telefication bv
The Netherlands
Chamber of Commerce
51565536
www.telefication.com

telefication

FCC Report for Parts 15.247, 15.207

Product name : WSN Node

Applicant : Evalan

FCC ID : 2AK2M-EVAWSN-N15

Test report No. : 170100161 Ver 1.00

Laboratory information

Accreditation

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

The Industry Canada registration number for the 3 meter test chamber of Telefication is: 4173A-1.

Documentation

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2005. 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).

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

Revision History

Version	Date	Remarks	By
v0.50	23-01-2017	First draft	PS
v1.00	30-03-2017	Initial release	PS

Table of Contents

Summary of Test results

FCC	Description	Section in report	Verdict
15.247(a)	6dB Bandwidth	3.1	Pass
15.247(b)(c)	RF output power	3.2	Pass
15.247(e)	Power spectral density	3.3	Pass
15.247(d)	Radiated Spurious emissions	3.4	Pass
15.209 (a)	Radiated Spurious emissions	3.4	Pass
15.205 (a)	Spurious emissions in the restricted bands	3.4	Pass
15.207 (a)	Conducted spurious on AC mains	3.5	Pass

1 General Description

1.1 Applicant

Client name:	Evalan B.V.
Address	Sarphatistraat 638
Zip code:	1018 AV
Telephone:	+31 (0)20-7790344
E-mail:	emiel.kleinsman@evalan.com
Contact name:	Emiel Kleinsman

1.2 Manufacturer

Manufacturer name:	Evalan B.V.
Address:	Sarphatistraat 638
Zip code:	1018 AV
Telephone:	+31 (0)20-7790344
E-mail:	emiel.kleinsman@evalan.com
Contact name:	Emiel Kleinsman

1.3 Tested Equipment Under Test (EUT)

Product name:	Evalan WSN Node
Brand name:	Evalan
Product type:	--
FCC ID:	2AK2M-EVAWSN-N15
Model(s):	--
Software version:	--
Hardware version:	v1.5
Date of receipt	16-01-2017
Tests started:	16-01-2017
Testing ended:	17-01-2017

1.4 Product specifications of Equipment under test

Tx Frequency range (MHz)	Bluetooth Low Energy (BLE): 2402 – 2480
Rx frequency range (MHz)	Bluetooth Low Energy (BLE): 2402 – 2480
Maximum output power to antenna (dBm)	Bluetooth Low Energy (BLE): +5
Antenna type	PIFA
Antenna gain (dBi)	3.3
Type of modulation	Bluetooth Low Energy (BLE): GFSK
Emission designator	1M00G1D

1.5 Modification of the Equipment Under Test (EUT)

None.

1.6 Observations and remarks

The product is a lighting control device which contains a DALI interface, several sensors and a module with Bluetooth Low Energy 4.0 specification. Through this module a wireless data link is established in order to communicate sensor information. In this report the Bluetooth Low Energy 4.0 test results are laid down.

1.7 Environmental conditions

Test date	16-01-2017	17-01-2017
Ambient temperature	24.3 °C	24.0 °C
Humidity	23.4 % RH	25.0 % RH

1.8 Measurement Standards

- FCC KDB Publication No. 558074 D01DTS Meas. Guidance V03r05
- ANSI C63.10:2013

1.9 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 §15.247, §15.207

1.10 Conclusions

The sample of the product showed NO NON-COMPLIANCES to the specifications stated in paragraph 1.9 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 1.9 *"Applicable standards".*

All tests are performed by:

Name : ing P.A. Suringa

Review of test methods and report by:

Name : ing R. van Barneveld

The above conclusions have been verified by the following signatory:

Date : 03-04-2017

Name : ing K.A. Roes

Function : Coordinator Radio laboratory

Signature :

2 Test configuration of the Equipment Under Test

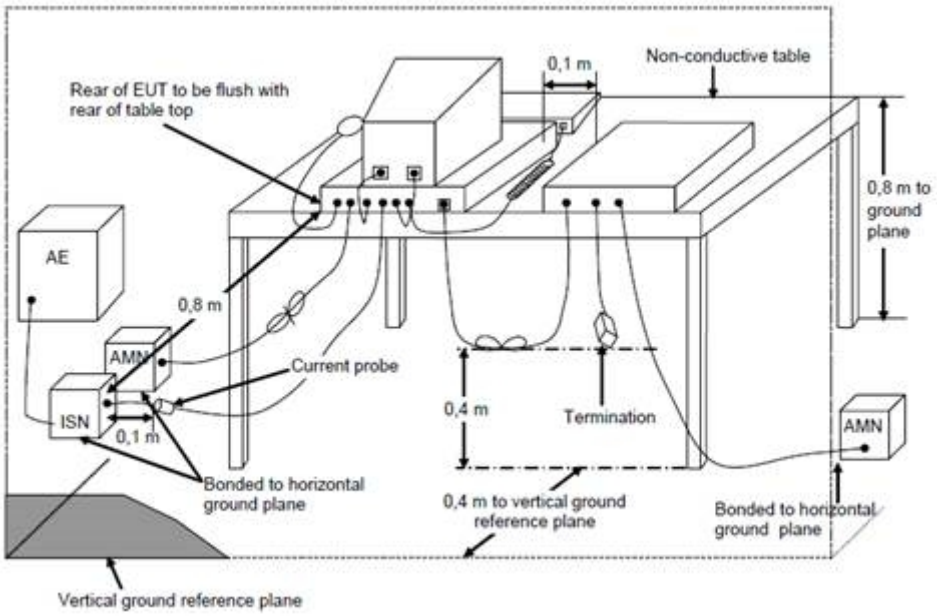
2.1 Test mode

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

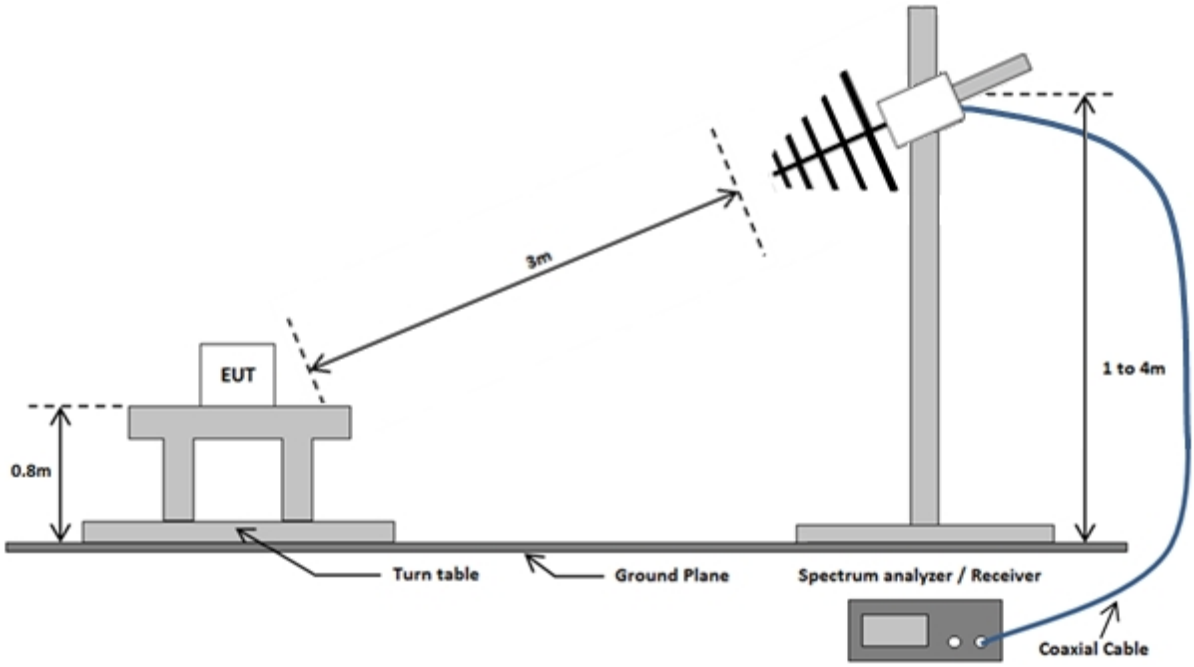
Technology	Channels	Data rate	Frequency (MHz)
Bluetooth Low Energy	37	1Mbps	2402
	17	1Mbps	2440
	39	1Mbps	2480

