



Recommendation ITU-R M.1184-3
(01/2018)

**Technical characteristics of mobile satellite
systems in the frequency bands below
3 GHz for use in developing criteria for
sharing between the mobile-satellite
service (MSS) and other services**

M Series
**Mobile, radiodetermination, amateur
and related satellite services**



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Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

Policy on Intellectual Property Right (IPR)

ITU-R policy on IPR is described in the Common Patent Policy for ITU-T/ITU-R/ISO/IEC referenced in Annex 1 of Resolution ITU-R 1. Forms to be used for the submission of patent statements and licensing declarations by patent holders are available from <http://www.itu.int/ITU-R/go/patents/en> where the Guidelines for Implementation of the Common Patent Policy for ITU-T/ITU-R/ISO/IEC and the ITU-R patent information database can also be found.

Series of ITU-R Recommendations

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Series	Title
BO	Satellite delivery
BR	Recording for production, archival and play-out; film for television
BS	Broadcasting service (sound)
BT	Broadcasting service (television)
F	Fixed service
M	Mobile, radiodetermination, amateur and related satellite services
P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

Electronic Publication
Geneva, 2018

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RECOMMENDATION ITU-R M.1184-3

Technical characteristics of mobile satellite systems in the frequency bands below 3 GHz for use in developing criteria for sharing between the mobile-satellite service (MSS) and other services

(Question ITU-R 201-1/4)

(1995-2000-2003-2018)

The ITU Radiocommunication Assembly,

considering

- a) that, while some MSS system parameters are still under development, a summary of representative technical characteristics of MSS systems is useful for conducting sharing studies and for development of appropriate sharing criteria by the ITU-R;
- b) that MSS system designs will evolve and new MSS systems may be proposed and therefore representative characteristics should be maintained as an on-going activity,

noting

- a) that the necessary frequency sharing studies require the involvement of several Radiocommunication Study Groups;
- b) that the technical parameters in this Recommendation are referenced and used in several other ITU-R Recommendations;
- c) that MSS networks and the associated lists of the technical parameters in this Recommendation have been chosen specifically for use in modelling frequency sharing and interference,

recommends

- 1 that the representative technical characteristics for non-GSO MSS systems, as given in Annexes 1 and 2, should be considered by the ITU-R in conducting sharing studies and in the development of Recommendations on sharing criteria for non-GSO MSS systems;
- 2 that the representative technical characteristics for geostationary MSS systems given in Annex 1 should be considered for conducting sharing studies and in the development of ITU-R Recommendations on sharing criteria for geostationary MSS systems;
- 3 that the characteristics given in Annexes 1 and 2 should be updated periodically to reflect changes in the MSS example system designs and to incorporate new MSS system examples as they are proposed and as their designs mature.

Annex 1

Characteristics of representative 1-3 GHz MSS networks

1 Satellite orbits

Currently, the GSO is being used for the MSS. Some proposed mobile-satellite systems plan to use non-GSO orbits. Suitable orbits are determined by coverage requirements, service considerations and frequency sharing, as well as other considerations.

2 Global and regional/national GSO systems

Current Inmarsat and Russian Volna satellites utilize Earth-coverage antennas to provide near-global coverage from the GSO. The Russian systems are similar to those of Inmarsat systems, the characteristics of which are presented in Table 2. Several administrations are implementing regional/national GSO mobile-satellite systems to provide aeronautical, land and maritime services at 1.6/1.5 GHz. In addition to the above systems at 1.6/1.5 GHz, Japan is planning to put into operation a GSO mobile-satellite system in the 2.6/2.5 GHz bands, and China has deployed its mobile-satellite system to provide regional service in the 1.6/2.5 GHz bands.

The future generation of Inmarsat and Russian satellites and the planned regional and national systems will use spot beam to provide greater spectrum efficiency and conserve transmitted power of the satellite and mobile earth station. China is planning to deploy the future generation of mobile-satellite system to provide its global service in the 1.6/2.5 GHz bands.

2.1 Maritime mobile-satellite service

The Inmarsat Fleet Broadband (FBB) system which is based on IMT-2000 standards provides broadband data and voice, simultaneously, as well as ISDN data capability through a compact antenna on a global basis. The Inmarsat-C system provides store and forward data and telex using small, low cost equipment.

2.2 Aeronautical mobile-satellite service

The International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs) for aeronautical mobile-satellite (R) service (AMS(R)S), airborne equipment have been published in Annex 10 to the Convention on International Civil Aviation. The SARPs include a requirement for priority and pre-emption for safety communications over all other communications. All systems providing AMS(R)S services to the international civil aviation community have to conform with the applicable ICAO SARPs.

