

Progress Report on Preparation for World Radiocommunication Conference 2015 (WRC-15)

Office of the Communications Authority
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Introduction

Following the discussion of Hong Kong preliminary positions on WRC-15 agenda items (AIs) at the last SSAC meeting, this paper

- Outlines the progress of our preparation work
- Provides updates and observations on issues relevant to WRC-15 AIs

OFCA Preparation Work (1)

- **OFCA attended the ITU Conference Preparatory Meetings (CPM) for WRC-15**
 - The CPM Report was issued in Apr 2015, incorporating results of relevant studies and possible solutions to WRC-15 AIs so as to provide reference for further discussion at WRC-15
- **OFCA also attended the meetings of APT Conference Preparatory Group for WRC-15**
 - Common proposals of the Asia-Pacific region will be developed for WRC-15 at its final meeting in Aug 2015

OFCA Preparation Work (2)

- **OFCA kept track of international organisations' positions**
 - International Civil Aviation Organisation (ICAO)
 - International Maritime Organisation (IMO)
 - World Meteorological Organisation (WMO)
- **OFCA considered stakeholders' comments**
 - Asia Satellite Telecommunications Company Limited (AsiaSat)
 - Civil Aviation Department (CAD)
 - Hong Kong Observatory (HKO)
 - Hong Kong amateur societies (Amateur)
- **OFCA exchanged views with the Ministry of Industry and Information Technology**

OFCA Preparation Work (3)

- **SSAC discussed WRC-15 issues in Sep 2013, Jan 2014 and Dec 2014**
 - Members were kept informed of the development of the WRC-15 related issues and their advice was sought
 - Hong Kong preliminary positions on WRC-15 AIs were issued in Dec 2014
 - Hong Kong positions are to be issued in Oct 2015

WRC-15 Agenda Items

The WRC-15 AIs are grouped according to the following topics for discussion under respective working groups

Topic	WRC-15 AI
Mobile and amateur issues	1.1, 1.2, 1.3, 1.4
Science issues	1.11, 1.12, 1.13, 1.14
Aeronautical, maritime and radiolocation issues	1.5, 1.15, 1.16, 1.17, 1.18
Satellite issues	
– fixed satellite service	1.6, 1.7, 1.8, 1.9.1
– mobile satellite service	1.9.2, 1.10
Satellite regulatory issues	7, 9.1 (9.1.1, 9.1.2, 9.1.3, 9.1.5, 9.1.8), 9.3
General issues	2, 4, 9.1 (9.1.4, 9.1.6, 9.1.7), 9.2, 10
Global flight tracking for civil aviation	one item (<i>in addition to WRC-15 AIs</i>)

AI 1.1 (1)

to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution 233 (WRC-12)

- **Frequency bands identified for IMT in all regions**
 - 450-470 MHz, 790-960 MHz, 1710-2025 MHz, 2110-2200 MHz, 2300-2400 MHz and 2500-2690 MHz
- **Frequency bands identified for IMT in 9 countries in Region 3 including the Mainland**
 - 610-790 MHz and 3400-3600 MHz
- **Potential candidate frequency bands listed in CPM Report**
 - 470-698 MHz, 1350-1400 MHz, 1427-1525 MHz, 1695-1710 MHz, 2700-2900 MHz, 3300-3400 MHz, 3400-3600 MHz, 3600-4200 MHz, 4400-4500 MHz, 4500-4800 MHz, 4800-4990 MHz, 5350-5470 MHz, 5725-5850 MHz, 5925-6425 MHz

AI 1.1 (2)

- **Update**

- Among the 19 potential candidate frequency bands, the CPM Report proposes no change to the allocation of the bands 5350-5470 MHz and 5725-5850 MHz due to unresolved issues on interference mitigation measures. These bands are therefore no longer enlisted for consideration under this AI
- Regarding the other potential candidate frequency bands, no consensus has been reached on their candidature

- **Observation**

- Due to the broad scope of this AI, a Joint Task Group (JTG) was established to develop the relevant studies on the feasibility of allocating potential candidate bands to mobile service, including IMT. As the issue is highly contentious, the JTG cannot reduce the number of candidate bands for consideration at WRC-15

AI 1.1 (3)

- **Observation (cont.)**

- ITU-R Report M.2290 indicates that the estimated total spectrum requirement for IMT by year 2020 is 1340-1960 MHz, depending on the user density settings. However, further queries on the projected spectrum demand are anticipated
- While some industry sectors opine that IMT is not using all its existing identified spectrum, the IMT sector argues that there are constraints on the use of certain identified IMT spectrum in individual countries. This argument may continue at WRC-15

