

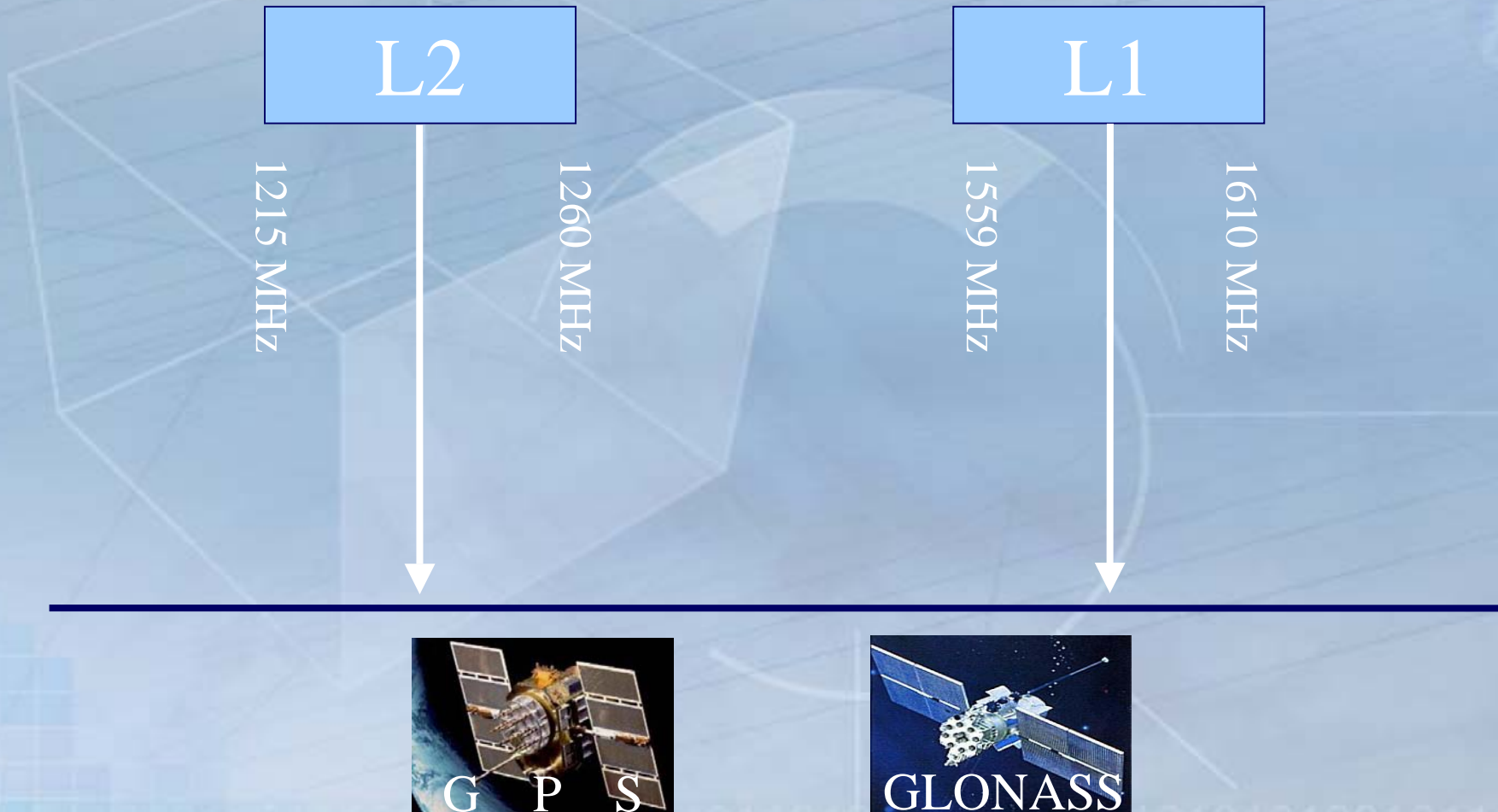
The background features a blue gradient with binary code (0s and 1s) scattered across it. A central globe is surrounded by a network of white lines, suggesting a global or satellite network. A smaller globe is visible in the upper right corner.

