Test Report

REP069681-1 This test report replaces the one identified with number REP069681 issued on November 27, 2024

Date of issue: February 13, 2025

Applicant:

Gridspertise S.r.l.
Via Ombrone, 2
00198 Roma – Italy

Product:

Triphase static electrical energy meter with G3 Hybrid PLC/RF communication module

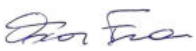
Model:	Model variant:
GLOBYTGNG3	--
FCC ID:	IC Registration number:
2BLES-GT0943	--

Specifications:

- FCC 47 CFR Part 15 Subpart C, §15.247
  Operation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz

Test location

Company name	Nemko S.p.A.
Address	Via Del Carroccio, 4
City	Biassono
Province	MB
Postal code	20853
Country	Italy
Telephone	+39 039 220 12 01
Facsimile	+39 039 220 12 21
Website	www.nemko.com
Site number	FCC: 682159; IC: 9109A

Tested by	Luis Anticona
Test engineer signature	
Reviewed by	Oscar Frau
Reviewer signature	 Firmato digitalmente da Frau Oscar

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 contain in this report are within Nemko S.p.A. ISO/IEC 17025 accreditation.

Copyright notification

Table of contents

Section 1. Report summary

1.1.1 Applicant and manufacturer

Company name	Gridspertise S.r.l.
Address	Via Ombrone, 2
City	Rome
Province/State	Rome
Postal/Zip code	00198
Country	Italy

1.1.2 Test specifications

FCC 47 CFR Part 15, Subpart C, Clause 15.247	Operation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–585 MHz

1.1.3 Test methods

558074 D01 DTS 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
662911 D01 Multiple Transmitter Output v02r01 (October 31, 2013)	Emissions Testing of Transmitters with Multiple Outputs in the Same Band
DA 00-705, Released March 30, 2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
ANSI C63.10 v2020	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. 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.

1.1.5 Exclusions

None

1.1.6 Test report revision history

Revision #	Details of changes made to test report
REP069681	Original report issued
REP069681-1	added tables with calculation for average value=pk-DCCF , in spurious emission graphs (clause 11)

Section 2. Summary of test results

2.1.1 FCC Part 15 Subpart C, general requirements test results

Part	Test description	Verdict
§15.207(a)	Conducted limits	Pass
§15.31(e)	Variation of power source	Pass[1]
§15.203	Antenna requirement	Pass[2]

Notes: [1] Measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, was performed with the supply voltage varied between 85 % and 115 % of the nominal rated supply voltage. No noticeable output power variation was observed

[2] The Antennas are located within the enclosure of EUT and not user accessible.

2.1.2 FCC Part 15 Subpart C, intentional radiators test results

Part	Test description	Verdict
§15.247(a)(1)(i)	Frequency hopping systems operating in the 902–928 MHz band	Pass
§15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725–5850 MHz band	Not applicable
§15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Not applicable
§15.247(a)(2)	Minimum 6 dB bandwidth for systems using digital modulation techniques	Pass
§15.247(b)(1)	Maximum peak output power of frequency hopping systems operating in the 2400–2483.5 MHz band and 5725–5850 MHz band	Not applicable
§15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902–928 MHz band	Pass
§15.247(b)(3)	Maximum peak output power of systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands	Not applicable
§15.247(c)(1)	Fixed point-to-point operation with directional antenna gains greater than 6 dBi	Not applicable
§15.247(c)(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(e)	Power spectral density for digitally modulated devices	Not applicable
§15.247(f)	Time of occupancy for hybrid systems	Not applicable

Section 3. Equipment under test (EUT) details

3.1.1 Sample information

Receipt date	November 11, 2024
Nemko sample ID number	-

3.1.2 EUT information

Product name	Triphase static electrical energy meter with G3 Hybrid PLC/RF communication module Brand Gridspertise Model GLOBYTGNG3
Model	GLOBYTGNG3
Model variant	-
Serial number	GYTPM0000312

3.1.3 Technical information

Category of Wideband Data Transmission equipment	☒ Frequency Hopping Spread Spectrum (FHSS) equipment ☐ Other types of Wideband Data Transmission equipment (e.g. DSSS, OFDM, etc.).
Frequency band	915 – 928 MHz
Frequency Min (MHz)	915.2 MHz
Frequency Max (MHz)	927.8 MHz
RF power Max (W), Conducted	0.532 W (27.26 dBm)
Field strength, dBµV/m @ 3 m	N/A
Measured BW (kHz), 99% OBW	117.9 kHz
Type of modulation	FSK
Emission classification	W7D
Transmitter spurious, dBµV/m @ 3 m	51.1 dBµV/m
Antenna information (see clause 8.3)	Integral helical antenna: max gain 1.69 dBi; dedicated antenna: max gain 4.12 dBi
Embedded Radio Module	--

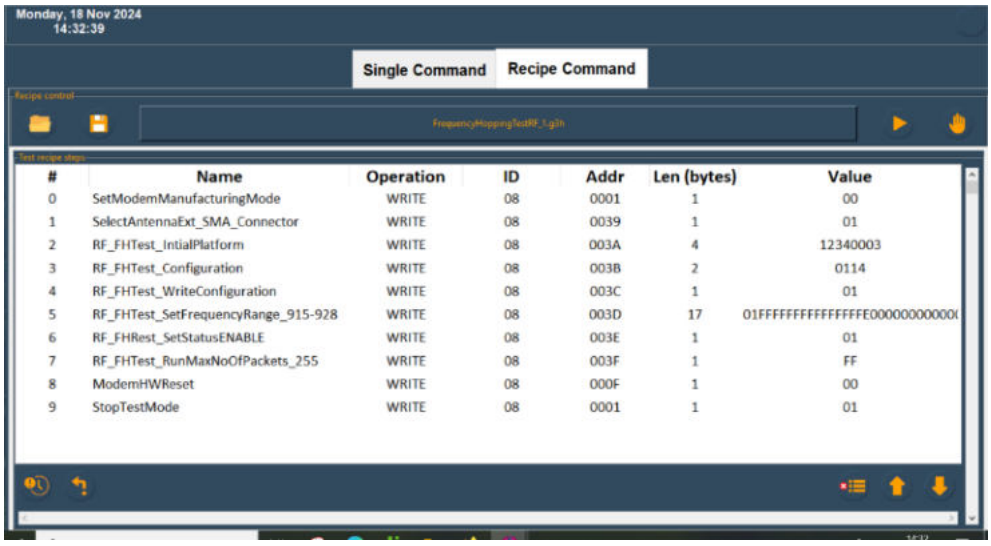
3.1.4 Product description and theory of operation

The EUT is a semi-direct static electrical energy meter with G3 Hybrid PLC/RF communication module. It's provided of two configurations, one with an internal antenna and one with an external antenna. For the version with external antenna the internal antenna is not removed by the EUT, but it's disabled by firmware command.

3.1.5 EUT exercise details

Operating conditions	The EUT has been tested in TX mode forced at a single frequency of in hopping mode with the following software:

#	Name	Operation	ID	Addr	Len (bytes)	Value
0	ReadMeterManufacturingMode	READ	12	FF09	1	
1	SetModemManufacturingMode	WRITE	08	0001	1	00
2	ReadModemManufacturingMode	READ	08	0001	1	
3	SelectAntennaExt_SMA_Connector	WRITE	08	0039	1	01
4	SelectAntennaInt_NO_SMA_Connector	WRITE	08	0039	1	00
5	SetFrequencyRF_Min_915.2	WRITE	08	0030	4	368CD800
6	SetFrequencyRF_Mid_921.2	WRITE	08	0030	4	36E86580
7	SetFrequencyRF_Max_927.8	WRITE	08	0030	4	374D1AC0
8	SetRFPower_27dBm	WRITE	08	0035	1	20
9	WriteDataRate_50	WRITE	08	0033	4	0000C350
10	WriteChannelSpace_200	WRITE	08	0034	4	00030D40

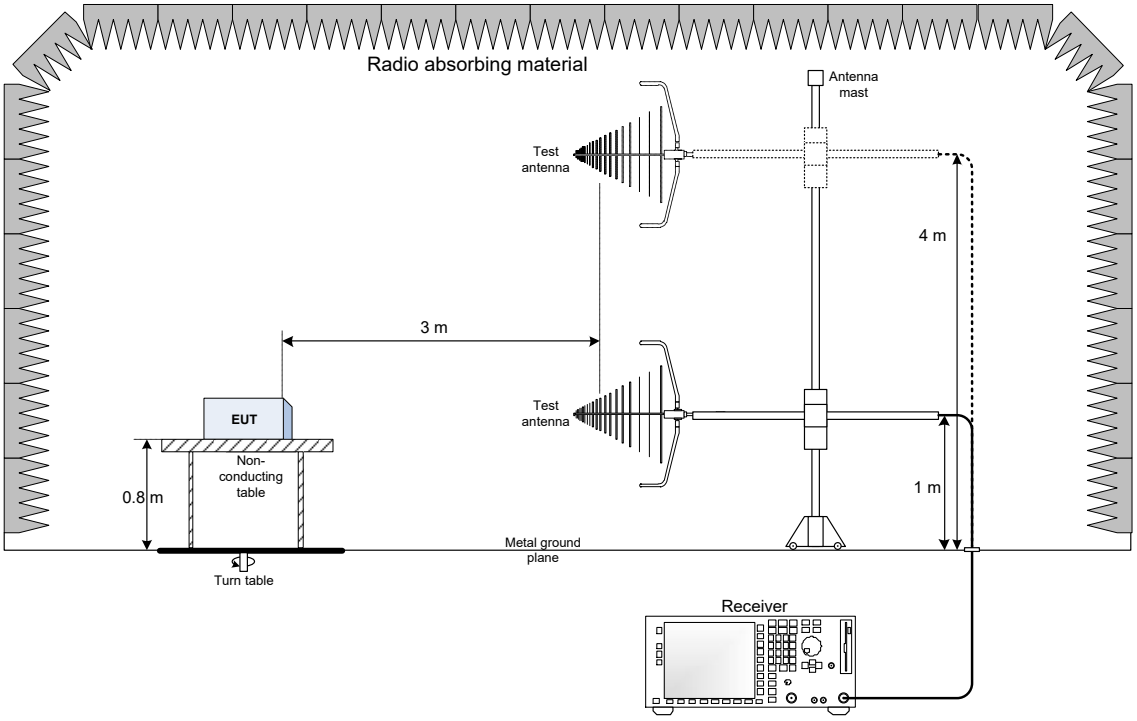


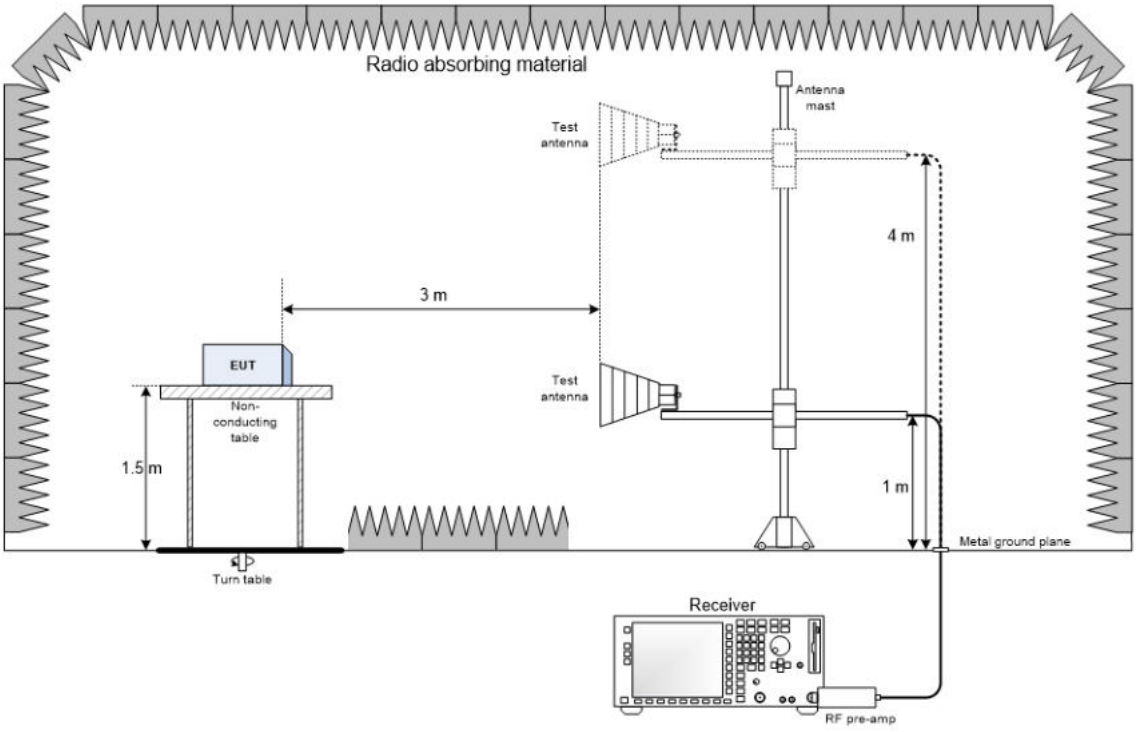
#	Name	Operation	ID	Addr	Len (bytes)	Value
0	SetModemManufacturingMode	WRITE	08	0001	1	00
1	SelectAntennaExt_SMA_Connector	WRITE	08	0039	1	01
2	RF_FHTest_IntialPlatform	WRITE	08	003A	4	12340003
3	RF_FHTest_Configuration	WRITE	08	003B	2	0114
4	RF_FHTest_WriteConfiguration	WRITE	08	003C	1	01
5	RF_FHTest_SetFrequencyRange_915-928	WRITE	08	003D	17	01FFFFFFFFFFFFFFFE00000000000
6	RF_FHRest_SetStatusENABLE	WRITE	08	003E	1	01
7	RF_FHTest_RunMaxNoOfPackets_255	WRITE	08	003F	1	FF
8	ModemHWReset	WRITE	08	000F	1	00
9	StopTestMode	WRITE	08	0001	1	01

Firmware version: 7.2.0

Transmitter state	Transmitter set in to continuous mode and in hopping mode.

3.1.6 EUT setup diagram





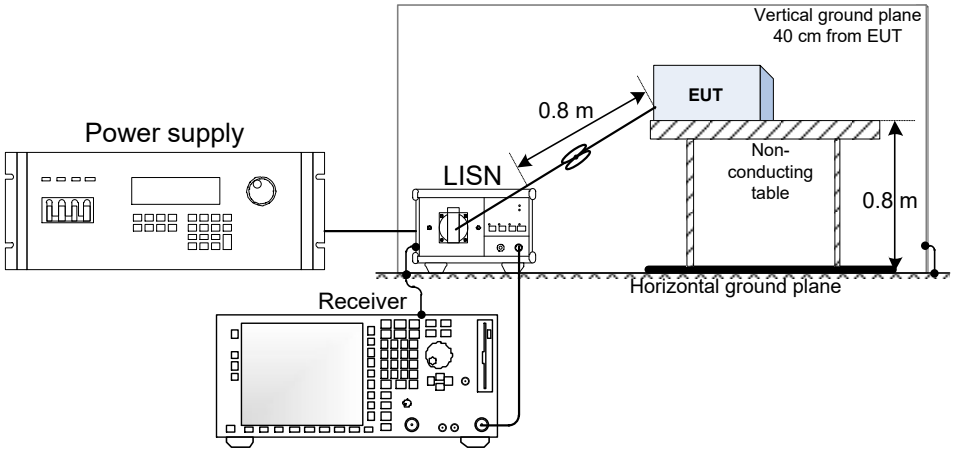


Figure 4.1-1: *Setup diagram*

3.1.7 EUT sub assemblies

Table 4.1-1: *EUT sub assemblies*

Description	Brand name	Model/Part number	Serial number
Personal computer	DELL	Latitude 5520	-

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

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

4.1.1 Technical judgment

None

4.1.2 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Temperature	18–33 °C
Relative humidity	20–70 %
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 cycle	Next cal.
Thermo-hygrometer	Testo	175-H2	20012380/305	2022-12	2024-12
Thermo-hygrometer	Testo	175-H2	38203337/703	2022-12	2024-12
Barometer	Castle	GPB 3300	072015	2024-04	2025-04

5.1.1 Power supply range

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 ±5 %, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

The measurement uncertainty was calculated for each test and quantity listed in this test report, according to CISPR 16-4-2, ETSI TR 100 028-1, ETSI TR 100 028-2 and other specific test standards and is documented in Nemko Spa working manuals WML1002 and WML0078.

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)
		Carrier power RF Output Power	0.009 MHz ÷ 30 MHz	1.1 dB	(1)
			30 MHz ÷ 18 GHz	1.5 dB	(1)
			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)
		Conducted spurious emissions	0.009 MHz ÷ 18 GHz	3.0 dB	(1)
			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)
		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)
	Radiated	Radiated spurious emissions	0.009 MHz ÷ 26.5 GHz	6.0 dB	(1)
			26.5 GHz ÷ 66 GHz	8.0 dB	(1)
			66 GHz ÷ 220 GHz	10 dB	(1)
		Effective radiated power transmitter	10 kHz ÷ 26.5 GHz	6.0 dB	(1)
			26.5 GHz ÷ 66 GHz	8.0 dB	(1)
			66 GHz ÷ 220 GHz	10 dB	(1)

NOTES:
(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 %

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI Receiver	Rohde & Schwarz	ESW44	101620	2024-09	2025-09
EMI Receiver	Rohde & Schwarz	ESU8	100202	2024-09	2025-09
Antenna 1 - 18 GHz	Schwarzbeck Mess-Elektronik	STLP9148	STLP 9148-152	2024-08	2027-08
Broadband Amplifier	Schwarzbeck Mess-Elektronik	BBV9718C	00121	2024-02	2025-02
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
3m Semi anechoic chamber	Comtest	SAC-3	1711-150	2024-09	2026-09
Software turntable and mast	Maturo	mcApp	8.1.0.5410	NCR	NCR
Cable set	Rosenberger and Huber + Suhner	RE01+RE02	1.654+1.655	2024-02	2025-02
10m Semi anechoic chamber	Comtest	SAC-10	530	2023-09	2025-09
Coaxial cable	Rosenberger+Huber-Suhner	RE03+RE04	1.510+1.511	2024-11	2025-11
Coaxial cable	Rosenberger+Huber-Suhner	RE04+RE05	1.511+1.512	2023-12	2024-12
Coaxial cable	Rosenberger+Huber-Suhner	RE01+RE02	1.654+1.655	2024-02	2025-02
Coaxial cable	Rosenberger+Huber+Suhner	CE01+CE02	1.498+1.632	2024-11	2025-11
Cable set	Rosenberger	ST.ALO-02	1.650	2024-11	2025-11
LISN	Rohde & Schwarz	ENV432	101714	2024-09	2025-09
Attenuator	Aeroflex / Weinschel	2	CC8577	2024-02	2025-02

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

Section 8. Testing data

8.1 Variation of power source

8.1.1 References, definitions and limits

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

Verdict	Pass		
Tested by	Luis Anticona	Test date	November 19, 2024

8.1.3 Observations, settings and special notes

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 ±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

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	Luis Anticona	Test date	November 19, 2024

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:

a) 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.

b) 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.

c) 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:

a) 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).

b) 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).

c) 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

Table 8.2-2: *Test channels selection*

Start of Frequency range, MHz	End of Frequency range, MHz	Frequency range bandwidth, MHz	Low channel, MHz	Mid channel, MHz	High channel, MHz
915	928	13	915.2	921.2	927.8

8.3 Antenna requirement

8.3.1 References, definitions and limits

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	Luis Anticona	Test date	November 19, 2024

8.3.3 Observations, settings and special notes

None

8.3.4 Test data

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

Note: the antenna and the connector are inside the enclosure of the EUT and it's not accessible to the user without removing the screws.

Table 8.3-1: *Antenna information*

Antenna type	Manufacturer	Model number	Maximum gain	Connector type
Integral helical antenna	Electronic Connector Technology	P/N 81800V685	1.69 dBi @ 910 MHz 1.41 dBi @ 920 MHz 1.14 dBi @ 930 MHz	PCB
External cable antenna	Electronic Connector Technology	P/N 81800VXXX	4.12 dBi @ 910 MHz 3.95 dBi @ 920 MHz 3.73 dBi @ 930 MHz	SMA RA

8.4 FCC 15.207(a) power line conducted emissions limits

8.4.1 Definitions and limits

FCC:
Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in table below. The more stringent limit applies at the frequency range boundaries.

Table 8.4-1: *Conducted emissions limit*

Frequency of emission, MHz	Conducted limit, dBµV	
	Quasi-peak	Average**
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

Note: * - The level decreases linearly with the logarithm of the frequency.
** - A linear average detector is required.

8.4.2 Test summary

Test date	November 19, 2024	Verdict	Pass
Test engineer	Luis Anticona	Sample tested	GLOBYTGNG3

8.4.3 Observations, settings and special notes

The EUT was set up as tabletop configuration.

The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver settings for preview measurements:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	Peak and Average
Trace mode	Max Hold
Measurement time	1000 ms

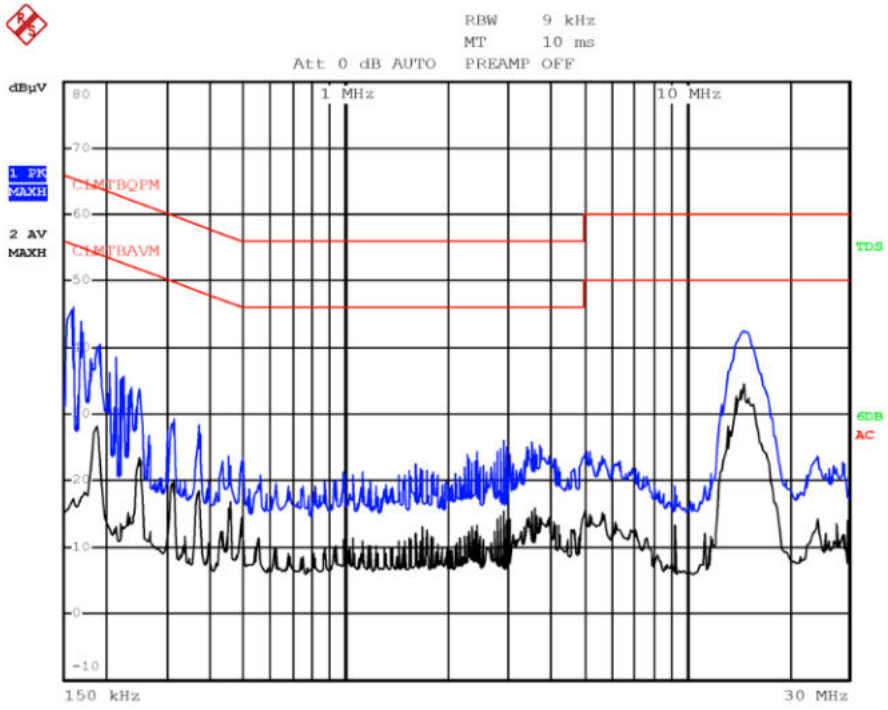
Receiver settings for final measurements:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	Quasi-Peak and Average
Trace mode	Max Hold
Measurement time	1000 ms

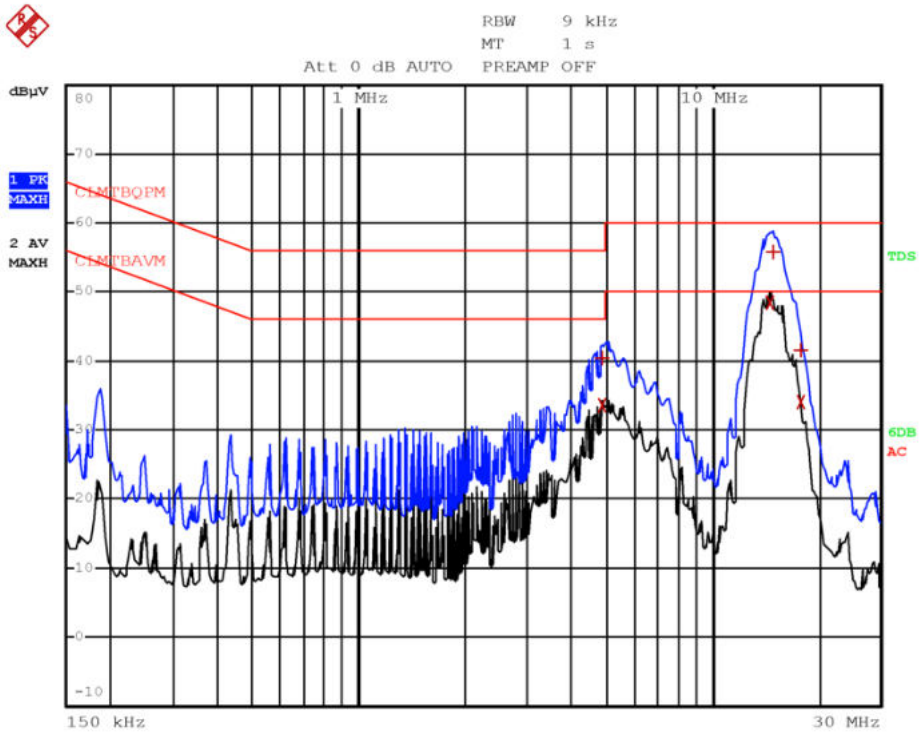
8.4.4 Test equipment used

Equipment	Manufacturer	Model no.	Asset no.
EMI Receiver	Rohde & Schwarz	ESU8	100202
Cable set	Rosenberger+Huber+Suhner	CE01+CE02	1.498+1.632
LISN	Rohde & Schwarz	ENV432	101714
Attenuator	Aeroflex / Weinschel	2	CC8577

