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RADIO TEST REPORT – 431857-1TRFWL

Type of assessment:

Final product testing

Applicant:

Texa Spa

Via I Maggio, 9

31050 Monastier di Treviso (TV)

Italy

Product:

Diagnosis black box

Model:

TMD MK5

Model variant(s):

--

FCC ID:

T8R-TMDFPT

IC Registration number:

23618-TMDFP

Specifications:

- ◆ FCC 47 CFR Part 15 Subpart C, §15.247
- ◆ RSS-247, Issue 2, Feb 2017, Section 5

Date of issue: March 24, 2021

P. Barbieri

Tested by

Signature

D. Guarnone

Reviewed by

Signature

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Doc. n. TRF001; Rev. 0; Date: 2020-11-30



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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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Table of Contents

Table of Contents	3
Section 1 Report summary	4
1.1 Test specifications	4
1.2 Test methods	4
1.3 Exclusions	4
1.4 Statement of compliance	4
1.5 Test report revision history	4
Section 2 Engineering considerations	5
2.1 Modifications incorporated in the EUT for compliance	5
2.2 Technical judgment	5
2.3 Deviations from laboratory tests procedures	5
Section 3 Test conditions	6
3.1 Atmospheric conditions	6
3.2 Power supply range	6
Section 4 Measurement uncertainty.....	7
4.1 Uncertainty of measurement	7
Section 5 Information provided by the applicant	8
5.1 Disclaimer	8
5.2 Applicant/Manufacture	8
5.3 EUT information	8
5.4 Radio technical information	9
5.5 EUT setup details	9
Section 6 Summary of test results	12
6.1 Testing location	12
6.2 Testing period	12
6.3 Sample information	12
6.4 FCC Part 15 Subpart A and C, general requirements test results	12
6.5 FCC Part §15.247 test results for frequency hopping spread spectrum systems (FHSS)	12
6.6 FCC Part §15.247 test results for digital transmission systems (DTS)	13
6.7 ISED RSS-Gen, Issue 5, test results	13
6.8 ISED RSS-247, Issue 2, test results for frequency hopping spread spectrum systems (FHSS)	13
6.9 ISED RSS-247, Issue 2, test results for digital transmission systems (DTS)	14
Section 7 Test equipment.....	15
7.1 Test equipment list	15
Section 8 Testing data.....	16
8.1 Variation of power source	16
8.2 Number of frequencies	17
8.3 Antenna requirement	19
8.4 Minimum 6 dB bandwidth for DTS systems	20
8.5 Transmitter output power and e.i.r.p. requirements for DTS in 2.4 GHz	27
8.6 Spurious (out-of-band) unwanted emissions	31
8.7 Power spectral density for digitally modulated devices	86
Section 9 EUT photos	89
9.1 External photos	89

Section 1 Report summary

1.1 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
RSS-247, Issue 2, Feb 2017, Section 5	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

1.2 Test methods

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.
DA 00-705, Released March 30, 2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.3 Exclusions

None

1.4 Statement of compliance

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

Table 1.5-1: Test report revision history

Revision #	Date of issue	Details of changes made to test report
431857-1TRFWL	March 24, 2021	Original report issued

Section 2 Engineering considerations

2.1 Modifications incorporated in the EUT for compliance

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

2.2 Technical judgment

None

2.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 3 Test conditions

3.1 Atmospheric conditions

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	03/2020	03/2021

3.2 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 $\pm 5\%$, 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)
		Carrier power	0.009 MHz ÷ 30 MHz	1.1 dB	(1)
		RF Output Power	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)
			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)
	Radiated	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)
			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)
			10 kHz ÷ 26.5 GHz	6.0 dB	(1)
		Effective radiated power transmitter	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 5 Information provided by the applicant

5.1 Disclaimer

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

Applicant name	Texa Spa
Applicant address	Via I Maggio, 9 – 31050 Monastier di Treviso (TV) – Italy
Manufacture name	Texa Spa
Manufacture address	Via I Maggio, 9 – 31050 Monastier di Treviso (TV) – Italy

5.3 EUT information

Product	Diagnosis black box
Model	TMD MK5
Serial number	4318570001 and 4318750002 (Number assigned by Nemko Spa)
Power supply requirements	Vehicle battery (12 or 24 V DC)
Product description and theory of operation	The EUT is a locator for vehicular application, supplied by the vehicle battery. It's provided with a Bluetooth radio module for data exchange with another device and a LTE radio module model Quectel BG96 for the communication with a remote server.

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	2400–2483.5 MHz
Frequency Min (MHz)	2402 MHz
Frequency Max (MHz)	2480 MHz
Channel numbers	40
RF power Max (W), Conducted	8.2 mW (9.1 dBm)
Field strength, dB μ V/m @ 3 m	N/A
Measured BW (kHz), 6 dB OBW	769 kHz
Measured BW (kHz), 99% OBW	1060 kHz
Type of modulation	BLE (GFSK)
Emission classification	F1D
Equipment Class	DTS
Transmitter spurious, dB μ V/m @ 3 m	50.2 dB μ V/m @ 4880 MHz (Peak)
Antenna information	Pulse CW3043 SMD ceramic chip Antenna, gain 4 dBi

5.5 EUT setup details

5.5.1 Radio exercise details

Operating conditions	The EUT use an embedded linux operating system version 4.14.79.AUTOINC+. To put the EUT in continuous transmission the Cypress mbt software (002-14799 Rev. C) has been used with the following commands, provided by the applicant: CH 0 mbt le_transmitter_test 0 37 0 CH 19 mbt le_transmitter_test 19 37 0 CH 39 mbt le_transmitter_test 39 37 0
Transmitter state	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

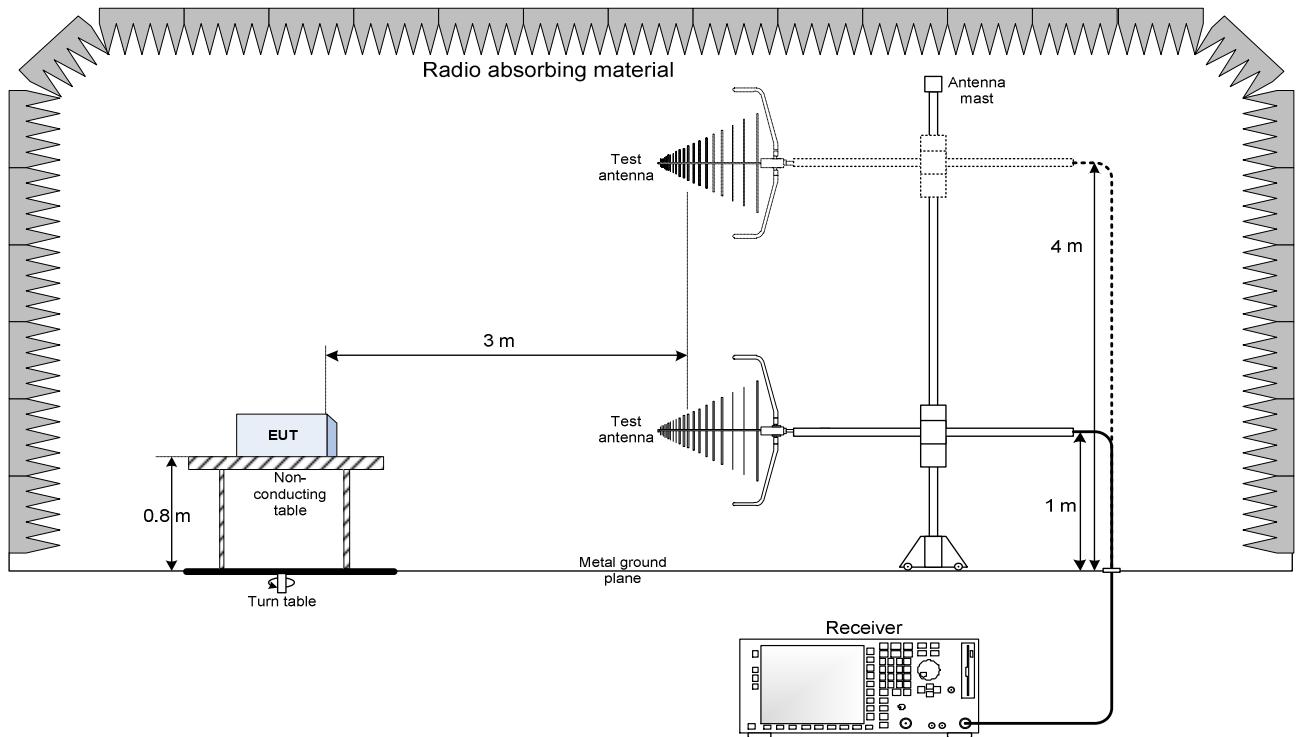


Figure 5.5-1: Radiated testing block diagram below 1 GHz with sample 4318570001

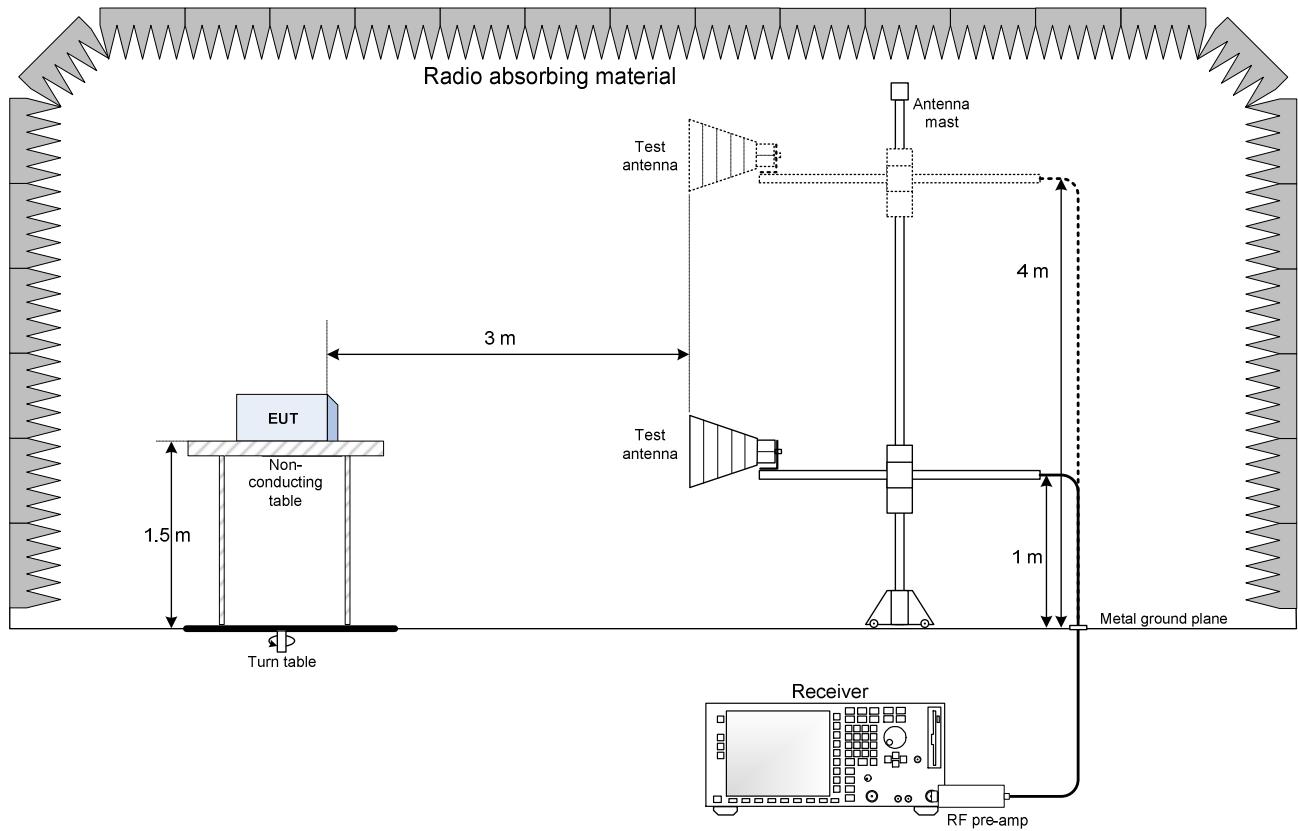


Figure 5.5-2: Radiated testing block diagram below 1 GHz with sample 4318570001

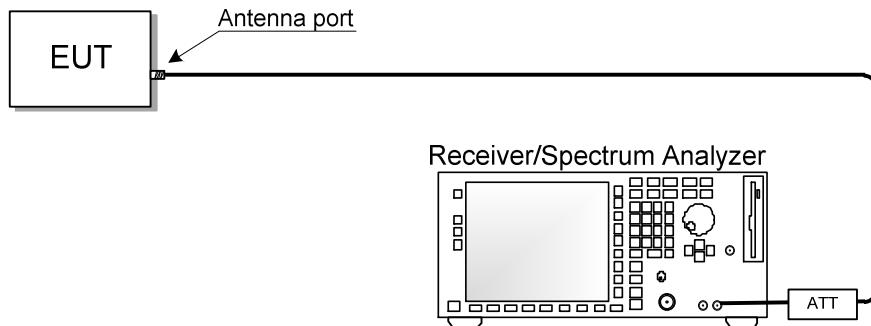


Figure 5.5-3: Antenna port testing block diagram with sample 4318570002 (temporary antenna connector provided by the manufacturer)

Section 6 Summary of test results

6.1 Testing location

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

Test start date	March 17, 2021	Test end date	March 24, 2021
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6.3 Sample information

Receipt date	March 17, 2021	Nemko sample ID number(s)	431857
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6.4 FCC Part 15 Subpart A and C, general requirements test results

Table 6.4-1: FCC general requirements results

Part	Test description	Verdict
§15.207(a)	Conducted limits	Not applicable
§15.311	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 vehicle 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(l)(1)	Fixed point-to-point operation with directional antenna gains greater than 6 dBi	Not applicable
§15.247(l)(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(l)(1)	Fixed point-to-point operation with directional antenna gains greater than 6 dBi	Not applicable
§15.247(l)(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(l)	Power spectral density	Pass
§15.247(f)	Time of occupancy for hybrid systems	Not applicable

Notes: --

6.7 ISED RSS-Gen, Issue 5, test results

Table 6.7-1: RSS-Gen requirements results

Part	Test description	Verdict
7.3	Receiver radiated emission limits	Not applicable
7.4	Receiver conducted emission limits	Not applicable
6.9	Operating bands and selection of test frequencies	Pass
8.8	AC power-line conducted emissions limits	Not applicable

Notes: ¹According to sections 5.2 and 5.3 of RSS-Gen, Issue 5 the EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.
The EUT is supplied by a vehicle battery

6.8 ISED RSS-247, Issue 2, test results for frequency hopping spread spectrum systems (FHSS)

Table 6.8-1: ISED FHSS requirements results

Part	Test description	Verdict
5.1 (a)	Bandwidth of a frequency hopping channel	Not applicable
5.1 (b)	Minimum channel spacing	Not applicable
5.1 (c)	Systems operating in the 902–928 MHz band	Not applicable
5.1 (d)	Systems operating in the 2400–2483.5 MHz band	Not applicable
5.1 (e)	Systems operating in the 5725–5850 MHz band	Not applicable
5.3	Hybrid Systems	
5.3 (a)	Digital modulation turned off	Not applicable
5.3 (b)	Frequency hopping turned off	Not applicable
5.4	Transmitter output power and e.i.r.p. requirements	
5.4 (a)	Systems operating in the 902–928 MHz band	Not applicable
5.4 (b)	Systems operating in the 2400–2483.5 MHz band	Not applicable
5.4 (c)	Systems operating in the 5725–5850 MHz	Not applicable
5.4 (e)	Point-to-point systems in 2400–2483.5 MHz and 5725–5850 MHz band	Not applicable
5.4 (f)	Transmitters which operate in the 2400–2483.5 MHz band with multiple directional beams	Not applicable
5.5	Unwanted emissions	Not applicable

Notes: --

6.9 ISED RSS-247, Issue 2, test results for digital transmission systems (DTS)

Table 6.9-1: ISED DTS requirements results

Part	Test description	Verdict
5.2 (a)	Minimum 6 dB bandwidth	Pass
5.2 (b)	Maximum power spectral density	Pass
5.3	Hybrid Systems	
5.3 (a)	Digital modulation turned off	Not applicable
5.3 (b)	Frequency hopping turned off	Not applicable
5.4	Transmitter output power and e.i.r.p. requirements	
5.4 (d)	Systems employing digital modulation techniques	Pass
5.4 (e)	Point-to-point systems in 2400–2483.5 MHz and 5725–5850 MHz band	Not applicable
5.4 (f)	Transmitters which operate in the 2400–2483.5 MHz band with multiple directional beams	Not applicable
5.5	Unwanted emissions	Pass

Notes:

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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 (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	03/2020	03/2021
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

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	P. Barbieri	Test date	March 17, 2021	Sample tested

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 $\pm 15\%$ 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

EUT Power requirements:

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

AC DC Battery

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.

RSS-Gen, Clause 6.9:

Except where otherwise specified, measurements shall be performed for each frequency band of operation for which the radio apparatus is to be certified, with the device operating at the frequencies in each band of operation shown in table below. The frequencies selected for measurements shall be reported in the test report.

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	March 17, 2021	Sample tested	4318570001

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.



Section 8
Test name
Specification *Testing data*
Number of frequencies
FCC Part 15 Subpart A and RSS-Gen, Issue 5

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
2400	2483.5	83.5	2402	2440	2480



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.

RSS-Gen, Clause 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report.

8.3.2 Test summary

Verdict	Pass				
Tested by	P. Barbieri	Test date	March 17, 2021	Sample tested	4318570001

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

Table 8.3-1: Antenna information

Antenna type	Manufacturer	Model number	Maximum gain	Connector type
Ceramic Chip Antenna	Pulse Electronics	CW3043	4 dBi	None



Section 8
Test name Minimum 6 dB bandwidth for DTS systems
Specification FCC Part 15 Subpart C and RSS-247, Issue 2

8.4 Minimum 6 dB bandwidth for DTS systems

8.4.1 References, definitions and limits

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.

RSS-247, Clause 5.2:

DTSs include systems that employ digital modulation techniques resulting in spectral characteristics similar to direct sequence systems. The following applies to the bands 902–928 MHz and 2400–2483.5 MHz:

- a. The minimum 6 dB bandwidth shall be 500 kHz.

RSS-Gen, Clause 6.7:

6 dB bandwidth is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated 6 dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

8.4.2 Test summary

Verdict	Pass				
Tested by	P. Barbieri	Test date	March 19, 2021	Sample tested	4318570002

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	$\geq 3 \times$ RBW
Frequency span	5 MHz
Detector mode	Peak
Trace mode	Max Hold

8.4.4 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

8.4.5 Test data

Table 8.4-1: 99% occupied bandwidth results

Modulation	Frequency, MHz	99% occupied bandwidth, kHz
BLE (GFSK)	2402	1060
	2440	1060
	2480	1058

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
BLE (GFSK)	2402	0.734	0.500	0.234
	2440	0.769	0.500	0.269
	2480	0.764	0.500	0.264

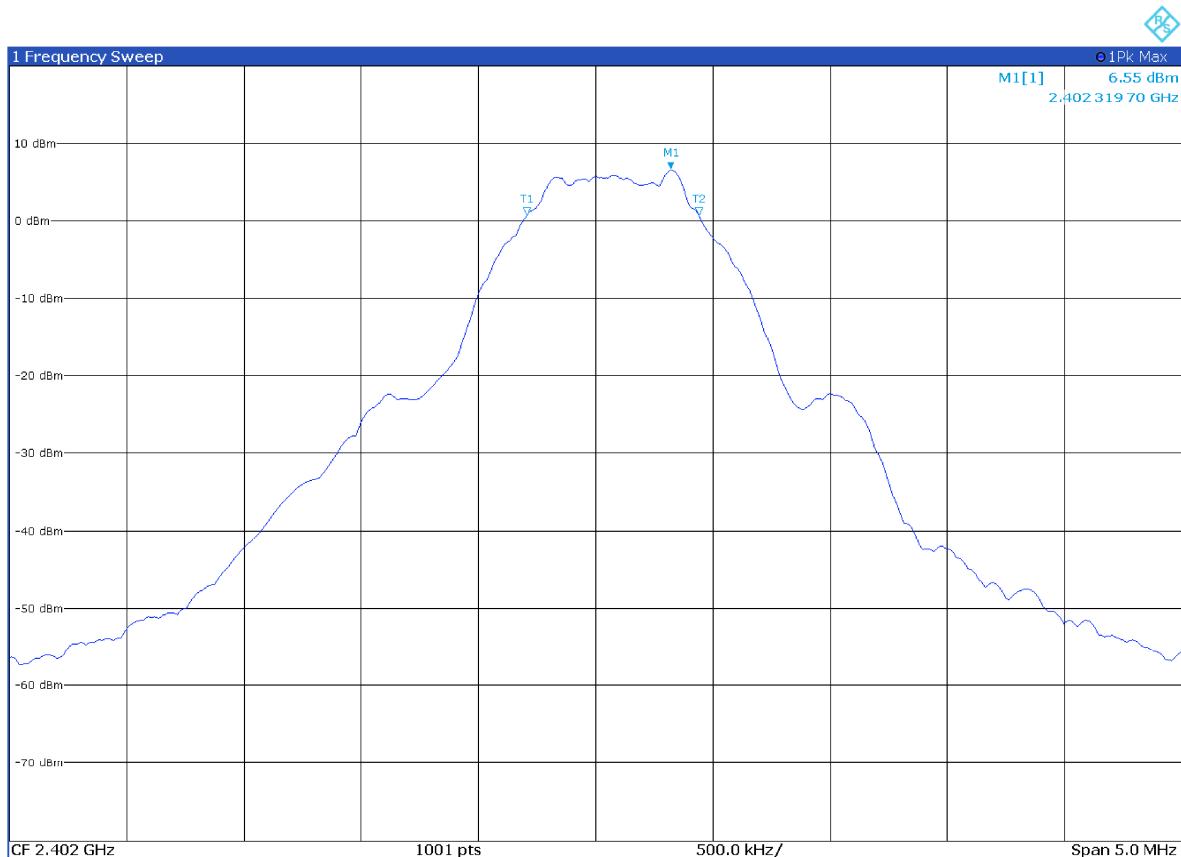


Figure 8.4-1: 6 dB bandwidth on low channel

2 Marker Table						
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1	1		2.4023197 GHz	6.55 dBm	ndB	6.0 dB
T1	1		2.4017053 GHz	0.62 dBm	ndB down BW	734.30 kHz
T2	1		2.4024396 GHz	0.63 dBm	Q Factor	3271.7