RadioNavigation Satellite Service

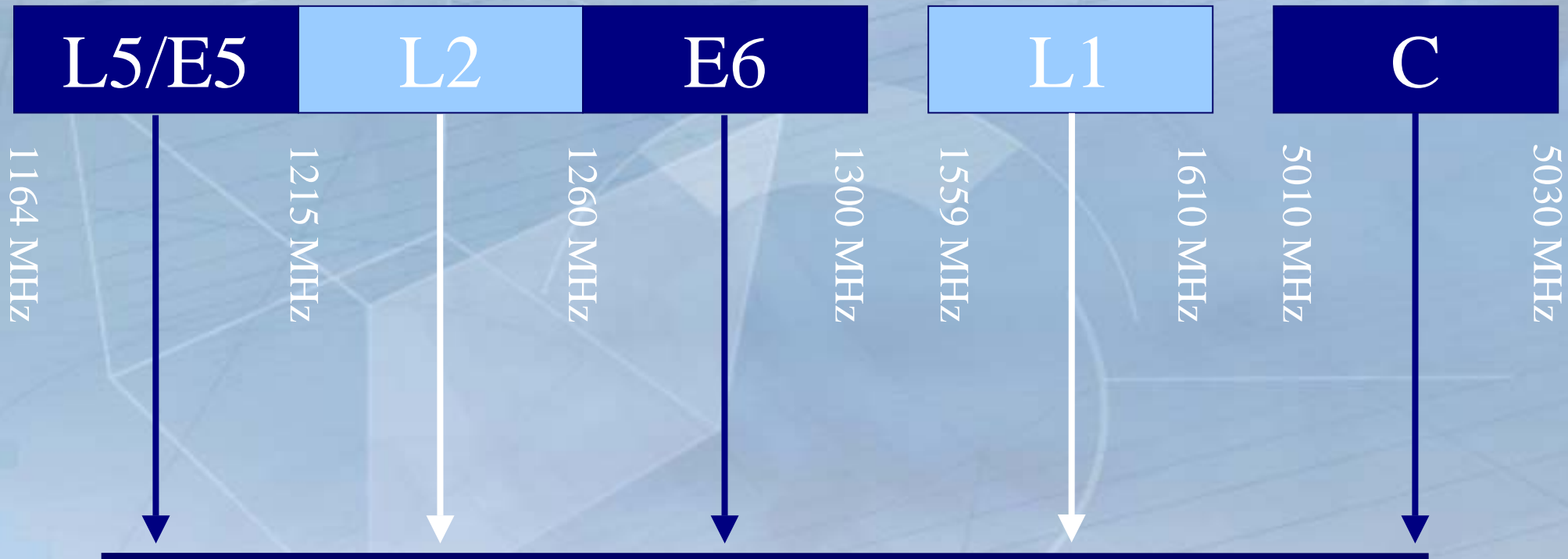
Progress Report 2004

Attila Matas, ITU-BR, Space Department

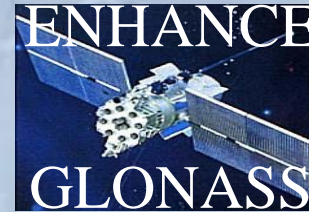
RNSS Allocation *before WRC-2000*



WRC-2000 Added ...



