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REVISION PROPOSAL FOR DRAFT MARCOM MANUAL

# Summary

Progress has been made in maritime radiocommunication during 2023 world radiocommunication conference (WRC-23). The relevant progress is added to the current draft manual “*DTEC-12.2.2.6 - Draft MRCP\_MarCom Manual-for DTEC02-WG2 reviewed*” to update its background, existing maritime radiocommunication technologies, future developments, GMDSS modernization and spectrum allocation. Some missing technical parameters are suggested to be added to table 2, and some inaccurate information is proposed to be corrected. Some related useful recommendations and guidelines are added for readers.

## Purpose of the document

The committee is invited to review the proposal which aims at developing more accurate and comprehensive manual in a timely manner.

## Related documents

[1] DTEC-12.2.2.6 - Draft MRCP\_MarCom Manual-for DTEC02-WG2 reviewed

# Background

The WRC-23 approved the revisions to Radio Regulations pertaining to GMDSS modernization and recommended agenda items on maritime radio issues for future conferences. The maritime radio communications manual will be finalized in DTEC 3 and participants are invited to review and provide input on this manual by DTEC 2.

# Discussion

The World Radiocommunication Conference was held in Dubai at the end of 2023, and progresses on maritime radiocommunication have been made during the conference, including allocating transmission frequencies for NAVDAT and Automatic Connection System (ACS), reclaiming NBDP distress communication frequencies, issuing resolutions on frequency issues related to the BeiDou message service system (BDMSS), etc. At the same time, WRC-23 has recommended preliminary agenda items on maritime radiocommunication for future conferences. These agenda items cover studies on improving utilization and channelization in MF and HF bands, maritime VHF digital voice and VDES-R mode, and the use of frequency bands 1645.5-1646.5MHz. The information is important for summarizing the current status and future development of maritime radio communication systems, so it is suggested to add the information to this manual to improve its timeliness. In addition, the missing content in this manual is supplemented, including NAVTEX technical parameters, to improve the completeness of the manual. Some inaccurate information has been corrected, including the use of VDES frequencies, to enhance the manual’s accuracy. Some guidelines and recommendations on maritime radio communication have been added to provide more information for manual users and improve the practicality of the manual.

The detailed revision proposals are displayed in change tracking mode in the annex. And reasons highlighted in gray are given under each proposal for clarification.

# References

1. ITU, Final acts of WRC-23: Articles 5, 32, 33 and 52, Appendix 15 and 17, Resolutions 252, 354, 363, 365, 366. Available: https://www.itu.int/hub/publication/r-act-wrc-16-2024/
2. ITU, Radio Regulations (2020): Appendix 18. Available: https://www.itu.int/en/publications/ITU-R/pages/publications.aspx?parent=R-REG-RR-2020&media=electronic
3. ITU-R M series Recommendations. Available: https://www.itu.int/rec/R-REC-M/en
4. ITU-R M series Reports. Available: https://www.itu.int/pub/R-REP-M/en
5. IMO, MSC.496(105) AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974. Available: https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MSCResolutions/MSC.496(105).pdf
6. IMO, MSC.508(105) PERFORMANCE STANDARDS FOR THE RECEPTION OF MARITIME SAFETY INFORMATION AND SEARCH AND RESCUE RELATED INFORMATION BY MF (NAVTEX) AND HF. Available: https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MSCResolutions/MSC.508(105).pdf
7. IMO MSC.512(105) PERFORMANCE STANDARDS FOR SHIPBORNE MF AND MF/HF RADIO INSTALLATIONS CAPABLE OF VOICE COMMUNICATION, DIGITAL SELECTIVE CALLING AND RECEPTION OF MARITIME SAFETY INFORMATION AND SEARCH AND RESCUE RELATED INFORMATION. Available: https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MSCResolutions/MSC.512(105).pdf

# Action requested of the Committee

The Committee is requested to consider this document's proposal and take appropriate actions.

1. DETAILED REVISION PROPOSAL FOR DRAFT MARCOM MANUAL
   1. Revision proposal for section 2.5

2.5 Technical

Significant changes underpinning services and systems are expected over the next decade being precipitated by the rapid deployment of satellite systems, the rapid growth of high bandwidth, low latency radio data communication systems and the merging of data and voice services.

Technical developments in digital data exchange and communications environment include the ITU work on:

* International Mobile Telecommunications 2020 (IMT-2020)
* International Mobile Telecommunications IMT-2030
* The development of the VHF Data Exchange System (VDES) including VDES R-mode
* The development of the digital Navigational Data System(NAVDAT)
* The development of maritime VHF digital voice.

Reasons: NAVDAT and maritime VHF digital voice are maritime digital communication.

A.2 Revision proposal for section 3.2

3.2.2 Medium Frequency / High Frequency Band (MF/HF)

The MF/HF radio spectrum is used by the maritime community for communication of voice and data. MF/HF transmissions support both general, Maritime Safety Information (MSI) and distress related communications using DSC, NBDP, voice and data. These communications take place across the maritime mobile service bands within 0.3-26.5 MHz as defined in Articles 5, 33, 52, Appendix 15, and Appendix **17** to the ITU Radio Regulations, whilst distress, urgency and safety communications are consigned to a small set of specific channels as indicated in Article 33 and Appendix **15** to the ITU Radio Regulations. *Article 52 describes special rules relating to the use of frequencies, including some frequencies arrangements in the MF and HF band. Appendix 17 of RR identifies frequencies and channelling arrangements in the HF bands for the maritime mobile service (MMS).* Channel bandwidths are typically 0.5 kHz (DSC and NBDP) and 3 kHz (voice and data).

