TEST REPORT

Part 15 Subpart C 15.247

Equipment under test Wifi Module

Model name WizFi250

FCC ID XR2WIZFI250

Applicant WIZNET Co., LTD.

Manufacturer WIZNET Co., LTD.

Date of test(s) 2014.03.05 ~2014.03.13

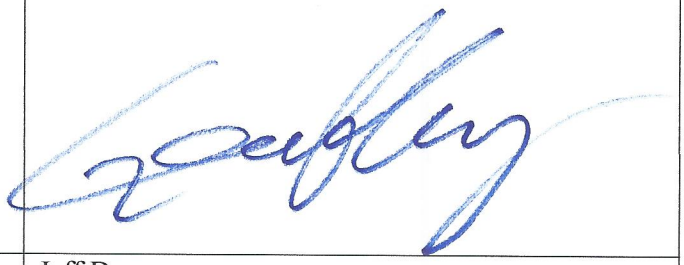
Date of issue 2014.03.18

Issued to

WIZNET Co., Ltd.
4F Humax Village, 11-4, Sunae-dong, Bundang-gu
Seongnam-si, Gyeonggi-do, 463-825, Korea
Tel: +82-31-8023-5690 / Fax: +82-31-8022-8090

Issued by

KES Co., Ltd.
C-3701, Simin-daero 365-40, Dongan-gu, Anyang-si,
Gyeonggi-do,431-716, Korea
473-29, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450

Test and report completed by :	Report approval by :
	
Hyeon-Su Jang Test engineer	Jeff Do Technical manager

Revision history

Revision	Date of issue	Test report No.	Description
-	2014.03.18	KES-RF-14T0004	Initial

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1. General information

1.1. EUT description

Equipment under test	Wifi Module
Model name	WizFi250
Serial number	N/A
Frequency range	2 412 ㎒ ~ 2 462 ㎒ (802.11 b/g/n_HT20)
Modulation technique	DSSS, OFDM
Number of channels	11(802.11 b/g/n_HT20)
Antenna type & gain	UFL type PCB antenna // 2.50 dBi PCB antenna // 4.15 dBi
Power source	DC 3.3 V

1.2. Test frequency

- 802.11b/g/n_HT20

	Low channel	**Middle channel**	**High channel**
Frequency (㎒)	2 412	2 442	2 462

1.3. Information about derivative model

N/A

1.4. Device modifications

N/A

1.5 Device information

- The device have two type antenna. When it use a UFL type PCB antenna, PCB Antenna does not operating, and vice versa.
- The device does not transmit simultaneously for UFL type PCB antenna and PCB antenna.
- The device duty cycle ≥ 98 percent

1.6. Test facility

C-3701, Simin-daero 365-40, Dongan-gu, Anyang-si, Gyeonggi-do,431-716, Korea
473-29, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea

The open area test site is constructed in conformance with the requirements ANSI C63.4-2003/2009.

1.7. Laboratory accreditations and listings

Country	Agency	Scope of accreditation	Certificate No.
USA	FCC	3 & 10 meter Open Area Test Sites and one conducted site to perform FCC Part 15/18 measurements.	343818
KOREA	KC	EMI (10 meter Open Area Test Site and two conducted sites) Radio (3 & 10 meter Open Area Test Sites and one conducted site)	KR0100
CANADA	IC	3 & 10 meter Open Area Test Sites and one conducted site	4769B-1

2. Summary of tests

Reference	Parameter	Test results
15.247(a)(2)	6 dB bandwidth	Pass
15.247(b)(3)	Output power	Pass
15.247(e)	Power spectral density	Pass
15.205, 15.209, 15.207(d)	Radiated spurious emission and conducted spurious emission	Pass
15.207	AC conducted emissions	Pass

Test procedures;
The measurement procedures described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 ㎑ to 40 ㎓ (ANSI C63.4-2003/2009) and the guidance provided in KDB 558074_v03r01 were used in the measurement of the EUT.

Pre-scanned maximum output power

Preliminary tests were performed in different data rate as below table and the highest power data rates(802.11b, 802.11g, 802.11n_HT20) were chosen for full test in the following section to demonstrate compliance to the FCC limit line.

- UFL type PCB antenna

Test mode	Detector mode	Conducted power(dB m)			
		Data rate(Mbps)			
		1	2	5.5	11
802.11b (Low channel)	Peak	14.39	14.54	**14.67**	14.65
	Average	11.55	11.72	**12.05**	11.89

Test mode	Detector mode	Conducted power(dB m)							
		Data rate(Mbps)							
		6	9	12	18	24	36	48	54
802.11g (Low channel)	Peak	**19.32**	19.15	18.75	19.23	19.20	18.86	18.85	17.88
	Average	**11.19**	11.04	10.84	10.99	11.05	11.06	10.99	10.23

Test mode	Detector mode	Conducted power(dB m)							
		Data rate(Mbps)							
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
802.11n(HT20) (Low channel)	Peak	**19.25**	19.16	19.15	18.96	18.24	18.67	18.47	17.73
	Average	**11.07**	10.94	10.95	10.97	10.29	10.06	10.09	9.75

- PCB antenna

Test mode	Detector mode	Conducted power(dB m)			
		Data rate(Mbps)			
		1	2	5.5	11
802.11b (Low channel)	Peak	16.72	**17.22**	16.97	16.78
	Average	12.55	**12.89**	12.17	12.38

Test mode	Detector mode	Conducted power(dB m)							
		Data rate(Mbps)							
		6	9	12	18	24	36	48	54
802.11g (Low channel)	Peak	**20.15**	20.13	20.12	20.09	20.06	20.05	20.07	20.03
	Average	**12.68**	12.57	12.47	12.33	12.27	12.09	11.89	11.18

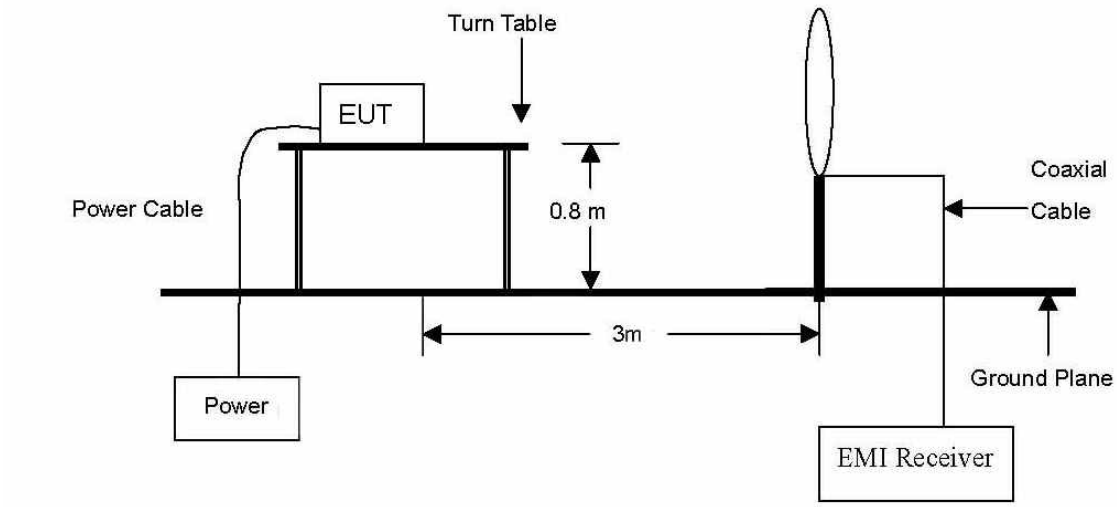
Test mode	Detector mode	Conducted power(dB m)							
		Data rate(Mbps)							
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
802.11n(HT20) (Low channel)	Peak	**20.09**	20.06	20.05	20.04	20.01	20.04	20.02	19.91
	Average	**12.55**	12.38	12.27	12.15	11.22	11.05	10.96	10.11

