Liaison Note to ITU-R Working Party 5B

Plan for Future VHF Data Communications

References: 1. 5B/801, “Three Essential Elements of e-Navigation Communications”

2. 5B/727 Annex 36, IALA Maritime Radio Communication Plan edition 1 (MRCP)

3. 5B/727 Annex 35, IALA World Wide Radio Navigation Plan (WRNP)

# Introduction

This Liaison Note describes IALA’s plan for the future development of VHF data exchange (VDE), and to inform ITU-R WP5B of the use planned by IALA of VHF channels of Appendix 18 for the purpose of data communications, taking into account the result of WRC-12, and Agenda Item 1.16 for WRC-15.

# Action requested

IALA requests ITU-R WP5B to consider this VHF plan in its studies under agenda item 1.16 for WRC-15

Status: For action

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ANNEX A Plan for Future VHF Data Communications

1. PLAN FOR FUTURE VHF DATA COMMUNICATIONS

# Summary

This Liaison Note describes IALA’s plan for the future development of VHF data exchange (VDE), and to inform ITU-R WP5B of the use planned by IALA of VHF channels of Appendix 18 for the purpose of data communications, taking into account the result of WRC-12, and Agenda Item 1.16 for WRC-15.

## Related documents

1. 5B/801, “Three Essential Elements of e-Navigation Communications” (original IALA reference number was Liaison Note e-Nav10-output-18)
2. 5B/727 Annex 36, IALA Maritime Radio Communication Plan edition 1 (MRCP)
3. 5B/727 Annex 35, IALA World Wide Radio Navigation Plan (WWRNP)

# WRC-12 outcome

## Long range AIS

The WRC-12 has identified channels 75 and 76 for the reception of automatic identification system (AIS) emissions of long-range AIS broadcast messages (Message 27, defined in Recommendation ITU‑R M.1371).

## Digital channels identified by WRC-12

WRC-12 identified channels inside Appendix 18, which could be used for digital systems from 1 January 2017.

However the availability of these channels is not the same over all 3 ITU Regions and all would be shared with fixed and mobile services.

Six channels have been identified worldwide for digitally modulated emissions in accordance with the Recommendation ITU‑R M.1842. These are Channels 24, 84, 25, 85, 26 and 86, corresponding to the frequency bands 157.200-157.325 and 161.800-161.925 MHz.

Channels 80, 21, 81, 22, 82, 23 and 83 corresponding to the frequency bands 157.025‑157.175 MHz and 161.625-161.775 MHz are also available for digitally modulated emissions in accordance with Recommendation ITU‑R M.1842, except in Region 2.

## AIS experiments

WRC-12 identified the frequency 160.900 MHz 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.

WRC-12 has identified the channels 27, 28, 87, and 88 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.

## Future WRC Agenda Item

The WRC-12 established a new Agenda item for the AIS for WRC-15:

Agenda item 1.16 to consider regulatory provisions and spectrum allocations to enable possible new Automatic Identification System (AIS) technology applications and possible new applications to improve maritime radiocommunication in accordance with Resolution COM6/21 (WRC‑12)

More specifically this Resolution in its “resolves” portion quotes:

1 to consider, based on the results of ITU‑R studies, modifications to the Radio Regulations, including possible spectrum allocations, to enable new AIS terrestrial and satellite applications, while ensuring that these applications will not degrade the current AIS operations and other existing services;

2 to consider, based on the results of ITU‑R studies, additional or new applications for maritime radiocommunication within existing maritime mobile and mobile-satellite service allocations, and if necessary to take appropriate regulatory measures.

WRC-12 has also established a new Agenda Item for WRC-18 dealing with the modernization of the GMDSS and the e-navigation:

**“**to consider regulatory actions, including spectrum allocations, to support GMDSS modernization and implementation of e-navigation in accordance with Resolution COM6/9 (WRC‑12)”

# Description of VHF data communications requirements

## Background

Prior to WRC-12, IALA created ITU document 5B/801 “Three essential elements of e-Navigation communications”, which originated in IALA as output document e-Nav10-output-18.

Two of these essential elements were concerned with AIS and with VHF channels for data exchange. (The third of these essential elements is MF radio communications, near 500 kHz. It is not considered in this paper, which is restricted to VHF matters.)

The objective of this document 5B/801 was to secure at WRC-12 additional AIS channels for satellite detection, and additional VHF channels to relieve the loading on AIS1 and AIS2 with the objective of optimizing the use of AIS1 and AIS2 for their original purpose. The result of WRC-12 was in accordance with these objectives.

