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Spectrum Management and Telecommunications

Radio Standards Specification

Mobile Earth Stations (MESs) and Ancillary Terrestrial Component (ATC) Equipment Operating in the Mobile Satellite Service (MSS) Bands

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Canada

Preface

Radio Standards Specification RSS-170, Issue 4, *Mobile Earth Stations (MESs) and Ancillary Terrestrial Component (ATC) Equipment Operating in the Mobile-Satellite Service (MSS) Bands*, replaces RSS-170, Issue 3, dated July 2015.

The main changes are listed below:

1. Added requirements for ATC equipment operating in the band 2483.5-2495 MHz as set forth in SMSE-009-20, *Decision on Globalstar Canada's Application for Ancillary Terrestrial Component (ATC) Authority in the 2.4 GHz Band (2483.5-2500 MHz)*.

2. Updated the frequency bands for MES and ATC equipment, in Table 1 and Table 2, respectively.

3. Removed ATC equipment band 2180-2200 MHz as it is now contained in RSS-139.

4. Modernized to reflect the current Radio Standards Specification structure.

5. Made editorial changes and clarifications, as appropriate.

Inquiries may be submitted by one of the following methods:

1. Online using the General Inquiry form (in the form, select the Directorate of Regulatory Standards radio button and specify "RSS-170" in the General Inquiry field)

2. By mail to the following address:

   Innovation, Science and Economic Development Canada
   Engineering, Planning and Standards Branch
   Attention: Regulatory Standards Directorate
   235 Queen Street
   Ottawa ON K1A 0H5
   Canada

3. By email to consultationradiostandards-consultationnormesradio@ised-isde.gc.ca

Comments and suggestions for improving this standard may be submitted online using the Standard Change Request form or by mail or email to the above addresses.

All documents related to spectrum and telecommunications are available on ISED's Spectrum Management and Telecommunications website.

Issued under the authority of
the Minister of Innovation, Science and Industry

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Martin Proulx
Director General
Engineering, Planning and Standards Branch

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1. Scope

This Radio Standard Specification (RSS) sets out certification requirements of radio equipment operating in the mobile-satellite service (MSS) bands, including mobile earth stations (MESs) and ancillary terrestrial component (ATC) equipment, for the frequency bands listed in Table 1 and Table 2, respectively.

2. Purpose and Application

This RSS applies to MESs and ATC equipment, including both base stations and mobile equipment, operating in the MSS bands.

3. General requirements and references

This section sets out the general requirements and references related to this RSS.

3.1 Coming into force and transition period

This document will be in force as of the date of its publication on Innovation, Science and Economic Development Canada's (ISED) website.

However, a transition period of six (6) months from the publication date will be provided. During this transition period, applications for certification under either RSS-170 issue 3 or issue 4 will be accepted. After this period, only applications for the certification of equipment under RSS-170 issue 4 will be accepted , and equipment manufactured, imported, distributed, leased, offered for sale, or sold in Canada, shall comply with this present issue.

A copy of RSS-170, issue 3, is available upon request by email.

3.2 Certification requirements

Equipment covered by this standard is classified as Category I equipment and shall be certified. Either a technical acceptance certificate (TAC) issued by the Certification and Engineering Bureau of ISED or a certificate issued by a recognized certification body (CB) is required.

Before equipment can be certified, the applicant shall provide a declaration from the licensed satellite operator(s) that the equipment is compatible with the satellite system.

ATC mobile equipment operating in the bands 2000-2020 MHz and 2483.5-2495 MHz may be certified for either dual-mode or single-mode operation (i.e. the equipment is not required to be capable of communicating with both the mobile-satellite network and the terrestrial ATC system).

ATC mobile equipment operating in bands other than 2000-2020 MHz and 2483.5-2495 MHz shall be

certified only if it is dual-mode equipment.

For certification of ATC equipment operating in the bands 1525-1559 MHz and 1626.5-1660 MHz, please contact the department by email for more information.

3.3 Licensing requirements

Equipment covered by this standard is subject to licensing pursuant to subsection 4(1) of the *Radiocommunication Act*.

3.4 RSS-Gen compliance

Equipment being certified under this standard shall also comply with the general requirements set out in RSS-Gen, *General Requirements for Compliance of Radio Apparatus*.

3.5 Related documents

ISED documents are available on the Published documents page of the Spectrum management and telecommunications web page.