3. Test results

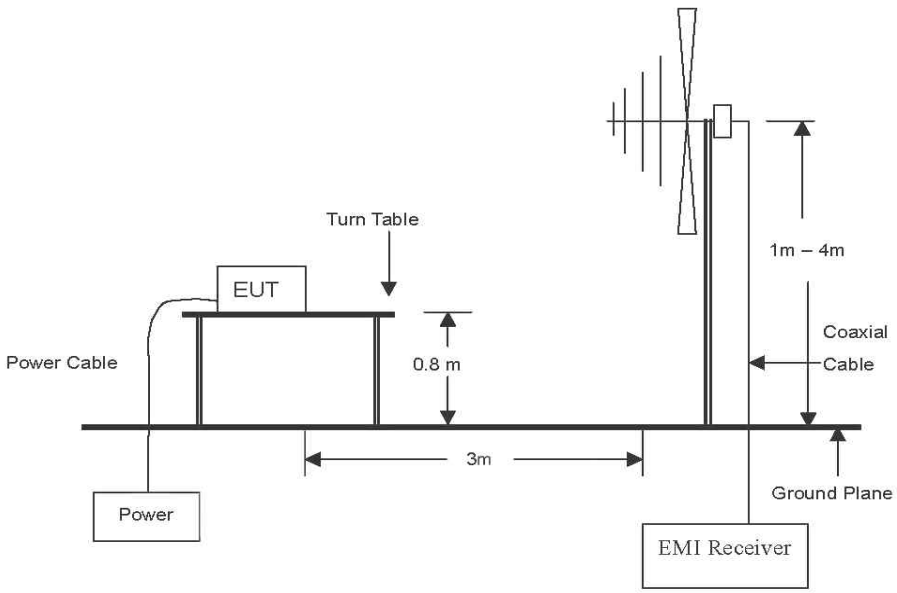
3.1 Radiated spurious emissions

Test setup

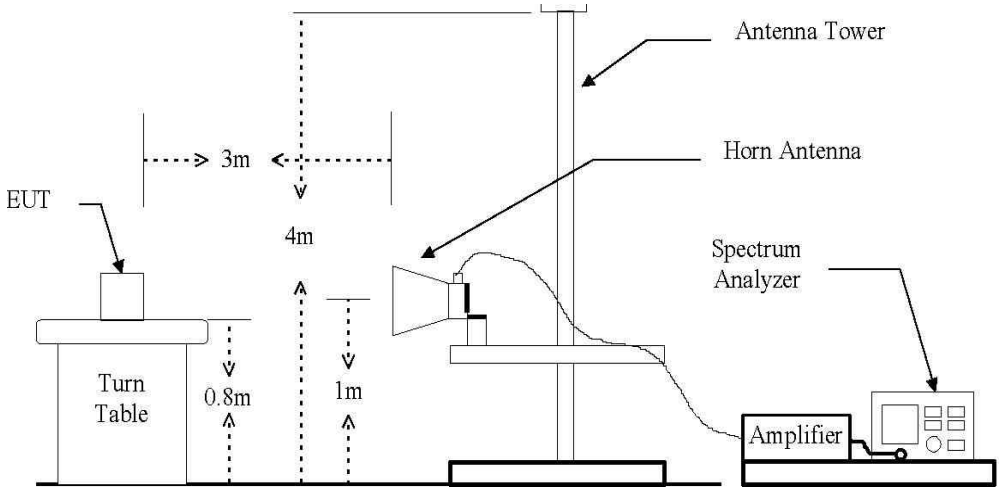
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to 24 ㎓ emissions.



Test procedure

Radiated emissions from the EUT were measured according to the dictates in section 11.0 & 12.0 of KDB 558074_v03r01

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site or open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the interference receiving antenna.
3. The antenna is a broadband antenna, and its height is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test receiver system was set to peak detect function and specified bandwidth with maximum hold mode.
6. If the emission level of the EUT in peak mode was 10 ㏈lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have10 ㏈ margin would be retested one by one using peak,quasi-peak or average method as specified and then reported in a data sheet

Note.
All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

1. Unwanted emissions into non-restricted frequency bands
   - The reference level measurement refer to section 11.1
   Set analyzer center frequency to DTS channel center frequency,
   Set SPAN to ≥ 1.5 times the DTS channel bandwidth,
   Set RBW=100 ㎑,
   Set VBW ≥ 3 × RBW,
   Set detector = peak,
   Set sweep time = auto couple,
   Trace = max hold

   - Unwanted emissions level measurement refer to section 11.2
   Set the center frequency and span to encompass frequency range to be measured,
   Set RBW=100㎑,
   Set VBW ≥ 3 × RBW,
   Set detector = peak,
   Ensure that the number of measurement points ≥ span / RBW,
   Set sweep time = auto couple,
   Trace = max hold

2. Unwanted emissions into restricted frequency bands
   - Peak power measurement procedure refer to section 12.2.4
   Set RBW=1㎒,
   Set VBW ≥ 3 × RBW,
   Set SPAN ≥ RBW,
   Set detector = Peak,
   Set sweep time = auto,
   Trace = max hold

   -Average power measurements procedure refer to section 12.2.5.1
   The EUT shall be configured to operate at the maximum achievable duty cycle.
   Set RBW = 1 ㎒,
   Set VBW ≥ 3 × RBW,
   Set detector = RMS, if span/(# of points in sweep) ≤ (RBW/2).
   Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied then the detector mode shall be set to peak, Averaging type = power (i.e.,RMS).
   1) As an alternative the detector and averaging type may be set for linear voltage averaging.
   2) Some instruments require linear display mode in order to use linear voltage averaging. Log or ㏈ Averaging shall not be used. Sweep time = auto, perform a trace average of at least 100 traces. Sweep time = auto, perform a trace average of at least 100 traces.

3. To get a maximum emission level from the EUT, the EUT is manipulated through three orthogonal planes.

Limit

According to 15.209(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (㎒)	Distance (Meters)	Radiated (㎶/m)
0.009 ~ 0.490	300	2 400 / F(㎑)
0.490 ~ 1.705	30	24 000 / F(㎑)
1.705 ~ 30.0	30	30
30 ~ 88	3	100**
88 ~ 216	3	150**
216 ~ 960	3	200**
Above 960	3	500

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 ~ 72 ㎒, 76 ~ 88 ㎒, 174 ~ 216 ㎒ or 470 ~ 806 ㎒. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

- UFL type PCB antenna

Test results (Below 30 ㎒) – Worst case configuration: 802.11g

The frequency spectrum from 9 ㎑ to 30 ㎒ was investigated. Emission levels are not reported much lower than the limits by over 20 ㏈.

Radiated emissions		Ant.	Correction factors			Total	Limit	
Frequency (㎒)	Reading (㏈㎶)	Pol.	Ant. factor (㏈/m)	Cable loss (㏈)	F_d (㏈)	Actual (㏈㎶/m)	Limit (㏈㎶/m)	Margin (㏈)
Not detected for above 30 ㎒								

Note.

1. All spurious emission at channels are almost the same below 30 ㎒, so that low channel was chosen at representative in final test.
2. Actual = Reading + Ant. factor + Cable loss + F_d
3. $F_d = 40\log(D_m / D_s)$
   Where:
   F_d = Distance factor in ㏈
   D_m = Measurement distance in meters
   D_s = Specification distance in meters

Test results (Below 1 000 ㎒) – Worst case configuration: 802.11g

The frequency spectrum from 30 ㎒ to 1 000 ㎒ was investigated. Emission levels are not reported much lower than the limits by over 20 ㏈.

Radiated emissions		Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (㏈㎶)	Pol.	Ant. factor (㏈/m)	Cable loss (㏈)	Actual (㏈㎶/m)	Limit (㏈㎶/m)	Margin (㏈)
60.98	16.19	V	11.81	0.73	28.73	40.00	11.27
61.01	23.84	H	11.80	0.73	36.37	40.00	3.63
95.91	24.77	V	9.10	1.00	34.87	43.50	8.63
95.92	22.83	H	9.10	1.00	32.93	43.50	10.57
167.77	21.77	V	12.43	1.37	35.57	43.50	7.93
191.84	26.85	H	9.95	1.37	38.17	43.50	5.33
191.87	23.58	V	9.95	1.40	34.93	43.50	8.57
201.32	28.14	V	9.34	1.39	38.87	43.50	4.63
287.78	25.79	H	12.31	1.71	39.81	46.00	6.19
335.97	23.59	H	12.51	1.85	37.95	46.00	8.05
352.05	20.03	V	13.88	1.90	35.81	46.00	10.19
597.85	13.85	V	18.66	2.68	35.19	46.00	10.81

Note.

1. All spurious emission at channels are almost the same below 1 ㎓, so that low channel was chosen at representative in final test.
2. Actual = Reading + Ant. factor + Cable loss
3. Detector mode: Quasi peak
4. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

Test results (Above 1 000 ㎒)

The frequency spectrum from 2.5 ㎓ to 25 ㎓ was investigated. No Emissions were found above 20 dB below the limit.

802.11b // Low channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 389.86	56.69	Perak	H	29.02	-29.61	56.10	74.00	17.90
2 389.86	42.17	Average	H	29.02	-29.61	41.58	54.00	12.42
2 389.39	57.20	Perak	V	29.02	-29.61	56.61	74.00	17.39
2 389.39	36.95	Average	V	29.02	-29.61	36.36	54.00	17.64

802.11b // Middle channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Not detected for above 1 000 ㎒								

802.11b // High channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 483.50	57.85	Perak	H	29.22	-29.38	57.69	74.00	16.31
2 483.50	36.59	Average	H	29.22	-29.38	36.43	54.00	17.57
2 483.50	58.36	Perak	V	29.22	-29.38	58.20	74.00	15.80
2 483.50	38.71	Average	V	29.22	-29.38	38.55	54.00	15.45

Note.

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + Ant. factor + Amp + CL (Cable loss)
5. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

802.11g // Low channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 390.00	61.39	Perak	H	29.02	-29.61	60.80	74.00	13.20
2 390.00	44.11	Average	H	29.02	-29.61	43.52	54.00	10.48
2 390.00	58.54	Perak	V	29.02	-29.61	57.95	74.00	16.05
2 390.00	42.12	Average	V	29.02	-29.61	41.53	54.00	12.47

802.11g // Middle channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Not detected for above 1 000 ㎒								

802.11g // High channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 483.91	60.14	Perak	H	29.23	-29.38	59.99	74.00	14.01
2 483.91	41.83	Average	H	29.23	-29.38	41.68	54.00	12.32
2 485.93	57.82	Perak	V	29.23	-29.37	57.68	74.00	16.32
2 485.93	38.05	Average	V	29.23	-29.37	37.91	54.00	16.09

Note.

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + Ant. factor + Amp + CL (Cable loss)
5. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

802.11n(HT20) // Low channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 390.00	61.84	Perak	H	29.02	-29.61	61.25	74.00	12.75
2 390.00	47.84	Average	H	29.02	-29.61	47.25	54.00	6.75
2 390.00	58.04	Perak	V	29.02	-29.61	57.45	74.00	16.55
2 390.00	44.55	Average	V	29.02	-29.61	43.96	54.00	10.04

802.11n(HT20) // Middle channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Not detected for above 1 000 ㎒								

802.11n(HT20) // High channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 484.11	57.68	Perak	H	29.23	-29.38	57.53	74.00	16.47
2 484.11	38.62	Average	H	29.23	-29.38	38.47	54.00	15.53
2 483.50	61.50	Perak	V	29.22	-29.38	61.34	74.00	12.66
2 483.50	44.98	Average	V	29.22	-29.38	44.82	54.00	9.18

Note.

