

# RADIO TEST REPORT – 438752TRFWL

Type of assessment:

Final product testing

Applicant:

B. Thermal Solutions Srl

Via Marconi, 100

60015 Falconara M.ma (AN)

Italy

Product:

Radio module

Model:

LoRa 1276 CI

Model variant(s):

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FCC ID:

2A2D3-LORA1276

Specifications:

- ◆ FCC 47 CFR Part 15 Subpart C, §15.247

Date of issue: July 9, 2021

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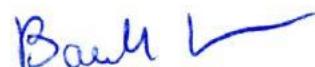
P. Barbieri

Tested by

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D. Guarnone

Reviewed by



Signature



Signature

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**Lab locations**

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Province	MB
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Website	<a href="http://www.nemko.com">www.nemko.com</a>
Site number	FCC: 682159 (10 m semi anechoic chamber)

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**Limits of responsibility**

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contained in this report are within Nemko S.p.A.. ISO/IEC 17025 accreditation.

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## Section 1 Report summary

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### 1.1 Test specifications

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FCC 47 CFR Part 15, Subpart C, Clause 15.247

Operation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–585 MHz

### 1.2 Test methods

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558074 D01 15.247 Meas Guidance v05r02  
(April 2, 2019)

Guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules.

ANSI C63.10 v2013

American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

### 1.3 Exclusions

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None

### 1.4 Statement of compliance

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In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.3 above. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

### 1.5 Test report revision history

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**Table 1.5-1: Test report revision history**

Revision #	Date of issue	Details of changes made to test report
438752TRFWL	July 9, 2021	Original report issued

## Section 2 Engineering considerations

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### 2.1 Modifications incorporated in the EUT for compliance

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There were no modifications performed to the EUT during this assessment.

### 2.2 Technical judgment

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None

### 2.3 Deviations from laboratory tests procedures

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No deviations were made from laboratory procedures.

## Section 3 Test conditions

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### 3.1 Atmospheric conditions

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In the laboratory, the following ambient conditions are respected for each test reported below:

Temperature	18 – 33 °C
Relative humidity	25 – 70 %
Air pressure	860 – 1060 mbar

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

The following instruments are used to monitor the environmental conditions:

Equipment	Manufacturer	Model no.	Asset no.	Cal date	Next cal.
Thermo-hygrometer data loggers	Testo	175-H2	20012380/305	12/2020	12/2022
Thermo-hygrometer data loggers	Testo	175-H2	38203337/703	12/2020	12/2022
Barometer	Castle	GPB 3300	072015	04/2021	04/2022

### 3.2 Power supply range

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The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages  $\pm 5\%$ , for which the equipment was designed.

## Section 4 Measurement uncertainty

### 4.1 Uncertainty of measurement

The measurement uncertainty was calculated for each test and quantity listed in this test report, according to CISPR 16-4-2 and other specific test standard and is documented in Nemko Spa working manual WML1002.

The assessment of conformity for each test performed on the equipment is performed not taking into account the measurement uncertainty. The two following possible verdicts are stated in the report:

P (Pass) - The measured values of the equipment respect the specification limit at the points tested. The specific risk of false accept is up to 50% when the measured result is close to the limit.

F (Fail) - One or more measured values of the equipment do not respect the specification limit at the points tested. The specific risk of false reject is up to 50% when the measured result is close to the limit.

Hereafter Nemko's measurement uncertainties are reported:

EUT	Type	Test	Range	Measurement Uncertainty	Notes	
Transmitter	Conducted	Frequency error	0.001 MHz ÷ 40 GHz	0.08 ppm	(1)	
			0.009 MHz ÷ 30 MHz	1.1 dB	(1)	
		Carrier power	30 MHz ÷ 18 GHz	1.5 dB	(1)	
		RF Output Power	18 MHz ÷ 40 GHz	3.0 dB	(1)	
			40 MHz ÷ 140 GHz	5.0 dB	(1)	
		Adjacent channel power	1 MHz ÷ 18 GHz	1.4 dB	(1)	
			0.009 MHz ÷ 18 GHz	3.0 dB	(1)	
		Conducted spurious emissions	18 GHz ÷ 40 GHz	4.2 dB	(1)	
			40 GHz ÷ 220 GHz	6.0 dB	(1)	
		Intermodulation attenuation	1 MHz ÷ 18 GHz	2.2 dB	(1)	
		Attack time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)	
		Attack time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)	
		Release time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)	
		Release time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)	
		Transient behaviour of the transmitter – Transient frequency behaviour	1 MHz ÷ 18 GHz	0.2 kHz	(1)	
		Transient behaviour of the transmitter – Power level slope	1 MHz ÷ 18 GHz	9%	(1)	
		Frequency deviation - Maximum permissible frequency deviation	0.001 MHz ÷ 18 GHz	1.3%	(1)	
		Frequency deviation - Response of the transmitter to modulation frequencies above 3 kHz	0.001 MHz ÷ 18 GHz	0.5 dB	(1)	
	Radiated	Dwell time	-	3%	(1)	
		Hopping Frequency Separation	0.01 MHz ÷ 18 GHz	1%	(1)	
		Occupied Channel Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)	
		Modulation Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)	
			0.009 MHz ÷ 26.5 GHz	6.0 dB	(1)	
		Radiated spurious emissions	26.5 GHz ÷ 66 GHz	8.0 dB	(1)	
			66 GHz ÷ 220 GHz	10 dB	(1)	
NOTES:			10 kHz ÷ 26.5 GHz	6.0 dB	(1)	
(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$ , which for a normal distribution corresponds to a coverage probability of approximately 95 %			26.5 GHz ÷ 66 GHz	8.0 dB	(1)	
			66 GHz ÷ 220 GHz	10 dB	(1)	

## Section 5 Information provided by the applicant

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### 5.1 Disclaimer

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This section contains information provided by the applicant and has been utilized to support the test plan. Inaccurate information provided by the applicant can affect the validity of the results contained within this test report. Nemko accepts no responsibility for the information contained within this section and the impact it may have on the test plan and resulting measurements.

### 5.2 Applicant/Manufacture

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Applicant name	B. Thermal Solutions Srl
Applicant address	Via Marconi, 100 – 60015 Falconara M.ma (AN) – Italy
Manufacture name	B. Thermal Solutions Srl
Manufacture address	Via Marconi, 100 – 60015 Falconara M.ma (AN) – Italy

### 5.3 EUT information

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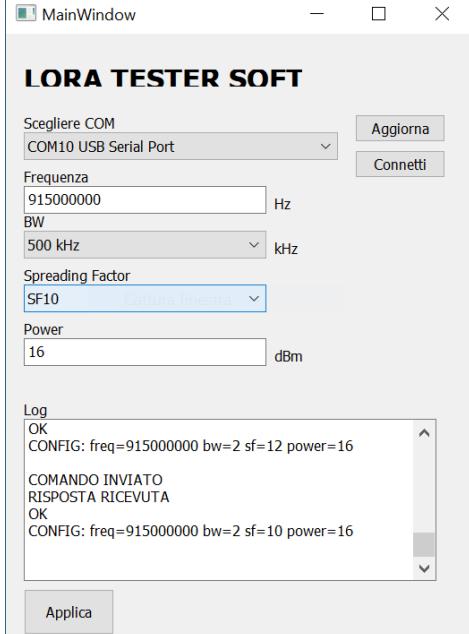
Product	Radio module
Model	LoRa 1276 CI
Serial number	4387520004 (for radiated measurements) and 4387520005 (for conducted measurements) Numbers assigned by Nemko Spa.
Power supply requirements	3.7 V DC from battery
Product description and theory of operation	The EUT is a LoRa radio module.

## 5.4 Radio technical information

Category of Wideband Data	<input type="checkbox"/> Frequency Hopping Spread Spectrum (FHSS) equipment
Transmission equipment	<input checked="" type="checkbox"/> Other types of Wideband Data Transmission equipment (e.g. DSSS, OFDM, etc.).
Frequency band	902 to 928 MHz
Frequency Min (MHz)	903 MHz
Frequency Max (MHz)	927 MHz
Channel numbers	--
RF power Max (W), Conducted	45.7 mW (16.6 dBm)
Field strength, dB $\mu$ V/m @ 3 m	N/A
Measured BW (kHz), 6 dB OBW	672 kHz
Measured BW (kHz), 99% OBW	814 kHz
Type of modulation	Standard LoRa
Emission classification	F1D
Equipment Class	DTS
Transmitter spurious, dB $\mu$ V/m @ 3 m	60.5 dB $\mu$ V/m @ 5464.75 MHz (Peak)
Antenna information	The EUT antenna is permanent attached 80 mm wire with a gain of 2.15 dBi.

## 5.5 EUT setup details

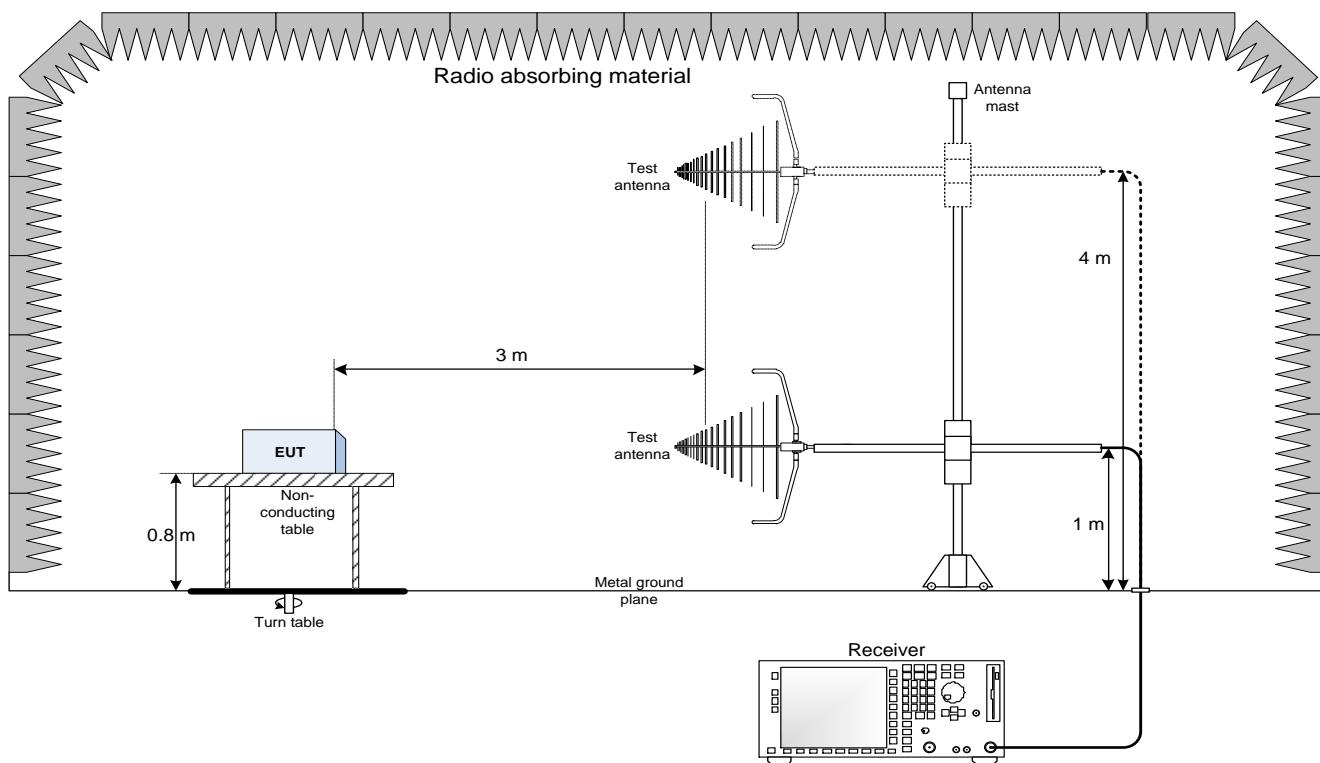
### 5.5.1 Radio exercise details

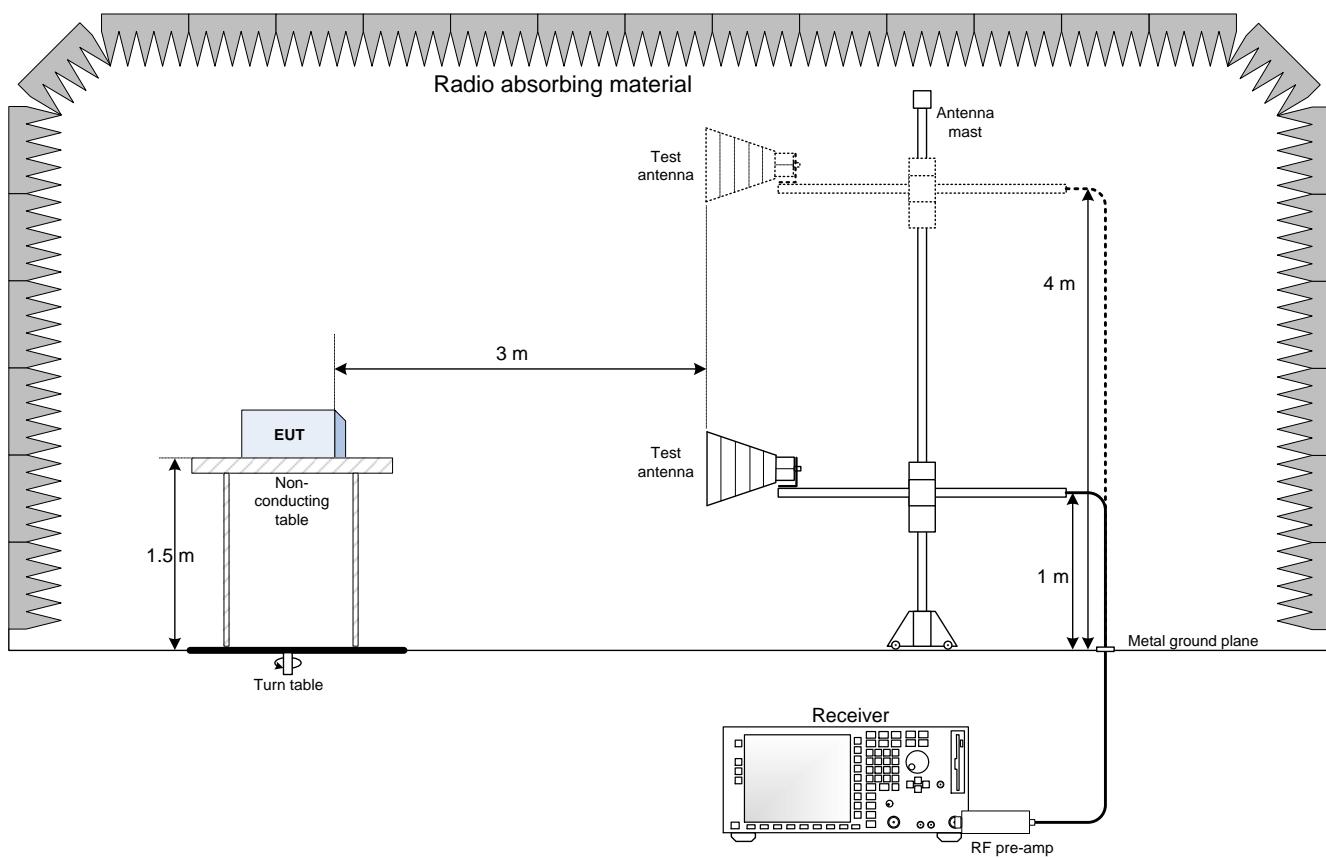
Operating conditions	<p>The EUT has been forced in TX mode with the following software:</p>  <p>For frequency above 910 MHz</p>	
Transmitter state	For frequency below or equal 910 MHz	For frequency above 910 MHz

Transmitter set into continuous mode.

