RADIO TEST REPORT

No. 1401596STO-001 Ed. 3

RF performance

EQUIPMENT UNDER TEST

Equipment :	2,4 GHz ZigBee radiomodule
Type / model :	DevCom 06 ZigBee Module
Manufacturer :	Develco AS
Tested by request of :	Dometic Siegen GmbH

SUMMARY

Referring to the emission limits and the operating mode during the tests specified in this report the equipment complies with the requirements according to

47 CFR Part 15, Subpart C, Intentional radiators, section 15.247
RSS-Gen Issue 4 (2014) RSS-210 Issue 8 (2010)
Test methods according to ANSI C63.10-2009

Date of issue: 2015-01-29

Tested by: Matti Virkki

Approved by: Stefan Andersson

Revision History

Edition	Date	Description
1	2014-08-28	First release
2	2014-09-29	Duty cycle measurement updated
3	2015-01-29	MPE calculation correction and RSS-GEN issue check and correction

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www.intertek.se
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CONTENTS

1 CLIENT INFORMATION

The EUT has been tested by request of

Company:	Dometic Siegen GmbH In der Steinweise 16 DE-57074 Siegen Germany
Name of contact:	Jörg Peter

2 EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT according to the manufacturer/client declaration

Equipment:	2,4 GHz ZigBee radiomodule
Type/Model:	DevCom 06 ZigBee Module
Brand name:	Dometic
Serial number:	No visible serial number on EUT
Manufacturer:	Develco AS
Transmitter frequency range:	2405 –2480 MHz
Receiver frequency range:	2405 – 2480 MHz
Frequency agile or hopping:	☐ Yes ☒ No
Antenna:	☒ Internal antenna ☐ External antenna
Antenna connector:	☒ None, internal antenna ☐ Yes, type SMB
Antenna gain:	2,15 dBi
Rating RF output power:	4.42 dBm (measured conducted)
Type of modulation:	
Temperature range:	☒ Category I (General): -20°C to +55°C ☐ Category II (Portable equipment): -10°C to +55°C ☐ Category III (Equipment for normal indoor use): +5°C to +35°C ☐ Other: <-20°C to +55°C
Transmitter standby mode supported:	☒ Yes ☐ No

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2.2 Additional hardware information about the EUT

The EUT consists of the following units:

Unit	revision number	Serial number
DevCom 06 ZigBee Module	ver 4.01	-

2.3 Additional software information about the EUT

During the tests the EUT supported the following software:

Software	Version / Release	Comment
Devcom06PT.txt		Test software

2.4 Host equipment

Host equipment is defined as equipment needed for correct operation of the EUT during the tests, and included as a part of the testing and evaluation of the EUT.
Module doesn't have RF – shield and radiated emissions were tested in following two host devices.

Equipment	Manufacturer / Type
Minibar	Dometic Siegen GmbH / H20/60
Ethernet gateway	Dometic Siegen GmbH / Zigbee FEP 241.3365-32

2.5 Test signals

Continuous signal with O-QPSK modulation on 3 channel 2405, 2440 and 2480 MHz.
Signal with normal duty cycle for duty cycle measurement.

2.6 Modification during the tests

No modifications have been made during the tests.

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3 TEST SPECIFICATIONS

3.1 Standards

47 CFR Part 15, Subpart C, Intentional radiators, section 15.247
RSS-Gen Issue 4 (2014) RSS-210 Issue 8 (2010)

Test methods in:

ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices

3.2 Additions, deviations and exclusions from standards and accreditation

No additions, deviations or exclusions have been made from standards and accreditation.

3.3 Test site

Measurements were performed at:

Intertek Semko AB.
Torshamnsgatan 43,
P.O. Box 1103
SE-164 22 Kista

Intertek Semko AB is a FCC listed test site with site registration number 90913
Intertek Semko AB is a Industry Canada listed test facility with IC assigned code 2042G

Measurement chambers

Measurement Chamber	Type of chamber	IC Site filing #
STORAHALLEN	Semi-anechoic 10m	2042G-2

3.4 Test set-up

Unless otherwise specified EUT temporary antenna port was connected to spectrum analyser via rf-cable and 10 dB attenuator.

3.5 Test conditions

If not additionally specified, the tests were performed under the following environmental conditions:

Parameter	Normal	Extreme
Supplying voltage, V	115 V 60 Hz	-
Air temperature, ^{o}C	22 - 25	-

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4 TEST SUMMARY

The results in this report apply only to the tested sample:

Test	Result	Section in report	Note
Standard test methods			
AC power-line conducted tests	NA	5	Class A / B
Radiated test below 30 MHz	NA		
Radiated emissions measurements from 30 to 1000 MHz	Pass	6	
Determination of radiated and antenna conducted emissions above 1 GHz	Pass	7	
Frequency Stability Test	NA		
Occupied bandwidth and band-edge tests	Pass	8, 11	
Output Power average symbol envelope power	NA		
Power Spectral Density < 40 GHz	Pass	10	
Power Spectral Density > 40 GHz	NA		
In-situ measurements	NA		
Polar plot, main lobe and variation on radiated emissions test	NA		
Device-specific tests			
Determining the average value of pulsed emissions per 15.35(c)	Pass		
Determination of frequency hopping compliance per 47 CFR 15.247	NA		
Determination of digital modulation compliance per 47 CFR 15.247	Pass	8	
Determination of peak conducted output unlicensed wireless device power [15.247(b), 15.255]	Pass	9	
Determination of antenna gains, including those emitting in multiple directions (15.247)	Pass	8	
Determination of compliance with RF exposure limits	Pass	7	

NT = Not Tested, by request of the Client
NA = Not Applicable

Notes:

1. The measured result is below the upper limit, but by a margin less than half of the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance is more probable than non-compliance.

2. The measured result is above the upper limit, but by a margin less than half of the uncertainty interval. It is therefore not possible to state non-compliance based on the 95% level of confidence. However, the result indicates that non-compliance is more probable than compliance.

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5 CONDUCTED EMISSIONS MEASUREMENTS FROM AC MAINS

Date of test:	2014-07-29	Test location:	EMC center
EUT Serial:	-	Ambient temp.	31 °C
Tested by:	Per Larsson	Relative humidity	60 %
Test result:	Pass	Margin:	17.1 dB

5.1 Requirement

FCC §15.207, IC RSS-210 Table 3

Frequency (MHz)	Disturbance Voltage QP (dBµV)	Disturbance Voltage AV (dBµV)
0.15 – 0.5	66-56	56-46
0.5 – 5	56	46
5 – 30	60	50

5.2 Test setup details

Host device containing the EUT was placed on non-conductive table 80 cm above the ground plane and 40 cm from vertical coupling plane. AC mains were connected to LISN which was bonded to ground plane.
EUT was tested in two different host units

Test set-up photo:

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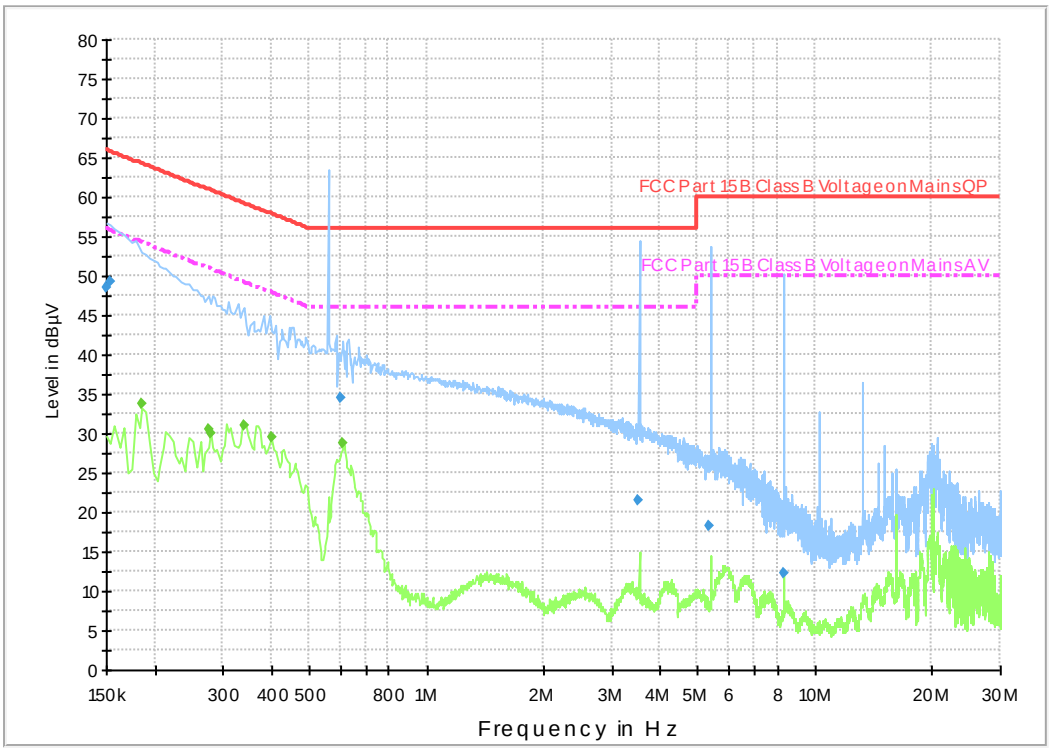
Overview sweeps performed with peak and average detectors. EUT in minibar.

04 ESH3-Z5 - FCC part 15 Cl. B



Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150	48.4	1000.0	9.000	GN	L1	10.0	17.6	66.0	
0.153	49.3	1000.0	9.000	GN	L1	10.0	16.6	65.8	
0.598	34.6	1000.0	9.000	GN	L1	10.1	21.4	56.0	
3.517	21.4	1000.0	9.000	GN	L1	10.2	34.6	56.0	
5.330	18.1	1000.0	9.000	GN	L1	10.3	41.9	60.0	
8.349	12.4	1000.0	9.000	GN	L1	10.4	47.6	60.0	

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.185	33.8	1000.0	9.000	GN	N	10.0	20.4	54.3	
0.276	30.5	1000.0	9.000	GN	N	10.0	20.5	50.9	
0.279	30.1	1000.0	9.000	GN	N	10.0	20.8	50.8	
0.339	30.9	1000.0	9.000	GN	N	10.0	18.3	49.2	
0.400	29.6	1000.0	9.000	GN	N	10.0	18.3	47.9	
0.609	28.9	1000.0	9.000	GN	N	10.0	17.1	46.0	

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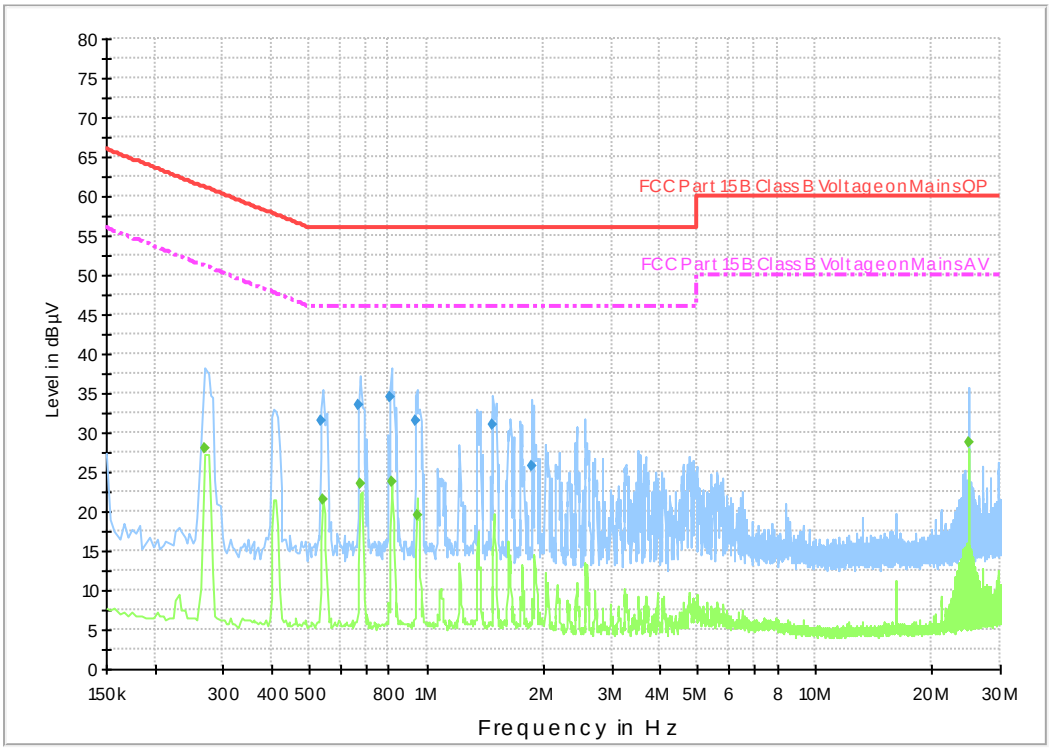
Overview sweeps performed with peak and average detectors. EUT in Ethernet gateway.

04 ESH3-Z5 - FCC part 15 Cl. B



Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.538	31.5	1000.	9.000	GN	N	10.0	24.5	56.0	
0.672	33.5	1000.	9.000	GN	N	10.0	22.5	56.0	
0.807	34.4	1000.	9.000	GN	N	10.0	21.6	56.0	
0.941	31.6	1000.	9.000	GN	N	10.0	24.4	56.0	
1.479	31.1	1000.	9.000	GN	N	10.0	24.9	56.0	
1.864	25.7	1000.	9.000	GN	N	10.0	30.3	56.0	

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.270	28.0	1000.0	9.000	GN	N	10.0	23.2	51.1	
0.540	21.6	1000.0	9.000	GN	N	10.0	24.4	46.0	
0.674	23.5	1000.0	9.000	GN	N	10.0	22.5	46.0	
0.812	23.7	1000.0	9.000	GN	N	10.0	22.3	46.0	
0.949	19.5	1000.0	9.000	GN	N	10.0	26.5	46.0	
25.000	28.7	1000.0	9.000	GN	N	11.0	21.3	50.0	

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6 RADIATED EMISSIONS MEASUREMENTS FROM 30 MHZ TO 1000MHZ

Date of test:	2014-4-14 / 2014-6-19	Test location:	Storahallen / Björkhallen
EUT Serial:	-	Ambient temp.	23 °C
Tested by:	Matti Virkki	Relative humidity	35 %
Test result:	Pass	Margin:	3.47 dB

6.1 Requirement

In restricted bands Reference: FCC §15.209, IC RSS-210 Table 3
Outside the restricted bands: FCC 15.247 (d), RSS-210 A8.5

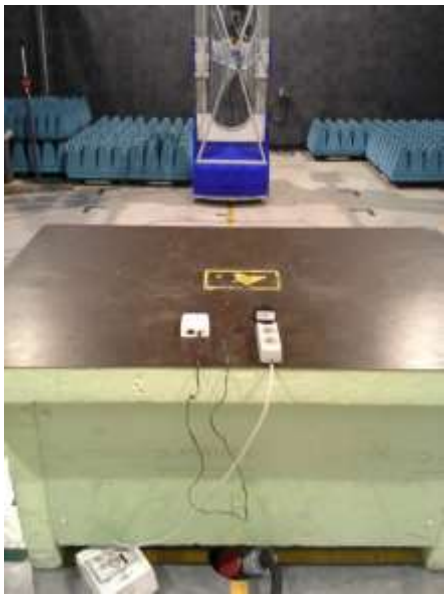
Frequency (MHz)	Field strength (dBµV/m)	Measurement distance (m)
30 – 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
960 –	44.0	10

Frequency (MHz)	Field strength (dBµV/m)	Measurement distance (m)
30 – 88	40.0	3
88 – 216	43.5	3
216 – 960	46.0	3
960 –	54.0	3

6.2 Test setup details

EUT was placed on non-conductive table 80 cm above the ground plane.
EUT was tested inside 2 different host devices

Test set-up photo:



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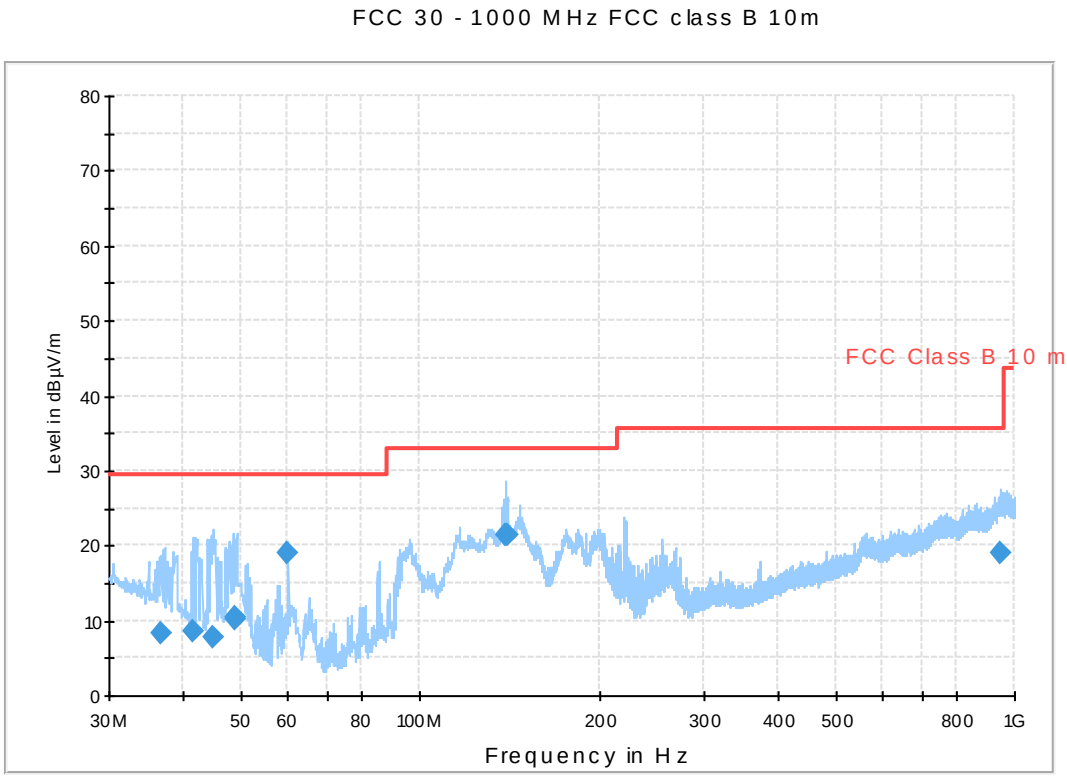
6.3 Test data

Overview sweeps performed with peak detectors, ch 11. EUT in minibar



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)
36.650	8.3	1000.0	120.000	144.0	V	200.0	-18.5	21.2
41.655	8.7	1000.0	120.000	100.0	V	194.0	-21.2	20.8
45.058	7.8	1000.0	120.000	400.0	V	238.0	-22.9	21.7
48.906	10.5	1000.0	120.000	198.0	V	14.0	-24.7	19.0
49.035	10.3	1000.0	120.000	275.0	V	13.0	-24.7	19.2
60.014	19.0	1000.0	120.000	256.0	V	225.0	-27.6	10.5
138.934	21.3	1000.0	120.000	100.0	V	-6.0	-21.3	11.7
139.970	21.5	1000.0	120.000	115.0	V	7.0	-21.3	11.5
947.929	19.0	1000.0	120.000	201.0	H	104.0	-4.3	16.6

Measured level [dBµV/m] = Analyser reading [dBµV] + cable loss [dB] – preamplifier gain [dB] + antenna factor [dB/m]

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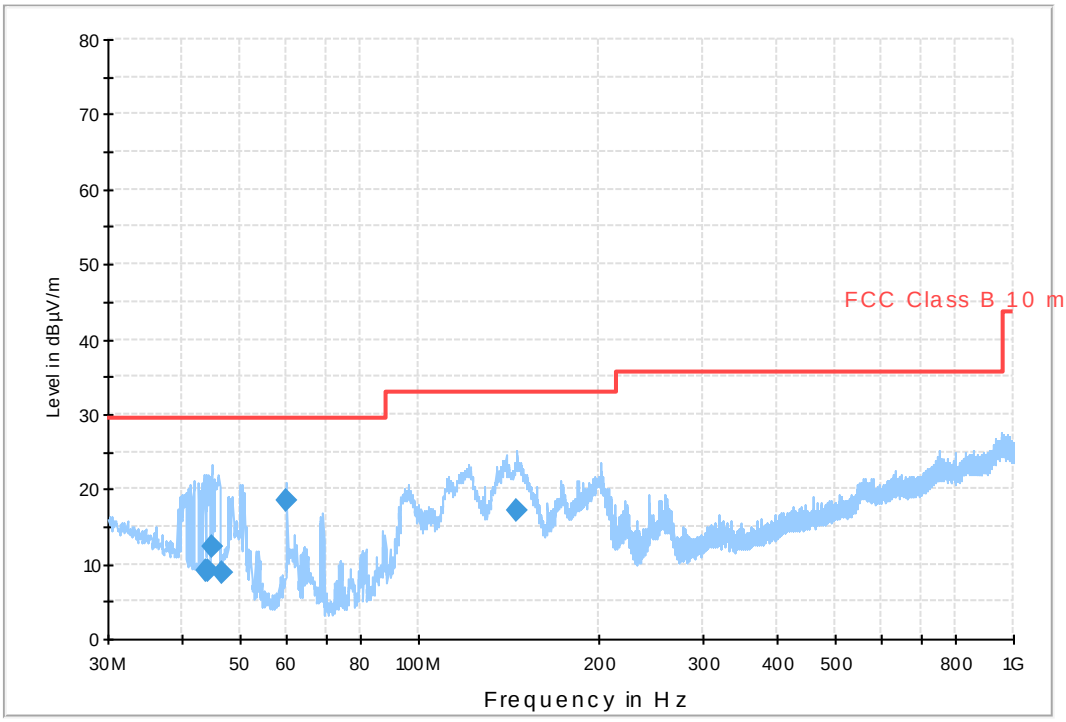
Overview sweeps performed with peak detectors, ch 18 EUT in minibar

FCC 30 - 1000 MHz FCC class B 10m



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)
43.941	9.0	1000.0	120.000	100.0	V	231.0	-22.4	20.5
44.089	9.0	1000.0	120.000	161.0	V	215.0	-22.4	20.5
45.002	12.3	1000.0	120.000	182.0	V	225.0	-22.9	17.2
46.645	8.9	1000.0	120.000	271.0	V	259.0	-23.6	20.6
60.014	18.6	1000.0	120.000	274.0	V	225.0	-27.6	10.9
145.550	17.1	1000.0	120.000	100.0	V	36.0	-21.5	15.9

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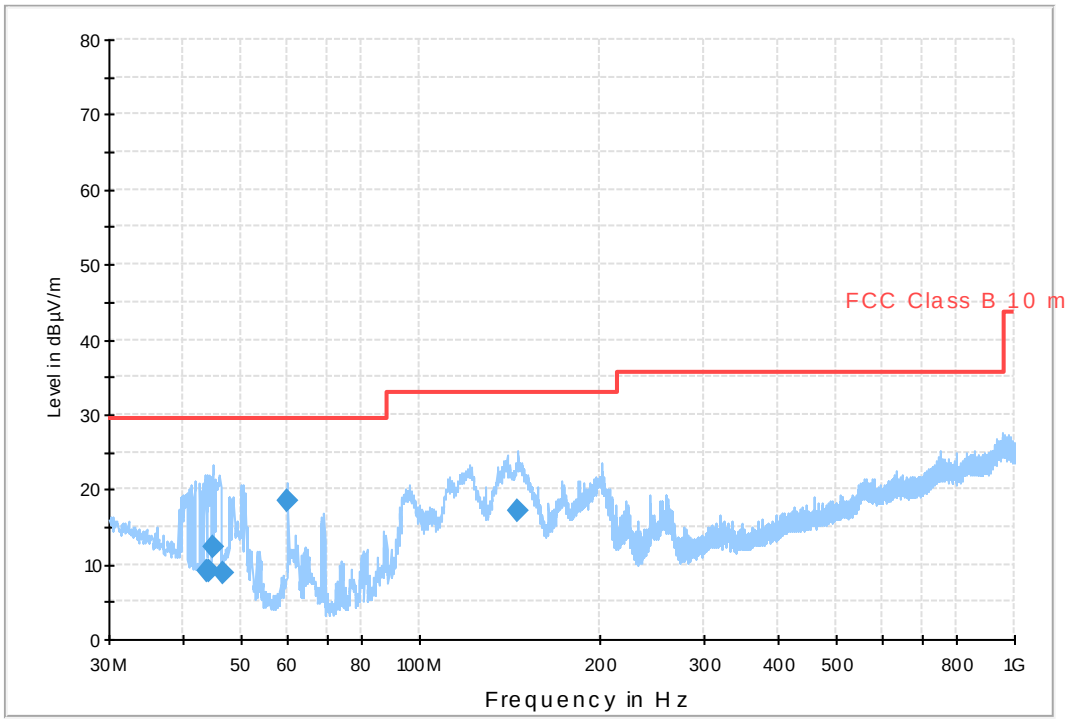
Overview sweeps performed with peak detectors, ch 26 EUT in minibar