New GNSS
systems

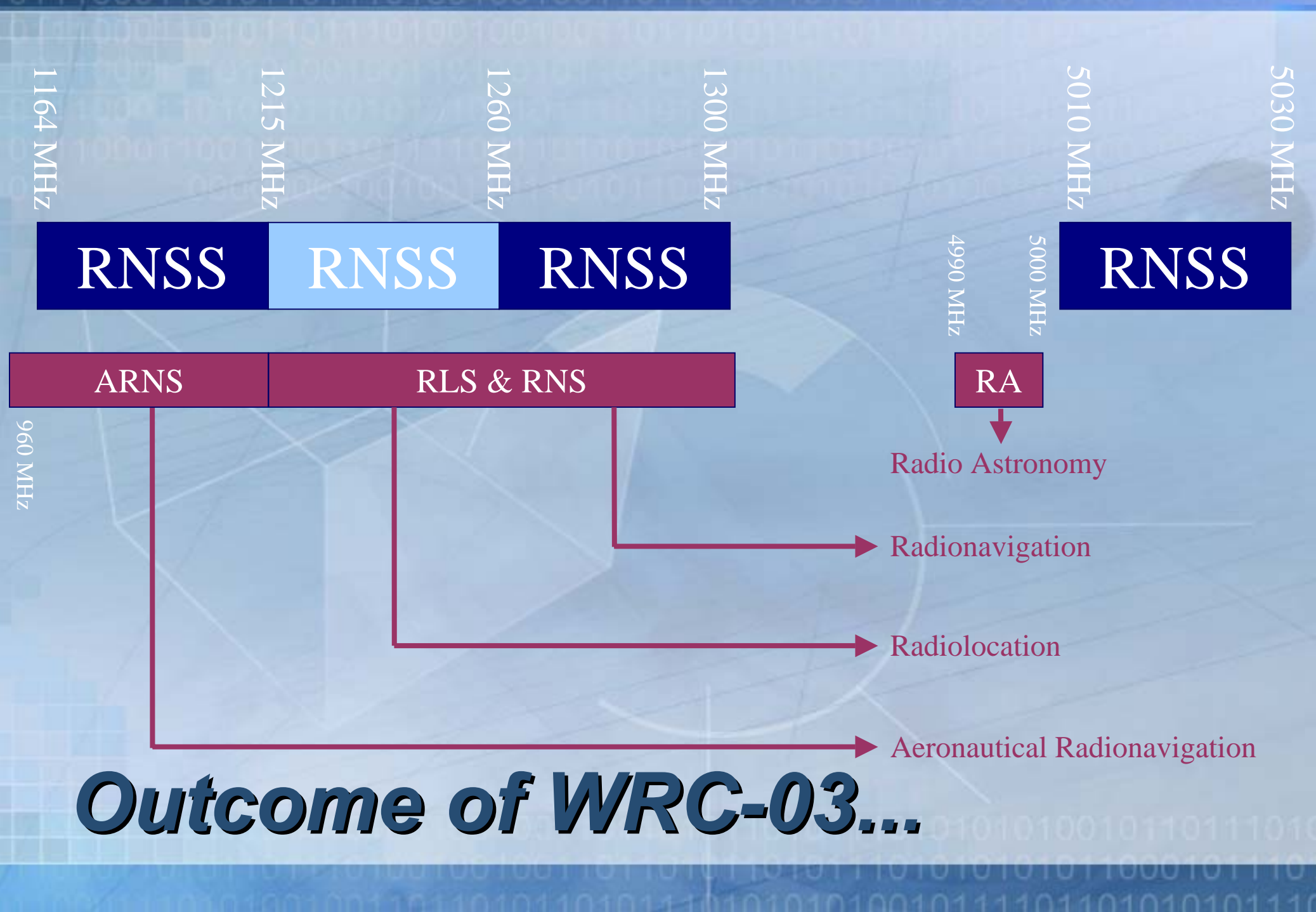


RNSS (WRC-03)

Agenda item 1.15

to review the results of studies concerning the radionavigation-satellite service

Outcome of WRC-03 ??



Outcome of WRC-03...

Outcome of WRC-03...

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

1164 MHz

1215 MHz

RNSS

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

*Bureau participates/observes/
publishes results in the IFIC*
(RES-609 (WRC-03))



RES 609 Consultation Meeting (1)

- All ADMs operating or planning to operate RNSS systems 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 equivalent power flux-density** (epfd) protection criterion ***≤ -121.5 dB(W/m²) in any 1MHz band***

1164 MHz

1215 MHz

RNSS

ARNS

960 MHz

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

1164 MHz

1215 MHz

RNSS

ARNS

960 MHz

RES 609 Consultation Meeting (3)

- ITU BR identified in January 2004 70 RNSS systems with frequency assignments in the band 1164-1215 MHz.
- ADMs submitted for 22 satellite systems (10 GSO and 12 Non-GSO systems) the appropriate Annex to RES-609 information
- Calculations of the equivalent PFD (epfd) level produced by all space stations of the referenced RNSS systems were compared and agreed at the second Consultation Meeting, held in Ottawa, Canada, June 2004.