AI 1.2

to examine the results of ITU-R studies, in accordance with Resolution 232 (WRC-12), on the use of the frequency band 694-790 MHz by the mobile, except aeronautical mobile, service in Region 1 and take the appropriate measures

- **Observation**

- As this AI covers the use of spectrum in Region 1, it is not relevant to the use of spectrum in Hong Kong (which is located in Region 3)

AI 1.3 (1)

to review and revise Resolution 646 (Rev.WRC-12) for broadband public protection and disaster relief (PPDR), in accordance with Resolution 648 (WRC-12)

- **Frequency bands identified for PPDR**

- Region 3 (harmonised): 406.1-430 MHz, 440-470 MHz, 806-824/851-869 MHz, 4940-4990 MHz and 5850-5925 MHz
- Region 3 (non-harmonised): 380-400 MHz, 746-806 MHz
- Hong Kong: 406.1-430 MHz, 4940-4990 MHz

- **Update**

- The 700/800 MHz ranges including the 698/703-894 MHz range are proposed to be identified as globally harmonised tuning ranges
- The band 5850-5925 MHz, which has not been used for PPDR in Region 3 so far, is proposed to be removed from the harmonised bands identified in Resolution 646 (Rev.WRC-12)
- No additional identification of harmonised spectrum for PPDR in Region 3 is proposed

AI 1.3 (2)

- **Observation**

- The CPM Report indicates the spectrum requirement for broadband PPDR in some countries is 20 MHz or more. This imposes additional constraints on the identification of additional spectrum for PPDR
- Due to the widespread operation of the incumbent broadcasting and mobile services in the 700/800 MHz ranges in some countries, there is no consensus on the feasibility of identifying spectrum within these ranges for PPDR applications for global harmonisation

AI 1.4 (1)

to consider possible new allocation to the amateur service (ARS) on a secondary basis within the band 5250-5450 kHz in accordance with Resolution 649 (WRC-12)

- **Update**

- Currently many countries such as Canada, Finland, Norway, Sweden, the UK and the USA allow amateur use of this band
- The ITU-R study results show divergent views on the compatibility of ARS with the incumbent services including fixed service in the band 5275-5450 kHz. Some study results indicate that the sharing is difficult unless limitations are imposed on the operation of ARS stations
- ICAO is of the view that the proposed allocation should not affect aeronautical mobile (R) service (AMS(R)) in the band 5450-5480 kHz in Region 2. Nevertheless, the ITU-R study results indicate that ARS in this band and AMS(R) in the adjacent band are compatible

AI 1.4 (2)

to consider possible new allocation to the amateur service (ARS) on a secondary basis within the band 5250-5450 kHz in accordance with Resolution 649 (WRC-12)

- **Observation**

- In addition to the proposals made before CPM15-2, the CPM Report proposes an allocation to ARS up to 15 kHz on a secondary basis in the band 5275-5450 MHz for consideration at WRC-15
- Regarding the proposal of allocating to ARS within the band 5275-5450 MHz, the maximum e.i.r.p. of ARS stations has not been agreed and requires further discussion at WRC-15

AI 1.5

to consider the use of frequency bands allocated to the fixed satellite service (FSS) not subject to Appendices 30, 30A and 30B for the control and non-payload communications (CNPC) of unmanned aircraft systems (UAS) in non-segregated airspaces, in accordance with Resolution 153 (WRC-12)

• Update

- ICAO is of the view that, in order to support the use of FSS systems for UAS CNPC links in non-segregated airspaces, the technical and regulatory actions to be identified must satisfy requirements for UAS communication
- WMO is concerned with the band 8025-8400 MHz allocated on a primary basis to EESS (space-to-Earth) and to FSS (Earth-to-space), and objects to the use of the 8 GHz FSS allocation for UAS CNPC links

• Observation

- A new ITU-R report is still under development to address relevant technical/operational characteristics, interference and regulatory environments. The CPM Report shows no consensus on any study result
- To introduce UAS in non-segregated airspaces, further work is required to resolve possible mutual interference between CNPC links and FSS systems

AI 1.6.1

to consider possible additional primary allocation to the fixed satellite service (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1, and review the regulatory provisions on the current allocations to the fixed satellite service within each range, taking into account the results of ITU-R studies, in accordance with Resolution 151 (WRC-12)

- **Observation**

- As this AI covers the use of spectrum in Region 1, it is not relevant to the use of spectrum in Hong Kong (which is located in Region 3)

