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RADIO TEST REPORT – 405536-1TRFWL

Type of assessment:

Final product testing

Applicant:

Redline Communications

Product:

LTE Base Station – Band 13

Model:

Ellipse 4G HP FIB Band 13

Model variant:

Ellipse 4G HP Band 13

FCC ID:

QC8-B13

IC Registration number:

4310A-B13

Specifications:

- FCC 47 CFR Part 27, Subpart C
- RSS-130 Issue 2, February 2019

Date of issue: October 13, 2020

Andrey Adelberg, Senior EMC/RF Specialist
Tested by

Signature

David Duchesne, EMC/RF Lab Manager
Reviewed by

Signature

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Test site registration	**Organization**	**Recognition numbers and location**		
	FCC/ISED	FCC: CA2040; IC: 2040A-4 (Ottawa/Almonte); FCC: CA2041; IC: 2040G-5 (Montreal); CA0101 (Cambridge)		
Website	www.nemko.com			

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 Canada's ISO/IEC 17025 accreditation.

Copyright notification

Table of contents

Section 1. Report summary

1.1 Test specifications

FCC 47 CFR Part 27, Subpart C	Miscellaneous wireless communications services
RSS-130 Issue 2, February 2019	Equipment Operating in the Frequency Bands 617–652 MHz, 663–698 MHz, 698–756 MHz and 777–787 MHz

1.2 Test methods

ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
FCC 47 CFR Part 2, Subpart J	Equipment authorization procedures
RSS-Gen Issue 5, March 2019	General Requirements for Compliance of Radio Apparatus
SRSP-518 Issue 2, February 2019	Technical Requirements in the Bands 617–652 MHz, 663–698 MHz, 698–756 MHz and 777–787 MHz

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
TRF	October 13, 2020	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

Both models Ellipse 4G HP FIB Band 13 and Ellipse 4G HP Band 13 are functionally identical.
The difference is optional fiber optic components (copper to fiber media converter) with external fiber optic port added for Model Ellipse 4G HP FIB instead of RJ-45 for Model Ellipse 4G HP Band 13.

2.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 3. Test conditions

3.1 Atmospheric conditions

Temperature	15 °C – 35 °C
Relative humidity	20 % – 75 %
Air pressure	86 kPa (860 mbar) – 106 kPa (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.

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 ±5 %, for which the equipment was designed.

Section 4. Measurement uncertainty

4.1 Uncertainty of measurement

UKAS Lab 34 and TIA-603-B have been used as guidance for measurement uncertainty reasonable estimations with regards to previous experience and validation of data. Nemko Canada, Inc. follows these test methods in order to satisfy ISO/IEC 17025 requirements for estimation of uncertainty of measurement for wireless products.

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of K = 2 with 95% certainty.

Table 4.1-1: *Measurement uncertainty calculations*

Test name	Measurement uncertainty, ±dB
All antenna port measurements	0.55
Occupied bandwidth	4.45
Conducted spurious emissions	1.13
Radiated spurious emissions	3.78
AC power line conducted emissions	3.55

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	Redline Communications
Applicant address	302 Town Center Blvd., Markham, ON, Canada, L3R 0E8
Manufacture name	Same as applicant
Manufacture address	Same as applicant

5.3 EUT information

Product	LTE Base Station – Band 13
Model	Ellipse 4G HP FIB Band 13
Model variant(s)	Ellipse 4G HP Band 13
Serial number	446RM1810022
Software version	1.3.0.17
Firmware version	2013.01-svn826 (Apr 04 2018 - 19:58:11)
Power supply requirements	48 V_{DC} via 120 V_{AC}/ 60 Hz power supply
Product description and theory of operation	Ellipse 4G HP is an all outdoor LTE eNodeB (E-UTRAN Node B) single band base station operating in LTE Band 13 (746–756 MHz).

5.4 Radio technical information

Operating band	746–757 MHz (FCC) and 698–756 MHz (ISED)
LTE band	Band 13: 746–756 MHz
Frequency Min (MHz)	748.5 (5 MHz channel); 751.0 (10 MHz channel)
Frequency Max (MHz)	753.5 (5 MHz channel); 751.0 (10 MHz channel)
RF power Max (W), Conducted	7.145 (38.54 dBm, 5 MHz channel); 6.998 (38.45 dBm, 10 MHz channel)
Measured BW (kHz), 99% OBW	4583 (5 MHz channel); 9038 (10 MHz channel)
Type of modulation	LTE: QPSK, 16 QAM, 64 QAM
Emission classification	5M00W7D, 10M0W7D
Transmitter spurious	[5 MHz channel] 64.10 dBµV/m (peak) @ 3 m at 4.513 GHz [10 MHz channel] 60.46 dBµV/m (peak) @ 3 m at 4.503 GHz
Antenna information	Based on the RF margins noted in this report, considerations pertaining to the maximum allowed EIRP and antenna type should be considered for each installation. Maximum allowed gain of antenna is 26 dBi.

5.5 EUT setup details

5.5.1 Radio exercise details

Transmitter state	EUT was controlled from external laptop using TeraTerm's Telnet session to set up the transmission at low/mid/high channels at different modulations and channel bandwidths.
Operating conditions	EUT was configured using E-UTRA test modes as per 3GPP 36.141 Release 10 E-TM1.1 for QPSK E-TM3.2 for 16-QAM E-TM3.1 for 64-QAM

5.5.2 EUT setup configuration

Table 5.5-1: *EUT interface ports*

Description	Qty.
EUT power port	1
Optical port	1
GPS port	1
Ethernet port	1

Table 5.5-2: *Support equipment*

Description	Brand name	Details
Laptop	Lenovo	MN: ideapad 110, SN: FA003195
Ethernet switch	Netgear	MN: GC110, SN: 4WR4817E80082
Power supply	Delta Electronics, Inc	MN: DRP048V240W1BN, SN: 00L13520086, Rev. 00
GPS antenna	PCTEL	MN: 3978D-HR-DH-W, SN: 503312

Table 5.5-3: *Inter-connection cables*

Cable description	From	To	Length (m)
Power cable	EUT power port	Power supply	1.5
Optical cable	Optical port	Ethernet switch	1.0
Ethernet cable	Ethernet switch	Laptop	20
GPS RF cable	GPS port	GPS antenna	30

EUT setup configuration, continued

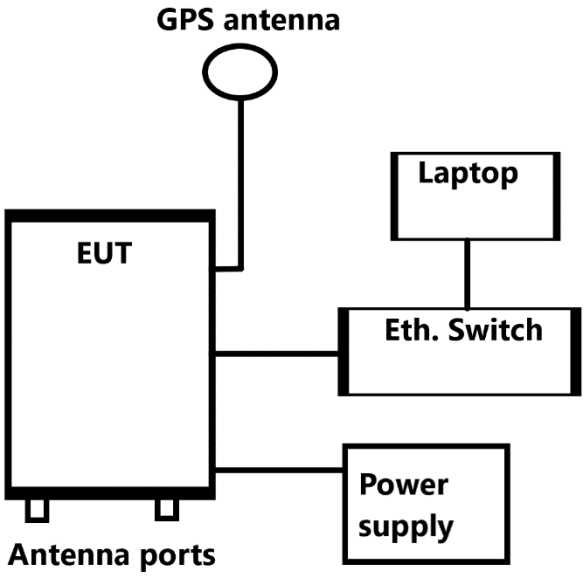


Figure 5.5-1: *EUT setup block diagram*

Section 6. Summary of test results

6.1 Testing location

Test location (s)	Ottawa

6.2 Testing period

Test start date	September 4, 2020	Test end date	September 10, 2020

6.3 Sample information

Receipt date	September 3, 2020	Nemko sample ID number(s)	1

6.4 FCC Part 27, Subpart C and Part 2, Subpart J requirements test results

Table 6.4-1: *FCC requirements results*

Part	Test description	Verdict
§27.50	RF Power output	Pass
§27.53 (c)(e)	Spurious emissions at antenna terminals	Pass
§27.53 (c)(e)	Field strength of spurious radiation	Pass
§27.53(f)	Spurious emissions within 1559–1610 MHz band	Pass
§27.54	Frequency stability	Pass
§2.1047 (a)	Audio Frequency response	Not applicable
§2.1047 (b)	Modulation limiting	Not applicable
§2.1049	Occupied bandwidth	Pass

6.5 RSS-130, Issue 2 and RSS-Gen, Issue 5 requirements test results

Table 6.5-1: *ISED requirements results*

Part	Test description	Verdict
RSS-130, 4.6.3	Transmitter output power and Effective Radiated Power (e.r.p.)	Pass
RSS-130, 4.7.1	General unwanted emission limits	Pass
RSS-130, 4.7.2	Additional unwanted emission limits	Pass
RSS-130, 4.7.2	Radiated spurious emissions within 1559–1610 MHz band	Pass
RSS-130, 4.5	Transmitter frequency stability	Pass
RSS-Gen, 6.7	Occupied bandwidth	Pass

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.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	January 24, 2021
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
61505 AC source	Chroma	61509	FA003036	—	VOU
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	November 8, 2020
Spectrum analyzer	Rohde & Schwarz	FSU	FA001877	1 year	October 31, 2020
Preamp (1–18 GHz)	ETS Lindgren	124334	FA002877	1 year	November 4, 2020
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	January 14, 2021
Horn antenna (1–18 GHz)	EMCO	3115	FA000825	1 year	October 31, 2020
50 Ω coax cable	Huber + Suhner	None	FA003099	1 year	April 9, 2021
High pass filter (1-10 GHz)	Thilithic Inc.	6HC1000/10000-3-KK	FA002232	1 year	February 3, 2021
Temperature chamber	Espec	EPX-4H	FA002735	1 year	September 11, 2020
Frequency counter	HP	5352B	FA001915	2 year	December 5, 2020

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

Section 8. Testing data

8.1 Number of frequencies

8.1.1 References, definitions and limits

ANSI C63.26, Clause 5.1.2:

Measurements of transmitters shall be performed and, if required, reported for each frequency band in which the EUT can be operated with the device transmitting at the number of frequencies in each band specified in table below.

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 8.1-1: *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.

8.1.2 Test summary

Verdict	Pass		
Tested by	Andrey Adelberg	Test date	September 4, 2020

8.1.3 Observations, settings and special notes

None

8.1.4 Test data

Table 8.1-2: *Test channels selection for 5 MHz channel width*

Start of Frequency range, MHz	End of Frequency range, MHz	Frequency range bandwidth, MHz	Low channel, MHz	Mid channel, MHz	High channel, MHz
746	756	10	748.5	751.0	753.5

This EUT has only one 10-MHz channel of operation: 751.0 MHz

8.2 Peak output power at RF antenna connector

8.2.1 References, definitions and limits

FCC §27.50:

(b) The following power and antenna height limits apply to transmitters operating in the 746–758 MHz, 775–788 MHz and 805–806 MHz bands:

(2) Fixed and base stations transmitting a signal in the 746–757 MHz, 758–763 MHz, 776–787 MHz, and 788–793 MHz bands with an emission bandwidth of 1 MHz or less must not exceed an ERP of 1000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section.

(3) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 746–757 MHz, 758–763 MHz, 776–787 MHz, and 788–793 MHz bands with an emission bandwidth of 1 MHz or less must not exceed an ERP of 2000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts ERP in accordance with Table 2 of this section.

(4) Fixed and base stations transmitting a signal in the 746–757 MHz, 758–763 MHz, 776–787 MHz, and 788–793 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP accordance with Table 3 of this section.

(5) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 746–757 MHz, 758–763 MHz, 776–787 MHz, and 788–793 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section.

(6) Licensees of fixed or base stations transmitting a signal in the 746–757 MHz, 758–763 MHz, 776–787 MHz, and 788–793 MHz bands at an ERP greater than 1000 watts must comply with the provisions set forth in paragraph (b)(8) of this section and §27.55(c).

(7) Licensees seeking to operate a fixed or base station located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 746–757 MHz, 758–763 MHz, 776–787 MHz, and 788–793 MHz bands at an ERP greater than 1000 watts must:

(8) Licensees authorized to transmit in the 746–757 MHz, 758–763 MHz, 776–787 MHz, and 788–793 MHz bands and intending to operate a base or fixed station at a power level permitted under the provisions of paragraph (b)(6) of this section must provide advanced notice of such operation to the Commission and to licensees authorized in their area of operation. Licensees who must be notified are all licensees authorized to operate in the 763–775 MHz and 793–805 MHz bands under part 90 of this chapter within 75 km of the base or fixed station and all regional planning committees, as identified in §90.527 of this chapter, with jurisdiction within 75 km of the base or fixed station. Notifications must provide the location and operating parameters of the base or fixed station, including the station's ERP, antenna coordinates, antenna height above ground, and vertical antenna pattern, and such notifications must be provided at least 90 days prior to the commencement of station operation.

(12) For transmissions in the 746–757, 758–763, 776–787, and 788–793 MHz bands, licensees may employ equipment operating in compliance with either the measurement techniques described in paragraph (b)(11) of this section or a Commission-approved average power technique. In both instances, equipment employed must be authorized in accordance with the provisions of §27.51

RSS-130:

4.6.3 Frequency bands 698–756 MHz and 777–787 MHz

The e.r.p. shall not exceed 30 watts for mobile equipment and outdoor fixed subscriber equipment. The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment.

For base and fixed equipment other than fixed subscriber equipment, refer to SRSP-518 for the e.i.r.p. limits.

SRSP-518, Clause 5.1:

21 For fixed and base stations transmitting in accordance with section 4, the maximum permissible equivalent isotropically radiated power (e.i.r.p.) is 1640 watts and 1640 watts/MHz for a channel bandwidth less than or equal to 1 MHz and greater than 1 MHz, respectively. These e.i.r.p. limits apply for stations with an antenna height above average terrain (HAAT) up to 305 metres.

22 Fixed and base stations located in geographical areas at a distance greater than 26 km from large or medium population centres and transmitting in accordance with section 4, may increase their e.i.r.p. up to a maximum of 3280 watts/MHz (i.e. no more than 3280 watts e.i.r.p. in any 1 MHz band segment), with an antenna HAAT up to 305 metres.

23 Within 26 km of any large or medium population centre, fixed and base stations may operate at increased e.i.r.p. if more than 50% of the population within a particular sector's coverage is located outside these large and medium population centres.

24 Fixed and base stations with increased e.i.r.p. must not be used to provide coverage to large and medium population centres. However, some incidental coverage of these large and medium population centres by stations with increased e.i.r.p. is permitted.

25 This provision also applies for fixed and base stations with a channel bandwidth equal to or less than 1 MHz (i.e. e.i.r.p. may be increased up to a maximum of 3280 watts).

26 For all installations with an antenna HAAT in excess of 305 metres, a corresponding reduction in e.i.r.p. according to the following formula shall be applied:

$$EIRP_{reduction} = 20 \log_{10}(HAAT/305) \text{ [dB]}$$

8.2.2 Test summary

Verdict	Pass		
Tested by	Andrey Adelberg	Test date	September 4, 2020

8.2.3 Observations, settings and special notes

The EUT was set up as tabletop configuration. Testing was performed using test method per ANSI C63.26, section 5.2.4 Average power and power spectral density measurements.

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.

ERP limit is 1000 W/MHz (60 dBm/MHz), EIRP limit is 1640 W/MHz (62.1484 dBm/MHz)
Based on the RF margins noted in this report, considerations pertaining to the maximum allowed EIRP/ERP and antenna type should be considered for each installation. For demonstration of compliance with ERP requirements the calculations were performed with antenna max antenna gain of 26 dBi or 23.85 dBd.