8.4.5 Test data

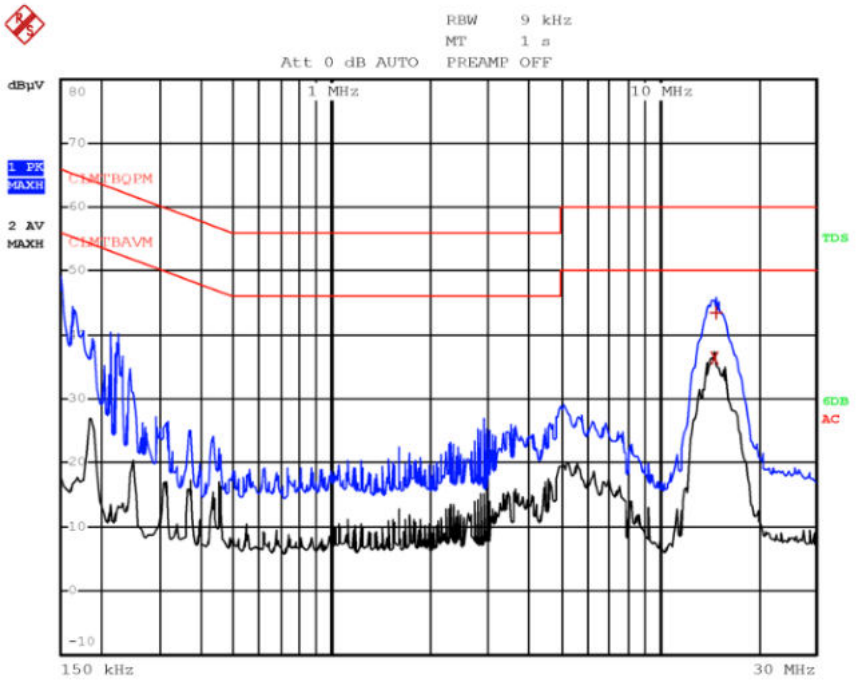


Plot 8.4-1: *Conducted emissions on phase line 1, 110V 60Hz*



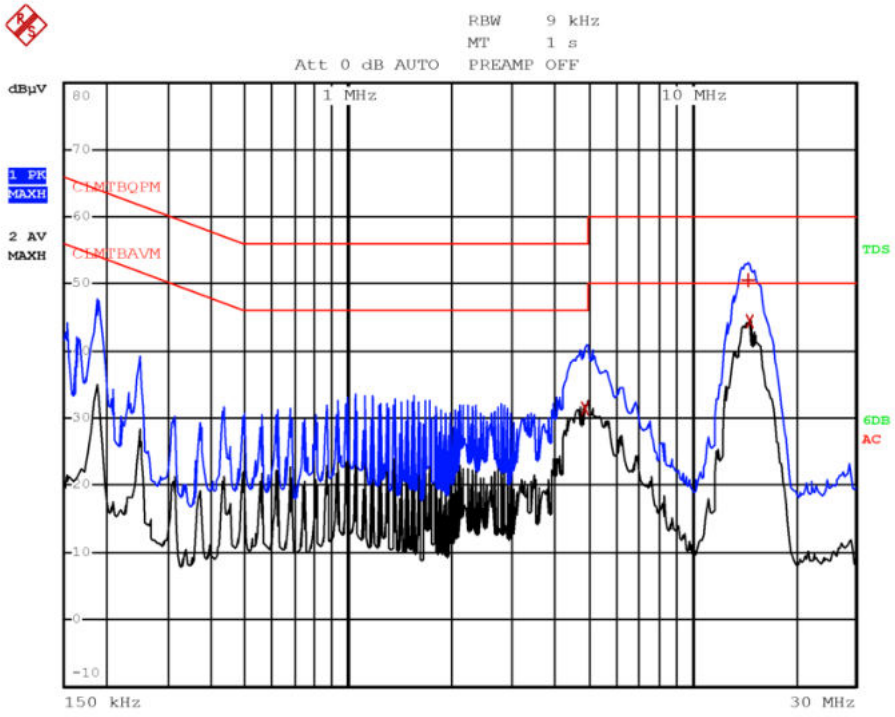
Plot 8.4-2: *Conducted emissions on phase line 2, 110V 60Hz*

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
4.8860	40.6	56.0	-15.4	QP
4.8860	33.5	46.0	-12.5	Av
14.5940	48.5	50.0	-1.5	Av
14.9020	55.8	60.0	-4.2	QP
17.6980	41.6	60.0	-18.4	QP
17.7540	34.1	50.0	-15.9	Av



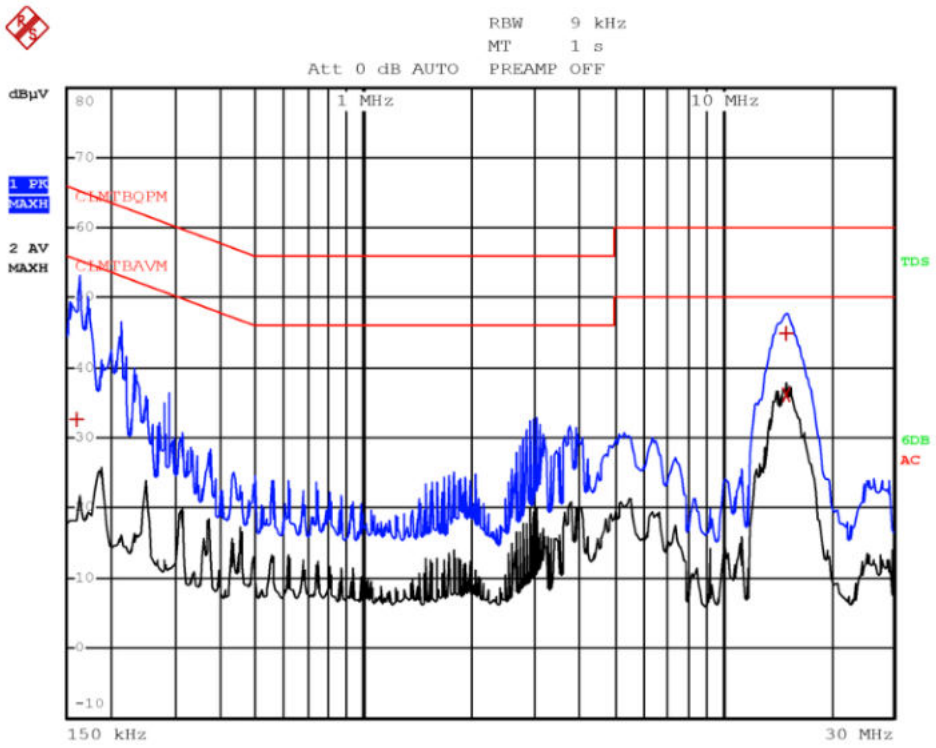
Plot 8.4-3: *Conducted emissions on phase line 3, 110V 60Hz*

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
14.7180	36.4	50.0	-13.6	Av
14.8420	43.5	60.0	-16.5	QP



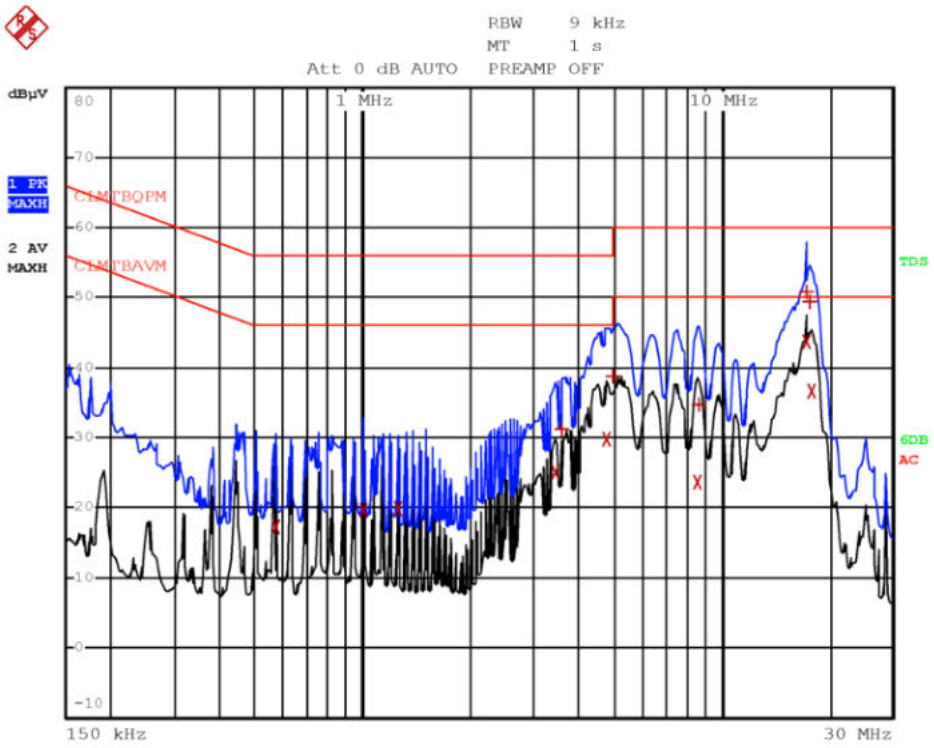
Plot 8.4-4: *Conducted emissions on neutral line, 110V 60Hz*

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
4.8900	31.5	46.0	-14.5	Av
14.5420	50.6	60.0	-9.4	QP
14.7900	44.5	50.0	-5.5	Av



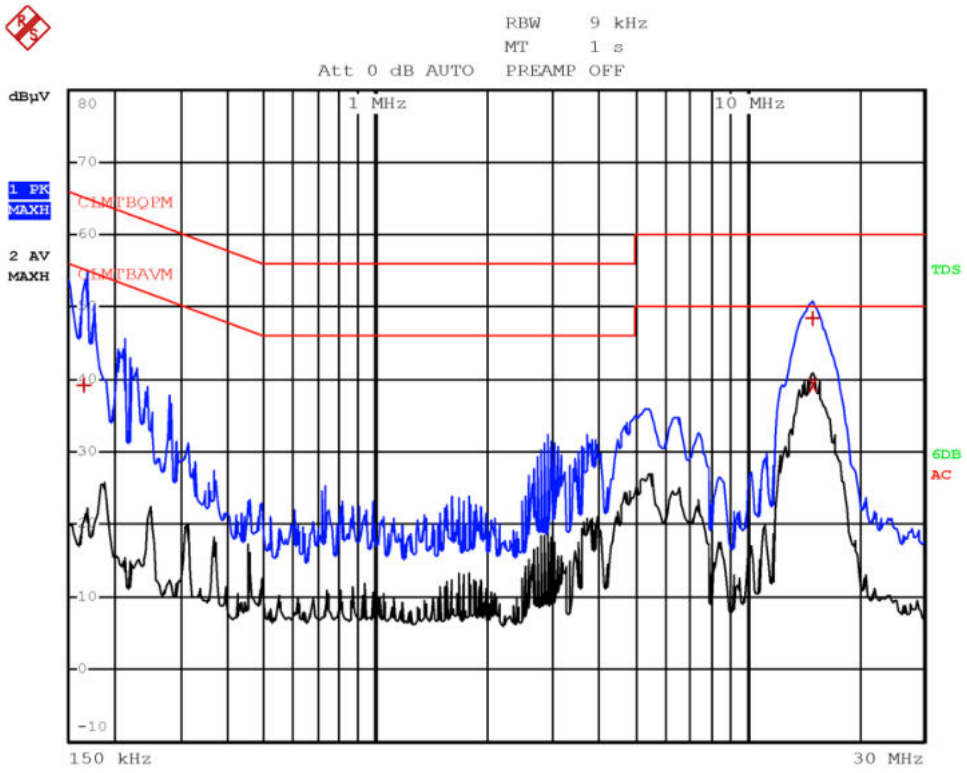
Plot 8.4-5: *Conducted emissions on phase line 1, 220V 60Hz*

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.1620	32.6	65.4	-32.8	QP
15.0460	45.1	60.0	-14.9	QP
15.1060	36.3	50.0	-13.7	Av



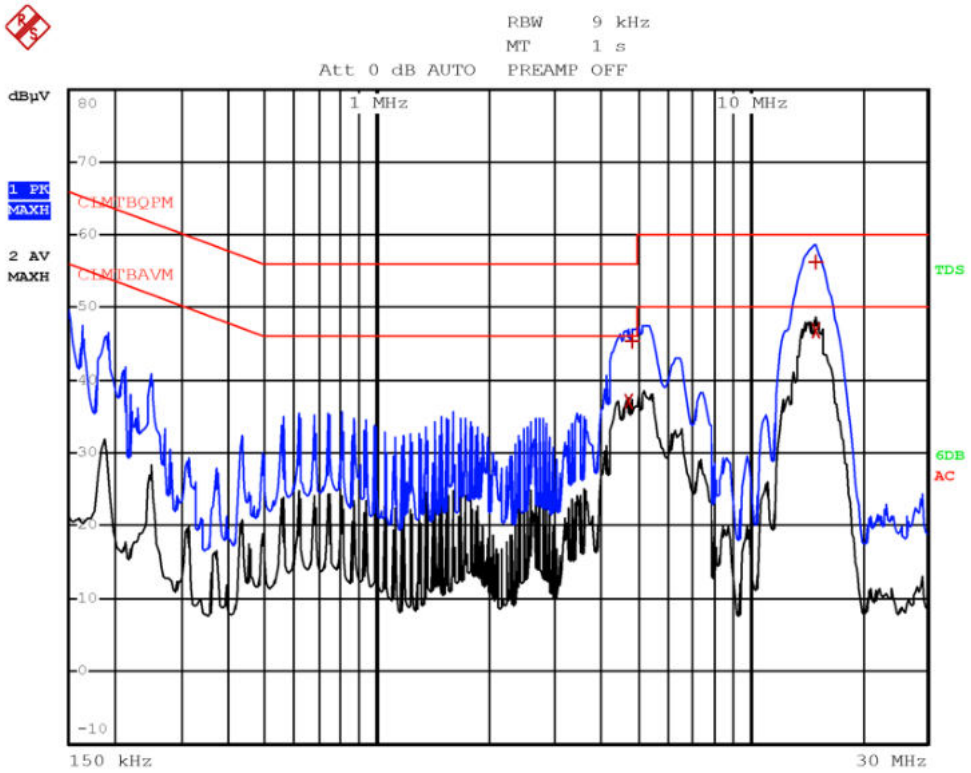
Plot 8.4-6: *Conducted emissions on phase line 2, 220V 60Hz*

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.5700	17.3	46.0	-28.7	Av
1.0100	19.7	46.0	-26.3	Av
1.2620	19.9	46.0	-26.1	Av
3.4660	25.1	46.0	-20.9	Av
3.5940	31.2	56.0	-24.8	QP
4.7900	29.9	46.0	-16.1	Av
4.9780	38.8	56.0	-17.2	QP
8.6300	23.7	50.0	-26.3	Av
8.6900	34.8	60.0	-25.2	QP
17.3620	50.8	60.0	-9.2	QP
17.3620	43.8	50.0	-6.2	Av
17.6860	49.5	60.0	-10.5	QP
17.7580	36.6	50.0	-13.4	Av



Plot 8.4-7: *Conducted emissions on phase line 3, 220V 60Hz*

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.1660	39.3	65.2	-25.9	QP
14.9860	48.4	60.0	-11.6	QP
15.0420	39.2	50.0	-10.8	Av



Plot 8.4-8: *Conducted emissions on neutral line, 220V 60Hz*

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
4.7660	37.1	46.0	-8.9	Av
4.8300	45.4	56.0	-10.6	QP
14.9860	56.3	60.0	-3.7	QP
14.9860	46.9	50.0	-3.1	Av

Section 9. FCC 15.247(a)(1) Frequency Hopping Systems requirements

9.1 Definitions and limits

FCC:

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

9.1.1 Test summary

Test date	November 25, 2024	Verdict	Pass
Test engineer	Luis Anticona	Sample tested	GLOBYTGNG3

9.1.2 Observations, settings and special notes

Spectrum analyser settings for carrier frequency separation (ANSI C63.10, §7.8.2):

Resolution bandwidth	Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
Video bandwidth	≥ RBW
Frequency span	wide enough to capture the peaks of two adjacent channels
Detector mode	Peak
Trace mode	Max Hold

Spectrum analyser settings for number of hopping frequencies (ANSI C63.10, §7.8.3):

Resolution bandwidth	To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
Video bandwidth	≥ RBW
Frequency span	the frequency band of operation
Detector mode	Peak
Trace mode	Max Hold

Spectrum analyser settings for time of occupancy (dwell time) (ANSI C63.10, §7.8.4):

Resolution bandwidth	shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
Video bandwidth	≥ RBW
Frequency span	Zero span, centered on a hopping channel.
Detector mode	Peak
Trace mode	Max Hold

Spectrum analyser settings for 20 dB bandwidth (ANSI C63.10, §6.9.2):

Resolution bandwidth	≥ 1-5% of the 20 dB bandwidth
Video bandwidth	≥ RBW
Frequency span	approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel
Detector mode	Peak
Trace mode	Max Hold

9.1.3 Test equipment used

Equipment	Manufacturer	Model no.	Asset no.
Spectrum Analyzer	Rohde & Schwarz	ESW44	101620
Cable set	Rosenberger	ST.ALO-02	1.650

9.1.4 Test data

Table 9.1-1: *20 dB bandwidth results*

Frequency, MHz	20 dB bandwidth, kHz
915.2	104.9
921.2	119.9
927.8	119.4

Table 9.1-2: *99% occupied bandwidth results*

Frequency, MHz	99% occupied bandwidth, kHz
915.2	114.8
921.2	117.9
927.8	117.6

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

Table 9.1-3: *Carrier frequency separation results*

Carrier frequency separation, kHz	Minimum limit, kHz	Margin, kHz
208.2	117.2	83.0

Table 9.1-4: *Number of hopping frequencies results*

Number of hopping frequencies	Minimum limit	Margin
64	50	14

Table 9.1-5: *Average time of occupancy results*

Dwell time of each pulse, ms	Number of pulses within period	Total dwell time within period, ms	Limit, ms	Margin, ms
10.4	3	31.2	400	-368.8