AI 1.6.2

to consider possible additional primary allocation to the fixed satellite service (Earth-to-space) of 250 MHz in Region 2 and 300 MHz in Region 3 within the range 13-17 GHz, and review the regulatory provisions on the current allocations to the fixed satellite service (FSS) within each range, taking into account the results of ITU-R studies, in accordance with Resolution 152 (WRC-12)

• Update

- The CPM Report proposes the bands 13.4-13.75 GHz, 14.5-14.8 GHz and 14.8-15.1 GHz for FSS allocation
- ITU-R study results show divergent views on the feasibility of sharing FSS with Earth exploration satellite service (active) in the band 13.4-13.75 GHz and mobile service (including aeronautical mobile service) in the band 14.5-15.1 GHz

• Observation

- As there are divergent views on how the existing services can share with FSS in the proposed bands, no consensus has been reached on the suitability of the three above-mentioned bands for FSS at CPM15-2
- The satellite industry is further working on the feasibility of allocating spectrum in the band 14.5-15.1 GHz for FSS

AI 1.7

*to review the use of the band 5091-5150 MHz by the fixed satellite service (FSS) (Earth-to-space) (limited to feeder links of the non-geostationary (non-GSO) mobile-satellite systems in the mobile satellite service (MSS)) in accordance with Resolution **114 (Rev.WRC-12)***

- **Date limitations on the FSS use of the band 5091-5150 MHz**

- After 1 January 2016, no new FSS assignment (for feeder link)
- After 1 January 2018, FSS (for feeder link) will become secondary to aeronautical radionavigation service (ARNS)

- **Update**

- The CPM Report proposes maintaining the FSS (feeder link) allocation in the band 5091-5150 MHz as a primary allocation without date limitations

- **Observation**

- As ICAO confirms that no new ARNS system is planned in this band, the technical and operational requirements specified in Recommendation ITU-R S.1342 would ensure the compatibility of the FSS and the ARNS in this band

AI 1.8

to review the provisions relating to earth stations located on board vessels (ESVs), based on studies conducted in accordance with Resolution 909 (WRC-12)

- **Update**

- The CPM Report proposes revising separation distances from the low-water mark of the coast for ESV operating in C/Ku band, by taking into account various factors including the increasing number of operational ESVs and the reducing ESV antenna diameter in C band, different maximum e.i.r.p. density levels transmitted by ESVs in C and Ku bands

- **Observation**

- As the ITU-R study results conducted under this AI are inconclusive, no consensus has been reached with respect to the revision to the current provisions relating to ESVs

AI 1.9.1

to consider, in accordance with Resolution 758 (WRC-12), possible new allocations to the fixed satellite service (FSS) in the frequency bands 7150-7250 MHz (space-to-Earth) and 8400-8500 MHz (Earth-to-space), subject to appropriate sharing conditions

- **Update**

- The ITU-R study results show that the sharing of FSS with the existing services in these bands requires appropriate technical and regulatory measures
- The CPM Report concludes that new allocation may be feasible subject to these measures

- **Observation**

- Though the sharing is feasible with the application of these measures, the space research sector emphasizes the difficulties in protecting space research service from FSS in these bands, and challenges the practicability of these measures

AI 1.9.2 (1)

to consider, in accordance with Resolution 758 (WRC-12), the possibility of allocating the bands 7375-7750 MHz and 8025-8400 MHz to the maritime mobile satellite service (MMSS) and additional regulatory measures, depending on the results of appropriate studies

- **Update**

- In the 7 GHz band, the ITU-R study results show that sharing with the existing services can be achieved by the existing regulatory provisions or mitigation techniques
- In the 8 GHz band, separation distances in the order of several hundred kilometres are required to protect EESS earth stations and fixed stations operating in the band 8025-8400 MHz and space research service (deep space) earth stations operating in the adjacent band
- There is also uncertainty in considering the 8 GHz band on how to ensure effective coordination by MMSS earth stations to prevent interference into FS and EESS stations

AI 1.9.2 (2)

to consider, in accordance with Resolution 758 (WRC-12), the possibility of allocating the bands 7375-7750 MHz and 8025-8400 MHz to the maritime mobile satellite service (MMSS) and additional regulatory measures, depending on the results of appropriate studies

- **Observation**

- The updates above suggest infeasibility of making MMSS (Earth-to-space) allocation in the 8 GHz band
- To ensure no impact from MMSS on the existing services in the 8 GHz band, allocation of only the band 7375-7750 MHz to MMSS (space-to-Earth) may be feasible
- The proposed MMSS allocation in the band 7375-7750 MHz would relieve the asymmetric spectrum demand of some MMSS applications requiring increased bandwidth in the downlink direction

