FCC and IC Test report for parts
22.359, 24.238, 27.53
RSS-Gen, RSS-132, RSS-133 RSS-139,
(Transmitter spurious and conducted emissions only)

Product name : Quectel EG25-G Manager V4 2G/3G/4G

Applicant : Inter-data Europe B.V.

FCC ID : 2A9P2-EG25-G

Test report No. : P000134978 001 Ver 1.00

Laboratory information

Accreditation

Kiwa Nederland B.V. complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2017. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L248 and is granted by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

Kiwa Nederland B.V. is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Designation number is: NL0001.

Kiwa Nederland B.V. is a Wireless Device Testing laboratory recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements.
The Industry Canada company number for Kiwa Nederland B.V. is: 4173A. The CABID is NL0001.

Kiwa Nederland B.V. is a registered Conformity Assessment body (CAB) under the Japan-EC MRA (Agreement on Mutual Recognition between Japan and the European Community). The registration number is: 201.

Documentation

The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 10 years at Kiwa Nederland B.V.

Testing Location

Test Site	Kiwa Nederland B.V.
Test Site location	Wilmersdorf 50 7327 AC Apeldoorn The Netherlands Tel. +31 88998 3393
Test Site FCC	NL0001
CABID	NL0001

Revision History

Version	Date	Remarks	By
v0.50	20-01-2023	First draft	KK
v1.00	20-02-2023	Final version	KK

Table of Contents

Summary of Test results

FCC	ISED	Description	Section in report	Verdict
22.359 24.238 27.53	RSS-Gen RSS-132 RSS-133 RSS-139	Radiated spurious emissions	3.1	Pass
15.207 (c)	RSS-Gen 8.8	Conducted spurious emissions on AC mains	3.2	Pass

1 General Description

1.1 Applicant

Client name:	Inter-data Europe B.V.
Address:	Wanraaij 4, Andelst, Netherlands
Zip code:	6673 DN
Telephone:	+31617518580
E-mail:	d.bouwens@inter-data.eu
Contact name:	Daniel Bouwens

1.2 Manufacturer

Manufacturer name:	Inter-data Europe B.V.
Address:	Wanraaij 4, Andelst, Netherlands
Zip code:	6673 DN
Telephone:	+31617518580
E-mail:	d.bouwens@inter-data.eu
Contact name:	Daniel Bouwens

1.3 Tested Equipment Under Test (EUT)

Product name:	Quectel EG25-G Manager V4 2G/3G/4G
Brand name:	Inter-data Europe B.V.
FCC ID:	2A9P2-EG25-G
Product description:	GNSS hardware with the option to write own scripts and control all peripherals including CANbus
Variant Model(s):	Quectel EG25-G FM03 2G/3G/4G
Batch and/or serial No.	-
Software version:	-
Hardware version:	XG3740 / XG3764
Date of receipt:	05-09-2022
Tests started:	07-09-2022
Testing ended:	11-11-2022

1.4 Product specifications of Equipment under test

Tx Frequency:	GSM: 850, 1900 WCDMA: B2, B5 LTE: B2, B5
Rx frequency:	GSM: 850, 1900 WCDMA: B2, B5 LTE: B2, B5
Antenna type:	PCB antenna
Antenna gain:	GSM: 3dBi, 6dBi WCDMA: 3dBi, 6dBi LTE: 3dBi, 6dBi
Type of modulation:	According to GSM/WCDMA/LTE
Emission designator	-

1.5 Environmental conditions

Test date	07-11-2022
Ambient temperature	19.5 C°
Humidity	54.3 %

1.6 Measurement standards

- ANSI C63.26: 2015
- ANSI C63.10: 2013

1.7 Applicable standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 22 Subpart C
- FCC Part 24 Subpart C
- FCC Part 27 Subpart C
- FCC Part 15 Subpart C
- RSS-Gen Issue 5
- RSS-132 Issue 3
- RSS-133 Issue 6, A1
- RSS-139 Issue 3

1.8 Observation and remarks

The EUT contains a pre-certified cellular module, so only radiated spurious emissions and conducted emissions are tested. Tests are performed on a representative selection of operating frequency bands. EUT is DC powered device.

1.9 Conclusions

The sample of the product showed **NO NON-COMPLIANCES** to the specifications stated in paragraph 1.7 of this report.

The results of the test as stated in this report, are exclusively applicable to the product items as identified in this report. Telefication accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.7 *"Applicable standards".*

All conducted tests are performed by:

Name : Koray Korcum, MSc

Review of test methods and report by:

Name : ing. R. van Barneveld

The above conclusions have been verified by the following signatory:

Date : 24-02-2023

Name : ing. R. van Barneveld

Function : Test Engineer

Signature :

2 Test configuration of the Equipment Under Test

2.1 Test mode

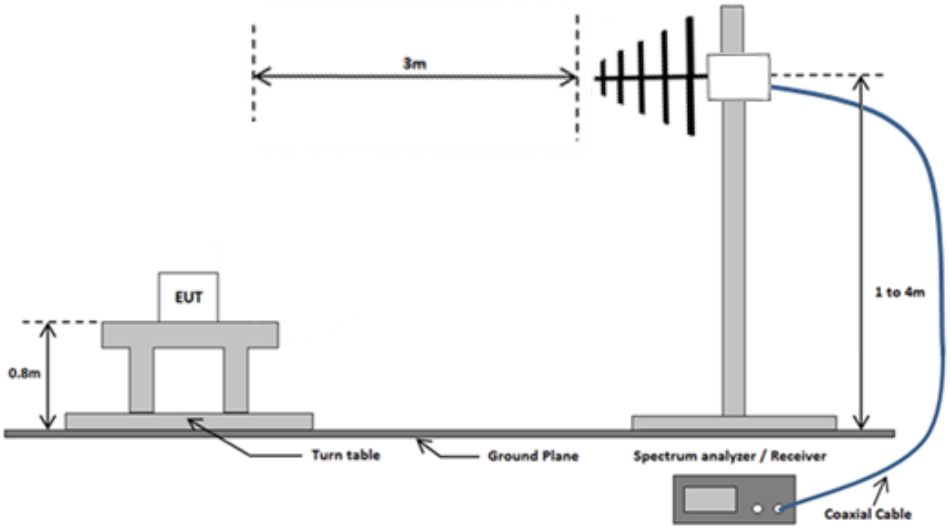
The equipment is configured with AT commands which keeps the transmitter continuously active and transmitting during testing.

Tested channels/bands

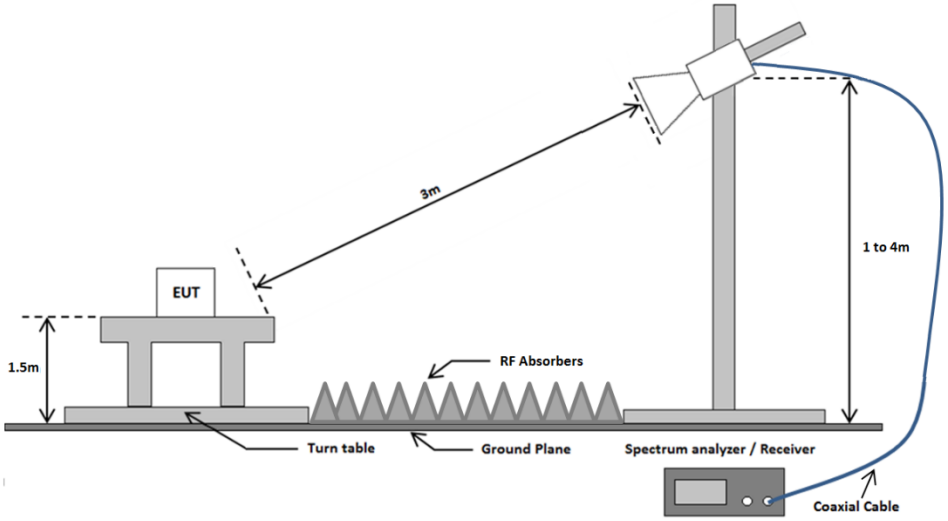
Technology	Band	Uplink Frequency range (MHz)
GSM	850	824.2 – 848.8
	1900	1850.2 – 1909.8
WCDMA	Band 2	1850 – 1910
	Band 5	824 – 849
LTE	Band 2	1850 – 1910
	Band 5	824 – 849

2.2 Test setups

Radiated emissions test setup 30 MHz - 1 GHz

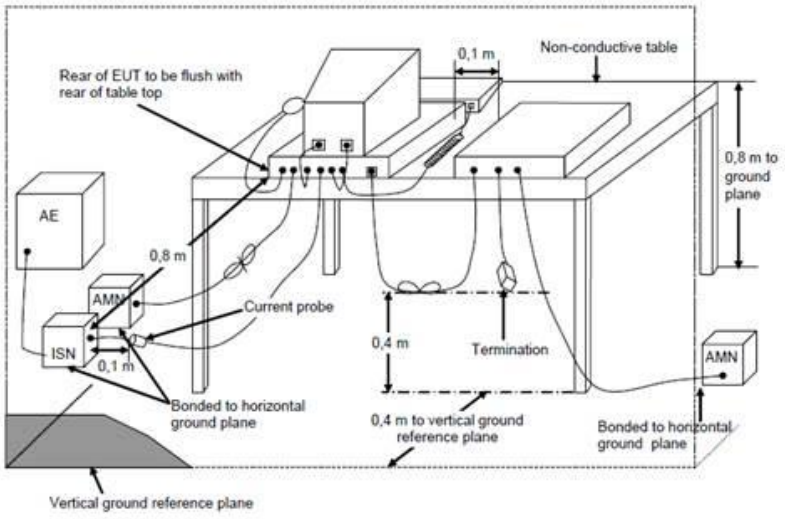


Radiated emissions test setup above 1 GHz



Conducted emissions test setup

Emissions test at AC mains



2.3 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Cal. Done date	Cal. due date	Used at Par.
Spectrum analyzer	Rohde & Schwarz	FSP40	114792	03-2022	03-2022	3.1
Measurement receiver	Rohde & Schwarz	ESR7	114534	01-2022	01-2023	3.1, 3.2
Log periodic Antenna	EMCO	3147	114385	02-2021	02-2026	3.1
Biconical Antenna	Seibersdorf laboratories	BBA 9106	114436	03-2021	03-2026	3.1
Horn antenna	EMCO	3115	114607	01-2021	01-2024	3.1
Preamplifier 1-18 GHz	µComp Nordic	MCNA-40-0010800-25-10P	114690	01-2022	01-2023	3.1
Preamplifier 18-40 GHz	Miteq	JS4-18004000-33-8P	114693	01-2022	01-2023	3.1
Horn antenna	Flann Microwave	20240-25	114607	NA*	NA*	3.1
Test software	DARE	Radimation Version 2021.2.7	--	--	--	3.1, 3.2
Two line V-network	Rohde & Schwarz	ENV 216	114379	07-2021	07-2023	3.2

*Note: Standard gain horn antennas do not need calibration

2.4 Sample calculations

All formulas for data conversions and conversion factors are reported in chapter 4 of this test report.

3 Test results

3.1 Radiated spurious emissions

3.1.1 Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB
P = 23 dBm = 0.2 W

$$limit = 23\ dBm - [43 + 10 * \log_{10}(0.2)]dB = -13\ dBm$$

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.1.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.1.4 Test procedure

30 MHz to 26.5 GHz: According to ANSI C63.10-2013

30 MHz to 1 GHz: IRN 026 – Method 1
1 GHz to 18 GHz: IRN 026 – Method 2
18 to 26.5 GHz: IRN 026 – Method 3

3.1.5 Measurement Uncertainty

Frequency range	Polarization	Uncertainty
30 – 200 MHz	Horizontal	±4.5 dB
	Vertical	±5.4 dB
200 -1000 MHz	Horizontal	±3.6 dB
	Vertical	±4.6 dB
1 – 18 GHz	Horizontal	±5.7 dB
	Vertical	±5.7 dB
18 – 26.5 GHz	Horizontal	±4.9 dB
	Vertical	±4.9 dB

3.1.6 Peak tables of the radiated spurious emissions measurement

Frequency	Peak	Peak Limit	Status	Angle	Height	Polarization
32,998 MHz	35,8 dBµV/m	82,2 dBµV/m	Pass	68 degrees	1 m	Vertical

Frequency	Peak	Peak Limit	Status	Angle	Height	Polarization
256,094 MHz	29,8 dBµV/m	46 dBµV/m	Pass	294 degrees	1,5 m	Horizontal
314,875 MHz	31,7 dBµV/m	46 dBµV/m	Pass	136 degrees	1 m	Horizontal

Frequency	Peak	Peak Limit	Average	Average Limit	Status	Angle	Height	Polarization
19,274 GHz	52,8 dBµV/m	74 dBµV/m	42,2 dBµV/m	54 dBµV/m	Pass	325 degrees	1 m	Horizontal

Frequency	Peak	Peak Limit	Average	Average Limit	Status	Angle	Height	Polarization
1,485 GHz	31,7 dBµV/m	74 dBµV/m	18,6 dBµV/m	54 dBµV/m	Pass	0 degrees	1 m	Horizontal
1,731 GHz	41 dBµV/m	74 dBµV/m	23,9 dBµV/m	54 dBµV/m	Pass	275 degrees	1 m	Horizontal

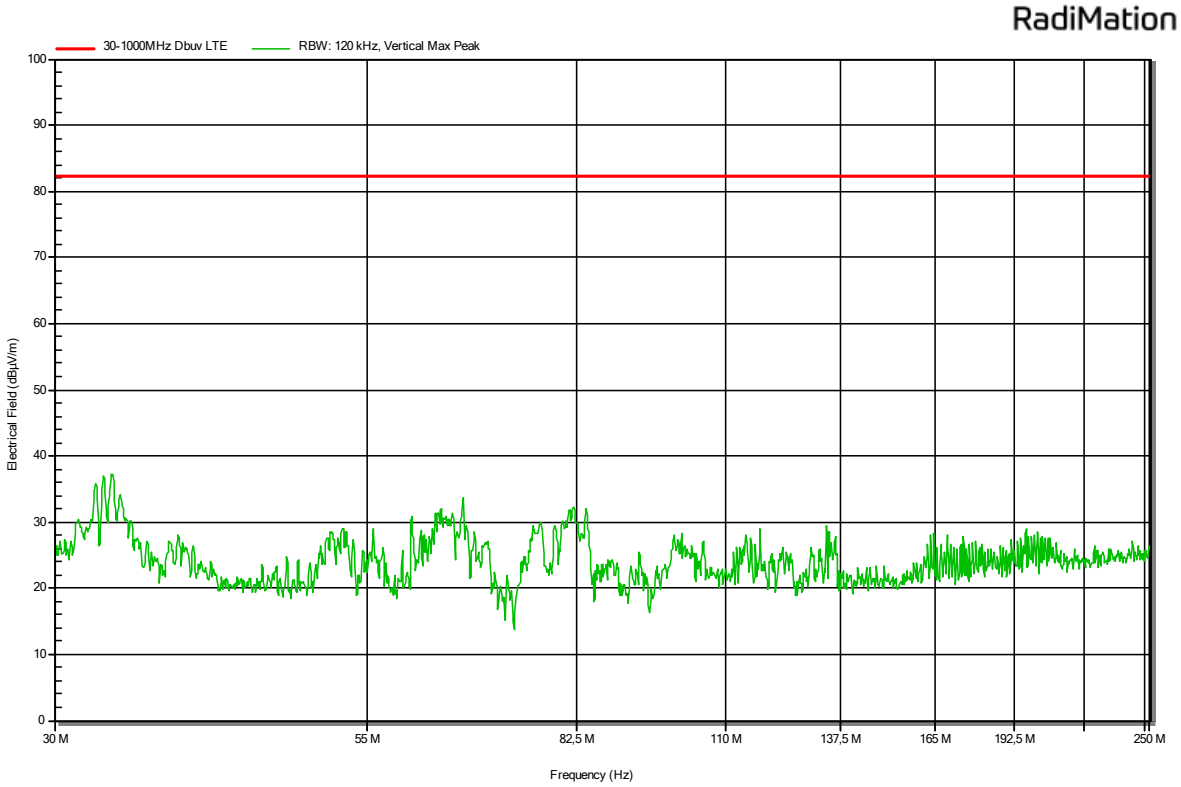
Frequency	Peak	Peak Limit	Average	Average Limit	Status	Angle	Height	Polarization
1,731 GHz	46 dBµV/m	74 dBµV/m	29,9 dBµV/m	54 dBµV/m	Pass	29 degrees	2 m	Vertical

