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FCC and IC Test report for parts 15.107, 15.109 15.207, 15.209, 15.225, 15.247

Product name : “FullCloud” IoT Lock System

Applicant : PinvAccess B.V.

FCC ID : 2A225-FC0320

Test report No. : 210400900 001 Ver 1.00

Laboratory information

Accreditation

Telefication 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 L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

Telefication 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.

Telefication 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 Telefication is: 4173A.

Telefication 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 Telefication Netherlands.

Testing Location

Test Site	Kiwa Telefication BV
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	27-07-2021	First draft	K.K.
v1.00	07-09-2021	Final draft	K.K.

Table of Contents

Summary of Test results

FCC	ISED	Description	Section in report	Verdict
15.247(d) 15.225(d) 15.209 (a)	RSS-Gen 8.9	Radiated spurious emissions	3.1	Pass
15.205 (a)	RSS Gen 8.10	Spurious emissions in the restricted bands	3.1	Pass
15.247 (a)	RSS-247 5.2(a)	6 dB bandwidth	3.2	Pass
15.247 (b)	RSS-247 5.4 (d)	RF output power	3.3	Pass
15.247 (e)	RSS-247 5.2 (b)	Power spectral density	3.4	Pass
15.247 (d)	RSS-247 5.5	Band edge	3.5	Pass
15.225(a),(b),(c)	RSS-210 B.6	Field strength of emissions	3.6	Pass
15.225(e)	RSS-210 B.6	Frequency Stability	3.7	Pass

1 General Description

1.1 Applicant

Client name:	PinvAccess B.V.
Address:	Laan van de Maagd 103, Apeldoorn
Zip code:	7324 BT
Telephone:	-
E-mail:	kai@pinvaccess.com
Contact name:	Kai Schöllkopf

1.2 Manufacturer

Manufacturer name:	PinvAccess B.V.
Address:	Laan van de Maagd 103, Apeldoorn
Zip code:	7324 BT
Telephone:	-
E-mail:	kai@pinvaccess.com
Contact name:	Kai Schöllkopf

1.3 Tested Equipment Under Test (EUT)

Product name:	“FullCloud” IoT Lock System
Brand name:	PinvAccess B.V.
FCC ID:	2A225-FC0320
Product type:	Lock System
Model(s):	-
Batch and/or serial No.	-
Software version:	-
Hardware version:	-
Date of receipt	19-07-2021
Tests started:	19-07-2021
Testing ended:	22-07-2021

1.4 Product specifications of Equipment under test

Tx Frequency:	NFC: 13.56 MHz BLE: 2400 – 2483.5 MHz Proprietary: 902 – 928 MHz
Rx frequency:	NFC: 13.56 MHz BLE: 2400 – 2483.5 MHz Proprietary: 902 – 928 MHz
Antenna type:	NFC: Loop Antenna BLE: Ceramic Chip Antenna Proprietary: Ceramic Chip Antenna
Antenna gain:	BLE: -0.5 dBi Proprietary: -2.6 dBi
Type of modulation:	NFC: ASK BLE: GFSK Proprietary: DSSS
Emission designator	NFC: 423KA1D BLE: 806KF1D Proprietary: 673KF1D

Disclaimer: The antenna gain, OCW and operating frequency bands are declared by the applicant

1.5 Environmental conditions

Test date	19-07-2021	20-07-2021	21-07-2021	22-07-2021
Ambient temperature	22.1	22.9	22.0	22.2
Humidity	55.4	46.5	55.3	58.9

1.6 Measurement standards

- ANSI C63.4:2014
- 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 15 Subpart C §15.107
- FCC Part 15 Subpart C §15.109
- FCC Part 15 Subpart C §15.207
- FCC Part 15 Subpart C §15.209
- FCC Part 15 Subpart C §15.225
- FCC Part 15 Subpart C §15.247

1.8 Observation and remarks

Proprietary modulation use wideband DSSS modulation under IEEE 802.15.4 protocol, It advertise in 902.6 - 927.4 MHz band with 200 kHz channel width.
Co-location test has been performed to observe the possible interference between the NFC and Proprietary.

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 under supervision of Roy van Barneveld, BASc

Review of test methods and report by:

Name : Paul van Wanrooij

The above conclusions have been verified by the following signatory:

Date : 10-09-2021

Name : P. van Wanrooij

Function : Test Engineer

Signature :

2 Test configuration of the Equipment Under Test

2.1 Test mode

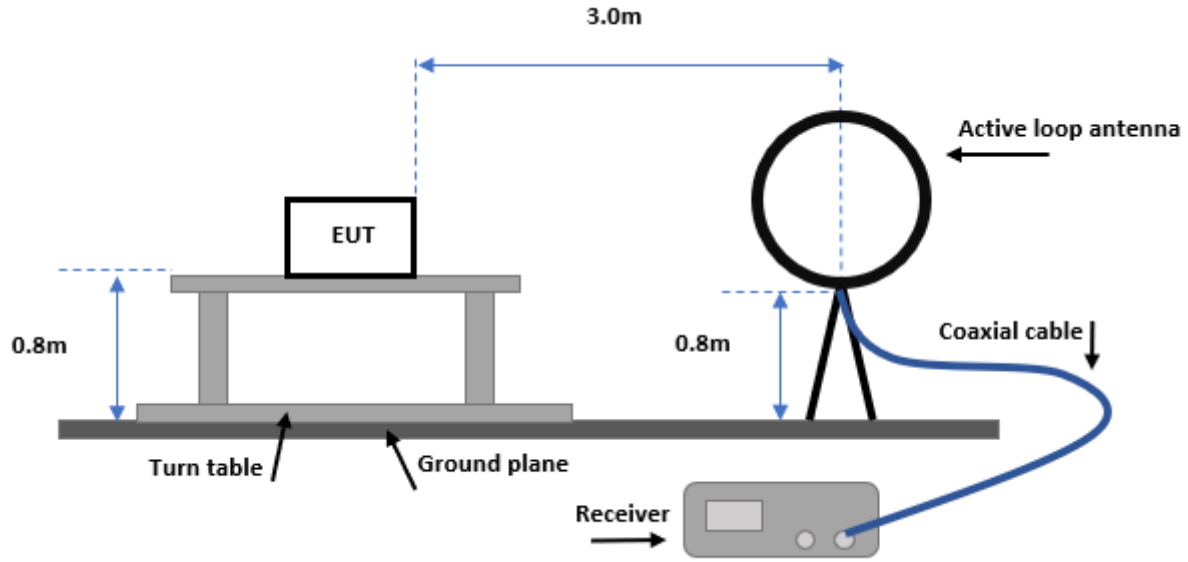
The client provided the means to set the EUT in the different test mode required for all the test cases.

2.2 Tested channels and Data rates

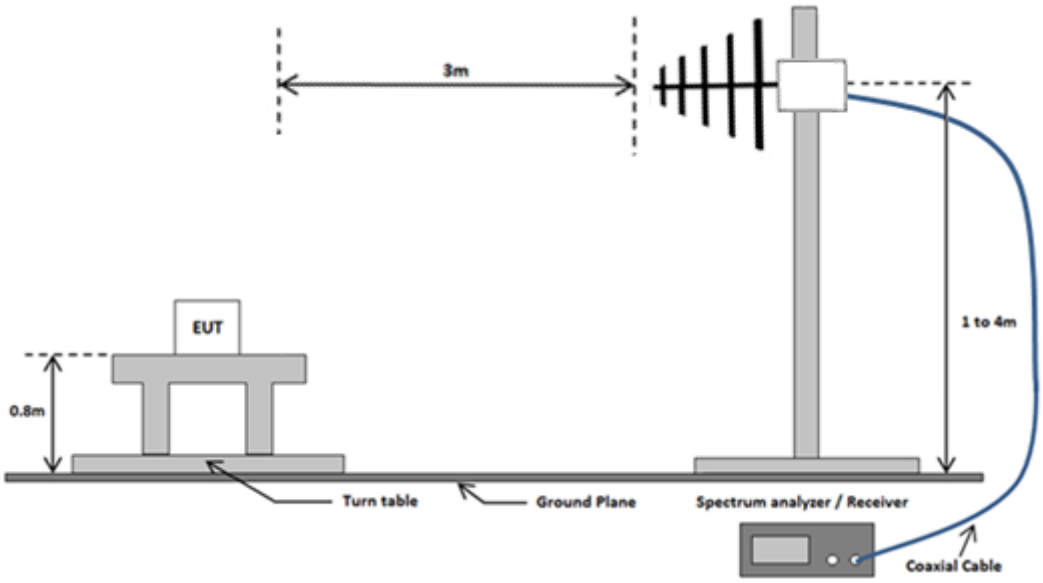
Technology	Channel	Data Rate	Frequency
NFC	--	424 kbps	13.56 MHz
BLE	Channel 37	1 Mbps	2402 MHz
BLE	Channel 17	1 Mbps	2440 MHz
BLE	Channel 39	1 Mbps	2480 MHz
Proprietary	Low	50 kbps	902.6 MHz
Proprietary	Mid	50 kbps	915.0 MHz
Proprietary	High	50 kbps	927.4 MHz

2.3 Test setups

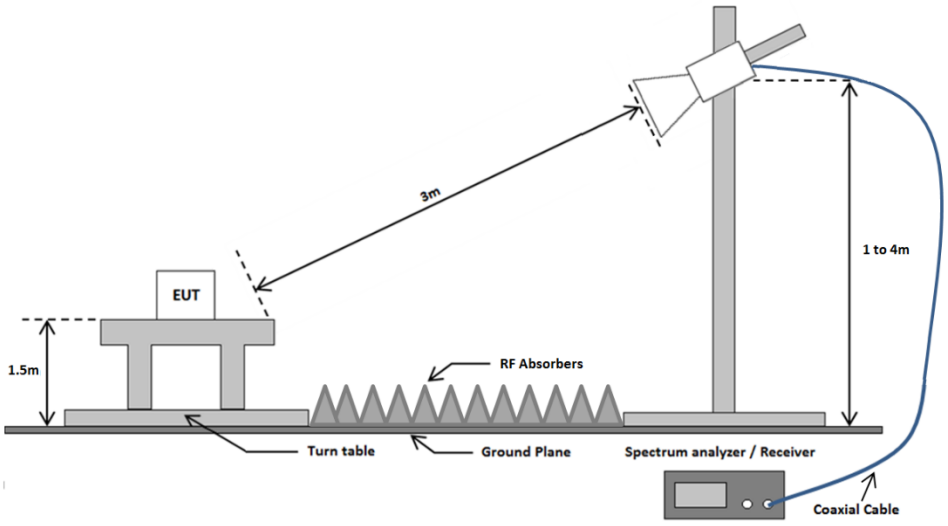
Radiated emissions test setup 9 kHz – 30 MHz



Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



2.4 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Used at Par.
EMI Receiver	Rohde & Schwarz	ESCI	TE11128	3.1 – 3.8
EMI Receiver	Rohde & Schwarz	ESR7	TE01220	3.1 – 3.8
Spectrum analyzer	Rohde & Schwarz	FSP40	TE11125	3.1 – 3.8
Spectrum Analyzer	Rohde & Schwarz	FSV40	TE01269	3.1 – 3.8
1.1 GHz HPF	Wainwright	WHK1.1/15G-10EF	TE01139	3.1
3.0 GHz HPF	Wainwright	WHK3.0/18G-10EF	TE01140	3.1
Active loop antenna	EMCO	6502	TE11171	3.1,3.7
Biconilog antenna	Chase	CBL6112A	TE00967	3.1
Horn antenna	EMCO	3115	TE00531	3.1
Preamplifier 1-18 GHz	µComp Nordic	MCNA-40-0010800-25-10P	TE11175	3.1
Horn antenna	FLANN-MICROWAVE	20240-25	TE 00818	3.1
Preamplifier 18-26 GHz	Miteq	JS4-18004000-33-8P	TE 11131	3.1
Test software	DARE	Radimation Version 2021.1.9	--	3.1, 3.7

2.5 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

15.225(d)
The field strength of any emissions appearing outside of the 13.110 -14.010 MHz band shall not exceed the general radiated emission limits in part 15.209.

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance(m)
0.009 – 0.490	2400/F(kHz)	20*{log[2400]-log[F(kHz)]}	300*
0.490 – 1.705	24000/F(kHz)	20*{log[24000]-log[F(kHz)]}	30*
1.705 – 13.11 14.01 – 30.0	30	29.5	30*
30 -88	100	40	3
88 - 216	150	43,5	3
216-960	200	46	3
Above 960	500	54	3

*Note: Limit lines in the plots corrected to 3m measurement distance according to the method described in ANSI C63.10-2013, clause 6.4

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

9 kHz – 30 MHz: According to ANSI C63.4-2014, section 5.4.2 and 8.2.3
30 MHz to 26.5 GHz: According to ANSI C63.4-2014, section 8.3

9 kHz to 30 MHz: IRN 026 – Method 10
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
9 kHz – 30 MHz	--	±1.6 dB
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

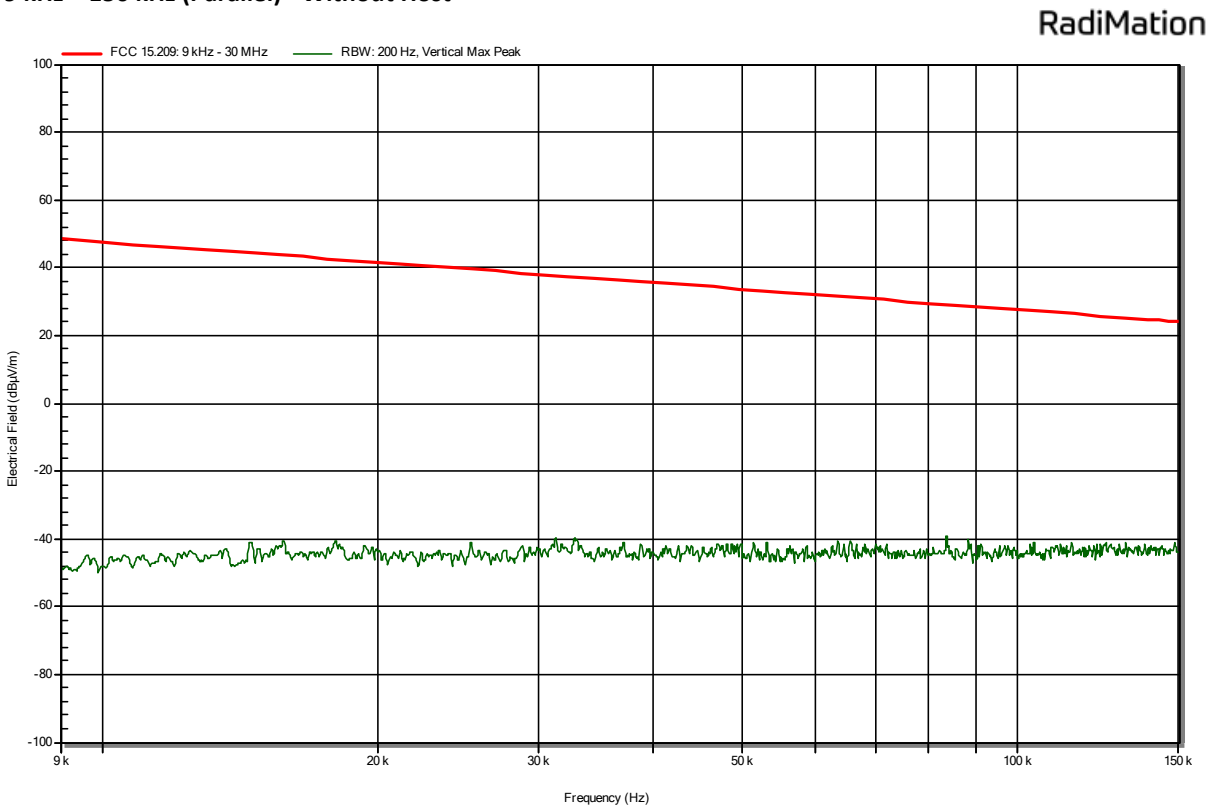
Peak table

Technology	Frequency (MHz)	Peak (dBµV/m)	Polarization
NFC	189	35.5	Vertical
NFC	806	41.7	Vertical
Proprietary	2706	39.9	Vertical
BLE	9608	51.2	Vertical

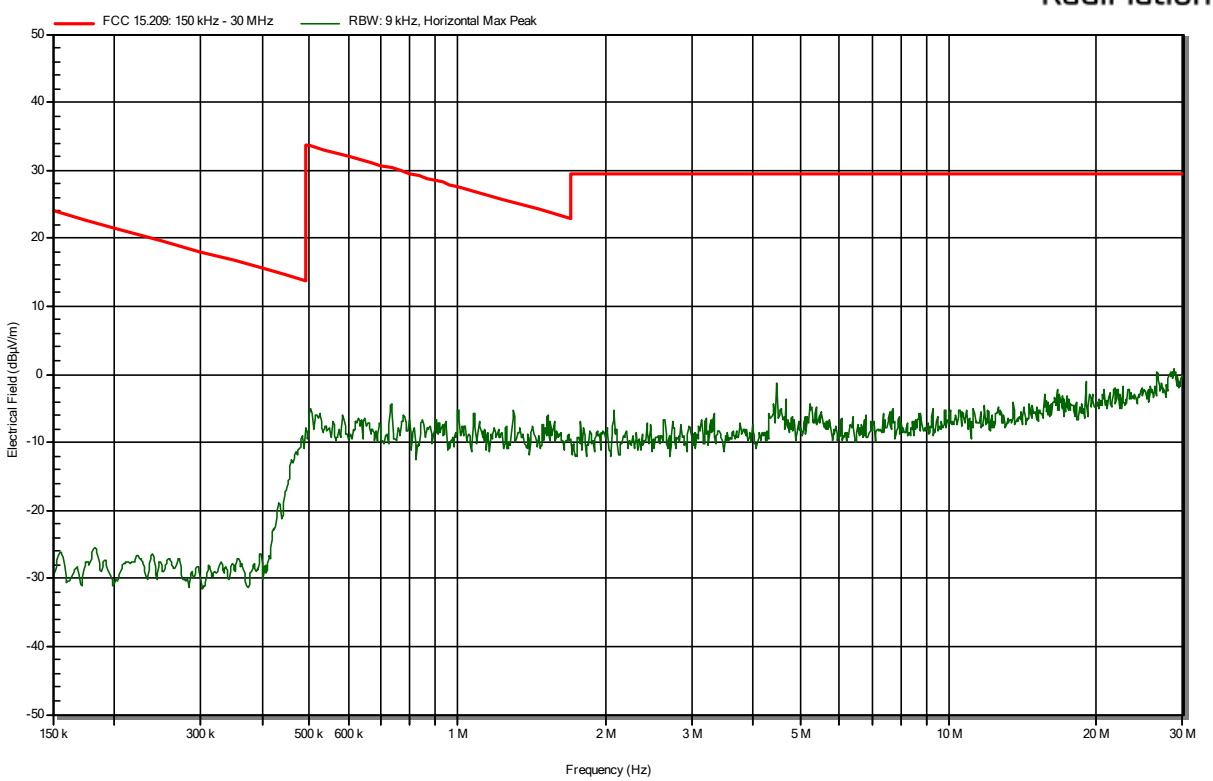
3.1.6 Plots of the Radiated Spurious Emissions Measurement

NFC

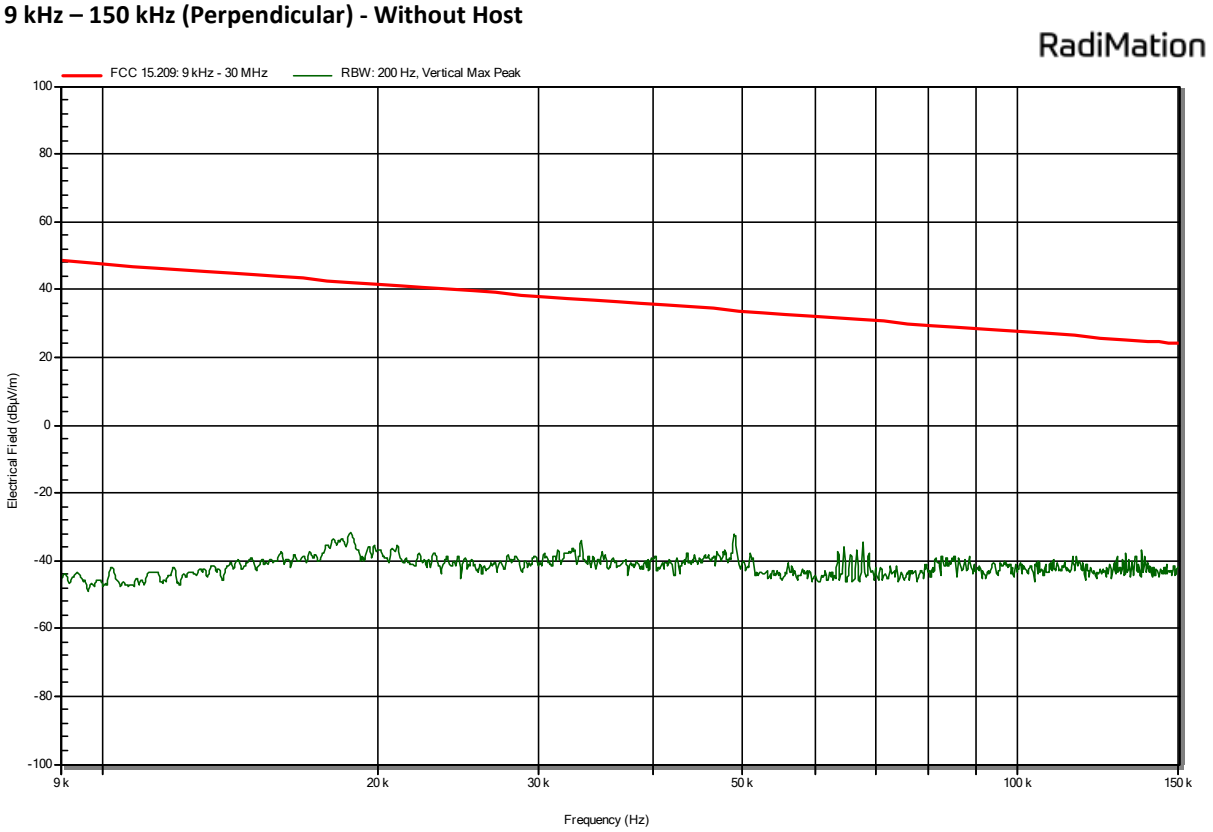
9 kHz – 150 kHz (Parallel) - Without Host