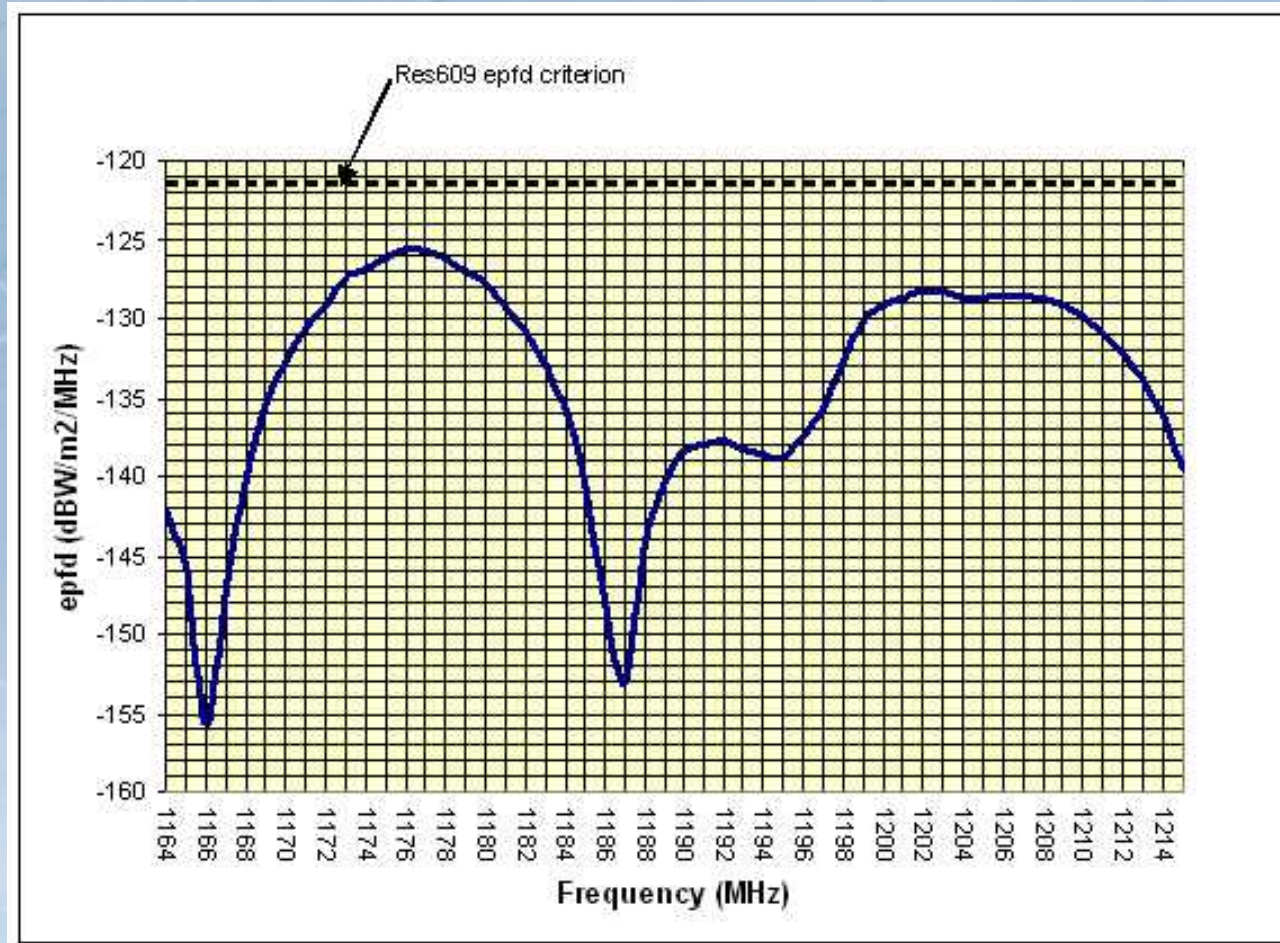
RES 609 Consultation Meeting *results* (1)

- CAN NAV 107.3W (GSO)
 - G INMARSAT GSO-2L & GSO-2N (GSO)
 - CHN COMPASS-140E & 110.5E & 80E & 58.7E (GSO)
 - USA LM-RPS-133W (GSO)
-

