not used heavily in commercial applications and is expected to facilitate the broadband communication system.

FIGURE 2

Over-40 GHz wave broadband wireless direct communication system between air and ground operated in Japan



3.2 Descriptions of system architecture and communication equipment

The specifications of the proposed communication system and the airborne/ground equipment are described as bellow. The frequency bands of the up and down links are supposed to use the 40 GHz frequency range and are tentatively given at 44 and 46 GHz bands, respectively for the prototype development. Table 1 summarizes the specification of the proposed communication system.

TABLE 1

Specifications of the communication system

Item	Specifications	Remark
Coverage area	10 km ~ 50 km in radius	Depend on weather conditions and communication speed.
Transmission rate	Up to 100 Mbit/s or over	Variable
Protocol	Full-duplex	
Frequency	Downlink: 44.45 GHz	The frequencies are

	± 100 MHz Uplink: 46.8 GHz ± 100 MHz	tentatively allocated.

The system uses the frequency division multiplex (FDD) method for communication.

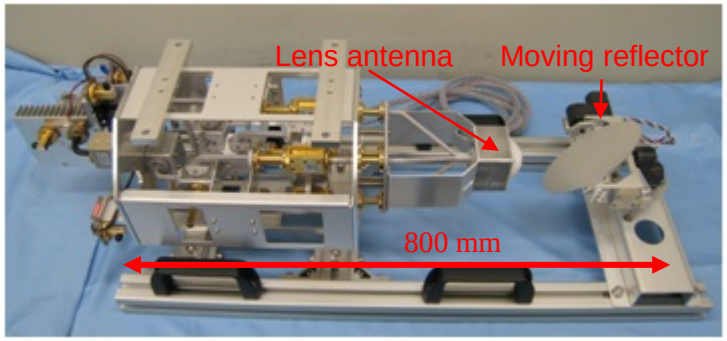
Considering the characteristics of the millimetre wave and the spectrum efficiency, both the airborne and the ground antenna track each antenna position. Therefore, the antenna system needs to consider the characteristics of the millimeter wave and the geographical dimensions. For example, the ground-based tracking antenna must continuously track the aircraft with a high degree of accuracy. Meanwhile, the airborne antenna must track the ground-based antenna based on the aircraft attitude and position, and must be also compact and lightweight.

A Ground station antenna

The ground station has a mechanically controlled reflector to direct the antenna beam in a specific direction by tilting the reflection disk mechanically as shown in Figure 3. With a reflector controlling the antenna beam in the system, the mechanism provides a cost-effective, power-efficient tracking antenna. Furthermore, a radio wave was separately transmitted at 44.55 GHz, in addition to the communication signal wave so that the system could execute the mono-pulse tracking technique by monitoring the reception level of the radio wave signal.

FIGURE 3

Prototype of ground tracking antenna with lens antenna

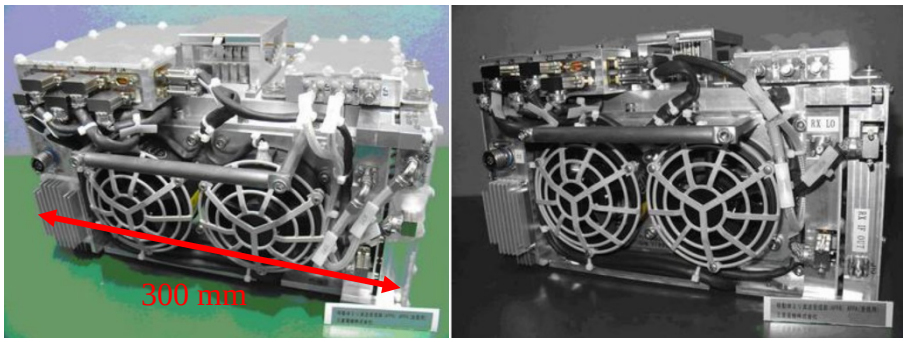


B Airborne antenna

As shown in Figure 4, the airborne antenna consists of a transmission (left) and a reception (right) components using active phased array antenna (APAA) technology, which is capable of two-dimensional electronic antenna scanning. The APAA is composed of 64 elements in an eight-by-eight array. The approximate weight of the antenna 11 kg. Each element of the APAA is connected to the transmitting/receiving module to control the antenna beam direction by changing the phase component with 4-bit resolution. In addition, the directional control of the antenna is limited to +/- 45 degrees as a device specification.

FIGURE 4

Appearance of transmission and reception components of active phased array antenna



3.3 Verification tests and results

For verifying the overall performance of this system, several trial flights with the prototype equipment were successfully conducted in 2012. This verification was mainly for the basic property of the airborne antenna, the ground tracking antenna, access control equipment and some other equipment. An airplane with the APAA was used as the airborne station. Table 2 presents an overview of the airborne verification test, and Figure 5 illustrates a diagram of the airborne verification test.

The transmission and reception frequencies were allocated as 46.8 GHz and 44.45 GHz, respectively, for simultaneous transmission. The data transfer rate was 141.7 Mbit/s when QPSK modulation with a symbol rate of 78 Msymbol/s was applied. The 106.3 Mbit/s transfer rate was realized when 8PSK modulation with a symbol rate of 39 Msymbol/s was applied.

The antenna control information, such as the reception level and antenna directional data, was stored in the control sections. The modem signal and the error information of Bit Error Rate (BER) or Packet Error Rate (PER) (circuit quality) were also stored in the modem sections at both the airborne and ground stations. The flight data, which consist of airplane position/attitude information, were stored only on the aircraft. The ground station treats the transmitting and receiving data through millimeter waves.

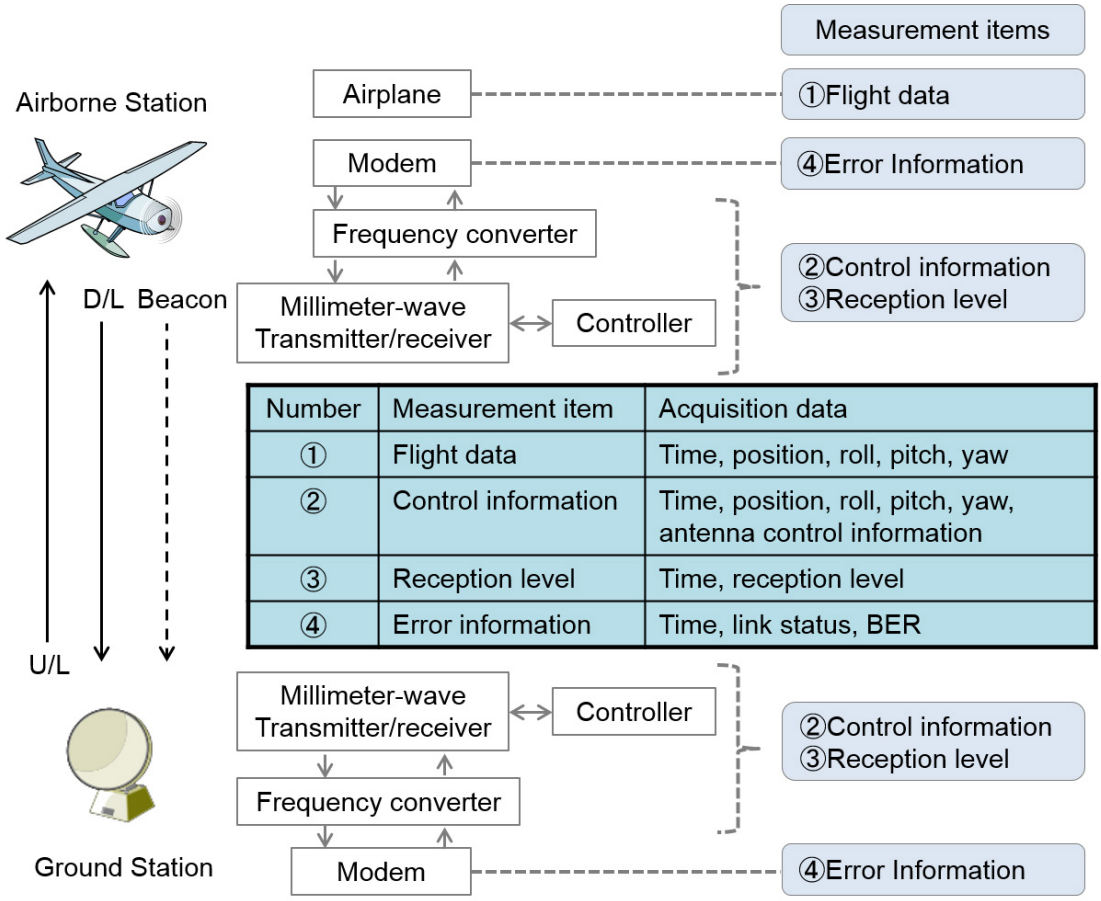
TABLE 2

Airborne verification test overview

Item	Contents
Airborne station	Active phased array antenna
Ground station	Millimeter-wave transmitter/receiver with mechanical driven antenna
Frequency	Uplink: 46.8 GHz Downlink: 44.45 GHz
Data transfer rate	141.7 Mbit/s at 78 Msymbol/s (QPSK) 106.3 Mbit/s at 39 Msymbol/s (8PSK)
Acquisition data	–Control information such as reception level and antenna directional data –Modem signal, error information of packet error rate or bit error rate. –Flight data (airborne status such as position/attitude information)

FIGURE 5

Airborne verification test system



Number	Measurement item	Acquisition data
①	Flight data	Time, position, roll, pitch, yaw
②	Control information	Time, position, roll, pitch, yaw, antenna control information
③	Reception level	Time, reception level
④	Error information	Time, link status, BER

We evaluated the following items in the airborne verification test: (a) antenna pattern measurement, (b) tracking ability test, (c) communication capability test and mass volume data transfer test, and (d) communication distance test.

Finally, the results confirmed the success of the airborne verification tests as follows:

(a) The beam width of the antenna was observed at about 8 degrees in the airborne tests, while it was observed at 10 degrees in an anechoic chamber. Although the width becomes approximately 2 degrees narrower than that of the designed value, the characteristics of the antenna beam were almost identical.

(b) The system with tracking mode could track each antenna position correctly when the maximum angular ground speed was 229.65 km/h at an altitude of 785.47 m, which corresponds to 4.7 degrees per second in calculation.

(c) Reception level and BER characteristics were measured and confirmed when the modulation types were QPSK and 8PSK and the flight altitude was approximately 2000 m.

(d) The results indicated that communication was established for a horizontal distance of 2380 m and a flight altitude of 1816 m, thus the communication distance was approximately 3 km. At this time, the angle of elevation sighting the airborne station from the ground station is 38 degrees, which was confirmed as a minor difference compared to the device specification of 45 degrees for the beam scan range of the APAA used on the airborne station.

Application of these results to various aircraft shall establish an environment that enables mass volume downloading with bidirectional IP communication.

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Preliminary draft revision of RECOMMENDATION ITU-R M.1450-4
Characteristics of broadband radio local area networks

Radiocommunication Study Groups

Source: Annex 16 to Document 5A/198

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Working Party 5A
(Drafting Group 5A2-2)

PRELIMINARY DRAFT REVISION OF RECOMMENDATION ITU-R M.1450-4

Characteristics of broadband radio local area networks

(Questions ITU-R 212/5 and ITU-R 238/5)

Summary of the revision

~~[TBD]~~In this revision:

- information related to standards already referenced in the current Recommendation has been updated;
- four new standards IEEE 802.11ac, IEEE 802.11ad, EN 301 893 and EN 302 567 and relevant information (technical parameters and spectrum masks) have been introduced;
- and updated information with regard to European implementation of the band 57-66 GHz has been introduced.

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Scope

This Recommendation provides the characteristics of broadband radio local area networks (RLANs) including technical parameters, and information on RLAN standards and operational characteristics. Basic characteristics of broadband RLANs and general guidance for their system design are also addressed.

The ITU Radiocommunication Assembly,

considering

a) that broadband radio local area networks (RLANs) are widely used for fixed, semi-fixed (transportable) and portable computer equipment for a variety of broadband applications;

b) that broadband RLANs are used for fixed, nomadic and mobile wireless access applications;

c) that broadband RLAN standards currently being developed are compatible with current wired LAN standards;

d) that it is desirable to establish guidelines for broadband RLANs in various frequency bands;

e) that broadband RLANs should be implemented with careful consideration to compatibility with other radio applications,

noting

a) that Report ITU-R F.2086 provides technical and operational characteristics and applications of broadband wireless access systems (WAS) in the fixed service;

b) that other information on broadband WAS, including RLANs, is contained in Recommendations ITU-R F.1763, ITU-R M.1652, ITU-R M.1739 and ITU-R M.1801,

recommends

1 that the broadband RLAN standards in Table 2 should be used (see also Notes 1, 2 and 3);

2 that Annex 2 should be used for general information on RLANs, including their basic characteristics;

3 that the following Notes should be regarded as part of this Recommendation.

NOTE 1 – Acronyms and terminology used in this Recommendation are given in Table 1.

NOTE 2 – Annex 1 provides detailed information on how to obtain complete standards described in Table 2.

NOTE 3 – This Recommendation does not exclude the implementation of other RLAN systems.

TABLE 1

Acronyms and terms used in this Recommendation

Access method	Scheme used to provide multiple access to a channel
AP	Access point
ARIB	Association of Radio Industries and Businesses
ATM	Asynchronous transfer mode
Bit rate	The rate of transfer of a bit of information from one network device to another
BPSK	Binary phase-shift keying
BRAN	Broadband Radio Access Networks (A technical committee of ETSI)
Channelization	Bandwidth of each channel and number of channels that can be contained in the RF bandwidth allocation
Channel Indexing	The frequency difference between adjacent channel center frequencies
CSMA/CA	Carrier sensing multiple access with collision avoidance
DAA	Detect And Avoid
DFS	Dynamic frequency selection
DSSS	Direct sequence spread spectrum
e.i.r.p.	Equivalent isotropically radiated power
ETSI	European Telecommunications Standards Institute
Frequency band	Nominal operating spectrum of operation

FHSS	Frequency Hopping Spread Spectrum
HIPERLAN2	High performance radio LAN 2
HiSWANa	High speed wireless access network – type a
HSWA	High speed wireless access
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
LAN	Local area network
LBT	Listen before talk
MU	Medium Utilisation
MMAC	Multimedia mobile access communication
Modulation	The method used to put information onto an RF carrier
MIMO	Multiple input multiple output
OFDM	Orthogonal frequency division multiplexing
PSD	Power spectral density
PSTN	Public switched telephone network
QAM	Quadrature amplitude modulation
QoS	Quality of Service
QPSK	Quaternary phase-shift keying
RF	Radio frequency
RLAN	Radio local area network
SSMA	Spread spectrum multiple access
Tx power	Transmitter power – RF power in Watts produced by the transmitter
TCP	Transmission control protocol
TDD	Time division duplex
TDMA	Time-division multiple access
TPC	Transmit power control
WATM	Wireless asynchronous transfer mode

TABLE 2

Characteristics including technical parameters associated with broadband RLAN standards

Characteristics	**IEEE Std 802.11-2012~~07~~ (Clause 1~~5~~7, commonly known as 802.11b)**	**IEEE Std 802.11-2012~~07~~ (Clause 1~~8~~7, commonly known as 802.11a[(1)])**	**IEEE Std 802.11-2012~~07~~ (Clause 1~~9~~8, commonly known as 802.11g[(1)])**	**IEEE Std 802.11-2012~~07~~ (Clause 1~~8~~9~~7~~, Annex ~~I~~D and Annex ~~J~~E, commonly known as 802.11j)**	**IEEE Std 802.11~~n-2009~~-2012 (Clause 20, commonly known as 802.11n)**	**IEEE P802.11ac**	**IEEE Std 802.11ad-2012**	**ETSI EN 300 328**	**ETSI ~~BRAN HIPERLAN2~~ EN 301 893 ~~(1), (2)~~**	**ARIB HiSWANa, (1)**	**ETSI EN 302 567**
Access method	**CSMA/CA, SSMA**	**CSMA/CA**					**Scheduled, CSMA/CA**		**TDMA/TDD**		
Modulation	CCK (8 complex chip spreading)	64-QAM-OFDM 16-QAM-OFDM QPSK-OFDM BPSK-OFDM 52 subcarriers (see Fig. 1)	DSSS/CCK OFDM PBCC DSSS-OFDM	64-QAM-OFDM 16-QAM-OFDM QPSK-OFDM BPSK-OFDM 52 subcarriers (see Fig. 1)	64-QAM-OFDM 16-QAM-OFDM QPSK-OFDM BPSK-OFDM 56 subcarriers in 20 MHz 114 subcarriers in 40 MHz MIMO, 1 – 4 spatial streams	256-QAM-OFDM 64-QAM-OFDM 16-QAM-OFDM QPSK-OFDM BPSK-OFDM 56 subcarriers in 20 MHz 114 subcarriers in 40 MHz 242 subcarriers in 80 MHz 484 subcarriers in 160 MHz and 80+80 MHz MIMO, 1-8 spatial streams	Single Carrier: DPSK, π/2-BPSK, π/2-QPSK, π/2-16QAM OFDM : 64-QAM, 16-QAM, QPSK, SQPSK 352 subcarriers	No restriction on the type of modulation ~~OFDM~~	64-QAM-OFDM 16-QAM-OFDM QPSK-OFDM BPSK-OFDM 52 subcarriers (see Fig. 1)		

Data rate		1, 2, 5.5 and 11 Mbit/s	6, 9, 12, 18, 24, 36, 48 and 54 Mbit/s	1, 2, 5.5, 6, 9, 11, 12, 18, 22, 24, 33, 36, 48 and 54 Mbit/s	3, 4.5, 6, 9, 12, 18, 24 and 27 Mbit/s for 10 MHz channel spacing 6, 9, 12, 18, 24, 36, 48 and 54 Mbit/s for 20 MHz channel spacing	From 6.5 to 288.9 Mbit/s for 20 MHz channel spacing From 6 to 600 Mbit/s for 40 MHz channel spacing	From 6.5 to 693.3 Mbit/s for 20 MHz channel spacing From 13.5 to 1 600 Mbit/s for 40 MHz channel spacing From 29.3 to 3 466.7 Mbit/s for 80 MHz channel spacing From 58.5 to 6 933.3 Mbit/s for 160 MHz and 80+80 MHz channel spacing			6, 9, 12, 18, 27, 36 and 54 Mbit/s		
Frequency band		2 400-2 483.5 MHz	5 150-5 250 MHz[5] 5 250-5 350 MHz[4] 5 470-5 725 MHz[4] 5 725-5 825 MHz	2 400-2 483.5 MHz	~~4 900~~4 940-~~5 000~~4 990 MHz[3] 5 030-5 091 MHz[3] 5 150-5 250 MHz[5] 5 250-5 350 MHz[4] 5 470-5 725 MHz[4] 5 725-5 825 MHz	2 400-2 483,5 MHz 5 150-5 250 MHz[5] 5 250-5 350 MHz[4] 5 470-5 725 MHz[4] 5 725-5 825 MHz	5 150-5 250 MHz[5] 5 250-5 350 MHz[4] 5 470-5 725 MHz[4] 5 725-5 825 MHz	57-66 GHz	2 400-2 483.5 MHz	5 150-5 350[5] and 5 470-5 725 MHz[4]	4 900 to 5 000 MHz[3] 5 150 to 5 250 MHz [5]	57-66 GHz
~~Channelization~~ Channel indexing		5 MHz				5 MHz in 2.4 GHz 20 MHz in 5 GHz	20 MHz	2 160 MHz		20 MHz	20 MHz channel spacing 4 channels in 100 MHz	
Spectrum mask		802.11b mask (Fig. 4)	OFDM mask (Fig. 1)			OFDM mask (Fig. 2A, 2B for 20 MHz and Fig. 3A, 3B for 40 MHz)	OFDM mask (Fig. 2B for 20 MHz, Fig. 3B for 40 MHz, Fig. 3C for 80 MHz, Fig. 3D for 160 MHz, and Fig. 3E for 80+80 MHz)	802.11ad mask (Fig. 5)		~~OFDM mask~~ (Fig. 1x)	OFDM mask (Fig. 1)	

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TABLE 2 (*end*)

Characteristics	IEEE Std 802.11-2012 (Clause 17, commonly known as 802.11b) ~~IEEE Std 802.11-2007 (Clause 15, commonly known as 802.11b)~~	IEEE Std 802.11-2012 (Clause 18, commonly known as 802.11a(1)) ~~IEEE Std 802.11-2007 (Clause 17, commonly known as 802.11a(1))~~	IEEE Std 802.11-2012 (Clause 19, commonly known as 802.11g(1)) ~~IEEE Std 802.11-2007 (Clause 18, commonly known as 802.11g(1))~~	IEEE Std 802.11-2012 (Clause 19, Annex D and Annex E, commonly known as 802.11j) ~~IEEE Std 802.11-2007 (Clause 17, Annex I and Annex J, commonly known as 802.11j)~~	IEEE Std 802.11-2012 (Clause 20, commonly known as 802.11n) ~~IEEE Std 802.11n-2009 (Clause 20)~~	IEEE P802.11ac	IEEE Std 802.11ad-2012	EN 300 328	~~BRAN HIPERLAN2~~ EN 301 893 ~~1), (2)~~	ARIB HiSWANa, (1)	ETSI EN 302 567
Transmitter											
Interference mitigation	**LBT**	**LBT/DFS/TPC**	**LBT**		**LBT/DFS/TPC**		**LBT**	**DAA/LBT, DAA/non-LBT, MU**	**LBT/DFS/TPC**	**LBT**	
Receiver											
Sensitivity	**Listed in Standard**										

(1) Parameters for the physical layer are common between IEEE 802.11a ~~and ETSI BRAN HIPERLAN2~~ and ARIB HiSWANa.

~~(2) WATM (Wireless ATM) and advanced IP with QoS are intended for use over ETSI BRAN HIPERLAN2 physical transport.~~

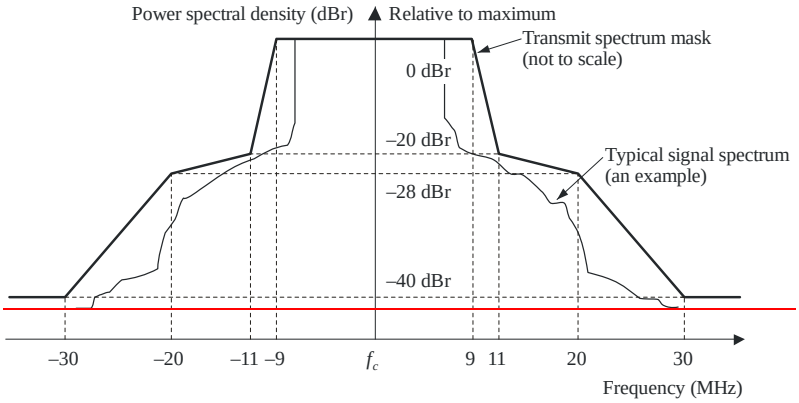
(3) See 802.11j-2004 and JAPAN MIC ordinance for Regulating Radio Equipment, Articles 49-20 and 49-21.

(4) DFS rules apply in the 5 250-5 350 and 5 470-5 725 MHz bands in many administrations and administrations must be consulted.

(5) **Pursuant to Resolution 229 (WRC-03), operation in the 5 150-5 250 MHz band is limited to indoor use.**

FIGURE 1

OFDM transmit spectrum mask for 802.11a, 11g, 11j, ~~HIPERLAN2~~ and HiSWANa systems



Note 1 – The outer heavy line is the spectrum mask for 802.11a, 11g, 11j, HiSWANa and the inner thin line is the envelope spectrum of OFDM signals with 52 subcarriers.

Note 2 – The measurements shall be made using a 100 kHz resolution bandwidth and a 30 kHz video bandwidth.

Note 3 – In the case of the 10 MHz channel spacing in 802.11j, the frequency scale shall be half.

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FIGURE 1X

Transmit spectrum mask for EN 301 893

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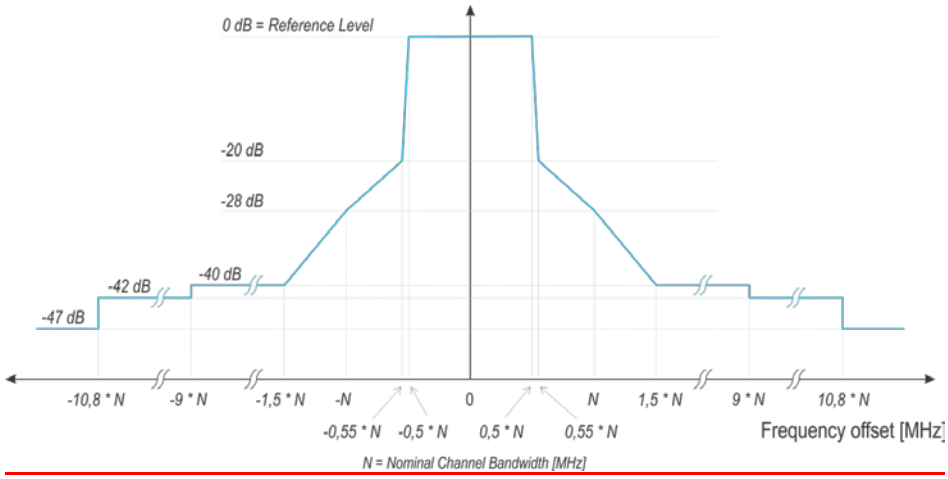
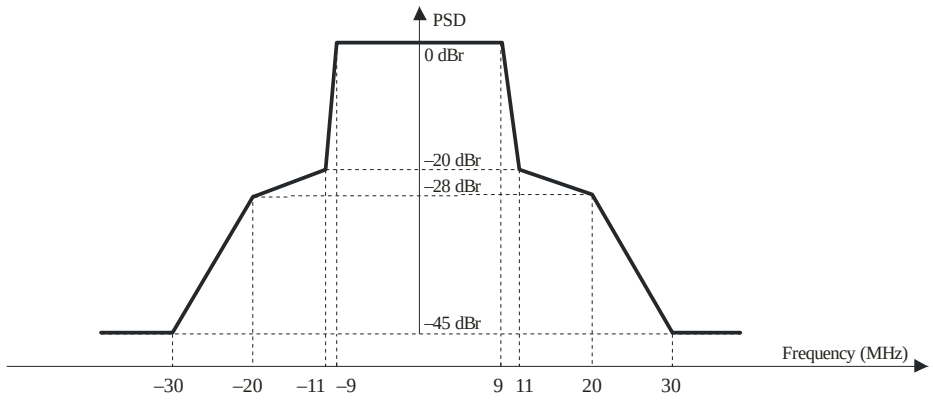


NOTE - dBc is the spectral density relative to the maximum spectral power density of the transmitted signal.

FIGURE 2a

Transmit spectral mask for 20 MHz 802.11n transmission in 2.4 GHz band



Note 1 – Maximum of –45 dBr and –53 dBm/MHz at 30 MHz frequency offset and above.

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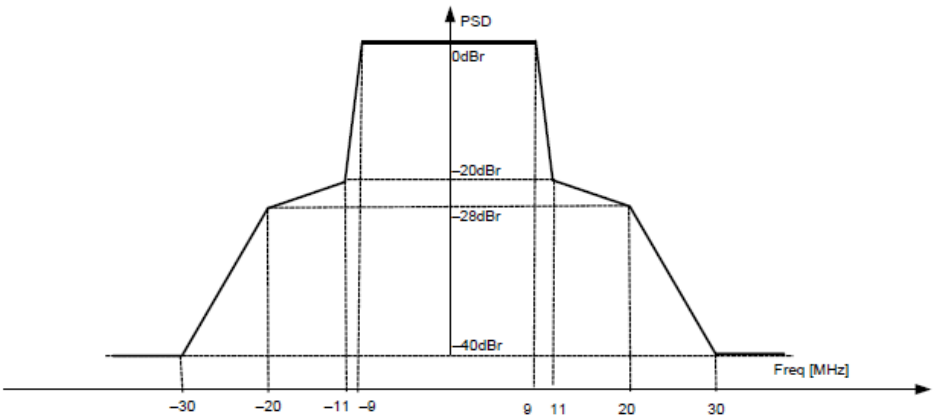
FIGURE 2b

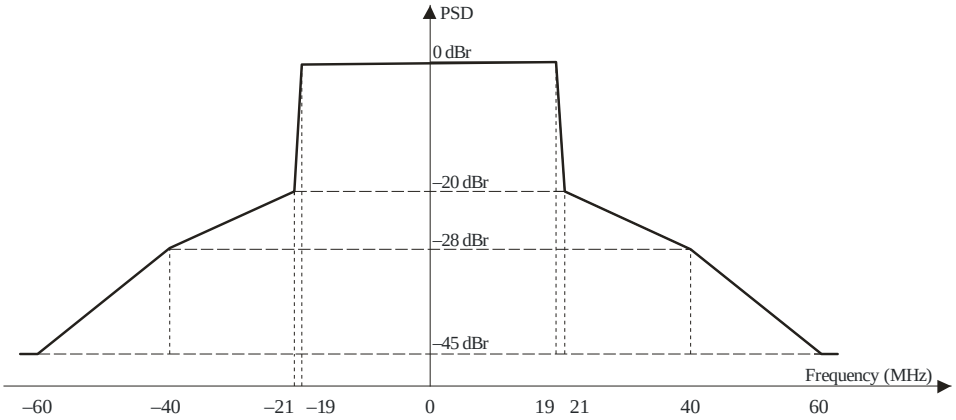
Transmit spectral mask for a 20 MHz 802.11n transmission in 5 GHz band and ~~interim~~ transmit spectral mask for 802.11ac



NOTE 1 – For 802.11n, the maximum of –40 dBr and –53 dBm/MHz at 30 MHz frequency offset and above. For 802.11ac, the transmit spectrum shall not exceed the maximum of the ~~interim~~ transmit spectral mask and –53 dBm/MHz at any frequency offset.

FIGURE 3a

Transmit spectral mask for a 40 MHz 802.11n channel in 2.4 GHz band



Note 1 – Maximum of –45 dBr and –56 dBm/MHz at 60 MHz frequency offset and above.

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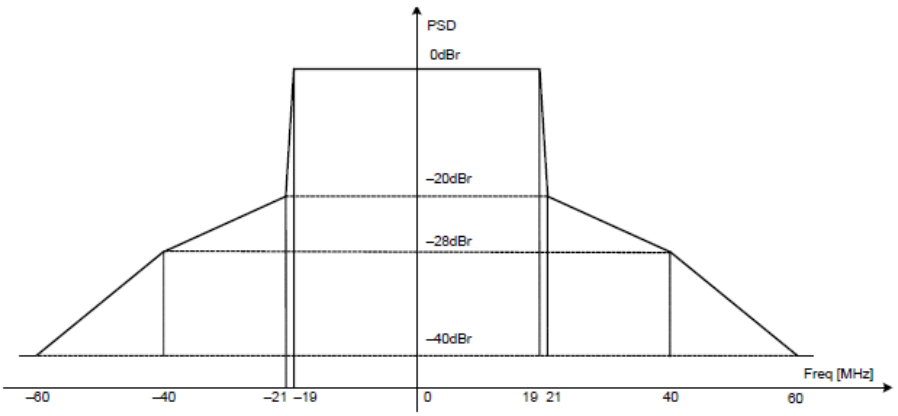
FIGURE 3b

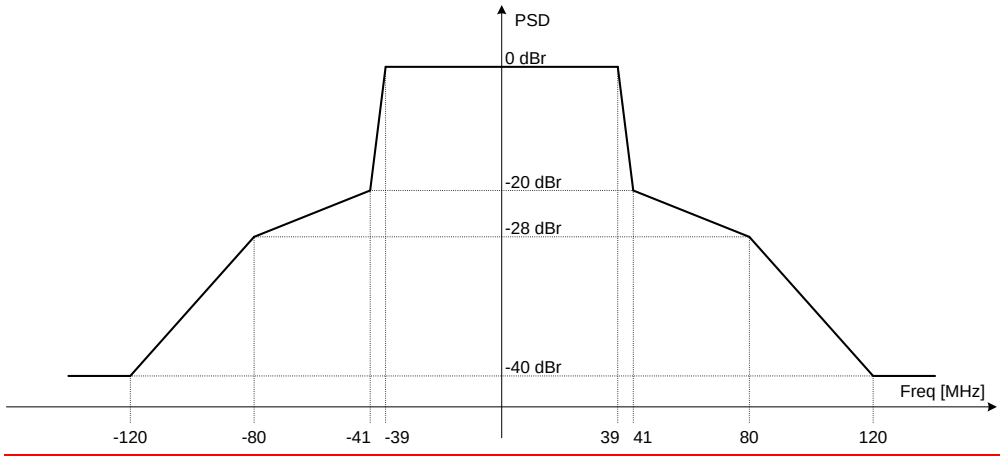
Transmit spectral mask for a 40 MHz 802.11n channel in 5 GHz band and ~~interim~~ transmit spectral mask for 802.11ac



NOTE 1 – For 802.11n, maximum of –40 dBr and –56 dBm/MHz at 60 MHz frequency offset and above. For 802.11ac, the transmit spectrum shall not exceed the maximum of the ~~interim~~ transmit spectral mask and –56 dBm/MHz at any frequency offset.

FIGURE 3c

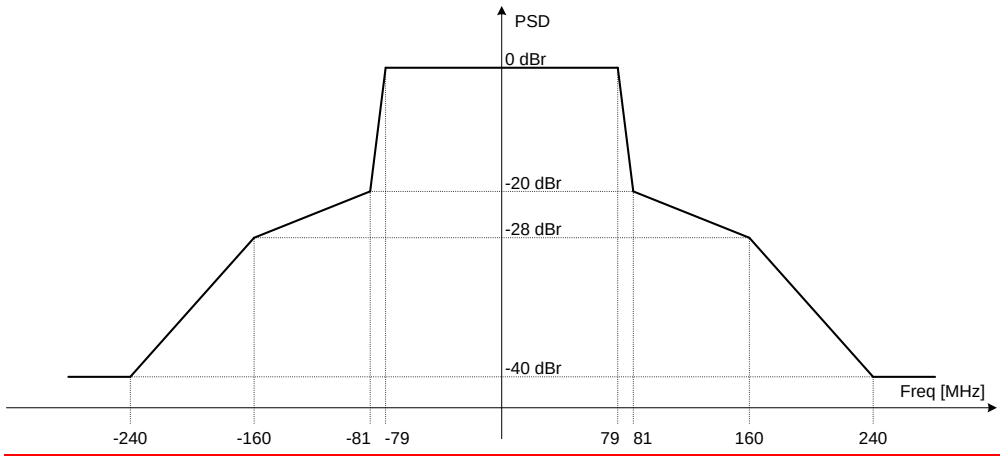
~~Interim t~~Transmit spectral mask for a 80 MHz 802.11ac channel



NOTE 1 – The transmit spectrum shall not exceed the maximum of the ~~interim~~ transmit spectral mask and –59 dBm/MHz at any frequency offset.

FIGURE 3d

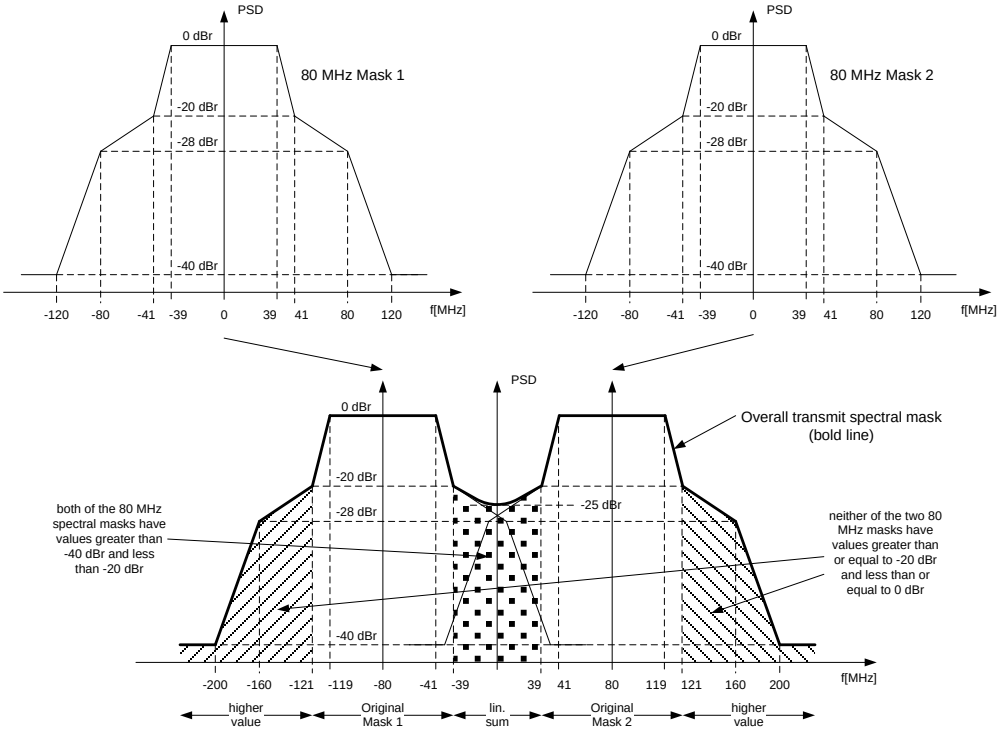
~~Interim t~~Transmit spectral mask for a 160 MHz 802.11ac channel



NOTE 1 – The transmit spectrum shall not exceed the maximum of the ~~interim~~ transmit spectral mask and –59 dBm/MHz at any frequency offset.

