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Test report

319272-1TRFWL

Date of issue: May 12, 2017

Applicant:

Redline Communications

Product:

Broad-band wireless infrastructure product

Model:

RDL-3100-RMA

FCC ID: QC8-RDL3100RMA

IC Registration number: 4310A-RDL3100RMA

Specifications:

- FCC 47 CFR Part 15 Subpart E, §15.407
  Unlicensed National Information Infrastructure Devises
- RSS-247, Issue 2, Section 6, Feb 2017
  Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

Nemko Canada Inc., a testing laboratory, is accredited by the Standards Council of Canada. The tests included in this report are within the scope of this accreditation

Test location

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Site number	FCC: 722545; IC: 2040G-5 (3 m semi anechoic chamber)

Tested by	Yong Huang Wireless/EMC Specialist
Reviewed by	Russell Grant, Senior Technical Assessor
Review date	July 14, 2017
Reviewer signature	Russell Grant

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Redline Communications
Address	302 Town Center Blvd., Markham, ON, Canada, L3R 0E8

1.2 Test specifications

FCC 47 CFR Part 15, Subpart E, Clause 15.407	Unlicensed National Information Infrastructure Devises
RSS-247, Issue 2, February 2017	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

1.3 Test methods

789033 D02 General UNII Test Procedures New Rules v01r04 (May 2, 2017)	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E
662911 D01 Multiple Transmitter Output v02r01 (October 31, 2013)	Emissions Testing of Transmitters with Multiple Outputs in the Same Band
662911 D02 MIMO with Cross Polarized Antenna v01 (October 25, 2011)	Emissions testing of transmitters with multiple outputs in the same band (MIMO) with Cross Polarized Antenna
ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See “Summary of test results” for full details.

1.5 Exclusions

As per quotation, this report is for C2PC purpose, power line conducted emission is deemed to be covered by previous grant, hence is excluded from the scope. DFS is excluded from the scope of this report as per quotation.

1.6 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued

Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, general requirements test results

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

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

[2] The EUT is a professionally installed equipment.

2.2 FCC Part 15 Subpart E, test results

Part	Test description	Verdict
§15.403(i)	Emission bandwidth	Pass
§15.407(a)(1)	Power and density limits within 5.15–5.25 GHz band	Not applicable
§15.407(a)(2)	Power and density limits within 5.25–5.35 GHz and 5.47–5.725 GHz bands	Pass
§15.407(a)(3)	Power and density limits within 5.725–5.85 GHz band	Not applicable
§15.407(b)(1)	Undesirable emission limits for 5.15–5.25 GHz band	Not applicable
§15.407(b)(2)	Undesirable emission limits for 5.25–5.35 GHz band	Pass
§15.407(b)(3)	Undesirable emission limits for 5.47–5.725 GHz bands	Not applicable
§15.407(b)(4)	Undesirable emission limits for 5.725–5.85 GHz band	Not applicable
§15.407(b)(6)	Conducted limits for U-NII devices using an AC power line	Not tested[2]
§15.407(e)	Minimum 6 dB bandwidth of U-NII devices within the 5.725-5.85 GHz band	Not applicable
§15.407(g)	Frequency stability	Pass
§15.407(h)(1)	Transmit power control (TPC)	Pass
§15.407(h)(2)[1]	Dynamic Frequency Selection (DFS)	Not tested

Notes: [1]DFS measurements were not tested at Nemko Canada lab. It's up to applicant to provide DFS compliance report.

[2] As per quotation, for C2PC purpose, power line conducted emission is not tested.

2.3 RSS-Gen, Issue 4, test results

Part	Test description	Verdict
6.6	Occupied Bandwidth	Pass
7.1.2[1]	Receiver radiated emission limits	Not applicable
7.1.3[1]	Receiver conducted emission limits	Not applicable
8.8	Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus	Not tested[3]
8.11[2]	Frequency stability	Pass

Notes: [1] According to sections 5.2 and 5.3 of RSS-Gen, Issue 4: if EUT does not have a stand-alone receiver neither scanner receiver, then it exempt from receiver requirements.

[2] According to section 8.11 of RSS-Gen, Issue 4: if the frequency stability of the licence-exempt radio apparatus is not specified in the applicable standard (RSS), measurement of the frequency stability is not required

[3] As per quotation, for C2PC purpose, power line conducted emission is not tested.

2.4 ISED RSS-247, Issue 2, test results

Section	Test description	Verdict
6.1 [1]	Types of Modulation	Pass
6.2	Power and unwanted emissions limits	Pass
6.3	Dynamic Frequency Selection (DFS) for devices operating in the bands 5250–5350 MHz, 5470–5600 MHz and 5650–5725 MHz	Not tested[2]
6.4	Additional requirements	Pass

Notes: [1] The EUT employs digital modulations, such as: 802.11a, 802.11n HT20 and 802.11n HT40

[2] DFS measurements were not tested at Nemko Canada lab. It's up to applicant to provide DFS compliance report.

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	March 2, 2017
Nemko sample ID number	Item #1

3.2 EUT information

Product name	Broad-band wireless infrastructure product
Model	RDL-3100-RMA
Serial number	318SC16300082

3.3 Technical information

Applicant IC company number	4310A
IC UPN number	RDL3100RMA
All used IC test site(s) Reg. number	2040G-5
RSS number and Issue number	RSS-247 Issue 2, Section 6, Feb. 2017
Frequency band	5250–5350 MHz
Frequency Min (MHz)	5255 (10 MHz channel), 5260 (20 MHz channel), 5270 (40 MHz channel)
Frequency Max (MHz)	5342.5 (10 MHz channel), 5337.5 (20 MHz channel), 5327.5 (40 MHz channel)
RF power Max (W), Conducted	0.039 (15.94 dBm for 10 MHz channel), 0.084 (19.22 dBm for 20 MHz channel), 0.110 (20.40 dBm for 40 MHz channel)
Field strength, Units @ distance	N/A
Measured BW (kHz) (26 dB)	9290 (10 MHz channel), 18730 (20 MHz channel), 37770 (40 MHz channel)
Calculated BW (kHz), as per TRC-43	N/A
Type of modulation	OFDM using 256-QAM, 128-QAM, 64-QAM, 16-QAM, QPSK and BPSK modulation for sub-carriers
Emission classification (F1D, G1D, D1D)	W7D
Transmitter spurious, Units @ distance	68.14 dBµV/m (average) at 5.250 GHz @ 3 m
Power requirements	48 V_{DC} PoE via 120 V_{AC}, 60 Hz
Antenna information	10 dBi Omni-directional Antenna Redline AOD-DB-0512-02 24 dBi Dual Polarization Antenna 4.9–6.1 GHz, Redline 30-00362-00 32 dBi Redline A3FT3204LTPD Parabolic Antenna, 4.9–5.8 GHz, 4 degree, dual polarity The EUT is professionally installed.

3.4 Product description and theory of operation

The EUT is a 2×2 MIMO point-to-multipoint (PMP) and point-to-point (PTP) carrier grade broadband wireless infrastructure product, designed to operate in the 5250–5350 MHz band.

3.5 EUT exercise details

The EUT was controlled to transmit at desired frequency and modulation from laptop using web interface at IP address: 192.168.25.2

3.6 EUT setup diagram

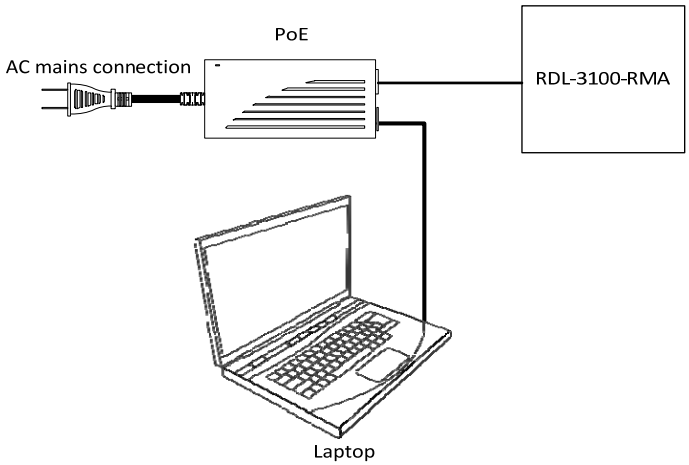

Figure 3.6-1: *Setup diagram*

3.7 EUT sub assemblies

Table 3.7-1: *EUT sub assemblies*

Description	Brand name	Model/Part number	Serial number
PoE	Cincon Electronics Co.	TRG60A-POE-L	2195

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

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

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
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.

5.2 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 6. Measurement uncertainty

6.1 Uncertainty of measurement

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

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

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.
Flush mount turntable	Sunol	FM2022	FA002550	—	NCR
Controller	Sunol	SC104V	FA002551	—	NCR
Antenna mast	Sunol	TLT2	FA002552	—	NCR
spectrum analyzer	Rohde & Schwarz	FSV 40	FA002731	1 year	May 6/17
50 Ω coax cable	C.C.A.	None	FA002603	—	VOU
50 Ω coax cable	C.C.A.	None	FA002605	—	VOU
50 Ω coax cable	C.C.A.	None	FA002607	—	VOU
Bilog antenna (20–2000 MHz)	Sunol	JB1	FA002517	1 year	Oct. 5/17
Horn antenna (1–18 GHz)	EMCO	3115	FA001452	1 year	Oct. 26/17
Horn antenna (18–40 GHz)	EMCO	3116	FA002487	2 year	Aug. 16/17
Pre-amplifier (0.5–18 GHz)	COM-POWER	PAM-118A	FA002561	1 year	May 6/17
Pre-amplifier (18–40 GHz)	COM-POWER	PAM-840	FA002508	1 year	May 6/17
2400-2483 MHz Notch Filter	Microwave Circuits	N0324413	FA002693	—	VOU
50 Ω coax cable	HUBER+SUHNER	SUCOFLEX 100	FA002564	—	VOU
Power source	California Instruments	5001ix	FA001770	1 year	Feb 1/18
Power meter	Rohde & Schwarz	NRP	FA002485	1 year	Oct. 19/17
Power sensor	Rohde & Schwarz	NRP-Z91	FA002488	1 year	Oct. 19/17
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 40	FA002071	1 year	April 23/17
Environmental Chamber	ESPEC	EPX-4H	FA002736	—	NCR
Multimeter	Fluke	26III	FA001261	1 year	Sep 7/17

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

Section 8. Testing data

8.1 FCC 15.403(i) Emission bandwidth

8.1.1 Definitions and limits

15.403(i) For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

8.1.2 Test summary

Test date	March 3, 2017 and March 6, 2017	Temperature	25 °C
Test engineer	Yong Huang	Air pressure	1020 mbar
Verdict	Pass	Relative humidity	36 %

8.1.3 Observations, settings and special notes

Spectrum analyser settings:

Resolution bandwidth	approximately 1% of the EBW
Video bandwidth	> RBW
Detector mode	Peak
Trace mode	Max Hold

8.1.4 Test data

Table 8.1-1: *Channel names description*

Channel name	10-MHz channel	20-MHz channel	40-MHz channel
Low	5255	5260	5270
Mid	5300	5300	5300
High	5342.5	5337.5	5327.5

Table 8.1-2: *26 dB bandwidth results (in MHz)*

Modulation	Channel	10-MHz channel	20-MHz channel	40-MHz channel
BPSK	Low	9.27	18.73	37.77
	Mid	9.29	18.37	37.20
	High	9.21	18.33	37.67
256-QAM	Low	9.17	18.52	37.40
	Mid	9.19	18.38	37.63
	High	9.29	18.33	37.60

8.1.4 Test data, continued

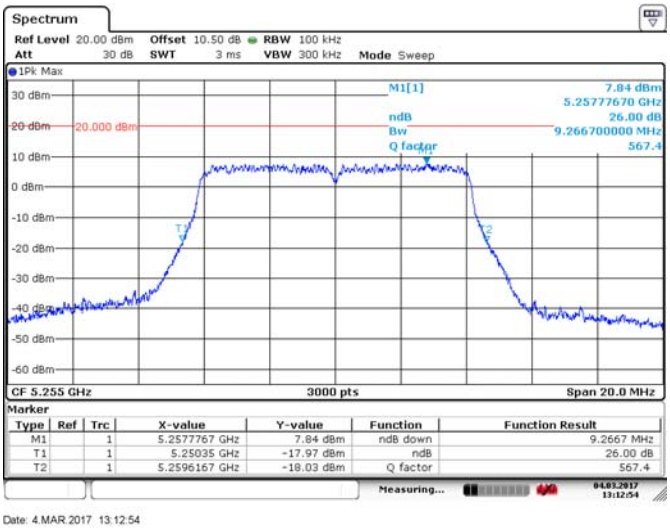

Figure 8.1-1: *26 dB bandwidth of the 10 MHz channel, sample plot*

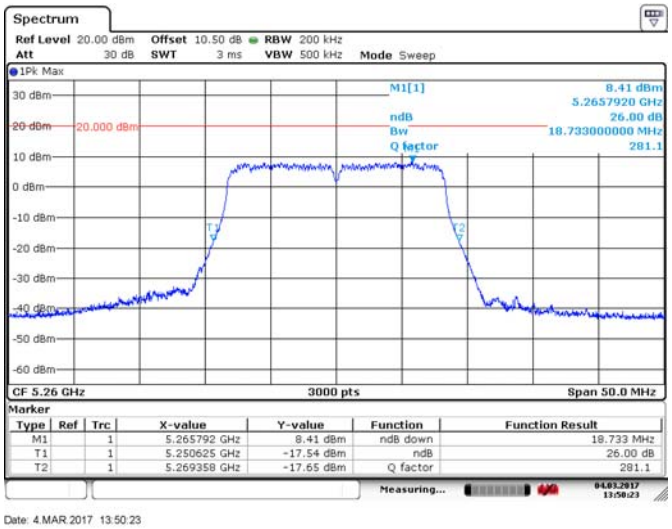

Figure 8.1-2: *26 dB bandwidth of the 20 MHz channel, sample plot*

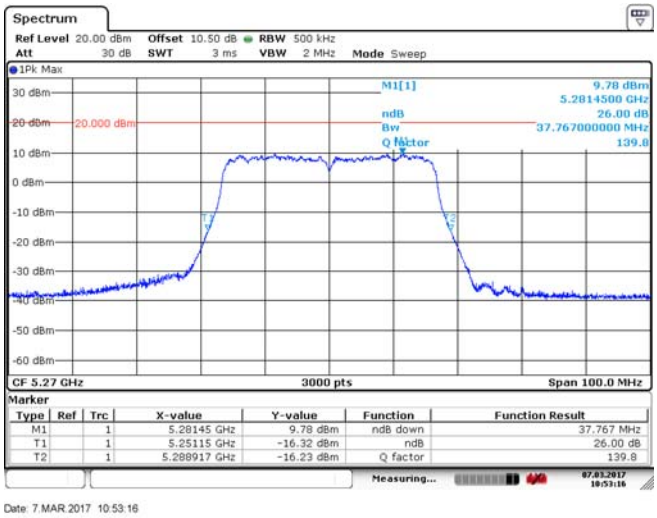

Figure 8.1-3: *26 dB bandwidth of the 40 MHz channel, sample plot*

8.2 RSS-Gen 6.6 Occupied bandwidth

8.2.1 Definitions and limits

The emission bandwidth (×dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated × dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3× the resolution bandwidth.

When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

8.2.2 Test summary

Test date	March 3, 2017 and March 6, 2017	Temperature	25 °C
Test engineer	Yong Huang	Air pressure	1020 mbar
Verdict	Pass	Relative humidity	36 %

8.2.3 Observations, settings and special notes

Spectrum analyser settings:

Resolution bandwidth:	1 % to 5 % of the OBW
Video bandwidth:	≥3 × RBW
Detector mode:	Peak
Trace mode:	Max Hold

8.2.4 Test data

Table 8.2-1: *99 % bandwidth results*

Modulation	Channel	10-MHz channel	20-MHz channel	40-MHz channel
BPSK	Low	8.18	16.38	32.90
	Mid	8.19	16.38	32.90
	High	8.19	16.37	32.90
256-QAM	Low	8.19	16.38	32.90
	Mid	8.19	16.38	32.90
	High	8.20	16.38	32.90

8.2.4 Test data, continued

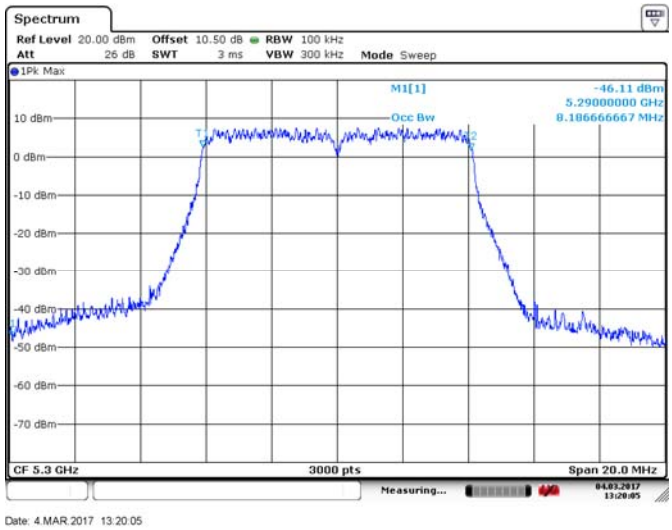

Figure 8.2-1: *99 % bandwidth of 10 MHz channel, sample plot*

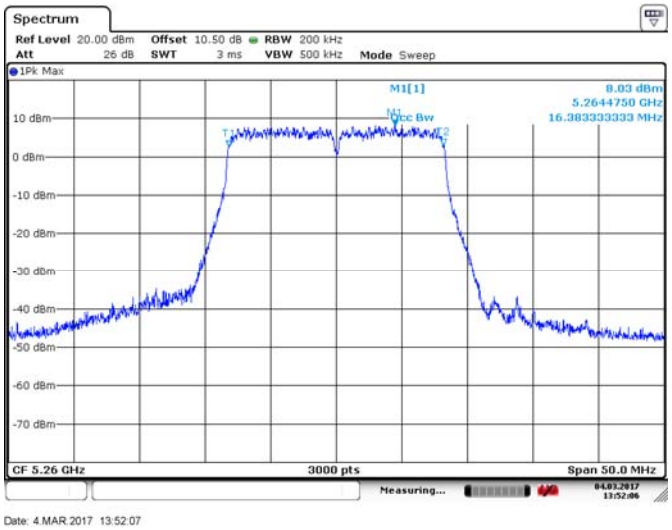

Figure 8.2-2: *99 % bandwidth of 20 MHz channel, sample plot*

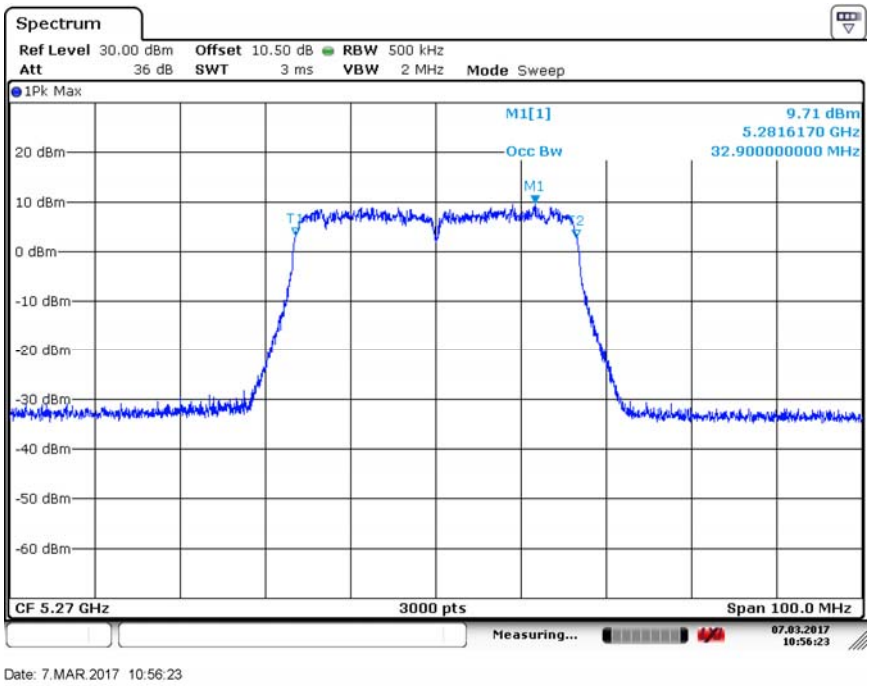

Figure 8.2-3: *99 % bandwidth of 40 MHz channel, sample plot*

8.3 FCC 15.407(a)(2) and RSS-247 6.2.2.1, 5.25–5.35 GHz band output power and spectral density limits

8.3.1 Definitions and limits

FCC:
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

FCC §15.407(h)(1) Transmit power control (TPC).
U-NII devices shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