3.1.7 Plots of the Radiated Spurious Emissions Measurement (GSM)

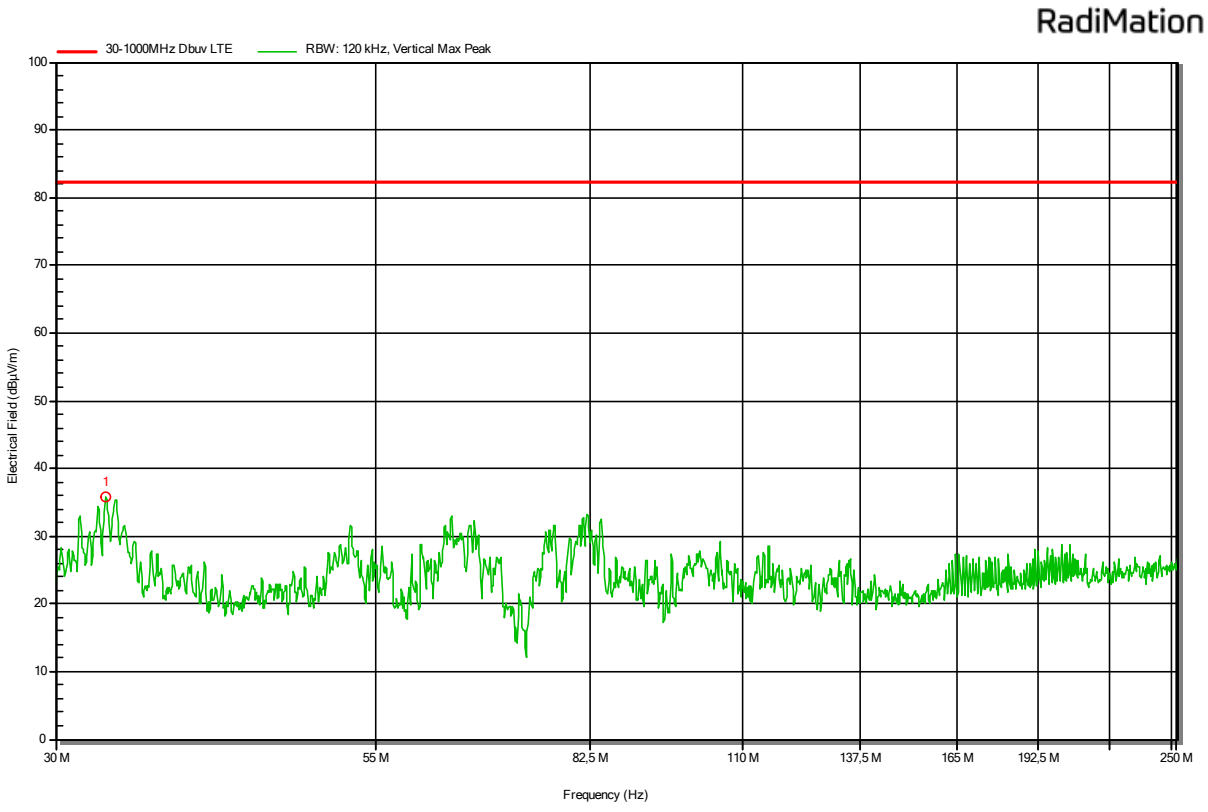
30 -250 MHz

Vertical polarization

GSM 850

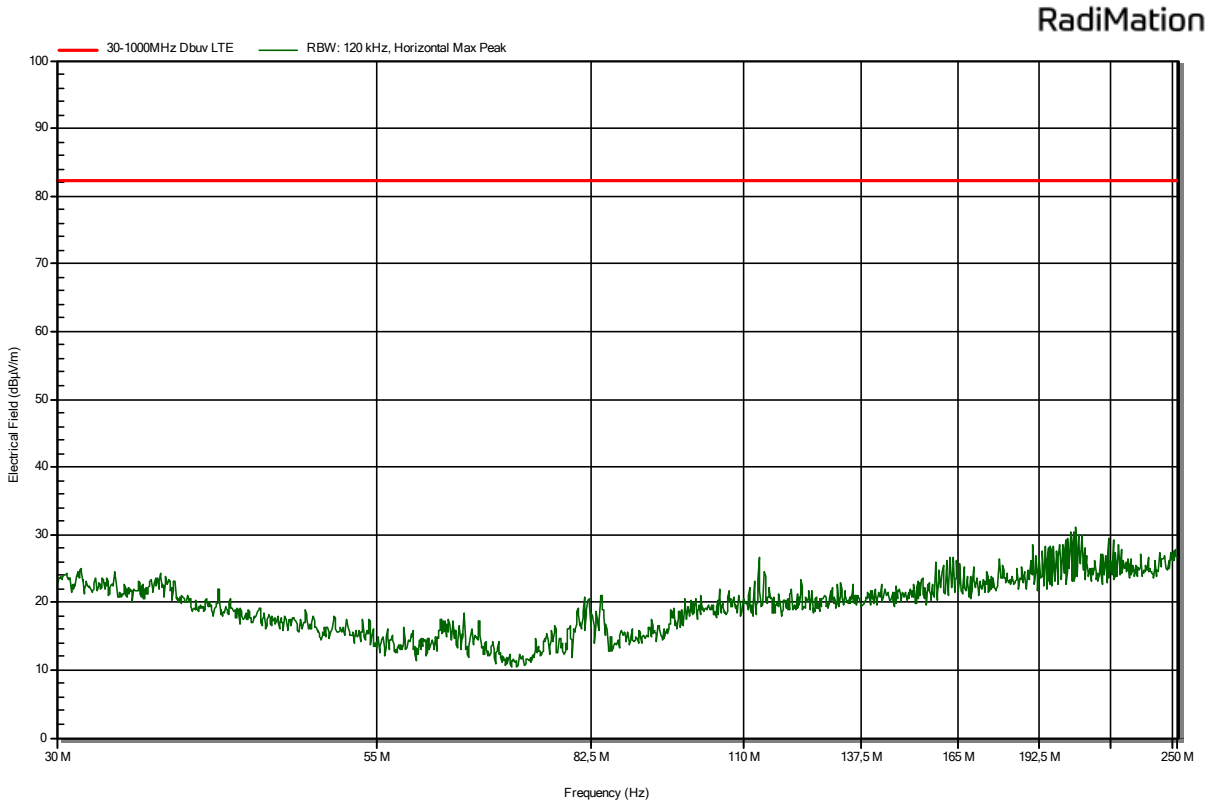


GSM 1900

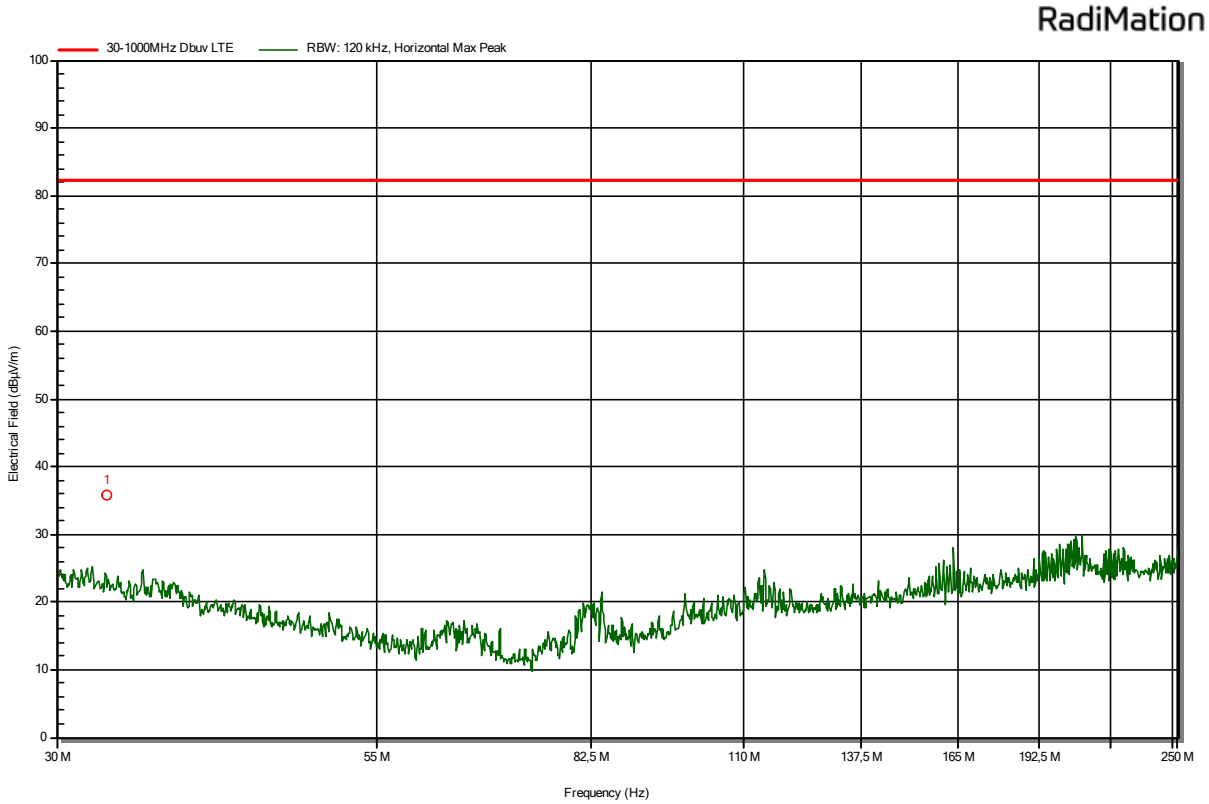


Horizontal polarization

GSM 850



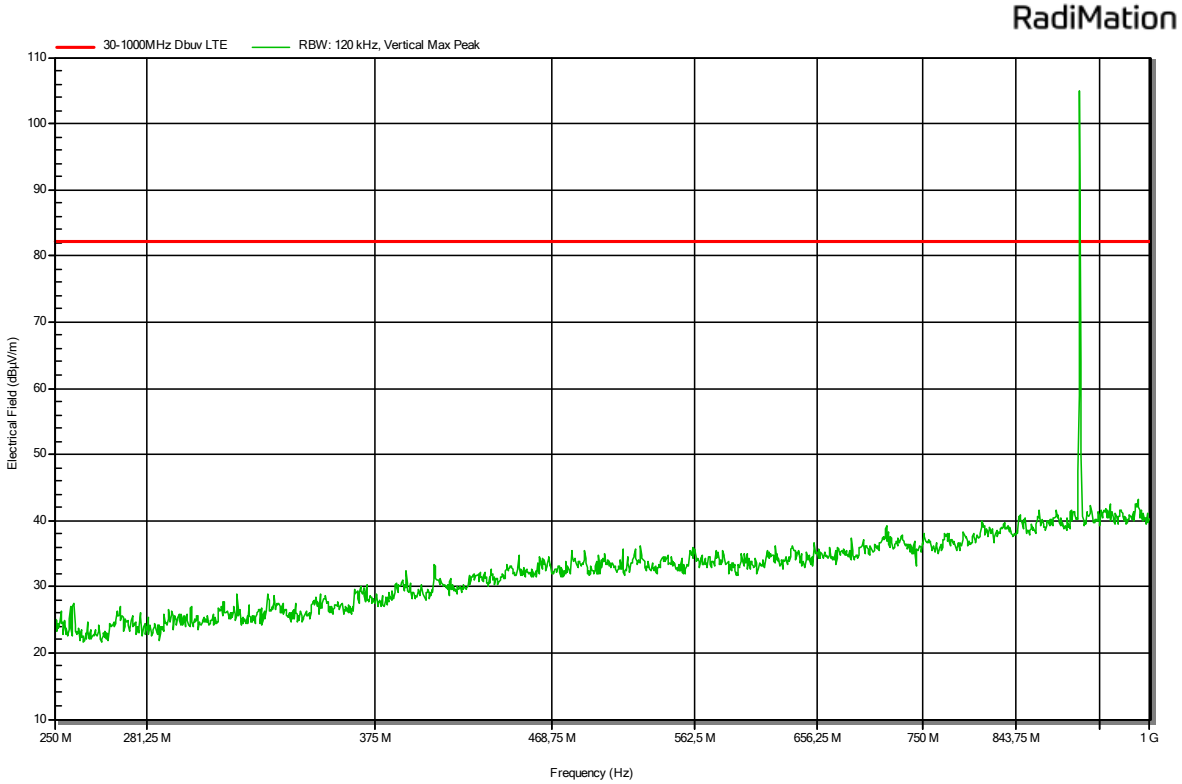
GSM 1900



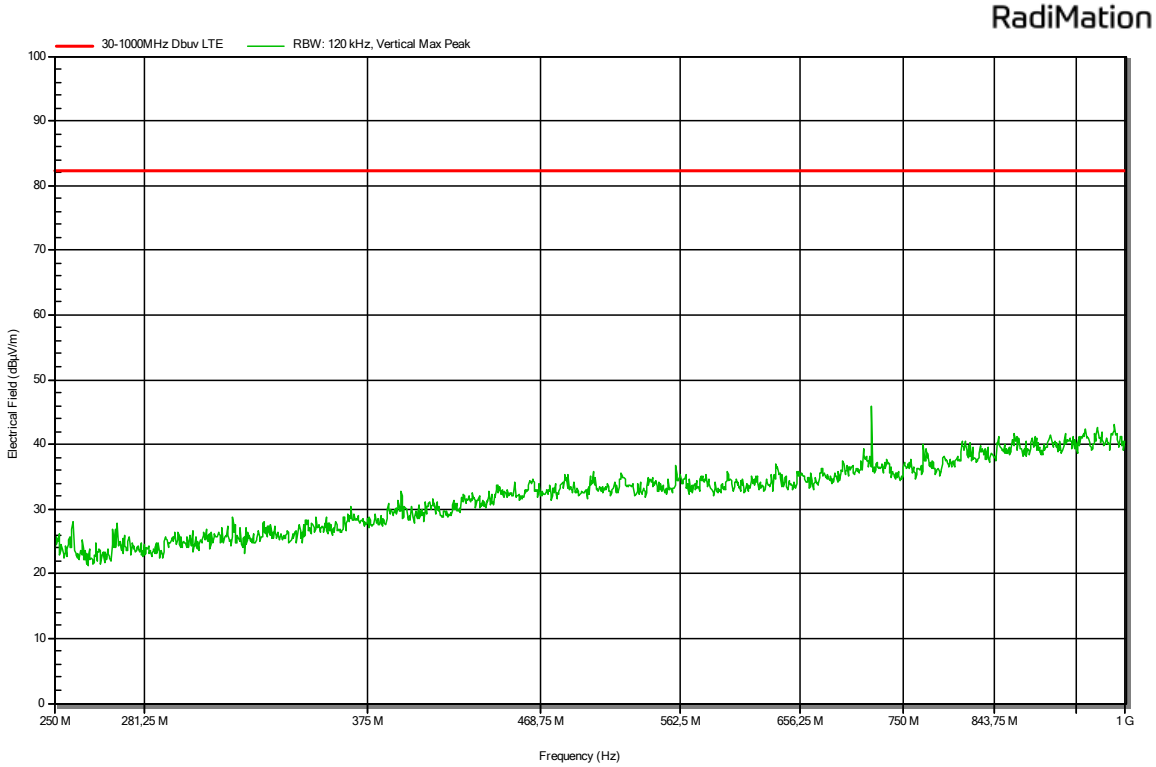
250 – 1000 MHz

Vertical polarization

GSM 850



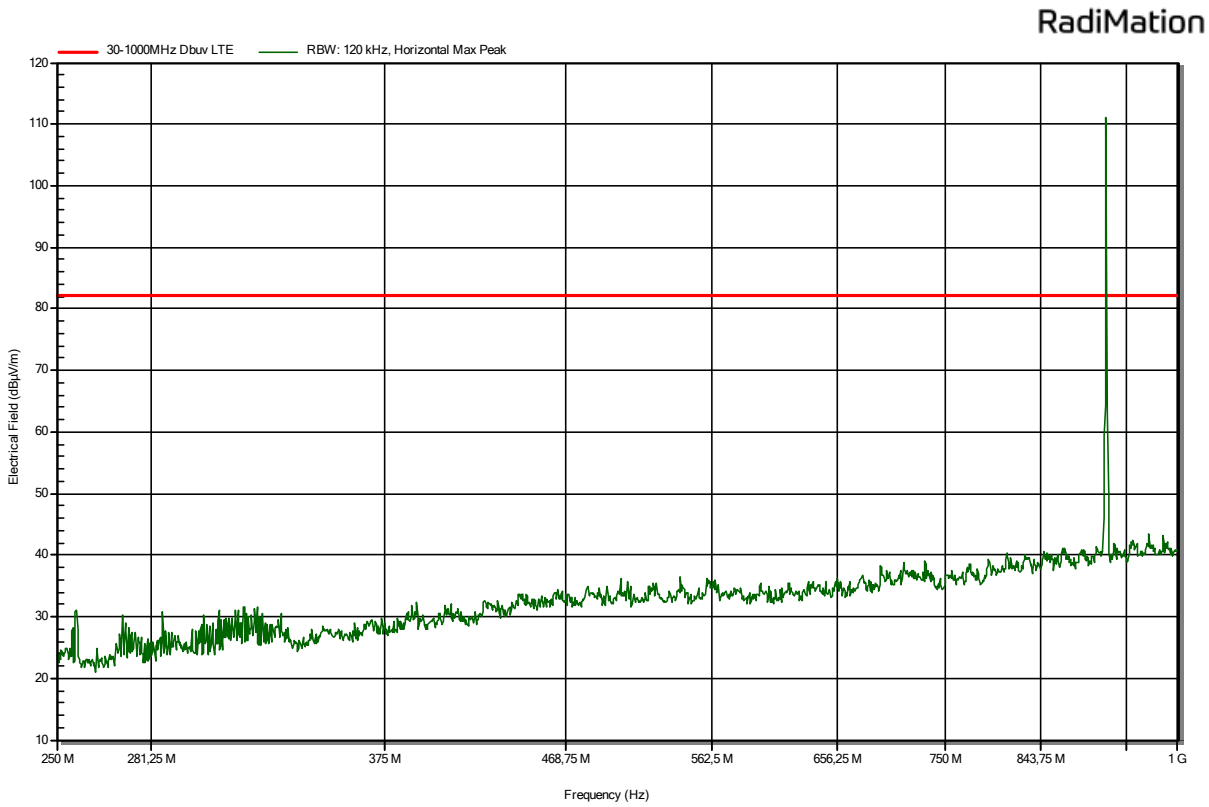
GSM 1900



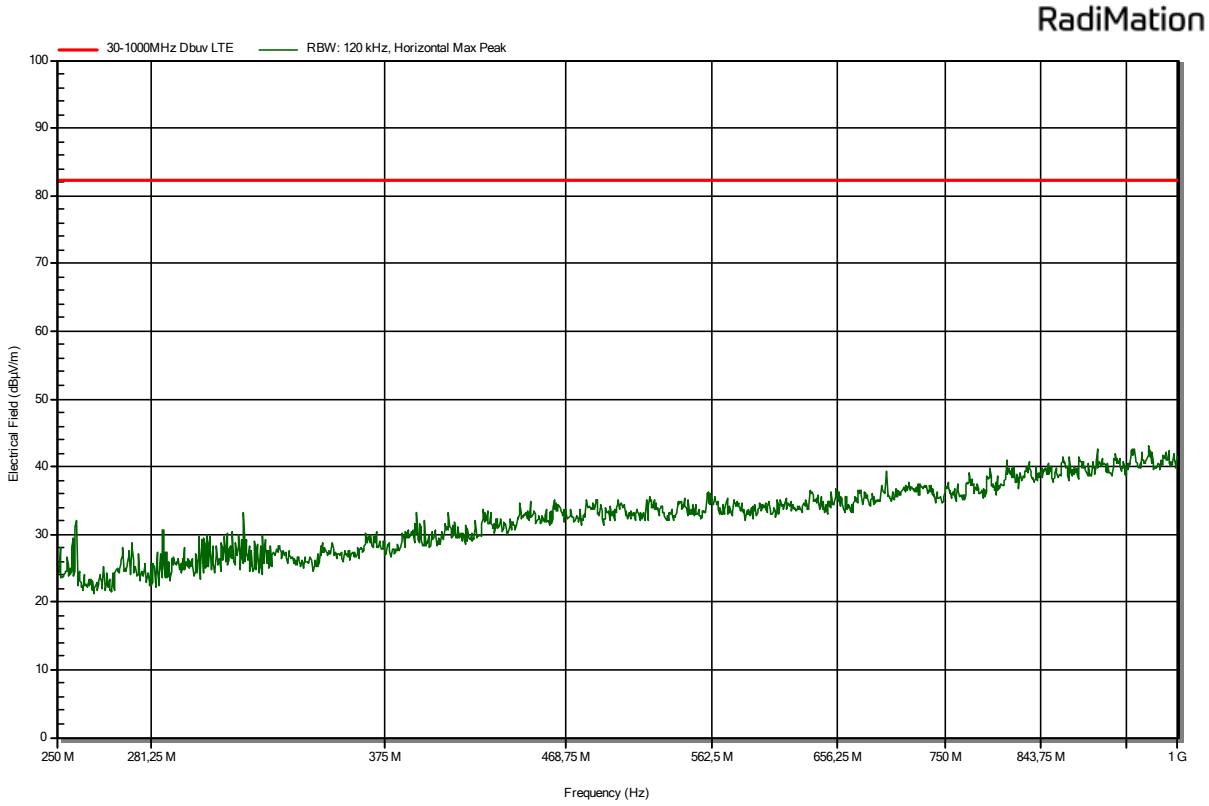
Note: The peak seen in the plot above is the transmission frequencies and therefore not subject to the spurious limit.

Horizontal polarization

GSM 850



GSM 1900

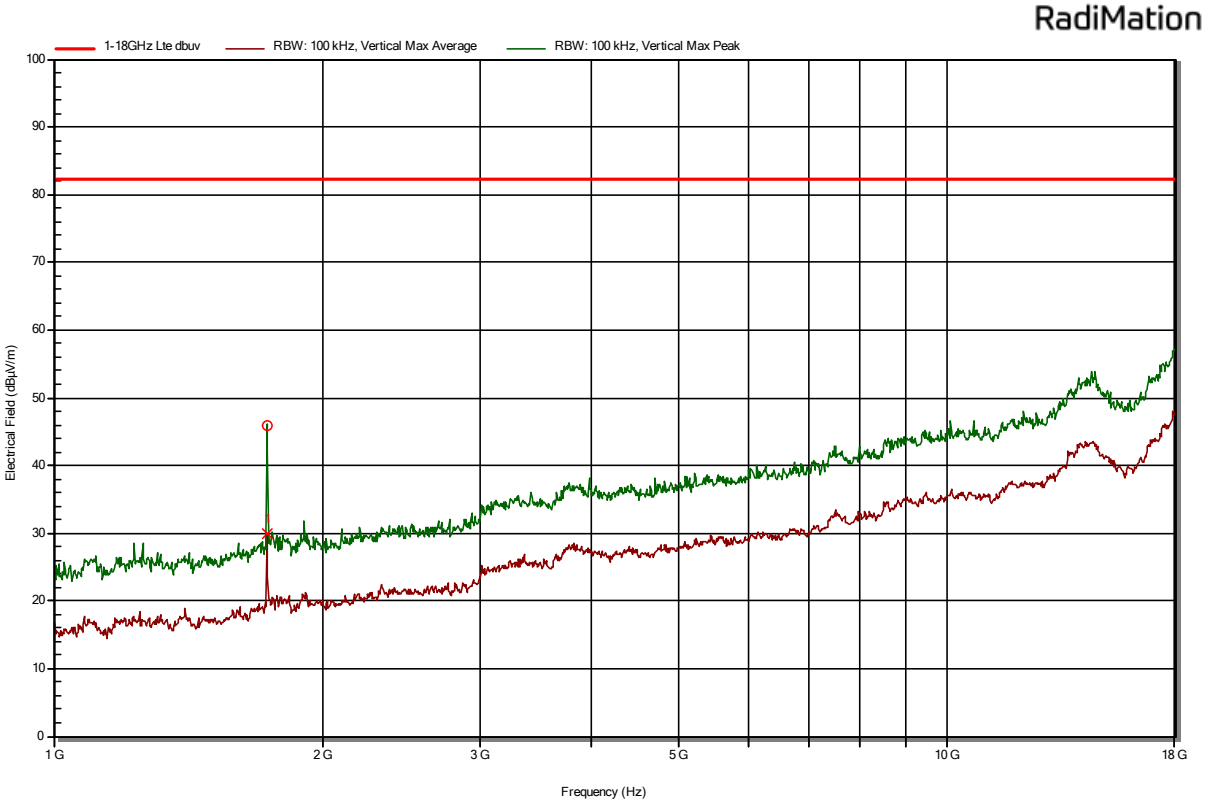


Note: The peak seen in the plot above is the transmission frequencies and therefore not subject to the spurious limit.

