RADIO TEST REPORT

No. 1405683STO-003 Ed. 3

RF performance

EQUIPMENT UNDER TEST

Equipment :	Remote Terminal Unit with Wi-Fi connection
Type / model :	R7-002
Additional model	R7-001
Manufacturer :	Creowave Oy
Tested by request of :	Creowave Oy

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 (2014)
47 CFR Part 15, Subpart E, Unlicensed national information infrastructure devices (2014)
RSS-Gen Issue 4 (2014) RSS-210 Issue 8 (2010)
Test methods according to ANSI C63.10-2009 and KDB 789033 D02

Date of issue: 2015-03-30

Tested by: Matti Virkki Approved by: Stefan Andersson

Revision History

Edition	Date	Description
1	2014-11-06	First release
2	2015-01-26	Updates and corrections requested by TCB
3	2015-03-30	Typing error correction on page 5

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1 CLIENT INFORMATION

The EUT has been tested by request of

Company:	Creowave Oy Yrttipellontie 10H 90230 Oulu Finland
Name of contact:	Taisto Soikkeli

2 EQUIPMENT UNDER TEST (EUT)

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

Equipment:	Remote Terminal Unit with Wi-Fi connection
Tested Model:	R7-002
Additional model:	R7-001
Brand name:	Creowave
Serial number:	CC0000170ABF18
Manufacturer:	Creowave Oy

Transmitter frequency range:	ZigBee 2405 –2480 MHz Wi-Fi 2412 – 2462 MHz, 5180 – 5220 MHz, 5745 – 5825 MHz
Receiver frequency range:	ZigBee 2405 – 2480 MHz Wi-Fi 2412 – 2462 MHz, 5180 – 5220 MHz, 5745 – 5825 MHz

Frequency agile or hopping:	☐ Yes	☒ No
Antenna:	☐ Internal antenna	☒ External antenna
Antenna connector:	☐ None, internal antenna	☒ Yes, type N

Antenna gain:	2.4 GHz band: 5 dBi, External antenna Extronics iANT200-24-S-1 5 GHz band: 8 dBi, External antenna Extronics iANT200-58-S-1
Rating RF output power:	ZigBee 19.18 dBm, 2,4 GHz Wi-Fi 19.27 dBm, (conducted) U-NII-1 14.43 dBm, U-NII-3 18.07dBm, (conducted)
Type of modulation:	O-QPSK (Zigbee), 64-QAM (Wi-Fi)
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
Power rating:	12V

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	Part number	Serial number
Remote Terminal Unit	C-site R7-002	CC0000170ABF18
4 x antenna	5 dBi, External antenna Extronics iANT200-24-S-1	
Antenna	8 dBi, External antenna Extronics iANT200-58-S-1	

EUT has three identical Zigbee transceivers and a Wi-Fi transceiver module.

2.3 Additional information about the EUT

During the tests the EUT supported the following software:

Software	Version / Release	Comment
	1.0	

2.4 Peripheral equipment

Peripheral equipment is defined as equipment needed for correct operation of the EUT during the tests, but not included as a part of the testing and evaluation of the EUT.

Equipment	Manufacturer / Type	Inventory number
PC	HP / Compaq NC6320	S12913

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.

Conducted measurements from Zigbee antenna port were made with model R7-101 which is identical to tested model except instead of Wi-Fi it contains a 3g module.
Zigbee output power was verified with both models.

Wi-Fi module was tested in 802.11 G and A modes with 64-QAM modulation on channels 1, 6, 11, 36, 40, 44, 149 157 and 165.

2.6 Modification during the tests

Band pass filters were added to 2,4 GHz rf outputs to prevent unwanted emissions.
Filter type ACFF-1024 (Avago, FBAR-filter).

2.7 Differences between models

According to manufacturer models are identical except in R7-002 cable connectors are for armoured cables and in R7-001 they are not.

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3 TEST SPECIFICATIONS

3.1 Standards

47 CFR Part 15, Subpart B, unintentional radiators, section 15.109
47 CFR Part 15, Subpart C, Intentional radiators, section 15.247
47 CFR Part 15, Subpart E, Unlicensed national information infrastructure devices
RSS-Gen Issue 4 (2014) RSS-210 Issue 8 (2010)

Test methods in:

KDB 789033 D02: General UNII test procedure new rule v01
ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices
ANSI C63.4-2009: American National Standard for Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

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 #
5m chamber	Semi-anechoic 3m	2042G-3
RADIOHALLEN	Fully-anechoic 3m	--

3.4 Test set-up

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

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3.5 Test conditions

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

Parameter	Normal	Extreme
Supplying voltage, V	12	-
Air temperature, ^{o}C	22	-

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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		
Radiated emissions measurements from 30 to 1000 MHz	Pass	5	Class A
Determination of radiated and antenna conducted emissions above 1 GHz	Pass	6, 12	Class A
Occupied bandwidth and band-edge tests	Pass	7, 11	
Output Power average symbol envelope power	Pass	8	
Power Spectral Density	Pass	9	1
Determining the average value of pulsed emissions per 15.35(c)	Pass	10	
Determination of peak conducted output unlicensed wireless device power [15.247(b), 15.255]	Pass	8	

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

Notes:

Class A: The host is a Class A digital device and its emissions comply with 15.109 and ICES-003 class A limits. All transmitter emissions comply with respective transmitter rules.

1) On UNII-1 band EUT complies with 8 dBi antennas only if antenna cable loss is more than 1.6 dB

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5 RADIATED EMISSIONS MEASUREMENTS FROM 30 MHZ TO 1000MHZ

Date of test:	2014-07-04	Test location:	5m chamber
EUT Serial:	CC0000170ABF18	Ambient temp.	23 ˚C
Tested by:	Matti Virkki	Relative humidity	35 %
Test result:	Pass	Margin:	6.5 dB

5.1 Requirement

In restricted bands Reference: FCC §15.209, IC RSS-210 Table 3
Outside the restricted bands: FCC 15.247 (d), 15.407(b), RSS-210 A8.5

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

5.2 Test setup details

EUT was placed on non-conductive table 80 cm above the ground plane.
Measurement distance is 3 meters. Preliminary sweeps were made with fixed antenna height wit 2 polarizations and 45º turntable steps.

Final measurements were made with antenna height scan of 1 – 4 meters and free turntable rotation to maximize the emissions

Highest gain antennas were connected to antenna ports. Transmitters were set to transmit continuous signal.

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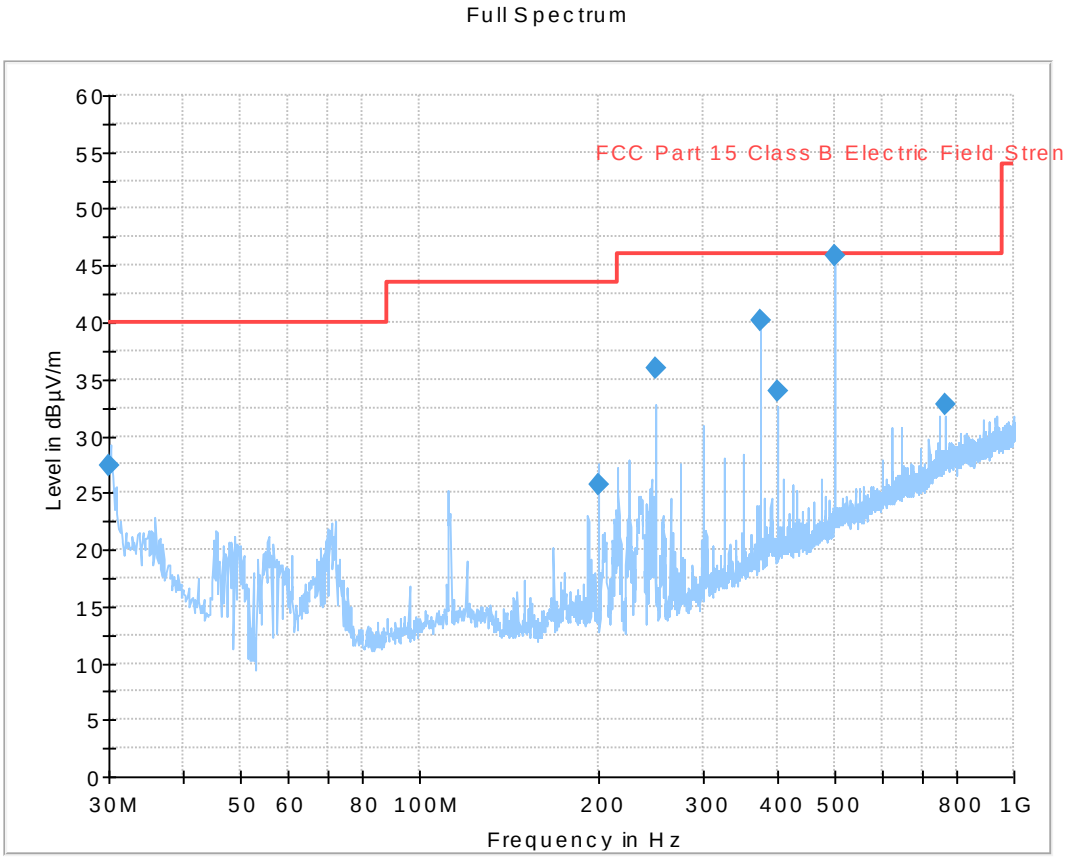
5.3 Test data

Overview sweeps performed with peak detectors, ch 11



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
30.020000	27.44	40.00	12.56	1000.0	120.000	100.0	V	-96.0
200.000000	25.68	43.52	17.84	1000.0	120.000	115.0	H	-132.0
250.000200	35.99	46.02	10.03	1000.0	120.000	100.0	H	-119.0
375.010301	40.15	46.02	5.87	1000.0	120.000	140.0	V	-88.0
400.020000	33.90	46.02	12.12	100.0	120.000	132.0	V	-78.0
* 500.020000	45.86	46.02	0.16	100.0	120.000	160.0	H	-128.0
767.935872	32.81	46.02	13.21	100.0	120.000	145.0	H	26.0

*500 MHz emission doesn't originate from transmitter circuitry

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

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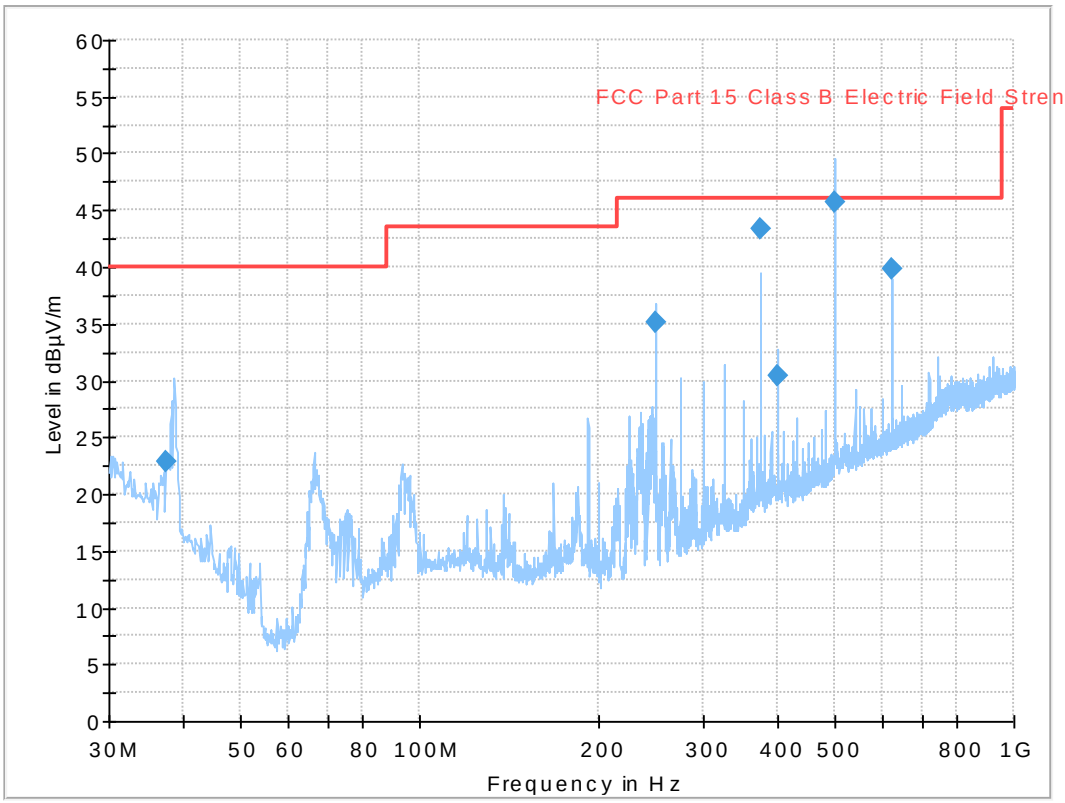
Overview sweeps performed with peak detectors, ch 18



Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
37.537395	22.94	---	40.00	17.06	1000.0	120.000	141.0	V	12.0
250.020200	35.18	---	46.02	10.84	1000.0	120.000	166.0	V	-143.0
375.010301	43.33	---	46.02	2.69	1000.0	120.000	153.0	V	0.0
400.020000	30.48	---	46.02	15.54	100.0	120.000	134.0	V	110.0
*500.020000	45.67	---	46.02	0.35	100.0	120.000	133.0	H	-120.0
625.010100	39.91	---	46.02	6.11	100.0	120.000	115.0	H	-192.0

*500 MHz emission doesn't originate from transmitter circuitry

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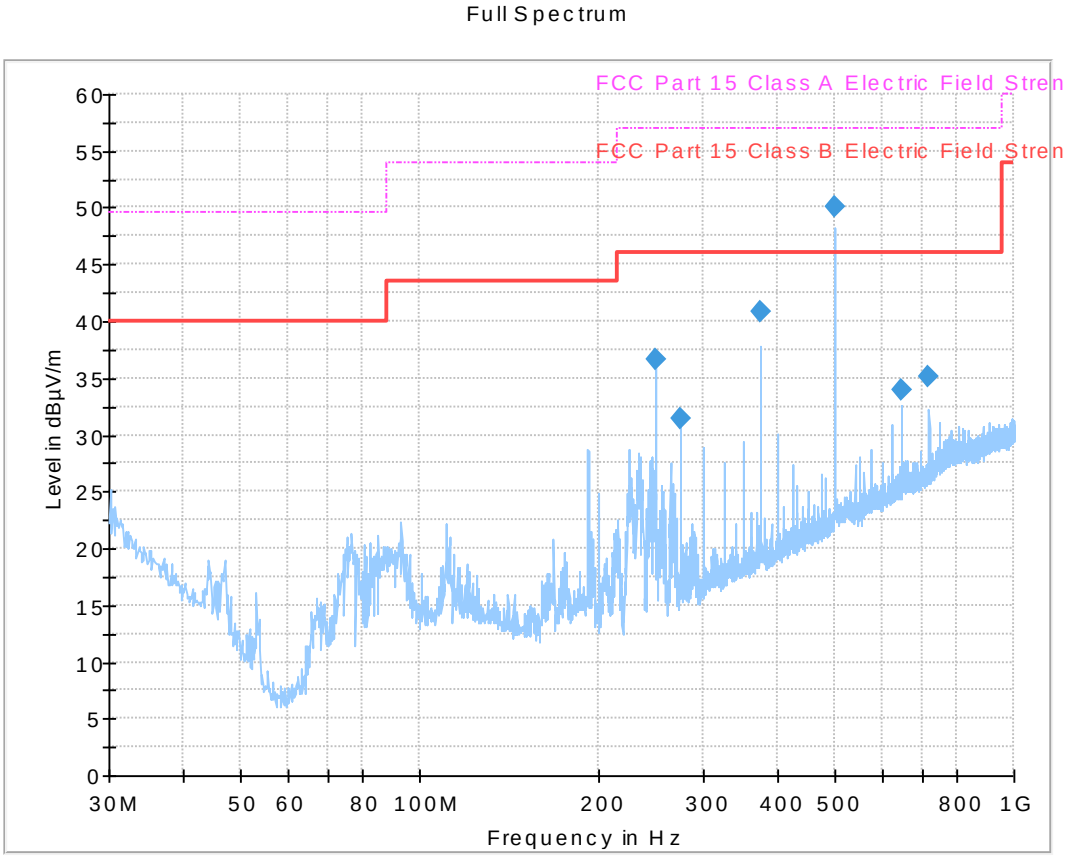
Overview sweeps performed with peak detectors, ch 26



Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
250.020	36.6	---	46.02	9.4	1000.0	120.000	145.0	H	2.0
275.030	31.5	---	46.02	14.5	1000.0	120.000	157.0	V	-138.0
375.010	40.8	---	46.02	5.2	1000.0	120.000	126.0	V	112.0
*500.020	50.1	---	46.02	-4.8	100.0	120.000	155.0	H	-146.0
647.995	33.9	---	46.02	12.2	100.0	120.000	152.0	V	0.0
719.979	35.1	---	46.02	10.9	100.0	120.000	140.0	V	-6.0

*500 MHz emission doesn’t originate from transmitter circuitry

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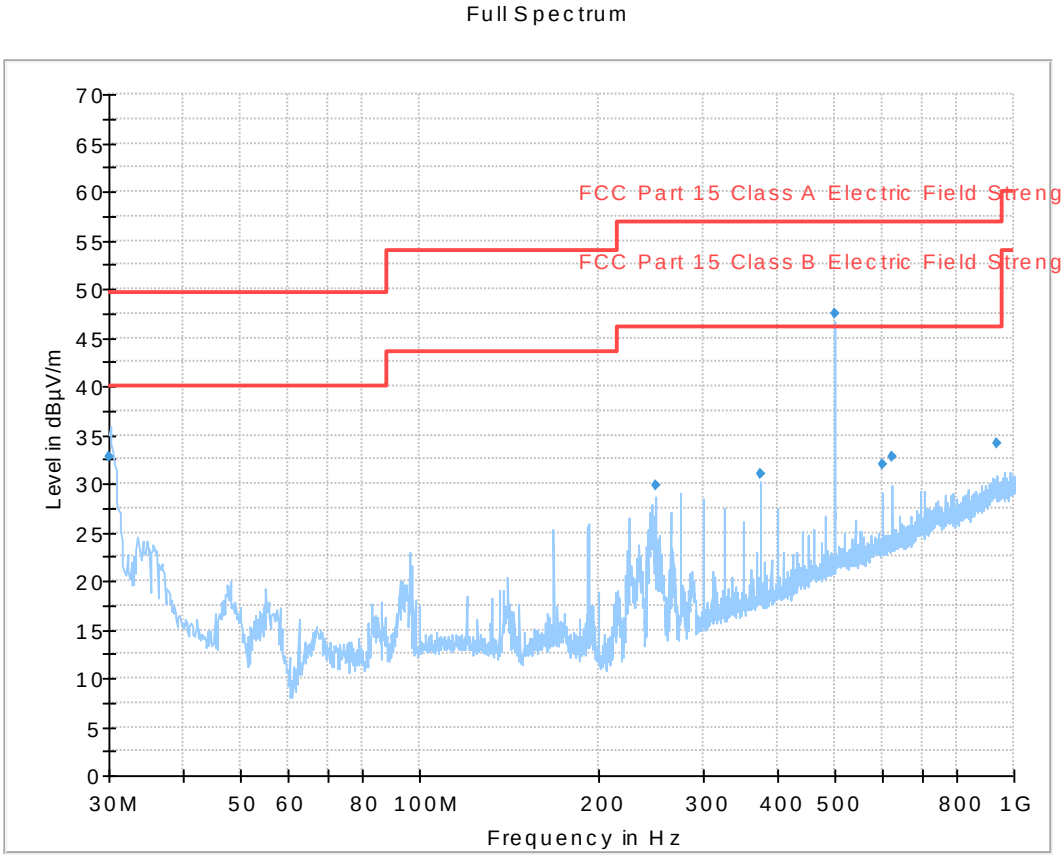
Overview sweeps performed with peak detectors. Transmitter idle



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
30.020	32.8	49.50	17.2	1000.0	120.000	102	V	327
249.999	29.7	56.02	26.3	1000.0	120.000	137	H	267
375.010	30.9	56.02	25.1	1000.0	120.000	139	V	309
500.000	47.4	56.02	8.6	1000.0	120.000	176	H	145
600.000	31.9	56.02	24.1	1000.0	120.000	156	H	231
624.989	32.7	56.02	23.3	1000.0	120.000	148	H	234
937.2140	34.2	56.02	21.8	1000.0	120.000	113	V	8

5.4 Test equipment

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

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6 RADIATED EMISSIONS MEASUREMENTS ABOVE 1 GHZ

Date of test:	2014-10-02 – 0214-10-06	Test location:	Radio hallen / 5m chamber
EUT Serial:	F9000170ABF0A / CC0000170ABF18	Ambient temp.	23 ˚C, 21˚C
Tested by:	Matti Virkki	Relative humidity	35 %, 38%
Test result:	Pass	Margin:	2.2 dB

6.1 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.

Reference: FCC §15.407, IC RSS-210 A9.2

(b) *Undesirable emission limits.* Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

6.2 Test setup details

EUT was placed on non-conductive table 80 cm above the ground plane.
Absorbers were placed on floor between EUT and antenna.
Preliminary sweeps were made with fixed antenna height wit 2 polarizations and 45º turntable steps.
Final measurements were made with antenna height scan of 1 – 4 meters and free turntable rotation to maximize the emissions.
During height scan EUT was kept in antenna's cone of radiation.
Highest gain antennas were connected to antenna ports.

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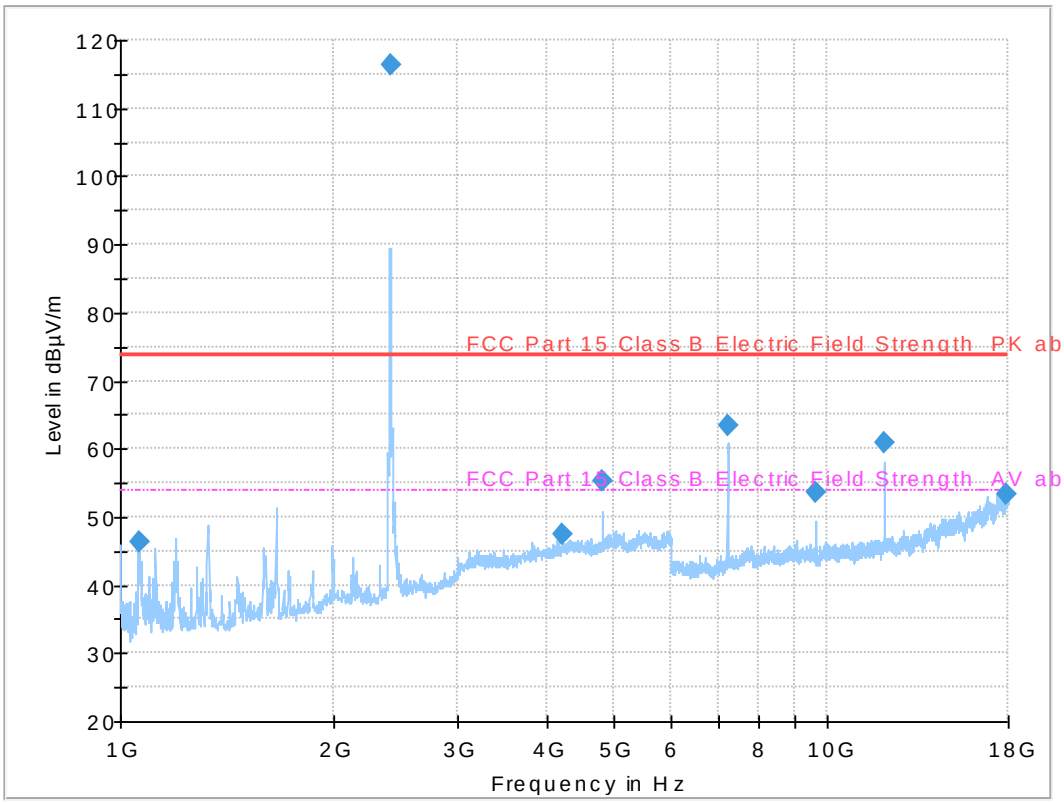
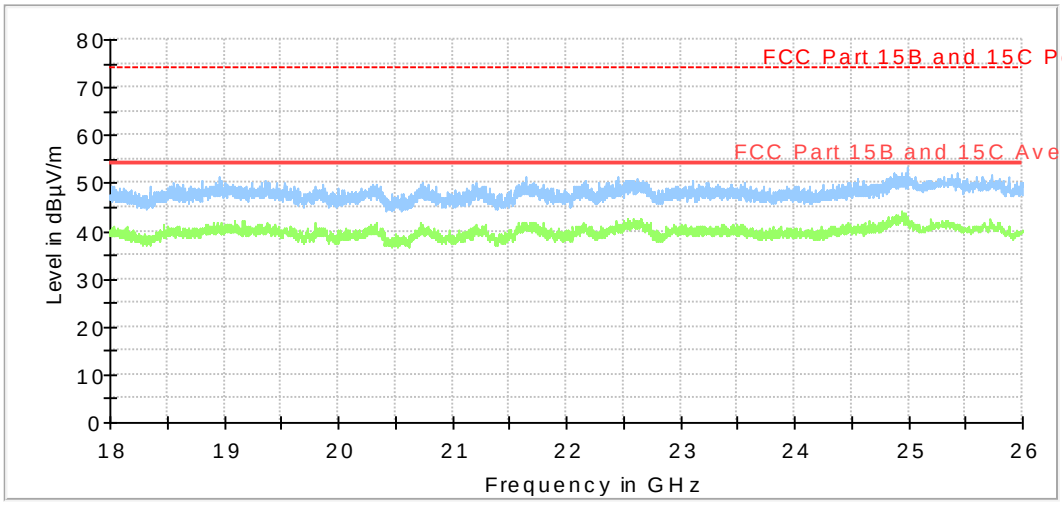
6.3 Test data 2.4 GHz Zigbee

