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**RF report for Wireless multiroom speaker  
Models BM5B/37, BM5B/17, BM5C/37, BM5C/17, BM5W/37,  
BM5W/17**

Guangzhou, date of issue: 2015-07-20

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By order of Gibson Innovations Limited at Hong Kong, China

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## 1 **CONCLUSION**

The device under test (DUT) as mentioned in this report complies with the stated requirements of the FCC Part 15, Subpart C.

FCC ID: 2AANU-BM5

This report is based on the product operating at WIFI mode.

The test results in this report belong to model BM5B/37, and the results are also representative for other models.

The conclusion and results stated in this test report are based on a non-recurrent examination of sample(s) provided by the applicant.

## 2 SUMMARY

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

### 2.1 Applied standards

Standard	Year	Title
FCC part 15, Subpart C	2014	Federal Communications Commission (FCC) – Radio Frequency Devices

### 2.2 Reference standards

Standard	Year	Title
ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices

### 2.3 Overview of results

Test Item	Standard	Result
Maximum Peak Output Power	FCC Part 15: 15.247(b)(1) ANSI C63.10: 2013	PASS
6 dB Bandwidth	FCC Part 15: 15.215 ANSI C63.10: 2013	PASS
Peak Power Spectral Density	FCC PART 15 C section 15.247(e) ANSI C63.10: 2013	PASS
Radiated Emission	FCC Part 15: 15.247(d) FCC Part 15: 15.209 ANSI C63.10: 2013	PASS
Band Edge Requirement & Conducted Spurious Emissions	FCC Part 15: 15.247(d) ANSI C63.10: 2013	PASS
Power Line Conducted Emission	FCC Part 15: 15.207 ANSI C63.10: 2013	PASS
Antenna requirement	FCC Part 15: 15.203	PASS

### 3 GENERAL INFORMATION

#### 3.1 Model description

The apparatus as supplied for the test is Wireless multiroom speaker, model BM5B/07 intended for residential use, the product contains electronic control circuitry.

According to the declaration from the applicant, the circuit, PCB layout, electrical parts and outlook of the products are identical to all models

According to customer's declaration,

1, the characteristics of Bluetooth module are:

Operating Frequency	2402 MHz – 2480 MHz	
Operating Temperature Range	0 – 35 °C	
Antenna Assembly	Type	Internal, PCB antenna
	Gain	Maximum 2,12 dBi
Modulation Type	FHSS: GFSK, ( $\pi/4$ )DQPSK, 8DPSK	
Adaptivity	Adaptive	
Version	V2.1+EDR	

For FHSS channels are:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	27	2429	54	2456
1	2403	28	2430	55	2457
2	2404	29	2431	56	2458
3	2405	30	2432	57	2459
4	2406	31	2433	58	2460
5	2407	32	2434	59	2461
6	2408	33	2435	60	2462
7	2409	34	2436	61	2463
8	2410	35	2437	62	2464
9	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454	/	/
26	2428	53	2455	/	/

2, the characteristics of IEEE 802.11b/g/n HT20 module are:

Operating Frequency	IEEE 802.11b/g: 2412 MHz – 2472 MHz		
	IEEE 802.11n HT20: 2412 MHz – 2472 MHz		
Operating Temperature Range	0 – 35 °C		
Antenna Assembly	Type	Internal, assembly antenna	
	Gain	Mains (one)	Max. 3,75 dBi
		Mains (two)	Max. 3,75 dBi
<b>Remark:</b> There is only one antenna active at any moment in time after detecting the larger power (Operating mode 1, Single antenna).			
Modulation Type	IEEE 802.11b: DSSS (CCK, QPSK, BPSK)		
	IEEE 802.11g: OFDM (BPSK, QPSK, 16QAM, 64QAM)		
	IEEE 802.11n HT20: OFDM (BPSK, QPSK, 16QAM, 64QAM)		
Adaptivity	Adaptive		
	q	32	

For IEEE 802.11b, 802.11g and 802.11n20, the 11 channels are:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	/	/
6	2437	/	/
7	2442	/	/

According to the declaration from the applicant, the only difference of the models are the cabinet colour and the denotes country

Hence, model BM5B/37 was chosen for full testing, and the corresponding data is representative of other models as well.

The provided ports are AC mains, Aux in, USB port (for software upgrade only exclude the software of Bluetooth and IEEE 802.11b/g/n module) and enclosure.





Figure 1 Model BM5B/37

The operating modes are On (Aux in, Bluetooth mode and IEEE 802.11b/g/n HT20 mode) and OFF mode.

### 3.2 Product Information

Equipment under test	Wireless multiroom speaker
Trade mark	PHILIPS
Tested Type	BM5B/37
Rating	5,0 Vdc, 2 A

Represented type(s)	BM5B/17, BM5C/37, BM5C/17, BM5W/37, BM5W/17
Rating	5,0 Vdc, 2 A

AC/DC Adapter	AS100-050-AA200
Trade mark	PHILIPS
Rating	Input: 100-120 Vac, 50-60 Hz, 0,5 A Output: 5.0 Vdc, 2.0 A

### 3.3 Customer Information

Applicant/ Manufacturer	Gibson Innovations Limited
Contact person	Wenke
Telephone	+86 755 8300 8803
Telefax	/
Address	5/F.-6F., Philips Electronics Building, 5 Science Park East Avenue, Hong Kong Science Park, New Territories, Hong Kong

Factory	Zhang Shan City LI TAI Electronic industrial Co., Ltd.
Contact person	Yuki Cai
Telephone	+86 760 2380 8322
Telefax	+86 760 2380 8800
Address	No.3 Industrial district, Wu guishan, Cheng gui Road, Zhangshan city, Guangdong, China

## 4 TEST INFORMATION

### 4.1 Test configuration

The WIFI module of the EUT was connected to a special test jig provided by manufacturer which has a com port to link with PC, and the PC will run "Hyperterminal" supplied by manufacturer to control the EUT work in test mode as below table.

Mode	Channel	Frequency (MHz)
802.11b	CH1	2412
	CH7	2442
	CH11	2462
802.11g	CH1	2412
	CH7	2442
	CH11	2462
802.11n20	CH1	2412
	CH7	2442
	CH11	2462

### 4.2 Transmit Data Rate:

The transmit data rate of the EUT used is:

802.11b:1/2/5.5/11 Mbps

802.11g:6/9/12/18/24/36/48/54 Mbps

802.11n (HT20): 7.2/14.4/21.7/28.9/43.3/57.8/65/72.2 Mbps

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

### 4.3 Special accessories of the EUT

No.

#### 4.4 Assistant equipment used on the test

Description	Manufacturer	Model	Other
HP Pro 3330 Small (PC)	HP	A6T13PA#AB2	AC line: 1,5 m, unshielded
LCD Colour Display	HP	GV537A	AC line: 1,5 m, unshielded VGA line: 1,5 m, Shielded
Keyboard	HP	KB-0316	Signal line: 1,5 m, unshielded
Mouse	HP	M-SBF96	Signal line: 1,5 m, unshielded

Note: the equipment only used to configure the engineering mode in the report and not during the test

#### 4.5 Test laboratory

Location	DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch
Address	Building A3, No.3 Qiyun Road, Science City, Guangzhou Hi-Tech Industrial Development Zone, Guangzhou, P.R. China
Date	2015-07-04 to 2015-07-20
Supervised by	Jazz Liang

#### 4.6 Environmental conditions

Tests have been performed in a controlled laboratory environment, where the environmental conditions are maintained within the applicable ranges.

Ambient temperature	15 °C – 25 °C
Relative Humidity air	30% - 60%

#### 4.7 Measurement Uncertainty

Test Item	Uncertainty
Occupied Channel Bandwidth	±0.7%
RF Output power, conducted	±0,6dB
Power Spectral Density, Conducted	±0.6dB
Unwanted Emissions, Conducted	±0,7dB
Temperature	±0,2°C
Humidity	±1%
DC and Low frequency voltage	±0,5%
Time	±1%
Duty Cycle	±1%
Uncertainty for Radiation Emission test (30MHz-1GHz)	3,14 dB (Polarize: V)
	3,16 dB (Polarize: H)
Uncertainty for Radiation Emission test (1GHz to 25GHz)	2,08dB(Polarize: V)
	2,56dB (Polarize: H)

**Remark:**

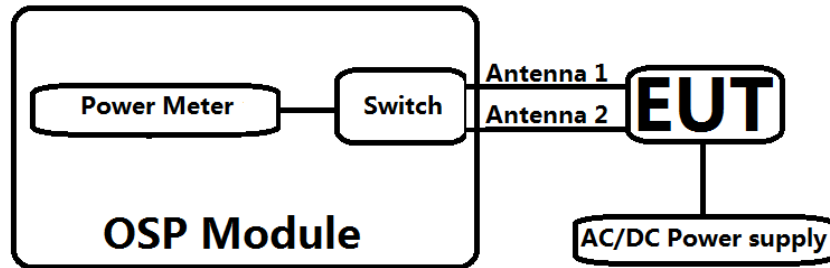
This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

## 5 MAXIMUM PEAK OUTPUT POWER

### 5.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	OSP module (Power measurement unit with power switching)	R&S	OSP-B157	101259	2015/05/14	1 Year
2	Temp & Humi Programmable Chamber	GRGTEST	CEEC-MSJ-60BE	11015	2015/03/24	1 Year

### 5.2 Block diagram of test setup



### 5.3 Limits

(b)(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

### 5.4 Test results

Mode	Channel	Frequency (MHz)	Data Rate	Reading Level (dBm)	Limit (dBm)
802.11b	Low	2412	11 Mbps	15,06	≤30(1W)
	Middle	2442	11 Mbps	15,63	
	High	2462	11 Mbps	16,11	
802.11g	Low	2412	54 Mbps	13,71	
	Middle	2442	54 Mbps	14,37	
	High	2462	54 Mbps	14,78	
802.11n20	Low	2412	72.2 Mbps	13,81	
	Middle	2442	72.2 Mbps	14,69	
	High	2462	72.2 Mbps	14,45	

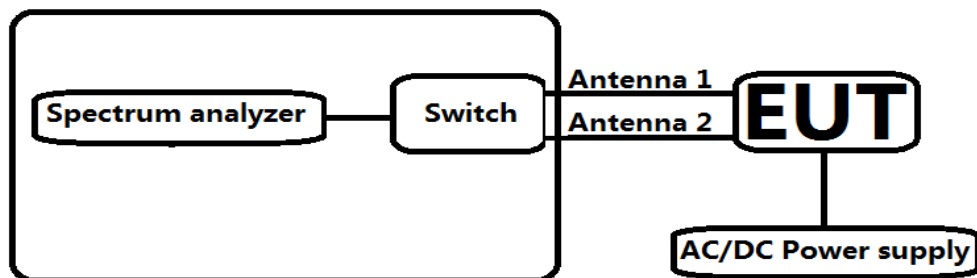
Note: Pre-Scan has been conducted to determine the worst-case mode from Antenna 1 and Antenna 2. Compliance test in continuous transmitting mode with Antenna 1 as the worst case was found.

## 6 PEAK POWER SPECTRAL DENSITY

### 6.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	R&S	FSV40	SN101012	2014/09/11	1 Year
2	OSP module	R&S	OSP-B157	101259	2015/05/14	1 Year
3	Temp & Humi Programmable Chamber	GRGTEST	CEEC-MSJ-60BE	11015	2015/03/24	1 Year

### 6.2 Block diagram of test setup



### 6.3 Limits

(e) 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.

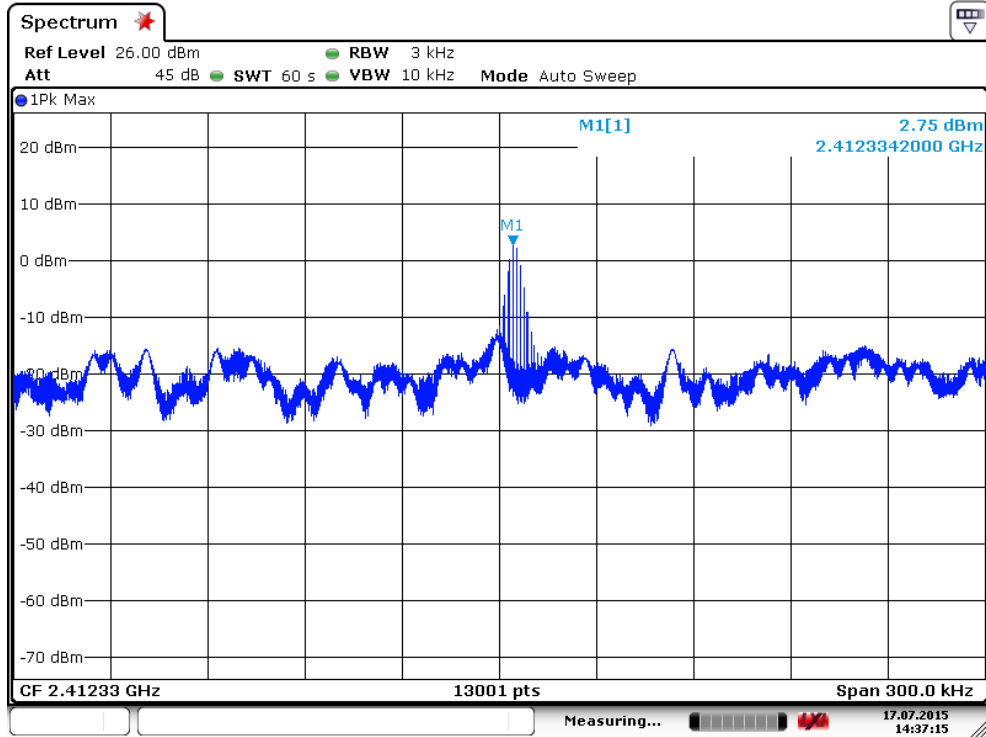
**6.4 Test results**

Mode	Channel	Frequency (MHz)	Data Rate	Power Spectral Density (dBm)	Limit (dBm/ MHz)
802.11b	Low	2412	11 Mbps	2.75	8dBm/3KHz
	Middle	2442	11 Mbps	3.44	
	High	2462	11 Mbps	4,21	
802.11g	Low	2412	54 Mbps	-21.53	
	Middle	2442	54 Mbps	-20.53	
	High	2462	54 Mbps	-19.92	
802.11n20	Low	2412	72.2 Mbps	-20.85	
	Middle	2442	72.2 Mbps	-19.00	
	High	2462	72.2 Mbps	-19.36	

Note: Pre-Scan has been conducted to determine the worst-case mode from Antenna 1 and Antenna 2. Compliance test in continuous transmitting mode with Antenna 1 as the worst case was found.

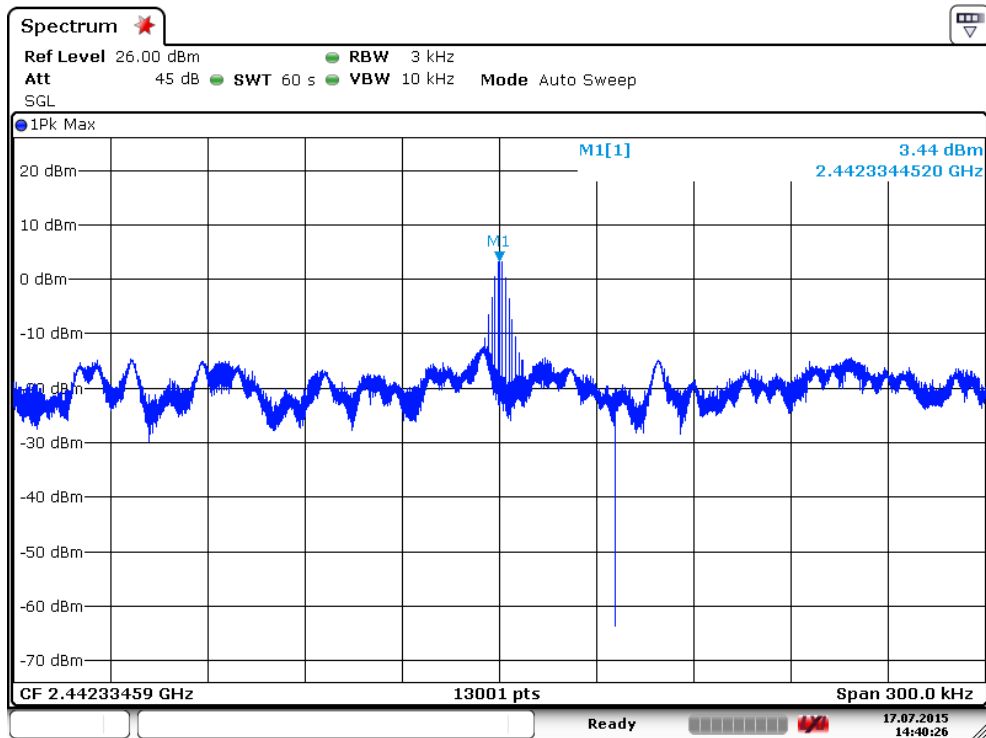


6.5 Test data  
802.11b  
2412MHz



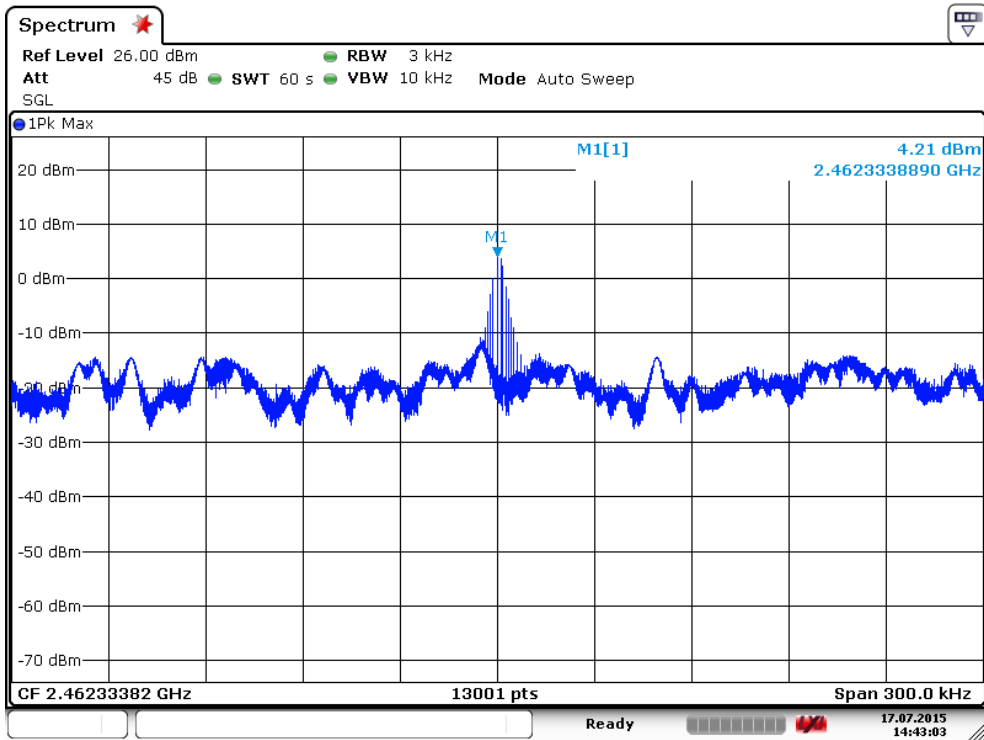
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2442MHz



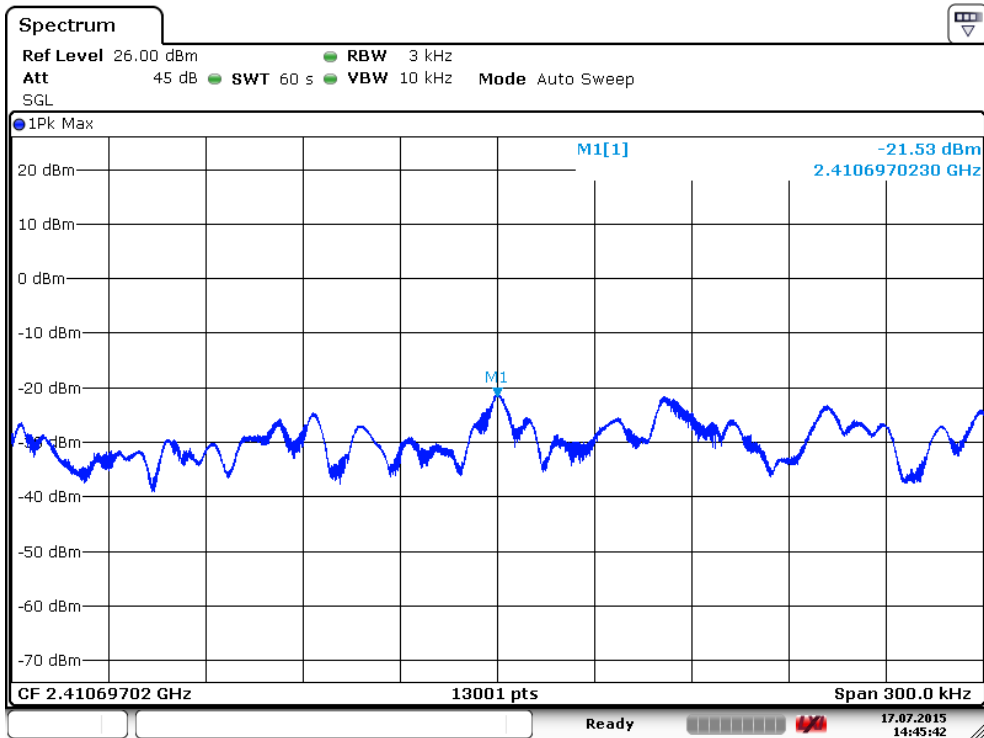
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2462MHz