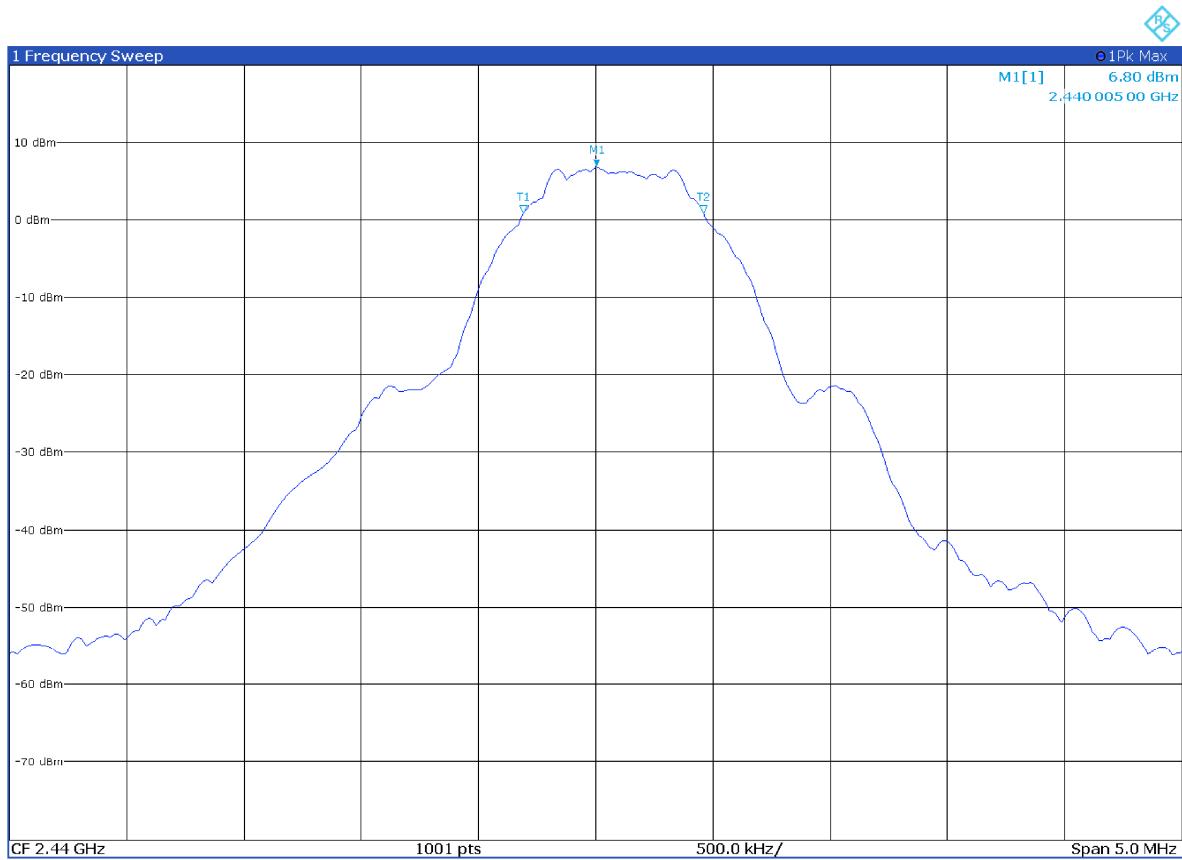


Figure 8.4-2: 6 dB bandwidth on mid channel

2 Marker Table						
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1	1		2.440 005 GHz	6.80 dBm	ndB	6.0 dB
T1	1		2.439 690 3 GHz	0.79 dBm	ndB down BW	769.20 kHz
T2	1		2.440 459 5 GHz	0.74 dBm	Q Factor	3172.0

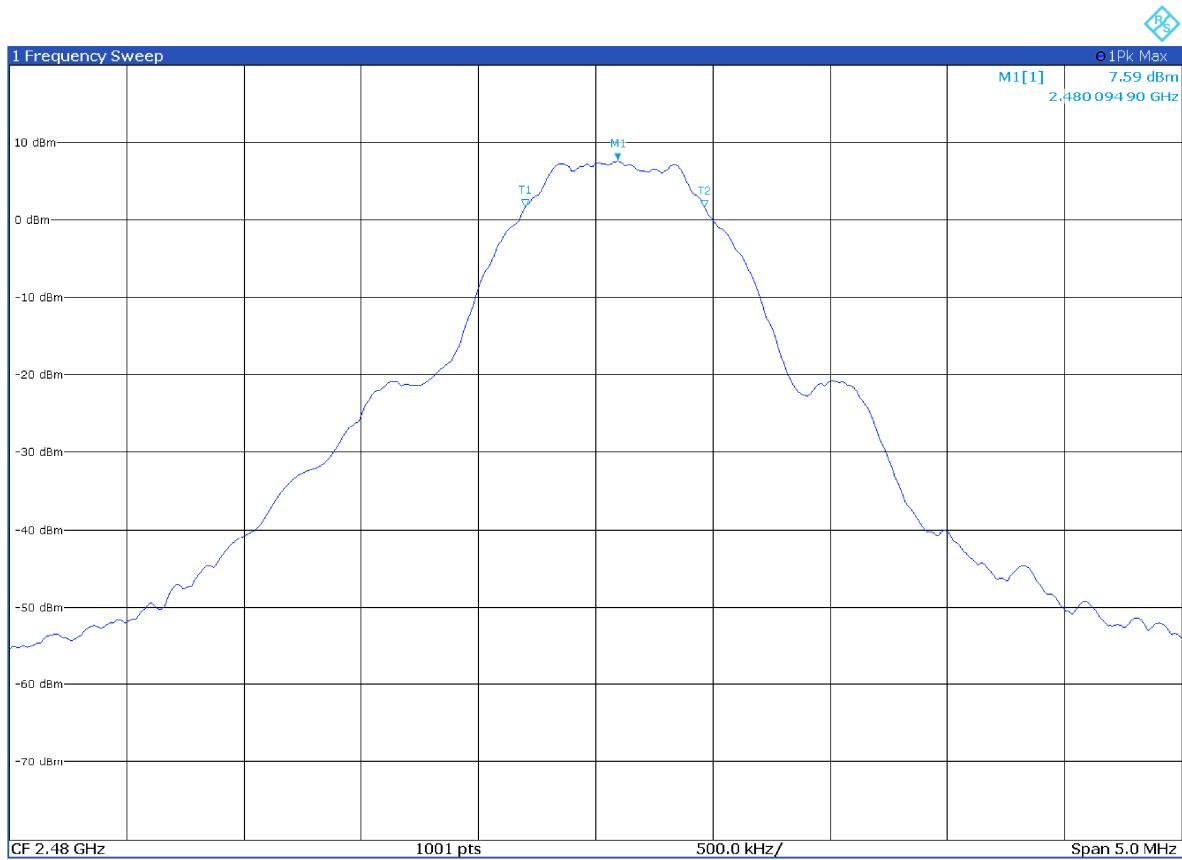


Figure 8.4-3: 6 dB bandwidth on high channel

2 Marker Table						
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1	1		2.480 094 9 GHz	7.59 dBm	ndB	6.0 dB
T1	1		2.479 700 3 GHz	1.67 dBm	ndB down BW	764.20 kHz
T2	1		2.480 464 5 GHz	1.49 dBm	Q Factor	3245.2

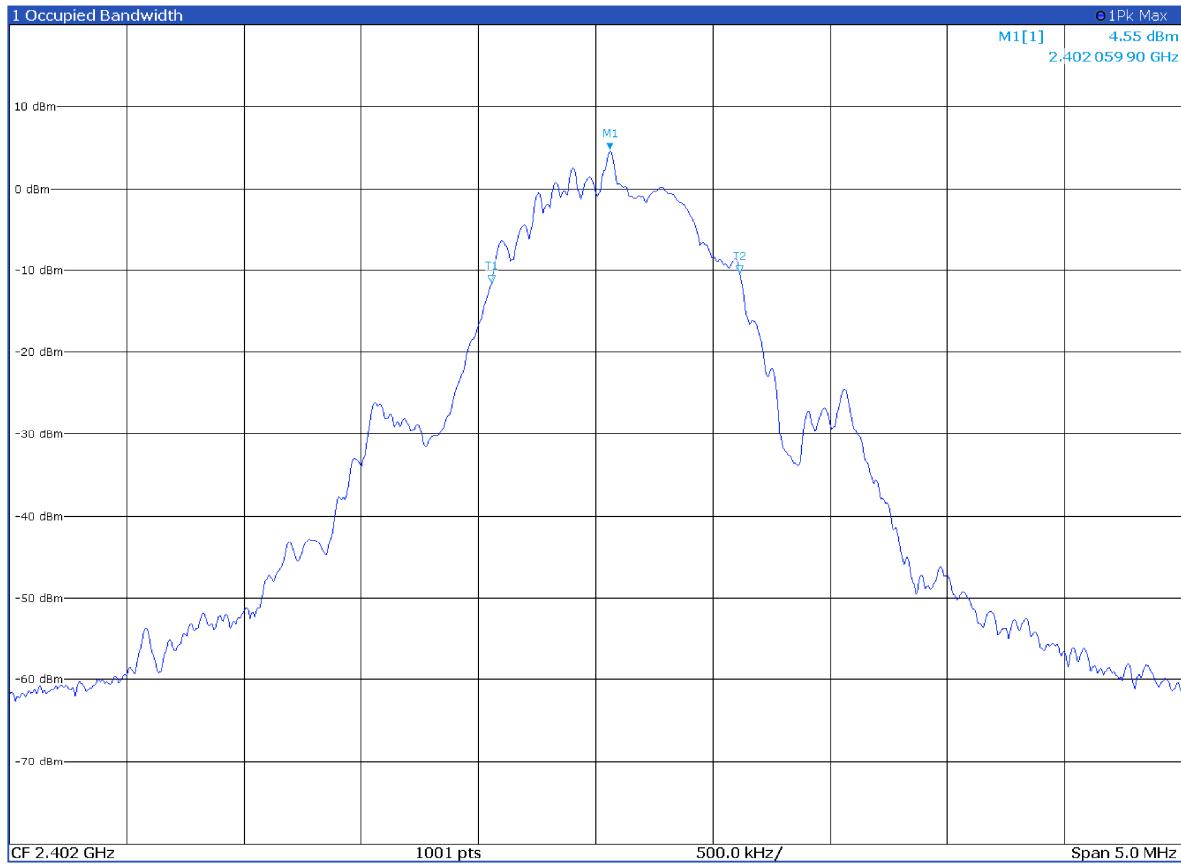


Figure 8.4-4: 99% occupied bandwidth on low channel

2 Marker Table						
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1	1		2.402 059 9 GHz	4.55 dBm	Occ Bw	1.059 513 548 MHz
T1	1		2.401 555 12 GHz	-11.59 dBm	Occ Bw Centroid	2.402 084 88 GHz
T2	1		2.402 614 64 GHz	-10.44 dBm	Occ Bw Freq Offset	84.879 501 951 kHz

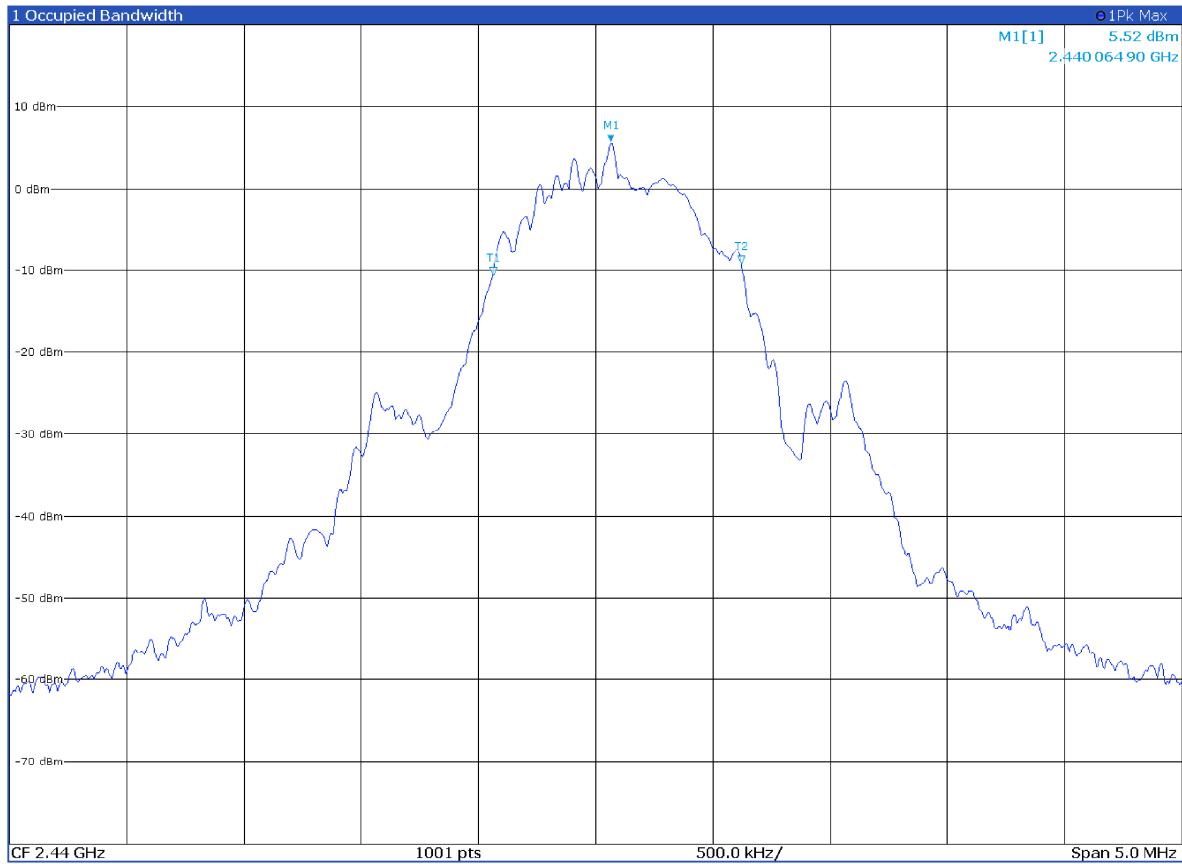


Figure 8.4-5: 99% occupied bandwidth on mid channel

2 Marker Table						
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1	1		2.440 064 9 GHz	5.52 dBm	Occ Bw	1.059 313 121 MHz
T1	1		2.439 561 41 GHz	-10.60 dBm	Occ Bw Centroid	2.440 091 071 GHz
T2	1		2.440 620 73 GHz	-9.19 dBm	Occ Bw Freq Offset	91.070 718 366 kHz

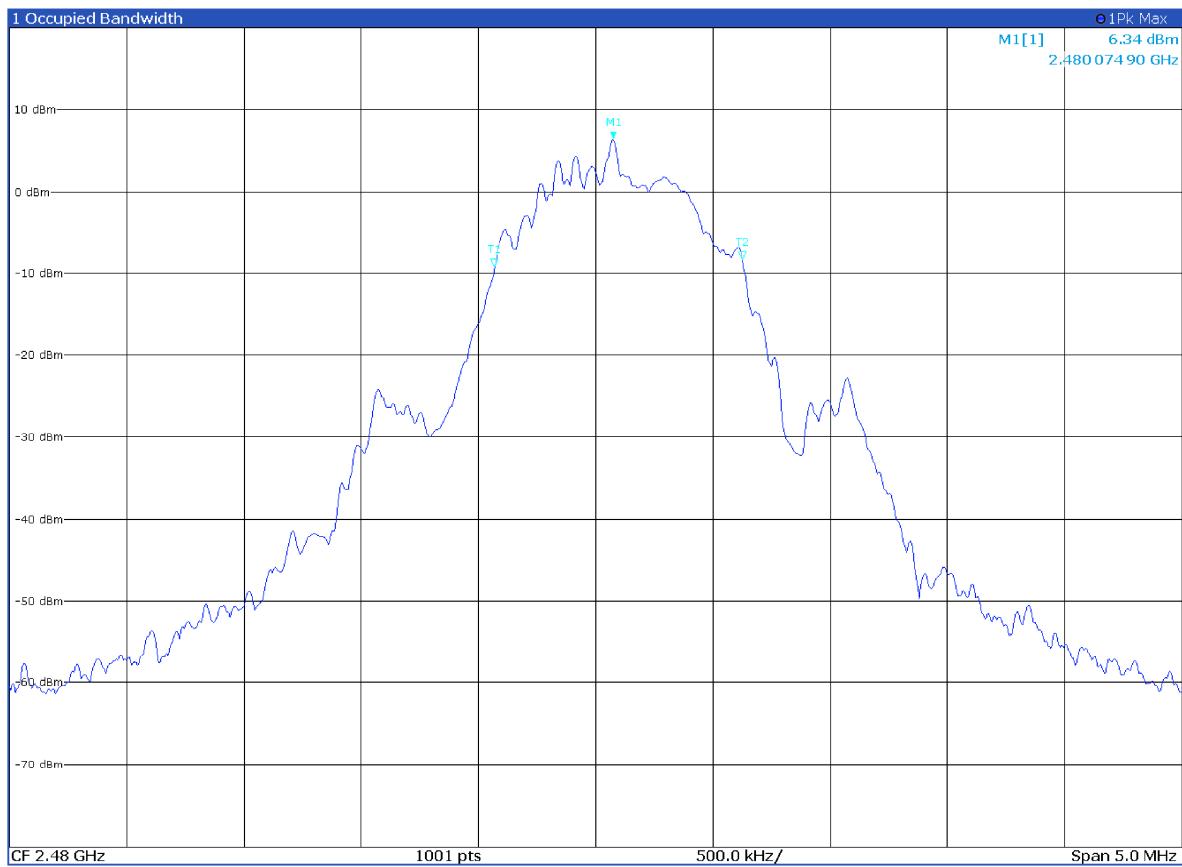


Figure 8.4-6: 99% occupied bandwidth on high channel

2 Marker Table						
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1	1		2.480 074 9 GHz	6.34 dBm	Occ Bw	1.057 079 56 MHz
T1	1		2.479 568 49 GHz	-9.16 dBm	Occ Bw Centroid	2.480 097 033 GHz
T2	1		2.480 625 57 GHz	-8.34 dBm	Occ Bw Freq Offset	97.032 986 08 kHz



Section 8	Testing data
Test name	<i>Transmitter output power and e.i.r.p. requirements</i>
Specification	<i>FCC Part 15 Subpart C and RSS-247, Issue 2</i>

8.5 Transmitter output power and e.i.r.p. requirements for DTS in 2.4 GHz

8.5.1 References, definitions and limits

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 2400–2483.5 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.
 - (iii) 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	Testing data
Test name	Transmitter output power and e.i.r.p. requirements
Specification	FCC Part 15 Subpart C and RSS-247, Issue 2

References, definitions and limits, continued

RSS-247, Clause 5.4:

Devices shall comply with the following requirements, where applicable:

d. For DTSs employing digital modulation techniques operating in the 2400–2483.5 MHz band, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling 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 transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

e. Fixed point-to-point systems in the 2400–2483.5 MHz band are permitted to have an e.i.r.p. higher than 4 W provided that the higher e.i.r.p. is achieved by employing higher gain directional antennas and not higher transmitter output powers. Point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information are prohibited from exceeding an e.i.r.p. of 4 W.

f. Transmitters operating in the band 2400–2483.5 MHz, may employ antenna systems that emit multiple directional beams simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers, provided that the emissions comply with the following:

- Different information must be transmitted to each receiver.
- If the transmitter employs an antenna system that emits multiple directional beams, but does not 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 applicable output power limit specified in sections 5.4(b) and 5.4(d). 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 the sum of 10 log (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.
- 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 applicable power limit specified in sections 5.4(b) and 5.4(d). If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the applicable limit specified in sections 5.4(b) and 5.4(d). In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the applicable limit specified in sections 5.4(b) and 5.4(d) by more than 8 dB.
- Transmitters that transmit a single directional beam shall operate under the provisions of sections 5.4(b), 5.4(d) and 5.4(e).