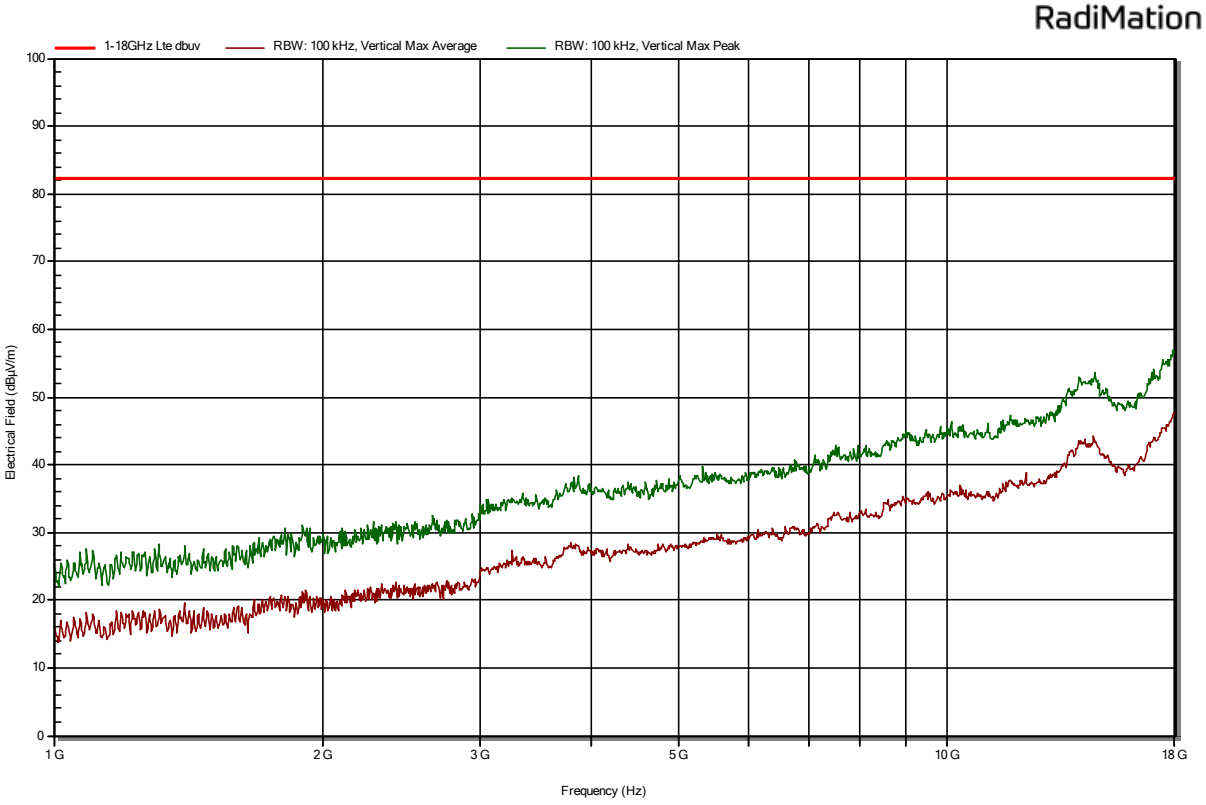
1 – 18 GHz

Vertical polarization

GSM 850

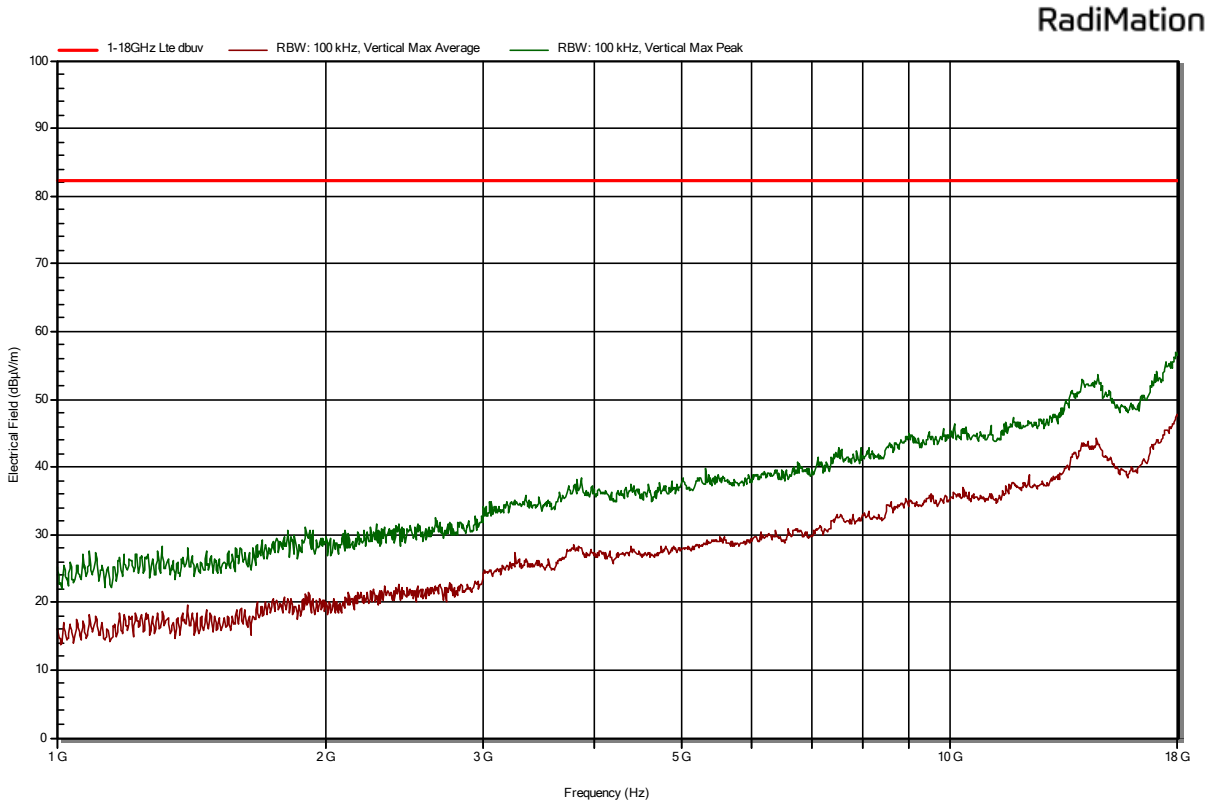


GSM 1900

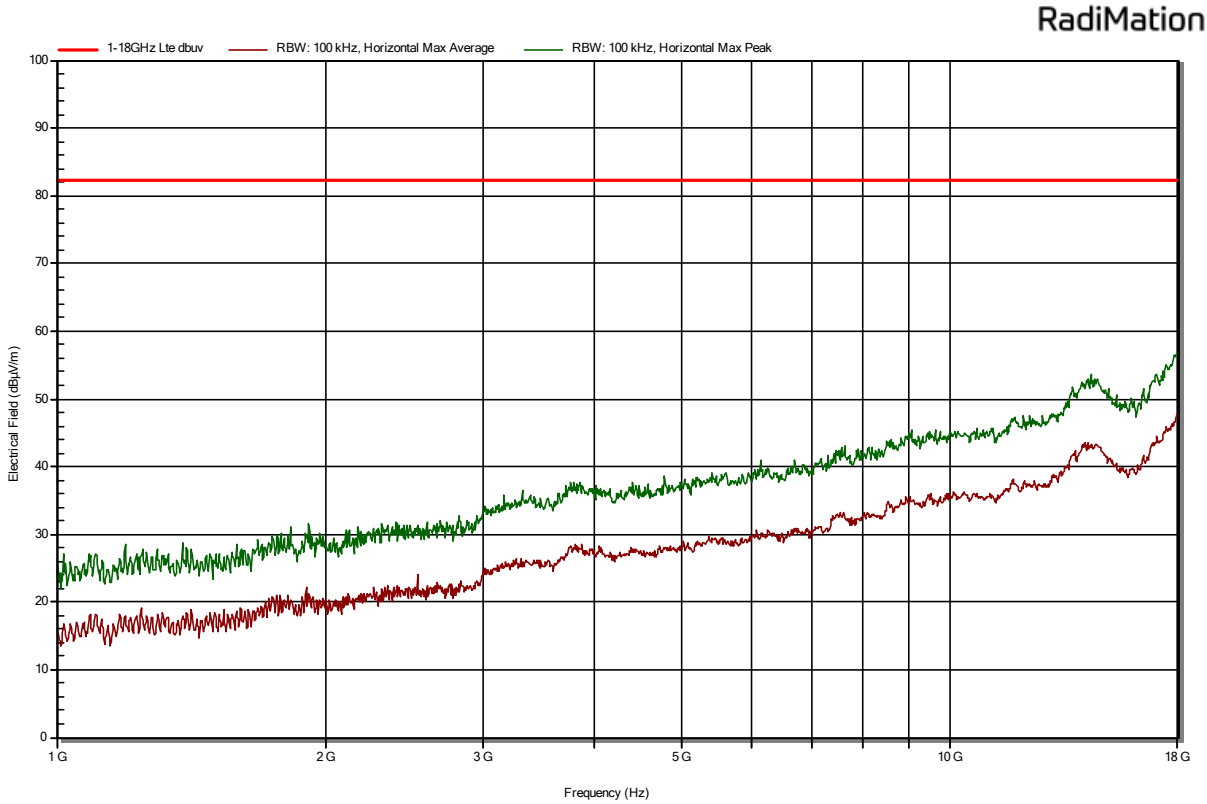


Horizontal polarization

GSM 850



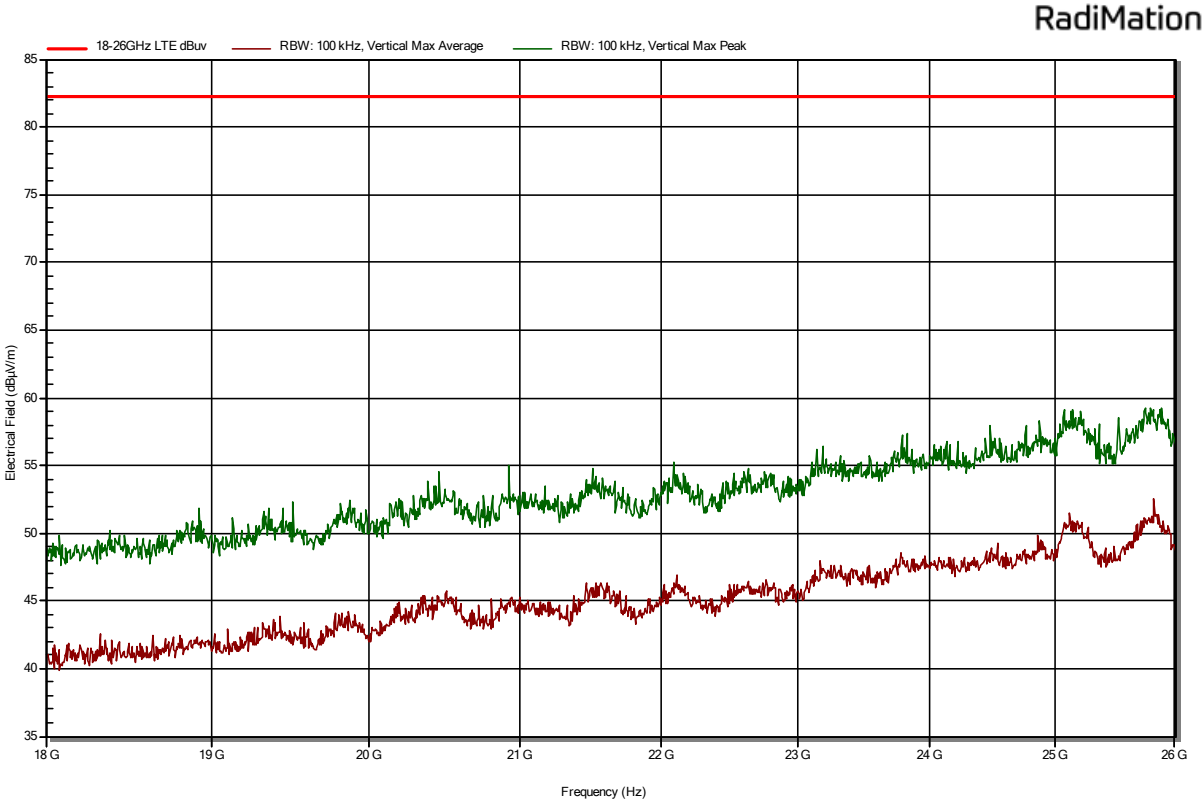
GSM 1900



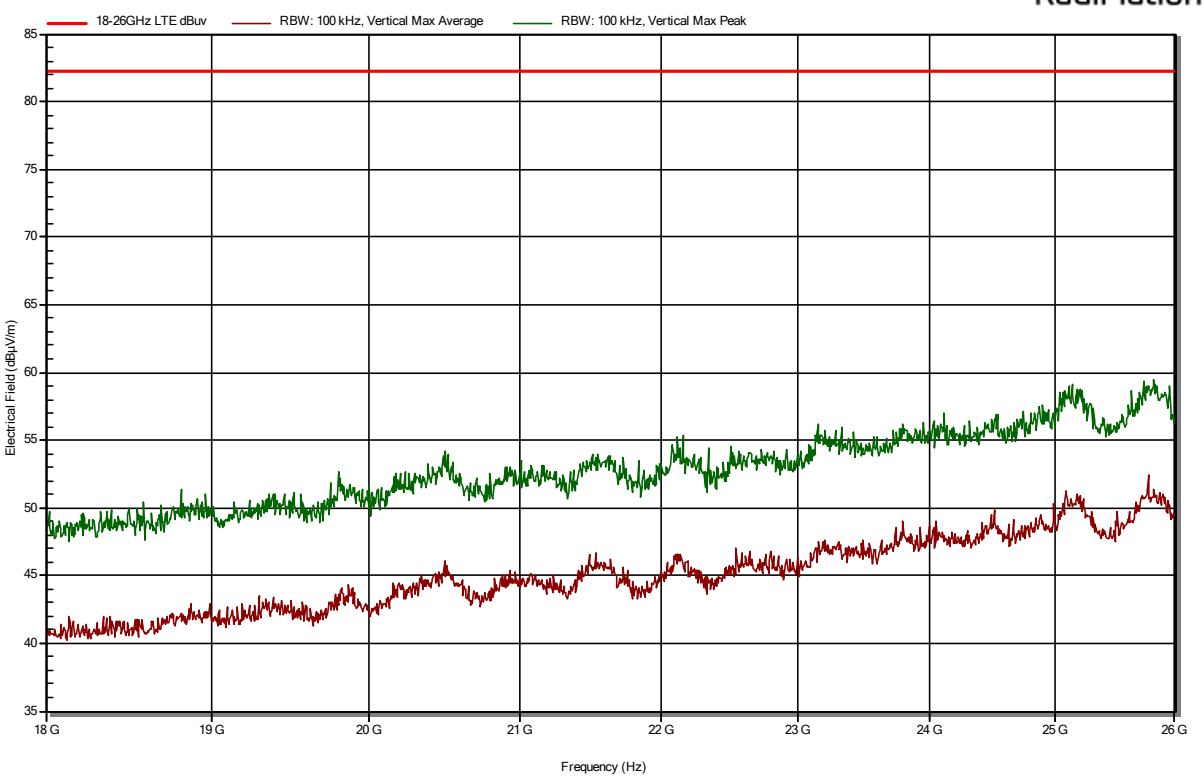
18 – 26 GHz

Vertical polarization

GSM 850

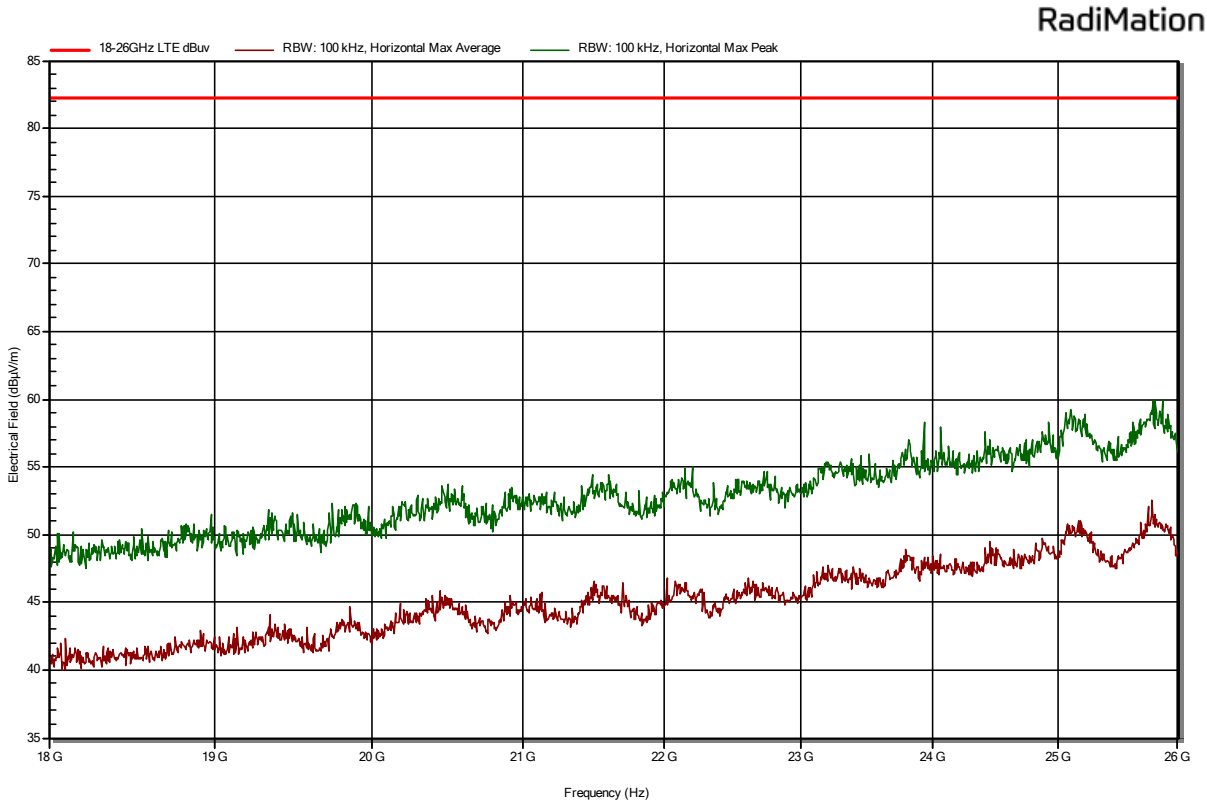


GSM 1900

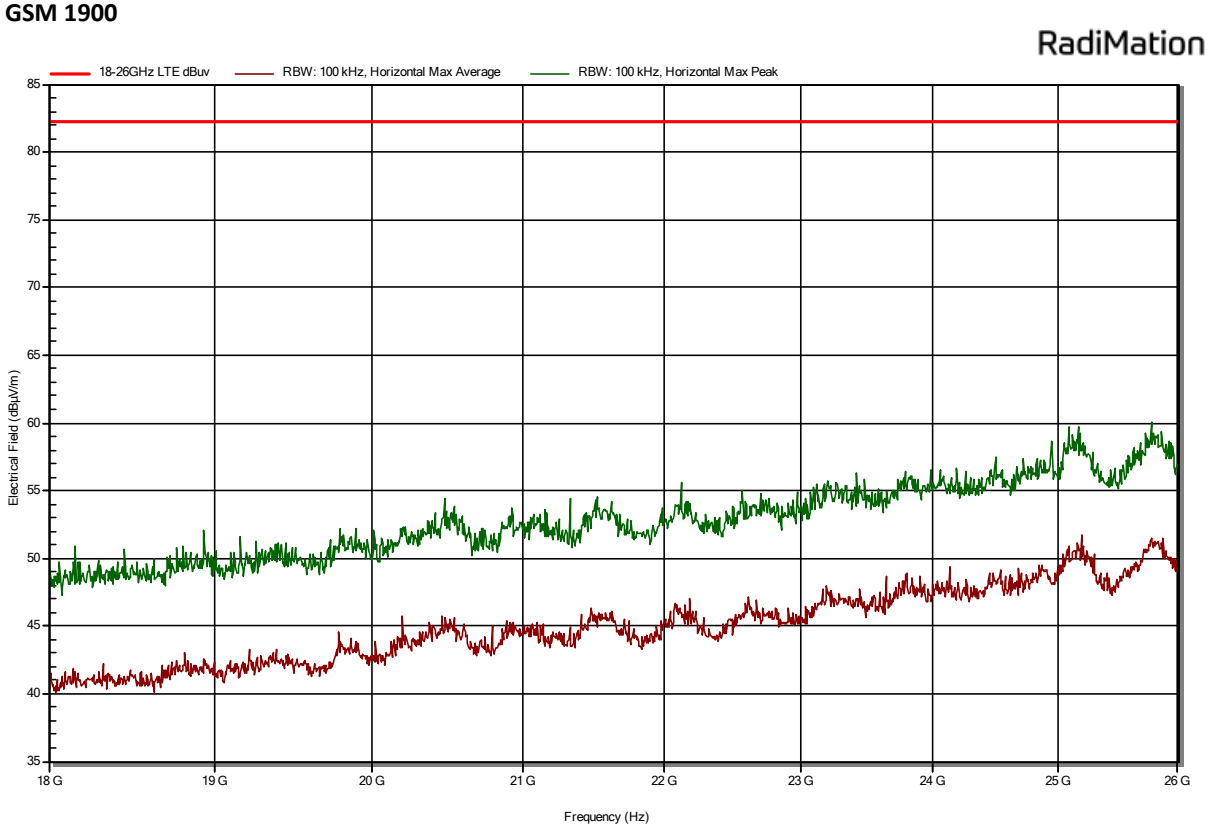


Horizontal polarization

GSM 850



GSM 1900

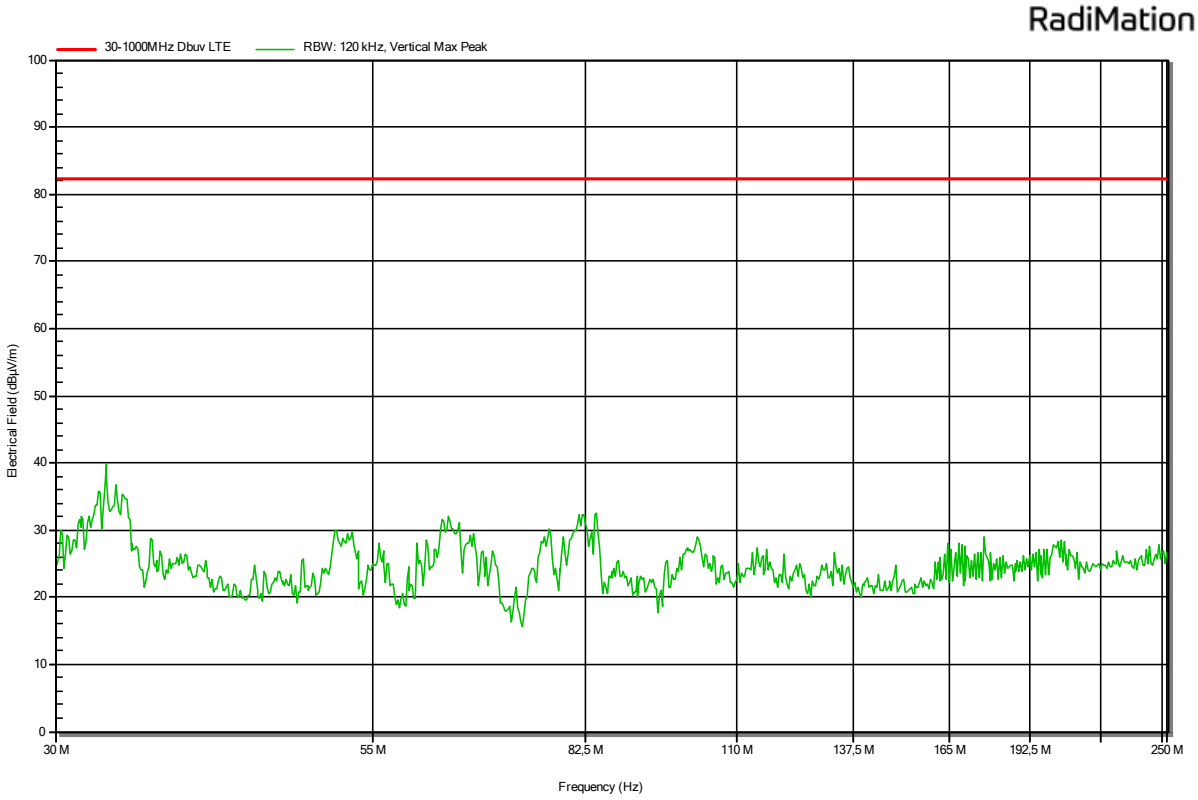


3.1.8 Plots of the Radiated Spurious Emissions Measurement (WCDMA)

