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|  | ASIA-PACIFIC TELECOMMUNITY | **Document No:** |
| **The 4th Meeting of the APT Conference Preparatory****Group for WRC-19 (APG19-4)** | **APG19-4/OUT-09** |
| 7 – 12 January 2019, Busan, Republic of Korea | 12 January 2019 |

Working Party 5

**PRELIMINARY VIEWs on WRC-19 agenda item 1.9.2**

**Agenda Item 1.9.2:**

*1.9 to consider, based on the results of ITU‑R studies:*

*1.9.2 modifications of the Radio Regulations, including new spectrum allocations to the maritime mobile-satellite service (Earth‑to‑space and space-to-Earth), preferably within the frequency bands 156.0125-157.4375 MHz and 160.6125-162.0375 MHz of Appendix****18****, to enable a new VHF data exchange system (VDES) satellite component, while ensuring that this component will not degrade the current terrestrial VDES components, applications specific messages (ASM) and AIS operations and not impose any additional constraints on existing services in these and adjacent frequency bands as stated in recognizing d) and e) of Resolution****360*** *(****Rev.WRC‑15****);*

**1. Background**

**1.1 Introduction**

The studies associated with WRC-15 AI 1.16 resulted in elaboration of a concept for the VHF data exchange system (VDES) reflected in Recommendation ITU-R M.2092-0. The system combines the current Automatic Identification System (AIS), applications specific messages (ASM) as well as data exchange terrestrial and satellite components.

During WRC-15 no allocations were made to VDES satellite component since the compatibility studies with the incumbent services in the frequency bands assumed for operation of VDES satellite component and in the adjacent frequency bands were incomplete.

For the preparation for WRC-19, ITU-R WP 5B was invited to conduct studies to identify the spectrum need of VDES satellite components (VDE-SAT), and also the sharing and compatibility studies between VDE-SAT and incumbent services in the same and adjacent frequency bands specified in *recognizing d)* and *e)* of ITU-R Resolution **360 (Rev. WRC-15)**.

Some incumbent services should be considered in the sharing studies, including land mobile service and maritime mobile service, which are widely used in global basis. It was also recognized that the radiolocation service and space operation service operated in the frequency bands 154-156 MHz and 163-167 MHz within the territory of a number of countries, including some APT countries, in accordance with RR No. **5. 225A** and **5.230**. The nearest frequency bands allocated to the radio astronomy service (RAS) should also be protected.

**1.2 Study progress in ITU-R WP 5B**

**1.2.1 Studies on the Draft CPM Text**

ITU-R WP 5B, as the responsible group for this agenda item, conducted technical and compatibility studies and produced draft CPM text at its meeting in May 2018 and also the new Report ITU-R M.2435-0, which was published by ITU-R Study Group 5 at its November meeting.

Following six methods were developed and incorporated in the Draft CPM Report to address the agenda item 1.9.2.

**Method A**

NOC to the Radio Regulations except suppression of Resolution **360 (Rev.WRC-15)**. This implies no allocation for the VHF data exchange (VDE) satellite component of the VHF data exchange system (VDES).

**Method B**

This method is based on frequency plan alternative 2 and proposes new primary allocations for the MMSS (Earth-to-space and space-to-Earth), details for coordination of the VDES space stations with respect to terrestrial services are described in the Draft CPM Report.

**Method C**

This method is based on frequency plan alternative 2 but with new secondary allocation for the MMSS (Earth‑to-space) and (space-to-Earth).

Due to the secondary allocation status for the VDE-SAT, there is no coordination between MMSS and terrestrial services and therefore there is no need to introduce a specific power flux-density (pfd) mask in the RR.

**Method D**

This method is based on frequency plan alternative 2 with the addition of a pfd limit in RR Article 5 in order to protect the terrestrial service. The description of the pfd mask is given in the Report ITU-R M.2435-0.

**Method E**

This method is based on frequency plan alternative 2 but uses a pfd mask different from that contained in Recommendation ITU-R M.2092-0. The description of the pfd mask is given in Annex **2** of the Report ITU-R M2435-0.

**Method F**

This method is based on frequency plan alternative 3.