Reasons: 490kHz and 518kHz are also medium frequency. According to ITU, medium frequency start from 0.3MHz. More information from RR about MF/HF usage are added for the convenience of readers.

3.2.2.1 Digital Selective Calling (DSC)

DSC is an element of the Global Maritime Distress and Safety System (GMDSS) and enables a radio station to establish contact with, and transfer information to, another station or group of stations, for distress or general communications over medium to long range distances using a unique MMSI (refer to Recommendation ITU-R M.585). DSC is primarily used for distress alerting, urgency and safety calling within ship-to-ship, ship-to-shore, and shore-to-ship prior to initiating distress, urgency and safety communications using radiotelephone.

DSC distress alerts are used to initiate emergency communications with ships and rescue co-ordination centres. DSC is intended to eliminate the need for manual watch keeping on a ship's bridge or on shore to monitor continuously radio receivers on the distress and safety frequencies.

Six specific MF/HF frequencies are also set aside for Digital Selective Calling (DSC) distress and safety communications, one in each communication sub-band up to 16 MHz band.

Automatic connection system (ACS) is an automatic connection function using digital selective calling (DSC) for shore-to-ship, ship-to-shore or ship-to-ship communication. ACS can judge the most appropriate frequency band for MF/HF communication from which an available working channel is selected.

WRC-23 approves the introduction of ACS and allocate frequencies of 2 174.5 kHz, 4 177.5 kHz, 6 268 kHz, 8 376.5 kHz, 12 520 kHz and 16 695 kHz to it, all of which are withdrawn from NBDP distress communication.

Operational procedures for both ship and coast stations for automatic connection system using digital selective calling communications in MF and HF bands are detailed in Report ITU-R M.2531.

Operational procedures for the use of digital selective calling equipment in the maritime mobile service are detailed in recommendation ITU-R M.541.

Digital selective-calling system for use in the maritime mobile service are detailed in recommendation ITU-R M.493.

Reasons: MF/HF radiotelex is no longer required in distress communication with regard to WRC-23 final act and MSC.496(105). According to WRC-23 final act and MSC.512(105), ACS is introduced. Therefore information on ACS is provided for the convenience of readers.

3.2.2.2 Voice Communication

The MF/HF radio spectrum is used by the maritime community for communication of voice in ship-ship, shore-ship, and ship-shore modes of operation. General voice communication takes place across the band 1.6-26.5 MHz. Channel bandwidths are typically 3 kHz. Detailed HF channel arrangement of radiotelephone is in section I of Part B of appendix 17 of RR. Frequencies of radiotelephone for distress traffic are in appendix 15 of RR.

Recommendation ITU-R M.1171 *Radiotelephony procedures for routine calls in the maritime mobile service* describes the radiotelephony procedures for routine calls within the maritime mobile service.

Recommendation ITU-R M.1173 *Technical characteristics of single-sideband transmitters used in the maritime mobile service for radiotelephony in the bands between 1 606.5 kHz (1 605 kHz Region 2) and 4 000 kHz and between 4 000 kHz and 27 500 kHz* provides the technical characteristics for single sideband transmitters used in the MF/HF maritime mobile service bands. Article 32 of RR specifies operational procedures for distress communications in the global maritime distress and safety system (GMDSS). Article 33 of RR specifies operational procedures for urgency and safety communications in GMDSS. RESOLUTION 354 (REV.WRC-23) specifies distress and safety radiotelephony procedures for 2182 kHz.

Reasons: Information on frequencies of radiotelephone in distress communication and HF radiotelephone channel arrangement is added for reference. Recommendations ITU-R M.1171 and ITU-R M.1173 are added to provide more useful information. Information on the procedure of GMDSS radiotelephone is provided for the convenience of readers.

3.2.2.4 Narrowband Direct Printing (NBDP)

NBDP (also known as radio telex) uses MF/HF channels of 0.5 kHz using FSK modulation and supports low speed data transmissions (100 bps) in the maritime mobile service bands within 0.3-26.5 MHz. HF NBDP channel arrangements are detailed in section II and III of Part B of appendix 17 of RR. NBDP is no longer used for distress follow-up communications but can still be used for MSI transmission. Frequencies for HF NBDP MSI are detailed in appendix 15 of RR.

NBDP has been removed from Regulation 10 SOLAS IV in the Jan 2024 as part of the modernisation of GMDSS.

The characteristics of the NBDP equipment are described in Recommendations ITU-R M.476, ITU-R M.625 and ITU-R M.627. Operational procedures for the use of direct-printing telegraph equipment in the maritime mobile service are described in Recommendations ITU-R M.492.

Technical characteristics for a HF NBDP system for promulgation of high seas maritime safety information are described in Recommendation ITU-R M.688 *Technical characteristics for a high frequency direct-printing telegraph system for promulgation of high seas and NAVTEX-type maritime safety information*.