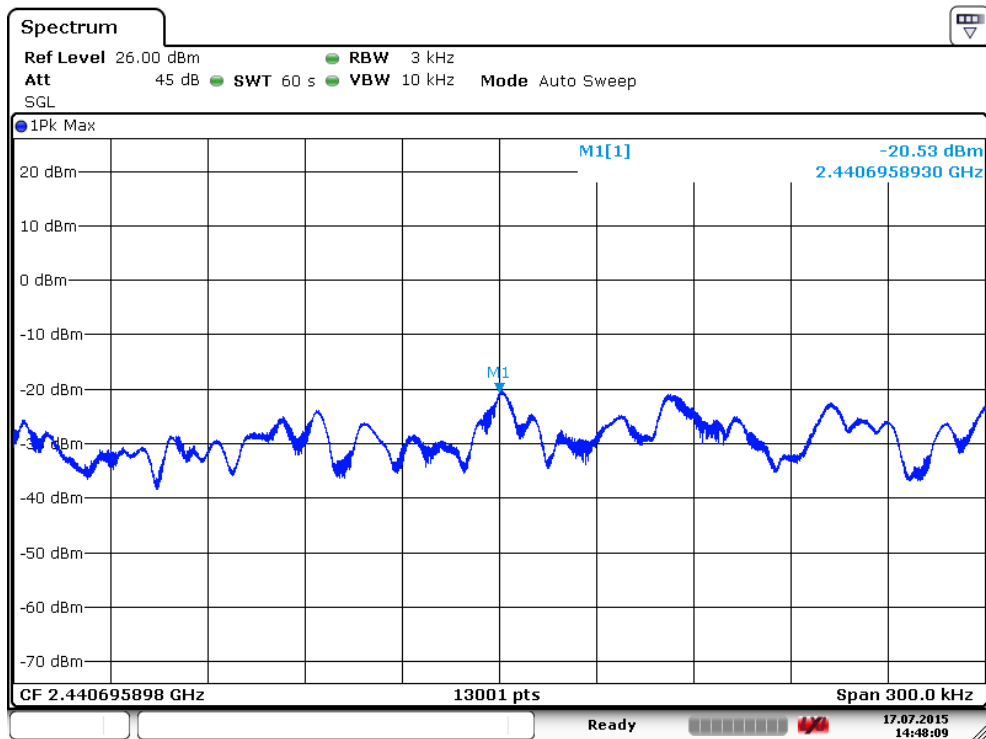
Date: 17 JUL 2015 14:43:03

802.11g  
2412MHz



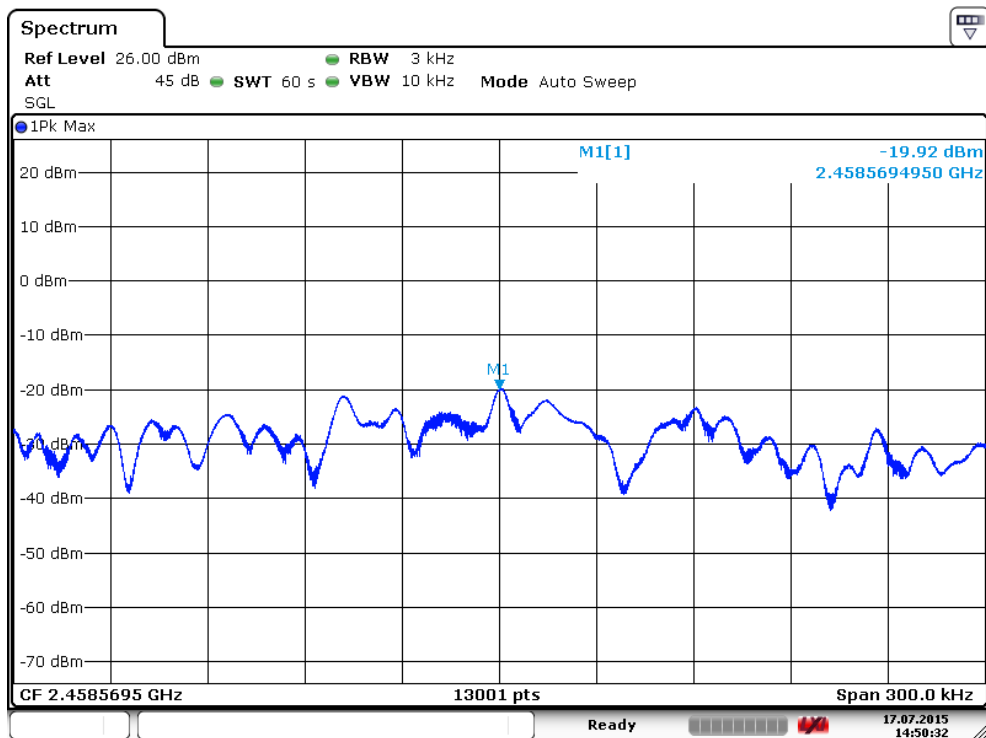
Date: 17 JUL 2015 14:45:42

### 2442MHz



Date: 17 JUL 2015 14:48:10

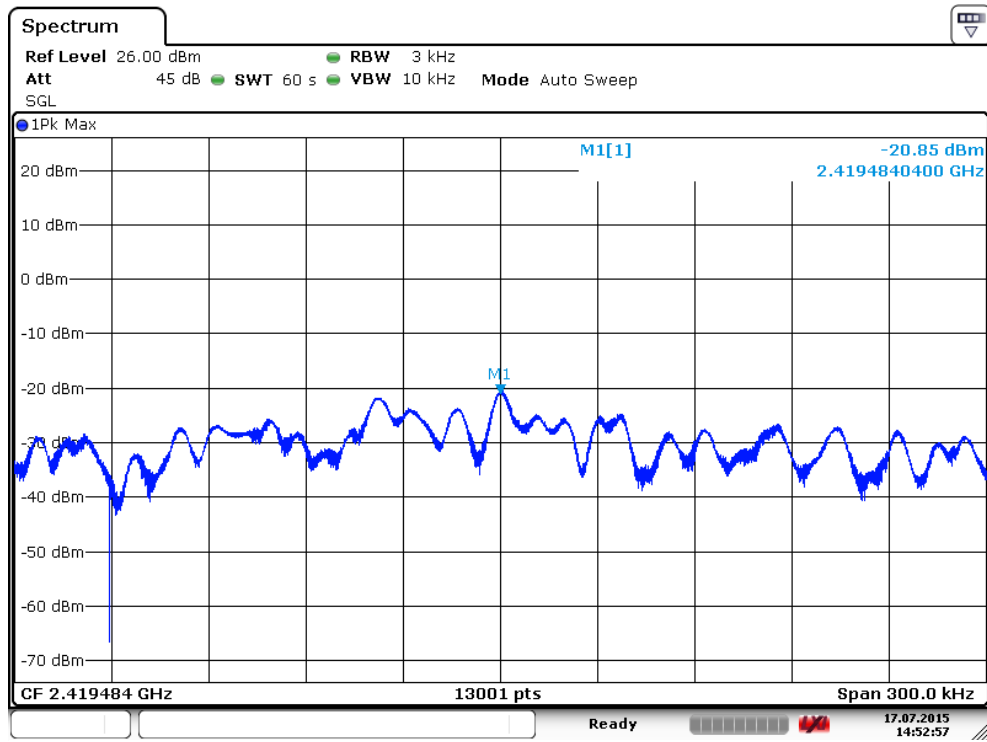
### 2462MHz



Date: 17 JUL 2015 14:50:32

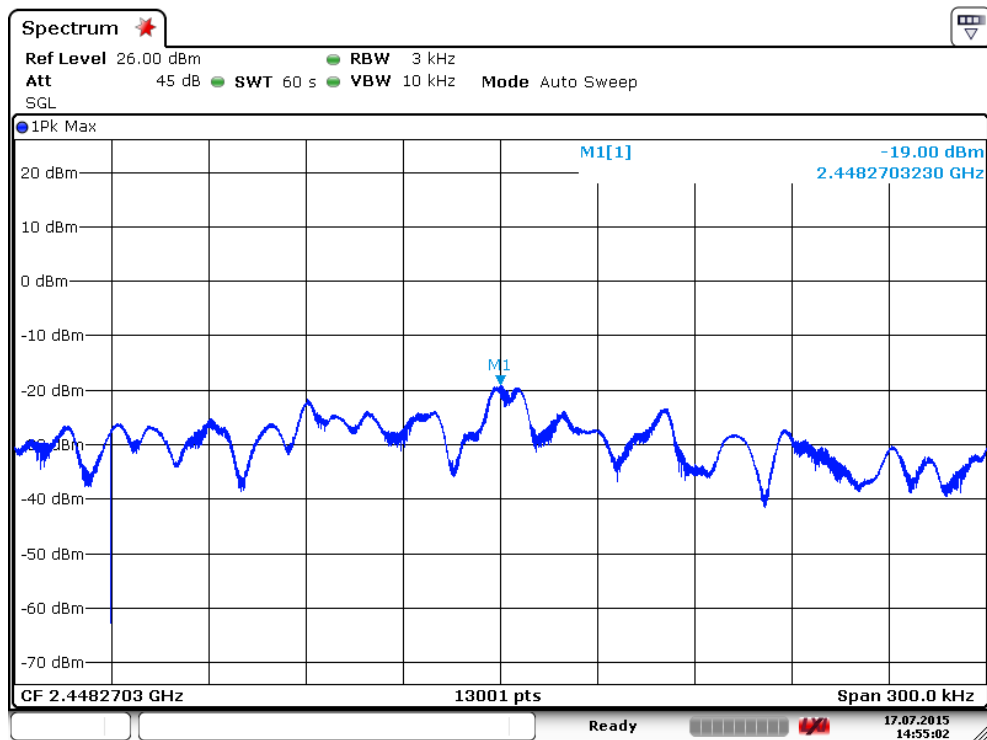
802.11n20

2412MHz



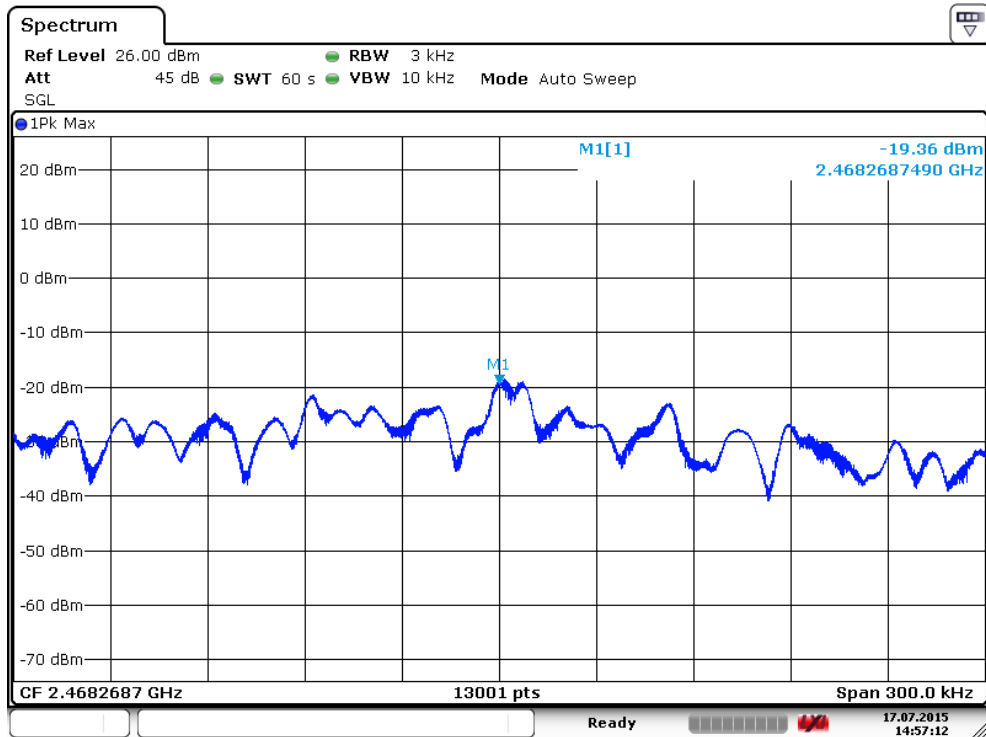
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2442MHz



Date: 17 JUL 2015 14:55:02

2462MHz



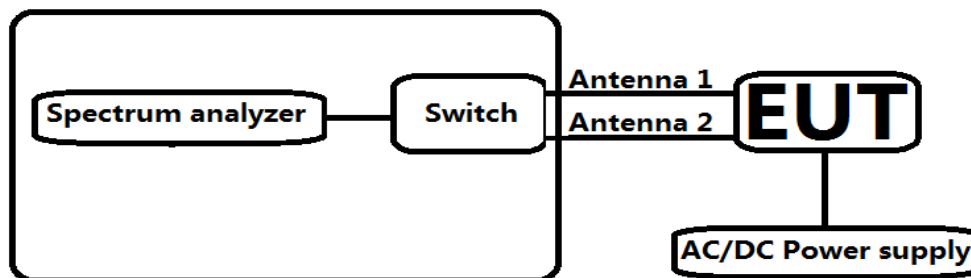
Date: 17 JUL 2015 14:57:11

## 7 6 DB BANDWIDTH

### 7.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	R&S	FSV40	SN101012	2014/09/11	1 Year
2	OSP module	R&S	OSP-B157	101259	2015/05/14	1 Year
3	Temp & Humi Programmable Chamber	GRGTEST	CEEC-MSJ-60BE	11015	2015/03/24	1 Year

### 7.2 Block diagram of test setup



### 7.3 Test Procedure

- (1) Configure EUT and Assistant system according to 4.1 and 7.2;
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable;
- (3) Configure EUT working in test mode as state in 4.1;

### 7.4 Limits

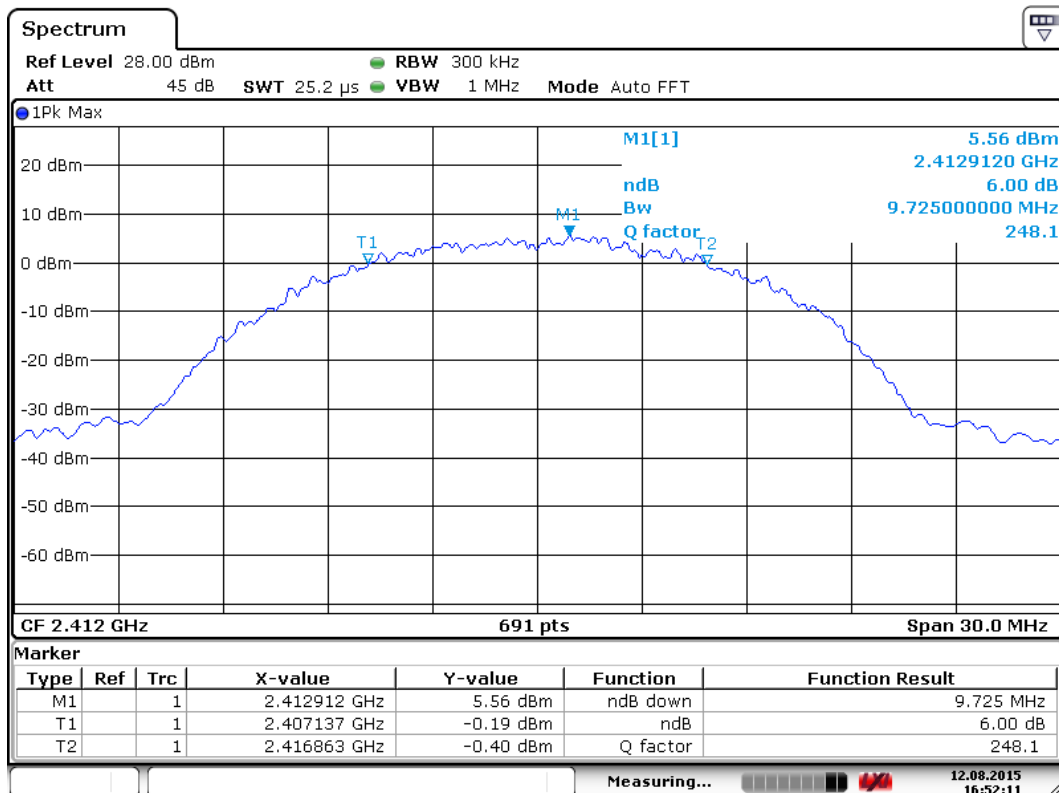
(a)(2) Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 7.5 Test results

Mode	Channel No.	Data Rate	Measured 6dB bandwidth (MHz)	Limit	Result
802.11b	1	11 Mbps	9.725	≥500KHz	Pass
	7	11 Mbps	9.725		Pass
	11	11 Mbps	9.638		Pass
802.11g	1	54 Mbps	16.467	≥500KHz	Pass
	7	54 Mbps	16.442		Pass
	11	54 Mbps	16.417		Pass
802.11n (HT20)	1	72.2 Mbps	17.891	≥500KHz	Pass
	7	72.2 Mbps	17.916		Pass
	11	72.2 Mbps	17.891		Pass

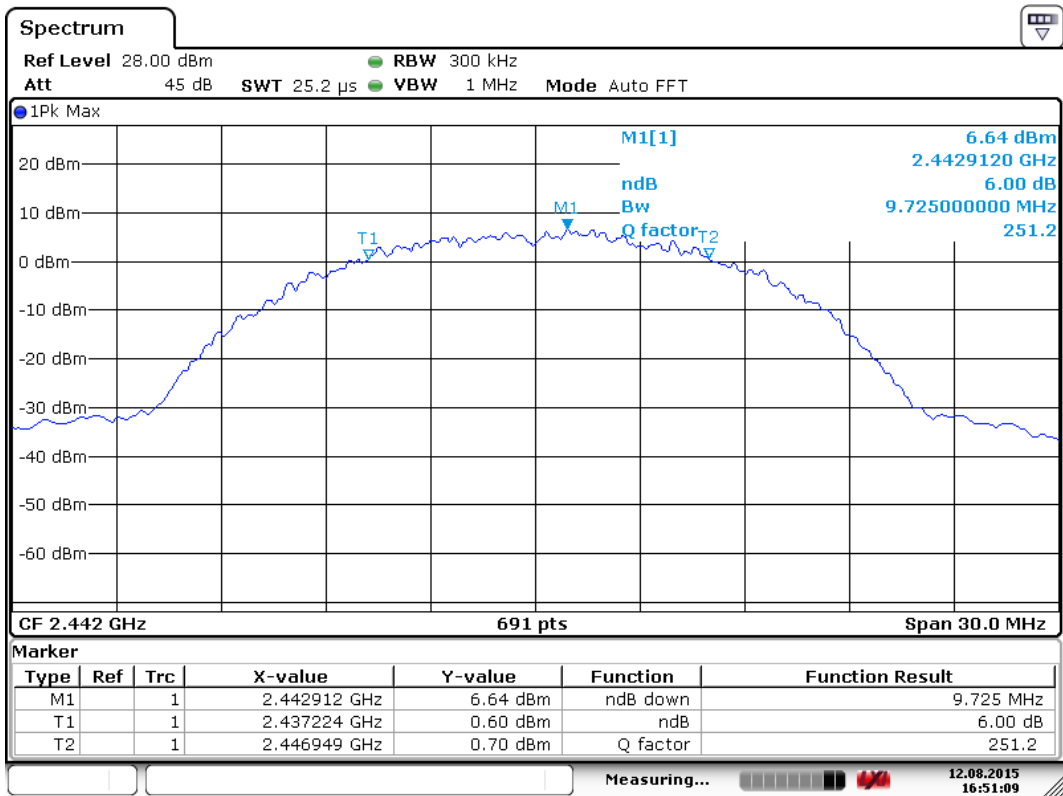
### 7.6 Original test data

802.11b  
2412



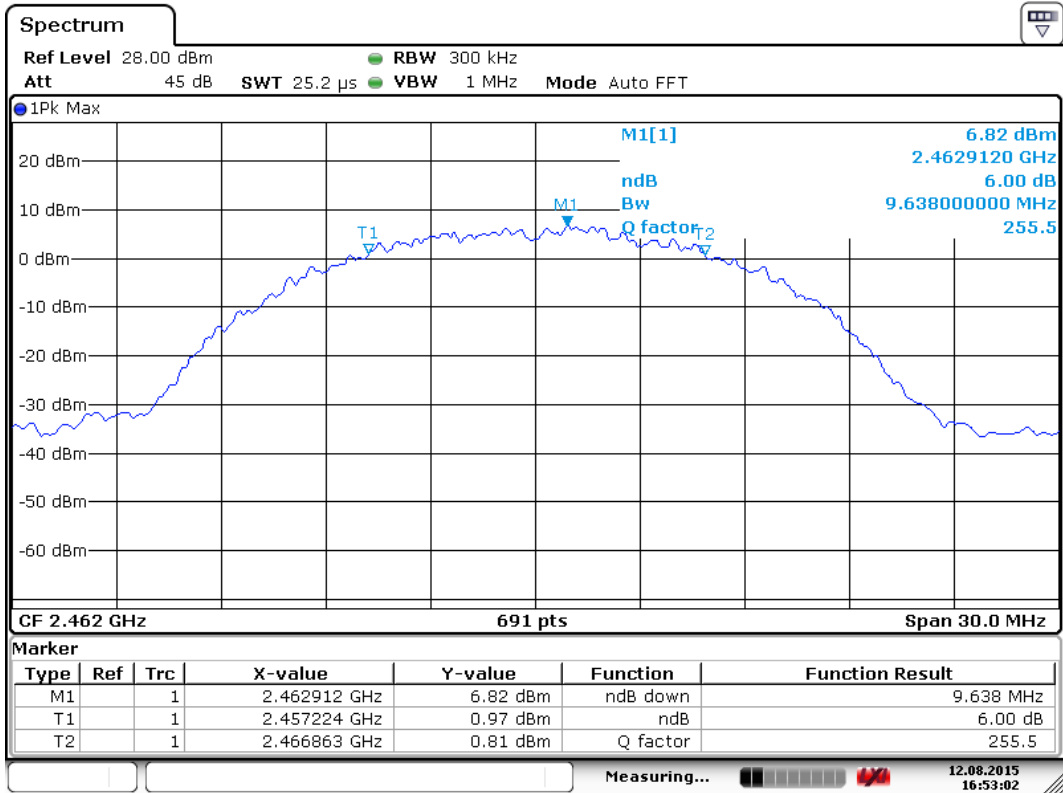
Date: 12 AUG. 2015 16:52:11

2442



Date:12 AUG .2015 16:51:09

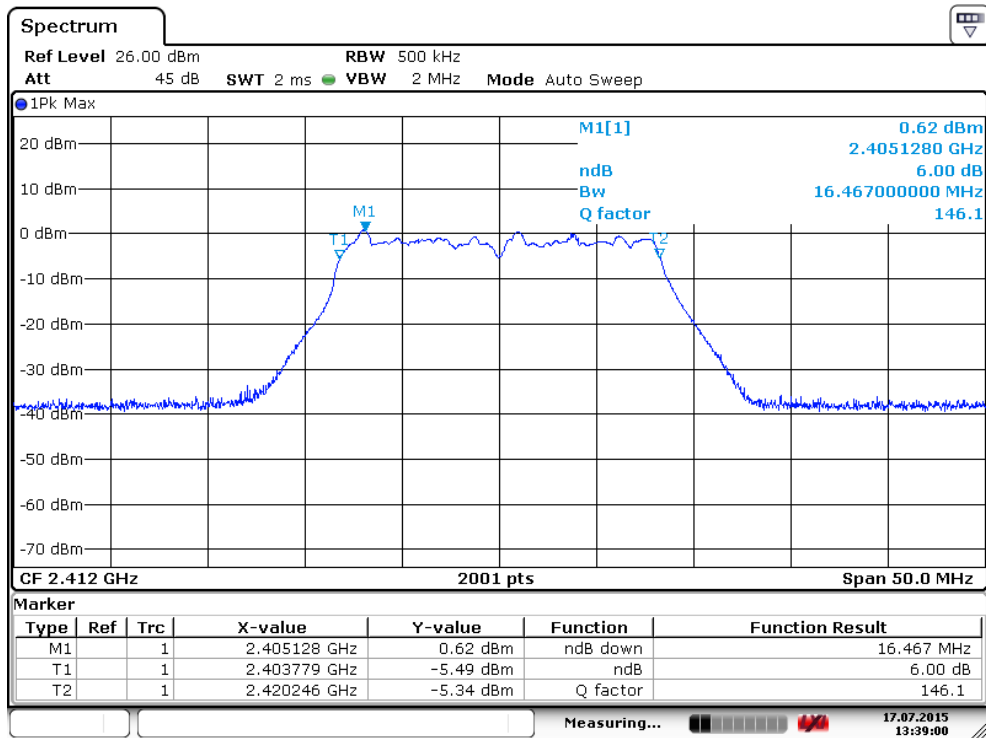
2462



Date:12 AUG .2015 16:53:02

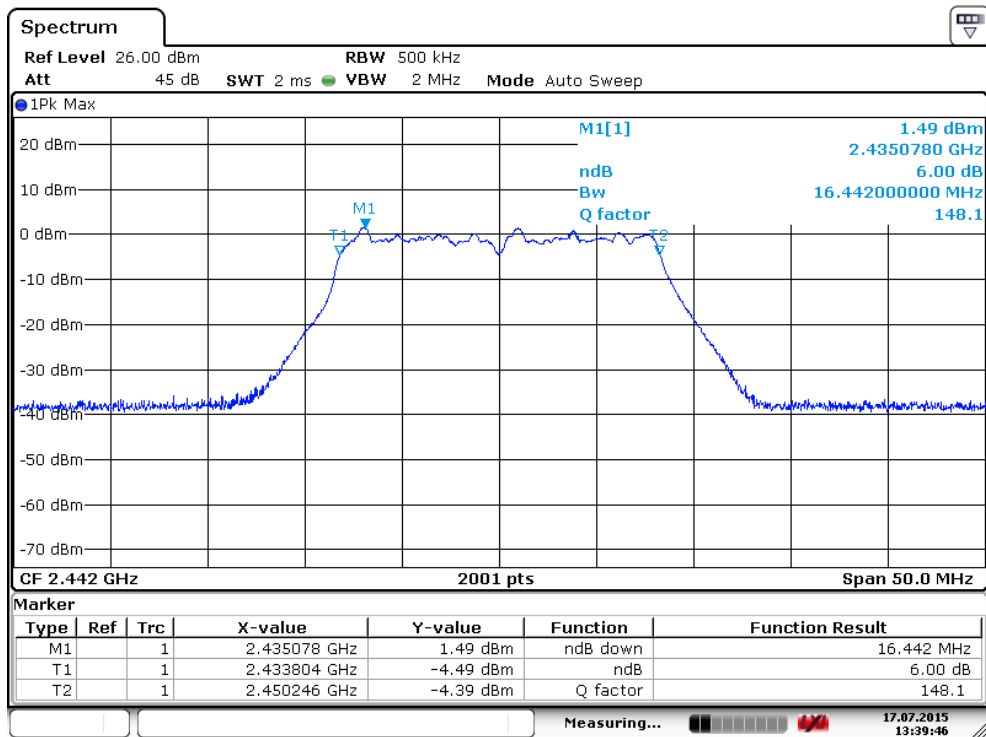


802.11g  
2412



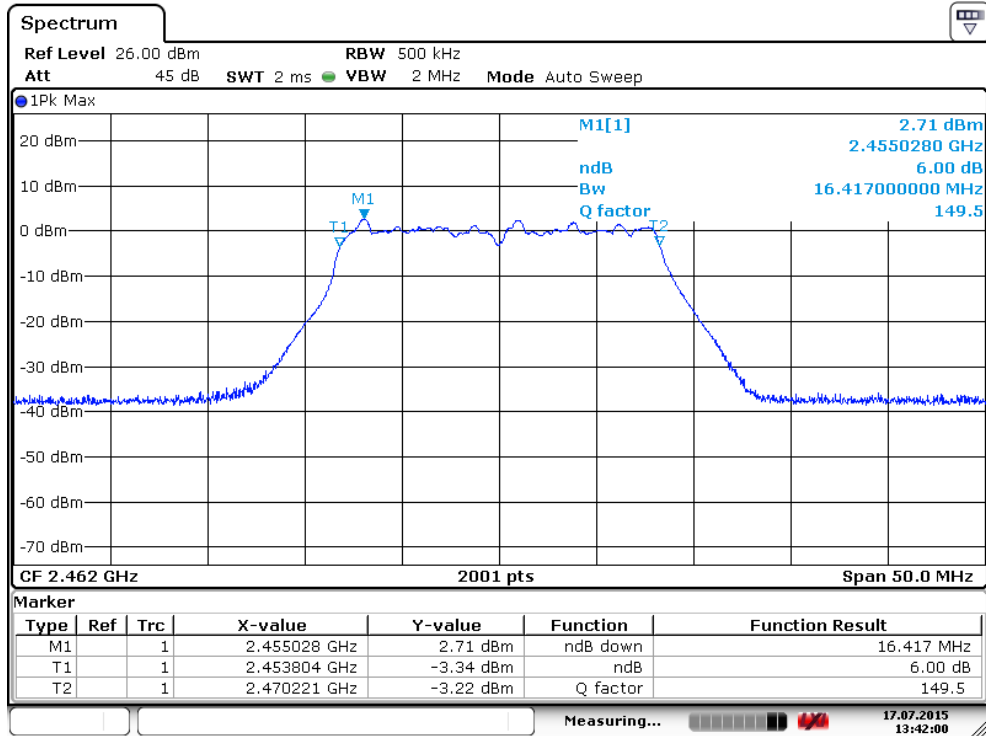
Date: 17 JUL 2015 13:39:00

2442



Date: 17 JUL 2015 13:39:46

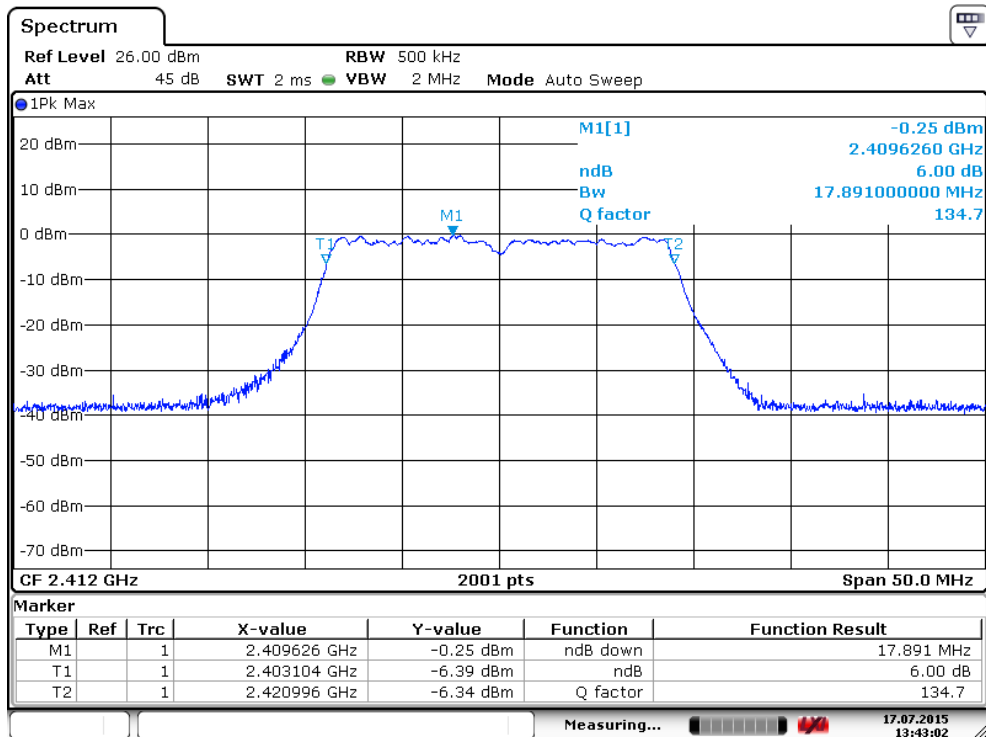
2462



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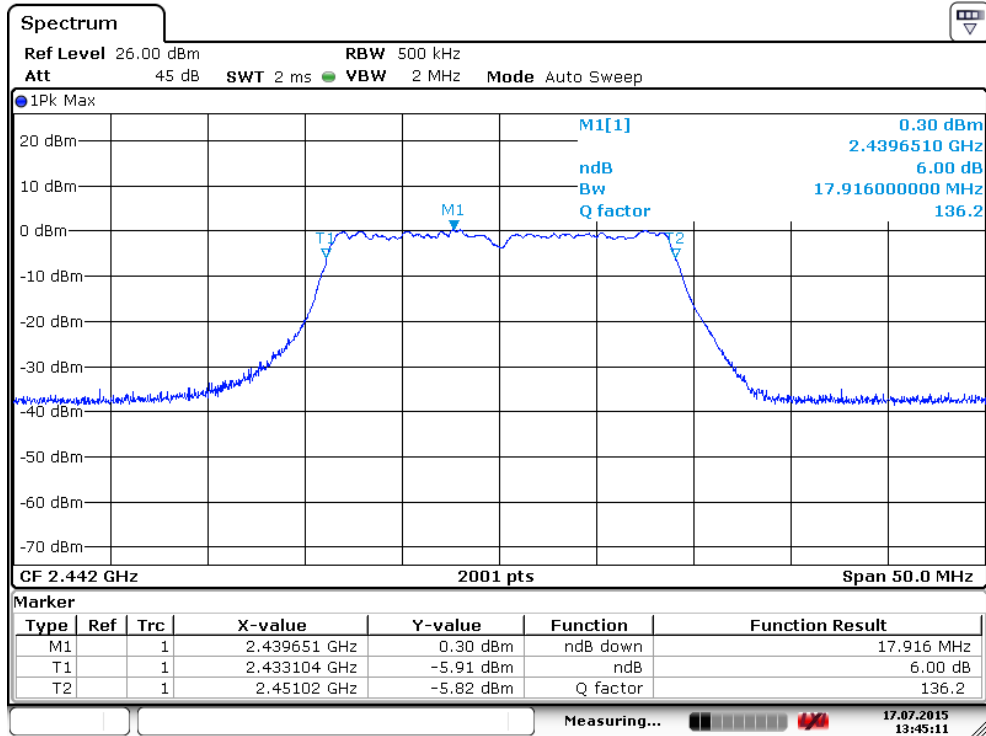
802.11n(HT20)

2412



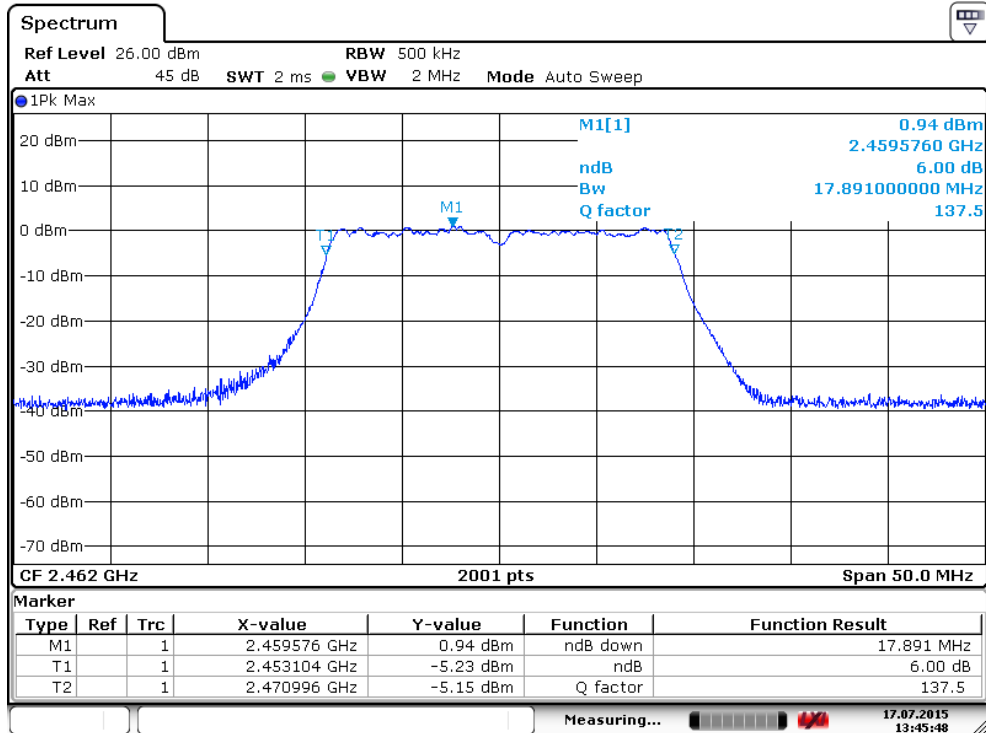
Date: 17 JUL 2015 13:43:02

2442



Date: 17 JUL 2015 13:45:11

2462



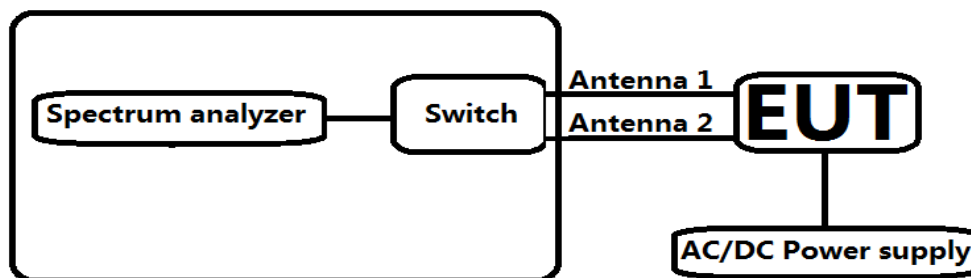
Date: 17 JUL 2015 13:45:49

## 8 BAND EDGES REQUIREMENT & CONDUCTED SPURIOUS EMISSIONS

### 8.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	R&S	FSV40	SN101012	2014/09/11	1 Year
2	OSP module	R&S	OSP-B157	101259	2015/05/14	1 Year
3	Temp & Humi Programmable Chamber	GRGTEST	CEEC-MSJ-60BE	11015	2015/03/24	1 Year

### 8.2 Block diagram of test setup



### 8.3 Test Procedure

- (1) Configure EUT and Assistant system according to 4.1 and 8.2;
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable;
- (3) Configure EUT working in test mode as state in 4.1;
- (4) The carrier frequency was measured by spectrum analyzer with 100 kHz RBW and 300 KHz VBW.

