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**Use of Appendix 18 to the Radio Regulations
for the maritime mobile service**

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**Mobile, radiodetermination, amateur
and related satellite services**

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Foreword

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REPORT ITU-R M.2231-1

Use of Appendix 18 to the Radio Regulations for the maritime mobile service

(2011-2014)

1 Introduction - A brief history of VHF maritime

The use of radio communications, for maritime purposes, has been an important part of ship safety and port operations, for many years. Some of the history even dates back to the early part of the 20th century. At that time, maritime communications were mainly (if not exclusively) in the LF frequency band. Around the 1930s, a paper discussed the use of frequency modulation as a technical solution to interference issues that were experienced in the HF frequency band (Edwin Howard Armstrong (1890-1954): “*A method of reducing disturbances in radio signalling by a system of frequency modulation*”). Subsequent to that, at the 1938 Radio Regulations Conference (Cairo), this note acknowledged this in the then: Table of Frequency Allocations:

“The frequency bands necessary for the various types of transmission, at the present state of technical development, are indicated below. This table is based solely on amplitude modulation. For frequency or phase modulation, the band-widths necessary for the various transmissions are many times greater.”

Whilst, there were service allocations in the VHF range at that time: 157-162 MHz mobile regional, 162-170 MHz stations of low power regional, these were not specifically identified for the maritime service. Use of the VHF frequency band, as indicated, for the use by maritime was facilitated through a number of Decisions of ITU Conferences which are included for information only:

- **1947:** Here specific maritime allocations were made in the frequency band 152-162 MHz. In addition, the identification of 156.8 MHz: for worldwide use for safety, calling, and inter-ship and harbour control communications in the maritime mobile service, was made.
- **1959:** Introduction of RR Appendix **18**, which identified the channels 1-28, as we currently recognize, with a 50 kHz channel or channel spacing. Also at this time the now deleted RR Appendix **19**, reflected that phase modulation had to be used.
- **1974:** World Maritime Administrative Radio Conference transition plans are announced to move from a channel spacing of 50 kHz to that of 25 kHz by modifying transmitters to a maximum deviation of ± 5 kHz from 1 January 1972. Modifications for all existing equipment, was to be completed by 1 January 1973 and all new equipment to conform to 25 kHz standards from 1 January 1973. Finally, all equipment was to conform to the 25 kHz standards from 1 January 1983.
- **1979:** RR saw the introduction of the additional channels; 60-88, which was possible via the earlier recognition of the 25 kHz channelling. Here, it was reflected, that the extra channels derived from the 1967 RRs and was in accordance with Resolution No. Mar 2-14. That Resolution was derived from the World Maritime Administrative Radio Conference in 1974 and gave a plan for the transition from 50 kHz to 25 kHz.
- **1983:** 1 January 1983 was the date by which all maritime radio equipment, that operate in RR Appendix **18**, were required to conform to the 25 kHz standards (Resolution **308 (WRC-79)**).
- **1987:** Since that time the next major global change to RR Appendix **18** was the identification of channel 70 for the use of the global maritime distress and safety system (GMDSS). This was done at WRC-87 (MOB-87), but whilst 70 was identified for the sole use by GMDSS, in RR Appendix **18**, it was not until WRC-03 where the frequency was identified as exclusively maritime mobile via an identification in Article **5** (of the RR). This is an example

of where it should not be inferred that identification in RR Appendix **18** means that the frequency is recognized, formally, as exclusive to the maritime mobile service.

- **1997:** Next, and probably the most recent change in RR Appendix **18**, was the creation and identification of the two channels for the use of the system referred to as; automatic identification system (AIS). Channels AIS 1 and AIS 2, were formally identified at WRC-97. That saw the splitting of the VHF channels 87 and 88 into four single frequencies with the “high” frequencies being used for AIS and the lower two frequencies retained for simplex operation. This change has facilitated the use of AIS which has proved to be a useful and valuable system that assists the management of shipping fleets by companies and those who interact with them around the world. As a consequence of the AIS channel changes, at WRC-97, two additional single frequencies were identified in RR Appendix **18**.
- **2000:** WRC-00 modified RR Appendix **18**, to include the addition of note *o*) against a number of the channels. This note *o*) permits the possible use, on a national basis, of various channels or frequency bands created by conversion of some duplex channels into simplex channels, for uses such as initial testing and the possible future introduction of new technologies.
WRC-00 also updated Resolution 342 for the introduction of new technologies to provide improved efficiency in the use of the frequency band 156-174 MHz by stations in the maritime mobile service.
- **2007:** WRC-07 modified the following notes:
 - e*) to permit administrations to apply 12.5 kHz channel interleaving via coordination with affected administrations.
 - f*) to permit aircraft stations to use, in addition to channel 06, channels 70, 16, AIS 1 and AIS 2 for search and rescue operations and additionally, other safety-related communication.
 - l*) to acknowledge the worldwide usage of AIS 1 and AIS 2.
 - m*) to permit certain two frequency channels to be operated as single frequency channels, subject to coordination with affected administrations.
 - o*) to permit these two frequency channels to be used for new technologies, instead of only testing, providing that such systems do not interfere with the detection of AIS signals on 161.975 MHz or 162.025 MHz.