FIGURE 3e

~~Interim t~~Transmit spectral mask for a 80+80 MHz 802.11ac channel



NOTE 1 – The transmit spectrum shall not exceed the maximum of the ~~interim~~ transmit spectral mask and –59 dBm/MHz at any frequency offset.

FIGURE 4

Transmit spectrum mask for 802.11b

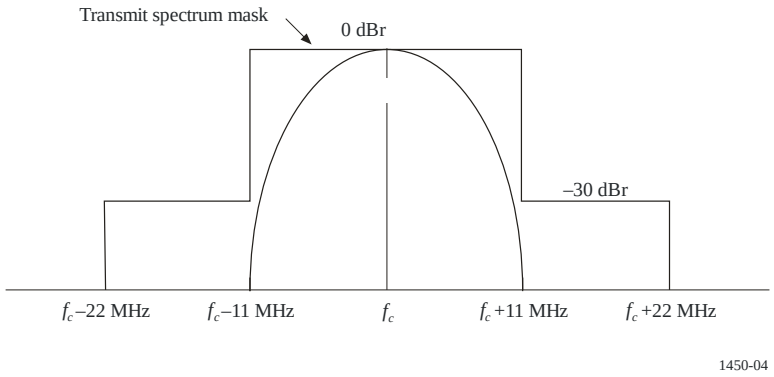
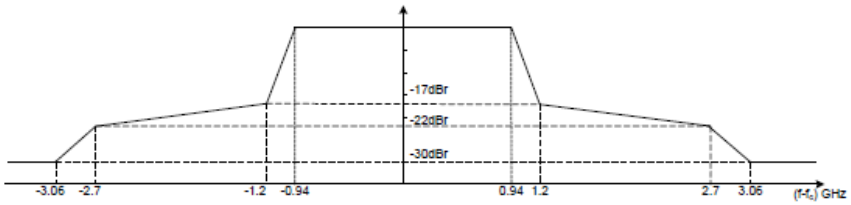


FIGURE 5

Transmit spectrum mask for 802.11ad



ANNEX 1

Obtaining additional information on RLAN standards

The ETSI EN 300 328, EN 301 893 and EN 302 567 standards can be downloaded http://pda.etsi.org/pda/queryform.asp. In addition to these standards, the Hiperlan type 2 standards can still be downloaded from the above link

~~HIPERLAN2 standards are TS 101 475 for the physical layer and TS 101 761 1 to TS 101 761 5 for the DLC layer, and these can be downloaded from the ETSI Publications Download Area http://www.etsi.org/services_products/freestandard/home.htm.~~

The IEEE 802.11 standards can be downloaded from: http://standards.ieee.org/getieee802/index.html.

IEEE 802.11 has developed a set of standards for RLANs, IEEE Std 802.11 – 2012~~07~~, which has been harmonized with IEC/ISO[1]. The medium access control (MAC) and physical characteristics for wireless local area networks (LANs) are specified in ISO/IEC 8802-11:2005, which is part of a series of standards for local and metropolitan area networks. The medium access control unit in ISO/IEC 8802-11:2005 is designed to support physical layer units as they may be adopted dependent on the availability of spectrum. ISO/IEC 8802-11:2005 contains five physical layer units: four radio units, operating in the 2 400-2 500 MHz band and in the bands comprising 5 150-5 250 MHz, 5 250-5 350 MHz, 5 470-5 725 MHz, and 5 725-5 825 MHz, and one baseband infrared (IR) unit. One radio unit employs the frequency-hopping spread spectrum (FHSS) technique, two employ the direct sequence spread spectrum (DSSS) technique, ~~and~~ another employs the orthogonal frequency division multiplexing (OFDM) technique, and another employs multiple input multiple output (MIMO) technique.

[1] ISO/IEC 8802-11:2005, Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications.

ANNEX 2

Basic characteristics of broadband RLANs and general guidance for deployment

1 Introduction

Broadband RLAN standards have been designed to allow compatibility with wired LANs such as IEEE 802.3, 10BASE-T, 100BASE-T and 51.2 Mbit/s ATM at comparable data rates.
Some broadband RLANs have been developed to be compatible with current wired LANs and are intended to function as a wireless extension of wired LANs using TCP/IP and ATM protocols. Recent spectrum allocations by some administrations promote development of broadband RLANs. This allows applications such as audio/video streaming to be supported with high QoS.

Portability is a feature provided by broadband RLANs but not wired LANs. New laptop and palmtop computers are portable and have the ability, when connected to a wired LAN, to provide interactive services. However, when they are connected to wired LANs they are no longer portable. Broadband RLANs allow portable computing devices to remain portable and operate at maximum potential.

Private on-premise, computer networks are not covered by traditional definitions of fixed and mobile wireless access and should be considered. The nomadic users are no longer bound to a desk. Instead, they are able to carry their computing devices with them and maintain contact with the wired LAN in a facility. In addition, mobile devices such as cellular telephones are beginning to incorporate the ability to connect to wireless LANs when available to supplement traditional cellular networks.

Speeds of notebook computers and hand-held computing devices continue to increase. Many of these devices are able to provide interactive communications between users on a wired network but sacrifice portability when connected. Multimedia applications and services require broadband communications facilities not only for wired terminals but also for portable and personal communications devices. Wired local area network standards, i.e. IEEE 802.3ab 1000BASE-T, are able to transport high rate, multimedia applications. To maintain portability, future wireless LANs will need to transport higher data rates. Broadband RLANs are generally interpreted as those that can provide data throughput greater than 10 Mbit/s.

2 Mobility

Broadband RLANs may be either pseudo fixed as in the case of a desktop computer that may be transported from place to place or portable as in the case of a laptop or palmtop devices working on batteries or cellular telephones with integrated wireless LAN connectivity. Relative velocity between these devices and an RLAN wireless access point remains low. In warehousing applications, RLANs may be used to maintain contact with lift trucks at speeds of up to 6 m/s. RLAN devices are generally not designed to be used at automotive or higher speeds.

3 Operational environment and considerations of interface

Broadband RLANs are predominantly deployed inside buildings, in offices, factories, warehouses, etc. For RLAN devices deployed inside buildings, emissions are attenuated by the structure.

RLANs utilize low power levels because of the short distances inside buildings. Power spectral density requirements are based on the basic service area of a single RLAN defined by a circle with a radius from 10 to 50 m. When larger networks are required, RLANS may be logically concatenated via bridge or router function to form larger networks without increasing their composite power spectral density.

One of the most useful RLAN features is the connection of mobile computer users to a wireless LAN network. In other words, a mobile user can be connected to his own LAN subnetwork anywhere within the RLAN service area. The service area may expand to other locations under different LAN subnetworks, enhancing the mobile user's convenience.

There are several remote access network techniques to enable the RLAN service area to extend to other RLANs under different subnetworks. International Engineering Task Force (IETF) has developed a number of the protocol standards on this subject.

To achieve the coverage areas specified above, it is assumed that RLANs require a peak power spectral density of e.g. approximately 10 mW/MHz in the 5 GHz operating frequency range (see Table 3). For data transmission, some standards use higher power spectral density for initialization and control the transmit power according to evaluation of the RF link quality. This technique is referred to as transmit power control (TPC). The required power spectral density is proportional to the square of the operating frequency. The large scale, average power spectral density will be substantially lower than the peak value. RLAN devices share the frequency spectrum on a time basis. Activity ratio will vary depending on the usage, in terms of application and period of the day.

Broadband RLAN devices are normally deployed in high-density configurations and may use an etiquette such as listen before talk and dynamic channel selection (referred to here as dynamic frequency selection, DFS), TPC to facilitate spectrum sharing between devices.

4 System architecture including fixed applications

Broadband RLANs are often point-to-multipoint architecture. Point-to-multipoint applications commonly use omnidirectional, down-looking antennas. The multipoint architecture employs several system configurations:

– point-to-multipoint centralized system (multiple devices connecting to a central device or access point via a radio interface);

– point-to-multipoint non-centralized system (multiple devices communicating in a small area on an ad hoc basis);

– RLAN technology is sometimes used to implement fixed applications, which provide point-to-multipoint (P-MP) or point-to-point (P-P) links, e.g. between buildings in a campus environment. P-MP systems usually adopt cellular deployment using frequency reuse schemes similar to mobile applications. Technical examples of such schemes are given in Report ITU-R F.2086 (see § 6.6). Point-to-point systems commonly use directional antennas that allow greater distance between devices with a narrow lobe angle. This allows band sharing via channel and spatial reuse with a minimum of interference with other applications;

– RLAN technology is sometimes used for multipoint-to-multipoint (fixed and/or mobile mesh network topology, in which multiple nodes relay a message to its destination). Omnidirectional and/or directional antennas are used for links between the nodes of the mesh network. These links may use one or multiple RF channels. The mesh topology enhances the overall reliability of the network by enabling multiple redundant communications paths throughout the network. If one link fails for any reason

(including the introduction of strong RF interference), the network automatically routes messages through alternate paths.

5 Interference mitigation techniques under frequency sharing environments

RLANs are generally intended to operate in unlicensed or license-exempt spectrum and must allow adjacent uncoordinated networks to coexist whilst providing high service quality to users. In the 5 GHz bands, sharing with primary services must also be possible. Whilst multiple access techniques might allow a single frequency channel to be used by several nodes, support of many users with high service quality requires that enough channels are available to ensure access to the radio resource is not limited through queuing, etc. One technique that achieves a flexible sharing of the radio resource is DFS.

In DFS all radio resources are available at all RLAN nodes. A node (usually a controller node or access point (AP)) can temporarily allocate a channel and the selection of a suitable channel is performed based on interference detected or certain quality criteria, e.g. received signal strength, *C*/*I*. To obtain relevant quality criteria both the mobile terminals and the access point make measurements at regular intervals and report this to the entity making the selection.

In the 5 250-5 350 MHz and 5 470-5 725 MHz bands, DFS must be implemented to ensure compatible operation with systems in the co-primary services, i.e. the radiolocation service.

DFS can also be implemented to ensure that all available frequency channels are utilized with equal probability. This maximizes the availability of a channel to node when it is ready to transmit, and it also ensures that the RF energy is spread uniformly over all channels when integrated over a large number of users. The latter effect facilitates sharing with other services that may be sensitive to the aggregated interference in any particular channel, such as satellite-borne receivers.

TPC is intended to reduce unnecessary device power consumption, but also aids in spectrum reuse by reducing the interference range of RLAN nodes.

6 General technical characteristics

Table 3 summarizes technical characteristics applicable to operation of RLANs in certain frequency bands and in certain geographic areas. Operation in the 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz frequency bands are ~~,~~ in accordance with Resolution **229 (Rev.WRC-~~03~~12)**.

TABLE 3

General technical requirements applicable in certain administrations and/or regions ~~in the 2.4 and 5 GHz bands~~

General band designation	Administration or region	Specific frequency band (MHz)	Transmitter output power (mW) (except as noted)	Antenna gain (dBi)
2.4 GHz band	USA	2 400-2 483.5	1 000	0-6 dBi(1) (Omni)
	Canada	2 400-2 483.5	4 W e.i.r.p.(2)	N/A
	Europe	2 400-2 483.5	100 mW (e.i.r.p.)(3)	N/A
	Japan	2 471-2 497 2 400-2 483.5	10 mW/MHz(4) 10 mW/MHz(4)	0-6 dBi (Omni) 0-6 dBi (Omni)
5 GHz band(5), (6)	USA	5 150-5 250(7) 5 250-5 350 5 470-5 725 5 725-5 850	50 2.5 mW/MHz 250 12.5 mW/MHz 250 12.5 mW/MHz 1 000 50.1 mW/MHz	0-6 dBi(1) (Omni) 0-6 dBi(1) (Omni) 0-6 dBi(1) (Omni) 0-6 dBi(8) (Omni)
	Canada	5 150-5 250(7) 5 250-5 350 5 470-5 725 5 725-5 850	200 mW e.i.r.p. 10 dBm/MHz e.i.r.p. 250 12.5 mW/MHz (11 dBm/MHz) 1 000 mW e.i.r.p.(9) 250 12.5 mW/MHz (11 dBm/MHz) 1 000 mW e.i.r.p.(9) 1 000 50.1 mW/MHz(9)	
	Europe	5 150-5 250(7) 5 250-5 350(10) 5 470-5 725	200 mW (e.i.r.p.) 10 mW/MHz (e.i.r.p.)~~0.25 mW/25 kHz~~ 200 mW (e.i.r.p.) 10 mW/MHz (e.i.r.p.) 1 000 mW (e.i.r.p.) 50 mW/MHz (e.i.r.p.)	N/A
~~57-66 GHz~~	~~Europe~~	~~57-66 GHz~~	~~40 dBm (e.i.r.p.)(12)~~ ~~13 dBm/MHz (e.i.r.p)~~	~~N/A~~

TABLE 3 (*end*)

General band designation	Administration or region	Specific frequency band (MHz)	Transmitter output power (mW) (except as noted)	Antenna gain (dBi)
5 GHz band[5], [6] (*cont.*)	Japan[4]	4 900-5 000[11]	250 mW 50 mW/MHz	13
		5 150-5 250[7]	10 mW/MHz (e.i.r.p.)	N/A
		5 250-5 350[10]	10 mW/MHz (e.i.r.p.)	N/A
		5 470-5 725	50 mW/MHz (e.i.r.p.)	N/A
57-66 GHz	Europe	57-66 GHz	40 dBm (e.i.r.p.)[12] 13 dBm/MHz (e.i.r.p)	N/A

(1) In the United States of America, for antenna gains greater than 6 dBi, some reduction in output power required. See sections 15.407 and 15.247 of the FCC's rules for details.

(2) Canada permits point-to-point systems in this band with e.i.r.p. > 4 W provided that the higher e.i.r.p. is achieved by employing higher gain antenna, but not higher transmitter output power.

(3) This requirement refers to ETSI EN 300 328.

(4) See Japan MIC ordinance for Regulating Radio Equipment, Articles 49-20 and 49-21 for details.

(5) Resolution 229 (WRC-03) establishes the conditions under which WAS, including RLANs, may use the 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz.

(6) DFS rules apply in the 5 250-5 350 MHz and 5 470-5 725 MHz bands in regions and administrations and must be consulted.

(7) Pursuant to Resolution 229 (WRC-03), operation in the 5 150-5 250 MHz band is limited to indoor use.

(8) In the United States of America, for antenna gains greater than 6 dBi, some reduction in output power required, except for systems solely used for point-to-point. See sections 15.407 and 15.247 of the FCC's rules for details.

(9) See RSS-210, Annex 9 for the detailed rules on devices with maximum e.i.r.p. greater than 200 http://strategis.ic.gc.ca/epic/site/smt-gst.nsf/en/sf01320e.html.

(10) In Europe and Japan, operation in the 5 250-5 350 MHz band is also limited to indoor use.

(11) For fixed wireless access, registered.

(12) This refers to the highest power level of the transmitter power control range during the transmission burst if transmitter power control is implemented. Fixed outdoor installations are not allowed.

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DRAFT REVISION OF RECOMMENDATION ITU-R F.1763-0
Radio interface standards for broadband wireless access systems in the fixed service operating below 66 GHz

Radiocommunication Study Groups

Source: Document 5A/TEMP/161(Rev.1)

Revision 1 to
Document 5/71-E
13 December 2013
English only

Working Party 5A

DRAFT REVISION OF RECOMMENDATION ITU-R F.1763-0

Radio interface standards for broadband wireless access systems in the fixed service operating below 66 GHz

(Question ITU-R 236/9)

(2006)

Summary of revision

In this draft revision, references have been added to relevant ITU-R Recommendations that have been developed since the publication of Recommendation ITU-R F.1763. As a consequence, the Annexes have been removed to reflect the fact that those standards have been incorporated into the ITU-R Recommendations that are now referenced in this draft revision of the Recommendation.

DRAFT REVISION OF RECOMMENDATION ITU-R F.1763-0

Radio interface standards for broadband wireless access systems in the fixed service operating below 66 GHz

(Question ITU-R 215-4/5)

(2006)

Scope

This Recommendation identifies specific radio interface standards which may be utilized for broadband wireless access (BWA)[1] systems in the fixed service operating below 66 GHz, addressing profiles for the recommended interoperability standards. It provides references to the standards for interoperability between BWA systems.

The interoperability standards referenced in this Recommendation include the following specifications:

– system profiles;

– physical layer parameters, i.e. channelization, modulation scheme, data rates;

– medium access control (MAC) layer messages and header fields.

This Recommendation is not intended to deal with the identification of suitable frequency bands for BWA systems, nor any regulatory issues.

Keywords

Fixed broadband wireless access, Broadband wireless access, BWA, radio interface standards.

References

Recommendation ITU-R F.1399: Vocabulary of terms for wireless access.

[1] "Wireless access" and "BWA" are defined in Recommendation ITU-R F.1399.

The ITU Radiocommunication Assembly,

considering

a) that it is useful to identify standards for broadband wireless access (BWA) systems in the fixed service for international use;

b) that the standards for BWA systems in the fixed services are developed by standardization development bodies with broad international participation;

c) that standards for systems operating in the mobile service can be utilized to provide fixed BWA;

d) that standards for BWA support a wide range of fixed and nomadic broadband applications, such as voice and videoconferencing, in urban, suburban, and rural areas,

recognizing

a) that Recommendation ITU-R F.1499, specifies radio transmission systems for fixed broadband wireless access (BWA) based on cable modem standards;

b) that the Handbook on Fixed Wireless Access (Volume 1 of the Land Mobile (including Wireless Access)), also includes a number of proprietary solutions for fixed BWA;

c) that Recommendation ITU-R F.1401, provides considerations for the identification of possible frequency bands for fixed wireless access and related sharing studies;

d) that Recommendation ITU-R M.1450, recommends broadband radio local area networks standards;

e) that Recommendation ITU-R M.1457, recommends IMT-2000 terrestrial radio interface standards, some of which may also be used to provide fixed BWA;

f) that Recommendation ITU-R M.1801, recommends radio interface standards for broadband wireless access systems, including mobile and nomadic applications, in the mobile service operating below 6 GHz, some of which may also be used to provide fixed BWA;

g) that Recommendation ITU-R M.2003, recommends multiple gigabit wireless systems in frequencies around 60 GHz, some of which may also be used to provide fixed BWA;

h) that Recommendation ITU-R M.2012, recommends detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-Advanced (IMT-Advanced), some of which may also be used to provide fixed BWA,

recommends

1 that the standards in *recognizings d), e), f), g) and h)* which can be also utilized to provide fixed BWA operations below 66 GHz, should be used.

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WORKING DOCUMENT TOWARD A PRELIMINARY DRAFT REVISION OF RECOMMENDATION ITU-R M.2015

Frequency arrangements for public protection and disaster relief radiocommunication systems in UHF bands in accordance with Resolution 646 (Rev.WRC-12)

Radiocommunication Study Groups

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Annex 19 to
Document 5A/306-E
1 June 2013
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Annex 19 to Working Party 5A Chairman's Report

WORKING DOCUMENT TOWARD A PRELIMINARY DRAFT REVISION OF RECOMMENDATION ITU-R M.2015

Frequency arrangements for public protection and disaster relief radiocommunication systems in UHF bands in accordance with Resolution 646 (Rev.WRC-12)

Scope of the revision

[To be added upon completion of revision]

Scope

This Recommendation provides guidance on frequency arrangements for public protection and disaster relief radiocommunications in certain regions in some of the bands below 1 GHz identified in Resolution **646 (Rev.WRC-12)**. Currently, the Recommendation addresses arrangements in the ranges 380-470 MHz in certain countries in Region 1, 746-806 MHz and 806-869 MHz in Region 2, and 806-824/851-869 MHz in some countries in Region 3 in accordance with Resolutions ITU-R 53, ITU-R 55 and WRC Resolutions **644 (Rev.WRC-12~~07~~)**, **646 (Rev.WRC-12)**, and **647 (Rev.WRC-~~07~~12)**.

The ITU Radiocommunication Assembly,

considering

a) that growing telecommunication and radiocommunication needs of public protection and disaster relief (PPDR) agencies and organizations are vital to the maintenance of law and order, protection of life and property, disaster relief and emergency response;

b) that many administrations wish to facilitate interoperability and interworking between systems used for PPDR radiocommunication, both nationally and for cross-border operations in emergency situations and for disaster relief;

c) that a continuing requirement is envisaged for narrow-band applications (such as voice and various types of messaging), along with wideband and broadband applications in the future~~there will continue to be narrow-band, wideband and broadband requirements for future applications~~;

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d) that continuing development of new technologies such as International Mobile Telecommunications (IMT) and Intelligent Transport Systems (ITS) may be able to serve, support or supplement advanced public protection and disaster relief applications;

e) that, over time, traditional narrow-band public protection and disaster relief applications, such as voice and low-data rate applications, may be integrated with advanced broadband applications;

f~~e~~) that ~~some~~ administrations may have different ~~operational needs and spectrum~~ requirements ~~from~~ for their ~~user~~ PPDR organizations ~~for PPDR applications~~ depending on their ~~circumstances~~operational needs, spectrum requirements, policy objectives and organizational structures;

g~~f~~) that national spectrum planning for PPDR radiocommunication systems needs to have regard for cooperation and bilateral consultation with other concerned administrations, in order to facilitate greater levels of spectrum harmonization;

h~~g~~) that usage of the same frequencies of the same allocation will enable administrations to benefit from harmonization while continuing to meet national planning requirements,

noting

a) that the benefits of spectrum harmonization are:

– increased potential for interoperability between PPDR organizations within a particular administration, or between PPDR organizations in difference administrations;

– a broader manufacturing base and increased volume of equipment resulting in economies of scale and expanded equipment availability;

– improved spectrum management and planning;

– enhanced cross-border coordination and circulation of equipment~~.~~;

b) that spectrum planning for PPDR radiocommunications is performed at the national level, taking into account the need for interoperability and benefits of neighbouring administrations using harmonized or common frequency bands;

c) the benefits of cooperation between countries for the provision of effective and appropriate humanitarian assistance during disasters;

d) the needs of countries, particularly the developing countries, for low-cost communication equipment;

e) that not all frequencies within an identified common frequency range will be available within each country of the relevant ITU Region;

f) that flexibility must be afforded to administrations:

– to determine, at the national level, how much spectrum to make available for PPDR from the bands identified in Resolution **646 (Rev.WRC-12)** in order to meet their particular national requirements;

– to have the ability for the bands identified in Resolution **646 (Rev.WRC-12)** to be used by all services having allocations according to the provisions of the Radio Regulations, taking into account the existing applications and their evolution; and

– to determine the need and timing of availability, as well as the conditions of usage of the bands identified in Resolution **646 (Rev.WRC-12)** for PPDR in order to meet specific national policy objectives, operational priorities, organizational structures and operating environments;~~situations.~~

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g) that information on technologies that may be appropriate for use in these frequency arrangements is provided in Recommendation ITU-R M.2009~~.~~ ~~*Radio interface standards for use by public protection and disaster relief operations in some parts of the UHF band in accordance with Resolution 646 (WRC-03) sent for adoption/approval by correspondence (PSAA) in Administrative Circular CAR/329*~~;~~

h) the relation~~s~~hip ~~of~~ between Resolution **646 (Rev.WRC-12)** on public protection and disaster relief, which invites the development of this Recommendation, ~~with~~ and Resolution **647 (Rev.WRC-~~07~~12)** on spectrum management guidelines for emergency and disaster relief ~~Radiocommunication~~ radiocommunication, and Resolution **644 (Rev.WRC-12~~07~~)** on radiocommunication resources for early warning, disaster mitigation and relief operations, which also address the need to coordinate activities under these Resolutions in order to prevent any possible overlap,

recognizing

a) Resolution **646 (Rev.WRC-12)** encourages administrations to consider the following identified frequency bands/ranges or parts thereof when undertaking their national planning for the purposes of achieving regionally harmonized frequency bands/ranges for advanced public protection and disaster relief solutions:

– in Region 1: 380-470 MHz as the frequency range within which the band 380-385/390-395 MHz is a preferred core harmonized band for permanent public protection activities within certain countries of Region 1 which have given their agreement;

– in Region 2[1]: 746-806 MHz, 806-869 MHz, 4 940-4 990 MHz;

– in Region 3[2]: 406.1-430 MHz, 440-470 MHz, 806-824/851-869 MHz, 4 940-4 990 MHz and 5 850-5 925 MHz;

b) the urgent need for development of regionally harmonized frequency arrangements in the frequency range 380-470 MHz in Region 1, the range 746-806 MHz in Region 2, the frequency range 806-869 MHz in Region 2, and the frequency range 806-824/851-869 MHz in some countries in Region 3 for the purposes of implementing advanced PPDR solutions;

c) that, in the context of Resolution **646 (Rev.WRC-12)**, the term "frequency range" means a range of frequencies over which relevant~~a~~ radio equipment is envisaged to be capable of operating, but limited to specific frequency band(s) according to national conditions and requirements;

d) that the identification of these frequency bands/ranges or parts thereof for PPDR radiocommunications does not preclude the use of, nor establish priority over, any other frequencies for PPDR in accordance with the Radio Regulations including the provisions of Resolution **646 (Rev.WRC-12)**, and does not preclude the use of these bands/frequencies by any application within the services to which these bands/frequencies are allocated;

e) that the frequency bands identified in Resolution **646 (Rev.WRC-12)** and covered by this Recommendation are allocated to a variety of services in accordance with the relevant provisions of the Radio Regulations;

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[1] Venezuela has identified the band 380-400 MHz for public protection and disaster relief applications.

[2] Some countries in Region 3 have also identified the bands 380-400 MHz and 746-806 MHz for public protection and disaster relief applications.

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f) that the frequency arrangements in the Annexes are provided for PPDR applications in the mobile service at the national level;

g) that compatibility of stations using these frequency arrangements with other services operating in other countries is studied in the ITU at the service level and not at the application level;

h) that Resolution ITU-R 53 instructs the Director of the Radiocommunication Bureau to assist Member States with their emergency radiocommunication preparedness activities, such as listing of currently available frequencies for use in emergency situations for inclusion in a database maintained by the Bureau;

j) that ~~WRC-07~~World Radiocommunication Conferences have identified bands, including 450-470 MHz, and part or all of the bands 698-960 MHz in certain Regions and countries, for use by administrations wishing to implement IMT, as detailed in Nos. 5.286AA, 5.317A, 5.313A, 5.316, 5.316A and 5.316B, Resolution **224 (Rev.WRC-12~~07~~)** and Resolution **749 (Rev.WRC-12~~07~~)**;

k) that the Regional Radiocommunication Conference (Geneva, 2006) established Regional Agreement relating to the planning of the digital terrestrial broadcasting service in Region 1 (parts of Region 1 *situated to the west of meridian 170° E and to the north of parallel 40° S*, except the territory of Mongolia) and in the Islamic Republic of Iran, in the frequency bands 174-230 MHz and 470-862 MHz (GE-06);

l) that commercial terrestrial wireless systems may effectively complement dedicated systems in support of PPDR, particularly where advantage can be taken of the availability, high-bit rate, and reliability features of these commercial systems. There may be a need for suitable upgrading of such commercial systems to meet the specific needs of PPDR agencies,

recommends

1 that administrations implementing the frequency arrangements in the Annexes should make all necessary efforts to ensure compatibility between PPDR and stations of other services in neighbouring countries;

2 that the frequency arrangements in the Annexes should be used by administrations as guidance when making spectrum available for PPDR applications in the frequency bands described in *recognizing* b).

Annex 1

Examples of frequency arrangements for the band 380-470 MHz in certain countries in Region 1 for narrow-band and wideband public protection and disaster relief operations

The frequency range 380-470 MHz has been identified as a tuning range for PPDR in Region 1. The frequency band 380-385 MHz (uplink)/390-395 MHz (downlink) is the harmonized core band for permanent use for PPDR. For more information relating to countries within Europe, see ECC/DEC/(08)05 and ECC Report 102.

Wideband PPDR applications use channels within available parts of the frequency range 380-470 MHz.

Additionally certain channels have been identified for DMO (Direct mode operation) and AGA (Air-ground-air operation) purposes.

DMO (Direct mode operation)

Simplex channels within the frequency bands 380-380.150 MHz and 390-390.150 MHz should be used as harmonized channels for DMO. For more information relating to countries within Europe see ERC/DEC/(01)19.

AGA (Air-ground-air operation)

Duplex channels within the frequency bands 384.800 MHz-385 MHz/394.800-395 MHz should be used as the core band for harmonized channels for AGA. Duplex channels within the frequency bands 384.750 MHz-384.800 MHz/394.750-394.800 MHz may be used as the preferred extension band for AGA when additional channels are required. For more information relating to countries within Europe, see ECC/DEC/(06)05.

Centre frequencies:

a) *For systems with a channel bandwidth of up to 150 kHz*

$$F_{CH} = \text{band edge} - (\text{channel bandwidth}/2) + n * \text{channel bandwidth}$$

where:

F_{CH} = centre frequency;

n = channel number (1, 2, 3, ...);

band edge: is lower edge of frequency band.

b) *For systems with a channel bandwidth of 200 kHz*

The centre frequencies should be selected according to the formula under *a)* with an option to offset these centre frequencies by 100 kHz.

c) *For systems with a channel bandwidth of 1.25 MHz*

The centre frequencies should be selected according to the formula under *a)* with an option to offset these centre frequencies by multiples of 12.5 kHz, in order to provide flexibility to locate the centre frequencies in the optimum position within the band.

Annex 2

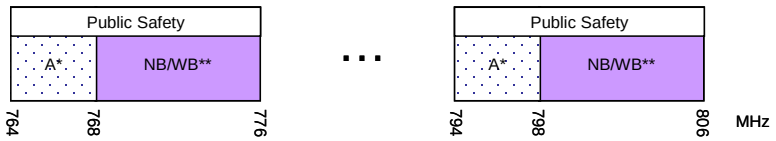
Examples of frequency arrangements within the bands 763 to 776 MHz and 793 to 806 MHz in certain countries in Region 2 for narrow-band, wideband and broadband public protection and disaster relief operations

1 Region 2

The frequency range 764-776 MHz and 794-806 MHz has been identified for PPDR in the CITEL PCC.II/REC. 18 (VII-06). Within this frequency range, administrations could consider a number of possible frequency arrangements examples as indicated below.

1.1 Example frequency arrangement "A"[3]

Base station transmit (MHz)	Mobile station transmit (MHz)	Frequency block
764-768	794-798	PPDR 1
768-776	798-806	PPDR 2



* Block A will be subject to a future consultation.

** The amount of narrowband (NB) and wideband (WB) spectrum will be set out in the relevant standard

[3] This frequency arrangement is from the Canadian rules. For more details, see Industry Canada's Gazette Notice No. DGTP-007-09 – Narrowband and Wideband Public Safety Radiocommunication Systems in the bands 768-776 MHz and 798-806 MHz (http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09553.html).

Field Code Changed

1.2 Example frequency arrangement "B"[4]

Base station transmit (MHz)	Mobile station transmit (MHz)	Frequency block
~~763~~758-768	~~793~~788-798	PPDR 1[1]
769-775	799-805	PPDR 2[2]
768-769	798-799	PPDR internal guardband
~~758-763~~	~~788-793~~	~~D (public/private partnership) with PPDR priority access during emergencies~~

NOTE 1 – This frequency block is used for broadband PPDR applications[5]. Broadband PPDR applications include web browsing, tactical video, surveillance video, high resolution imaging, database access, and virtual private networks.

NOTE 2 – This frequency block is used for PPDR applications that provide narrow-band voice and low-speed data services. In the context of PPDR, narrow-band is defined in Resolution **646 (Rev.WRC-12)** as "supporting voice and low data-rate applications, typically in channel bandwidths of 25 kHz or less". Narrowband channels may also be consolidated into wideband channels (50 to 150 kHz) if approval by the licensing administration is obtained through a limited waiver process.

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[4] This band plan is from the United States' FCC Rules. For more details, see Part 90 of the FCC Rules at http://wireless.fcc.gov/index.htm?job=rules_and_regulations.

Field Code Changed

[5] The use of the term "broadband" in this Annex means indicative data rates in the order of 1-100 Mbit/s with channel bandwidths dependent on the use of spectrally efficient technologies (from Resolution **646 (Rev.WRC-12)** and Report ITU-R M.2033). It is recognized that other definitions of these terms exist in other ITU texts (such as Recommendation ITU-R F.1399) or in the rules of various individual administrations.

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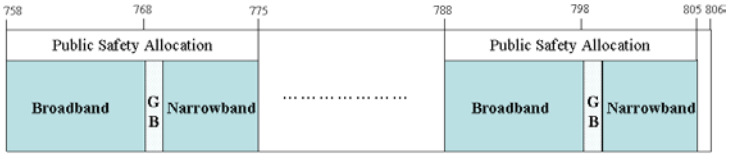
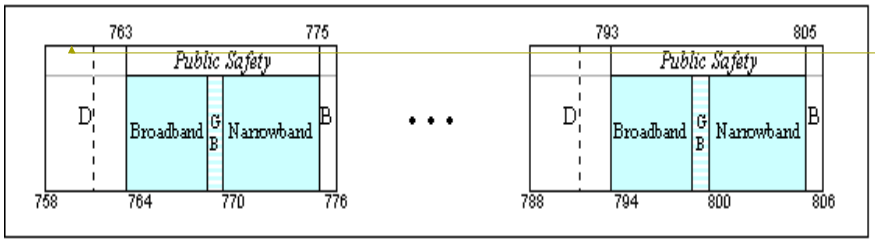
Revised 700 MHz Band Plan for PPDR Services

Frequencies in MHz



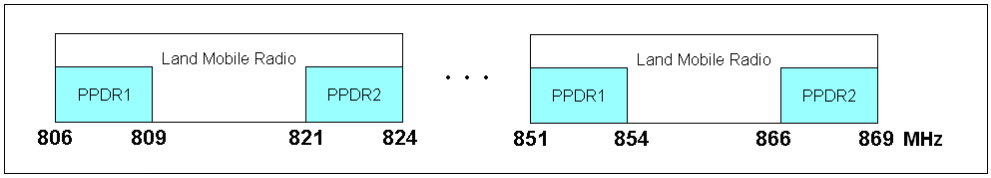


Annex 3

Examples of frequency arrangements for the band 806 to 869 MHz in certain countries in Region 2 for narrow-band public protection and disaster relief operations

1 General band plan – 806-824/851-869 MHz

In a number of countries in the Region 2, the band 806-824/851-869 MHz is allocated to the mobile service, and designated for Land Mobile Radio (LMR) applications. The duplex spacing is 45 MHz, with the base stations transmitting in the 851-869 MHz, and the mobile stations in the 806-824 MHz range. PPDR channels may be assigned throughout this band and specific blocks may be designated exclusively for PPDR applications. (See § 1.1) Radio equipment is capable of tuning to all channels in the band ensuring interoperability. To simplify cross-border coordination and to ensure that public safety agencies have access to a stable and predictable pool of radio frequency channels, neighbouring administrations could implement complementary frequency arrangements, an example being shown in the figure below.



1.1 Example frequency arrangement

1.1.1 Designation of frequency blocks

Mobile station/Control station transmit (MHz)	Base station transmit (MHz)	Frequency block
806-809	851-854	PPDR1[6]
821-824	866-869	PPDR2[7]

1.1.2 Channelization

The frequencies corresponding to the centre frequency of the channel number are defined by the following formulas, where *n* is the channel number:

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (kHz)
n = 1 to 600	$f_n = 806.0125 + (0.025) \times (n - 1)$	$f_n = 851.0125 + (0.025) \times (n-1)$	25
n = 602 to 790 except 639, 677, 715, 753	$f_n = 821.0375 + 0.0125 \times (n - 602) + 0.025 \times \text{floor}[(n - 601) / 38]$	$f_n = 866.0375 + 0.0125 \times (n - 602) + 0.025 \times \text{floor}[(n - 601) / 38]$	12.5
n = 601, 639, 677, 715, 753	$f_n = 821.0125 + 0.5 \times \text{floor}[(n - 601) / 38]$	$f_n = 866.0125 + 0.5 \times \text{floor}[(n - 601) / 38]$	25
n = 791 to 830	$f_n = 823.5 + (0.0125) \times (n - 791)$	$f_n = 868.5 + (0.0125) \times (n - 791)$	2512.5

[6] This frequency arrangement is from the United States' FCC Rules. For more details, see Part 90 of the FCC Rules at http://wireless.fcc.gov/index.htm?job=rules_and_regulations.

[7] This frequency arrangement is from the Canadian rules. For more details, see Standard Radio System Plan 502 at http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf00050.html.

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Annex 4

Examples of frequency arrangements for the bands 806 to 824 MHz and 851 to 869 MHz in some countries in Region 3 for narrowband and broadband public protection and disaster relief operations

~~This example frequency arrangement is provided for information.~~

1 Example narrowband plan – 806-824/851-869 MHz

The entire band ~~may normally~~could be used ~~with~~ for channel bandwidths of 25 kHz for digital trunked radio systems. However some administrations may want to use different channel bandwidths according to their policy. This ~~Annex~~ sub-section provides ~~the~~ examples ~~case~~ of ~~channelling. T~~three channelling schemes ~~can be considered in this band~~. In the sub-band of 806-811/851-856 MHz the channel bandwidth is 25 kHz, in the sub-band of 811-813.5/ 856-858.5 MHz the channel bandwidth is 12.5 kHz and in sub-band 813.5-816/858.5-861 MHz the channel bandwidth is 6.25 kHz. The lower block 806-824 MHz is used for mobile station transmitters (uplink) and the upper block is used for base station transmitters (downlink).

