

The background features a blue gradient with binary code (0s and 1s) scattered across it. A central globe is surrounded by a circular grid pattern, and a smaller globe is visible in the upper right corner.

WRC-03 Agenda items 1.15 and 1.28
related to the RNSS and the RNS

Attila Matas, ITU-BR, Space Department

What is RNSS?

Radionavigation Satellite Service

What is RNSS?



Global Positioning System (GPS) – USA

*24 MEOs satellites / 6 orbital planes / 55 deg
inclination / 20350 km altitude / 11h 56m period*

What is RNSS?

Global Navigation Satellite System (GLONASS) – RUS

24 MEOs satellites / 3 orbital planes / 64.8 deg inclination / 19140 km altitude / 11h 15m period



What is RNSS?



GALILEO – EUR

*30 MEOs satellites / 3 orbital planes / 56 deg
inclination / 23616 km altitude / 14h 5m period*

RNSS Allocation

L2

1215 MHz

1260 MHz



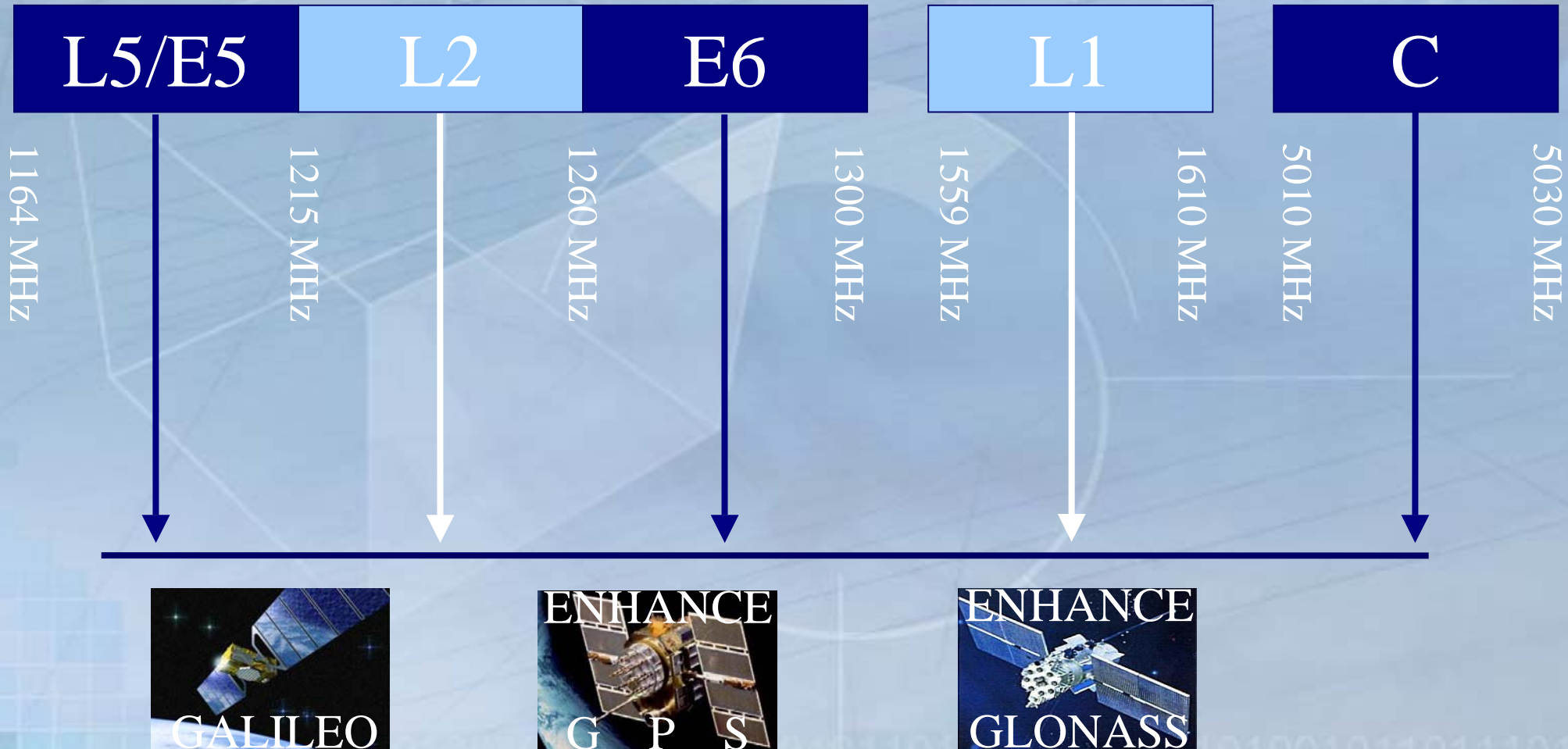
L1

1559 MHz

1610 MHz

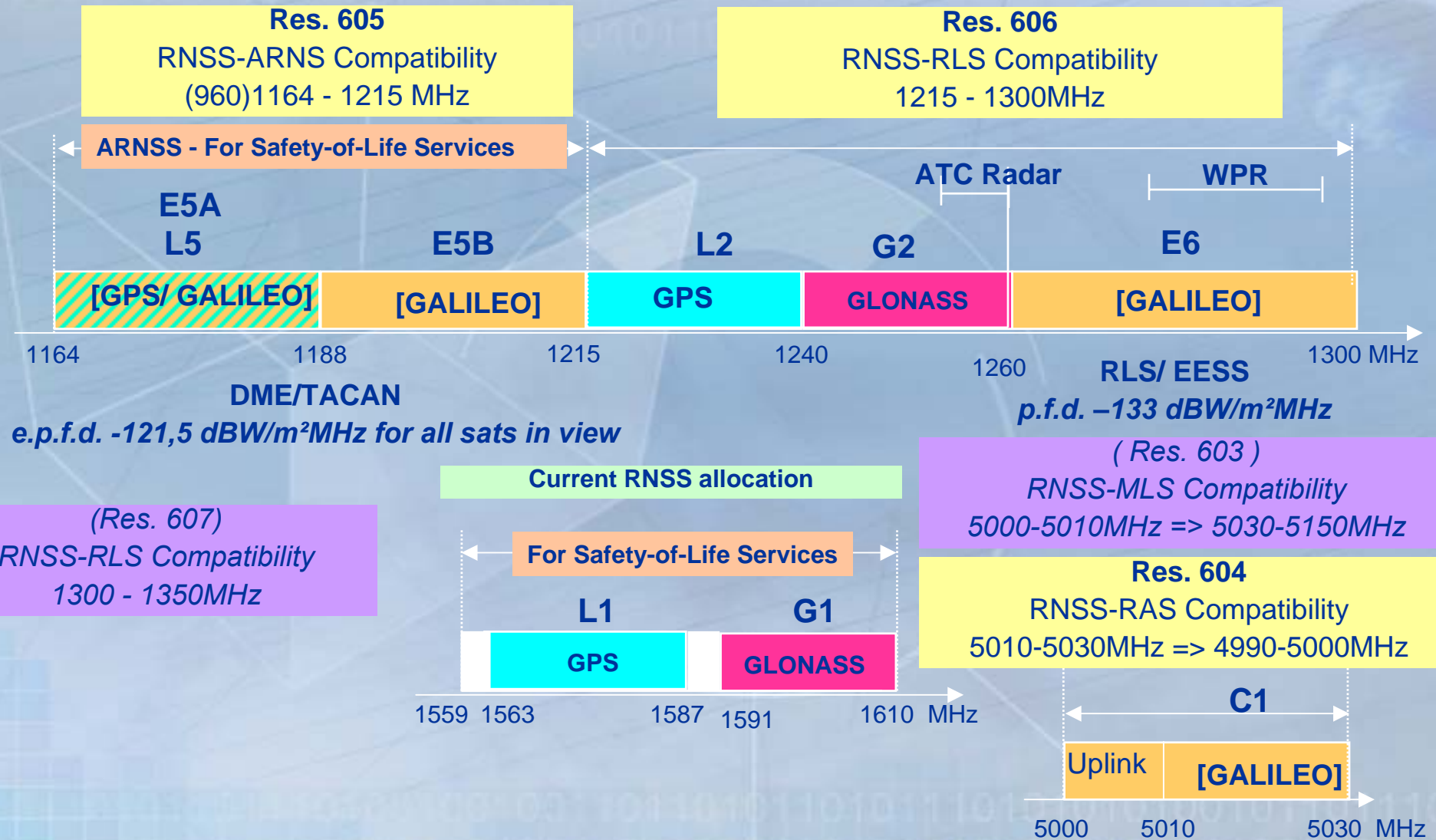


WRC-2000 Added ...