Comparison of frequency plans from the Draft CPM Report

During its November meeting, WP 5B considered the questions on the draft CPM text for agenda item 1.9.2, raised by the CPM-19 management team, and some comments were developed and incorporated into the WP 5B Chairman’s Report, aiming to provide assistance to the administrations for their preparation of input contributions on this agenda item to CPM19-2.

**1.2.2 Studies on the supporting material**

Report ITU-R M.2435-0 was issued in November 2018, which provides technical description of the VDE-SAT and the compilation of results of the sharing and compatibility studies. During the WP 5B and SG 5 meeting, the Administration of Russian Federation indicate the views that the pfd mask derived from Recommendation ITU-R M.2092-0 does not protect land mobile and fixed service systems operating in accordance with existing allocations because it is based on an arithmetical mistake and objected to approve it. According to Resolution ITU-R 1-7 of Radio Assembly, one statement provided by Russian Federation was added to the Report.

In the Report ITU-R M.2435-0, four different pfd masks of VDE-SAT downlink were developed based on studies from administrations, who had different interpretation of protection criteria to land mobile service contained in the Recommendation ITU-R M.1808-0.

In the Report ITU-R M.2435-0, three alternative frequency utilization plans were developed based on studies from administrations.

**1.3 List of relevant ITU-R Reports/Recommendations**

- Recommendation ITU-R M.2092-0: Technical characteristics for a VHF data exchange system in the VHF maritime mobile band

- Report ITU-R M.2435-0: Technical studies on the satellite component of the VHF data exchange system

**2. Documents**

Input Documents: APG19-4/INP-19(Rev.1) (AUS), APG19-4/INP-26 (NZL),
APG19-4/INP-33 (THA), PG19-4/INP-63 (J),
APG19-4/INP-80 (KOR), APG19-4/INP-99 (CHN),
APG19-4/INP-122 (INS)

Information Documents: APG19-4/INP-09(Rev.1) (APG chairman),
APG19-4/INF-04 (ICAO), APG19-4/INF-22 (CITEL),
APG19-4/INF-23 (CEPT), APG19-4/INF-24 (RCC)

**3. Summary of discussions**

**3.1 Summary of APT Members’ views**

**3.1.1 Australia - Document APG19-4/INP-19(Rev.1)**

Australia supports facilitating the introduction of a new VHF data exchange system (VDES) satellite component consistent with Resolution **360 (Rev.WRC-15)**.

Any new allocation for the satellite component of VDES should coexist and be compatible with the systems in the radiocommunication services allocated in the same and adjacent frequency bands without imposing any additional constraints on those services.

Australia supports elements of Methods E and F in the Draft CPM Report subject to further consideration.

Australia supports the APT Preliminary View on this agenda item from the APG19-3 meeting.

**3.1.2 New Zealand - Document APG19-4/INP-26**

New Zealand supports the studies undertaken in accordance with Resolution **360 (Rev. WRC-15)** to identify possible new allocations to the maritime mobile-satellite service for VDES satellite component.

New Zealand is of the view that the candidate band for this possible new allocation to the maritime mobile-satellite service should be within the existing frequency range already assigned to VHF maritime mobile channels in accordance with RR Appendix **18**. Therefore, New Zealand supports Method F as outlined in the draft CPM text for WRC-19 Agenda item 1.9.2.

**3.1.3 Thailand - Document APG19-4/INP-33**

Thailand supports a new primary allocation for the MMSS (Earth-to-space) in the frequency band 157.1875-157.3375 MHz and a new primary allocation for the MMSS (space-to-Earth) in the frequency band 161.7875-161.9375 MHz.

Thailand is also of the view that:

- Existing services in the same and adjacent bands should be protected from harmful interference, and no any additional constraints are imposed; and

- In order to protect the RAS, Annex 1 to Resolution **739 (Rev.WRC-15)** should be revised.