8.5.2 Test summary

Verdict	Pass				
Tested by	P. Barbieri	Test date	March 19, 2021	Sample tested	4318570002

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 $RBW \geq DTS$ bandwidth (Maximum peak conducted output power)

Spectrum analyser settings:

Resolution bandwidth	3 MHz
Video bandwidth	$\geq 3 \times RBW$
Frequency span	20 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
2402	7.5	30	-22.5	4	11.5	36	-24.5
2440	8.5	30	-21.5	4	12.5	36	-23.5
2480	9.1	30	-20.7	4	13.1	36	-22.9

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



Figure 8.5-1: Output power on low channel

Test data, continued

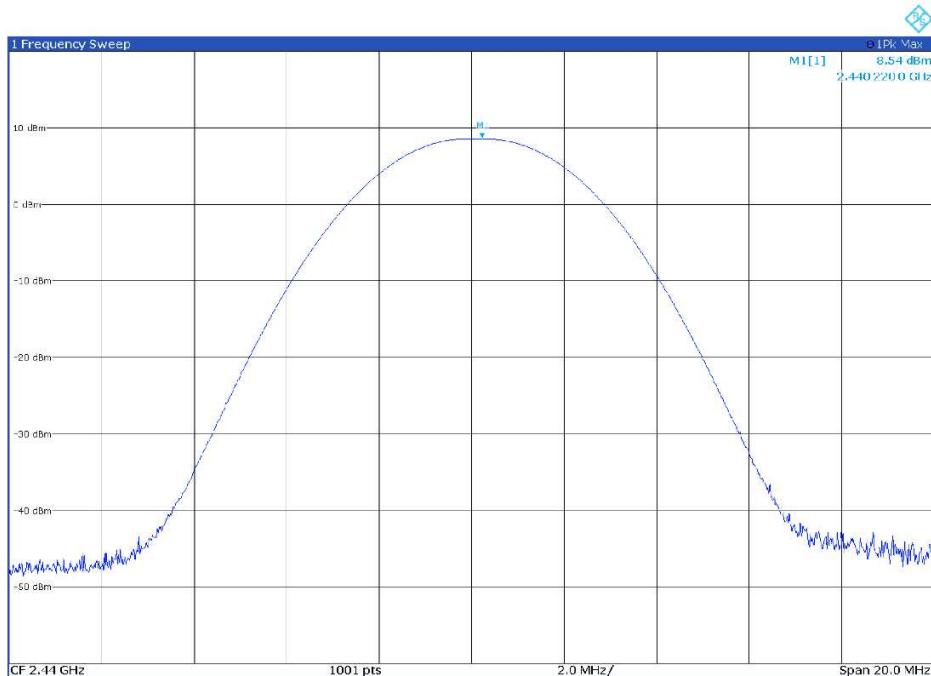


Figure 8.5-2: Output power on mid channel

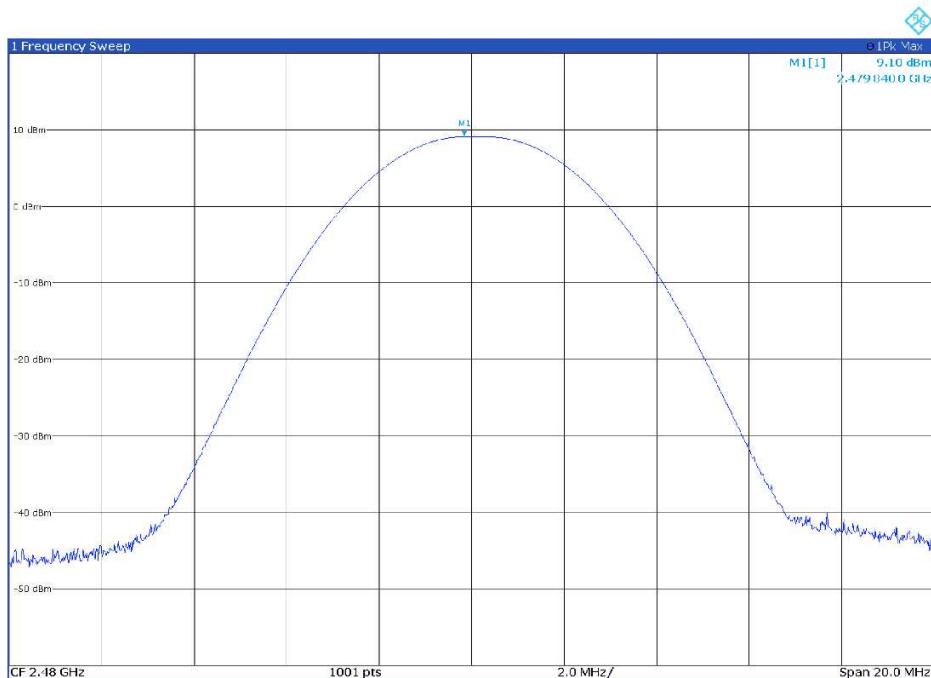


Figure 8.5-3: Output power on high channel



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)).

RSS-247, Clause 5.5:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Table 8.6-1: FCC §15.209 and RSS-Gen – 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 ₁₀ (F)	300
0.490–1.705	24000/F	87.6 – 20 × 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.



References, definitions and limits, continued

Table 8.6-2: ISED restricted frequency bands

MHz	MHz	MHz	GHz
0.090–0.110	12.57675–12.57725	399.9–410	7.25–7.75
0.495–0.505	13.36–13.41	608–614	8.025–8.5
2.1735–2.1905	16.42–16.423	960–1427	9.0–9.2
3.020–3.026	16.69475–16.69525	1435–1626.5	9.3–9.5
4.125–4.128	16.80425–16.80475	1645.5–1646.5	10.6–12.7
4.17725–4.17775	25.5–25.67	1660–1710	13.25–13.4
4.20725–4.20775	37.5–38.25	1718.8–1722.2	14.47–14.5
5.677–5.683	73–74.6	2200–2300	15.35–16.2
6.215–6.218	74.8–75.2	2310–2390	17.7–21.4
6.26775–6.26825	108–138	2483.5–2500	22.01–23.12
6.31175–6.31225	149.9–150.05	2655–2900	23.6–24.0
8.291–8.294	156.52475–156.52525	3260–3267	31.2–31.8
8.362–8.366	156.7–156.9	3332–3339	36.43–36.5
8.37625–8.38675	162.0125–167.17	3345.8–3358	
8.41425–8.41475	167.72–173.2	3500–4400	Above 38.6
12.29–12.293	240–285	4500–5150	
12.51975–12.52025	322–335.4	5350–5460	

Note: Certain frequency bands listed in Table 8.6-2 and above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

Table 8.6-3: 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

Verdict	Pass		
Tested by	P. Barbieri	Test date	March 17, 2021
Sample tested	4318570002 for band-edge test in non-restricted frequency bands and 4318570001 for the others		



8.6.3 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 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	03/2020	03/2021
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

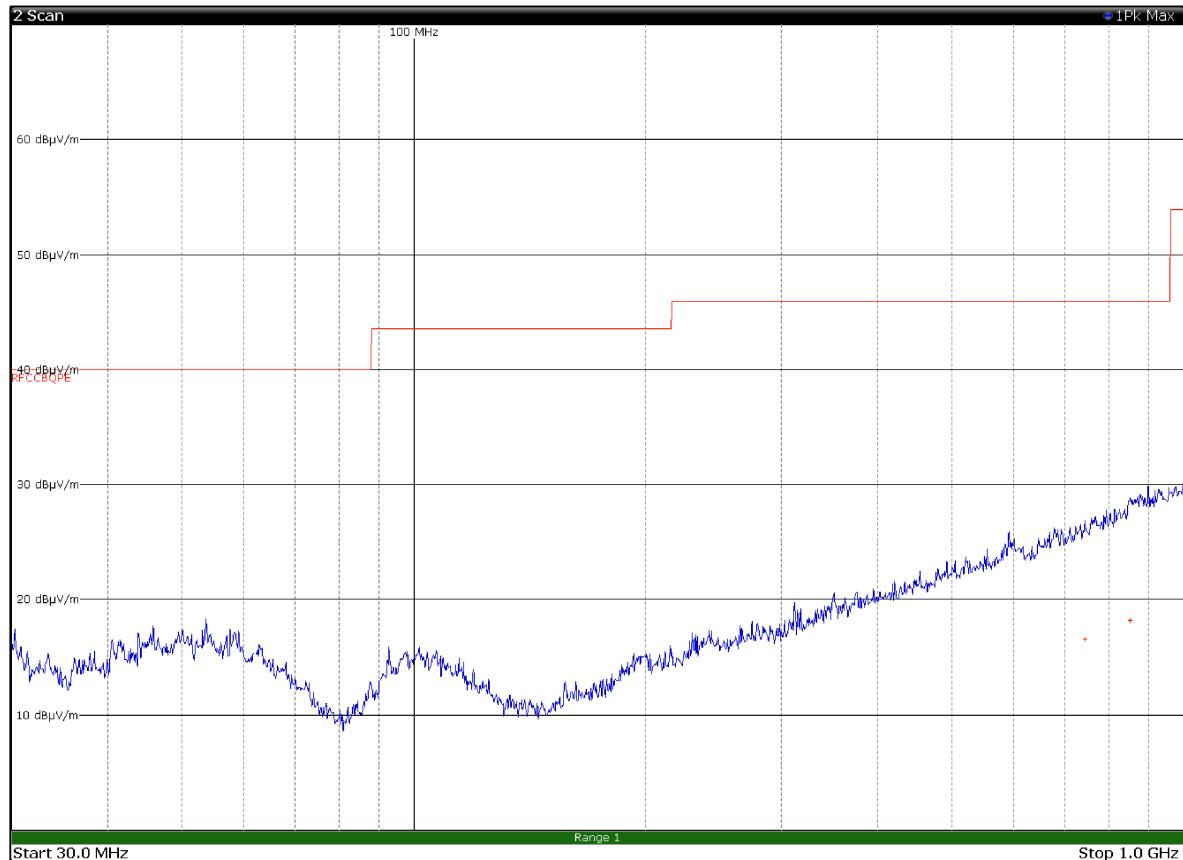


Figure 8.6-1: Radiated spurious emissions on low channel with antenna in horizontal polarization – EUT in horizontal position

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector
743.4000	16.6	46.0	-29.4	QP
851.7000	18.2	46.0	-27.8	QP

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

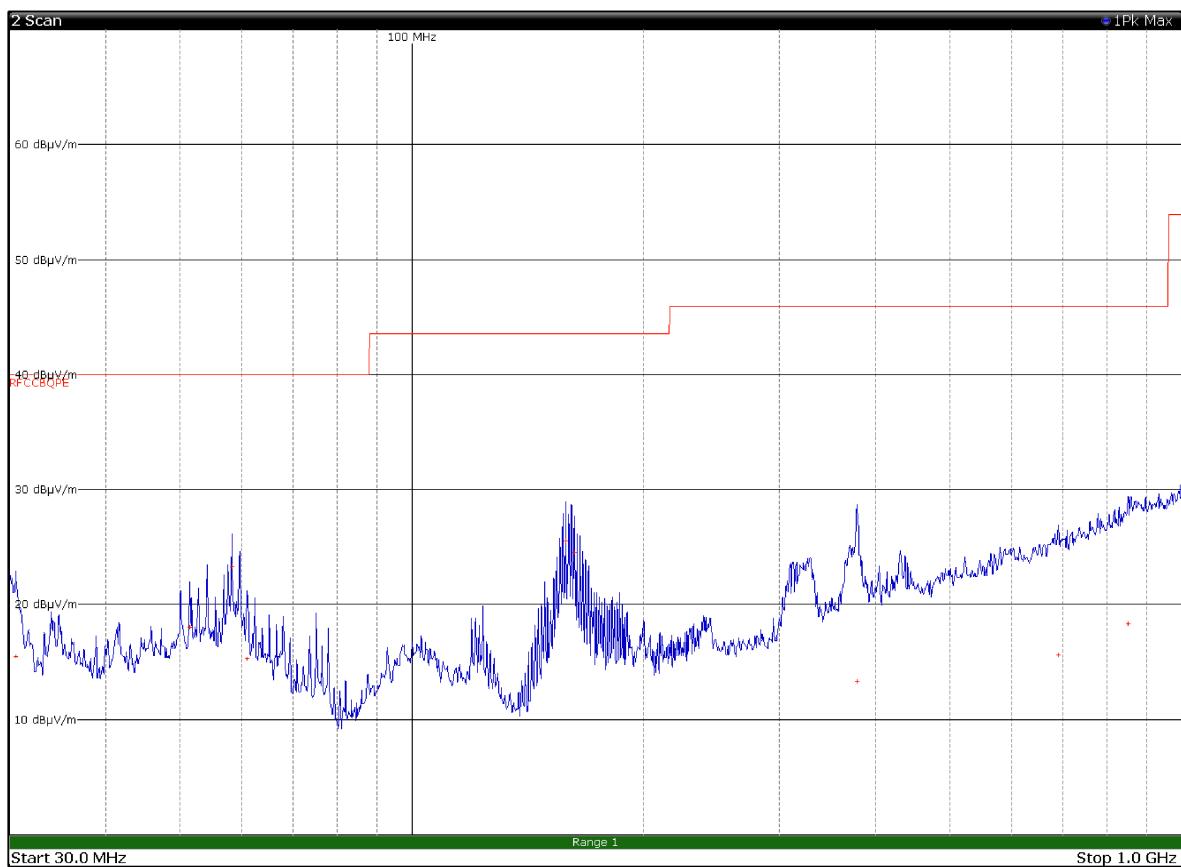


Figure 8.6-2: Radiated spurious emissions on low channel with antenna in vertical polarization – EUT in horizontal position

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
30.5700	15.6	40.0	-24.4	QP
51.3900	18.1	40.0	-21.9	QP
58.3200	23.3	40.0	-16.7	QP
61.0800	15.4	40.0	-24.6	QP
158.3100	25.6	43.5	-17.9	QP
162.4500	24.6	43.5	-18.9	QP
378.3000	13.3	46.0	-32.7	QP
690.8100	15.7	46.0	-30.3	QP
852.3300	18.4	46.0	-27.6	QP

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

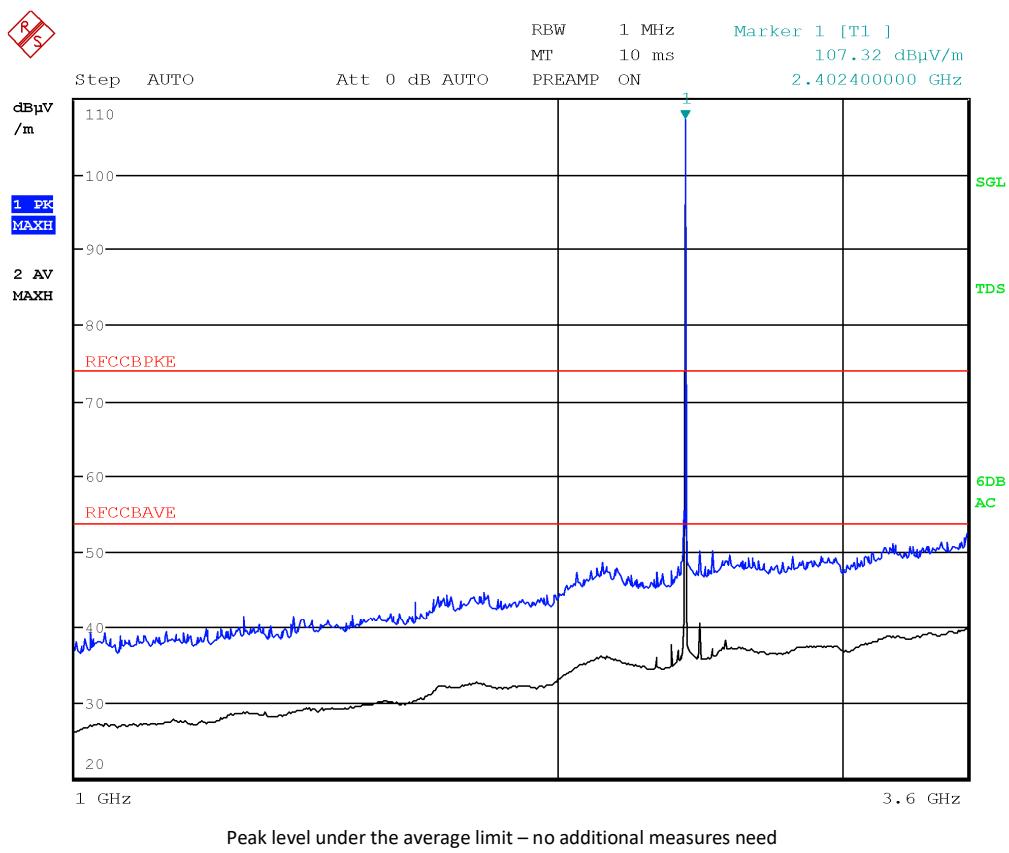


Figure 8.6-3: Radiated spurious emissions on low channel with antenna in horizontal polarization – EUT in horizontal position

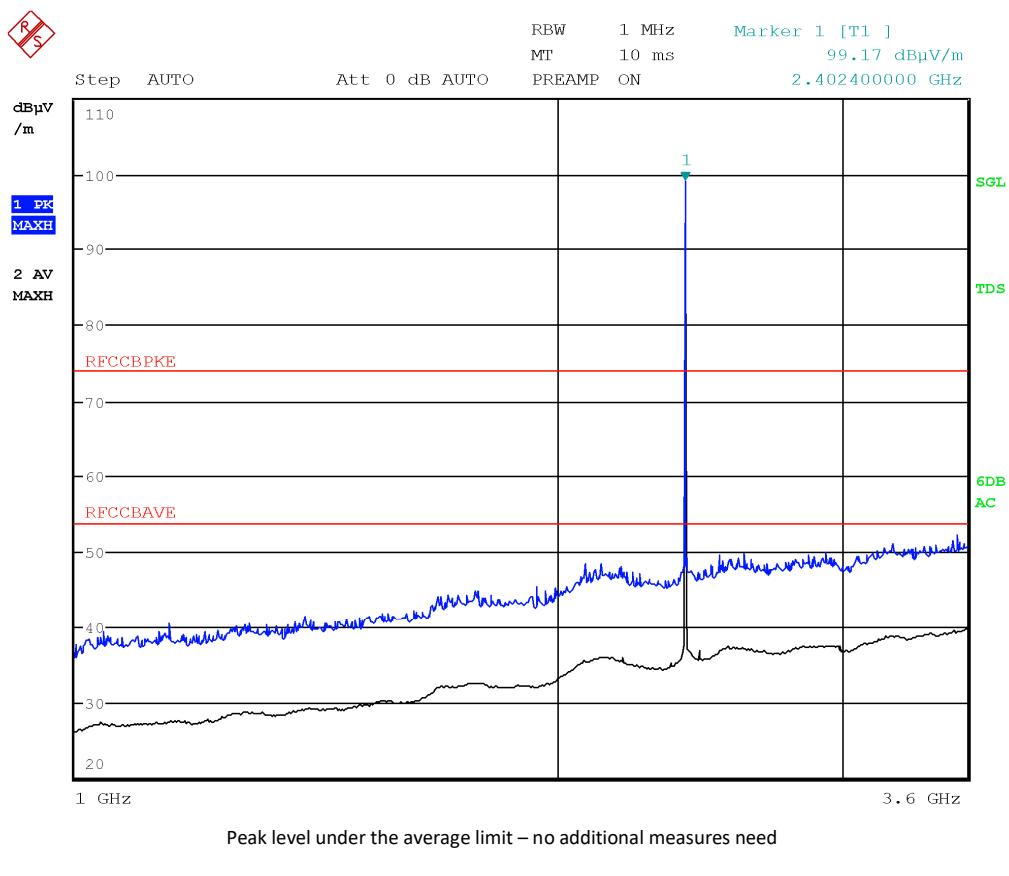


Figure 8.6-4: Radiated spurious emissions on low channel with antenna in vertical polarization – EUT in horizontal position

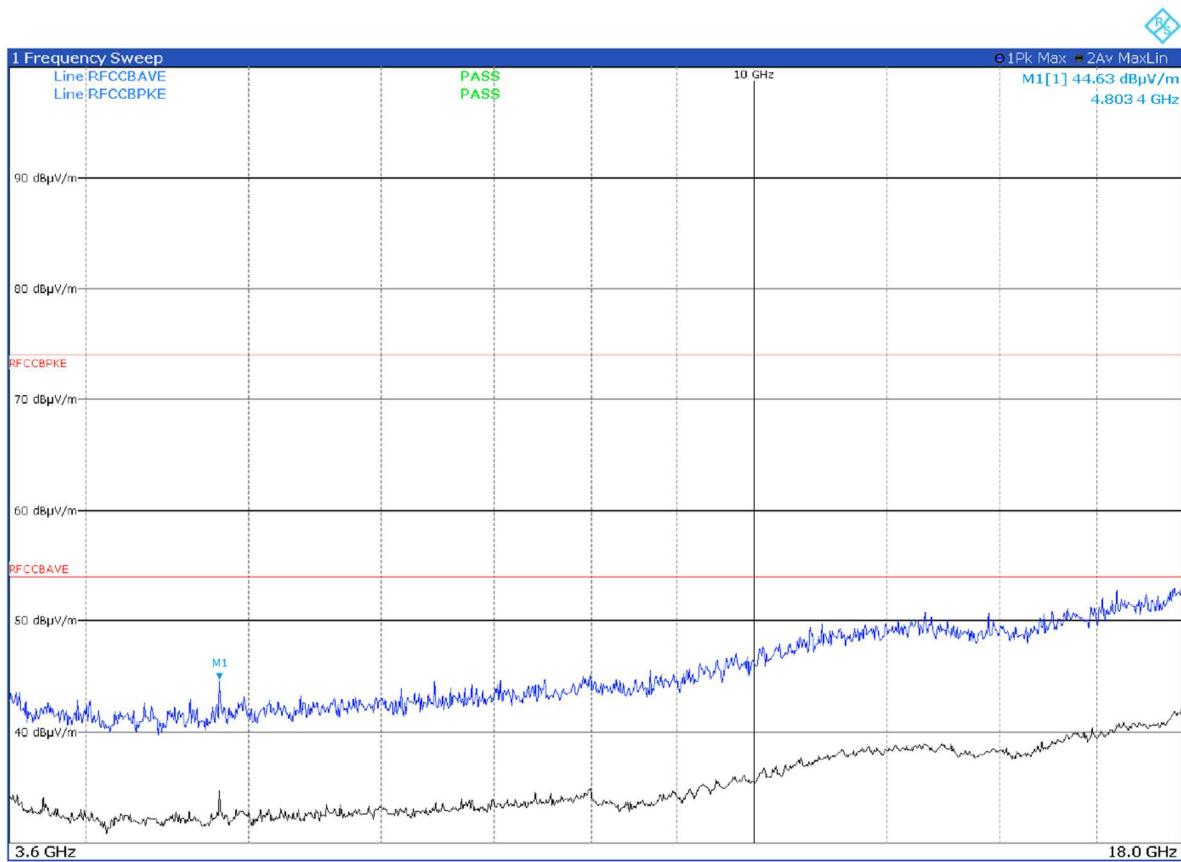
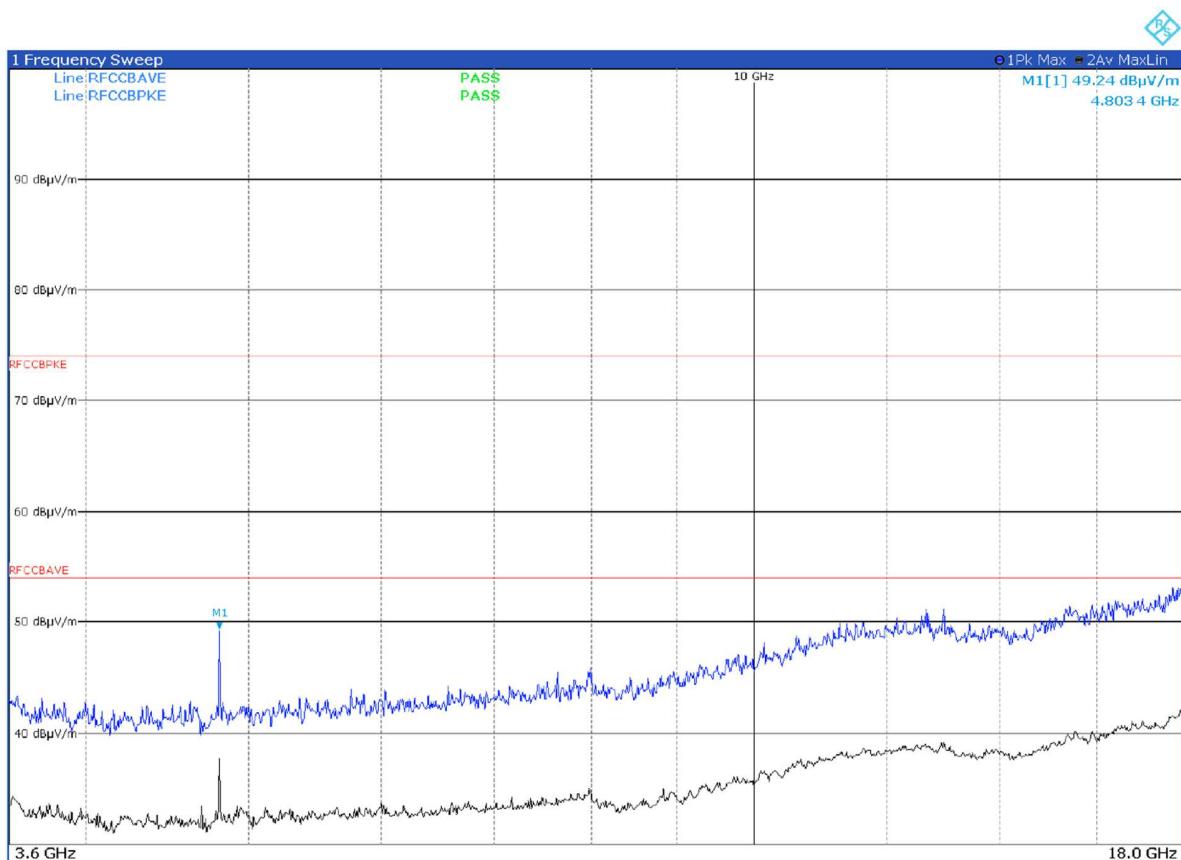