WRC-07 also added the following notes:

- p*) to permit the use of AIS 1 and AIS 2 by the mobile-satellite service (Earth-to-space) to receive AIS transmissions from ships.
- q*) requiring precautions when using channels 10 and 11, so as to avoid harmful interference to channel 70.
- **2012:** WRC-12 modified the following notes:
 - c*) to keep the possibility to use certain channels (with the exception of channels 06, 13, 15, 16, 17, 70, 75 and 76) for direct-printing telegraphy and data transmission;
 - e*) to permit Administrations to apply 12.5 kHz channel interleaving on a non-interfering basis to the existing 25 kHz frequencies of maritime mobile distress and safety frequencies, automatic identification system (AIS) and data exchange frequencies especially to the channels 06, 13, 15, 16, 17, 70, AIS1 and AIS2;
 - n*) to permit the transmission of the long range AIS broadcast message (Message 27; see the most recent version of Recommendation ITU-R M.1371), over the channels 75 and 76, while continuing to limit the output power at 1 W for voice communication in order to avoid harmful interference to channel 16. The reference to geographic separation has been removed.

WRC-12 also added the following notes:

- r)* in the maritime mobile service, this frequency is reserved for experimental use for future applications or systems (e.g. new AIS applications, man over board systems, etc.). If authorized by administrations for experimental use, the operation shall not cause harmful interference to, or claim protection from, stations operating in the fixed and mobile services;
- s)* channels 75 and 76 are also allocated to the mobile-satellite service (Earth-to-space) for the reception of long-range AIS broadcast messages from ships (Message 27; see the most recent version of Recommendation ITU-R M.1371);
- t)* until 1 January 2017, 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. From that date, these channels shall only be assigned as single-frequency channels. However, existing duplex channel assignments may be preserved for coast stations and retained for vessels, subject to coordination with affected administrations;
- u)* in Region 2, these channels may be operated as single-frequency channels, subject to coordination with affected administrations;
- 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;
- w)* in Regions 1 and 3:
until 1 January 2017, the frequency bands 157.025-157.325 MHz and 161.625-161.925 MHz (corresponding to channels: 80, 21, 81, 22, 82, 23, 83, 24, 84, 25, 85, 26, 86) may be used for new technologies, subject to coordination with affected administrations. Stations using these channels or frequency bands for new technologies shall not cause harmful interference to, or claim protection from, other stations operating in accordance with Article 5;
from 1 January 2017, the frequency bands 157.025-157.325 MHz and 161.625-161.925 MHz (corresponding to channels: 80, 21, 81, 22, 82, 23, 83, 24, 84, 25, 85, 26, 86) are identified for the utilization of the digital systems described in the most recent version of Recommendation ITU-R M.1842. These frequency bands could also be used for analogue modulation described in the most recent version of Recommendation ITU-R M.1084 by an administration that wishes to do so, subject to not claiming protection from other stations in the maritime mobile service using digitally modulated emissions and subject to coordination with affected administrations;
- ww)* in Region 2, the frequency bands 157.200-157.325 and 161.800-161.925 MHz (corresponding to channels: 24, 84, 25, 85, 26 and 86) are designated for digitally modulated emissions in accordance with the most recent version of Recommendation ITU-R M.1842;
- x)* from 1 January 2017, in Angola, Botswana, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Democratic Republic of the Congo, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe, the frequency bands 157.125-157.325 and 161.725-161.925 MHz (corresponding to channels: 82, 23, 83, 24, 84, 25, 85, 26 and 86) are designated for digitally modulated emissions;
from 1 January 2017, in China, the frequency bands 157.150-157.325 and 161.750-161.925 MHz (corresponding to channels: 23, 83, 24, 84, 25, 85, 26 and 86) are designated for digitally modulated emissions;
- y)* these channels may be operated as single or duplex frequency channels, subject to coordination with affected administrations;

z) 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.

Note o) suppressed at WRC-12.

Additionally, over the period from the mid-1980s until the present, there have been minor changes to the frequency arrangements in RR Appendix **18**. These predominately permit national flexibility which do not require global changes and, consequently, these arrangements do not affect or influence the global maritime environment.

