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Radio Standards Specification

Vehicular Radar and Airport Fixed or Mobile Radar in the 76-81 GHz Frequency Band

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Canada

Preface

Radio Standard Specification RSS-251, issue 2, *Vehicular Radar and Airport Fixed or Mobile Radar in the 76-81 GHz Frequency Band* replaces RSS-251, issue 1, *Field Disturbance Sensors in the Bands 46.7-46.9 GHz (Vehicular Radar) and 76-77 GHz (Vehicular and Airport Fixed Radar).*

List of changes:

1. Field disturbance sensors operating in the 46.7-46.9 GHz frequency band for vehicular radar purposes have been removed from the scope of the standard to harmonize with the global migration of vehicular radar to the 76-81 GHz frequency band.
2. A six-month transition period has been included to accommodate the phase out of 46.7-46.9 GHz vehicular radar devices.
3. A six-month transition period has been included to accommodate the compliance of 76-77GHz vehicular radar devices and airport fixed radar to RSS-251, issue 2 requirements.
4. The frequency band for vehicular radar and airport fixed (now also for airport mobile radar) has been expanded from 76-77 GHz to 76-81 GHz to harmonize with the global usage of the frequency band.
5. The scope of the term “vehicle” has been included in the purpose and application of the current standard to identify vehicle types that fall within the scope of this standard. This includes aircraft-mounted radars for ground operations while within airport air operations areas.
6. The scope of airport radar systems has been expanded to allow fixed or mobile radar system for airport air operations purposes, in addition to those previously listed (foreign object debris detection and monitoring of aircrafts and service vehicles in service areas where there is no public access).
7. A requirement to implement a radar deactivation mechanism when an aircraft becomes airborne, has been implemented as aircrafts’ use of the 76-81 GHz radars is intended exclusively for their operation while on the ground, in airport air operations areas.
8. New sections to address certification and licensing requirements information (licence-exempt) have been included in the general section (section 3).
9. A definitions section (section 4) has been added to clarify select terms used in this standard.
10. The sections referencing RSS-102 (for radio frequency exposure) and RSP-100 (requirements for the certification of radio apparatus) have been removed. These are referenced by RSS-Gen, which is referenced by this current standard.
11. Removed the allowance to transmit information in addition to the primary radar functions, which was applicable to radar devices in the bands 46.7-46.9 GHz and 76-77 GHz. Radar (i.e. vehicular and airport fixed or mobile radar) is the only permitted use by devices under the scope of this current standard.
12. The method of measurements and limits for average e.i.r.p. and peak e.i.r.p. spectral density for 76-81 GHz radars have been reviewed and prescribed accordingly.
13. The unwanted emission requirements for 76-81 GHz radars have been reviewed and prescribed accordingly.
14. Editorial changes have been made as appropriate to improve the standard.

Issued under the authority of
the Minister of Innovation, Science and Economic Development Canada

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Martin Proulx
Director General
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Contents

1 Scope

Radio Standards Specification RSS-251, *Vehicular Radar and Airport Fixed or Mobile Radar in the 76-81 GHz Frequency Band*, sets out the certification requirements for licence-exempt radio apparatus operating in the 76-81 GHz frequency band. Such radio apparatus consists of vehicular radar and airport fixed or mobile radar.

2 Transition period

2.1 Coming into force

This document will come into force upon its publication on the Innovation, Science and Economic Development Canada's (ISED) Spectrum Management and Telecommunications website.

2.2 46.7-46.9 GHz vehicular radar

Effective six (6) months from July 31, 2018, ISED will no longer accept applications for the certification of new vehicular radar (i.e. field disturbance sensors) operating in the bands 46.7-46.9 GHz for vehicular radar purposes.

2.3 76-77 GHz vehicular radar and airport fixed radar

Effective six (6) months from July 31, 2018, ISED will no longer accept applications for the certification of new vehicular radar and airport fixed radar (i.e. field disturbance sensors) operating in the bands 76-77 GHz complying with RSS-251, issue 1 (available upon request by email), but not with Issue 2. After this date, applications for the certification of new radars shall comply with issue 2 of RSS-251.

2.4 Existing radars installed onboard vehicles or at airports

Models of radar devices operating in the 76-77 GHz frequency band, compliant with RSS-251 issue 1, which were certified prior to the end of the transition period specified in section 2.3, may continue to be manufactured, imported, distributed, leased, offered for sale or sold, for the life of the vehicle or of the airport fixed radar systems within which such device models are already installed, for the purpose of replacing or repairing a defective, damaged or potentially malfunctioning radar.

Notwithstanding the above, effective January 1, 2022, no new radars certified under issue 1 of RSS-251 shall be installed onboard vehicles or at airports. New radar installations shall comply with RSS-251, issue 2 radars, unless stated otherwise.

3 General

3.1 Purpose and application

Radar devices subject to this standard consist of licence-exempt radio apparatus operating in the 76-81 GHz frequency band for ground-based vehicles and for airport air operations (fixed or mobile).

A radar device for ground-based vehicles (i.e. vehicular radar) may be installed on-board vehicles such as: passenger cars, busses, trucks and aircraft (the radar may operate while taxing only), etc. Other uses include within railroad train locomotives, train cars, monorails or trams, construction vehicles, farming vehicles such as tractors and harvesters, motorcycles, scooters and motorbikes, mobile scissor-lifts and mobile work platforms, and boats and ships operated within territorial waters of Canada.