Test receiver settings:

Detector mode	RMS
Resolution bandwidth	>OBW
Video bandwidth	>RBW
Trace mode	Power averaging
Measurement time	Auto

8.2.4 Test data

Table 8.2-1: *Output power measurement results for 5 MHz channel, SISO operation*

Remarks	Frequency, MHz	Total RF output power, dBm	Total RF output power, W	RF output power (PSD), dBm/MHz	Max antenna gain, dBd	ERP, dBm/MHz	ERP limit, dBm/MHz	Margin, dB
QPSK, antenna port 1	748.5	38.48	7.047	33.00	23.85	56.85	60.00	3.15
QPSK, antenna port 1	751.0	38.49	7.063	33.12	23.85	56.97	60.00	3.03
QPSK, antenna port 1	753.5	38.44	6.982	33.01	23.85	56.86	60.00	3.14
QPSK, antenna port 2	748.5	38.20	6.607	32.66	23.85	56.51	60.00	3.49
QPSK, antenna port 2	751.0	38.11	6.471	32.51	23.85	56.36	60.00	3.64
QPSK, antenna port 2	753.5	38.14	6.516	32.70	23.85	56.55	60.00	3.45
64-QAM, antenna port 1	748.5	38.42	6.950	32.89	23.85	56.74	60.00	3.26
64-QAM, antenna port 1	751.0	38.43	6.966	32.89	23.85	56.74	60.00	3.26
64-QAM, antenna port 1	753.5	38.54	7.145	33.01	23.85	56.86	60.00	3.14
64-QAM, antenna port 2	748.5	38.10	6.457	32.66	23.85	56.51	60.00	3.49
64-QAM, antenna port 2	751.0	38.11	6.471	32.66	23.85	56.51	60.00	3.49
64-QAM, antenna port 2	753.5	38.09	6.442	32.62	23.85	56.47	60.00	3.53

Table 8.2-2: *Output power measurement results for 10 MHz channel, SISO operation*

Remarks	Frequency, MHz	Total RF output power, dBm	Total RF output power, W	RF output power (PSD), dBm/MHz	Max antenna gain, dBd	ERP, dBm/MHz	ERP limit, dBm/MHz	Margin, dB
QPSK, antenna port 1	751.0	38.44	6.982	29.84	23.85	53.69	60.00	6.31
QPSK, antenna port 2	751.0	38.08	6.427	29.53	23.85	53.38	60.00	6.62
64-QAM, antenna port 1	751.0	38.45	6.998	29.84	23.85	53.69	60.00	6.31
64-QAM, antenna port 2	751.0	38.06	6.397	29.44	23.85	53.29	60.00	6.71

Test data, continued

Table 8.2-3: *Output power measurement results for 5 MHz, MIMO operation*

Remarks	Frequency, MHz	RF output power Antenna 1, dBm/MHz	RF output power Antenna 2, dBm/MHz	Total output power, dBm/MHz	Max antenna gain, dBd	ERP, dBm/MHz	ERP limit, dBm/MHz	Margin, dB
QPSK modulation	748.5	33.00	32.66	35.84	23.85	59.69	60.00	0.31
QPSK modulation	751.0	33.12	32.51	35.84	23.85	59.69	60.00	0.31
QPSK modulation	753.5	33.01	32.70	35.87	23.85	59.72	60.00	0.28
64-QAM modulation	748.5	32.89	32.66	35.79	23.85	59.64	60.00	0.36
64-QAM modulation	751.0	32.89	32.66	35.79	23.85	59.64	60.00	0.36
64-QAM modulation	753.5	33.01	32.62	35.83	23.85	59.68	60.00	0.32

Table 8.2-4: *Output power measurement results for 10 MHz, MIMO operation*

Remarks	Frequency, MHz	RF output power Antenna 1, dBm/MHz	RF output power Antenna 2, dBm/MHz	Total output power, dBm/MHz	Max antenna gain, dBd	ERP, dBm/MHz	ERP limit, dBm/MHz	Margin, dB
QPSK modulation	751.0	29.84	29.84	32.85	23.85	56.70	60.00	3.30
64-QAM modulation	751.0	29.53	29.44	32.50	23.85	56.35	60.00	3.65

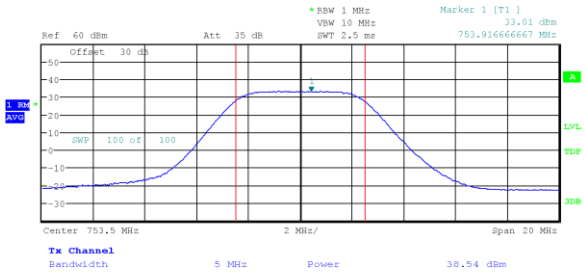


Figure 8.2-1: *Output power and PSD sample plot for 5 MHz channel*

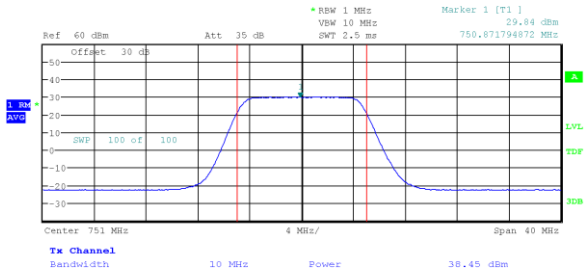


Figure 8.2-2: *Output power and PSD sample plot for 10 MHz channel*

Test data, continued

Table 8.2-5: *Complementary Cumulative Distribution Function (CCDF) of the PAPR reduction measurement results*

Remarks	Frequency, MHz	0.1% CCDF, dB	PAPR reduction limit, dB	Margin, dB
QPSK, antenna port 1, 5 MHz channel	748.5	7.47	13.00	5.53
QPSK, antenna port 1, 5 MHz channel	751.0	7.50	13.00	5.50
QPSK, antenna port 1, 5 MHz channel	753.5	7.53	13.00	5.47
QPSK, antenna port 2, 5 MHz channel	748.5	7.50	13.00	5.50
QPSK, antenna port 2, 5 MHz channel	751.0	7.50	13.00	5.50
QPSK, antenna port 2, 5 MHz channel	753.5	7.53	13.00	5.47
64-QAM, antenna port 1, 5 MHz channel	748.5	7.47	13.00	5.53
64-QAM, antenna port 1, 5 MHz channel	751.0	7.56	13.00	5.44
64-QAM, antenna port 1, 5 MHz channel	753.5	7.53	13.00	5.47
64-QAM, antenna port 2, 5 MHz channel	748.5	7.53	13.00	5.47
64-QAM, antenna port 2, 5 MHz channel	751.0	7.56	13.00	5.44
64-QAM, antenna port 2, 5 MHz channel	753.5	7.47	13.00	5.53
QPSK, antenna port 1, 10 MHz channel	751.0	6.73	13.00	6.27
QPSK, antenna port 2, 10 MHz channel	751.0	7.72	13.00	5.28
64-QAM, antenna port 1, 10 MHz channel	751.0	7.69	13.00	5.31
64-QAM, antenna port 2, 10 MHz channel	751.0	7.76	13.00	5.24

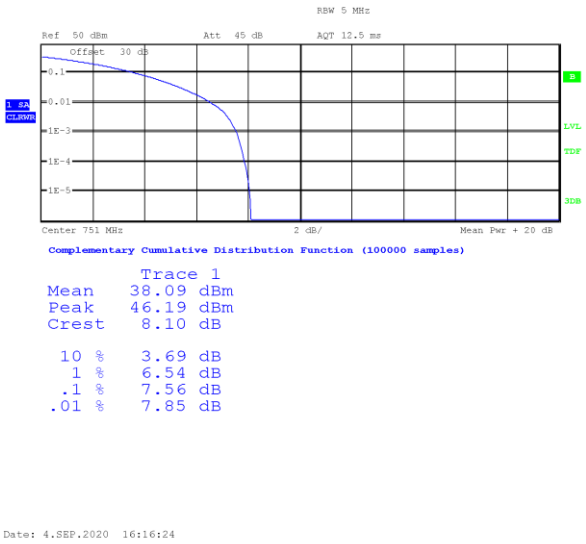


Figure 8.2-3: *CCDF sample plot for PAPR values for 5 MHz channel*

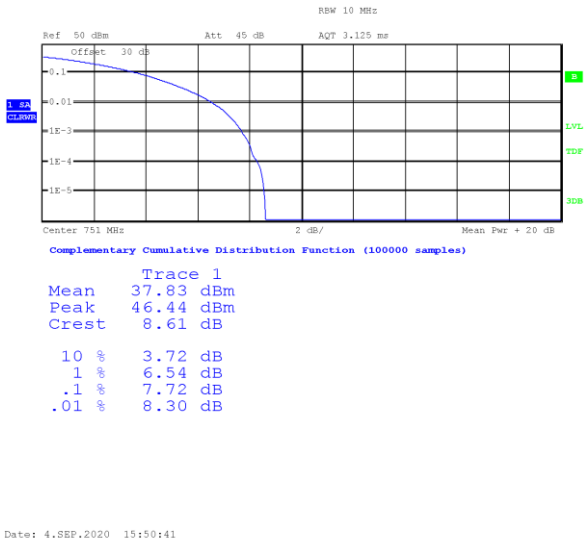


Figure 8.2-4: *CCDF sample plot for PAPR values for 10 MHz channel*

8.3 Spurious emissions at RF antenna connector

8.3.1 References, definitions and limits

FCC §27.53:

(c) For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(5) Compliance with the provisions of paragraph (c)(1) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraph (c)(3) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

RSS-130:

4.7.1 General unwanted emissions limits

The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 $\log_{10}$ p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

4.7.2 Additional unwanted emissions limits

In addition to the limit outlined in section 4.7.1 above, equipment operating in the frequency bands 746–756 MHz and 777–787 MHz shall also comply with the following restrictions:

(a) The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763–775 MHz and 793–806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:

- 76 + 10 $\log_{10}$ p (watts), dB, for base and fixed equipment and
- 65 + 10 $\log_{10}$ p (watts), dB, for mobile and portable equipment

8.3.2 Test summary

Verdict	Pass		
Tested by	Andrey Adelberg	Test date	September 8 and 9, 2020

8.3.3 Observations, settings and special notes

Testing was performed using test method per ANSI C63.26, section 5.7 Unwanted (out-of-band and spurious) conducted emissions measurement procedures (conducted test at antenna port).
The spectrum was searched from 9 kHz to the 10th harmonic. No emissions below 30 MHz were detected.
For MIMO applications all marker values on the plots in this section should be increased by 3 dB *(10 × Log_{10}(2))*
Testing within 763–775 MHz and 793–805 MHz frequency bands was done using 10 kHz RBW which resulted in worse results than the 6.25 kHz would have provided.

Spectrum analyzer settings for conducted spurious emissions measurements:

Resolution bandwidth:	10 kHz, 30 kHz and 100 kHz
Video bandwidth:	≥ 3 × RBW
Detector mode:	Peak
Trace mode:	Max Hold

8.3.4 Test data

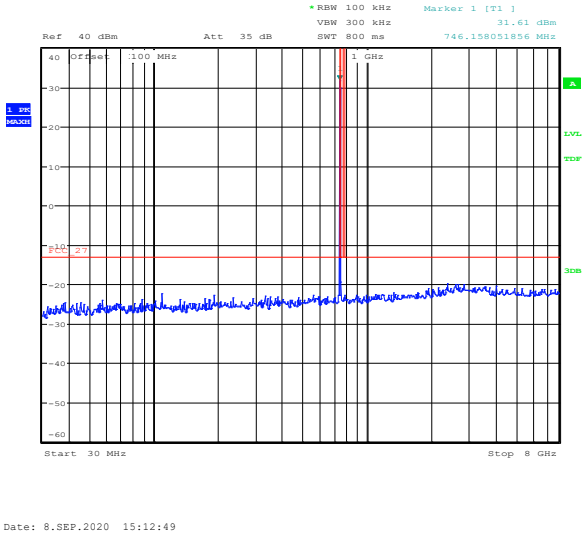


Figure 8.3-1: *Spurious emissions for 5 MHz low channel with QPSK at antenna 1*

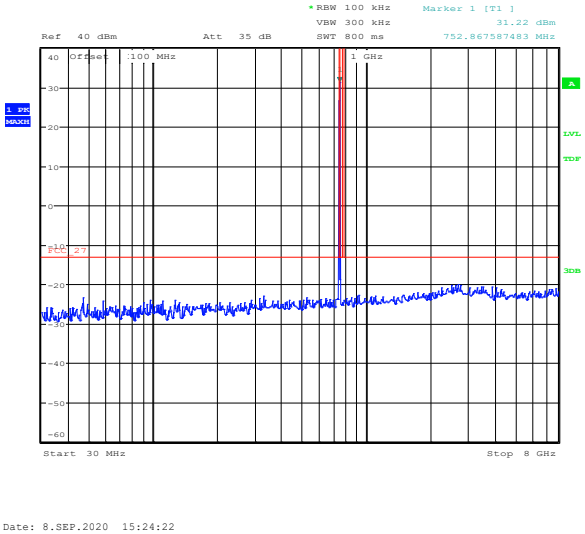


Figure 8.3-2: *Spurious emissions for 5 MHz mid channel with QPSK at antenna 1*

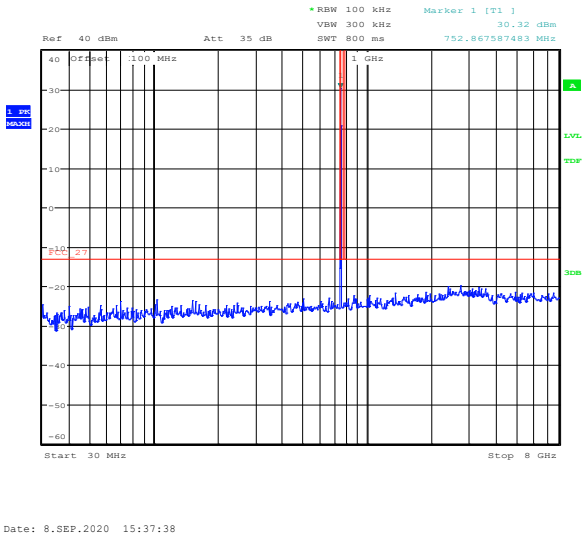


Figure 8.3-3: *Spurious emissions for 5 MHz high channel with QPSK at antenna 1*

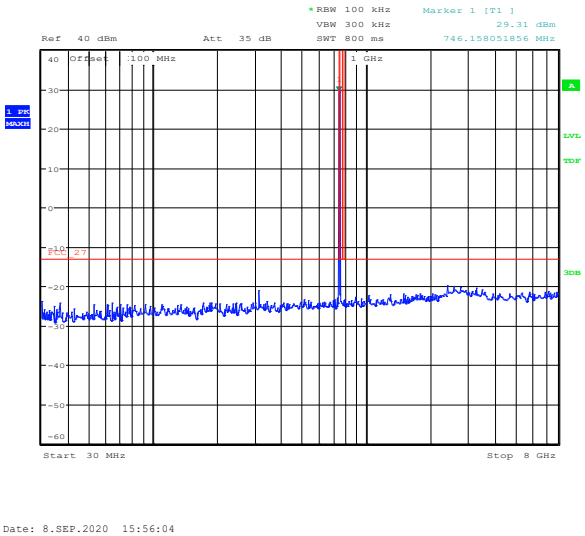


Figure 8.3-4: *Spurious emissions for 5 MHz low channel with 64QAM at antenna 1*

Test data, continued

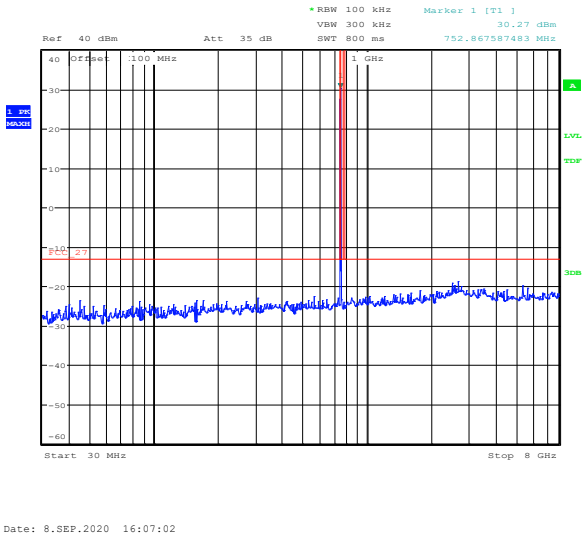


Figure 8.3-5: *Spurious emissions for 5 MHz mid channel with 64QAM at antenna 1*

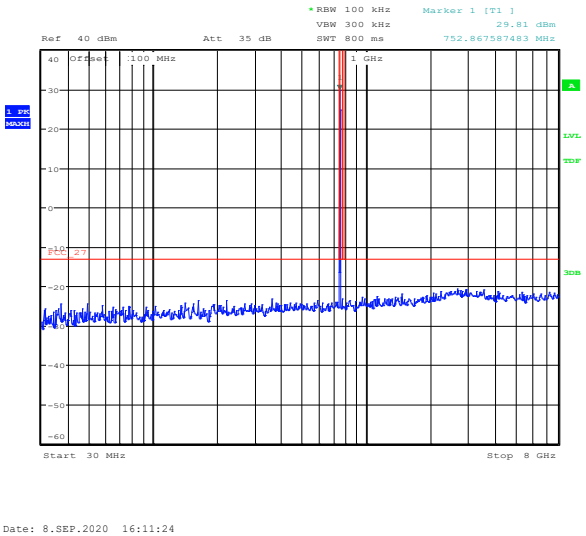


Figure 8.3-6: *Spurious emissions for 5 MHz high channel with 64QAM at antenna 1*

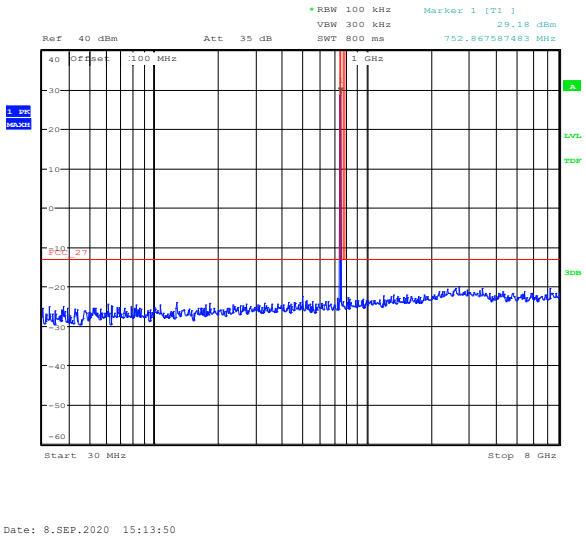


Figure 8.3-7: *Spurious emissions for 5 MHz low channel with QPSK at antenna 2*

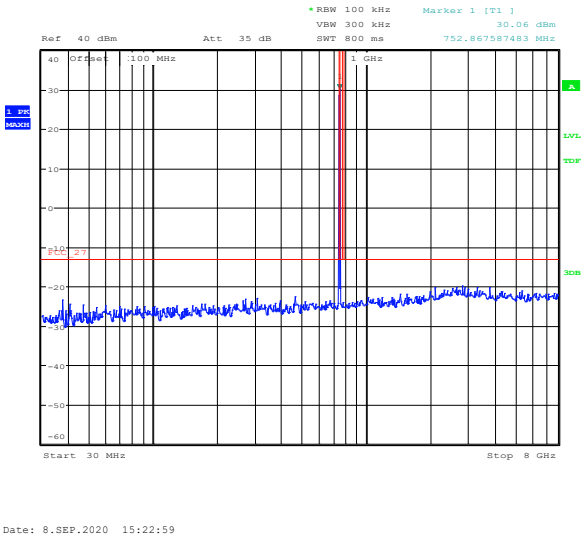


Figure 8.3-8: *Spurious emissions for 5 MHz mid channel with QPSK at antenna 2*

Test data, continued

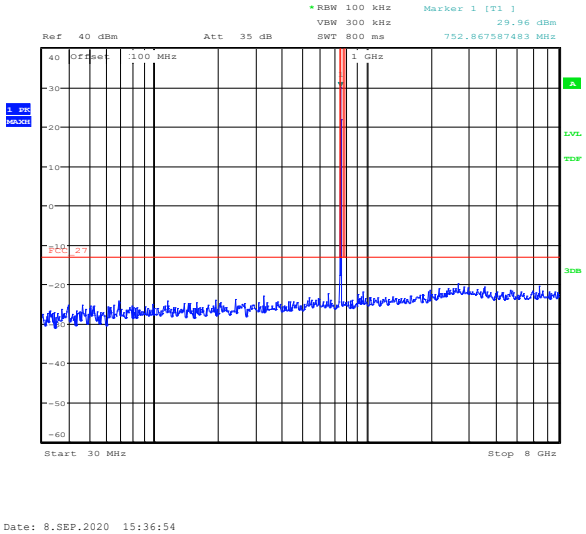


Figure 8.3-9: *Spurious emissions for 5 MHz high channel with QPSK at antenna 2*

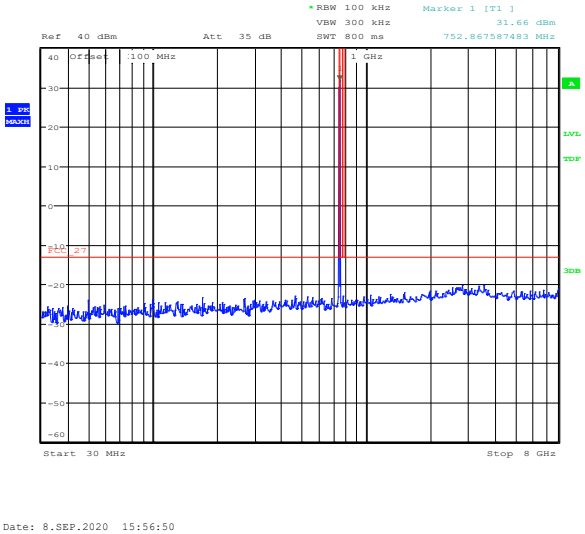


Figure 8.3-10: *Spurious emissions for 5 MHz low channel with 64QAM at antenna 2*