Note: Pre-Scan has been conducted to determine the worst-case mode from Antenna 1 and Antenna 2. Compliance test in continuous transmitting mode with Antenna 1 as the worst case was found.

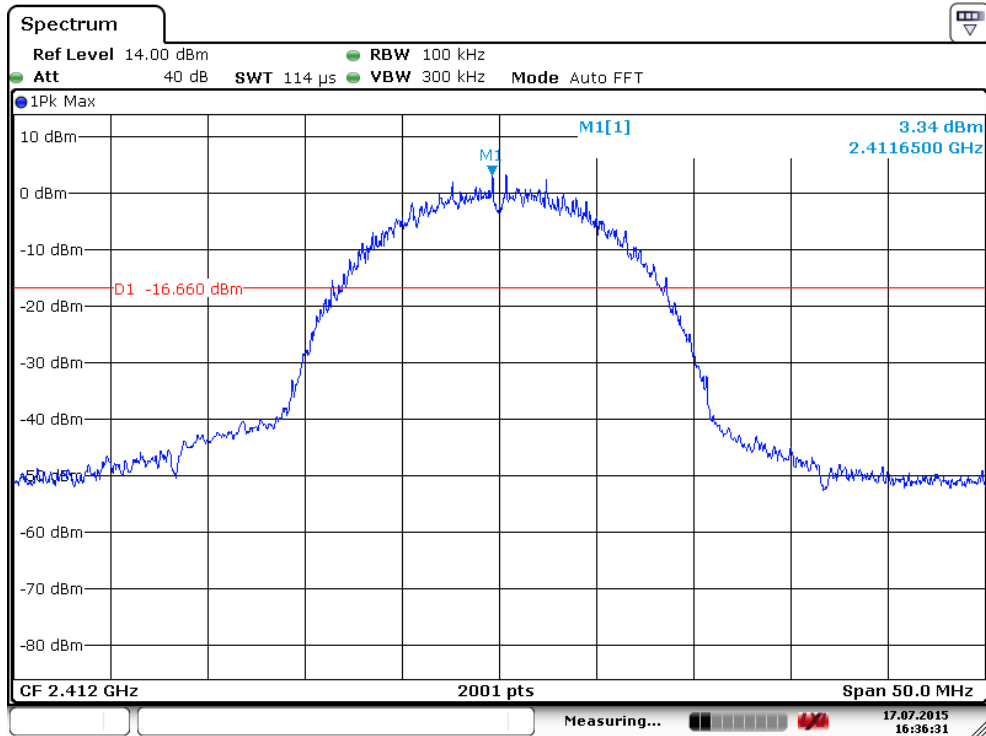
#### 8.4 Requirement and limit

(d) In any 100 kHz 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 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 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 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

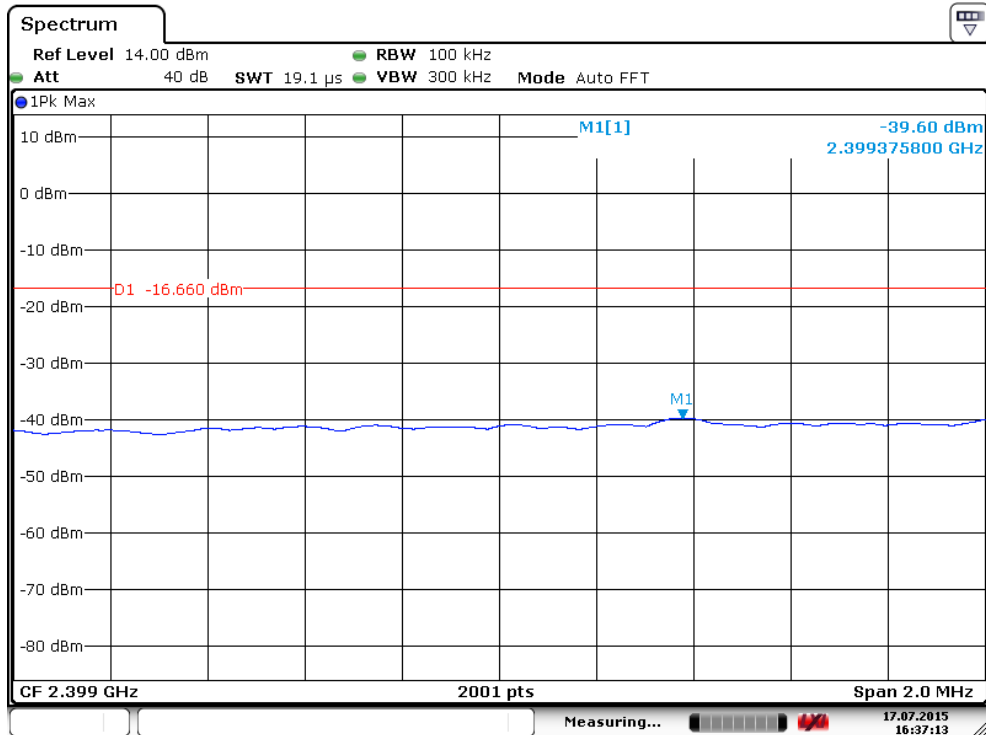
8.5  
8.5.1  
802.11b  
2412

### Test results

#### Band edge

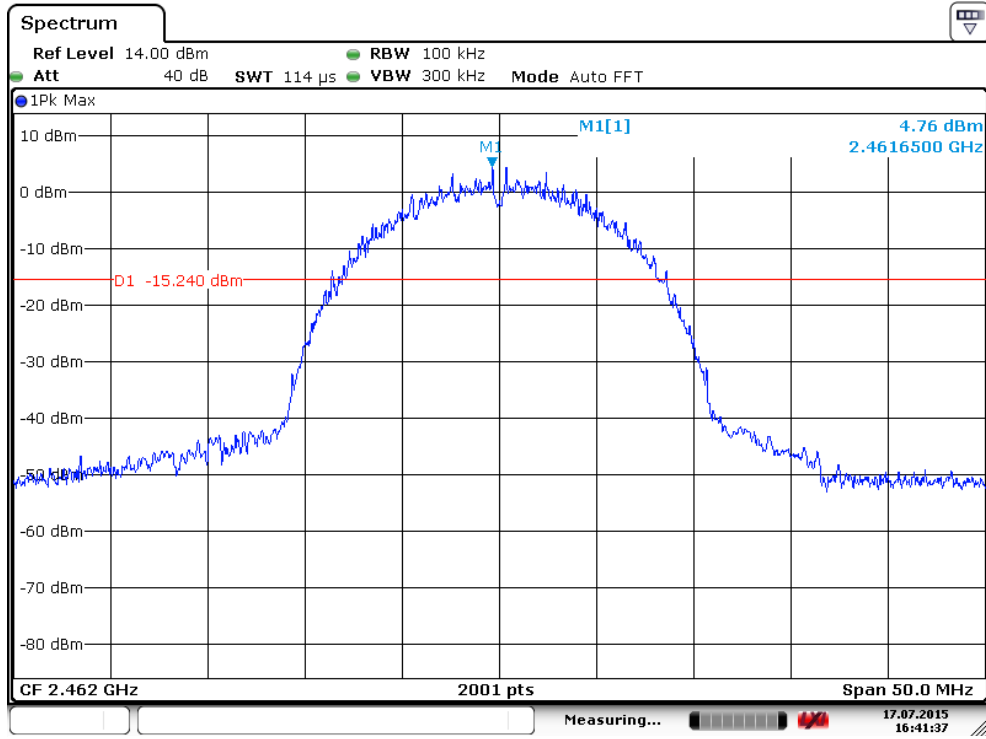


Date: 17 JUL 2015 16:36:31

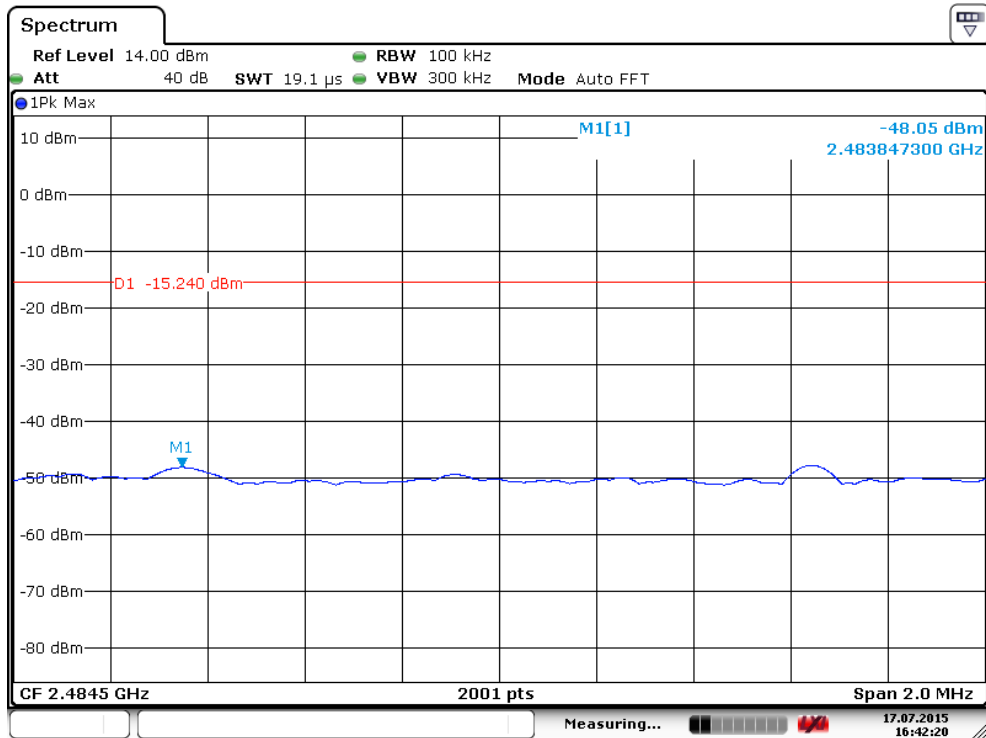


Date: 17 JUL 2015 16:37:13

2462



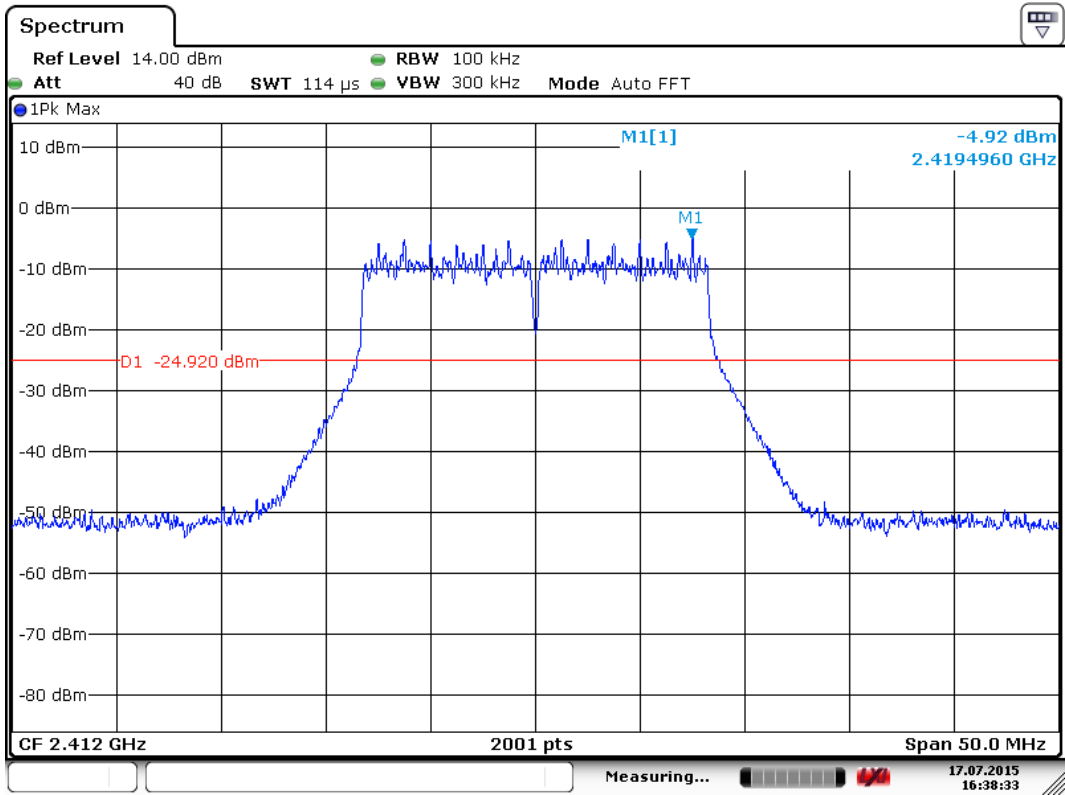
Date: 17 JUL 2015 16:41:37



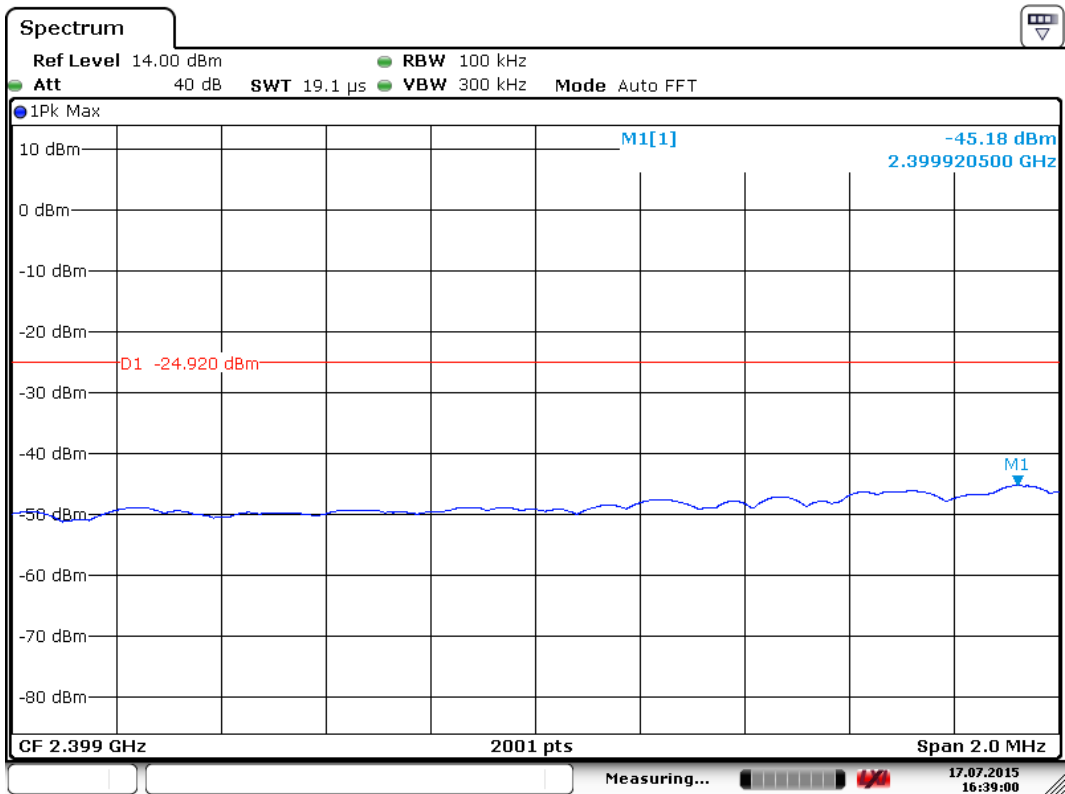
Date: 17 JUL 2015 16:42:19

802.11g

2412



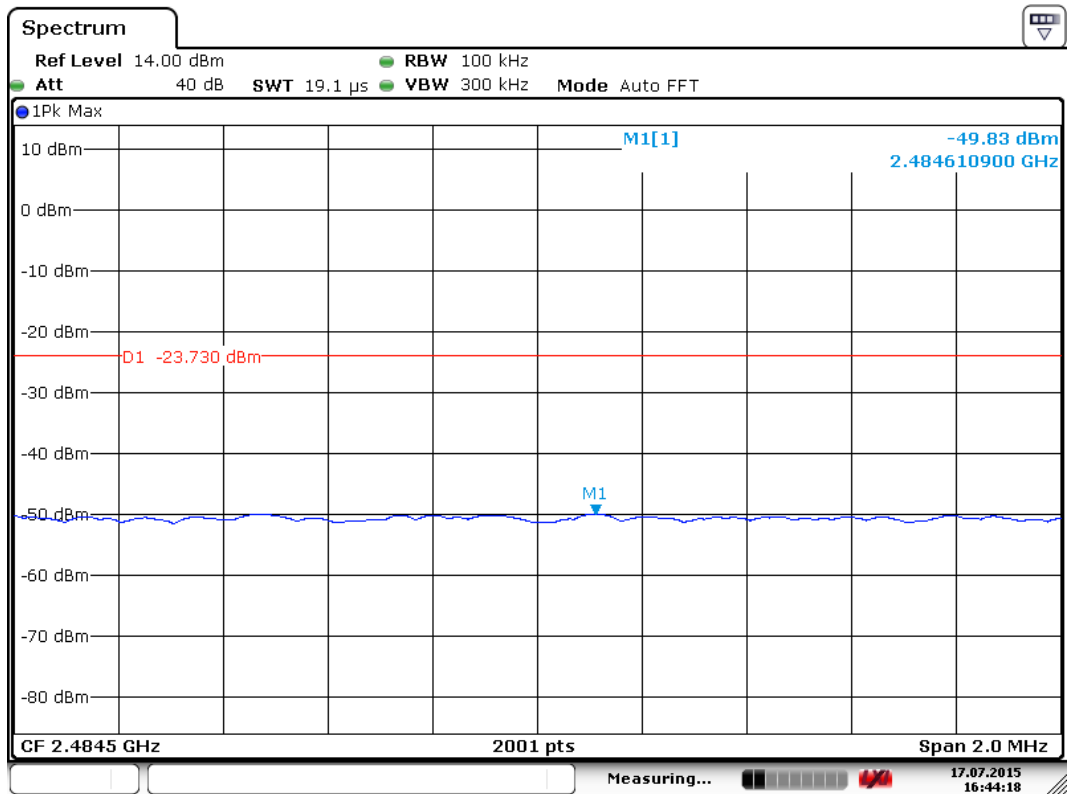
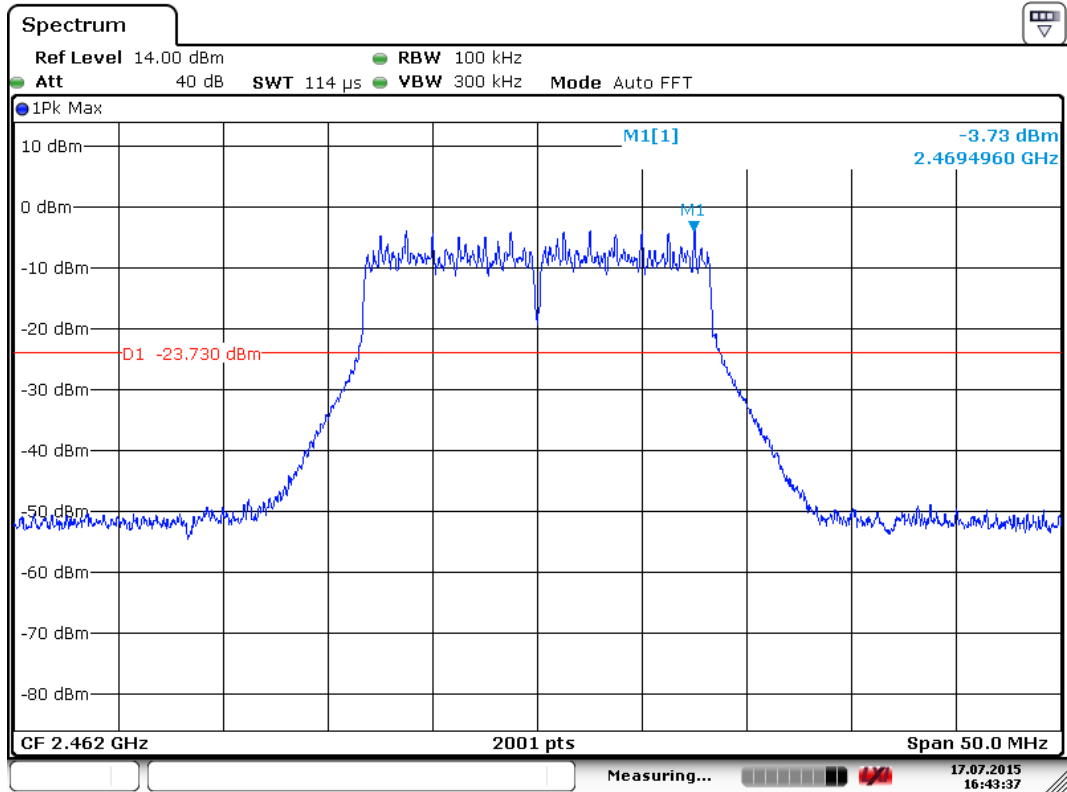
Date: 17 JUL.2015 16:38:34



