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CEPT BRIEF ON AGENDA ITEM 1.16

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 360 (WRC 12);

# ISSUE

The Automatic Identification System (AIS) is a proven maritime data system, with a large number of ships equipped and a supporting terrestrial and satellite infrastructure established;

AIS is used in the ship movement service for collision avoidance, it enables the identification of stations using this system, provides information about a ship and its cargo. It provides a means for ships to exchange ship data, including identification, position, course and speed, with other nearby ships and coast stations.

AIS has the capability for data exchange by application-specific messages for complementary information for navigation. Within recent years the AIS use is increasing rapidly, as well as Application Specific Message (ASM), and a potential overloading, of the current AIS1 and AIS2 (Appendix 18 of the Radio Regulations) need to be considered.

The decision of WRC 12 to assign new channels of the appendix 18 to digital communication makes the implementation and use of new digital communication means possible. The establishment of the VHF data exchange and certain satellite communication components on these new frequencies offers potential enhancements to VHF maritime safety communications on a global basis to satisfy the increasing need for maritime radiocommunications for enhanced maritime safety.

# CEPT position

* CEPT is of the view that the implementation of the Concept of the VHF Data Exchange System (VDES) which contains a VDE terrestrial component, a satellite component and an ASM component would enhance maritime radio communications.
* CEPT is of the view that no modifications should be required to existing AIS equipment on board existing vessels and that the integrity of the original operational purpose of AIS as the primary function on the existing AIS frequencies should be protected.
* CEPT is of the view that channels 27 and 28 will be split into four simplex channels, channels 1027, 1028, 2027 and 2028. Channels 2027 and 2028 will be assigned for the ASM application, and that the channels 1027, 1028, 1087 and 1088 will be used by analogue voice. Noting that 1087 is today known as 87 and 1088 as 88.
* CEPT is of the view that Channels 2078, 2019, 2079 and 2020 should not be available for transmitting from ships to prevent blocking of the reception of AIS as well as ASM transmissions.
* CEPT considers that a combination of channels 24, 25, 84, and 85 could be a possible solution for the terrestrial component for the future VDES.
* CEPT is considering a new secondary allocation to the maritime mobile satellite service (Earth-to-space) and a primary allocation to the maritime mobile satellite service (space-to-Earth), while ensuring the protection of existing terrestrial and radio astronomy services. The provisions 5.208A and 5.208B are proposed to be modified in order to quote the frequency band where VDES is intended to operate. The VDES downlink has to fulfil these modified provisions in order to ensure compatibility with the radio astronomy services. Furthermore to ensure coordination with the terrestrial service, provision of RR No. 9.14 shall apply, this is done with a new footnote RR No. 5.B116.
* CEPT is of the view that a satellite component should use frequencies within the appendix 18 close to AIS 1 and AIS 2 so that the same equipment as for VDES can be used. Therefore the downlink could comprise the following combination of channels 2024, 2025, 2026, 2084, 2085 and 2086. For the uplink comprising the following channels 1024, 1025, 1026 1084, 1085, 1086 and the frequencies ASM1 (Channel 2027) and ASM2 (Channel 2028) (See Annex 1).

# Background

Resolves part of Resolution 360 (WRC-12) invites ITU-R:

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;

The shipborne automatic identification system (AIS) mandated under Chapter V of the international convention for the Safety of Life At Sea (SOLAS) has become well accepted by the maritime community and is also being used by thousands of ships not subject to carriage requirement under the SOLAS Convention.

AIS is supported by a large shore based VHF infrastructure as well as being able to be detected by satellite. AIS is routinely used by ships for navigation such as situation awareness and exchange of information between ships through short messages. AIS messages can be sent with a priority #1 (highest) through #4 (lowest).

AIS 1 and AIS 2 should be reserved for “Navigation Safety/Collision Avoidance” purposes (as a SOLAS requirement) and therefore the Application-Specific Messages (ASM) and other “non-critical communications” should be moved to new channels of RR Appendix 18 to avoid deleterious loading of the AIS VDL (VHF Data Link). This problem increases as more different types of equipment using AIS technology and applications are developed, and an increasing number of these devices are implemented, particulary in the fishing and leisure market.

Taking into account the channels identified by WRC-12 as described in above, new digitalized channels could be used with modulation techniques described in Recommendation ITU-R M.1842-1, and could 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.