In addition to related documents specified in RSS-Gen, the following ISED documents should be consulted:

RSS-139	*Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710-1780 MHz and 2110-2200 MHz*
RP-023	*Spectrum and Licensing Policy to Permit Ancillary Terrestrial Mobile Services as Part of Mobile-Satellite Service Offerings*
SRSP-519	*Technical Requirements for the Ancillary Terrestrial Component (ATC) of Mobile-Satellite Service (MSS) Systems Operating in the Bands 2000-2020 MHz and 2180-2200 MHz*
SMSE-009-20	*Decision on Globalstar Canada's Application for Ancillary Terrestrial Component (ATC) Authority in the 2.4 GHz Band (2483.5-2500 MHz)*
SLPB-008-14	*Decision on a Policy, Technical and Licensing Framework for Mobile Satellite Service and Advanced Wireless Service (AWS-4)[1] in the Bands 2000-2020 MHz and 2180-2200 MHz*

RP – Radio Systems Policy

[1] In RSS-170, AWS-4 bands are referred to as ATC bands 2000-2020 MHz

SLPB – Decision Paper
SRSP – Standard Radio System Plan

4. Definitions

Active Antenna System (AAS): An antenna system where the amplitude and/or phase between antenna elements is dynamically adjusted resulting in an antenna pattern that varies in response to short-term changes in the radio environment. AAS may be integrated in a fixed or base station. Antenna systems used for long-term beam shaping such as fixed electrical down tilt are not considered an AAS.

Active Antenna System (AAS) base station: A base station equipment with AAS.

Ancillary terrestrial component (ATC): A ground communications network complementary to and operating as a part of an integrated MSS system, and which, together with the satellite component, provides an integrated satellite offering. In such a system, the ground component is controlled by the satellite resource and network management system. Furthermore, the ground component uses the same authorized frequency band as the associated operating MSS system.

ATC base station equipment: A terrestrial fixed equipment designed for communicating with ATC mobile equipment.

ATC mobile equipment: An equipment designed for single- or dual-mode operation and intended to be used while in motion or during temporary stops at unspecified locations. ATC single-mode mobile equipment shall be capable of communicating only with the terrestrial ATC system, whereas ATC dual-mode mobile equipment shall be capable of communicating with both the mobile satellite network and the terrestrial ATC system.

Broadband emission: An emission with a bandwidth greater than 700 Hz.

Discrete emission: An emission with a bandwidth lesser than or equal to 700 Hz.

Carrier-off state: The state when a MES is authorized by the network control facility (NCF) to transmit but does not transmit a signal.

Mobile earth station (MES): An equipment designed to communicate with a satellite in the MSS and intended to be used while in motion or during temporary stops at unspecified locations.

Total Radiated Power (TRP): The integral of the power transmitted by an antenna, in different directions over the entire radiation sphere.

5. Transmitter Requirements

This section sets out the requirements applicable to radio transmitters subject to this standard.

5.1 Measurement methods

Unless otherwise specified, all measurements shall be performed in accordance with the requirements of RSS-Gen.For TRP measurements, the standards listed on ISED's Certification and Engineering Bureau website shall be consulted.

The unwanted emissions from the transmitter shall be measured for all channel bandwidths with the carrier frequency set at both the highest and lowest channels in which the equipment is designed to operate.

The equivalent isotropically radiated power (e.i.r.p) density of unwanted and carrier-off state emissions outlined in sections 5.6 through 5.10 shall be averaged over any 2 ms active transmission period using a power average detector.

5.2 Band plan

Equipment subject to this standard shall operate in the bands listed in Table 1 and Table 2.

Table 1 : Frequency Bands for MESs

Transmit Frequency (MHz)	Receive Frequency (MHz)	Application
148-150.05	137-138	Non-voice
399.9-400.05	400.15-401	Voice and Data
1610-1626.5	2483.5-2500	
1626.5-1660.5	1525-1559	
2000-2020	2180-2200	

Table 2 : Frequency Bands for ATC Equipment

ATC Base Station		ATC Mobile Equipment	
Transmit Frequency (MHz)	**Receive Frequency (MHz)**	**Transmit Frequency (MHz)**	**Receive Frequency (MHz)**
2483.5-2495	1610-1626.5/ 2483.5-2495	1610-1626.5/ 2483.5-2495	2483.5-2495
1525-1559	1626.5-1660.5	1626.5-1660.5	1525-1559
2000-2020	N/A	N/A	2000-2020/2180-2200

Note: For ATC base station operating in frequency bands 2180-2200 MHz, please refer to RSS-139.

5.3 Frequency stability

For MES equipment, the carrier frequency shall not depart from the reference frequency by more than ±10 ppm.

For ATC equipment operating in the band 2000-2020 MHz, the frequency stability shall be sufficient to ensure that the emission bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

For all other ATC equipment, the carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile equipment, and ±1.5 ppm for base station equipment.

