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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	: BI-PS005
Applicant	: Velux A/S
FCC ID	: XSG832644
IC ID	: 8642A-832644

Test report No. : 200501094 001 Ver 1.0

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

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	Telefication BV
Test Site location	Edisonstraat 12a 6902 PK Zevenaar The Netherlands Tel. +31316583180 Fax. +31316583189
Test Site FCC	NL0001

Test Site	Kiwa Telefication BV
Test Site location	Wilmersdorf 50 7327 AC Apeldoorn The Netherlands Tel. +31 88998 3393
Test Site FCC	NL0001

Revision History

Version	Date	Remarks	By
v0.5	08-12-2020	First draft	PvW
v1.0	08-02-2021	Initial release version	PvW

Table of Contents

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 (a)	RSS-247 5.2(a)	6 dB bandwidth	3.2	Pass
--	RSS-Gen 6.7	99% bandwidth	3.3	Pass
15.247 (b)	RSS-247 5.4 (d)	RF output power	3.4	Pass
15.247 (e)	RSS-247 5.2 (b)	Power spectral density	3.5	Pass
15.247 (d)	RSS-247 5.5	Band edge	3.6	Pass
15.207 (c) 15.107 (a)	RSS-Gen 8.8	Conducted spurious emissions on AC mains	3.7	Pass

1 General Description

1.1 Applicant

Client name:	Velux A/S
Address:	Baekgaardsvej 40
Zip code:	6900, Skjern, Denmark
Telephone:	+45 3058 1588
E-mail:	j.a.m.thomsen@velux.com
Contact name:	Mr. Jens Aksel Thomsen

1.2 Manufacturer

Manufacturer name:	Velux A/S
Address:	Baekgaardsvej 40
Zip code:	6900, Skjern, Denmark
Telephone:	+45 3058 1588
E-mail:	j.a.m.thomsen@velux.com
Contact name:	Mr. Jens Aksel Thomsen

1.3 Tested Equipment Under Test (EUT)

Product name:	BI-PS005
Brand name:	VELUX
FCC ID:	XSG832644
IC ID:	8642A-832644
Product type:	Power supply for Velux products (window opener and curtains)
Model(s):	BI-PS005
Batch and/or serial No.	--
Software version:	Build 14
Hardware version:	Control PCB: Version 2 PSU: Version 5
Date of receipt:	04-09-2020
Tests started:	05-10-2020
Testing ended:	19-11-2020

1.4 Product specifications of Equipment under test

Tx Frequency:	Zigbee: 2400 – 2483.5 MHz
Rx frequency:	Zigbee: 2400 – 2483.5 MHz
Antenna type	PCB antenna
Type of modulation:	OQPSK
Emission designator	2M40M1D

1.5 Environmental conditions

Test date	05-10-2020	06-10-2020	19-11-2020
Ambient temperature	22.1°C	21.0°C	20.9°C
Humidity	46.3%	53.2%	45.1%

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 manufacturer made modifications to the EUT to reduce radiated spurious emissions in the 30 – 1000 MHz frequency range.
Emissions in the 30 – 1000 MHz range were measured at the Apeldoorn test site, all other measurements were measured at the Zevenaar test site.

For each test the worst case configuration (running/standby mode) has been determined. Running mode means the device is powering an auxiliary device which can open and close windows. The transmitter is in normal operating mode. Standby mode means the transmitter is in a continuous Tx mode for RF testing.

Radiated emissions (clause 3.1) are measured in standby mode, with the transmitter continuously transmitting. Additionally, measurements in the 30-1000 MHz range are made with the device in running mode with the transmitter operating in normal mode.
Conducted emissions (clause 3.7) are measured in running mode with the transmitter operating in normal mode.
All other RF tests (clauses 3.2 to 3.6) are measured in standby mode with the transmitter continuously transmitting.

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 : P. van Wanrooij, BASc

Review of test methods and report by:

Name : ing. R. van Barneveld

The above conclusions have been verified by the following signatory:

Date : 09-02-2021

Name : ing. R. van Barneveld

Function : Test Engineer

Signature :

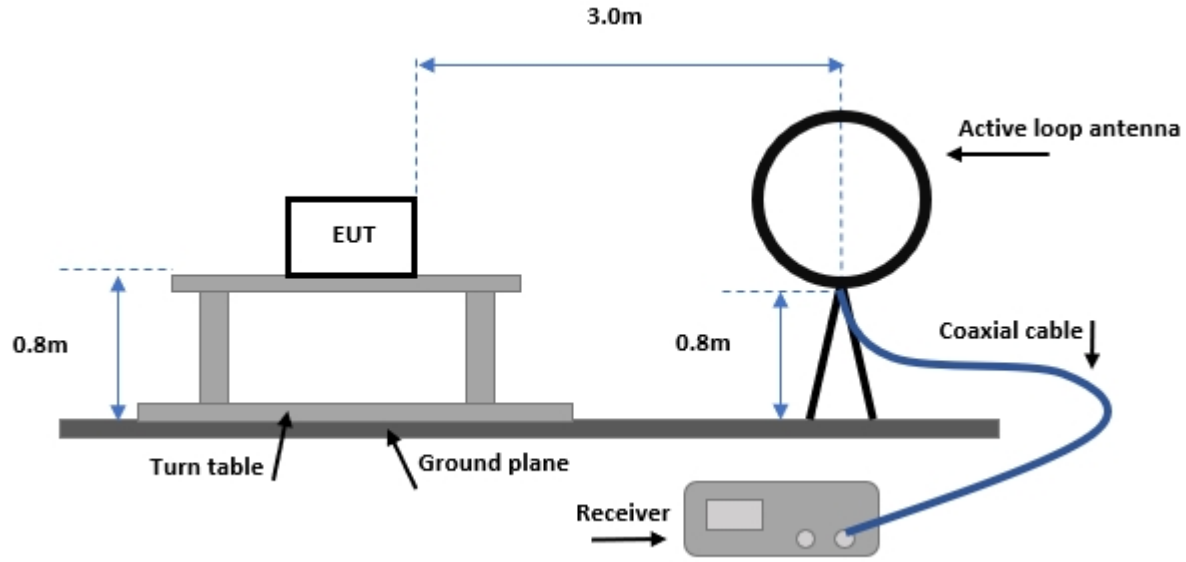
2 Test configuration of the Equipment Under Test

2.1 Test mode

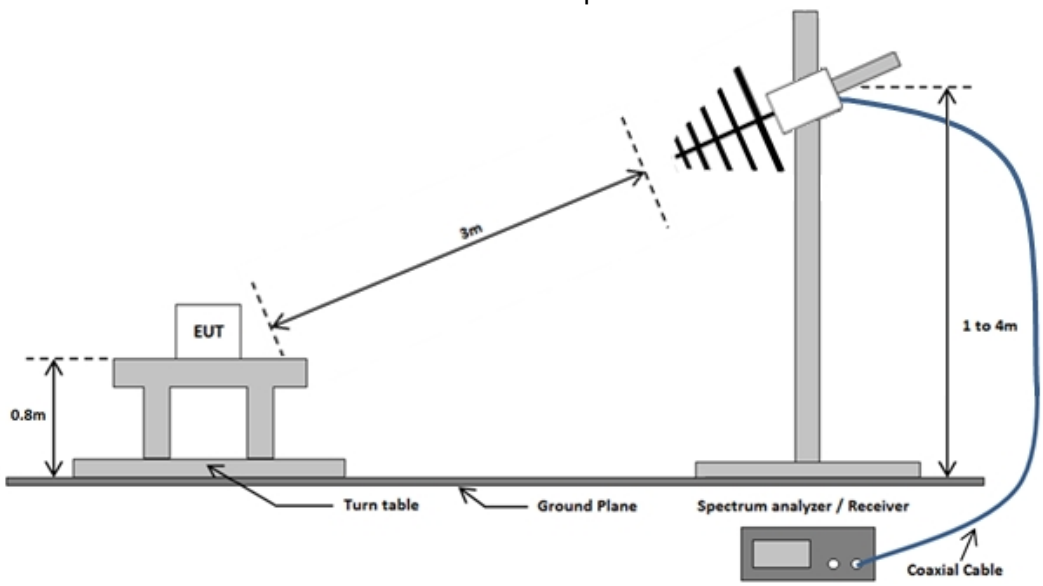
The applicant provided test mode firmware for the Zigbee radio, in which it was possible to configure the radio to transmit continuously on a fixed channel.

2.2 Test setups

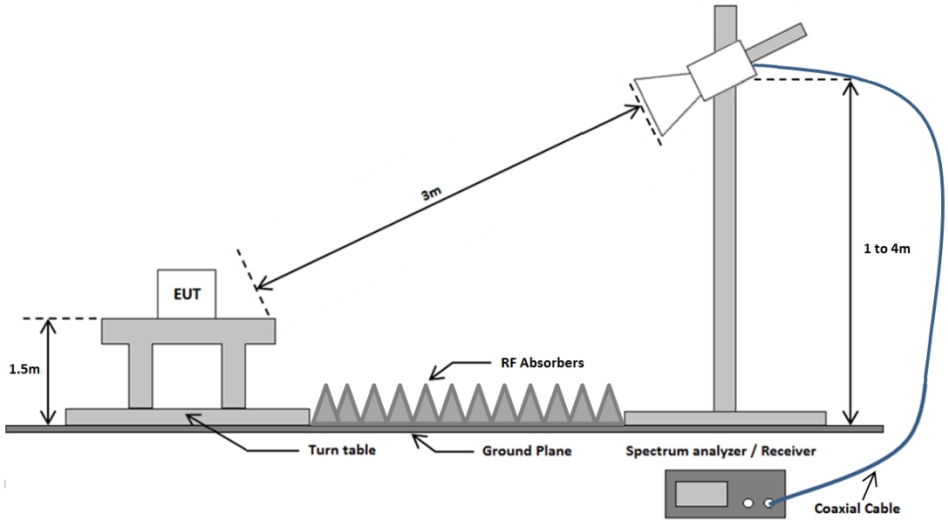
Radiated emissions test setup 9 kHz – 30 MHz