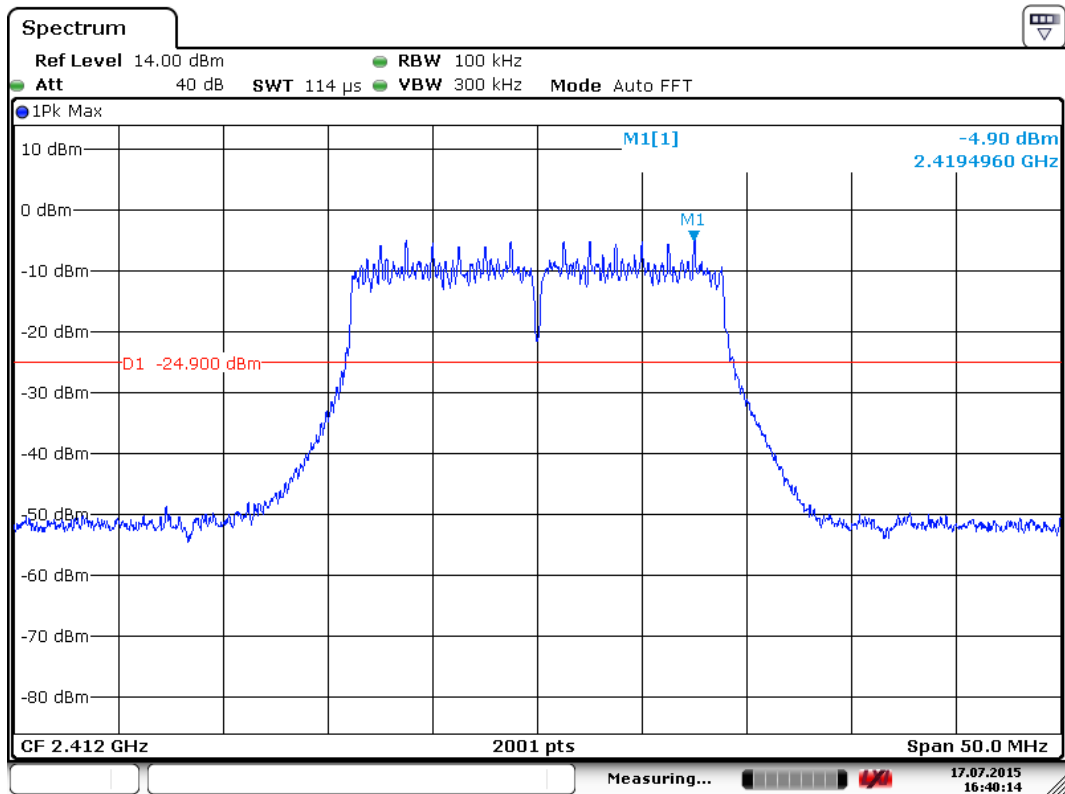
Date: 17 JUL.2015 16:39:00



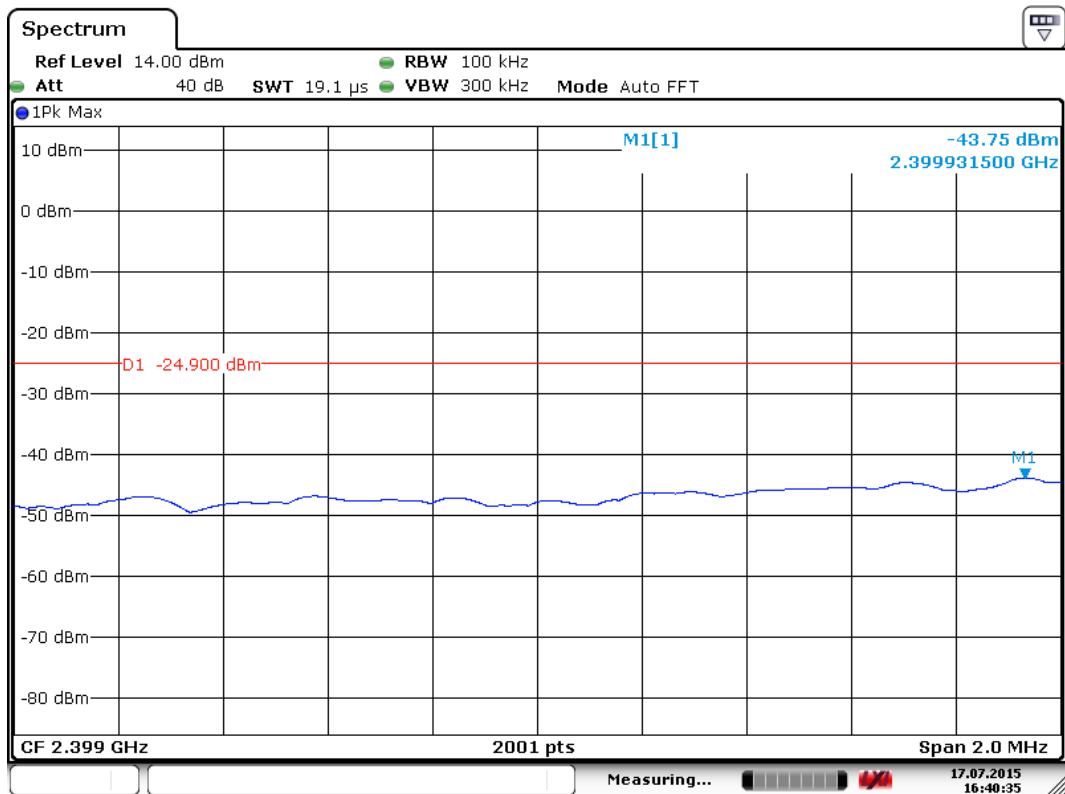
2462



802.11n(HT20)  
2412

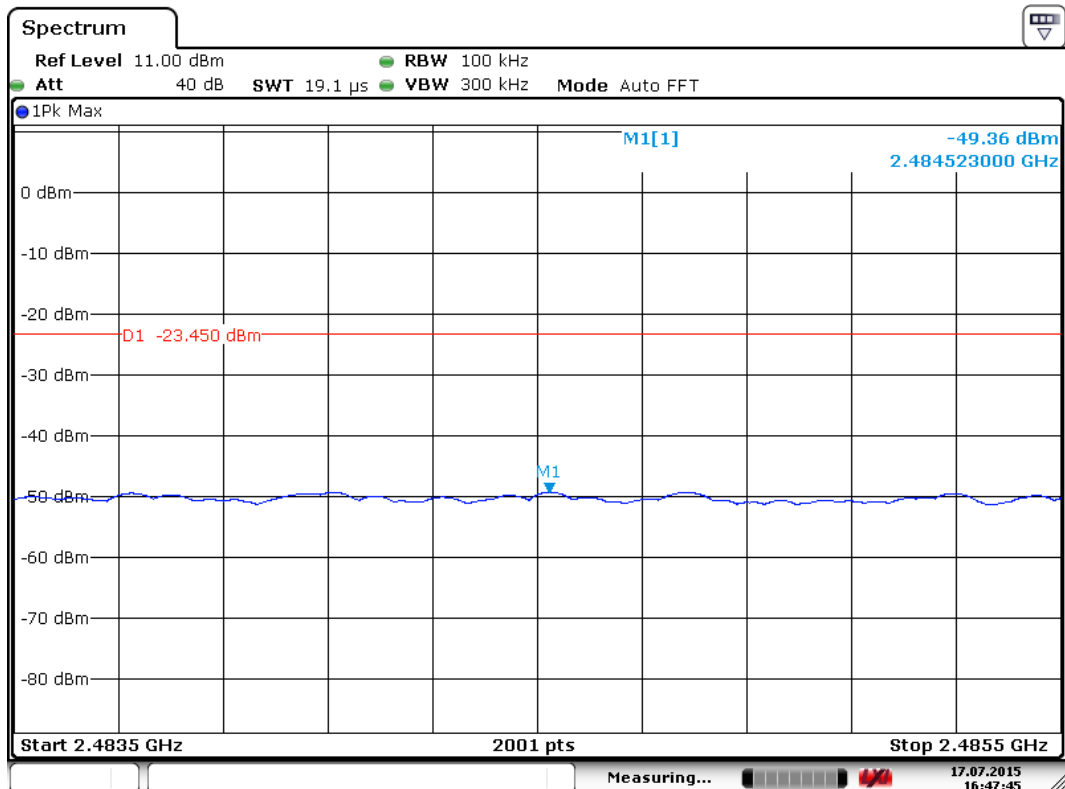
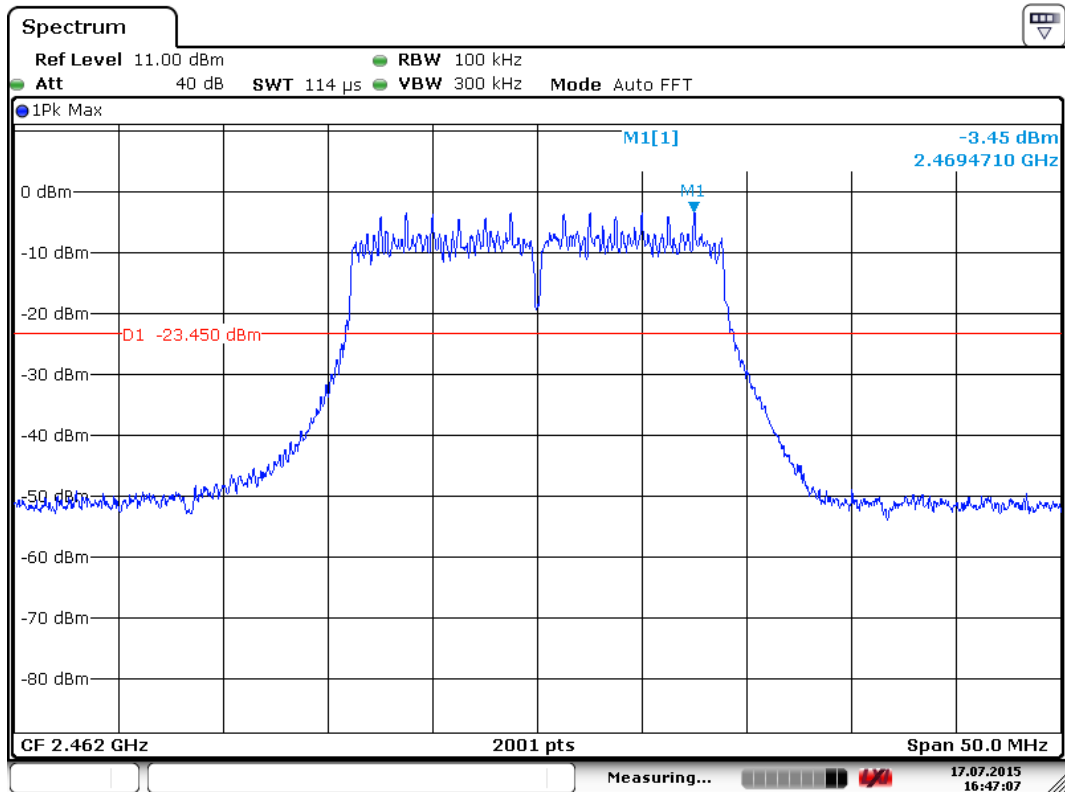


Date: 17 JUL 2015 16:40:14



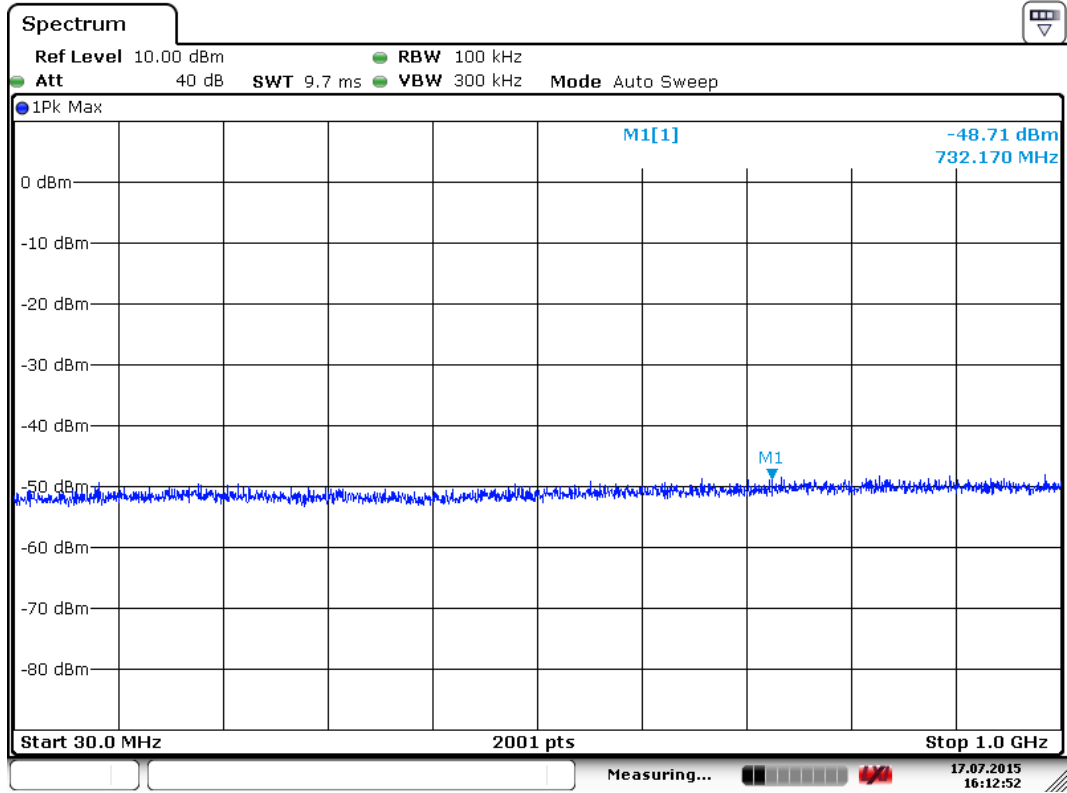
Date: 17 JUL 2015 16:40:36

2462

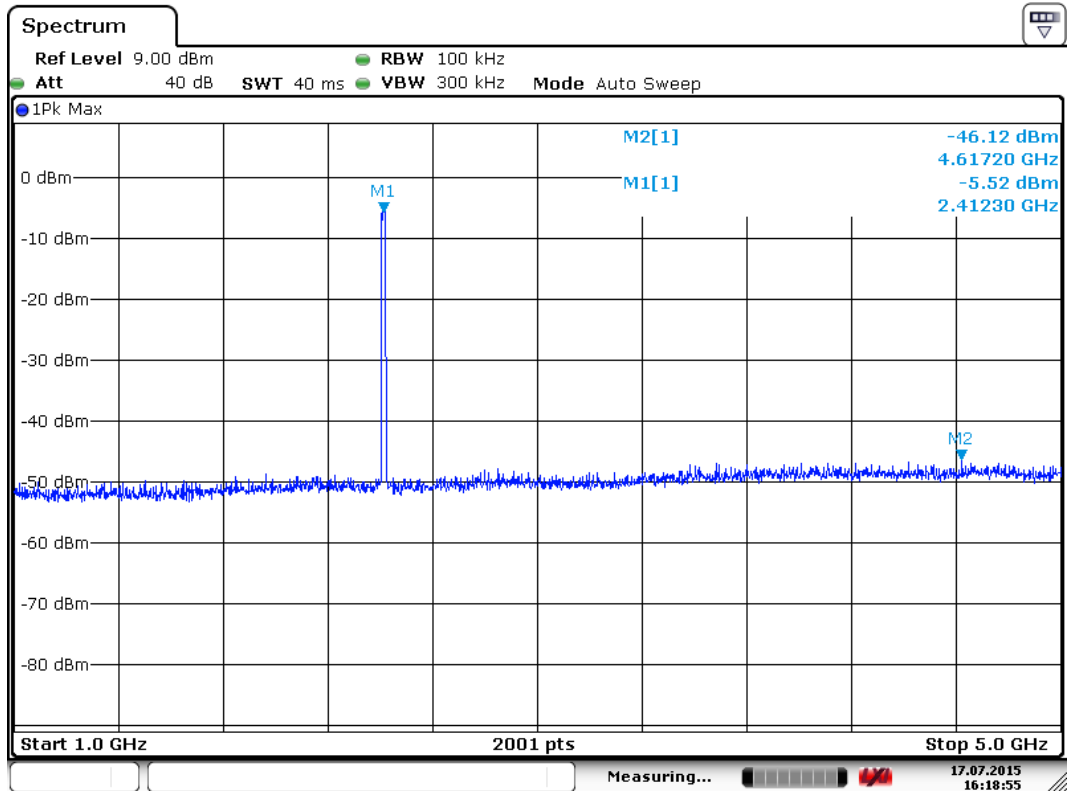


Compare with the output power of the lowest frequency, the Lower Edges attenuated more than 20dB  
 Compare with the output power of the highest frequency, the Upper Edges attenuated more than 20dB.

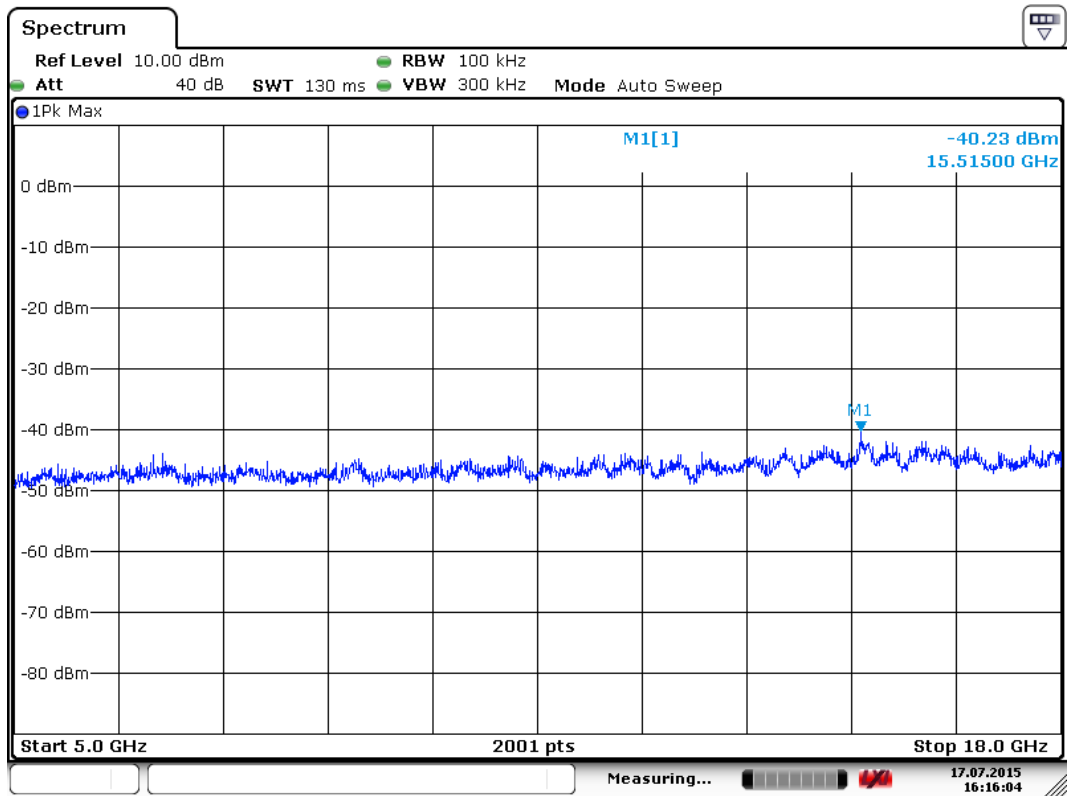
### 8.5.2 Conducted spurious emissions 802.11b 2412