ISED:
For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or 1.76 + 10 $\log_{10}$B, dBm, whichever is less. Devices shall implement TPC in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.
Devices, other than devices installed in vehicles, shall comply with the following:
The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band;
The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

Section 6.2.2.3
Outdoor fixed devices with a maximum e.i.r.p. greater than 200 mW shall comply with the following e.i.r.p. at different elevations, where θ is the angle above the local horizontal plane (of the Earth) as shown below:

1. −13 dBW/MHz for $0° \le \theta < 8°$
2. −13 − 0.716 (θ-8) dBW/MHz for $8° \le \theta < 40°$
3. −35.9 − 1.22 (θ-40) dBW/MHz for $40° \le \theta \le 45°$
4. −42 dBW/MHz for $\theta > 45°$

8.3.2 Test summary

Test date:	March 20, 2017 to March 23, 2017	Temperature:	21 °C
Test engineer:	Yong Huang	Air pressure:	1010 mbar
Verdict:	Pass	Relative humidity:	31 %

8.3.3 Observations, settings and special notes

Output power was tested using RMS power meter.
Spectrum analyzer settings for PSD measurement:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Frequency span	20 MHz (for 10 MHz channel), 50 MHz (for 20 MHz channel), 70 MHz (for 40 MHz channel)
Detector mode	RMS
Trace mode	Power Averaging over 100 sweeps

FCC output power limit calculation for 10 MHz channel: 11 + 10 × Log_{10} (EBW) < 24 dBm, hence as 11 + 10 × Log_{10} (EBW), dBm;
FCC output power limit calculation for 20 MHz channel: 11 + 10 × Log_{10} (EBW) < 24 dBm, hence as 11 + 10 × Log_{10} (EBW), dBm;
FCC output power limit calculation for 40 MHz channel: 11 + 10 × Log_{10} (EBW) > 24 dBm, hence as 24 dBm.

ISED EIRP limit calculation for 10 MHz channel: 17 + 10 × Log_{10} (OBW) < 30 dBm, hence as 17 + 10 × Log_{10} (OBW), dBm;
ISED EIRP limit calculation for 20 MHz channel: 17 + 10 × Log_{10} (OBW) < 30 dBm, hence as 17 + 10 × Log_{10} (OBW), dBm;
ISED EIRP limit calculation for 40 MHz channel: 17 + 10 × Log_{10} (OBW) > 30 dBm, hence as 30 dBm.

Output power/EIRP/PSD limit adjustment for 10 dBi antenna: Output power/EIRP limit – (10 dBi −0.7 dB – 6 dBi);
Output power/EIRP/PSD limit adjustment for 24 dBi antenna: Output power/EIRP limit – (24 dBi −0.7 dB – 6 dBi);
Output power/EIRP/PSD limit adjustment for 32 dBi antenna: Output power/EIRP limit – (32 dBi −0.7 dB – 6 dBi);
Note: cable loss is 0.7 dB.

Combined average output power was calculated as follows:

$$P_{combined} = 10 \times log_{10}\left(\left(10^{P_{ch0}/10}\right) + \left(10^{P_{ch1}/10}\right)\right)$$

EIRP was calculated as follows:

$$EIRP = P_{combined} + antenna\ gain$$

For antennas with the directional gain greater than 6 dBi, the maximum power spectral density limit was calculated as follows:
For 10 dBi antenna: 11 dBm/1 MHz – (10 dBi −0.7 dB – 6 dBi) = 7.7 dBm/1 MHz;
For 24 dBi antenna: 11 dBm/1 MHz – (24 dBi −0.7 dB – 6 dBi) = -6.3 dBm/1 MHz;
For 32 dBi antenna: 11 dBm/1 MHz – (32 dBi −0.7 dB – 6 dBi) = -14.3 dBm/1 MHz.

As per ISED requirements, EUT as outdoor fixed devices, antenna #1(10 dBi) and antenna #2(24 dBi) were configured with reduced output power with a maximum e.i.r.p. less than 200 mW. The antenna #3(32 dBi) was verified with pattern complying with the requirement at different elevations.
All ISED power setting were not greater than FCC setting, hence PSD is deemed to be compliance if FCC PSD meets compliance.

8.3.4 Test data

Table 8.3-1: *FCC Output power measurements and EIRP calculation results for 10 MHz channel, 10 dBi antenna*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 3.3 Mbps	5255.0	12.83	12.80	15.83	17.37	1.55	9.30	25.13	26.67	1.55
	5300.0	12.91	12.94	15.94	17.38	1.44	9.30	25.24	26.68	1.44
	5342.5	12.82	12.95	15.90	17.34	1.45	9.30	25.20	26.64	1.45
256-QAM 93.3 Mbps	5255.0	12.88	12.76	15.83	17.32	1.49	9.30	25.13	26.62	1.49
	5300.0	12.89	12.96	15.94	17.33	1.40	9.30	25.24	26.63	1.40
	5342.5	12.81	12.99	15.91	17.38	1.47	9.30	25.21	26.68	1.47

Table 8.3-2: *FCC Output power measurements and EIRP calculations results for 10 MHz channel, 24 dBi antenna gain*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 3.3 Mbps	5255.0	-0.51	-0.58	2.47	3.37	0.91	23.30	25.77	26.67	0.91
	5300.0	-0.47	-0.42	2.57	3.38	0.81	23.30	25.87	26.68	0.81
	5342.5	-0.49	-0.38	2.58	3.34	0.77	23.30	25.88	26.64	0.77
256-QAM 93.3 Mbps	5255.0	-0.54	-0.56	2.46	3.32	0.86	23.30	25.76	26.62	0.86
	5300.0	-0.46	-0.42	2.57	3.33	0.76	23.30	25.87	26.63	0.76
	5342.5	-0.48	-0.36	2.59	3.38	0.79	23.30	25.89	26.68	0.79

Table 8.3-3: *FCC Output power measurements and EIRP calculations results for 10 MHz channel, 32 dBi antenna gain*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 3.3 Mbps	5255.0	-8.51	-8.61	-5.55	-4.63	0.92	31.30	25.75	26.67	0.92
	5300.0	-8.48	-8.44	-5.45	-4.62	0.83	31.30	25.85	26.68	0.83
	5342.5	-8.49	-8.39	-5.43	-4.66	0.77	31.30	25.87	26.64	0.77
256-QAM 93.3 Mbps	5255.0	-8.55	-8.57	-5.55	-4.68	0.87	31.30	25.75	26.62	0.87
	5300.0	-8.48	-8.46	-5.46	-4.67	0.79	31.30	25.84	26.63	0.79
	5342.5	-8.48	-8.37	-5.41	-4.62	0.79	31.30	25.89	26.68	0.79

Table 8.3-4: *FCC Output power measurements and EIRP calculation results for 20 MHz channel, 10 dBi antenna*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 6.6 Mbps	5260.0	16.24	16.18	19.22	20.43	1.20	9.30	28.52	29.73	1.20
	5300.0	16.15	16.17	19.17	20.34	1.17	9.30	28.47	29.64	1.17
	5337.5	14.28	14.28	17.29	20.33	3.04	9.30	26.59	29.63	3.04
256-QAM 186.6 Mbps	5260.0	16.12	16.04	19.09	20.38	1.29	9.30	28.39	29.68	1.29
	5300.0	16.18	16.18	19.19	20.34	1.15	9.30	28.49	29.64	1.15
	5337.5	14.30	14.25	17.29	20.33	3.05	9.30	26.59	29.63	3.05

Table 8.3-5: *FCC Output power measurements and EIRP calculations results for 20 MHz channel, 24 dBi antenna gain*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 6.6 Mbps	5260.0	2.80	2.70	5.76	6.43	0.66	23.30	29.06	29.73	0.66
	5300.0	2.73	2.75	5.75	6.34	0.59	23.30	29.05	29.64	0.59
	5337.5	2.68	2.80	5.75	6.33	0.58	23.30	29.05	29.63	0.58
256-QAM 186.6 Mbps	5260.0	2.67	2.65	5.67	6.38	0.71	23.30	28.97	29.68	0.71
	5300.0	2.72	2.76	5.75	6.34	0.59	23.30	29.05	29.64	0.59
	5337.5	2.70	2.80	5.76	6.33	0.57	23.30	29.06	29.63	0.57

Table 8.3-6: *FCC Output power measurements and EIRP calculations results for 20 MHz channel, 32 dBi antenna gain*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 6.6 Mbps	5260.0	-5.42	-5.35	-2.37	-1.57	0.80	31.30	28.93	29.73	0.80
	5300.0	-5.30	-5.28	-2.28	-1.66	0.62	31.30	29.02	29.64	0.62
	5337.5	-5.33	-5.26	-2.28	-1.67	0.62	31.30	29.02	29.63	0.62
256-QAM 186.6 Mbps	5260.0	-5.34	-5.39	-2.35	-1.62	0.73	31.30	28.95	29.68	0.73
	5300.0	-5.29	-5.28	-2.27	-1.66	0.62	31.30	29.03	29.64	0.62
	5337.5	-5.32	-5.25	-2.27	-1.67	0.61	31.30	29.03	29.63	0.61

Table 8.3-7: *FCC Output power measurements and EIRP calculation results for 40 MHz channel, 10 dBi antenna*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 13.3 Mbps	5270.0	17.53	17.13	20.34	20.70	0.36	9.30	29.64	30.00	0.36
	5300.0	17.53	17.21	20.38	20.70	0.32	9.30	29.68	30.00	0.32
	5327.5	16.18	16.21	19.21	20.70	1.49	9.30	28.51	30.00	1.49
256-QAM 373.3 Mbps	5270.0	17.52	17.12	20.33	20.70	0.37	9.30	29.63	30.00	0.37
	5300.0	17.55	17.22	20.40	20.70	0.30	9.30	29.70	30.00	0.30
	5327.5	16.20	16.23	19.23	20.70	1.47	9.30	28.53	30.00	1.47

Table 8.3-8: *FCC Output power measurements and EIRP calculations results for 40 MHz channel, 24 dBi antenna gain*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 13.3 Mbps	5270.0	2.94	2.66	5.81	6.70	0.89	23.30	29.11	30.00	0.89
	5300.0	2.95	2.78	5.88	6.70	0.82	23.30	29.18	30.00	0.82
	5327.5	2.72	2.78	5.76	6.70	0.94	23.30	29.06	30.00	0.94
256-QAM 373.3 Mbps	5270.0	2.93	2.67	5.81	6.70	0.89	23.30	29.11	30.00	0.89
	5300.0	2.96	2.76	5.87	6.70	0.83	23.30	29.17	30.00	0.83
	5327.5	2.73	2.80	5.78	6.70	0.92	23.30	29.08	30.00	0.92

Table 8.3-9: *FCC Output power measurements and EIRP calculations results for 40 MHz channel, 32 dBi antenna gain*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 13.3 Mbps	5270.0	-5.07	-5.38	-2.21	-1.30	0.91	31.30	29.09	30.00	0.91
	5300.0	-5.02	-5.31	-2.15	-1.30	0.85	31.30	29.15	30.00	0.85
	5327.5	-5.31	-5.25	-2.27	-1.30	0.97	31.30	29.03	30.00	0.97
256-QAM 373.3 Mbps	5270.0	-5.07	-5.38	-2.21	-1.30	0.91	31.30	29.09	30.00	0.91
	5300.0	-5.03	-5.28	-2.14	-1.30	0.84	31.30	29.16	30.00	0.84
	5327.5	-5.28	-5.26	-2.26	-1.30	0.96	31.30	29.04	30.00	0.96

Table 8.3-10: *FCC PSD measurements results for 10 MHz channel, 10 dBi antenna*

Modulation and data rate	Frequency, MHz	PSD on ch0, dBm/MHz	PSD on ch1, dBm/MHz	Combined PSD, dBm/MHz	Limit, dBm/MHz	Margin, dB
BPSK, 3.3 Mbps	5255	-0.03	0.67	3.34	7.70	4.36
	5300	-0.05	0.77	3.39	7.70	4.31
	5342.5	-0.04	0.75	3.38	7.70	4.32
256-QAM 93.3 Mbps	5255	0.69	0.15	3.44	7.70	4.26
	5300	0.01	0.53	3.29	7.70	4.41
	5342.5	0.01	0.79	3.43	7.70	4.27

Table 8.3-11: *FCC PSD measurements results for 10 MHz channel, 24 dBi antenna*

Modulation and data rate	Frequency, MHz	PSD on ch0, dBm/MHz	PSD on ch1, dBm/MHz	Combined PSD, dBm/MHz	Limit, dBm/MHz	Margin, dB
BPSK, 3.3 Mbps	5255	-13.38	-13.80	-10.57	-6.30	4.27
	5300	-12.91	-12.44	-9.66	-6.30	3.36
	5342.5	-13.12	-13.04	-10.07	-6.30	3.77
256-QAM 93.3 Mbps	5255	-13.06	-13.63	-10.33	-6.30	4.03
	5300	-13.02	-13.22	-10.11	-6.30	3.81
	5342.5	-13.32	-12.78	-10.03	-6.30	3.73

Table 8.3-12: *FCC PSD measurements results for 10 MHz channel, 32 dBi antenna*

Modulation and data rate	Frequency, MHz	PSD on ch0, dBm/MHz	PSD on ch1, dBm/MHz	Combined PSD, dBm/MHz	Limit, dBm/MHz	Margin, dB
BPSK, 3.3 Mbps	5255	-20.95	-22.50	-18.65	-14.30	4.35
	5300	-20.47	-20.44	-17.44	-14.30	3.14
	5342.5	-20.83	-20.97	-17.89	-14.30	3.59
256-QAM 93.3 Mbps	5255	-20.88	-20.94	-17.90	-14.30	3.60
	5300	-21.10	-20.62	-17.84	-14.30	3.54
	5342.5	-21.08	-20.72	-17.89	-14.30	3.59

Table 8.3-13: *FCC PSD measurements results for 20 MHz channel, 10 dBi antenna*

Modulation and data rate	Frequency, MHz	PSD on ch0, dBm/MHz	PSD on ch1, dBm/MHz	Combined PSD, dBm/MHz	Limit, dBm/MHz	Margin, dB
BPSK, 6.6 Mbps	5260	0.75	0.24	3.51	7.70	4.19
	5300	0.50	0.64	3.58	7.70	4.12
	5337.5	-1.99	-1.22	1.42	7.70	6.28
256-QAM 186.6 Mbps	5260	0.53	0.39	3.47	7.70	4.23
	5300	0.88	0.37	3.64	7.70	4.06
	5337.5	-2.37	-1.40	1.15	7.70	6.55

Table 8.3-14: *FCC PSD measurements results for 20 MHz channel, 24 dBi antenna*

Modulation and data rate	Frequency, MHz	PSD on ch0, dBm/MHz	PSD on ch1, dBm/MHz	Combined PSD, dBm/MHz	Limit, dBm/MHz	Margin, dB
BPSK, 6.6 Mbps	5260	-12.51	-13.00	-9.74	-6.30	3.44
	5300	-13.14	-12.78	-9.95	-6.30	3.65
	5337.5	-12.60	-12.77	-9.67	-6.30	3.37
256-QAM 186.6 Mbps	5260	-12.74	-13.24	-9.97	-6.30	3.67
	5300	-13.08	-13.01	-10.03	-6.30	3.73
	5337.5	-13.01	-12.48	-9.73	-6.30	3.43

Table 8.3-15: *FCC PSD measurements results for 20 MHz channel, 32 dBi antenna*

Modulation and data rate	Frequency, MHz	PSD on ch0, dBm/MHz	PSD on ch1, dBm/MHz	Combined PSD, dBm/MHz	Limit, dBm/MHz	Margin, dB
BPSK, 6.6 Mbps	5260	-21.33	-21.02	-18.16	-14.30	3.86
	5300	-20.48	-20.67	-17.56	-14.30	3.26
	5337.5	-21.18	-21.22	-18.19	-14.30	3.89
256-QAM 186.6 Mbps	5260	-21.15	-21.15	-18.14	-14.30	3.84
	5300	-20.81	-20.83	-17.81	-14.30	3.51
	5337.5	-20.86	-20.62	-17.73	-14.30	3.43

Table 8.3-16: *FCC PSD measurements results for 40 MHz channel, 10 dBi antenna*

Modulation and data rate	Frequency, MHz	PSD on ch0, dBm/MHz	PSD on ch1, dBm/MHz	Combined PSD, dBm/MHz	Limit, dBm/MHz	Margin, dB
BPSK, 13.3 Mbps	5270.0	-1.71	-3.33	0.57	7.70	7.13
	5300.0	-3.42	-4.10	-0.74	7.70	8.44
	5327.5	-3.44	-5.06	-1.16	7.70	8.86
256-QAM 373.3 Mbps	5270.0	-2.79	-3.58	-0.16	7.70	7.86
	5300.0	-1.89	-3.90	0.23	7.70	7.47
	5327.5	-3.00	-4.32	-0.60	7.70	8.30