Radiated emissions test setup 30 MHz - 1 GHz

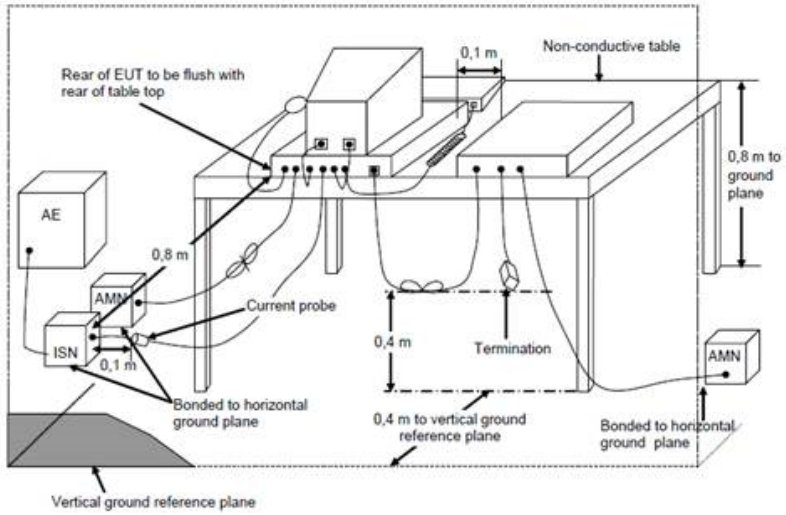


Radiated emissions test setup above 1 GHz

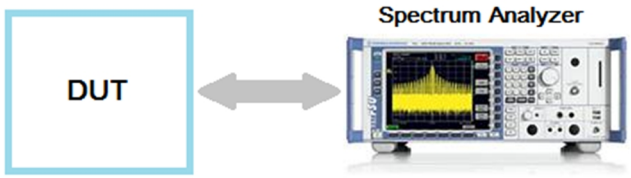


Conducted emissions test setup

Emissions test at AC mains



RF conducted tests



2.3 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Used at Par.
EMI Receiver	Rohde & Schwarz	ESCI	TE11128	3.7
EMI Receiver	Rohde & Schwarz	ESR7	TE01220	3.1
Spectrum analyzer	Rohde & Schwarz	FSP40	TE11125	3.1
Spectrum Analyzer	Rohde & Schwarz	FSV40	TE01269	3.2 – 3.6
3.0 GHz HPF	Wainwright	WHK3.0/18G-10EF	TE01140	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
Preamplifier 18-26 GHz	Miteq	JS4-18004000-33-8P	TE11131	3.1
Two-Line V-Network	Rohde & Schwarz	ENV216	TE11176	3.7

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 C63.4-2014, 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

Device is tested in running mode and standby mode

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 Test results of the radiated spurious emissions measurement (standby mode)

Measured peaks 30 – 1000 MHz Low channel

Frequency	Polarization	Height	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference
37,277 MHz	Vertical	1,3 m	33,7 dBµV/m	40 dBµV/m	-6,3 dB
961,826 MHz	Horizontal	3,8 m	29,8 dBµV/m	54 dBµV/m	-24,2 dB
980,816 MHz	Vertical	2,7 m	30,3 dBµV/m	54 dBµV/m	-23,7 dB
944,764 MHz	Vertical	2 m	29,3 dBµV/m	46 dBµV/m	-16,7 dB

Measured peaks 30 – 1000 MHz Middle channel

Frequency	Polarization	Height	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference
30,645 MHz	Horizontal	3,8 m	29,3 dBµV/m	40 dBµV/m	-10,7 dB
35,24 MHz	Horizontal	1 m	24,1 dBµV/m	40 dBµV/m	-15,9 dB
38,253 MHz	Horizontal	4,2 m	31,6 dBµV/m	40 dBµV/m	-8,4 dB
185,262 MHz	Vertical	1,2 m	33,8 dBµV/m	43,5 dBµV/m	-9,7 dB

Measured peaks 30 – 1000 MHz High channel

Frequency	Polarization	Height	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference
178,191 MHz	Vertical	3,7 m	28,1 dBµV/m	43,5 dBµV/m	-15,4 dB
47,423 MHz	Vertical	2 m	34,3 dBµV/m	40 dBµV/m	-5,7 dB
37,416 MHz	Vertical	3 m	29 dBµV/m	40 dBµV/m	-11,0 dB

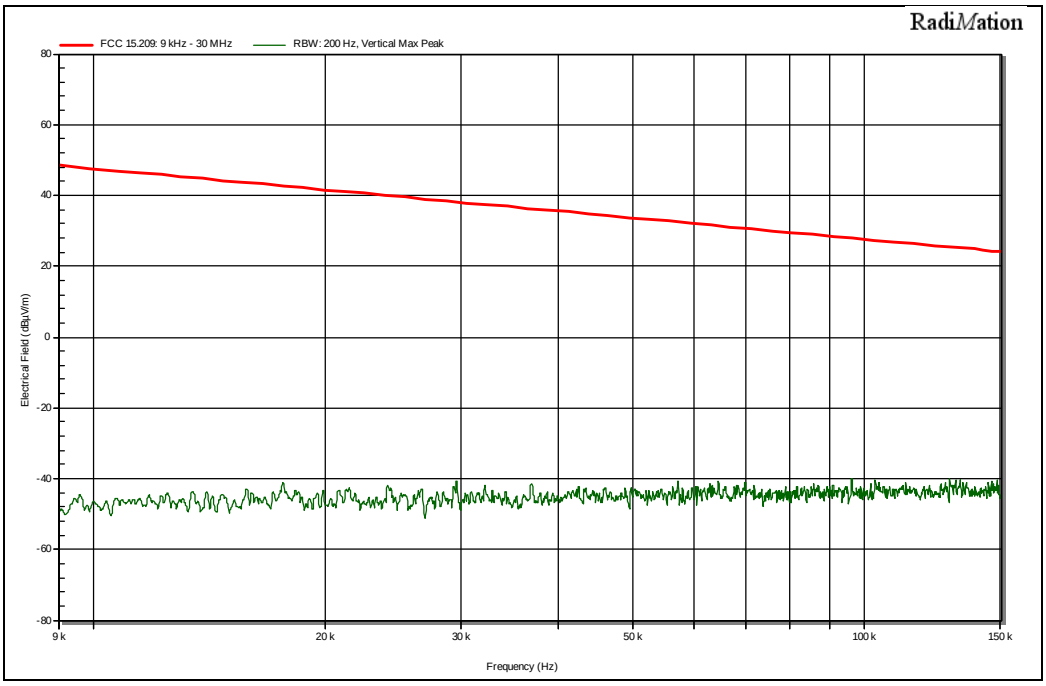
Measured peaks 1 – 18 GHz Low channel

Frequency	Polarization	Height	Peak	Average	Peak Limit	Average Limit	Peak Difference	Average Difference
4,851 GHz	Vertical	1 m	49,9 dBµV/m	42,4 dBµV/m	74 dBµV/m	54 dBµV/m	-24,1 dB	-11,6 dB
7,273 GHz	Vertical	2,7 m	48,8 dBµV/m	39,4 dBµV/m	74 dBµV/m	54 dBµV/m	-25,2 dB	-14,6 dB
9,702 GHz	Vertical	3,7 m	51,4 dBµV/m	41,9 dBµV/m	74 dBµV/m	54 dBµV/m	-22,6 dB	-12,1 dB

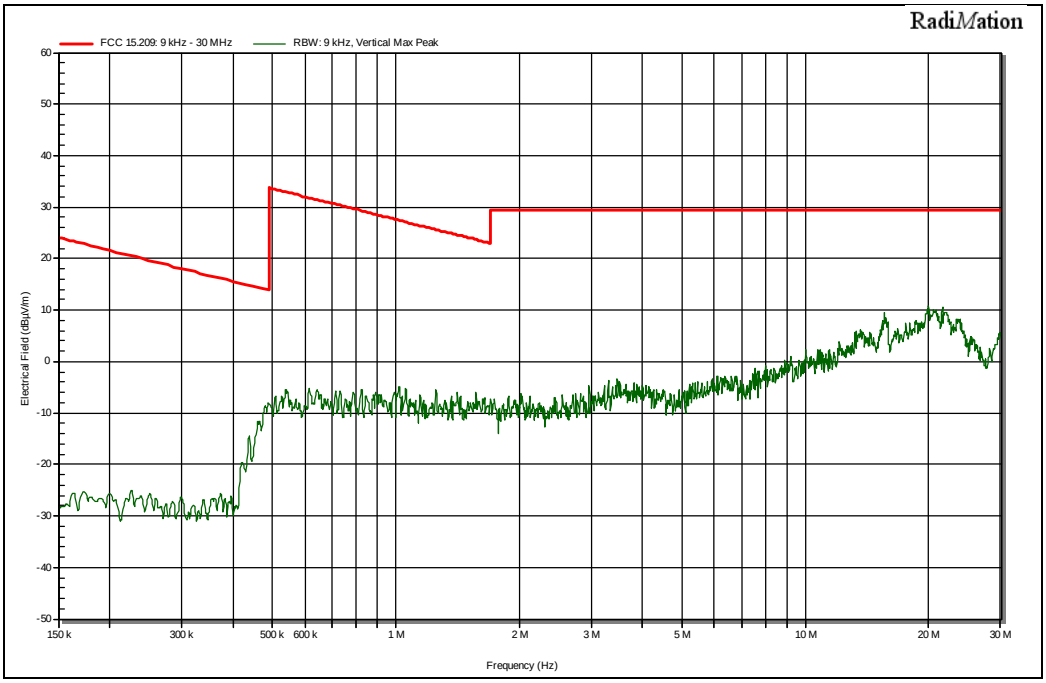
3.1.7 Plots of the Radiated Spurious Emissions (standby mode)