2.3 Conducted Test setup (AC mains)

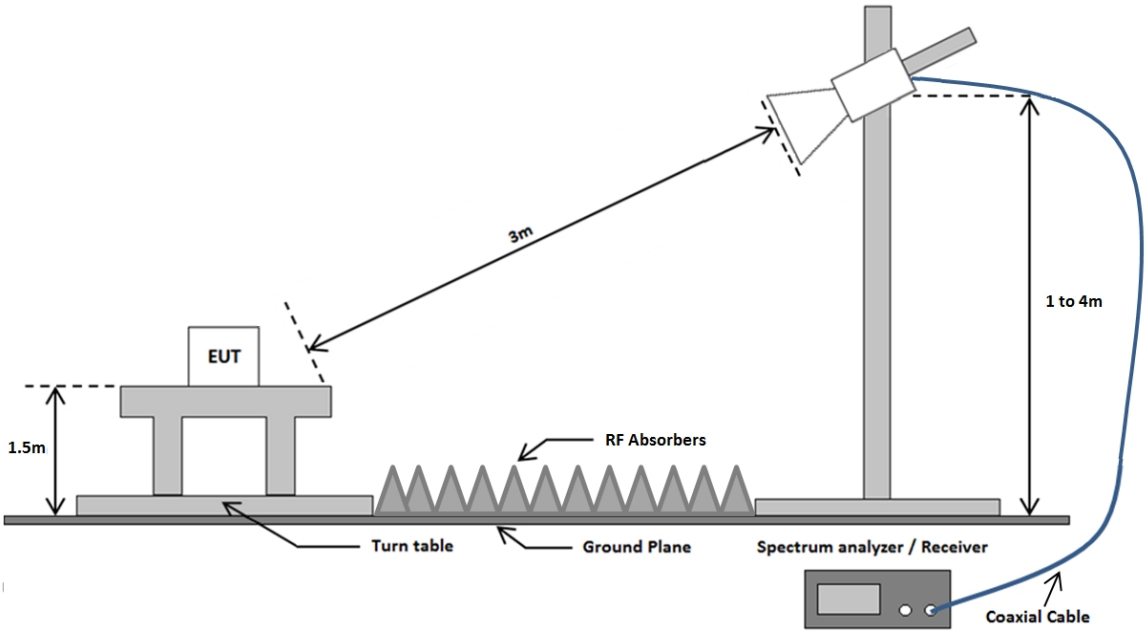


2.4 Radiated Test setup

Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



2.5 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Used at Par.
Spectrum Analyzer	Rohde & Schwarz	FSP40	TE11125	3.1, 3.2, 3.3, 3.4
Spectrum Analyzer	Rohde & Schwarz	ESR7	TE01220	3.4
Biconilog Antenna	Chase	CBL6112A	TE00967	3.4
Horn Antenna	EMCO The Electro – Mechanics Co	3115	TE00531	3.4
Semi Anechoic Chamber (SAC)	Comtest Engineering BV	-	TE00861	3.4
Artificial Mains Network (AMN)	Rohde & Schwarz	ESH3-Z5	TE00208	3.5
Pulse limiter	Rohde & Schwarz	ESH3-Z2	TE00756	3.5
High pass filter	Wainwright instruments	WHK3.0/18G-10EF	TE01140	3.4
Pre-amplifier	Miteq	JF4-18004000-30-8P-A1	TE11131	3.4
Triple loop antenna	Schwarzbeck	HXYZ 9170	TE01311	3.4
Receiver	Rohde & Schwarz	ESCI	TE11128	3.5
Artificial Mains network (AMN)	Rohde & Schwarz	ESH3-Z5	TE00208	3.5

2.6 Sample calculations

Field Strength Measurement example:

Frequency (GHz)	Polarization	Height(m)	Peak (dBµV/m)
4.85	Vertical	1.5	45.1

The following relation applies:

E (dBµV/m) = U(dBµV) + AF (dB/m) – G (dB) + CL (dB)

Where:

E = Electric field strength
U = Measuring receiver voltage
AF = Antenna factor
G = Gain of the pre-amplifier
CL = Cable loss

(45.1 = 44.82 + 33 - 38.42 + 5.7)

3 Test results

3.1 6dB bandwidth Measurement

3.1.1 Limit

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

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.1.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.1.4 Test procedure

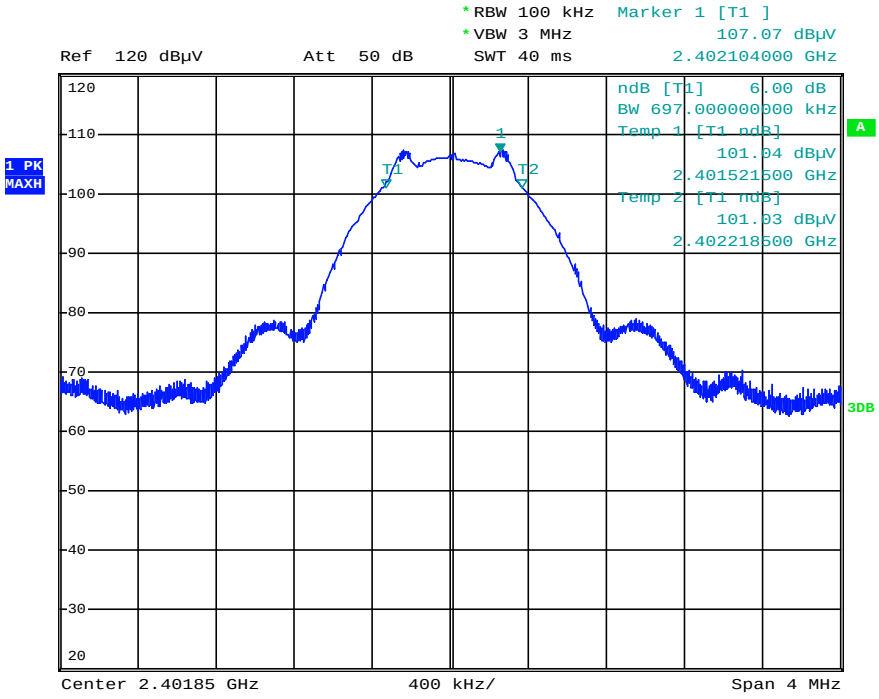
The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.

3.1.5 Test Results of the 6 dB bandwidth Measurement

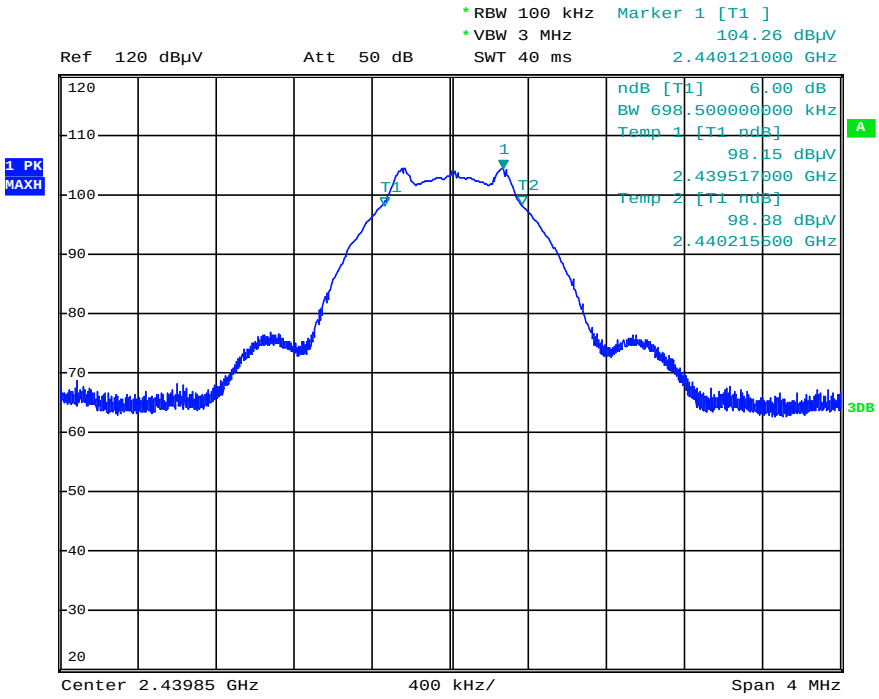
Technology Std.	Channel	Frequency (MHz)	Data rate	6dB bandwidth (MHz)
Bluetooth Low Energy	37	2402	1Mbps	0.697
	17	2440	1Mbps	0.6985
	39	2480	1Mbps	0.7115
Uncertainty	±2.8 kHz			