Table 8.3-17: *FCC PSD measurements results for 40 MHz channel, 24 dBi antenna*

Modulation and data rate	Frequency, MHz	PSD on ch0, dBm/MHz	PSD on ch1, dBm/MHz	Combined PSD, dBm/MHz	Limit, dBm/MHz	Margin, dB
BPSK, 13.3 Mbps	5270.0	-17.86	-17.66	-14.75	-6.30	8.45
	5300.0	-16.47	-19.00	-14.54	-6.30	8.24
	5327.5	-17.47	-18.38	-14.89	-6.30	8.59
256-QAM 373.3 Mbps	5270.0	-17.70	-18.41	-15.03	-6.30	8.73
	5300.0	-17.22	-18.48	-14.79	-6.30	8.49
	5327.5	-17.27	-18.45	-14.81	-6.30	8.51

Table 8.3-18: *FCC PSD measurements results for 40 MHz channel, 32 dBi antenna*

Modulation and data rate	Frequency, MHz	PSD on ch0, dBm/MHz	PSD on ch1, dBm/MHz	Combined PSD, dBm/MHz	Limit, dBm/MHz	Margin, dB
BPSK, 13.3 Mbps	5270.0	-24.98	-25.90	-22.41	-14.30	8.11
	5300.0	-24.58	-26.56	-22.45	-14.30	8.15
	5327.5	-25.17	-26.71	-22.86	-14.30	8.56
256-QAM 373.3 Mbps	5270.0	-25.34	-26.32	-22.79	-14.30	8.49
	5300.0	-24.73	-26.72	-22.60	-14.30	8.30
	5327.5	-25.23	-26.28	-22.71	-14.30	8.41

Table 8.3-19: *ISED Output power measurements and EIRP calculation results for 10 MHz channel, 10 dBi antenna*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 3.3 Mbps	5255.0	6.18	6.08	9.14	16.83	7.69	9.30	18.44	23.00	4.56
	5300.0	10.33	10.37	13.36	16.83	3.47	9.30	22.66	23.00	0.34
	5342.5	10.32	10.43	13.39	16.83	3.45	9.30	22.69	23.00	0.31
256-QAM 93.3 Mbps	5255.0	6.15	6.07	9.12	16.83	7.71	9.30	18.42	23.00	4.58
	5300.0	10.35	10.38	13.38	16.83	3.46	9.30	22.68	23.00	0.32
	5342.5	10.33	10.41	13.38	16.84	3.46	9.30	22.68	23.00	0.32

Note: as per additional requirements of antenna elevation gain, EIRP limit was adjusted to 200 mW (23 dBm)

Table 8.3-20: *ISED Output power measurements and EIRP calculations results for 10 MHz channel, 24 dBi antenna gain*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 3.3 Mbps	5255.0	-7.92	-8.01	-4.95	2.83	7.78	23.30	18.35	23.00	4.65
	5300.0	-3.64	-3.85	-0.73	2.83	3.57	23.30	22.57	23.00	0.43
	5342.5	-3.89	-3.79	-0.83	2.83	3.66	23.30	22.47	23.00	0.53
256-QAM 93.3 Mbps	5255.0	-7.92	-8.02	-4.96	2.83	7.79	23.30	18.34	23.00	4.66
	5300.0	-3.89	-3.82	-0.84	2.83	3.68	23.30	22.46	23.00	0.54
	5342.5	-3.83	-3.79	-0.80	2.84	3.64	23.30	22.50	23.00	0.50

Note: as per additional requirements of antenna elevation gain, EIRP limit was adjusted to 200 mW (23 dBm)

Table 8.3-21: *ISED Output power measurements and EIRP calculations results for 10 MHz channel, 32 dBi antenna gain*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 3.3 Mbps	5255.0	-14.92	-15.01	-11.95	-5.17	6.78	31.30	19.35	26.13	6.78
	5300.0	-8.48	-8.44	-5.45	-5.17	0.28	31.30	25.85	26.13	0.28
	5342.5	-8.49	-8.39	-5.43	-5.17	0.26	31.30	25.87	26.13	0.26
256-QAM 93.3 Mbps	5255.0	-14.92	-14.99	-11.94	-5.17	6.78	31.30	19.36	26.13	6.78
	5300.0	-8.48	-8.46	-5.46	-5.17	0.29	31.30	25.84	26.13	0.29
	5342.5	-8.48	-8.37	-5.41	-5.16	0.25	31.30	25.89	26.14	0.25

Table 8.3-22: *ISED Output power measurements and EIRP calculation results for 20 MHz channel, 10 dBi antenna*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 6.6 Mbps	5260.0	6.48	6.32	9.41	19.84	10.43	9.30	18.71	23.00	4.29
	5300.0	10.63	10.65	13.65	19.84	6.19	9.30	22.95	23.00	0.05
	5337.5	10.63	10.45	13.55	19.84	6.29	9.30	22.85	23.00	0.15
256-QAM 186.6 Mbps	5260.0	6.44	6.33	9.40	19.84	10.45	9.30	18.70	23.00	4.30
	5300.0	10.65	10.61	13.64	19.84	6.20	9.30	22.94	23.00	0.06
	5337.5	10.61	10.55	13.59	19.84	6.25	9.30	22.89	23.00	0.11

Note: as per additional requirements of antenna elevation gain, EIRP limit was adjusted to 200 mW (23 dBm)

Table 8.3-23: *ISED Output power measurements and EIRP calculations results for 20 MHz channel, 24 dBi antenna gain*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 6.6 Mbps	5260.0	-7.63	-7.78	-4.69	5.84	10.54	23.30	18.61	23.00	4.39
	5300.0	-3.58	-3.64	-0.60	5.84	6.44	23.30	22.70	23.00	0.30
	5337.5	-3.59	-3.78	-0.67	5.84	6.51	23.30	22.63	23.00	0.37
256-QAM 186.6 Mbps	5260.0	-7.64	-7.78	-4.70	5.84	10.54	23.30	18.60	23.00	4.40
	5300.0	-3.59	-3.59	-0.58	5.84	6.42	23.30	22.72	23.00	0.28
	5337.5	-3.61	-3.78	-0.68	5.84	6.53	23.30	22.62	23.00	0.38

Note: as per additional requirements of antenna elevation gain, EIRP limit was adjusted to 200 mW (23 dBm)

Table 8.3-24: *ISED Output power measurements and EIRP calculations results for 20 MHz channel, 32 dBi antenna gain*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 6.6 Mbps	5260.0	-14.62	-14.78	-11.69	-2.16	9.53	31.30	19.61	29.14	9.53
	5300.0	-5.30	-5.28	-2.28	-2.16	0.12	31.30	29.02	29.14	0.12
	5337.5	-5.33	-5.26	-2.28	-2.16	0.13	31.30	29.02	29.14	0.13
256-QAM 186.6 Mbps	5260.0	-14.62	-14.77	-11.68	-2.16	9.53	31.30	19.62	29.14	9.53
	5300.0	-5.29	-5.28	-2.27	-2.16	0.12	31.30	29.03	29.14	0.12
	5337.5	-5.32	-5.25	-2.27	-2.16	0.12	31.30	29.03	29.14	0.12

Table 8.3-25: *ISED Output power measurements and EIRP calculation results for 40 MHz channel, 10 dBi antenna*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 13.3 Mbps	5270.0	6.50	6.40	9.46	20.70	11.24	9.30	18.76	23.00	4.24
	5300.0	10.69	10.64	13.68	20.70	7.02	9.30	22.98	23.00	0.02
	5327.5	10.62	10.65	13.65	20.70	7.05	9.30	22.95	23.00	0.05
256-QAM 373.3 Mbps	5270.0	6.51	6.40	9.47	20.70	11.23	9.30	18.77	23.00	4.23
	5300.0	10.71	10.63	13.68	20.70	7.02	9.30	22.98	23.00	0.02
	5327.5	10.72	10.64	13.69	20.70	7.01	9.30	22.99	23.00	0.01

Note: as per additional requirements of antenna elevation gain, EIRP limit was adjusted to 200 mW (23 dBm)

Table 8.3-26: *ISED Output power measurements and EIRP calculations results for 40 MHz channel, 24 dBi antenna gain*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 13.3 Mbps	5270.0	-7.59	-7.69	-4.63	6.70	11.33	23.30	18.67	23.00	4.33
	5300.0	-3.52	-3.59	-0.54	6.70	7.24	23.30	22.76	23.00	0.24
	5327.5	-3.53	-3.57	-0.54	6.70	7.24	23.30	22.76	23.00	0.24
256-QAM 373.3 Mbps	5270.0	-7.58	-7.67	-4.61	6.70	11.31	23.30	18.69	23.00	4.31
	5300.0	-3.51	-3.62	-0.55	6.70	7.25	23.30	22.75	23.00	0.25
	5327.5	-3.53	-3.56	-0.53	6.70	7.23	23.30	22.77	23.00	0.23

Note: as per additional requirements of antenna elevation gain, EIRP limit was adjusted to 200 mW (23 dBm)

Table 8.3-27: *ISED Output power measurements and EIRP calculations results for 40 MHz channel, 32 dBi antenna gain*

Modulation and data rate	Frequency, MHz	Output power on ch0, dBm	Output power on ch1, dBm	Combined power, dBm	Limit, dBm	Margin, dB	Tot. Gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB
BPSK, 13.3 Mbps	5270.0	-14.58	-14.70	-11.63	-1.30	10.33	31.30	19.67	30.00	10.33
	5300.0	-5.02	-5.31	-2.15	-1.30	0.85	31.30	29.15	30.00	0.85
	5327.5	-5.31	-5.25	-2.27	-1.30	0.97	31.30	29.03	30.00	0.97
256-QAM 373.3 Mbps	5270.0	-14.56	-14.68	-11.61	-1.30	10.31	31.30	19.69	30.00	10.31
	5300.0	-5.03	-5.28	-2.14	-1.30	0.84	31.30	29.16	30.00	0.84
	5327.5	-5.28	-5.26	-2.26	-1.30	0.96	31.30	29.04	30.00	0.96

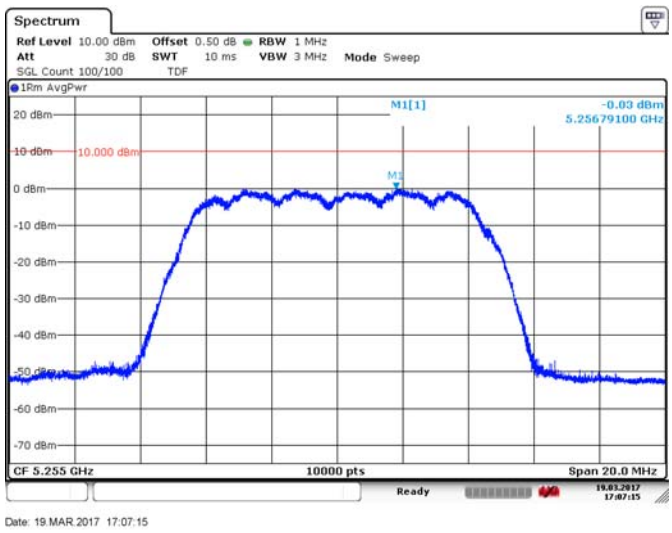

Figure 8.3-1: *Sample plot for PSD on 10 MHz channel*

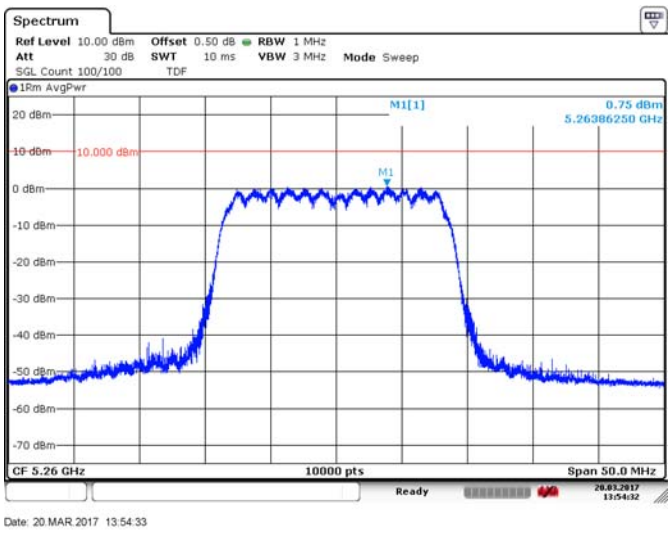

Figure 8.3-2: *Sample plot for PSD on 20 MHz channel*

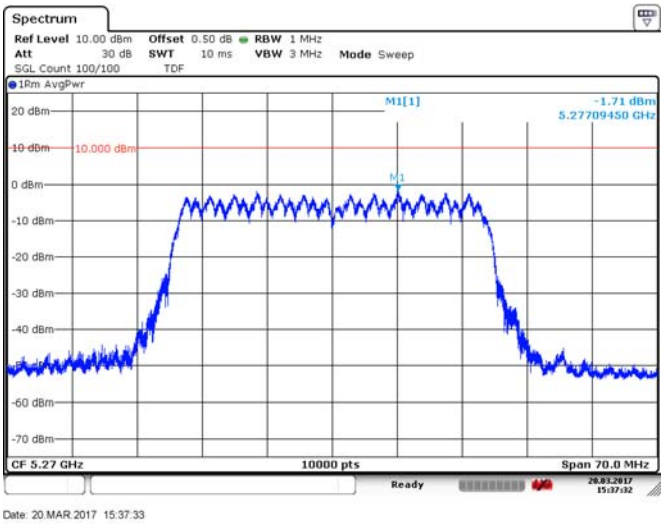

Figure 8.3-3: *Sample plot for PSD on 40 MHz channel*

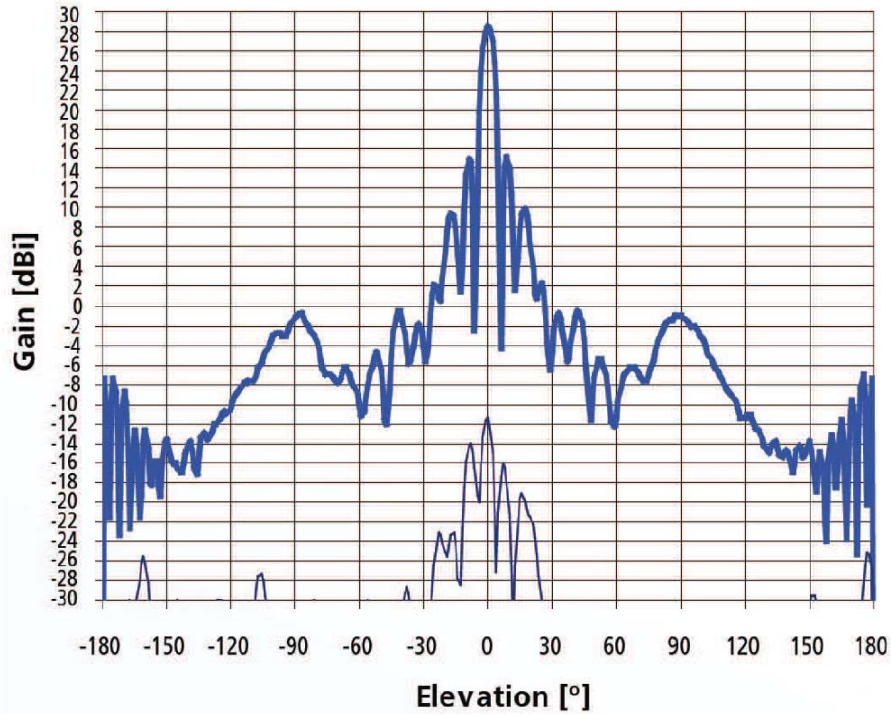

Figure 8.3-4: *Elevation Gain pattern of antenna 3(32 dBi)*

Table 8.3-28: *ISED additional requirement for e.i.r.p, calculation for 32 dBi antenna gain at different elevations*

Elevation angle range, °	Elevation angle, °	Max Peak antenna gain, dBi	Max PSD conducted, dBm/MHz	e.i.r.p, dBm/MHz	Limit, dBm/MHz	Margin, dB
for 0° ≤ θ < 8°	0	31.3	-17.44	13.86	17	3.14
for 8° ≤ θ < 40°	10	15	-17.44	-2.44	15.57	18.01
for 8° ≤ θ < 40°	15	10	-17.44	-7.44	11.99	19.43
for 8° ≤ θ < 40°	25	2	-17.44	-15.44	4.83	20.27
for 40° ≤ θ ≤ 45°	40	0	-17.44	-17.44	-5.90	11.54
for θ > 45°	65	-6	-17.44	-23.44	-12	11.44
for θ > 45°	90	-1	-17.44	-18.44	-12	6.44

8.4 FCC 15.407(b) and RSS-247 6.2.2.2 Spurious (out-of-band) emissions

8.4.1 Definitions and limits

FCC:
(2) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of −27 dBm/MHz.
(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209.
(7) The provisions of § 15.205 apply to intentional radiators operating under this section.
(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

ISED:
Devices shall comply with the following:

All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p.; or
All emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. and its power shall comply with the spectral power density for operation within the band 5150-5250 MHz. The device, except devices installed in vehicles, shall be labelled or include in the user manual the following text "for indoor use only."

Table 8.4-1: *FCC §15.209 and RSS-Gen – Radiated emission limits*

Frequency, MHz	Field strength of emissions µV/m	Field strength of emissions dBµV/m	Measurement distance, m
0.009–0.490	2400/F *(F in kHz)*	67.6 – 20 × $\log_{10}$(F) *(F in kHz)*	300
0.490–1.705	24000/F *(F in kHz)*	87.6 – 20 × $\log_{10}$(F) *(F in kHz)*	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes: In the emission table above, the tighter limit applies at the band edges.
For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

Table 8.4-2: *ISED restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	12.51975–12.52025	399.9–410	5.35–5.46
2.1735–2.1905	12.57675–12.57725	608–614	7.25–7.75
3.020–3.026	13.36–13.41	960–1427	8.025–8.5
4.125–4.128	16.42–16.423	1435–1626.5	9.0–9.2
4.17725–4.17775	16.69475–16.69525	1645.5–1646.5	9.3–9.5
4.20725–4.20775	16.80425–16.80475	1660–1710	10.6–12.7
5.677-5.683	25.5–25.67	1718.8–1722.2	13.25–13.4
6.215–6.218	37.5–38.25	2200–2300	14.47–14.5
6.26775–6.26825	73–74.6	2310–2390	15.35–16.2
6.31175–6.31225	74.8–75.2	2655–2900	17.7–21.4
8.291–8.294	108–138	3260–3267	22.01–23.12
8.362–8.366	156.52475–156.52525	3332–3339	23.6–24.0
8.37625–8.38675	156.7–156.9	3345.8–3358	31.2–31.8
8.41425–8.41475	240–285	3500–4400	36.43–36.5
12.29–12.293	322–335.4	4500–5150	Above 38.6

Note: Certain frequency bands listed in Table 8.4-2 and above 38.6 GHz are designated for low-power license-exempt applications. These frequency bands and the requirements that apply to the devices are set out in this Standard

Table 8.4-3: *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			

8.4.2 Test summary

Test date:	March 19, 2017 to April 10, 2017	Temperature:	22 °C
Test engineer:	Yong Huang	Air pressure:	1010 mbar
Verdict:	Pass	Relative humidity:	31 %

8.4.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to 40 GHz while the EUT was transmitting on both MIMO chains simultaneously.
Radiated measurements below 18 GHz were performed at a distance of 3 m.
Radiated measurements above 18 GHz were performed at a distance of 1 m.
All conducted plots below have been corrected with antenna gains, RF cable losses and multiple antenna correction factors.
Where it is not specified in the figure comment, the power settings were set to a maximum between FCC and ISED.
As per customer, the transmitter output signals on the two chains are completely uncorrelated.
Cabinet radiation were performed while both antenna connectors were terminated with 50 Ω load. No emissions related to RF transmitter were detected within 6 dB below the limit.