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. The use of the six VHF data channels plus two further channels (which have been identified for “possible testing of future AIS applications”) for an international scheme to be known as “VHF data exchange system” (VDES).

Suitable frequencies for a satellite VDE downlink channel, as part of the VDES concept - allow the reception of the satellite channel with low-cost receive-only equipment, or can make extensive use of the existing VHF infrastructure on the ships and require only minor modifications.

A satellite downlink channel would allow information to be passed to ships which are out of reach of the terrestrial shore infrastructure. This extends the geographical reach of services to remote areas e.g. polar regions.

1. 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,

Satellite communications is an effective means to deliver information in a broadcast or multicast mode to a large number of ships, i.e. efficiently addressing many vessels using only minimal parts of the limited maritime radio spectrum resource. A satellite downlink channel that is able to address a single message to thousands of ships simultaneously within its footprint is the appropriate mean to comply to this request.

In remote areas VDE terrestrial frequencies (RR App. 18) are also able to provide an effective means for received VDE and ASM messages to be acknowledged and to send local information to the assigned coast station via satellite by using ASM or VDE messages.

Invites part of Resolution 360 (WRC-12) invites ITU-R:

1. to conduct, as a matter of urgency, studies that identify potential regulatory actions to accommodate emerging maritime mobile service and mobile-satellite service AIS requirements;
2. to conduct, as a matter of urgency, studies on additional or new applications for maritime radiocommunication within maritime mobile and mobile-satellite service allocations, and to identify potential regulatory actions to accommodate emerging maritime radiocommunication requirements;
3. to complete studies in time for WRC-15 taking into account existing systems and services that share the bands.

# List of relevant documents

ITU-Documentation (Recommendations, Reports, other)

* Recommendation ITU-R M.1084 – Interim solutions for improved efficiency in the use of the band 156-174 MHz by stations in the maritime mobile service.
* Recommendation ITU-R M.1371 – Technical characteristics for an automatic identification system using time-division multiple access in the VHF maritime mobile band.
* 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.
* Draft New Recommendation ITU-R M.[VDES]
* Report ITU-R M.2317 - VHF data exchange system channel sounding campaign.
* Report ITU-R M.2371 - Selection of the channel plan for a VHF data exchange system.
* Draft New Report ITU-R M.[AIS.PROTECTION]
* CPM Report for AI 1.16

Other ITU documents:

* Updated information/documentation on the ITU-R Preparatory Studies for WRC-15 is available at <http://www.itu.int/ITU-R/go/rcpm-wrc-15-studies>.
* Report ITU-R M 2287 Automatic Identification System VHF Datalink loading

CEPT and/or ECC Documentation (Decisions, Recommendations, Reports)

EU Documentation (Directives, Decisions, Recommendations, other), if applicable.

# Actions to be taken

* None

# Relevant information from outside CEPT (examples of these are below)

## European Union (date of proposal)

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## Regional telecommunication organisations:

APT (August 2015)

Supports ITU-R studies towards new applications using the AIS and enhanced maritime radiocommunication in the maritime mobile service in accordance with Resolution 360 (WRC-12).

The implementation of the concept of the VDES which contains the VDE terrestrial component, the satellite component and the ASM component would enhance maritime radio communications.

Modifications should not be required to existing AIS equipment on board existing vessels. New applications using AIS technology should be allowed to evolve, supported by communication primarily on the new frequencies identified by WRC-12, while protecting the integrity of the original operational purpose of AIS as the primary function on the existing AIS frequencies.

That the frequency band identified for VDES should accommodate the expected future AIS VDL loading.

Any change to the regulatory provisions and spectrum allocations resulting from this agenda item should not adversely impact on the capability of search and rescue aircraft to effectively communicate with vessels during disaster relief operations.

It is needed to take full account of the outcomes of WRC-12 on digital communication channel arrangements in RR Appendix 18 for the global and regional channel allocation for VDES. Different types of VDES applications and equipment in different scenarios and operating in different frequency arrangement plan could be considered.

Any new allocation for the future applications, including satellite application, to the frequency bands listed in the RR Appendix 18 should be based on issued ITU-R Recommendation.