2 Maritime frequency arrangements - RR Appendix 18

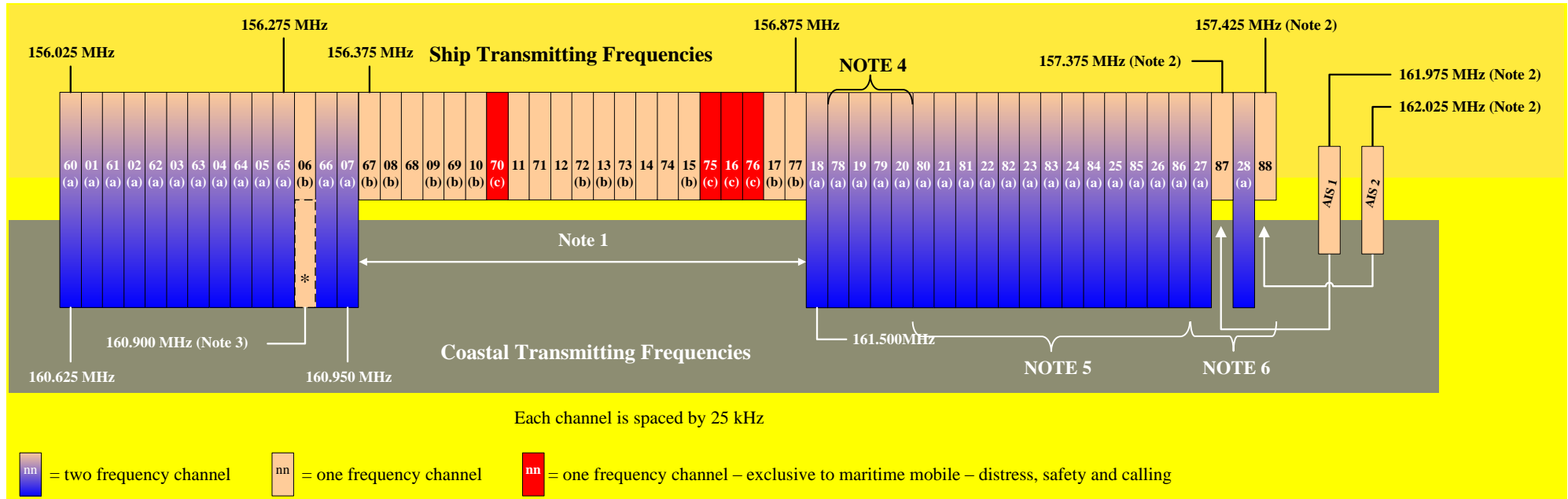
All shipborne equipment is designed to access all the frequencies identified in Appendix **18** which ensures global compatibility.

The frequency arrangements for maritime mobile use are detailed in general terms in the allocations in Article **5** of the Radio Regulations, and in more detail in RR Appendix **18** of the same. Here, there is an important point to recognize when considering what constitutes maritime allocations. With reference to the Article **5** allocations, it is only in fact the RR Appendix **18** channels; 70, 16, 75 and 76, which are exclusive to the maritime mobile service, globally. Channels 70 and 16 are also recognized for GMDSS, distress, safety/and calling, Channels 75 and 76 are retained as guard bands around channel 16.

The remaining frequencies, reflected in RR Appendix **18**, are not exclusively allocated to the maritime mobile service and administrations are not obligated to allocate those remaining RR Appendix **18** frequencies for use in the maritime service. Various footnotes imply that priority be given to the maritime mobile service, but these footnotes do not carry the same weight as the Article **5** identification.

The following diagram illustrates the configuration of RR Appendix **18**.

FIGURE 1
Frequency arrangements for RR Appendix 18



Channels: 06, 08, 09, 10, 13, 15, 17, 67, 69, 72, 73 and 77 are identified for inter-ship use (indicated by (b) in the above diagram).

Channel: 01-07 (inclusive), 18-28 (inclusive) and 78-86 (inclusive) are identified for public correspondence (indicated by (a) in the above diagram).

NOTE 1 – Whilst the frequency range/channels appears to be within the scope of RR Appendix 18, it should be noted that the “gaps” as indicated are general mobile allocations with no footnote priority to maritime use.

NOTE 2 – At WRC-97, the original channels 87 and 88, were split into four single frequency channels. The “high” frequencies were identified for AIS, with the remaining “low” single frequencies now designated as channels 87 and 88 (i.e. now no longer two frequency, duplex channels, but single frequency simplex channels).

NOTE 3 – This channel, whilst not explicitly referenced in Appendix 18, falls with the frequency bands identified within RR No. 5.226 and is the upper frequency, (i.e. +4.6 MHz) related to channel 6.