5.4 Transmitter output power for ATC equipment

The maximum transmitter power of the equipment measured in terms of average values shall comply with the limits below:

The maximum e.i.r.p. of ATC mobile equipment transmitting in the band 1610-1626.5 MHz shall not exceed 1 dBW in a 1.25 MHz bandwidth.

The maximum e.i.r.p. of ATC mobile equipment transmitting in the band 1626.5-1660.5 MHz shall not exceed 0 dBW per channel bandwidth.

The maximum e.i.r.p. of ATC mobile and base station equipment transmitting in the band 2483.5-2495 MHz shall not exceed 6 dBW per channel, and the maximum conducted transmitter output power shall not exceed 0 dBW.

The maximum e.i.r.p of ATC base stations operating in the band 2000-2020 MHz shall not exceed 65 dBm/MHz. For base stations equipped with active antenna systems (AAS) the maximum total radiated power (TRP) shall not exceed 46 dBm/MHz[2].

5.5 Transmitter output power for MESs

The application for MES certification shall state the MES e.i.r.p. that is necessary for satisfactory communication. The maximum permissible e.i.r.p. will be the stated e.i.r.p. plus a 2 dB margin. If a detachable antenna is used, the application for certification shall state the recommended antenna type and manufacturer, the antenna gain and the maximum transmitter output power at the antenna terminal.

[2] The limits specified in this RSS are for the purpose of certification and may not apply to all deployment scenarios, consult SRSP-519 for more details

5.6 Unwanted emissions for ATC base station equipment

This section sets out the unwanted emissions requirements for equipment covered under this standard.

For ATC equipment operating in the bands 2000-2020 MHz and 2483.5-2495 MHz, compliance with the unwanted emission limits shall be determined using a measurement bandwidth of 1 MHz or greater. However, in the 1 MHz band immediately outside and adjacent to the equipment's operating frequency block, a resolution bandwidth of at least 1% of the occupied bandwidth may be employed.

5.6.1 1525-1559 MHz band

For ATC base station equipment in the band 1525-1559 MHz, the e.i.r.p. density of unwanted emissions shall not exceed:

i. -32.4 dBW/MHz and -39.4 dBW/MHz at 1 MHz and 2 MHz beyond the edges of the equipment channel bandwidth, respectively; and

ii. -70 dBW/MHz in the 1559-1605 MHz band, and linearly interpolated from -70 dBW/MHz at 1605 MHz to -46 dBW/MHz at 1610 MHz for broadband emissions; and

iii. -80 dBW/kHz in the 1559-1605 MHz band, and linearly interpolated from -80 dBW/kHz at 1605 MHz to -56 dBW/kHz at 1610 MHz, for discrete emissions.

5.6.2 2000-2020 MHz band

The unwanted emissions of ATC base station equipment, measured in terms of average value, transmitting in the band 2000-2020 MHz at frequencies outside the equipment's operating frequency block shall not exceed –13 dBm/MHz.

5.6.3 2483.5-2495 MHz band

The unwanted emissions of ATC base station equipment, measured in terms of average value, transmitting in the band 2483.5-2495 MHz shall not exceed the emission limits specified in Table 3 for emissions below 2483.5 MHz and Table 4 for emissions above 2495 MHz, where X is the greater of 6 MHz or the actual emission bandwidth.

Table 3: Unwanted emission limits below 2483.5 MHz

Offset from the block edge (MHz)	Unwanted emission limits (in dBm/MHz)
<5	-10
5-X	-13
>X	-25

Table 4: Unwanted emission limits above 2495 MHz

Offset from the block edge (MHz)	Unwanted emission limits (in dBm/MHz)
≤X	-13
>X	-25

Notwithstanding the above requirements, the e.i.r.p. density of the ATC system's unwanted emission shall not exceed:

i. -44.1 dBW/30 kHz measured from the edge of the equipment channel bandwidth; and
ii. -70 dBW/MHz for broadband emissions and –80 dBW/kHz for discrete emissions in the band 1559-1610 MHz.

5.7 Unwanted emissions for ATC mobile equipment

ATC mobile equipment operating in the band 2483.5-2495 MHz shall comply with the unwanted emissions limit specified in section 5.7.3.

All other ATC mobile equipment shall comply with the unwanted emissions limits specified in section 5.8 in addition to the limits specified in this section.