Spectrum analyser for peak conducted measurements within restricted bands below 1 GHz:

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

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

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

Spectrum analyser for average conducted measurements within restricted bands above 1 GHz for frequencies where peak results were above the average limit:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	RMS
Trace mode:	Power average
Number of averaging traces:	100

Spectrum analyser for peak conducted measurements outside restricted bands:

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

Conducted emissions measurements outside restricted bands were performed on each individual MIMO chain. The reference level offset was adjusted to include antenna directional gain.

8.4.4 Test data

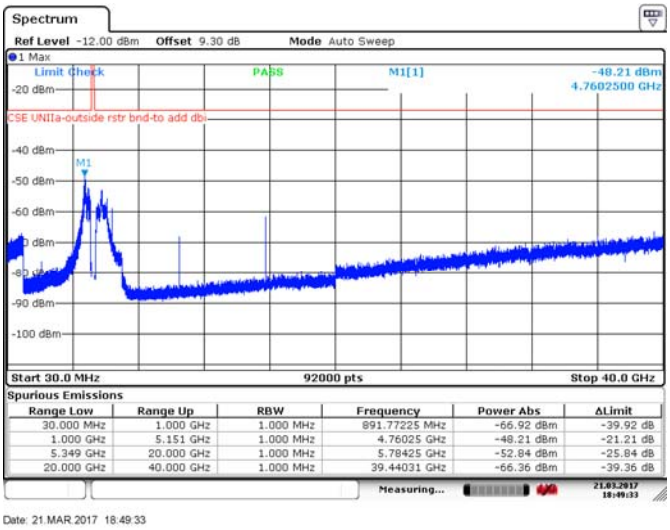

Figure 8.4-1: *Spurious emissions outside restricted bands, 10 MHz channel, low channel, 10 dBi antenna, cho, 256-QAM*

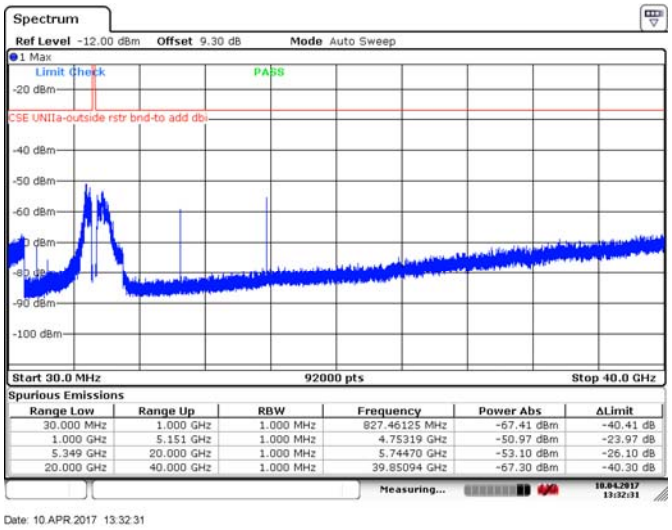

Figure 8.4-2: *Spurious emissions outside restricted bands, 10 MHz channel, low channel, 10 dBi antenna, ch1, 256-QAM*

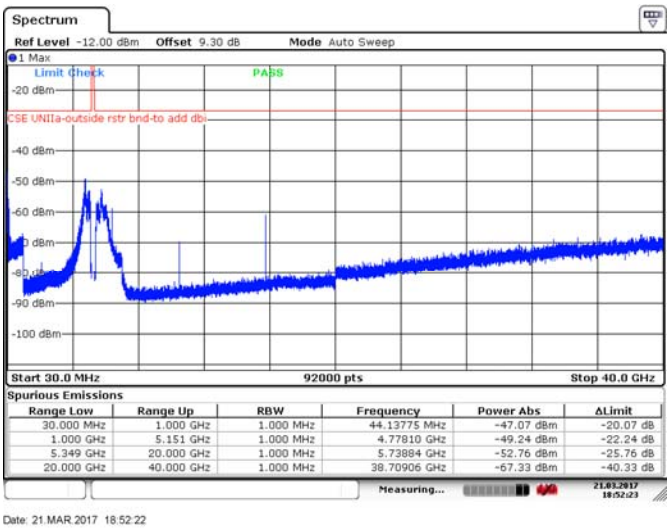

Figure 8.4-3: *Spurious emissions outside restricted bands, 10 MHz channel, low channel, 10 dBi antenna, cho, BPSK*

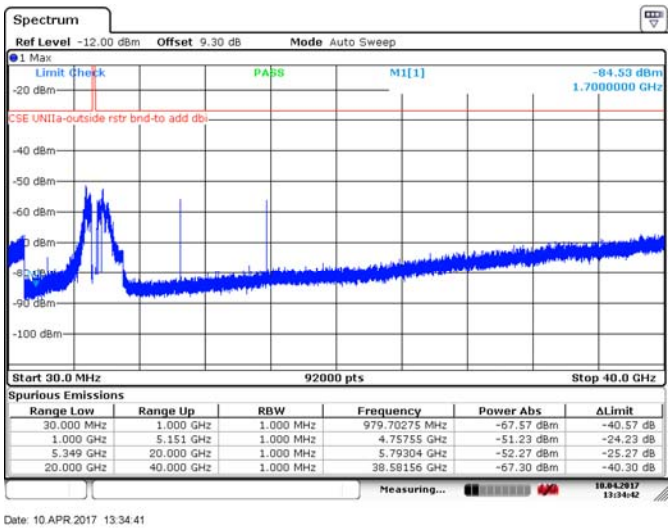

Figure 8.4-4: *Spurious emissions outside restricted bands, 10 MHz channel, low channel, 10 dBi antenna, ch1, BPSK*

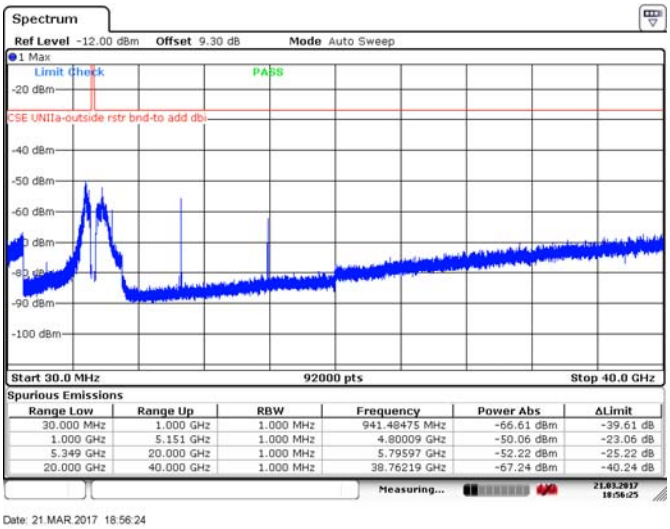

Figure 8.4-5: *Spurious emissions outside restricted bands, 10 MHz channel, mid channel, 10 dBi antenna, ch0, 256-QAM*

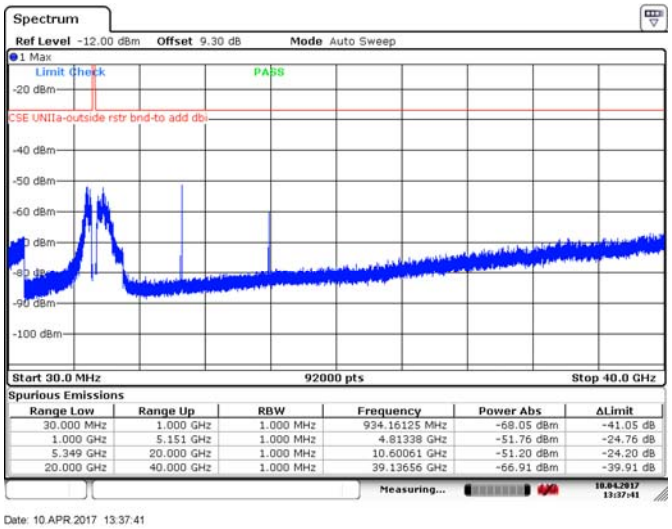

Figure 8.4-6: *Spurious emissions outside restricted bands, 10 MHz channel, mid channel, 10 dBi antenna, ch1, 256-QAM*

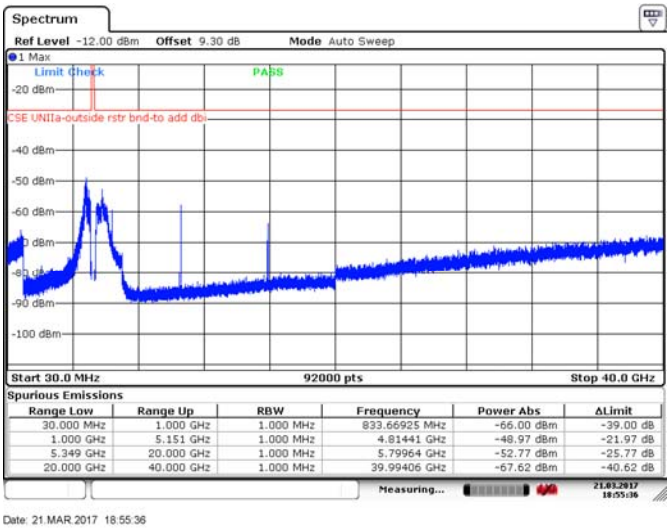

Figure 8.4-7: *Spurious emissions outside restricted bands, 10 MHz channel, mid channel, 10 dBi antenna, ch0, BPSK*

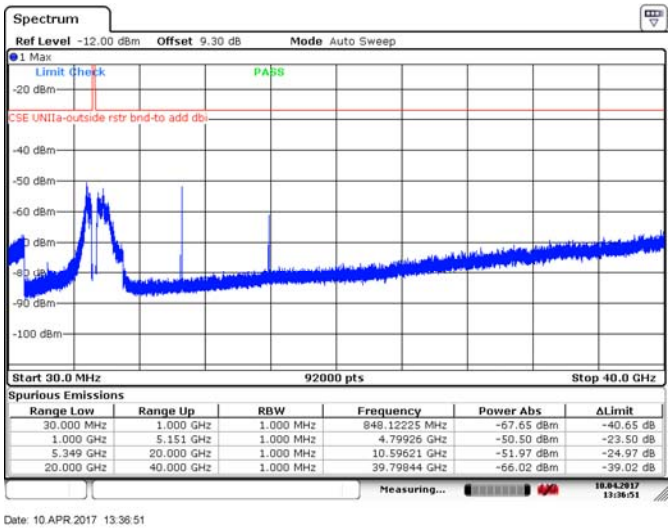

Figure 8.4-8: *Spurious emissions outside restricted bands, 10 MHz channel, mid channel, 10 dBi antenna, ch1, BPSK*

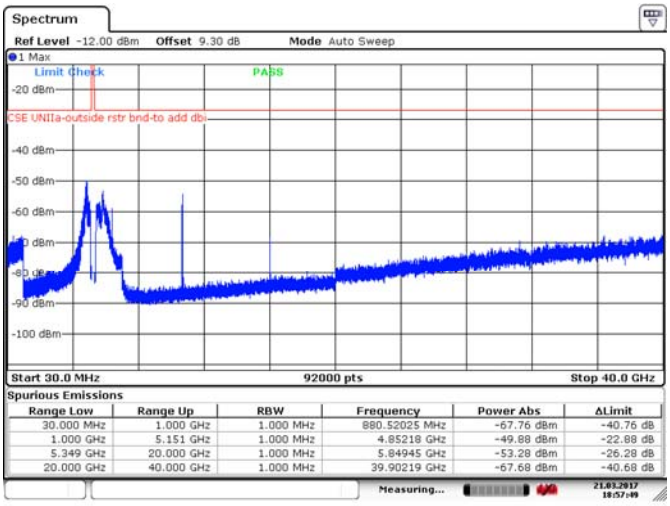

Figure 8.4-9: *Spurious emissions outside restricted bands, 10 MHz channel, high channel, 10 dBi antenna, ch0, 256-QAM*

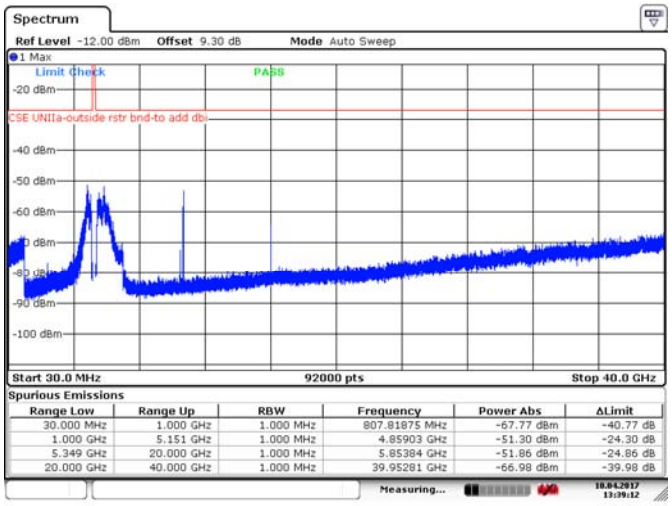

Figure 8.4-10: *Spurious emissions outside restricted bands, 10 MHz channel, high channel, 10 dBi antenna, ch1, 256-QAM*

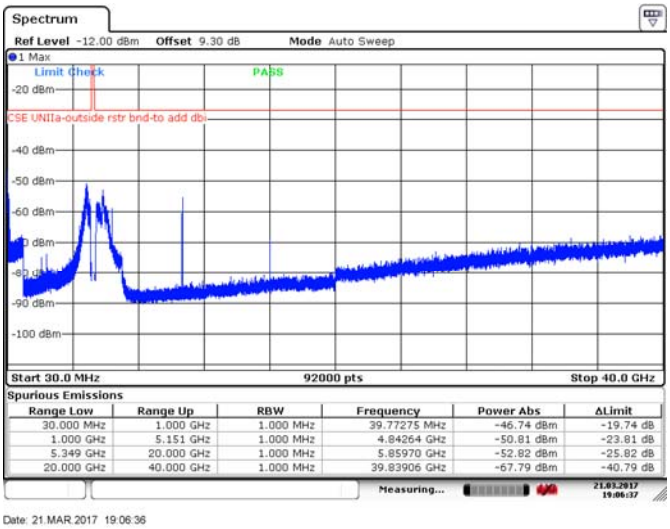

Figure 8.4-11: *Spurious emissions outside restricted bands, 10 MHz channel, high channel, 10 dBi antenna, ch0, BPSK*

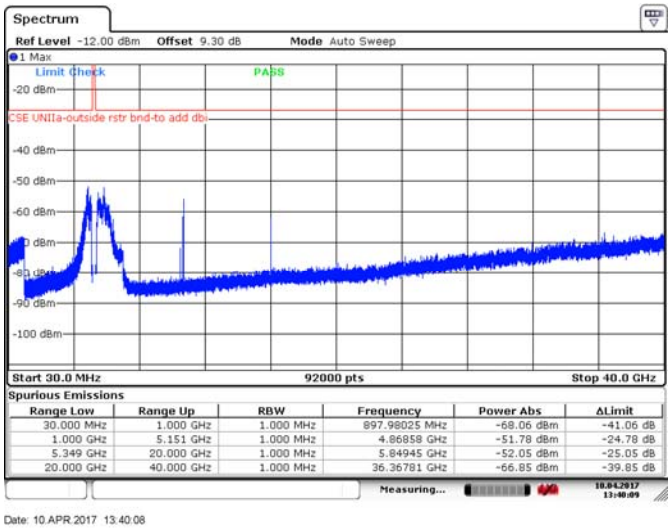

Figure 8.4-12: *Spurious emissions outside restricted bands, 10 MHz channel, high channel, 10 dBi antenna, ch1, BPSK*

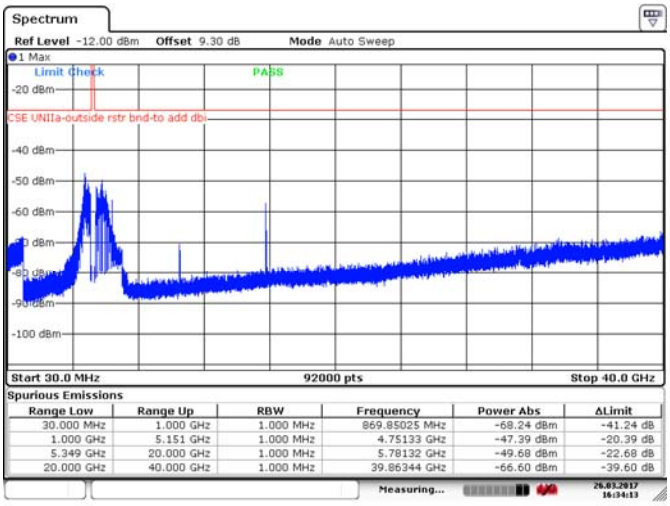

Figure 8.4-13: *Spurious emissions outside restricted bands, 20 MHz channel, low channel, 10 dBi antenna, cho, 256-QAM*

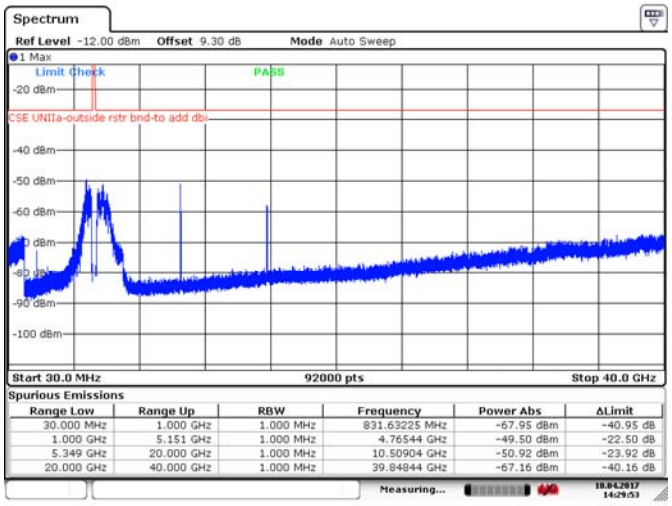

Figure 8.4-14: *Spurious emissions outside restricted bands, 20 MHz channel, low channel, 10 dBi antenna, ch1, 256-QAM*