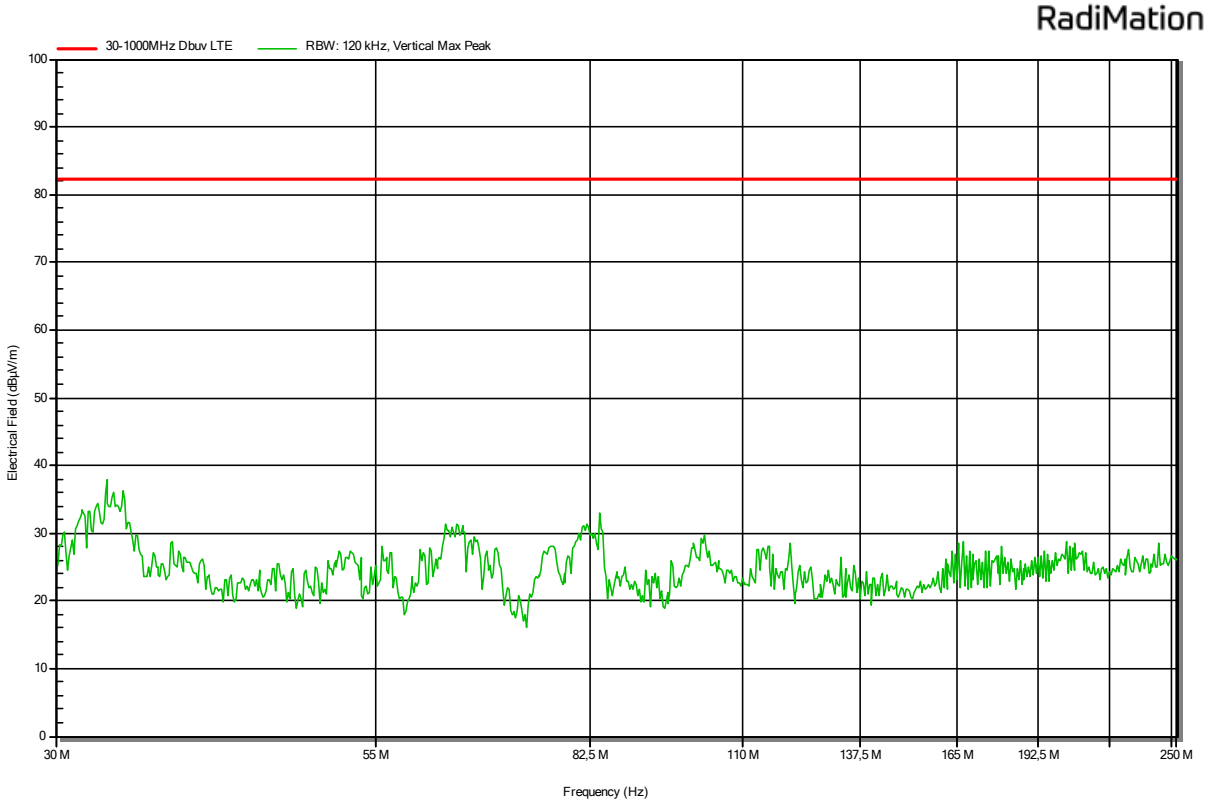
30 -250 MHz

Vertical polarization

WCDMA B2

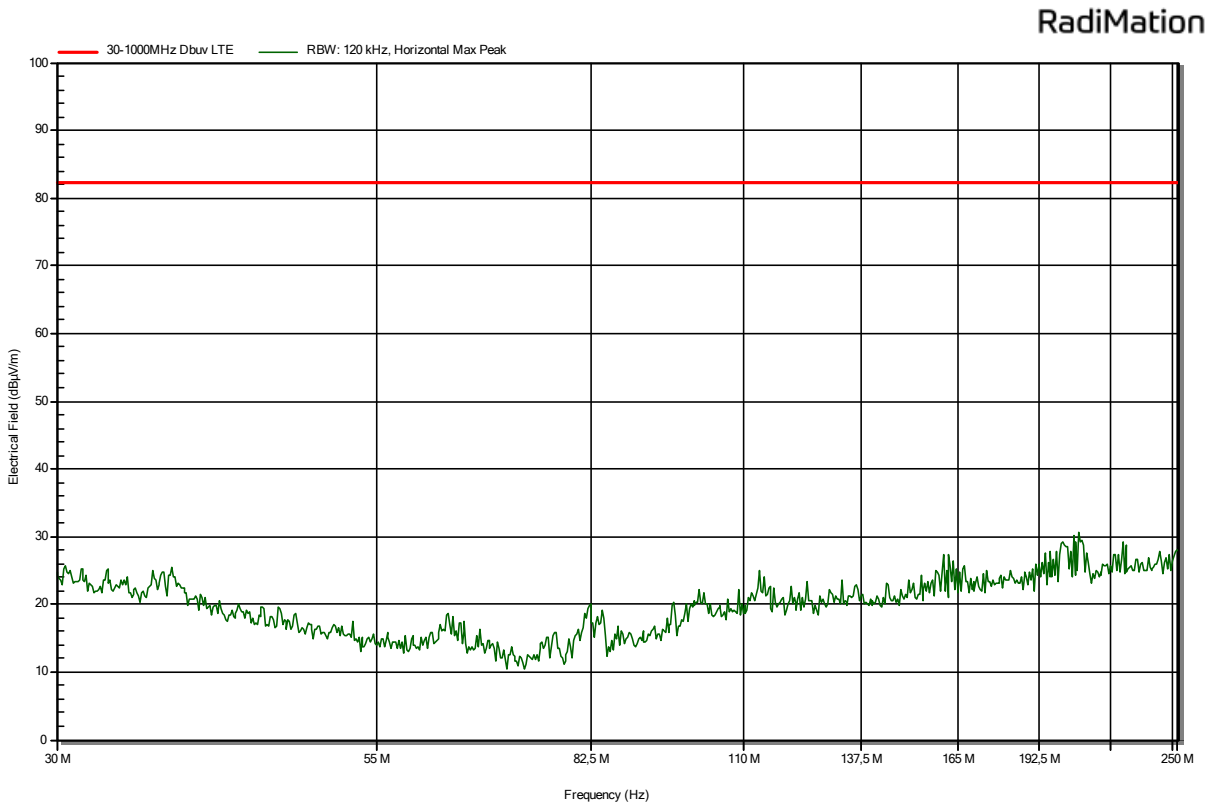


WCDMA B5

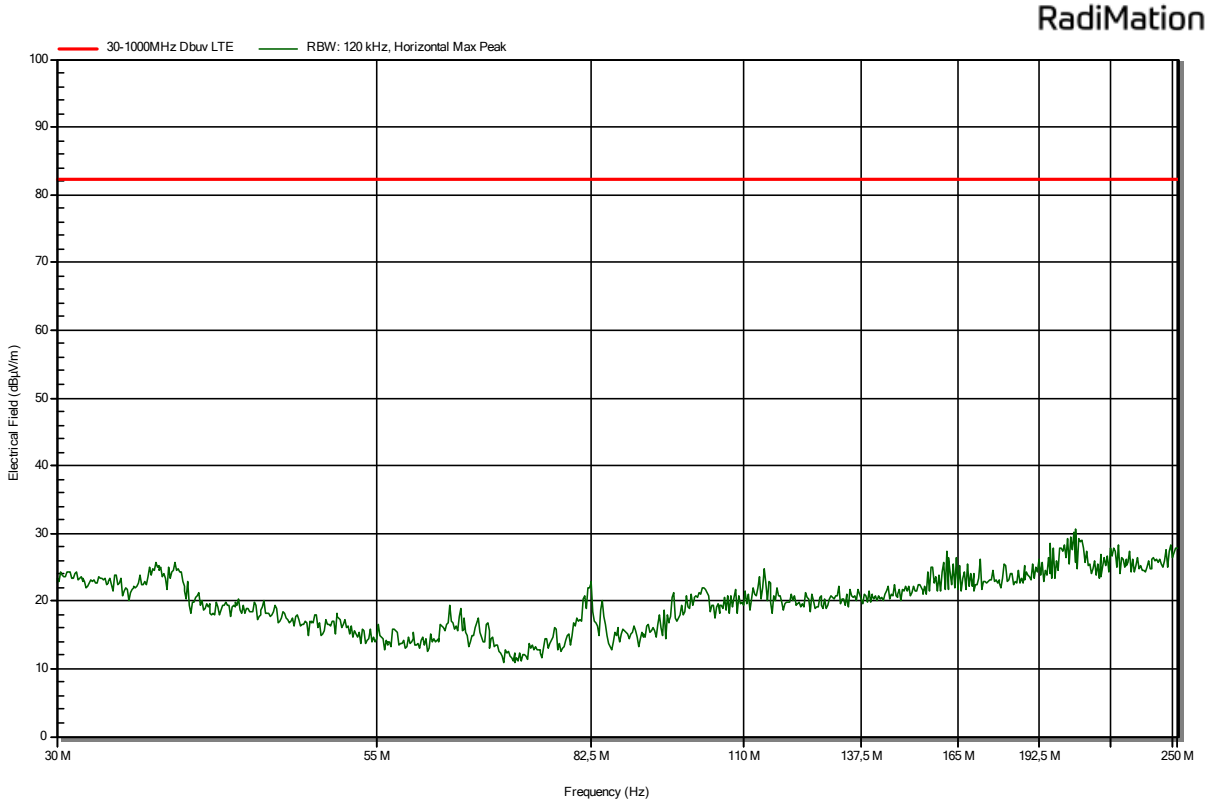


Horizontal polarization

WCDMA B2



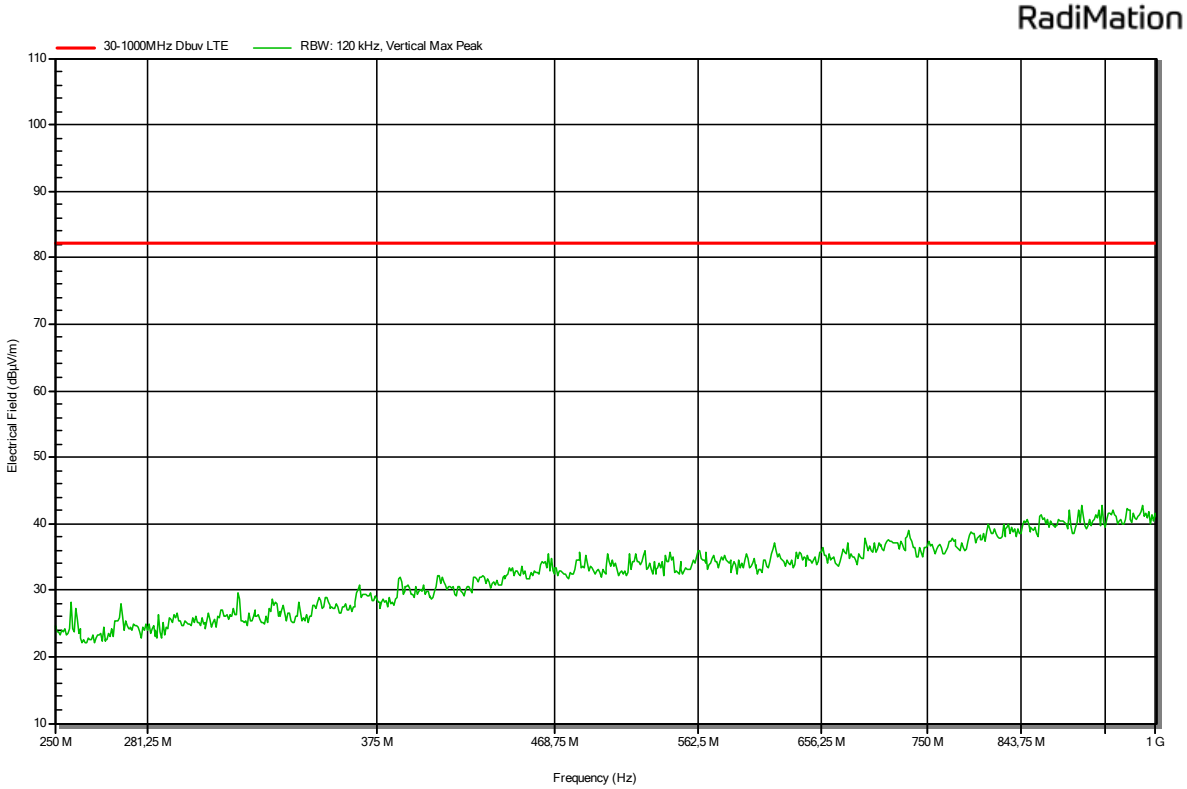
WCDMA B5



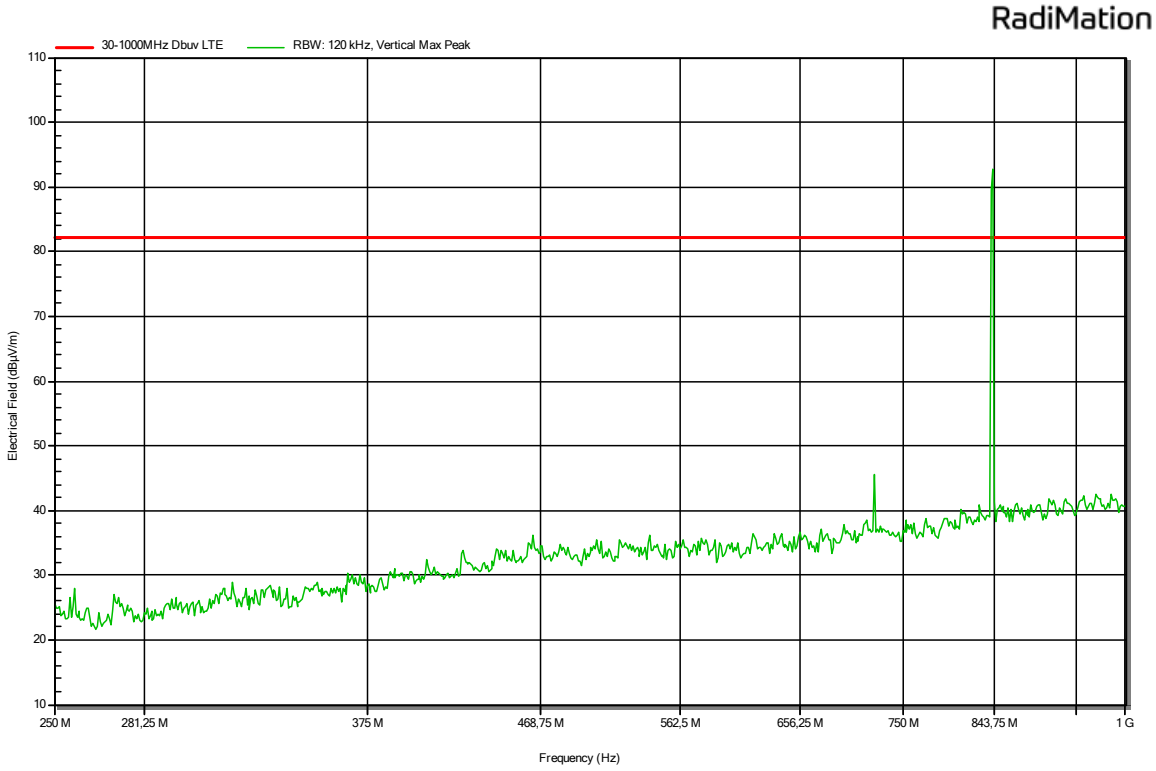
250 – 1000 MHz

Vertical polarization

WCDMA B2



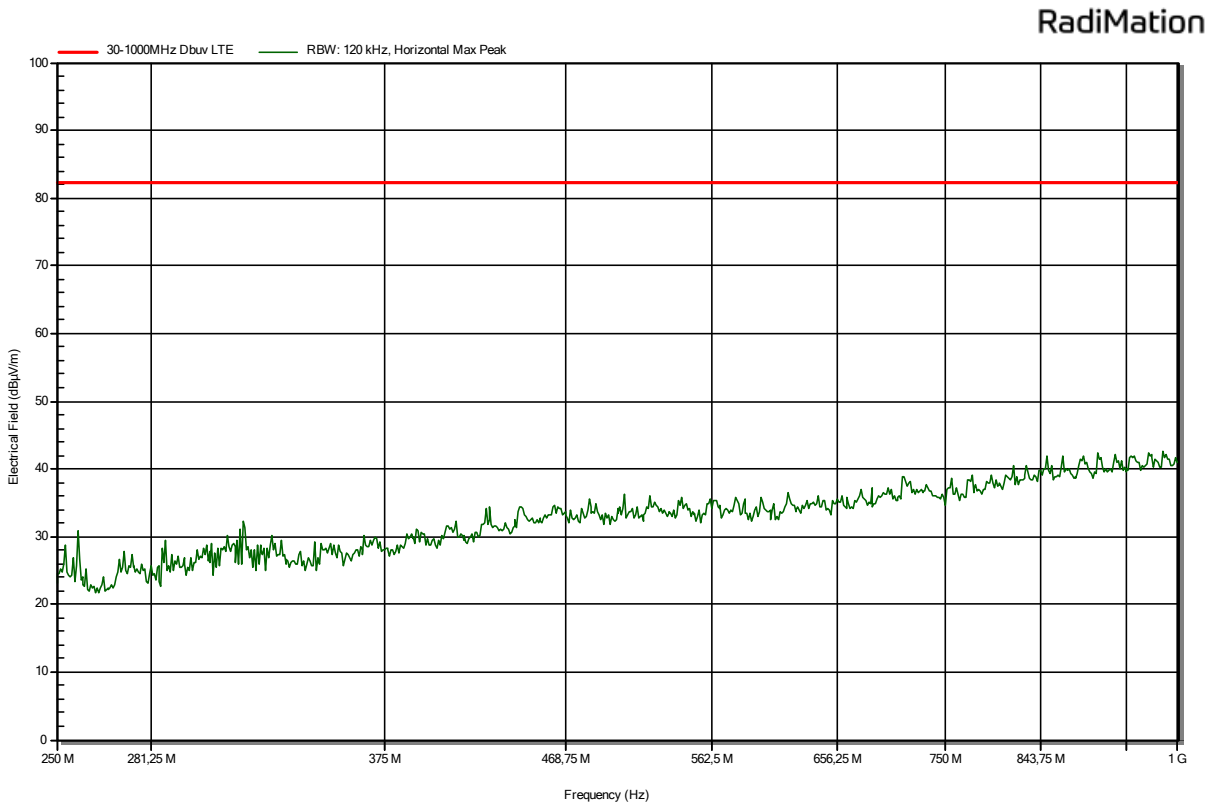
WCDMA B5



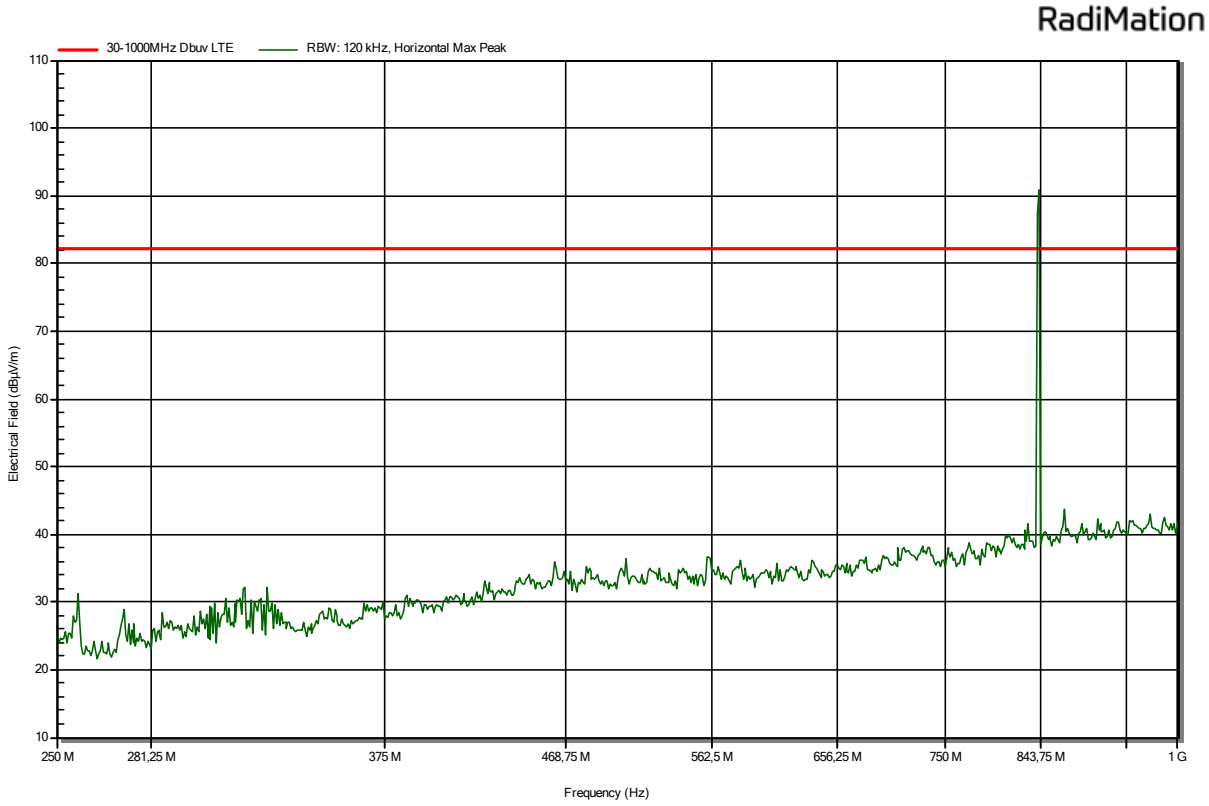
Note: The peak seen in the plot above is the transmission frequencies and therefore not subject to the spurious limit.