3.1.6 Plots of the 6 dB bandwidth Measurement

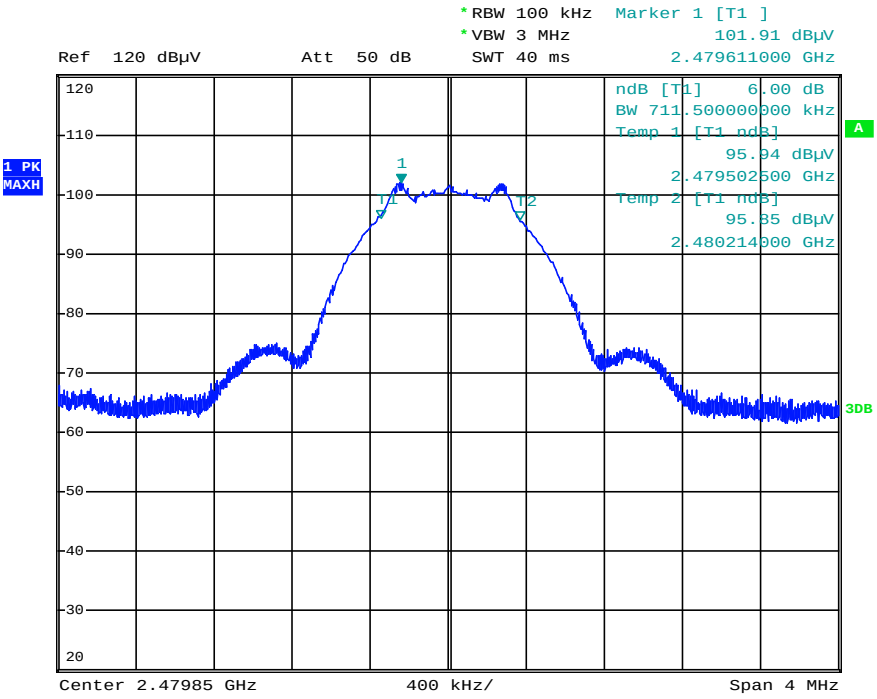
6 dB Bandwidth (Channel 37)



6 dB Bandwidth (Channel 17)



6 dB Bandwidth (Channel 39)



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 2.5 of this report.

3.2.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.2.4 Test procedure

The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.

3.2.5 Test results of Output Power Measurement

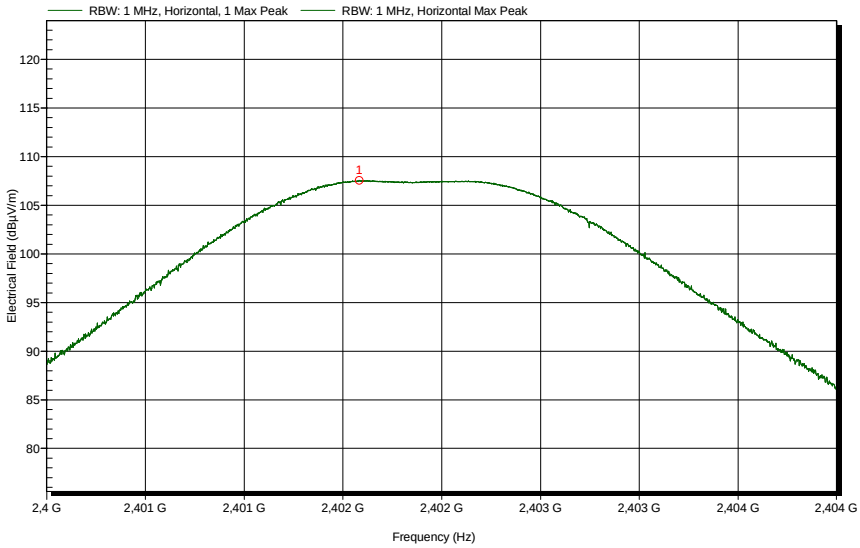
Peak method

Technology Std.	Channels	Frequency (MHz)	Data rate	Peak output power (dBm)
Bluetooth Low Energy	37	2402	1Mbps	15.7
	17	2440	1Mbps	15.8
	39	2480	1Mbps	14.6
Uncertainty	±1.78 dB			

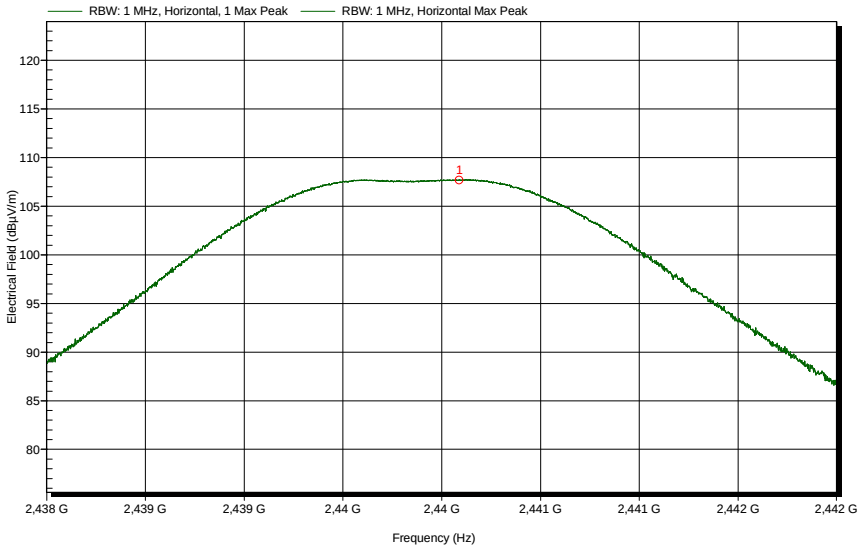
Note: Peak output power = Measured value + Antenna gain

3.2.6 Plots of Peak Output Power Measurement

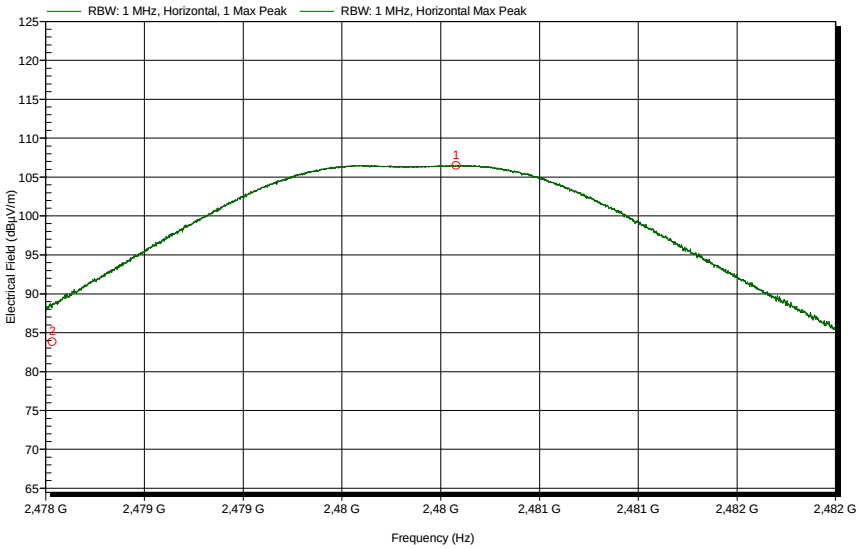
Peak Output Power (Channel 37)



Peak Output Power (Channel 17)



Peak Output Power (Channel 39)



3.3 Power Spectral Density

3.3.1 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.

