



ICG-8

9 - 14 November 2013, Dubai, United Arab Emirates

Radio **N**avigation **S**atellite **S**ervice and the ITU Radio Regulations

Attila MATAS

Head, Space Publication and Registration division,
Space Services Department
ITU - Radiocommunication Bureau



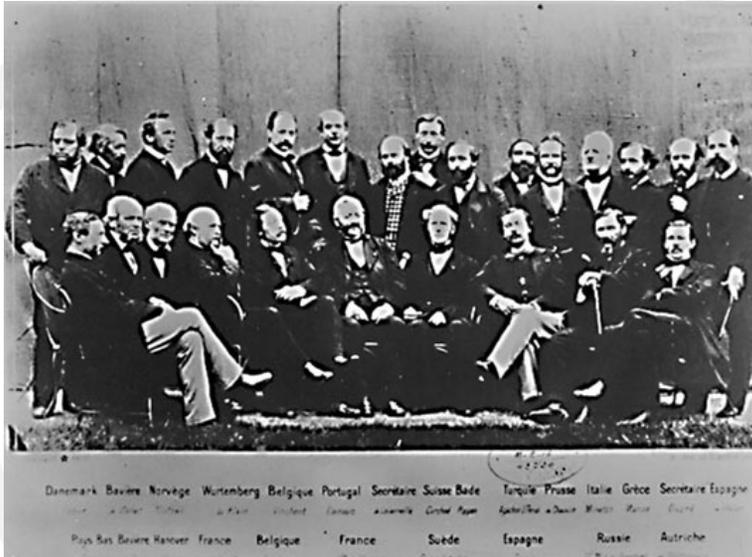
Committed to connecting the world

ITU in brief

Committed to Connecting the World



- Founded on 17 May 1865



- 193 Member States
- > 700 Sector Members & Associates
- 750 staff / 70 nationalities
- Annual budget = \$150,000,000
- <http://www.itu.int>

