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Wireless test report – 367596-12TRFWL

Applicant:

Topcon AG Turin

Via Nizza 262, Int. 25 – 10126 Torino (TO) – Italy

Product name:

General Purpose IoT device

Model:	FCC ID:	IC Registration number
CL-55 LTE VZW+RADIO	2ASVE-CL55	24901-CL55

Specifications:

- FCC 47 CFR Part 15 Subpart C, §15.209 and RSS-GEN Issue 5 §8.9
- FCC 47 CFR Part 15 Subpart C, §15.247 (d) and RSS 247 Issue 2 §5.5
- FCC 47 CFR Part 15 Subpart E, §15.407 (b) and RSS 247 Issue 2 §6.2
- FCC 47 CFR Part 27 Subpart C, §27.53 (c) and (h)

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Site number	FCC test site registration number: 682159 (10 m semi anechoic chamber) ISED test site number: 9109A

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 Spa's ISO/IEC 17025 accreditation.

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Date of issue: April 19, 2019

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Topcon AG Turin
Address	Via Nizza 262, Int. 25 – 10126 Torino (TO) – Italy

1.2 Test specifications

FCC 47 CFR Part 15 Subpart C, §15.209	Radiated emission limits; general requirements.
FCC 47 CFR Part 15 Subpart C, §15.247	Operation within the bands 902.2-927.8 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
FCC 47 CFR Part 15 Subpart E, §15.407	Unlicensed National Information Infrastructure Devices
FCC 47 CFR Part 27 Subpart C, §27.53	Emission limits.
RSS-GEN Issue 5 §8.9	Transmitter emission limits
RSS 247 Issue 2 §5.5	Unwanted emissions
RSS 247 Issue 2 §6.2	Unwanted emission limits

1.3 Test methods

ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.26 v2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.5 below. 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 quote, the purpose of this report is verification of transmitters colocation. Only inter-modulation products within restricted bands were assessed, other requirements were excluded from the scope of this report.

1.6 Test report revision history

Revision #	Date of issue	Details of changes made to test report
TRF	March 29, 2019	Original report issued

Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, and FCC Part 27 Subpart C test results

Part	Test description	Verdict
§15.209	Radiated emission limits; general requirements.	Pass
§15.247 (d)	Spurious emissions.	Pass
§15.407 (b)	Undesirable emission limits.	Pass
§27.53 (c)	Emission limit for operations in the 746-758 MHz band and the 776-788 MHz band	Pass
§27.53 (h)	Emission limit for for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands	Pass

2.2 RSS test results

Part	Test description	Verdict
RSS-GEN Issue 5 §8.9	Transmitter emission limits	Pass
RSS 247 Issue 2 §5.5	Unwanted emissions	Pass
RSS 247 Issue 2 §6.2	Unwanted emission limits	Pass

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	February 25, 2019
Nemko sample ID number	367596-2/3

3.2 EUT information

Product name	General Purpose IoT device
Model	CL-55 LTE VZW+RADIO
Serial number	1910036AA

3.3 Technical information

Frequency band	WIFI/ BT/BLE: 2400–2483.5 MHz band WIFI: 5150–5250 MHz, 5250–5350 MHz 5450–5725 and 5725–5850 MHz LTE: North American Bands UHF: 902.2 – 927.8 MHz
Type of modulation	GFSK, 802.11a/n, OFDM
Emission classification (F1D, G1D, D1D)	F1D, W7D
EUT power requirements	8 to 36 V DC
Antenna information	The EUT uses a unique antenna coupling. EUT has 2 antenna configurations. First configuration: 4 in 1 antenna Taoglas model MA245-LBIC.008 with 3.0 mt cable and half wave antenna ComAnt model CA915H_A. Second configuration: 4 in 1 antenna Taoglas model MA245-LBIC.008 with 0.4 m cable and half wave antenna ComAnt model CA915H_A.

3.4 EUT setup diagram

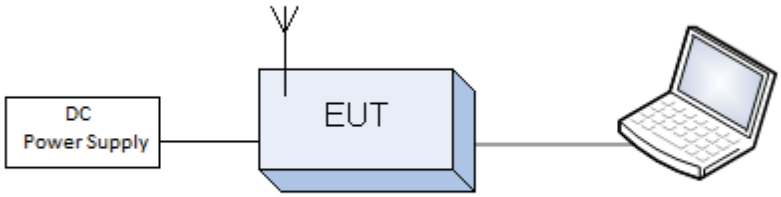


Figure 3.4-1: *Setup diagram*

3.5 EUT sub assemblies

Table 3.5-1: *EUT sub assemblies*

Description	Brand name	Model/Part number	Serial number
General Purpose IoT device	Topcon AG Turin	CL-55 LTE VZW+RADIO	1910036AA
4 in 1 antenna	Taoglas	MA245-LBIC.008	--
UHF antenna	ComAnt	CA915H_A	--

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	18–33 °C
Relative humidity	30–60 %
Air pressure	980–1060 mbar

Test equipment used for the monitoring of the environmental conditions

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Thermohygrometer data loggers	Testo	175-H2	20012380/305	2019-01	2021-01
Thermohygrometer data loggers	Testo	175-H2	38203337/703	2019-01	2021-01
Barometer	MSR	MSR145B	330080	2018-04	2019-04

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

EUT	Type	Test	Range and Setup features	Measurement Uncertainty	Notes
Transmitter	Conducted	Frequency error	0.001 MHz ÷ 40 GHz	0.08 ppm	(1)
		Carrier power RF Output Power	10 kHz ÷ 30 MHz	1.0 dB	(1)
			30 MHz ÷ 18 GHz	1.5 dB	(1)
			18 MHz ÷ 40 GHz	3.0 dB	(1)
		Adjacent channel power	1 MHz ÷ 18 GHz	1.6 dB	(1)
		Conducted spurious emissions	10 kHz ÷ 26 GHz	3.0 dB	(1)
			26 GHz ÷ 40 GHz	4.5 dB	(1)
		Intermodulation attenuation	1 MHz ÷ 18 GHz	2.2 dB	(1)
		Attack time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Attack time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Release time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Release time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Transient behaviour of the transmitter– Transient frequency behaviour	1 MHz ÷ 18 GHz	0.2 kHz	(1)
		Transient behaviour of the transmitter – Power level slope	1 MHz ÷ 18 GHz	9%	(1)
		Frequency deviation - Maximum permissible frequency deviation	0.001 MHz ÷ 18 GHz	1.3%	(1)
		Frequency deviation - Response of the transmitter to modulation frequencies above 3 kHz	0.001 MHz ÷ 18 GHz	0.5 dB	(1)
		Dwell time	-	3%	(1)
		Hopping Frequency Separation	0.01 MHz ÷ 18 GHz	1%	(1)
		Occupied Channel Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)
		Modulation Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)
	Radiated	Radiated spurious emissions	10 kHz ÷ 26.5 GHz	6.0 dB	(1)
			26.5 GHz ÷ 40 GHz	8.0 dB	(1)
		Effective radiated power transmitter	10 kHz ÷ 26.5 GHz	6.0 dB	(1)
			26,5 GHz ÷ 40 GHz	8.0 dB	(1)
Receiver	Radiated	Radiated spurious emissions	10 kHz ÷ 26.5 GHz	6.0 dB	(1)
			26.5 GHz ÷ 40 GHz	8.0 dB	(1)
		Sensitivity measurement	1 MHz ÷ 18 GHz	6.0 dB	(1)
	Conducted	Conducted spurious emissions	10 kHz ÷ 26 GHz	3.0 dB	(1)
			26 GHz ÷ 40 GHz	4.5 dB	(1)

(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2 which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI receiver (20 Hz ÷ 8 GHz)	R&S	ESU8	100202	2019-01	2020-01
EMI receiver (20 Hz ÷ 8 GHz)	R&S	ESW44	101620	2018-05	2019-05
Trilog Broadband Antenna	Schwarzbeck	VULB 9162	9162-025	2018-07	2021-07
Bilog antenna (1 ÷ 18 GHz)	Schwarzbeck	STLP 9148	9148-123	2018-07	2021-07
Horn antenna (4 ÷ 40 GHz)	RFSpin	DRH40	061106A40	2017-02	2020-02
Preamplifier (1 ÷ 18 GHz)	Schwarzbeck	BBV9718	9718-137	2018-08	2019-08
Preamplifier (18 ÷ 40 GHz)	Miteq	JS44-18004000-35-8P-R	1.627	2018-08	2019-08
Antenna mast	R&S	HCM	836 529/05	NCR	NCR
Controller	R&S	HCC	836 620/7	NCR	NCR
Turning-table	R&S	HCT	835 803/03	NCR	NCR
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	2018-09	2021-09
Shielded room	Siemens	10m control room	1947	NCR	NCR

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

Section 8. Testing data

8.1 Radiated emission

Definitions and limits

FCC § 15.209 (f)
In accordance with §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in §15.109 that are applicable to the incorporated digital device.

FCC §15.247 (d)
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

FCC §15.407 (b)
Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(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 e.i.r.p. of −27 dBm/MHz.
(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 e.i.r.p. of −27 dBm/MHz.
(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(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.
(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.

FCC §27.53 (c)
For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:
(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;
(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;
(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;
(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;
(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;
(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

FCC §27.53 (h)
AWS emission limits—(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.
(2) Additional protection levels. Notwithstanding the foregoing paragraph (h)(1) of this section:
(i) Operations in the 2180-2200 MHz band are subject to the out-of-band emission requirements set forth in §27.1134 for the protection of federal government operations operating in the 2200-2290 MHz band.
(ii) For operations in the 2000-2020 MHz band, the power of any emissions below 2000 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.
(iii) For operations in the 1915-1920 MHz band, the power of any emission between 1930-1995 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.
(iv) For operations in the 1995-2000 MHz band, the power of any emission between 2005-2020 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.
(3) Measurement procedure. (i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
(iii) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.
(4) Private agreements. (i) For AWS operations in the 2000-2020 MHz and 2180-2200 MHz bands, to the extent a licensee establishes unified operations across the AWS blocks, that licensee may choose not to observe the emission limit specified in paragraph (h)(1), above, strictly between its adjacent block licenses in a geographic area, so long as it complies with other Commission rules and is not adversely affecting the operations of other parties by virtue of exceeding the emission limit.
(ii) For AWS operations in the 2000-2020 MHz band, a licensee may enter into private agreements with all licensees operating between 1995 and 2000 MHz to allow the 70 + 10 log10(P) dB limit to be exceeded within the 1995-2000 MHz band.
(iii) An AWS licensee who is a party to a private agreement described in this section (4) must maintain a copy of the agreement in its station files and disclose it, upon request, to prospective AWS assignees, transferees, or spectrum lessees and to the Commission.

RSS 247 Issue 2 §5.5
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

RSS 247 Issue 2 §6.2
For transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth (i.e. 99% bandwidth), above 5250 MHz. The 26 dB bandwidth may fall into the 5250-5350 MHz band; however, if the occupied bandwidth also falls within the 5250-5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5250-5350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5250-5350 MHz band.
Devices shall comply with the following:
a. All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p.;or
b. 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 withinthe band 5150-5250 MHz. The device, except devices installed in vehicles, shallbe labelled or include in the user manual the following text "for indoor useonly."
Emissions outside the band 5470-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p. However, devices with bandwidth overlapping the band edge of 5725 MHz can meet the emission limit of -27 dBm/MHz e.i.r.p.at 5850 MHz instead of 5725 MHz.
Devices operating in the band 5725-5850 MHz with antenna gain greater than 10 dBi can have unwanted emissions that comply with either the limits in this section or in section 5.5 until six (6) months after the publication date of this standard for certification. Certified devices that do not comply with emission limits in this section shall not be manufactured, imported, distributed, leased, offered for sale or sold after April 1, 2018.
Devices operating in the band 5725-5850 MHz with antenna gain of 10 dBi or less can have unwanted emissions that comply with either the limits in this section or in section 5.5 until April 1, 2018 for certification. Certified devices that do not comply with emission limits in this section shall not be manufactured, imported, distributed, leased, offered for sale or sold after April 1, 2020.
Devices operating in the band 5725-5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:
a.27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 Bm/MHz at 5 MHz above or below the band edges;
b.15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearlyto 10 dBm/MHz at 25 MHz above or below the band edges;
c.10 dBm/MHz at 25 MHz above or below the band edges decreasing linearlyto -27 dBm/MHz at 75 MHz above or below the band edges; and
d.-27 dBm/MHz at frequencies more than 75 MHz above or below the bandedges.

Table 8.1-1: *FCC §15.209 and RSS-GEN – Radiated emission limits*

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

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

Table 8.1-2: *FCC restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

Table 8.1-3: *ISED restricted frequency bands*

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

Note: Certain frequency bands listed in Table 8.1-3 and above 38.6 GHz are designated for low-power licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in this Standard

Test summary

Test start date	March 21, 2019
Test engineer	P. Barbieri

Observations, settings and special notes

The spectrum was searched from 30 MHz to 40 GHz.
EUT's LTE and WIFI transmitters were set to transmit continuously, different channel setting has been investigated as per provided by client's setup
Radiated measurements were performed at a distance of 3 m.

Spectrum analyzer settings for frequencies below 1000 MHz:

Detector mode	Quasi-Peak
Resolution bandwidth	120 kHz
Trace mode	Max Hold
Measurement time	100 ms

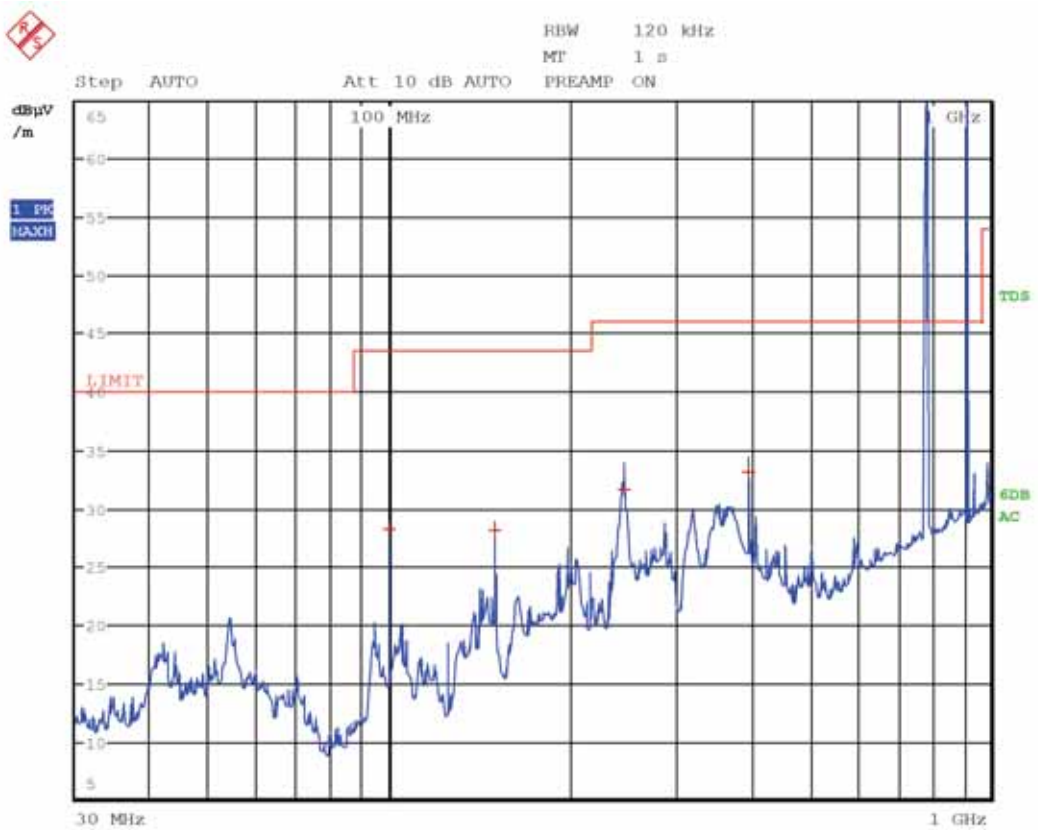
Spectrum analyser settings for peak radiated measurements within restricted bands above 1 GHz:

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

Spectrum analyser settings for average radiated measurements within restricted bands above 1 GHz:

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

8.1.4 Test data

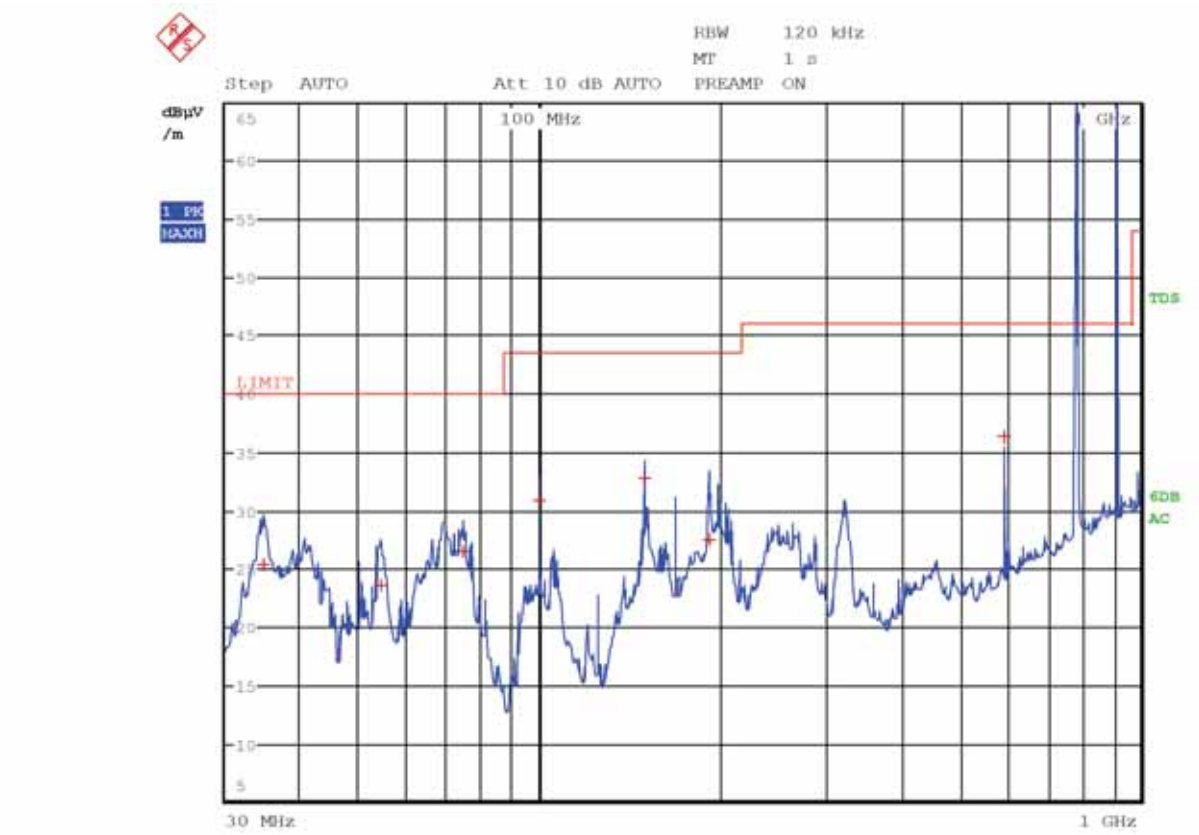


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
99.9900	28.2	43.5	-15.3	QP
150.0000	28.1	43.5	-15.4	QP
245.9400	31.7	46.0	-14.3	QP
245.9700	31.7	46.0	-14.3	QP
396.0000	33.3	46.0	-12.7	QP
782.0000	113.1	--	--	PK
915.0000	116.9	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued

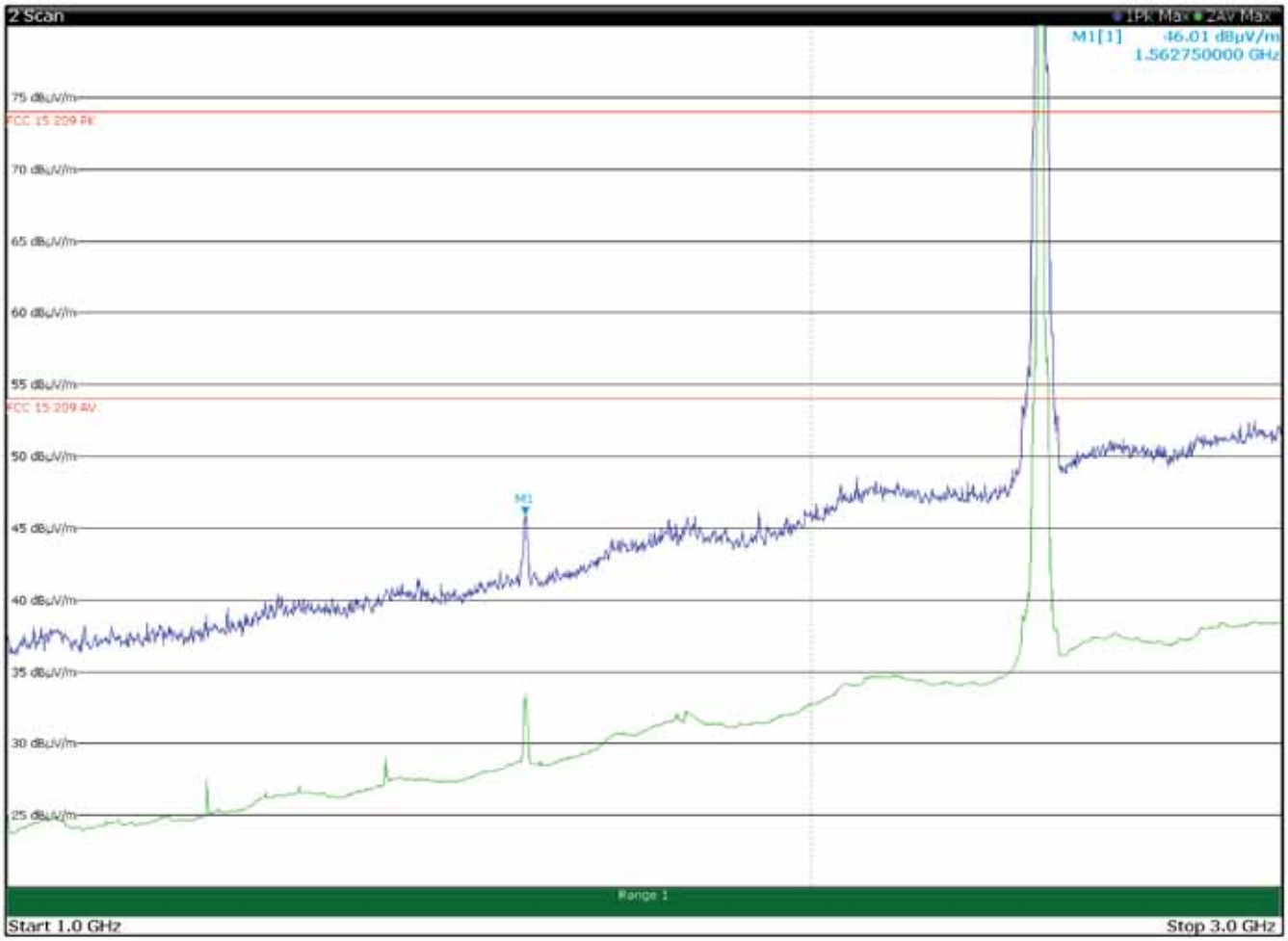


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
34.6800	25.4	40.0	-14.6	QP
54.4800	23.7	40.0	-16.3	QP
74.5500	26.5	40.0	-13.5	QP
99.9900	31.0	43.5	-12.5	QP
150.0000	32.8	43.5	-10.7	QP
191.1600	27.5	43.5	-16.0	QP
594.0000	36.3	46.0	-9.7	QP
782.0000	109.7	--	--	PK
915.0000	127.8	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued



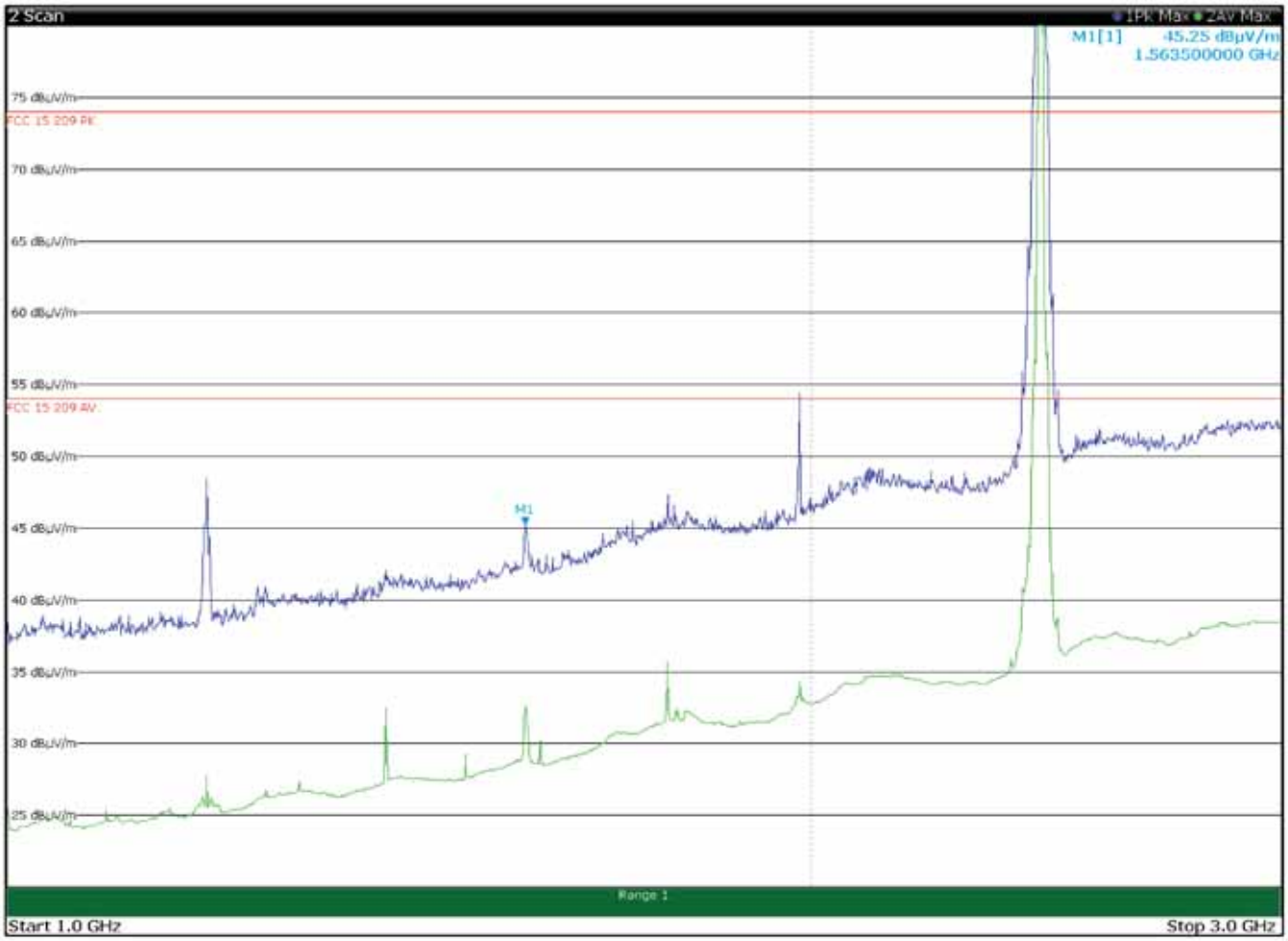
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1564.0000	46.9	82.2	-35.3	Pk
2437.0000	112.8	--	--	Pk

Limit exceeded by the carriers

The limit for FCC 27.53 is -13 dBm. Limit (dBµV/m) = limit (dBm) + 95.23 = 82.2 dBµV/m

8.1.4 Test data, continued



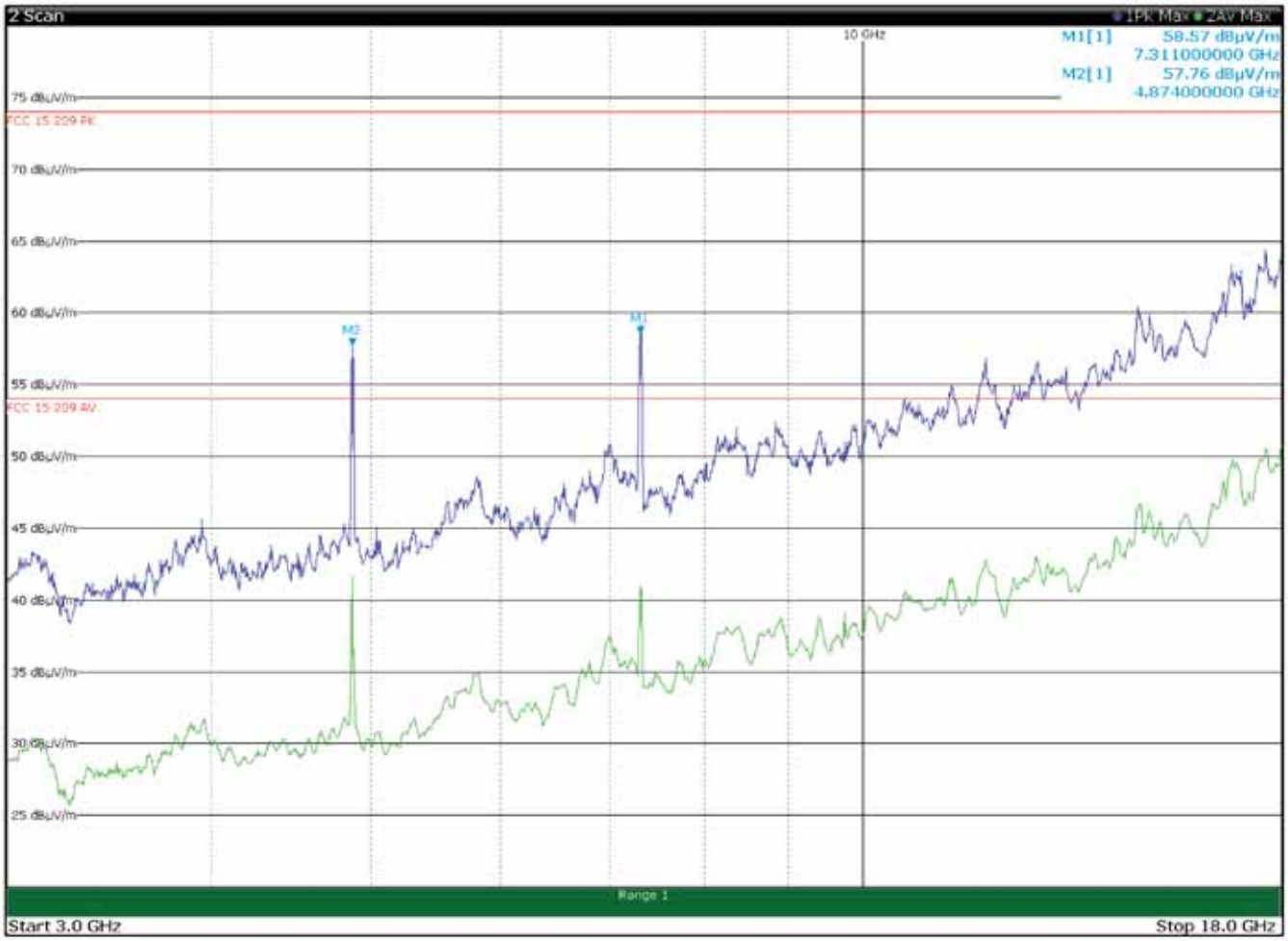
Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1188.0000	48.5	74.0	-25.5	Pk
1564.0000	45.3	82.2	-36.9	Pk
1980.0000	54.4	74.0	-19.6	Pk
2437.0000	105.4	--	--	Pk

Limit exceeded by the carriers

The limit for FCC 27.53 is -13 dBm. Limit (dBµV/m) = limit (dBm) + 95.23 = 82.2 dBµV/m