Measurement Period is 20 s

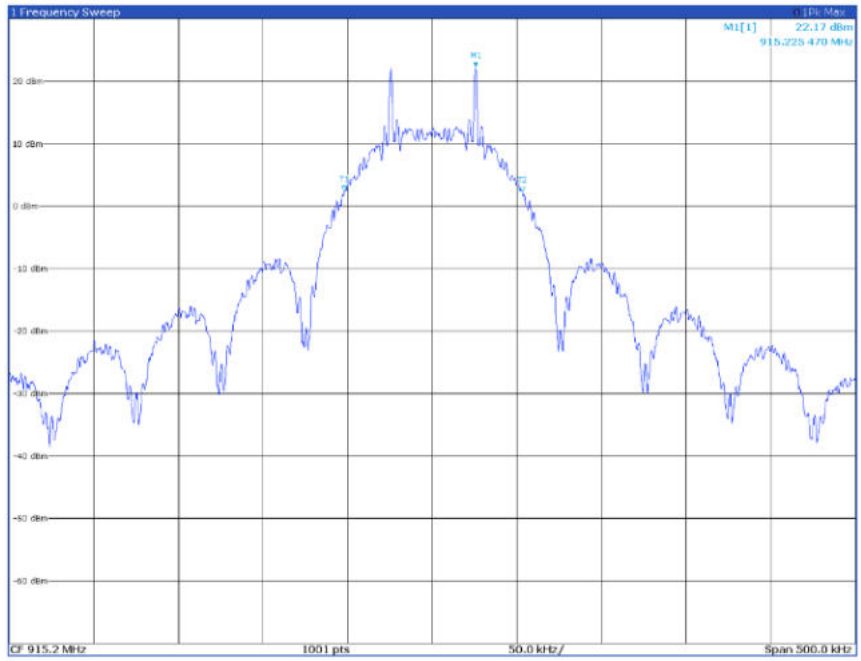


Figure 9.1-1: *20 dB bandwidth on low channel*

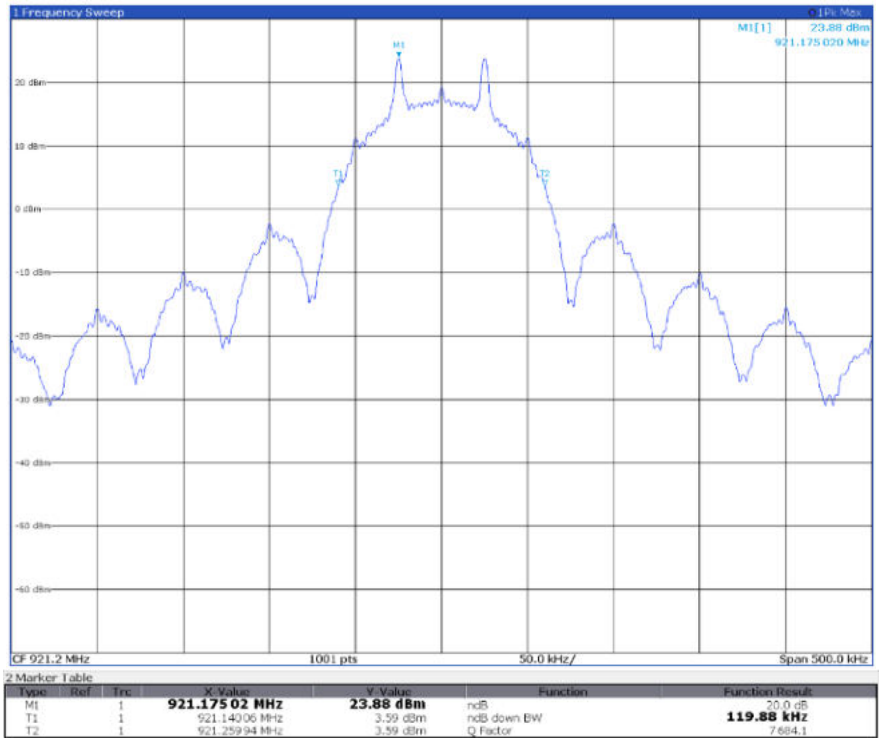


Figure 9.1-2: *20 dB bandwidth on mid channel*

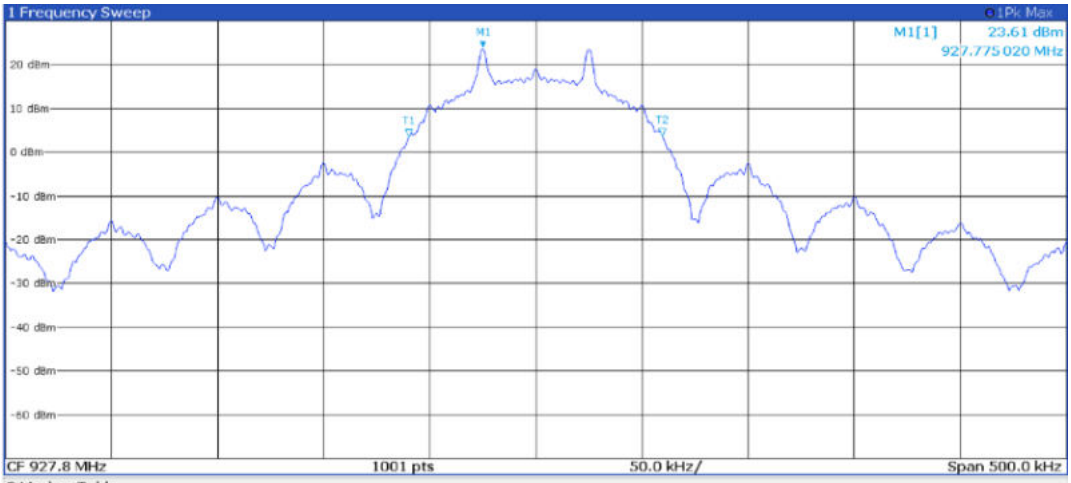


Figure 9.1-3: *20 dB bandwidth on high channel*

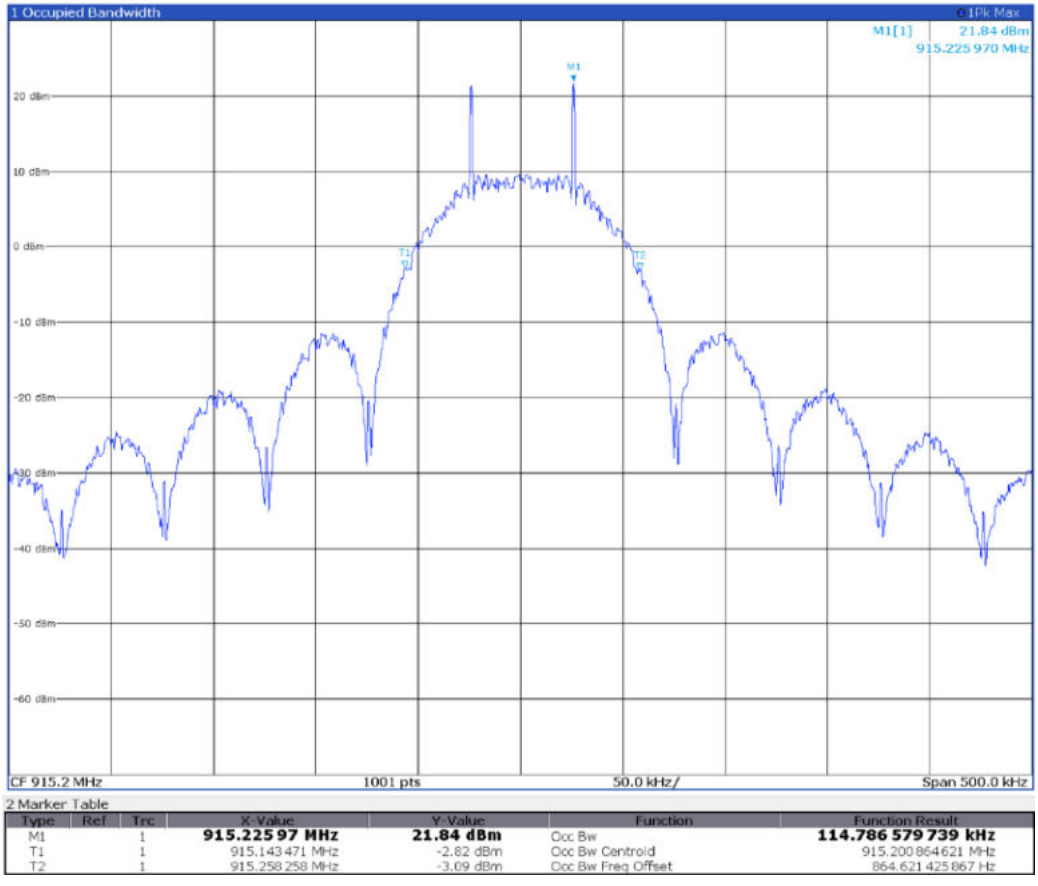


Figure 9.1-4: *99% bandwidth on low channel*

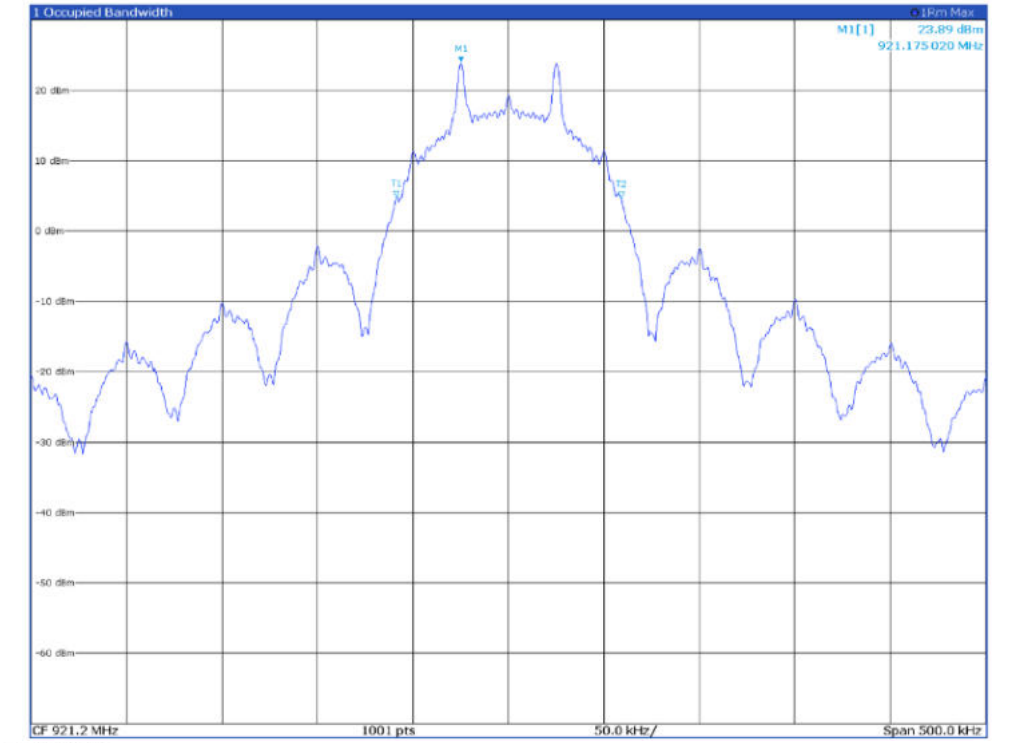


Figure 9.1-5: *99% bandwidth on mid channel*

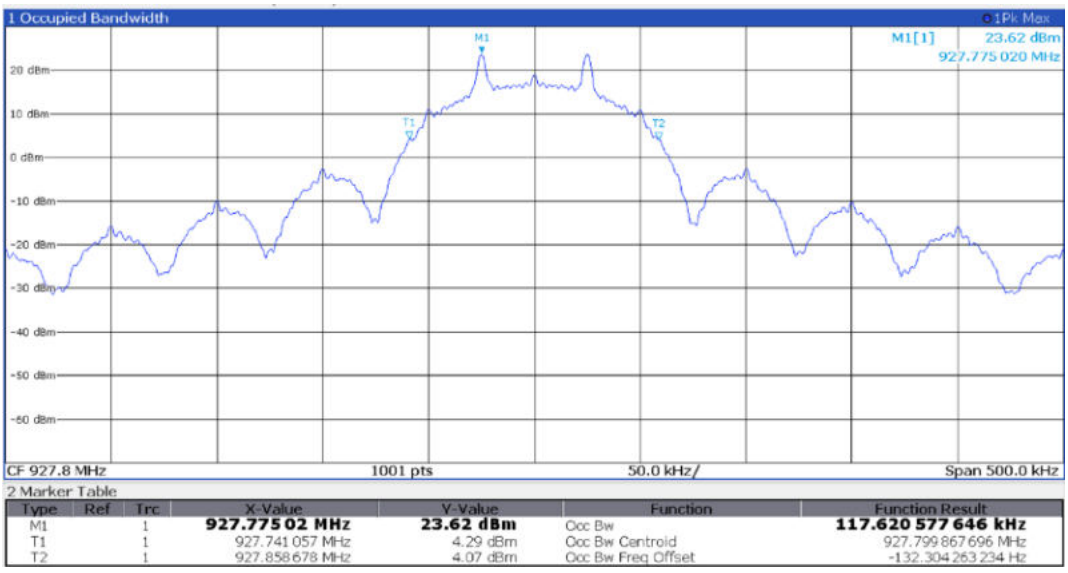


Figure 9.1-6: *99% bandwidth on high channel*

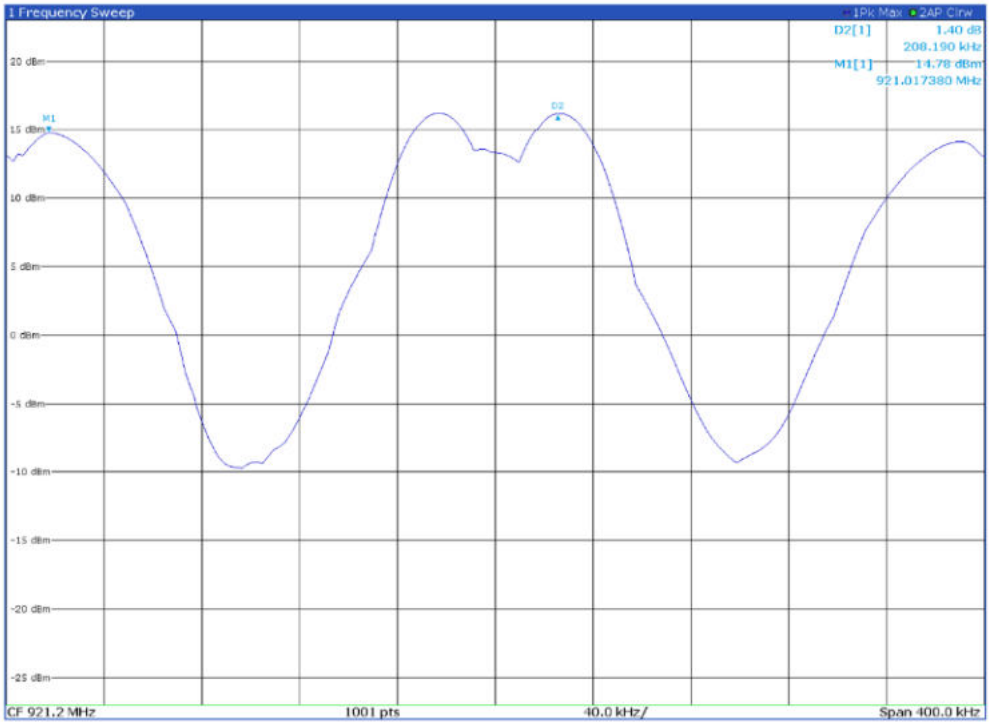


Figure 9.1-7: *Carrier frequency separation*

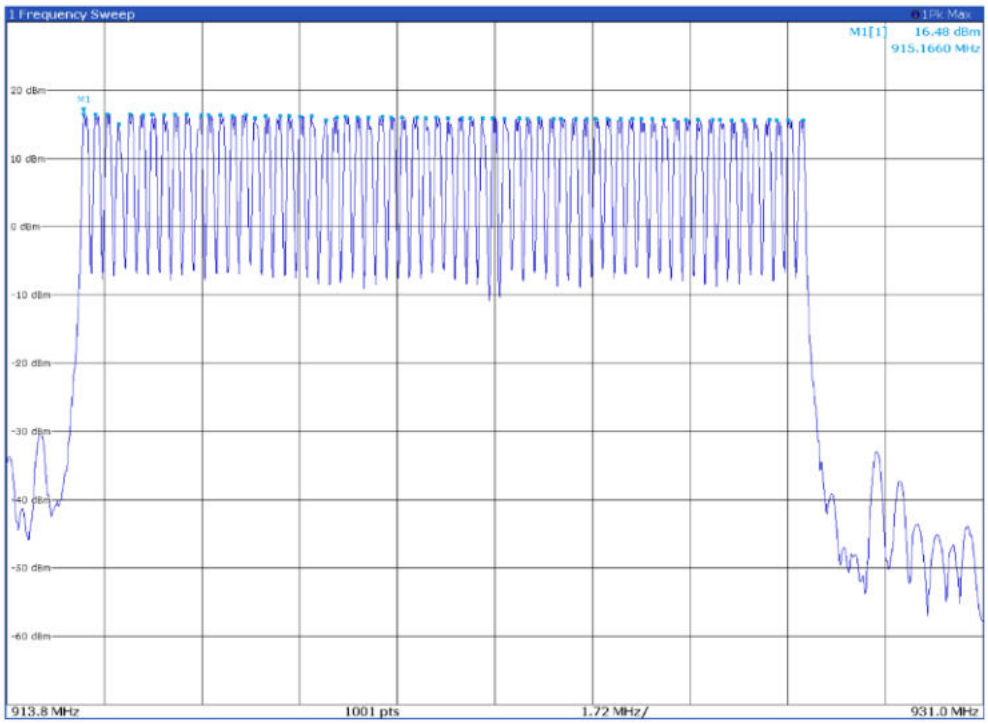


Figure 9.1-8: *Number of hopping channels*

2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	915.166000 MHz	16.482 dBm	33	921.575000 MHz	15.860 dBm
2	915.372000 MHz	16.416 dBm	34	921.816000 MHz	15.878 dBm
3	915.578000 MHz	16.393 dBm	35	921.970000 MHz	15.895 dBm
4	915.785000 MHz	15.000 dBm	36	922.177000 MHz	15.885 dBm
5	915.974000 MHz	16.407 dBm	37	922.366000 MHz	15.849 dBm
6	916.214000 MHz	16.352 dBm	38	922.572000 MHz	15.793 dBm
7	916.369000 MHz	16.417 dBm	39	922.830000 MHz	15.860 dBm
8	916.575000 MHz	16.362 dBm	40	922.967000 MHz	15.812 dBm
9	916.764000 MHz	16.403 dBm	41	923.173000 MHz	15.871 dBm
10	916.970000 MHz	16.372 dBm	42	923.431000 MHz	15.829 dBm
11	917.228000 MHz	16.305 dBm	43	923.568000 MHz	15.797 dBm
12	917.365000 MHz	16.292 dBm	44	923.826000 MHz	15.798 dBm
13	917.572000 MHz	16.300 dBm	45	924.015000 MHz	15.780 dBm
14	917.778000 MHz	16.240 dBm	46	924.170000 MHz	15.764 dBm
15	918.018000 MHz	16.273 dBm	47	924.376000 MHz	15.819 dBm
16	918.173000 MHz	15.919 dBm	48	924.617000 MHz	15.754 dBm
17	918.362000 MHz	16.233 dBm	49	924.823000 MHz	15.722 dBm
18	918.620000 MHz	16.211 dBm	50	924.977000 MHz	15.737 dBm
19	918.774000 MHz	16.161 dBm	51	925.166000 MHz	15.751 dBm
20	918.963000 MHz	16.149 dBm	52	925.373000 MHz	15.715 dBm
21	919.170000 MHz	16.182 dBm	53	925.562000 MHz	15.644 dBm
22	919.427000 MHz	15.576 dBm	54	925.768000 MHz	15.714 dBm
23	919.616000 MHz	15.969 dBm	55	925.974000 MHz	15.703 dBm
24	919.771000 MHz	16.146 dBm	56	926.232000 MHz	15.657 dBm
25	919.977000 MHz	15.955 dBm	57	926.369000 MHz	15.678 dBm
26	920.166000 MHz	16.022 dBm	58	926.575000 MHz	15.606 dBm
27	920.424000 MHz	16.075 dBm	59	926.764000 MHz	15.521 dBm
28	920.579000 MHz	15.974 dBm	60	926.971000 MHz	15.623 dBm
29	920.768000 MHz	16.032 dBm	61	927.228000 MHz	15.622 dBm
30	921.025000 MHz	16.004 dBm	62	927.366000 MHz	15.553 dBm
31	921.180000 MHz	15.916 dBm	63	927.572000 MHz	15.592 dBm
32	921.369000 MHz	15.971 dBm	64	927.830000 MHz	15.541 dBm

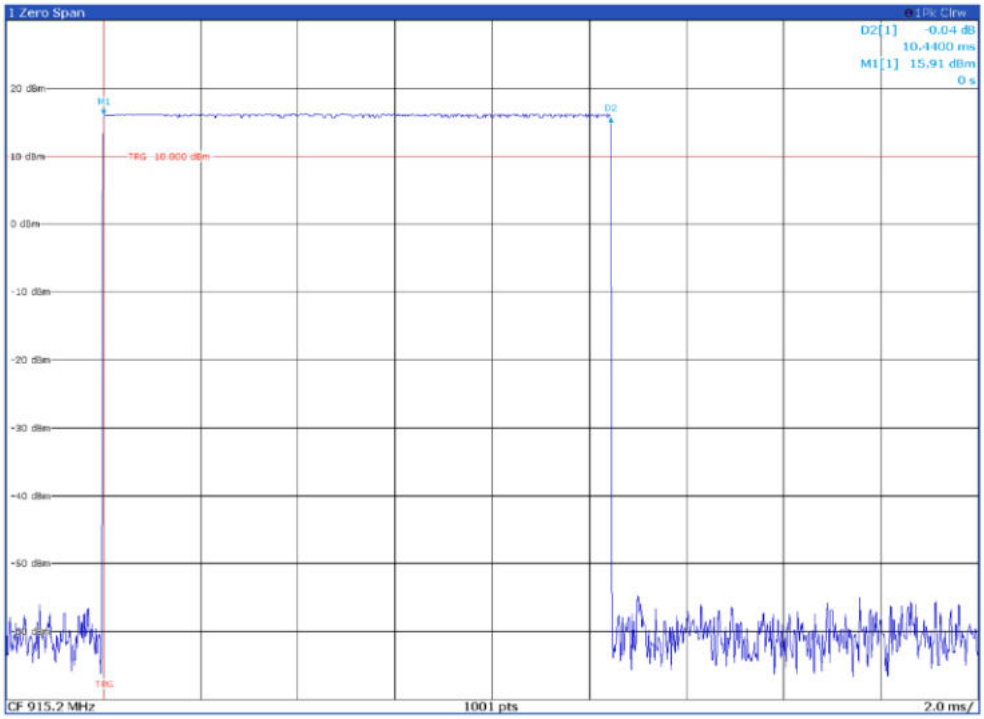


Figure 9.1-9: *Dwell time*

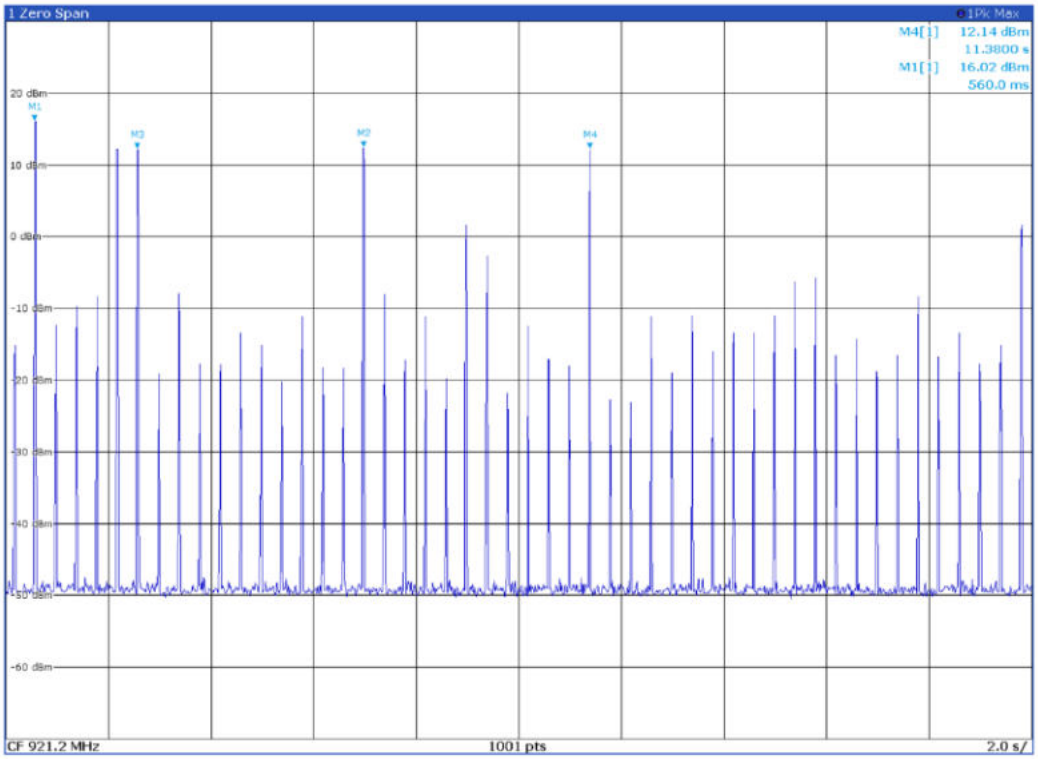


Figure 9.1-10: *Number of pulses*

Section 10. FCC 15.247(b) Transmitter output power and e.i.r.p. requirements

10.1 Definitions and limits

FCC:

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

(2) For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

(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.

10.1.1 Test summary

Test date	November 25, 2024	Verdict	Pass
Test engineer	Luis Anticona	Sample tested	GLOBYTGNG3

10.1.2 Observations, settings and special notes

Spectrum analyser settings for output power (ANSI C63.10, §7.8.5):

Resolution bandwidth	> the 20 dB bandwidth of the emission being measured
Video bandwidth	≥ RBW
Frequency span	approximately 5 times the 20 dB bandwidth, centered on a hopping channel
Detector mode	Peak
Trace mode	Max Hold

10.1.3 Test equipment used

Equipment	Manufacturer	Model no.	Asset no.
Spectrum Analyzer	Rohde & Schwarz	ESW44	101620
Cable set	Rosenberger	ST.ALO-02	1.650

10.1.4 Test data

Table 10.1-1: *Output power and EIRP results for configuration with internal antenna*

Frequency, MHz	Output power, dBm	Output power limit, dBm	Margin, dB	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
915.2	27.10	30.00	-2.90	1.69	28.79	36.00	-7.21
921.2	27.26	30.00	-2.74	1.41	28.67	36.00	-7.33
927.8	26.94	30.00	-3.06	1.14	28.08	36.00	-7.92

EIRP = Output power + Antenna gain

Table 10.1-2: *Output power and EIRP results for configuration with external antenna*

Frequency, MHz	Output power, dBm	Output power limit, dBm	Margin, dB	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
915.2	27.10	30.00	-2.90	4.12	31.22	36	-4.78
921.2	27.26	30.00	-2.74	3.95	31.21	36	-4.79
927.8	26.94	30.00	-3.06	3.73	30.67	36	-5.33

Notes: EIRP = Output power + Antenna gain

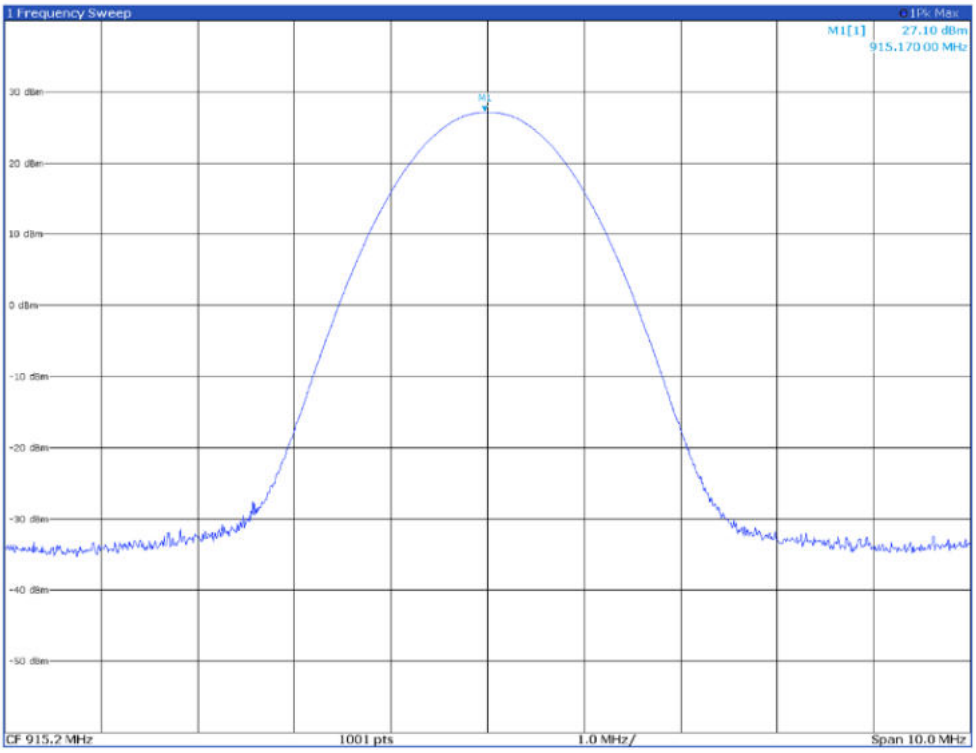


Figure 10.1-1: *Output power on low channel*

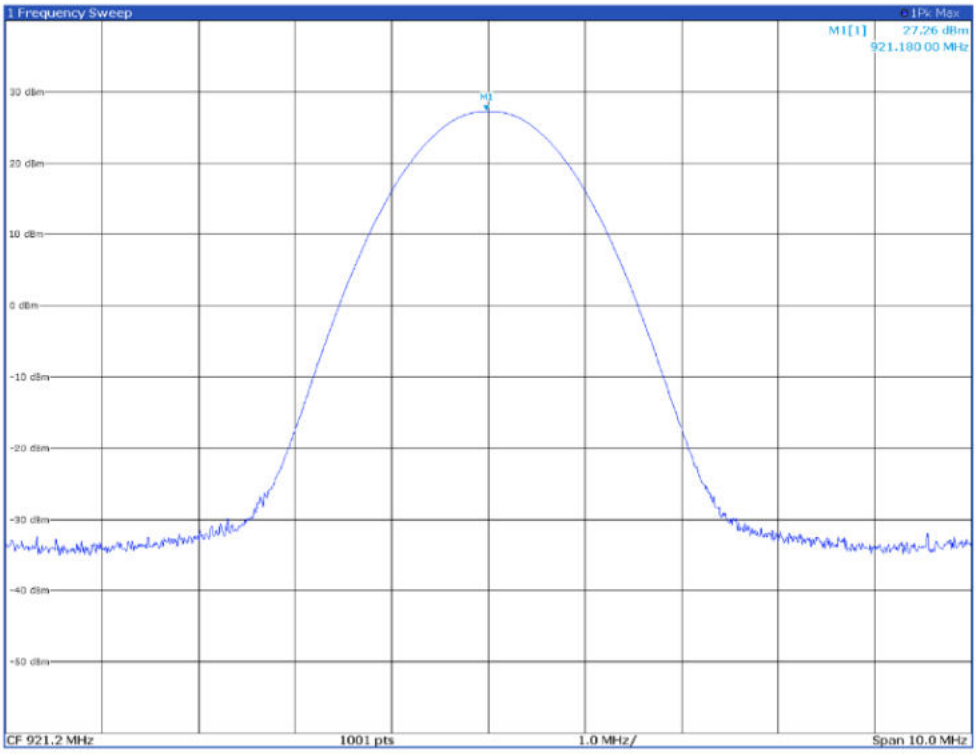


Figure 10.1-2: *Output power on mid channel*

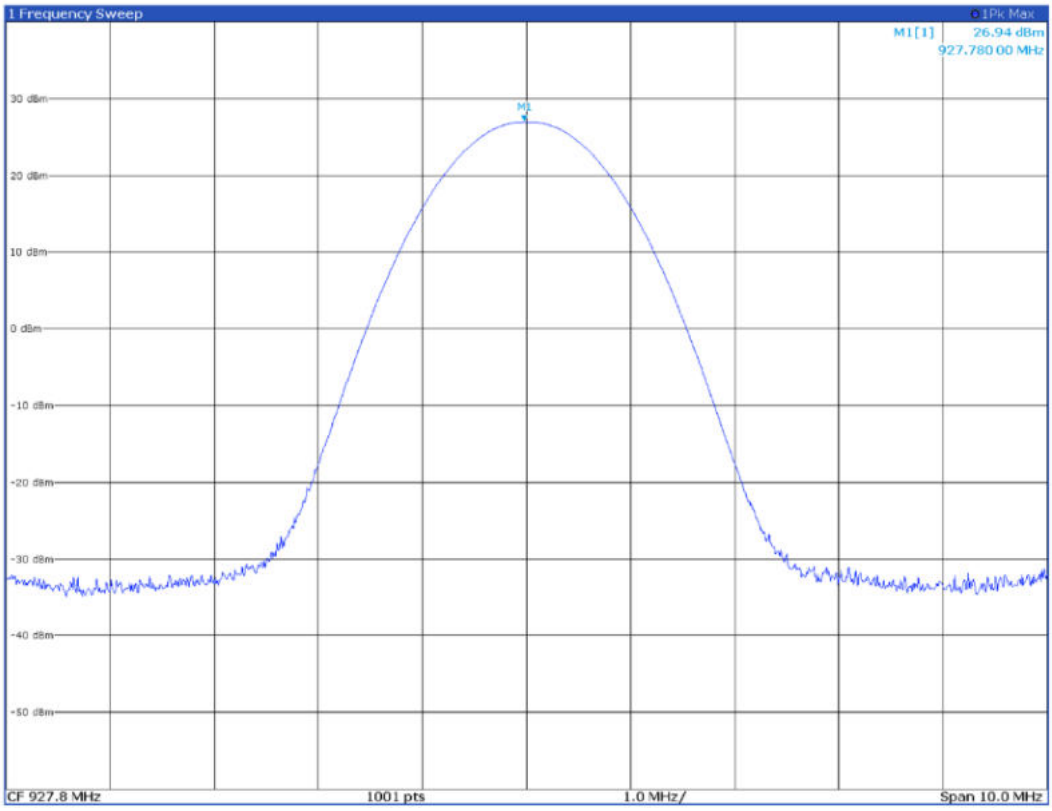


Figure 10.1-3: *Output power on high channel*

Section 11. FCC 15.247(d) Spurious (out-of-band) unwanted emissions

11.1 Definitions and limits

FCC:
(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 11.1-1: *FCC §15.209 – Radiated emission limits*

Frequency, MHz	Field strength of emissions		Measurement distance, m
	µV/m	dBµV/m	
0.009–0.490	2400/F	$67.6 - 20 \times \log_{10}(F)$	300
0.490–1.705	24000/F	$87.6 - 20 \times \log_{10}(F)$	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 11.1-2: *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			

11.1.1 Test summary

Test date	November 21, 2024	Verdict	Pass
Test engineer	Luis Alberto	Sample tested	GLOBYTGNG3

11.1.2 Test equipment used

Equipment	Manufacturer	Model no.	Asset no.
EMI Receiver	Rohde & Schwarz	ESW44	101620
EMI Receiver	Rohde & Schwarz	ESU8	100202
Spectrum Analyzer	Rohde & Schwarz	FSW43	101767
Antenna 1 - 18 GHz	Schwarzbeck Mess-Elektronik	STLP9148	STLP 9148-152
Broadband Amplifier	Schwarzbeck Mess-Elektronik	BBV9718C	00121
Controller	Maturo	FCU3.0	10041
Tilt antenna mast	Maturo	TAM4.0-E	10042
Turntable	Maturo	TT4.0-5T	2.527
3m Semi anechoic chamber	Comtest	SAC-3	1711-150
Software turntable and mast	Maturo	mcApp	8.1.0.5410
Cable set	Rosenberger and Huber + Suhner	RE01+RE02	1.654+1.655
10m Semi anechoic chamber	Comtest	SAC-10	530
Cable set	Rosenberger+Huber-Suhner	RE03+RE04	1.510+1.511
Cable set	Rosenberger+Huber-Suhner	RE04+RE05	1.511+1.512
Cable set	Rosenberger+Huber+Suhner	CE01+CE02	1.498+1.632
Cable set	Rosenberger	ST.ALO-02	1.650
LISN	Rohde & Schwarz	ENV432	101714
Attenuator	Aeroflex / Weinschel	2	CC8577

11.1.3 Observations, settings and special notes

- As part of the current assessment, the test range of 9 kHz to 10th harmonic has been fully considered and compared to the actual frequencies utilized within the EUT. Since the EUT contains a transmitter in the 900 MHz 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.
- EUT was set to transmit with 100 % duty cycle.
- Radiated measurements were performed at a distance of 3 m.
- 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.