Overview sweeps performed with peak detectors, ch 11

Full Spectrum



Full Spectrum



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Final results Ch 11

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1066.11	---	22.32	54.00	31.68	1000.000	102.0	H	-83.0
1066.11	46.25	---	73.90	27.65	1000.000	102.0	H	-83.0
2405.40	---	108.24	54.00	-54.24	1000.000	165.0	V	-139.0
2405.40	116.49	---	73.90	-42.59	1000.000	165.0	V	-139.0
4221.44	---	34.25	54.00	19.75	1000.000	168.0	H	200.0
4221.44	47.57	---	73.90	26.33	1000.000	168.0	H	200.0
4811.41	---	41.29	54.00	12.71	1000.000	201.0	V	-200.0
4811.41	55.30	---	73.90	18.60	1000.000	201.0	V	-200.0
7216.43	---	49.63	54.00	4.37	1000.000	100.0	V	-39.0
7216.43	63.44	---	73.90	10.46	1000.000	100.0	V	-39.0
9618.63	---	38.77	54.00	15.23	1000.000	164.0	V	-41.0
9618.63	53.53	---	73.90	20.37	1000.000	164.0	V	-41.0
12027.65	---	45.38	54.00	8.62	1000.000	153.0	V	0.0
12027.65	60.94	---	73.90	12.96	1000.000	153.0	V	0.0
17937.46	---	40.14	54.00	13.86	1000.000	225.0	H	5.0
17937.46	53.24	---	73.90	20.66	1000.000	225.0	H	5.0

No emission above noise floor between 18 -26 GHz

Final results Ch. 18

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2440.00	116.64	---	73.90	-42.74	1000.000	180.0	V	200.0
2440.00	---	108.96	54.00	-54.96	1000.000	180.0	V	200.0
4880.00	53.85	---	73.90	20.05	1000.000	184.0	V	136.0
4880.00	---	41.22	54.00	12.78	1000.000	184.0	V	136.0
7320.00	---	46.53	54.00	7.47	1000.000	136.0	V	-45.0
7320.00	58.50	---	73.90	15.40	1000.000	136.0	V	-45.0
9760.00	---	33.78	54.00	20.22	1000.000	167.0	V	196.0
9760.00	47.63	---	73.90	26.27	1000.000	167.0	V	196.0
12200.00	---	42.10	54.00	11.90	1000.000	100.0	V	200.0
12200.00	56.03	---	73.90	17.87	1000.000	100.0	V	200.0
14640.00	---	36.09	54.00	17.91	1000.000	324.0	H	74.0
14640.00	49.79	---	73.90	24.11	1000.000	324.0	H	74.0
17080.00	---	38.19	54.00	15.81	1000.000	350.0	H	185.0
17080.00	51.95	---	73.90	21.95	1000.000	350.0	H	185.0
19520.00	47.24	---	73.90	26.66	1000.000	150	H	90.0
19520.00	---	38.43	54.00	15.57	1000.000	150	H	90.0
21960.00	49.62	---	73.90	24.28	1000.000	159	V	315.0
21960.00	---	40.11	54.00	13.89	1000.000	159	V	315.0
24400.00	48.18	---	73.90	25.72	1000.000	150	H	225.0
24400.00	---	38.36	54.00	15.64	1000.000	150	H	225.0

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Final results Ch. 26

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2480.00	115.25	---	73.90	-41.35	1000.000	100.0	V	186.0
2480.00	---	107.30	54.00	-53.30	1000.000	100.0	V	186.0
4960.00	56.80	---	73.90	17.10	1000.000	178.0	V	188.0
4960.00	---	44.44	54.00	9.56	1000.000	178.0	V	188.0
7440.00	56.61	---	73.90	17.29	1000.000	270.0	H	90.0
7440.00	---	43.58	54.00	10.42	1000.000	270.0	H	90.0
9920.00	45.88	---	73.90	28.02	1000.000	298.0	H	46.0
9920.00	---	32.25	54.00	21.75	1000.000	298.0	H	46.0
12400.00	---	36.78	54.00	17.22	1000.000	100.0	V	200.0
12400.00	51.37	---	73.90	22.53	1000.000	100.0	V	200.0
14880.00	49.51	---	73.90	24.39	1000.000	200.0	V	135.0
14880.00	---	35.50	54.00	18.50	1000.000	200.0	V	135.0
17360.00	52.77	---	73.90	21.13	1000.000	102.0	H	36.0
17360.00	---	39.30	54.00	14.70	1000.000	102.0	H	36.0
19840.00	47.15	---	73.90	26.75	1000.000	150	V	45.0
19840.00	---	39.23	54.00	14.77	1000.000	150	V	45.0
22320.00	46.49	---	73.90	27.26	1000.000	150	H	270.0
22320.00	---	36.90	54.00	17.10	1000.000	150	H	270.0
24800.00	48.64	---	73.90	25.26	1000.000	150	H	0.0
24800.00	---	40.21	54.00	13.79	1000.000	150	H	0.0

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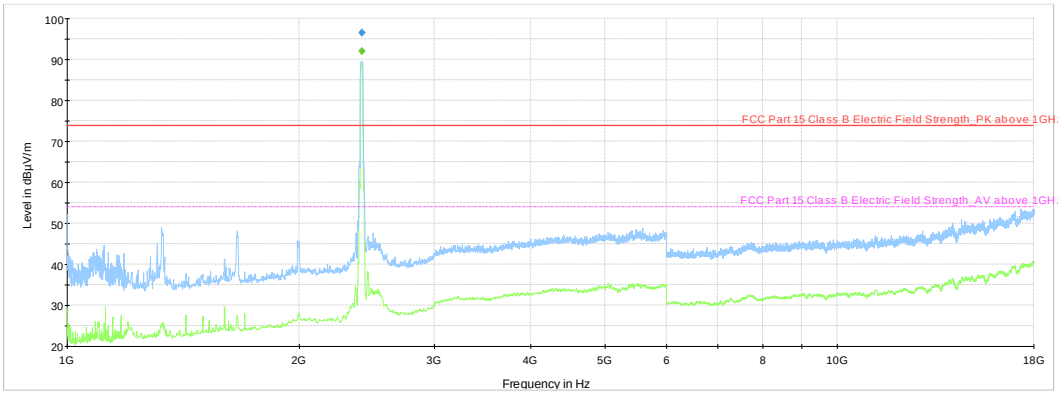
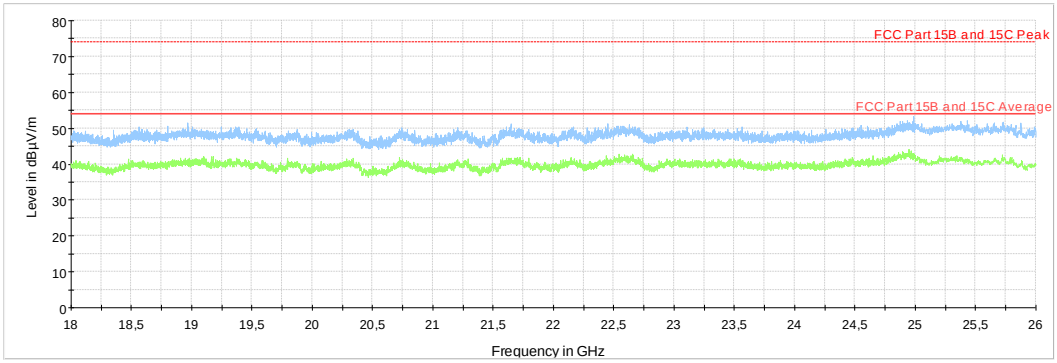
6.4 Test data 2.4 GHz Wi-Fi

Preliminary sweeps on Ch1





Final results

Ch 1

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
2412.826	96.47	92.06	---	---	163	V	-170	-3.3	Carrier

Pre-scan shows no emission above noise floor

Ch 6

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
2437	97.09	89.71	---	---	142	V	112	-3.2	Carrier
4874	48.79	35.65	54	18.35	145	V	180	6.2	noise
7311	44.89	30.97	54	23.03	314	H	91	-3.3	noise
9748	45.77	32.09	54	21.91	220	H	178	0.4	noise
12185	46.90	33.45	54	20.55	202	H	200	2.6	noise
14622	49.42	35.65	54	18.35	256	H	141	4.9	noise
17059	52.07	38.34	54	15.66	153	H	147	10.0	noise
19496	47.71	37.84	54	16.16	150	V	135	4.5	noise
21933	46.78	37.94	54	16.06	150	H	270	6.2	noise
24370	47.58	39.28	54	14.72	150	V	270	6.8	noise

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Ch 11

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
2462	95.71	88.39	---	---	174	V	138	-3	Carrier
4924	49.9	36.10	54		305	V	178	6.2	noise
7386	43.84	30.65	54		159	H	200	-3.1	noise
9848	45.58	31.99	54		183	V	67	0.4	noise
12310	46.96	33.26	54		209	H	200	2.7	noise
14772	49.19	36.07	54		344	H	25	5.3	noise
17234	52.18	38.32	54		140	H	27	10.0	noise
19697	46.77	36.97	54		150	H	135	4.5	noise
22160	49.51	40.55	54		150	H	180	6.7	noise
24623	48.67	39.12	54		150	V	45	6.7	noise

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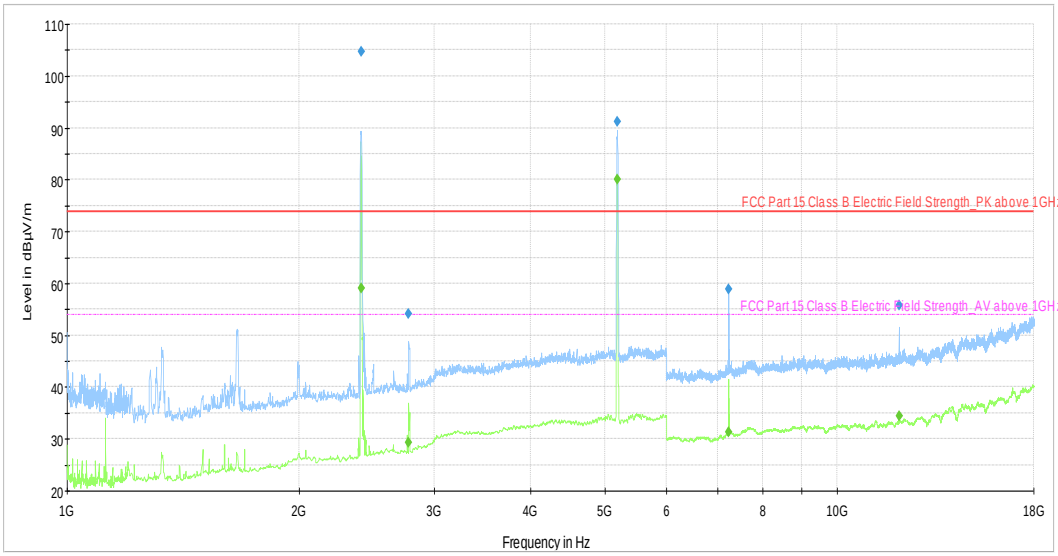
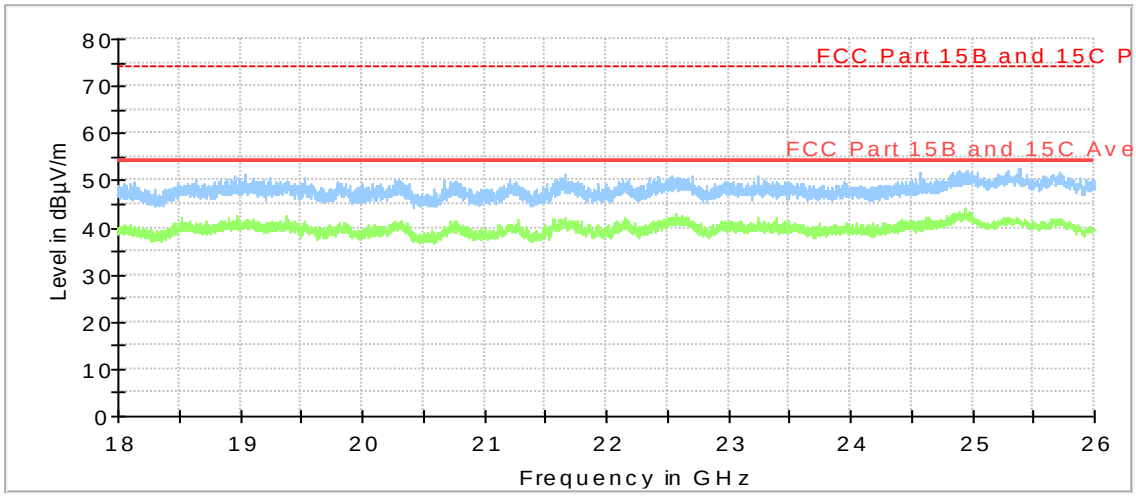
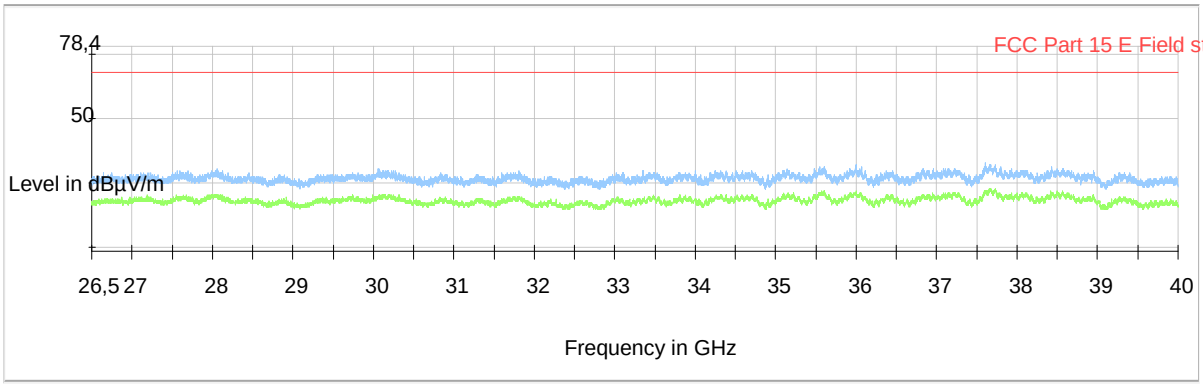
6.5 Test data 5 GHz Wi-Fi

Preliminary sweeps on Ch36 and Zigbee ch 12



Full Spectrum





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Ch 36

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
2410.82	104.65	---	---	182	V	-33	-3.3	Zigbee carrier
2777.56	54.13	68.2	24.70	146	V	-46	-2.0	
5180.36	91.24	---	---	152	V	-85	5.5	Wi-Fi carrier
7228.46	58.96	68.2	22.63	301	V	-43	-3.5	Noise
12028.06	55.86	68.2	19.61	100	V	-25	2.6	

Pre scan shows no emissions above 12 GHz. No emissions from Wi-Fi transmitter were found.

Ch 40

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
5200.00	92.7	---	---	165	V	-86	5.3	Carrier
10400.00	45.7	68.2	22.5	190	H	-112	0.4	noise
15600.00	48.8	68.2	19.4	221	V	-113	6.7	noise
20800.00	47.2	68.2	21.0	150	V	45	4.8	noise
26000.00	48.5	68.2	19.7	150	V	0	3.6	noise
31200.00	25.7	68.2	42.5	130	V	180	-32	noise
36400.00	27.5	68.2	50.7	130	V	0	-32.5	noise

Ch 44

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
5220.00	92.6	---	---	148	V	-83	5.4	Carrier
10440.00	45.7	68.2	22.5	263	H	-127	0.7	noise
15660.00	49.9	68.2	18.3	102	V	143	7.0	noise
20880.00	46.9	68.2	21.3	130	V	135	4.8	noise
26100.00	52.2	68.2	16.0	150	H	291	3.6	noise
31320.00	26.4	68.2	41.8	130	H	240	-32.0	noise
36540.00	25.7	68.2	42.5	130	V	120	-32.3	noise

Ch 149

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Comment
5745.00	94.9	---	---	1000	254	V	-87	Carrier
11490.00	46.9	68.2	21.3	1000	101	V	-178	noise
17235.00	51.5	68.2	16.7	1000	337	H	68	noise
22980.00	48.5	68.2	19.7	1000	150	V	45	noise
28725.00	25.6	68.2	42.6	1000	130	V	240	noise
34470.00	26.8	68.2	41.4	1000	130	H	210	noise

Ch 157

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Comment
5785.00	95.3	---	---	1000	161	V	-198	Carrier
11570.00	58.9	68.2	9.7	1000	165	V	-198	noise
17355.00	53.9	68.2	8.7	1000	101	V	-196	noise
23140.00	47.3	68.2	10.9	1000	150	V	45	noise
28925.00	25.3	68.2	42.9	1000	130	V	120	noise
34710.00	28.3	68.2	39.9	1000	130	H	240	noise

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Ch 165

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Comment
5825.00	93.1	---	---	1000	169	V	-157	noise
11650.00	61.9	68.2	11.9	1000	206	V	-157	noise
17475.00	57.1	68.2	16.7	1000	100	V	-198	noise
23300.00	53.7	68.2	14,5	1000	130	V	200	noise
29125.00	25.0	68.2	43,2	1000	130	H	120	noise
34950.00	25.5	68.2	42,7	1000	130	H	0	noise

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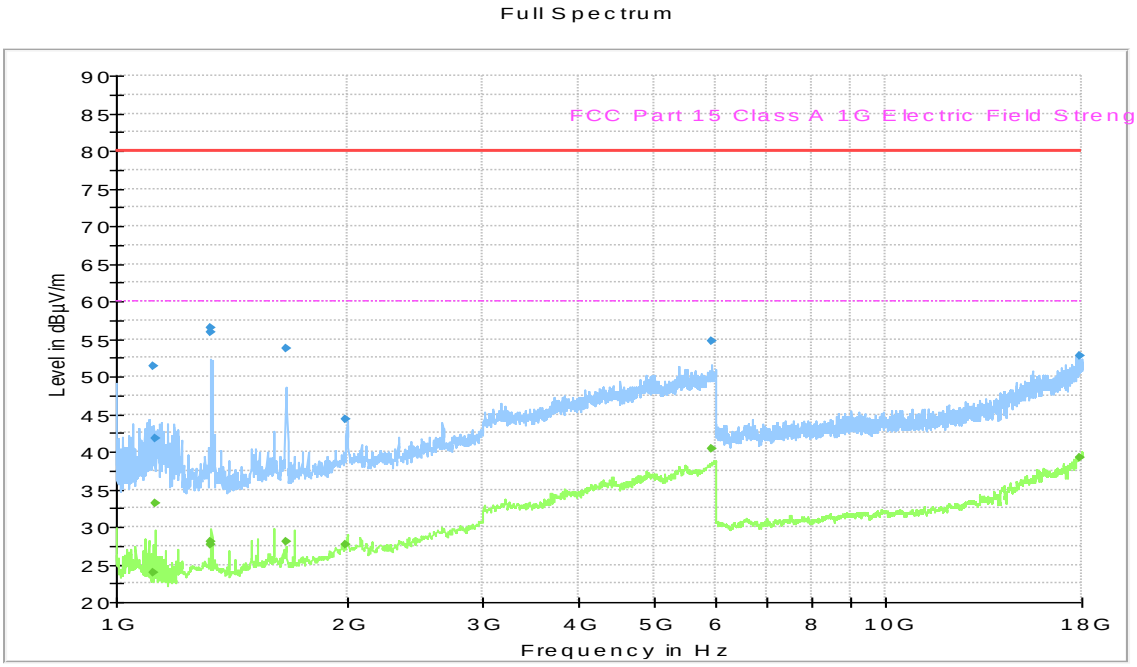
Test data transmitters idle.



6.6 Test equipment

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

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7 OCCUPIED BANDWIDTH

Date of test:	2014-07-02, 2014-10-31	Test location:	EMC Center
EUT Serial:	F9000170ABF0A / CC0000170ABF18	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	Pass	Margin:	1023.6 kHz

7.1 Requirement

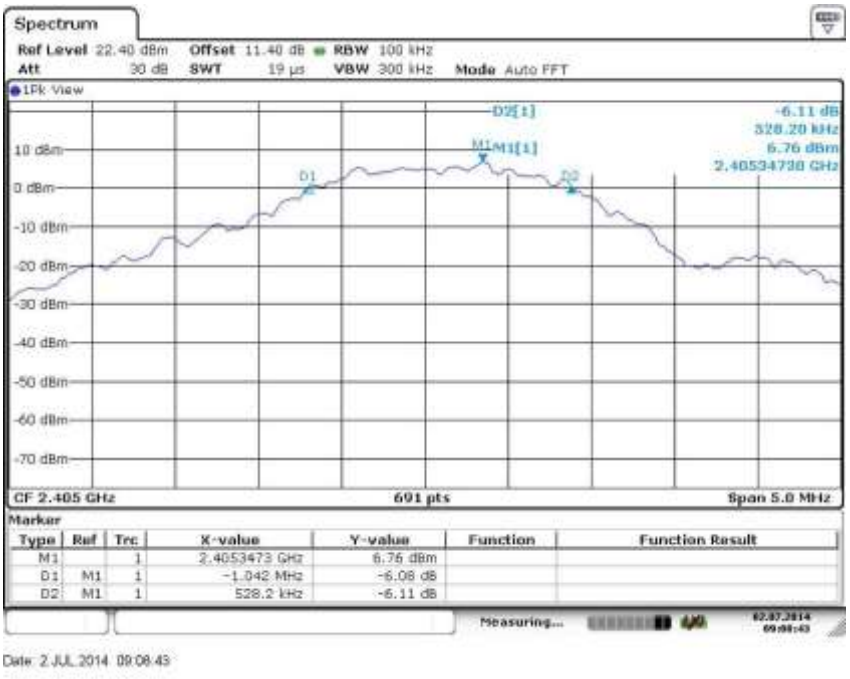
Reference: FCC §15.247(a)(2), RSS-210 A8.2 (a)
Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

7.2 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.

7.3 Test data 2.4 GHz Zigbee

Ch 11



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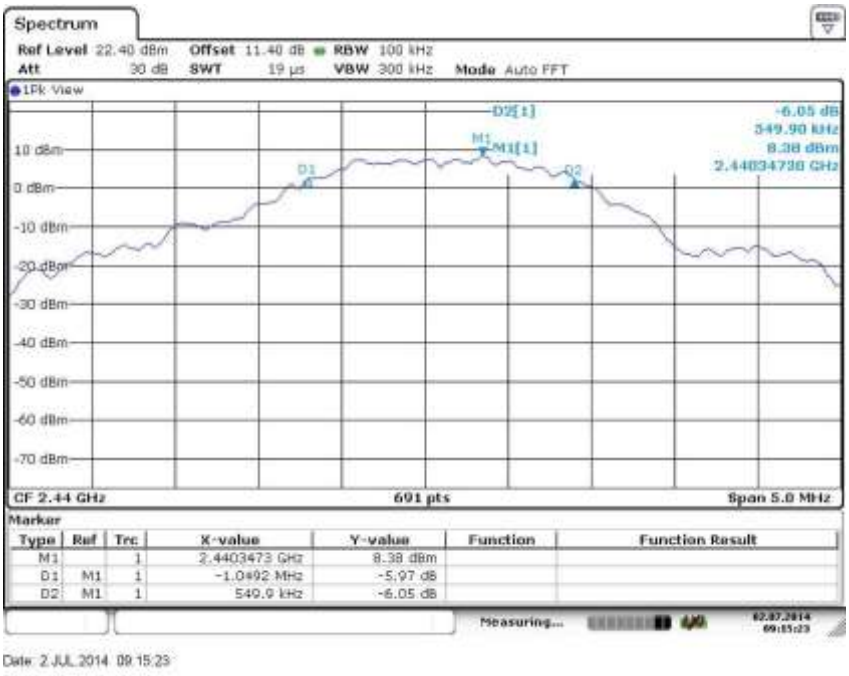
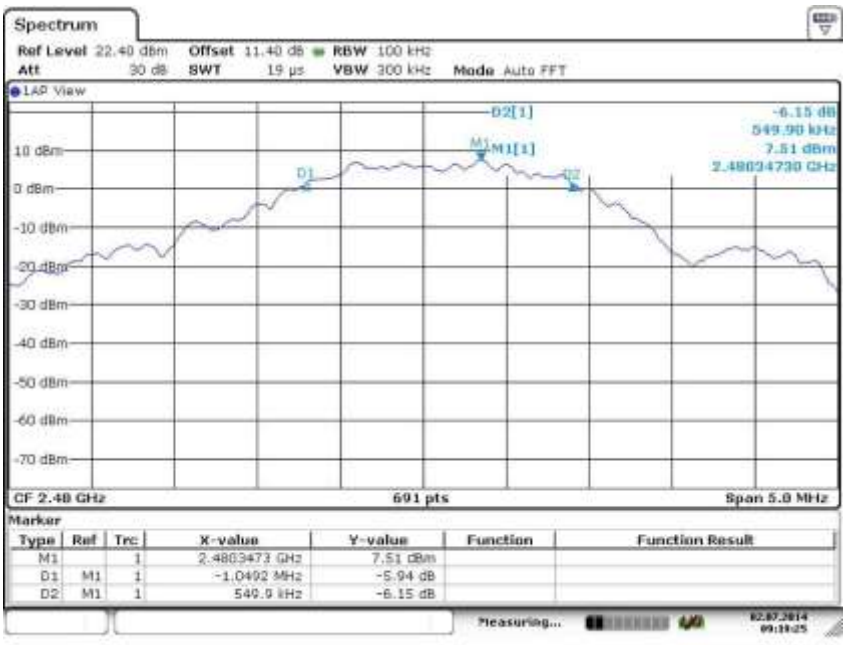
Ch18



Date: 2.JUL.2014 09:15:23

Ch 26

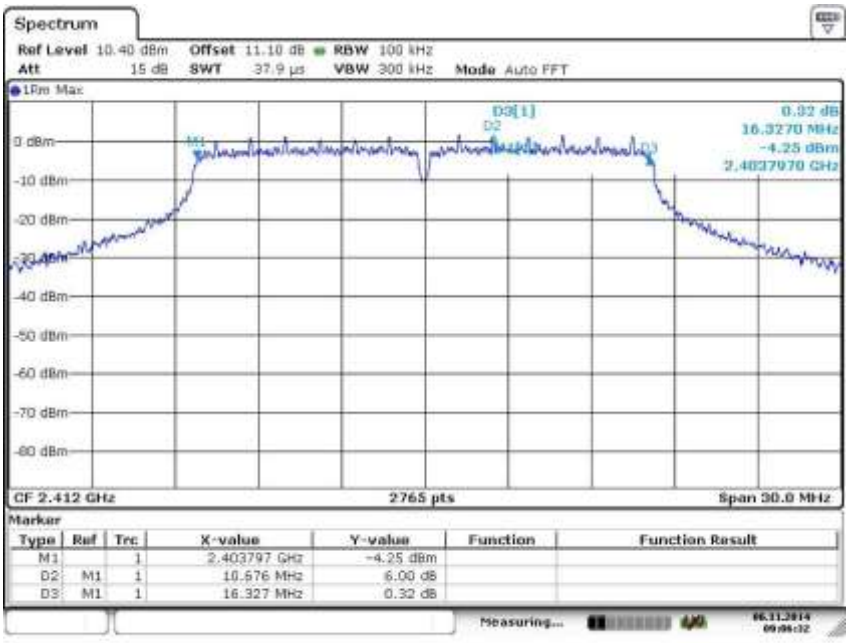


Date: 2.JUL.2014 09:19:25

Frequency MHz	6 dB bandwidth kHz	Limit kHz	Margin kHz
2405	1523.6	500	1023.6
2445	1599.1	500	1099.1
2480	1599.1	500	1099.1

