
***International Committee on GNSS (ICG)
Working Group A
Compatibility Sub Group Report***

***9th meeting of International Committee on GNSS (ICG)
Prague, Czech Republic
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Takahiro MITOME (Japan), Dominic HAYES (EC)

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Objectives of Compatibility Sub-Group

- work on the compatibility issues as approved by WG-A, including the information sharing regarding the protection of GNSS spectrum from the interference from other radio services;
- express its agreed results in the form of findings, reports, or whatever form may be appropriate for the case;
- provide proposals of compatibility issues to WG-A, for discussion and decisions.

Existing Actions Assigned to Sub-Group and Related Activities (1 of 2)

- Open Service GNSS Performance Parameters:
- **Action to WG-A:** Representatives from each system provider should review the draft template and prepare feedback for presentation and discussion at the ICG-7 meeting of WG-A
- **Status:** At WG-A in ICG-8, the status of each system provider's review was checked.
- **Major Activities to date:**
It was agreed to develop a standard template for all open signals in all frequency bands. As the starting point, a specific band (e.g., the band 1164-1215 MHz) will be used for determining parameters and other frequency bands will be added as the template evolves.

Existing Actions Assigned to Sub-Group and Related Activities (2 of 2)

- **IMT-GNSS Compatibility, Recommendation 2.1 (November 2012):**
ICG members are encouraged to actively participate in the ITU-R and regional WRC-15 preparatory work on new IMT spectrum allocations to ensure that proposals do not impact existing and future GNSS operations. Members may also consider forming links with other satellite groups already defending satellite spectrum.
- **Action to WG-A:** Investigate specific IMT spectrum utilization plans (ITU-R Rec. M.1036-4) within relevant Administration's and regional groups and investigate whether interference mitigation methods already exist within the telecommunications industry.
- **Status:** to watch the 700 MHz mobile service channel plan in Europe, which is related to WRC-15 agenda item 1.2, and recognized the importance of the activities to prevent potential harmonic interference into RNSS.

Follow-on Actions: JTG 4-5-6-7 (1 of 2)

To monitor the ITU activities for new spectrum for IMT (WRC-15 agenda item 1.1) to avoid potential interference into RNSS.

Current Status of JTG 4-5-6-7 (Responsible Group for WRC-15 agenda item 1.1):

Potential candidate frequency bands for IMT included the frequency band 1300-1527 MHz (adjacent to the band 1215-1300 MHz). But the JTG 4-5-6-7 meeting in February 2014 excluded the frequency range 1300-1350 MHz, mainly because of the difficult sharing with radars in the band 1300-1400 MHz.

Sharing between IMT and MSS in the band 1518-1559 MHz is concluded as the sharing is not feasible. Therefore the band 1527-1559 MHz (adjacent to the band 1559-1610 MHz) is excluded from potential candidate frequency bands.

Follow-on Actions: JTG 4-5-6-7 (2 of 2)

Summary of the Discussions until February 2014

Frequency Band	Current Status in JTG	Note
1164-1215 MHz 1215-1300 MHz	Not in candidate frequencies	Freedom from harmful interference into RNSS is recognized.
1300-1350 MHz	Not in candidate frequencies	Brazil Sweden, UK, GSM Association, Telstra had proposed 1300-1400 MHz band. But at its February 2014 meeting, JTG excluded 1300-1350 MHz band from the candidate frequencies. The protection of RNSS (Earth-to-space) is also taken into account at JTG.
1518-1559 MHz	Not in candidate frequencies	Because of the difficult sharing with MSS, this frequency band is excluded from the candidate frequencies.
1559-1610 MHz	Not in candidate frequencies	Freedom from harmful interference into RNSS is recognized.

Only the frequency bands for which there are no RNSS concerns are being discussed as the candidate frequencies for future IMT identification. Following editor's note was added to the Draft CPM text: "No technical studies on compatibility between RNSS and IMT-Advanced has been received by JTG 4-5-6-7." This indicated that in-band IMT is not feasible.