In the tables below, only the 15.209 limits are show. Outside the FCC restricted frequency bands, the limit is 20 dB below the peak of the carrier measurement as show in the plot above the table. Average values in the graphics are not compensated with the DCCS and should not be taken into account.

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:

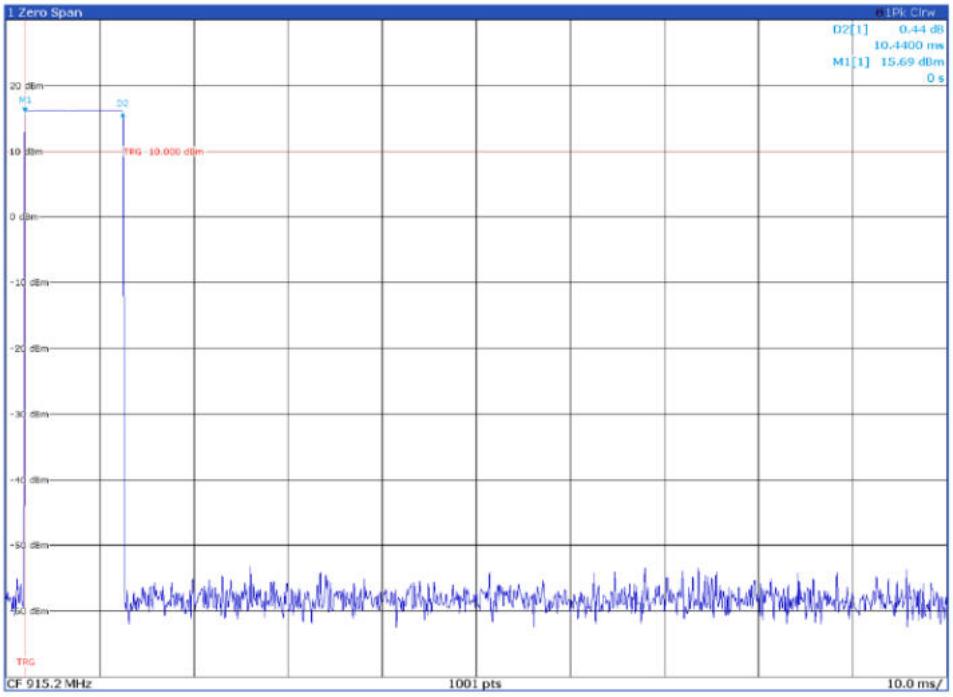
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold

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

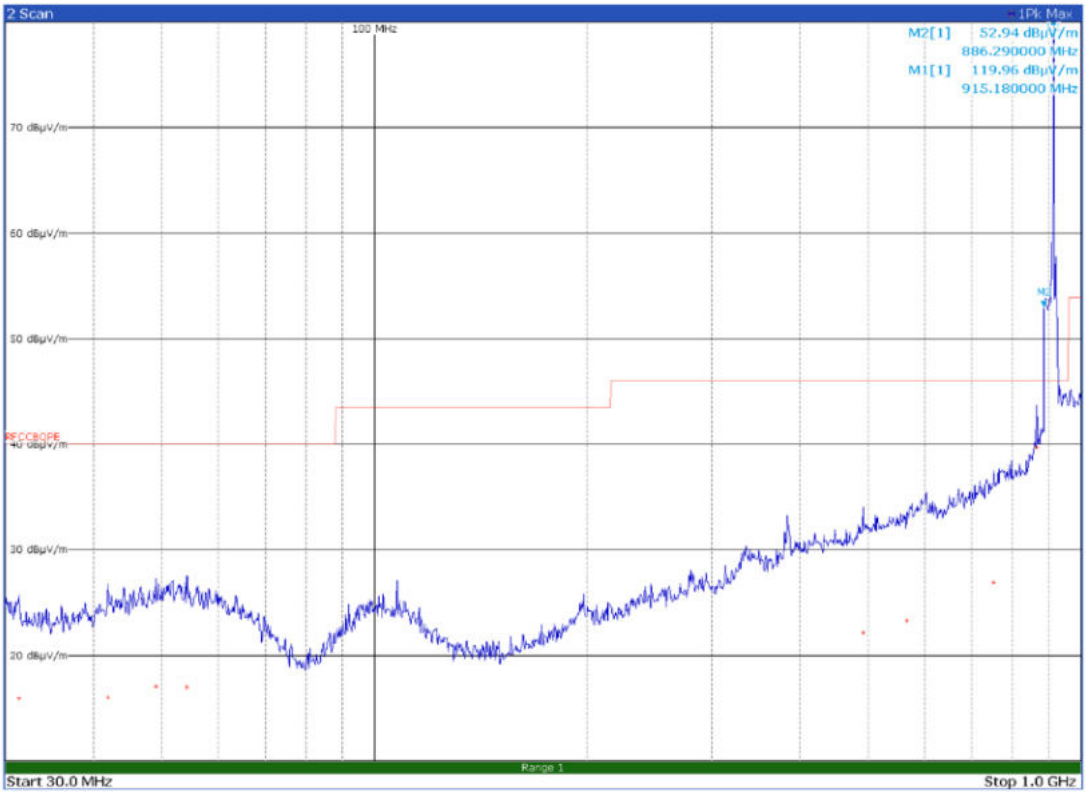
Spectrum analyser settings for conducted spurious emissions measurements:

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



Duty cycle correction factor applied: 20 * LOG (Ton/100ms)= -19.6 dB
Av value = Pk value + DCCF

11.1.4 Test data



Limit for 886.29 MHz peak is -20 dBc = 119.96 dBµV/m – 20 dB = 109.96 dBµV/m

Figure 11.1-1: *Radiated spurious emissions on low channel with antenna in horizontal polarization – Frequency range 30 to 1000 MHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
31.3500	15.9	40.0	-24.1	QP
41.9100	16.0	40.0	-24.0	QP
48.9900	17.1	40.0	-22.9	QP
54.2700	17.0	40.0	-23.0	QP
491.3700	22.2	46.0	-23.8	QP
567.3300	23.3	46.0	-22.7	QP
752.4900	26.9	46.0	-19.1	QP
865.1700	39.8	46.0	-6.2	QP

Limit exceeded by the carrier

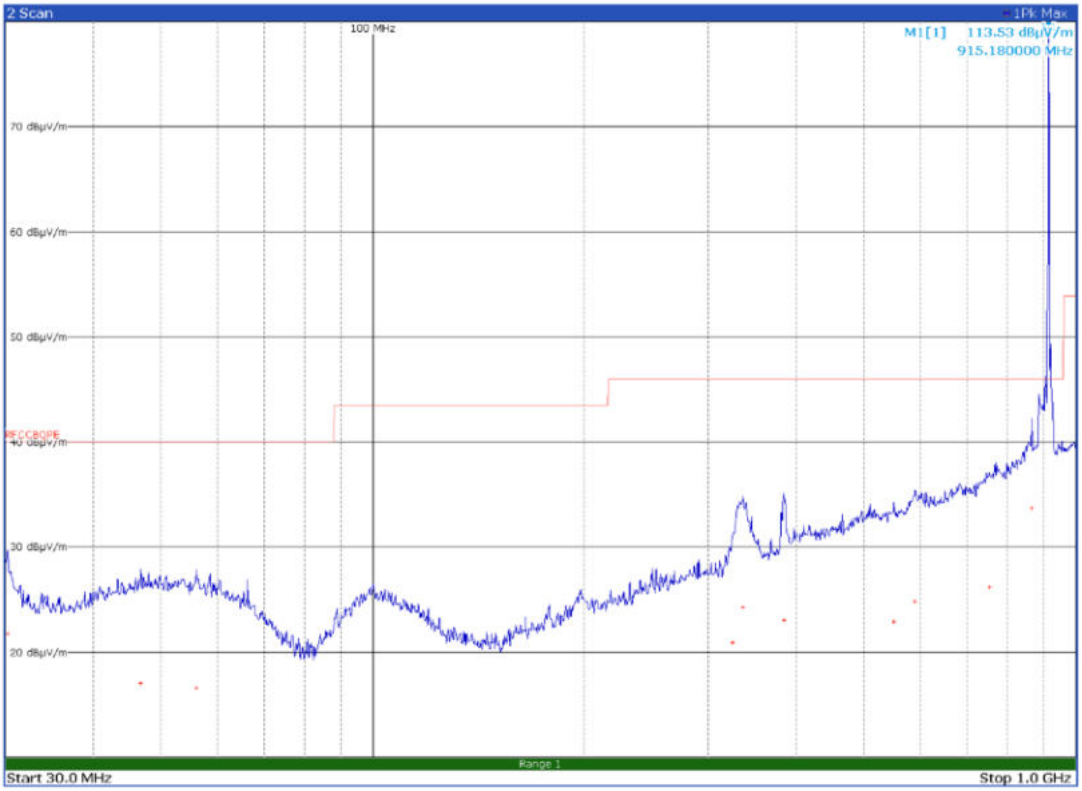


Figure 11.1-2: *Radiated spurious emissions on low channel with antenna in vertical polarization – Frequency range 30 to 1000 MHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
30.2100	21.8	40.0	-18.2	QP
46.7700	17.1	40.0	-22.9	QP
56.1000	16.7	40.0	-23.3	QP
324.8100	20.9	46.0	-25.1	QP
336.0900	24.3	46.0	-21.7	QP
384.0300	23.1	46.0	-22.9	QP
550.2900	22.9	46.0	-23.1	QP
590.4900	24.8	46.0	-21.2	QP
753.3000	26.2	46.0	-19.8	QP
865.1700	33.8	46.0	-12.2	QP

Limit exceeded by the carrier

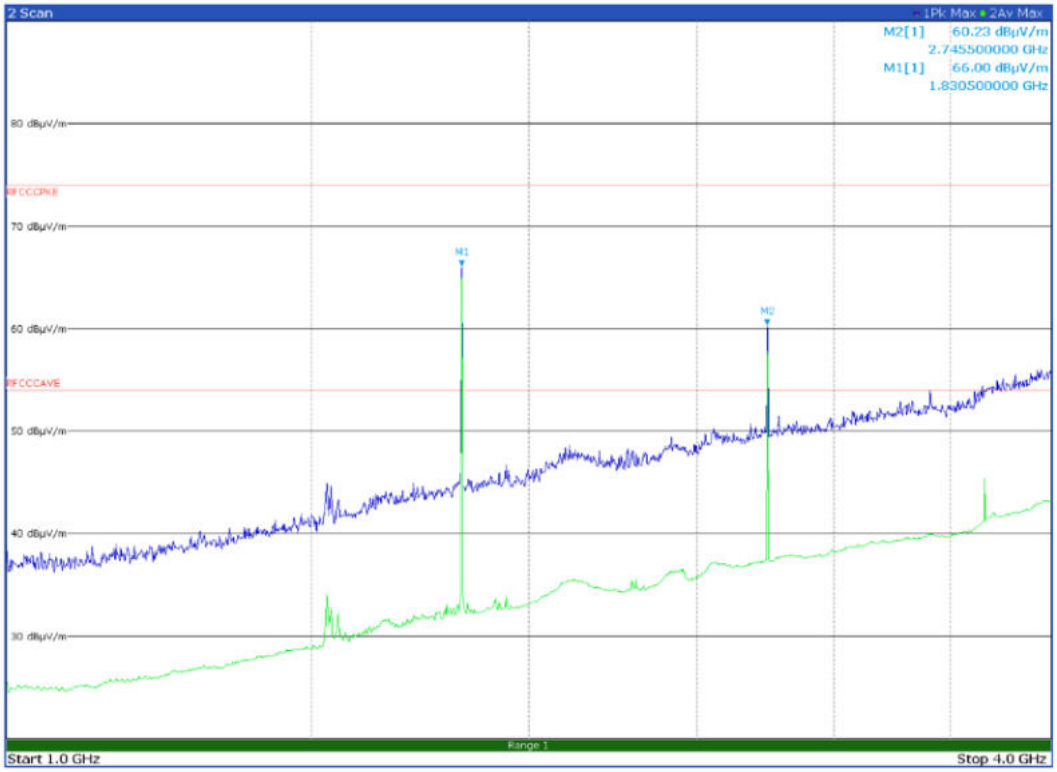


Figure 11.1-3: *Radiated spurious emissions on low channel with antenna in horizontal polarization – Frequency range 1 to 4 GHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1830.5000	66.0	74.0	-4.0	-19.6	46.4	54.0	-7.6
2745.5000	60.2	74.0	-13.8	-19.6	40.6	54.0	-13.4

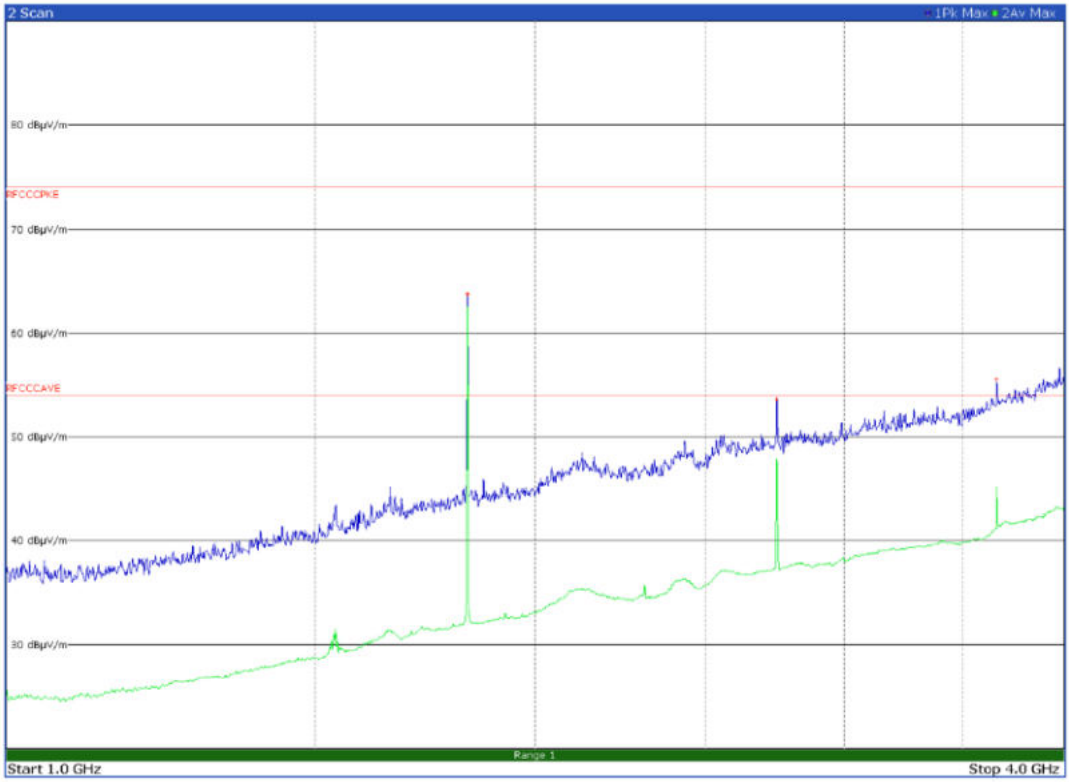


Figure 11.1-4: *Radiated spurious emissions on low channel with antenna in vertical polarization – Frequency range 1 to 4 GHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1830.5000	63.8	74.0	-10.2	-19.6	44.2	54.0	-9.8
2745.5000	53.7	74.0	-20.3	-19.6	34.1	54.0	-19.9
3661.0000	55.6	74.0	-18.4	-19.6	36.0	54.0	-18.0

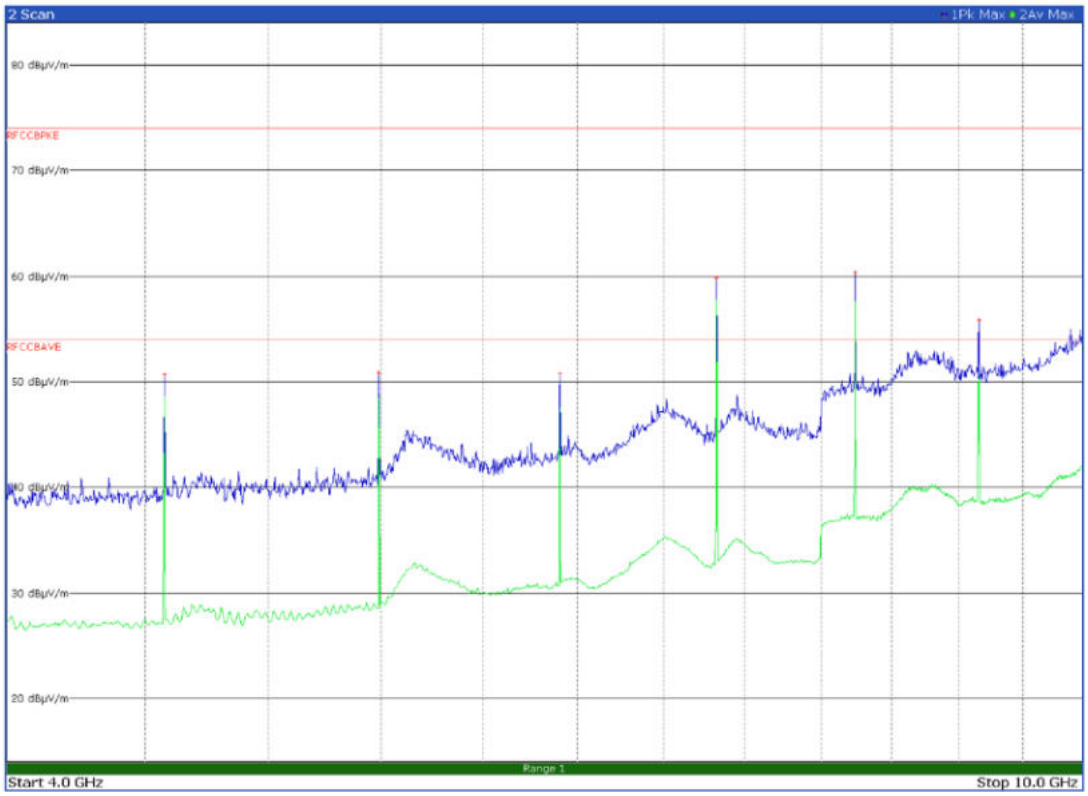


Figure 11.1-5: *Radiated spurious emissions on low channel with antenna in horizontal polarization – Frequency range 4 to 10 GHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4575.7500	50.7	74.0	-23.3	-19.6	31.1	54.0	-22.9
5491.0000	50.9	74.0	-23.1	-19.6	31.3	54.0	-22.7
6406.2500	50.8	74.0	-23.2	-19.6	31.2	54.0	-22.8
7321.7500	59.8	74.0	-14.2	-19.6	40.2	54.0	-13.8
8237.0000	60.4	74.0	-13.6	-19.6	40.8	54.0	-13.2
9152.2500	55.9	74.0	-18.1	-19.6	36.3	54.0	-17.7

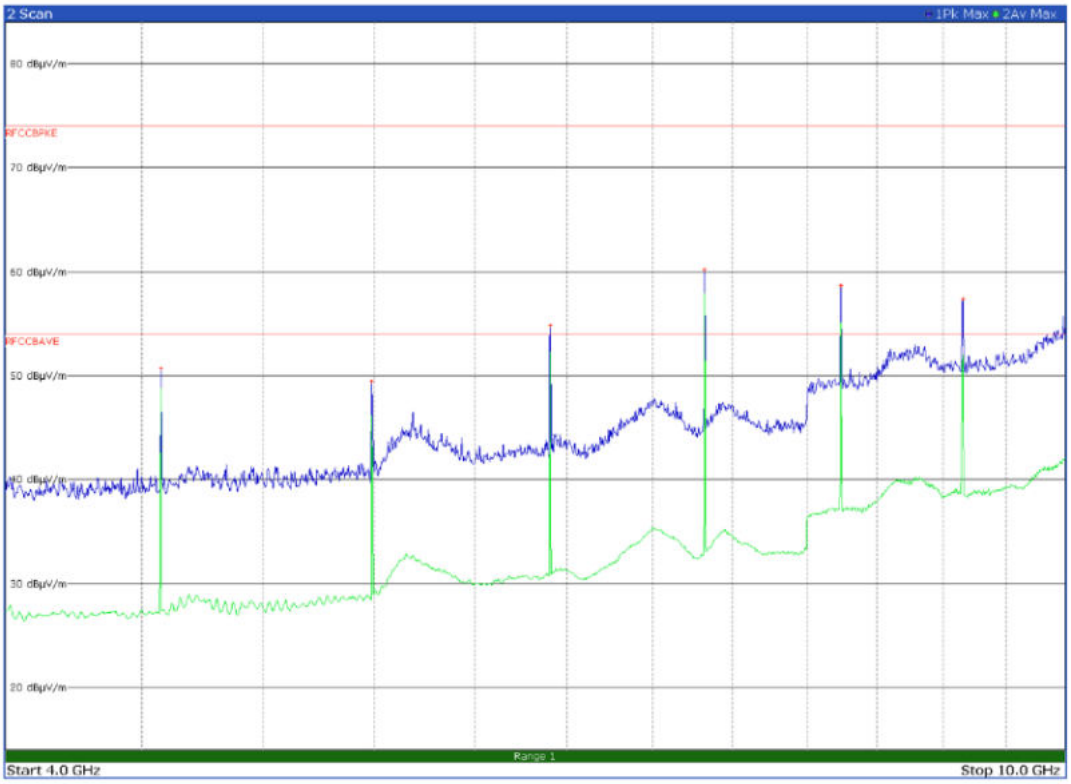
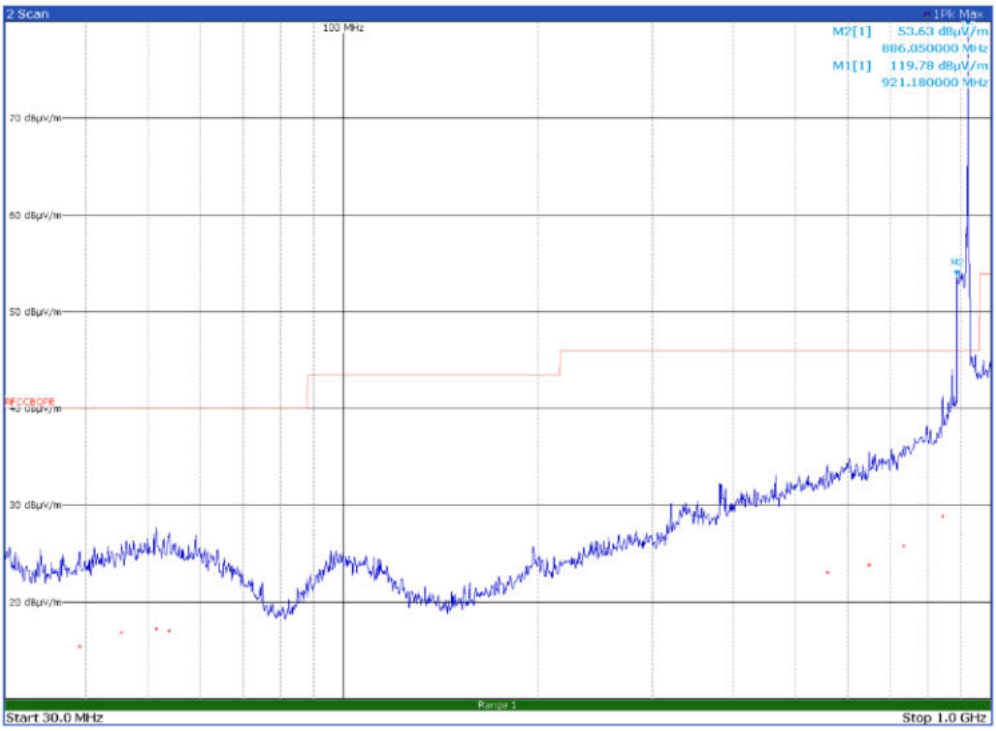


Figure 11.1-6: *Radiated spurious emissions on low channel with antenna in vertical polarization – Frequency range 4 to 10 GHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4576.0000	50.8	74.0	-23.2	-19.6	31.2	54.0	-22.8
5491.2500	49.5	74.0	-24.5	-19.6	29.9	54.0	-24.1
6406.2500	54.9	74.0	-19.1	-19.6	35.3	54.0	-18.7
7321.7500	60.2	74.0	-13.8	-19.6	40.6	54.0	-13.4
8237.0000	58.7	74.0	-15.3	-19.6	39.1	54.0	-14.9
9151.7500	57.4	74.0	-16.6	-19.6	37.8	54.0	-16.2



Limit for 886.05 MHz peak is -20 dBc = 119.78 dBµV/m – 20 dB = 99.78 dBµV/m

Figure 11.1-7: *Radiated spurious emissions on mid channel with antenna in horizontal polarization – Frequency range 30 to 1000 MHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
39.1200	15.4	40.0	-24.6	QP
45.4200	16.9	40.0	-23.1	QP
51.4500	17.3	40.0	-22.7	QP
53.7900	17.1	40.0	-22.9	QP
559.1400	23.1	46.0	-22.9	QP
648.4500	23.9	46.0	-22.1	QP
733.0200	25.8	46.0	-20.2	QP
841.4400	28.9	46.0	-17.1	QP