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)
43.941	9.0	1000.0	120.000	100.0	V	231.0	-22.4	20.5
44.089	9.0	1000.0	120.000	161.0	V	215.0	-22.4	20.5
45.002	12.3	1000.0	120.000	182.0	V	225.0	-22.9	17.2
46.645	8.9	1000.0	120.000	271.0	V	259.0	-23.6	20.6
60.014	18.6	1000.0	120.000	274.0	V	225.0	-27.6	10.9
145.550	17.1	1000.0	120.000	100.0	V	36.0	-21.5	15.9

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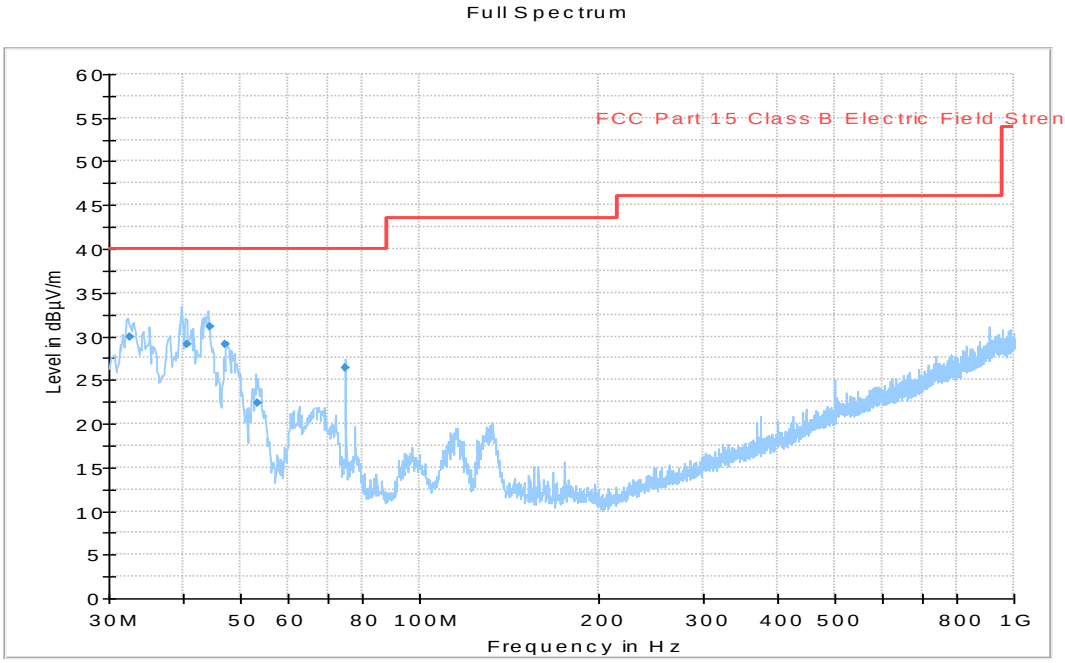
Overview sweeps performed with peak detectors, ch 11 EUT in Ethernet gateway.



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
32.464489	29.86	40.00	10.14	1000.0	120.000	108.0	V	236.0
40.719359	29.15	40.00	10.85	1000.0	120.000	100.0	V	38.0
44.208056	31.04	40.00	8.96	1000.0	120.000	102.0	V	14.0
47.074790	29.01	40.00	10.99	1000.0	120.000	102.0	V	180.0
53.266012	22.33	40.00	17.67	1000.0	120.000	100.0	V	47.0
75.010060	26.37	40.00	13.63	1000.0	120.000	139.0	V	34.0

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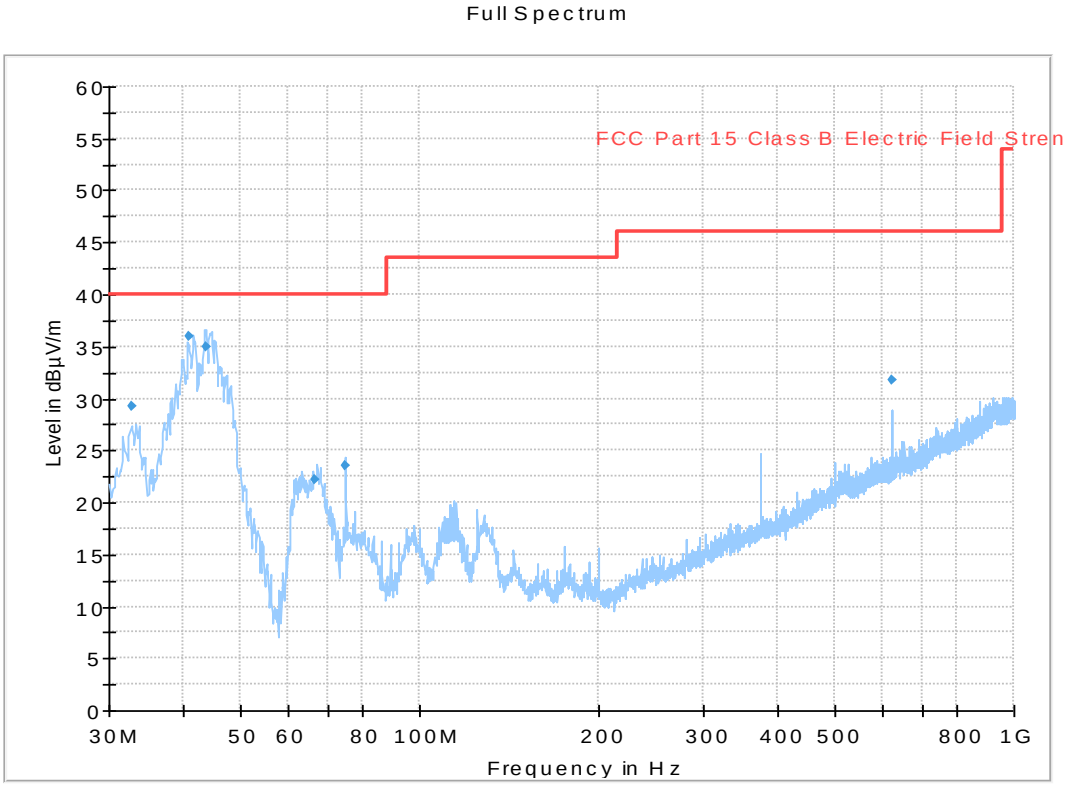
Overview sweeps performed with peak detectors, ch 18 EUT in Ethernet gateway.



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
32.866733	29.32	40.00	10.68	1000.0	120.000	100.0	V	64.0
41.043287	35.94	40.00	4.06	1000.0	120.000	100.0	V	27.0
43.847214	34.88	40.00	5.12	1000.0	120.000	103.0	V	37.0
66.734349	22.20	40.00	17.80	1000.0	120.000	158.0	V	64.0
74.990060	23.47	40.00	16.53	1000.0	120.000	167.0	V	126.0
624.989699	31.70	46.02	14.32	1000.0	120.000	137.0	H	256.0

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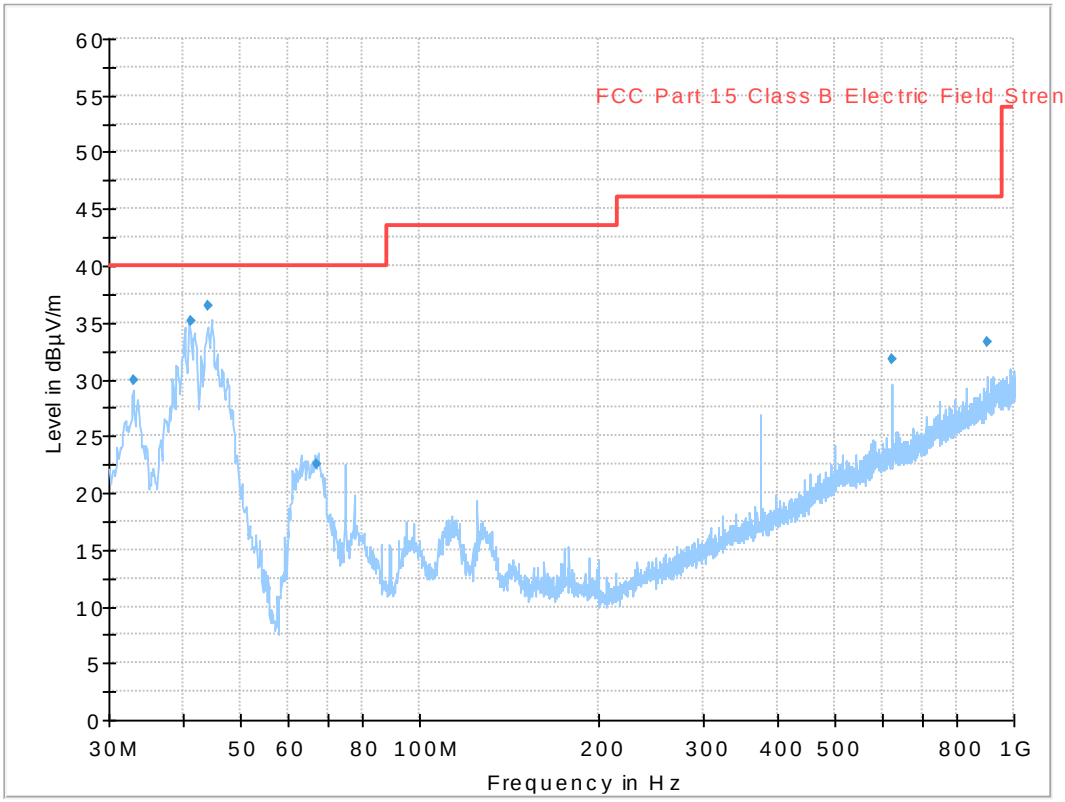
Overview sweeps performed with peak detectors, ch 26 EUT in Ethernet gateway.

Full Spectrum



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
33.025892	29.86	40.00	10.14	1000.0	120.000	100.0	V	34.0
41.281603	35.21	40.00	4.79	1000.0	120.000	100.0	V	5.0
44.089178	36.53	40.00	3.47	1000.0	120.000	103.0	V	347.0
67.094910	22.60	40.00	17.40	1000.0	120.000	177.0	V	29.0
624.990100	31.78	46.02	14.24	1000.0	120.000	152.0	H	254.0
901.902806	33.28	46.02	12.74	1000.0	120.000	211.0	V	6.0

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6.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Measurement software	Rohde & Schwarz	EMC 32	--	--
Receiver	Rohde & Schwarz	ESI	32291	7/2014
UltraLog antenna	Rohde & Schwarz	HL 562	30711	12/2014
Hornantenna	Rohde & Schwarz	HF907	32307	6/2015
Pre amplifier	Rohde & Schwarz	TS-PRE1	32306	7/2014
Switch unit	Rohde & Schwarz	OSP130	32300	7/2014
Filter unit	Rohde & Schwarz	OSP-F7-B	32301	--

7 RADIATED EMISSIONS MEASUREMENTS ABOVE 1 GHZ

Date of test:	2014-06-19	Test location:	Radiohallen / Stora hallen
EUT Serial:	--	Ambient temp.	23 C
Tested by:	Matti Virkki	Relative humidity	50 %
Test result:	Pass	Margin:	4.86 dB

7.1 Requirement

Reference: FCC §15.209, IC RSS-210 Table 3
In the restricted bands:

Frequency (MHz)	Field strength (dBμV/m)	Measurement distance (m)
30 – 88	40.0	3
88 – 216	43.5	3
216 – 960	46.0	3
960 –	54.0	3

Outside the restricted bands: FCC 15.247 (d), RSS-210 A8.5
Carrier – 20 dB.

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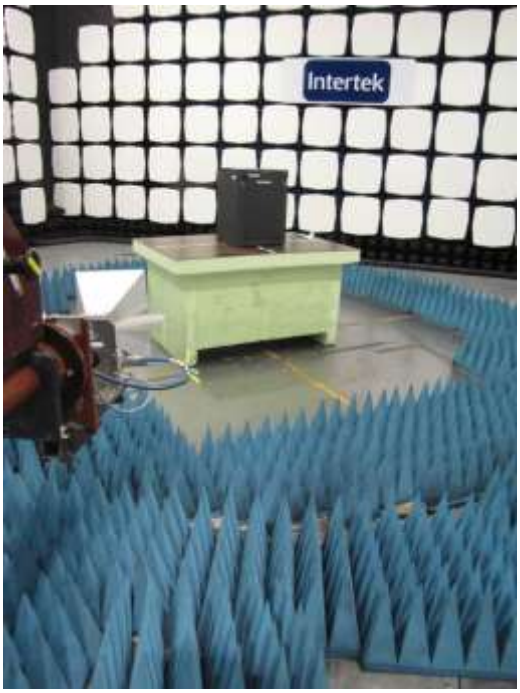
7.2 Test setup details

Host device containing the EUT was placed on non-conductive table 80 cm above the ground plane.
Absorbers were placed on floor between EUT and antenna.

Test set-up photo:



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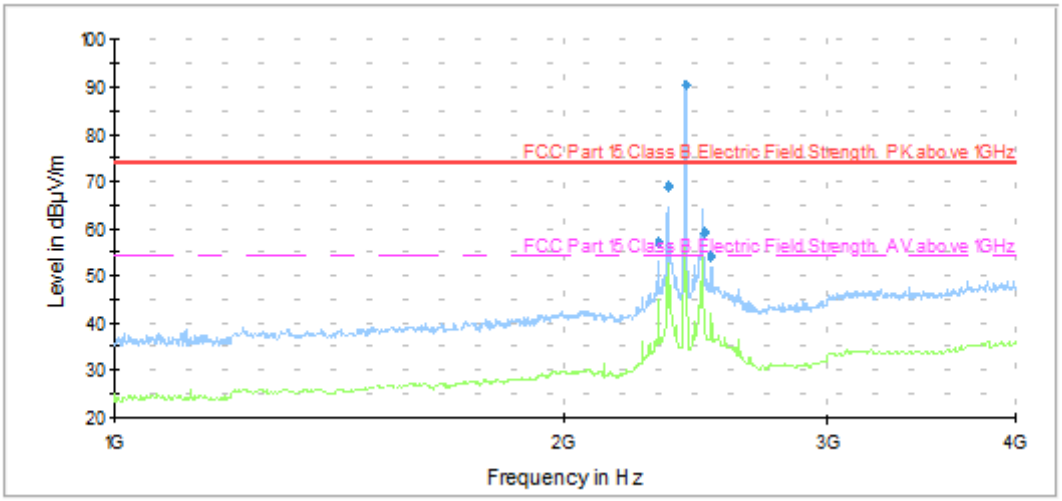
7.3 Test data

Overview sweeps performed with peak detectors, Frequency range 1 – 4 GHz Ch. 11
EUT in Ethernet gateway.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2307.613227	---	37.17	54.00	16.73	1000.0	1000.000	100.0	H	55.0
2307.613227	57.17	---	73.90	16.73	1000.0	1000.000	100.0	H	55.0
2341.481363	---	49.04	54.00	4.86	1000.0	1000.000	100.0	H	59.0
2341.481363	69.04	---	73.90	4.86	1000.0	1000.000	100.0	H	59.0
2405.409619	90.43	---	---	---	1000.0	1000.000	100.0	V	34.0
2405.409619	---	70.43	---	---	1000.0	1000.000	100.0	V	34.0
2477.169940	---	39.18	---	---	1000.0	1000.000	100.0	H	54.0
2477.169940	59.18	---	---	---	1000.0	1000.000	100.0	H	54.0
2501.610020	54.13	---	73.90	19.77	1000.0	1000.000	225.0	H	52.0
2501.610020	---	34.13	54.00	10.14	1000.0	1000.000	225.0	H	52.0

Duty cycle averaging 20 LOG * Ton /100ms is used to determine average level.
Transmitter sends 5.39 s / 100 ms.
Averaging factor is -25.31 dB – 20 dB is used to determine average level.

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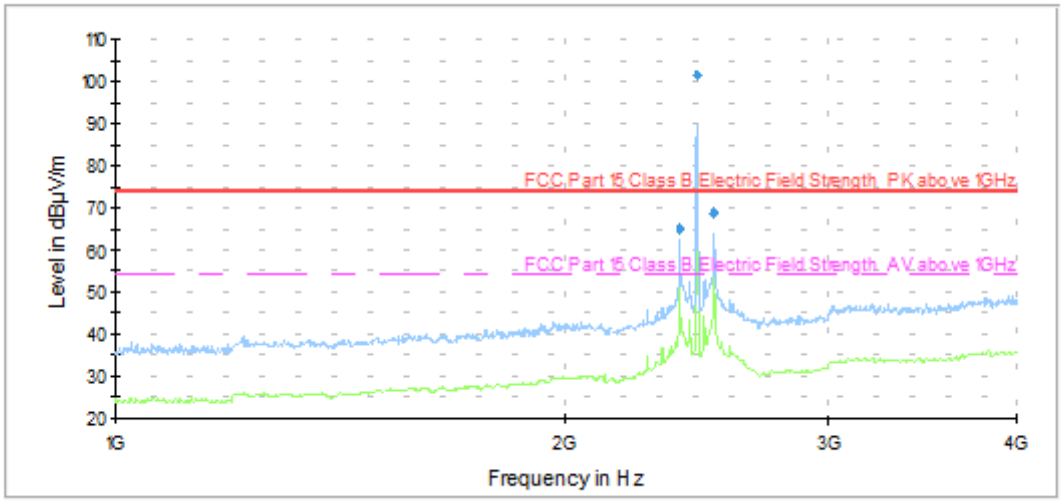
Overview sweeps performed with peak detectors, Frequency range 1 – 4 GHz Ch. 18
EUT in Ethernet gateway.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2381.361523	---	44.91	54.00	8.99	1000.0	1000.000	300.0	H	194.0
2381.361523	64.91	---	73.90	8.99	1000.0	1000.000	300.0	H	194.0
2445.485772	101.53	---	---	---	1000.0	1000.000	100.0	V	225.0
2445.485772	---	81.53	---	---	1000.0	1000.000	100.0	V	225.0
2509.418036	68.88	---	73.90	5.02	1000.0	1000.000	100.0	H	194.0
2509.418036	---	48.88	54.00	5.02	1000.0	1000.000	100.0	H	194.0

Duty cycle averaging 20 LOG * Ton /100ms is used to determine average level.
Transmitter sends 5.39 s / 100 ms.
Averaging factor is -25.31 dB – 20 dB is used to determine average level.

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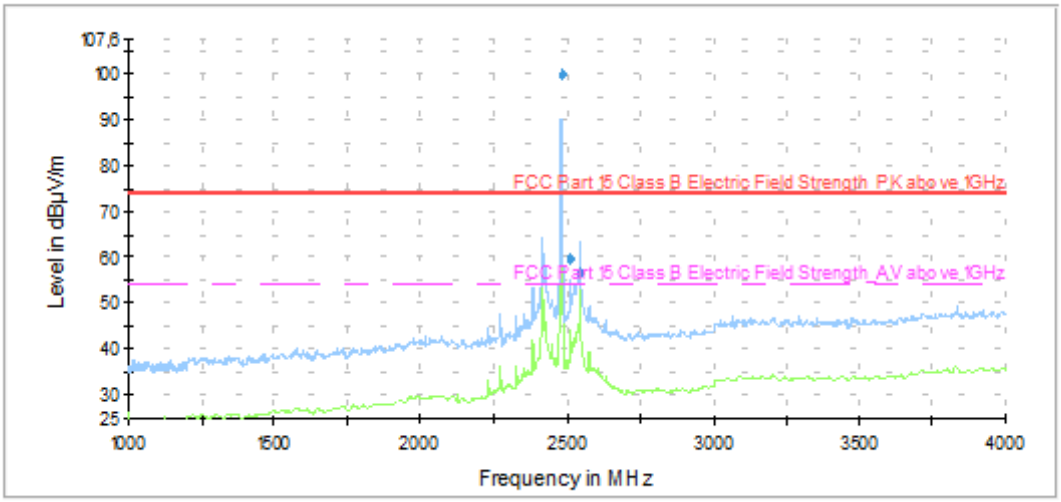
Overview sweeps performed with peak detectors, Frequency range 1 – 18 GHz Ch. 26
EUT in Ethernet gateway.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2480.357916	---	79.85	---		1000.0	1000.000	200.0	V	0.0
2480.357916	99.85	---	---		1000.0	1000.000	200.0	V	0.0
2511.422044	59.87	---	73.90	14.03	1000.0	1000.000	100.0	H	64.0
2511.422044	---	39.87	54.00	14.03	1000.0	1000.000	100.0	H	64.0
2544.486172	56.88	---	73.90	17.02	1000.0	1000.000	125.0	H	14.0
2544.486172	---	36.88	54.00	17.02	1000.0	1000.000	125.0	H	14.0

Duty cycle averaging 20 LOG * Ton /100ms is used to determine average level.
Transmitter sends 5.39 s / 100 ms.
Averaging factor is -25.31 dB – 20 dB is used to determine average level.