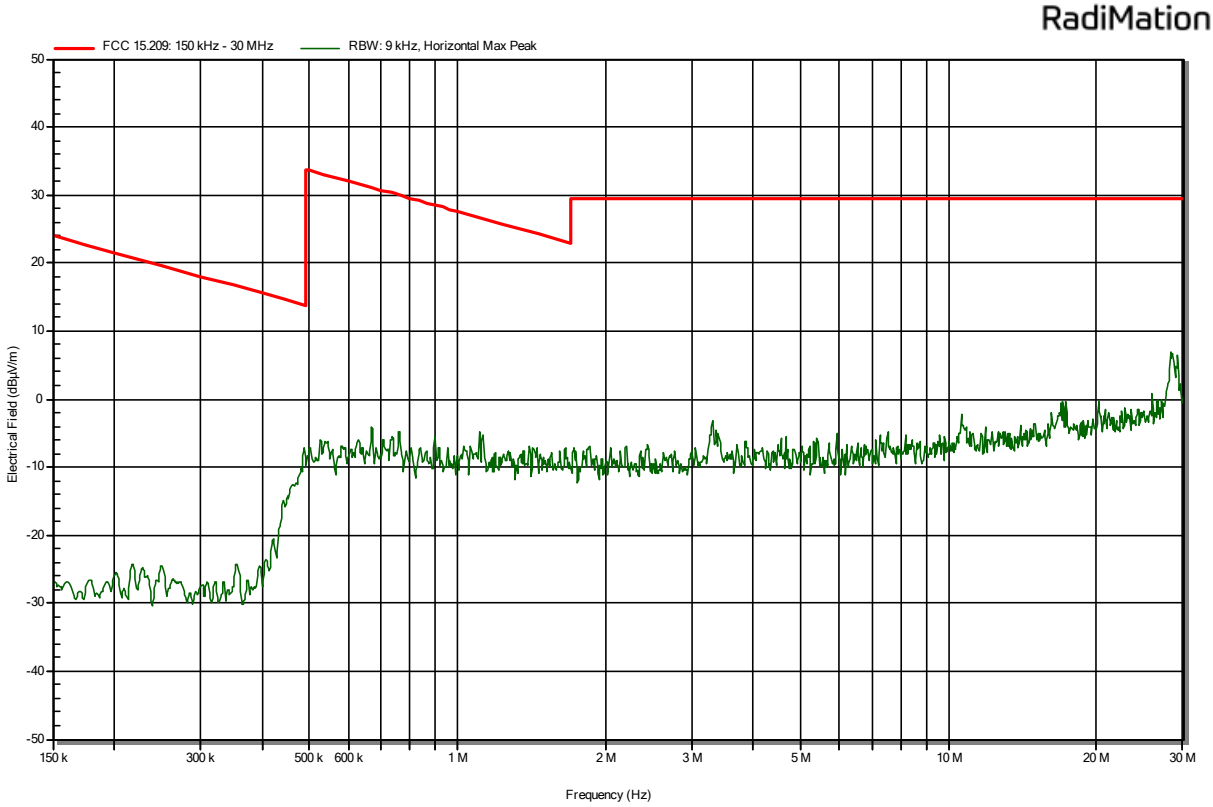
150 – 30 MHz (Parallel) - without host



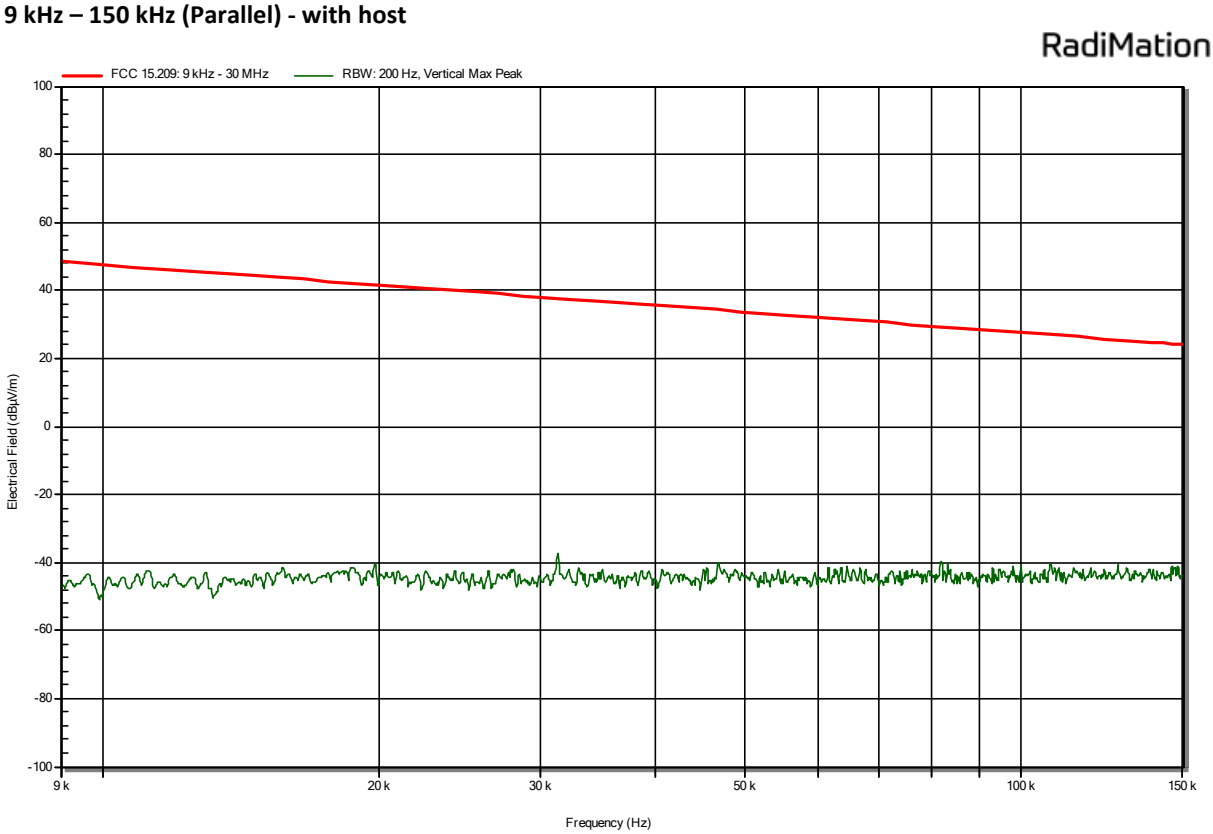
9 kHz – 150 kHz (Perpendicular) - Without Host



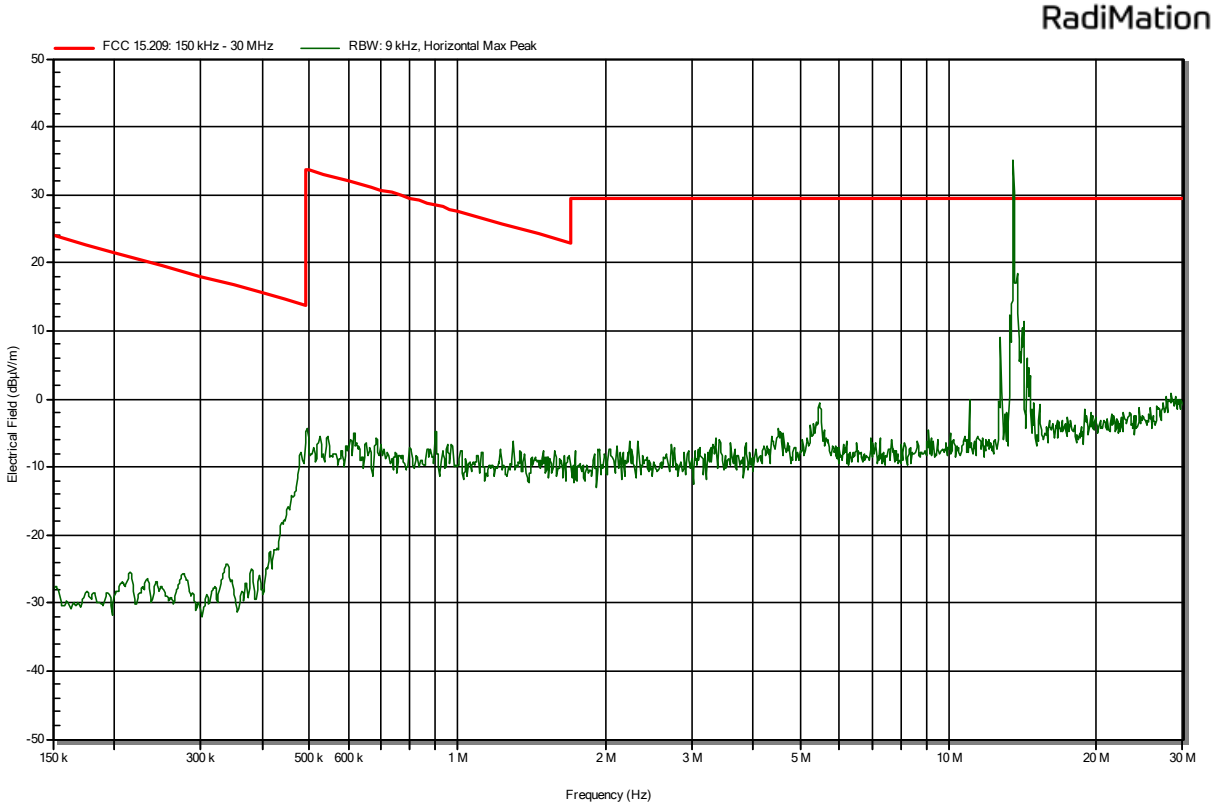
150 – 30 MHz (Perpendicular) - without host



9 kHz – 150 kHz (Parallel) - with host

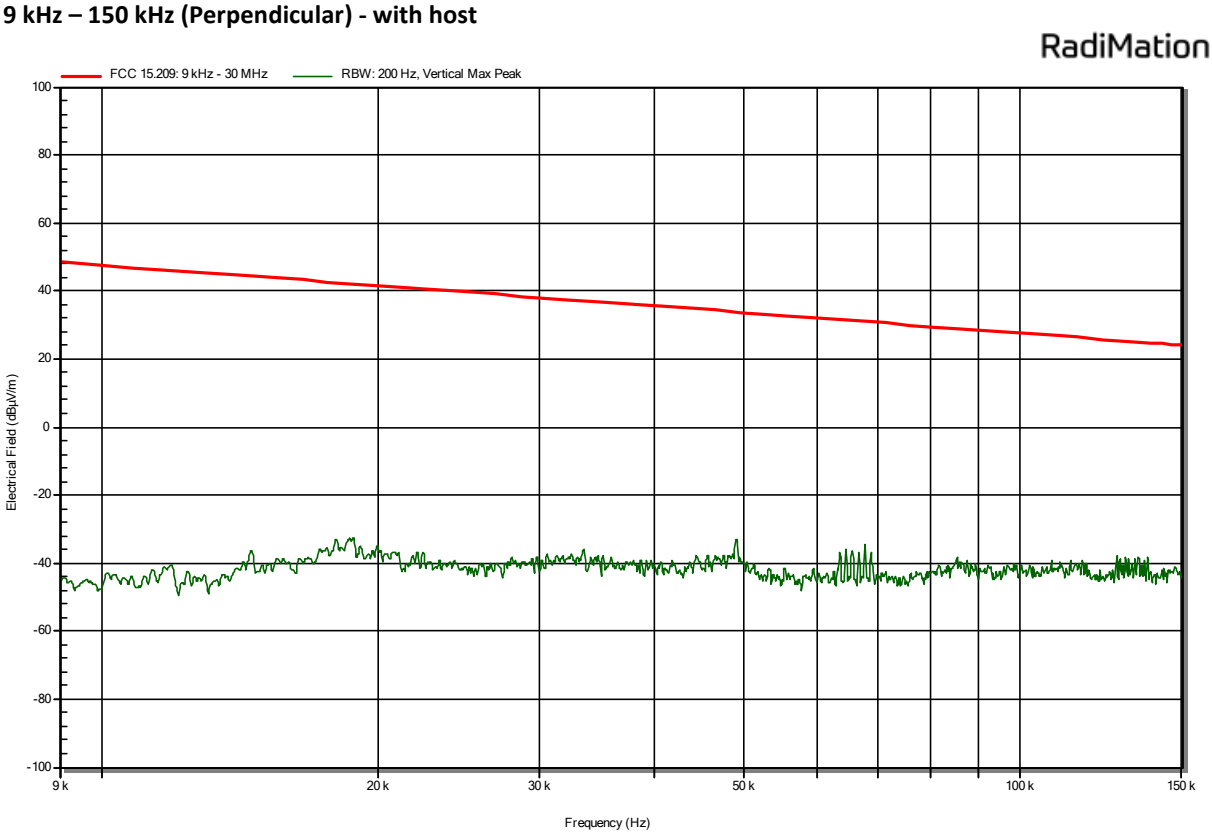


150 – 30 MHz (Parallel) - with host

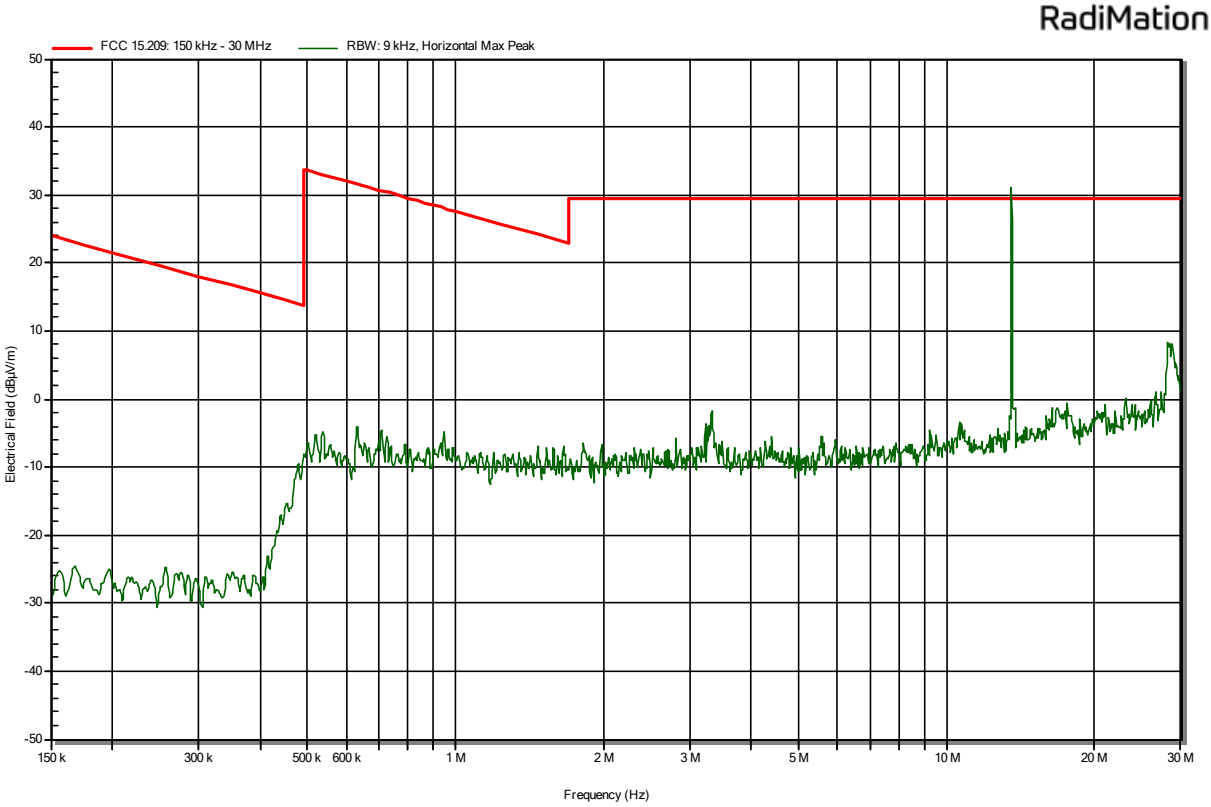


Note: The peak at 13.56 MHz in the plot is the fundamental frequency , and is not subject to the limit in the plot

9 kHz – 150 kHz (Perpendicular) - with host



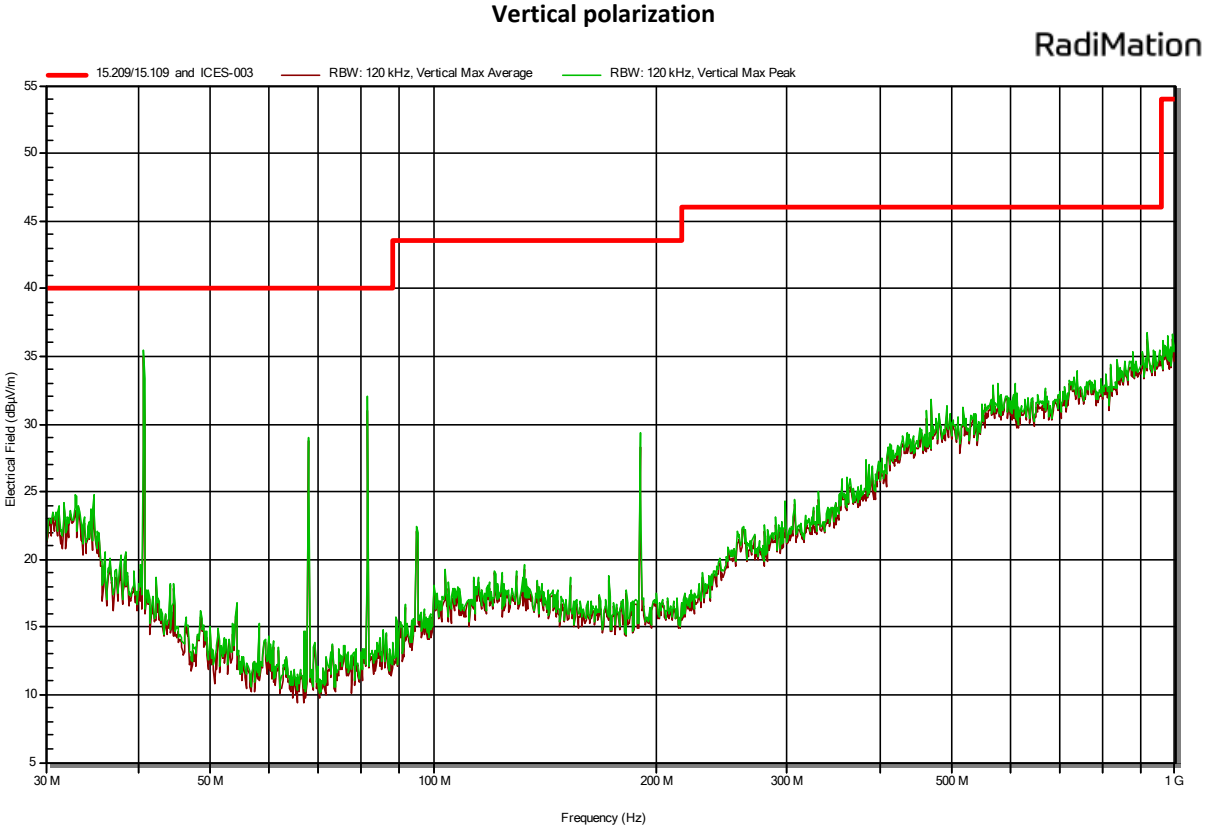
150 – 30 MHz (Perpendicular) - with host



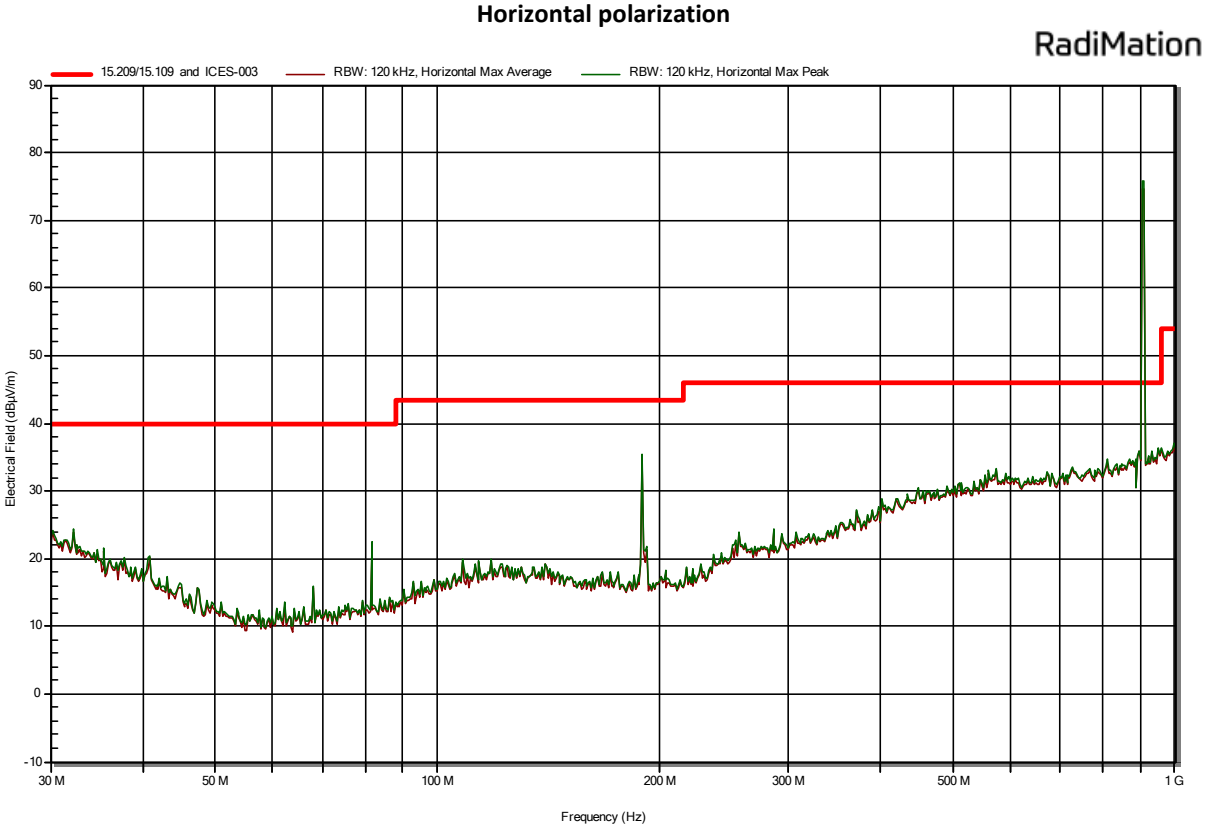
Note: The peak at 13.56 MHz in the plot is the fundamental frequency , and is not subject to the limit in the plot

30 -1000 MHz - with host

Vertical polarization



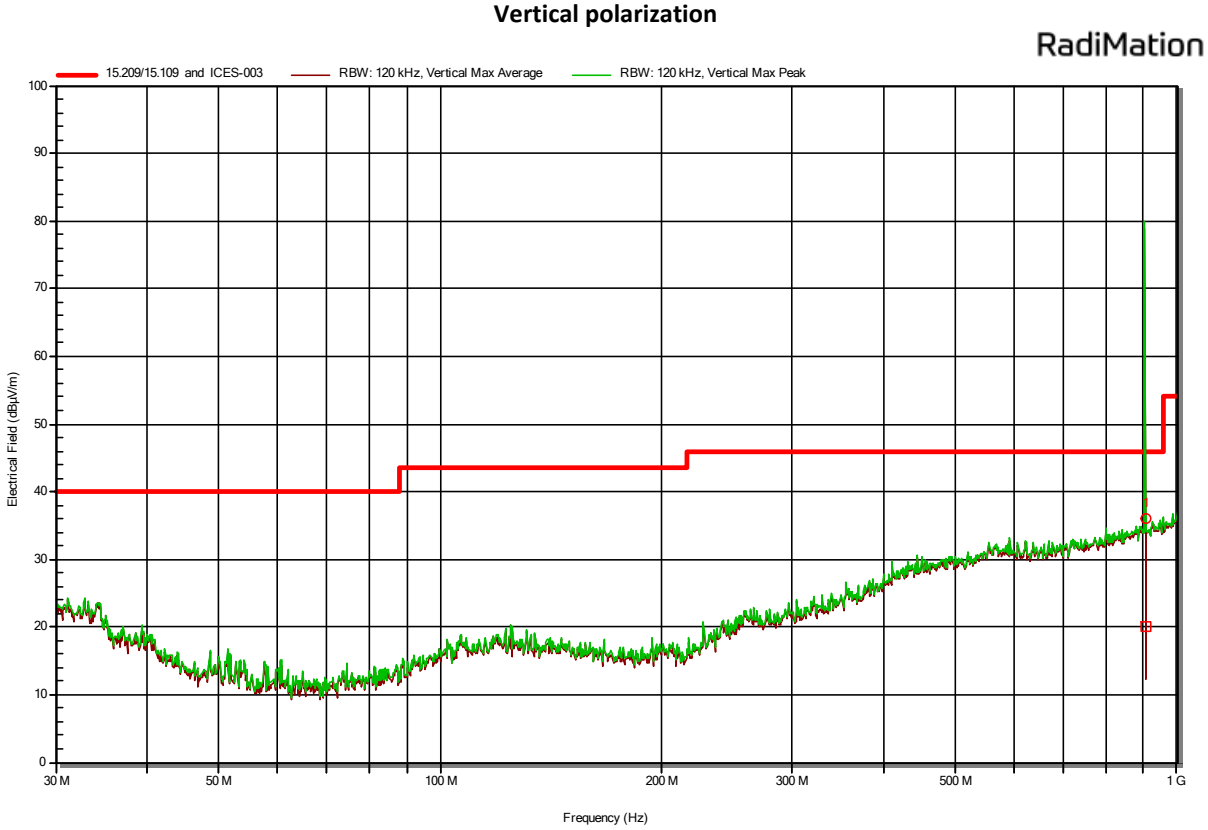
Horizontal polarization



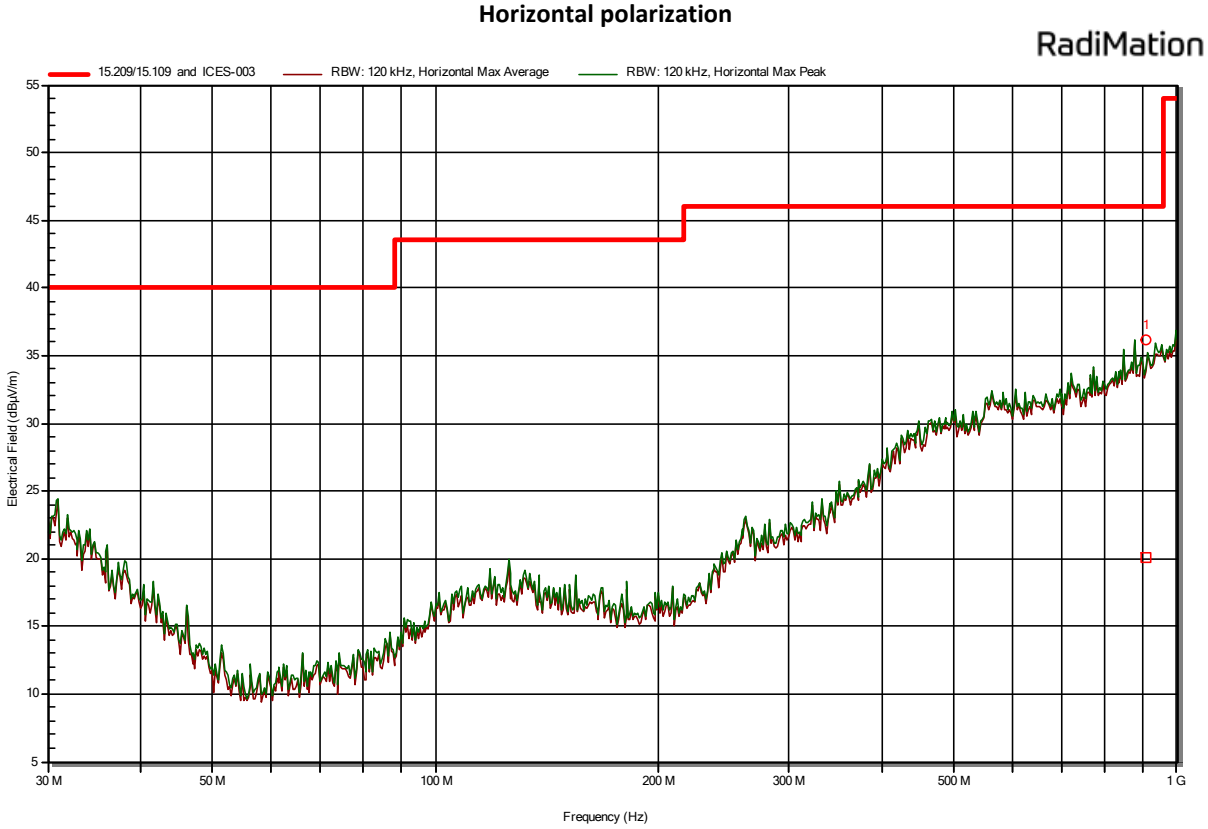
Note: The peak at 915 MHz in the plot is the fundamental frequency and it is not subject to the limit in the plot