9 kHz to 150 kHz

Parallel

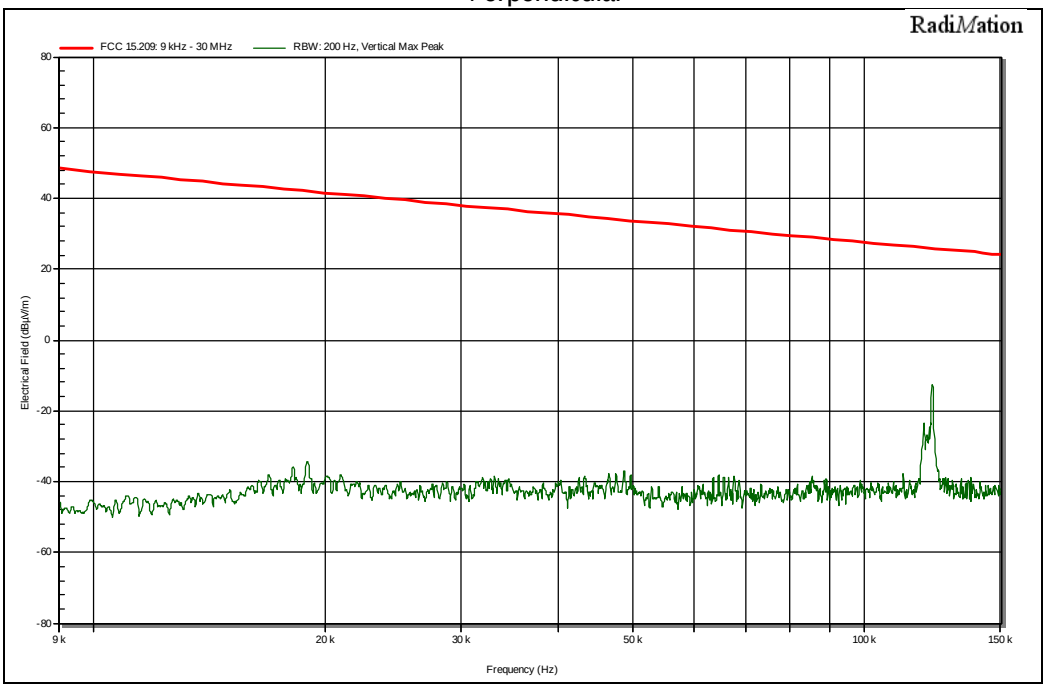


150 kHz to 30 MHz

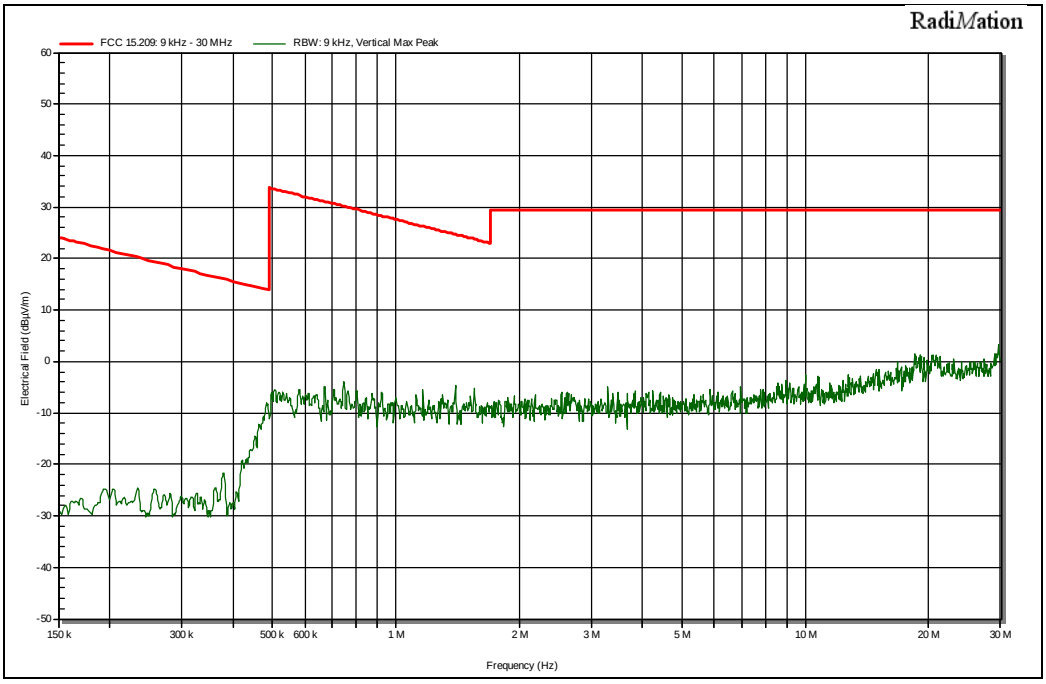


9 kHz to 150 kHz

Perpendicular

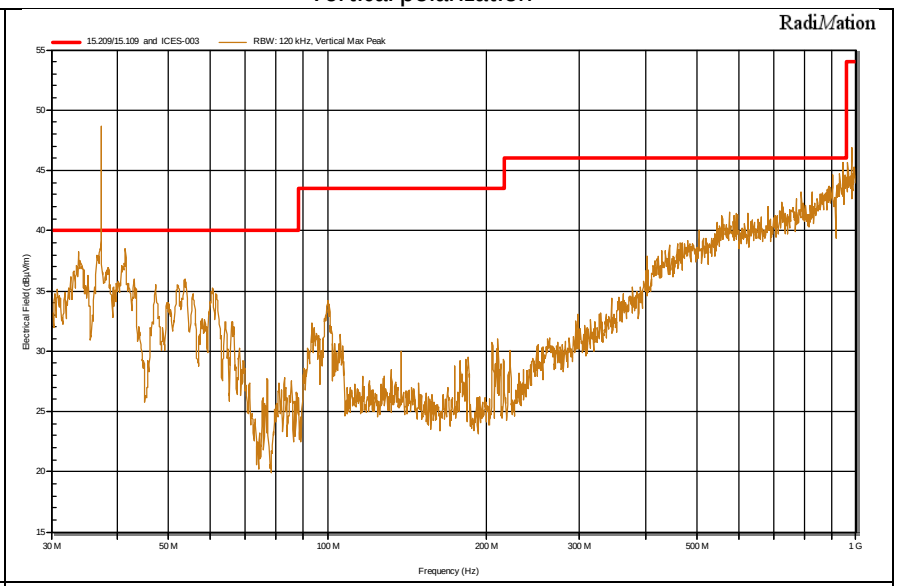
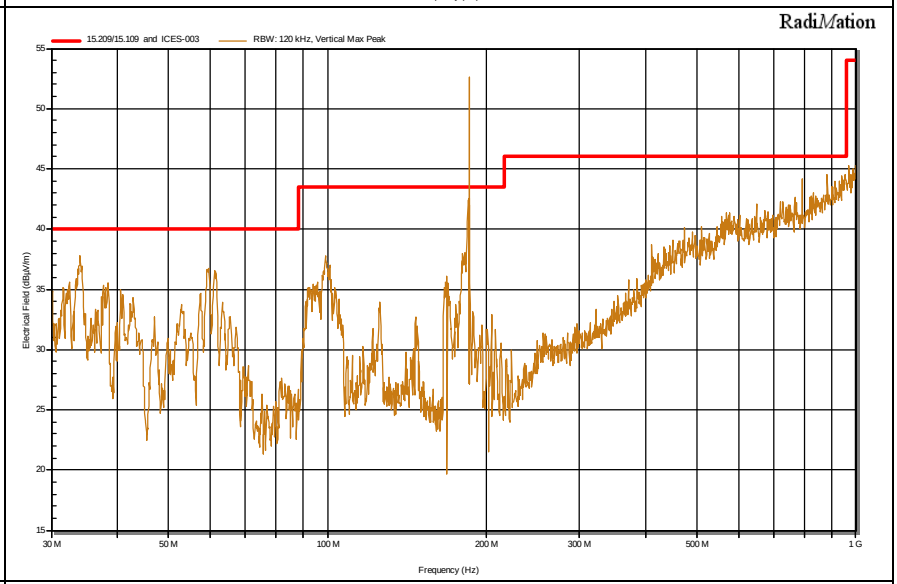
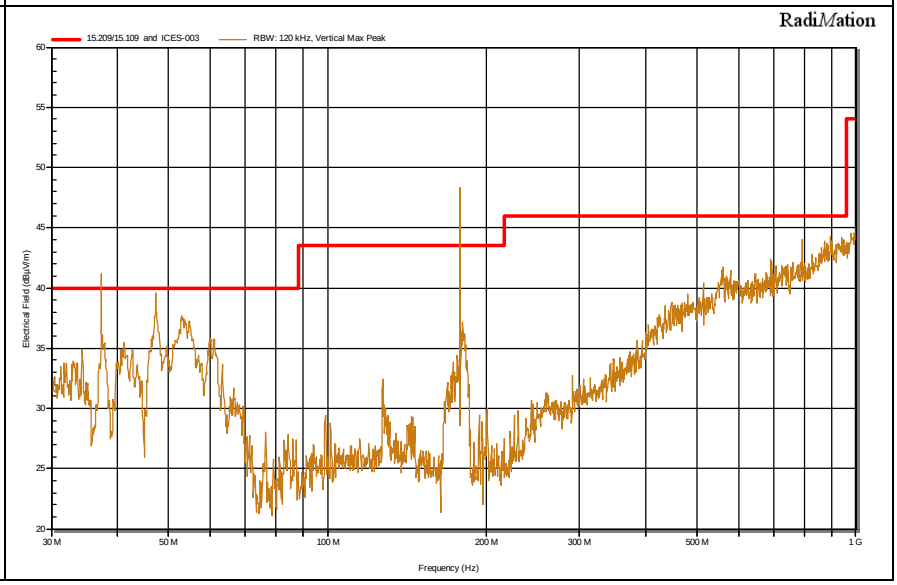