AI 1.10

*to consider spectrum requirements and possible additional spectrum allocations for the mobile satellite service (MSS) in the Earth-to-space and space-to-Earth directions, including the satellite component for broadband applications, including International Mobile Telecommunications (IMT), within the frequency range from 22 GHz to 26 GHz, in accordance with Resolution **234 (WRC-12)***

- **Update**

- Spectrum requirements for MSS under this AI have yet to be identified
- Services including amateur service, Earth exploration satellite service, fixed service, fixed satellite service, radiolocation service and radionavigation service in the 22-26 GHz range have not been studied completely for possible sharing and compatibility with MSS

- **Observation**

- There are not sufficient compatibility studies to support allocating spectrum to MSS in this range

AI 1.11

to consider a primary allocation for the Earth exploration satellite service (EESS) (Earth-to-space) in the 7-8 GHz range, in accordance with Resolution 650 (WRC-12)

- **Update**

- The ITU-R study results show that sharing between EESS and the existing services in the band 7192-7250 MHz is feasible
- WMO supports a new EESS (Earth-to-space) allocation in the band 7190-7250 MHz
- The CPM Report proposes new allocation to EESS in the band 7190-7250 MHz

- **Observation**

- To strike a balance between protection of existing services and operational constraints on EESS, further discussion is needed on the necessity of setting out provisions such as imposing emission mask requirement on EESS

AI 1.12 (1)

*to consider an extension of the current worldwide allocation to the Earth exploration satellite service (EESS) (active) in the frequency band 9300-9900 MHz by up to 600 MHz within the frequency bands 8700-9300 MHz and/or 9900-10500 MHz, in accordance with Resolution **651 (WRC-12)***

- **Update**

- The ITU-R study results show that in the band 10-10.5 GHz, the percentage of time for radiolocation radars to be affected by the proposed EESS (active) systems is very low
- The CPM Report proposes allocation of spectrum within the bands 9200-9300 MHz and 9900-10500 MHz for extension of the existing EESS (active) allocation in the band 9300-9900 MHz
- The CPM Report proposes a total of either 300 MHz or 600 MHz spectrum be allocated

AI 1.12 (2)

*to consider an extension of the current worldwide allocation to the Earth exploration satellite service (EESS) (active) in the frequency band 9300-9900 MHz by up to 600 MHz within the frequency bands 8700-9300 MHz and/or 9900-10500 MHz, in accordance with Resolution **651 (WRC-12)***

- **Observation**

- There is no consensus on whether the spectrum requirement should be 300 MHz or 600 MHz
- Regarding the CPM Report's proposal of allocating all or part of spectrum in the band 9900-10500 MHz to EESS, there is an option of allocation up to 10400 MHz only. In doing so, it allows for protection of RLS operating in the band 10400-10500 MHz

AI 1.13

to review No. 5.268 with a view to examining the possibility for increasing the 5 km distance limitation and allowing space research service (SRS) (space-to-space) use for proximity operations by space vehicles communicating with an orbiting manned space vehicle, in accordance with Resolution 652 (WRC-12)

- **Update**

- The ITU-R study results show that the existing emission mask requirement can be met by the SRS (space-to-space) system communicating with an orbiting manned space vehicle at distances beyond 5 km, thus protecting the existing services in the band 410-420 MHz
- The CPM Report proposes removing the 5 km distance limitation

- **Observation**

- CPM15-2 has reached a consensus on the removal of the 5 km distance limitation as proposed by the CPM Report

AI 1.14

to consider the feasibility of achieving a continuous reference time-scale, whether by the modification of coordinated universal time (UTC) or some other method, and take appropriate action, in accordance with Resolution 653 (WRC-12)

- **Update**

- The CPM Report proposes either removing the leap second insertion/deletion under UTC or keeping it unchanged
- The CPM Report also proposes the introduction of a new continuous time scale
- IMO requests to minimise the impact on maritime services

- **Observation**

- Relevant studies on UTC issues have been conducted by ITU-R since the early 2000s. While several alternatives were discussed at CPM15-2, no conclusion has been drawn

AI 1.15

to consider spectrum demands for on-board communication stations in the maritime mobile service (MMS) in accordance with Resolution 358 (WRC-12)