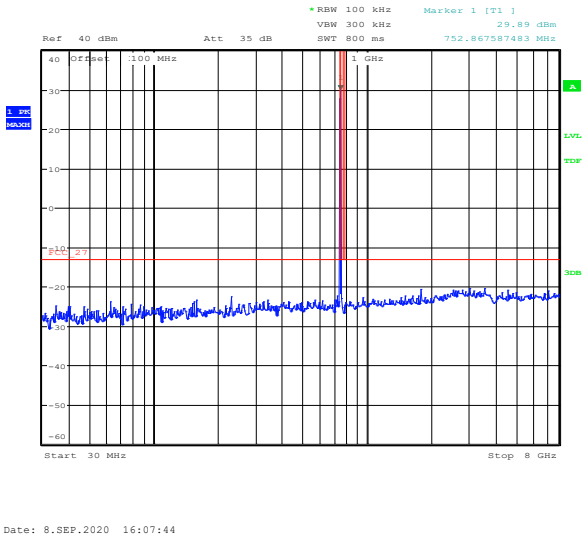


Figure 8.3-11: *Spurious emissions for 5 MHz mid channel with 64QAM at antenna 2*

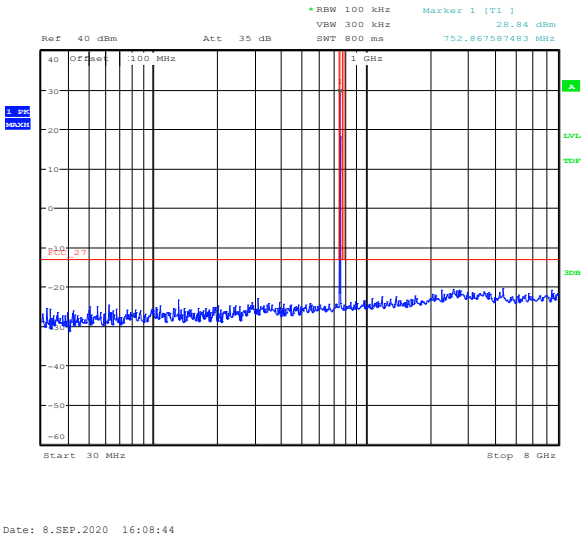


Figure 8.3-12: *Spurious emissions for 5 MHz high channel with 64QAM at antenna 2*

Test data, continued

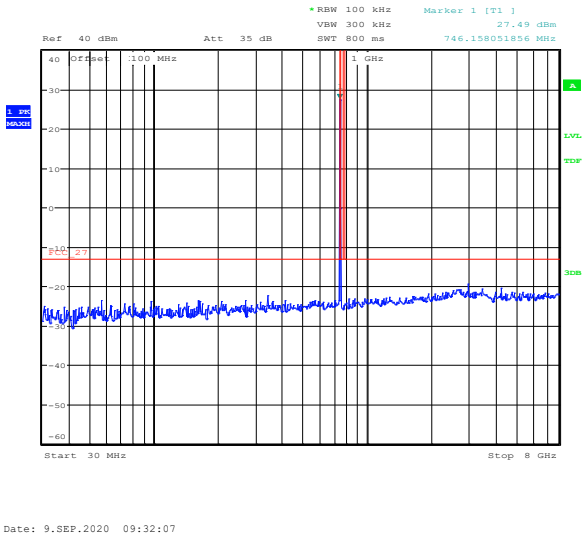


Figure 8.3-13: *Spurious emissions for 10 MHz channel with QPSK at antenna 1*

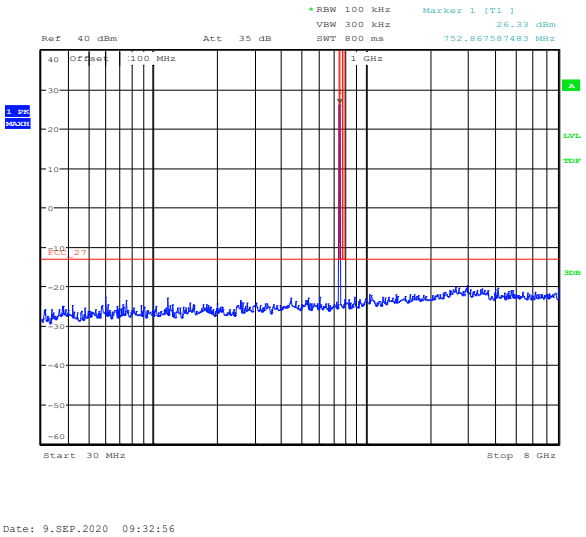


Figure 8.3-14: *Spurious emissions for 10 MHz channel with QPSK at antenna 2*

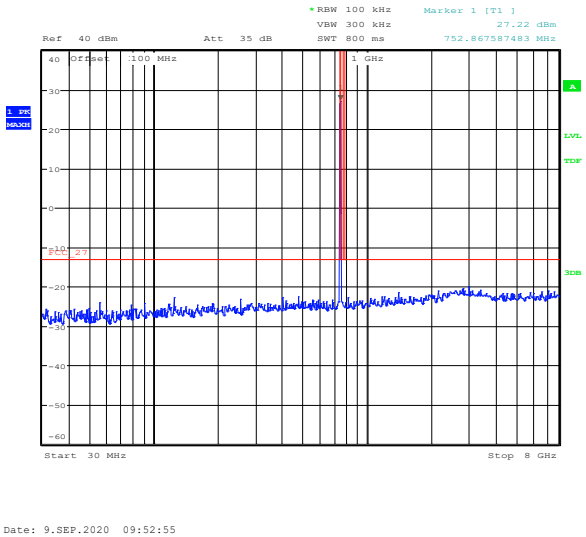


Figure 8.3-15: *Spurious emissions for 10 MHz channel with 64QAM at antenna 1*

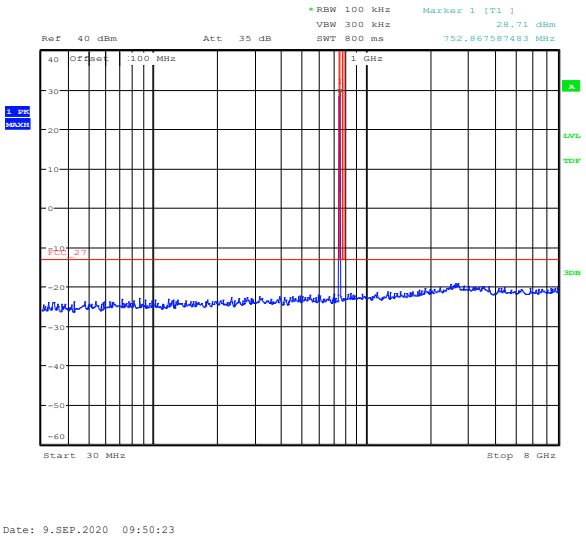


Figure 8.3-16: *Spurious emissions for 10 MHz channel with 64QAM at antenna 2*

Test data, continued

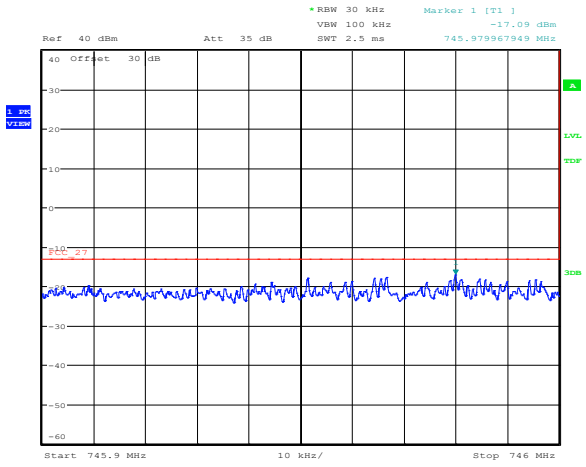


Figure 8.3-17: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 5 MHz low channel with QPSK at antenna 1*

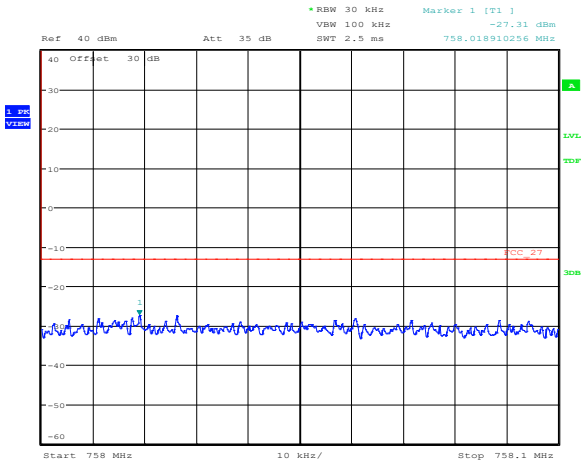


Figure 8.3-18: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 5 MHz low channel with QPSK at antenna 1*

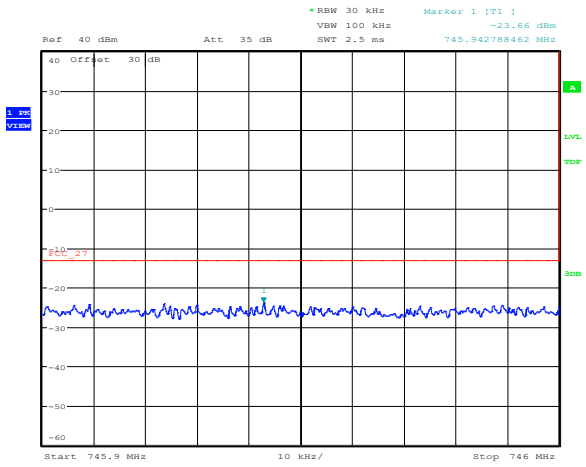


Figure 8.3-19: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 5 MHz low channel with QPSK at antenna 2*

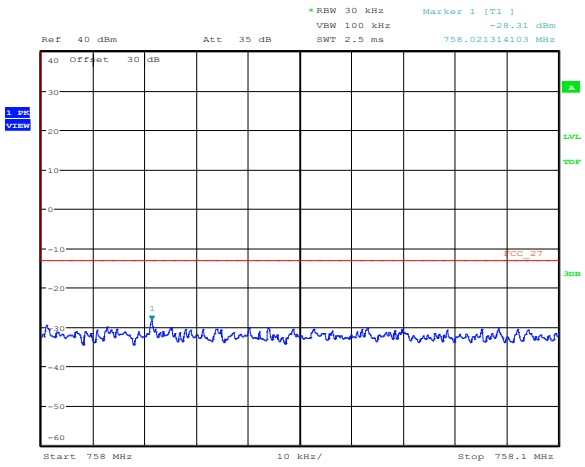


Figure 8.3-20: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 5 MHz low channel with QPSK at antenna 2*

Test data, continued

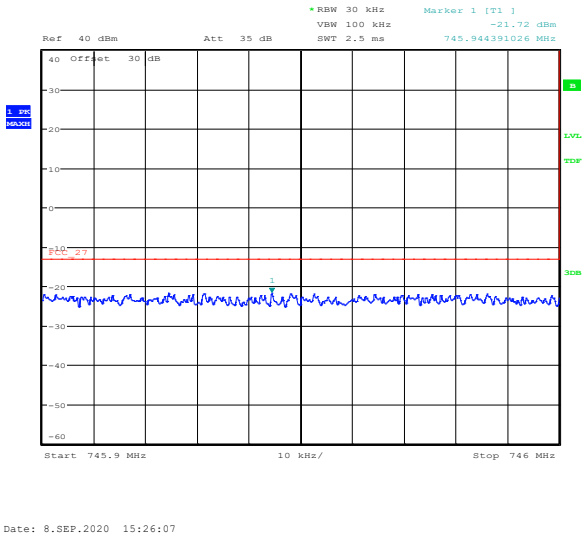


Figure 8.3-21: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 5 MHz mid channel with QPSK at antenna 1*

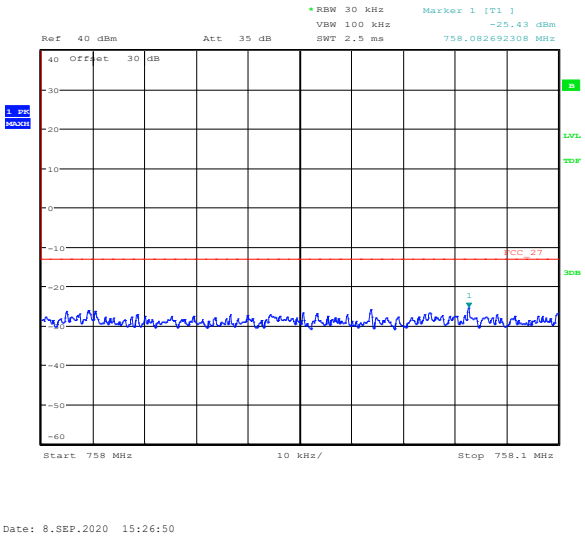


Figure 8.3-22: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 5 MHz mid channel with QPSK at antenna 1*

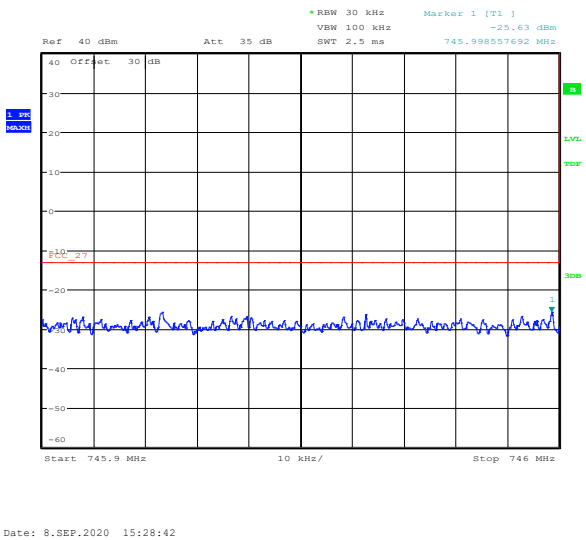


Figure 8.3-23: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 5 MHz mid channel with QPSK at antenna 2*

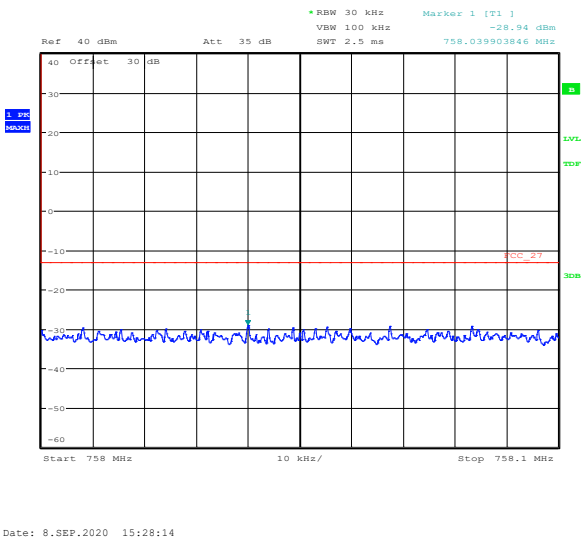


Figure 8.3-24: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 5 MHz mid channel with QPSK at antenna 2*

Test data, continued

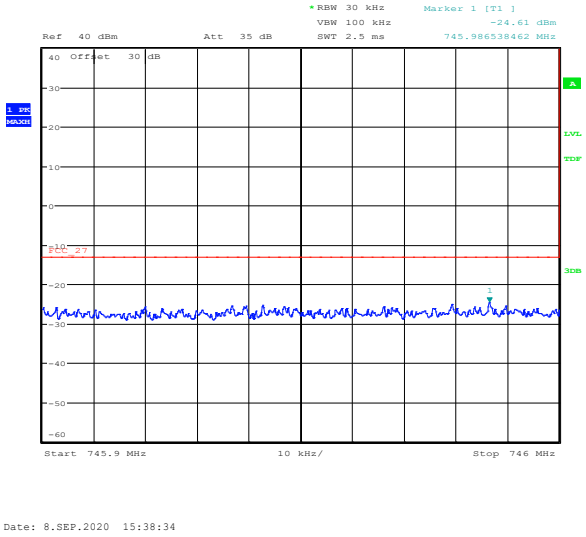


Figure 8.3-25: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 5 MHz high channel with QPSK at antenna 1*