Horizontal polarization

WCDMA B2



WCDMA B5

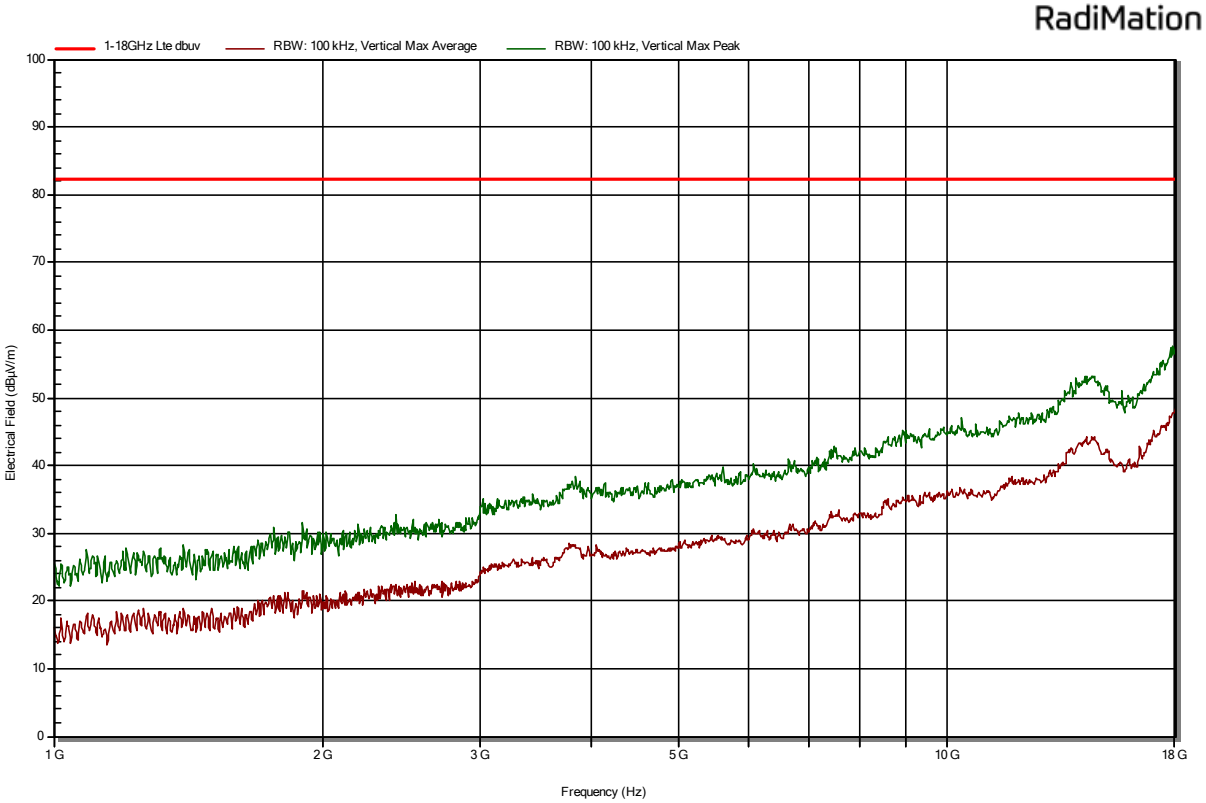


Note: The peak seen in the plot above is the transmission frequencies and therefore not subject to the spurious limit.