Frequency Spectrum for the RNSS

Regulatory situation before WRC-03

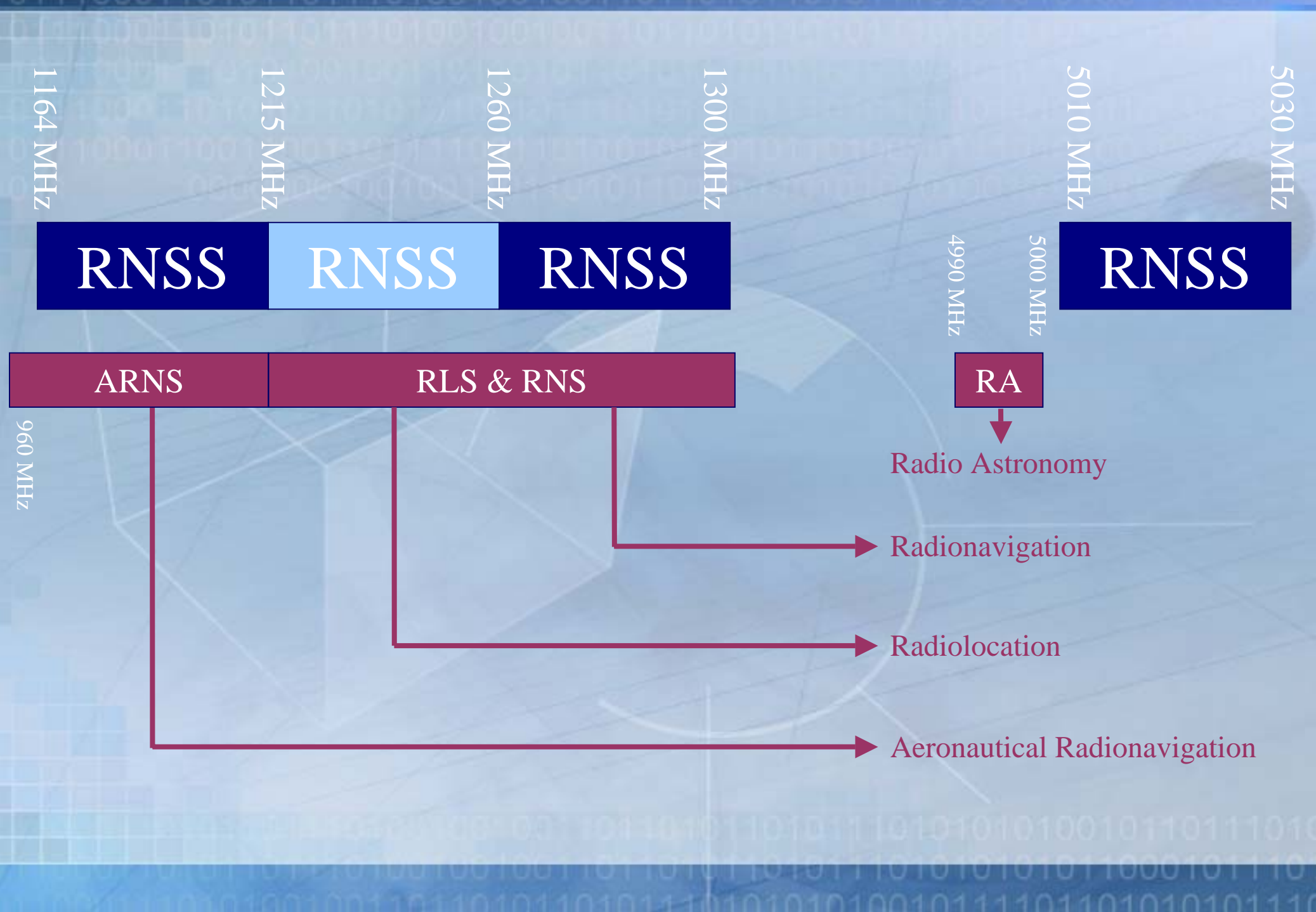


RNSS (WRC-03)

Agenda item 1.15

to review the results of studies concerning the radionavigation-satellite service in accordance with Resolutions 604 (WRC-2000), 605 (WRC-2000) and 606 (WRC-2000)

Outcome of WRC-03 ?