NOTE 4 – As result of WRC-12, channels 78, 19, 79, 20 may be operated as single frequency channels, subject to coordination with affected administrations. In Region 1 except the Netherlands and in Region 3, these channels can continue to be used as duplex channels until 1 January 2017.

NOTE 5 – The frequency bands 157.025-157.325 MHz and 161.625-161.925 MHz (corresponding to channels: 80, 21, 81, 22, 82, 23, 83, 24, 84, 25, 85, 26, 86) that may be used for new technologies in Regions 1 and 3 and the conditions of such usage before and after 1 January 2017. These channels that may be operated as single or duplex frequency channels, subject to coordination with affected administrations.

The frequency bands 157.200-157.325 and 161.800-161.925 MHz (corresponding to channels: 24, 84, 25, 85, 26 and 86) that are designated for digitally modulated emissions in Region 2.

The frequency bands 157.125-157.325 and 161.725-161.925 MHz (corresponding to channels: 82, 23, 83, 24, 84, 25, 85, 26 and 86) that are designated for digitally modulated emissions in some African countries and in China.

NOTE 6 – 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.

3 Maritime use in RR Appendix 18

The use of channels 16, 70, 75 and 76 form the core safety elements within RR Appendix 18. This is reflected by the use of the channels by GMDSS, retained voice communications and the guard channels around channel 16. In addition to this, RR Appendix 15 notes GMDSS use on channels 6 and 13, although these channels do not carry the same regulatory status as 16, 70, 75 and 76. This primary safety requirement is well recognized and accommodated by the global maritime community. The use of local national variations, apart from the recognized difference between identified sea areas¹, is not normally implemented as it would compromise these requirements.

Outside the core safety elements, there are variation of other uses, these are:

- use of dedicated channels for the control of, mainly local, incidents such as oil spills;
- use of dedicated channels for on-board use;
- use of the automatic identification system, to aid those who manage shipping, locally and globally;
- use of channels for port control and ship movement;
- use of channels for communication between ships;
- use of channels for public correspondence (“link calls” via the PSTN);
- other national/regional variations that encompass different frequency arrangement (e.g. split channels, interleaved channel spacing² and data/digital systems).

Whilst the above have links to the safe movement of shipping the status of those channels are not reflected in the same way as channels; 16, 70, 75 and 76³.

¹ Because the various radio systems used in the GMDSS have different limitations with regard to range and services provided, GMDSS operation divides the world's oceans into 4 areas. In some of those areas, the range capabilities of VHF is not sufficient for reliable communications and other alternative systems (e.g. MF radio, Inmarsat) are the recognized primary GMDSS system.

² Interleaved channels at spacing of 12.5 kHz, 6.25 kHz and 5 kHz are reflected in Recommendation ITU-R M.1084-4.

³ Figure 1 refers.

Use of dedicated channels for the control of, mainly local, incidents

The VHF channel 6 (156.300 MHz) may be used in coordinated search and rescue operations. This covers incidents such as: coordinated exercises, search and rescue, broadcast of safety information. As such incidents cannot be anticipated, these channels are reserved for this safety related use. In certain identified sea areas, the channels: 10 (156.500 MHz), 67 (156.375 MHz) and 73 (156.675 MHz) are additionally identified for this use.

Use of dedicated channels for on-board use

Channels 15 and 17 (156.750 MHz and 156.850 MHz) are reserved for on-board communications. They are restricted to low power to assist in ensuring that the use of these channels does not cause interference with the ships' own on-board communications use. These allocations are in addition to a number of UHF frequencies that are also identified for on-board ship use, although this UHF allocation is via a footnote to Article 5 (i.e. are not reflected in RR Appendix 18) and to some extent subject to national arrangement and agreement but in conformance with Recommendation ITU-R M.1174 series.

Use of the automatic identification system, to aid those who manage shipping, locally and globally

The AIS use is current reflected in RR Appendix 18 in two VHF channels (Fig. 1 refers). AIS is now used extensively throughout the maritime sector. AIS is backwards compatible with elements of the digital selective calling system. AIS has the ability to provide immediate and accurate contact between vessels. To help with the coordination of vessel identity, ships fitted with AIS use the same MMSI numbers assigned to the vessel for GMDSS purposes.

Use of channels for port control and ship movement including vessel traffic services

Currently, management of ship movement is through a number of systems. In a number of regions shared database systems record ships routes and anticipated calling points⁴. Additionally, where deployed, the use of AIS allows ports to record and monitor ships within their responsible area. However, even where these systems exist, it appears that ports retain the need for standard voice communications. Part of the reason here is that commercial ports not only observe (safety-of-life at sea) SOLAS vessels, but they also observe vessels that are not subject to the SOLAS requirements and these ships may not be fitted with AIS. Therefore, voice communications is not regarded as a back-up to AIS but as a valuable and necessary ship management tool.

