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Radio test report

315111-1R1TRFWL

Date of issue: September 30, 2016

Applicant:

LM Ericsson AB

Product type:

Radio Base Station

Product name:

RBS 6402

Model:

KRD 901 060/83X

FCC ID:

TA8AKRD90106083

IC Registration number:

287AB-AS90106080

Specifications:

- FCC 47 CFR Part 15 Subpart E, §15.407

  Unlicensed National Information Infrastructure Devises

- RSS-247, Issue 1, Section 6, May 2015

  Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

Test location

Company name	Nemko Canada Inc.
Address	303 River Road
City	Ottawa
Province	Ontario
Postal code	K1V 1H2
Country	Canada
Telephone	+1 613 737 9680
Facsimile	+1 613 737 9691
Toll free	+1 800 563 6336
Website	www.nemko.com
Site number	FCC: 176392; IC: 2040A-4 (3 m semi anechoic chamber)

Tested by	Andrey Adelberg, Senior Wireless/EMC Specialist
Reviewed by	Kevin Rose, Wireless/EMC Specialist
Review date	September 30, 2016
Reviewer signature	

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.

Copyright notification

Table of contents

Section 1. Report summary

1.1 Applicant and manufacturer

Company name	LM Ericsson AB
Address	Elektroniikkatie 10 90590 Oulu Finland

1.2 Test specifications

FCC 47 CFR Part 15, Subpart E, Clause 15.407	Unlicensed National Information Infrastructure Devises
RSS-247, Issue 1, May 2015	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 v01r03 (August 22, 2016)	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E
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/test plan. 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

EUT was tested as per test plan provided by the applicant/manufacturer. Limited subset of testing was performed as per the test plan.

1.6 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued
R1TRF	Minor cosmetic corrections were applied

Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, test results

Part	Test description	Verdict
§15.209(a)	Receiver spurious emissions	Pass

2.2 FCC Part 15 Subpart E, test results

Part	Test description	Verdict
§15.407(b)(1)	Undesirable radiated emission limits for 5.15–5.25 GHz band	Pass
§15.407(b)(4)	Undesirable radiated emission limits for 5.725–5.85 GHz band	Pass
§15.407(b)(6)	Conducted limits for U-NII devices using an AC power line	Pass

2.3 IC RSS-GEN, Issue 4, test results

Part	Test description	Verdict
7.1.2	Receiver radiated emission limits	Pass
8.8	Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus	Pass

Note: receiver spurious emissions were tested as per customer test plan.

2.4 IC RSS-247, Issue 1, test results

Section	Test description	Verdict
6.2.1 (2)	Unwanted radiated emission limits for 5150–5250 MHz band	Pass
6.2.4 (2)	Unwanted radiated emission limits for 5725–5850 MHz band	Pass

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	August 11, 2016
Nemko sample ID number	133-002579

3.2 EUT information

Product type	Radio Base Station
Product name	RBS 6402
Model	KRD 901 060/83X
Serial number	TG3N021040

3.3 Technical information

Applicant IC company number	287AB
IC UPN number	AS901060
All used IC test site(s) Reg. number	2040A-4
RSS number and Issue number	RSS-247 Issue 1, Section 6, May 2015
Frequency band	U-NII-1: 5150–5250 MHz and U-NII-3: 5725–5850 MHz
Rated RF power to antenna for FCC	21 dBm (U-NII-1), 21 dBm (U-NII-3)
Rated RF power to antenna for ISED	14 dBm (U-NII-1), 21 dBm (U-NII-3)
Channel bandwidth	LTE: 5 MHz, 10 MHz, 15 MHz, 20 MHz; LAA: 20 MHz
Type of modulation	QPSK, 16-QAM and 64-QAM
Emission classification (F1D, G1D, D1D)	D7W
Power requirements	120 V_{AC}, 60 Hz via power supply or PoE injector
Antenna information	Internal antenna with 6 dBi gain, MIMO gain is less than 5 dBi The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.
SW version	RASW_ETSW_20160516_LBT_DFE_4_5_UPDATE

Note: The EUT can be both wall mounted (vertical) and mounted in the ceiling (horizontal). According to previous measurements, see Intertek SEMKO test report 1507865STO-001, Ed 1, vertical is the worst case orientation.

3.4 Product description and theory of operation

This WCDMA/LTE RBS 6402 product is a synthesized transmitter and receiver designed for use in the 3GPP (Third Generation Partnership Project) LTE (Long Term Evolution) and for LAA to extend benefits of LTE on unlicensed spectrum.
This RBS 6402 operates in operating frequency bands 2, 25, 4, 7, 46A and 46D defined by 3GPP. Band 46A corresponds to UNII-1 and Band 46D corresponds to UNII-3 band. UNII-2 is not supported by the RBS 6402.

The transmitter part of this RBS 6402 operates in the frequency band of:
1930 to 1990 MHz for Band 2
1930 to 1995 MHz for Band 25
2110 to 2155 MHz for Band 4
2620 to 2690 MHz for Band 7
5150 to 5250 MHz for Band 46A
5735 to 5835 MHz for Band 46D

The receiver part of this RBS 6402 operates in the frequency band of:
1850 to 1910 MHz for Band 2
1850 to 1915 MHz for Band 25
1710 to 1755 MHz for Band 4
2500 to 2570 MHz for Band 7

For LTE, RBS 6402 supports modulations of QPSK, 16QAM and 64QAM. The channel bandwidth is configurable within 5.0 MHz, 10 MHz, 15 MHz and 20 MHz with possibility to activate 25, 50 and 100 resource blocks (RB) for the licensed bands. It is able to transmit dual carrier. On the unlicensed bands, only the 20 MHz channel bandwidth is supported.

This RBS 6402 has two dual-TX radio modules where each of the two RF chains are identical. The first dual-TX radio module operates on the licensed bands, and the other dual-TX radio module operates on the unlicensed bands. The RBS 6402 can be configured to two 2×2 MIMO per radio or CA inter-band CA, or LAA operation with two radio cards.

The RBS 6402 supports two radio modules of which the licensed band radio module have two identical down-link and up-link signal paths. The unlicensed band radio module has two identical downlink signal paths.

This RBS 6402 has following functions:
- Transmitting and Receiving Processing (TRP).
- On licensed band radio module
  - Downlink (transmitter) and uplink (receiver) signal processing and RF filtering
  - 2-TX (transmitter)
  - 2-RX (receiver)
  - Low output power: max. 250 mW, min. 20 mW total configured power per branch. If two carriers per branch, total power is divided between the carriers
- On unlicensed band radio module
  - Downlink (transmitter), uplink carrier sensing functionality and RF filtering
  - 2-TX (transmitter)
  - Carrier sensing receiver
  - Low output power: max. 125 mW, min. 20 mW total configured power per branch. If two carriers per branch, total power is divided between the carriers.
- Possibility to use integrated wide sector antenna

Integrated antenna:

- Integrated omni antenna, consisting of two integrated antennas operating on the same frequency band e.g. in dual polarized antenna. In CA configuration, another radio module might have low band antenna and another radio module might have high band antenna.
- Product no KRE 105 211/1;
  - Minimum gain, Gain per antenna port is > −6 dBi
    (−180° ≤ θ ≤ +180° and 0° ≤ φ ≤ 45°)
  - Maximum gain, Gain per antenna port is 6 dBi.
  - Maximum MIMO gain < 5 dBi

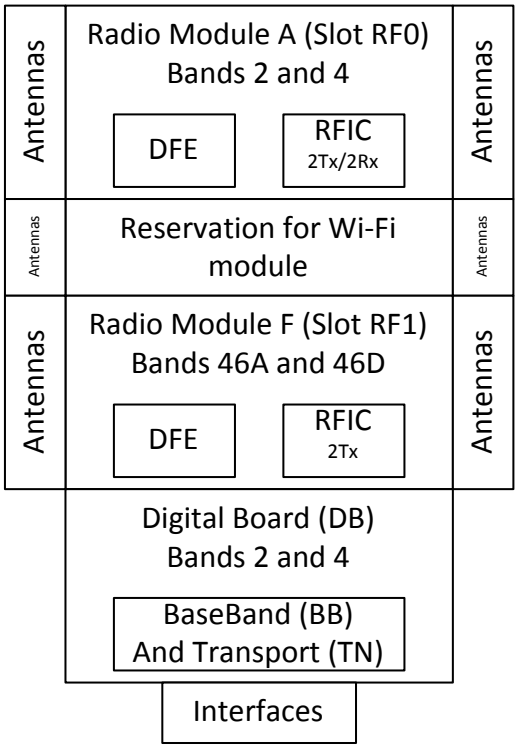


Figure 3.4-1: *RBS 6402 block diagram (KRD 901 060/83), Wi-Fi module was not assembled in the tests*

The tested LAA HW configuration of the RBS 6402:

- Product configuration: KRD 901 060/83 (FCC ID: TA8AKRD90106083, IC: 287AB-AS90106080)
- Slot RF0 furnished with RM A (supported FDD bands 2/25, 4 and 7)
- Slot RF1 furnished with RM F (supported FDD bands 46A and 46D)
- FDD carrier aggregation of configuration:
  - B2/25, B4 or B7 primary cell (PCell), DL and UL
  - B46A or B46D secondary cell (SCell), DL only
- BW's 5, 10, 15 and 20 MHz supported in PCell
- BW 20 MHz supported in SCell

Frequency range or tested configuration
- Downlink band frequency range (TX):
  - 1930 to 1990 MHz for Band 2
  - 1930 to 1995 MHz for Band 25
  - 2110 to 2155 MHz for Band 4
  - 2500 to 2570 MHz for Band 7
  - 5150 to 5250 MHz for Band 46A
  - 5735 to 5835 MHz for Band 46D
- Uplink band frequency range (RX):
  - 1850 to 1910 MHz for Band 2
  - 1850 to 1915 MHz for Band 25
  - 1710 to 1755 MHz for Band 4
  - 2620 to 2690 MHz for Band 7

3.5 EUT exercise details

EUT was powered via the AC/DC power adapter.
EUT was controlled from Laptop computer connected via Ethernet line and was set to maximum nominal power level.
LTE radio module: in the tests only band 4 top channel (TX: 2152.5 MHz; RX: 1752.5 MHz), BW 5 MHz, QPSK was used.
LAA radio module: bottom, middle and top channels (U-NII-1: 5160.0, 5200.0 and 5240 MHz; U-NII-3: 5745.0, 5785.0 and 5825.0 MHz) were tested. QPSK modulation (worst case as per customer request) was used.

3.6 EUT setup diagram

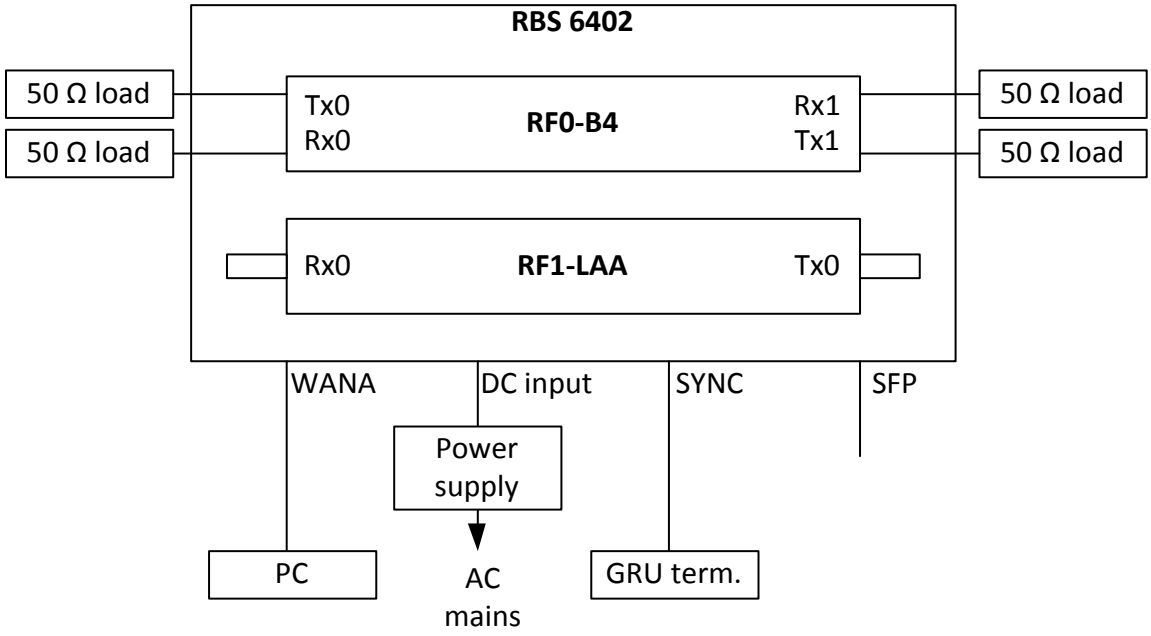


Figure 3.6-1: *Setup diagram*

Note: WANA was terminated instead of the PC connection for the radiated emission measurements below 1 GHz. Ethernet emission tests model (TM-1) used.

3.7 EUT support equipment

Table 3.7-1: *EUT support equipment*

Description	Brand name	Model/Part number	Serial number
Power supply	Artesyn	DP10054P3L	D880000003
Laptop	Dell	Latitude E7450	Tag: CC4N462, ID: 10150655979

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.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Dec. 01/16
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
AC Power source	Chenwa	2700M-10k	FA002716	—	VOU
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Jan. 07/17
Spectrum analyzer	Rohde & Schwarz	FSU	FA001877	1 year	Apr. 15/17
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	Apr. 28/17
Horn antenna (1–18 GHz)	EMCO	3115	FA000825	1 year	Apr. 26/17
Horn antenna 18–40 GHz	EMCO	3116	FA001847	1 year	Apr.15/17
Pre-amplifier (1–18 GHz)	JCA	JCA118-503	FA002091	1 year	April 26/17
Pre-amplifier (18–26 GHz)	Narda	BBS-1826N612	FA001550	—	VOU
Pre-amplifier (26–40 GHz)	Narda	DBL-2640N610	FA001556	—	VOU
LISN	Rohde & Schwarz	ENV216	FA002023	1 year	Mar. 08/17

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

Section 8. Testing data

8.1 FCC 15.407(b) and RSS-247 6.2.1(2) U-NII-1 Undesirable (unwanted) emissions

8.1.1 Definitions and limits

FCC:
(1) For transmitters operating in the 5.15–5.25 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.

IC:
For transmitters operating in the band 5150–5250 MHz, all emissions outside the band 5150–5350 MHz shall not exceed −27 dBm/MHz e.i.r.p. However, any unwanted emissions that fall into the band 5250–5350 MHz must be 26 dBc, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth, above 5.25 GHz. Otherwise, the transmission is considered as intentional and the devices shall implement dynamic frequency selection (DFS) and transmitter power control (TPC) as per the requirements for the band 5250–5350 MHz.

RSS-Gen 8.10 Emissions falling within restricted frequency bands
Restricted bands, identified in Table 8.1-2, are designated primarily for safety-of-life services (distress calling and certain aeronautical bands), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following restrictions apply:
(a) fundamental components of modulation of licence-exempt radio apparatus shall not fall within the restricted bands of below;
(b) unwanted emissions falling into restricted bands of below shall comply with the limits specified in RSS-Gen;
(c) unwanted emissions not falling within restricted frequency bands shall either comply with the limits specified in the applicable RSS, or with those specified in RSS-Gen.

Table 8.1-1: *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)*	$67.6 - 20 \times \log_{10}$(F) *(F in kHz)*	300
0.490–1.705	24000/F *(F in kHz)*	$87.6 - 20 \times \log_{10}$(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

8.1.1 Definitions and limits, continued

Table 8.1-2: *IC 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 8.1-2 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 8.1-3: *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			

8.1.2 Test summary

Test date:	August 11, 2016	Temperature:	22 °C
Test engineer:	Andrey Adelberg	Air pressure:	1008 mbar
Verdict:	Pass	Relative humidity:	33 %

8.1.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to 40 GHz.
EUT was set to transmit with 100 % duty cycle.
Radiated measurements were performed at a distance of 3 m.

Spectrum analyser settings for pre-scan measurements below 1 GHz:

Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Detector mode	Peak
Trace mode	Max-hold

Spectrum analyser settings for final measurements below 1 GHz:

Resolution bandwidth	120 kHz
Video bandwidth	300 kHz
Detector mode	Quasi-Peak
Trace mode	Max-hold

Spectrum analyser settings for peak measurements above 1 GHz:

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

Spectrum analyser settings for average measurements above 1 GHz:

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

Limit for frequencies outside restricted bands was calculated as follows: −27 dBm/MHz + 95.23 dB (conversion factor) = 68.23 dBµV/m @ 3 m at 1 MHz.