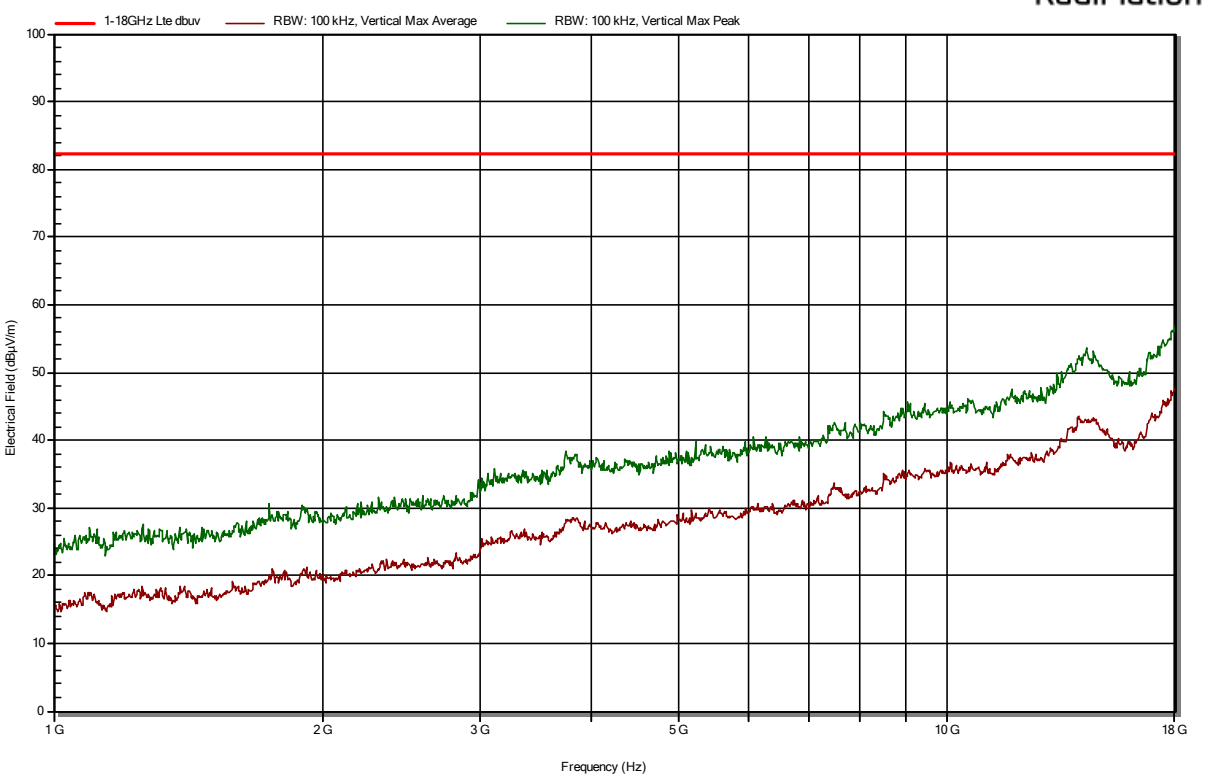
1 – 18 GHz

Vertical polarization

WCDMA B2

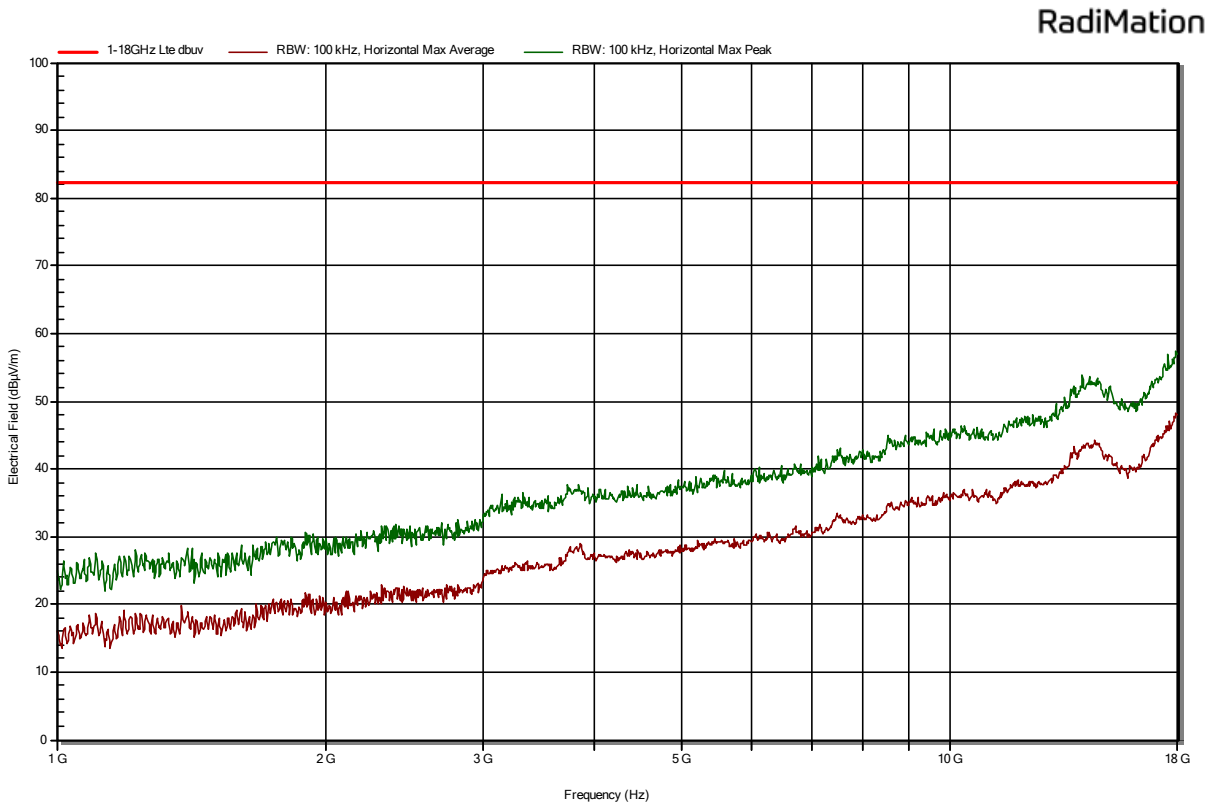


WCDMA B5

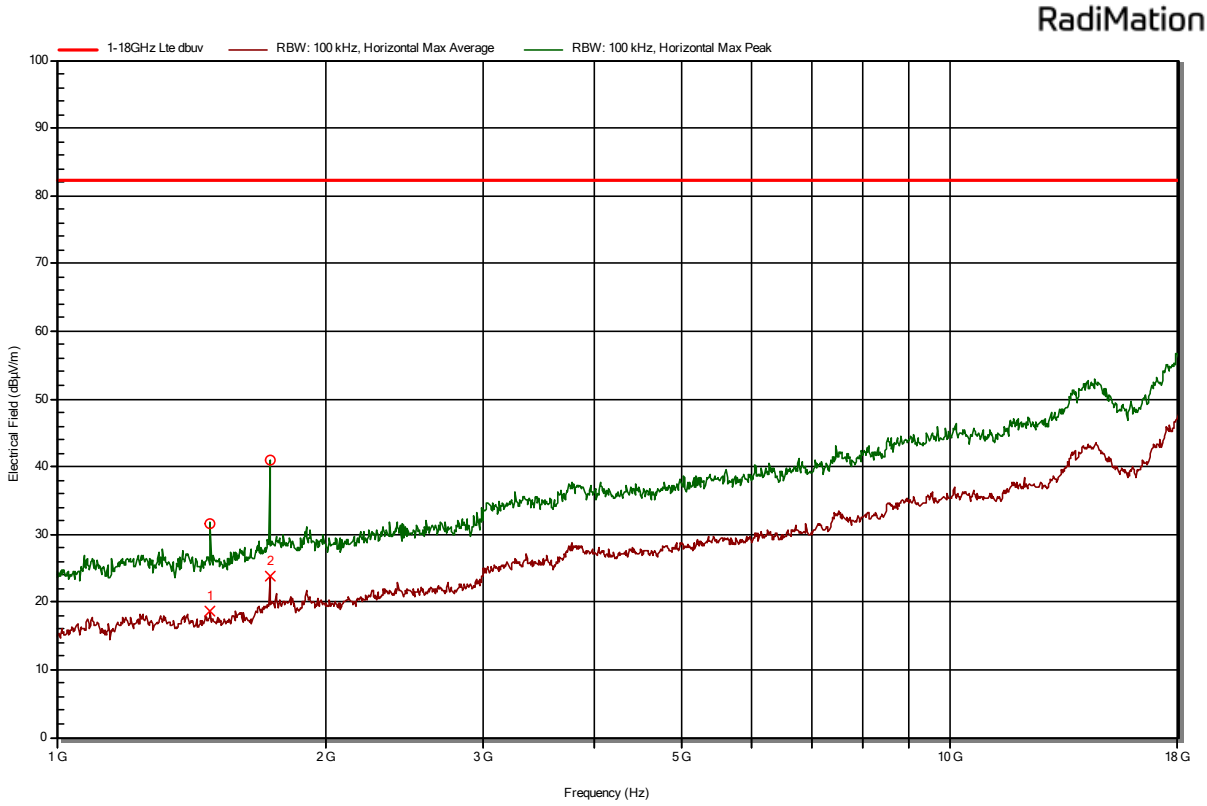


Horizontal polarization

WCDMA B2



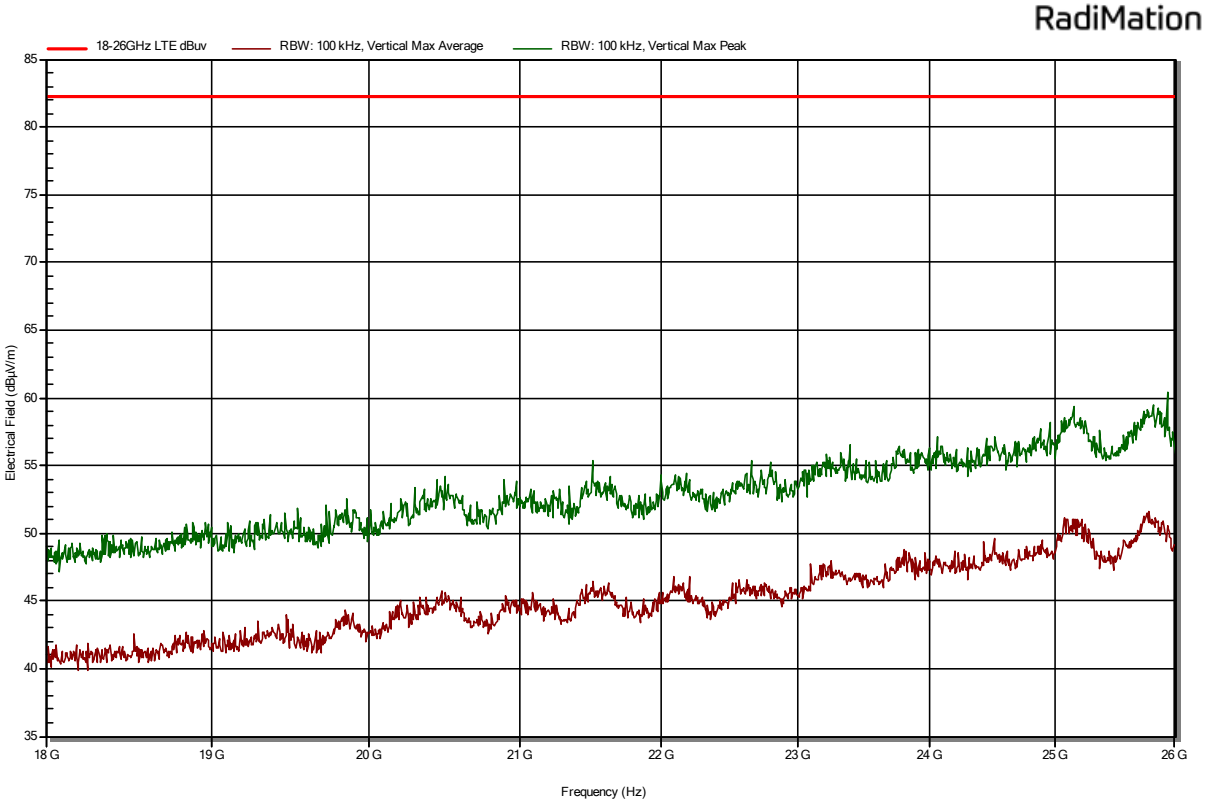
WCDMA B5



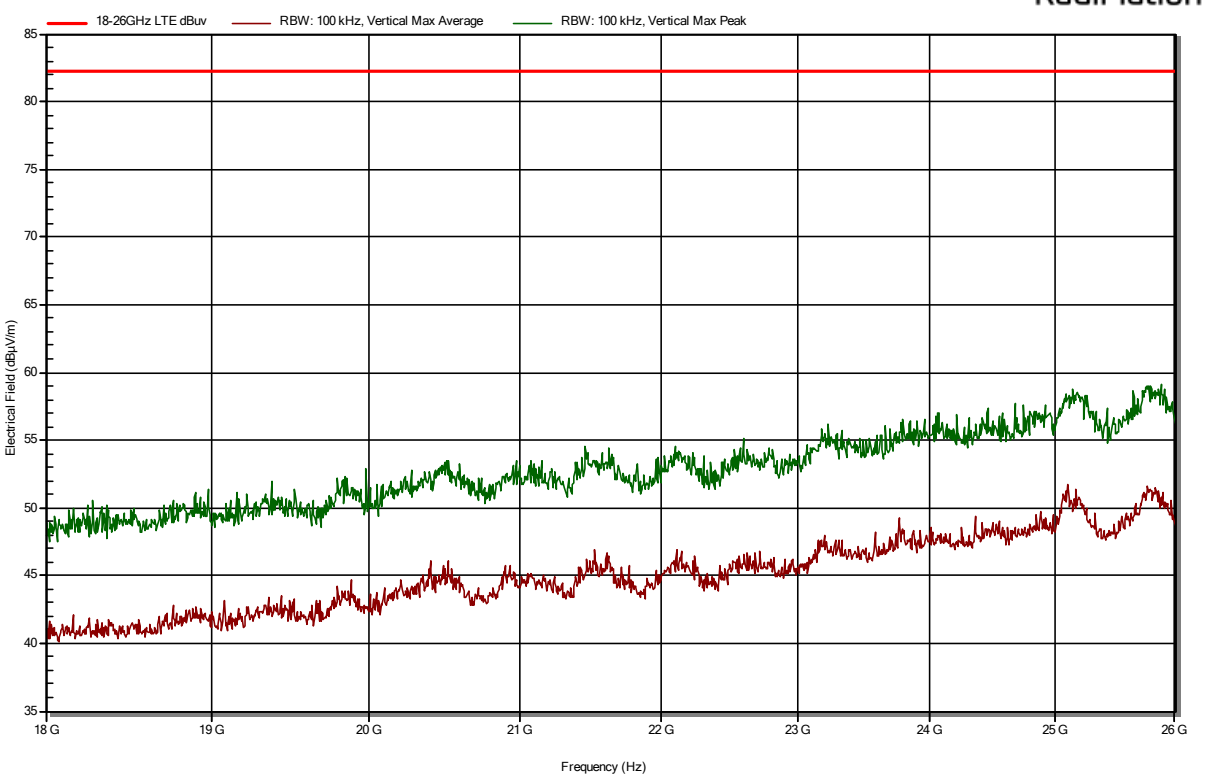
18 – 26 GHz

Vertical polarization

WCDMA B2

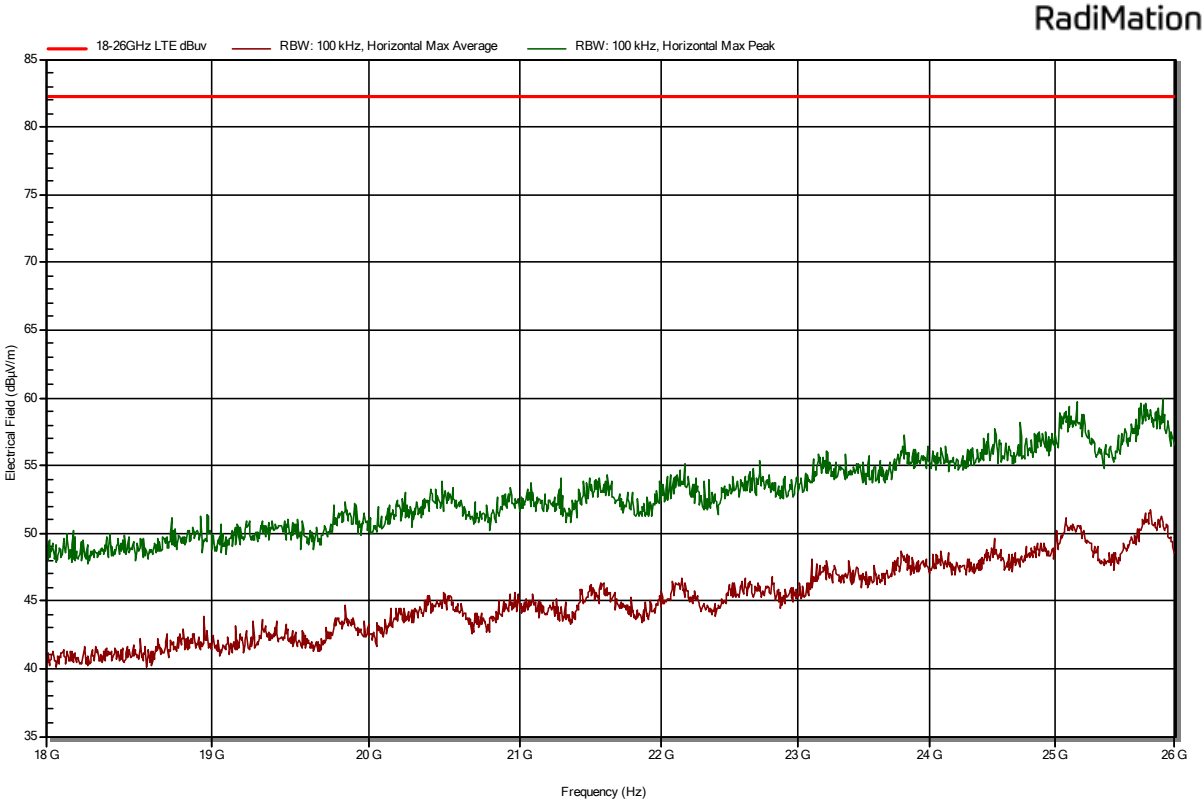


WCDMA B5

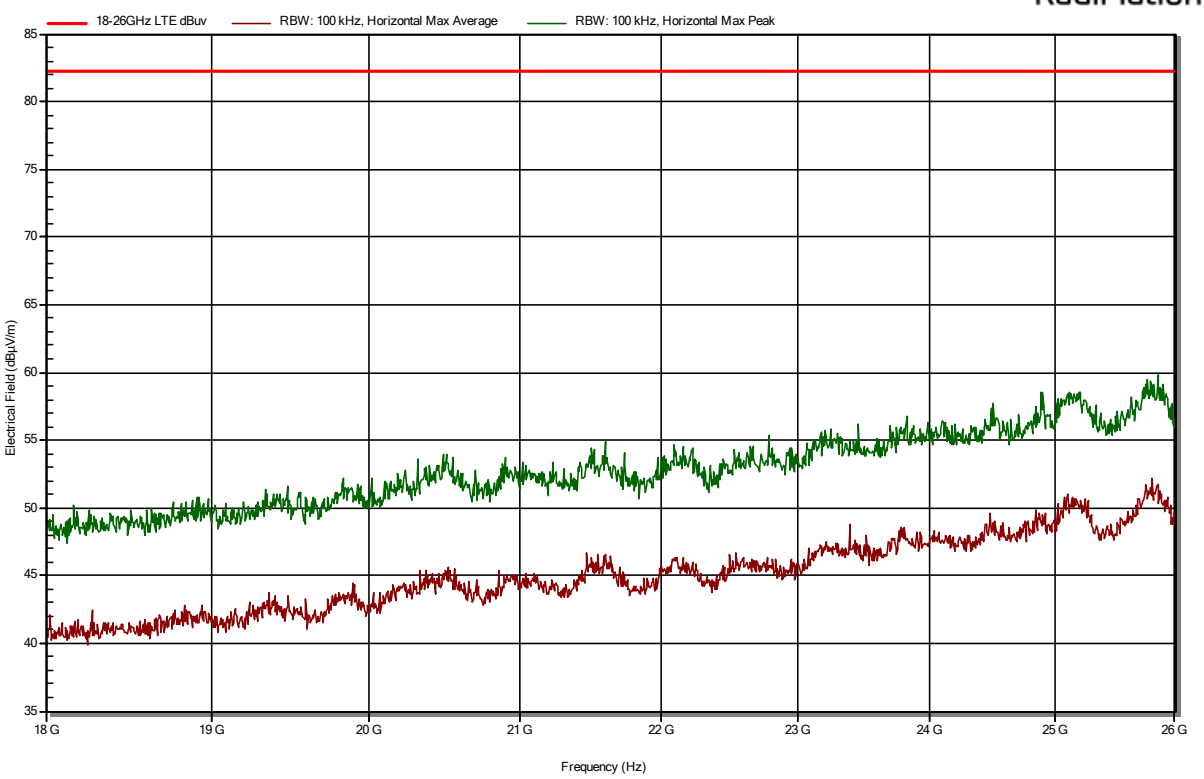


Horizontal polarization

WCDMA B2



WCDMA B5

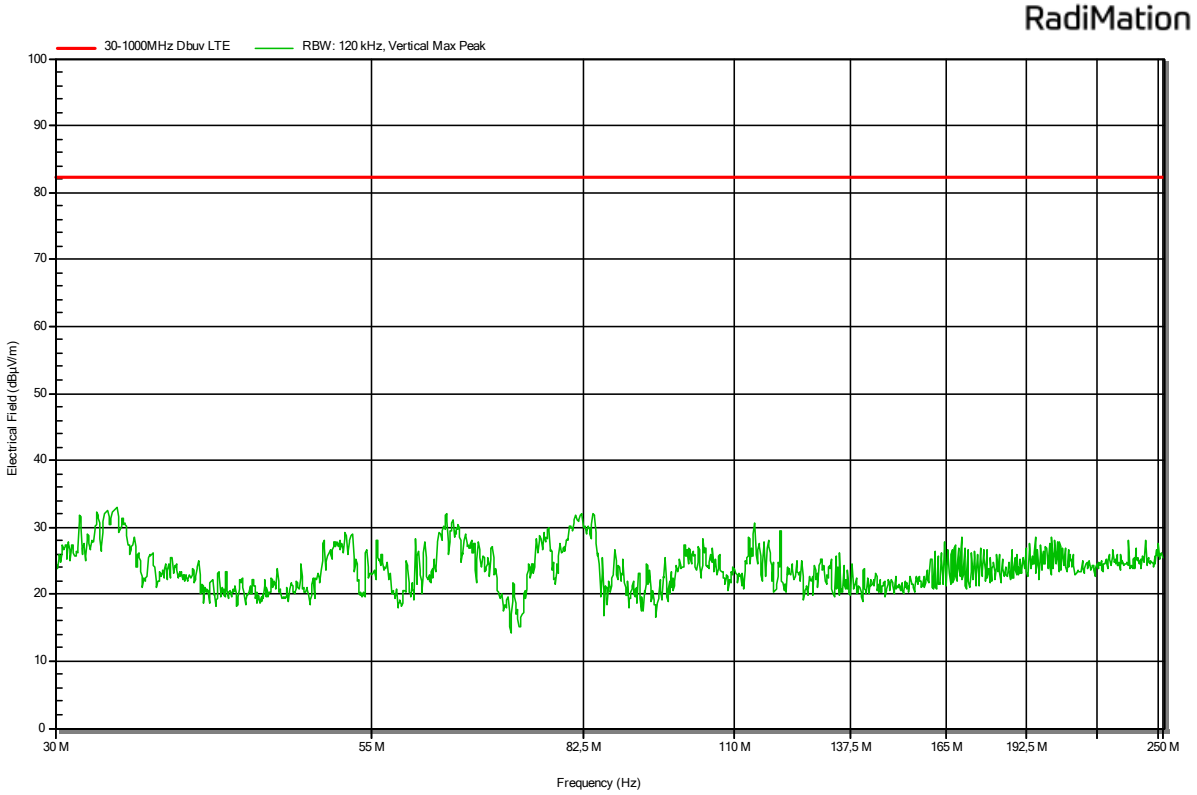


3.1.9 Plots of the Radiated Spurious Emissions Measurement (LTE)

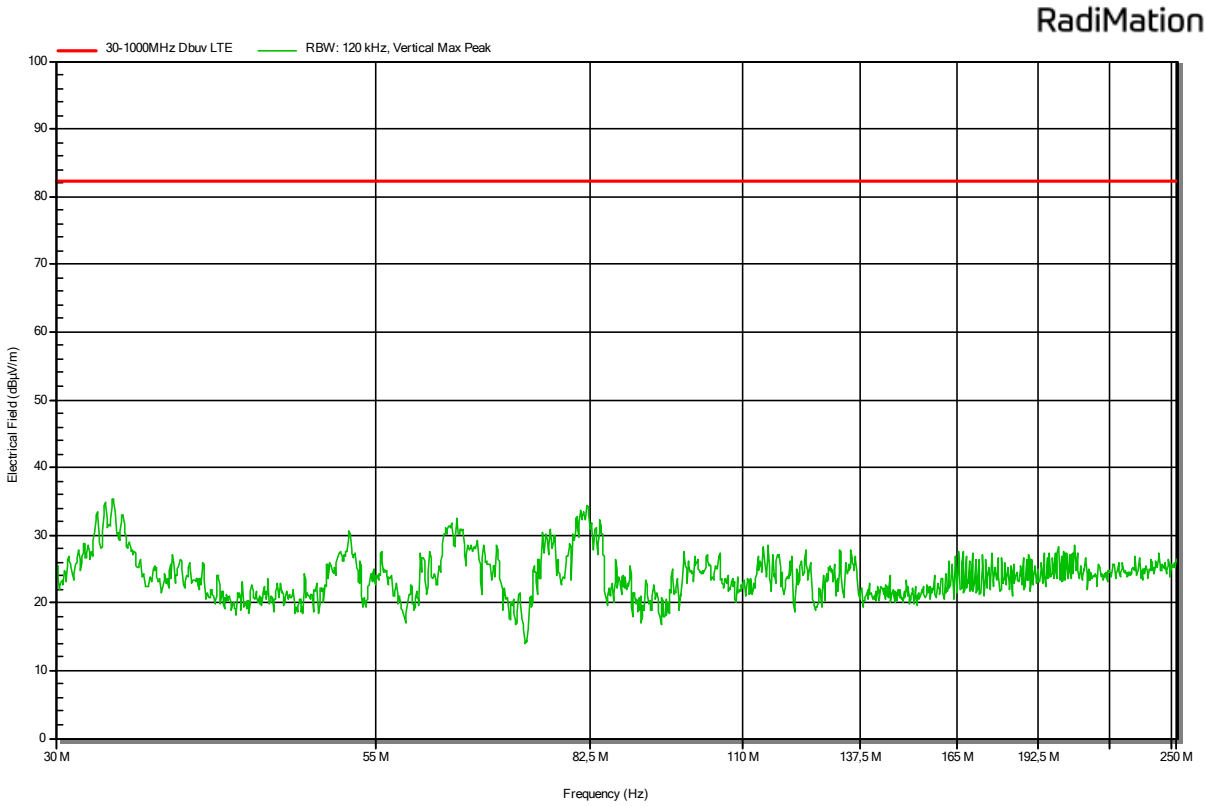
30 -250 MHz

Vertical polarization