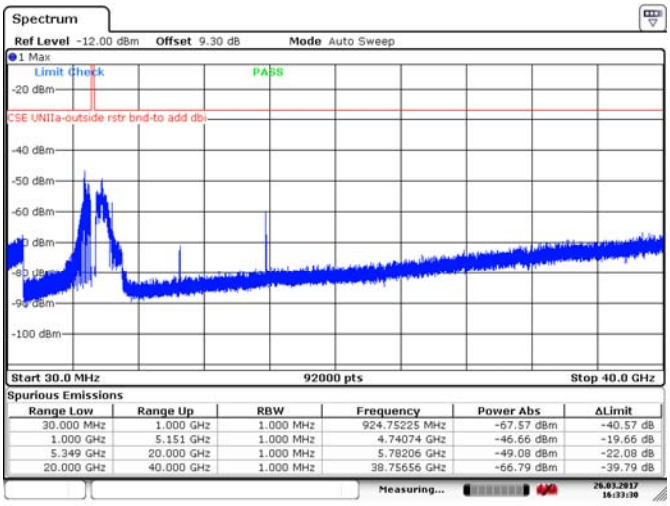

Figure 8.4-15: *Spurious emissions outside restricted bands, 20 MHz channel, low channel, 10 dBi antenna, cho, BPSK*

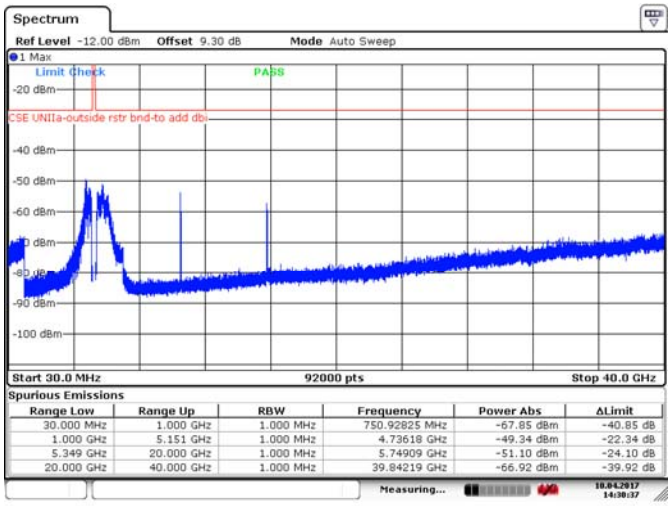

Figure 8.4-16: *Spurious emissions outside restricted bands, 20 MHz channel, low channel, 10 dBi antenna, ch1, BPSK*

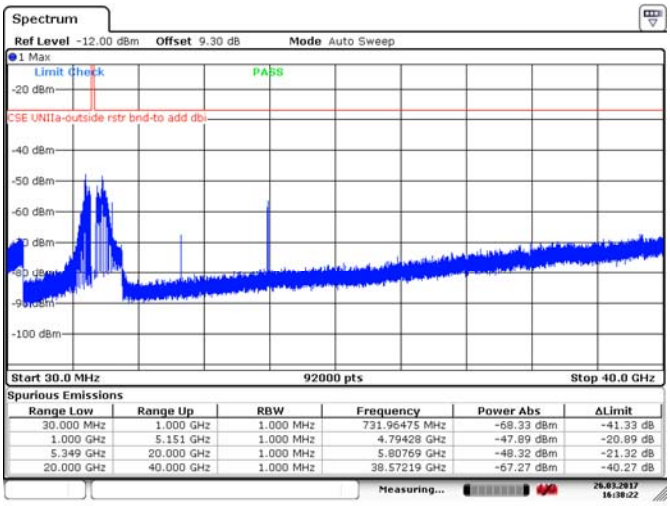

Figure 8.4-17: *Spurious emissions outside restricted bands, 20 MHz channel, mid channel, 10 dBi antenna, ch0, 256-QAM*

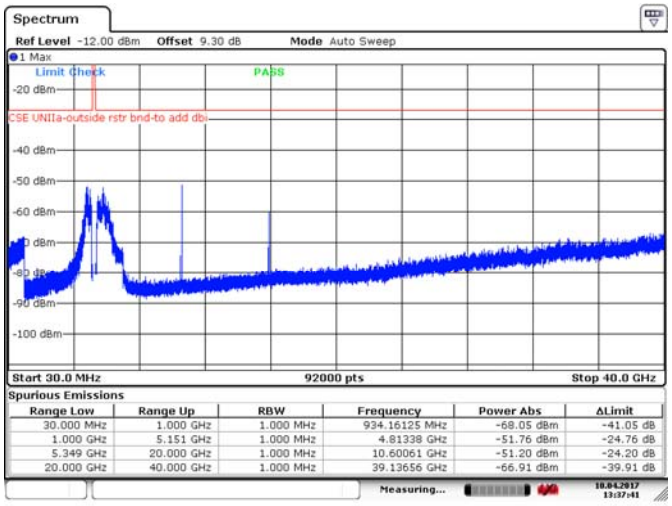

Figure 8.4-18: *Spurious emissions outside restricted bands, 20 MHz channel, mid channel, 10 dBi antenna, ch1, 256-QAM*

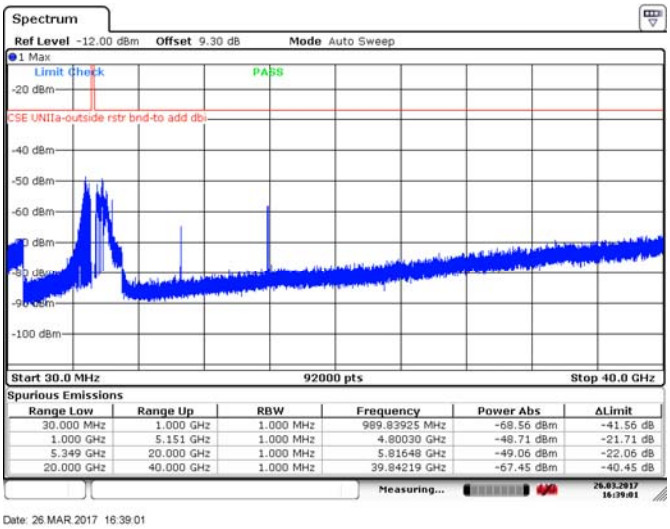

Figure 8.4-19: *Spurious emissions outside restricted bands, 20 MHz channel, mid channel, 10 dBi antenna, ch0, BPSK*

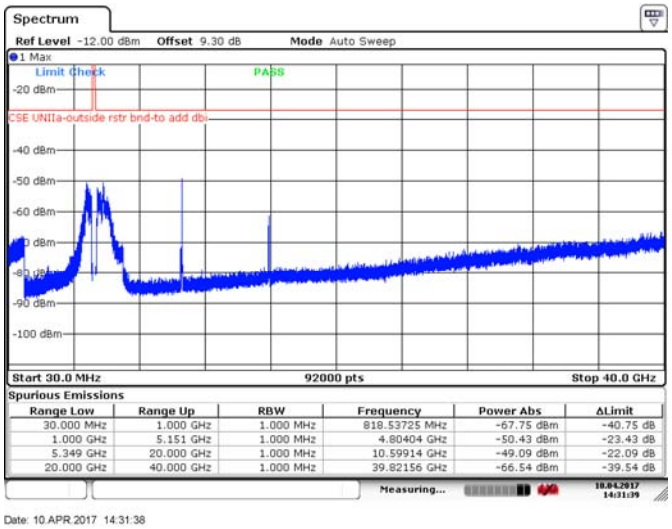

Figure 8.4-20: *Spurious emissions outside restricted bands, 20 MHz channel, mid channel, 10 dBi antenna, ch1, BPSK*

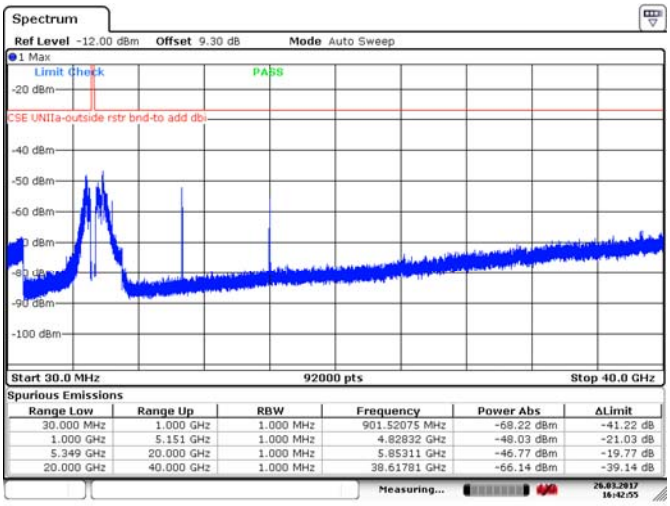

Figure 8.4-21: *Spurious emissions outside restricted bands, 20 MHz channel, high channel, 10 dBi antenna, ch0, 256-QAM*

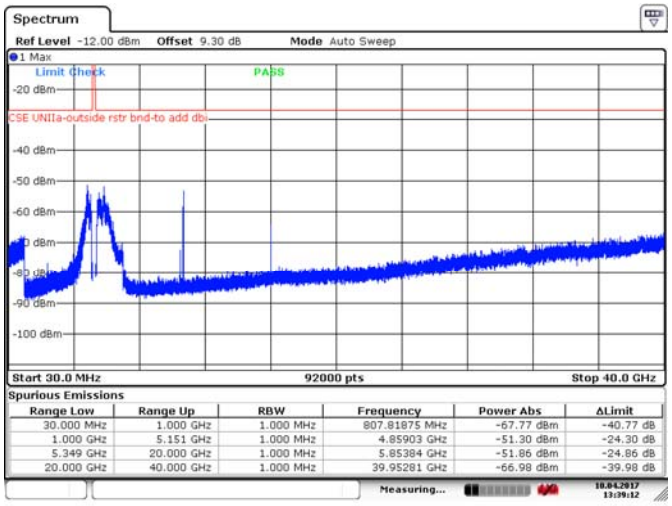

Figure 8.4-22: *Spurious emissions outside restricted bands, 20 MHz channel, high channel, 10 dBi antenna, ch1, 256-QAM*

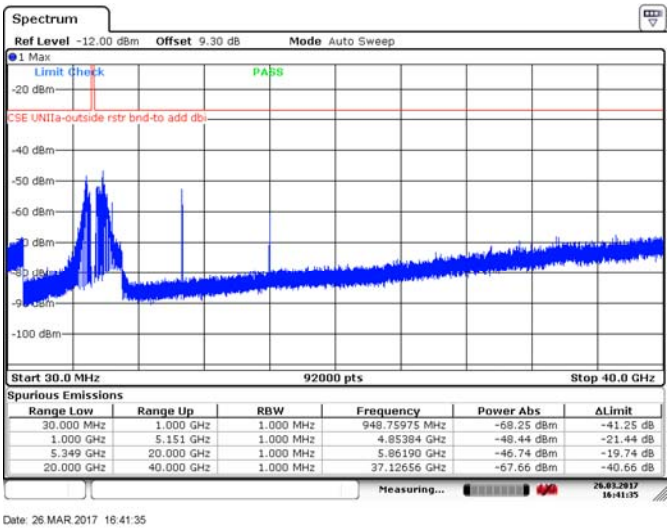

Figure 8.4-23: *Spurious emissions outside restricted bands, 20 MHz channel, high channel, 10 dBi antenna, ch0, BPSK*

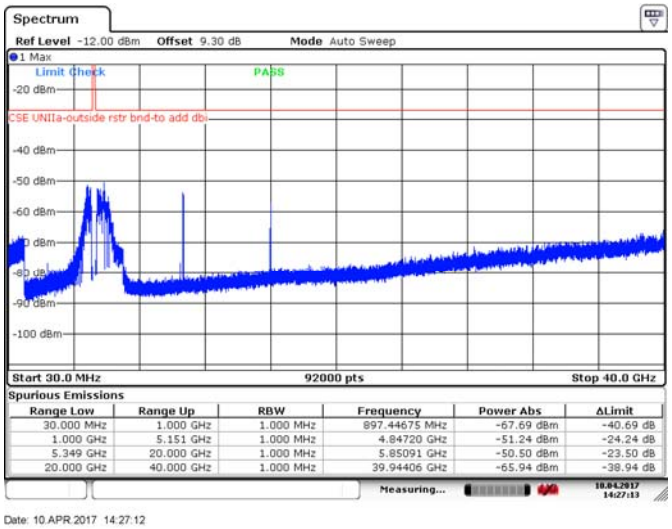

Figure 8.4-24: *Spurious emissions outside restricted bands, 20 MHz channel, high channel, 10 dBi antenna, ch1, BPSK*

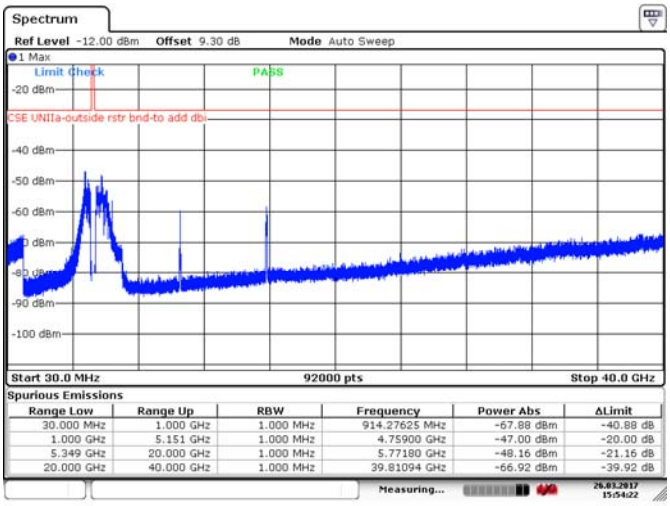

Figure 8.4-25: *Spurious emissions outside restricted bands, 40 MHz channel, low channel, 10 dBi antenna, ch0, 256-QAM*

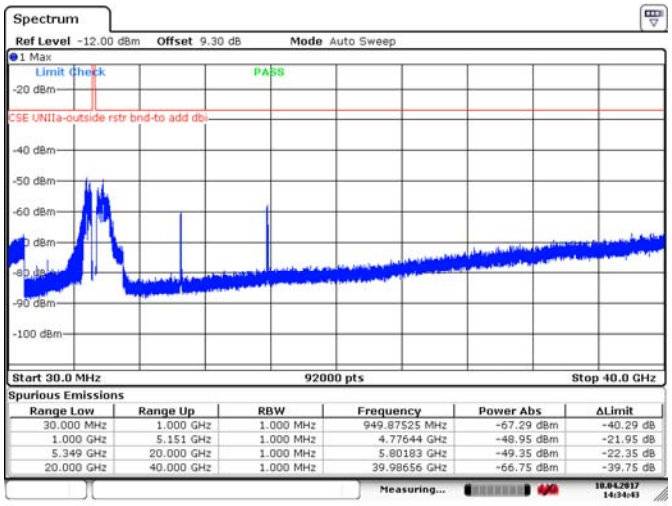

Figure 8.4-26: *Spurious emissions outside restricted bands, 40 MHz channel, low channel, 10 dBi antenna, ch1, 256-QAM*

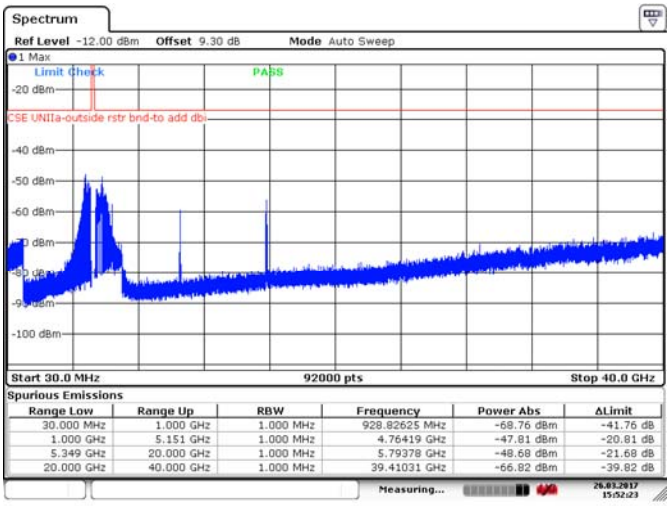

Figure 8.4-27: *Spurious emissions outside restricted bands, 40 MHz channel, low channel, 10 dBi antenna, ch0, BPSK*

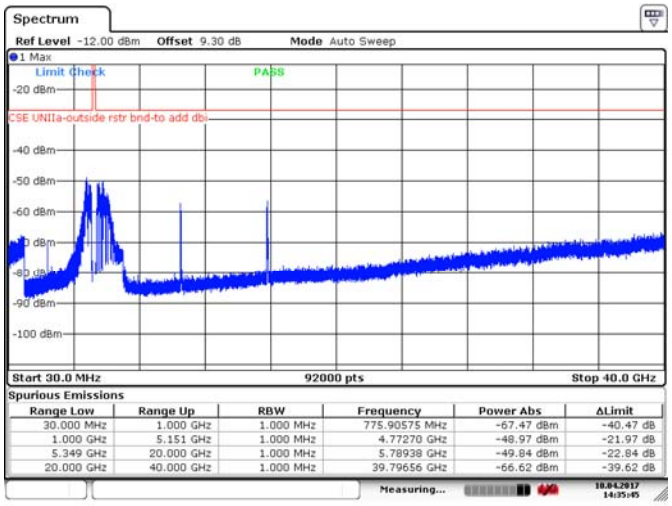

Figure 8.4-28: *Spurious emissions outside restricted bands, 40 MHz channel, low channel, 10 dBi antenna, ch1, BPSK*

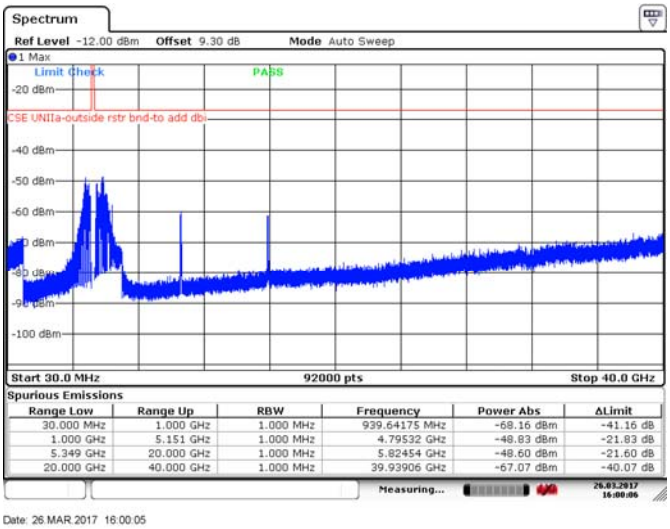

Figure 8.4-29: *Spurious emissions outside restricted bands, 40 MHz channel, mid channel, 10 dBi antenna, ch0, 256-QAM*