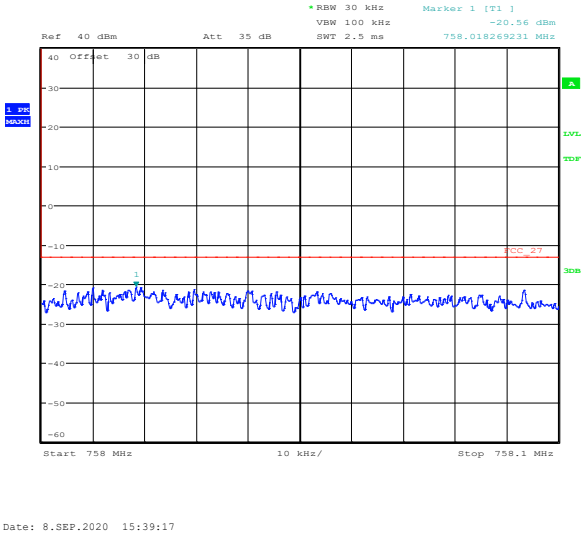


Figure 8.3-26: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 5 MHz high channel with QPSK at antenna 1*

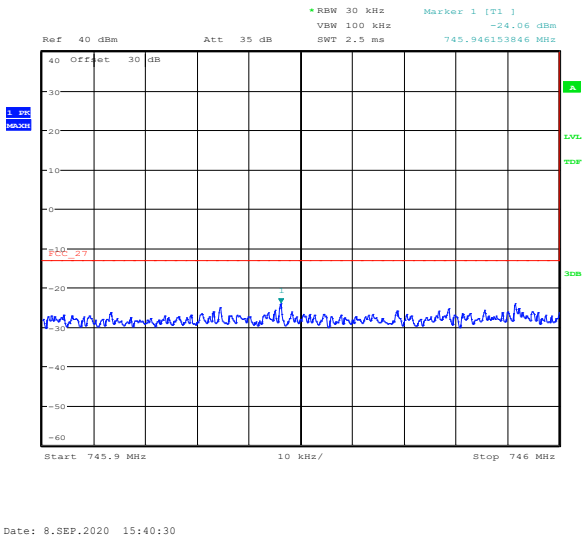


Figure 8.3-27: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 5 MHz high channel with QPSK at antenna 2*

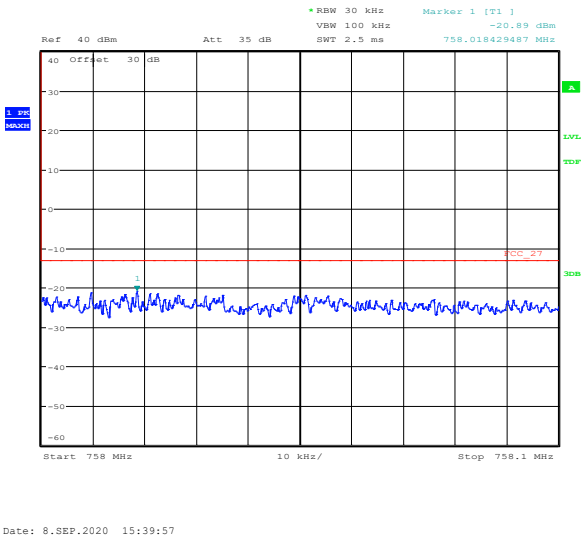


Figure 8.3-28: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 5 MHz high channel with QPSK at antenna 2*

Test data, continued

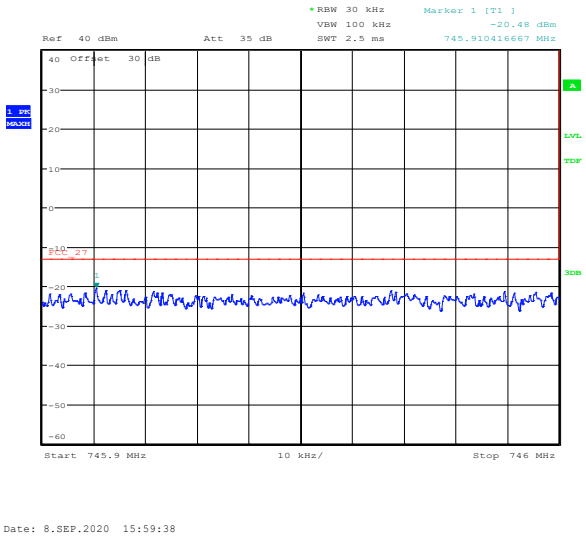


Figure 8.3-29: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 5 MHz low channel with 64QAM at antenna 1*

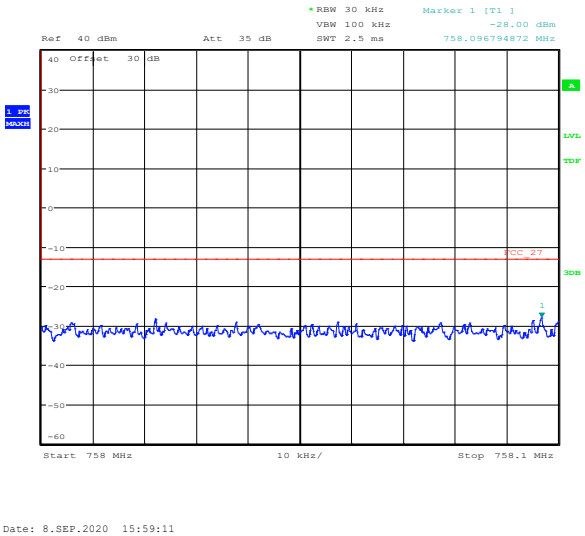


Figure 8.3-30: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 5 MHz low channel with 64QAM at antenna 1*

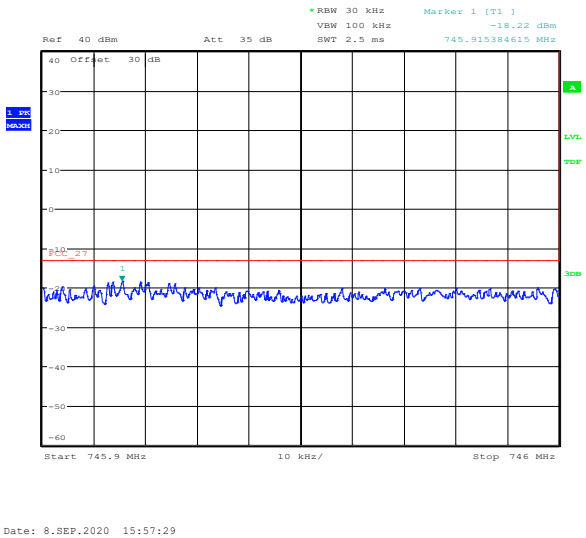


Figure 8.3-31: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 5 MHz low channel with 64QAM at antenna 2*

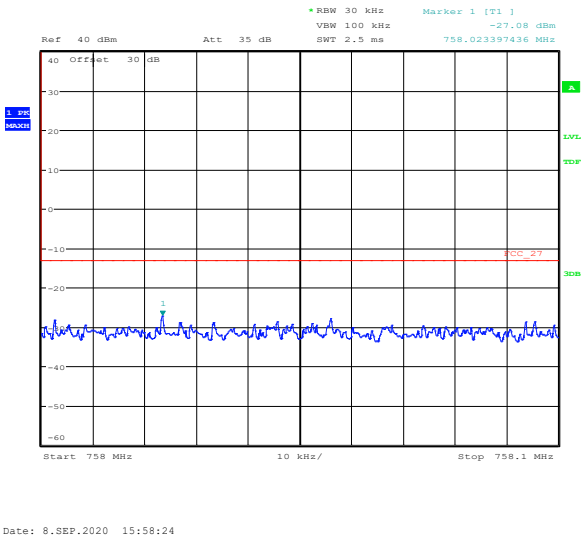


Figure 8.3-32: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 5 MHz low channel with 64QAM at antenna 2*

Test data, continued

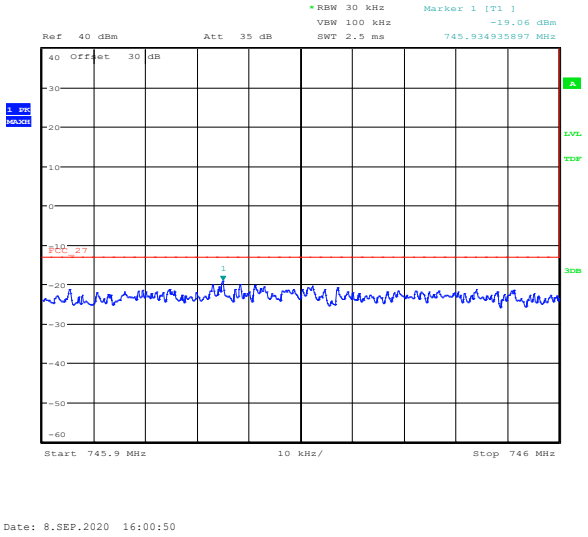


Figure 8.3-33: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 5 MHz mid channel with 64QAM at antenna 1*

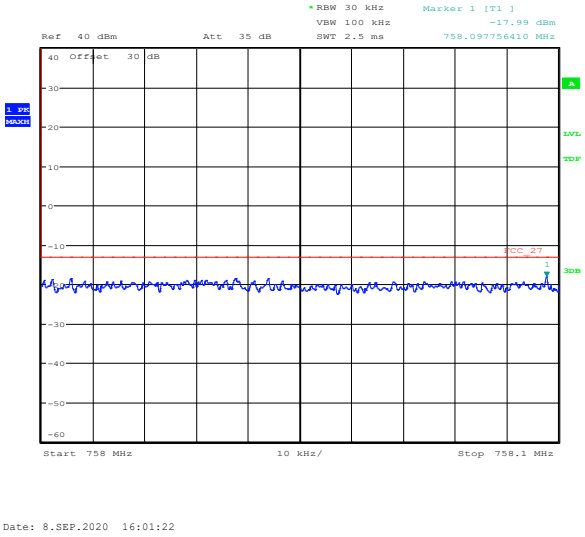


Figure 8.3-34: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 5 MHz mid channel with 64QAM at antenna 1*

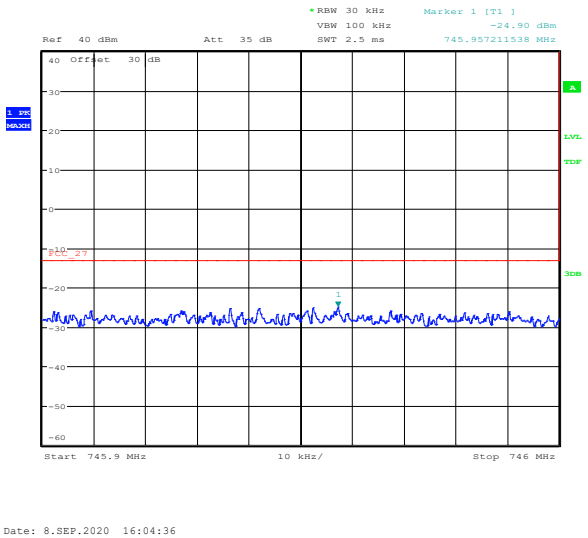


Figure 8.3-35: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 5 MHz mid channel with 64QAM at antenna 2*

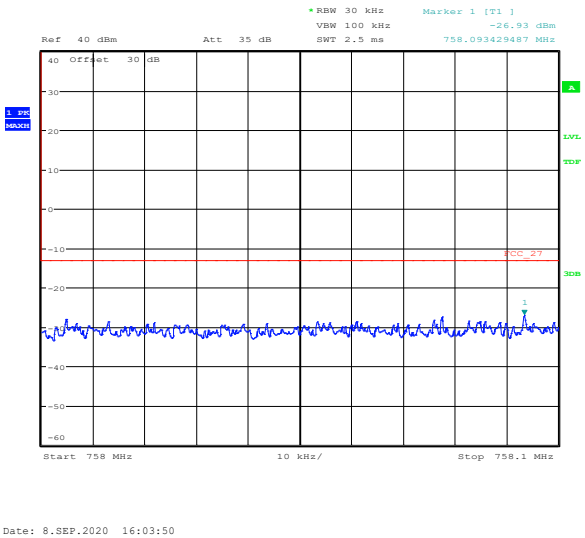


Figure 8.3-36: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 5 MHz mid channel with 64QAM at antenna 2*

Test data, continued

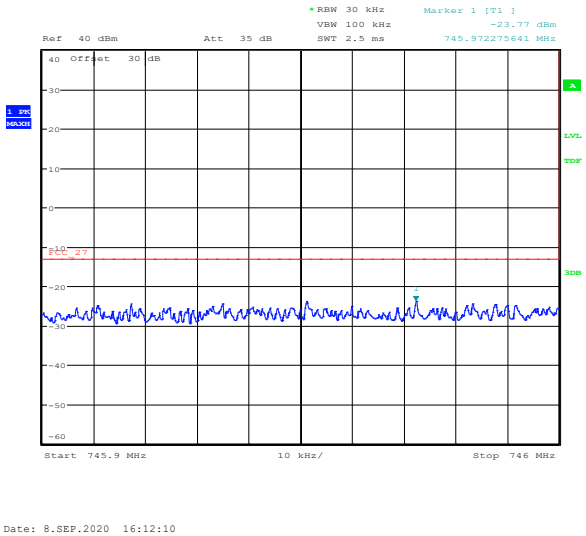


Figure 8.3-37: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 5 MHz high channel with 64QAM at antenna 1*

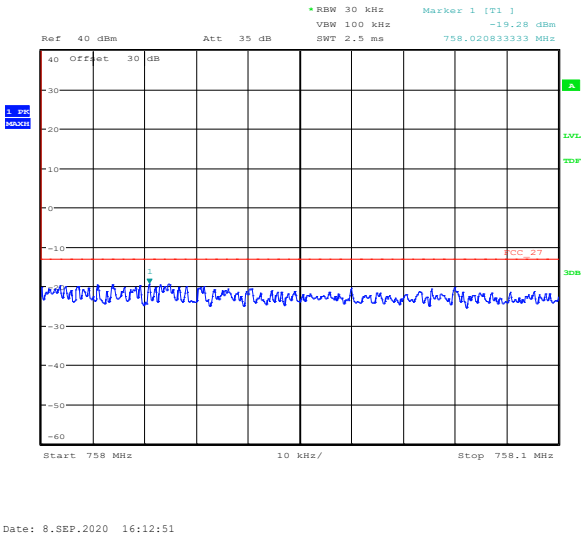


Figure 8.3-38: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 5 MHz high channel with 64QAM at antenna 1*

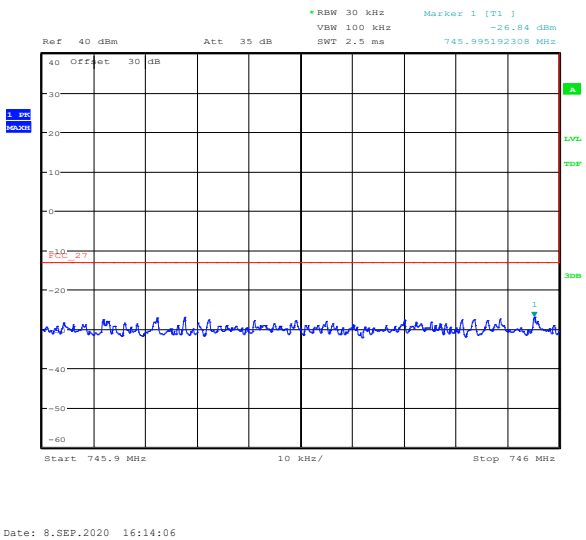


Figure 8.3-39: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 5 MHz high channel with 64QAM at antenna 2*

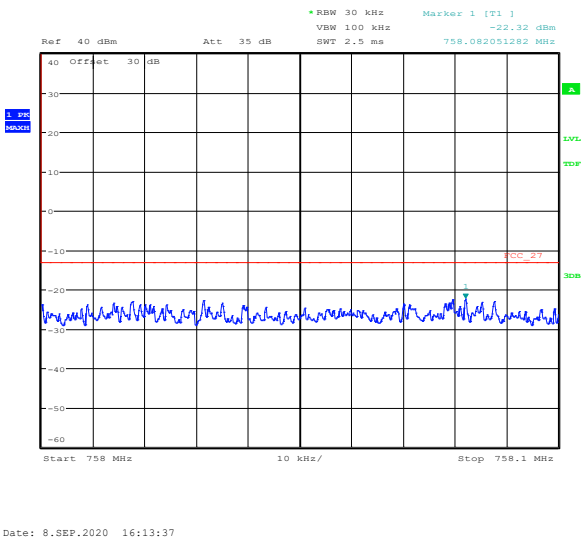


Figure 8.3-40: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 5 MHz high channel with 64QAM at antenna 2*

Test data, continued

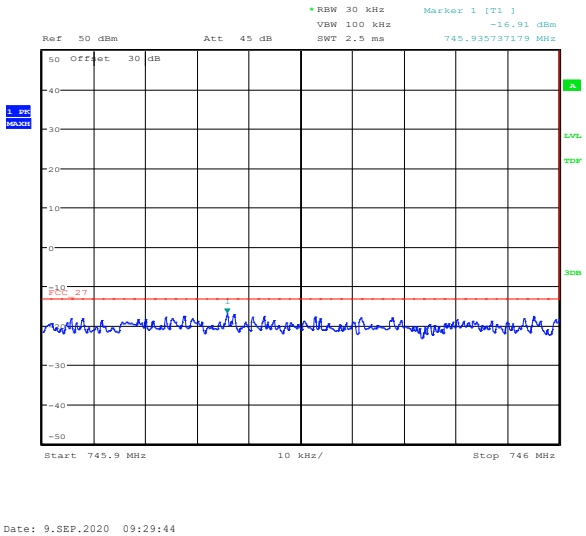


Figure 8.3-41: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 10 MHz channel with QPSK at antenna 1*