Limit exceeded by the carrier

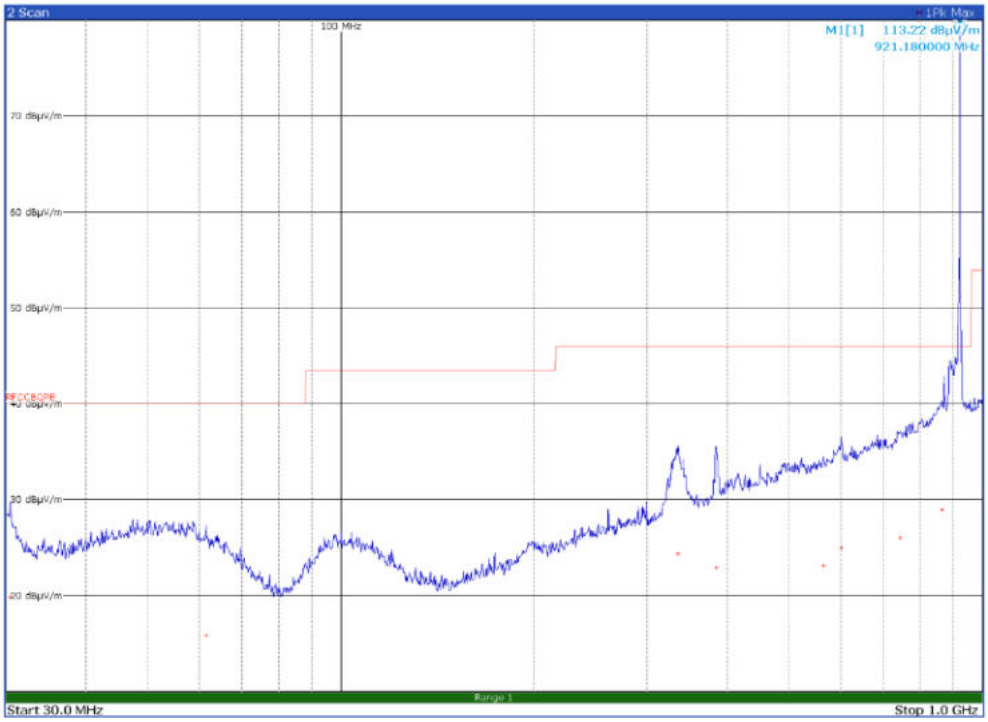


Figure 11.1-8: *Radiated spurious emissions on mid channel with antenna in vertical polarization – Frequency range 30 to 1000 MHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
30.4800	19.9	40.0	-20.1	QP
61.7100	15.9	40.0	-24.1	QP
335.3100	24.4	46.0	-21.6	QP
384.0000	23.0	46.0	-23.0	QP
565.3200	23.2	46.0	-22.8	QP
601.8000	25.0	46.0	-21.0	QP
743.6400	26.1	46.0	-19.9	QP
864.5700	29.0	46.0	-17.0	QP

Limit exceeded by the carrier

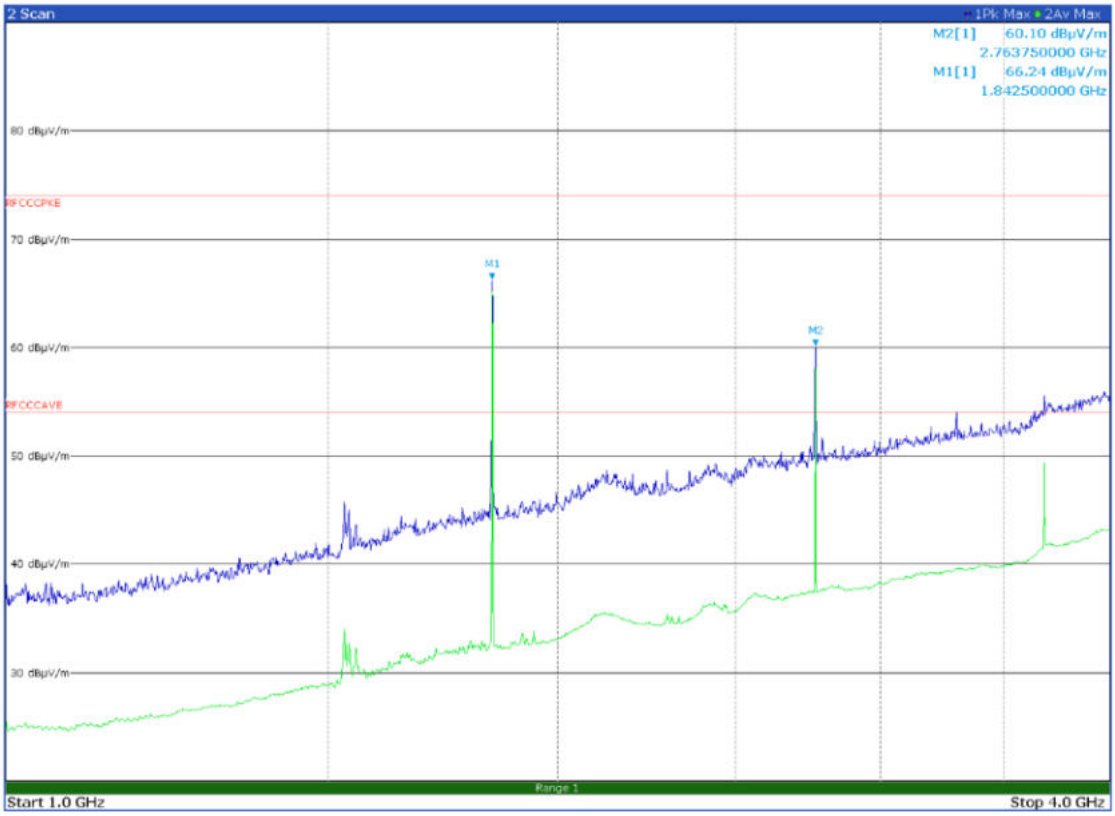


Figure 11.1-9: *Radiated spurious emissions on mid channel with antenna in horizontal polarization – Frequency range 1 to 4 GHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1842.5000	66.2	74.0	-9.8	-19.6	46.6	54.0	-7.4
2763.7500	60.1	74.0	-15.6	-19.6	40.5	54.0	-13.5

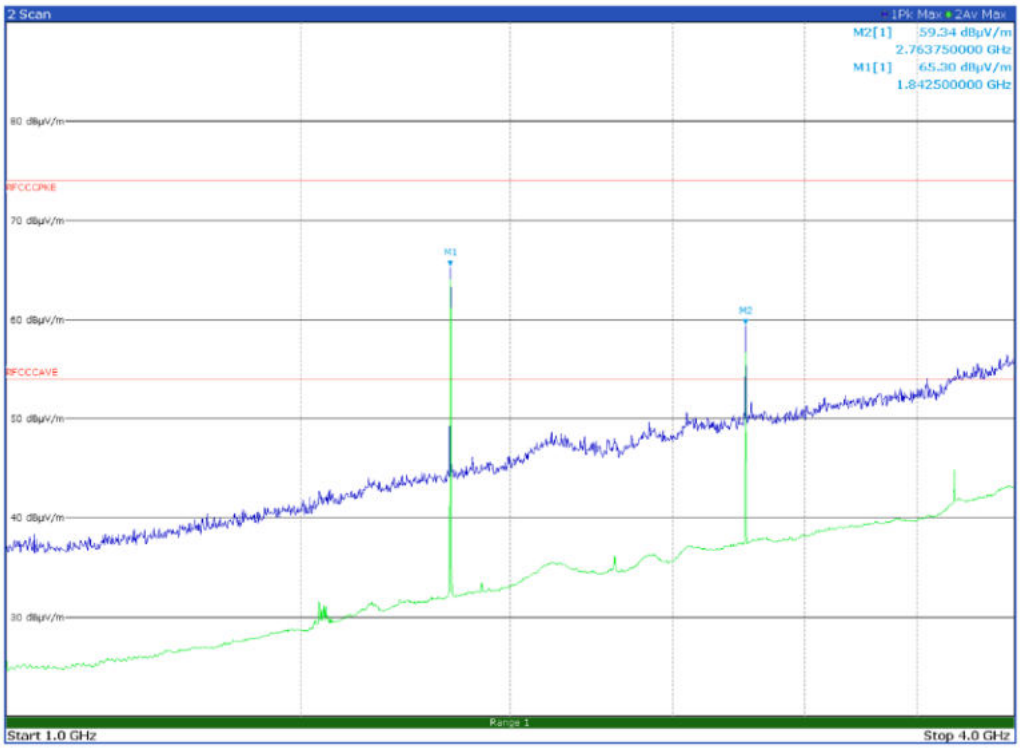


Figure 11.1-10: *Radiated spurious emissions on mid channel with antenna in vertical polarization – Frequency range 1 to 4 GHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1842.5000	65.3	74.0	-9.8	-19.6	45.7	54.0	-8.3
2763.7500	59.3	74.0	-15.6	-19.6	39.7	54.0	-14.3

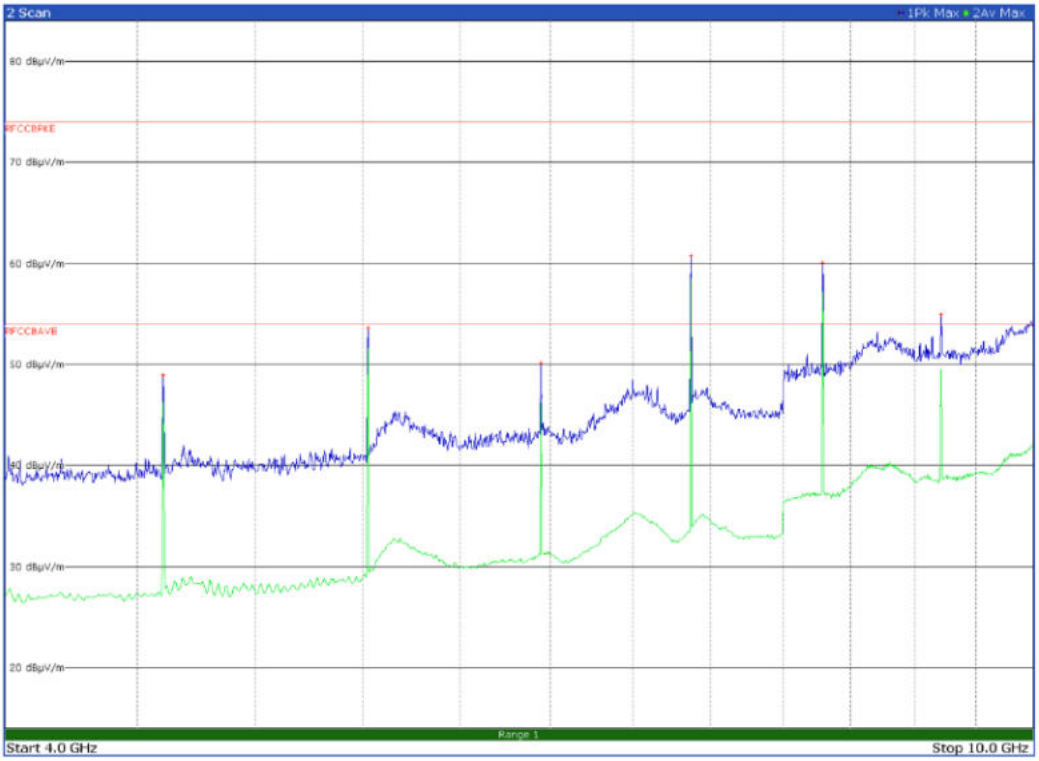


Figure 11.1-11: *Radiated spurious emissions on mid channel with antenna in horizontal polarization – Frequency range 4 to 10 GHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4606.0000	48.9	74.0	-25.1	-19.6	29.3	54.0	-24.7
5527.0000	53.7	74.0	-20.3	-19.6	34.1	54.0	-19.9
6448.2500	50.2	74.0	-23.8	-19.6	30.6	54.0	-23.4
7369.7500	60.8	74.0	-13.2	-19.6	41.2	54.0	-12.8
8291.0000	60.1	74.0	-13.9	-19.6	40.5	54.0	-13.5
9212.2500	55.0	74.0	-19.0	-19.6	35.4	54.0	-18.6

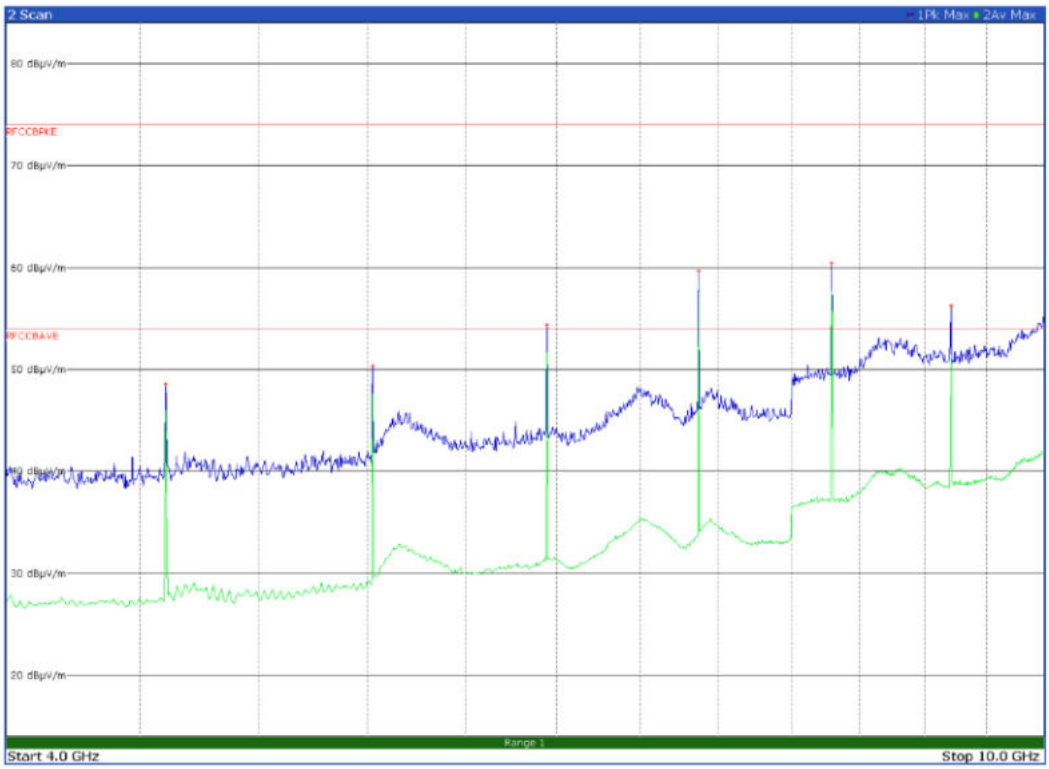


Figure 11.1-12: *Radiated spurious emissions on mid channel with antenna in vertical polarization – Frequency range 4 to 10 GHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4606.0000	48.6	74.0	-25.4	-19.6	29.0	54.0	-25.0
5527.2500	50.3	74.0	-23.7	-19.6	30.7	54.0	-23.3
6448.5000	54.4	74.0	-19.6	-19.6	34.8	54.0	-19.2
7369.7500	59.7	74.0	-14.3	-19.6	40.1	54.0	-13.9
8290.5000	60.5	74.0	-13.5	-19.6	40.9	54.0	-13.1
9212.2500	56.2	74.0	-17.8	-19.6	36.6	54.0	-17.4

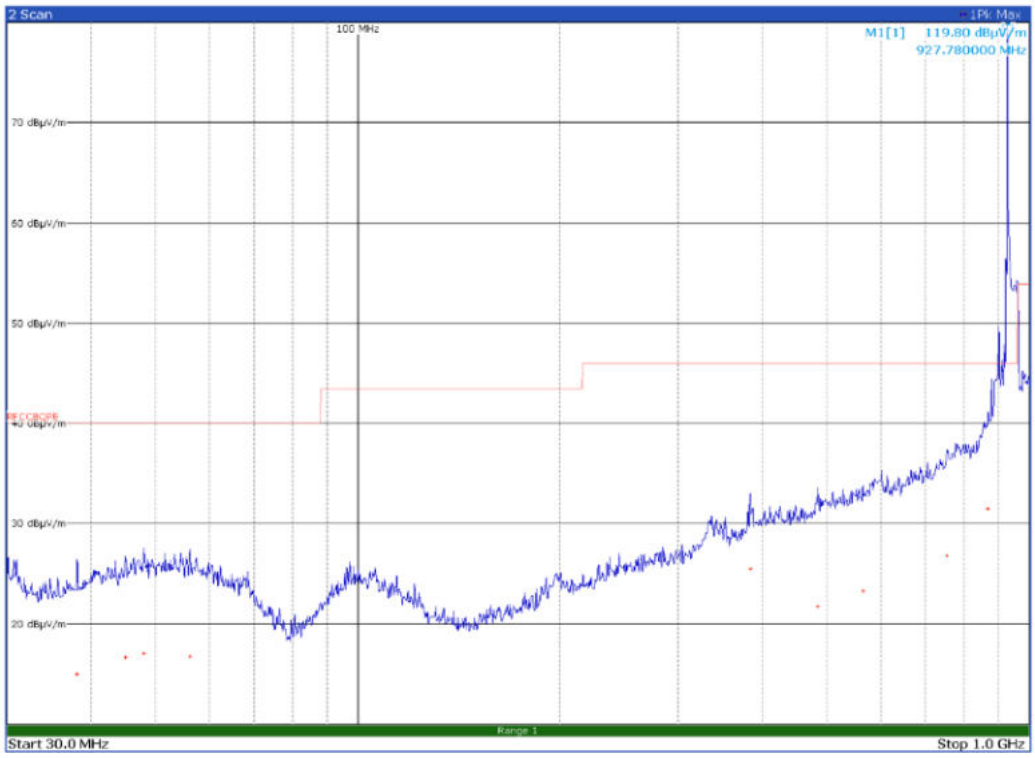


Figure 11.1-13: *Radiated spurious emissions on high channel with antenna in horizontal polarization – Frequency range 30 to 1000 MHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
38.1900	15.1	40.0	-24.9	QP
45.0600	16.7	40.0	-23.3	QP
48.0000	17.1	40.0	-22.9	QP
56.1900	16.8	40.0	-23.2	QP
384.0000	25.6	46.0	-20.4	QP
483.6000	21.8	46.0	-24.2	QP
564.7500	23.3	46.0	-22.7	QP
754.5000	26.8	46.0	-19.2	QP
868.0200	31.5	46.0	-14.5	QP

Limit exceeded by the carrier

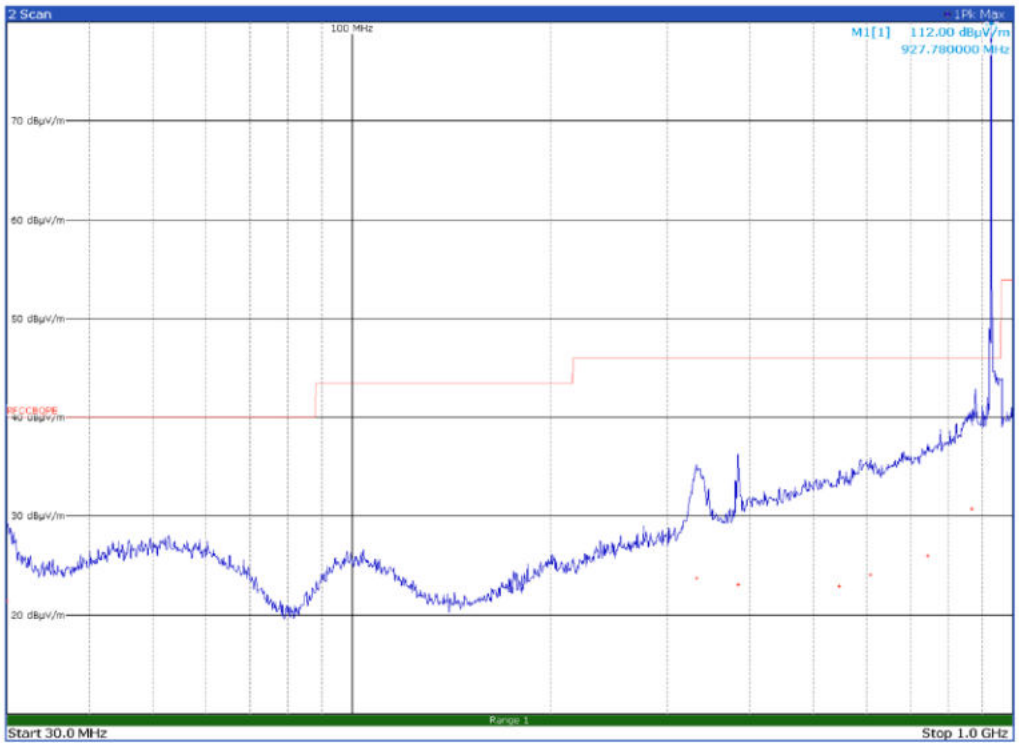


Figure 11.1-14: *Radiated spurious emissions on high channel with antenna in vertical polarization – Frequency range 30 to 1000 MHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
30.0000	21.5	40.0	-18.5	QP
332.1900	23.8	46.0	-22.2	QP
384.0000	23.1	46.0	-22.9	QP
546.9600	23.0	46.0	-23.0	QP
609.1200	24.1	46.0	-21.9	QP
744.0900	26.0	46.0	-20.0	QP
866.5200	30.8	46.0	-15.2	QP

Limit exceeded by the carrier

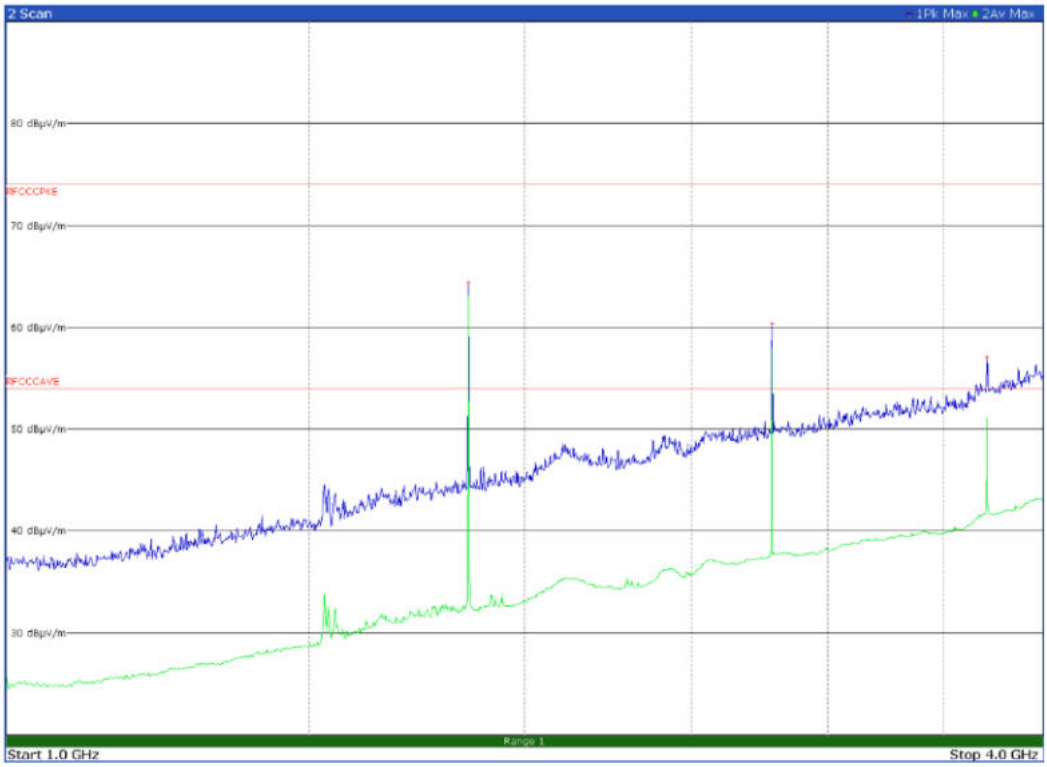


Figure 11.1-15: *Radiated spurious emissions on high channel with antenna in horizontal polarization – Frequency range 1 to 4 GHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1855.5000	64.4	74.0	-9.6	-19.6	44.8	54.0	-9.2
2783.2500	60.4	74.0	-13.6	-19.6	40.8	54.0	-13.2
3711.5000	57.1	74.0	-16.9	-19.6	37.5	54.0	-16.5

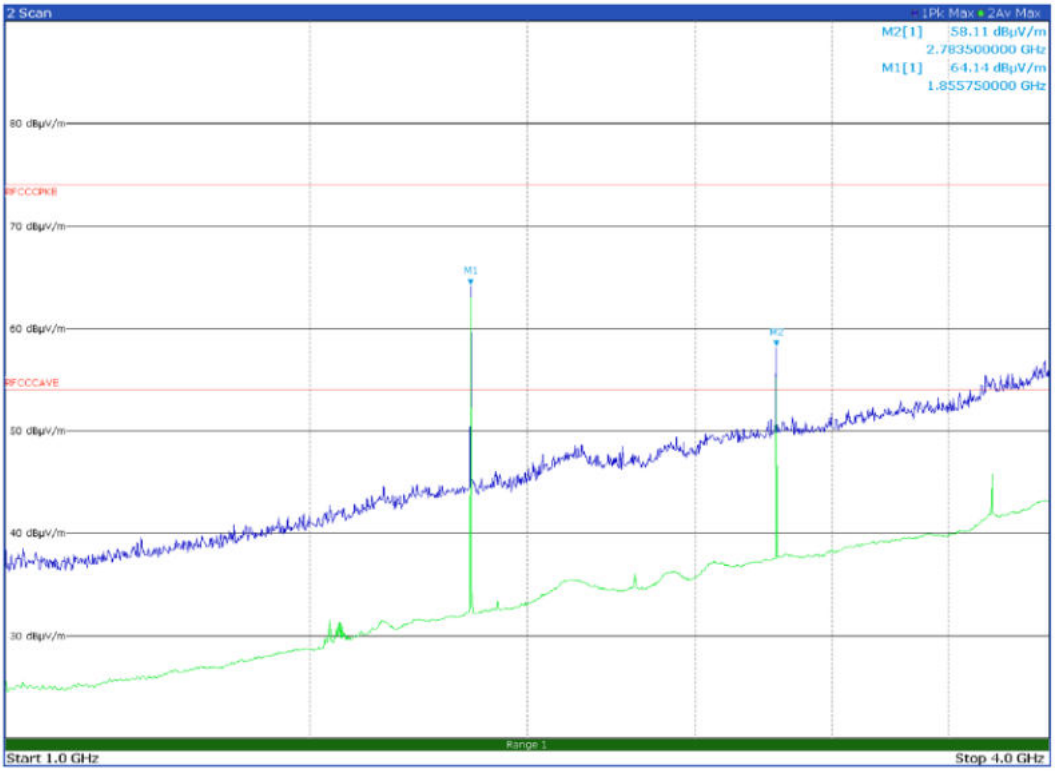


Figure 11.1-16: *Radiated spurious emissions on high channel with antenna in vertical polarization – Frequency range 1 to 4 GHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1855.7500	64.1	74.0	-9.6	-19.6	44.5	54.0	-9.5
2783.5000	58.1	74.0	-13.6	-19.6	38.5	54.0	-15.5