8.1.4 Test data, continued

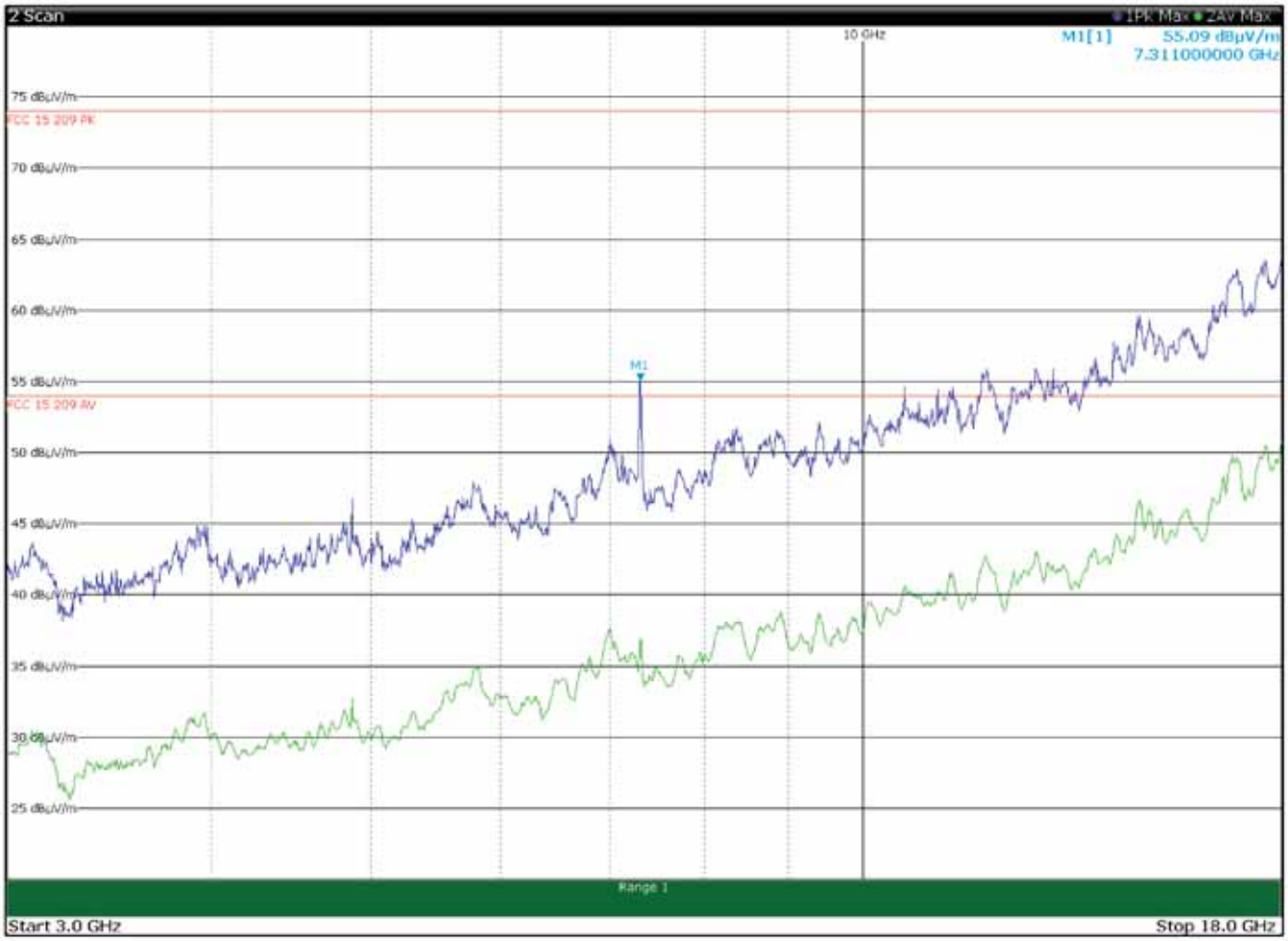


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
4874.0000	57.8	74.0	-16.2	Pk
4874.0000	49.4	54.0	-4.6	Av
7311.0000	58.6	74.0	-15.4	Pk
7311.0000	50.2	54.0	-3.8	Av

The correction factor for the average value of pulsed emissions is 20 log (DC) = 20 log (0.38) = 8.4 dB

8.1.4 Test data, continued

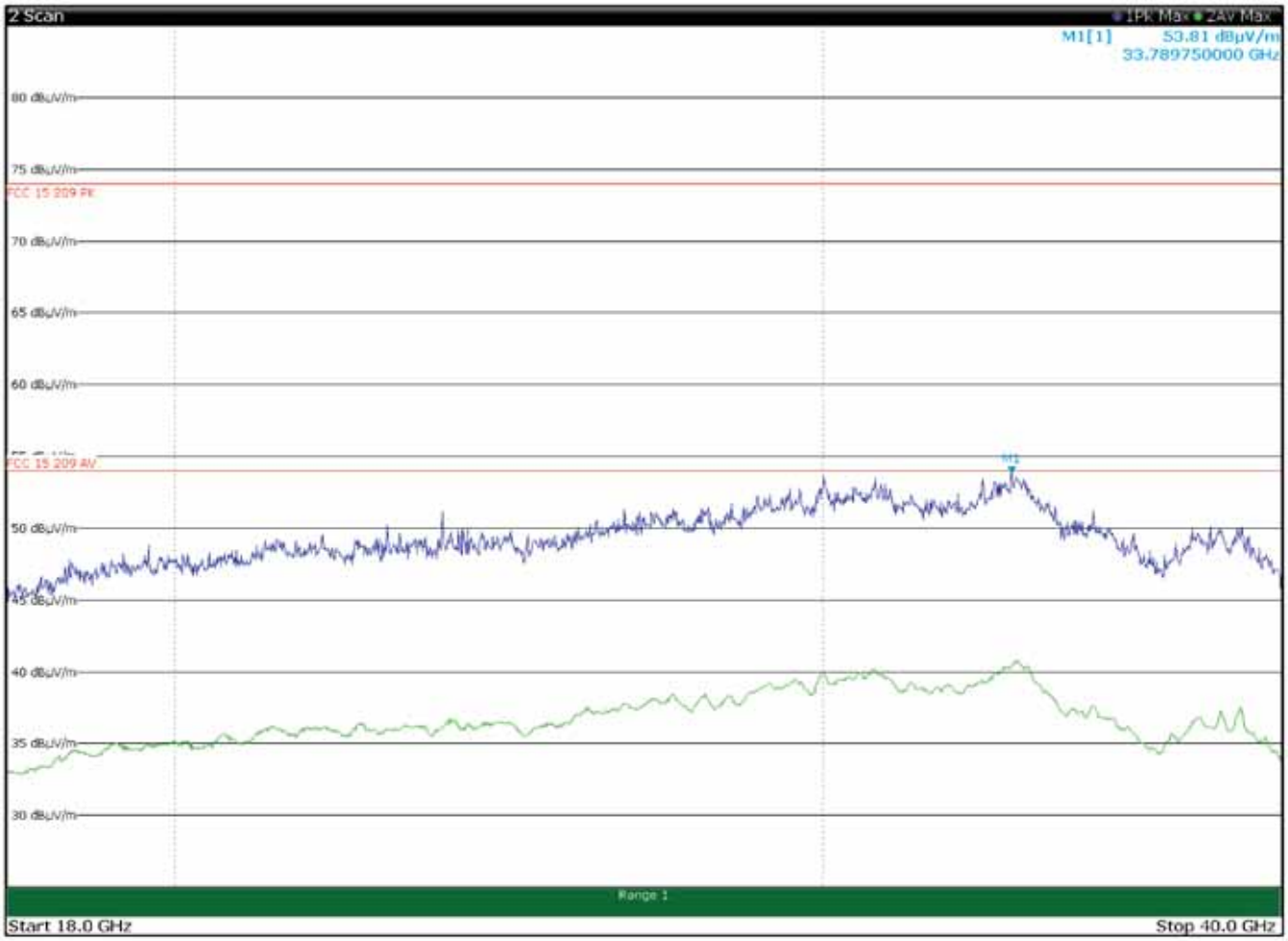


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
4874.0000	47.2	74.0	-26.8	Pk
4874.0000	38.8	54.0	-15.2	Av
7311.0000	55.1	74.0	-18.9	Pk
7311.0000	46.7	54.0	-7.3	Av

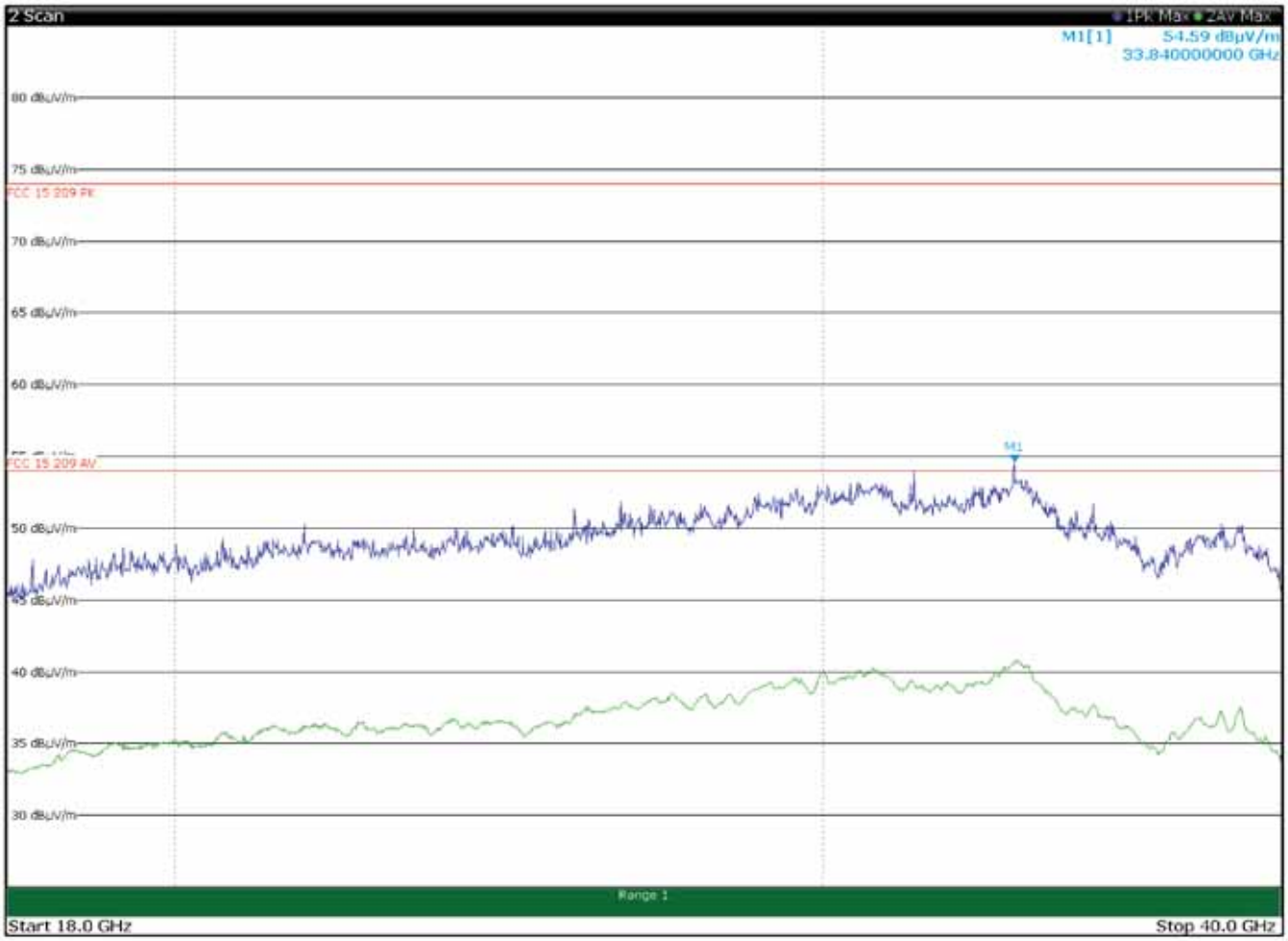
The correction factor for the average value of pulsed emissions is 20 log (DC) = 20 log (0.38) = 8.4 dB

8.1.4 Test data, continued



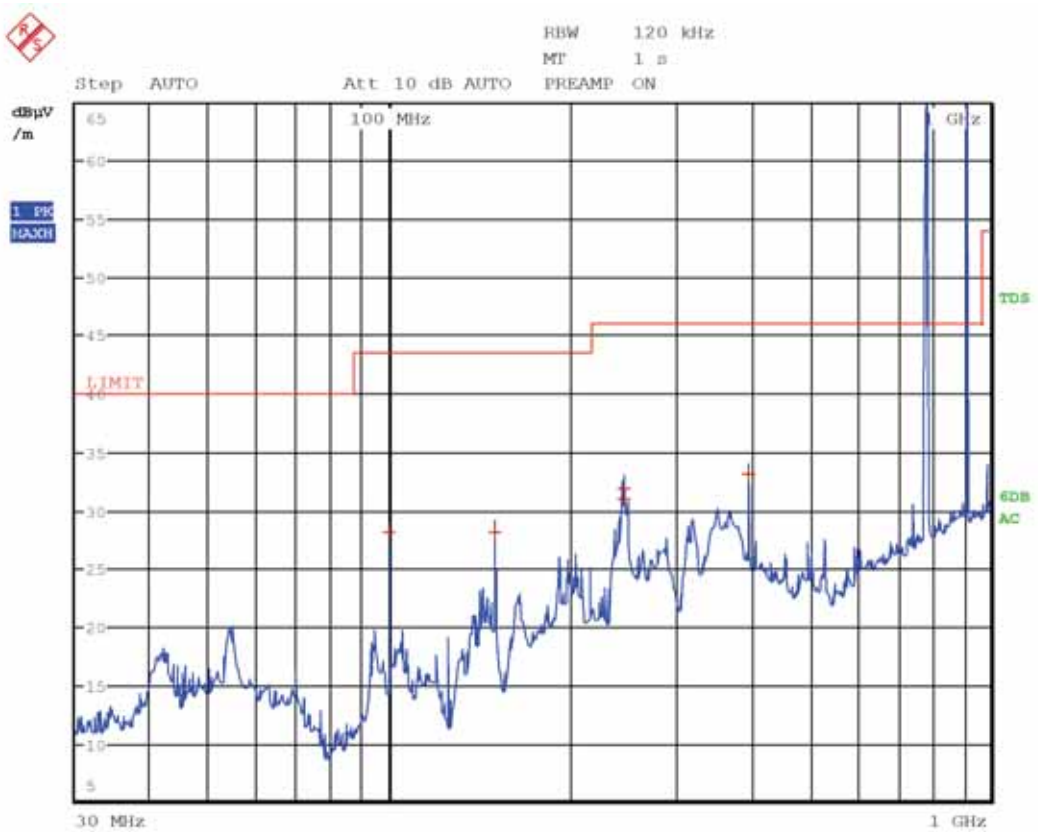
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

8.1.4 Test data, continued



Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

8.1.4 Test data, continued

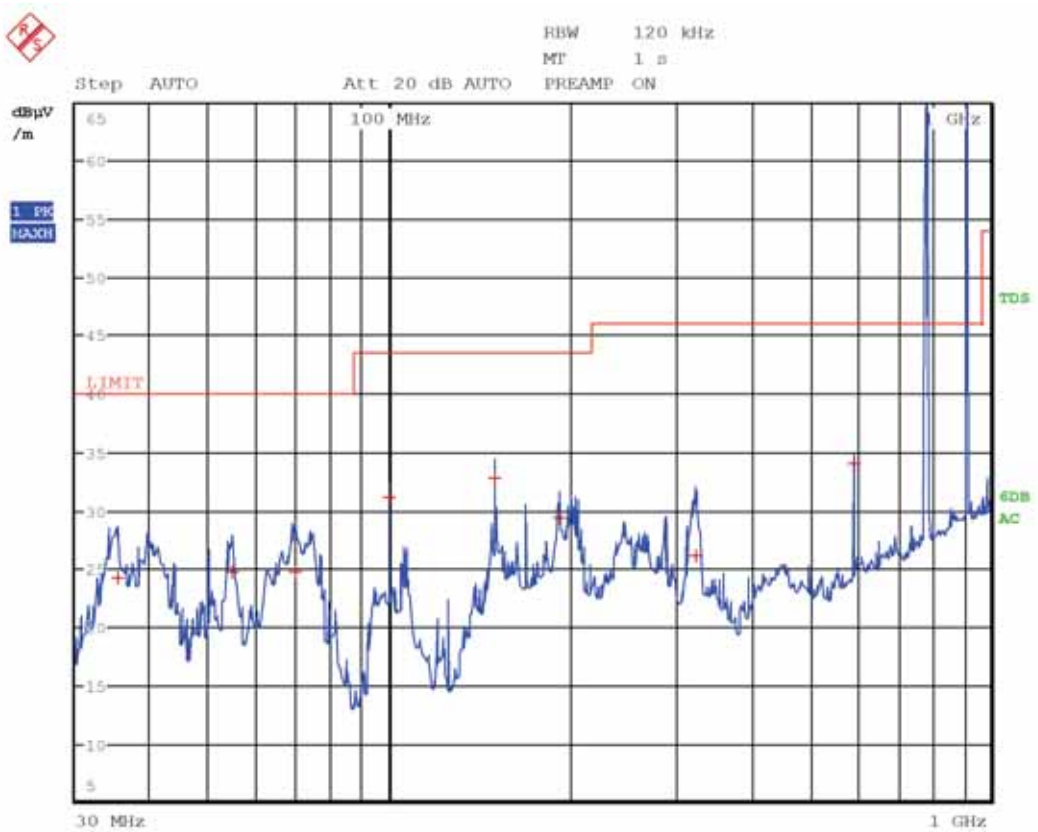


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
99.9900	28.2	43.5	-15.3	QP
150.0000	28.1	43.5	-15.4	QP
245.9400	31.9	46.0	-14.1	QP
245.9700	31.1	46.0	-14.9	QP
396.0000	33.2	46.0	-12.8	QP
782.0000	113.4	--	--	PK
915.0000	116.8	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued

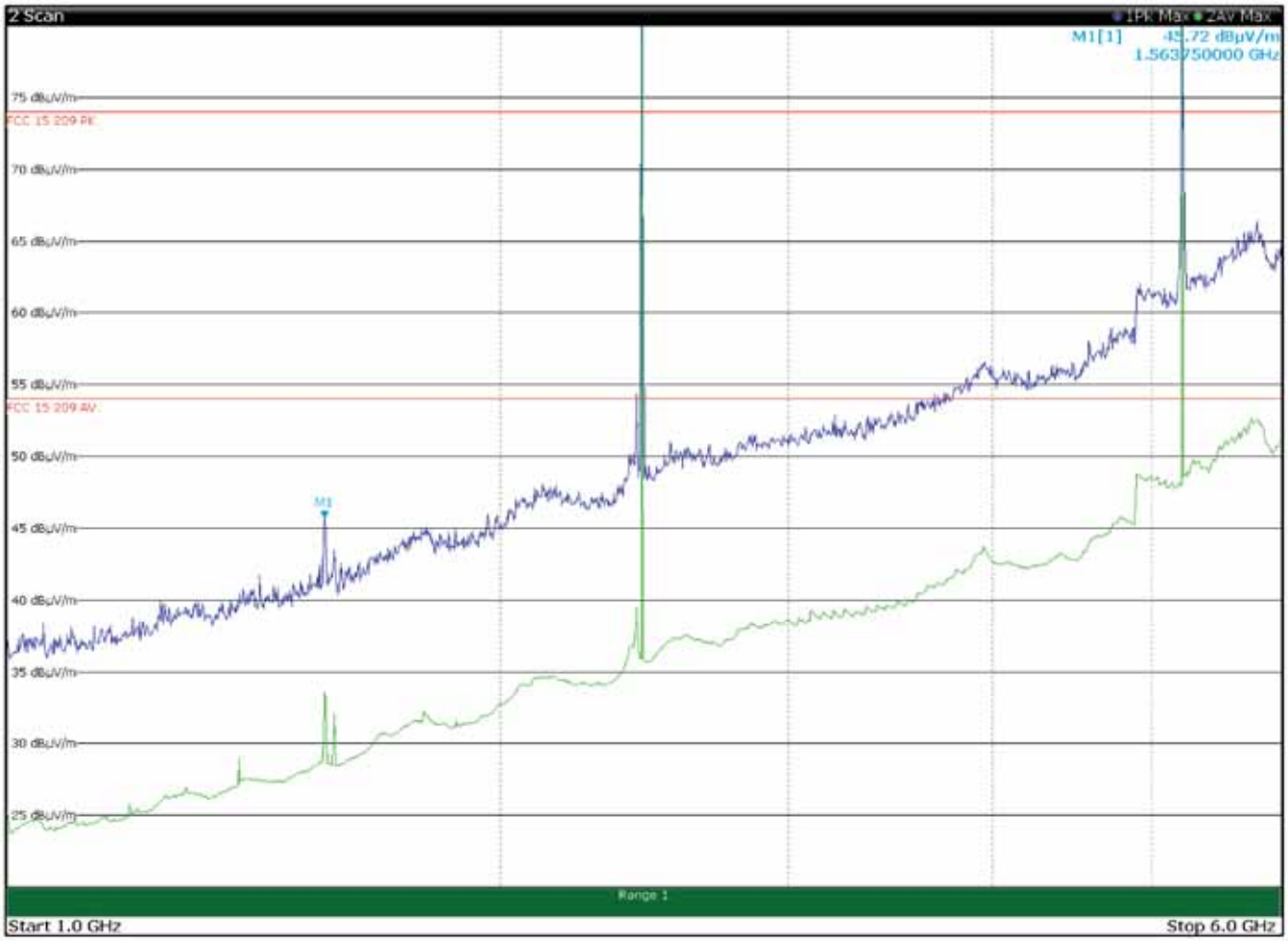


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
35.3400	24.3	40.0	-15.7	QP
54.6600	24.8	40.0	-15.2	QP
69.6900	24.7	40.0	-15.3	QP
99.9900	31.2	43.5	-12.3	QP
150.0000	32.9	43.5	-10.6	QP
192.0600	29.5	43.5	-14.0	QP
323.1000	26.1	46.0	-19.9	QP
594.0000	34.1	46.0	-11.9	QP
782.0000	109.8	--	--	PK
915.0000	127.6	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued



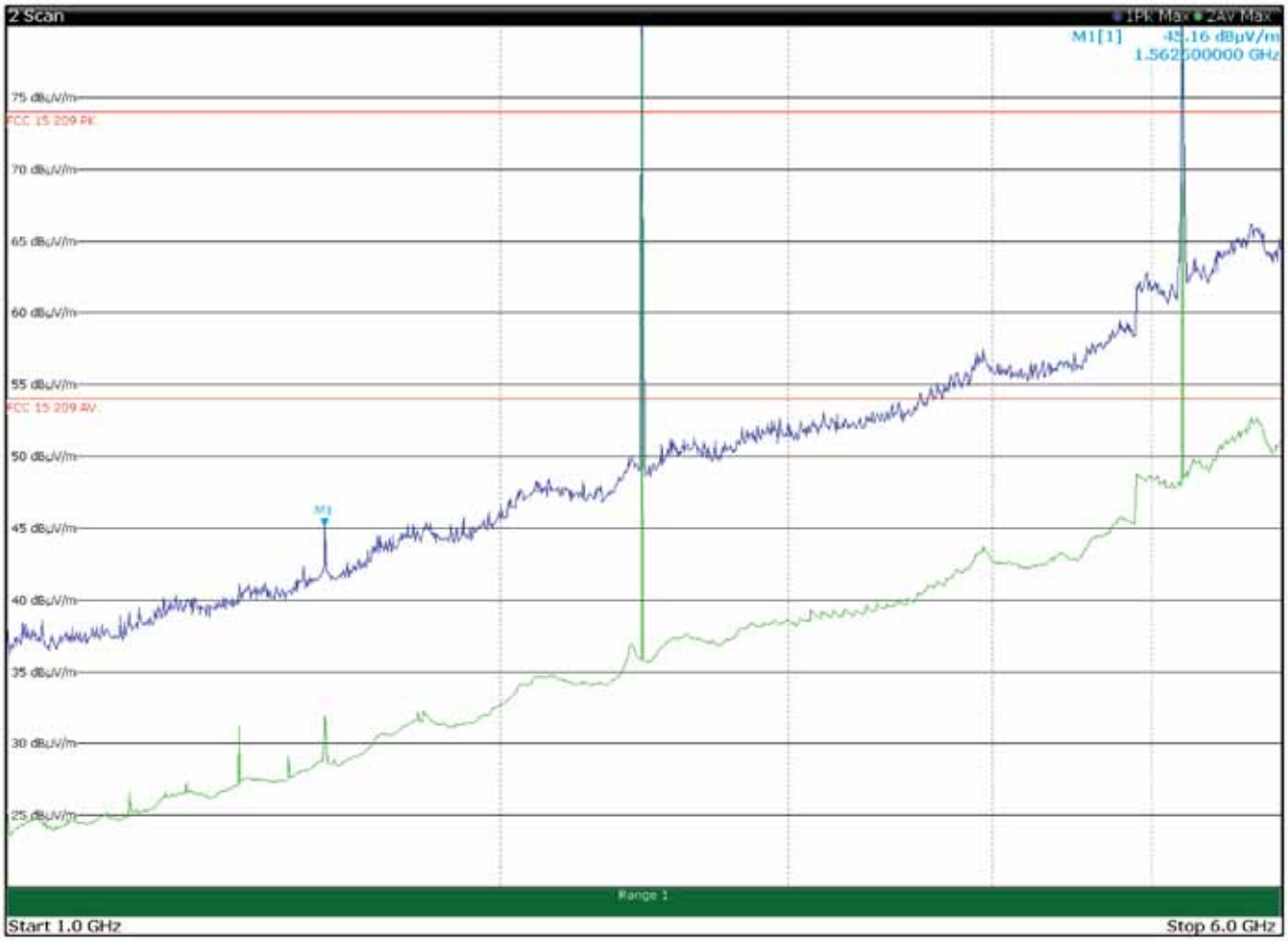
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1564.0000	45.8	82.2	-36.4	Pk
2441.0000	98.1	--	--	Pk
5220.0000	116.2	--	--	Pk

Limit exceeded by the carriers

The limit for FCC 27.53 is -13 dBm. Limit (dBµV/m) = limit (dBm) + 95.23 = 82.2 dBµV/m

8.1.4 Test data, continued



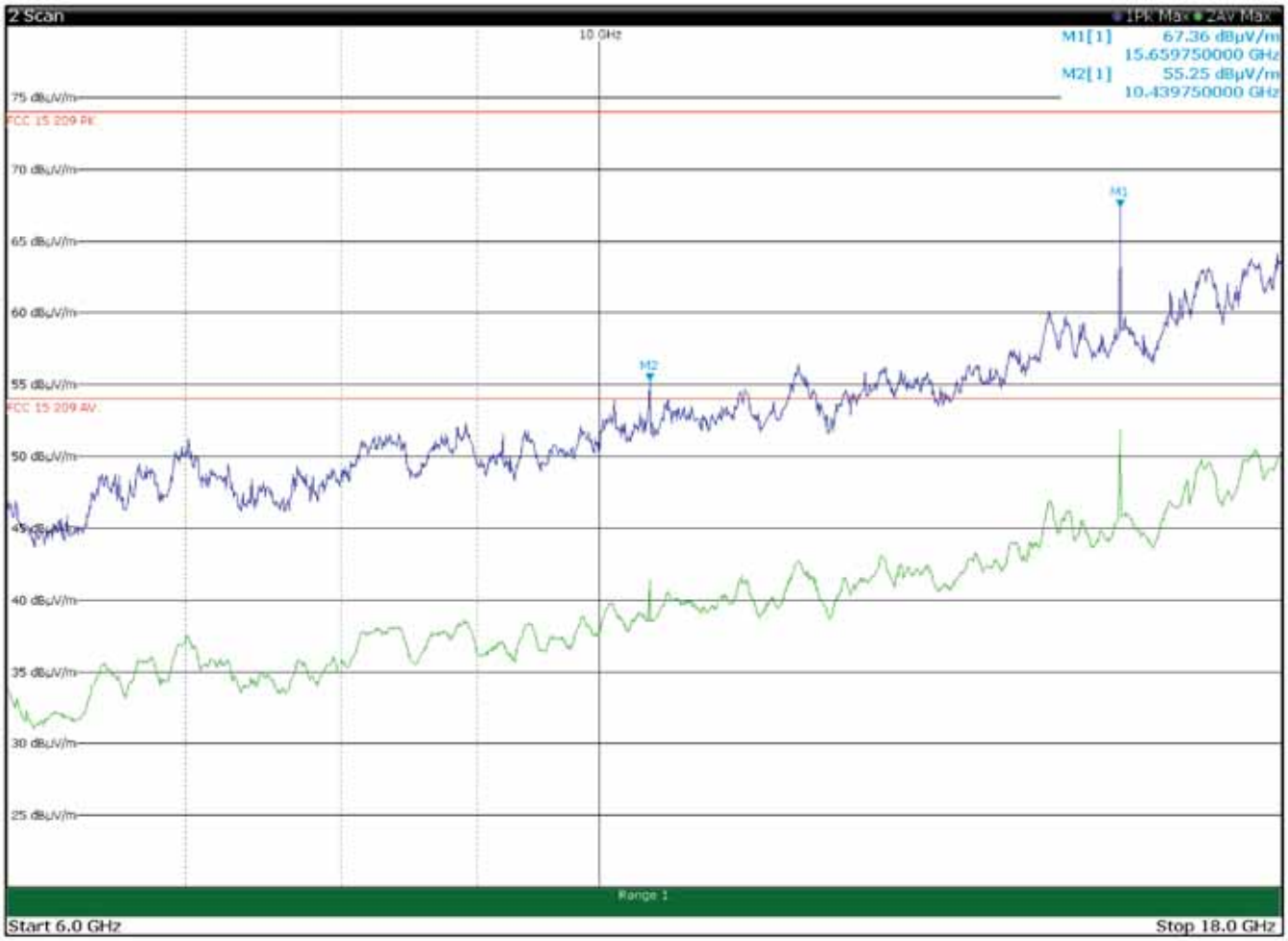
Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1564.0000	46.5	82.2	-35.7	Pk
2441.0000	89.5	--	--	Pk
5220.0000	105.6	--	--	Pk

Limit exceeded by the carriers

The limit for FCC 27.53 is -13 dBm. Limit (dBµV/m) = limit (dBm) + 95.23 = 82.2 dBµV/m

8.1.4 Test data, continued



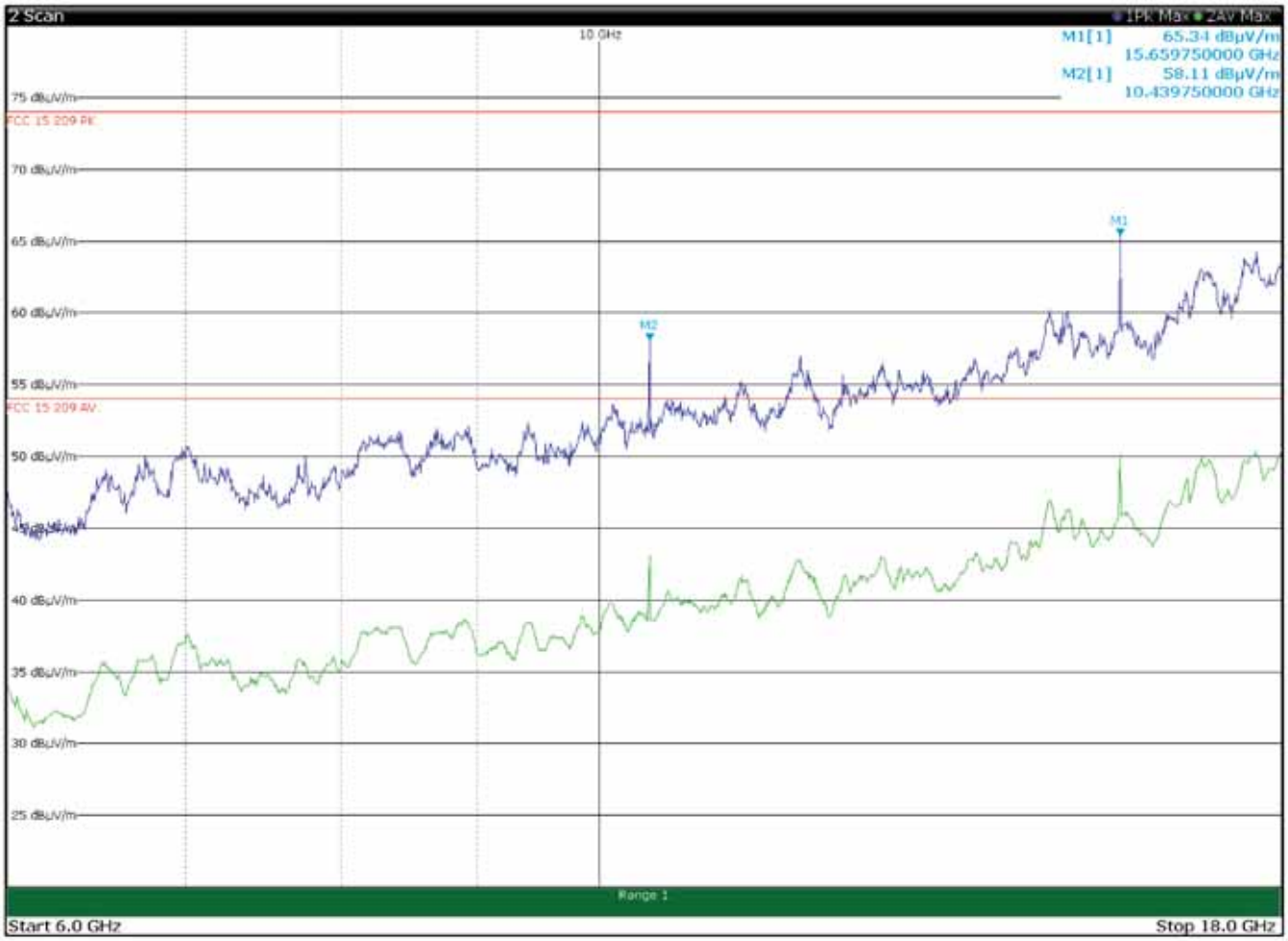
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
10439.7500	55.3	68.2	-12.9	Pk
15439.7500	67.4	74.0	-6.6	Pk
15439.7500	52.5	54.0	-1.5	Av

The limit for FCC 15.407 is -27 dBm. Limit (dBµV/m) = limit (dBm) + 95.23 = 68.2 dBµV/m

