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|  | ASIA-PACIFIC TELECOMMUNITY |  | |  |
| **The 4th Meeting of the APT Conference Preparatory Group for WRC-15 (APG15-4)** | | **Document**  **APG15-4 /OUT-13** | |
| 09 – 14 February 2015, Bangkok, Thailand | | **13 February 2015** | |

**Working Party 3**

**preliminary views on WRC-15 agenda item 1.16**

**Agenda Item 1.16:**

*To consider regulatory provisions and spectrum allocations to enable possible new Automatic Identification System (AIS) technology applications and possible new applications to improve maritime radiocommunication in accordance with Resolution****360 (WRC‑12)***

**1. Background**

Resolution **360 (WRC-12)** *resolves* to invite WRC-15

1. to consider, based on the results of ITU-R studies, modifications to the Radio Regulations (RR), including possible spectrum allocations, to enable new AIS terrestrial and satellite applications, with ensuring that these applications will not degrade the current AIS operations and other existing services;
2. to consider, based on the results of ITU-R studies, additional or new applications for maritime radiocommunication within existing maritime mobile and mobile-satellite service allocations, and if necessary to take appropriate regulatory measures.
   1. **Automatic Identification System**

The AIS is a proven maritime data system, with a large number of ships equipped and a supporting terrestrial and satellite infrastructure established. The AIS is designed to assist safety-of-navigation.

AIS is used in the ship movement service for safety-of-navigation, it enables the identification of stations using this system, provides information about a ship and its cargo. It provides a means for ships to exchange ship data, including identification, position, course and speed, with other nearby ships and coast stations.

Carriage of the ship-borne AIS is mandatory for safety-of-navigation under Chapter V of the International Convention for the Safety of Life at Sea (SOLAS), has become well accepted by the maritime community. It is also being used by thousands of ships not subject to the SOLAS Convention.

The AIS is supported by a large number of shore based VHF infrastructures as well as being able to be detected by satellite, though its effectiveness is unacceptably limited where VHF data link (VDL) loading is high. The need for separate dedicated channels was recognized by WRC-12 and two additional channels were designated. This new designation solves the problem for satellite detection.

AIS has the capability for data exchange by application-specific messages (ASM) for complementary information. The AIS is routinely used by ships for navigation and crew familiarity is a positive factor. AIS messages can be sent with a priority #1 (highest) through #4 (lowest). Critical link management messages including position report messages are the highest priority (priority #1), safety related messages are the high service priority (priority #2) and some of the other messages including ASM are the lowest priority (priority #4). The decision of WRC-12 to assign new channels of the RR Appendix **18** to digital communication makes the implementation and use of new digital communication means possible. The establishment of the maritime AIS, the VHF data exchange and certain satellite communication components on these new frequencies offers potential enhancements to VHF maritime safety communications on a global basis to satisfy the increasing need for maritime radiocommunication for enhanced maritime safety.

* 1. **AIS VHF Data Link Loading**

AIS VDL loading remains an issue to an increasing degree in many parts of the world due to the proliferation of AIS applications, message types, services and equipment types plus the unanticipated increase in user volume.

Noting that WRC-12 has provided four candidate channels from the Appendix **18** on an experimental basis, to protect the integrity of the AIS VDL, it is considered beneficial to move ASM to two of these channels.

The VDL is designed mainly for safety-of-navigation. The ships positions are continuously transmitted on the VDL and the closer ships have the highest probability of reception. This ensures that, even during high VDL loading, ships will receive all position reports from the closest ships but fewer position reports from the more distant ships.

When the AIS VDL is used for data communications, it performs poorly with higher loads of VDL message traffic resulting in higher loss of AIS messages, and a higher number of retransmissions. This situation culminates with the breakdown of data communications on the AIS VDL.An increasing number of ASM will reduce the available time slots for the intended AIS messages. With increasing demand for maritime VHF data communications, AIS will become more heavily used which will lead to an overloading of the existing AIS1 and AIS2 channels.