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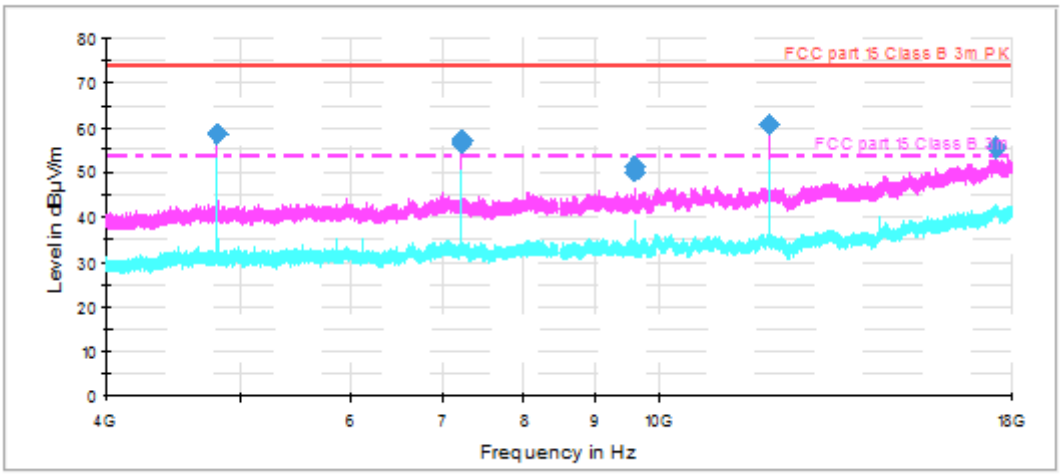
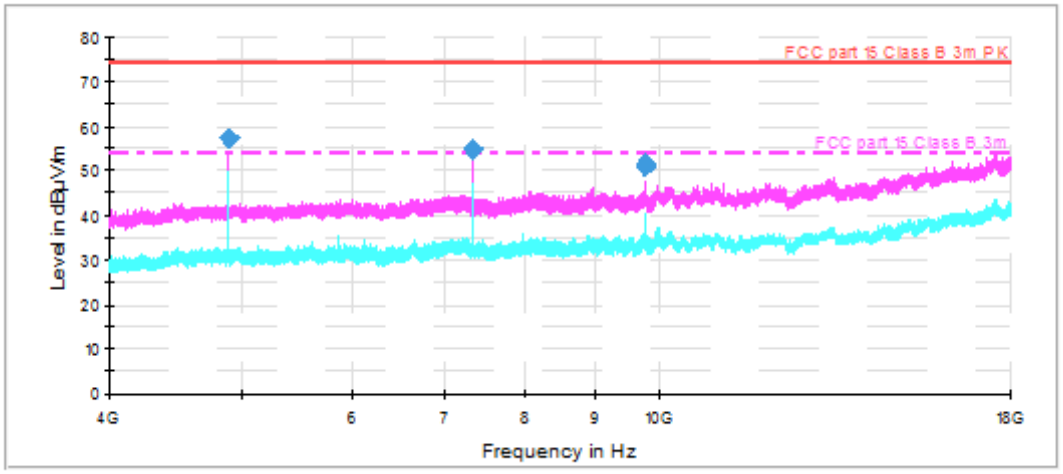
Overview sweeps performed with peak detectors, Frequency range 4 – 18 GHz Ch. 11
EUT in Ethernet gateway.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)
12022.602000	60.7	40.7	1000.0	1000.000	202.0	V	35.0	3.5
9617.880000	50.1	30.7	1000.0	1000.000	290.0	V	104.0	1.5
4810.937000	58.4	38.4	1000.0	1000.000	100.0	H	158.0	-4.9
4810.906333	58.3	38.3	1000.0	1000.000	100.0	H	158.0	-4.9
17518.632000	55.4	35.4	1000.0	1000.000	145.0	V	222.0	11.7
7213.458667	57.4	37.4	1000.0	1000.000	127.0	V	222.0	-1.0
7213.206333	56.3	36.3	1000.0	1000.000	218.0	V	215.0	-1.0
9622.243667	51.3	31.3	1000.0	1000.000	201.0	V	255.0	1.6

Overview sweeps performed with peak detectors, Frequency range 4 – 18 GHz Ch. 18
EUT in Ethernet gateway.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)
4890.824000	57.2	37.2	1000.0	1000.000	286.0	V	64.0	-4.8
9777.473333	50.9	30.9	1000.0	1000.000	274.0	H	128.0	1.8
9777.872333	51.2	31.2	1000.0	1000.000	195.0	H	141.0	1.8
7333.263000	54.8	34.8	1000.0	1000.000	100.0	V	224.0	-0.9

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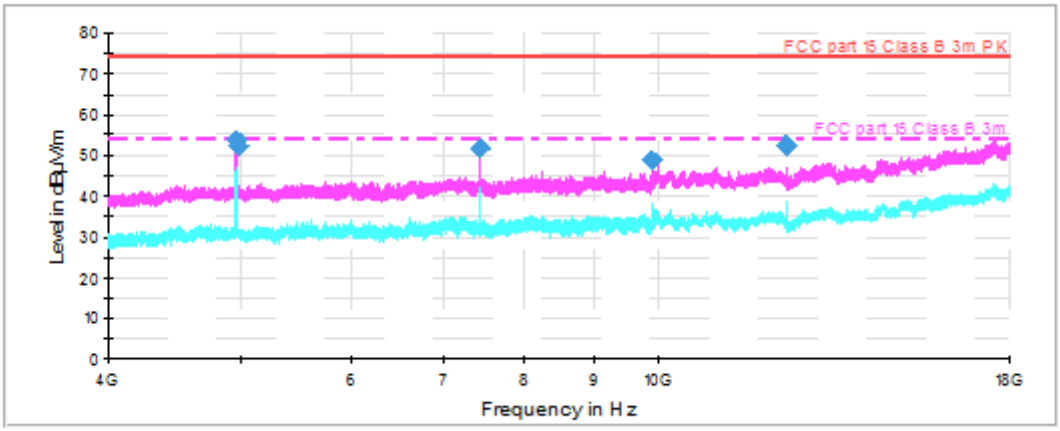
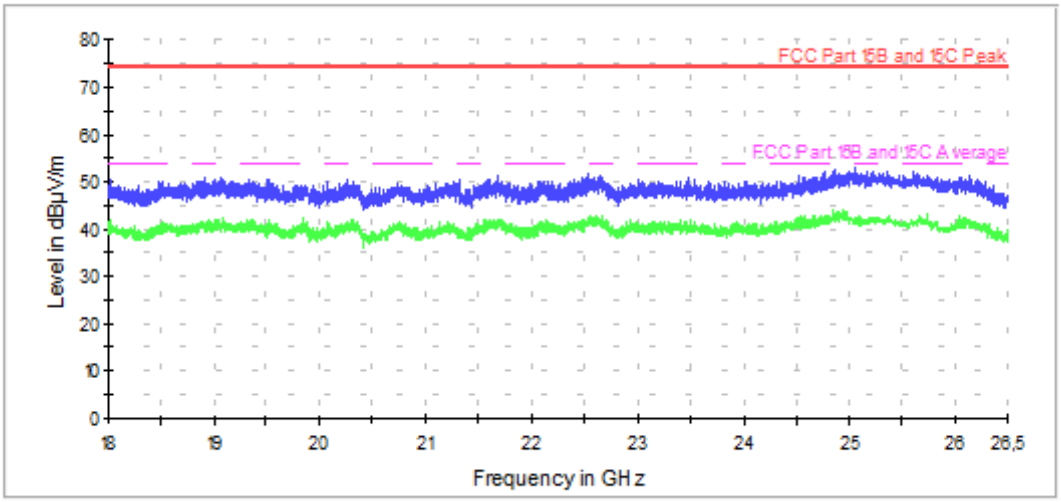
Overview sweeps performed with peak detectors, Frequency range 4 – 18 GHz Ch. 26
EUT in Ethernet gateway.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)
7441.339667	51.9	31.9	1000.0	1000.000	222.0	V	2.0	-0.9
7440.978333	51.8	31.8	1000.0	1000.000	225.0	V	8.0	-0.9
12397.294000	52.3	32.3	1000.0	1000.000	180.0	V	32.0	3.9
12397.343000	52.6	32.6	1000.0	1000.000	188.0	V	61.0	3.9
4959.231667	53.7	33.7	1000.0	1000.000	169.0	V	222.0	-4.7
4960.889333	52.3	32.3	1000.0	1000.000	127.0	V	221.0	-4.7
9921.365667	48.9	28.9	1000.0	1000.000	243.0	V	225.0	2.1

Overview sweeps performed with peak detectors, Frequency range 18 – 26 GHz Ch. 11
EUT in Ethernet gateway.



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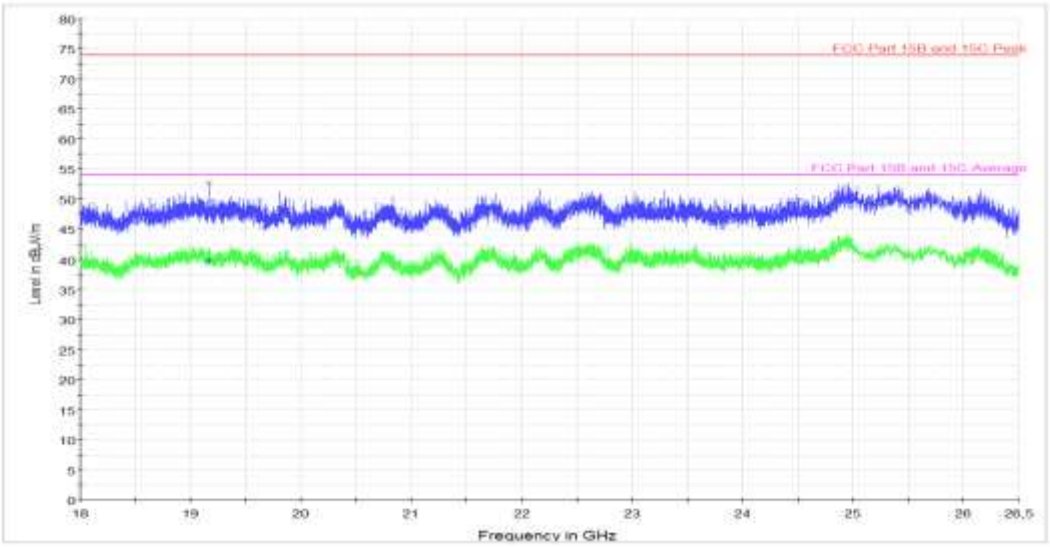
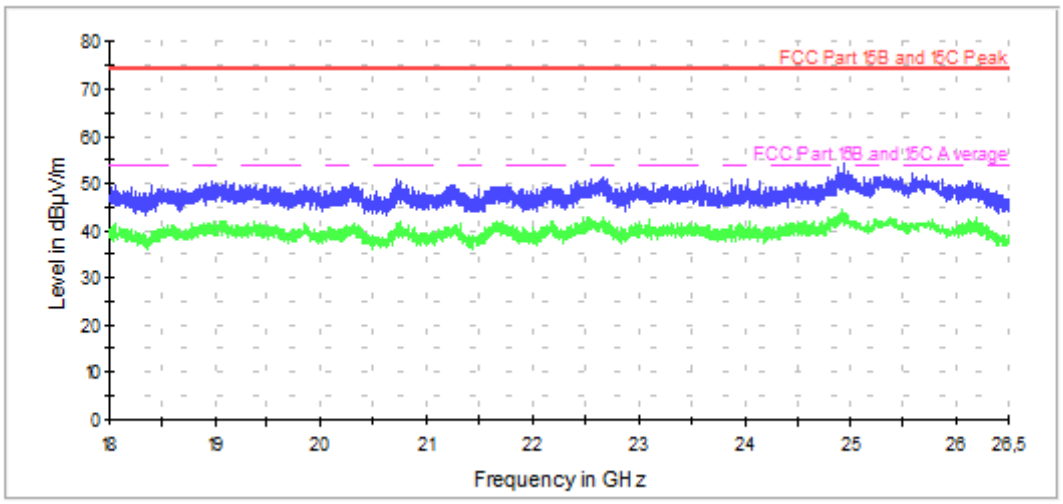
Overview sweeps performed with peak and average detectors Frequency range 18 – 26 GHz.
Ch. 18 EUT in Ethernet gateway.



Overview sweeps performed with peak and average detectors, Frequency range 18 – 26 GHz
Ch. 26 EUT in Ethernet gateway.



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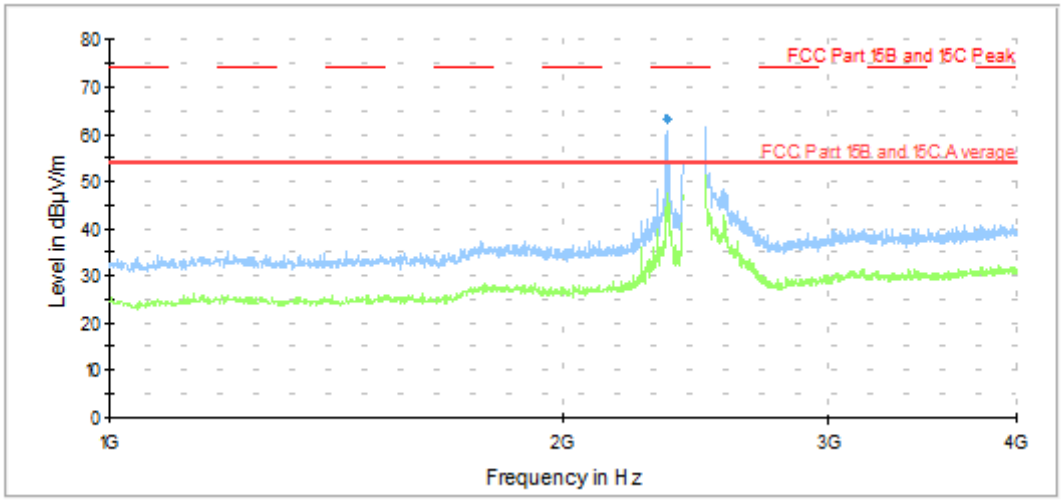
Overview sweeps performed with peak and average detectors, Frequency range 1 – 4 GHz
Ch. 11EUT in minibar.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2341.533	---	43.14	54.00	10.86	130.0	H	191.0	-8.7
2341.533	63.14	---	74.00	10.86	130.0	H	188.0	-8.7

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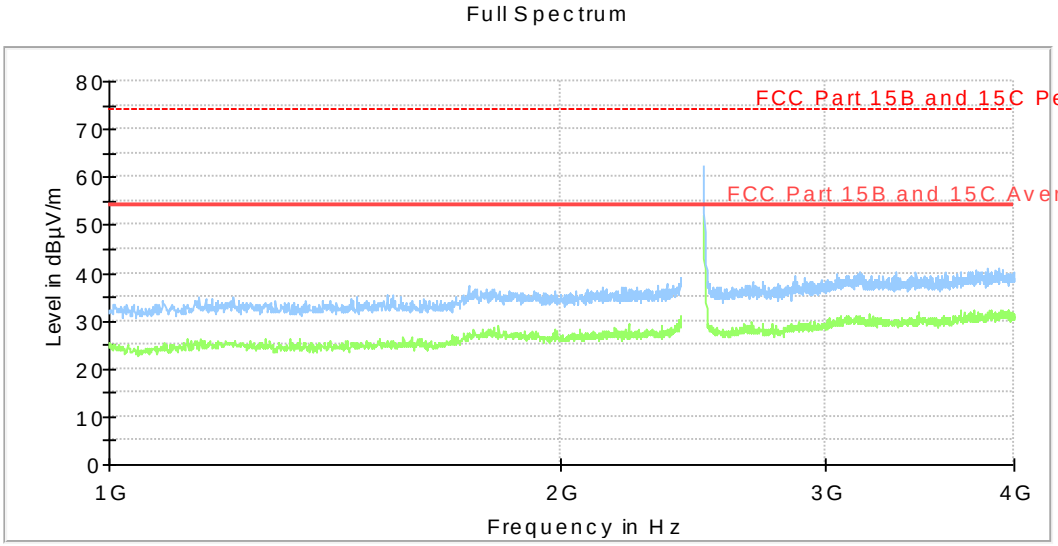
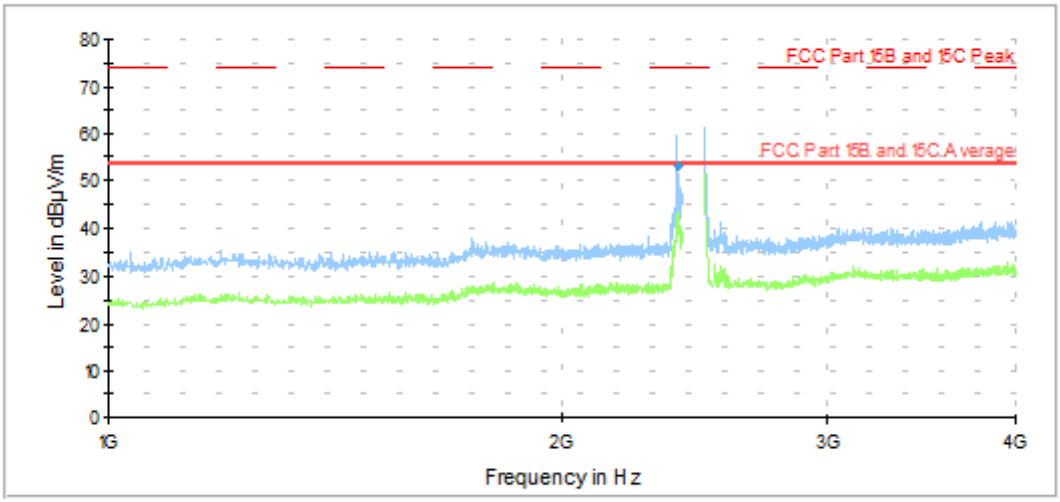
Overview sweeps performed with peak and average detectors, Frequency range 1 – 4 GHz
Ch. 18 EUT in minibar.



Overview sweeps performed with peak and average detectors, Frequency range 1 – 4 GHz
Ch. 26 EUT in minibar.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2384.398797	52.86	---	74.00	21.14	130.0	H	186.0	-8.1
2386.563126	---	32.86	54.00	21.14	130.0	H	191.0	-8.0

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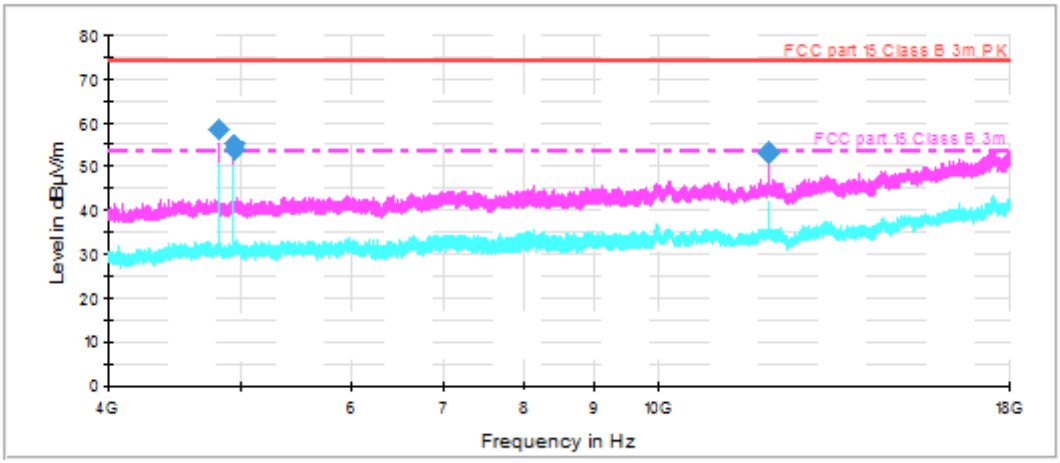
Overview sweeps performed with peak and average detectors, Frequency range 4 – 18 GHz
Ch. 11EUT in minibar.



Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)
4808.912333	58.6	1000.0	1000.000	133.0	V	176.0	-4.9	15.4
4939.410667	54.0	1000.0	1000.000	164.0	H	207.0	-4.7	20.0
4939.416000	55.0	1000.0	1000.000	143.0	H	210.0	-4.7	19.0
12022.320500	53.2	1000.0	1000.000	204.0	H	155.0	3.5	20.8
12027.232500	53.3	1000.0	1000.000	115.0	V	145.0	3.5	20.7

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)
4808.912333	38.6	1000.0	1000.000	133.0	V	176.0	-4.9	15.4
4939.410667	34.0	1000.0	1000.000	164.0	H	207.0	-4.7	20.0
4939.416000	35.0	1000.0	1000.000	143.0	H	210.0	-4.7	19.0
12022.320500	33.2	1000.0	1000.000	204.0	H	155.0	3.5	20.8
12027.232500	33.3	1000.0	1000.000	115.0	V	145.0	3.5	20.7

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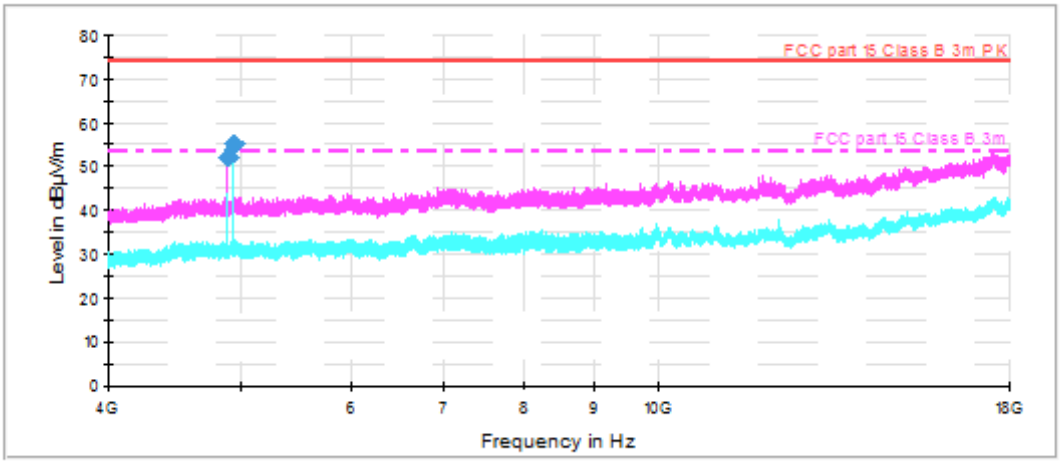
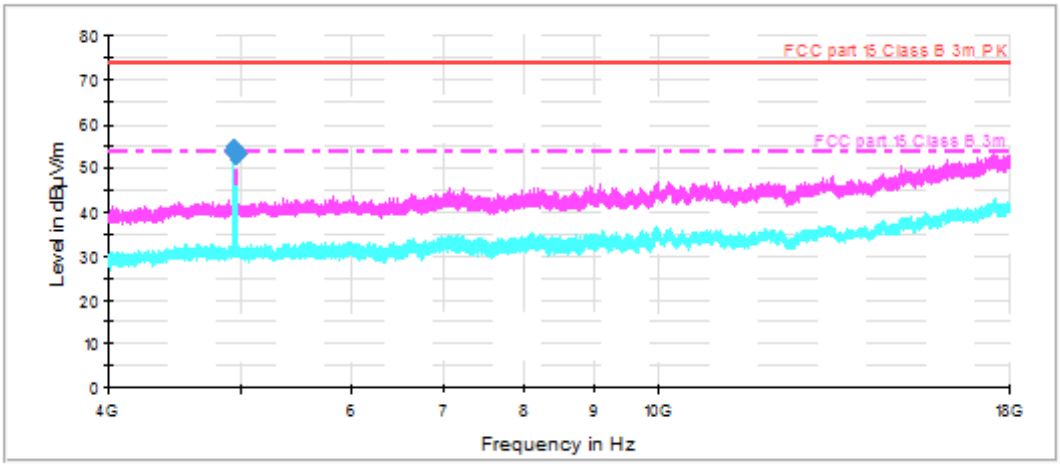
Overview sweeps performed with peak and average detectors, Frequency range 4 – 18 GHz
Ch. 18 EUT in minibar.



Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4889.067000	52.3	1000.0	1000.000	127.0	V	173.0	-4.8	21.7	74.0
4939.486667	55.0	1000.0	1000.000	144.0	H	210.0	-4.7	19.0	74.0

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4889.067000	32.3	1000.0	1000.000	127.0	V	173.0	-4.8	21.7	54.0
4939.486667	35.0	1000.0	1000.000	144.0	H	210.0	-4.7	19.0	54.0

Overview sweeps performed with peak and average detectors, Frequency range 4 – 18 GHz
Ch. 26 EUT in minibar.



Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4939.325000	54.2	1000.0	1000.000	164.0	H	207.0	-4.7	19.8	74.0
4959.953333	52.9	1000.0	1000.000	158.0	H	182.0	-4.7	21.1	74.0

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4939.325000	34.2	1000.0	1000.000	164.0	H	207.0	-4.7	19.8	54.0
4959.953333	32.9	1000.0	1000.000	158.0	H	182.0	-4.7	21.1	54.0

7.4 EIRP and antenna gain

Measured maximum transmitter field strength is converted to EIRP using following formula $P=(Ed)^2/(30)$.

E = field strength V/m
D = measurement distance
P = Power W

Frequency (MHz)	MaxPeak (dBµV/m)	EIRP (dBm)	Limit (dBm)
2405	90.43	-4.80	36
2445	101.53	6.30	36
2480	99.85	4.62	36

EIRP < 36 dBm and antenna gain <6dBi

7.5 MPE calculation

A worst case calculation is as follows:

$$S = \frac{dc \times EIRP}{4 \times \pi \times r^2}$$

Dc = 1
EIRP = 4.54 mW
R = 20 cm

S = 4.54 mW / (4 x π x 20 cm^2) = 0,0009 mW / cm^2

§1.1310 (e) table 1 Limit for general population / uncontrolled exposure is 1mW / cm^2.
The requirement is fulfilled without testing.

RSS 102 2.5.2 states that device operating at or above 1.5 GHz and having maximum e.i.r.p is equal or less than 5 W are exempted from routine evaluation. Maximum EIRP is 4.54 mW. Device is exempted from evaluation.