**3.1.4 Japan - Document PG19-4/INP-63**

Japan supports the introduction of VDES satellite component. Japan is of the view that only the frequencies in RR Appendix **18** should be considered for the satellite component of the VDES. The frequencies, considered in ITU-R, not in RR Appendix **18** are used for terrestrial services other than maritime mobile service, and existing stations in these services need to be protected. Therefore, Japan supports Method F in the methods currently raised to allocate VDES satellite component frequencies in the draft CPM Report, in the view that the satellite component of the VDES in the frequency bands should be channelized in RR Appendix **18** which is already identified for VHF maritime mobile.

**3.1.5 Korea (Rep. of) - Document APG19-4/INP-80**

APT Members support the ITU-R studies undertaken in accordance with Resolution **360 (Rev. WRC-15)** to identify possible new allocations to the maritime mobile-satellite service for VDE satellite component.

In regards to the possible modification of the Radio Regulations under WRC-19 Agenda Item 1.9.2, APT Members are of the view that:

- Existing allocations and systems in the same and adjacent bands, especially the AIS, must be protected from harmful interference or any constraints, which include but are not limited to, any modification requested to existing AIS equipment;

- Search and rescue aircraft system operating in maritime frequencies must be protected;

- VDE satellite components downlink transmission should not degrade the VDE terrestrial components, ASM and AIS operations;

- VDE satellite components should not claim protection from harmful interference caused by stations of a land mobile service to which frequencies are already assigned; and

- If the spectrum needs were appropriately justified, new spectrum allocations could be identified to the maritime mobile-satellite service (MMSS) (Earth-to-space and space-to-Earth) with the provisions ensuring not to cause harmful interference and no claim of protection from incumbent service on a primary basis in the same and adjacent frequency bands.

**3.1.6 China (People’s Republic of) - Document APG19-4/INP-99**

This administration supports to consider frequency allocation to MMSS, recognizing VDES could provide broadband communications to shore and ship stations in maritime environment to meet the demand of the maritime community, and also considering that the VDE-SAT could provide communication capability in the sea area not available for VDE-TER. And this administration also agrees with the APT preliminary views that the VDE-SAT should not cause harmful interference to, and not claim of protection from incumbent services on a primary basis in the same and adjacent frequency bands, therefore, the secondary allocation should be considered.

Two frequency plans are used in current methods in Draft CPM Text, which referred to frequency plan alternative 2 and 3 in section 3.3 of the Report ITU-R M.[VDE-SAT]. Considering frequency plan alternative 2 offers significant advantages in terms of higher available bandwidth, improved system capacity and link robustness for both the terrestrial and the satellite components of the VDES, this administration supports frequency plan alternative 2.

Additionally, the pfd mask 4 is supported in order to provide protection to incumbent service in the same frequency band.

Therefore, one new method was proposed, which is variant of method D but using pfd mask 4.

* This method is based on frequency plan alternative 2 and proposes a new secondary allocation for the MMSS (Earth‑to-space)in the frequency band 157.1875-157.3375 MHz (channels 1024, 1084, 1025, 1085, 1026 and 1086) and the frequency band 161.7875-161.9375 (channels 2024, 2084, 2025, 2085 2026 and 2086). The channels 1026, 1086, 2026 and 2086 are identified for ship-to‑satellite (VDE-SAT uplink) communications. The channels 1024, 1084, 1025 and 1085 are identified for ship-to-shore communications, but ship-to-satellite (VDE-SAT uplink) communications are possible without imposing constraints on ship-to-shore communications.
* The method proposes a new secondary allocation for the MMSS (space-to-Earth) in the frequency band 160.9625-161.4875 MHz, for improved VDE communication capacity and coverage. The pfd mask of VDE-SAT downlink should be applied, which is described as the following equation.

$$pfd(θ)=\left\{\begin{matrix}-158.5+12\left(\frac{θ}{θ\_{3}}\right)^{2} & for 0<\left|θ\right|<θ\_{3}\\-143.5-10log\_{10}\left(k+1\right) & for θ\_{3}<\left|θ\right|<θ\_{5}\\-143.5-10log\_{10}\left(\left(\frac{\left|θ\right|}{θ\_{3}}\right)^{-1.5}+k\right)& for θ\_{5}<\left|θ\right|<90^{°}\end{matrix}\right.$$

with $θ$ the elevation angle, $θ\_{3}=16.47°$, $θ\_{5}=16.95°$ and $k=0.7$.