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + Ant. factor + Amp + CL (Cable loss)
5. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

- PCB antenna

Test results (Below 30 ㎒) – Worst case configuration: 802.11g

The frequency spectrum from 9 ㎑ to 30 ㎒ was investigated. Emission levels are not reported much lower than the limits by over 20 ㏈.

Radiated emissions		Ant.	Correction factors			Total	Limit	
Frequency (㎒)	Reading (㏈㎶)	Pol.	Ant. factor (㏈/m)	Cable loss (㏈)	F_d (㏈)	Actual (㏈㎶/m)	Limit (㏈㎶/m)	Margin (㏈)
Not detected for above 30 ㎒								

Note.

1. All spurious emission at channels are almost the same below 30 ㎒, so that low channel was chosen at representative in final test.
2. Actual = Reading + Ant. factor + Cable loss + F_d
3. $F_d = 40\log(D_m / D_s)$
   Where:
   F_d = Distance factor in ㏈
   D_m = Measurement distance in meters
   D_s = Specification distance in meters

Test results (Below 1 000 ㎒) – Worst case configuration: 802.11g

The frequency spectrum from 30 ㎒ to 1 000 ㎒ was investigated. Emission levels are not reported much lower than the limits by over 20 ㏈.

Radiated emissions		Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (㏈㎶)	Pol.	Ant. factor (㏈/m)	Cable loss (㏈)	Actual (㏈㎶/m)	Limit (㏈㎶/m)	Margin (㏈)
95.91	22.51	H	9.10	1.00	32.61	43.50	10.89
95.94	23.04	V	9.11	1.00	33.15	43.50	10.35
167.77	20.42	V	12.43	1.37	34.22	43.50	9.28
201.33	27.47	H	9.34	1.39	38.20	43.50	5.30
233.17	14.73	H	10.58	1.53	26.84	46.00	19.16
335.96	12.53	V	13.51	1.85	27.89	46.00	18.11
335.97	21.80	H	13.51	1.85	37.16	46.00	8.84
352.05	9.11	V	13.88	1.90	24.89	46.00	21.11
352.34	10.80	H	13.89	1.90	26.59	46.00	19.41
384.05	22.03	H	14.53	2.03	38.59	46.00	7.41
424.08	9.88	V	15.50	2.16	27.54	46.00	18.46

Note.

1. All spurious emission at channels are almost the same below 1 ㎓, so that low channel was chosen at representative in final test.
2. Actual = Reading + Ant. factor + Cable loss
3. Detector mode: Quasi peak
4. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

Test results (Above 1 000 ㎒)

The frequency spectrum from 2.5 ㎓ to 25 ㎓ was investigated. No Emissions were found above 20 dB below the limit.

802.11b // Low channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 374.96	54.55	Perak	H	28.99	-29.62	53.93	74.00	20.07
2 374.96	40.23	Average	H	28.99	-29.62	39.61	54.00	14.39
2 386.68	57.51	Perak	V	29.02	-29.61	56.91	74.00	17.09
2 386.68	37.21	Average	V	29.02	-29.61	36.61	54.00	17.39

802.11b // Middle channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Not detected for above 1 000 ㎒								

802.11b // High channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 486.99	56.18	Perak	H	29.23	-29.37	56.04	74.00	17.96
2 486.99	36.25	Average	H	29.23	-29.37	36.11	54.00	17.89
2 489.14	58.37	Perak	V	29.24	-29.37	58.24	74.00	15.76
2 489.14	38.76	Average	V	29.24	-29.37	38.63	54.00	15.37

Note.

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + Ant. factor + Amp + CL (Cable loss)
5. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

802.11g // Low channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 390.00	60.28	Perak	H	29.02	-29.61	59.69	74.00	14.31
2 390.00	44.23	Average	H	29.02	-29.61	43.64	54.00	10.36
2 390.00	59.37	Perak	V	29.02	-29.61	58.78	74.00	15.22
2 390.00	43.20	Average	V	29.02	-29.61	42.61	54.00	11.39

802.11g // Middle channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Not detected for above 1 000 ㎒								

802.11g // High channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 486.87	60.06	Perak	H	29.23	-29.37	59.92	74.00	14.08
2 486.87	41.90	Average	H	29.23	-29.37	41.76	54.00	12.24
2 483.50	58.00	Perak	V	29.22	-29.38	57.84	74.00	16.16
2 483.50	40.01	Average	V	29.22	-29.38	39.85	54.00	14.15

Note.

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + Ant. factor + Amp + CL (Cable loss)
5. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

802.11n(HT20) // Low channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 390.00	61.92	Perak	H	29.02	-29.61	61.33	74.00	12.67
2 390.00	45.44	Average	H	29.02	-29.61	44.85	54.00	9.15
2 389.81	59.03	Perak	V	29.02	-29.61	58.44	74.00	15.56
2 389.81	45.32	Average	V	29.02	-29.61	44.73	54.00	9.27

802.11n(HT20) // Middle channel

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Not detected for above 1 000 ㎒								

802.11n(HT20) // High channel

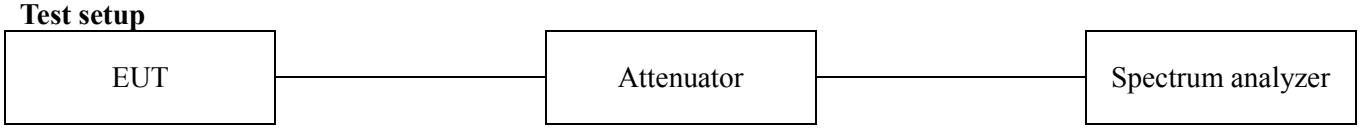
Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 483.50	57.55	Perak	H	29.22	-29.38	57.39	74.00	16.61
2 483.50	38.50	Average	H	29.22	-29.38	38.34	54.00	15.66
2 483.50	61.04	Perak	V	29.22	-29.38	60.88	74.00	13.12
2 483.50	43.33	Average	V	29.22	-29.38	43.17	54.00	10.83

Note.

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + Ant. factor + Amp + CL (Cable loss)
5. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

3.2 Conducted spurious emissions

Test setup



Test procedure

All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.

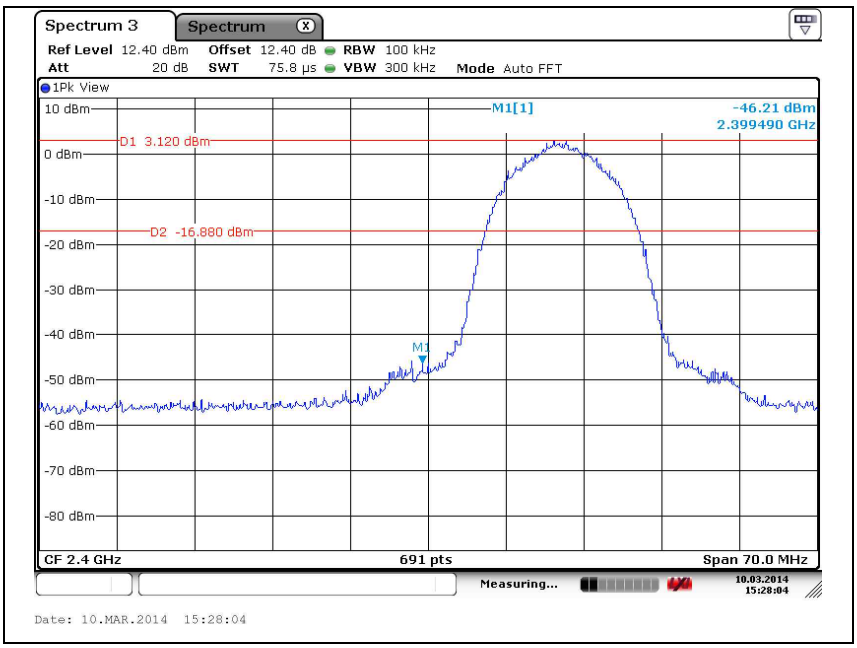
Per the guidance of KDB 558074_v03r01, section 11.1&11.2, the reference level for out of band emissions is established from the plots of this section since the band edge emissions are measured with a RBW of 100 ㎑. This reference level is then used as the limit in subsequent plots for out of band spurious emissions shown in section 2.4.3. The limit for out of band spurious emission at the band edge is 20㏈ below the fundamental emission level measured in a 100 ㎑ bandwidth.

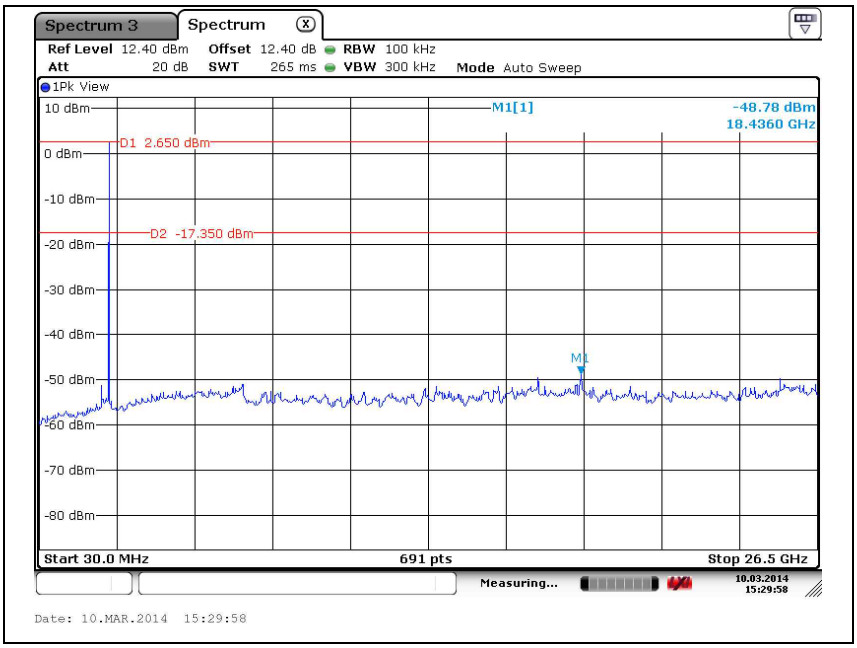
Limit

According to 15.247(d), in any 100 ㎑ bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 ㏈ below that in the 100 ㎑ bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval , as permitted under paragraph(b)(3) of this section , the attenuation required under this paragraph shall be 30 ㏈ instead of 20 ㏈. Attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section 15.205(a), must also comply the radiated emission limits specified in section 15.209(a) (see section 15.205(c))