So far, some administrations reported that the AIS VDL loading in high traffic area is nearing critical limiting factor of 50% as noted in International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendation A-124 Appendix **18** “VDL Loading Management”. The new Report ITU-R M.2287 indicates the necessity of additional channels for the new applications using AIS technology.

* 1. **VHF Data Exchange concept**

The main activity relating to resolves 1 and resolves 2 in Resolution **360 (WRC-12)** relates to a new concept called the VHF Data Exchange System (VDES) proposed by the IALA. Initially proposed as a terrestrial system, with a possible satellite broadcast capability (space-to-Earth) and called VHF Data Exchange (VDE), the current proposal includes transmit capability from ships (and other stations) to satellites (Earth-to-space) on certain VHF Appendix **18** channels, through VDES. The satellites could be in low Earth orbits and/or medium Earth orbits. It is important to note that existing channels AIS 1 and AIS 2, and channels 75 and 76 as used for the transmission of Message 27 (long-range AIS broadcast message) are all included in the VDES plan, and that AIS itself, will play a crucial role, as will the Global Navigation Satellite System (GNSS).

The VDES concept addresses functions of VDE, ASM and the AIS in the VHF maritime mobile band.

The AIS 1 and AIS 2 (simplex channels) are intended to be preserved for their original purpose of safety-of-navigation, position reporting and identification, in both the ship-to-ship and ship-to-shore and shore-to-ship direction.

An important requirement is sharing with the land mobile service along coastlines and inland waterways, fixed and mobile service, and protection of the radio astronomy service in the VHF frequency bands by the satellite component. Depending on which satellite solution is agreed, other satellite services also need to be protected. A pfd mask for the Earth’s surface from MSS space systems is proposed in the Draft CPM Report to protect the mobile service and the fixed service in the relevant frequency band.

**Relevant documents delivered by ITU-R**

The following ITU-R Working Party 5B (WP 5B) documents have already been published or nearing completion:

* Preliminary draft new Recommendation ITU-R M.[VDES] describes the VDES system.
* Preliminary draft new Report ITU-R M.[AIS.PROTECTION] examines the issue of blocking of certain channels on ships equipped with AIS, and concludes that channels 2078, 2019, 2079 and 2020 should not be used for voice radio communications. In addition, Annex 1 contains results of studies conducted by China on channel usage to protect AIS and new application channels.
* Report ITU-R M.2287, *Automatic identification system VHF data link loading,* demonstrates the need to move certain types of non safety-of-navigation AIS messages to channels other than AIS 1 and AIS 2 (including application-specific messages).
* Preliminary draft new Report ITU-R M.[MAR.MSS] describes the use of a non-geostationary satellite system to provide reliable communications in regions where traditional terrestrial maritime radio communication is not feasible, and where geostationary satellite networks may not be able to provide reliable coverage. This Report does not identify any regulatory changes required at this stage, but highlights that the development of these systems may require modifications to the Radio Regulations in due course.
* Preliminary draft new Report ITU-R M.[VDES-SELECT] demonstrates four channel plans (A, B, C and D) for VDES and the merits and limitations for each channel plan are considered. In addition, Annex 1 contains results of studies conducted by China, and Annex 2 currently contains a study conducted in Canada examining in detail, Channel Plans A, B and C.
* Report ITU-R M.[CHANNEL SOUNDING] examined radio propagation conditions for all channels intended for use in ship-to-shore and shore-to-ship VDE and application-specific message (ASM) communication. Radio propagation conditions between ship and shore have been characterised in line-of-sight and non-line-of-sight conditions. Observed channel effects were consistent with theoretical expectation and may be managed via several waveform design approaches. Results show that spectrum currently being considered for the terrestrial component of VDE and ASM is well suited to the purpose. This Report is of field trials conducted by United Kingdom and Australia, and was approved at the November 2014 session of Study Group 5.
  1. **Methods to Satisfy WRC-15 Agenda item 1.16**

The following methods are currently being considered by WP 5B to satisfy this Agenda item:

**ISSUE A** – Application-specific message designation

**Method A1** – RR Appendix **18** channels 27 and 28 will be split into four simplex channels, i.e. channels 1027, 1028, 2027 and 2028. Channels 2027 and 2028 will be assigned for the ASM application. To prevent blocking of the reception of the channels AIS1, AIS 2, 2027 and 2028, the transmission from ship on channels 2078, 2019, 2079 and 2020 will not be permitted. This will be achieved through a transitional period and an effective date which is subject to WRC-15 decision.