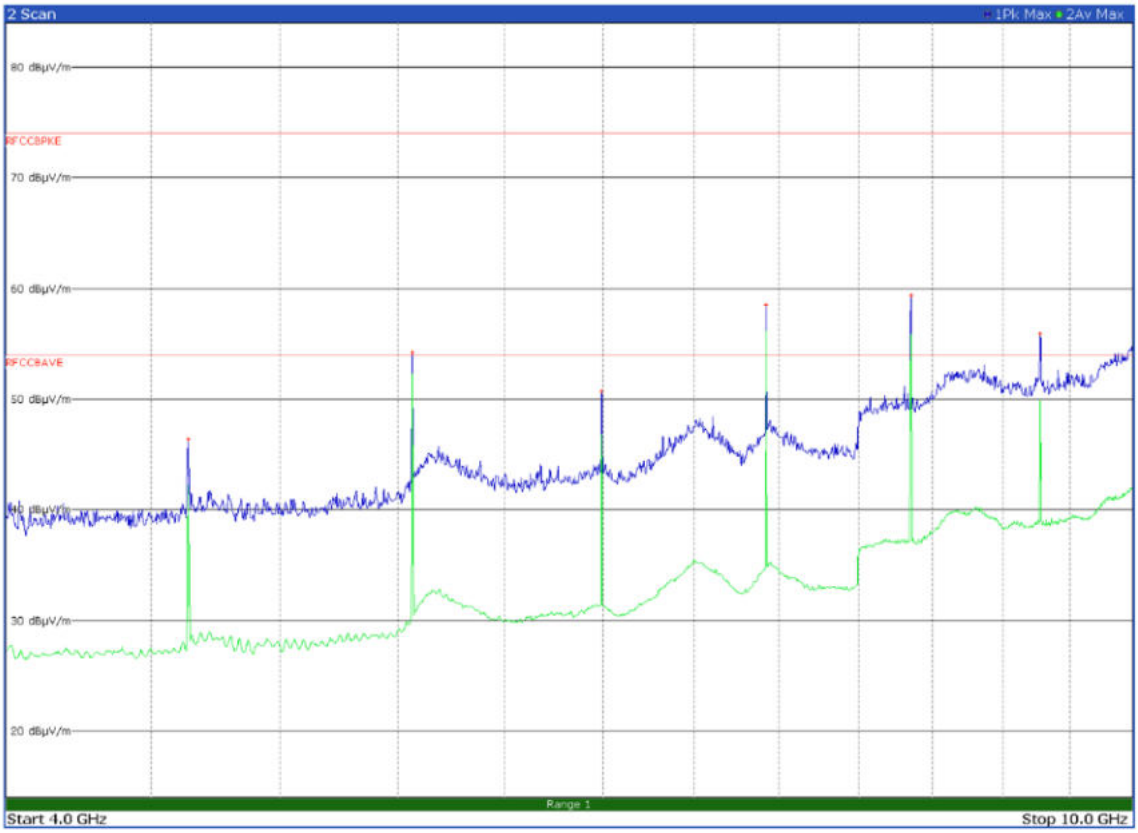


Figure 11.1-17: *Radiated spurious emissions on high channel with antenna in horizontal polarization – Frequency range 4 to 10 GHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4639.0000	46.4	74.0	-27.6	-19.6	26.8	54.0	-27.2
5566.5000	54.3	74.0	-19.7	-19.6	34.7	54.0	-19.3
6494.7500	50.7	74.0	-23.3	-19.6	31.1	54.0	-22.9
7422.5000	58.5	74.0	-15.5	-19.6	38.9	54.0	-15.1
8350.0000	59.4	74.0	-14.6	-19.6	39.8	54.0	-14.2
9278.2500	56.0	74.0	-18.0	-19.6	36.4	54.0	-17.6

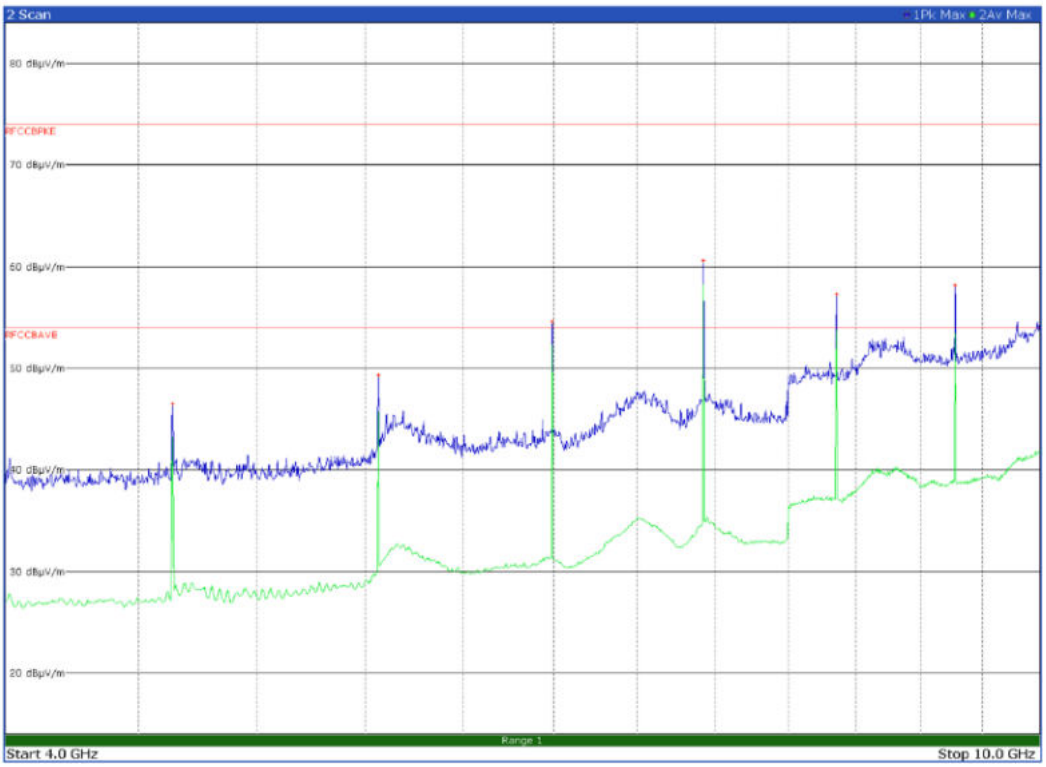


Figure 11.1-18: *Radiated spurious emissions on high channel with antenna in vertical polarization – Frequency range 4 to 10 GHz*

Internal antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4638.7500	46.5	74.0	-27.5	-19.6	26.9	54.0	-27.1
5566.7500	49.4	74.0	-24.6	-19.6	29.8	54.0	-24.2
6494.7500	54.7	74.0	-19.3	-19.6	35.1	54.0	-18.9
7422.5000	60.6	74.0	-13.4	-19.6	41.0	54.0	-13.0
8350.5000	57.3	74.0	-16.7	-19.6	37.7	54.0	-16.3
9278.2500	58.2	74.0	-15.8	-19.6	38.6	54.0	-15.4

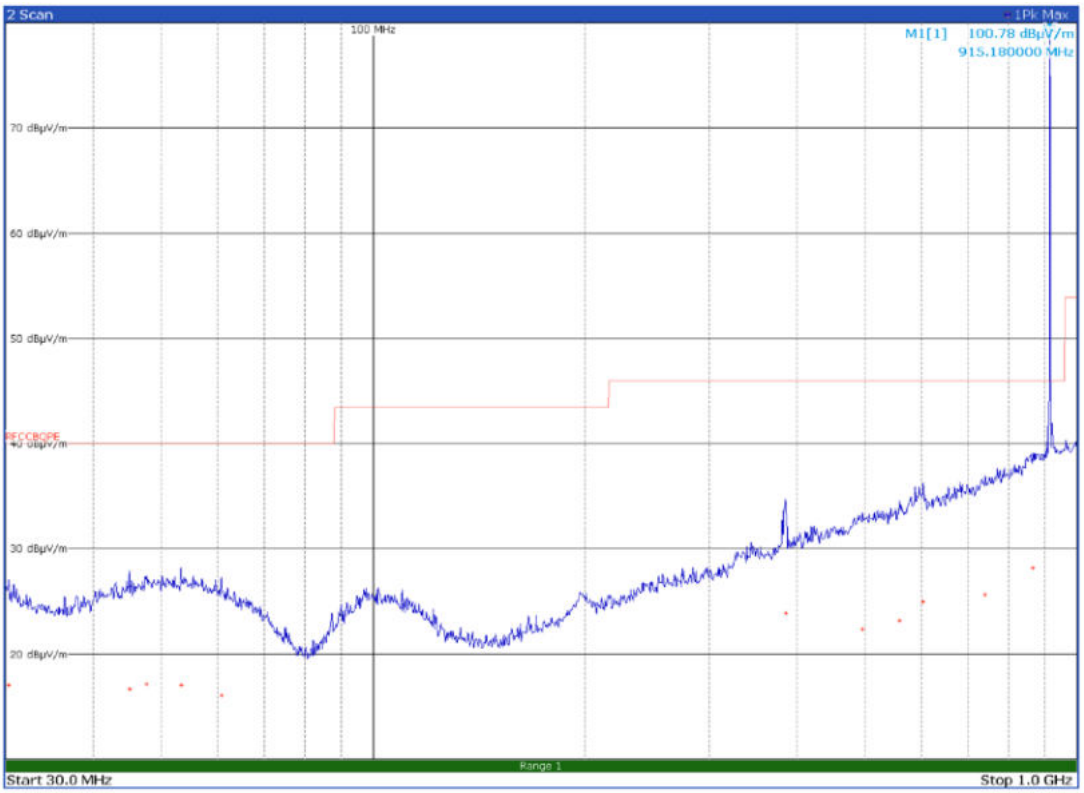


Figure 11.1-19: *Radiated spurious emissions on low channel with antenna in horizontal polarization – Frequency range 30 to 1000 MHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
30.3300	17.1	40.0	-22.9	QP
45.0300	16.7	40.0	-23.3	QP
47.6100	17.1	40.0	-22.9	QP
53.2800	17.1	40.0	-22.9	QP
60.8100	16.1	40.0	-23.9	QP
385.0200	24.0	46.0	-22.0	QP
495.5400	22.4	46.0	-23.6	QP
559.4400	23.2	46.0	-22.8	QP
604.3200	25.0	46.0	-21.0	QP
740.4900	25.7	46.0	-20.3	QP
865.8300	28.2	46.0	-17.8	QP

Limit exceeded by the carrier

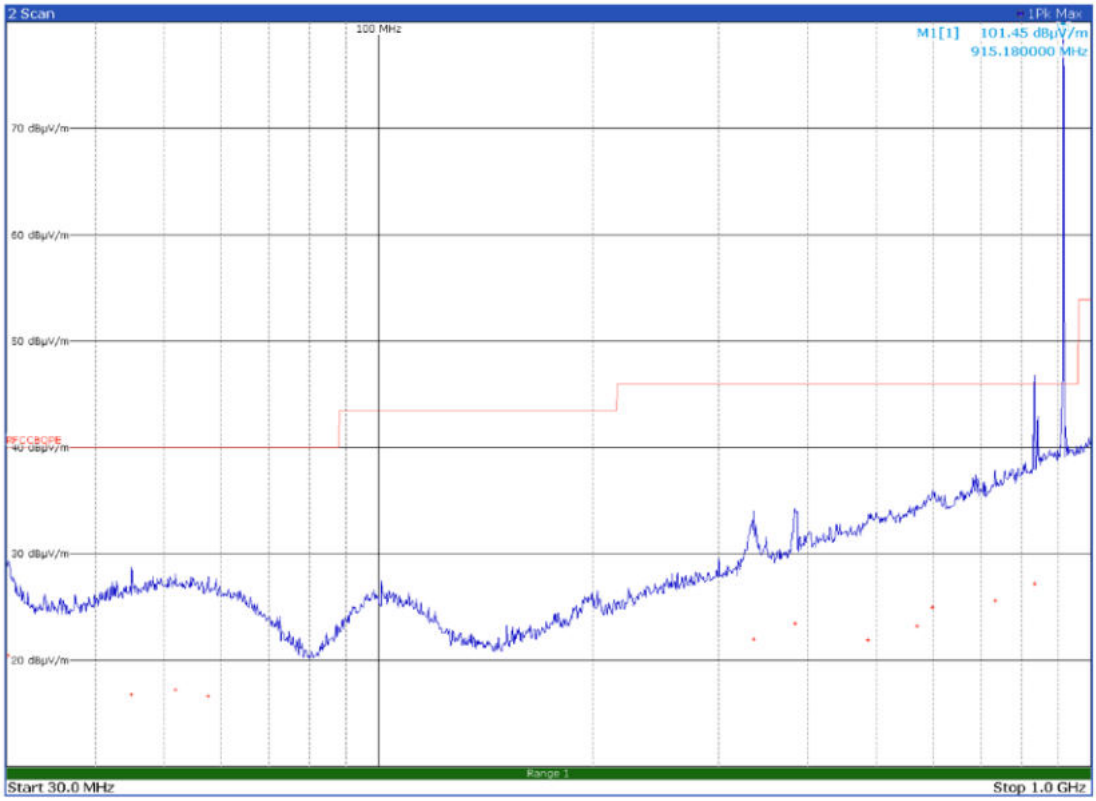


Figure 11.1-20: *Radiated spurious emissions on low channel with antenna in vertical polarization – Frequency range 30 to 1000 MHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
30.1500	20.5	40.0	-19.5	QP
44.9700	16.8	40.0	-23.2	QP
51.8100	17.2	40.0	-22.8	QP
57.6600	16.7	40.0	-23.3	QP
336.0300	22.0	46.0	-24.0	QP
384.0000	23.5	46.0	-22.5	QP
486.3900	22.0	46.0	-24.0	QP
570.5100	23.3	46.0	-22.7	QP
599.4900	25.0	46.0	-21.0	QP
733.4100	25.6	46.0	-20.4	QP
832.5900	27.2	46.0	-18.8	QP

Limit exceeded by the carrier

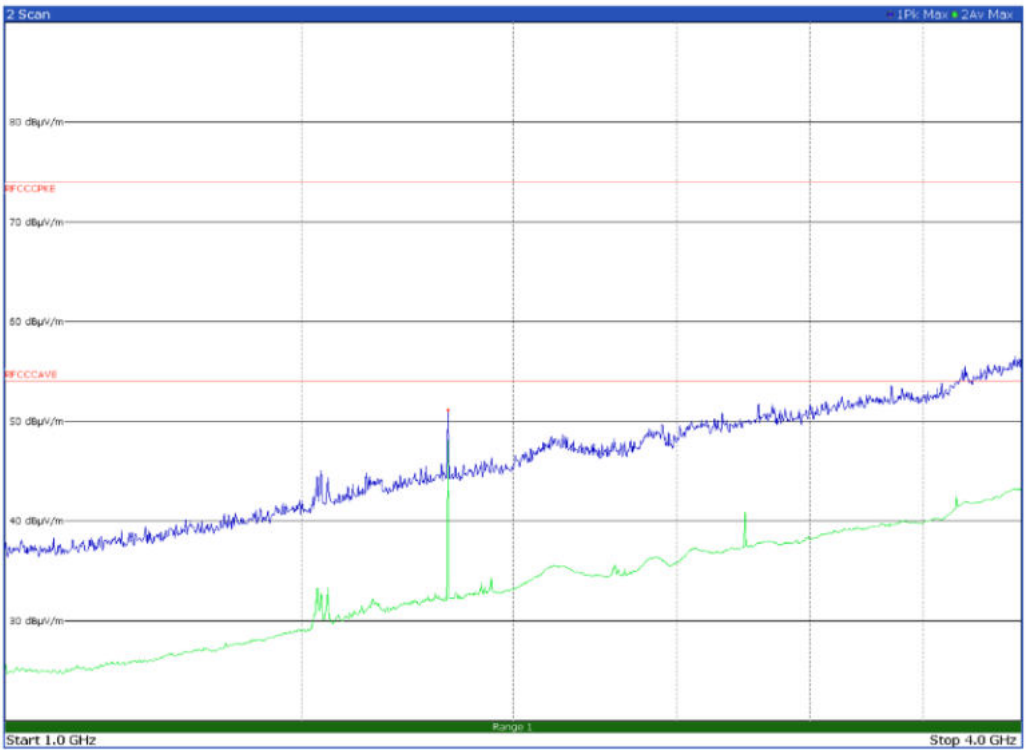


Figure 11.1-21: *Radiated spurious emissions on low channel with antenna in horizontal polarization – Frequency range 1 to 4 GHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1830.2500	51.1	74.0	-22.9	-19.6	31.5	54.0	-22.5

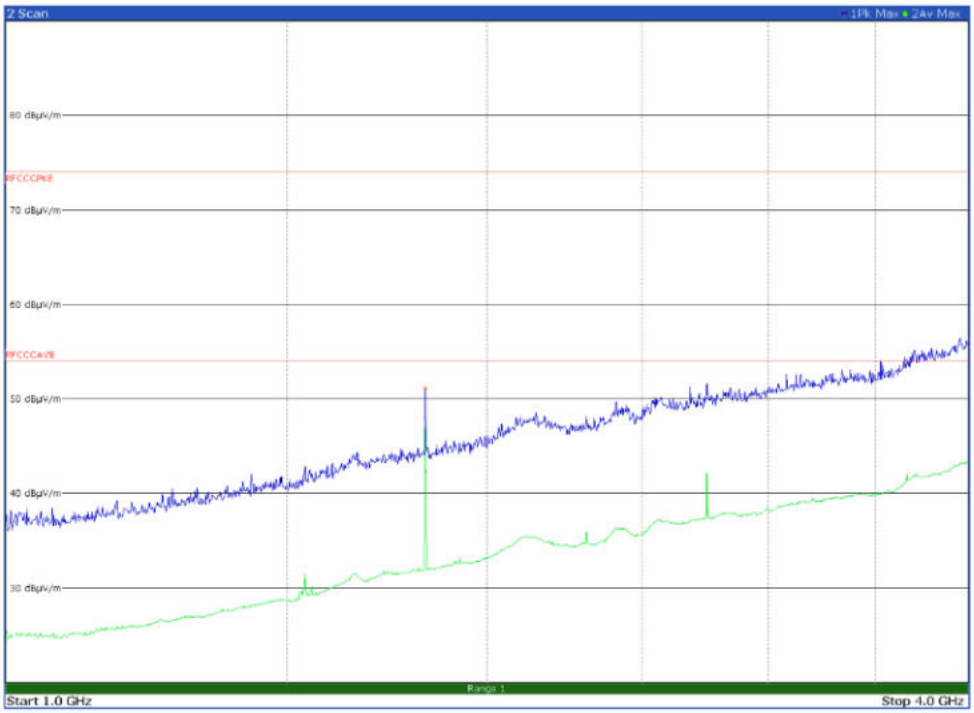


Figure 11.1-22: *Radiated spurious emissions on low channel with antenna in vertical polarization – Frequency range 1 to 4 GHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1830.2500	51.1	74.0	-22.9	-19.6	31.5	54.0	-22.5

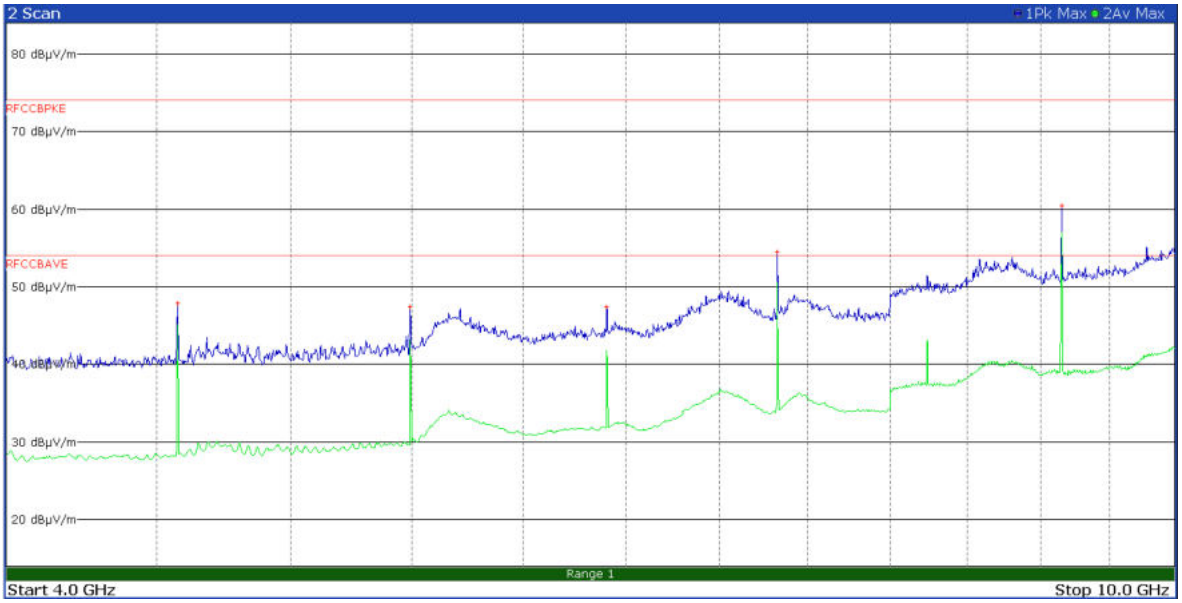


Figure 11.1-23: *Radiated spurious emissions on low channel with antenna in horizontal polarization – Frequency range 4 to 10 GHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4576.0000	47.9	74.0	-26.1	-19.6	28.3	54.0	-25.7
5491.2500	47.5	74.0	-26.5	-19.6	27.9	54.0	-26.1
6406.7500	47.5	74.0	-26.5	-19.6	27.9	54.0	-26.1
7321.7500	54.6	74.0	-19.4	-19.6	35.0	54.0	-19.0
9152.2500	60.5	74.0	-13.5	-19.6	40.9	54.0	-13.1

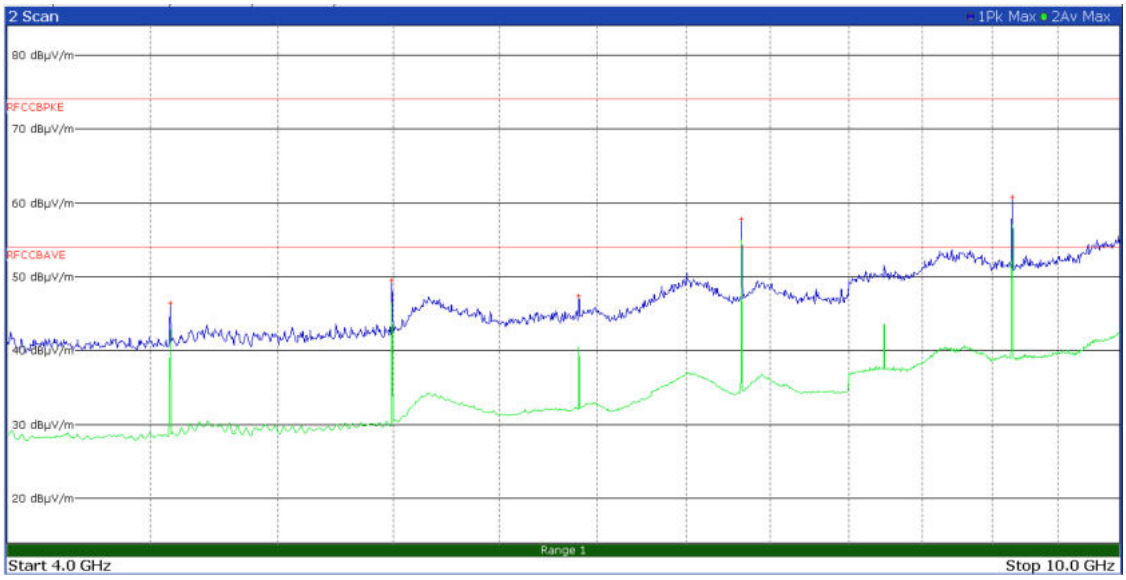


Figure 11.1-24: *Radiated spurious emissions on low channel with antenna in vertical polarization – Frequency range 4 to 10 GHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4575.7500	46.5	74.0	-27.5	-19.6	26.9	54.0	-27.1
5491.0000	49.6	74.0	-24.4	-19.6	30.0	54.0	-24.0
6406.5000	47.4	74.0	-26.6	-19.6	27.8	54.0	-26.2
7321.7500	57.8	74.0	-16.2	-19.6	38.2	54.0	-15.8
9152.2500	60.8	74.0	-13.2	-19.6	41.2	54.0	-12.8

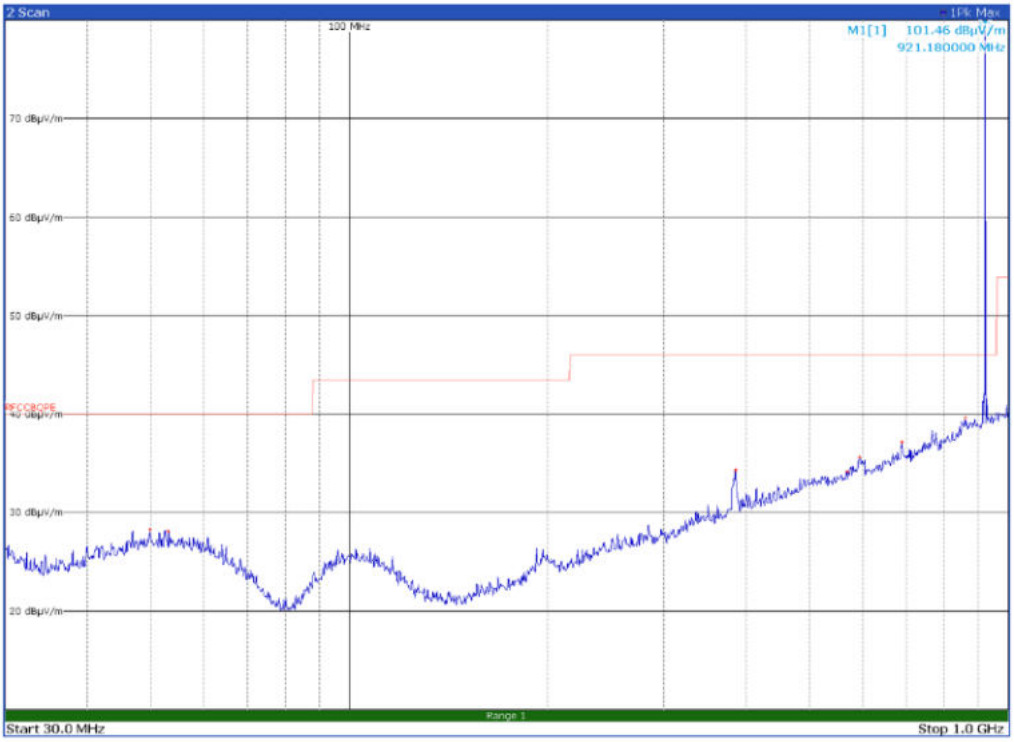


Figure 11.1-25: *Radiated spurious emissions on mid channel with antenna in horizontal polarization – Frequency range 30 to 1000 MHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
49.8000	28.3	40.0	-11.7	QP
53.1300	28.2	40.0	-11.8	QP
385.0200	34.4	46.0	-11.6	QP
570.5700	34.2	46.0	-11.8	QP
594.8400	35.7	46.0	-10.3	QP
688.8000	37.2	46.0	-8.8	QP
859.7100	39.6	46.0	-6.4	QP