Figure 8.6-5: Radiated spurious emissions on low channel with antenna in horizontal polarization – EUT in horizontal position



Peak level under the average limit – no additional measures need

Figure 8.6-6: Radiated spurious emissions on low channel with antenna in vertical polarization – EUT in horizontal position

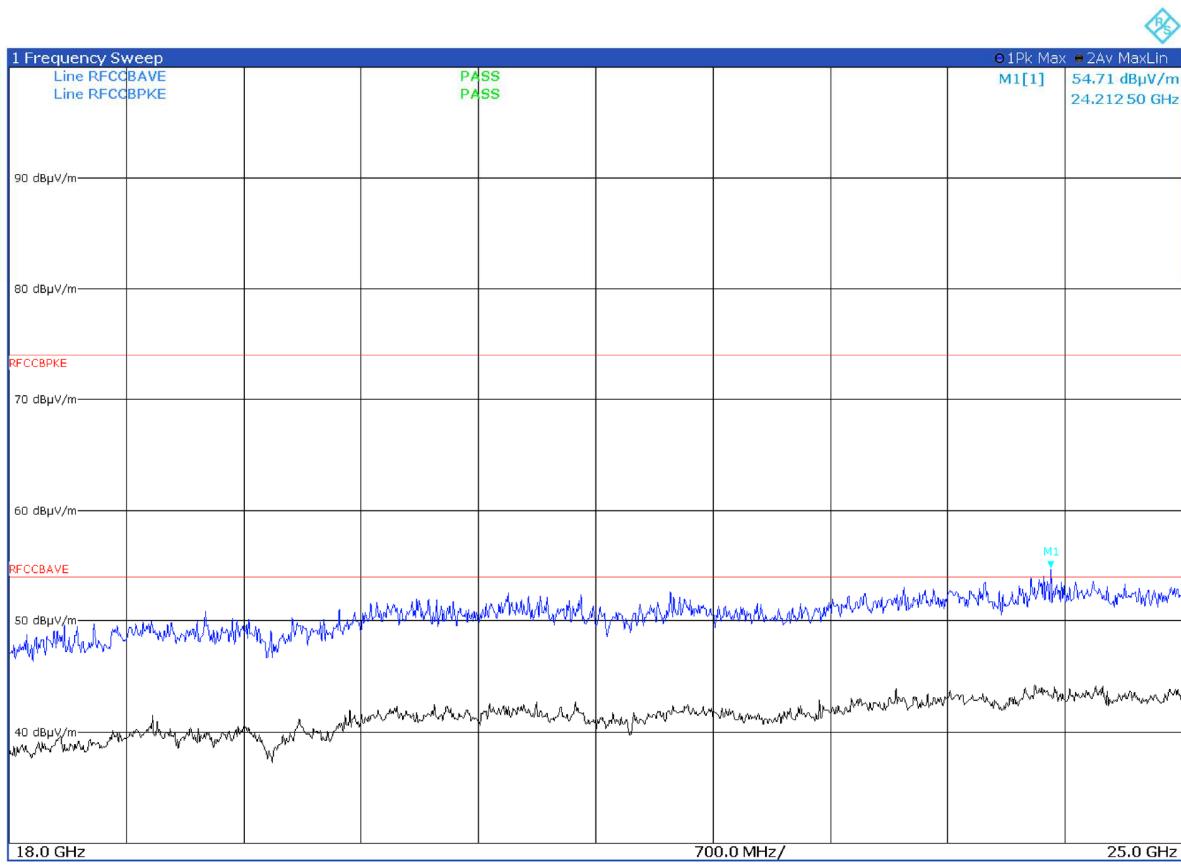
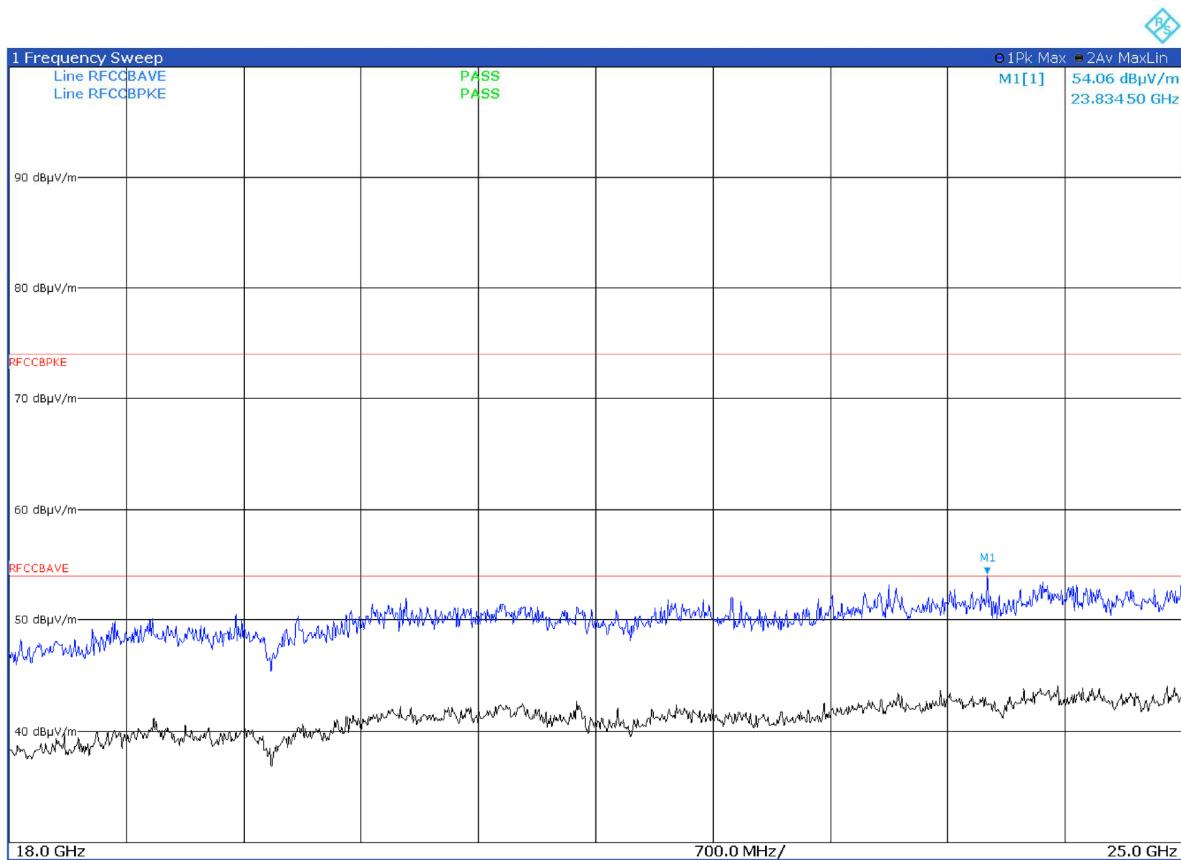


Figure 8.6-7: Radiated spurious emissions on low channel with antenna in horizontal polarization – EUT in horizontal position



Peak level under the average limit – no additional measures need

Figure 8.6-8: Radiated spurious emissions on low channel with antenna in vertical polarization – EUT in horizontal position

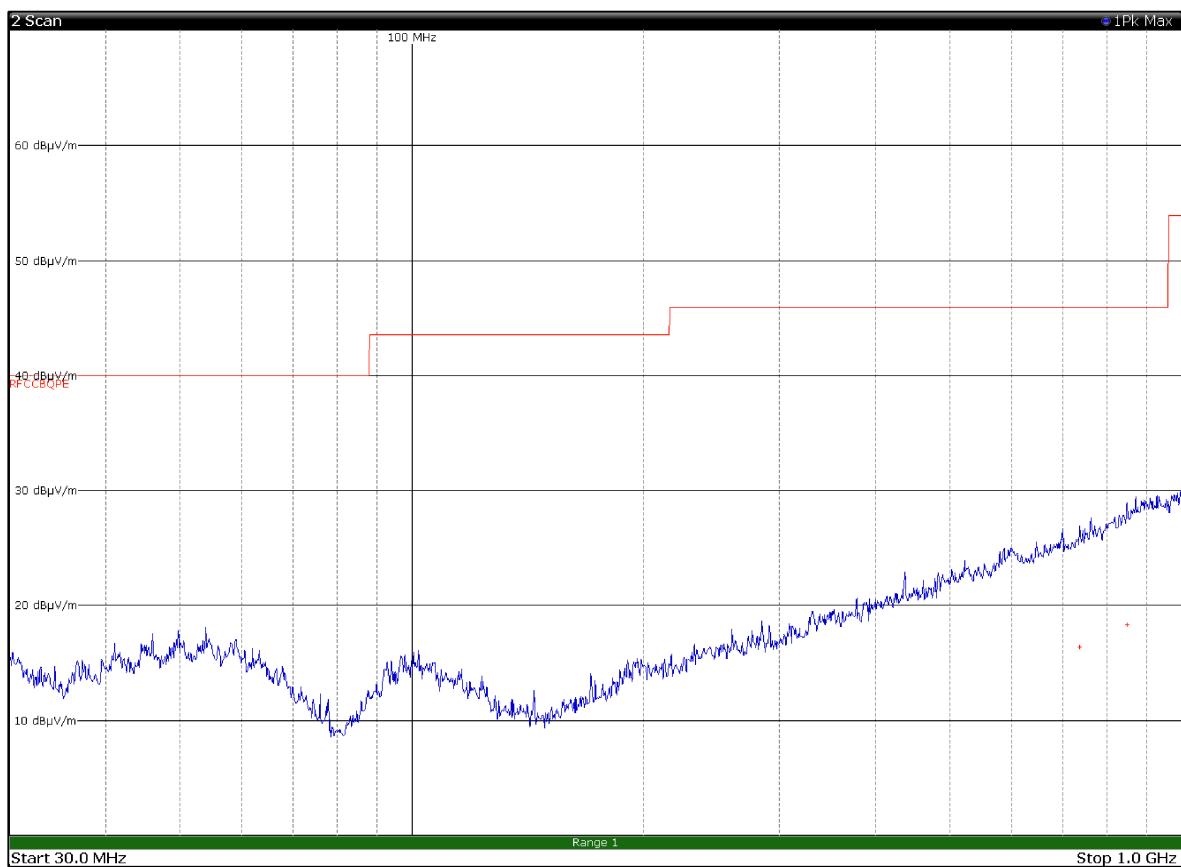


Figure 8.6-9: Radiated spurious emissions on mid channel with antenna in horizontal polarization – EUT in horizontal position

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector
736.2600	16.5	46.0	-29.5	QP
848.0400	18.4	46.0	-27.6	QP

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

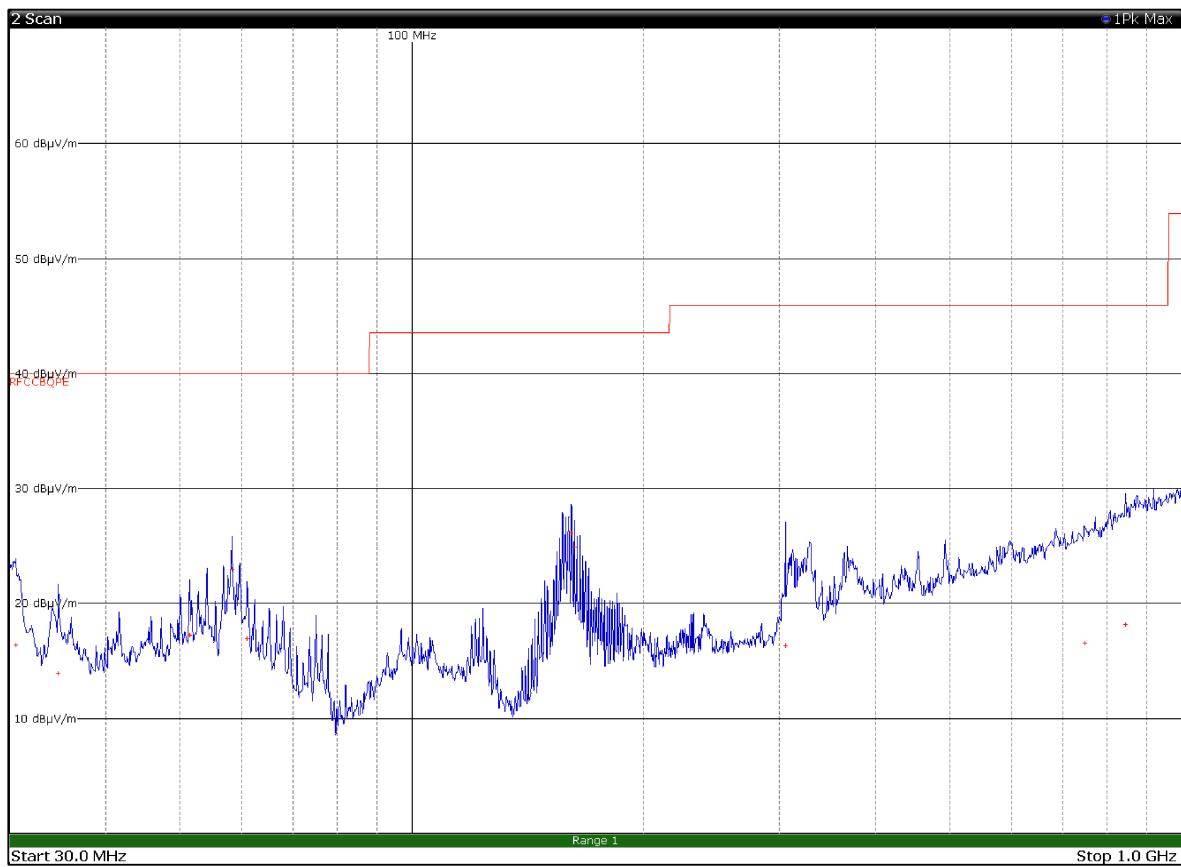


Figure 8.6-10: Radiated spurious emissions on mid channel with antenna in vertical polarization – EUT in horizontal position

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector
30.5700	16.5	40.0	-23.5	QP
34.7100	13.9	40.0	-26.1	QP
51.3900	17.3	40.0	-22.7	QP
58.3200	23.0	40.0	-17.0	QP
61.0800	17.0	40.0	-23.0	QP
161.0700	26.2	43.5	-17.3	QP
162.4800	24.9	43.5	-18.6	QP
305.7900	16.4	46.0	-29.6	QP
746.9400	16.7	46.0	-29.3	QP
845.2200	18.2	46.0	-27.8	QP
Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.				

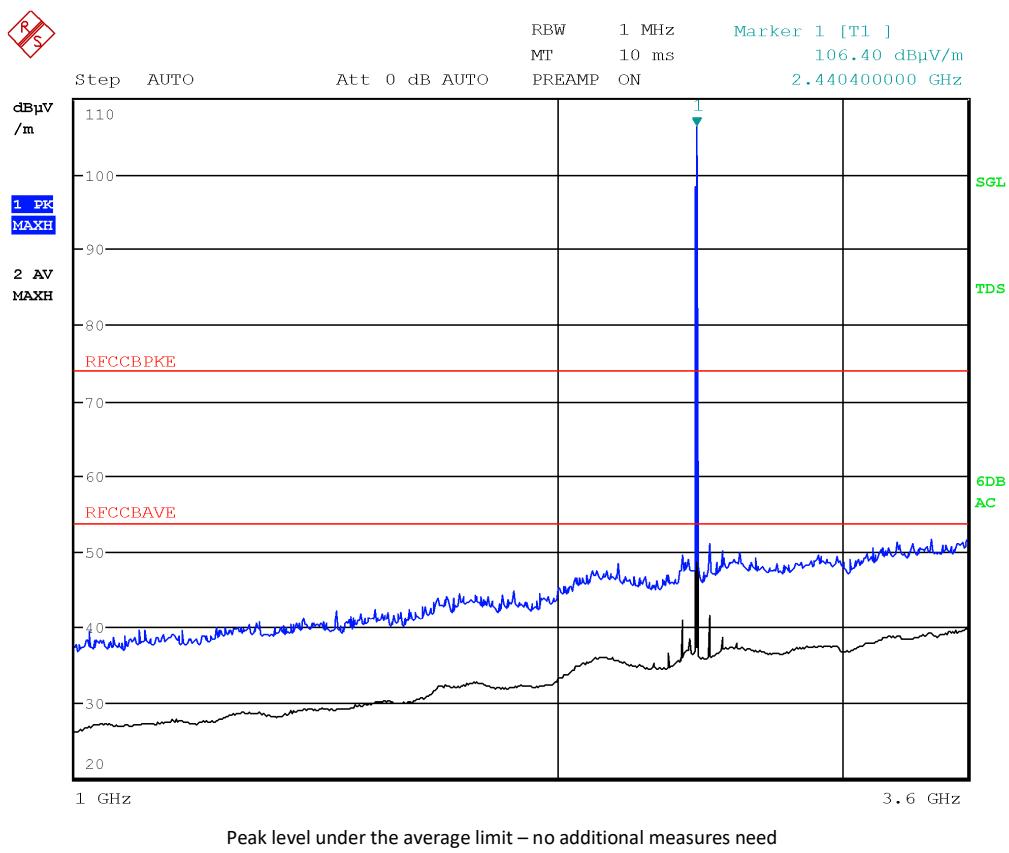


Figure 8.6-11: Radiated spurious emissions on mid channel with antenna in horizontal polarization – EUT in horizontal position