**Method A2** – RR Appendix **18** simplex channels 87 and 88 will be assigned for ASM applications with an effective date subject to WRC-15 decision.

To prevent the potential blocking of the reception of the channels AIS1, AIS2 the appropriate regulatory measures to restrict power limit for the transmission from ship on channels 2078, 2079, 2019 and 2020 should be applied.

**ISSUE B** – New applications for maritime radiocommunication – terrestrial component

**Method B1** – In order to introduce the terrestrial component of the VDES, it is proposed to identify the following duplex channels of RR Appendix **18**: channels 24, 84, 25 and 85. It is further proposed that the merging of these channels will permit a better data rate for the VDE terrestrial component. This is achieved through a new Note *AAA)* in the RR Appendix **18.**

**Method B2** – Channels 24, 84, 25, 85, 26 and 86 in RR Appendix **18** could be used for global harmonized VDE testing and experiments, including terrestrial component and satellite component.

**ISSUE C** – New application for maritime radiocommunication – satellite component

**Method C1** – It is proposed to create a new secondary allocation for the maritime mobile-satellite service (Earth-to-space) for frequency band 161.9375-161.9625 MHz (channel 2027) and frequency band 161.9875-162.0125 MHz (channel 2028) for improved ASM communications capacity and coverage.

It is proposed to create a new secondary allocation for the maritime mobile-satellite service (Earth-to-space), for frequency band 157.1875-157.3375 MHz (channels 1024, 1084, 1025, 1085, 1026 and 1086).

It is proposed to create a new secondary allocation for the maritime mobile-satellite service (space-to-Earth) for frequency band 161.7875-161.9375 MHz (channels 2024, 2084, 2025, 2085, 2026 and 2086), for improved VDE communications capacity and coverage.

Coordination of VDE space stations of the maritime mobile-satellite service (space-to-Earth) with respect to terrestrial services is described in modification of RR Appendix **5**, proposing a PFD mask.

It is proposed to modify provision RR No. **5.208B** in order to ensure the protection of the nearest radio astronomy band.

In order to protect the radio astronomy service, Annex 1 to Resolution **739 (Rev.WRC‑07)** would be revised to include new space service in the frequency band 161.7875-161.9375 MHz.

Recommendation/Report ITU-R M.[VDES] describes the concept and characteristics of VDES has been developed during the study period.

**Method C2** – It is proposed to use the frequency band 148-150 MHz (Earth-to-space) for the purpose of the VDES satellite uplink (improvement of VDE communications capacity and coverage, ASM communications capacity and coverage) as the band already allocated for mobile-satellite service.

It is proposed to use the frequency band 137-138 MHz (space-to-Earth) for the purpose of the VDES satellite downlink as the band already allocated for MSS.

These frequency bands restricted by NGSO systems in accordance with RR No. **5.209** (WRC-97).

No additional allocations and RR changes are required to MSS for this method.

**ISSUE D** – VDES regional solution

**Method D** – Channels 80, 21, 81, 22, 82, 23 and 83 are available in some Regions as follows:

* Channels 80, 21, 81 and 22 can be used using multiple 25 kHz contiguous channels for both ship and coast station transmission as regional use.
* Channel 82 can be used for both ship and coast station transmission as regional use.
* Channels 23 and 83 can be used using multiple 25 kHz contiguous channels for both ship and coast station transmission as regional use.