Date: 17 JUL 2015 16:12:52

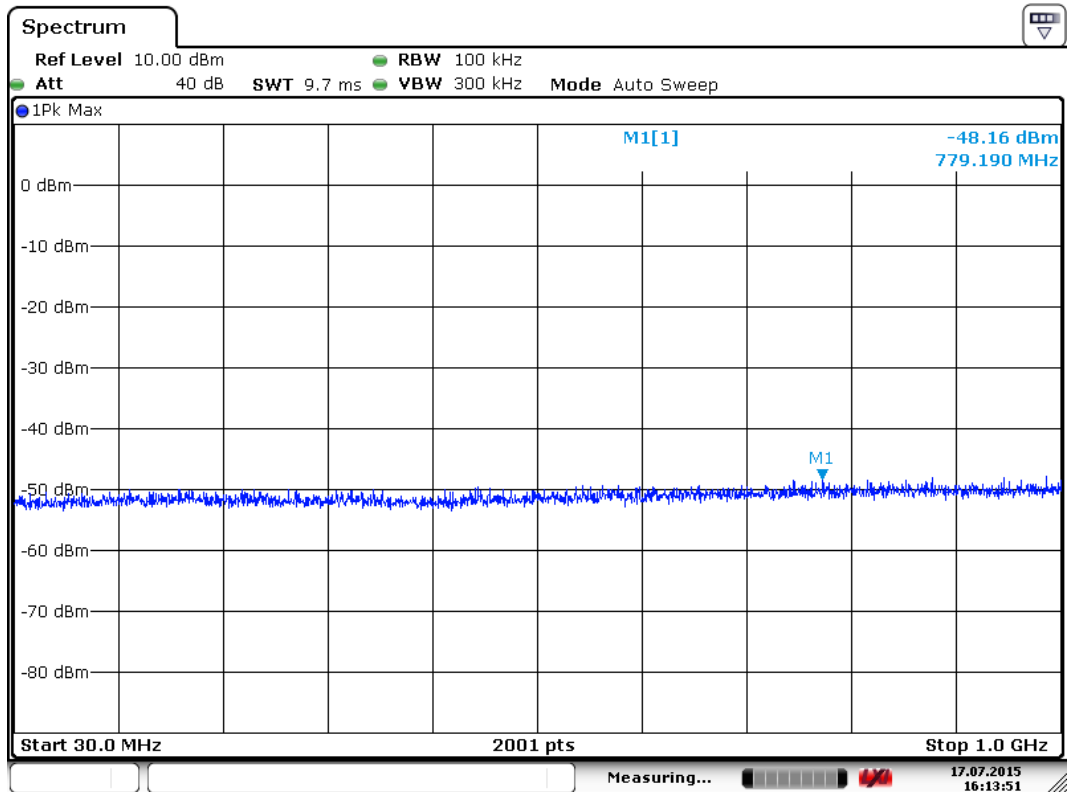


Date: 17 JUL 2015 16:18:54

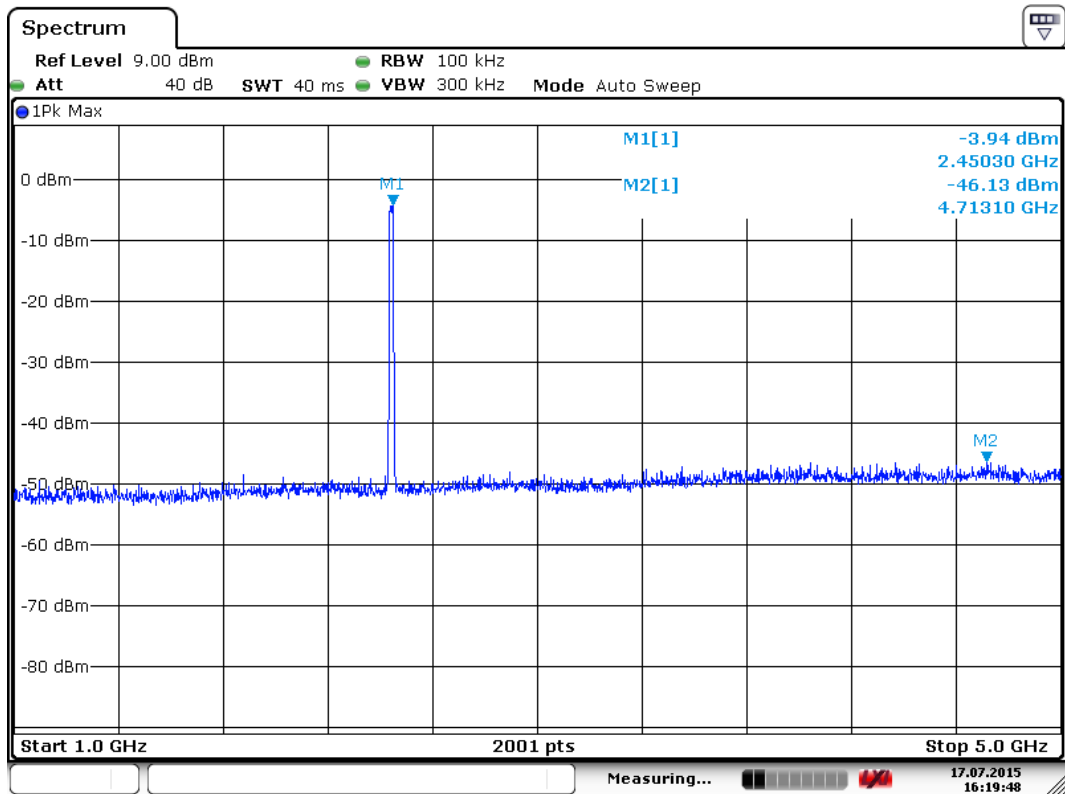


Date: 17 JUL 2015 16:16:05

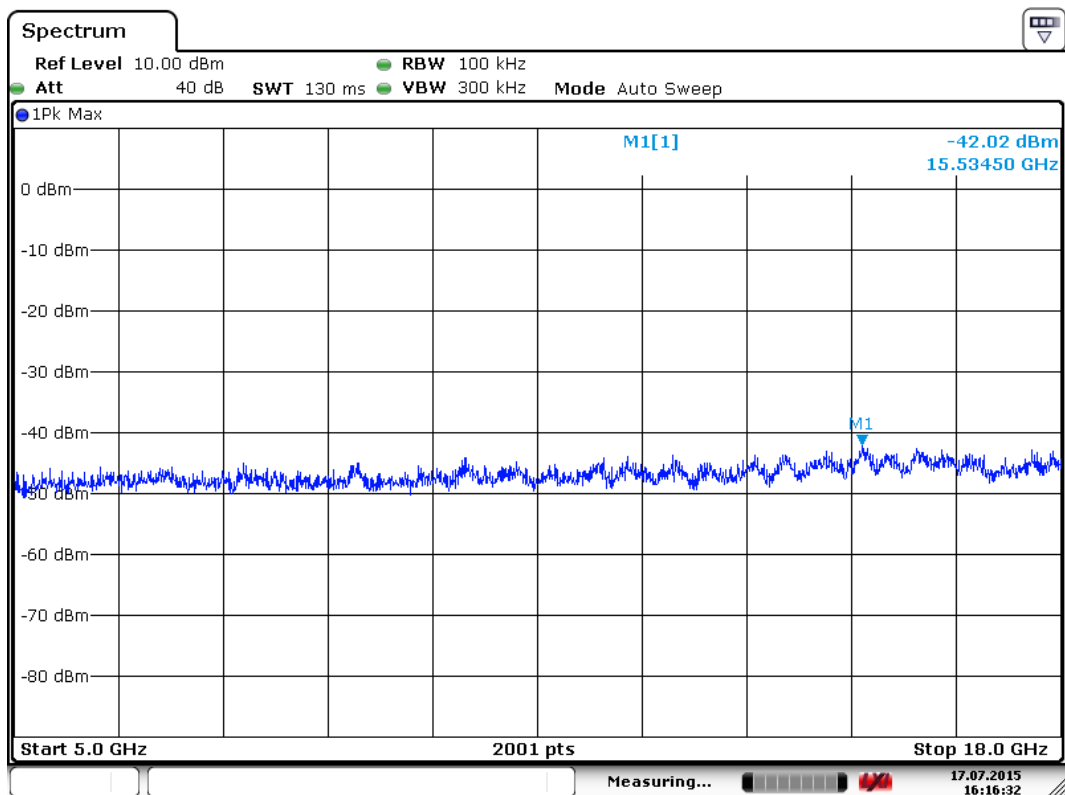
### 802.11b 2442



Date: 17 JUL 2015 16:13:51

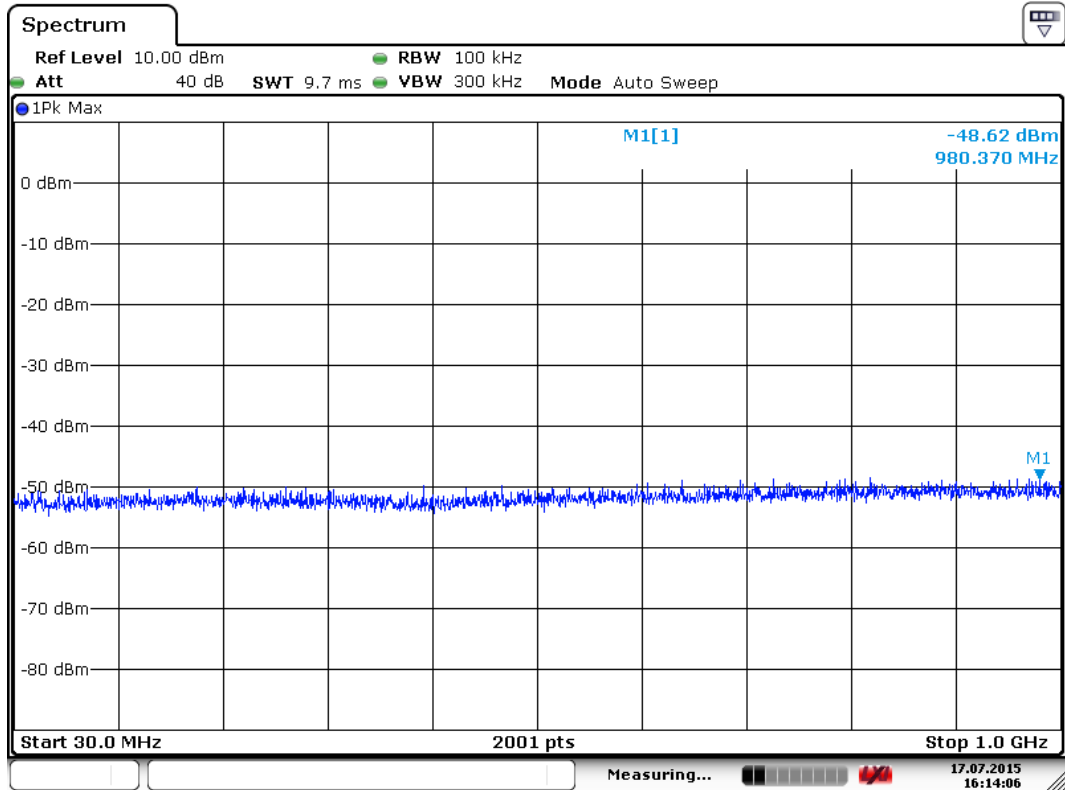


Date: 17 JUL.2015 16:19:48

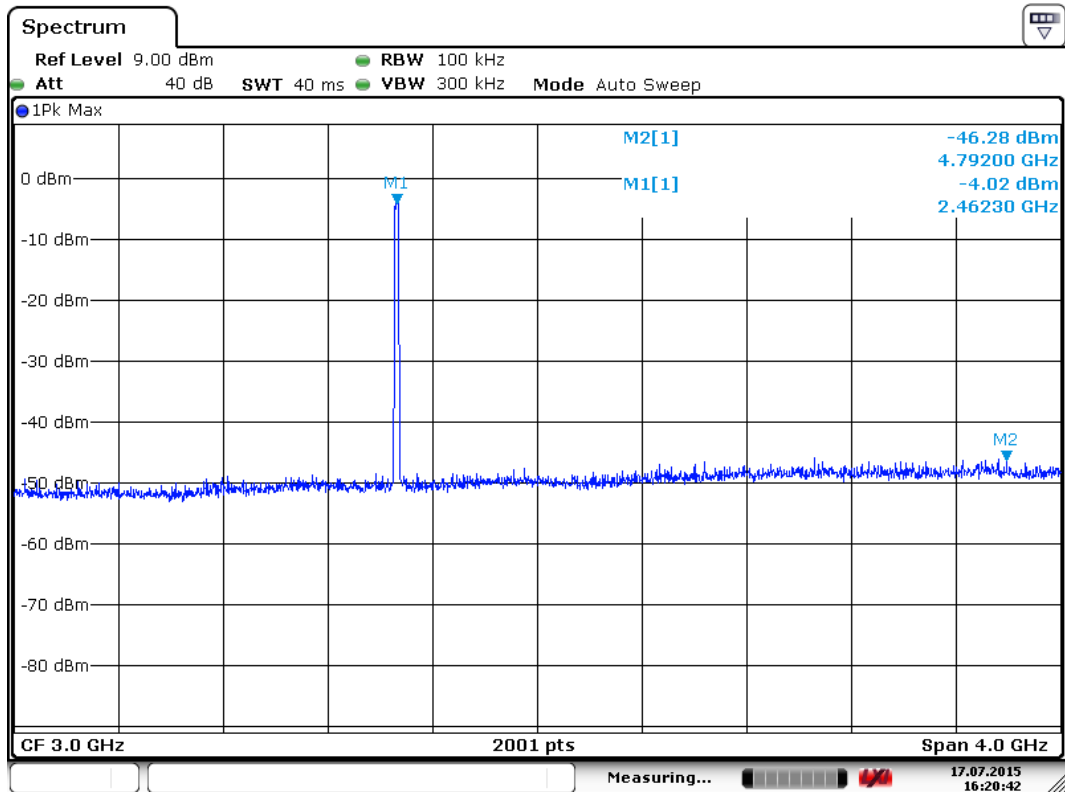


Date: 17 JUL.2015 16:16:32

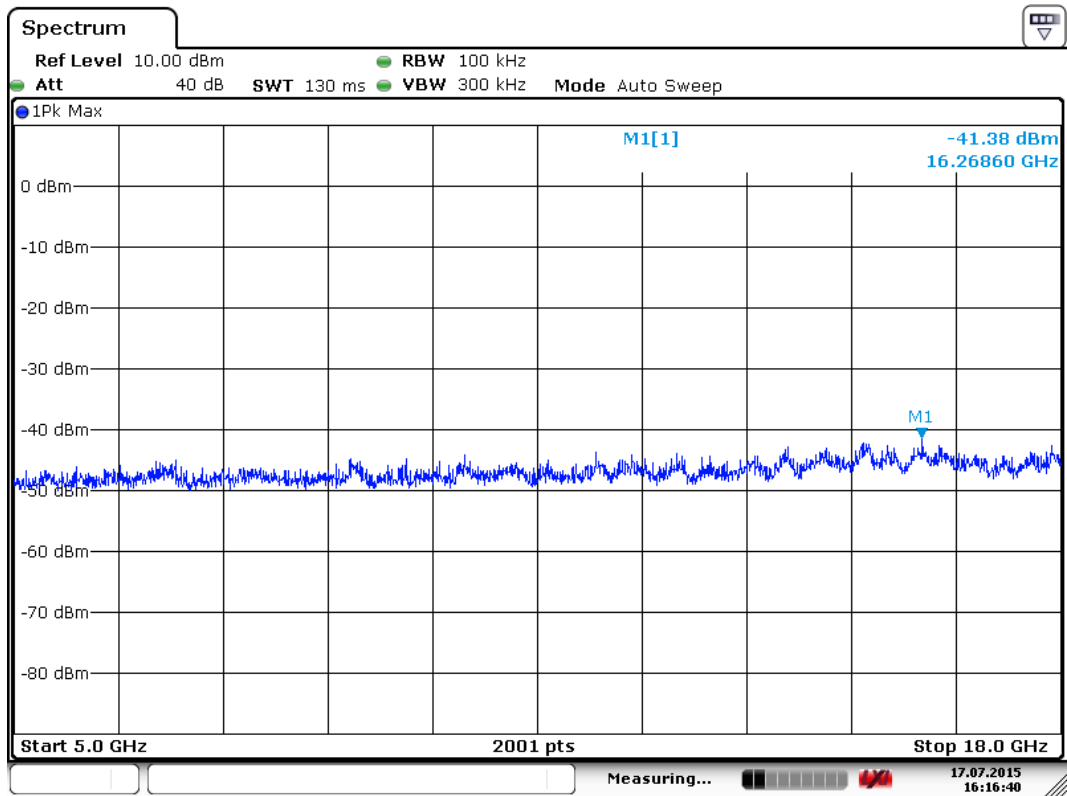
802.11b 2462



Date: 17 JUL 2015 16:14:06

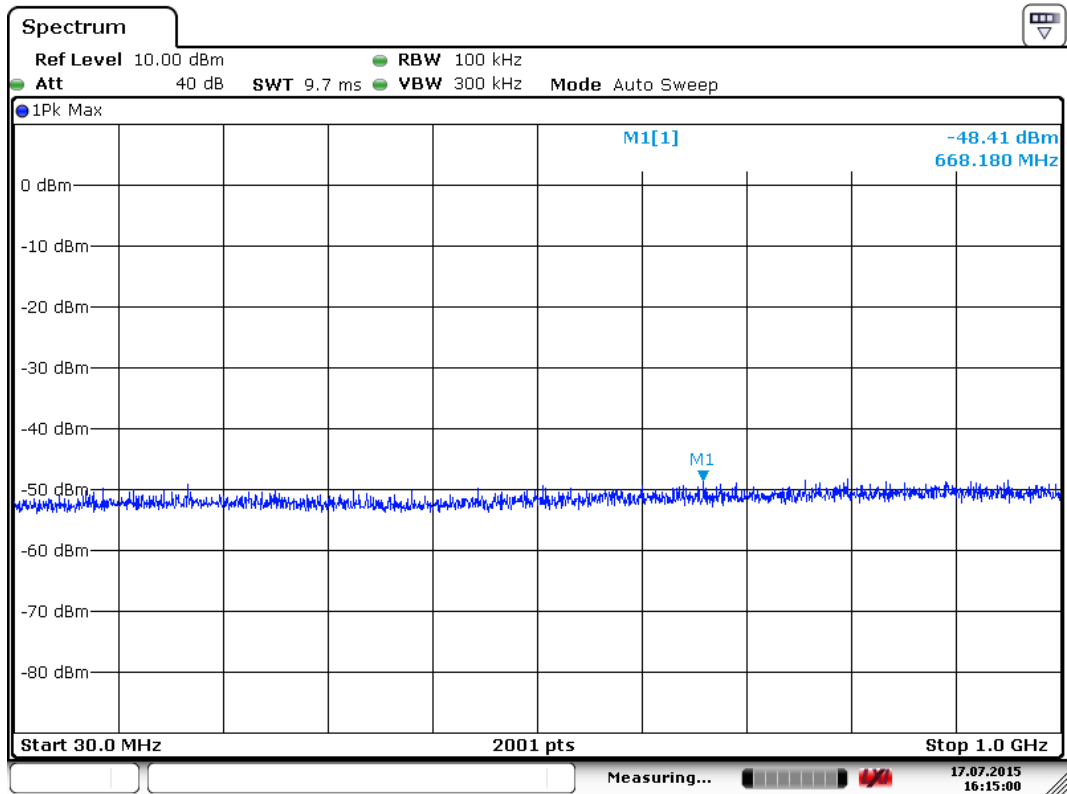


Date: 17 JUL 2015 16:20:42



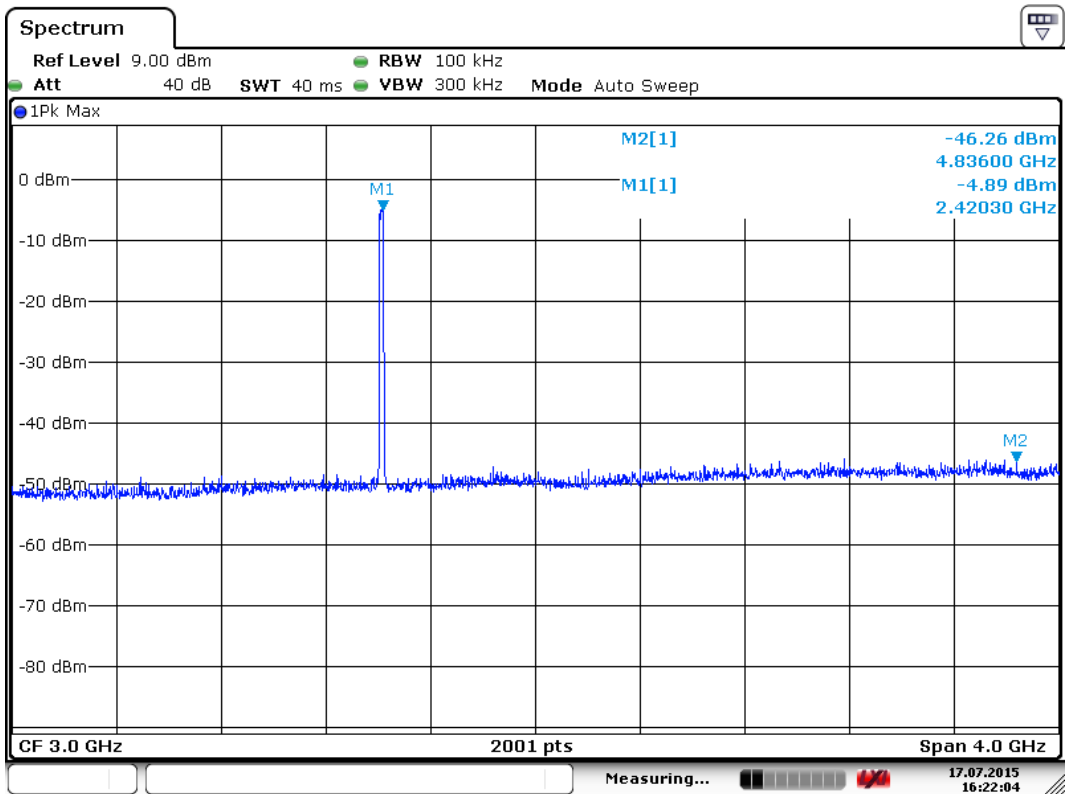
Date: 17 JUL 2015 16:16:40

### 802.11g 2412

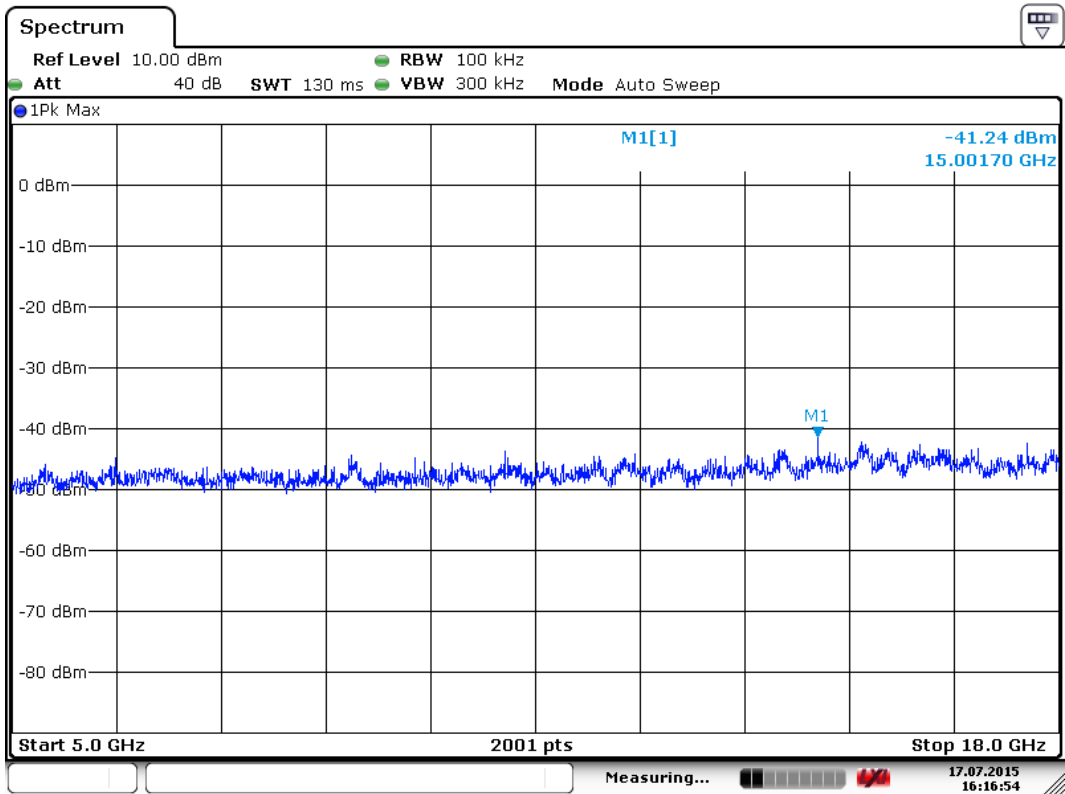


Date: 17 JUL 2015 16:15:00



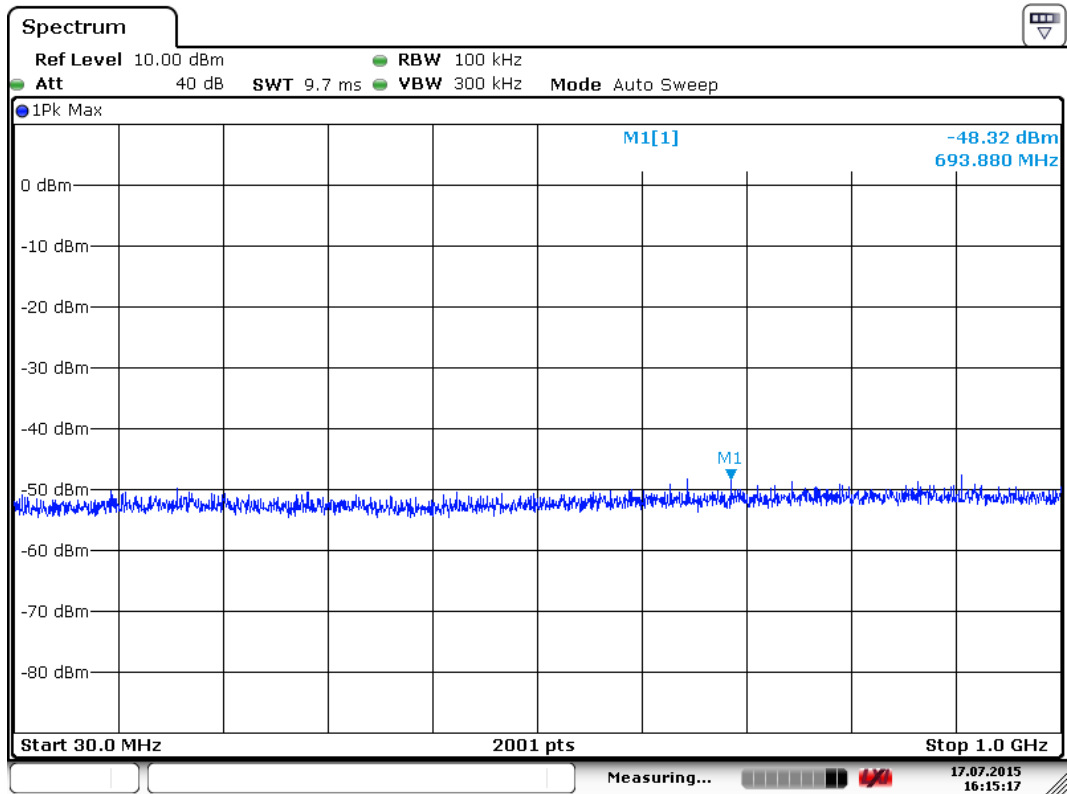


Date: 17 JUL 2015 16:22:04

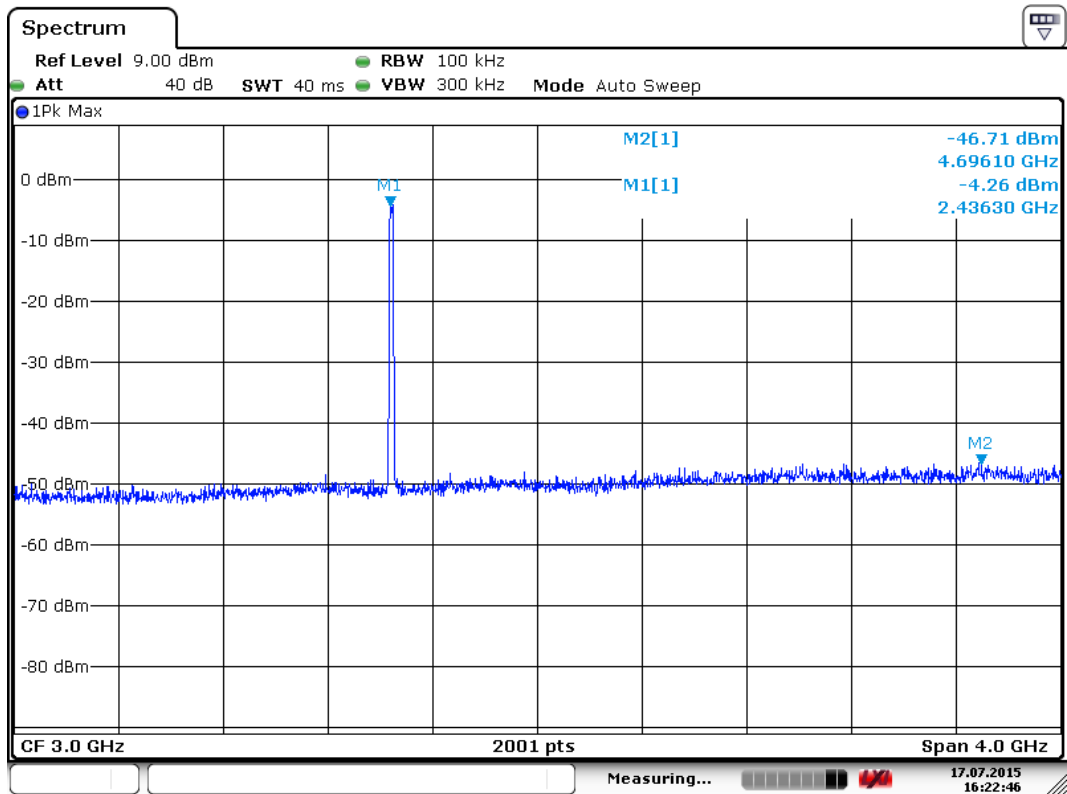


Date: 17 JUL 2015 16:16:54

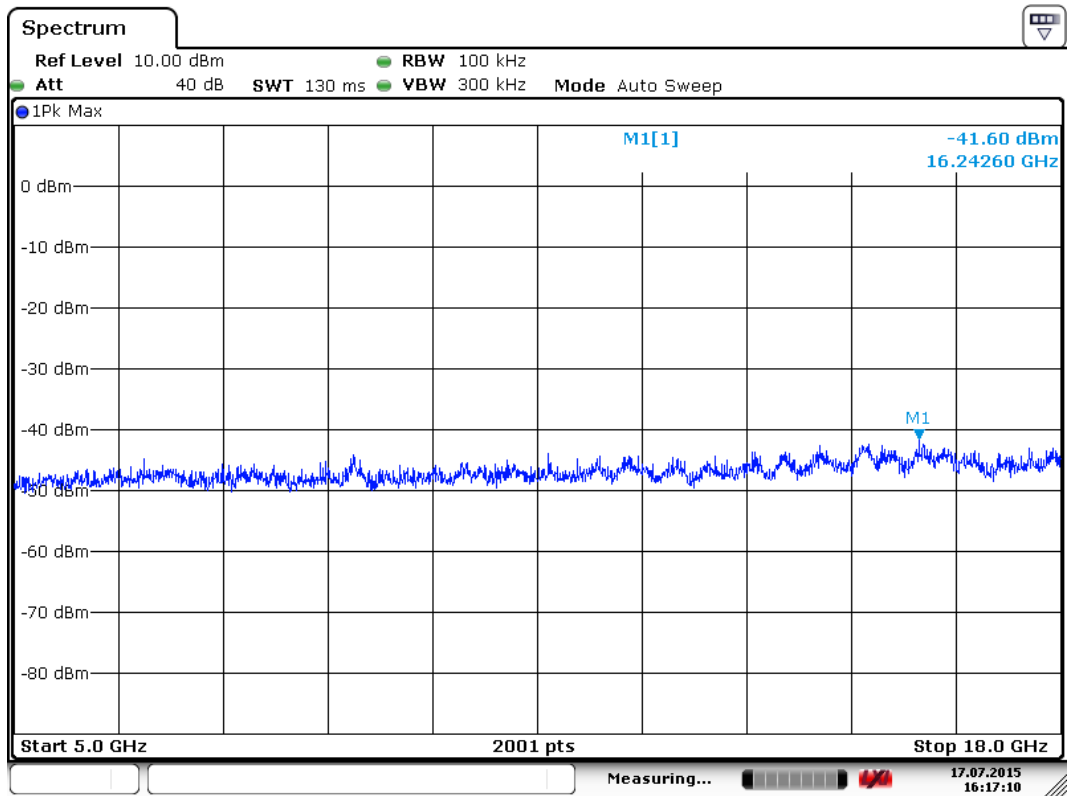
### 802.11g 2442



Date: 17 JUL 2015 16:15:16

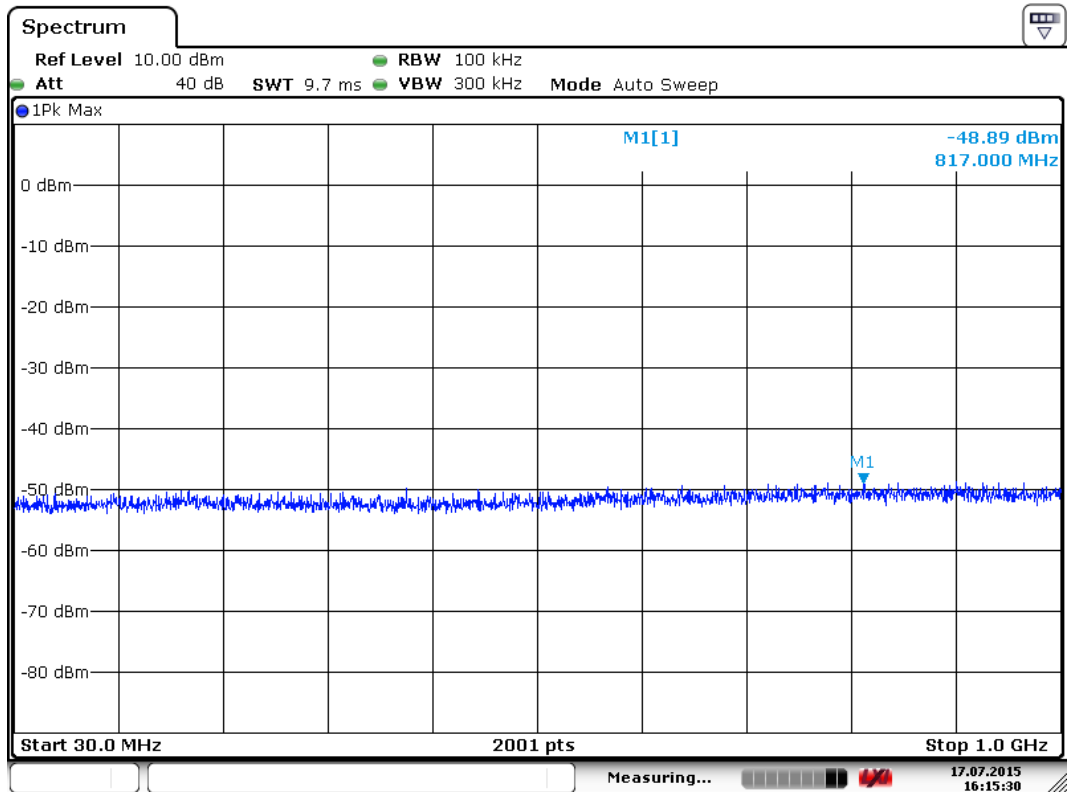


Date: 17 JUL 2015 16:22:45

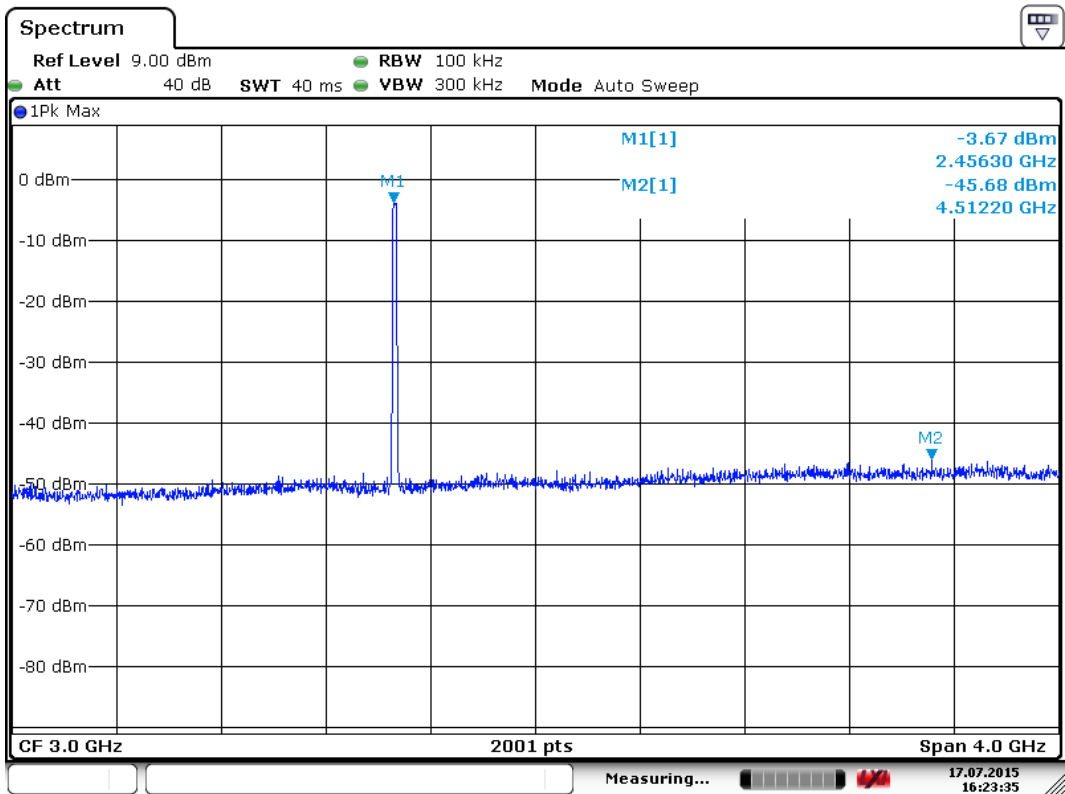


Date: 17 JUL 2015 16:17:10

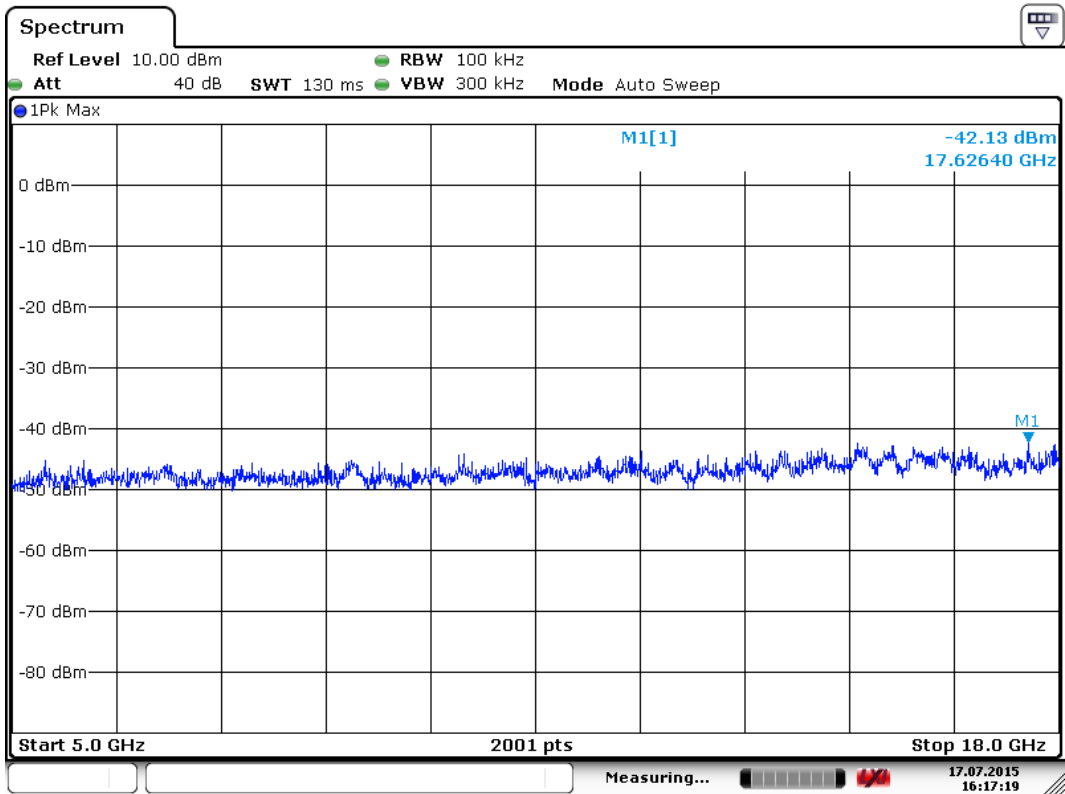
### 802.11g 2462



Date: 17 JUL 2015 16:15:30

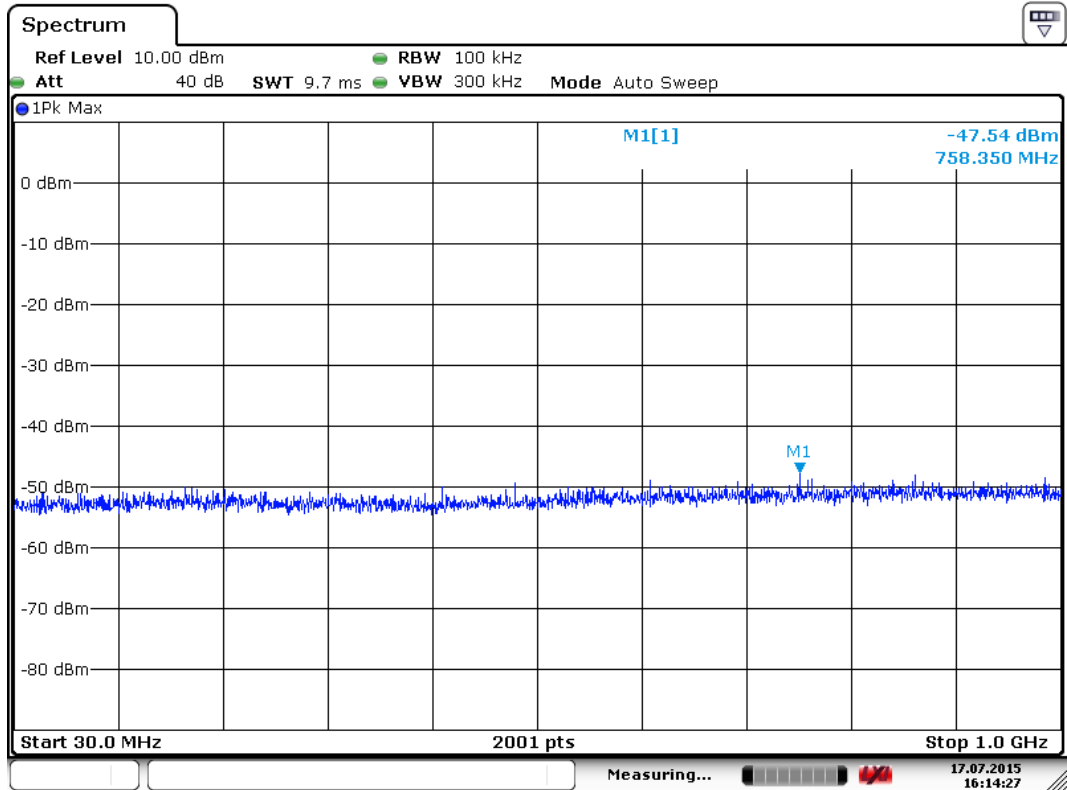


Date: 17 JUL 2015 16:23:36

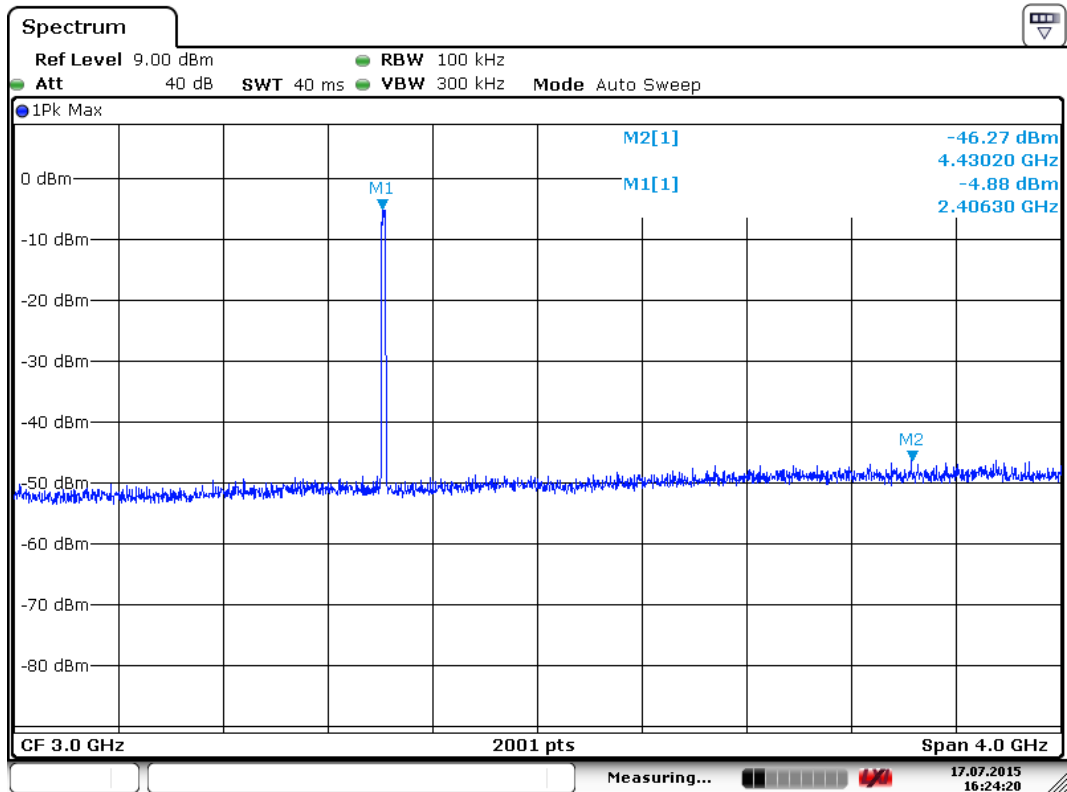


Date: 17 JUL 2015 16:17:19

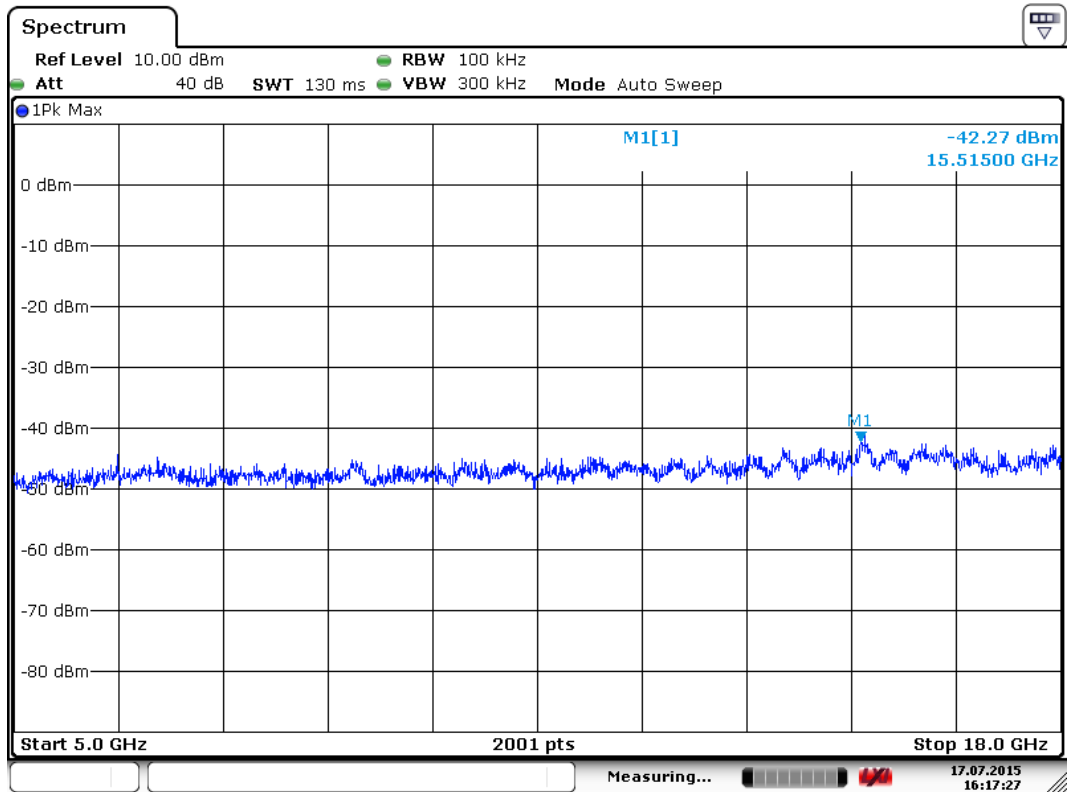
### 802.11n(HT20) 2412



Date: 17 JUL 2015 16:14:27

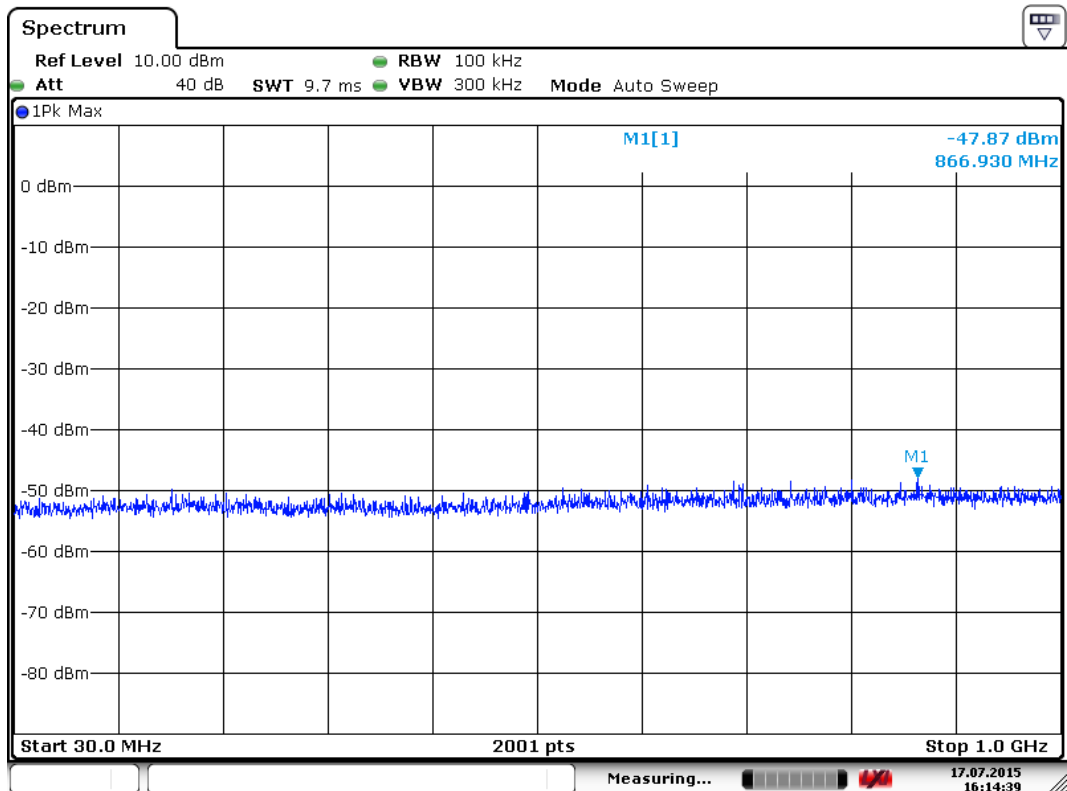


Date: 17 JUL 2015 16:24:20

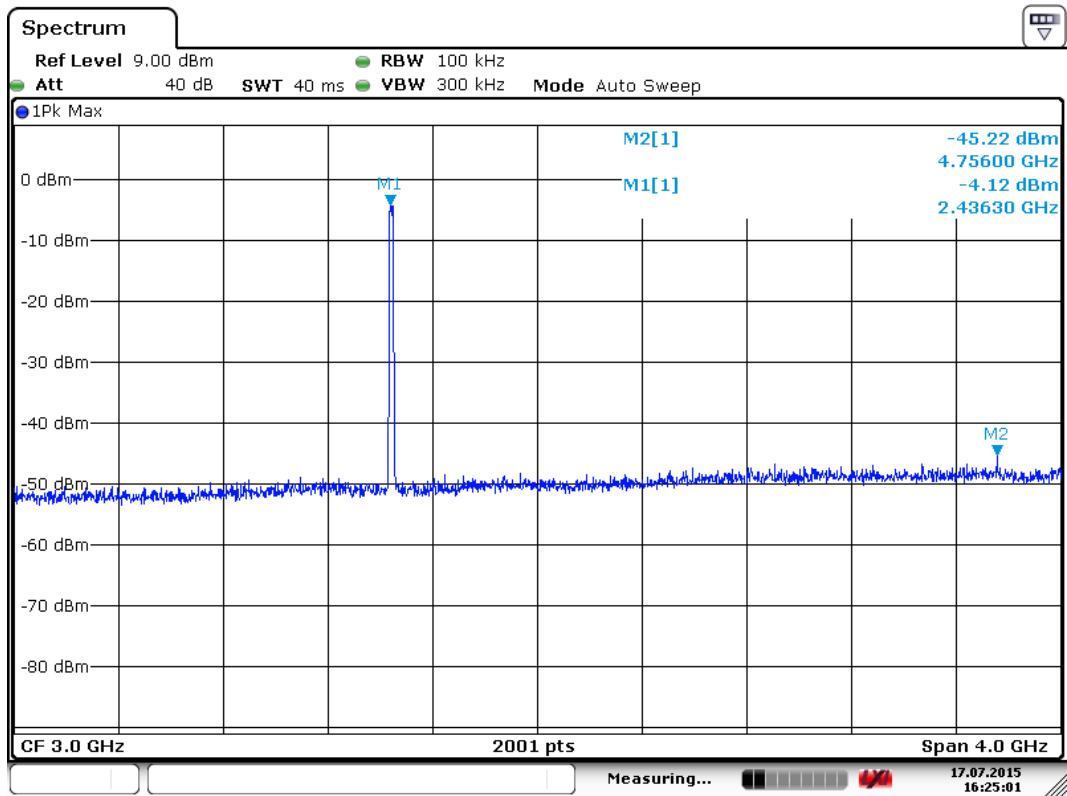


Date: 17 JUL 2015 16:17:28

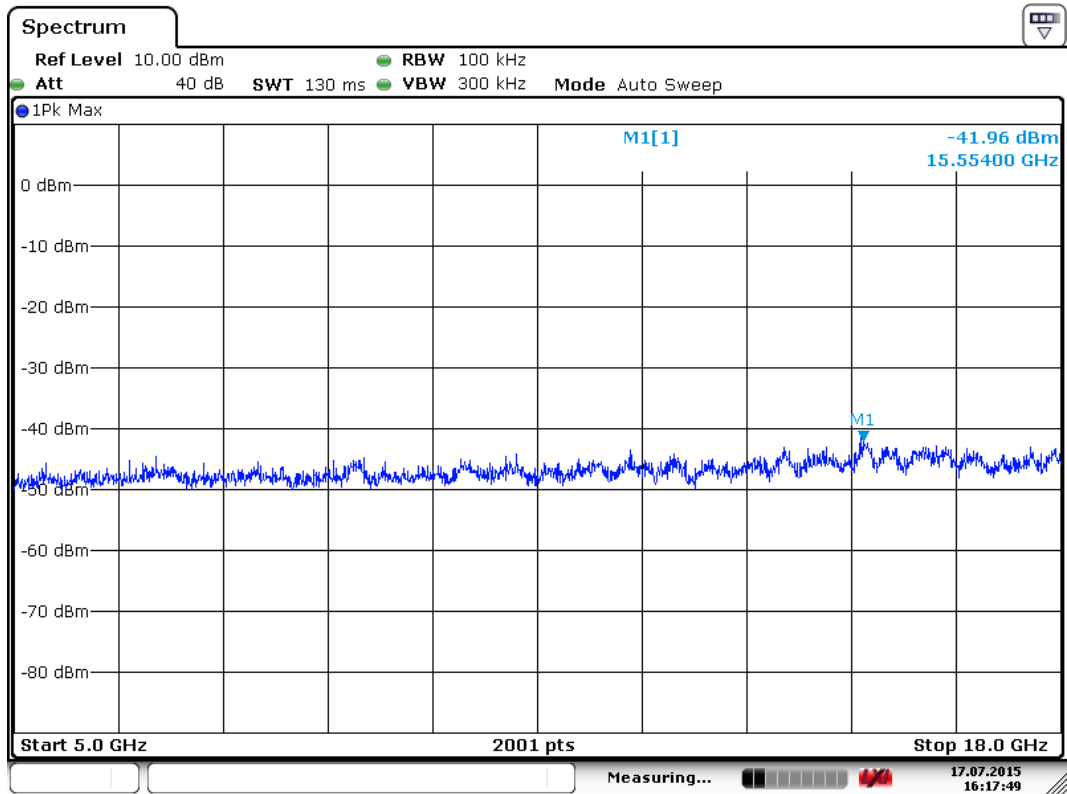
### 802.11n(HT20) 2442



Date: 17 JUL 2015 16:14:39

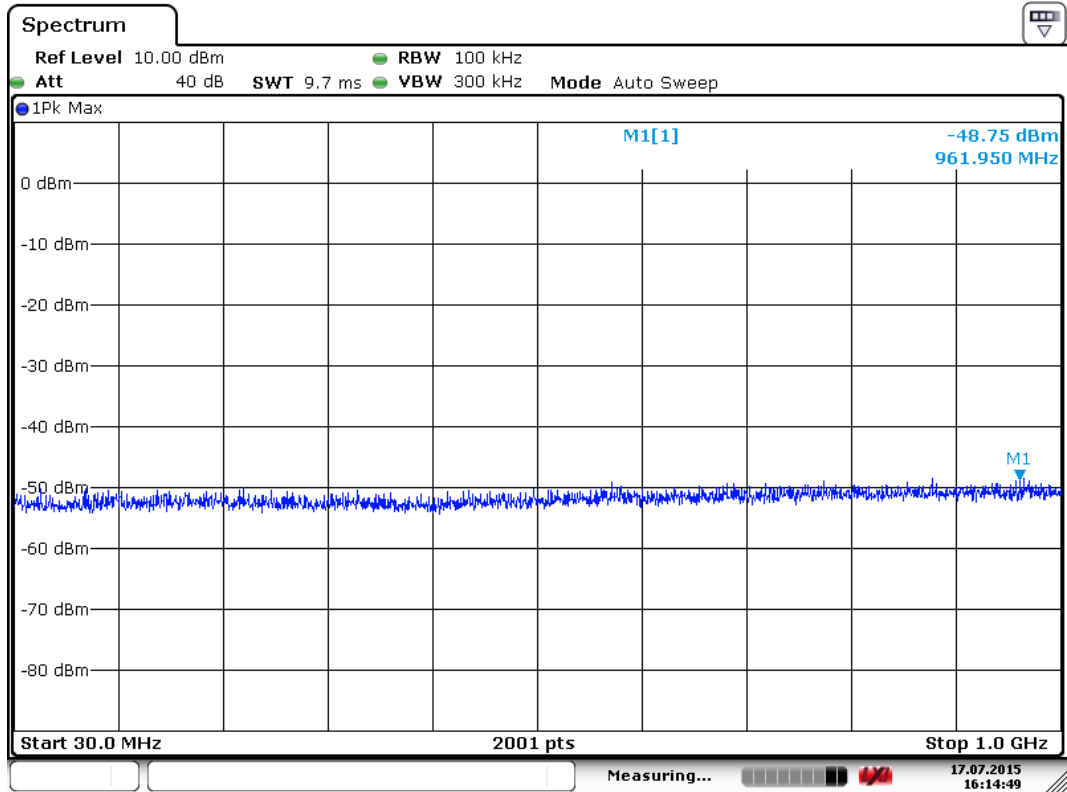


Date: 17 JUL 2015 16:25:01

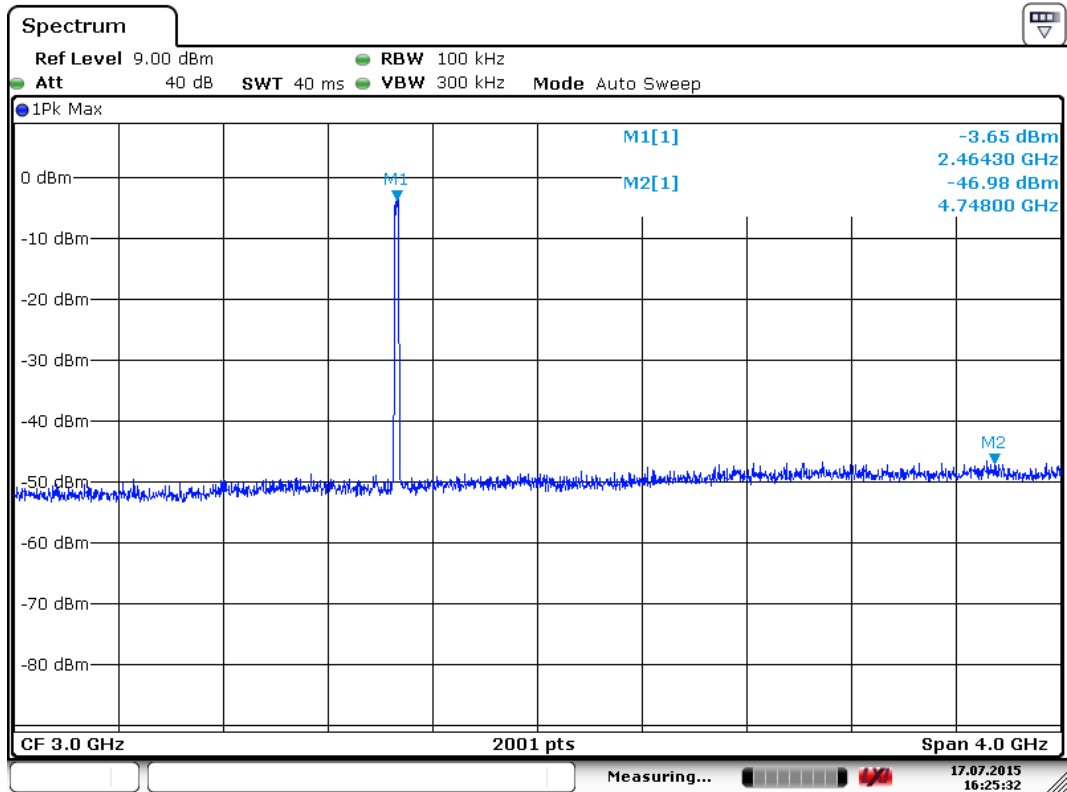


Date: 17 JUL 2015 16:17:49

802.11n(HT20) 2462

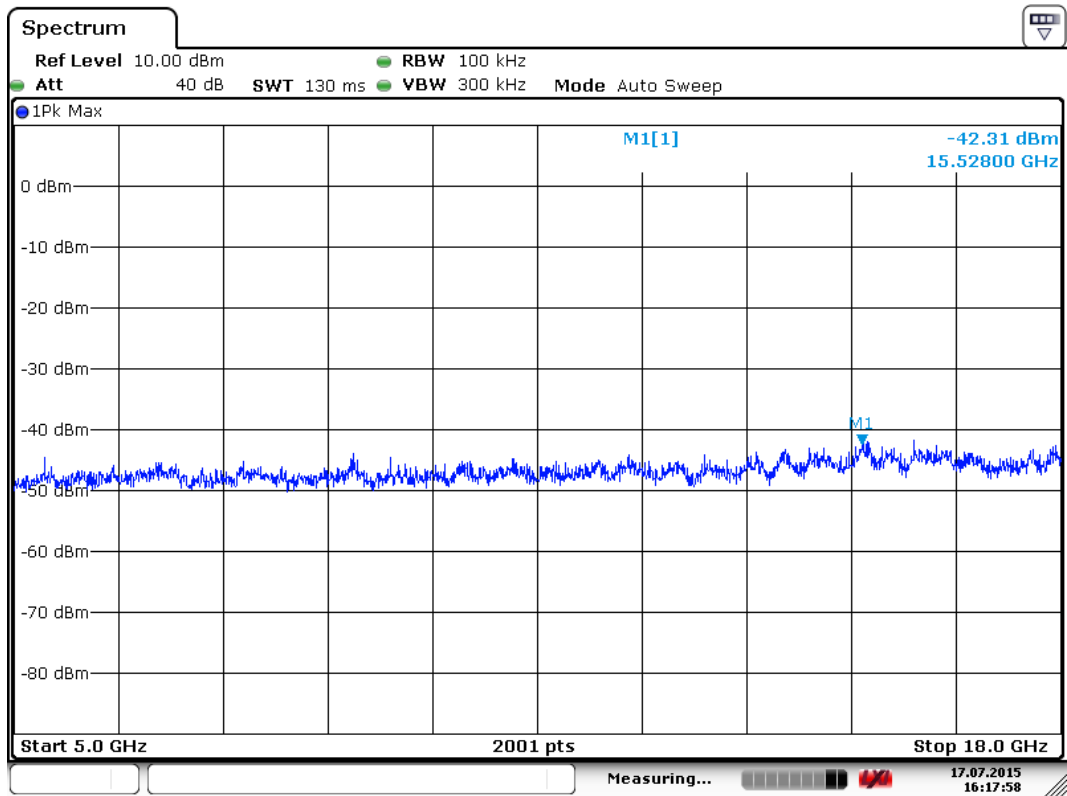


Date: 17 JUL 2015 16:14:49



Date: 17 JUL 2015 16:25:32





Date: 17 JUL 2015 16:17:58

