



Seventh Meeting of ICG
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Radio Navigation Satellite Service

Progress report after 9th RES-609 meeting

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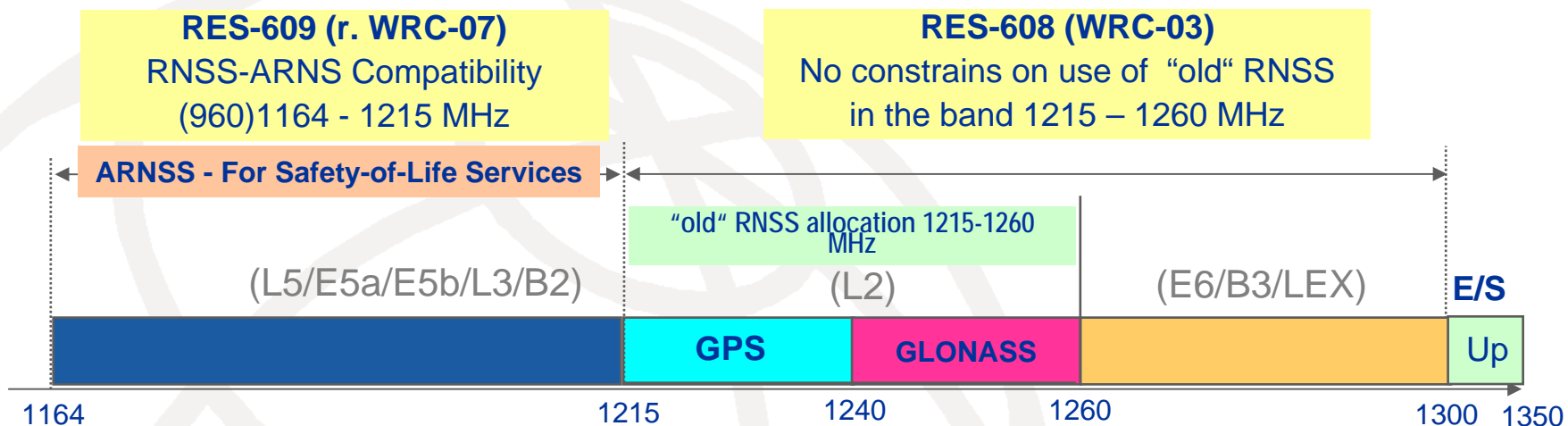
Committed to connecting the world

“To ensure rational, equitable, efficient and economical use of the radio frequency spectrum by all radiocommunication services - including those using the geostationary satellite orbit or other satellite orbits - and to carry out studies on radiocommunication matters”

