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FCC and IC Test report for parts 15.107, 15.109 15.207, 15.209, 15.247 RSS-247, RSS-Gen

Product name	: Portable ultrasonic flowmeter signal converter with Bluetooth connectivity
Applicant	: Krohne Altometer
FCC ID	: 2A3Y8-UFC300P
IC	: 28077- UFC300P

Test report No. : P000029886 001 Ver 2.00

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).

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Documentation

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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	25-11-2021	First draft	KK
v1.00	13-01-2022	Final version	KK
v2.00	17-03-2022	Applicant information changed	KK

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Summary of Test results

FCC	ISED	Description	Section in report	Verdict
15.247(d) 15.209 (a) 15.109 (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 (b)	RSS-247 5.4 (d)	RF output power	3.2	Pass
15.207 (c) 15.107(a)	RSS-Gen 8.8	Conducted spurious emissions on AC mains	3.3	Pass

1 General Description

1.1 Applicant

Client name:	Krohne Altometer
Address:	Kerkeplaat 12, Dordrecht, The Netherlands
Zip code:	3313 LC
Telephone:	+31-786306233
E-mail:	e.vuelban@krohne.com
Contact name:	Edgar Vuelban

1.2 Manufacturer

Manufacturer name:	Krohne Altometer
Address:	Kerkeplaat 12, Dordrecht, The Netherlands
Zip code:	3313 LC
Telephone:	+31-786306233
E-mail:	e.vuelban@krohne.com
Contact name:	Edgar Vuelban

1.3 Tested Equipment Under Test (EUT)

Product name:	Portable ultrasonic flowmeter signal converter with Bluetooth connectivity
Brand name:	OPTISONIC 6300 P
FCC ID:	2A3Y8-UFC300P
IC:	28077- UFC300P
Product type:	Flowmeter converter
Model(s):	-
Batch and/or serial No.	UFC300P
Software version:	ER2.x
Hardware version:	ER2.x
Date of receipt	08-11-2021
Tests started:	08-11-2021
Testing ended:	06-01-2022

1.4 Product specifications of Equipment under test

Tx Frequency:	BT Classic: 2400 – 2483.5
Rx frequency:	BT Classic: 2400 – 2483.5
Occupied channel width:	1025 kHz
Antenna type:	Flexible Planner Inverted F Antenna
Antenna gain:	2.5 dBi
Type of modulation:	GFSK
Emission designator	1M03G1D

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

1.5 Environmental conditions

Test date	08-11-2021
Ambient temperature	21.4 °C
Humidity	40.1 %

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 §15.247
- RSS-Gen Issue 5
- RSS-247 Issue 2

1.8 Observation and remarks

The device has pre-certified radio module.

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 : Paul van Wanrooij

The above conclusions have been verified by the following signatory:

Date : 03-05-2022

Name : Raoul Tolud, MSc

Function : Test Engineer

Signature :

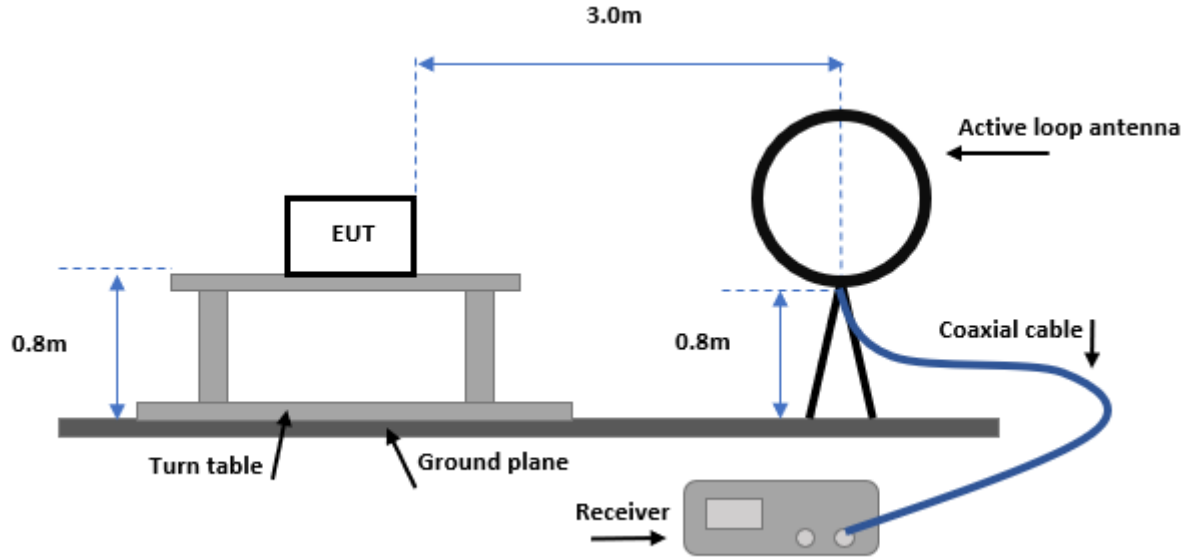
2 Test configuration of the Equipment Under Test

2.1 Test mode

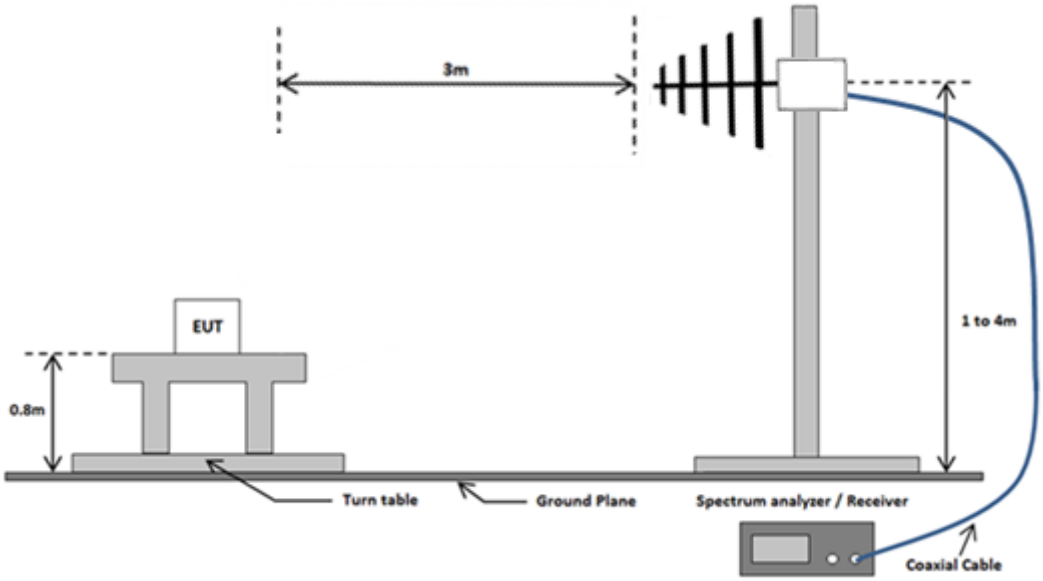
Technology	Channels	Data rate	Frequency (MHz)
BT Classic	0	1 Mbps	2402
	39	1 Mbps	2440
	78	1 Mbps	2480

2.2 Test setups

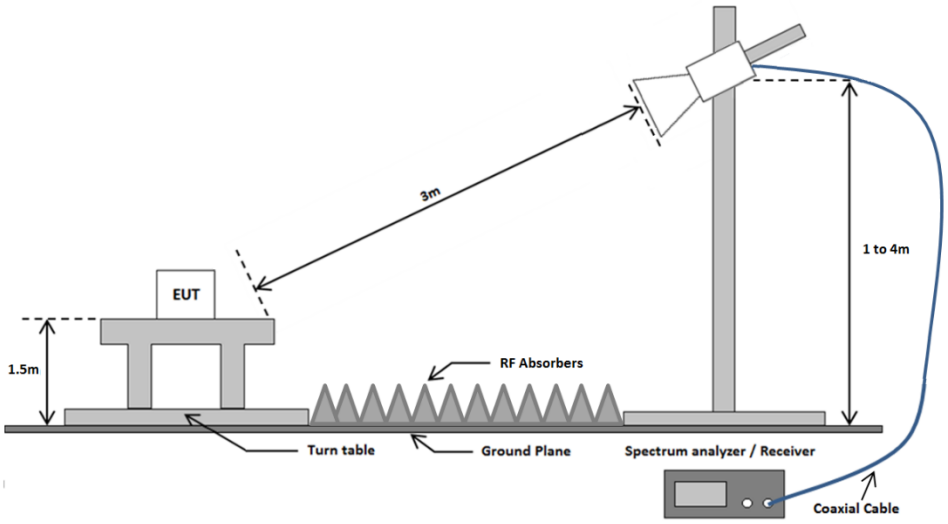
Radiated emissions test setup 9 kHz – 30 MHz



Radiated emissions test setup 30 MHz - 1 GHz

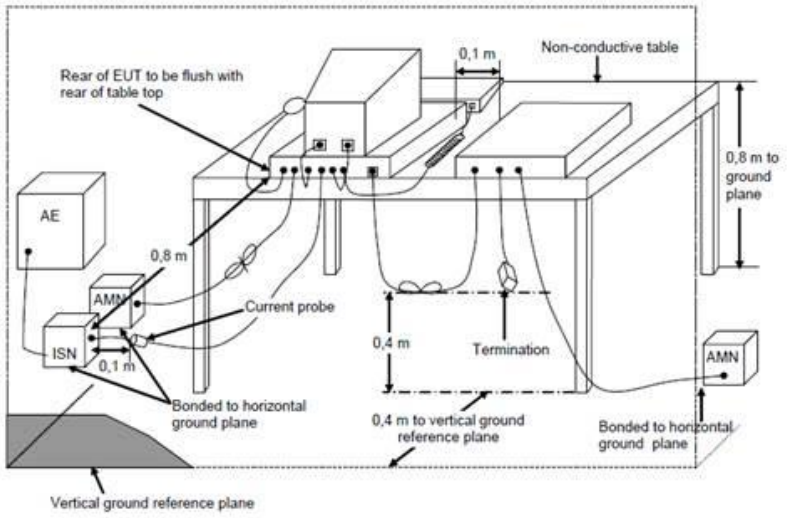


Radiated emissions test setup above 1 GHz



Conducted emissions test setup

Emissions test at AC mains



2.3 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Cal. due date	Used at Par.
EMI Receiver	Rohde & Schwarz	ESCI	TE11128	Feb 2022	3.1
EMI Receiver	Rohde & Schwarz	ESR7	TE01220	Jan 2022	3.1 , 3.3
Spectrum analyzer	Rohde & Schwarz	FSP40	TE11125	Mar 2022	3.1, 3.2
Spectrum Analyzer	Rohde & Schwarz	FSV40	TE01269	Sep 2022	3.1
Active loop antenna	EMCO	6502	TE11171	Jan 2024	3.1
Biconilog antenna	Chase	CBL6112A	TE00967	Apr 2026	3.1
Horn antenna	EMCO	3115	TE00531	Jan 2024	3.1
Preamplifier 1-18 GHz	µComp Nordic	MCNA-40-0010800-25-10P	TE11175	Feb 2023	3.1
Horn antenna	FLANN-MICROWAVE	20240-25	TE 00818	Standard gain	3.1
Preamplifier 18-26 GHz	Miteq	JS4-18004000-33-8P	TE 11131	Feb 2023	3.1
LISN	Rohde & Schwarz	ENV216	TE11176	July 2023	3.3
Test software	DARE	Radimation Version 2021.1.9	--	-	3.1