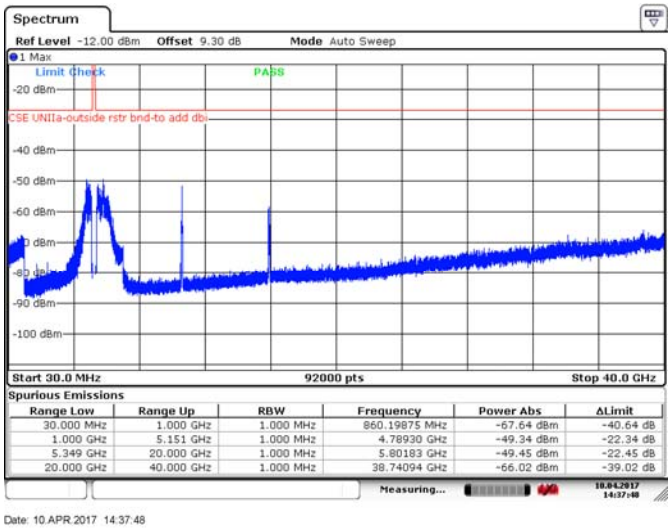

Figure 8.4-30: *Spurious emissions outside restricted bands, 40 MHz channel, mid channel, 10 dBi antenna, ch1, 256-QAM*

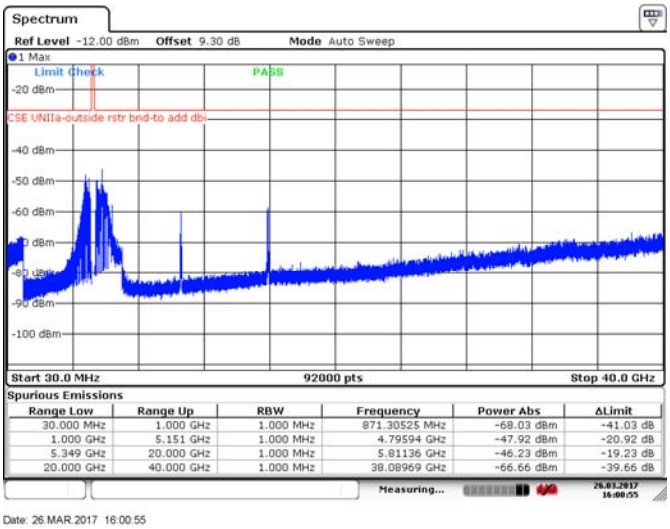

Figure 8.4-31: *Spurious emissions outside restricted bands, 40 MHz channel, mid channel, 10 dBi antenna, ch0, BPSK*

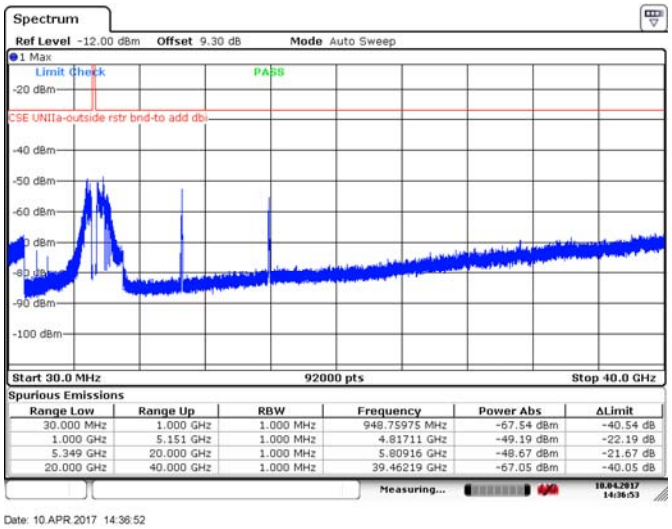

Figure 8.4-32: *Spurious emissions outside restricted bands, 40 MHz channel, mid channel, 10 dBi antenna, ch1, BPSK*

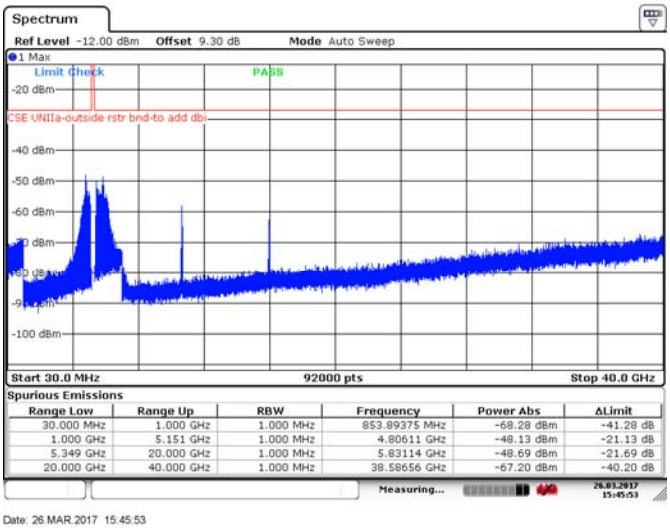

Figure 8.4-33: *Spurious emissions outside restricted bands, 40 MHz channel, high channel, 10 dBi antenna, ch0, 256-QAM*

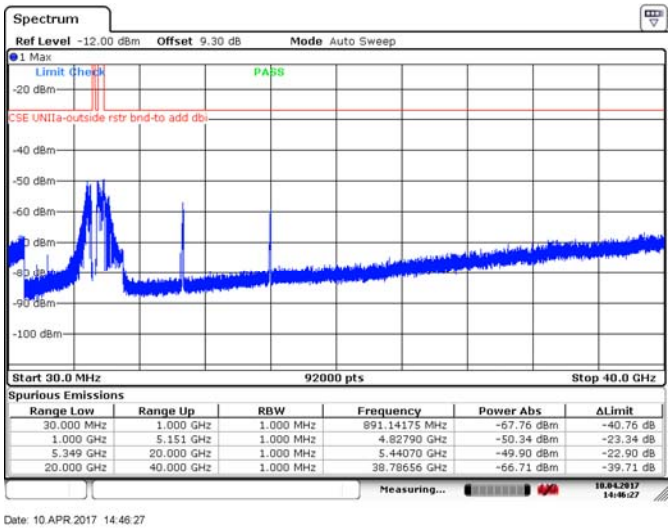

Figure 8.4-34: *Spurious emissions outside restricted bands, 40 MHz channel, high channel, 10 dBi antenna, ch1, 256-QAM*

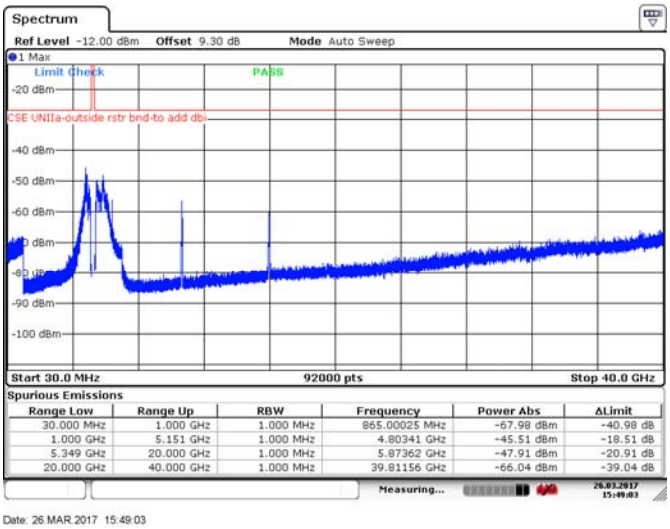

Figure 8.4-35: *Spurious emissions outside restricted bands, 40 MHz channel, high channel, 10 dBi antenna, ch0, BPSK*

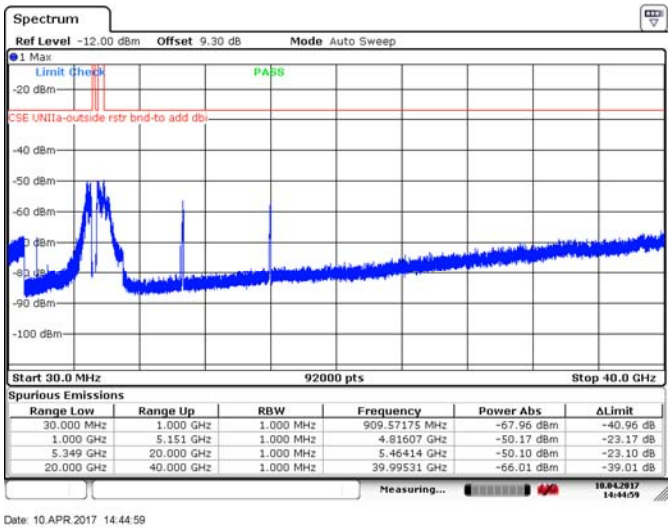

Figure 8.4-36: *Spurious emissions outside restricted bands, 40 MHz channel, high channel, 10 dBi antenna, ch1, BPSK*

Peak limit EIRP equivalent: 74 dBµV/m – 95.23 dB = −21.23 dBm
Average limit EIRP equivalent: 54 dBµV/m – 95.23 dB = −41.23 dBm

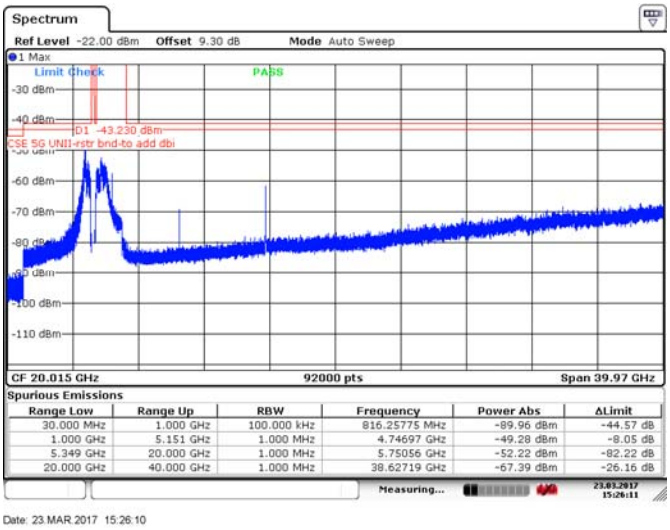

Figure 8.4-37: *Spurious emissions within restricted bands, 10 MHz channel, low channel, 10 dBi antenna, ch0, BPSK*

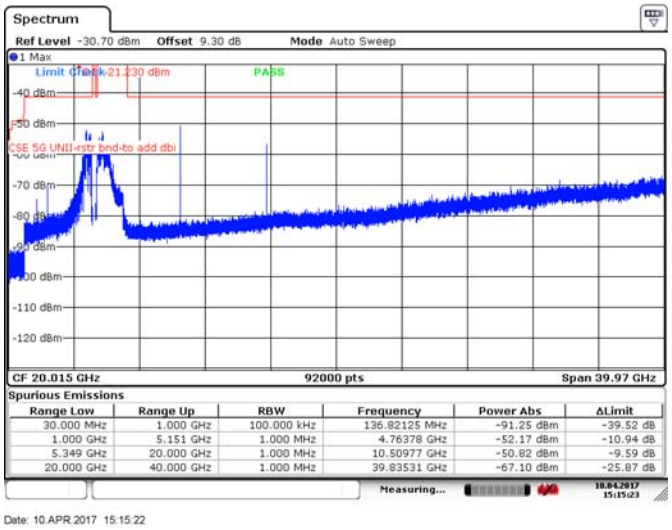

Figure 8.4-38: *Spurious emissions within restricted bands, 10 MHz channel, low channel, 10 dBi antenna, ch1, BPSK*

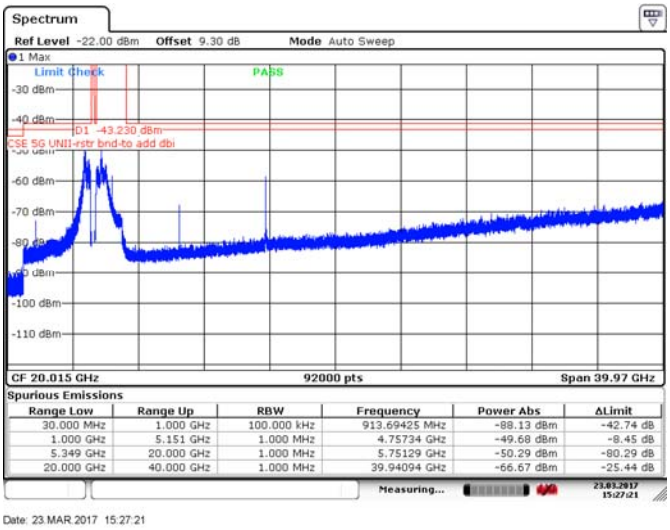

Figure 8.4-39: *Spurious emissions within restricted bands, 10 MHz channel, low channel, 10 dBi antenna, ch0, 256QAM*

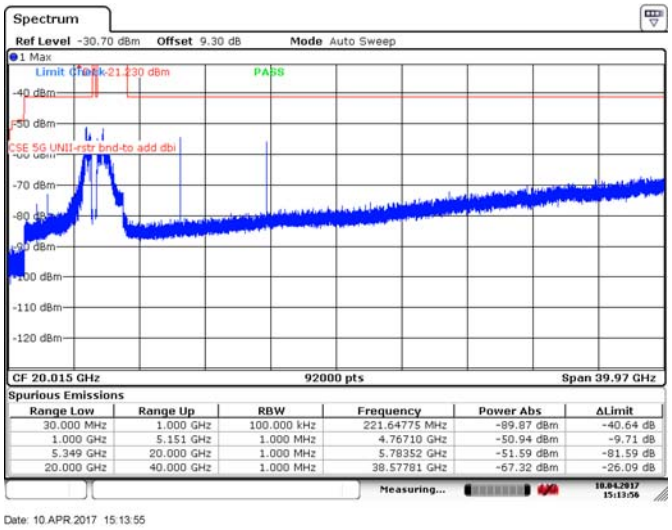

Figure 8.4-40: *Spurious emissions within restricted bands, 10 MHz channel, low channel, 10 dBi antenna, ch1, 256QAM*

Peak limit EIRP equivalent: 74 dBµV/m – 95.23 dB = −21.23 dBm
Average limit EIRP equivalent: 54 dBµV/m – 95.23 dB = −41.23 dBm

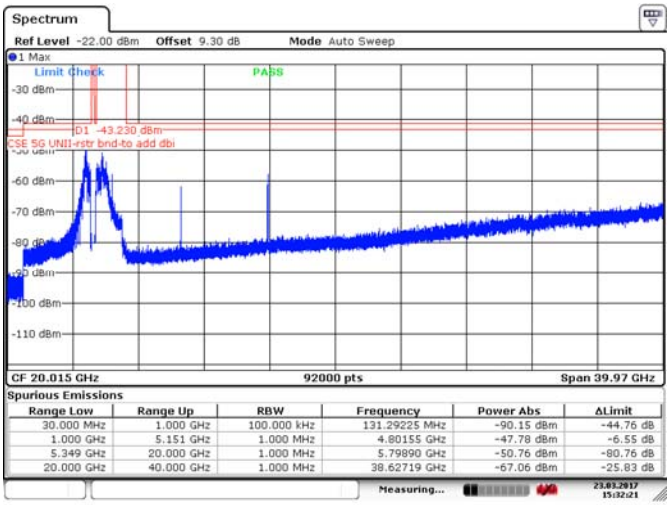

Figure 8.4-41: *Spurious emissions within restricted bands, 10 MHz channel, mid channel, 10 dBi antenna, ch0, BPSK*

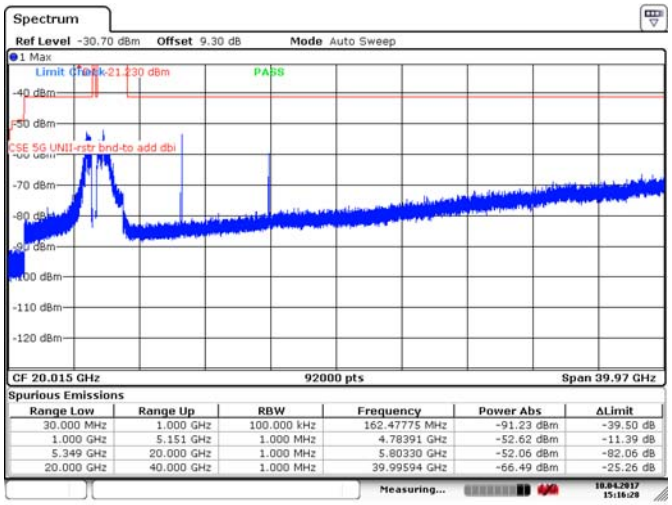

Figure 8.4-42: *Spurious emissions within restricted bands, 10 MHz channel, mid channel, 10 dBi antenna, ch1, BPSK*

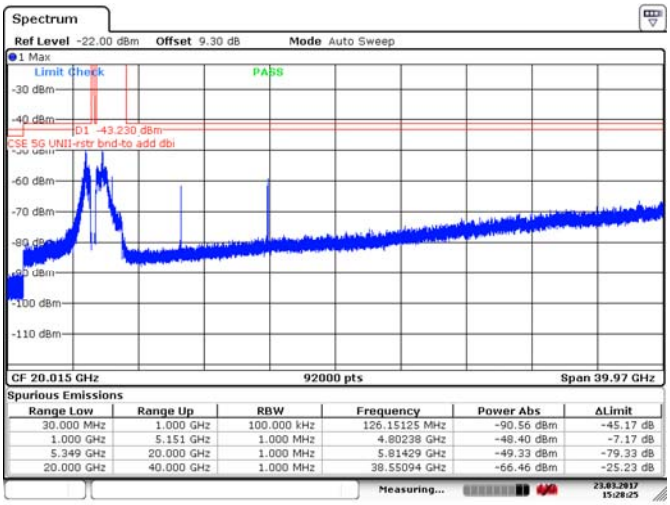

Figure 8.4-43: *Spurious emissions within restricted bands, 10 MHz channel, mid channel, 10 dBi antenna, ch0, 256-QAM*