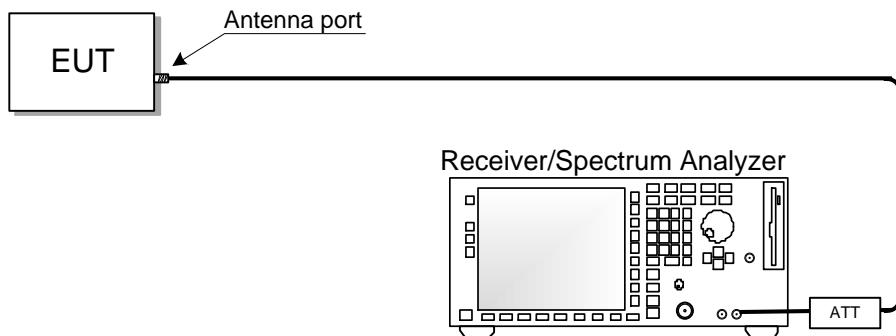
**5.5.2 EUT setup configuration**
**Table 5.5-1: EUT interface ports**

Description	Qty.
DC power port with four wires cable connected to an external DC power source	1
USB port with standard cable (used only for programming the EUT) connected to a PC	1


**Figure 5.5-1: Radiated testing block diagram below 1 GHz with sample 4318570001**



**Figure 5.5-2: Radiated testing block diagram below 1 GHz with sample 4318570001**



**Figure 5.5-3: Antenna port testing block diagram with sample 4318570002 (temporary antenna connector provided by the manufacturer)**

## Section 6 Summary of test results

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### 6.1 Testing location

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Test location (s)	Nemko Spa Via del Carroccio, 4 – 20053 Biassono (MB) - Italy
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### 6.2 Testing period

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Test start date	July 6, 2021	Test end date	July 9, 2021
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### 6.3 Sample information

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Receipt date	July 6, 2021	Nemko sample ID number(s)	438752
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### 6.4 FCC Part 15 Subpart A and C, general requirements test results

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**Table 6.4-1: FCC general requirements results**

Part	Test description	Verdict
§15.207(a)	Conducted limits	Not applicable
§15.31	Variation of power source	Pass
§15.31(m)	Number of tested frequencies	Pass
§15.203	Antenna requirement	Pass

Notes: The EUT is supplied by a battery

## 6.5 FCC Part §15.247 test results for frequency hopping spread spectrum systems (FHSS)

**Table 6.5-1: FCC FHSS requirements results**

Part	Test description	Verdict
§15.247(a)(1)(i)	Requirements for operation in the 902–928 MHz band	Not applicable
§15.247(a)(1)(ii)	Requirements for operation in the 5725–5850 MHz band	Not applicable
§15.247(a)(1)(iii)	Requirements for operation in the 2400–2483.5 MHz band	Not applicable
§15.247(b)(1)	Maximum peak output power in the 2400–2483.5 MHz band and 5725–5850 MHz band	Not applicable
§15.247(b)(2)	Maximum peak output power in the 902–928 MHz band	Not applicable
§15.247(1)	Fixed point-to-point operation with directional antenna gains greater than 6 dBi	Not applicable
§15.247(2)	Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams	Not applicable
§15.247(d)	Spurious emissions	Not applicable
§15.247(f)	Time of occupancy for hybrid systems	Not applicable

Notes: --

## 6.6 FCC Part §15.247 test results for digital transmission systems (DTS)

**Table 6.6-1: FCC DTS requirements results**

Part	Test description	Verdict
§15.247(a)(2)	Minimum 6 dB bandwidth	Pass
§15.247(b)(3)	Maximum peak output power in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands	Pass
§15.247(1)	Fixed point-to-point operation with directional antenna gains greater than 6 dBi	Not applicable
§15.247(2)	Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams	Not applicable
§15.247(d)	Spurious emissions	Pass
§15.247(1)	Power spectral density	Pass
§15.247(f)	Time of occupancy for hybrid systems	Not applicable

Notes: --

## Section 7 Test equipment

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### 7.1 Test equipment list

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**Table 7.1-1: Equipment list**

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI receiver (20 Hz ÷ 8 GHz)	Rohde & Schwarz	ESU8	100202	08/2020	08/2021
EMI receiver (2 Hz ÷ 44 GHz)	Rohde & Schwarz	ESW44	101620	09/2020	09/2021
Spectrum Analyzer (2 Hz ÷ 43 GHz)	Rohde & Schwarz	FSW43	101767	01/2021	01/2022
Trilog Antenna (30 MHz ÷ 7 GHz)	Schwarzbeck	VULB 9162	9162-025	07/2018	07/2021
Bilog antenna (1 ÷ 18 GHz)	Schwarzbeck	STLP 9148	9148-123	07/2018	07/2021
Horn Antenna (4 ÷ 40 GHz)	RFSpin	DRH40	061106A40	04/2020	04/2023
Preamplifier (1 ÷ 18 GHz)	Schwarzbeck	BBV 9718C	00121	01/2021	01/2022
Preamplifier (18 ÷ 40 GHz)	Sage	STB-1834034030-KFKF-L1	18490-01	04/2021	04/2022
Controller	Maturo	FCU3.0	10041	NCR	NCR
Tilt antenna mast	Maturo	TAM4.0-E	10042	NCR	NCR
Turntable	Maturo	TT4.0-5T	2.527	NCR	NCR
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	09/2019	09/2021
Shielded room	Siemens	10m control room	1947	NCR	NCR

Notes: NCR - no calibration required, VOU - verify on use



## Section 8 Testing data

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### 8.1 Variation of power source

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#### 8.1.1 References, definitions and limits

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##### FCC §15.31 (e):

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

#### 8.1.2 Test summary

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Verdict	Pass			
Tested by	P. Barbieri	Test date	July 6, 2021	Sample tested 4387520004 4387520005

#### 8.1.3 Observations, settings and special notes

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The testing was performed as per ANSI C63.10 Section 5.13.

- a) Where the device is intended to be powered from an external power adapter, the voltage variations shall be applied to the input of the adapter provided with the device at the time of sale. If the device is not marketed or sold with a specific adapter, then a typical power adapter shall be used.
- b) For devices, where operating at a supply voltage deviating  $\pm 15\%$  from the nominal rated value may cause damages or loss of intended function, test to minimum and maximum allowable voltage per manufacturer's specification and document in the report.
- c) For devices with wide range of rated supply voltage, test at 15% below the lowest and 15% above the highest declared nominal rated supply voltage.
- d) For devices obtaining power from an input/output (I/O) port (USB, firewire, etc.), a test jig is necessary to apply voltage variation to the device from a support power supply, while maintaining the functionalities of the device.

For battery-operated equipment, the equipment tests shall be performed using a variable power supply.

#### 8.1.4 Test data

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EUT Power requirements:

AC  DC  Battery

If EUT is an AC or a DC powered, was the noticeable output power variation observed?

YES  NO  N/A

If EUT is battery operated, was the testing performed using fresh batteries?

YES  NO  N/A

If EUT is rechargeable battery operated, was the testing performed using fully charged batteries?

YES  NO  N/A

## 8.2 Number of frequencies

### 8.2.1 References, definitions and limits

#### FCC §15.31:

(m) Measurements on intentional radiators or receivers shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table.

*Table 8.2-1: Frequency Range of Operation*

Frequency range over which the device operates (in each band)	Number of test frequencies required	Location of measurement frequency inside the operating frequency range
1 MHz or less	1	Center (middle of the band)
1–10 MHz	2	1 near high end, 1 near low end
Greater than 10 MHz	3	1 near high end, 1 near center and 1 near low end

Notes: "near" means as close as possible to or at the centre / low end / high end of the frequency range over which the device operates.

### 8.2.2 Test summary

Verdict	Pass			
Tested by	P. Barbieri	Test date	July 6, 2021	Sample tested 4387520004 4387520005

### 8.2.3 Observations, settings and special notes

#### ANSI C63.10, Clause 5.6.2.1:

The number of channels tested can be reduced by measuring the center channel bandwidth first and then applying the following relaxations as appropriate:

- For each operating mode, if the measured channel bandwidth on the middle channel is at least 150% of the minimum permitted bandwidth, then it is not necessary to measure the bandwidth on the high and low channels.
- For multiple-input multiple-output (MIMO) systems, if the measured channel bandwidth on testing the middle channel exceeds the minimum permitted bandwidth by more than 50% on one transmit chain, then it is not necessary to repeat testing on the other chains.
- If the measured channel bandwidth on the middle channel is less than 50% of the maximum permitted bandwidth, then it is not necessary to measure the bandwidth on the high and low channels.

#### ANSI C63.10, Clause 5.6.2.2:

For devices with multiple operating modes, measurements on the middle channel can be used to determine the worst-case mode(s). The worst-case modes are as follows:

- Band edge requirements—Measurements on the mode with the widest bandwidth can be used to cover the same channel (center frequency) on modes with narrower bandwidth that have the same or lower output power for each modulation family (e.g., OFDM and direct sequence spread spectrum).
- Spurious emissions—Measure the mode with the highest output power and the mode with the highest output power spectral density for each modulation family (e.g., OFDM and direct sequence spread spectrum).
- In-band PSD—Measurements on the mode with the narrowest bandwidth can be used to cover all modes within the same modulation family of an equal or lower output power provided the result is less than 50% of the limit.

#### 8.2.4 Test data

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**Table 8.2-2: Test channels selection**

<b>Start of Frequency range, MHz</b>	<b>End of Frequency range, MHz</b>	<b>Frequency range bandwidth, MHz</b>	<b>Low channel, MHz</b>	<b>Mid channel, MHz</b>	<b>High channel, MHz</b>
902	928	26	903	915	927

Additional tests have been performed at 911 MHz

## 8.3 Antenna requirement

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### 8.3.1 References, definitions and limits

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**FCC §15.203:**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

**FCC §15.247:**

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:  
(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 8.3.2 Test summary

---

Verdict	Pass			
Tested by	P. Barbieri	Test date	July 6, 2021	Sample tested 4387520004 4387520005

### 8.3.3 Observations, settings and special notes

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None

### 8.3.4 Test data

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Must the EUT be professionally installed?

YES  NO

Does the EUT have detachable antenna(s)?

YES  NO

If detachable, is the antenna connector(s) non-standard?

YES  NO  N/A

**Picture 8.3-1: Antenna information**



Antenna gain: 2.15 dBi declared by manufacturer



## 8.4 Minimum 6 dB bandwidth for DTS systems

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### 8.4.1 References, definitions and limits

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#### FCC §15.247:

- (a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:
- (2) Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 8.4.2 Test summary

---

Verdict	Pass				
Tested by	P. Barbieri	Test date	July 8, 2021	Sample tested	4387520005

### 8.4.3 Observations, settings and special notes

---

The test was performed as per KDB 558074, section 8.2 with reference to ANSI C63.10 subclause 11.8.

Spectrum analyser settings:

Resolution bandwidth	6 dB BW: 100 kHz; 99% OBW: 1–5% of OBW
Video bandwidth	≥3 × RBW
Frequency span	5 MHz
Detector mode	Peak
Trace mode	Max Hold

### 8.4.4 Test equipment list

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Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Spectrum Analyzer (2 Hz ÷ 43 GHz)	Rohde & Schwarz	FSW43	101767	01/2021	01/2022
Shielded room	Siemens	10m control room	1947	NCR	NCR

#### 8.4.5 Test data

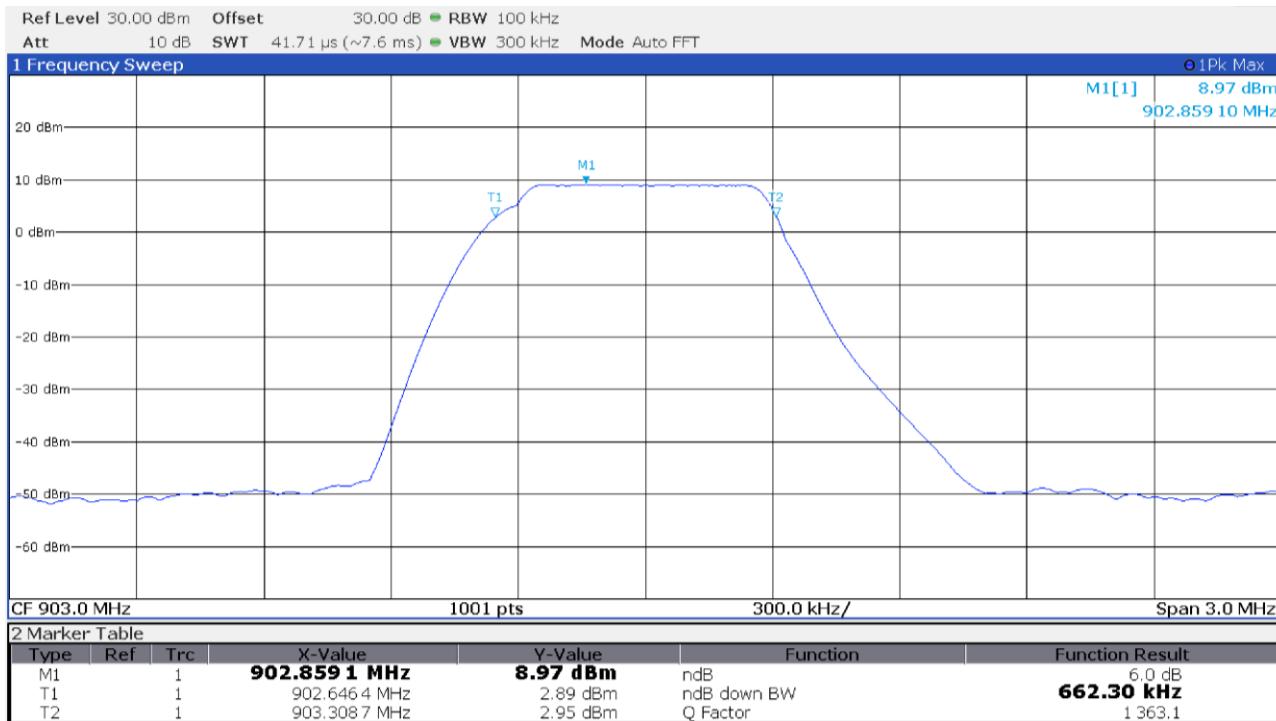
**Table 8.4-1: 99% occupied bandwidth results**

Modulation	Frequency, MHz	99% occupied bandwidth, kHz
LoRa	903	737.8
	915	813.5
	927	732.8

Notes: There is no 99% occupied bandwidth limit in the standard's requirements, the measurement results provided for information purposes only.

**Table 8.4-2: 6 dB bandwidth results**

Modulation	Frequency, MHz	6 dB bandwidth, MHz	Minimum limit, MHz	Margin, MHz
LoRa	903	662.3	0.500	0.1622
	915	671.3	0.500	0.1713
	927	668.3	0.500	0.1683