The correction factor for the average value of pulsed emissions is 20 log (DC) = 20 log (0.18) = 14.9 dB

8.1.4 Test data, continued



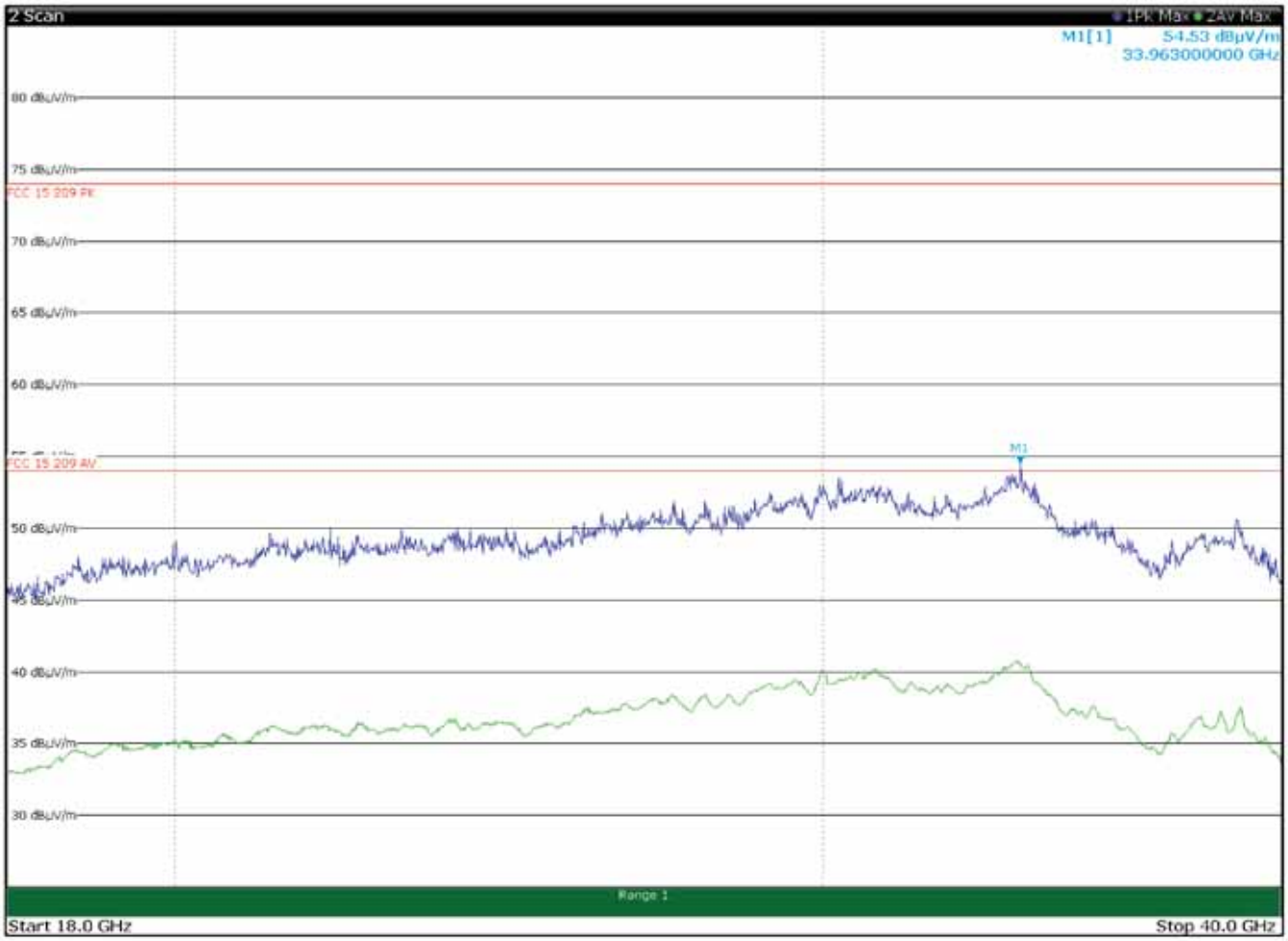
Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
10439.7500	58.2	68.2	-10.0	Pk
15659.7500	65.4	74.0	-8.6	Pk
15659.7500	50.5	54.0	-3.5	Av

The limit for FCC 15.407 is -27 dBm. Limit (dBµV/m) = limit (dBm) + 95.23 = 68.2 dBµV/m

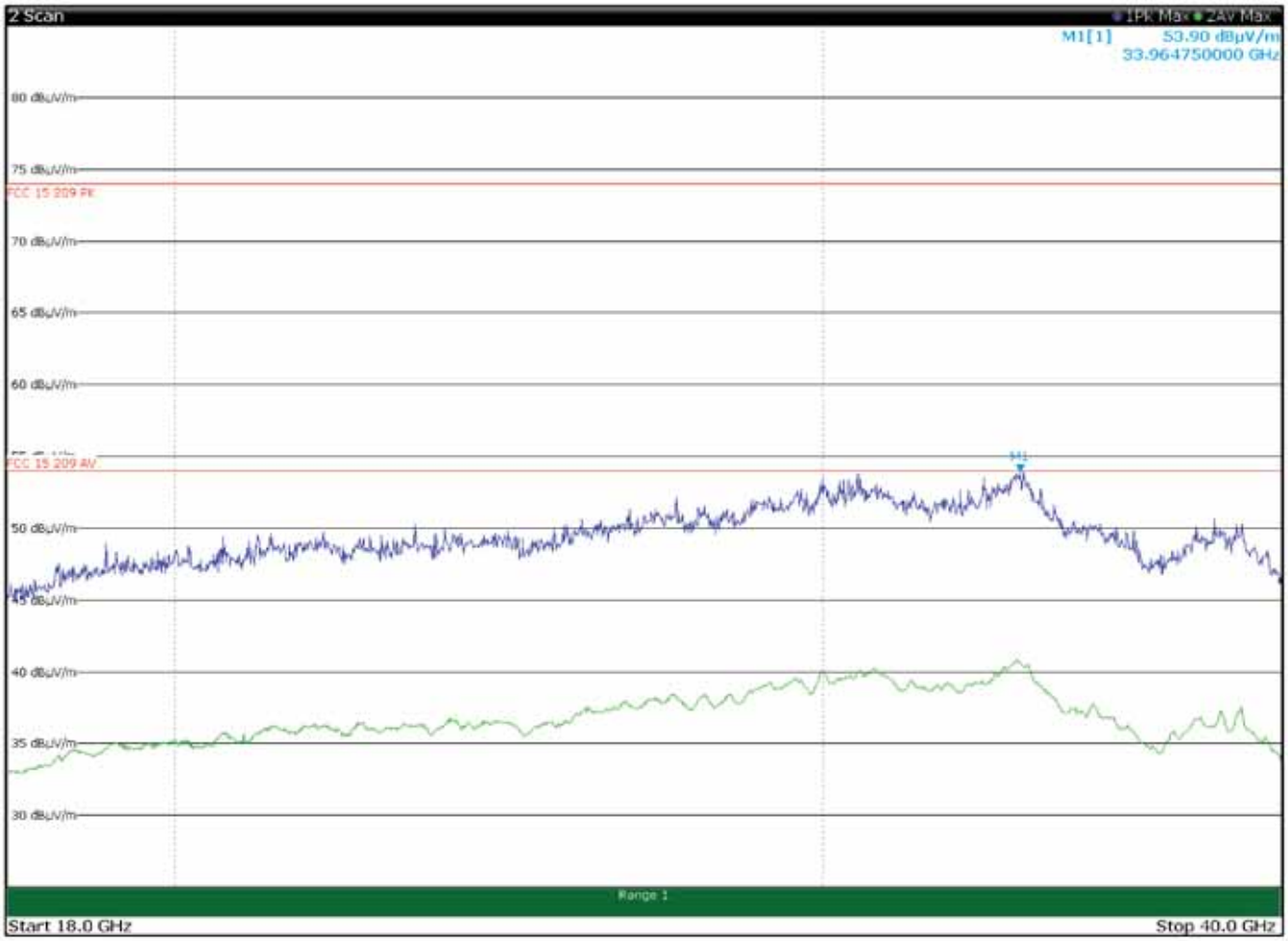
The correction factor for the average value of pulsed emissions is 20 log (DC) = 20 log (0.18) = 14.9 dB

8.1.4 Test data, continued



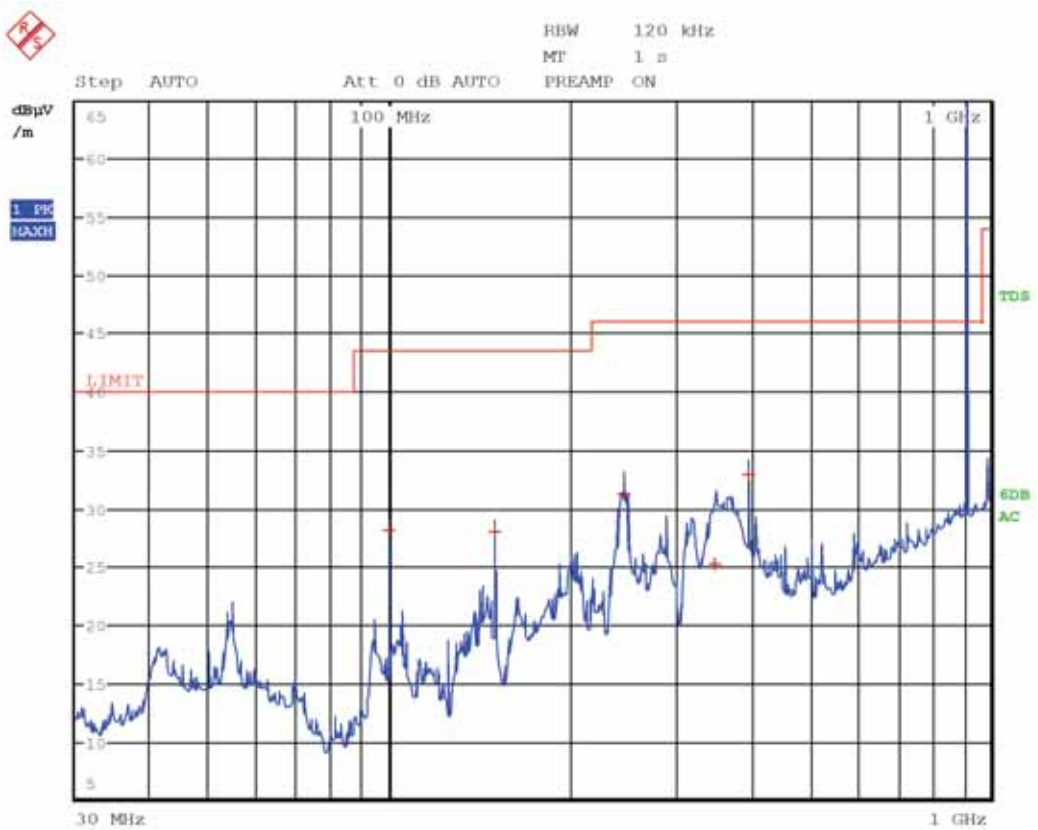
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

8.1.4 Test data, continued



Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

8.1.4 Test data, continued

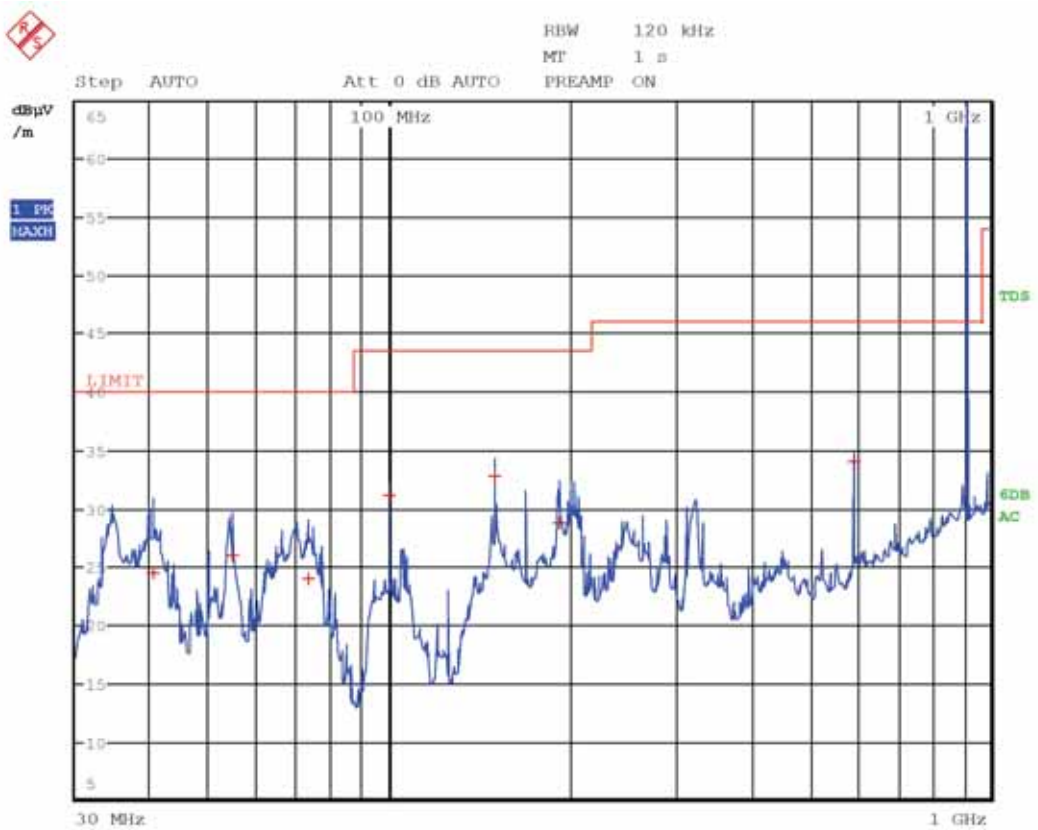


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
99.9900	28.1	43.5	-15.4	QP
150.0000	28.0	43.5	-15.5	QP
245.5800	31.3	46.0	-14.7	QP
348.7800	25.3	46.0	-20.7	QP
396.0000	33.0	46.0	-13.0	QP
915.0000	116.5	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued

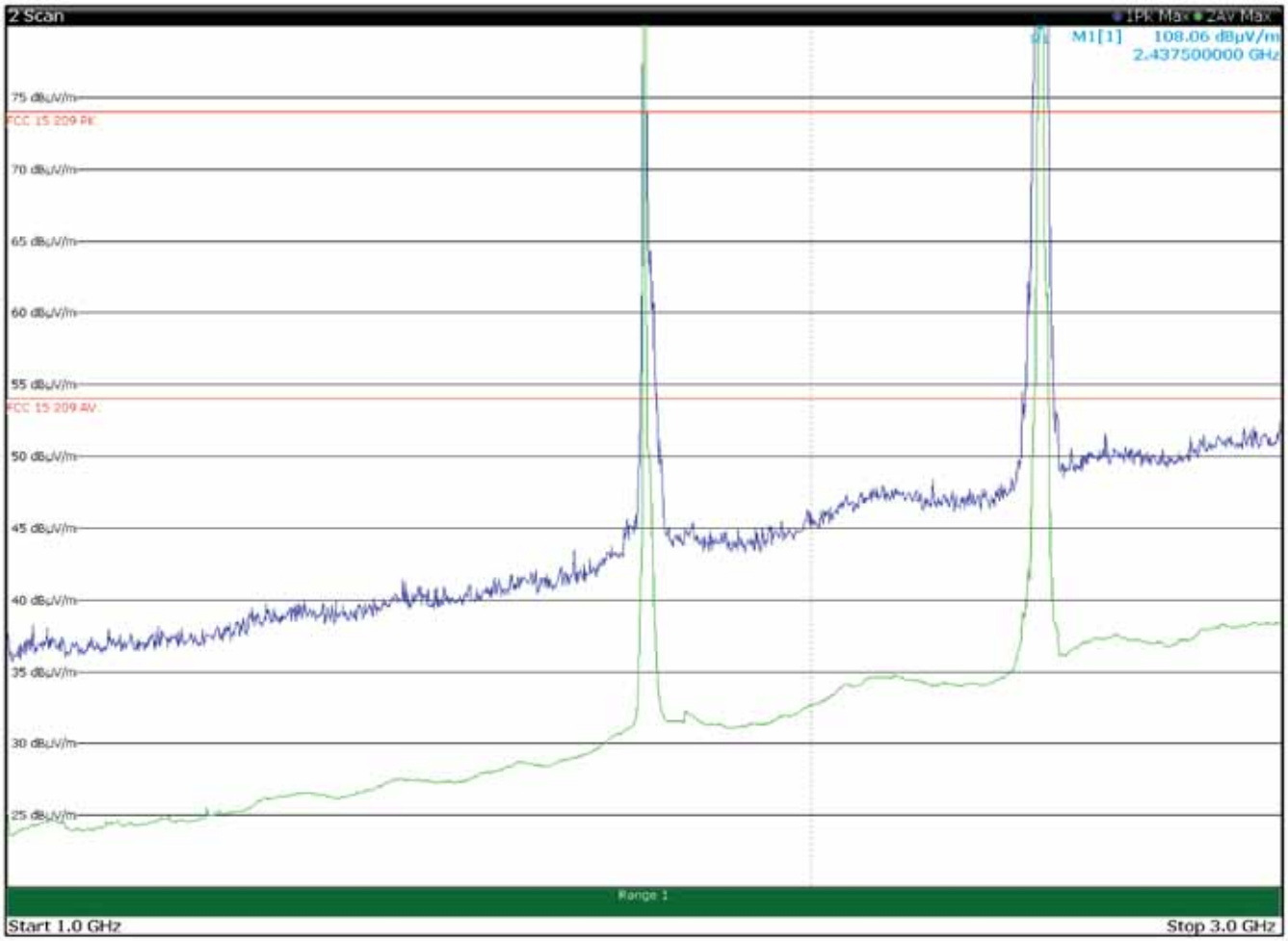


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
40.3500	24.5	40.0	-15.5	QP
54.6600	26.1	40.0	-13.9	QP
73.1400	24.0	40.0	-16.0	QP
99.9900	31.2	43.5	-12.3	QP
150.0000	32.8	43.5	-10.7	QP
192.0300	28.7	43.5	-14.8	QP
594.0000	34.1	46.0	-11.9	QP
915.0000	127.5	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued

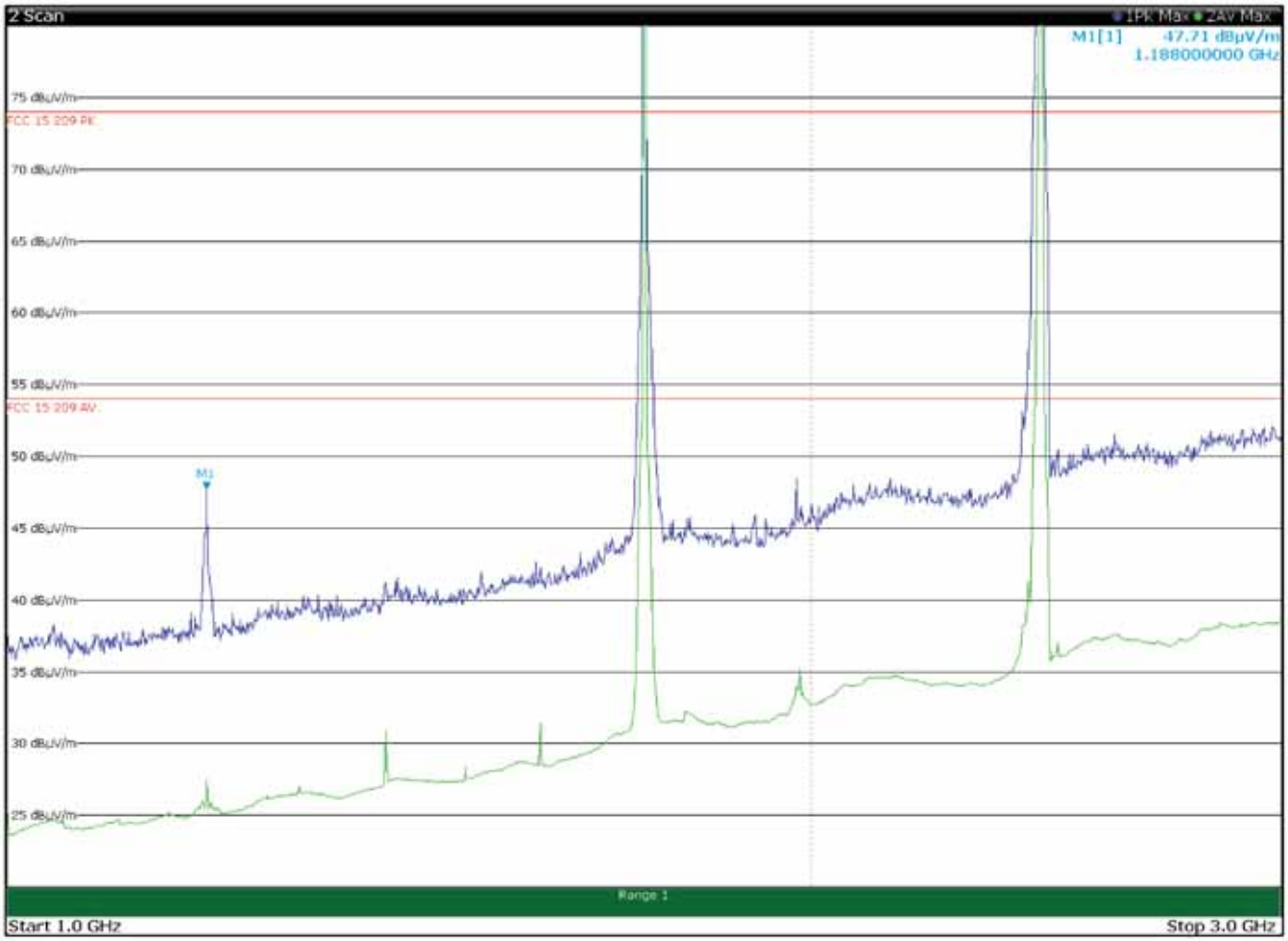


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1732.5000	110.2	--	--	Pk
2437.0000	112.8	--	--	Pk

Limit exceeded by the carriers

8.1.4 Test data, continued

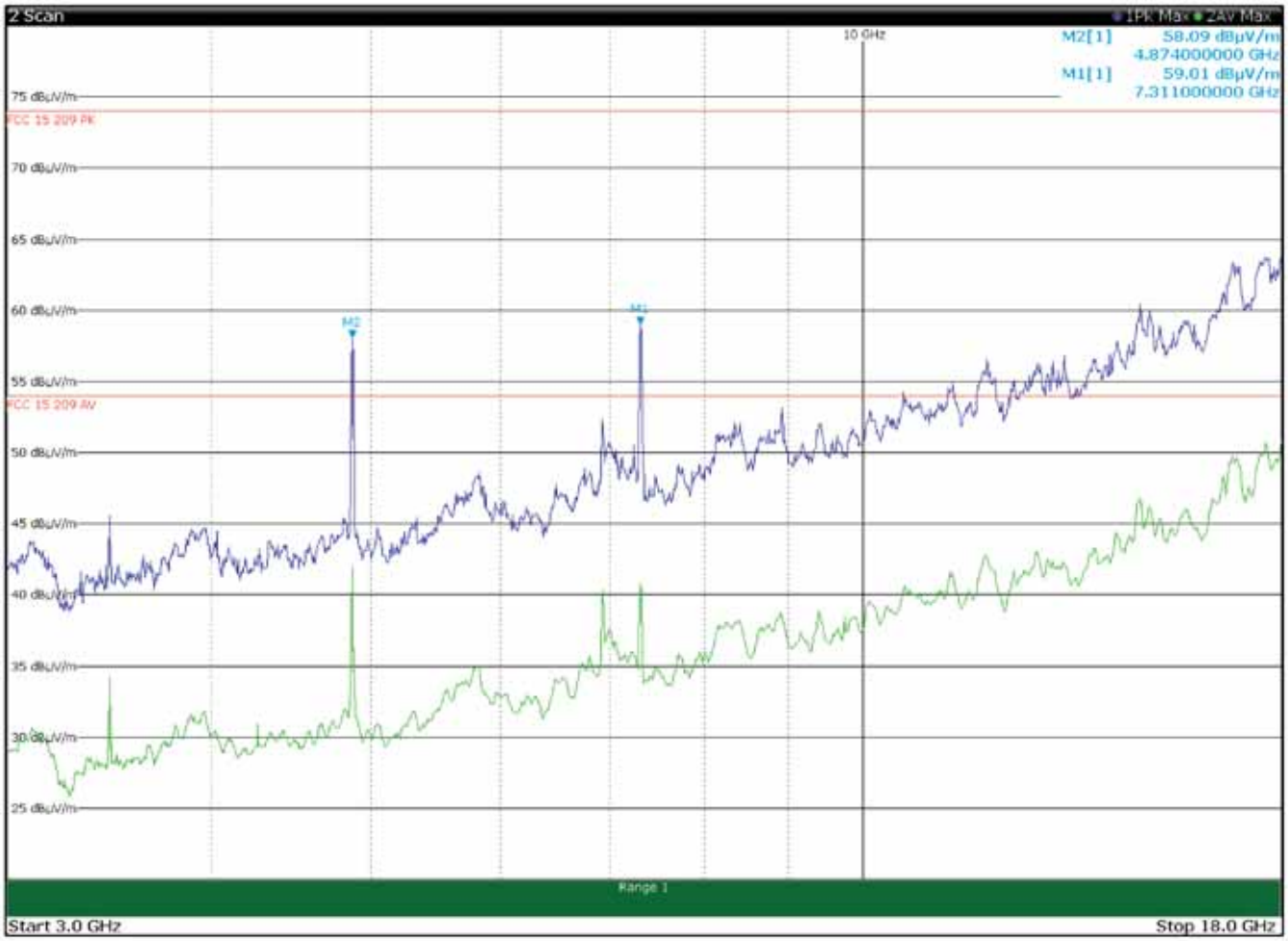


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1188.0000	47.8	74.0	-26.2	Pk
1732.5000	109.4	--	--	Pk
2437.0000	105.1	--	--	Pk

Limit exceeded by the carriers

8.1.4 Test data, continued

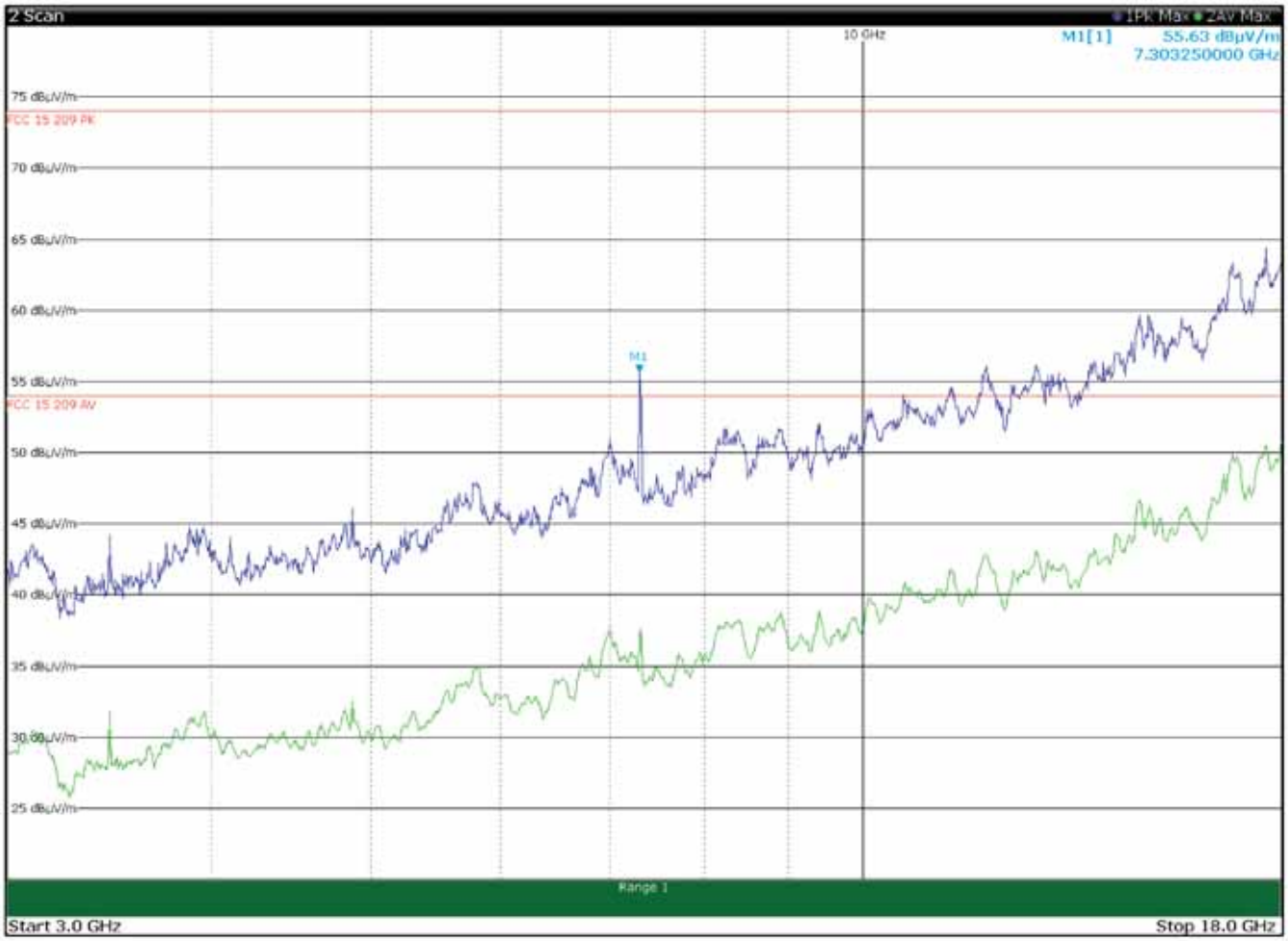


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
4874.0000	58.1	74.0	-15.9	Pk
4874.0000	49.7	54.0	-4.3	Av
7311.0000	59.1	74.0	-14.9	Pk
7311.0000	50.7	54.0	-3.3	Av

The correction factor for the average value of pulsed emissions is 20 log (DC) = 20 log (0.38) = 8.4 dB

8.1.4 Test data, continued

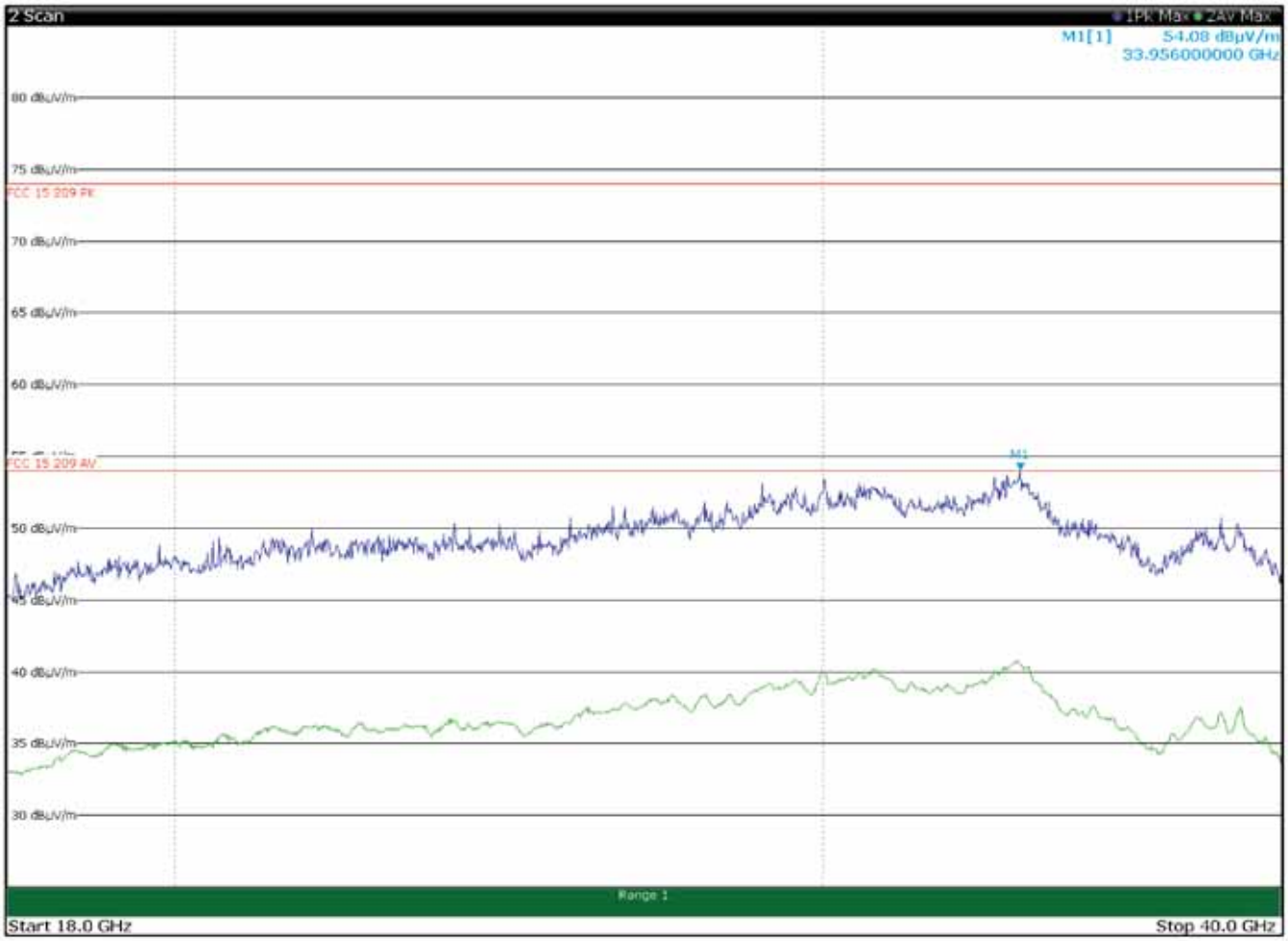


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
4874.0000	46.5	74.0	-27.5	Pk
4874.0000	38.1	54.0	-15.9	Av
7303.2500	55.7	74.0	-18.3	Pk
7303.2500	47.3	54.0	-6.7	Av