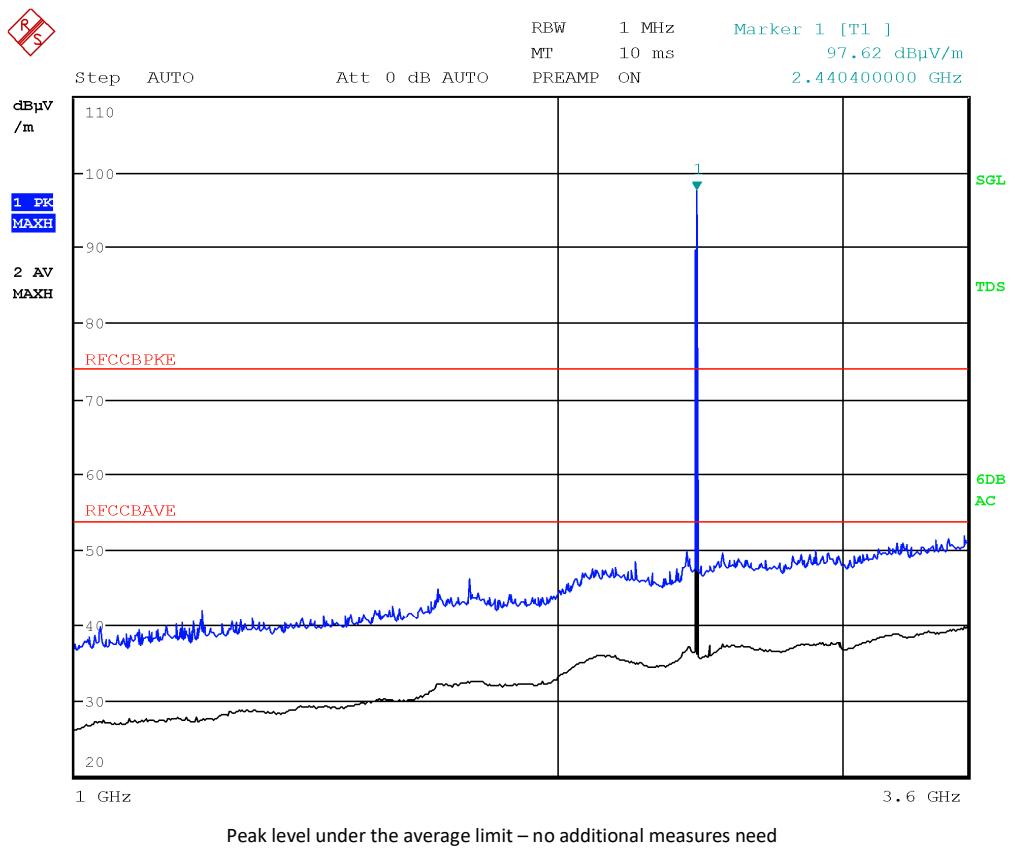
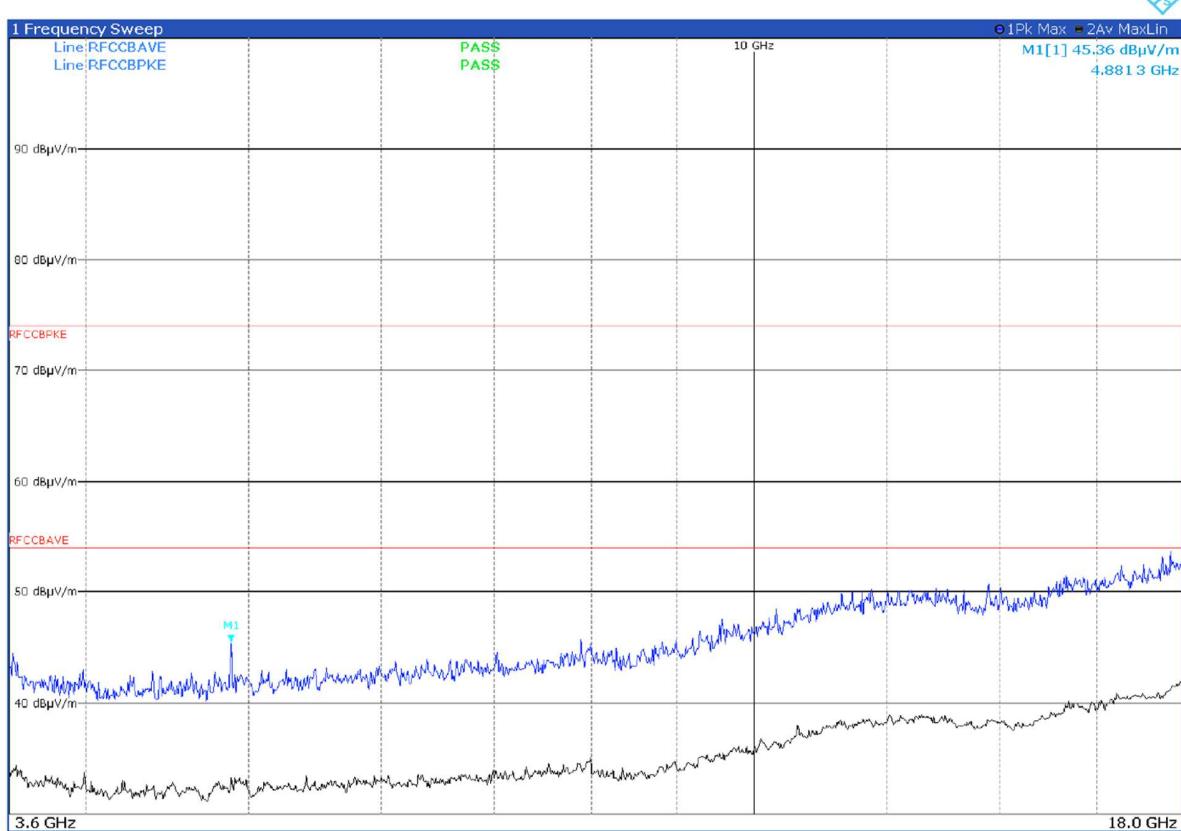
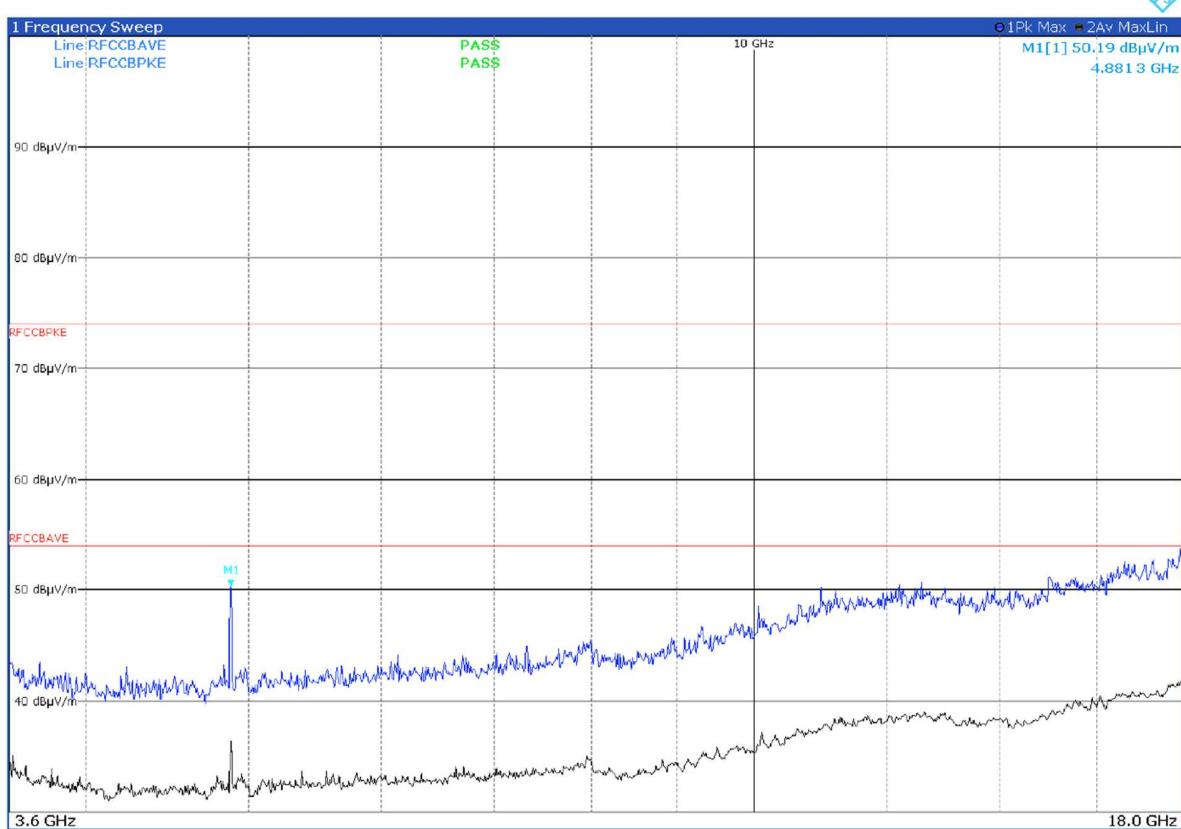


Figure 8.6-12: Radiated spurious emissions on mid channel with antenna in vertical polarization – EUT in horizontal position



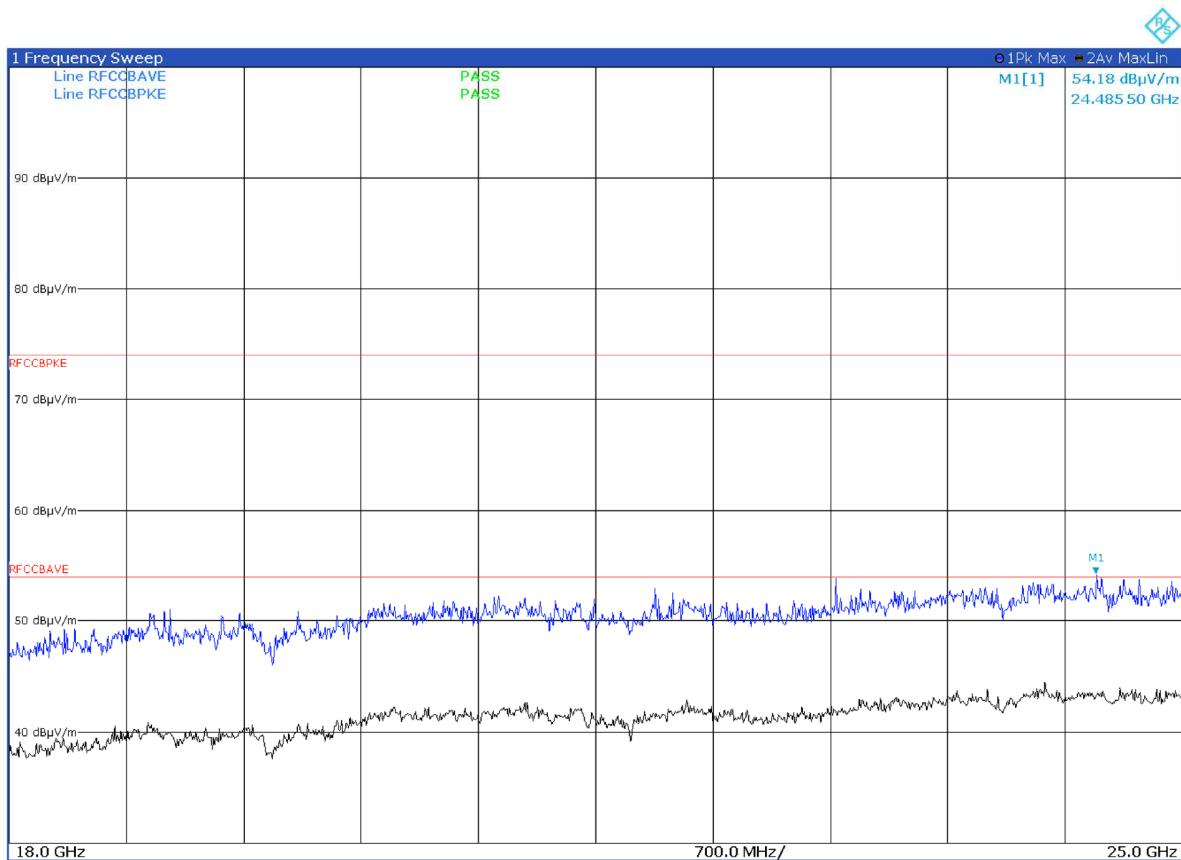
Peak level under the average limit – no additional measures need

Figure 8.6-13: Radiated spurious emissions on mid channel with antenna in horizontal polarization – EUT in horizontal position



Peak level under the average limit – no additional measures need

Figure 8.6-14: Radiated spurious emissions on mid channel with antenna in vertical polarization – EUT in horizontal position



Peak level under the average limit – no additional measures need

Figure 8.6-15: Radiated spurious emissions on mid channel with antenna in horizontal polarization – EUT in horizontal position

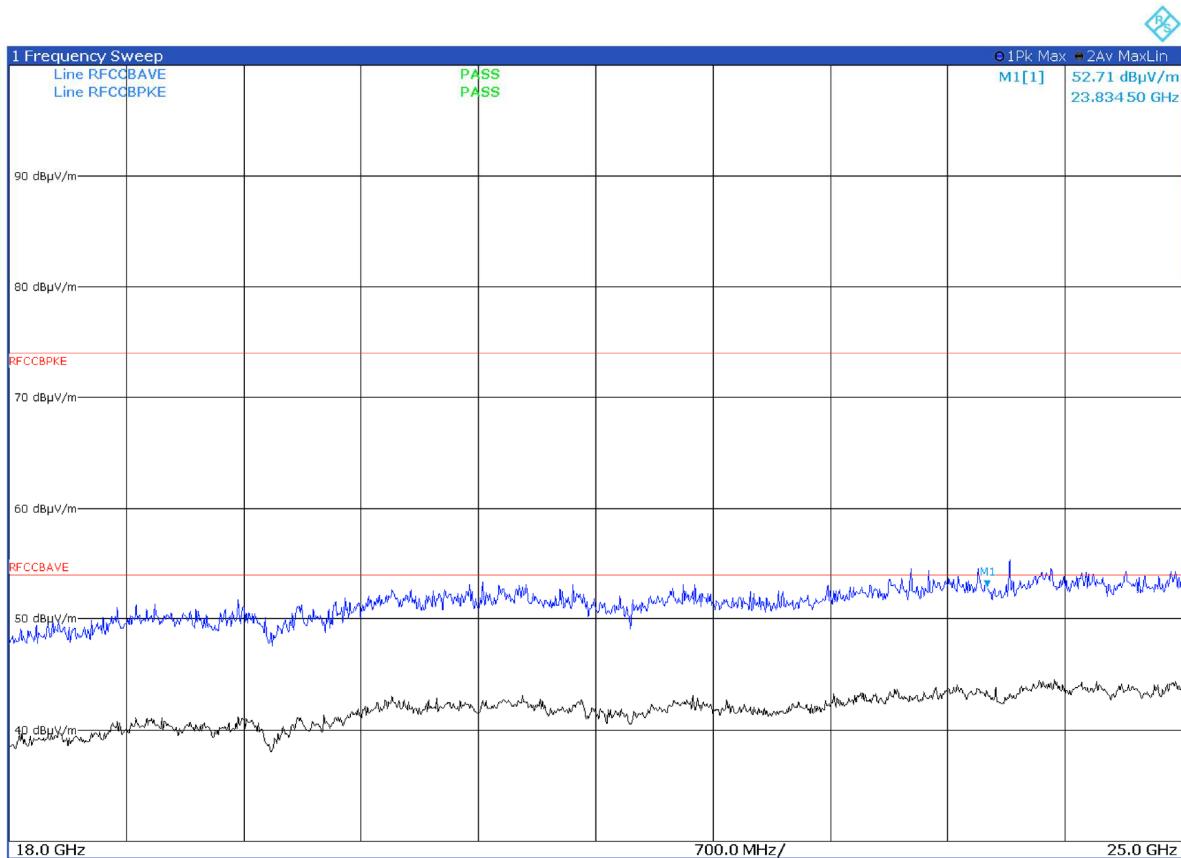


Figure 8.6-16: Radiated spurious emissions on mid channel with antenna in vertical polarization – EUT in horizontal position

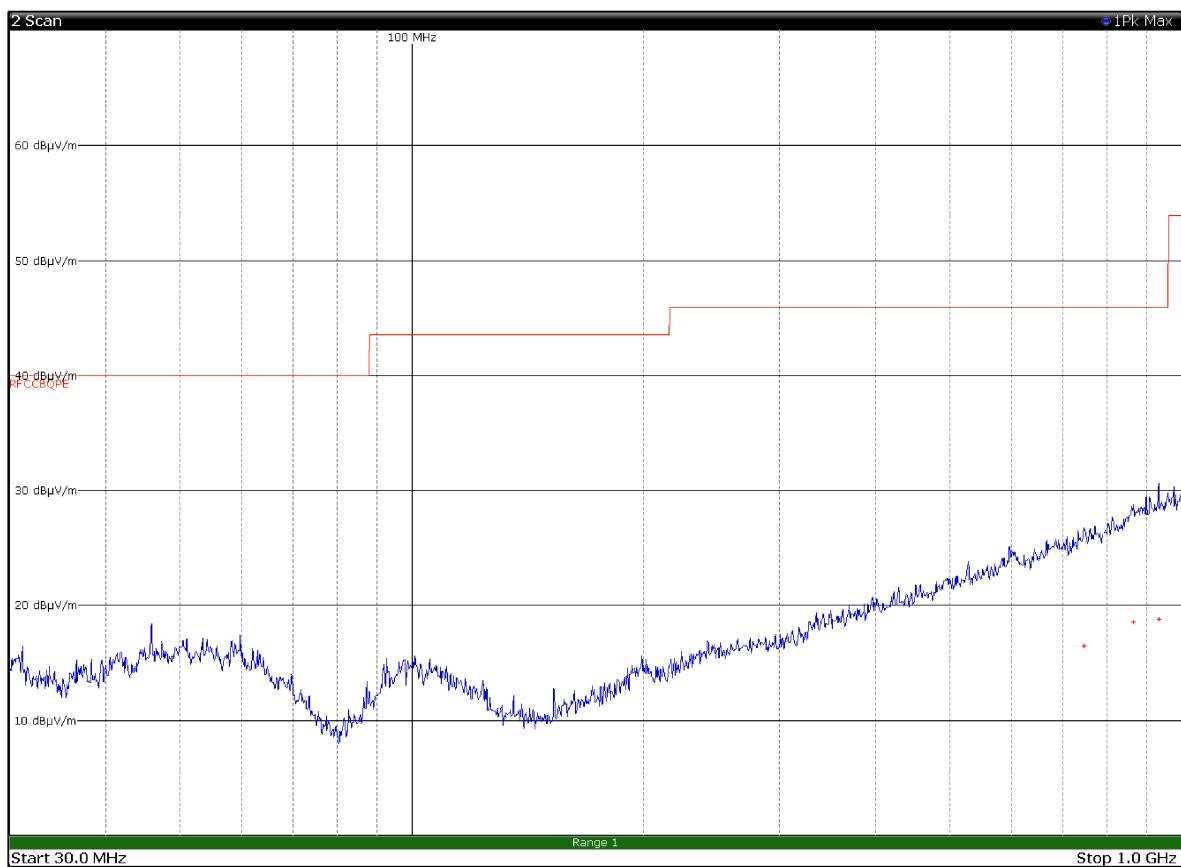


Figure 8.6-17: Radiated spurious emissions on high channel with antenna in horizontal polarization – EUT in horizontal position

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector
745.7400	16.5	46.0	-29.5	QP
864.3600	18.6	46.0	-27.4	QP
932.8500	18.9	46.0	-27.1	QP

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

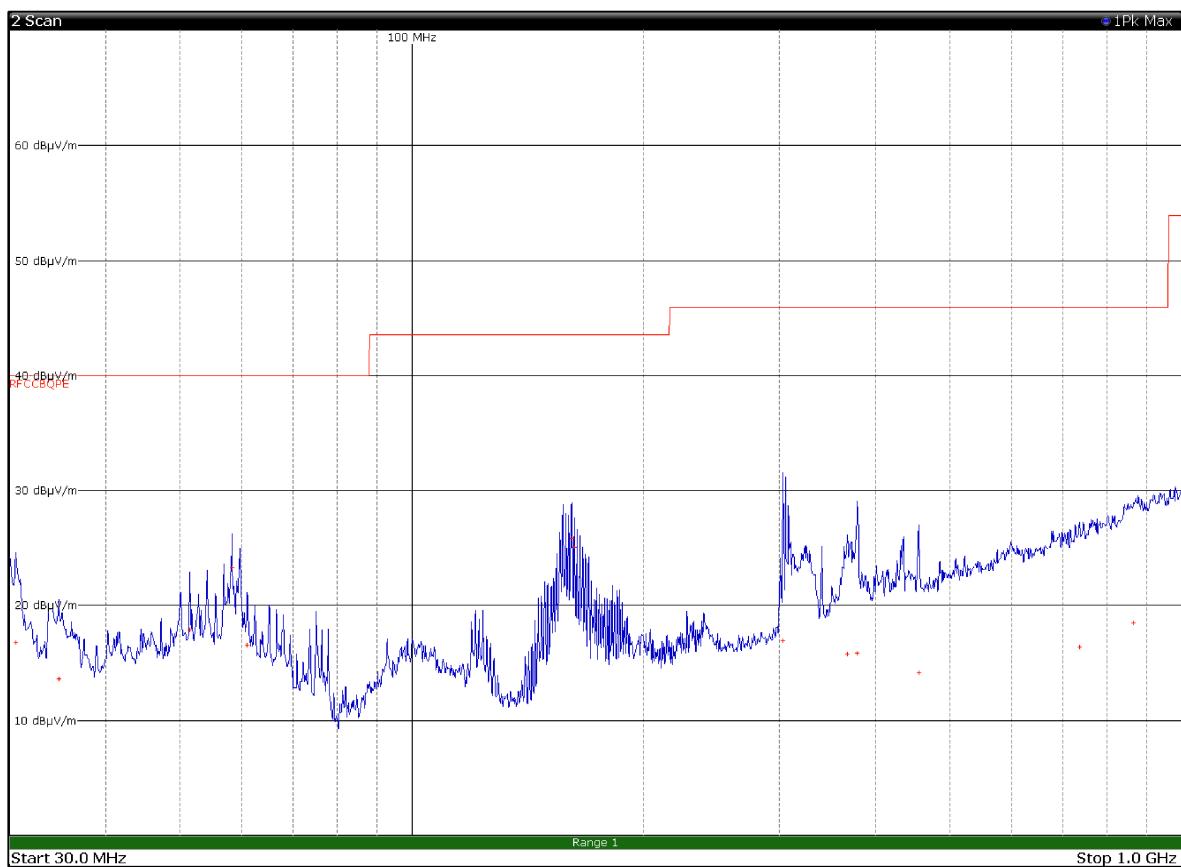


Figure 8.6-18: Radiated spurious emissions on high channel with antenna in vertical polarization – EUT in horizontal position

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector
30.5400	16.9	40.0	-23.1	QP
34.7400	13.6	40.0	-26.4	QP
51.3900	17.9	40.0	-22.1	QP
58.3200	23.3	40.0	-16.7	QP
61.1100	16.6	40.0	-23.4	QP
161.1000	25.9	43.5	-17.6	QP
162.4800	25.2	43.5	-18.3	QP
303.1200	17.0	46.0	-29.0	QP
367.8300	15.9	46.0	-30.1	QP
378.2100	15.9	46.0	-30.1	QP
454.8000	14.2	46.0	-31.8	QP
735.5700	16.5	46.0	-29.5	QP
864.6900	18.5	46.0	-27.5	QP

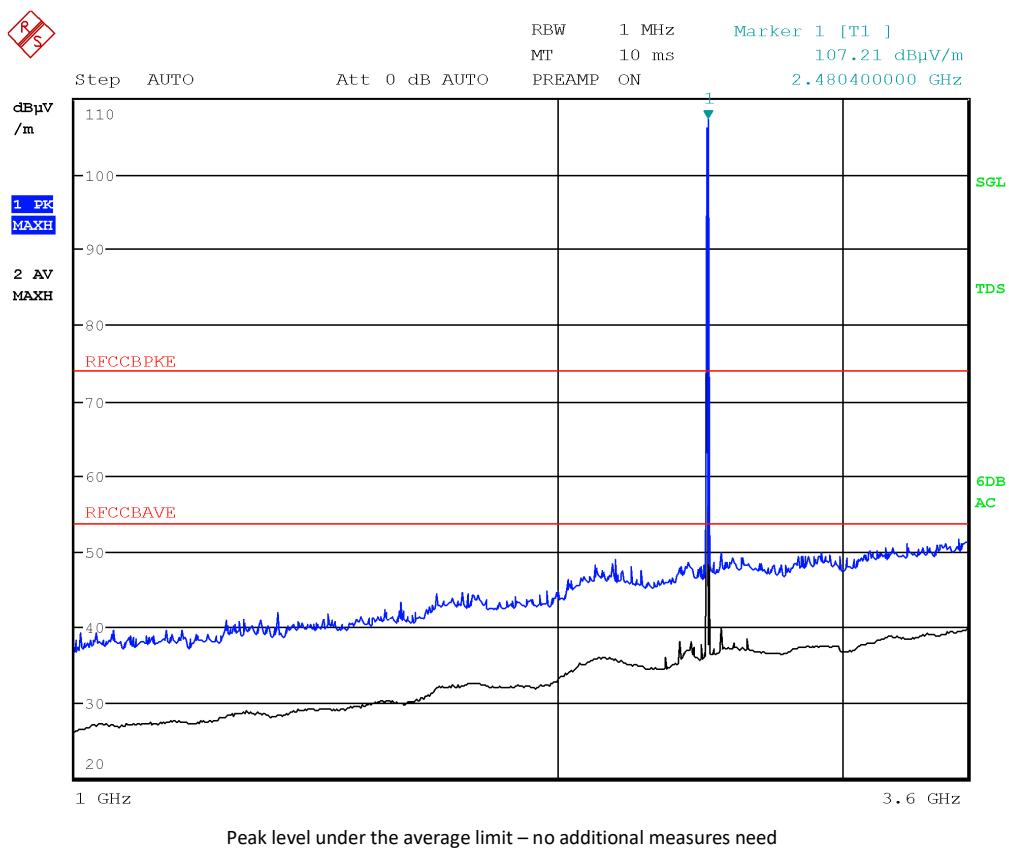


Figure 8.6-19: Radiated spurious emissions on high channel with antenna in horizontal polarization – EUT in horizontal position