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

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 C63.10-2014, section 5.4.2 and 8.2.3
30 MHz to 26.5 GHz: According to ANSI C63.10-2014, 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

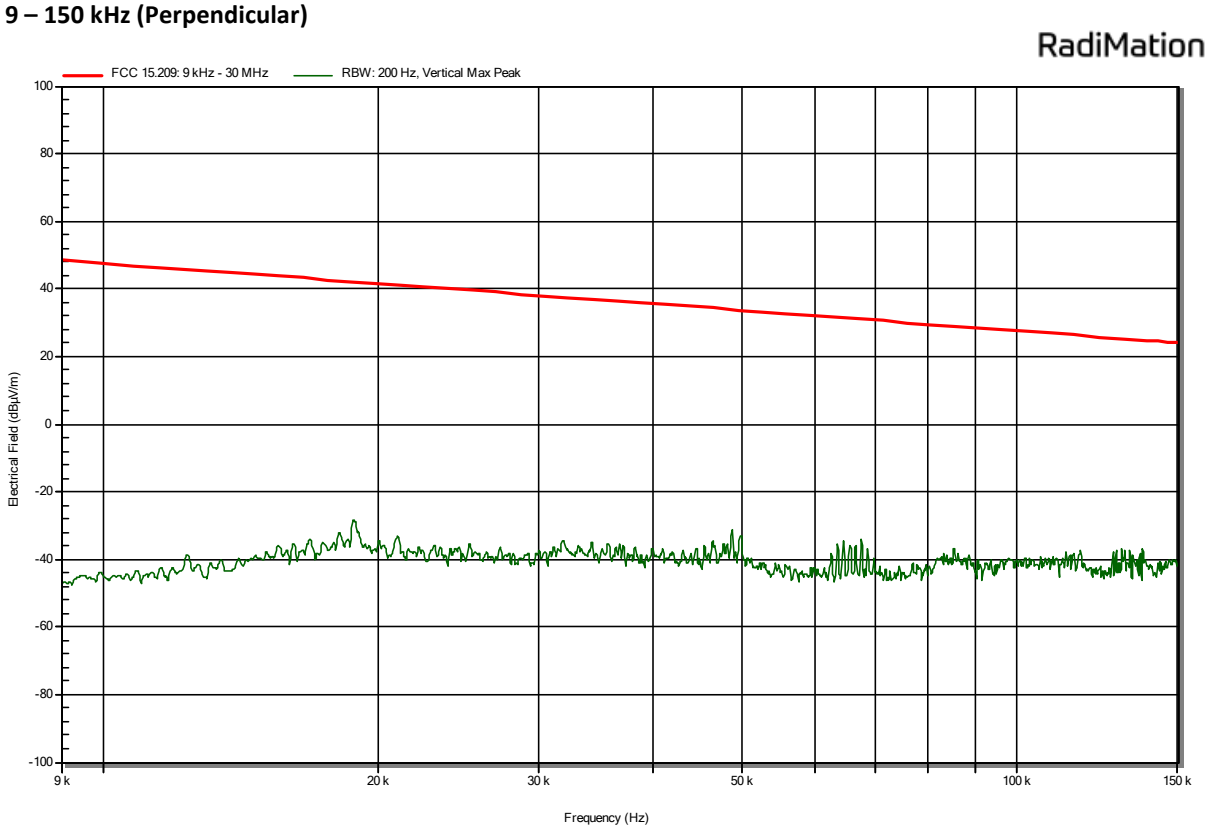
Frequency range	Polarization	Uncertainty
9 kHz – 30 MHz	--	±1.6 dB
30 – 200 MHz	Horizontal	±4.5 dB
	Vertical	±5.4 dB
200 -1000 MHz	Horizontal	±3.6 dB
	Vertical	±4.6 dB
1 – 18 GHz	Horizontal	±5.7 dB
	Vertical	±5.7 dB
18 – 26.5 GHz	Horizontal	±4.9 dB
	Vertical	±4.9 dB

Pick Table

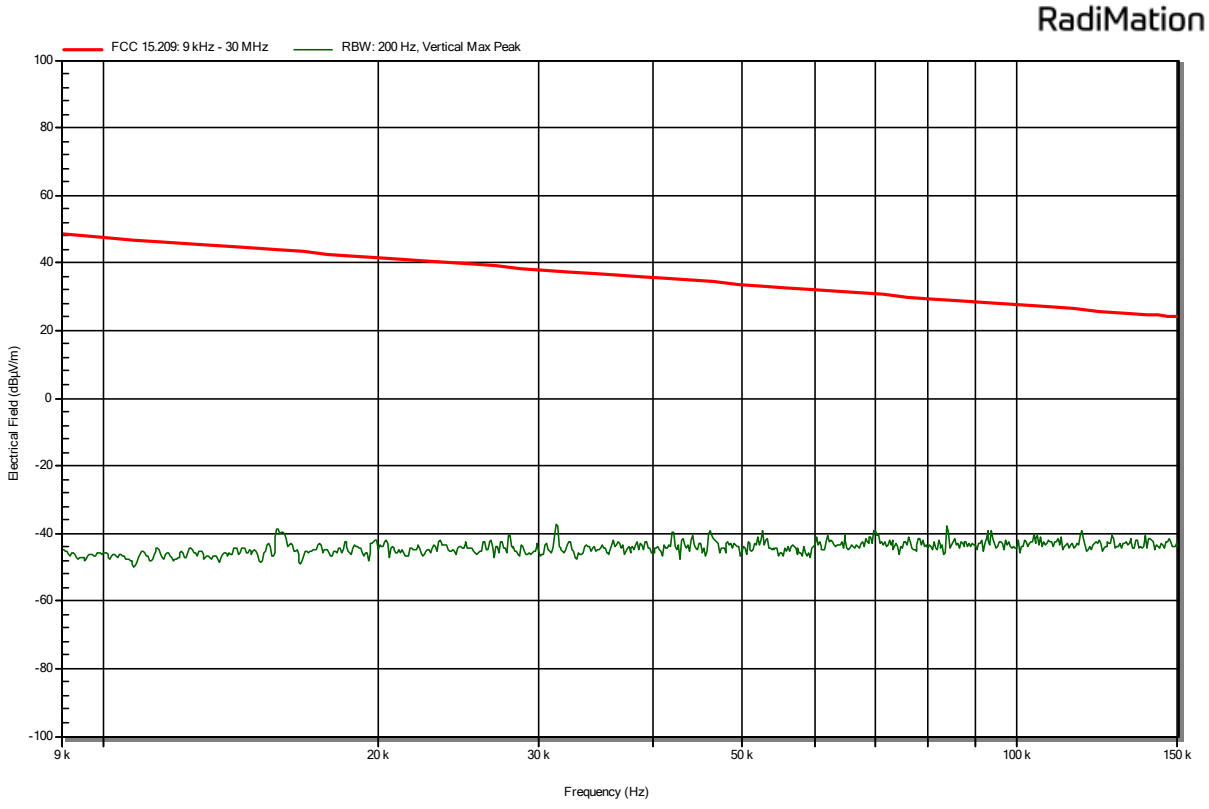
Frequency	Polarization	Technology
4,96 GHz	Horizontal	BT Classic
4,88 GHz	Vertical	BT Classic
7,439 GHz	Vertical	BT Classic

3.1.6 Plots of the Radiated Spurious Emissions Measurement

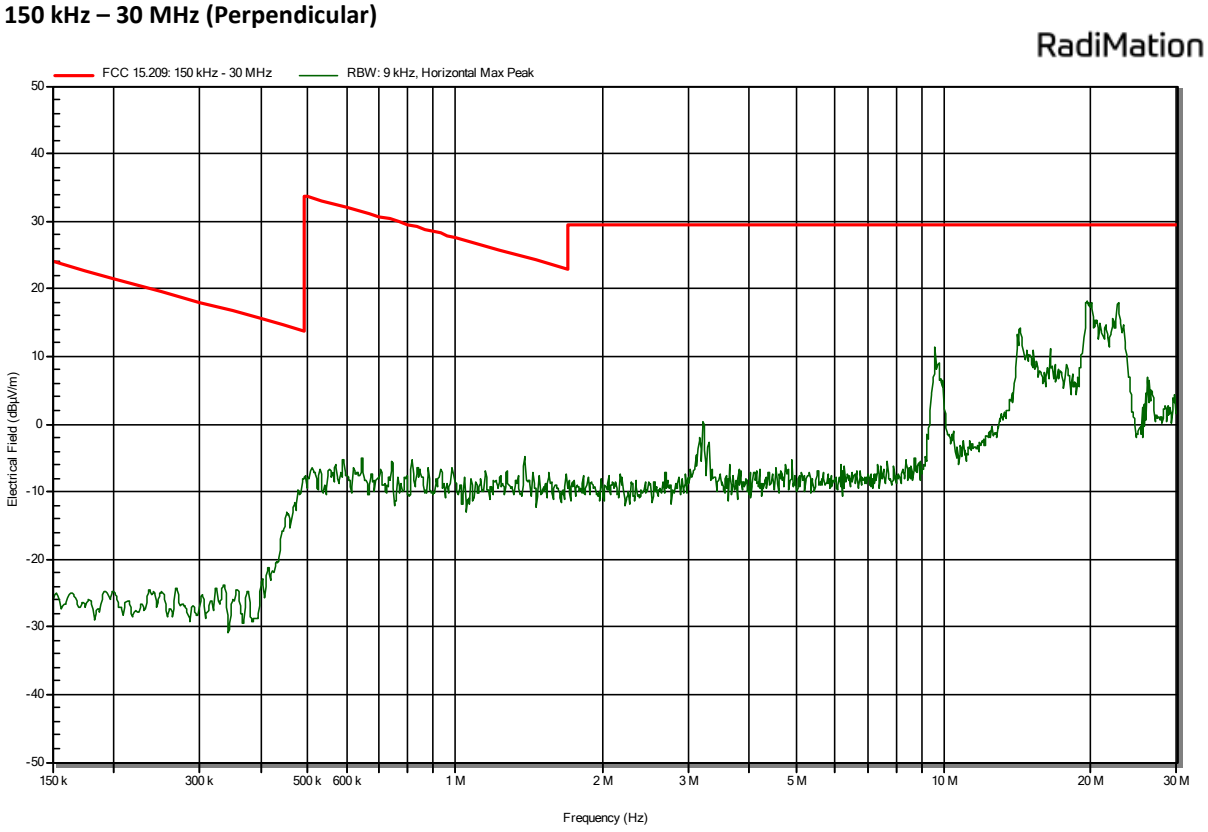
9 – 150 kHz (Perpendicular)



