

**Resolution 609 (WRC-03) Consultation Meeting
26-28 September 2006**

**Record of Decisions Taken at the
Fourth Resolution 609 (WRC-03) Consultation Meeting**

(Bangalore, 26-28 September 2006)

The fourth Resolution 609 (WRC-03) Consultation Meeting was convened, pursuant to the requirements of Resolution 609 (WRC-03), at the facilities of the India Space Research Organization in Bangalore, India, from 26-28 September 2006. A list of participants is available on the Resolution 609 Forum page on the ITU web site. Approximately 61 delegates from government and industry, along with a representative of the Radiocommunication Bureau, attended the meeting. The following actions were taken:

1. The Meeting agreed to a modification to the Terms of Reference that were adopted in December 2003 to address the subjects of i) the matters relating to the distribution of submissions for Consultation Meetings and ii) the process to be followed in case of disagreement during a Consultation Meeting. A copy of the modified Terms of Reference has been posted to the Resolution 609 Forum that is maintained by the BR on the ITU web site (<http://www.itu.int/ITU-R/space/res609/>).
2. The Meeting decided that the fifth Resolution 609 (WRC-03) Consultation Meeting will be convened in XXX, for a period of three working days, tentatively in 13-15 May 2008.
3. The meeting didn't revise the format for the List of System Characteristics which is contained in Attachment 1 hereto. The following points of elaboration on the List of System Characteristics are repeated without change from prior Consultation Meetings for emphasis:
 - a. Section I-9 of Attachment 1 contains the format of the results of the epfd calculation for each RNSS individual system, in MS Excel format (see Attachment 2 at Template, Sheet 1), using 5 degree steps in latitude and longitude. For non-GSO systems, administrations should also provide the time step resolution and the number of time steps simulated.
 - b. If the calculation of the aggregate epfd of all RNSS systems is within 2 dB of the epfd limit ($-121.5 \text{ dBW/m}^2/\text{MHz}$), the results for each RNSS system under Section I-9 of Attachment 1 should be provided in 1 degree steps (see Attachment 2 at Template, Sheet 2).
 - c. The system spectral adjustment factors (SAF) provided under Section I-8 should be in MS Excel format (see Attachment 2 at Template, Sheet 3).

4. The Meeting agreed with respect to the systems that provided technical characteristics to the September 2006 Consultation Meeting that it would not be necessary for such same information to be provided anew to the Fifth Consultation Meeting.
5. The Meeting compared the results from different tools for determining i) the epfd produced by each modified or new RNSS system and ii) the aggregate epfd produced by all considered RNSS systems. After discussions regarding the assumptions and methodologies used by each tool, the meeting agreed on the specific epfd matrix to be retained for each modified or new RNSS system. With respect to the aggregate epfd produced by all RNSS systems, the results provided by the different tools were found to be in agreement to within 0.15 dB at all frequencies. The Meeting was satisfied with this degree of closeness.
6. The Meeting performed two calculations of the maximum aggregate epfd produced by all RNSS systems that provided characteristics to the September 2006 Meeting. One calculation was performed for all systems for which information was provided on or before the 15 February 2006 deadline for system characteristics submissions (see attachments 3-1 and 4-1), and a second calculation was performed for all systems for which information or updated information was provided after the 15 February 2006 deadline (see attachments 3-2 and 4-2).
7. The Meeting determined that under both of its aggregate epfd calculations, the maximum epfd of all satellites associated with the referenced RNSS systems was -125.7 dB (W/m²/MHz), i.e. 4.2 dB below the Resolution 609 limit of -121.5 dBW/m²/MHz. The meeting noted that in both cases, this result is based on the use of worst-case assumptions in terms of interference from RNSS into ARNS. For example, in the case of non-GSO RNSS systems using circular orbits, the epfd at a given latitude is considered equal for any longitude to that of the worst-case longitude.
8. The Meeting agreed on a Report to the Radiocommunication Bureau that contains the results of the calculation mentioned in Nos. 6 and 7 above, and directed that this Report be communicated to the BR in the manner contemplated in § 14 of the Terms of Reference. A copy of the Report to the Radiocommunication Bureau has been posted to the Resolution 609 Forum that is maintained by the BR on the ITU web site (<http://www.itu.int/ITU-R/space/res609/>).
9. The Meeting agreed that it is important, for the orderly operation of the Resolution 609 (WRC-03) consultation process and to ensure the achievement of accurate calculation results, that administrations providing information to Consultation Meetings comply with the deadlines established in the Terms of Reference.
10. The Meeting received for information a copy of the BR determination of compliance with the pfd criterion as per *instructs BR 2* from Resolution 609 (WRC-03). After some discussion, the Meeting noted the document.
11. The Meeting expressed its gratitude to the India Space Research Organization for hosting the Meeting and providing extraordinary hospitality to the participants.

List of Attachments

Attachment 1 (Word document) – input format for RNSS system characteristics.

Attachment 2 (Excel spreadsheet):

- Sheet 1. Template for new section I-9 of Attachment 1, latitude/longitude format for individual system epfd calculation results (5° steps).
- Sheet 2. Template for new section I-9 of Attachment 1, longitude/latitude (note orientation change) format for individual system epfd calculation results (1° steps).
- Sheet 3. Template for section I-8 of Attachment 1, spectral adjustment factors (SAF) relative to the worst 1MHz.