- CHN COMPASS-M & MG & H (N-GSO)
- J N-SAT-HEO2 (N-GSO)
- RUS GLONASS-M (N-GSO)
- USA NAVSTAR GPS L5 (N-GSO)
- F/GLS MSATNAV-2 * (N-GSO)

*(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), GALILEO-M-NAVSTAR (I), E-NSS-1 (ESA), and SNS (G))

RES 609 Consultation Meeting *results* (2)



5030 MHz

5010 MHz

RNSS

5000 MHz

4990 MHz

RA

1300 MHz

RNSS

1260 MHz

RNSS

1215 MHz

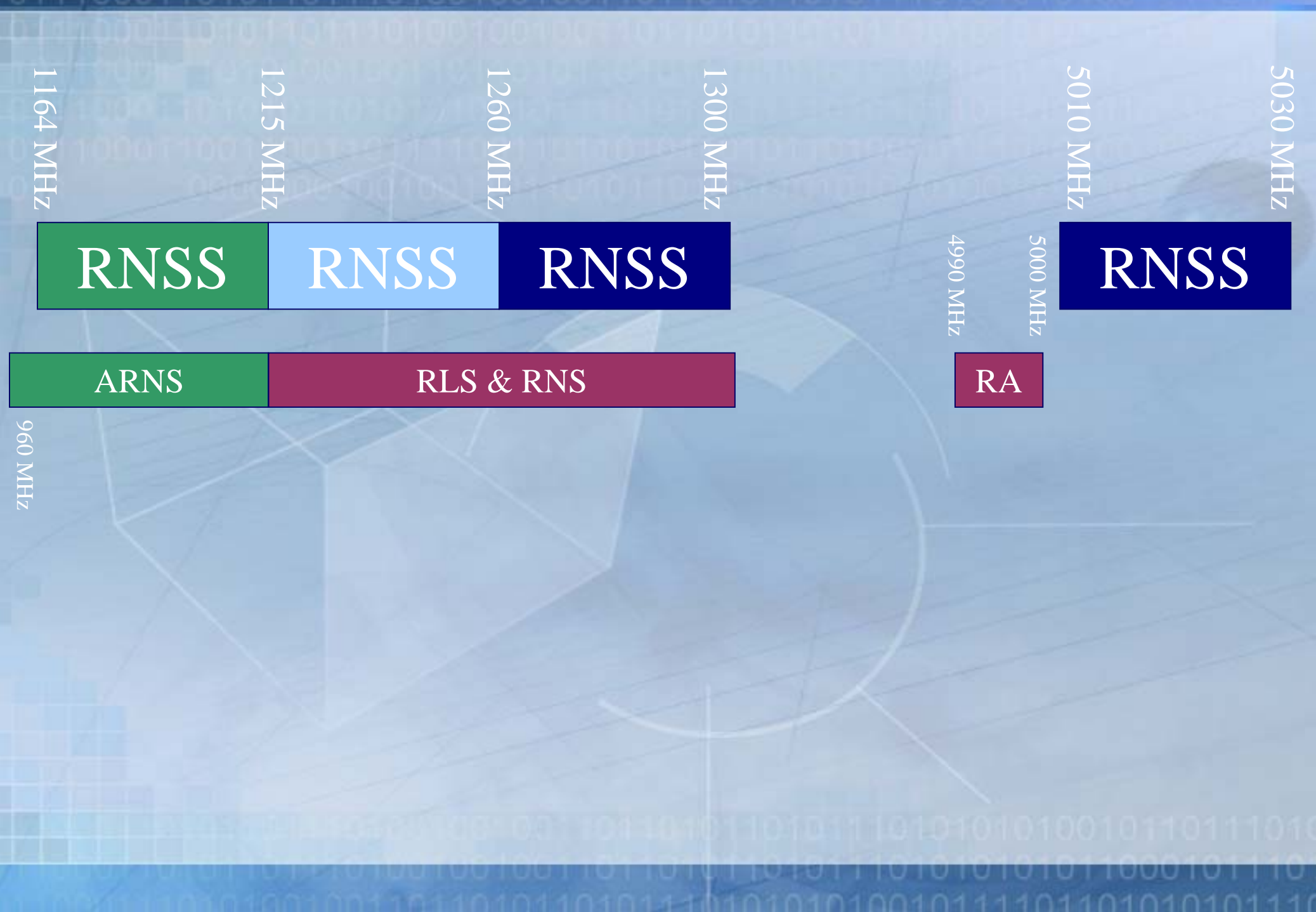
RNSS

1164 MHz

RLS & RNS

ARNS

960 MHz



WRC-03

AI 1.15: RES-606 (WRC-2000)