7.6 Test equipment

Measurement software	Rohde & Schwarz	EMC 32	--	--
Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Measurement software	Rohde & Schwarz	EMC 32	--	--
Measurement receiver	Rohde & Schwarz	ESU 40	13178	07-2014
Pre-amplifier	BONN Elektronik	BLMA 0118-M	31246	07-2014
Horn antenna	Rohde & Schwarz	HF907	31245	11-2014
High pass filter	K&L	H1G013G1	13142	07-2014
Horn antenna	Rohde & Schwarz	BLMA 1826-5A	31247	12/2016
Measurement receiver	Rohde & Schwarz	ESU 40	13178	07-2014

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8 OCCUPIED BANDWIDTH

Date of test:	5/28/2014	Test location:	EMC Center
EUT Serial:	-	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	Pass	Margin:	1135 kHz

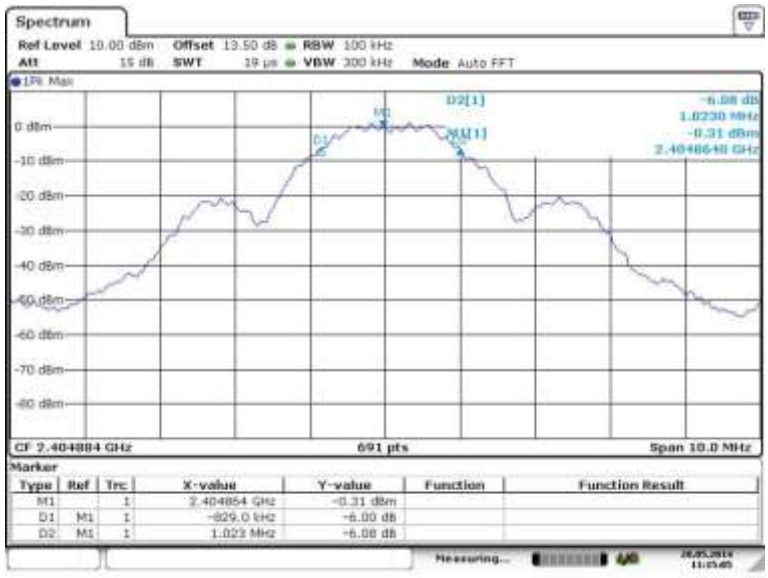
8.1 Requirement

Reference: FCC §15.247(a)(2), RSS-210 A8.2 (a)
Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

8.2 Test set-up

EUT antenna port was connected to spectrum analyser via rf-cable and 10 dB attenuator. Analyser's Reference level offset was used to compensate cable and attenuator losses.

8.3 Test data



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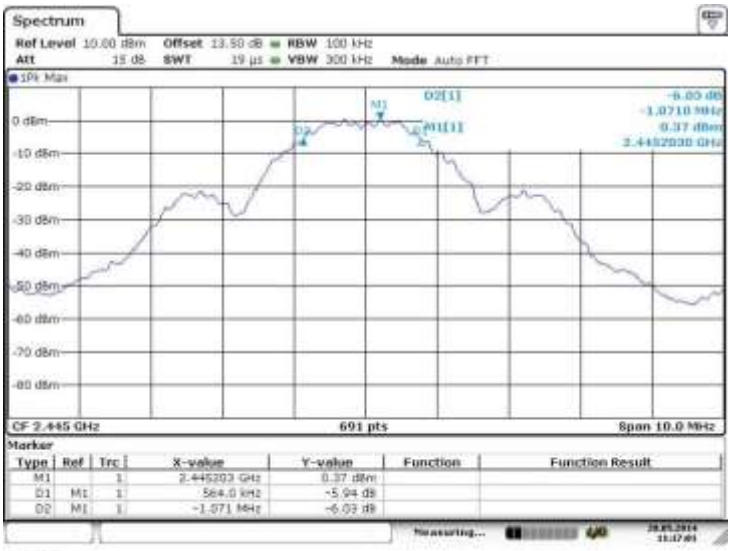
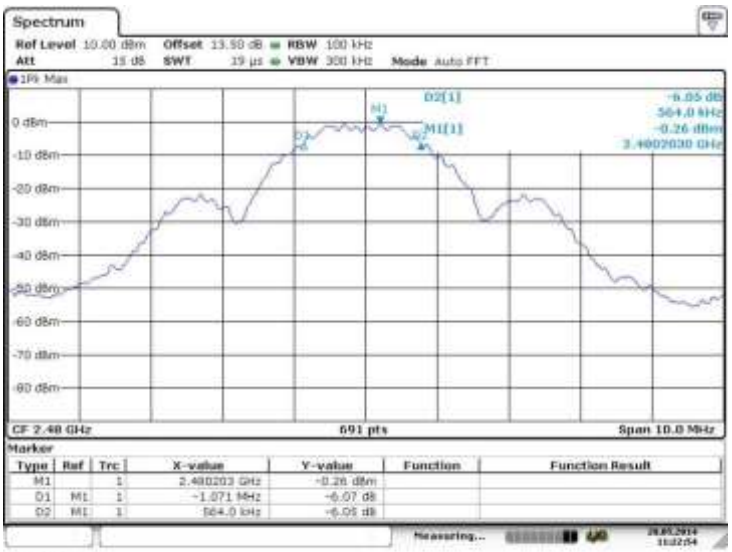




Frequency MHz	6 dB bandwidth kHz	Limit kHz	Margin kHz
2405	1852	500	1352
2445	1635	500	1135
2480	1635	500	1135

8.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2015
Rf-attenuator	H+S	5910_N-010 10dB	32696	7/2014

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

9 DUTY CYCLE

Date of test:	9/17/2014	Test location:	EMC Center
EUT Serial:	-	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	-	Margin:	-

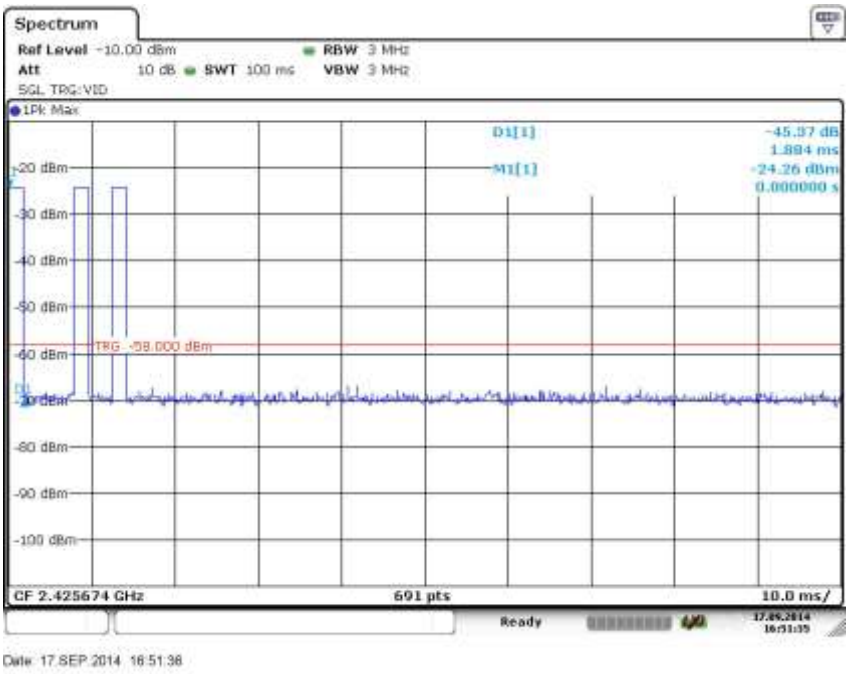
9.1 Requirement

Transmitter dwell time is measured for transmitter spurious emission duty cycle averaging.

9.2 Test set-up

EUT antenna port was connected to spectrum analyser via rf-cable and 10 dB attenuator.

9.3 Test data



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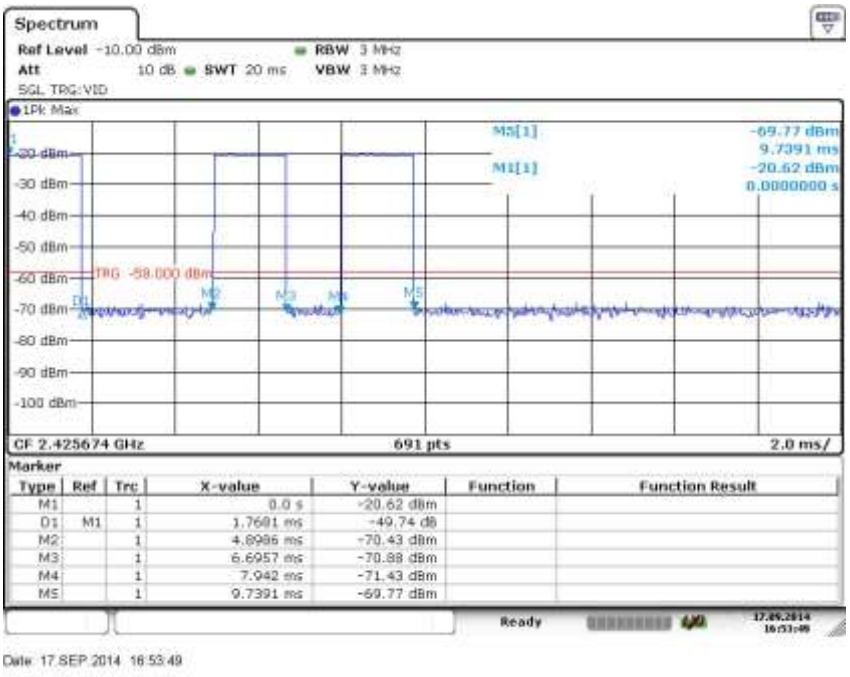

Ton/100ms	Duty cycle averaging factor 20LOG(Ton/100ms)	Averaging factor to be used
3 * 1.797 ms 5.39 ms	-25,37 dB	-20 dB

9.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2015
Rf-attenuator	H+S	5910_N-010 10dB	32696	7/2015

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10 CONDUCTED PEAK OUTPUT POWER

Date of test:	5/28/2014	Test location:	EMC Center
EUT Serial:	-	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	Pass	Margin:	25.58 dB

10.1 Requirement

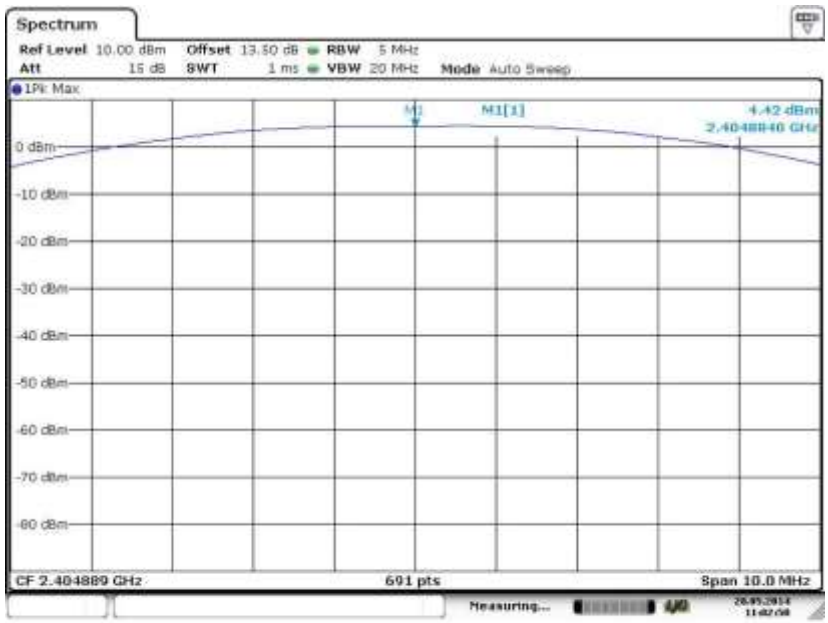
Reference: FCC §15.247(b)(3), RSS-210 A8.4.4

For systems employing digital modulation techniques operating in the bands 902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz, the maximum peak conducted output power shall not exceed 1 W.

10.2 Test set-up

EUT antenna port was connected to spectrum analyser via rf-cable and 10 dB attenuator. Analyser's Reference level offset was used to compensate cable and attenuator losses.

10.3 Test data



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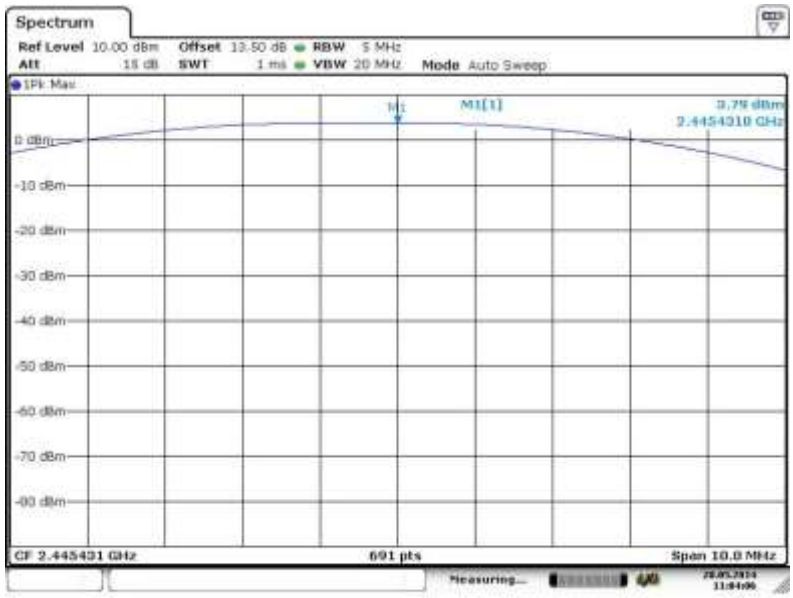
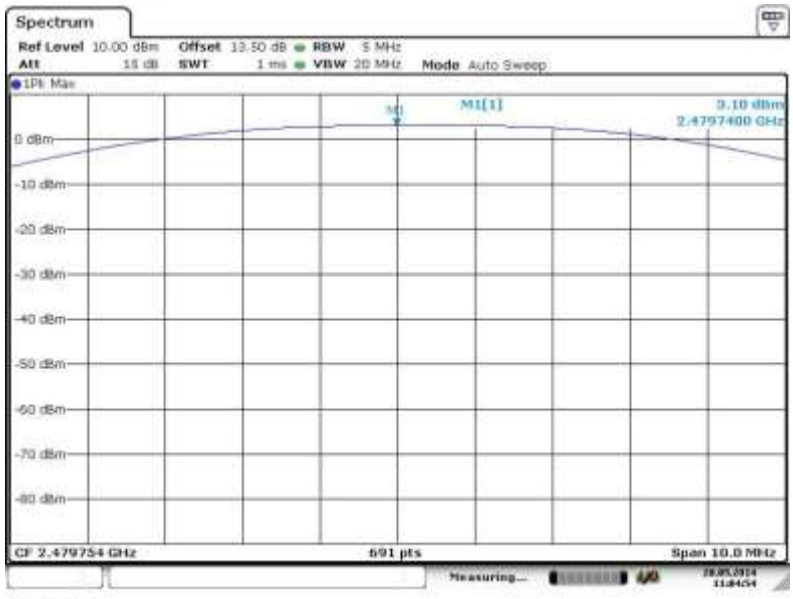


Lowest channel

Date: 28.MAY.2014 11:04:06



Lowest channel

Date: 28.MAY.2014 11:04:54

Frequency MHz	Peak power dBm	Limit dBm	Margin dB
2405	4.42	30	25.58
2445	3.79	30	26.21
2480	3.10	30	26.90

10.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2015
Rf-attenuator	H+S	5910_N-010 10dB	32696	7/2014

11 PEAK POWER SPECTRAL DENSITY

Date of test:	5/28/2014	Test location:	EMC Center
EUT Serial:	-	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	Pass	Margin:	17.59

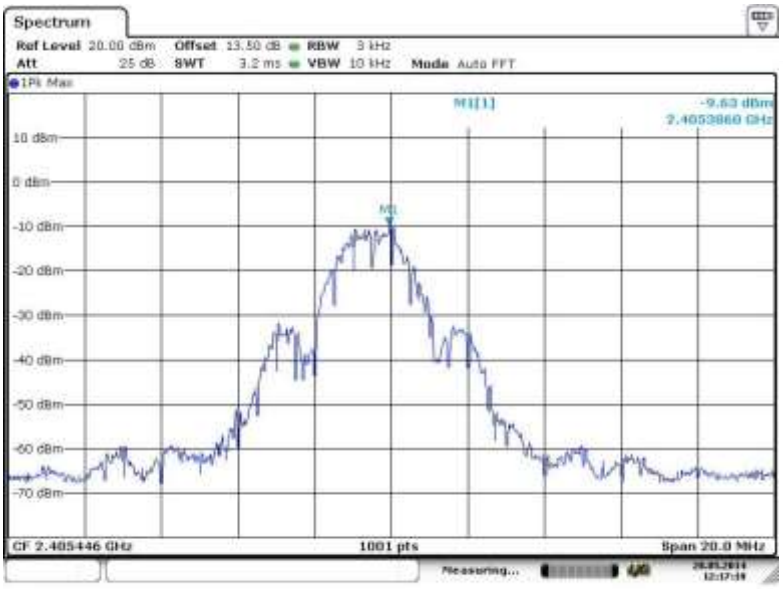
11.1 Requirement

Reference: FCC §15.247(e), RSS-210 A8.2 (b)
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

11.2 Test set-up

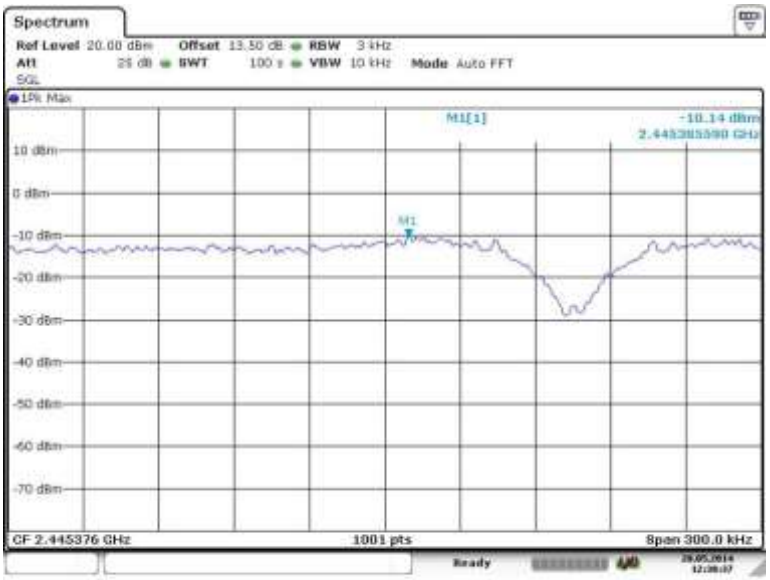
EUT antenna port was connected to spectrum analyser via rf-cable and 10 dB attenuator. Analyser's Reference level offset was used to compensate cable and attenuator losses.

11.3 Test data



Lowest channel
Date: 28.MAY.2014 12:31:35

Lowest channel
Date: 28.MAY.2014 12:34:51



Lowest channel
Date: 28.MAY.2014 12:38:36

Lowest channel
Date: 28.MAY.2014 12:44:09

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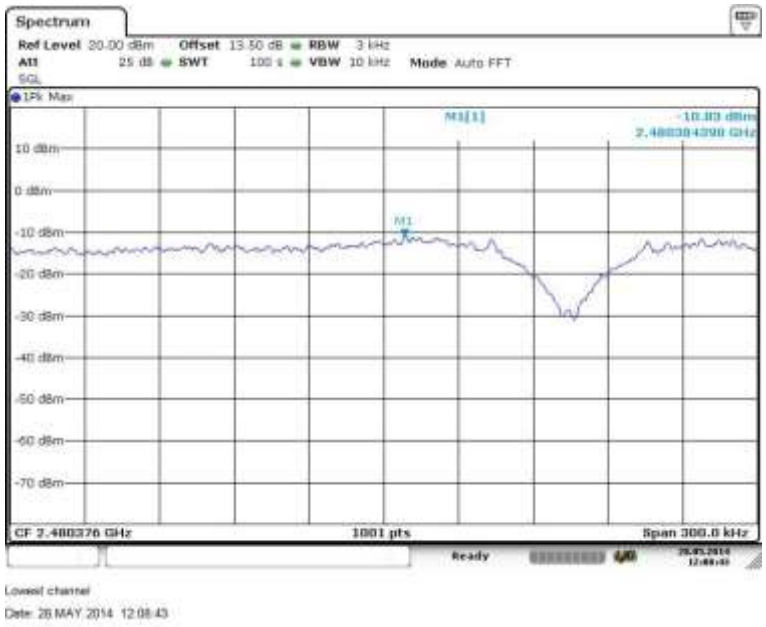

Frequency MHz	Peak power spectral density dBm/3kHz	Limit dBm/3kHz	Margin dB
2405	-9.59	8	17.59
2445	-10.14	8	18.14
2480	-10.83	8	18.83

11.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2015
Rf-attenuator	H+S	5910_N-010 10dB	32696	7/2014

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12 BAND EDGE

Date of test:	5/28/2014	Test location:	EMC Center
EUT Serial:	-	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	Pass	Margin:	25.4 dB

12.1 Requirement

Reference: FCC §15.247(d), RSS-210 A8.5
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.

12.2 Test set-up

EUT antenna port was connected to spectrum analyser via rf-cable and 10 dB attenuator. Analyser's Reference level offset was used to compensate cable and attenuator losses.

12.3 Test data

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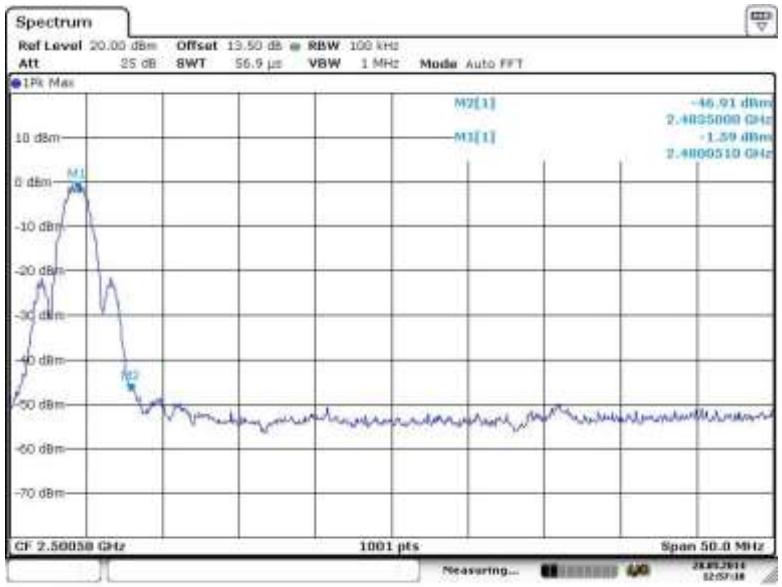

Frequency MHz	Level dBm/100kHz	Attenuation from carrier dB	Margin dB
2405.2	0.98	carrier	-
2480.0	-1.59	carrier	-
2400	-48.4	49.4	29.4
2483.5	-46.9	45.3	25.4

12.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2015
Rf-attenuator	H+S	5910_N-010 10dB	32696	7/2014

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13 UNCERTAINTIES SUMMARY

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.
Measurement uncertainty is calculated in accordance with EA-4/02-1997.
The measurement uncertainty is given with a confidence of 95% (k=2).