**2. Documents**

***2.1 Input Documents:***

[APG15-4/INP-18](http://www.apt.int/sites/default/files/2015/01/APG15-4-INP-18_KOR_WP3.docx) (KOR), [APG15-4/INP-25](http://www.apt.int/sites/default/files/2015/01/APG15-4-INP-25_NZL3_-_WP3.docx) (NZL), [APG15-4/INP-33](http://www.apt.int/sites/default/files/2015/02/APG15-4-INP-33_INS-WP3.docx) (INS), [APG15-4/INP-38](http://www.apt.int/sites/default/files/2015/02/APG15-4-INP-38_IRN_WP3.docx) (IRN), [APG15-4/INP-43](http://www.apt.int/sites/default/files/2015/02/APG15-4-INP-43_CHN_PV_WP3.docx) (CHN), [APG15-4/INP-52](http://www.apt.int/sites/default/files/2015/02/APG15-4-INP-52_CHN_CPM3.docx) (CHN), [APG15-4/INP-57](http://www.apt.int/sites/default/files/2015/02/APG15-4-INP-57_AUS_PV_WP3.docx) (AUS), [APG15-4/INP-79](http://www.apt.int/sites/default/files/2015/02/APG15-4-INP-79_J_PV_WP3.docx) (J), [APG15-4/INP-93](http://www.apt.int/sites/default/files/2015/02/APG15-4-INP-93_VTN_PV_WP3.docx) (VTN)

***2.2 Information Documents:***

[APG15-4/INF-14](http://www.apt.int/sites/default/files/2015/01/APG15-4-INF-14_RCC_position_WRC-15_ENG_05_12_2014.docx) (RCC), [APG15-4/INF-18](http://www.apt.int/sites/default/files/2015/02/APG15-4-INF-18_ITU_BR_-_Update_on_preparation_status_of_CPM-15RA-15WRC-15_v1.pdf) (ITU), [APG15-4/INF-19](http://www.apt.int/sites/default/files/2015/02/APG15-4-INF-19_CEPT_Presentation_Regional_org__February_2015.pdf) (CEPT), [APG15-4/INF-20](http://www.apt.int/sites/default/files/2015/02/APG15-4-INF-20_CITEL_Preparation.pdf)  (CITEL)

**3. Summary of Discussion**

In this APG meeting, this group considered nine input contributions from members of APT and four information documents from other regional groups. The administrations presented their views on the methods in Draft CPM Report and proposed modification to the draft APT Preliminary Views.

The draft APT Preliminary Views on this agenda item was updated accordingly. APT members support the implementation of VDES to enhance maritime radio communications, while protecting the integrity of the original operational purpose of AIS as the primary function on the existing AIS frequencies. The Methods A1 and D to address ASM and regional VDES respectively were supported by APT members. After the extensive discussion, it was agreed that final decisions to identify these digital communication channels in RR Appendix **18** to terrestrial and satellite components of VDE would be developed at next APG meeting noting technical studies at ITU-R WP 5B are near completion.

**4. APT Preliminary Views**

**4.1 Preliminary Views**

* Supports ITU-R studies towards new applications using the AIS and enhanced maritime radiocommunication in the maritime mobile service in accordance with Resolution **360 (WRC-12)**.
* The implementation of the concept of the VDES which contains the VDE terrestrial component, the satellite component and the ASM component would enhance maritime radio communications.
* Modifications should not be required to existing AIS equipment on board existing vessels. New applications using AIS technology should be allowed to evolve,, supported by communication primarily on the new frequencies identified by WRC-12, while protecting the integrity of the original operational purpose of AIS as the primary function on the existing AIS frequencies.
* That the frequency band identified for VDES should accommodate the expected future AIS VDL loading.
* Any change to the regulatory provisions and spectrum allocations resulting from this agenda item should not adversely impact on the capability of search and rescue aircraft to effectively communicate with vessels during disaster relief operations.
* It is needed to take full account of the outcomes of WRC-12 on digital communication channel arrangements in RR Appendix **18** for the global and regional channel allocation for VDES. Different types of VDES applications and equipment in different scenarios and operating in different frequency arrangement plan could be considered.
* Any new allocation for the future applications, including satellite application, to the frequency bands listed in the RR Appendix **18** should be based on issued ITU-R Recommendation(s).
* Transitional arrangements are required to minimize the impact of use of new applications on the existing services using frequencies listed in the RR Appendix **18**. The VDES equipment should provide backwards compatibility for existing AIS, the installation costs should be minimized and the proper transitional period should be considered.
* New VDES should not adversely impact VHF radiotelephony channels used for maritime safety at sea and ports.
* Operation of designated ASM channels should not adversely impact AIS 1 and AIS 2 channels.
* VDES Satellite downlinks should not adversely impact AIS 1 and AIS 2 channels, and terrestrial component of VDE, and incumbent services in the same frequency band.
* It is desirable to consider the possibility of VDES involvement in the future modernized GMDSS.
* The two safety-of-navigation channels, AIS 1 and AIS 2, should be protected from harmful interference and blocking. To prevent blocking of the reception of the AIS channels and ASM channels, the transmitting from ship on channels 2078, 2019, 2079 and 2020 will not be permitted.
* The two channels 2027 and 2028 should be used for new AIS applications as ASM channels, the usage of remaining channels 1027 and 1028 should be taken into account.