Reasons: According to articles 51.39-51.44 of RR, there is NBDP service between 415kHz and 535kHz. Therefore Medium Frequency (MF) is applied to NBDP service. MF start from 0.3MHz with reference to RR article 2.1. According to final act of WRC-23 and MSC.496(105), NBDP is no longer used for distress follow-up communication. According to final act of WRC-23, MSC.1-Circ.1645 and MSC.508(105), NBDP can still be used for MSI transmission. Several ITU recommendations are added to provide more information on NBDP for readers. Information on channel arrangement of HF NBDP and MSI frequencies of HF NBDP are added for reference.

3.2.2.5 Navigational Telex (NAVTEX)

NAVTEX is an international automated system for distributing MSI such as maritime navigational warnings, weather forecasts and warnings, and SAR related information from shore to ship by means of NBDP. A NAVTEX receiver is installed on the ship’s bridge. NAVTEX messages are broadcast in English on the international frequency 518 kHz, with national broadcasts on frequency 490 kHz and 4209.5 kHz in the local language. The messages are coded with the transmitting stations, type of messages, and the serial number of the message. The time of broadcasts are internationally co-ordinated by NAVAREA & METAREA Coordinators.

Operational and technical characteristics for MF NAVTEX are described in Recommendation ITU-R M.540 Operational and technical characteristics for an automated direct-printing telegraph system for promulgation of navigational and meteorological warnings and urgent information to ships. Technical characteristics for HF NAVTEX are described in Recommendation ITU-R M.688.

Reasons: When NAVTEX is used for dissemination of MSI, its dissemination can be instant or scheduled. NAVTEX is a narrow-band direct-printing telegraphy. Recommendations about operational and technical characteristics of NAVTEX is added to provide more information for readers.

3.2.2.6 Navigational Data (NAVDAT)

NAVDAT is an MF and HF radio system, for broadcast and automatic reception of MSI and SAR related information from shore-to-ship by means of digital modulation. Channel bandwidths can be 1, 3, 5, or 10kHz.

WRC-12 approved the worldwide exclusive usage of the frequency band 495 - 505 kHz for the maritime mobile service. The NAVDAT system utilizes an OFDM modulation in this 10 kHz bandwidth which provides a flow rate of about 15/25 Kbit/s (more than 300 times the NAVTEX transmission), featuring:

* Possibility to transmit any type of text, graphs, pictures, data etc with encryption if required;
* Automatic reception;
* Possibility to use Single Frequency Network (SFN) technology, with no need for time slot allocation on the same frequency.

WRC-19 added a footnote to the 495-505 kHz frequency band in the frequency allocation table of Article 5 of RR, and specified its use as NAVDAT. In addition, NAVDAT was added to the footnote at 415-495 kHz and 505-526.5 kHz in addition to radiotelegraphy (NAVTEX).

WRC-19 also lists the NAVDAT frequency bands in the Maritime HF Band Frequency Table in RR Appendix 17.

WRC-23 lists the detailed NAVDAT frequencies in Articles 5 and 33 and Appendices 15 and 17 of RR. And Resolution 364 (WRC-23) about coordination of services provided by the NAVDAT system are published.

The MF NAVDAT system is described in the Recommendation ITU-R **M.2010 Characteristics of a digital system, named Navigational Data for broadcasting maritime safety and security related information from shore-to-ship in the 500 kHz band.**

The HF NAVDAT system is described in the Recommendation ITU-R **M.2058 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.

Reasons: Bandwidth information are provided for reference. WRC-23 approved detailed frequencies for NAVDAT. Such information is provided for reference. ITU Recommendations on NAVDAT were updated in 2023. Therefore the outdated version and its corresponding date number is deleted.

3.2.3 Very High Frequency Band (VHF)

Voice communication uses the maritime VHF band (156.025-162.025 MHz) as the primary means of ship-shore, shore-ship, and ship-ship communication system. It is used for distress, urgency, safety and general communications. Maritime VHF channel arrangement is detailed in Appendix 18 of the Radio Regulations. Channel spacing is currently 25 kHz although the use of 12.5 kHz channels on an interleaved basis is allowed as described in accordance with Recommendation ITU-R M.1084 to improve spectrum efficiency.

Reasons: Editorial improvement.

3.2.3.2 Voice Communication

Voice communication in VHF is currently analogue and uses the maritime mobile band (156.025 to 162.025 MHz). It is used for distress, urgency, safety and general communications. Hand-held units are generally utilized for on-board communications. Primary channels used for distress and safety communications by voice are Ch 6, Ch 13 and Ch 16. Ch 06(156.3MHz) may be used for communication between ship stations and aircraft stations engaged in coordinated search and rescue operations. It may also be used by aircraft stations to communicate with ship stations for other safety purposes. CH 13(156.650 MHz) is used for ship-to-ship communications relating to the safety of navigation. Ch 16(156.8 MHz) is used for distress and safety communications by radiotelephony. Additionally, the frequency 156.8 MHz may be used by aircraft stations for safety purposes only. The use of other channels is designated in Appendix 18 to the ITU Radio Regulations.

REPORT ITU-R M.2530 Digital voice communication in the VHF maritime frequency band gives the requirements for voice and digital communication in the VHF band and describes possible ways to address coexistence with existing analogue and digital voice channels. The report investigates an approach for the possible expansion of the number of VHF maritime voice channels based on the implementation of digital technology.

Reasons: Detailed usage for Ch 06, 13 and 16 are added for reference. And an ITU report about maritime VHF digital voice is added for reference.