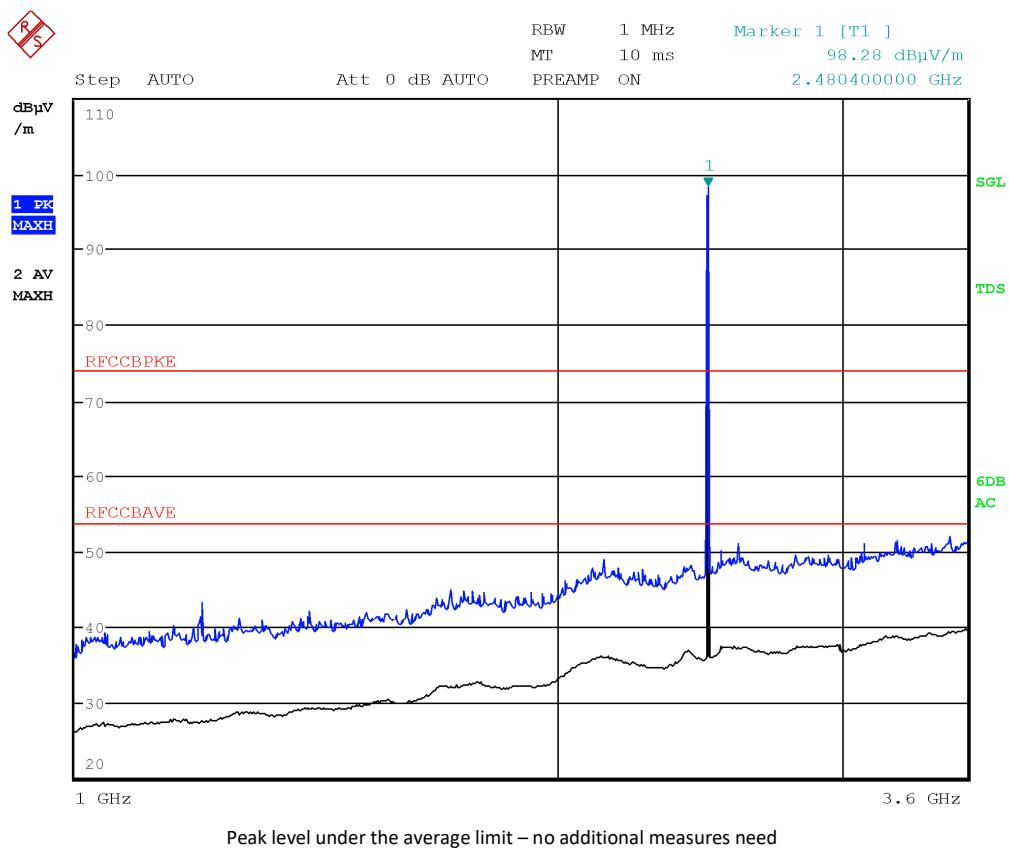
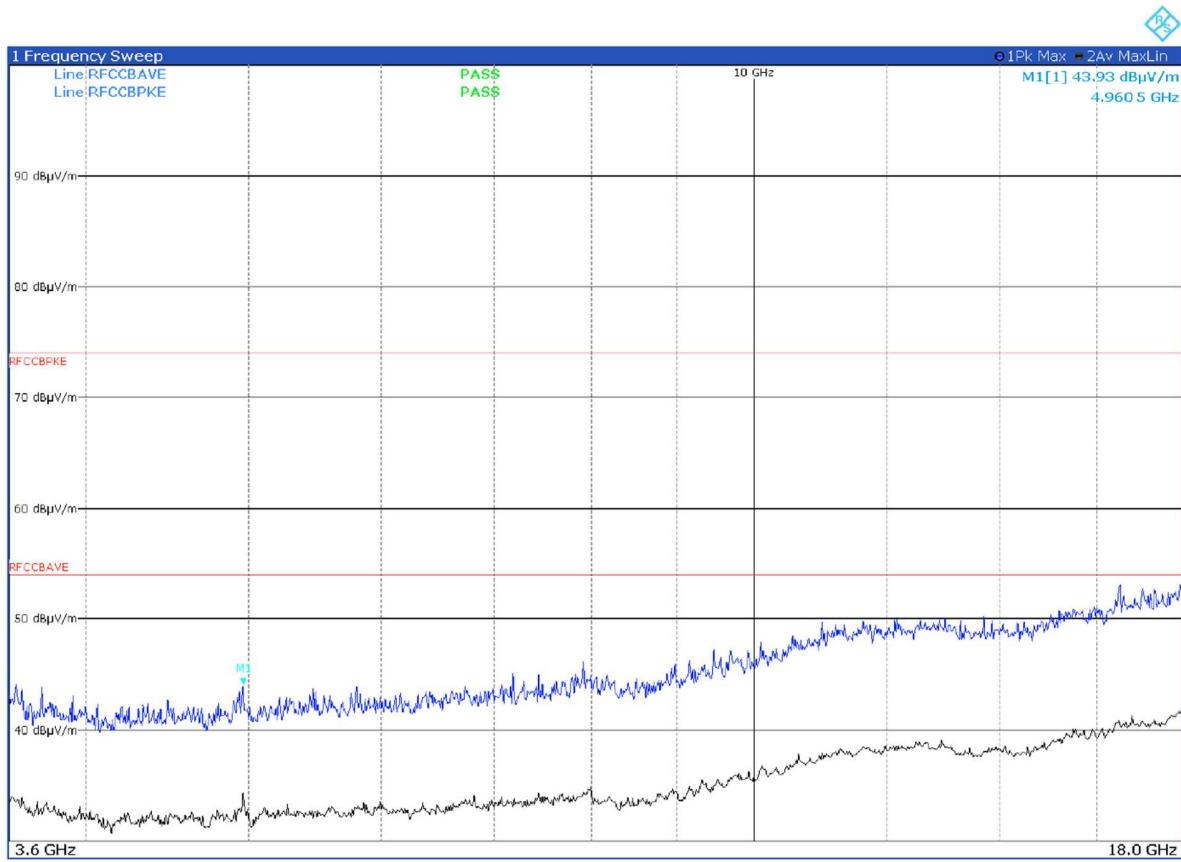
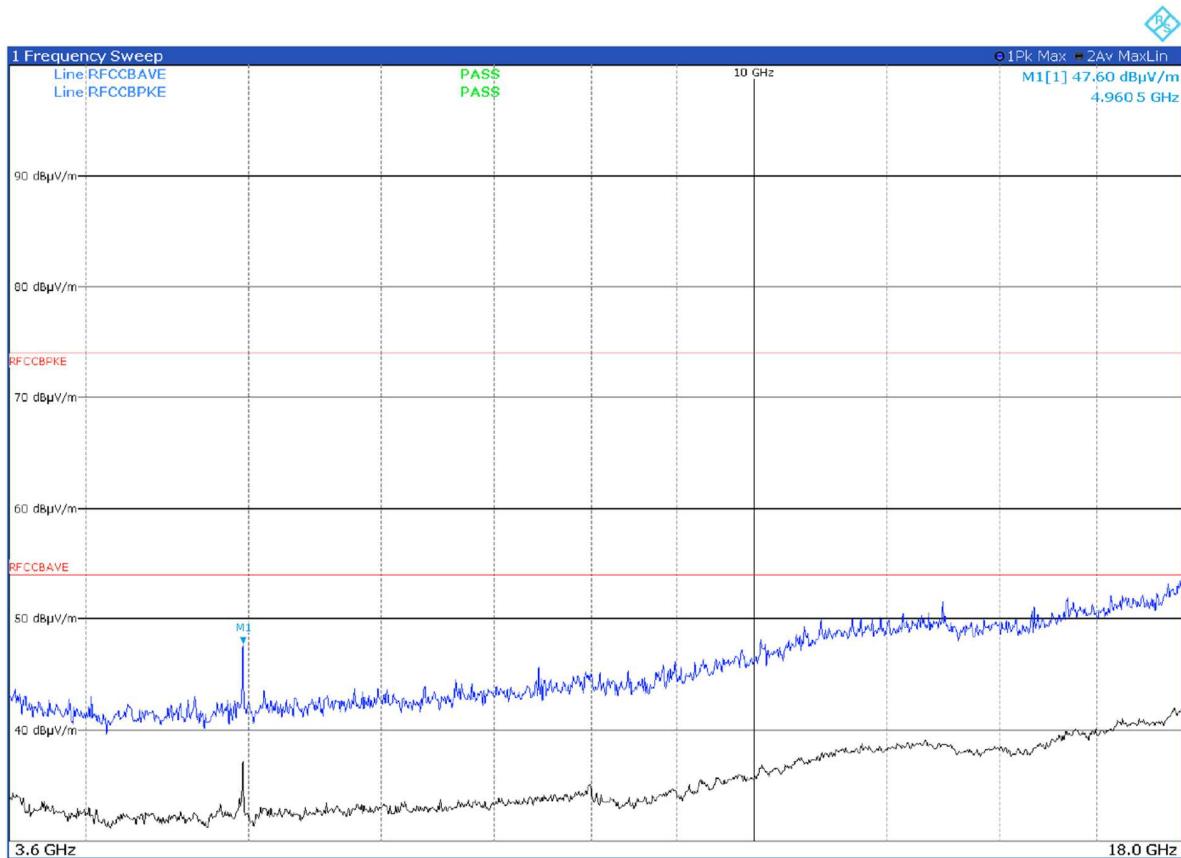


Figure 8.6-20: Radiated spurious emissions on high channel with antenna in vertical polarization – EUT in horizontal position



Peak level under the average limit – no additional measures need

Figure 8.6-21: Radiated spurious emissions on high channel with antenna in horizontal polarization – EUT in horizontal position



Peak level under the average limit – no additional measures need

Figure 8.6-22: Radiated spurious emissions on high channel with antenna in vertical polarization – EUT in horizontal position

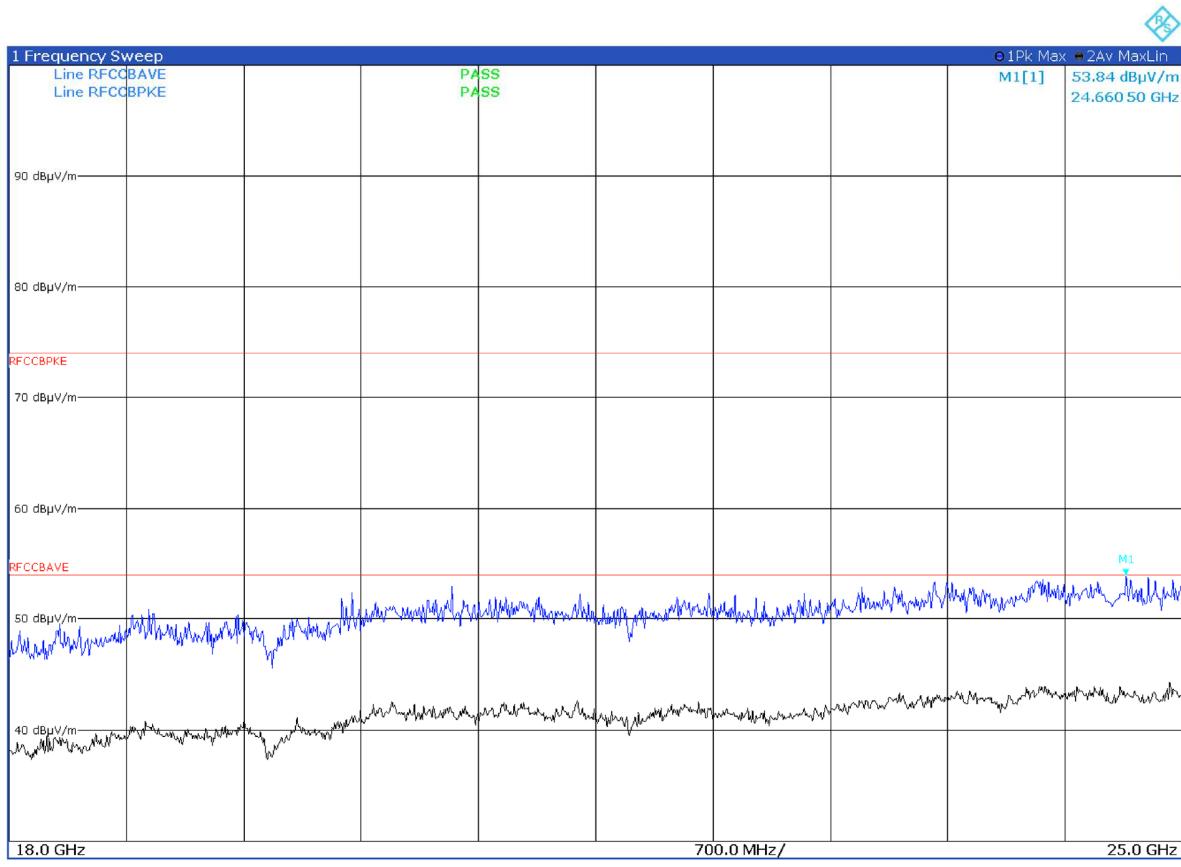


Figure 8.6-23: Radiated spurious emissions on high channel with antenna in horizontal polarization – EUT in horizontal position

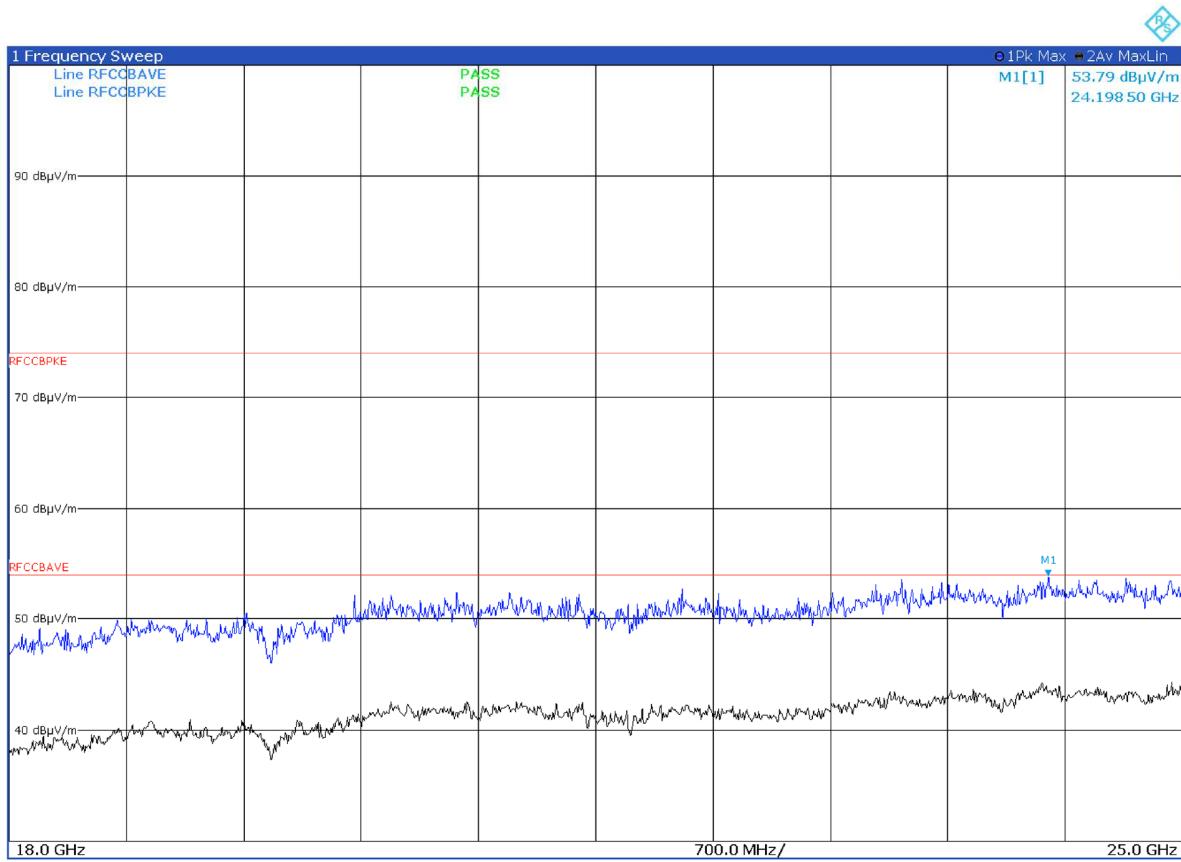


Figure 8.6-24: Radiated spurious emissions on high channel with antenna in vertical polarization – EUT in horizontal position

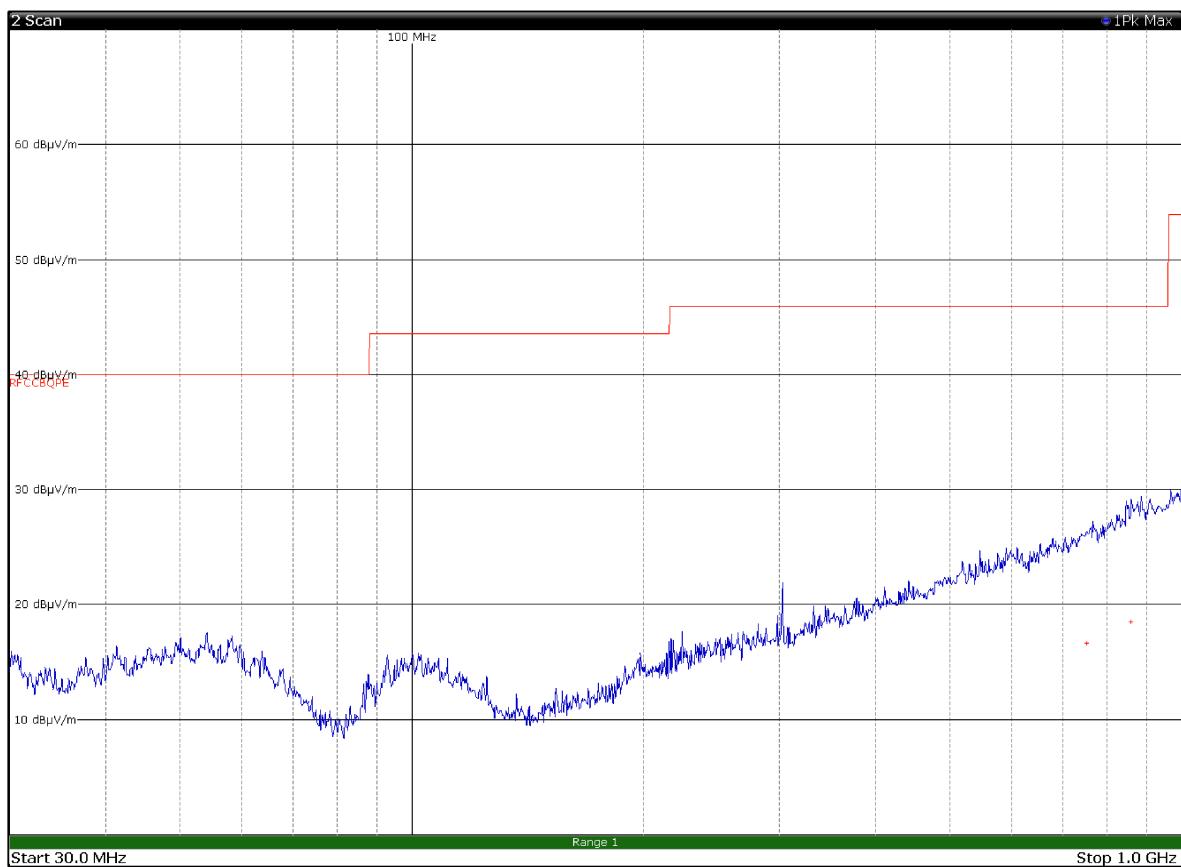


Figure 8.6-25: Radiated spurious emissions on low channel with antenna in horizontal polarization – EUT in vertical position

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector
752.2800	16.7	46.0	-29.3	QP
858.7500	18.5	46.0	-27.5	QP

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

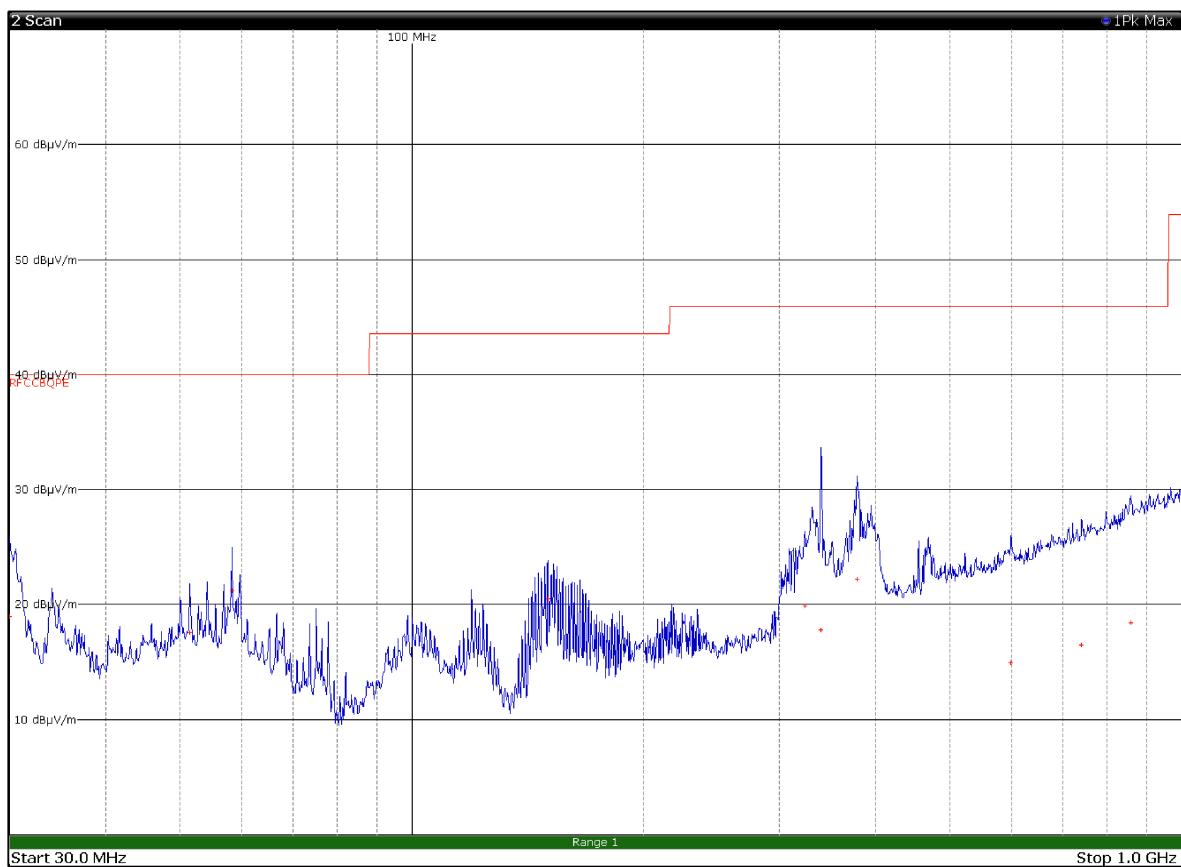


Figure 8.6-26: Radiated spurious emissions on low channel with antenna in vertical polarization – EUT in vertical position

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector
30.0000	19.0	40.0	-21.0	QP
51.3900	17.7	40.0	-22.3	QP
58.3200	21.3	40.0	-18.7	QP
150.0000	20.5	43.5	-23.0	QP
323.5800	20.0	46.0	-26.0	QP
339.8100	17.8	46.0	-28.2	QP
378.3300	22.2	46.0	-23.8	QP
599.7900	15.0	46.0	-31.0	QP
740.9100	16.5	46.0	-29.5	QP
857.1600	18.5	46.0	-27.5	QP
Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.				