1164 MHz

1215 MHz

1260 MHz

1300 MHz

5010 MHz

5030 MHz

RNSS

RNSS

RNSS

RNSS

4990 MHz

5000 MHz

RA

ARNS

RLS & RNS

Radio Astronomy

Radionavigation

Radiolocation

Aeronautical Radionavigation

960 MHz

5030 MHz

5010 MHz

RNSS

5000 MHz

4990 MHz

RA

1300 MHz

1260 MHz

1215 MHz

RNSS

RLS & RNS

1164 MHz

RNSS

ARNS

960 MHz

Outcome of WRC-03...

1164 MHz

1215 MHz

WRC-03

AI 1.15: Res. 605 (WRC-2000)

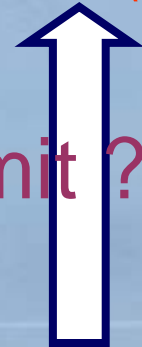
RNSS

- EPFD limit shared by all RNSS
 $\leq -121.5 \text{ dB(W/m}^2\text{-1MHz)}$ (*5.328A / Res. 609 (WRC-03)*)

ARNS

960 MHz

How to share this limit ?



'Real' RNSS systems only



Satisfy criteria annexed to Res. 609 (WRC-03)

PFD limit per RNSS space station

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



Consultation Meeting

BR participates / observes / publishes results in IFIC (Res. 609 (WRC-03))

1164 MHz

1215 MHz

EPFD

RNSS

ARNS

- *The equivalent power flux-density is defined as the sum of the power flux-densities produced by all the transmit stations within a RNSS non-geostationary-satellite systems, taking into account the off-axis discrimination of a reference receiving antenna assumed to be pointing in its nominal direction.*

960 MHz

1164 MHz

1215 MHz

RNSS

ARNS

960 MHz

RES 609 Consultation Meeting (1)

- All ADMs (**12 ADM** - 01.12.03) operating or planning to operate RNSS systems (**66 systems** - 01.12.03) shall, in collaboration, take all necessary steps, including, if necessary, by means of appropriate modifications to their systems, to ensure that the aggregate interference into ARNS systems caused by such RNSS systems operating in these frequency bands is **shared equitably among the systems and does not exceed** the aggregate protection criterion
 $\leq -121.5 \text{ dB(W/m}^2\text{)}$ in any 1MHz band

RES 609 Consultation Meeting (2)

- that all potential RNSS system operators and ADMs are given full visibility of the process
- **no single RNSS system** shall be permitted to use up the entire interference allowance
- ADMs operating or planning to operate RNSS systems will need to **agree cooperatively** to achieve the level of protection for ARNS
- ADMs participating in this process of epfd calculation should hold Consultation meetings on a regular basis
- ADMs participating in the Consultation meeting shall designate one ADM that shall **communicate to the Bureau the results of any aggregate sharing determinations**