7.4 Test data 2.4 GHz Wi-Fi

Ch1



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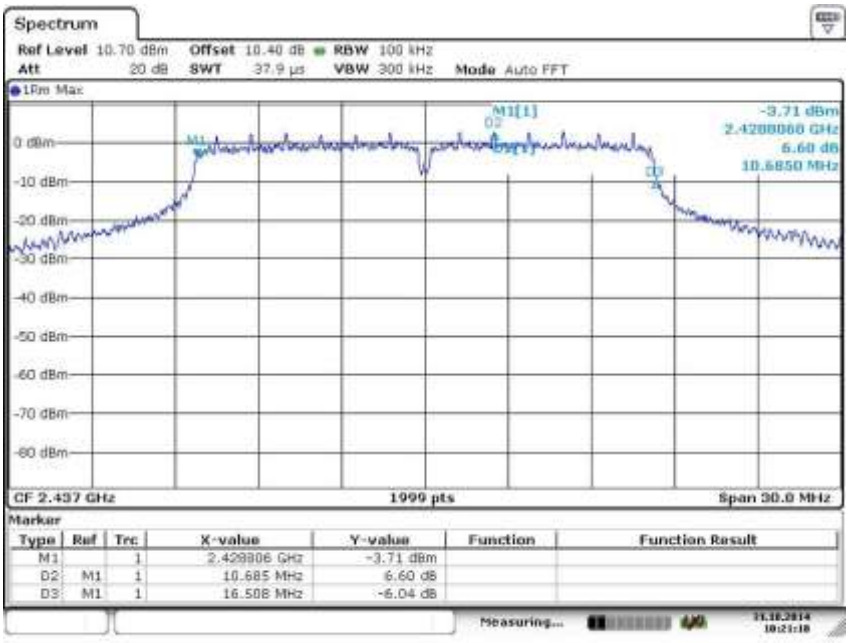
Ch 6



Date: 31.OCT.2014 10:21:17

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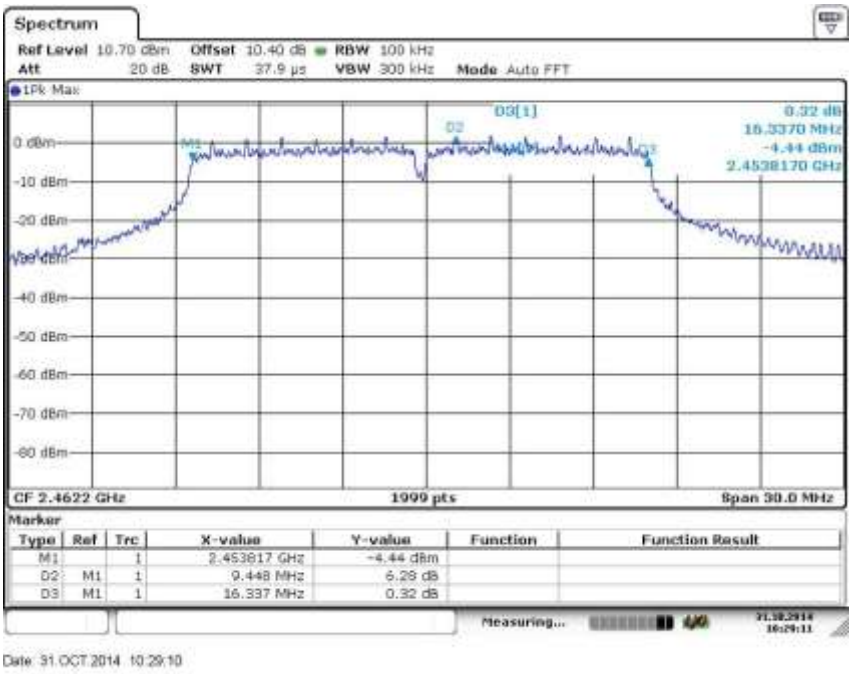
Ch11



Frequency MHz	6 dB bandwidth kHz	Limit kHz	Margin kHz
2412	16337	500	15837
2437	16508	500	16008
2462	16337	500	15837

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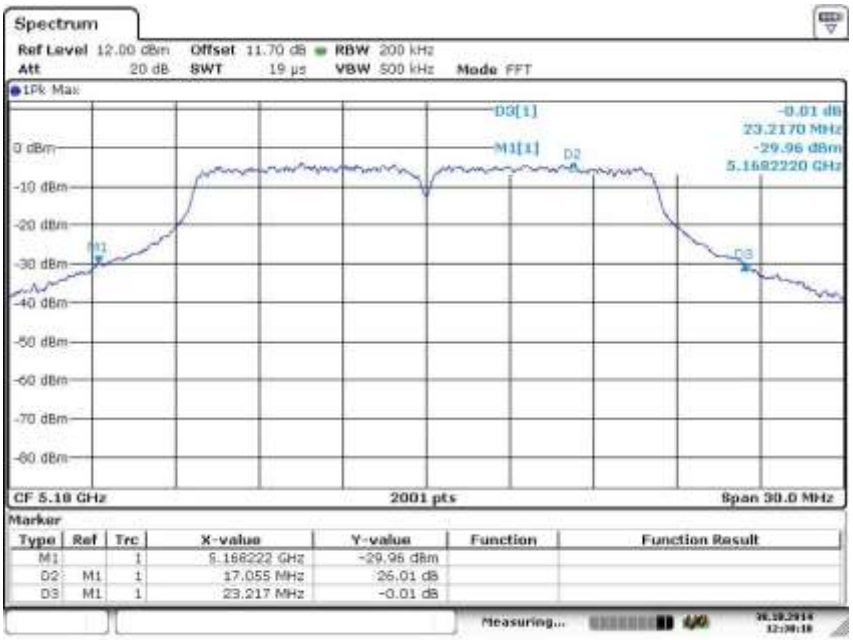
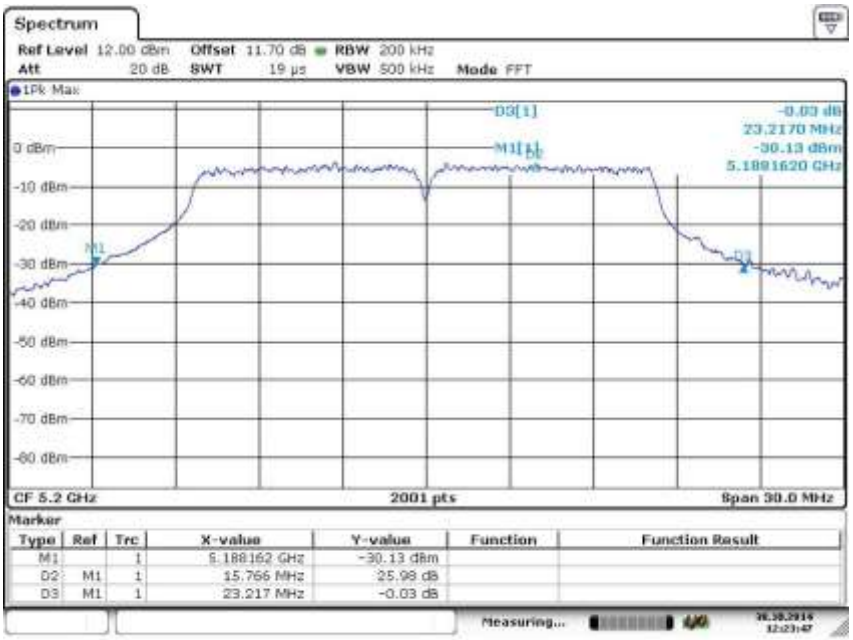
7.5 Test data 5 GHz Wi-Fi

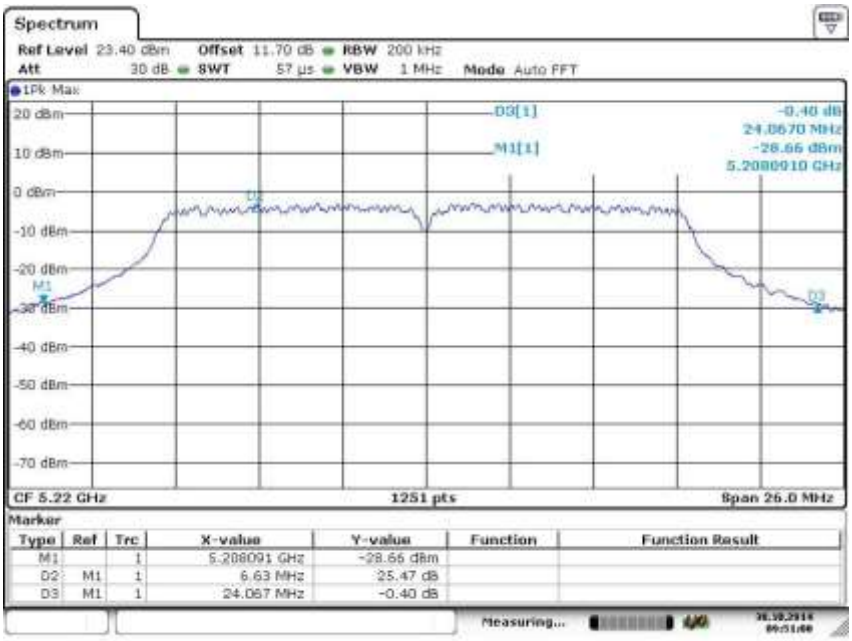
Ch 36



Ch 40

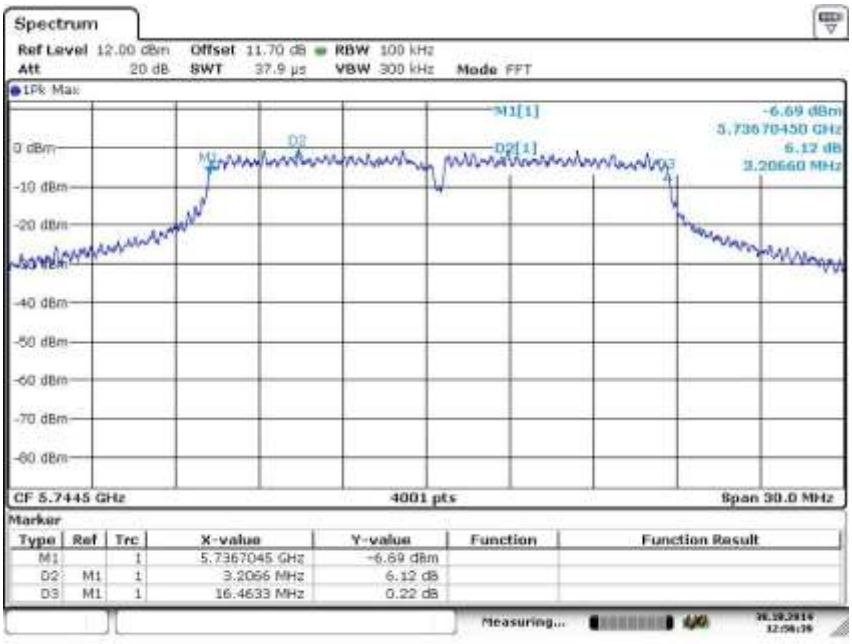


Ch 44



Date: 30.OCT.2014 09:51:00

Ch 149



Date: 30.OCT.2014 12:56:39

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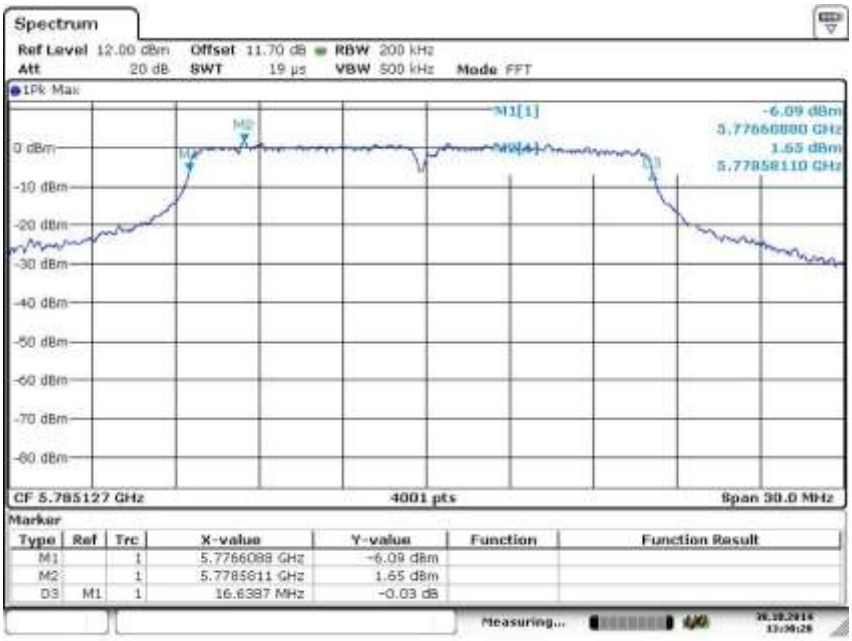
Ch 157



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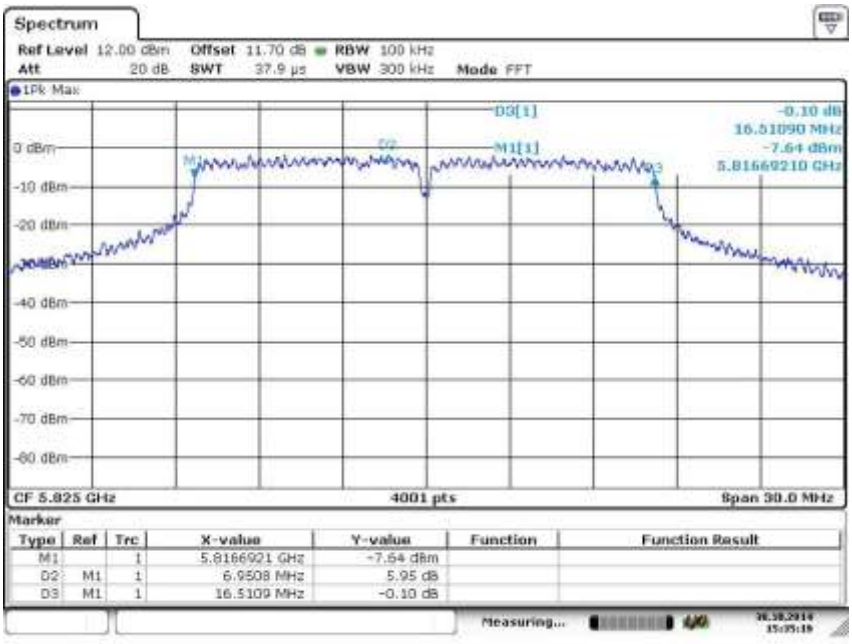
Ch 165



Date: 30.OCT.2014 15:35:19

Frequency MHz	6 dB bandwidth kHz	Limit kHz	Margin kHz
5745	16463	500	15963
5785	16639	500	16139
5825	16511	500	16011

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7.6 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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8 CONDUCTED OUTPUT POWER

Date of test:	2014-09-11	Test location:	EMC Center
EUT Serial:	F9000170ABF0A / CC0000170ABF18	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	Pass	Margin:	0.75 dB

8.1 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.

§15.407 (a) *Power limits:*

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

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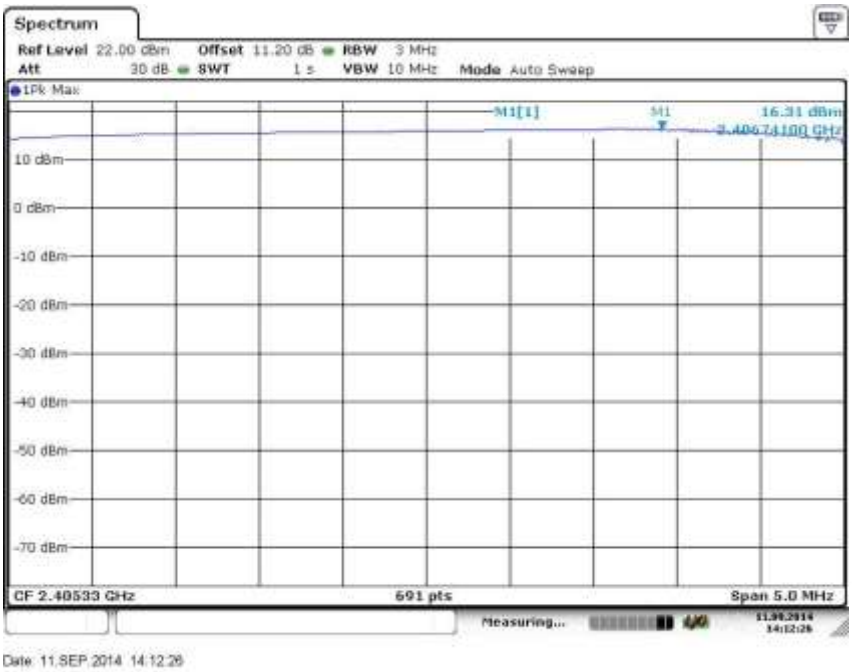
8.2 Test set-up

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 2.4 GHz Zigbee

Ch 11 Transceiver 0



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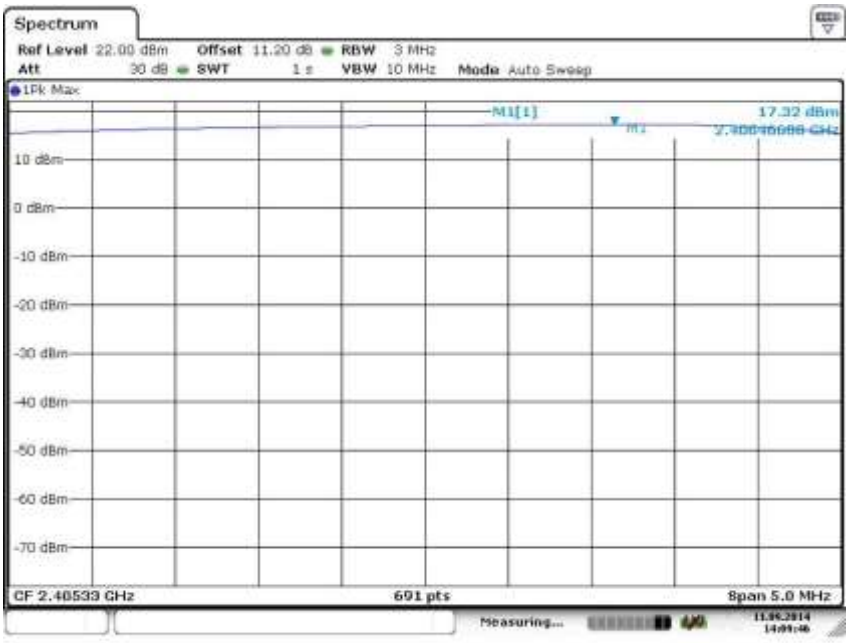
Ch 11 Transceiver 1



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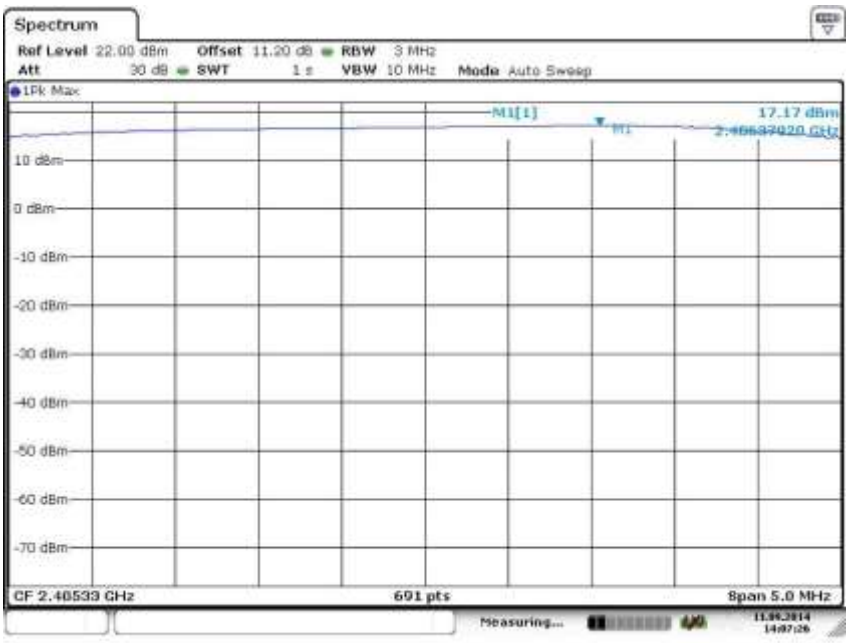

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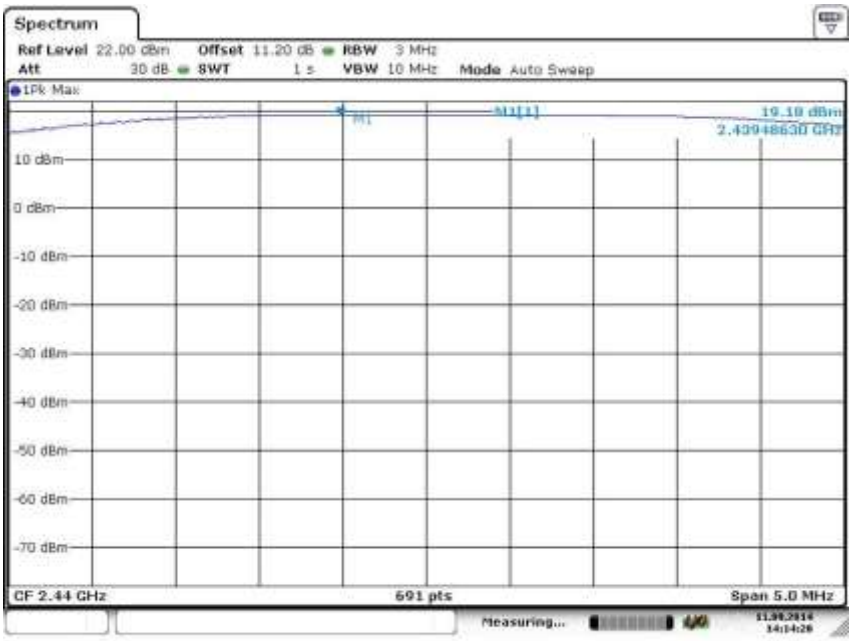
Ch 18 Transceiver 0



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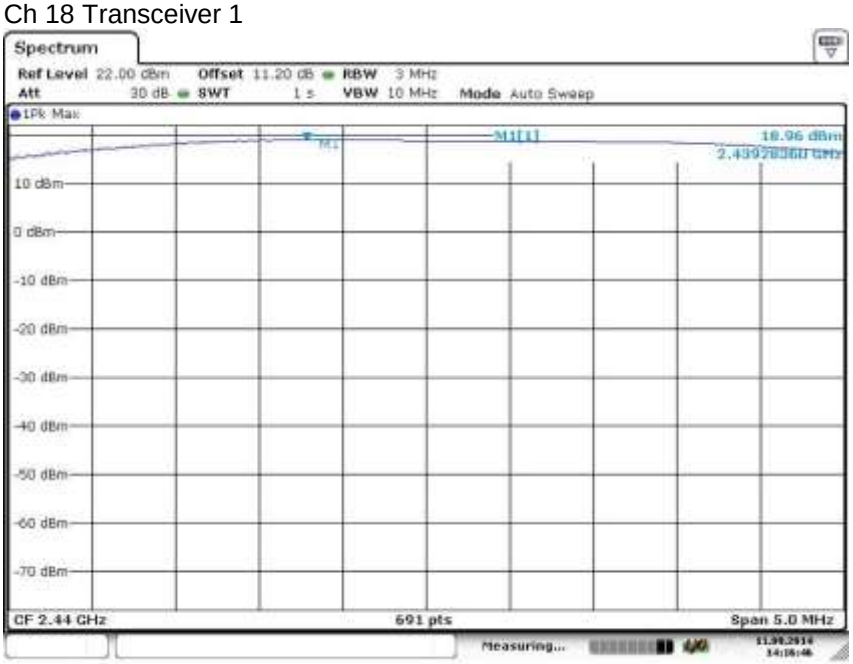

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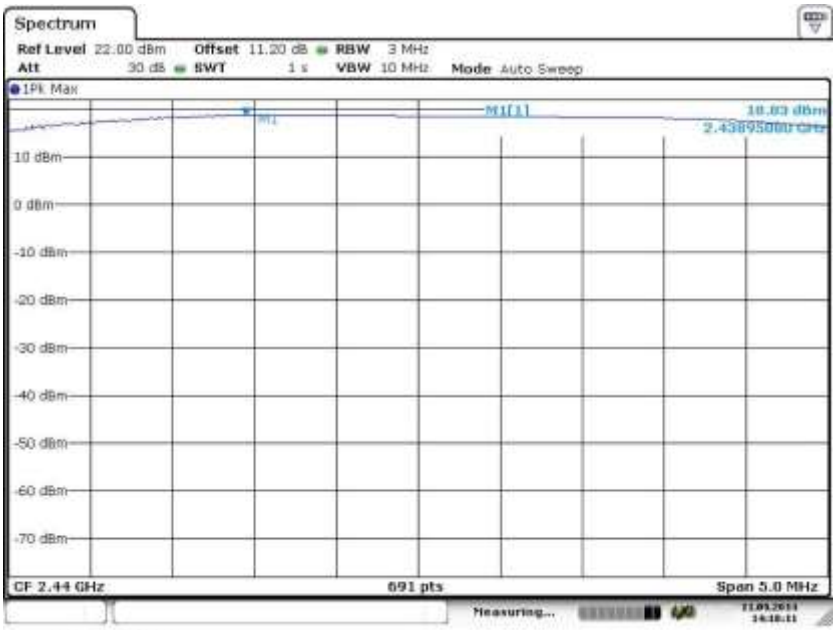
Ch 18 Transceiver 2