LTE B2

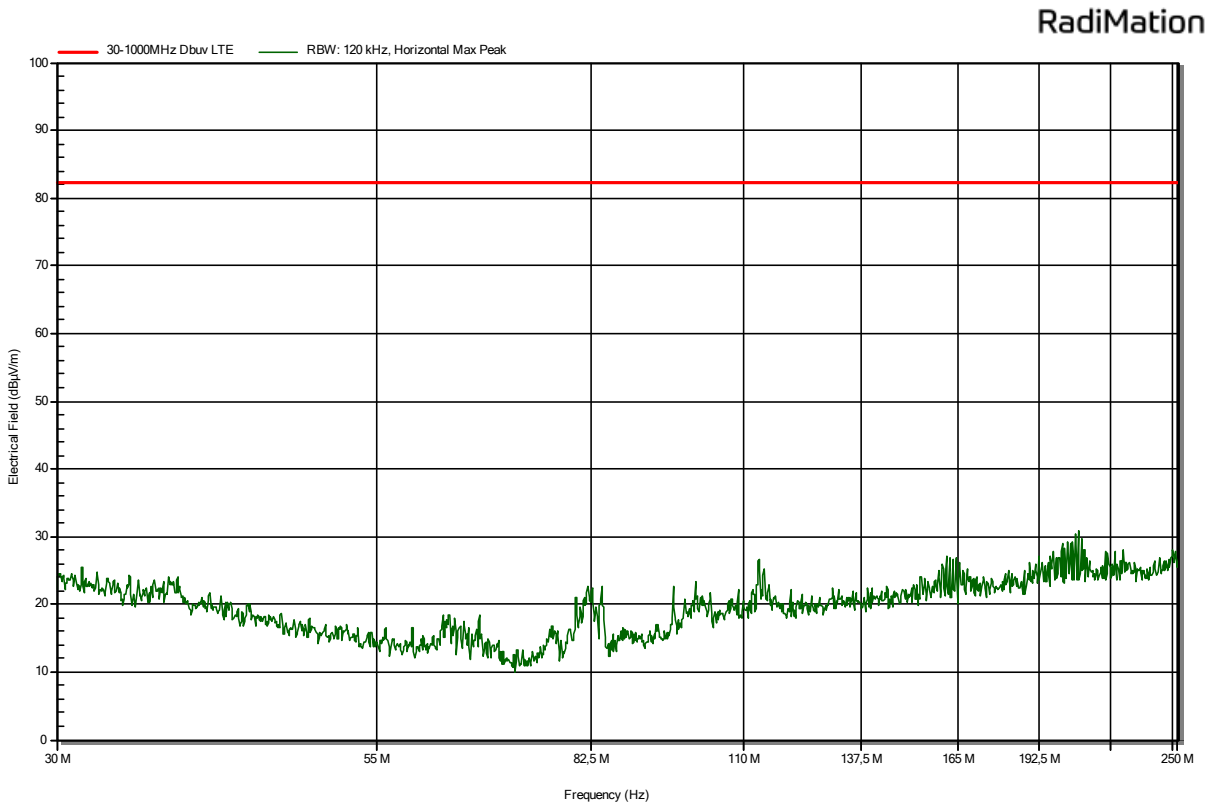


LTE B5

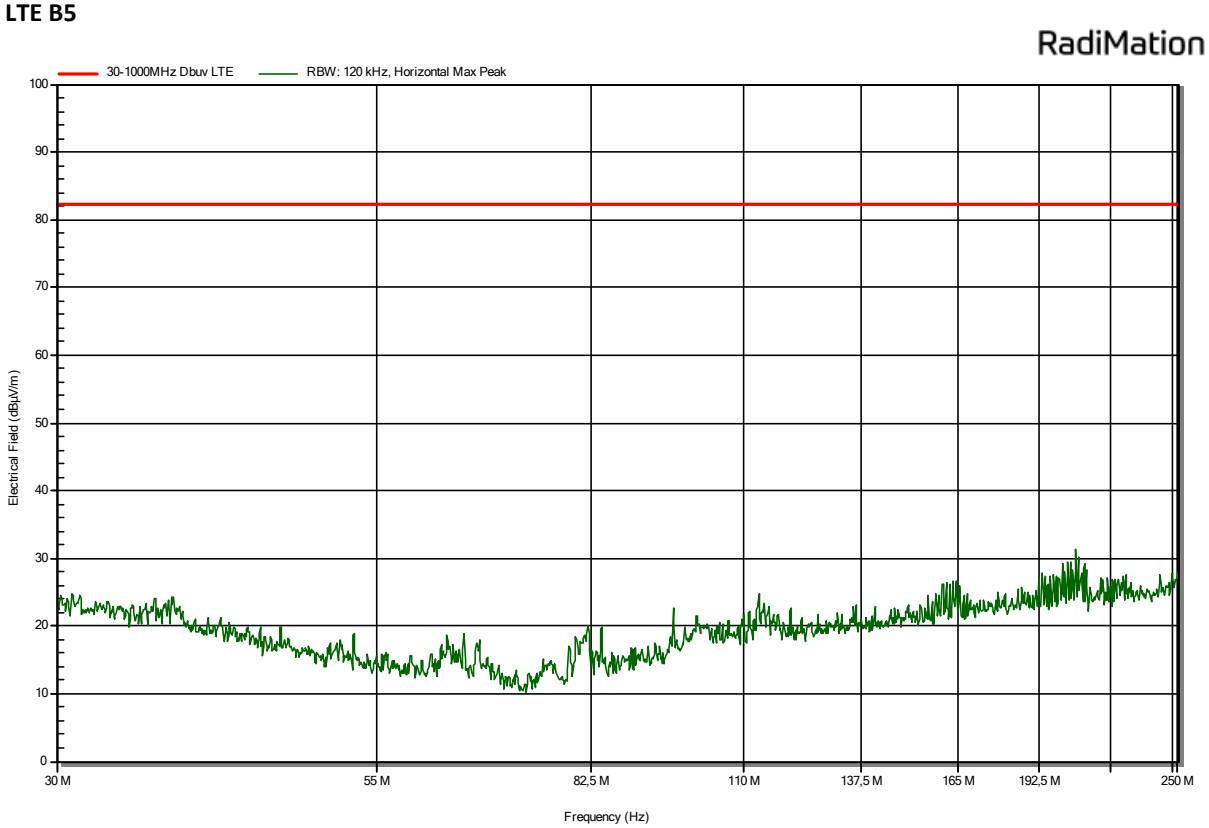


Horizontal polarization

LTE B2



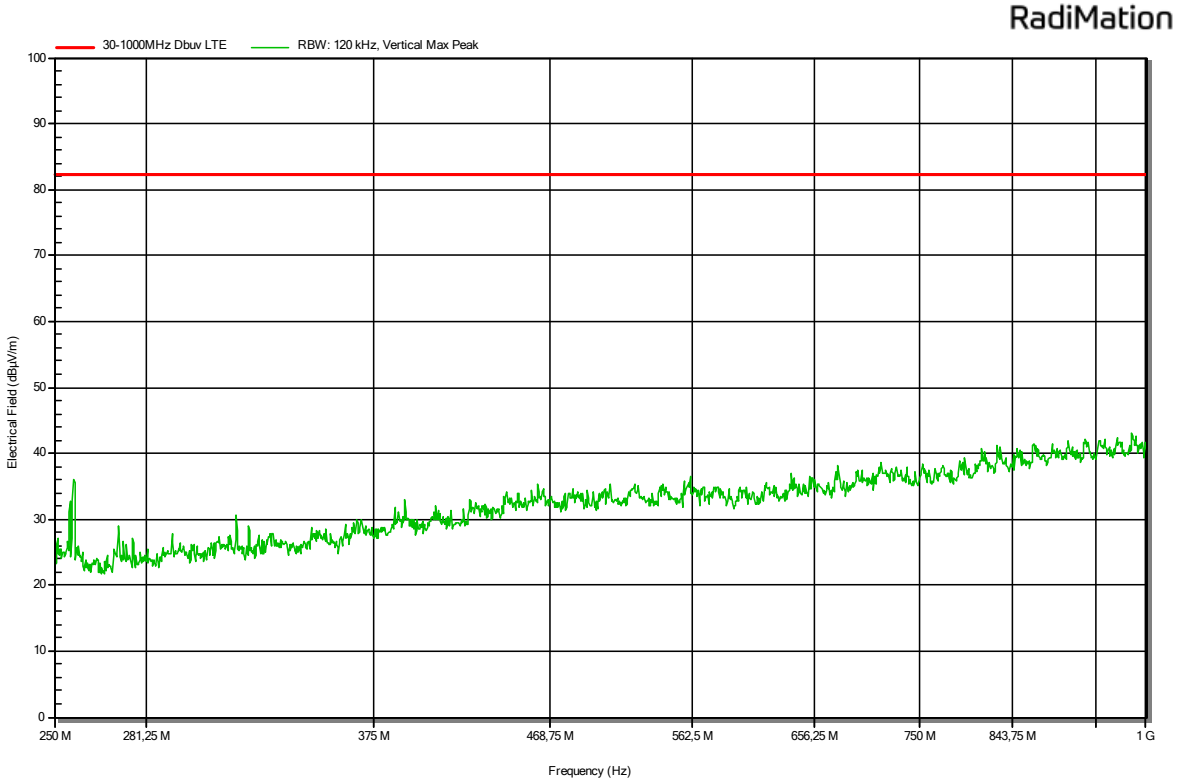
LTE B5



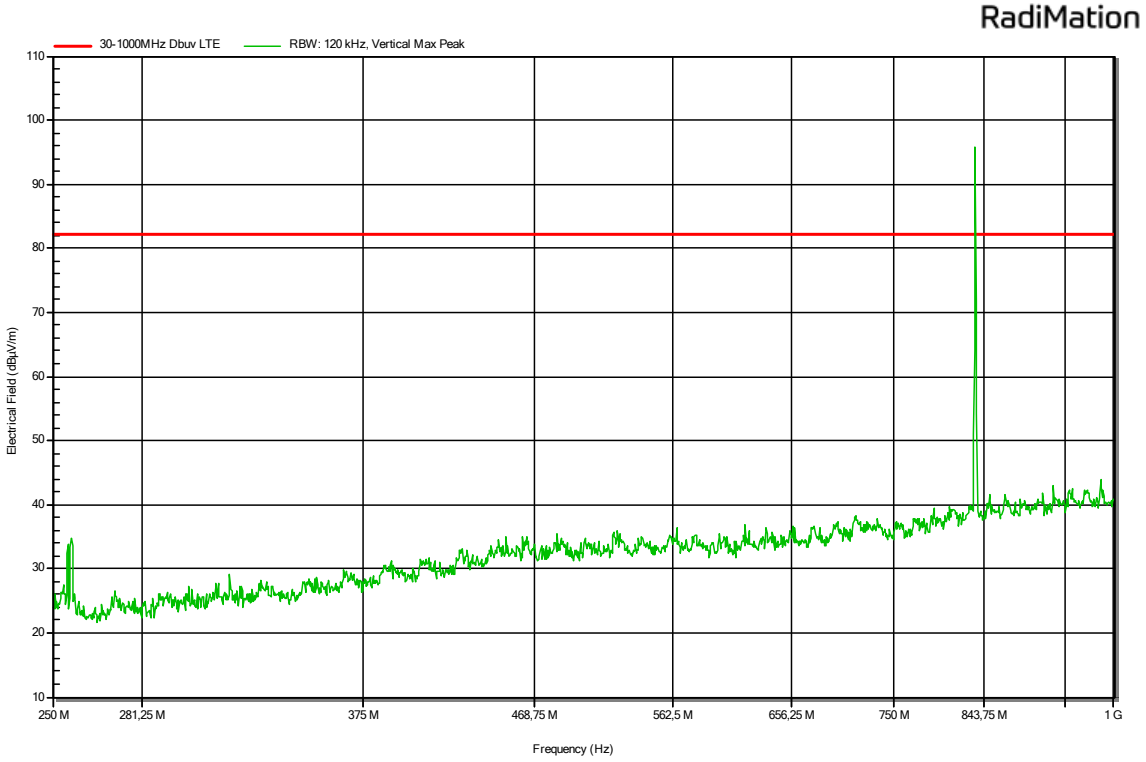
250 – 1000 MHz

Vertical polarization

LTE B2



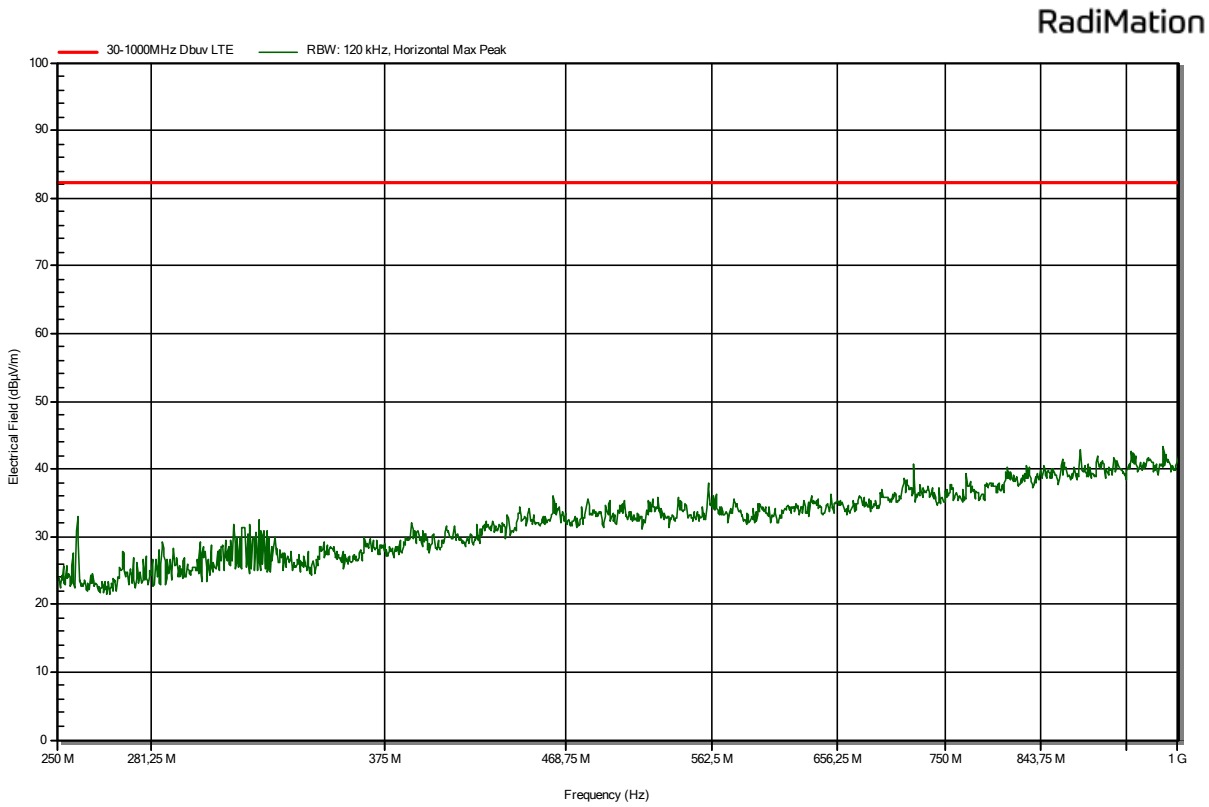
LTE B5



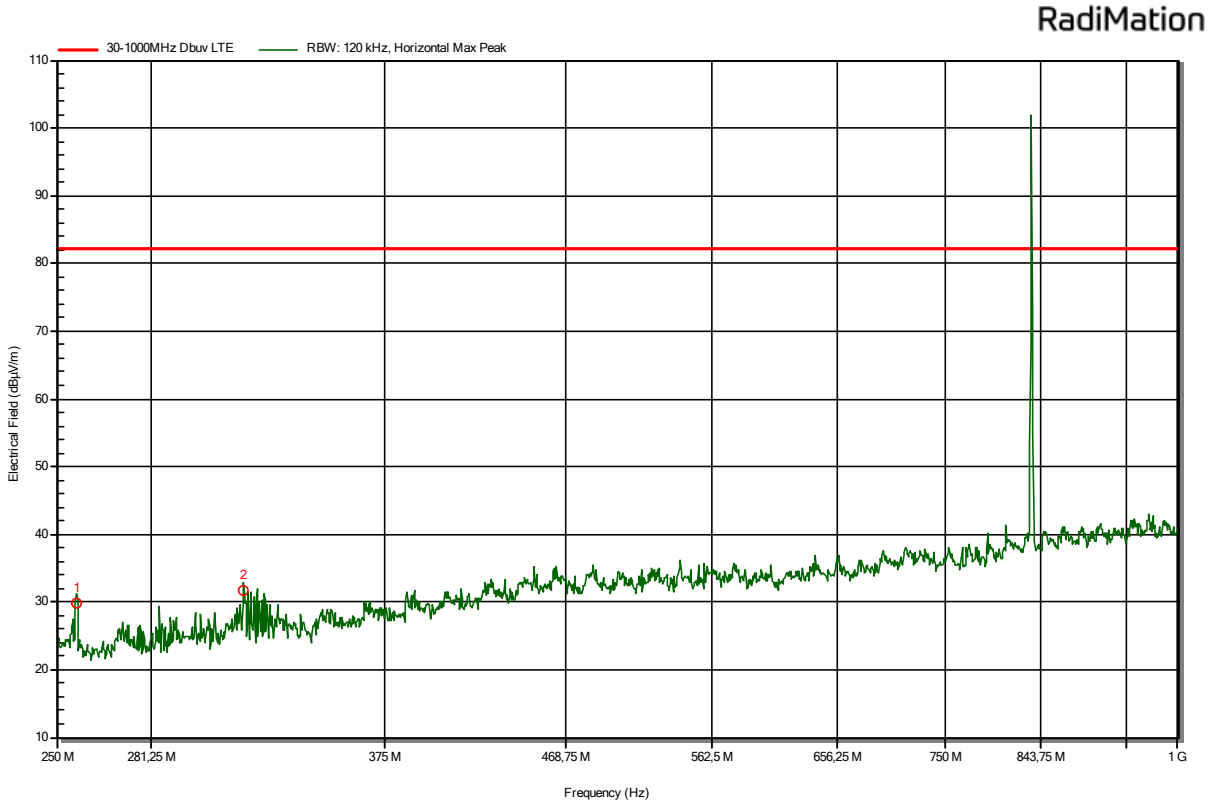
Note: The peak seen in the plot above is the transmission frequencies and therefore not subject to the spurious limit.

Horizontal polarization

LTE B2



LTE B5

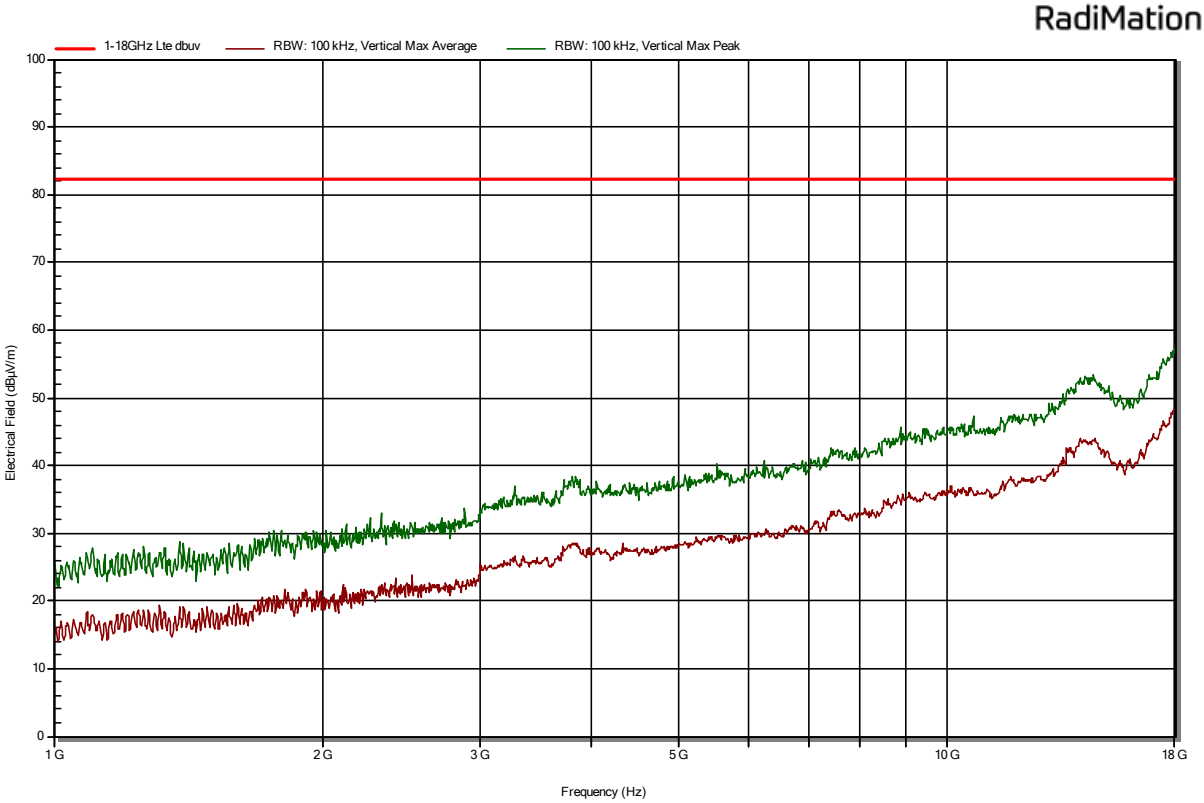


Note: The peak seen in the plot above is the transmission frequencies and therefore not subject to the spurious limit.