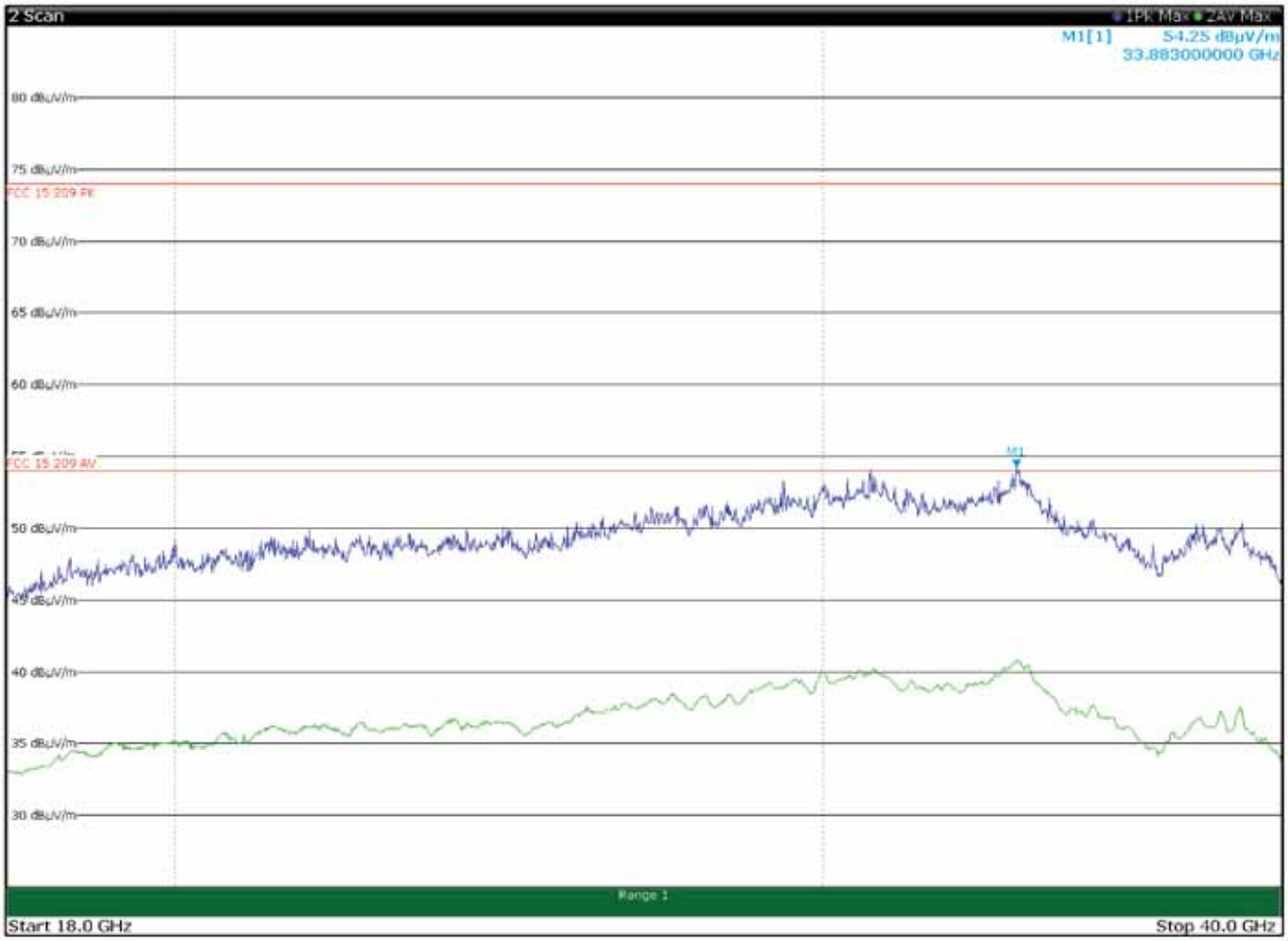
The correction factor for the average value of pulsed emissions is 20 log (DC) = 20 log (0.38) = 8.4 dB

8.1.4 Test data, continued



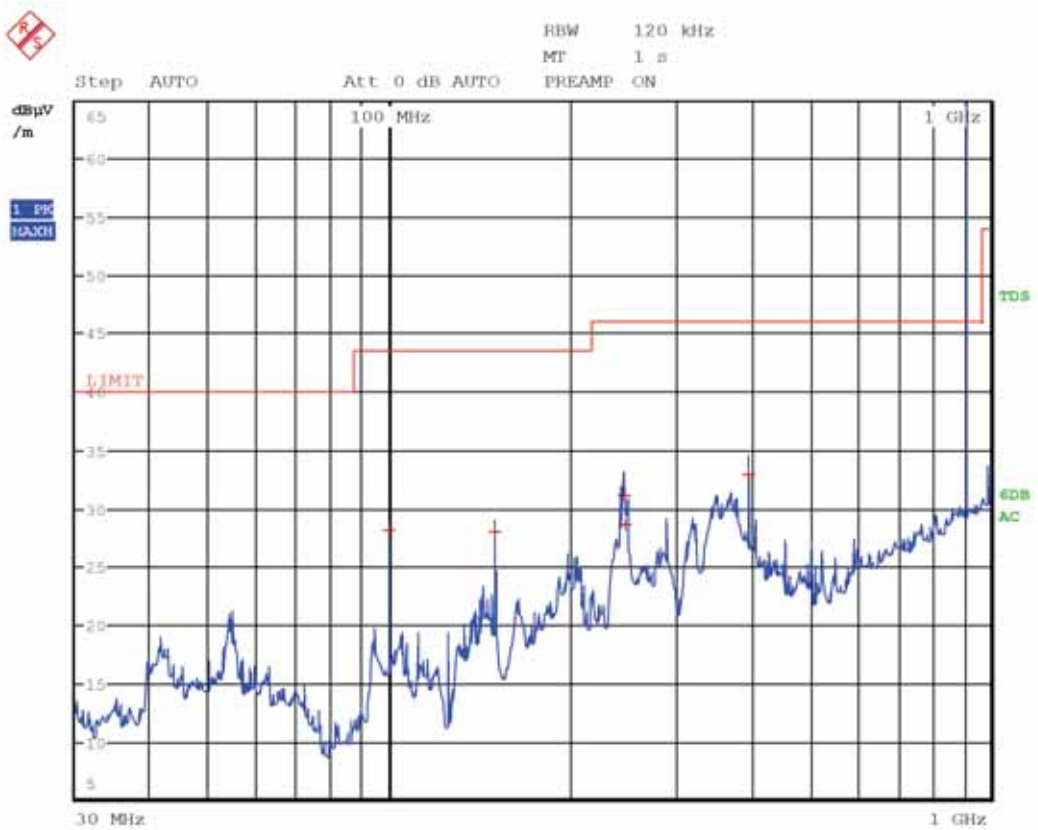
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

8.1.4 Test data, continued



Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 1)

8.1.4 Test data, continued

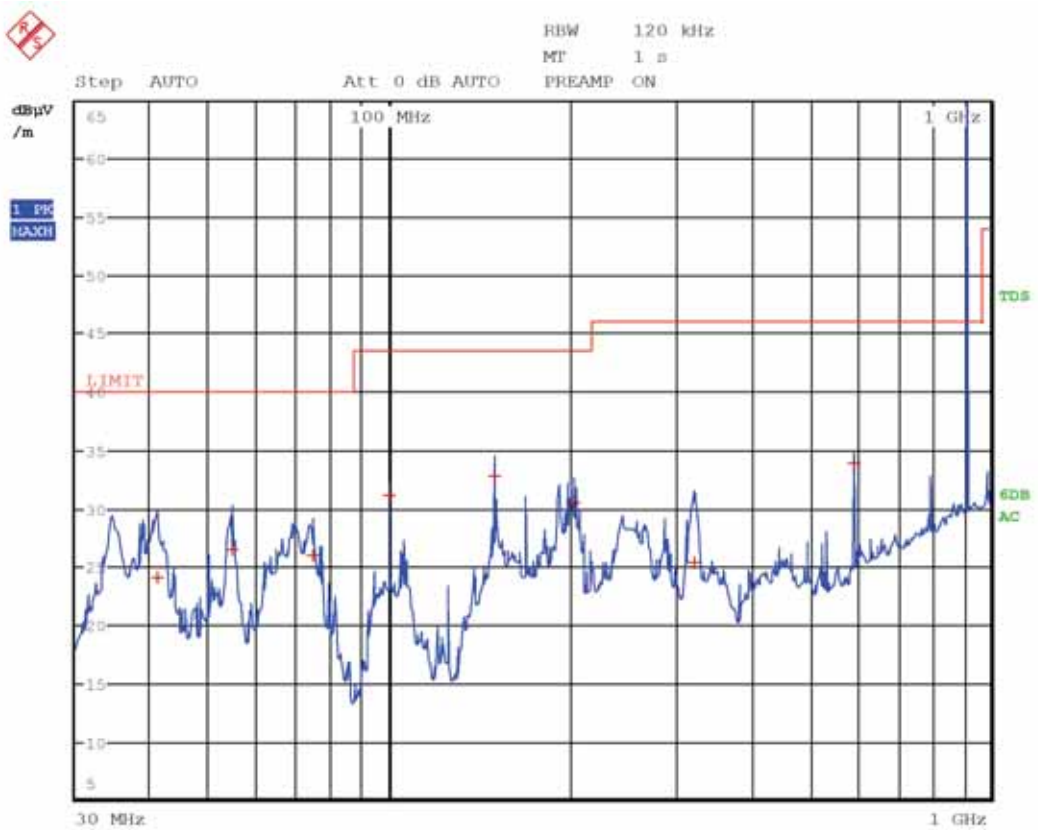


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
99.9900	28.1	43.5	-15.4	QP
150.0000	28.0	43.5	-15.5	QP
245.5200	31.3	46.0	-14.7	QP
246.7200	28.7	46.0	-17.3	QP
396.0000	32.9	46.0	-13.1	QP
915.0000	116.9	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued

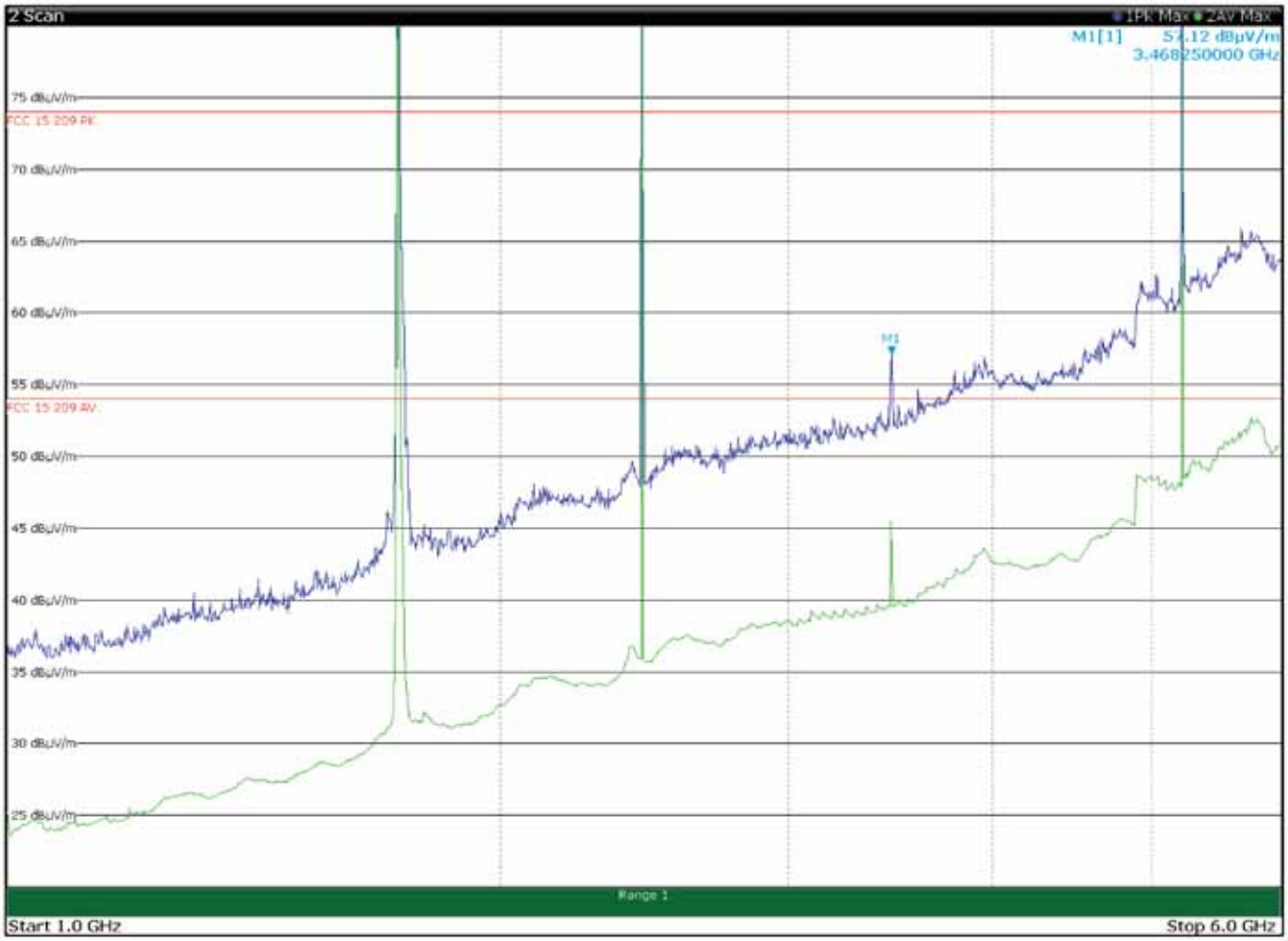


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
41.1300	24.1	40.0	-15.9	QP
54.6000	26.5	40.0	-13.5	QP
74.5500	26.0	40.0	-14.0	QP
99.9900	31.2	43.5	-12.3	QP
150.0000	32.8	43.5	-10.7	QP
202.9500	30.6	43.5	-12.9	QP
320.9700	25.4	46.0	-20.6	QP
594.0000	34.0	46.0	-12.0	QP
915.0000	127.7	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued

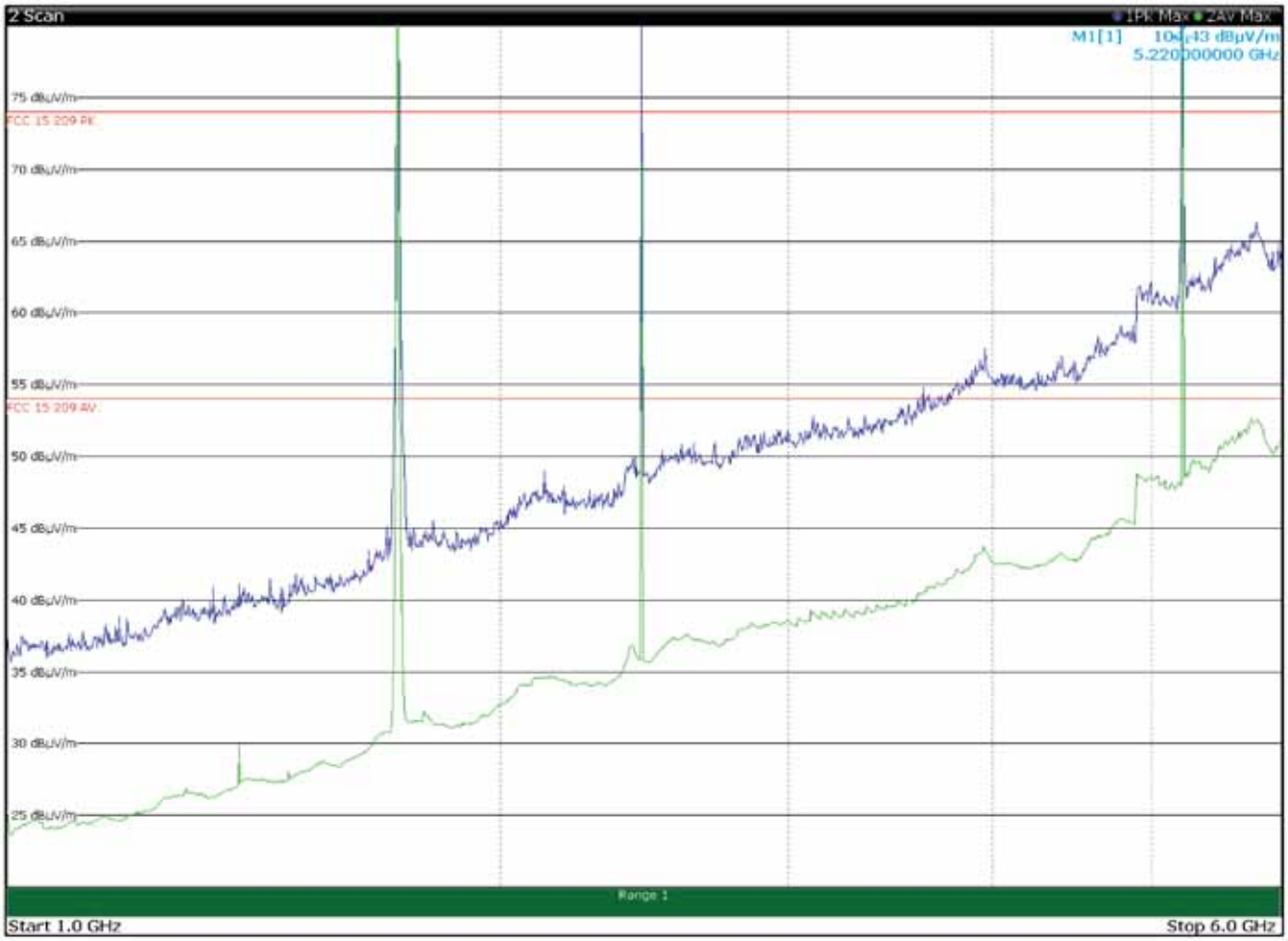


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1732.5000	110.4	--	--	Pk
2441.0000	98.5	--	--	Pk
3465.0000	57.2	82.2	-25.0	Pk
5220.0000	116.0	--	--	Pk

Limit exceeded by the carriers

8.1.4 Test data, continued

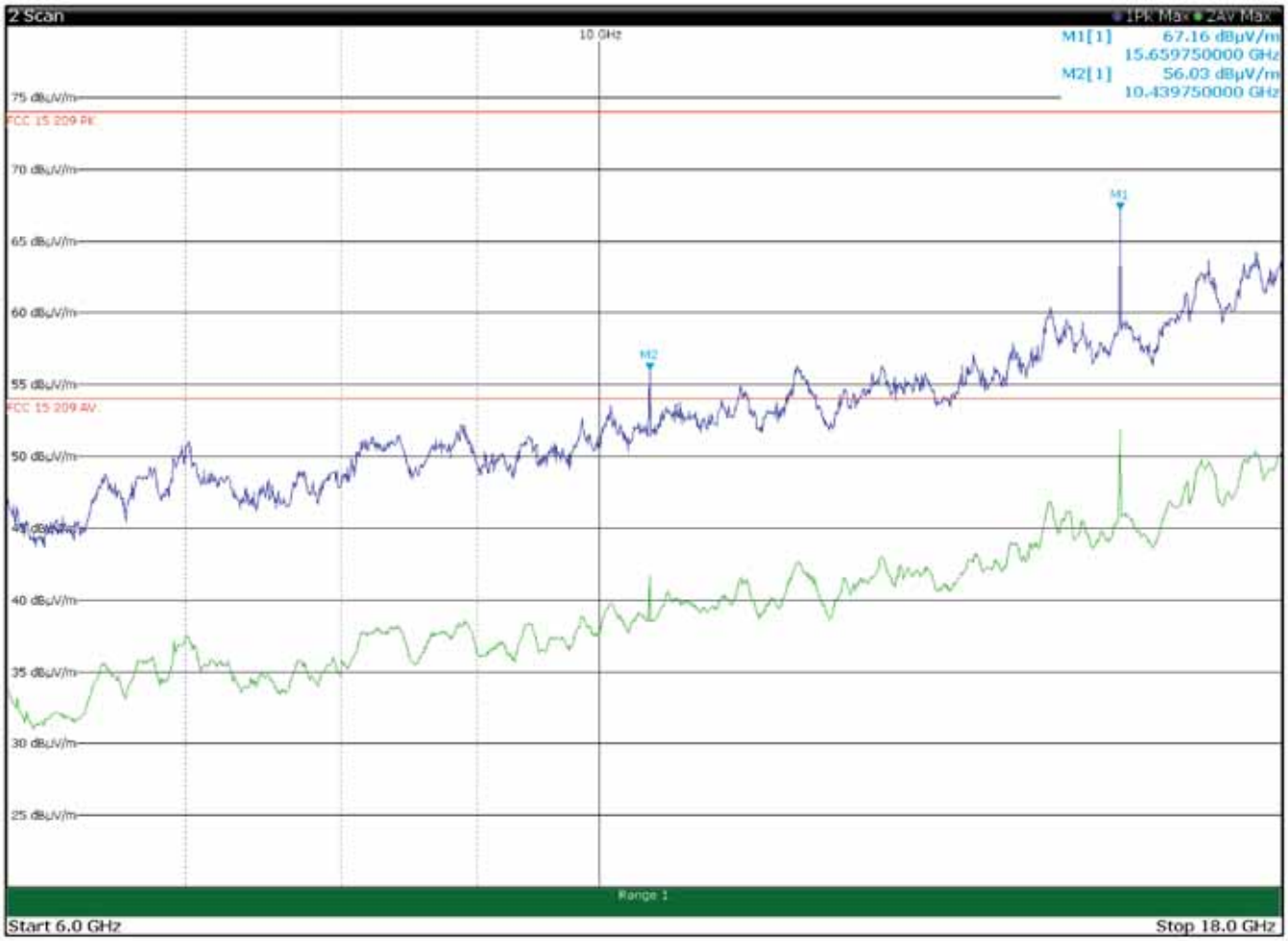


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1732.5000	109.5	--	--	Pk
2441.0000	89.2	--	--	Pk
5220.0000	105.4	--	--	Pk

Limit exceeded by the carriers

8.1.4 Test data, continued



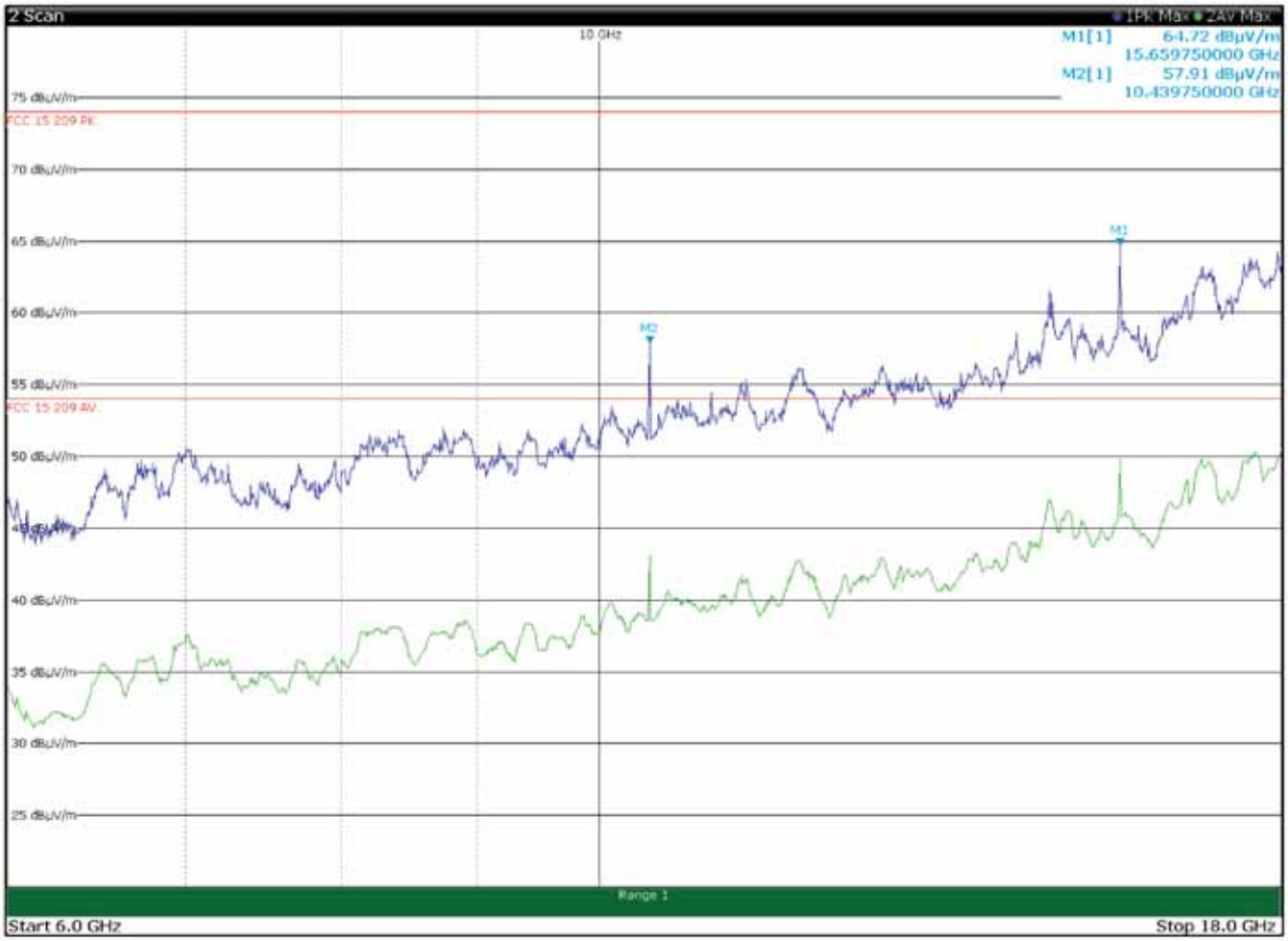
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
10439.7500	56.1	68.2	-12.1	Pk
15659.7500	67.2	74.0	-6.8	Pk
15659.7500	52.3	54.0	-1.7	Av

The limit for FCC 15.407 is -27 dBm. Limit (dBµV/m) = limit (dBm) + 95.23 = 68.2 dBµV/m

The correction factor for the average value of pulsed emissions is 20 log (DC) = 20 log (0.18) = 14.9 dB

8.1.4 Test data, continued



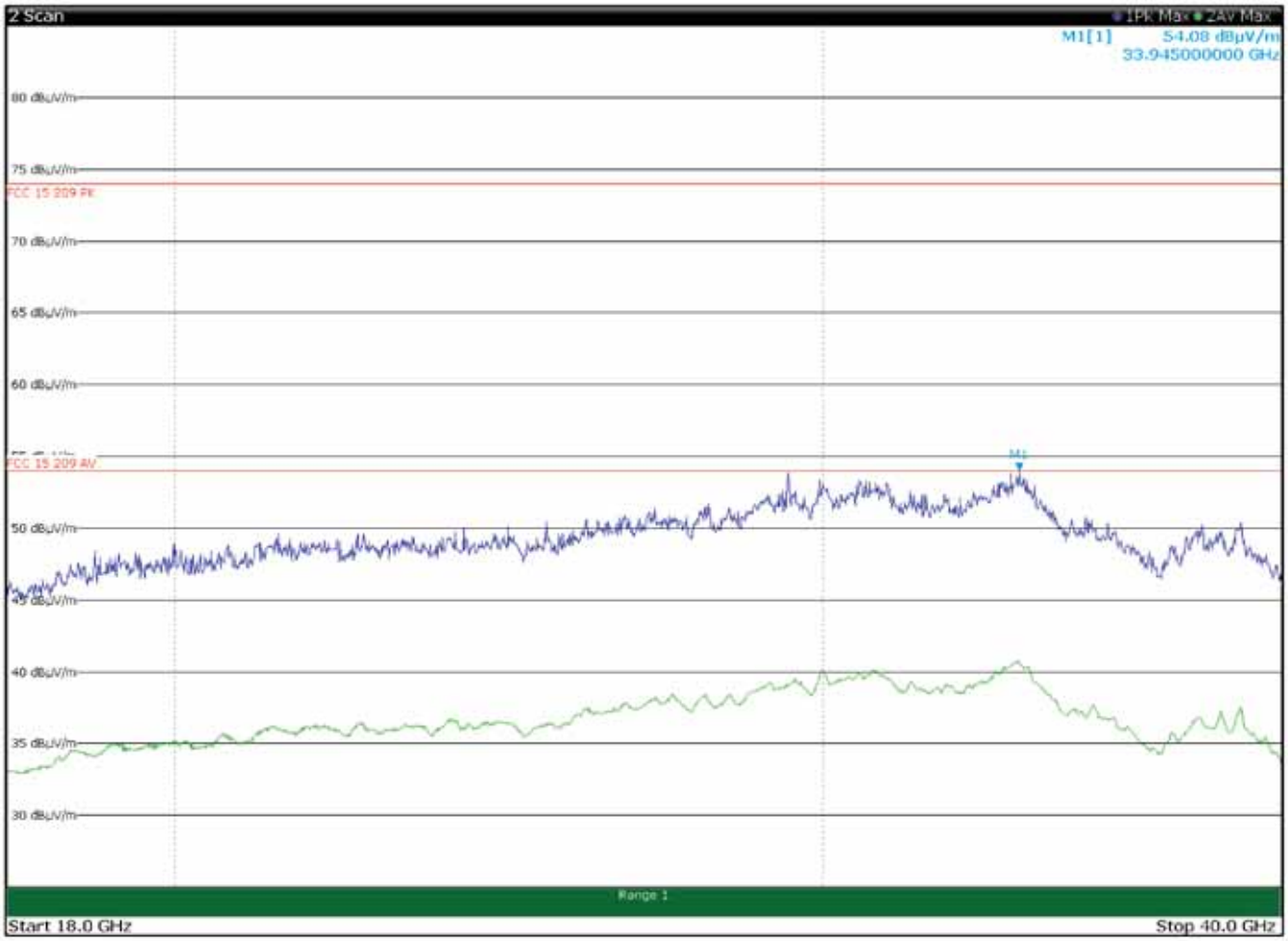
Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
10439.7500	58.1	68.2	-10.1	Pk
15659.7500	64.8	74.0	-9.2	Pk
15659.7500	49.9	54.0	-4.1	Av

The limit for FCC 15.407 is -27 dBm. Limit (dBµV/m) = limit (dBm) + 95.23 = 68.2 dBµV/m

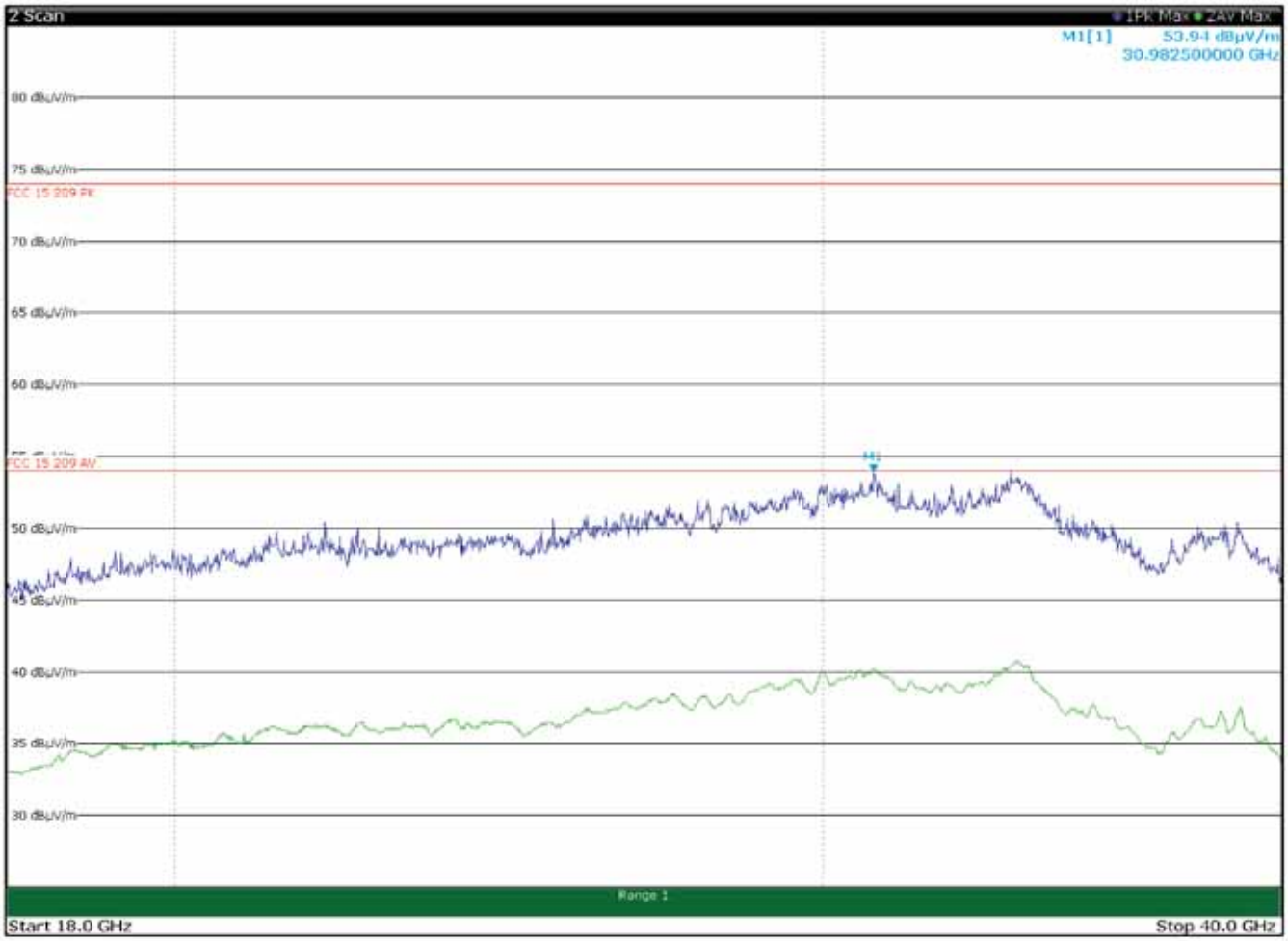
The correction factor for the average value of pulsed emissions is 20 log (DC) = 20 log (0.18) = 14.9 dB