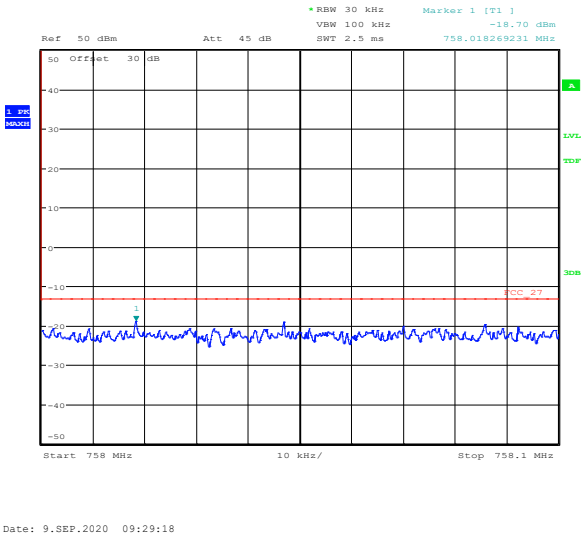


Figure 8.3-42: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 10 MHz channel with QPSK at antenna 1*

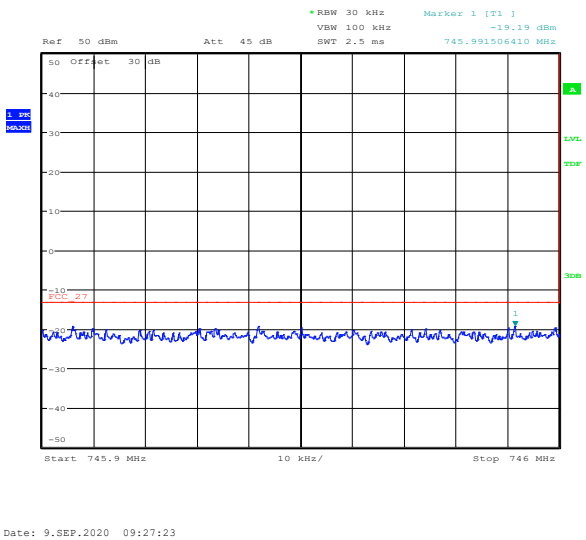


Figure 8.3-43: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 10 MHz channel with QPSK at antenna 2*

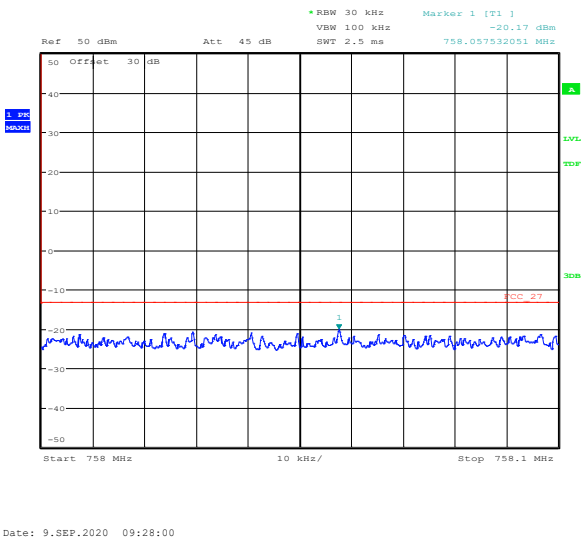


Figure 8.3-44: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 10 MHz channel with QPSK at antenna 2*

Test data, continued

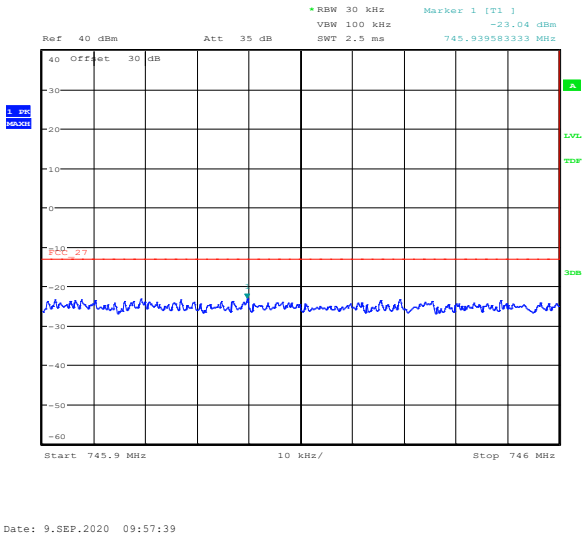


Figure 8.3-45: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 10 MHz channel with 64QAM at antenna 1*

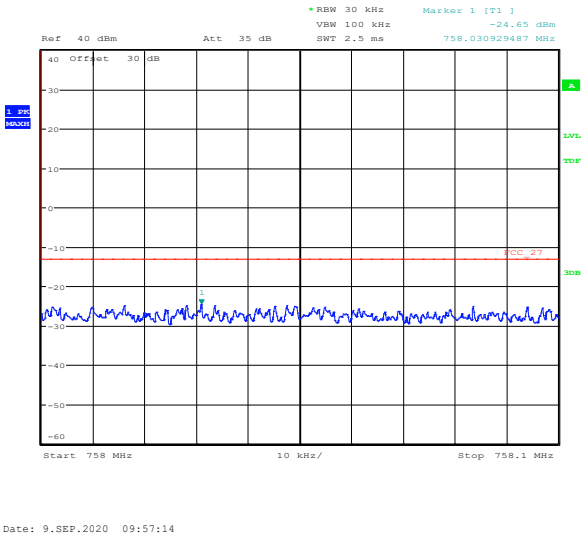


Figure 8.3-46: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 10 MHz channel with 64QAM at antenna 1*

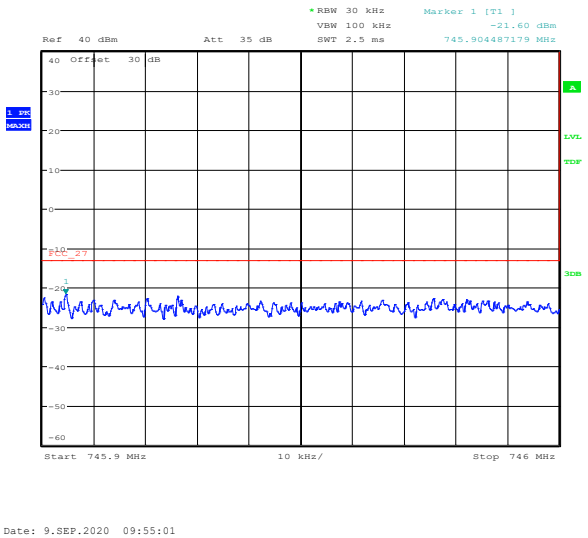


Figure 8.3-47: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 745.9–746 MHz for 10 MHz channel with 64QAM at antenna 2*

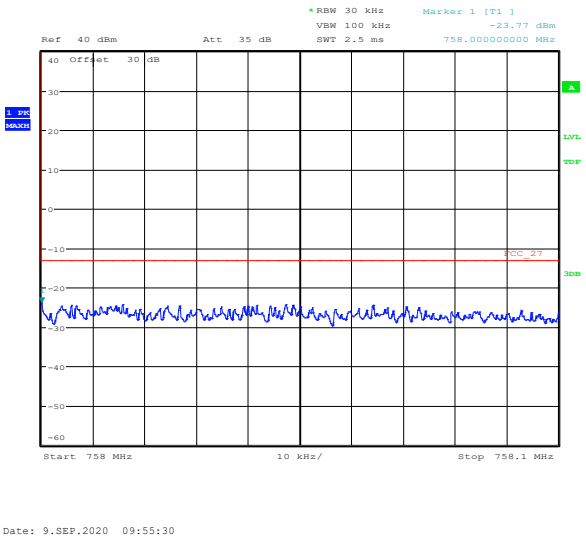


Figure 8.3-48: *Spurious emissions in the 100 kHz bands immediately outside and adjacent to the frequency block within 758–758.1 MHz for 10 MHz channel with 64QAM at antenna 2*

Test data, continued

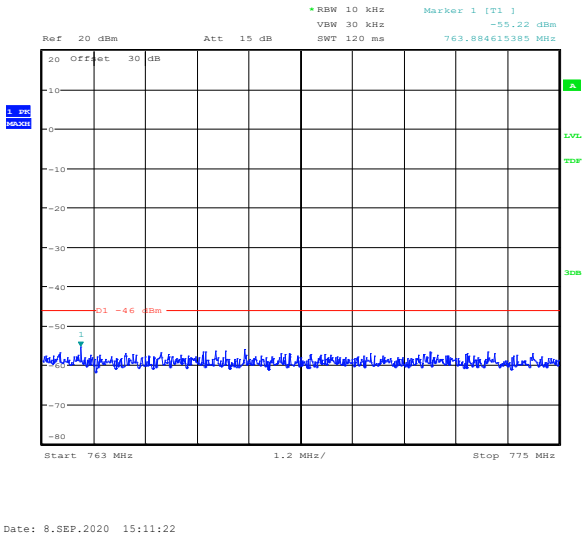


Figure 8.3-49: *Additional spurious emissions requirements within 763–775 MHz for 5 MHz low channel with QPSK at antenna 1*

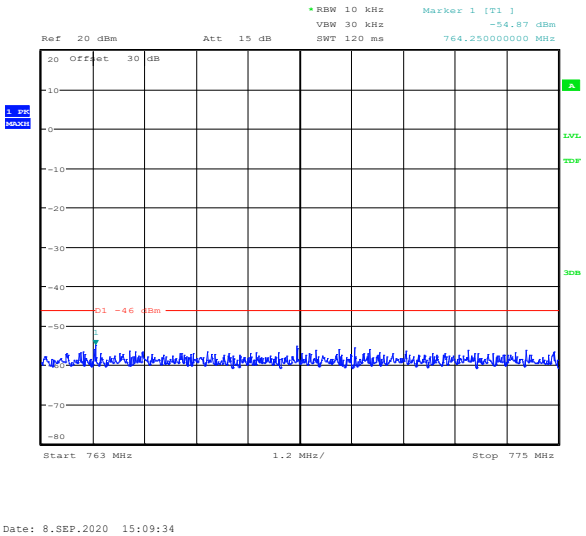


Figure 8.3-50: *Additional spurious emissions requirements within 763–775 MHz for 5 MHz low channel with QPSK at antenna 2*

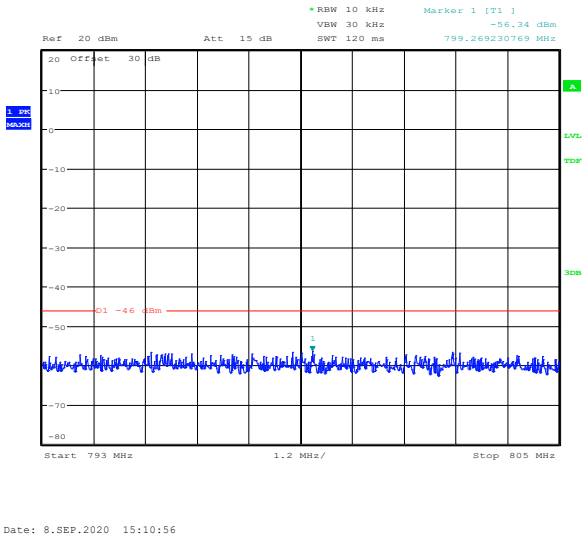


Figure 8.3-51: *Additional spurious emissions requirements within 793–805 MHz for 5 MHz low channel with QPSK at antenna 1*

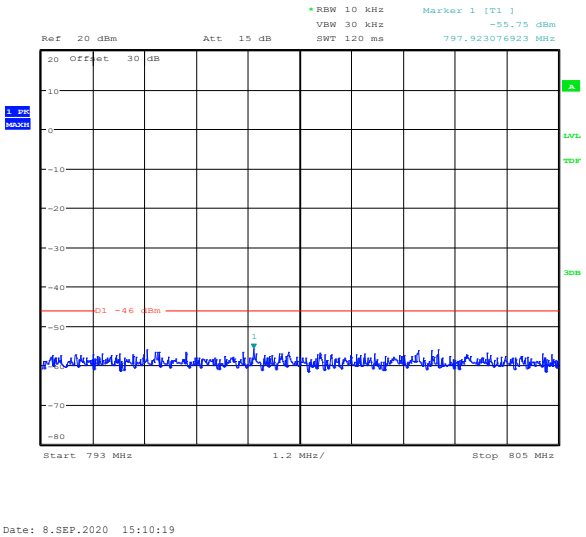


Figure 8.3-52: *Additional spurious emissions requirements within 793–805 MHz for 5 MHz low channel with QPSK at antenna 2*

Test data, continued

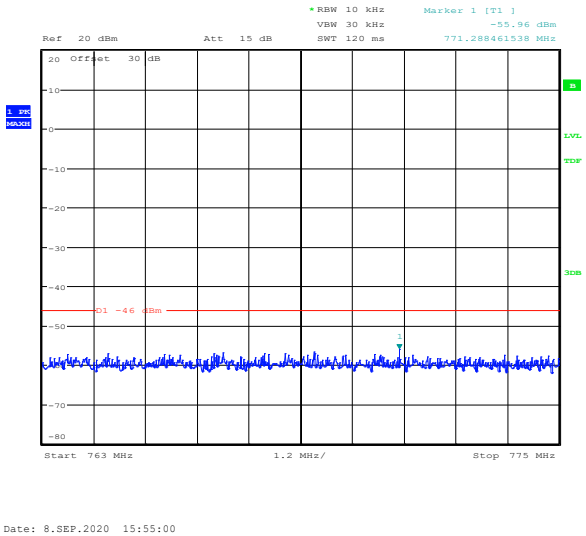


Figure 8.3-53: *Additional spurious emissions requirements within 763–775 MHz for 5 MHz low channel with 64QAM at antenna 1*

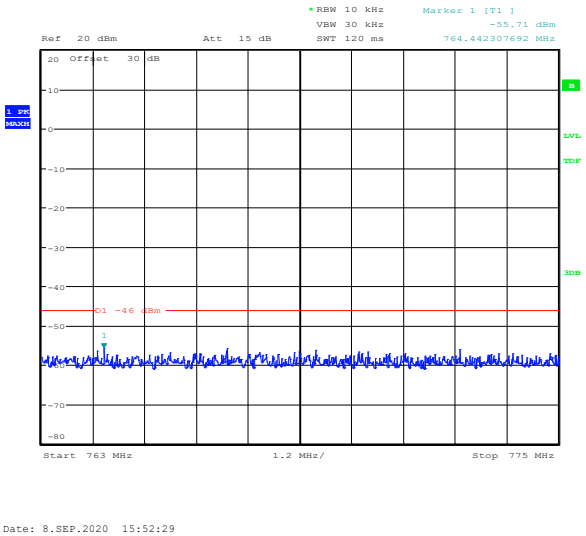


Figure 8.3-54: *Additional spurious emissions requirements within 763–775 MHz for 5 MHz low channel with 64QAM at antenna 2*

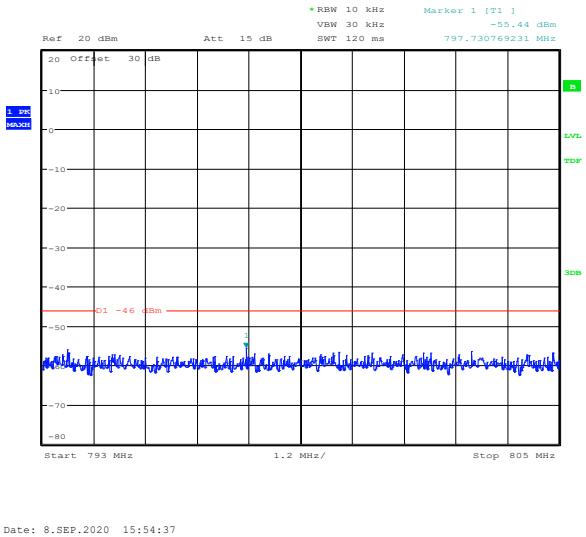


Figure 8.3-55: *Additional spurious emissions requirements within 793–805 MHz for 5 MHz low channel with 64QAM at antenna 1*

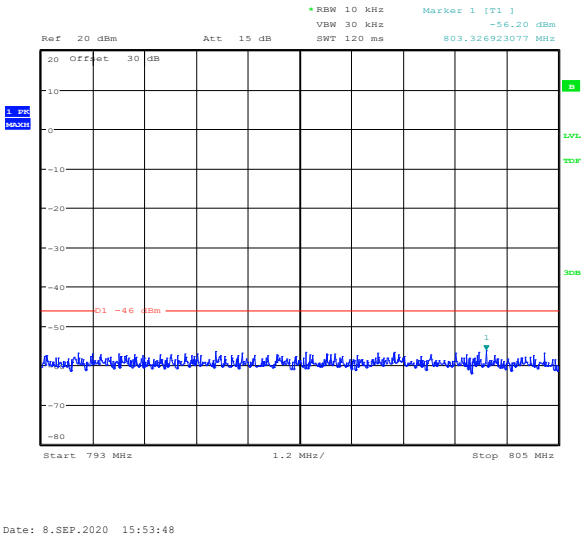


Figure 8.3-56: *Additional spurious emissions requirements within 793–805 MHz for 5 MHz low channel with 64QAM at antenna 2*