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Follow-on Actions: WP 5D

Current Status of WP 5D (One of the contributing group for WRC-15 agenda item 1.1, Responsible for Studying IMT Characteristics):

Suitable frequency ranges have been discussed.

But WP 5D did not decide specific suitable frequency ranges for IMT. Furthermore, no proposal regarding suitable frequency ranges were made at the recent WP 5D meeting (18-25 June 2014).



- **With regard to WRC-15 agenda item 1.1, JTG-4-5-6-7 should be watched (not WP5D).**
- **But, WP 5D started the discussion for WRC-19 agenda item for future IMT. In this regard, it is recommended to keep watching WP 5D activities.**

Follow-on Actions: Asia-Pacific Telecommunity (APT) (1 of 2)

The 3rd meeting of APT Conference Preparatory Group for WRC-15 (APG-15) was held on 9 to 13 June 2014.

Summary of proposals for WRC-15 agenda item 1.1 by APT members

APT Members	Proposed Frequency Ranges for IMT	Notes
Thailand		Oppose 1300-1400 MHz
Japan	1427.9-1462.9MHz, 1475.9-1510.9 MHz and C bands	
New Zealand	1350-1525 MHz, 2025-2110 MHz and 2200-2290 MHz etc.	Oppose 1300-1350 MHz
Australia	1427-1518 MHz etc.	Oppose 1300-1350 MHz, 1525-1559 MHz, 2025-2110 MHz/2200-2290 MHz
Indonesia	1427-1518 MHz, 1695-1700 MHz and etc.	Oppose 1300-1400 MHz, 1518-1559 MHz and 1559-1610 MHz
China	C bands	Oppose 2025-2110 MHz and 2200-2290 MHz
Korea	1452-1492 MHz and C bands	
Vietnam	1350-1400 MHz and 1452-1492 MHz	



All proposals were OK for RNSS.

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Follow-on Actions:

Asia-Pacific Telecommunity (APT) (2 of 2)

The output document of 3rd meeting of APT Conference Preparatory Group for WRC-15 (APG-15) just supported current ITU-R studies, which excludes RNSS concern on both in-band and adjacent band interference.

In addition, some APT members oppositions to the IMT identification in the adjacent bands to RNSS were also addressed in the above output document.



- **With regard to WRC-15 agenda item 1.1, there are no concern on APT position.**
- **But, APT started the discussion for WRC-19 agenda item for future IMT.**

Follow-on Actions: European Conference of Postal and Telecommunications Administrations (CEPT) (1 of 3)

In considering new spectrum for terrestrial mobile broadband applications, the CEPT brief on **WRC-15 agenda item 1.1** indicates that:

- ✓ 1300-1350 MHz is NOT supported by CEPT
- ✓ 1350-1400 MHz is also now not supported
- ✓ 1525-1559 MHz was ruled out early in the process

Only bands well away from RNSS are now being considered.

Follow-on Actions: European Conference of Postal and Telecommunications Administrations (CEPT) (2 of 3)

Based upon existing studies, CEPT supports the following bands for future IMT under **agenda item 1.1**:

- 1427-1452 MHz
- 1452-1492 MHz
- 1492-1518 MHz (new)
- 3400-3600 MHz
- 3600-3800 MHz

For which there are no RNSS concerns

The following bands remain subject to further consideration taking into account sharing and compatibility studies:

- 470 – 694 MHz
- 5725-5850 MHz
- 5925-6425 MHz

Again, no RNSS concerns

Follow-on Actions: European Conference of Postal and Telecommunications Administrations (CEPT) (3 of 3)

For **agenda item 1.2**, the 700 MHz mobile service channel plan in Europe and concerns potential harmonic interference into RNSS

The CEPT brief for agenda item 1.2 defines the following:

The CEPT channeling arrangement for IMT in the 694-790 MHz band will consist of:

- 2x30 MHz FDD aligned with the lower duplexer of Recommendation ITU-R M.1036-4 frequency arrangement A5: (uplink 703-733 MHz and downlink 758-788 MHz).
- Up to 20 MHz (738-758 MHz) for supplemental downlink.