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Formulas to calculate the center frequency ~~centre~~ of each channel are as follows:

– In sub-band of 806-811/851-856 MHz:

The band is divided into 25 kHz channels.

Centre frequency of N-th base station transmitting channel (MHz):

$$F_N = 851.0125 + (N - 1) \times 0.025 \qquad N = 1, 2, 3, \ldots, 200$$

Centre frequency of N-th base station receiving channel (MHz):

$$F_N' = 806.0125 + (N - 1) \times 0.025 \qquad N = 1, 2, 3, \ldots, 200$$

– In sub-band of 811-813.5/856-858.5 MHz:

This sub-band is divided into 12.5 kHz channels.

Centre frequency of N-th base station transmitting channel (MHz):

$$F_N = 856.00625 + (N - 1) \times 0.0125 \qquad N = 1, 2, 3, \ldots, 200$$

Centre frequency of N-th base station receiving channel (MHz):

$$FN' = 811.00625 + (N - 1) \times 0.0125 \qquad N = 1, 2, 3, \ldots, 200$$

– In sub-band of 813.5-816/858.5-861 MHz:

This sub-band is divided into 6.25 kHz channels.

Centre frequency of N-th base station transmitting channel (MHz):

$$FN = 858.503125 + (N - 1) \times 0.00625 \quad N = 1, 2, 3, \ldots, 400$$

Centre frequency of N-th base station receiving channel (MHz):

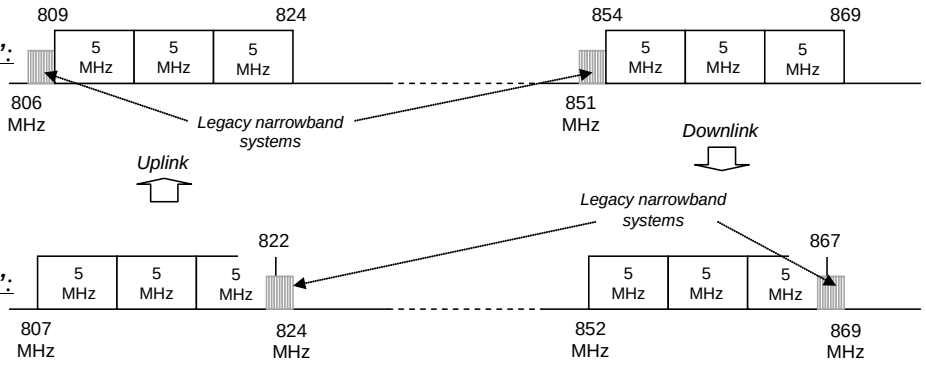
$$F_N' = 813.503125 + (N - 1) \times 0.00625 \quad N = 1,2, 3, \ldots, 400.$$

2 Example broadband plan – 806-824/851-869 MHz

The broadband channel plan is based on paired frequencies with mobile station transmitters used in the frequency band 806-824 MHz (uplink) and base station transmitters used in the frequency band 851-869 MHz (downlink).

To allow for possible co-existence with legacy narrowband systems and adjacent broadband channel arrangements, administrations could consider the examples below:

Plan 'A':



Plan 'B':

The raster for the wideband channels is 100 kHz, which means that the channel center frequencies are an integer multiple of 100 kHz. The broadband channel bandwidth is an integer multiple of 5 MHz. This provides flexibility for administrations to implement appropriate channel arrangements in accordance with the above Plans 'A' or 'B', or some subset thereof, to suit specific national circumstances. Some administrations may want to use different amounts of broadband and narrowband spectrum than the examples in Plan 'A' or 'B' to allow for transition.

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Annex X to Working Party 5A Chairman's Report
Working document towards the preliminary draft CPM text
for WRC-15 Agenda item 1.3

Radiocommunication Study Groups

Source: Document 5A/TEMP/128

Revision 1 to
Document 5A/TEMP/163-E
27 November 2013
English only

Working Party 5A
(Sub-Working Group 5A-3)

ANNEX X TO WORKING PARTY 5A CHAIRMAN'S REPORT

WORKING DOCUMENT TOWARDS THE PRELIMINARY DRAFT CPM TEXT FOR WRC-15 AGENDA ITEM 1.3

AGENDA ITEM 1.3
(**WP 5A** / **WP 5B, WP 5C, WP 5D**, (WP 1B), (WP 4A), (WP 4B), (WP 4C), (WP 6A), (WP 7B), (WP 7C), (WP 7D))

*1.3 to review and revise Resolution **646 (Rev. WRC-12)** for broadband public protection and disaster relief (PPDR), in accordance with Resolution **648 (WRC-12)**;*

Resolution **648 (WRC-12)**: *Studies to support broadband public protection and disaster relief.*

1/1.3/1 Executive summary

1/1.3/2 Background

Resolution **646 (Rev.WRC-12)** on Public Protection and Disaster Relief (PPDR), encourages Administrations, for the purpose of achieving regionally harmonized frequency bands/ranges for advanced public protection and disaster relief solutions, to consider certain identified frequency bands/ranges or parts thereof when undertaking their national planning.

The benefits of regionally or internationally harmonized frequency bands have been documented in that Resolution and in many studies and reports. These benefits include, among others, achieving economies of scale and expanded equipment availability, possibly increasing competition and improved spectrum management and planning. In emergency and disaster relief situations, the benefits of spectrum harmonization also include enhanced cross-border circulation of equipment and increased potential for interoperability of communications when a country receives assistance from other nations.

Since the initial adoption of that Resolution in 2003, major technological breakthroughs have taken place. Moreover, the use of data applications in certain countries has gone beyond voice

applications and the trend continues to grow. New broadband mobile technologies have emerged, for which today there are already practical applications, and PPDR agencies increasingly recognize the importance of video and broadband to carry out their activities more efficiently. [In addition, some countries have designated new frequency bands for broadband PPDR that are currently not identified in Resolution 646.]

It has also been recognized that, during disasters, wireless video systems are rolled out more rapidly than fibre or cable networks. In various parts of the world, governments and PPDR institutions are using high-speed wireless video networks to enhance the safety of officers, increase their effectiveness and save lives. In this context, new scenarios of applications and demand for public safety communications have emerged. WRC-15, under agenda item 1.3, will review and revise, as appropriate, Resolution **646 (Rev.WRC-12)** for broadband PPDR in accordance with Resolution **648 (WRC-12)**.

[**Resolution 647 (WRC-07)** on Spectrum management guidelines for emergency and disaster relief radiocommunications encourages administrations to consider global and/or regional frequency bands/ranges for emergency and disaster relief when undertaking their national planning and to communicate this information to the Bureau. This resolution also requires the Director of the Radiocommunication Bureau to assist Member States with their emergency communication preparedness activities by establishing a database of currently available frequencies for use in emergency situations, which are not limited to those listed in Resolution **646 (WRC-03)**, and by issuing an appropriate listing, taking into account Resolution ITU-R 53 of the Radiocommunication Assembly (Geneva, 2007).

It is proposed to clarify the relationship between Res. 647 and Res. 646 while revising Resolution 646 to make it clear that while Resolution 646 is focused on the harmonisation of spectrum for Public protection agencies, these agencies also play a critical role as the first responders whenever there is any disaster or a major emergency.]

1/1.3/3 Summary of technical and operational studies, including a list of relevant ITU-R Recommendations

[Editor's Note: Include an introduction on the summary of work from PPDR Report Drafting Group including a summary of the studies below]

[Report ITU-R M.2033 "Radiocommunication objectives and requirements for Public Protection and Disaster Relief (PPDR)" defines the PPDR objectives and requirements for the implementation of future advanced solutions to satisfy the operational needs of PPDR organizations around the year 2010. Specifically, it identifies objectives, applications, requirements, a methodology for spectrum calculations, spectrum requirements and solutions for interoperability.

Recommendation ITU-R M.2015 "Frequency arrangements for public protection and disaster relief radiocommunication systems in UHF bands in accordance with Resolution 646 (Rev.WRC-12)" provides guidance on frequency arrangements for public protection and disaster relief radiocommunications in certain regions in some of the bands below 1 GHz identified in Resolution 646 (Rev.WRC-12).

Recommendation ITU-R M.2009 "Radio interface standards for use by public protection and disaster relief operations in some parts of the UHF band in accordance with Resolution 646 (WRC-03)" identifies radio interface standards applicable for public protection and disaster relief (PPDR) operations in some parts of the UHF band.

Recommendation ITU-R M.1826 addresses harmonized frequency channel plans in the band 4 940-4 990 MHz for broadband public protection and disaster relief radiocommunications in Regions 2 and 3.]

Region 1

[Editor's Note: Text to be provided by Region 1 members including reference to Region 1 specific studies]

Region 2

[Editor's Note: Text to be provided by Region 2 members including reference to Region 2 specific studies]

Region 3

[Editor's Note: Text to be provided by Region 3 members including reference to Region 3 specific studies]

List of Relevant ITU-R Recommendations and Reports

Reports ITU-R M.2033, M.[PPDR]

Recommendations ITU-R M.1826, M.2009, M.2015

1/1.3/4 Analysis of the results of studies

In general, it is expected that narrowband PPDR technology will play an important role in the medium term (i.e. at least in the next 10-15 years). Notwithstanding that future broadband technology is expected to be able to include voice requirements as additional feature. Its implementation is however depending on national decisions. It was recognised, that the broadband PPDR needs vary to a significant extent, regardless whether the operation and/or the ownership of the PPDR network is in governmental or commercial hand (or a mixture of both - hybrid).

Region 1

[Editor's Note: Text to be provided by Region 1 members]

Region 2

[Editor's Note: Text to be provided by Region 2 members.]

Region 3

[Editor's Note: Text to be provided by Region 3 members.]

1/1.3/5 Methods to satisfy the agenda item

[1/1.3/5.1 Method A: Only Editorial updating to Resolution 646 (Rev.WRC-12)]

Under this method, no change will be made to Resolution 646 (Rev. WRC-12), other than editorial amendments to Footnote 1 of Resolution 646 (Rev. WRC-12), and the broadband PPDR requirements will be addressed through ITU-R studies appropriately indicated in Section 1/1.3/6.1.

Advantages

This method fulfills the objectives of review and revision of Resolution **646 (Rev. WRC-12)**.

Disadvantages

This method will not fulfill the needs of Resolution **648 (Rev. WRC-12).**

1/1.3/5.2 Method B: Modify Resolution 646 (Rev.WRC-12)

Under this method, requirements of broadband PPDR would be addressed in the revision of Resolution **646 (WRC-12)** appropriately as indicated in Section 1/1.3/6.2.

[Editor's Note: The text below needs to be reviewed and has been placed here as a placeholder. Members are requested to provide advice on the appropriate placement of such text.]

[Considering the growing use of mobile broadband communications, including mobile video applications, additional spectrum for PPDR mobile broadband is needed, so that administrations may assign RF spectrum for broadband PPDR-IMT. Spectrum below 1 GHz is suitable for such applications, despite the current broadcasting primary status throughout Region 1. Moreover, spectrum may also be needed for broadband PPDR at frequencies above 1 GHz bands, in order to combine RF spectrum with good coverage and penetration characteristics (below 1 GHz), together with RF spectrum (above 1 GHz) that adds capacity. Common RF spectrum will enable efficient deployment and will ease coordination and harmonization between different PPDR agencies and will advance international aid during disasters and major events. In addition to the benefits of scale production, regional harmonization will improve inter-operability among first responders and will drive suitable devices and standards dedicated to broadband PPDR.]

Advantages

[Editor's Note: The text below was not discussed at the November 2013 WP 5A meeting. Administrations are requested to provide input to reduce the options to the extent practicable.]

The proposal to revise Resolution **646 (Rev.WRC-12)** takes into account major technological breakthroughs that have taken place since its adoption in 2013. The proposed revisions recognize the use of data applications in certain countries that has gone beyond voice applications and now support high speed data, internet access and video applications, a trend that continues to grow. The proposed changes also support new IMT based broadband mobile technologies have emerged, for which today there are already practical applications, and PPDR agencies increasingly recognize the importance of video and broadband to carry out their activities more efficiently.

The proposal also recognizes that the governments and PPDR organizations around the world are using high-speed wireless video networks to enhance the safety of public as well as their officers, increase their effectiveness in saving lives.

Or

Studies carried out by the ITU-R in accordance with Resolution 648 lead to the development of a new report on PPDR-Advanced requirements. This new report is focussed on the PPDR-adavanced as distinct from from the PPDR-traditional requiremnts that are covered in Report ITU-R M.2033. This new Report on advanced PPDR requiremnts entitled "Enhanced" or "Advanced" PPDR includes necessary technical requiremnnbts of Broadband PPDR.

Or

The proposed revision by adding the range 694-862 MHz for Region 1 will open a high degree of flexibility for the national administrations in identifying LTE spectrum to cover the requirements for broad band PPDR according to national circumstances.

PPDR Spectrum from within this range will allow for the design of more cost effective PPDR UE's applying as much as possible the high volume radio chips and antenna systems used within the spectrally adjacent commercial radio devices.

The identified requirement, that special PPDR UE shall be technical capable also to operate in a commercial network can most easily be implemented.

The proposed spectrum range will match well with the requirement for still smaller and light weight body worn PPDR UE'S.

The proposed frequency range for Region 1 is in alignment with similar frequency ranges proposed for other Regions.

The proposed spectrum range is aligning with spectrum in 800 MHz which some countries of Region 1 are using or planning to use.

Disadvantages

[Editor's Note: The text below was not discussed at the November 2013 WP 5A meeting. Administrations are requested to provide input to reduce the options to the extent practicable.]

Countries of Region1 planning to introduce PPDR mobile broad band services in the low end of the 700 MHz range may have to bilaterally coordinate with neighboring countries still transmitting high power terrestrial broadcasting on Channel 48.

Or

None

1/1.3/6 Regulatory and procedural considerations

1/1.3/6.1 For Method A: Only Editorial updating to Resolution 646 (Rev.WRC-12)

RESOLUTION 646 (Rev.WRC-12)

Public protection and disaster relief

The World Radiocommunication Conference (Geneva, 2012),

considering

…

g) that new technologies for wideband and broadband public protection and disaster relief applications are being developed in various standards organizations[1];

…

[1] ~~For example, a joint standardization programme between the European Telecommunications Standards Institute (ETSI) and the Telecommunications Industry Association (TIA), known as Project MESA (Mobility for Emergency and Safety Applications) has commenced for broadband public protection and disaster relief. Also, the Working Group on Emergency Telecommunications (WGET), convened by the United Nations Office for Humanitarian Affairs (OCHA), is an open forum to facilitate the use of telecommunications in the service of humanitarian assistance comprising United Nations entities, major non-governmental organizations, the International Committee of the Red Cross (ICRC), ITU and experts from the private sector and academia. Another platform for coordination and to foster harmonized global Telecommunication for Disaster Relief (TDR) standards is the TDR Partnership Coordination Panel, which has just been established under the coordination of ITU with participation of international telecommunication service providers, related government departments, standards development organizations, and disaster relief organizations.~~

m) that the Tampere Convention on the Provision of Telecommunications Resources for Disaster Mitigation and Relief Operations (Tampere, 1998), an international treaty deposited with the United Nations Secretary-General and related United Nations General Assembly resolutions and reports are also relevant in this regard[2],

…

1/1.3/6.2 For Method B: Modify Resolution 646 (Rev.WRC-12)

[Editor's Note: The text below was not discussed at the November 2013 WP 5A meeting. Alternate text for each item where agreement cannot/was not reached is provided below. Administrations are requested to provide input to reduce the options to the extent practicable.]

RESOLUTION 646 (Rev.WRC-12)

Public protection and disaster relief

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that the term "public protection radiocommunication" refers to radiocommunications used by responsible agencies and organizations dealing with maintenance of law and order, protection of life and property and emergency situations;

b) that the term "disaster relief radiocommunication" refers to radiocommunications used by agencies and organizations dealing with a serious disruption of the functioning of society, posing a significant widespread threat to human life, health, property or the environment, whether caused by accident, natural phenomena or human activity;, ~~and whether developing suddenly or as a result of complex, long-term processes;~~

c) the growing telecommunication and radiocommunication needs of public protection agencies and organizations, including those dealing with emergency situations and disaster relief, that are vital to the maintenance of law and order, protection of life and property, disaster relief and emergency response;

d) that many administrations wish to promote interoperability and interworking between systems used for public protection and disaster relief, both nationally and for cross-border operations in emergency situations and for disaster relief;

e) ~~——~~that ~~current~~ traditional public protection and disaster relief applications are mostly narrow-band supporting voice and low data-rate applications or wideband with data rates below 1 MBP/S, typically in channel bandwidths between ~~o~~f 25 to 100 kHz or less;

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[2] The Working Group on Emergency Telecommunications (WGET), convened by the United Nations Office for Humanitarian Affairs (OCHA), is an open forum to facilitate the use of telecommunications in the service of humanitarian assistance comprising United Nations entities, major non-governmental organizations, the International Committee of the Red Cross (ICRC), ITU and experts from the private sector and academia. Another platform for coordination and to foster harmonized global Telecommunication for Disaster Relief (TDR) standards is the TDR Partnership Coordination Panel, which has just been established under the coordination of ITU with participation of international telecommunication service providers, related government departments, standards development organizations, and disaster relief organizations. ~~-~~

or

e) that current public protection and disaster relief applications are mostly narrow-band supporting voice and low data-rate applications, typically in channel bandwidths of 25 kHz or less;

f) ~~that~~, although ~~there will continue to be~~many narrow-band and wideband applications continue to be used for meeting PPDR requirements, many PPDR agencies have stated need for ~~future applications will be wideband (indicative data rates in the order of 384-500 kbit/s) and/or~~ broadband applications with ~~(indicative~~ data rates in the order of 1-100 Mbit/s) with larger channel bandwidths of 5Mhz and above ~~dependent on the use of spectrally efficient technologies;~~for systems based on IMT technologies;

or

f) that, although there [will] [may] continue to be narrow-band requirements, many future applications will be wideband (indicative data rates in the order of 384-500 kbit/s) and/or broadband (indicative data rates in the order of 1-100 Mbit/s) with channel bandwidths dependent on the use of spectrally efficient technologies;

g) that new technologies for wideband and broadband public protection and disaster relief applications are being developed in various standards organizations[3];

or

g) IMT technologies support higher data rates, reliability, resiliency, and higher capacity in comparison to traditional PPDR networks. Report ITU-R M. IMT.BROAD.PPDR provides details of the capabilities of IMT technologies for meeting broadband PPDR requirements;

or

g) that some administrations have started using IMT and IMT-advanced technologies such as LTE (and LTE-Advanced) to meet the needs of their PPDR agencies for data and video;

h) that continuing development of new technologies and systems such as International Mobile Telecommunications (IMT) and Intelligent Transportation Systems (ITS) may be able to support or supplement advanced public protection and disaster relief applications;

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~~[3] For example, a joint standardization programme between the European Telecommunications Standards Institute (ETSI) and the Telecommunications Industry Association (TIA), known as Project MESA (Mobility for Emergency and Safety Applications) has commenced for broadband public protection and disaster relief. Also, the Working Group on Emergency Telecommunications (WGET), convened by the United Nations Office for Humanitarian Affairs (OCHA), is an open forum to facilitate the use of telecommunications in the service of humanitarian assistance comprising United Nations entities, major non-governmental organizations, the International Committee of the Red Cross (ICRC), ITU and experts from the private sector and academia. Another platform for coordination and to foster harmonized global Telecommunication for Disaster Relief (TDR) standards is the TDR Partnership Coordination Panel, which has just been established under the coordination of ITU with participation of international telecommunication service providers, related government departments, standards development organizations, and disaster relief organizations.~~

or

h) that, some administrations have started using IMT and IMT-advanced technologies such as LTE to meet the needs of their PPDR agencies for data and video. In particular, some countries in Region 2 have earmarked parts of 698-806 MHz IMT band for their broadband PPDR requirements;

hbis) [that, over time, traditional narrow-band public protection and disaster relief applications, such as voice and low-data rate applications, may be integrated with advanced broadband applications;]

or

hbis) that during disasters and emergency events requiring response not only from PPDR agencies but also from humanitarian agencies and public in general. Additional frequencies may be needed for adhoc broadband networks covering such disasters areas. Resolution **647(WRC-07)** provides necessary guidelines for meeting such spectrum needs;

i) that some commercial terrestrial and satellite systems are complementing the dedicated systems in support of public protection and disaster relief, that the use of commercial solutions will be in response to technology development and market demands and that this may affect the spectrum required for those applications and for commercial networks;

j) that Resolution **36 (Rev.Marrakesh, 2002)** of the Plenipotentiary Conference urges Member States to facilitate use of telecommunications for the safety and security of the personnel of humanitarian organizations;

k) that Recommendation ITU-R M.1637 offers guidance to facilitate the global circulation of radiocommunication equipment in emergency and disaster relief situations;

kbis) that Resolution **647(WRC-07)** on Spectrum management guidelines for emergency and disaster relief radiocommunications encourages administrations to consider global and/or regional frequency bands/ranges for emergency and disaster relief when undertaking their national planning and to communicate this information to the Bureau. Resolution **647 (WRC-07)** also requires the Director of the Radiocommunication Bureau to assist Member States with their emergency communication preparedness activities by establishing a database of currently available frequencies for use in emergency situations, which are not limited to those listed in *Resolves* 2) of this resolution but also take into account Resolution ITU-R 53 of the Radiocommunication Assembly (Geneva, 2007);

l) that some administrations may have different operational needs and spectrum requirements for public protection and disaster relief applications depending on the circumstances;

m) that the Tampere Convention on the Provision of Telecommunications Resources for Disaster Mitigation and Relief Operations (Tampere, 1998), an international treaty deposited with the United Nations Secretary-General and related United Nations General Assembly resolutions and reports are also relevant in this regard[4],

[Editor's Note: Proposals are invited for review and simplification of text in considering *m*) and foot note 2]

recognizing

a) the benefits of spectrum harmonization such as:

– increased potential for interoperability;

– a broader manufacturing base and increased volume of equipment resulting in economies of scale and expanded equipment availability;

– improved spectrum management and planning; and

– enhanced cross-border coordination and circulation of equipment;

b) that the organizational distinction between public protection activities and disaster relief activities are matters for administrations to determine at the national level;

c) that national spectrum planning for public protection and disaster relief needs to have regard to cooperation and bilateral consultation with other concerned administrations, which should be facilitated by greater levels of spectrum harmonization;

d) the benefits of cooperation between countries for the provision of effective and appropriate humanitarian assistance in case of disasters, particularly in view of the special operational requirements of such activities involving multinational response;

or

~~*d)* the benefits of cooperation between countries for the provision of effective and appropriate humanitarian assistance in case of disasters, particularly in view of the special operational requirements of such activities involving multinational response;~~

e) the needs of countries, particularly the developing countries[2][5], for low-cost communication equipment;

f) that the trend is to increase the use of technologies based on Internet Protocols;

or

~~*f)* that the trend is to increase the use of technologies based on Internet Protocols;~~

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[4] The Working Group on Emergency Telecommunications (WGET), convened by the United Nations Office for Humanitarian Affairs (OCHA), is an open forum to facilitate the use of telecommunications in the service of humanitarian assistance comprising United Nations entities, major non-governmental organizations, the International Committee of the Red Cross (ICRC), ITU and experts from the private sector and academia. Another platform for coordination and to foster harmonized global Telecommunication for Disaster Relief (TDR) standards is the TDR Partnership Coordination Panel, which has just been established under the coordination of ITU with participation of international telecommunication service providers, related government departments, standards development organizations, and disaster relief organizations. -

[5] Taking into account, for example, the ITU-D Handbook on disaster relief.

fbis) that the adoption of IMT should be encouraged for broadband PPDR because of the spectral and other operating efficiencies that these technologies offer;

g) that currently some bands or parts thereof have been designated for existing public protection and disaster relief operations, as documented in Report ITU-R M.2033[3][6];

h) that for solving future bandwidth requirements, there are several emerging technology developments such as software-defined radio, advanced compression and networking techniques that may reduce the amount of new spectrum required to support some public protection and disaster relief applications;

or

~~*h)* that for solving future bandwidth requirements, there are several emerging technology developments such as software-defined radio, advanced compression and networking techniques that may reduce the amount of new spectrum required to support some public protection and disaster relief applications;~~

i) that in times of disasters, if most terrestrial-based networks are destroyed or impaired, amateur, satellite and other non-ground-based networks may be available to provide communication services to assist in public protection and disaster relief efforts;

j) that the amount of spectrum needed for public protection on a daily basis can differ significantly between countries, that certain amounts of spectrum are already in use in various countries for narrow-band applications, and that in response to a disaster, access to additional spectrum on a temporary basis may be required;

jbis) studies carried out by various user agencies in different countries indicate varying spectrum bandwidth requirements for broadband PPDR between XX to XX MHz, recognising that the bandwidth requirements will vary between countries depending on their PPDR agencies requirements;

[Editorial Note: The amount XX to be completed based on the new Requirements report being considered in WP 5A]

jter) that certain amounts of spectrum are already in use in various countries for narrow-band applications, and that in response to a disaster, access to additional spectrum on a temporary basis may be required for narrow band PPDR operations;

k) that in order to achieve spectrum harmonization, an approach~~solution~~ based on regional frequency ranges[4][7] may enable administrations to benefit from harmonization while continuing to meet national planning requirements;

or

~~*k)* that in order to achieve spectrum harmonization, an approach~~solution based on regional frequency ranges[4][8] may enable administrations to benefit from harmonization while continuing to meet national planning requirements;

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6 3-30, 68-88, 138-144, 148-174, 380-400 MHz (including CEPT designation of 380-385/ 390-395 MHz), 400-430, 440-470, 764-776, 794-806 and 806-869 MHz (including CITEL designation of 821-824/866-869 MHz).

7 In the context of this Resolution, the term “frequency range” means a range of frequencies over which a radio equipment is envisaged to be capable of operating but limited to specific frequency band(s) according to national conditions and requirements.

l) that not all frequencies within an identified common frequency range will be available within each country;

or

~~*l)* that not all frequencies within an identified common frequency range will be available within each country;~~

m) that the identification of a common frequency range within which equipment could operate may ease the interoperability and/or inter-working, with mutual cooperation and consultation, especially in national, regional and cross-border emergency situations and disaster relief activities;

or

~~*m)* that the identification of a common frequency range within which equipment could operate may ease the interoperability and/or inter-working, with mutual cooperation and consultation, especially in national, regional and cross-border emergency situations and disaster relief activities;~~

n) that when a disaster occurs, the public protection and disaster relief agencies are usually the first on the scene using their day-to-day communication systems, but that in most cases other agencies and organizations may also be involved in disaster relief operations,

noting

a) that many administrations currently use frequency bands below 1 GHz for narrow-band public protection and disaster relief applications;

b) that applications requiring large coverage areas and providing good signal availability would generally be accommodated in lower frequency bands and that applications requiring wider bandwidths would generally be accommodated in progressively higher bands;

c) that public protection and disaster relief agencies and organizations have an initial set of requirements, including but not limited to interoperability, secure and reliable communications, sufficient capacity to respond to emergencies, priority access in the use of non-dedicated systems, fast response times, ability to handle multiple group calls and the ability to cover large areas as described in Report ITU-R M.2033 and Report ITU-R M.[PPDR-B];

[Editor's Note: Text of noting c) will be updated based on work ongoing in respect of a new report and/or revision of M.2033]

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cbis) that public protection and disaster relief agencies and organizations have an initial set of requirements for broadband communications as described in Report ITU-R M.BROAD.PPDR[(New Report TBD];

d) [that, while harmonization may be one method of realizing the requirements outlined in *noting b)* and *c)*[~~desired benefits~~],~~in~~ some countries, the use of multiple frequency bands can contribute to meeting the communication needs in disaster situations;]

~~[8] In the context of this Resolution, the term "frequency range" means a range of frequencies over which a radio equipment is envisaged to be capable of operating but limited to specific frequency band(s) according to national conditions and requirements.~~

or

~~*d)* [that, while harmonization may be one method of realizing the requirements outlined in *noting b)* and *c)*[desired benefits],in some countries, the use of multiple frequency bands can contribute to meeting the communication needs in disaster situations;]~~

e) that many administrations have made significant investments in public protection and disaster relief systems;

f) that flexibility must be afforded to disaster relief agencies and organizations to use current and future radiocommunications, so as to facilitate their humanitarian operations,

fbis) that IMT offers a high degree of flexibility for supporting broadband PPDR applications and there are a number of different approaches for using IMT for meeting the broadband communications needs of PPDR agencies which are outlined in Report ITU-R M.[B-PPDR]],

emphasizing

a) that the frequency bands identified in this Resolution are allocated to a variety of services in accordance with the relevant provisions of the Radio Regulations and are currently used intensively by the fixed, mobile, mobile satellite and broadcasting services;

abis) that only some of the frequency bands identified in this Resolution are suitable for Broadband PPDR;

b) that flexibility must be afforded to administrations:

– to determine, at national level, how much spectrum to make available for public protection and disaster relief from the bands identified in this Resolution in order to meet their particular national requirements;

– to have the ability for bands identified in this Resolution to be used by all services having allocations within those bands according to the provisions of the Radio Regulations, taking into account the existing applications and their evolution;

– to determine the need and timing of availability as well as the conditions of usage of the bands identified in this Resolution for public protection and disaster relief in order to meet specific national situations,

c) that in emergency and disaster relief situations, administrations be encouraged, to satisfy temporary needs for frequencies in addition to what may be normally provided for in agreements with the concerned administrations;

d) that public protection and disaster relief agencies and organizations be encouraged to utilize both existing and new technologies and solutions (satellite and terrestrial), to the extent practicable, to satisfy interoperability requirements and to further the goals of public protection and disaster relief;

e) that PPDR agencies and organizations be encouraged to use advanced wireless solutions taking into account *considering h)* and *i)* for providing complementary support to public protection and disaster relief;

f) that administrations should facilitate cross-border circulation of radiocommunication equipment intended for use in emergency and disaster relief situations through mutual cooperation and consultation without hindering national legislation;

g) that administrations encourage public protection and disaster relief agencies and organizations to utilize relevant ITU-R Recommendations in planning spectrum use and implementing technology and systems supporting public protection and disaster relief;

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h) that administrations continue to work closely with their public protection and disaster relief communities to further refine the operational requirements for public protection and disaster relief activities;

i) that manufacturers be encouraged to take this Resolution into account in future equipment designs, including the need for administrations to operate within different parts of the identified bands,

resolves

1 to strongly recommend administrations to use regionally harmonized bands for public protection and disaster relief to the maximum extent possible, taking into account the national and regional requirements and also having regard to any needed consultation and cooperation with other concerned countries;

[Proposal 1]

2 to encourage administrations, for the purposes of achieving regionally harmonized frequency bands/ranges for advanced public protection and disaster relief solutions, to consider the following identified frequency bands/ranges or parts thereof when undertaking their national planning:

– in Region 1: 380-470 MHz as the frequency range within which the band 380-385/ 390-395 MHz is a preferred core harmonized band for permanent public protection activities within certain countries of Region 1 which have given their agreement[9]

[The frequency band (s) XXX-XXX is/are the preferred harmonized band(s) for broadband public protection and disaster relief solutions in some countries in Region 1]

– in Region 2[5][10]: 746-806 MHz, 806-869 MHz, 4 940-4 990 MHz;

in Region 3[6][11]: 406.1-430 MHz, 440-470 MHz, 806-824/851-869 MHz, 4 940-4 990 MHz and 5 850-5 925 MHz;

[Proposal 2]

2 to encourage administrations, for the purposes of achieving regionally harmonized frequency bands/ranges for advanced public protection and disaster relief solutions, to consider the ~~following preferred~~ identified frequency bands/ranges shown in the Table below, or parts thereof when undertaking the~~ir~~ national planning [of interoperable public protection and disaster relief systems]

~~in Region 1: 380-470 MHz as the frequency range within which the band 380-385/ 390-395 MHz is a preferred core harmonized band for permanent public protection activities within certain countries of Region 1 which have given their agreement;~~

~~in Region 2[5]: 746-806 MHz, 806-869 MHz, 4 940-4 990 MHz;~~

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[9] [Option 1:] [Israel has identified the band 806-824/851-869 MHz for public protection and disaster relief applications] [Option 2:][Some countries in Region 1 already have identified bands for public protection and disaster relief].

[10] Venezuela has identified the band 380-400 MHz for public protection and disaster relief applications.

[11] Some countries in Region 3 have also identified the bands 380-400 MHz and 746-806 MHz for public protection and disaster relief applications.

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~~in Region 3[6]: 406.1-430 MHz, 440-470 MHz, 806-824/851-869 MHz, 4 940-4 990 MHz and 5 850-5 925 MHz;~~

TABLE

Frequency ranges for PPDR systems

Region	**Band/frequency range**	**~~Comments~~Notes**
1	380-470 MHz [12] [13],	380-385/ 390-395 MHz is a preferred core harmonized band for permanent public protection activities within certain countries of Region 1 which have given their agreement
2	746-806 MHz, 806-869 MHz, 4 940-4 990 MHz	Venezuela has identified the band 380-400 MHz for public protection and disaster relief applications
3	406.1-430 MHz, 440-470 MHz, 806-824/851-869 MHz, 4 940-4 990 MHz, 5 850- 5 925 MHz	Some countries have identified the band 380-400 MHz and 746-806 MHz for public protection and disaster relief applications

[Proposal 3]

2 to encourage administrations, for the purposes of achieving regionally harmonized frequency bands/ranges for advanced public protection and disaster relief solutions, to consider the following identified frequency bands/ranges or parts thereof when undertaking their national planning:

~~in Region 1: 380-470 MHz as the frequency range within which the band 380-385/ 390-395 MHz is a preferred core harmonized band for permanent public protection activities within certain countries of Region 1 which have given their agreement~~

~~in Region 2[5][14]: 746-806 MHz, 806-869 MHz, 4 940-4 990 MHz;~~

~~in Region 3[6][15]: 406.1-430 MHz, 440-470 MHz, 806-824/851-869 MHz, 4 940-4 990 MHz and 5 850-5 925 MHz;~~

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~~5 Venezuela has identified the band 380-400 MHz for public protection and disaster relief applications.~~

~~6 Some countries in Region 3 have also identified the bands 380-400 MHz and 746-806 MHz for public protection and disaster relief applications.~~

12 [The frequency band (s) XXX-XXX is/are the preferred harmonized band(s) for broadband public protection and disaster relief solutions in some countries in Region 1]

13 [Option 1] [Israel has identified the band 806-824/851-869 MHz for public protection and disaster relief applications].[Option 2] [Some countries in Region 1 already have identified bands for public protection and disaster relief].

~~14 Venezuela has identified the band 380-400 MHz for public protection and disaster relief applications.~~

~~15 Some countries in Region 3 have also identified the bands 380-400 MHz and 746-806 MHz for public protection and disaster relief applications.~~

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TABLE

Frequency bands/ranges for PPDR

Region	Identified frequency Bands/range	Notes
1	380-470 MHz ,	a) 380-385/ 390-395 MHz is a preferred core harmonized band for permanent public protection activities within certain countries of Region 1 which have given their agreement b) The bands XXX-XXX MHz and XXX-XXX MHz, within the frequency range of XXX-XXX MHZ are the preferred bands for broadband PPDR
2	~~746~~698-806 MHz, 806-869 MHz, 4 940-4 990 MHz	a) Venezuela has identified the band 380-400 MHz for public protection and disaster relief applications b) the band XXX-XXX MHz and XXX-XXX MHz within the frequency range of XXX-XXX MHZ are the preferred bands for broadband PPDR
3	406.1-430 MHz, 440-470 MHz, 806-824 MHz, 4 940-4 990 MHz, 5 850- 5 925 MHz	a) Some countries in Region 3 have identified the band 380-400 MHz and ~~746~~698-806 MHz for public protection and disaster relief applications b) The band XXX-XXX MHz and XXX-XXX MHz within the frequency range of XXX-XXX MHZ are the preferred bands for broadband PPDR

[Proposal 4]

2 to encourage administrations, for the purposes of achieving regionally harmonized frequency bands/ranges for advanced public protection and disaster relief solutions, to consider the following identified frequency bands/ranges or parts thereof when undertaking their national planning:

2.1 in Region 1:

i) 380-470 MHz as the frequency range within which the band 380-385/ 390-395 MHz is a preferred core harmonized band for permanent public protection activities within certain countries of Region 1 which have given their agreement;

ii) the band 698-713 MHz /753-768 MHz within the frequency range 694-790 MHz and the band 791-801 / 832-842 MHz within the frequency range 790-862 MHz are the preferred bands for broadband PPDR within certain countries of Region1 which have given their agreement;

2.2 in Region 2[16]:

i) 746-806 MHz, 806-869 MHz, 4 940-4 990 MHz;

ii) the band 703-713/758-768 MHz within the frequency range 698-806 MHz and the band 758-768/788-798 MHz within the frequency 746-806 MHz are the preferred bands for broadband PPDR within certain countries of Region 2 which have given their agreement;

2.3 in Region 3[17]:

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[16] Venezuela has identified the band 380-400 MHz for public protection and disaster relief applications.