Radiated disturbance, field strength, 30 MHz - 1000 MHz	
30 to 300 MHz at 3 m	± 4,7 dB
200 to 1000 MHz at 3 m	± 4,8 dB
Radiated disturbance, field strength, 1 to 40 GHz in Semi Anechoic Chambers "Stora Hallen"and "Björkhallen"	
1 to 18 GHz with filter or attenuator	± 5,4 dB
1 to 18 GHz without filter or attenuator	± 5,2 dB
18 to 26 GHz without filter or attenuator	± 5,5 dB
26 to 40 GHz without filter or attenuator	± 5,6 dB
Conducted disturbances at the antenna port on radio equipment	
Frequency range 9 kHz – 1 GHz	± 0,9 dB
Frequency range 1 GHz – 7 GHz	± 1,4 dB
Frequency range 7 GHz -18GHz	± 2,4 dB
Frequency range 18 GHz -26,5GHz	± 3,0 dB
Frequency range 26,5 GHz - 40 GHz	± 3,6 dB
Output power	
Digital signals, conducted	± 0,6 dB
Digital signals, radiated:	
25 MHz - 1000 MHz	± 3,7 dB
1 GHz - 18 GHz	± 3,4 dB
Peak power density	
Conducted:	
8593E	± 2,5 dB
8566B	± 2,7 dB
Radiated:	
8593E & 8566B, 25 - 1000 MHz	± 4,5 dB
8593E & 8566B, 1 - 18 GHz	± 4,7 dB

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14 PHOTO OF THE EUT

EUT

EUT in Ethernet gateway

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Ethernet gateway bottom

Ethernet gateway top

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EUT in minibar

EUT in minibar

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Revision History

Edition	Date	Description
1	2014-08-28	First release
2	2014-09-29	Duty cycle measurement updated
3	2015-01-29	MPE calculation correction and RSS-GEN issue check and correction

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CONTENTS

1 CLIENT INFORMATION

The EUT has been tested by request of

Company:	Dometic Siegen GmbH In der Steinweise 16 DE-57074 Siegen Germany
Name of contact:	Jörg Peter

2 EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT according to the manufacturer/client declaration

Equipment:	2,4 GHz ZigBee radiomodule
Type/Model:	DevCom 06 ZigBee Module
Brand name:	Dometic
Serial number:	No visible serial number on EUT
Manufacturer:	Develco AS
Transmitter frequency range:	2405 –2480 MHz
Receiver frequency range:	2405 – 2480 MHz
Frequency agile or hopping:	☐ Yes ☒ No
Antenna:	☒ Internal antenna ☐ External antenna
Antenna connector:	☒ None, internal antenna ☐ Yes, type SMB
Antenna gain:	2,15 dBi
Rating RF output power:	4.42 dBm (measured conducted)
Type of modulation:	
Temperature range:	☒ Category I (General): -20°C to +55°C ☐ Category II (Portable equipment): -10°C to +55°C ☐ Category III (Equipment for normal indoor use): +5°C to +35°C ☐ Other: <-20°C to +55°C
Transmitter standby mode supported:	☒ Yes ☐ No

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2.2 Additional hardware information about the EUT

The EUT consists of the following units:

Unit	revision number	Serial number
DevCom 06 ZigBee Module	ver 4.01	-

2.3 Additional software information about the EUT

During the tests the EUT supported the following software:

Software	Version / Release	Comment
Devcom06PT.txt		Test software

2.4 Host equipment

Host equipment is defined as equipment needed for correct operation of the EUT during the tests, and included as a part of the testing and evaluation of the EUT.
Module doesn't have RF – shield and radiated emissions were tested in following two host devices.

Equipment	Manufacturer / Type
Minibar	Dometic Siegen GmbH / H20/60
Ethernet gateway	Dometic Siegen GmbH / Zigbee FEP 241.3365-32

2.5 Test signals

Continuous signal with O-QPSK modulation on 3 channel 2405, 2440 and 2480 MHz.
Signal with normal duty cycle for duty cycle measurement.

2.6 Modification during the tests

No modifications have been made during the tests.

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3 TEST SPECIFICATIONS

3.1 Standards

47 CFR Part 15, Subpart C, Intentional radiators, section 15.247
RSS-Gen Issue 4 (2014) RSS-210 Issue 8 (2010)

Test methods in:

ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices

3.2 Additions, deviations and exclusions from standards and accreditation

No additions, deviations or exclusions have been made from standards and accreditation.

3.3 Test site

Measurements were performed at:

Intertek Semko AB.
Torshamnsgatan 43,
P.O. Box 1103
SE-164 22 Kista

Intertek Semko AB is a FCC listed test site with site registration number 90913
Intertek Semko AB is a Industry Canada listed test facility with IC assigned code 2042G

Measurement chambers

Measurement Chamber	Type of chamber	IC Site filing #
STORAHALLEN	Semi-anechoic 10m	2042G-2

3.4 Test set-up

Unless otherwise specified EUT temporary antenna port was connected to spectrum analyser via rf-cable and 10 dB attenuator.

3.5 Test conditions

If not additionally specified, the tests were performed under the following environmental conditions:

Parameter	Normal	Extreme
Supplying voltage, V	115 V 60 Hz	-
Air temperature, ^{o}C	22 - 25	-

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4 TEST SUMMARY

The results in this report apply only to the tested sample:

Test	Result	Section in report	Note
Standard test methods			
AC power-line conducted tests	NA	5	Class A / B
Radiated test below 30 MHz	NA		
Radiated emissions measurements from 30 to 1000 MHz	Pass	6	
Determination of radiated and antenna conducted emissions above 1 GHz	Pass	7	
Frequency Stability Test	NA		
Occupied bandwidth and band-edge tests	Pass	8, 11	
Output Power average symbol envelope power	NA		
Power Spectral Density < 40 GHz	Pass	10	
Power Spectral Density > 40 GHz	NA		
In-situ measurements	NA		
Polar plot, main lobe and variation on radiated emissions test	NA		
Device-specific tests			
Determining the average value of pulsed emissions per 15.35(c)	Pass		
Determination of frequency hopping compliance per 47 CFR 15.247	NA		
Determination of digital modulation compliance per 47 CFR 15.247	Pass	8	
Determination of peak conducted output unlicensed wireless device power [15.247(b), 15.255]	Pass	9	
Determination of antenna gains, including those emitting in multiple directions (15.247)	Pass	8	
Determination of compliance with RF exposure limits	Pass	7	

NT = Not Tested, by request of the Client
NA = Not Applicable

Notes:

1. The measured result is below the upper limit, but by a margin less than half of the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance is more probable than non-compliance.

2. The measured result is above the upper limit, but by a margin less than half of the uncertainty interval. It is therefore not possible to state non-compliance based on the 95% level of confidence. However, the result indicates that non-compliance is more probable than compliance.

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5 CONDUCTED EMISSIONS MEASUREMENTS FROM AC MAINS

Date of test:	2014-07-29	Test location:	EMC center
EUT Serial:	-	Ambient temp.	31 °C
Tested by:	Per Larsson	Relative humidity	60 %
Test result:	Pass	Margin:	17.1 dB

5.1 Requirement

FCC §15.207, IC RSS-210 Table 3

Frequency (MHz)	Disturbance Voltage QP (dBµV)	Disturbance Voltage AV (dBµV)
0.15 – 0.5	66-56	56-46
0.5 – 5	56	46
5 – 30	60	50

5.2 Test setup details

Host device containing the EUT was placed on non-conductive table 80 cm above the ground plane and 40 cm from vertical coupling plane. AC mains were connected to LISN which was bonded to ground plane.
EUT was tested in two different host units

Test set-up photo:

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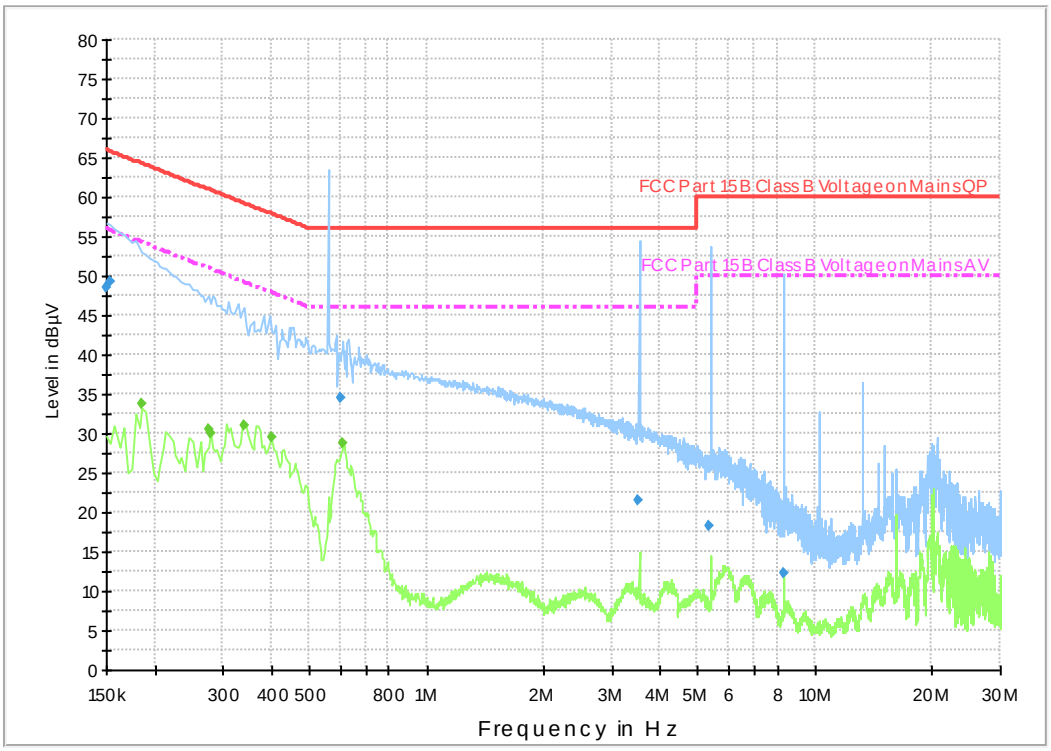
Overview sweeps performed with peak and average detectors. EUT in minibar.

04 ESH3-Z5 - FCC part 15 Cl. B



Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150	48.4	1000.0	9.000	GN	L1	10.0	17.6	66.0	
0.153	49.3	1000.0	9.000	GN	L1	10.0	16.6	65.8	
0.598	34.6	1000.0	9.000	GN	L1	10.1	21.4	56.0	
3.517	21.4	1000.0	9.000	GN	L1	10.2	34.6	56.0	
5.330	18.1	1000.0	9.000	GN	L1	10.3	41.9	60.0	
8.349	12.4	1000.0	9.000	GN	L1	10.4	47.6	60.0	

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.185	33.8	1000.0	9.000	GN	N	10.0	20.4	54.3	
0.276	30.5	1000.0	9.000	GN	N	10.0	20.5	50.9	
0.279	30.1	1000.0	9.000	GN	N	10.0	20.8	50.8	
0.339	30.9	1000.0	9.000	GN	N	10.0	18.3	49.2	
0.400	29.6	1000.0	9.000	GN	N	10.0	18.3	47.9	
0.609	28.9	1000.0	9.000	GN	N	10.0	17.1	46.0	

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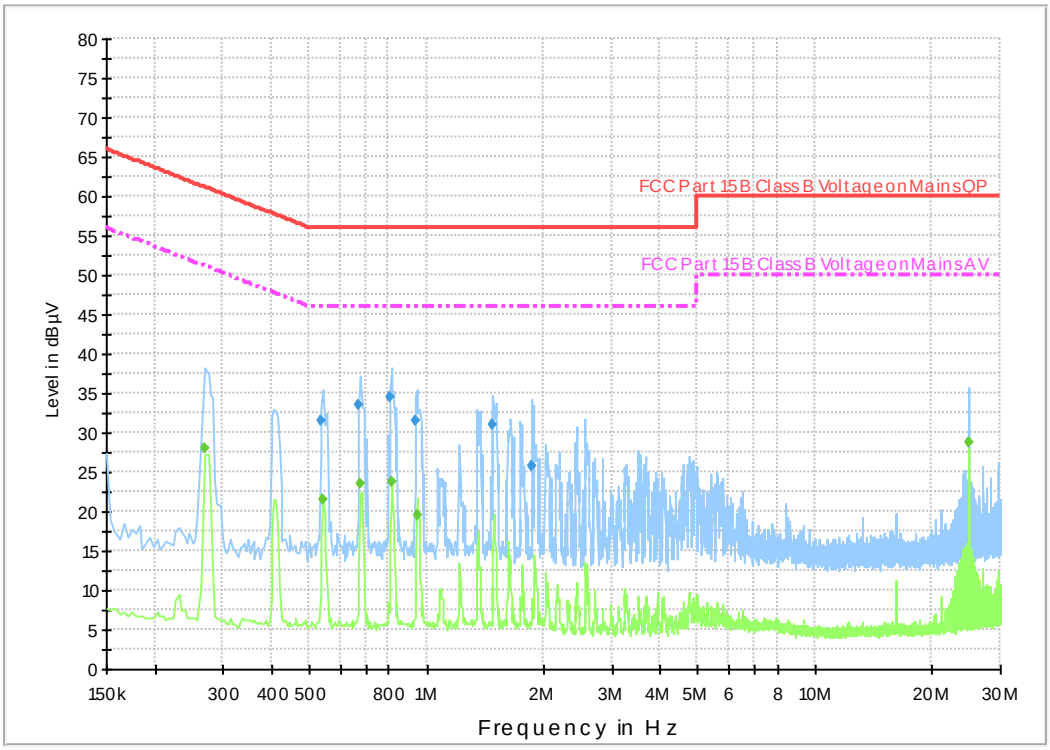
Overview sweeps performed with peak and average detectors. EUT in Ethernet gateway.

04 ESH3-Z5 - FCC part 15 Cl. B



Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.538	31.5	1000.	9.000	GN	N	10.0	24.5	56.0	
0.672	33.5	1000.	9.000	GN	N	10.0	22.5	56.0	
0.807	34.4	1000.	9.000	GN	N	10.0	21.6	56.0	
0.941	31.6	1000.	9.000	GN	N	10.0	24.4	56.0	
1.479	31.1	1000.	9.000	GN	N	10.0	24.9	56.0	
1.864	25.7	1000.	9.000	GN	N	10.0	30.3	56.0	

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.270	28.0	1000.0	9.000	GN	N	10.0	23.2	51.1	
0.540	21.6	1000.0	9.000	GN	N	10.0	24.4	46.0	
0.674	23.5	1000.0	9.000	GN	N	10.0	22.5	46.0	
0.812	23.7	1000.0	9.000	GN	N	10.0	22.3	46.0	
0.949	19.5	1000.0	9.000	GN	N	10.0	26.5	46.0	
25.000	28.7	1000.0	9.000	GN	N	11.0	21.3	50.0	

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6 RADIATED EMISSIONS MEASUREMENTS FROM 30 MHZ TO 1000MHZ

Date of test:	2014-4-14 / 2014-6-19	Test location:	Storahallen / Björkhallen
EUT Serial:	-	Ambient temp.	23 °C
Tested by:	Matti Virkki	Relative humidity	35 %
Test result:	Pass	Margin:	3.47 dB

6.1 Requirement

In restricted bands Reference: FCC §15.209, IC RSS-210 Table 3
Outside the restricted bands: FCC 15.247 (d), RSS-210 A8.5

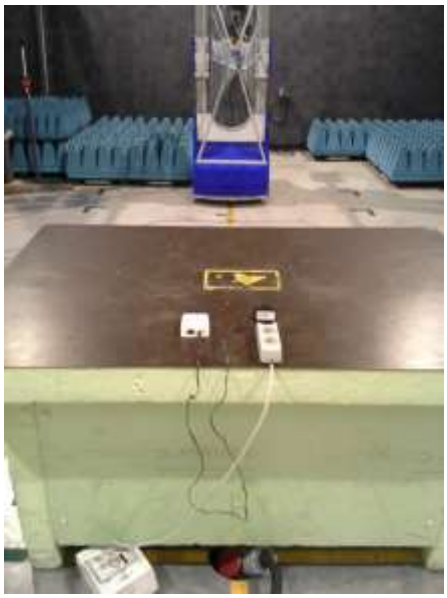
Frequency (MHz)	Field strength (dBµV/m)	Measurement distance (m)
30 – 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
960 –	44.0	10

Frequency (MHz)	Field strength (dBµV/m)	Measurement distance (m)
30 – 88	40.0	3
88 – 216	43.5	3
216 – 960	46.0	3
960 –	54.0	3

6.2 Test setup details

EUT was placed on non-conductive table 80 cm above the ground plane.
EUT was tested inside 2 different host devices

Test set-up photo:



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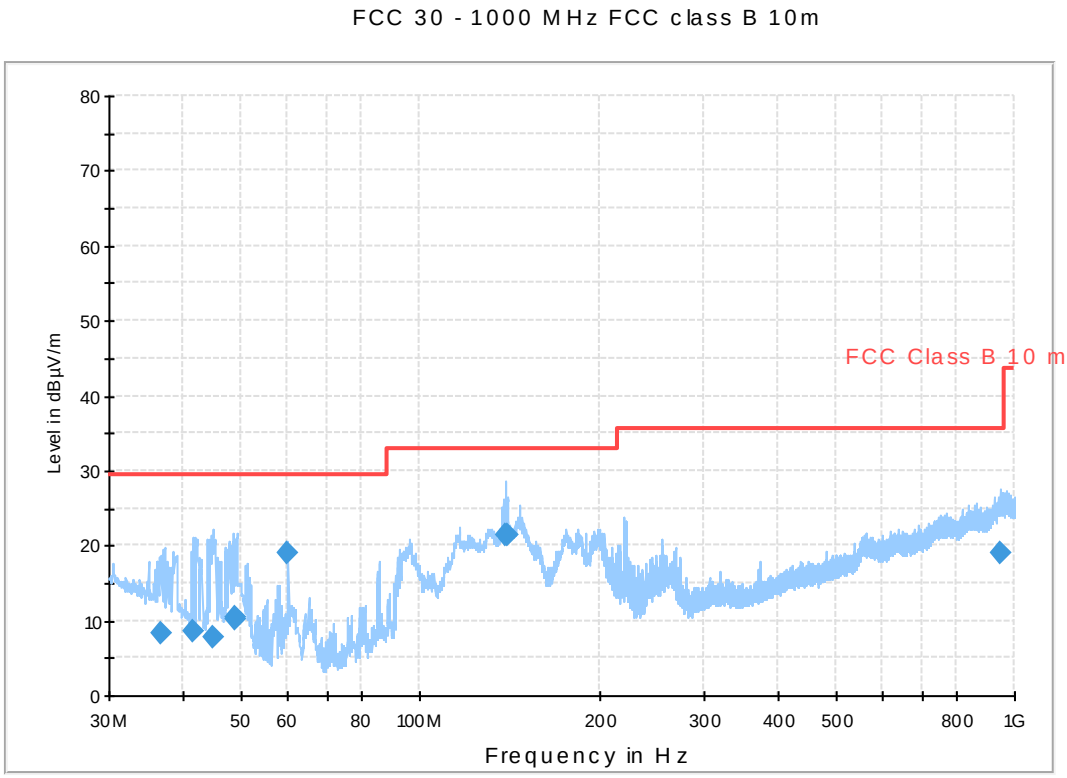
6.3 Test data

Overview sweeps performed with peak detectors, ch 11. EUT in minibar



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)
36.650	8.3	1000.0	120.000	144.0	V	200.0	-18.5	21.2
41.655	8.7	1000.0	120.000	100.0	V	194.0	-21.2	20.8
45.058	7.8	1000.0	120.000	400.0	V	238.0	-22.9	21.7
48.906	10.5	1000.0	120.000	198.0	V	14.0	-24.7	19.0
49.035	10.3	1000.0	120.000	275.0	V	13.0	-24.7	19.2
60.014	19.0	1000.0	120.000	256.0	V	225.0	-27.6	10.5
138.934	21.3	1000.0	120.000	100.0	V	-6.0	-21.3	11.7
139.970	21.5	1000.0	120.000	115.0	V	7.0	-21.3	11.5
947.929	19.0	1000.0	120.000	201.0	H	104.0	-4.3	16.6

Measured level [dBµV/m] = Analyser reading [dBµV] + cable loss [dB] – preamplifier gain [dB] + antenna factor [dB/m]

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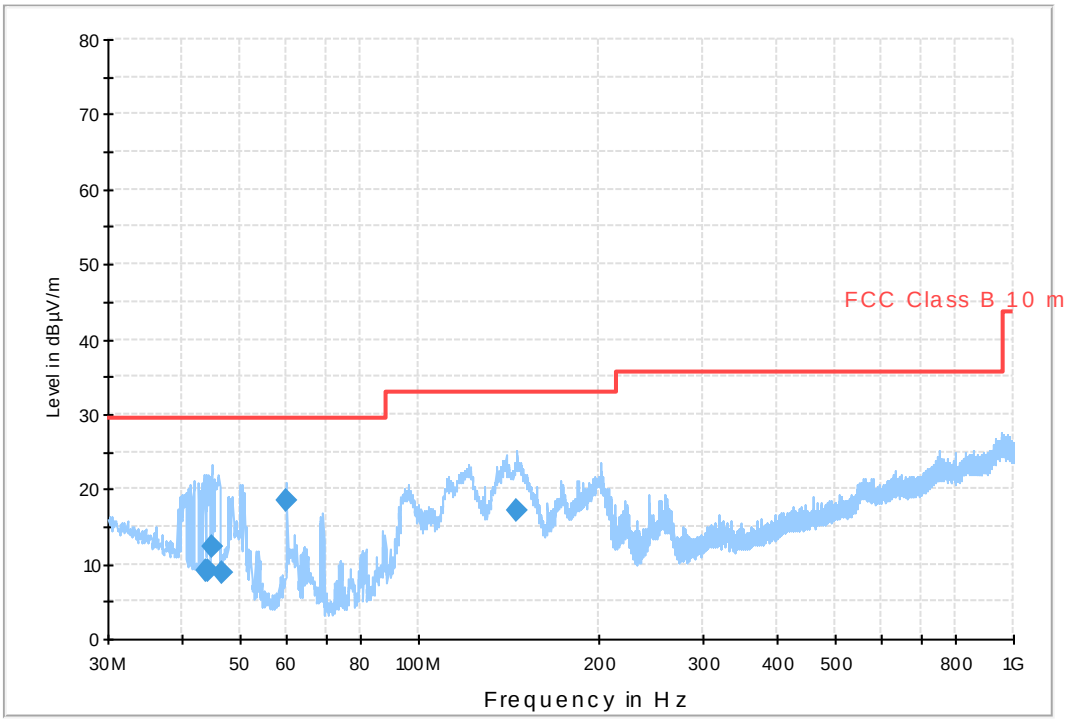
Overview sweeps performed with peak detectors, ch 18 EUT in minibar

FCC 30 - 1000 MHz FCC class B 10m



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)
43.941	9.0	1000.0	120.000	100.0	V	231.0	-22.4	20.5
44.089	9.0	1000.0	120.000	161.0	V	215.0	-22.4	20.5
45.002	12.3	1000.0	120.000	182.0	V	225.0	-22.9	17.2
46.645	8.9	1000.0	120.000	271.0	V	259.0	-23.6	20.6
60.014	18.6	1000.0	120.000	274.0	V	225.0	-27.6	10.9
145.550	17.1	1000.0	120.000	100.0	V	36.0	-21.5	15.9

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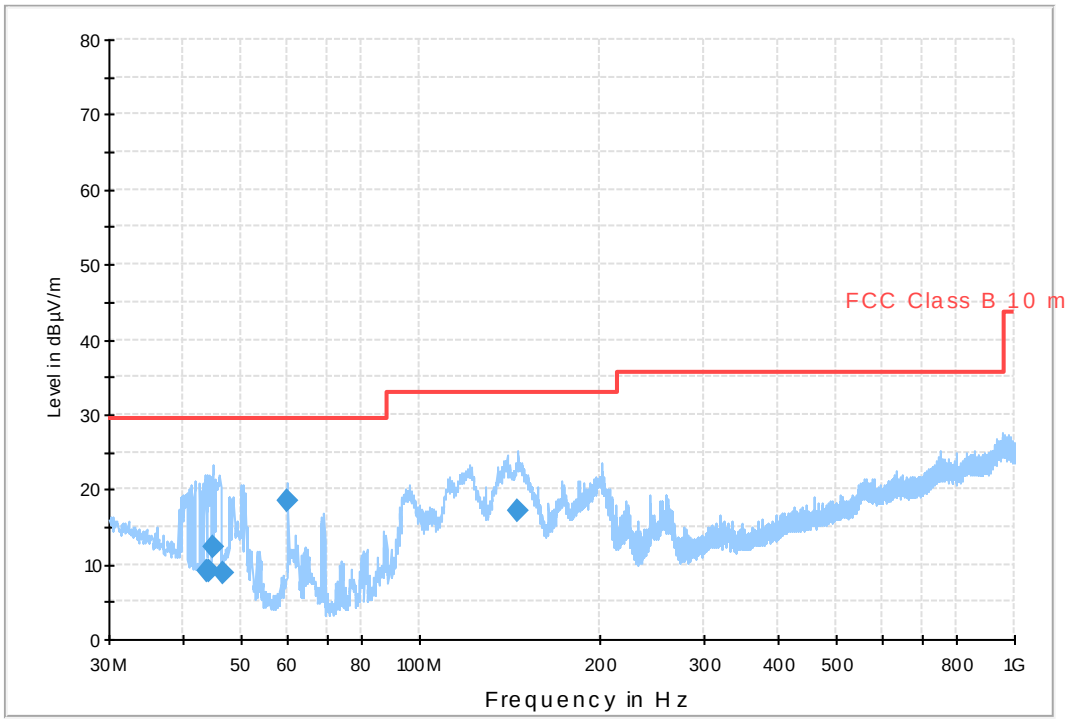
Overview sweeps performed with peak detectors, ch 26 EUT in minibar



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)
43.941	9.0	1000.0	120.000	100.0	V	231.0	-22.4	20.5
44.089	9.0	1000.0	120.000	161.0	V	215.0	-22.4	20.5
45.002	12.3	1000.0	120.000	182.0	V	225.0	-22.9	17.2
46.645	8.9	1000.0	120.000	271.0	V	259.0	-23.6	20.6
60.014	18.6	1000.0	120.000	274.0	V	225.0	-27.6	10.9
145.550	17.1	1000.0	120.000	100.0	V	36.0	-21.5	15.9

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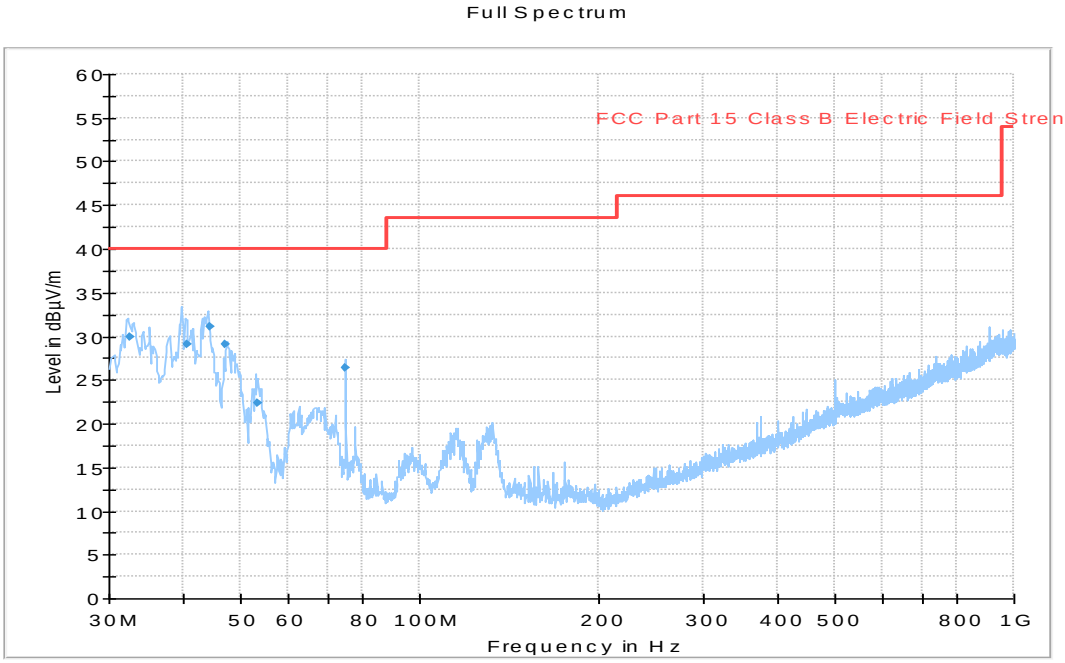
Overview sweeps performed with peak detectors, ch 11 EUT in Ethernet gateway.