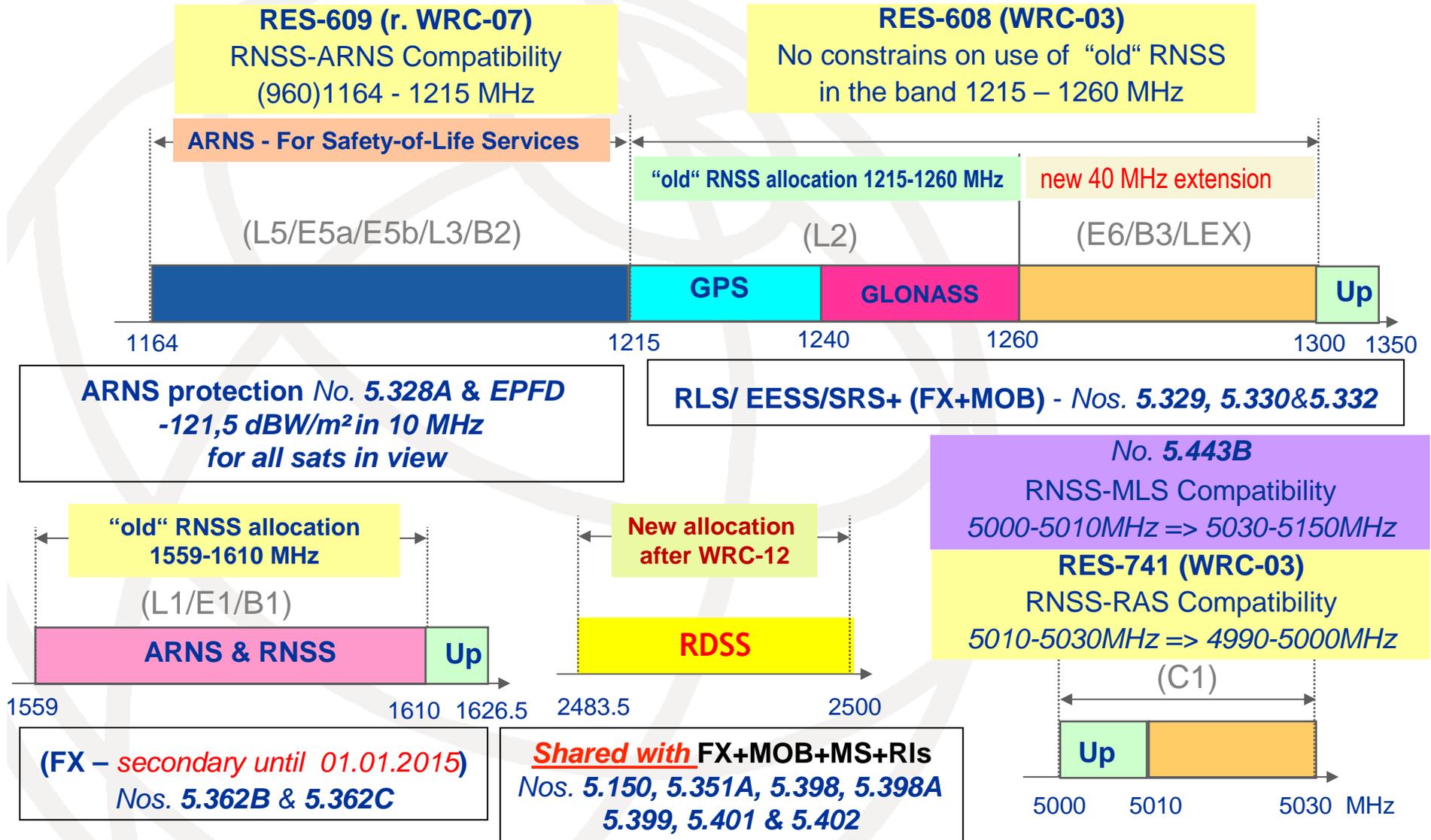


- **ITU** is the leading UN agency for information and communication technologies

➤ **Definitions from the ITU Radio Regulations (RR)**

- No. **1.43** ***radionavigation-satellite service (RNSS):***
A radiodetermination-satellite service used for the purpose of radionavigation
- No. **1.59** ***safety service:***
Any radiocommunication service used for the safeguarding of human life and property
- No. **4.10** Member States recognize that the safety aspects of radionavigation and other safety services require special measures to ensure their freedom from harmful interference; it is necessary therefore to take this factor into account in the assignment and use of frequencies.

RNSS Regulatory situation summary after WRC-12 (as of 18.02.2012)



RNSS allocation 1 164 - 1 215 MHz

1 164 MHz

1 215 MHz

RNSS

- epfd limit shared by **all** RNSS
 $\leq -121.5 \text{ dB(W/m}^2\text{-1MHz)}$ (No. **5.328A** / RES-609)

ARNS

960 MHz

How to share this limit ?

'Real' RNSS
systems only



PFD limit per
RNSS space
station



**RES-609
Consultation
Meeting**

The Bureau participates /
observes / publishes results
in the BR IFIC

Satisfy milestone
criteria annexed to
RES-609 (r.WRC-07)

$\leq -129 \text{ dB(W/m}^2\text{·MHz)}$
REC-608 (WRC-03)



RNSS allocation **1 215 - 1 300 MHz**

1215 MHz

1260 MHz

1300 MHz

RNSS

RNSS

RLS & RNS

- **Retained existing protection of RNS & extended protection to RLS - No. 5.329**

No. 5.329 - Use of the RNSS in the band 1 215-1 300 MHz shall be subject to the condition that no harmful interference is caused to, and **no protection is claimed from, the RNS authorized under No. 5.331**. Furthermore, **the use of the RNSS in the band 1 215-1 300 MHz shall be subject to the condition that no harmful interference is caused to the RLS**. No. 5.43 shall not apply in respect of the RLS. Resolution 608 (WRC-03) shall apply. (WRC-03)