[17] Some countries in Region 3 have also identified the bands 380-400 MHz and ~~746~~698-806 MHz for public protection and disaster relief applications.

i) 406.1-430 MHz, 440-470 MHz, 806-824/851-869 MHz, 4 940-4 990 MHz and 5 850-5 925 MHz;

ii) the band 703-748/758-803 MHz within the frequency range 698-806 MHz and the band 806-834/851-879 MHz within the frequency range of 806-879 MHz are the preferred bands for broadband PPDR within certain countries of Region 3 which have given their agreement;

3 that the identification of the above frequency bands/ranges for public protection and disaster relief does not preclude the use of these bands/frequencies by any application within the services to which these bands/frequencies are allocated and does not preclude the use of nor establish priority over any other frequencies for public protection and disaster relief in accordance with the Radio Regulations;

4 to encourage administrations, in emergency and disaster relief situations, to satisfy temporary needs for frequencies in addition to what may be normally provided for in agreements with the concerned administrations;

Or

~~4 to encourage administrations, in emergency and disaster relief situations, to satisfy temporary needs for frequencies in addition to what may be normally provided for in agreements with the concerned administrations;~~

5 that administrations encourage public protection and disaster relief agencies and organizations to utilize both existing and new technologies [, systems and solutions (satellite and terrestrial),] to the extent practicable, to satisfy interoperability requirements and to further the goals of public protection and disaster relief;

Or

~~5 that administrations encourage public protection and disaster relief agencies and organizations to utilize both existing and new technologies [, systems and solutions (satellite and terrestrial),] to the extent practicable, to satisfy interoperability requirements and to further the goals of public protection and disaster relief;~~

6 that administrations may encourage agencies and organizations to use advanced wireless [solutions /applications] taking into account *considering h)* and *i)* for providing complementary support to public protection and disaster relief;

Or

~~6 that administrations may encourage agencies and organizations to use advanced wireless [solutions /applications] taking into account *considering h)* and *i)* for providing complementary support to public protection and disaster relief;~~

7 to encourage administrations to facilitate cross-border circulation of radiocommunication equipment intended for use in emergency and disaster relief situations through mutual cooperation and consultation without hindering national legislation;

Or

~~7 to encourage administrations to facilitate cross-border circulation of radiocommunication equipment intended for use in emergency and disaster relief situations through mutual cooperation and consultation without hindering national legislation;~~

8 that administrations encourage public protection and disaster relief agencies and organizations to utilize relevant ITU-R Recommendations in planning spectrum use and implementing technology and systems supporting public protection and disaster relief;

Or

~~8 that administrations encourage public protection and disaster relief agencies and organizations to utilize relevant ITU-R Recommendations in planning spectrum use and implementing technology and systems supporting public protection and disaster relief;~~

9 to encourage administrations to continue to work closely with their public protection and disaster relief community to further refine the operational requirements for public protection and disaster relief activities;

Or

~~9 to encourage administrations to continue to work closely with their public protection and disaster relief community to further refine the operational requirements for public protection and disaster relief activities;~~

10 that manufacturers should be encouraged to take this Resolution into account in future equipment designs, including the need for administrations to operate within different parts of the identified bands,

Or

~~10 that manufacturers should be encouraged to take this Resolution into account in future equipment designs, including the need for administrations to operate within different parts of the identified bands,~~

invites ITU-R

1 to continue its technical studies and to make recommendations concerning technical and operational implementation, as necessary, for advanced solutions to meet the needs of public protection and disaster relief radiocommunication applications, taking into account the capabilities, evolution and any resulting transition requirements of the existing systems, particularly those of many developing countries, for national and international operations;

2 to conduct further appropriate technical studies in support of possible additional identification of other frequency ranges to meet the particular needs of certain countries in Region 1 which have given their agreement, especially in order to meet the radiocommunication needs of public protection and disaster relief agencies.

Or

~~2 to conduct further appropriate technical studies in support of possible additional identification of other frequency ranges to meet the particular needs of certain countries in Region 1 which have given their agreement, especially in order to meet the radiocommunication needs of public protection and disaster relief agencies.~~

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DRAFT REVISION OF REPORT ITU-R M.2116-1
Characteristics of broadband wireless access systems operating in the land mobile service for use in sharing studies

Radiocommunication Study Groups

Source: Annex 19 to Document 5A/198

Revision 1 to
Document 5A/TEMP/168-E
26 November 2013
English only

Working Party 5A
(Working Group 5A-4)

~~WORKING DOCUMENT TOWARDS A PRELIMINARY~~
DRAFT REVISION OF REPORT ITU-R M.2116-1

Characteristics of broadband wireless access systems operating in the land mobile service for use in sharing studies

(Questions ITU-R 1/5 and ITU-R 7/5)

(2007-2010)

TABLE OF CONTENTS

1 Introduction

This Report provides characteristics for a number of terrestrial broadband wireless access (BWA)[1] systems, including mobile and nomadic applications, operating, in the mobile service for use in sharing studies between these terrestrial BWA systems and other fixed or mobile systems.

2 Characteristics

Annex 1 contains technical and operational characteristics of mobile BWA[2] systems to be used for sharing studies for both mobile stations and base stations. It should be recognized that the footnotes in the Table provide important information on the derivation of particular values and any limits to their applicability for sharing studies. Therefore, these footnotes should be taken into account wherever referenced.

3 IMT-2000 radio interfaces

Terrestrial IMT-2000 systems[3] meet the definition of BWA found in Recommendation ITU-R F.1399. In addition to the characteristics found in Annex 1, sharing and deployment characteristics of IMT-2000 systems ~~in the 2 GHz range~~ can be found in Report ITU-R M.2039 – Characteristics of terrestrial IMT-2000 systems for frequency sharing/interference analyses, and are not duplicated herein. These systems should also be considered in sharing analysis involving BWA systems[4].

~~Systems beyond IMT-2000 will also meet the criteria to be considered BWA, and as these systems are developed their characteristics should also be considered for sharing studies with BWA systems. Systems beyond IMT-2000 may be incorporated into future revisions of this Report directly or by reference.~~

4 IMT-Advanced radio interfaces

Terrestrial IMT-Advanced systems[5] meet the definition of BWA found in Recommendation ITU-R F.1399. In addition to the characteristics found in Annex 1, sharing and deployment characteristics of IMT-Advanced systems can be found in Report ITU-R M.[IMT.ADV.PARAM] – Characteristics of terrestrial IMT-Advanced systems for frequency sharing/interference analyses, and are not duplicated herein. These systems should also be considered in sharing analysis involving BWA systems.

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[1] "Wireless access" and "BWA" are defined in Recommendation ITU-R F.1399.

[2] BWA radio interface standards can be found in Recommendation ITU-R M.1801. Radio interface standards for broadband wireless access systems, including mobile and nomadic operations, in the mobile service operating below 6 GHz.

[3] IMT-2000 radio interface standards are described in Recommendation ITU-R M.1457. Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT-2000).

[4] Recommendation ITU-R M.1823 provides values for some systems applicable to BWA.

[5] IMT-Advanced radio interface standards are described in Recommendation ITU-R M.2012. Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-Advanced (IMT-Advanced).

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[*Note to the Secretariat:* Report ITU-R M.[IMT.ADV.PARAM] has been submitted to Study Group ~~5 as Document 5/65. Once this report has been approved by Study Group 5 the appropriate~~ report number should be inserted.]

54 RLAN characteristics

In addition to the characteristics found in Annex 1, characteristics of RLAN systems can be found in Recommendation ITU-R M.1450 – Characteristics of broadband radio local area networks, and are not duplicated herein.

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ANNEX 1

Table 1 contains technical and operational characteristics for use in sharing studies in the 1-3 GHz frequency range, Tables 2a and 2b contain technical and operational characteristics for use in sharing studies for the 3.4-4.2 GHz band and Table 3 contains a list of acronyms and abbreviations.

TABLE 1

Technical and operational characteristics for use in sharing studies in the 1-3 GHz frequency range

Parameter	IEEE 802.16 (1)		HC-SDMA(2)		XGP (3)		~~T1.716/717(4)~~		~~ATIS.0700001.2004(5)~~		~~T1.723(6)~~		SCDMA BWA(~~4~~7)	
	BS	**MS**	**BS**	**MS**	**BS**	**MS**	~~**BS**~~	~~**MS**~~	~~**BS**~~	~~**MS**~~	~~**BS**~~	~~**MS**~~	**BS**	**MS**
System														
Nominal channel BW (MHz)	5 {1a}		0.625 {1b}		10, 20 {1c}		~~2 × 5 to 2 × 20 MHz (in 3.5 or 5 MHz increments)~~		~~5~~		~~1.25~~		5	
Modulation type	QPSK, 16-QAM, 64-QAM	QPSK, 16-QAM, 64-QAM	BPSK, QPSK, 8-PSK, 12-QAM, 16-QAM, 24-QAM	BPSK, QPSK, 8-PSK, 12-QAM, 16-QAM	BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM	BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM	~~QPSK~~	~~QPSK~~	~~QPSK, 8-PSK, 64-QAM~~	~~QPSK, 8-PSK 16-QAM~~	~~QPSK~~	~~BPSK, QPSK~~	QPSK, 8-PSK, 16-QAM, 64-QAM	QPSK, 8-PSK, 16-QAM, 64-QAM
Duplex method	TDD/FDD		TDD		TDD		~~FDD~~		~~TDD~~		~~FDD~~		TDD	
Access technique	TDMA/OFDMA		TDMA/FDMA/SDMA		TDMA/OFDMA/ SC-FDMA		~~CDMA~~		~~CDMA~~		~~CDMA~~		CS-OFDMA	
No. of sectors	3 {3a}	Not applicable	3 {3b}	Not applicable	1 or more	Not applicable	~~Typically 3~~	~~Not applicable~~	~~Typically 3~~	~~Not applicable~~	~~Typically 3~~	~~Not applicable~~	Typically 3	Not applicable
Reuse factor	1:1, 1:3		1:1 {4a}		1:1		~~1:1, 1:3~~		~~1:1 {4a}~~		~~1:1~~		1:1	
Antennas per sector	Not specified		12 {5a}	1	4 or more	1 or more	~~Not specified~~	~~Not specified~~	~~Not specified~~	~~1~~	~~Not specified~~	~~1~~	1 or more typically 8	1 or more
Co-located antenna minimum coupling loss (dB) {6}	30	Not applicable	30	Not applicable	30	Not applicable	~~30~~	~~Not applicable~~	~~30~~	~~Not applicable~~	~~30~~	~~Not applicable~~	30	Not applicable
Antenna gain (dBi)	18 {10a}	0 to 6 {10a}	15	0	12 or more	0 to 4	~~18 {10a}~~	~~0 to 6 {10a}~~	~~18 {10a}~~	~~0 to 6 {10a}~~	~~17 {10a}~~	~~0 to 6 {10a}~~	17{10a}	0 to 6 {10a}
Antenna height AGL (m)	15 to 30 {11}	≤ 1.5	15 to 45	≤ 1.5	15 to 45	≤ 1.5	~~15 to 30 {11}~~	~~≤ 1.5~~	~~15 to 30 {11}~~	~~≤ 1.5~~	~~15 to 30~~	~~≤ 1.5~~	15 to 30 {11}	≤ 1.5
Radiation pattern	Horizontal {7c} Vertical {7d}	Not specified	Adaptive {7b}	Omni-directional {7a}	Omni-directional or directional {7a}	Omni-directional {7a}	~~Not specified~~	~~Not specified~~	~~Not specified~~	~~Not specified~~	~~Not specified~~	~~Not specified~~	Typically vertical	Typically vertical

TABLE 1 (*continued*)

Parameter	IEEE 802.16 [1]		HC-SDMA[2]		XGP [3]		~~T1.716/717~~[4]		~~ATIS.0700001.2004~~[5]		~~T1.723~~[6]		SCDMA BWA[47]	
	BS	MS	BS	MS	BS	MS	~~BS~~	~~MS~~	~~BS~~	~~MS~~	~~BS~~	~~MS~~	BS	MS
Transmitter														
Average power (dBm)	36 {8a}	20 {8a}	24.2 {8b}	20	~~40~~43 {8a}{8c} 46 {8a}{8d}	23 {8a}	~~36~~	~~20~~	~~24.2 {8b}~~	~~20~~	~~43~~	~~26~~	33 {8b}	23
TDD activity factor (dB) {9}	3		–1.76 {9a}	–4.77 {9b}	3		~~Not applicable~~		~~Variable 0 to –4.77~~		~~Not applicable~~		Variable –8.45 to 8.45	
Antenna gain (dBi)	18 {10a}	0 to 6 {10a}	15	0	12 or more	0 to 4	~~18 {10a}~~	~~0 to 6 {10a}~~	~~18 {10a}~~	~~0 to 6 {10a}~~	~~17 {10a}~~	~~0 to 6 {10a}~~	17 {10a}	0 to 6 {10a}
Antenna height AGL (m)	15 to 30 {11a}	≤ 1.5	15 to 45	≤ 1.5	15 to 45	1.5	~~15 to 30 {11b}~~	~~≤ 1.5~~	~~15 to 30 {11b}~~	~~≤ 1.5~~	~~15 to 30~~	~~≤ 1.5~~	15 to 30	≤ 1.5
Misc. losses (dB)	2 {12a}	0	1 {12b}	0	~~2~~5 {12b}	0	~~2 {12b}~~	~~0~~	~~2 {12b}~~	~~0~~	~~< 2 {12b}~~	~~0~~	< 1	0
Adjacent Channel Leakage Ratio (ACLR) (dB)	{13a}		{13b}		{13d}		~~{13e}~~		~~{13e}~~		~~{13f}~~		{13e}	
ACLR_1 (dB)	53.5	33	53.5 {13c}	33	40	~~23~~21 {8c} 20 {8d}	~~40 {13c}~~	~~33~~	~~40 {13c}~~	~~33~~	~~40 {13c}~~	~~33~~	40 {13c}	33
ACLR_2 (dB)	66	43	66 {13c}	43	~~60~~55	33	~~50 {13c}~~	~~43~~	~~50 {13c}~~	~~43~~	~~50 {13c}~~	~~43~~	50 {13c}	43
Receiver														
Antenna gain (dBi)	18 {10a}	0 to 6 {10a}	15	0	12 or more	0 to 4	~~18 {10a}~~	~~0 to 6 {10a}~~	~~18~~	~~From 0 to 6 {10a}~~	~~17~~	~~0 to 6~~	17	0 to 6
Antenna height (AGL) (m)	15 to 30 {11a}	≤ 1.5	15 to 45	≤ 1.5	15 to 45	1.5	~~15 to 30 {11b}~~	~~≤ 1.5~~	~~15 to 30~~	~~≤ 1.5~~	~~15 to 30~~	~~≤ 1.5~~	15 to 30	≤ 1.5
Misc. losses (dB)	0 {12a}	0	1 {12b}	0	2 {12b}	0	~~0 {12a}~~	~~0~~	~~0 {12a}~~	~~0~~	~~0 {12a}~~	~~0~~	< 1	0
Noise figure (dB)	3	5	5	7	5	7	~~4~~	~~7~~	~~4~~	~~7~~	~~4~~	~~7~~	4	6
Thermal noise density (dBm/Hz)	–174		–174		–174		~~–174~~		~~–174~~		~~–174~~		–174	
Adjacent Channel Selectivity (ACS) (dB)	{14a}				{14b}									
ACS_1 (dB)	46	33	46	33	42	30	~~46~~	~~33~~	~~46~~	~~33~~	~~46~~	~~33~~	46	33
ACS_2 (dB)	56	47	46	43	42	30	~~56~~	~~43~~	~~56~~	~~43~~	~~56~~	~~43~~	56	43

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TABLE 1 (*end*)

Parameter	IEEE 802.16 [1]		HC-SDMA[2]		XGP [3]		~~T1.716/717~~[4]		~~ATIS.0700001.2004~~[5]		~~T1.723~~[6]		SCDMA BWA[47]	
	BS	**MS**	**BS**	**MS**	**BS**	**MS**	~~**BS**~~	~~**MS**~~	~~**BS**~~	~~**MS**~~	~~**BS**~~	~~**MS**~~	**BS**	**MS**
Interference criterion, *I*/*N* (dB) {15}	–6 or –10	–6 or –10	{15a}	{15a}	–6 or –10	–6 or –10	~~–6 or –10~~	~~–6 or –10~~	~~–6 or –10~~	~~–6 or –10~~	~~–6 or –10~~	~~–6 or –10~~	–6 or –10	–6 or –10
Required SINR (dB) {16}	{16a}	{16a}	1-17	0-14	{16a}	{16a}	~~{16a}~~	~~{16a}~~	~~{16a}~~	~~{16a}~~	~~{16a}~~	~~{16a}~~	{16a}	{16a}
Max. tolerable interference power (dBm) {17}	–110 or –114	–108 or –112	{17a}	Not applicable	–105 or –109	–103 or –107	~~–108 or –112~~	~~–105 or –109~~	~~–108 or –112 {17b}~~	~~–105 or –109 {17b}~~	~~–108 or –112 {17b}~~	~~–105 or –109 {17b}~~	{17a}	Not applicable
Nominal reference sensitivity (dBm)	Not applicable	Not applicable	–109.8 {18a}	–108.5 {18b}	Not applicable	Not applicable	~~Not applicable~~	~~Not applicable~~	~~Not applicable~~	~~Not applicable~~	~~Not applicable~~	~~Not applicable~~	Not applicable	Not applicable

NOTE 1 – Numbers in {} refer to the Notes below.

[1] IEEE Std 802.16 forms the basis of WiMAX™ for fixed and mobile applications. Parameters for IMT-2000 OFDMA TDD WMAN are contained in Report ITU-R M.2039. The values given in this Report belong to non-IMT mobile implementations of IEEE 802.16 even though there might be similarities in some of the performance values to those expressed in Report ITU-R M.2039. Parameters in this table are specified by the WiMAX Forum.

[2] ANSI ATIS 0700004-2005, High capacity – Spatial division multiple access (HC-SDMA) is commercially known as the iBurst™ system.

[3] A-GN4.00-0~~1~~2-TS, XGP Forum Technical specifications.

~~[4] T1.716/7-2000 (R2004) air interface standard for broadband direct sequence CDMA for fixed wireless PSTN access – layer 1/layer 2.~~

~~[5] ANSI ATIS-0700001.2004 MCSB physical, MAC/LLC, and network layer specification.~~

~~[6] T1.723-2002 I-CDMA spread spectrum systems air interface standard, operating up to 2 GHz.~~

[47] Air interface of SCDMA broadband wireless access system standard.

Notes relating to Table 1:

{1a} While other nominal channel bandwidths are allowed in the standard, 5 MHz is chosen as a typical configuration for the frequency band of interest.

{1b} The HC-SDMA standard uses a 625 kHz carrier bandwidth. For a 5 MHz channel bandwidth, deployment of multiple 625 kHz carriers is assumed.

{1c} While other nominal channel bandwidths are allowed in the standard, this marked value is chosen as a typical configuration for the frequency band of interest.

{3a} Number of sectors ranges from 1 (omnidirectional) to higher numbers such as 6. For the sake of sharing studies, three-sectored sites are being considered.

{3b} Number of sectors ranges from 1 (omnidirectional) to higher numbers such as 3. For the sake of sharing studies, three-sectored sites are being considered.

{4a} System can support reuse of less than 1 through spatial division multiple access wherein up to four users can simultaneously share the same carrier/time slot combination. Reuse 1 is considered in the sharing study.

{5a} The HC-SDMA system utilizes a multi-antenna architecture with multiple antennas per sector.

{6} For co-located base stations, this parameter captures the minimum coupling loss between two systems. *Note:* Higher values are achievable. For example, Report ITU-R M.2045 suggests that a coupling loss of up to 70 dB is achievable with a few metres of antenna separation. In real deployment conditions, a coupling loss of up to 45 dB may be achievable.

{7a} This is the typical pattern; however, it should be noted that the radiation pattern will depend on the operator's deployment scenarios and equipment suppliers.

{7b} HC-SDMA systems are deployed with adaptive multi-antenna arrays. Therefore, the BS antenna array radiation pattern varies in time and space depending on changes in the relative configuration of desired and interfering signals.

{7c} See 3GPP TR 25.892 v2.0.0 2004-06.

{7d} See Recommendations ITU-R M.1646 and ITU-R F.1336~~-2~~.

{8a} TX power reported is typical and higher values may be available based on region. TX power is the RF power averaged during the transmit burst, without considering traffic statistics or lowered-power operation or UL/DL ratio.

{8b} Average power per antenna per carrier. Equivalent isotropic radiated power for victim systems should be computed statistically based on the average power per antenna and array geometry.

{8c} In case of Nominal channel BW is 10 MHz.

{8d} In case of Nominal channel BW is 20 MHz.

{9} A function of UL/DL ratio of the TDD mode, this parameter is not applicable to FDD operation.

{9a} BS transmit duty cycle expressed in dB.

{9b} MS transmit duty cycle expressed in dB.

{10a} Base station antenna gains are typical of wide area terrestrial cellular deployments and are consistent with the values provided by ETSI. Mobile subscriber station antenna gain ranges from 0 dBi, for PDA and other handheld terminals, to 6 dBi, for laptops.

{11} Previous ITU-R studies on sharing of IMT-2000 systems (Reports ITU-R M.2030 and ITU-R M.2045) use 30 m as a base station antenna height.

{12a} Miscellaneous losses account for cable/connector losses in the TX path. In the RX path, these losses are assumed to be avoided by using tower-top LNA.

{12b} Miscellaneous losses account for cable/connector losses in the TX and RX path.

{13a} Defined as the ratio of the on-channel transmitted power to the power transmitted in adjacent channels as measured at the output of the receiver filter, ACLR represents the interference power into a receiver operating in the adjacent channel(s). ACLR_*n* in the table are ACLR values at *n* 5-MHz channels away calculated with a receiver filter bandwidth of 4.5 MHz. The IEEE 802.16 standard does not specify ACLR information. These are values provided by the WiMAX Forum.

{13b} Defined as the ratio of the on-channel transmitted power to the power transmitted in adjacent channels, ACLR represents the interference power into a receiver operating in the adjacent channel(s). ACLR_*n* in the table are ACLR values at *n* 5-MHz away. Values are quoted as dBc per 625 kHz.

{13c} ACLR values dependent on filter roll-off and number of carriers.

{13d} Defined as the ratio of the on-channel transmitted power to the power transmitted in adjacent channels, ACLR represents the interference power into a receiver operating in the adjacent channel(s). ACLR_*n* in the table are ACLR values at *n* 10-MHz away. Values are quoted as dBc per 1 MHz.

Notes relating to Table 1 (end):

{13e} Defined as the ratio of the on-channel transmitted power to the power transmitted in adjacent channels, ACLR represents the interference power into a receiver operating in the adjacent channel(s). ACLR_*n* in the table are ACLR values at *n* 5-MHz away.

~~{13f} Defined as the ratio of the on-channel transmitted power to the power transmitted in adjacent channels, ACLR represents the interference power into a receiver operating in the adjacent channel(s). ACLR_*n* in the table are ACLR values at *n* 1.25-MHz away.~~

{14a} The IEEE 802.16 standard does not specify ACS information. The values shown were submitted by the WiMAX Forum.

{14b} The ACS values are based on anticipated performance by some of the industry, as provided by the XGP Forum. These values are with the following conditions: modulation type BPSK and BER of 10^{-5}.

{15} The *I*/*N* of –10 dB, corresponding to about half a dB impact on the receiver sensitivity, is a stringent criterion which is recommended in certain cases including in some ITU-R Recommendations. The number of –6 dB, corresponding to 1 dB impact on the receiver sensitivity, however, is also recommended in Recommendation ITU-R F.758~~-3~~.

{15a} *I*/*N* is not required since the information is provided by the SINR.

{16} Required SINR (dB) measured after array processing/equalization dependent on modulation class.

{16a} Not required because maximum tolerable interference power is specified.

{17} Numbers are based on *I*/*N* of –6 dB or –10 dB respectively (see {16a}).

{17a} Active interference selectivity is used for this system instead of maximum tolerable interference power. Multi-antenna HC-SDMA systems can achieve 20-30 dB active interference rejection, which can be used to address both intra-system and inter-system interferers.

~~{17b} Assumes equal interference across all carriers.~~

{18a} The base station nominal reference sensitivity for Mod Class 0 = –109.8 dBm. The reference sensitivity level of the base station shall be no greater than 1.2 dB above the nominal limits specified for each Mod Class (i.e. Mod Class 0 through Mod Class 8) for FER = 10^{-2}.

{18b} This user terminal nominal reference sensitivity for Mod Class 0 = 108.5 dBm. The reference sensitivity level of the UT (user terminal) shall be no greater than 1 dB higher than the nominal limits specified for each Mod Class (i.e. Mod Class 0 through Mod Class 8) at FER = 10^{-2}.

TABLE 2a

Technical and operational characteristics of base stations for use in sharing studies in the 3.4-4.2 GHz band[1]

IEEE 802.16[2]			
System			
Deployment scenario	Specific cellular deployment rural with expected nomadic BWA use	Typical cellular deployment rural	Typical cellular deployment urban
Channel bandwidth (MHz)	7 (5, 10)[3]	7 (5, 10)[3]	7 (5, 10)[3]
Carrier frequency	3.5 GHz	3.5 GHz	3.5 GHz
Modulation type	QPSK, 16-QAM, 64-QAM	QPSK, 16-QAM, 64-QAM	QPSK, 16-QAM, 64-QAM
Duplex method	TDD/FDD	TDD/FDD	TDD/FDD
Access technique	TDMA/OFDMA	TDMA/OFDMA	TDMA/OFDMA
No. of sectors	3	3	3
Reuse factor	1:3 (1:1)[4]	1:3 (1:1)[4]	1:3 (1:1)[4]
Antennas per sector	Depending on deployment	Depending on deployment	Depending on deployment
Colocated antenna minimum coupling loss (dB)	50	50	50
Peak antenna gain (dBi)	17	17	9
Antenna 3 dB beamwidth (degrees)	60 and 90 (sectorized)	60 and 90 (sectorized)	Omnidirectional
Antenna downtilt (degrees)[5]	0-8 (1°)	0-8 (2°)	0-8 (4°)
Antenna height a.g.l. (m)	50	30	15
Antenna gain pattern	Recommendation ITU-R F.1336	Recommendation ITU-R F.1336	Recommendation ITU-R F.1336
Transmitter			
TX peak output power (dBm)	43	35	32
Feeder loss (dB)	3	3	3
Power control (dB)	> 10	> 10	> 10
e.i.r.p. (dBm)	57	49	38
Unwanted emissions[6]	ECC Recommendation (04)05[7]		
Adjacent channel leakage ratio (ACLR) (dB)			
ACLR_1 (dB)	37 (51)[8]	37 (51)[8]	37 (51)[8]
ACLR_2 (dB)	48 (87)[8]	48 (87)[8]	48 (87)[8]
Receiver			
Noise figure (dB)	5	5	5
Thermal noise density (dBm/Hz)	–174	–174	–174
Adjacent channel selectivity (ACS)/ Adjacent channel rejection (ACR) (dB)			
ACR_1 (dB)	20[9]	20[9]	20[9]
ACR_2 (dB)	39[9]	39[9]	39[9]
Interference criterion, *I*/*N* (dB)[10]	–6 or –10	–6 or –10	–6 or –10
Required SINR (dB)	2.9 (for CTC QPSK ½)	2.9 (for CTC QPSK ½)	2.9 (for CTC QPSK ½)
Nominal reference sensitivity (dBm)	Not applicable	Not applicable	Not applicable

Notes relating to Table 2a:

(1) The ATIS standard~~s (T1.716/717, T1.723, ATIS.07000001,~~ ATIS.07000004 (HC-SDMA) do~~es~~ not specify operation above 3 GHz, therefore no parameters are available.

(2) The information in this table applies to non-IMT IEEE 802.16 systems operating in the range 3.3 GHz to 3.8 GHz.

(3) Other values of 5 and 10 MHz channel bandwidth in parenthesis are also supported.

(4) Other values of Reuse 3 (1:3) in parenthesis are also supported.

(5) A range of values is indicated, recognizing that the value for each situation depends on the actual deployment scenario taking into account the topology of the terrain. In parentheses, a typical value is given for use in the compatibility studies.

(6) Information on unwanted emissions, including out-of-band and/or spurious emissions, to use in the sharing studies is still under consideration. This information may be provided in the form felt to be most appropriate for use in the compatibility studies.

(7) BWA base stations may comply with a specific regional regulatory requirement to the lowermost and uppermost edges of an operator's block assignment. The regulatory requirement is detailed as a block edge mask. The block edge mask regulatory requirement imposes a more stringent out of block emission performance on the operator and therefore implies a correspondingly more stringent unwanted emission performance across the edges of the system operating block which can be deduced from analysis of the defined block edge mask. The block edge mask is as specified in Section 2 Annex 2 of ECC Recommendation (04)05.

(8) Additional ACLR values for the base station are provided in parentheses. These additional ACLR values result from the application of a specific regional regulatory requirement to the lowermost and uppermost edges of an operator's block assignment. The regulatory requirement is detailed as a block edge mask. The block edge mask regulatory requirement imposes a more stringent out of block emission performance on the operator and therefore implies a correspondingly more stringent ACLR performance across the edges of the system operating block which can be deduced from analysis of the defined Block Edge Mask.

(9) The numbers provided are for receiver adjacent channel rejection (ACR) that is a measure of the capability of the receiver to receive a wanted signal without exceeding a given degradation due to the presence of an unwanted signal (interferer) either in the first or second adjacent channel. Receiver adjacent channel rejection is expressed as the ratio, in dB, of the level of the unwanted signal to the level of the wanted signal, at the receiver input. The minimum receiver adjacent channel rejection is expressed for a bit error ratio (BER) $\leq 10^{-6}$. Adjacent channel selectivity (ACS) can be derived from ACR through ACS = ACR + SNR_min + 3dB.

(10) The *I*/*N* of –10 dB, corresponding to about half a dB impact on the receiver sensitivity, is a stringent criterion which is recommended in certain cases. The number of –6 dB, corresponding to 1 dB impact on the receiver sensitivity, however, is also recommended in Recommendation ITU-R F.758~~-4~~.

TABLE 2b

Technical and operational characteristics of terminal stations for use in sharing studies in the 3.4-4.2 GHz band[(1)]

IEEE 802.16[(2)]				
	Fixed-outdoor	**Fixed-indoor**	**Nomadic**	**Mobile**
System				
Channel bandwidth (MHz)	7 (5, 10)[(3)]	7 (5, 10)[(3)]	7 (5, 10)[(3)]	7 (5, 10)[(3)]
Carrier frequency	3.5 GHz	3.5 GHz	3.5 GHz	3.5 GHz
Modulation type	QPSK, 16-QAM, 64-QAM	QPSK, 16-QAM, 64-QAM	QPSK, 16-QAM, 64-QAM	QPSK, 16-QAM, 64-QAM
Duplex method	TDD/FDD	TDD/FDD	TDD/FDD	TDD/FDD
Access technique	TDMA/OFDMA	TDMA/OFDMA	TDMA/OFDMA	TDMA/OFDMA
No. of sectors	Not applicable	Not applicable	Not applicable	Not applicable
Reuse factor	1:3 (1:1)[(4)]	1:3 (1:1)[(4)]	1:3 (1:1)[(4)]	1:3 (1:1)[(4)]
Antennas per sector	Not specified	Not specified	Not specified	Not specified
Colocated antenna minimum coupling loss (dB)	Not applicable	Not applicable	Not applicable	Not applicable
Peak antenna gain (dBi)	17	5	5	0
Antenna gain pattern	Recommendation ITU-R F.1245	Omnidirectional	Omnidirectional	Omnidirectional
Antenna 3 dB beamwidth (degrees)	24°	n/a	n/a	n/a
Antenna height a.g.l. (m)	10	1.5	1.5	1.5
Number of co-channel TSs per BS	10 users for uplink activity factor[(5)] of 38% in a 5 msec frame	10 users for uplink activity factor[(5)] of 38% in a 5 msec frame	10 users for uplink activity factor[(5)] of 38% in a 5 msec frame	10 users for uplink activity factor[(5)] of 38% in a 5 msec frame
Transmitter				
TX peak output power (dBm)	26[(6)]	26[(6)]	22[(6)]	20[(6)]
Feeder loss (dB)	1	1	1	1
Power control (dB) [(7)]	0-45	0-45	0-45	0-45

TABLE 2b (*end*)

IEEE 802.16[2]				
	Fixed-outdoor	**Fixed-indoor**	**Nomadic**	**Mobile**
e.i.r.p. (dBm)	42	30	26	19
Unwanted emissions	See Attachment 1[8]			
Adjacent channel leakage ratio (ACLR) (dB**)**				
ACLR_1 (dB)	33	33	33	33
ACLR_2 (dB)	43	43	43	43
Receiver				
Noise figure (dB)	8	8	8	8
Thermal noise density (dBm/Hz)	–174	–174	–174	–174
Feeder loss (dB)	1	1	1	1
Adjacent channel selectivity (ACS) (dB)				
ACS_1 (dB)	28	28	28	28
ACS_2 (dB)	47	47	47	47
Interference criterion, *I*/*N* (dB)[9]	–6 or –10	–6 or –10	–6 or –10	–6 or –10
Required SINR (dB)	2.9 (for CTC QPSK ½)	2.9 (for CTC QPSK ½)	2.9 (for CTC QPSK ½)	2.9 (for CTC QPSK ½)
Nominal reference sensitivity (dBm)	Not applicable	Not applicable	Not applicable	Not applicable

(1) The ATIS standard~~s (T1.716/717, T1.723, ATIS.07000001,~~ ATIS.07000004 (HC-SDMA) do~~es~~ not specify operation above 3 GHz, therefore no parameters are available.

(2) The information in this table applies to non-IMT IEEE 802.16 systems operating in the range 3.3 GHz to 3.8 GHz.

(3) Other values of 5 and 10 MHz channel bandwidth in parenthesis are also supported.

(4) Other values of Reuse 1 (1:1) in parenthesis are also supported.

(5) Uplink activity factor for TDD mode is defined by the ratio of uplink subframe over the entire frame, that is uplink plus downlink subframes.

(6) WiMAX Forum profile 5.A, 5.B and 5.C, in general, cover a range of power classes.

(7) The 45 dB is based on the minimum dynamic range requirements.

(8) The unwanted emission information in Attachment 1 is applicable to the 3.3-3.8 GHz range.

(9) The I/N of –10 dB, corresponding to about half a dB impact on the receiver sensitivity, is a stringent criterion which is recommended in certain cases including in some ITU-R Recommendations. The number of –6 dB, corresponding to 1 dB impact on the receiver sensitivity, however, is also recommended in Recommendation ITU-R F.758~~–4~~.

Acronyms and abbreviations

ACLR	Adjacent channel leakage ratio
ACR	Adjacent channel rejection
ACS	Adjacent channel selectivity
AGL	Above ground level
ATIS	Alliance for Telecommunications Industry Solutions
BPSK	Binary phase shift keying
BS	Base station
BWA	Broadband wireless access
DL	Downlink
FDD	Frequency division duplex
FER	Frame error ratio
HC-SDMA	High capacity-spatial division multiple access
IEEE	Institute of Electrical and Electronic Engineers
MS	Mobile station
PSK	Phase shift keying
QAM	Quadrature amplitude modulation
QPSK	Quadrature phase shift keying
SINR	Signal to interference-plus-noise ratio
TDD	Time division duplex
Tx	Transmitter
UL	Uplink
UT	User terminal
XGP	eXtended Global Platform

ATTACHMENT 1

Spectrum emission mask for terminal station equipment operating in the band 3 400-3 800 MHz

This is based on an extract from the WiMAX Forum mobile radio specification [1].

Emission mask for 5 MHz channel bandwidth

The spectrum emission mask of the MS applies to frequency offsets between 2.5 MHz and 12.5 MHz on both sides of the MS centre carrier frequency. The out-of-channel emission is specified as power level measured over the specified measurement bandwidth relative to the total mean power of the MS carrier measured in the 5 MHz channel.

1) The MS emission shall not exceed the levels specified in Table 3. Assuming specific power classes, the relative requirements of Table 3 can be converted to absolute values for testing purposes.

2) In addition, for centre carrier frequencies within the 3 650-3 700 MHz range, all emission levels shall not exceed –13 dBm/MHz.

TABLE 3

Spectrum emission mask requirement for 5 MHz channel bandwidth

Frequency offset Δf	Minimum requirement	Measurement bandwidth
2.5 MHz to 3.5 MHz	$\left\{-33.5-15\times\left(\frac{\Delta f}{\text{MHz}}-2.5\right)\right\}$ dBc	30 kHz
3.5 to 7.5 MHz	$\left\{-33.5-1\times\left(\frac{\Delta f}{\text{MHz}}-3.5\right)\right\}$ dBc	1 MHz
7.5 to 8.5 MHz	$\left\{-37.5-10\times\left(\frac{\Delta f}{\text{MHz}}-7.5\right)\right\}$ dBc	1 MHz
8.5 to 12.5 MHz	–47.5 dBc	1 MHz

NOTE 1 – Δf is the separation between the carrier frequency and the centre of the measuring filter.

NOTE 2 – The first measurement position with a 30 kHz filter is at Δf equals 2.515 MHz; the last is at Δf equals 3.485 MHz.

NOTE 3 – The first measurement position with a 1 MHz filter is at Δf equals 4 MHz; the last is at Δf equals 12 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 4 – Note that equivalent PSD type mask can be derived by applying 10*log ((5 MHz)/(30 kHz)) = 22.2 dB and 10*log((5 MHz)/(1 MHz)) = 7 dB scaling factor for 30 kHz and 1 MHz measurement bandwidth respectively.