**Figure 8.4-1: 6 dB bandwidth on low channel**



Figure 8.4-2: 6 dB bandwidth on mid channel

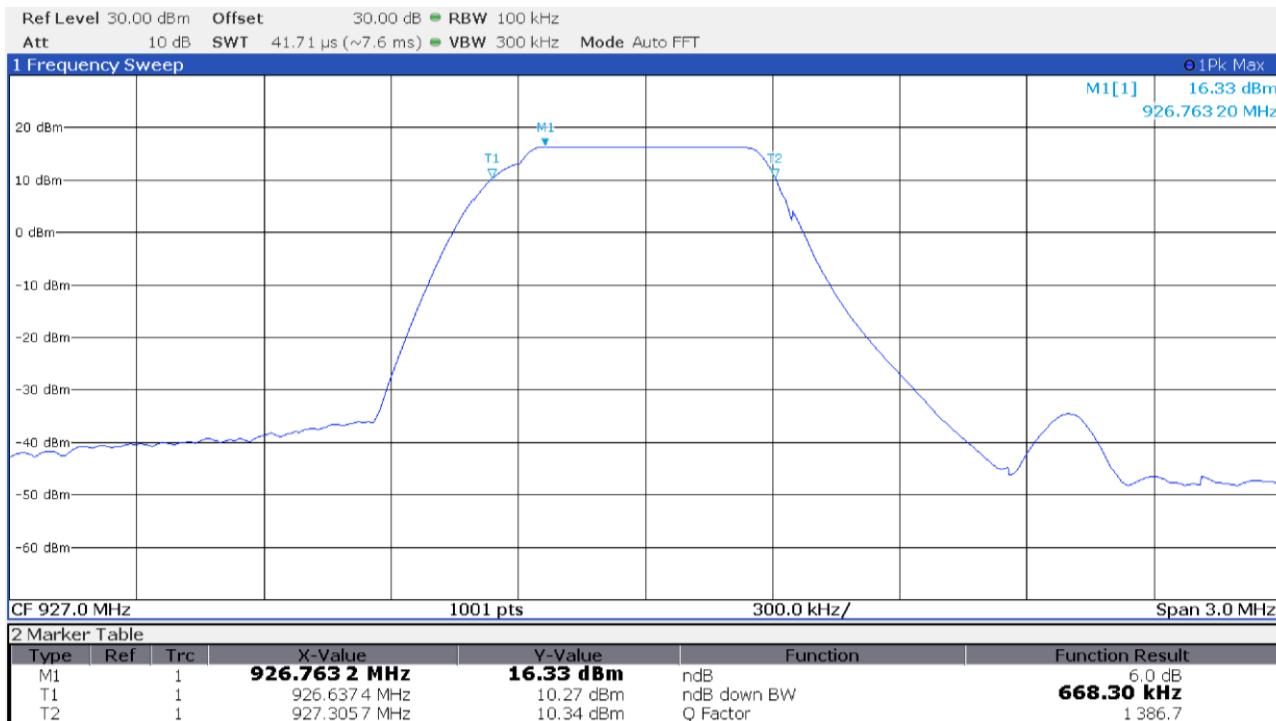


Figure 8.4-3: 6 dB bandwidth on high channel



Figure 8.4-4: 99% occupied bandwidth on low channel

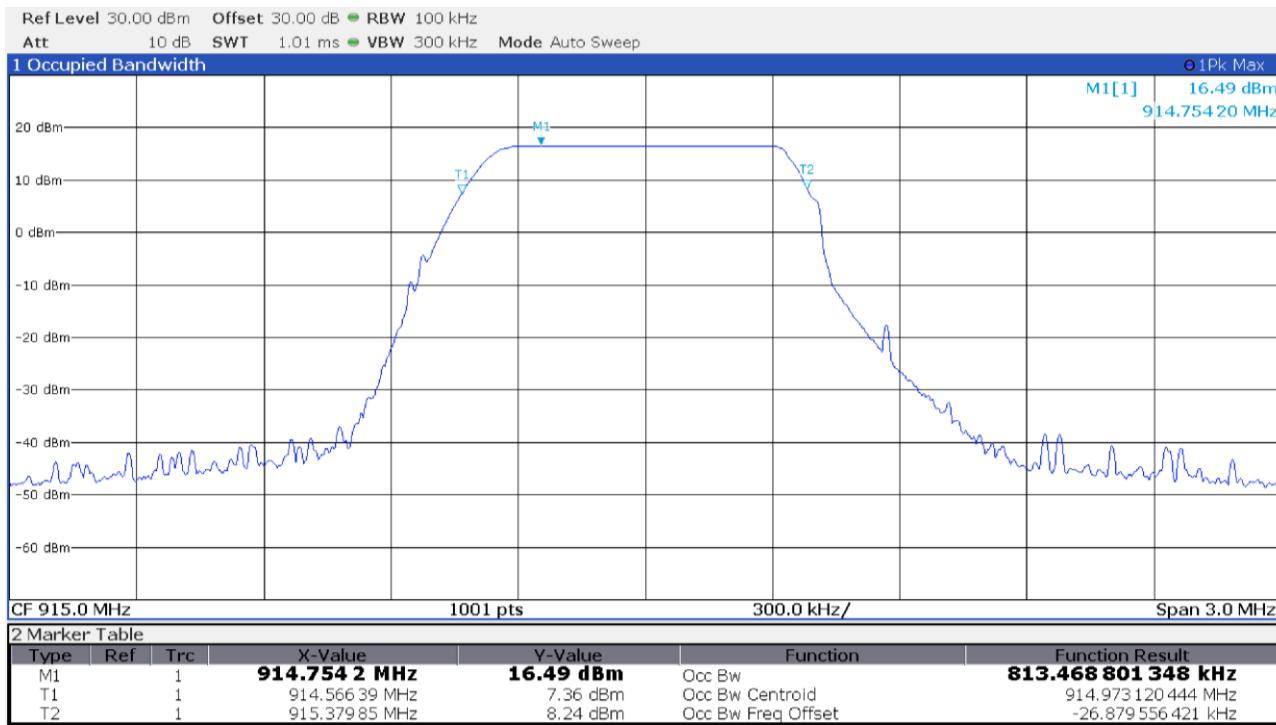


Figure 8.4-5: 99% occupied bandwidth on mid channel

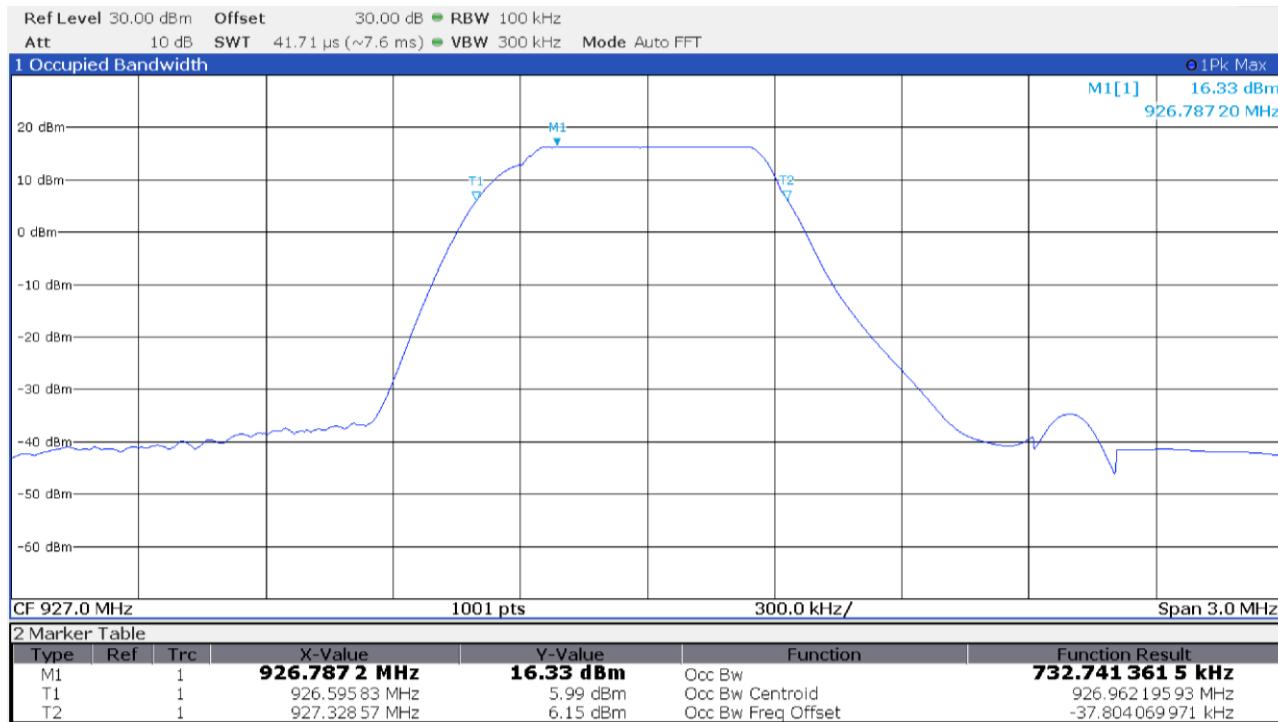


Figure 8.4-6: 99% occupied bandwidth on high channel

## 8.5 Transmitter output power and e.i.r.p. requirements for DTS in 902-928 MHz band

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### 8.5.1 References, definitions and limits

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#### FCC §15.247:

- (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:
  - (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz band: 1 W (30 dBm). As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
  - (4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
- (c) Operation with directional antenna gains greater than 6 dBi.
  - (1) Fixed point-to-point operation:
    - (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.
    - (ii) Fixed, point-to-point operation, as used in paragraphs (c)(1)(i) and (c)(1)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.
  - (2) In addition to the provisions in paragraphs (b)(1), (b)(3), (b)(4) and (c)(1)(i) of this section, transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams, simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers provided the emissions comply with the following:
    - (i) Different information must be transmitted to each receiver.
    - (ii) If the transmitter employs an antenna system that emits multiple directional beams but does not do emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device, i.e., the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels, shall not exceed the limit specified in paragraph (b)(1) or (b)(3) of this section, as applicable. However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as follows:
      - (A) The directional gain shall be calculated as the sum of  $10 \log$  (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.
      - (B) A lower value for the directional gain than that calculated in paragraph (c)(2)(ii)(A) of this section will be accepted if sufficient evidence is presented, e.g., due to shading of the array or coherence loss in the beamforming.
    - (iii) If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the power limit specified in paragraph (c)(2)(ii) of this section. If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the limit specified in paragraph (c)(2)(ii) of this section. In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the limit specified in paragraph (c)(2)(ii) of this section by more than 8 dB.
    - (iv) Transmitters that emit a single directional beam shall operate under the provisions of paragraph (c)(1) of this section.

**Section 8****Test name****Specification***Testing data**Transmitter output power and e.i.r.p. requirements**FCC Part 15 Subpart C***References, definitions and limits, continued****8.5.2 Test summary**

<b>Verdict</b>	<b>Pass</b>				
Tested by	P. Barbieri	Test date	July 8, 2021	Sample tested	4387520005

**8.5.3 Test equipment list**

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Spectrum Analyzer (2 Hz ÷ 43 GHz)	Rohde & Schwarz	FSW43	101767	01/2021	01/2022
Shielded room	Siemens	10m control room	1947	NCR	NCR

**8.5.4 Observations, settings and special notes**

The test was performed as per KDB 558074, section 8.3 with reference to ANSI C63.10 subclause 11.9.1 (peak power) using method RBW≥DTS bandwidth (Maximum peak conducted output power)

Spectrum analyser settings:

Resolution bandwidth	3 MHz
Video bandwidth	≥3 × RBW
Frequency span	10 MHz
Detector mode	Peak
Trace mode	Max hold

**8.5.5 Test data****Table 8.5-1: Output power and EIRP results (antenna port measurement)**

Frequency, MHz	Conducted output power, dBm	Output power limit, dBm	Output power margin, dB	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
903	9.1	30	-20.9	2.15	11.3	36	-24.8
911	16.6	30	-13.4	2.15	18.8	36	-17.3
915	16.5	30	-13.5	2.15	18.7	36	-17.4
927	16.4	30	-13.6	2.15	18.6	36	-17.5

Note: EIRP [dBm] = Conducted output power [dBm] + Antenna gain [dBi]

Test data, continued

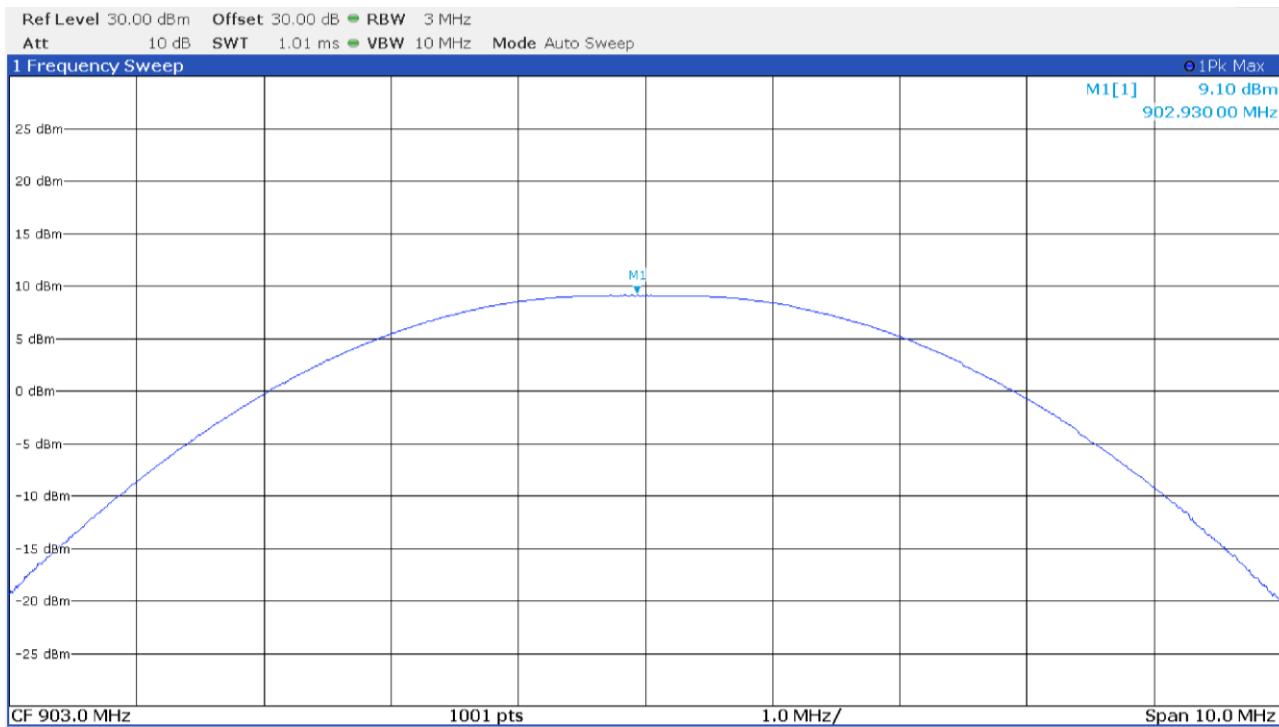


Figure 8.5-1: Output power on low channel

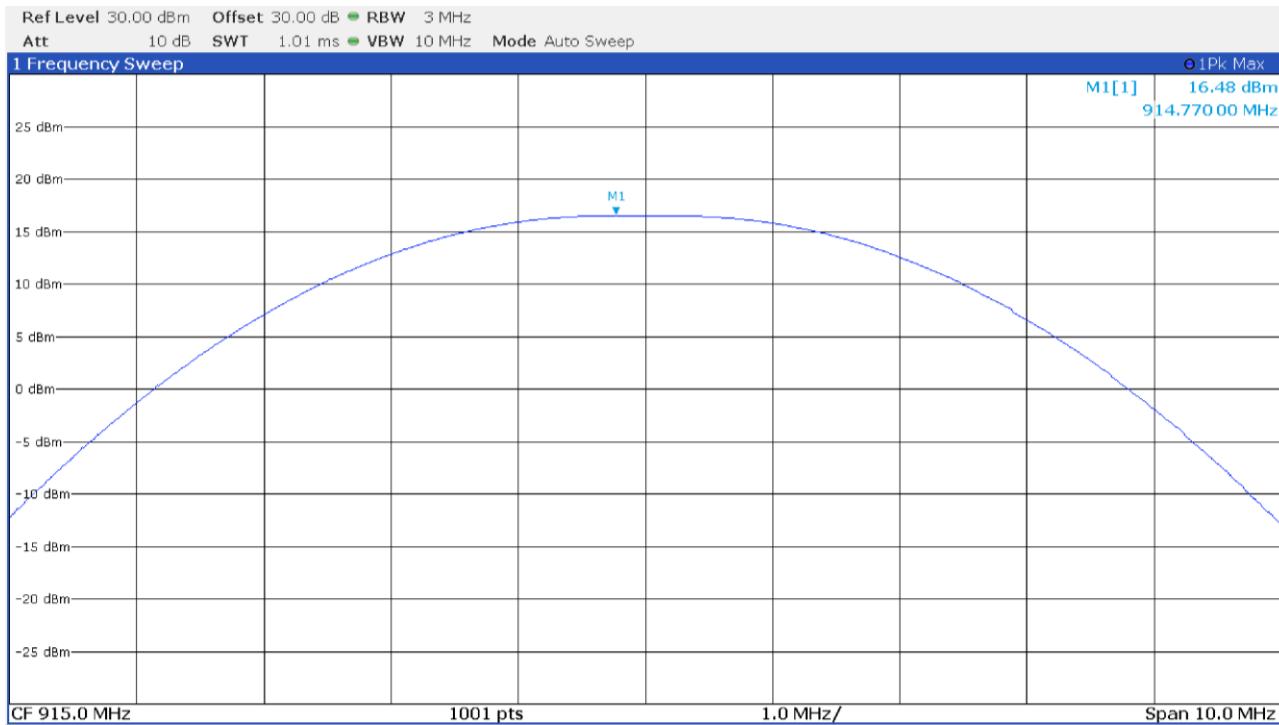


Figure 8.5-2: Output power on mid channel

Test data, continued

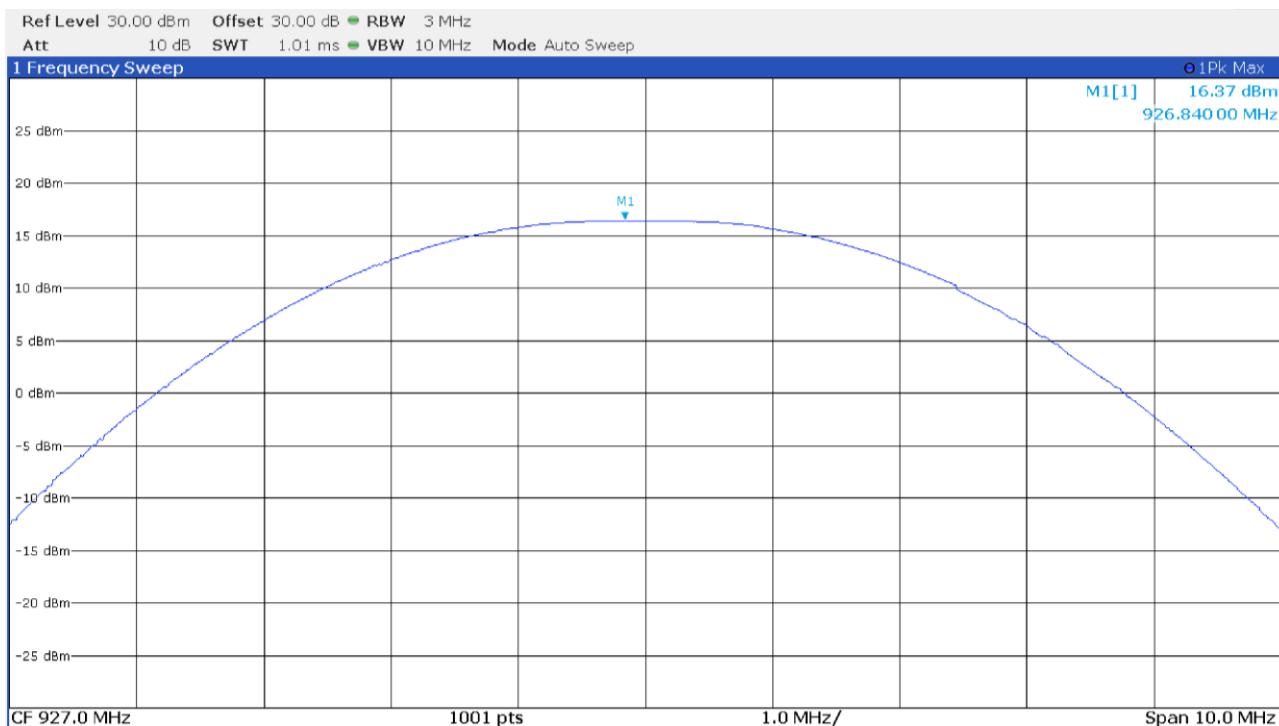


Figure 8.5-3: Output power on high channel

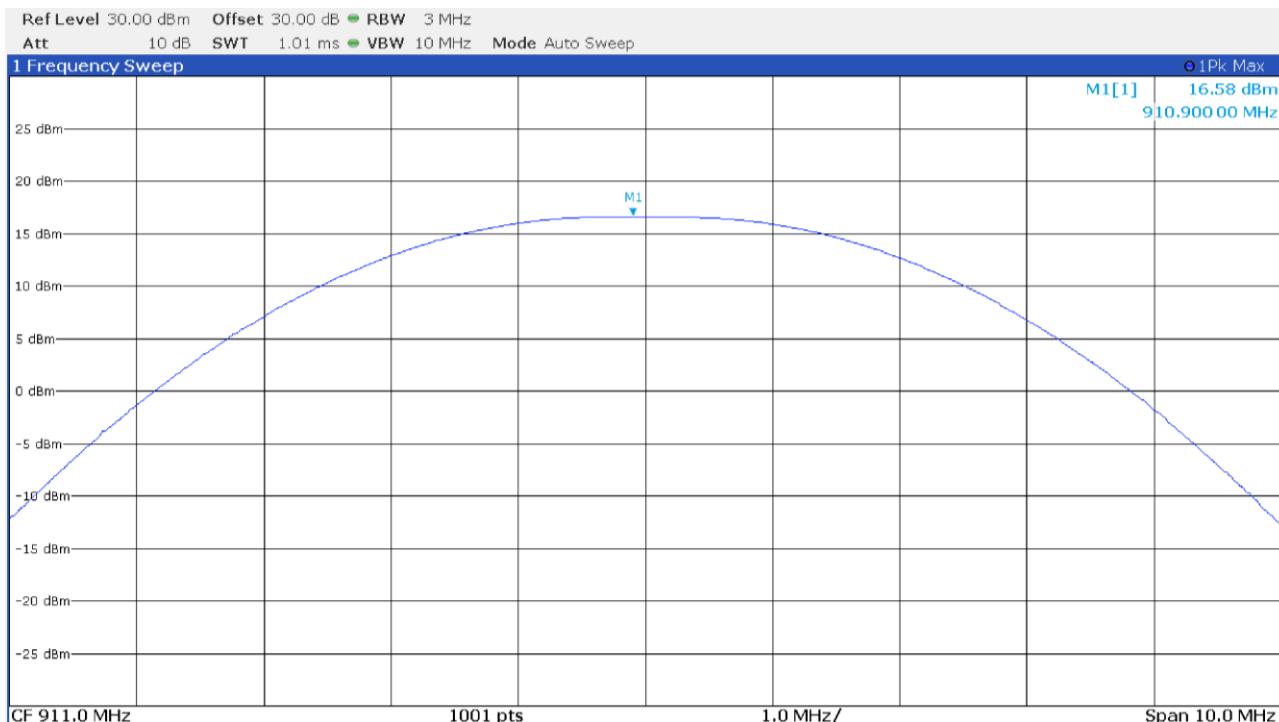


Figure 8.5-4: Output power on additional channel

## 8.6 Spurious (out-of-band) unwanted emissions

### 8.6.1 References, definitions and limits

#### FCC §15.247:

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

**Table 8.6-1: FCC §15.209 – Radiated emission limits**

Field strength of emissions			
Frequency, MHz	µV/m	dBµV/m	Measurement distance, m
0.009–0.490	2400/F	67.6 – 20 × log <sub>10</sub> (F)	300
0.490–1.705	24000/F	87.6 – 20 × log <sub>10</sub> (F)	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes: In the emission table above, the tighter limit applies at the band edges.