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
32.464489	29.86	40.00	10.14	1000.0	120.000	108.0	V	236.0
40.719359	29.15	40.00	10.85	1000.0	120.000	100.0	V	38.0
44.208056	31.04	40.00	8.96	1000.0	120.000	102.0	V	14.0
47.074790	29.01	40.00	10.99	1000.0	120.000	102.0	V	180.0
53.266012	22.33	40.00	17.67	1000.0	120.000	100.0	V	47.0
75.010060	26.37	40.00	13.63	1000.0	120.000	139.0	V	34.0

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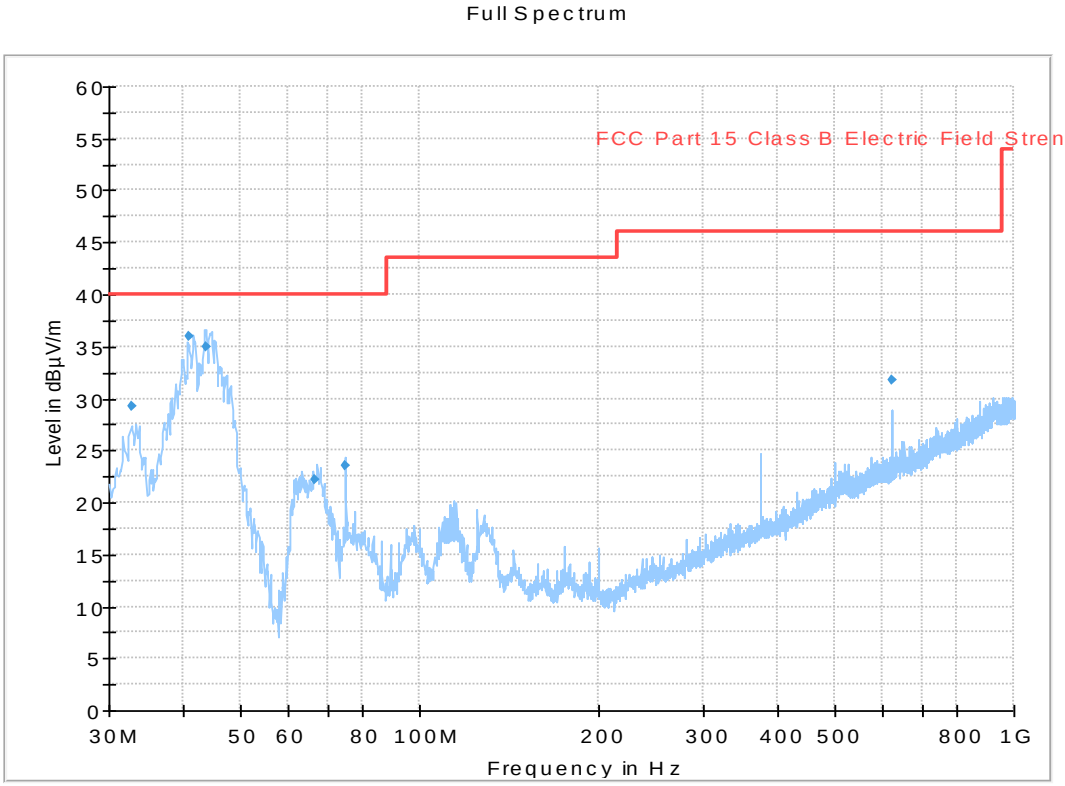
Overview sweeps performed with peak detectors, ch 18 EUT in Ethernet gateway.



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
32.866733	29.32	40.00	10.68	1000.0	120.000	100.0	V	64.0
41.043287	35.94	40.00	4.06	1000.0	120.000	100.0	V	27.0
43.847214	34.88	40.00	5.12	1000.0	120.000	103.0	V	37.0
66.734349	22.20	40.00	17.80	1000.0	120.000	158.0	V	64.0
74.990060	23.47	40.00	16.53	1000.0	120.000	167.0	V	126.0
624.989699	31.70	46.02	14.32	1000.0	120.000	137.0	H	256.0

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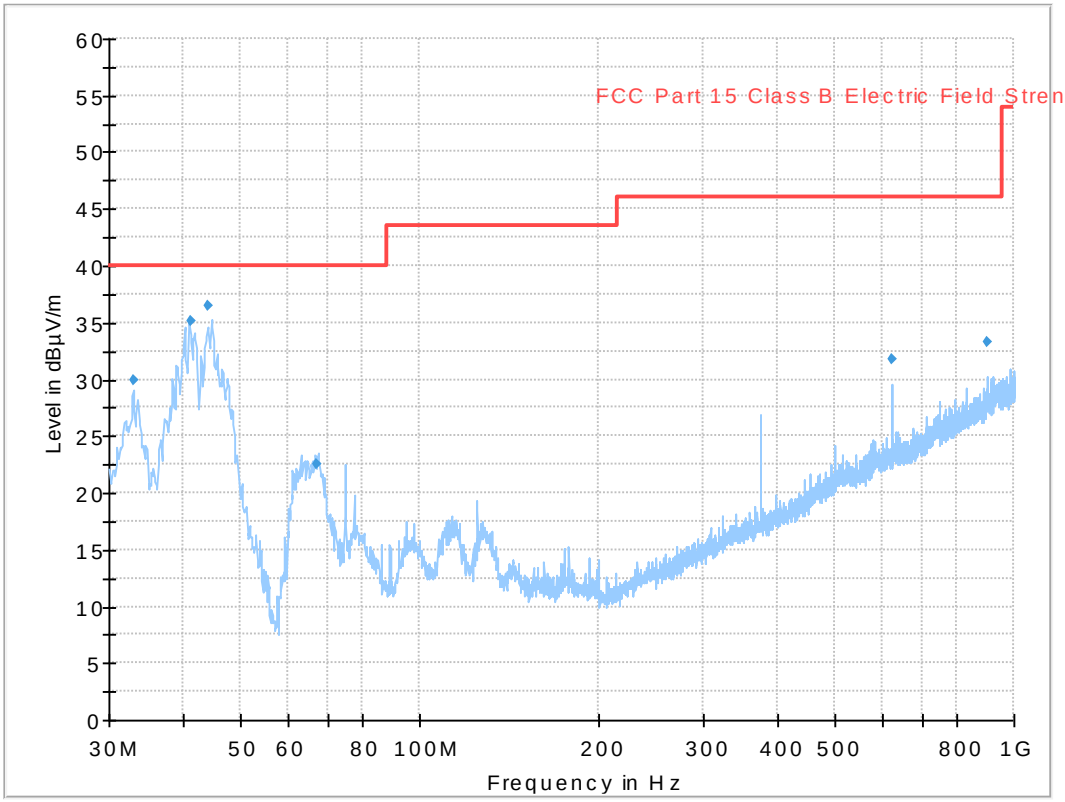
Overview sweeps performed with peak detectors, ch 26 EUT in Ethernet gateway.

Full Spectrum



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
33.025892	29.86	40.00	10.14	1000.0	120.000	100.0	V	34.0
41.281603	35.21	40.00	4.79	1000.0	120.000	100.0	V	5.0
44.089178	36.53	40.00	3.47	1000.0	120.000	103.0	V	347.0
67.094910	22.60	40.00	17.40	1000.0	120.000	177.0	V	29.0
624.990100	31.78	46.02	14.24	1000.0	120.000	152.0	H	254.0
901.902806	33.28	46.02	12.74	1000.0	120.000	211.0	V	6.0

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6.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Measurement software	Rohde & Schwarz	EMC 32	--	--
Receiver	Rohde & Schwarz	ESI	32291	7/2014
UltraLog antenna	Rohde & Schwarz	HL 562	30711	12/2014
Hornantenna	Rohde & Schwarz	HF907	32307	6/2015
Pre amplifier	Rohde & Schwarz	TS-PRE1	32306	7/2014
Switch unit	Rohde & Schwarz	OSP130	32300	7/2014
Filter unit	Rohde & Schwarz	OSP-F7-B	32301	--

7 RADIATED EMISSIONS MEASUREMENTS ABOVE 1 GHZ

Date of test:	2014-06-19	Test location:	Radiohallen / Stora hallen
EUT Serial:	--	Ambient temp.	23 C
Tested by:	Matti Virkki	Relative humidity	50 %
Test result:	Pass	Margin:	4.86 dB

7.1 Requirement

Reference: FCC §15.209, IC RSS-210 Table 3
In the restricted bands:

Frequency (MHz)	Field strength (dBμV/m)	Measurement distance (m)
30 – 88	40.0	3
88 – 216	43.5	3
216 – 960	46.0	3
960 –	54.0	3

Outside the restricted bands: FCC 15.247 (d), RSS-210 A8.5
Carrier – 20 dB.

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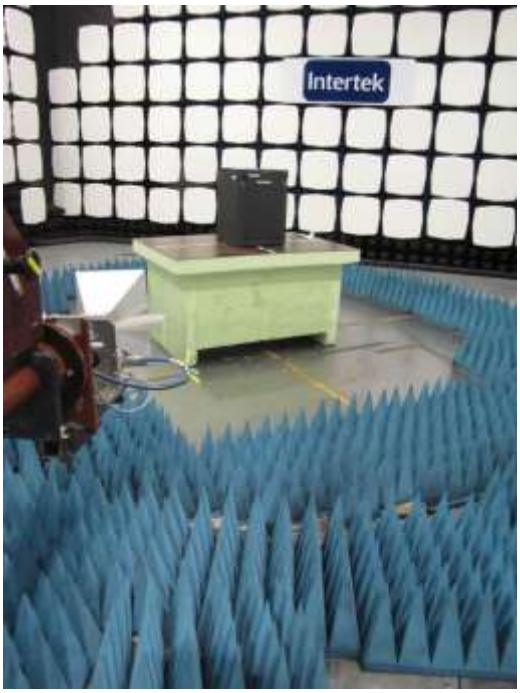
7.2 Test setup details

Host device containing the EUT was placed on non-conductive table 80 cm above the ground plane.
Absorbers were placed on floor between EUT and antenna.

Test set-up photo:



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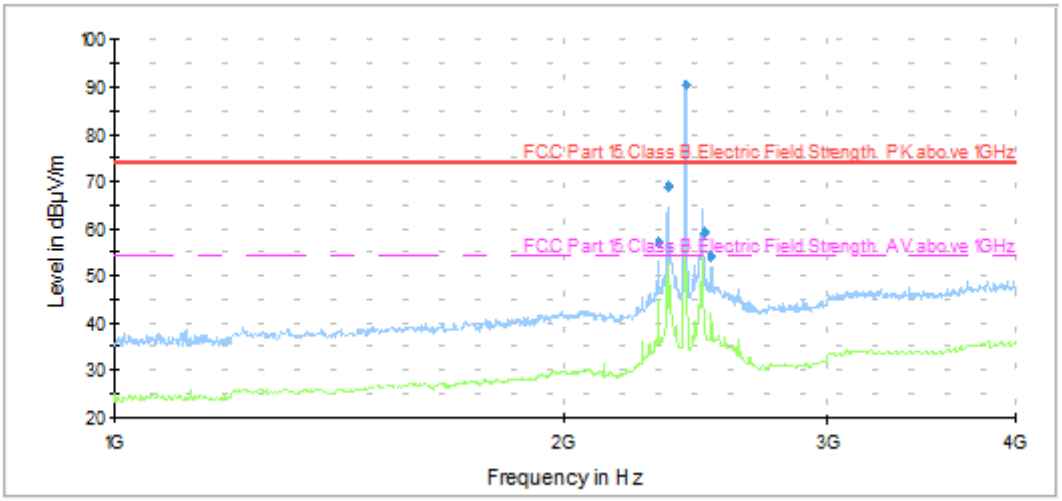
7.3 Test data

Overview sweeps performed with peak detectors, Frequency range 1 – 4 GHz Ch. 11
EUT in Ethernet gateway.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2307.613227	---	37.17	54.00	16.73	1000.0	1000.000	100.0	H	55.0
2307.613227	57.17	---	73.90	16.73	1000.0	1000.000	100.0	H	55.0
2341.481363	---	49.04	54.00	4.86	1000.0	1000.000	100.0	H	59.0
2341.481363	69.04	---	73.90	4.86	1000.0	1000.000	100.0	H	59.0
2405.409619	90.43	---	---	---	1000.0	1000.000	100.0	V	34.0
2405.409619	---	70.43	---	---	1000.0	1000.000	100.0	V	34.0
2477.169940	---	39.18	---	---	1000.0	1000.000	100.0	H	54.0
2477.169940	59.18	---	---	---	1000.0	1000.000	100.0	H	54.0
2501.610020	54.13	---	73.90	19.77	1000.0	1000.000	225.0	H	52.0
2501.610020	---	34.13	54.00	10.14	1000.0	1000.000	225.0	H	52.0

Duty cycle averaging 20 LOG * Ton /100ms is used to determine average level.
Transmitter sends 5.39 s / 100 ms.
Averaging factor is -25.31 dB – 20 dB is used to determine average level.

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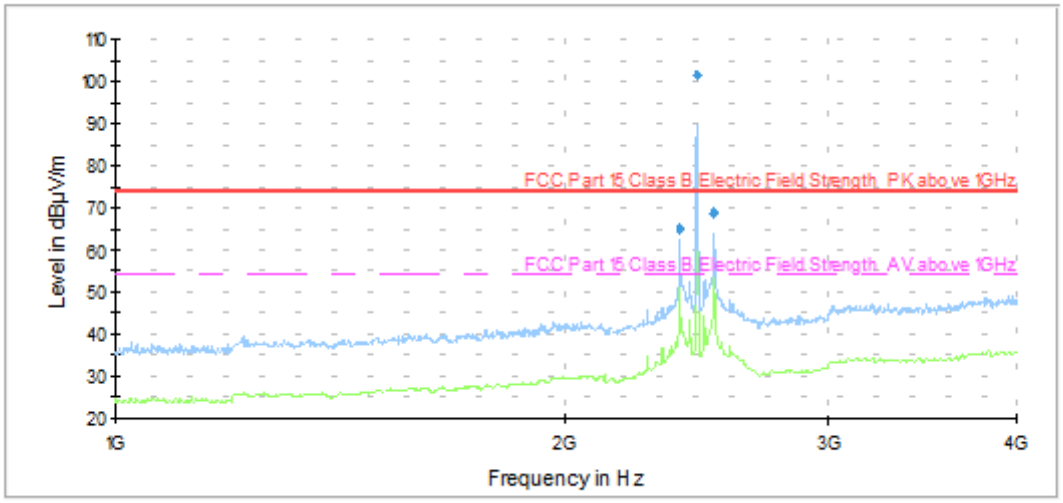
Overview sweeps performed with peak detectors, Frequency range 1 – 4 GHz Ch. 18
EUT in Ethernet gateway.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2381.361523	---	44.91	54.00	8.99	1000.0	1000.000	300.0	H	194.0
2381.361523	64.91	---	73.90	8.99	1000.0	1000.000	300.0	H	194.0
2445.485772	101.53	---	---	---	1000.0	1000.000	100.0	V	225.0
2445.485772	---	81.53	---	---	1000.0	1000.000	100.0	V	225.0
2509.418036	68.88	---	73.90	5.02	1000.0	1000.000	100.0	H	194.0
2509.418036	---	48.88	54.00	5.02	1000.0	1000.000	100.0	H	194.0

Duty cycle averaging 20 LOG * Ton /100ms is used to determine average level.
Transmitter sends 5.39 s / 100 ms.
Averaging factor is -25.31 dB – 20 dB is used to determine average level.

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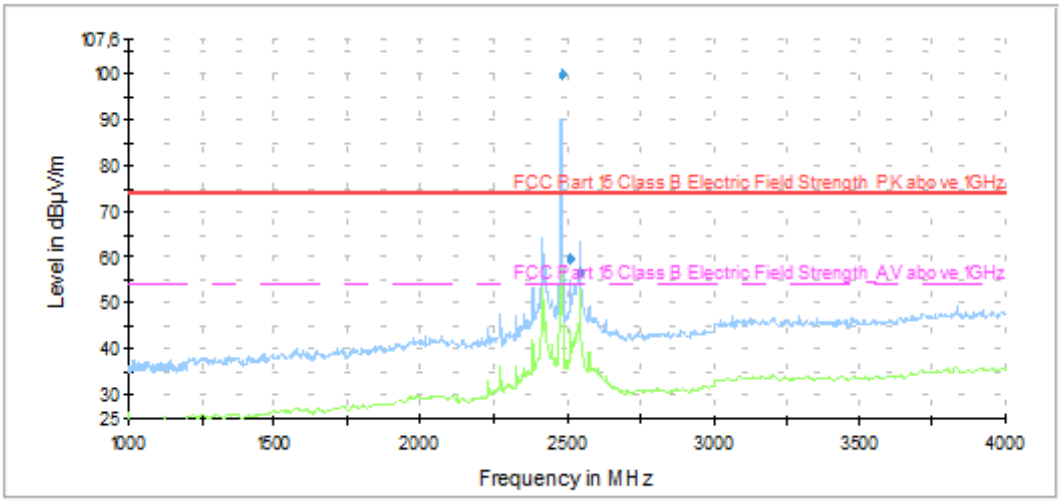
Overview sweeps performed with peak detectors, Frequency range 1 – 18 GHz Ch. 26
EUT in Ethernet gateway.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2480.357916	---	79.85	---		1000.0	1000.000	200.0	V	0.0
2480.357916	99.85	---	---		1000.0	1000.000	200.0	V	0.0
2511.422044	59.87	---	73.90	14.03	1000.0	1000.000	100.0	H	64.0
2511.422044	---	39.87	54.00	14.03	1000.0	1000.000	100.0	H	64.0
2544.486172	56.88	---	73.90	17.02	1000.0	1000.000	125.0	H	14.0
2544.486172	---	36.88	54.00	17.02	1000.0	1000.000	125.0	H	14.0

Duty cycle averaging 20 LOG * Ton /100ms is used to determine average level.
Transmitter sends 5.39 s / 100 ms.
Averaging factor is -25.31 dB – 20 dB is used to determine average level.