* The method proposes to modify provisions RR Nos. **5.208A** and **5.208B** in order to ensure the protection of the RAS in the nearest frequency band.
* In order to protect the RAS, Annex 1 to Resolution **739** **(Rev.WRC-07)** is revised to include MMSS in the frequency band 160.9625-161.4875 MHz.

The proposals to the Draft CPM Report is provided in another input contribution.

**3.1.7 Indonesia (Republic of) - Document APG19-4/INP-122**

Indonesia supports that activities of WP 5B to consider regulatory provisions and spectrum allocations to the maritime mobile-satellite service to enable the satellite component of the VHF Data Exchange System and enhanced maritime radiocommunication. Indonesia also raises a concern that any modifications of VDES components should not impact the existing AIS equipment on-board which is already installed on the vessel.

**3.2 Summary of issues raised during the meeting**

- Existing services need to be protected from the VDES satellite component.

- Some APT members proposed modifications to the Draft CPM Report.

**4. APT Preliminary View(s)**

APT Members support the ITU-R studies undertaken in accordance with Resolution **360 (Rev. WRC-15)** to identify possible new allocations to the maritime mobile-satellite service for VDES satellite component (VDE-SAT).

In regards to the possible modification of the Radio Regulations under WRC-19 Agenda Item 1.9.2, APT Members are of the view that:

- Existing allocations and systems in the same and adjacent bands, especially the current terrestrial VDES components, ASM and AIS operations, should be protected, not be degraded or subject to additional constraints, which include but are not limited to, any modification requested to existing AIS equipment;

- Search and rescue aircraft systems operating in maritime frequencies must be protected;

- VDES satellite components should not claim protection from harmful interference caused by stations of a land mobile service to which frequencies are already assigned;

- If the spectrum needs were appropriately justified, new spectrum allocations could be identified to the maritime mobile-satellite service (MMSS) (Earth-to-space and space-to-Earth), with the provision they do not cause harmful interference, and have no claim of protection from incumbent service on a primary basis in the same and adjacent frequency bands; and

- In order to protect the RAS, Annex 1 to Resolution **739 (Rev.WRC-15)** should be revised.

**5. Other View(s) from APT Members**

- Some APT Members support a new primary allocation for the MMSS (Earth-to-space) in the frequency band 157.1875-157.3375 MHz (channels 1024, 1084, 1025, 1085, 1026 and 1086) and a new primary allocation for the MMSS (space-to-Earth) in the frequency band 161.7875-161.9375 MHz (channels 2024, 2084, 2025, 2085 2026 and 2086) with pfd mask which is described in Recommendation ITU-R M.2092-0.

- Some other APT Members support a new secondary allocation for the MMSS (Earth to-space) in the frequency band 157.1875-157.3375 MHz (channels 1024, 1084, 1025, 1085, 1026 and 1086) and the frequency band 161.7875-161.9375 (channels 2024, 2084, 2025, 2085 2026 and 2086). And also support a new secondary allocation for the MMSS (space-to-Earth) in the frequency band 160.9625-161.4875 MHz (not channelized in RR Appendix **18**) with new pfd mask which is described as the following equation.

$$pfd(θ)=\left\{\begin{matrix}-158.5+12\left(\frac{θ}{θ\_{3}}\right)^{2} & for 0<\left|θ\right|<θ\_{3}\\-143.5-10log\_{10}\left(k+1\right) & for θ\_{3}<\left|θ\right|<θ\_{5}\\-143.5-10log\_{10}\left(\left(\frac{\left|θ\right|}{θ\_{3}}\right)^{-1.5}+k\right)& for θ\_{5}<\left|θ\right|<90^{°}\end{matrix}\right.$$

with $θ$ the elevation angle, $θ\_{3}=16.47°$, $θ\_{5}=16.95°$ and $k=0.7$.