1164 MHz

1215 MHz

RNSS

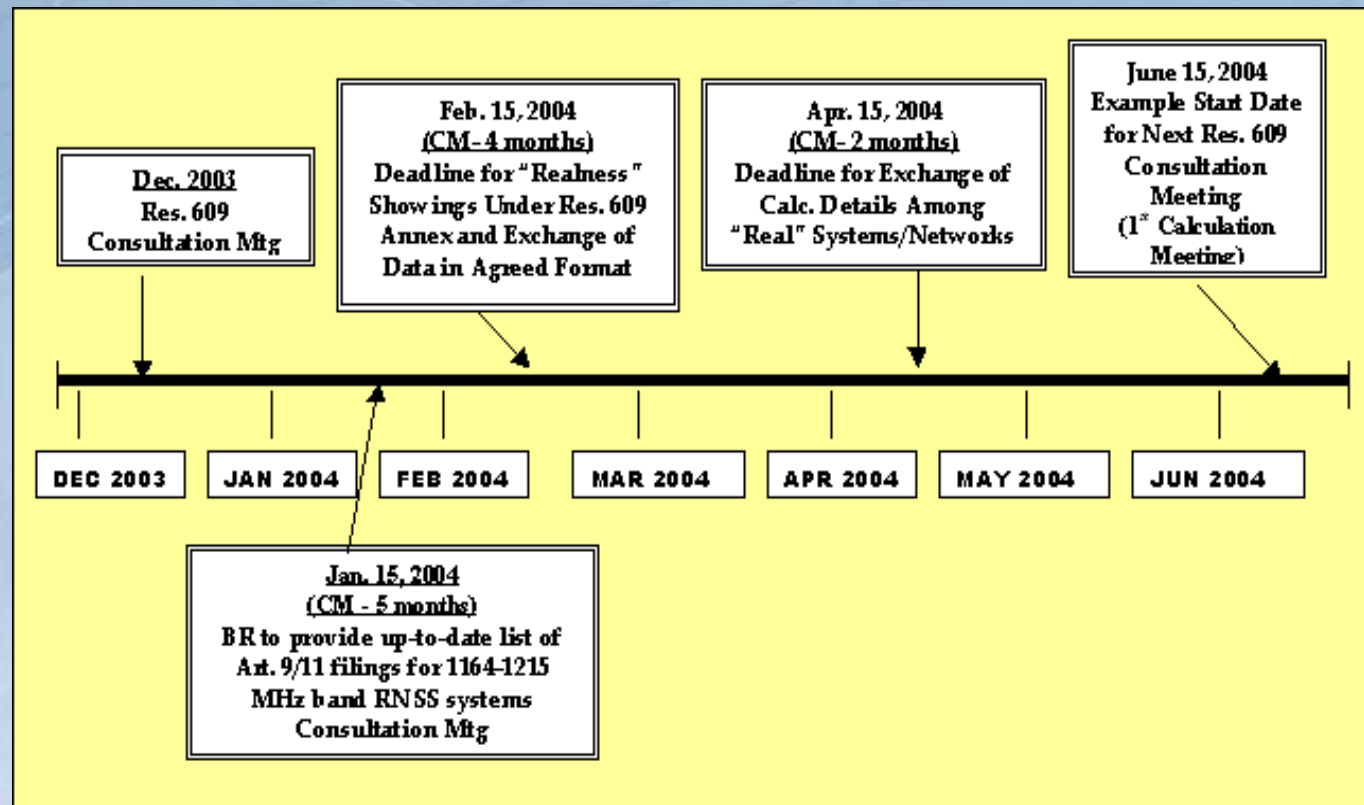
ARNS

960 MHz

RES 609 Consultation Meeting Timeline

More information?

Resolution 609 Forum and the ITU web site
<http://www.itu.int/ITU-R/space/res609/index.html>



1164 MHz

1215 MHz

RNSS

ARNS

960 MHz

5030 MHz

5010 MHz

RNSS

5000 MHz

4990 MHz

RA

1300 MHz

RNSS

1260 MHz

RNSS

1215 MHz

RNSS

1164 MHz

RLS & RNS

ARNS

960 MHz

1215 MHz

1260 MHz

1300 MHz

WRC-03

AI 1.15: Res 606 (WRC-2000)

RNSS

RNSS

RLS & RNS

- Retained existing protection of RNS
- Extended protection to RLS

(RR No. 5.329 (WRC-03))

- No additional constraints, if brought into use before WRC-2000

(Res 608 (WRC-03))

