

**Resolution 609 (WRC-03) Consultation Meeting  
2-4 June 2004**

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

**(Ottawa, 2-4 June 2004)**

The second Resolution 609 (WRC-03) Consultation Meeting was convened, pursuant to the requirements of Resolution 609 (WRC-03), at the facilities of the Telesat Canada in Ottawa, Canada, from 2-4 June 2004. A list of participants is available on the Resolution 609 Forum page on the ITU web site. Approximately 55 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 the preparation of the Report to the Radiocommunication Bureau, treatment at future Consultation Meetings of system characteristics and commitments pursuant to the Annex to Resolution 609 (WRC-03) that had been supplied pursuant to §§ 11 b) and c) to a previous Consultation Meeting, and the matters relating to the distribution of submissions for Consultation Meetings. 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 third Resolution 609 (WRC-03) Consultation Meeting will be convened in Brussels, Belgium, for a period of three working days, tentatively in June 2005.
3. The Meeting agreed to a modification to the format for the provision of RNSS system characteristics to the Consultation Meeting. The revised format is contained in Attachment 1 hereto. The meeting agreed that under the revised format, as under the format adopted initially in December 2003, each administration should also provide a new Section I-9 (see Attachment 1) containing the result of the epfd calculation for each RNSS individual system, available 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.
  - a. It was agreed that if the calculation of the aggregate epfd of all RNSS systems is within 2 dB of the epfd limit ( $-121.5$  dBW/m<sup>2</sup>/MHz), the results for each RNSS system should be provided in 1 degree steps (see Attachment 2 at Template, Sheet 2).
  - b. 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 June 2004 Consultation Meeting that it would not be necessary for such same information to be provided anew to the Third Consultation Meeting. Instead, where revisions were necessitated by the revision to the characteristics format referred to in No. 3 above, the Meeting agreed that such revisions are adequately reflected in the system characteristics statements for the submitting systems that are included in Attachment 3 hereto.
5. The Meeting compared the results from five different tools for determining the aggregate epdf produced by all considered RNSS systems. These tools were found to be in agreement to within 0.15 dB at all frequencies. The Meeting was satisfied with this degree of closeness of the results of calculations performed using the five calculation tools.
6. The Meeting performed two calculations of the maximum aggregate epdf produced by all RNSS systems that provided characteristics to the June 2004 Meeting. One calculation was performed for all systems for which information was provided on or before the 2 February 2004 deadline for system characteristics submissions, and a second calculation was performed for all systems for which information was provided on or before the 2 February 2004 deadline, and for several systems for which information was submitted after the 2 February 2004 deadline.
7. The Meeting determined that under both of its aggregate epdf calculations, the maximum epdf of all satellites associated with the referenced RNSS systems was  $-125.7$  dB (W/m<sup>2</sup>/MHz), i.e. 4.2 dB below the Resolution 609 limit of  $-121.5$  dBW/m<sup>2</sup>/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 epdf 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 modified 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. Discussion took place regarding the requirement to comply with the provisional aggregate pfd limit ( $-115$  dB(W/m<sup>2</sup>/MHz)) in No. 5.328A (WRC-2000) of the Radio Regulations, which was put into place by WRC-2000. Although not within the terms of reference of the Resolution 609 Consultation Meeting, the issue is closely related to the subject of epdf determination, as

WRC-03 replaced the provisional aggregate pfd limit with the epfd criterion. GSO RNSS networks which requested coordination before the last day of WRC-03 were required to provide a value of the aggregate pfd with the coordination information. The question was raised as to whether there remained a need for RNSS networks to demonstrate compliance with the provisional aggregate pfd limit. For coordination requests and notifications made after 1 January 2004, the Bureau explained that with the changes to Appendix 4 made by WRC-03, there is now a requirement to provide a commitment of compliance with the per-satellite pfd level (item A.17.a) and no requirement for any further commitment regarding the provisional aggregate pfd limit. Furthermore, the Bureau explained that administrations which gave a commitment prior to the end of WRC-03 that they would comply with the provisional aggregate pfd limit would not be required to take any further action with regard to that limit. The interested participants were appreciative of the opportunity to meet with the Bureau and receive this useful clarification with regard to this matter.

12. The Meeting expressed its gratitude to Telesat Canada 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) RNSS system characteristics using revised input format

Attachment 4 (Excel spreadsheet): Simulated per-system epfd

## 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 apogee<sup>1</sup>) (km)

$h_p$ : satellite altitude above the Earth at perigee<sup>1</sup> (km)

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

Satellite index $I$	RAAN $\Omega_{i0}$ (degrees)	Argument of latitude $u_{i0}$ (degrees)	Argument of perigee of the non-GSO system <sup>1</sup> $\omega$
1	...		...
2	...		...
...	...		...
$N$	...		...

<sup>1</sup>Note: Applicable to non-GSO systems with elliptical orbit.

##### **I-3 GSO satellite system longitude**

LonGSO <sub>$i$</sub> : 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 <sup>2</sup> /MHz)))
-4	pfd (-4°)
-3	pfd (-3°)
...	...
...	...
90	pfd (90°)

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

Longitude (each 1°)	0	1	...	360
Latitude (each 1°)	Maximum pfd dB(W/m <sup>2</sup> ) in worst 1 MHz			
-90	pfd (0, -90)	...	...	...
-89	...	...	...	...
...	...	...	...	...
...	...	...	...	...
90	...	...	...	pfd (360, 90)

**I-6 Maximum elliptical orbit non-GSO space station off-axis EIRP density and additional satellite antenna pointing information (worst 1MHz)**

For elliptical orbit non-GSO systems, 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°)
...	...

### **I-7 Frequency/Satellite Matrix**

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

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

### **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**

<b>Center Frequency (MHz)</b>	<b>SAF (dB)</b>	<b>Center Frequency (MHz)</b>	<b>SAF (dB)</b>	<b>Center Frequency (MHz)</b>	<b>SAF (dB)</b>	<b>Center Frequency (MHz)</b>	<b>SAF (dB)</b>
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°) <sup>2</sup>	0	5°	...	360
Latitude (each 5°) <sup>2</sup>	Maximum epfd dB(W/m <sup>2</sup> ) 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:**

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<sup>2</sup> See Record of 2-4 June 2004 Consultation Meeting.

**ATTACHMENT 2**



Microsoft Excel  
Worksheet



**ATTACHMENT 3**



"Attachment3 on  
RNSS systems input c

## ATTACHMENT 4



"Att4 - Per-system  
epfd matrix (5°).xls"