8.1.4 Test data

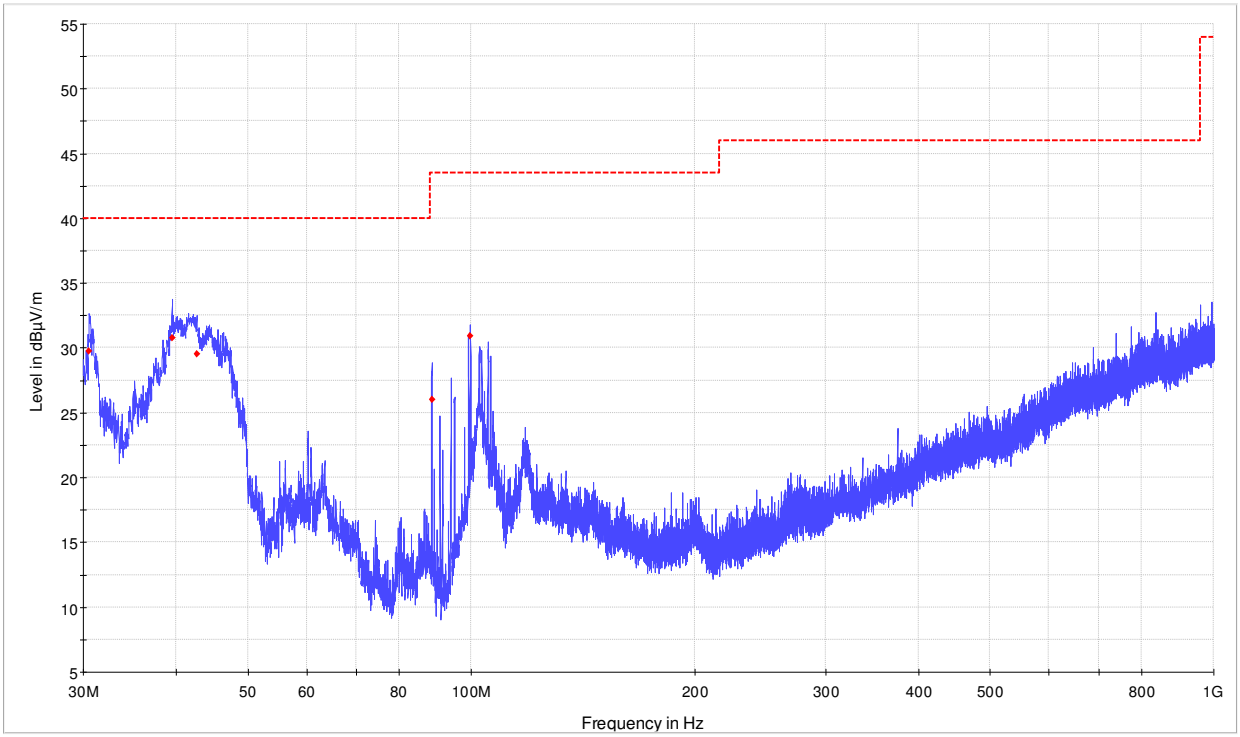


Figure 8.1-1: *Radiated spurious emissions below 1 GHz, low channel*

Table 8.1-4: *Radiated field strength measurement results, low channel*

Frequency, MHz	Quasi-Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
39.5200	30.8	40.0	9.2
30.5600	29.8	40.0	10.2
99.6800	30.9	43.5	12.6
88.4800	26.0	43.5	17.5
42.6800	29.5	40.0	10.5

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

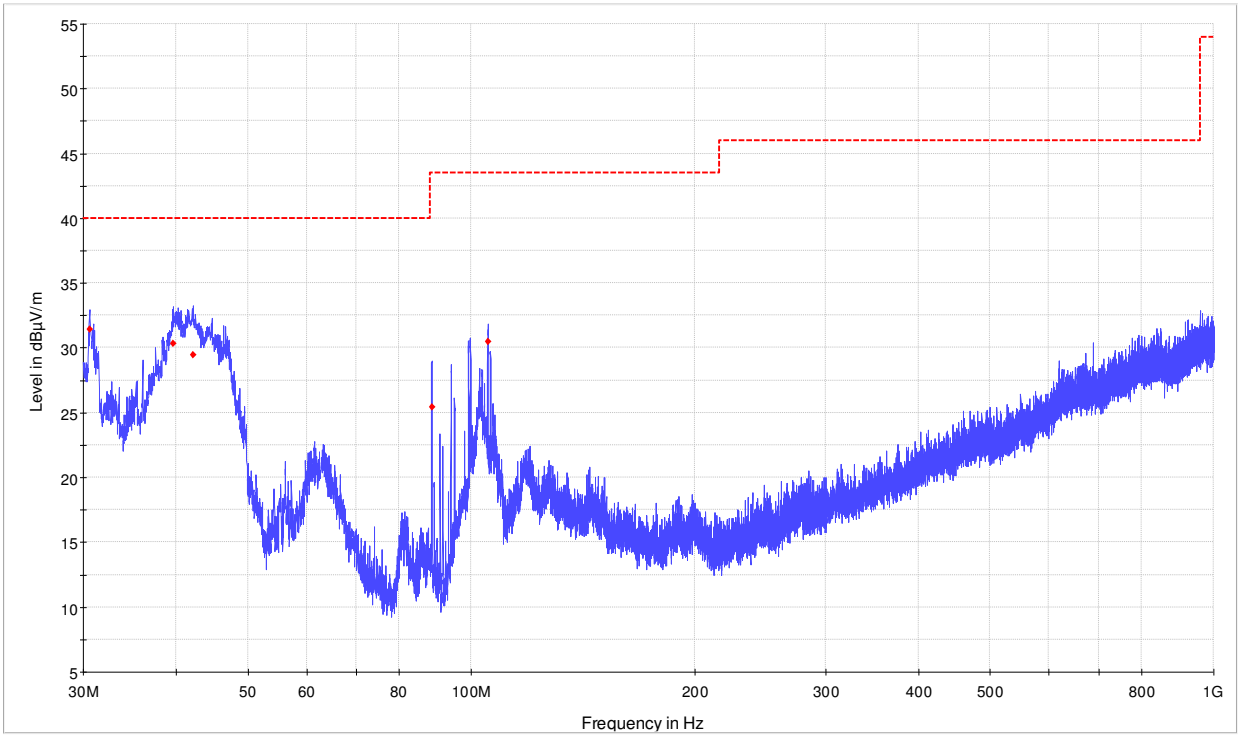


Figure 8.1-2: *Radiated spurious emissions below 1 GHz, mid channel*

Table 8.1-5: *Radiated field strength measurement results, mid channel*

Frequency, MHz	Quasi-Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
30.600	31.5	40.0	8.5
39.680	30.4	40.0	9.6
42.200	29.5	40.0	10.5
88.440	25.5	43.5	18.0
105.240	30.5	43.5	13.0

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

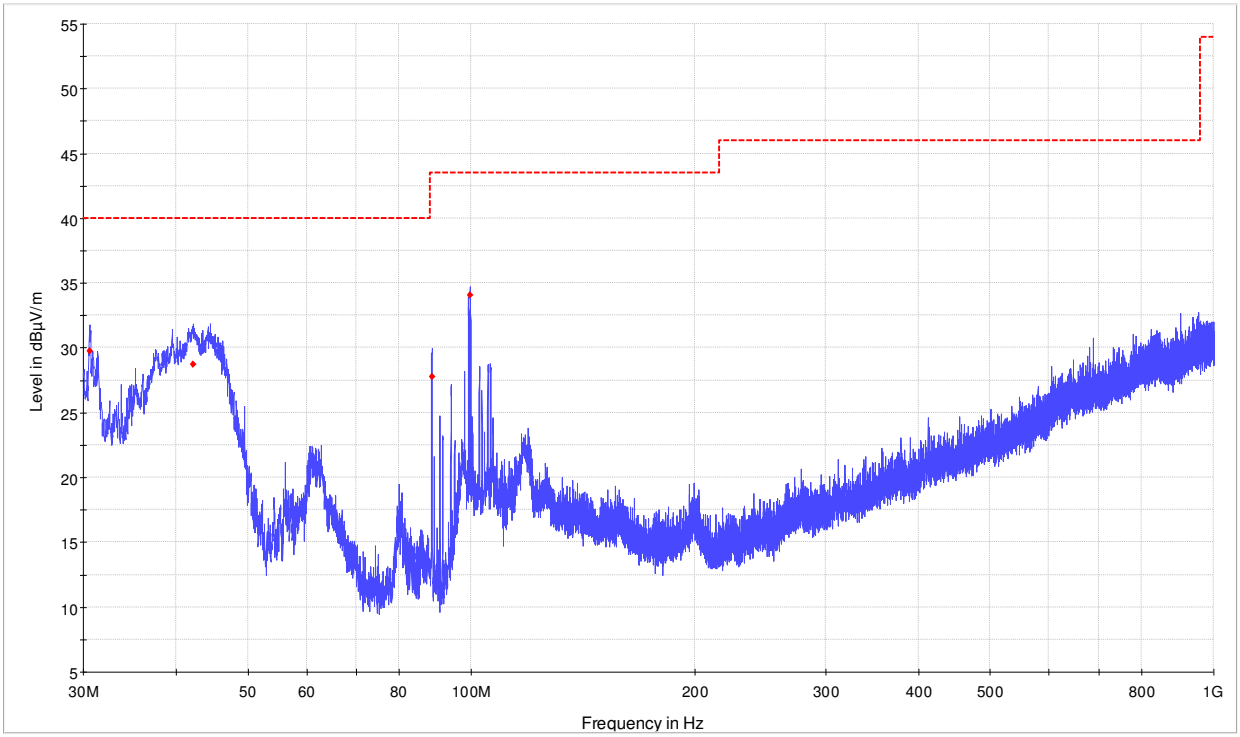


Figure 8.1-3: *Radiated spurious emissions below 1 GHz, high channel*

Table 8.1-6: *Radiated field strength measurement results, high channel*

Frequency, MHz	Quasi-Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
30.600	29.8	40.0	10.2
42.240	28.7	40.0	11.3
88.480	27.8	43.5	15.7
99.680	34.1	43.5	9.4

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

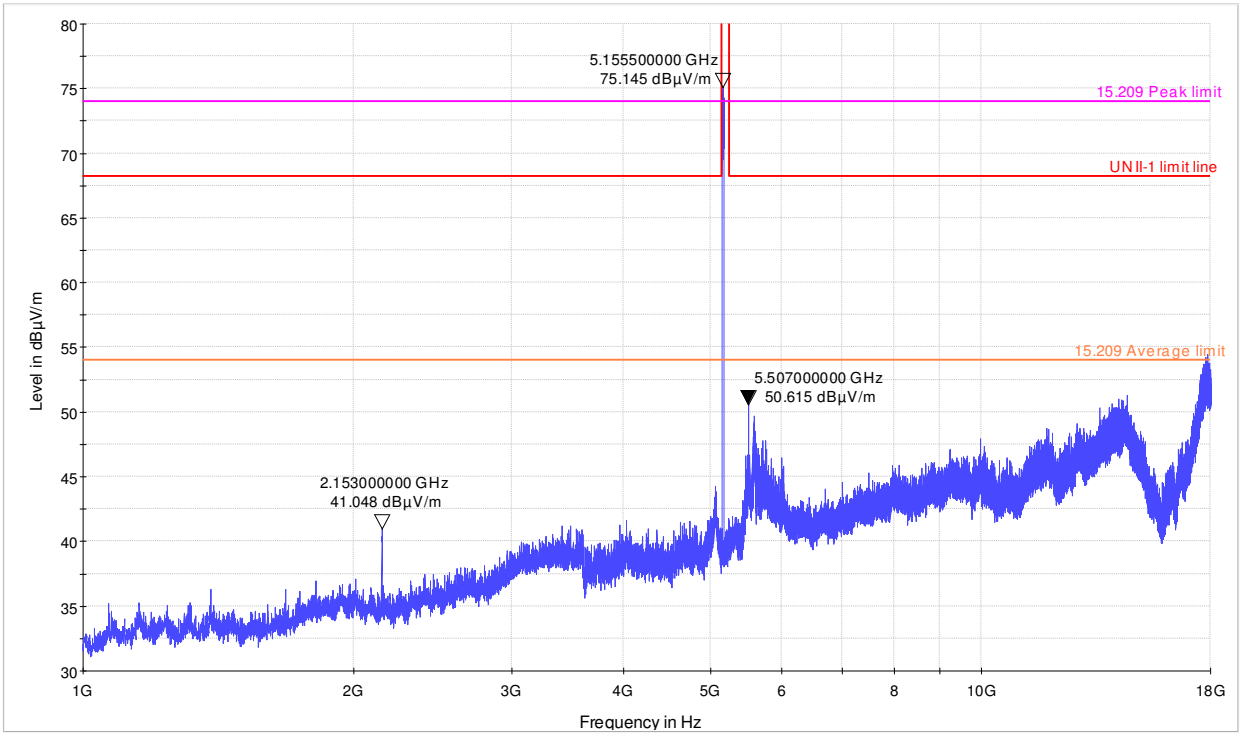


Figure 8.1-4: *Radiated spurious emissions within 1–18 GHz, low channel*

Note: 2.153 GHz emission belongs to a carrier frequency for RF0, LTE B4 and is exempt from this measurement.

Table 8.1-7: *Radiated outside restricted band field strength measurement results, low channel*

Frequency, GHz	Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
5.507	50.615	68.23	17.615

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

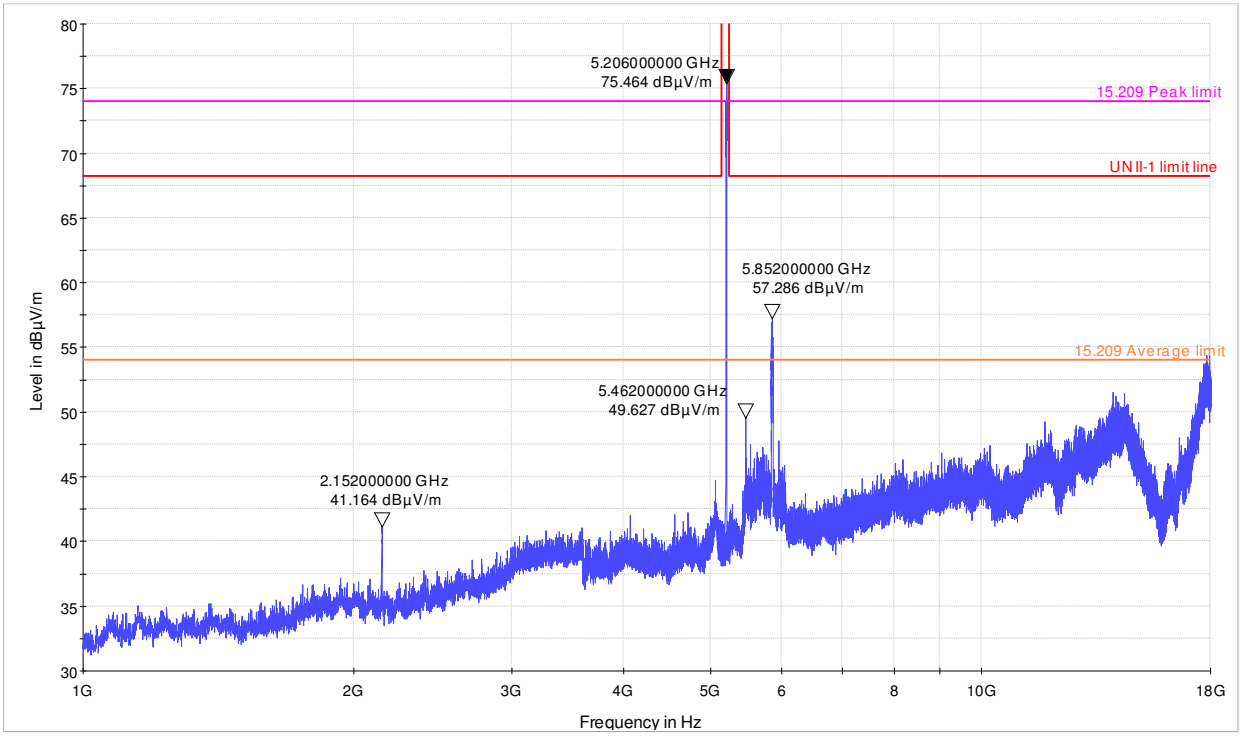


Figure 8.1-5: *Radiated spurious emissions within 1–18 GHz, mid channel*

Note: 2.152 GHz emission belongs to a carrier frequency for RF0, LTE B4 and is exempt from this measurement.