Limit exceeded by the carrier

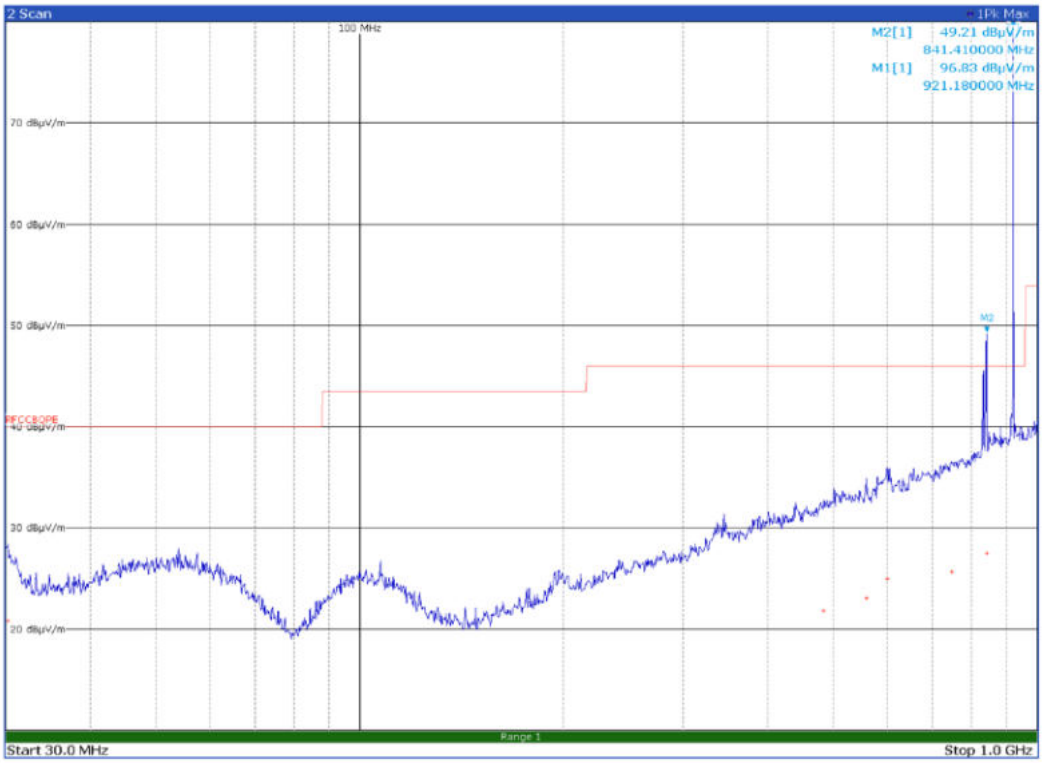


Figure 11.1-26: *Radiated spurious emissions on mid channel with antenna in vertical polarization – Frequency range 30 to 1000 MHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
30.2400	20.9	40.0	-19.1	QP
484.2000	21.8	46.0	-24.2	QP
559.5300	23.1	46.0	-22.9	QP
600.0300	25.0	46.0	-21.0	QP
747.3300	25.7	46.0	-20.3	QP
841.4100	27.5	46.0	-18.5	QP

Limit exceeded by the carrier

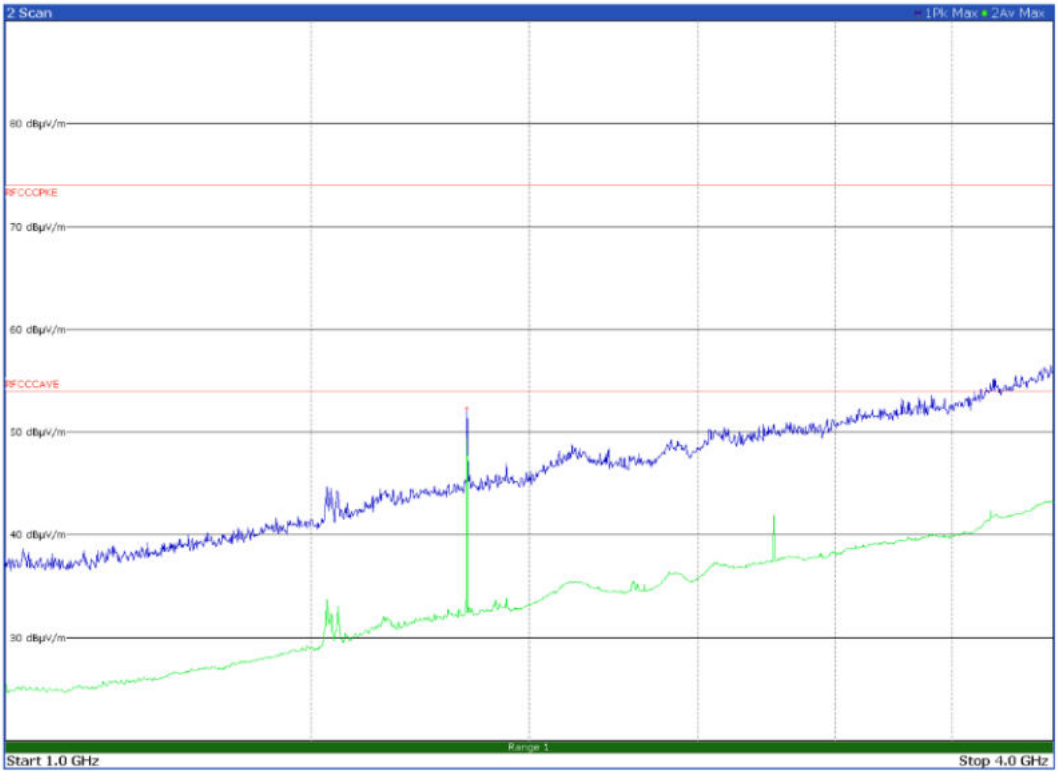


Figure 11.1-27: *Radiated spurious emissions on mid channel with antenna in horizontal polarization – Frequency range 1 to 4 GHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1842.2500	52.3	74.0	-21.7	-19.6	32.7	54.0	-21.3

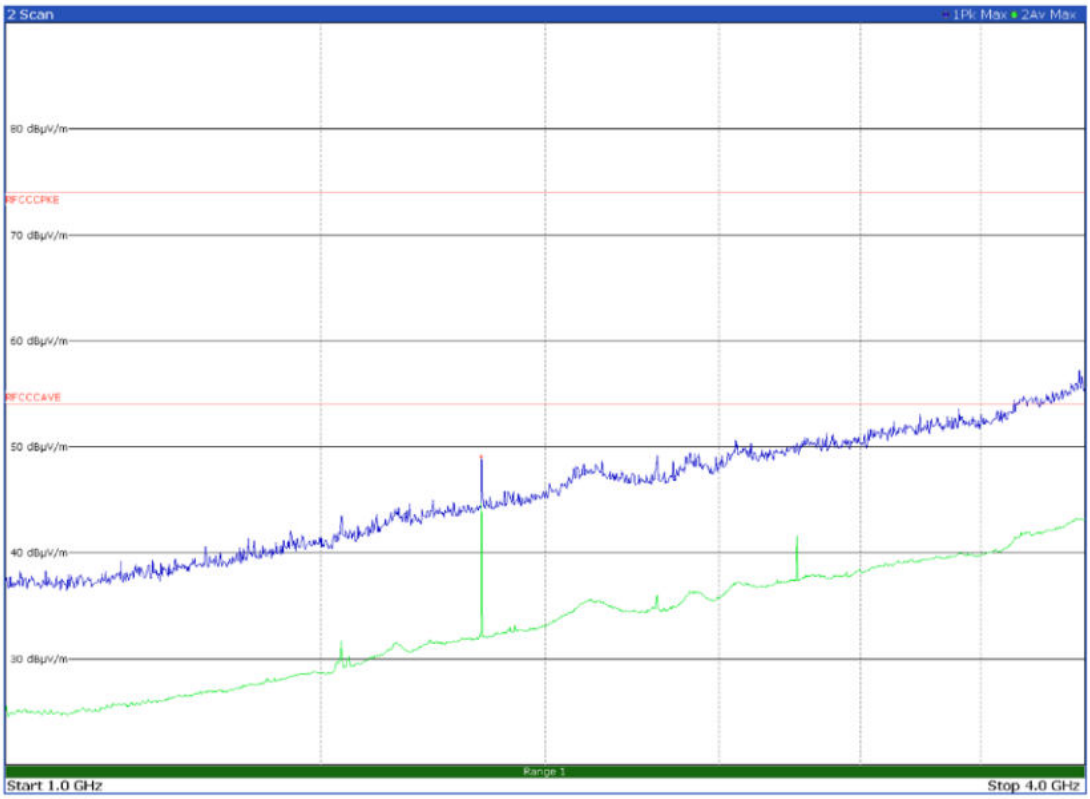


Figure 11.1-28: *Radiated spurious emissions on mid channel with antenna in vertical polarization – Frequency range 1 to 4 GHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1842.5000	49.1	74.0	-24.9	-19.6	29.5	54.0	-24.5

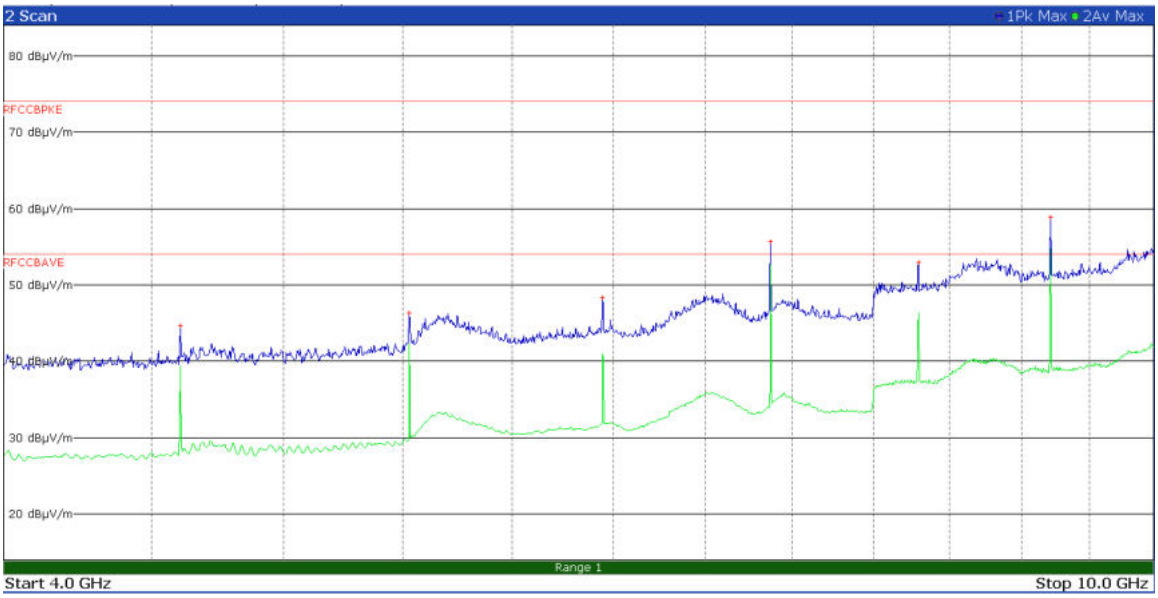


Figure 11.1-29: *Radiated spurious emissions on mid channel with antenna in horizontal polarization – Frequency range 4 to 10 GHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4606.0000	44.7	74.0	-29.3	-19.6	25.1	54.0	-28.9
5527.0000	46.4	74.0	-27.6	-19.6	26.8	54.0	-27.2
6448.2500	48.4	74.0	-25.6	-19.6	28.8	54.0	-25.2
7369.5000	55.7	74.0	-18.3	-19.6	36.1	54.0	-17.9
8291.0000	53.0	74.0	-21.0	-19.6	33.4	54.0	-20.6
9212.2500	59.0	74.0	-15.0	-19.6	39.4	54.0	-14.6

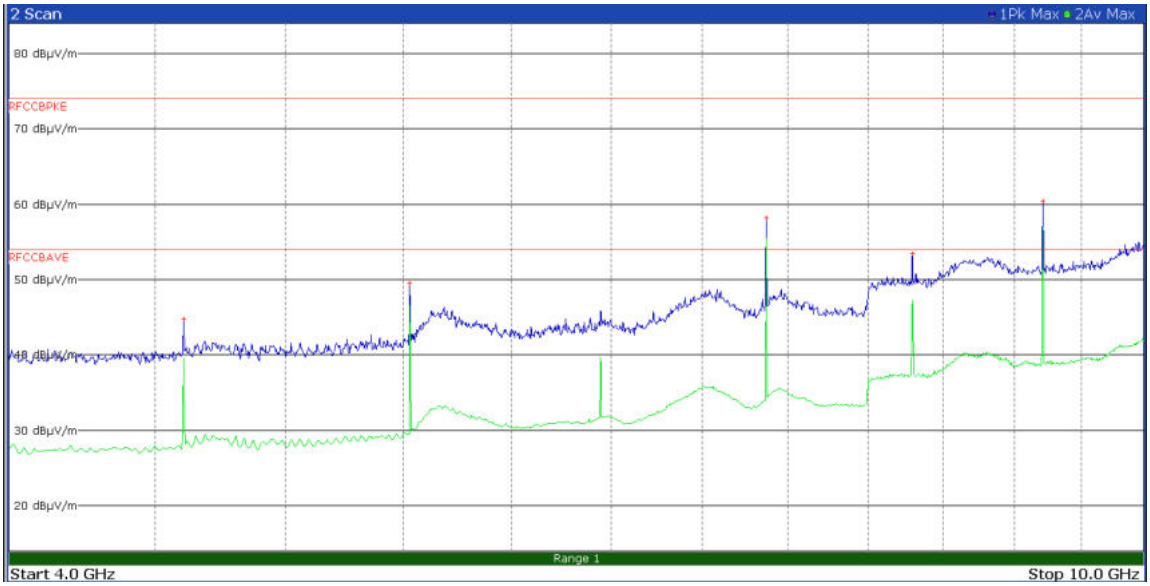
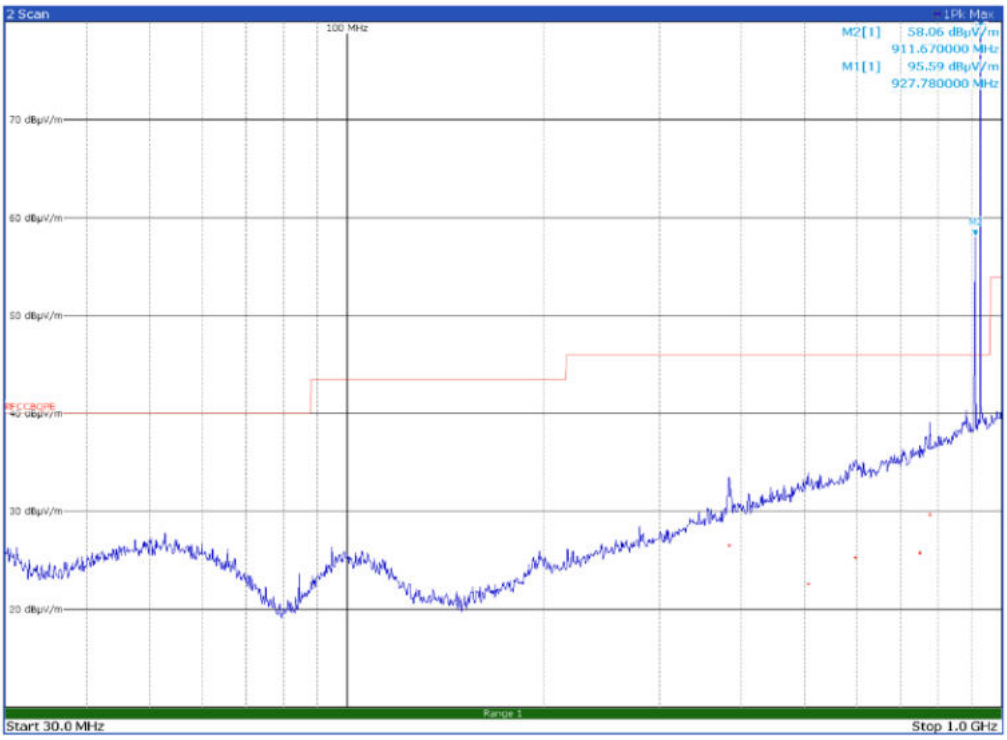


Figure 11.1-30: *Radiated spurious emissions on mid channel with antenna in vertical polarization – Frequency range 4 to 10 GHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4606.0000	44.9	74.0	-29.1	-19.6	25.3	54.0	-28.7
5527.0000	49.6	74.0	-24.4	-19.6	30.0	54.0	-24.0
7369.7500	58.2	74.0	-15.8	-19.6	38.6	54.0	-15.4
8290.5000	53.5	74.0	-20.5	-19.6	33.9	54.0	-20.1
9211.7500	60.5	74.0	-13.5	-19.6	40.9	54.0	-13.1



Limit for 911.67 MHz peak is -20 dBc = 95.59 dBµV/m – 20 dB = 75.59 dBµV/m

Figure 11.1-31: *Radiated spurious emissions on high channel with antenna in horizontal polarization – Frequency range 30 to 1000 MHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
382.9800	26.5	46.0	-19.5	QP
505.8300	22.6	46.0	-23.4	QP
597.8400	25.3	46.0	-20.7	QP
750.3000	25.8	46.0	-20.2	QP
776.1600	29.7	46.0	-16.3	QP

Limit exceeded by the carrier

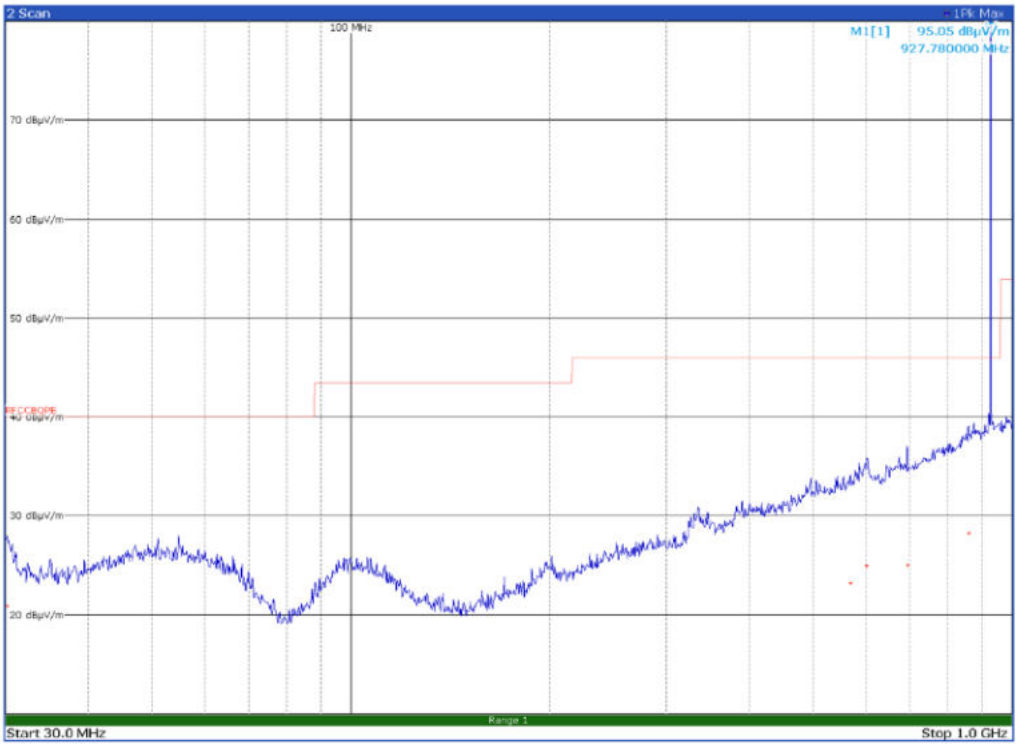


Figure 11.1-32: *Radiated spurious emissions on high channel with antenna in vertical polarization – Frequency range 30 to 1000 MHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
30.1800	21.0	40.0	-19.0	QP
569.2500	23.3	46.0	-22.7	QP
602.8200	25.0	46.0	-21.0	QP
693.7500	25.1	46.0	-20.9	QP
860.7900	28.3	46.0	-17.7	QP

Limit exceeded by the carrier

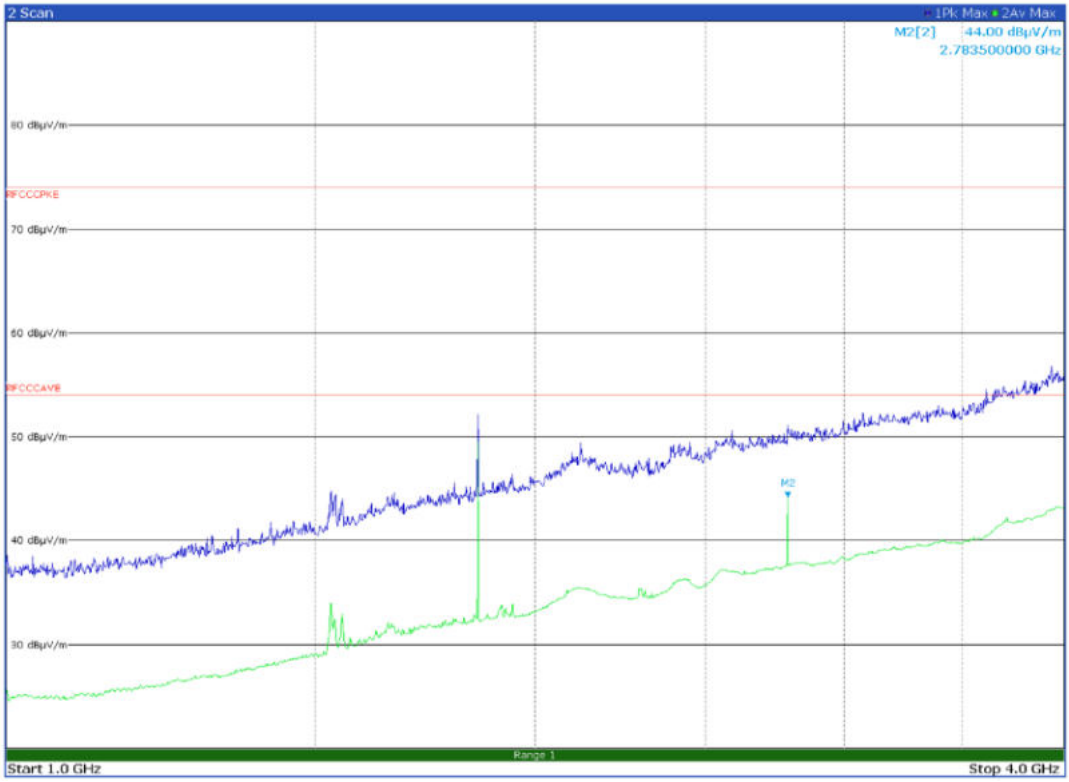


Figure 11.1-33: *Radiated spurious emissions on high channel with antenna in horizontal polarization – Frequency range 1 to 4 GHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1842.2500	52.3	74.0	-21.7	-19.6	32.7	54.0	-21.3

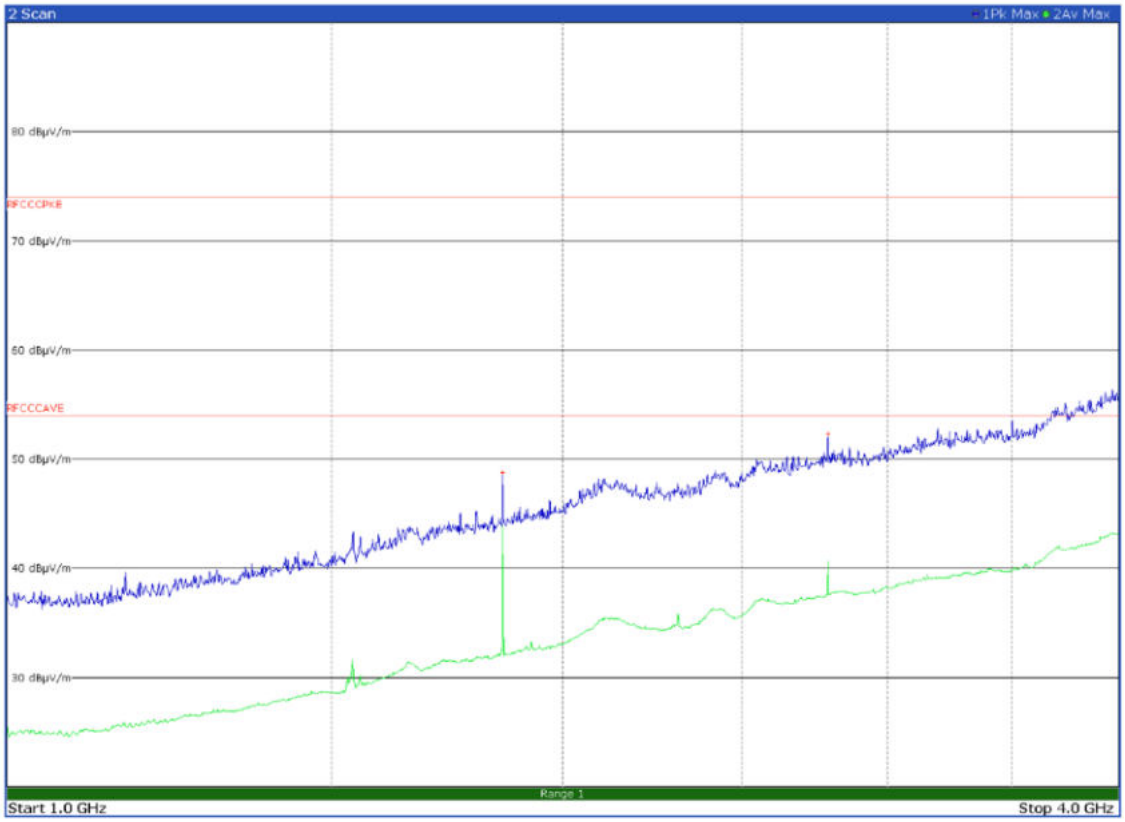


Figure 11.1-34: *Radiated spurious emissions on high channel with antenna in vertical polarization – Frequency range 1 to 4 GHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1855.5000	48.9	74.0	-25.1	-19.6	29.3	54.0	-24.7
2783.5000	52.3	74.0	-21.7	-19.6	32.7	54.0	-21.3