In summary, the aeronautical satellite communication systems will have to take into account the priority needs for safe operation of aircraft and the avionics will have to satisfy the severe requirements of aircraft environments.

2.3 Land mobile-satellite service

The land mobile-satellite service (LMSS) has proven to be an effective means for providing dependable communications in remote and sparsely populated areas, either as extensions of terrestrial VHF and UHF networks or as replacements for HF networks. Worldwide roaming capability is a mandatory function of International Mobile Telecommunications-2000 (IMT-2000) and the satellite component defined in Recommendations ITU-R M.687 and ITU-R M.818 is one of the important components that encourage the IMT-2000 capability. The interworking of the mobile-satellite system

with the terrestrial system can encourage user convenience within not only IMT-2000 but also general LMSS.

2.4 Distress and safety service

Tables 1 to 3 present representative technical characteristics of service links for selected MSS networks that utilize space stations in GSOs.

TABLE 1a

Technical characteristics of GSO mobile-satellite systems (service return link)

System Parameter	GSO							
	A	B	C	D	E	F	G	H
<i>Polarization</i>								
Feeder link	Linear	Linear	Linear	Linear	Circular	Linear	Circular	Circular
Service link	RHCP	RHCP	RHCP	RHCP	RHCP	Circular	LHCP	LHCP
Direction of transmission	Earth-to-space	Earth-to-space	Earth-to-space	Earth-to-space	Earth-to-space	Earth-to-space	Earth-to-space	Earth-to-space
<i>Frequency bands</i>								
Feeder link (GHz)	5	12	11	11	4	4, 11, 12	4	4
Service link (GHz)	1.6	1.6	1.6	2.0	2.0	1.6	1.6	1.6
<i>Orbit</i>								
Altitude (km)	36 000	36 000	36 000	36 000	36 000	36 000	36 000	36 000
Satellite separation (degrees)	120	78	Not applicable	Not applicable	*	Not applicable	20 to 30	20 to 30
Number of satellites	3	2	1	1	4 to 6	1 or 2	5 to 8	5 to 8
Orbital planes	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Inclination angle	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
<i>Satellite antennas</i>								
Number of beams (service link)	180	50	7	28	250	Over 200	2	7
Beam size (degrees)	1	1	6	2	*	0.7	7	6
Satellite coverage area	Global	Regional	North America, Alaska, Hawaii	North America, Alaska, Hawaii	Global	Regional	Regional	Regional
Average beam side lobes (dB)	*	−25	−25	−25	*	−20	−20	−20
Beam frequency reuse	5	5	1.3	2	*	1 to 30	*	*

TABLE 1a (end)

System Parameter	GSO							
	A	B	C	D	E	F	G	H
<i>Link characteristics</i>								
Nominal user e.i.r.p. (dBW)	6	0.5	12.5	10.9	−1 to +8	−7.5 to 3.5	5 to 12	3 to 10
EOC satellite G/T (dB(K ^{−1}))	10	11	3.0	9.8	11	15.7	−3	−1
<i>Transmission parameters</i>								
Modulation	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	BPSK	BPSK
Coding	FEC	FEC	*	*	FEC	FEC	FEC	FEC
Access scheme	CDMA	FDMA	FDMA	FDMA	FDMA/ TDMA	FDMA/ TDMA	CDMA	CDMA
Duplex scheme	*	FDD	FDD	FDD	FDD	FDD	FULL	FULL
Frame length	Not applicable	Not applicable	Not applicable	Not applicable	*	40	20 to 200	20 to 1100
Burst rate (kbit/s)	Not applicable	Not applicable	Not applicable	Not applicable	32	46.8	8	4 to 16
Chip rate (Mchip/s)	8.33	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	4.1	4.1
Voice activity factor	0.4	0.4	0.4	0.4	0.4	0.4	Not applicable	Not applicable
RF carrier spacing (MHz)	*	0.006	0.006	0.006	*	0.03125	Not applicable	Not applicable
RF channel spacing (MHz)	*	0.006	0.006	0.006	*	0.03125	Not applicable	Not applicable
Modulation bandwidth (MHz)	*	0.0045	0.0047	0.0047	*	0.0234	8.2	8.2
<i>Required E_b/N_0 (dB)</i>								
Voice	2.5	9.0	9.0	9.0	4.0	3.5	Not applicable	Not applicable
Data	4.1	9.0	9.0	9.0	*	5.5 to 7.0	7.0	7.0
Maximum MES antenna discrimination towards the horizon (dBi)	*	7	7	7	1.0	7 to 19	*	*

NOTE 1 – See the legend for special terms and symbols at the end of Table 4.