Test results for conducted spurious emission
- UFL type PCB antenna

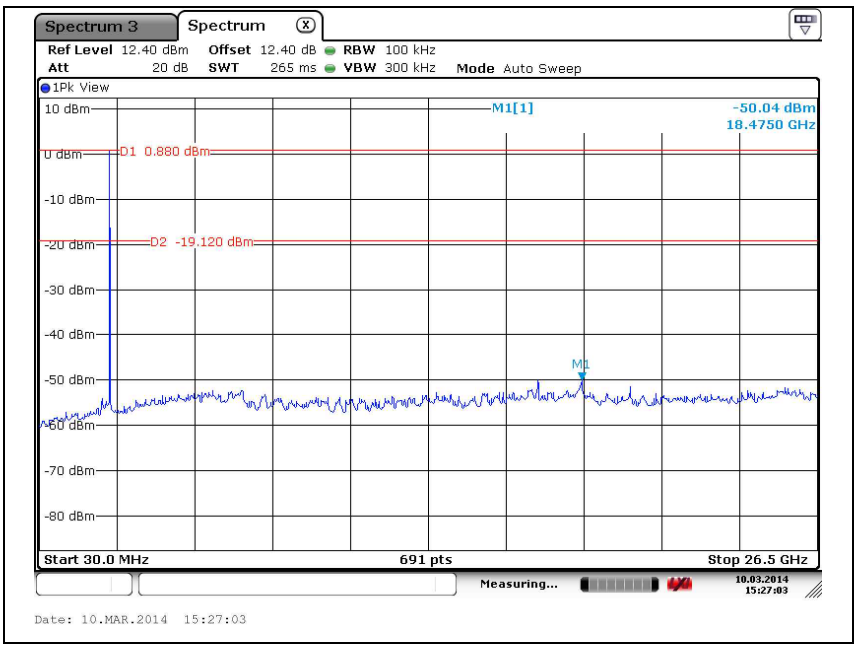
802.11b // Low channel



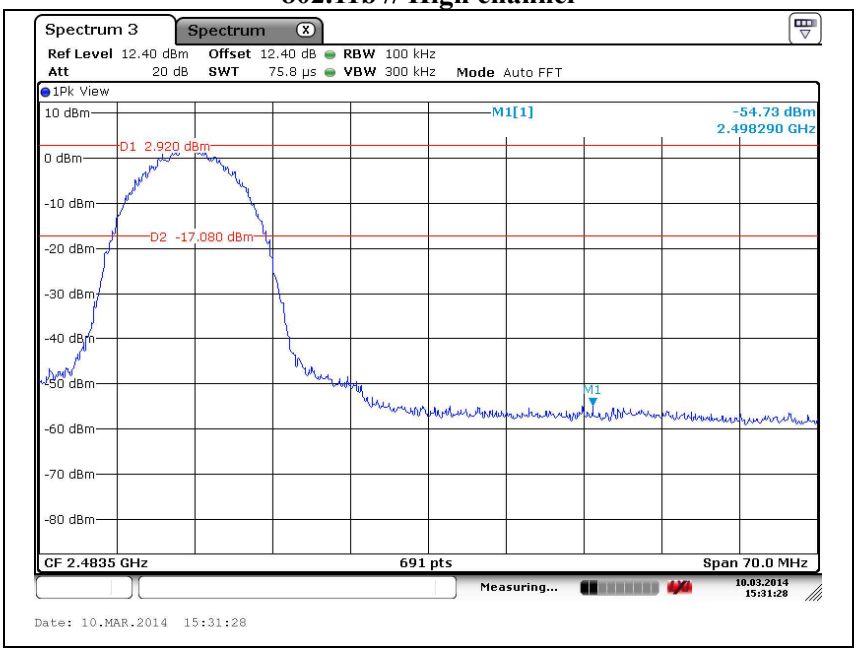


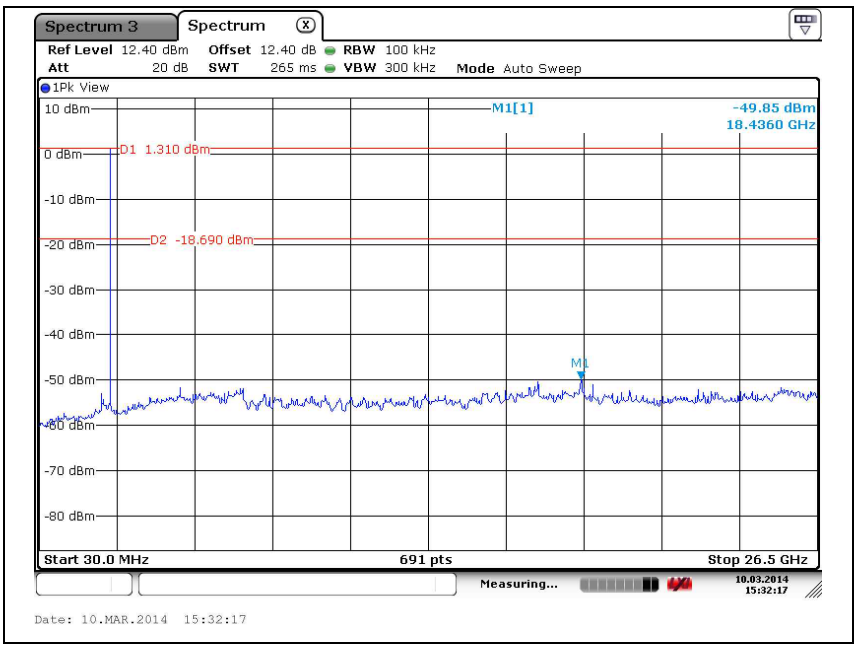
802.11b // Middle channel

N/A

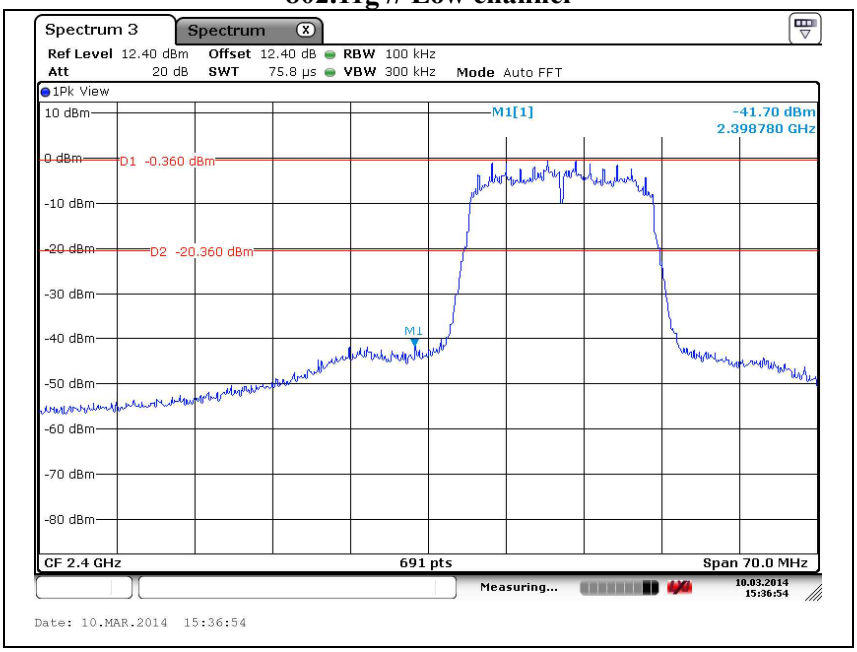


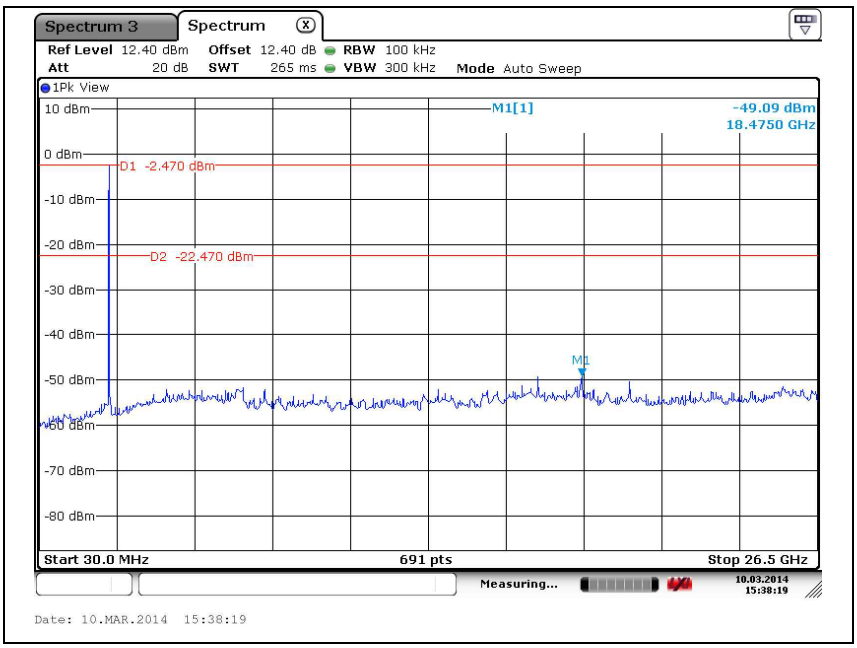