30 -1000 MHz - without host

Vertical polarization



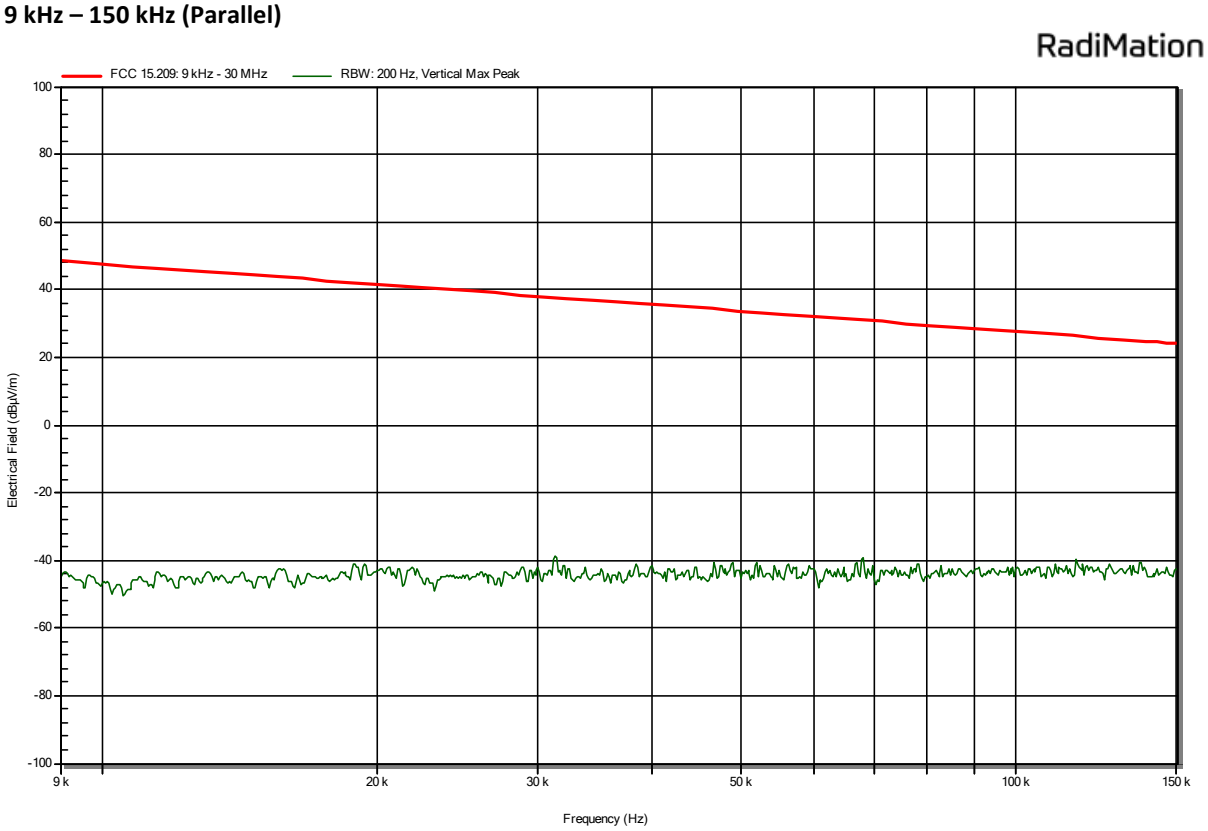
Horizontal polarization



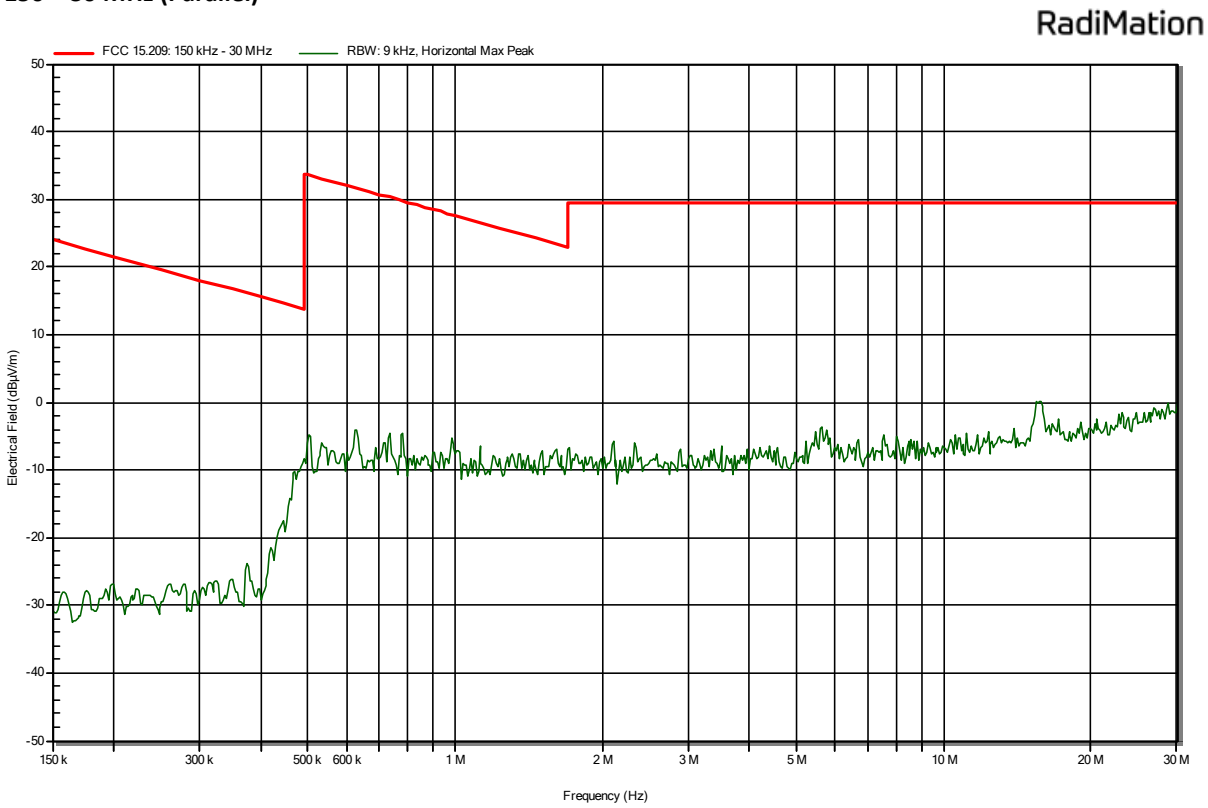
Note: The peak at 915 MHz in the plot is the fundamental frequency and it is not subject to the limit in the plot

Proprietary

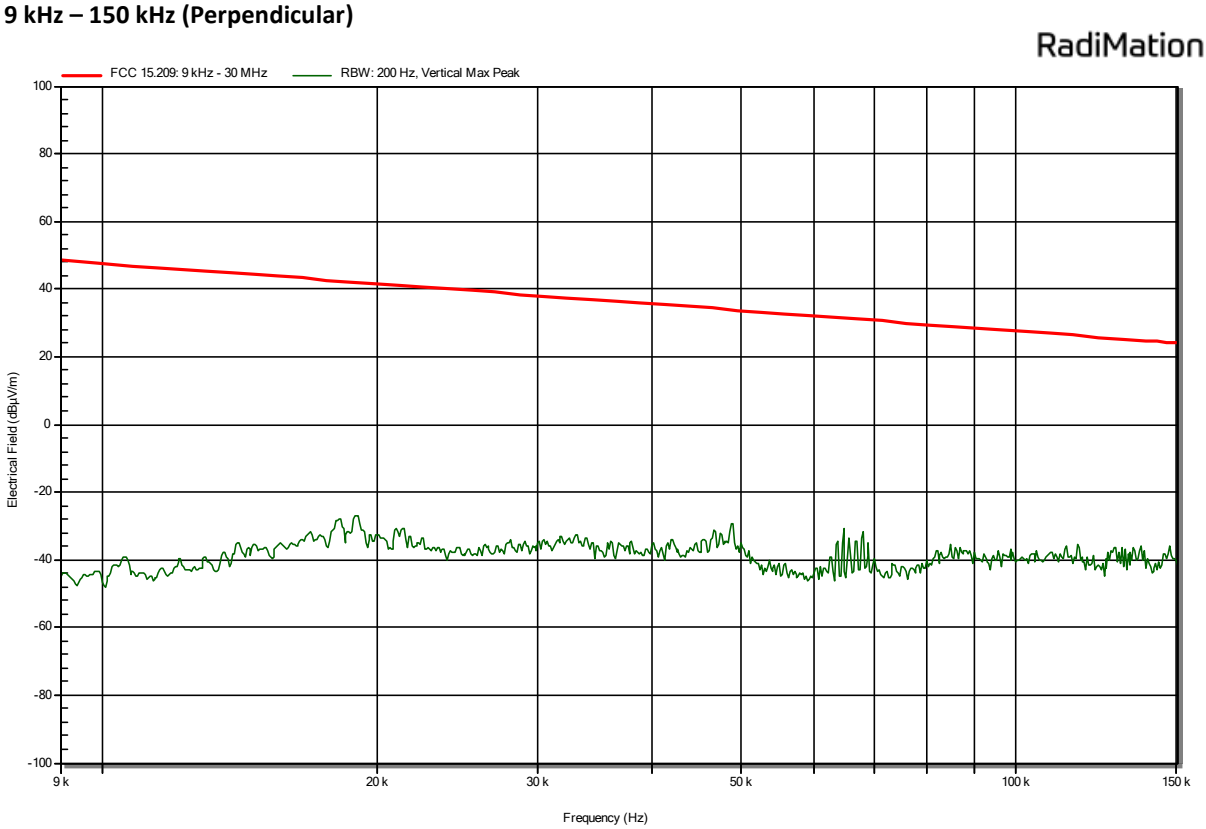
9 kHz – 150 kHz (Parallel)



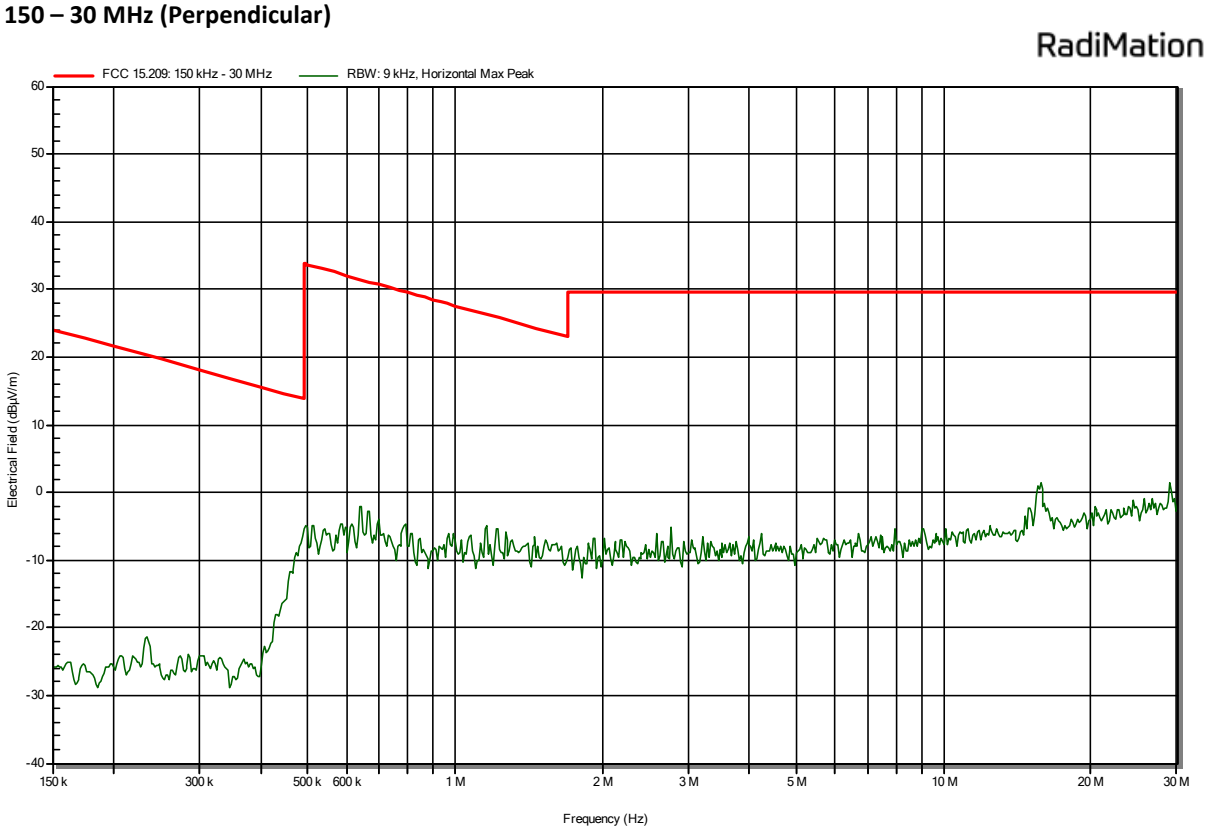
150 – 30 MHz (Parallel)



9 kHz – 150 kHz (Perpendicular)



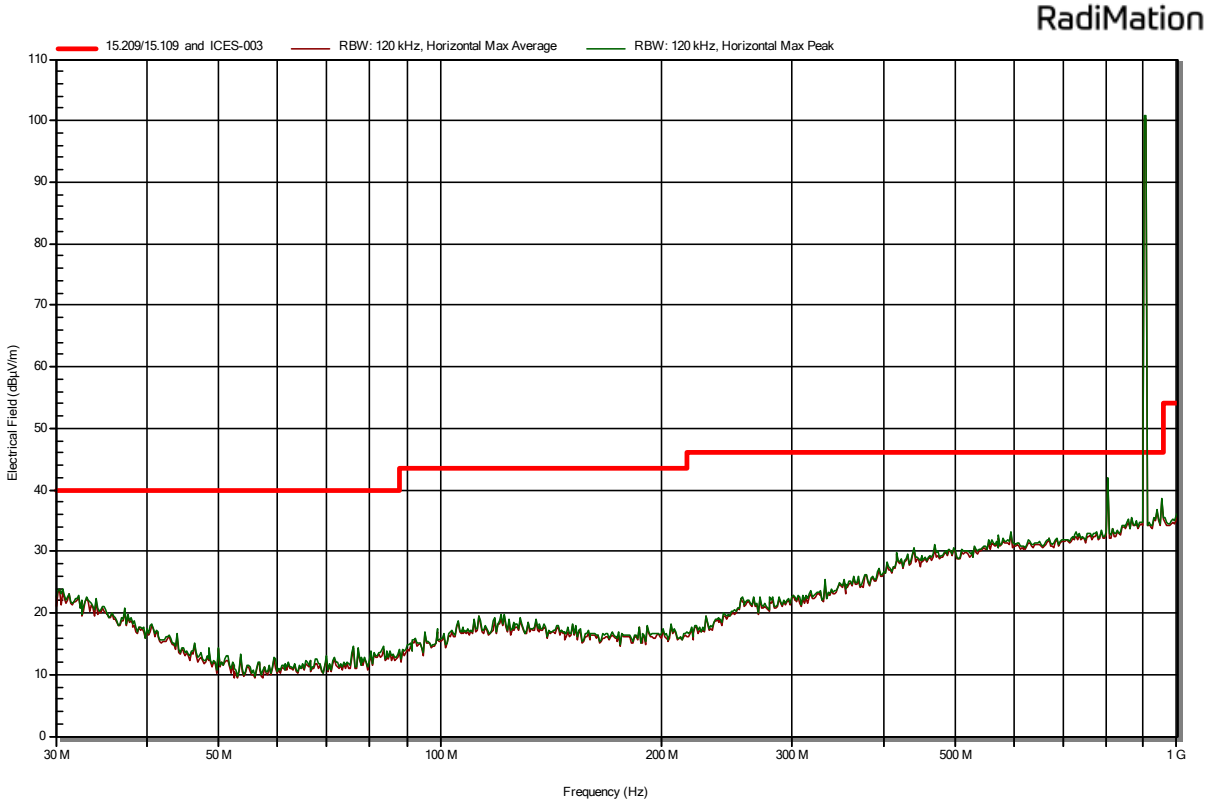
150 – 30 MHz (Perpendicular)



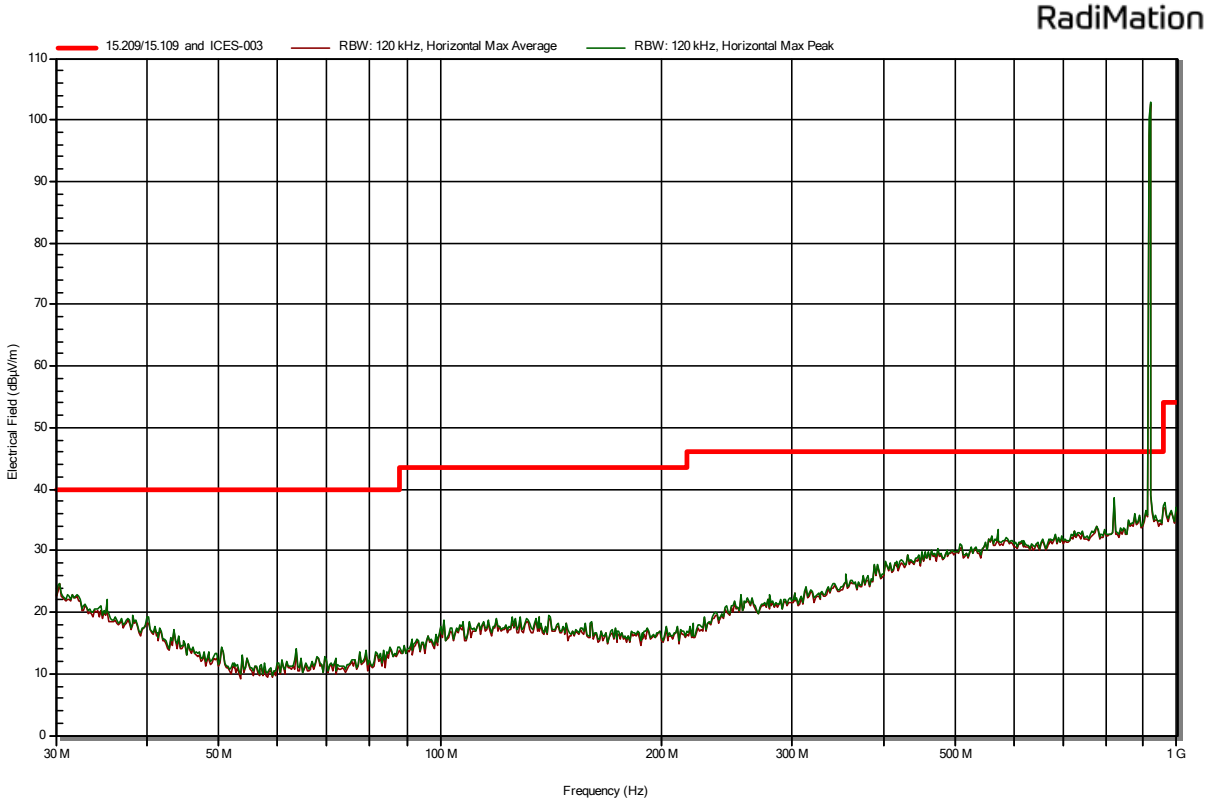
30 -1000 MHz

Horizontal polarization

Low

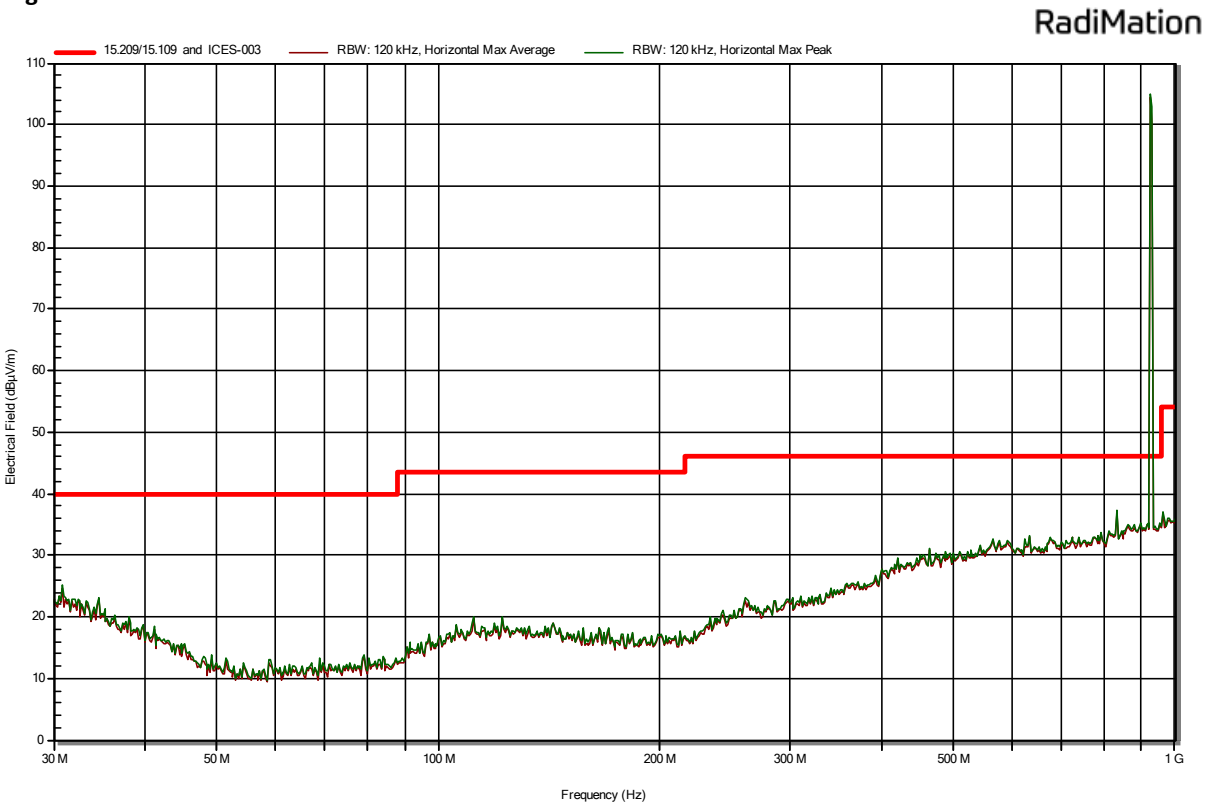


Mid



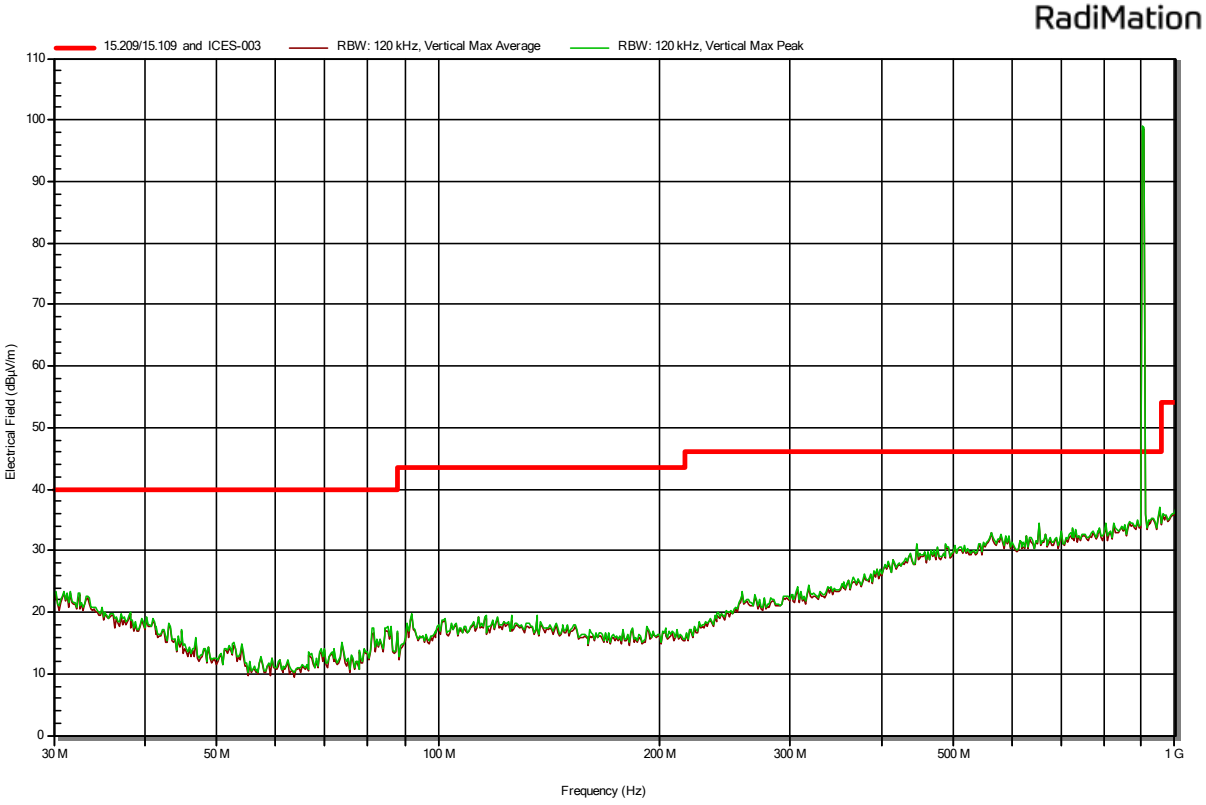
Note: The peak at 915 MHz in the plot is the fundamental frequency and it is not subject to the limit in the plot