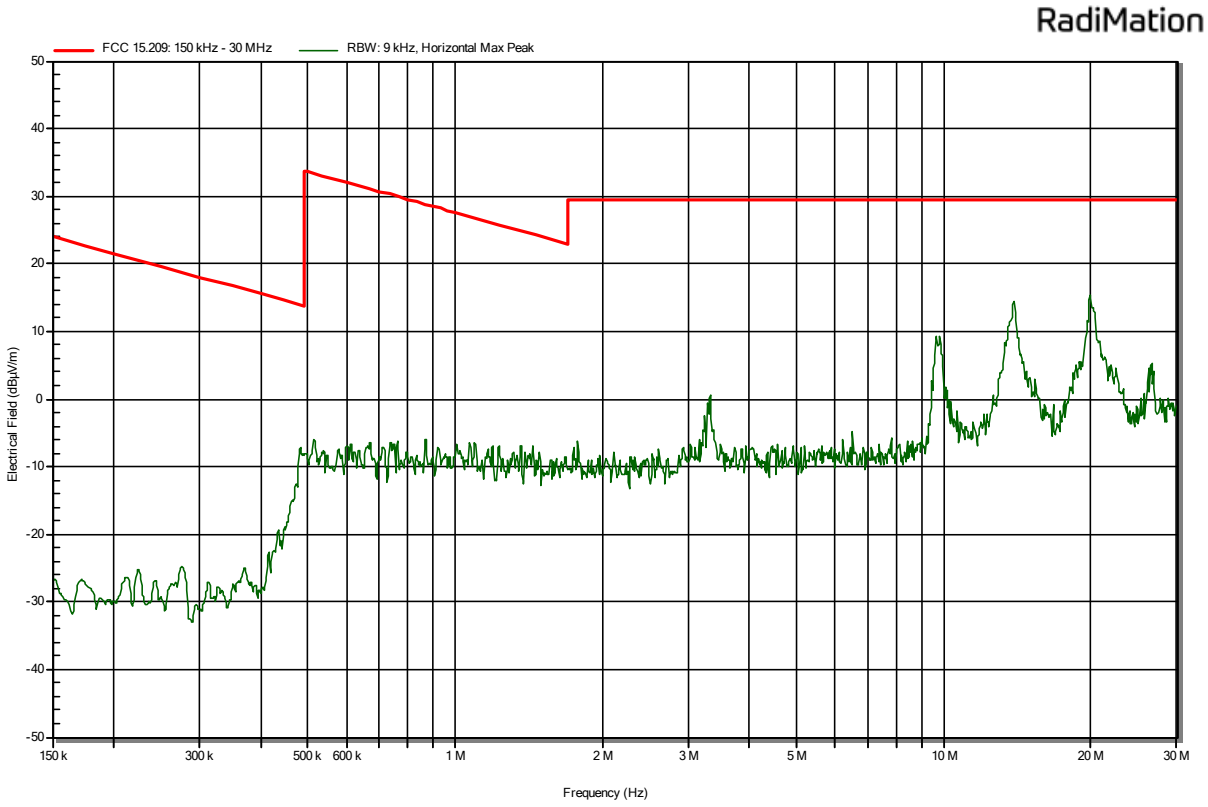
9 – 150 kHz (Parallel)



150 kHz – 30 MHz (Perpendicular)



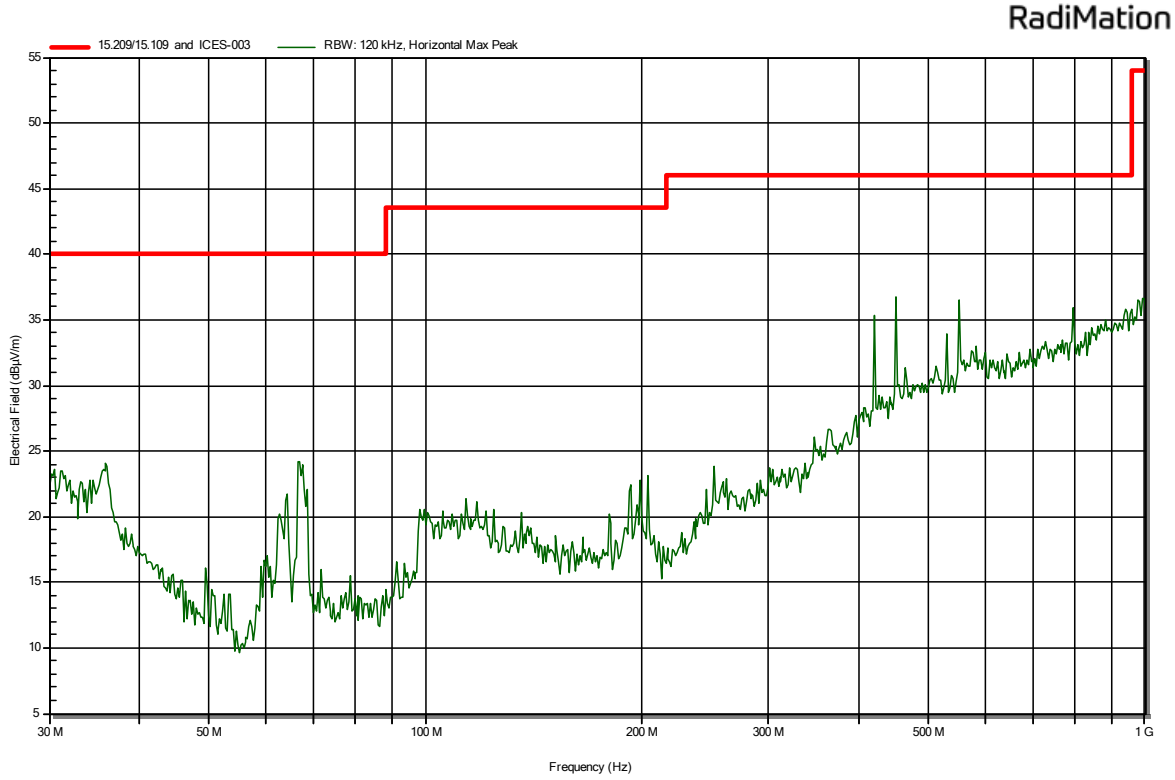
150 kHz – 30 MHz (Parallel)