1215 MHz

1260 MHz

1300 MHz

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 – *see (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

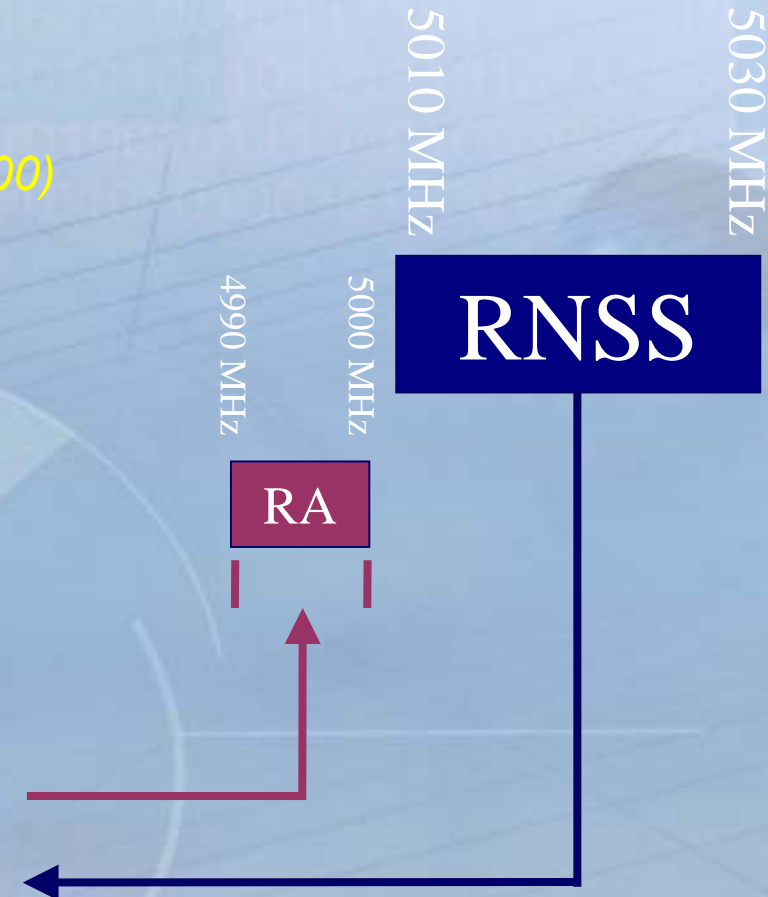
WRC-03

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