5030 MHz

5010 MHz

RNSS

5000 MHz

4990 MHz

RA

1300 MHz

RNSS

1260 MHz

RNSS

1215 MHz

RLS & RNS

1164 MHz

RNSS

ARNS

960 MHz

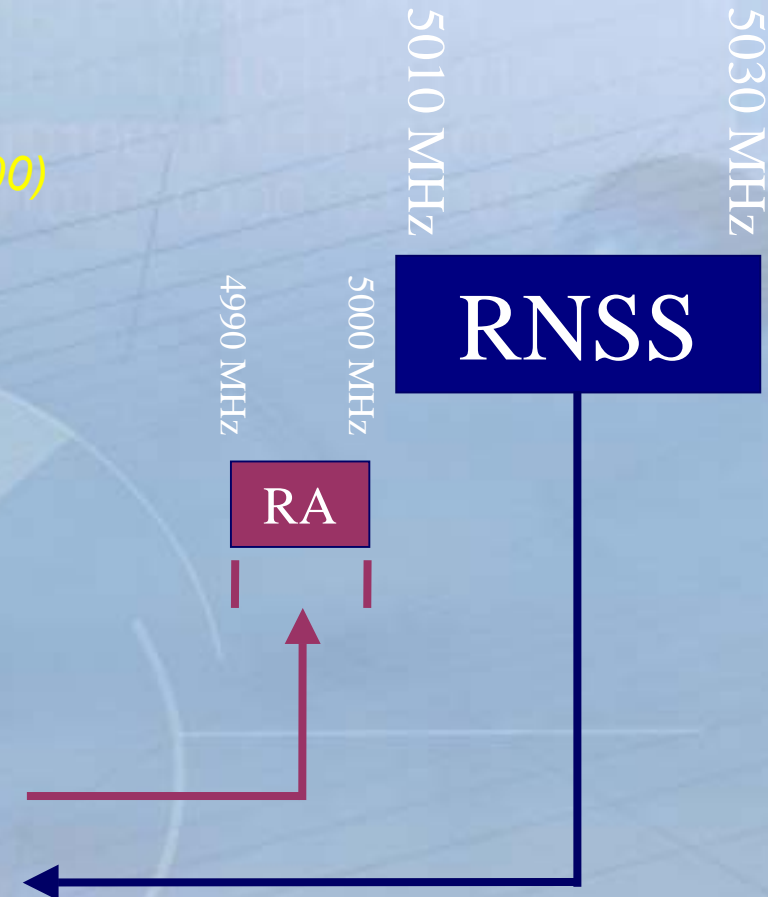
WRC-03

1.15: Res 604 (WRC-2000)

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)**
- RR No. 5.443B also no interference to the MLS



5030 MHz

5010 MHz

RNSS

5000 MHz

4990 MHz

RA

1300 MHz

RNSS

1260 MHz

RNSS

1215 MHz

RNSS

1164 MHz

RLS & RNS

ARNS

960 MHz

1164 MHz

1215 MHz

1260 MHz

1300 MHz

1559 MHz

1610 MHz

5010 MHz

5030 MHz

RNSS

RNSS

RNSS

RNSS

RNSS

WRC-03 results !



Additional Coordination Requirements

*RR Nos. 9.12, 9.12A, 9.13 (see 5.328B / Res 610 (WRC-03))
after **01.01.2005***

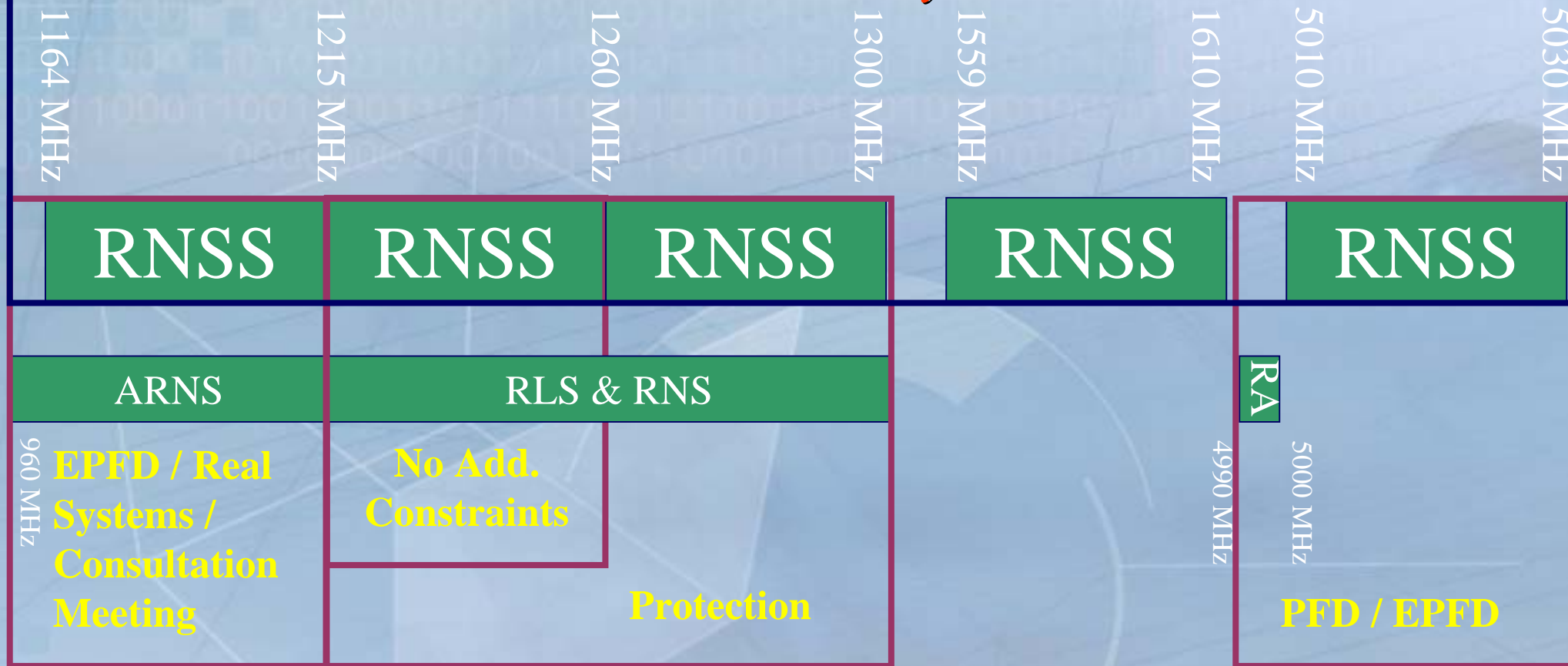
RR No. 9.7 exists already for the GSO RNSS