30 – 1000 MHz

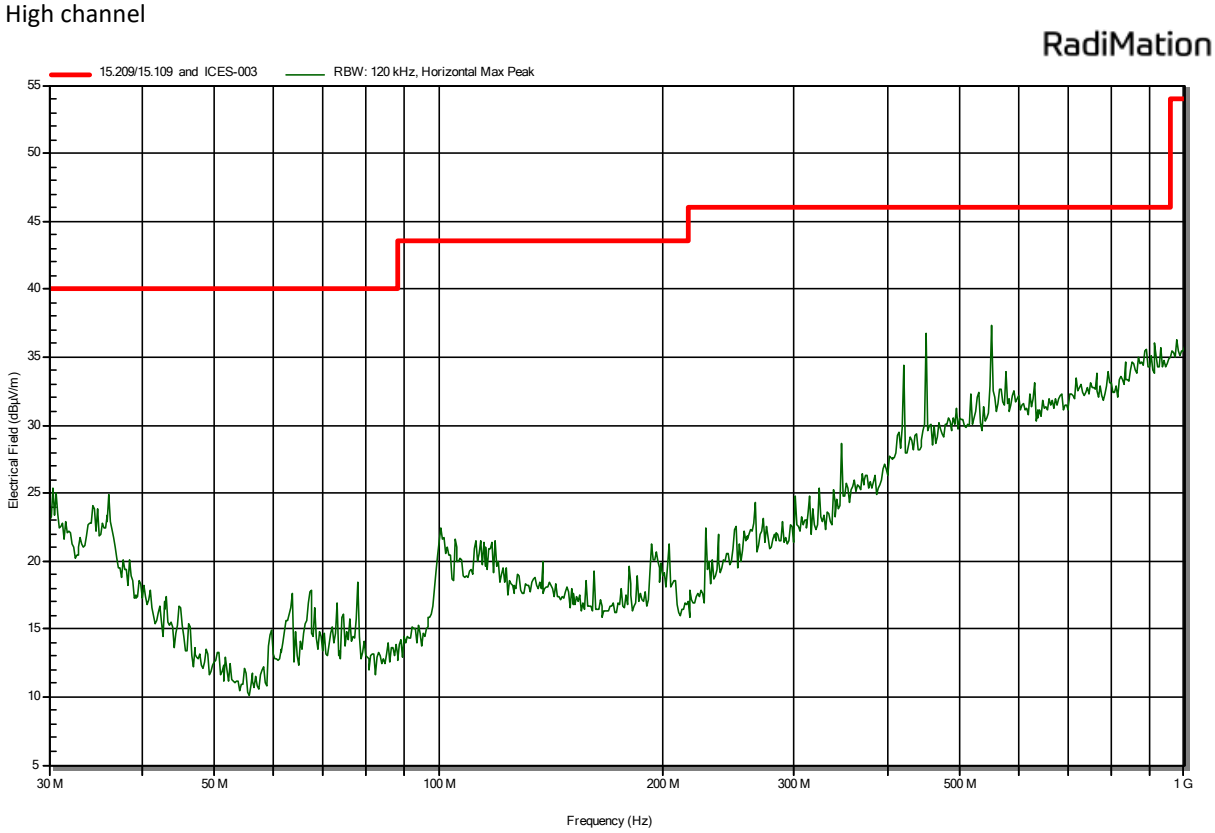
Horizontal

Low channel



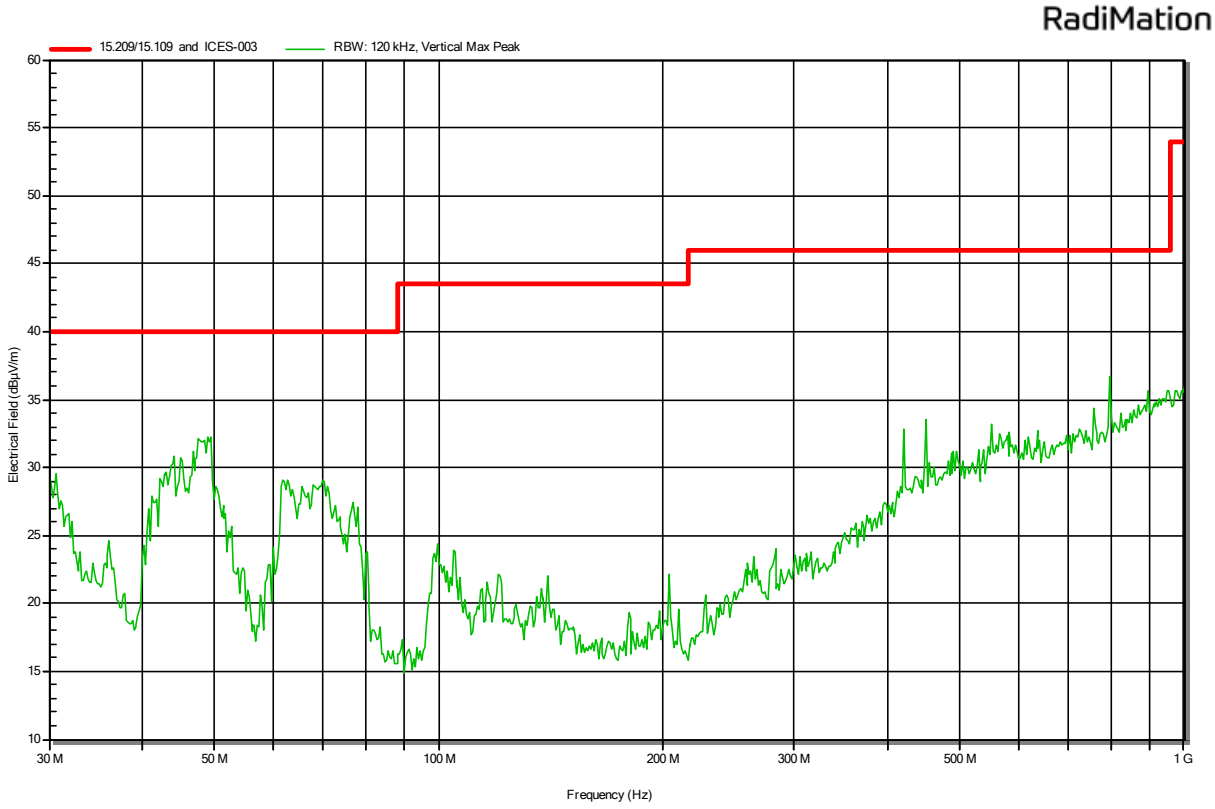
Mid channel

High channel

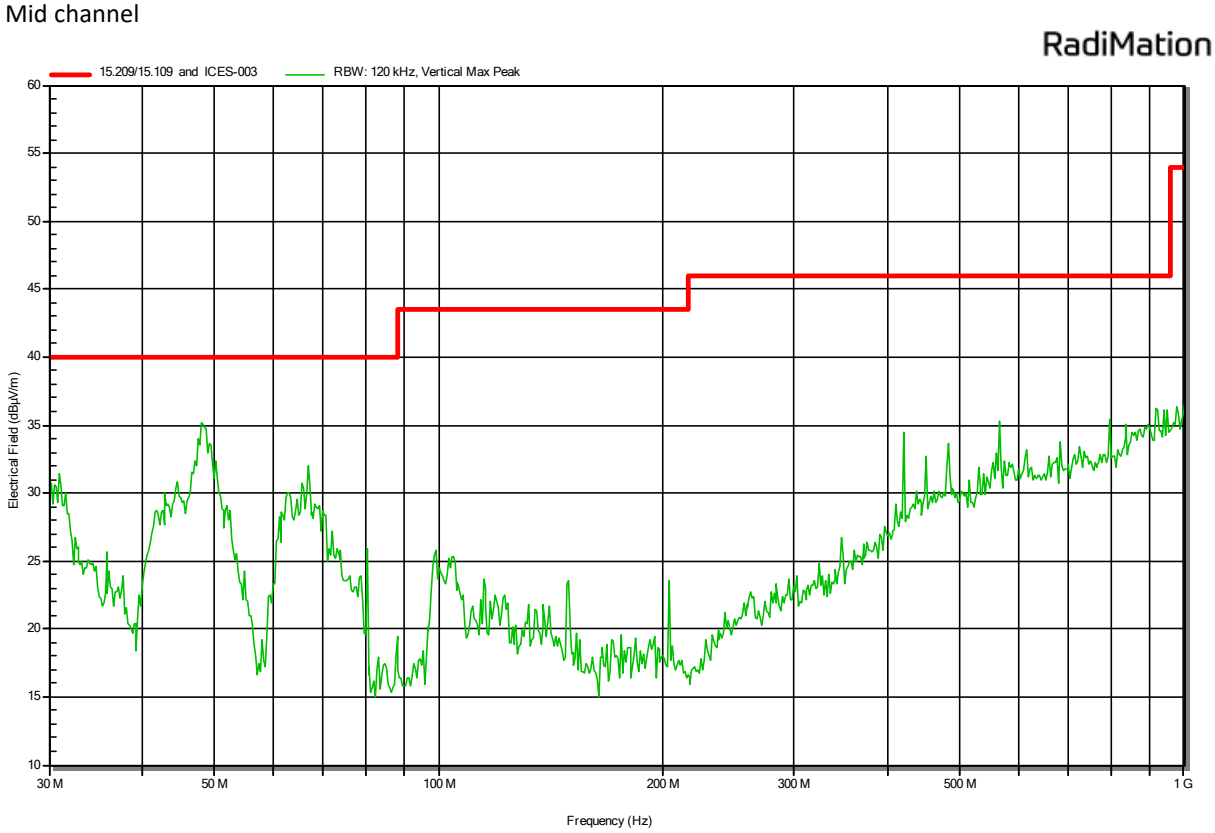


Vertical

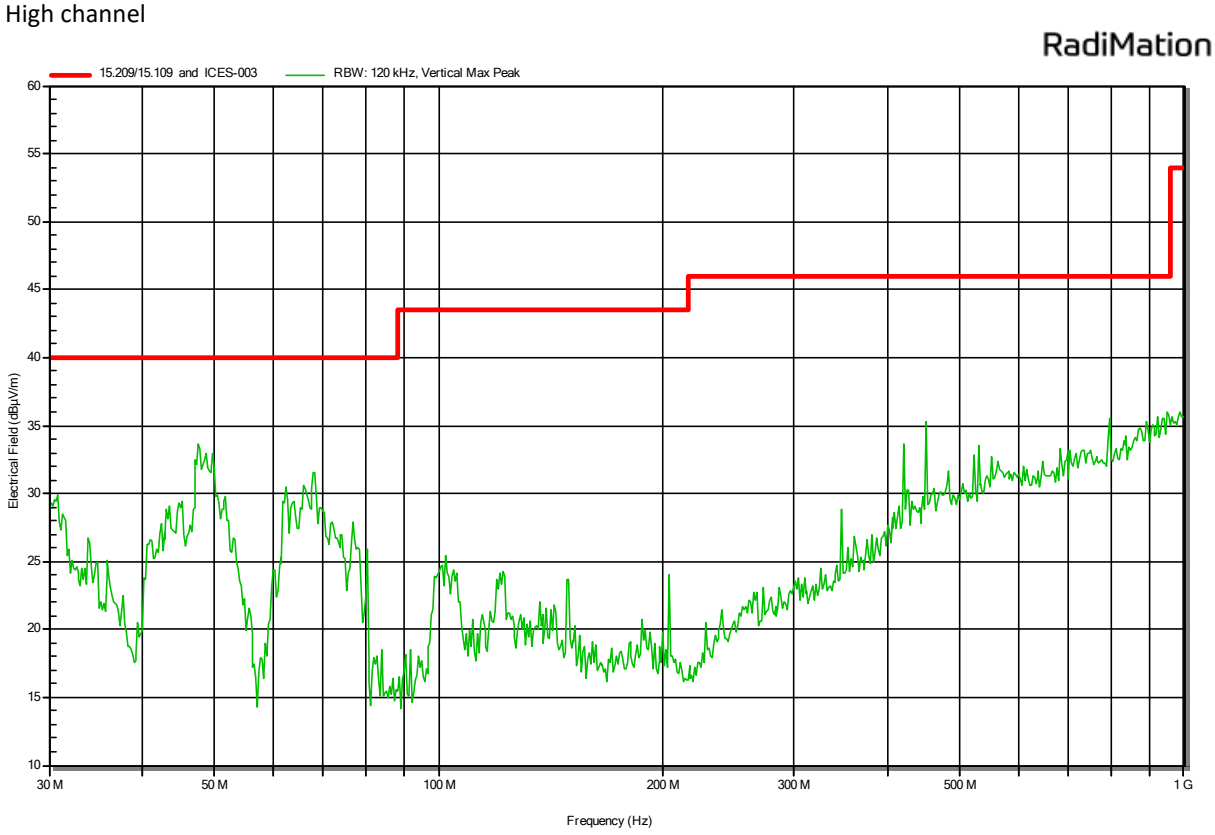
Low channel



Mid channel



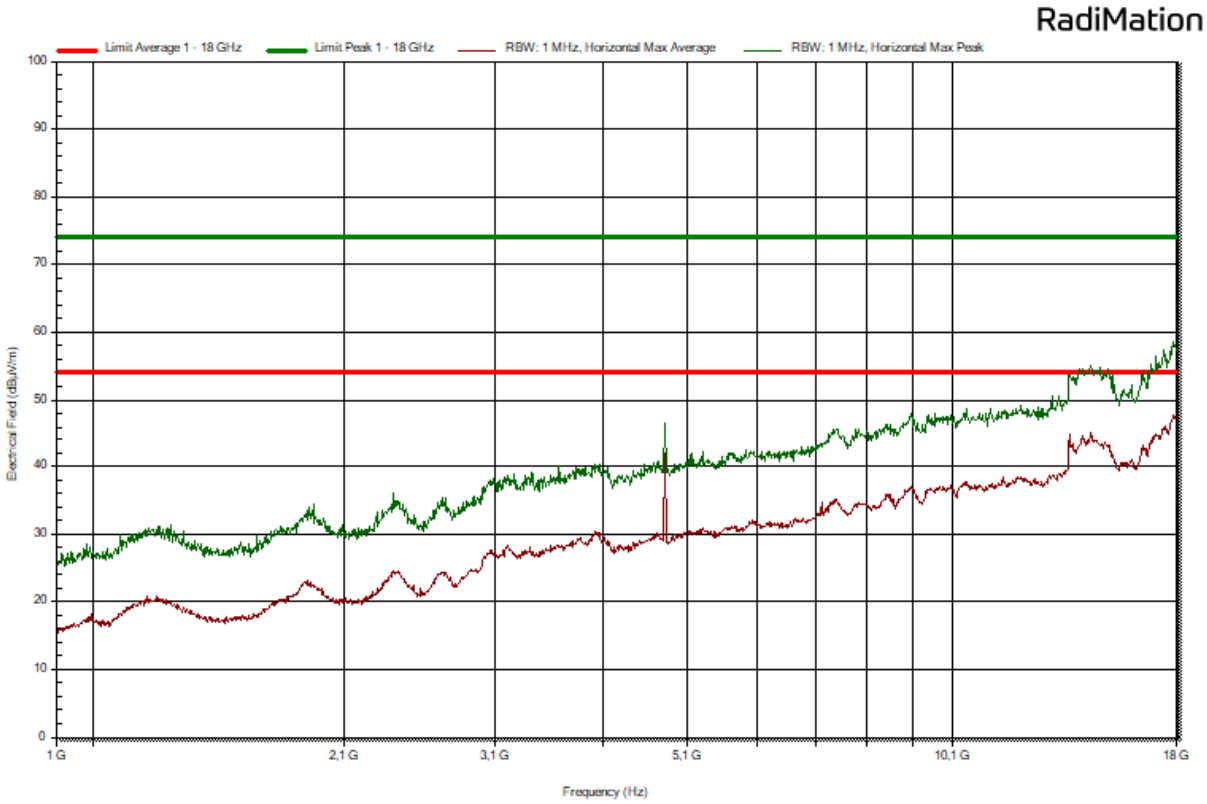
High channel



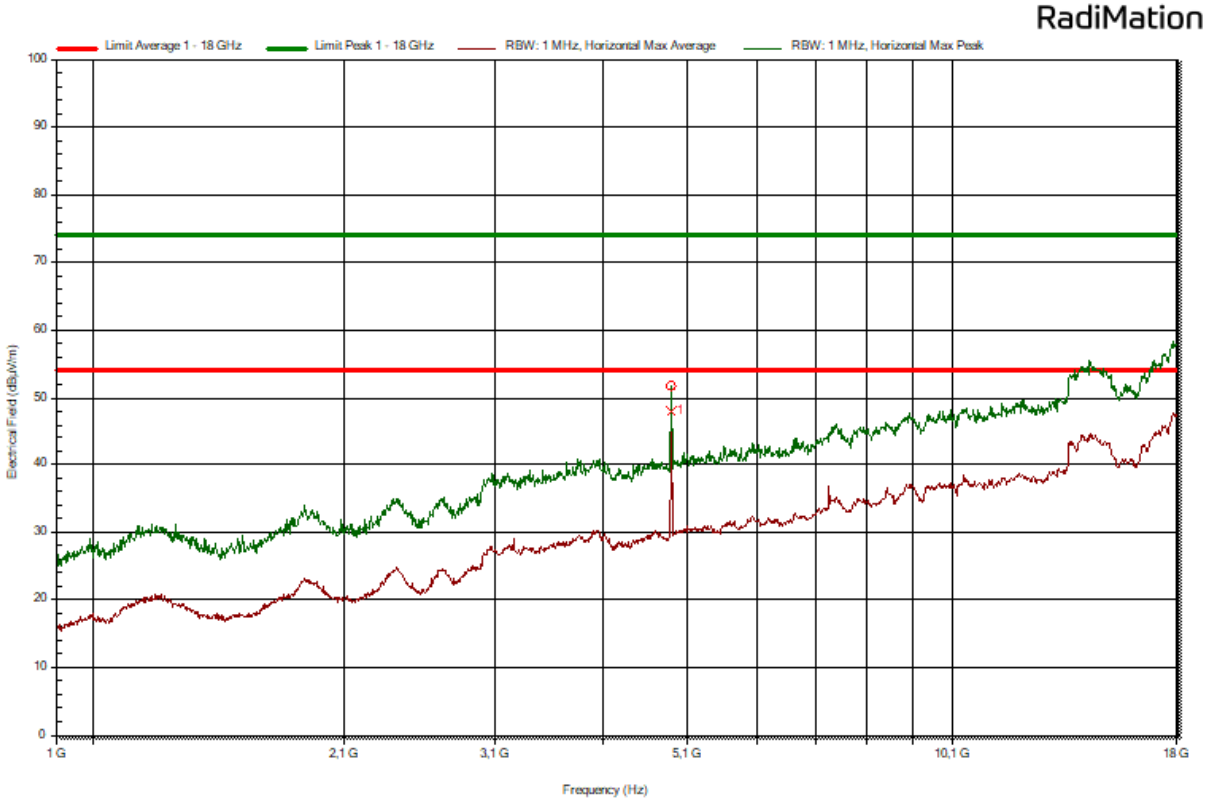
1 – 18 GHz

Horizontal