Use of channels for coastal vessel traffic services

There is a category of vessel traffic services (VTS) known as "coastal VTS" established in various parts of the world. These VTS systems require VHF communications harmonized along coastlines. An example is the great barrier reef and torres strait vessel traffic service (REEFVTS) in Australia which extends over 2 000 km. As of 1 July 2011, a new communications plan for this coastal VTS was implemented using simplex Channels 11 and 14 (which replaced the previous system of duplex channels 5, 18 and 19) in an effort to simplify reporting arrangements for ships.

Use of channels for communication between ships

Channels 8, 72 and 77 are used as inter-ship channels. Because these channels are recognized, globally, for inter-ship working, it is accepted practice by most administrations that they are retained, in the main, purely for this use. Channel 6 is identified for inter-ship work, but this channel is subject

⁴ For example the "SafeSeaNet" system, in Europe.

to an additional footnote that indicates that it may also be used for search and rescue and other safety-related purposes.

Use of channels for public correspondence (“link calls” via the PSTN⁵)

Referring to Fig. 1, there is a large number of channels formally identified for VHF public correspondence (VPC). This identification was originally required to accommodate the service that enabled shipping to make telephone calls via local coastal radio stations. This was a valuable aid to mariners at a time when mobile cellular communications and satellite systems were not in wide spread use. There were originally 35 channels identified for this use but through the changes at WRC-97 which identified channels for AIS, that number was reduced to 33. However, today, the public correspondence service has been largely superseded by mobile cellular and mobile satellite systems. As a result, the number of coastal stations, able to offer this service has greatly reduced to the point where many countries no longer offer such a service. As a result, many of the channels, originally identified for public correspondence, now lay dormant. In some areas, port operations and VTS coastal stations are allocated those VPC channels, presumably because the other available channels (i.e. not safety frequencies, inter-ship, etc.) are insufficient to meet demand.

Other national/regional variations that encompass different frequency arrangement (e.g. split channels, interleaved channels, data/digital systems and supplementary national search and rescue arrangements)

In previous WRCs, regulatory footnotes have been added, to RR Appendix 18, which have permitted administrations to use channels in a manner that offers flexibility. This flexibility has seen a number of national or regional variations to the RR Appendix 18 “plan”. The detail of these potential flexibilities, are in Recommendation ITU-R M.1084-4 – Interim solutions for improved efficiency in the use of the band 156-174 MHz by stations in the maritime mobile service.

In addition, Recommendation ITU-R M.1842 – Characteristics of VHF radio systems and equipment for the exchange of data and electronic mail in the maritime mobile service RR Appendix 18 channels details the technical characteristics of a number of national and regional digital/data systems. In all of these cases of flexible operations, the use is subject to RR Appendix 18 and associated footnotes. This means agreements with potentially affected administrations should be arranged, along with consideration of the global shipping environment.

Split channels: In most countries, four public correspondence channels (#78, 19, 79, 20) have been split from their two frequency channel configuration into single frequency channels. Here the splitting has not necessarily been done to offer flexibility for the maritime mobile service, but clearly the maritime use has been able to make use of the single frequency channel. However, not all shipping is likely to be able to take advantage of this channel splitting without re-configuration of channels on-board vessels. One administration indicated having actively encouraged new port and ship movement stations to use the split channels. The attitude of license applicants has been negative. The license holders clearly want to use traditional maritime VHF-channels because that ensures interoperability with international shipping. The split channels have been accepted by users only in a few cases where a port uses the channel solely for its internal PMR-type communication.

Interleaved channels: Here the national/regional flexibility permits the interleaving of channels between the established 25 kHz spacing in RR Appendix 18 frequency table. Varying interleaving options are detailed in the above-referenced Recommendation, such as: 12.5, 6.25 and 5 kHz. Interleaving dramatically increases the channels available, although to take advantage of the potential extra channels, both coastal stations and ships would need to upgrade their radios in a similar manner

⁵ Public switched telephone network.

to that undertaken when 25 kHz (changing from 50 kHz) was introduced into the RR Appendix 18 frequency band. This would be a significant change and is likely to be harder to implement than the splitting of two frequency channels. This is probably due to the conversion or replacement of existing equipment and information that recognizes this fact is reflected in Report ITU-R M.2010 – Improved efficiency in the use of the band 156-174 MHz by stations in the maritime mobile service. One administration indicated that they have been prepared to issue licenses for 12.5 kHz channels. No applicants have emerged as all users want to use 25 kHz spaced channels for full international compatibility reasons. No administrations have indicated use of 6.25 and 5 kHz interleaving channels.