Table 8.1-8: *Radiated outside restricted band field strength measurement results, mid channel*

Frequency, GHz	Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
5.462	49.627	68.23	18.603
5.852	57.286	68.23	10.944

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

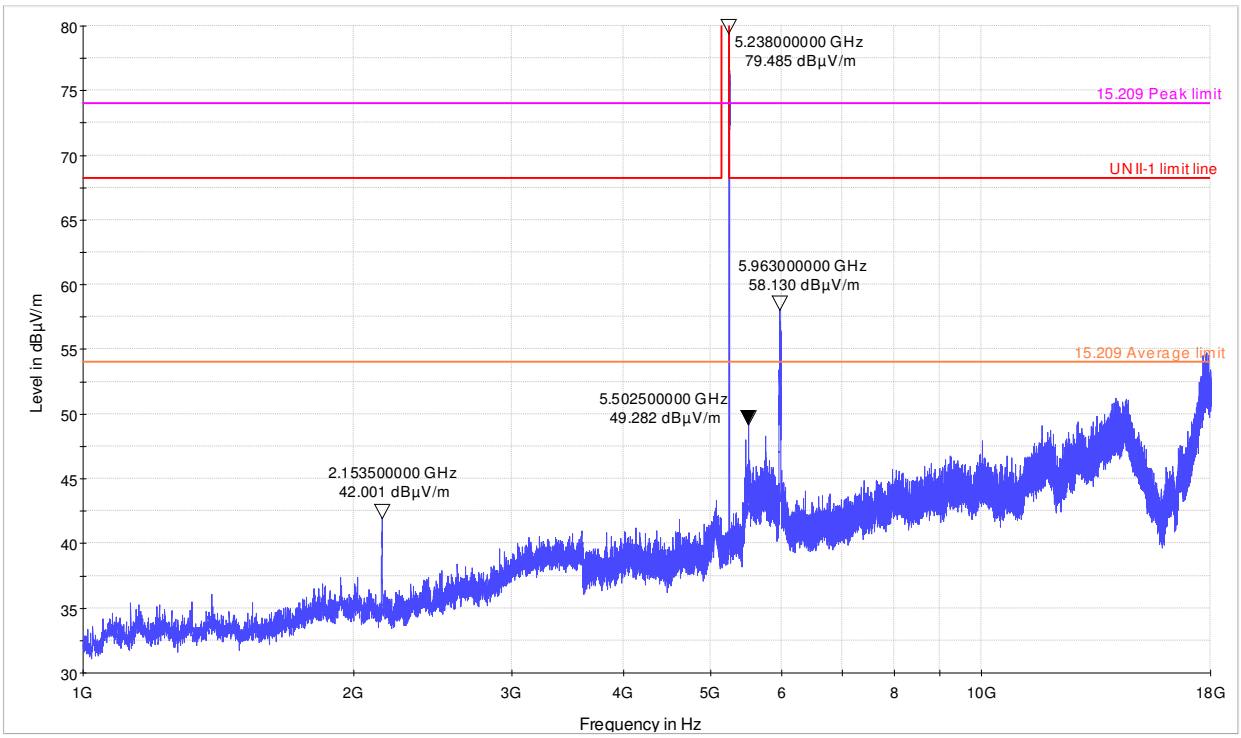


Figure 8.1-6: *Radiated spurious emissions within 1–18 GHz, high channel*

Note: 2.153 GHz emission belongs to a carrier frequency for RF0, LTE B4 and is exempt from this measurement.

Table 8.1-9: *Radiated outside restricted band field strength measurement results, high channel*

Frequency, GHz	Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
5.503	49.282	68.23	18.948
5.963	58.130	68.23	10.100

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

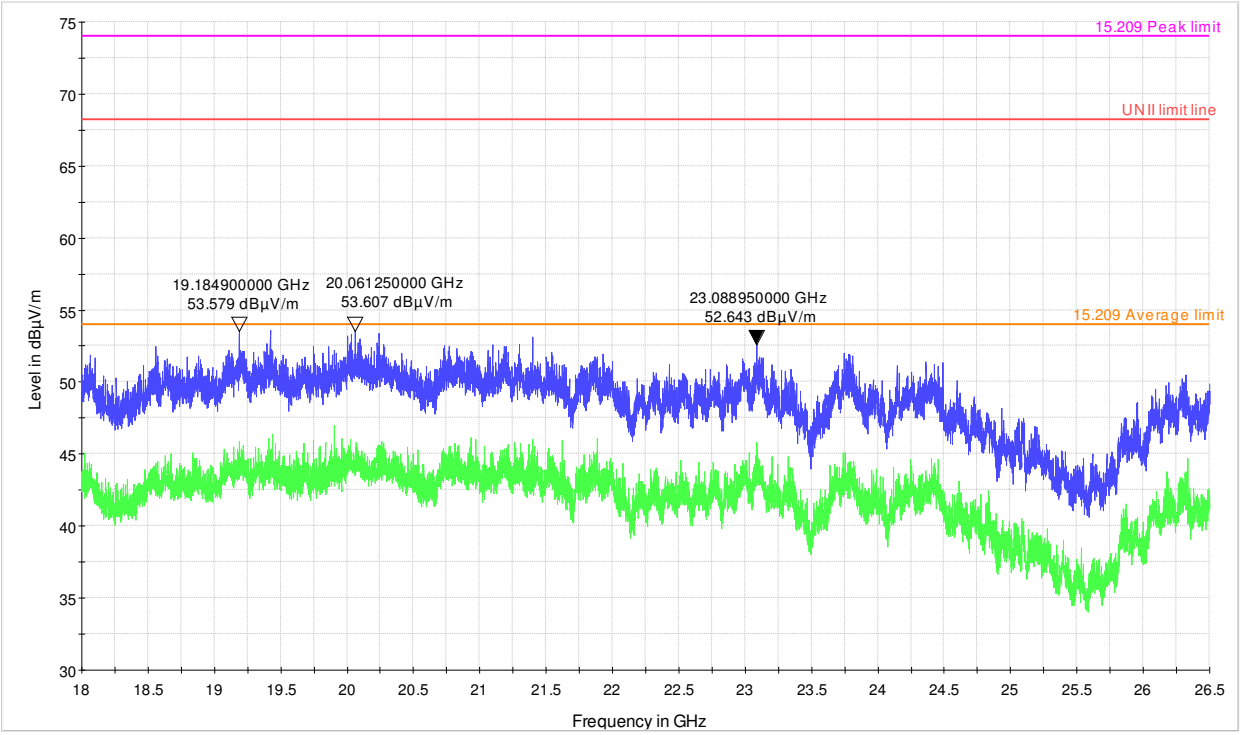


Figure 8.1-7: *Radiated spurious emissions within 18–26.5 GHz, low channel*

Note: A peak field strength of all emissions were below the 15.209 or RSS-Gen average limits.

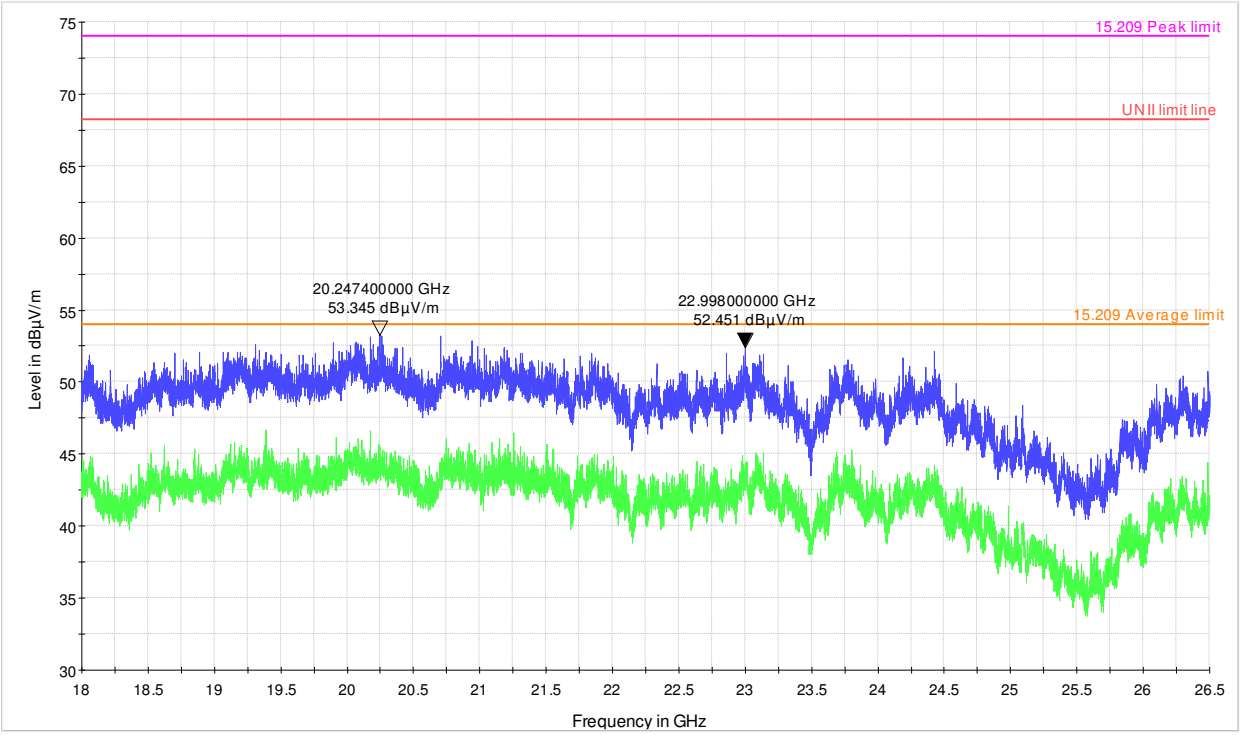


Figure 8.1-8: *Radiated spurious emissions within 18–26.5 GHz, mid channel*

Note: A peak field strength of all emissions were below the 15.209 or RSS-Gen average limits.

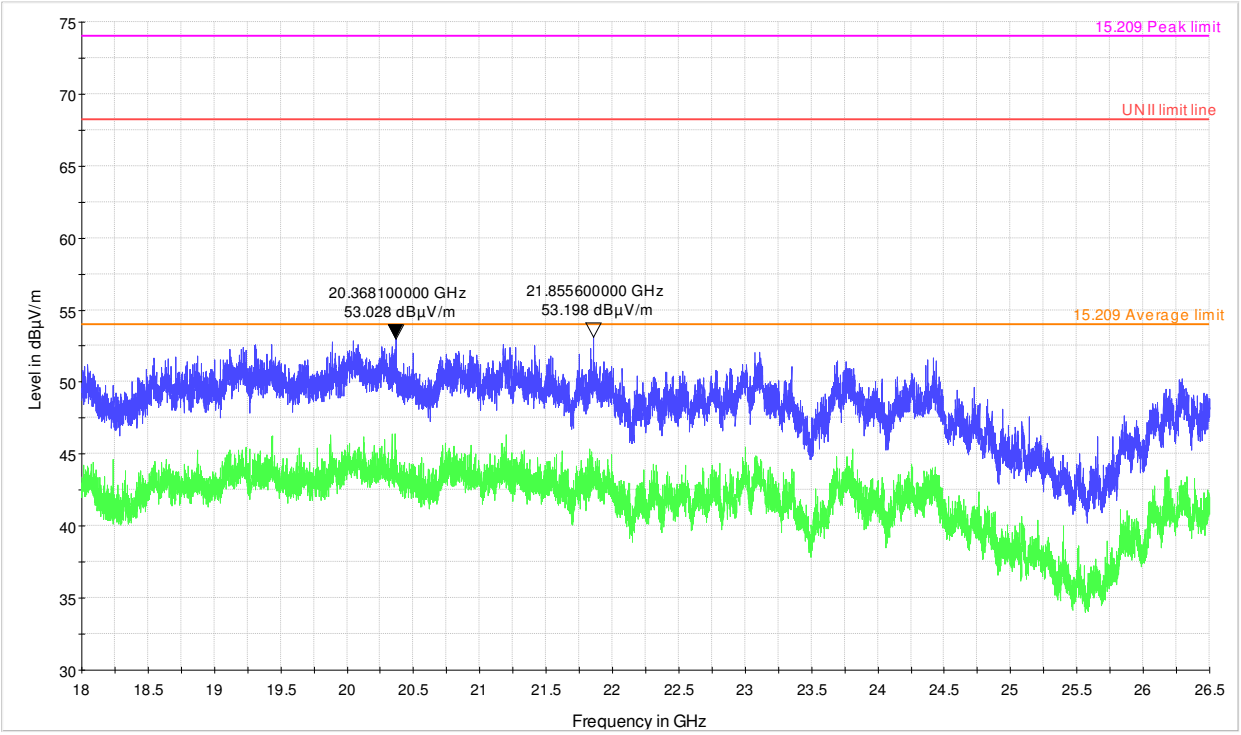


Figure 8.1-9: *Radiated spurious emissions within 18–26.5 GHz, high channel*

Note: A peak field strength of all emissions were below the 15.209 or RSS-Gen average limits.

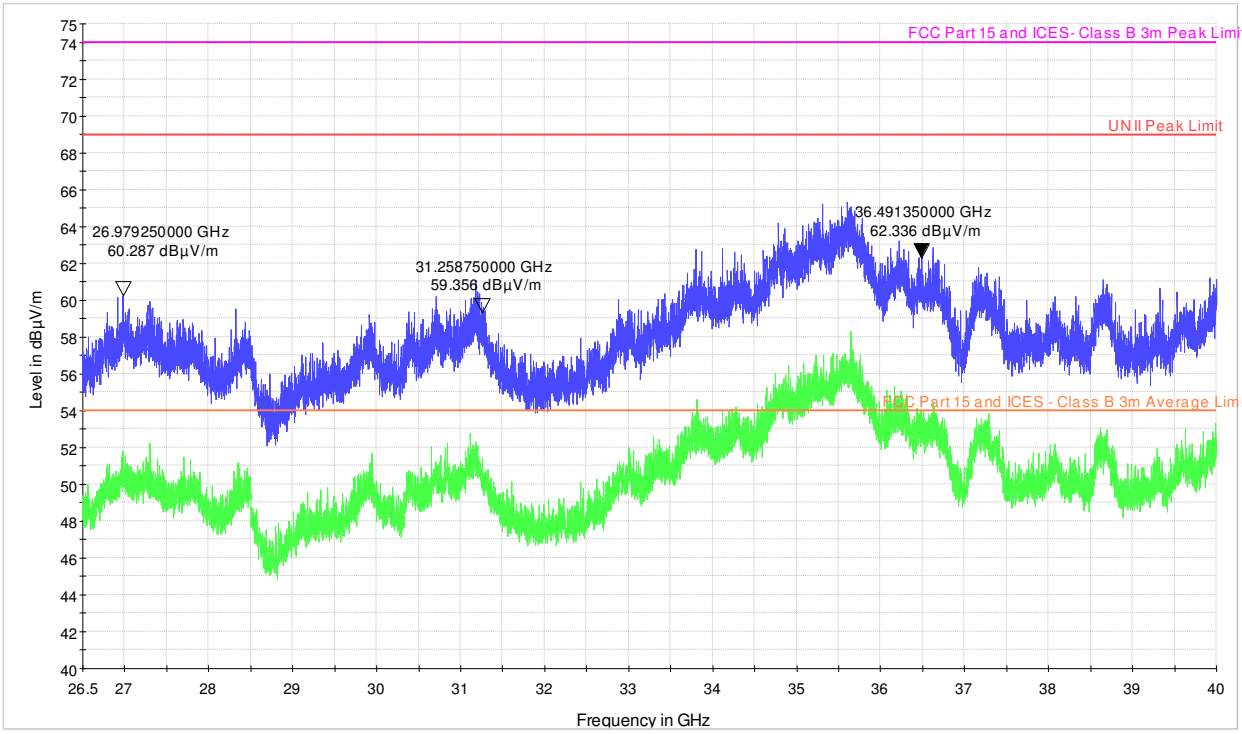


Figure 8.1-10: *Radiated spurious emissions within 26.5–40 GHz, low channel*

Table 8.1-10: *Radiated outside restricted band field strength measurement results, low channel*