A fixed or mobile radar system in airport air operations areas is intended for uses such as, but not limited to, monitoring of aircrafts and service vehicles on taxiways and in other airport vehicle service areas that do not allow access to public vehicles. Other uses include foreign object debris detection radar, which is a radar device designed to detect foreign object debris in airport air operations areas.

All devices subject to this standard operate on a no-protection, no-interference basis.

RSS-251 does not apply to radio apparatus intended for operation on aircraft while airborne.

3.2 Certification requirement

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

3.3 Licensing requirements

Equipment covered by this standard is exempt from licensing requirements pursuant to section 15 of the *Radiocommunication Regulations*.

3.4 RSS-Gen compliance

RSS-251 shall be used in conjunction with RSS-Gen, *General Requirements for Compliance of Radio Apparatus*, for general specifications and information relevant to the equipment for which this standard applies.

3.5 Reference publications

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

The following document shall be consulted as per the applicable edition specified in RSS-Gen, *General Requirements for Compliance of Radio Apparatus*:

ANSI C63.10 *American National Standard for Testing Unlicensed Wireless Devices*

In case of discrepancy between RSS-Gen requirements and ANSI C63.10 requirements, those of RSS-Gen requirements shall take precedence, unless stated otherwise.

4 Definitions

Airport fixed or mobile radar system is a radar system operating in airport air operations areas for uses such as, but not limited to: facilitating the monitoring of aircrafts and service vehicles on taxiways and in other airport vehicle service areas that do not allow access to public vehicles or foreign object debris detection radar.

Air operations area consists of all airport areas where aircraft can operate, either under their own power or while in tow. The airport operations area includes runways, taxiways, apron areas, and all unpaved surfaces within the airport's perimeter fence. An apron area is a surface in the air operations area where aircraft park and are serviced (refueled, loaded with cargo, and/or boarded by passengers).

Foreign object debris (FOD) detection radar is a radar device designed to detect foreign object debris in airport air operations areas.

Radar is a radiodetermination system based on the comparison of reference signals with radio signals reflected, or retransmitted, from the position to be determined.

Vehicles include, but are not limited to, passenger cars, busses, trucks, aircraft while taxing, railroad train locomotives, train cars, monorails or trams, construction vehicles, farming vehicles such as tractors and harvesters, motorcycles, scooters and motorbikes, mobile scissor-lifts and mobile work platforms, and boats and ships operated within territorial waters of Canada.

5 Aircraft-mounted radar operation prevention mechanism

Aircraft-mounted radars shall be equipped with a mechanism that will automatically prevent its operation once the aircraft becomes airborne (i.e. not touching the ground). A description of the mechanism shall be provided in the test report.

6 Modulation characteristics

In addition to the reporting requirements of RSS-Gen, the following information shall be provided, as per the applicable modulation type:

a. Pulsed radar: pulse width and pulse repetition frequency (PRF). If the PRF is variable, the maximum and minimum values shall be reported.

b. Non-pulsed radar (e.g. frequency modulated continuous wave (FMCW)): modulation type (i.e. sawtooth, sinusoid, triangle, or square wave) and sweep characteristics (sweep bandwidth, sweep rate, sweep time).

7 Occupied bandwidth

7.1 Measurement method

The measurement shall be performed in accordance with the requirements of RSS-Gen.

7.2 Limit

The radar device's occupied bandwidth (i.e. 99% emission bandwidth) shall be contained in the 76-81GHz frequency band.

8 Average equivalent isotropically radiated power (e.i.r.p.)

8.1 Measurement method

The average e.i.r.p. measurement shall be performed using a power averaging detector with a 1 MHz resolution bandwidth (RBW). The power shall be integrated over the occupied bandwidth.

8.2 Limit

The radar device's total average e.i.r.p. shall not exceed 50 dBm over the occupied bandwidth.

9 Peak e.i.r.p. spectral density

9.1 Measurement method

The peak e.i.r.p. measurement shall be performed by sweeping the transmitted occupied bandwidth with a positive peak power detector, using a peak hold display mode, and a 1 MHz resolution bandwidth. The power integration is not to be used in performing this measurement.

9.2 Limit

The radar device's peak e.i.r.p. spectral density shall not exceed 55 dBm/MHz.

10 Unwanted emissions

10.1 Measurement method

In addition to the requirements specified in RSS-Gen and the method of measurement of ANSI C63.10, the spectrum shall be investigated up to 162 GHz.

10.2 Limit

The radar device's unwanted emissions outside the 76-81 GHz frequency band shall comply with the limits in table 1, below.

Table 1: Unwanted emissions limits outside the 76-81 GHz frequency band

Emission frequency range	Limit	Applicable detector
Below 40 GHz	RSS-Gen general field strength limits for licence-exempt radio apparatus	RSS-Gen requirements
40-162 GHz *	-30 dBm/MHz (e.i.r.p.)	RMS detector
Note: * For radar devices that operate solely in the 76-77 GHz band (i.e. the occupied bandwidth is entirely contained in the 76-77 GHz band), an unwanted emissions limit of 0 dBm/MHz shall apply for the unwanted emission that fall in the 73.5-76 GHz band. Outside of the 73.5-76 GHz band, the unwanted emission limits prescribed in table 1 shall apply.		

11 Frequency stability

11.1 Measurement method

The radar device shall be subjected to the applicable conditions of operation specified in RSS-Gen applicable to licence-exempt radio apparatus.

11.2 Limit

The radar device's occupied bandwidth (i.e. 99% emission bandwidth) shall be maintained within the 76-81 GHz frequency band while subjected to all conditions of operation specified in RSS-Gen.