## VHF data communications

VHF data communications will provide robust high-speed data exchange between ships and between ship and shore. The AIS system is not capable of handling, nor is intended for, this high-speed data exchange.

Taking into account the channels identified by WRC-12 as described in 2.2 above, channels 24, 84, 25, 85, 26, and 86 will use the modulation technique described in ITU-R M.1842-1, and will be used for future VHF digital data, and ship-to-shore data exchange.

These may be used as discrete data communications channels, or a number may be combined into a single wide-bandwidth channel.

* A typical scheme would be to allocate the four channels 25, 85, 26, and 86 for data exchange (in accordance with ITU-R M.1842 Annex 4) in areas such as ports and crowded waterways, with the other two channels (24 and 84) allocated to operation (in accordance with ITU-R M.1842, either Annex 1 or Annex 3) along the coastline between these areas.
* Where a number of the 25 kHz channels are combined, a typical scheme might have a 100 kHz bandwidth, allowing a much higher data throughput than a single 25 kHz channel.

## IALA “VHF Data Exchange” (VDE) plan

IALA plans to use six VHF data channels 24, 84, 25, 85, 26, and 86 plus channels 27 and 28 (which have been identified for “possible testing of future AIS applications”) for an international scheme to be known as “VHF Data Exchange” (VDE).

# Summary of the IALA VDE plan and its relationship with AIS

## VDE and its relationship with AIS

To summarise the VDE plan, and its relationship with AIS:

* VHF Data Exchange (VDE):
  + The duplex channels 27 and 28, which have been identified by WRC-12 for testing of future AIS applications, will be used for ‘radiocommunications involving, but not limited to, area warnings and meteorological and hydrographic data, as well as channel management of AIS, future VHF digital data, and ship-to-shore data exchange’:
    - These may use the same message structures and TDMA technology similar to AIS;
    - This use for terrestrial data exchange will not prevent the use of these channels for satellite applications as referred in AI-1.16 of WRC-15.
  + The four contiguous channels 25, 85, 26, 86 will be used for data exchange using the modulation technique described in ITU-R M.1842-1 Annex 4:
    - These may be used as separate channels or combined into a single 100KHz broadband channel.
  + The two contiguous channels 24 and 84 may also be used for data exchange along the coastlines and waterways using the modulation techniques described in ITU-R M.1842-1 Annex 1 or Annex 3.
* AIS
  + The existing AIS frequencies AIS-1 and AIS-2 (both are simplex channels) will be used exclusively for safety of navigation, primarily position reporting and identification, ship to ship and ship to shore;
  + the simplex channels 75 and 76 will be used for satellite detection of AIS using AIS Message 27, long range AIS broadcast message.

**Table 1 - ‘VHF Data Communications and AIS’ provides a summary of the technical assignment of various VHF channels for communication including protocol and types of messages to meet the functionality required by user needs.**

1. **VHF Data Communications and AIS**

|  | ***VHF Data Communications (including VDE)*** | | ***AIS*** | |
| --- | --- | --- | --- | --- |
| **Sub-group** | ***Data communications using existing AIS protocol*** | ***Data communications using ITU standard protocol*** | ***AIS for safety of navigation*** | ***AIS long range*** |
| **Radio channels** | * *Channels 27 and 28* * *World-wide dedicated channels (WRC-15 target)* | * *Channels 24, 84, 25, 85, 26, 86* | * *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* * *Maritime and inland distress and safety communications (Subject to inclusion in GMDSS Modernization by IMO)* | * *Space detection of AIS* * *Future SAR* |
| **Message types**  **for AIS protocol** | * *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* * *Other messages for support of future SAR* |
| **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* * *Future distress alerting (Subject to inclusion in GMDSS Modernization by IMO)* |

## Outcome

This plan will provide a robust high-speed VHF data exchange capability. Additionally, this plan will thus address the present problem of increasingly congested conditions on AIS-1 and AIS-2, enable much better satellite detection of AIS even in crowded sea areas, and ensure that marine safety information can be disseminated effectively.

# ****Action planned by IALA****

IALA intends to take the following action:

* Update the VHF portion of the MRCP (5B/727 Annex 36) in accordance with the content of this paper;
* Consider the potential need for addressing migration issues (including backward compatibility);
* At the appropriate times, initiate communications via the IALA Council with ITU.