.. received after 01.01.2005

.. between 'Real' RNSS systems only

Satisfy criteria annexed to Res 610 (WRC-03)

Coordination / Real systems

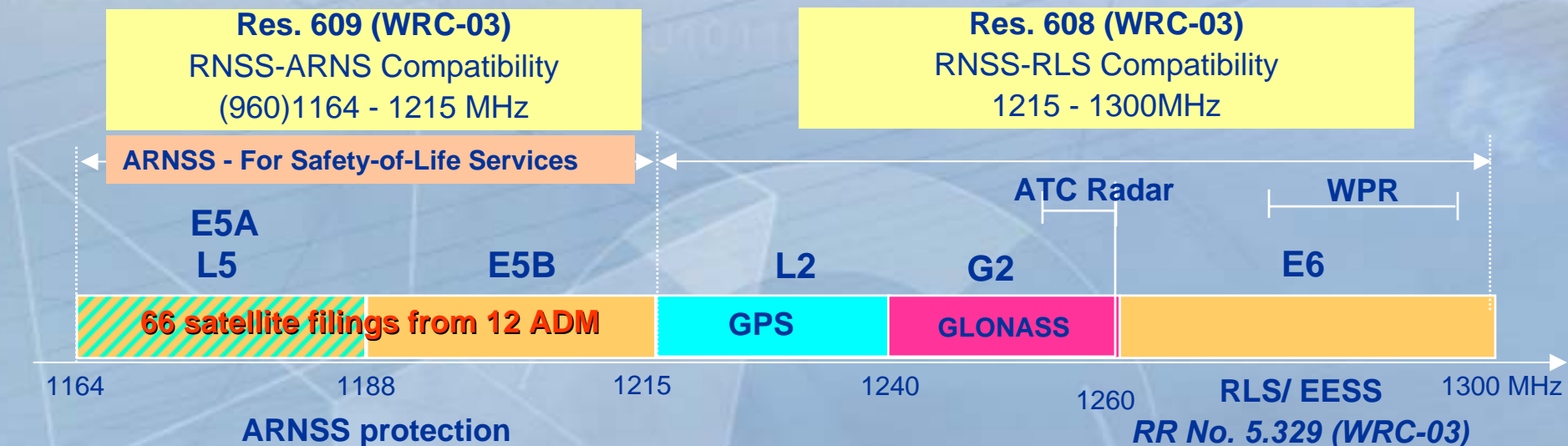


WRC-03 results - *Suppression of*

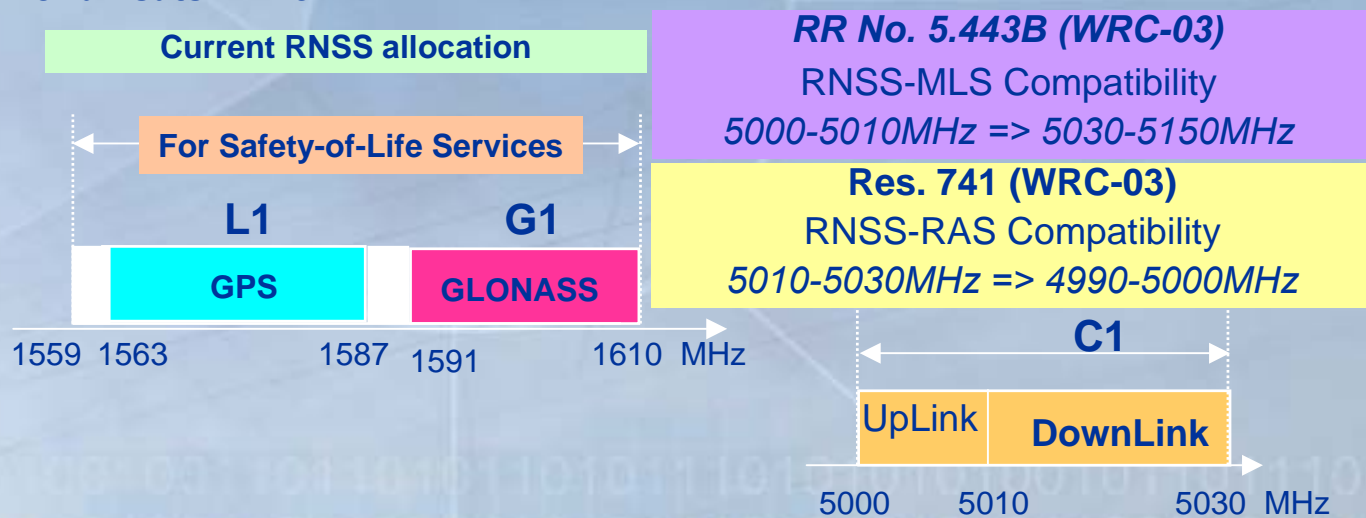
Res. 603, Res.604, Res.605, Res.606 and Res.607 (WRC-00)

Frequency Spectrum for the RNSS

Regulatory situation after WRC-03



Res. 610 (WRC-03)
Coordination and bilateral resolution of technical compatibility issues for RNSS networks



RNSS (WRC-03)

Agenda item 1.28

to permit the use of the band 108-117.975 MHz for the transmission of radionavigation satellite differential correction signals by ICAO standard ground-based systems

Outcome of WRC-03 ?

AI 1.28 - Use of the band 108-117.975 MHz for the transmission of RNSS differential correction signals (1)

- New aviation requirement for transmission of augmentation data for the Global Navigation Satellite Service (GNSS) for precision approach and landing and for the Ground Based Augmentation Systems (GBAS)
- The need for the aeronautical community to provide additional services by enhancing navigation and surveillance systems through a communication data link
- Compatibility with FM broadcasting stations has already been addressed in the development of GBAS
- Ensure compatibility between these systems and the ICAO standard ILS/VOR systems

Outcome of WRC-03...

AI 1.28 - Use of the band 108-117.975 MHz for the transmission of RNSS differential correction signals (2)

- RR No. 5.197A The band 108-117.975 MHz may also be used by the aeronautical mobile (R) service on a primary basis, limited to **systems** that transmit navigational information in support of air navigation and surveillance functions in accordance with recognized international aviation standards and Res. 413 (WRC-03) apply and on the condition that priority and protection be given to the ARNS.
- Res. 413 (WRC-03)
 - ✓ additional aeronautical **systems** planned to operate in the frequency band 108-117.975 MHz shall, as a minimum, meet the FM broadcasting immunity
 - ✓ additional aeronautical **systems** operating in the band 108-117.975 MHz shall place no additional constraints on the broadcasting service or cause harmful interference to stations operating in the bands allocated to the broadcasting service
 - ✓ frequencies below 112 MHz shall not be used for these additional aeronautical **systems** excluding the standard ICAO systems until all potential compatibility issues with the frequency band 87-108 MHz have been resolved,

WRC-03

***Agenda items 1.15 and 1.28
related to the RNS and the RNSS***

Attila MATAS - ITU BR

Questions ?