High



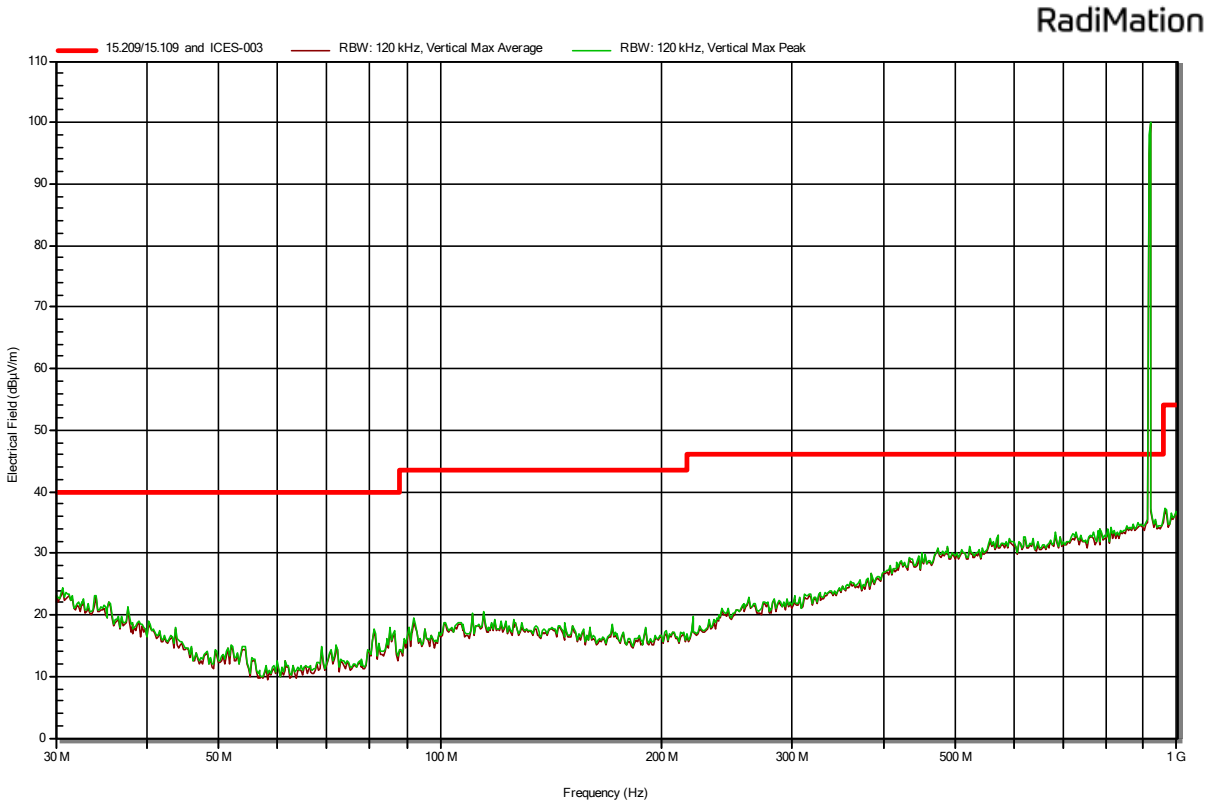
Vertical polarization

Low



Note: The peak at 915 MHz in the plot is the fundamental frequency and it is not subject to the limit in the plot

Mid



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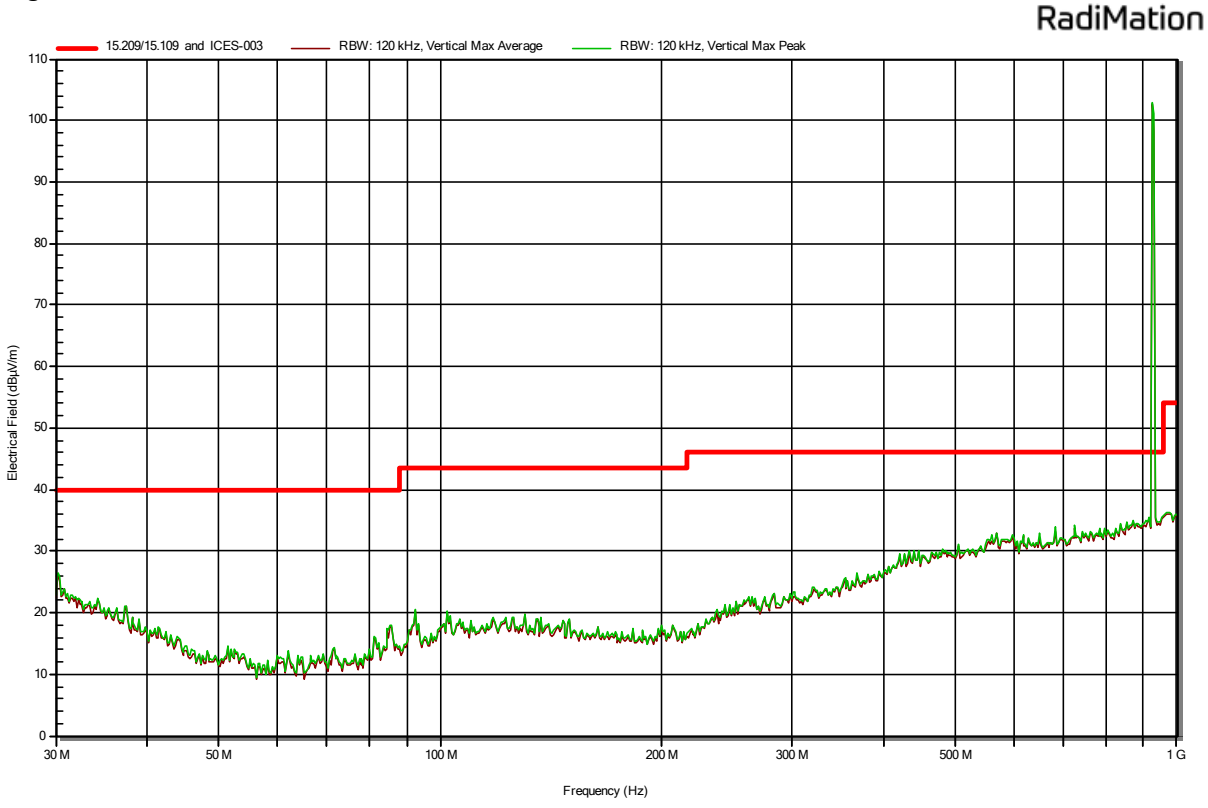
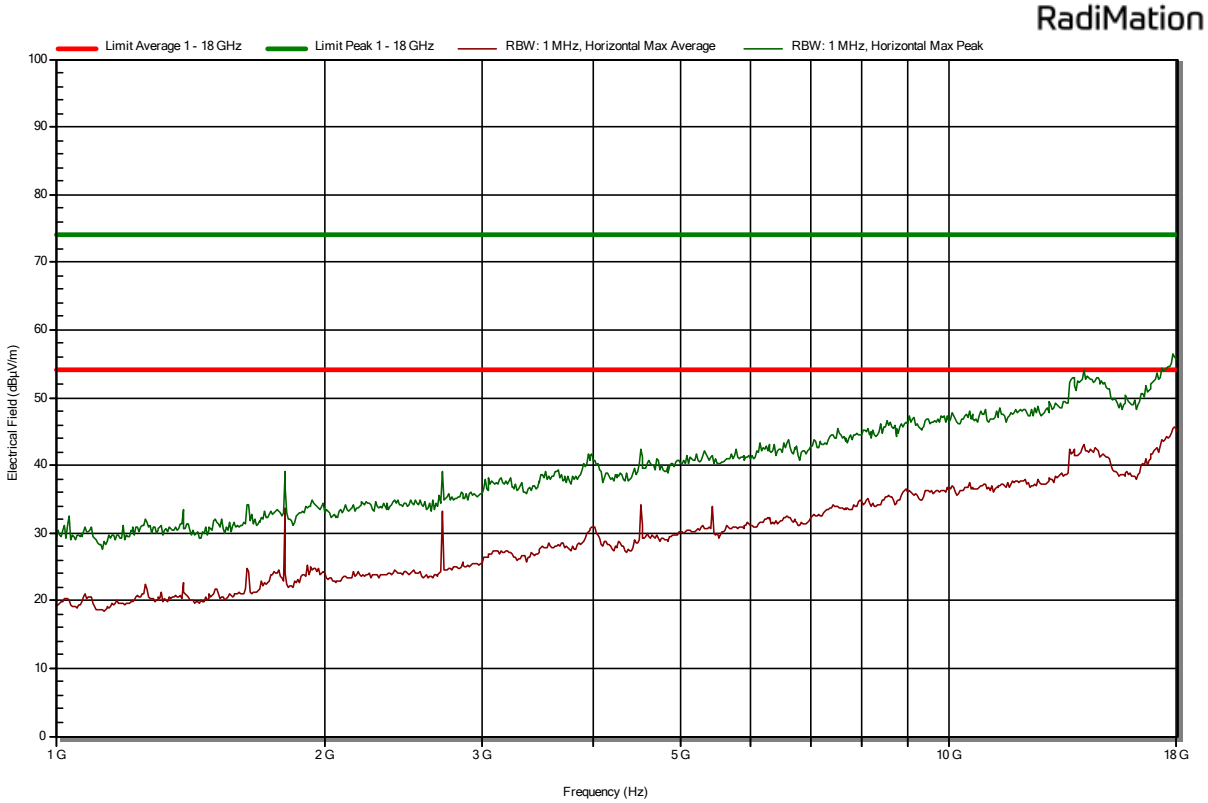


Note: The peak at 915 MHz in the plot is the fundamental frequency and it is not subject to the limit in the plot

