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Chamber of Commerce
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FCC and IC Test report for parts 15.109,15.107, 15.209, 15.247, 15.407, RSS-247 and RSS-Gen

Product name	: SCRS-REC
Applicant	: Siemens Industry Software Netherlands B.V.
FCC ID	: 2AF88-SCRS-REC1
IC	: 28364-SCRS-REC1

Test report No. : 200400935 008 v2.00

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	19-11-2021	First draft	RvB
v1.00	09-06-2022	Release version	RvB
V2.00	20-12-2023	Added conducted emission results + updated 802.11n radiated emission results	RvB

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 (b)	RSS-247 5.4 (d)	RF output power	3.2	Pass
15.407 (a)	RSS-247 6.2.1.1 RSS-247 6.2.4.1	Conducted power and e.i.r.p.	3.2	Pass
15.207 (c)	RSS-Gen 8.8	AC power-line conducted emissions	3.3	Pass
15.109 (a)	--	Radiated spurious emissions	3.1	Pass
15.107 (c)	--	AC power-line conducted emissions	3.3	Pass

1 General Description

1.1 Applicant

Client name:	Siemens Industry Software B.V.
Address:	Weidehek 53, Breda
Zip code:	4824 AT
Telephone:	+31 76 5736363
E-mail:	Tom.schrijer@siemens.com
Contact name:	Mr. T. Schrijer

1.2 Manufacturer

Manufacturer name:	Siemens Industry Software B.V.
Address:	Weidehek 53, Breda
Zip code:	4824 AT
Telephone:	+31 76 5736363
E-mail:	Tom.schrijer@siemens.com
Contact name:	Mr. T. Schrijer

1.3 Tested Equipment Under Test (EUT)

Product name:	SCRS-REC
Brand name:	Siemens
FCC ID:	2AF88-SCRS-REC1
IC ID:	28364-SCRS-REC1
Product Description	Simcenter SCADAS Rugged Series
Model(s):	SCRS-UPS “see chapter 1.8”
Batch and/or serial No.	--
Software version:	--
Hardware version:	--
Date of receipt	20-07-2020
Tests started:	20-07-2020
Testing ended:	18-10-2021

1.4 Product specifications of Equipment under test

TX Frequency range :	2400 – 2483.5 MHz 5150 – 5825 MHz
RX frequency range :	2400 – 2483.5 MHz 5150 – 5825 MHz 1575.42 MHz
Antenna type:	Dipole
Antenna gain :	2.4 GHz: 1.5 dBi 5 GHz: 2.1 dBi
Type of modulation:	According IEEE 802.11b/g/n/ac According to GNSS

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

No.	Description	No.	Description
1	Mode button	7	USB 3.0 connector **(roadmap)**
2	Sync connector **(roadmap)**	8	CAN1/2, CAN3/4 connector (2x)
3	GNSS connector **(roadmap)**	9	Digital Input connector (3x) **(roadmap)**
4	1 Gb Ethernet connector	10	USB 2.0 connector (2x) **(roadmap)**
5	I/O connector **(roadmap)**	11	Power OUT Chain connector (4x)
6	Wi-Fi connector (2x)	12	Power IN connector

1.5 Environmental conditions

Test date	Ambient temperature (°C)	Humidity (%)
21-07-2021	23.3	50.7
16-02-2021	19.8	28.3
17-02-2021	19.7	39.1
29-03-2021	20.2	37.1
16-03-2021	19.0	35.3
15-03-2021	19.2	36.6

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
- FCC Part 15 Subpart C §15.407
- RSS-Gen Issue 5
- RSS-247 Issue 2

1.8 Observation and remarks

The EUT contains a pre-certified module, only RF output power and TX/RX spurious emissions are tested.
The EUT is part of the SCADAS RS system. This systems consists of 5 different units (see table below).
Model info:

Type:	Description	Family name	Trademark
OEM	SCRS-UPS	SCRS	Simcenter
OEM	SCRS-REC	SCRS	Simcenter
OEM	SCRS-B24	SCRS	Simcenter
OEM	SCRS-S24	SCRS	Simcenter
OEM	SCRS-U12	SCRS	Simcenter

1.9 Modification of the Equipment Under Test (EUT)

The AC adapter was changed due to a CE problem.
The new power supply used is the MEAM WELL GSM40A48

1.10 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 : ing. R. van Barneveld

Review of test methods and report by:

Name : Koray Korcum, M.Sc.

The above conclusions have been verified by the following signatory:

Date : 20-12-2023

Name : ing P.A. Suringa

Function : Senior test engineer

Signature :

2 Test configuration of the Equipment Under Test

2.1 Test mode

The applicant provided test mode firmware for the EUT, in which it was possible to configure the EUT into different test channels.

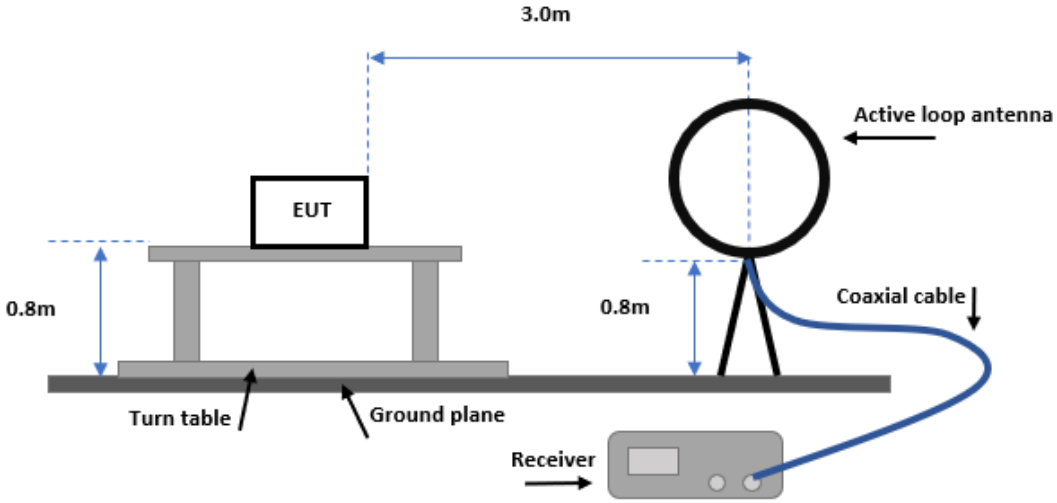
2.2 Tested channels and Data rates

Technology	Channels	Channel bandwidth	Power setting	Frequency (MHz)
802.11b	1	20	16	2412
	11	20	16	2462

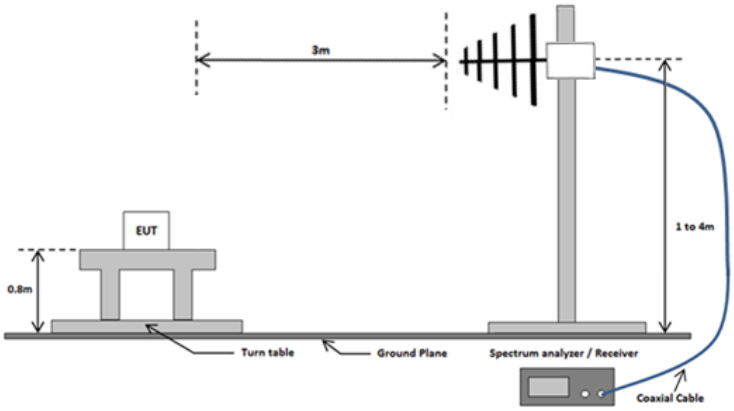
Technology	Channels	Channel bandwidth	Power setting	Frequency (MHz)
802.11n	36	20	13	5180
802.11ac	58	80	8	5290
802.11n	64	20	13	5320
802.11n	100	20	13	5500
802.11ac	122	80	8	5610
802.11n	165	20	13	5875

2.3 Test setups

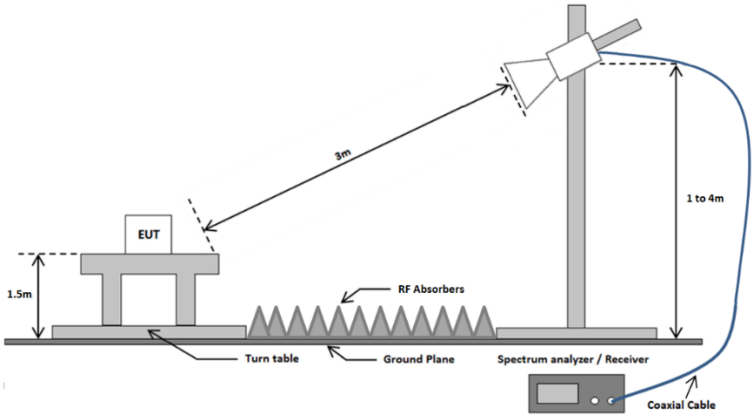
Radiated emissions test setup 9 kHz – 30 MHz



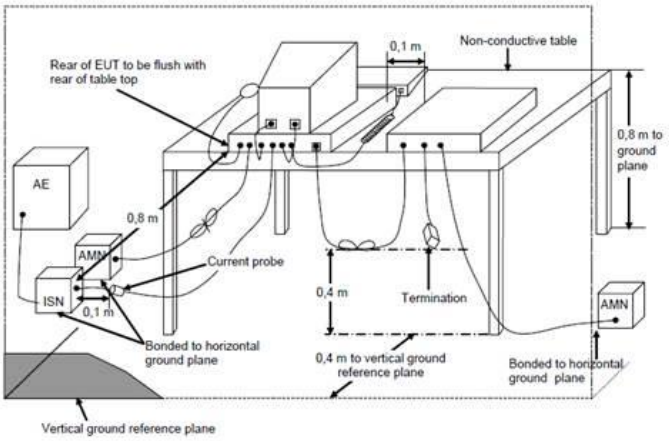
Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



Conducted emissions test setup



2.4 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Used at Par.
EMI Receiver	Rohde & Schwarz	ESCI	TE11128	3.1,3.3
EMI Receiver	Rohde & Schwarz	ESR7	TE01220	3.1
Spectrum analyzer	Rohde & Schwarz	FSP40	TE11125	3.1
Spectrum Analyzer	Rohde & Schwarz	FSV40	TE01269	3.2
3.0 GHz HPF	Wainwright	WHK3.0/18G-10EF	TE01140	3.1
7.0 GHz HPF	Wainwright	WHKX7.0/18G-8SS	TE01141	3.1
Active loop antenna	EMCO	6502	TE11171	3.1
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, 3.2
LISN /Two line V-network	Rohde & Schwarz	ENV 216	114379	3.3

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

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

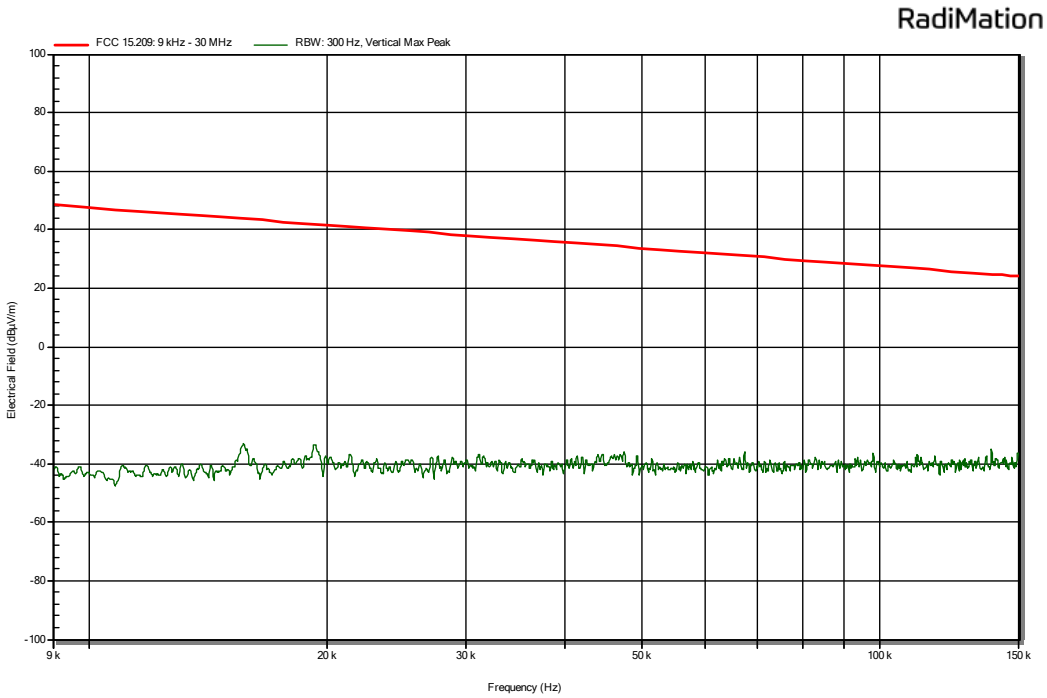
Frequency range	Polarization	Uncertainty
9 kHz – 30 MHz	--	±1.6 dB
30 – 200 MHz	Horizontal	±4.5 dB
	Vertical	±5.4 dB
200 -1000 MHz	Horizontal	±3.6 dB
	Vertical	±4.6 dB
1 – 18 GHz	Horizontal	±5.7 dB
	Vertical	±5.7 dB
18 – 26.5 GHz	Horizontal	±4.9 dB
	Vertical	±4.9 dB

3.1.6 Note

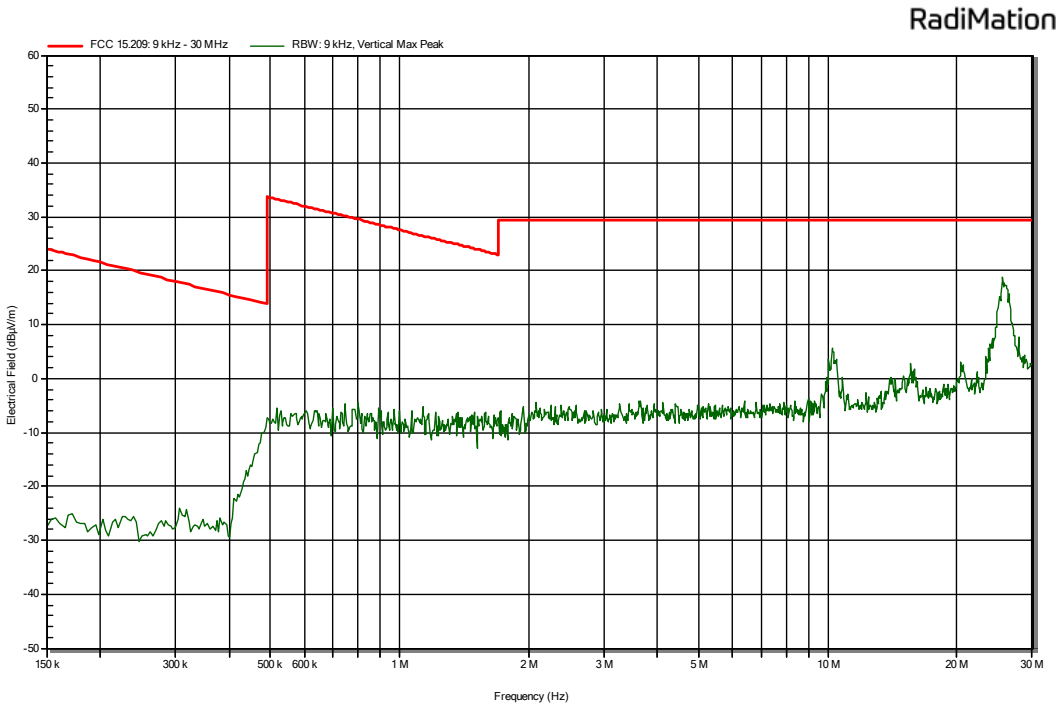
The measurement were performed with both the Radio active and the other functionality of the EUT.
For this reason the plots are valid for both Part 15.209 and 15.109.

3.1.7 Plots of the Radiated Spurious Emissions Measurement

9 – 150 kHz

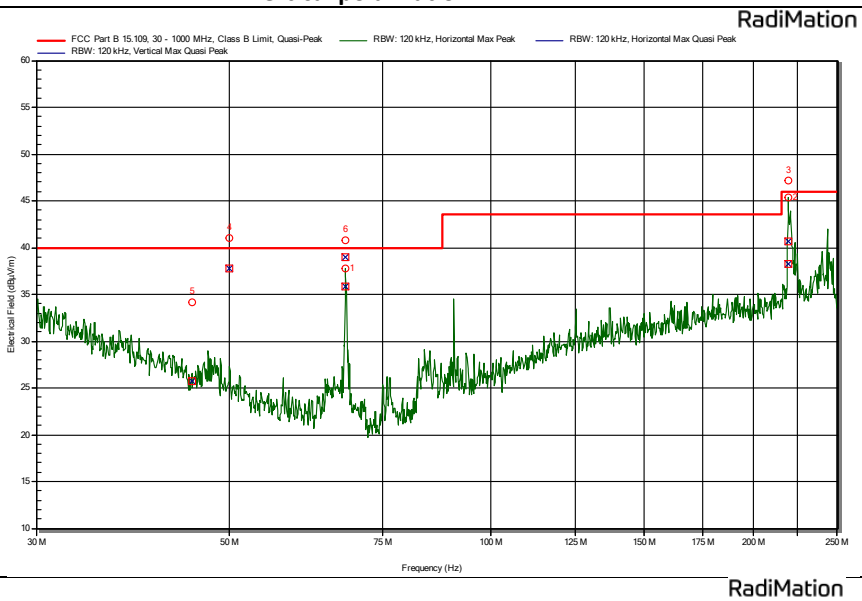
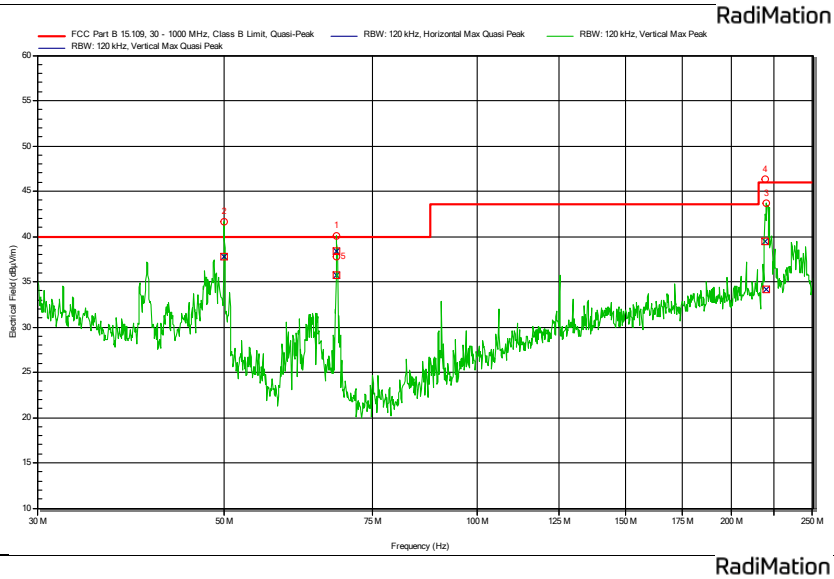
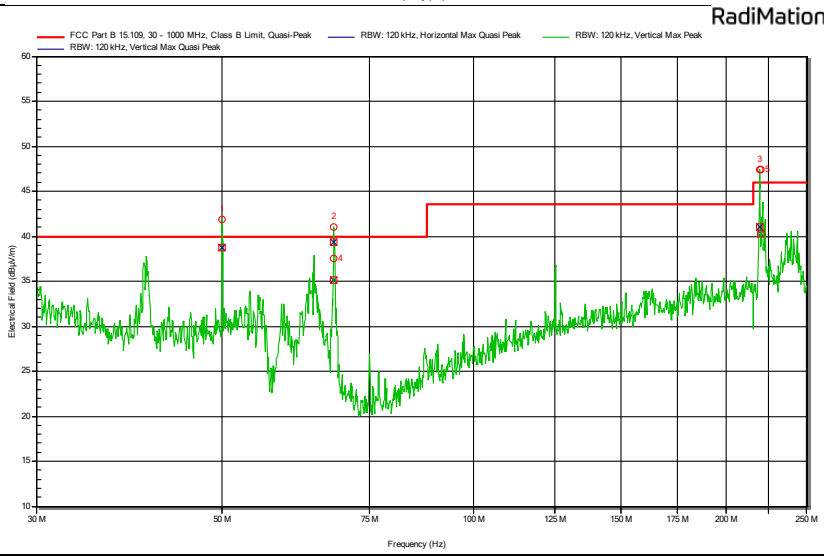