802.11b // High channel





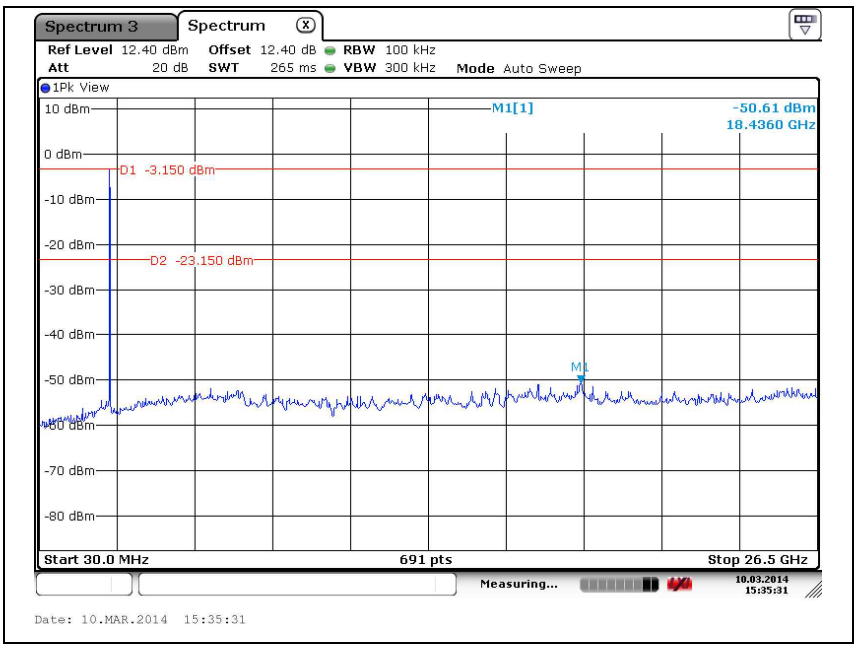
802.11g // Low channel



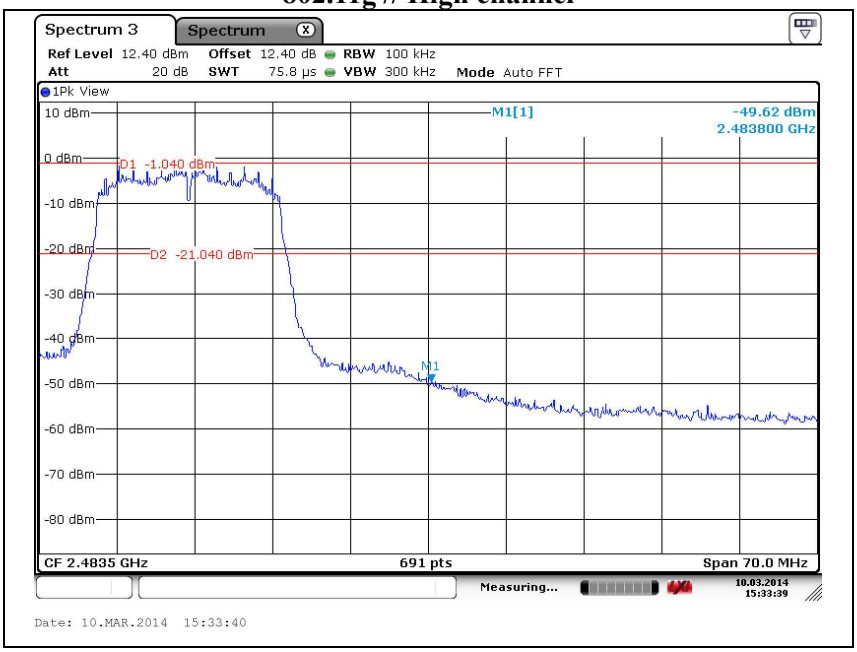


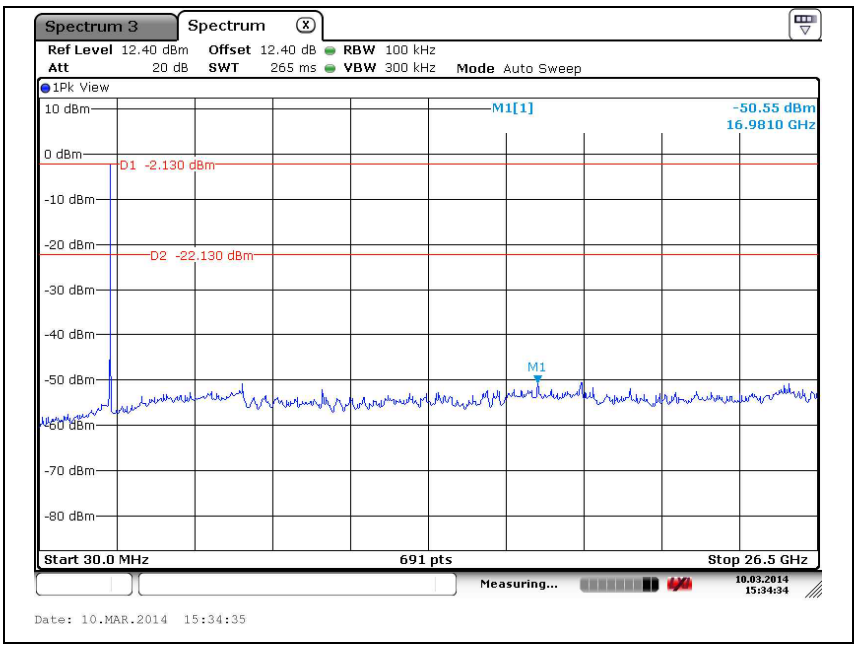
802.11g // Middle channel

N/A

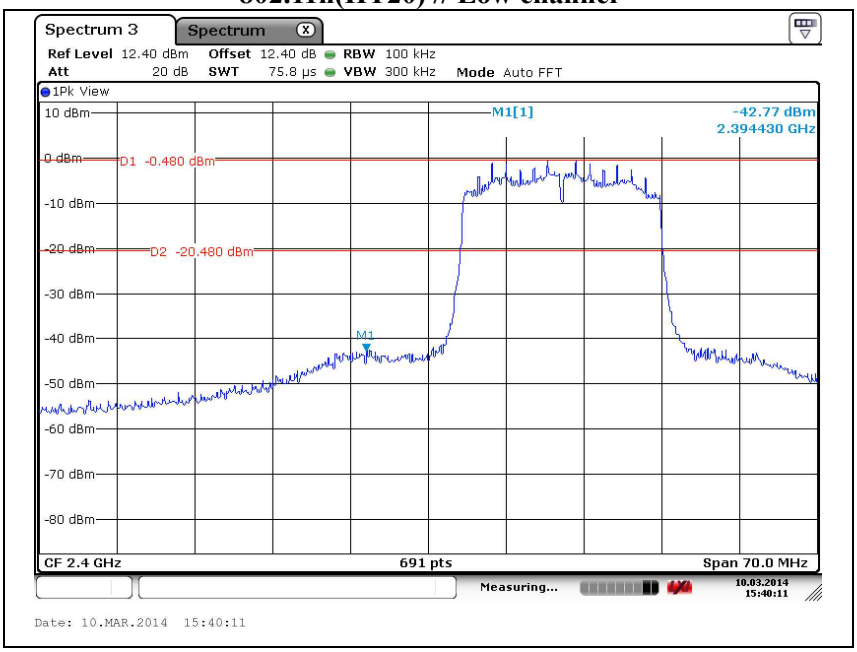


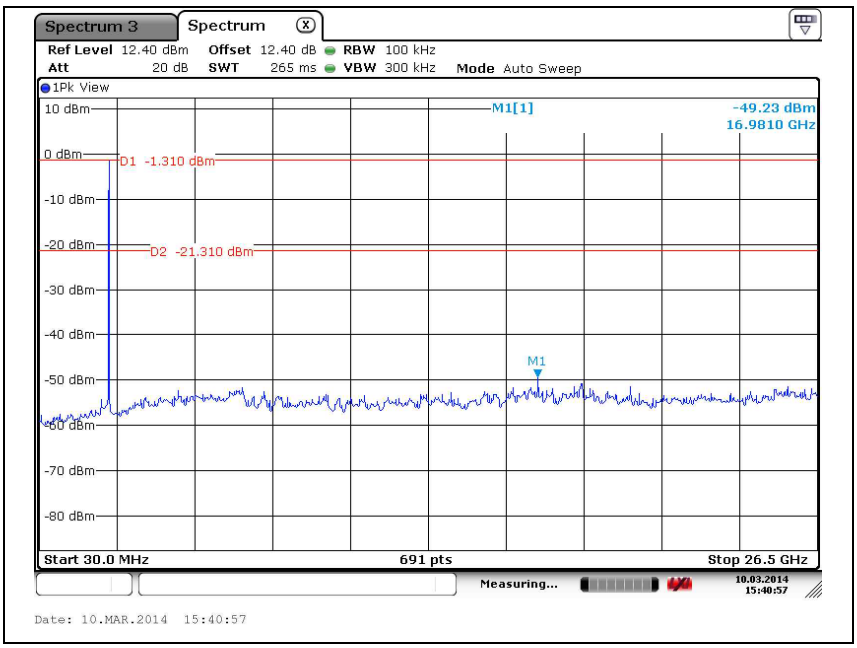
802.11g // High channel





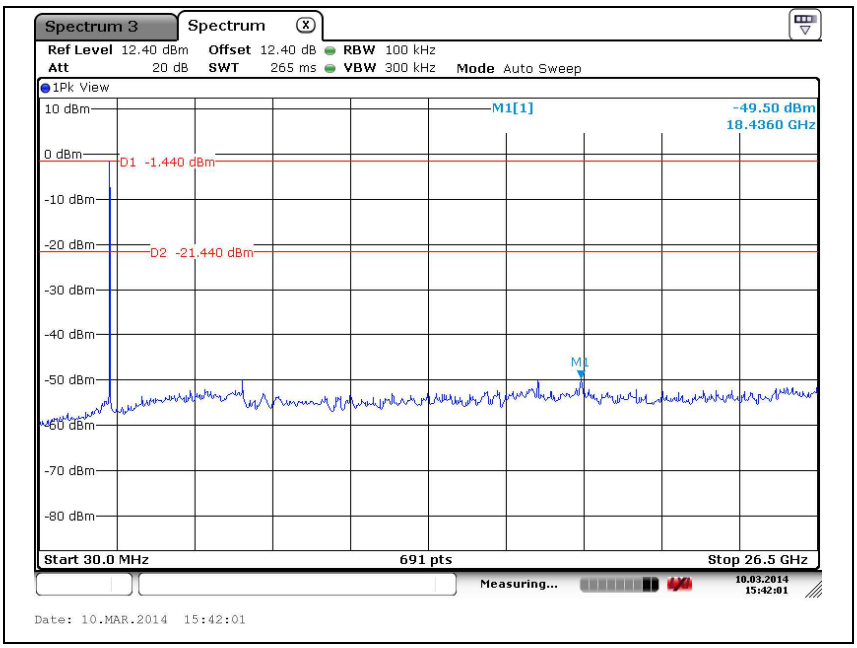