150 kHz to 30 MHz



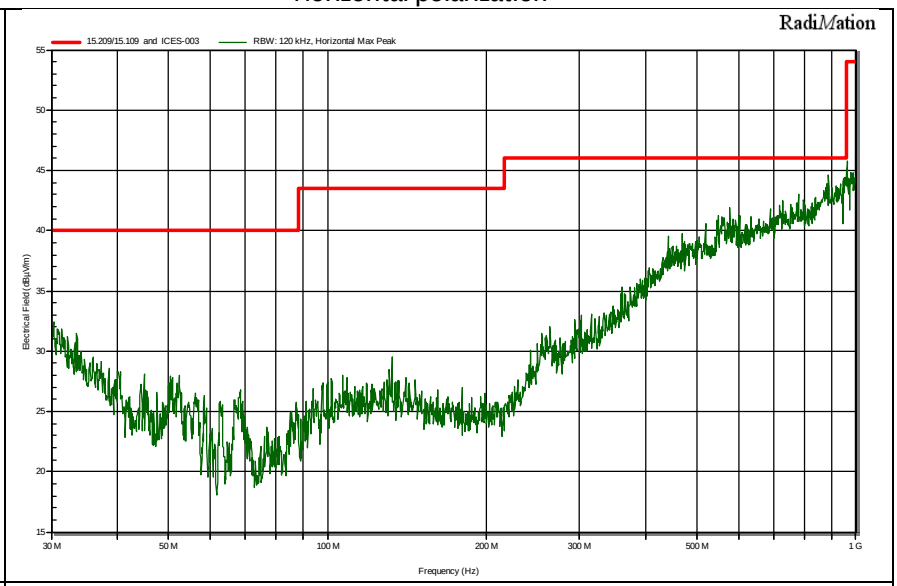
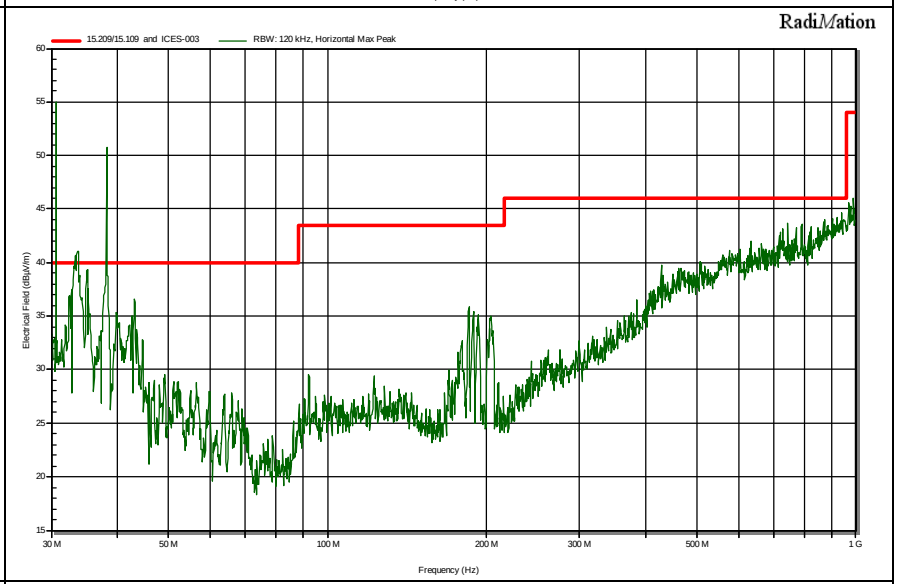
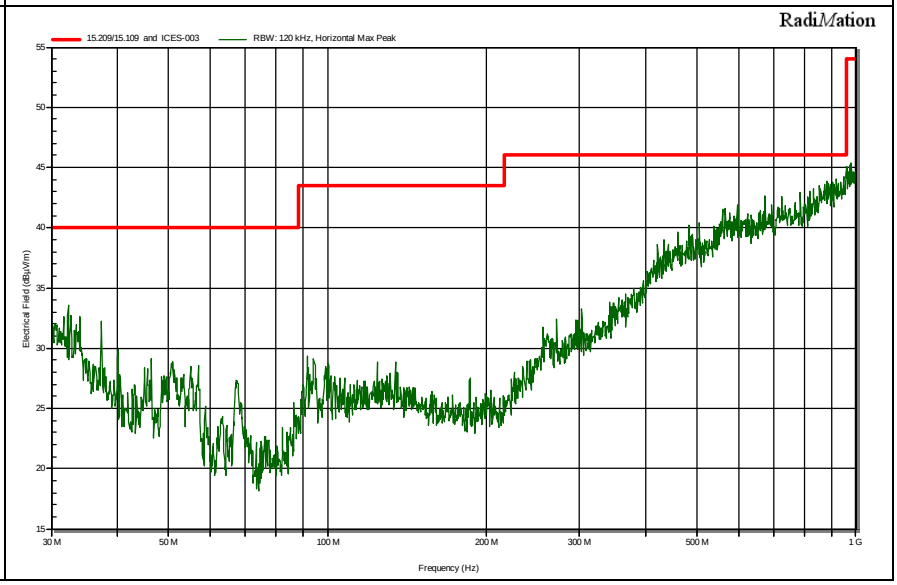
30 MHz to 1 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

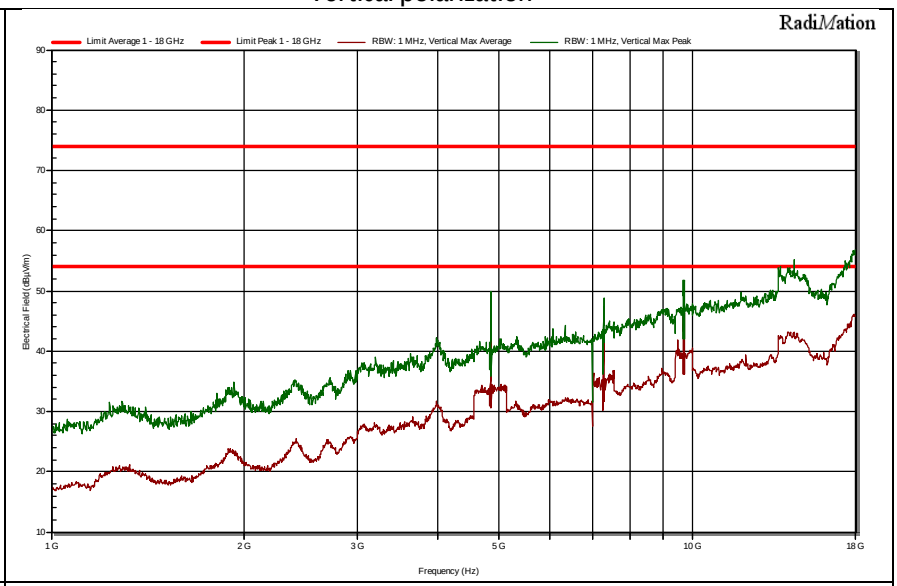
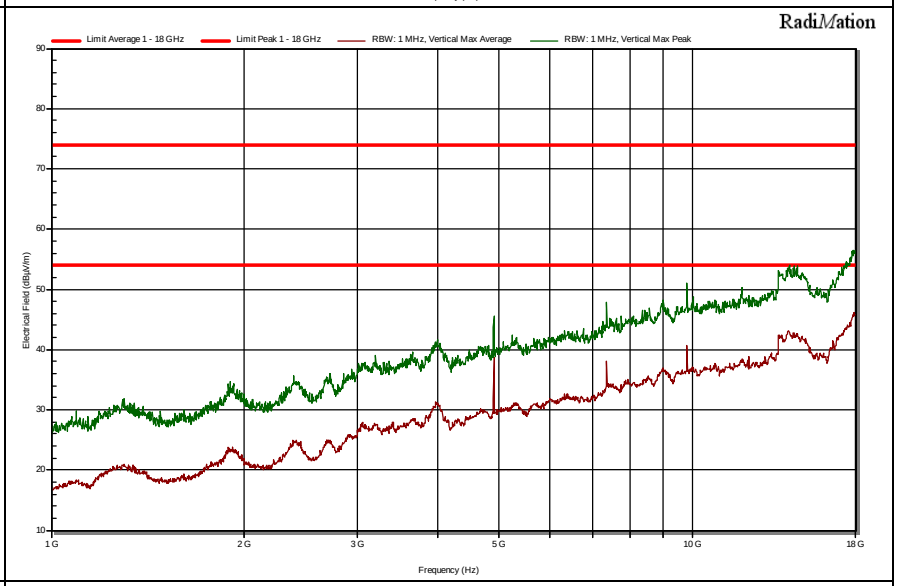
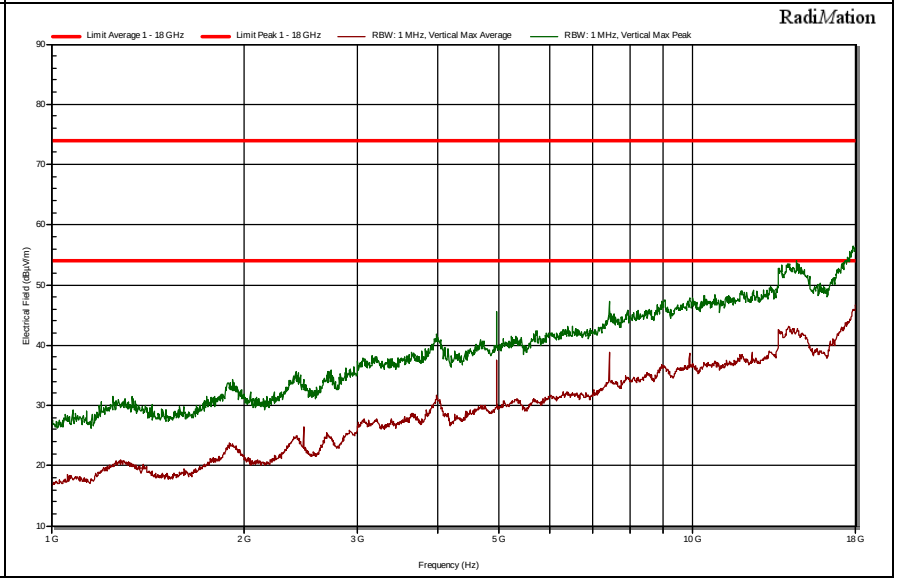
30 MHz to 1 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