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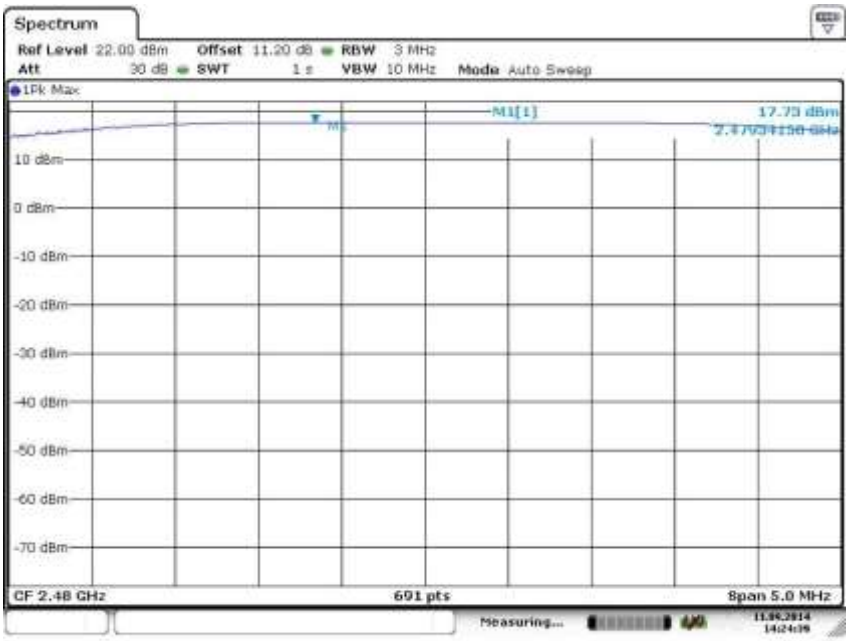
Ch 26 Transceiver 0



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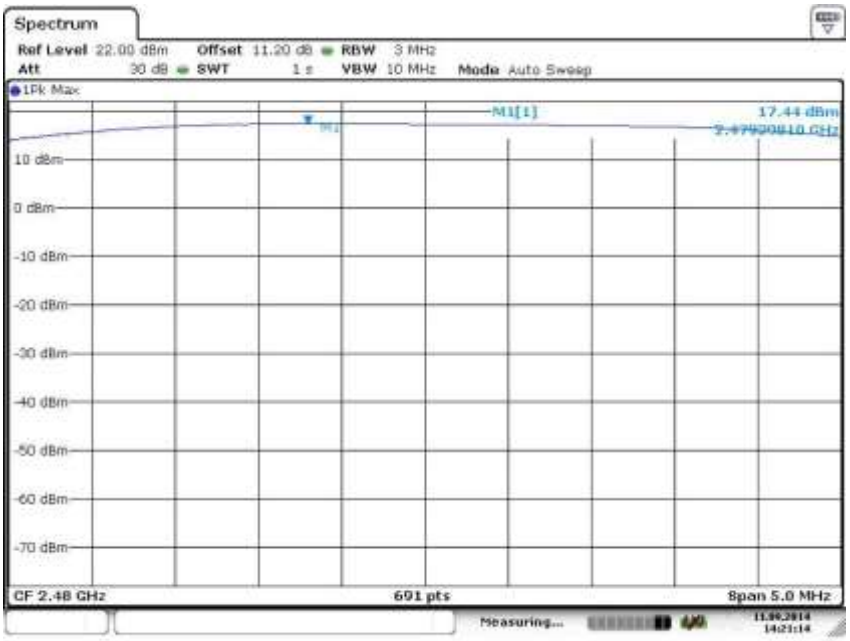
Ch 26 Transceiver 1



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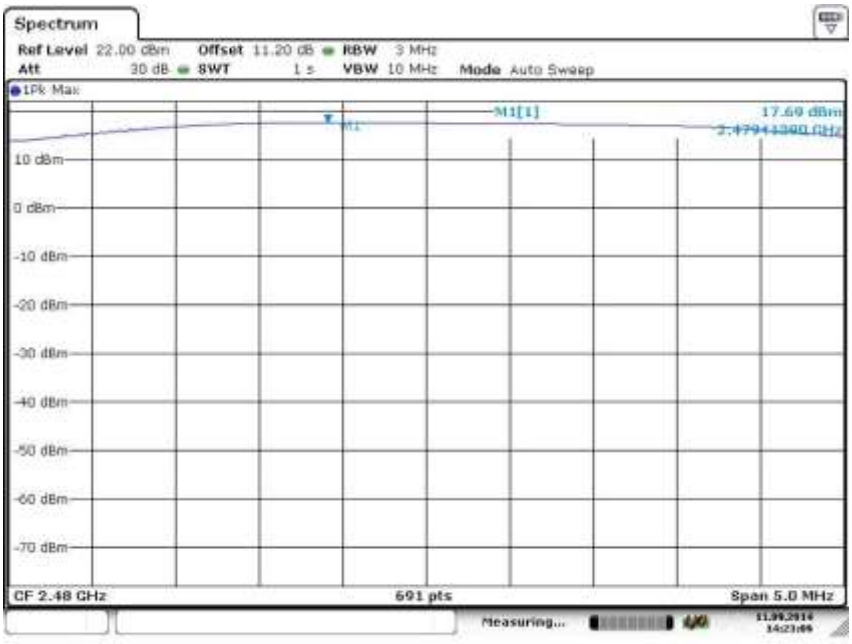
Ch 26 Transceiver 2



Date: 11.SEP.2014 14:23:09

Output power ZigBee

Frequency MHz	Peak power Transceiver 0 dBm	Peak power Transceiver 1 dBm	Peak power Transceiver 2 dBm	Limit dBm	Margin dB
2405	16.31	17.32	17.17	30	12.62
2445	19.18	18.96	18.83	30	10.82
2480	17.73	17.69	17.44	30	12.27

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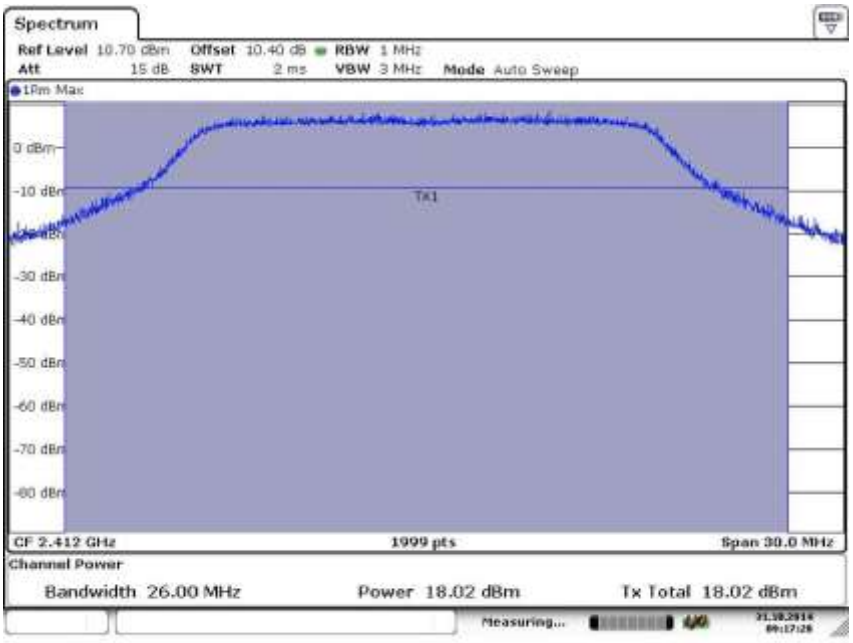
8.4 Test data 2.4 GHz Wi-Fi

Ch 1



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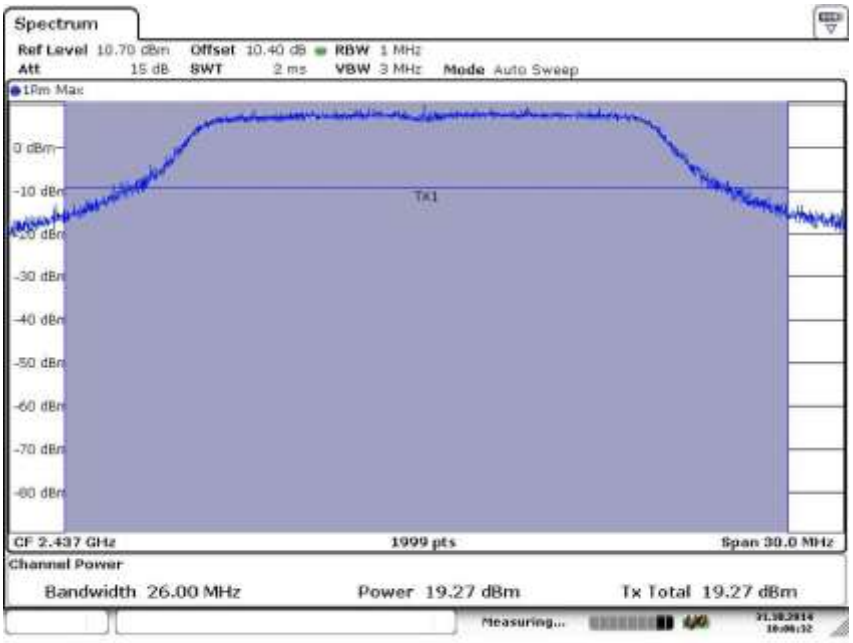
Ch 6



Date: 31.OCT.2014 10:06:32

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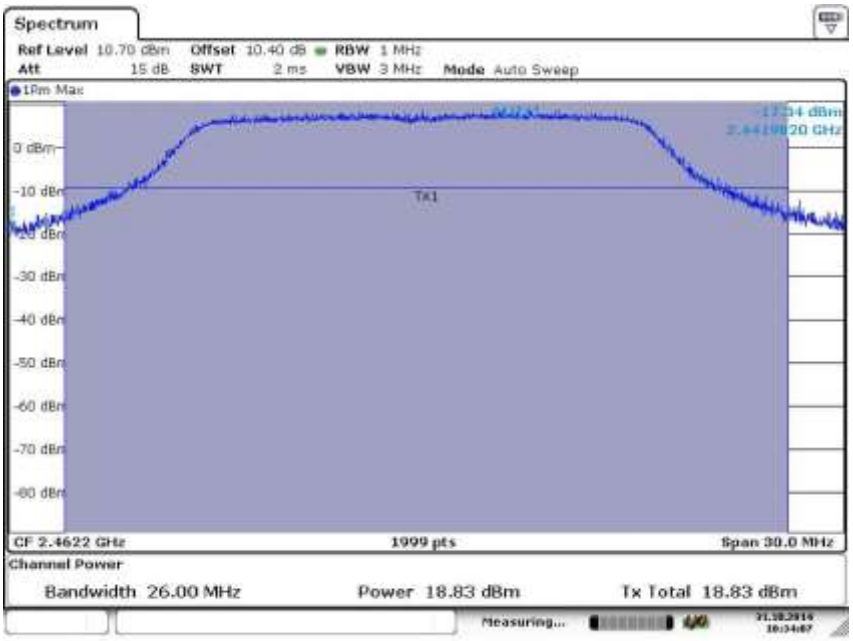
Ch11



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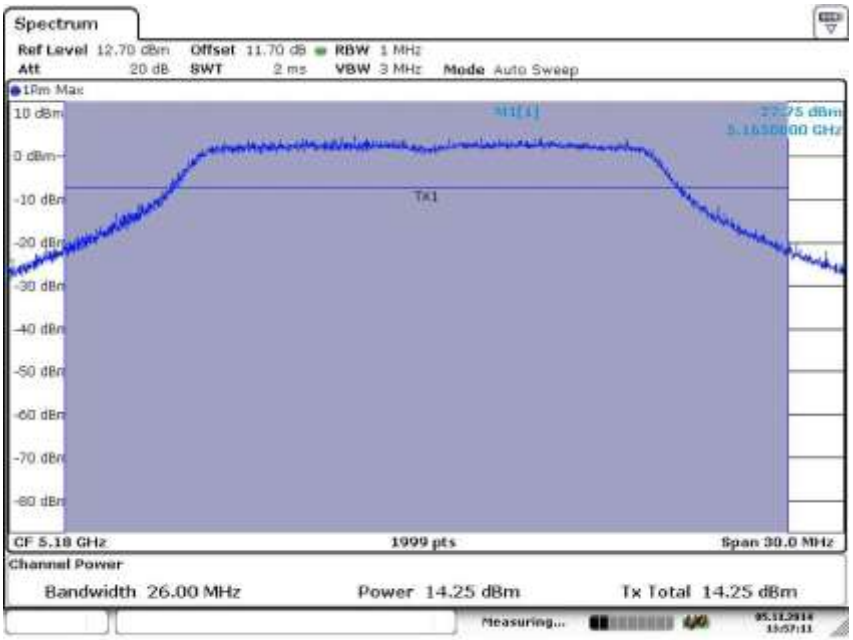
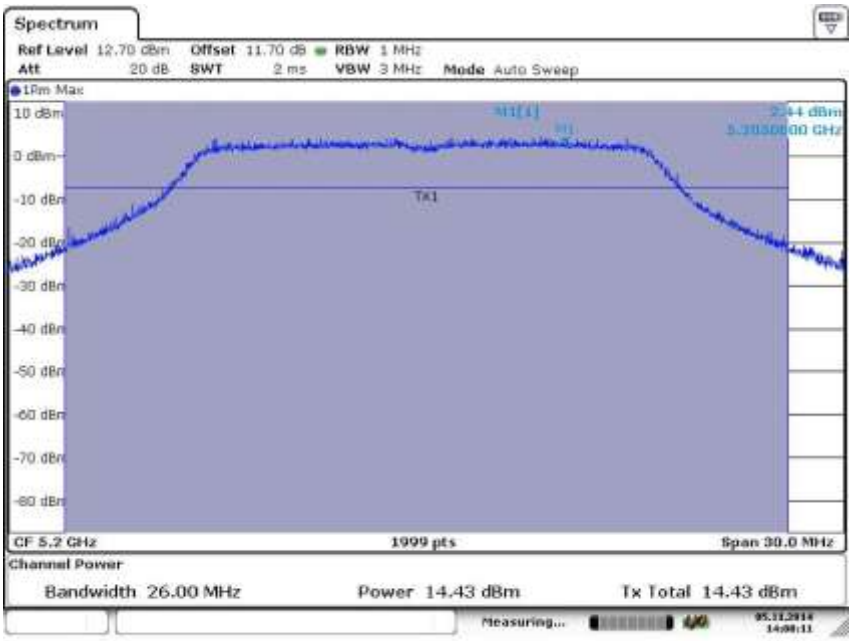
8.5 Test data 5 GHz Wi-Fi

Ch 36



Date: 5.NOV.2014 13:57:11

Ch 40



Date: 5.NOV.2014 14:08:10

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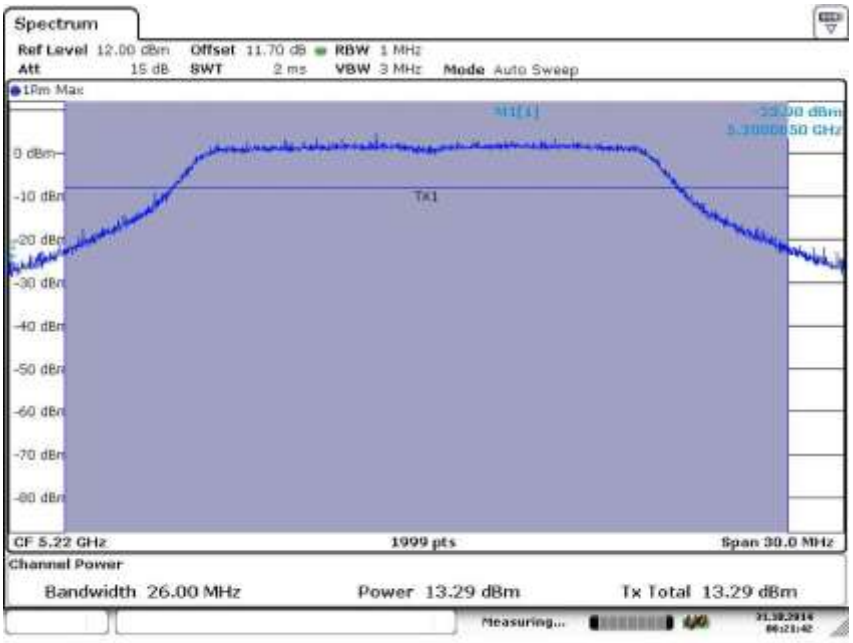
Ch 44



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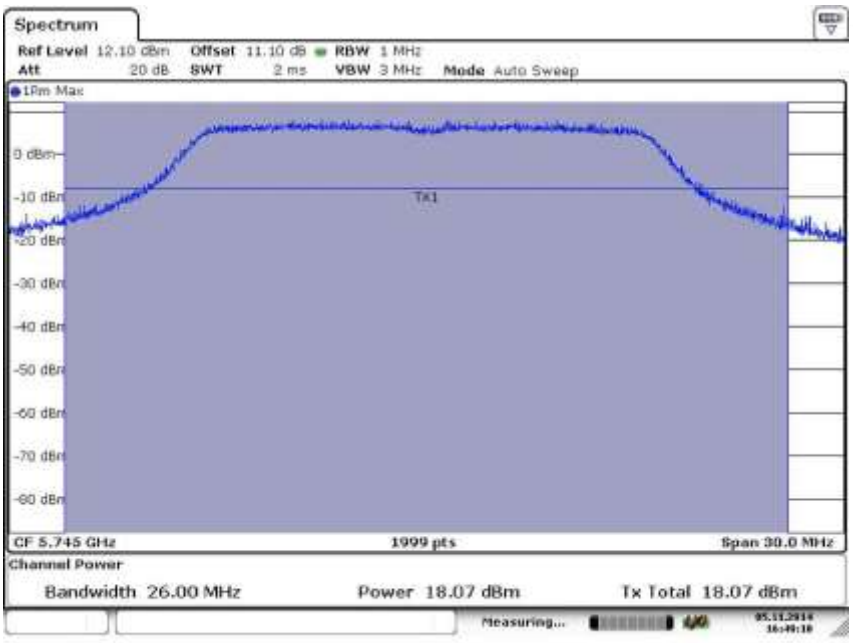
Ch 149



Date: 5.NOV.2014 16:49:10

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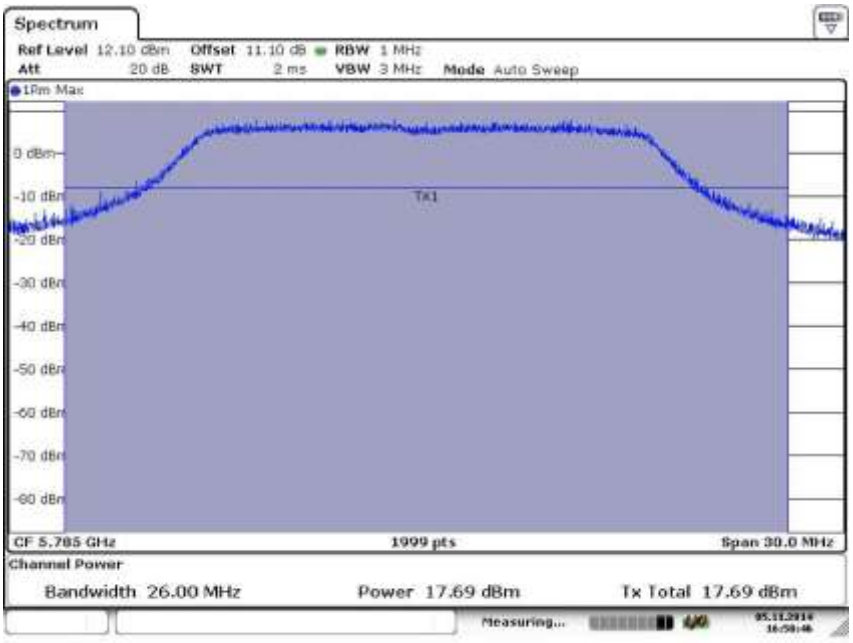
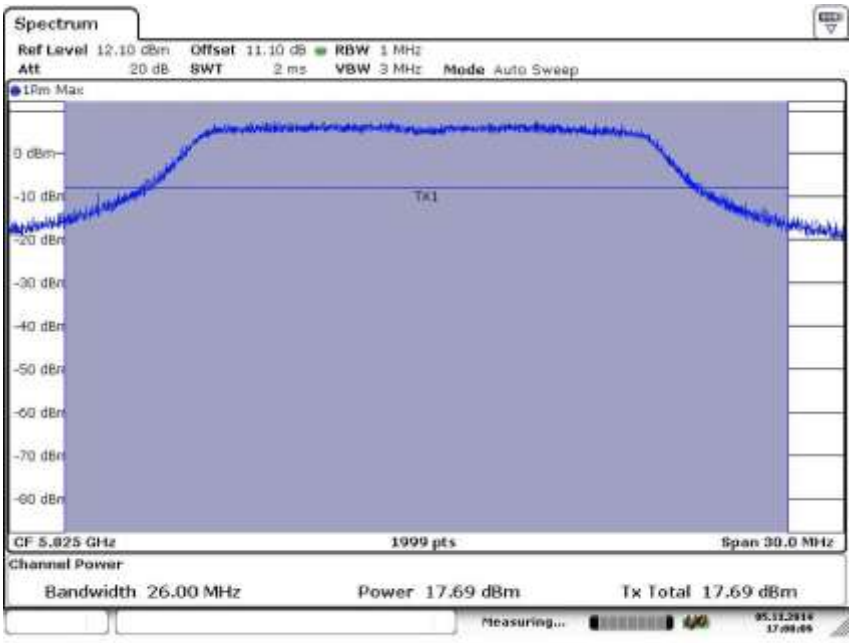
Ch 157



Date: 5.NOV.2014 16:58:46

Ch 165



Date: 5.NOV.2014 17:08:09

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Conducted output power Wi-Fi

Frequency MHz	power dBm	Limit dBm	Margin dB
2412	18.02	30	12.62
2437	19.27	30	10.82
2462	18.83	30	12.27
5180	14.25	22	7.75
5200	14.43	22	7.57
5220	13.29	22	8.71
5745	18.07	28	9.93
5785	17.69	28	10.31
5825	17.69	28	10.31

EIRP Wi-Fi

Frequency MHz	power dBmi	Limit FCC dBm	Limit IC dBm	Margin dB
2412	23.02	36	36	12.98
2437	24.27	36	36	11.73
2462	23.83	36	36	12.17
5180	22.25	30	23	0.75
5200	22.43	30	23	0.57
5220	21.29	30	23	1.71
5745	26.07	36	36	9.93
5785	25.69	36	36	10.31
5825	25.69	36	36	10.31

8.6 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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9 PEAK POWER SPECTRAL DENSITY

Date of test:	2014-09-11	Test location:	EMC Center
EUT Serial:	F9000170ABF0A / CC0000170ABF18	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	Pass	Margin:	0.89 dB

9.1 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.

Reference: RSS-210 A9.2
Band 5150–5250 MHz**:**
The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

9.2 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.