- Some other APT members support a new primary allocation for the MMSS (Earth to-space) in the frequency band 157.1875-157.3375 MHz (channels 1024, 1084, 1025, 1085, 1026 and 1086) and the frequency band 161.7875-161.9375 (channels 2024, 2084, 2025, 2085 2026 and 2086). And also support a new primary allocation for the MMSS (space-to-Earth) in the frequency band 160.9625-161.4875 MHz (not channelized in RR Appendix **18**) with pfd mask which is described in Annex 2 of the Report ITU-R M.2435-0.

- Some other APT Members expressed view that Method F on the Draft CPM Report constrains the frequency usage of VDES terrestrial component and therefore believes that Method F is out of scope of Resolution **360 (Rev.WRC-15)**.

**6. Issues for Consideration at Next APG Meeting**

APT Members are encouraged to contribute their views, including identification of their preferred Method, taking into account ITU-R studies, outcome of the CPM19-2 and the APT preliminary views, and submit contributions to the next APG meeting (APG19-5) to develop the draft PACP on WRC-19 agenda item 1.9.2.

**7. Views from Other Organisations**

**7.1 Regional Groups**

**7.1.1 ASMG** - **Document APG19-4/INP-09(Rev.1)**

ASMG Position is support:

Following-up the on-going studies in ITU-R and protecting the current usage of mobile service in the candidate bands without imposing any additional constraints on existing services in these and adjacent frequency bands as stated in recognizing d) and e) of Resolution 360 (Rev.WRC-15)

**7.1.2 ATU** - **Document APG19-4/INP-09(Rev.1)**

African preliminary position:

Support, as a matter of principle, new spectrum allocations to the maritime mobile-satellite service (MMSS) (Earth-to-space and space to Earth), preferably within the frequency bands 156.0125 - 157.4375 MHz and 160.6125 162.0375 MHz of RR Appendix 18, to enable a new VDES satellite component, while ensuring that this component will not degrade the current terrestrial VDES components, ASM and AIS operations and not impose any additional constraints on existing services in these and adjacent frequency bands.

**7.1.4 CITEL** - **Document APG19-4/INF-22**

DIAP based on Method C (secondary allocation for VDE-SAT MMSS uplink and downlink frequencies) and a proposal supporting Method F for a primary MMSS allocation.

**7.1.3 CEPT** - **Document APG19-4/INF-23**

Preliminary CEPT position:

CEPT supports sharing and compatibility studies between the proposed VDES satellite component (VDE-SAT) and the systems in the radiocommunication services allocated in the same and in adjacent frequency bands.

CEPT is of the view that implementability of VDE-SAT and feasibility of its sharing and compatibility with the systems in the radiocommunication services allocated in the same and adjacent frequency bands without imposing any limitations on those services have been confirmed by appropriate studies and measurement results.

CEPT supports the introduction of a new primary maritime mobile-satellite (space-to-Earth) service allocation within the frequency band 160.9625-161.4875 MHz, which is not channelized in RR Appendix **18**, and the introduction of a new primary maritime mobile-satellite (Earth-to-space) service allocation for the channels 24, 84, 25, 85, 26 and 86 of RR Appendix **18**. The coordination mechanism under No. **9.14** is introduced through a new footnote in the RR, taking into account the pfd-mask contained in Recommendation ITU-R M.2092. This is in line with Method B of the draft CPM Report (Document CPM19-2/1).

**7.1.5 RCC** - **Document APG19-4/INF-24**

RCC position:

The RCC Administrations consider that introduction of the VDES satellite component shall not result in imposing constraints on existing and planned systems of services which have allocations in the common and adjacent frequency bands.

The RCC Administrations oppose new allocations to the maritime mobile-satellite service (MMSS) on a primary basis for VDES satellite component in the frequency bands within 156-162 MHz, since the studies conducted on the basis of Recommendations ITU-R M.1801 and М.2092 have shown that VDES space stations are not compatible with stations of fixed and mobile services to which these frequency bands are allocated on a primary basis.

**7.2 International Organisations**

**7.2.2 ICAO - Document APG19-2/INF-04**

ICAO Position:

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

**7.2.2 WMO**

No contribution covering this Agenda Item.

**7.2.3 IARU**

No contribution covering this Agenda Item.

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