For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

**Table 8.6-2: FCC restricted frequency bands**

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			



#### 8.6.2 Test summary

<b>Verdict</b>	Pass		
Tested by	P. Barbieri	Test date	March 17, 2021
Sample tested	4387520005 for band-edge test in non-restricted frequency bands and 4387520004 for the others		

#### 8.6.3 Observations, settings and special notes

- As part of the current assessment, the test range of 9 kHz to 10<sup>th</sup> harmonic has been fully considered and compared to the actual frequencies utilized within the EUT. Since the EUT contains a transmitter in the GHz range, the EUT has been deemed compliant without formal testing in the 9 kHz to 30 MHz test range, therefore formal test results (tabular data and/or plots) are not provided within this test report.
- Radiated measurements were performed at a distance of 3 m.
- DTS emissions in non-restricted frequency bands test was performed as per KDB 558074, section 8.5 with reference to ANSI C63.10 subclause 11.11.
- Since fundamental power was tested using the maximum peak conducted output power procedure to demonstrate compliance, the spurious emissions limit is -20 dBc/100 kHz.
- DTS emissions in restricted frequency bands test was performed as per KDB 558074, section 8.6 with reference to ANSI C63.10 subclause 11.12.
- DTS band-edge emission measurements test was performed as per KDB 558074, section 8.7 with reference to ANSI C63.10 subclause 11.13.

Spectrum analyser settings for radiated measurements within restricted bands below 1 GHz:

Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for peak radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold

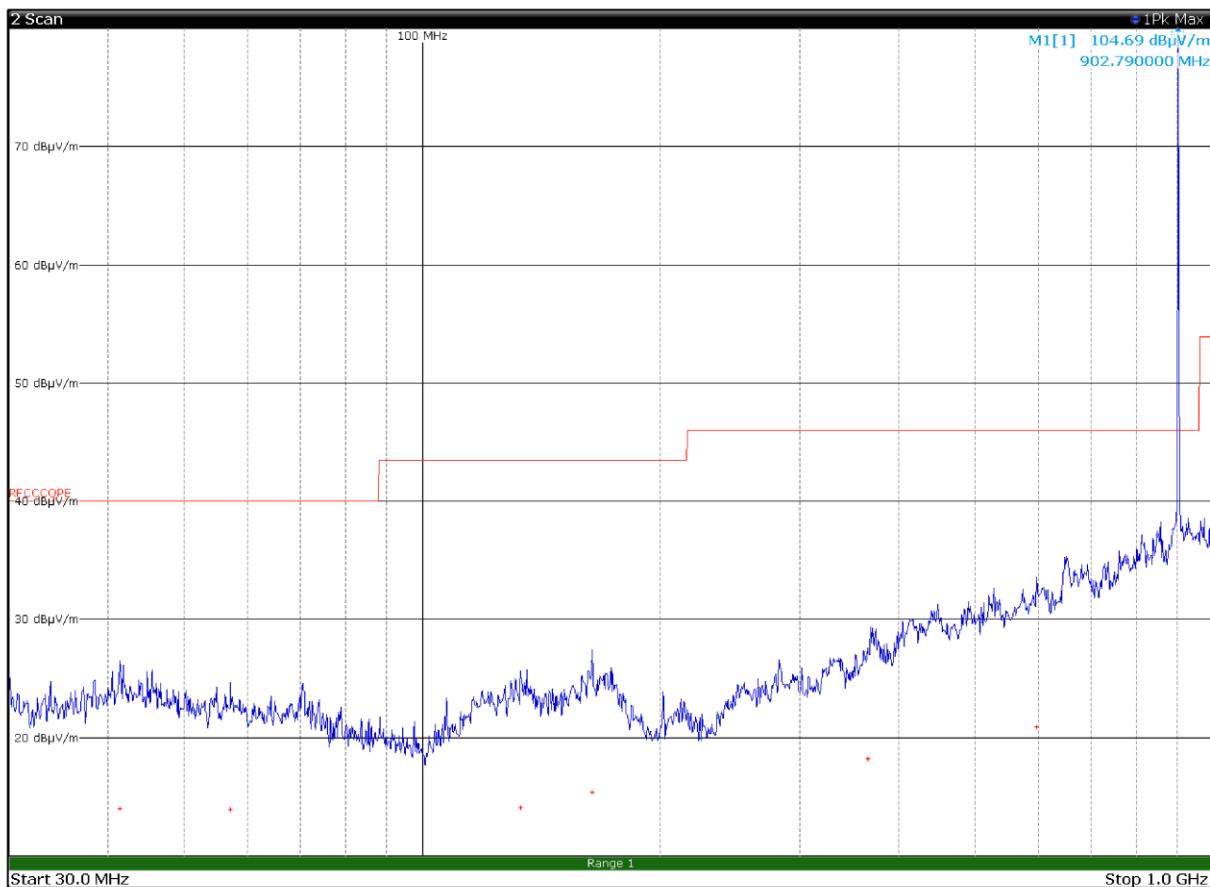
Spectrum analyser settings for average radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	10 Hz
Detector mode:	Peak
Trace mode:	Max Hold

#### 8.6.4 Test equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI receiver (20 Hz ÷ 8 GHz)	Rohde & Schwarz	ESU8	100202	08/2020	08/2021
EMI receiver (2 Hz ÷ 44 GHz)	Rohde & Schwarz	ESW44	101620	09/2020	09/2021
Spectrum Analyzer (2 Hz ÷ 43 GHz)	Rohde & Schwarz	FSW43	101767	01/2021	01/2022
Trilog Antenna (30 MHz ÷ 7 GHz)	Schwarzbeck	VULB 9162	9162-025	07/2018	07/2021
Bilog antenna (1 ÷ 18 GHz)	Schwarzbeck	STLP 9148	9148-123	07/2018	07/2021
Horn Antenna (4 ÷ 40 GHz)	RFSpin	DRH40	061106A40	04/2020	04/2023
Preamplifier (1 ÷ 18 GHz)	Schwarzbeck	BBV 9718C	00121	01/2021	01/2022
Preamplifier (18 ÷ 40 GHz)	Sage	STB-1834034030-KFKF-L1	18490-01	04/2021	04/2022
Controller	Maturo	FCU3.0	10041	NCR	NCR
Tilt antenna mast	Maturo	TAM4.0-E	10042	NCR	NCR
Turntable	Maturo	TT4.0-5T	2.527	NCR	NCR
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	09/2019	09/2021
Shielded room	Siemens	10m control room	1947	NCR	NCR

### 8.6.5 Test data

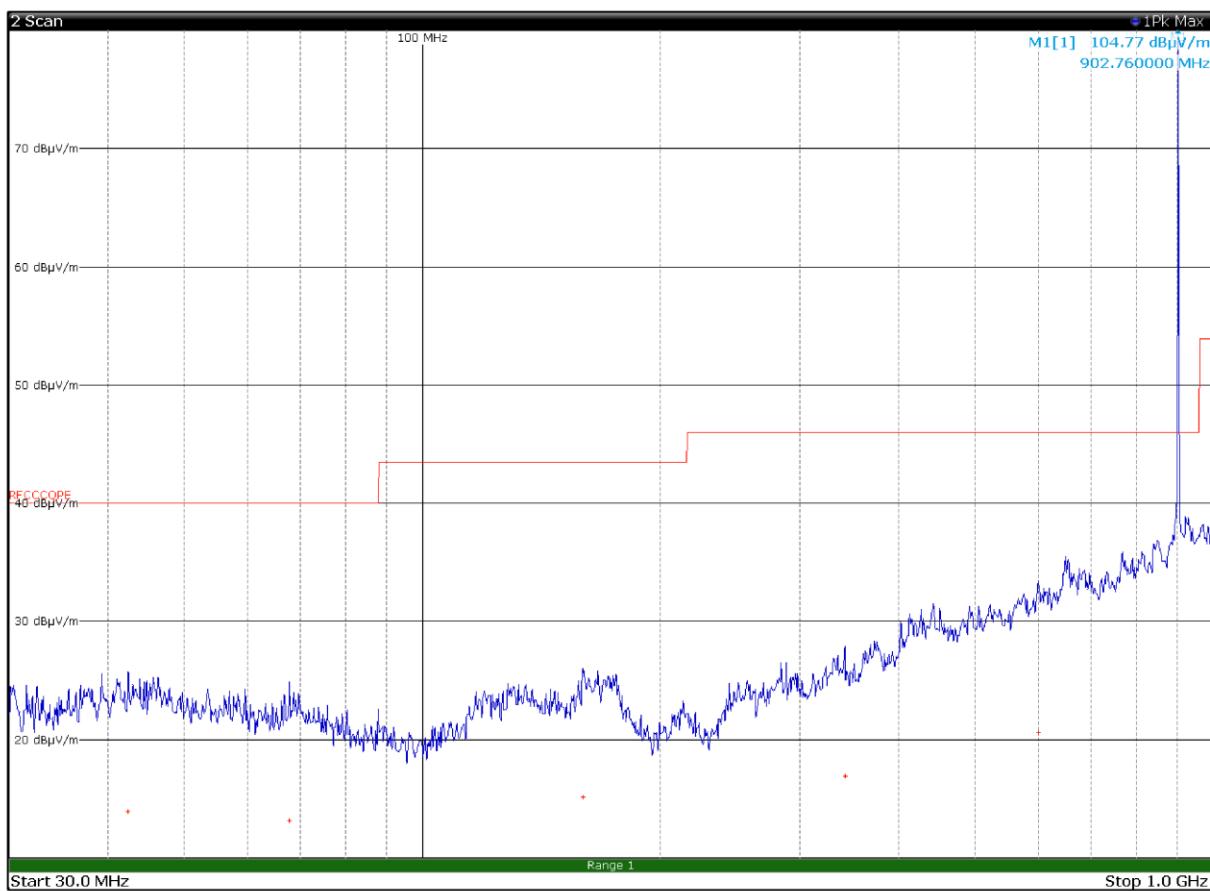


**Figure 8.6-1:** Radiated spurious emissions on low channel with antenna in horizontal polarization

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
41.4300	14.1	40.0	-25.9	QP
57.1500	13.9	40.0	-26.1	QP
132.9000	14.1	43.5	-29.4	QP
163.9200	15.4	43.5	-28.1	QP
365.4900	18.2	46.0	-27.8	QP
597.9000	21.0	46.0	-25.0	QP

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

Limit exceeded by the carrier

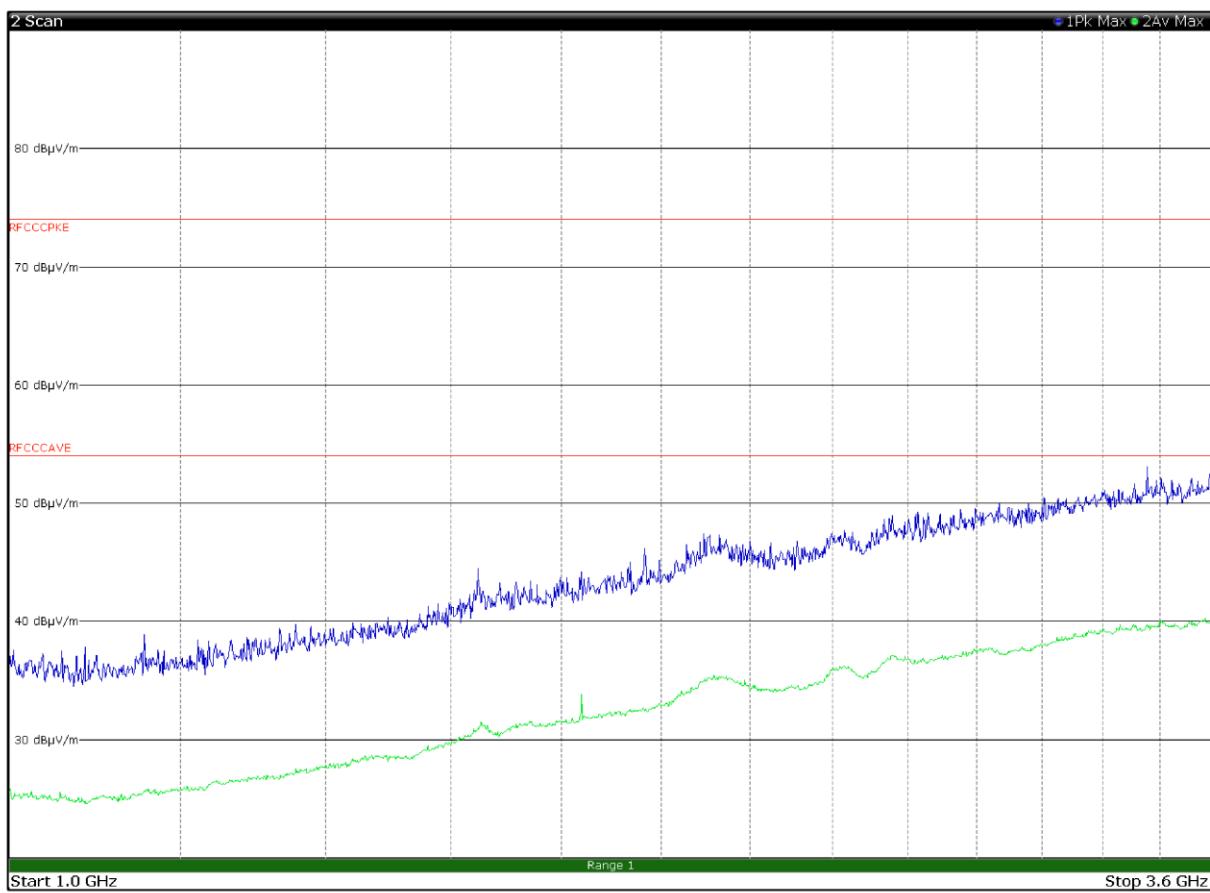


**Figure 8.6-2:** Radiated spurious emissions on low channel with antenna in vertical polarization

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
42.4500	14.0	40.0	-26.0	QP
67.8600	13.2	40.0	-26.8	QP
87.8700	9.5	40.0	-30.5	QP
159.6600	15.2	43.5	-28.3	QP
341.9400	16.9	46.0	-29.1	QP
600.2700	20.7	46.0	-25.3	QP

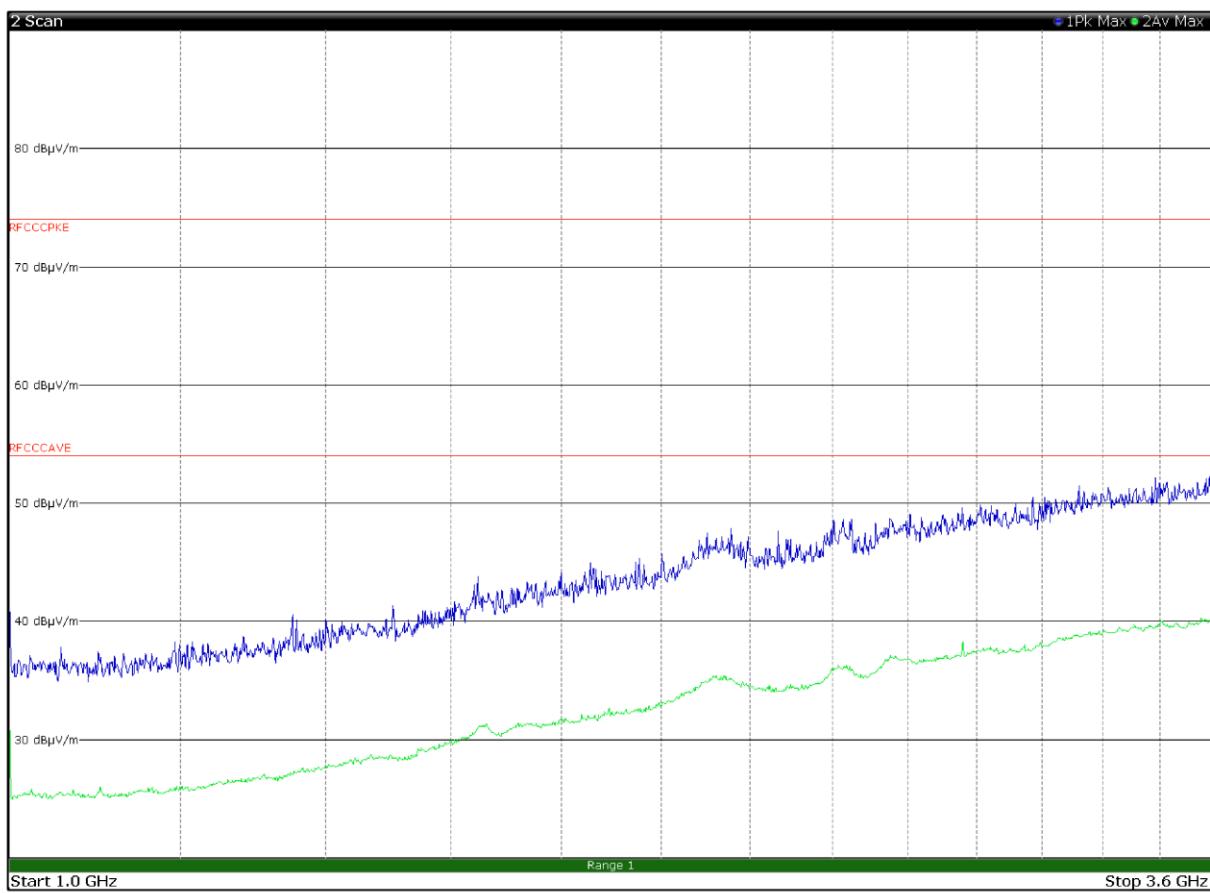
Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