Transitional arrangements are required to minimize the impact of use of new applications on the existing services using frequencies listed in the RR Appendix 18. The VDES equipment should provide backwards compatibility for existing AIS, the installation costs should be minimized and the proper transitional period should be considered.

New VDES should not adversely impact VHF radiotelephony channels used for maritime safety at sea and ports.

Operation of designated ASM channels should not adversely impact AIS 1 and AIS 2 channels.

VDE Satellite downlinks should not adversely impact AIS 1 and AIS 2 channels, and terrestrial component of VDE, and incumbent services in the same frequency band.

It is desirable to consider the possibility of VDES involvement in the future modernized GMDSS.

The two safety-of-navigation channels, AIS 1 and AIS 2, should be protected from harmful interference and blocking.

The two channels 2027 and 2028 should be used for new AIS applications as ASM channels, the usage of remaining channels 1027 and 1028 should be taken into account.

APT Members support the Method A1 for Issue A, Method B1 for Issue B, Method C1-A for Issue C and Method D for Issue D. The resulting proposals are shown in the attached document

ATU (July 2015)

Africa recognize the importance of AIS, and support any allocation improving AIS, however specific bands to identified after the availability of results of ongoing studies

EACO:

Issue A: Method A2 RR Appendix 18 simplex channels 87 and 88 will be assigned for ASM applications with an effective date. To prevent the potential blocking of the reception of the channels AIS1, AIS2 appropriate regulatory measures to restrict power limit for the transmission from ship on channels 2078, 2079, 2019, 2020 should be applied.

Issue B: Method B2 Channels 24, 84, 25, 85, 26 and 86 in RR Appendix 18 could be used for global harmonized VDE testing and experiments, including terrestrial component and satellite component.

Issue C: Method C2

Issue D: Method D Channels 80, 21, 81, 22, 82, 23 and 83 are available in some Regions.

Channels 80, 21, 81 and 22 can be used using multiple 25 kHz contiguous channels for both ship and coast station transmission as regional use.

Channel 82 can be used for both ship and coast station transmission as regional use.

Channels 23 and 83 can be used using multiple 25 kHz contiguous channels for both ship and coast station transmission as regional use.

ECCAS: Compte tenu de ceque les fréquences additionnelles devraient satisfaire les nouveaux besoins d’exploitation des AIS pour les communications de terre et par satellite, nous pouvons être favorables à cette nouvelle attribution.

ECOWAS:

Issue A: A1

Issue B: B1

Issue C: C2

Issue D: The proposed method

SADC:

SADC supports the identification of additional spectrum for AIS provided that existing services are protected. Allocation on a secondary basis as proposed by the study groups makes provision for protection of the primary services.

SADC supports additional or new applications for maritime radio communications within existing maritime mobile services (MMS) and maritime mobile-satellite services (MMSS) allocations considering the potential benefits this could bring to the maritime industry, provided that existing services are protected.

SUDAN:

Sudan supports all proposed methods of channel distribution in isuues A, B and C since all new frequencies are part of MMs and MMSS current allocation according to RR articles 31, 51 and RR appendix 18.

CONGO:

Compte tenu de ce que les fréquences additionnelles devraient satisfaire les nouveaux besoins d’exploitation des AIS pour les communications de terre et par satellite, notre Administration est favorable à cette nouvelle attribution. Elle soutient les méthodes A1 pour les messages propres aux applications, B1 pour les nouvelles applications des radiocommunications maritimes composante terre et C1-A pour les nouvelles applications des radiocommunications maritime composante satellite.

GUINEE:

Question A: Après analyse du rapport de RPC 1, notre Administration choisie la méthode A1 qui consiste à diviser les canaux 27 et 28 de l’appendice 18 du RR en quatre canaux simplex : 1027,1028, 2027, 2028. Les canaux 2027 et 2028 seront affectés à l’application spécifique des messages (ASM).

Question B:

Question C:

Question D:

NIGERIA:

In view of the importance of AIS in maritime operation for tracking and monitoring of vessels, also considering that THE TWO CHANNELS ALREADY in use are getting congested, Nigeria supports spectrum allocation for possible new AIS technologies.

Nigeria supports Method A, i.e. splitting of existing Automatic Identification System (AIS) channels to 4 channels. Two (2) of the channels are to be dedicated to Application Specific Messages (ASM) with effect from 1st January 2019.