150 kHz – 30 MHz

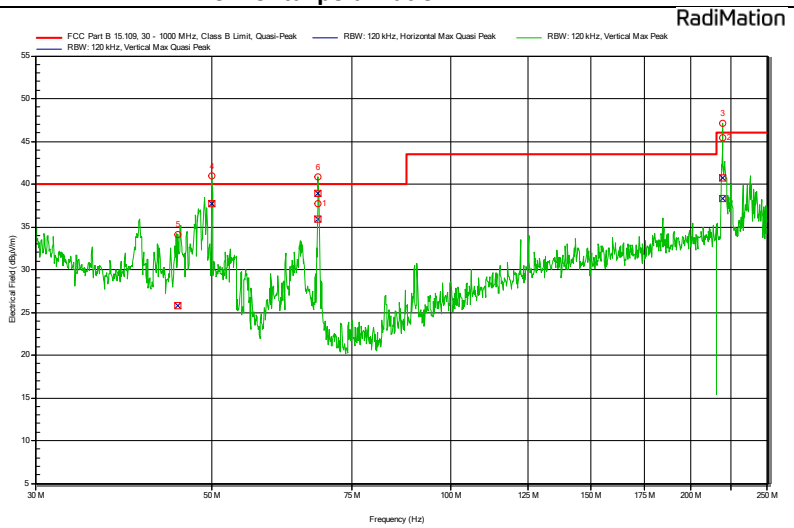
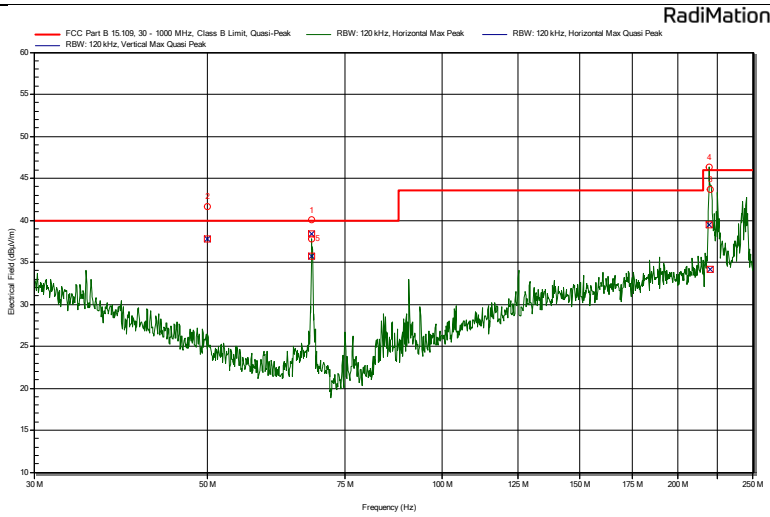
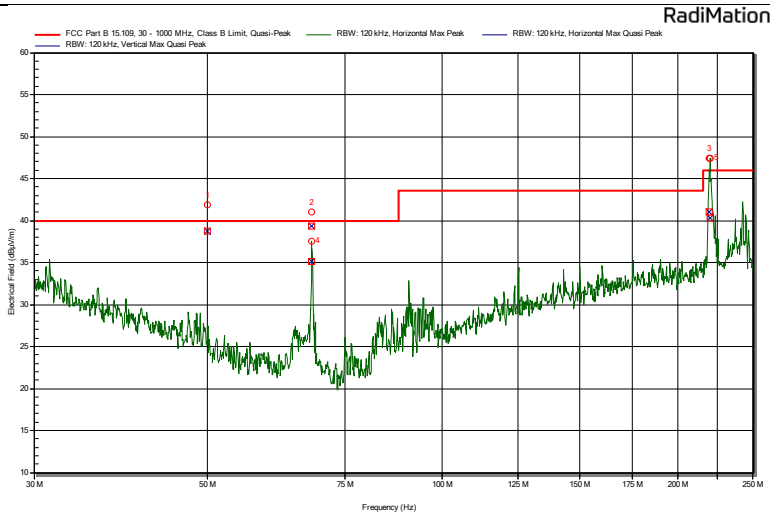


30 -250 MHz
802.11b

Vertical polarization

Low ch	
Mid ch	
High ch	

Horizontal polarization

Low ch	
Mid ch	
High ch	

Measured peaks
Low channel

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Status	Angle	Height	Polarization
68,077 MHz	37,8 dBµV/m	35,9 dBµV/m	40 dBµV/m	Pass	179 degrees	3,3 m	Horizontal
219,758 MHz	45,4 dBµV/m	38,3 dBµV/m	46 dBµV/m	Pass	301 degrees	2,5 m	Horizontal
219,503 MHz	47,1 dBµV/m	40,7 dBµV/m	46 dBµV/m	Pass	1 degrees	2,3 m	Vertical
50,005 MHz	41 dBµV/m	37,7 dBµV/m	40 dBµV/m	Pass	8 degrees	1,2 m	Vertical
45,298 MHz	34,1 dBµV/m	25,8 dBµV/m	40 dBµV/m	Pass	69 degrees	1 m	Vertical
68,064 MHz	40,8 dBµV/m	38,9 dBµV/m	40 dBµV/m	Pass	338 degrees	1,8 m	Vertical

Middle channel

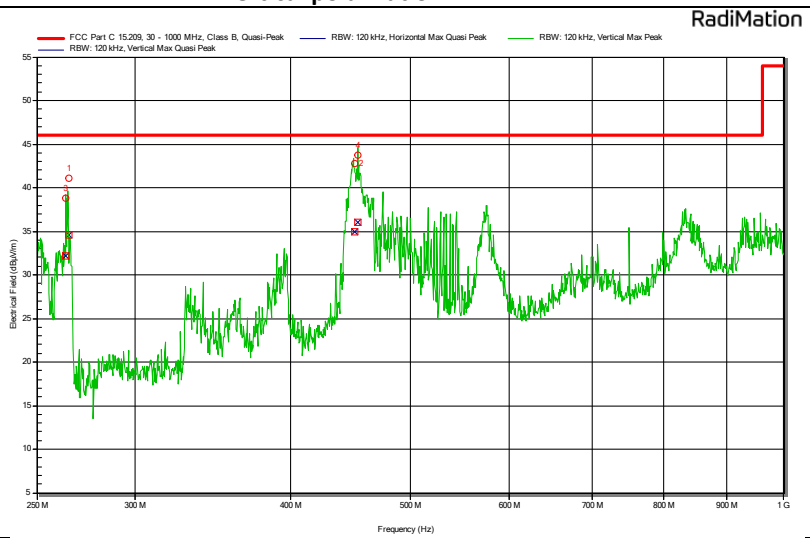
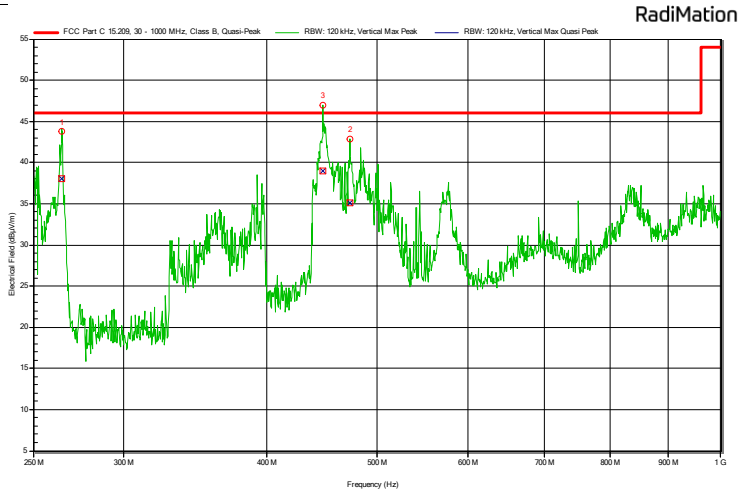
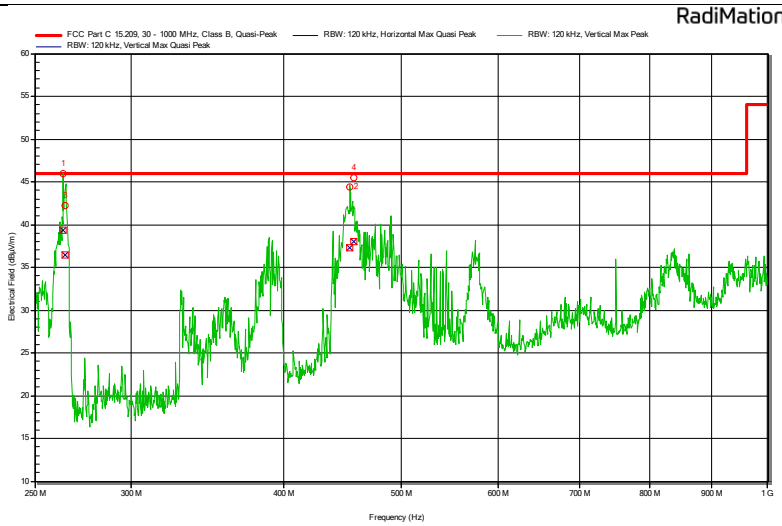
Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Status	Angle	Height	Polarization
68,08 MHz	40 dBµV/m	38,4 dBµV/m	40 dBµV/m	Pass	310 degrees	2,3 m	Vertical
49,987 MHz	41,6 dBµV/m	37,8 dBµV/m	40 dBµV/m	Pass	337 degrees	1 m	Vertical
220,485 MHz	43,7 dBµV/m	34,2 dBµV/m	46 dBµV/m	Pass	60 degrees	3,3 m	Vertical
219,779 MHz	46,3 dBµV/m	39,4 dBµV/m	46 dBµV/m	Pass	286 degrees	1 m	Horizontal

High channel

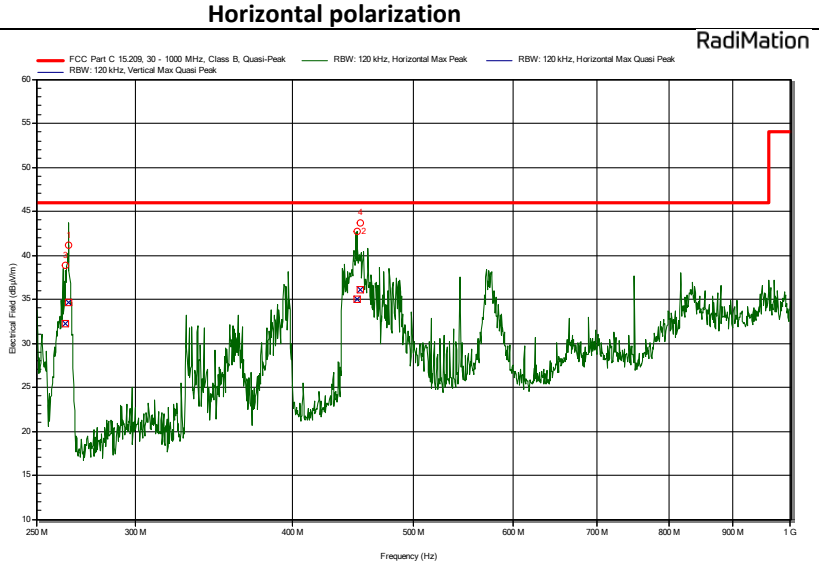
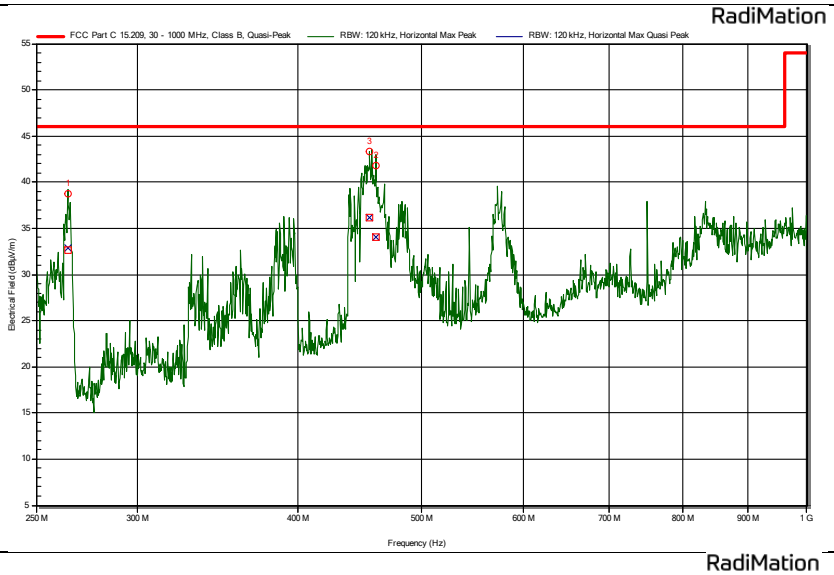
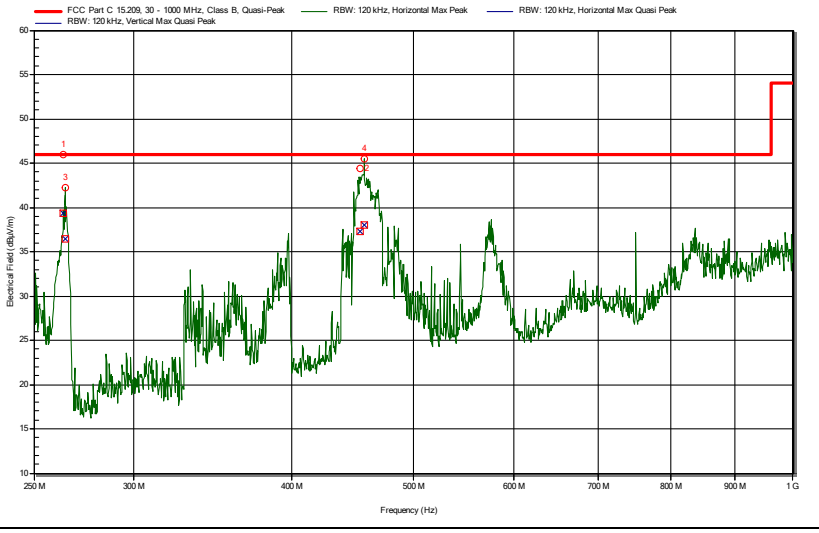
Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Status	Angle	Height	Polarization
50,011 MHz	41,8 dBµV/m	38,7 dBµV/m	40 dBµV/m	Pass	352 degrees	1 m	Vertical
68,087 MHz	41,1 dBµV/m	39,4 dBµV/m	40 dBµV/m	Pass	319 degrees	1,8 m	Vertical
219,465 MHz	47,4 dBµV/m	41 dBµV/m	46 dBµV/m	Pass	360 degrees	1,7 m	Vertical
68,062 MHz	37,5 dBµV/m	35,1 dBµV/m	40 dBµV/m	Pass	206 degrees	3,3 m	Horizontal
219,915 MHz	47,4 dBµV/m	40,3 dBµV/m	46 dBµV/m	Pass	279 degrees	1,7 m	Horizontal

250 - 1000MHz
802.11b

Vertical polarization

Low ch	
Mid ch	
High ch	

Horizontal polarization

Low ch	
Mid ch	
High ch	

Measured peaks
Low channel

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Status	Angle	Height	Polarization
265,189 MHz	41,1 dBµV/m	34,6 dBµV/m	46 dBµV/m	Pass	209 degrees	1,2 m	Horizontal
450,836 MHz	42,8 dBµV/m	35 dBµV/m	46 dBµV/m	Pass	306 degrees	1 m	Horizontal
263,993 MHz	38,8 dBµV/m	32,2 dBµV/m	46 dBµV/m	Pass	360 degrees	2,3 m	Vertical
453,723 MHz	43,7 dBµV/m	36,1 dBµV/m	46 dBµV/m	Pass	292 degrees	1,5 m	Vertical

Middle channel

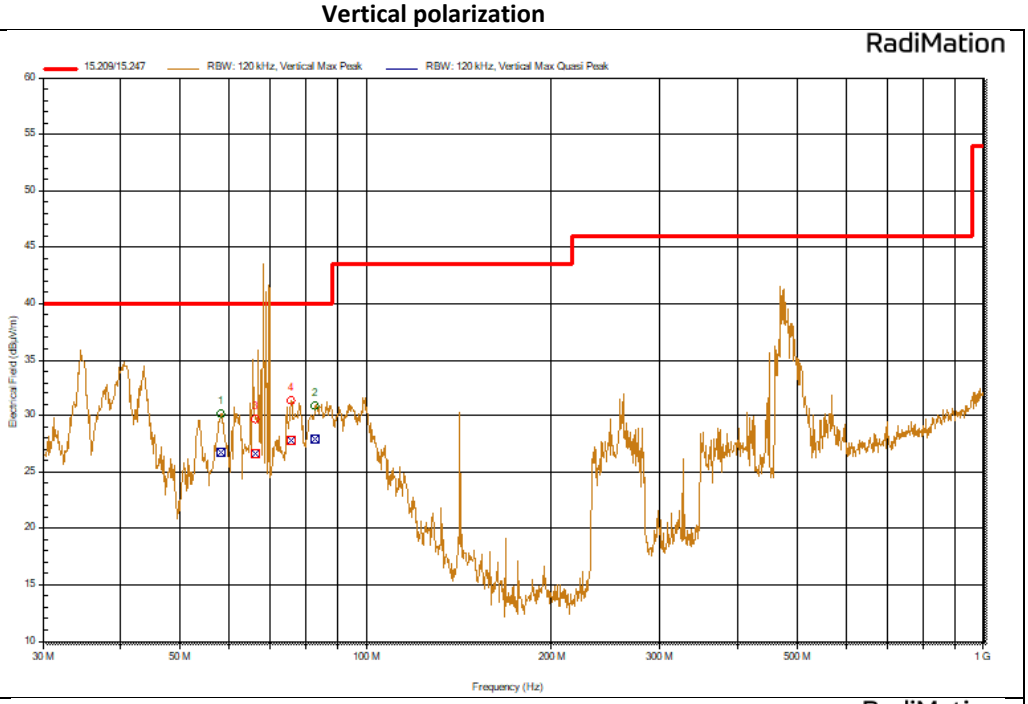
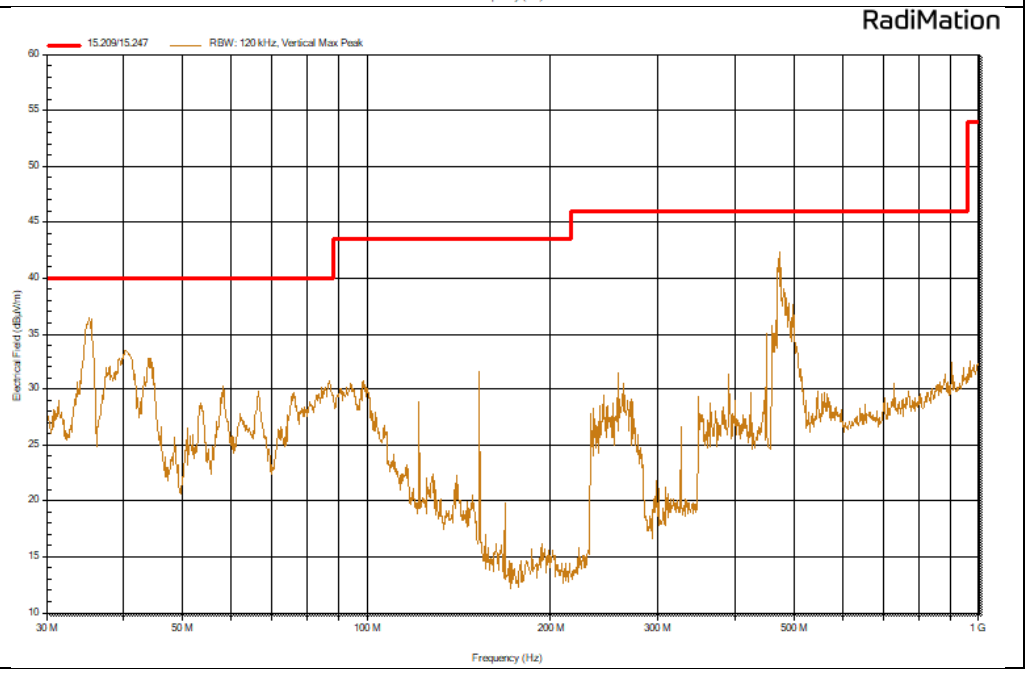
Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Status	Angle	Height	Polarization
264,66 MHz	43,8 dBµV/m	38 dBµV/m	46 dBµV/m	Pass	298 degrees	1 m	Vertical
473,062 MHz	42,9 dBµV/m	35,1 dBµV/m	46 dBµV/m	Pass	269 degrees	1,8 m	Vertical
448,241 MHz	46,9 dBµV/m	39 dBµV/m	46 dBµV/m	Pass	298 degrees	1,2 m	Vertical
264,847 MHz	38,8 dBµV/m	32,7 dBµV/m	46 dBµV/m	Pass	143 degrees	1,3 m	Horizontal
460,389 MHz	41,8 dBµV/m	34 dBµV/m	46 dBµV/m	Pass	263 degrees	1 m	Horizontal
455,569 MHz	43,3 dBµV/m	36,2 dBµV/m	46 dBµV/m	Pass	224 degrees	1 m	Horizontal