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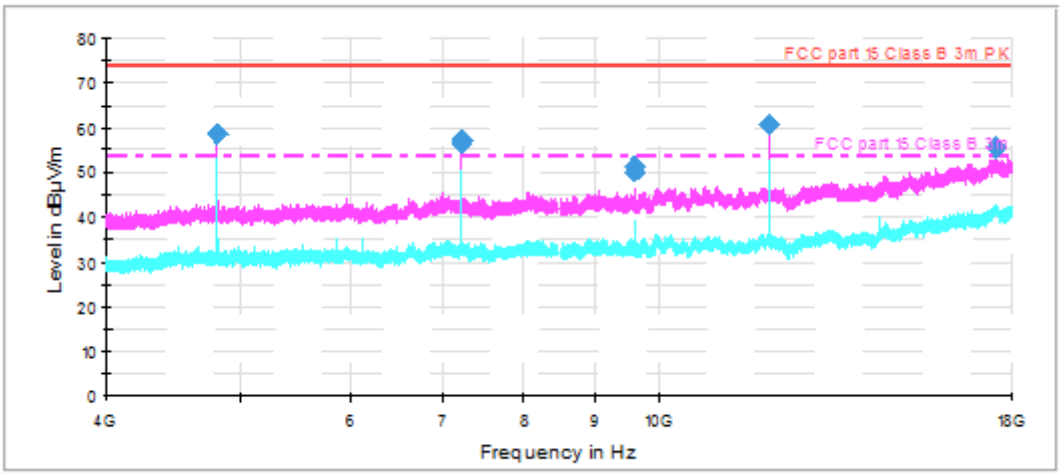
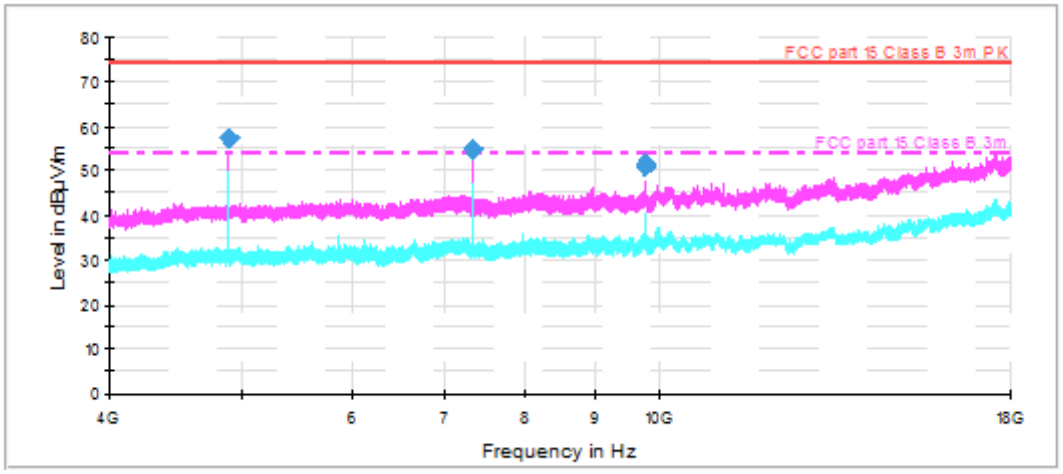
Overview sweeps performed with peak detectors, Frequency range 4 – 18 GHz Ch. 11
EUT in Ethernet gateway.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)
12022.602000	60.7	40.7	1000.0	1000.000	202.0	V	35.0	3.5
9617.880000	50.1	30.7	1000.0	1000.000	290.0	V	104.0	1.5
4810.937000	58.4	38.4	1000.0	1000.000	100.0	H	158.0	-4.9
4810.906333	58.3	38.3	1000.0	1000.000	100.0	H	158.0	-4.9
17518.632000	55.4	35.4	1000.0	1000.000	145.0	V	222.0	11.7
7213.458667	57.4	37.4	1000.0	1000.000	127.0	V	222.0	-1.0
7213.206333	56.3	36.3	1000.0	1000.000	218.0	V	215.0	-1.0
9622.243667	51.3	31.3	1000.0	1000.000	201.0	V	255.0	1.6

Overview sweeps performed with peak detectors, Frequency range 4 – 18 GHz Ch. 18
EUT in Ethernet gateway.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)
4890.824000	57.2	37.2	1000.0	1000.000	286.0	V	64.0	-4.8
9777.473333	50.9	30.9	1000.0	1000.000	274.0	H	128.0	1.8
9777.872333	51.2	31.2	1000.0	1000.000	195.0	H	141.0	1.8
7333.263000	54.8	34.8	1000.0	1000.000	100.0	V	224.0	-0.9

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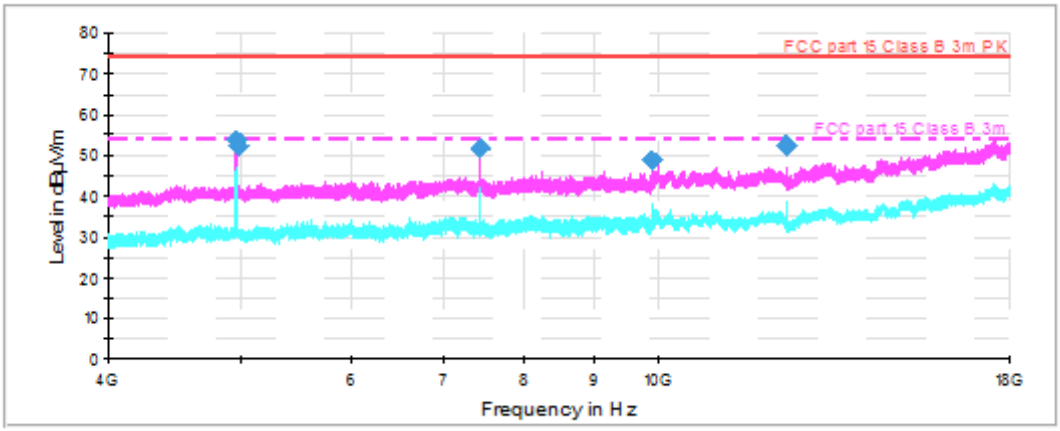
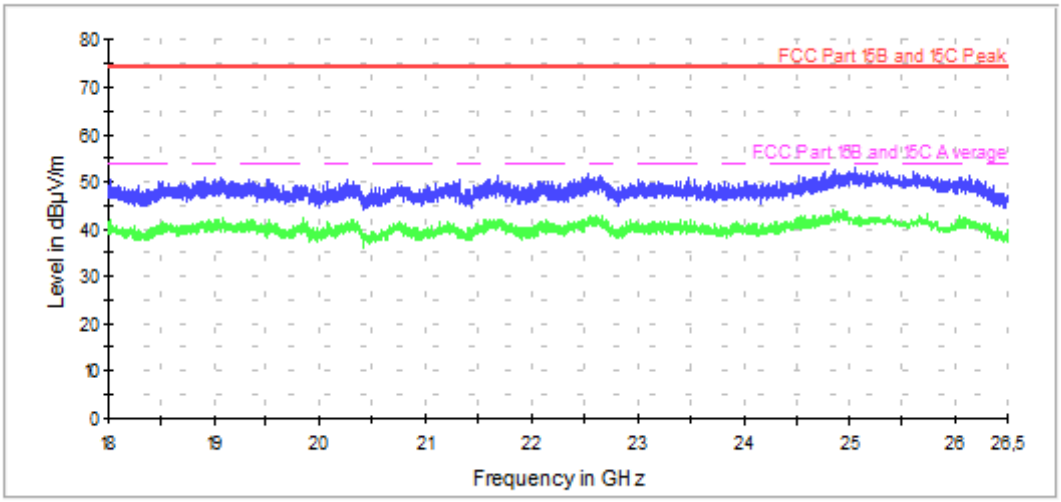
Overview sweeps performed with peak detectors, Frequency range 4 – 18 GHz Ch. 26
EUT in Ethernet gateway.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)
7441.339667	51.9	31.9	1000.0	1000.000	222.0	V	2.0	-0.9
7440.978333	51.8	31.8	1000.0	1000.000	225.0	V	8.0	-0.9
12397.294000	52.3	32.3	1000.0	1000.000	180.0	V	32.0	3.9
12397.343000	52.6	32.6	1000.0	1000.000	188.0	V	61.0	3.9
4959.231667	53.7	33.7	1000.0	1000.000	169.0	V	222.0	-4.7
4960.889333	52.3	32.3	1000.0	1000.000	127.0	V	221.0	-4.7
9921.365667	48.9	28.9	1000.0	1000.000	243.0	V	225.0	2.1

Overview sweeps performed with peak detectors, Frequency range 18 – 26 GHz Ch. 11
EUT in Ethernet gateway.



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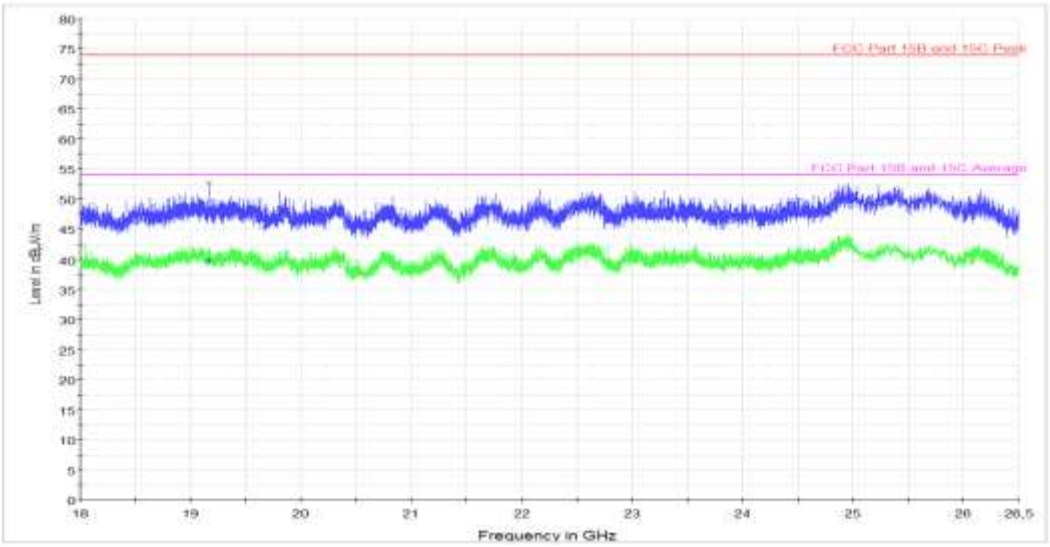
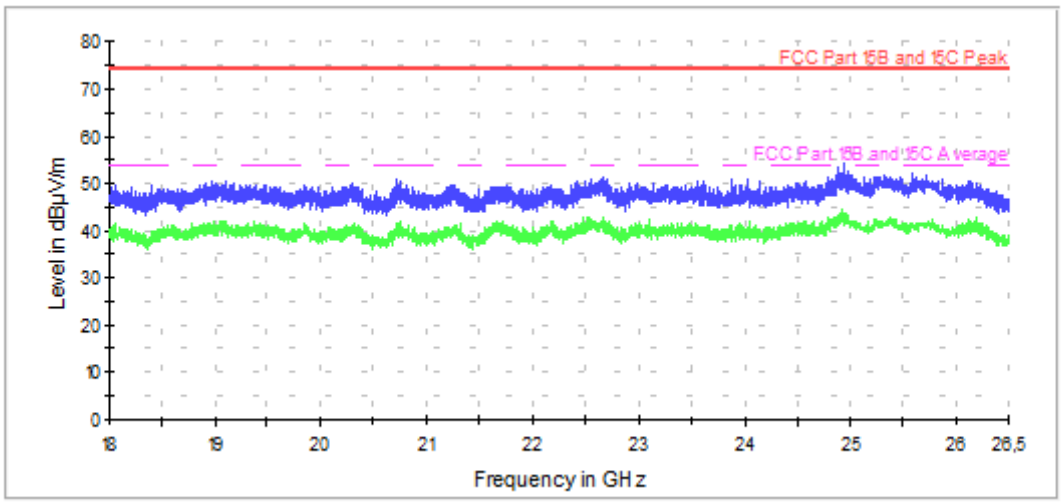
Overview sweeps performed with peak and average detectors Frequency range 18 – 26 GHz.
Ch. 18 EUT in Ethernet gateway.



Overview sweeps performed with peak and average detectors, Frequency range 18 – 26 GHz
Ch. 26 EUT in Ethernet gateway.



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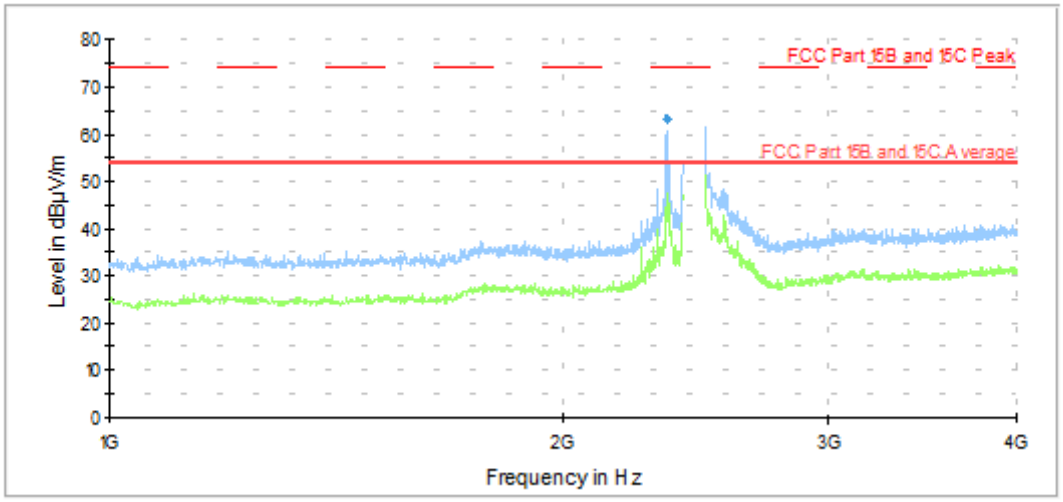
Overview sweeps performed with peak and average detectors, Frequency range 1 – 4 GHz
Ch. 11EUT in minibar.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2341.533	---	43.14	54.00	10.86	130.0	H	191.0	-8.7
2341.533	63.14	---	74.00	10.86	130.0	H	188.0	-8.7

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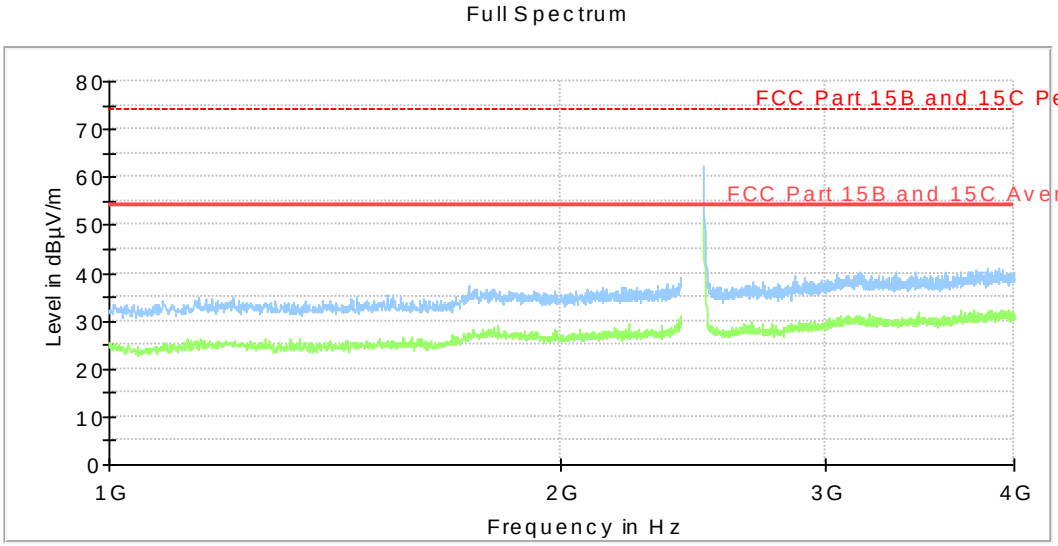
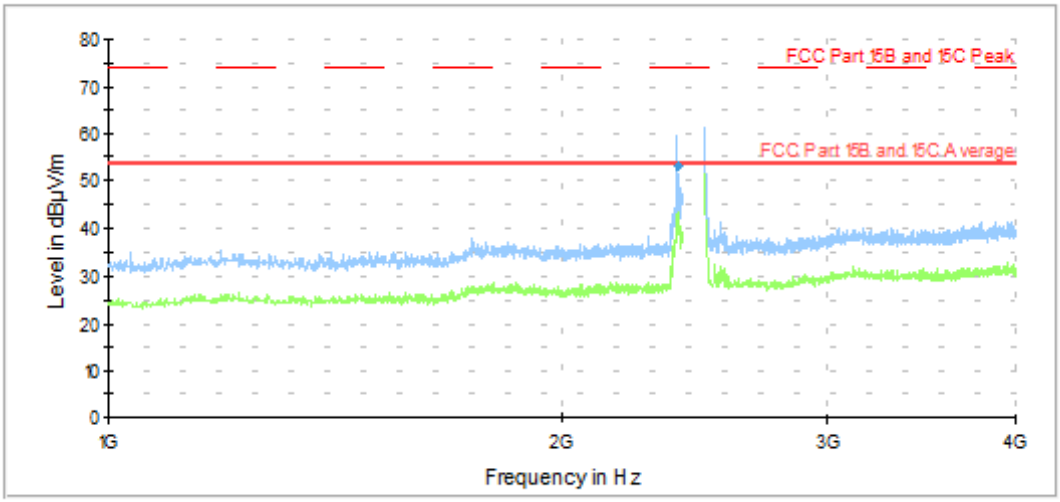
Overview sweeps performed with peak and average detectors, Frequency range 1 – 4 GHz
Ch. 18 EUT in minibar.



Overview sweeps performed with peak and average detectors, Frequency range 1 – 4 GHz
Ch. 26 EUT in minibar.



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2384.398797	52.86	---	74.00	21.14	130.0	H	186.0	-8.1
2386.563126	---	32.86	54.00	21.14	130.0	H	191.0	-8.0

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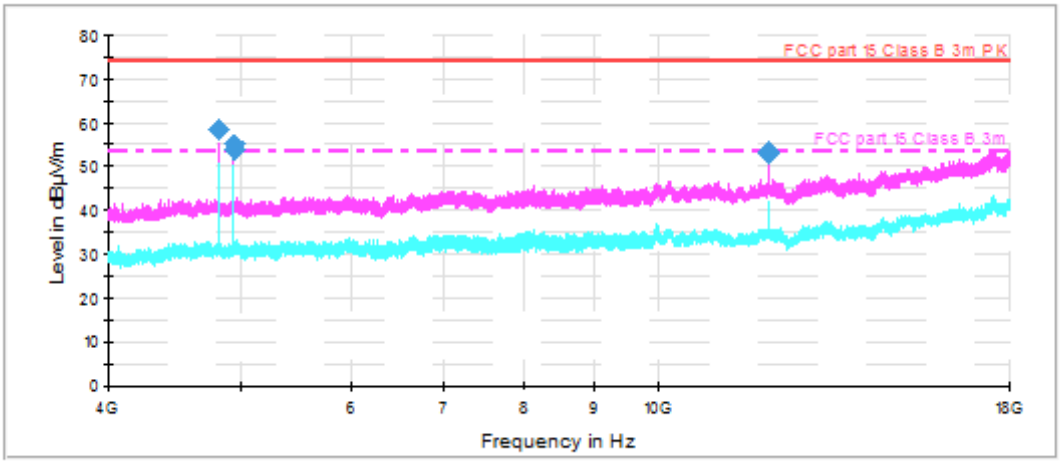
Overview sweeps performed with peak and average detectors, Frequency range 4 – 18 GHz
Ch. 11EUT in minibar.



Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)
4808.912333	58.6	1000.0	1000.000	133.0	V	176.0	-4.9	15.4
4939.410667	54.0	1000.0	1000.000	164.0	H	207.0	-4.7	20.0
4939.416000	55.0	1000.0	1000.000	143.0	H	210.0	-4.7	19.0
12022.320500	53.2	1000.0	1000.000	204.0	H	155.0	3.5	20.8
12027.232500	53.3	1000.0	1000.000	115.0	V	145.0	3.5	20.7

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)
4808.912333	38.6	1000.0	1000.000	133.0	V	176.0	-4.9	15.4
4939.410667	34.0	1000.0	1000.000	164.0	H	207.0	-4.7	20.0
4939.416000	35.0	1000.0	1000.000	143.0	H	210.0	-4.7	19.0
12022.320500	33.2	1000.0	1000.000	204.0	H	155.0	3.5	20.8
12027.232500	33.3	1000.0	1000.000	115.0	V	145.0	3.5	20.7

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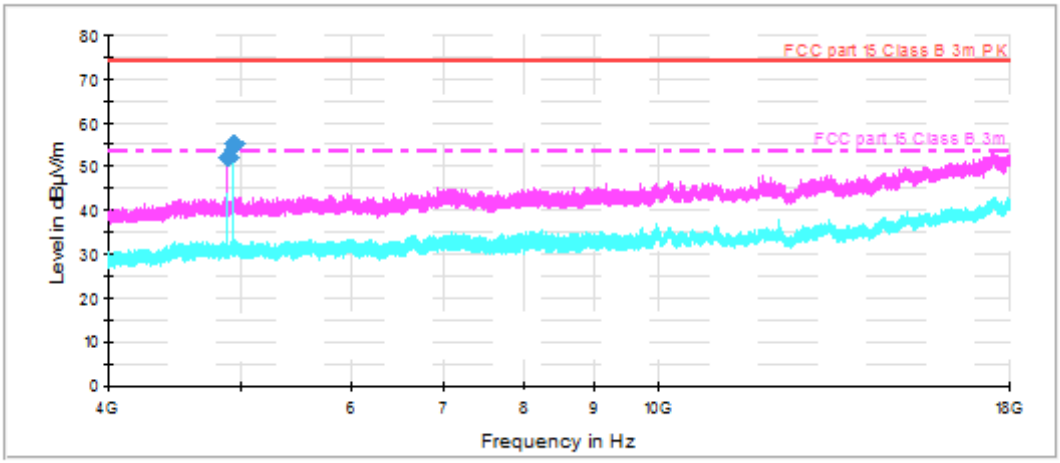
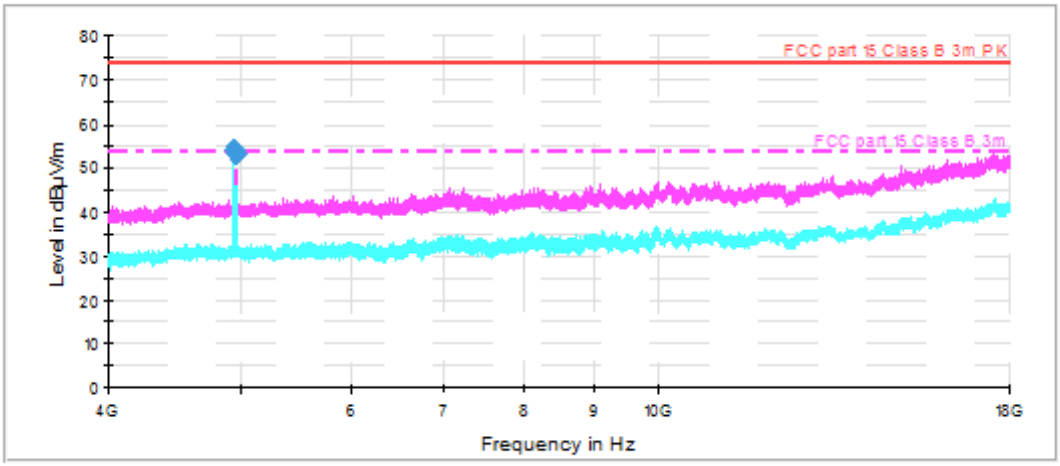
Overview sweeps performed with peak and average detectors, Frequency range 4 – 18 GHz
Ch. 18 EUT in minibar.



Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4889.067000	52.3	1000.0	1000.000	127.0	V	173.0	-4.8	21.7	74.0
4939.486667	55.0	1000.0	1000.000	144.0	H	210.0	-4.7	19.0	74.0

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4889.067000	32.3	1000.0	1000.000	127.0	V	173.0	-4.8	21.7	54.0
4939.486667	35.0	1000.0	1000.000	144.0	H	210.0	-4.7	19.0	54.0

Overview sweeps performed with peak and average detectors, Frequency range 4 – 18 GHz
Ch. 26 EUT in minibar.



Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4939.325000	54.2	1000.0	1000.000	164.0	H	207.0	-4.7	19.8	74.0
4959.953333	52.9	1000.0	1000.000	158.0	H	182.0	-4.7	21.1	74.0

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4939.325000	34.2	1000.0	1000.000	164.0	H	207.0	-4.7	19.8	54.0
4959.953333	32.9	1000.0	1000.000	158.0	H	182.0	-4.7	21.1	54.0

7.4 EIRP and antenna gain

Measured maximum transmitter field strength is converted to EIRP using following formula $P=(Ed)^2/(30)$.

E = field strength V/m
D = measurement distance
P = Power W

Frequency (MHz)	MaxPeak (dBµV/m)	EIRP (dBm)	Limit (dBm)
2405	90.43	-4.80	36
2445	101.53	6.30	36
2480	99.85	4.62	36

EIRP < 36 dBm and antenna gain <6dBi

7.5 MPE calculation

A worst case calculation is as follows:

$$S = \frac{dc \times EIRP}{4 \times \pi \times r^2}$$

Dc = 1
EIRP = 4.54 mW
R = 20 cm

S = 4.54 mW / (4 x π x 20 cm^2) = 0,0009 mW / cm^2

§1.1310 (e) table 1 Limit for general population / uncontrolled exposure is 1mW / cm^2.
The requirement is fulfilled without testing.

RSS 102 2.5.2 states that device operating at or above 1.5 GHz and having maximum e.i.r.p is equal or less than 5 W are exempted from routine evaluation. Maximum EIRP is 4.54 mW. Device is exempted from evaluation.