802.11n(HT20) // Low channel



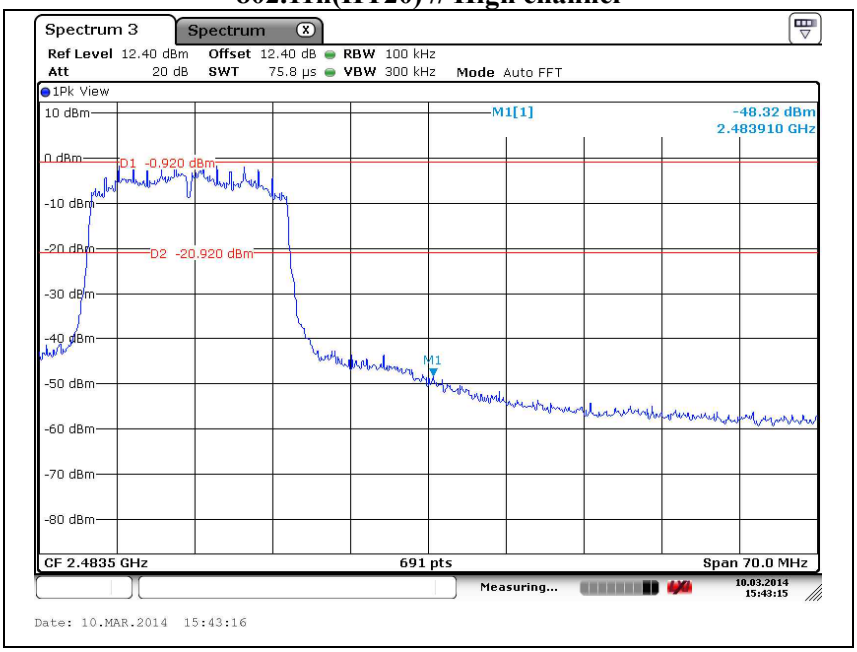


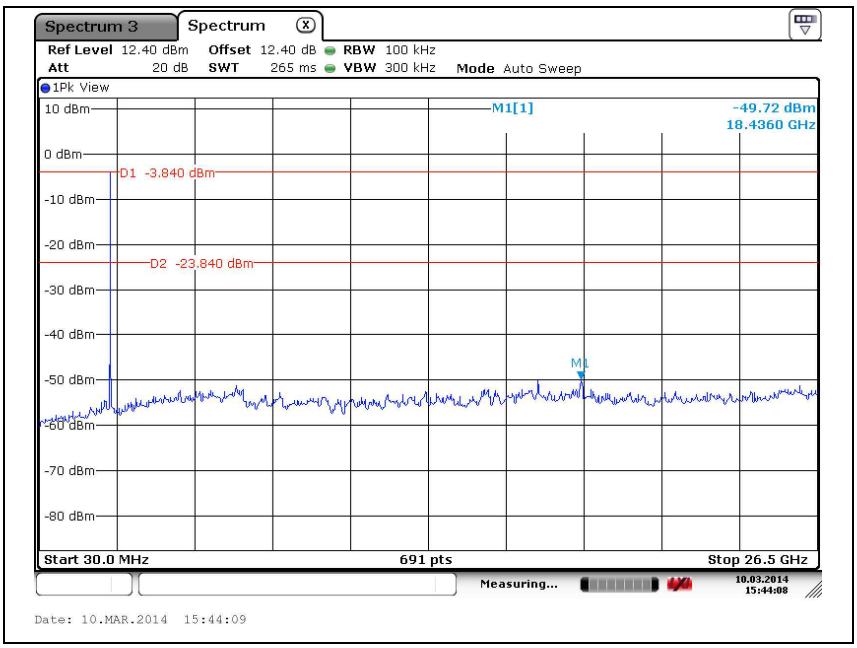
802.11n(HT20) // Middle channel

N/A



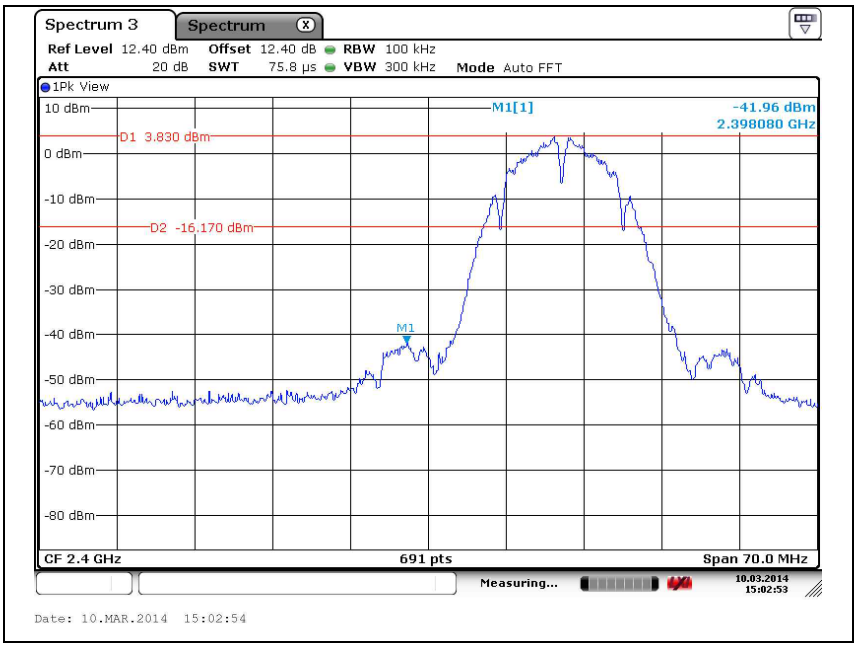
802.11n(HT20) // High channel

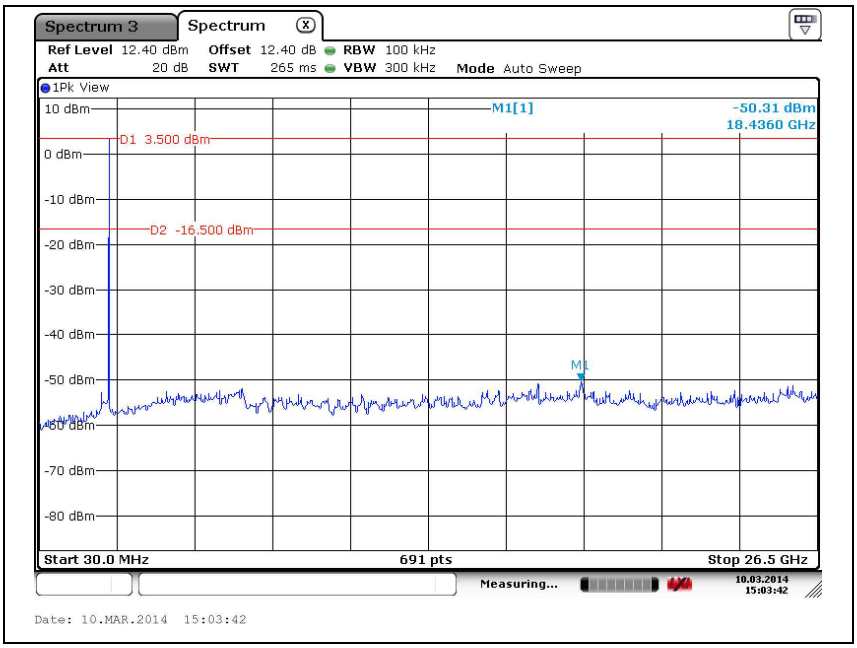




- PCB antenna

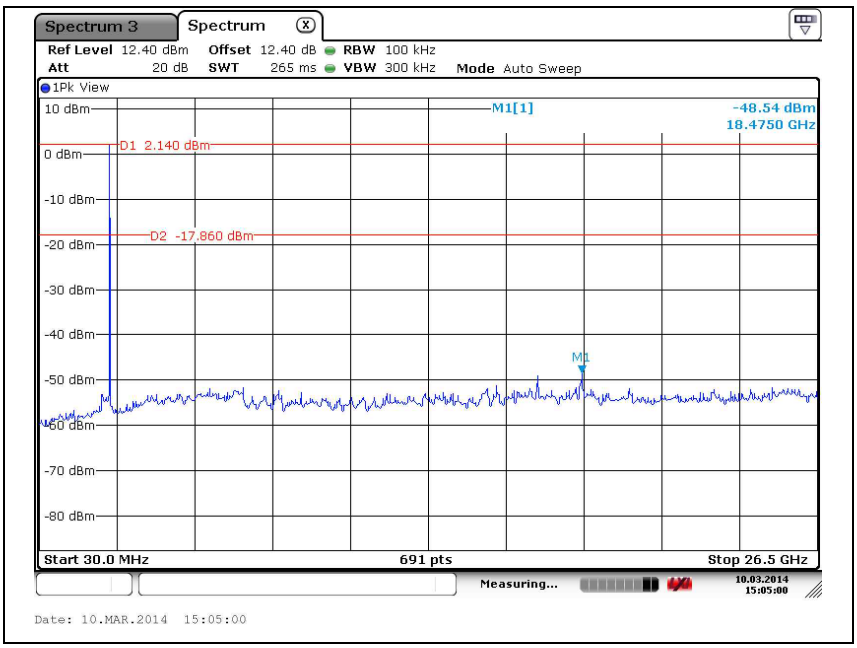