8.1.4 Test data, continued



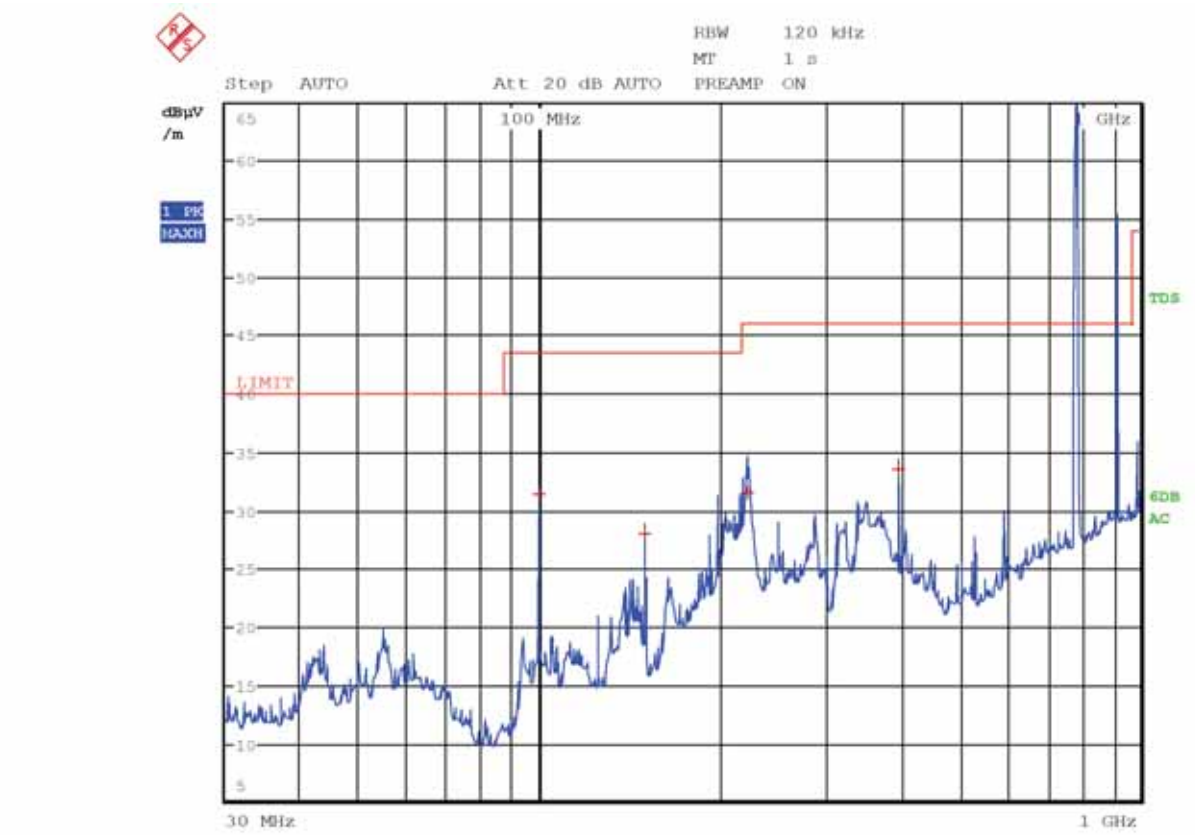
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

8.1.4 Test data, continued



Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 1)

8.1.4 Test data, continued

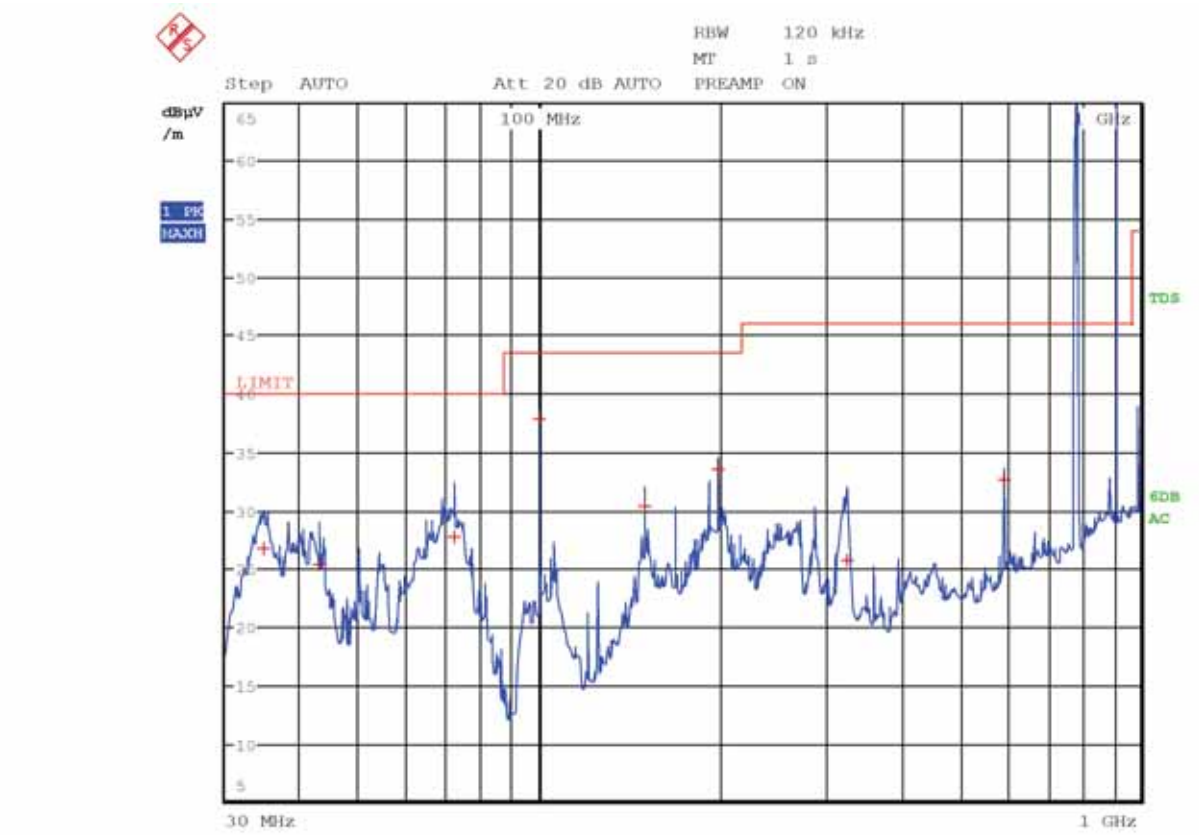


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
99.9900	31.5	43.5	-12.0	QP
150.0000	28.0	43.5	-15.5	QP
222.0300	31.6	46.0	-14.4	QP
396.0000	33.5	46.0	-12.5	QP
782.0000	114.0	--	--	PK
915.0000	116.6	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued

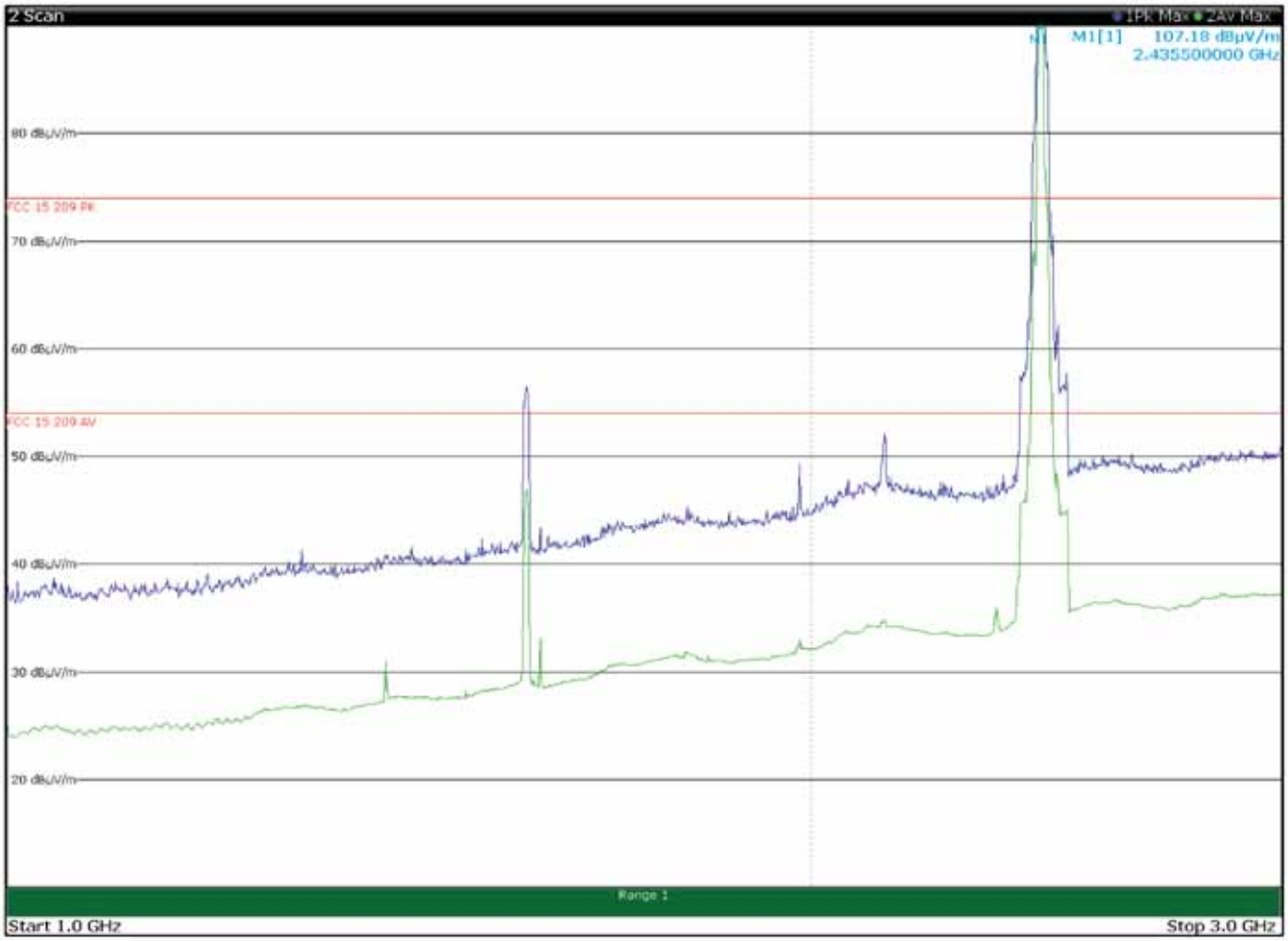


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
34.6200	26.8	40.0	-13.2	QP
42.9300	25.4	40.0	-14.6	QP
72.0600	27.8	40.0	-12.2	QP
99.9900	37.8	43.5	-5.7	QP
150.0000	30.4	43.5	-13.1	QP
198.0000	33.6	43.5	-9.9	QP
324.5400	25.8	46.0	-20.2	QP
594.0000	32.8	46.0	-13.2	QP
782.0000	111.5	--	--	PK
915.0000	127.9	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued



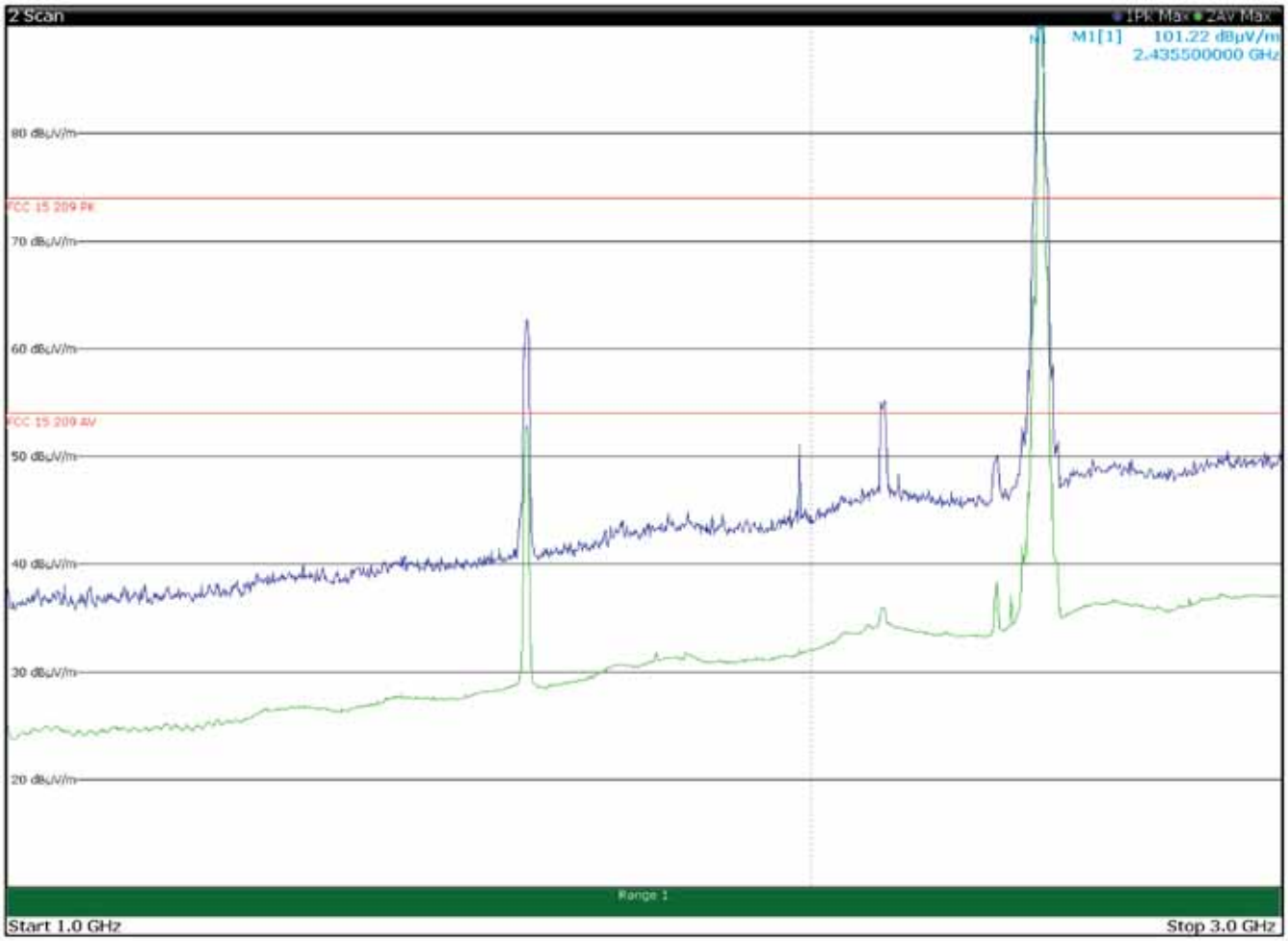
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1564.0000	56.6	82.2	-25.6	Pk
2130.7500	52.1	74.0	-21.9	Pk
2437.0000	114.3	--	--	Pk

Limit exceeded by the carriers

The limit for FCC 27.53 is -13 dBm. Limit (dBµV/m) = limit (dBm) + 95.23 = 82.2 dBµV/m

8.1.4 Test data, continued



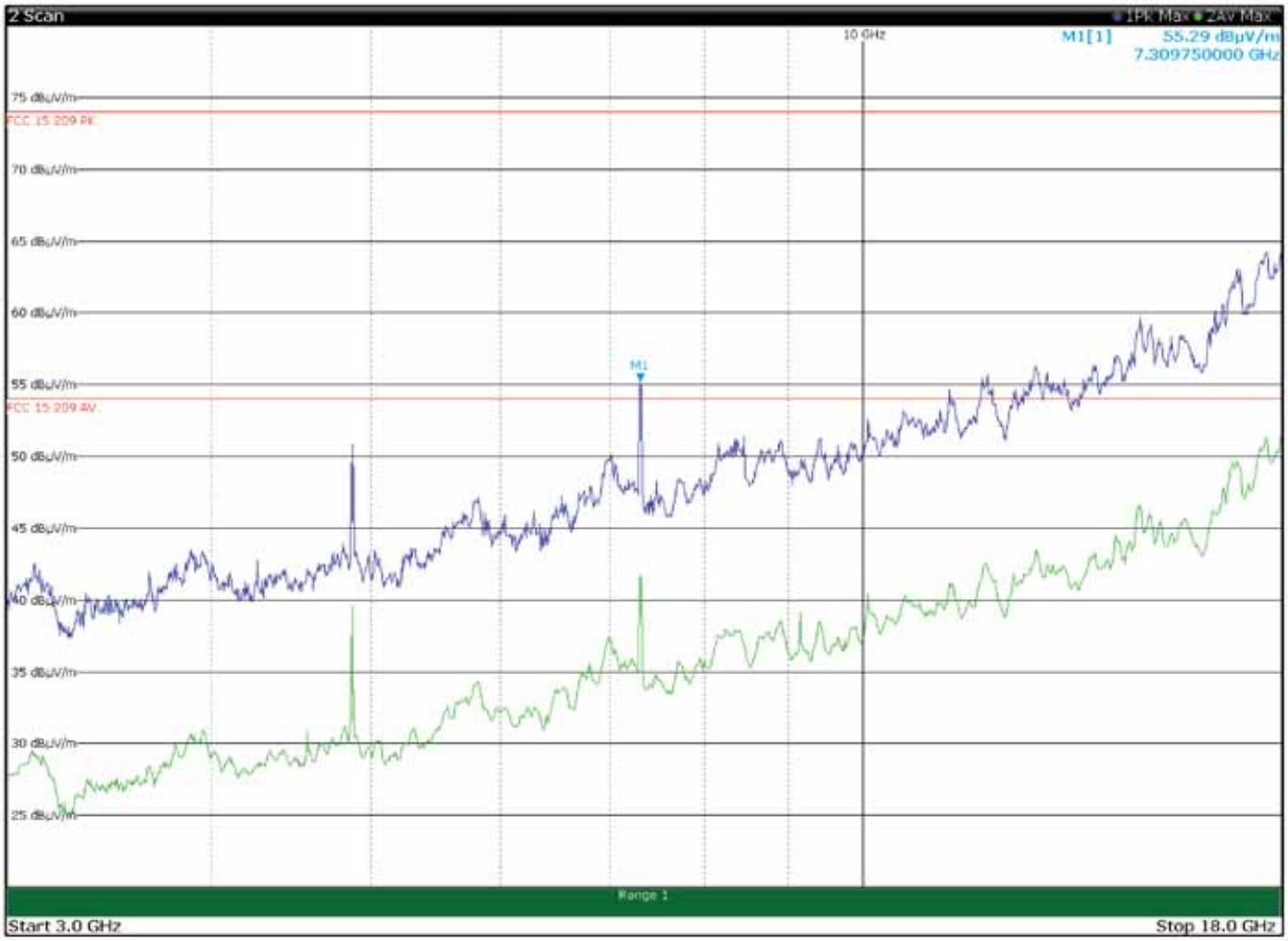
Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1564.0000	62.8	82.2	-19.4	Pk
1980.0000	51.1	74.0	-22.9	Pk
2132.0000	55.2	74.0	-18.8	Pk
2437.0000	106.9	--	--	Pk

Limit exceeded by the carriers

The limit for FCC 27.53 is -13 dBm. Limit (dBµV/m) = limit (dBm) + 95.23 = 82.2 dBµV/m

8.1.4 Test data, continued

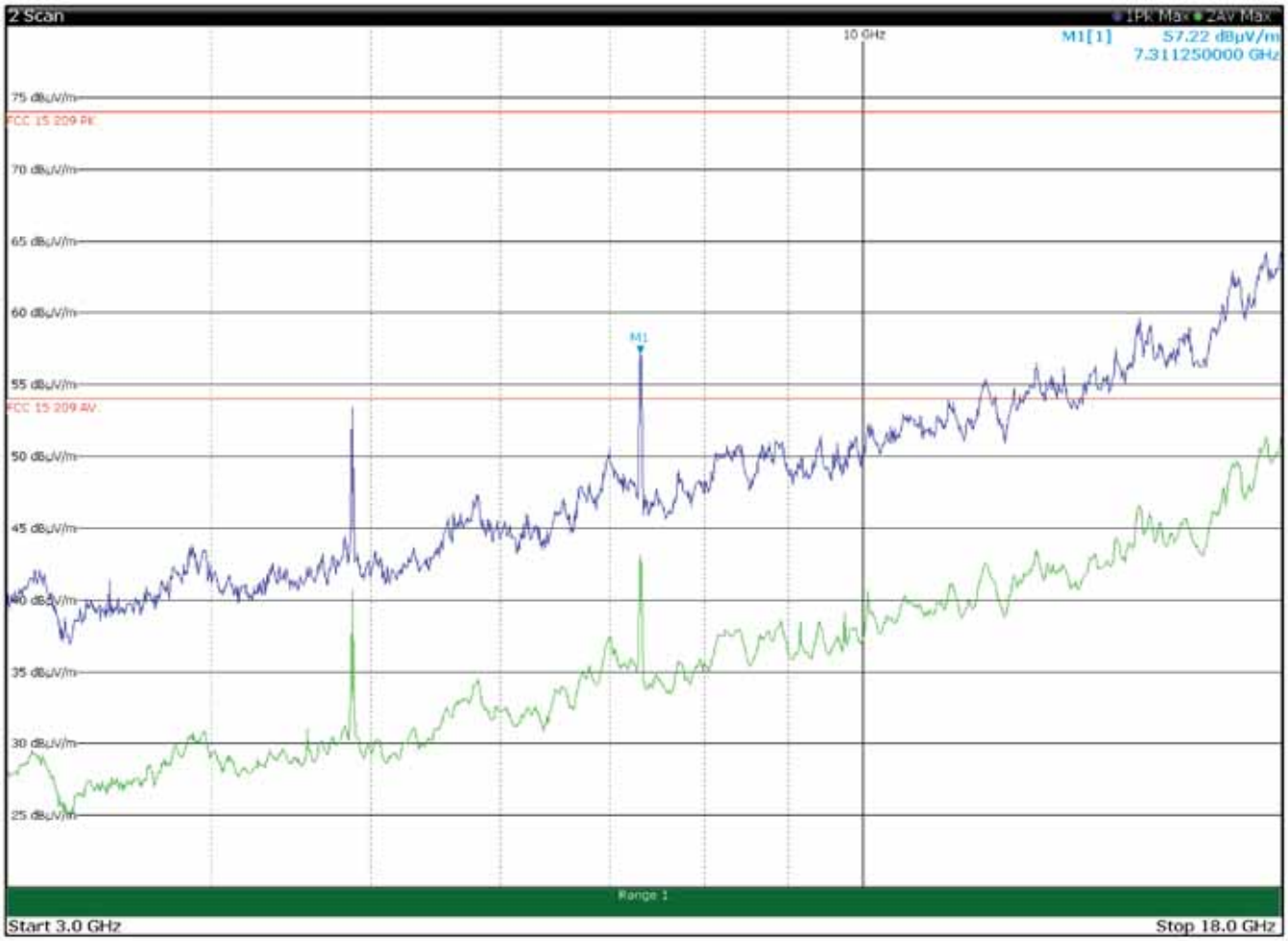


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
4874.0000	50.5	74.0	-23.5	Pk
4874.0000	42.1	54.0	-11.9	Av
7309.7500	55.3	74.0	-18.7	Pk
7309.7500	46.9	54.0	-7.1	Av

The correction factor for the average value of pulsed emissions is 20 log (DC) = 20 log (0.38) = 8.4 dB

8.1.4 Test data, continued

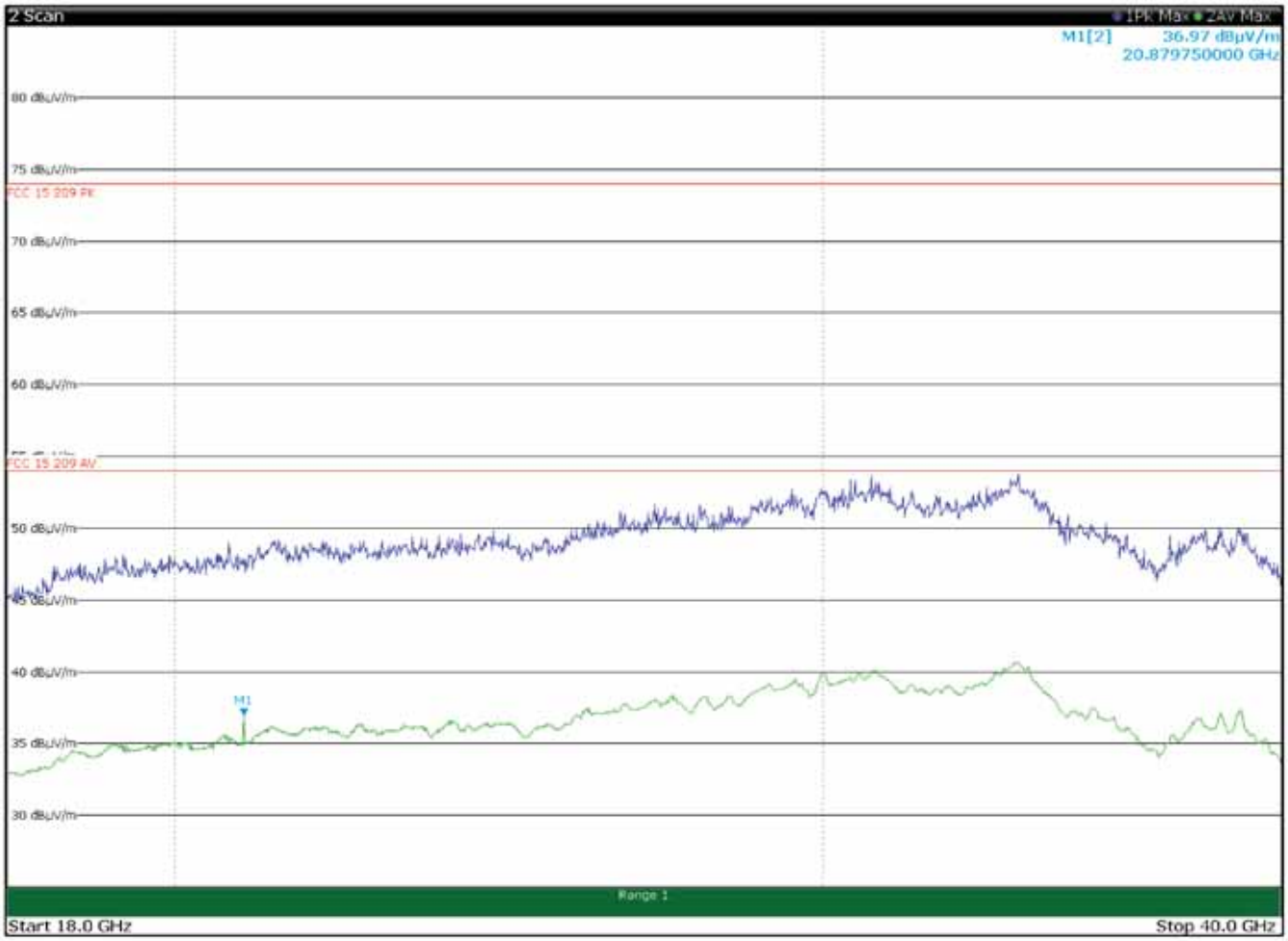


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
4874.0000	53.8	74.0	-20.2	Pk
4874.0000	45.4	54.0	-8.6	Av
7311.2500	57.3	74.0	-16.7	Pk
7311.2500	48.9	54.0	-5.1	Av

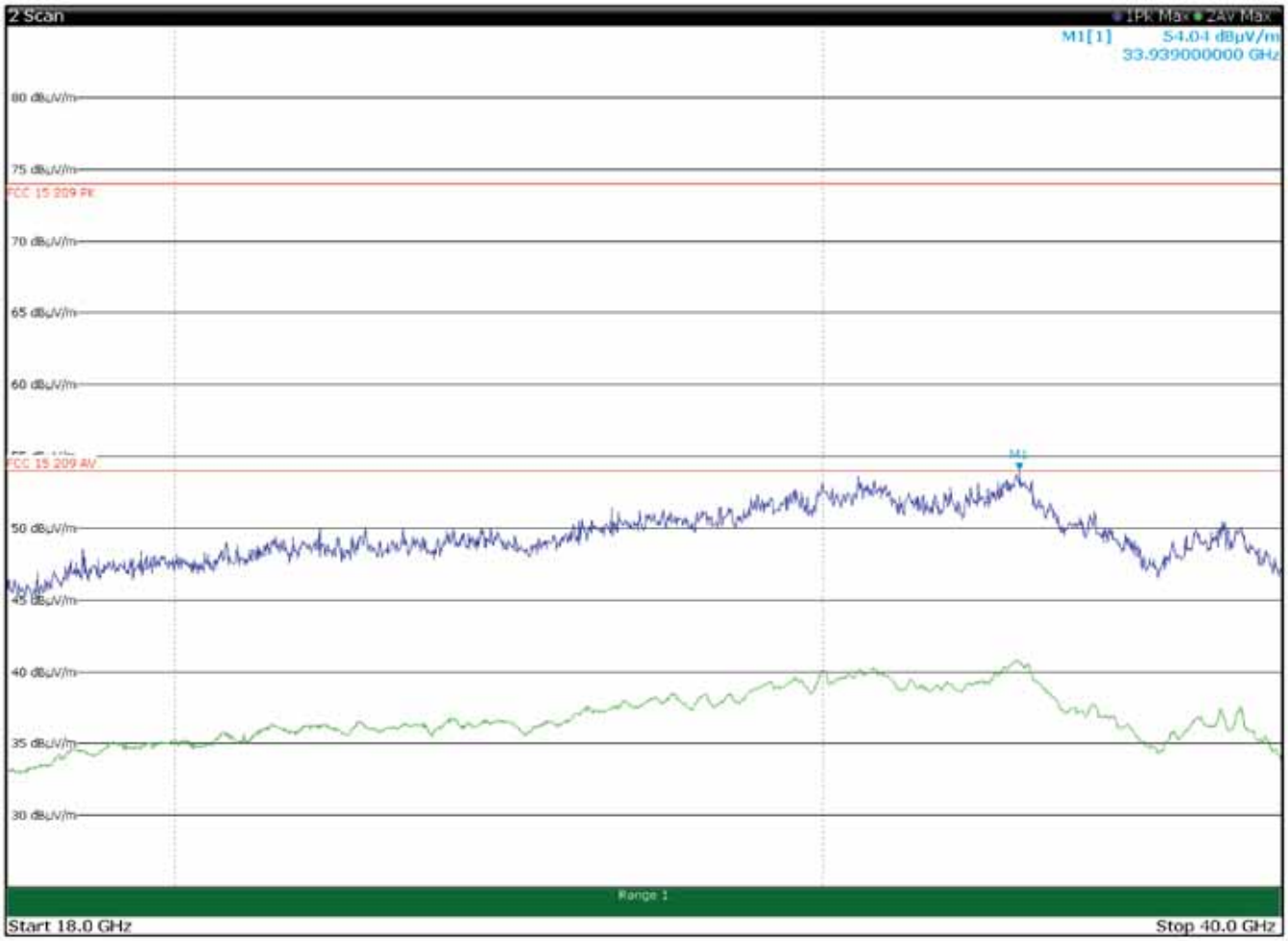
The correction factor for the average value of pulsed emissions is 20 log (DC) = 20 log (0.38) = 8.4 dB