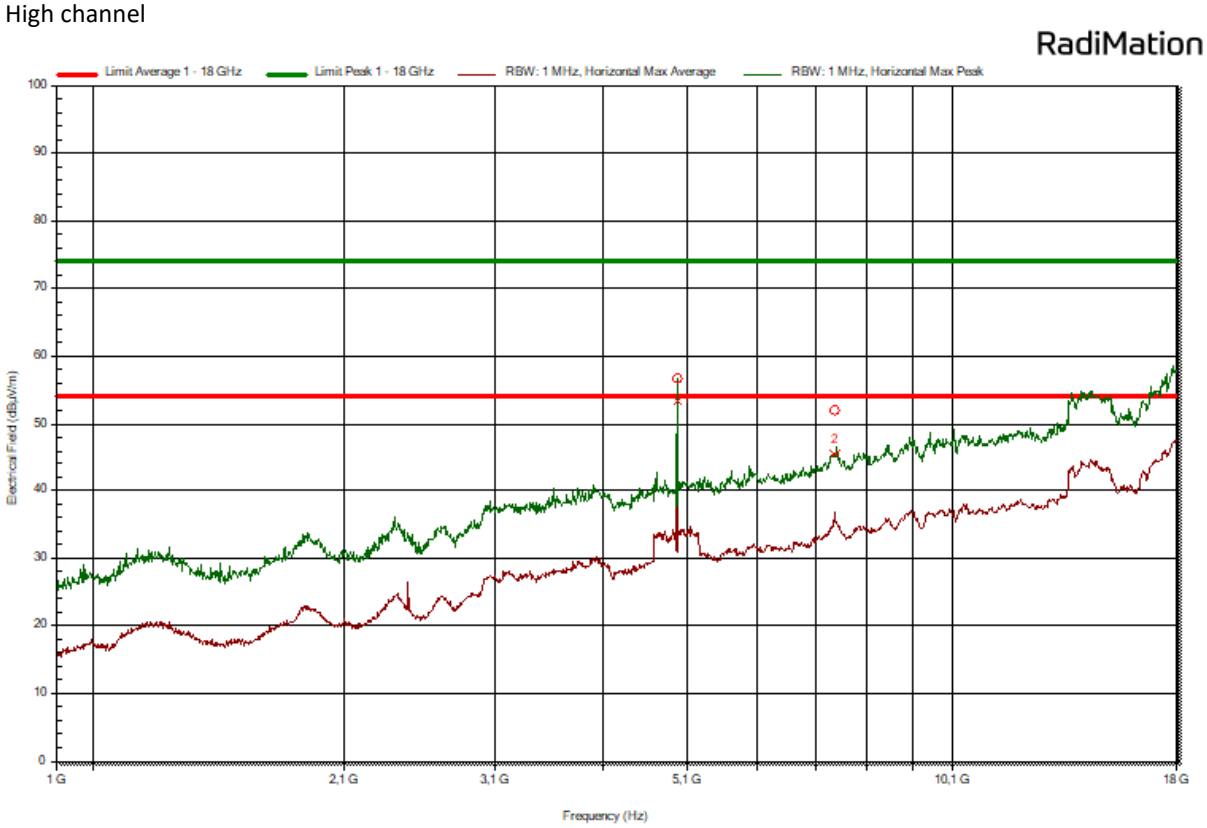
Low channel



Mid channel



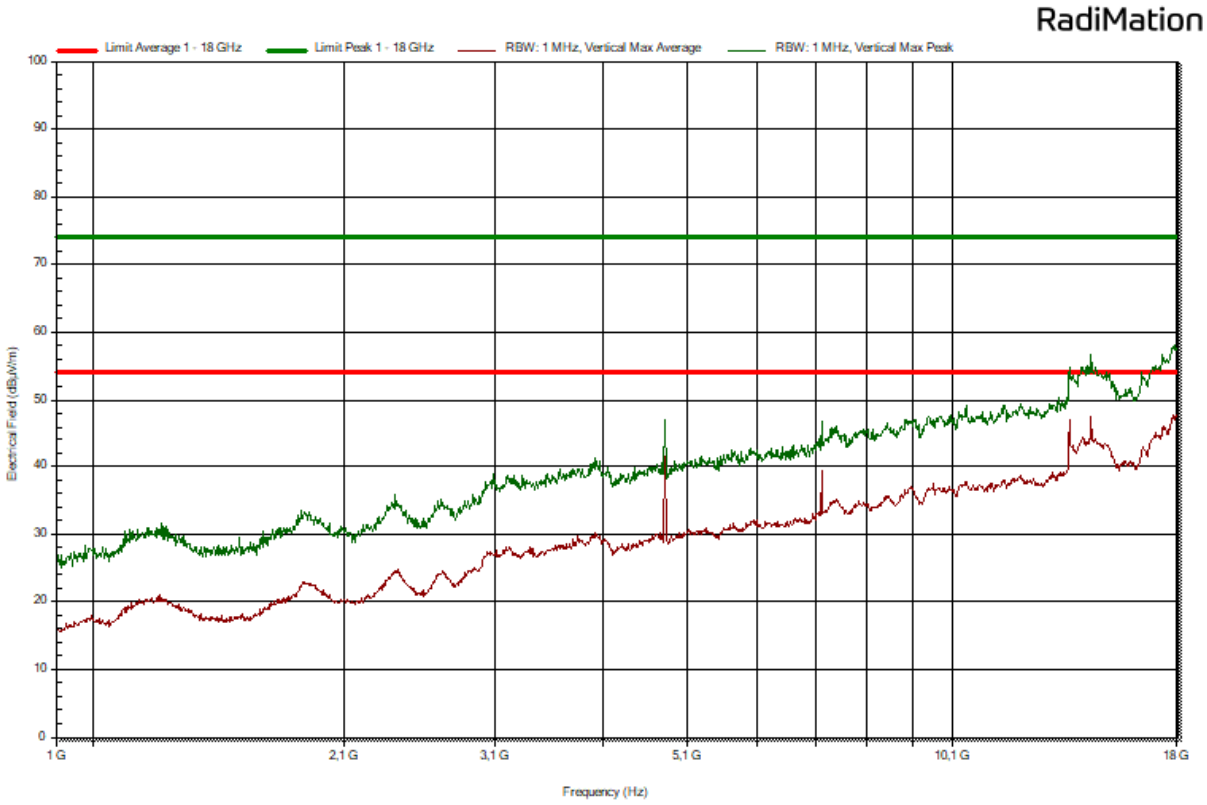
High channel



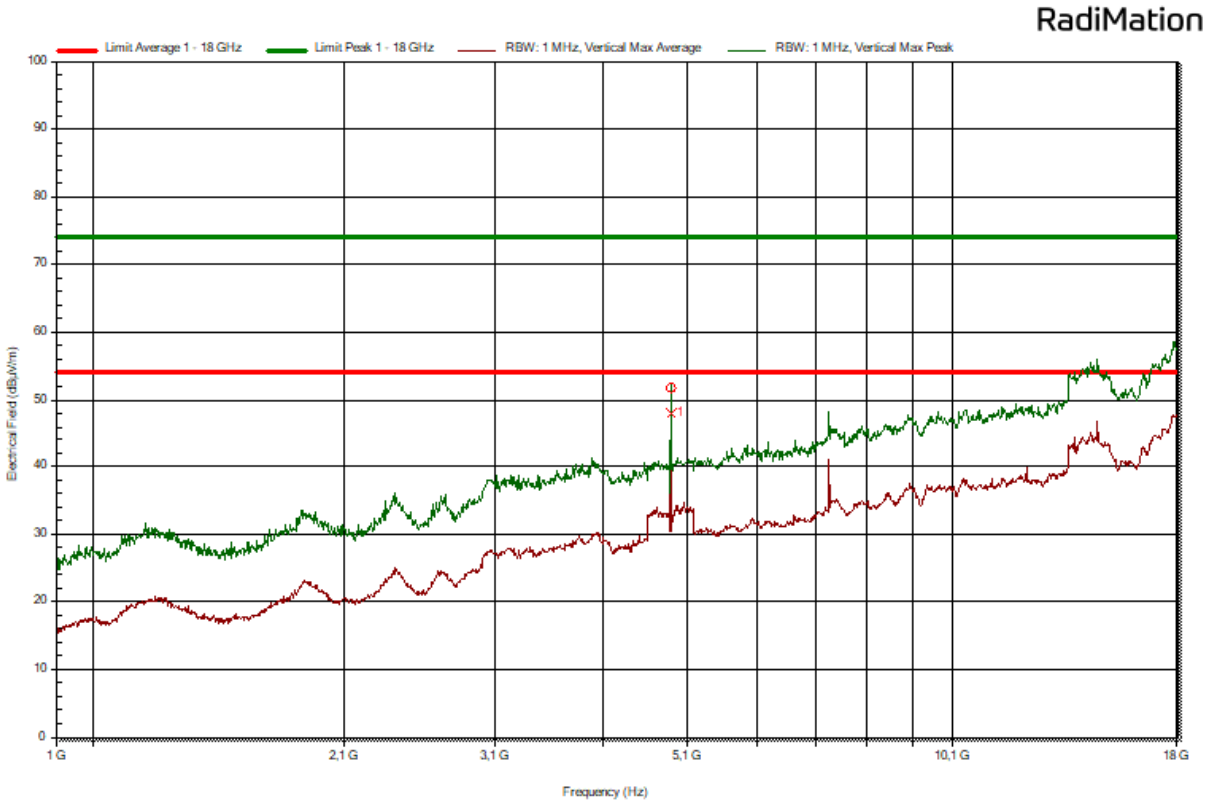
Frequency	Peak	Peak Limit	Average	Average Limit	Status	Angle	Height	Distance	Polarization
4,96 GHz	56,8 dBµV/m	74 dBµV/m	53,4 dBµV/m	54 dBµV/m	Pass	346 degrees	1,2 m	3 m	Horizontal

Vertical

Low channel

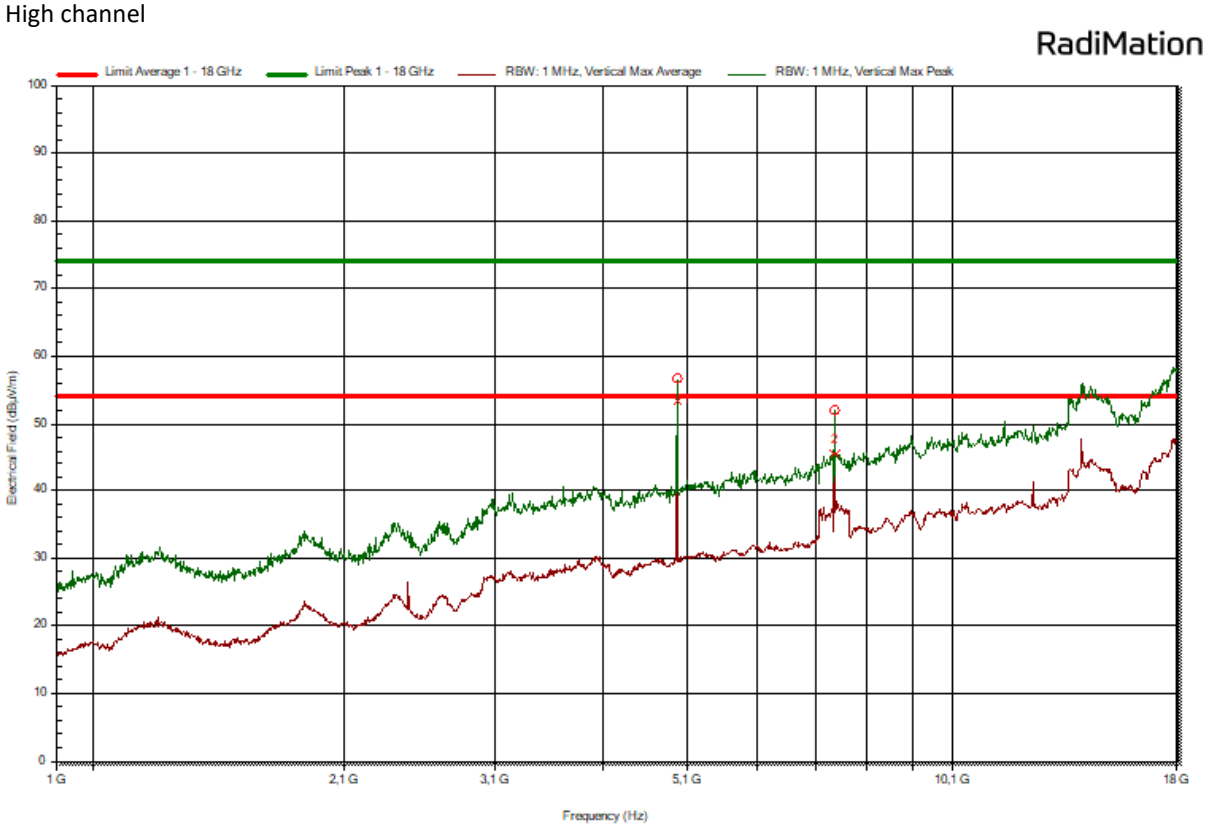


Mid channel