802.11b // Low channel



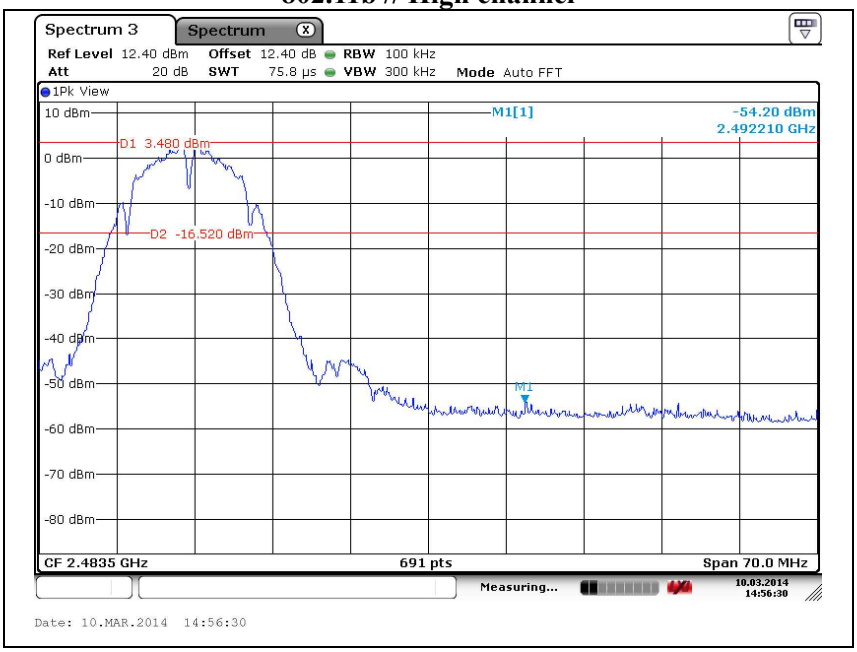


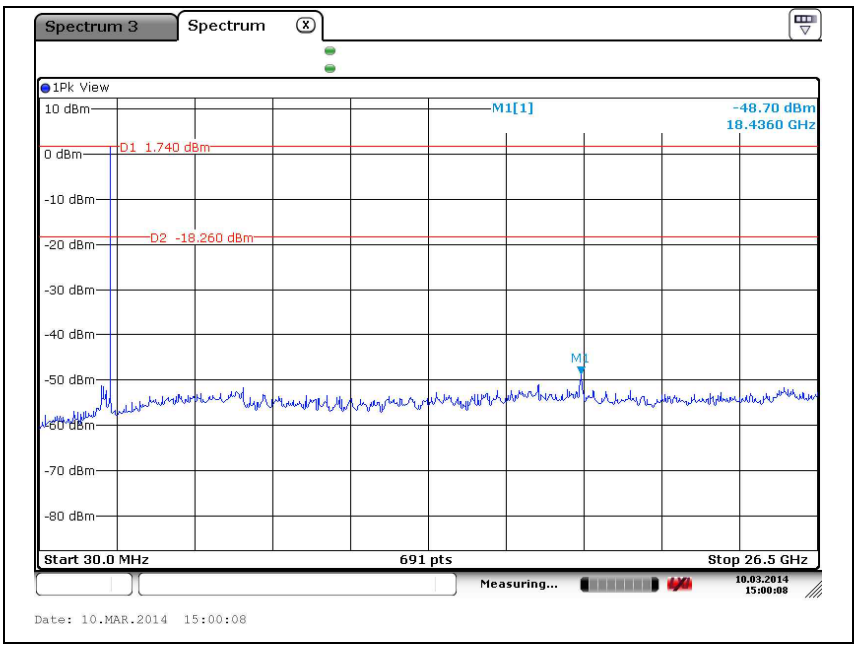
802.11b // Middle channel

N/A

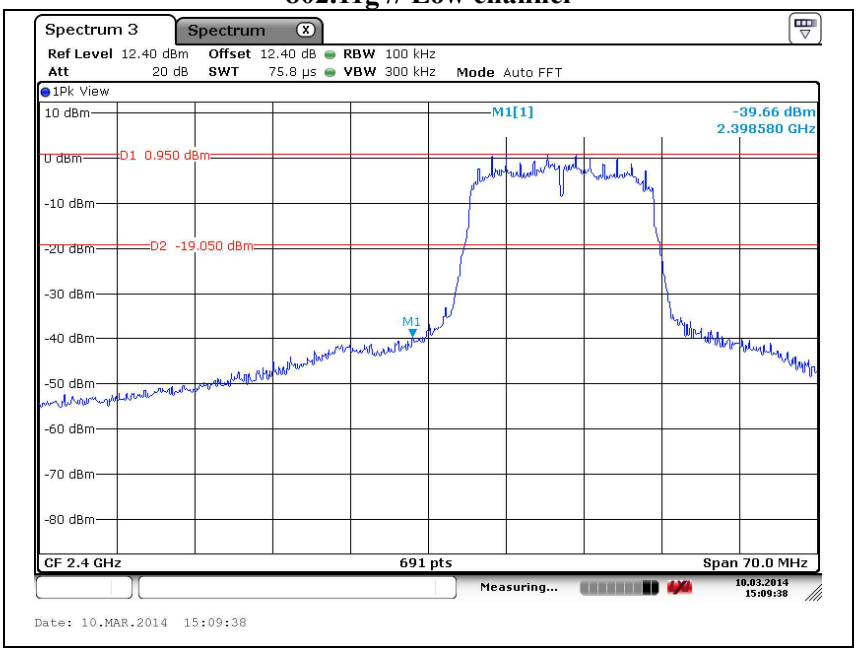


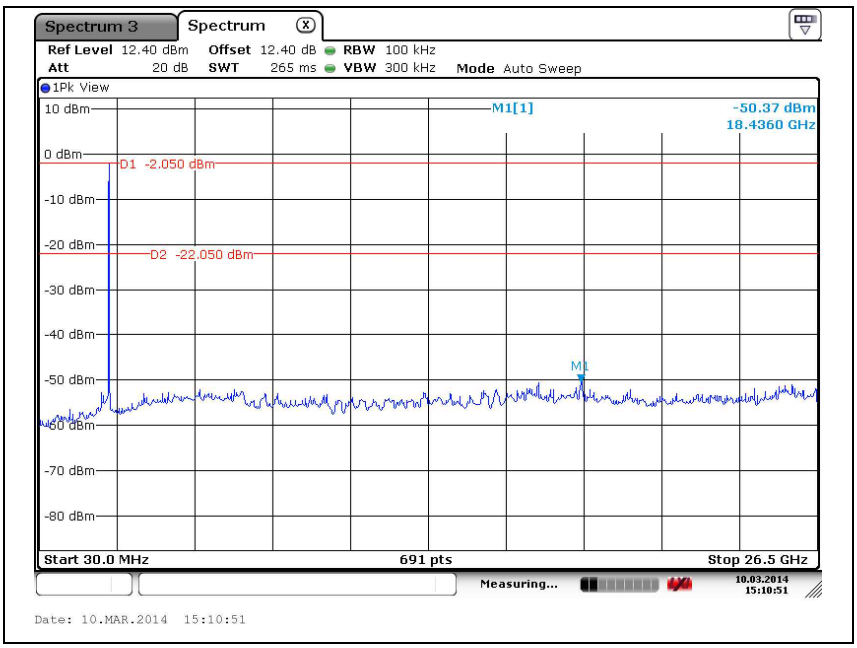
802.11b // High channel





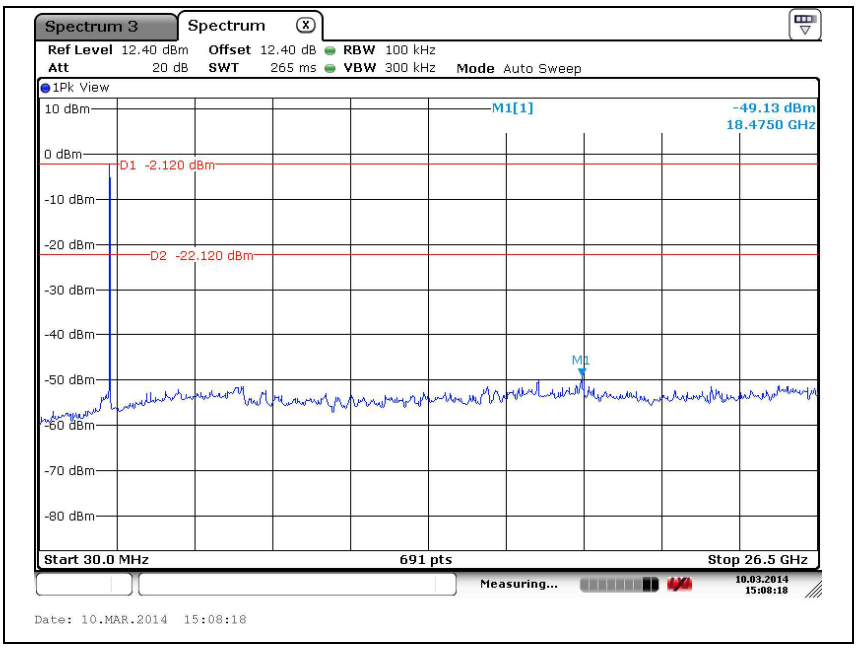
802.11g // Low channel



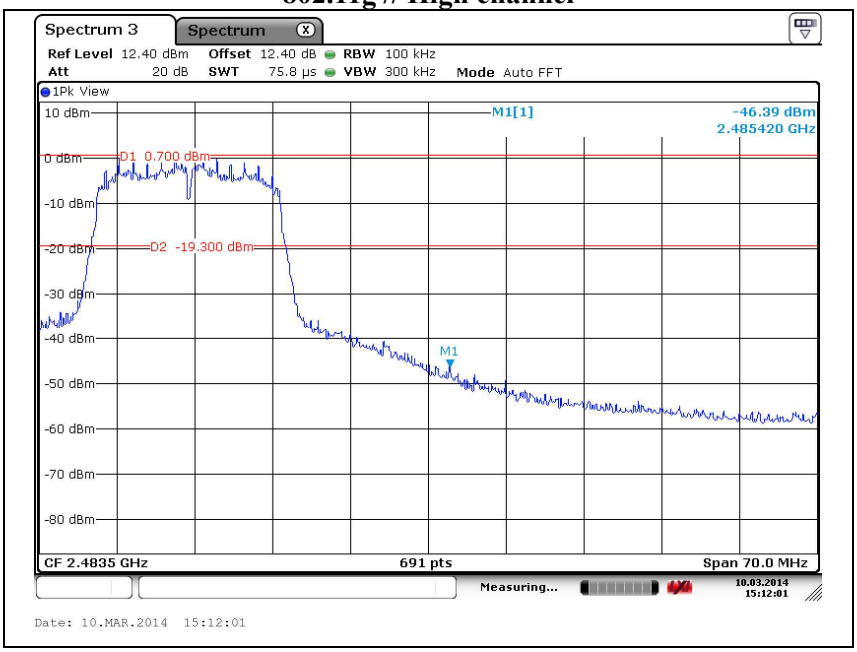