**4.2 APT Preliminary Views on methods to satisfy this Agenda item**

APT Members support methods in the Draft CPM Report to enable possible new AIS technology applications and possible new applications to improve maritime radiocommunication in accordance with Resolution **360** (WRC-12) as follows:

**4.2.1 On issue of ASM designation**

Support Method A1.

* + 1. **On issue of new applications for maritime radiocommunication – terrestrial component:**

It was noted that technical studies at ITU-R WP 5B are near completion and final decisions on this issue by APT members would be developed at next APG meeting.

* + 1. **On issue of new application for maritime radiocommunication – satellite component**

It was noted that technical studies at ITU-R WP 5B are near completion and final decisions on this issue by APT members would be developed at next APG meeting.

* + 1. **On issue of VDES regional solution**

Support Method D.

* 1. **Regulatory and procedural considerations**

Appendix **18 (Rev.WRC-12)** Table of transmitting frequencies in the VHF maritime mobile band

| Channel designator | Notes | Transmitting frequencies  (MHz) | | Inter-ship | Port operations  and ship movement | | Public corres-pondence |
| --- | --- | --- | --- | --- | --- | --- | --- |
| From ship stations | From coast stations | Single frequency | Two frequency |
| … |  | … | … |  |  |  |  |
| 78 | t), u), v) | 156.925 | 161.525 |  | x | x | x |
| 1078 |  | 156.925 | 156.925 |  | x |  |  |
| 2078 | t), u), v) |  | 161.525 |  | x |  |  |
| 19 | t), u), v) | 156.950 | 161.550 |  | x | x | x |
| 1019 |  | 156.950 | 156.950 |  | x |  |  |
| 2019 | t), u), v) |  | 161.550 |  | x |  |  |
| 79 | t), u), v) | 156.975 | 161.575 |  | x | x | x |
| 1079 |  | 156.975 | 156.975 |  | x |  |  |
| 2079 | t), u), v) |  | 161.575 |  | x |  |  |
| 20 | t), u), v) | 157.000 | 161.600 |  | x | x | x |
| 1020 |  | 157.000 | 157.000 |  | x |  |  |
| 2020 | t), u), v) |  | 161.600 |  | x |  |  |
| 80 | *w), y), xx)* | 157.025 | 161.625 |  | x | x | x |
| 1080 | *w), y), xx)* | 157.025 | 157.025 | x | x |  |  |
| 2080 | *w), y), xx)* | 161.625 | 161.625 | x | x |  |  |
| 21 | *w), y), xx)* | 157.050 | 161.650 |  | x | x | x |
| 1021 | *w), y), xx)* | 157.050 | 157.050 | x | x |  |  |
| 2021 | *w), y), xx)* | 161.650 | 161.650 | x | x |  |  |
| 81 | *w), y), xx)* | 157.075 | 161.675 |  | x | x | x |
| 1081 | *w), y), xx)* | 157.075 | 157.075 | x | x |  |  |
| 2081 | *w), y), xx)* | 161.675 | 161.675 | x | x |  |  |
| 22 | *w), y), xx)* | 157.100 | 161.700 |  | x | x | x |
| 1022 | *w), y), xx)* | 157.100 | 157.100 | x | x |  |  |
| 2022 | *w), y), xx)* | 161.700 | 161.700 | x | x |  |  |
| 82 | *w), x), y)* | 157.125 | 161.725 |  | x | x | x |
| 1082 | *w), x), y)* | 157.125 | 157.125 | x | x |  |  |
| 2082 | *w), x), y)* | 161.725 | 161.725 | x | x |  |  |
| 23 | *w), x), y),*  *xxx)* | 157.150 | 161.750 |  | x | x | x |
| 1023 | *w), x), y),*  *xxx)* | 157.150 | 157.150 | x | x |  |  |
| 2023 | *w), x), y),*  *xxx)* | 161.750 | 161.750 | x | x |  |  |
| 83 | *w), x), y), xxx)* | 157.175 | 161.775 |  | x | x | x |
| 1083 | *w), x), y),*  *xxx)* | 157.175 | 157.175 | x | x |  |  |
| 2083 | *w), x), y),*  *xxx)* | 161.775 | 161.775 | x | x |  |  |
| … |  |  |  |  |  |  |  |
| 27 | *z)* | 157.350 | 161.950 |  |  | x | x |
| 1027 |  | 157.350 | 157.350 |  | x |  |  |
| 2027 |  | 161.950 | 161.950 |  | x |  |  |
| 87 | *z)* | 157.375 | 157.375 |  | x |  |  |
| 28 | *z)* | 157.400 | 162.000 |  |  | x | x |
| 1028 |  | 157.400 | 157.400 |  | x |  |  |
| 2028 |  | 162.00 | 162.000 |  | x |  |  |
| 88 | *z)* | 157.425 | 157.425 |  | x |  |  |
| AIS 1 | *f), l), p)* | 161.975 | 161.975 |  |  |  |  |
| AIS 2 | *f), l), p)* | 162.025 | 162.025 |  |  |  |  |