3.3.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.3.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.3.4 Test procedure

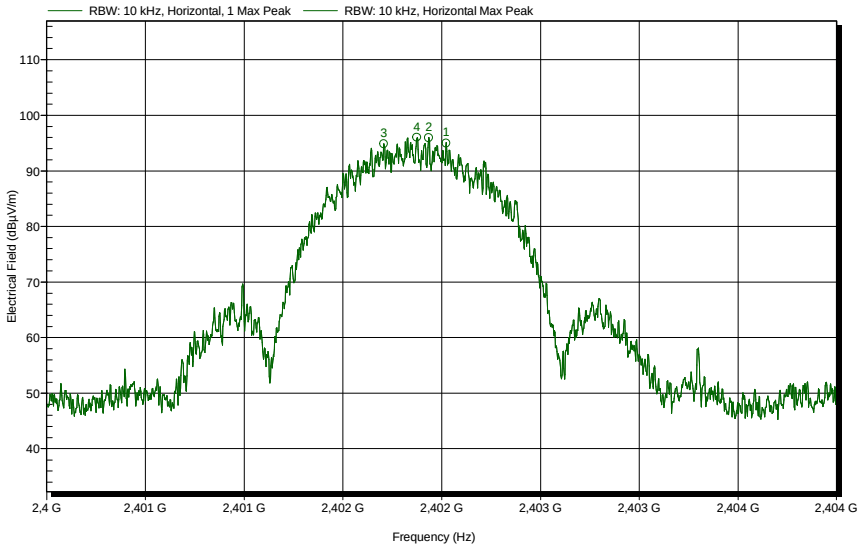
The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.

3.3.5 Test results of Power Spectral Density Measurement

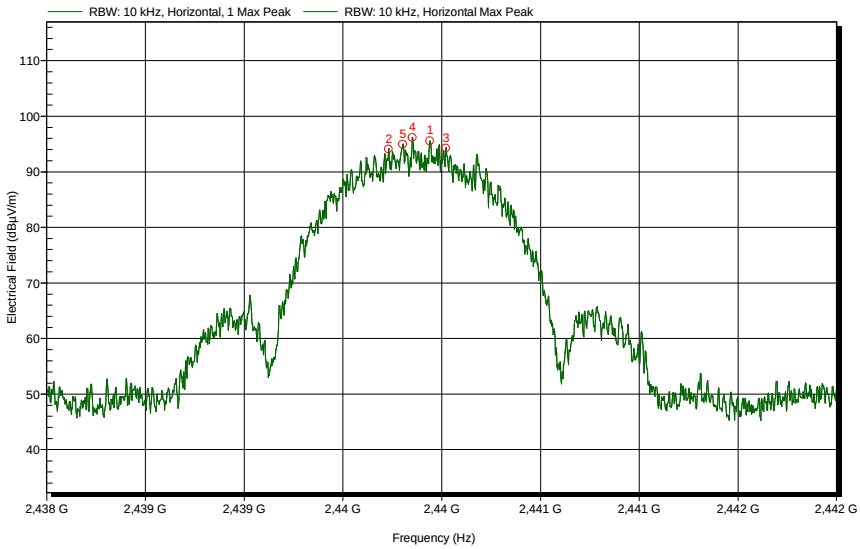
Technology Std.	Channels	Frequency (MHz)	Data rate	PSD/10 kHz (dBm)
Bluetooth Low Energy	37	2402	1Mbps	0.8
	17	2440	1Mbps	1.0
	39	2480	1Mbps	1.8
Uncertainty	±0.63 dB			

3.3.6 Plots of the Power Spectral Density Measurements

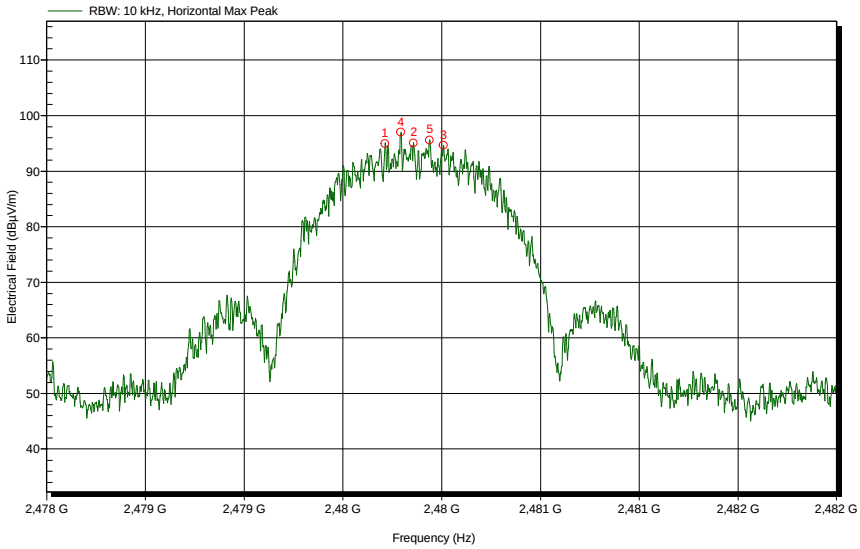
Power Spectral Density 10 kHz (channel 37)



Power Spectral Density 10 kHz (channel 17)



Power Spectral Density 10 kHz (channel 39)



3.4 Radiated Spurious Emissions Measurement

3.4.1 Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (µV/m)	Measurement distance(m)
0.009 - 0490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 - 30	30	30
30 -88	100	3
88 - 216	150	3
216-960	200	3
Above 960	500	3

3.4.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.4.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

3.4.4 Test procedure

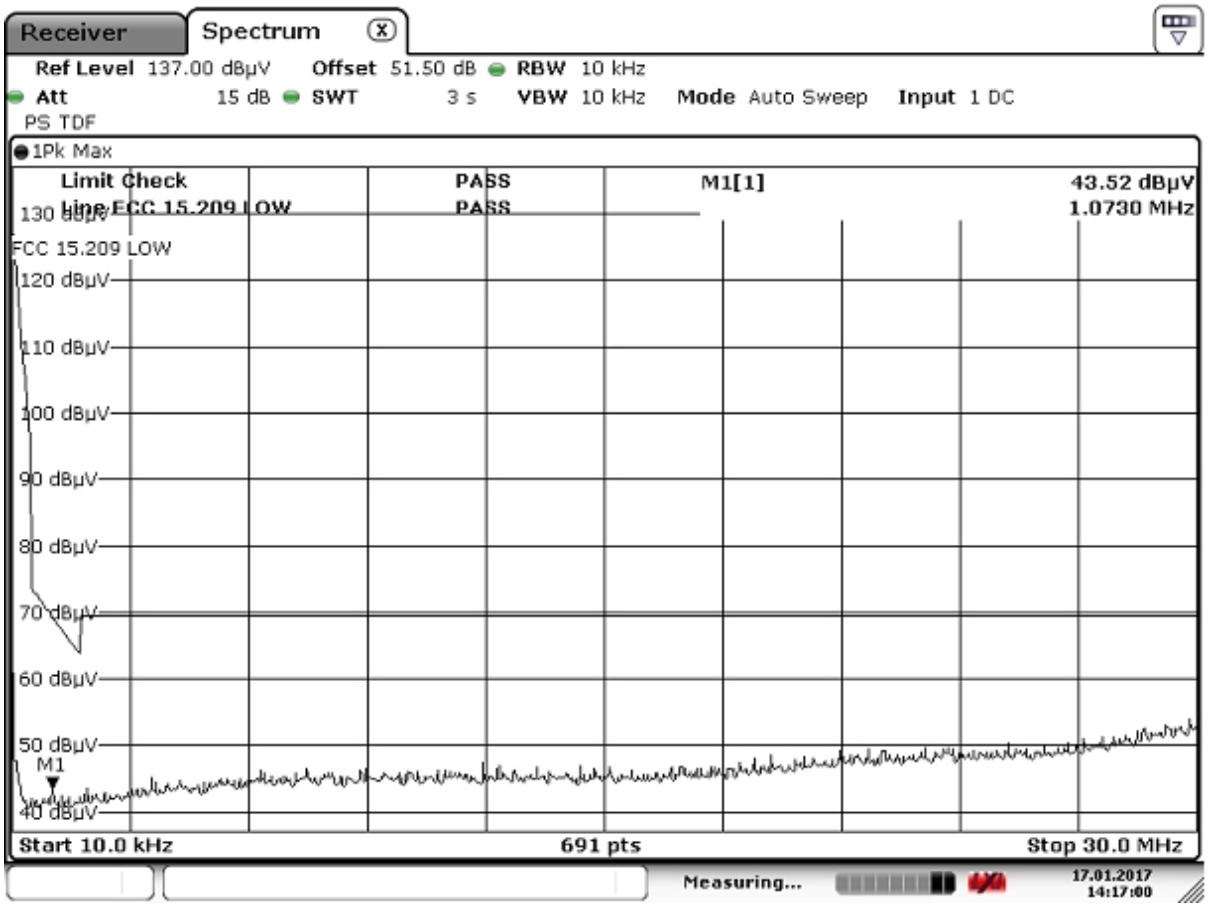
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz.
Radiated emission limits in these three bands are based on measurements employing an average detector.