3.2.3.4 VHF Data Exchange System

ITU introduced a standard with options for 25 kHz, 50 kHz, and 100 kHz channels at an on air (not throughput) data rates up to 307.2 kbps to improve spectrum efficiency in 2012. ITU has issued new Recommendation ITU-R M.2092-1 Technical characteristics for a VHF data exchange system in the VHF maritime mobile band. VHF data exchange system (VDES) integrates the components of VHF data exchange (VDE), application specific messages (ASM) and the automatic identification system (AIS) in the VHF maritime mobile band. This recommendation provides the technical characteristics of ASM and VDE. ITU Recommendation ITU-R M.1371 Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile frequency band provides the technical characteristics of AIS.

Reasons: ITU recommendation on technical characteristics of AIS is provided for reference.

Development of the VDES, the concepts of VDES, the potential use of VDES, and technical overview etc are described in IALA Guideline G1117 *VHF DATA EXCHANGE SYSTEM (VDES) OVERVIEW.*

Reasons: Information on IALA guideline G1117 is provided for interested readers.

The ASM uses π/4 Quadrature Phase Shift Keyed (π/4-QPSK) modulation and the VDE uses a range of different modulation methods dependent on the Radio Frequency environment. VDES has both a bi-directional Terrestrial and a Satellite component. A VDES transceiver can communicate with AIS, ASM and VDE Terrestrial and Satellite systems.

Reasons: Accurate information for ASM modulation from IALA G1117 and Recommendation ITU-R M.2092-1 is provided.

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Description automatically generated

1. Overview of VDES Frequencies

Reasons: According to recommendation ITU-R M.2092-1 and RR appendix 18, there is no regional or national VDE channels. And channels 1024,1084,2024 and 2084 are Global VDE. Channels 1026, 1086, 2026, 2086 are only used for Satellite communication. Channels 1024, 1084, 1025 and 1085 are used not only for ship-to-shore communication, but also for shore-to-ship and ship-to-ship communication. A figure of channel usage for VDES from recommendation ITU-R M.2092-1 is added.

Reference [to include – IALA G1117 and ITU 2092-1 references]

VDES consists of four components: AIS + ASM + VDE-TER + VDE-SAT

* AIS uses channels AIS 1, AIS 2, 75 and 76, for terrestrial communications (AIS 1 and AIS 2) and satellite uplinks (AIS 1, AIS 2, 75 and 76)
* ASM uses channels ASM 1 and ASM 2, for both terrestrial communications and satellite uplinks
* VDE-TER uses channels 24, 84, 25, 85, 1024, 1084, 1025, 1085, 2024, 2084, 2025 and 2085 for terrestrial communications
* VDE-SAT uses channels 1024, 1084, 1025, 1085,1026, 1086, 2024, 2084, 2025, 2085, 2026 and 2086, for both satellite uplink and downlink communications.

1. VHF Data Exchange System Overview (VDES)

|  | VHF Data Exchange System (Recommendation ITU-R M.2092-1) | | Automatic Identification System (Recommendation ITU-R M.1371-5) | |
| --- | --- | --- | --- | --- |
| Sub-group | Application Specific Message (ASM) | VHF Data Exchange (VDE) | AIS for safety of navigation | AIS long range |
| Radio channels | * Channels ASM 1 and ASM 2 * World-wide dedicated channels (WRC-15 agreed, including Sat uplink) | * Channels 24,84, 25, 85, 26, 86 (WRC-15 agreed VDE-TER; VDE-SAT WRC-19) | * AIS-1 & AIS-2 (simplex) | * Channels 75 and 76 (simplex)   ⦁ WRC-12 |
| Functionality | * Marine safety information * Marine security information * SSRMs * General purpose information communication | * General purpose data exchange * Robust high speed data exchange | * Safety of navigation | * Space detection of AIS |
| Message types | * IMO SN.1/ Circ.289 international application specific messages * Regional application specific messages * Base Station |  | * Vessel identification * Vessel dynamic data * Vessel static data * Voyage related data * Aids to Navigation * Base Station | * Space detection of AIS |
| Sub functionality | * Area warnings and advice * Meteorological and hydrological data * Traffic management * Ship-shore data exchange * Channel management | * High message payload | * Ship to ship collision avoidance * VTS * Tracking of ships * Locating in SAR * VDL control (by Base Station) | * Detection of vessels by coastal states beyond range of coastal AIS base stations |

Reasons: Recommendation ITU-R M.1371-5 is aimed for AIS. According to MSC.496(105), GMDSS modernization by IMO doesn’t include Long-range AIS for distress alert.

3.2.3.4.1 VDES - Automatic Identification System (AIS)

AIS is a Self-Organised Time Division Multiple Access (SOTDMA) data exchange system used by ships and shore authorities to improve the safety of navigation by assisting in the efficient navigation of ships, protection of the environment, and operation of Vessel Traffic Services (VTS). AIS data includes identification, position, course, and speed. AIS assists VTS and the vessel's watch keeping officers and allow maritime authorities to track and monitor vessel movements. The AIS technical specification is Recommendation ITU-R M.1371-5.

AIS uses VHF Channels AIS 1 (161.975 MHz), AIS 2 (162.025 MHz), 75(156.775MHz) and 76(156.825MHz). Channels 75 and 76 are designated for long-range AIS. Additionally, AIS has the capability for data exchange by application specific messages for navigation and safety related purposes. The VHF Data link (VDL) loading should be considered when using application specific messages.