Limit exceeded by the carrier



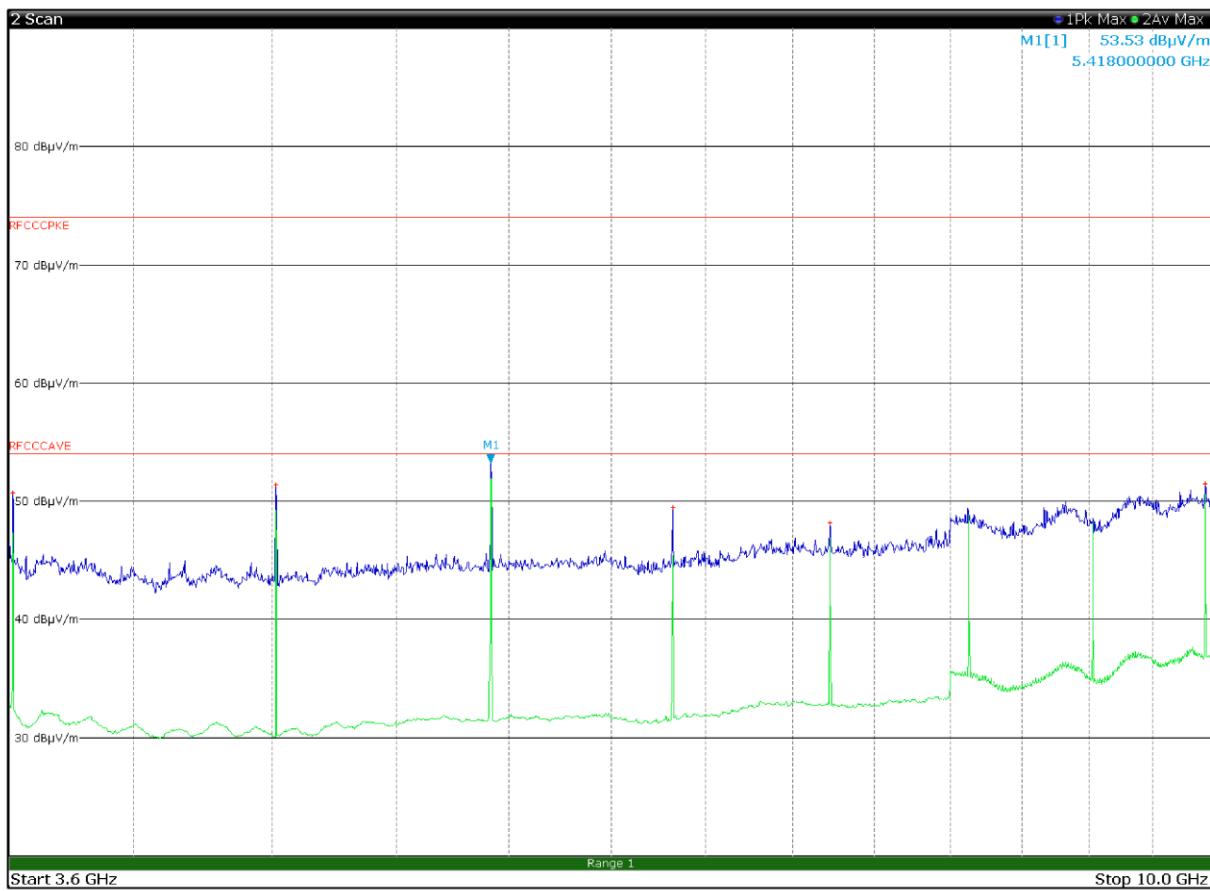
Peak level under the average limit – no additional measures need

**Figure 8.6-3:** Radiated spurious emissions on low channel with antenna in horizontal polarization



Peak level under the average limit – no additional measures need

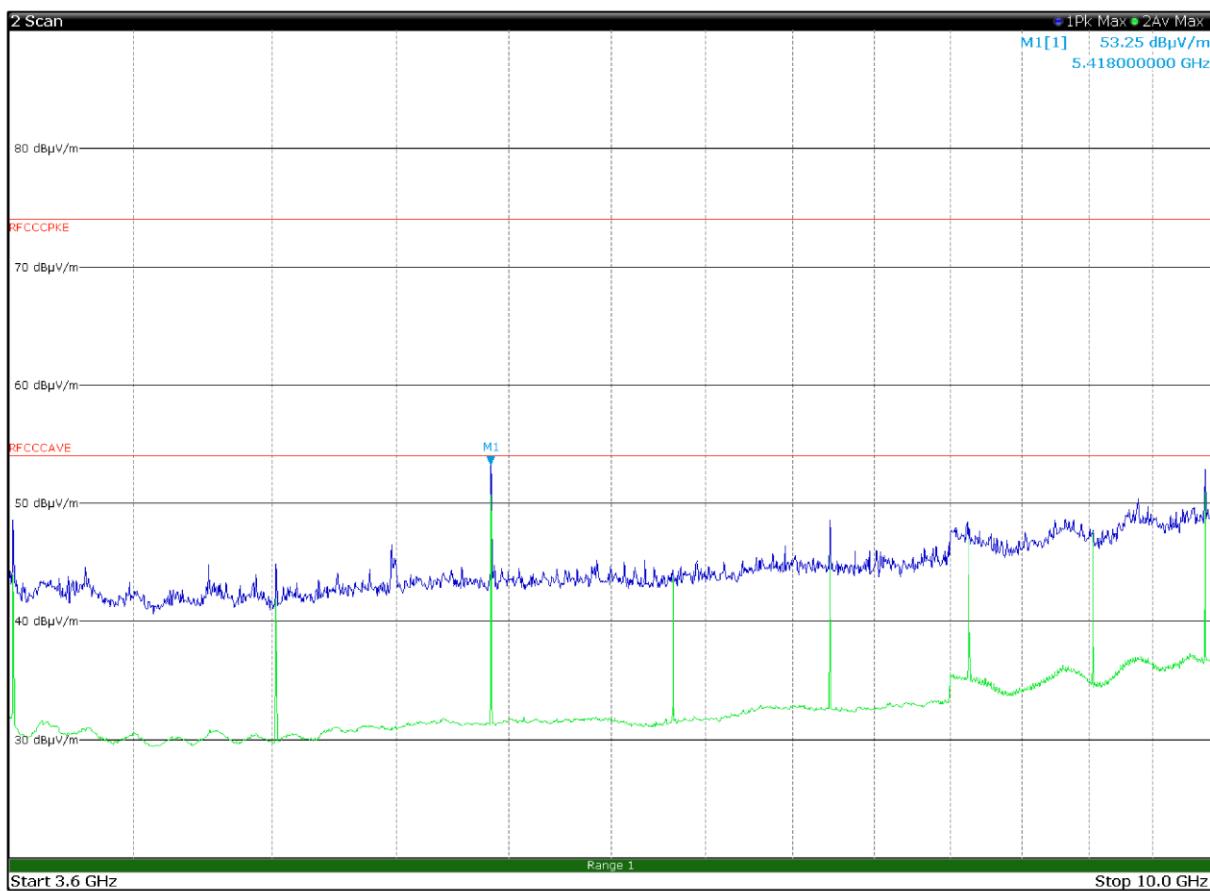
**Figure 8.6-4:** Radiated spurious emissions on low channel with antenna in vertical polarization



**Figure 8.6-5:** Radiated spurious emissions on low channel with antenna in horizontal polarization

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
3612.2500	50.8	54.0	-3.2	AV
4514.7500	51.4	54.0	-2.6	AV
5418.0000	53.5	54.0	-0.5	AV
6320.7500	49.5	54.0	-4.5	AV
7224.0000	48.2	54.0	-5.8	AV
9933.7500	51.5	54.0	-2.5	AV

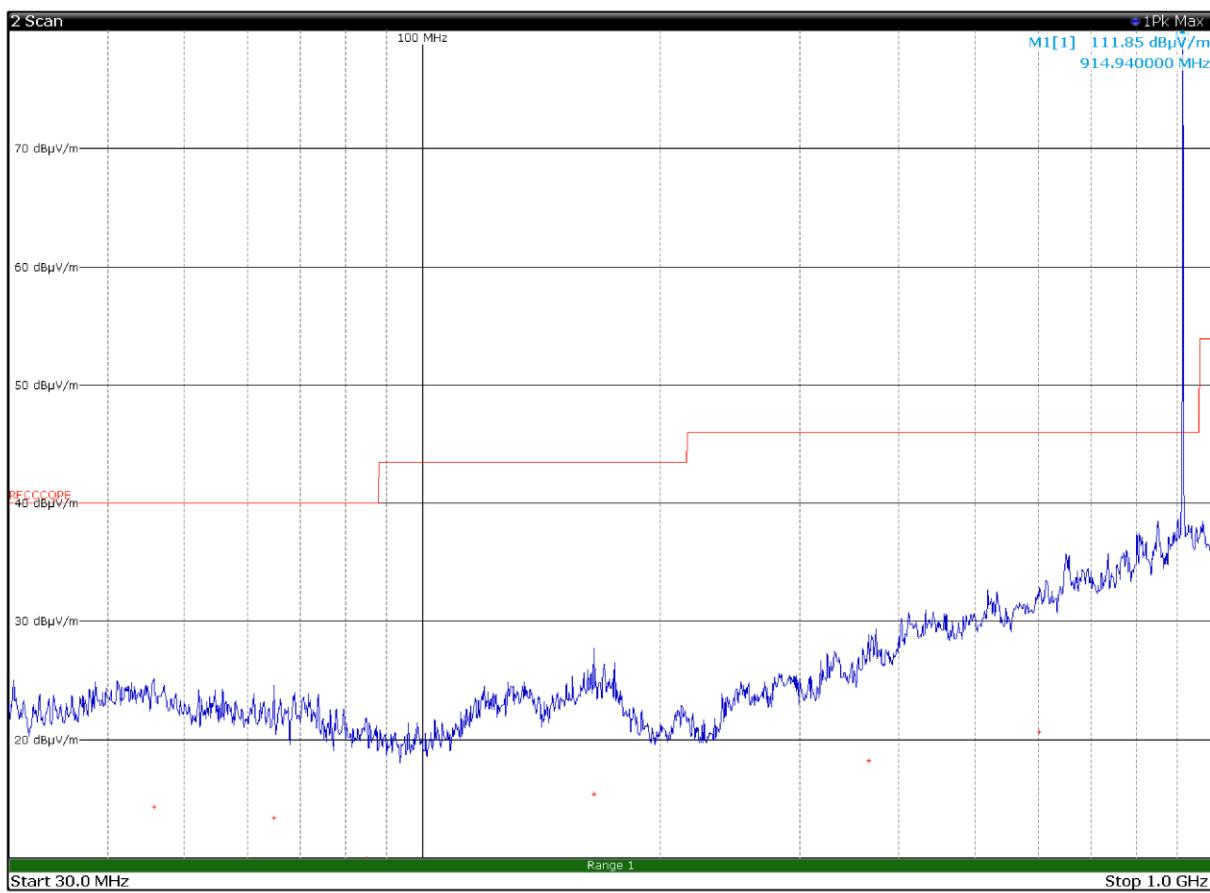
Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.



**Figure 8.6-6:** Radiated spurious emissions on low channel with antenna in vertical polarization

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
3612.2500	49.3	54.0	-4.7	AV
5418.0000	53.2	54.0	-0.8	AV
9933.7500	52.7	54.0	-1.3	AV

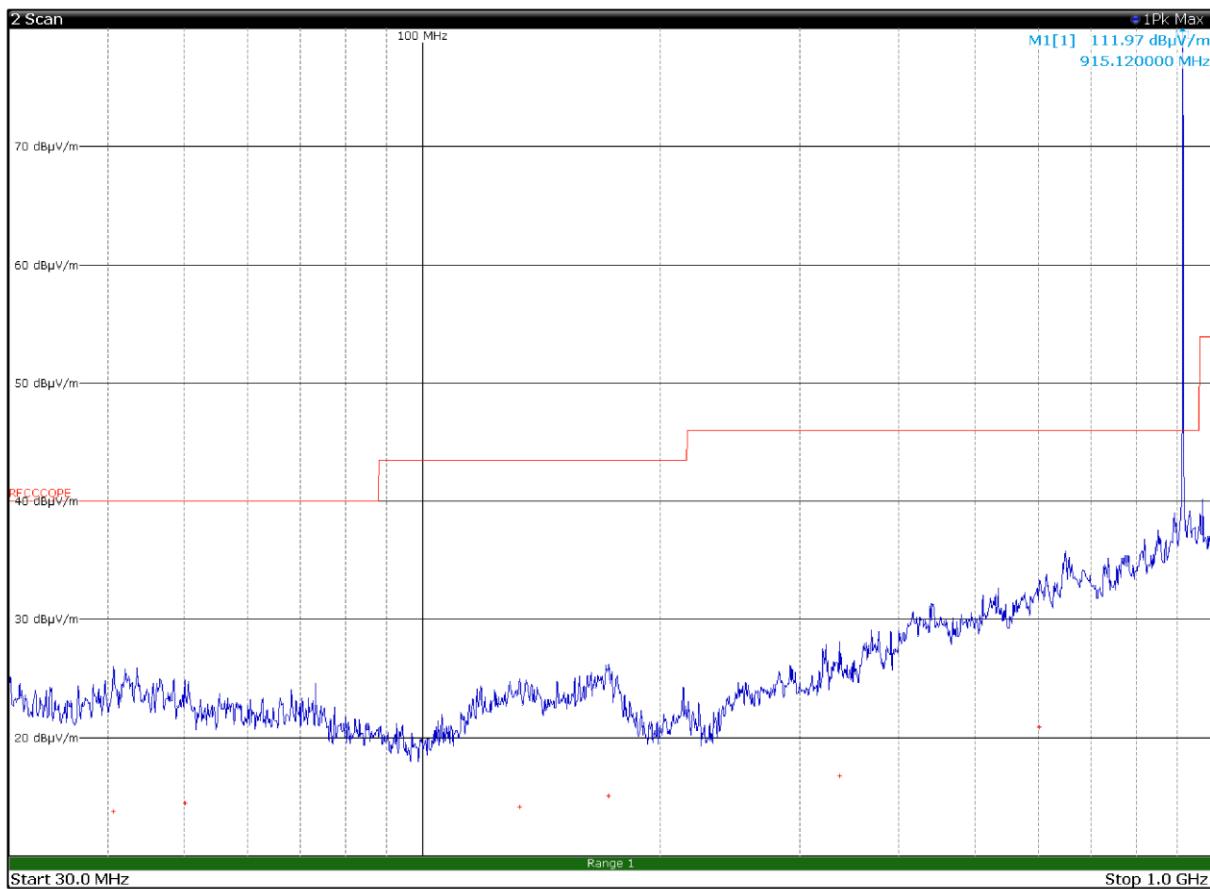
Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.



**Figure 8.6-7:** Radiated spurious emissions on mid channel with antenna in horizontal polarization

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
45.7500	14.4	40.0	-25.6	QP
64.8600	13.4	40.0	-26.6	QP
84.9300	9.9	40.0	-30.1	QP
164.6400	15.4	43.5	-28.1	QP
366.7500	18.3	46.0	-27.7	QP
602.5800	20.7	46.0	-25.3	QP
Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.				

Limit exceeded by the carrier

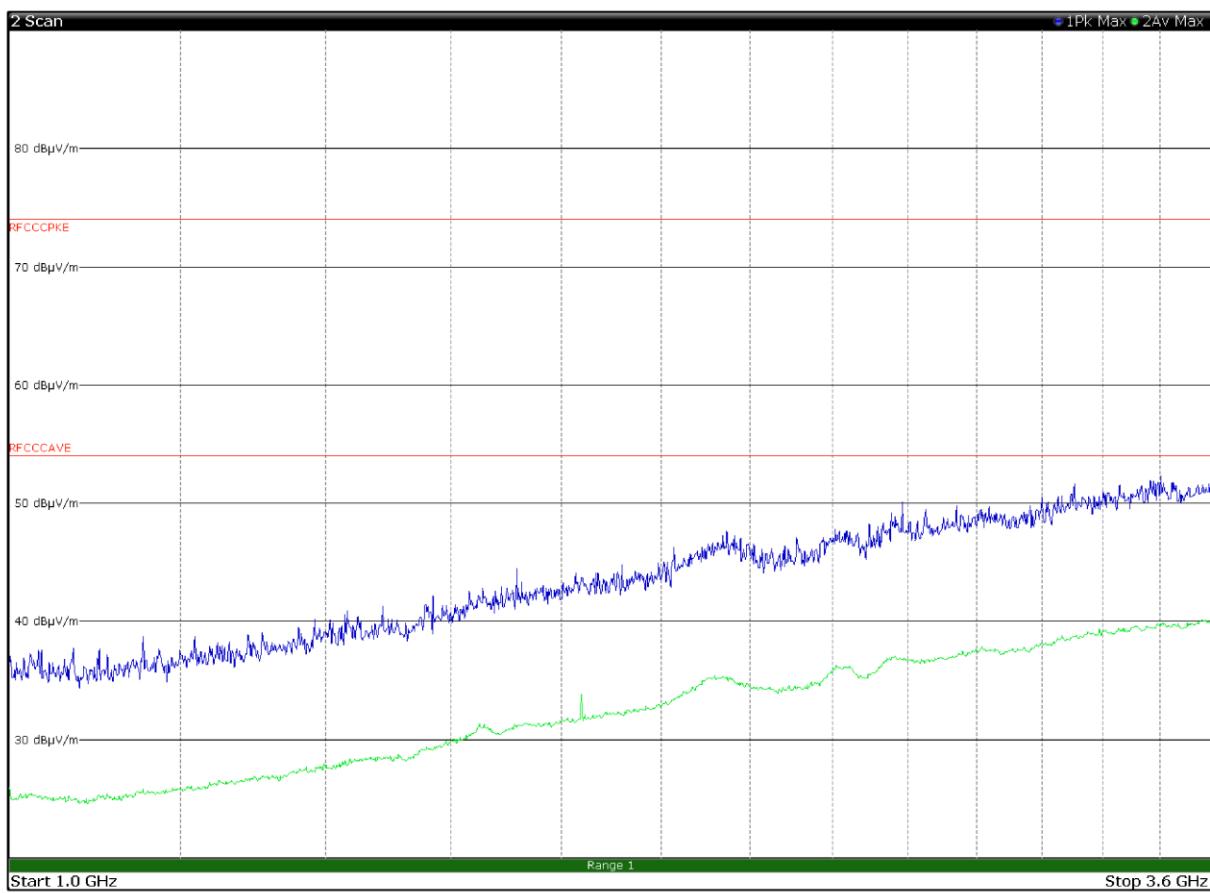


**Figure 8.6-8:** Radiated spurious emissions on mid channel with antenna in vertical polarization

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
40.6800	13.8	40.0	-26.2	QP
50.0400	14.5	40.0	-25.5	QP
132.5400	14.2	43.5	-29.3	QP
171.9900	15.1	43.5	-28.4	QP
336.7500	16.8	46.0	-29.2	QP
602.6100	21.0	46.0	-25.0	QP