Emission mask for 7 MHz channel bandwidth

The spectrum emission mask of the MS applies to frequency offsets between 3.5 MHz and 17.5 MHz on both sides of the MS centre carrier frequency. The out-of-channel emission is specified as power level measured over the specified measurement bandwidth relative to the total mean power of the MS carrier measured in the 7 MHz channel.

1) The MS emission shall not exceed the levels specified in Table 4. Assuming specific power classes, the relative requirements of Table 4 can be converted to absolute values for testing purposes.

2) In addition, for centre carrier frequencies within the 3 650-3 700 MHz range, all emission levels shall not exceed –13 dBm/MHz.

TABLE 4

Spectrum emission mask requirement for 7 MHz channel bandwidth

Frequency offset Δf	**Minimum requirement**	**Measurement bandwidth**
3.5 MHz to 4.75 MHz	$\left\{-33.5-13.5\times\left(\frac{\Delta f}{\text{MHz}}-3.5\right)\right\}$ dBc	30 kHz
4.75 to 10.5 MHz	$\left\{-35-0.7\times\left(\frac{\Delta f}{\text{MHz}}-4.75\right)\right\}$ dBc	1 MHz
10.5 to 11.9 MHz	$\left\{-39.0-7\times\left(\frac{\Delta f}{\text{MHz}}-10.5\right)\right\}$ dBc	1 MHz
11.9 to 17.5 MHz	–49.0 dBc	1 MHz

NOTE 1 – Δf is the separation between the carrier frequency and the centre of the measuring filter.

NOTE 2 – The first measurement position with a 30 kHz filter is at Δf equals 3.515 MHz; the last is at Δf equals 4.735 MHz.

NOTE 3 – The first measurement position with a 1 MHz filter is at Δf equals 5.25 MHz; the last is at Δf equals 17 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 4 – Note that equivalent PSD type mask can be derived by applying 10*log ((7 MHz)/(30 kHz)) = 23.7 dB and 10*log((7 MHz)/(1 MHz)) = 8.5 dB scaling factor for 30 kHz and 1 MHz measurement bandwidth respectively.

Emission mask for 10 MHz channel bandwidth

The spectrum emission mask of the MS applies to frequency offsets between 5.0 MHz and 25.0 MHz on both sides of the MS centre carrier frequency.

The out-of-channel emission is specified as power level measured over the specified measurement bandwidth relative to the total mean power of the MS carrier measured in the 10 MHz channel.

1) The MS emission shall not exceed the levels specified in Table 5. Assuming specific power classes, the relative requirements of Table 5 can be converted to absolute values for testing purposes.

2) In addition, for centre carrier frequencies within the 3 650-3 700 MHz range, all emission levels shall not exceed –13 dBm/MHz.

TABLE 5

Spectrum emission mask requirement for 10 MHz channel bandwidth

Frequency offset Δf	**Minimum requirement**	**Measurement bandwidth**
5.0 MHz to 7.0 MHz	$\left\{-33.5-9\times\left(\frac{\Delta f}{\text{MHz}}-5.0\right)\right\}$ dBc	30 kHz
7.0 to 15.0 MHz	$\left\{-36.5-0.5\times\left(\frac{\Delta f}{\text{MHz}}-7.0\right)\right\}$ dBc	1 MHz
15.0 to 17.0 MHz	$\left\{-40.5-5\times\left(\frac{\Delta f}{\text{MHz}}-15.0\right)\right\}$ dBc	1 MHz
17.0 to 25.0 MHz	–50.5 dBc	1 MHz

NOTE 1 – Δf is the separation between the carrier frequency and the centre of the measuring filter.

NOTE 2 – The first measurement position with a 30 kHz filter is at Δf equals 510.015 MHz; the last is at Δf equals 6.985 MHz.

NOTE 3 – The first measurement position with a 1 MHz filter is at Δf equals 7.5 MHz; the last is at Δf equals 24.5 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 4 – Equivalent PSD type mask can be derived by applying 10*log ((10 MHz)/(30 kHz)) = 25.2 dB and 10*log((10 MHz)/(1 MHz)) = 10 dB scaling factor for 30 kHz and 1 MHz measurement bandwidth respectively.

REFERENCES

[1] WiMAX Forum® Mobile Radio Specifications, (WMF-T23-005-R015v04).

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WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT REVISION OF RECOMMENDATION ITU-R M.1824

System characteristics of television outside broadcast, electronic news gathering and electronic field production in the mobile service for use in sharing studies

Radiocommunication Study Groups

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Working Party 5A
(Working Group 5A-4)

WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT REVISION OF RECOMMENDATION ITU-R M.1824*

System characteristics of television outside broadcast, electronic news gathering and electronic field production in the mobile service for use in sharing studies

(Questions ITU-R 1/8 and ITU-R 7/8)

(2007)

Summary of the revision

– Editorial updates in the light of the results of RA-12 and WRC-12.

– Added information on operational and technical characteristics that should be used for sharing studies between mobile broadband networks used for ENG applications in the mobile service and other services.

Scope

This Recommendation, dealing with system characteristics of television outside broadcast (TVOB), electronic news gathering (ENG) and electronic field production (EFP) in the mobile service to assist sharing studies, contains the typical operational and technical characteristics of broadcast auxiliary services (BAS)[1], which are required for sharing studies both between the BAS in the mobile service and other radiocommunication services and between mobile broadband networks used for ENG applications in the mobile service and other radiocommunication services.

The ITU Radiocommunication Assembly,

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* This Recommendation should be brought to the attention of Radiocommunication Study Group 6.

[1] The term "BAS", also known as services ancillary to broadcasting (SAB), is defined in Report ITU-R BT.2069.

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considering

a) that some administrations operate extensive terrestrial broadcast auxiliary services (BAS) under mobile service allocations;

b) that some administrations are migrating from analogue to digital terrestrial BAS under mobile allocations;

c) that many administrations are likely to operate BAS including both terrestrial analogue and digital electronic news gathering (ENG) and television outside broadcast (TVOB) equipment in the mobile allocations for a reasonable amount of time;

d) that the frequency bands used for these BAS including TVOB, ENG and electronic field production (EFP) are, in many cases, shared by the mobile service and other services;

e) that the technical and operational characteristics of terrestrial BAS deployed under the mobile service are different from those systems deployed under the fixed service;

f) that several types of antennas are used by the BAS operated in various vehicles, and those antennas are controlled in elevation and azimuth during their operation to establish reliable links to the studio;

g) that it is desirable to identify the system parameters and operational characteristics to facilitate sharing with other services,

~~noting~~recognizing

a) that Recommendation ITU-R F.1777 ~~dealing with~~provides system characteristics of television outside broadcast (TVOB), electronic news gathering (ENG) and electronic field production (EFP) in the fixed service for use in sharing studies;

b) that Report ITU-R BT.2069 ~~—~~addresses ~~S~~spectrum usage and operational characteristics of terrestrial electronic news gathering (ENG), television outside broadcast (TVOB) and electronic field production (EFP) systems;

c) that Resolution ITU-R 59 (2012) resolves to carry out studies on availability of frequency bands and/or tuning ranges for worldwide and/or regional harmonization and conditions for their use by terrestrial electronic news gathering systems”~~that the World Radiocommunication Conference in 2003 adopted Recommendation 723 recommending the ITU-R study, as a matter of urgency, the technical, operational and frequency issues of ENG on a global basis~~;

noting

~~d)~~ that mobile broadband networks can be used for ENG applications when it is advantageous to do so,

recommends

1 that the operational and technical characteristics ~~parameters~~ described in ~~the~~ Annex 1 should be used for sharing studies between BAS deployed in the mobile service and other services.

2 that the operational and technical characteristics provided in Annex 2 should be used for sharing studies between mobile broadband networks used for ENG applications in the mobile service and other services.

ANNEX 1

Operational and technical characteristics of BAS systems deployed in the mobile service

1 Operational characteristics of BAS systems in the mobile service

Broadcasters use several frequency bands and several types of antennas depending on the situation where terrestrial crews send and receive live images. Figures 1 and 2 are examples of link situations. These systems are used for reporting the events of national disasters, contents production outside studio, etc. noting that the timing and location of national disaster events cannot be predicted.

Moreover, since broadcasters need to send the live video of national disasters and the contents which are needed in programme production; the geographical relation between the ENG equipments and collecting station or relay station installed on the helicopter or vehicular cannot be predicted. As a consequence, the antennas of ENG equipment need to point to any azimuth and elevation angle.

Figure 1 shows the example operation for transmitting live video to the collecting station, in order to broadcast the events which occur at the suburban area. In this case, the terrestrial video engineer who controls the microwave equipment points the antenna to the relay station installed on helicopter to avoid terrestrial obstacles. The relay station on the helicopter relays the live video to the collecting station which sends it to the broadcasting studio. The return link is also necessary to allow the terrestrial video engineers to collect information from the broadcasting studio.

Figure 2 shows the example of operation for transmitting live video to the collecting station, in order to broadcast the events which occur at the urban area. In this case, there are several ways to make a microwave link to the collecting station. The camera crew riding on the motorcycle takes the live video, and transmits it to the relay station installed on the vehicle which is also running in front of the motorcycle. In some cases, the relay station installed on the helicopter picks up the video which is transmitted by the camera crew riding on the motorcycle. A low gain antenna is usually used in these cases. The relay station installed on the vehicle also transmits live video to the helicopter which relays it to the collecting station, or directly transmits it to the collecting station by using a high gain antenna.

Broadcasters choose the antenna and frequency band depending on circumstances where the microwave links are to be established.

FIGURE 1

Example of operation for transmitting video to the collecting stations via helicopter

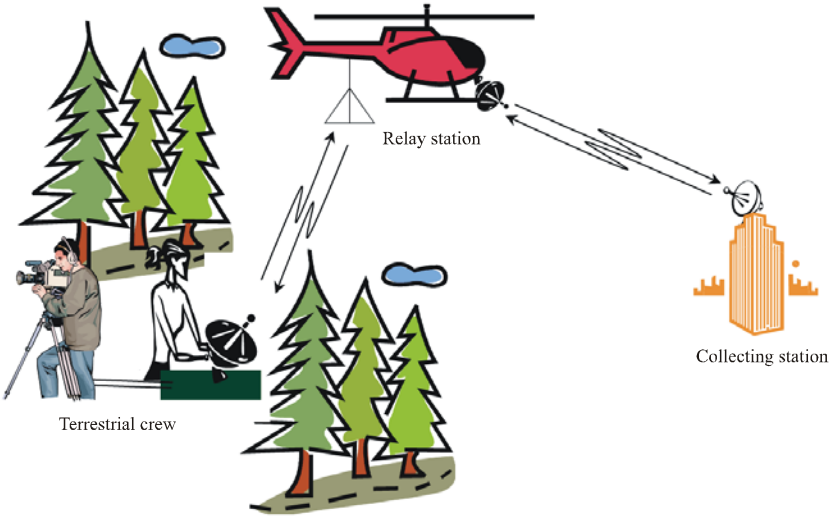
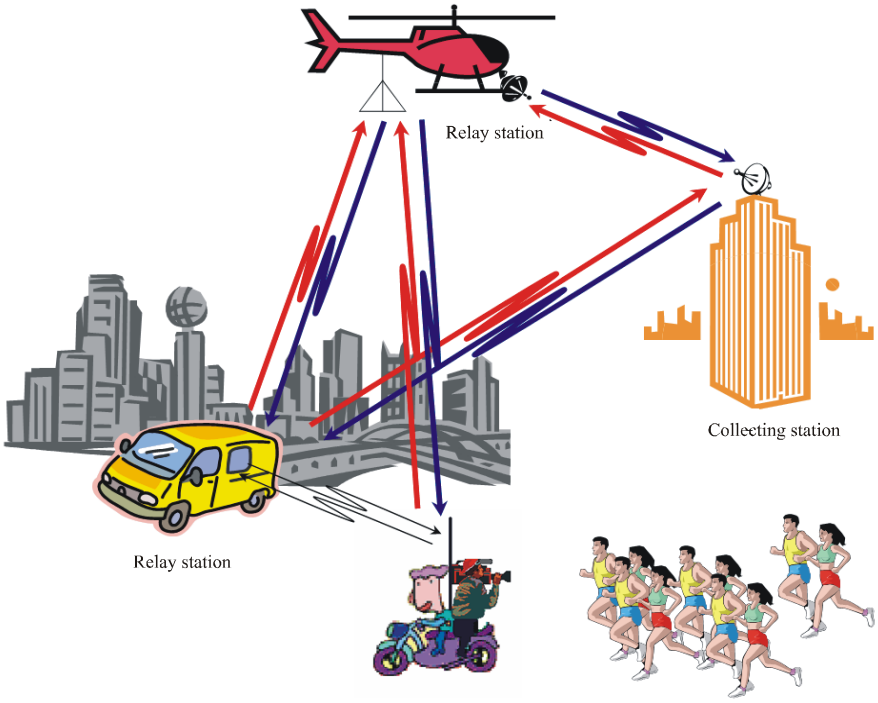


FIGURE 2

Example of operation for transmitting live video to the collecting stations via vehicles



2 Technical characteristics of BAS systems deployed in the mobile service[2]

Table 1 summarizes the technical parameters of BAS video link systems.

Table 2 summarizes the technical parameters of BAS talkback and walkie-talkie[3] systems.

Table 3 summarizes the technical parameters of BAS audio link systems[4].

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[2] The radio microphone systems, which are currently operated in the bands 40.68 MHz to 47.27 MHz and 779.125 MHz to 805.875 MHz on a licensed basis in Japan, are not included in this Recommendation.

[3] These systems are used as the BAS audio link application in absence of alternative measures to establish the audio link.

[4] The terminologies of video link, talkback and audio link systems are defined in the Report ITU-R BT.2069.

TABLE 1

Parameters of BAS video link systems operated in the mobile service

Frequency allocation[1]	**770-806 MHz (r2, R3, 5.293)** **790-862 MHz (5.314, 5.316)**	**5 850-5 925 MHz (R1, R2, R3)** **6 425-6 570 MHz (R1, R2, R3)** **6 870-7 125 MHz (R1, R2, R3)**		**10.25-10.45 GHz (R1, R3, 5.480)** **10.55-10.68 GHz (R1, R2, R3)** **12.95-13.25 GHz (R1, R2, R3)**		**41.55-41.95 GHz (r1, r2, r3, 5.551F)**		**Note**
Antenna type and gain	Helix (10-13 dBi)	Parabolic (22-35 dBi) Helix (10-13 dBi)				Parabolic (38-41 dBi)		H, V or circular polarization
	YAGI (12-19 dBi)	Horn (5-20 dBi)				N/A		Circular polarization
	Co-linear (5-6 dBi) Non-directional (2 dBi)	Horn (15-20 dBi) Non-directional (2 dBi)				Horn (19 dBi)		H and V polarization
Tracking method	Automatic or Manual							
Modulation	QPSK-OFDM 16-QAM-OFDM 32-QAM-OFDM	QPSK-OFDM 16-QAM-OFDM 32-QAM-OFDM 64-QAM-OFDM				N/A		16-QAM-OFDM is normally adopted
	FM	FM				FM		
Maximum capacity (Mbit/s)	16	30	60	30	60	N/A	N/A	
Channel spacing (MHz)	9	9	18	9	18	N/A	N/A	For the digital system
	9	N/A	18	N/A	18	33	100	For the FM system
Feeder/multiplexer loss (typical) (dB)	1	1	1	1	1	1	1	For both transmitter and receiver

TABLE 1 (*END*)

Parameters of BAS video link systems operated in the mobile service

Frequency allocation[(1)]	**770-806 MHz (r2, R3, 5.293)** **790-862 MHz (5.314, 5.316)**	**5 850-5 925 MHz (R1, R2, R3)** **6 425-6 570 MHz (R1, R2, R3)** **6 870-7 125 MHz (R1, R2, R3)**		**10.25-10.45 GHz (R1, R3, 5.480)** **10.55-10.68 GHz (R1, R2, R3)** **12.95-13.25 GHz (R1, R2, R3)**		**41.55-41.95 GHz (r1, r2, r3, 5.551F)**		**Note**
Maximum antenna input power (dBW)	7	4	7	4*	7**	0	0	* –6 dBW in 10.60-10.68 GHz by the transmitter power. ** –3 dBW in 10.60-10.68 GHz by the transmitter power.
e.i.r.p. (maximum) (dBW)	25	38	41	38*	41**	40	40	* 29 dBW in 10.60-10.68 GHz. ** 32 dBW in 10.60-10.68 GHz.
Receiver IF bandwidth (MHz)	9	9	18	9	18	27	80	
Receiver noise figure (dB)	4	4	4	4	4	6	6	
Receiver thermal noise (dBW)	–130.5	–130.5	–127.4	–130.5	–127.4	–123.7	–119.0	
Normal Rx input level (dBW)	–88	–88	–85	–88	–85	–82	–77	
Rx input level for 1×10^{-3} BER (dBW)	–120 –113 –110.7 –	–120 –113 –110.7 –108.2	–116.9 –109.9 –107.6 –105.1	–120 –113 –110.7 –108.2	–116.9 –109.9 –107.6 –105.1	N/A	N/A	QPSK-OFDM 16-QAM-OFDM 32-QAM-OFDM 64-QAM-OFDM
Rx input level for CNR = 27 (dB)	–103.5	N/A	–100.4	N/A	–100.4	–96.7	–92.0	For FM system
Nominal long term interference (dBW)	–140.5	–140.5	–137.4	–140.5	–137.4	–133.7	–129.0	
Spectral density (dB(W/MHz))	–150.0	–150.0	–150.0	–150.0	–150.0	–148	–148	

(1) Each table contains the letters “R1”, “R2” and “R3”, “r1”, “r2”, “r3”, and the reference to footnote 5.xxx. The letters “R1”, “R2” and “R3” stand for the ITU-R Region which has a primary mobile allocation to the specified frequency band, the letters “r1”, “r2” and “r3” stand for the ITU-R Region which has a secondary mobile allocation to the specified frequency band, and the reference to footnote 5.xxx refers to the country footnote in the table of frequency allocations.

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TABLE 2

Parameters of BAS talkback/walkie-talkie* systems operated in the mobile service

Frequency allocation[1]	**26.574 MHz (R1, R2, R3)**	**143-144 MHz (5.211, 5.212, R2, R3) 146-148 MHz (R1, 5.217, R3) 148-149.9 MHz (R1, R2, R3) 149.9-150.05 MHz (5.223) 150-156.7625 MHz (R1, R2, R3) 156.8375-174 MHz (R1, R2, R3)**	**166.5-166.9 MHz (R1, R2, R3) 168.5-168.9 MHz (R1, R2, R3)**	**459.5125-460 MHz (R1, R2, R3) 469.5-470 MHz (R1, R2, R3)**
Antenna type and gain	Co-linear, 8 dBi for base station (BS), non-directional, 2 dBi for mobile station (MS)			
Modulation	SSB	FM	RZ-SSB	FM
Channel spacing (kHz)		20	6.25	25
Feeder/multiplexer loss (typical) (dB)	Tx: 1.5 (BS), 0 (MS) Rx: 1.5 (BS), 1 (MS)	Tx: 1 (BS), 0 (MS) Rx: 1	Tx: 4 (BS), 0 (MS) Rx: 1	Tx: 1 (BS), 0 (MS) Rx: 1
Maximum antenna input power (dBW)	17 (BS), 14 (MS)	17	17	13
e.i.r.p. (maximum) (dBW)	17.5 (BS), 16 (MS)	24 (BS), 19 (MS)	21(BS), 19 (MS)	20 (BS), 15 (MS)
Receiver IF bandwidth (kHz)	3	12/ 16	3.4 /5.8	12/16
Receiver noise figure (dB)	4	4	4	4
Receiver thermal noise (dBW)	–165.0	–159.0/–157.7	–164.5/–162.2	–159.0/–157.7
Minimum Rx input level (dBW)	–147	–147.1/–145.9	–146.5/–144.2	–147.1/–145.9
Nominal long term interference (dBW)	–175.0	–169.0/–167.8	–174.5/–172.2	–169.0/–167.8
Spectral density (dB(W/kHz))	–179.8	–179.8	–179.8	–179.8
Audio frequency range	300 Hz-3 000 Hz	300 Hz-3 400 Hz	300 Hz-3 400 Hz	300 Hz-3 400 Hz

* These systems are used as the BAS audio link application in absence of alternative measures to establish the audio link.

Each table contains the letters “R1”, “R2” and “R3”, “r1”, “r2”, “r3”, and the reference to footnote 5.xxx. The letters “R1”, “R2” and “R3” stand for the ITU-R Region which has a primary mobile allocation to the specified frequency band, the letters “r1”, “r2” and “r3” stand for the ITU-R Region which has a secondary mobile allocation to the specified frequency band, and the reference to footnote 5.xxx refers to the country footnote in the table of frequency allocations.

NOTE 1 – Antenna height and altitude above sea level of base stations will be required for sharing studies. For example, the antenna height more than 20 m and the altitude above sea level more than 1 000 m are used in some cases.

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TABLE 3

Parameters of BAS audio link systems operated in the mobile service

Frequency allocation[1]	**38.96 MHz (R1, R2, R3)**	**164-167 MHz (R1, R2, R3)**	**462-465 MHz (R1, R2, R3)**	**3 405-3 423 MHz (r1, r2, r3, 5.432)**
Antenna type and gain	Non-directional (2 dBi)	Yagi (13 dBi) Non-directional (2 dBi)	Yagi (13 dBi) Non-directional (2 dBi)	Parabolic (22-26 dBi)
Modulation	FM AM	FM		
Channel spacing (kHz)	–	240	240	1 000
Feeder/multiplexer loss (typical) (dB)	Tx: 0 Rx: 1	Tx: 0 Rx: 1	Tx: 0 Rx: 1	Tx: 1 Rx: 1
Maximum antenna input power (dBW)	17	17	13	0
e.i.r.p. (maximum) (dBW)	19	30	26	25
Receiver IF bandwidth (kHz)	16/30	100	100	400
Receiver noise figure (dB)	4	4	4	4
Receiver thermal noise (dBW)	–157.8/–155.1	–149.8	–149.8	–139.8
Minimum Rx input level (dBW)	–125.7/–123	–123	–123	–95
Nominal long term interference (dBW)	–167.8/–165.1	–159.8	–159.8	–149.8
Spectral density (dB(W/kHz))	–179.9	–179.9	–179.9	–179.9
Audio frequency range	7 kHz	10 kHz	10 kHz	17 kHz

(1) Each table contains the letters “R1”, “R2” and “R3”, “r1”, “r2”, “r3”, and the reference to footnote 5.xxx. The letters “R1”, “R2” and “R3” stand for the ITU-R Region which has a primary mobile allocation to the specified frequency band, the letters “r1”, “r2” and “r3” stand for the ITU-R Region which has a secondary mobile allocation to the specified frequency band, and the reference to footnote 5.xxx refers to the country footnote in the table of frequency allocations.

NOTE 1 – Antenna height and altitude above sea level of collecting radio stations will be required for sharing studies. For example, the antenna height more than 20 m and the altitude above sea level more than 1 000 m are used in some case.

ANNEX 2

Operational and technical characteristics of mobile broadband networks for ENG applications

1 Operational characteristics of mobile broadband networks used for ENG applications in the mobile service

Until recently, ENG applications used specialized systems. However, with recent advances in technology and consumer take up of mobile broadband, commercial systems have evolved and now are also able to fulfill the requirements of ENG, so they can be used when it is advantageous to do so[5].

In addition to meeting the demands of media consumers, mobile broadband networks can also support wireless feeds for news gathering applications for program development in the domain of Electronic News Gathering/Outside Broadcasting services (ENG/OB). This mobile broadband application provides real time feeds for broadcasting; the users could be professionals (e.g., camera people on a motorcycle following an event and transmitting the feed using LTE) or the general public (e.g., people with mobile broadband devices sending videos to newspapers and broadcasters). Suitably configured LTE networks enable the transmission of high-definition (HD) video streams from live cameras with the low latency and high quality required for studio feeds. This has been demonstrated in several events (see footnote).

Compared to using alternative dedicated/transportable links for ENG/OB, LTE networks can be more readily setup with less overhead. The LTE quality of service framework can ensure priority for the ENG/OB services above other types of traffic in the LTE network, thereby providing carrier-grade performance.

The applicable Recommendations for mobile broadband standards include:

Recommendation ITU-R M.1457, “Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)”

Recommendation ITU-R M.1801, “Radio interface standards for broadband wireless access systems, including mobile and nomadic applications, in the mobile service operating below 6 GHz”

[5] This has been demonstrated in several events, including:

– Swedish Crown Princess Royal Wedding in 2010, where Swedish TV companies broadcasted live from the celebrations in Stockholm, as well as being available live from the official website of the wedding (http://www.teliasonera.com/en/newsroom/press-kits/4G/ and http://www.kungahuset.se/royalcourt/wedding.4.396160511584257f218000603l5.html, retrieved September 2012);

– Japanese Nippon TV reporting from the Nobel press conference in Stockholm 2010 (http://www.teliasonera.com/innovation/entertainment/2011/4/nobel-prize-awards-live-tv-4g-broadcast-stockholm-tokyo, retrieved September 2012);

– YouTube streamed the entire wedding event of Prince William and the Duchess of Cambridge live from The Royal Channel, which was built specifically for wedding. BBC provided full streaming of the event at BBC News' dedicated wedding site. It was possible to watch the entire event live on a smartphone or other Internet devices such as tablets (http://www.pcmag.com/article2/0,2817,2384533,00.asp).

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Recommendation ITU-R M.2012, "Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications Advanced (IMT-Advanced)"

2 Technical characteristics of mobile broadband networks used for ENG applications in the mobile service

The technical characteristics to be used in sharing studies are found in the following Recommendations and Report:

Recommendation ITU-R M.2039 "Characteristics of terrestrial IMT-2000 systems for frequency sharing/interference analyses"

Recommendation ITU-R M.2116 "Characteristics of broadband wireless access systems operating in the land mobile service for use in sharing studies"

Draft new Report ITU-R M.[IMT.ADV.PARAM] - Characteristics of terrestrial IMT-Advanced systems for frequency sharing/interference analyses (Doc. 5/65)

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PRELIMINARY Draft New RECOMMENDATION ITU-R M.[MS 14.5-15.35 CHAR]

Characteristics of and protection criteria for systems operating in the mobile service in the frequency range 14.5-15.35 GHz

Source: Document 5A/363

Document 5A/TEMP/170-E
22 November 2013
English only

Working Party 5A
(Working Group 5A-4)

~~WORKING DOCUMENT TOWARDS A~~ PRELIMINARY DRAFT NEW ~~[REPORT/~~RECOMMENDATION~~]~~ ITU-R M.[MS 14.5-15.35 CHAR]

Characteristics of and protection criteria for systems operating in the mobile service in the frequency range 14.5-15.35 GHz

Scope

This ~~[Report/~~ Recommendation~~]~~ specifies the characteristics of and protection criteria for systems operating in the mobile service in the frequency range 14.5-15.35 GHz. These technical and operational characteristics ~~are to~~should be used ~~as a guideline~~ in analyzing compatibility between systems operating in the mobile service with systems in other services.

Keywords

Mobile Service, Ku-band, Technical Characteristics, Protection Criteria.

Abbreviations/Glossary

BPSK	Binary Phase Shift Keying
FET	Field Effect Transistor
FSK	Frequency Shift Keying
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency

The ITU Radiocommunication Assembly,

considering

a) that mobile systems in the 14.5-15.35 GHz frequency range are used for a variety of purposes including land mobile ground-to- ground data links used to convey voice, data, and/or video;

~~*a*~~*b)* that antenna, signal propagation, and large bandwidth characteristics of mobile systems to achieve their functions and requirements are optimum in certain frequency bands;

~~*b*~~*c)* that the technical characteristics of systems operating in the mobile service in this frequency range are determined by the purpose of the system and vary widely ~~within frequency bands~~;

~~*c*~~*d)* that representative technical and operational characteristics of systems operating in frequency bands allocated to the mobile service are required to determine the feasibility of introducing new types of systems~~,~~ as well as conducting sharing studies;

~~*d*~~*e)* that procedures and methodologies are needed to analyse compatibility between systems operating in the mobile service and systems in other services,

recognizing

that the authorization and operation of these systems should comply with applicable national spectrum policies and the ITU Radio Regulations,

noting

a) that the frequency range 14.5-15.35 GHz is allocated worldwide on a primary basis to the mobile service and fixed services;

b) that the frequency band 14.5-14.8 GHz is allocated worldwide on a primary basis to the fixed-satellite services (Earth-to-space) limited by No. 5.510 to feeder links for the broadcasting satellite service for countries outside Europe;

c) that the frequency range 14.5-15.35 GHz is allocated worldwide on a secondary basis to the space research service,

recommends

1 that the technical and operational characteristics of the systems operating in the mobile service described in Annex 1 be considered representative of those operating in the frequency band 14.5-15.35 GHz;

2 that the technical and operational characteristics of the systems operating in the mobile service as described in Annex 1 should be used for sharing and compatibility studies involving the mobile service and other services in the frequency band 14.5-15.35 GHz;

3 that the criterion of interfering signal power to mobile system receiver noise power level, *I*/*N*, of –6 dB should be used as the required protection level for the mobile systems in the frequency range 14.5-15.35 GHz, and that this ~~represents the~~ protection level is for aggregate interference if multiple interferers are present.

ANNEX 1

Technical and operational characteristics of systems operating in the mobile service in the frequency range 14.5-15.35 GHz

1 Introduction

In the frequency ~~band~~ range 14.5-15.35 GHz mobile systems support a variety of useful functions including reliable transmission of large amounts of data for land mobile to land mobile voice, data, and video wideband links.

2 Technical characteristics of mobile systems in the frequency band 14.5-15.35 GHz

The technical parameters of representative mobile systems operating in the frequency range 14.5-15.35 GHz are presented in Table 1.

TABLE 1
Mobile system characteristics in the band 14.5-15.35 GHz

Characteristics	System 1	System 2	System 3	System 4	System 5	System 6	Units
Frequency Range	14.5-15.35	14.5-15.35	14.5-15.35	14.5-15.0	14.5-15.30	14.6-15.35	GHz
Platform type	Land-mobile vehicle	Handheld	Land-mobile vehicle	Land-mobile vehicle	Land Mobile vehicle	Land Mobile vehicle	
Modulation	8-QAM, QPSK	BPSK	FSK	FSK	BPSK/OQPSK	BPSK/QPSK/QAM	
Emission Designator	50M0G1D	18M5F9W	4M60F9W	20M0G7W	2M46G1D	40M0G7W	
Transmit peak power	15	5	25	18	40W(mean)	0.5W(mean)	W
Maximum data rate	140	10	5	19	1.024/3.072	108	Mbit/~~p~~s
Output device	Solid State	FET	FET	FET	FET	Gallium Arsenide Field Effect Transistor	
Antenna pattern type	Directional	~~Directional~~ Hemispherical	Directional	Directional	Directional	Directional	
Antenna type	Electronically scanned circular array	Stacked Microstrip Patch	Stacked Microstrip Patch	Stacked Microstrip Patch	Stacked Microstrip Patch	Phased-array	
Antenna polarization	Right-hand Circular	Linear	Linear	Linear	Horizontal and Vertical	Left Hand Circular	
Antenna gain	18	4	23	25	24	28	dBi
Antenna Pattern Model	ITU-R F. 1336~~-3~~ (k = 0)	Omni Directional	ITU-R F. 1336~~-3~~ (k= 0)	ITU-R F. 1336~~-3~~ (k = 0)	ITU-R F. 1336~~-3~~ (k = 0)	ITU-R F. 1336~~-3~~ (k = 0)	
Antenna horizontal beamwidth	10	360	3	2.1	2.2	1.9	degrees
Antenna vertical beamwidth	15	40	3	2.1	2.2	1.9	degrees
~~Antenna 1st side lobe level~~	~~8~~	~~0~~	~~10~~	~~12~~	~~11~~	~~NA~~	~~dBi~~
Antenna height	4 - 18	2	4 - 14	4 - 13	~~[TBD]~~ 4 - 15	~~[TBD]~~ 4 - 17	m
Receiver IF –3 dB bandwidth	55	21	4	23	3	35	MHz
Receiver noise figure	4	3	3	4	4	5	dB
Minimum Sensitivity	–93	–98	–105	–97	–106	–94	dBm
Transmitter RF emission bandwidth: –3 dB/-20 dB	30/55	10/20	3/6	12/22	1.5/2.4	20/38	MHz

~~NA = Not available.~~

3 Characteristics of mobile systems in the frequency range 14.5-15.35 GHz

~~[*Editor's Note: A section on the interrelationships of the systems in Table 1 may be addressed in future contributions to this document.*]~~

3.1 Introduction

Technology advancements in signal processing, complex modulations, antenna design, and solid-state components are enabling the design and manufacture of communication systems in the 14.5-15.35 GHz frequency range that are intended to be used as hand-held devices, e.g. Table 1, System 2, or on ground-based mobile vehicles, e.g. Table 1, System 1 and System 3 - System 6, that can inter-operate with other similar ground-based vehicles while one or both of the vehicles are in motion or stationary. The hand-held devices can communicate with each other or with the vehicular systems.

Some Administrations use this band for mobile ground data links that convey voice, data, and/or video, for example, in situations where there is a need to establish and maintain wideband communication among mobile vehicles and personnel providing relief and public safety to an area subjected to a catastrophic natural disaster. Platforms equipped with these data links can be deployed anywhere within a country whose Administration has authorized their use.

The wide available bandwidth and relative ease of propagation when obstacle-free conditions exist in this frequency range allow mobile systems with data rates up to many 10's of Mbit/~~p~~s.

Largely because of these mission requirements, the mobile systems using or planned to use the band 14.5-15.35 GHz tend to possess the following general characteristics:

– they typically use solid-state power-amplifier transmitters that are usually able to tune through the frequency band and use digital modulations;

– an increasing number of these systems have antenna main beams that are steerable in both azimuth and elevation using electronic beam steering techniques.

Table 1 summarizes technical characteristics of representative mobile systems deployed or planned to be deployed in the whole or portions of the band 14.5-15.35 GHz. This information is sufficient for general calculation to assess the compatibility between these mobile systems and other systems. Some or all of the mobile systems whose characteristics are presented in Table 1 possess the properties above, although they do not illustrate the full repertoire of attributes that might appear in future systems.

3.2 Transmitters

The mobile systems operating or planned to operate in the 14.5-15.35 GHz band typically use digital modulations. A given transmitter may be capable of radiating more than one waveform Solid-state power amplifier output devices are typically used in the transmitters. The trend towards use of solid-state transmitters in new mobile systems will continue for the foreseeable future due to the wide bandwidth, low level of generated spurious emissions, low power consumption, and reliability of these devices.

Typical transmitter RF emission (3 dB) bandwidths of mobile systems operating or planned to operate in the band 14.5-15.35 GHz range from about 4 MHz to 50 MHz. Current transmitter peak output powers range from 5 W (37 dBm) to 25 W (44 dBm). However, advances in solid state modules will enable systems in the near future to generate peak power outputs of 70 W – 130 W in this frequency range.

3.3 Receivers

The newer-generation mobile systems in the 14.5-15.35 GHz use digital modulations to enhance system performance.

The signal processing in the newer generation of mobile systems use digital phase, frequency, or amplitude modulation techniques.

3.4 Antennas

A variety of different types of antennas are used by systems in the 14.5-15.35 GHz band. Antennas in this band are generally of a variety of sizes and thus are of interest for applications where mobility and lightweight are important. The directional antenna pattern for mobile systems must be able cover 360° in the horizontal plane either electronically or mechanically. Sectored horn or circular phased arrays may be used to obtain 360 degree horizontal coverage. Flat-plate electronically steered antennas may require several facets or sub-antennas to achieve 360° horizontal coverage. Both horizontal and vertical polarizations are used. No current ITU-R Recommendations adequately addresses the antenna pattern for mobile systems in the 14.5-15.35 GHz frequency range. However, as an interim measure, the analytical procedures contained in Recommendation ITU-R F.1336-3, with a suggested "k-factor" of 0, can be used to model the directional antenna pattern for the vehicular antennas for use in compatibility studies and sharing analyses.

Typical antenna heights for ground-based mobile vehicle systems range from 4 m to 15 m above surface level. The 4 m height is typical for operations when the antenna is configured in a stowed or retracted position while the vehicle is in motion. The 13-18 m height is typical when the vehicle is halted and an antenna mast can be extended.

Operations while the antenna is in the stowed position while the vehicle is on the move may limit the signal strength of the desired signal due to its propagation along non-line of sight paths with various obstructions. In this frequency range selection of antenna locations on elevated terrain is desirable to mitigate the effects of, e.g., foliage and buildings, etc., on electromagnetic propagation to maximize communication distances when the vehicle is operating when halted.

4 Protection criteria

Under noise-limited conditions, a protection criteria of I/N = –6 dB limits the increase in the noise level in the receiver to about 1 dB and corresponds to an $(I + N)/N$ ratio of 1.26. The 1 dB increase in the noise level could be manifested as, e.g., a decrease in the available fade margin, a decrease in the effective coverage area where a maximum given bit error rate (BER) must be maintained, or receiver desensitization, which would constitute significant degradation for digital receivers that must operate with very low bit error rates. The 1 dB increase represents the aggregate effect of multiple interferers, when present; the received level of interference from an individual interferer depends on the interferer geometry and other factors, and needs to be assessed in the course of analysis of a given scenario. The specified tolerable I/N ratio is referenced to the mobile receiver input and requires taking in to account all sources of interference. If a single interference source is present, protection of the mobile systems requires that this criterion is not exceeded due to the interference from the single source. If multiple interference sources are present, protection of the mobile systems requires that this criterion is not exceeded due to the aggregate interference from the multiple sources.