Reasons: Channels 75 and 76 are also used for AIS.

There are various types of AIS and used for different purposes and include:

* AIS base stations
* AIS repeaters
* AIS AtoN types 1, 2 and 3
* Class A AIS used on SOLAS vessels
* Class B Carrier Sense
* Class B SOTDMA
* AIS SART (see section **错误!未找到引用源。**)

Guidance on the use of AIS Application Specific Messages (AIS ASMs) is provided in IMO SN.1/Circ. 289, and guidance for the presentation and display of AIS ASMs is provided in IMO SN.1/Circ. 290. Regionally, ASMs are managed by IALA, through the IALA e-Navigation Portal[[1]](#footnote-2)

Reasons: IMO SN.1/Circ. 290 doesn’t provide use example but portrayal example instead. Editorial improvement are made to give more accurate information for the two circulars.

Reference: IMO SN.1/Circular 289 and 290. IALA Docs, ITU references

3.2.3.4.2 VDES - Application Specific Messages (ASM)

The term ‘Application Specific Messages’ as used in the MARCOM Manual refers to the channels used for ASM. These are the channels ASM1(161.950MHz) and ASM2(162.000MHz), which are available for satellite uplink [refer to figure 2] as well as terrestrial use.

Reasons: According to recommendation ITU-R M.2092-1 and RR appendix 18(WRC-19), ASM channel of VDES is named as ASM1 and ASM2 instead of 2027 and 2028. Actually in the appendix 18 of RR(WRC-19), there is no maritime VHF channels named as 2027 and 2028.

3.2.3.4.3 VDES - VHF Data Exchange (VDE)

These are the channels provided for VDE.

* Channels 1024-1085 are used for ship-to-shore, shore to ship and ship to ship communication, may be possible for ship-to-satellite and satellite-to-ship communications without imposing constraints on ship-to-shore, shore-to-ship and ship-to-ship communications
* Channels 1026-1086 are merely available for satellite to ship and ship to satellite communication

Reasons: According to recommendation ITU-R M.2092-1 and RR appendix 18(WRC-19), there are no regional channels for VDE. Channels 1024-1085 are used for ship-to-shore, shore-to-ship and ship-to-ship communication, also can be used for satellite-to-ship and ship-to-satellite communication without imposing constraints on ship-to-shore, shore-to-ship and ship-to-ship communications. Channels 1026-1086 are merely available for communication between satellite and ship (both uplink and downlink).

* Channels 2024-2085 are identified for shore-to-ship and ship-to-ship communication, may be possible for ship-to-satellite and satellite-to-ship communications without imposing constraints on shore-to-ship and ship-to-ship communications
* Channels 2026-2086 are identified for satellite to ship and ship to satellite communication.

Reasons: According to recommendation ITU-R M.2092-1 and RR appendix 18(WRC-19), there are no regional channels for VDE. Channels 2024-2085 are used for shore-to-ship and ship-to-ship communication, also can be used for satellite-to-ship and ship-to-satellite communication without imposing constraints on shore-to-ship and ship-to-ship communications. Channels 2026-2086 are merely available for communication between satellite and ship (both uplink and downlink).

3.2.3.5 Man Overboard Device (MOB)

There are various systems available that operate on either DSC based or AIS based technology as well as others that utilize Bluetooth or other technologies. AMRD Group A MOB devices operate on VHF channel 70 for alerting using VHF DSC and on automatic identification system frequencies (AIS1 and AIS2) for tracking. The AMRD Group A MOB devices are fitted with a VHF DSC and an AIS transmitter. The AMRD Group A MOB devices should operate in accordance with Recommendations ITU-R M.493, ITU-R M.541, ITU-R M.1371 and ITU-R M.2135.

Reasons: Distress alerting using VHF DSC is an important function of AMRD Group A MOB, while AIS location is the other function. Therefore it is not appropriate to say that it must not be regarded as distress alert system. Information on AMRD Group A MOB is provided for reference.

3.2.4 Ultra-High Frequency Band / Super High Frequency Band (UHF/SHF)

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3.2.4.3 Satellite Voice and Data Communication

Satellite communications in the UHF band is commonly deployed on vessels to fulfil several distress, safety and general communications purposes.

Satellite communication links can support analogue and digital voice, broadband connectivity, e-mail, SMS, crew calling, telex, facsimile, remote monitoring, tracking (position reporting), chart and weather updates and Inmarsat FleetNET services.

Satellite systems are commercially provided services, which may have global or regional coverage. These systems may be geostationary or non-geostationary. Non-geostationary systems are often in Low Earth Orbit (LEO) or Medium Earth Orbit (MEO).

Inmarsat[[2]](#footnote-3), Iridium and BDMSS[[3]](#footnote-4) are elements of the GMDSS for distress alerting, urgency, and safety communication.

Other Geostationary systems include Thuraya.

Non-geostationary satellite systems include Globalstar, SpaceX, OneWeb and Orbcomm.

Reasons: BDMSS is recognized by IMO for GMDSS use and the recognition information is indicated by a footnote. Fleet Safety are recognized by IMO for GMDSS(RESOLUTION MSC.450(99)) and is expected to provide service in mid-2025(refer to NCSR 11/5). The currently operational GMDSS service by Inmarsat is only Inmarsat C(refer to NCSR 11/5). GMDSS communication functions of the ship earth stations are not limited to calling. Therefore a more general wording “communication” is suggested to replace “calling”.