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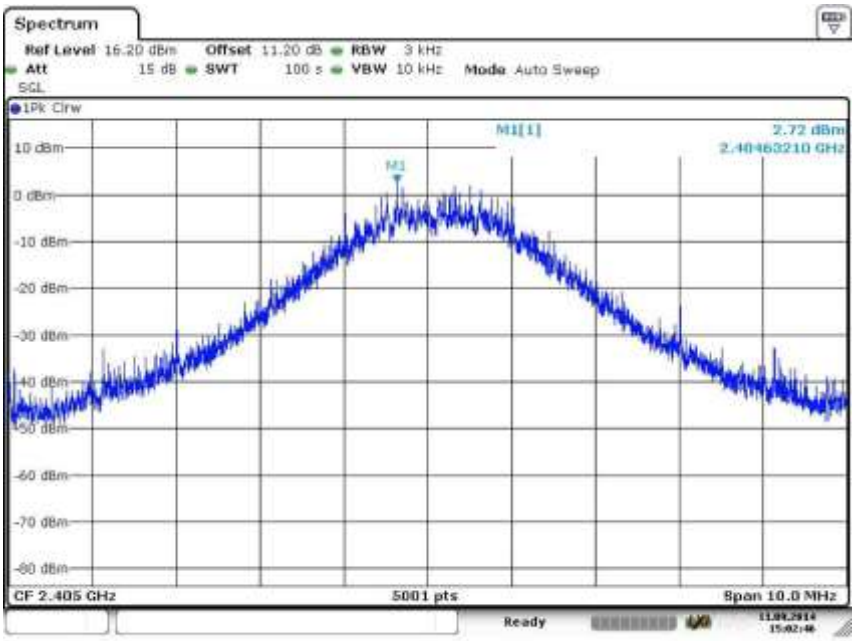
9.3 Test data 2.4 GHz Zigbee

Ch 11



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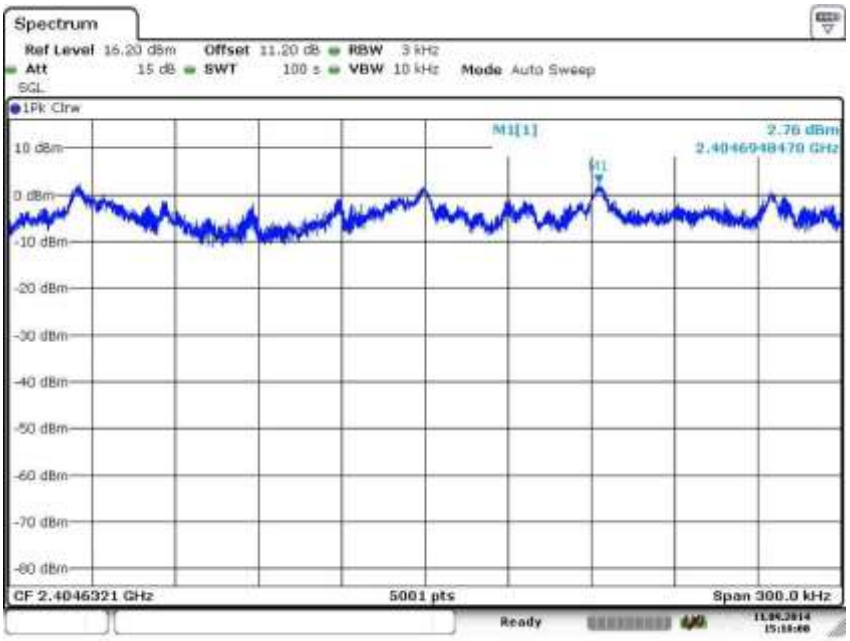

Date: 11.SEP.2014 15:18:00

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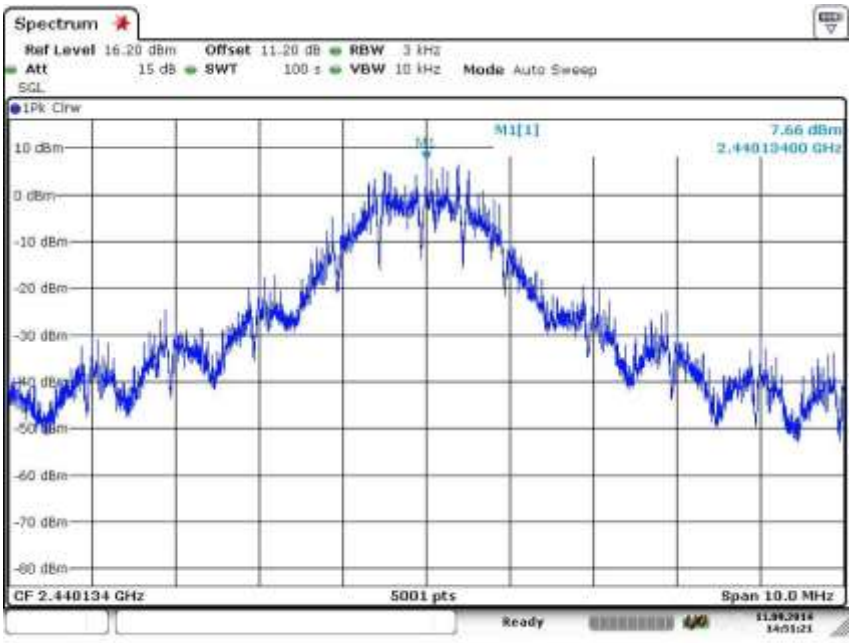
Ch 18



Date: 11.SEP.2014 14:51:20

Date: 11.SEP.2014 14:58:09

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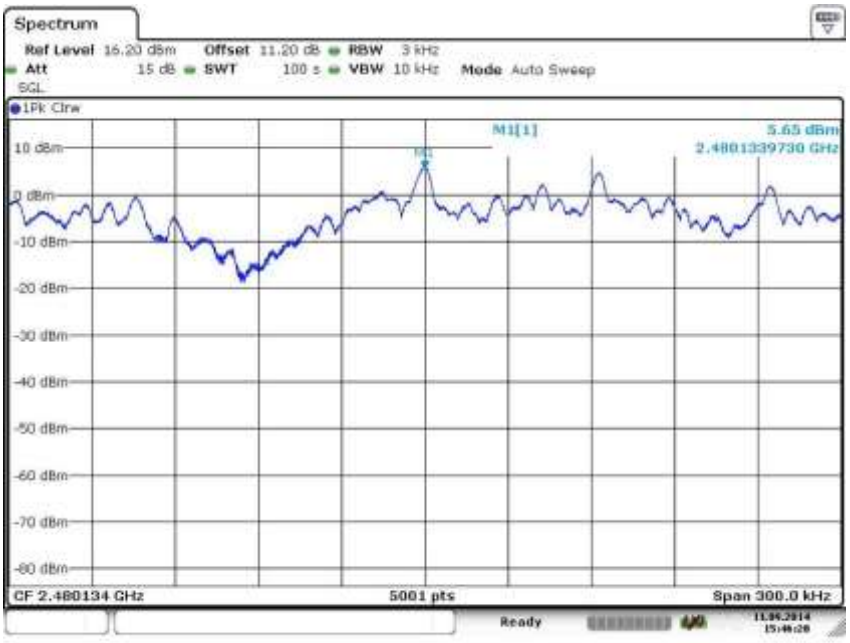
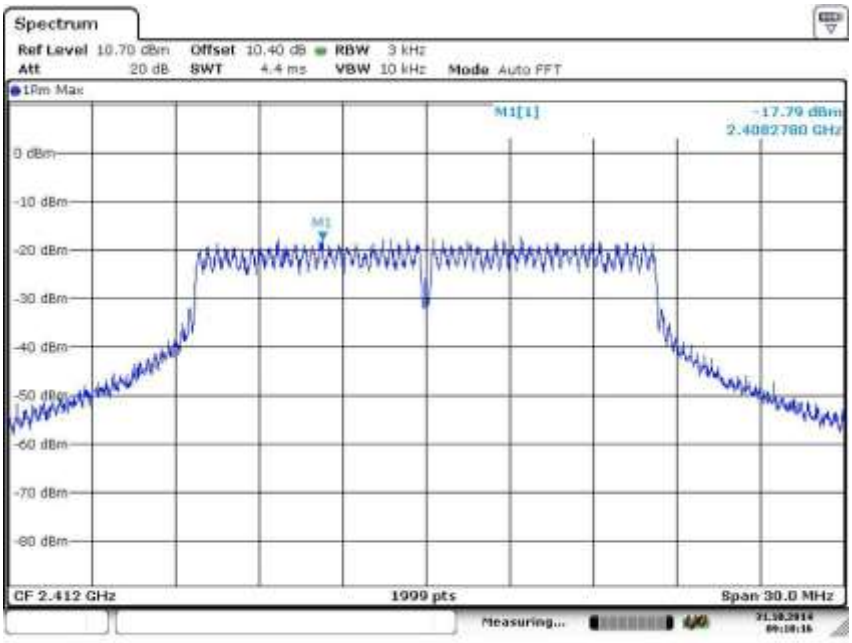
Ch 26



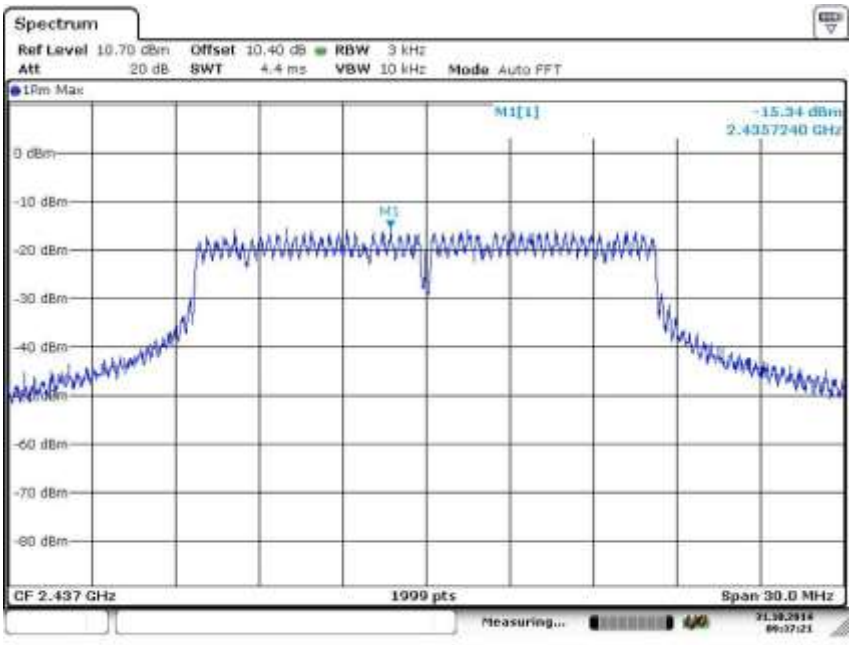
Frequency MHz	Peak power spectral density dBm/3kHz	Limit dBm/3kHz	Margin dB
2405	2.76	8	5.24
2445	7.84	8	0.16
2480	5.65	8	2.35

9.4 Test data 2.4 GHz Wi-Fi

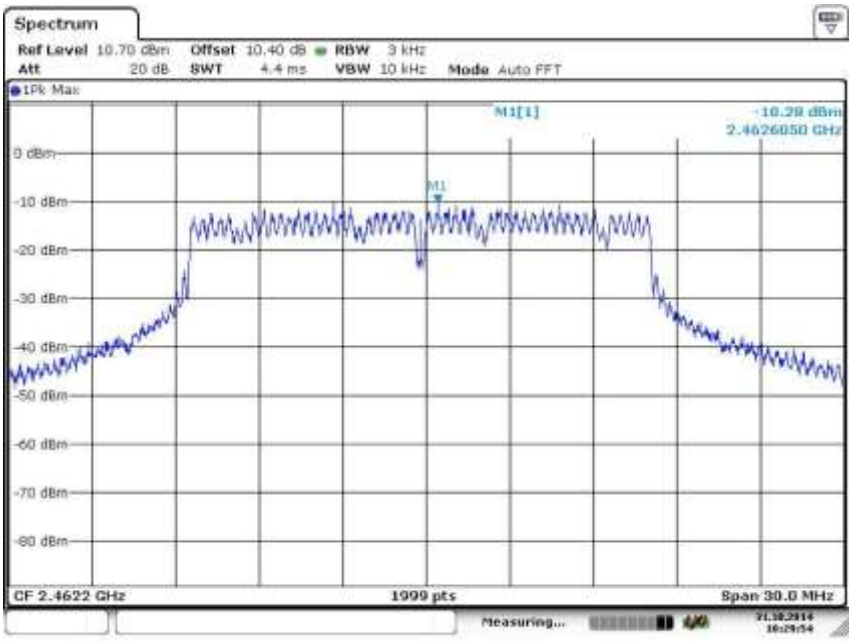
Ch1



Ch6



Ch11



Frequency MHz	Peak power spectral density dBm/3kHz	Limit dBm/3kHz	Margin dB
2412	-17.79	8	25.79
2436	-15.34	8	23.34
2462	-10.28	8	18.28

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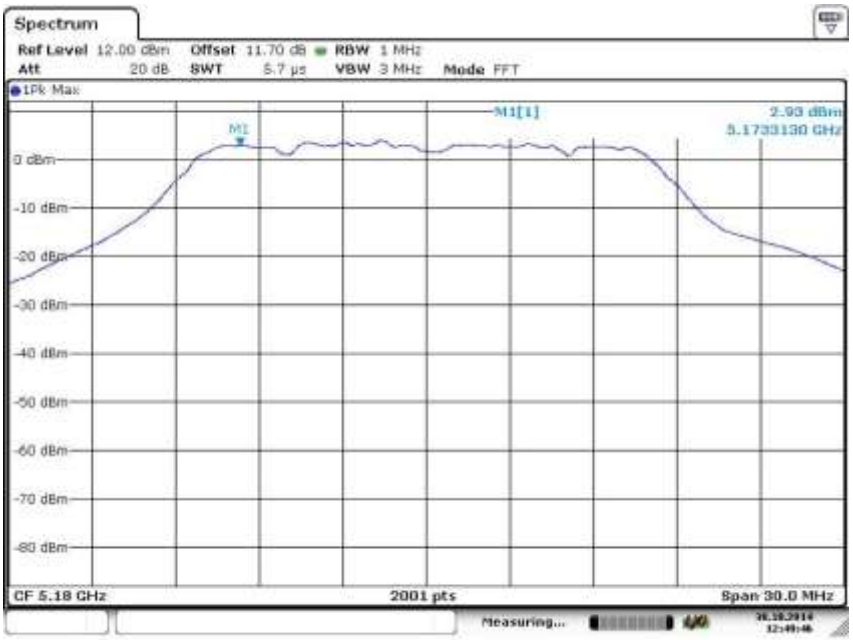
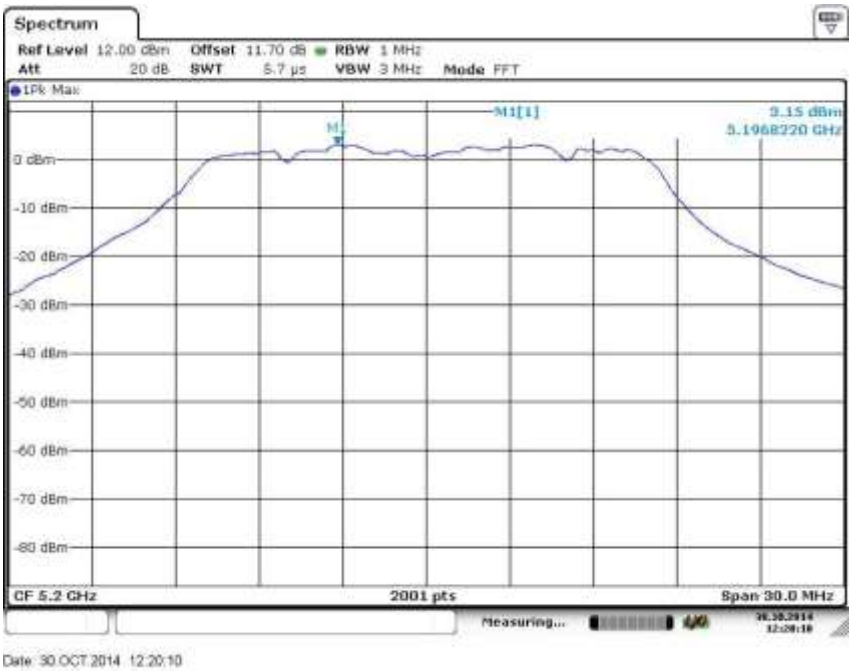
9.5 Test data 5 GHz Wi-Fi

Ch 36



Ch 40



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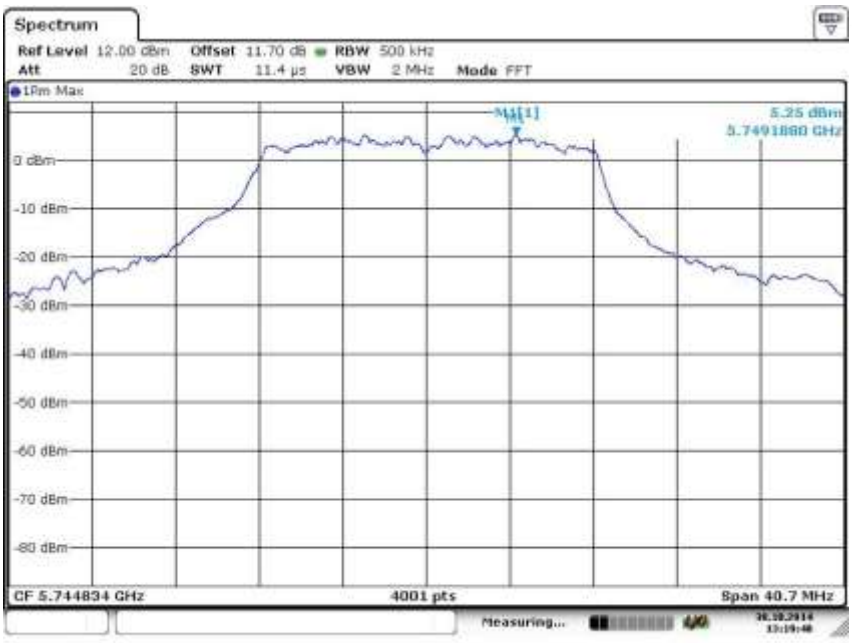
Ch 44

Date: 31.OCT.2014 08:19:41

Ch 149 (CFR 47 15.407)



Date: 30.OCT.2014 13:19:48

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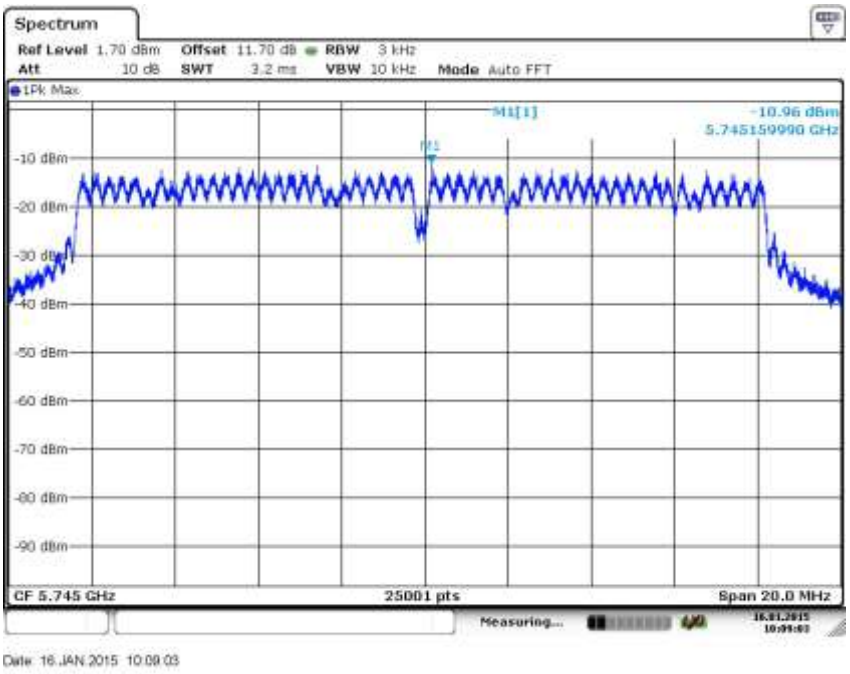
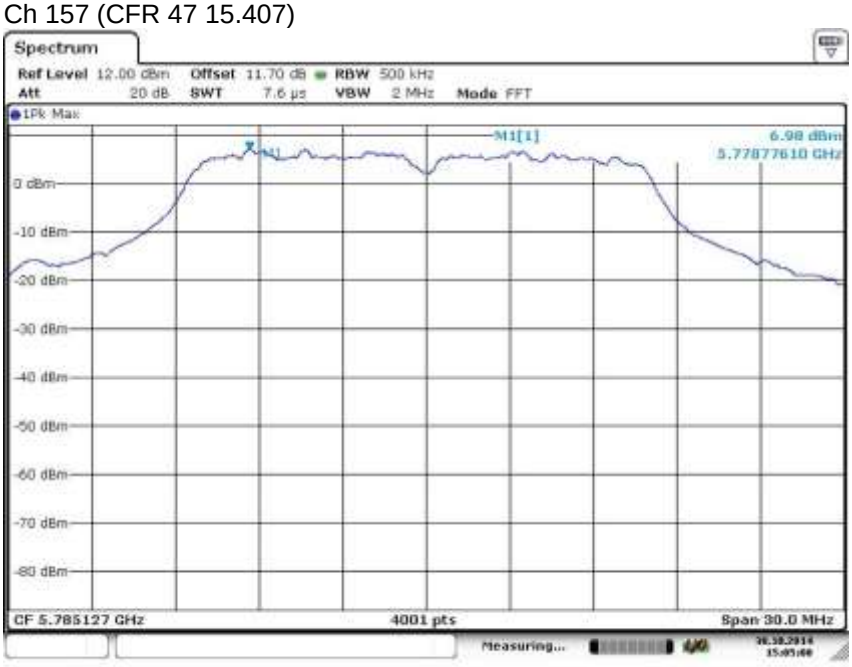
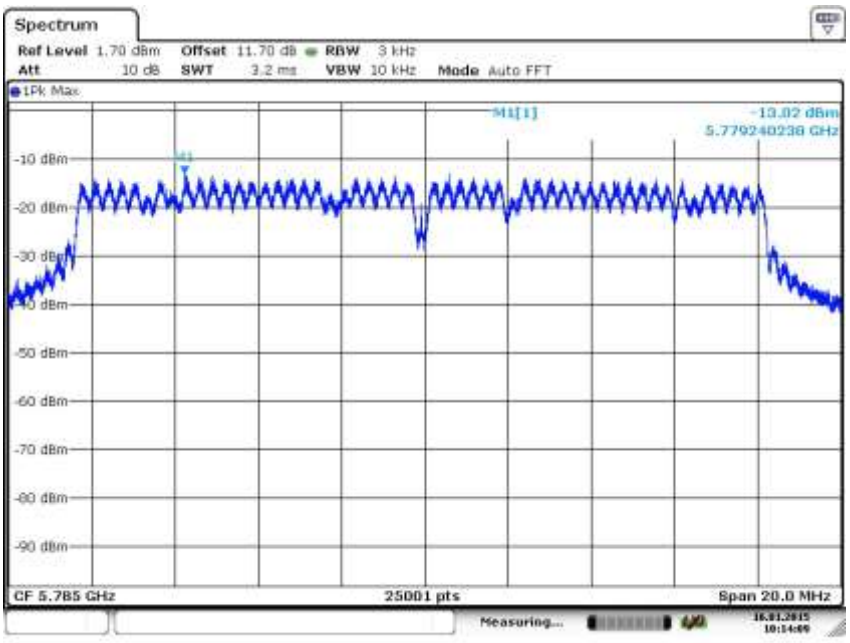
Ch 149 (RSS-210 A 8)



Ch 157 (CFR 47 15.407)



Ch 157 (RSS-210 A 8)



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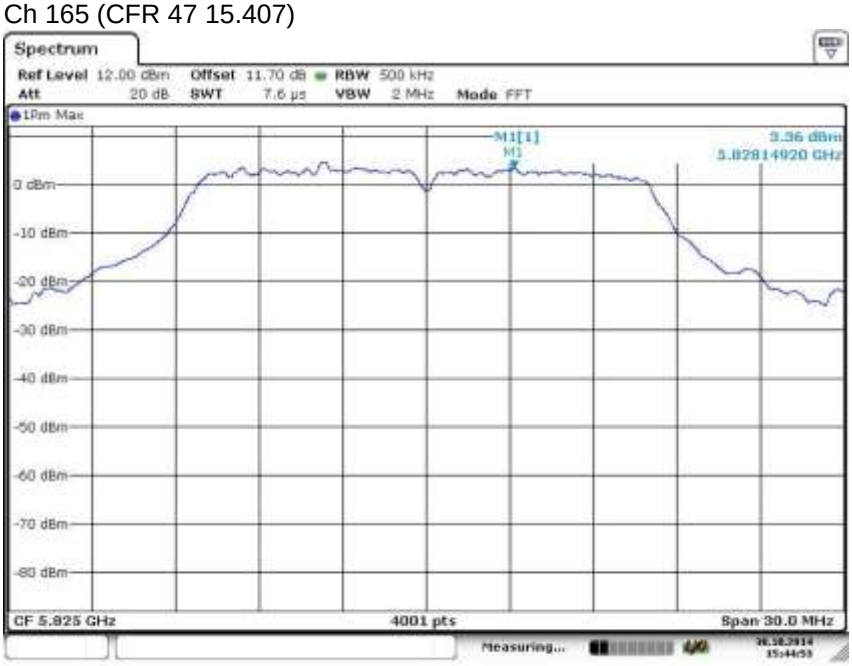
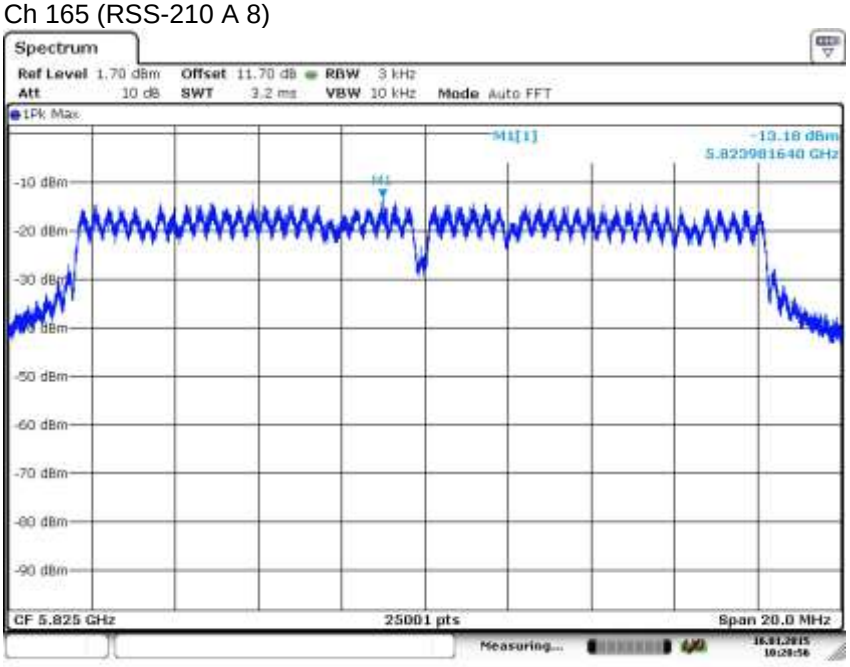
Ch 165 (CFR 47 15.407)



Date: 30.OCT.2014 15:44:53

Ch 165 (RSS-210 A 8)



Date: 16.JAN.2015 10:20:56

CFR 47 15.407 and RSS-210 A9.2

Frequency MHz	Peak power spectral density dBm/MHz	Limit dBm/MHz	Limit dBmi/MHz	Margin dB
5180	2.93	9	10	6.07
5200	3.15	9	10	5.85
5220	3.54	9	10	5.46

Compliance with 8 dBi antenna requires at least 1.6 dB antenna cable loss.