Data/Digital systems: Appendix 18 also describes the harmonized channels where the digital technologies defined in Recommendation ITU-R M.1842-1 could be used. Some of these national/regional systems that can be used under the footnote to RR Appendix 18 are detailed in Recommendation ITU-R M.1842 – Characteristics of VHF radio systems and equipment for the exchange of data and electronic mail in the maritime mobile service RR Appendix 18 channels. As most of these systems require duplex channel arrangements, they tend to operate on VPC channels. This is because the VPC channels are, in many areas, either under-utilized or vacant. Recommendation ITU-R M.1842-1 describes narrow-band systems which could operate in the envelope of one channel (25 kHz bandwidth) or wideband systems working with the combination of more than one channel (up to 100 kHz). These systems operate on duplex channel arrangements.

Technical characteristics for a VHF data exchange system in the VHF maritime mobile band will be provided in a future ITU-R Recommendation.

Supplementary national search and rescue arrangements: A number of administrations have implemented search and rescue (SAR) arrangements where channels other than 16 and 70 are used for the management of logistics during such incidents. Whilst these channels are not those safety and distress channels recognized globally, they are recognized at a national level for this use.

Experimental use for future applications or systems

Channel 2006 (160.9 MHz) is reserved for experimental use for future applications or systems (e.g. new AIS applications, man over board systems, etc.). If authorized by administrations for experimental use, the operation shall not cause harmful interference to, or claim protection from, stations operating in the fixed and mobile services.

Also channels 27, 87, 28, 88 may be used for possible testing of future AIS applications on the same basis.

Satellite detection of AIS messages

Improvement of the satellite detection of AIS messages has been requested by many administrations.

Channels 75 and 76 are exclusively dedicated to maritime use therefore these channels are proposed to be shared with the MSS. This proposal meets the intent of footnote n) to RR Appendix 18 for interference mitigation.

Satellite detection of the ship-borne AIS utilizing channels 75 and 76 should be limited to the AIS Class A equipment.

4 Current operational environment for channels in RR Appendix 18

Survey undertaken by one administration

Purely as a general snap-shot of use, United Kingdom (UK) undertook a brief survey of users who make use of maritime mobile radio, in the VHF frequency band. This included both ports and

shipping. The survey did not include the core safety systems used in the VHF frequency band, but focused on general questions on the use made in the non-core safety parts of the VHF frequency band.

Ports

The survey ranged from the major ports, i.e. those that are mainly used for international shipping, through to the minor ports (mainly those used by leisure vessels). Ports generally operate voice-based communications in conjunction with AIS systems. In addition some of the larger ports have access to database systems, at both a national and regional level, that record ship routes and thereby give information relating to vessels the ports are expected to manage. Approximately 26 ports, throughout the UK, responded to the survey.

In response to a question: *“Where you make use of VHF standard voice communication, do you feel that this is still an important part of the overall port to ship communication (where “4” is critical and “1” is for back up to other systems)?”*

The majority said that this was a critical requirement and two felt it was important. None of the responders felt it was either “useful” or only a backup system. This seemed to indicate that ports, still regard voice communications as a valuable part of the systems used to manage ship movements. Also all, apart from three of the ports surveyed, operate their communications on simplex frequencies, with some of those who use a duplex channel, use this as an additional supplementary channel. This supplementary channel is sometimes referred to as a “private” channel. This is because on a duplex channel, whilst ports radio traffic can be heard by all ships, the return traffic (from ship to coastal station) can only be heard by the port with which it is communicating. Whilst this might give some implied “privacy”, this does not mean that the traffic is encrypted or encoded. Whilst other ships might not be able to hear other ships, where duplex channels are used, this is only because of the RR Appendix 18 frequency band plan used and monitoring of the frequency can be done with other devices.

None of the responses indicated that there would be a time when voice communications would not be required. This, they say, is because their radio communications requirements will be dictated by the commonality across all vessels that might come into contact with a port.

Ships

The survey responses, for ships, were broadly similar that for ports. The UK shipping survey included passenger ferries, cargo vessels and tugs. Around 50 responses were received.

Again here, when asked: *“Where you make use of VHF standard voice communication, do you feel that this is still an important part of the overall port to ship communication (where “J” is critical and ‘1’ is for back up to other systems)?”*, around 80% felt that “voice” remained a critical requirement, with just under 20% stating it was important, with a single response stating it was “useful”.

On the need for port operations being on simplex frequencies, responses were broadly split between critical and important, only four felt it was “useful”. Around 35% of responses stated that they communicated with ports on duplex channels, although of these none indicated that contact with duplex channelled ports made more than 50% of overall ports related communication. None of the responses indicated that they currently used public correspondence systems. On the question of a potential of removal of all voice communications from vessels, 94% felt this was unlikely particularly where vessels remained manned. Some felt that supplementary systems ran the risk of complicating the bridge of a vessel and that the instant and immediacy of voice had benefits and this leads to a degree of confidence.