3.2.4.4 Enhanced Group Call (EGC)

Enhanced Group Calling (EGC) allows broadcast messages to be made to selected groups of ship stations located anywhere within satellite coverage. The EGC service is part of the GMDSS for the transmission of Maritime Safety Information (MSI) and SAR-related information for areas where there is no coverage by NAVTEX. The messages broadcast include Navigational Warnings, Meteorological forecasts and warnings and SAR related information. The information broadcast over NAVTEX and EGC are not mutually exclusive.

Reasons: EGC is used for both MSI and SAR-related information transmission.

A.3 Revision proposal for section 3.3

3.3.2 Medium Frequency / High Frequency Band (MF/HF)

WRC-31 preliminary agenda item 2.8 is to consider improving the utilization and channelization of maritime radiocommunication in the MF and HF bands, including potential revisions of Article 52 and Appendix 17, in accordance with Resolution 366 (WRC-23) Improving the utilization and channelization of maritime radiocommunication in the MF and HF bands, including potential revisions to Article 52 and Appendix 17.

Resolution 366 (WRC-23) invites ITU-R to complete in time for WRC-31 studies on possible revisions to the Article 52 and Appendix 17 channel plans to identify additional working channels on an international basis to improve the use of maritime radiocommunication in the MF and HF bands.

Resolution 366 (WRC-23) invites WRC-31 to consider, based on the results of studies, possible revisions to the Article 52 and Appendix 17 channel plans in the maritime mobile MF and HF bands to improve use and efficiency.

Reasons: Preliminary study plan for utilization and channelization of maritime radiocommunication in the MF and HF bands is provided for reference.

3.3.2.1 Digital Data Communication Using MF/HF Band

The likely increase in ship traffic in Polar regions, because of receding ice fields, may increase the requirements for HF communications, since geostationary satellites do not cover these areas. Various system operators are studying increased data rates using 3 kHz channels, which may produce data rates of 19.2 kbps, and other solutions to likewise increase data speeds.

Furthermore, a new data communication system using 10-20 kHz bandwidth for data rates up to 51 kbps, has been incorporated in the Recommendation ITU-R M.1798-2. Appendix 17 to the Radio Regulations was revised at the World Radiocommunication Conference 2012 (WRC-12). The revision of AP17 will implement new digital bands for 3 kHz systems as well as wideband systems. WRC-19 has also approved use of band 495-505 kHz, 4221-4231 kHz, 6332.5-6342.5 kHz, 8438-8448 kHz, 12658.5-12668.5 kHz, 16904.5-16914.5 kHz and 22445.5-22455.5 kHz for use of high-speed Navigational Data service (NAVDAT) (see article 5.82C and footnote pp of appendix 17 of RR). WRC-23 has approved HF MSI frequencies by means of NAVDAT and relevant regulatory or technical rules (see articles 5.82D, 5.137A, 33.40A, 33.46A, 33.46B, 33.48, 51.64C, 51.64E, 52.6, and 52.13A in RR, appendix 15 in RR, footnote ppp of appendix 17 and RESOLUTION 364 (WRC-23) in RR).

Performance standard for NAVDAT is pending approval at IMO MSC 109. Draft NAVDAT manual is in preparation for joint ITU/IMO expert group meeting.

Reasons: WRC-19 approved 6 HF bands for NAVDAT in footnote pp of appendix 17 of RR. Detailed modification to RR pertaining to NAVDAT in WRC-23 is provided for reference. Information on ITU-R M.2058 is already provided in section 3.2.2.6. Progress on NAVDAT in IMO is added for information.

3.3.3 Very High Frequency Band (VHF)

3.3.3.1 Digital Data Communication

…

IMO NCSR is considering to amend SOLAS chapter V to incorporate VDES. Guidelines for the operational use of VDES and draft VDES performance standard are being development in IMO NCSR. IEC is drafting test standard for VDES.

Reasons: Information on progress of VDES made by organizations including IMO is provided for interested readers.

3.3.3.4 Digital Voice Communication

Digital voice communication may, in the long term, replace the present analogue VHF voice communication service, i.e. ship-to-ship/ship-to-shore/shore-to-ship. As this develops, the introduction of mixed digital / analogue equipment should be encouraged. It is recognized that global digitization will make spectrum use more efficient, but this will take some time to complete.

WRC-31 preliminary agenda item 2.7 is to consider improving the utilization of VHF maritime radiocommunication, in accordance with Resolution 363 (Rev.WRC-23) *Improving the utilization of the VHF maritime mobile band.*

Resolution 363 (Rev.WRC-23)invites ITU Radiocommunication Sector to complete in time for WRC-31 studies on sharing and compatibility with incumbent services that are allocated on a primary basis in the same and adjacent frequency bands and studies on spectrum needs, transitional arrangements and possible changes to the VHF maritime mobile band, in order to advance digital voice and data technologies in the MMS.

Resolution 363 (Rev.WRC-23) invites WRC-31 to consider, based on the results of studies, and within the Radio Regulations, excluding new allocations under Article 5, possible regulatory changes to advance digital voice and data technologies in the MMS within the VHF maritime mobile band.

Reasons: Preliminary study agenda for maritime VHF digital voice recommended by WRC-23 is added to provide information for interested readers.