Test data, continued

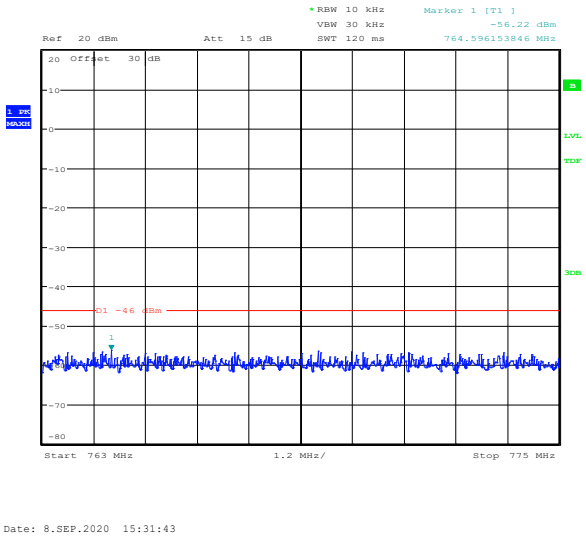


Figure 8.3-57: *Additional spurious emissions requirements within 763–775 MHz for 5 MHz mid channel with QPSK at antenna 1*

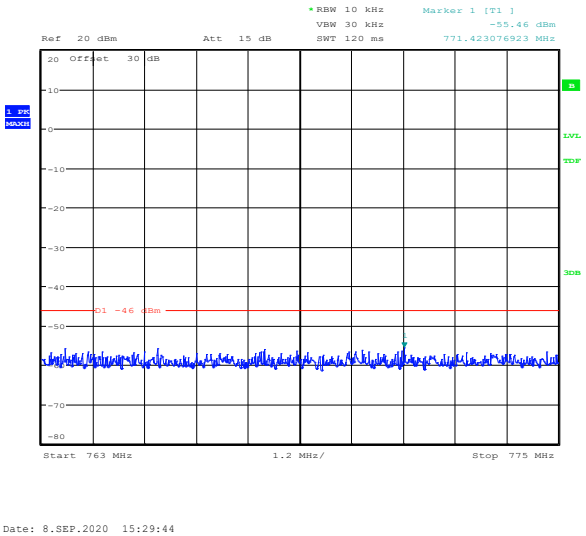


Figure 8.3-58: *Additional spurious emissions requirements within 763–775 MHz for 5 MHz mid channel with QPSK at antenna 2*

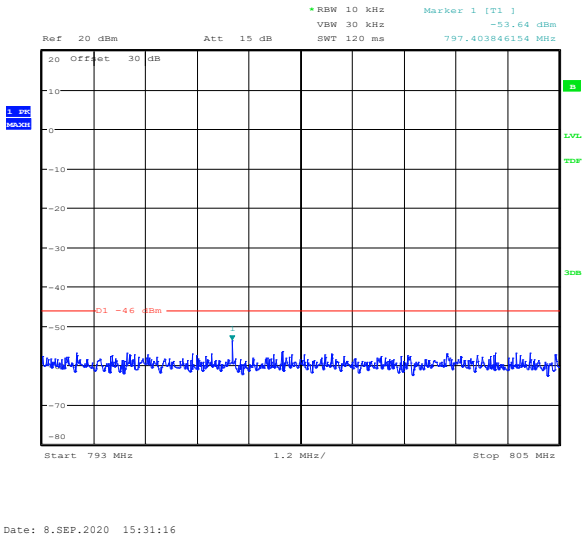


Figure 8.3-59: *Additional spurious emissions requirements within 793–805 MHz for 5 MHz mid channel with QPSK at antenna 1*

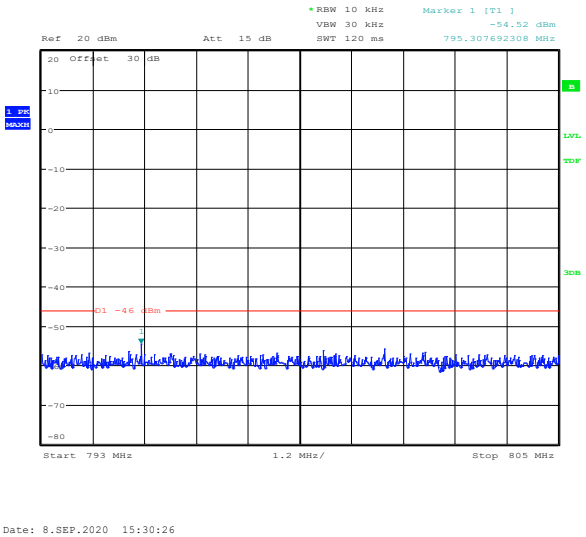


Figure 8.3-60: *Additional spurious emissions requirements within 793–805 MHz for 5 MHz mid channel with QPSK at antenna 2*

Test data, continued

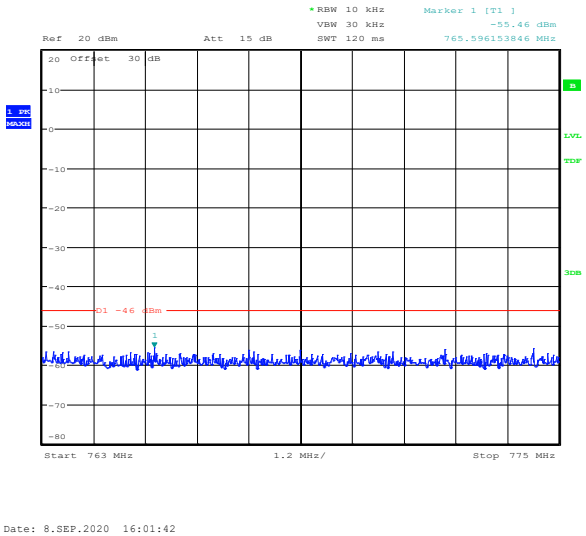


Figure 8.3-61: *Additional spurious emissions requirements within 763–775 MHz for 5 MHz mid channel with 64QAM at antenna 1*

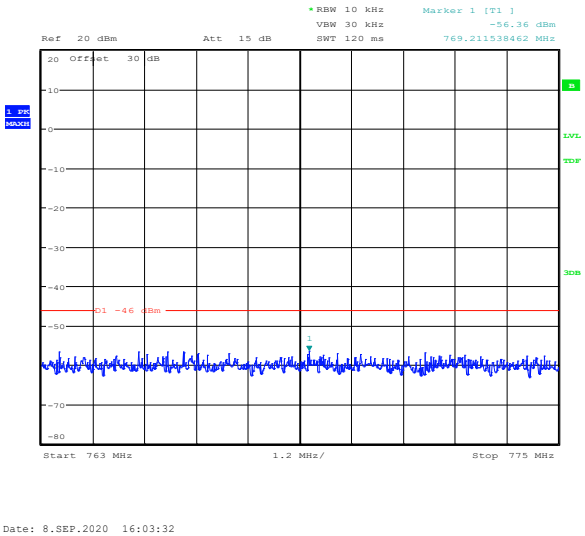


Figure 8.3-62: *Additional spurious emissions requirements within 763–775 MHz for 5 MHz mid channel with 64QAM at antenna 2*

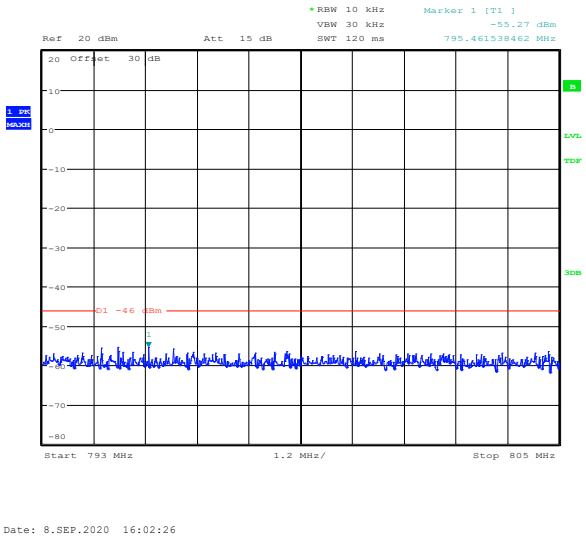


Figure 8.3-63: *Additional spurious emissions requirements within 793–805 MHz for 5 MHz mid channel with 64QAM at antenna 1*

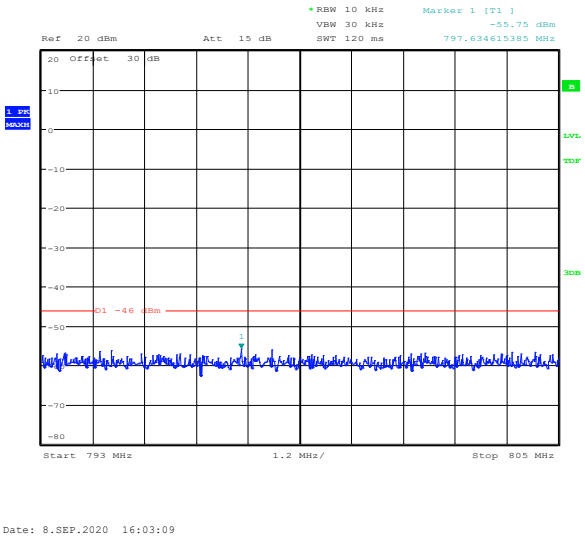


Figure 8.3-64: *Additional spurious emissions requirements within 793–805 MHz for 5 MHz mid channel with 64QAM at antenna 2*

Test data, continued

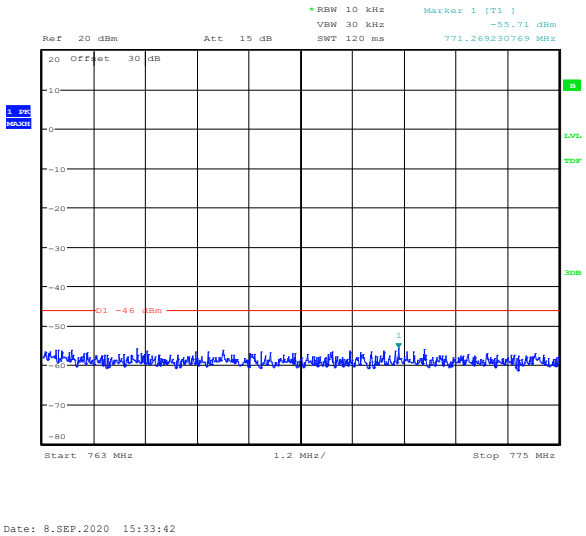


Figure 8.3-65: *Additional spurious emissions requirements within 763–775 MHz for 5 MHz high channel with QPSK at antenna 1*

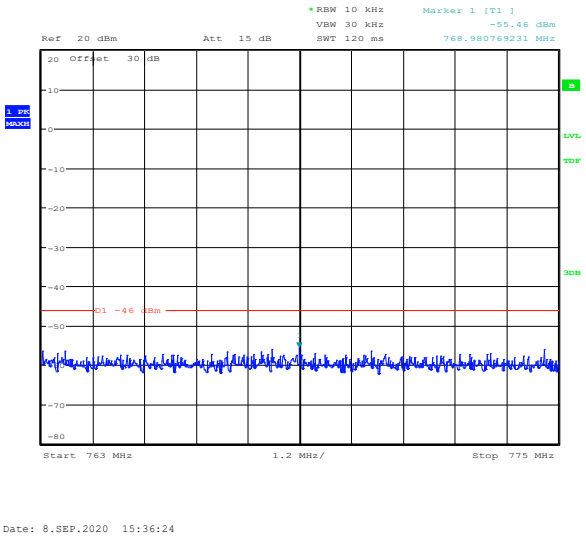


Figure 8.3-66: *Additional spurious emissions requirements within 763–775 MHz for 5 MHz high channel with QPSK at antenna 2*

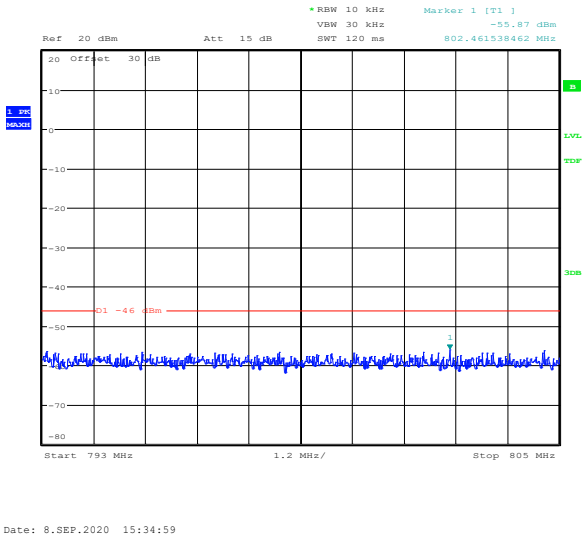


Figure 8.3-67: *Additional spurious emissions requirements within 793–805 MHz for 5 MHz high channel with QPSK at antenna 1*

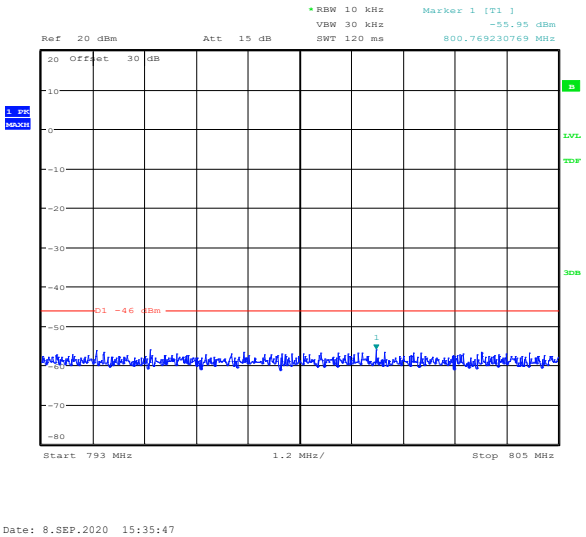


Figure 8.3-68: *Additional spurious emissions requirements within 793–805 MHz for 5 MHz high channel with QPSK at antenna 2*

Test data, continued

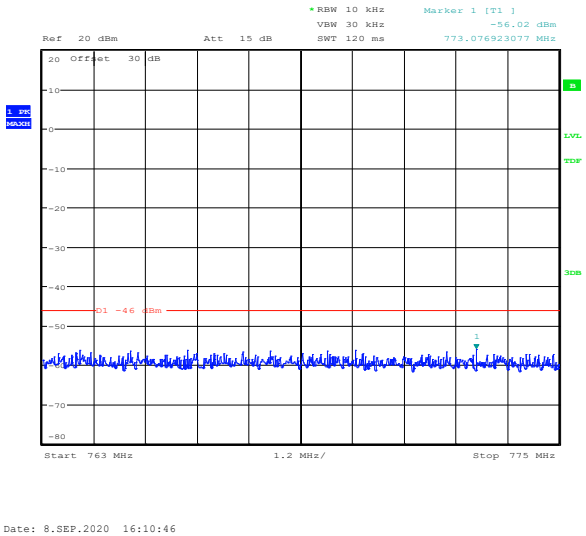


Figure 8.3-69: *Additional spurious emissions requirements within 763–775 MHz for 5 MHz high channel with 64QAM at antenna 1*

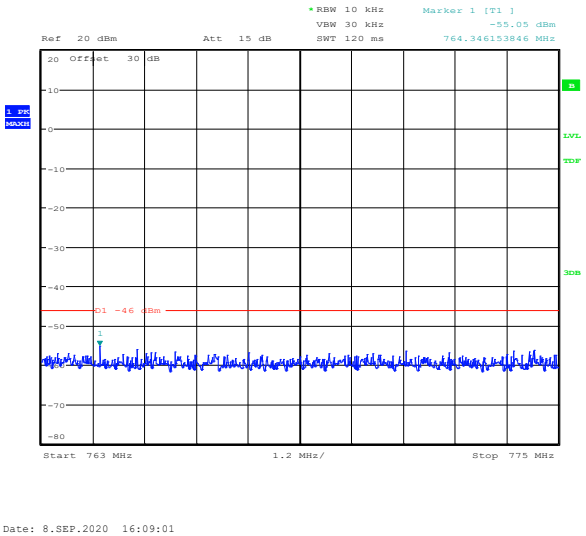


Figure 8.3-70: *Additional spurious emissions requirements within 763–775 MHz for 5 MHz high channel with 64QAM at antenna 2*

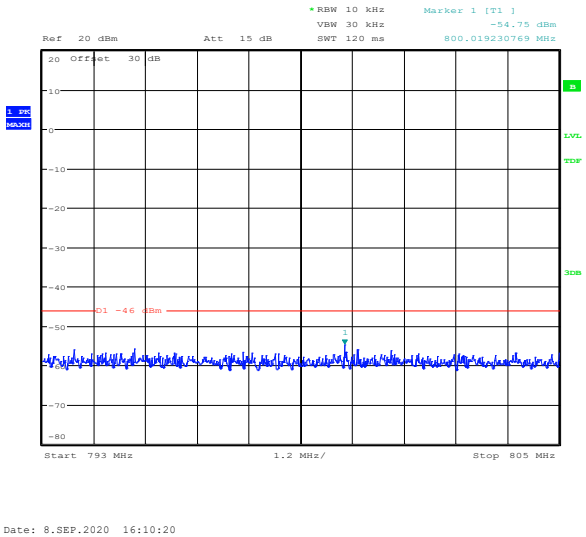


Figure 8.3-71: *Additional spurious emissions requirements within 793–805 MHz for 5 MHz high channel with 64QAM at antenna 1*

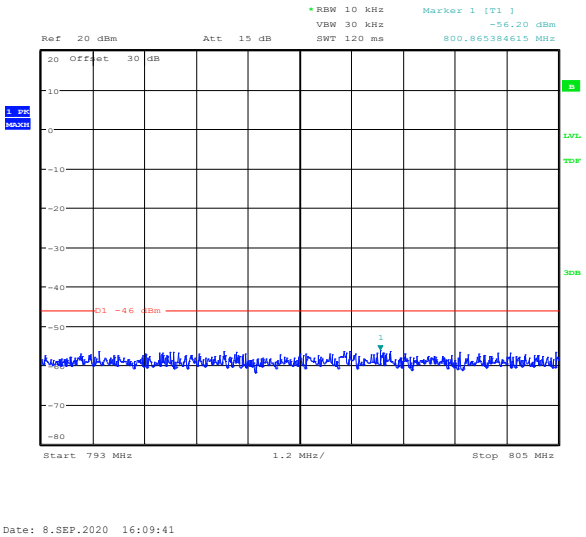


Figure 8.3-72: *Additional spurious emissions requirements within 793–805 MHz for 5 MHz high channel with 64QAM at antenna 2*