7.6 Test equipment

Measurement software	Rohde & Schwarz	EMC 32	--	--
Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Measurement software	Rohde & Schwarz	EMC 32	--	--
Measurement receiver	Rohde & Schwarz	ESU 40	13178	07-2014
Pre-amplifier	BONN Elektronik	BLMA 0118-M	31246	07-2014
Horn antenna	Rohde & Schwarz	HF907	31245	11-2014
High pass filter	K&L	H1G013G1	13142	07-2014
Horn antenna	Rohde & Schwarz	BLMA 1826-5A	31247	12/2016
Measurement receiver	Rohde & Schwarz	ESU 40	13178	07-2014

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8 OCCUPIED BANDWIDTH

Date of test:	5/28/2014	Test location:	EMC Center
EUT Serial:	-	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	Pass	Margin:	1135 kHz

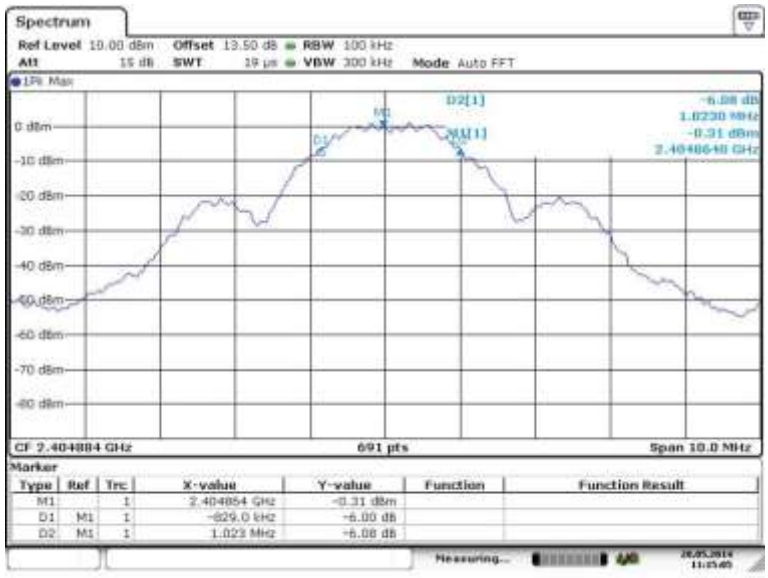
8.1 Requirement

Reference: FCC §15.247(a)(2), RSS-210 A8.2 (a)
Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

8.2 Test set-up

EUT antenna port was connected to spectrum analyser via rf-cable and 10 dB attenuator. Analyser's Reference level offset was used to compensate cable and attenuator losses.

8.3 Test data



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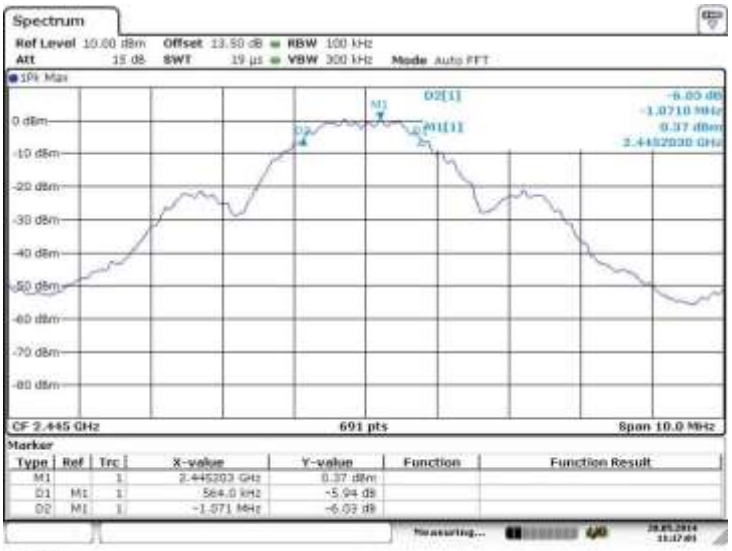

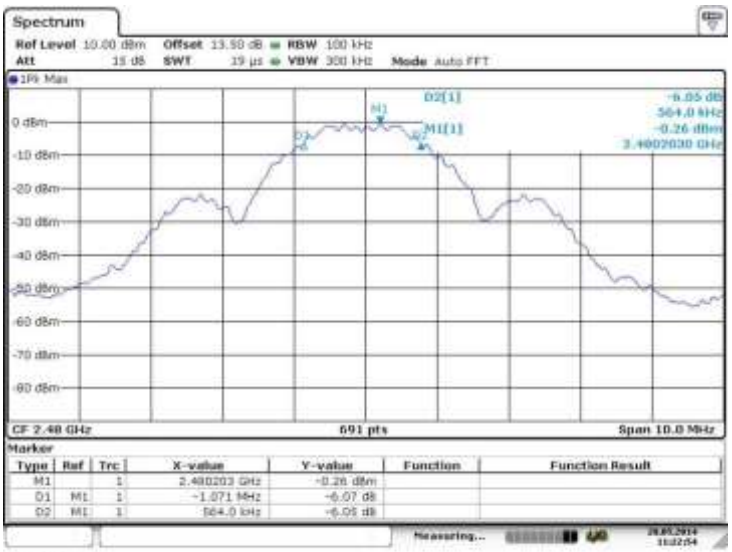

Frequency MHz	6 dB bandwidth kHz	Limit kHz	Margin kHz
2405	1852	500	1352
2445	1635	500	1135
2480	1635	500	1135

8.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2015
Rf-attenuator	H+S	5910_N-010 10dB	32696	7/2014

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9 DUTY CYCLE

Date of test:	9/17/2014	Test location:	EMC Center
EUT Serial:	-	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	-	Margin:	-

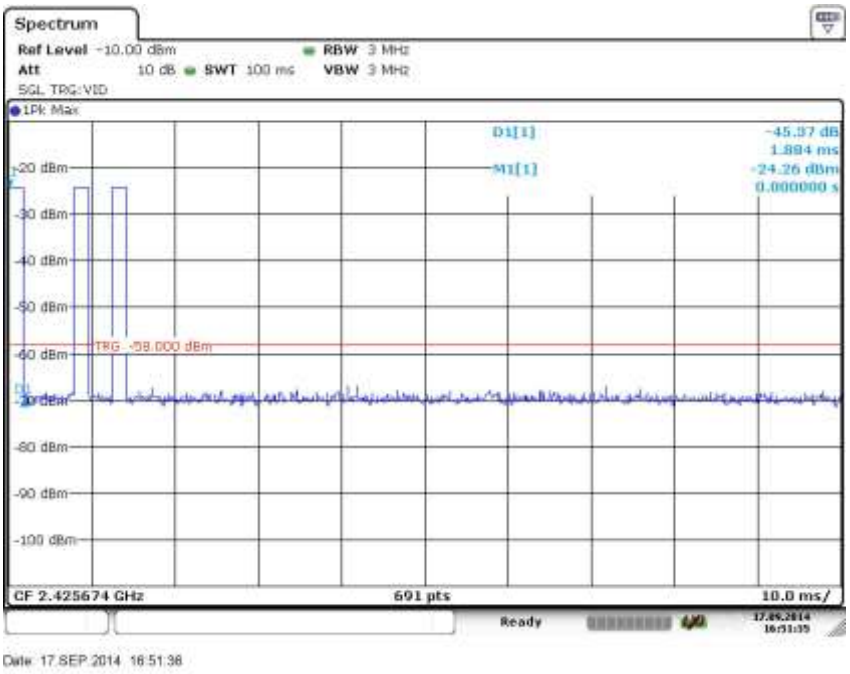
9.1 Requirement

Transmitter dwell time is measured for transmitter spurious emission duty cycle averaging.

9.2 Test set-up

EUT antenna port was connected to spectrum analyser via rf-cable and 10 dB attenuator.

9.3 Test data



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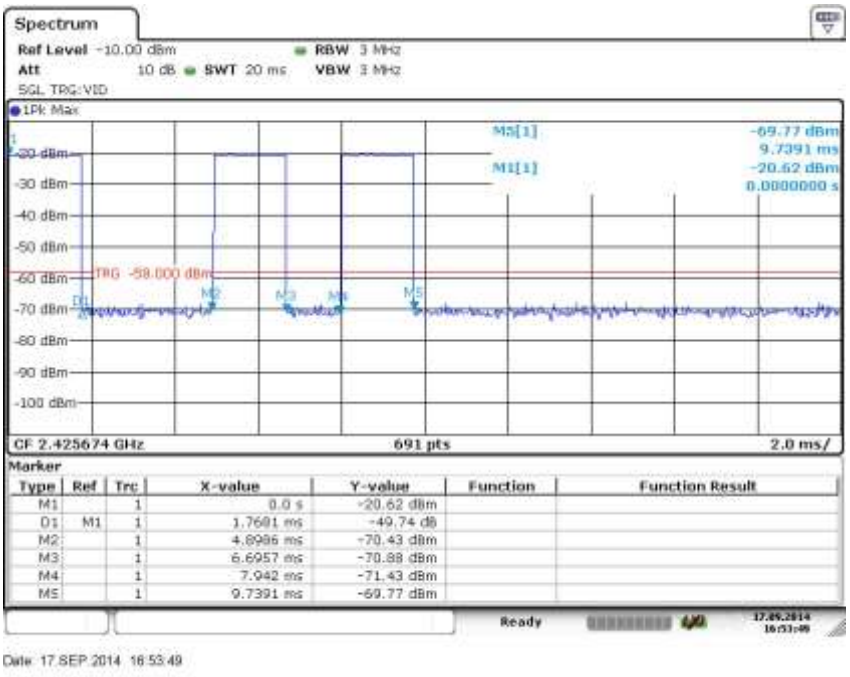

Ton/100ms	Duty cycle averaging factor 20LOG(Ton/100ms)	Averaging factor to be used
3 * 1.797 ms 5.39 ms	-25,37 dB	-20 dB

9.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2015
Rf-attenuator	H+S	5910_N-010 10dB	32696	7/2015

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10 CONDUCTED PEAK OUTPUT POWER

Date of test:	5/28/2014	Test location:	EMC Center
EUT Serial:	-	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	Pass	Margin:	25.58 dB

10.1 Requirement

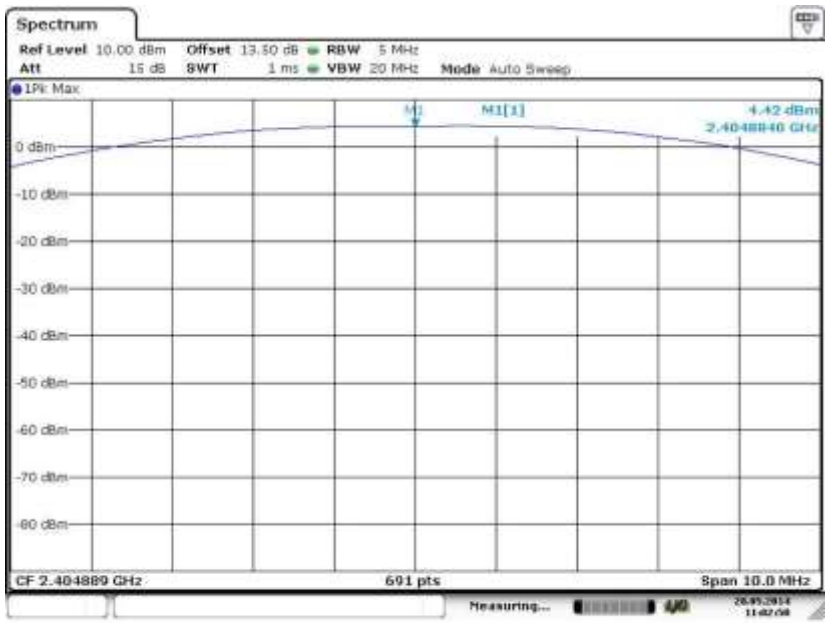
Reference: FCC §15.247(b)(3), RSS-210 A8.4.4

For systems employing digital modulation techniques operating in the bands 902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz, the maximum peak conducted output power shall not exceed 1 W.

10.2 Test set-up

EUT antenna port was connected to spectrum analyser via rf-cable and 10 dB attenuator. Analyser's Reference level offset was used to compensate cable and attenuator losses.

10.3 Test data



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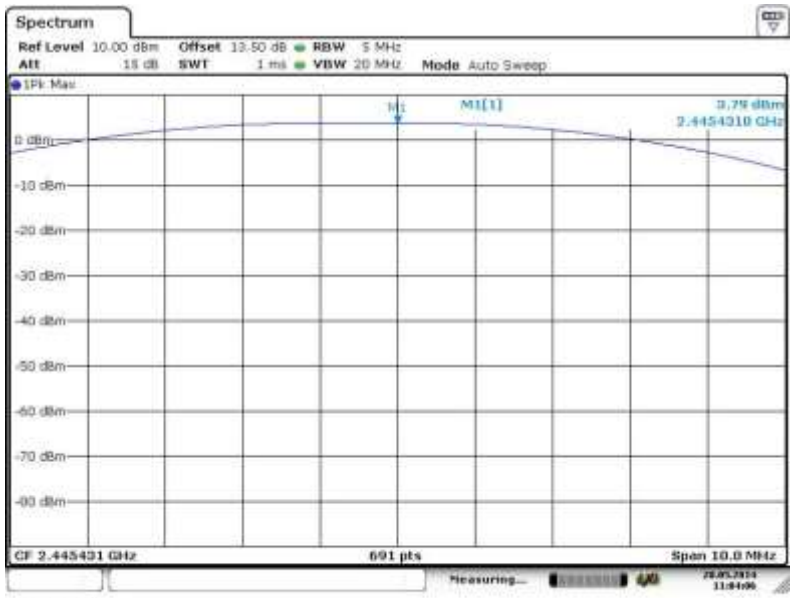
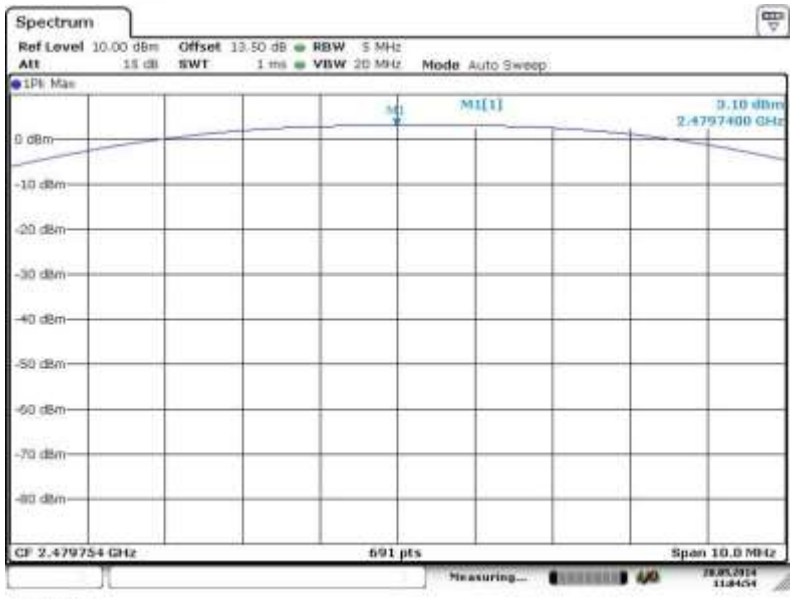


Lowest channel

Date: 28.MAY.2014 11:04:06



Lowest channel

Date: 28.MAY.2014 11:04:54

Frequency MHz	Peak power dBm	Limit dBm	Margin dB
2405	4.42	30	25.58
2445	3.79	30	26.21
2480	3.10	30	26.90

10.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2015
Rf-attenuator	H+S	5910_N-010 10dB	32696	7/2014

11 PEAK POWER SPECTRAL DENSITY

Date of test:	5/28/2014	Test location:	EMC Center
EUT Serial:	-	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	Pass	Margin:	17.59

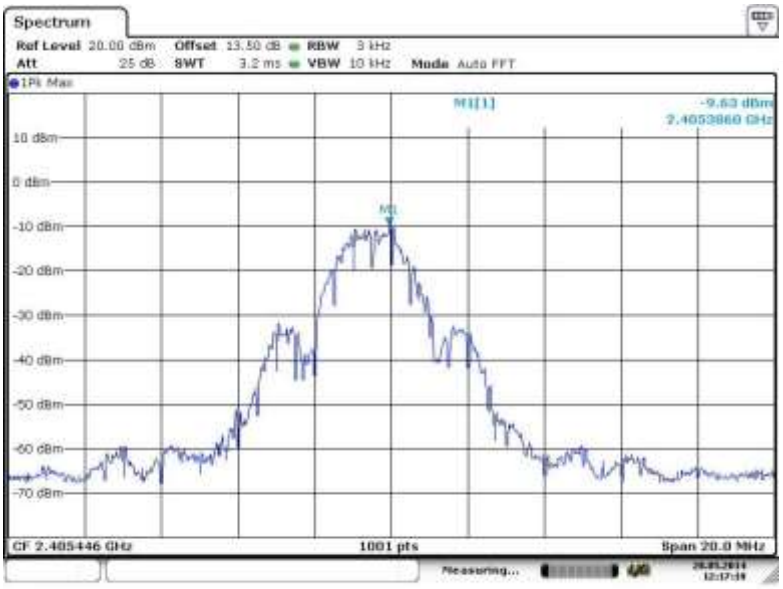
11.1 Requirement

Reference: FCC §15.247(e), RSS-210 A8.2 (b)
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

11.2 Test set-up

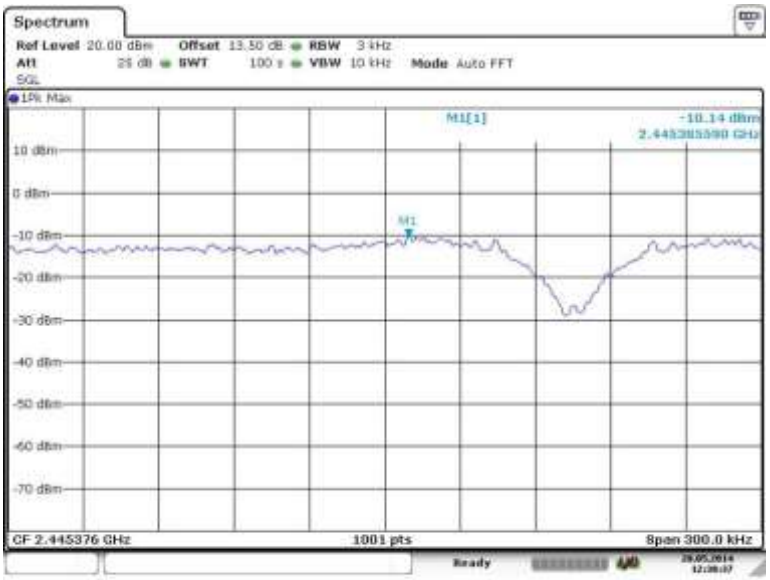
EUT antenna port was connected to spectrum analyser via rf-cable and 10 dB attenuator. Analyser's Reference level offset was used to compensate cable and attenuator losses.

11.3 Test data



Lowest channel
Date: 28.MAY.2014 12:31:35

Lowest channel
Date: 28.MAY.2014 12:34:51



Lowest channel
Date: 28.MAY.2014 12:38:36

Lowest channel
Date: 28.MAY.2014 12:44:09

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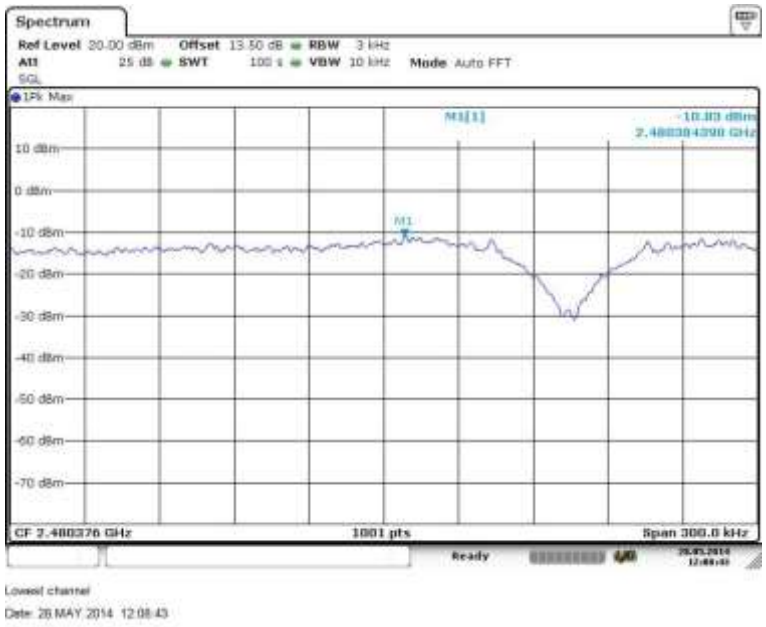

Frequency MHz	Peak power spectral density dBm/3kHz	Limit dBm/3kHz	Margin dB
2405	-9.59	8	17.59
2445	-10.14	8	18.14
2480	-10.83	8	18.83

11.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2015
Rf-attenuator	H+S	5910_N-010 10dB	32696	7/2014

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12 BAND EDGE

Date of test:	5/28/2014	Test location:	EMC Center
EUT Serial:	-	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	Pass	Margin:	25.4 dB

12.1 Requirement

Reference: FCC §15.247(d), RSS-210 A8.5
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.

12.2 Test set-up

EUT antenna port was connected to spectrum analyser via rf-cable and 10 dB attenuator. Analyser's Reference level offset was used to compensate cable and attenuator losses.

12.3 Test data

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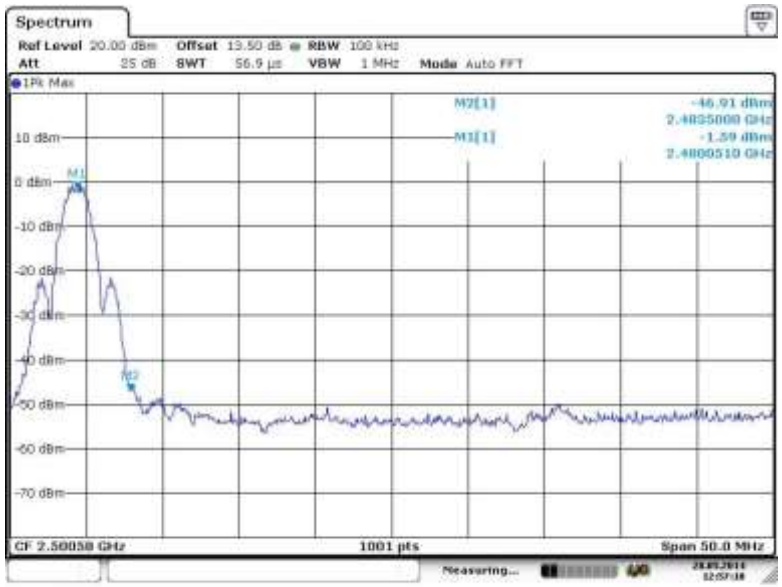

Frequency MHz	Level dBm/100kHz	Attenuation from carrier dB	Margin dB
2405.2	0.98	carrier	-
2480.0	-1.59	carrier	-
2400	-48.4	49.4	29.4
2483.5	-46.9	45.3	25.4

12.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2015
Rf-attenuator	H+S	5910_N-010 10dB	32696	7/2014

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13 UNCERTAINTIES SUMMARY

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.
Measurement uncertainty is calculated in accordance with EA-4/02-1997.
The measurement uncertainty is given with a confidence of 95% (k=2).

Radiated disturbance, field strength, 30 MHz - 1000 MHz	
30 to 300 MHz at 3 m	± 4,7 dB
200 to 1000 MHz at 3 m	± 4,8 dB
Radiated disturbance, field strength, 1 to 40 GHz in Semi Anechoic Chambers "Stora Hallen"and "Björkhallen"	
1 to 18 GHz with filter or attenuator	± 5,4 dB
1 to 18 GHz without filter or attenuator	± 5,2 dB
18 to 26 GHz without filter or attenuator	± 5,5 dB
26 to 40 GHz without filter or attenuator	± 5,6 dB
Conducted disturbances at the antenna port on radio equipment	
Frequency range 9 kHz – 1 GHz	± 0,9 dB
Frequency range 1 GHz – 7 GHz	± 1,4 dB
Frequency range 7 GHz -18GHz	± 2,4 dB
Frequency range 18 GHz -26,5GHz	± 3,0 dB
Frequency range 26,5 GHz - 40 GHz	± 3,6 dB
Output power	
Digital signals, conducted	± 0,6 dB
Digital signals, radiated:	
25 MHz - 1000 MHz	± 3,7 dB
1 GHz - 18 GHz	± 3,4 dB
Peak power density	
Conducted:	
8593E	± 2,5 dB
8566B	± 2,7 dB
Radiated:	
8593E & 8566B, 25 - 1000 MHz	± 4,5 dB
8593E & 8566B, 1 - 18 GHz	± 4,7 dB

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EUT

EUT in Ethernet gateway

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Ethernet gateway bottom

Ethernet gateway top

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EUT in minibar

EUT in minibar

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