This is consistent with the RNSS receiver requirements

Follow-on Actions: Inter-American Telecommunication Commission (CITEL)

- Canada and US oppose 1164-1215 MHz, 1215-1300 MHz and 1559-1610 MHz for future IMT under **WRC-15 agenda item 1.1**
- With regard to bands adjacent to RNSS, there is no support by CITEL members
- Note these are positions from the March 2014 CITEL meeting, there was a meeting in Sept/Oct 2014, but outputs are not public yet. Unlikely to be major differences

In summary, CITEL supports in-band and adjacent band protection of RNSS against future IMT under **WRC-15 agenda item 1.1**

Follow-on Actions: Regional Commonwealth in the field of Communications (RCC)*

With regard to in-band use of RNSS spectrum, no support by RCC

- RCC opposes the bands 1300-1350 MHz and 1525-1559 MHz and etc. for future IMT under **WRC-15 agenda item 1.1**.

In summary, RCC supports in-band and adjacent band protection of RNSS against future IMT under **WRC-15 agenda item 1.1**

*: Regional organization by CIS (Commonwealth of Independent States) countries

How to Protect RNSS Spectrum

June 2014, FCC workshop "GPS Protection and Receiver Performance"

(<http://www.fcc.gov/events/workshop-gps-protection-and-receiver-performance>)

summarised objectives were to consider:

- GNSS benefits to the US, including infrastructure
- Protection of RNSS spectrum and receivers (resilience?) from OOBES
- Roadmap to protect GPS operations from interference (device certification?)

September 2014, similar DOT workshop to discuss the "Adjacent-Band Compatibility (ABC) Assessment Plan"

(<http://www.gps.gov/spectrum/ABC>)

- Aims to develop, eg power limits for adjacent band services to ensure continued GPS operations

✓ Seems like a helpful initiative to protect GPS (GNSS) spectrum

Summary of RNSS Spectrum Protection

- ITU-R studies and regional positions for WRC-15 agenda item 1.1, show little danger for interference into RNSS by new IMT spectrum identifications
 - We should keep watching relevant ITU-R/regional meetings to ensure RNSS allocations are protected
- CPM text for WRC-15 agenda item 1.1 was finalised at the final JTG 4-5-6-7 meeting (21 to 31 July 2014) to meet the submission deadline for CPM texts (15 August 2014).
 - We should also continue watching the 700 MHz band mobile service channel plans under WRC-15 agenda item 1.2, also for discussion at the JTG 4-5-6-7 meeting
- Possible IMT agenda items for the next WRC should also be monitored

Sub-Group Activities until ICG-10

(1) Open Service GNSS Performance Parameters

Discussion for the proposed template should be continued.

(3) RNSS Spectrum Protection

The CPM texts for WRC-15 agenda items 1.1 and 1.2, which will include candidate frequency bands for new IMT spectrum identifications and 700 MHz band mobile service channel plan, will be finalized at the final ITU-R JTG 4-5-6-7 meeting.

Sub-group will keep monitoring the status of this meeting and conduct information exchange/sharing at ICG-9 as appropriate.

WG-A Tasking to WG-A Compatibility Sub-Group

In the interest of increasing GNSS spectrum protection, study the feasibility of designating RDSS/RNSS allocations in each currently used band as safety of life service.

- In the future, pending the outcome of the sub-group's assessment, the ICG could encourage its members' administrations to initiate studies in the ITU-R related to potential regulatory changes regarding the RDSS/RNSS safety of life allocations/service.

In order to support this study, WG-A compatibility sub-group provides the summary of RDSS/RNSS allocation status and procedures for new WRG agenda item, which is the only way to change the allocation conditions of radio services.