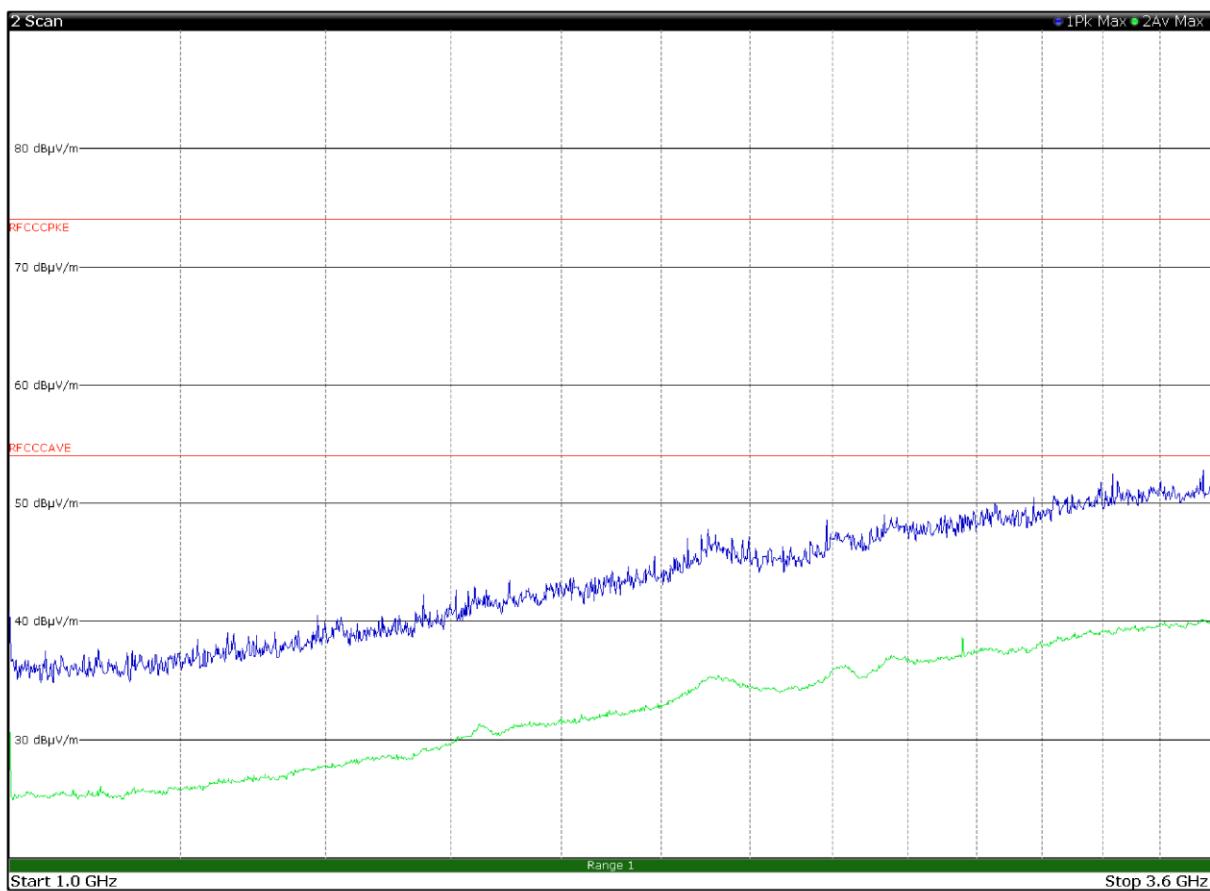
Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

Limit exceeded by the carrier



Peak level under the average limit – no additional measures need

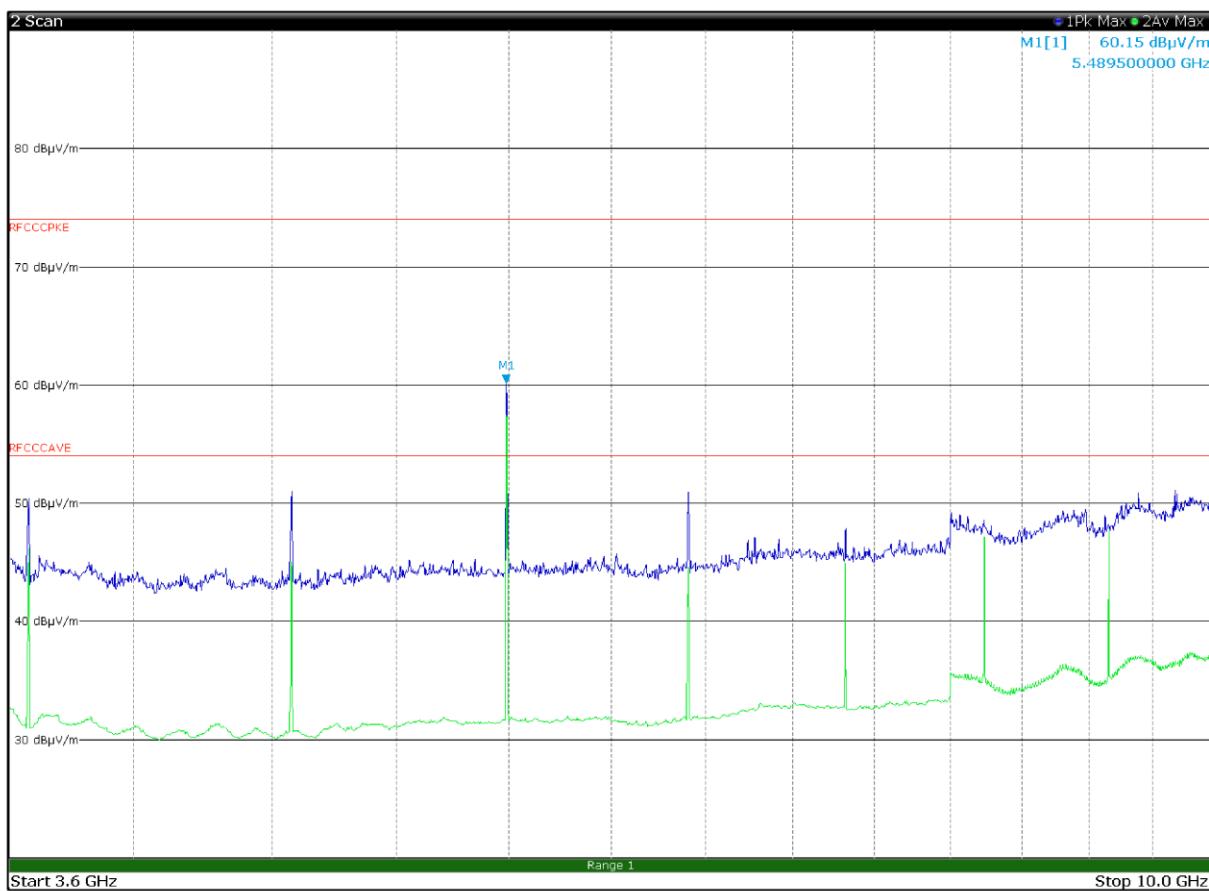
**Figure 8.6-9:** Radiated spurious emissions on mid channel with antenna in horizontal polarization



Peak level under the average limit – no additional measures need

Limit exceeded by the carrier

**Figure 8.6-10:** Radiated spurious emissions on mid channel with antenna in vertical polarization

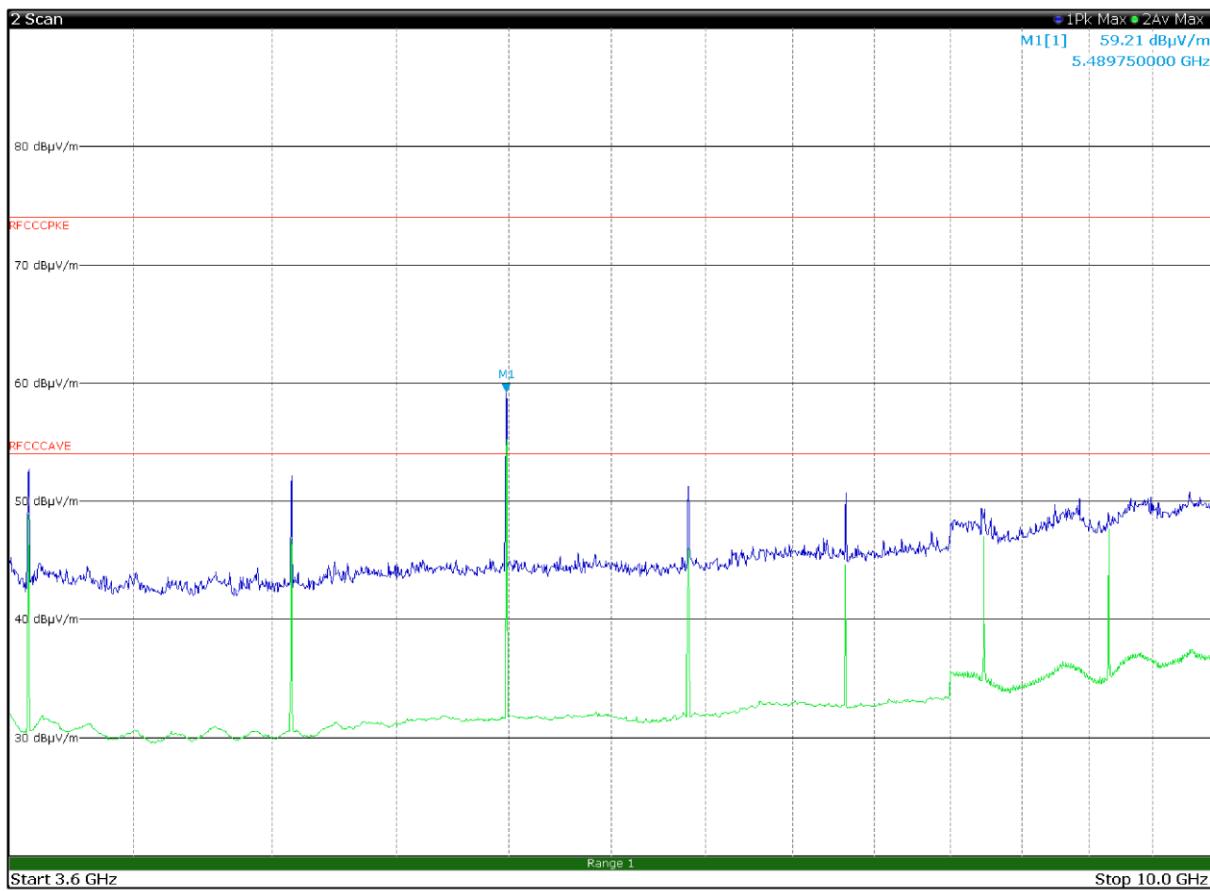


**Figure 8.6-11:** Radiated spurious emissions on mid channel with antenna in horizontal polarization

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
3660.7500	50.5	54.0	-3.5	AV
4575.2500	51.0	54.0	-3.0	AV
5489.5000	60.2	91.8 (1)	-31.6	AV
6405.7500	51.0	54.0	-3.0	AV
7320.2500	47.9	54.0	-6.1	AV
8233.5000	48.6	54.0	-5.4	AV
9121.2500	49.0	54.0	-5.0	AV

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

Note (1): for this frequency the limit is: EIRP @ 100 kHz – 20 dBc = 111.8 dBm – 20 dB = 91.8 dBm as require is 15.247 (d)  
(see 30 to 1000 MHz plot above)

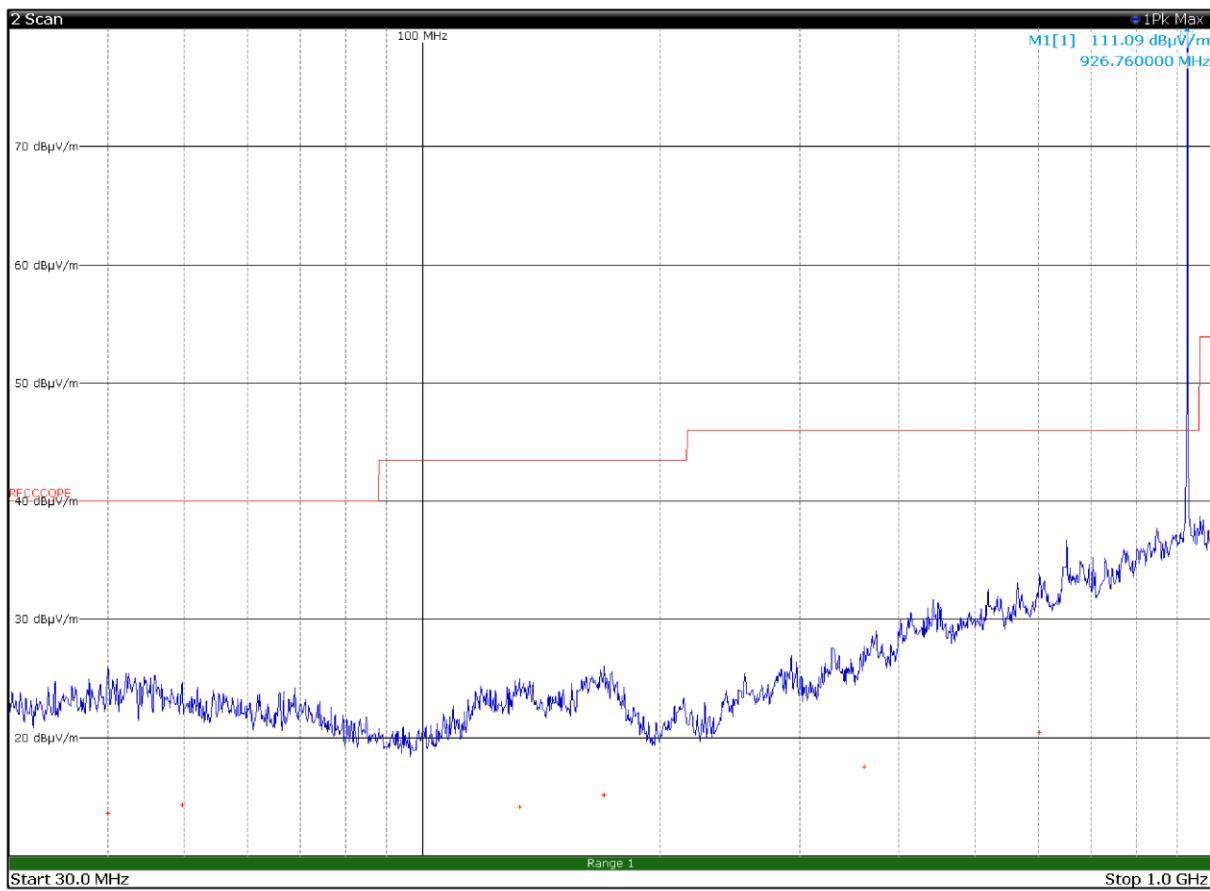


**Figure 8.6-12:** Radiated spurious emissions on mid channel with antenna in vertical polarization

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
3676.2500	52.5	54.0	-1.5	AV
4595.2500	52.2	54.0	-1.8	AV
5513.0000	58.7	91.9 (1)	-33.2	AV
6432.2500	42.4	54.0	-11.6	AV
6432.7500	50.4	54.0	-3.6	AV
7353.0000	48.9	54.0	-5.1	AV
9190.0000	50.1	54.0	-3.9	AV
9807.7500	50.9	54.0	-3.1	AV

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

Note (1): for this frequency the limit is: EIRP @ 100 kHz – 20 dBc = 111.9 dBm – 20 dB = 91.9 dBm as require is 15.247 (d)  
(see 30 to 1000 MHz plot above)

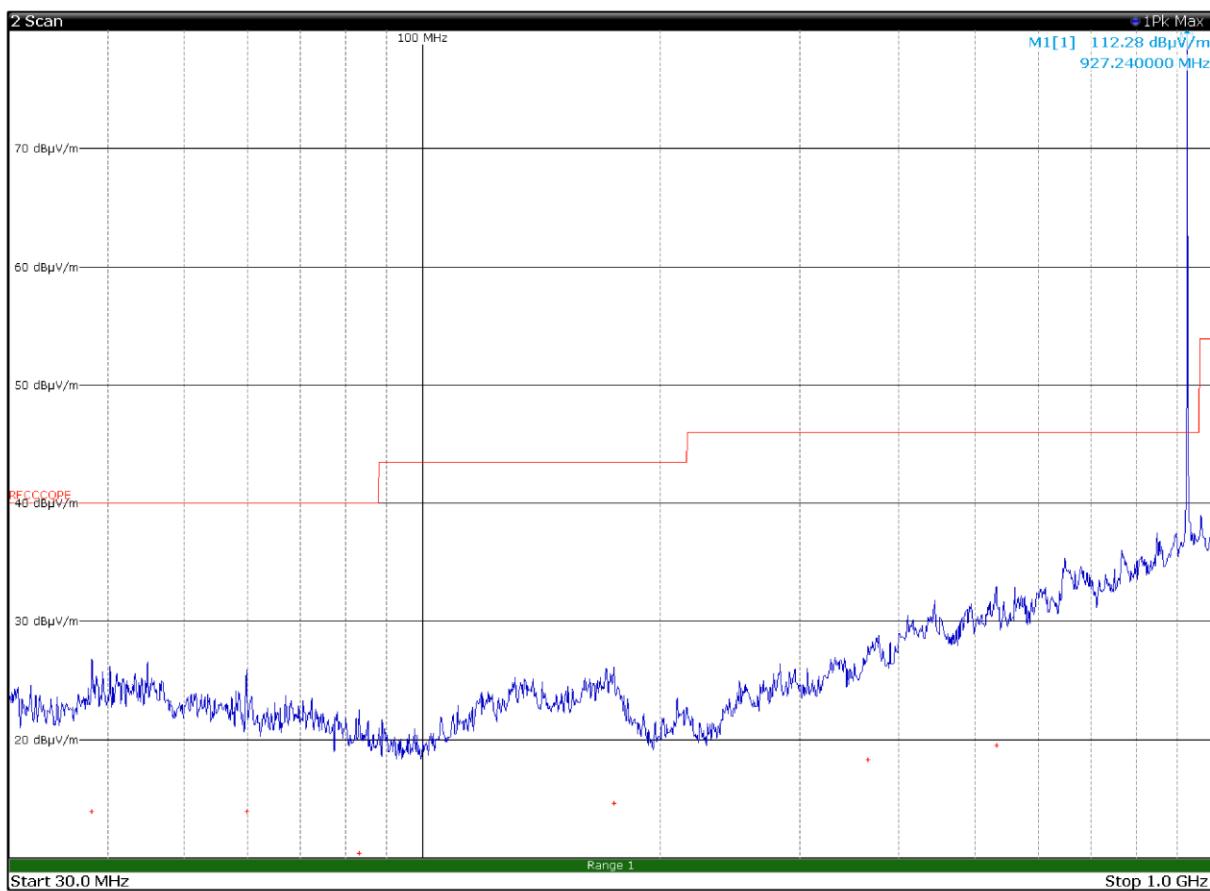


**Figure 8.6-13:** Radiated spurious emissions on high channel with antenna in horizontal

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
40.0500	13.6	40.0	-26.4	QP
49.6200	14.4	40.0	-25.6	QP
132.5400	14.2	43.5	-29.3	QP
169.6200	15.2	43.5	-28.3	QP
361.5600	17.6	46.0	-28.4	QP
602.6400	20.5	46.0	-25.5	QP