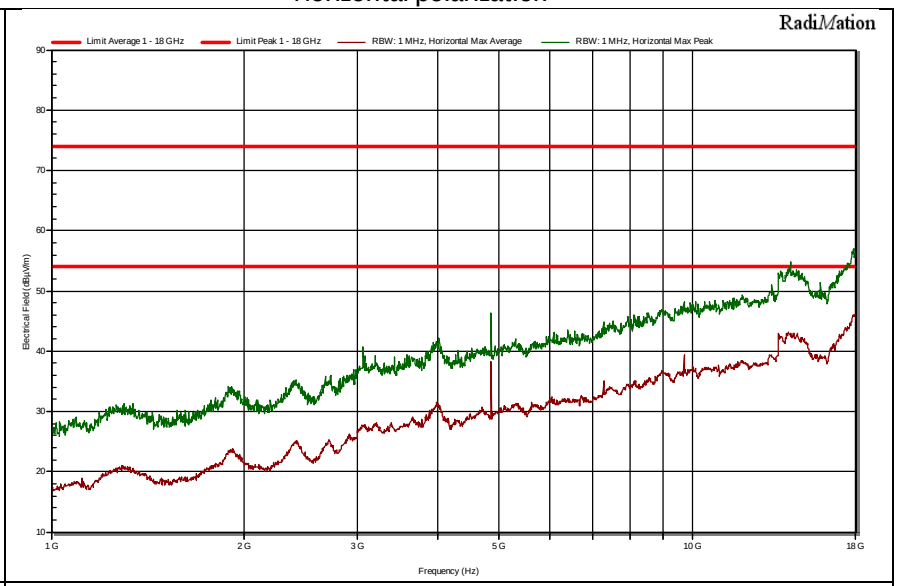
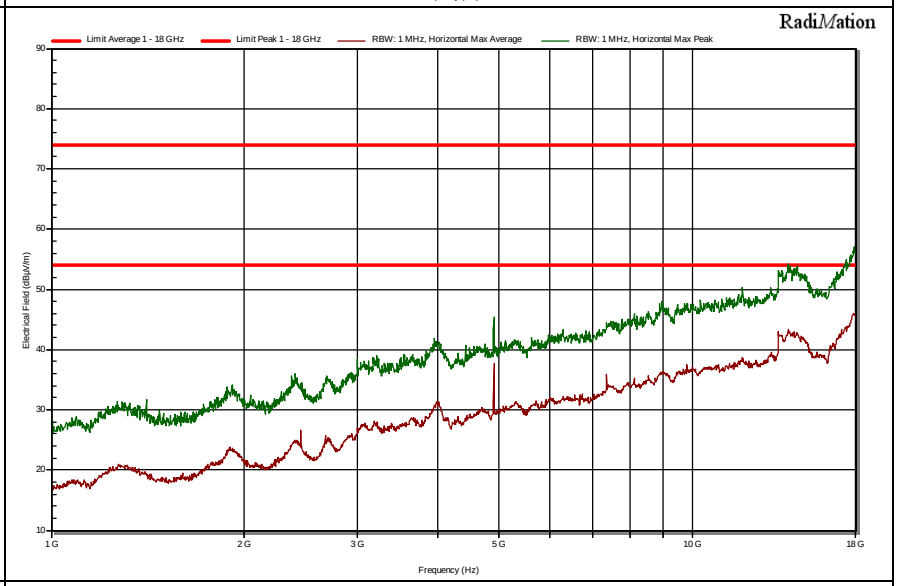
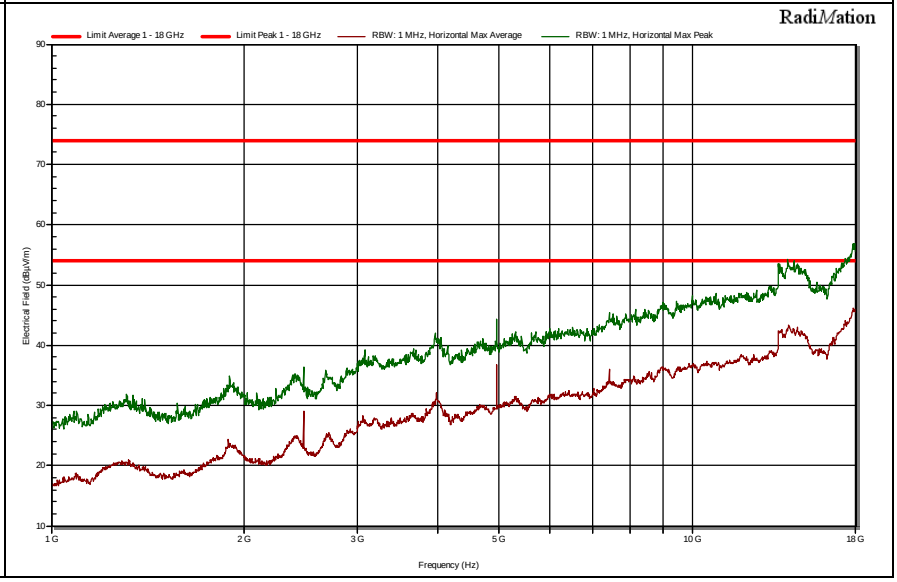
1 GHz to 18 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

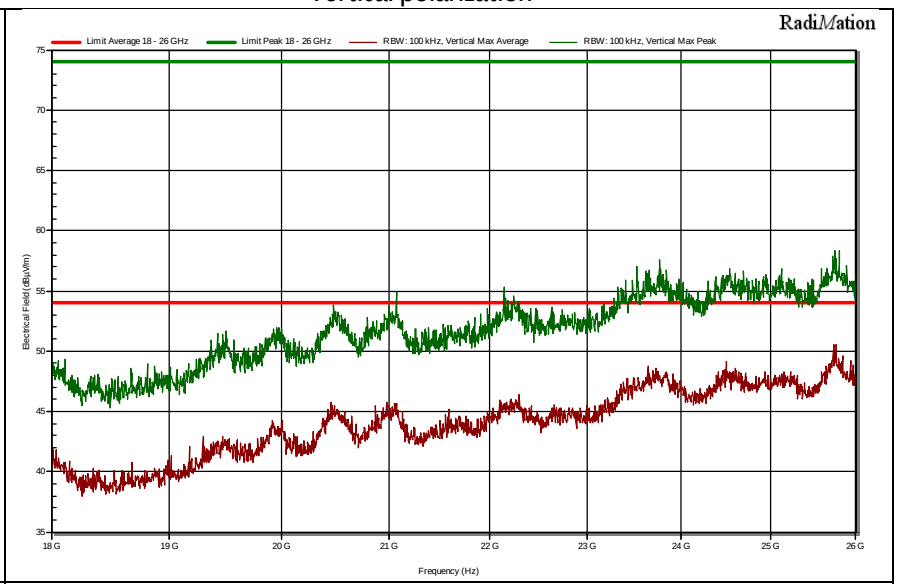
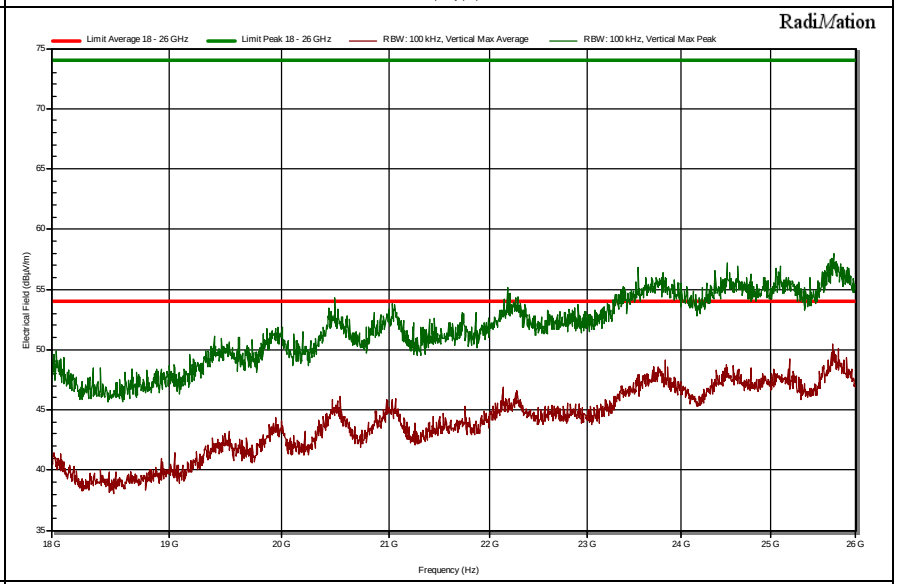
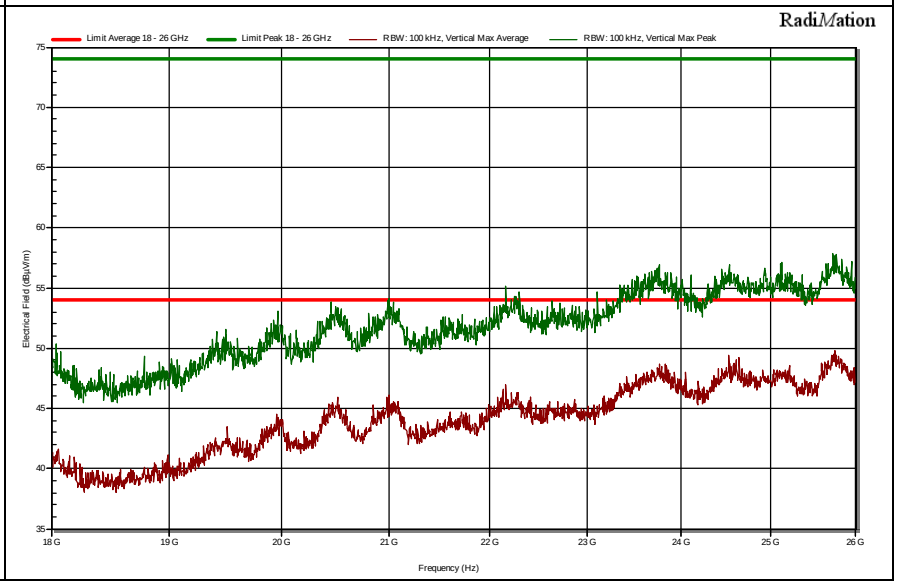
1 GHz to 18 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