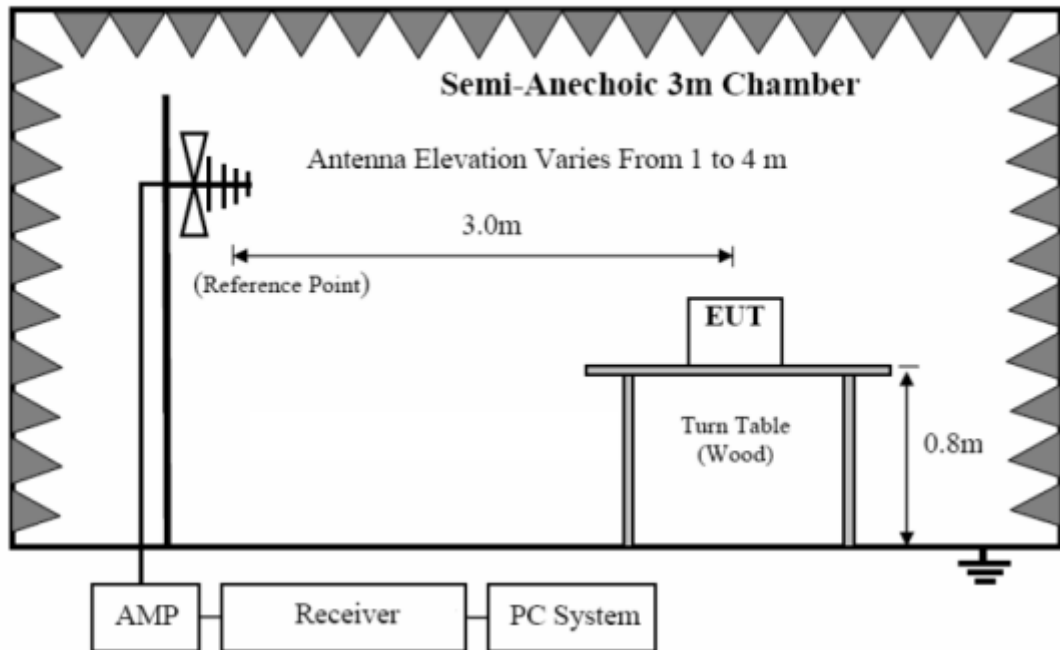
## 9 RADIATED EMISSION

### 9.1 Test equipment

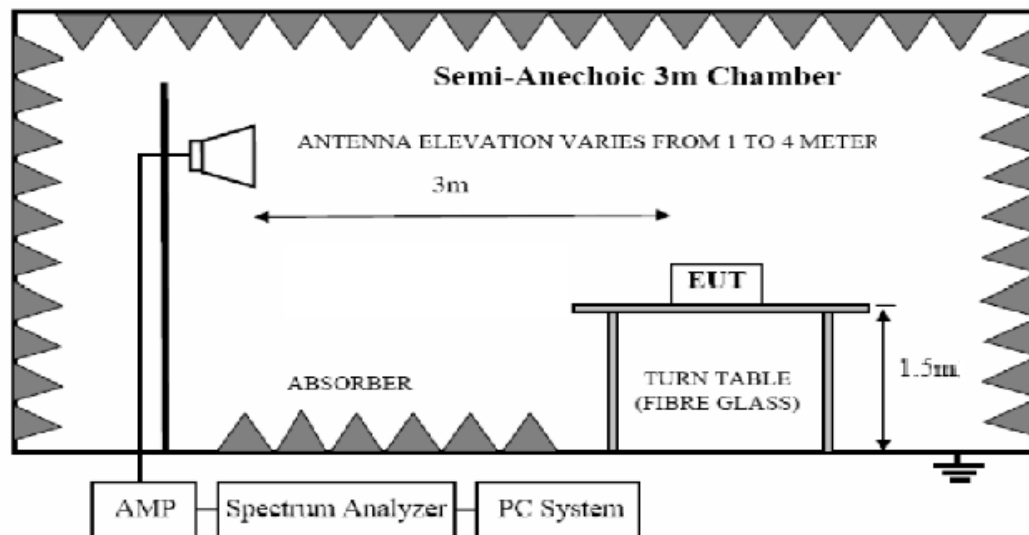
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	EMI Receiver	R&S	ESU8	100316	2014/11/26	1 Year
2	Spectrum analyzer	R&S	FSV40	SN101012	2014/09/11	1 Year
3	Loop Antenna	TESEQ	HLA6120	20129	2014/11/26	1 Year
4	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2014/11/26	1 Year
5	Double Ridged Horn Antenna	R&S	HF907	100276	2014/11/26	1 Year
6	Horn Antenna	EMCO	3116	00060095	2014/11/26	1 Year
7	Pre-Amplifier	R&S	SCU-01	10049	2014/11/26	1 Year
8	Pre-Amplifier	A.H.	PAM0-0118	360	2014/11/26	1 Year
9	Pre-Amplifier	A.H.	PAM-1840VH	562	2014/11/26	1 Year
10	RF Cable	R&S	R01	10403	2014/11/26	1 Year
11	RF Cable	R&S	R02	10512	2014/11/26	1 Year
12	Notch filter	EM electronics corp	BRM50701	S/N-037	2014/11/26	1 Year

## 9.2 Block diagram of test setup

In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

### 9.3 Limits

#### 9.3.1 FCC 15.205 restricted frequency band

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )

#### 9.3.2 FCC 15.209 limit

Frequency (MHz)	Distance (m)	Field Strength Limit	
		uV/m	dB(uV)/m
30 – 88	3	100	40,0
88 – 216	3	150	43,5
216 – 960	3	200	46,0
960 – 1000	3	500	54,0
Above 1000	3	74,0 dB(uV)/m for Peak 54,0 dB(uV)/m for Average	

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20 dB below the fundamental emissions, or comply with 15.209 limits.

Note1: For 802.11g/n HT20 mode in modulation type, and based exploratory test, there is no significant difference of 802.11b test result of the radiated emission below 1G. Compliance test in continuous transmitting mode with 802.11b as the worst case was found. Hence, the test (Harmonic and other spurious emissions below 1G) was performed 802.11b only.

Note2: In order to protect the instrument, the notch filter (stop band from 2400MHz to 2500MHz) is used in the test (Harmonic and other spurious emissions above 1G).