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

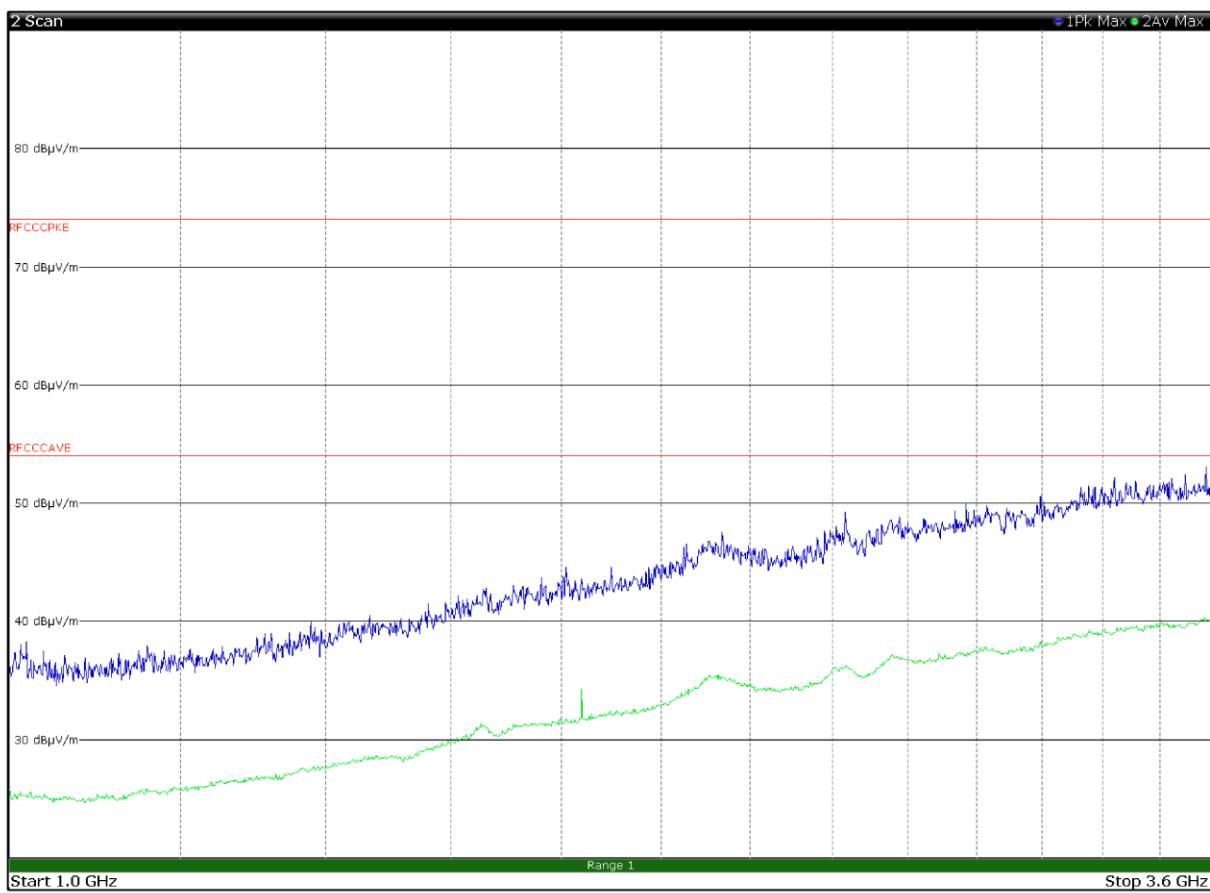
Limit exceeded by the carrier



**Figure 8.6-14:** Radiated spurious emissions on high channel with antenna in vertical polarization

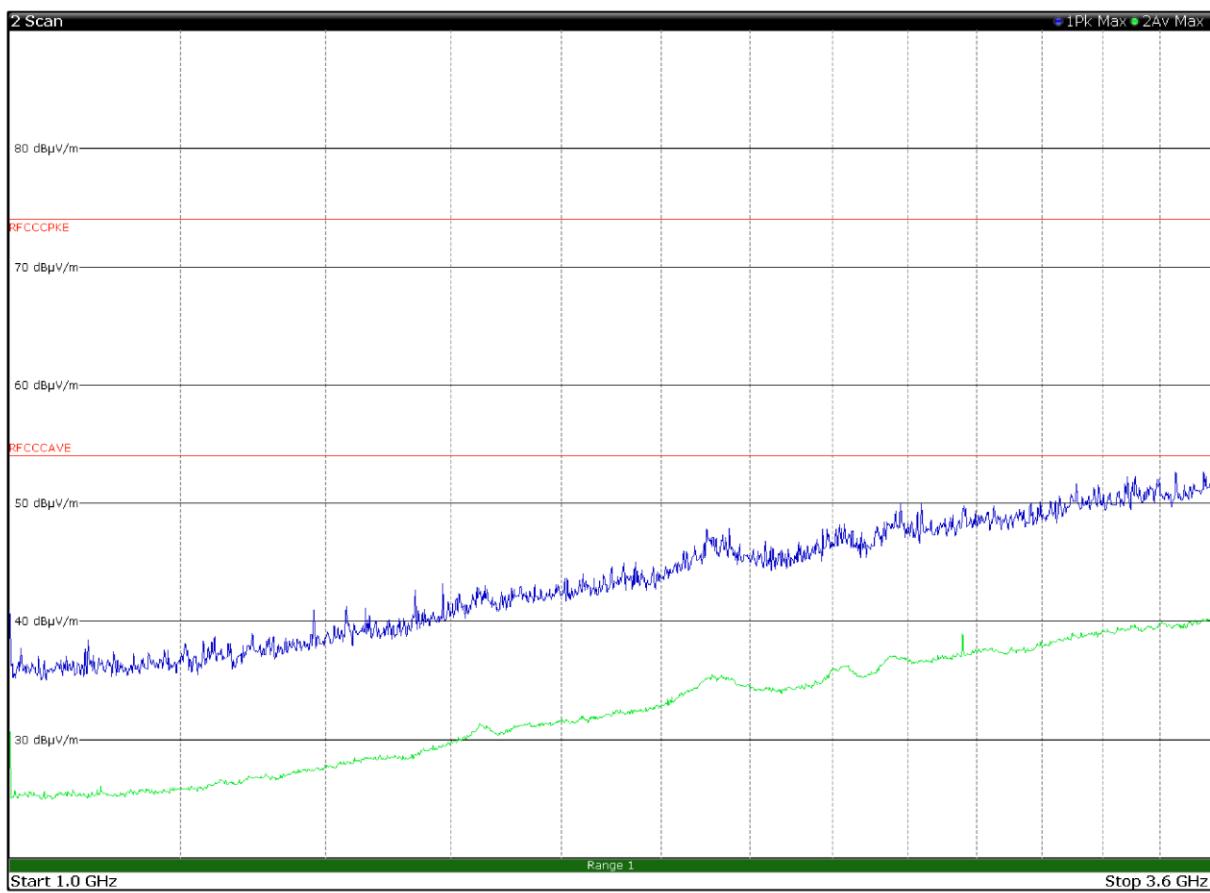
Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
38.1900	13.9	40.0	-26.1	QP
59.8800	14.0	40.0	-26.0	QP
83.1000	10.5	40.0	-29.5	QP
174.6900	14.6	43.5	-28.9	QP
365.7300	18.3	46.0	-27.7	QP
531.3600	19.6	46.0	-26.4	QP
Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.				

Limit exceeded by the carrier



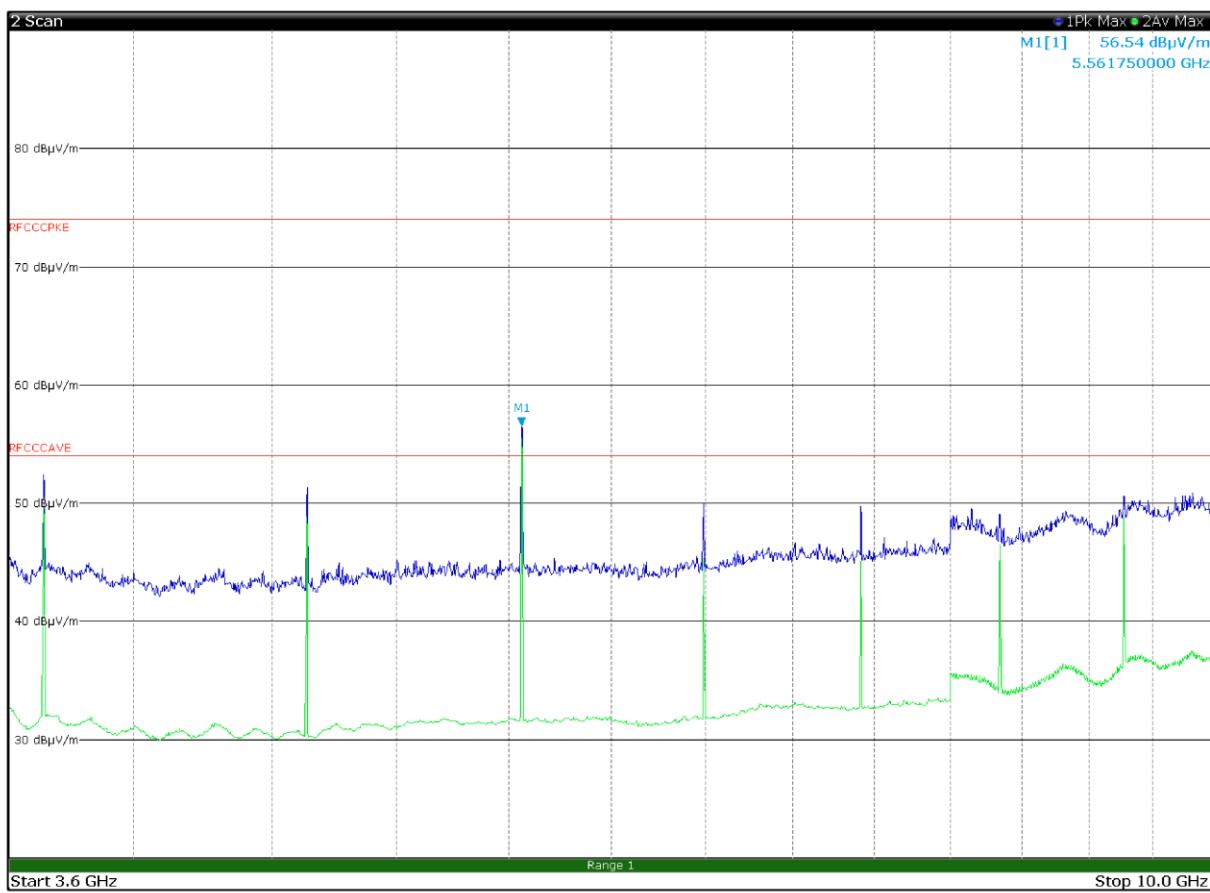
Peak level under the average limit – no additional measures need

**Figure 8.6-15:** Radiated spurious emissions on high channel with antenna in horizontal polarization



Peak level under the average limit – no additional measures need

**Figure 8.6-16:** Radiated spurious emissions on high channel with antenna in vertical polarization

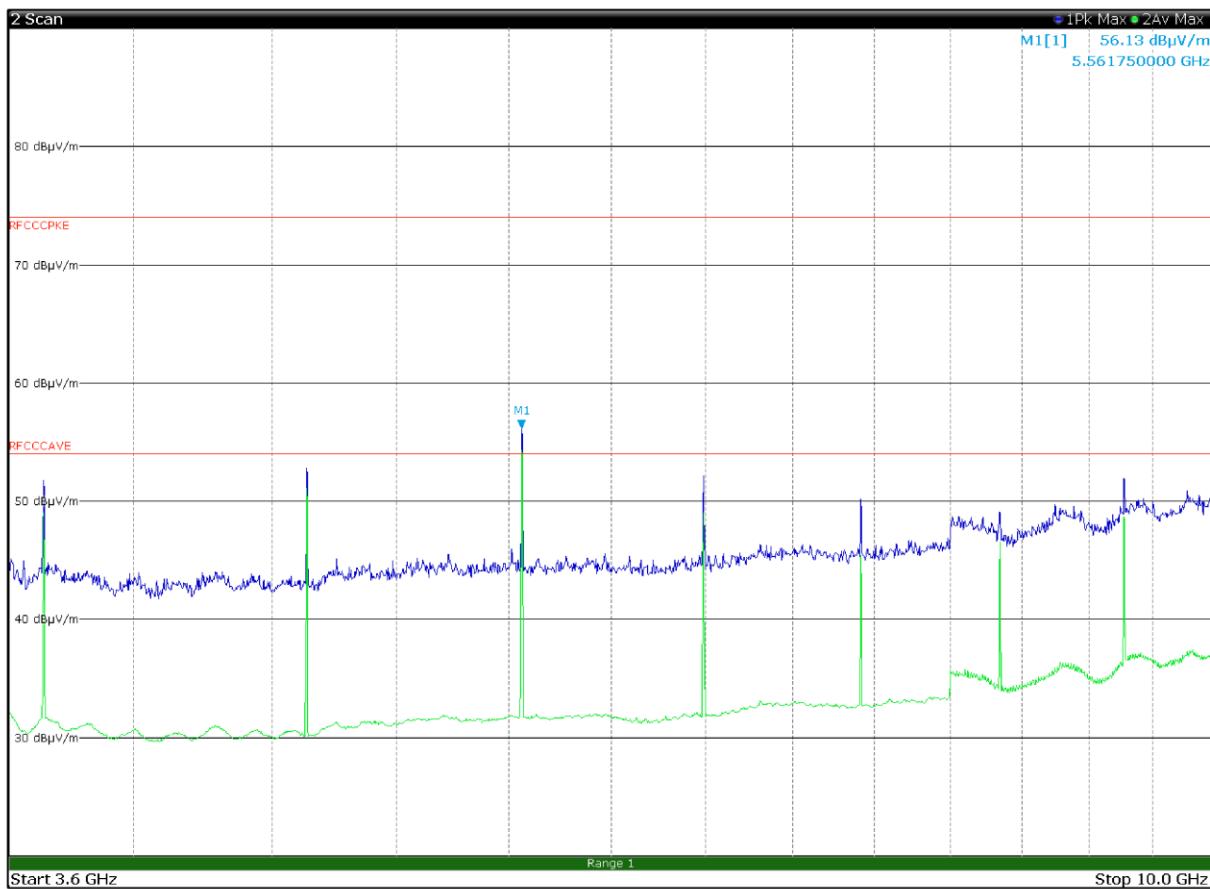


**Figure 8.6-17:** Radiated spurious emissions on high channel with antenna in horizontal polarization

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
3708.0000	52.4	54.0	-1.6	AV
4635.2500	51.4	54.0	-2.6	AV
5562.0000	56.9	91.1 (1)	-34.2	AV
6489.2500	50.0	54.0	-4.0	AV
7416.0000	49.7	54.0	-4.3	AV
8342.7500	49.2	54.0	-4.8	AV
9269.7500	50.7	54.0	-3.3	AV

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

Note (1): for this frequency the limit is: EIRP @ 100 kHz – 20 dBc = 111.1 dBm – 20 dB = 91.1 dBm as require is 15.247 (d)  
 (see 30 to 1000 MHz plot above)

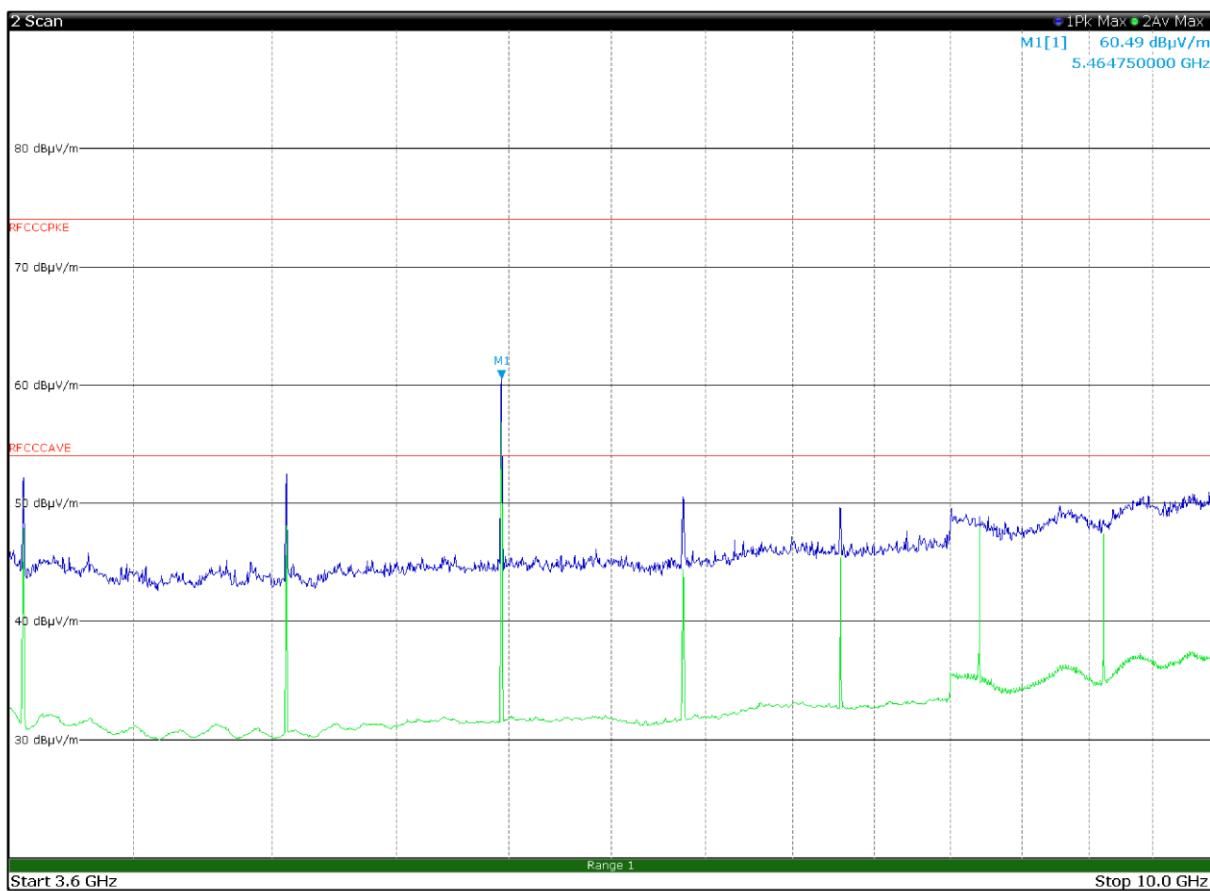


**Figure 8.6-18:** Radiated spurious emissions on high channel with antenna in vertical polarization

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
3708.0000	51.9	54.0	-2.1	AV
4635.0000	52.8	54.0	-1.2	AV
5561.7500	56.2	92.3 (1)	-36.1	AV
6488.7500	52.2	54.0	-1.8	AV
7416.0000	50.2	54.0	-3.8	AV
9270.2500	51.9	54.0	-2.1	AV