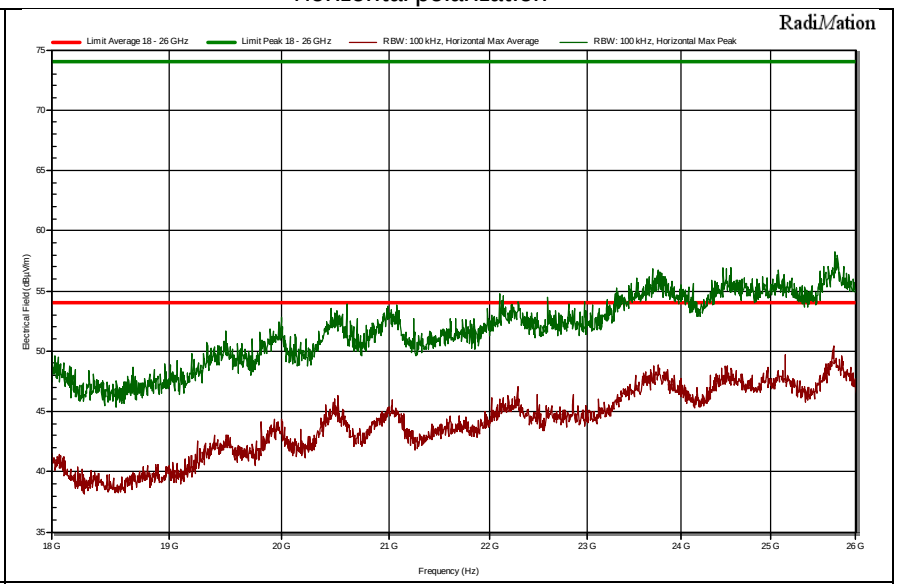
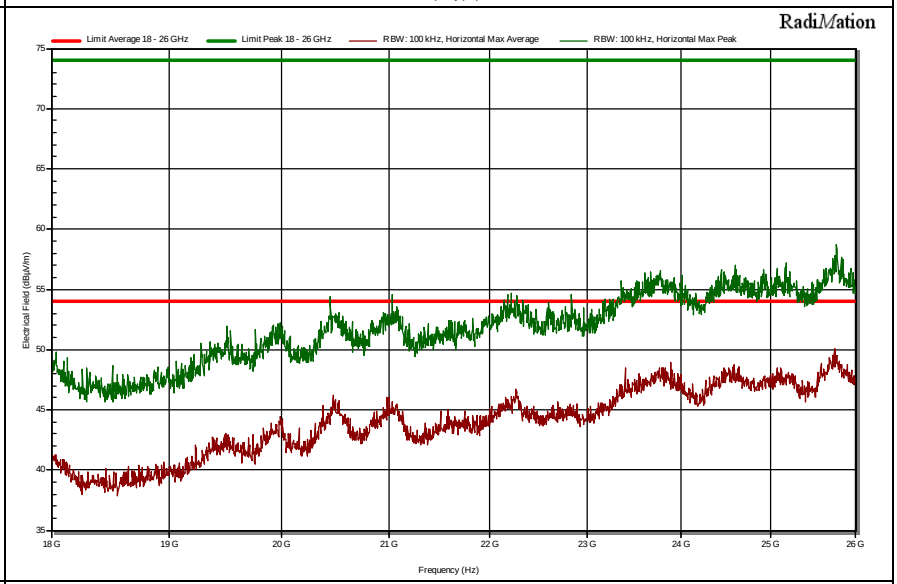
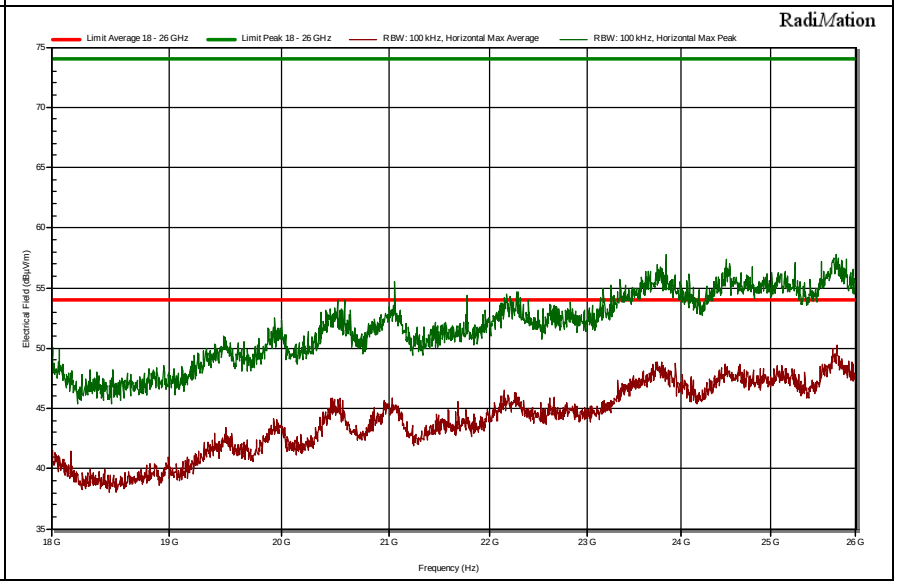
18 GHz to 26 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

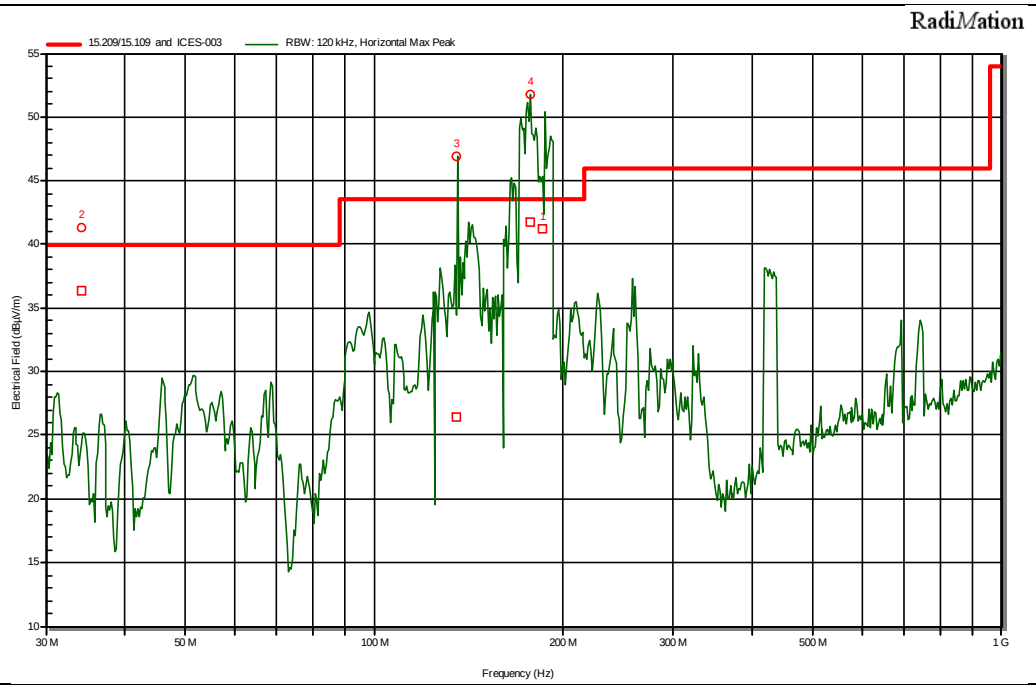
18 GHz to 26 GHz

Horizontal polarization

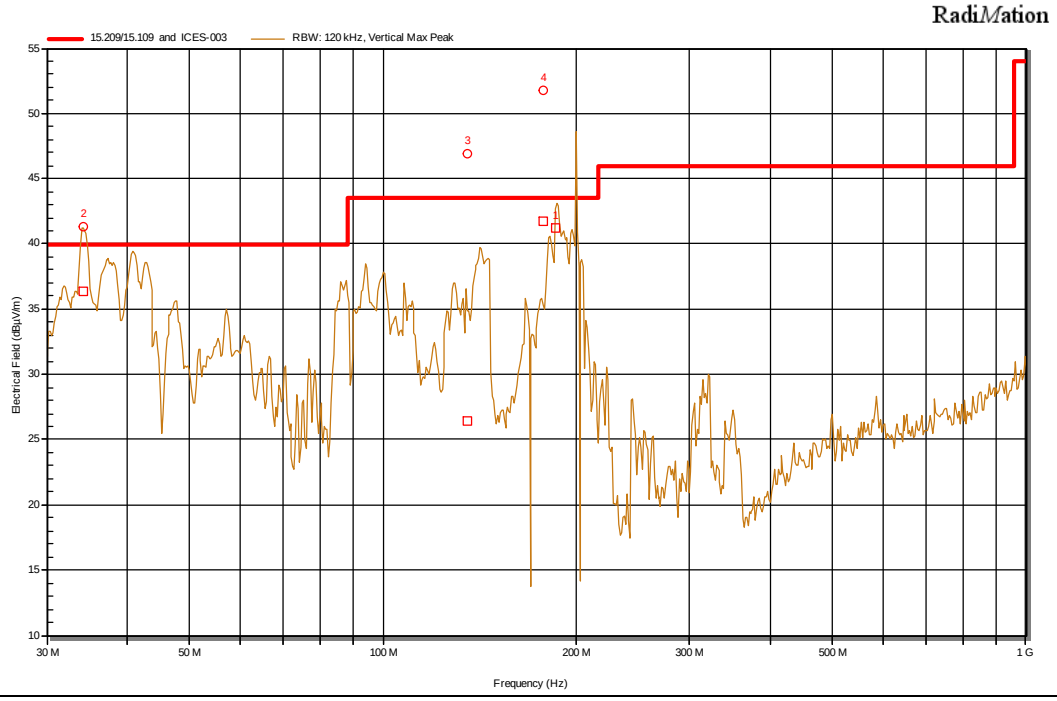
Low ch	
Mid ch	
High ch	

3.1.8 Test results of the radiated spurious emissions (running mode)

Hor. Pol.



Vert. Pol.



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Status	Polarization
1	185,976 MHz	41,2 dBµV/m	43,5 dBµV/m	Pass	Vertical
2	34,113 MHz	36,3 dBµV/m	40 dBµV/m	Pass	Vertical
3	135,593 MHz	26,4 dBµV/m	43,5 dBµV/m	Pass	Horizontal
4	177,234 MHz	41,7 dBµV/m	43,5 dBµV/m	Pass	Horizontal

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.
Standby mode

3.2.5 Test Results of the 6 dB bandwidth Measurement

Technology Std.	Channel	Frequency (MHz)	Data rate	6dB bandwidth (kHz)
Zigbee	15	2425	250 kbps	1382.6
	20	2450	250 kbps	1549.4
	25	2475	250 kbps	1574.9
Uncertainty	± 36.2 kHz			

3.3 99% Occupied Bandwidth

3.3.1 Limit

According to RSS-Gen 6.7

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

IRN 017 - Occupied bandwidth (Hz) Method 1 – XX % power bandwidth.