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working document toward a preliminary draft new recomendation ITU-R M.[V2X]
Radio interface standards of vehicle-to-vehicle and vehicle-to-infrastructure communications for intelligent transport systems applications

Radiocommunication Study Groups

Source: Annex 25 to Document 5A/306, Documents 5A/341, 381, 405

Subject: Question ITU-R 205-5/5

Revision 1 to Document 5A/TEMP/174-E
27 November 2013
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Working Party 5A (WG 5A-5)

WORKING DOCUMENT TOWARD A PRELIMINARY DRAFT NEW RECOMENDATION ITU-R M.[V2X]

Radio interface standards of vehicle-to-vehicle and vehicle-to-infrastructure communications for intelligent transport systems applications

(Question ITU-R 205-5/5)

Scope

This Recommendation identifies specific radio interface standards of vehicle-to-vehicle and vehicle-to-infrastructure communications for ITS applications. The technical and operational characteristics described in this Recommendation are based on current and existing frequency bands already identified for ITS systems and applications in the mobile service.

Keywords

ITS, V2X, vehicle to vehicle communications, vehicle to infrastructure communications

Acronyms and abbreviations

ARIB	Association of Radio Industries and Businesses
BPSK	Binary phase shift keying
CSMA/CA	Carrier sense multiple access/collision avoidance
DSRC	Dedicated short range communications
ETSI	European Telecommunications Standards Institute
FEC	Forward error correction
IEEE	Institute of Electrical and Electronics Engineers
ITS	Intelligent transport systems
OFDM	Orthogonal frequency-division multiplexing

QAM Quadrature amplitude modulation

QPSK Quadrature phase shift keying

TTA Telecommunications Technology Association

V2X Vehicle to vehicle and vehicle to infrastructure

Related ITU Recommendations

[Recommendation ITU-R M.1453 Intelligent Transport Systems – dedicated short-range communications at 5.8 GHz]

Recommendation ITU-R M.1890 Intelligent Transport Systems – Guidelines and Objectives

The ITU Radiocommunication Assembly,

[Editor's note: Recommendation ITU-R M.1453 is in square bracket for further comments, because of possible misunderstanding of limitation to the frequency range in 5.8 GHz. ~~This~~ Recommendation ITU-R M.[V2X] is not intended to be limited to parameters referenced in Recommendation ITU-R M.1453.]

considering

a) that standards development organizations (SDOs) are developing specific standards for vehicle to vehicle and vehicle to infrastructure communication in the intelligent transport system (ITS) service;

b) that using the ITU-R Recommendation identifying these standards, manufacturers and operators should be able to determine the most suitable standards for their needs,

noting

Recommendation ITU-R M.1453, which recommends ~~D~~dedicated ~~S~~short-~~R~~range ~~C~~communications (DSRC) operating at 5.8 GHz,

recommends

1 that the radio interface standards in Annexes 1 to 3 should be used for vehicle-to-vehicle and vehicle-to-infrastructure communication.

ANNEX 1

ETSI standards

ETSI Standards developed for the access and media layer are based on features such as:

– 5,9 GHz spectrum usage;

– multichannel operation;

– decentralized congestion control (DCC);

– coexistence of ITS and EFC (CEN DSRC) services in the 5.8 GHz and 5.9 GHz bands.

Base standards for the access and media layer

Standard title	Standard number
Intelligent transport systems (ITS); Radiocommunication equipment operating in the 5 855 MHz to 5 925 MHz frequency band; Harmonized EN covering the essential requirements of Article 3.2 of the R&TTE Directive	ETSI EN 302 571
Intelligent transport systems (ITS); Access layer specification for intelligent transport systems operating in the 5 GHz frequency band	ETSI EN 302 663
Intelligent transport systems (ITS); Decentralized congestion control mechanisms for intelligent transport systems operating in the 5 GHz range; Access layer part	ETSI TS 102 687
Intelligent transport systems (ITS); Mitigation techniques to avoid interference between European CEN dedicated short-range communication (CEN DSRC) equipment and intelligent transport systems (ITS) operating in the 5 GHz frequency range	ETSI TS 102 792
Intelligent transport systems (ITS); Harmonized channel specifications for intelligent transport systems (ITS) operating in the 5 GHz frequency band	ETSI TS 102 724

Testing standards for the access and media layer

Testing Standard title	Standard number
Intelligent transport systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5.9 GHz range; Part 1: Protocol implementation conformance statement (PICS)	ETSI TS 102 917-1
Intelligent transport systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5.9 GHz range; Part 2: Test suite structure and test purposes (TSS & TP)	ETSI TS 102 917-2
Intelligent transport systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5.9 GHz range; Part 3: Abstract test suite (ATS) and partial protocol implementation eXtra information for testing (PIXIT)	ETSI TS 102 917-3
Intelligent transport systems (ITS); Test specifications for the methods to ensure coexistence of cooperative ITS G5 with RTTT DSRC; Part 1: Protocol implementation conformance statement (PICS)	ETSI TS 102 916-1
Intelligent transport systems (ITS); Test specifications for the methods to ensure coexistence of cooperative ITS G5 with RTTT DSRC; Part 2: Test suite structure and test purposes (TSS&TP)	ETSI TS 102 916-2
Intelligent transport systems (ITS); Test specifications for the methods to ensure coexistence of cooperative ITS G5 with RTTT DSRC; Part 3: Abstract test suite (ATS) and partial protocol implementation eXtra information for testing (PIXIT)	ETSI TS 102 916-3

ANNEX 2

ETSI standards

[*Editor's Note: Administrations, Sector Members or IEEE may wish to contribute to the November 2013 meeting, similar to the IEEE specifications provided in Document 5A/262.*]

ANNEX 3

ARIB standard

In Japan, for the use of the ~~S~~safe ~~D~~driving ~~S~~support ~~S~~systems, a part of the 700 MHz band (755.5-764.5 MHz) has been assigned in new spectrum allocation on a primary basis in the ~~D~~digital ~~D~~dividend band. The technical characteristic of vehicle-to-vehicle and vehicle-to-infrastructure communications for safe driving support systems are shown in Table 1.

TABLE 1

Characteristics of the transmission scheme

Item	Technical characteristic
Operating frequency range	755.5–764.5 MHz (Single channel)
Occupied bandwidth	Less than 9 MHz
Modulation scheme	BPSK OFDM/ QPSK OFDM/ 16QAM OFDM
Forward error correction	Convolutional coding, rate = 1/2, 3/4
Data transmission rate	3 Mbit/s, 4.5 Mbit/s, 6 Mbit/s, 9 Mbit/s, 12 Mbit/s, 18 Mbit/s
Media access control	CSMA/CA

Table 1 shows basic specifications of ARIB standard; ARIB STD-T109[1], 700 MHz band ~~I~~intelligent ~~T~~transport ~~S~~systems (ITS) which has been developed in February 2012.

A 9 MHz channel width in the 700 MHz radio frequency band will be used for the safe driving support systems.

Data transmission rate is variable based on the selection of Modulation scheme and coding rate (R) as follows:

– 3 Mbit/s (BPSK OFDM, R = 1/2), 4.5 Mbit/s (BPSK OFDM, R = 3/4);
– 6 Mbit/s (QPSK OFDM/, R = 1/2), 9 Mbit/s (QPSK OFDM, R = 3/4);
– 12 Mbit/s (16QAM OFDM, R = 1/2), 18 Mbit/s (16QAM OFDM, R = 3/4).

The single channel accommodates both vehicle-to-vehicle and vehicle-to-infrastructure communications based on CSMA/CA media access control.

[1] ARIB standard; ARIB STD-T109, 700MHz band ~~I~~intelligent ~~T~~transport ~~S~~systems (http://www.arib.or.jp/english/html/overview/doc/5-STD-T109v1_1-E1.pdf).

ANNEX 4

TTA standards

1 Technical characteristics

The advanced ITS radiocommunications system has to consider the described V2V/V2I communications and its service requirements and WAVE standards for international harmonization. In V2V applications, it is required to consider the low packet latency because the life-saving time of safety message is useful in the span of 100 m/s. Also it requires a highly activated radio channel when many vehicles try to activate radio channel simultaneously. In V2I applications, it needs to adopt the long packet transmission which includes a short message, map information and image information to be order of 2 kbytes in a packet size in high mobility condition. Thus the advanced ITS radiocommunication system has the following features as shown in Table 5.

TABLE 5

Technical characteristics

Item	Technical characteristic
RF frequency	[To be defined]
RF channel bandwidth	10 MHz
RF Transmit power	23 dBm
Modulation type	OFDM(BPSK, QPSK, 16QAM, 64QAM)
Data rate	3, 4.5, 6, 9, 12, 18, 24, 27 Mbps
MAC	Time Slot based CSMA/CA, EDCA
Networking	IPv4/IPv6, WSMP(IEEE 1609.3/4 compatible)
Multi-hop	Location information based routing

2 TTA Standards related to advanced ITS radiocommunications

In the Republic of Korea, Telecommunication Technology Association (TTA) established five standards for advanced ITS radiocommunications. The detailed information of these standards is shown in Table 6.

TABLE 6

TTA standards related to advanced ITS radiocommunications

Standard No.	Standard title	Summary	Issued date
[TTAS.KO-06.0175/R1]	Vehicle communication system Stage 1: Requirements	The standard describes mainly some services are supported by the multi-hop vehicle-to-vehicle communications such as the warning service and group communication service. And it also describes general requirements and performance requirements of vehicle communication systems for information service and the group communications service, etc.	2013.12

Standard No.	Standard title	Summary	Issued date
[TTAS.KO-06.0193/R1]	Vehicle communication system Stage 2: Architecture	The standard describes mainly architecture and components of vehicle communications system which supports vehicle communication services such as the warning service and group communication service. As to the main contents, this standard defines the structure of the inter-vehicle communication system describing the hierarchical layers comprised the system architecture. And it also describes general architecture with the of vehicle-to-infrastructure communication systems for information service, etc.	[2013.12]
[TTAS.KO-06.0216/R1]	Vehicle communication system Stage 3: PHY/MAC	The standard describes specifications of physical (PHY) and medium access control layer (MAC) for vehicle communication systems. This standard is based on IEEE P802.11pTM which modifies IEEE P802.11TM -2007 standard. The detailed description of IEEE P802.11pTM is not specified in this standard. This document only deals with new technologies for vehicle-to-vehicle communication systems which are not covered in IEEE 802.11pTM. The other technical contents which are not specified in this standard follow IEEE 802.11pTM.	[2013.12]
[TTAS.KO-06.0234/R1]	Vehicle communication system State 3: Networking	The standard describes specifications of networking layer for vehicle multi-hop communication systems. This standard is based on IEEE P1609TM (WAVE) and IEEE P802.11pTM standards. The detailed description of IEEE P1609.3TM is not specified in this standard. This document only deals with new technologies for vehicle-to-vehicle multi-hop communication systems which are not covered in IEEE P1609.3TM. The other technical contents which are not specified in this standard follow IEEE P1609.3TM.	[2013.12]
[TTAK.KO-06.0242/R1]	Vehicle communication system Stage 3: Application Protocol Interface	This standard is to specify the application protocol interface for vehicle communication system and to support its network layer. Also, it describes the authentication and registration procedures in application layer to interoperate between IEEE 802.11p WAVE and vehicle communication system.	[2013.12]

[NOTE– These standards are in the revision process. They will be finalized at the end of this year.]

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executive Report of the eleventh and twelfth meetings of Working Party 5A

Radiocommunication Study Groups

Document 5/89-E
29 November 2013
English only

Chairman, Working Party 5A

EXECUTIVE REPORT OF THE ELEVENTH AND TWELFTH MEETINGS OF WORKING PARTY 5A

1 Introduction

Working Party 5A (WP 5A) has held two meetings since the seventh meeting of Study Group 5 (Geneva, 19 November 2012).

Working Party 5A held its eleventh meeting from 20-30 May 2013 in Geneva. The meeting participants (see list in Doc. 5A/305) included 179 participants from 39 countries representing 36 administrations, 6 registered operating agencies, 10 scientific or industrial organizations, one U.N. Specialized Agency, 3 regional and other international organizations, one regional telecommunications organization, one intergovernmental organization operating satellite systems, 2 other entities, and the BR. The meeting dealt with 115 input documents (see list Doc. 5A/305(Rev.1)) and upon their consideration the meeting prepared 55 output temporary documents (see list in Annex 28 to Doc. 5A/198). The Chairman's Report is in Doc. 5A/306.

Working Party 5A held its twelfth meeting from 18-28 November 2013 in Geneva. The meeting participants (see list in Doc. 5A/420) included 196 participants from 43 countries representing 41 administrations, 4 registered operating agencies, 14 scientific or industrial organizations, 3 regional and other international organizations, one regional telecommunication organization, one other entity dealing with telecommunications, one academia and the BR. The meeting dealt with 114 input documents (see list in Doc. 5A/410(Rev.1)) and upon their consideration the meeting prepared 47 output temporary documents (see list in Annex 21 to Doc. 5A/421). The Chairman's Report is in Doc. 5A/421.

Annex 1 to Doc. 5A/421 contains the management aspects of WP 5A, including a summary of the status of the texts that are the responsibility of WP 5A and the use of electronic facilities. The list of texts that are the responsibility of WP 5A is kept up to date in line with Doc. 5/2(Rev.1), including the assignment of responsibilities to the Working Groups of WP 5A and identification of topics for the Recommendations and Reports.

During the eleventh meeting of WP 5A in May 2013, ITU hosted a successful half-day WWRF Workshop on "Requirements and Technologies for the Next Generation of Mobile Communications" (Geneva, 21 May 2013), to which members of the Working Parties, RAG and any other ITU members were invited to attend: http://www.itu.int/oth/R0A06000057/en.

On 18 November 2013, in conjunction with its twelfth meeting, WP 5A held a successful half-day Seminar on Cognitive Radio Systems and the use of White Spaces. The programme, presentations, speaker biographies and archived webcast are available at this link: http://www.itu.int/en/ITU-R/seminars/rsg/RWP5A-2013/Pages/default.aspx.

Annex 1 to this Report provides the objectives for the thirteenth meeting of Working Party 5A.

2 Structure of Working Party 5A

The structure of WP 5A is as follows:

Group	Title	Resolutions, Recommendations, Questions .../5	Chairman
WG 5A-1	Amateur services	AI 1.4 (Res. 649 (WRC-12)); Q. 48-6; Q. 209-4 (Amateur aspects only)	Dale Hughes, Australia
WG 5A-2	Systems and standards	Wireless Access: Q. 101-4 and (except sharing Q. 212-4, Q. 215-4, Q. 238-2 Specific Appl.: Q. 37-6 (except PPDR) Climate Change: Res. 60 Conformance: Res. 62	Lang Baozhen, China
WG 5A-3	PPDR	AI 1.3 (Res. 648 (WRC-12)); Res. 644 (Rev.WRC-12), Res. 646 (Rev.WRC-12), Res. 647 (Rev.WRC-12); Res. 53-1, Res. 55-1; Q. 37-6 (PPDR aspects only); Q. 209-4 (Mobile aspects only)	Amy Sanders, USA
WG 5A-4	Interference and sharing	Res. 229 (Rev.WRC-12), Res.703 (WRC-07); Rec. 34 (WRC-12); Q. 1-5, Q. 7-7 Sharing aspects of: Q. 212-4, Q. 215-4, Q. 238-2	Michael Kraemer, Germany
WG 5A-5	New technologies	SDR: Q. 230-3 CRS: Res. 58; Rec. 76 (WRC-12); Q. 241-2 ITS: AI 1.18 (Res. 654 (WRC-12), invites 205-5 WASN: Q. 250-1	Hitoshi Yoshino, Japan

Field Code Changed

Field Code Changed

Working Party 5A has appointed liaison rapporteurs for coordination activities: Dr Gabrielle Owen, The Netherlands (reports on relevant activities in certain countries in Region 1), Mr Brennan Price, USA (reports on relevant activities in certain countries in Region 2), Dr Hitoshi Yoshino, Japan (reports on relevant activities in certain countries in Region 3); Ms Amy Sanders, USA (reports Disaster relief), Mr Paul Najarian, USA (reports on ITS activities) and Dr Hitoshi Yoshino (reports WWRF, Wireless World Research Forum), and Mr Brian Copsey, UK (reports on ITU-T JCA-AHF). Working Party 5A has two Rapporteurs: Dr Gabrielle Owen for the Land Mobile Handbook (including wireless access), and Mr Christian Rissone, France, for Vocabulary. Working Party 5A also maintains a matrix of contacts with external organizations on the topics under its responsibility in accordance with Resolution ITU-R 9-4 (Annex 1 to Doc. 5A/421).

3 Executive summary of the results of the eleventh and twelfth meetings of Working Party 5A

3.1 Summary of documents approved by Working Party 5A

The guide to the use of ITU-R texts related to the land mobile service including wireless access in the fixed service was updated at the eleventh meeting of WP 5A, in May 2013, and the current version is available on the WP 5A webpage: http://www.itu.int/ITU-R/index.asp?category=study-groups&link=rwp5a&lang=en.

Working Party 5A approved a response to the request from the ITU Secretary General on the ICT Sectorial Consultation on the Role of ICTs to promote the inclusion of persons with disabilities (see Attachment 1 to Annex 2 to Doc. 5A/306).

Working Party 5A approved a revision of the ITU-R Handbook for amateur and amateur-satellite services, at its twelfth meeting in November 2013, which will replace the 2008 Edition: http://www.itu.int/en/publications/ITU-R/pages/publications.aspx?parent=R-HDB-52-2008&media=electronic

The consolidation of all the texts approved by WP 5A, including the liaison statements and proposals to Study Group 5, appears in Annex 2 to Doc. 5A/306 for the ninth meeting and Annex 2 to Doc. 5A/421 for the tenth meeting.

3.2 Summary of proposals and documents submitted by Working Party 5A to Study Group 5

3.2.1 Draft revised Recommendation proposed for consideration

Working Party 5A proposes the following draft revised Recommendation for consideration by Study Group 5 for adoption by correspondence followed by approval by correspondence:

- Draft revision of Recommendation ITU-R M.1450-4 – Characteristics of broadband radio local area networks – Doc. 5/69.

3.2.2 Draft revised and new Recommendations proposed for PSAA

Working Party 5A proposes the following draft new and revised Recommendations for consideration for PSAA by Study Group 5:

- Draft revision of Recommendation ITU-R F.1763 – Radio interface standards for broadband wireless access systems in the fixed service operating below 66 GHz – Doc. 5/71
- Draft new Recommendation ITU-R M.[AUTO] – Systems characteristics of automotive radars operating in the frequency band 76-81 GHz for intelligent transport systems applications – Doc. 5/73.

3.2.3 Suppression of Recommendations

Working Party 5A proposes the suppression of the following Recommendations for consideration by Study Group 5:

Recommendation ITU-R M.1740 (2006) “Guide to the application of ITU-R texts related to the amateur and amateur-satellite services” (to be replaced by a document on the ITU-R WP 5A web page)

Recommendation ITU-R M.1222 (1997) “Transmission of data messages on shared private land mobile radio channels” (not required after the approval of Report ITU-R M.2014-2).

3.2.4 Draft revised and new Reports

Working Party 5A proposes the following draft new and revised Reports for consideration for approval by Study Group 5:

- Draft new Report ITU-R M.[5 MHz CHAR] – Characteristics of amateur radio stations in the range 5 250-5 450 kHz for sharing studies – Doc. 5/54
- Draft new Report ITU-R M.[LMS.ATG] – Systems for public mobile communications with aircraft – Doc. 5/72

- Draft revision of Report ITU-R M.2116-1 – Characteristics of broadband wireless access systems operating in the land mobile service for use in sharing studies – Doc. 5/91.

3.2.5 Suppression of Reports

Working Party 5A proposes the suppression of the following Reports for consideration by Study Group 5:

Report ITU-R M.741 (1990) "Multi-channel land mobile systems for dispatch traffic (with or without PSTN interconnection)" (not required after the approval of Report ITU-R M.2014-2)

Report ITU-R M.901 (1990) "Frequency assignment methods for trunked mobile radio systems" (not required after the approval of Report ITU-R M.2014-2)

Report ITU-R M.1051 (1990) "Public mobile telephone service with aircraft" (not required after the approval of draft new Report ITU-R M.[LMS.ATG] in Doc. 5/72).

3.2.6 Draft new Question

Working Party 5A proposes the following draft new Question for consideration by Study Group 5:

- Draft new Question ITU-R [DOC. XXX]/5 – Operation of short-range radiocommunication public access system supporting hearing aid systems – Doc. 5/70.

3.3 Amateur and amateur-satellite services

The work on WRC-15 agenda item 1.4 was progressed; the draft CPM text and workplan for this agenda item appear in Annexes 4 and 5 of Doc. 5A/421, respectively. A working document toward preliminary draft new Report(s) on compatibility and spectrum occupancy was developed (Annex 10 to Doc. 5A/421).

3.4 Systems and standards

Work continued on the development of a draft revision of Recommendations ITU-R M.1076 (Annex 11 to Doc. 5A/421). The working documents towards preliminary draft revisions of Recommendation ITU-R M.2003 (Annex 13 to Doc. 5A/421) and Report ITU-R M.2227 (Annex 14 to Doc. 5A/421) on "Multiple gigabit wireless systems in frequencies around 60 GHz" were elevated to preliminary drafts with the intention of finalizing them at the May 2014 meeting. Work was initiated on operational guidelines for the deployment of broadband mobile systems for local coverage in the frequency bands below 6 GHz (Annex 12 to Doc. 5A/421).

3.5 Public protection and disaster relief

The work on WRC-15 agenda item 1.3 was progressed; the draft CPM text and workplan for this agenda item appear in Annexes 6 and 7 of Doc. 5A/421, respectively. Work continued towards the development of draft revisions of Recommendations ITU R M.2009 (Annex 15 and ITU-R M.2015 (Annex 19 to Doc. 5A/306). Work was initiated toward a preliminary draft new Report ITU-R M.[PPDR] "Public protection and disaster relief communications", which intended to supersede Report ITU-R M.2033 (Annex 16 to Doc. 5A/421), in support of WRC-15 agenda item 1.3.

3.6 Interference and sharing

Work continued on the development of a preliminary draft new Recommendation ITU-R M.[MS 14.5-15.35 CHAR] on characteristics of and protection criteria for systems operating in the mobile service in the frequency range 14.5-15.35 GHz (Annex 17 to Doc. 5A/421).

Working Party 5A provided information to JTG 4-5-6-7 regarding the spectrum requirements for the work on WRC-15 agenda item 1.1.

A working document was initiated towards a preliminary draft revision of Recommendation ITU-R M.1824 “System characteristics of television outside broadcast, electronic news gathering and electronic field production in the mobile service for use in sharing studies” (Annex 18 Doc. 5A/421).

3.7 New technologies

In cooperation with WP 5B, the work on WRC-15 agenda item 1.18 (invites ITU-R iii) has been progressed; the draft CPM text and workplan for this agenda item appear in Annexes 8 and 9 Doc. 5A/421, respectively. The documents on cognitive radio systems (CRS) (Annex 20 Doc. 5A/421) and intelligent transport systems (ITS) (Annex 19 to Doc. 5A/421) are being progressed.

3.8 Land Mobile Handbook

Since the publication of Volume 5 (Deployment of broadband wireless access systems) no further activity on handbooks has been undertaken yet; WP 5A is maintaining liaison with ITU-D Study Group 2 to assist them with their work.

4 Objectives for the ninth meeting of Working Party 5A

Please refer to Annex 1 of this executive Report to Study Group 5.

5 Progression of the work and concluding remarks

The work will continue by correspondence, in particular a Correspondence Group on the narrowband and wideband parts of the working document towards a draft new Report ITU-R M.[PPDR] will conduct its work using the Share Point facilities: https://extranet.itu.int/rsg-meetings/sg5/wp5a/cg-ppdr-report-n-w/

The WP 5A and wireless access systems (WAS) home pages can be found, respectively, at

http://www.itu.int/ITU-R/go/rwp5a/en

http://www.itu.int/ITU-R/go/rwp8a-was.

The Chairman thanks all the WP 5A participants for their hard work, and in particular the Chairmen of the Working Groups, Ms Amy Sanders and Messrs Dale Hughes, Lang Baozhen, Michael Kraemer, and Hitoshi Yoshino; the LMH Rapporteur, Dr Gabrielle Owen; the vocabulary Rapporteur, Mr Christian Rissone; the Liaison Rapporteurs, Mses Gabrielle Owen and Amy Sanders and Messrs Brennan Price, Paul Najarian, Hitoshi Yoshino, and Brian Copsey, UK; and the BR, in particular the WP 5A Counsellor, Mr Sergio Buonomo, and the interim WP 5A Counsellor for the twelfth meeting, Mr David Botha, for the excellent support provided at the meetings.

Annex: 1

ANNEX

Objectives for the thirteenth meeting of Working Party 5A

The principal objective for the 13th meeting of Working Party 5A is to assess any work that may need to be conducted by WP 5A in support for the preparations for WRC-15 and to continue the work on the study questions assigned to WP 5A.

Working Party 5A is to update the relevant information in Attachments 1 and 2 in Document RAG13-1/2 for posting on the webpage of Study Group 5 (cf. Doc. 5A/352).

Summarize the views of Working Party 5A on the experience and any additional comments for improvements of the demonstration version of the Recommendations database search facility, which is available at https://extranet.itu.int/itu-r/rsg/docs/filter.aspx, and convey the result to the Chairman of Study Group 5 (cf. Doc. 5A/354).

Based on the reports from the Working Groups, the following overall objectives are tentatively set for the 13th meeting of WP 5A:

1 Amateur and amateur-satellite

– Progress the work on WRC-15 agenda item 1.4, in accordance with the adopted workplan and milestones:

  i) Complete sharing studies taking into account feedback from contributing groups

  ii) Complete draft new Report(s) on sharing studies

  iii) Finalize CPM text, considering and incorporating from contributing groups

– Continue to review and update as necessary ITU-R Recommendations, Reports and Handbooks relevant to the amateur and amateur-satellite services

– Review ITU-D Questions, Recommendations, Reports and Handbooks relevant to the amateur and amateur-satellite services and, if necessary, develop liaison statements to responsible ITU-D Study Groups.

2 Systems and standards

Continue the work on WAS Study Questions on the basis of input contributions and, in particular, to continue the work on:

– Development of a preliminary draft revision of Recommendation ITU-R M.1076

– Development of a preliminary draft revision of Recommendation ITU-R M.2003

– Development of a preliminary draft revision of Report ITU-R M.2227

– Development of a working document on operational guidelines for the deployment of broadband mobile systems for local coverage in the frequency bands below 6 GHz.

3 Public protection and disaster relief

– Continue the development of the new Report on narrowband, wideband and broadband PPDR based on input contributions

– Continue the development of working document toward a preliminary draft revision of Recommendation ITU-R M.2009 based on input contributions

– Continue development of the working document toward a preliminary draft revision of Recommendation ITU-R M.2015 based on input contributions, and

– Finalize draft CPM text for WRC-15 agenda item 1.3 based on the results of studies and input contributions.

4 Interference and sharing

– Continue the development of the draft revision of Recommendation ITU-R M.1824 on system characteristics of television outside broadcast, electronic news gathering and electronic field production in the mobile service for use in sharing studies

– Further progress the development of the preliminary draft new Recommendation ITU-R M.[MS 14.5-15.35 CHAR] on characteristics of and protection criteria for systems operating in the mobile service in the frequency range 14.5-15.35 GHz

– Consider the new approach for base station antenna modelling for land mobile systems based on the proposal transferred from WP 5C (see section 14 of Document 5C/155).

5 New technologies

– Further develop a PDN Reports ITU-R M.[LMS.CRS2] on cognitive radio systems in accordance with Question ITU-R 241-1/5 and Resolution ITU-R 58,with an aim to finalize it in its 13th meeting in May 2013

– Continue the development of working document towards a preliminary draft new Recommendation ITU-R M.[V2X], and working document towards a preliminary draft revision of Report ITU-R M.2228 on advanced ITS radiocommunications

– Continue to work with WP 5B on WRC-15 agenda item 1.18 on systems characteristics of automotive radars operating in the frequency band 76-81 GHz for ITS applications.

6 Land Mobile Handbook

– With the completion of 5 volumes of the Land Mobile Handbook (including wireless access), no particular objectives are set for the next meeting. The development of future volumes will be contribution driven.

7 Vocabulary

– Continue the development of the land mobile vocabulary (Annex 25 to Doc. 5A/79) with a view to develop either a new Recommendation or a future revision of the existing Recommendation ITU-R M.1797.

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Executive Report on the eleventh and twelth meetings of working party 5B

Document 5/94-E
2 December 2013
English only

Chairman, Working Party 5B

EXECUTIVE REPORT ON THE ELEVENTH AND TWELTH MEETINGS OF WORKING PARTY 5B

(Geneva, 20th – 31st May and 18th – 29th November 2013)

1 Introduction

Working Party (WP) 5B has held 2 meetings since the last meeting of Study Group 5 considering a total of 306 contributions pertaining to the radiodetermination, maritime mobile and aeronautical mobile services. These were handled by 4 Working Groups which focused primarily on the preparatory work for the 5 WRC-15 agenda items under its purview and providing information to other Working Parties who have responsibility for agenda items that WP 5B is an interested party. Additionally work has been undertaken on reviewing the target date of questions related to the work of WP 5B.

The working party has on average been attended by 263 delegates, representing 43 Administrations, 8 Recognized Operating Agencies, 6 Scientific or Industrial Organizations, 3 Regional or other International Organizations and 3 Specialized Agencies of the United Nations.

The working party formed the following working groups (WG):

WG	Subject	Chairman
5B-1	Radiodetermination	Mr D. Reed (USA)
5B-2	Aeronautical	Mr M. Weber (D)
5B-3	Maritime	Mr F. Huang (CHN)
5B-4	Other	Mr A. Roy (ASRI)

2 Executive Summary

The Working Party has started its work on the Reports, Recommendations and draft CPM texts related to the various WRC-15 agenda items under the purview of WP 5B. In addition WP 5B have developed 3 draft revisions to ITU-R Recommendations, 8 draft revisions to ITU-R Reports and a request to establish a database on oceanographic radar which have been submitted to Study Group 5 for consideration.

62 liaison statements have been prepared to other Working Parties, Task Groups and International Organizations as well as 38 preliminary texts for further consideration at the next meeting of WP 5B.

2.1 Actions of relevance to Study Group 5

2.1.1 Progress on documents referenced in draft CPM text

Draft CPM texts for all 5 of the WRC-15 agenda items under the purview of WP 5B have been started and continue to be developed. Work plans and milestones for these agenda items have also been developed and are being updated in response to the progress made at each meeting. Additionally work has started on a number of Reports that are related to these agenda items and other items under the purview of WP 5B.

A summary of the document related to the 5 WRC-15 agenda items under the purview of WP 5B is given below.

WRC		Issue	Document		Reference
AI	Res		Type	Title	
1.5	153	Use of satellites operating in the fixed satellite service for the provision of command and non-payload communication for unmanned aircraft systems	Draft CPM text	Working document towards draft CPM text for WRC-15 agenda item 1.5	5B/475 (Annex 1)
			Work plan/Milestones	Work plan and milestones for WRC-15 agenda item 1.5	5B/475 (Annex 2)
			Report	Working document towards a preliminary draft new Report ITU-R M.[UAS-FSS] – Studies to support the beyond line-of-sight CNPC mobile links for UAS in certain frequency bands allocated to FSS	5B/475 (Annex 25)
1.15	358	On-board (including close proximity) ship communication	Draft CPM text	Working document towards draft CPM text for WRC-15 agenda item 1.15	5B/475 (Annex 3)
			Work plan/Milestones	Work plan and milestones for WRC-15 agenda item 1.15	5B/475 (Annex 4)
1.16	360	New automatic identification system (AIS) applications	Draft CPM text	Working document towards draft CPM text for WRC-15 agenda item 1.16	5B/475 (Annex 5)
			Work plan/Milestones	Work plan and milestones for WRC-15 agenda item 1.16	5B/475 (Annex 6)
			Other	Working document in order to template the studies dealing with the identification for the channelling plan for VDES under agenda item 1.16	5B/475 (Annex 38)
1.17	423	Wireless avionics intra-communications (wireless aircraft on-board communication)	Draft CPM text	Working document towards draft CPM text for WRC-15 agenda item 1.17	5B/475 (Annex 7)
			Work plan/Milestones	Work plan and milestones for WRC-15 agenda item 1.17	5B/475 (Annex 8)
			Recommendation	Draft new Report ITU-R M.[WAIC_CHAR_SPEC]- Technical characteristics and spectrum requirements of Wireless Avionics Intra-Communications systems to support their safe operation	5/51
			Recommendation	Working document towards a preliminary draft new Recommendation ITU-R M.[WAIC] - Definitions, technical characteristics and protection criteria for Wireless Avionics Intra-Communications systems	5B/475 (Annex 22)
			Report	Working document towards a preliminary draft new Report ITU-R M.[WAIC_CHAR_SPEC] – Characteristics of WAIC systems and bandwidth requirements to support their safe operation	5B/475 (Annex 21)
			Report	Working document towards a preliminary draft new Report ITU-R M.[WAIC-SHARING_2 700-2 900 MHz] - Sharing analyses between wireless avionics intra-Communications and systems operating under an existing allocation in the frequency band 2 700-2 900 MHz	5B/304 (Annex 42)
			Report	Working document towards a preliminary draft new Report ITU-R M.[WAIC_SHARING_4 200-4 400MHz] - Compatibility analysis between wireless avionics intra-communications systems and systems in the existing services in the frequency band 4 200-4 400 MHz	5B/475 (Annex 28)

			Report	Working document towards a preliminary draft new Report ITU-R M.[WAIC-SHARING_5 350-5 460 MHz] - Sharing analyses between wireless avionics intra-communication systems and other systems operating under allocations in the frequency band 5 350-5 460 MHz	5B/475 (Annex 27)
			Report	Working document towards a preliminary draft new Report ITU-R M.[WAIC_SHARING_22/23 GHZ] - Sharing studies between wireless avionics intra-communications systems and systems in the 22.5-22.55 GHz and 23.55-23.6 GHz frequency bands	5B/475 (Annex 34)
			Report	Working document towards a preliminary draft new Report ITU-R M.[WAIC BANDS] – Analysis of the aeronautical mobile (route), aeronautical mobile and aeronautical radionavigation services to accommodate wireless avionics intra-communications	5B/475 (Annex 36)
1.18	**654**	Automotive radar in the frequency range 77.5-78 GHz	Draft CPM text	Working document towards draft CPM text for WRC-15 agenda item 1.18	5B/475 (Annex 9)
			Work plan/Milestones	Work plan and milestones for WRC-15 agenda item 1.18	5B/475 (Annex 10)
			Report	Working document towards a preliminary draft new Report ITU-R M.[AUTOMOTIVE RADARS] – Systems characteristics and compatibility of automotive radars operating in the 77.5-78 GHz band for sharing studies	5B/475 (Annex 29)

Note: At the time of the Study Group 5 meeting these documents were not available

2.1.2 Progress on other documents

Since the last Study Group 5 meeting WP 5B has continued work on updating recommendations under its purview and 3 draft revisions to ITU-R recommendations have been submitted to Study Group 5 for consideration. Additionally 8 draft new reports have been developed and a request for the establishment of an oceanographic radar database within the ITU-R produced on which WP 5B would request approval by Study Group 5.

Work continues on the revision of 8existing ITU-R Recommendations, the development of 6 new ITU-R Recommendations and the development of 13 new ITU-R Reports.

2.1.3 Documents for approval by Study Group 5

2.1.3.1 Recommendations

Document Number	Title	WRC Related	Requested Action
5/51	Draft new Report ITU-R M.[WAIC_CHAR_SPEC]- Technical characteristics and spectrum requirements of Wireless Avionics Intra-Communications systems to support their safe operation	Yes	Approval
5/55	Draft new Recommendation – Operational and technical characteristics and protection criteria of radio altimeters utilizing the frequency band 4 200 – 4 400 MHz	No	Approval
5/57	Draft new Report - Compatibility of radionavigation satellite service (space-to-Earth) Systems and Radars Operating in the frequency band 1 215-1 300 MHz	No	Approval
5/74	Draft revision of Recommendation ITU-R M.2008-0 – Characteristics and protection criteria for radars operating in the aeronautical radionavigation service in the frequency band 13.25 – 13.40 GHz	No	PSAA
5/75	Draft new Report ITU-R M.[MAN OVERBOARD SYSTEMS] - Maritime survivor locating systems and devices (man overboard systems) - An overview of systems and their mode of operation	No	Approval
5/76	Draft new Report ITU-R M.[TELE-CHAR] – Operational characteristics of aeronautical mobile telemetry systems	No	Approval
5/77	Draft new Report ITU-R M.[VDL-LOADING]- Automatic identification system VHF data link loading	No	Approval
5/78	Draft revision of Recommendation ITU-R M.1371-4 - Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile band	No	PSAA
5/81	Draft revision of Recommendation ITU-R M.1796-1 - Characteristics of and protection criteria for terrestrial radars operating in the radiodetermination service in the frequency band 8 500-10 680 MHz	No	PSAA
5/82	Draft new Report ITU-R M.[VOICE-DATA] - Digital voice communication system on MF/HF radio channels of the maritime mobile service for shore-to-ship/ship-to-shore applications	No	Approval
5/83	Draft new Recommendation ITU-R M.[NAVDAT-HF] - Characteristics of a digital system, named navigational data for broadcasting maritime safety and security related information from shore-to-ship in the maritime HF frequency band	No	PSAA
5/93	Note from Study Group 5 to the Director, Radiocommunication Bureau - Development of a database of oceanographic radars	No	Approval

2.1.4 Review of Questions assigned to Working Party 5B

Subsequent to the last meeting of Study Group no further questions assigned to WP 5B have been identified for deletion however it is proposed to further review the continued need for the questions and the target dates at the end of the study cycle.