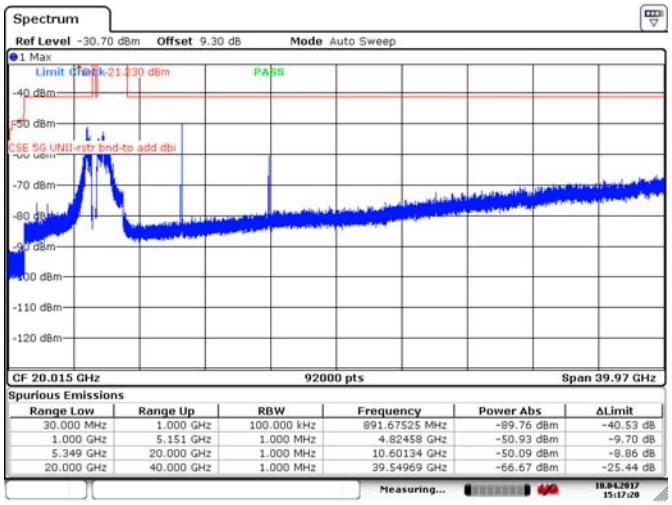

Figure 8.4-44: *Spurious emissions within restricted bands, 10 MHz channel, mid channel, 10 dBi antenna, ch1, 256-QAM*

Peak limit EIRP equivalent: 74 dBµV/m – 95.23 dB = −21.23 dBm
Average limit EIRP equivalent: 54 dBµV/m – 95.23 dB = −41.23 dBm

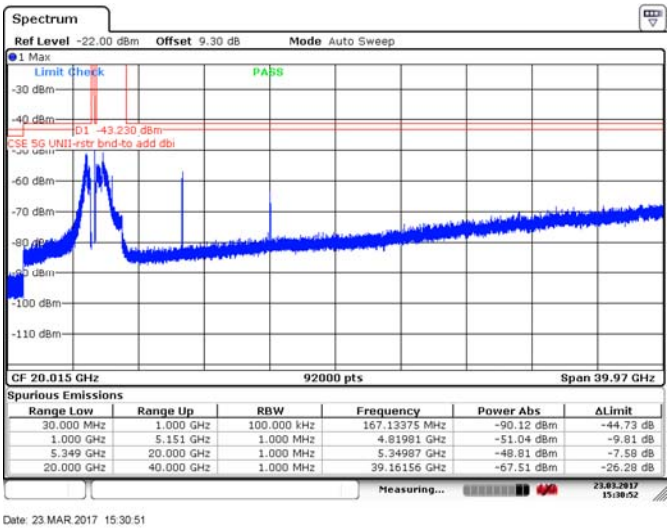

Figure 8.4-45: *Spurious emissions within restricted bands, 10 MHz channel, high channel, 10 dBi antenna, ch0, BPSK*

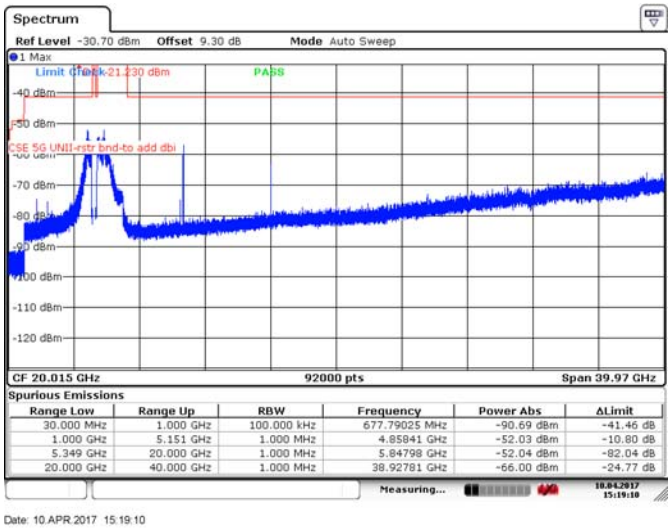

Figure 8.4-46: *Spurious emissions within restricted bands, 10 MHz channel, high channel, 10 dBi antenna, ch1, BPSK*

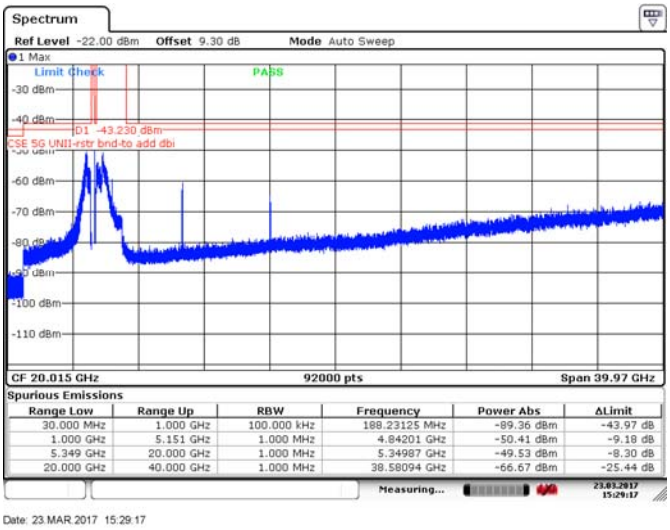

Figure 8.4-47: *Spurious emissions within restricted bands, 10 MHz channel, high channel, 10 dBi antenna, ch0, 256-QAM*

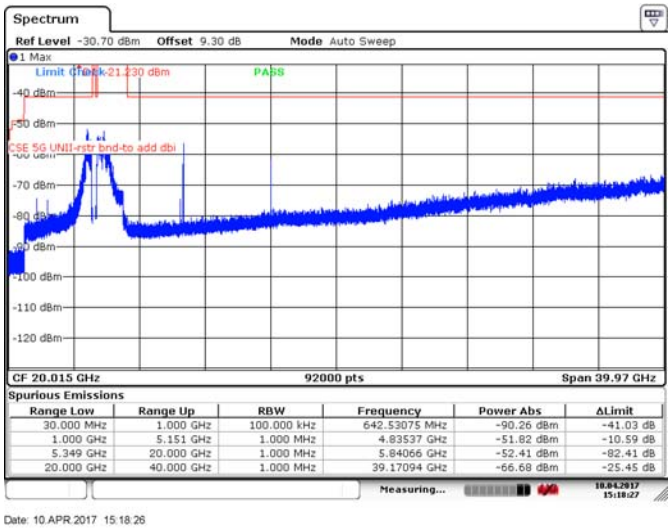

Figure 8.4-48: *Spurious emissions within restricted bands, 10 MHz channel, high channel, 10 dBi antenna, ch1, 256-QAM*

Peak limit EIRP equivalent: 74 dBµV/m – 95.23 dB = −21.23 dBm
Average limit EIRP equivalent: 54 dBµV/m – 95.23 dB = −41.23 dBm

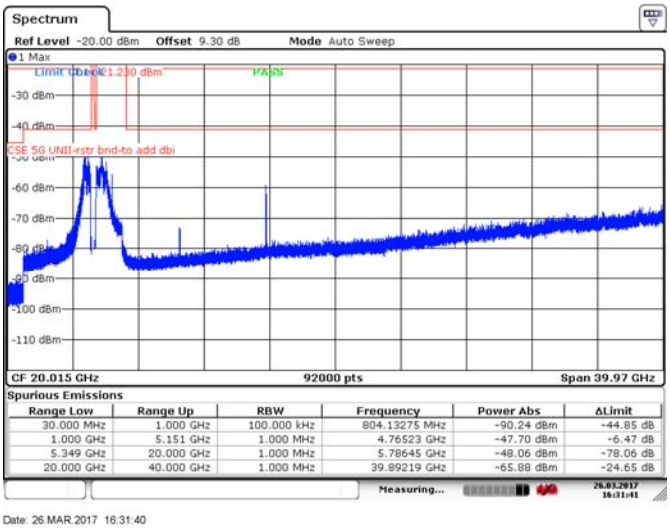

Figure 8.4-49: *Spurious emissions within restricted bands, 20 MHz channel, low channel, 10 dBi antenna, ch0, BPSK*

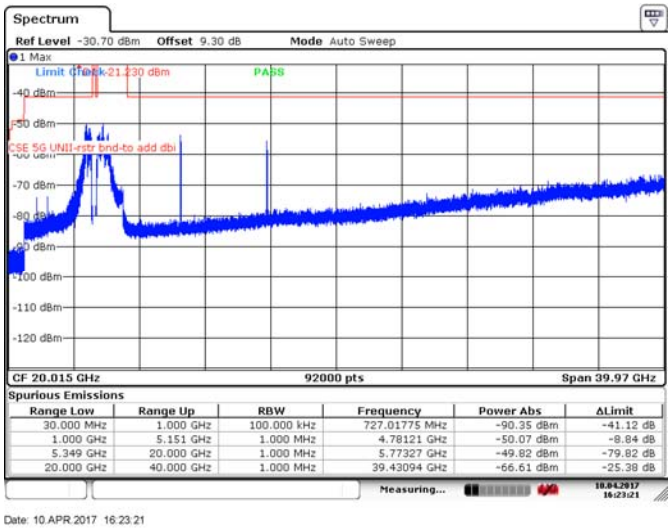

Figure 8.4-50: *Spurious emissions within restricted bands, 20 MHz channel, low channel, 10 dBi antenna, ch1, BPSK*

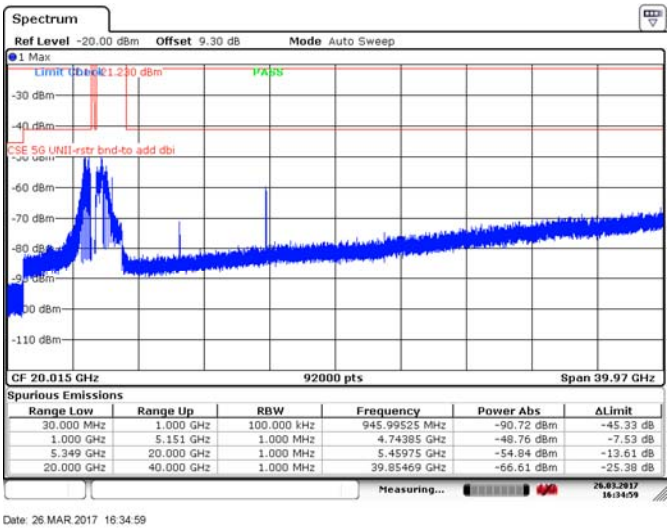

Figure 8.4-51: *Spurious emissions within restricted bands, 20 MHz channel, low channel, 10 dBi antenna, ch0,256QAM*

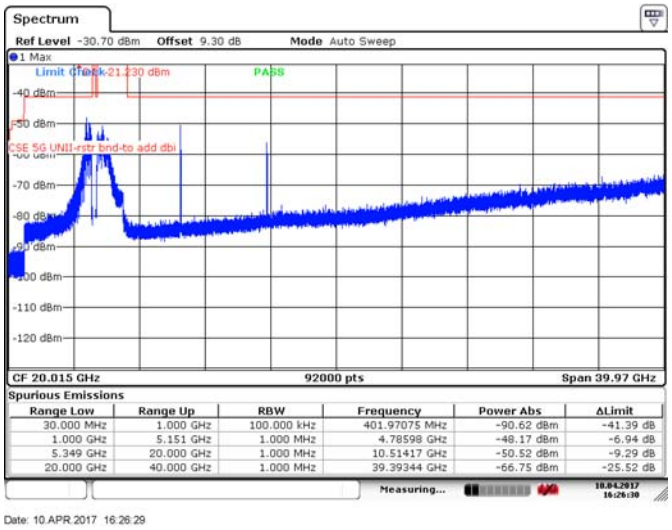

Figure 8.4-52: *Spurious emissions within restricted bands, 20 MHz channel, low channel, 10 dBi antenna, ch1,256QAM*

Peak limit EIRP equivalent: 74 dBµV/m – 95.23 dB = −21.23 dBm
Average limit EIRP equivalent: 54 dBµV/m – 95.23 dB = −41.23 dBm

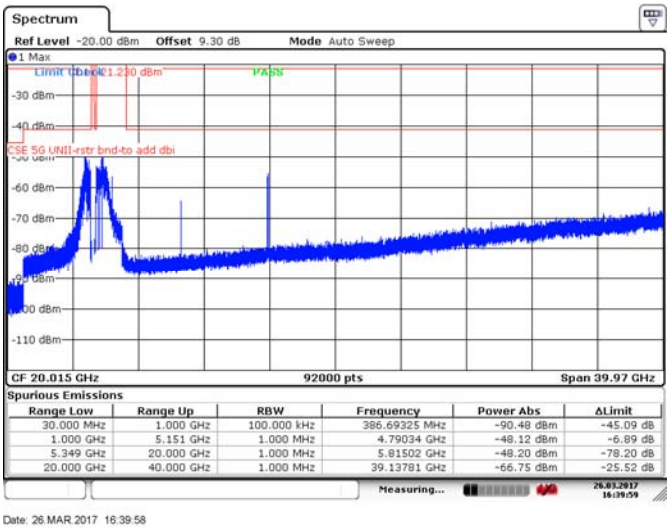

Figure 8.4-53: *Spurious emissions within restricted bands, 20 MHz channel, mid channel, 10 dBi antenna, ch0, BPSK*

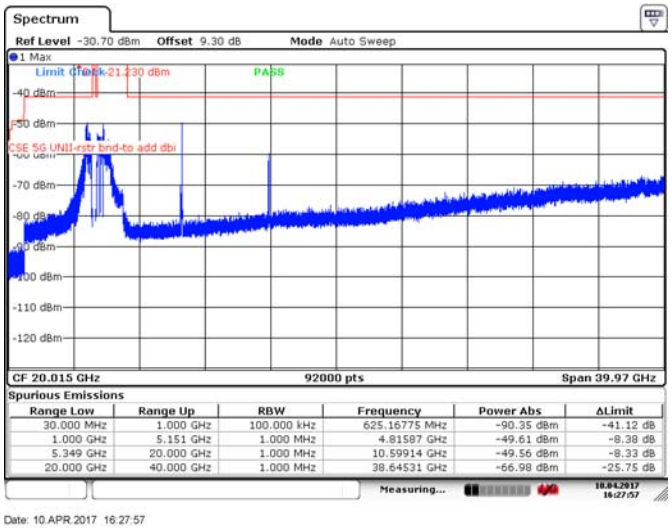

Figure 8.4-54: *Spurious emissions within restricted bands, 20 MHz channel, mid channel, 10 dBi antenna, ch1, BPSK*

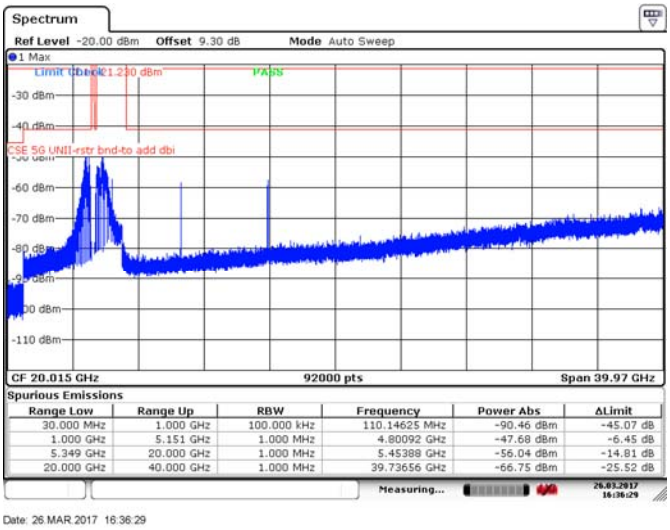

Figure 8.4-55: *Spurious emissions within restricted bands, 20 MHz channel, mid channel, 10 dBi antenna, ch0, 256-QAM*

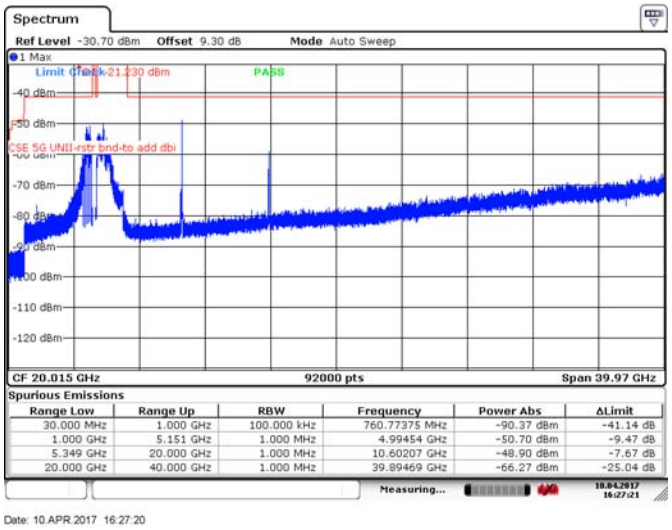

Figure 8.4-56: *Spurious emissions within restricted bands, 20 MHz channel, mid channel, 10 dBi antenna, ch1, 256-QAM*

Peak limit EIRP equivalent: 74 dBµV/m – 95.23 dB = −21.23 dBm
Average limit EIRP equivalent: 54 dBµV/m – 95.23 dB = −41.23 dBm

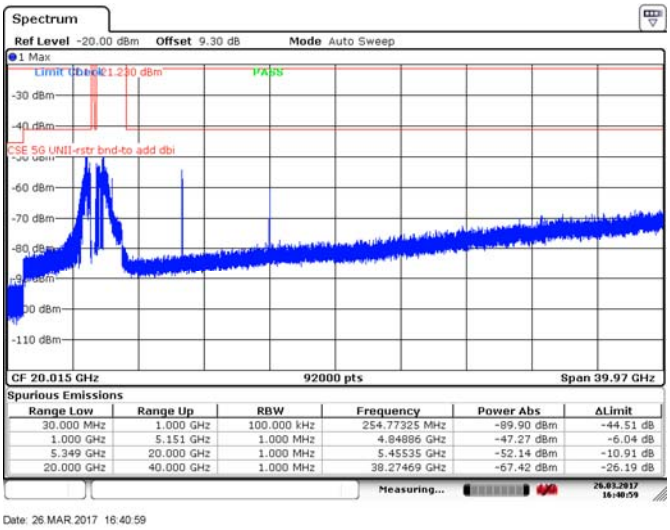

Figure 8.4-57: *Spurious emissions within restricted bands, 20 MHz channel, high channel, 10 dBi antenna, ch0, BPSK*

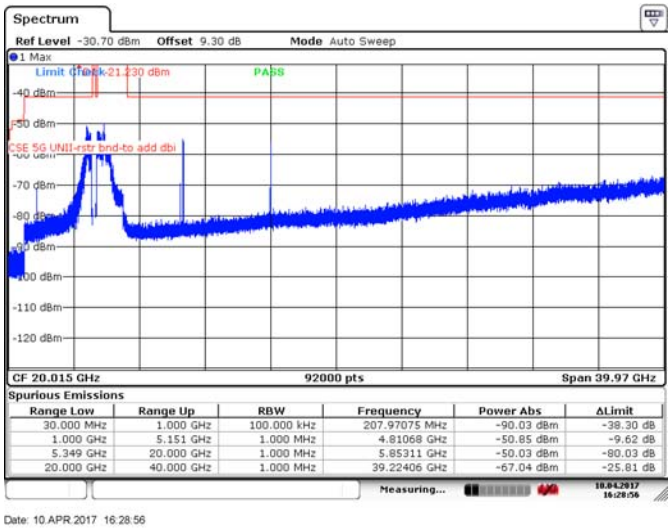

Figure 8.4-58: *Spurious emissions within restricted bands, 20 MHz channel, high channel, 10 dBi antenna, ch1, BPSK*