High channel

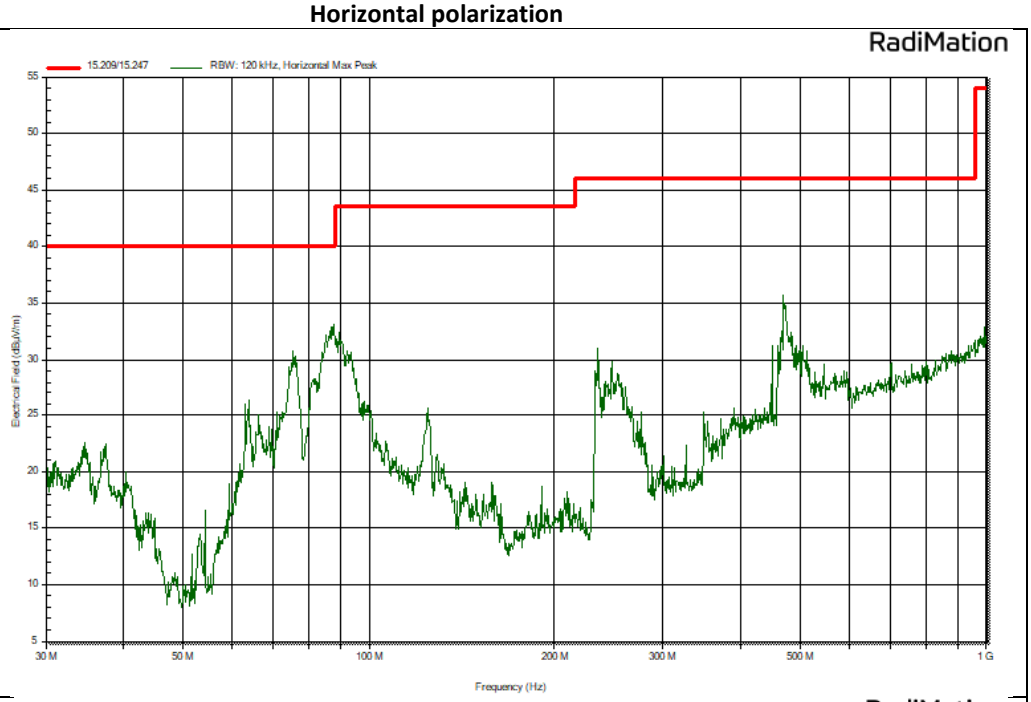
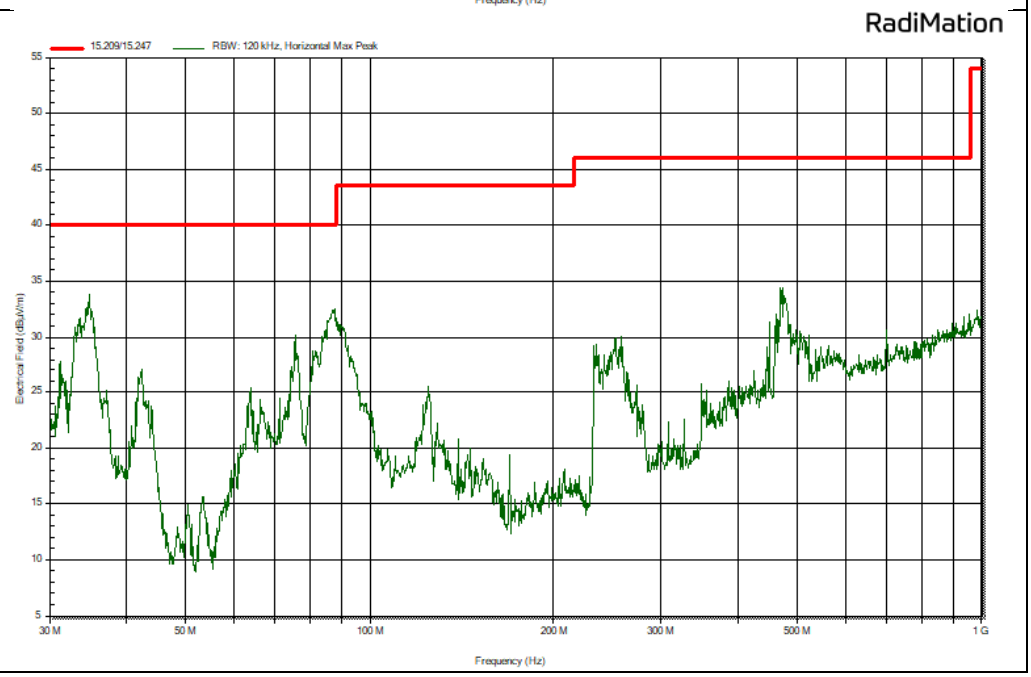
Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Status	Angle	Height	Polarization
263,833 MHz	45,9 dBµV/m	39,3 dBµV/m	46 dBµV/m	Pass	354 degrees	1 m	Vertical
453,998 MHz	44,4 dBµV/m	37,3 dBµV/m	46 dBµV/m	Pass	317 degrees	2 m	Vertical
264,865 MHz	42,3 dBµV/m	36,4 dBµV/m	46 dBµV/m	Pass	168 degrees	1,3 m	Horizontal
457,004 MHz	45,5 dBµV/m	38 dBµV/m	46 dBµV/m	Pass	249 degrees	1 m	Horizontal

802.11n/ac

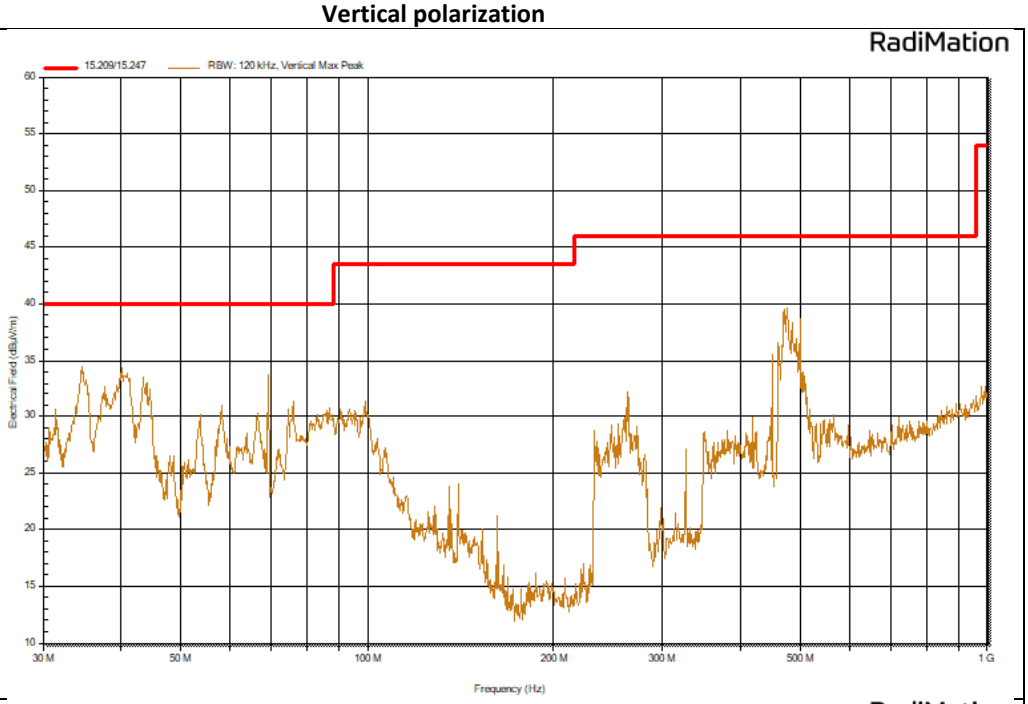
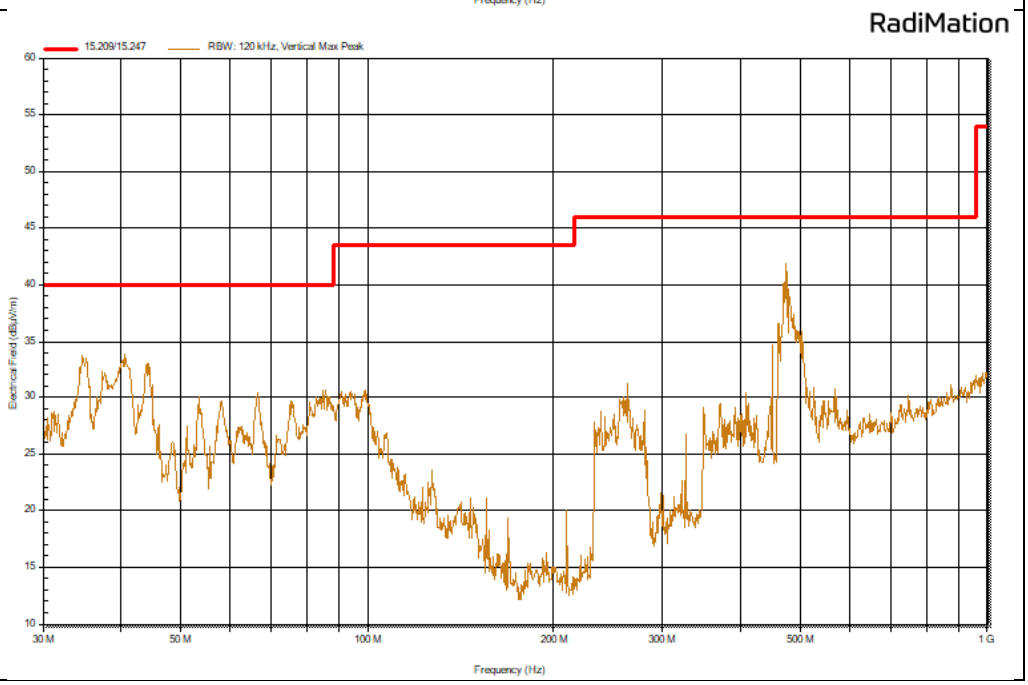
Vertical polarization

36	
64	

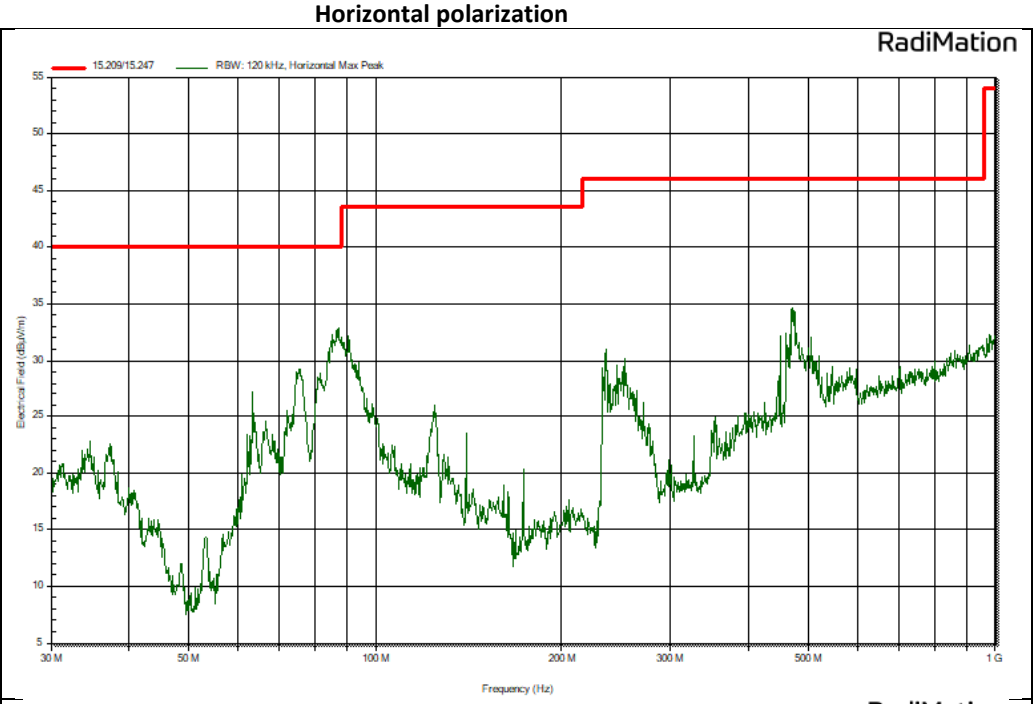
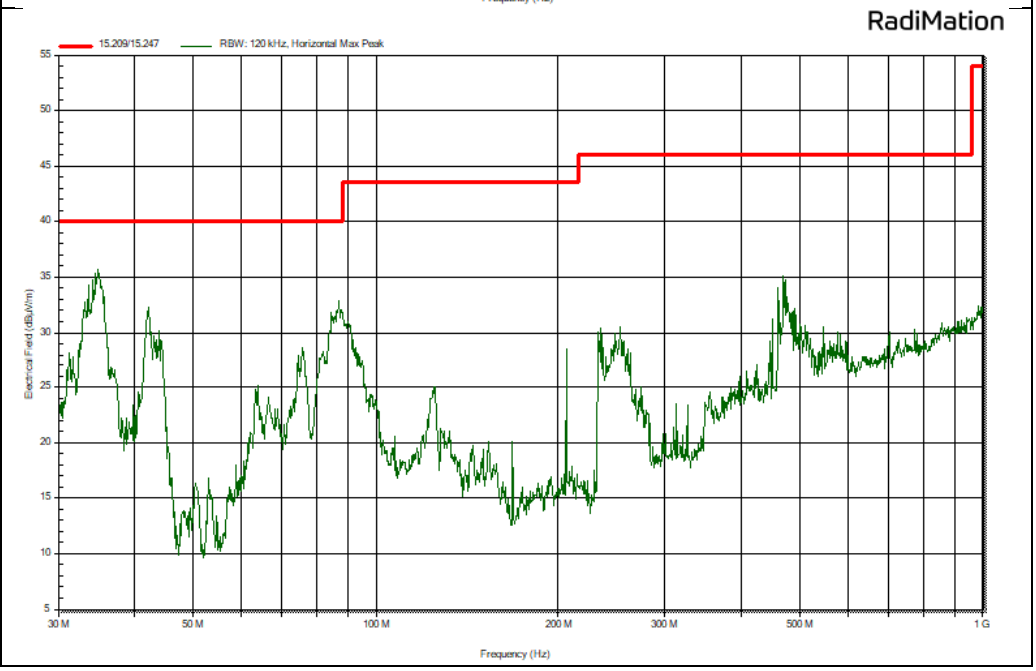
Horizontal polarization

36	
64	

Vertical polarization

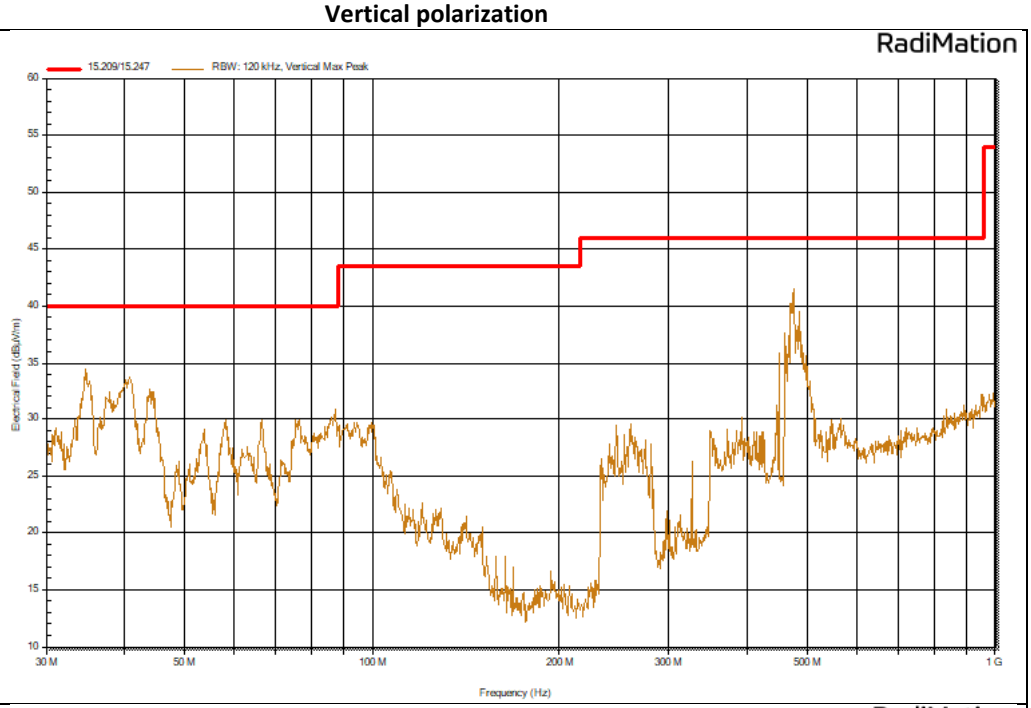
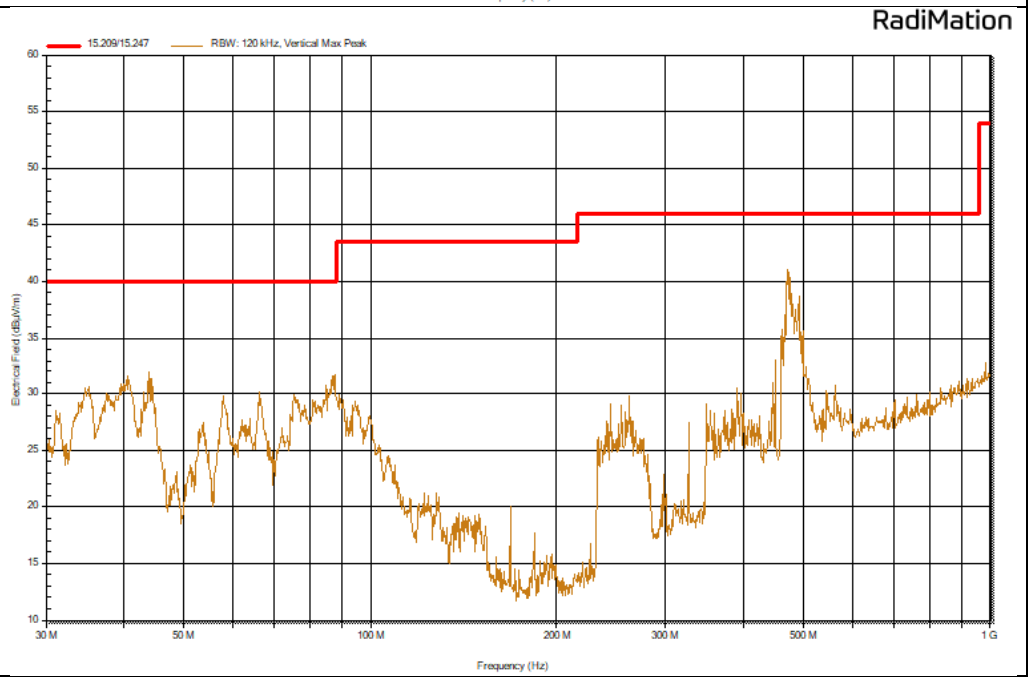
58	
100	

Horizontal polarization

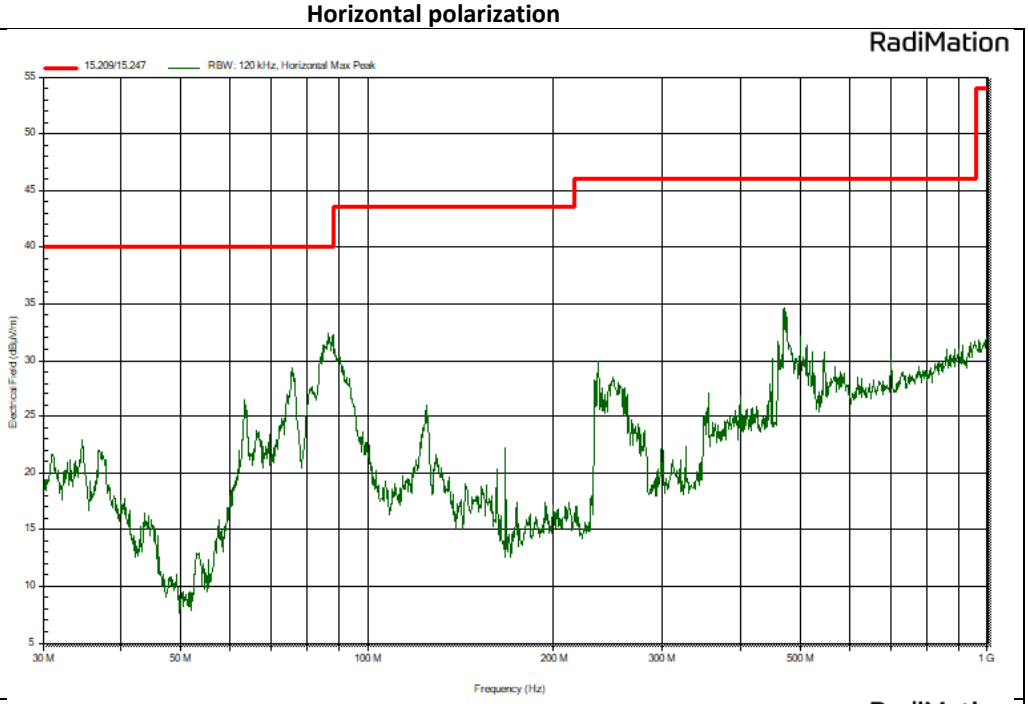
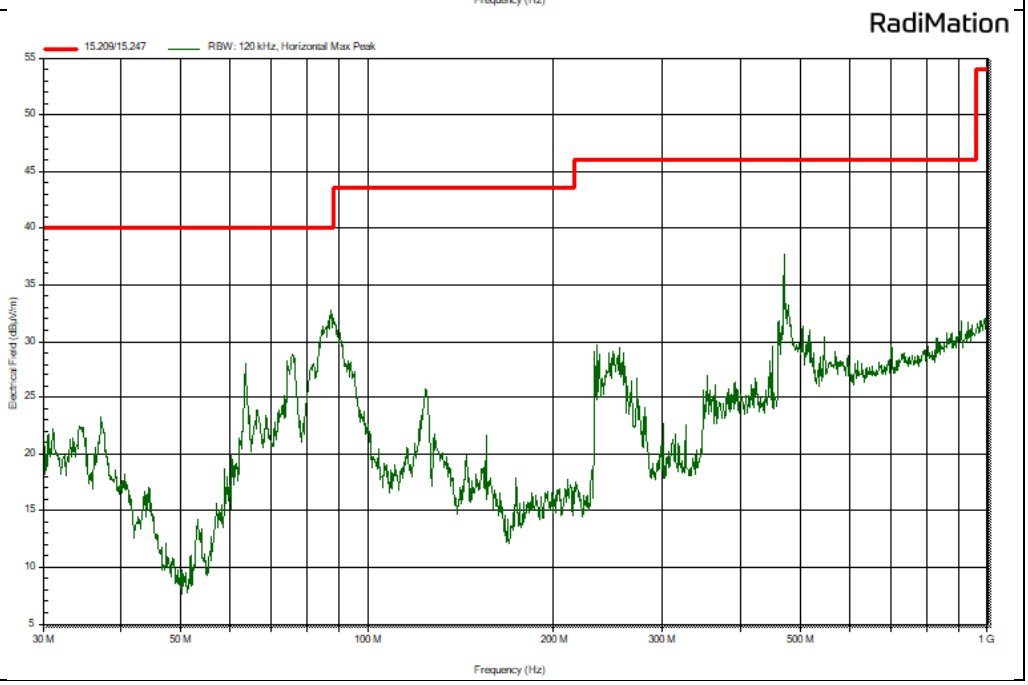
58	
100	