2.1.5 Resolution ITU-R 60 – Power efficiency

No contributions have been received by WP 5B from administrations on this issue however in various discussions the various points have been raised that WP 5B would ask Study Group 5 to take into account when reporting on its activities with respect to Resolution ITU-R 60.

– Aeronautical and maritime systems are designed to expedite the passage of aircraft and ships from one port to another safely in a manner that reduces the flight/voyage time and hence reduces the fuel burnt in undertaking that flight/voyage. Since this fuel/energy saving is significantly greater than any saving that might result from improving the power efficiency of the radio equipment used to facilitate such flights/voyages it is felt more prudent to concentrate on designing systems to further expedite the passage of aircraft/ships rather than on the power efficiency of the radio equipment.

– Where aviation is looking at employing energy efficient systems that are powered through fuel harvesting there is a dilemma because in order to design a robust system that can be powered by such a means spectral efficiency has to be sacrificed.

– In certain cases the introduction of green systems such as windfarms or ships partially powered by kites, additional equipment needs to be installed to either detect the presence of such systems or to mitigate their effects on aeronautical and maritime navigational radio systems.

2.1.6 Resolution ITU-R 62 – Conformance/Interoperability

The work of WP 5B is closely related to that of 3 other UN bodies:

– International Civil Aviation Organization

– International Maritime Organization

– World Meteorological Organization.

Due to the global nature of these organizations they are interested in ensuring that their systems are globally interoperable and hence they have well established mechanisms for developing globally harmonised standards and recommended practices. These standards and recommended practices, when addressing radio systems take into account and ensure conformance of such systems to the ITU Radio Regulations.

Additionally, since these systems are routinely used for ensuring the safety of human life and property there is a significant regulatory framework and conformance testing already carried out to ensure that these standards and recommended practices are adhered too.

In the view of WP 5B therefore, there is no need for the ITU to take any further action towards ensuring conformance or interoperability with the ITU Radio Regulations as any such action may be counterproductive.

2.1.7 Liaison Rapporteurs and Correspondence Groups

The Working Party considered the list of liaison Rapporteurs and Correspondence Groups. Both means are considered efficient and WP 5B will continue to take advantage of these procedures.

Working Party 5B confirmed the need to maintain the four existing Correspondence Groups to facilitate and accelerate the work to be carried out with the minor amendment to the terms of reference for Radar WG to include specific mention of oceanographic radar. The groups are supported by e-mail reflectors. Each e-mail reflector has a related archive, which shows all e-mails that have been sent previously to that reflector.

For the time being the following Correspondence Groups are active:

Correspondence Group	**Convenor**
Radar WG	Mr D. Franc (USA) Mr R. Leck (USA)
Maritime WG	Mr F. Huang (CHN)
Aeronautical WG	Mr M. Weber (D)
Report/Recommendation maintenance	Mr M. Weber (D)

For the complete information on the Correspondence Groups please visit the WP 5B website.

At this meeting, WP 5B nominated various Rapporteurs to help the Working Party to deal with these issues and recommended to keep liaison with other groups via these Rapporteurs. The WP 5B Rapporteurs to other groups are as follows:

JTG 4-5-6-7	Mr John Mettrop (UK)
WP 1A	Mr John Mettrop (UK)
WP 6A	Mr John Shaw (UK)
IEC-TC80 on test standards for GMDSS equipment	Mr Kim Fisher (UK)
IALA	Mr Christian Rissone (F) Mr William Kautz (USA)
ISO	Mr Jon Turban (USA) Mr Stephen Ward (USA)

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executive report oN the eleventh and twelfth meetings of working party 5C

Radiocommunication Study Groups

Document 5/92-E
29 November 2013
English only

Chairman, Working Party 5C

EXECUTIVE REPORT ON THE ELEVENTH AND TWELFTH MEETINGS OF WORKING PARTY 5C

1 Introduction

Working Party 5C held its eleventh meeting from May 20-29, 2013 and its twelfth meeting from 18-27 November 2013 in Geneva, Switzerland chaired by Charles Glass (United States). The meeting participants can be found in Documents 5C/170 and 5C/234).

The eleventh meeting dealt with 53 input documents and upon their consideration the meeting prepared 36 output temporary documents. The Chairman's Report is in Document 5C/171.

The twelfth meeting dealt with fifty-seven (57) input documents to the meeting and four (4) liaison documents (Documents 230 – 233) received during the meeting. Upon their consideration the meeting prepared twenty-five (25) output temporary documents. The Chairman's Report is in Document 5C/235.

2 Structure of Working Party 5C

The structure of Working Party 5C (WP 5C) for the eleventh and twelfth meetings was as follows:

Name	Issues	Chairs
WG 5C-1	Issues addressing spectrum at or below 30 MHz	Charles Glass (United States)
WG 5C-2	Issues addressing spectrum greater than 30 MHz but less than 18 GHz	Nasarat Ali (U.K.)
WG 5C-3	Issues addressing spectrum equal to or greater than 18 GHz and general contributions that have not been assigned to any particular WG. This Group will also address the WP 5C view on SDR/CRS	Roger Bunch (Australia)
WG 5C-4	Review and proposed revisions of Recommendations and Reports not related to WRC-12 agenda items	Akira Hashimoto (Japan)

Working Party 5C has appointed liaison Rapporteurs as appropriate for coordination activities.

3 Summary of proposals and documents submitted by Working Party 5C to Study Group 5

3.1 Draft Recommendations

Working Party 5C has submitted four (4) draft revisions of Recommendations as shown below:

Document	Title
5/53	Draft revision of Recommendation ITU-R F.557-4 – Availability objective for radio-relay systems over a hypothetical reference circuit and a hypothetical reference digital path
5/85	draft revision of Recommendation ITU-R F.1336-3 – "Reference radiation patterns of omnidirectional, sectoral and other antennas for the fixed and mobile services for use in sharing studies in the frequency range from 400 MHz to about 70 GHz"
5/86	draft revision of Recommendation ITU-R F.1497-1 – "Radio-frequency channel arrangements for fixed wireless systems operating in the band 55.78-59 GHz"
5/90	Draft revision of Recommendation ITU-R F.1105-2 – "Fixed wireless systems for disaster mitigation and relief operations"

3.2 Editorial updating of Recommendations

Working Party 5C has submitted three (3) editorial updating of Recommendations as shown below:

Document	Title
5/87	draft editorial update of Recommendation ITU-R F.746-10 – "Radio-frequency arrangements for fixed service systems"

Note: This editorial updating should only occur upon final approval of the draft revision of Recommendation ITU-R F.1497-1 provided in Document 5/86.

3.3 Suppression of Recommendations

Working Party 5C developed two (2) proposals for suppression as shown below:

Document	Title
5/52	Proposed suppression of Recommendation ITU-R SF.357-4
5/84	Proposal for suppression of Recommendation ITU-R SF.356-4

3.4 Draft Reports

Working Party 5C developed one (1) proposal for a draft new Report as shown below:

Document	Title
5/88	draft new Report ITU-R F.[ANALOG] - List of ITU-R Recommendations on analogue systems in the fixed service

3.5 Draft Questions

Working Party 5C had no input for the November 2013 Study Group 5 meeting.

4 Summary of the results of the Eleventh meeting of Working Party 5C

Working Party 5C approved 18 liaison statements to other groups.

The consolidation of texts approved at the tenth meeting of WP 5C is in Annex 18 to Document 5C/171.

Working Party 5C met jointly with WP 5A to discuss documents of joint concern. The joint ad hoc meeting agreed to:

– continue the correspondence group on cross border coordination;

– jointly approve Recommendation ITU-R F.1336 for use in Joint Task Group 4-5-6-7 for antenna patterns below 1 GHz;

– jointly develop liaison activities with ITU-T.

4.1 Fixed and land mobile systems operating at or below 30 MHz

Working Group 5C-1 (WG 5C-1) deals with HF fixed service and land mobile matters. WG 5C-1 chaired by Mr Charles Glass (USA) met once and considered three (3) input contributions to this meeting of WP 5C. WG 5C-1 developed three (3) joint liaisons statements for joint contribution from WPs 5A, 5B, and 5C addressing issues under development in ITU-T. Additional work within WG 5C-1 was deferred to the next meeting of WP 5C with a call to administrations to provide input contributions to the next meeting. This work includes development of the HF Handbook, the adaptive HF tutorial Handbook, and work on Recommendations.

4.2 Fixed systems operating above 30 MHz but less than 18 GHz

Working Group 5C-2 (WG 5C-2), chaired by Mr Nasarat Ali (UK), met twice and considered 20 input documents including Annexes 13 and 14 to Document 5C/47 and Annex 10 to Document 5C/602, Chairman's Reports of the previous WP 5C meetings. WG 5C-2 developed 12 output documents in the form of, 9 liaison statements and 3 working documents to be carried forward to the next meeting. In addition WG 5C-2 noted without a need for an action on Documents 5C/116-119, 5C/122-123, 5C/129 and 5C/135.

Administrations are invited to consider contributions to the next meeting of WP 5C on electronic news gathering activity under Resolution ITU-R 59 (see sections 3.4.1 and 3.4.4 of this document) taking into account work plan given in Annex 3 to Document 5C/171.

4.2.1 Electronic news gathering (ENG)

A drafting group (DG 5C-2a) was created to address this issue in detail.

During discussions it was noted that the BR Director had been invited by the RAG (see Document 5C/169), in relation to the instruction in Resolution ITU-R 59, to develop a webpage to consolidate links to administration lists of information on ENG, and to develop the frequency database for ENG. WG 5C-2 considered and developed the initial elements towards possible format of the ENG database (see Annex 1 to Document 5C/171). It was proposed that the list found in Annex 1 be considered towards developing examples of the ENG information which may be submitted by member states to the BR. Annex 2 is given as an example of the ENG information which may be submitted by member states to the BR for the development of a database on ENG applications within an administration, specifically whether the criteria and parameters listed are appropriate.

4.2.2 Liaison statements

Document number	Destination	Topic
Annex 15 to 5C/171	IEEE	Studies on availability of frequency bands and/or tuning ranges for worldwide and/or regional harmonisation and conditions for their use by terrestrial electronic news gathering systems
5A/307; 7B/162	WPs 5A and 7B	Description of certain electronic news gathering (ENG) systems operating in the 2 025-2 110 MHz band
4A/249; 5A/313; 7B/166	WP 4A (WPs 5A and 7B for information)	WRC-15 agenda item 1.9.1
4A/248	WP 4A	WRC-15 agenda item 1.6
Annex 16 to 5C/171	ETSI	Studies on availability of frequency bands and/or tuning ranges for worldwide and/or regional harmonisation and conditions for their use by terrestrial electronic news gathering systems
4-5-6-7/136; 5D/327	JTG 4-5-6-7 (WP 7D for information)	Update of fixed service characteristics, protection criteria and modelling for WRC-15 agenda item 1.1
4A/250	WP 4A	WRC-15 agenda item 1.8
5A/310; 5D/324; 5B/308	WPs 5A and 5D (copy to WP 5B)	Studies on availability of frequency bands and/or tuning ranges for worldwide and/or regional harmonization and conditions for their use by terrestrial electronic news gathering systems
7C/136	WP 7C	WRC-15 agenda item 1.12 – Sharing studies between the Earth exploration satellite service and the fixed service in the frequency bands 8 700-8 750 MHz and 10 000-10 500 MHz

4.2.3 Documents to be attached to the Chairman's Report

Administrations are urged to contribute on the following documents under Resolution ITU-R 59.

Document number	Description
Annex 1 to 5C/171	Format for ENG database – Studies on availability of frequency bands and/or tuning ranges for worldwide and/or regional harmonisation and conditions for their use by terrestrial electronic news gathering systems
Annex 2 to 5C/171	Preliminary draft new Report – Sharing and compatibility issues between ENG and other systems in frequency bands allocated to the fixed and mobile and broadcasting services
Annex 3 to 5C/171	Proposal for Working Party 5C work plan – Studies on availability of frequency bands and/or tuning ranges for worldwide and/or regional harmonisation and conditions for their use by terrestrial electronic news gathering systems

4.2.4 Final comments

The WG 5C-2 Chairman, Mr Ali, would like to thank the participants for their efficient working methods in the progress of the meeting. He also expresses thanks to Mr Bunch (Australia), Mr Glass (USA) and Mr Guyomard (France and ESA), Chairmen/Coordinators of the Drafting Group activity within WG 5C-2.

4.3 Fixed systems operating at frequencies equal to or greater than 18 GHz and general contributions that have not been assigned to any particular WG including the WP 5C view on SDR/CRS

At its May 2013 meeting (20-29 May) Working Party 5C established Working Group 5C-3 (WG 5C-3) to deal with f**ixed systems operating at frequencies equal to or greater than 18 GHz**. WP 5C requested that Mr R. Bunch (Australia) chairs WG 5C-3.

Working Group 5C-3 dealing with fixed service using frequencies above 18 GHz and general issues met three times and considered the following documents:

5C/602 (**Annex 6)** (November 2011), 5C/112 (**Annex 2),** 5C/113 (WP 5B), 5C/114 (WP 5A), 5C/124 (WP 5D), 5C/125 (WP 5D), 5C/126 (ITU-T SG 16), 5C/133 (ITU-T SG 13), 5C/134 (France), 5C/139 (ETSI), 5C/148 (Canada), 5C/150 (TP SA), 5C/159 (Chair CG).

All Working Groups were requested by the Chairman of Working Party 5C to also consider an appropriate response to Document 5C/132 *"Assignment of a document submitted to Study Group 5 – ITU-R Study Groups Vocabulary work"*.

Working Group 5C-3 decided to develop liaison statements at the WG level in response to Documents 5C/113 (WP 5B), 114 (WP 5A), 126 (ITU-T SG 16), 5C/133 (ITU-T SG 13).

4.3.1 The following Drafting Groups established and the documents allocated in the following manner:

DG 5C3-1 Working document towards a preliminary draft new Handbook ITU-R F.[CROSS-BORDER];

DG 5C3-2 SDR / CRS;

DG 5C3-3 Working document towards a preliminary draft new Report ITU-R F.[FS/RADAR COEXISTENCE IN 71-86 GHz] – Coexistence between fixed service operating in 71-76 GHz and 81-86 GHz and vehicular collision avoidance radar operating in the bands 76-77 GHz and 81-86 GHz;

DG5C3-4 Antenna distribution.

The Drafting Groups were organised as follows:

DG 5C3-1 chaired by Mr E. Tonkikh (Russian Federation)

DG 5C3-2 chaired by Mr R. Macchi (Italy)

DG 5C3-3 chaired by Mr M. Christensen (Canada)

DG 5C3-4 chaired by Mr B. Lagarde (France) and Mr G. Zagorda (TP SA).

4.3.2 Working Group 5C-3 developed 5 output documents in the form of, 1 draft liaison statement, 3 working documents towards preliminary drafts to be carried forward to the next meeting and a work plan for further activity on development of guidance for bilateral/multilateral discussions on use frequency range 29.7 MHz-43.5 GHz by fixed/land mobile systems:

Doc.	Title
Annex 04 to Doc. 5C/171	Cross-border Handbook work plan – Further activity on development of guidance for bilateral/multilateral discussions on use frequency range 29.7 MHz – 43.5 GHz by fixed/land mobile systems
Annex 05 to Doc. 5C/171	Working document towards a preliminary draft new Report ITU-R F.[FS-SDR] – The impact of software-defined radio (SDR) and cognitive radio systems (CRS) on the fixed service
5A/309 5B/307	Draft liaison statement to Working Parties 5A and 5B – Potential impact to the fixed service from automotive collision avoidance radar in adjacent frequency bands 76-77 GHz and 77-81 GHz
Annex 06 to Doc. 5C/171	Working document towards a preliminary draft new Report ITU-R F.[FS/RADAR COEXISTENCE IN 71-86 GHz] – Coexistence between fixed service operating in 71-76 GHz and 81-86 GHz and automotive collision avoidance radar operating in the bands 76-77 GHz and 77-81 GHz
Annex 07 to Doc. 5C/171	Working document towards a preliminary draft new Handbook ITU-R F.[CROSS-BORDER] – Guidance for bilateral/multilateral discussions on use frequency range 29.7 MHz-43.5 GHz by fixed/land mobile systems.

Administrations are urged to consider the following in preparation for the next WP 5C meeting.

4.3.3 Working document towards a preliminary draft new Handbook ITU-R F.[CROSS-BORDER]

Working Parties 5A and 5C are now developing new ITU-R Handbook “Guidance for bilateral/multilateral discussions on use of frequency range 29.7 MHz – [43.5 GHz] by fixed/land mobile systems”. There were no proposals from administrations to update or modify this document from November 2012 meeting at the May 2013 meeting except the contribution and editorial proposal from Joint Correspondence Group 5A/5C Chairman which became the basis of latest changes of draft Handbook as it was reported during the WP 5A and WP 5C May 2013 meetings (Document 5C/159 – 5A/284).

Taking into account the lack of administrations’ activity and tentative status of the document WP 5C decided to develop a work plan to outline expected updates of document and date(s) of finalizing this work. Refer Annexes 4 and 7 to Document 5C/171.

4.3.4 Working document towards a preliminary draft new Report ITU-R F.[FS-SDR]

To its May 2013 meeting WP 5C received Document 5C/139 “Liaison statement on DNR ITU-R F.[FS-SDR] – *Software-defined radio information on ETSI and ECC related activities”*.

ETSI ATTM (Technical Committee for Access Terminals, Transmission and Multiplexing) WG TM4 advised it is responsible for fixed radio systems issues and indicated it is aware of the current ITU-R WP 5C activity on the development of DNR ITU-R F.[FS-SDR].

It noted in Annex 6 to Document 5C/602 that ETSI EN 302 217-2-2 is presently referenced. That ETSI EN contained technical information on the use of Adaptive Transmit Power Control (ATPC), Remote Transmit Power Control (RTPC), Adaptive Modulation (AM, Mixed-mode in ETSI TM4 terminology) and Bandwidth Adaptive (BA) systems.

WG TM4 in Document 5C/139 advised that it has recently completed an extensive revision of the EN 302 217-2-2, which also transposed most of the ATPC, RTPC, AM and BA background to a specific new Technical Report TR 103 103 with significant up-dating, improvement in the content and the revised EN 302 217-2-2 still maintains a reduced set of information on how those adaptive

technologies should be used for the harmonised CE marking and relevant equipment assessment under the 1999/5/EC Directive.

WG TM4 informed WP 5C that the TR 103 103 has also been extensively used within CEPT/ECC PT SE19 for developing similar guidelines for the administrations approaching these systems from the point of view of link planning and administrative provisions. This new ECC Report 198 is also freely available at the CEPT/ECO website: http://www.erodocdb.dk/doks/doccategoryECC.aspx?doccatid=4.

Taking these matters into account WP5C took the following action in the further development of DNReport ITU-R F.[FS-SDR]:

– The reference to ETSI TR 103 103 is added to the present reference to ETSI EN 302 217-2-2.

– A new reference to CEPT/ECC Report 198 is inserted.

– The updated PDNReport ITU-R F.[FS-SDR] has been attached to the chairman report (see Document 5C/171 (Annex 5)).

Working Party 5C seeks contributions to its next meeting which consider:

– inclusion into the DNReport ITU-R F.[FS-SDR], of some parts (texts and/or graphics) of ETSI TR 103 103 (see Annex 1 to Document 5C/139) noting that WP 5C can improve or modify these parts, according to the need, as per the provisions of the existing MoU between ETSI and ITU (see Annex 2 to Document 5C/139: ETSI-ITU Memorandum of Understanding);

– comments/suggestions for improvement to the present version of TR 103 103 for its future revision; and

– whether SDR / CRS applications should be considered for deployment in frequency bands below 30 MHz.

Questions on the technical content of the above ETSI documents may be directly addressed to the ETSI WG ATTM/TM4 Chairman <Roberto.macchi@siaemic.it>.

4.3.5 Modifications to working document towards a preliminary draft new Report ITU-R F.[FS/RADAR COEXISTENCE IN 71-86 GHz]

Working Party 5C has made additional progress on its studies to assess compatibility between fixed services operating in the frequency bands 71-76 GHz and 81-86 GHz and automotive radars in the adjacent band. An updated version of this work is attached. Although this work is still in a preliminary state, WP 5C would welcome comments on this document, particularly regarding the parameters and assumptions used for the automotive radar systems.

4.3.6 Statistical distribution of antenna elevation angles

The Chairman's Report of the tenth meeting of Working Party 5C (Document 5C/112) requested administrations to consider contributions on the statistical distribution of antenna elevation angles.

To its May 2013 meeting Working Party 5C received two contributions on this topic (Documents 5C/134 and 5C/150).

Working Party 5C was requested to consider:

– antenna elevation angles according to frequency bands in the range 1.4 to 80 GHz;

– the percentage of each elevation angle in linear and in logarithmic scale and as cumulative value;

– equations used for the evaluation of the elevation angles.

Working Party 5C considered the information within these contributions to be valuable and should be retained for possible inclusion of the data in:

– a new working document towards a report on statistical distribution of elevation angles of antennas deployed in the fixed service;

– further development of the working document towards a preliminary draft new Report on FS use and future trends or a possible new ITU-R Recommendation;

– further updates to Recommendation ITU-R F.758 "*System parameters and considerations in the development of criteria for sharing or compatibility between digital fixed wireless systems in the fixed service and systems in other services and other sources of interference*".

Working Party 5C calls for further contributions on this topic to its next meeting in November 2013 towards the development of a profile of elevation angles of antennas and antenna heights deployed in the fixed service.

4.3.7 The WG 5C-3 Chairman, Mr Roger Bunch, thanked all the delegates, the Chairmen of the drafting groups, the BR staff for the excellent work and for their very efficient support during the meeting.

4.4 Working Group 5C-4 – Review of Recommendations assigned to WP 5C

Working Group 5C-4 (WG 5C-4) addressed the review and proposed revisions of Recommendations not directly related to WRC-15 agenda items. The WG was chaired by Mr Akira Hashimoto (Japan). At this meeting, 17 new inputs and 6 preliminary texts contained in the past Chairman's Report were assigned to this Working Group for consideration.

During this meeting, WG 5C-4 organized two Drafting Groups to carry out the works on specific topics.

	Terms of reference	Chairman
DG 5C4a	Revision of Recommendation ITU-R F.1336-3	Mr Masaharu Araki
DG 5C4b	Development of new Report ITU-R F.[FS USE-TRENDS]	Mr Shinya Otsuki

Through three meetings and the work conducted by the drafting groups, WG 5C-4 produced the 17 outputs in total, as elaborated in § 1.1 to 1.3.

4.4.1 Issues directly considered in Working Group 5C-4

4.4.1.1 Draft revision of Recommendation ITU-R F.557-4 "Availability objectives for radio-relay systems over a hypothetical reference digital path"

Based on the input from Japan (Document 5C/156), the preliminary draft revision of Recommendation ITU-R F.557-4 (Annex 3 to Document 5C/112) was further refined. It was agreed to submit to Study Group 5 as a draft revision of Recommendation (Document 5/53). During the work, the scope has been slightly reviewed to make a new reference to a draft new Report ITU-R F.[ANALOG] listing the F-series Recommendations on analogue systems, most of which were already suppressed. This Report is developed based on Ex-Recommendation ITU-R F.745-1 and for the purpose of supplementing the information on analogue systems already removed from the valid Recommendations. The work on this Report is to be completed at the next meeting in November 2013 before the text of the draft revision of Recommendation ITU-R F.557-4 is considered by the Study Group 5 meeting (Annex 11 to Document 5C/171).

4.4.1.2 Suppression of Recommendation ITU-R SF.357-4 "Maximum allowable values of interference in a telephone channel of an analogue angle-modulated radio-relay system sharing the same frequency bands as systems in the FSS"

At the previous meeting, Working Party 5C proposed the suppression of Recommendation ITU-R SF.357-4, since it was general attempt for Working Party 5C to suppress Recommendations on analogue systems in F-series or the SF-series, or to remove analogue-related elements from their texts. Therefore, Working Party 5C sent the liaison statement to Working Party 4A seeking their view on this suppression while the draft proposal was attached to the Chairman's Report waiting for a response from WP 4A (Annex 6 to Document 5C/112).

At this meeting, Working Party 4A replied and agreed to this proposal (Document 5C/163). With this agreement, Working Party 5C decided to propose the suppression to the next Study Group 5 meeting (Document 5/52), and sent a liaison statement to Working Party 4A expecting the same action by Working Party 4A to Study Group 4 (Document 4A/247).

4.4.1.3 Discussion on the proposed suppression of Recommendation ITU-R F.1502 "Protection of the FS in the frequency band 8 025-8 400 MHz sharing with GSO-satellite systems of the EESS (space-to-Earth)"

At the previous meeting, Working Party 5C considered the suppression of the above Recommendation. However, it was not agreed by Russian Federation with the reason that more time was needed for consideration on the proposed suppression. The draft text for the suppression was attached to the WP 5C Chairman's Report to be considered at this meeting (Annex 5 to Document 5C/112).

At this time, Russian Federation submitted an input document (Document 5C/143) to clarify their reason for further consideration. According to Russia's view, the language used in RR footnote **5.462A** stipulating the pfd mask (approved at WRC-12 based on the specified values in Recommendation ITU-R F.1502) has ambiguity in its interpretation (and thereby in the application of the pfd), and proposed that WP 5C or a concerned administration should send the request to the Radio Regulations Board (RRB) to clarify this point.

Recognizing that WP 5C cannot send such a request to the RRB but administrations can, the meeting encouraged Russian Federation to send their message to the RRB. WP 5C may consider at its future opportunity to raise the issue as a topic for the BR Director's Report to the next WRC, if the matter is not solved by the suggested action. Through these discussions, it was also agreed to postpone the consideration of the proposed suppression of Recommendation ITU-R F.1502 until full agreement could be reached within WP 5C.

4.4.1.4 Preliminary draft revision of Recommendation ITU-R F.1105-2 "Fixed wireless systems for disaster mitigation and relief operations"

Japan's input document (Document 5C/157) proposed the revision of this Recommendation by adding new description on transportable fixed wireless systems used for mobile backhaul links, which are interoperable with a transportable mobile base station in the same vehicle.

Since this Recommendation is under joint responsibility between WPs 5C and 5A and the proposal included the information on the transportable mobile base stations, participation from Working Party 5A was invited at the joint ad hoc meeting of both Working Parties.

As the result of the discussion, it was agreed to start the revision work of this Recommendation as proposed (Annex 9 to Document 5C/171). Also, since it was pointed out that the work has some relevance to Question 22-1/2 of ITU-D, Utilization of telecommunications/ICT for disaster preparedness, mitigation and response, a joint liaison statement was sent to ITU-D Study Group 2 informing of this revision work (Annex 14 to Document 5C/171).

4.4.1.5 Preliminary draft revision of Recommendation ITU-R F.1497-2 "RF channel arrangements for fixed wireless systems operating in the band 55.78-59 GHz"

The input document from Sweden (Document 5C/138), as a contribution agreed within the CEPT, proposed to revise this Recommendation with respect to the following points:

– to extend the upper frequency of the concerned bands from 59 GHz to 66 GHz;

– to modify Annex 2 to specify a 50 MHz separation arrangement in the band 57-64 GHz (to extend the frequency range up to 64 GHz from 57 GHz and to remove the existing 100 MHz separation);

– to add new Annex 3 providing 30 MHz and 50 MHz separation arrangements in the band 64-66 GHz;

– to update the scope and other parts of the text accordingly.

It was agreed to continue the work on the revision of this Recommendation inviting further contributions from other regions/countries at the next meeting. The meeting decided to attach the preliminary text proposed from Sweden to attach to the Chairman's Report after some drafting work (Annex 10 to Document 5C/171).

4.4.1.6 Liaison to WP 4C on working document for Recommendation / Report on potential future coordination between MSS or RDSS and the fixed service in the band 2 483.5-2 500 MHz

In reply to the liaison from WP 4C (Document 5C/140) informing of the development of the working document on the above topic, WP 5C sent a liaison statement (Document 4C/178), providing comments on the following points:

– polarization discrimination factor between linear and circular polarizations;

– FS station feeder loss other than 0 dB;

– potential probability of FS station antenna elevation angles higher than 0 degree.

4.4.1.7 Liaison to WP 7B on revision of Recommendation ITU-R SA.1626 "Feasibility of sharing between the SRS (space-to-Earth) and the FS and MS in the band 14.8-15.35 GHz"

Working Party 5C received a liaison statement from WP 7B (Document 5C/136) informing of the work on the revision of Recommendation ITU-R SA.1626. A short reply liaison was sent to WP 7B inquiring about the purpose of this revision, since the role of this Recommendation seemed to be completed through the work for WRC-03 (Document 7B/163).

4.4.1.8 Working document towards a new Report on fixed service backhaul networks for IMT and other terrestrial mobile broadband systems

At this meeting, a proposal was received from Canada to develop a new Report on IMT transport network in the fixed service (Document 5C/149), based on the decision by Study Group 5 (WP 5C) during the previous study cycle to replace Report ITU-R F.2060 suppressed in 2011. There was another input from the United States (Document 5C/152) to expand the scope of this new Report to cover the transport network for mobile broadband systems other than IMT.

After the discussion at the WG 5C-4 meeting, the US proposal was accepted and the title of the new Report was provisionally agreed as follows:

– Fixed service backhaul networks for IMT and other terrestrial mobile broadband systems.

On this basis, the original text in the Canada's input was editorially reviewed to be attached to the Chairman's Report (Annex 8 to Document 5C/171).

There was further discussion on whether the scope of the Report would be broadened to include fixed wireless access backhaul requirements. Therefore, Working Party 5C will consider this issue at its next meeting.

Since this topic has relevance to the works now going on in other groups, a liaison statement to inform of the initiation of the work was developed and sent to Working Parties 5A and 5D and ITU-T Study Groups 13 and 15 (Document 5A/311-5D/325).

4.4.1.9 Proposal for a new Question on fixed P-P systems used in packet-based network

There was a proposal from Huawei Tech. and China Mobile (Document 5C/153) for a draft new Question on fixed point-to-point wireless systems used in packet-based network. A view was expressed that such a question may be studied more appropriately by other groups including those in ITU-T. Another observation was also stated that there may be advantageous aspects for WP 5C in studying this topic. Discussion on this issue resulted in that consideration could continue until the next meeting, where the text for the draft new Question should be available.

4.4.2 Work of the Drafting Groups

4.4.2.1 Drafting Group 5C4a

Drafting Group 5C4a worked on revision of Recommendation ITU-R F.1336-3 jointly with Working Party 5A members. Since antenna reference pattern is one of the key parameters in the preparatory work for the sharing studies under WRC-15 agenda items 1.1 and 1.2, liaison activity to the relevant groups was also included in the task of the DG 5C4a.

At this meeting, a new approach was proposed from Japan (Document 5C/158) regarding the approximation of sectoral antenna reference radiation patterns, in which the parameter *k* value was selected separately for the elevation and the azimuth planes. Further inputs providing measured pattern data were received from Telstra (Document 5C/154) and LM Ericsson (Document 5C/160).

Discussion took place based on these inputs, focusing on the selection of the *k* parameters used in the new approach and the existing method (already specified in Annex 8 to the Recommendation). The results of the discussion were summarized according to calculation models (peak or average), applications (typical type: fixed system general or improved type: IMT) and frequency ranges (below 1 GHz, 1-6 GHz and 6-70 GHz). This information was conveyed to Joint Task Group 4-5-6-7 and Working Party 5D through the following liaison statements:

– liaison to WP 5D (Document 5D/330): Conveying the new calculation approach and requesting their view on the undecided k parameter values used for IMT systems and to liaise the result, as appropriate, to JTG 4-5-6-7;

– liaison to JTG 4-5-6-7 (Document 4-5-6-7/135): Informing of the new calculation approach and that another liaison may be followed by WP 5D specifically for IMT systems.

Including the above results and taking into account the points raised in Document 5C/158 and the other input from Telstra (Document 5C/155), a new version of the working document toward preliminary draft revision of this Recommendation was developed to be attached to the WP 5C Chairman's Report (Annex 12 to Document 5C/171).

4.4.2.2 Drafting Group 5C4b

Drafting Group 5C4b worked on the development of new Report ITU-R F.[FS USE-TRENDS]. For this topic, as agreed at the previous meeting, the Correspondence Group activity prior to this meeting produced a significantly updated working document (Document 5C/151). There was another input from United Kingdom (Document 5C/161) proposing a liaison statement to request a view of propagation experts in relation to the substance of the working document. During the meeting, DG 5C4b continued the discussion based on these two inputs.

Regarding the development of the new Report, it was agreed to convert the current working document to a preliminary draft new Report (Annex 13 to Document 5C/171), since its substance became fairly mature except for a few sections to which the text was yet to be provided.

It was also agreed to continue the Correspondence Group activity under the same terms of reference and the convenor (Mr Otsuki, Japan) until the next meeting in November 2013. Therefore, the CG should carry out its study based on the PDN Report contained in Annex 13 to Document 5C/171.

With a view to the completion of the work at the next meeting, the following liaison statements were sent:

– liaison to WPs 3J, 3K and 3M (Document 3J/30-3K/45-3M/75): Requesting their view on the applicability of the propagation models contained in the relevant P-series Recommendations to the bands above 50 GHz in particular for about 70/80 GHz up to 90 GHz, as well as further information on Non line of sight (NLoS) or Quasi Non line of sight (QNLoS) propagation models in bands above about the 15-20 GHz;

– liaison to ETSI ATTM TM4 and IEEE 802 (Annex 17 to Document 5C/171): Inviting their comments on the preliminary draft new Report.

Furthermore, the meeting considered the treatment of Report ITU-R F.2047 “Technology developments and application trends in the fixed service” developed in 2006, and, deferring the conclusion to the next meeting, an Editor’s note was added to the PDN Report stating that views are sought on the relationship between this PDN Report and Report ITU-R F.2047. Another opinion was also expressed that it would be difficult to reflect the extensive results of the consideration in the existing Report and, thereby, the PDN Report will replace Report ITU-R F.2047.

4.4.3 Summary of the work

4.4.3.1 Documents for submission to Study Group 5

The following documents were agreed for submission to the next Study Group 5 meeting in December 2013:

– proposed suppression of Recommendation ITU-R SF.357-4 – Maximum allowable values of interference in a telephone channel of an analogue angle-modulated radio-relay system sharing the same frequency bands as systems in the fixed-satellite service (Document 5/52);

– draft revision of Recommendation ITU-R F.557-4 – Availability objectives for radio-relay systems over a hypothetical reference circuit and a hypothetical reference digital path (Document 5/53).

4.4.3.2 Documents approved by the Working Party 5C Plenary

The following documents were approved by the WP 5C Plenary as liaison statements to other groups:

– Liaison statement to WP 4A – Proposed suppression of certain SF-series Recommendations (Document 4A/247).

– Liaison statement to WP 7B – Revision of Recommendation ITU-R SA.1626 – Feasibility of sharing between the space research service (space-to-Earth) and the fixed and mobile services in the band 14.8-15.35 GHz (7B/163).

– Liaison statement to WPs 3J, 3K and 3M – Propagation models for planning and interference assessment involving fixed service links in bands above 50 GHz (Document 3J/30-3K/45-3M/75).

– Liaison statement to Working Parties 5A and 5D and ITU-T Study Groups 13 and 15 – Development of a draft new Report ITU-R F.[FS.IMT/BB] – Fixed service backhaul networks for IMT and other terrestrial mobile broadband systems (Document 5A/311-5D/325).

– Liaison statement to WP 4C – Studies to assist coordination between RDSS or MSS and the fixed service in the 2 483-5-2 500 MHz band (Document 4C/178).

– Liaison statement to ETSI ATTM TM4 and IEEE 802 – Preliminary draft new Report ITU-R F.[FS USE-Trends] on fixed service use and future trends (Annex 17 to Document 5C/171);

– Liaison statement to Joint Task Group 4-5-6-7 – Update of fixed service antenna modelling characteristics (Document 4-5-6-7/135).

– Liaison statement to ITU-D Study Group 2 (Question 22-1/2) – Preliminary draft revision of Recommendation ITU-R F.1105-2 – Fixed wireless systems for disaster mitigation and relief operations (Annex 14 to Document 5C/171).

– Liaison statement to Working Party 5D – Applicability of the sectoral antenna pattern approximations in Recommendation ITU-R F.1336-3 (Document 5D/330).

4.4.3.3 Documents to be carried forward and attached to Chairman's Report as preliminary texts

The following documents were agreed to be attached to the Working Party 5C Chairman’s Report for further consideration at the next meeting in November 2013:

– Preliminary draft new Report ITU-R F.[ANALOG] – List of ITU-R Recommendations on analogue systems in the fixed service (Annex 11 to Document 5C/171).

– Preliminary draft revision of Recommendation ITU-R F.1497-1 – Radio-frequency channel arrangements for fixed wireless systems operating in the band 55.78-59 GHz (Annex 10 to Document 5C/171).