CFR 47 15.407

Frequency MHz	Peak power spectral density dBm/500kHz	Limit dBm/500kHz	Margin dB
5745	5.25	30	24.75
5785	6.98	30	23.02
5825	3.36	30	26.64

RSS-210 A 8.2

Frequency MHz	Peak power spectral density dBm/3kHz	Limit dBm/3kHz	Margin dB
5745	-10.96	8	18.96
5785	-13.02	8	21.02
5825	-13.18	8	21.18

9.6 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 TRANSMITTER DWELL TIME AND DUTY CUCLE AVERAGING FACTOR

Date of test:	2014-06-25	Test location:	EMC Center
EUT Serial:	F9000170ABF0A	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%

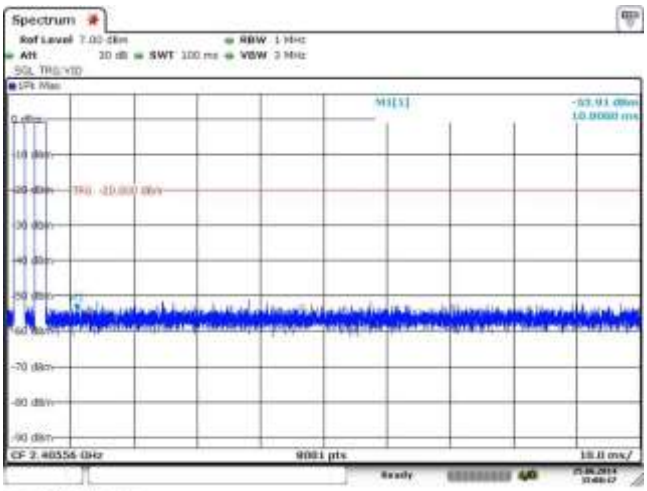
10.1 Requirement

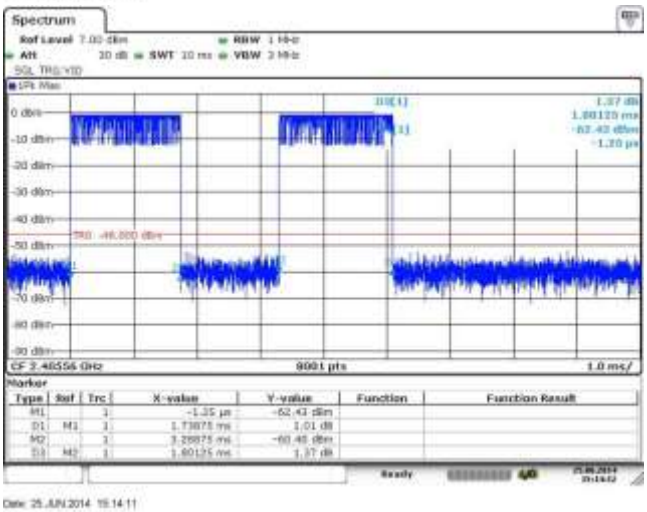
Transmitter dwell time is measured for Zigbee transmitter spurious emission duty cycle averaging.

10.2 Test set-up

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

10.3 Test data





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Ton/100ms	Duty cycle averaging factor 20LOG(Ton/100ms)	Averaging factor to be used
2.54 ms	-31.90 dB	-20 dB

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	7/2015

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11 BAND EDGE

Date of test:	2014-07-02 / 2014-10-30 / 2015-01-16	Test location:	EMC Center
EUT Serial:	F9000170ABF0A / CC0000170ABF18	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	Pass	Margin:	1.21 dB

11.1 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.

Reference: FCC §15.407, IC RSS-210 A9.2

(b) *Undesirable emission limits.* Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

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.

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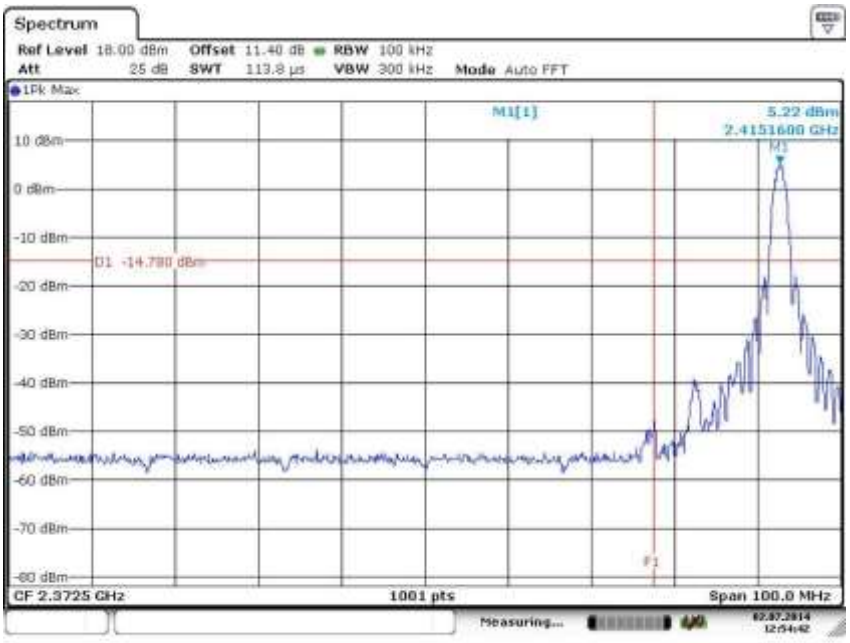
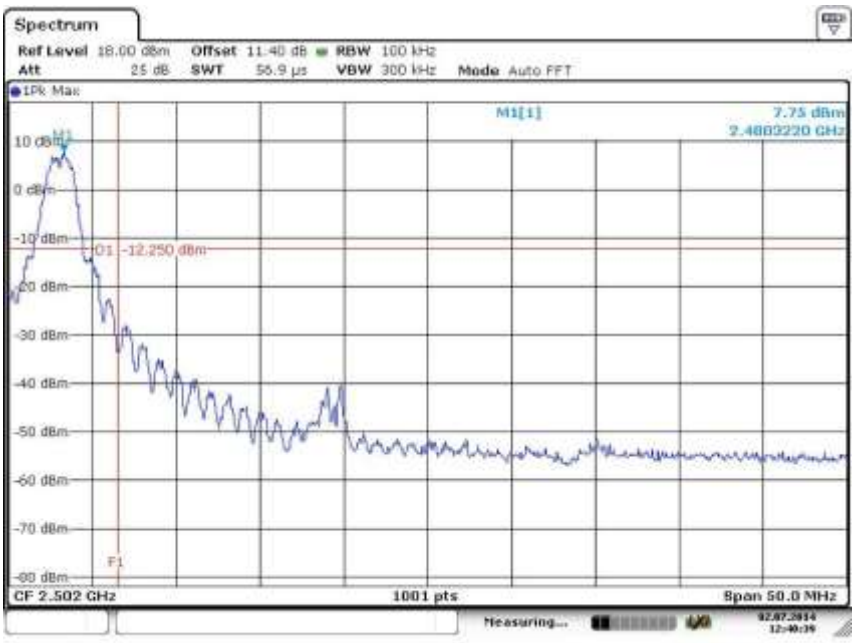
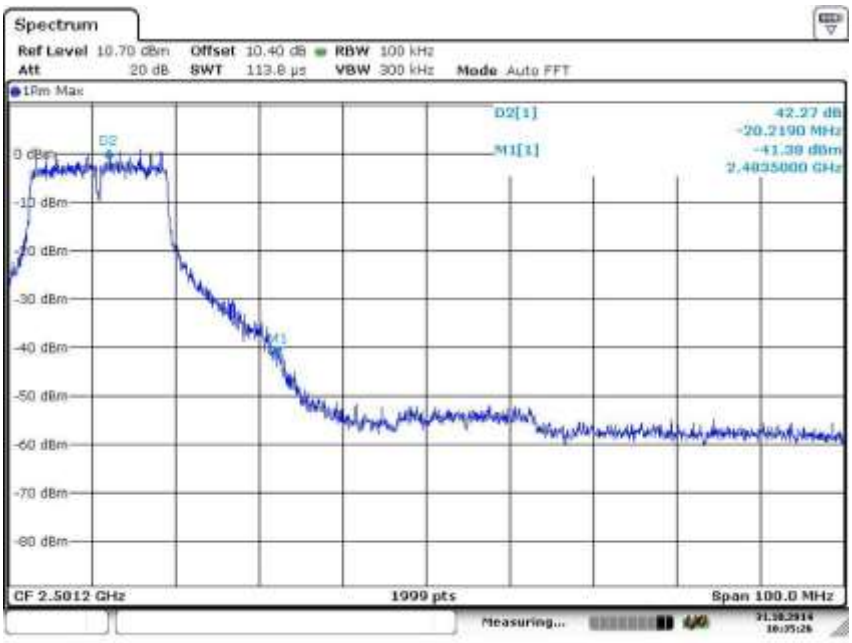
11.3 Test data 2.4 GHz Zigbee



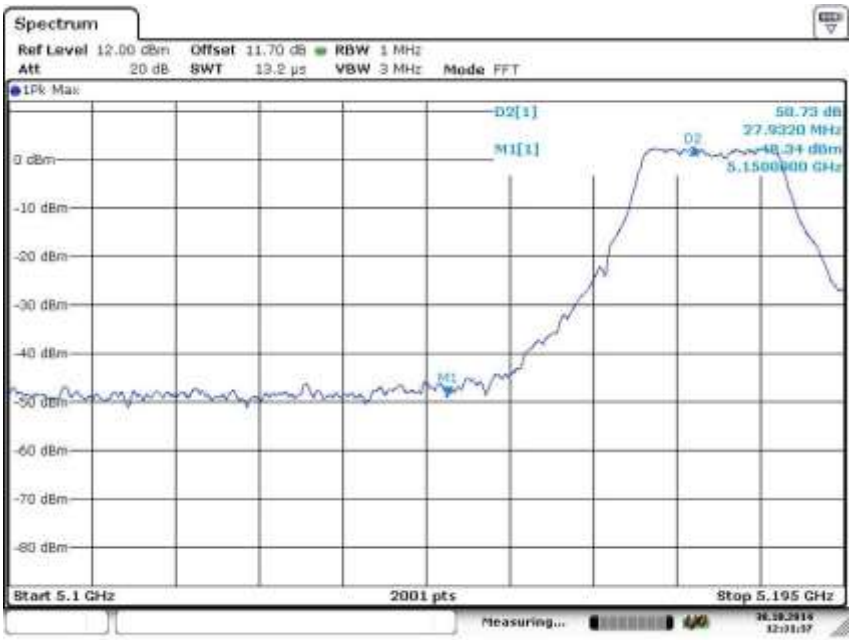


11.4 Test data 2.4 GHz Wi-Fi

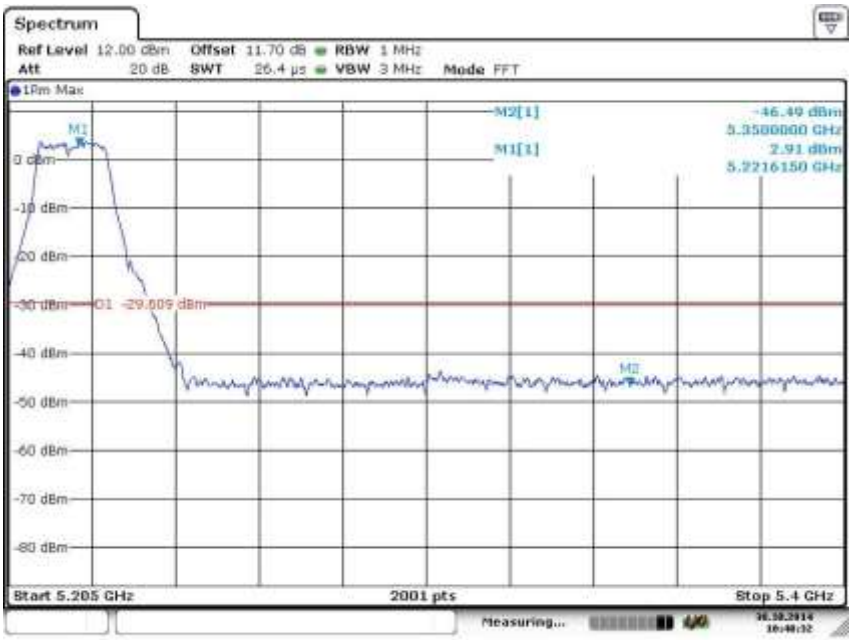


11.5 Test data 5 GHz Wi-Fi

Ch 36



Ch 44



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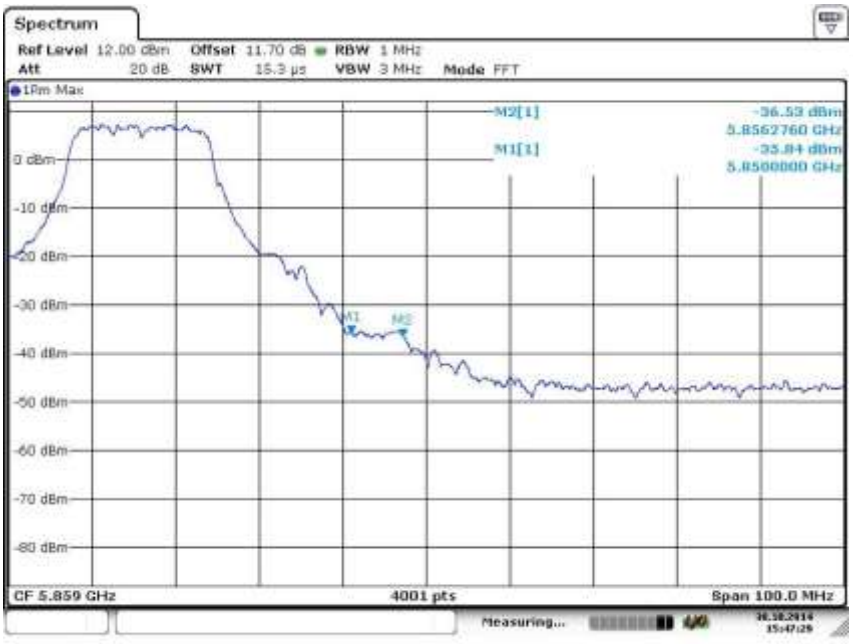
Ch 149

Date: 30.OCT.2014 15:52:22

Ch 165



Date: 30.OCT.2014 15:47:26

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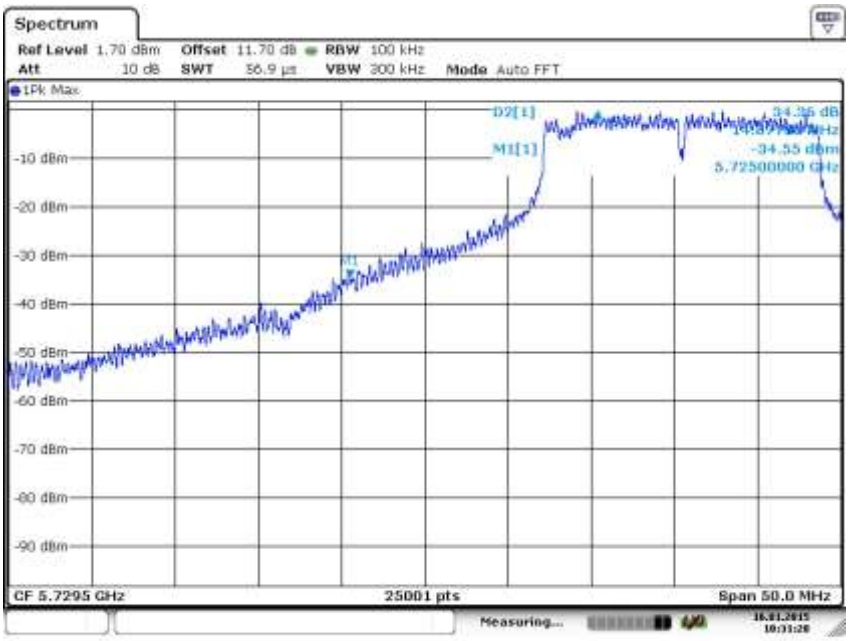
Ch 149



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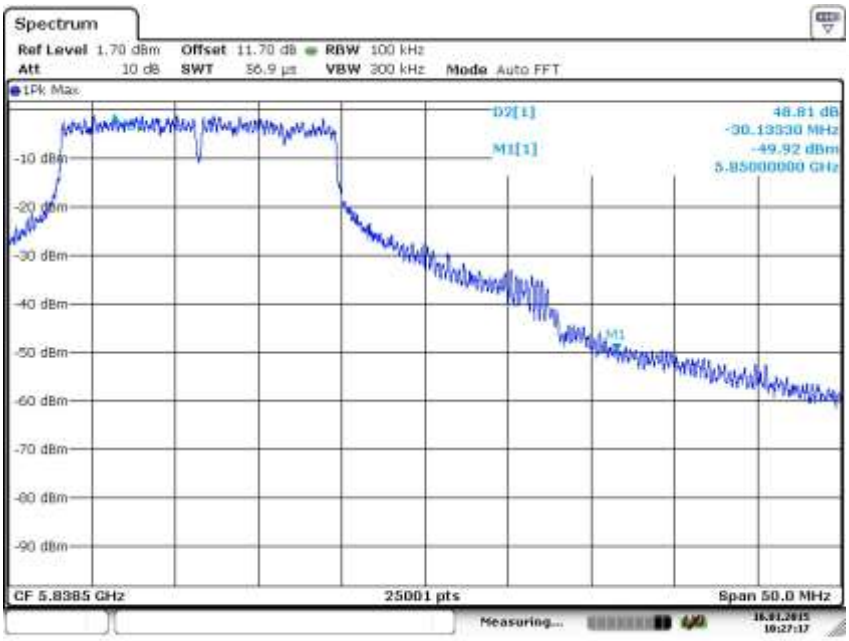
Ch 165



Date: 16.JAN.2015 10:27:16

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Result CFR 47 Part 15.407 RSS-210 A9.2

Frequency MHz	Analyser reading dBm/MHz	Antenna gain dBi	EIRP dBm/MHz	Limit dBm/MHz	Margin dB
5150	-48.34	8	-40.34	-27	13.34
5350	-46.49	8	-38.49	-27	11.49
5725	-26.39	8	-18.39	-17	1.39
5715	-36.21	8	-28.21	-27	1.21
5850	-35.84	8	-27.84	-17	10.84
5860	-36.54	8	-28.54	-27	1.54

Result CFR 47 part 15.247 RSS 210 A8.5

Frequency MHz	Attenuation	Limit dB	Margin dB
2400	31.79	>30	1.79
2483.5	42.27	>30	12.27
5725	34.36	>30	4.36
5850	48.81	>30	8.81

11.6 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 CONDUCTED SPURIOUS EMISSION

Date of test:	2014-06-17 / 2014-09-02 / 2014-11-04	Test location:	EMC Center
EUT Serial:	F9000170ABF0A / CC0000170ABF18	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	Pass	Margin:	35.2 dB

12.1 Requirement

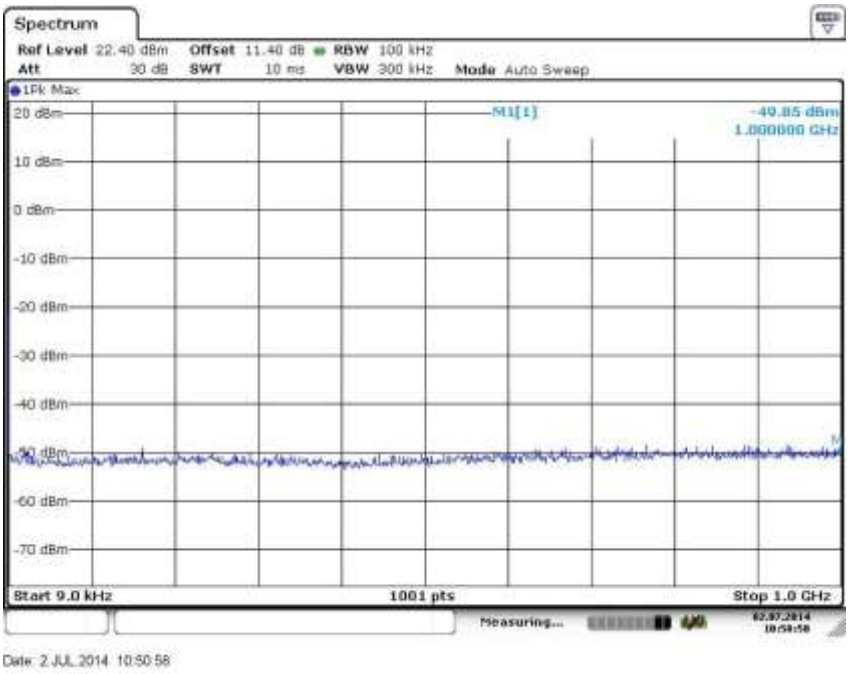
Reference: FCC §15.247(d), RSS-210 A8.5
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level 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.

12.3 Test data 2.4 GHz Zigbee

Ch 11



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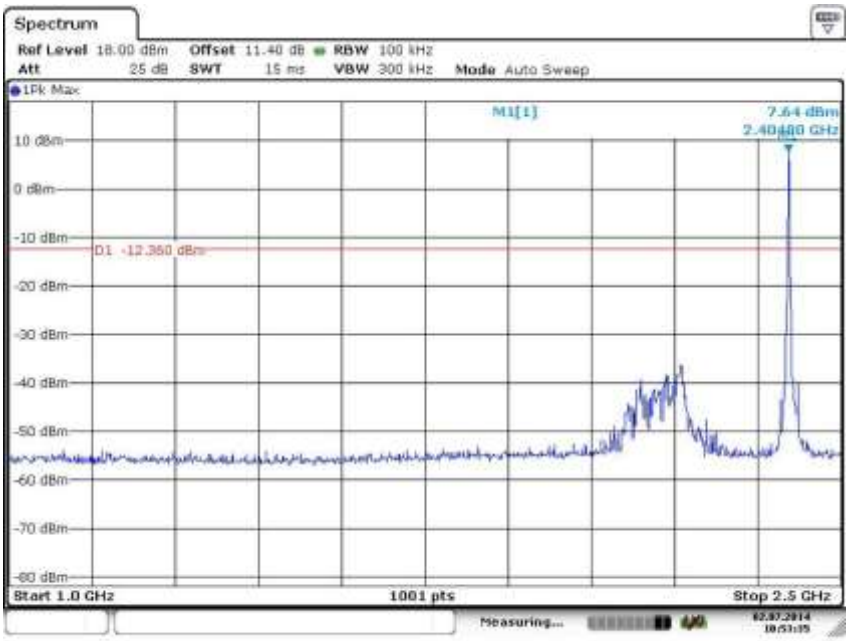

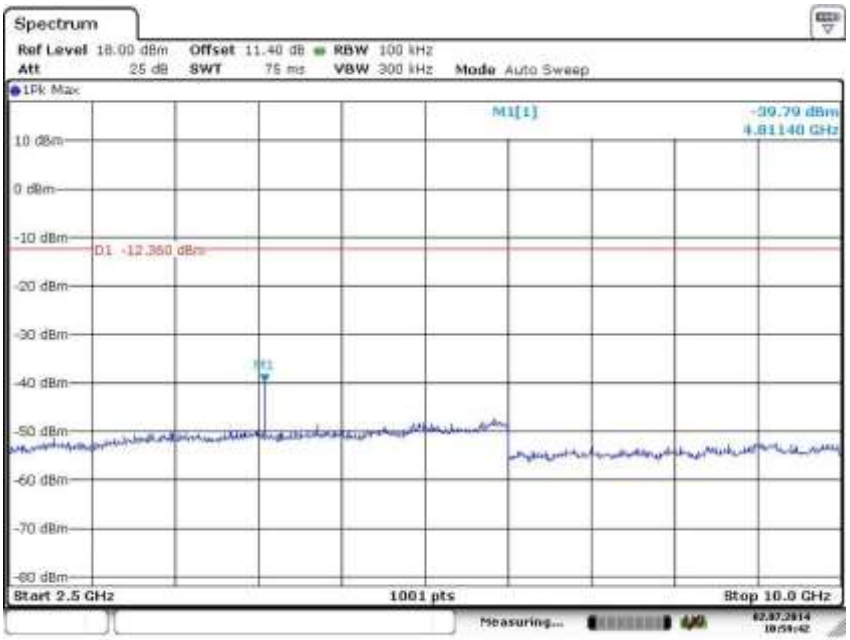

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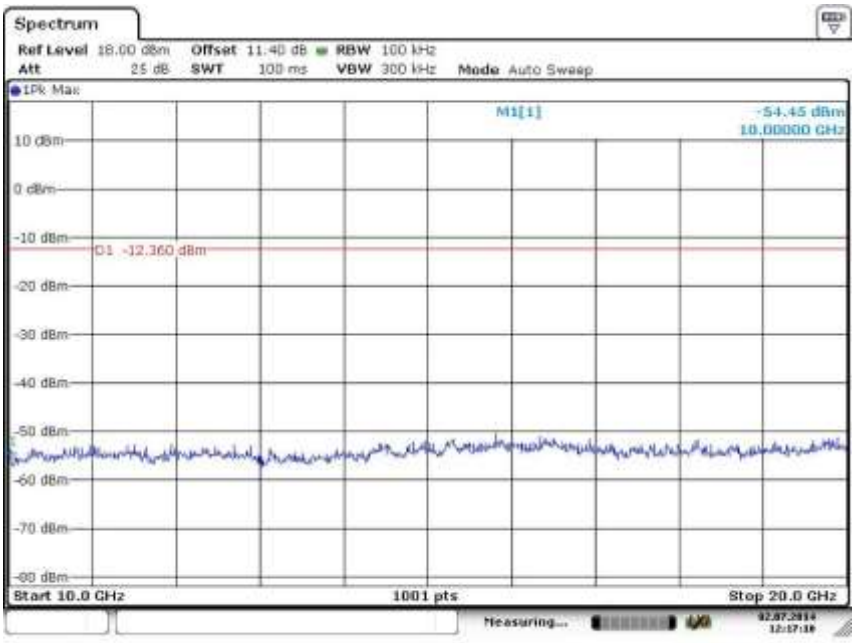

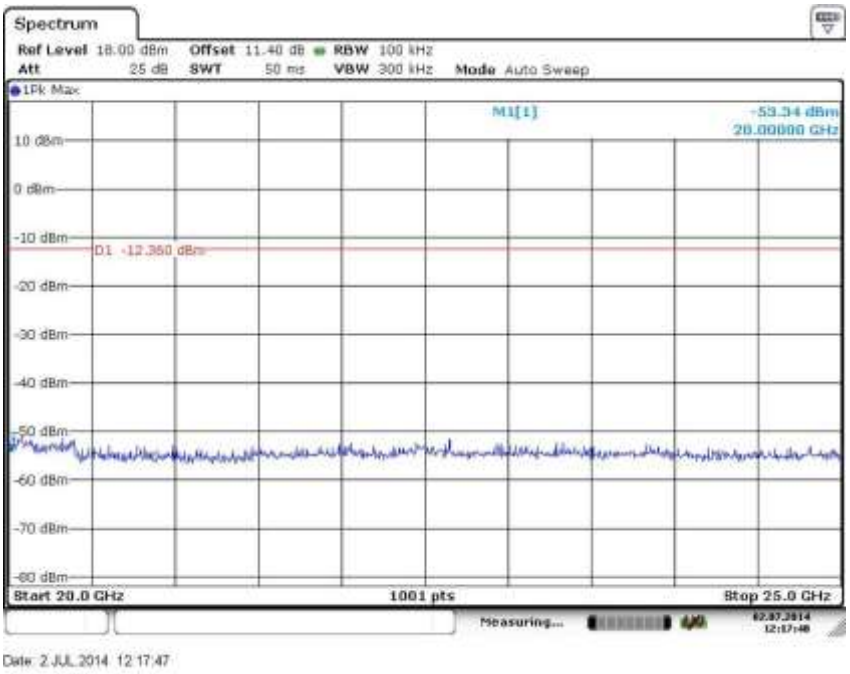

Frequency MHz	Level dBm/100kHz	Attenuation from carrier dB	Margin dB
2404.8	7.64	Carrier	
4811.4	-39.79	47.43	27.43