802.11n/ac

Vertical polarization

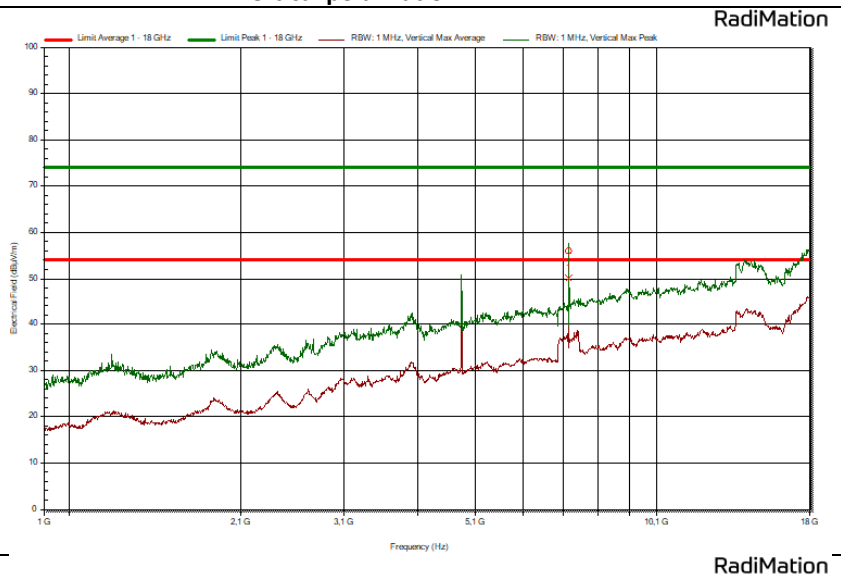
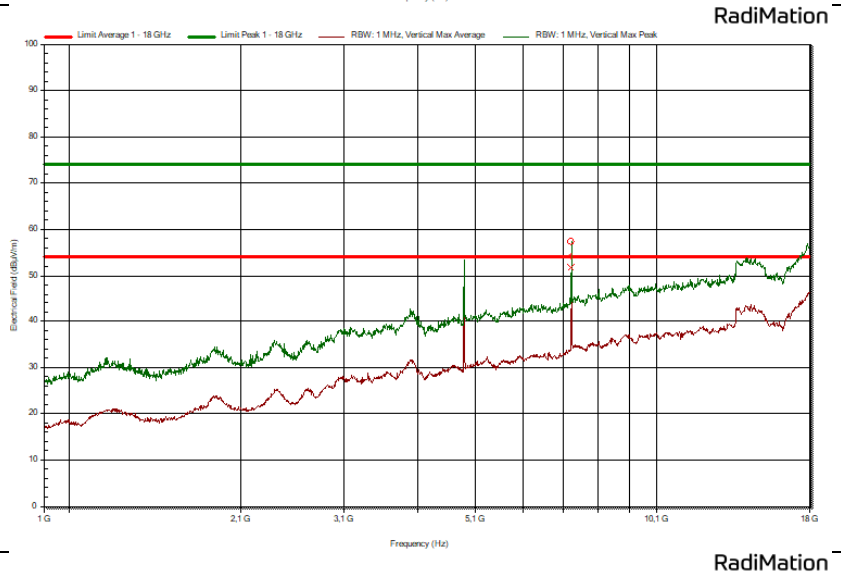
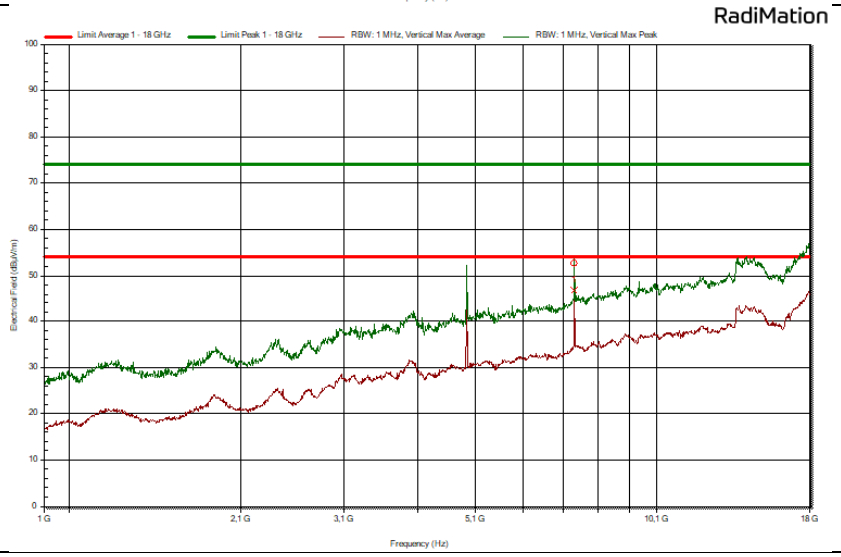
122	
165	

Horizontal polarization

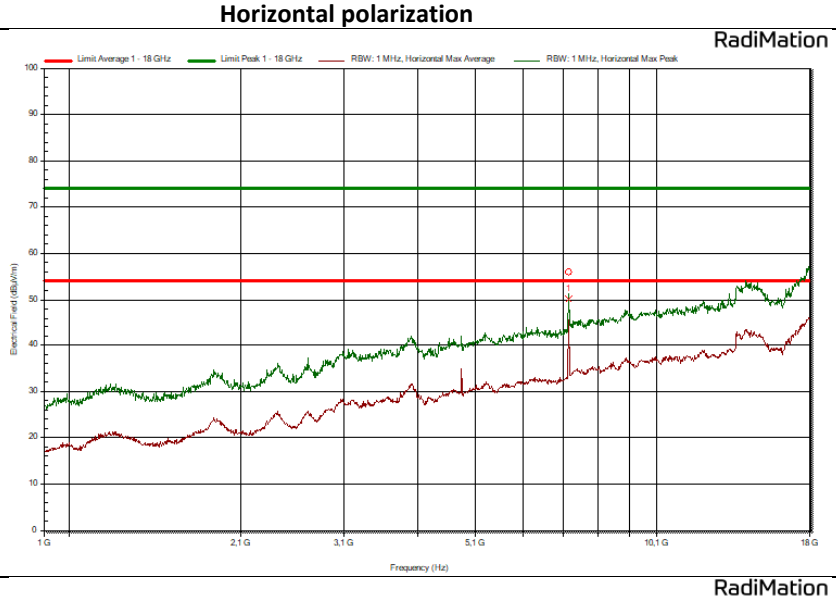
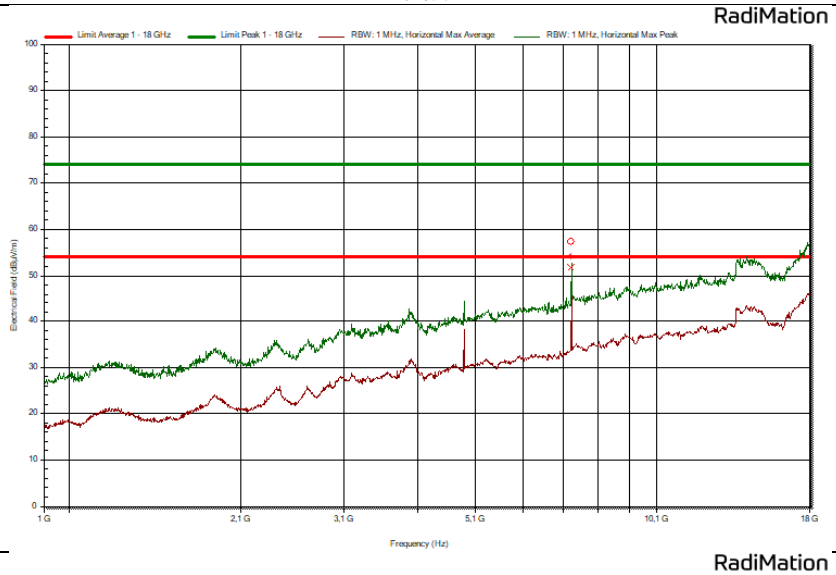
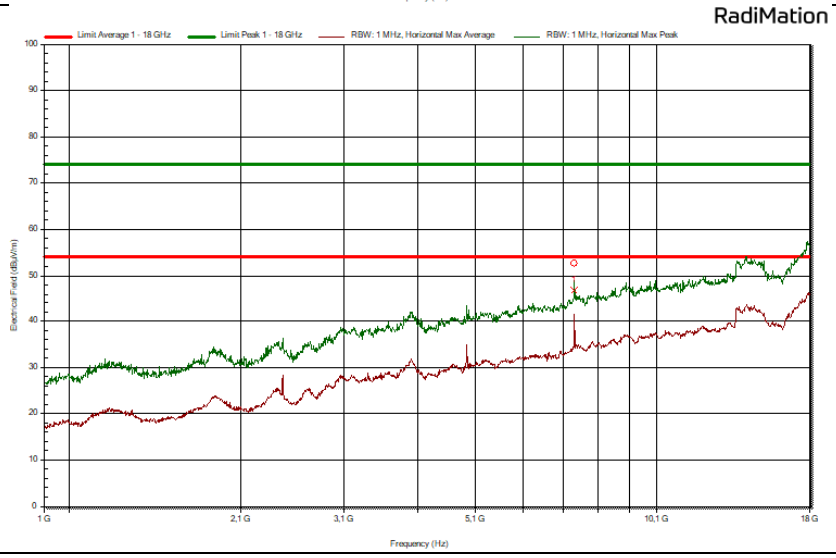
122	
165	

1- 18 GHz
802.11b

Vertical polarization

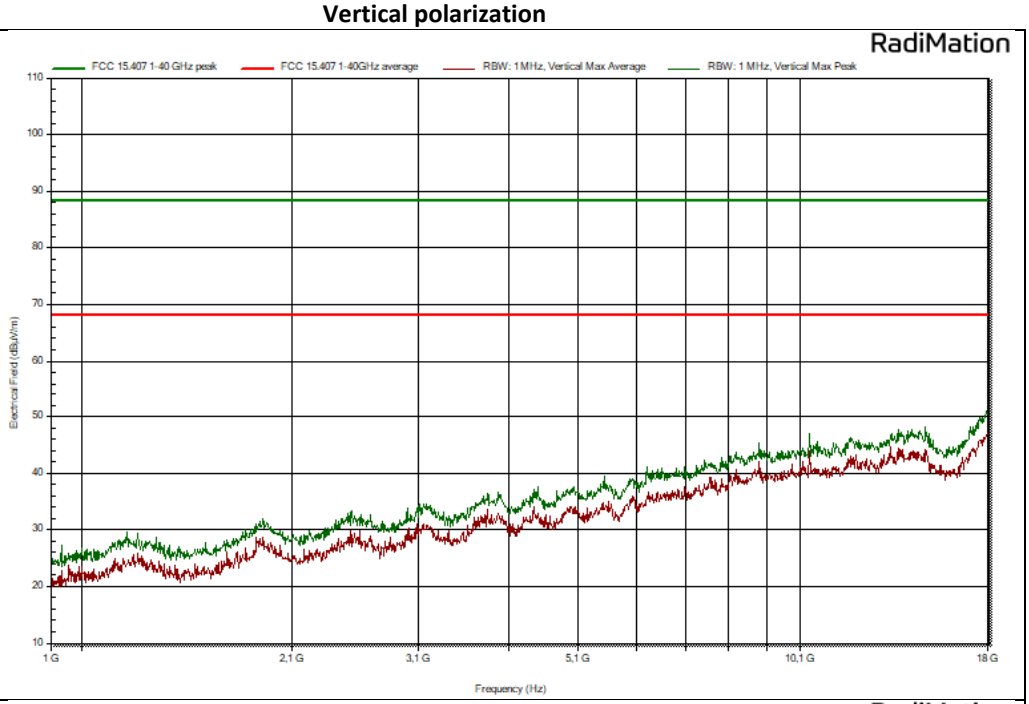
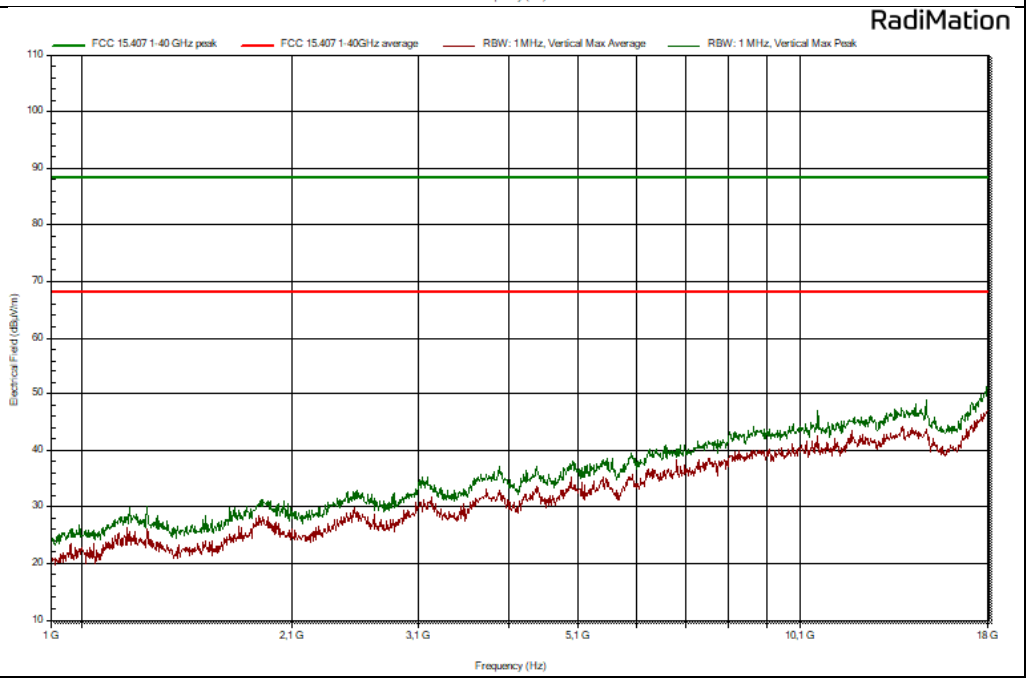
Low ch	
Mid ch	
High ch	

Horizontal polarization

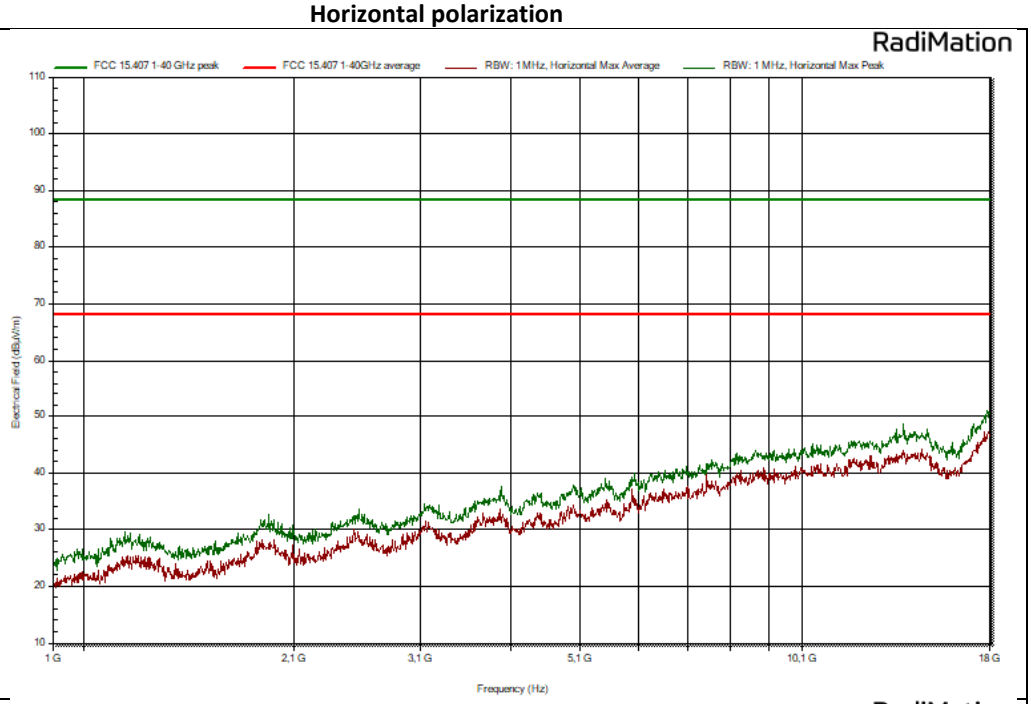
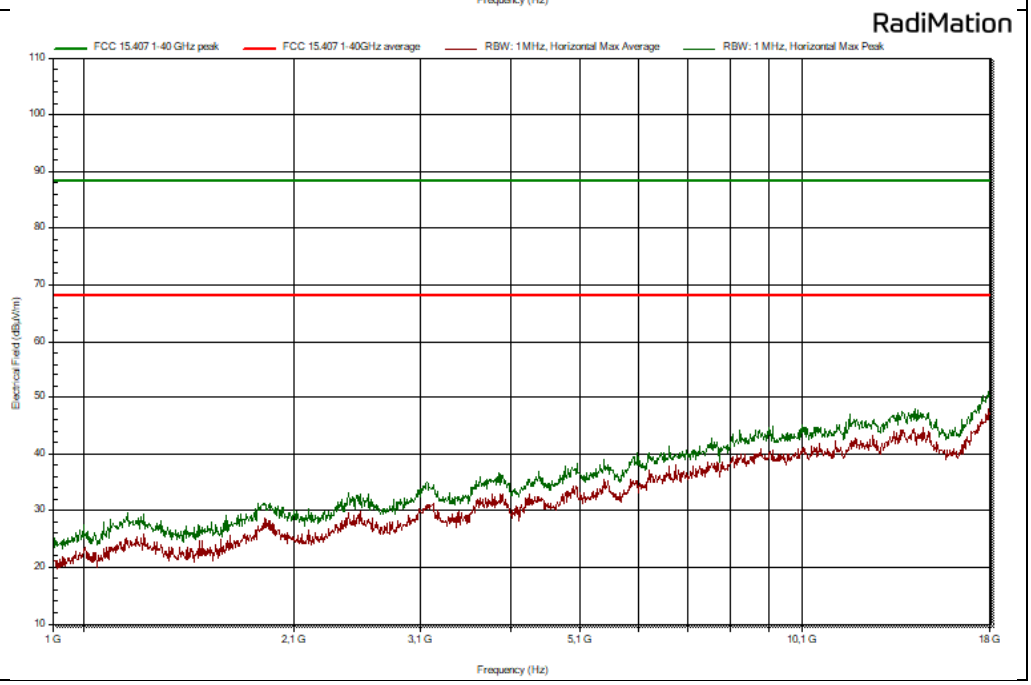
Low ch	
Mid ch	
High ch	

802.11n/ac

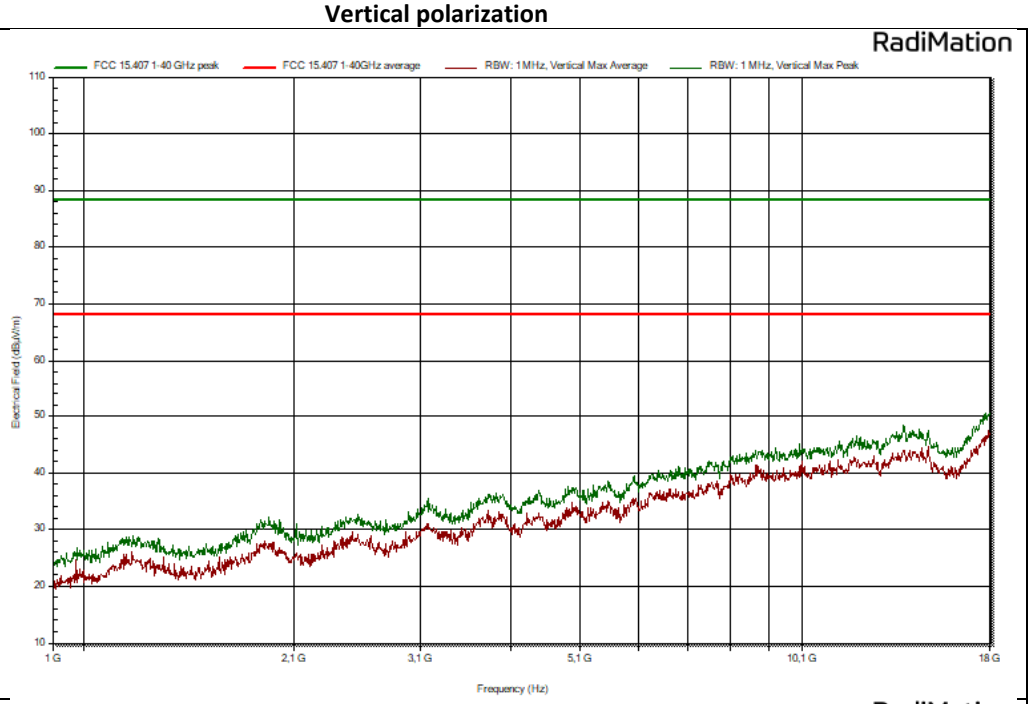
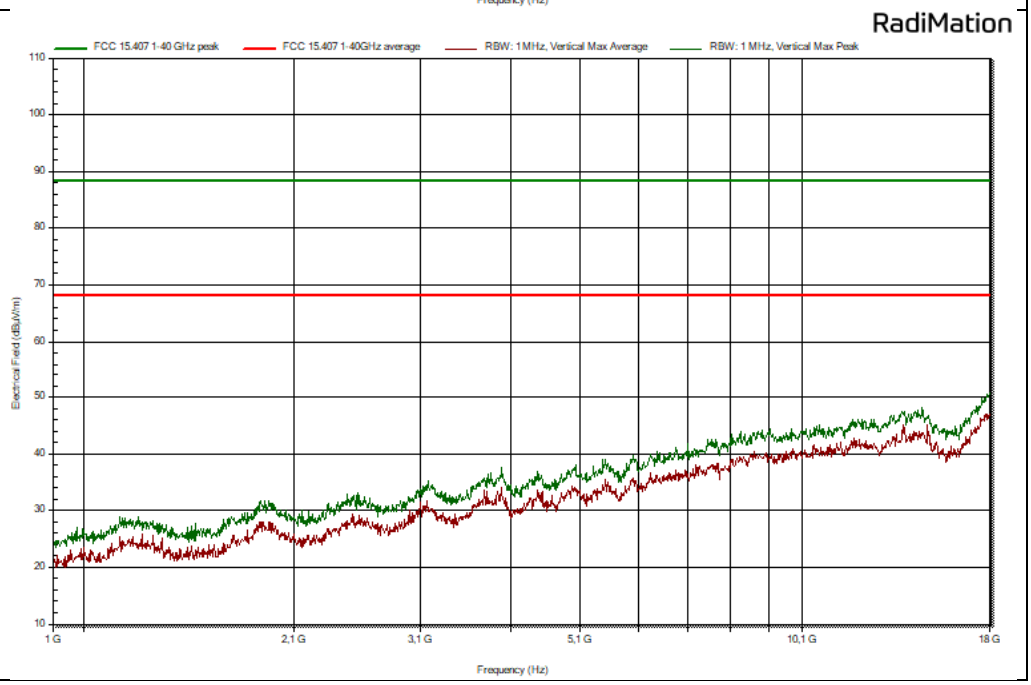
Vertical polarization