Note3: Pre-Scan has been conducted to determine the worst-case mode from Antenna 1 and Antenna 2. Compliance test in continuous transmitting mode with Antenna 1 as the worst case was found.

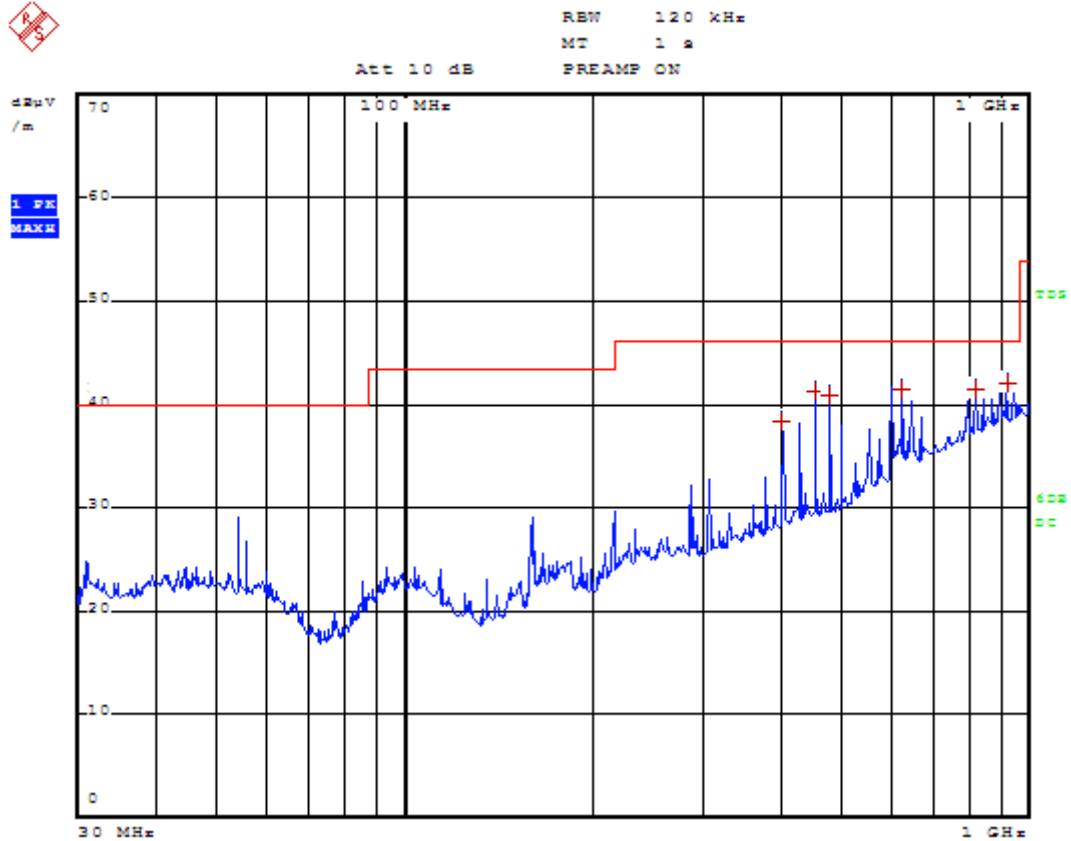
### 9.4 Harmonic and other spurious emissions

Test result:

Below 1G

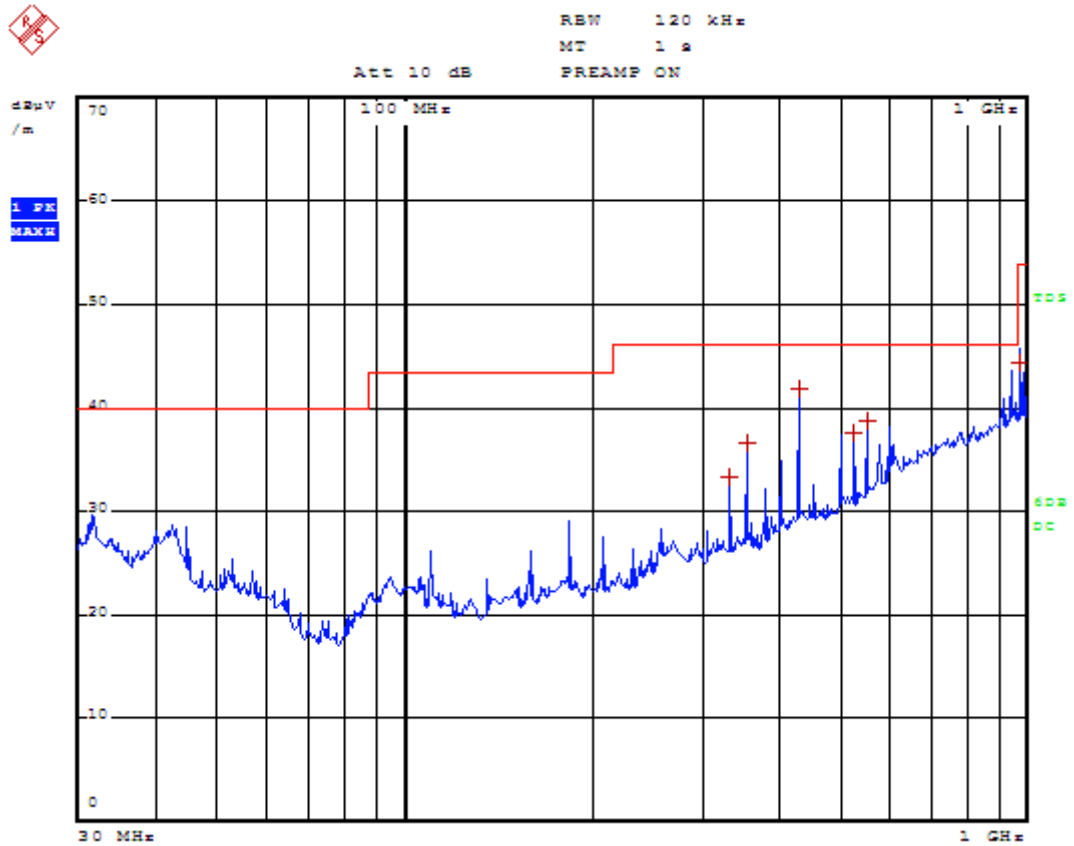
2412MHz

Horizontal:



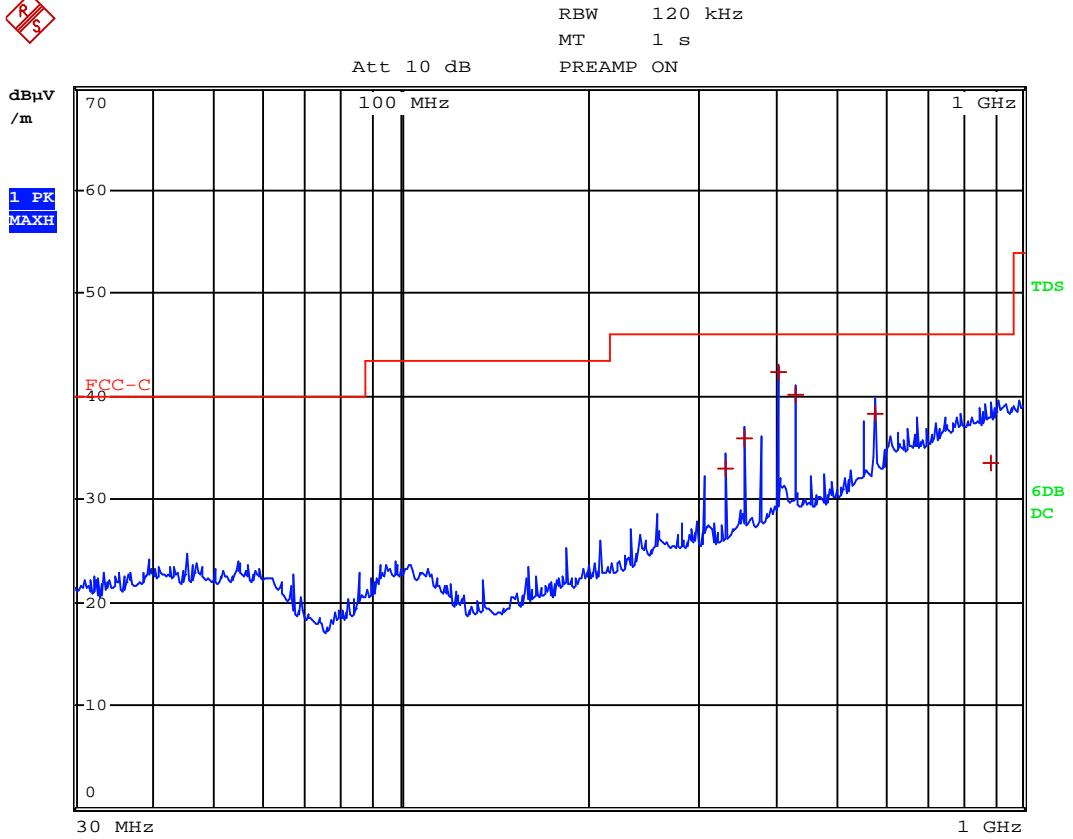
Trace	Frequency(MHz)	Level (dBµV/m)	Margin(dB)
QP	400.22	36.23	-9.77
QP	450.12	41.05	-4.95
QP	472.64	40.49	-5.51
QP	614.87	40.21	-5.79
QP	811.19	39.70	-6.3
QP	912.65	40.65	-5.35

Vertical:



Trace	Frequency(MHz)	Level (dBµV/m)	Margin(dB)
QP	328.25	32.23	-13.77
QP	350.34	37.05	-8.95
QP	430.34	41.73	-4.27
QP	514.86	36.21	-9.79
QP	531.14	38.70	-7.3
QP	970.76	44.35	-9.65

2442MHz  
Horizontal:



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC-C		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	405.52 MHz	42.31	-3.68
1 Quasi Peak	430.08 MHz	40.13	-5.86
1 Quasi Peak	577.52 MHz	38.37	-7.63
1 Quasi Peak	356.36 MHz	35.99	-10.00
1 Quasi Peak	890.6 MHz	33.61	-12.38
1 Quasi Peak	331.8 MHz	32.89	-13.10

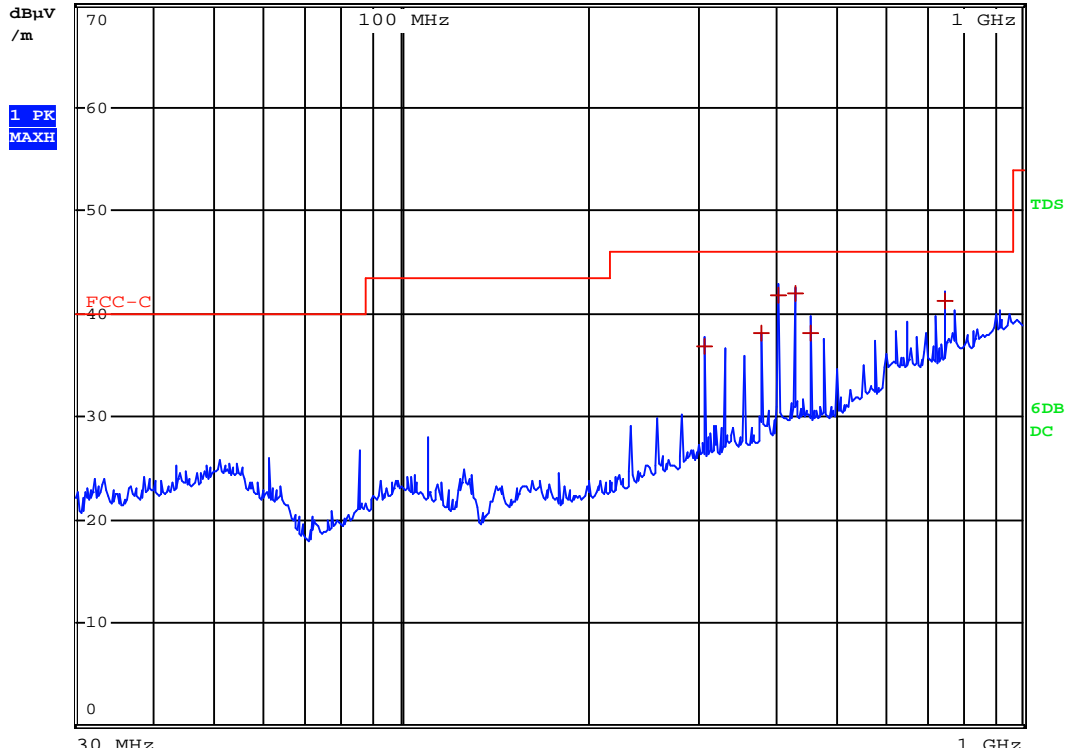


Vertical:



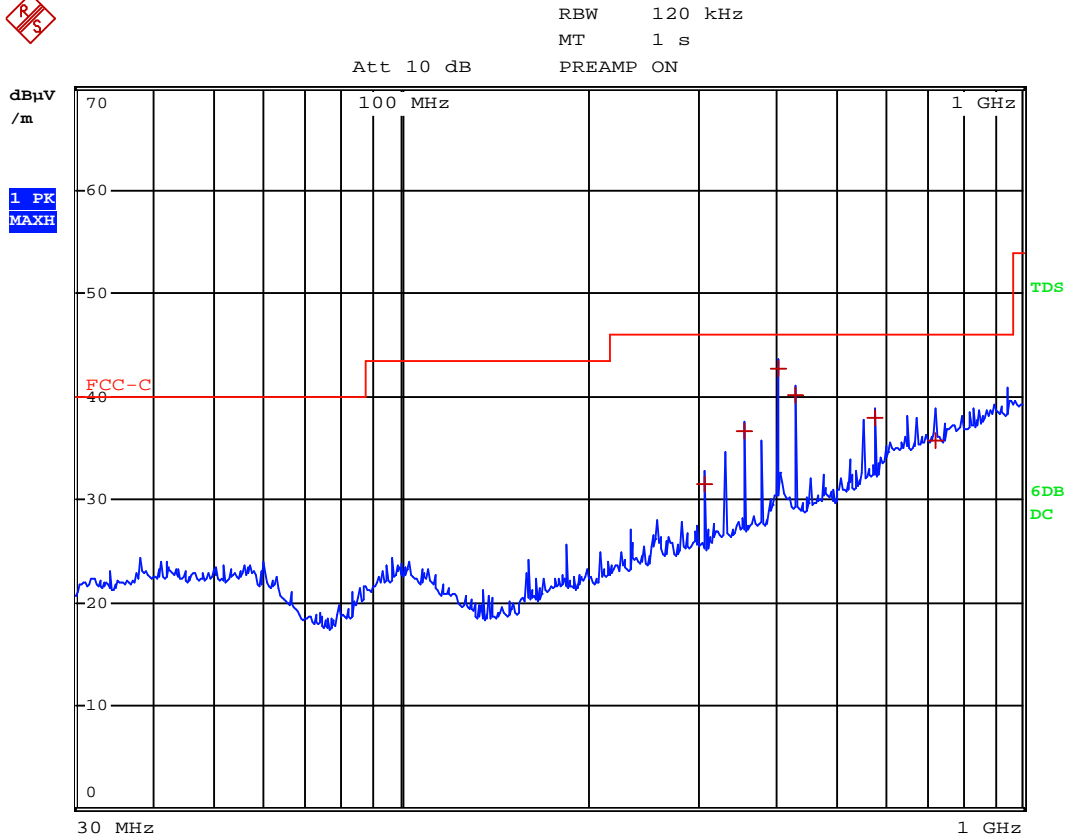
RBW 120 kHz  
MT 1 s  
PREAMP ON

Att 10 dB



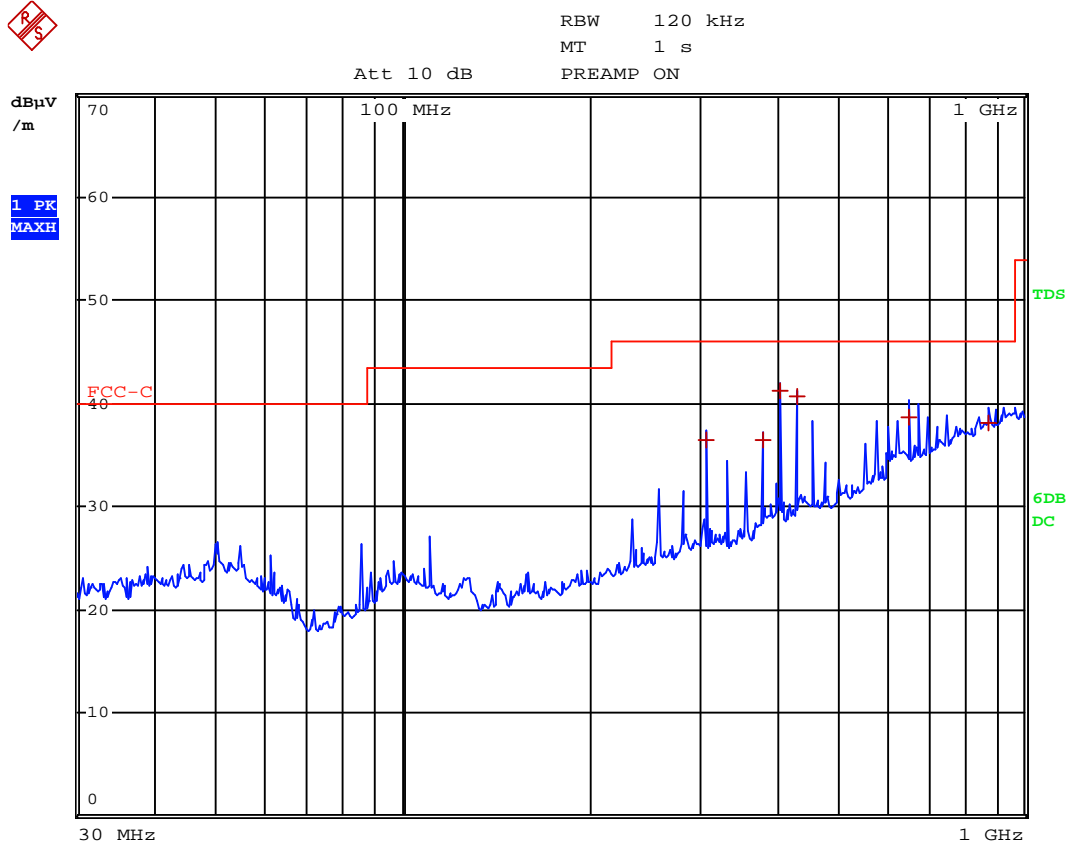
EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC-C		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	430.08 MHz	41.98	-4.01
1 Quasi Peak	405.52 MHz	41.82	-4.17
1 Quasi Peak	749.56 MHz	41.28	-4.71
1 Quasi Peak	454.68 MHz	38.18	-7.81
1 Quasi Peak	380.92 MHz	38.15	-7.84
1 Quasi Peak	307.2 MHz	36.88	-9.11

2462MHz  
Horizontal:



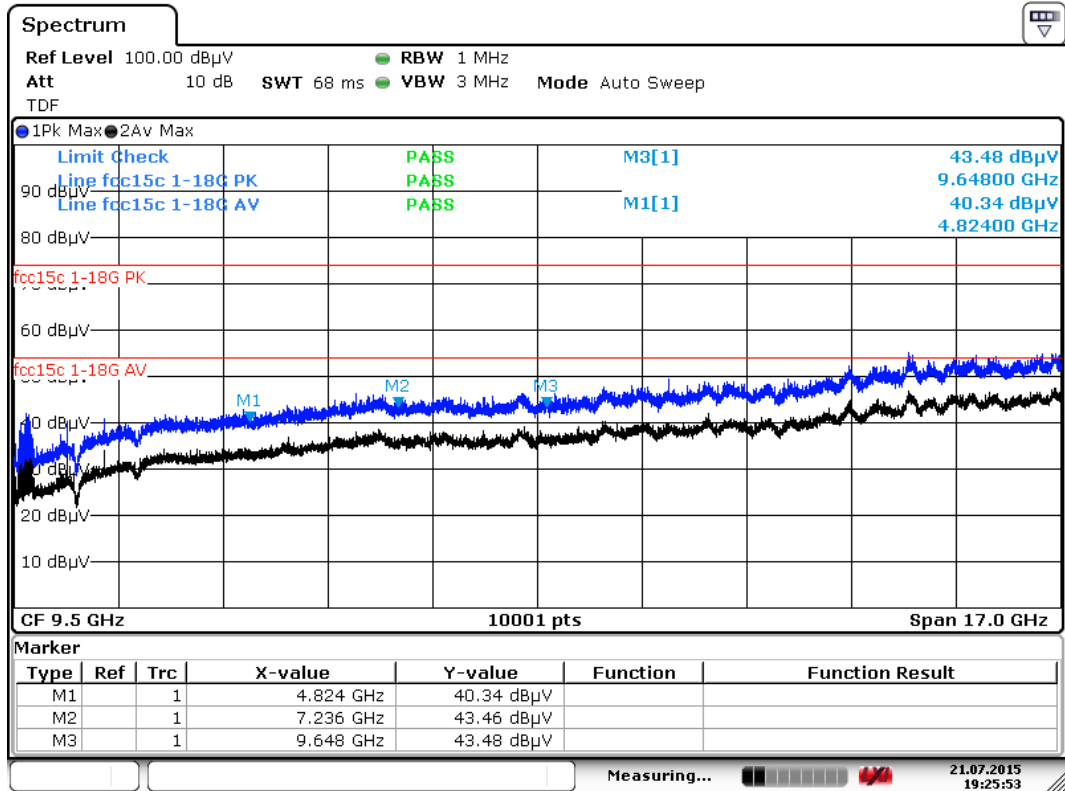
EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC-C		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	405.52 MHz	42.69	-3.30
1 Quasi Peak	430.08 MHz	40.16	-5.83
1 Quasi Peak	577.52 MHz	37.87	-8.12
1 Quasi Peak	356.36 MHz	36.68	-9.31
1 Quasi Peak	725 MHz	35.69	-10.30
1 Quasi Peak	307.2 MHz	31.50	-14.49