Frequency, GHz	Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
26.979	60.287	68.23	7.943

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

Table 8.1-11: *Radiated within restricted band field strength measurement results, low channel*

Frequency, GHz	Peak Field strength, dBµV/m	Peak limit, dBµV/m	Peak margin, dB	Average Field strength, dBµV/m	Average limit, dBµV/m	Average margin, dB
31.2587	59.365	74.00	14.635	46.47	54.00	7.53
36.4913	62.336	74.00	11.664	48.92	54.00	5.08

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

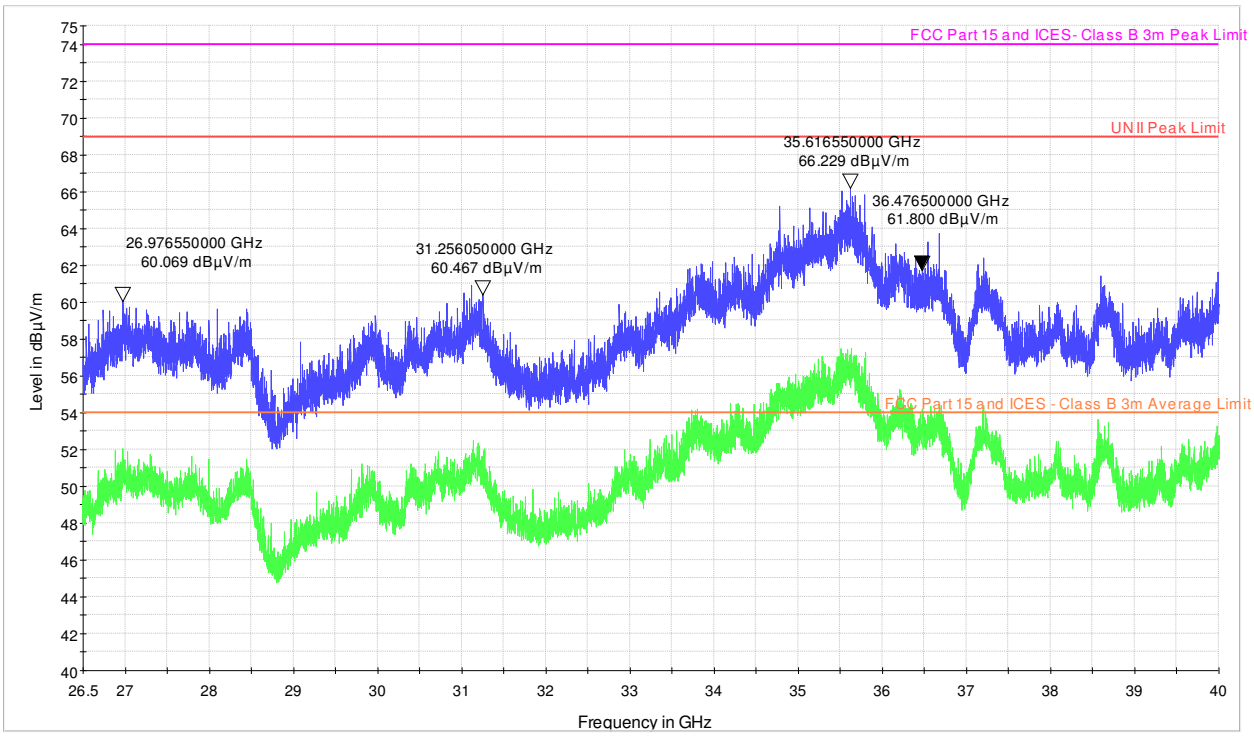


Figure 8.1-11: *Radiated spurious emissions within 26.5–40 GHz, mid channel*

Table 8.1-12: *Radiated outside restricted band field strength measurement results, mid channel*

Frequency, GHz	Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
26.9765	60.069	68.23	8.161
35.6165	66.229	68.23	2.001

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

Table 8.1-13: *Radiated within restricted band field strength measurement results, mid channel*

Frequency, GHz	Peak Field strength, dBµV/m	Peak limit, dBµV/m	Peak margin, dB	Average Field strength, dBµV/m	Average limit, dBµV/m	Average margin, dB
31.2560	60.467	74.00	13.533	46.52	54.00	7.48
36.4765	61.800	74.00	12.200	49.38	54.00	4.62

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

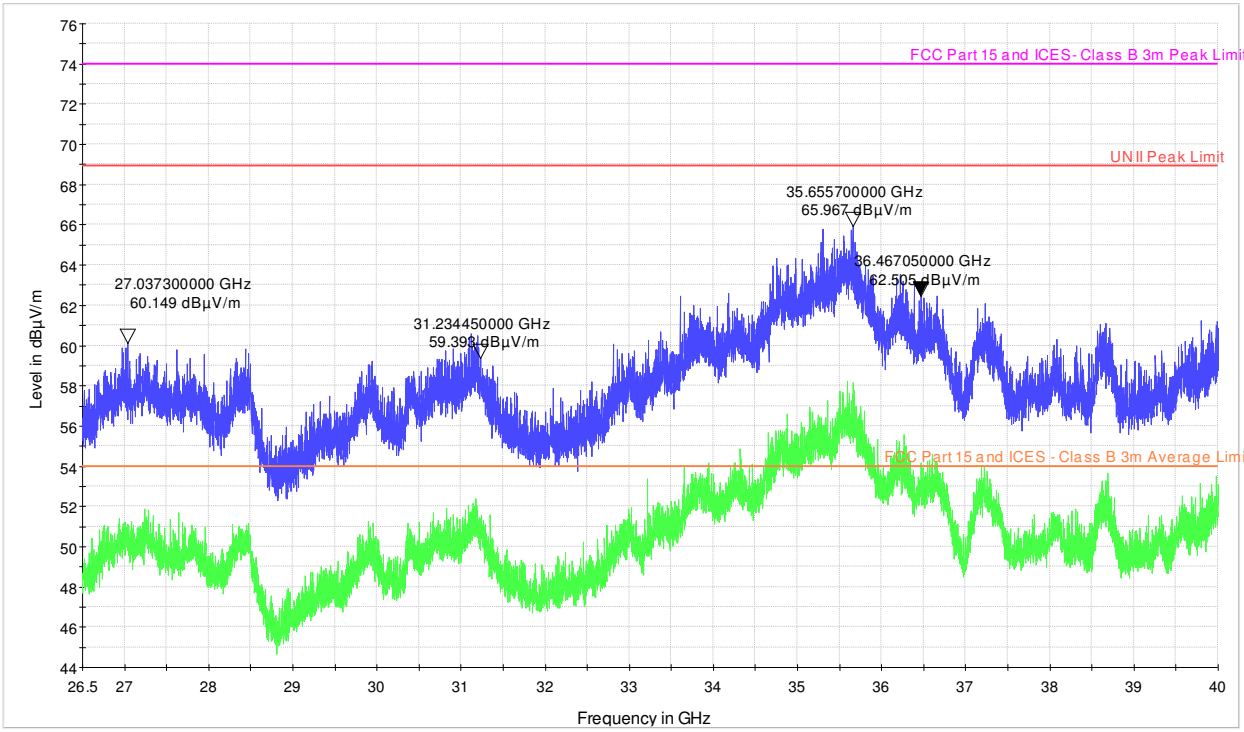


Figure 8.1-12: *Radiated spurious emissions within 26.5–40 GHz, high channel*

Table 8.1-14: *Radiated outside restricted band field strength measurement results, high channel*

Frequency, GHz	Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
27.0373	60.149	68.23	8.081
35.6557	65.967	68.23	2.263

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

Table 8.1-15: *Radiated within restricted band field strength measurement results, high channel*

Frequency, GHz	Peak Field strength, dBµV/m	Peak limit, dBµV/m	Peak margin, dB	Average Field strength, dBµV/m	Average limit, dBµV/m	Average margin, dB
31.2344	59.393	74.00	14.607	46.19	54.00	7.81
36.4670	62.505	74.00	11.495	48.96	54.00	5.04

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

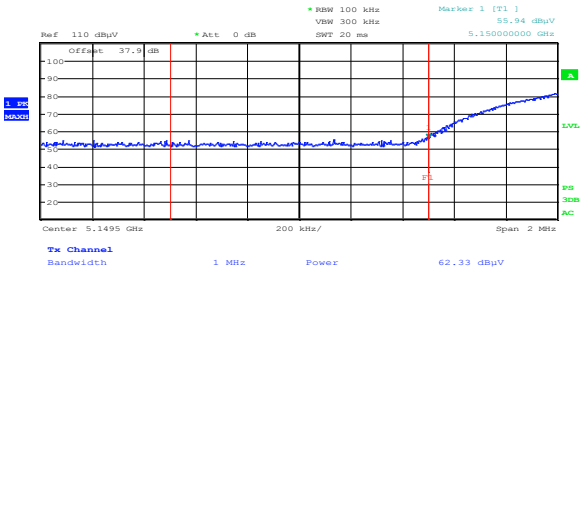


Figure 8.1-13: *Peak spurious emission at the lower band edge, low channel*

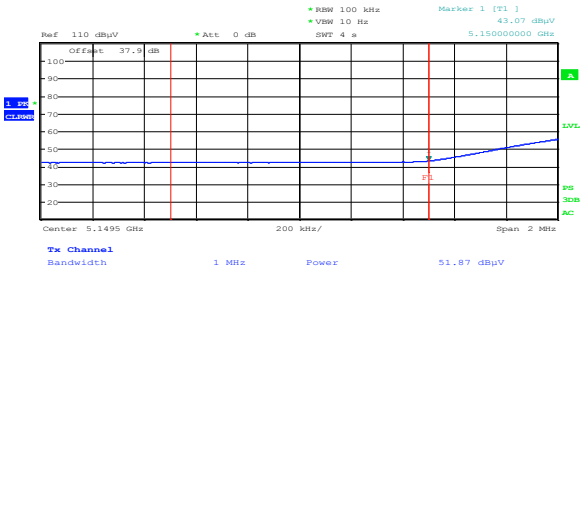


Figure 8.1-14: *Average spurious emission at the lower band edge, low channel*

Table 8.1-16: *Radiated band edge within restricted band field strength measurement results, low channel*

Frequency, GHz	Peak Field strength, dBµV/m	Peak limit, dBµV/m	Peak margin, dB	Average Field strength, dBµV/m	Average limit, dBµV/m	Average margin, dB
5.1500	62.33	74.00	11.67	51.87	54.00	2.13

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

8.2 FCC 15.407(b) and RSS-247 6.2.4(2) U-NII-3 Undesirable (unwanted) emissions

8.2.1 Definitions and limits

FCC:
(4) For transmitters operating in the 5.725–5.85 GHz band:
(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
(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.

IC:
For the band 5725–5850 MHz, emissions at frequencies from the band edges to 10 MHz above or below the band edges shall not exceed −17 dBm/MHz e.i.r.p.
For emissions at frequencies more than 10 MHz above or below the band edges, the emissions power shall not exceed −27 dBm/MHz.

RSS-Gen 8.10 Emissions falling within restricted frequency bands
Restricted bands, identified in Table 8.1-2, are designated primarily for safety-of-life services (distress calling and certain aeronautical bands), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following restrictions apply:
(a) fundamental components of modulation of licence-exempt radio apparatus shall not fall within the restricted bands of below;
(b) unwanted emissions falling into restricted bands of below shall comply with the limits specified in RSS-Gen;
(c) unwanted emissions not falling within restricted frequency bands shall either comply with the limits specified in the applicable RSS, or with those specified in RSS-Gen.

Table 8.2-1: *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)*	$67.6 – 20 \times \log_{10}$(F) *(F in kHz)*	300
0.490–1.705	24000/F *(F in kHz)*	$87.6 – 20 \times \log_{10}$(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

8.2.2 Definitions and limits, continued

Table 8.2-2: *IC 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 8.1-2 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 8.2-3: *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			

8.2.3 Test summary

Test date:	August 11, 2016	Temperature:	22 °C
Test engineer:	Andrey Adelberg	Air pressure:	1008 mbar
Verdict:	Pass	Relative humidity:	33 %

8.2.4 Observations, settings and special notes

The spectrum was searched from 30 MHz to 40 GHz.
EUT was set to transmit with 100 % duty cycle.
Radiated measurements were performed at a distance of 3 m.

Spectrum analyser settings for pre-scan measurements below 1 GHz:

Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Detector mode	Peak
Trace mode	Max-hold

Spectrum analyser settings for final measurements below 1 GHz:

Resolution bandwidth	120 kHz
Video bandwidth	300 kHz
Detector mode	Quasi-Peak
Trace mode	Max-hold

Spectrum analyser settings for peak measurements above 1 GHz:

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

Spectrum analyser settings for average measurements above 1 GHz:

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

Limit for frequencies outside restricted bands was calculated as follows: −27 dBm/MHz + 95.23 dB (conversion factor) = 68.23 dBµV/m @ 3 m at 1 MHz.

8.2.5 Test data

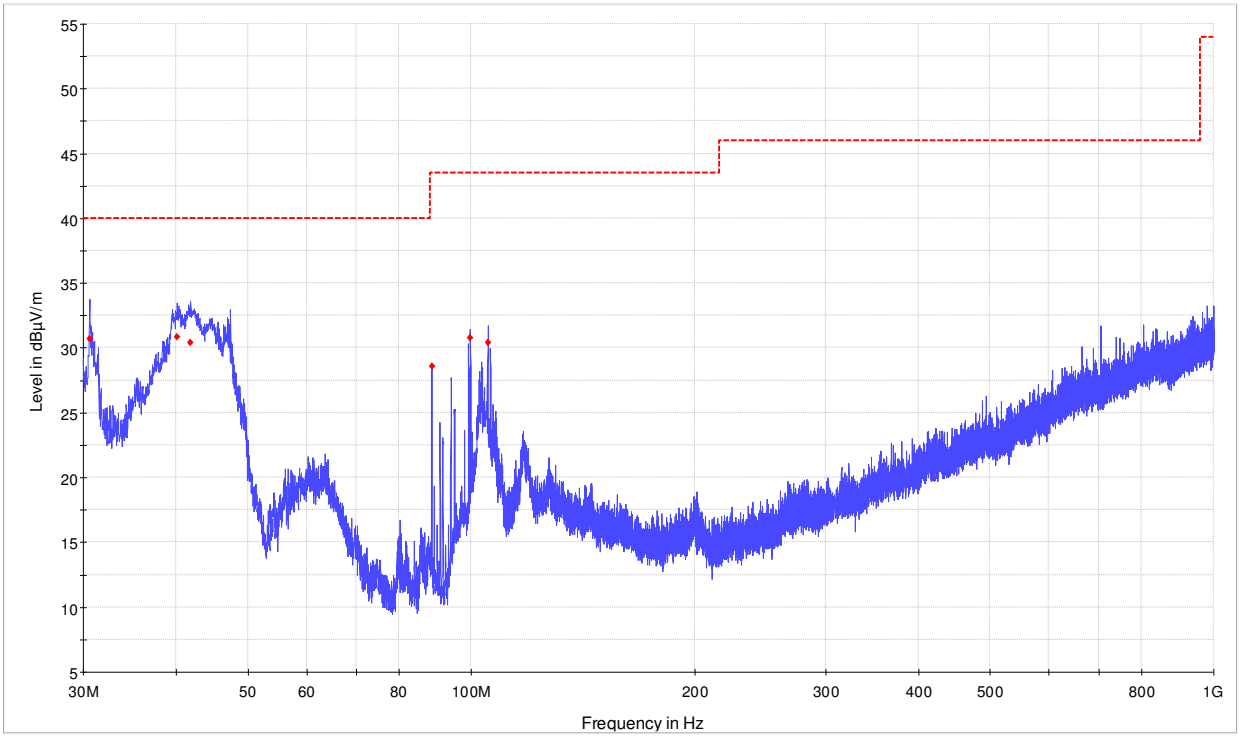


Figure 8.2-1: *Radiated spurious emissions below 1 GHz, low channel*

Table 8.2-4: *Radiated field strength measurement results, low channel*

Frequency, MHz	Quasi-Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
30.600000	30.7	40.0	9.3
40.120000	30.9	40.0	9.1
41.880000	30.4	40.0	9.6
88.520000	28.6	43.5	14.9
99.680000	30.8	43.5	12.7
105.320000	30.4	43.5	13.1