8.1.4 Test data, continued



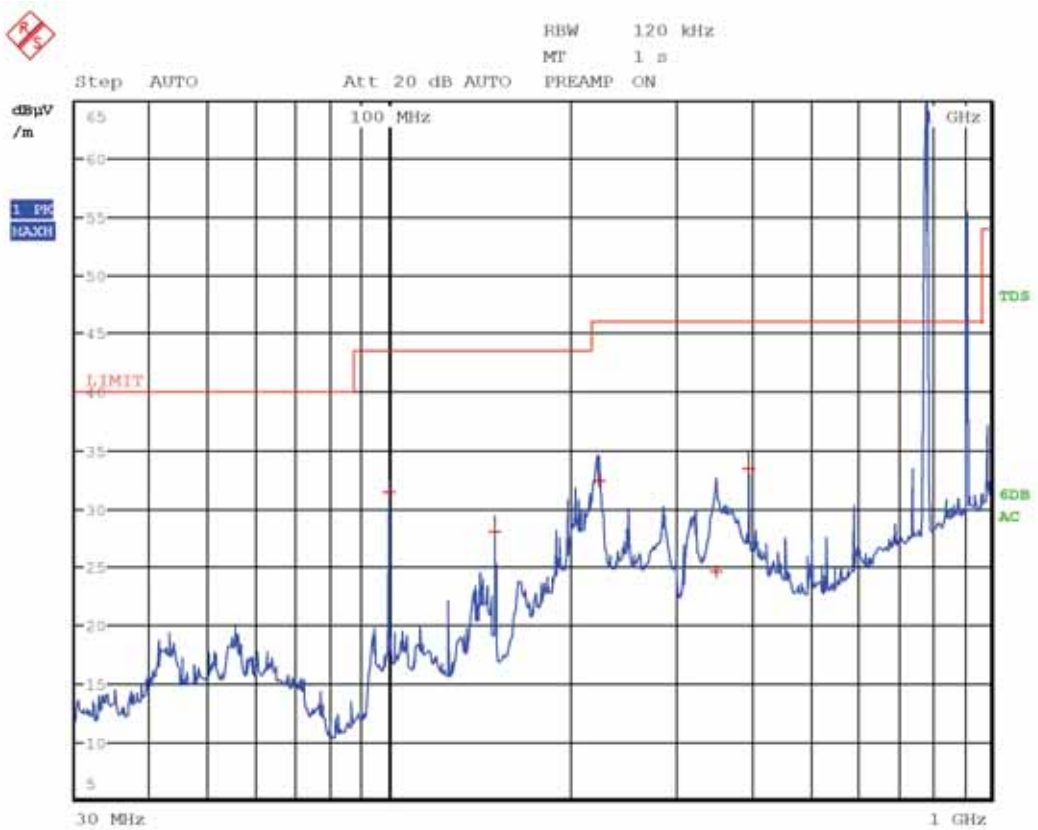
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

8.1.4 Test data, continued



Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

8.1.4 Test data, continued

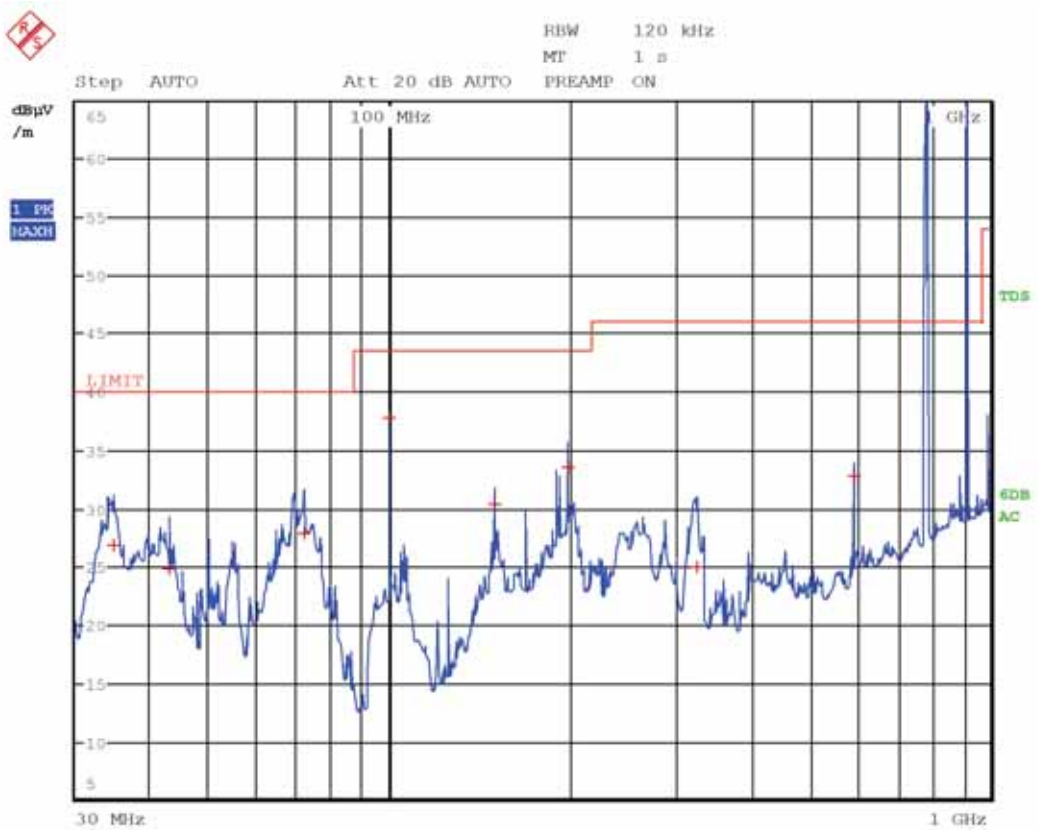


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
99.9900	31.5	43.5	-12.0	QP
150.0000	28.0	43.5	-15.5	QP
223.1400	32.4	46.0	-13.6	QP
349.0200	24.7	46.0	-21.3	QP
396.0000	33.5	46.0	-12.5	QP
782.0000	114.4	--	--	PK
915.0000	116.9	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued

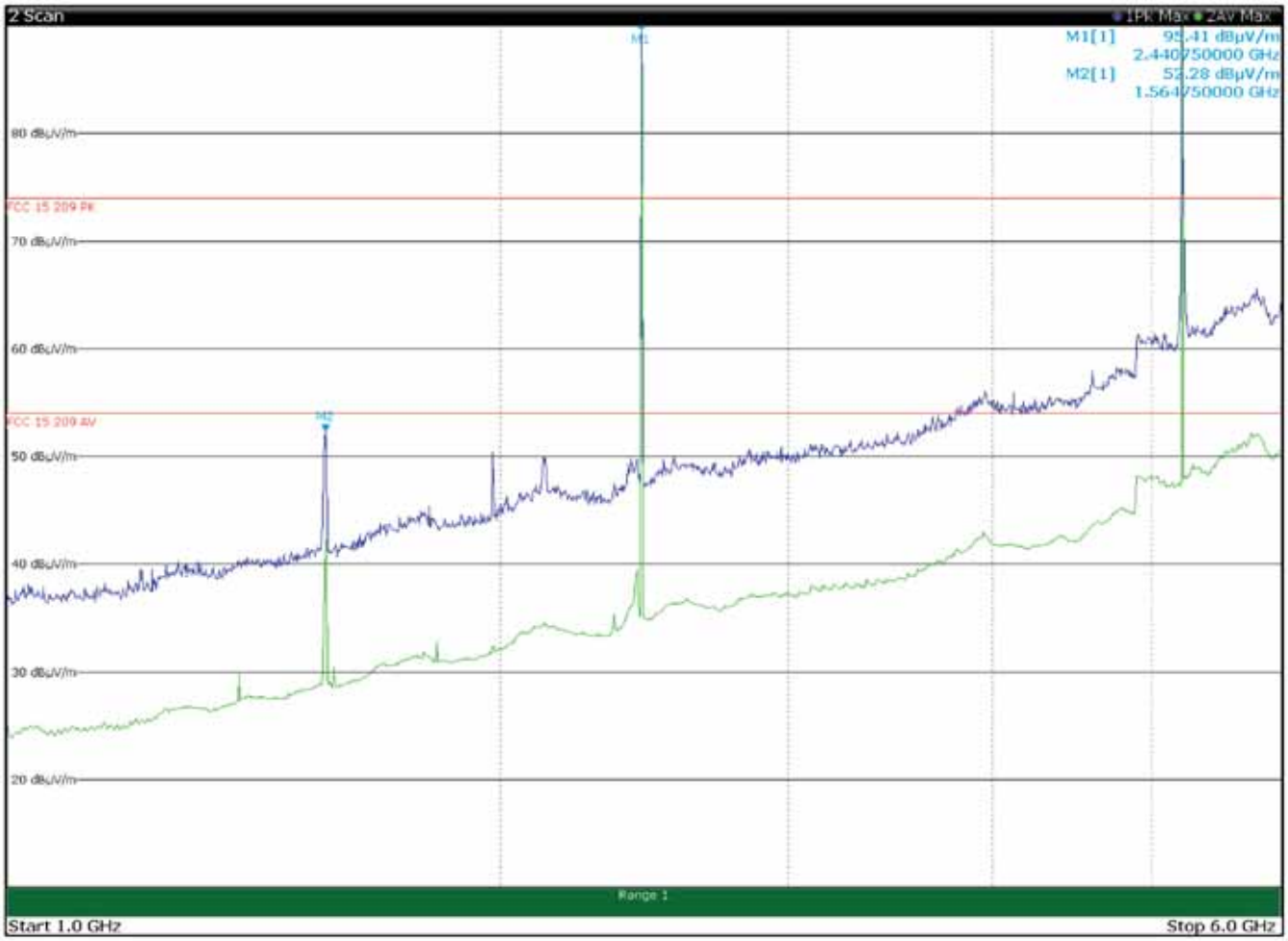


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
34.6200	27.0	40.0	-13.0	QP
42.9000	24.9	40.0	-15.1	QP
72.0000	27.9	40.0	-12.1	QP
99.9900	37.8	43.5	-5.7	QP
150.0000	30.5	43.5	-13.0	QP
198.0000	33.6	43.5	-9.9	QP
325.5900	25.1	46.0	-20.9	QP
594.0000	32.8	46.0	-13.2	QP
782.0000	111.7	--	--	PK
915.0000	127.7	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued



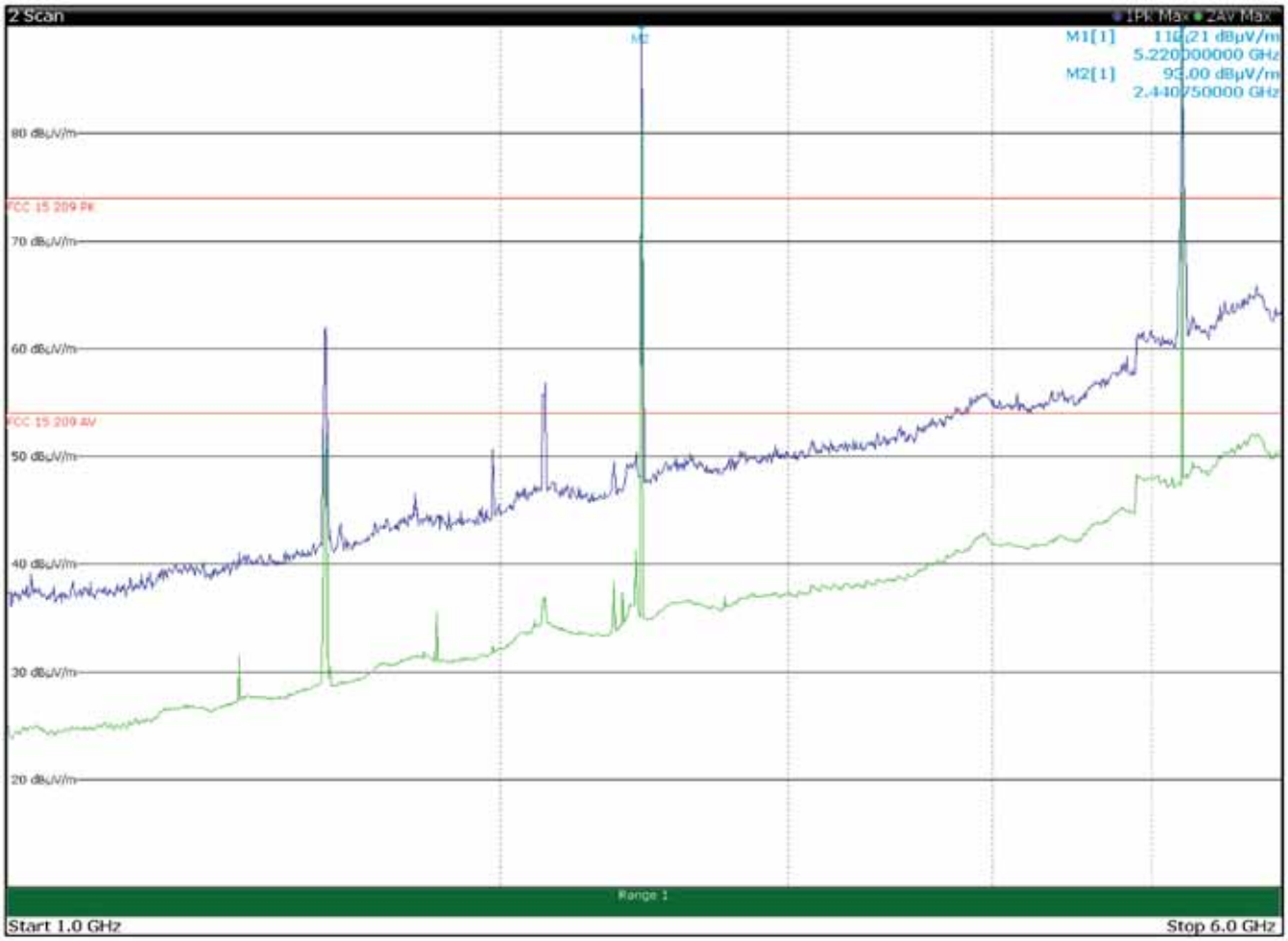
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1564.0000	56.4	82.2	-25.8	Pk
1980.0000	50.4	74.0	-23.6	Pk
2441.0000	99.8	--	--	Pk
5220.0000	118.6	--	--	Pk

Limit exceeded by the carriers

The limit for FCC 27.53 is -13 dBm. Limit (dBµV/m) = limit (dBm) + 95.23 = 82.2 dBµV/m

8.1.4 Test data, continued



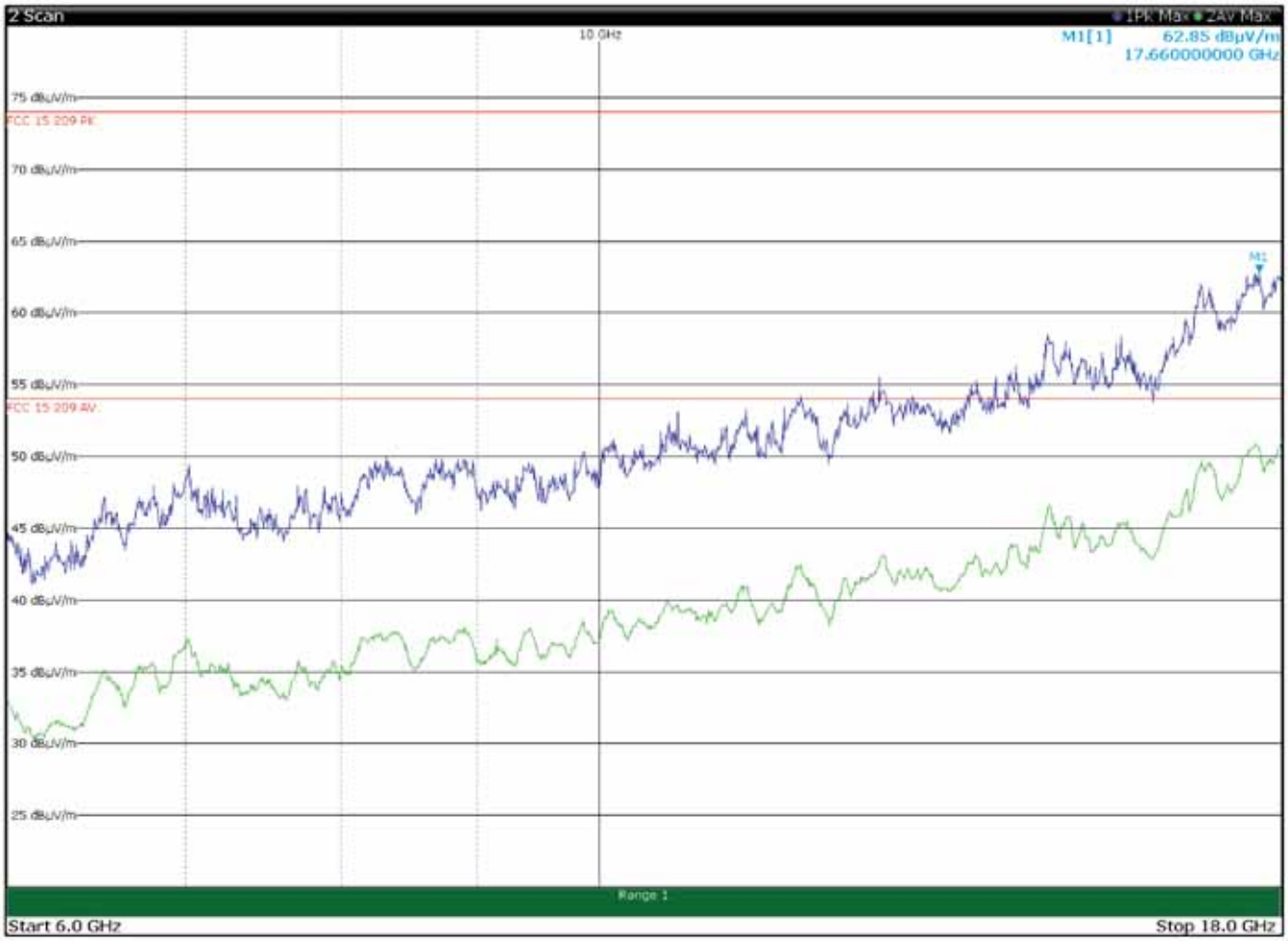
Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1564.0000	62.5	82.2	-19.7	Pk
1980.0000	50.7	74.0	-23.3	Pk
2131.7500	56.8	74.0	-17.2	Pk
2441.0000	91.1	--	--	Pk
5220.0000	107.3	--	--	Pk

Limit exceeded by the carriers

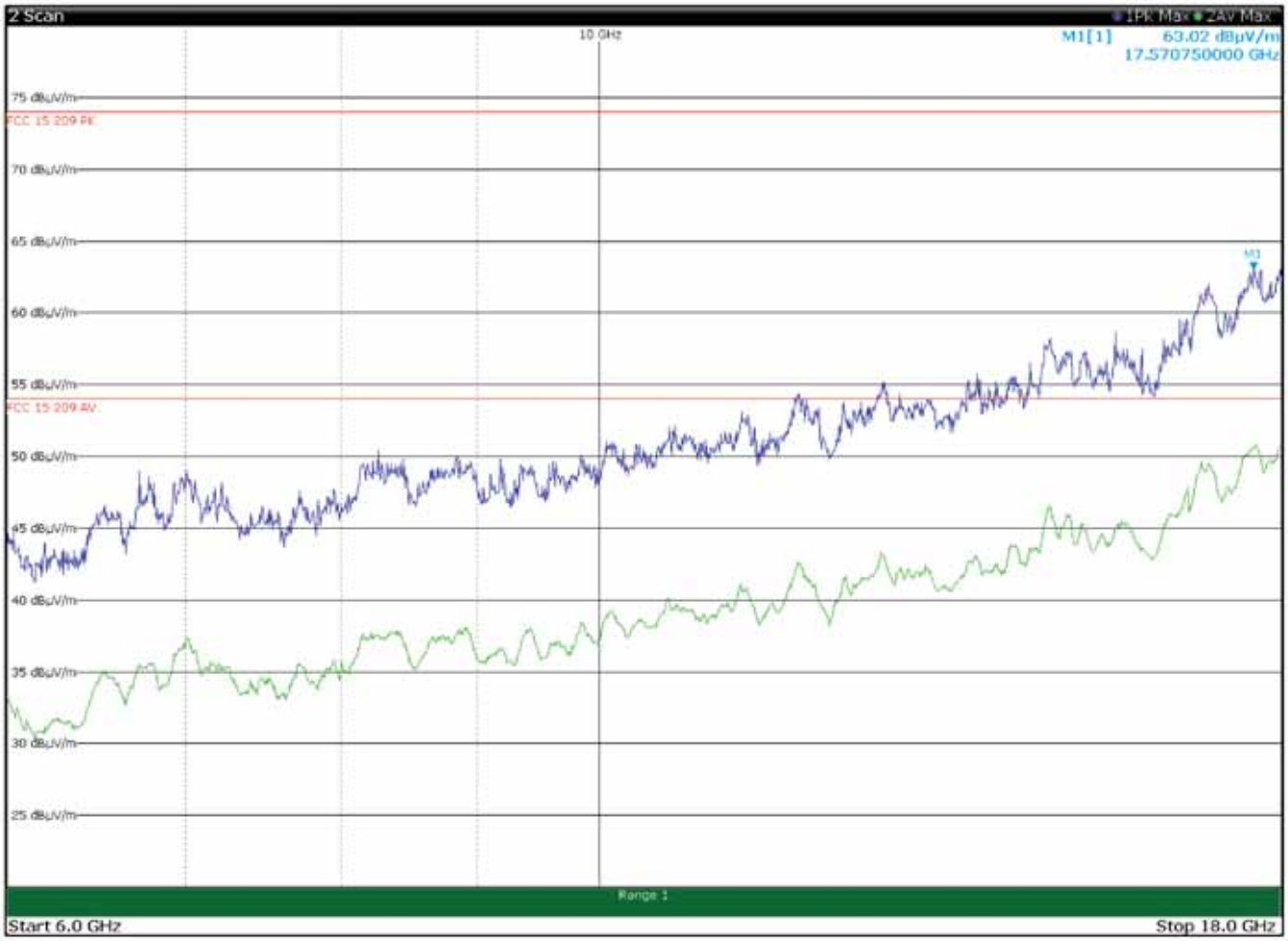
The limit for FCC 27.53 is -13 dBm. Limit (dBµV/m) = limit (dBm) + 95.23 = 82.2 dBµV/m

8.1.4 Test data, continued



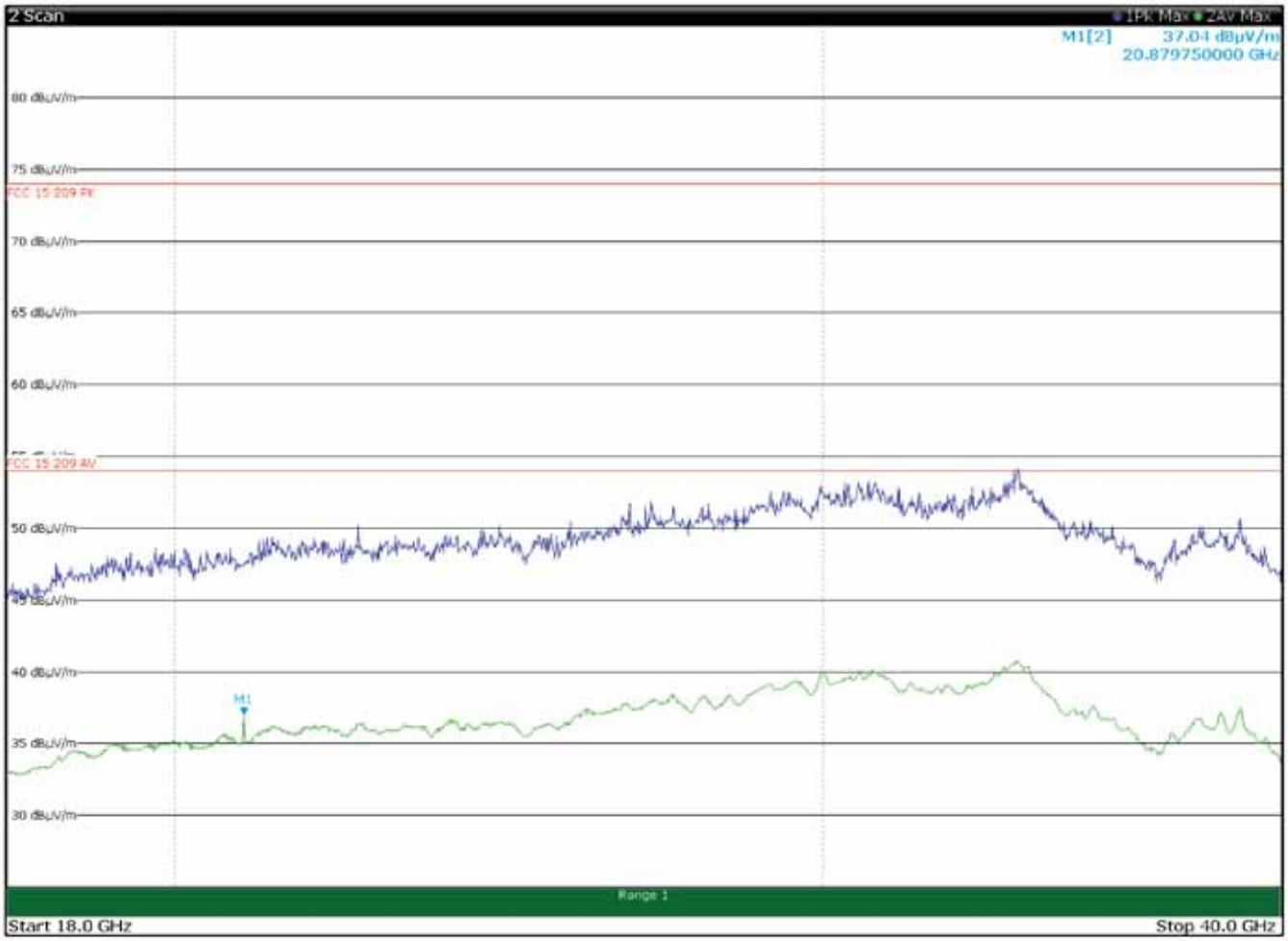
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

8.1.4 Test data, continued



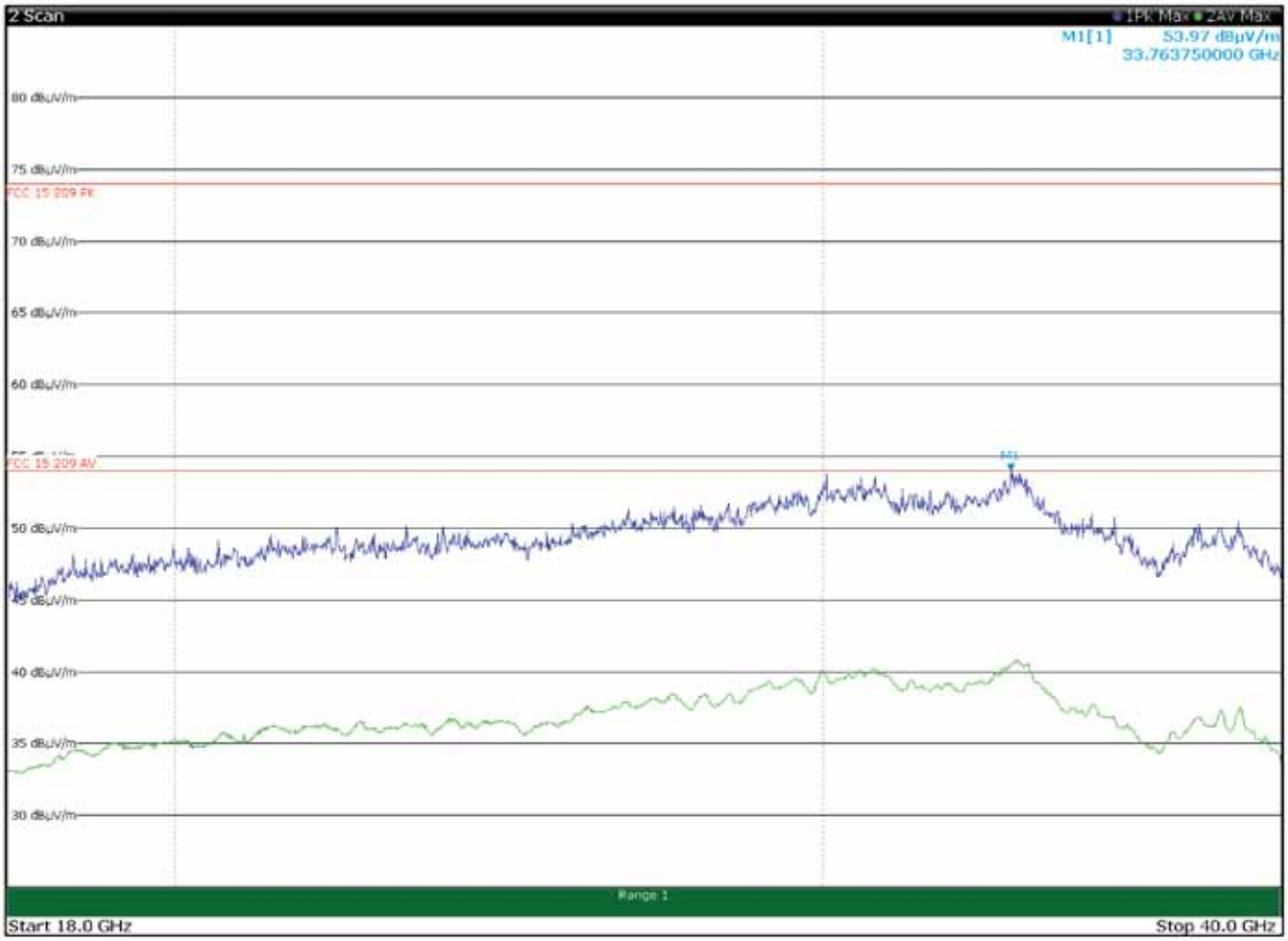
Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

8.1.4 Test data, continued



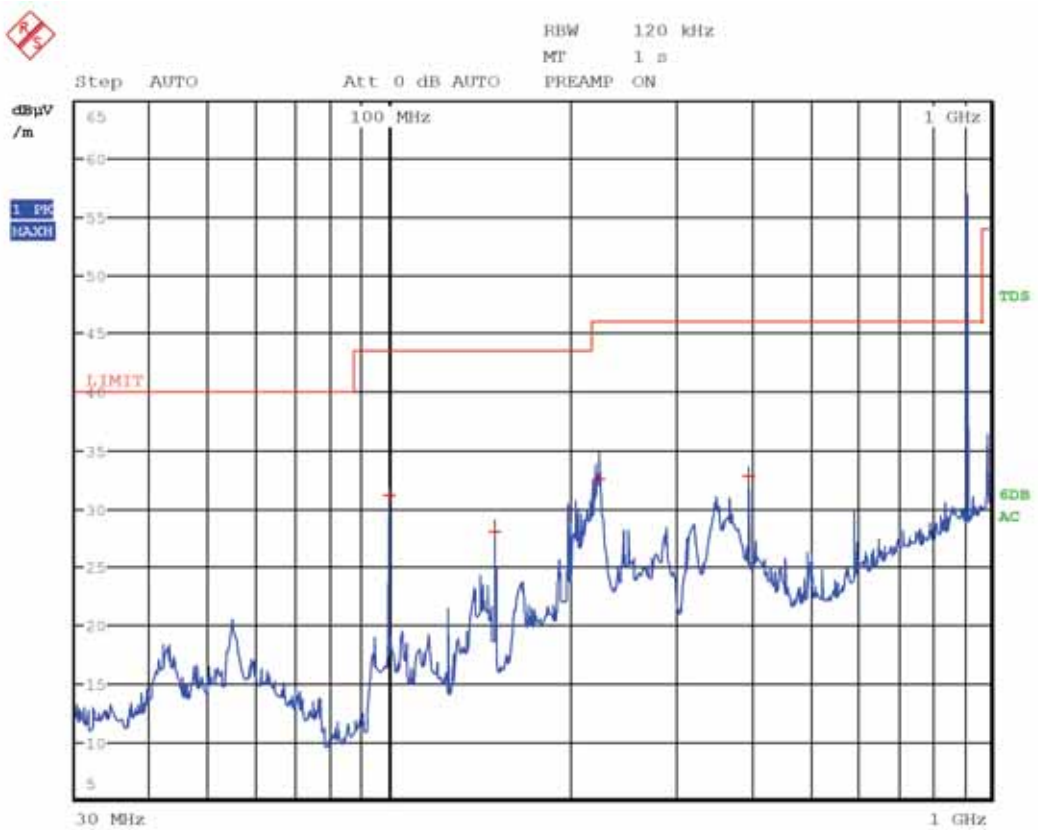
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

8.1.4 Test data, continued



Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 782 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