- **Frequencies identified for MMS on-board communication**
 - 457.525 MHz, 457.550 MHz, 457.575 MHz, 467.525 MHz, 467.550 MHz and 467.575 MHz using 25 kHz / 12.5 kHz channel spacing
 - 457.5375 MHz, 457.5625 MHz, 467.5375 MHz and 467.5625 using 12.5 kHz channel spacing
- **Update**
 - The CPM Report proposes no new frequency allocation for MMS
 - The CPM Report proposes additional channel arrangement, enabling the use of 25 kHz, 12.5 kHz and 6.25 kHz channel spacing at all identified frequencies for MMS on-board communication
- **Observation**
 - As 12.5 or 6.25 kHz channel spacing with digital technologies can achieve a more efficient usage of the identified frequencies, CPM15-2 was supportive of this proposal consensually

AI 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)

- **Update**

- To reduce the loading of channel AIS 1 and channel AIS 2, the CPM Report proposes identifying some other channels of Appendix 18 of the Radio Regulations (RR) for data exchange of non-critical messages by AIS
- For data exchange with satellite uplink and downlink employing AIS technology, the CPM Report also proposes using the bands 148-149 MHz and 137-138 MHz

- **Observation**

- The bands 148-149 MHz and 137-138 MHz have been globally allocated to mobile satellite service. Using these frequencies to introduce the satellite component of data exchange systems employing AIS technology is permitted under RR
- As the relevant ITU-R studies have not been completed yet, the CPM Report has not drawn a conclusion on the spectrum allocation issue

AI 1.17

to consider possible spectrum requirements and regulatory actions, including appropriate aeronautical allocations, to support wireless avionics intra-communications (WAIC), in accordance with Resolution 423 (WRC-12)

- **Update**

- The results of the relevant ITU-R studies indicate that only the band 4200-4400 MHz is feasible for sharing between WAIC systems and other systems of existing services
- CPM15-2 reached a consensus on the proposal of allocating the band 4200-4400 MHz to aeronautical mobile (route) service (AM(R)S) exclusively for WAIC

- **Observation**

- There is no conflicting view on the proposed AM(R)S allocation in this band

AI 1.18

to consider a primary allocation to the radiolocation service (RLS) for automotive applications in the 77.5-78.0 GHz frequency band in accordance with Resolution 654 (WRC-12)

- **Update**

- The ITU-R study results show that the probability of interference from automotive radars to stations of the existing amateur and amateur satellite services is very low
- CPM15-2 reached a consensus on allocating the band 77.5-78 GHz to RLS for automotive applications

- **Observation**

- Allocation of the band 77.5-78 GHz to RLS could provide for a contiguous band 76-81 GHz for radiolocation service
- Allocation of the band 77.5-78 GHz to applications other than automotive applications would be subject to further discussion

Global Flight Tracking for Civil Aviation

to consider various aspects of global flight tracking (GFT), as stipulated by Resolution 185 adopted by the ITU Plenipotentiary Conference Busan, 2014

- **Update**

- GFT is to be addressed by a combination of different types of terrestrial and satellite systems
- Technical options include ADS-B (automatic dependent surveillance – broadcast) satellite system and the terrestrial aeronautical radionavigation system

- **Observation**

- Since relevant ITU-R studies are still in progress and the views are divergent, the CPM report has no solid proposal on this issue and only incorporates the relevant view for consideration at WRC-15
- Subject to the result of the sharing studies, new primary aeronautical mobile satellite (route) service (Earth-to-space) allocation may be added to the band 1087.7-1092.3 MHz to enable the satellite reception for ADS-B system

Als 2, 4, 9.1.4, 9.1.6, 9.1.7, 9.2, 10

- **Issue**

- These Als mainly cover administrative issues relating to the RR
- These include updating of references in the RR, possible revision/replacement/abrogation of resolutions and recommendations, considering any inconsistencies and/or difficulties in the applications of the RR, and considering preliminary Als for the next WRC

- **Update**

- Regarding Al 10 on preliminary Als for the next WRC, there are two confirmed Als. One is on Global Maritime Distress and Safety System and the other is related to the deployment and operation of nanosatellites and picosatellites
- Other proposed preliminary Als, such as future IMT spectrum above 6 GHz and spectrum for intelligent transport systems, need further discussion
- OFCA would continue to monitor any development on these Als

Als 7, 9.1.1, 9.1.2, 9.1.3, 9.1.5, 9.1.8, 9.3

- **Issue**

- These Als cover various topics including the advance publication, co-ordination, notification and recording procedures of satellite networks, the use of satellite orbital positions and associated frequency spectrum to deliver international public telecommunication services in developing countries, and the regulatory aspects for nanosatellites and picosatellites

- **Update**

- The issues raised under some of these Als are still under discussion and development. For example, the CPM Report adds three more issues under AI 7 for discussion at WRC-15 on top of the nine issues raised before CPM15-2 under this AI
- OFCA would continue to monitor any development on these Als

Thank you!