➤ 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

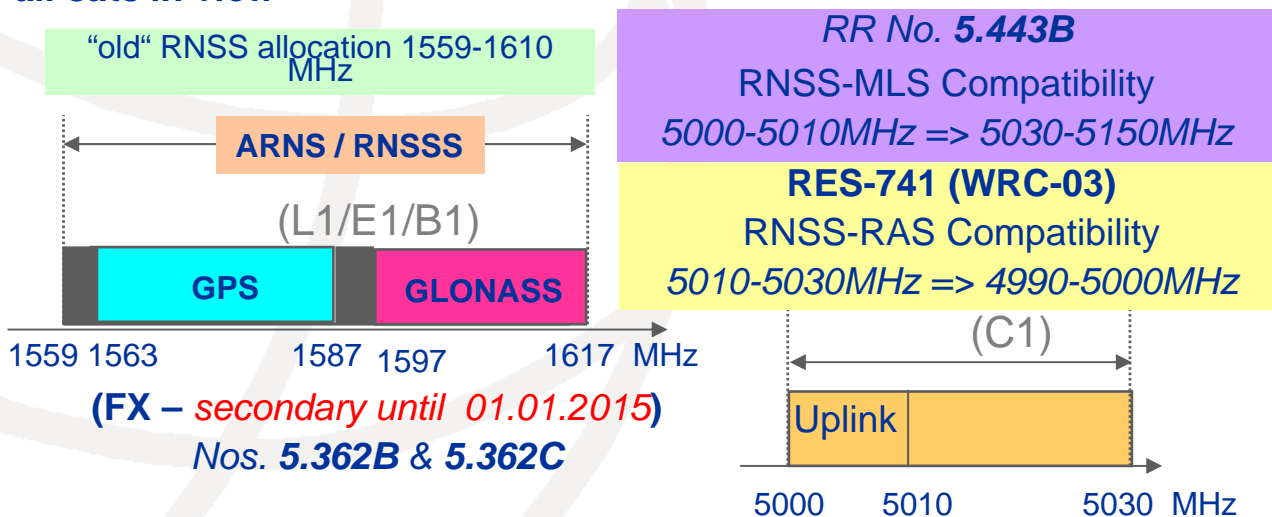


ARNSS protection

RLS/ EESS/SRS+ (FX+MOB) - Nos. 5.329, 5.330&5.332

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

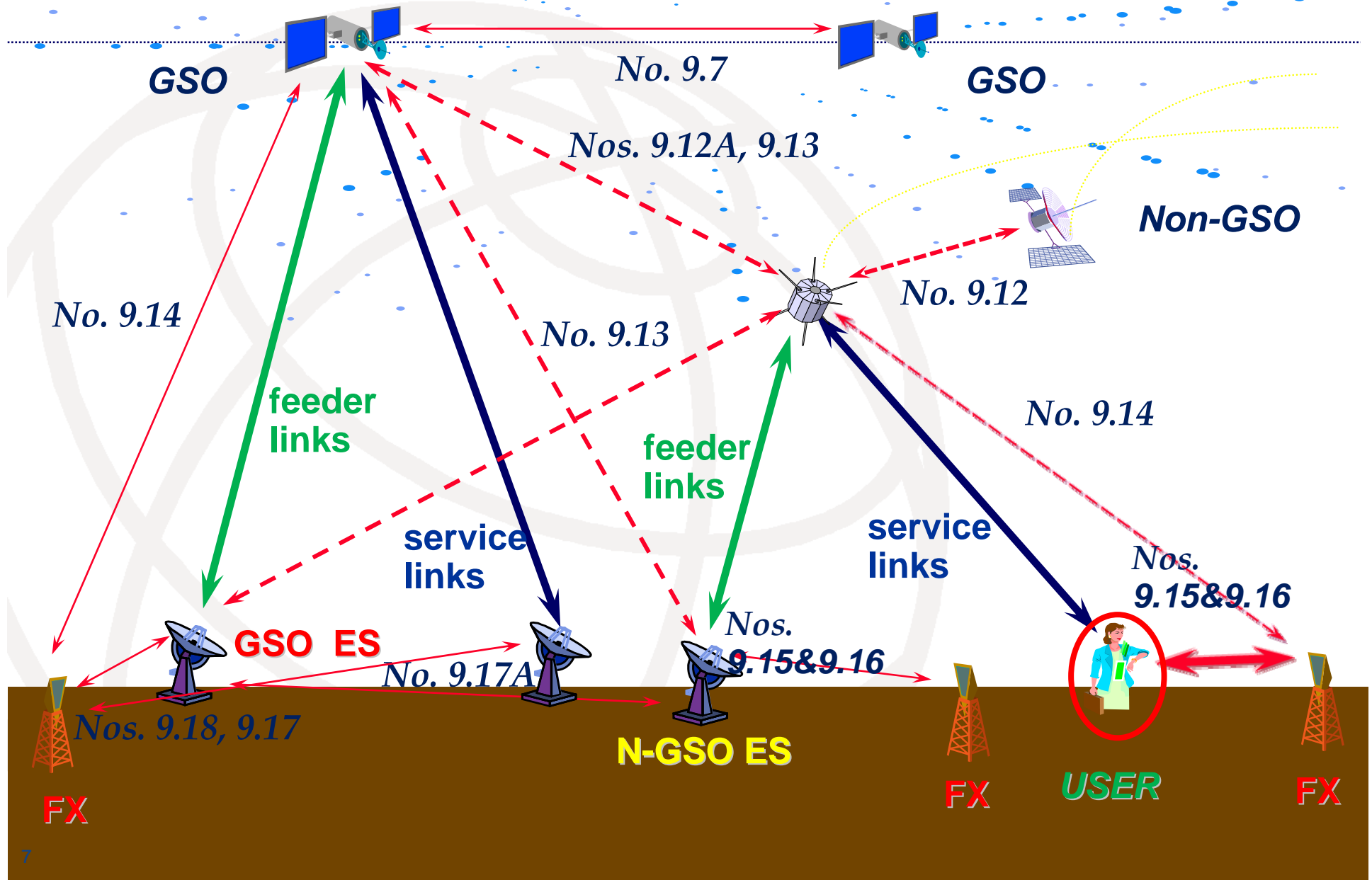
RES-610 (WRC-03)
 Coordination and bilateral resolution of technical compatibility issues for RNSS networks



(FX – secondary until 01.01.2015)
Nos. 5.362B & 5.362C

- No **1.166** *interference*: The effect of unwanted energy due to one or a combination of *emissions, radiations*, or inductions upon reception in a *radiocommunication* system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy.
- No **1.167** *permissible interference*: Observed or predicted *interference* which complies with quantitative *interference* and sharing criteria contained in these Regulations or in ITU-R Recommendations or in special agreements as provided for in these Regulations.
- No **1.168** *accepted interference*: *Interference* at a higher level than that defined as *permissible interference* and which has been agreed upon between two or more administrations without prejudice to other administrations.
- No **1.169** *harmful interference (HI)*: *Interference* which endangers the functioning of a radionavigation service or of other *safety services* or seriously degrades, obstructs, or repeatedly interrupts a *radiocommunication service* operating in accordance with Radio Regulations.