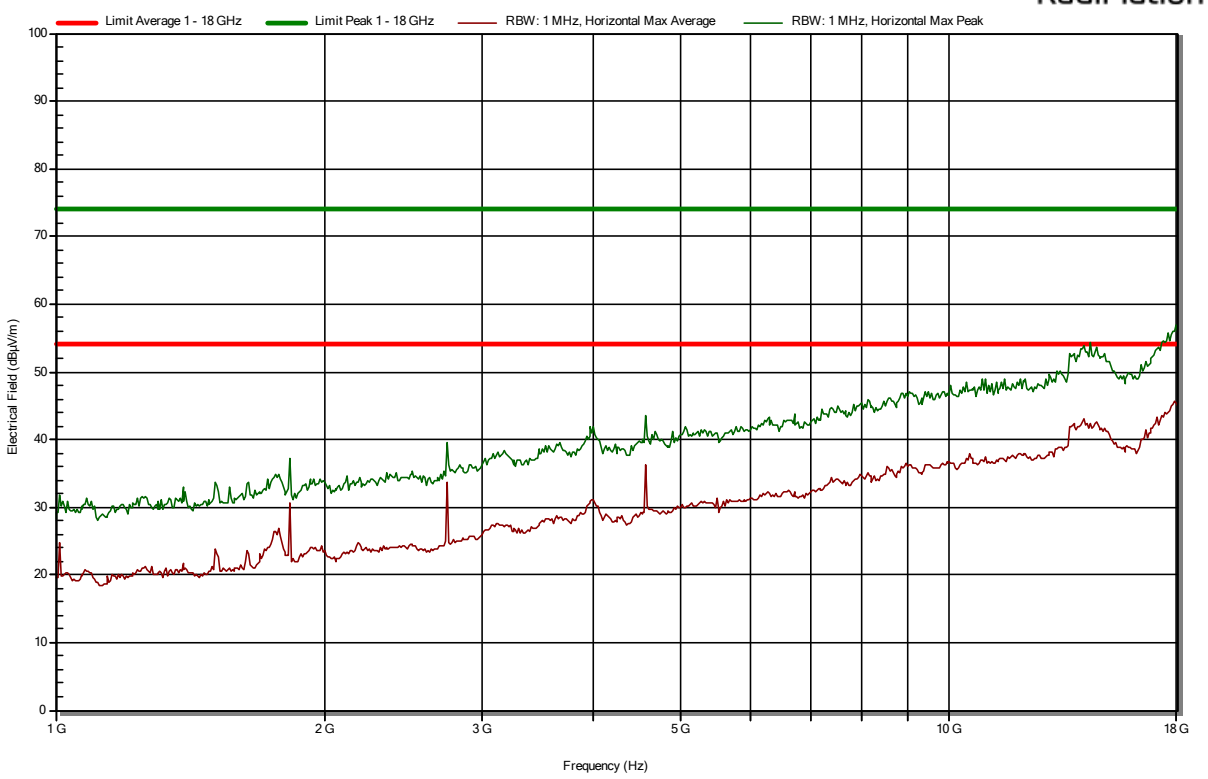
1 – 18 GHz

Horizontal polarization

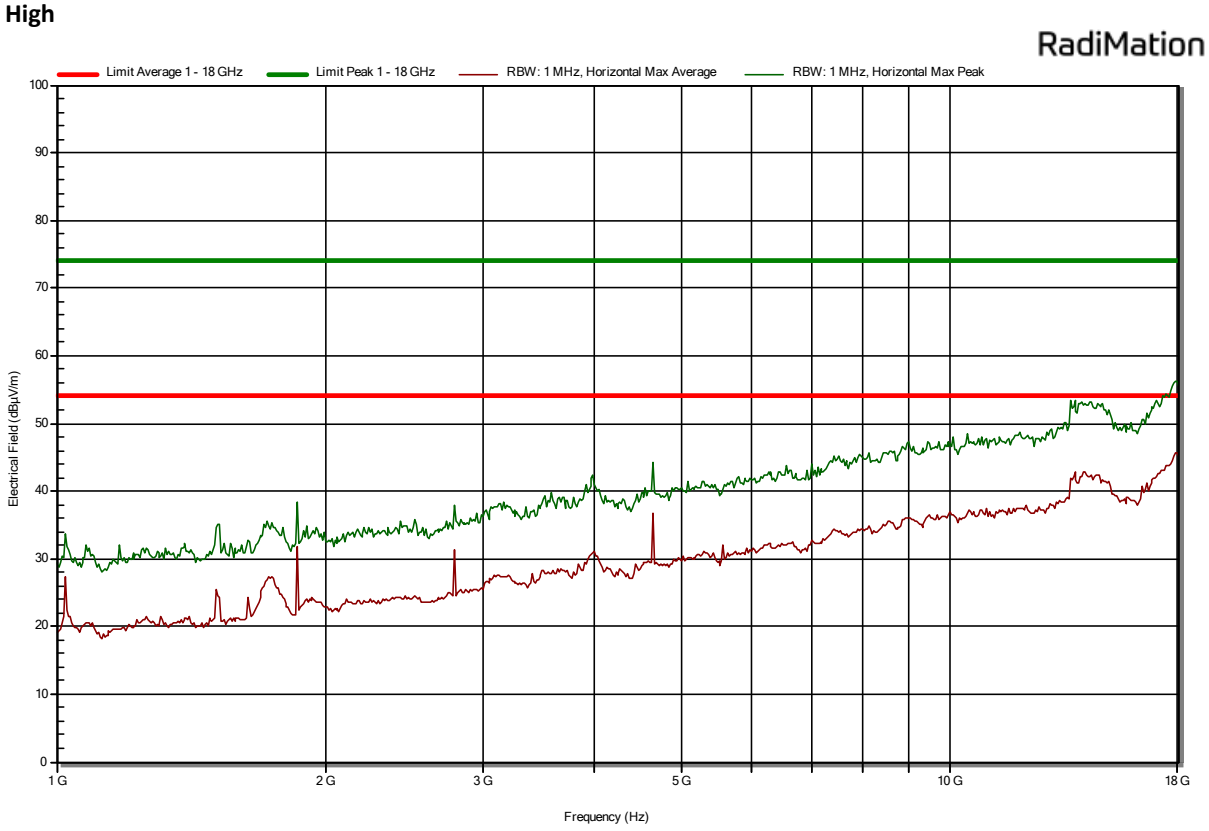
Low



Mid

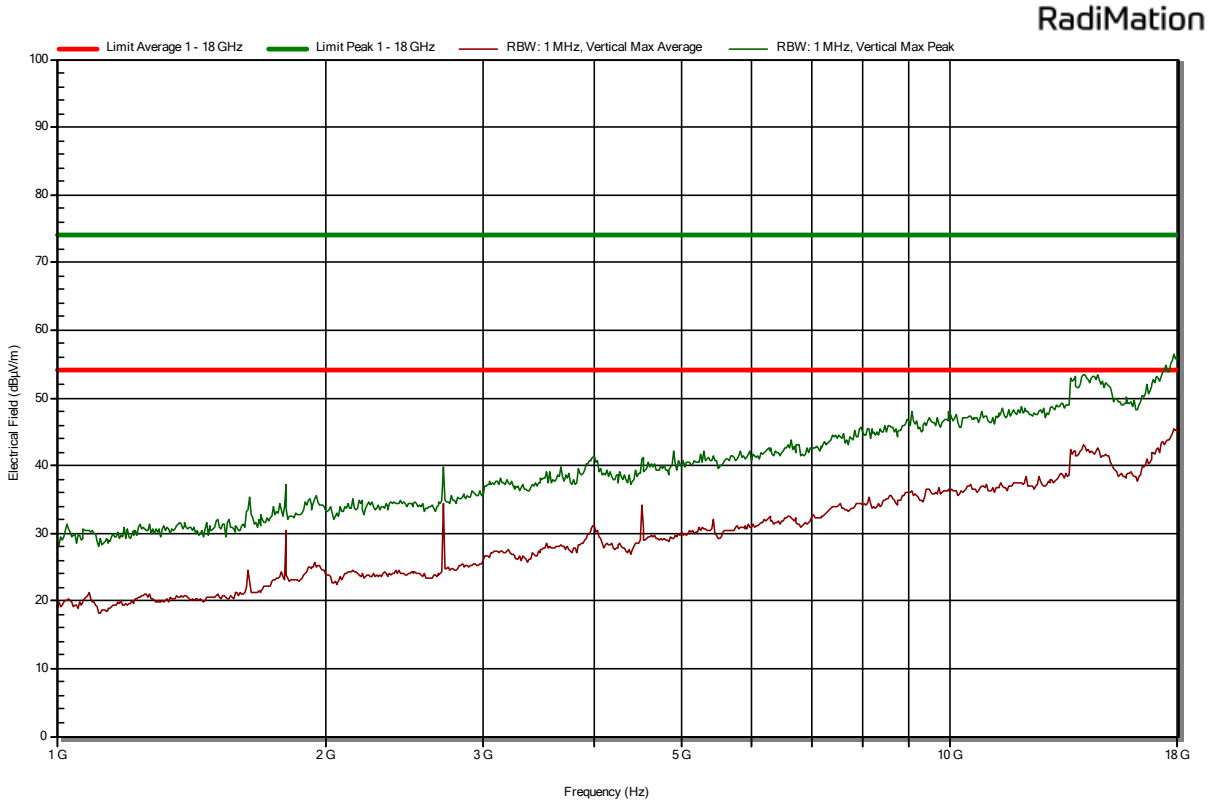


High

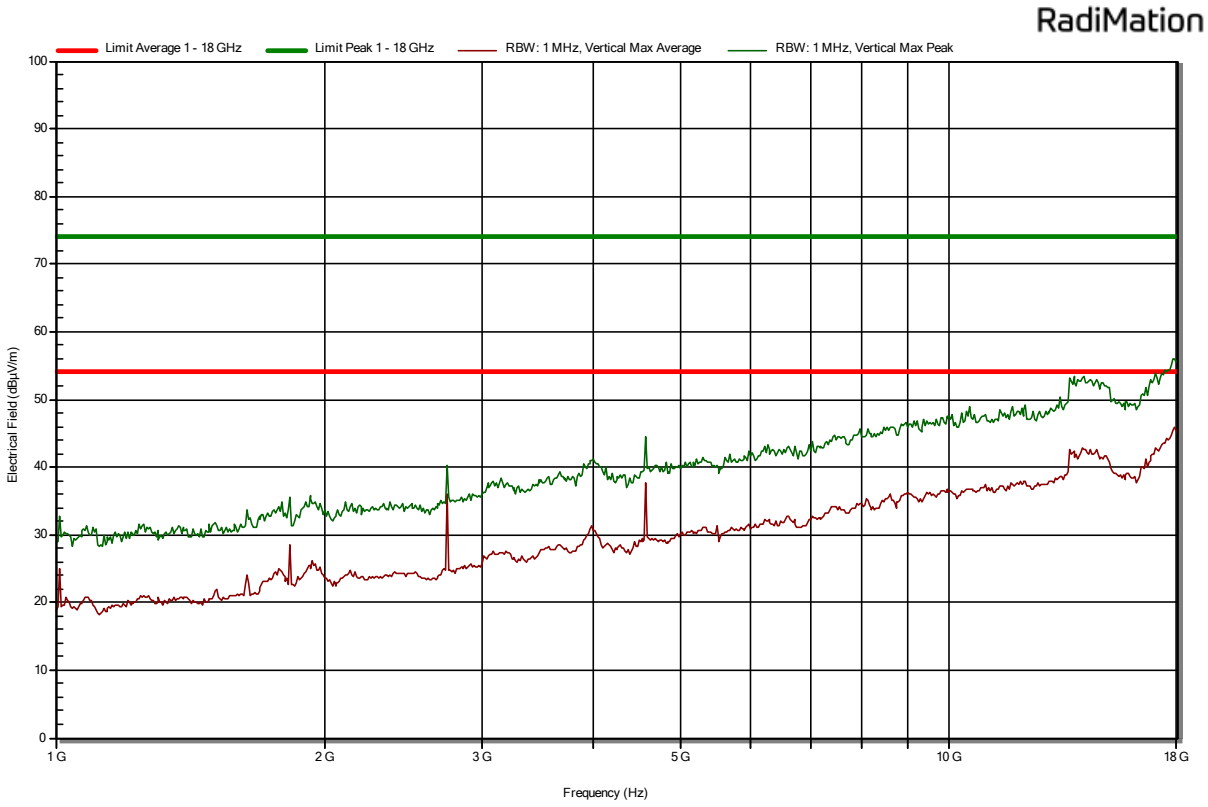


Vertical polarization

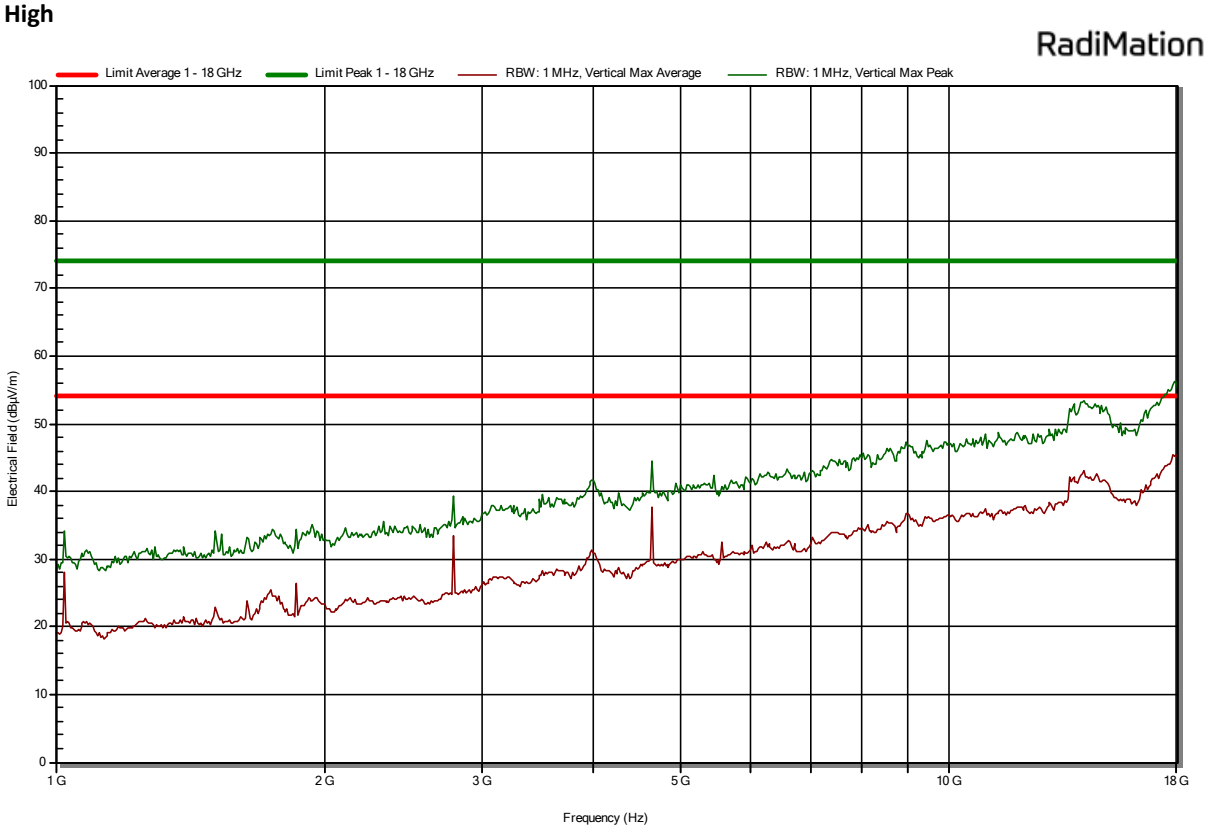
Low



Mid

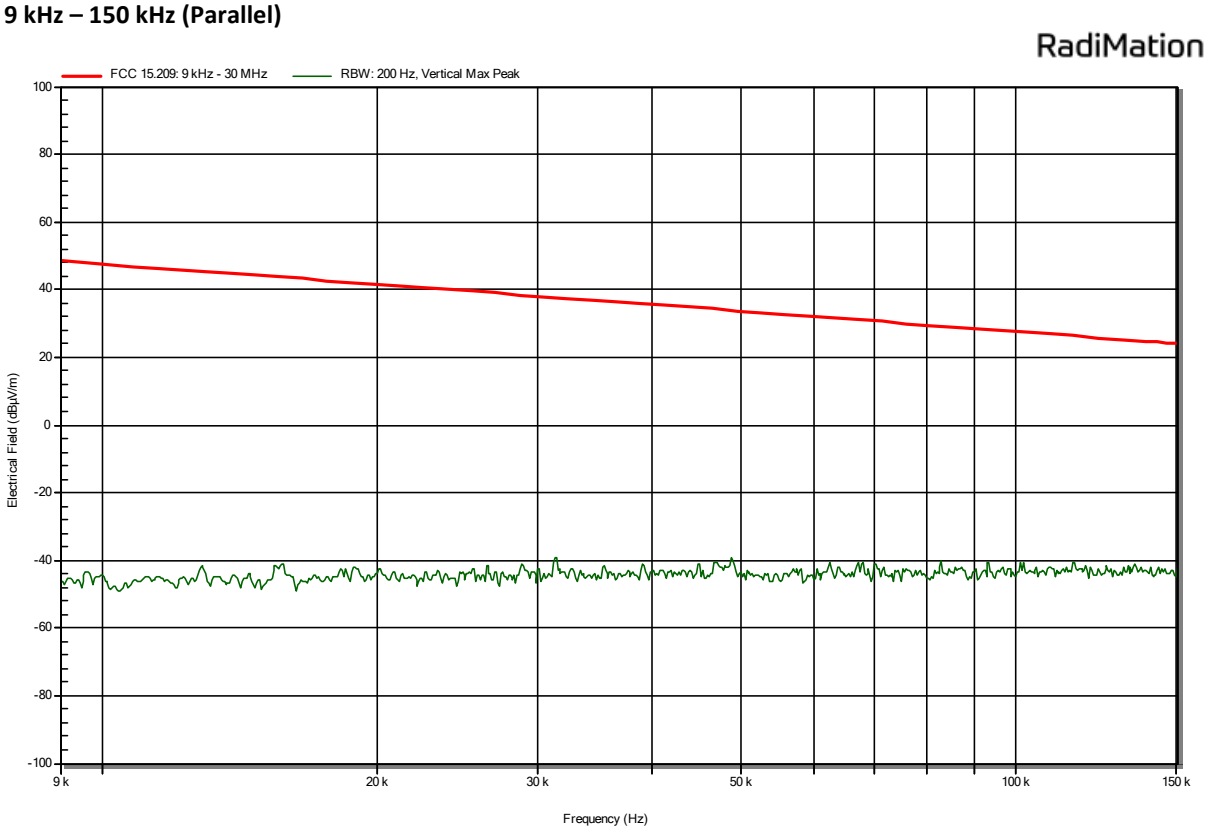

RadiMation
Limit Average 1 - 18 GHz
Limit Peak 1 - 18 GHz
RBW: 1 MHz, Vertical Max Average
RBW: 1 MHz, Vertical Max Peak
Electrical Field (dBµV/m)
100
90
80
70
60
50
40
30
20
10
0
1 G
2 G
3 G
5 G
10 G
18 G
Frequency (Hz)

High

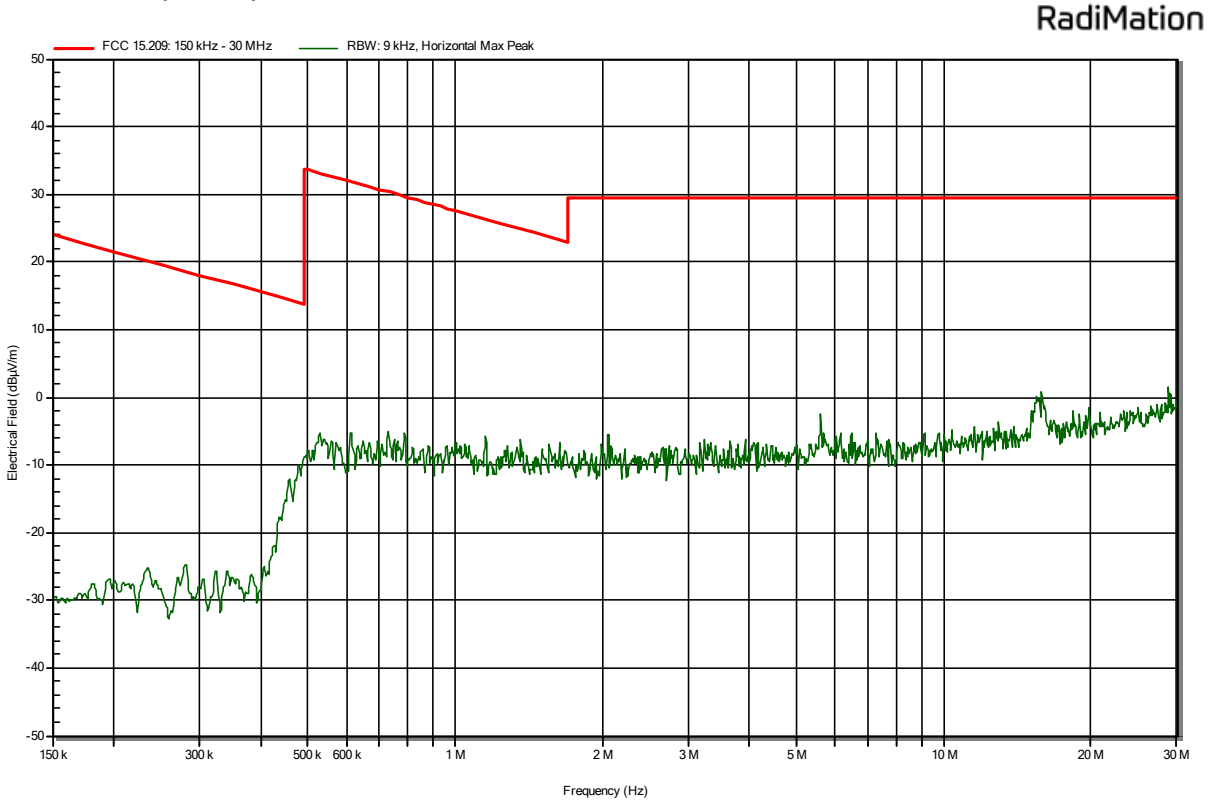

RadiMation
Limit Average 1 - 18 GHz
Limit Peak 1 - 18 GHz
RBW: 1 MHz, Vertical Max Average
RBW: 1 MHz, Vertical Max Peak
Electrical Field (dBµV/m)
100
90
80
70
60
50
40
30
20
10
0
1 G
2 G
3 G
5 G
10 G
18 G
Frequency (Hz)

BLE

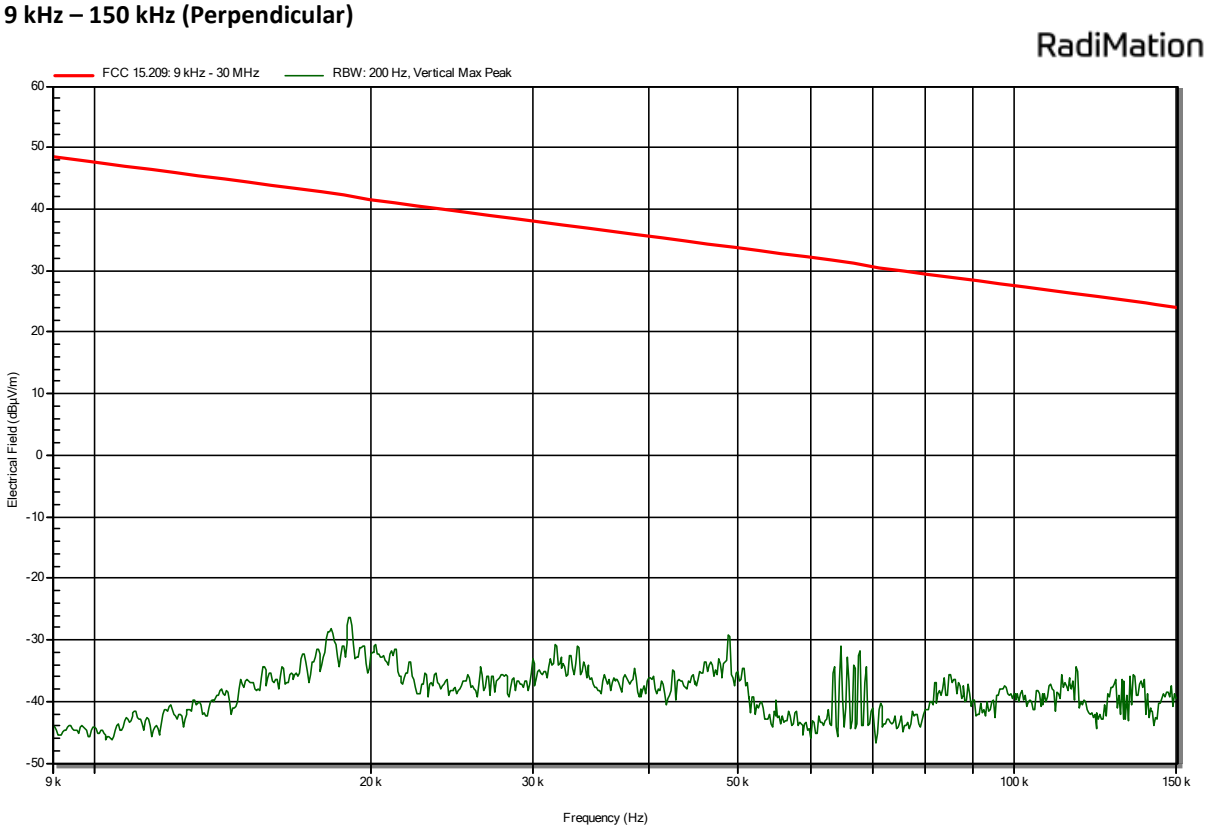
9 kHz – 150 kHz (Parallel)



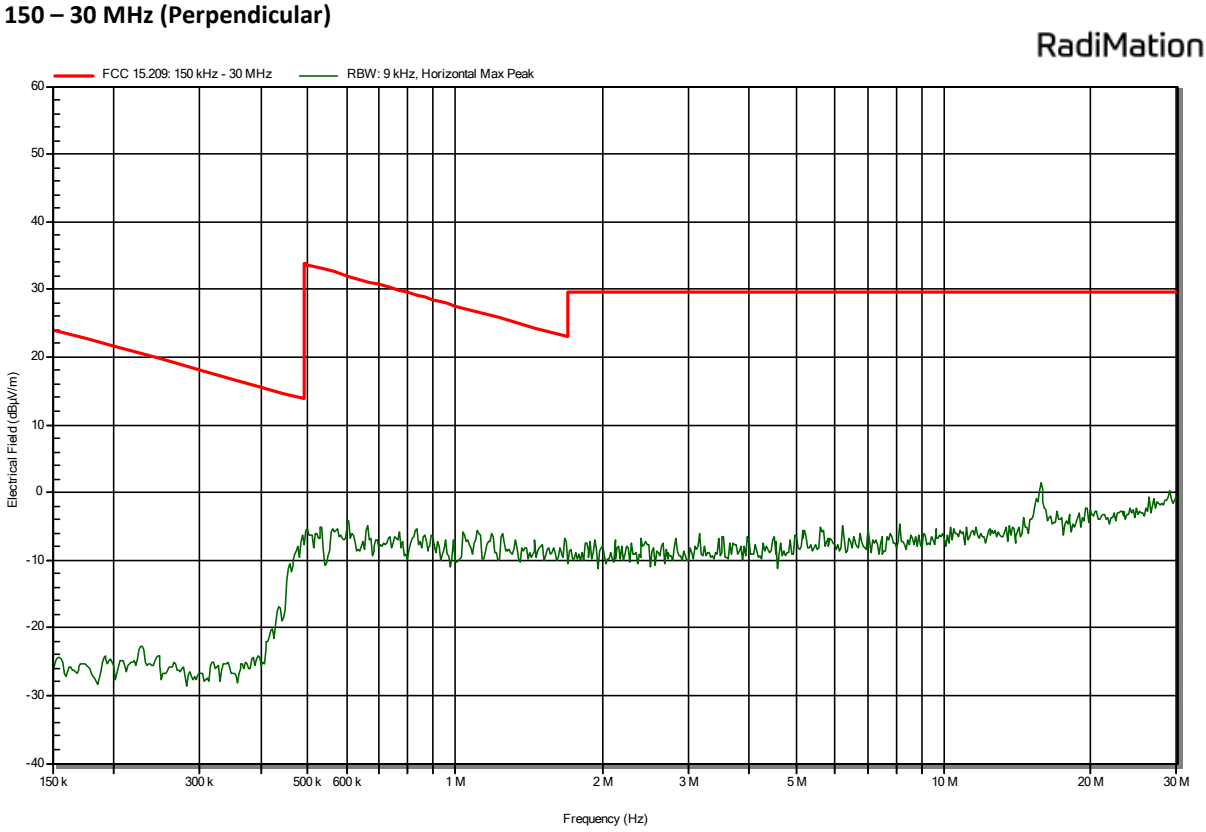
150 – 30 MHz (Parallel)



9 kHz – 150 kHz (Perpendicular)



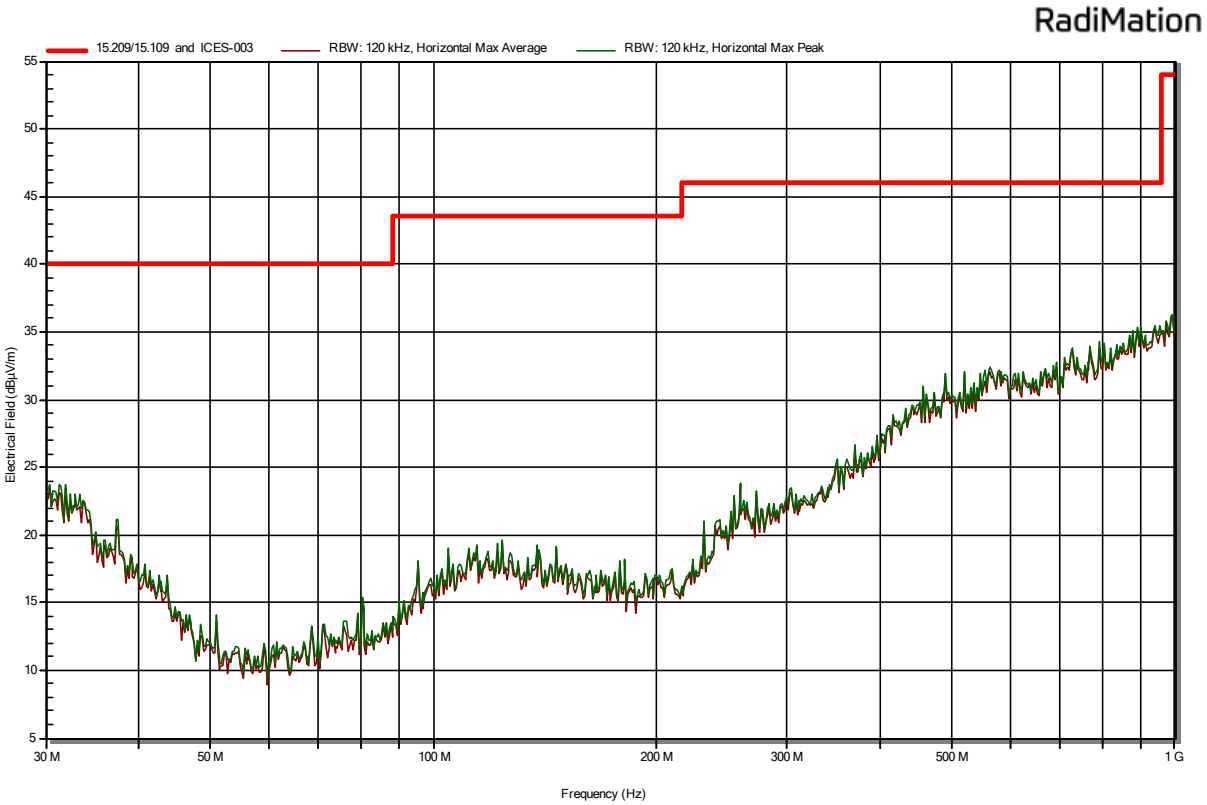
150 – 30 MHz (Perpendicular)