Other details are according to KDB Publication 558074 V03r05, sections 11.3 and 12.1

3.4.5 Notes

In the frequency range of 1 – 26 GHz the green trace is measured using a peak detector and the red trace is measured using an average detector. The top limit line represent the peak limit and the bottom limit represents the average limit

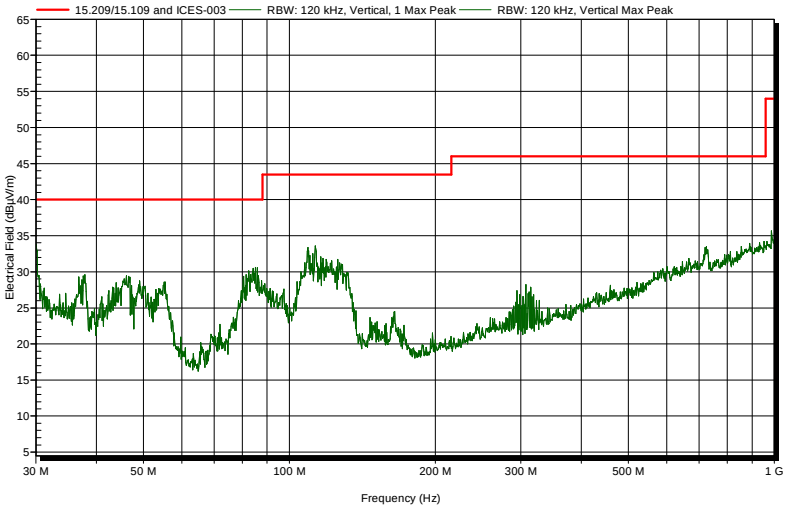
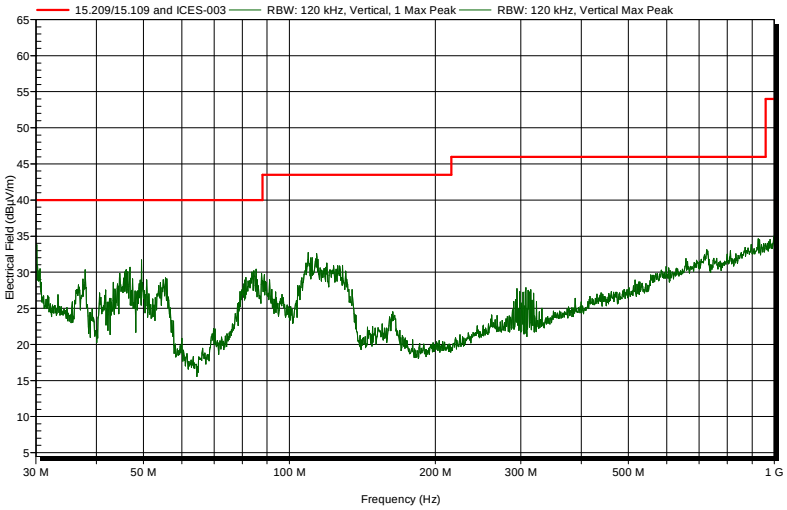
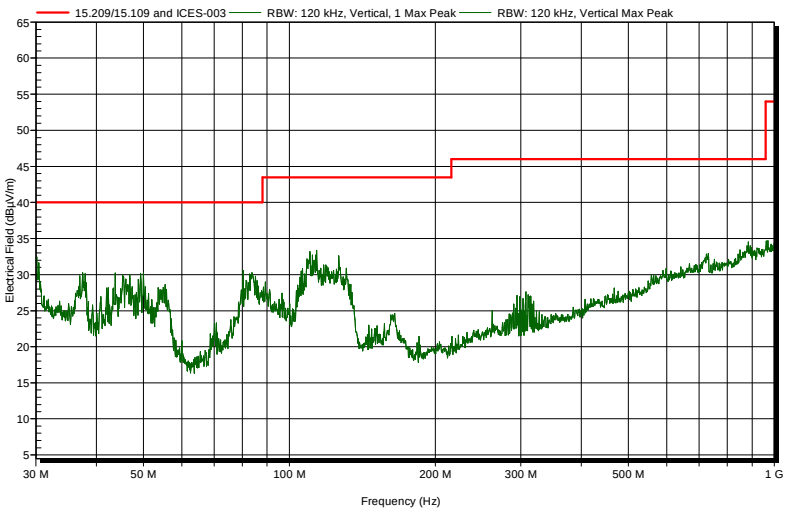
3.4.6 Plots of the Radiated Spurious Emissions Measurement



Note: a 40 dB/decade inverse linear distance extrapolation factor is used for specified distances other than 3 m.

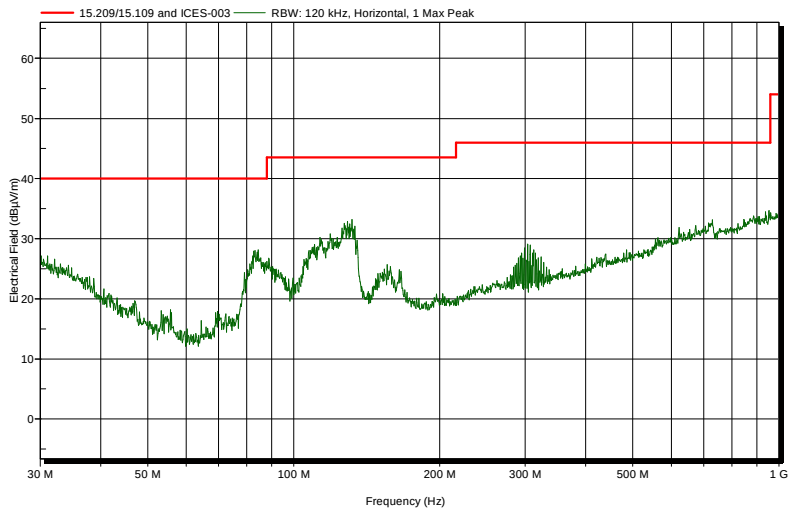
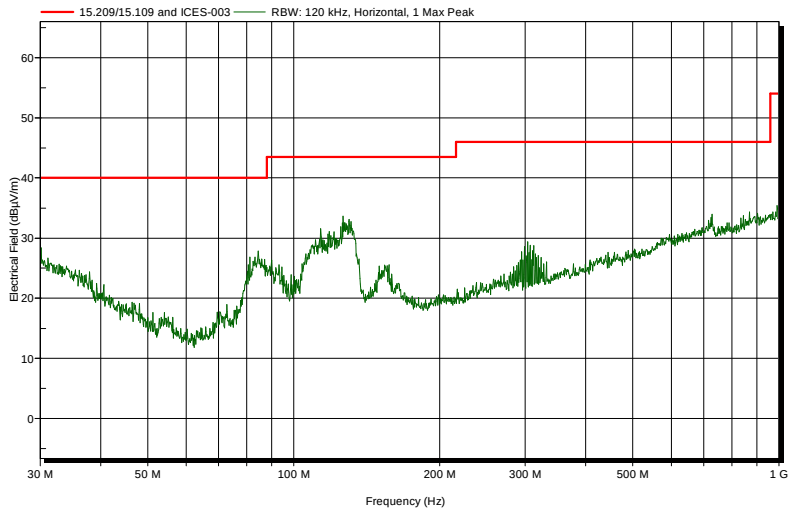
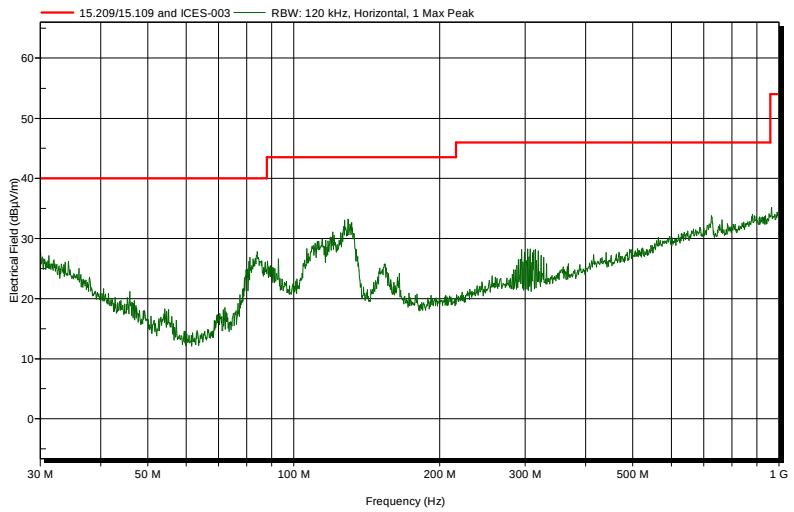
30 MHz to 1 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