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

Note (1): for this frequency the limit is: EIRP @ 100 kHz – 20 dBc = 112.3 dBm – 20 dB = 92.3 dBm as require is 15.247 (d)  
 (see 30 to 1000 MHz plot above)

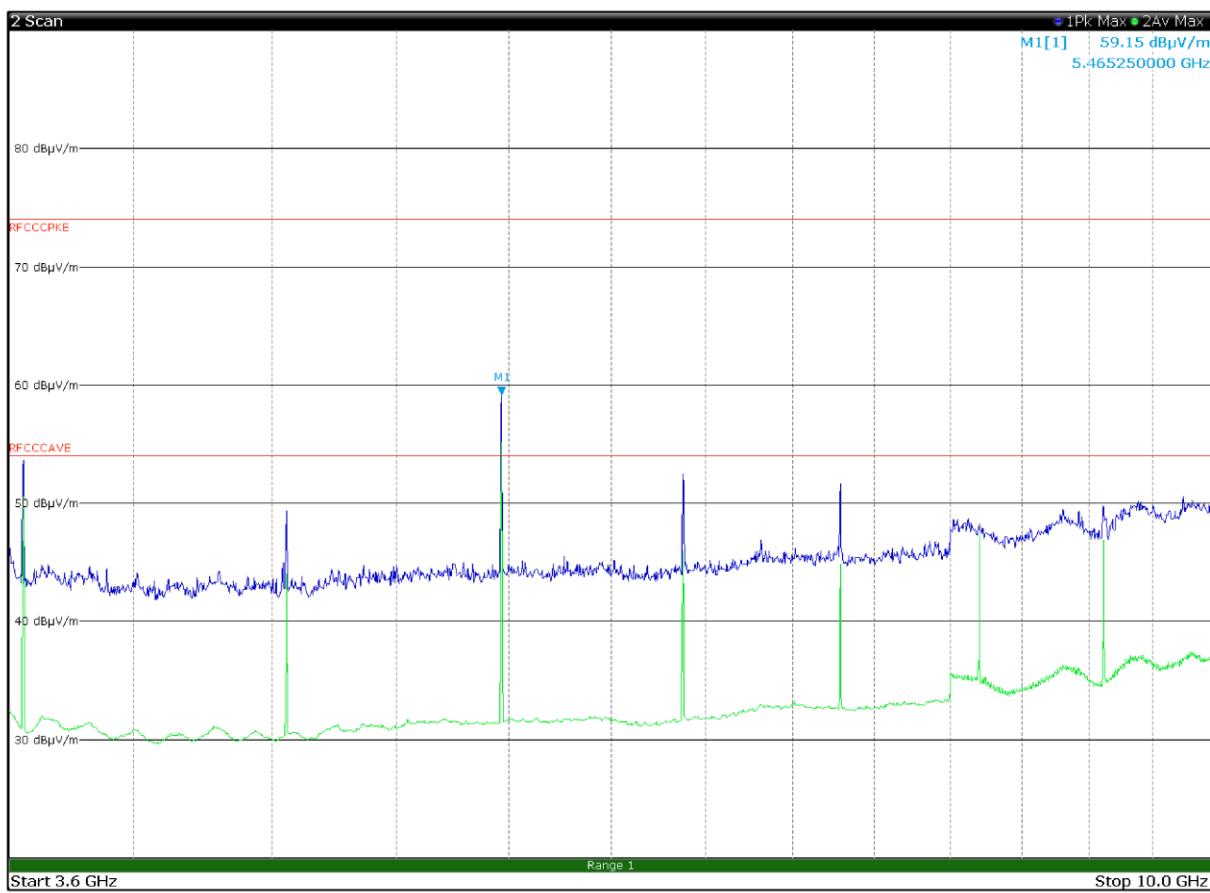


**Figure 8.6-19:** Radiated spurious emissions on addition channel with antenna in horizontal polarization

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
3643.2500	52.2	54.0	-1.8	AV
4554.7500	52.5	54.0	-1.5	AV
5464.7500	60.5	92.1 (1)	-31.5	AV
6378.2500	50.6	54.0	-3.4	AV
7286.5000	49.7	54.0	-4.3	AV

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

Note (1): for this frequency the limit is: EIRP @ 100 kHz – 20 dBc = 112.1 dBm – 20 dB = 92.1 dBm as require is 15.247 (d)



**Figure 8.6-20:** Radiated spurious emissions on addition channel with antenna in vertical polarization

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
3643.5000	53.6	54.0	-0.4	AV
4554.7500	49.4	54.0	-4.6	AV
5465.2500	59.2	91.8 (1)	-32.6	AV
6378.0000	52.5	54.0	-1.5	AV
7287.2500	51.6	54.0	-2.4	AV
9107.7500	49.7	54.0	-4.3	AV

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

Note (1): for this frequency the limit is: EIRP @ 100 kHz – 20 dBc = 111.8 dBm – 20 dB = 91.8 dBm as require is 15.247 (d)

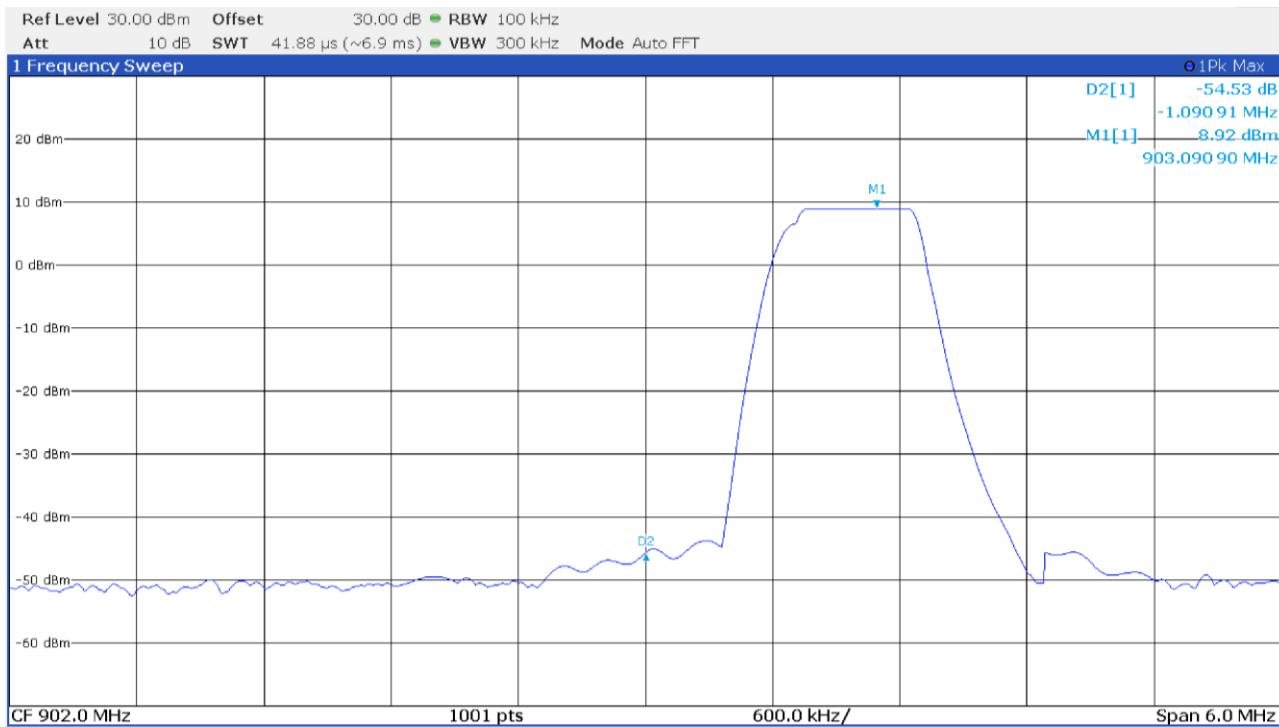


Figure 8.6-21: Band edge spurious emissions at 902 MHz for non-restricted frequency bands

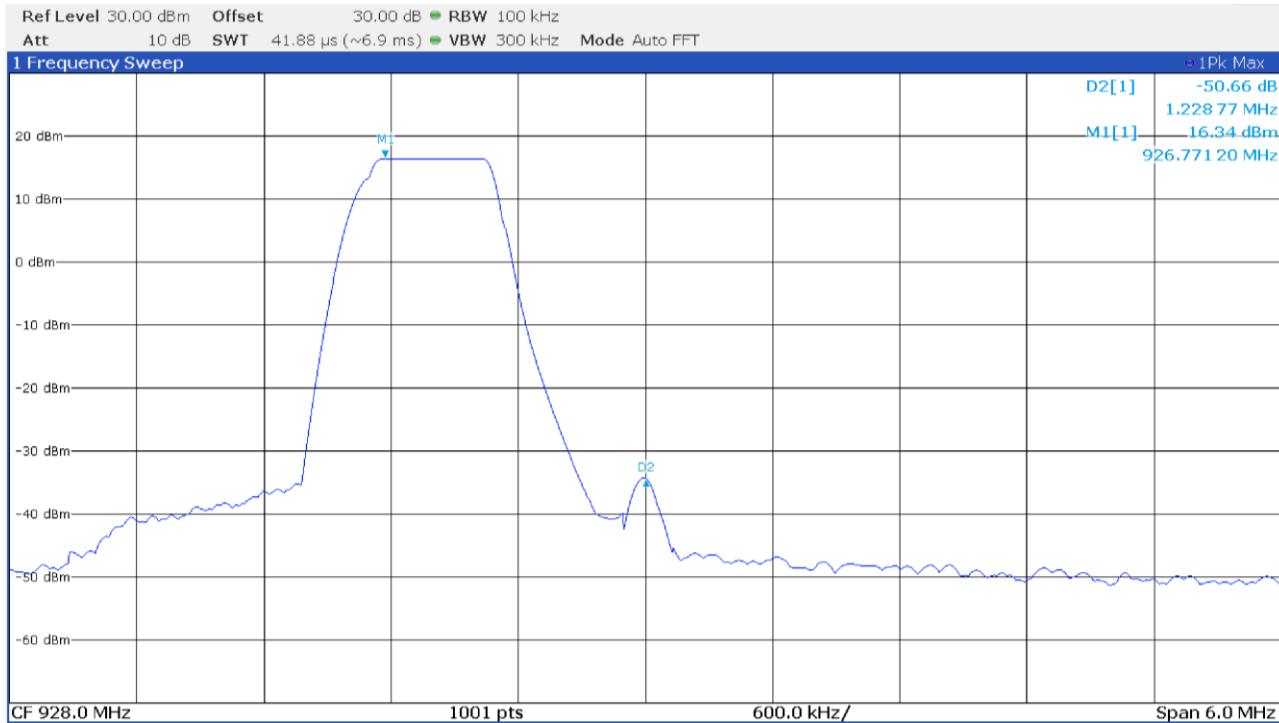


Figure 8.6-22: Band edge spurious emissions at 928 MHz for non-restricted frequency bands

## 8.7 Power spectral density for digitally modulated devices

### 8.7.1 References, definitions and limits

#### FCC §15.247:

- (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.
- (f) For the purposes of this section, hybrid systems are those that employ a combination of both frequency hopping and digital modulation techniques. The frequency hopping operation of the hybrid system, with the direct sequence or digital modulation operation turned-off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4. The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 8.7.2 Test summary

Verdict	Pass				
Tested by	P. Barbieri	Test date	July 8, 2021	Sample tested	4387520005

### 8.7.3 Observations, settings and special notes

Power spectral density test was performed as per KDB 558074, section 8.4 with reference to ANSI C63.10 subclause 11.10.

The test was performed using method PKPSD (peak PSD).

Spectrum analyser settings:

Resolution bandwidth:	3 kHz
Video bandwidth:	≥3 × RBW
Frequency span:	1.5 times the DTS BW (Peak)
Detector mode:	Peak
Trace mode:	Max hold

### 8.7.4 Test equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Spectrum Analyzer (2 Hz ÷ 43 GHz)	Rohde & Schwarz	FSW43	101767	01/2021	01/2022
Shielded room	Siemens	10m control room	1947	NCR	NCR

## 8.7.5 Test data

**Table 8.7-1: PSD results (antenna port measurement)**

Frequency, MHz	PSD, dBm/3 kHz	PSD limit, dBm/3 kHz	Margin, dB
903	0.5	8	-7.5
915	7.7	8	-0.3
927	7.6	8	-0.4



**Figure 8.7-1: PSD on low channel**

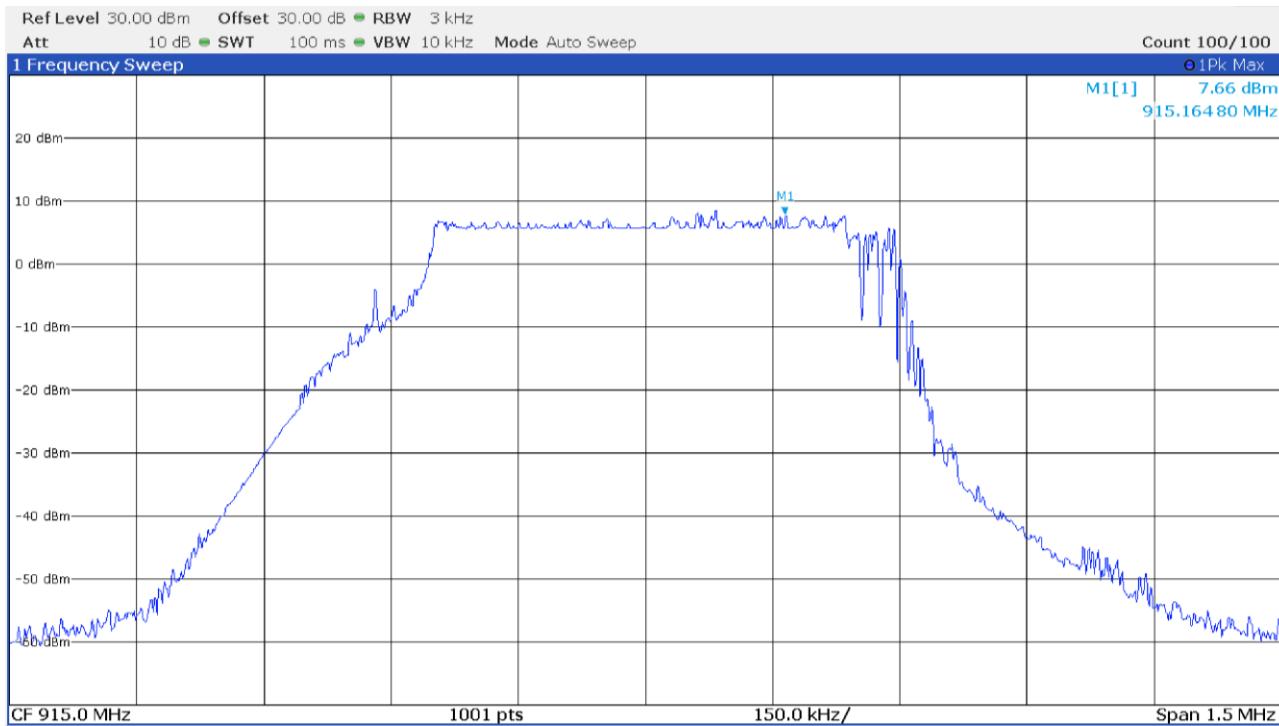


Figure 8.7-2: PSD on mid channel



Figure 8.7-3: PSD on high channel

## Section 9 EUT photos

### 9.1 External photos

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**Figure 9.1-1:** Top view photo



**Figure 9.1-2:** Bottom view photo



**Figure 9.1-3:** EUT modified with antenna connector for conducted test

## 9.2 Set-up photos

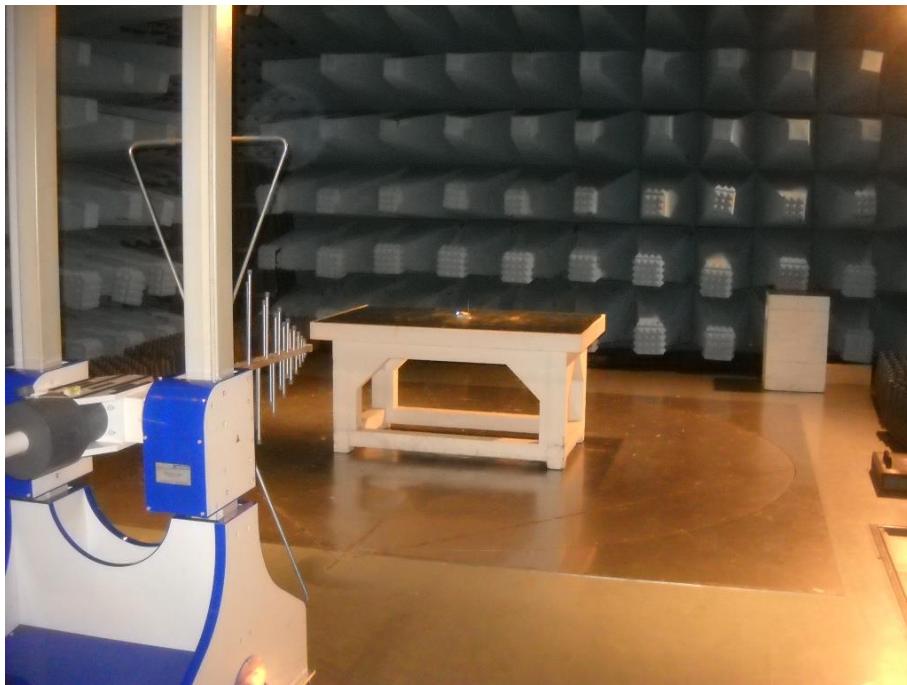


Figure 9.2-1: Radiated emission testing below 1 GHz



Figure 9.2-2: Radiated emission testing above 1 GHz



**Figure 9.2-3: Antenna port testing**

**End of the test report**