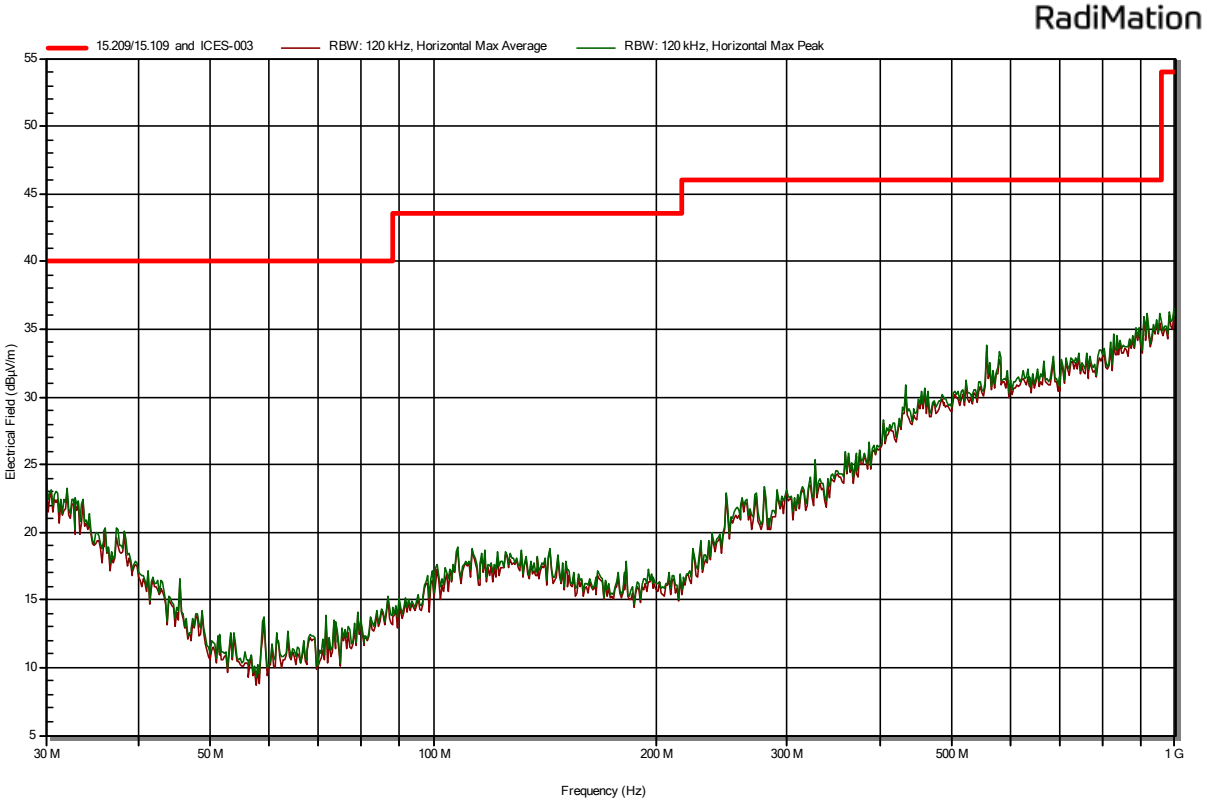
30 -1000 MHz

Horizontal polarization

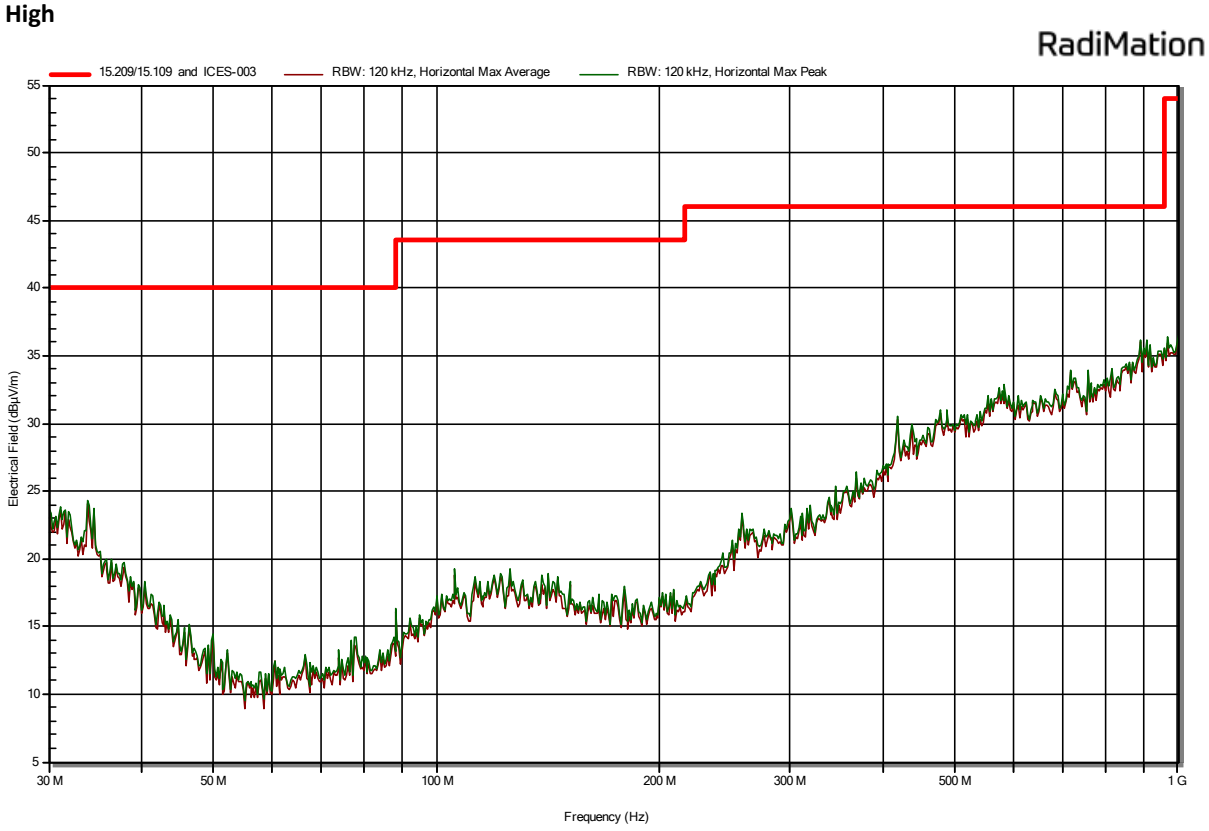
Low



Mid

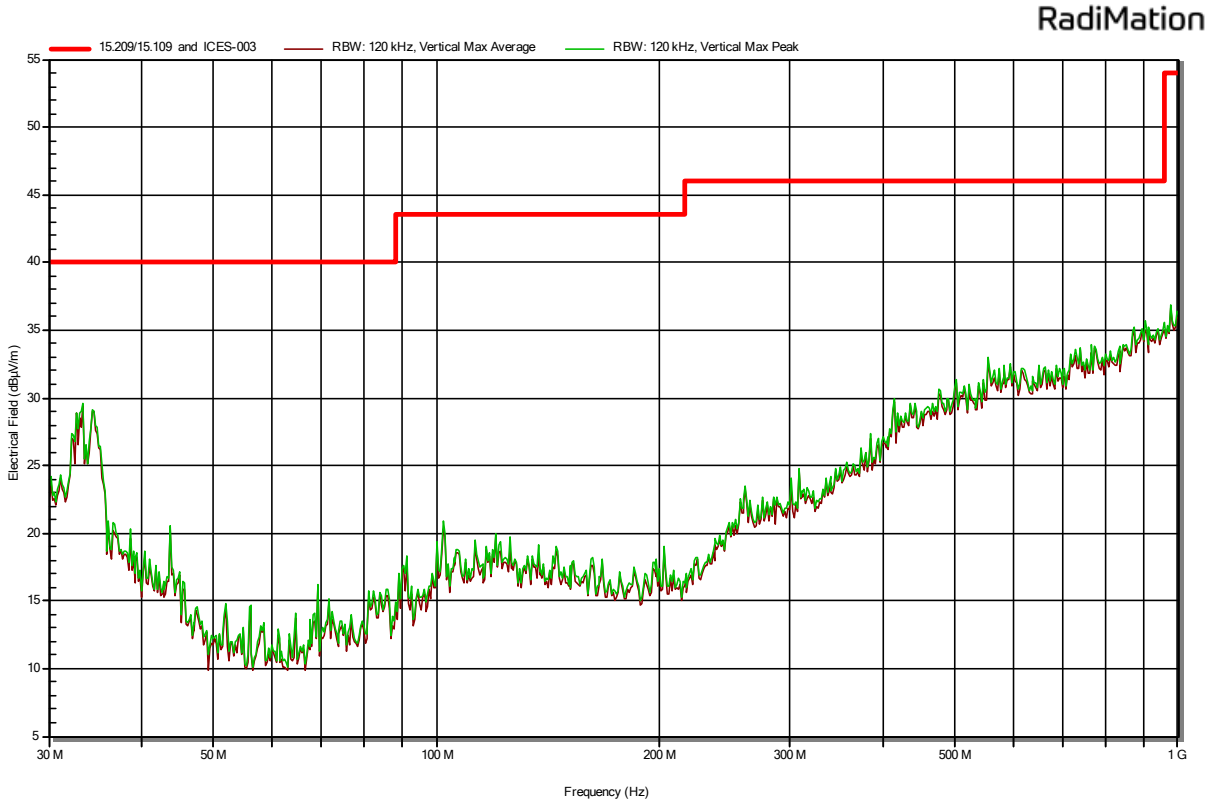


High

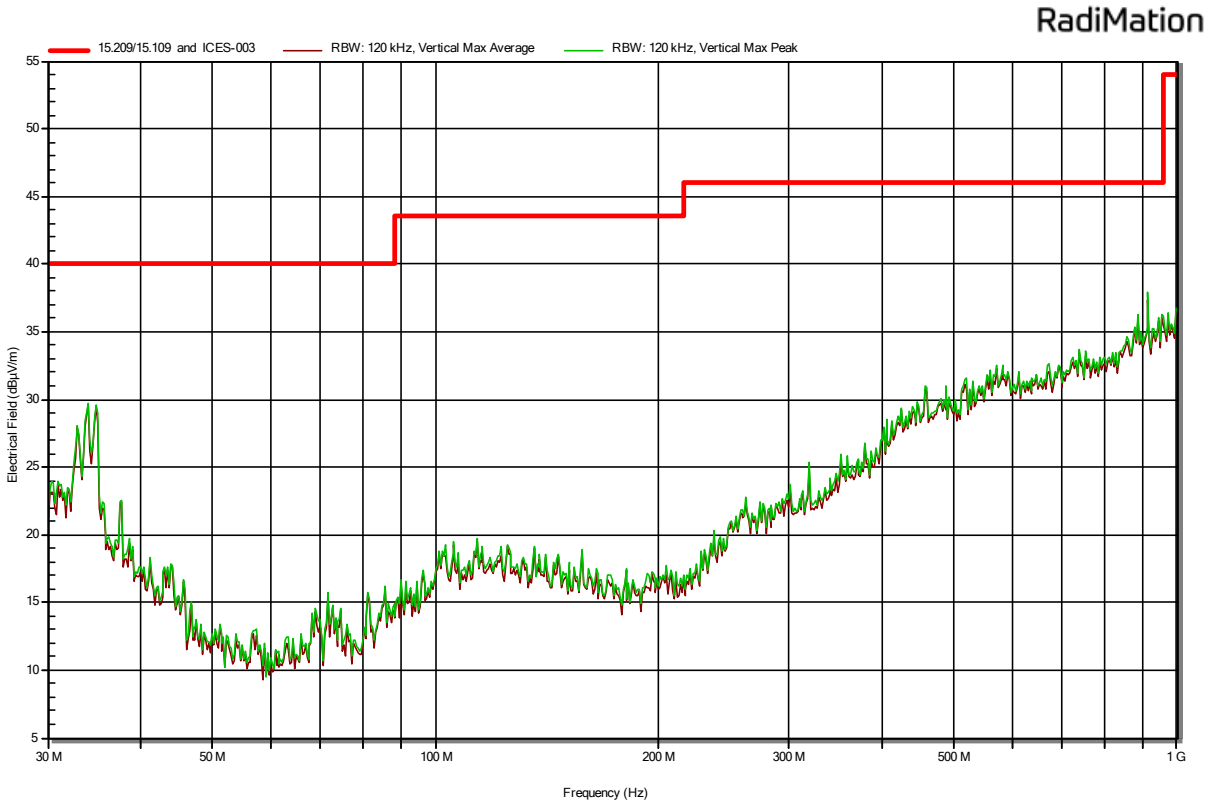


Vertical polarization

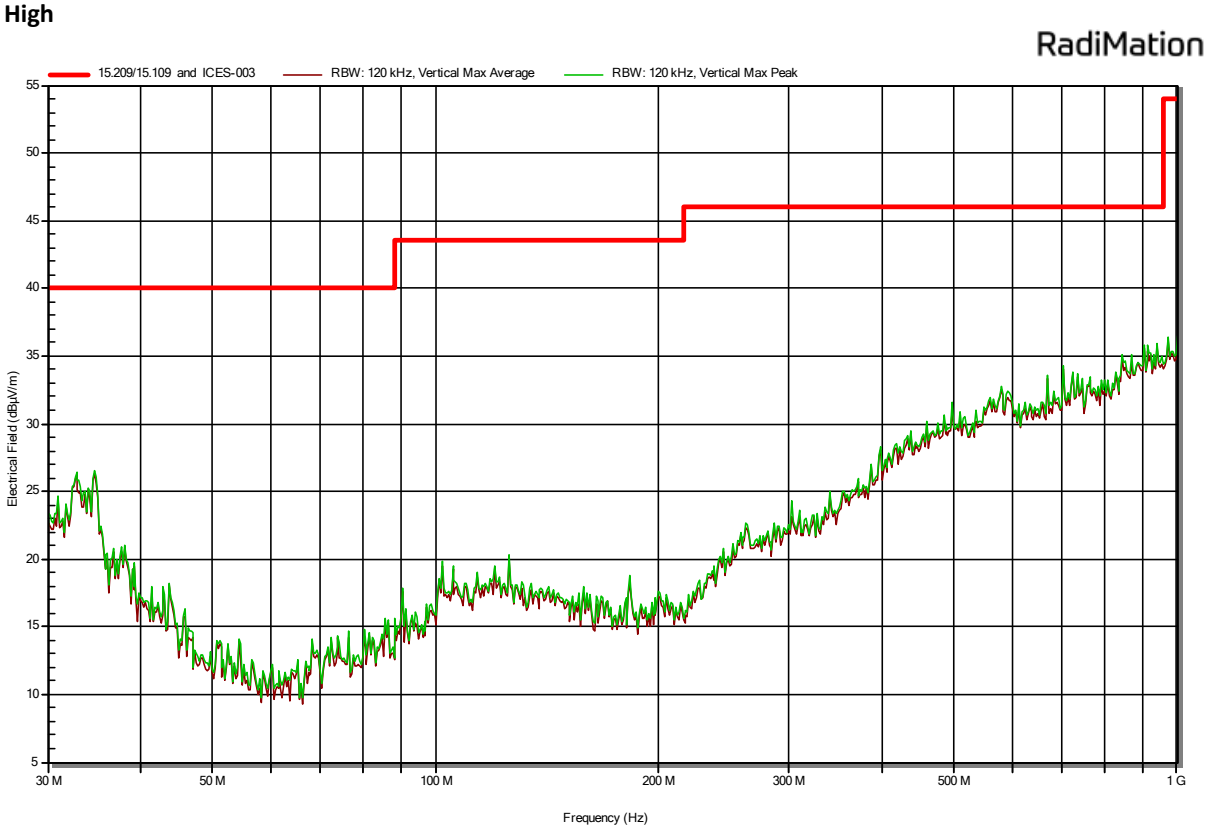
Low



Mid


RadiMation
15.209/15.109 and ICES-003
RBW: 120 kHz, Vertical Max Average
RBW: 120 kHz, Vertical Max Peak
Electrical Field (dBµV/m)
55
50
45
40
35
30
25
20
15
10
5
30 M
50 M
100 M
200 M
300 M
500 M
1 G
Frequency (Hz)

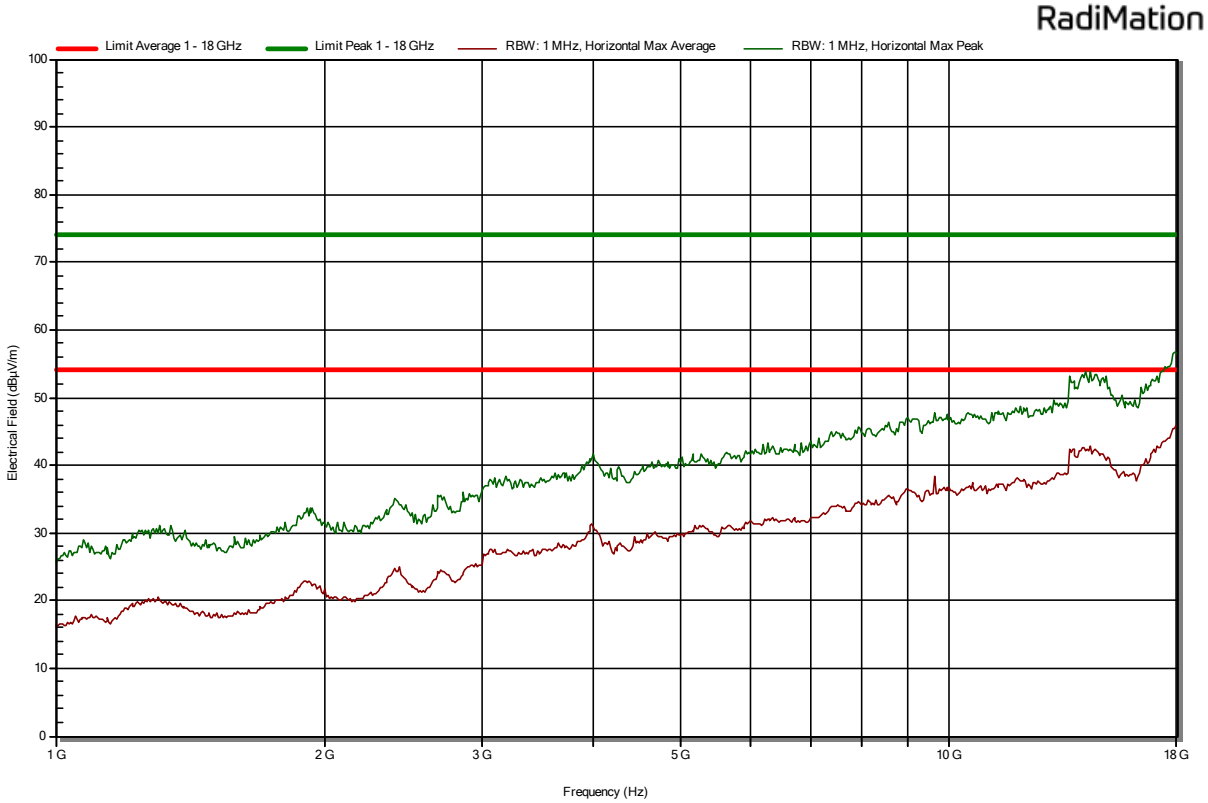
High


RadiMation
15.209/15.109 and ICES-003
RBW: 120 kHz, Vertical Max Average
RBW: 120 kHz, Vertical Max Peak
Electrical Field (dBµV/m)
55
50
45
40
35
30
25
20
15
10
5
30 M
50 M
100 M
200 M
300 M
500 M
1 G
Frequency (Hz)

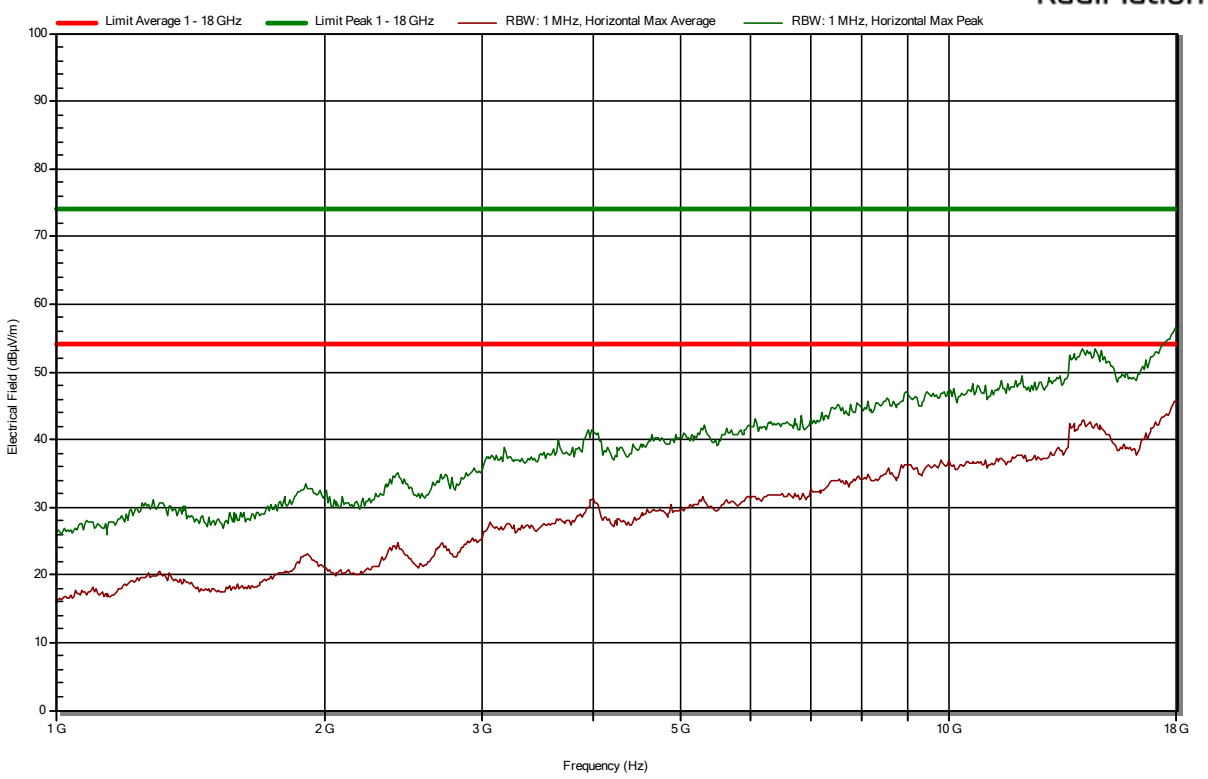
1 – 18 GHz

Horizontal polarization

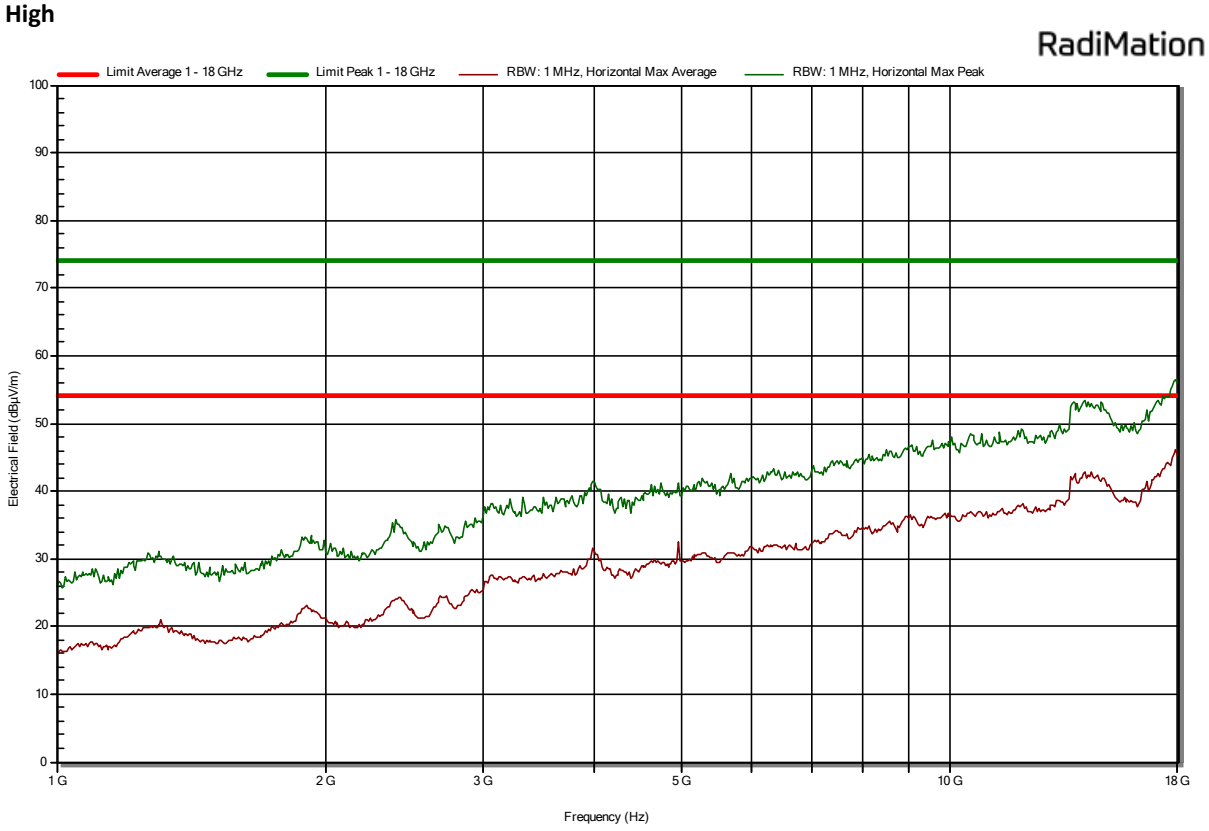
Low



Mid

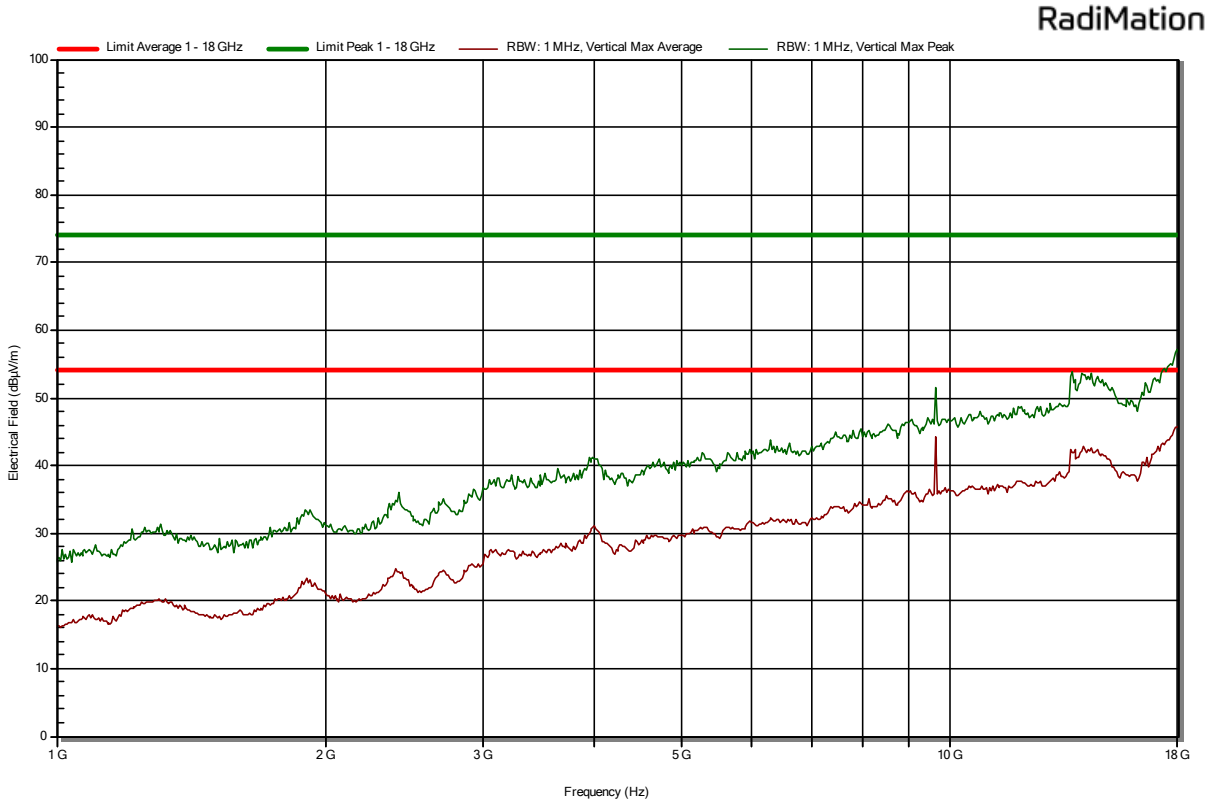


High

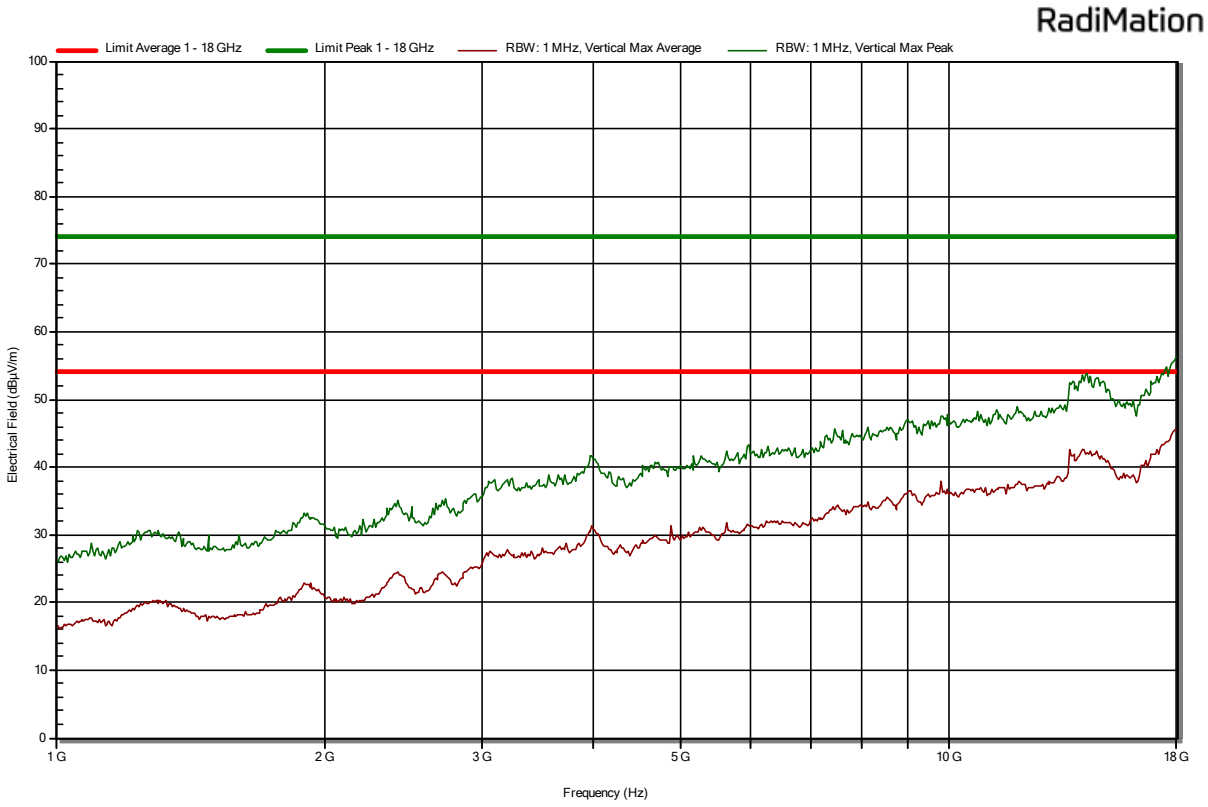


Vertical polarization

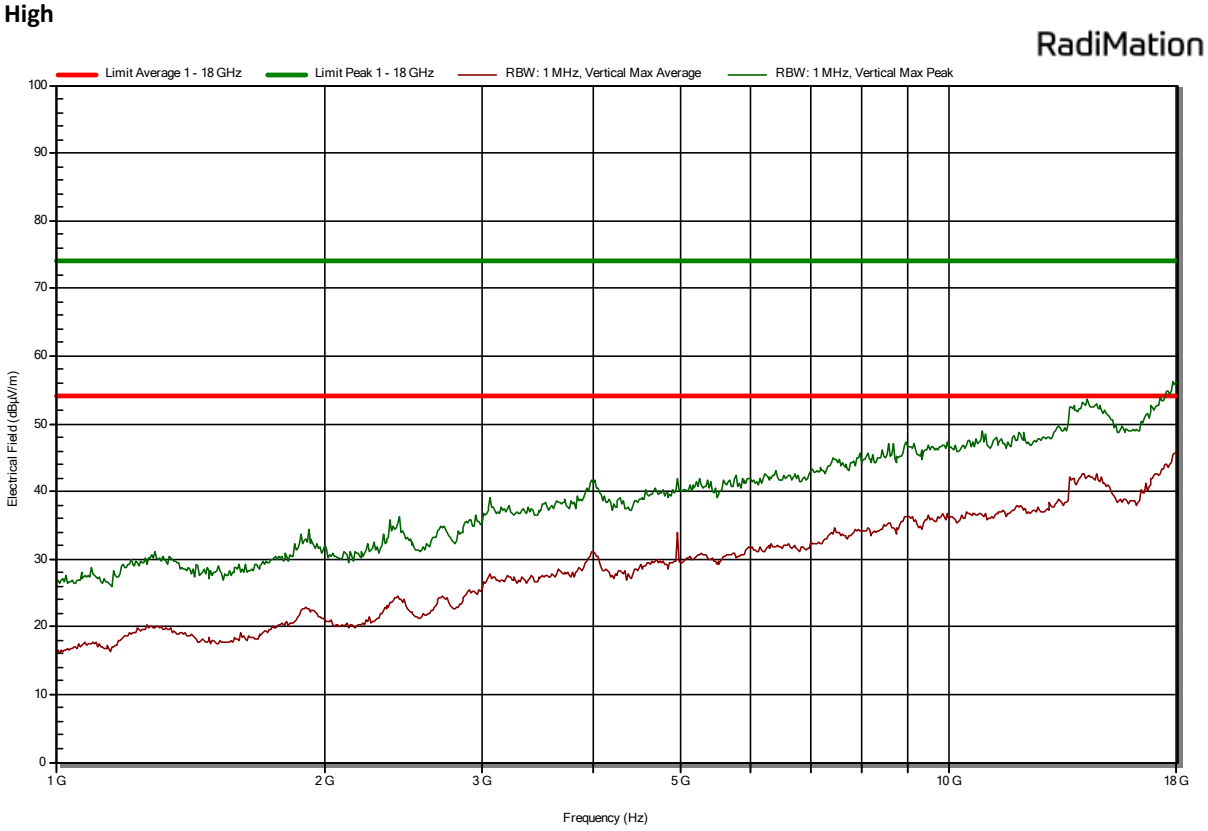
Low



Mid


RadiMation
Limit Average 1 - 18 GHz
Limit Peak 1 - 18 GHz
RBW: 1 MHz, Vertical Max Average
RBW: 1 MHz, Vertical Max Peak
Electrical Field (dBµV/m)
Frequency (Hz)
1 G
2 G
3 G
5 G
10 G
18 G