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

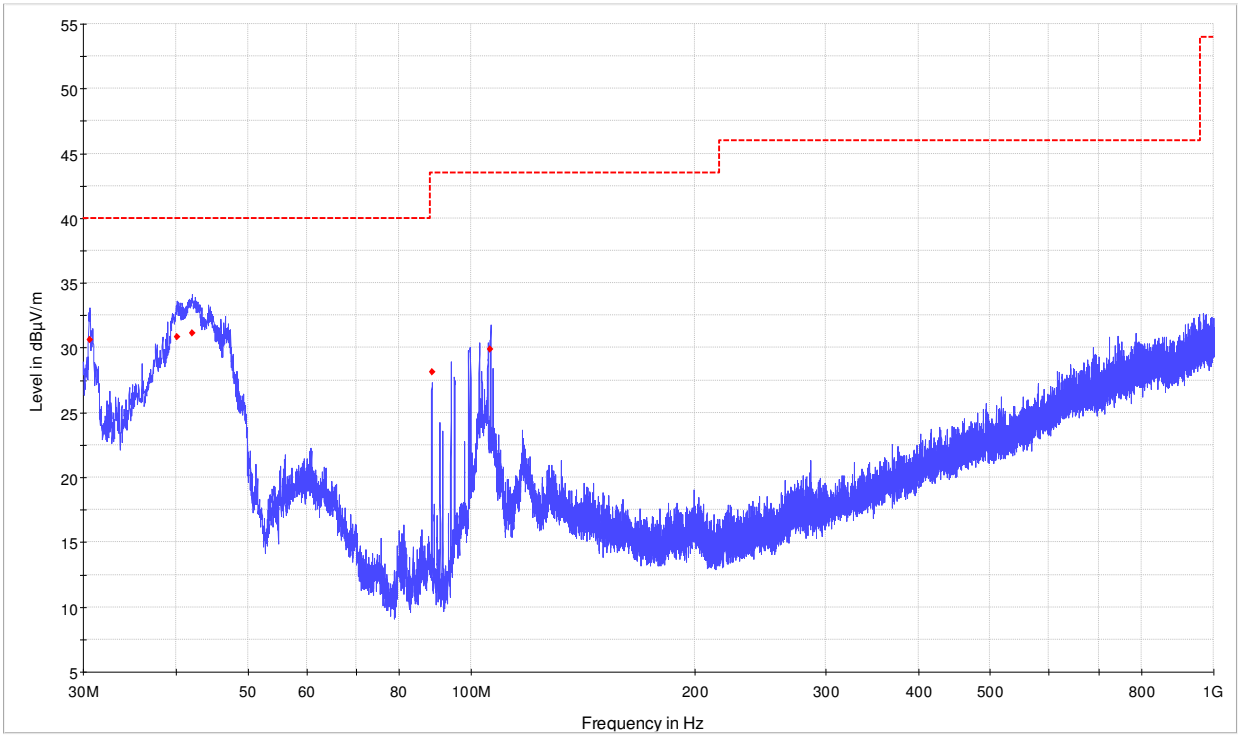


Figure 8.2-2: *Radiated spurious emissions below 1 GHz, mid channel*

Table 8.2-5: *Radiated field strength measurement results, mid channel*

Frequency, MHz	Quasi-Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
30.600000	30.7	40.0	9.3
40.120000	30.8	40.0	9.2
42.080000	31.1	40.0	8.9
88.480000	28.1	43.5	15.4
106.120000	29.9	43.5	13.6

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

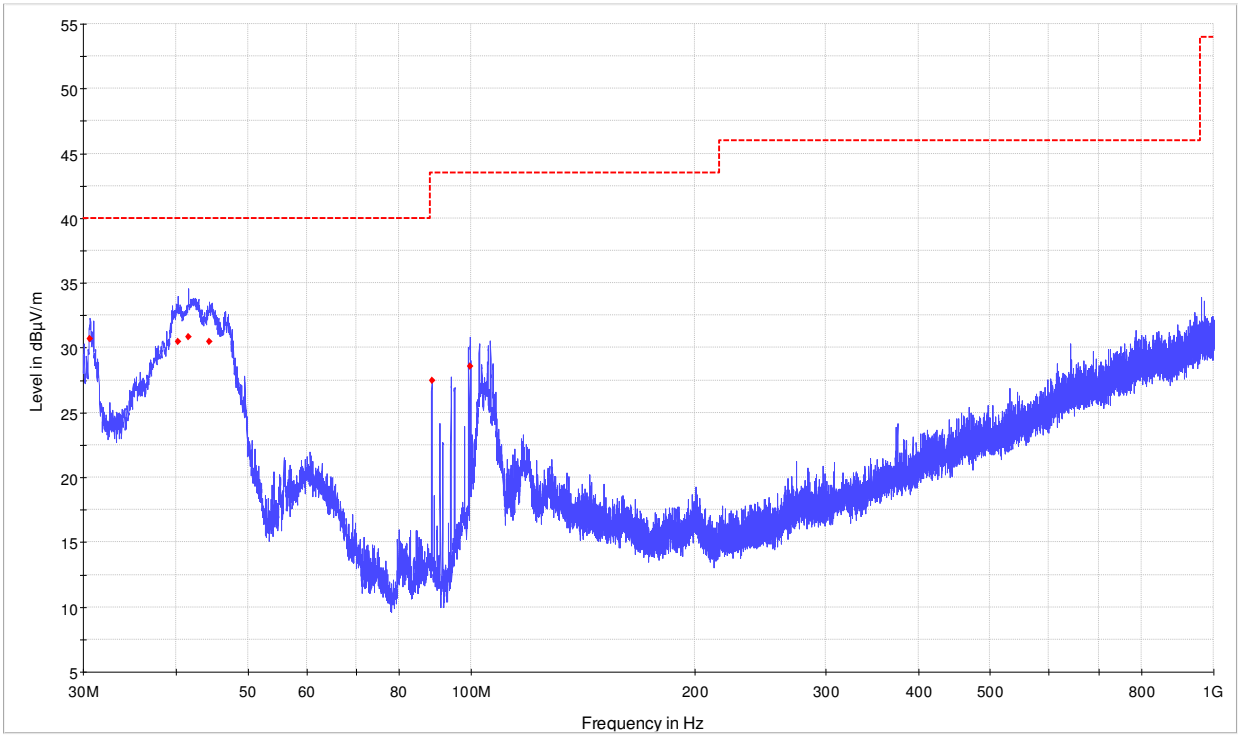


Figure 8.2-3: *Radiated spurious emissions below 1 GHz, high channel*

Table 8.2-6: *Radiated field strength measurement results, high channel*

Frequency, MHz	Quasi-Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
41.600000	30.9	40.0	9.1
30.640000	30.7	40.0	9.3
40.280000	30.5	40.0	9.5
99.760000	28.5	43.5	15.0
88.440000	27.5	43.5	16.0
44.400000	30.5	40.0	9.5

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

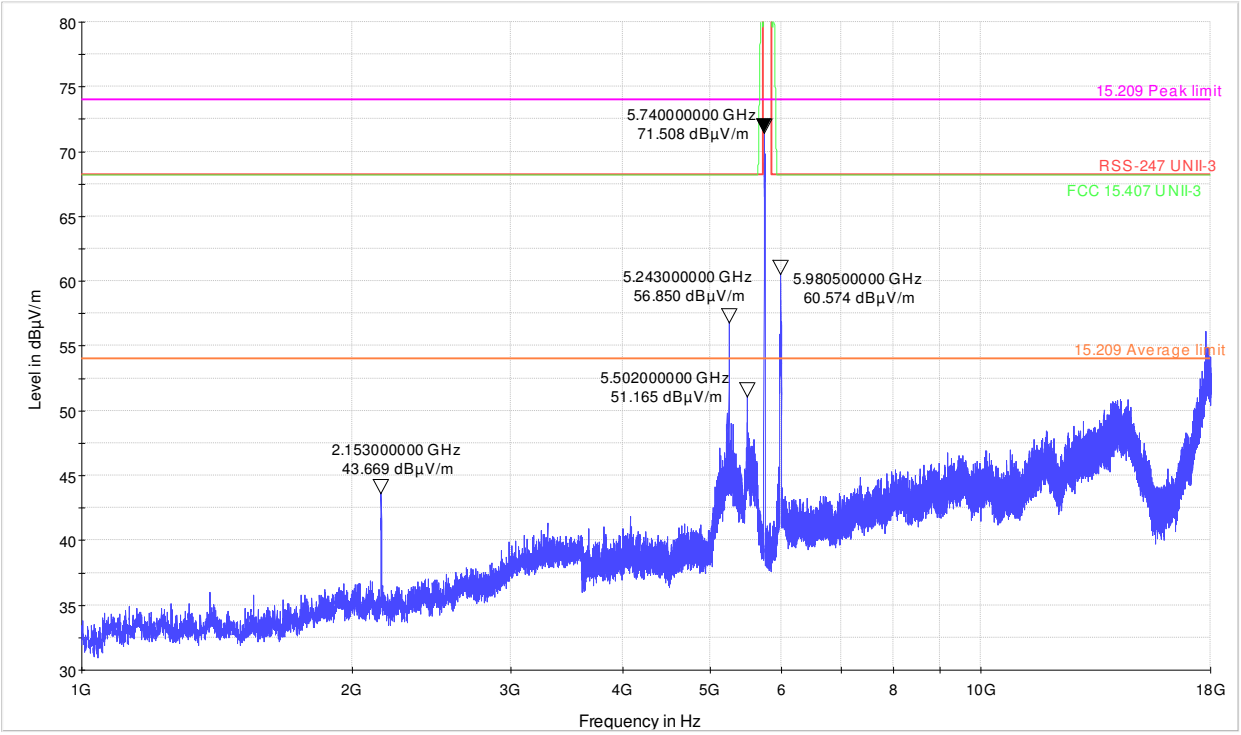


Figure 8.2-4: *Radiated spurious emissions within 1–18 GHz, low channel*

Note: 2.153 GHz emission belongs to a carrier frequency for RF0, LTE B4 and is exempt from this measurement.

Table 8.2-7: *Radiated outside restricted band field strength measurement results, low channel*

Frequency, GHz	Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
5.243	56.850	68.23	11.380
5.502	51.165	68.23	17.065
5.980	60.574	68.23	7.656

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

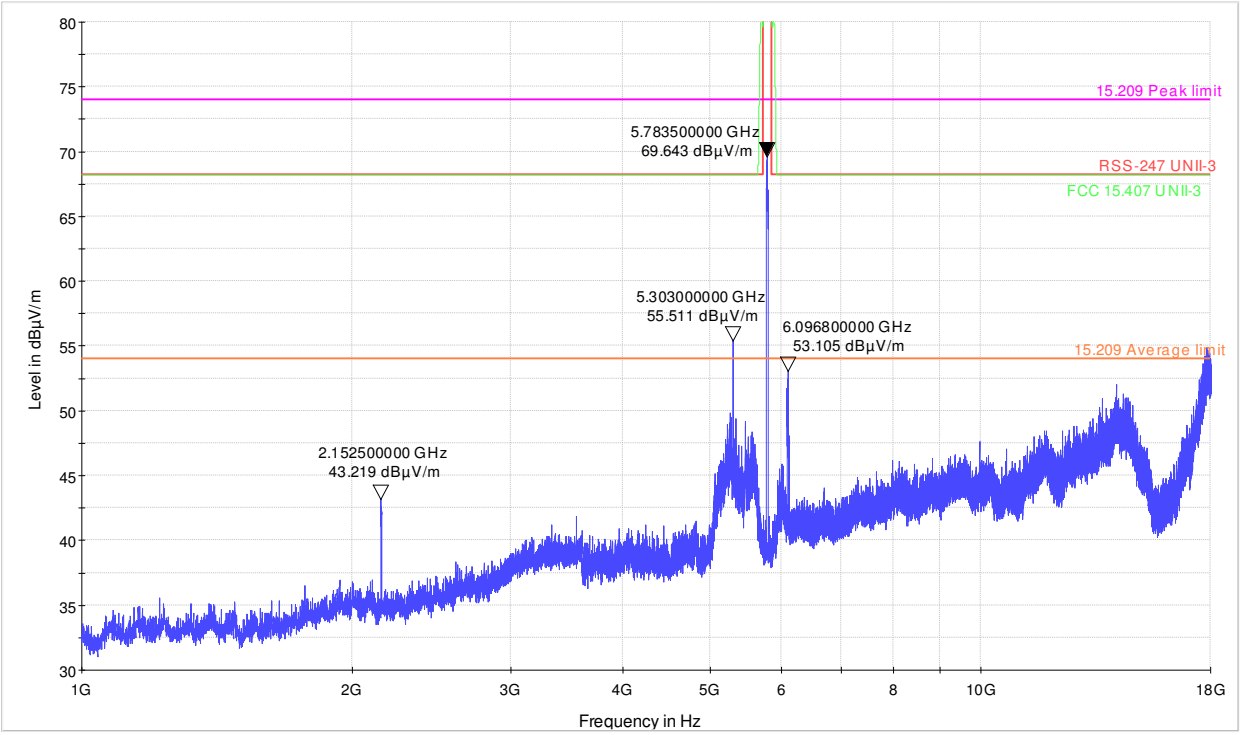


Figure 8.2-5: *Radiated spurious emissions within 1–18 GHz, mid channel*

Note: 2.152 GHz emission belongs to a carrier frequency for RF0, LTE B4 and is exempt from this measurement.

Table 8.2-8: *Radiated outside restricted band field strength measurement results, mid channel*

Frequency, GHz	Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
5.303	55.511	68.23	12.719
6.096	53.105	68.23	15.125

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

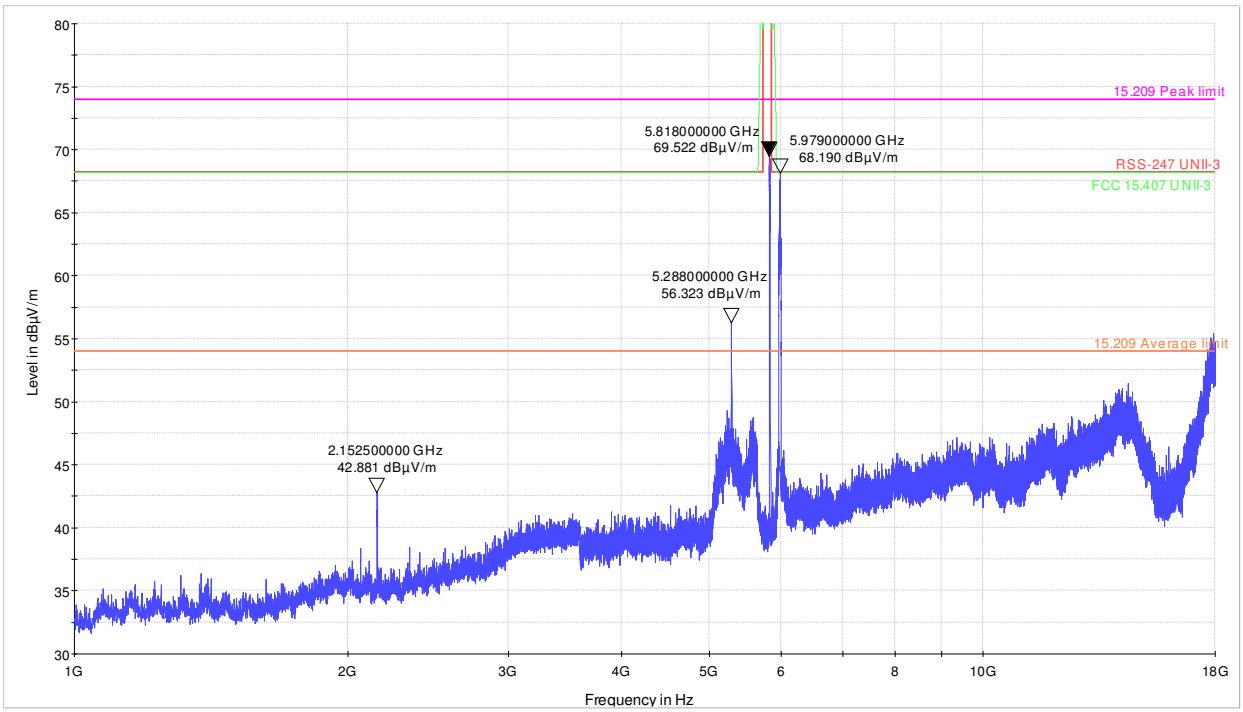


Figure 8.2-6: *Radiated spurious emissions within 1–18 GHz, high channel*

Note: 2.152 GHz emission belongs to a carrier frequency for RF0, LTE B4 and is exempt from this measurement.

