

RECOMMENDATION ITU-R S.1328-4

Satellite system characteristics to be considered in frequency sharing analyses within the fixed-satellite service

(Questions ITU-R 205/4, ITU-R 206/4 and ITU-R 231/4)

(1997-1999-2000-2001-2002)

The ITU Radiocommunication Assembly,

considering

- a) that a database containing the characteristics of typical systems in the fixed-satellite service (FSS) is needed for use in frequency sharing studies within ITU-R;
- b) that to be most readily usable such a database should be in the same format for all systems and should be available in electronic form;
- c) that the World Radiocommunication Conference (Geneva, 1995) (WRC-95), in Resolutions 116 (WRC-95) and 117 (WRC-95), allocated frequencies to the FSS for use by feeder links of non-GSO MSS systems;
- d) that WRC-95, in Resolution 118 (WRC-95), provided for parts of the 30/20 GHz bands in the FSS to be used by the non-GSO FSS without the restrictions of Radio Regulations (RR) No. S22.2;
- e) that WRC-95, in Resolution 120 (WRC-95), provided for parts of the 30/20 GHz band in the FSS to be shared with feeder links of the non-GSO MSS;
- f) that WRC-95, in Resolution 121 (WRC-95), advocated the development of interference criteria and methodology for sharing between feeder links of the non-GSO MSS and networks of the GSO FSS;
- g) that the World Radiocommunication Conference (Geneva, 1997) (WRC-97) in Resolution 130 (WRC-97), advocated the development of interference criteria and methodology for sharing between non-GSO FSS and networks of the GSO FSS,

recommends

1 that representative technical characteristics of existing and planned satellite systems be compiled in an electronic databank available from the Radiocommunication Bureau (BR) for the purpose of conducting sharing studies in Radiocommunication Study Groups. Details of the tables in the databank are contained in Annex 1, as *pro forma* to be used for the submission of technical characteristics (see Notes 1 and 2). Information on validation of the data, and descriptions of the parameters requested are given in Annexes 2 and 3;

2 that, in the planning and development of new FSS networks, both GSO and non-GSO, and feeder links for MSS systems affecting the FSS allocations, the representative technical characteristics of existing and planned satellite systems in the databank be taken into consideration;

3 that, in studies pertaining to the development of sharing criteria between satellite systems, the representative technical characteristics of existing and planned systems in the databank may be used in interference analyses;

4 that administrations planning modifications to these systems or proposing future satellite system networks in FSS bands are urged to submit their representative technical characteristics to the ITU-R using the *pro forma* in Annex 1 to update this databank (see also Annexes 2 and 3 and Notes 3, 4, 5 and 6).

NOTE 1 – The data in the databank are to be regarded as representative examples of system technical characteristics, to be used only for sharing studies within Radiocommunication Study Groups and not as a basis for coordination between satellite networks. The databank should not be interpreted as a comprehensive source of data on the number of satellite systems or their particular characteristics, and is thus not suitable for statistical studies or evaluations.

NOTE 2 – Additional information (textual and/or graphical) which cannot readily be incorporated into the spreadsheet format may be appended as a text file.

NOTE 3 – The existing information annexed hitherto to this Recommendation will be held by BR until one year after approval of this revision to the Recommendation. Administrations are requested to resubmit existing technical characteristics using the *pro forma* in Annex 1.

NOTE 4 – Only data submitted in response to this Recommendation shall be included in the databank.

NOTE 5 – In order to ensure rapid and error-free incorporation into the databank, administrations are strongly encouraged to submit data in electronic format (preferably Microsoft EXCEL).

NOTE 6 – An explanation of the requested fields in the databank is included in Annex 2 of this Recommendation, while Annex 3 gives an explanation of a simple check on the validity of the input data which is included in the spreadsheets. This validity check is not intended as a filter to eliminate data from the databank, but serves only to minimize the risk of inaccurate entry of the data.