Considerations for the maritime use of RR Appendix 18 in the United States

In the United States (US), the VHF maritime mobile frequency band (RR Appendix 18) is shared with other services. Since the Administration has exclusively assigned many of these frequencies to other services, they are unavailable for maritime use. Two examples of this are:

- The upper legs of the duplex channels 1, 2, 3, 4, 5, 6, 7, 18, 19, 60, 61, 62, 63, 64, 65, 66, 78 and 79 have been assigned exclusively to the land mobile service and are not available for maritime service in the US.
- The upper legs of the duplex channels 21, 22, 23, 80, 81, 82 and 83 have been assigned exclusively for “broadcast auxiliary remote pickup” and are not available for maritime service in the US.

In addition, the Administration assigned the only remaining VPC channels 24-28 and 84-88 to one operator. The Administration exclusively designated AIS 1 and AIS 2, channels 87B and 88B, nationwide to the maritime mobile service for the AIS. The VPC channelling plan was separated into maritime service areas and non-maritime service areas, and one organization was awarded all of the maritime service areas. Since then, the Administration has proceeded with further rulemaking to further specify the use of the VPC channels in the maritime service areas. At present, only the VPC channels 24, 25, 26, 27, 28, 84, 85, 86 and 87 are still available for maritime use.

Report ITU-R M.2122 – EMC assessment of shore-based electronic navigation (eNAV) infrastructure and new draft Standards for data exchange in the VHF maritime mobile band (156-174 MHz) provides an EMC (electromagnetic compatibility) analysis between these VPC channels and the AIS, and this Report is considered in Recommendation ITU-R M.1842-1 for the exchange of data by VHF. This Report shows that the AIS channels are most susceptible to interference from channels 27 and 28 which are interleaved adjacent to AIS 1 and AIS 2. Thus, it is prudent to consider that the VHF data exchange service envisioned in Recommendation ITU-R M.1842-1 should be addressed primarily to the contiguous set of frequencies contained in the six remaining VPC channels 24, 84, 25, 85, 26 and 86.

Table 1 provides a view of the maritime availability of RR Appendix 18 in the United States.

TABLE 1

Availability of RR Appendix 18 for maritime service in the United States

A = available for maritime service in the US

M = available only to one operator for maritime service in the US

R = assigned to railroads, not available for maritime service in the US

B = assigned for broadcast auxiliary remote pickup, not available for maritime service in US

L = assigned to land-mobile radio services, not available for maritime service in the US

Rx/Tx = assigned for coast-to-ship environmental broadcasts only

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public correspondence
		From ship stations	From coast stations		Single frequency	Two frequency	
60	<i>m), o)</i>	156.025L	160.625R			x	x
01	<i>m), o)</i>	156.050A	160.650R			x	x
61	<i>m), o)</i>	156.075L	160.675R		x	x	x
02	<i>m), o)</i>	156.100L	160.700R		x	x	x
62	<i>m), o)</i>	156.125L	160.725R		x	x	x
03	<i>m), o)</i>	156.150L	160.750R		x	x	x
63	<i>m), o)</i>	156.175A	160.775R		x	x	x
04	<i>m), o)</i>	156.200L	160.800R		x	x	x
64	<i>m), o)</i>	156.225L	160.825R		x	x	x
05	<i>m), o)</i>	156.250A	160.850R		x	x	x
65	<i>m), o)</i>	156.275A	160.875R		x	x	x
06	<i>f)</i>	156.300A		x			
66	<i>m), o)</i>	156.325A	160.925R			x	x
07	<i>m), o)</i>	156.350A	160.950R			x	x
67	<i>h)</i>	156.375A	156.375A	x	x		
08		156.400A		x			
68		156.425A	156.425A		x		
09	<i>i)</i>	156.450A	156.450A	x	x		
69		156.475A	156.475A	x	x		
10	<i>h), q)</i>	156.500A	156.500A	x	x		
70	<i>f), j)</i>	156.525A	156.525A	Digital selective calling for distress, safety and calling			
11	<i>q)</i>	156.550A	156.550A		x		
71		156.575A	156.575A		x		
12		156.600A	156.600A		x		
72	<i>i)</i>	156.625A		x			
13	<i>k)</i>	156.650A	156.650A	x	x		
73	<i>h), i)</i>	156.675A	156.675A	x	x		
14		156.700A	156.700A		x		
74		156.725A	156.725A		x		
15	<i>g)</i>	156.750Rx	156.750Tx	x	x		
75	<i>n)</i>	156.775A	156.775A		x		

TABLE 1 (continued)