1. Set the centre frequency to the nominal EUT channel centre frequency
2. Set span = 1.5 times to 0.5 times the Occupied Bandwidth
3. Set VBW ≥ 3x RBW
4. Video averaging is not permitted. Where practical, detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

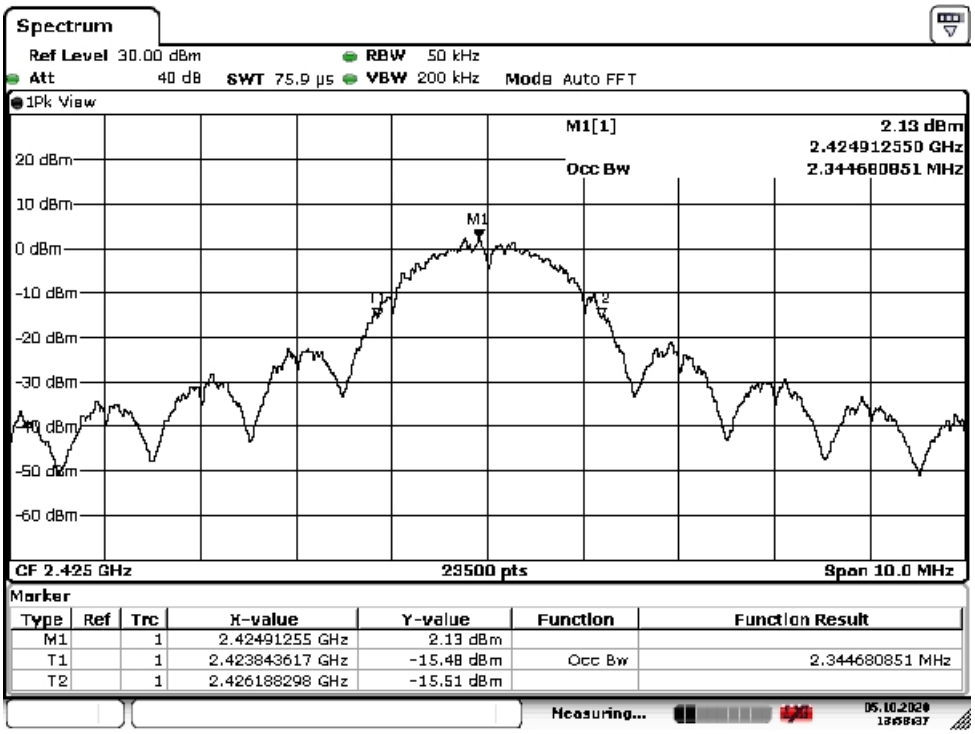
Standby mode

3.3.5 Test results of the 99% occupied bandwidth measurement

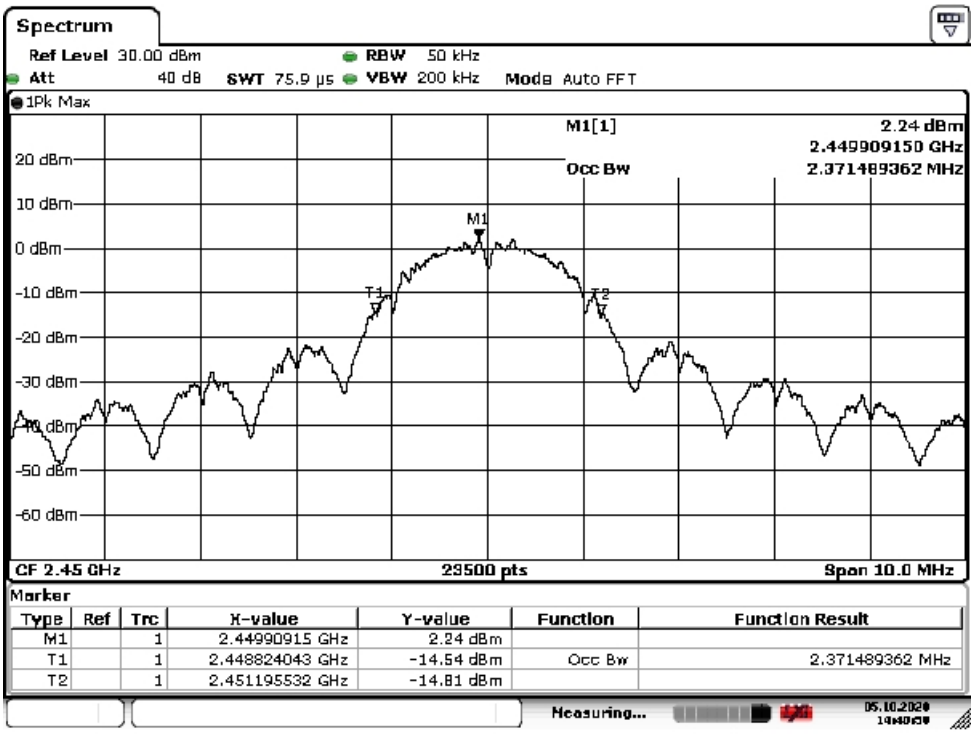
Technology Std.	Channel	Frequency (MHz)	Data rate	99% bandwidth (kHz)
Zigbee	15	2425	250 kbps	2344
	20	2450	250 kbps	2371
	25	2475	250 kbps	2400
Uncertainty	± 12 kHz			

3.3.6 Plots of the 99% occupied bandwidth measurement

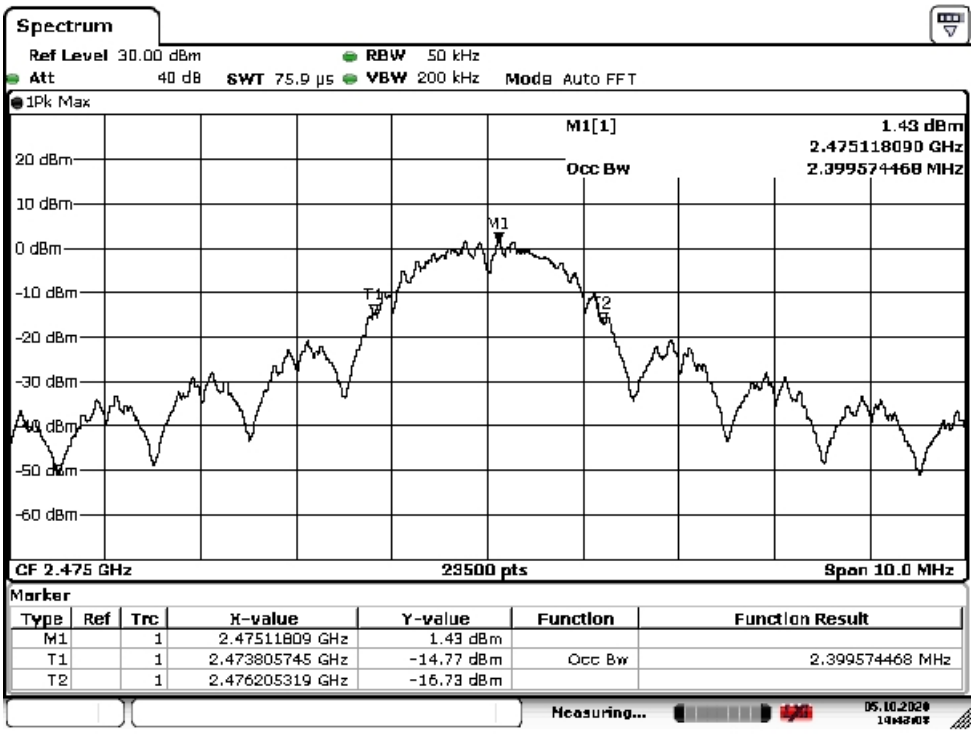
Channel 15



Channel 20



Channel 25


Spectrum
Ref Level 30.00 dBm
RBW 50 kHz
Att 40 dB
SWT 75.9 µs
VBW 200 kHz
Mode Auto FFT
1Pk Max
M1[1]
1.43 dBm
2.475118090 GHz
Occ Bw
2.399574468 MHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M1
T1
T2
CF 2.475 GHz
29500 pts
Span 10.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.47511809 GHz 1.43 dBm
T1 1 2.473805745 GHz -14.77 dBm Occ Bw 2.399574468 MHz
T2 1 2.476205319 GHz -16.73 dBm
Measuring...
05.10.2020

3.4 Output Power Measurement

3.4.1 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.

3.4.2 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 014 - RF power (W) - Method 1 – AVGSA (DTS) according to ANSI C63.10.

Standby mode

3.4.5 Test results of Output Power Measurement

Peak method

Technology Std.	Channel	Frequency (MHz)	Data rate	Peak output power (dBm)
Zigbee	15	2425	250 kbps	9.2
	20	2450	250 kbps	9.0
	25	2475	250 kbps	8.8
Uncertainty	±0.7 dB			

3.5 Power Spectral Density

3.5.1 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.

3.5.2 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.
IRN 030 - Spectral power density (W per n.Hz) - Method 5 – Peak method PKPSD (PSD in 3 kHz band)
Standby mode

3.5.5 Test results of Power Spectral Density Measurement

Peak Power spectral density

Technology Std.	Channel	Frequency (MHz)	Data rate	PSD (dBm/3 kHz)
Zigbee	15	2425	250 kbps	-7.2
	20	2450	250 kbps	-6.9
	25	2475	250 kbps	-6.7
Uncertainty	±2.0 dB			

3.6 Band edge Measurement

3.6.1 Limit

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

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

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.
Standby mode

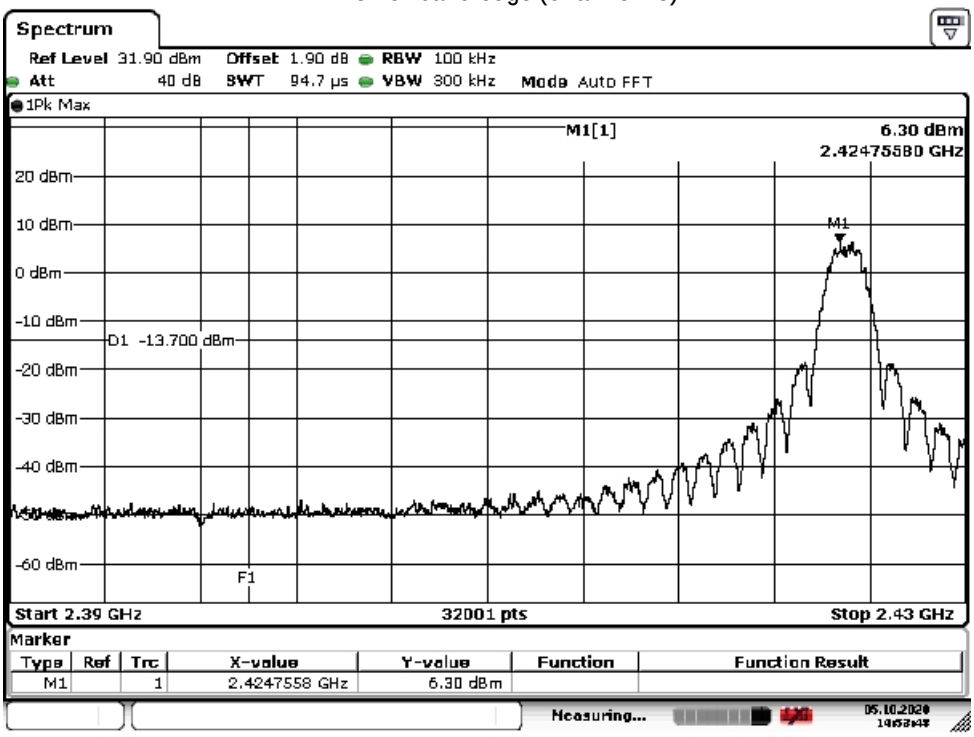
3.6.5 Measurement Uncertainty

± 5.7 dB.