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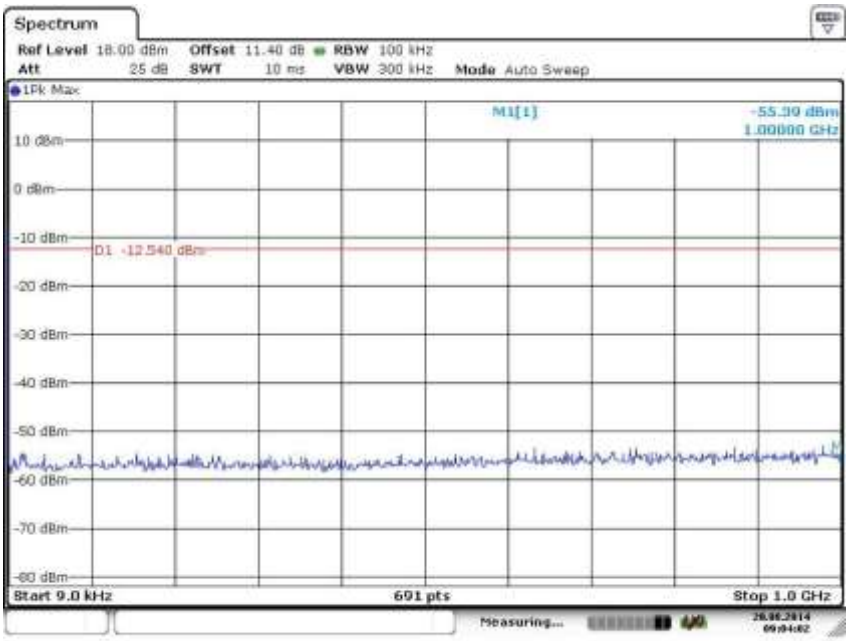
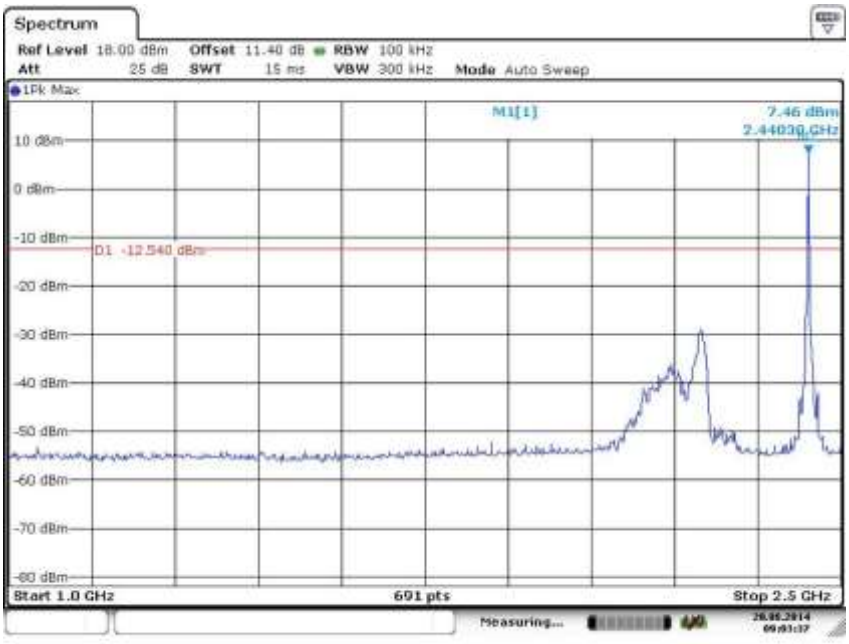
Ch 18





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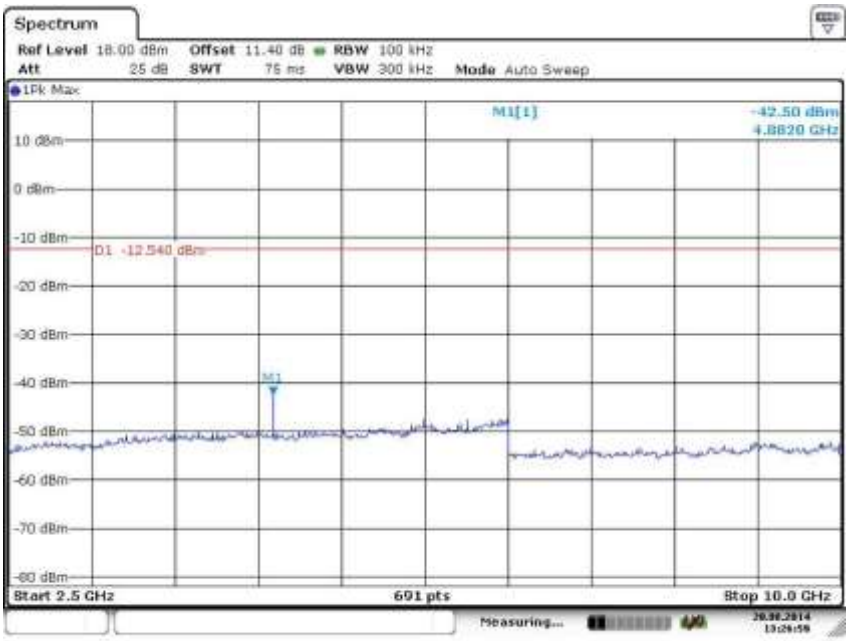

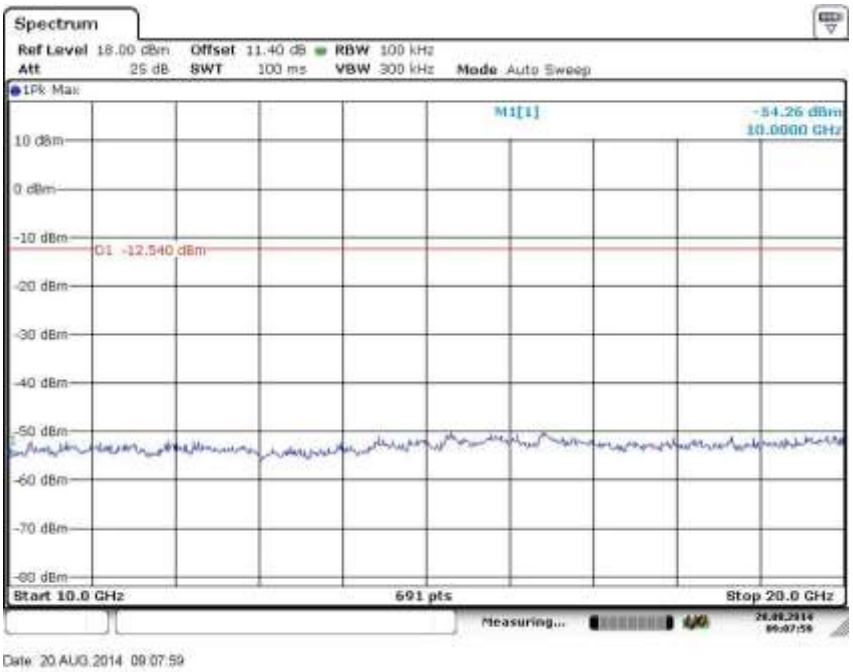

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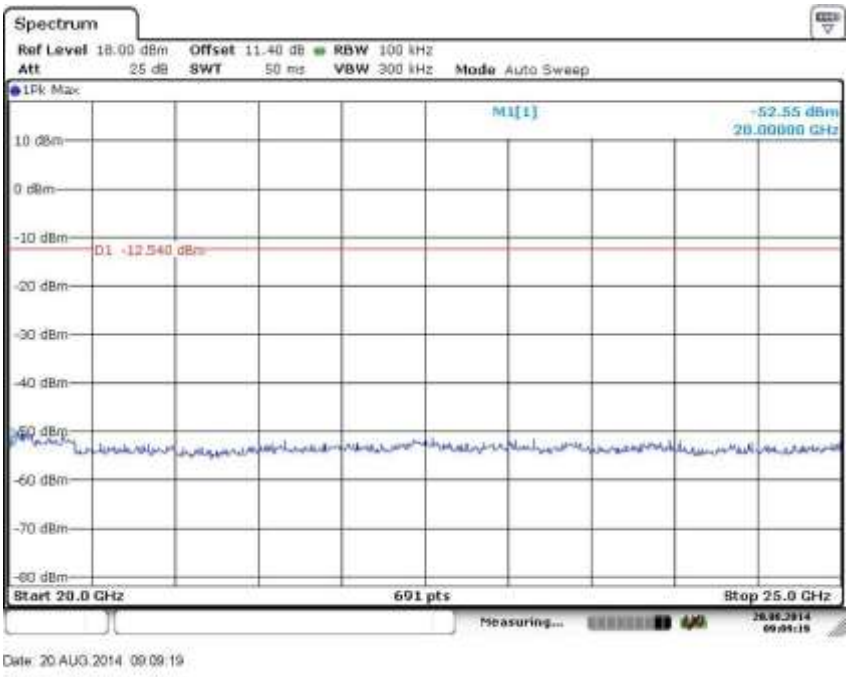

Frequency MHz	level dBm / 100 kHz	Spurious emission attenuation from carrier dB	Margin dB
2440	7.5	carrier	
4882	-42.5	49.95	29.96

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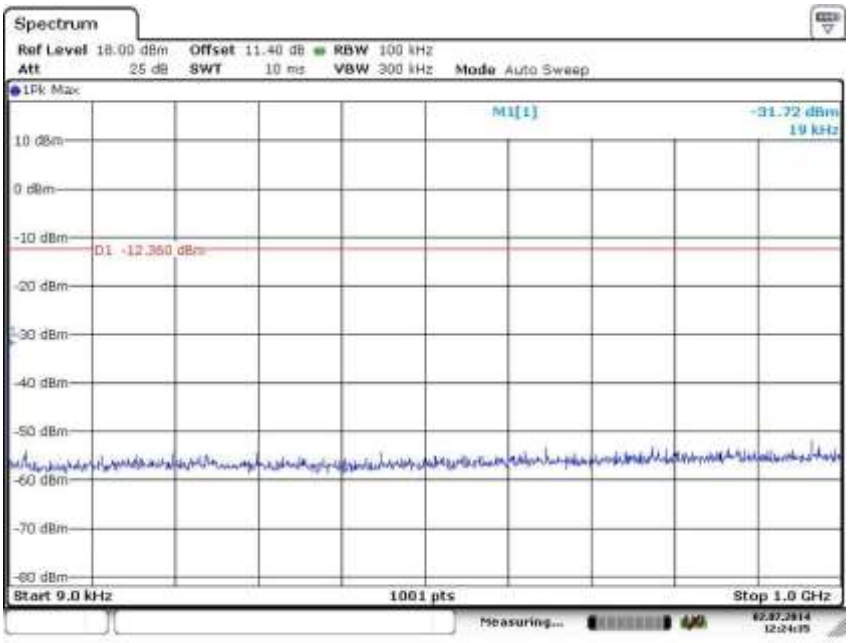
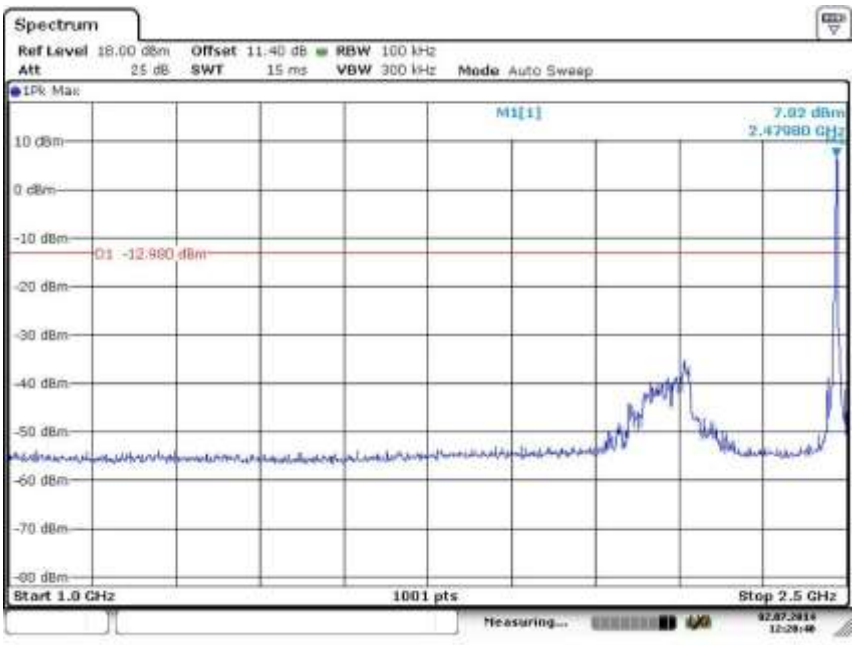
Ch 26





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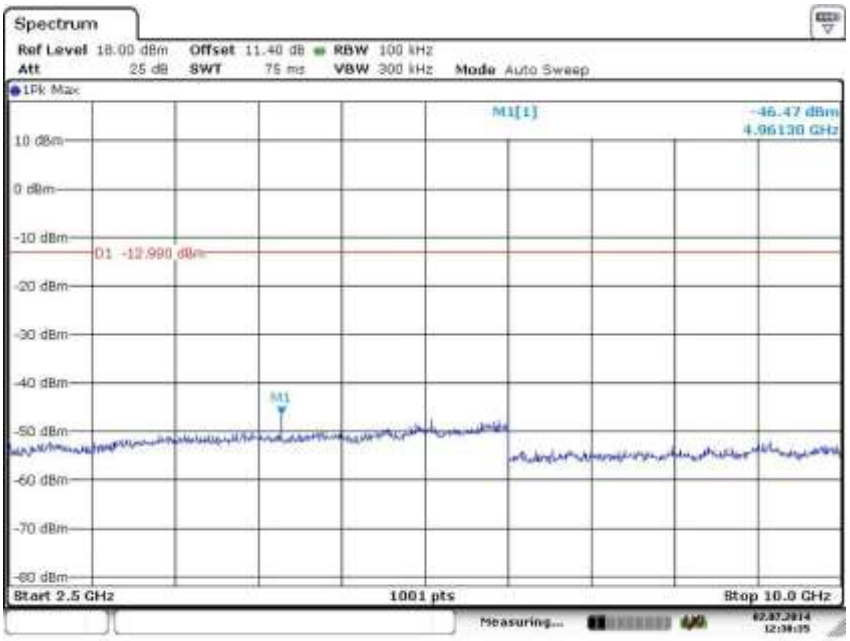

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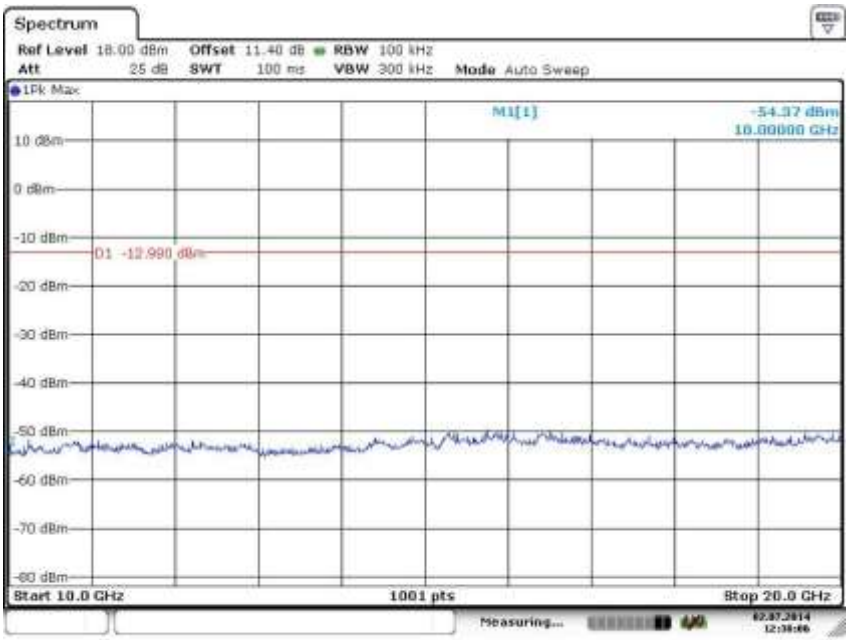

Date: 2.JUL.2014 12:38:06

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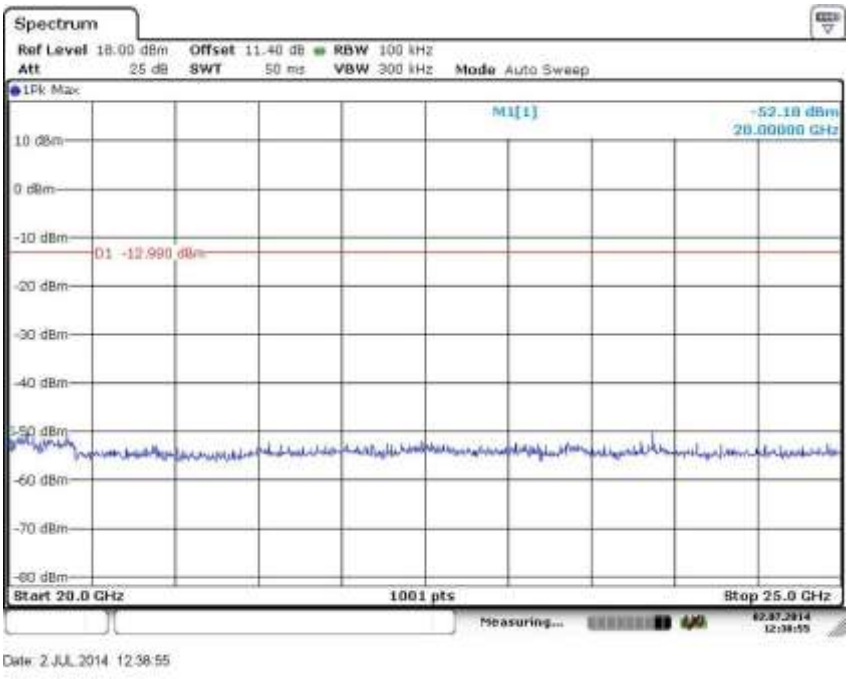

Frequency MHz	level dBm / 100 kHz	Spurious emission attenuation from carrier	Margin dB
2480	7.02	carrier	
4961	-46.47	53.49	33.49

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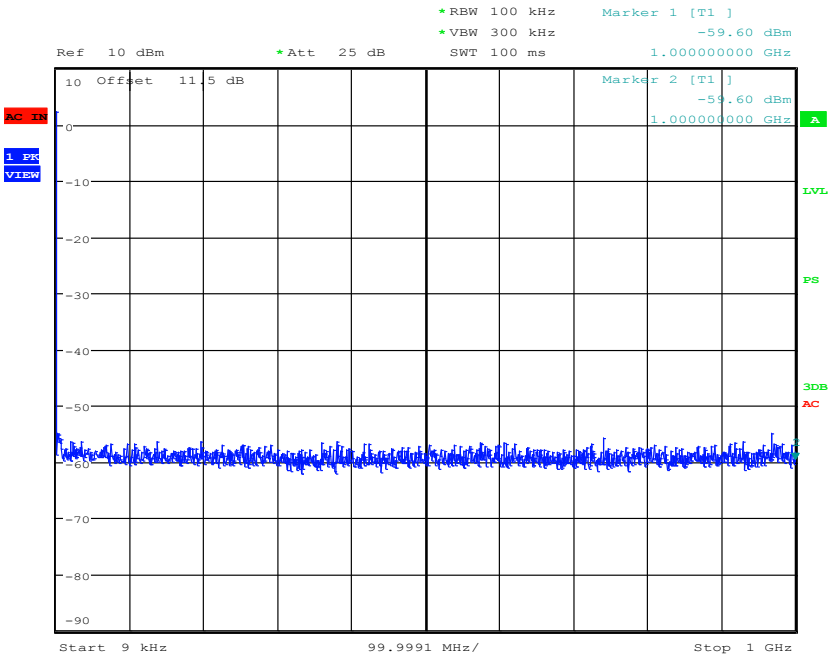
12.4 Test data 2.4 GHz Wi-Fi

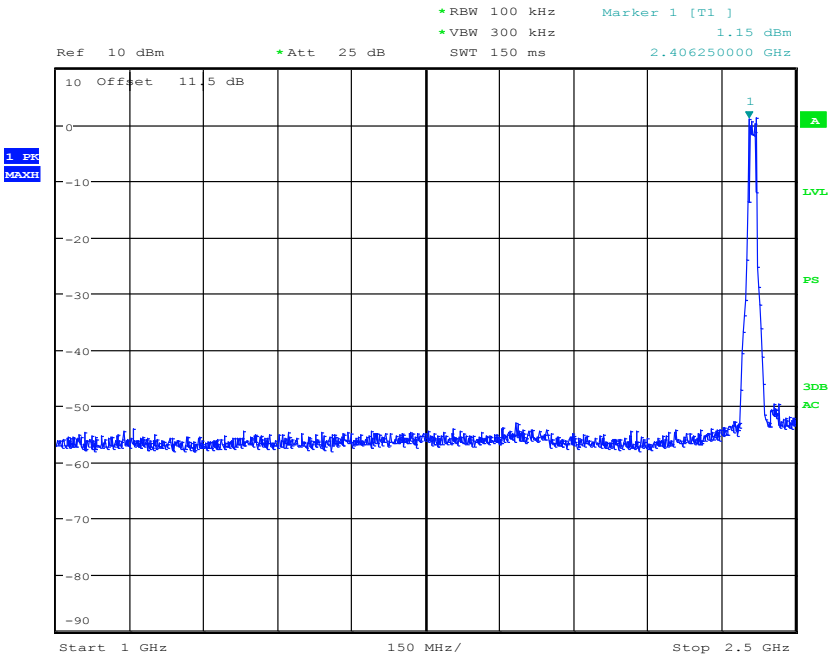
Ch 1



FREQ LVC 1.38V

Date: 3.SEP.2014 10:52:20

Ch 1



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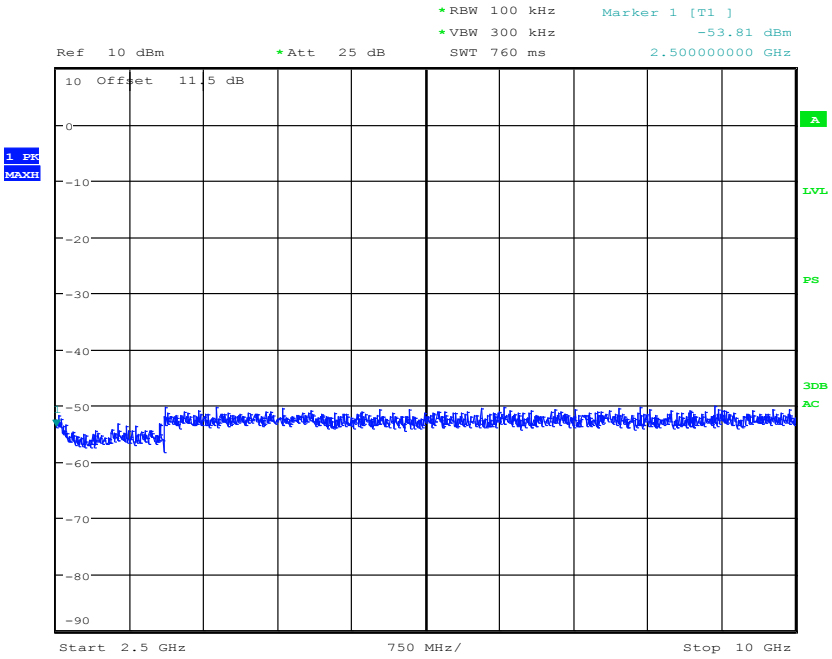

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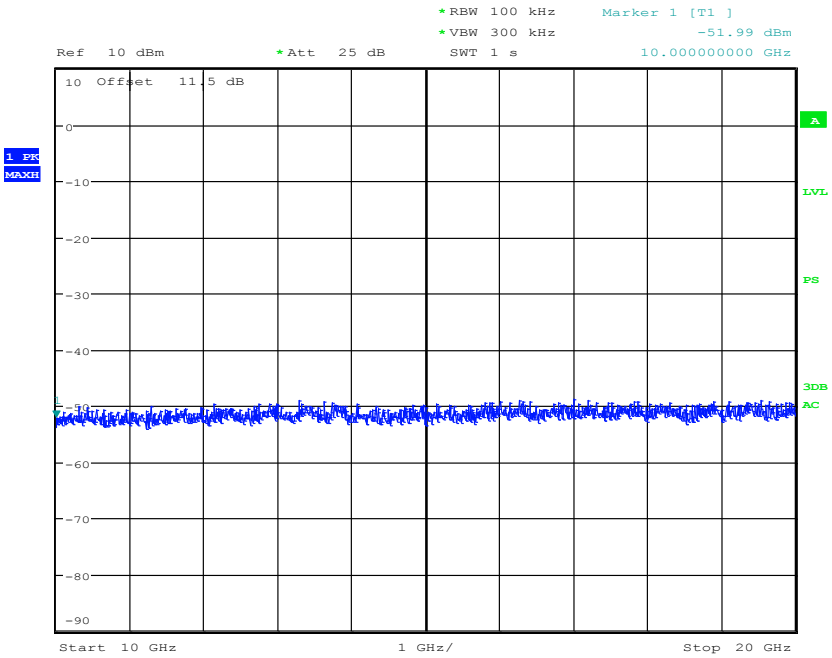