N-GSO interference situation



➤ 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/>

- **Before 2000** - 2 RNSS systems (NAVSTAR-GPS and GLONASS)
- **WRC-2000** created new allocations for the RNSS
- **2000 – 2003 period** - **70** new satellite filings (51 GSO and 19 N-GSO)
- **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
- **10.2012** - **270** satellite filings representing **173** RNSS networks (**41** N-GSO and **132** GSO) from **19** administrations (ARG, ARS/ARB, B, CHN, D/GLS, EGY,F,F/GLS,G,I,I/GLS,IND,J,LUX,NIG,PNG,RUS,TUR,USA)

- 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)
- J MTSAT-C-140E, -145E (GSO)
- LUX LUX-G6-2-E, LUX-G7-9-E2 (GSO)
- USA LM-RPS-133W, 107.3W (GSO)
- CHN COMPASS-M, MEO, H ⁽²⁾ (N-GSO)
- J QZSS (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-GS (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

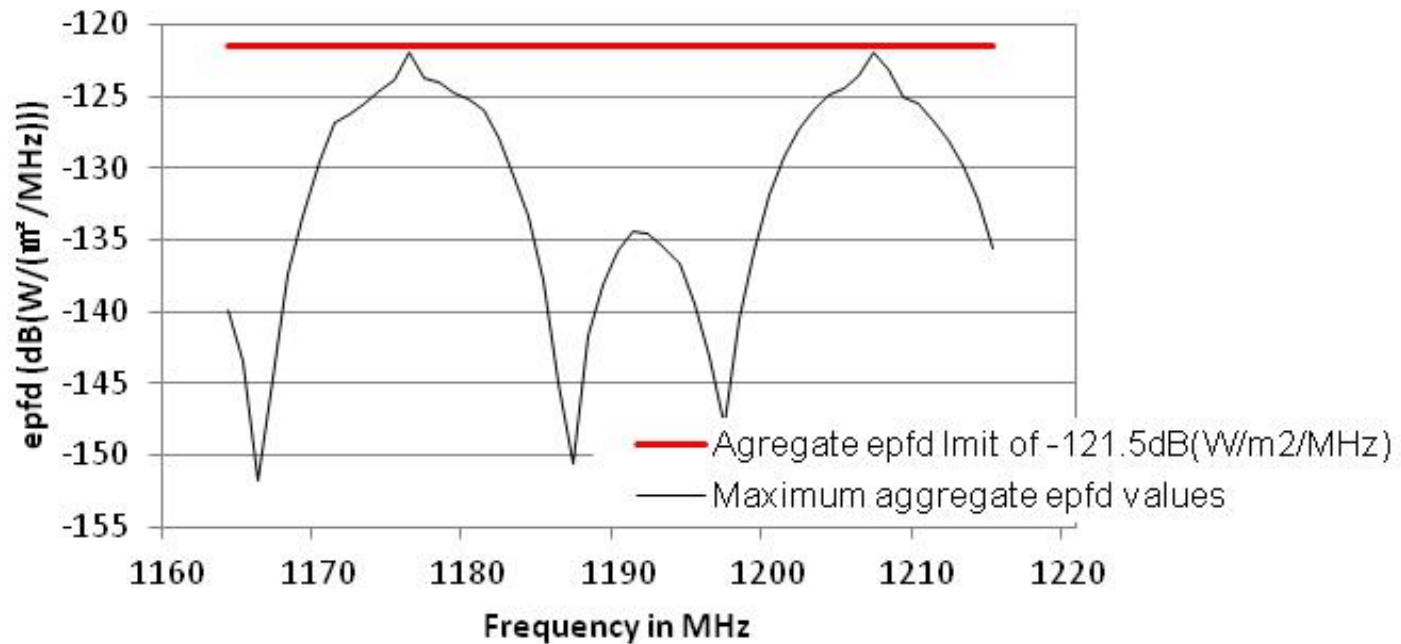
3 - INMARSAT filings represent a single network for the purposes of the Res 609 (Rev.WRC-07) consultation process.

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.

- The maximum epfd of all satellites associated with the referenced RNSS systems (presented on the 9th 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

Maximum RNSS aggregate efd values per MHz with 1°steps



- **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 current ITU-R Recommendations** is provided to all users at:

<http://www.itu.int/pub/R-REC/en>

➤ **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

- **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

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Questions ?