3.3.3.5 R-Mode

Ranging mode (R-Mode) is a terrestrial positioning system which is under development. It uses the frequency bands of the existing maritime radio infrastructure for the provision of timing signals that enables GNSS-independent position and time estimation. At present, the MF band of the IALA radio beacon system and the VHF bands utilized for AIS, ASM and VDE-TER of the VDES are being used in R-Mode testbeds in Europe, Asia and North America. [refer to IALA Guideline on VDES R-Mode G1158]

WRC-31 preliminary agenda item 2.7 is to consider improving the utilization of VHF maritime radiocommunication, in accordance with Resolution 363 (Rev.WRC-23).

Resolution 363 (Rev.WRC-23) invites ITU Radiocommunication Sector to complete in time for WRC-31 compatibility studies, limited to frequencies identified in Appendix 18 for VDES, for a new allocation of the maritime radio navigation service under Article 5 and within the existing MMS to implement R-Mode.

Resolution 363 (Rev.WRC-23) invites WRC-31 to consider, based on the results of studies, possible revisions to the Radio Regulations, including new allocations under Article 5, limited to frequencies identified in Appendix 18 for VDES, for implementation of R-Mode as a new maritime radionavigation service.

Reasons: Preliminary study agenda for VDES-R mode recommended by WRC-23 is added to provide information for interested readers.

3.3.4 Ultra High Frequency Band / Super High Frequency Band (UHF/SHF)

3.3.4.1 Satellite Communication Using the UHF/SHF Band

In the future, navigational satellite payloads may include transponders connected with GMDSS and may function as additional SAR resources. (i.e. return link capability is possible functionality within Galileo).

Resolution 365 (WRC-23) may affect maritime spectrum use. It concerns provisional application of the Radio Regulations for the introduction of new geostationary satellite networks into the global maritime distress and safety system.

Reasons: Resolution 365(WRC-23) specifies the scheme for the frequency issue of BDMSS. It involves the frequency usage for GMDSS. Therefore the information is provided for interested readers.

3.3.4.3 On-board Communications

Limited availability of spectrum for on-board communications gives rise to congestion and interference. Consideration of this issue at ITU is of utmost importance as well as developing new techniques for communication in this band.

Recommendation ITU-R M.1174 *Technical characteristics of equipment used for on-board vessel communications in the bands between 450 and 470 MHz* describes the technical characteristics for equipment operating in the maritime mobile services in accordance with the provisions of No. 5.287 of the Radio Regulations (RR) for on-board vessel communications. Provision is made for 25 kHz or 12.5 kHz channel spacing for analogue and digital technologies. In addition, 6.25 kHz channel spacing may also be used for digital technology.

Reasons: An ITU recommendation about on-board communication is provided to give more information for interested readers.

A.4 Revision proposal for Table 2

1. Overview of Communications Technologies

| Communication Technology | On air data rate | Frequencies | Latency | Available data rate | Primary constraints | Infrastructure | Coverage | Transmission | Maritime / public | Notes |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NAVDAT | 12-18 kbps | Can operate in both MF (500kHz) and HF (6 bands from 4.226kHz to 22.455,5kHz) |  |  | To increase amount of data, another form of modulation is used (4-QAM, 16-QAM and 64-QAM), which means the transmitter output power needs to be larger to obtain the same coverage (compared to NAVTEX).  Existing NAVTEX Receivers (vessels) will have to be replaced or supplemented. | Based on NAVTEX infrastructure | 250/300 NM for MF NAVDAT;  Global coverage for HF NAVDAT | Broadcast  Terrestrial | Maritime |  |
| NAVTEX | 100bps | 490kHz, 518kHz and 4209.5kHz |  | 50bps |  | Shore to ship, coast Navtex station |  | Broadcast  Terrestrial | Maritime |  |
| AIS | 9.6 kbps | AIS 1 (161.975 MHz), AIS 2 (162.025 MHz), 75(156.775MHz), 76(156.825MHz) |  |  |  | AIS station |  | Broadcast/Addressed | Maritime |  |

Reasons: For NAVDAT, one missing modulation scheme is added. Power expression is suggested to be made general because there is no experimental evidence for 10 times of NAVTEX. Cost issue is suggested to be omitted here for the reason that NAVDAT is still under experimental stage and there is no reliable cost information. 250/300 NM is MF NAVDAT coverage. HF NAVDAT has a global coverage. According to Recommendation ITU-R M 540 and 688 and IMO NAVTEX Manual, information of NAVTEX is added. According to Recommendation ITU-R M.1371, some information of AIS is added.

A.5 Revision proposal for section 3.6

3.6 Modernisation of GMDSS

The current GMDSS system was designed over 25 years ago and is currently being reviewed by IMO. This is the first full review since its implementation in 1999 and recognises that technology has developed significantly in that time. Existing technology elements within the GMDSS have also evolved, although the functions have not been altered. The current system remains sound, however there are GMDSS elements where improvement could be made, e.g. managing the cessation of international telex, and reviewing the continued use of narrow-band direct-printing in certain sea areas.

The elements that will be identified may need to be examined and reviewed as a matter of some urgency. The 14th session of IMO Sub-Committee on Radiocommunications and Search and Rescue (COMSAR 14, held on March 2010) initiated a Scoping Exercise and a Work Plan to define the requirements for the GMDSS Review and Modernization. The Scoping Exercise was finalized at COMSAR16 (March 2012) and the Review will take place over a three-year period (2013-2015).