ALGERIA:

L’Administration algérienne est favorable pour la finalisation des études engagées au niveau de l’UIT-R relatives aux dispositions réglementaires de manière à satisfaire les besoins des systèmes AIS et améliorer la sécurité maritime sans pour autant porter préjudice ou imposer des contraintes supplémentaires aux systèmes des services exploitant ses canaux .

Outcome (African Common Position):

Issue A: No common position (TBD)

Issue B: No common position (TBD)

Issue C: Method C2

Issue D: Method D

Arab Group (August 2015)

Issue A: Application-specific messages

* MOD Appendix 18 as per method A1 in the CPM report

Issue B: New applications for the maritime radiocommunication – terrestrial component

* ACP: MOD Appendix 18 as per method B1 in the CPM report

Issue C: New applications for the maritime radiocommunication – satellite component

* ACP: MOD RR Article 5 as per C1-A in the CPM report

Issue D: VDES regional solution

* ACP: MOD Appendix 18 as per method D in the CPM report

CITEL (August 2015)

Agenda Item 1.16: New AIS technology applications and possible new applications to improve maritime radiocommunication

MOD Appendix 18

* Split channels 27 and 28 for the designation of 2027 and 2028 to application specific messages (ASM) to reduce AIS loading due to the proliferation of AIS applications, message types, services and equipment types plus the unanticipated increase in user volume.
* Channels 2078, 2019, 2079 and 2020 are not available for transmitting from ships to avoid interference to AIS reception on board ship stations. Includes a country footnote for administrations that use channels 27 and 28 for public correspondence

MOD Article 5

* New secondary allocation to the MMSS (Earth-to-space) limited to the designated ASM channels 2027 and 2028 identified in AP 18.United States (part of Method A1)

RCC (September 2015)

The RCC Administrations consider that:

* it is possible to identify frequency bands (channels) for implementation of enhanced applications of AIS technology and new applications to improve maritime radiocommunication in accordance with Resolution 360 (WRC-12). Such identification should be conducted within existing allocations to the MMS and MSS taking into account compatibility with existing radio services;
* it is possible to identify new channels within the MMS for AIS-ASM (AIS functions not related to distress), with optional use of channels 2027 (161.950 МHz) and 2028 (162.000 МHz).

The RCC Administrations also consider that protection of AIS1 and AIS2 channels from interference which may be caused by operation of channels 2078, 2079, 2019 and 2020, by limiting transmission power of ship stations in these channels is more preferable method than full transmission disabling.

The RCC Administrations consider that it is possible to use combinations of VHF channels 24, 25, 26, 84, 85, 86 allocated at the WRC-12 for digital technologies in the MMS, for the terrestrial component of the VHF data system (VDE);

The RCC Administrations are in favor of using frequency bands which are already allocated to MSS (excluding 148.0-150.05 MHz (Earth to space) for automatic identification system technology using satellite and new applications to improve maritime radiocommunication in accordance with Resolution 360 (WRC-12).

The RCC Administrations believe that:

Using frequency bands which are not allocated to the MSS for additional or new applications of maritime radiocommunication is not supported since it is beyond the scope of the decides 2 of Resolution 360 (WRC-12).The RCC Administrations consider that:

## International organisations

ASFCP (September 2015)

To ensure that any change to the regulatory provisions and spectrum allocations resulting from this agenda item do not adversely impact on the capability of search and rescue aircraft to effectively communicate with vessels during disaster relief operations.

IATA (date of proposal)

No Position for A.I. 1.16.

ICAO (July 2015)

To ensure that any change to the regulatory provisions and spectrum allocations resulting from this agenda item do not adversely impact on the capability of search and rescue aircraft to effectively communicate with vessels during disaster relief operations.

IMO (April 2015)

Modifications should not be required to existing AIS equipment on board existing vessels. New applications using AIS technology should be allowed to evolve, supported by communication primarily on the new frequencies identified by WRC-12, while protecting the integrity of the original operational purpose of AIS on the existing AIS frequencies. This will also address the concerns expressed previously on congestion by moving various applications to alternative channels in the existing VHF mobile band. IMO supports the VDES concept, without committing the Organization regarding future requirements on the use of the VHF frequency band.