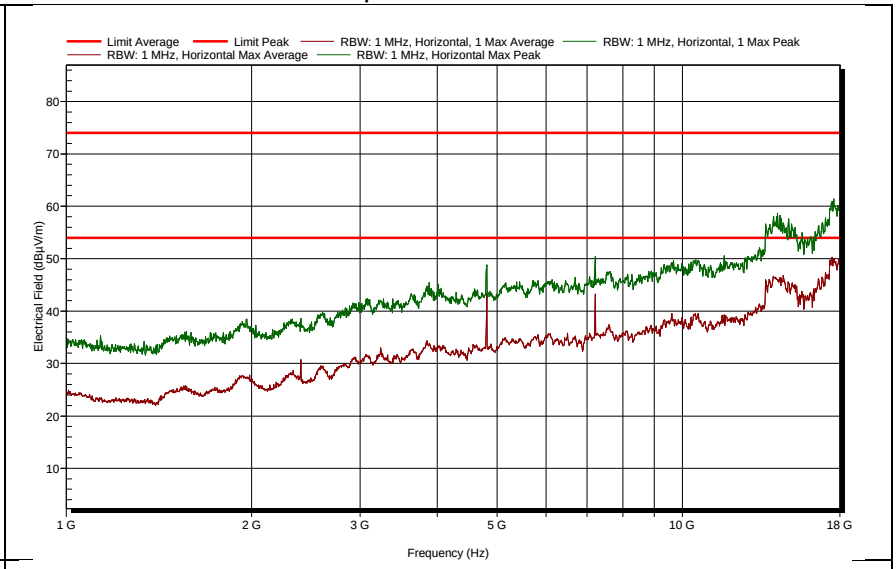
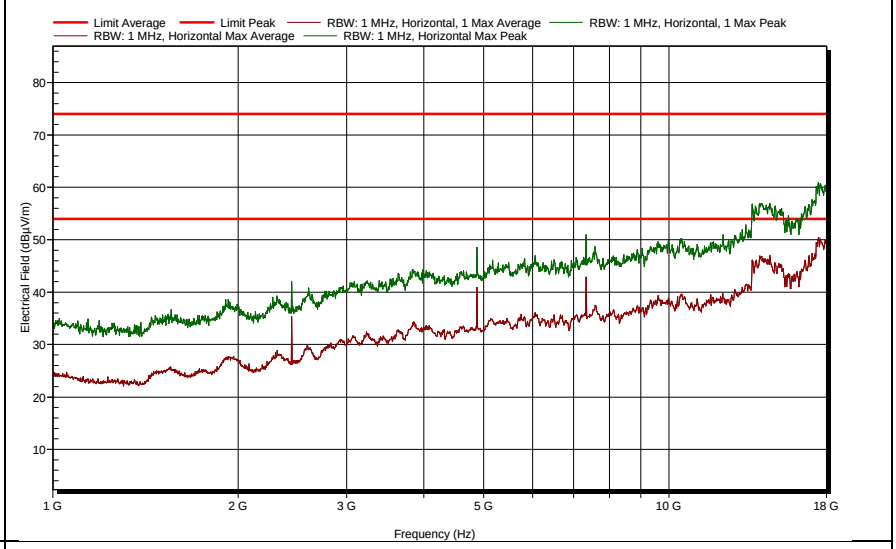
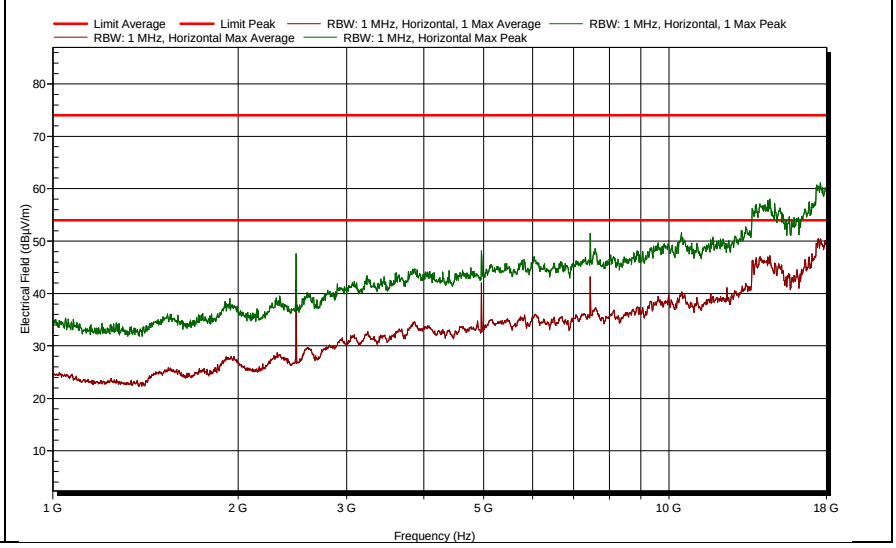
30 MHz to 1 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

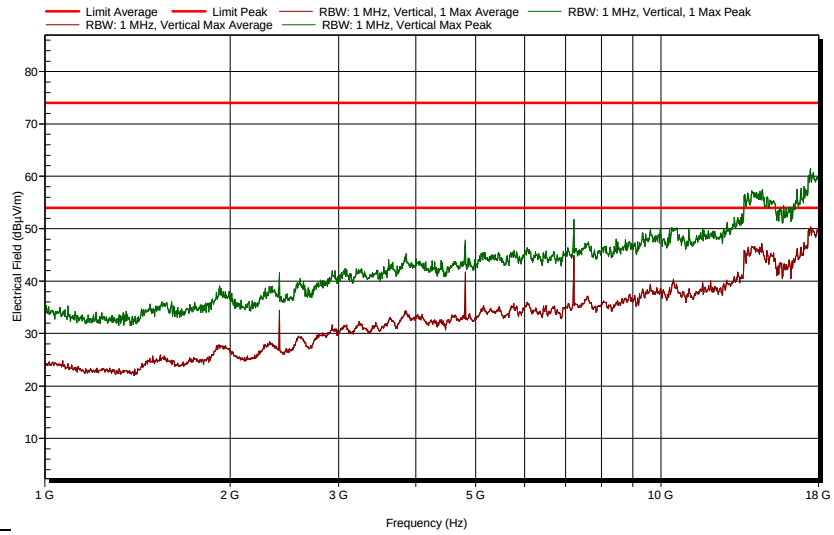
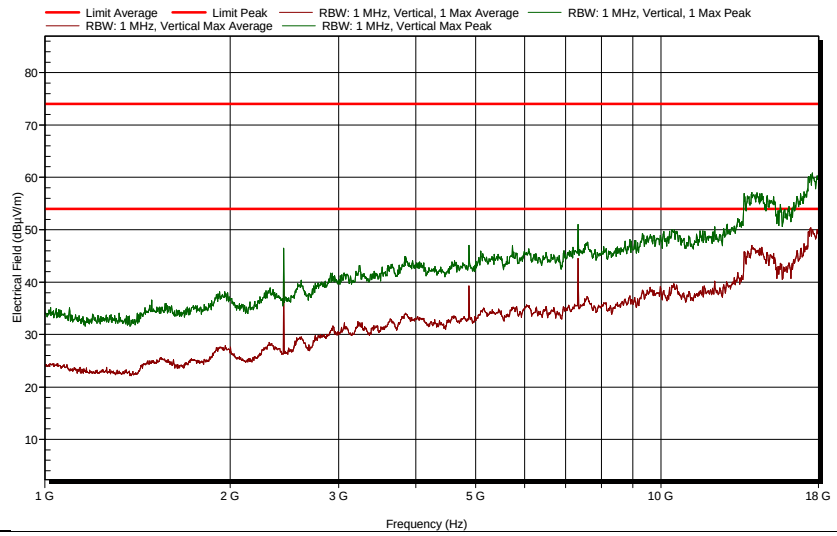
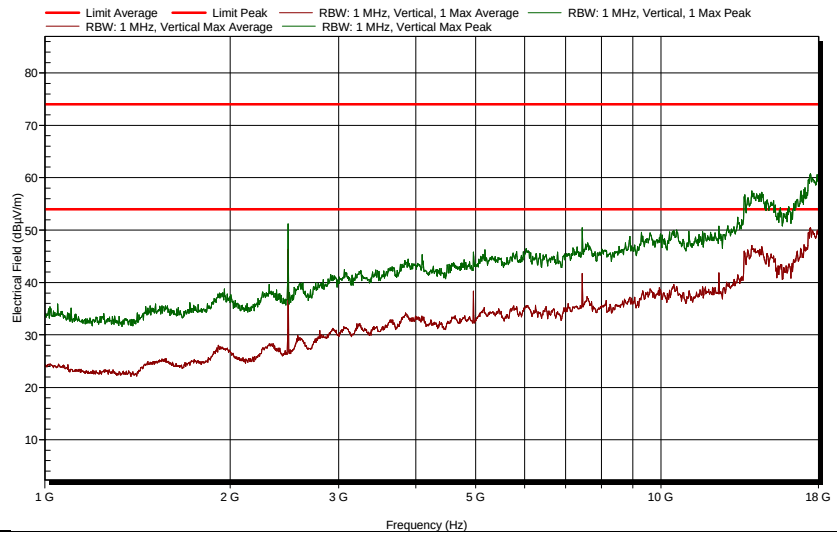
1 GHz to 18 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