Table 8.2-9: *Radiated outside restricted band field strength measurement results, high channel*

Frequency, GHz	Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
5.288	56.323	68.23	11.907
5.979	68.190	68.23	0.040

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

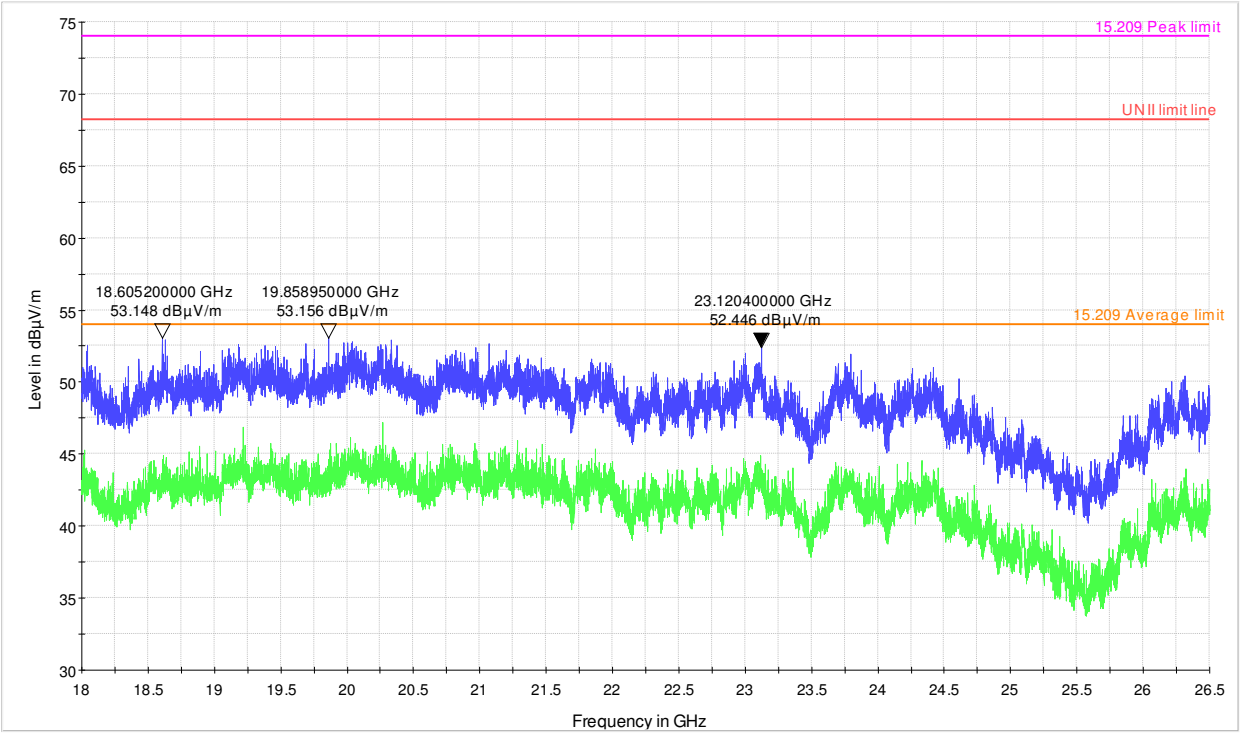


Figure 8.2-7: *Radiated spurious emissions within 18–26.5 GHz, low channel*

Note: A peak field strength of all emissions were below the 15.209 or RSS-Gen average limits.

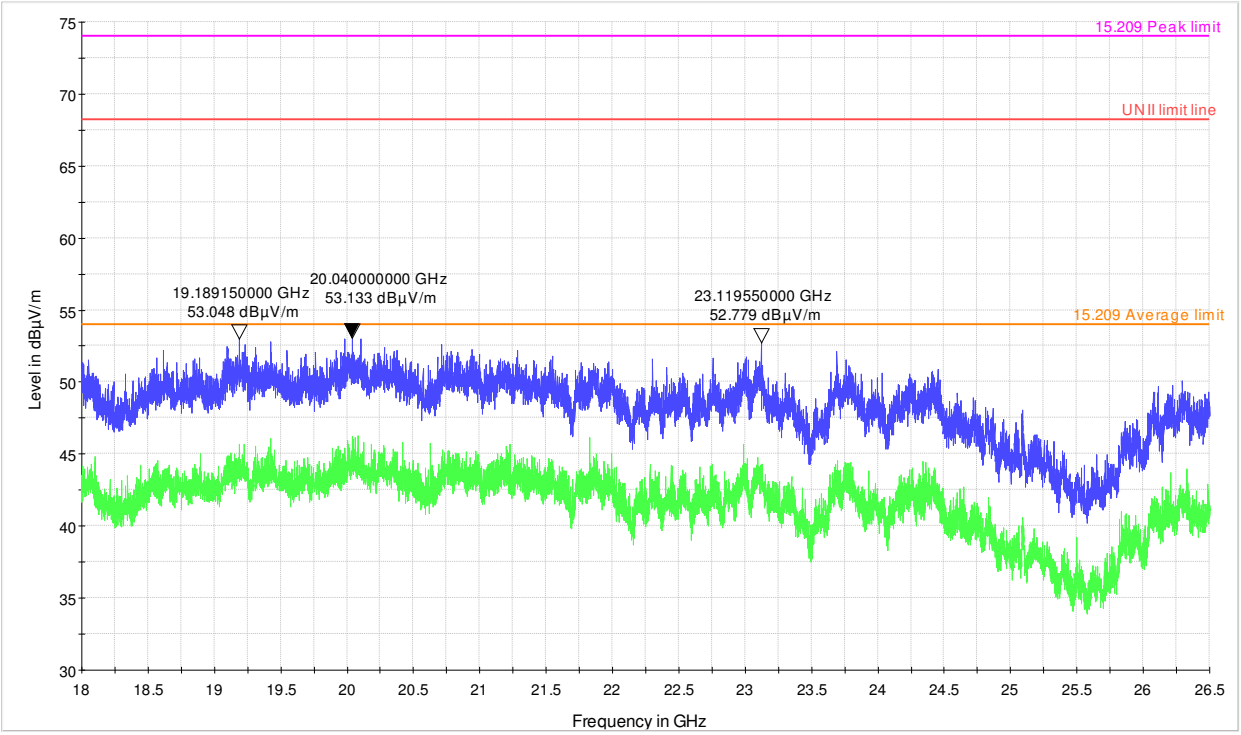


Figure 8.2-8: *Radiated spurious emissions within 18–26.5 GHz, mid channel*

Note: A peak field strength of all emissions were below the 15.209 or RSS-Gen average limits.

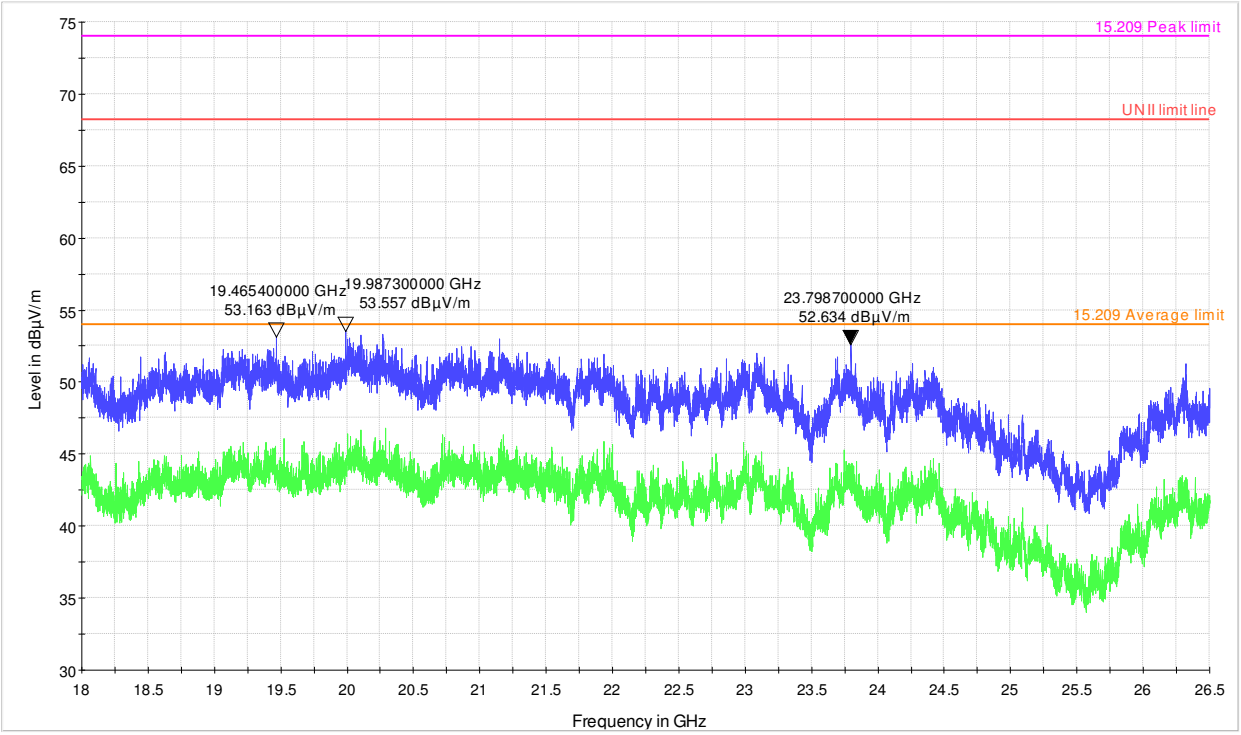


Figure 8.2-9: *Radiated spurious emissions within 18–26.5 GHz, high channel*

Note: A peak field strength of all emissions were below the 15.209 or RSS-Gen average limits.

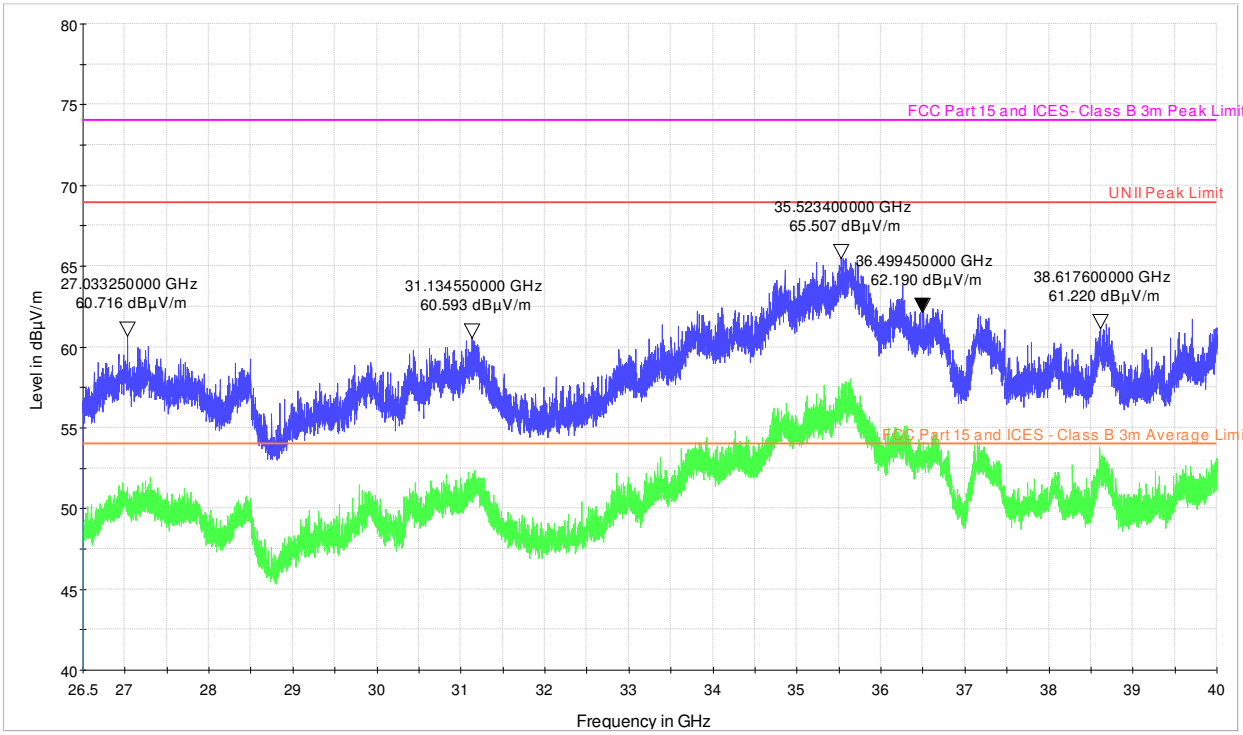


Figure 8.2-10: *Radiated spurious emissions within 26.5–40 GHz, low channel*

Table 8.2-10: *Radiated outside restricted band field strength measurement results, low channel*

Frequency, GHz	Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
27.033	60.716	68.23	7.514
31.134	60.593	68.23	7.637
35.523	65.507	68.23	2.723

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

Table 8.2-11: *Radiated within restricted band field strength measurement results, low channel*

Frequency, GHz	Peak Field strength, dBµV/m	Peak limit, dBµV/m	Peak margin, dB	Average Field strength, dBµV/m	Average limit, dBµV/m	Average margin, dB
36.499	62.190	74.00	11.81	48.910	54.00	5.090
38.617	61.220	74.00	12.78	47.360	54.00	6.640

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

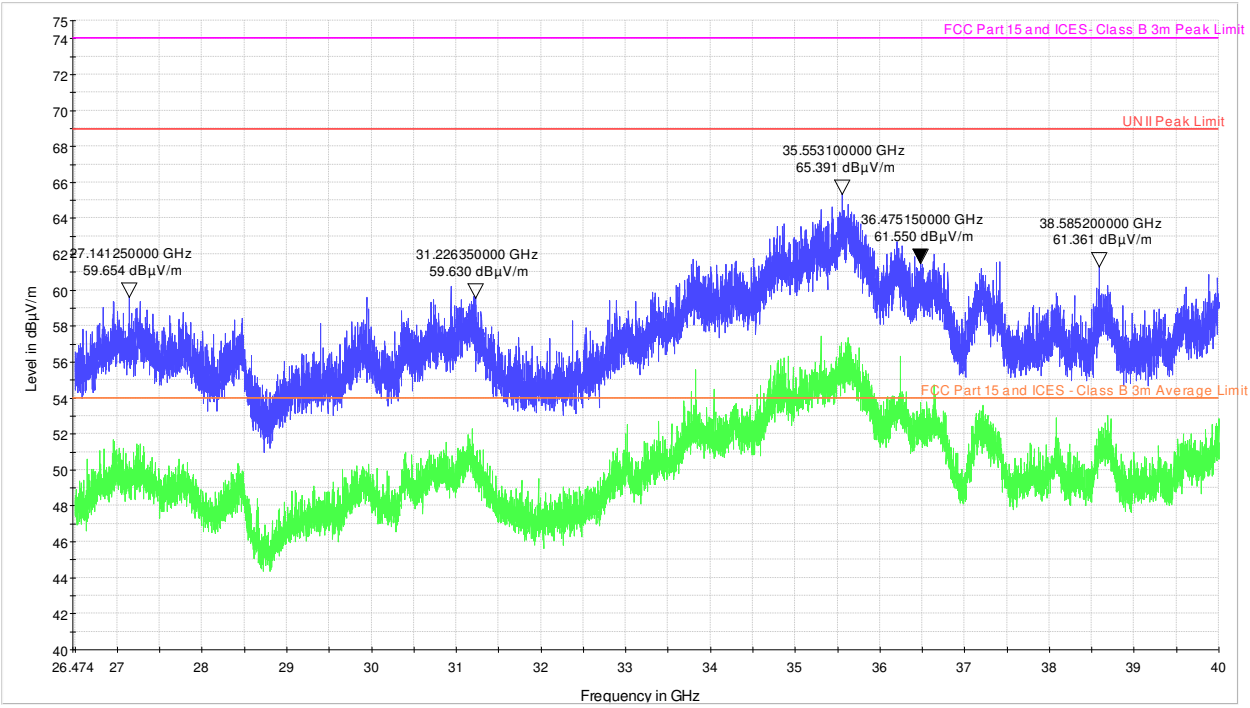


Figure 8.2-11: *Radiated spurious emissions within 26.5–40 GHz, mid channel*

Table 8.2-12: *Radiated outside restricted band field strength measurement results, mid channel*