A further two-year period is envisaged (2015-2017) for the GMDSS modernization plan. This will be followed by development of legal instruments, revision/development of relevant performance standards and an implementation period. This followed the modification work to chapters III and IV of the International Convention for the Safety of Life at Sea (SOLAS) and consequential amendments to IMO instruments other than the SOLAS Convention.

IMO finalized the work for GMDSS modernization at NCSR 8 (April 2021. MSC 104 (October 2021) approved draft amendments to SOLAS chapters II-1, III, IV and V, and the appendix (Certificates) and relative MSC resolutions. MSC 105 (April 2022) adopted a set of amendments to complete the work on modernization of the GMDSS and to enable the future use of modern communication systems in the GMDSS whilst removing obsolete requirements. The amendments are expected to enter into force on 1 January 2024. MSC.1/Circ.1676 is about delays affecting the availability of new GMDSS equipment compliant with the revised performance standards set out in resolutions msc.511(105), msc.512(105) and msc.513(105). The Circular invites Member States to consider permitting until 1 January 2028 the continued installation of :

* shipborne VHF radio installations conforming to performance standards not inferior to those specified in the annex to resolution A.803(19), as amended;
* shipborne MF and MF/HF radio installations conforming to performance standards not inferior to those specified in the annex to resolutions A.804(19), as amended and A.806(19), as amended; and
* Inmarsat-C ship earth stations conforming to performance standards not inferior to those specified in the annex to resolution A.807(19), as amended.

[link to IMO amendments to SOLAS]

WRC-23 agenda 1.11 is to consider possible regulatory actions to support the modernization of the Global

Maritime Distress and Safety System and the implementation of e-navigation, in accordance with Resolution 361 (Rev.WRC-19). WRC-23 has approved the relevant revisions of Radio Regulations to support the modernization of the Global Maritime Distress and Safety System (GMDSS).

Reasons: The information of MSC.1/Circ.1676 is necessary for stakeholders. Therefore, the delay information is added here. The progress on GMDSS modernization in ITU is useful for interested readers.

A.6 Revision proposal for section 4.1

4.1 Situation with Respect to Existing Spectrum Usage

Section 3.2 described the existing maritime technologies, which use the radio spectrum and indicated the bands in which they operate. Whilst there is consideration of variations to the technologies which may be used, all such variations take, as their base assumption, the ongoing use of existing spectrum allocations. These variations may give rise to a need to change the channelization within certain bands.

Reasons: Section 3.2 is about existing maritime technologies while 3.3 is about future development.

A.7 Revision proposal for section 4.2

Reasons: WRC-23 has closed. Its outcomes have been reflected in above sections.

4.2 Agenda Item for WRC-27

Agenda item 1.12 of WRC-27 in Resolution 813 (WRC23-) will affect maritime spectrum use. The agenda item is to consider, based on the results of studies, possible new allocations to the mobile-satellite service and possible regulatory actions in the frequency bands 1 427-1 432 MHz (space-to-Earth), 1 645.5-1 646.5 MHz (space-to-Earth) (Earth-to-space), 1 880-1 920 MHz (space-to-Earth) (Earth-to-space) and 2 010-2 025 MHz (space-to-Earth) (Earth-to-space) required for the future development of low-data-rate non-geostationary mobile-satellite systems, in accordance with Resolution 252 (WRC-23).

Note: According to Article 5.375 of Radio Regulations, the use of the frequency band 1 645.5-1 646.5 MHz by the mobile-satellite service (Earth-to-space) and for inter-satellite links is limited to distress, urgency and safety communications (see Article 31) (WRC-23).

Reasons: WRC-23 recommended agenda for WRC-27. Agenda item 1.12 involves usage of 1 645.5-1 646.5 MHz. This agenda item may affect maritime spectrum use. Use of the 1MHz band was once limited to distress and safety communication of EPIRB(earth to space) and inter-satellite links. WRC-23 has removed the restriction that when used for earth to space link the band is limited to EPIRB. The information is provided for interested readers.

A.8 Revision proposal for section 4.3

4.3 Preliminary Agenda Item for WRC-31

Preliminary agenda items 2.7 and 2.8 in Resolution 814 (WRC-23) may affect maritime spectrum use:

Preliminary agenda items 2.7 is to consider improving the utilization of VHF maritime radiocommunication, in accordance with Resolution 363 (Rev.WRC-23).

Preliminary agenda items 2.8 is to consider improving the utilization and channelization of maritime radiocommunication in the MF and HF bands, including potential revisions of Article 52 and Appendix 17, in accordance with Resolution 366 (WRC-23).

Reasons: WRC-23 recommended preliminary agenda for WRC-31. Two preliminary agenda items, namely 2.7 and 2.8 involve maritime use. The information is provided to interested readers.

1. http://www.iala-aism.org/asm/ [↑](#footnote-ref-2)
2. Inmarsat B, C, Fleet 77 and Fleet Safety are elements of GMDSS. Inmarsat C is currently in operation. Fleet Safety is expected to provide GMDSS service in mid-2025. [↑](#footnote-ref-3)
3. see paragraph 13.24 of MSC 106/19 *Report Of The Maritime Safety Committee On Its 106Th Session* [↑](#footnote-ref-4)