ANNEX 1

Tables for submission of satellite system characteristics

This Annex includes *pro forma* tables for the submission of new and revised data for the electronic databank of satellite system characteristics. Data should be submitted to the BR for consideration by Working Party 4A on paper and additionally in spreadsheet format using these tables, blank copies of which can be downloaded from the Working Party 4A web pages at: www.itu.int/ITU-R/study-groups/sg/sg4/info/index.html

Additional supporting information which cannot readily be incorporated into the spreadsheet may be appended in the form of a text file, to be associated with the spreadsheet, and clearly referenced therein.

TABLE 1

Representative characteristics of GSO satellite systems

1		GSO SYSTEMS	UNITS	Example (a)	Example (b)	Add as many columns as required
2	1	SYSTEM				
3	1.1	Information provider		<i>Xxland</i>	<i>Yyland</i>	
4	1.2	Space station name in ITU filing		<i>XX-1</i>	<i>YY-4</i>	
5	1.3	Carrier designation		<i>LDR-1</i>	<i>SCPC</i>	
6	2	SATELLITE PARAMETERS				
7	2.1	Orbital position	deg. East	<i>201</i>	<i>158</i>	
8	2.2	Type of transponder (<i>Transp</i> -transparent; <i>Remod</i> -remodulating)		<i>Remod</i>	<i>Transp</i>	
9	3	CARRIER PARAMETERS				
10	3.1	Uplink type (i.e. maximum, minimum or typical e.i.r.p. and C/I levels)	See Note	<i>Typical</i>	<i>Typical</i>	
11	3.2	Downlink type (i.e. maximum, minimum or typical e.i.r.p. and C/I levels)	See Note	<i>Minimum</i>	<i>Typical</i>	
12	3.3	Centre frequency of uplink band	GHz	<i>29.75</i>	<i>28.4</i>	
13	3.4	Uplink polarization (RHC, LHC, VL, HL or offset linear)		<i>RHC</i>	<i>RHC (RR No. 1.145)</i>	
14	3.5	Centre frequency of downlink band	GHz	<i>19.95</i>	<i>18.6</i>	
15	3.6	Downlink polarization (RHC, LHC, VL, HL or offset linear)		<i>LHC</i>	<i>RHC (RR No. 1.145)</i>	
16	3.7	Access type (end-to-end if transparent transponder, on downlink if remodulating transponder)		<i>TDM</i>	<i>FDMA</i>	
17	3.8	Uplink access type for carriers using remodulating transponders		<i>TDMA</i>	<i>N/A</i>	
18	3.9	Modulation type (e.g. FM, BPSK, QPSK etc.) (end-to-end if transparent transponder, on downlink if remodulating transponder)		<i>QPSK</i>	<i>QPSK</i>	
19	3.10	Uplink modulation type for carriers using remodulating transponders		<i>QPSK</i>	<i>N/A</i>	
20	3.11	Uplink occupied bandwidth per carrier	MHz	<i>1.7</i>	<i>0.034</i>	
21	3.12	Downlink occupied bandwidth per carrier	MHz	<i>81</i>	<i>0.034</i>	

22	4	SPACE STATION PARAMETERS				
23	4.1	Peak receive antenna gain	dBi	47	43.8	
24	4.2	Receive antenna gain in the direction of the transmit earth station	dBi	45.7	42.7	
25	4.3	Receive antenna gain pattern (e.g. Rec. ITU-R S.672, CR/58 data file, etc.)		S.672 $L_s = -20$ dB	Shaped	
26	4.4	Satellite receive noise temperature	K	700	1202	
27	4.5	Transmit e.i.r.p. per carrier in the direction of the receive earth station	dBW	57	15.8	
28	4.6	Peak transmit antenna gain	dBi	50.5	38.8	
29	4.7	Transmit antenna gain in the direction of the receive earth station	dBi	49	38.8	
30	4.8	Transmit antenna gain pattern (e.g. Rec. ITU-R S.672, CR/58 data file, etc.)		S.672 $L_s = -20$ dB	Shaped	
31	4.9	Transmission gain of transparent transponder link, as defined in RR App. 8	dB	N/A	-8.9	
32	4.10	Automatic level control range of transponder (0 if none)	dB	0	0	
33	5	EARTH STATION PARAMETERS				
34	5.1	On-axis e.i.r.p. per carrier from transmit earth station	dBW	41.9	38.8	
35	5.2	Peak transmit antenna gain	dBi	48	64.6	
36	5.3	Transmit antenna gain pattern (e.g. Rec. ITU-R S.465, Rec. ITU-R S.580, etc.)		S.580	S.580	
37	5.4	Uplink power control range (>0, 0 dB if none)	dB	12	10	
38	5.5	Power control step-size (if power control used)	dB	0.1	<1	
39	5.6	Receive antenna -3 dB beamwidth	deg.	1	0.55	
40	5.7	Peak receive antenna gain	dBi	44.5	53.1	
41	5.8	Receive antenna gain pattern (e.g. Rec. ITU-R S.465, Rec. ITU-R S.580, etc.)		S.465	S.580	
42	5.9	Noise temperature of receive earth station	K	250	250	
43	5.10	Elevation angle of transmit earth station towards the satellite	deg.	30	40	
44	5.11	Elevation angle of receive earth station towards the satellite	deg.	20	33	
45	6	INTERFERENCE PARAMETERS				
46	6.1	Uplink C/I from internal sources (e.g. intermod, xpol, multi-beam frequency reuse, etc.)	dB	15.4	100	
47	6.2	Uplink C/I from external sources (i.e. terrestrial and other satellites)	dB	15	23.5	