8.1.4 Test data, continued

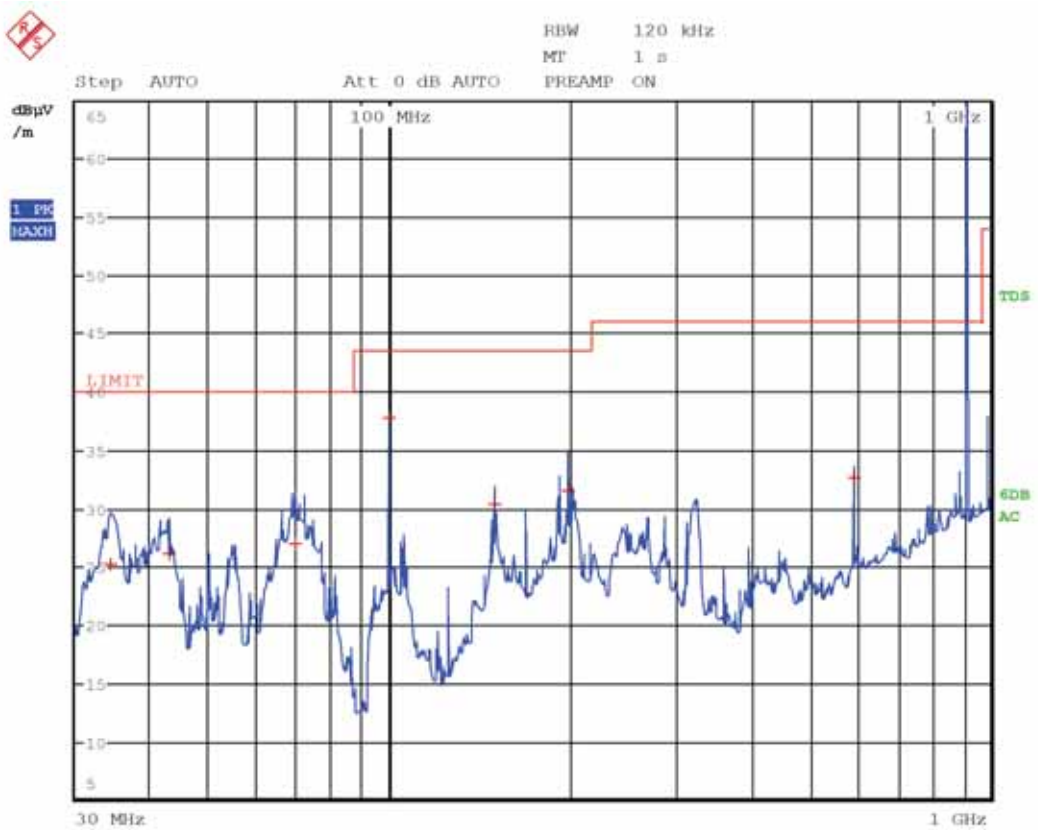


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
99.9900	31.2	43.5	-12.3	QP
150.0000	28.0	43.5	-15.5	QP
222.8400	32.6	46.0	-13.4	QP
396.0000	32.9	46.0	-13.1	QP
915.0000	116.9	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued

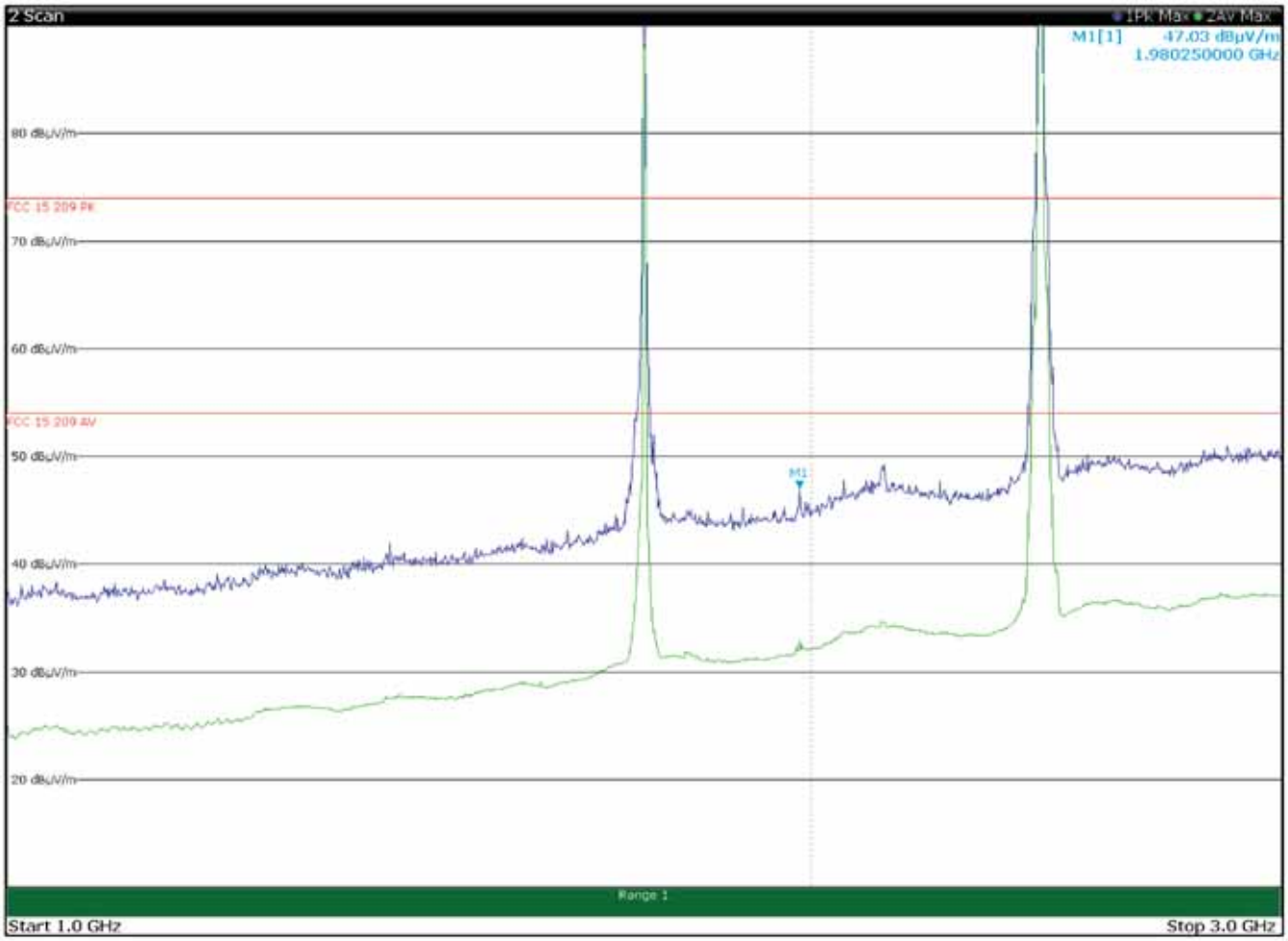


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
34.2900	25.3	40.0	-14.7	QP
42.8400	26.2	40.0	-13.8	QP
69.6900	27.1	40.0	-12.9	QP
99.9900	37.7	43.5	-5.8	QP
150.0000	30.4	43.5	-13.1	QP
197.9700	31.6	43.5	-11.9	QP
594.0000	32.8	46.0	-13.2	QP
915.0000	127.5	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued

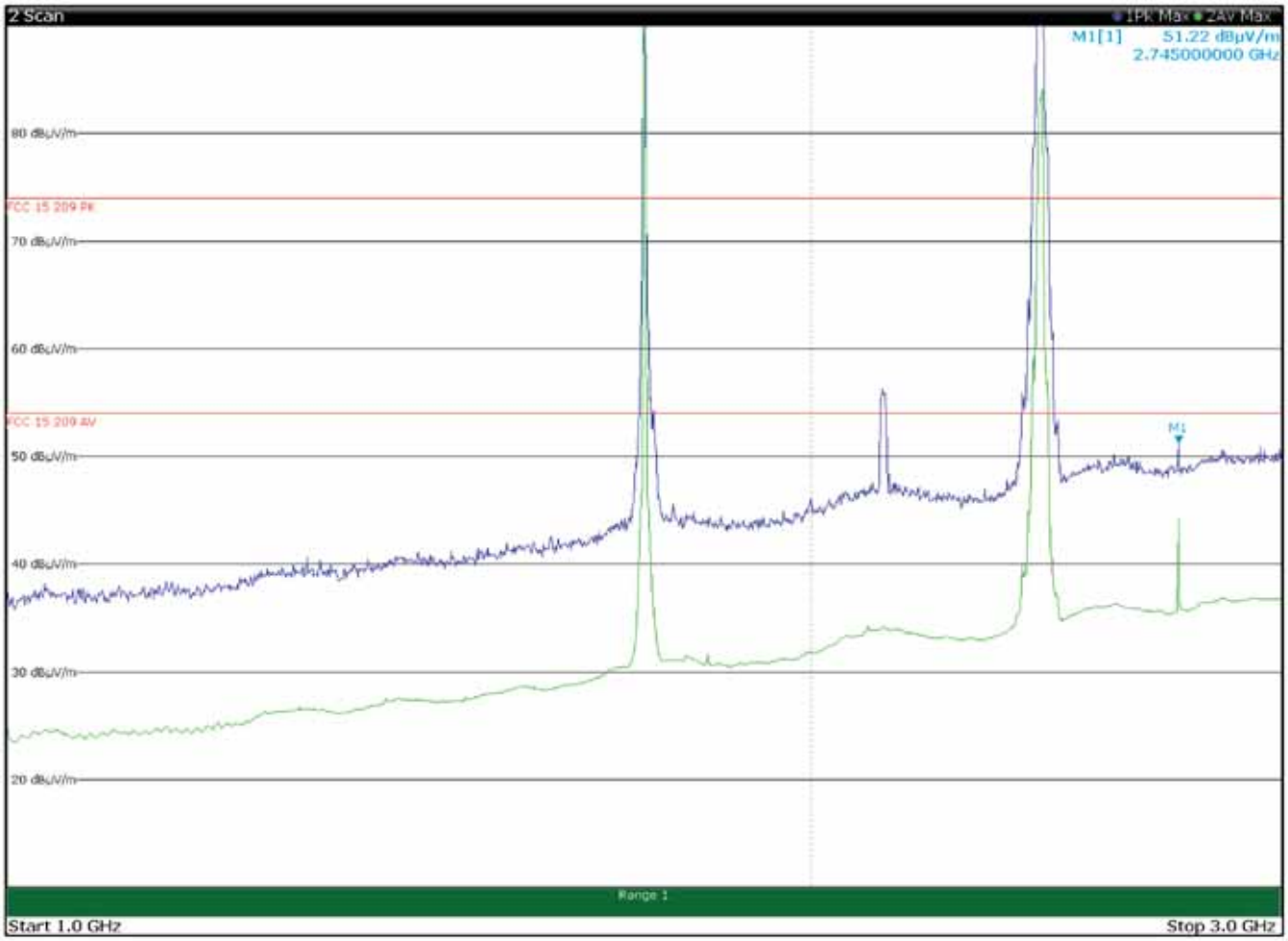


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1732.5000	111.6	--	--	Pk
1980.2000	47.1	74.0	-36.9	Pk
2437.0000	114.1	--	--	Pk

Limit exceeded by the carriers

8.1.4 Test data, continued

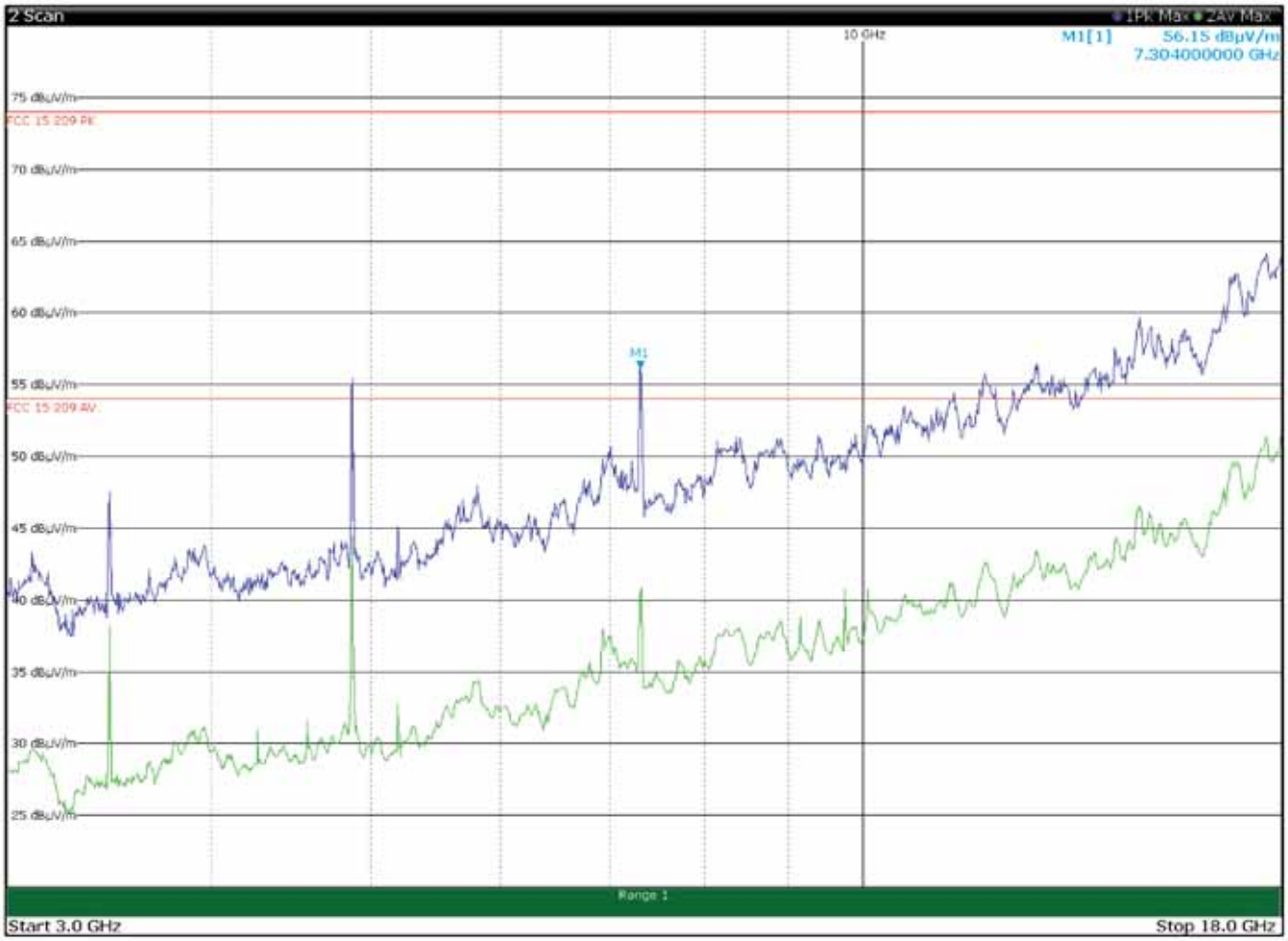


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1732.5000	111.0	--	--	Pk
2437.0000	106.8	--	--	Pk
2745.0000	51.3	74.0	-22.7	Pk
2745.0000	44.5	54.0	-9.5	Av

Limit exceeded by the carriers

8.1.4 Test data, continued



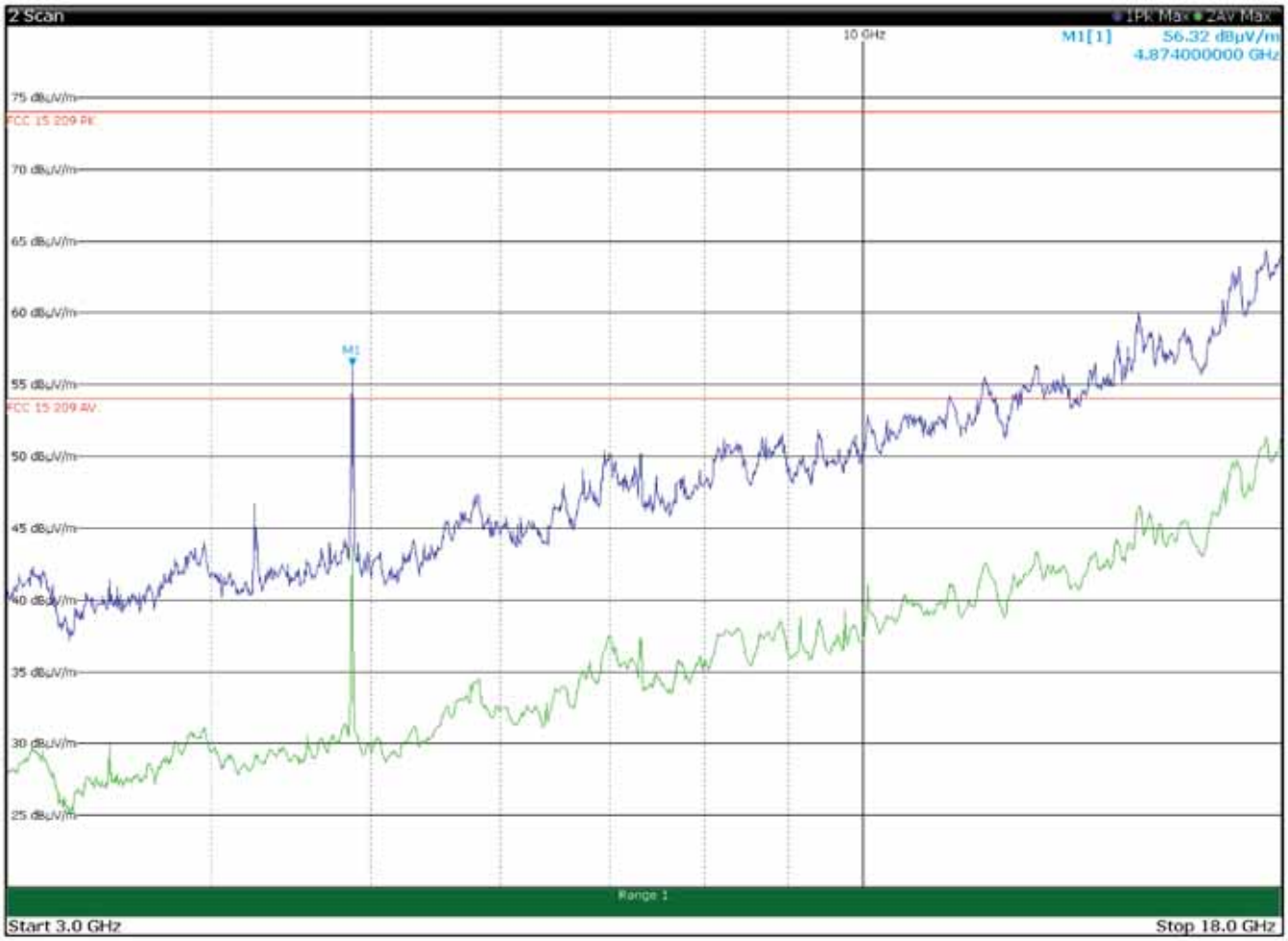
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
3465.0000	56.5	82.2	-25.7	Pk
4874.0000	55.7	74.0	-18.3	Pk
4874.0000	47.3	54.0	-6.7	Av
7309.7500	56.2	74.0	-17.8	Pk
7309.7500	47.8	54.0	-6.2	Av

The limit for FCC 27.53 is -13 dBm. Limit (dBµV/m) = limit (dBm) + 95.23 = 82.2 dBµV/m

The correction factor for the average value of pulsed emissions is 20 log (DC) = 20 log (0.38) = 8.4 dB

8.1.4 Test data, continued

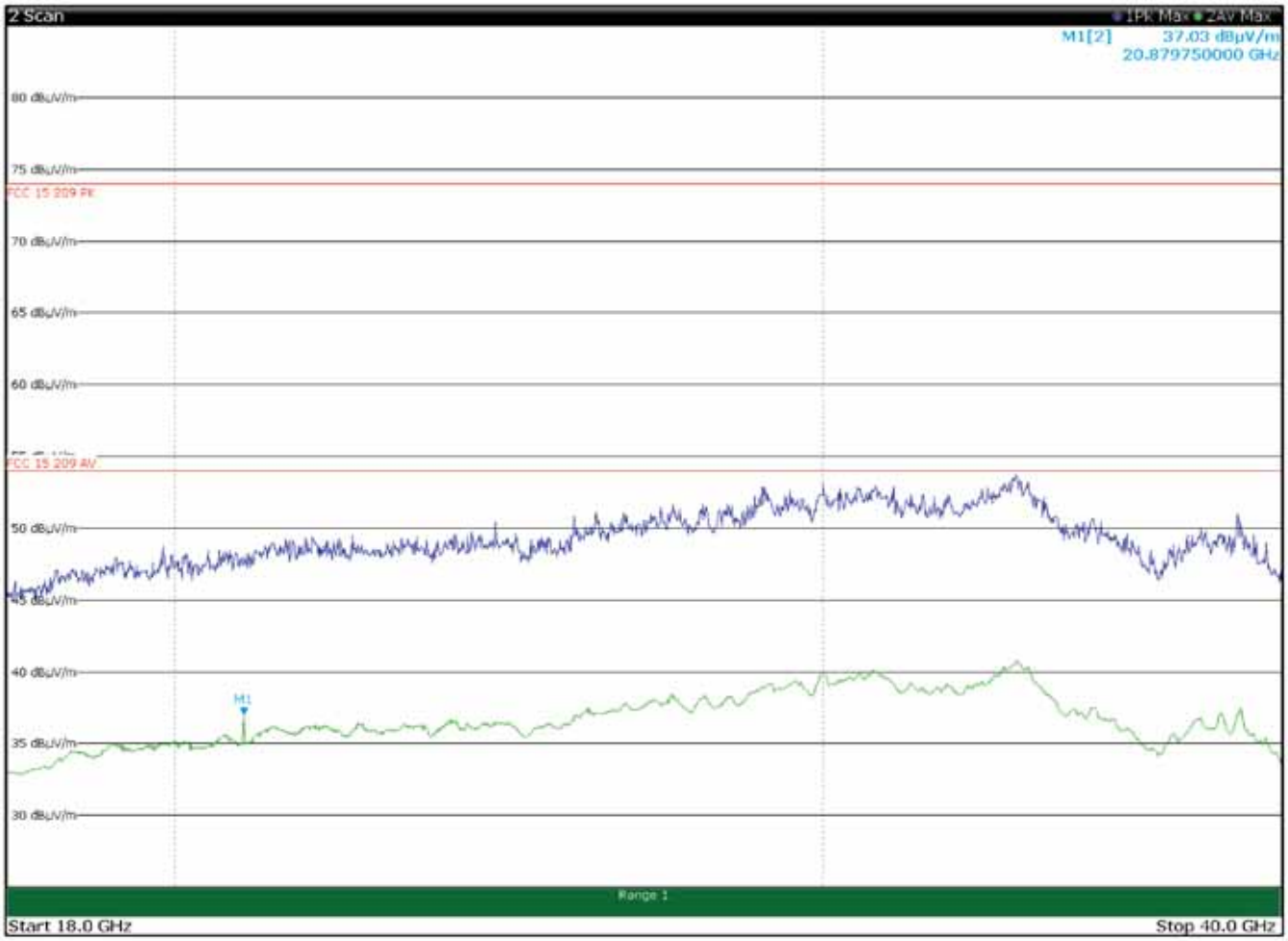


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
4874.0000	56.3	74.0	-17.7	Pk
4874.0000	47.9	54.0	-6.1	Av
7311.2500	53.9	74.0	-20.1	Pk
7311.2500	45.5	54.0	-8.5	Av

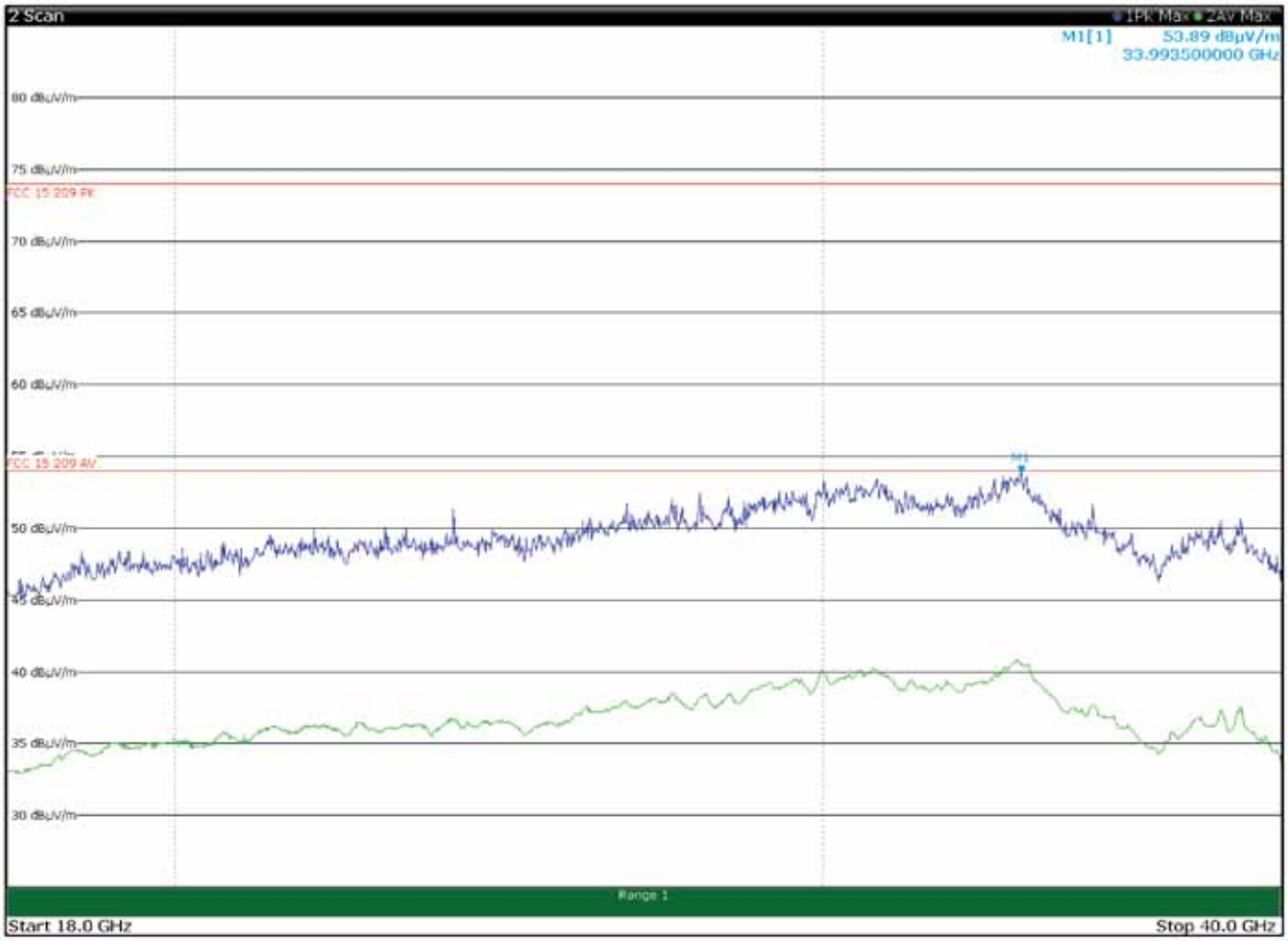
The correction factor for the average value of pulsed emissions is 20 log (DC) = 20 log (0.38) = 8.4 dB

8.1.4 Test data, continued



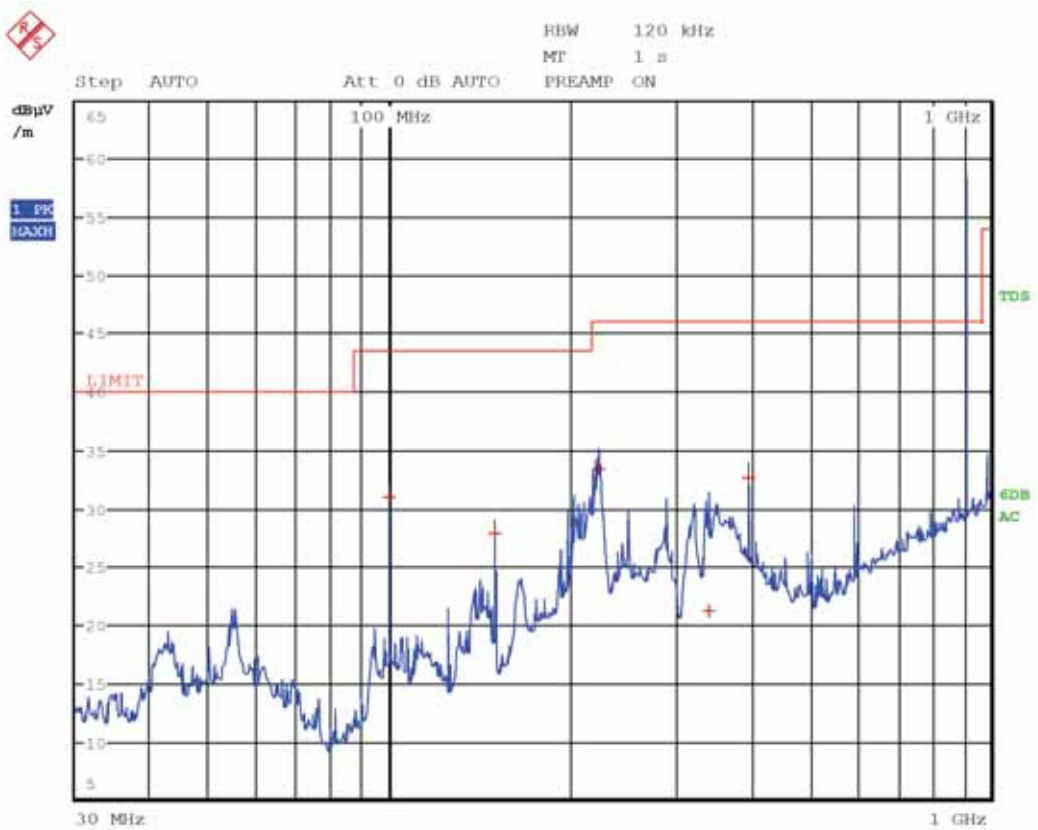
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

8.1.4 Test data, continued



Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 2437 MHz and BT Tx at 2441 MHz (antenna configuration 2)

8.1.4 Test data, continued

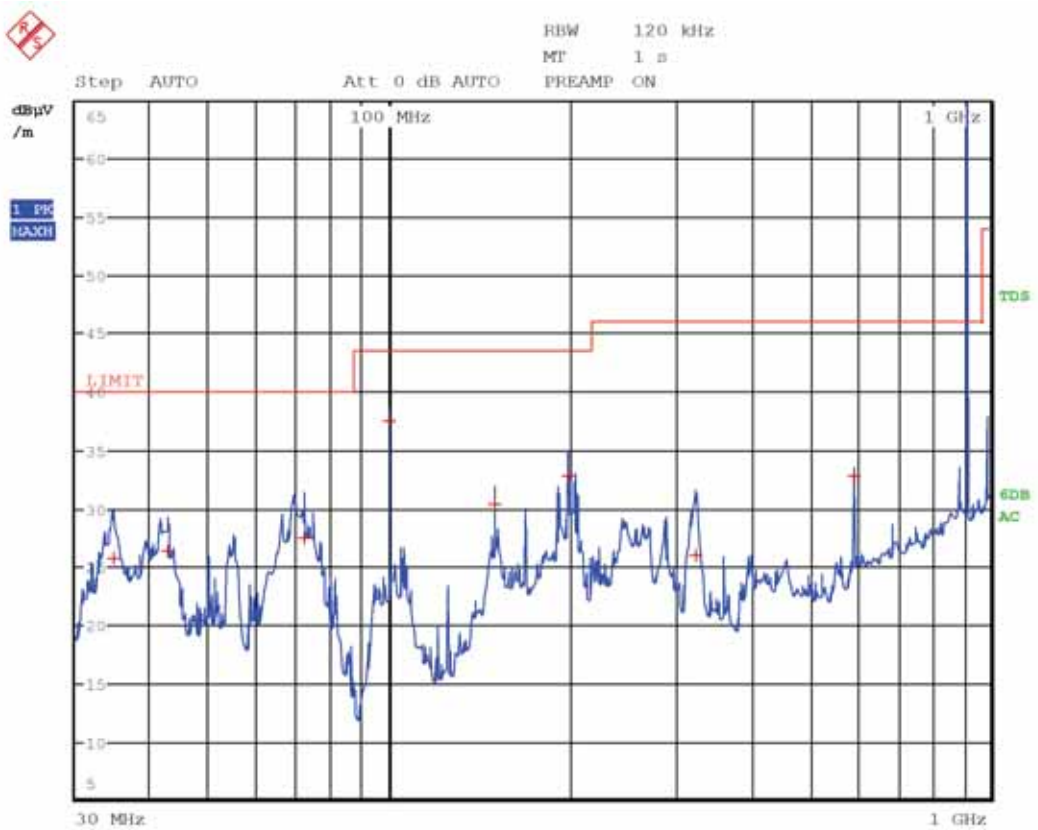


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
99.9900	31.1	43.5	-12.4	QP
150.0000	27.9	43.5	-15.6	QP
222.6900	33.5	46.0	-12.5	QP
339.5100	21.2	46.0	-24.8	QP
396.0000	32.7	46.0	-13.3	QP
915.0000	116.3	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued

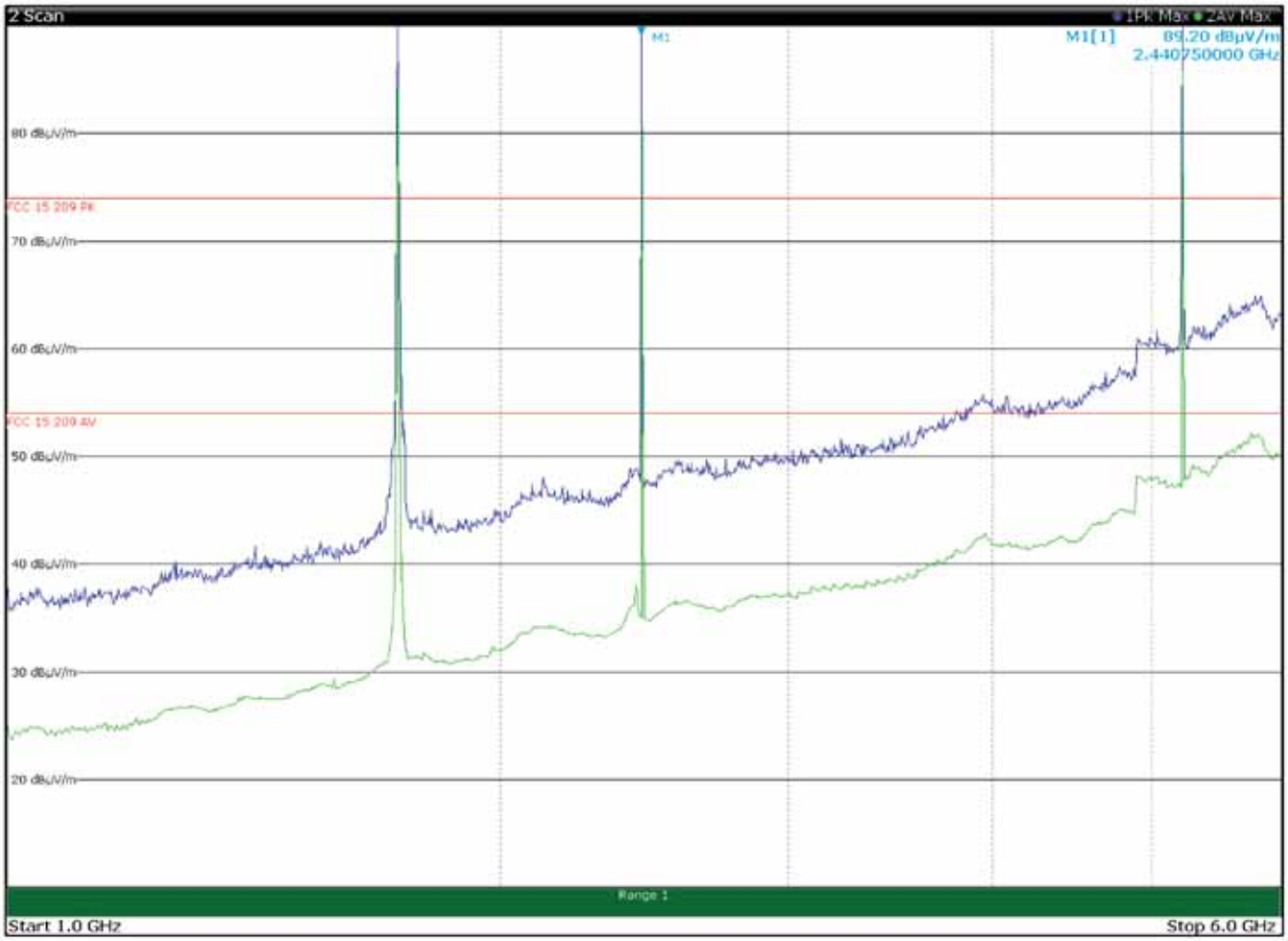


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
34.6200	25.8	40.0	-14.2	QP
42.8100	26.4	40.0	-13.6	QP
72.0300	27.5	40.0	-12.5	QP
99.9900	37.5	43.5	-6.0	QP
150.0000	30.4	43.5	-13.1	QP
198.0000	32.8	43.5	-10.7	QP
323.9400	26.0	46.0	-20.0	QP
594.0000	32.8	46.0	-13.2	QP
915.0000	127.9	--	--	PK

Limit exceeded by the carriers

8.1.4 Test data, continued

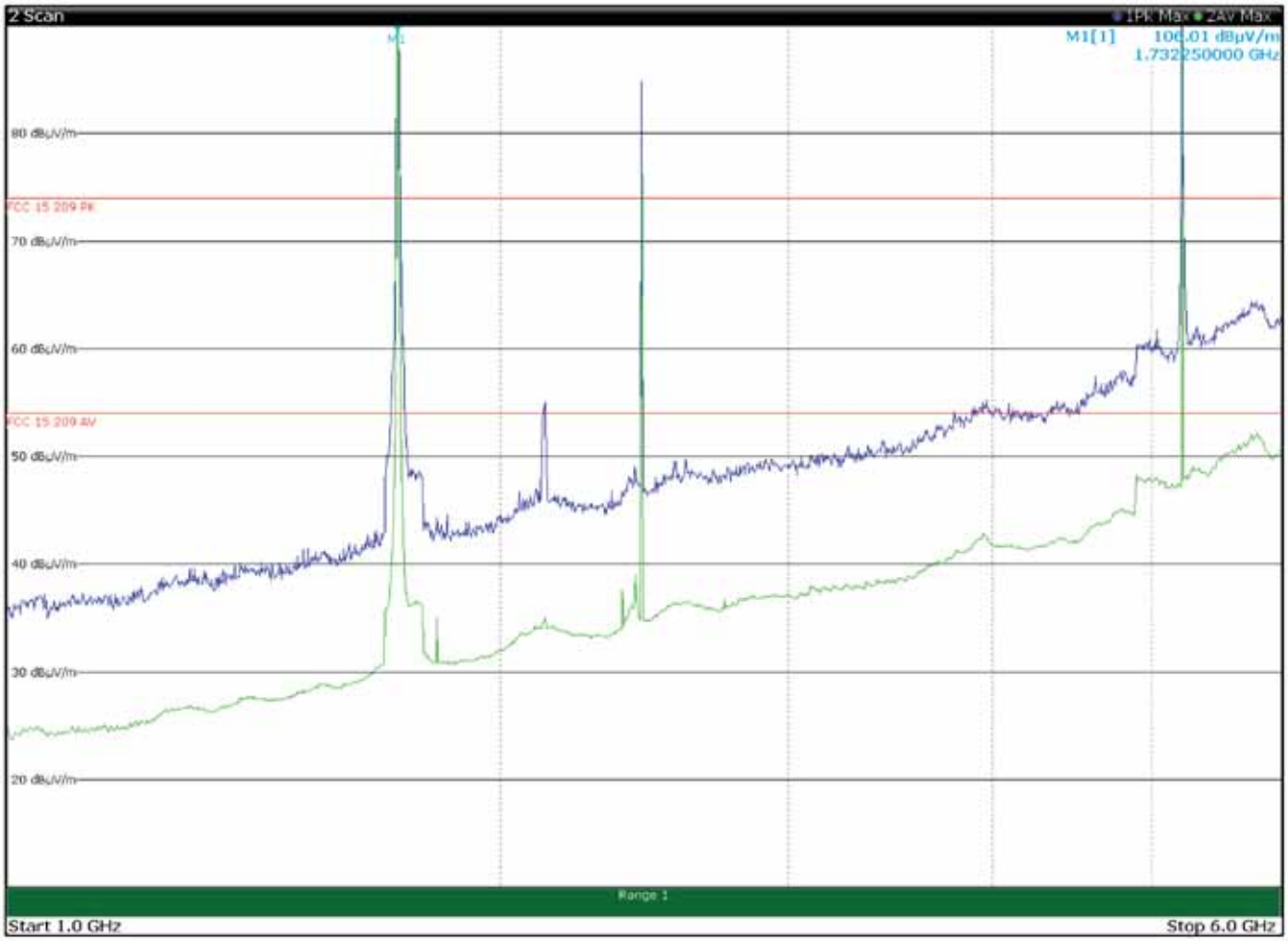


Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1732.5000	111.8	--	--	Pk
2441.0000	99.9	--	--	Pk
5220.0000	118.4	--	--	Pk

Limit exceeded by the carriers

8.1.4 Test data, continued

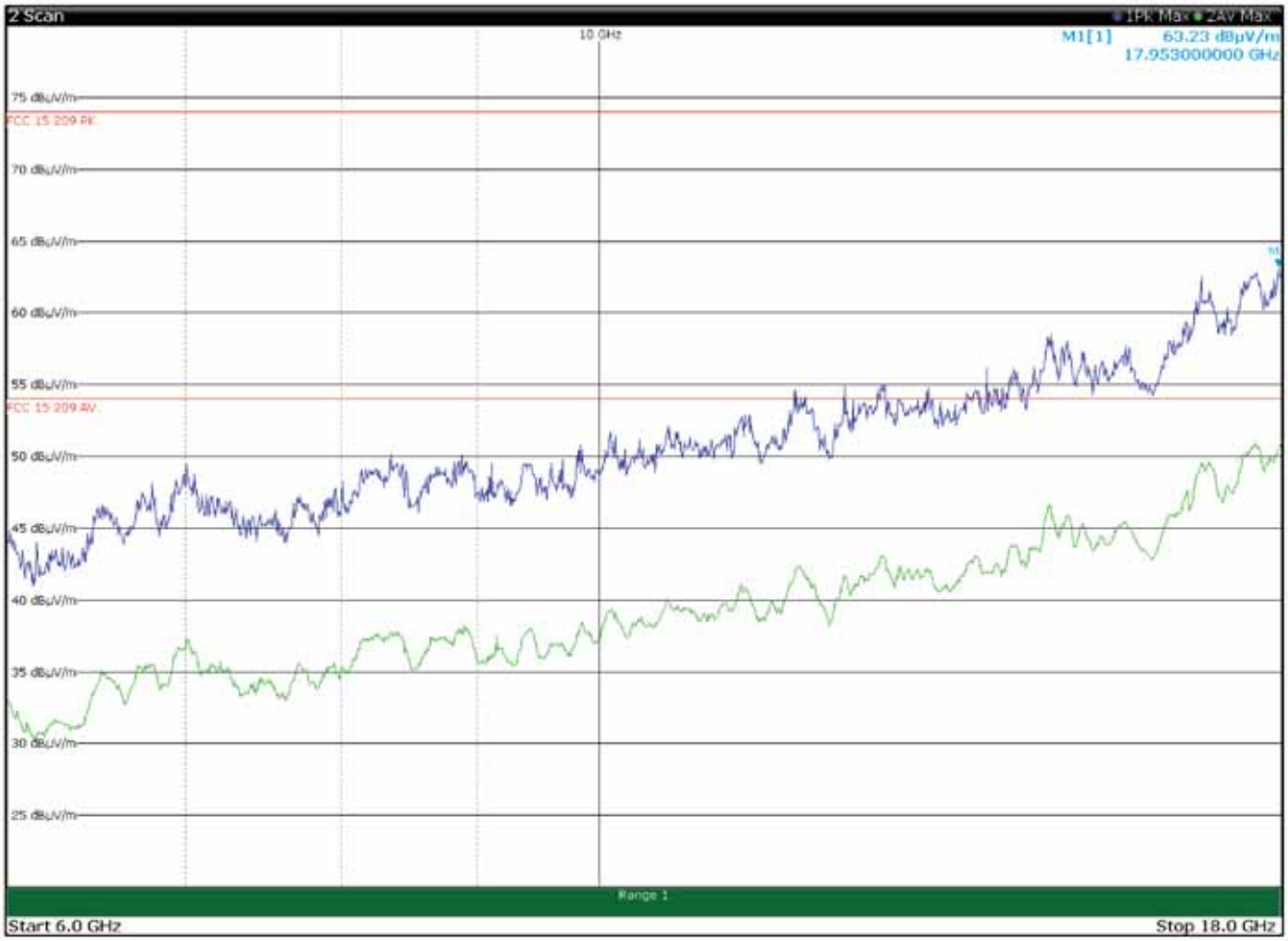


Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1732.5000	110.9	--	--	Pk
2131.0000	55.0	74.0	-19.0	Pk
2441.0000	90.3	--	--	Pk
5220.0000	107.0	--	--	Pk

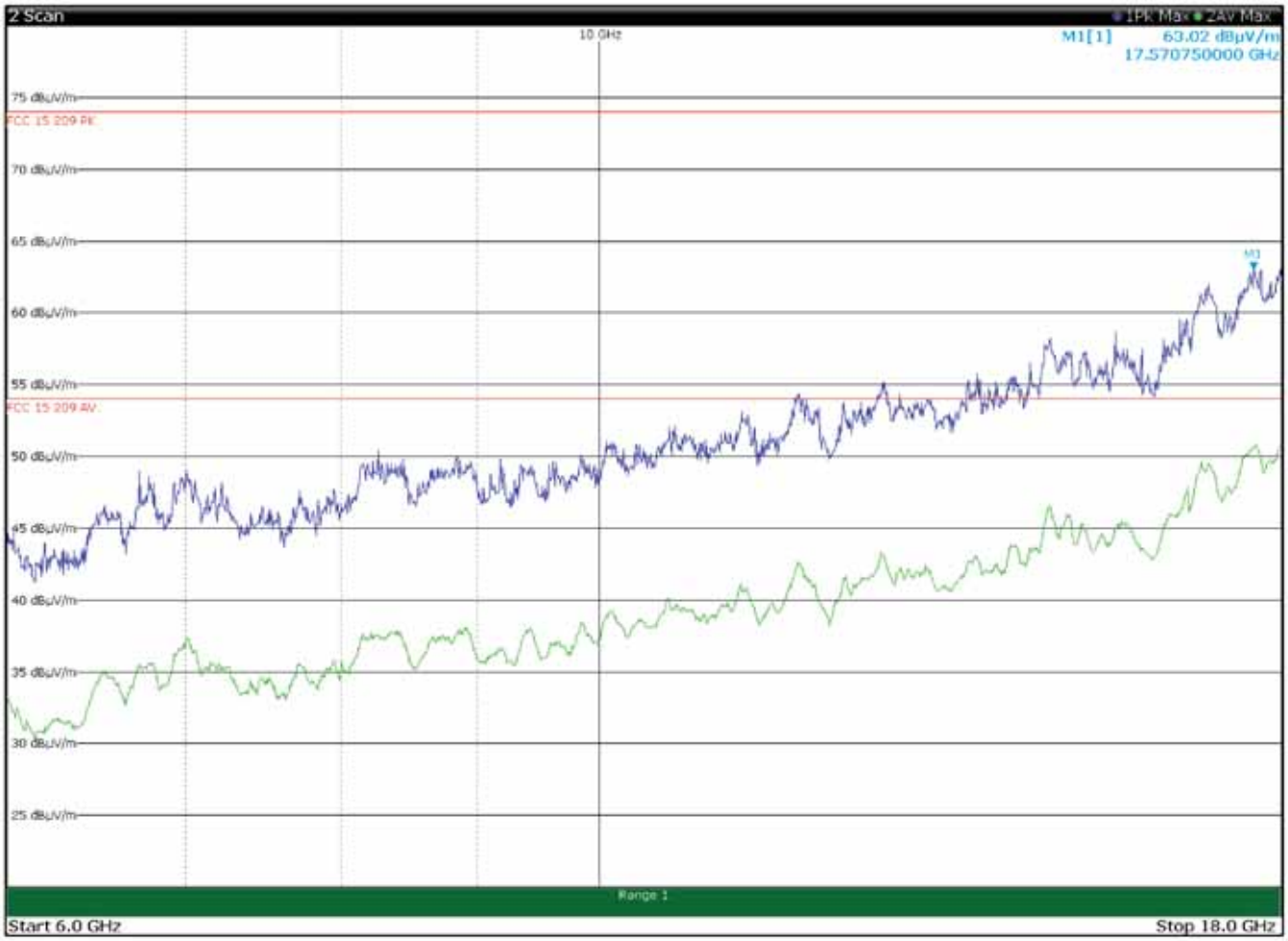
Limit exceeded by the carriers

8.1.4 Test data, continued



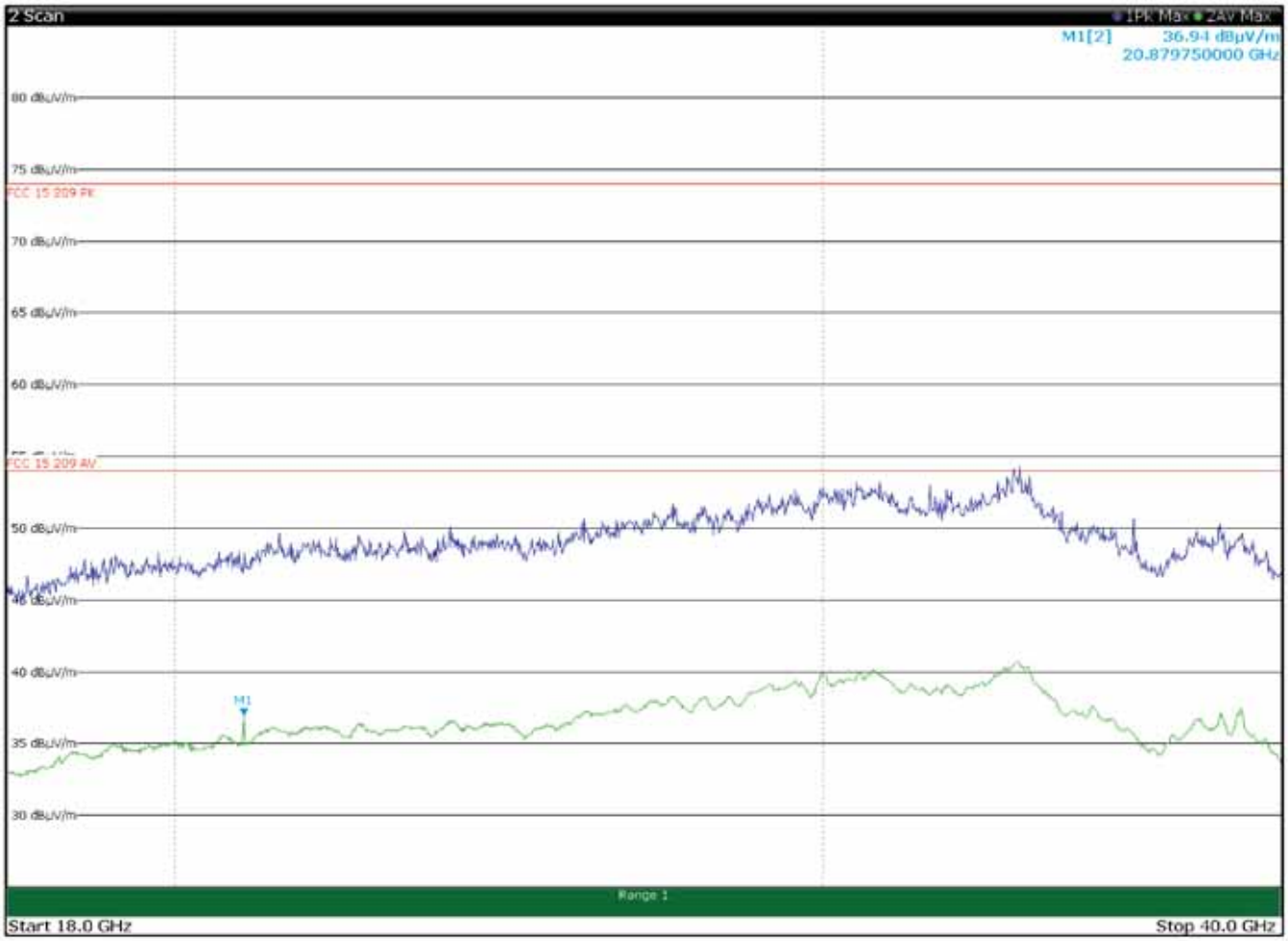
Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

8.1.4 Test data, continued



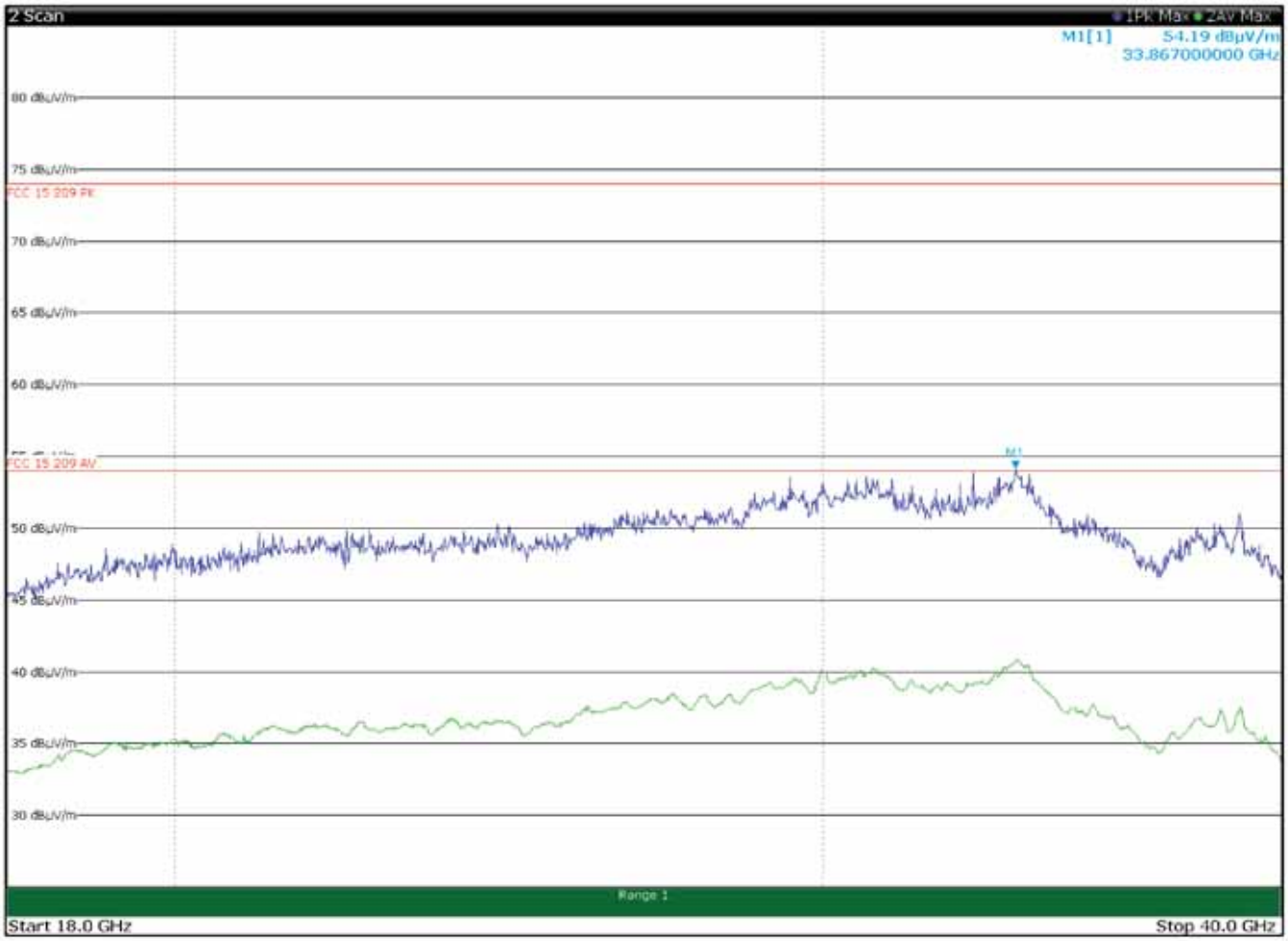
Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

8.1.4 Test data, continued



Radiated spurious emissions with antenna in horizontal polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

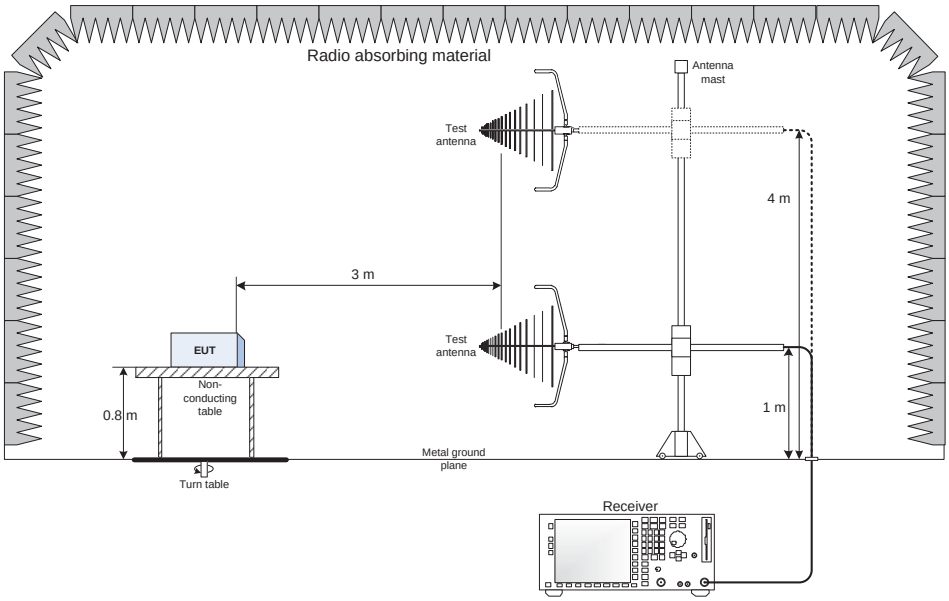
8.1.4 Test data, continued



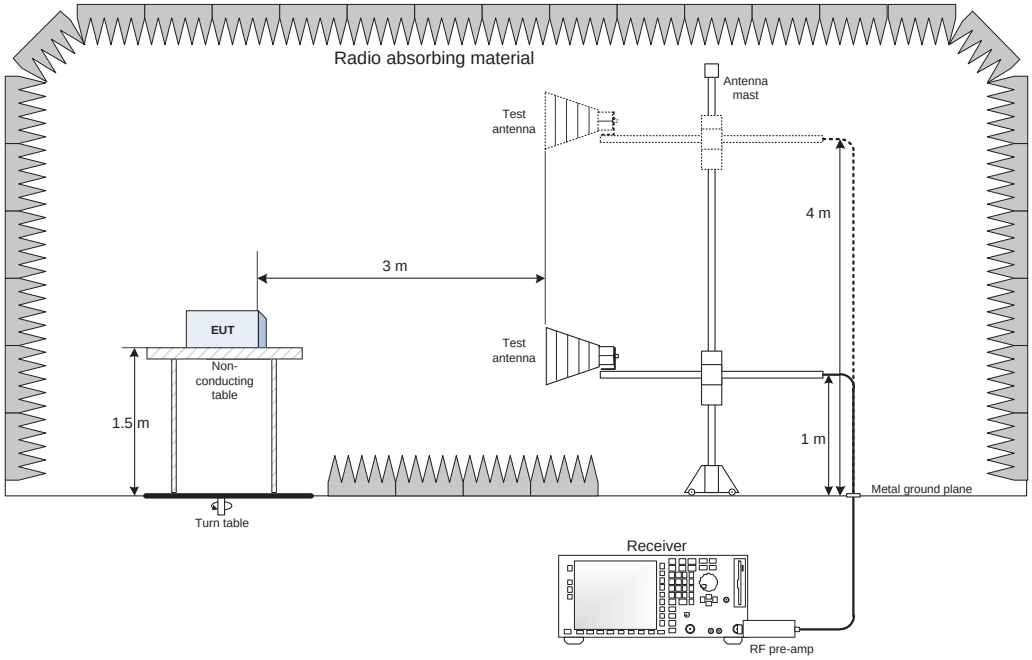
Radiated spurious emissions with antenna in vertical polarization and with
LTE Tx at 1732.5 MHz, UHF Tx at 915 MHz, WIFI Tx at 5220 MHz and BT Tx at 2441 MHz (antenna configuration 2)

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up for frequencies below 1 GHz

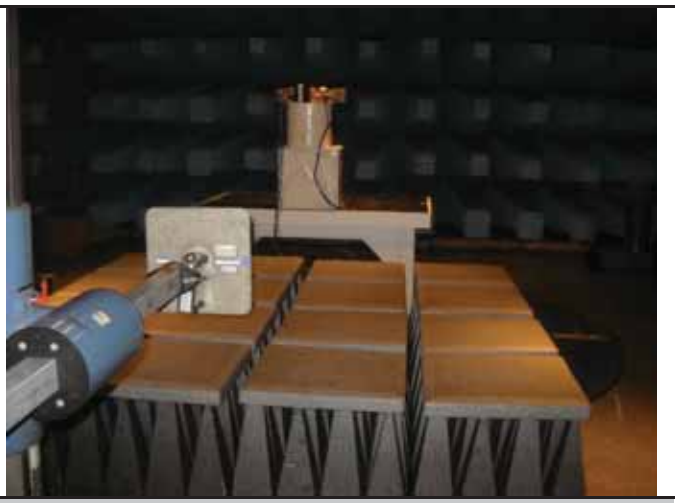


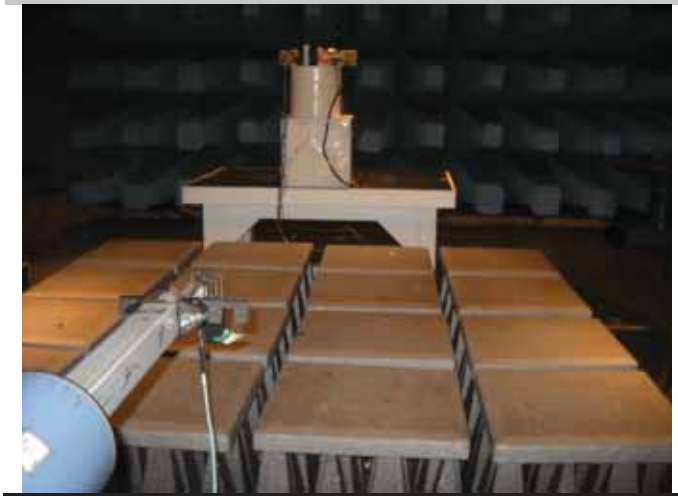
9.2 Radiated emissions set-up for frequencies above 1 GHz

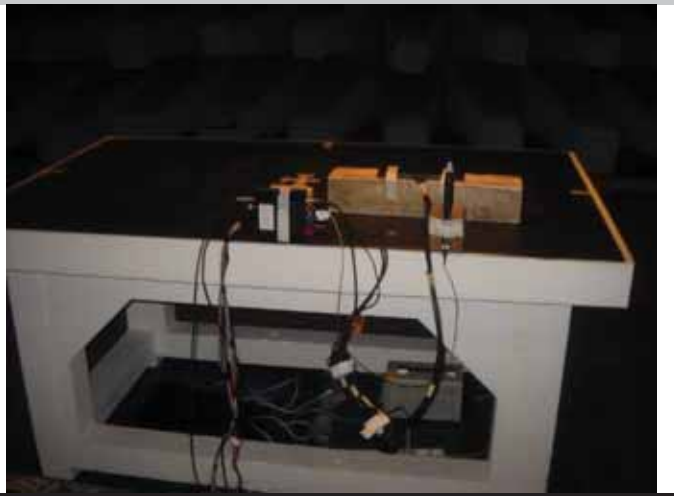


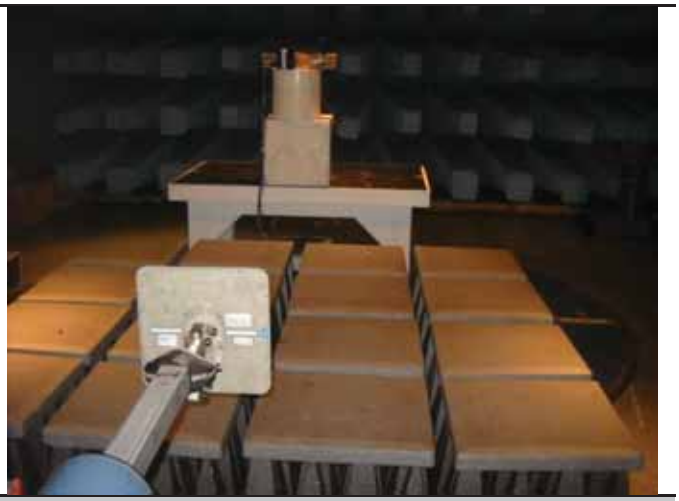
Section 10. Photos

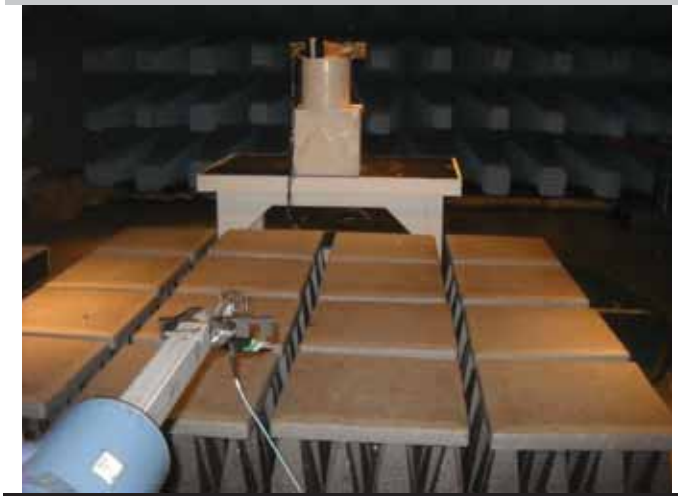
10.1 Photos of the test set-up











10.2 Photos of the EUT

CL-55 LTE VZW+RADIO (front)

CL-55 LTE VZW+RADIO (rear; with draft label)

(End of report)