Frequency, GHz	Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
27.141	59.654	68.23	8.576
35.553	65.391	68.23	2.839
38.585	61.361	68.23	6.869

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

Table 8.2-13: *Radiated within restricted band field strength measurement results, mid channel*

Frequency, GHz	Peak Field strength, dBµV/m	Peak limit, dBµV/m	Peak margin, dB	Average Field strength, dBµV/m	Average limit, dBµV/m	Average margin, dB
31.226	59.630	74.00	14.37	46.270	54.00	7.730
36.475	61.550	74.00	12.45	48.930	54.00	5.070

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

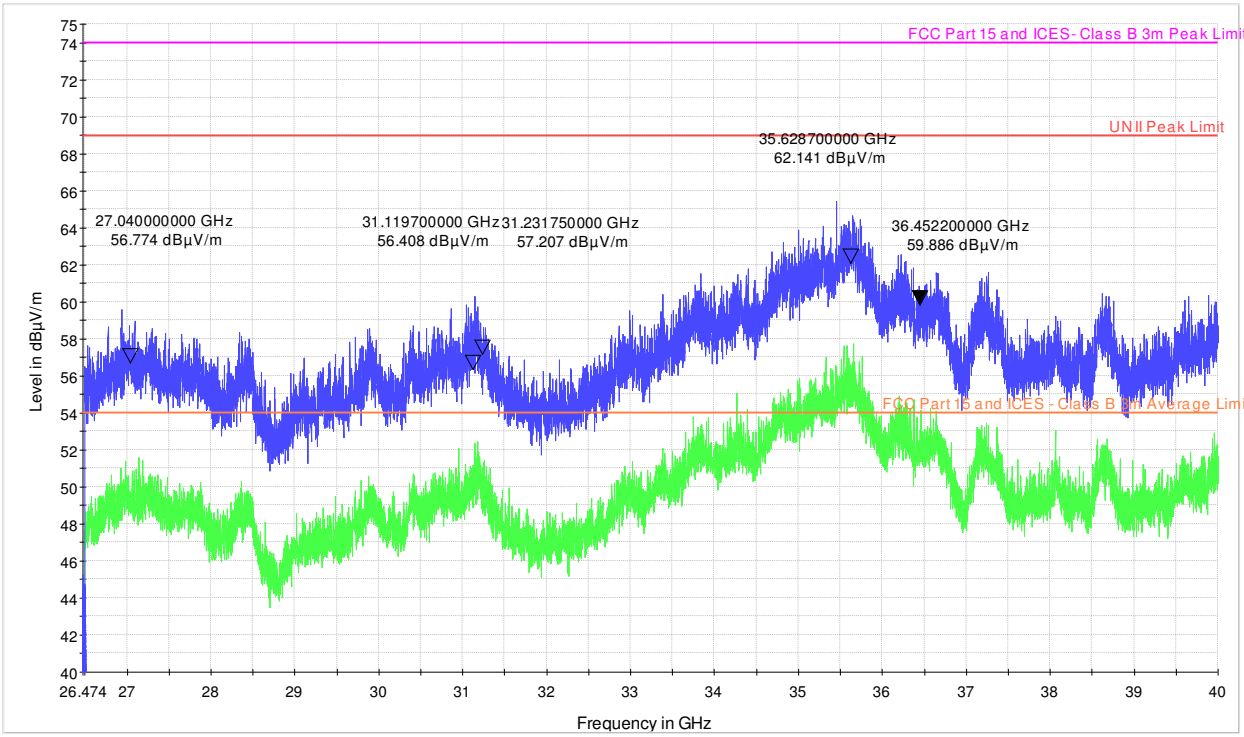


Figure 8.2-12: *Radiated spurious emissions within 26.5–40 GHz, high channel*

Table 8.2-14: *Radiated outside restricted band field strength measurement results, high channel*

Frequency, GHz	Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
27.040	56.774	68.23	11.456
31.119	56.408	68.23	11.822
35.629	62.141	68.23	6.089

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

Table 8.2-15: *Radiated within restricted band field strength measurement results, high channel*

Frequency, GHz	Peak Field strength, dBµV/m	Peak limit, dBµV/m	Peak margin, dB	Average Field strength, dBµV/m	Average limit, dBµV/m	Average margin, dB
31.232	57.207	74.00	16.79	47.130	54.00	6.870
36.452	59.886	74.00	14.11	48.530	54.00	5.470

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

8.3 FCC 15.207(a) and RSS-Gen 8.8 AC power line conducted emissions limits, U-NII-1

8.3.1 Definitions and limits

FCC §15.407(6)(b):

Any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207

FCC §15.207(a):
Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

IC:
A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz, shall not exceed the limits in table below.

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

Table 8.3-1: *Conducted emissions limit*

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

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

8.3.2 Test summary

Test date:	August 12, 2016	Temperature:	21 °C
Test engineer:	Andrey Adelberg	Air pressure:	1010 mbar
Verdict:	Pass	Relative humidity:	34 %

8.3.3 Observations, settings and special notes

The EUT was set up as tabletop configuration.

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

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

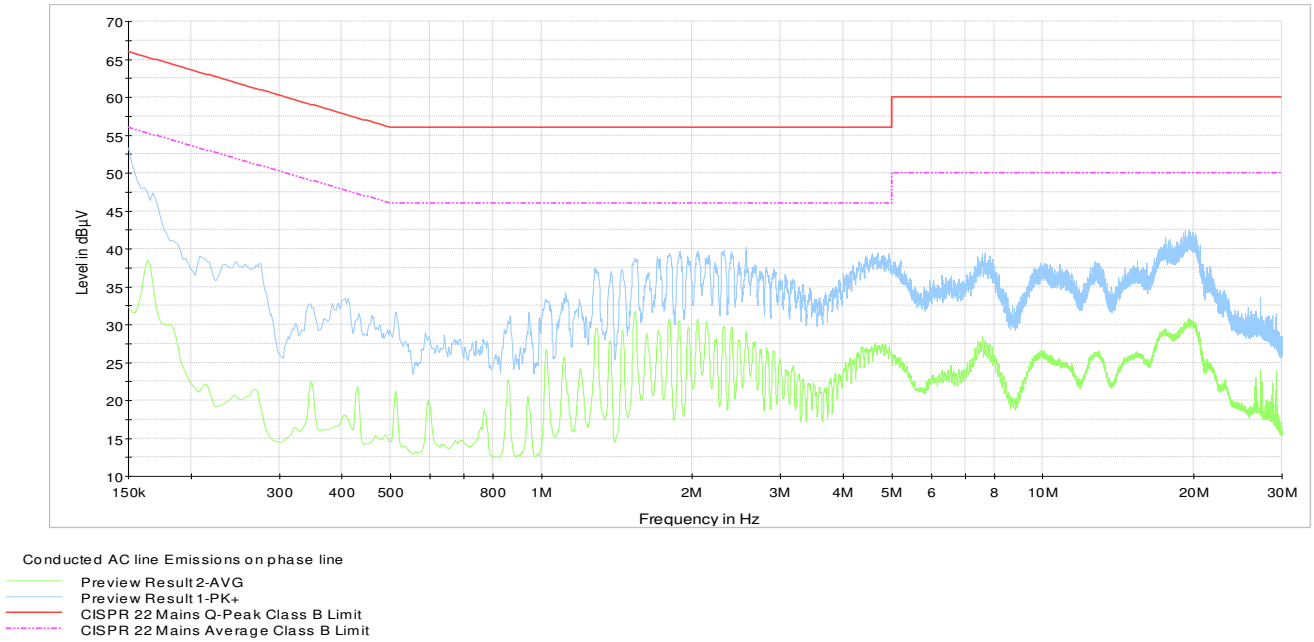
Receiver settings for preview measurements:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	Peak and Average
Trace mode	Max Hold
Measurement time	100 ms

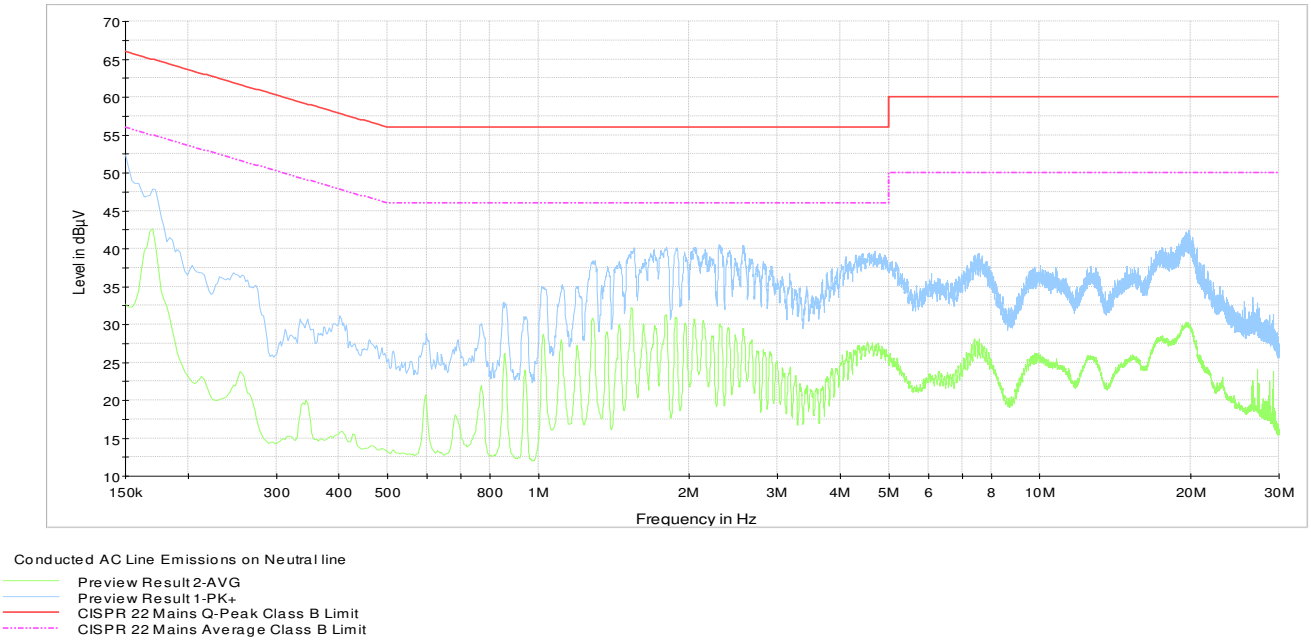
Receiver settings for final measurements:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	Quasi-Peak and Average
Trace mode	Max Hold
Measurement time	100 ms

8.3.4 Test data



Plot 8.3-1: *Conducted emissions on phase line*



Plot 8.3-2: *Conducted emissions on neutral line*

8.4 FCC 15.207(a) and RSS-Gen 8.8 AC power line conducted emissions limits, U-NII-3

8.4.1 Definitions and limits

FCC §15.407(6)(b):

Any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207

FCC §15.207(a):
Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

IC:
A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz, shall not exceed the limits in table below.

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

Table 8.4-1: *Conducted emissions limit*

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

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

8.4.2 Test summary

Test date:	August 12, 2016	Temperature:	21 °C
Test engineer:	Andrey Adelberg	Air pressure:	1010 mbar
Verdict:	Pass	Relative humidity:	34 %

8.4.3 Observations, settings and special notes

The EUT was set up as tabletop configuration.

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

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

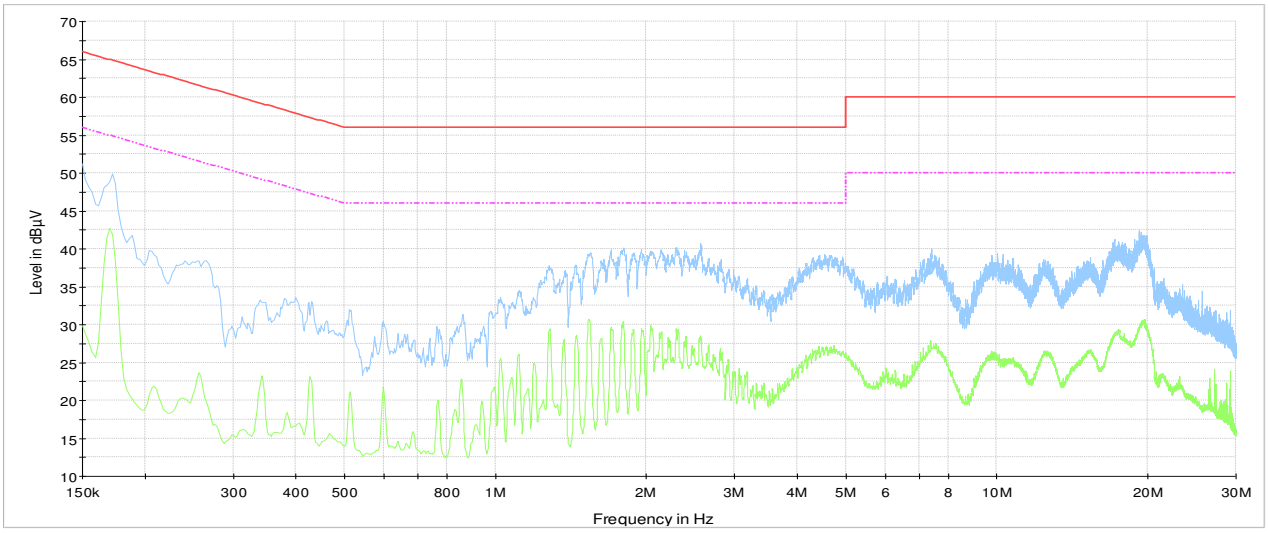
Receiver settings for preview measurements:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	Peak and Average
Trace mode	Max Hold
Measurement time	100 ms

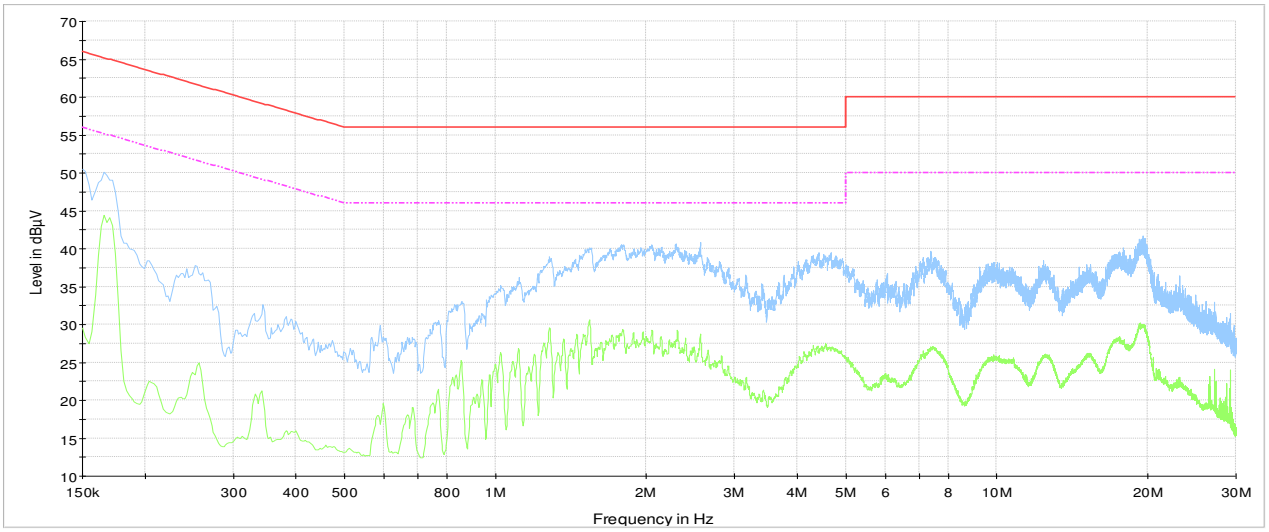
Receiver settings for final measurements:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	Quasi-Peak and Average
Trace mode	Max Hold
Measurement time	100 ms

8.4.4 Test data



Plot 8.4-1: *Conducted emissions on phase line*



Plot 8.4-2: *Conducted emissions on neutral line*

8.5 FCC 15.209(a) and RSS-Gen 7.1.2 U-NII-1 Receiver spurious emissions

8.5.1 Definitions and limits

FCC:
(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

IC:
Radiated emission measurements shall be performed with the receiver antenna connected to the receiver antenna terminals. The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least 5x the highest tunable or local oscillator frequency, whichever is higher, without exceeding 40 GHz.
Spurious emissions from receivers shall not exceed the radiated limits shown in table below.