36	
64	

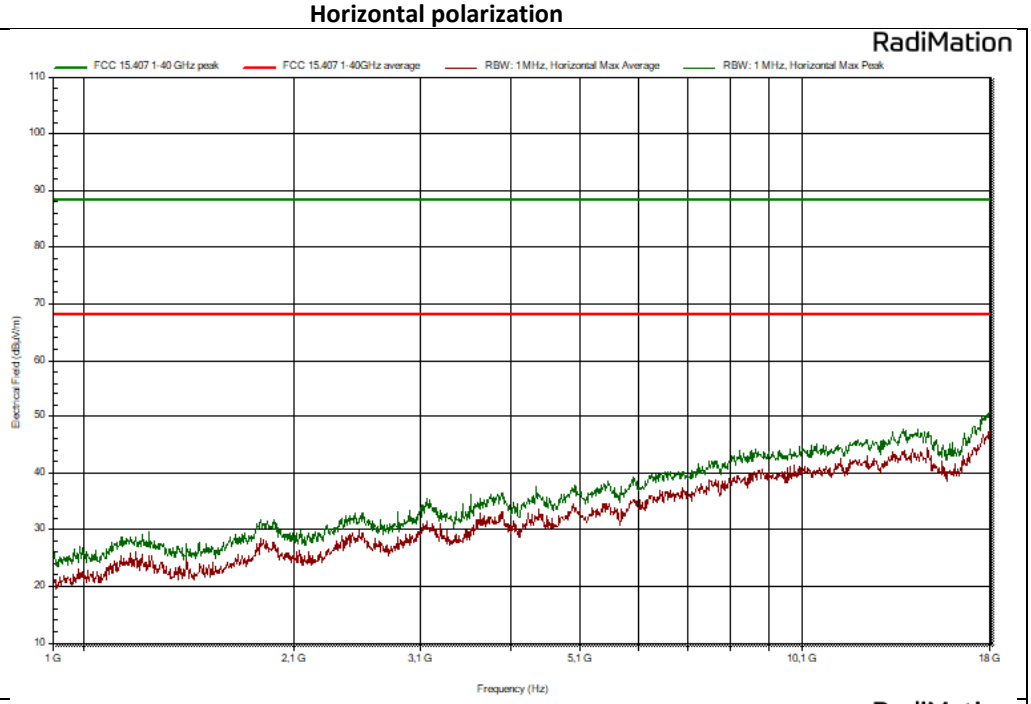
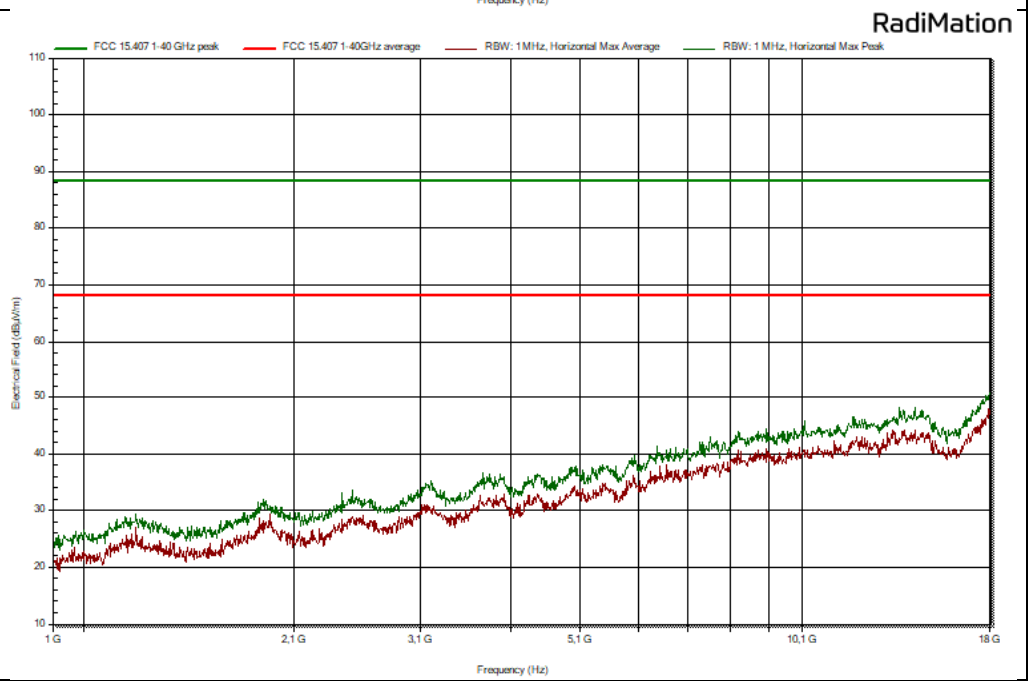
Horizontal polarization

36	
64	

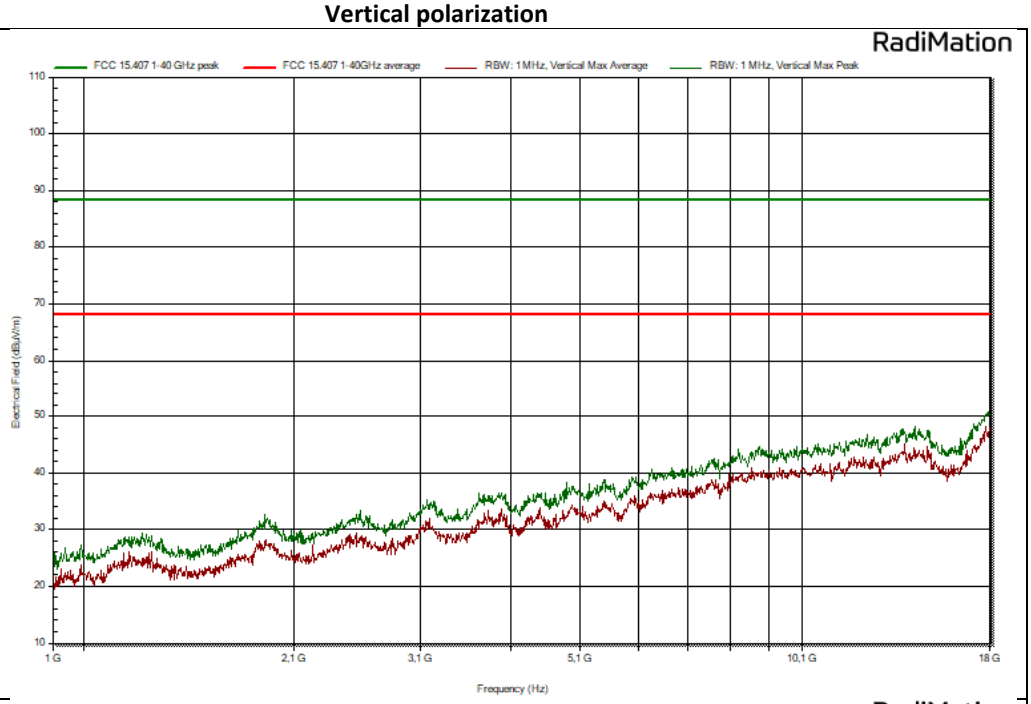
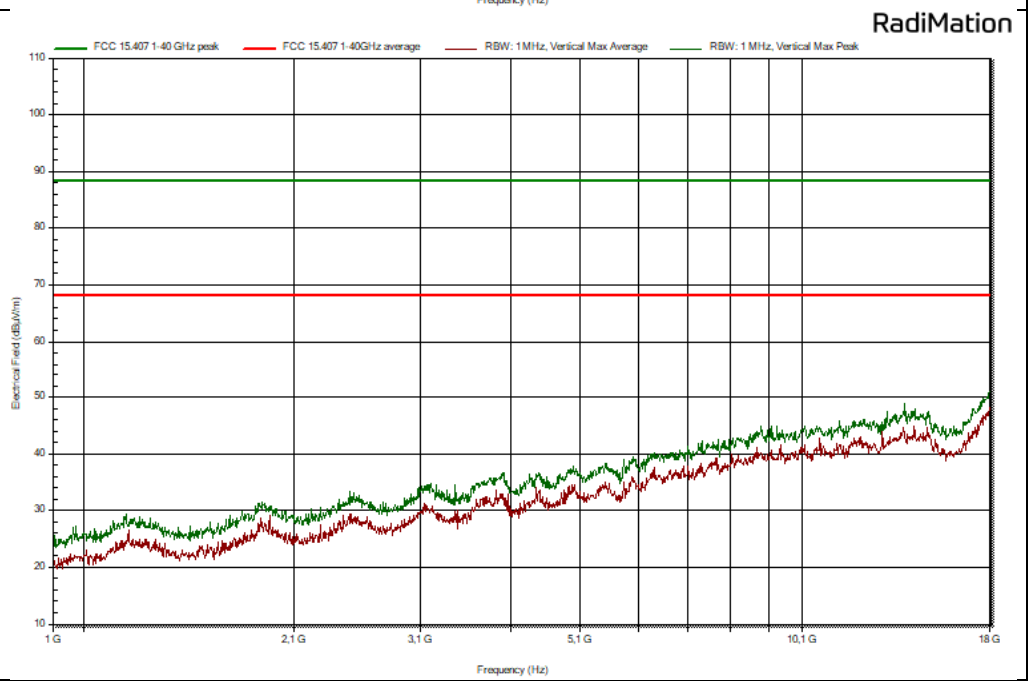
Vertical polarization

58	
100	

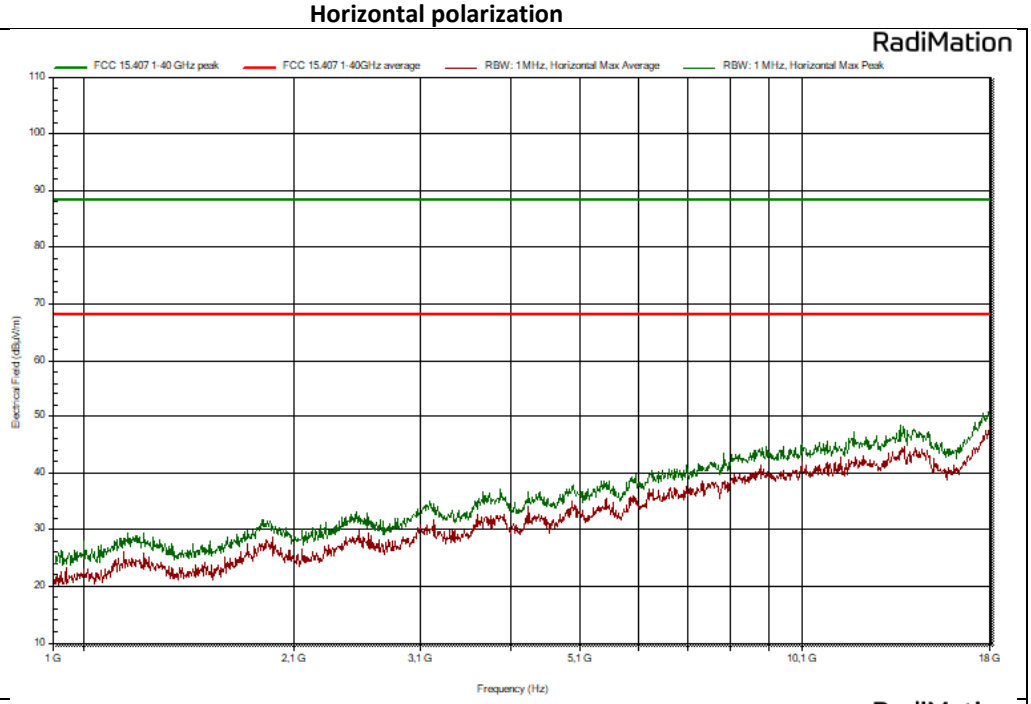
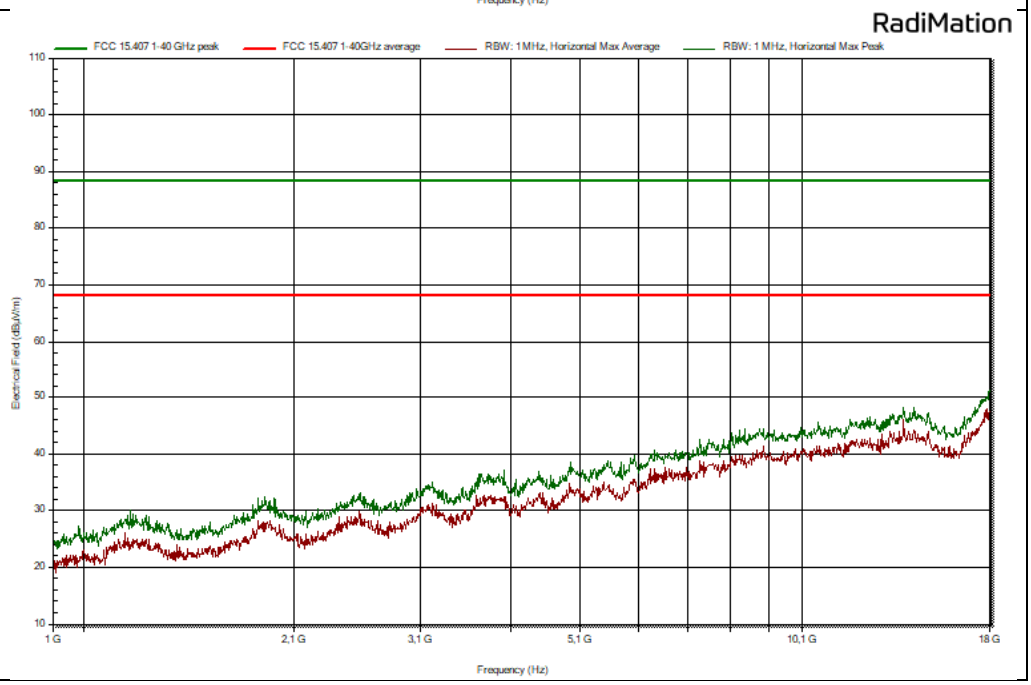
Horizontal polarization

58	
100	

Vertical polarization

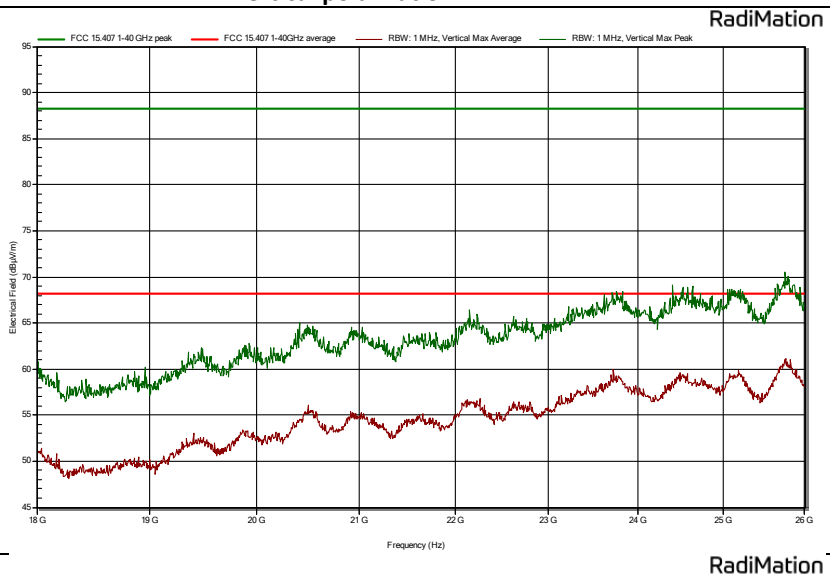
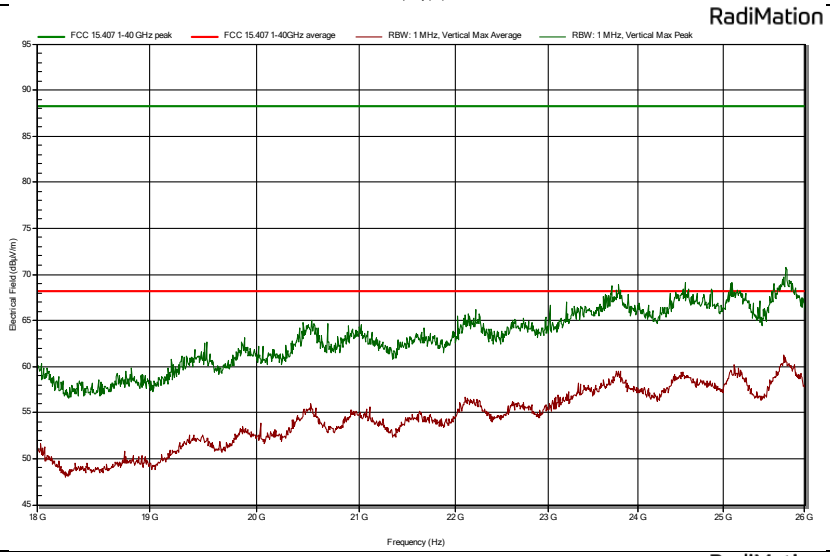
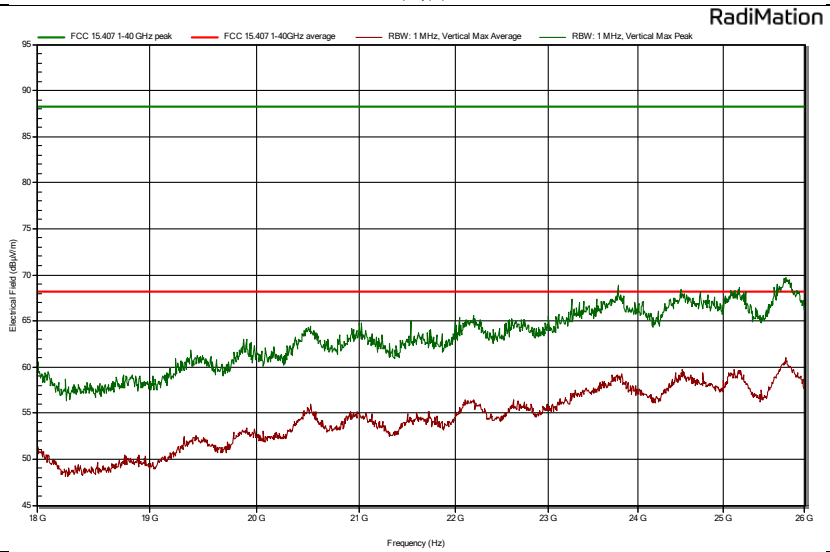
122	
165	

Horizontal polarization

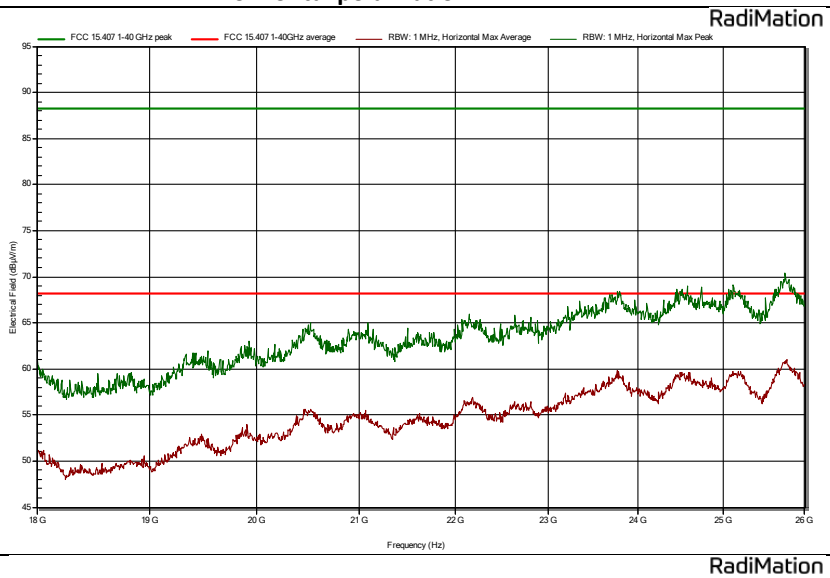
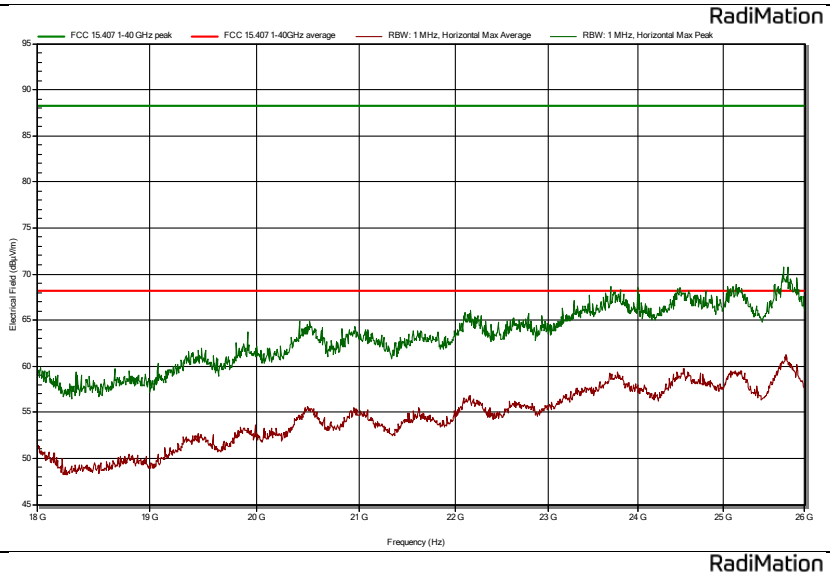
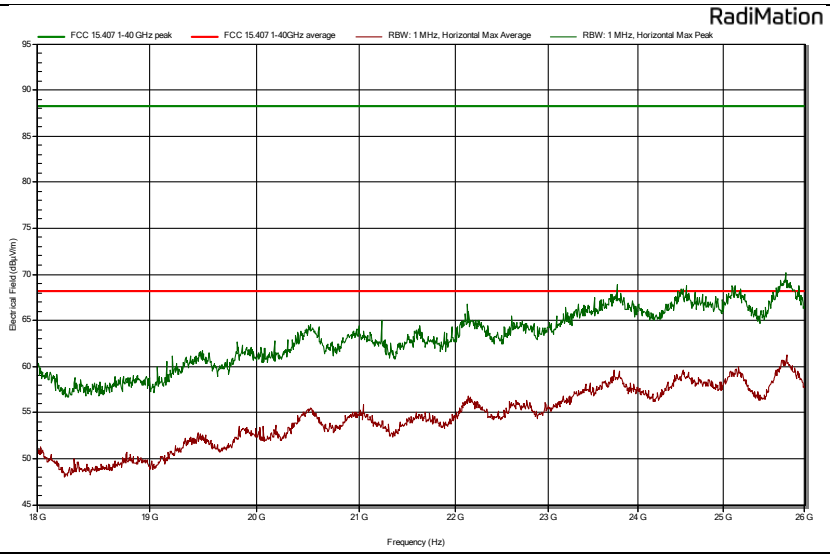
122	
165	