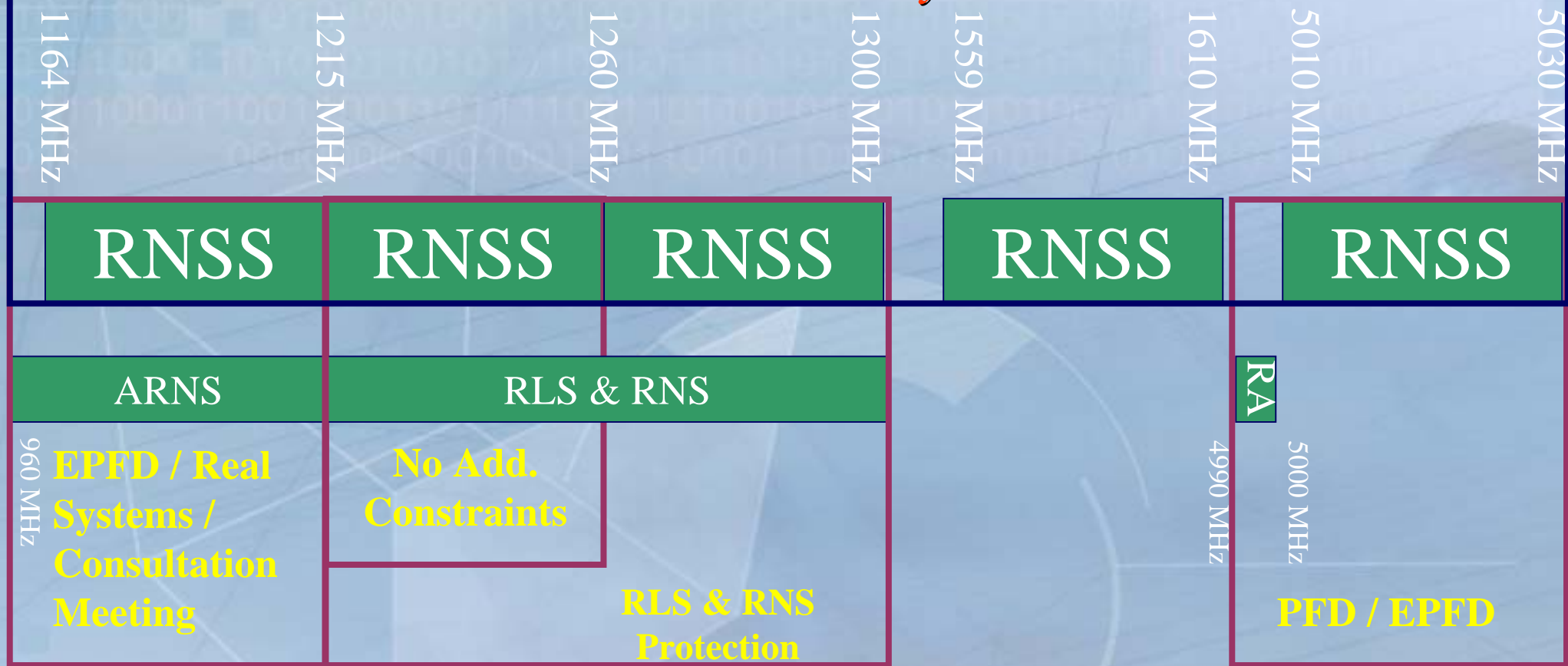
RR No. 9.7 exists already for the GSO RNSS

.. received after 01.01.2005

.. between 'Real' RNSS systems only

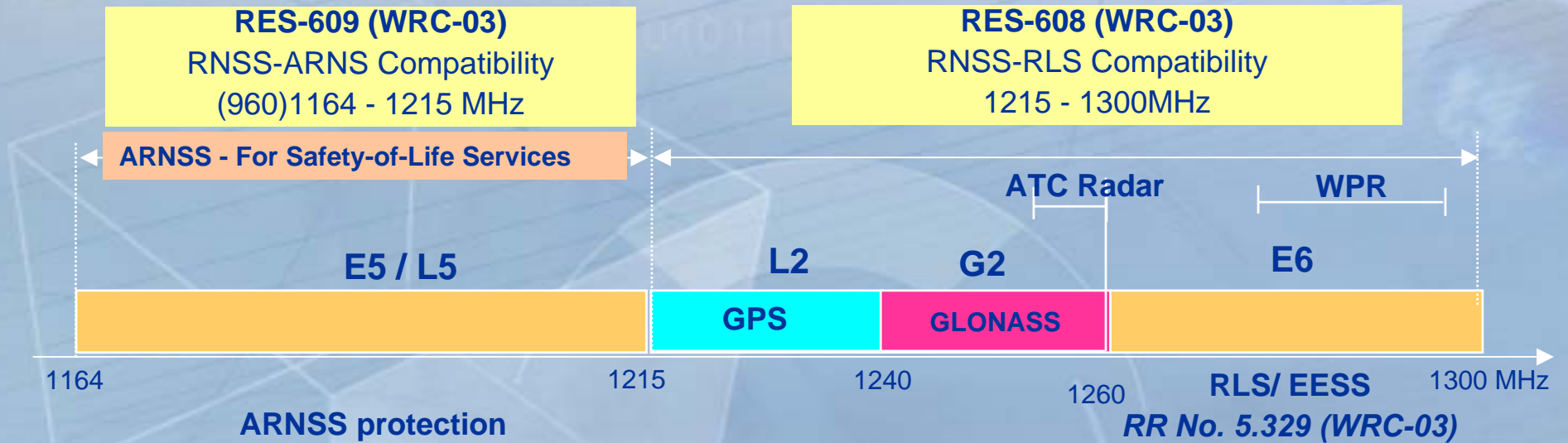
Satisfy criteria annexed to RES-610 (WRC-03)