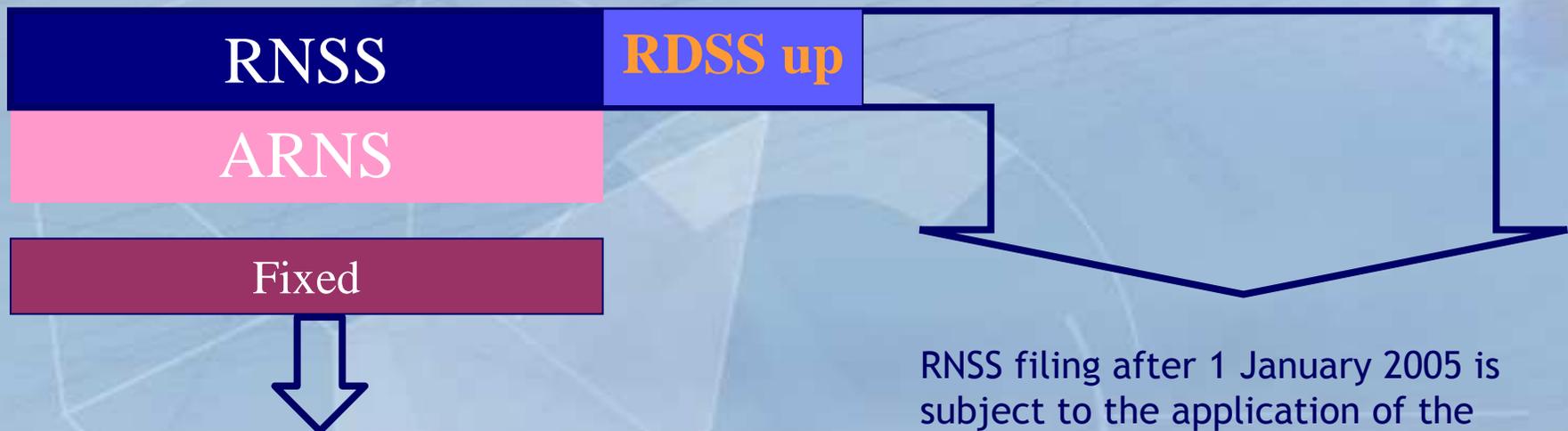
No additional constraints for “old RNSS systems”, if brought into use before WRC-2000 – **see RES-608**

1559 MHz

1610 MHz

1626.5 MHz

RNSS allocation **1 559 - 1 610 MHz**



Nos. 5.362B, 5.362C... the band 1 559-1 610 MHz is also allocated to the *fixed service* on a *secondary basis* until 1 January 2015, at which time this allocation shall no longer be valid. Administrations are urged to take all practicable steps to protect the RNSS and not authorize new frequency assignments to fixed-service systems in this band

RNSS filing after 1 January 2005 is subject to the application of the provisions of Nos. 9.12, 9.12A and 9.13.

NEW (18.02.2012) GLOBAL
RNSS allocation
2483.5 – 2 500 MHz

2483.5 MHz

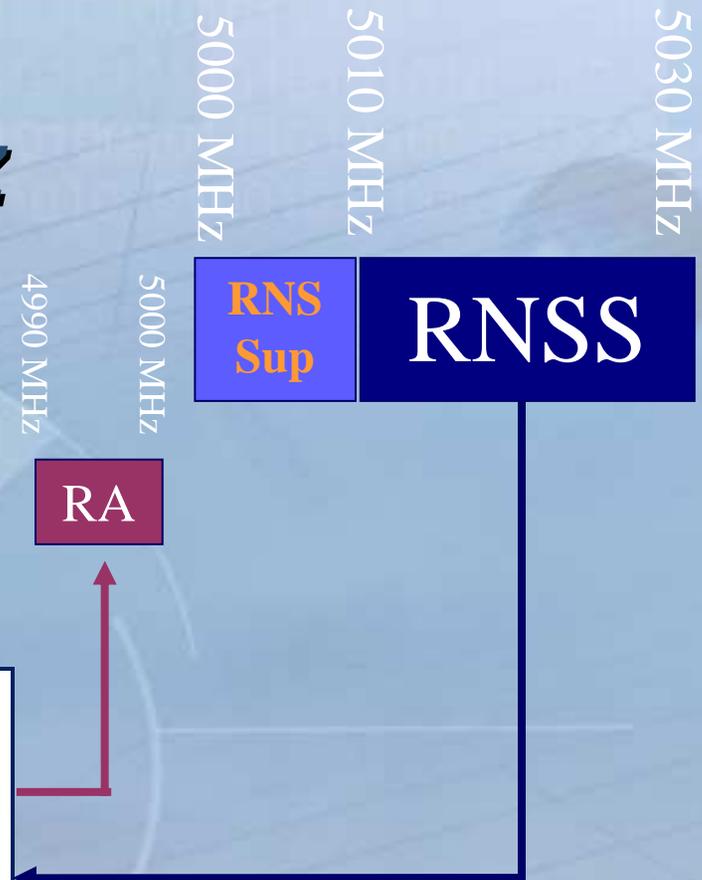
2500 MHz



Nos. **5.398A** & **5.399** In...(ADM list), this band is allocated on a primary basis to the Radiolocation service.