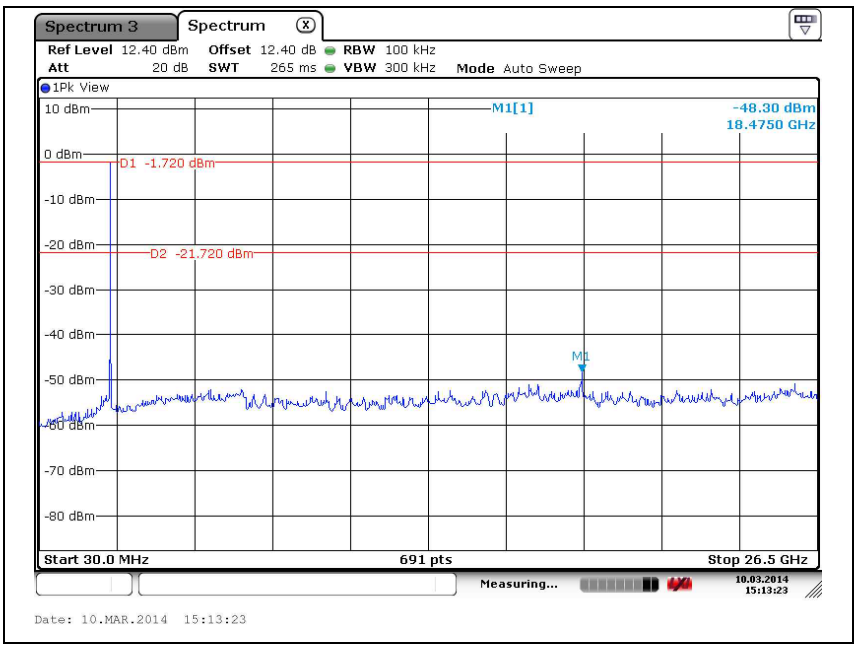
802.11g // Middle channel

N/A

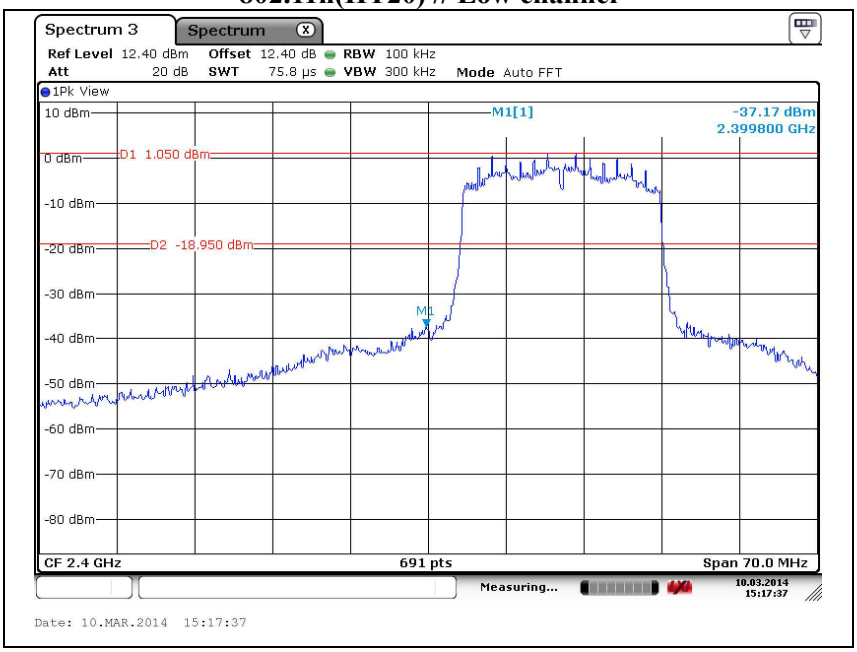


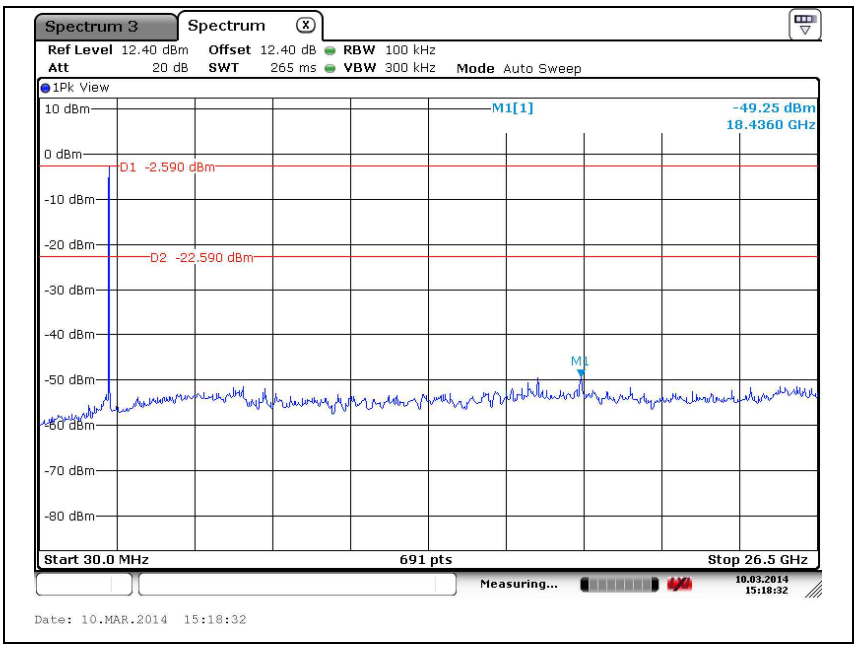
802.11g // High channel





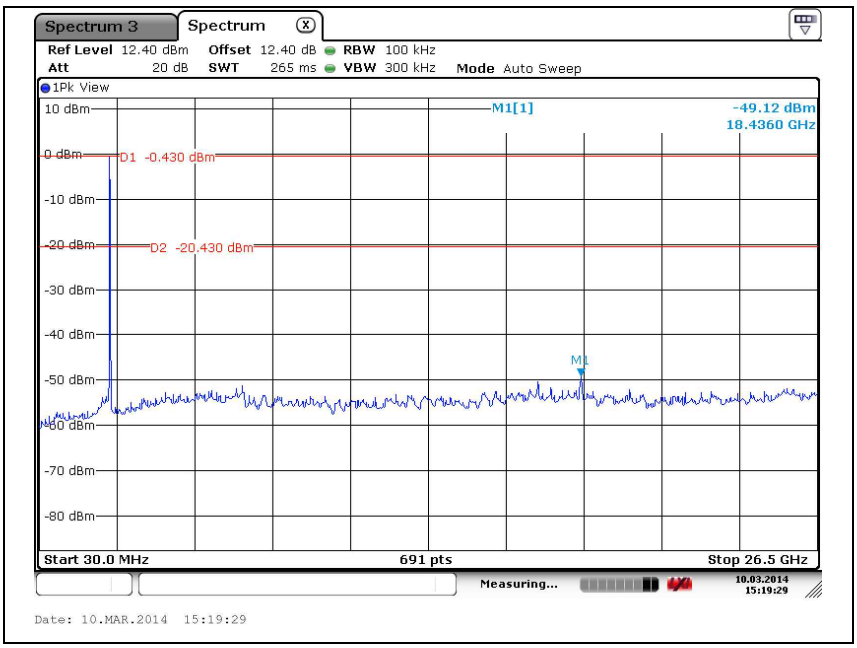
802.11n(HT20) // Low channel





802.11n(HT20) // Middle channel

N/A



802.11n(HT20) // High channel