Coordination / Real systems



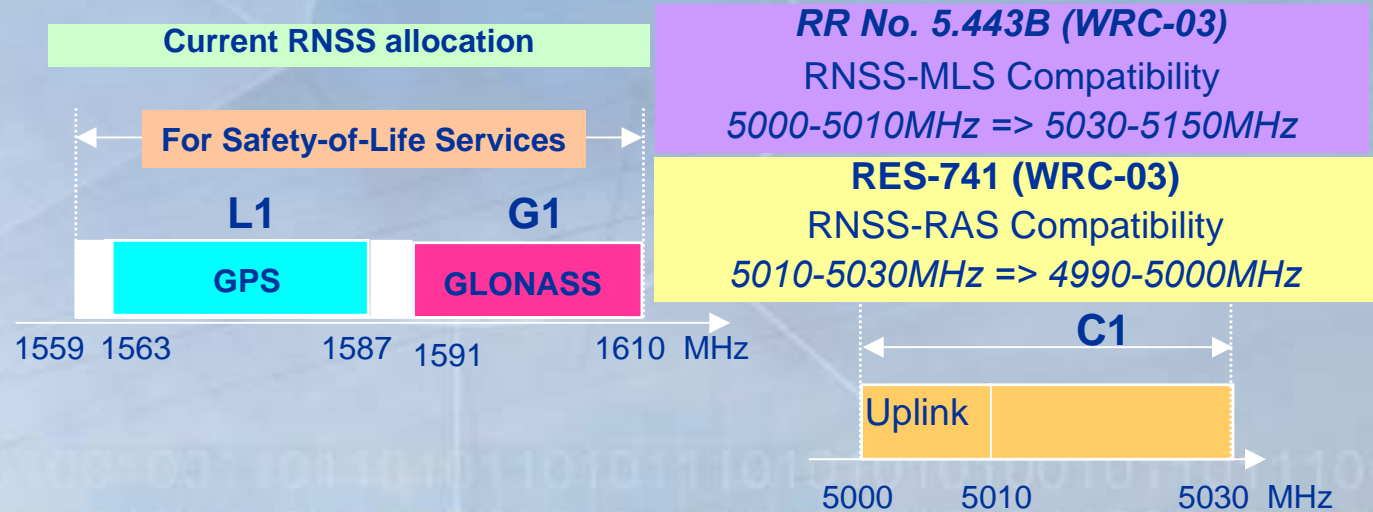
Frequency Spectrum for the RNSS

Regulatory situation after WRC-03



ARNSS protection
EPFD -121,5 dBW/m² in 10 MHz for all sats in view

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



RNSS progress

- **Before 2000** - 2 RNSS systems
- **WRC-2000** created new allocations for the RNSS
- **2000 – 2003 period** - 70 new satellite filings (51 GSO and 19 N-GSO)
- **01.2004** - ITU BR identified that only 24 RNSS networks (12 GSO and 12 N-GSO) were submitted by ADM with an appropriate information (see RES-609)
- **06.2004** - 2nd RES 609 Consultation Meeting - calculations of the equivalent PFD (epfd)

RNSS **conclusion** (at the end of 2004)

- The maximum efd of all satellites associated with the referenced RNSS systems (presented on the 2nd RES-609 Consultation meeting) was -125.7 dB (W/m²/MHz), i.e. 4.2 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
- The coordination provisions of Nos. **9.12, 9.12A and 9.13** will apply to RNSS systems and networks for which complete coordination or notification information, as appropriate, is received by the Bureau after 1.1.2005

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

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

RadioNavigation Satellite Service

Progress Report 2004

Attila MATAS - ITU BR

Questions ?