**Method A1**

**MOD**

*t)* In Regions 1 and 3, the existing duplex channels 78, 19, 79 and 20 can continue to be assigned. These channels may be operated as single-frequency channels, subject to coordination with affected administrations. However, existing duplex channel assignments may be preserved for coast stations and retained for vessels, subject to coordination with affected administrations. Channels 2078, 2019, 2079 and 2020 are not available for transmitting from ships. (WRC‑15)

*u)* In Region 2, these channels may be operated as single-frequency channels, subject to coordination with affected administrations.  Channels 2078, 2019, 2079 and 2020 are not available for transmitting from ships. (WRC‑15)

*v)* After 1 January 2017, in the Netherlands, these channels may continue to be operated as duplex frequency channels, subject to coordination with affected administrations.  Channels 2078, 2019, 2079 and 2020 are not available for transmitting from ships. (WRC‑15)

**MOD**

*z)* [TBD], these channels may be used for possible testing of future AIS applications without causing harmful interference to, or claiming protection from, existing applications and stations operating in the fixed and mobile services.

[TBD], these channels are split into two simplex channels. The upper legs, 2027 and 2028 respectively designated as ASM 1 and ASM 2 are used for non-navigation ASM (application-specific messages) as described in the most recent version of the Recommendation ITU-R M.[VDES].

The channels 2027 and 2028 are also allocated to the maritime mobile-satellite service (Earth‑to‑space) for the reception of ASM messages from ships as described in the most recent version of the Recommendation ITU-R M.[VDES] in which they are denominated respectively as SAT Up1 and SAT Up2. (WRC‑15)

**Method D**

**ADD**

*xx)* Assignable for wide-band digital system operation using multiple 25 kHz contiguous channels.

*xxx)* Assignable for 50 kHz bandwidth digital system operation using two 25 kHz contiguous channels.

**5. Issues for Consideration at APG 15-5 Meeting:**

APT Members are encouraged to review this document and provide more input contributions to develop APT Preliminary Views on this Agenda item.

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