Attachment 3 (Word document):

- Attachment 3-1 : RNSS System Characteristics provided before the 15 February 2006 submission deadline
- Attachment 3-2 : RNSS System Characteristics provided after the 15 February 2006 submission deadline

Attachment 4 (Excel spreadsheet):

- Attachment 4-1 : Simulated per-system epfd of RNSS systems with characteristics provided before the 15 February 2006 submission deadline
- Attachment 4-2 : Simulated per-system epfd of RNSS systems with characteristics provided after the 15 February 2006 submission deadline

ATTACHMENT 1

List of RNSS system characteristics to be provided to the Consultation Meeting per Item 11 c) of the Terms of Reference

I RNSS systems characteristics

I-1 RNSS ITU publication reference

RNSS network name	BR Network ID	ITU Publication reference	IFIC
		AR11/A/...	
		API/A/...	
		AR11/C/...	
		CR/C/...	

I-2 Non-GSO satellite system constellation parameters

N : number of space stations of the non-GSO system

K : number of orbital planes

h : satellite altitude above the Earth (at apogee¹) (km)

h_P : satellite altitude above the Earth at perigee¹ (km)

I : inclination angle of the orbital plane above the Equator (degrees).

Satellite index I	RAAN $\Omega_{i,0}$ (degrees)	Argument of latitude $u_{i,0}$ (degrees)	Argument of perigee of the non-GSO system ¹ ω
1
2
...
N

¹Note: Applicable to non-GSO systems with elliptical orbit.

I-3 GSO satellite system longitude

LonGSO _{i} : longitude of each of the GSO satellites (degrees).

I-4 Maximum circular orbit non-GSO space station pfd versus the elevation angle at 40,000 feet above the Earth’s surface (worst 1 MHz)

Elevation angle (each 1°)	Pfd (dB(W/(m ² /MHz)))
-4	pfd (-4°)
-3	pfd (-3°)
...	...
...	...
90	pfd (90°)

I-5 GSO space station maximum pfd versus latitude and longitude at 40,000 feet above the Earth’s surface (worst 1 MHz)

Longitude (each 5°)*	0	5	...	360
Latitude (each 5°)*	Maximum pfd dB(W/m ²) in worst 1 MHz			
-90	pfd (0, -90)	...	...	...
-85	...	...	...	...
...
...
90	...	...	...	pfd (360, 90)

* According to the Record of Decisions of the Munich meeting, there may be a need to make these determinations in 1 degree increments.

I-6 Maximum off-axis EIRP density for non-GSO space stations with steerable beams, and antenna pointing information (worst 1MHz)

For non-GSO systems with steerable beams, the following information is needed in order to calculate the epfd matrix:

- a) Satellite antenna pointing direction and other operational information to be used in calculating epfd values.
- b) Off-axis EIRP density:

Off-axis Angle (each 1°)*	EIRP density (dBW in worst 1MHz)
0	Eirp (0°)
1	Eirp (1°)
...	...

* Off-axis values for smaller separation angles should be given to support the 5 degree or 1 degree calculations, as appropriate.

I-7 Frequency/Satellite Matrix

For non-GSO constellations where each satellite transmits different signals and/or at different central frequencies,

<u>Satellite index</u> <u>I</u>	<u>Transmitted Signal</u> <u>Central</u> <u>Frequency (MHz)</u>	<u>Attenuation of</u> <u>transmitted signal in</u> <u>worst 1 MHz (dB)</u>
<u>1</u>		
<u>⋮</u>		
<u>N</u>		

I-8 GSO/non-GSO satellite system spectrum

The level of spectrum emission in each 1 MHz relative to the spectrum value at the worst 1 MHz of the whole band (1 164-1 215 MHz) is provided below as the Spectral Adjustment Factor (SAF) in dB.

Normalised Signal Power Spectrum

Center Frequency (MHz)	SAF (dB)	Center Frequency (MHz)	SAF (dB)	Center Frequency (MHz)	SAF (dB)	Center Frequency (MHz)	SAF (dB)
1164		1177		1190		1203	
1165		1178		1191		1204	
1166		1179		1192		1205	
1167		1180		1193		1206	
1168		1181		1194		1207	
1169		1182		1195		1208	
1170		1183		1196		1209	
1171		1184		1197		1210	
1172		1185		1198		1211	
1173		1186		1199		1212	
1174		1187		1200		1213	
1175		1188		1201		1214	
1176		1189		1202		1215	

I-9 Results of the epfd calculation for an individual system in the worst 1 MHz of the 1 164-1 215 MHz band

Longitude (each 5°) ²	0	5°	...	360
Latitude (each 5°) ²	Maximum epfd dB(W/m ²) in worst 1 MHz			
-90	Epfd (0, -90)	...	...	...
-85	...	...	...	...
...
...
90	...	...	...	epfd (360, 90)

Additional simulation data for non-GSO systems only:

Time step (sec)	
Number of time steps	

II. Technical Contact Person

Name:
Tel./Fax:
E-mail Address:

² See Record of 14-16 June 2005 Consultation Meeting. According to the Record of Decisions, there may be a need to make these determinations in 1 degree increments.

ATTACHMENT 2

ATTACHMENT 3

ATTACHEMENT 3.1

RNSS System Characteristics provided before the 15 February 2006 submission deadline

ATTACHEMENT 3.2

RNSS System Characteristics provided after the 15 February 2006 submission deadline

ATTACHMENT 4

ATTACHEMENT 4.1

Simulated per-system epfd of RNSS systems with characteristics provided before the 15 February 2006 submission deadline

ATTACHEMENT 4.2

Simulated per-system epfd of RNSS systems with characteristics provided after the 15 February 2006 submission deadline