

PLENARY MEETING

Document CPM15-2/182-E
23 March 2015
Original: English

Working Group 2

PROPOSED MODIFICATIONS TO DRAFT CPM REPORT

CHAPTER 2, AGENDA ITEM 1.13

(WP 7B / WP 5A, WP 5C)

1.13 *to review No. 5.268 with a view to examining the possibility for increasing the 5 km distance limitation and allowing space research service (space-to-space) use for proximity operations by space vehicles communicating with an orbiting manned space vehicle, in accordance with Resolution 652 (WRC-12);*

Resolution 652 (WRC-12): *Use of the band 410-420 MHz by the space research service (space-to-space)*

2/1.13/1 Executive summary

Resolution 652 (WRC-12) calls for studies between SRS (space-to-space) systems communicating in proximity with orbiting manned space vehicles and systems operating in the fixed and mobile (except aeronautical mobile) services in the band 410-420 MHz. WRC-15 is called to review RR No. 5.268 with a view to examine the possibility for increasing the 5 km distance limitation and allowing space research service (space-to-space) use for proximity operations by space vehicles communicating with an orbiting manned space vehicle.

Sharing studies between stations of the SRS (space-to-space) and stations of the FS and MS in the band 410-420 MHz have been completed. These studies found that the protection criteria specified in RR No. 5.268 can be met without a distance limitation on SRS use of proximity operations.

Taking into account the results of sharing studies, one method has been proposed to satisfy this agenda item. This method proposes relevant modifications to RR No. 5.268 to remove the 5 km distance limitation and not solely limit the use of the frequency band for extra-vehicular activities. Taking into account that studies required by Resolution 652 (WRC-12) have been completed this resolution should be suppressed.

2/1.13/2 Background

The band 410-420 MHz is used today for communications by astronauts conducting extra-vehicular activities (EVA) operations in the immediate vicinity of the International Space Station. Use of this frequency band for proximity operations by vehicles approaching the International Space Station or

other manned space vehicles would be advantageous as the propagation and physical properties of this frequency range enable favourable coverage performance in the highly multipath environment of the International Space Station. The 5 km limit was agreed during WARC-92 when the envisioned use of the band was limited to free floating astronauts working in the rear vicinity of a manned space vehicle. The addition of power flux-density (pfd) limits by WRC-97 provided a primary allocation for SRS (space-to-space) uses as specified in RR No. **5.268** while ensuring the protection of systems operating in the FS and MS. Vehicles approaching the International Space Station, whether manned or robotic, need to communicate over a longer distance to provide safe operations during docking manoeuvres. It is therefore necessary to modify RR No. **5.268** to remove the 5 km limitation and EVA use limitation while maintaining the current pfd limits.

2/1.13/3 Summary of technical and operational studies, including a list of relevant ITU-R Recommendations

Existing relevant ITU-R Reports and Recommendations: Report [ITU-R SA.2162](#).

New relevant ITU-R Report: [ITU-R SA.2271](#).

The ITU-R has developed Report ITU-R SA.2271 on sharing and compatibility studies between space research proximity operations links and FS and MS links in the 410-420 MHz frequency band. The report describes technical parameters and operational characteristics of SRS systems employed for proximity operations and provides a compatibility analysis between SRS communication links and links of the FS and MS. The results of this analysis show that the pfd produced by transmitters of space vehicles communicating with an orbiting manned space vehicle at the surface of the Earth do not exceed limits specified in RR No. **5.268** at distances much greater than 5 km.

2/1.13/4 Analysis of the results of studies

The studies show that the pfd limits specified in RR No. **5.268** can be met by SRS (space-to-space) systems communicating in proximity with orbiting manned space vehicles at distances beyond 5 km that ensures protection of systems operating in the FS and MS, independent of distance from, or the source of, space-to-space communications in the SRS.

2/1.13/5 Method(s) to satisfy the agenda item

One method is proposed to satisfy this agenda item.

The proposed method is to modify RR No. **5.268** to remove the 5 km distance limitation and not solely limit the use of the frequency band 410-420 MHz for extra-vehicular activities. Also Resolution **652 (WRC-12)** should be consequentially suppressed.

Advantages:

- This method would allow vehicles approaching a manned space vehicle (e.g. the International Space Station), whether manned or robotic, to communicate over longer distances to ensure safe operations and docking manoeuvres.
- This method will allow for further development of space facilities to allow for increased support of many of the planned and envisioned space activities.
- This method will ensure protection of FS and MS systems.

Disadvantages:

- None.

2/1.13/6 Regulatory and procedural considerations

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations (See No. 2.1)

MOD

410-460 MHz

Allocation to services		
Region 1	Region 2	Region 3
410-420	FIXED MOBILE except aeronautical mobile SPACE RESEARCH (space-to-space) MOD 5.268	

MOD

5.268 Use of the frequency band 410-420 MHz by the space research service is limited to space-to-space communications with an orbiting, manned space vehicle. The power flux-density at the surface of the Earth produced by emissions from transmitting stations of the space research service (space-to-space) in the frequency band 410-420 MHz shall not exceed $-153 \text{ dB(W/m}^2\text{)}$ for $0^\circ \leq \delta \leq 5^\circ$, $-153 + 0.077 (\delta - 5) \text{ dB(W/m}^2\text{)}$ for $5^\circ \leq \delta \leq 70^\circ$ and $-148 \text{ dB(W/m}^2\text{)}$ for $70^\circ \leq \delta \leq 90^\circ$, where δ is the angle of arrival of the radio-frequency wave and the reference bandwidth is 4 kHz. In this frequency band stations of the space research (space-to-space) service shall not claim protection from, nor constrain the use and development of, stations of the fixed and mobile services. No. **4.10** does not apply. (WRC-15)

SUP

RESOLUTION 652 (WRC-12)

Use of the band 410-420 MHz by the space research service (space-to-space)