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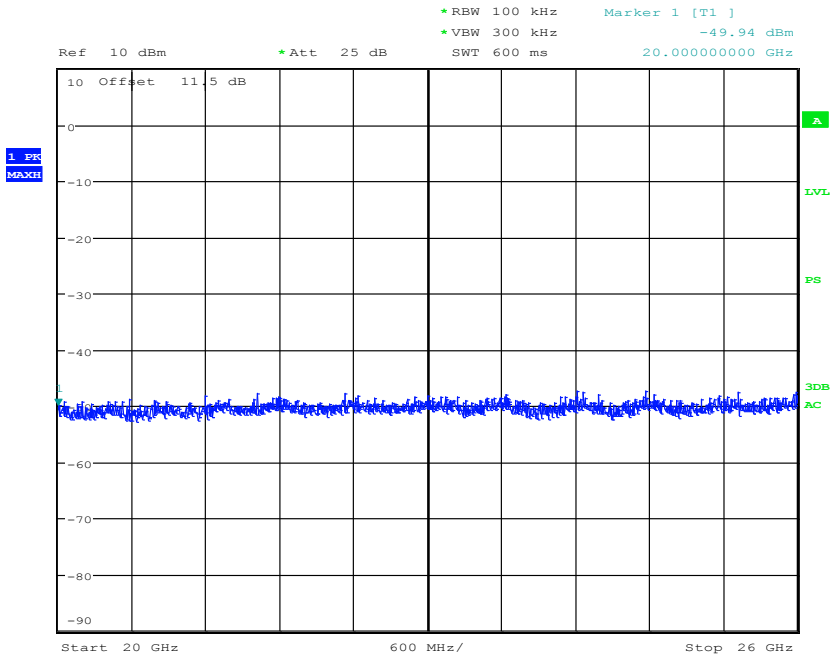
Ch 1



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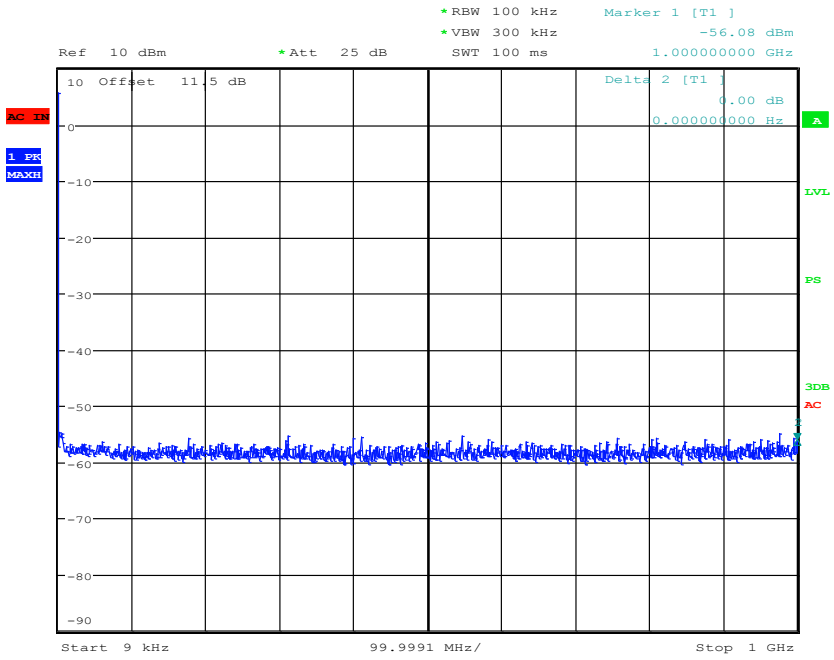
Date: 3.SEP.2014 10:54:09

Ch 6



FREQ LVC 1.38V

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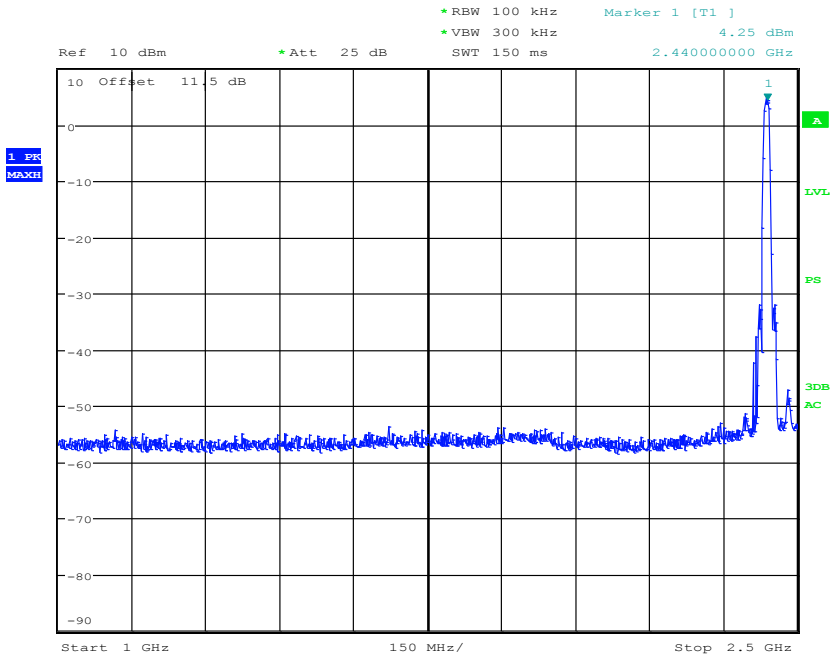
Ch 6



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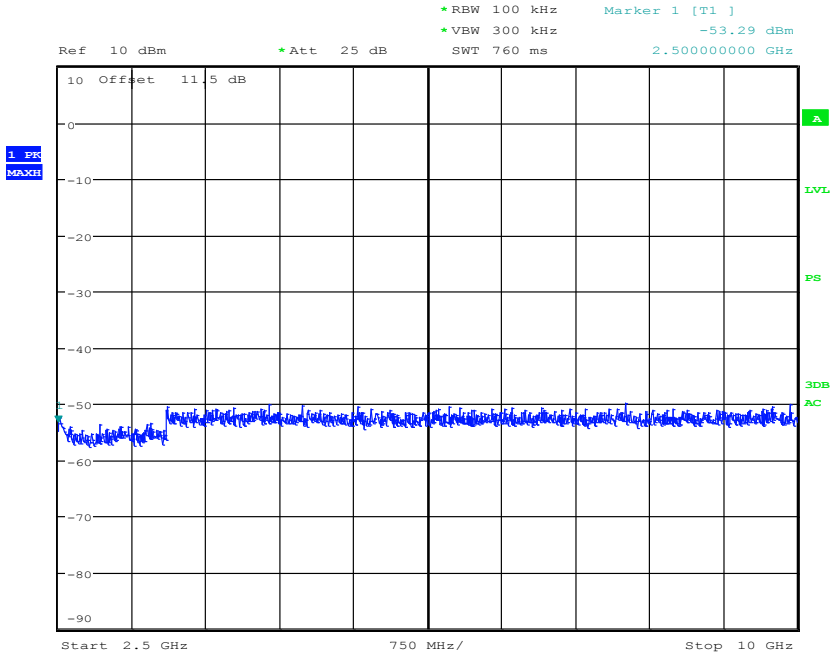
Date: 3.SEP.2014 12:07:38

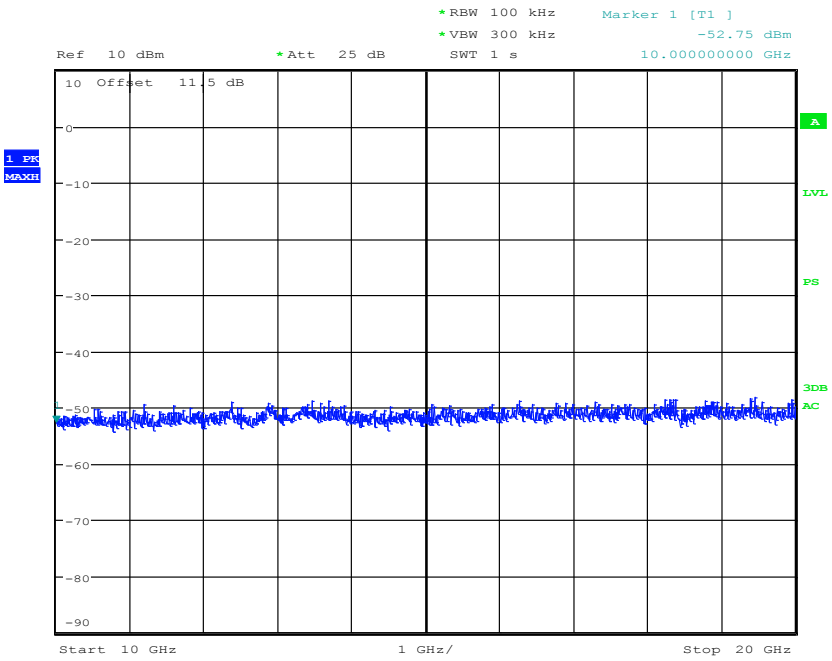
Ch6



FREQ LVC 1.38V

Date: 3.SEP.2014 12:07:55

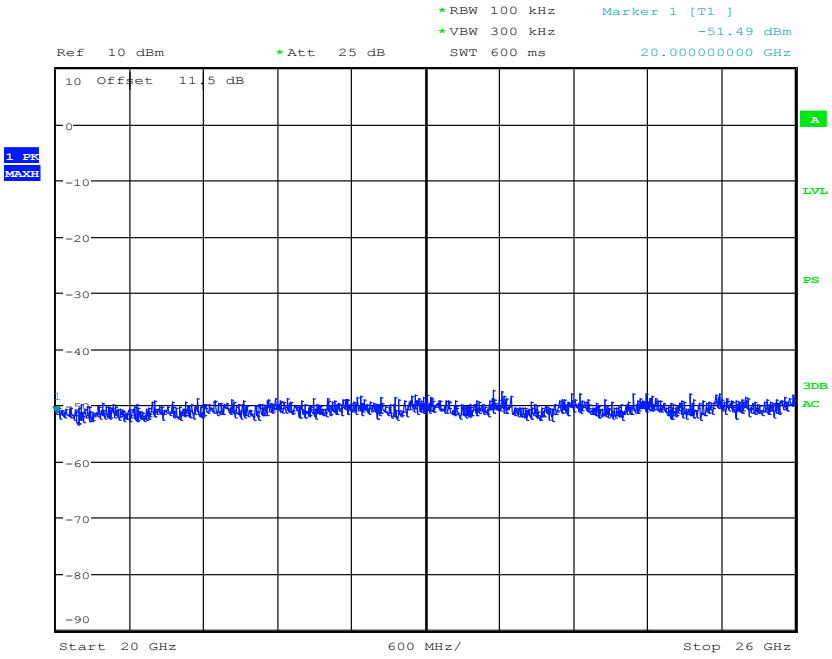
Ch6



FREQ LVC 1.38V

Date: 3.SEP.2014 12:08:12

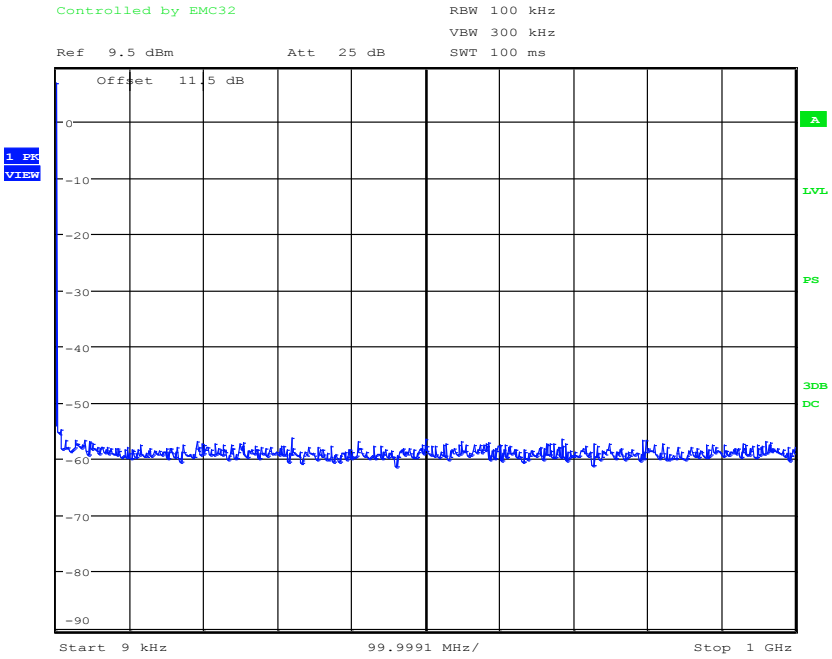
Ch6



FREQ LVC 1.38V

Date: 3.SEP.2014 12:08:26

Ch11



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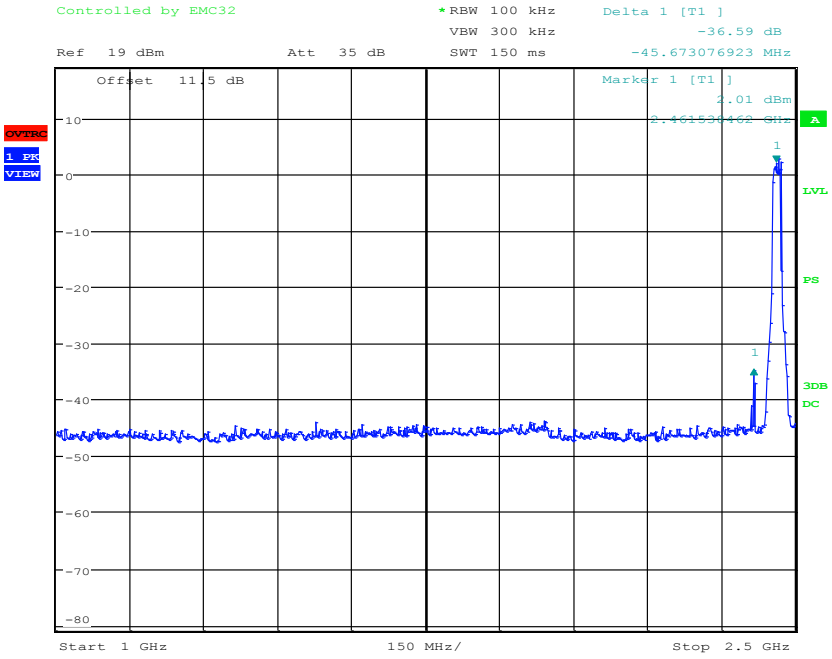
Date: 3.SEP.2014 10:27:58

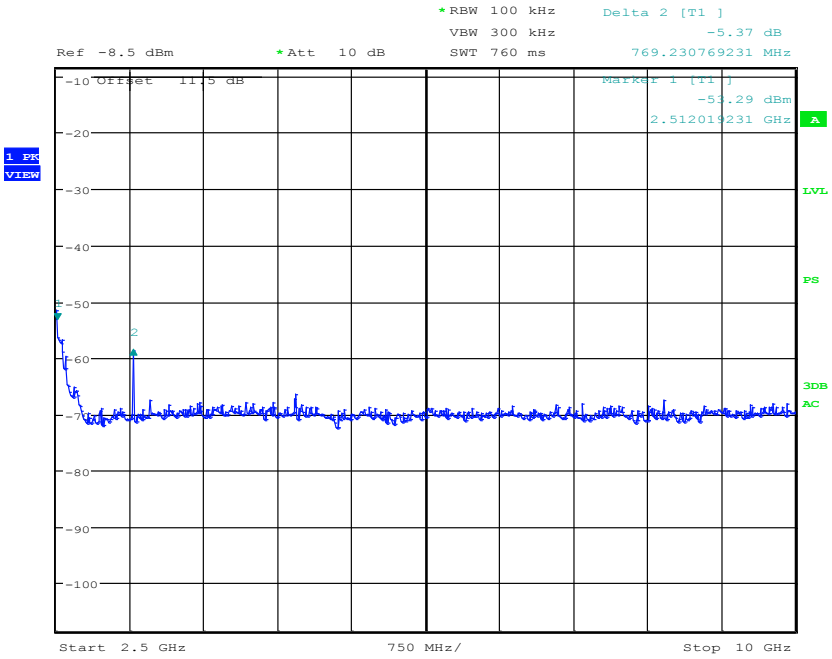
Ch11



FREQ LVC 1.38V

Date: 3.SEP.2014 10:29:37

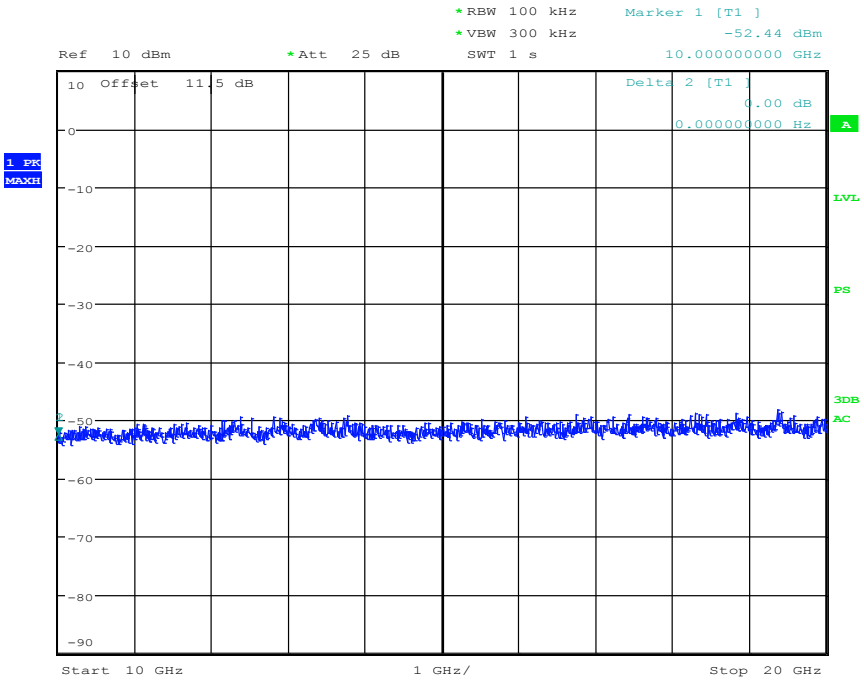
Ch11



FREQ LVC 1.38V

Date: 3.SEP.2014 10:32:29

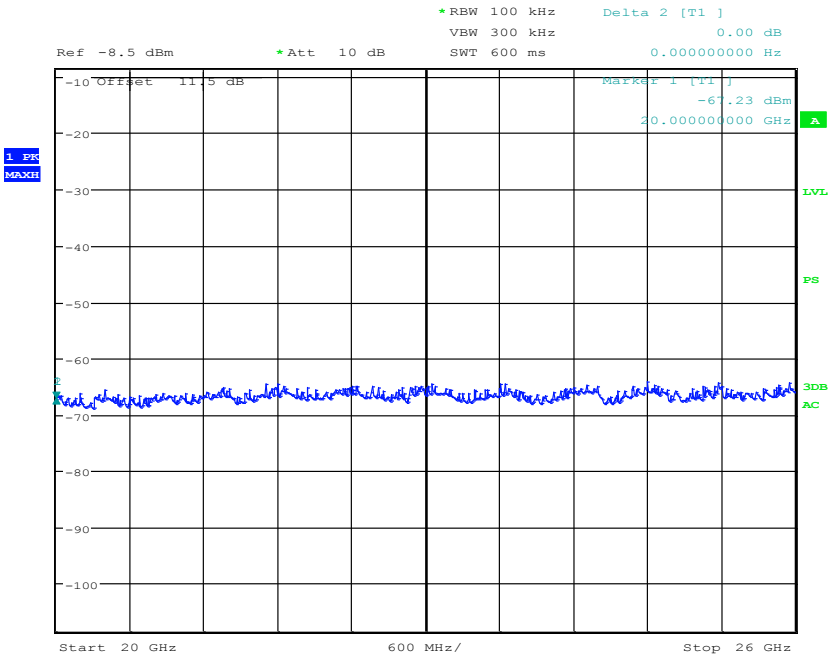
Ch11



FREQ LVC 1.38V

Date: 3.SEP.2014 11:57:29

Ch11



FREQ LVC 1.38V
Date: 3.SEP.2014 10:33:25

12.5 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2015
Measurement receiver	Rohde & Schwarz	ESU	13178	7/2015
Rf-attenuator	H+S	5910_N-010 10dB	32696	7/2015

Intertek Semko AB
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13 FREQUENCY STABILITY

Date of test:	2015-01-20	Test location:	EMC Center
EUT Serial:	F9000170ABF0A / CC0000170ABF18	Ambient temp.	22°C
Tested by:	Matti Virkki	Relative humidity	39%
Test result:	Pass	Margin:	EUT stays within band

13.1 Requirement

Reference: FCC §15.407(g)

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user manual.

13.2 Test set-up

EUT antenna port was connected to spectrum analyser via rf-cable and 10 dB attenuator placed inside the temperature chamber

13.3 Test data

Extreme temperatures with nominal voltage

Temperature [˚C]	Center freq [MHz] 0 min	Center freq [MHz] 2 min	Center freq [MHz] 5 min	Center freq [MHz] 10 min	Largest Error [kHz]
50	5199.9746	5199.9703	5199.9693	5199.9563	59
40	5199.8660	5199.8854	5199.8892	5199.9132	-50
30	5199.9194	5199.9194	5199.9194	5199.9194	-3
20	5199.9155	5199.9156	5199.9154	5199.9154	
10	5199.9194	5199.9196	5199.9199	5199.9203	4
-10	5199.9446	5199.9445	5199.9431	5199.9428	29
-20	5199.9601	5199.9599	5199.9597	5199.9591	45
-30	5199.9700	5199.9697	5199.9696	5199.9693	55

Extreme voltage in nominal temperature

Voltage [V]	Center freq [MHz]	Error [kHz]
13.8 (115%)	5199.965240	50
12 (nom)	5199.915470	0
10.2 (85%)	EUT won't start up	-
10.8	5199.91498	-5

Largest frequency error is 59 kHz or 11ppm. All emission will stay within assigned band.

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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
Temperature chamber	Voetsch	VC4018	12282	7/2015

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14 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
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
Output power	
Digital signals, conducted	± 0,6 dB
Peak power density	
Conducted:	
Spectrum analyser	± 2,5 dB
Frequency error	
With frequency counter	± 150 Hz
Frequency range	
R&S FSIQ	± 0,2 %

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15 PHOTO OF THE EUT

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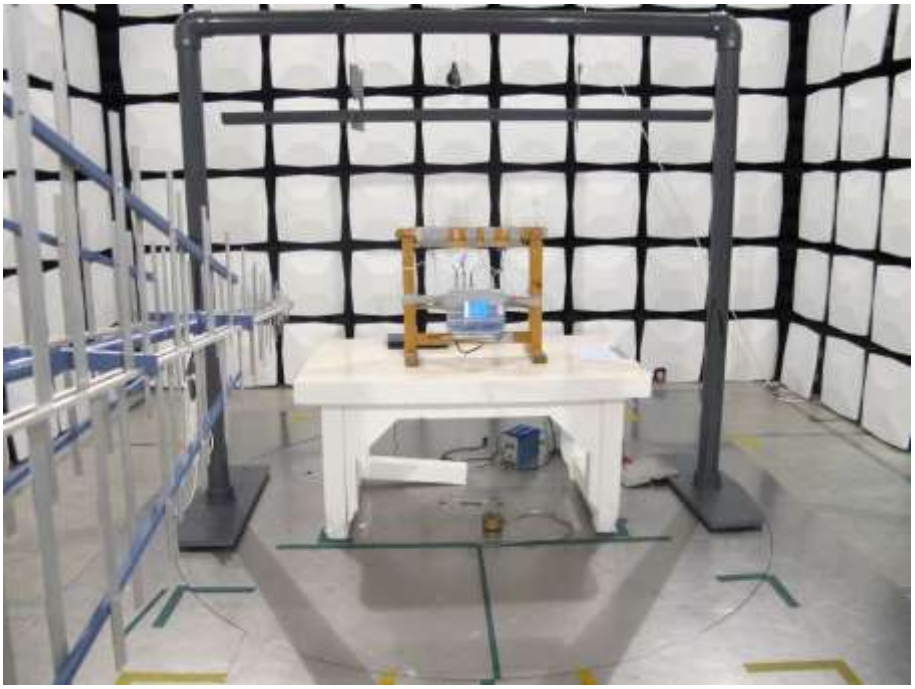
16 TEST SETUP PICTURES

Radiated emissions 30 MHz – 1GHz



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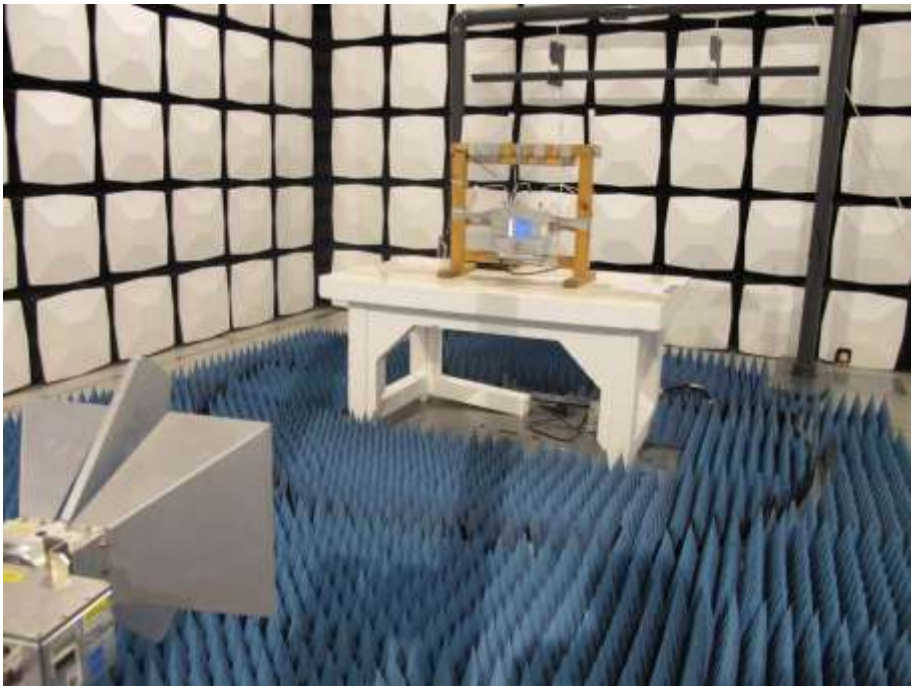
Radiated emission 1 – 18 GHz



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Radiated emission 18 – 40 GHz preliminary sweep

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