Frequency	Peak	Peak Limit	Average	Average Limit	Status	Angle	Height	Distance	Polarization
4,88 GHz	51,7 dBµV/m	74 dBµV/m	47,9 dBµV/m	54 dBµV/m	Pass	234 degrees	2,5 m	3 m	Vertical

High channel

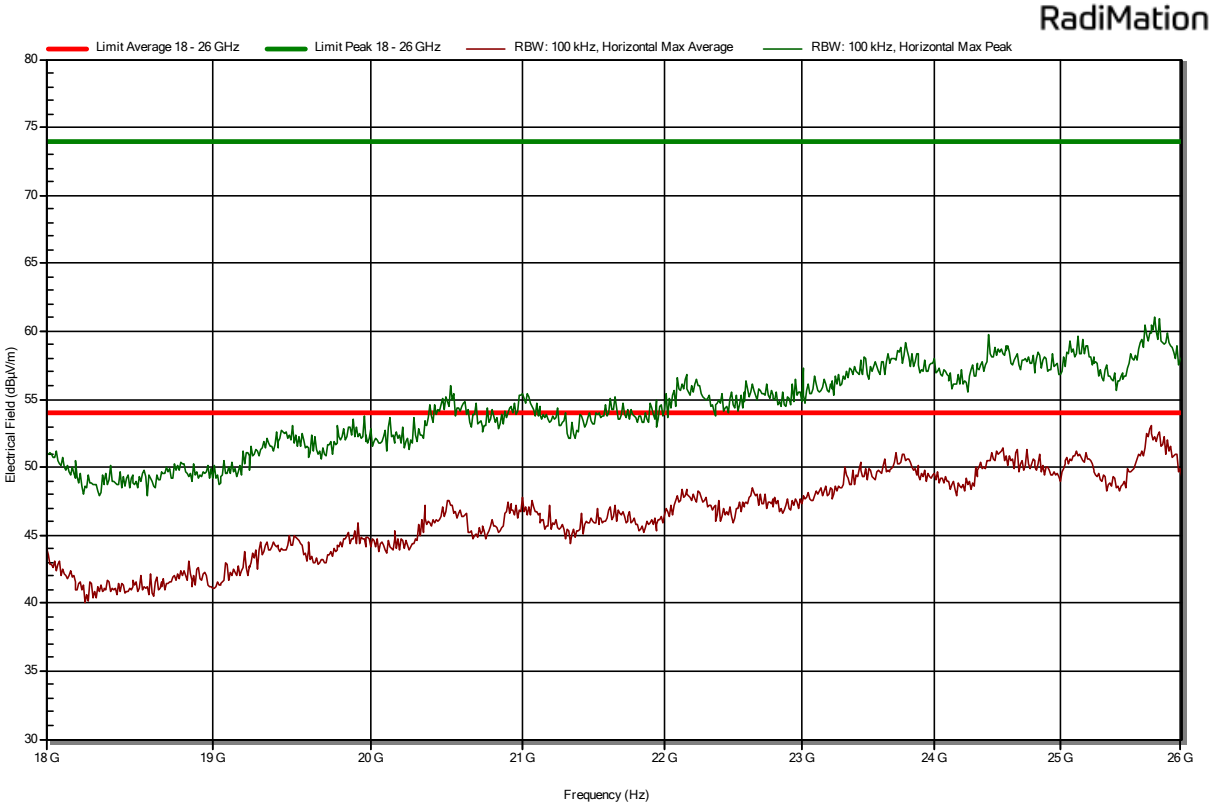


Frequency	Peak	Peak Limit	Average	Average Limit	Status	Angle	Height	Distance	Polarization
7,439 GHz	52 dBµV/m	74 dBµV/m	45,5 dBµV/m	54 dBµV/m	Pass	305 degrees	2 m	3 m	Vertical