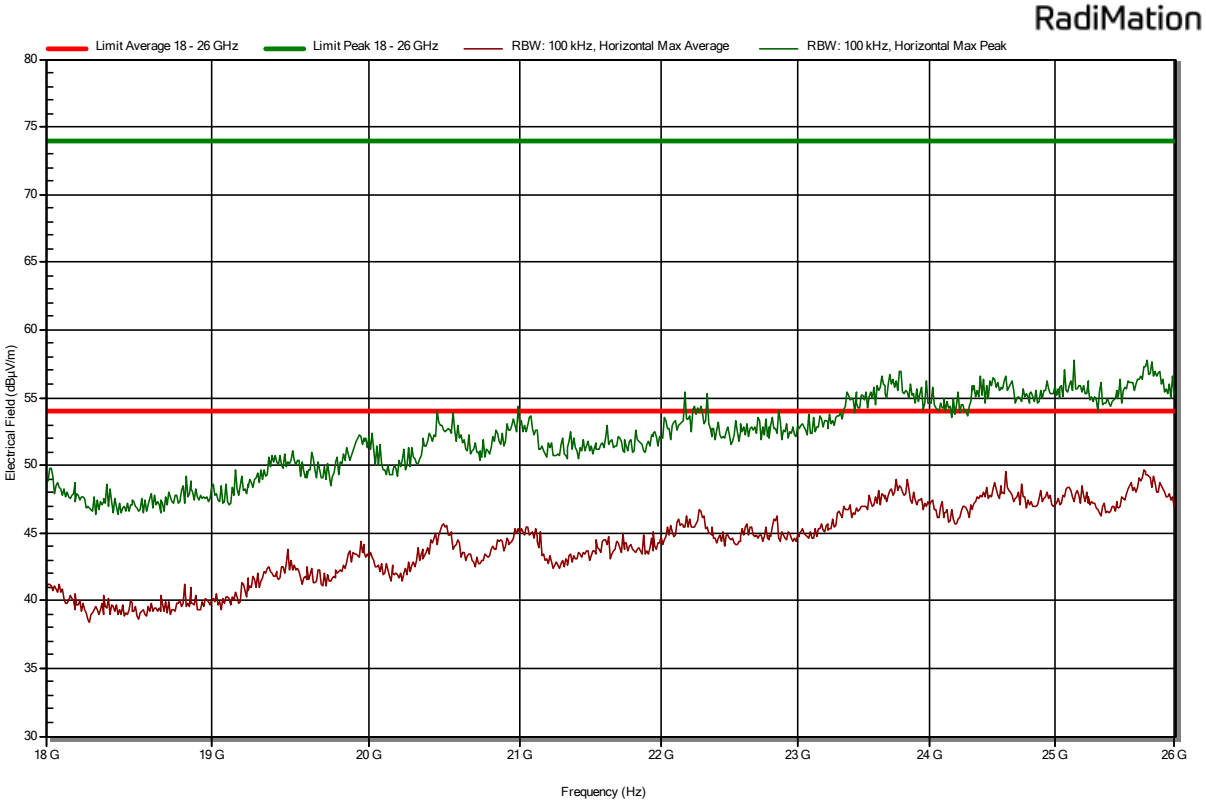
High


RadiMation
Limit Average 1 - 18 GHz
Limit Peak 1 - 18 GHz
RBW: 1 MHz, Vertical Max Average
RBW: 1 MHz, Vertical Max Peak
Electrical Field (dBµV/m)
Frequency (Hz)
1 G
2 G
3 G
5 G
10 G
18 G

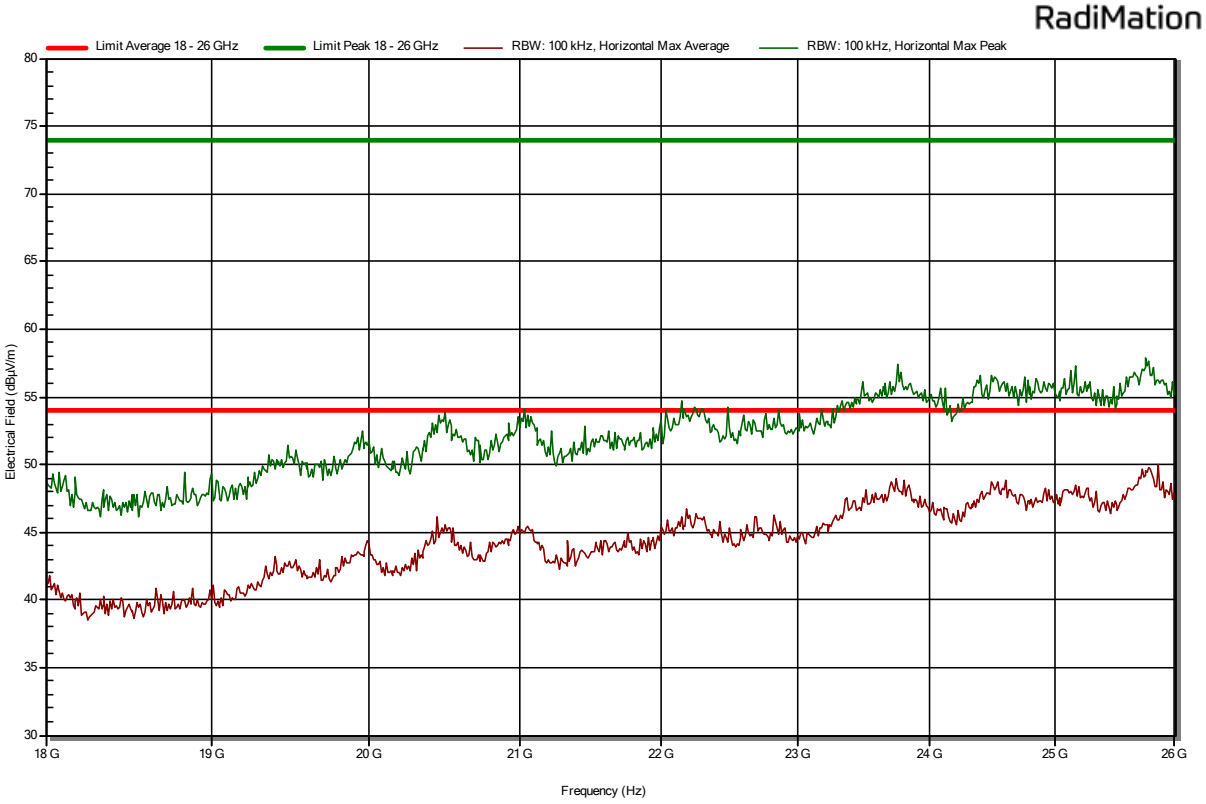
18 – 26 GHz

Horizontal polarization

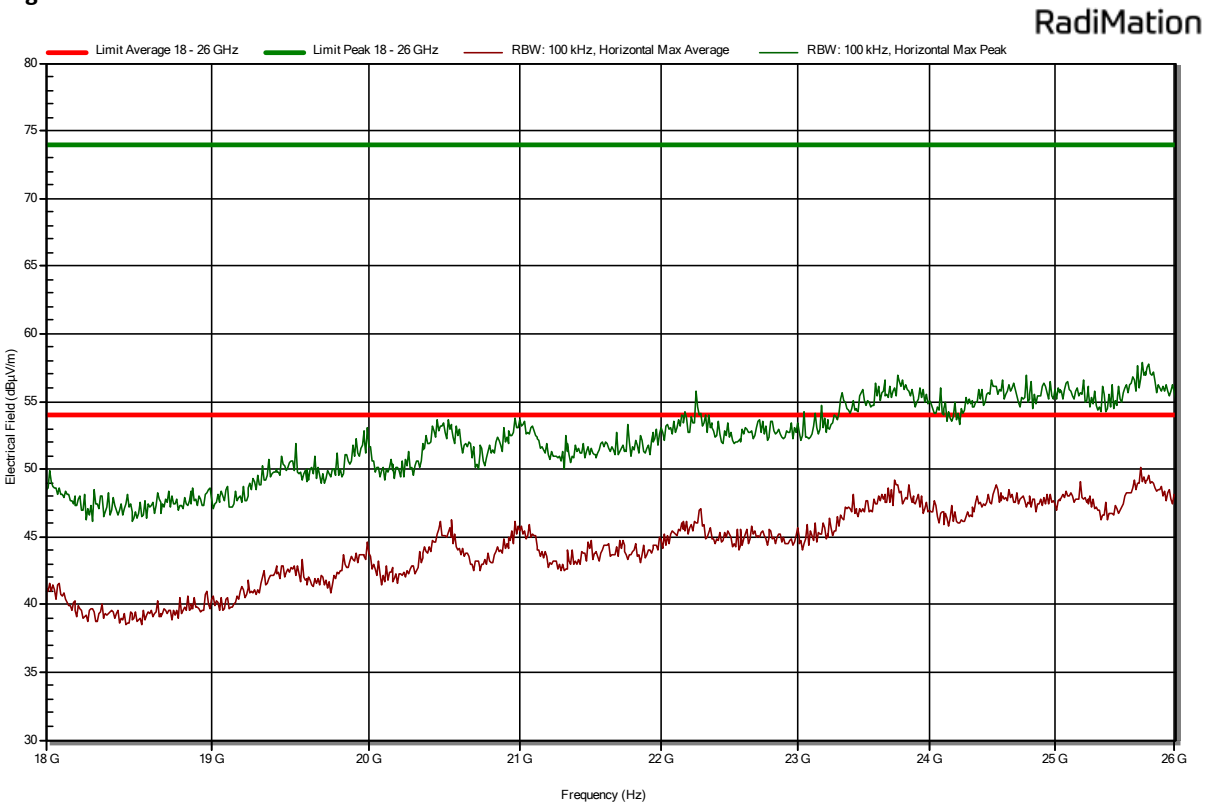
Low



Mid

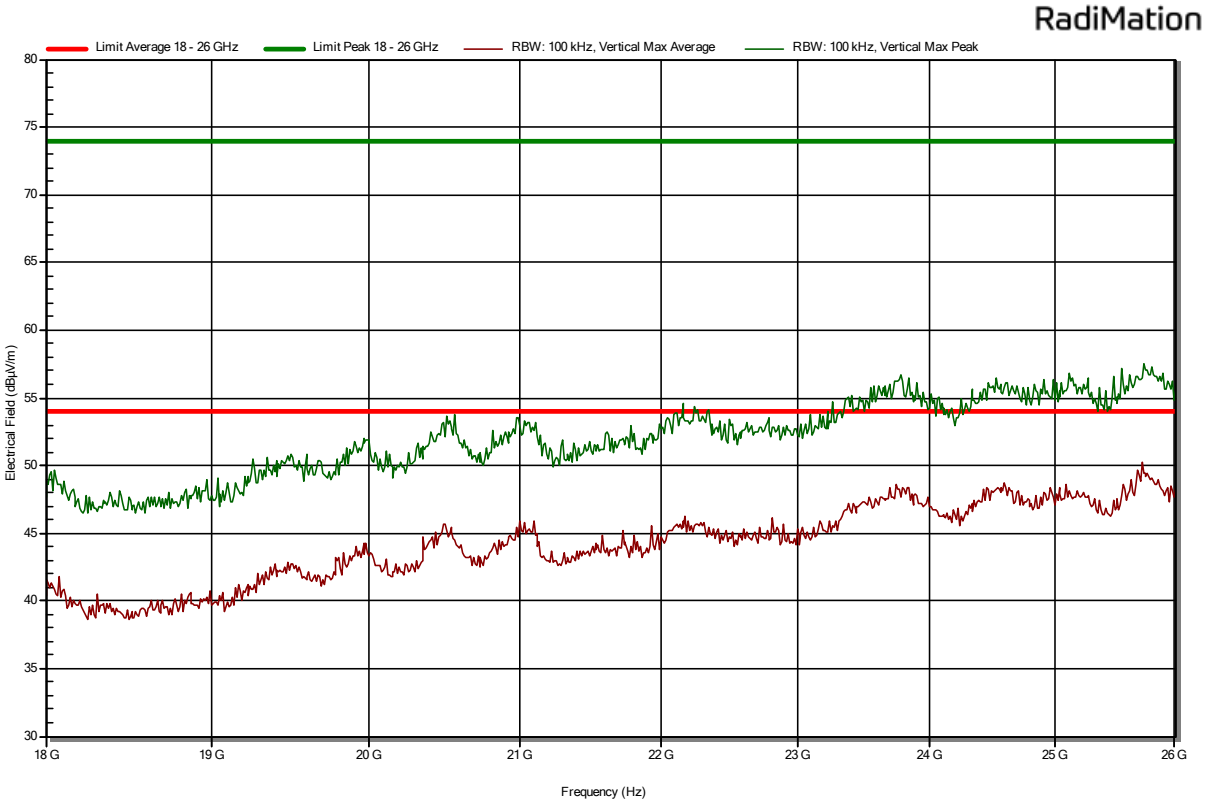


High

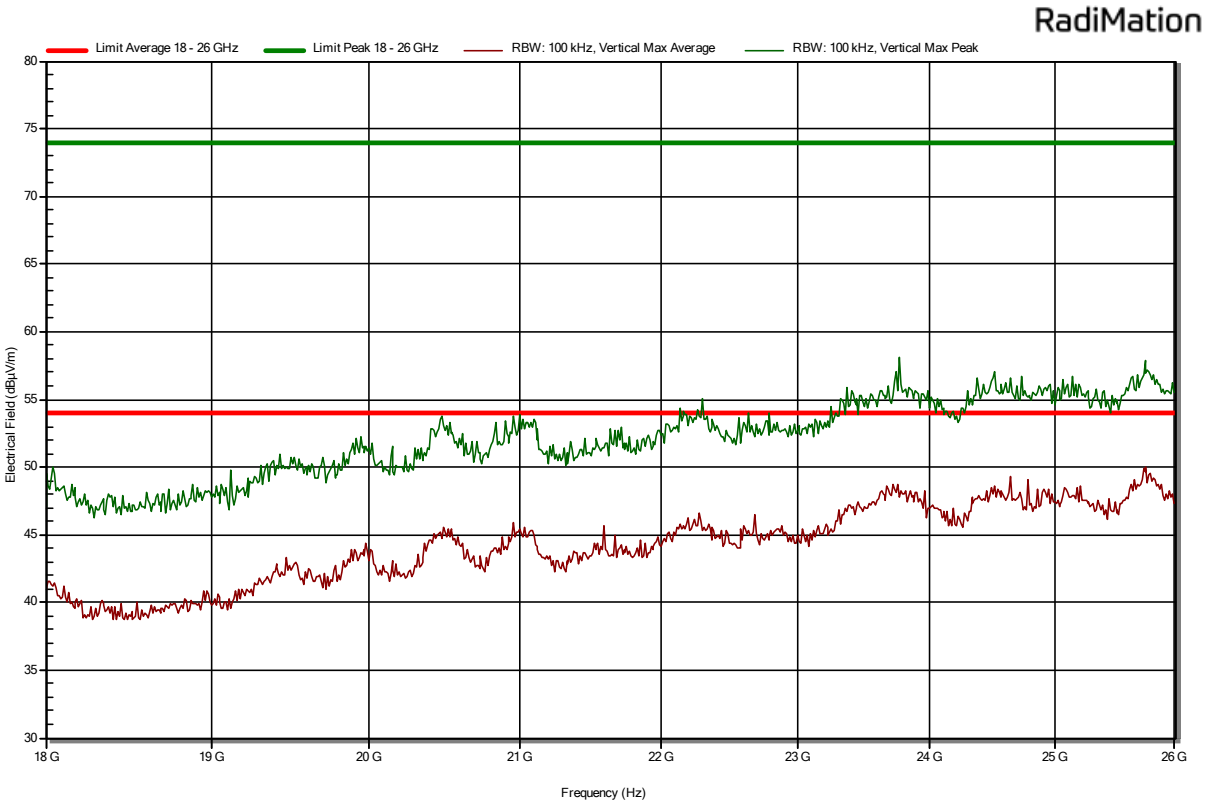


Vertical polarization

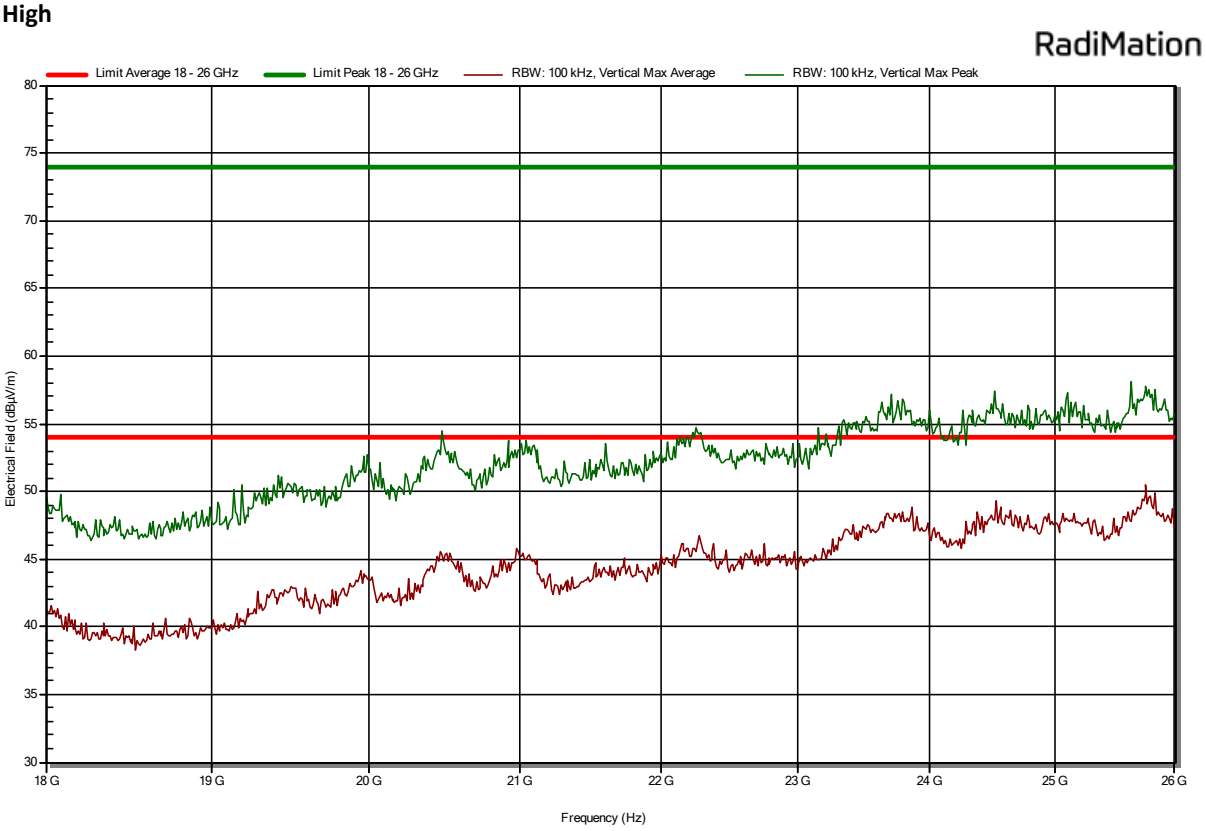
Low



Mid


RadiMation
Limit Average 18 - 26 GHz
Limit Peak 18 - 26 GHz
RBW: 100 kHz, Vertical Max Average
RBW: 100 kHz, Vertical Max Peak
Electrical Field (dBµV/m)
80
75
70
65
60
55
50
45
40
35
30
18 G
19 G
20 G
21 G
22 G
23 G
24 G
25 G
26 G
Frequency (Hz)

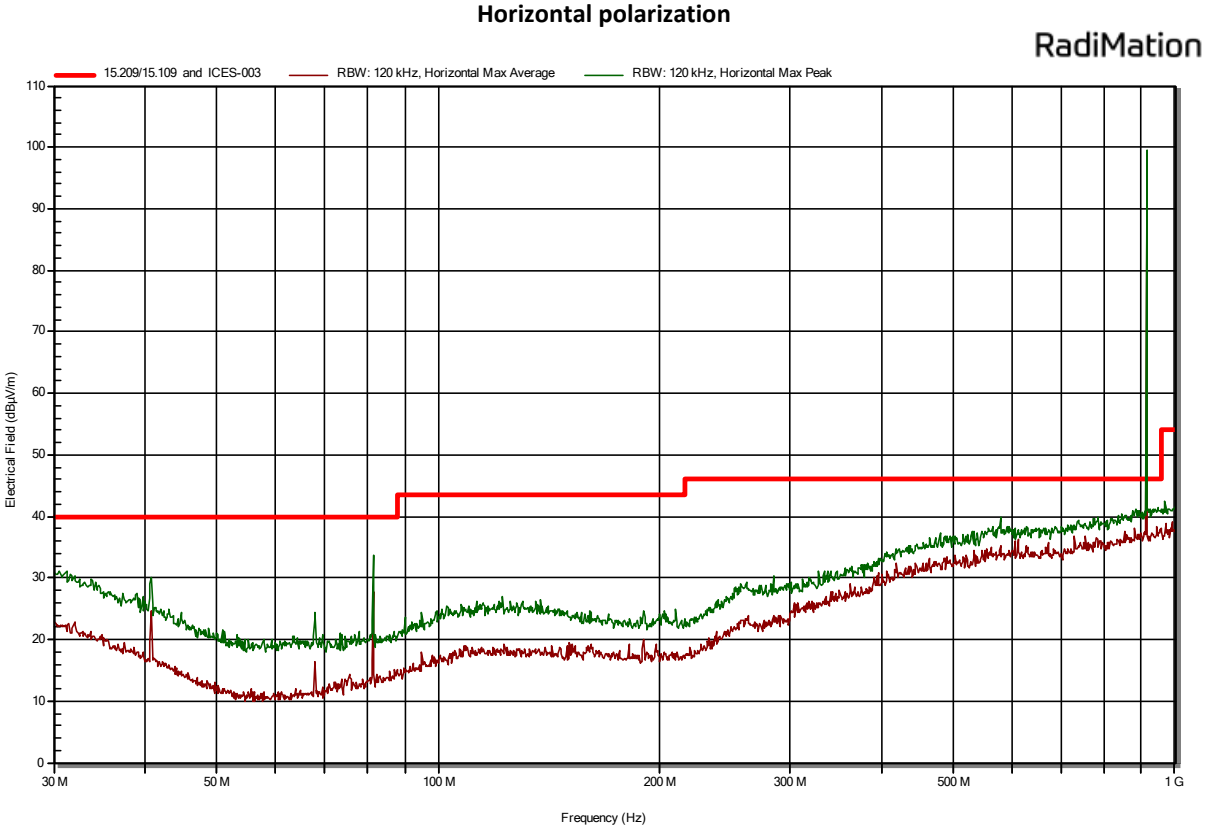
High


RadiMation
Limit Average 18 - 26 GHz
Limit Peak 18 - 26 GHz
RBW: 100 kHz, Vertical Max Average
RBW: 100 kHz, Vertical Max Peak
Electrical Field (dBµV/m)
80
75
70
65
60
55
50
45
40
35
30
18 G
19 G
20 G
21 G
22 G
23 G
24 G
25 G
26 G
Frequency (Hz)