48	6.3	Downlink C/I from internal sources (e.g. intermod, xpol, multi-beam frequency reuse, adjacent carrier, etc.)	dB	18.4	20	
49	6.4	Downlink C/I from external sources (i.e. terrestrial and other satellites)	dB	16.8	21.4	
50	7	NETWORK PERFORMANCE REQUIREMENTS				
51	7(a)	Transparent or remodulating transponder – Performance at input to demodulator in receive earth station				
52	7.1	Long-term (clear-sky) C/(N+I) ratio	dB	12.1	13.31	
53	7.2	Short-term C/(N+I) ratio (i.e. unavailability threshold)	dB	6.8	5.9	
54	7.3	Percentage of time for which short-term C/(N+I) should be exceeded	%	99.5	99.88	
55	7.4	C/(N+I) at which loss of demodulator synchronization occurs	dB	5	5.3	
56	7(b)	Remodulating transponder only – Performance at input to demodulator in satellite receiver				
57	7.5	Long-term (clear-sky) C/(N+I) ratio	dB	8.5	N/A	
58	7.6	Short-term C/(N+I) ratio (i.e. unavailability threshold)	dB	7.6	N/A	
59	7.7	Percentage of time for which short-term C/(N+I) should be exceeded	%	99.5	N/A	
60	7.8	Curve linking C/N to BER				
61	8	ADDITIONAL NOTES				
62		Additional information may be attached in text files, if required				
63		NOTE – If a given carrier may be operated within a range of e.i.r.p. levels on the uplink and/or downlink, separate columns should be included giving the maximum, minimum and typical e.i.r.p. levels and the corresponding C/I ratios. If the performance requirements differ for e.i.r.p. levels within the range, the appropriate C/(N+I) thresholds and time percentages should be shown.				
64	9	DERIVED PARAMETERS				
65	9.1	Uplink path loss	dB	–213.6	–213.1	
66	9.2	Satellite receive input power	dBW	–126.0	–131.6	
67	9.3	Satellite receive noise power	dBW	–137.8	–152.5	
68	9.4	Derived uplink C/N	dB	11.8	20.9	
69	9.5	Uplink C/I	dB	12.2	23.5	
70	9.6	Derived uplink C/(N+I)	dB	9.0	19.0	
71	9.7	Downlink path loss	dB	–210.4	–209.5	
72	9.8	Earth station receive input power	dBW	–108.9	–140.6	