18 – 26 GHz
802.11b

Vertical polarization

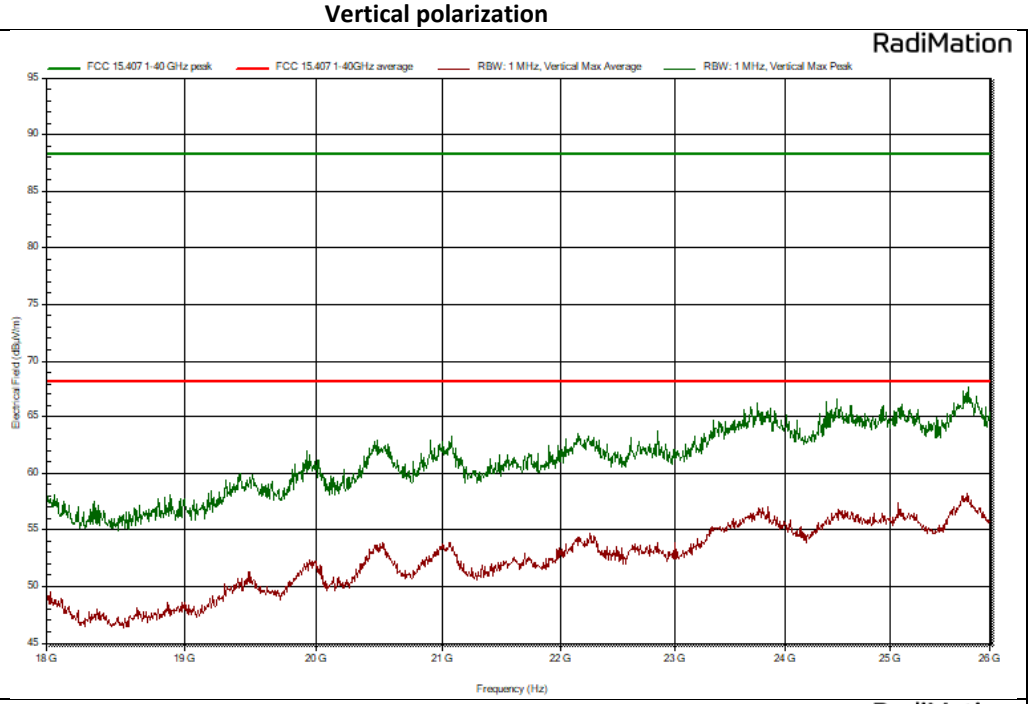
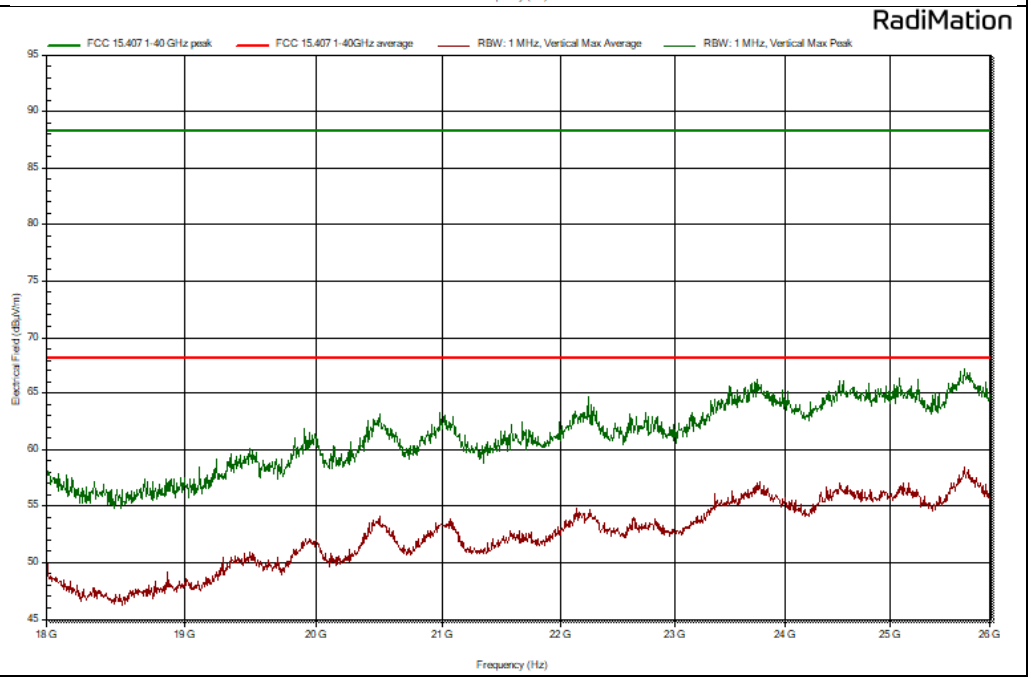
Low ch	
Mid ch	
High ch	

Horizontal polarization

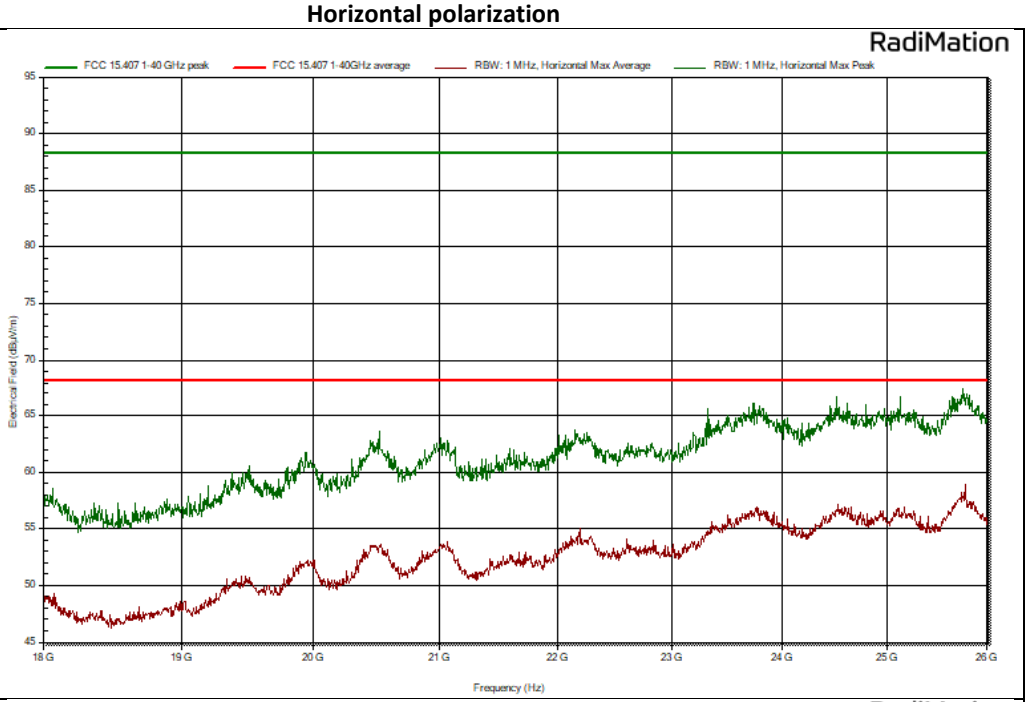
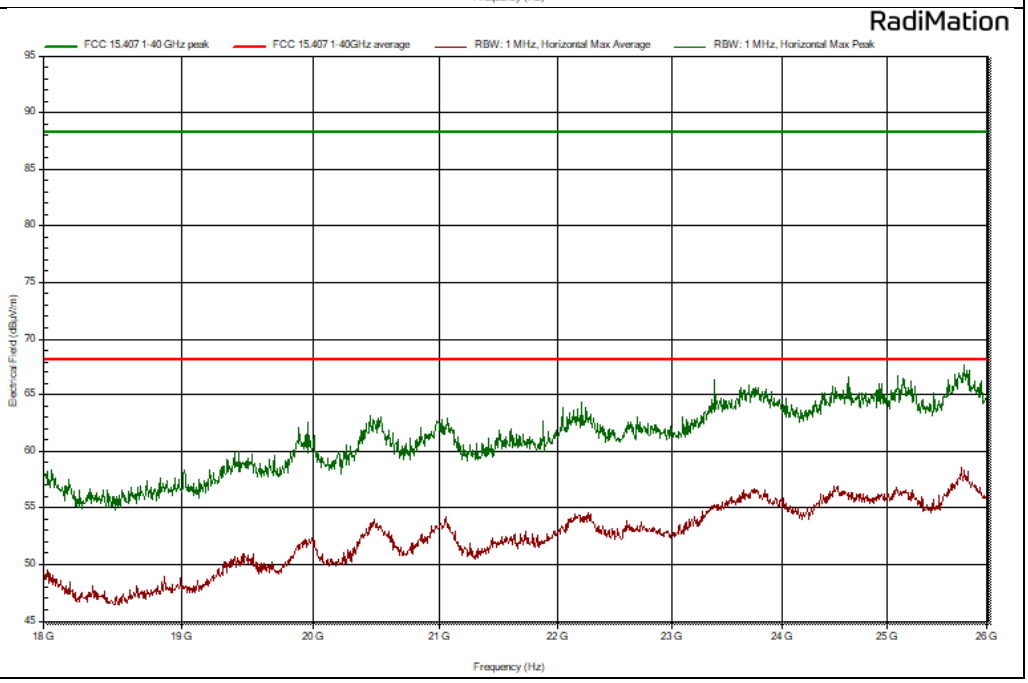
Low ch	
Mid ch	
High ch	

802.11n/ac

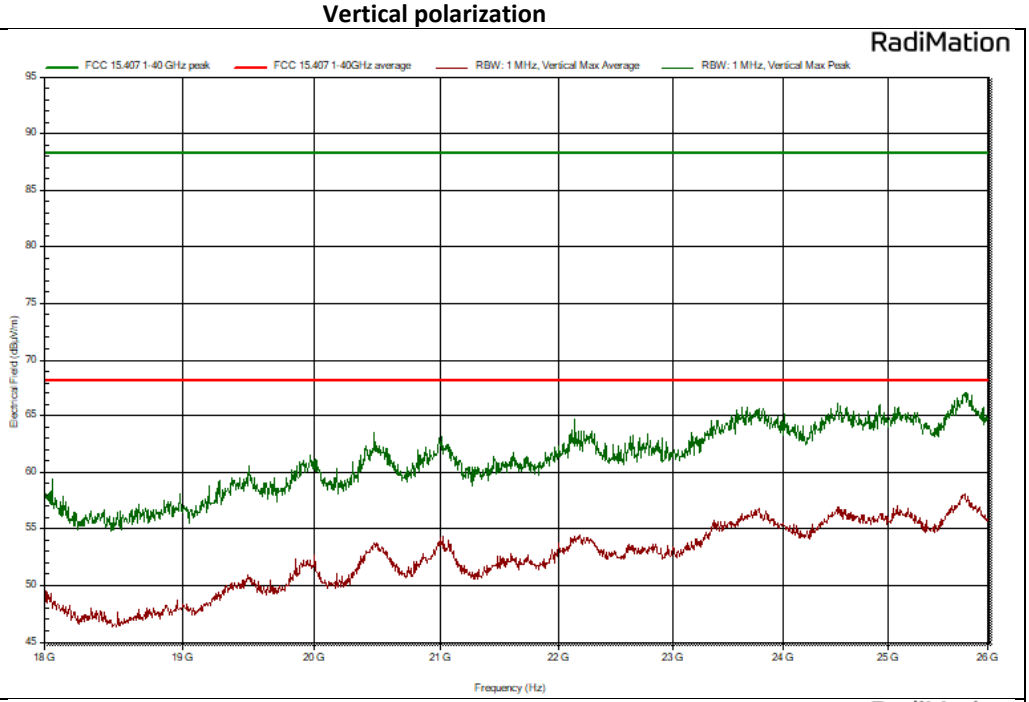
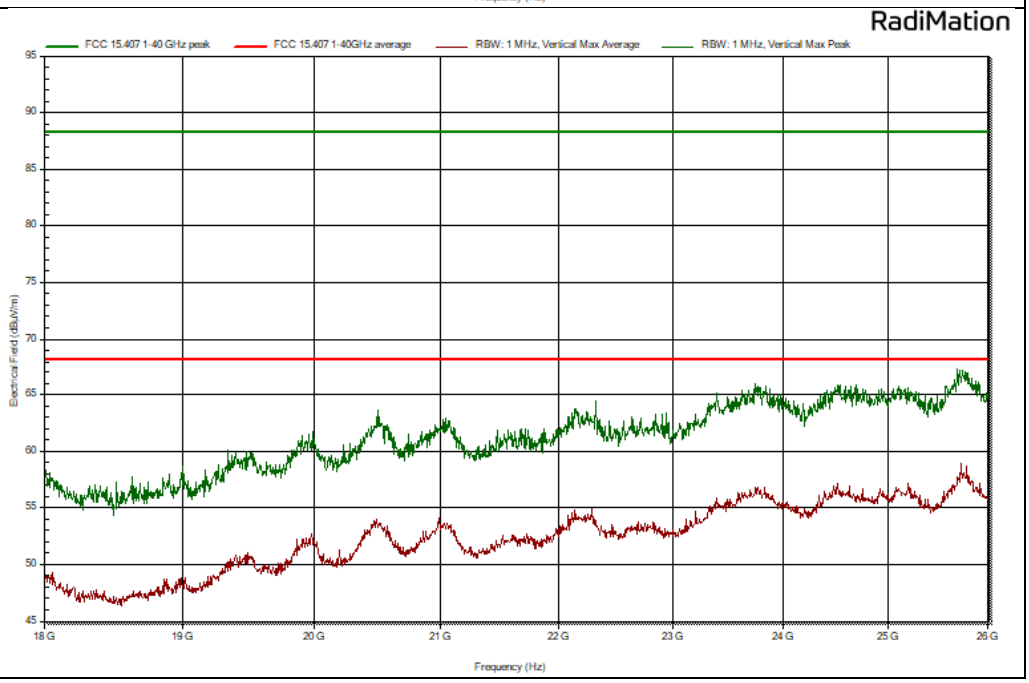
Vertical polarization

36	
64	

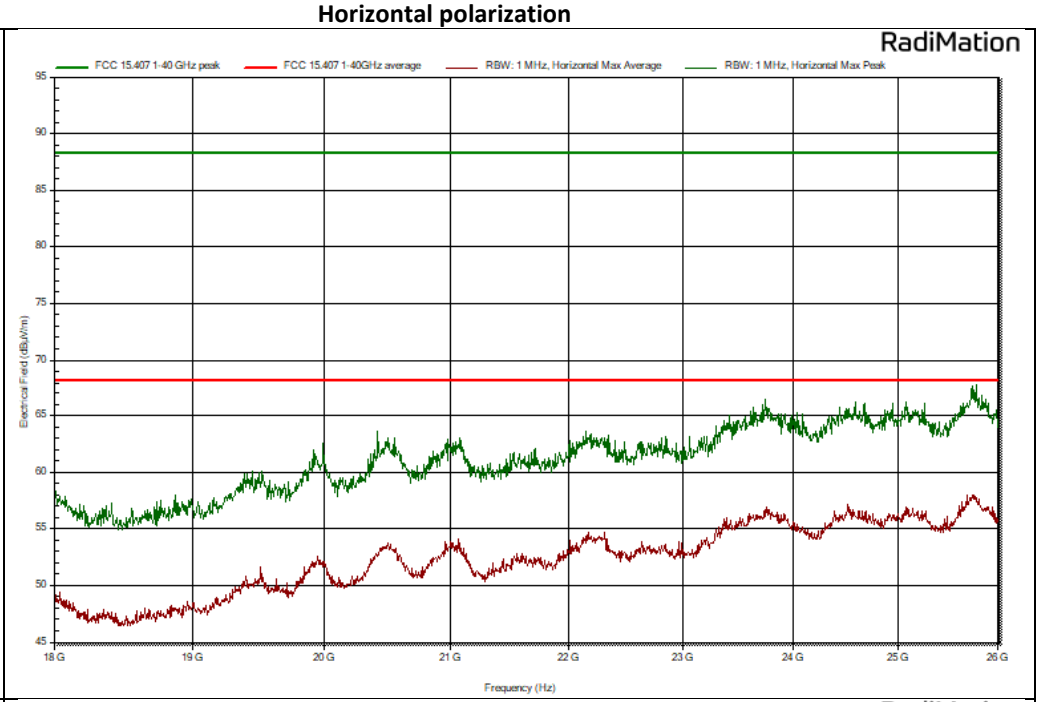
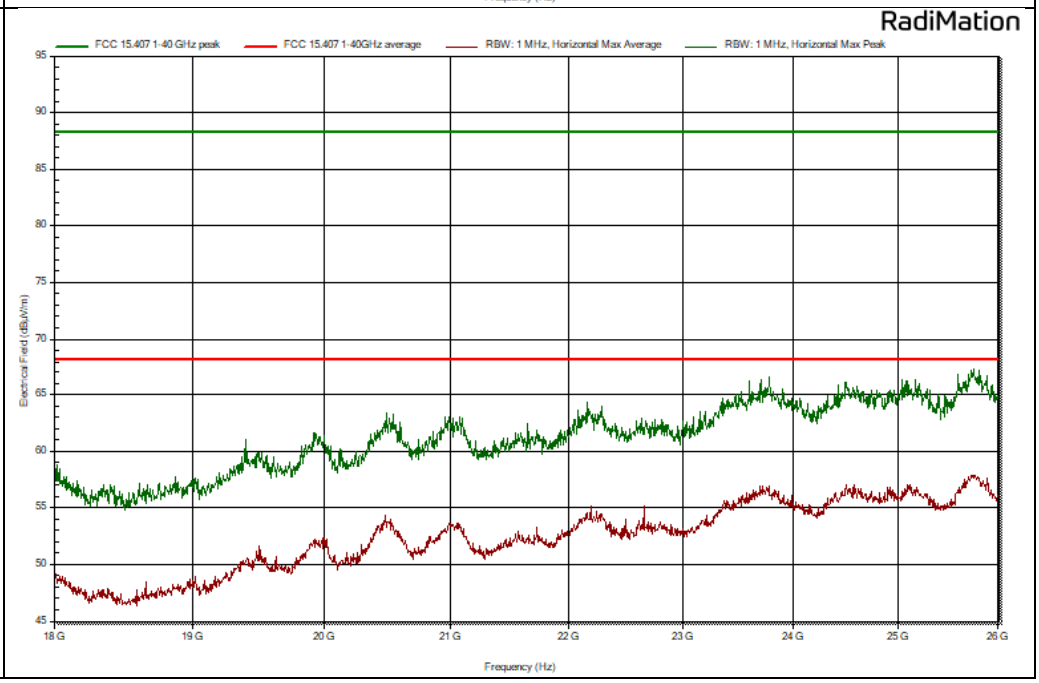
Horizontal polarization