RNSS Spectrum Allocation Status

Regulatory Status of RNSS (Downlink) Allocations (1 of 3)

RNSS Bands	Other Services in the Same Band	Conditions against Other Radio Services (Provisions in RR)
1164-1215 MHz	ARNS	RNSS shall not claim protection from ARNS (5.328A)
1215-1300 MHz	EESS (active)	1215-1260 MHz: The status of RNSS is higher than that of EESS (active) (EESS (active) cannot cause harmful interference to, or claim protection from RNSS.) (5.332) 1260-1300 MHz: RNSS and EESS (active) are the same status.
	RLS	RNSS can claim protection from RLS, but can cause no harmful interference to RLS. (5.329)
	SRS (active)	The same status between RNSS and SRS.
	FS, MS: limited number of countries	The same status between RNSS and FS/MS. (5.330)
	RNS: limited number of countries ARNS(1240-1300 MHz): Canada, US	RNSS shall cause no harmful interference to, or claim no protection from RNS or ARNS. (5.329)
	Amateur (1240-1300 MHz: secondary)	RNSS can claim full protection from Amateur. (5.28 to 5.31)

RNSS Spectrum Allocation Status

Regulatory Status of RNSS (Downlink) Allocations (2 of 3)

RNSS Allocations	Other Services in the Same Band	Conditions
1559-1610 MHz	ARNS (not used in practice)	The same status between RNSS and ARNS (Remark)
	FS (secondary until 1 Jan 2015): Limited number of countries (5.362B, 5.362C)	RNSS can claim full protection from FS. (5.28 to 5.31)
2483.5-2500 MHz Not for safety service (5.398)	FS, MS, RLS	The same status between RNSS and FS/MS/RLS
	MSS	9.11A coordination procedure is applied between MSS (Globalstar) and RNSS
5010-5030 MHz	ARNS, AMS(R)S (not used in practice, either)	The same status between RNSS and ARNS/AMS(R)S (Remark)

Remark: Though ARNS allocation is not used, no need to remove this ARNS allocation. This is because RNSS can enjoy the status of safety service by the existence of ARNS.

RNSS Spectrum Allocation Status

Consideration on Regulatory Status of RNSS (Downlink) Allocations

RNSS Allocations	Application of Safety of life	Possibility of Regulatory Change
1164-1215 MHz	RNSS in this band can be used for safety of life.	With the existence of ARNS, it would be difficult to expect better regulatory status than current status.
1215-1300 MHz	Since RNSS cannot claim protection from RNS or ARNS, it would be difficult for RNSS to use this band for safety of life.	It would be very challenging to change the regulatory status between RNSS and RNS/ ARNS.
1559-1610 MHz	RNSS in this band can be used for safety of life.	With the existence of ARNS, it would be difficult to expect better regulatory status than current status.
2483.5-2500 MHz	Due to the provisions of the Radio Regulations, RNSS in this band cannot be used for safety of life	This band should be outside of the scope of this consideration
5010-5030 MHz	RNSS in this band can be used for safety of life.	With the existence of ARNS, it would be difficult to expect better regulatory status than current status.