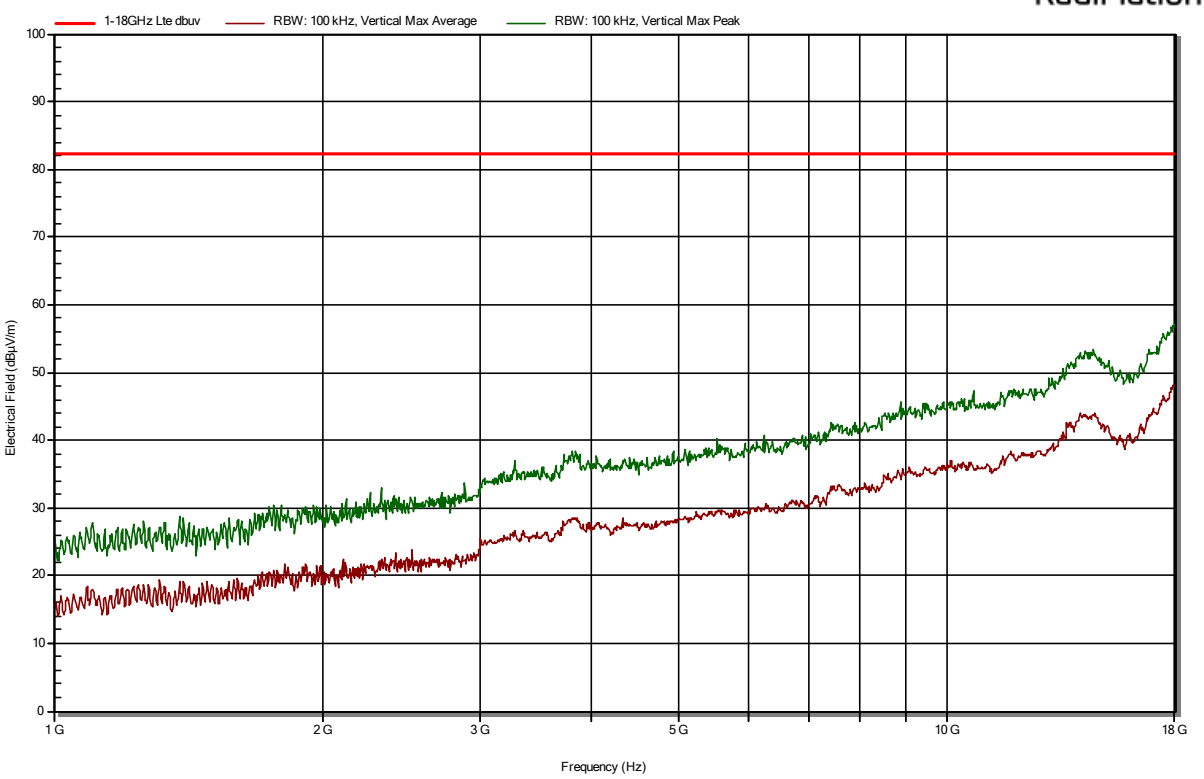
1 – 18 GHz

Vertical polarization

LTE B2

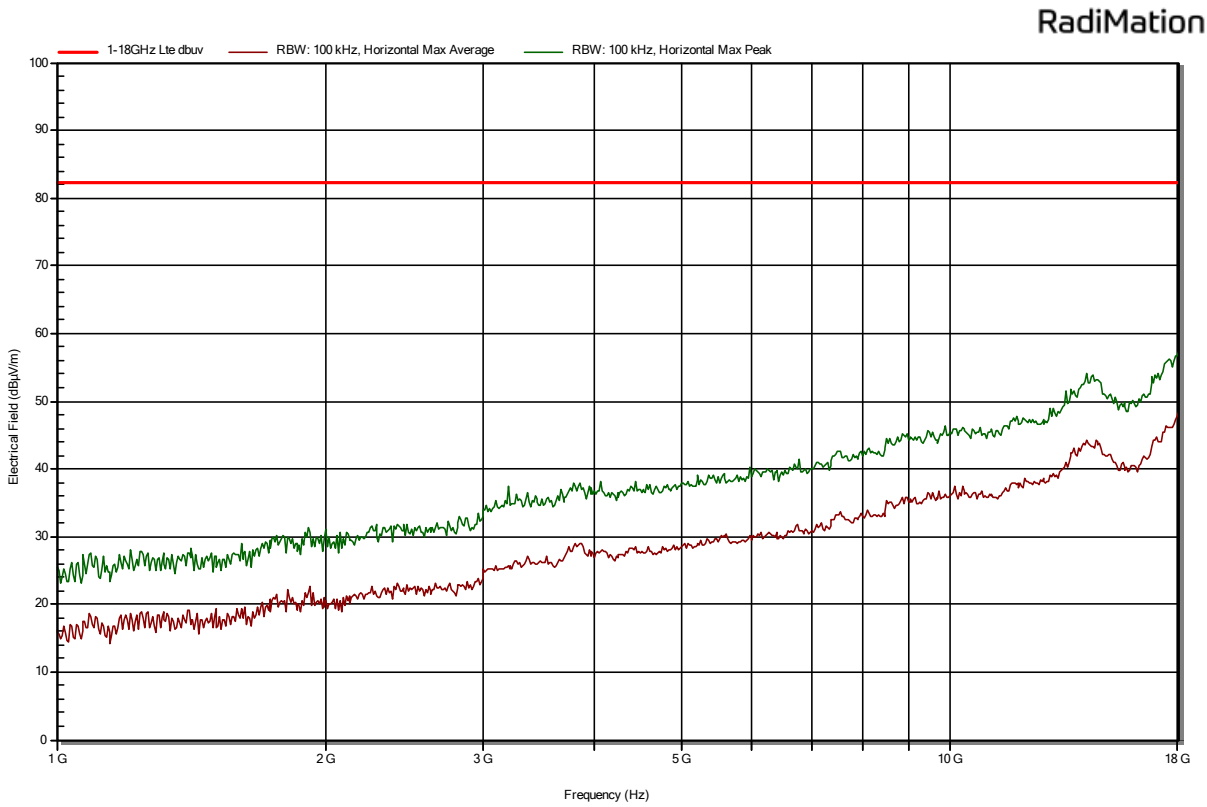


LTE B5

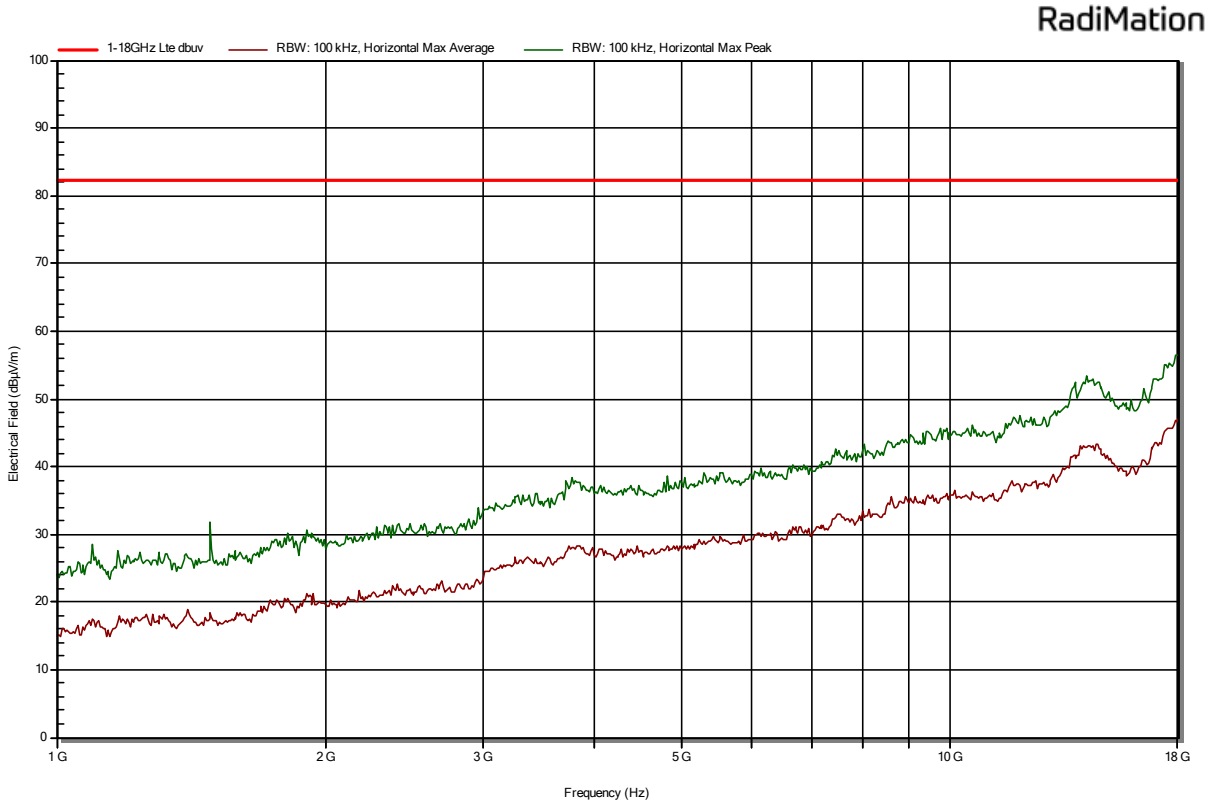


Horizontal polarization

LTE B2



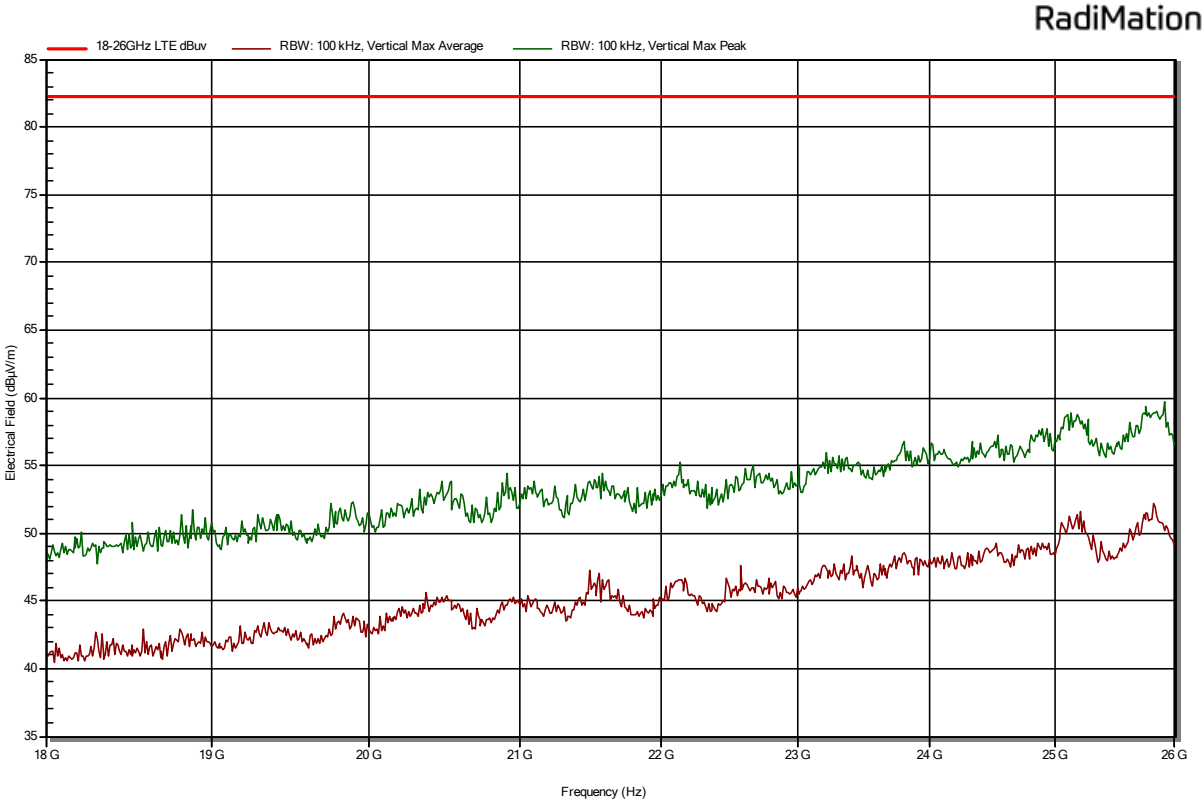
LTE B5



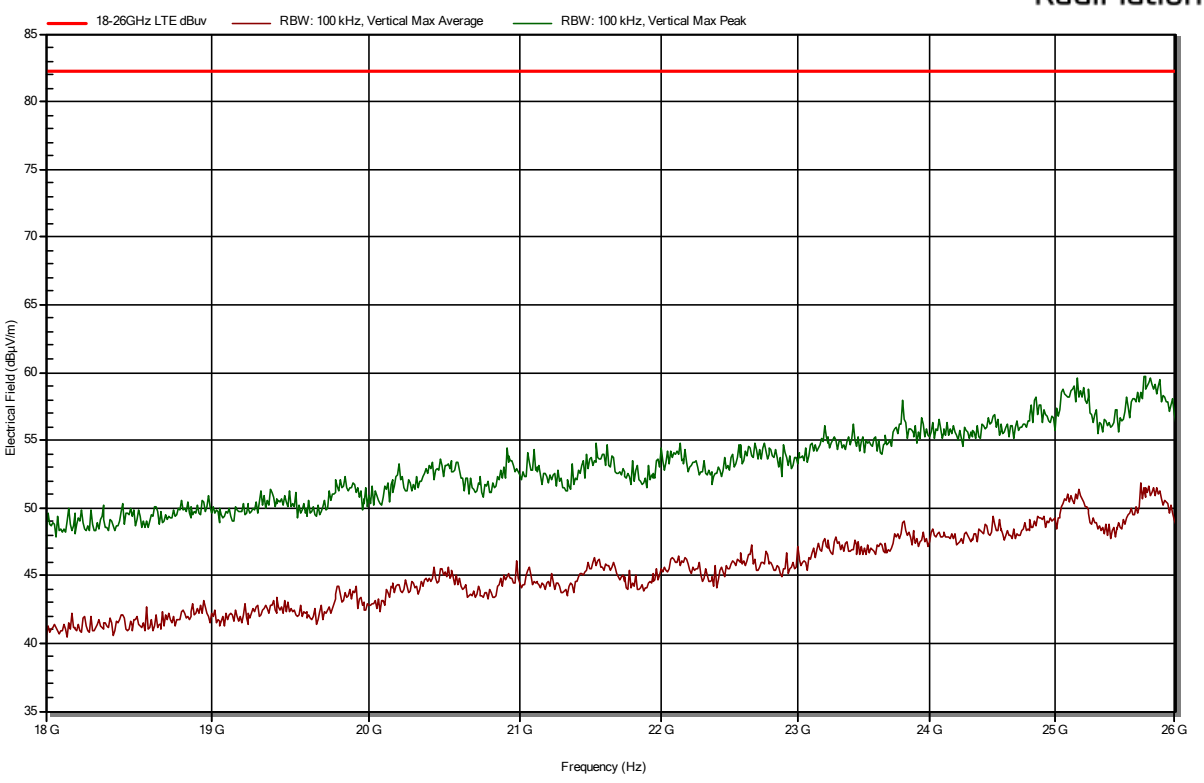
18 – 26 GHz

Vertical polarization

LTE B2

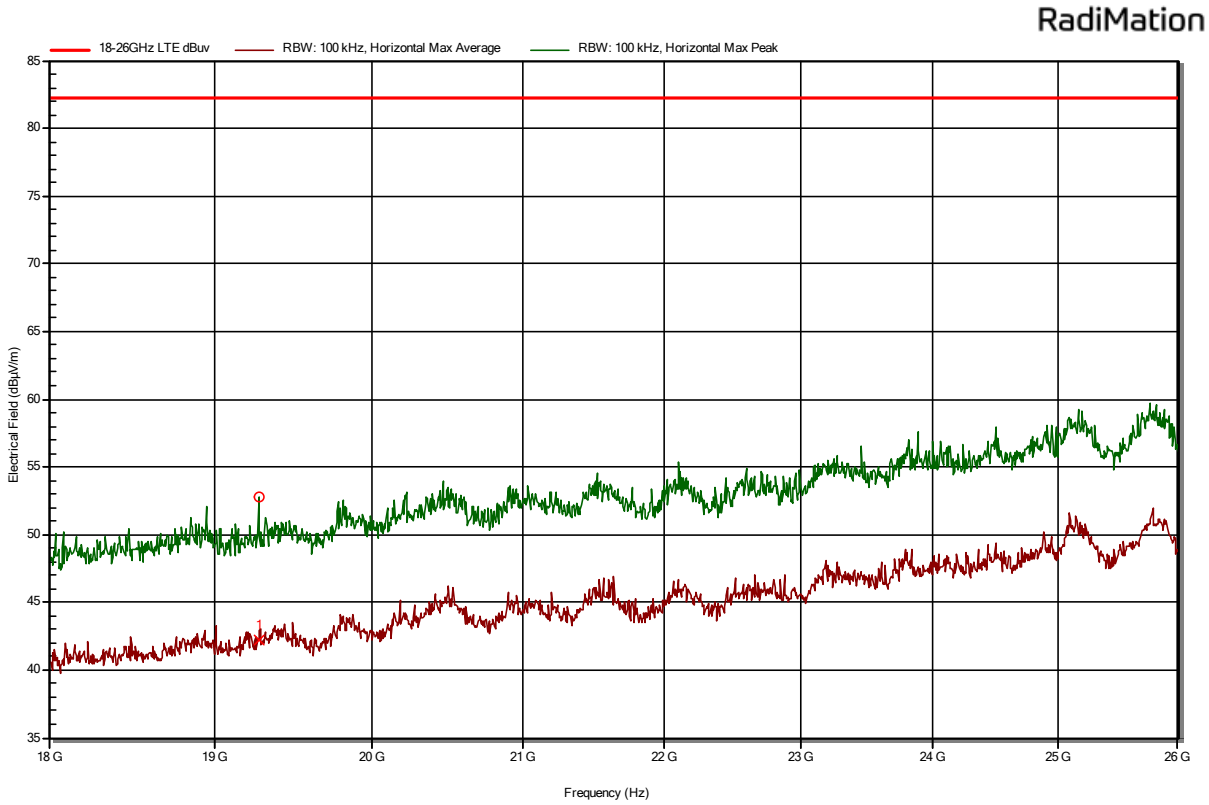


LTE B5

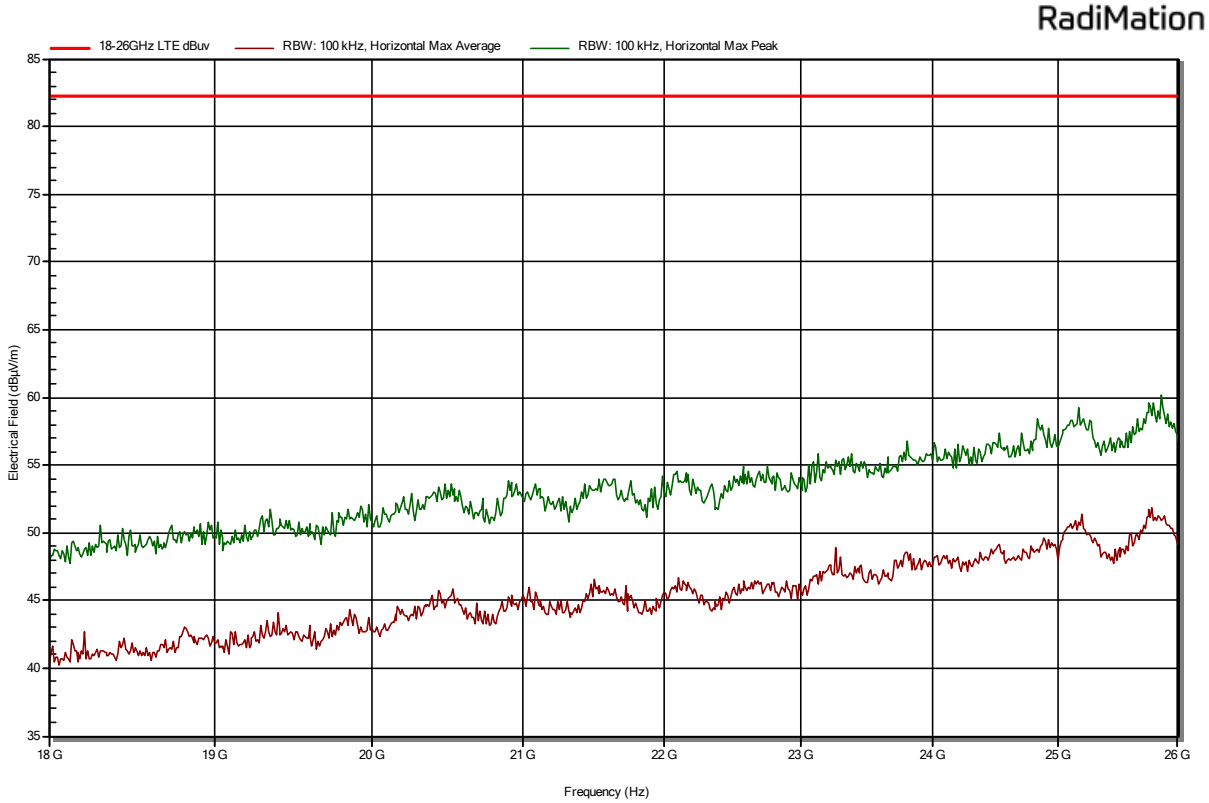


Horizontal polarization

LTE B2



LTE B5



3.2 Conducted emissions

3.2.1 Limit

According to 15.207 (c)

Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

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

*Decreases with the logarithm of the frequency.

3.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.2.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.2.4 Test procedure

According to ANSI C63.10: 2013
IRN 029 – Method 1

3.2.5 Test results and plots of the AC mains conducted measurement

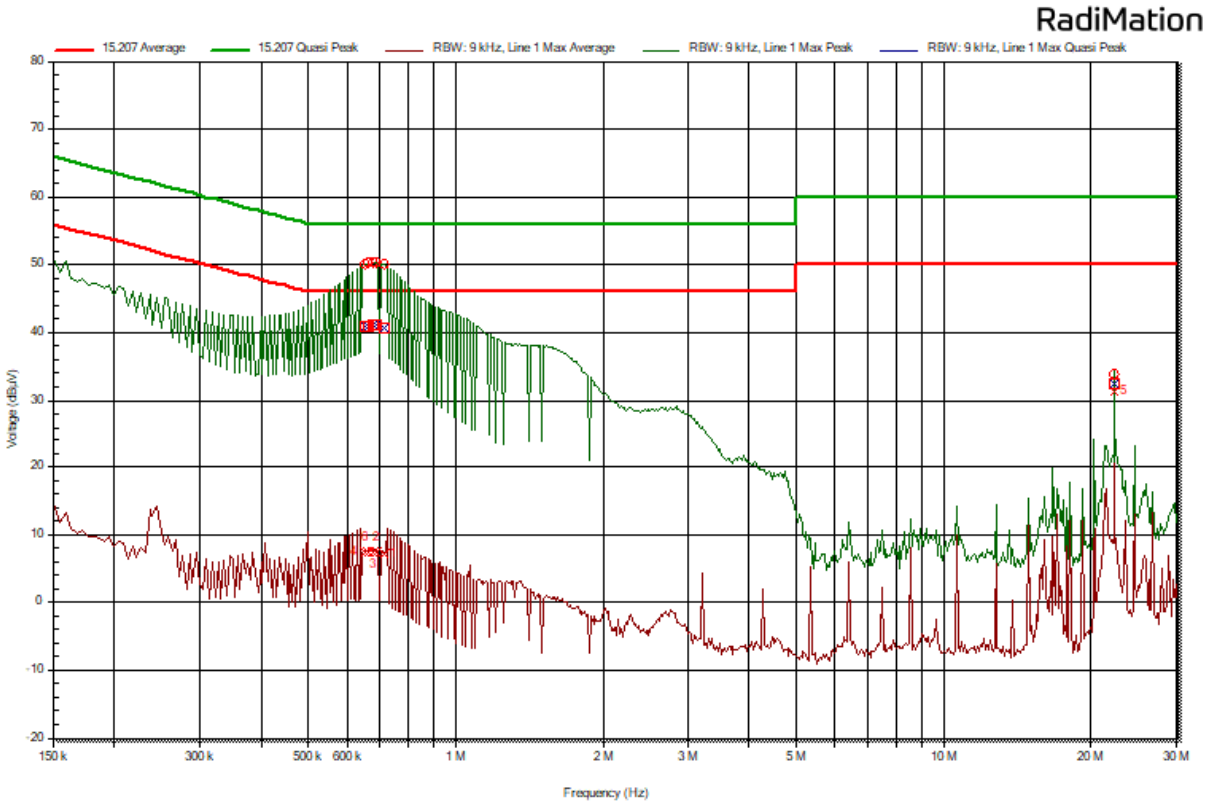
See next page.

3.2.6 Measurement uncertainty

+/- 3.6 dB

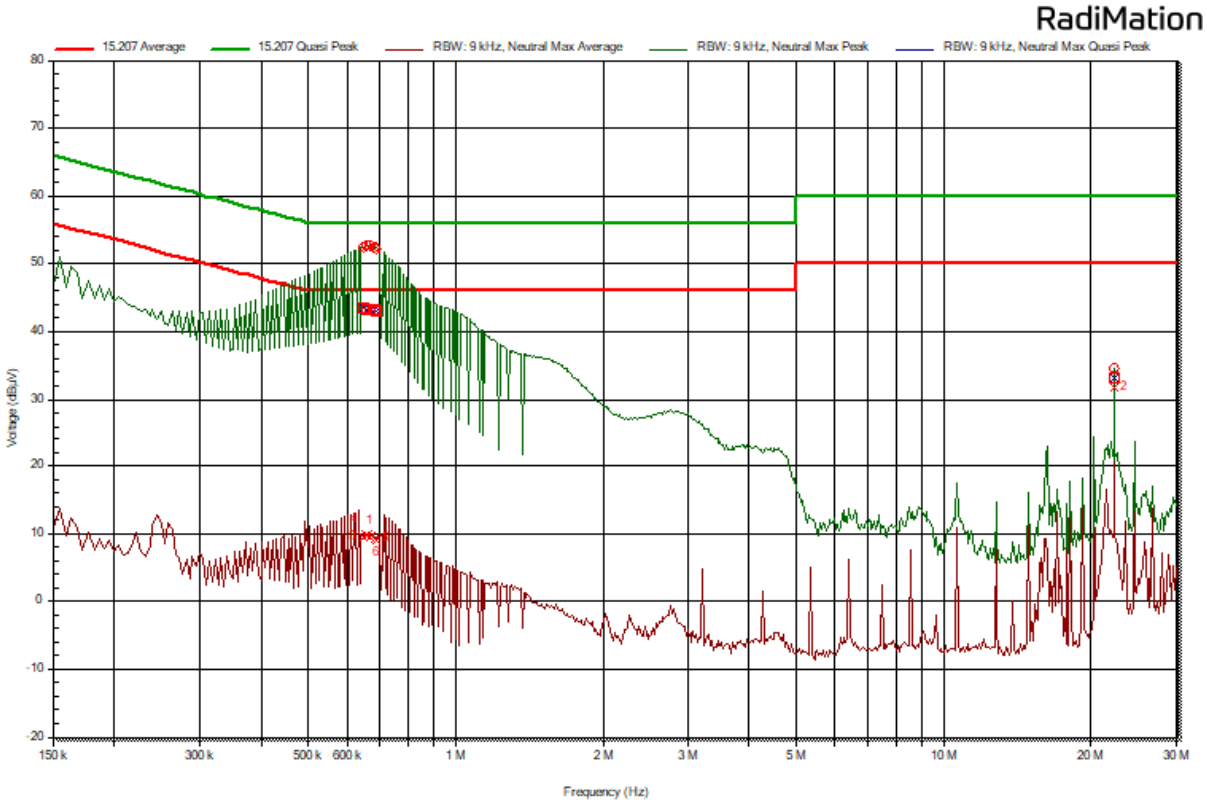
3.2.7 Plots of the AC mains conducted spurious measurement

Phase



Frequency	Peak	Peak Limit	Average	Average Limit	Quasi-Peak	Quasi-Peak Limit	Status	LISN
712,5 kHz	50 dBµV	56 dBµV	7 dBµV	46 dBµV	40,7 dBµV	56 dBµV	Pass	Line 1
685,5 kHz	50,4 dBµV	56 dBµV	7,3 dBµV	46 dBµV	41,2 dBµV	56 dBµV	Pass	Line 1
676,5 kHz	50,3 dBµV	56 dBµV	7,3 dBµV	46 dBµV	41,1 dBµV	56 dBµV	Pass	Line 1
663 kHz	50,2 dBµV	56 dBµV	7,3 dBµV	46 dBµV	41 dBµV	56 dBµV	Pass	Line 1
22,367 MHz	33,8 dBµV	60 dBµV	31,3 dBµV	50 dBµV	32,4 dBµV	60 dBµV	Pass	Line 1
654 kHz	50,1 dBµV	56 dBµV	7,3 dBµV	46 dBµV	40,9 dBµV	56 dBµV	Pass	Line 1

Neutral



Frequency	Peak	Peak Limit	Average	Average Limit	Quasi-Peak	Quasi-Peak Limit	Status	LISN
667,5 kHz	52,6 dBµV	56 dBµV	9,4 dBµV	46 dBµV	43,3 dBµV	56 dBµV	Pass	Neutral
22,367 MHz	34,5 dBµV	60 dBµV	31,7 dBµV	50 dBµV	33,2 dBµV	60 dBµV	Pass	Neutral
649,5 kHz	52,5 dBµV	56 dBµV	9,5 dBµV	46 dBµV	43,4 dBµV	56 dBµV	Pass	Neutral
658,5 kHz	52,6 dBµV	56 dBµV	9,6 dBµV	46 dBµV	43,3 dBµV	56 dBµV	Pass	Neutral
681 kHz	52,4 dBµV	56 dBµV	9,2 dBµV	46 dBµV	43,2 dBµV	56 dBµV	Pass	Neutral
690 kHz	52,2 dBµV	56 dBµV	9,1 dBµV	46 dBµV	43 dBµV	56 dBµV	Pass	Neutral

4 Sample calculations

All formulas for data conversions and conversion factors are reported in this chapter.

Conducted emission Measurement (see chapter 3.9):

U_{lisn} (dBµV) = U (dBµV) + Corr. (dB)

Where:
U = Measuring receiver voltage
LISN insertion loss = Voltage division factor of LISN
Corr. = sum of single correction factors of used LISN, cables and pulse limiter.
Linear interpolation will be used for frequencies in between the values in the table.

Frequency (Mhz)	**Voltage division LISN (db)**	**Insertion Loss Pulse limiter (dB)**	**Cable loss (dB)**	**Corr. (dB)**
	TE 00208 SN: 892785/004 Rohde & Schwarz ESH3-Z5	**TE 00756 SN: 5SM03153 Rohde & Schwarz ESH3-Z2**	**TE 11134**	
0,15	0,09	9,87	0,02	9,98
0,2	0,1	9,87	0,03	10
0,3	0,1	9,87	0,03	10
0,5	0,1	9,87	0,08	10,05
0,7	0,12	9,87	0,25	10,24
0,8	0,12	9,87	0,25	10,24
1	0,13	9,87	0,11	10,11
2	0,16	9,87	0,15	10,18
3	0,19	9,87	0,21	10,27
5	0,26	9,88	0,21	10,35
7	0,36	9,89	0,25	10,5
8	0,39	9,89	0,25	10,53
10	0,46	9,91	0,29	10,66
15	0,77	9,93	0,34	11,04
20	0,95	9,96	0,37	11,28
25	1,12	9,99	0,43	11,54
30	1,1	10,04	0,45	11,59

Field Strength Measurement (see chapter 3.3):

E (dBµV/m) = U(dBµV) + AF (dB/m) + Corr. (dB)

Where:
E = Electric field strength
U = Measuring receiver voltage
AF = Antenna factor
CL = Cable loss

Corr. = sum of single correction factors of used cable and amplifier (if applicable).
Linear interpolation will be used for frequencies in between the values in the table.
Tables shows an extract of the values.

Frequency (Mhz)	**AF (dB/m)** **TE 00967** **Chase CBL6112A** **SN: 2308**	**Cable loss (dB)** **Id: SAR cable**	**Corr. (dB)**
30	18,6	0,68	19,28
100	10,7	1,15	11,85
150	10,6	1,41	12,01
200	9,3	1,63	10,93
250	12,6	1,93	14,53
300	13,3	2,12	15,42
350	14,6	2,2	16,8
400	15,5	2,29	17,79
450	16,9	2,53	19,43
500	17,5	2,67	20,17
550	18,4	2,9	21,3
600	18,8	3,02	21,82
650	19,2	3,09	22,29
700	19	3,22	22,22
750	19,8	3,56	23,36
800	19,7	3,69	23,39
900	20,4	3,81	24,21
950	20,8	3,91	24,71
1000	21,2	4,3	25,5

Frequency (Mhz)	AF (dB/m) TE 00531 Emco 3115 SN: 9412-4377	Gain (dB) TE 11132 Miteq JS4-18004000-30-8P-A1	Cable loss (dB) TE 01315	Corr. (dB)
1000	23,6	40,4	2,0	66
1500	25,1	40,5	2,4	68
2000	27,1	40,5	2,7	70,3
2500	28,6	40,7	3,2	72,5
3000	30,5	40,7	3,2	74,4
3500	31,2	40,7	3,4	75,3
4000	32,7	40,9	4,9	78,5
4500	32,4	40,9	4,4	77,7
5000	33,2	40,7	4,6	78,5
5500	34,0	40,5	4,5	79
6000	34,6	40,0	5,2	79,8
6500	34,3	39,4	5,9	79,6
7000	35,2	38,6	5,7	79,5
7500	36,4	39,2	5,9	81,5
8000	37,0	38,9	6,3	82,2
8500	37,5	38,4	6,4	82,3
9000	38,1	37,4	6,5	82
9500	37,8	37,0	7,1	81,9
10000	38,2	36,5	7,3	82
10500	38,1	36,7	7,6	82,4
11000	38,3	36,9	8,3	83,5
11500	38,5	37,6	8,1	84,2
12000	39,1	38,3	8,4	85,8
12500	38,7	38,5	8,3	85,5
13000	39,2	38,9	9,2	87,3
13500	40,5	40,2	8,3	89
14000	41,1	40,0	8,2	89,3
14500	41,4	40,1	8,2	89,7
15000	40,2	41,4	8,3	89,9
15500	37,9	41,4	8,6	87,9
16000	37,5	42,8	9,2	89,5
16500	38,6	42,3	8,8	89,7
17000	41,1	43,1	9,4	93,6
17500	42,7	43,2	9,4	95,3
18000	44,0	44,2	9,8	98

Frequency (Mhz)	AF (dB/m) TE 00531 Emco 3115 SN: 9412-4377	Gain (dB) TE 11132 Miteq JS4-18004000-30-8P-A1	Cable loss (dB) TE 01315	Corr. (dB)
18000	31,3	26,2	9,8	67,3
19000	31,5	26,1	9,6	67,2
20000	31,7	25,9	11	68,6
21000	31,9	24,3	10,7	66,9
22000	32,1	18,3	10,5	60,9
23000	32,2	18,9	10,8	61,9
24000	32,3	23,6	11,4	67,3
25000	32,4	24,5	11,6	68,5
26000	32,5	25,3	11,7	69,5