Table 8.5-1: *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
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

8.5.2 Test summary

Test date:	August 11, 2016	Temperature:	22 °C
Test engineer:	Andrey Adelberg	Air pressure:	1008 mbar
Verdict:	Pass	Relative humidity:	33 %

8.5.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to 40 GHz.
EUT was set to transmit with 100 % duty cycle.
Radiated measurements were performed at a distance of 3 m.

Spectrum analyser settings for pre-scan measurements below 1 GHz:

Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Detector mode	Peak
Trace mode	Max-hold

Spectrum analyser settings for final measurements below 1 GHz:

Resolution bandwidth	120 kHz
Video bandwidth	300 kHz
Detector mode	Quasi-Peak
Trace mode	Max-hold

Spectrum analyser settings for peak measurements above 1 GHz:

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

Spectrum analyser settings for average measurements above 1 GHz:

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

8.5.4 Test data

Table 8.5-2: *Radiated Rx field strength measurement results below 1 GHz, low channel*

Frequency, MHz	Quasi-Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
39.5200	30.8	40.0	9.2
30.5600	29.8	40.0	10.2
99.6800	30.9	43.5	12.6
88.4800	26.0	43.5	17.5
42.6800	29.5	40.0	10.5

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

Table 8.5-3: *Radiated Rx field strength measurement results below 1 GHz, mid channel*

Frequency, MHz	Quasi-Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
30.600	31.5	40.0	8.5
39.680	30.4	40.0	9.6
42.200	29.5	40.0	10.5
88.440	25.5	43.5	18.0
105.240	30.5	43.5	13.0

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

Table 8.5-4: *Radiated Rx field strength measurement results below 1 GHz, high channel*

Frequency, MHz	Quasi-Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
30.600	29.8	40.0	10.2
42.240	28.7	40.0	11.3
88.480	27.8	43.5	15.7
99.680	34.1	43.5	9.4

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

Table 8.5-5: *Radiated Rx field strength measurement results above 1 GHz, low channel*

Frequency, GHz	Peak Field strength, dBµV/m	Peak Limit, dBµV/m	Peak Margin, dB	Average Field strength, dBµV/m	Average Limit, dBµV/m	Average Margin, dB
5.507	50.615	74.00	23.385	50.615	54.00	3.385
26.979	60.287	74.00	13.713	46.350	54.00	7.650
31.259	59.365	74.00	14.635	46.47	54.00	7.53
36.491	62.336	74.00	11.664	48.92	54.00	5.08

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

Table 8.5-6: *Radiated Rx field strength measurement results above 1 GHz, mid channel*

Frequency, GHz	Peak Field strength, dBµV/m	Peak Limit, dBµV/m	Peak Margin, dB	Average Field strength, dBµV/m	Average Limit, dBµV/m	Average Margin, dB
5.462	49.627	74.00	24.373	49.627	54.00	4.373
5.852	57.286	74.00	16.714	45.410	54.00	8.590
26.977	60.069	74.00	13.931	46.310	54.00	7.690
35.617	66.229	74.00	7.771	48.180	54.00	5.820
31.256	60.467	74.00	13.533	46.52	54.00	7.48
36.477	61.800	74.00	12.200	49.38	54.00	4.62

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

Table 8.5-7: *Radiated Rx field strength measurement results above 1 GHz, high channel*

Frequency, GHz	Peak Field strength, dBµV/m	Peak Limit, dBµV/m	Peak Margin, dB	Average Field strength, dBµV/m	Average Limit, dBµV/m	Average Margin, dB
5.503	49.282	74.00	24.718	49.282	54.00	4.718
5.963	58.130	74.00	15.870	46.900	54.00	7.100
27.037	60.149	74.00	13.851	46.290	54.00	7.710
35.656	65.967	74.00	8.033	50.870	54.00	3.130
31.234	59.393	74.00	14.607	46.19	54.00	7.81
36.467	62.505	74.00	11.495	48.96	54.00	5.04

8.6 FCC 15.209(a) and RSS-Gen 7.1.2 U-NII-3 Receiver spurious emissions

8.6.1 Definitions and limits

FCC:
(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

IC:
Radiated emission measurements shall be performed with the receiver antenna connected to the receiver antenna terminals. The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least 5x the highest tunable or local oscillator frequency, whichever is higher, without exceeding 40 GHz.
Spurious emissions from receivers shall not exceed the radiated limits shown in table below.

Table 8.6-1: *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
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

8.6.2 Test summary

Test date:	August 11, 2016	Temperature:	22 °C
Test engineer:	Andrey Adelberg	Air pressure:	1008 mbar
Verdict:	Pass	Relative humidity:	33 %

8.6.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to 40 GHz.
EUT was set to transmit with 100 % duty cycle.
Radiated measurements were performed at a distance of 3 m.

Spectrum analyser settings for pre-scan measurements below 1 GHz:

Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Detector mode	Peak
Trace mode	Max-hold

Spectrum analyser settings for final measurements below 1 GHz:

Resolution bandwidth	120 kHz
Video bandwidth	300 kHz
Detector mode	Quasi-Peak
Trace mode	Max-hold

Spectrum analyser settings for peak measurements above 1 GHz:

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

Spectrum analyser settings for average measurements above 1 GHz:

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

8.6.4 Test data

Table 8.6-2: *Radiated Rx field strength measurement results below 1 GHz, low channel*

Frequency, MHz	Quasi-Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
30.600000	30.7	40.0	9.3
40.120000	30.9	40.0	9.1
41.880000	30.4	40.0	9.6
88.520000	28.6	43.5	14.9
99.680000	30.8	43.5	12.7
105.320000	30.4	43.5	13.1

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

Table 8.6-3: *Radiated Rx field strength measurement results below 1 GHz, mid channel*

Frequency, MHz	Quasi-Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
30.600000	30.7	40.0	9.3
40.120000	30.8	40.0	9.2
42.080000	31.1	40.0	8.9
88.480000	28.1	43.5	15.4
106.120000	29.9	43.5	13.6

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

Table 8.6-4: *Radiated Rx field strength measurement results below 1 GHz, high channel*

Frequency, MHz	Quasi-Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
41.600000	30.9	40.0	9.1
30.640000	30.7	40.0	9.3
40.280000	30.5	40.0	9.5
99.760000	28.5	43.5	15.0
88.440000	27.5	43.5	16.0
44.400000	30.5	40.0	9.5

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

Table 8.6-5: *Radiated Rx field strength measurement results above 1 GHz, low channel*

Frequency, GHz	Peak Field strength, dBµV/m	Peak Limit, dBµV/m	Peak Margin, dB	Average Field strength, dBµV/m	Average Limit, dBµV/m	Average Margin, dB
5.243	56.850	74.00	17.150	50.800	54.00	3.200
5.502	51.165	74.00	22.835	51.165	54.00	2.835
5.980	60.574	74.00	13.426	44.200	54.00	9.800
27.033	60.716	74.00	13.284	46.180	54.00	7.820
31.134	60.593	74.00	13.407	46.730	54.00	7.270
35.523	65.507	74.00	8.493	53.570	54.00	0.430
36.499	62.190	74.00	11.81	48.910	54.00	5.090
38.617	61.220	74.00	12.78	47.360	54.00	6.640

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

Table 8.6-6: *Radiated Rx field strength measurement results above 1 GHz, mid channel*

Frequency, GHz	Peak Field strength, dBµV/m	Peak Limit, dBµV/m	Peak Margin, dB	Average Field strength, dBµV/m	Average Limit, dBµV/m	Average Margin, dB
5.303	55.511	74.00	18.489	51.000	54.00	3.000
6.096	53.105	74.00	20.895	53.105	54.00	0.895
27.141	59.654	74.00	46.370	54.00	7.630	46.370
35.553	65.391	74.00	50.760	54.00	3.240	50.760
38.585	61.361	74.00	47.340	54.00	6.660	47.340
31.226	59.630	74.00	14.37	46.270	54.00	7.730
36.475	61.550	74.00	12.45	48.930	54.00	5.070

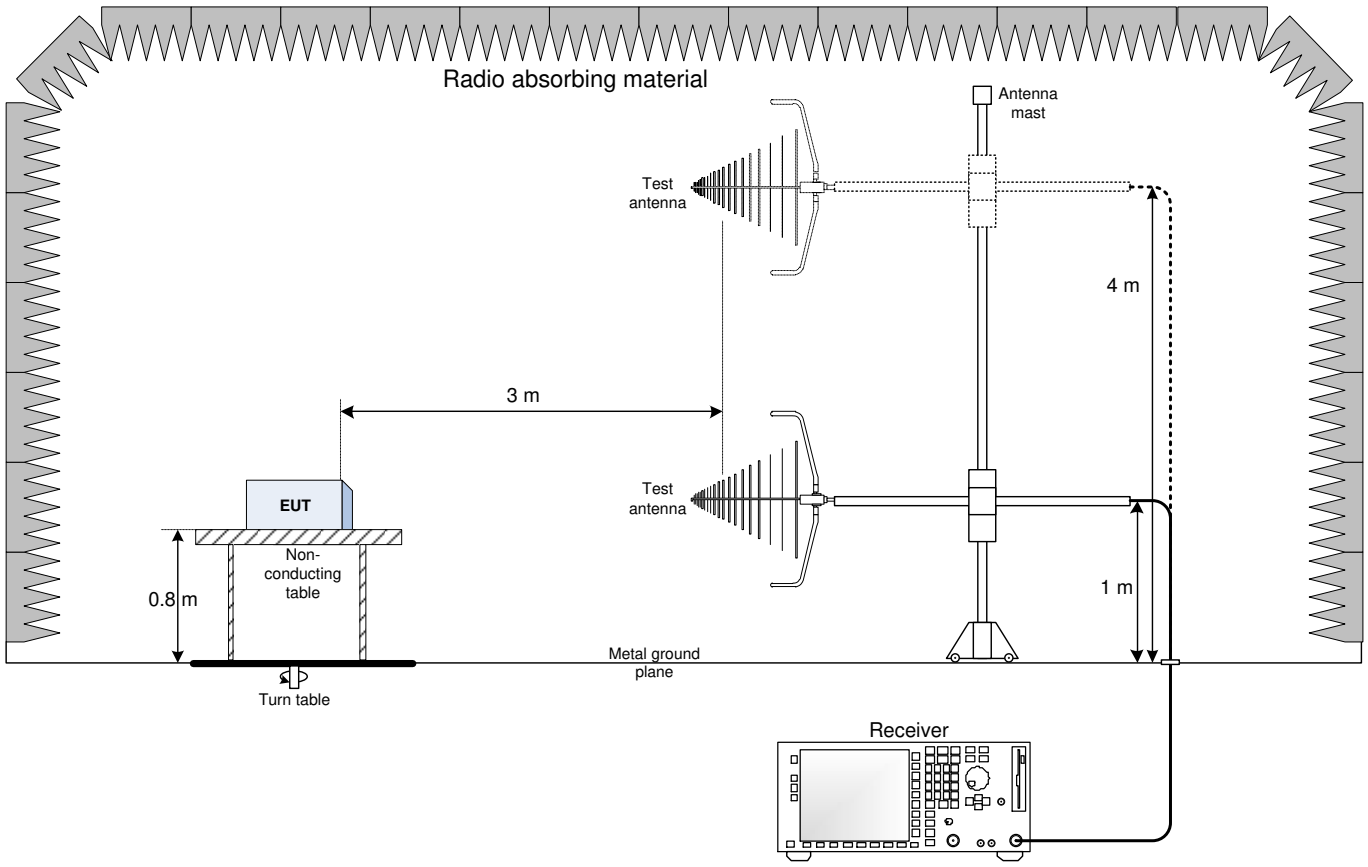
Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

Table 8.6-7: *Radiated Rx field strength measurement results above 1 GHz, high channel*

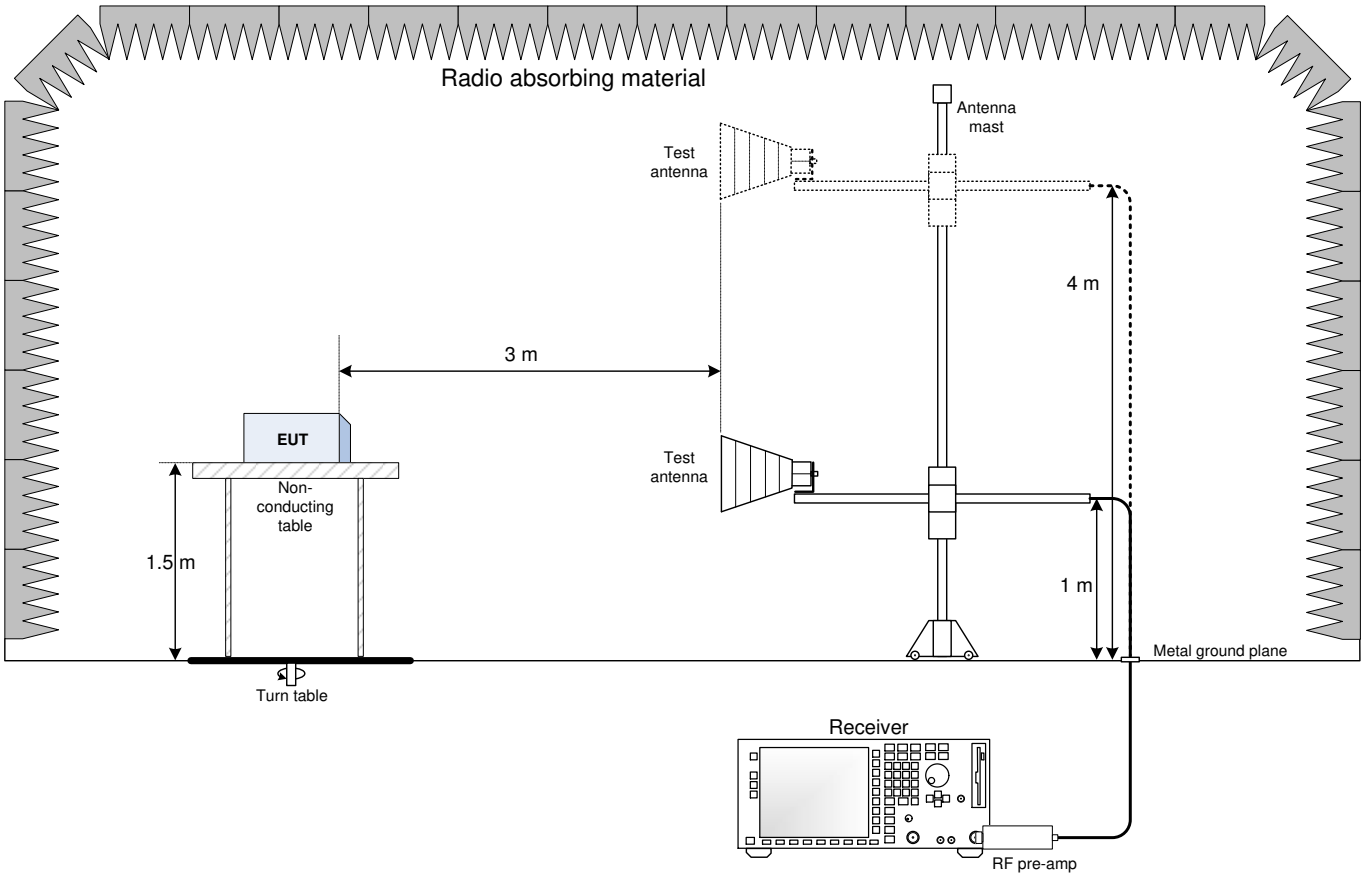
Frequency, GHz	Peak Field strength, dBµV/m	Peak Limit, dBµV/m	Peak Margin, dB	Average Field strength, dBµV/m	Average Limit, dBµV/m	Average Margin, dB
5.288	56.323	74.00	17.677	53.700	54.00	0.300
27.040	56.774	74.00	17.226	45.980	54.00	8.020
31.119	56.408	74.00	17.592	47.090	54.00	6.910
35.629	62.141	74.00	11.859	52.010	54.00	1.990
31.232	57.207	74.00	16.79	47.130	54.00	6.870
36.452	59.886	74.00	14.11	48.530	54.00	5.470

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 Conducted emissions set-up