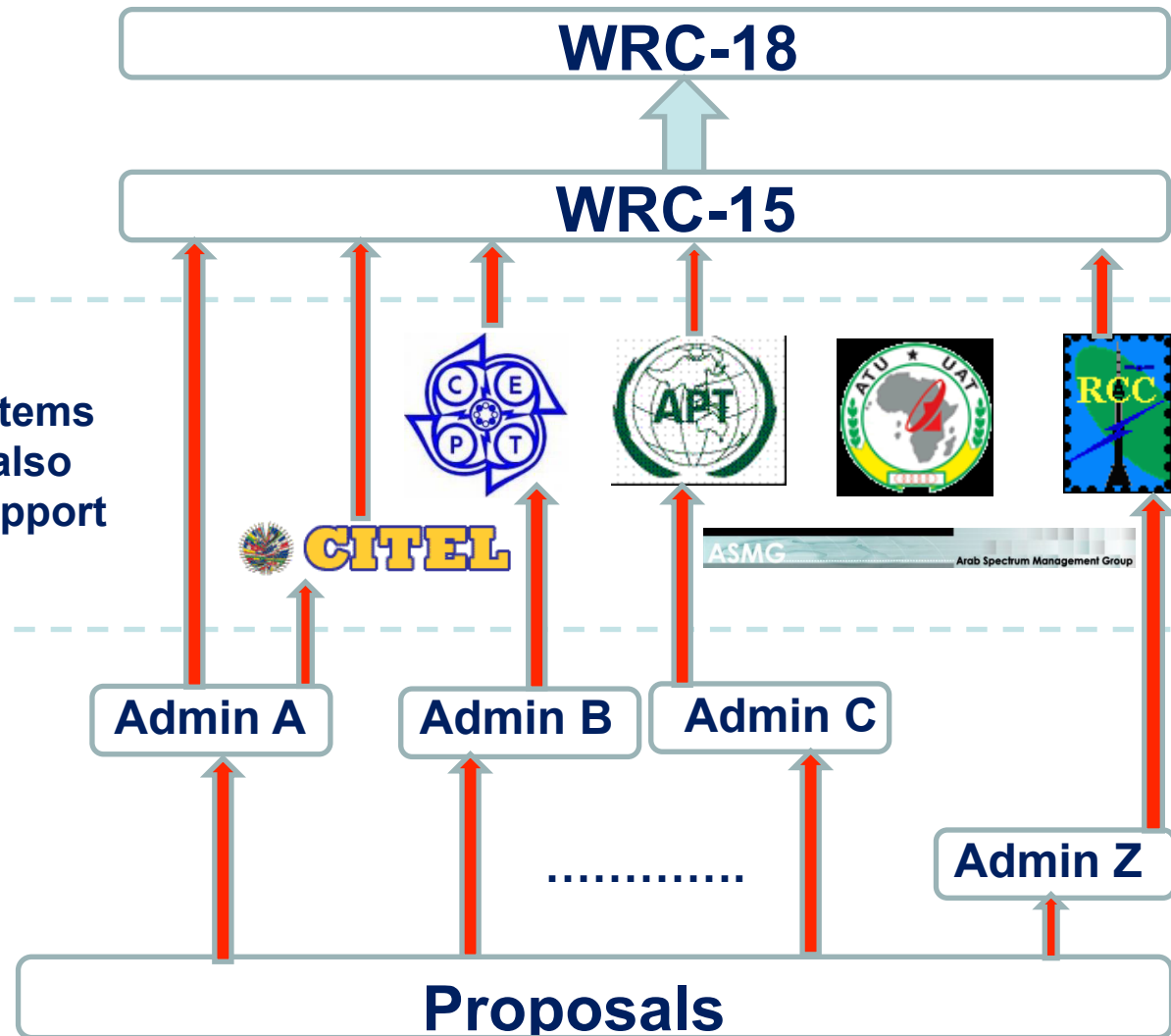
Procedure for New WRC Agenda Item



WRC-18 agenda items are decided at WRC-15

Each regional organization propose new WRC agenda items (Direct proposal to WRC is also OK. But it is better to get support by regional organizations.)

As the first step, proposal for new WRC agenda items should be accepted at each telecommunication administrations



Result of Study by Compatibility Sub-Group

The regulatory status of RNSS in the bands 1164-1215 MHz, 1559-1610 MHz and 5010-5030 MHz is in good shape. RNSS in these frequency band can be used for the safety of life applications. (But it would be difficult to use the safety of life applications in other RNSS bands.)

There are many steps to get new WRC agenda item. The remaining time before WRC-15 (November 2015), at which new WRC agenda items should be proposed, is limited.

Taking into account the above, WG-A compatibility sub-group would like to ask WG-A to check the original intent of the assigned task (whether to pursue better regulatory status of RNSS in the above frequency bands).