

AGENDA ITEM 1.15

1.15 to consider spectrum demands for on-board communication stations in the maritime mobile service in accordance with Resolution 358 (WRC-12);

Resolution 358 (WRC-12): *Consideration of improvement and expansion of on-board communication stations in the maritime mobile service in the UHF bands*

3/1.15/1 Executive summary

The use of UHF frequencies for on-board communication is considered very important, without these, critical functions of the ship in restricted waters could not effectively take place. These functions include anchoring, berthing, control of firefighting/damage control parties, security patrols, terrorism threats etc. Whilst these are of significant concern to those operating the ship the consequences of failure affect not only the seafarer but have significant implication for the immediate environment the ship is operating in.

Only six frequencies, in the frequency range 450-470 MHz, are currently identified in RR No. **5.287** for on-board communication stations using 25 kHz channels spacing. These frequencies are 457.525 MHz, 457.550 MHz, 457.575 MHz, 467.525 MHz, 467.550 MHz and 467.575 MHz. Where needed, equipment designed for 12.5 kHz channel spacing using also the additional frequencies 457.5375 MHz, 457.5625 MHz, 467.5375 MHz and 467.5625 MHz may be introduced for on-board communications.

The use of these frequencies in territorial waters may be subject to the national regulations of the administration concerned. The characteristics of the equipment used shall conform to those specified in Recommendation ITU-R M.1174-2.

A worldwide survey indicates that in several geographical areas, communications by UHF of a ship were either prevented on some channels by traffic from other vessels or shore operations or were severely interfered.

One method has been identified to satisfy this agenda item.

No new frequency bands are proposed for on-board communication, but in order to have a more efficient usage of the existing frequencies it is proposed to introduce digital technologies and to encourage the use of mitigation technologies, such as continuous tone coded squelch systems (CTCSS), digital coded squelch (DCS) and listen before talk (LBT), as a way to mitigate the impression of congestion to the user.

This is intended to be achieved with a revision of Recommendation ITU-R M.1174-2 during the study period. Amendments to RR No. **5.287** are proposed to reflect these changes.

3/1.15/2 Background

RR No. **5.287** says that in the maritime mobile service (MMS) six frequencies in UHF frequency band may be used by on-board communication stations:

5.287 *In the maritime mobile service, the frequencies 457.525, 457.550, 457.575, 467.525, 467.550 and 467.575 MHz may be used by on-board communication stations. Where needed, equipment designed for 12.5 kHz channel spacing using also the additional frequencies 457.5375, 457.5625, 467.5375 and 467.5625 MHz may be introduced for on-board communications. The use of these frequencies in territorial waters may be subject to the national regulations of the administration concerned. The characteristics of the equipment used shall conform to those specified in Recommendation ITU-R M.1174-2. (WRC-07)*

It should be noted that some administrations actively use these frequencies for land mobile service. In accordance with RR No. **5.286AA** the frequency band 450-470 MHz is identified for use by administrations wishing to implement International Mobile Telecommunication (IMT).

3/1.15/3 Summary of technical and operational studies, including a list of relevant ITU-R Recommendations

Recommendations: [ITU-R M.478](#), [ITU-R M.1036](#), [ITU-R M.1174](#), [ITU-R M.1184](#), [ITU-R M.1450](#), [ITU-R M.1732](#), [ITU-R M.1808](#), [ITU-R M.1823](#), [ITU-R M.1824](#).

Reports: [ITU-R M.2039](#), [ITU-R M.2110](#), [ITU-R M.2116](#).

3/1.15/4 Analysis of the results of studies

A more efficient usage of the existing on-board frequencies could be achieved with the systematic utilization of 12.5 kHz and 6.25 kHz channel spacing for spectrum identified in the RR for on-board communications. The use of 12.5 or 6.25 kHz channels with digital technologies can provide up to 4 times the capacity compared with traditional 25 kHz system.

The MMS is part of the mobile service. Analogue and different digital modulations are already in use for the land mobile applications successfully; this is used as an example to show compatibility.

Within the study (Report ITU-R M.2110) of CDMA450 (IMT) it is recognized that the mobile service is heavily operating in the frequency range 450-470 MHz and CDMA450 (IMT) has to provide appropriate filtering to ensure compatibility with analogue and digital communication systems in this frequency band.

For certain countries the frequency range 420-460 MHz is allocated to the aeronautical radio navigation service on a secondary basis, therefore they cannot claim protection against the mobile service in this frequency band. The frequency band 460-470 MHz is in certain countries allocated for Meteorological-satellite systems (space-to-Earth) on a primary basis. In the relevant frequency band 467.50- 467.60 MHz for MMS no assignment or application for a satellite was noted in the ITU database, therefore the compatibility can be assumed.