NATO (September 2015)

NATO supports the consideration of regulatory provisions or enhanced AIS technology applications and for enhanced maritime radiocommunication, while protecting the integrity of the original operational purpose of AIS.

SFCG (August 2015)

No Position for A.I. 1.16.

WMO and EUMETNET

No Position for A.I. 1.16.

CRAF (September 2015)

CRAF supports Method C2 and C1 as long as an attenuation of 85 dB and the pfd mask described in section 3/1.16/4.3 of the CPM15-2 report as proposed by the MMSS are implemented for the nearby radio astronomy band. Under such conditions compatibility between MMSS in the band 161.7875-161.9375 MHz and the RAS in the band 150.05-153 MHz will be feasible.

## OTHER INTERNATIONAL AND REGIONAL ORGANISATIONS

EACAP (28th May 2015)

To ensure that any change to the regulatory provisions and spectrum allocations resulting from this agenda item do not adversely impact on the capability of search and rescue aircraft to effectively communicate with vessels during disaster relief operations.

ESA (date of proposal)

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Eurocontrol (date of proposal)

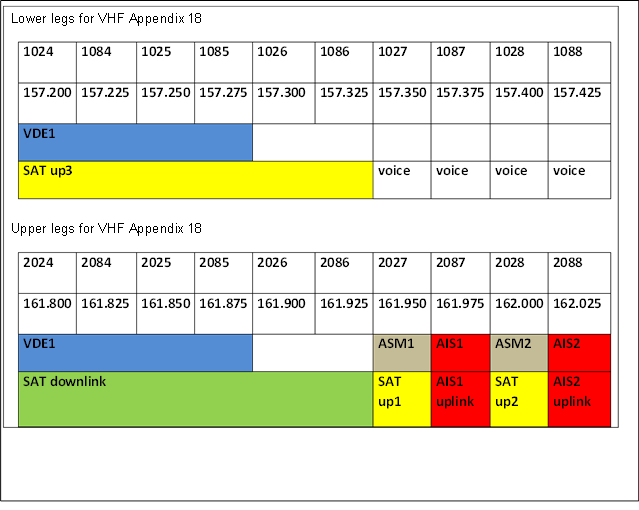
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CRAF (26th May 2015)

CRAF supports Method C2 that does not change the RR.

CRAF approves Methods C1 as long as an attenuation of 85 dB and the pfd mask described in section 3/1.16/4.3 of the CPM15-2 report as proposed by the MMSS are implemented for the nearby radio astronomy band. Under such conditions compatibility between MMSS in the band 161.7875-161.9375 MHz and the RAS in the band 150.05-153 MHz will be feasible.

1. 1. Channel plan



* + 1. VHF data exchange system channel usage:
    2. VHF data exchange system data exchange between terrestrial stations:

AIS 1 (161.975) and AIS 2 (162.025) are AIS channels, in accordance with Recommendation ITU-R M.1371;

ASM 1 (161.950) and ASM 2 (162.000) are non-navigation application specific messages (ASM);

VDE 1 lower legs (channels 1024… 1085) are ship-shore VDE (VHF data exchange);

VDE 1 upper legs (channels 2024… 2085) are shore-ship and ship-ship VDE.

* 1. VHF data exchange system data exchange between satellites and terrestrial stations:

AIS 1 (161.975) and AIS 2 (162.025) are used as uplinks for receiving AIS messages by satellite;

SAT up1 (161.950) and SAT up 2 (162.000) are used for receiving ASM by satellite;

SAT up3 (channels 1024… 1086) is a ship-satellite VDE uplink;

SAT Downlink (channels 2024… 2086) is the satellite-ship VDE downlink.

* 1. Technical characteristics
     1. Shipborne VHF data exchange system receivers are protected

As in AIS, shipborne VDES receivers are on the upper legs of RR Appendix 18, 4.6 MHz above the lower legs, which facilitates protection by filtering from receiver blocking by ships VHF radios.

* + 1. SAT Downlink is optimized

The satellite downlink power is spread over 6 channels to minimize interference to terrestrial services and to maximize reception by ship VDES stations.

* + 1. VDE1 uses both legs of the duplex channels

Full channel capacity is utilized for the duplex channels in VDE1 by using the lower legs for ship-shore and the upper legs for shore-ship and ship-ship digital messaging.