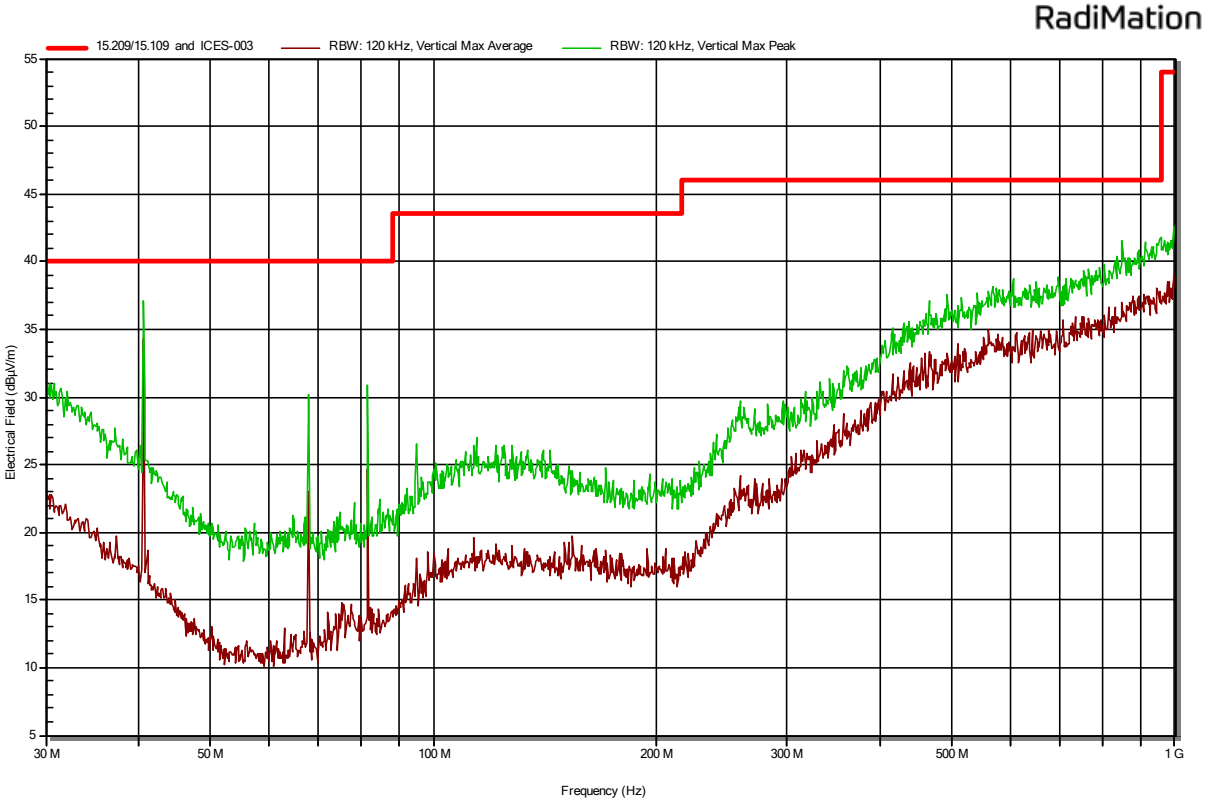
Co-Location (NFC and Proprietary)

30 -1000 MHz

Horizontal polarization



Vertical polarization



3.2 6dB bandwidth Measurement

3.2.1 Limit

The minimum 6 dB Bandwidth shall be at least 500 kHz.

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

Tests according to ANSI C63.10
IRN 017 - Occupied bandwidth (Hz) Method 4 – DTS Bandwidth.

3.2.5 Test Results of the 6 dB bandwidth Measurement

Technology Std.	Channel	Frequency (MHz)	Data rate	6dB bandwidth (kHz)
Proprietary	Low	902.6	50 kbps	665.29
	Mid	915.0	50 kbps	673.42
	High	927.4	50 kbps	667.79
Bluetooth Low energy	37	2402	1 Mbps	797.79
	17	2440	1 Mbps	803.72
	39	2480	1 Mbps	806.07
Uncertainty	± 36.2 kHz			

3.3 Output Power Measurement

3.3.1 Limit

For systems using digital modulation in the 2400-2483.5 MHz, the limit for the peak output power is 30 dBm. If transmitting antenna of directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point to point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

3.3.2 Measurement instruments

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

3.3.3 Test setup

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

3.3.4 Test procedure

The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05.

IRN 014 - RF power (W) - Method 1 – AVGSA (DTS) according to ANSI C63.10.

3.3.5 Test results of Output Power Measurement

Peak method

Technology Std.	Channel	Frequency (MHz)	Data rate	Peak output power (dBm)
Proprietary	Low	902.6	50 kbps	7.99
	Mid	915.0	50 kbps	7.75
	High	927.4	50 kbps	7.71
Bluetooth Low energy	37	2402	1 Mbps	-0.38
	17	2440	1 Mbps	-0.83
	39	2480	1 Mbps	-0.47
Uncertainty	±0.71 dB			

3.4 Power Spectral Density

3.4.1 Limit

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band at any time interval of continuous transmission.

3.4.2 Measurement instruments

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

3.4.3 Test setup

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

3.4.4 Test procedure

The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05.

IRN 030 - Spectral power density (W per n.Hz) - Method 5 – Peak method PKPSD (PSD in 3 kHz band)

3.4.5 Test results of Power Spectral Density Measurement

Peak Power spectral density

Technology Std.	Channel	Frequency (MHz)	Data rate	PSD (dBm/3 kHz)
Proprietary	Low	902.6	50 kbps	0.86
	Mid	915.0	50 kbps	0.65
	High	927.4	50 kbps	0.48
Bluetooth Low energy	37	2402	1 Mbps	-9.44
	17	2440	1 Mbps	-9.37
	39	2480	1 Mbps	-9.53
Uncertainty	±2 dB			

3.5 Band edge Measurement

3.5.1 Limit

Band edge:
At the edge of the authorized band the RF power shall be at least 20 dB down.

3.5.2 Measurement instruments

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

3.5.3 Test setup

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

3.5.4 Test procedure

The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05, sections 11.3 and 12.1. IRN 026 - Radiated electrical disturbance (V per m) Method 6 – Radiated electrical disturbance at the Authorized band edge.

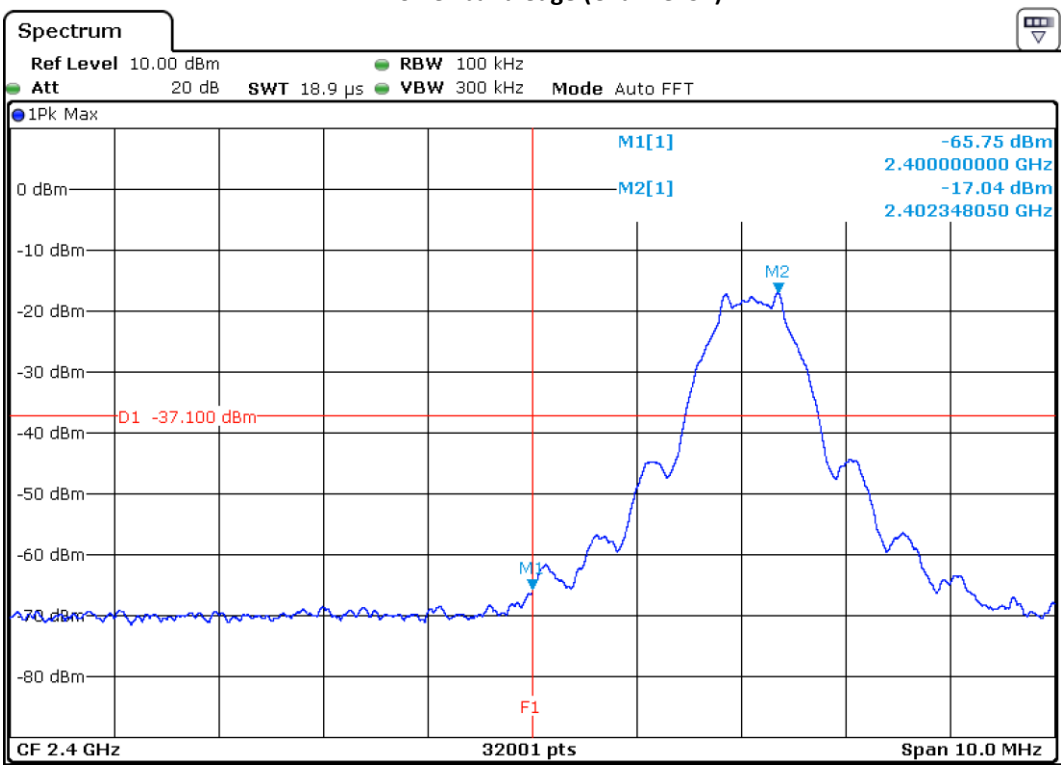
3.5.5 Measurement Uncertainty

± 5.7 dB.

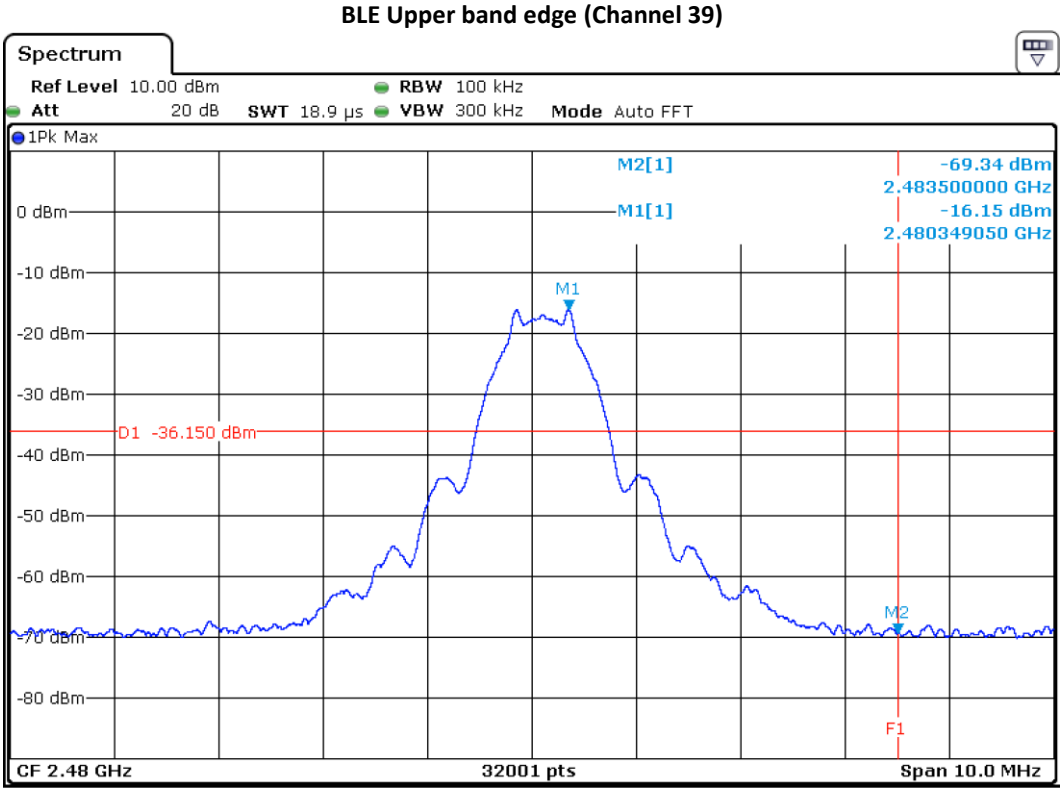
3.5.6 Plots of the Band edge Measurements

See next page

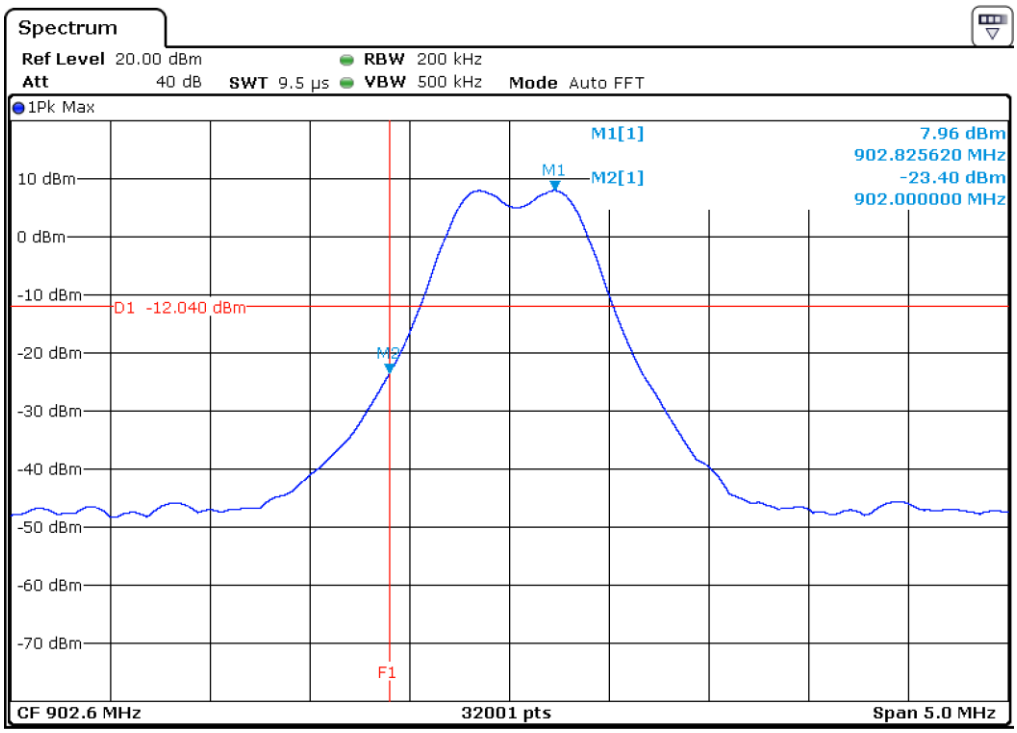
BLE Lower band edge (Channel 37)



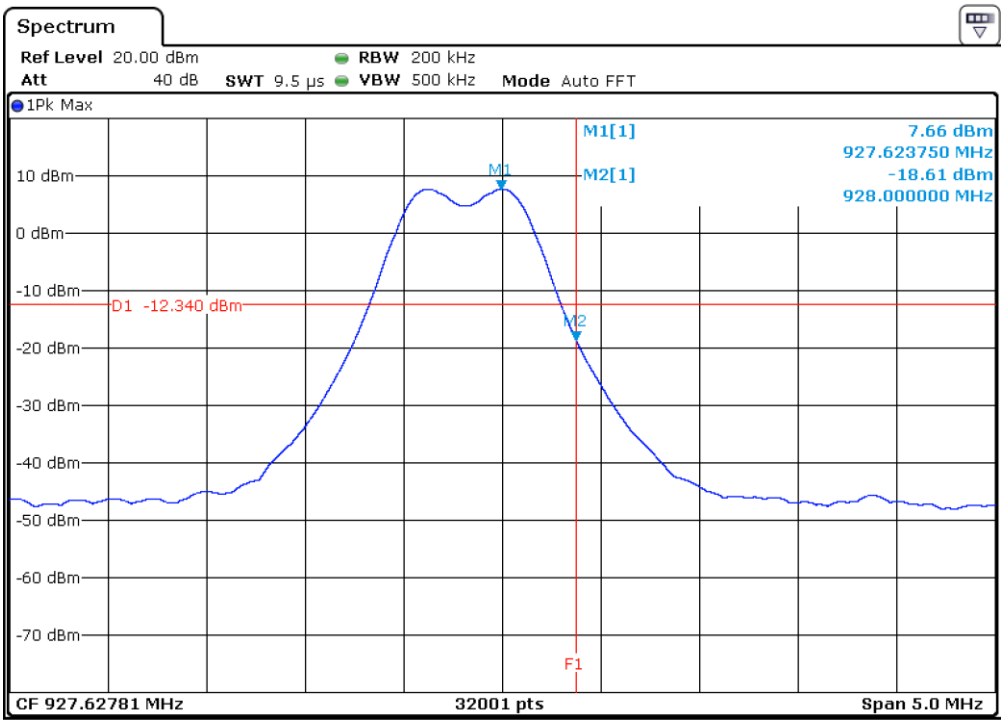
BLE Upper band edge (Channel 39)



Proprietary Lower band edge (Channel 37)



Proprietary Upper band edge (Channel 39)



3.6 Field strength of emissions

3.6.1 Limit

Frequency (MHz)	µV/m at 30 meter	dBµV/m at 30 meter
13.553 – 13.567	15,848	84
13.410 – 13.553 and 13.567 – 13.710	334	50.5
13.110 – 13.410 and 13.710 - 14.010	106	40.5

15.225(d)

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance(m)
0.009 - 0.490	2400/F(kHz)	67.6-20 log(F(kHz))	300
0.490 – 1.705	24000/F(kHz)	87.6-20 log(F(kHz))	30
14.010 - 30	30	29.5	30

3.6.2 Measurement instruments

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

3.6.3 Test setup

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

3.6.4 Test procedure

According to ANSI C63.10-2013, section 6.4.4.2
IRN 026 – Method 10

3.6.5 Test results of Field strength of emissions

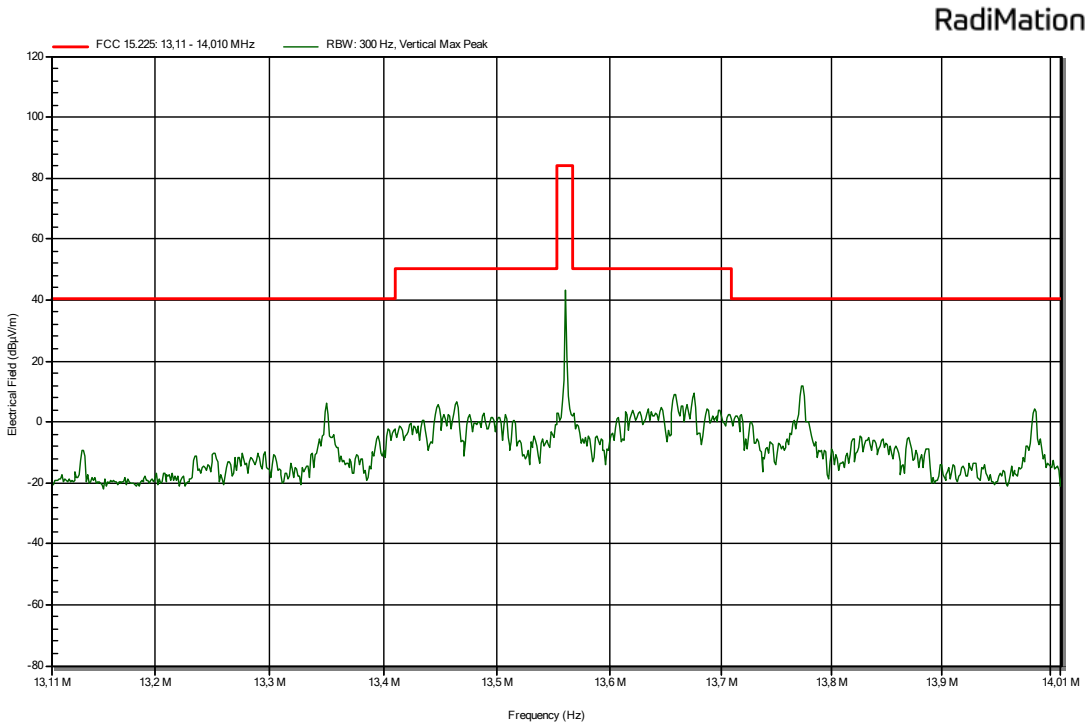
Frequency (MHz)	Max Field strength at 3m (dBµV/m) (Perpendicular to site axis)	Max Field strength at 3m (dBµV/m) (Parallel to site axis)
13.56	39.2	43.4
Uncertainty	+3.0 / -2.5 dB	

Note: 9 kHz – 1000 MHz spurious emissions as required by FCC part 15.225 (d) are covered in chapter 3.1

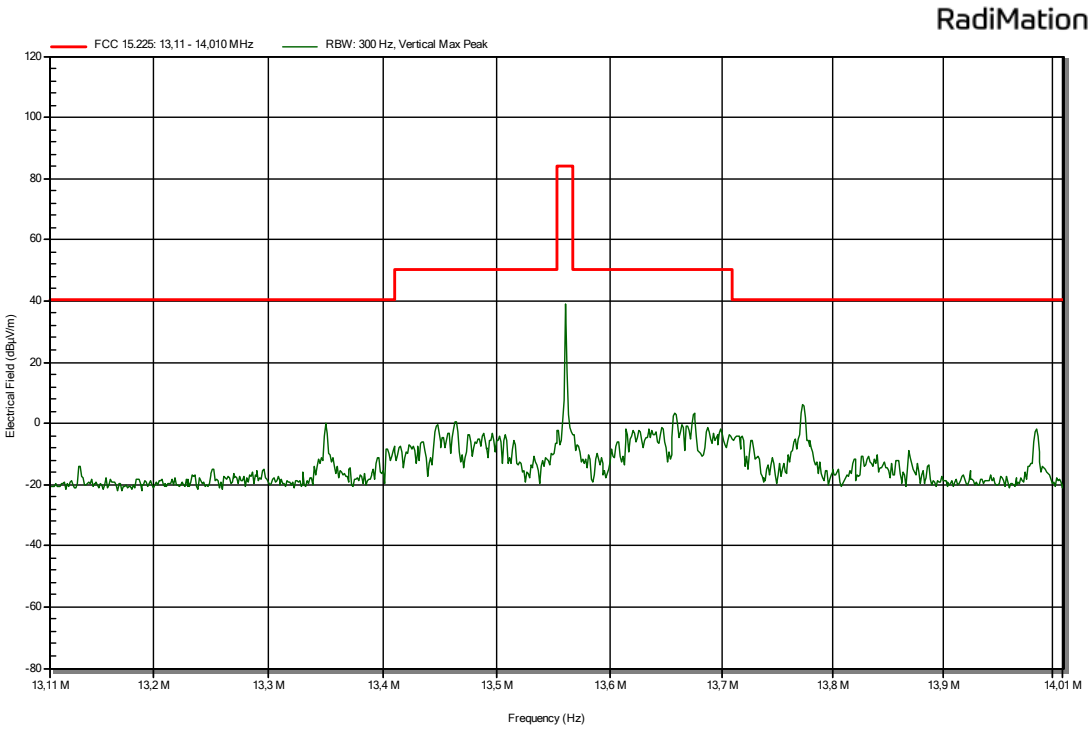
3.6.6 Plots of Field strength of emissions Measurement

Field strength of emission (13.11 MHz to 14.01 MHz)

Parallel



Perpendicular



3.7 Frequency Stability

3.7.1 Limit

The frequency stability of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

The measured frequency for the 13.56 MHz radio should fall within the limits 13558.644 kHz ≤ f ≤ 13561.356 kHz.

3.7.2 Measurement instruments

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

3.7.3 Test setup

The test has been performed in a climatic chamber using a test fixture

3.7.4 Test procedure

According to ANSI C63.10-2013, section 6.8
IRN 005 – Method 2

3.7.5 Test results of Frequency Stability Measurements

Temperature variation:

	Time after power on	2 minutes	5 minutes	10 minutes
Temperature				
50°C		13.5610 MHZ	13.5610 MHZ	13.5610 MHZ
40°C		13.5610 MHZ	13.5610 MHZ	13.5610 MHZ
30°C		13.5610 MHZ	13.5610 MHZ	13.5610 MHZ
20°C		13.5610 MHZ	13.5610 MHZ	13.5610 MHZ
10°C		13.5608 MHZ	13.5608 MHZ	13.5608 MHZ
0°C		13.5606 MHZ	13.5606 MHZ	13.5606 MHZ
-10°C		13.5610 MHZ	13.5610 MHZ	13.5610 MHZ
-20°C		13.5610 MHZ	13.5610 MHZ	13.5610 MHZ

Voltage variation:

Voltage	Frequency (MHz)	Deviation (%)*)	Limit (%)
5.1 V	13.5610	0	0.01
6.0 V	13.5610	0	0.01
6.9 V	13.5610	0	0.01

*) w.r.t. nominal frequency of 13.56 MHz

3.7.6 Measurement Uncertainty

Measurement uncertainty = + /- 10 Hz

4 Sample calculations

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

Conducted emission Measurement:

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:

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