The frequencies indicated in provision RR No. **5.287** are part of the spectrum of licenced conventional radio systems, mobiles and handheld portables operating in the private mobile radio (PMR) frequency range 30 to 1 000 MHz. At present a transition from analogue to digital technology for land mobile radio applications can be observed. Both systems are operating side by side on the same frequencies. Operational experience shows that the interference between the different technologies is comparable to that between analogue systems. Compatibility studies for land mobile applications to other services had already been published.

With respect to on-board communication stations in the MMS the restriction to analogue technology should be abrogated. Basically this kind of radio communication is restricted to on-board use of a vessel. For both communication technologies, analogue as well as digital, on board larger vessels infrastructure plans for the arrangement of antennas and repeaters is required. When using the same amount of infrastructure of repeaters and antennas digital technology works as robustly and stable as analogue systems but provides better communication quality.

Conventional analogue and digital two-way radio operates in UHF ranges that include spectrum for on-board communications. Studies on analogue and digital two-way radio systems show that:

- Analogue and digital technologies are working very robustly, and advantages of digital system are recognized.

- Repeaters can be seen within UHF on-board communication system in large vessels. The implementation of repeater stations together with distributed antennas could help to utilize digital systems without a propagation issue.
- With the same infrastructure, digital technology can work as robustly and stable as analogue systems but provides additional useful features as well as better communication quality;
- Interference between analogue systems is the same situation as between analogue and digital system. That means that the coexistence issue is not different among analogue vs analogue, analogue vs digital and digital vs digital systems.
- Digital private mobile radio (dPMR) and digital mobile radio (DMR) are two major standards for digital two-way voice/data radio, DMR system is a two time-slot TDMA while dPMR is a FDMA system. Both standards use 4-FSK modulation variants (DMR using 9 600 bps in 12.5 kHz channels and dPMR uses 4 800 bps in 6.25 kHz channels) and voice digitally coded with error correction at 3 600 bps.
- CTCSS, DCS and listen before talk (LBT) could be a way to mitigate the congestion.

Modifications to provisions of RR No. **5.287** and Recommendation ITU-R M.1174-2 are needed to introduce additional channel arrangement with channel numbering as well as digital technology for on-board communication stations in the maritime mobile service. The draft revision of Recommendation ITU-R M.1174-2 was agreed by ITU-R SG 5 meeting in November 2014 and has been sent in the adoption/approval process referred to in Resolution ITU-R 1-6 (section 10.2 and 10.4), see Administrative Circular CACE/710.

Mariners should be informed about the usage of these frequencies. This information should be delivered by the member states having contiguous sea areas under their jurisdiction.

3/1.15/5 Method(s) to satisfy the agenda item

The identification of new spectrum for on-board communications in UHF is not justified and therefore not necessary.

However the importance of on-board communications to safe ship operations is fully recognized, together with the congestion in some geographical area.

A more efficient usage of the existing frequencies could be achieved with the systematic utilization of 12.5 kHz and 6.25 kHz channel spacing for all the channels identified for on-board communications. The numbering of these channels should be clearly harmonized worldwide.

The implementation of digital technology will open the possibility for additional operational features and a number of different standards are available.

For analogue technology the use of CTCSS and DCS could be used as a way to mitigate the impression of congestion to the user.

For digital technology the use of DCS or an operational equivalent system could be used as a way to mitigate the impression of congestion to the user.

The LBT protocol should be used as a possible mitigation technique, in both analogue and digital technology systems.

To achieve this, amendments to provision RR No. **5.287** are necessary, in accordance with the Recommendation ITU-R M.1174 which has been revised. Provision is made for 25 kHz, 12.5 kHz and 6.25 kHz channel spacing. No constraints should be placed on the usage by the existing 25 kHz analogue on-board communication systems.

To achieve a higher degree of flexibility for the use of systems, it is proposed to indicate the frequencies in RR No. 5.287 as two frequency bands.

3/1.15/6 Regulatory and procedural considerations

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

(See No. 2.1)

MOD

5.287 Use of the frequency bands 457.5125-457.5875 MHz and 467.5125-467.5875 MHz ~~by~~ in the maritime mobile service, ~~is limited to the frequencies 457.525 MHz, 457.550 MHz, 457.575 MHz, 467.525 MHz, 467.550 MHz and 467.575 MHz may be used by~~ on-board communication stations. ~~Where needed, equipment designed for 12.5 kHz channel spacing using also the additional frequencies 457.5375 MHz, 457.5625 MHz, 467.5375 MHz and 467.5625 MHz may be introduced for on-board communications. The use of these frequencies in territorial waters may be subject to the national regulations of the administration concerned.~~ The characteristics of the equipment ~~used and the channelling arrangement~~ shall ~~be in conformity with to those specified in~~ Recommendation ITU-R M.1174-23. The use of these frequency bands in territorial waters may also be subject to the national regulations of the administration concerned. (WRC-0715)

SUP

RESOLUTION 358 (WRC-12)

Consideration of improvement and expansion of on-board communication stations in the maritime mobile service in the UHF bands