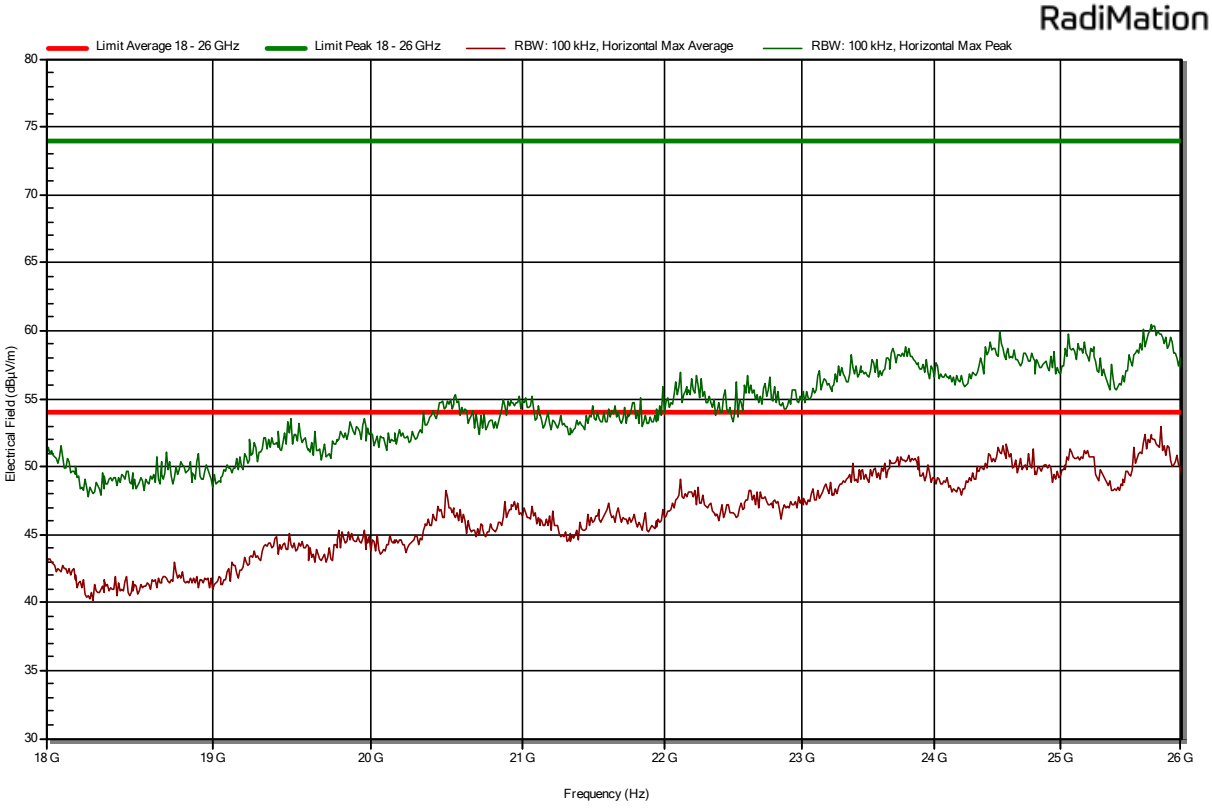
18 – 26 GHz

Horizontal

Low channel



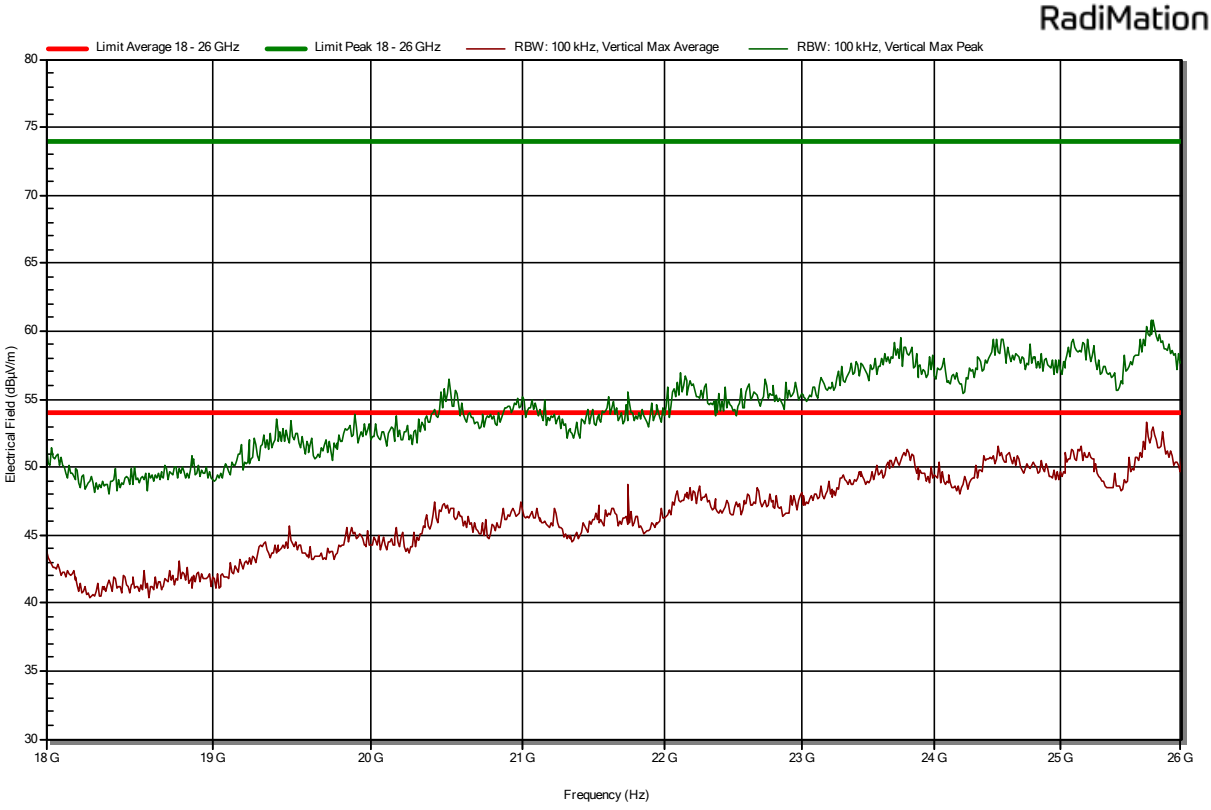
Mid channel



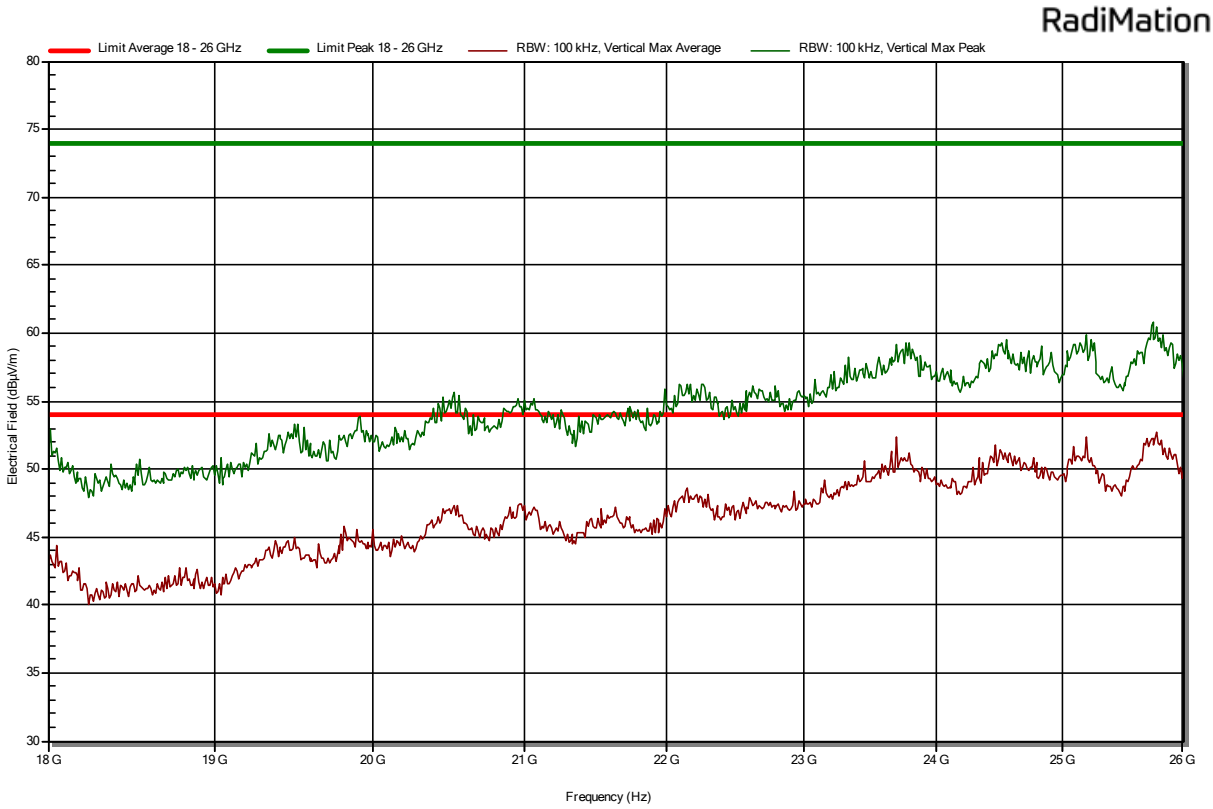
High channel

Vertical

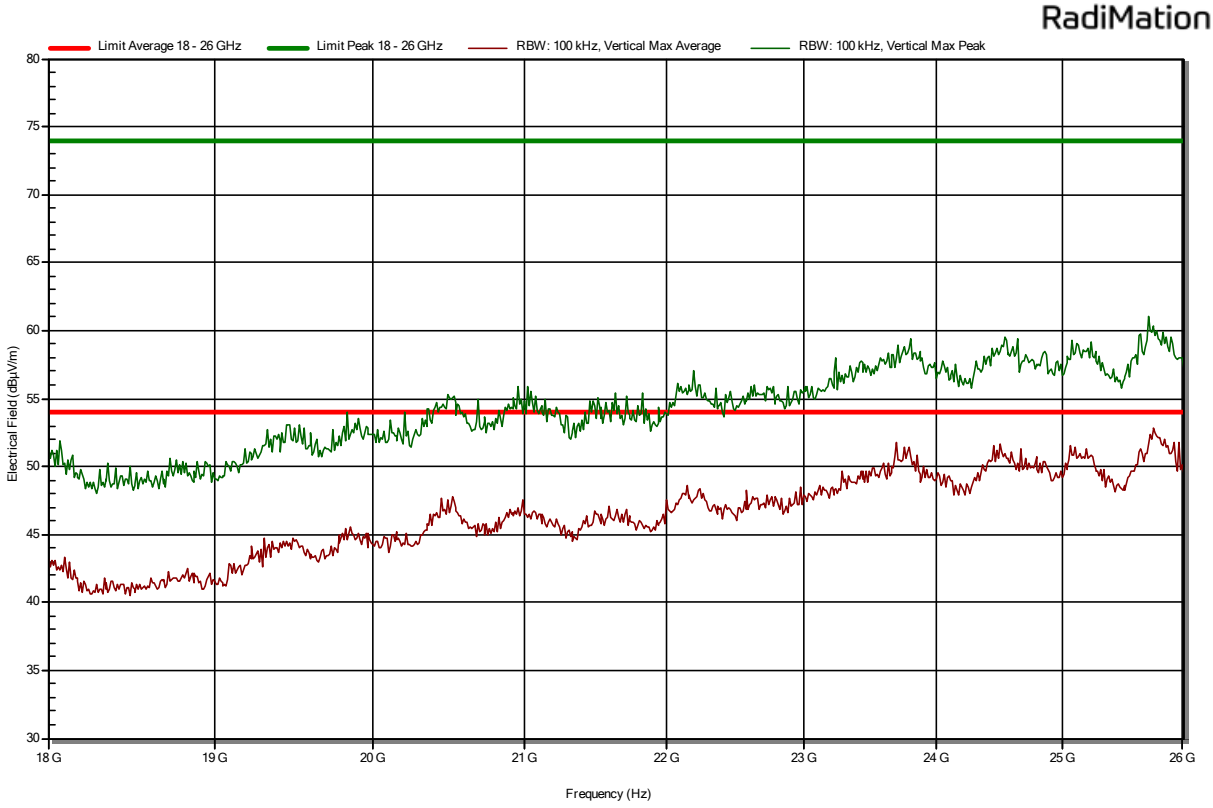
Low channel



Mid channel



High channel



3.2 Output Power Measurement

3.2.1 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.

3.2.2 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

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

IRN 014 - RF power (W) - Method 6 – Peak method according to ANSI C63.10.

3.2.5 Test results of Output Power Measurement

Peak method

Technology Std.	Channel	Frequency (MHz)	Data rate	Peak output power (dBm)
BT Classic	1	2402	1 Mbps	8.05
	18	2440	1 Mbps	7.83
	39	2480	1 Mbps	7.48
Uncertainty	±0.71 dB			

3.3 Conducted emissions

3.3.1 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.

3.3.2 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