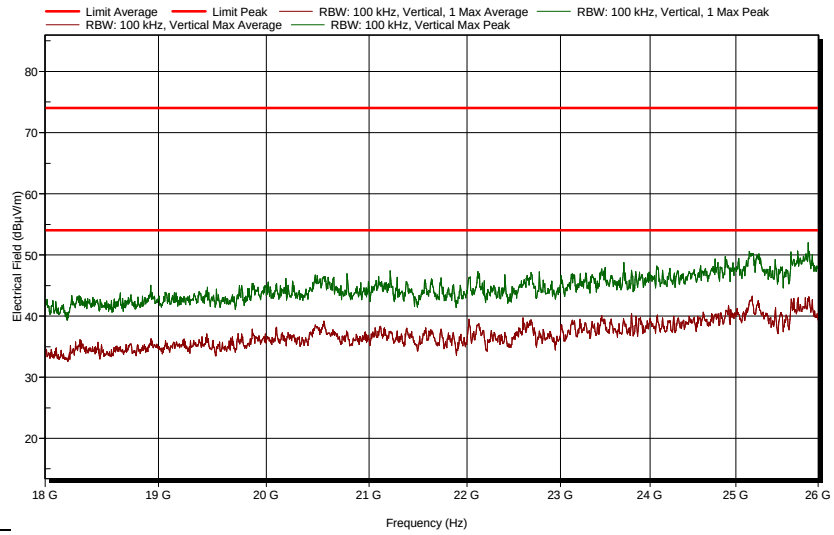
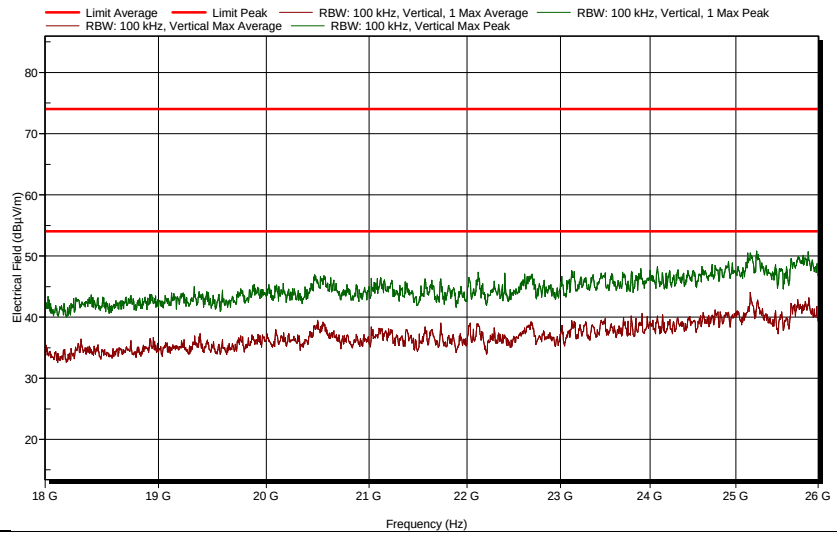
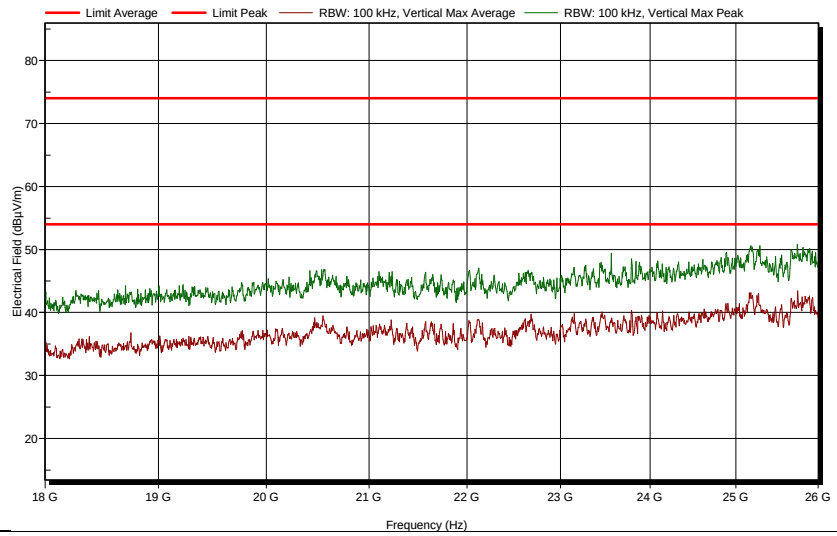
1 GHz to 18 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