- No. **5.398** In respect of the RDSS, the provisions of No. **4.10** do not apply.
- No. **5.401** In...(ADM list) this band was already allocated on a primary basis to the RDSS before WRC-12, subject to agreement obtained under No. **9.21** from countries not listed in this provision. Systems in the RDSS for which complete coordination information has been received by the Bureau before 18 February 2012 will retain their regulatory status, as of the date of receipt of the coordination request information.
- No. **5.402** The use of the band 2 483.5-2 500 MHz by the MS and the RDSS is subject to the coordination under No. **9.11A**.

RNSS allocation **5 000 - 5 030 MHz**



PFD limit (GSO RNSS) & EPFD limit (NGSO RNSS)

$PFD \leq -171 \text{ dB}(W/m^2 \cdot 10\text{MHz})$ for **any** GSO RNSS
 $EPFD \leq -245 \text{ dB}(W/m^2 \cdot 10\text{MHz})$ by **all** NGSO
RNSS 2% of time, over 5deg elevation; over RA band

- **RES-741 (WRC-03)**
- **No. 5.443B** also no interference to the MLS

RNSS progress



- **Before 2000** - 2 RNSS systems (NAVSTAR-GPS and GLONASS)
- **WRC-2000** created new allocations for the RNSS
- **12.2003** – 1st RES 609 Consultation Meeting – NO epfd calculation
- **01.2004** - ITU BR identified **117** satellite filings representing **66** RNSS networks (**18** N-GSO and **48** GSO) from **11** administrations (CAN, CHN, D, F/ESA, F/GLS, G, I, IND, J, RUS, USA)
- **06.2004** - 2nd RES 609 Consultation Meeting - calculations of the aggregate equivalent PFD (epfd) for **5** GSO and **4** N-GSO
- **06.2005** - 3d RES 609 Consultation Meeting - calculations of the aggregate equivalent PFD (epfd) for **14** GSO and **6** N-GSO
- **09.2006** - 4th RES 609 Consultation Meeting - calculations of the aggregate equivalent PFD (epfd) for **15** GSO and **8** N-GSO
- **05.2008** - 5th RES 609 Consultation Meeting - calculations of the aggregate equivalent PFD (epfd) for **20** GSO and **6** N-GSO
- **09.2009** - 6th RES 609 Consultation Meeting - calculations of the aggregate equivalent PFD (epfd) for **18** GSO and **6** N-GSO
- **06.2010** - 7th RES 609 Consultation Meeting - calculations of the aggregate equivalent PFD (epfd) for **21** GSO and **6** N-GSO
- **09.2011** - 8th RES 609 Consultation Meeting - calculations of the aggregate equivalent PFD (epfd) for **24** GSO and **8** N-GSO
- **10.2012** - 9th RES 609 Consultation Meeting - calculations of the aggregate equivalent PFD (epfd) for **25** GSO and **10** N-GSO
- **09.2013** - 10th RES 609 Consultation Meeting - **349** satellite filings representing **238** RNSS networks (**24** N-GSO and **214** GSO) from **22** administrations (ALG, ARG, ARS/ARB, B, CHN, D/GLS, EGY, F, F/GLS, G, I, I/GLS, IND, INS, J, LUX, NIG, PAK, PNG, RUS, TUR, USA)

RES-609 RNSS info



➤ The ITU BR is maintaining a special web site and web Forum – **RES-609 Consultation meeting**

- posting of required information from administrations
- exchange of information
- posting the results of the epfd calculation from the participants of the RES-609 Consultation meeting
- Posting the results of all RES-609 Consultation meetings

<http://www.itu.int/ITU-R/space/res609/>

10th RES 609 Consultation Meeting *results (1)* 10 -12 September 2013, Los Angeles, USA



GSO:

- G INMARSAT-4 25E, -4A 25E, XL1, -4 143.5, -4A 143.5, -4 98W, -4A 98W (GSO) ⁽³⁾
- CHN COMPASS-160E, 140E, 110.5E, 80E, 58.7E, -B-84E,-B-144.5E (GSO)
- IND INSAT-NAV(34), (55), (82), (83), (132) (GSO)
- LUX LUX-G6-2-E, LUX-G7-9-E2 (GSO)
- USA LM-RPS-133W, 107.3W (GSO)

N-GSO:

- CHN COMPASS-M,COMPASS-MEO,COMPASS-H, COMPASS-IGSO ⁽²⁾ (N-GSO)
- J NSAT-HEO2, QZSS, QZSS-1, QZSS-GS1...8 (N-GSO) ⁽⁴⁾
- RUS GLONASS-M (N-GSO)
- USA NAVSTAR GPS IIRF (N-GSO) ⁽⁵⁾
- F/GLS MSATNAV-2 ⁽¹⁾ (N-GSO)
- IND INSAT-NAV-A-GS, INSAT-NAVR-GS, INSAT-NAVR-NGSA (N-GSO)

1 - The following filings remain available for Galileo and shall be treated with MSATNAV-2 filing as a single planned RNSS system for purposes of performing the epfd calculations - MSATNAV-3 and 4 (F/GLS), GALILEO-NAV-2004 (D/GLS), GALILEO-M-NAVSTAR (I/GLS), and SNS (G))

2 - Compass-M, -MEO, and -H represent a single system for purposes of the Res 609 consultation process

3 - INMARSAT filings represent a single network for the purposes of the Res **609** (Rev.WRC-07) consultation process.

4 - QZSS system shall be treated with the N-SAT-HEO2 as a single planned RNSS system for purposes of performing the epfd calculations.

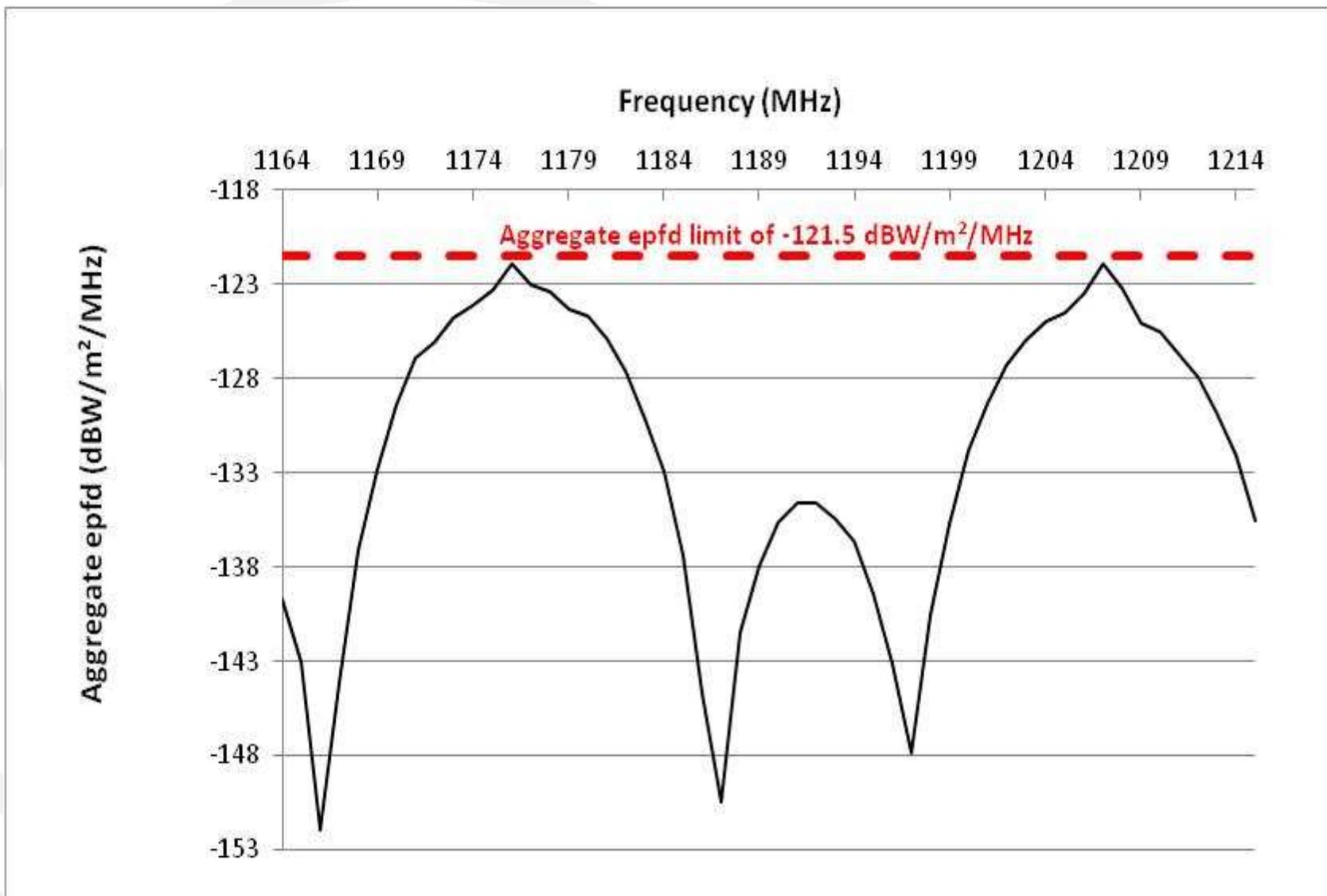
5 - USRSR system shall be treated with NAVSTAR GPS-IIRF as a single planned RNSS system for purposes of performing the epfd calculations.....