3.6.6 Plots of the Band edge Measurements

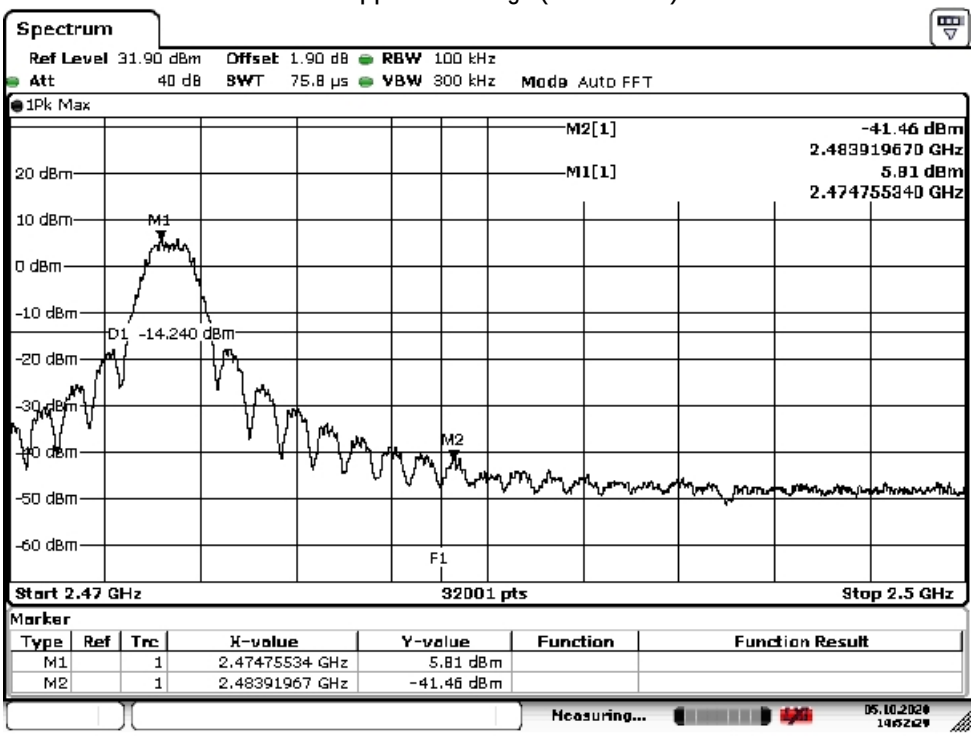
See next page

BLE Lower band edge (Channel 15)



Date: 5.OCT.2020 14:53:48

BLE Upper band edge (Channel 25)



Date: 5.OCT.2020 14:52:29

3.7 Conducted emissions

3.7.1 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.

3.7.2 Measurement instruments

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

3.7.3 Test setup

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

3.7.4 Test procedure

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

3.7.5 Test results and plots of the AC mains conducted measurement

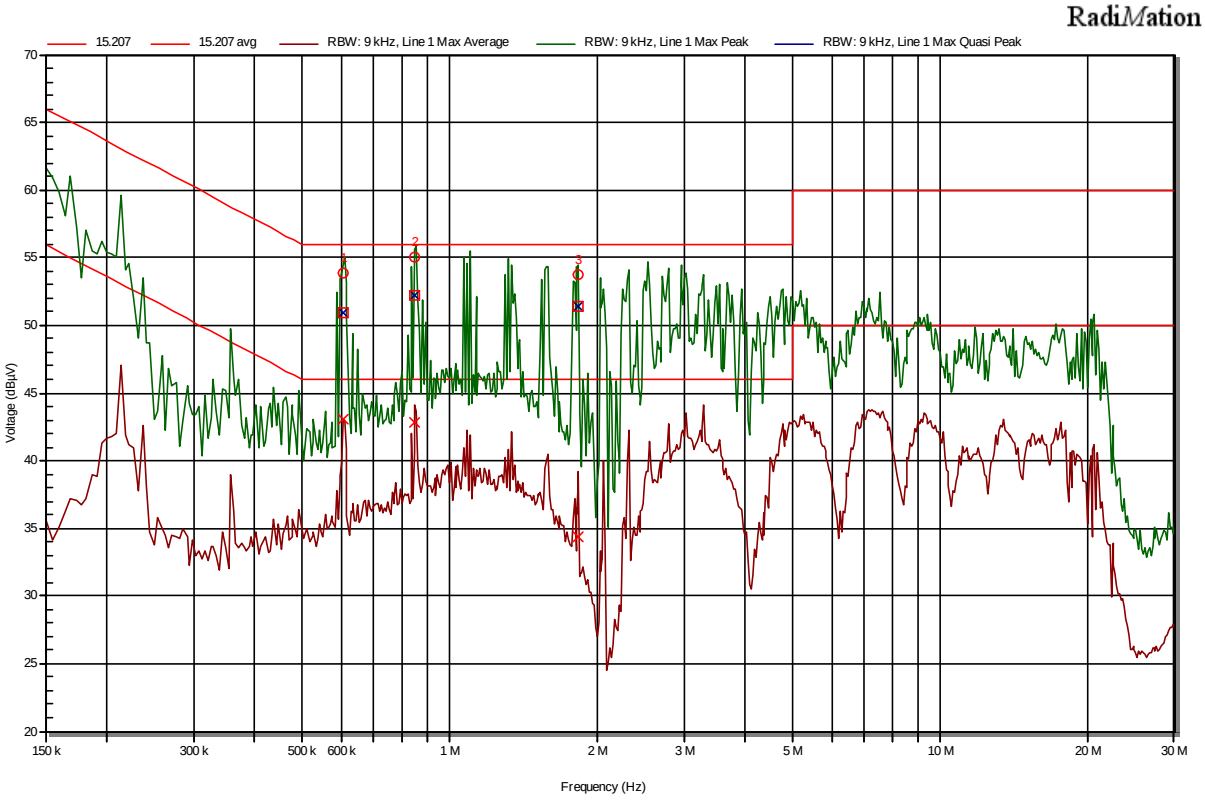
See next page.

3.7.6 Measurement uncertainty

+/- 3.6 dB

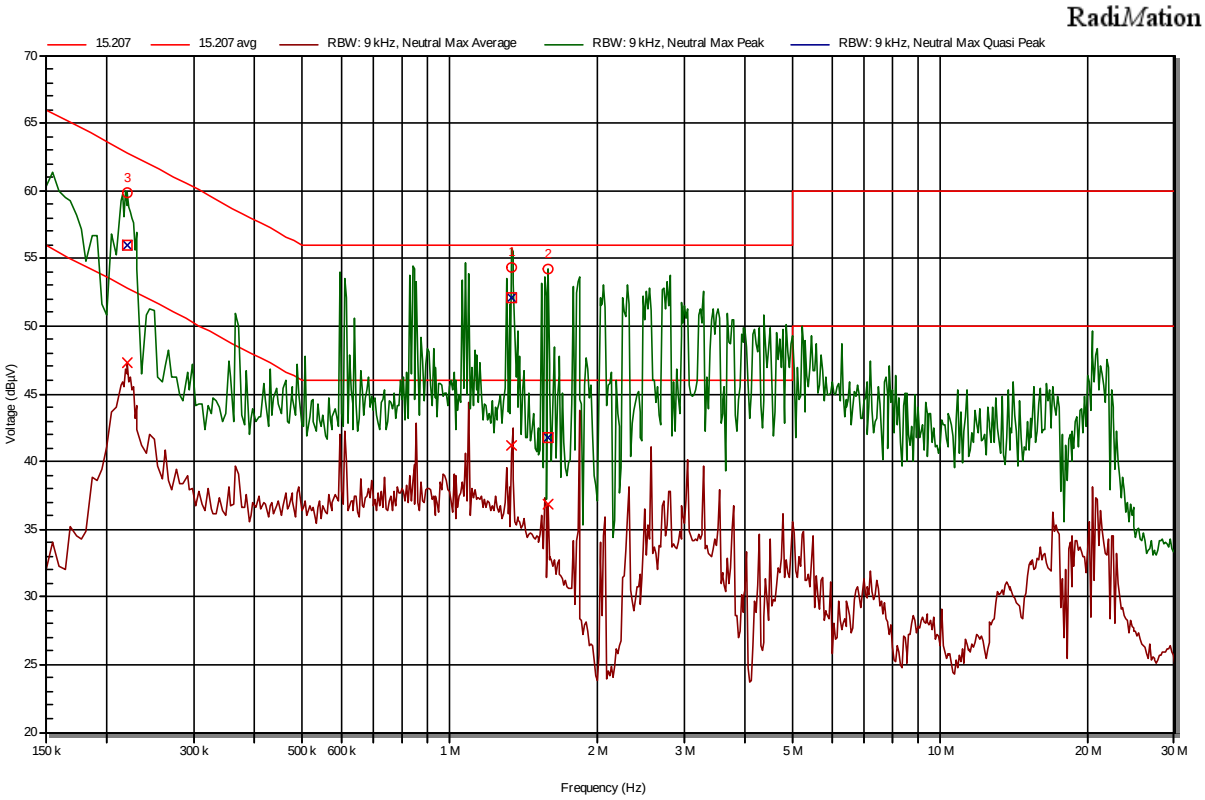
3.7.7 Plots of the AC mains conducted spurious measurement

Phase



Peak Number	Frequency	Average	Average Limit	Quasi-Peak	Quasi-Peak Limit	Status
1	605,85 kHz	43,1 dBµV	46 dBµV	50,9 dBµV	56 dBµV	Pass
2	851,1 kHz	42,9 dBµV	46 dBµV	52,2 dBµV	56 dBµV	Pass
3	1,828 MHz	34,4 dBµV	46 dBµV	51,4 dBµV	56 dBµV	Pass

Neutral



Peak Number	Frequency	Average	Average Limit	Quasi-Peak	Quasi-Peak Limit	Status
1	1,339 MHz	41,2 dBµV	46 dBµV	52,1 dBµV	56 dBµV	Pass
2	1,583 MHz	36,8 dBµV	46 dBµV	41,8 dBµV	56 dBµV	Pass
3	219,75 kHz	47,3 dBµV	52,8 dBµV	56 dBµV	62,8 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