36	
64	

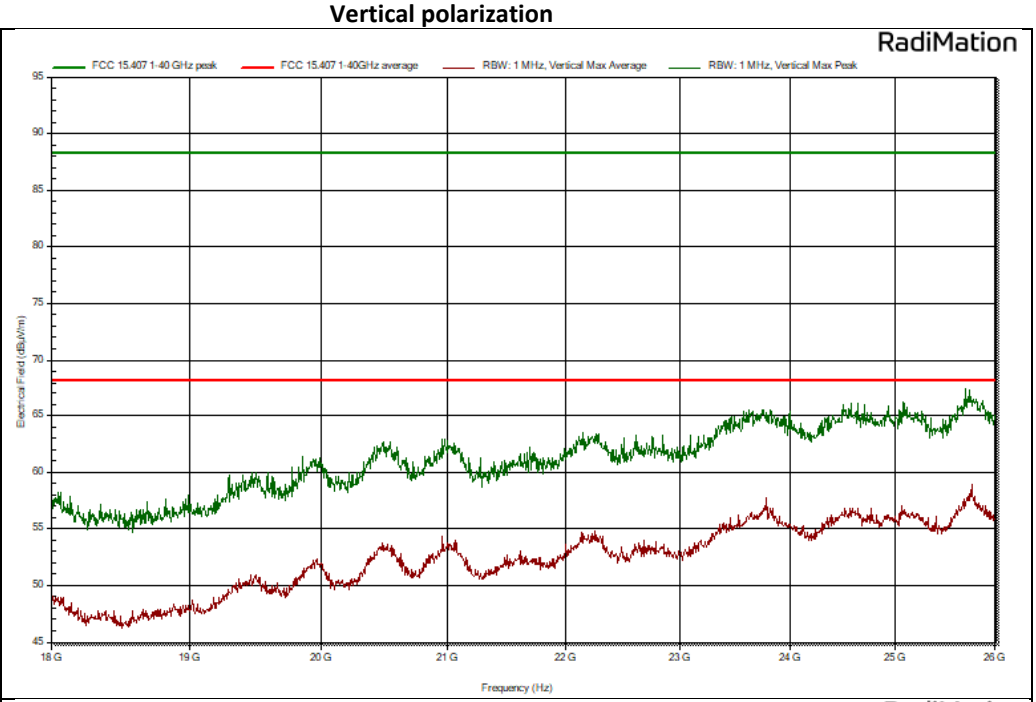
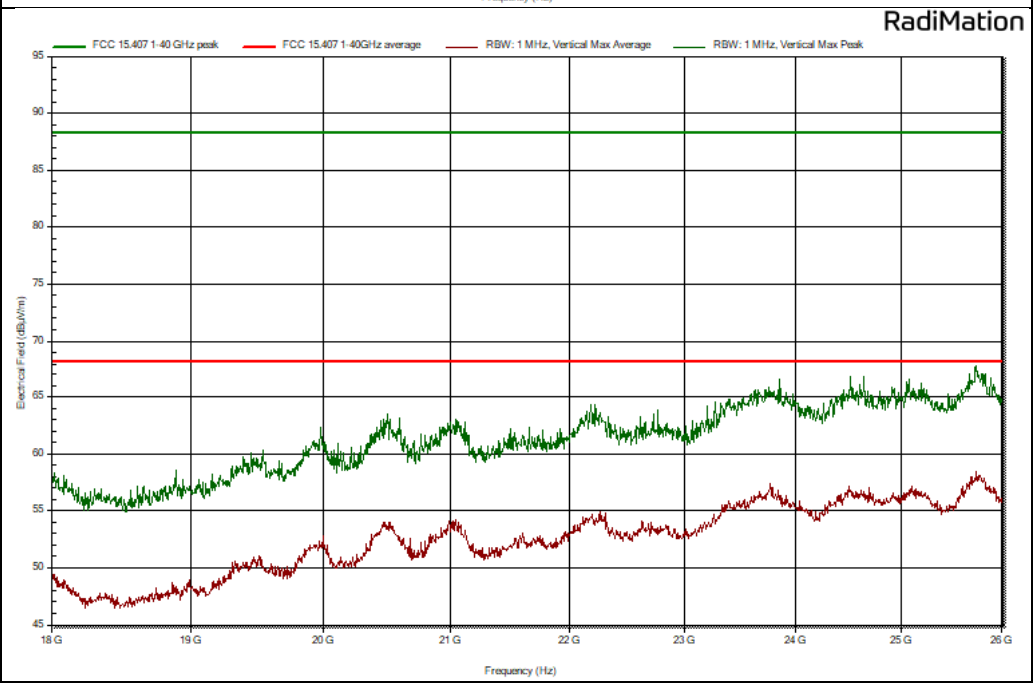
Vertical polarization

58	
100	

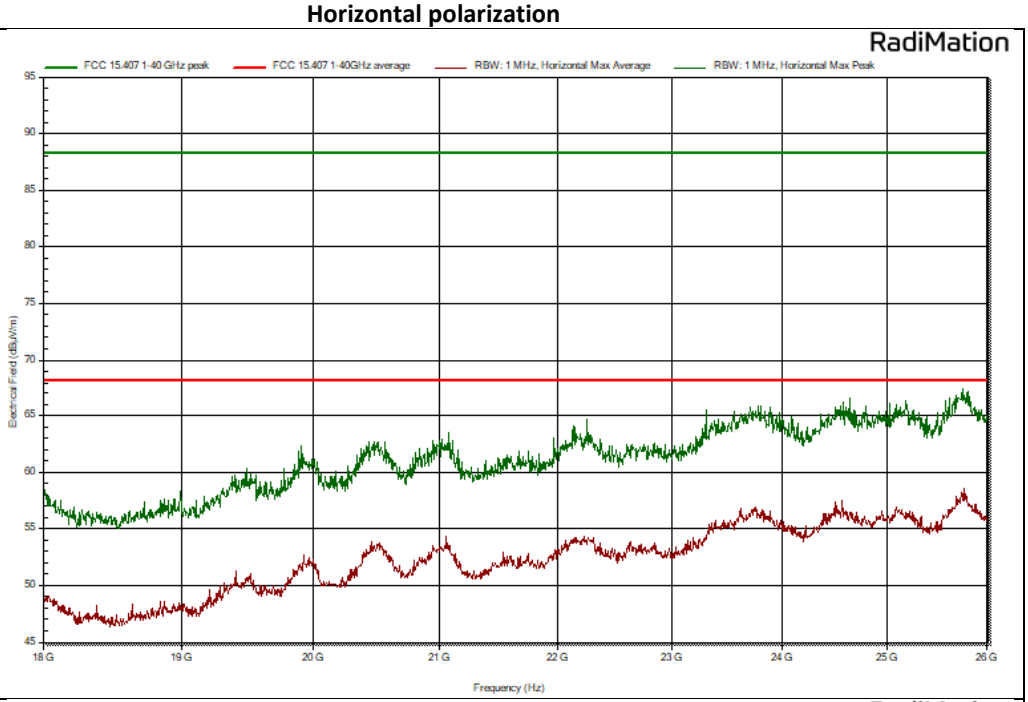
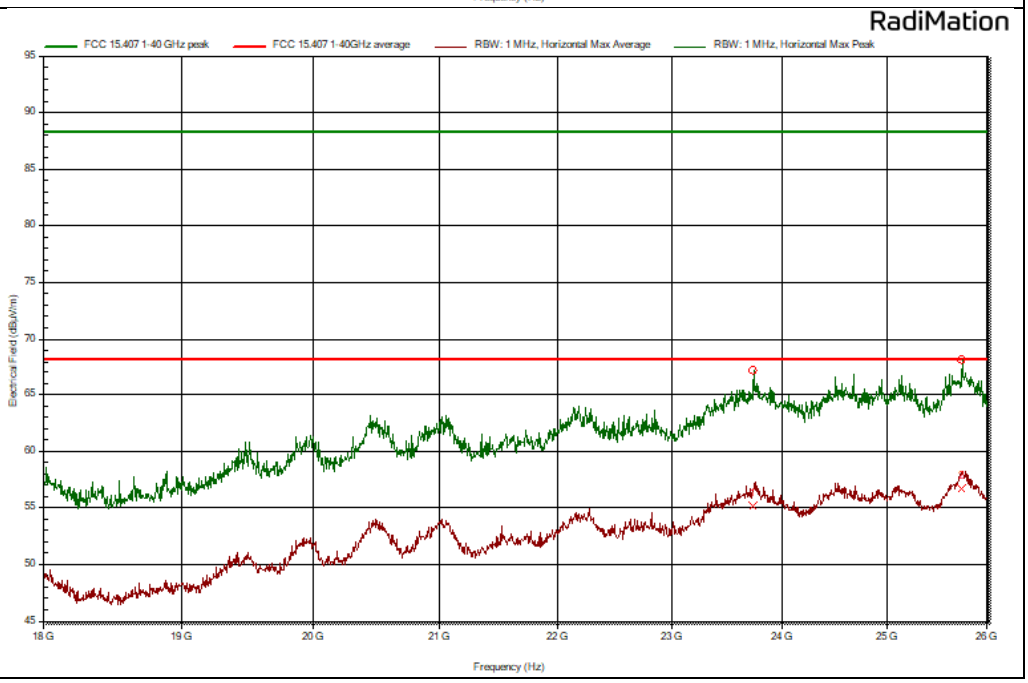
Horizontal polarization

58	
100	

Vertical polarization

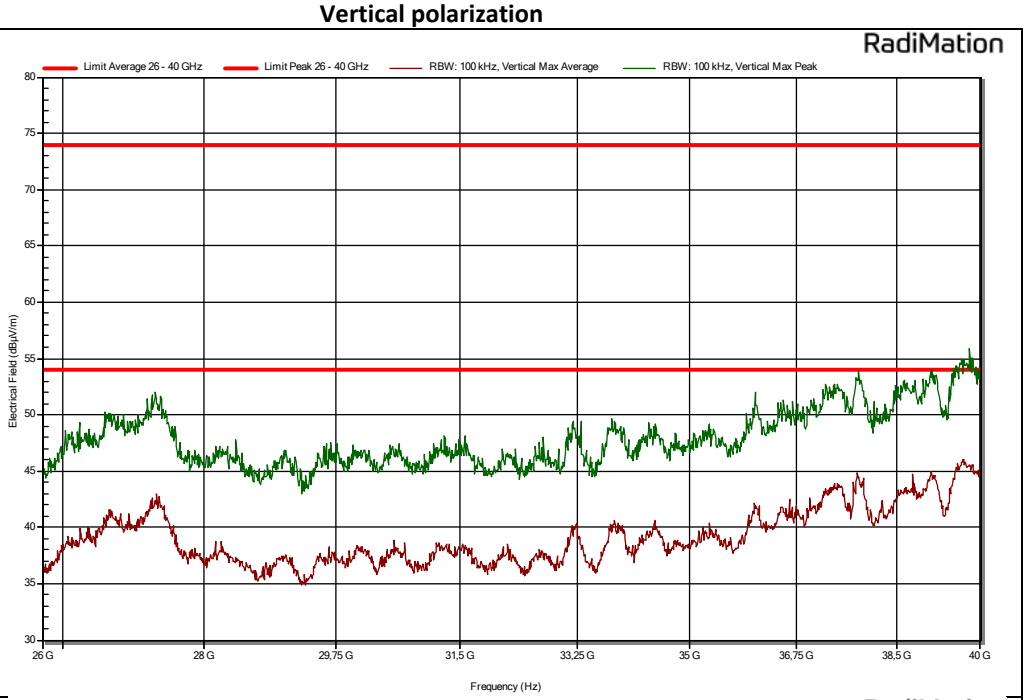
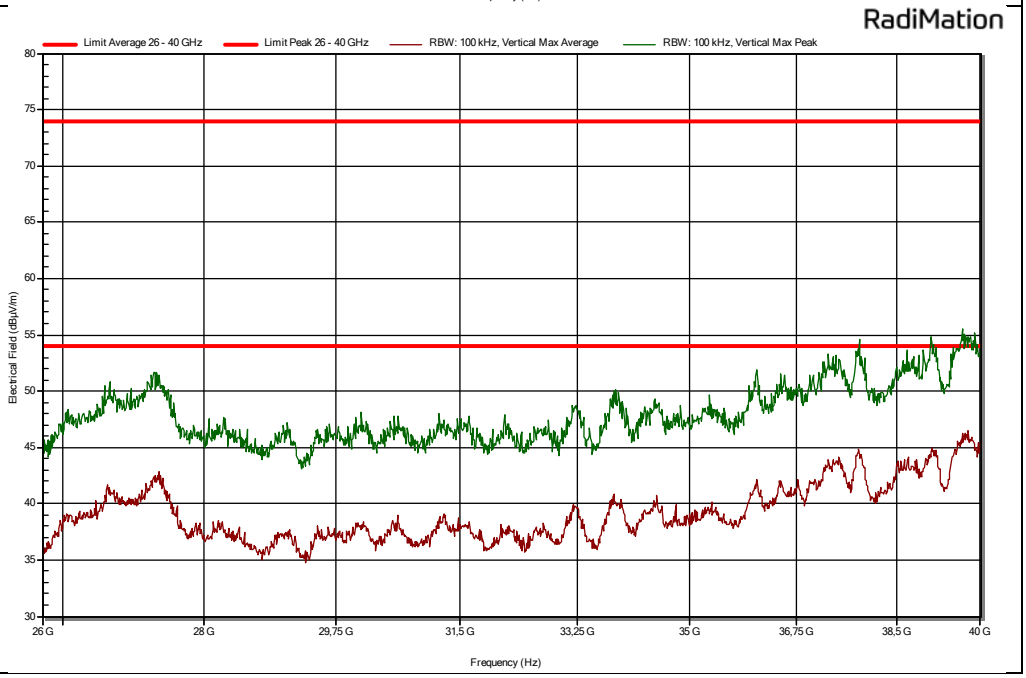
122	
165	

Horizontal polarization

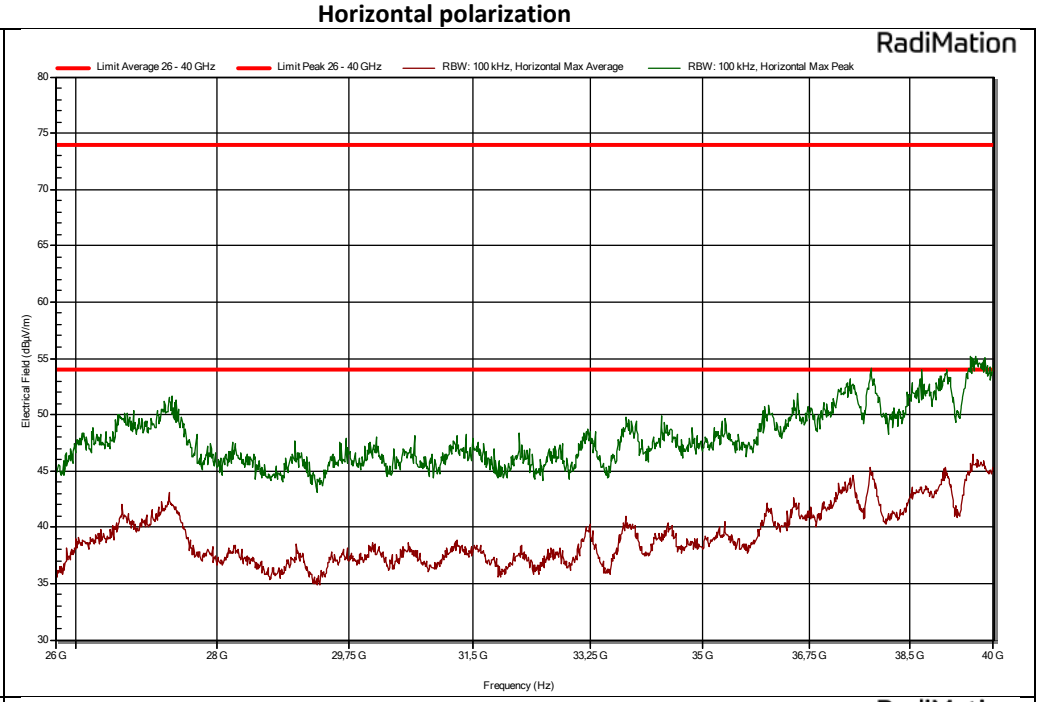
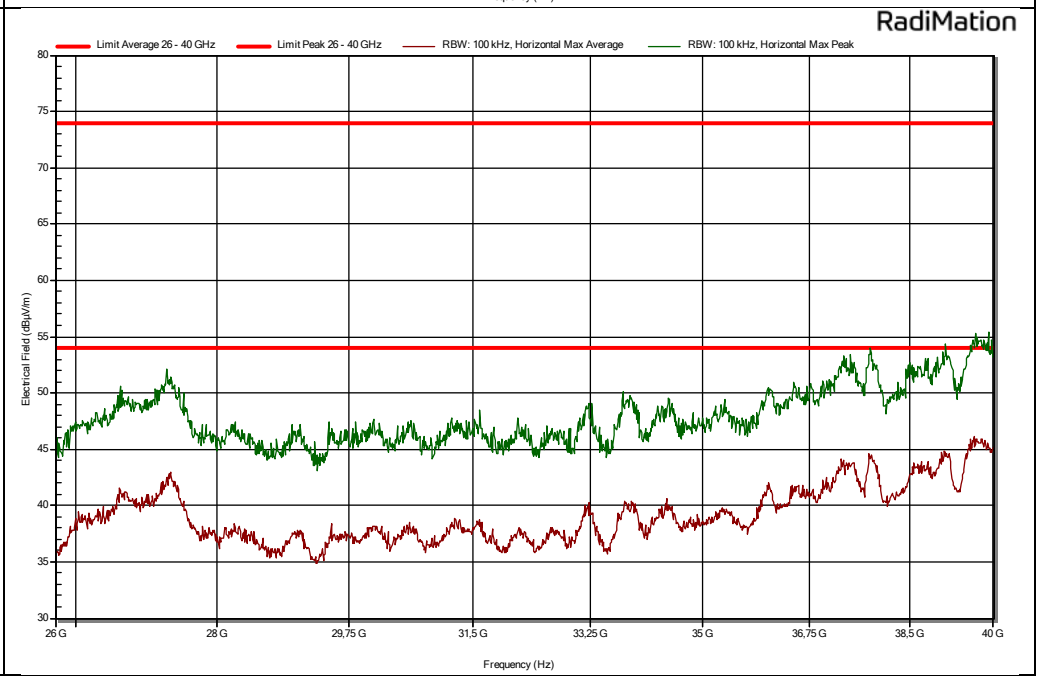
122	
165	

26 – 40 GHz
802.11n/ac

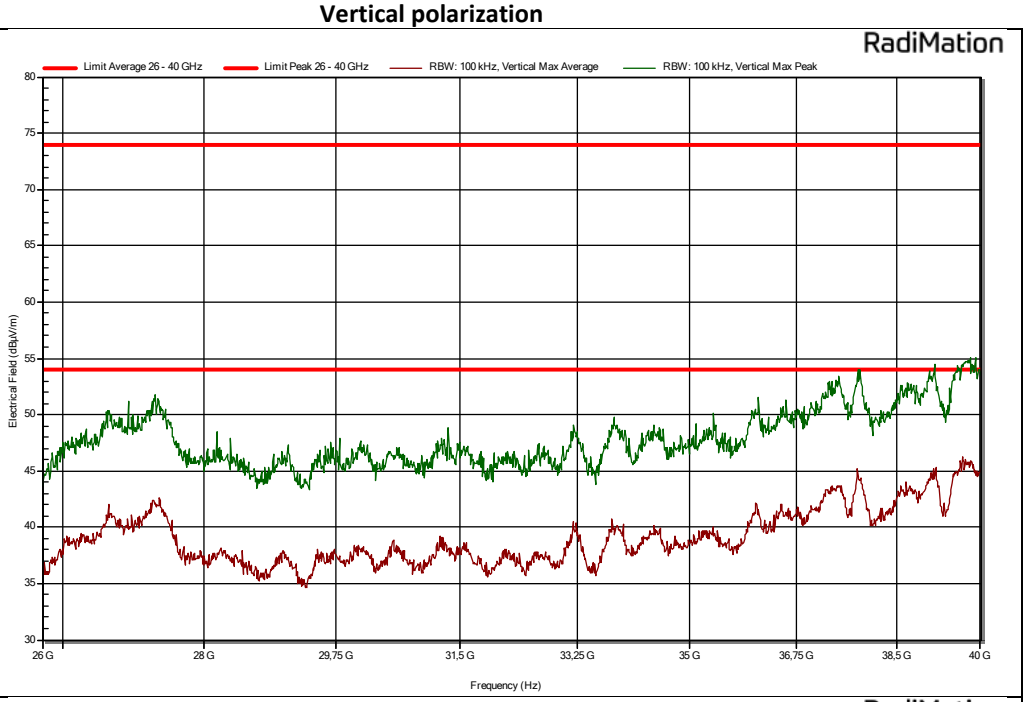
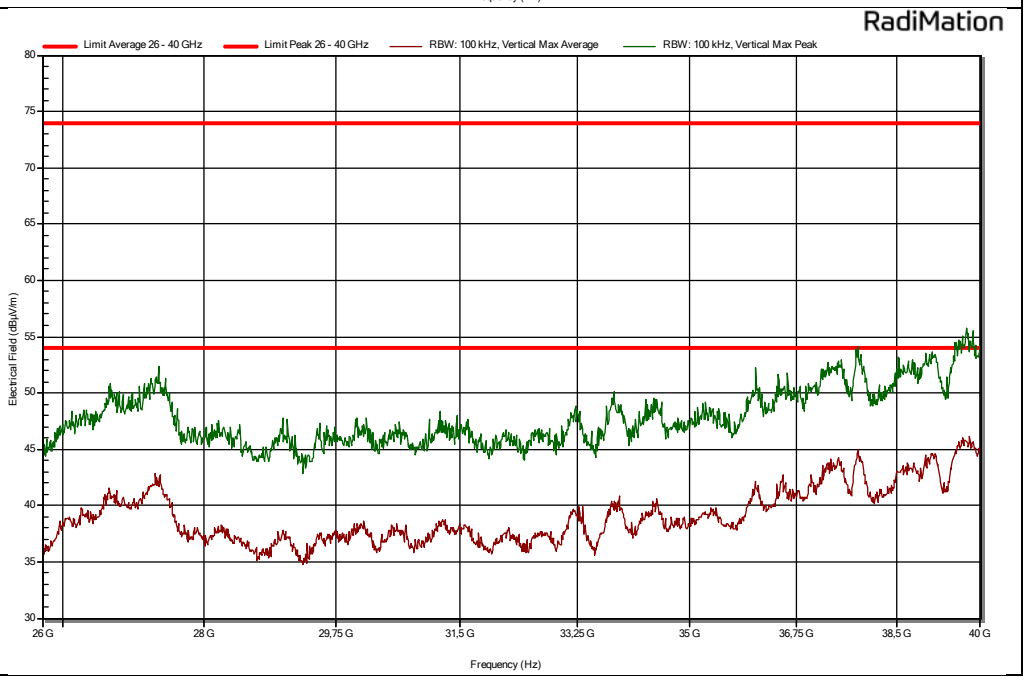
Vertical polarization