Test data, continued

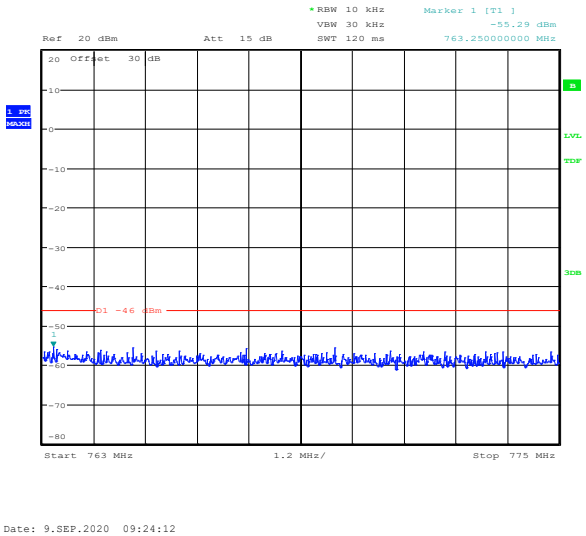


Figure 8.3-73: *Additional spurious emissions requirements within 763–775 MHz for 10 MHz channel with QPSK at antenna 1*

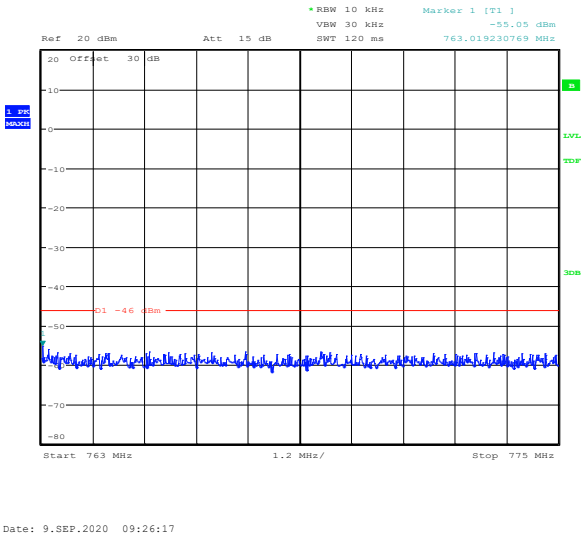


Figure 8.3-74: *Additional spurious emissions requirements within 763–775 MHz for 10 MHz channel with QPSK at antenna 2*

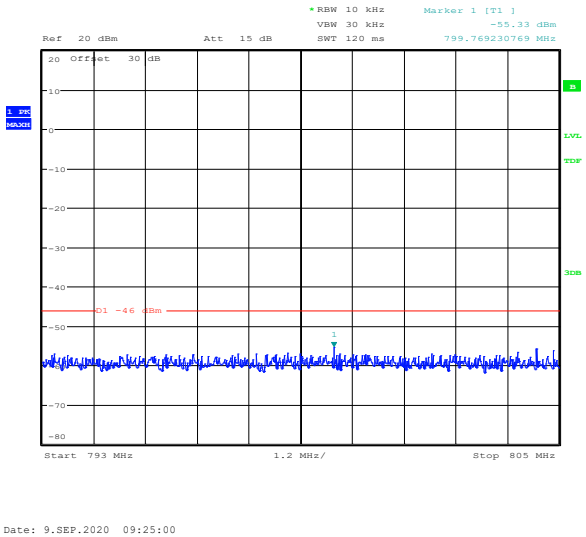


Figure 8.3-75: *Additional spurious emissions requirements within 793–805 MHz for 10 MHz channel with QPSK at antenna 1*

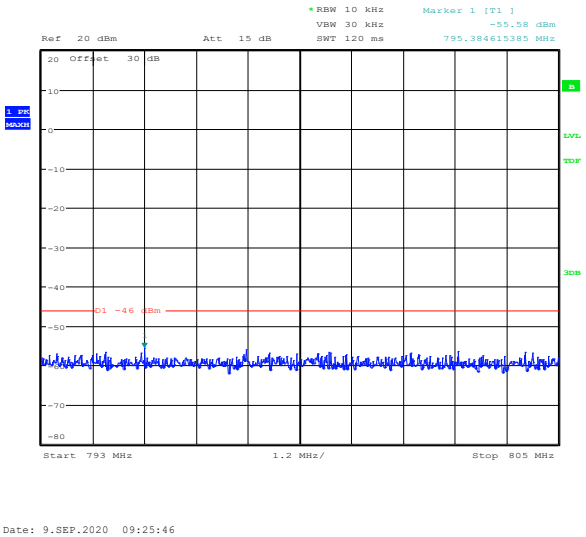


Figure 8.3-76: *Additional spurious emissions requirements within 793–805 MHz for 10 MHz channel with QPSK at antenna 2*

Test data, continued

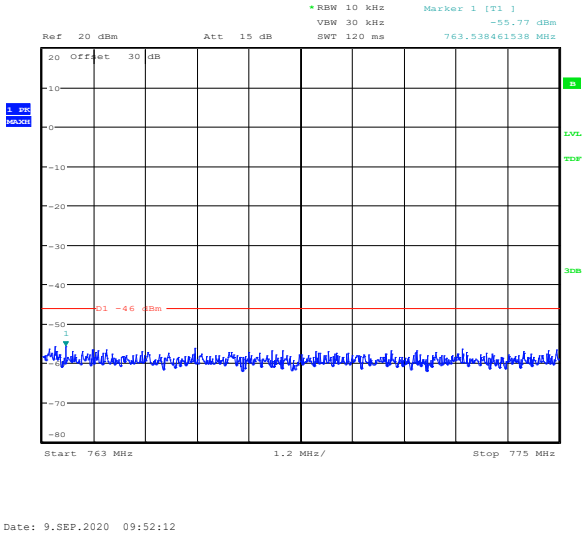


Figure 8.3-77: *Additional spurious emissions requirements within 763–775 MHz for 10 MHz channel with 64QAM at antenna 1*

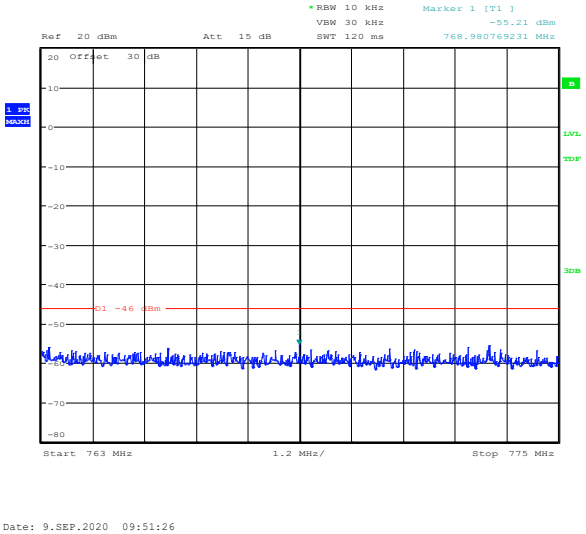


Figure 8.3-78: *Additional spurious emissions requirements within 763–775 MHz for 10 MHz channel with 64QAM at antenna 2*

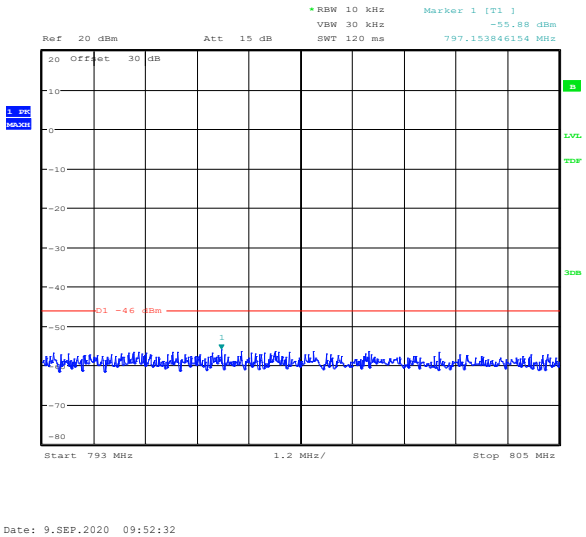


Figure 8.3-79: *Additional spurious emissions requirements within 793–805 MHz for 10 MHz channel with 64QAM at antenna 1*

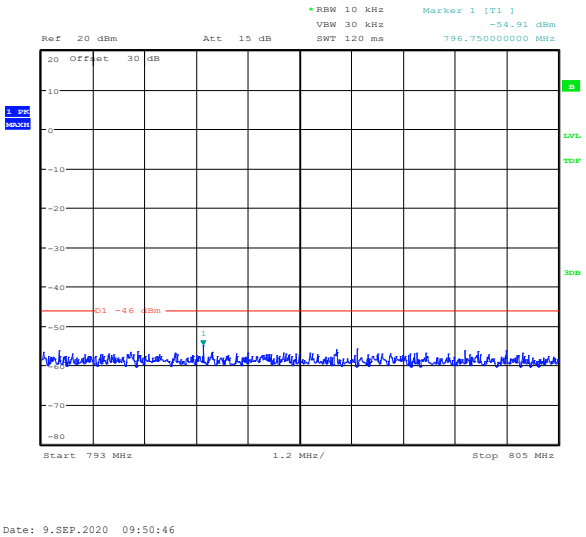


Figure 8.3-80: *Additional spurious emissions requirements within 793–805 MHz for 10 MHz channel with 64QAM at antenna 2*

8.4 Radiated spurious emissions

8.4.1 References, definitions and limits

FCC §27.53:

(c) For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

RSS-130:

4.7.1 General unwanted emissions limits

The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 $\log_{10}$ p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

4.7.2 Additional unwanted emissions limits

In addition to the limit outlined in section 4.7.1, equipment operating in the frequency bands 746–756 MHz and 777–787 MHz shall also comply with the following restrictions:

(a) The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763–775 MHz and 793–806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:

- 76 + 10 $\log_{10}$ p (watts), dB, for base and fixed equipment and
- 65 + 10 $\log_{10}$ p (watts), dB, for mobile and portable equipment

8.4.2 Test summary

Verdict	Pass		
Tested by	Andrey Adelberg	Test date	September 9, 2020

8.4.3 Observations, settings and special notes

Testing was performed using test method per ANSI C63.26, section 5.5 Radiated emissions testing.
The spectrum was searched from 30 MHz to the 10th harmonic.
The output terminal of EUT is connected to RF dummy 50-Ω load for radiated measurement.
The measurements were performed at the distance of 3 m. Final emission power results were obtained using substitution methods.

Spectrum analyzer settings for conducted spurious emissions measurements:

Resolution bandwidth:	100 kHz (below 1 GHz); 1 MHz (above 1 GHz)
Video bandwidth:	300 kHz (below 1 GHz); 3 MHz (above 1 GHz)
Detector mode:	Peak
Trace mode:	Max Hold

8.4.4 Test data

Table 8.4-1: *Radiated spurious emissions, worst case*

Remarks	Frequency, GHz	Emission power level, dBm	Limit, dBm	Margin, dB
5 MHz low channel	1.4995	-49.14	-13.00	36.14
	2.0000	-37.48	-13.00	24.48
	4.4910	-39.95	-13.00	26.95
5 MHz mid channel	1.5015	-48.71	-13.00	35.71
	2.0000	-37.30	-13.00	24.30
	4.5055	-32.46	-13.00	19.46
5 MHz high channel	1.5070	-48.34	-13.00	35.34
	2.0000	-37.46	-13.00	24.46
	4.5130	**-31.13**	-13.00	18.13
10 MHz channel	1.5035	-50.53	-13.00	37.53
	2.0000	-37.50	-13.00	24.50
	4.5035	**-34.77**	-13.00	21.77

Note: all other emissions were more than 20 dB below the limits.
The worst case 5 MHz channel transmitter radiated spurious emission of 64.10 dBµV/m field strength or −31.13 dBm EIRP was measured at 4.5130 GHz with peak detector;
The worst case 10 MHz channel transmitter radiated spurious emission of 60.46 dBµV/m field strength or −34.77 dBm EIRP was measured at 4.5035 GHz with peak detector.

Test data, continued

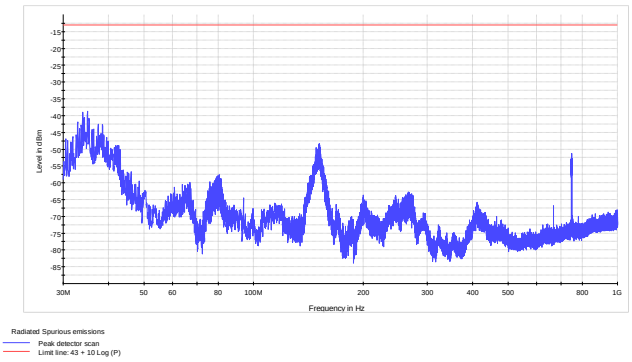


Figure 8.4-1: *Radiated spurious emissions below 1GHz with 5 MHz low channel*

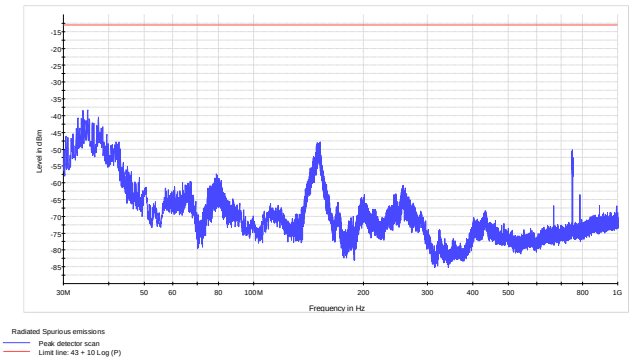


Figure 8.4-2: *Radiated spurious emissions below 1GHz with 5 MHz mid channel*

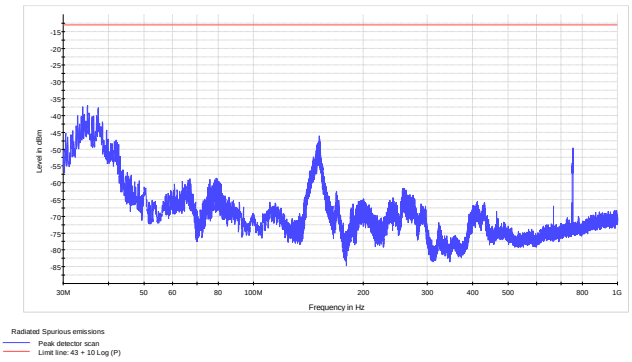


Figure 8.4-3: *Radiated spurious emissions below 1GHz with 5 MHz high channel*

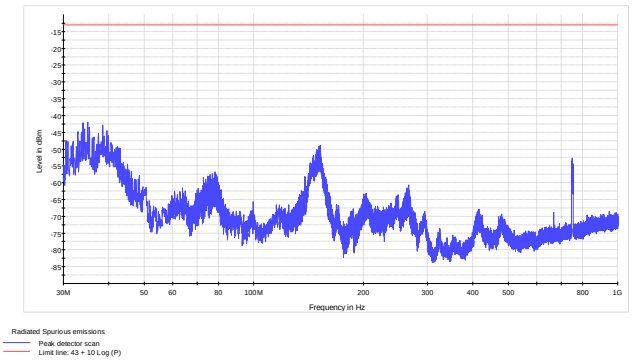


Figure 8.4-4: *Radiated spurious emissions below 1GHz with 10 MHz channel*

Test data, continued

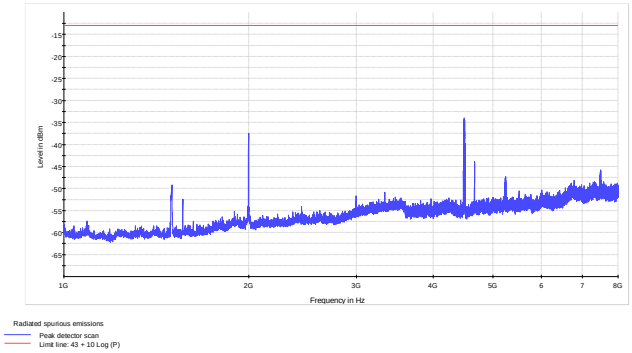


Figure 8.4-5: *Radiated spurious emissions above 1GHz with 5 MHz low channel*

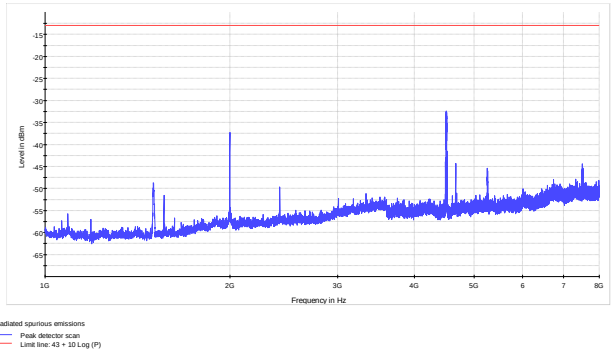


Figure 8.4-6: *Radiated spurious emissions above 1GHz with 5 MHz mid channel*

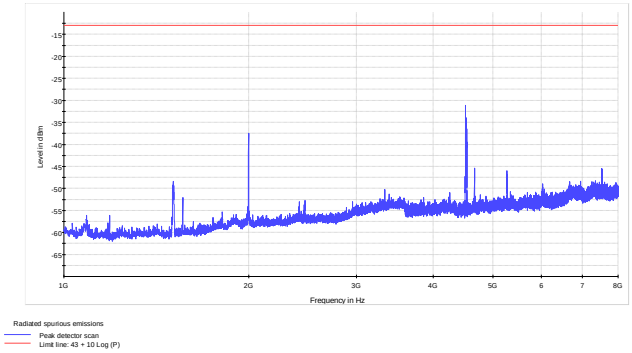


Figure 8.4-7: *Radiated spurious emissions above 1GHz with 5 MHz high channel*

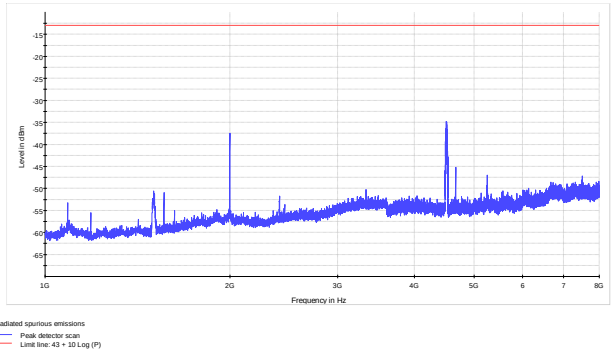


Figure 8.4-8: *Radiated spurious emissions above 1GHz with 10 MHz channel*

8.5 Radiated spurious emissions within 1559–1610 MHz band

8.5.1 References, definitions and limits

FCC §27.53:

(f) For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

RSS-130:

4.7.2 Additional unwanted emissions limits

In addition to the limit outlined in section 4.7.1, equipment operating in the frequency bands 746–756 MHz and 777–787 MHz shall also comply with the following restrictions:

(b) the e.i.r.p. in the band 1559–1610 MHz shall not exceed −70 dBW/MHz for wideband signal and −80 dBW for discrete emission with bandwidth less than 700 Hz.