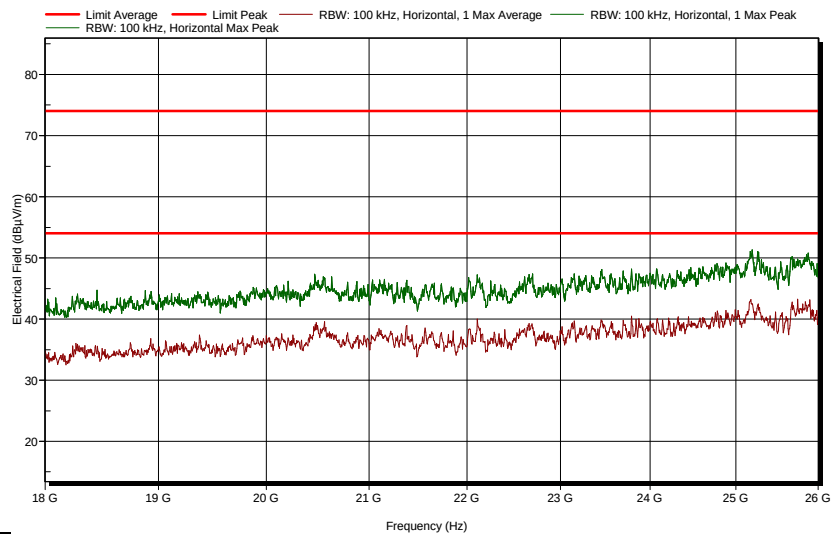
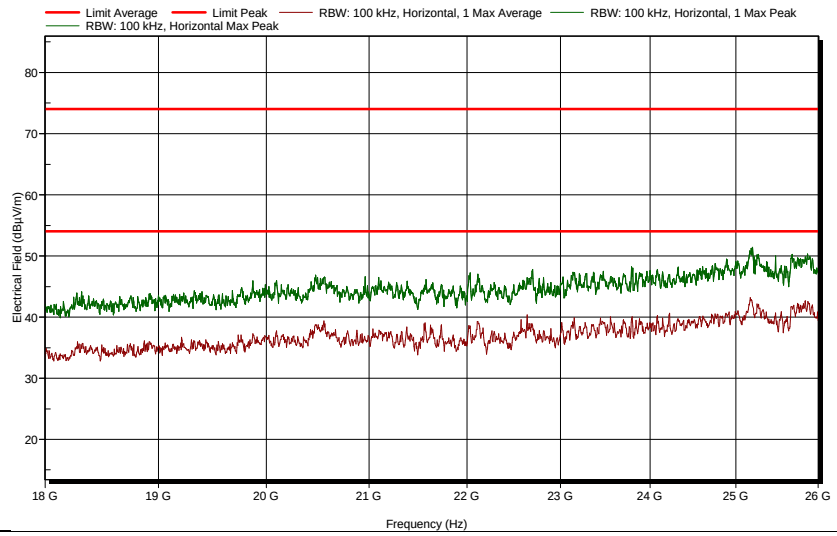
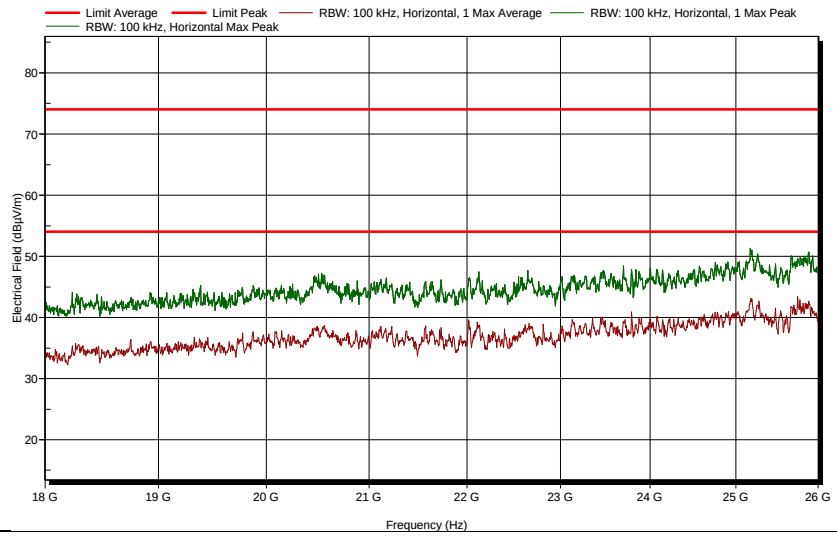
18 GHz to 26.5 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

18 GHz to 26.5 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

3.4.7 Measurement Uncertainty

Measurement uncertainty Radiated emissions below 1 GHz

Horizontal polarization	
30 – 200 MHz	4.5 dB
200 – 1000 MHz	3.6 dB
Vertical polarization	
30 – 200 MHz	5.4 dB
200 – 1000 MHz	4.6 dB

Measurement uncertainty Radiated emissions above 1 GHz

1000- 18000 MHZ	+ 5.7/- 5.7 dB
18000 – 26000 MHz	+ 3.9/- 3.9 dB

3.5 Conducted spurious measurement on AC mains

3.5.1 Limit

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.

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.

3.5.2 Measurement equipment

The measurement instruments are listed in chapter 2.5 of this report.

3.5.3 Test set up

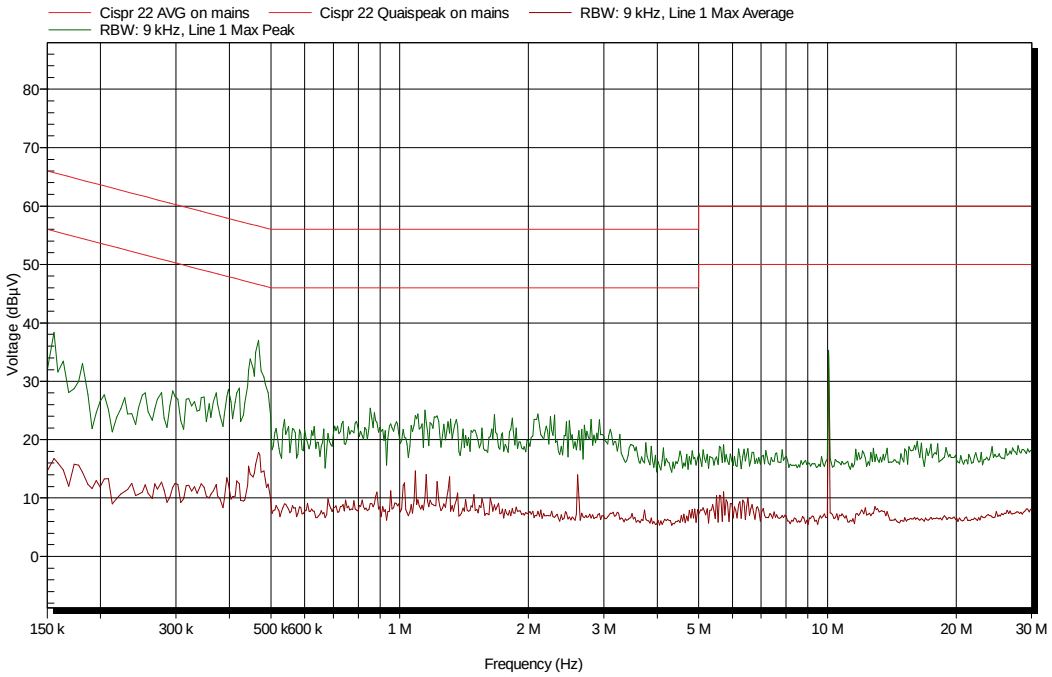
The test setup is as shown in chapter 2.3 of this report.

3.5.4 Test procedure

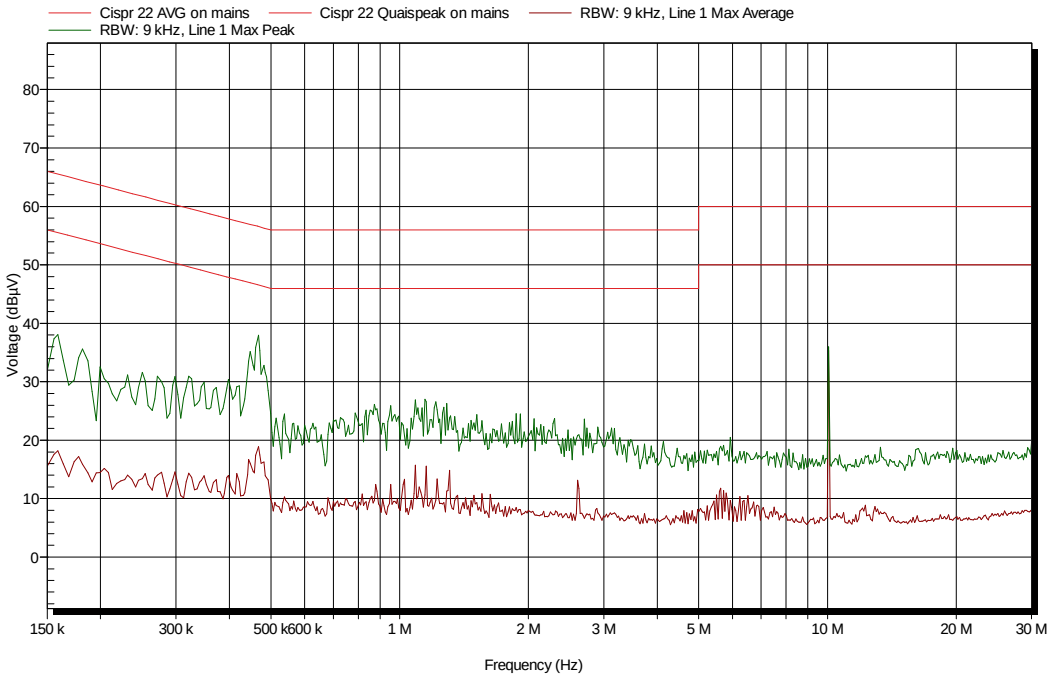
According to ANSI C63.4: 2014, section 13.3.

3.5.5 Plots of the AC conducted spurious measurement

Phase



Neutral



3.5.6 Measurement uncertainty

+/- 3.6 dB

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approx. 95%, but excluding the effect of measurement system repeatability.