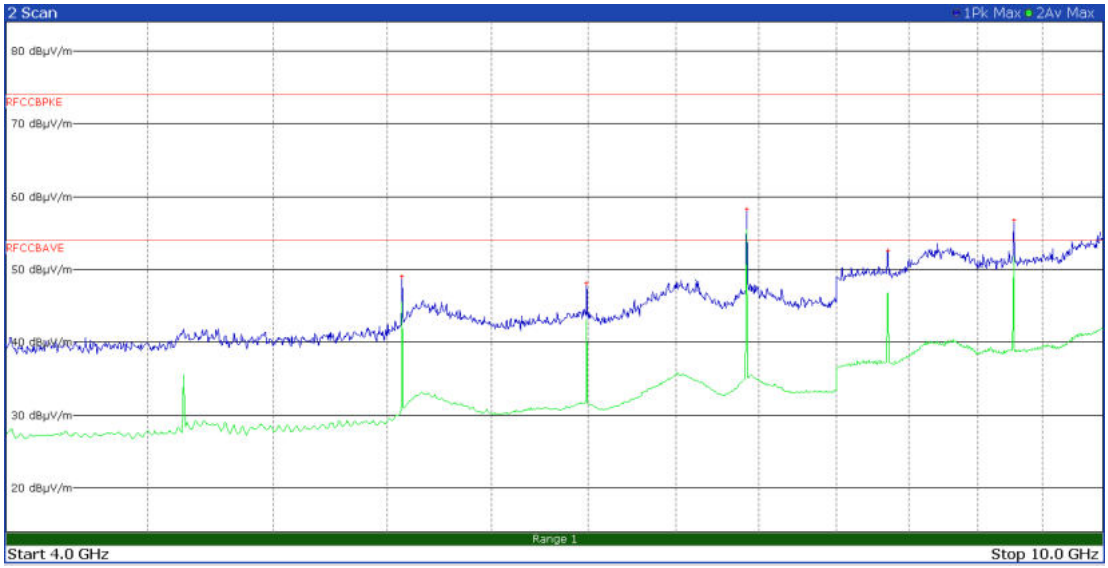


Figure 11.1-35: *Radiated spurious emissions on high channel with antenna in horizontal polarization – Frequency range 4 to 10 GHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5566.7500	49.1	74.0	-24.9	-19.6	29.5	54.0	-24.5
6494.5000	48.2	74.0	-25.8	-19.6	28.6	54.0	-25.4
7422.5000	58.3	74.0	-15.7	-19.6	38.7	54.0	-15.3
8350.5000	52.7	74.0	-21.3	-19.6	33.1	54.0	-20.9
9278.2500	56.8	74.0	-17.2	-19.6	37.2	54.0	-16.8

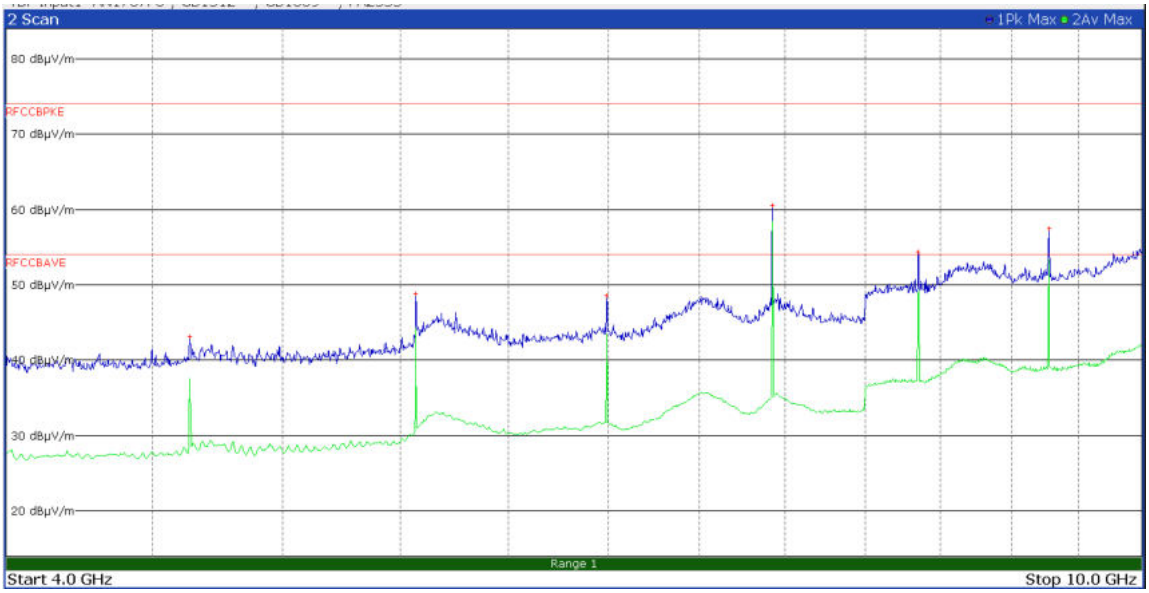


Figure 11.1-36: *Radiated spurious emissions on high channel with antenna in vertical polarization – Frequency range 4 to 10 GHz*

External antenna configuration

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	DCCF	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4639.0000	43.1	74.0	-30.9	-19.6	23.5	54.0	30.5
5566.7500	48.9	74.0	-25.1	-19.6	29.3	54.0	24.7
6494.7500	48.7	74.0	-25.3	-19.6	29.1	54.0	24.9
7422.2500	60.6	74.0	-13.4	-19.6	41.0	54.0	13.0
8350.0000	54.5	74.0	-19.5	-19.6	34.9	54.0	19.1
9277.7500	57.6	74.0	-16.4	-19.6	38.0	54.0	16.0

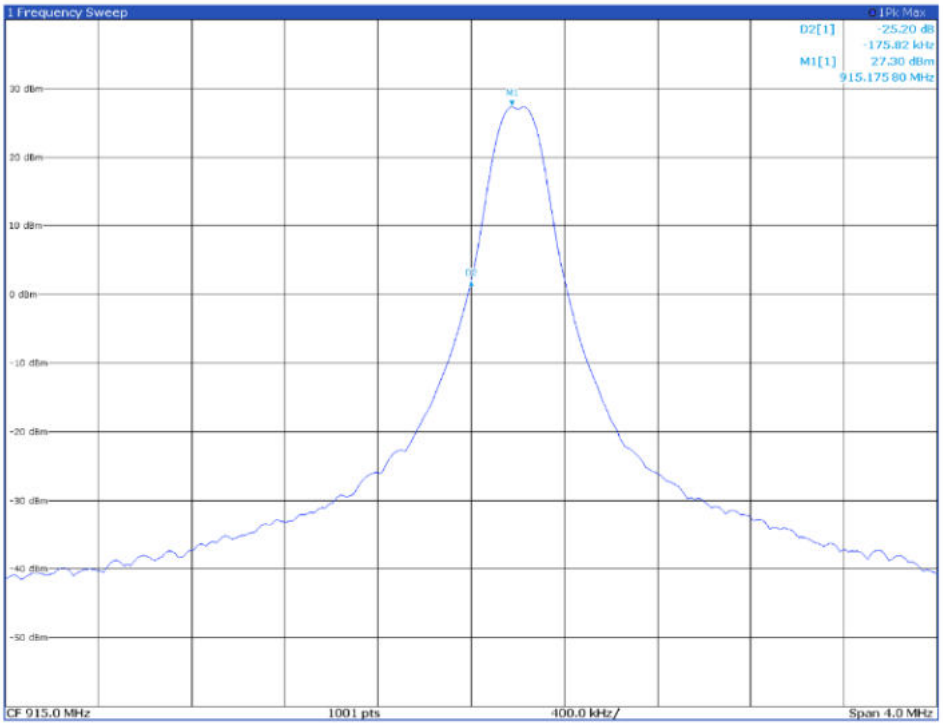


Figure 11.1-37: *Band edge spurious emissions at 915 MHz* (low frequency)

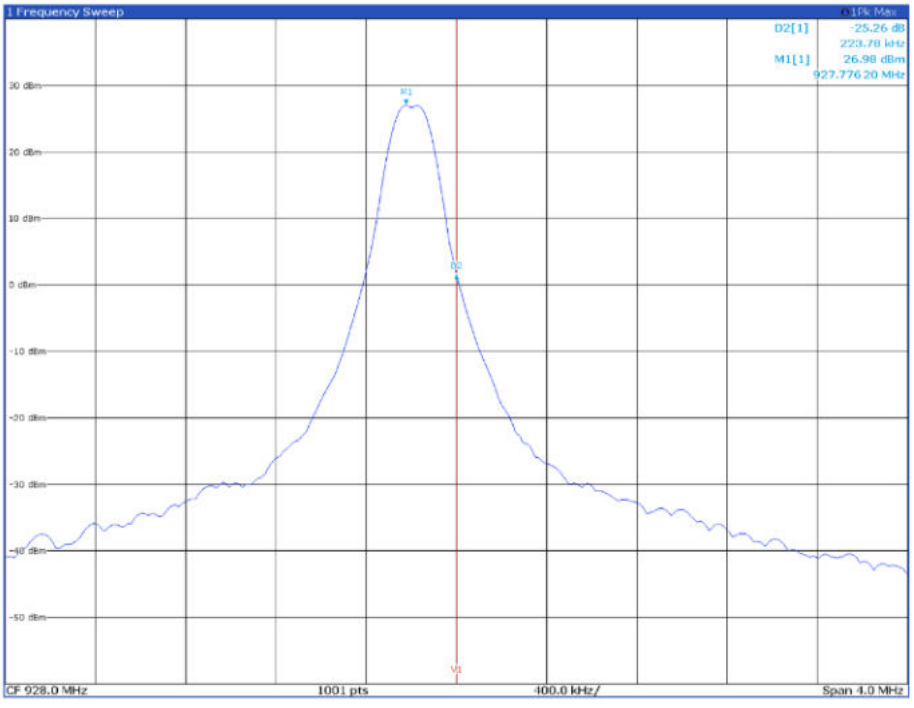


Figure 11.1-38: *Band edge spurious emissions at 928 MHz* (high frequency)

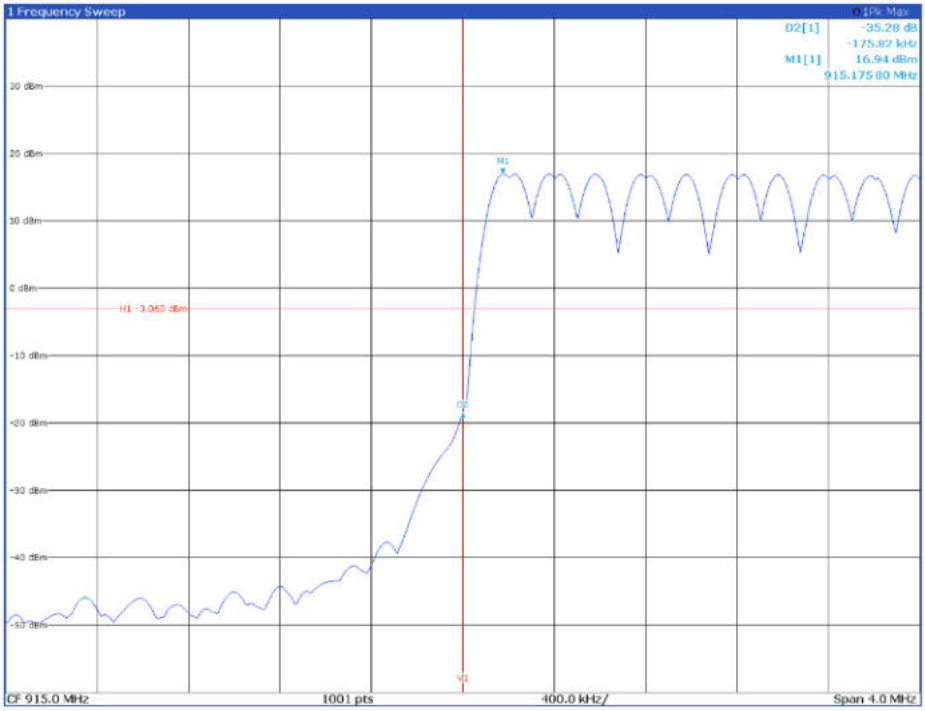


Figure 11.1-39: *Band edge spurious emissions at 915 MHz* (hopping mode)

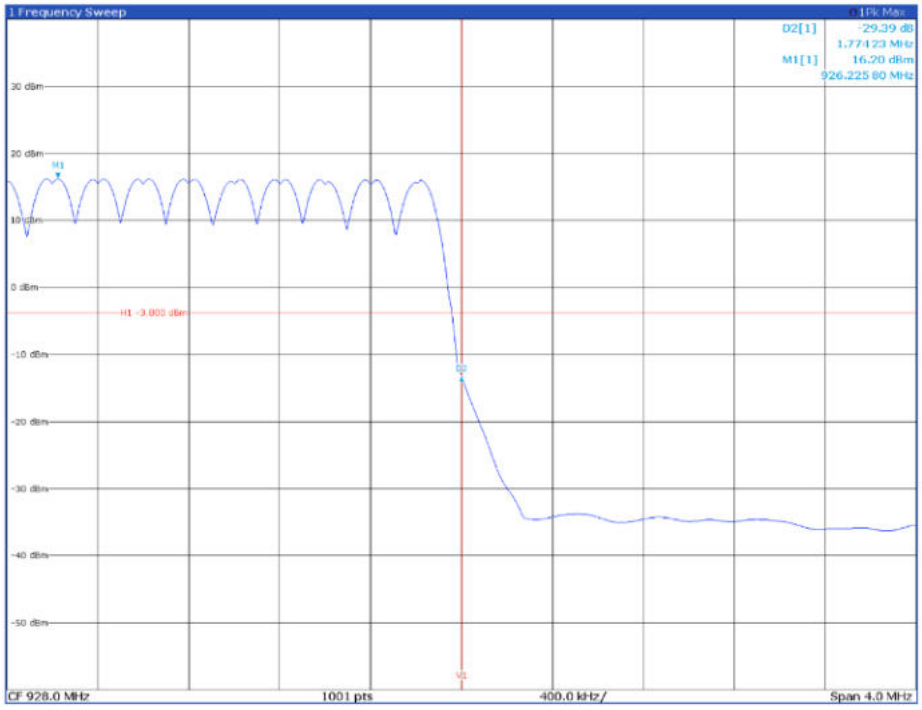


Figure 11.1-40: *Band edge spurious emissions at 928 MHz* (hopping mode)

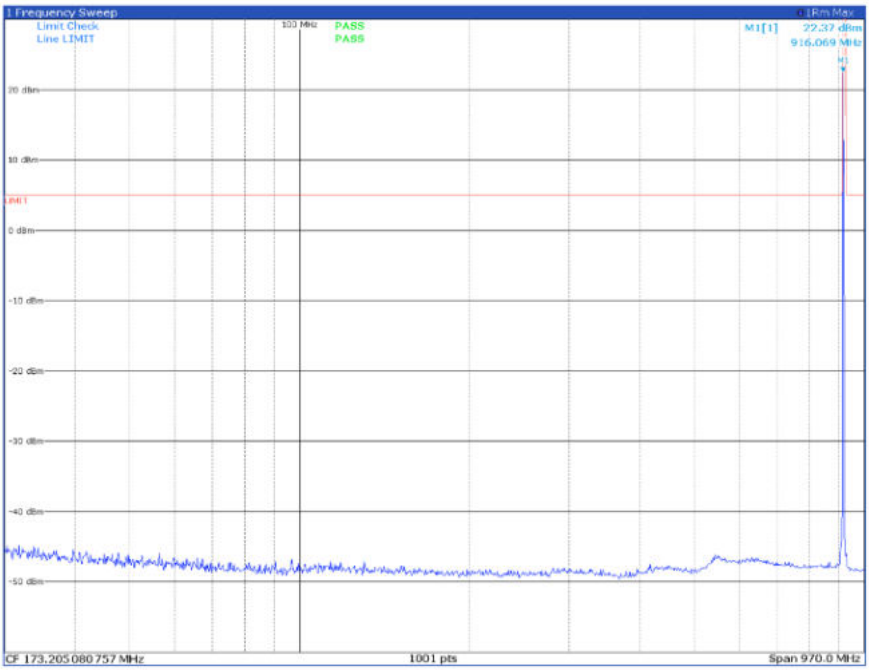


Figure 11.1-41: *Conducted spurious emissions on* low channel – Frequency range 30 to 1000 MHz

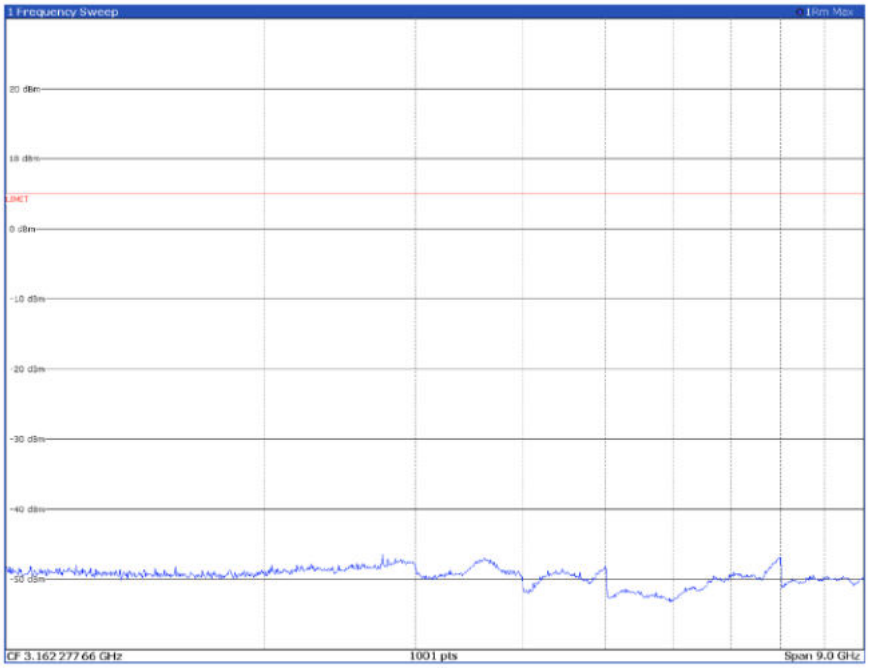


Figure 11.1-42: *Conducted spurious emissions on* low channel – Frequency range 1 to 10 GHz

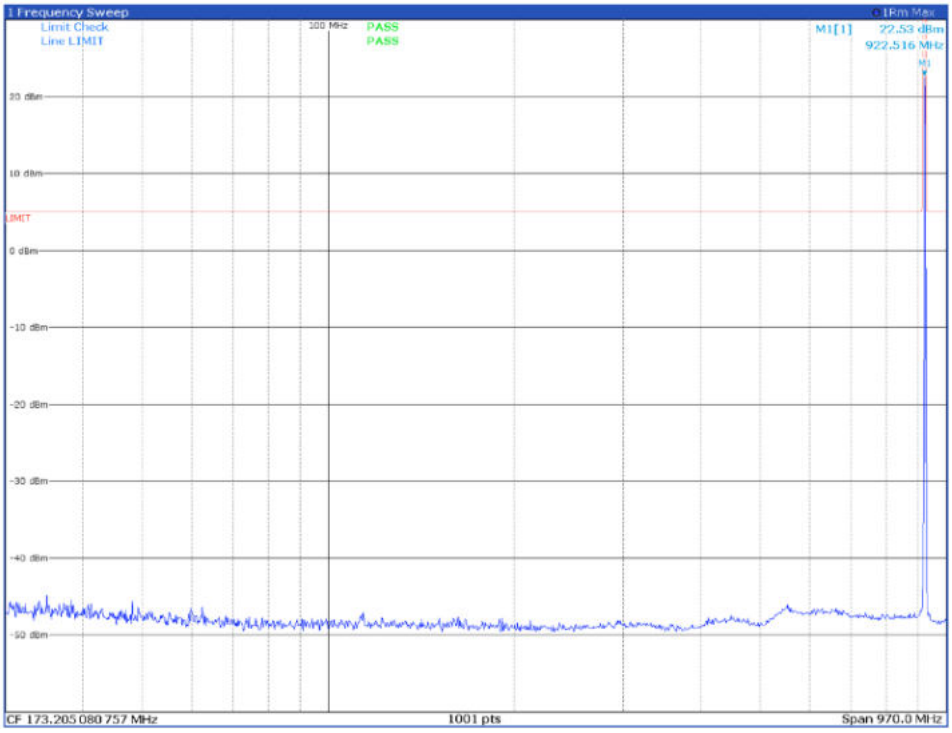


Figure 11.1-43: *Conducted spurious emissions on mid* channel – Frequency range 30 to 1000 MHz

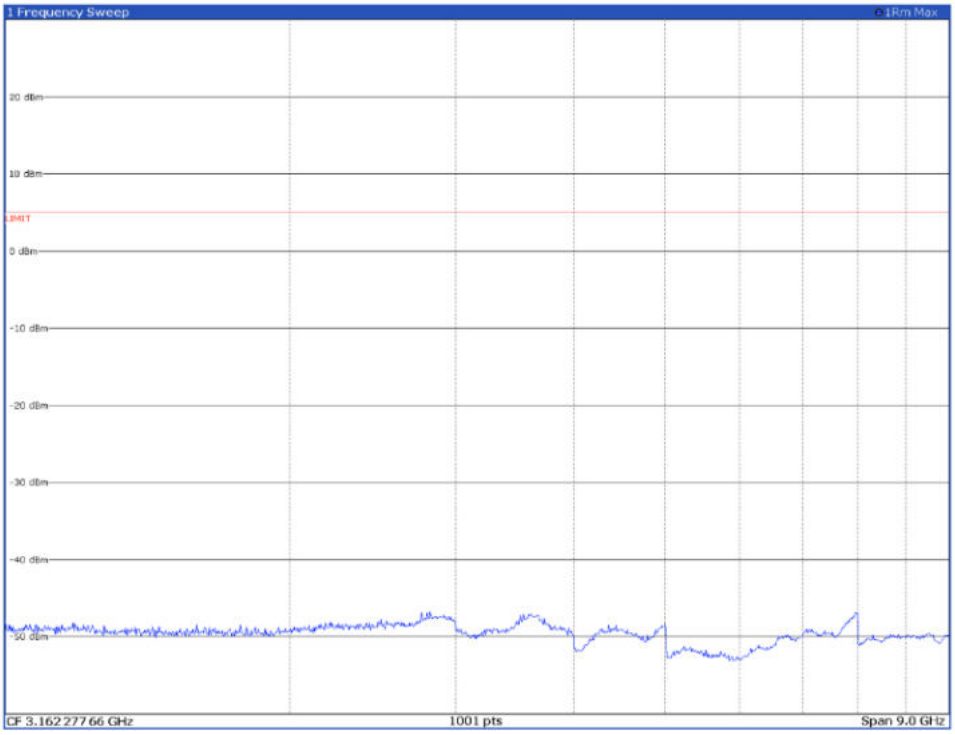


Figure 11.1-44: *Conducted spurious emissions on mid* channel – Frequency range 1 to 10 GHz

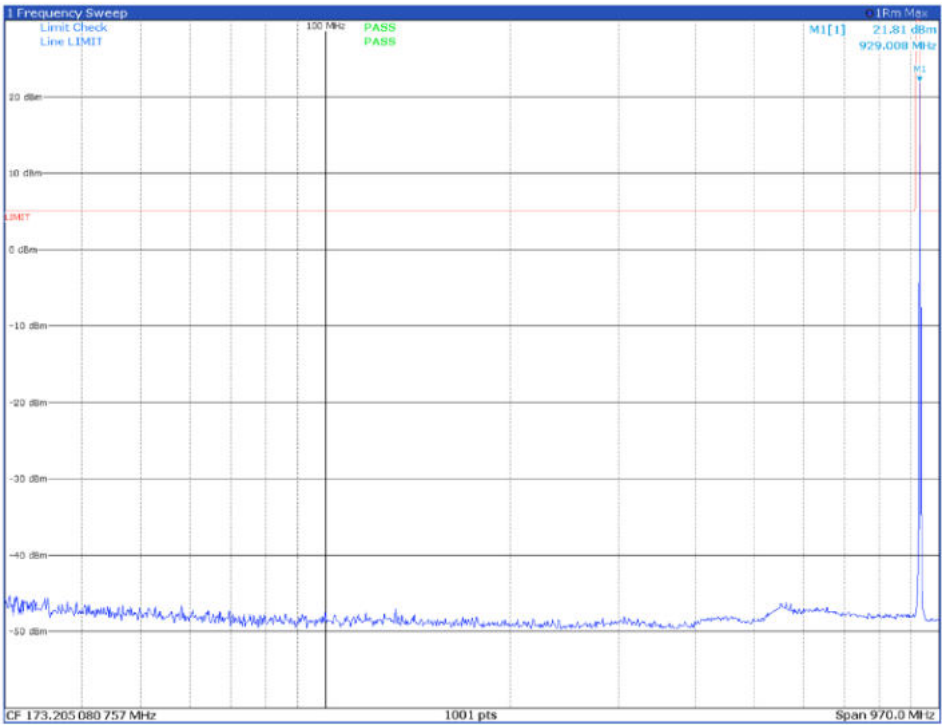


Figure 11.1-45: *Conducted spurious emissions on high* channel – Frequency range 30 to 1000 MHz

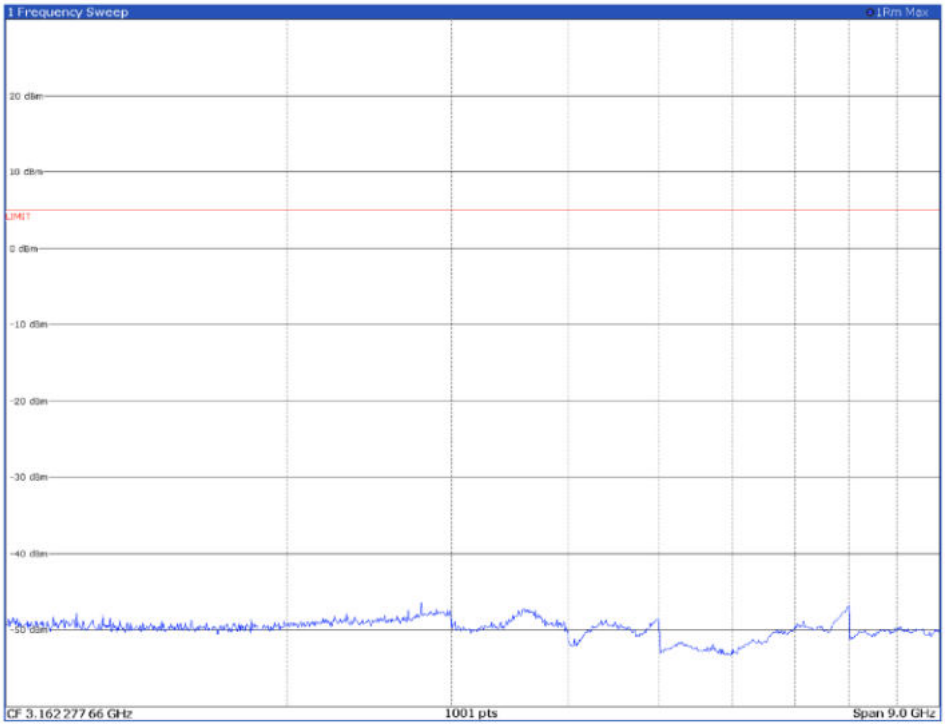


Figure 11.1-46: *Conducted spurious emissions on high* channel – Frequency range 1 to 10 GHz

Section 12. Photos

12.1 EUT

See “Annex I - Test Setup photos” exhibit.

End of report