According to ANSI C63.4: 2014, section 13.3
IRN 029 – Method 1

3.3.5 Test results and plots of the AC mains conducted measurement

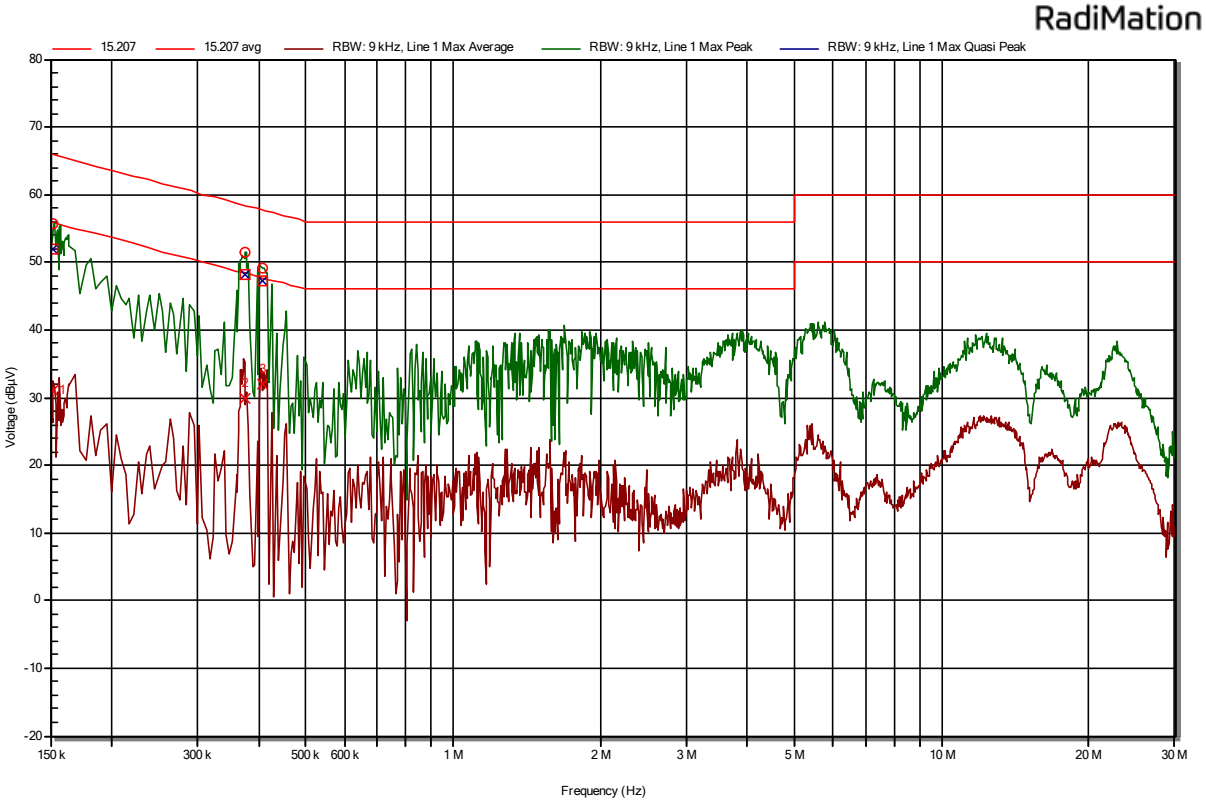
See next page.

3.3.6 Measurement uncertainty

+/- 3.6 dB

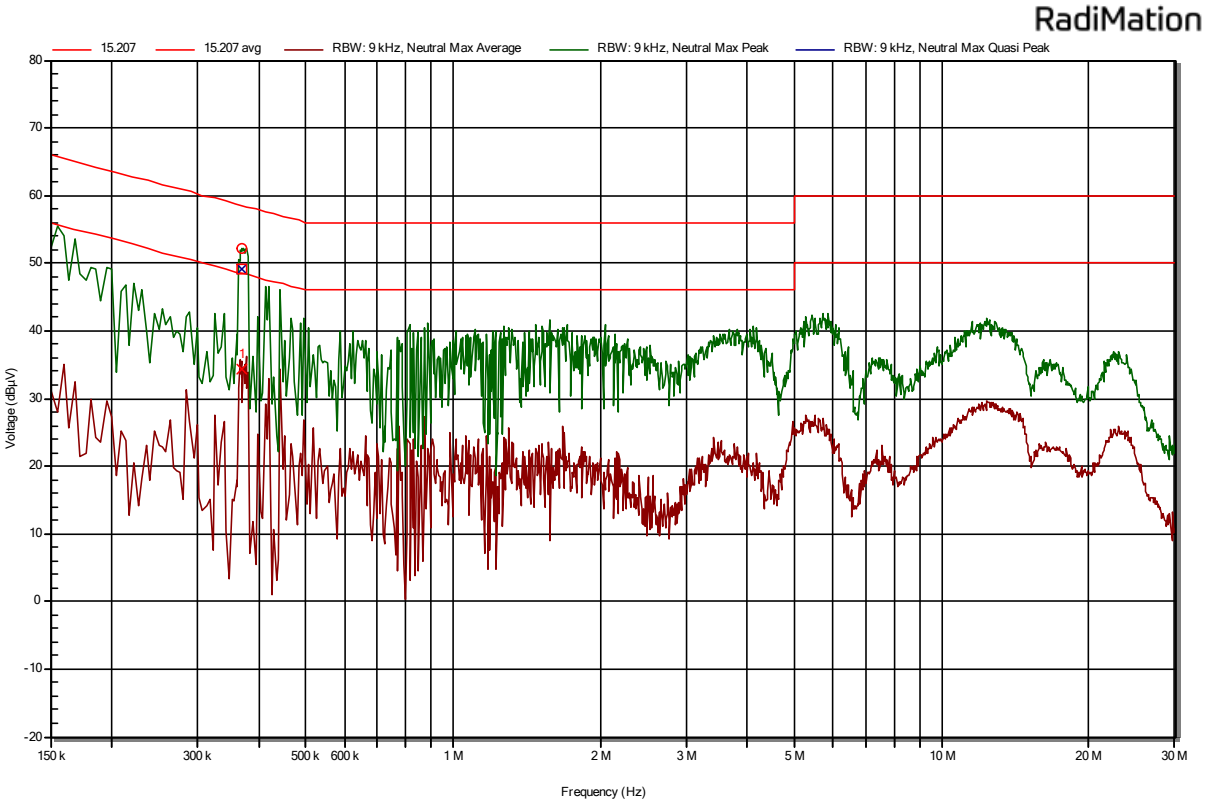
3.3.7 Plots of the AC mains conducted spurious measurement

Phase



Frequency	Peak	Peak Limit	Average	Average Limit	Quasi-Peak	Quasi-Peak Limit	Status	LISN
151,8 kHz	55,8 dBµV	65,9 dBµV	31 dBµV	55,9 dBµV	51,8 dBµV	65,9 dBµV	Pass	Line 1
375,9 kHz	51,4 dBµV	58,4 dBµV	29,9 dBµV	48,4 dBµV	48,3 dBµV	58,4 dBµV	Pass	Line 1
408,75 kHz	49,1 dBµV	57,7 dBµV	31,9 dBµV	47,7 dBµV	47,2 dBµV	57,7 dBµV	Pass	Line 1

Neutral



Frequency	Peak	Peak Limit	Average	Average Limit	Quasi-Peak	Quasi-Peak Limit	Status	LISN
370,5 kHz	52,1 dBµV	58,5 dBµV	34,3 dBµV	48,5 dBµV	49,2 dBµV	58,5 dBµV	Pass	Neutral

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