73	9.9	Earth station receive noise power	dBW	−125.5	−159.3	
74	9.10	Derived downlink C/N	dB	16.7	18.7	
75	9.11	Downlink C/I	dB	14.5	17.6	
76	9.12	Derived downlink C/(N+I)	dB	12.4	15.1	
77	9(a)	Transparent transponder systems				
78	9.13	Derived total (end-to-end) C/(N+I) in clear-sky conditions	dB	–	13.6	
79	9.14	Required long-term (clear-sky) C/(N+I) ratio	dB	–	13.3	
80	9.15	End-to-end clear-sky margin	dB	–	0.3	
81	9(b)	Remodulating transponder systems				
82	9.16	Derived uplink C/(N+I) in clear-sky conditions	dB	9.0	–	
83	9.17	Required long-term (clear sky) uplink C/(N+I)	dB	8.5	–	
84	9.18	Uplink clear-sky margin	dB	0.5	–	
85	9.19	Derived downlink C/(N+I) in clear-sky conditions	dB	12.4	–	
86	9.20	Required long-term (clear sky) downlink C/(N+I)	dB	12.1	–	
87	9.21	Downlink clear-sky margin	dB	0.3	–	

TABLE 2

Representative characteristics of non-GSO satellite systems

1		NON-GSO SYSTEMS	UNITS	Example (a)	Example (b)	Add as many columns as required
2	1	SYSTEM				
3	1.1	Information provider		<i>Xxland</i>	<i>Yyland</i>	
4	1.2	Space station name in ITU filing		<i>LEO-XX</i>	<i>HEO-YY</i>	
5	1.3	Carrier designation		<i>SMS-X1</i>	<i>IDS-Y</i>	
6	2	ORBITAL PARAMETERS				
7	2.1	Shape of orbit: circular or elliptical		<i>circular</i>	<i>elliptical</i>	
8	2.2	Orbit radius (circular orbit) or semi-major axis (elliptical orbit)	km	<i>7 850</i>	<i>41 500</i>	
9	2.3	Inclination angle	deg	<i>54</i>	<i>63</i>	
10	2.4	Eccentricity for elliptical orbits		<i>N/A</i>	<i>0.66</i>	
11	2.5	Argument of perigee for elliptical orbits		<i>N/A</i>	<i>270</i>	
12	2.6	If repeating ground track, repeat period	h	<i>660</i>	<i>8</i>	

13	2.7	Do all satellites follow the same ground track? (Yes or No)		No	No	
14	2.8	Number of orbit planes		16	3	
15	2.9	Number of satellites per plane		4	4	
16	2.10	Longitude of ascending node of first plane (if repeating ground track)	deg. East	0	357.2	
17	2.11	True anomaly of first satellite in first plane	deg.	0	36	
18	2.12	Separation between adjacent satellites in each plane	deg.	30	N/A	
19	2.13	Satellite phasing between planes	deg.	90	120	
20	3	CARRIER PARAMETERS				
21	3.1	Centre frequency of uplink band	GHz	29.5	17.8	
22	3.2	Uplink polarization (RHC, LHC, VL, HL or offset linear)		RHC	RHC	
23	3.3	Centre frequency of downlink band	GHz	19.95	12.6	
24	3.4	Downlink polarization (RHC, LHC, VL, HL or offset linear)		LHC	LHC	
25	3.5	Access type (e.g. TDMA, CDMA, FDMA, etc.) (end-to-end if transparent transponder, on downlink if remodulating transponder)		TDMA	FDMA/ TDMA	
26	3.6	Uplink access type for carriers using remodulating transponders		TDMA	N/A	
27	3.7	Modulation type (e.g. FM, QPSK, BPSK etc.) (end-to-end if transparent transponder, on downlink if remodulating transponder)		QPSK	QPSK	
28	3.8	Uplink modulation type for carriers using remodulating transponders		QPSK	N/A	
29	3.9	Uplink occupied bandwidth per carrier	MHz	2.4	24	
30	3.10	Downlink occupied bandwidth per carrier	MHz	81	24	
31	4	SPACE STATION PARAMETERS				
32	4.1	Type of transponder (<i>Transp</i> -transparent; <i>Remod</i> -remodulating)		Remod	Transp	
33	4.2	Transponder output bandwidth	MHz	10	24	
34	4.3	Number of transmit beams per satellite		16	10	
35	4.4	Number of receive beams per satellite		16	10	
36	4.5	Downlink cell shape/diagonal length	km	Hexagon 750	Hexagon 1 818	
37	4.6	Downlink cell frequency reuse distance	km	1 675	3 150	
38	4.7	Down-beam pointing method (tracking or fixed relative to sub-satellite point)		Tracking	Sticky beams	

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