36	
64	

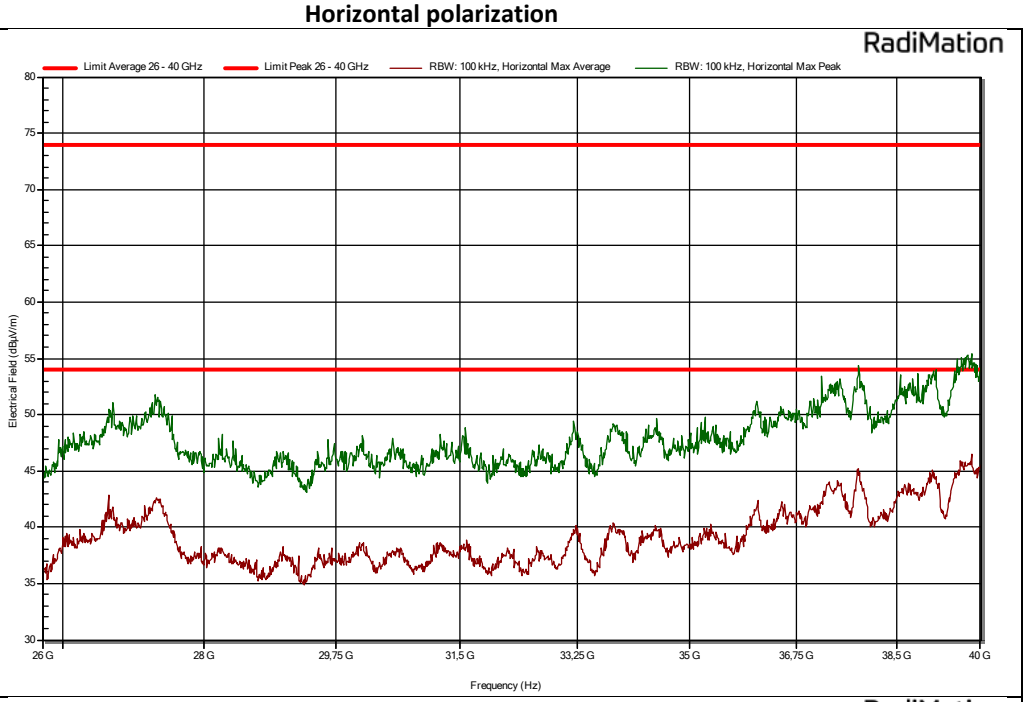
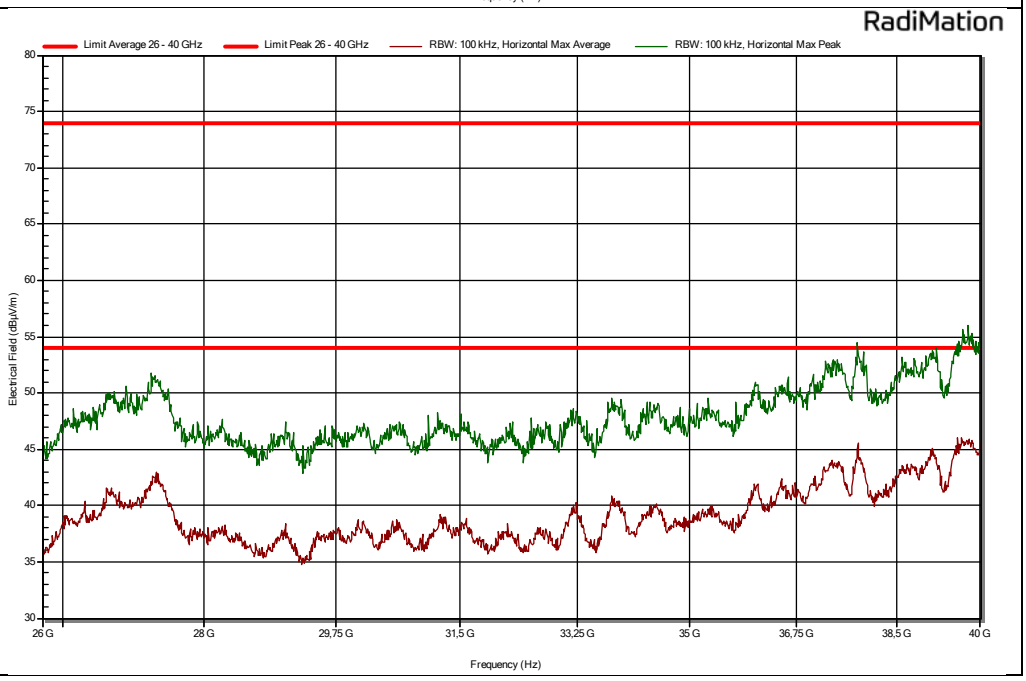
Horizontal polarization

36	
64	

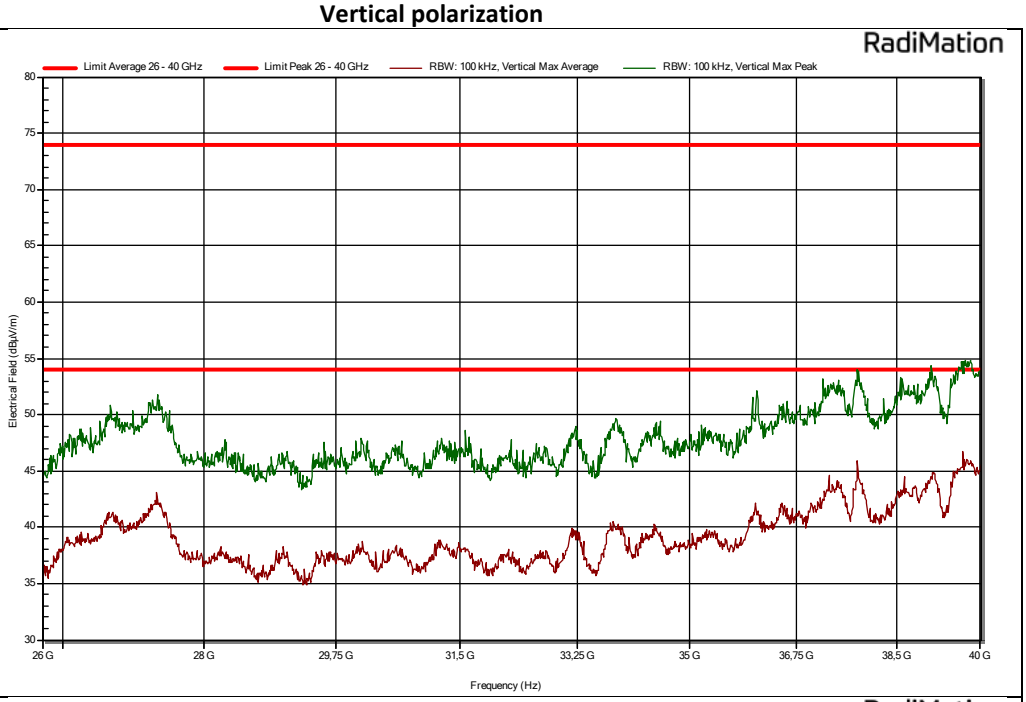
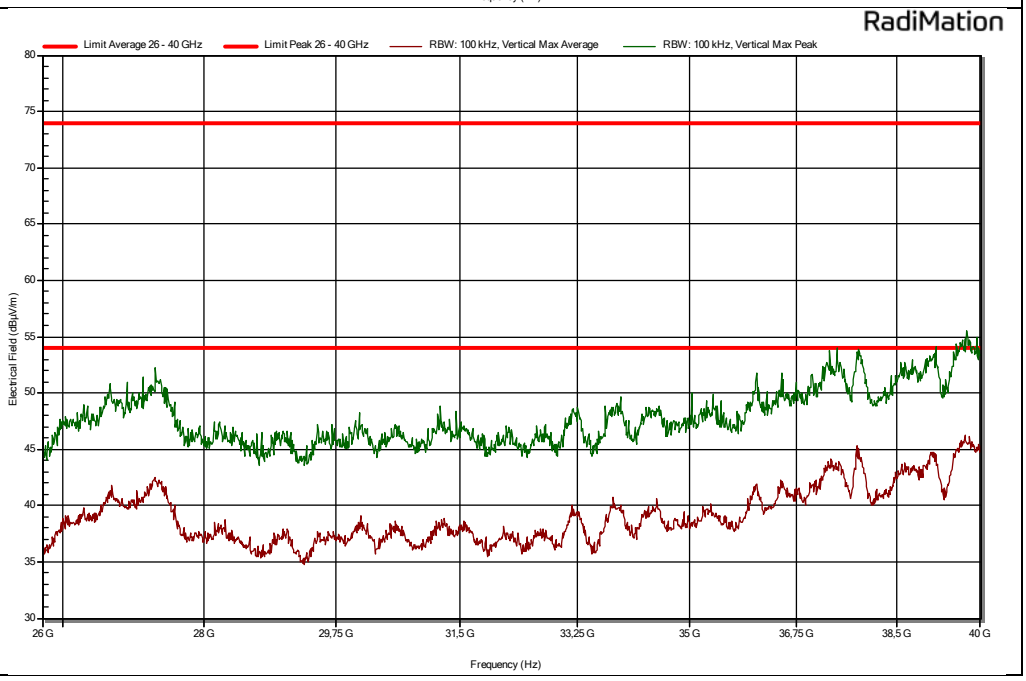
Vertical polarization

58	
100	

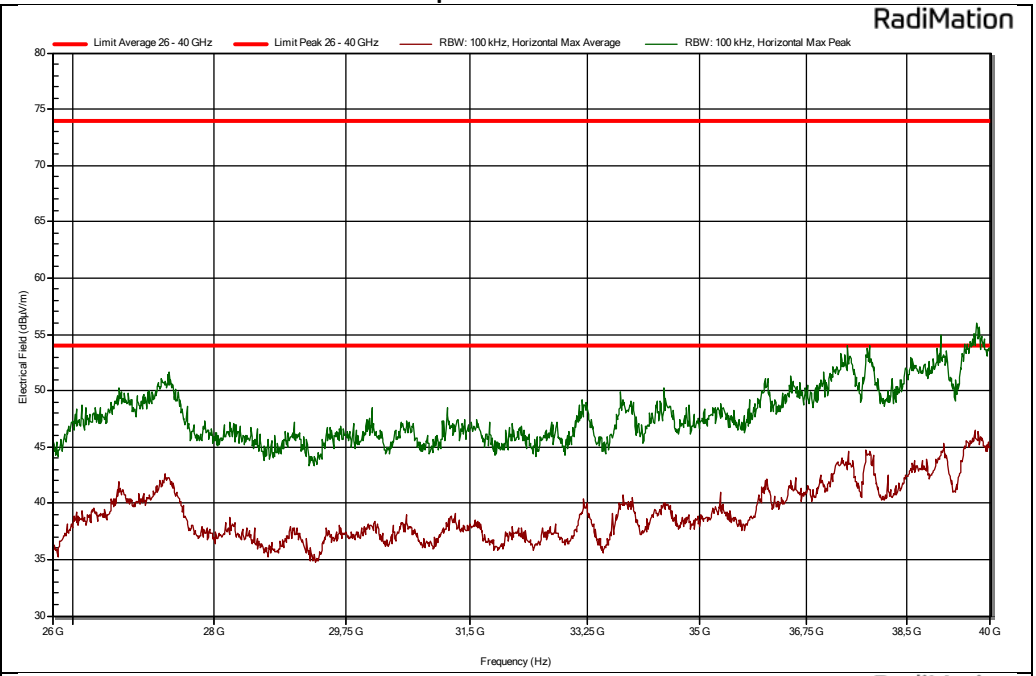
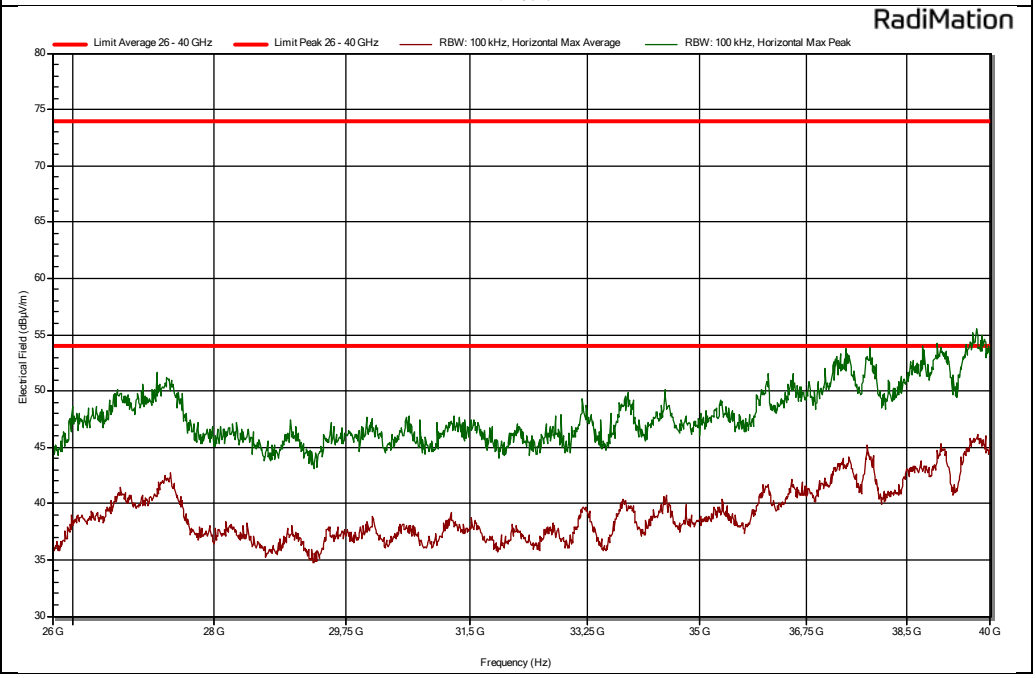
Horizontal polarization

58	
100	

Vertical polarization

122	
165	

Horizontal polarization

122	
165	

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.

For systems using digital modulation in the 5150 - 5850 MHz

Standard	Frequency range (GHz)	Limit (W)	Specification
FCC 15.407 (a)	5.15 – 5.25	1.0	Conducted
	5.725 – 5.85	1.0	Conducted
RSS-247 6.2	5.15 – 5.25	0.2	e.i.r.p.
	5.725 – 5.85	1.0	Conducted

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 2

3.2.5 Test results of Output Power Measurement

Peak method

Technology Std.	Channel	Frequency (MHz)	Peak output power (dBm)
802.11b	1	2412	18.3
	11	2462	17.4
Uncertainty	±0.71 dB		

Peak method

Technology Std.	Channel	Frequency (MHz)	Peak output power (dBm)
802.11n	36	5180	15.4
	64	5320	13.9
	100	5500	14.0
Uncertainty	±0.71 dB		

Peak method

Technology Std.	Channel	Frequency (MHz)	Peak output power (dBm)
802.11ac	58	5290	8.7
	122	5610	7.3
	165	5825	12.5
Uncertainty	±0.71 dB		

Note: conducted power (dBm) +antenna gain (dBi) = Peak output power (dBm)

3.3 AC Power-line conducted emissions

3.3.1 Limit

According to 15.207 (a), (c) and 15.107 (a)

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN).

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 C63.10-2020 Section 6.2
According to ANSI C63.4: 2014, section 13.3
IRN 439 – Method 1

3.3.5 Measurement uncertainty

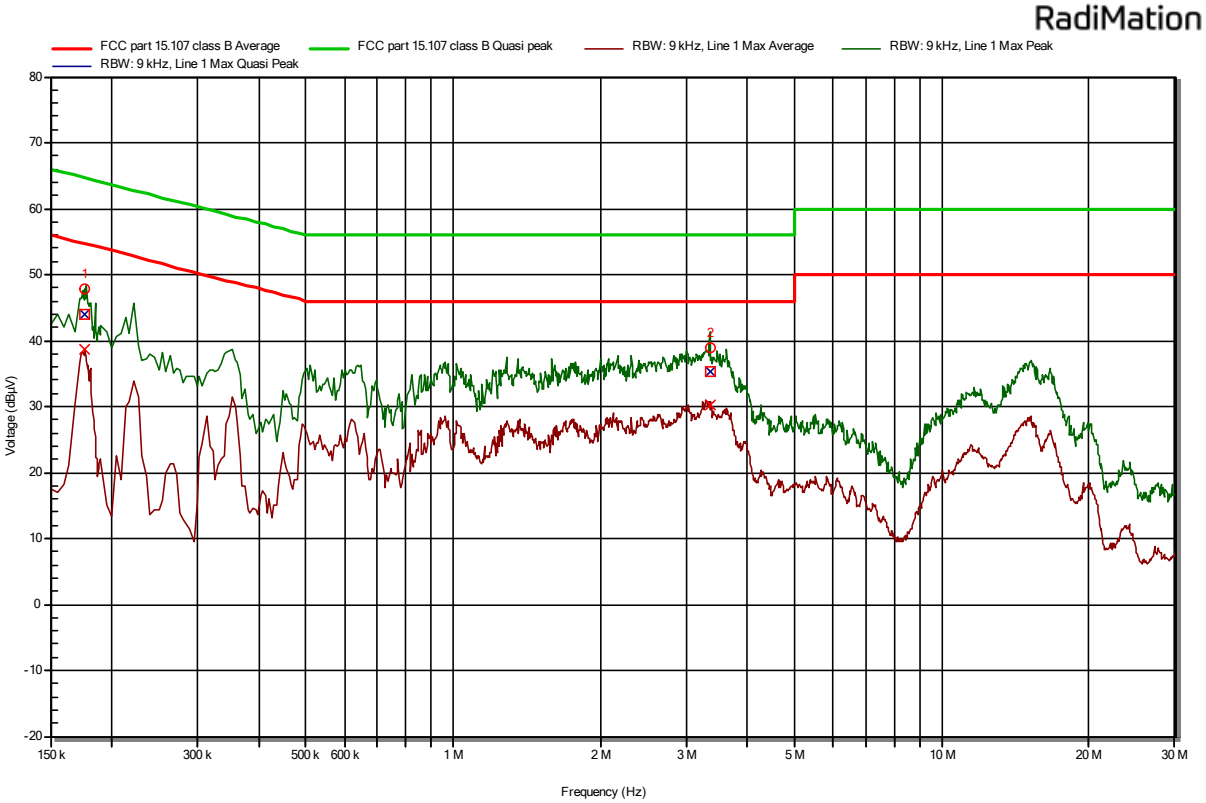
+/- 3.6 dB

3.3.6 Note

The measurement were performed with both the Radio active and the other functionality of the EUT.
For this reason the plots are valid for both Part 15.207 and 15.107.

3.3.7 Plots of the AC mains conducted spurious measurement

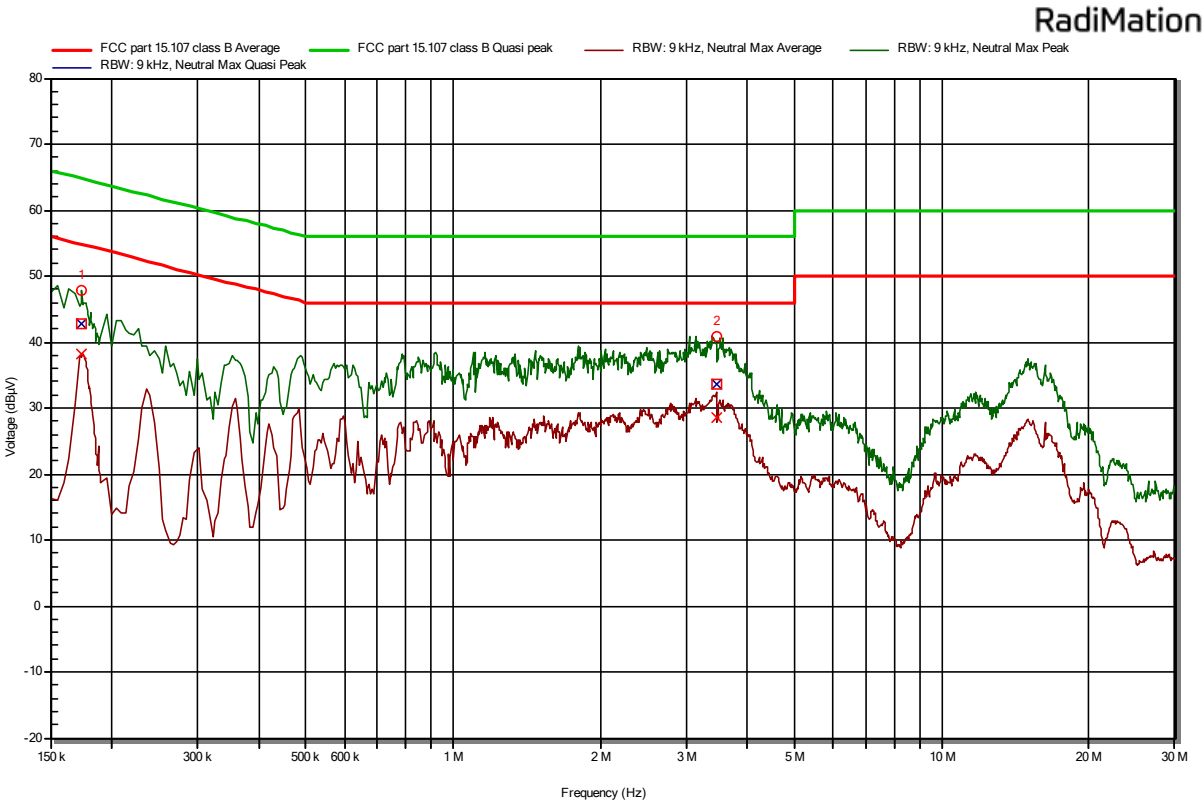
Pre-scan plot with peak detector of the AC Power-line Conducted emissions on **Phase**



Measured peaks

Frequency	Peak	Average	Average Limit	Quasi-Peak	Quasi-Peak Limit	Status
176,55 kHz	47,9 dBµV	38,6 dBµV	54,6 dBµV	44 dBµV	64,6 dBµV	Pass
3,354 MHz	39 dBµV	30,1 dBµV	46 dBµV	35,2 dBµV	56 dBµV	Pass

Pre-scan plot with peak detector of the AC Power-line Conducted emissions on **Neutral**



Measured peaks

Frequency	Peak	Average	Average Limit	Quasi-Peak	Quasi-Peak Limit	Status
173,85 kHz	47,9 dBµV	38,1 dBµV	54,8 dBµV	42,7 dBµV	64,8 dBµV	Pass
3,476 MHz	40,9 dBµV	28,6 dBµV	46 dBµV	33,5 dBµV	56 dBµV	Pass

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