Availability of RR Appendix 18 for maritime service in the United States

A = available for maritime service in the US

M = available only to one operator for maritime service in the US

R = assigned to railroads, not available for maritime service in the US

B = assigned for Broadcast Auxiliary Remote Pickup, not available for maritime service in US

L = assigned to land-mobile radio services, not available for maritime service in the US

Rx/Tx = assigned for coast-to-ship environmental broadcasts only

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public correspondence
		From ship stations	From coast stations		Single frequency	Two frequency	
16	<i>f)</i>	156.800A	156.800A		Distress, safety and calling		
76	<i>n)</i>	156.825A	156.825A		x		
17	<i>g)</i>	156.850A	156.850A	x	x		
77		156.875A		x			
18	<i>m)</i>	156.900A	161.500R		x	x	x
78	<i>m)</i>	156.925A	161.525R			x	x
19	<i>m)</i>	156.950A	161.550R			x	x
79	<i>m)</i>	156.975A	161.575R			x	x
20	<i>m)</i>	157.000A	161.600A			x	x
80	<i>m)</i>	157.025A	161.625B			x	x
21	<i>m)</i>	157.050A	161.650B			x	x
81	<i>m)</i>	157.075A	161.675B			x	x
22	<i>m)</i>	157.100A	161.700B		x	x	x
82	<i>m), o)</i>	157.125A	161.725B		x	x	x
23	<i>m), o)</i>	157.150A	161.750B		x	x	x
83	<i>m), o)</i>	157.175A	161.775B		x	x	x
24	<i>m), o)</i>	157.200M	161.800M		x	x	x
84	<i>m), o)</i>	157.225M	161.825M		x	x	x
25	<i>m), o)</i>	157.250M	161.850M		x	x	x
85	<i>m), o)</i>	157.275M	161.875M		x	x	x
26	<i>m), o)</i>	157.300M	161.900M		x	x	x
86	<i>m), o)</i>	157.325M	161.925M		x	x	x
27		157.350M	161.950M			x	x
87		157.375M	157.375M		x		
28		157.400M	162.000M			x	x
88		157.425A	157.425A		x		
AIS 1	<i>f), l), p)</i>	161.975A	161.975A				
AIS 2	<i>f), l), p)</i>	162.025A	162.025A				

5 Observations including access to simplex channels

In general, the use in RR Appendix **18** can currently be split into three broad groups; core safety use (including the use of AIS), port operations and national/regional variations. It seems that when reviewing the frequency band and taking account of this actual use, the numbers of channels currently identified for VPC do not reflect the actual need for these uses. This is because, the VPC usage is now so limited around the world that the channels currently designated for that purpose now exceed those actually required.

Another point, borne out from the survey is the potential use of channels 87 and 88 post WRC-97 Decisions. WRC-97 implemented changes to RR Appendix **18** where two, originally VPC channels, were split to facilitate the establishment and use of AIS. The modification of RR Appendix **18** that allowed for the identification of two frequencies for AIS had the result that channels 87 and 88 were designated as single frequency channels. These two single frequency channels have remained within RR Appendix **18**. However, a recent trial by a port in the UK illustrated that only around 38% of vessels surveyed could actually make use of channels 87 and 88 in simplex configuration. It is understood, that, post WRC-97 no specific instructions were issued that required the VHF radio sets to be modified to accommodate the “new” configuration for channels 87 and 88.

The above case illustrates that channels 87 and 88, post WRC-97 changes, have had limited practical use. This is due to the lack of vessels which have had their VHF radios modified to accommodate these changes. IMO requires that radio equipment, for SOLAS vessels, operates in accordance with Appendix **18** of the Radio Regulations. This requirement is met through IMO Resolution A.803(19), although that compliance is via the requirements to meet relevant technical specifications, rather than the ITU Radio Regulations directly. This illustrates the existing disconnect between some IMO performance standards and, for instance IEC or ETSI, equipment standards and ITU channelling arrangements (as revised). This might go some way to explain why some radios, under the UK survey, were unable to meet the post WRC-97 RR Appendix **18** arrangements for channels 87 and 88.

It is important to recognize that IMO Resolution A.803(19) does not require equipment installed before 23 November 1996 to be updated. As a result, this means that, in some cases the pre-WRC-97 duplex channels 87 and 88() are retained in radio equipment installed before that 1996 date.

This is an area where greater liaison between ITU, IMO and Standardization bodies would help to ensure that the implications and consequences of RR Appendix **18** changes are better understood.

Finally, any potential changes to RR Appendix **18** should balance the needs across the entire maritime industry. That balance should also recognize that, to a certain extent, the VPC originally accommodated in RR Appendix **18** no longer warrants the amount of spectrum reserved for it, particularly where other systems (e.g. mobile satellite and mobile cellular systems) offer substitutable communication alternatives.