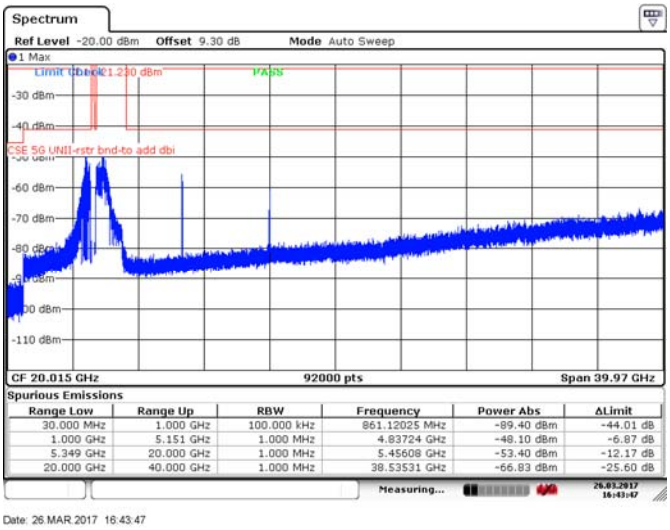

Figure 8.4-59: *Spurious emissions within restricted bands, 20 MHz channel, high channel, 10 dBi antenna, ch0, 256-QAM,*

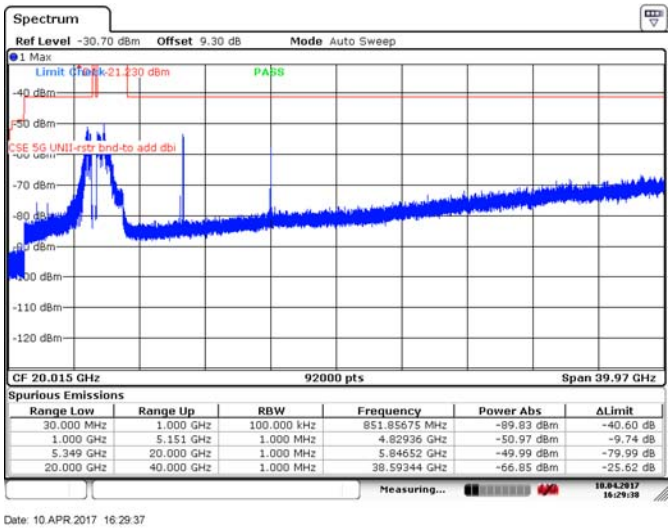

Figure 8.4-60: *Spurious emissions within restricted bands, 20 MHz channel, high channel, 10 dBi antenna, ch1, 256-QAM,*

Peak limit EIRP equivalent: 74 dBµV/m – 95.23 dB = −21.23 dBm
Average limit EIRP equivalent: 54 dBµV/m – 95.23 dB = −41.23 dBm

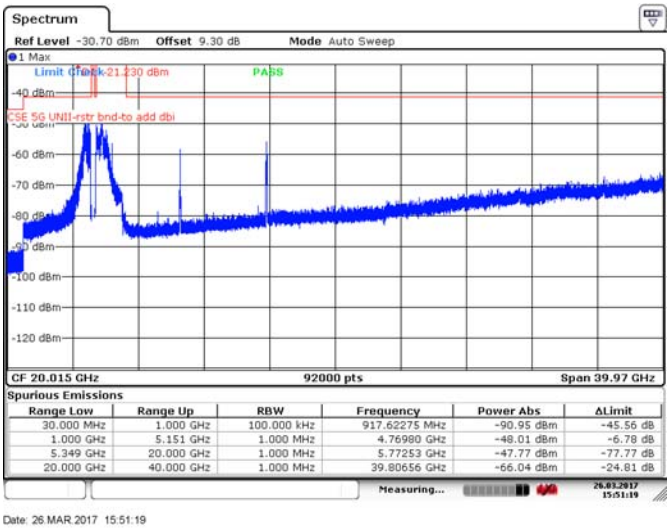

Figure 8.4-61: *Spurious emissions within restricted bands, 40 MHz channel, low channel, 10 dBi antenna, ch0, BPSK*

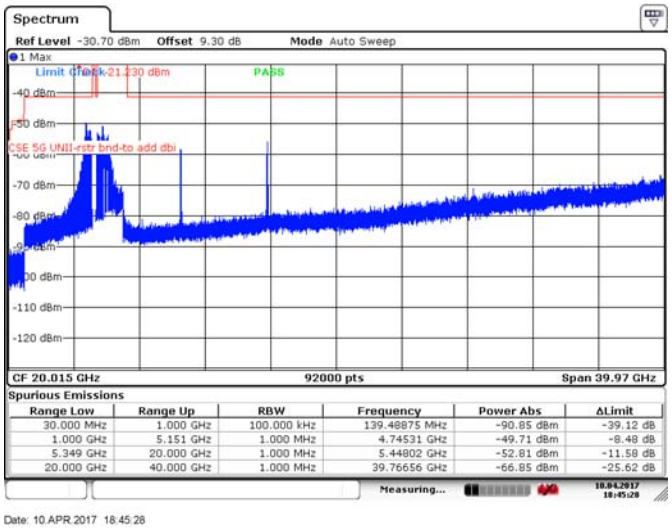

Figure 8.4-62: *Spurious emissions within restricted bands, 40 MHz channel, low channel, 10 dBi antenna, ch1, BPSK*

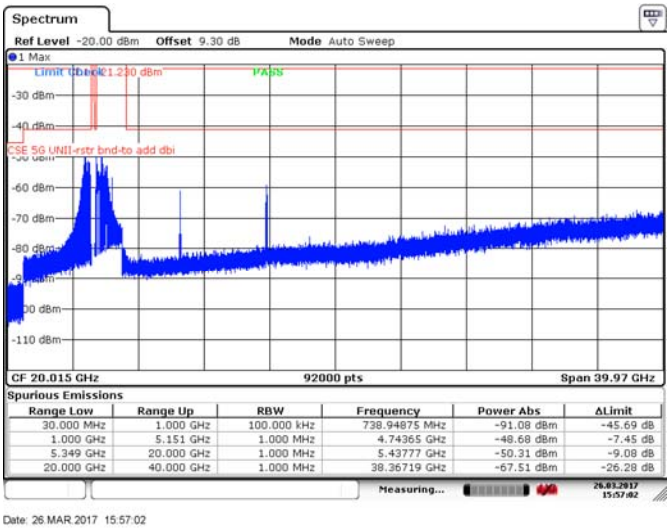

Figure 8.4-63: *Spurious emissions within restricted bands, 40 MHz channel, low channel, 10 dBi antenna, ch0, 256QAM*

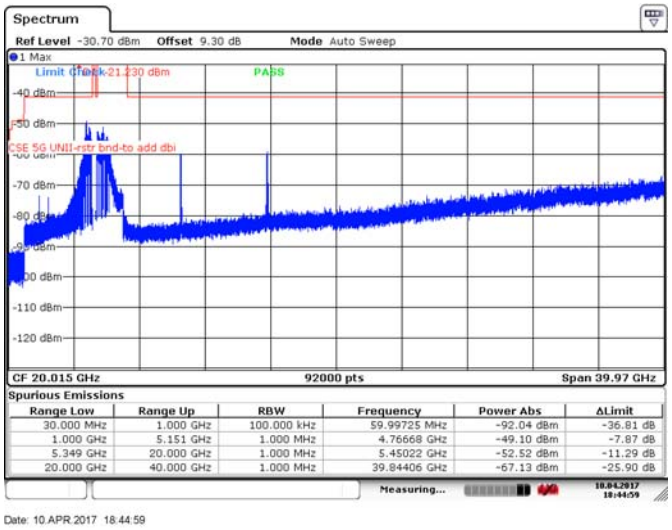

Figure 8.4-64: *Spurious emissions within restricted bands, 40 MHz channel, low channel, 10 dBi antenna, ch1, 256QAM*

Peak limit EIRP equivalent: 74 dBµV/m – 95.23 dB = −21.23 dBm
Average limit EIRP equivalent: 54 dBµV/m – 95.23 dB = −41.23 dBm

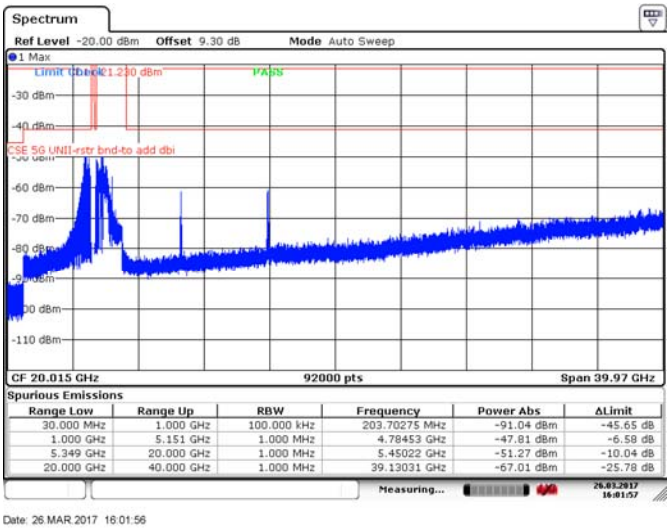

Figure 8.4-65: *Spurious emissions within restricted bands, 40 MHz channel, mid channel, 10 dBi antenna, ch0, BPSK*

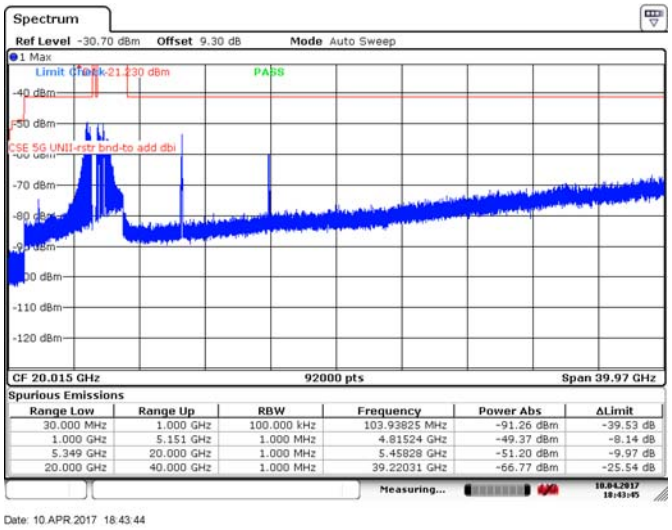

Figure 8.4-66: *Spurious emissions within restricted bands, 40 MHz channel, mid channel, 10 dBi antenna, ch1, BPSK*

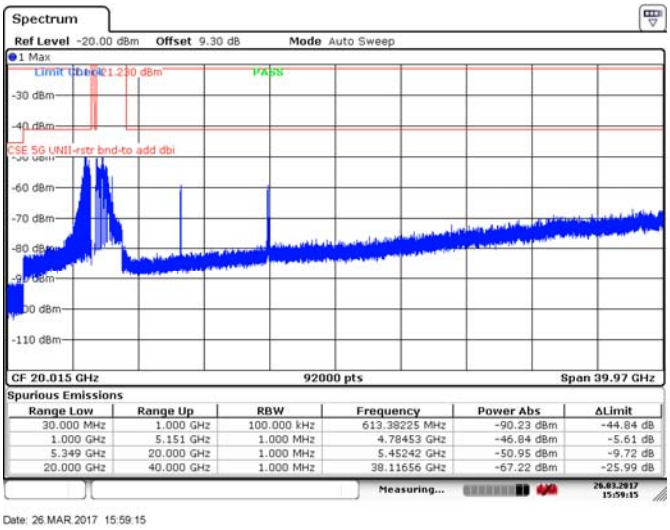

Figure 8.4-67: *Spurious emissions within restricted bands, 40 MHz channel, mid channel, 10 dBi antenna, ch0, 256-QAM*

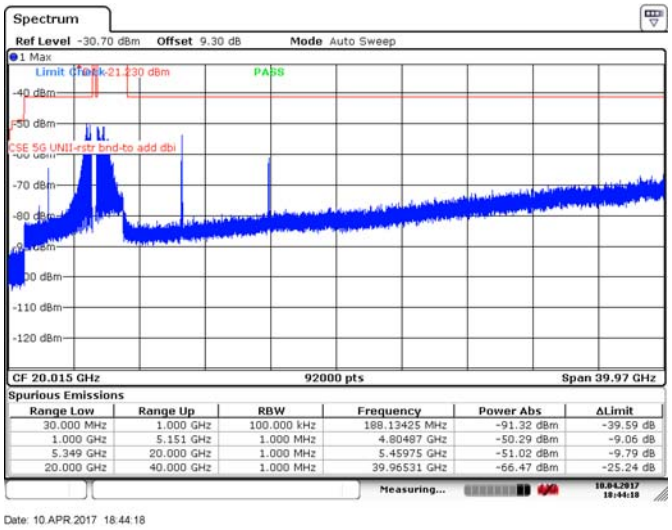

Figure 8.4-68: *Spurious emissions within restricted bands, 40 MHz channel, mid channel, 10 dBi antenna, ch1, 256-QAM*

Peak limit EIRP equivalent: 74 dBµV/m – 95.23 dB = −21.23 dBm
Average limit EIRP equivalent: 54 dBµV/m – 95.23 dB = −41.23 dBm

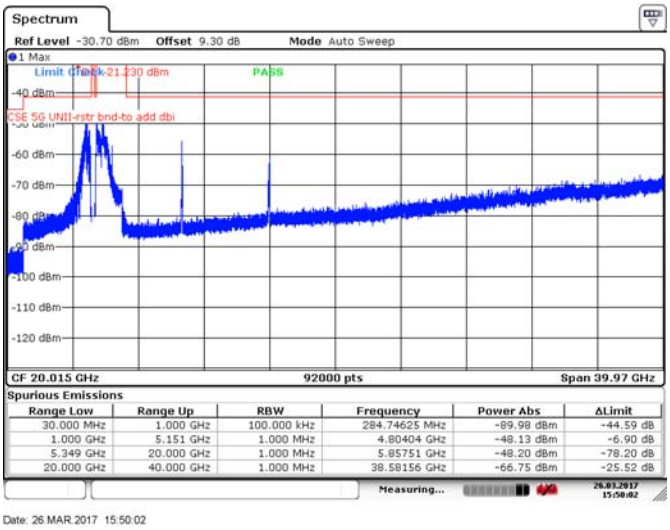

Figure 8.4-69: *Spurious emissions within restricted bands, 40 MHz channel, high channel, 10 dBi antenna, ch0, BPSK*

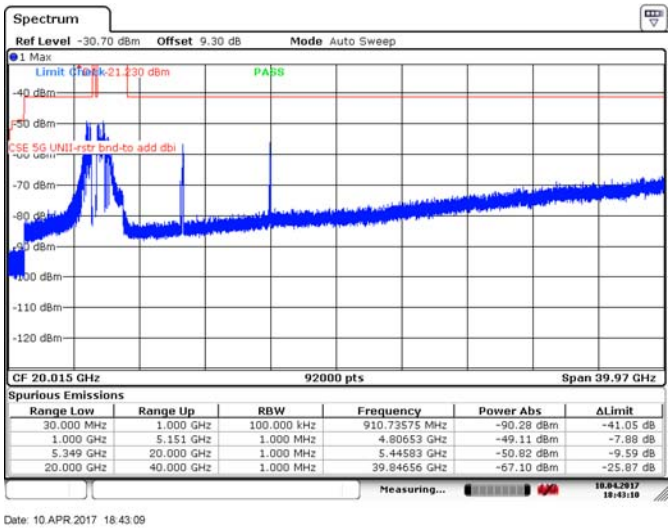

Figure 8.4-70: *Spurious emissions within restricted bands, 40 MHz channel, high channel, 10 dBi antenna, ch1, BPSK*

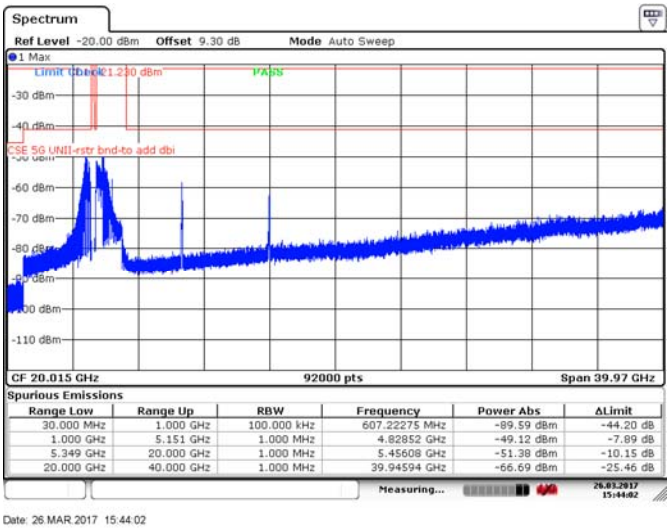

Figure 8.4-71: *Spurious emissions within restricted bands, 40 MHz channel, high channel, 10 dBi antenna, ch0, 256-QAM*

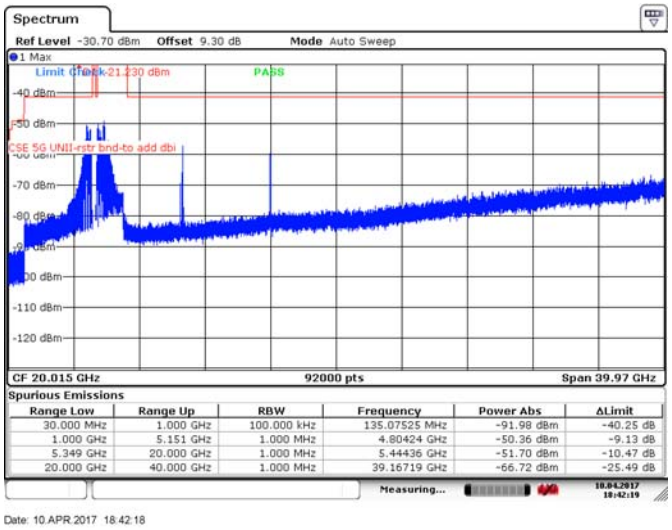

Figure 8.4-72: *Spurious emissions within restricted bands, 40 MHz channel, high channel, 10 dBi antenna, ch1, 256-QAM*