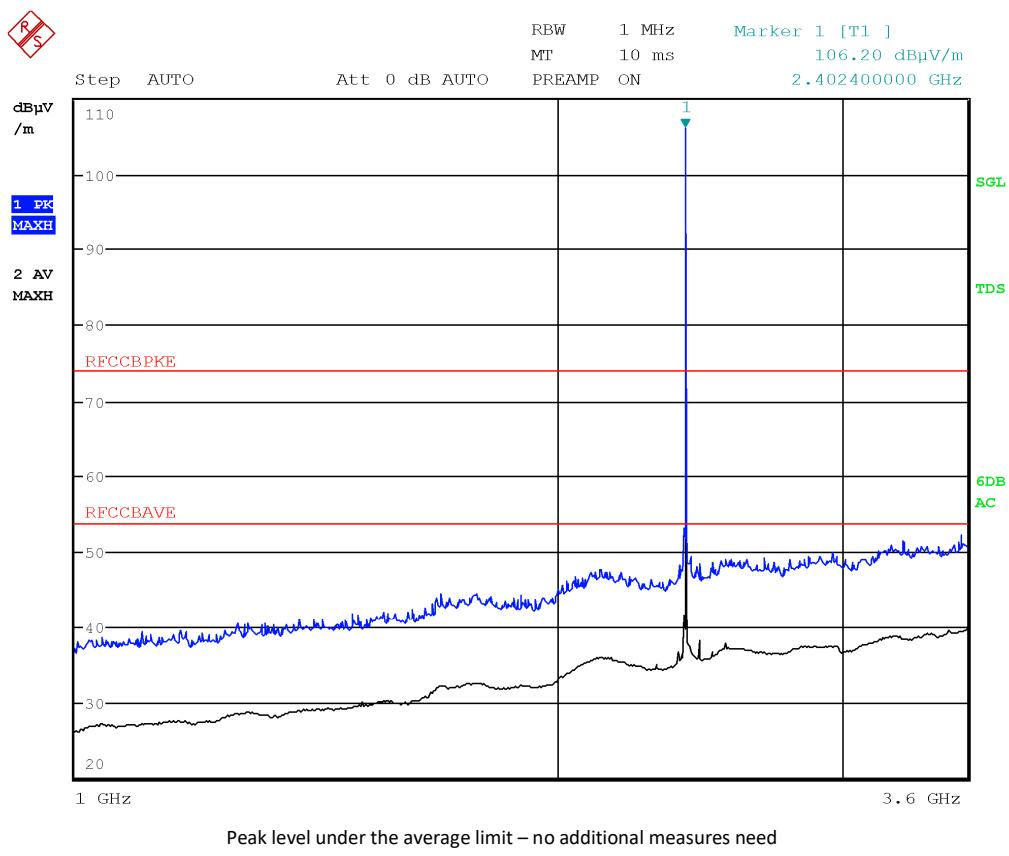
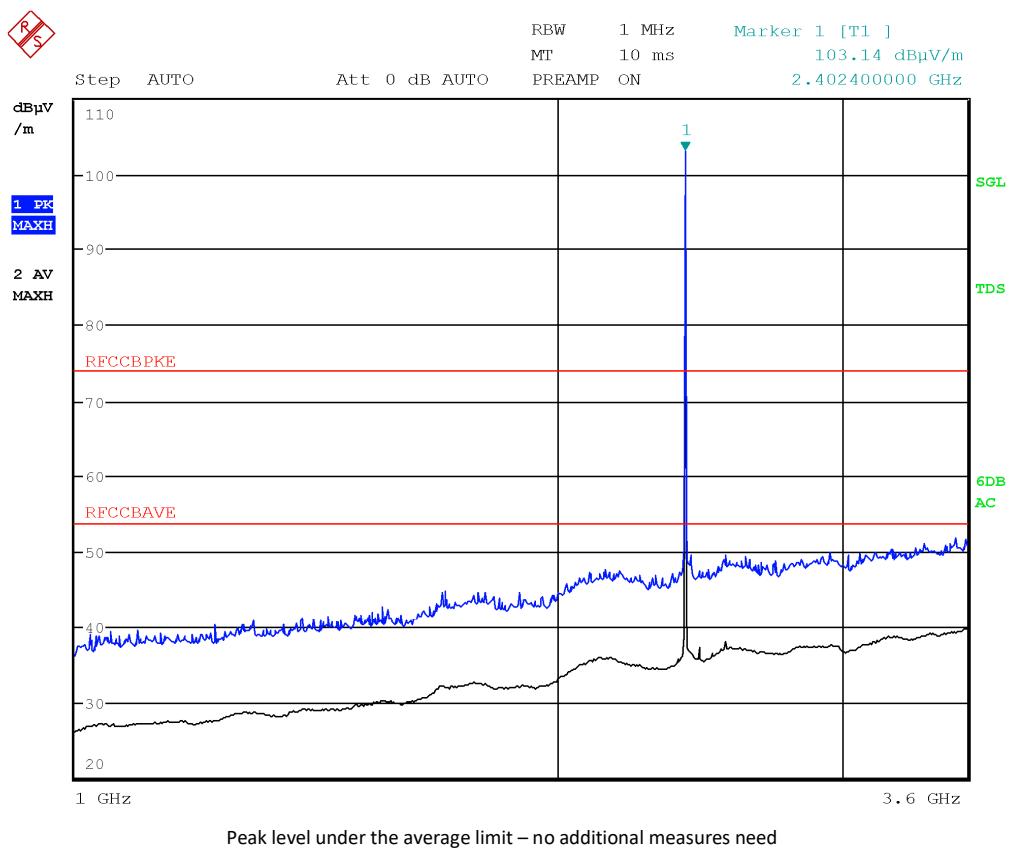
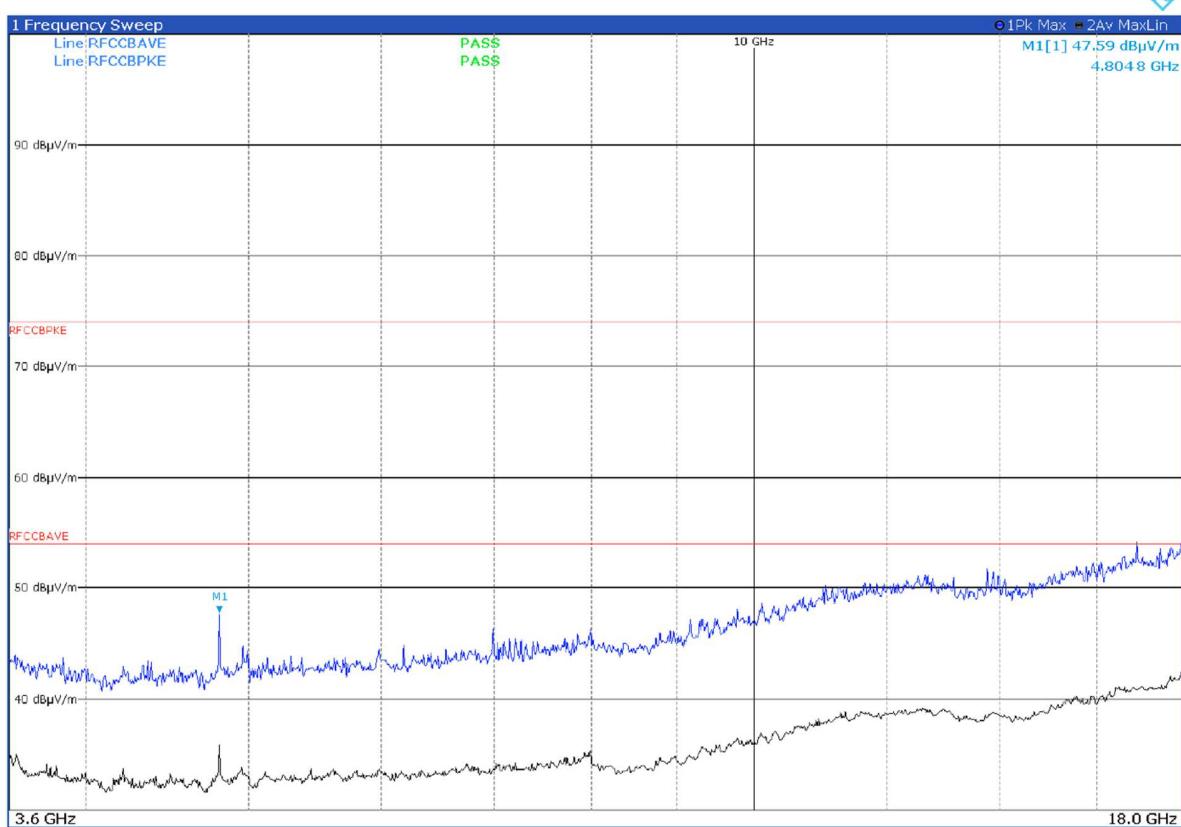


Figure 8.6-27: Radiated spurious emissions on low channel with antenna in horizontal polarization – EUT in vertical position



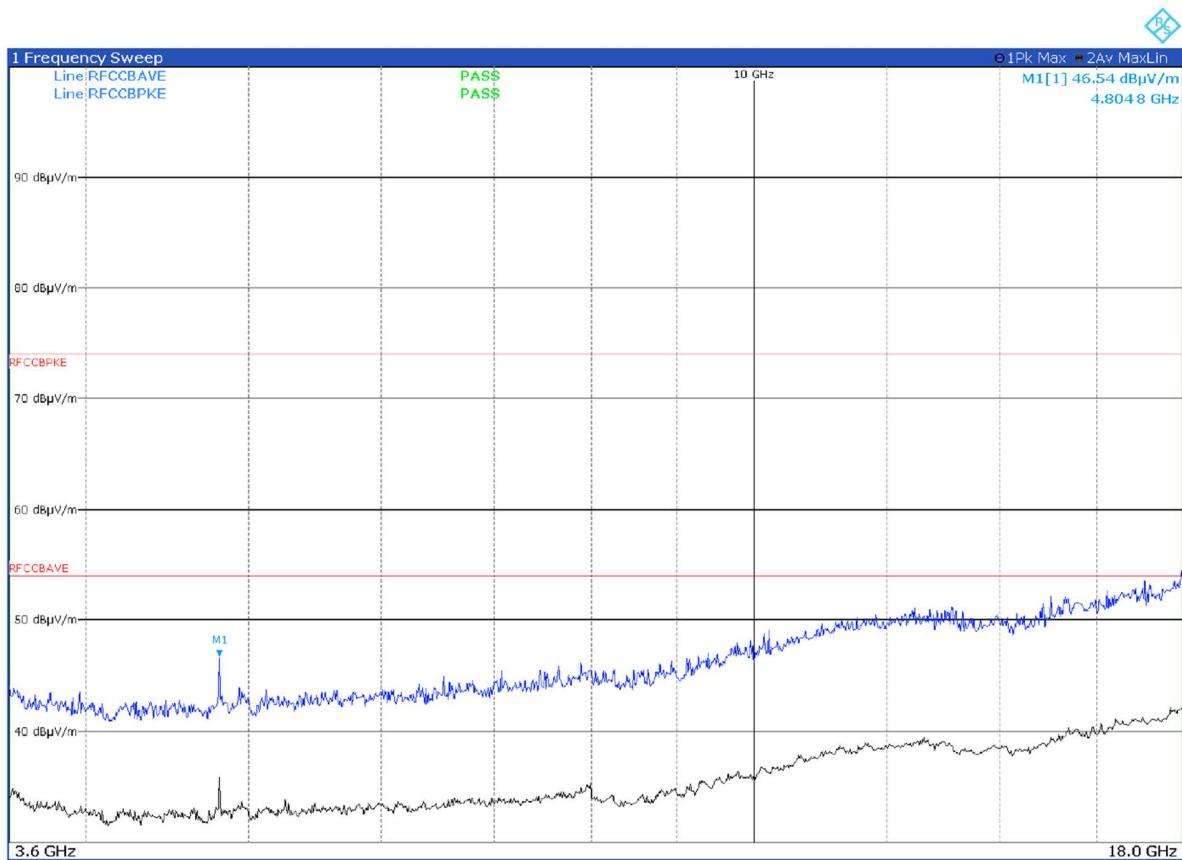
Limit exceeded by the carrier

Figure 8.6-28: Radiated spurious emissions on low channel with antenna in vertical polarization – EUT in vertical position



Peak level under the average limit – no additional measures need

Figure 8.6-29: Radiated spurious emissions on low channel with antenna in horizontal polarization – EUT in vertical position



Peak level under the average limit – no additional measures need

Figure 8.6-30: Radiated spurious emissions on low channel with antenna in vertical polarization – EUT in vertical position

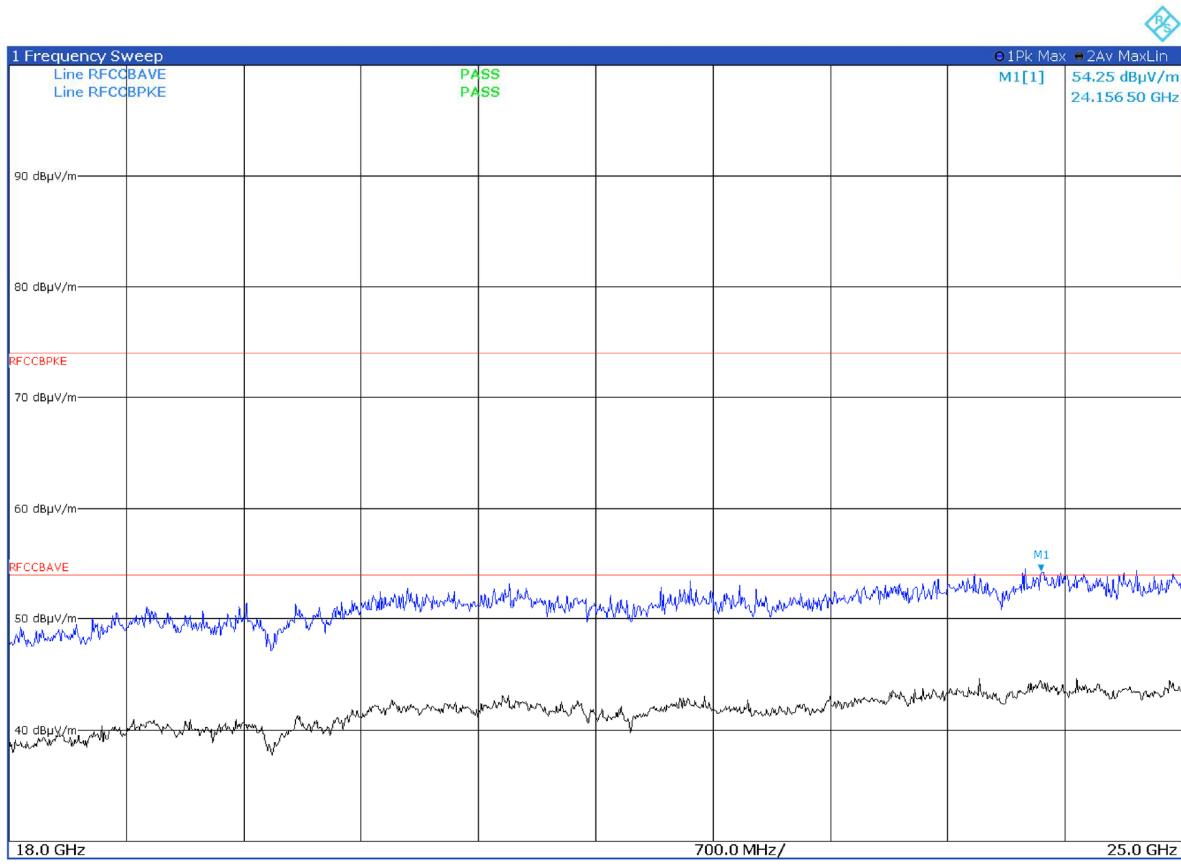
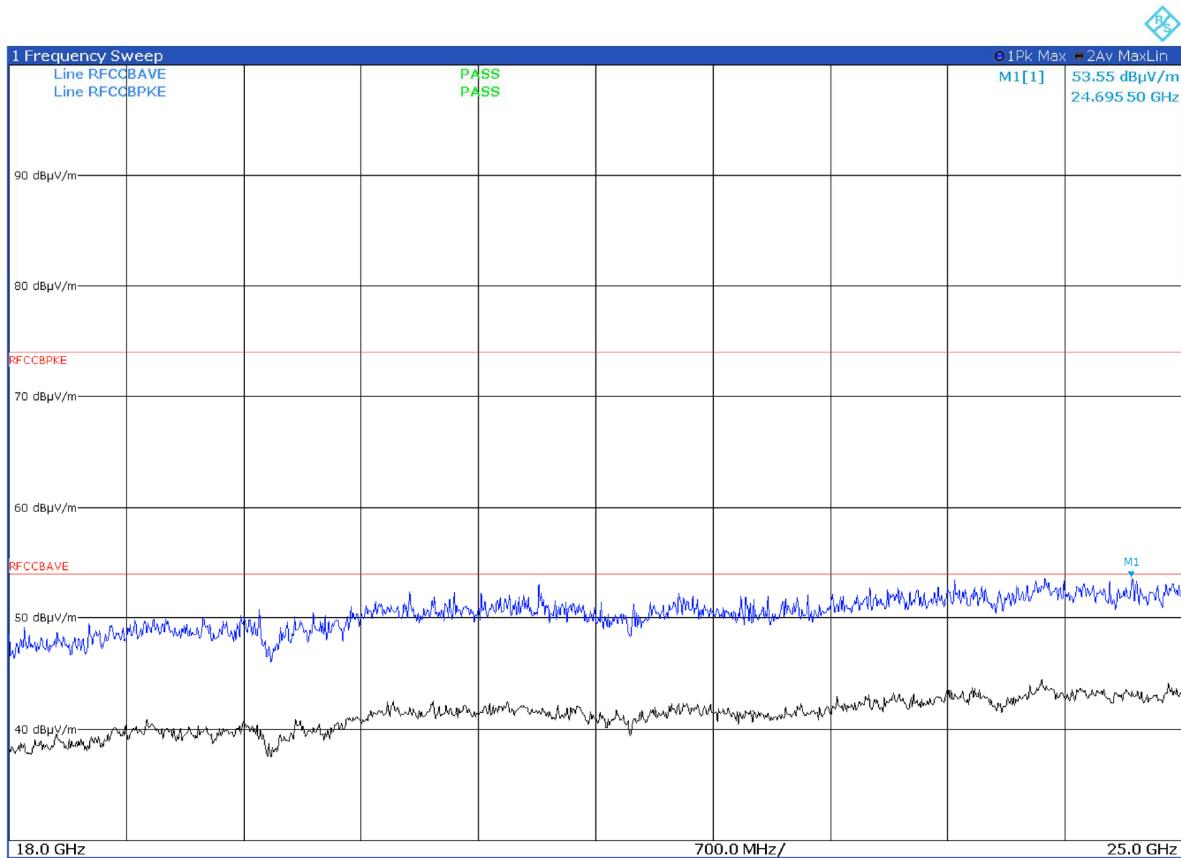


Figure 8.6-31: Radiated spurious emissions on low channel with antenna in horizontal polarization – EUT in vertical position



Peak level under the average limit – no additional measures need

Figure 8.6-32: Radiated spurious emissions on low channel with antenna in vertical polarization – EUT in vertical position