5.7.1 1610-1626.5 MHz band

The e.i.r.p. density of unwanted emissions from ATC mobile equipment transmitting in the band 1610-1626.5 MHz shall not exceed:

i. -57.1 dBW/30 kHz measured from the edge of the equipment channel bandwidth;

ii. -70 dBW/MHz in the band 1559-1605 MHz, and linearly interpolated from -70 dBW/MHz at 1605 MHz to -10 dBW/MHz at 1610 MHz for broadband emissions; and

iii. -80 dBW/kHz in the band 1559-1605 MHz, and linearly interpolated from -80 dBW/kHz at 1605 MHz to -20 dBW/kHz at 1610 MHz for discrete emissions.

5.7.2 1626.5-1660.5 MHz band

The e.i.r.p. density of unwanted emissions of ATC mobile equipment transmitting in the band 1626.5-1660.5 MHz shall not exceed:

i. -58 dBW/4 kHz at 1 MHz beyond the edge of the equipment channel bandwidth;

ii. -70 dBW/MHz in the band 1559-1605 MHz, and linearly interpolated from -70 dBW/MHz at 1605 MHz to -46 dBW/MHz at 1610 MHz for broadband emissions; and

iii. -80 dBW/kHz in the band 1559-1605 MHz, and linearly interpolated from -80 dBW/kHz at 1605 MHz to -56 dBW/kHz at 1610 MHz for discrete emissions.

5.7.3 2483.5-2495 MHz band

The unwanted emissions of ATC mobile equipment, measured in terms of average value, transmitting in the band 2483.5-2495 MHz shall not exceed the emission limits specified in Table 5 for emissions below 2483.5 MHz and Table 6 for emissions above 2495 MHz, where X is the greater of 6 MHz or the actual emission bandwidth.

Table 5: Unwanted emission limits below 2483.5 MHz

Offset from the block edge (MHz)	Unwanted emission limits (in dBm/MHz)
<5	-10
5-X	-13
>X	-25

Table 6: Unwanted emission limits above 2495 MHz

Offset from the block edge (MHz)	Unwanted emission limits (in dBm/MHz)
≤X	-13
>X	-25

Notwithstanding the above requirements, the e.i.r.p. density of the ATC system's unwanted emission shall not exceed:

i. -44.1 dBW/30 kHz measured from the edge of the equipment channel bandwidth; and
ii. -70 dBW/MHz for broadband emissions and –80 dBW/kHz for discrete emissions in the band 1559-1610 MHz.

5.8 Unwanted emissions for MES in all frequency bands

The average power of unwanted emissions shall be attenuated below the average output power, P (dBW), of the transmitter, as specified below:

i. 25 dB in any 4 kHz, the frequency of which is offset from the channel centre frequency by more than 50%, up to and including 100% of the occupied bandwidth or necessary bandwidth, whichever is greater;

ii. 35 dB in any 4 kHz, the frequency of which is offset from the channel centre frequency by more than 100%, up to and including 250% of the occupied bandwidth or necessary bandwidth, whichever is greater; and

iii. 43 + 10 log p (watts) in any 4 kHz, the frequency of which is offset from the channel centre frequency by more than 250% of the occupied bandwidth or necessary bandwidth, whichever is greater.

5.9 Additional unwanted emission limits for MESs to protect radionavigation-satellite service

MESs with transmitting frequency in the bands 1610-1626.5 MHz and 1626.5-1660.5 MHz shall comply

with the unwanted emission limits specified in this section, where applicable, in addition to the limits in section 5.8.

5.9.1 1610-1626.5 MHz band

MESs with transmitting frequencies between 1610 MHz and 1626.5 MHz shall have the e.i.r.p. density of unwanted emissions in the band 1605-1610 MHz, averaged over any 2 ms active transmission interval, not exceed the following limits:

(1) -70 dBW/MHz at 1605 MHz, linearly interpolated to -10 dBW/MHz at 1610 MHz for broadband emissions; and

(2) -80 dBW/kHz at 1605 MHz, linearly interpolated to -20 dBW/kHz at 1610 MHz for discrete emissions.

5.9.2 1626.5-1660.5 MHz band

Mobile earth stations with transmitting frequencies between 1626.5 MHz and 1660.5 MHz shall have the e.i.r.p. density of unwanted emissions in the band 1605-1610 MHz, averaged over any 2 ms active transmission interval, not exceed the following limits:

(1) -70 dBW/MHz at 1605 MHz, linearly interpolated to -46 dBW/MHz at 1610 MHz, for broadband emissions; and

(2) -80 dBW/kHz at 1605 MHz, linearly interpolated to -56 dBW/kHz at 1610 MHz, for discrete emissions.

5.10 Carrier-off state emissions

Mobile earth station equipment with transmitting frequencies between 1 GHz and 3 GHz shall have the e.i.r.p. density of carrier-off state emissions in the band 1559-1610 MHz not exceed -80 dBW/MHz.