10th RES 609 Consultation Meeting *results* (2)
10 -12 September 2013, Los Angeles, USA



- The maximum *equivalent power flux-density (epfd)* of all satellites associated with the referenced RNSS systems (presented on the 10th RES-609 Consultation meeting) is
–121.93 dB (W/m²/MHz) i.e. 0.43 dB below
the RES-609 limit of -121.5 dBW/ m²/MHz
- It is noted that the results are based on the use of worst-case assumptions in terms of interference from RNSS into ARNS

10th RES 609 Consultation Meeting *results (3)* 10 -12 September 2013, Los Angeles, USA



RNSS info 1



- **ITU-R WP 4C** is responsible for studies related to all mobile-satellite services including **RNSS**
 - Studies on the RNSS are very active
 - **Sharing** and **protection criteria** have been intensively investigated for existing spectrum allocation for RNSS
 - Studies are also on-going for newly allocated bands for future enhancements and newly planned RNSS systems, addressing **frequency sharing with other services**
 - These studies contribute not only to the development of **ITU-R M Series Recommendations** but also to **WRC-15** preparation
 - **Free online access to all ITU-R Recommendations:**
<http://www.itu.int/publ/R-REC/en>
- **Free online access to the ITU Radio Regulations**
<http://www.itu.int/pub/R-REG-RR-2012>

RNSS info 2



- *List of most important ITU-R Recommendations related to RNSS (1)*
 - **ITU-R M.1582** - Method for determining coordination distances, in the 5 GHz band, between the international standard microwave landing system stations operating in the aeronautical radionavigation service and stations of the radionavigation-satellite service
 - **ITU-R M.1787** - *Description of systems and networks in the radionavigation-satellite service and technical characteristics of transmitting space stations operating in the bands 1 164-1 215 MHz, 1 215-1 300 MHz and 1 559-1 610 MHz*
 - **ITU-R M.1831** - *A coordination methodology for RNSS inter-system interference estimation*
 - **ITU-R M.1901**- *Guidance on ITU-R Recommendations related to systems and networks in the radionavigation-satellite service operating in the frequency bands 1 164-1 215 MHz, 1 215-1 300 MHz, 1 559-1 610 MHz, 5 000-5 010 MHz and 5 010-5 030 MHz*
 - **ITU-R M.1902** - Characteristics and protection criteria for receiving earth stations in the radionavigation-satellite service (space-to-Earth) operating in the band 1 215-1 300 MHz

RNSS info 3



- *List of most important ITU-R Recommendations related to RNSS (2)*
 - **ITU-R M.1903** - Characteristics and protection criteria for receiving earth stations in the radionavigation-satellite service (space-to-Earth) and receivers in the aeronautical radionavigation service operating in the band 1 559-1 610 MHz
 - **ITU-R M.1904** - Characteristics, performance requirements and protection criteria for receiving stations of the radionavigation-satellite service (space-to-space) operating in the frequency bands 1 164-1 215 MHz, 1 215-1 300 MHz and 1 559-1 610 MHz
 - **ITU-R M.1905** - Characteristics and protection criteria for receiving earth stations in the radionavigation-satellite service (space-to-Earth) operating in the band 1164-1 215 MHz
 - **ITU-R M.1906** - Characteristics and protection criteria of receiving space stations and characteristics of transmitting earth stations in the radionavigation-satellite service (Earth-to-space) operating in the band 5 000-5 010 MHz



Radio Navigation Satellite Service and the ITU Radio Regulations

Attila MATAS
ITU BR
matas@itu.int

Questions ?



Committed to connecting the world