– Preliminary draft revision of Recommendation ITU-R F.1105-2 – Fixed wireless systems for disaster mitigation and relief operations (Annex 9 to Document 5C/171).

– Working document towards a preliminary draft new Report ITU-R F.[FS.IMT/BB] – Fixed service backhaul networks for IMT and other terrestrial mobile broadband systems (Annex 8 to Document 5C/171).

– Working document towards preliminary draft revision of Recommendation ITU-R F.1336-3 – Reference radiation patterns of omnidirectional, sectoral and other antennas in point-to-multipoint systems for use in sharing studies in the frequency range from MHz to about 70 GHz (Annex 12 to Document 5C/171).

– Preliminary draft new Report ITU-R F.[FS USE-TRENDS] – Fixed service use and future trends (Annex 13 to Document 5C/171).

5 Executive summary of the results of the twelfth meeting of Working Party 5C

Working Party 5C approved eighteen (18) liaison statements to other groups.

The consolidation of texts approved at the twelfth meeting of WP 5C is in Annex 10 to Document 5C/235.

Working Party 5C met jointly with WP 5A to discuss documents of joint concern. The joint ad hoc meeting agreed to:

- Issue: Cross-border handbook: 5A/350=5C/206 (Chairman, JCG 5A/5C); 5A/385=5C/227 (Russian Federation)
- Conclusion: It was agreed to limit the scope of the handbook to Fixed Service only based on input contributions.
- Issue: Update of Rec. ITU-R F.1336: 5A/326=5C/185, 5A/347=5C/203 (WP 5D); 5C/226 (Japan); 5A/396=5C/228 (Ericsson)
- Conclusion: WP 5C will take the lead for development of this Revision (WG 5C-4). WP 5A participants to participate directly in WP 5C, WG 5C-4.
- Issue: Proposed revision of Recommendation ITU-R F.1105-2 “Fixed wireless systems for disaster mitigation and relief operations”: 5C/225 (Japan)
- Conclusion: WP 5C will take the lead for development of this Revision (WG 5C-4). The Chair of WG 5C-4 will coordinate with the Chair of 5A-3 on joint liaison statement.
- Issue: Proposed Development of a Draft New Report ITU-R F.[FS.IMT/BB]: 5A/311 (WP 5C), 5A/327=5C/186 (WP 5D)
- Conclusion: WP 5C will take the lead for development of DN Report (WG 5C-4), WP 5A (WG 5A-2) to provide Joint Liaison statement
- Issue: ENG - Update of Recs. ITU-R F.1777 and M.1824: 5C/224 (Australia), 5A/373=5C/216 (Canada)
- Conclusion: WP 5C will develop the Revisions to F.1777 and WP 5ª will devellop the Revision to M.1824.
- Issue: Joint liaison activities: (WP 1A) 5A/314=5C/177, 5A/315=5C/178, 5A/316=5C/179, 5A/317=5C/180
- Conclusion: To be noted by both WP 5A and WP 5C
- Issue: Joint liaison activities: (WP 5D) 5A/324=5C/184
- Conclusion: To be noted by both WP 5A and WP 5C
- Issue: Joint liaison activities: (ITU-T SG 15) 5A/328=5C/187
- Conclusion: Joint Liaison with WP 5A developing text as lead
- Issue: Joint liaison activities: (ITU-T SG 9) 5A/351=5C/208
- Conclusion: Joint Liaison with WP 5A developing text as lead

5.1 Fixed and land mobile systems operating at or below 30 MHz

Working Group 5C-1 (WG 5C-1) deals with HF fixed service and land mobile matters. WG 5C-1 chaired by Mr Charles Glass (USA) met twice and considered seven (7) input contributions to this meeting of WP 5C.

5.1.1 Progress of Work

WG 5C-1 considered two (2) liaisons statements for joint contribution from WPs 5A and 5C addressing issues under development in ITU-T and developed one output liaison statement to WP 5A addressing WRC-15 Agenda Item 1.4. WG 5C-1 developed one annex for attachment to the chairman's report addressing a **Preliminary draft revision of Recommendation ITU-R F.1778 - Channel access requirements for HF adaptive systems in the fixed and land mobile services.**

5.1.2 Call for Contributions

WG 5C-1 would also call for administrations to provide input contributions to the next meeting to address continued work on development of the HF Handbook, the adaptive HF tutorial Handbook, and work on Recommendations.

5.1.3 Conclusions

The Chair of WG 5C-1 would like to thank the delegates for their cooperation in the spirit of compromise and dedication to the consideration of work for fixed and land mobile systems operating at or below 30 MHz.

5.2 Fixed systems operating above 30 MHz but less than 18 GHz

Working Group 5C-2 (WG 5C-2) deals with fixed wireless systems operating in the range 30 MHz-18 GHz. WG5C-2 chaired by Mr Nasarat Ali (UK) met three times and considered 19 input documents including annexes 1 – 3 and 15 – 16 to Document 5C/171 and annex 13 to Document 5C/47, Chairman's Reports of the previous WP 5C meetings. WG 5C-2 developed 10 output documents in the form of, 7 liaison statements and 3 working documents to be carried forward to the next meeting. In addition WG 5C-2 noted without a need for an action on Documents 5C/205, 5C/176 and 5C/174.

Administrations are invited to consider contributions to the next meeting of WP 5C on electronic news gathering activity under Resolution ITU-R 59 (see Sections 5.2.1 and 5.2.3 of this document) taking into account work plan given in Annex 2 to Document 5C/235.

5.2.1 Electronic news gathering (ENG)

WG 5C-2 established a drafting group 5C-2a (ENG) to deal with topics in the area of electronic news gathering (ENG) chaired by Mr R Bunch (Australia).

During discussions the following were discussed in detail;

(a) Development of database on ENG - The Radiocommunications Bureau (BR) reported on the status of development of the ENG /SNG databases and Document 5C/224 provided sample data for entry into the ENG database. The following issues with respect to the future development of the database were considered:

- Will the database be able to allow multiple organisation entries?
- How will the ID mapping operate?
- Could the BR provide advice on the relationship between the fields in the database?
- Will the BR advise administrations via a circular letter of the database's development?

Further input from the BR by way of an Information Paper on the ENG database was requested to the next WP 5C meeting to clarify above points.

(b) Working document towards a revision of Recommendation ITU-R F.1777 - Digital system characteristics of television outside broadcast, electronic news gathering and electronic field production in the fixed service for use in sharing studies was further developed.

(c) Revisions to Recommendation ITU-R SA.1154 were proposed to update and reflect characteristics of current digital ENG systems and their usage/deployment. This was agreed to be sent to ITU-R WP 7B for their consideration and agreement. It was noted that Recommendation ITU-R SA.1154 is incorporated by reference in the Radio Regulations and if these revisions are agreed by WP 7B then these will need to be carried out in accordance with Resolution **28 (Rev.WRC-03)** and in association with Study Groups 7 and 4 and 5 and their relevant Working Parties.

5.2.2 Liaison statements

Document number	Destination	Topic
5C/TEMP/123	WP 7C	Sharing studies between the Earth exploration-satellite service (active) and the fixed service in the frequency bands 8 700-8 750 MHz and 10 000-10 500 MHz under WRC-15 agenda item 1.12
5C/TEMP/124	WP 7B	Sharing between the EESS (Earth-to-Space) and the fixed service in the 7-8 GHz range under WRC-15 agenda item 1.11
5C/TEMP/125	WP 4A (WPs 5A and 7B for information)	WRC-15 agenda item 1.9.1
5C/TEMP/126	WP 4A	WRC-15 agenda item 1.6
5C/TEMP/128	WP 7B	Proposed revisions to Recommendation ITU-R SA.1154 - Updating of characteristics of current digital ENG systems and their usage/deployment
5C/TEMP/130	WP 4A	WRC-15 agenda item 1.8
5C/TEMP/132	WP 5B	WRC-15 agenda item 1.16

5.2.3 Documents to be attached to the Chairman's Report

Administrations are urged to contribute on the following documents under Resolution ITU-R 59.

Document number	Description
Annex 04 to Doc. 5C/235	Working document towards a draft revision of Recommendation ITU-R F.1777 - Digital system characteristics of television outside broadcast, electronic news gathering and electronic field production in the fixed service for use in sharing studies
Annex 03 to Doc. 5C/235	Development of an ENG database - Studies on availability of frequency bands and/or tuning ranges for worldwide and/or regional harmonization and conditions for their use by terrestrial electronic news gathering systems
Annex 02 to Doc. 5C/235	Work plan for addressing Resolution ITU-R 59 - Studies on availability of frequency bands and/or tuning ranges for worldwide and/or regional harmonization and conditions for their use by terrestrial electronic news gathering systems

5.2.4 Final comments

The WG 5C-2 Chairman, Mr Ali, would like to thank the participants for their efficient working methods in the progress of the meeting. He also expresses thanks to Mr Bunch (Australia) and Mr Glass (USA), Chairmen/Coordinators of the Drafting Group activity within WG 5C-2.

5.3 Fixed systems operating at frequencies equal to or greater than 18 GHz and general contributions that have not been assigned to any particular WG including the WP 5C view on SDR/CRS

At its November 2013 meeting (18th to 27th May) Working Party 5C established Working Group 5C-3 to deal with f**ixed systems operating at frequencies equal to or greater than 18 GHz.** Working Party 5C requested that Mr R Bunch (Australia) chair Working Group 5C-3.

Working Group 5C-3 (WG 5C-3) deals with fixed service using frequencies above 18 GHz and general issues. WG 5C-3 met three times and considered contributions under the following topic headings:

Working Group 5C-3: Systems in spectrum equal to or greater than 18 GHz and general contributions	
General	5C/171
Bilateral Handbook	5C/227, 206
SDR/CRS	5C/182
9.1.6	5C/181
[M.1076]	[5C/172, 194, 195]
Antenna distribution	5C/218, 213, 212
Automotive radar	5C/220, 173

All Working Groups were requested by the Chair of Working Party 5C to also consider where more than one group needs/desires to review a particular document the final output will be coordinated with the responsible Working Group through the respective Working Group Chairs. Working Group chairs were also requested to monitor incoming liaison statements from WP 5A and WP 5B and prepare responses according to their work assignments.

5.3.1 Work Programme

In this particular matter 5C-3 took a presentation of 5C/232 *Proposed draft liaison statement to Working Party 5C - WRC-15 agenda item 1.17*. It was decided to carry this document to the next meeting and as no input contributions were received to this meeting to call for contributions to the next meeting.

Drafting Group activity was undertaken in the following manner:

– DG5C3-1 Working Document towards a preliminary draft new Handbook ITU-R F.[CROSS-BORDER]

– DG5C3-2 SDR / CRS

– DG5C3-3 Working document towards a preliminary draft new Report ITU-R F.[FS/RADAR COEXISTENCE IN 71-86 GHz] - Coexistence between fixed service operating in 71-76 GHz and 81-86 GHz and vehicular collision avoidance radar operating in the bands 76-77 GHz and 81-86 GHz

– DG5C3-4 Antenna distribution

– DG5C3-5 Liaison statements developed at SWG level

The Drafting Groups were organised as follows:

– Drafting Group DG 5C3-1 chaired by Mr E Tonkikh (Russian Federation)

– Drafting Group DG 5C3-2 chaired by Mr R Bunch (AUS)

– Drafting Group DG 5C3-3 chaired by Mr M Christensen (Canada)

– Drafting Group DG 5C3-4 chaired by Mr R Bunch (AUS)

– Documents were attributed to the Drafting Groups as follows:

Working Group 5C-3: Systems at or above 18 GHz and other issues		
DG5C3-1	Working Document towards a preliminary draft new Handbook ITU-R F.[CROSS-BORDER]	5C/227, 206
DG5C3-2	SDR / CRS	5C/182, [172, 194, 195]
DG5C3-3	Working document towards a preliminary draft new Report ITU-R F.[FS/RADAR COEXISTENCE IN 71-86 GHz] - Coexistence between fixed service operating in 71-76 GHz and 81-86 GHz and vehicular collision avoidance radar operating in the bands 76-77 GHz and 81-86 GHz	5C/220, 173
DG5C3-4	Antenna distribution	5C/218, 213, 212
DG5C3-5	Liaison statements developed at SWG level	5C/181

During the course of the meeting 5C/213 was transferred to WG 5C-4.

WG 5C-3 developed 6 output documents as follows:

Annex 05 to Doc. 5C/235	Working document towards a preliminary draft new Handbook ITU-R F.[CROSS-BORDER] - Guidance for bilateral/multilateral discussions on use frequency range 29.7 MHz-43.5 GHz by fixed/land mobile systems
5C/TEMP/137	Draft liaison statement to Working Parties 5A and 5B - Potential impact to the fixed service from automotive collision avoidance radar in adjacent frequency bands 76-77 GHz and 77-81 GHz
5C/TEMP/136	Draft liaison statement to Working Party 1B - WRC-15 agenda item 9.1, issue 9.1.6 - Resolution **957 (WRC-12)** - Studies towards review of the definitions of fixed service, fixed station and mobile station
Annex 06 to Doc. 5C/235	Working document towards a preliminary draft new Recommendation ITU-R F.[GD DEPLOY] - Deployment scenarios for point-to-point systems in the fixed service
Annex 07 to Doc. 5C/235	Working document towards a preliminary draft new Report ITU-R F.[FS/RADAR COEXISTENCE IN 71-86 GHz] - Coexistence between fixed service operating in 71-76 GHz and 81-86 GHz and automotive collision avoidance radar operating in the bands 76-77 GHz and 77-81 GHz

5.3.2 Future Work

Administrations are urged to consider the following in preparation for the next WP 5C meeting:

Working Group 5C-3 considered document towards a preliminary draft new Handbook ITU-R F.[CROSS-BORDER] “Guidance for bilateral/multilateral discussions on use frequency range 29.7 MHz-43.5 GHz by fixed/land mobile systems” (Annex 7 to Document 5C/171).

The Russian Federation has provided contribution with modifications of working document towards a preliminary draft new Handbook ITU-R F.[CROSS-BORDER].

It has been agreed to continue this work and call for contributions between the November 2013 and May 2014 meetings, with aim to finalize this work as Handbook for fixed systems only.

Working document towards a preliminary draft new Report ITU-R F.[FS/RADAR COEXISTENCE IN 71-86 GHz] - Coexistence between fixed service operating in 71-76 GHz and 81-86 GHz and automotive collision avoidance radar operating in the bands 76-77 GHz and 77-81 GHz

Working Party 5C has updated its working document towards a preliminary draft new Report ITU-R F.[FS/RADAR COEXISTENCE IN 71-86 GHz], *Coexistence between fixed service operating in 71-76 GHz and 81-86 GHz and automotive collision avoidance radar operating in the bands 76-77 GHz and 77-81 GHz,* which is being studied under Question ITU-R 252/5. Significant progress has been made on these studies, although additional work is needed before the results can be considered final. WP 5C welcomes comments on this document. In addition, there are several areas where WP 5C has not yet finalized the assumptions to be used in this study. In particular, WP 5C welcomes views on the following tentative study parameters relating to WP 5A and WP 5B’s areas of expertise:

Working document towards a preliminary draft new Recommendation ITU-R F.[GD DEPLOY] - Deployment scenarios for point-to-point systems in the fixed service

Working Party 5C has commenced work on a working document towards a preliminary draft new Recommendation ITU-R F.[GD DEPLOY] - *Deployment scenarios for point-to-point systems in the fixed service*. This working document towards a preliminary draft new Recommendation ITU-R F.[GD DEPLOY] contains information on deployment scenarios and related statistics for point-to-point microwave systems in the Fixed Service. This information can be used in sharing and interference studies between systems in the Fixed Service and systems in other services. This Recommendation is intended to be used in conjunction with Recommendation ITU-R F.758.

5.3.3 Call for Contributions

Administrations are encouraged to provide statistical information on the antenna elevation angles (both positive and negative), link lengths and antenna heights (above ground level) in their administration. WP 5C’s intention is to temporarily append such data to this working document for use in the development and validation of assumptions for use in sharing studies. As appropriate deployment assumptions are confirmed, the supporting data will be removed from the working document. Contributions are also sought to address the various notes and text that follow. Once approved, there will be a need to review existing ITU-R Recommendations to ensure consistency (including Recs. ITU-R F.758 and F.1498).

5.3.4 Conclusions

The WG 5C-3 Chair Mr Roger Bunch thanked all the WG 5C-3 delegates, the Chairs of the Drafting Groups, the Chair of WP 5C and the BR staff, particularly the Counsellors for their

assistance on the matter of the ENG database, for the excellent work and for their very efficient support during the meeting.

5.4 Working Group 5C-4 – Review of Recommendations assigned to WP 5C

5.4.1 Work programme

Working Group 5C-4 (WG 5C-3) deals with issues on Recommendations and Reports not directly related to WRC-15 agenda items.

During the November 2013 meeting, it held 4 meetings and carried out the tasks concerning the input documents in the Table below, which were allocated by the WP 5C Plenary.

The input documents allocated to Working Group 5C-4		
Subject	**Preliminary texts in the previous Chairman's Report**	**New inputs**
Revision of F.1105	Annex 9 to 5C/171	5C/225,
Revision of F.1336	Annex 12 to 5C/171	5C/185, 5C/203, 5C/226, 5C/228
Revision of F.1497	Annex 10 to 5C/171	
Report F.[FS IMT/BB]	Annex 8 to 5C/171	5C/186, 5C/193, 5C/207, 5C/211
Report F.[Analog]	Annex 11 to 5C/171	
Report F.[FS USE TRENDS]	Annex 13 to 5C/171	5C/183, 5C/210, 5C/213, 5C/215, 5C/221
Suppression of SF.356		5C/204
Suppression of F.750 & F.751		5C/222
Liaison to WP 4C		5C/197
Liaison to WP 7B		5C/191

5.4.2 Structure of the Working Group

During this meeting, WG 5C-4 organized two Drafting Groups to carry out the works on specific topics.

	Terms of reference	**Chairman**
DG 5C4 F.1336	Revision of Recommendation ITU-R F.1336-3	Mr Masaharu Araki
DG 5C4 FS trends	Development of new Report ITU-R F.[FS USE-TRENDS]	Mr Shinya Otsuki

5.4.3 Summary of the work

5.4.3.1 Documents for submission to Study Group 5

Working Group 5C4 produced the following outputs, which were agreed at the WP 5C Plenary for submission to the subsequent Study Group 5 meeting:

– Proposed suppression of Recommendation ITU-R SF.356-4 – Maximum allowable values of interference from line-of-sight radio-relay systems in a telephone channel of a system in the fixed-satellite service employing frequency modulation, when the same frequency bands are shared by both systems (5/84);

– Draft revision of Recommendation ITU-R F.1497-1 – Radio-frequency channel arrangements for fixed wireless systems operating in the band 55.78-59 GHz (5/86);

– Draft revision of Recommendation ITU-R F.1105-2 – Fixed wireless systems for disaster mitigation and relief operations (5/90);

– Draft revision of Recommendation ITU-R F.1336-3 – Reference radiation patterns of omnidirectional, sectoral and other antennas in point-to-multipoint systems for use in sharing studies in the frequency range from MHz to about 70 GHz (5/85);

– Editorial updating of Recommendation ITU-R F.746-10 – Radio-frequency arrangements for fixed service systems (5/87);

– Draft new Report ITU-R F. [ANALOG] – List of ITU-R Recommendations on analogue systems in the fixed service in frequency bands above 30 MHz (5/88).

5.4.3.2 Documents approved by the Working Party 5C Plenary

The following documents were approved by the WP 5C Plenary as liaison statements to other groups:

– Liaison statement to WP 4A – Suppression of Recommendation ITU-R SF.356 (4A/352).

– Liaison statement to WP 7B – Liaison statement to Working Party 7B - Revisions of Recommendations ITU-R F.1247-3, ITU-R F.1249-3 and ITU-R F.1509-2 (5C/TEMP/143).

– Liaison statement to WP 4C – Studies to assist coordination between RDSS or MSS and the fixed service in the 2 483-5-2 500 MHz band (5C/TEMP/121).

– Liaison statement to ITU-D Study Group 2 (Question 22-1/2) –Draft revision of Recommendation ITU-R F.1105-2 – Fixed wireless systems for disaster mitigation and relief operations (5C/TEMP/118);

– Liaison statement to Working Party 5D- Draft revision of Recommendation ITU-R F.1336-3 - Reference radiation patterns of omnidirectional, sectoral and other antennas (5C/TEMP/139);

– Liaison statement to Working Parties 5A, 5D and ITU-T JCA-AHF - Working document towards a draft new Report ITU-R F.[FS.IMT/BB] - Fixed service backhaul networks for IMT and other terrestrial mobile broadband systems (5C/TEMP/122);

– Liaison statement to Working Party 5A - Preliminary draft new Report ITU-R F.[FS USE-TRENDS] - Fixed service use and future trends (5C/TEMP/144).

5.4.3.3 Documents to be carried forward and attached to Chairman's Report as preliminary texts

The following documents were agreed to be attached to the Working Party 5C Chairman’s Report for further consideration at the next meeting in May 2014:

– Preliminary draft new Report ITU-R F.[FS USE-TRENDS] – Fixed service use and future trends (Annex 08 to Document 5C/235).

– Working document towards a preliminary draft new Report ITU-R F.[FS.IMT/BB] – Fixed service backhaul networks for IMT and other terrestrial mobile broadband systems (Annex 09 to Document 5C/235).

6 Progression of the work

6.1 Contributing agenda item work

Working Party 5C worked with other Working Parties on WRC-12 agenda items for which it was a contributing member. WP 5C has provided input on these issues and wishes to thank the Working Parties involved for their dedication and hard work on these important issues and their willingness to incorporate input from Working Party 5C.

6.2 General work

The ongoing review of Opinions, Resolutions, Questions, Recommendations and Reports assigned to WP 5C continues.

7 Conclusions

The Chairman of WP 5C would like to thank and to extend the well wishes of WP 5C members to his counsellor, Mr Sergio Buonomo and wish him a speedy recover. The Chair would also like to thank Mr. David Botha as acting counsellor for the twelfth meeting of WP 5C, the BR Secretariat and staff of the ITU-R for their hard work and dedication to assisting the work of WP 5C. In addition the Chairman notes that the work completed at this meeting of WP 5C would not have been possible without the Sub-Groups Chairmen: Mr Ali Nasarat, Mr Roger Bunch and Mr Akira Hashimoto. As recognized experts and efficient Chairman they forwarded the work of WP 5C in an efficient manner. Finally the Chairman would like to thank all the delegates for their hard work carried out in a spirit of cooperation which made any of the work possible and urge them to provide input to the next meeting of WP 5C to forward the important work of this group.

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executive Report from Working Party 5D

Radiocommunication Study Groups

Document 5/80-E
26 November 2013
English only

Chairman, Working Party 5D

EXECUTIVE REPORT FROM WORKING PARTY 5D

This Report summarizes the progress of Working Party 5D and is submitted to the meeting of Study Group 5 in December 2013. There are seven documents submitted to Study Group 5 for consideration from WP 5D that were finalized at the meetings #15 - #17 of WP 5D in 2013.

1 Documents submitted to Study Group 5 for consideration

1.1 Draft revised Recommendations for consideration

Document	Title	Action Requested
Doc 5/61	*Draft revision 1 of Recommendation ITU-R M.2012 - Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-Advanced (IMT-Advanced)*	Consideration for adoption in Study Group 5 and subsequent approval by correspondence under § 10.2.2 of Resolution 1-6 *(See Note 1)*
Doc 5/62	*Draft revision of Recommendation ITU-R M.1580-4 - Generic unwanted emission characteristics of base stations using the terrestrial radio interfaces of IMT-2000*	Consideration for adoption in Study Group 5 and subsequent approval by correspondence under § 10.2.2 of Resolution 1-6 *(See Note 1)*
Doc 5/63	*Draft revision of Recommendation ITU-R M.1581-4 - Generic unwanted emission characteristics of mobile stations using the terrestrial radio interfaces of IMT-2000*	Consideration for adoption in Study Group 5 and subsequent approval by correspondence under § 10.2.2 of Resolution 1-6 *(See Note 1)*

Note 1: It is noted that Documents 5/61, 5/62, and 5/63 have been previously indicated in the invitation for this Study Group 5 meeting (Annex 2 to CACE/625) and have also met the four week posting requirement of § 10.2.2.1 of Resolution ITU-R 1-6 being available electronically since 21 October 2013.

1.2 Draft new Reports for consideration

Document	Title	Action Requested
Doc 5/58	*Draft new Report ITU-R M.[IMT.2020.INPUT] - Future radio aspect parameters for use with the terrestrial IMT spectrum estimate methodology of Recommendation ITU-R M.1768-1* (from the WP 5D 16th meeting)	Consideration for approval under § 2.30 of Resolution 1-6
Doc 5/60	*Draft new Report ITU-R M.[IMT.2020.ESTIMATE] - Future spectrum requirements estimate for terrestrial IMT*	Consideration for approval under § 2.30 of Resolution 1-6
Doc 5/64	*Draft new Report ITU-R M.[IMT.BROAD.PPDR] - The use of International Mobile Telecommunications (IMT) for broadband public protection and disaster relief (PPDR) applications*	Consideration for approval under § 2.30 of Resolution 1-6
Doc 5/65	*Draft new Report ITU-R M.[IMT.ADV.PARAM] - Characteristics of terrestrial IMT-Advanced systems for frequency sharing/interference analyses*	Consideration for approval under § 2.30 of Resolution 1-6

2 General summary of WP 5D work

Working Party 5D held three meetings in 2013.

The 15th meeting was held from 30 January – 6 February 2013 in Geneva. The report of this meeting is contained in Document 5D/300.

The 16th meeting was held from 9 to 16 July 2013 in Sapporo Japan. The report of this meeting is contained in Document 5D/441.

The 17th meeting was held from 9 to 16 October 2013 in Geneva. The report of this meeting is contained in Document 5D/532.

Working Party 5D has been successful in completing all the designated deliverables for 2013.

Working Party 5D has a number of ongoing work items that will continue throughout the Study Period.

Working Party 5D continues with its internal structure subdivided into three major Working Groups: General Aspects, Spectrum Aspects and Technology Aspects.

The key deliverables being addressed in the work program in the remainder of the Study Period are indicated below, organized by Working Group. WP 5D maintains updated detailed work plans for each of its major activities on deliverables such as Recommendation, Reports and Handbooks, in the Chapter 2 of the Chairman's Report for each of the WP 5D meetings.

2.1 General Aspects related work

2.1.1 Work on draft new Report ITU-R M.[IMT.BEYOND 2020 TRAFFIC]

This activity is in support of the future views of the marketplace for IMT and for WRC-15 agenda item 1.1 and addresses the traffic and related market demand and users needs towards the years 2020 focusing on terrestrial IMT – including "traffic related" inputs and parameters for use with the terrestrial IMT spectrum estimate methodology.

2.1.2 Work on draft new Recommendation ITU-R M.[IMT.VISION]

This activity is to address the longer term IMT vision for 2020 and beyond to drive the future developments for the radio access network.

2.1.3 Handbooks

This is on-going work to produce, in cooperation with ITU-T and ITU-D, a Handbook on "Global trends in IMT".

2.2 Spectrum Aspects related work

2.2.1 Work on draft revision of Recommendation ITU-R M.1036-4

Studies towards a draft new revision of Recommendation ITU-R M.1036-4 were undertaken with the aim of revising the recommendation in accordance with the RAG recommended format and also to incorporate new amendments related to frequency bands already identified for IMT.

2.2.2 Work on draft revision of Report ITU-R M.2039-2

This activity is the updating of the existing "Characteristics of terrestrial IMT-2000 systems for frequency sharing/interference analysis". It has a role in support of information supplied in this topic to JTG 4-5-6-7 particularly for studies on WRC-15 agenda items 1.1 and 1.2.

2.2.3 Working document ITU-R M.[IMT.ARRANGEMENTS]

This activity continues on developing document ITU-R M.[IMT.ARRANGEMENTS] on channelling arrangements for IMT adapted to the frequency band below 790 MHz, as indicated in Resolution 232 (WRC-12) "*invites* 2". The work will focus on the harmonized channelling arrangements for IMT adapted to the frequency band below 790 MHz down to around 694 MHz for Region 1, taking into account the existing arrangements in Region 1 in the bands between 790 and 862 MHz as defined in the last version of Recommendation ITU-R M.1036, in order to ensure coexistence with the networks operated in the new allocation and the operational networks in the band 790-862 MHz. This directly supports WRC-15 agenda item 1.2.

2.2.4 Work on draft new Report ITU-R M.[IMT.SMALL]

Work also continues on compatibility studies between FSS and small cell deployment IMT systems in the frequency band 3 400-3 600 MHz. A working document has been generated.

2.2.5 Work on draft new Report ITU-R M.[TDD.COEXISTANCE]

A working document on compatibility of co-located, adjacent TDD blocks in the 2 300-2 400 MHz frequency band was prepared and further consideration of this topic will be undertaken.

2.2.6 Work on preliminary draft new Report ITU-R M.[IMT vs. IMT-UHF]

Work is continuing on developing a report to address compatibility between IMT systems operating in the UHF band.

2.3 Technology Aspects work

2.3.1 Work on draft Revision of Recommendation ITU-R M.1457-11

This is on-going work to develop the next revision of Recommendation ITU-R M.1457-11 "*Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)"* for completion year-end 2014 under the schedule that had been previously announced. This work is in conjunction with certain external organizations under Resolution ITU-R 9-4.

2.3.2 Work on draft revision of Recommendation ITU-R M.2012-1

This is on-going work to develop the next revision of Recommendation ITU-R M.2012 "*Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications Advanced (IMT-Advanced)"* for completion year-end 2015 under the schedule that had been previously announced. This work is in conjunction with certain external organizations under Resolution ITU-R 9-4.

2.3.3 Work on draft revision of Recommendation ITU-R M.1579-1

The work is an update of Recommendation ITU-R M.1579-1 on "*Global circulation of IMT-2000 terminals"* for adding information related to IMT-Advanced now that Recommendation ITU-R M.2012.

2.3.4 Work towards a draft new Recommendations ITU-R M.[IMT.OOBE]

The work is to develop in a Recommendation the specific "unwanted emission characteristics" related to IMT-Advanced base stations and terminals and links to the technologies in Recommendation ITU-R M.2012. This Recommendation is foreseen to be developed in two parts – one for the base station and one for the mobile station respectively (similar to Recommendations ITU-R M.1580 and ITU-R M.1581).

2.3.5 Work on draft new Report ITU-R M.[FUTURE TECHNOLOGY TRENDS]

This work is to develop a broad view of future technology aspects and trends of terrestrial IMT systems. Report ITU-R M.[FUTURE TECHNOLOGY TRENDS] will focus on the technology aspects and enablers considering the approximate timeframe 2015-2020 *and beyond* for system deployment, and this would include aspects of terrestrial IMT systems related to WRC-15 studies as part of its scope.

2.3.6 Work on draft new Report ITU-R M.[IMT.ANTENNA]

This work address the technical and operational aspects of passive and active base station antennas for IMT systems based on Question ITU-R 251/5.

2.3.7 Work on draft new Report ITU-R M.[IMT.ARCH]

This report is planned to address the Architecture and Topology of IMT Networks. It is currently in the initial stages of definition.

2.3.8 New working document towards a preliminary draft new Report ITU-R M.[IMT.ABOVE 6 GHz]

This is newly initiated work. The current perspective (subject to further discussion) is "There has been recent academic and industry research and development related to suitability of mobile broadband systems in bands above 6 GHz.

The purpose of this report is to provide information on the study of technical feasibility of IMT in the bands above 6 GHz. Technical feasibility includes information on current IMT or potential IMT radio interface technologies and system approaches appropriate for operation above 6 GHz, on technology enablers such as active and passive components, antenna techniques, deployment architectures, and results of simulations and performance tests".

2.3.9 Further studies on cognitive radio systems

This work relates to the development of studies on cognitive radio systems implementation in IMT in relation to Resolution ITU-R 58.

3 Specific activities in WP 5D to support JTG 4-5-6-7

Working Party 5D has met its expected plan with regard to liaison activity to the JTG.

The Chairman of Working Party 5D, in Document 4-5-6-7/39, had indicated to first meeting of the JTG 4-5-6-7 (JTG) the comprehensive plan, taking all due regard of the Terms of Reference of the JTG, that WP 5D had developed its meeting #13 (July 2012) to address its studies related to WRC-15 agenda items 1.1 and 1.2 and its responsibilities toward the work of the JTG.

The Chairman of Working Party 5D, in Document 4-5-6-7/239 (Rev 1), informed the JTG 4-5-6-7, in its third meeting in July 2013 , that WP 5D WP 5D has successfully completed its work plan in this matter and has complied with its obligation to the JTG by the requested deadlines for information on WRC-15 agenda items 1.1 and 1.2.

The summary of deliverables to the JTG is provided in Table 1 below.

TABLE 1

Summary of information forwarded to JTG 4-5-6-7 from WP 5D related to WRC-15 AIs 1.1 and 1.2

"Liaised topic"	**Information liaised from WP 5D meeting #13 (16-20 July 2012)**	**Information liaised from WP 5D meeting #14 (3-11 October 2012)**	**Information liaised from WP 5D meeting #15 (30 Jan – 6 Feb 2013)**	**Information liaised from WP 5D meeting #16 (10-17 July 2013)**
Spectrum Estimate	-	Spectrum requirements as set out in Resolution **232 (WRC-12)** **(**Doc**.** 4-5-6-7/50**)** Initial information on spectrum requirements as set out in Resolution **233 (WRC-12)** **(**Doc. 4-5-6-7/47**)**	-	Spectrum requirements as set out in Resolution **233 (WRC-12)** **(**Doc. 4-5-6-7/237**)**
Suitable Frequency Ranges	Initial text on suitable frequency ranges **(**Doc. 4-5-6-7/38**)**	Further elaboration on suitable frequency ranges and their suitability **(**Doc. 4-5-6-7/46**)**	Further elaboration on suitable frequency ranges and their suitability **(**Doc. 4-5-6-7/118**)** **(**Doc. 4-5-6-7/117**)**	Any final input to JTG 4-5-6-7 on suitable frequency ranges **(**Doc. 4-5-6-7/220**)**
Sharing , compatibility & protection criteria for IMT systems	Listing of relevant existing Reports and Recommendations related to sharing and compatibility studies **(**Doc. 4-5-6-7/38**)**	Final input on sharing parameters for Resolution **232 (WRC-12)** related work **(**Doc. 4-5-6-7/49**)**	Adjacent band compatibility between IMT UL and DTT under WRC-15 agenda item 1.2 **(**Doc. 4-5-6-7/116**)**	Final input on sharing parameters for Resolution **233 (WRC-12)** related work **(**Doc. 4-5-6-7/236**)** Status of compatibility study between FSS networks and IMT systems in the band 3 400-3 600 MHz for small cell deployments **(**Doc. 4-5-6-7/238**)**
Frequency Arrangements	-	Channelling arrangements as per Resolution **232 (WRC-12)** **(**Doc. 4-5-6-7/48**)**	-	-

4 Workshops

In conjunction with the Working Party 5D upcoming 18th meeting in Viet Nam, a WP 5D Workshop "*Research views on IMT beyond 2020*" will be held on Wednesday, February 12th at 1400 hours. The Workshop will be open to all Working Party 5D participants and has been announced in the invitation circular letter for the meeting (5/LCCE/44).

Objective of the Workshop

The objective of the Workshop is to provide Working Party 5D delegates with an overview and understanding of ongoing worldwide research activities and initiatives on future mobile communications reaching beyond 2020. This Workshop will assist Working Party 5D in the development of the new Recommendation ITU-R M.[IMT.VISION].

Terms of Reference for Workshop

Representatives from national/regional/global research groups/projects or programs and other interested parties are invited to present their work on future looking scenarios and visions of mobile communication systems beyond 2020, which could include:

– user demands trends;
– views on the future role of IMT in serving users and the society;
– the timeline/workplan to implement the visions;
– traffic, technology and spectrum aspects.

5 Future meetings of WP 5D

The previously developed and published schedule for the planned meetings of Working Party 5D for 2014-2015 is:

GROUP	No.	START	STOP	PLACE	COMMENTS
WP 5D	18	12 February 14	19 February 14	Viet Nam	
WP 5D	19	18 June 14	25 June 14	Canada	
WP 5D	20	15 October 14	22 October 14	[TBD]	
WP 5D	21	28 January 15	4 February 15	[TBD]	7 working day meeting
WP 5D	22	10 June 15	17 June 15	[TBD]	7 working day meeting

Note: Dates of the 20th – 22nd meeting may be adjusted depending upon circumstances.

6 Remarks

The Chairman thanks the delegates in WP 5D for the successful completion of the general 2013 work program. Special thanks is given to WP 5D for its work towards WRC-15 agenda items 1.1 and 1.2, particularly with regard to the support given in successfully meeting the WP 5D obligations in the work of the JTG 4-5-6-7.

The Chairman also recognizes the Chairpersons of the Working Groups, Sub Working Groups and Ad Hoc Groups. Special thanks are extended to the Drafting Group Chairs and document Editors for their dedication during the meeting and their leadership.

Working Party 5D has additional deliverables to complete on its defined work plan for the 2014/2015 period, which includes finalizing the nearer term technology trends of IMT (2015-2020) and the next vision of IMT (2020 and beyond) both of which will become catalysts for the much talked about "5G" which will enable ITU-R to ensure that IMT can meet the "new" broadband mobile marketplace that will appear in the next many years.