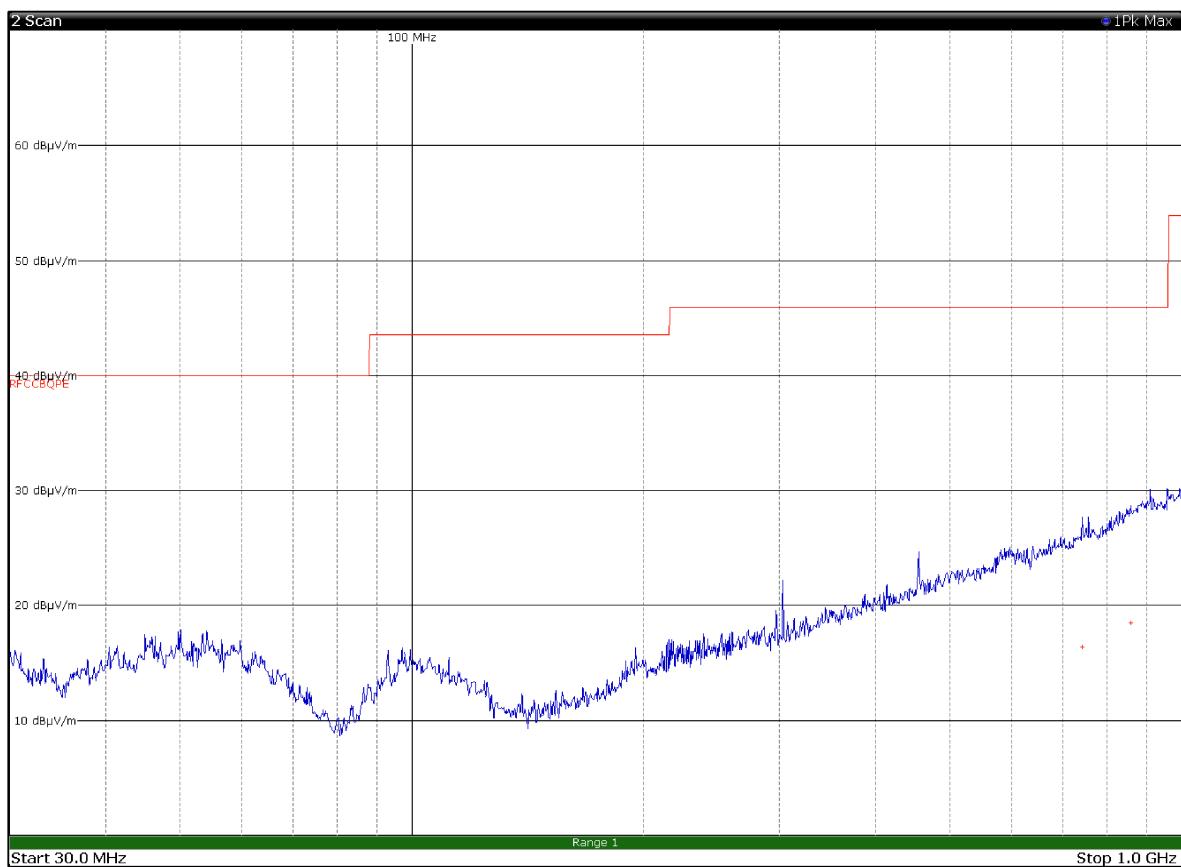


Figure 8.6-33: Radiated spurious emissions on mid channel with antenna in horizontal polarization – EUT in vertical position

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector
742.2900	16.5	46.0	-29.5	QP
858.2100	18.6	46.0	-27.4	QP

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

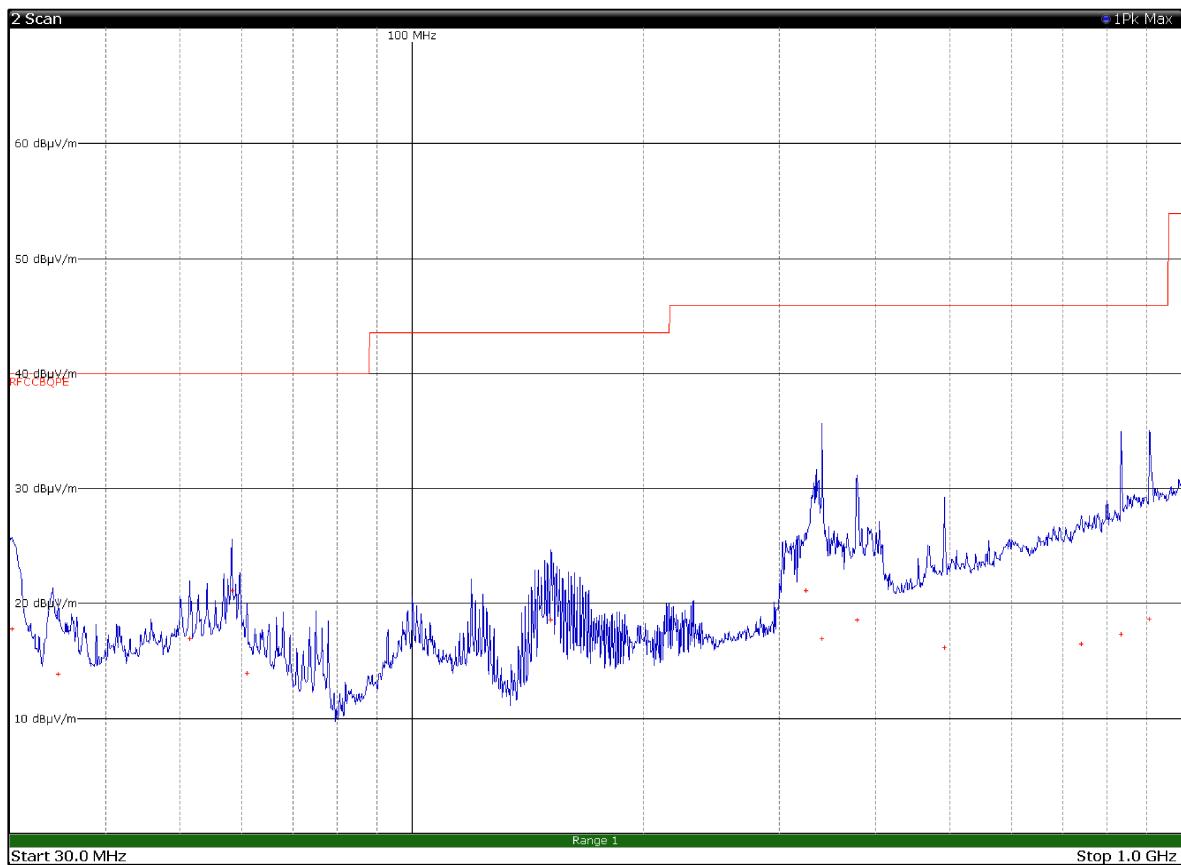


Figure 8.6-34: Radiated spurious emissions on mid channel with antenna in vertical polarization – EUT in vertical position

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector
30.2400	17.9	40.0	-22.1	QP
34.7100	13.8	40.0	-26.2	QP
51.3900	17.0	40.0	-23.0	QP
58.3200	21.2	40.0	-18.8	QP
61.0800	14.0	40.0	-26.0	QP
151.3500	18.7	43.5	-24.8	QP
324.9600	21.1	46.0	-24.9	QP
340.8000	17.0	46.0	-29.0	QP
378.2100	18.6	46.0	-27.4	QP
491.7900	16.2	46.0	-29.8	QP
739.8900	16.6	46.0	-29.4	QP
833.4900	17.4	46.0	-28.6	QP
908.0100	18.7	46.0	-27.3	QP

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

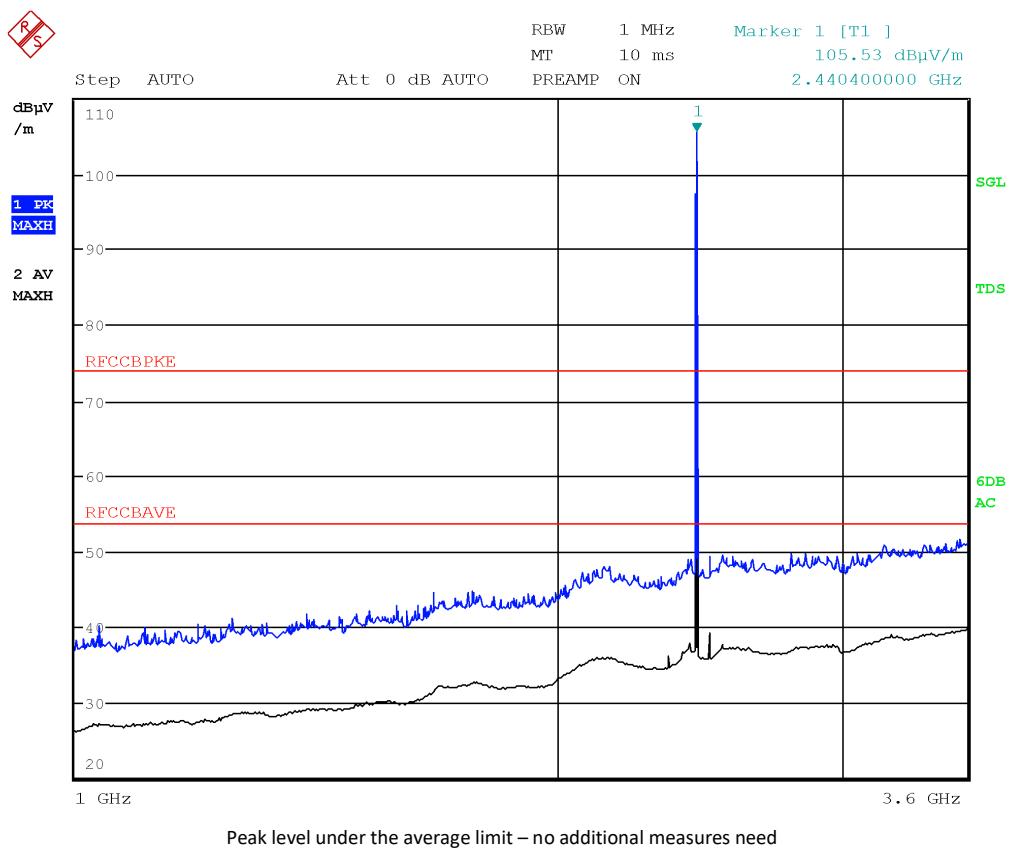


Figure 8.6-35: Radiated spurious emissions on mid channel with antenna in horizontal polarization – EUT in vertical position

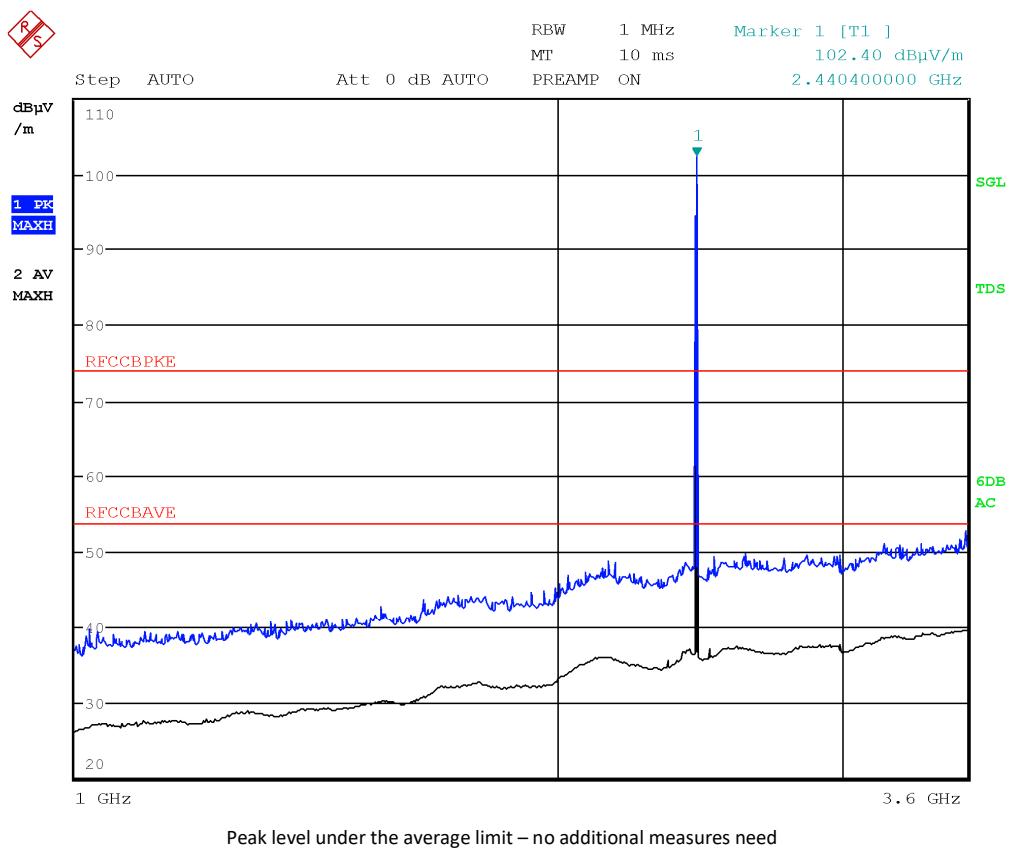
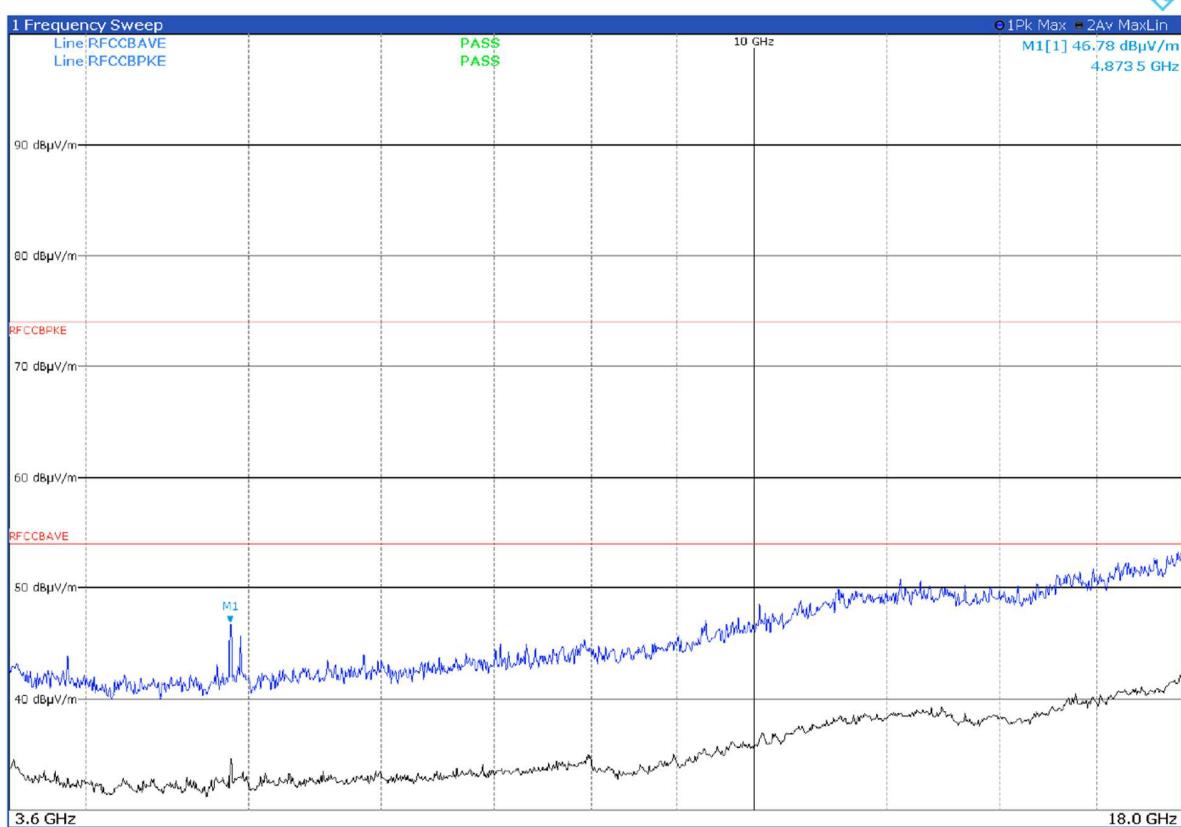
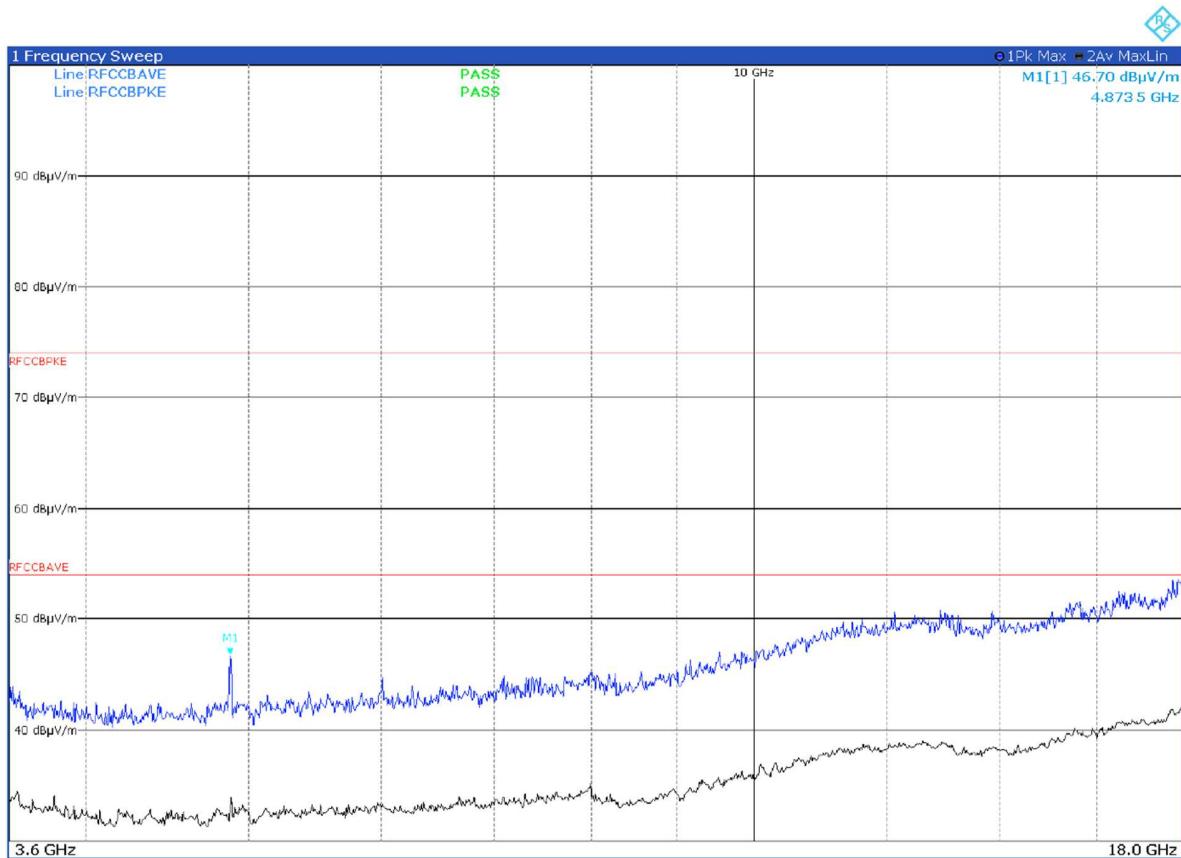


Figure 8.6-36: Radiated spurious emissions on mid channel with antenna in vertical polarization – EUT in vertical position



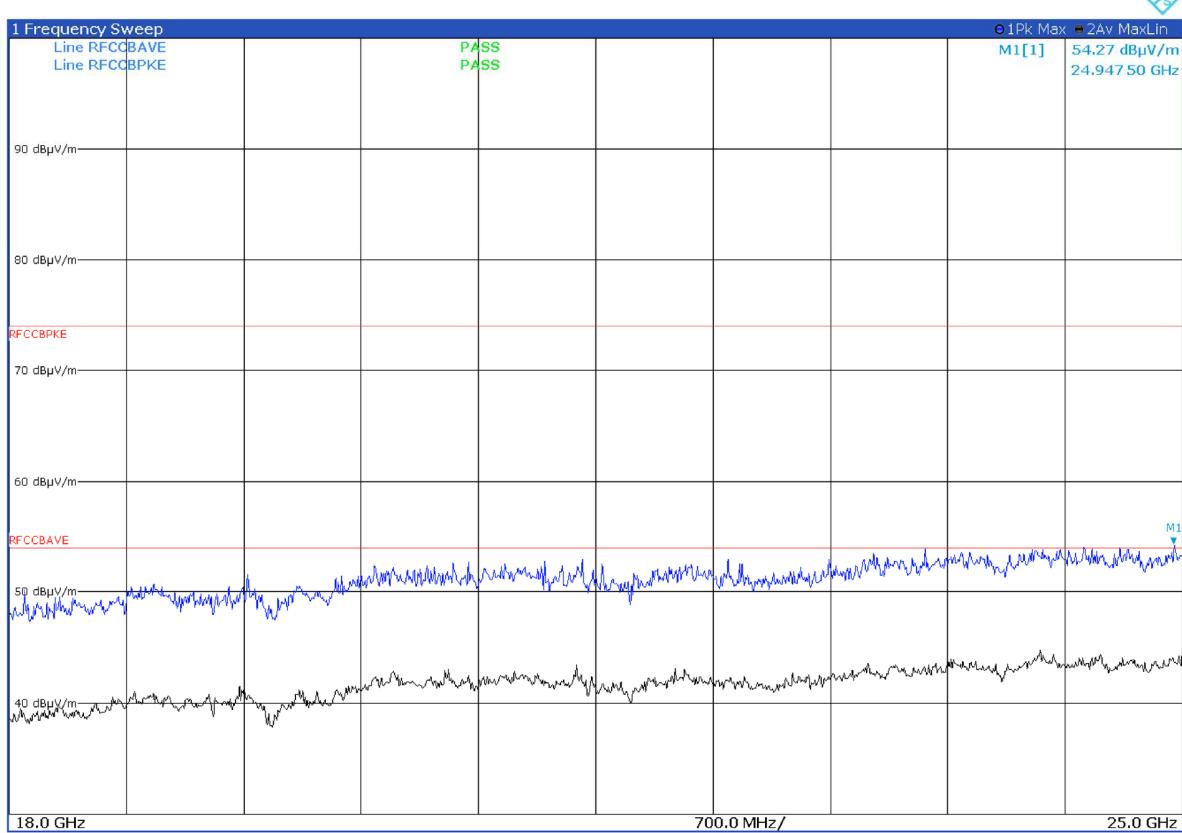
Peak level under the average limit – no additional measures need

Figure 8.6-37: Radiated spurious emissions on mid channel with antenna in horizontal polarization – EUT in vertical position



Peak level under the average limit – no additional measures need

Figure 8.6-38: Radiated spurious emissions on mid channel with antenna in vertical polarization – EUT in vertical position



Peak level under the average limit – no additional measures need

Figure 8.6-39: Radiated spurious emissions on mid channel with antenna in horizontal polarization – EUT in vertical position