8.5.2 Test summary

Verdict	Pass		
Tested by	Andrey Adelberg	Test date	September 10, 2020

8.5.3 Observations, settings and special notes

Testing was performed using test method per ANSI C63.26, section 5.5 Radiated emissions testing.
The spectrum was searched from 1559–1610 MHz.
The output terminal of EUT is connected to RF dummy 50-Ω load for radiated measurement.
The measurements were performed at the distance of 3 m.

Spectrum analyzer settings for conducted spurious emissions measurements:

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

8.5.4 Test data

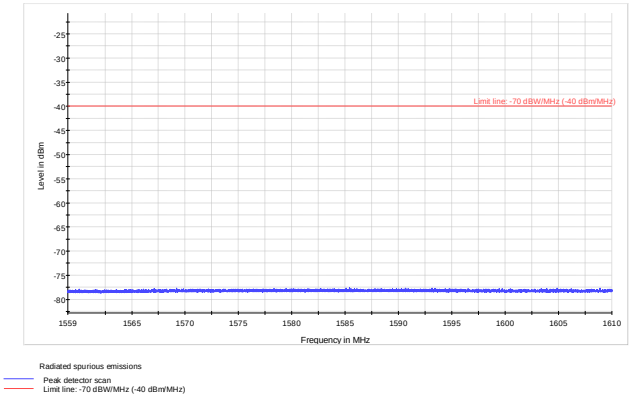


Figure 8.5-1: *Field strength within 1559–1610 MHz band for 5 MHz low channel*

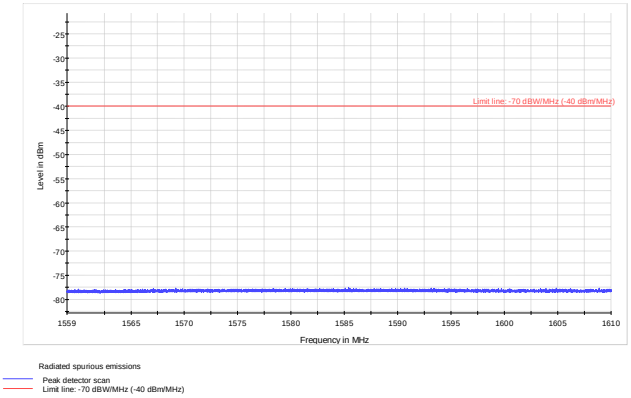


Figure 8.5-2: *Field strength within 1559–1610 MHz band for 5 MHz mid channel*

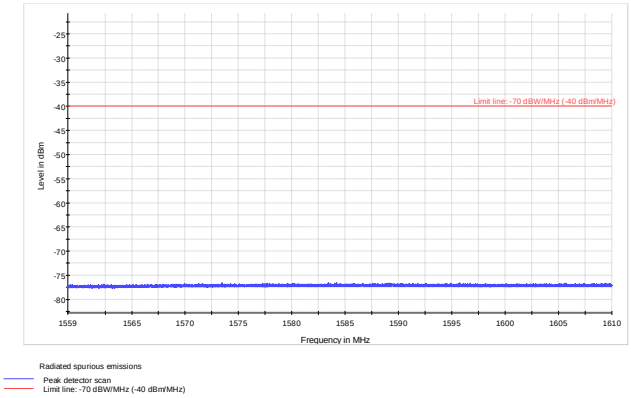


Figure 8.5-3: *Field strength within 1559–1610 MHz band for 5 MHz high channel*

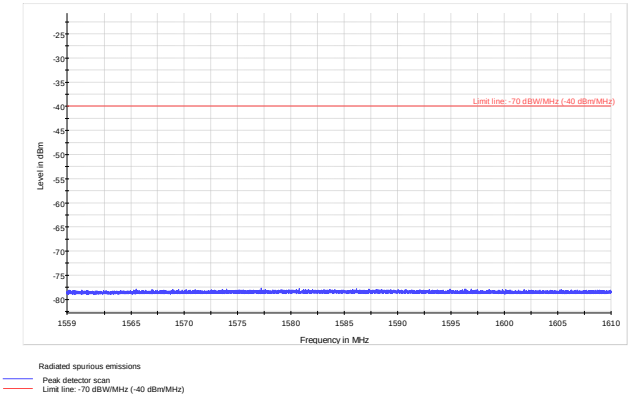


Figure 8.5-4: *Field strength within 1559–1610 MHz band for 10 MHz channel*

8.6 Occupied bandwidth

8.6.1 References, definitions and limits

FCC §2.1049:

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

RSS-Gen, Clause 6.7:

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).

8.6.2 Test summary

Verdict	Pass		
Tested by	Andrey Adelberg	Test date	September 4, 2020

8.6.3 Observations, settings and special notes

Testing was performed using test method per ANSI C63.26, section 5.4 Occupied bandwidth. Spectrum analyzer settings:

Detector mode	Peak
Resolution bandwidth	≥1 % of span
Video bandwidth	RBW × 3
Trace mode	Max Hold

8.6.4 Test data

Table 8.6-1: *Occupied Bandwidth measurement results*

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
5 MHz low channel, QPSK, antenna 1	748.5	5.096	4.615
5 MHz mid channel, QPSK, antenna 1	751.0	5.128	4.583
5 MHz high channel, QPSK, antenna 1	753.5	5.096	4.583
5 MHz low channel, QPSK, antenna 2	748.5	5.096	4.583
5 MHz mid channel, QPSK, antenna 2	751.0	5.096	4.583
5 MHz high channel, QPSK, antenna 2	753.5	5.128	4.583
5 MHz low channel, 64QAM, antenna 1	748.5	5.064	4.551
5 MHz mid channel, 64QAM, antenna 1	751.0	5.064	4.583
5 MHz high channel, 64QAM, antenna 1	753.5	5.128	4.583
5 MHz low channel, 64QAM, antenna 2	748.5	5.128	4.583
5 MHz mid channel, 64QAM, antenna 2	751.0	5.128	4.583
5 MHz high channel, 64QAM, antenna 2	753.5	5.064	4.551
10 MHz channel, QPSK, antenna 1	751.0	9.712	9.006
10 MHz channel, QPSK, antenna 2	751.0	9.712	8.974
10 MHz channel, 64QAM, antenna 1	751.0	9.680	9.038
10 MHz channel, 64QAM, antenna 2	751.0	9.615	9.006

Test data, continued

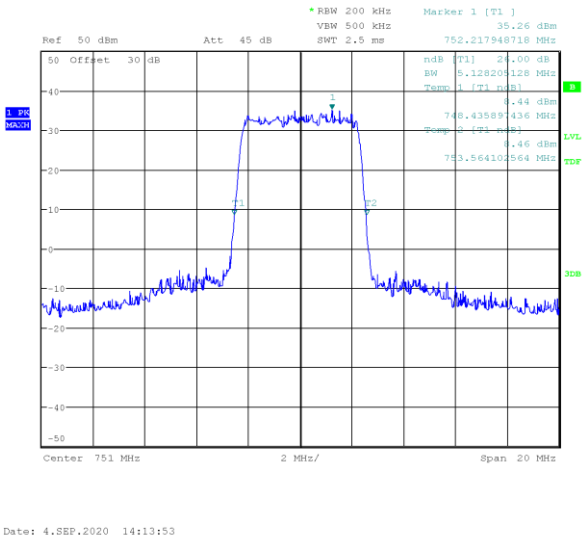


Figure 8.6-1: *26 dB BW sample plot for 5 MHz channel*

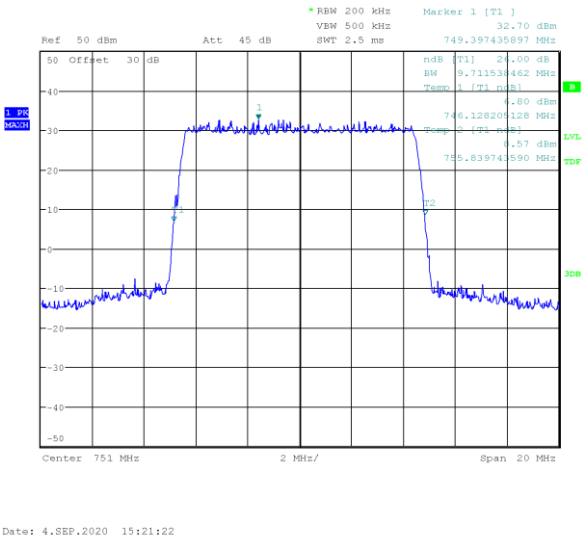


Figure 8.6-2: *99% OBW sample plot sample plot for 5 MHz channel*

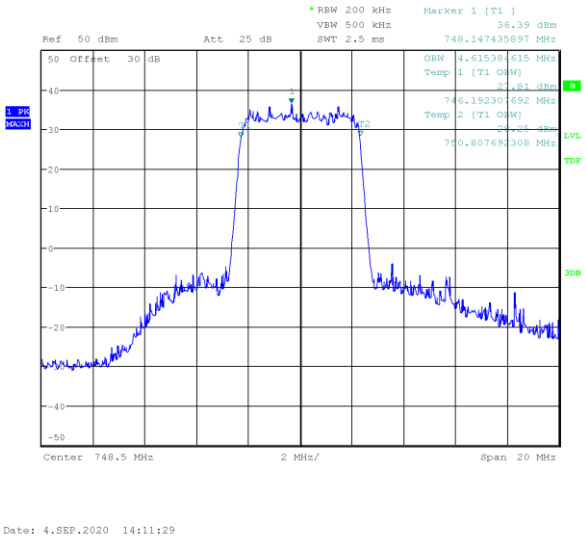


Figure 8.6-3: *26 dB BW sample plot for 10 MHz channel*

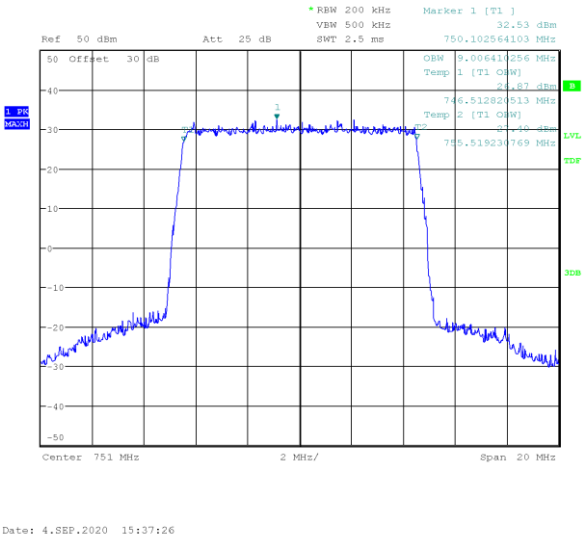


Figure 8.6-4: *99% OBW sample plot sample plot for 10 MHz channel*

8.7 Frequency stability

8.7.1 References, definitions and limits

FCC §27.54:

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

RSS-130, Clause 4.5:

For equipment that is capable of transmitting numerous channels simultaneously for different applications (e.g. LTE and narrowband – Internet of Things (IoT)), the occupied bandwidth shall be the bandwidth representing the sum of the occupied bandwidths of these channels.

The frequency stability shall be sufficient to ensure that the occupied bandwidth remains within each frequency block range when tested at the temperature and supply voltage variations specified in RSS-Gen.

8.7.2 Test summary

Verdict	Pass		
Tested by	Andrey Adelberg	Test date	September 10, 2020

8.7.3 Observations, settings and special notes

Testing was performed using test method per ANSI C63.26, section 5.6 Frequency stability testing. EUT was set to transmit CW tone.

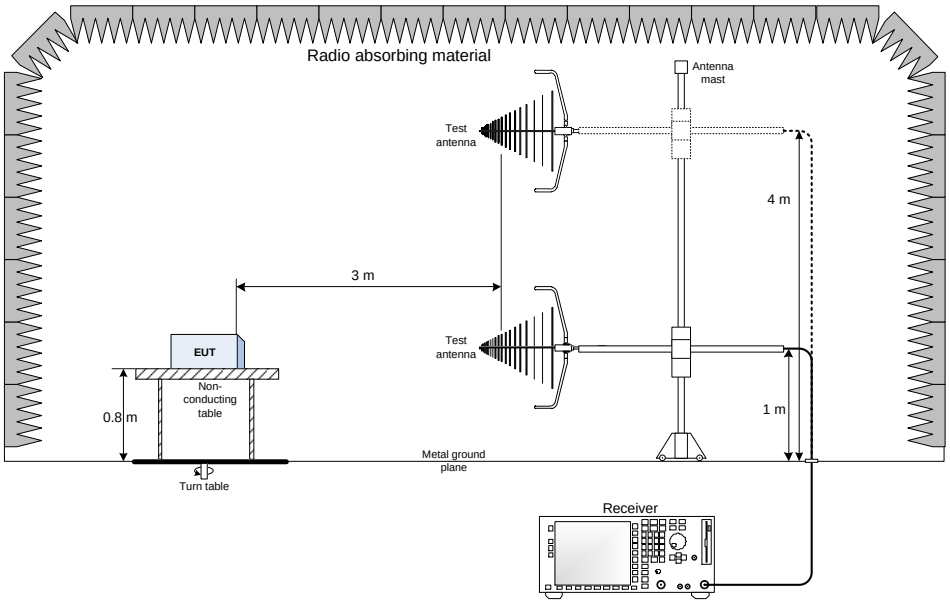
8.7.4 Test data

Table 8.7-1: *Frequency drift*

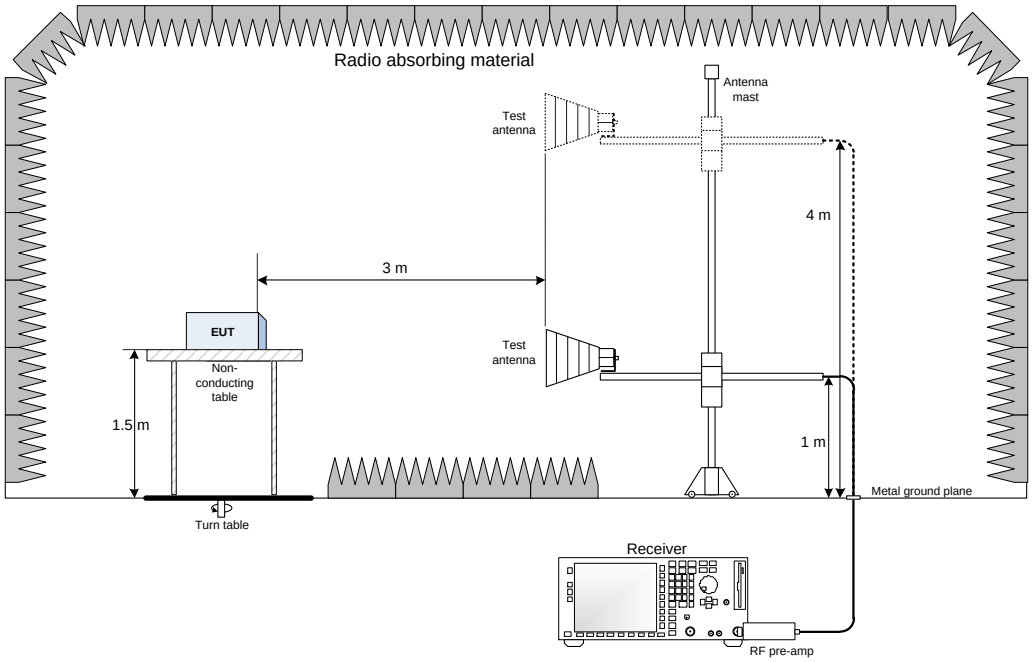
Test conditions	Frequency, Hz	Drift, Hz
+50 °C, Nominal voltage	750999936	0
+40 °C, Nominal voltage	750999937	1
+30 °C, Nominal voltage	750999936	0
+20 °C, Nominal voltage +15 %	750999936	0
+20 °C, Nominal voltage	750999936	Reference
+20 °C, Nominal voltage −15 %	750999936	0
+10 °C, Nominal voltage	750999936	0
0 °C, Nominal voltage	750999936	0
−10 °C, Nominal voltage	750999936	0
−20 °C, Nominal voltage	750999935	-1

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up for frequencies below 1 GHz



9.2 Radiated emissions set-up for frequencies above 1 GHz



9.3 Antenna port set-up