Vertical:

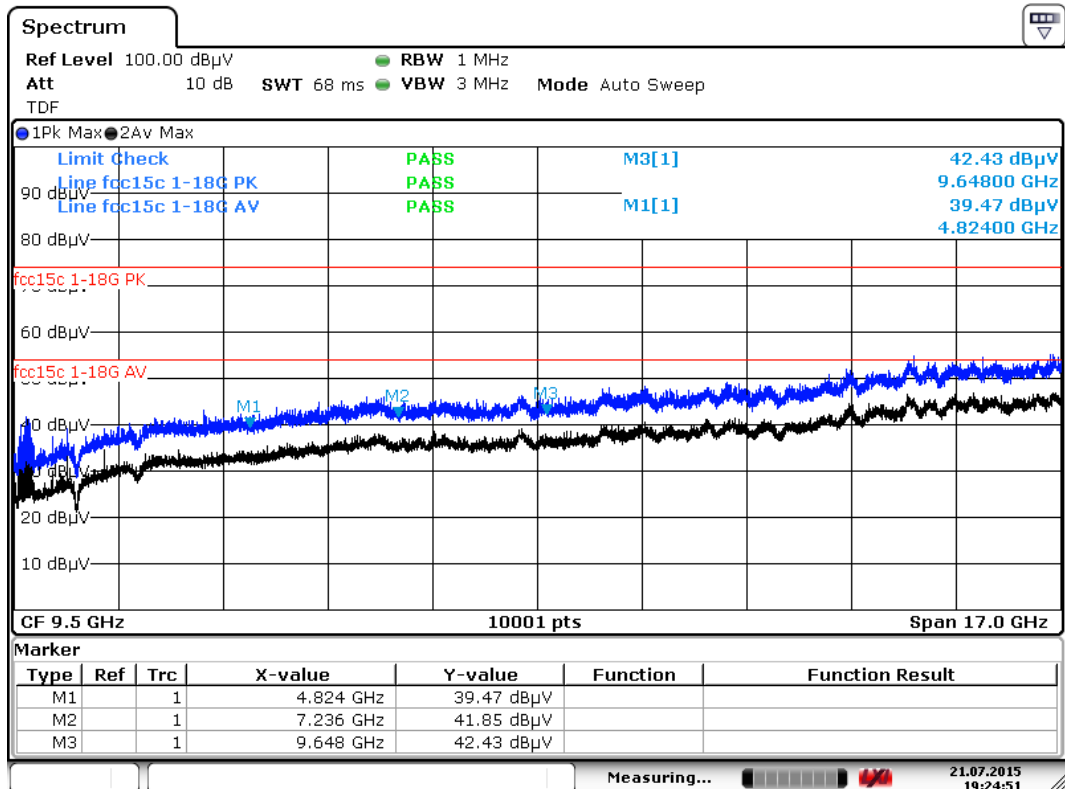


EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC-C		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	405.52 MHz	41.15	-4.84
1 Quasi Peak	430.08 MHz	40.66	-5.33
1 Quasi Peak	651.28 MHz	38.66	-7.33
1 Quasi Peak	872.44 MHz	38.06	-7.93
1 Quasi Peak	307.2 MHz	36.46	-9.53
1 Quasi Peak	380.92 MHz	36.41	-9.58

Above 1G  
802.11b 2412MHz  
Horizontal:

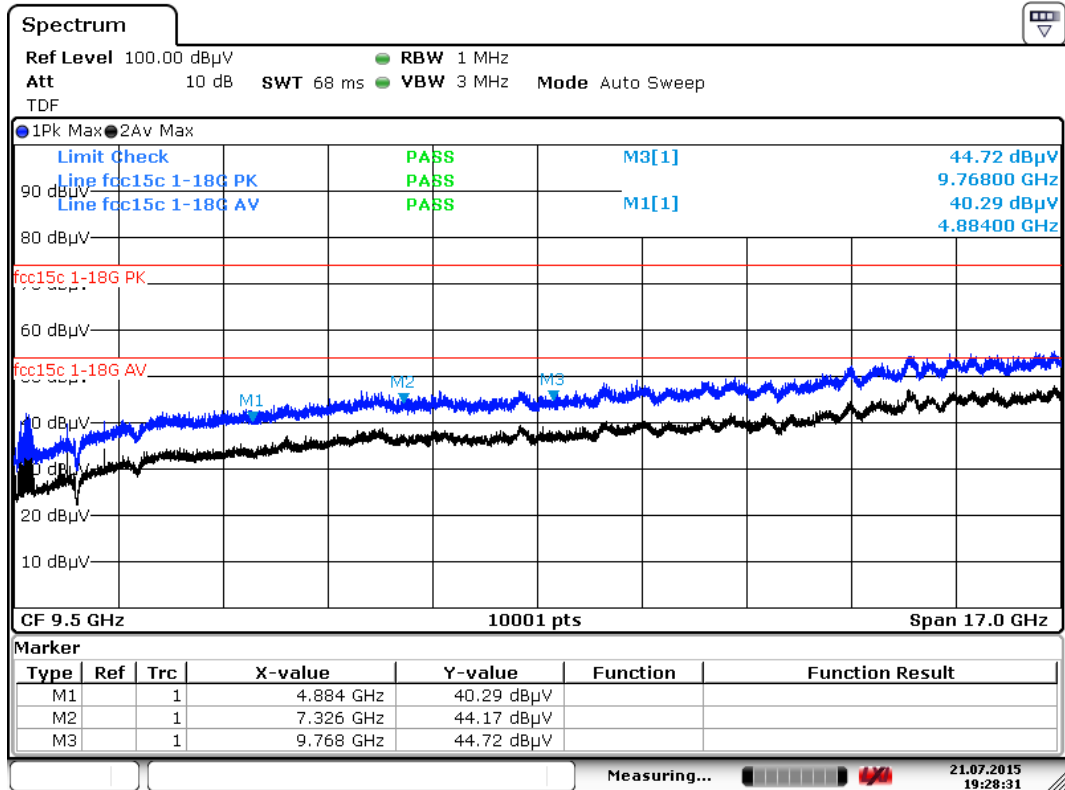


Vertical:

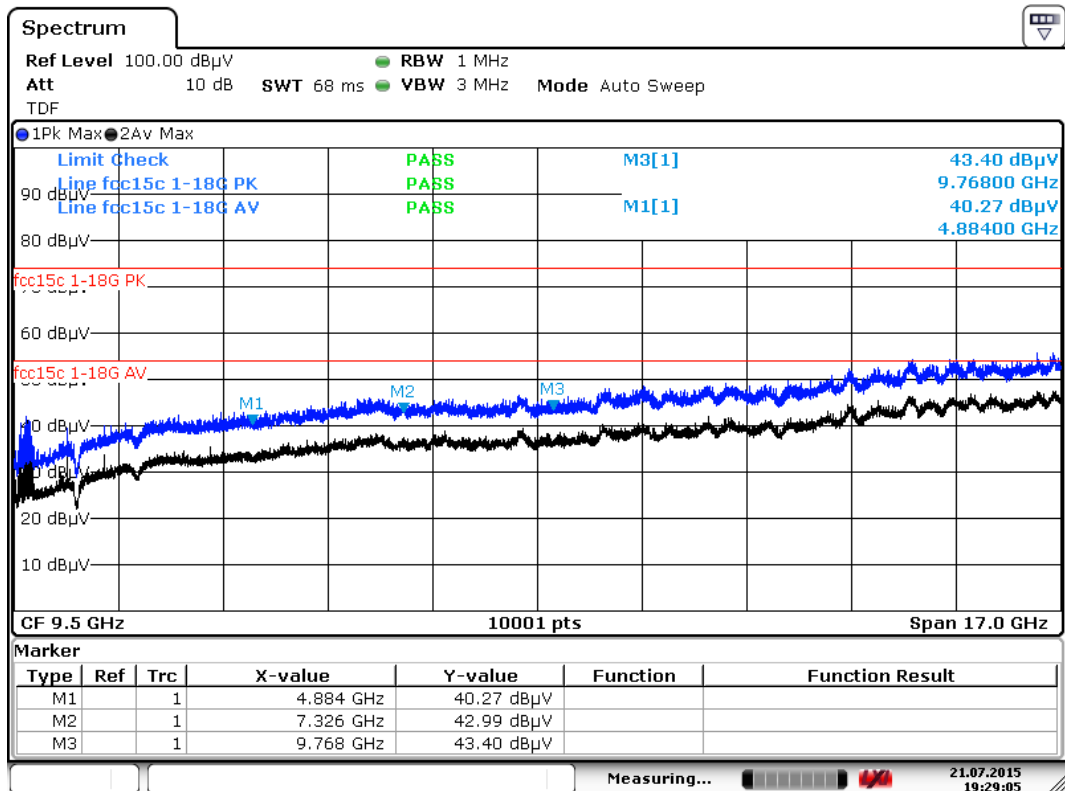


802.11b 2442MHz

Horizontal:

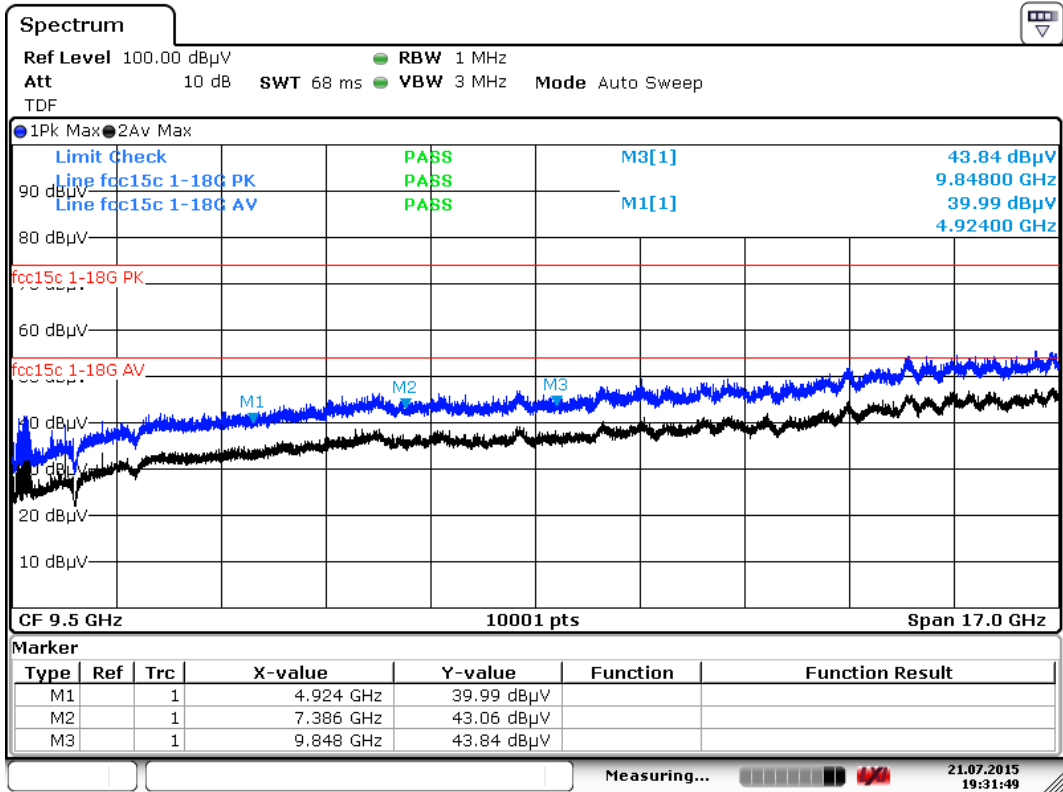


Vertical:

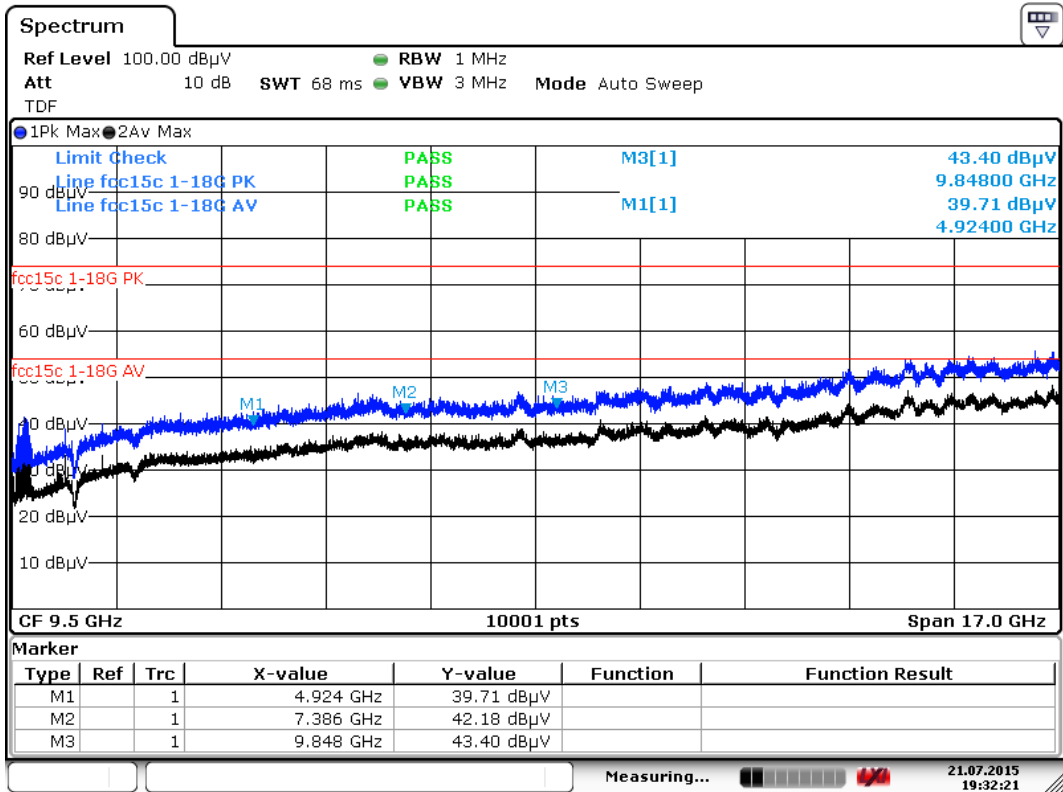


802.11b 2462MHz

Horizontal:

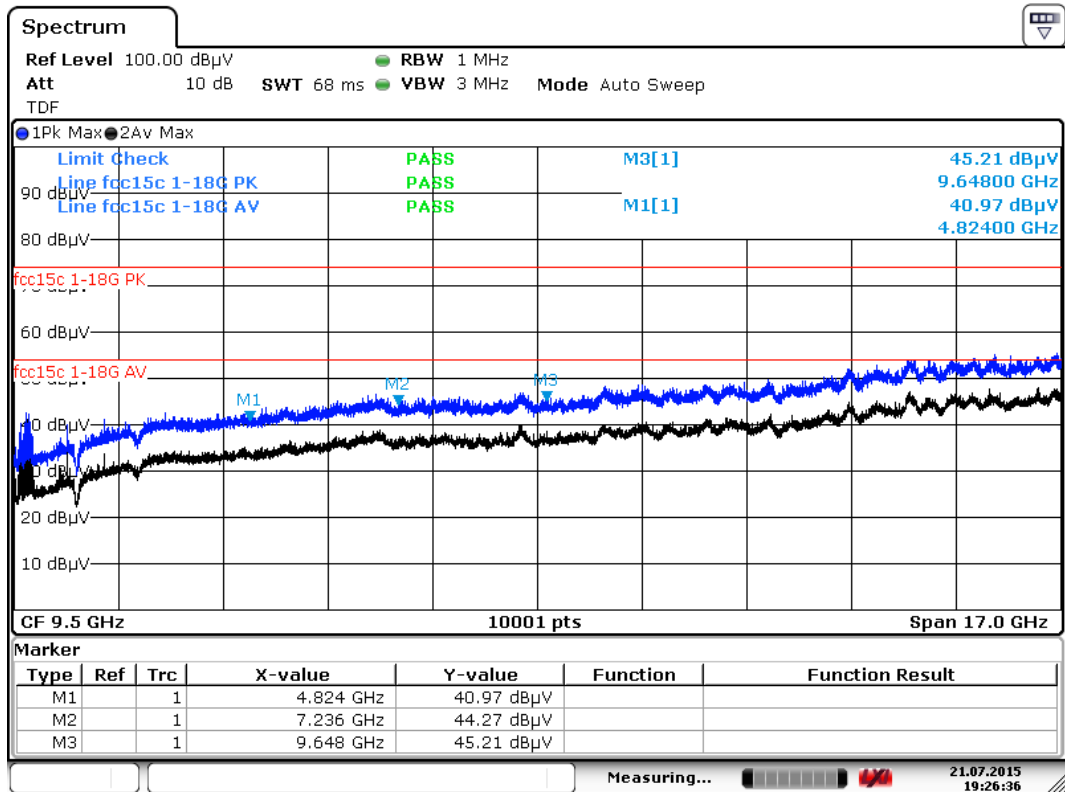


Vertical:

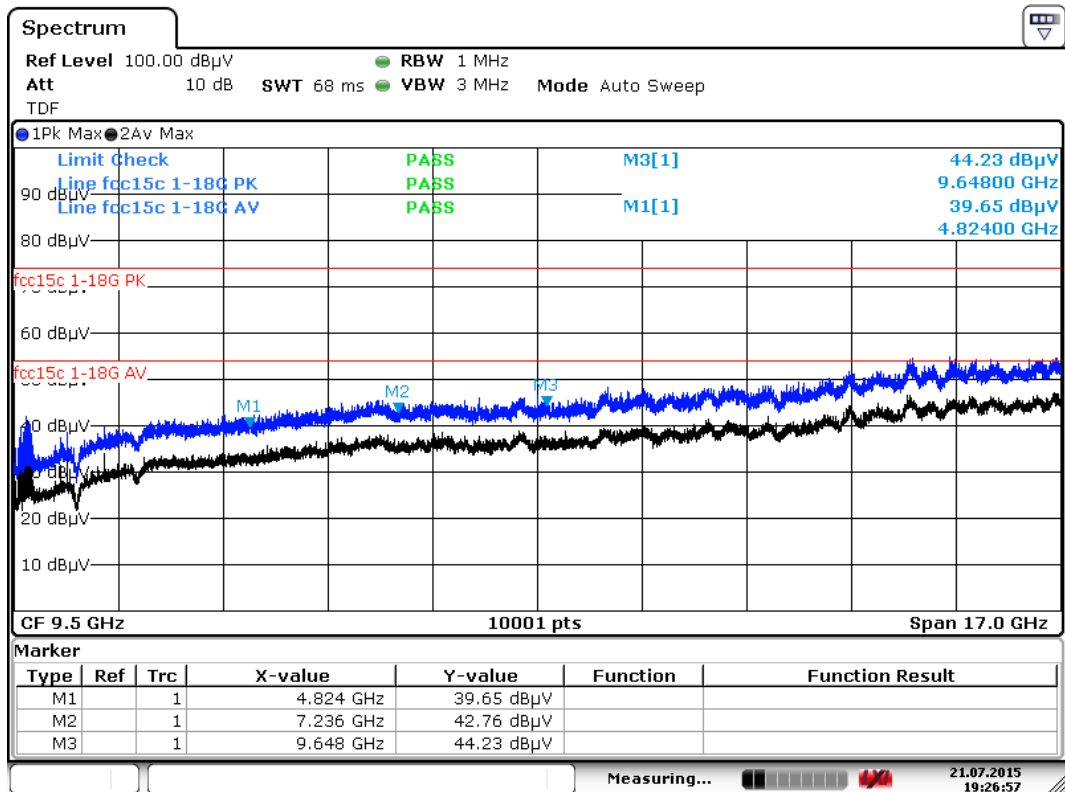


802.11g 2412MHz

Horizontal:

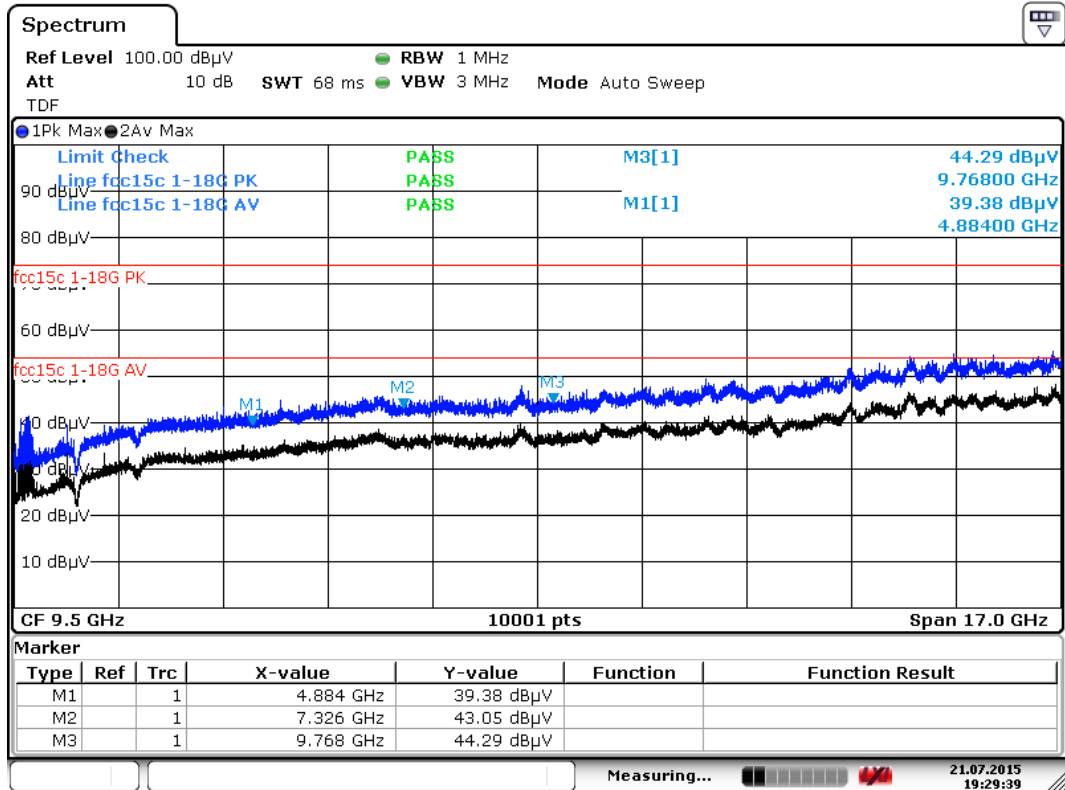


Vertical:

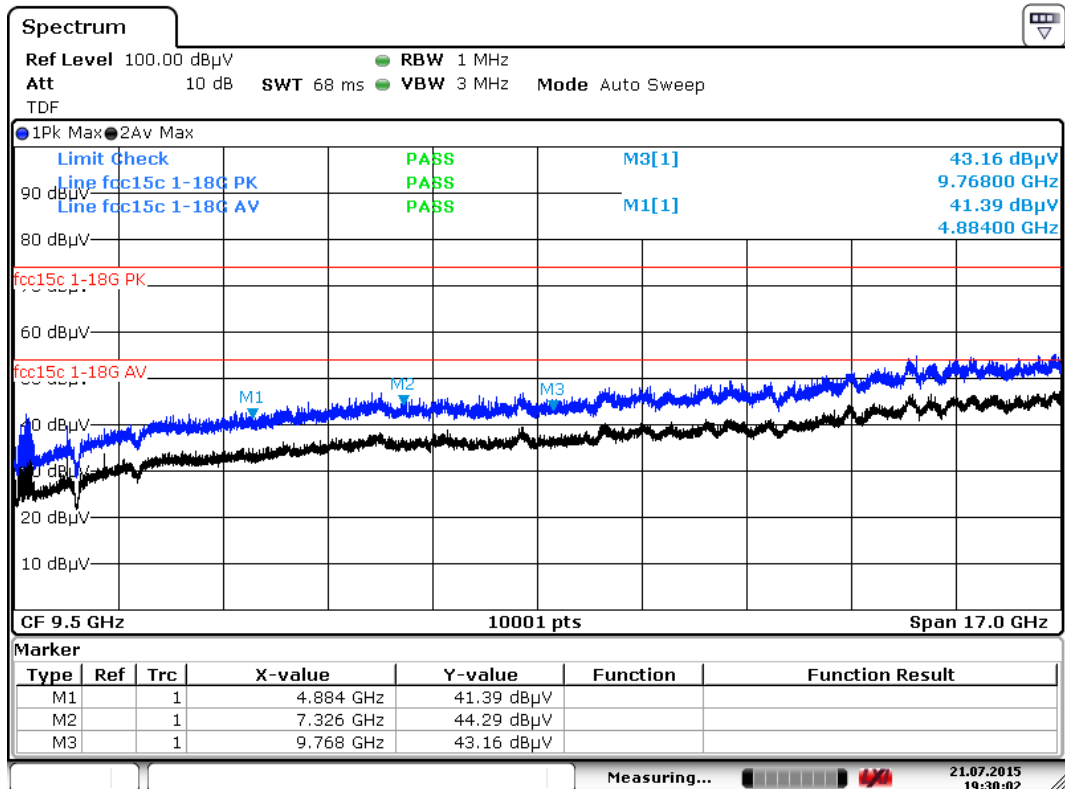


802.11g 2442MHz

Horizontal:



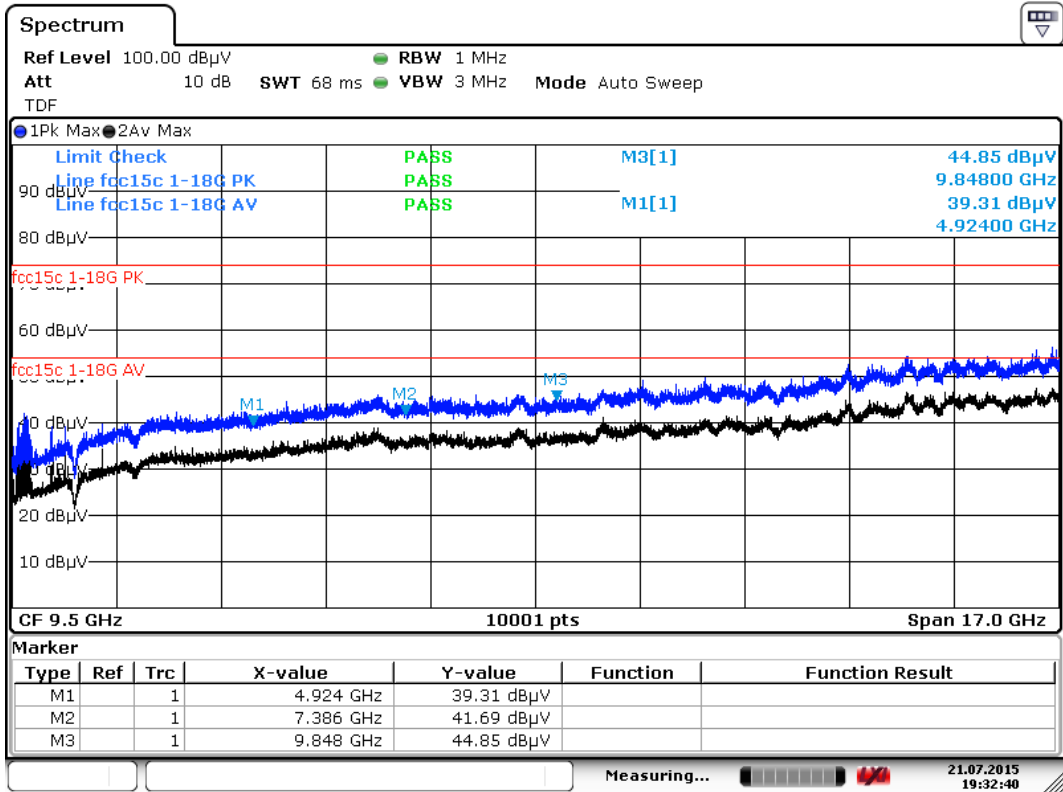
Vertical:



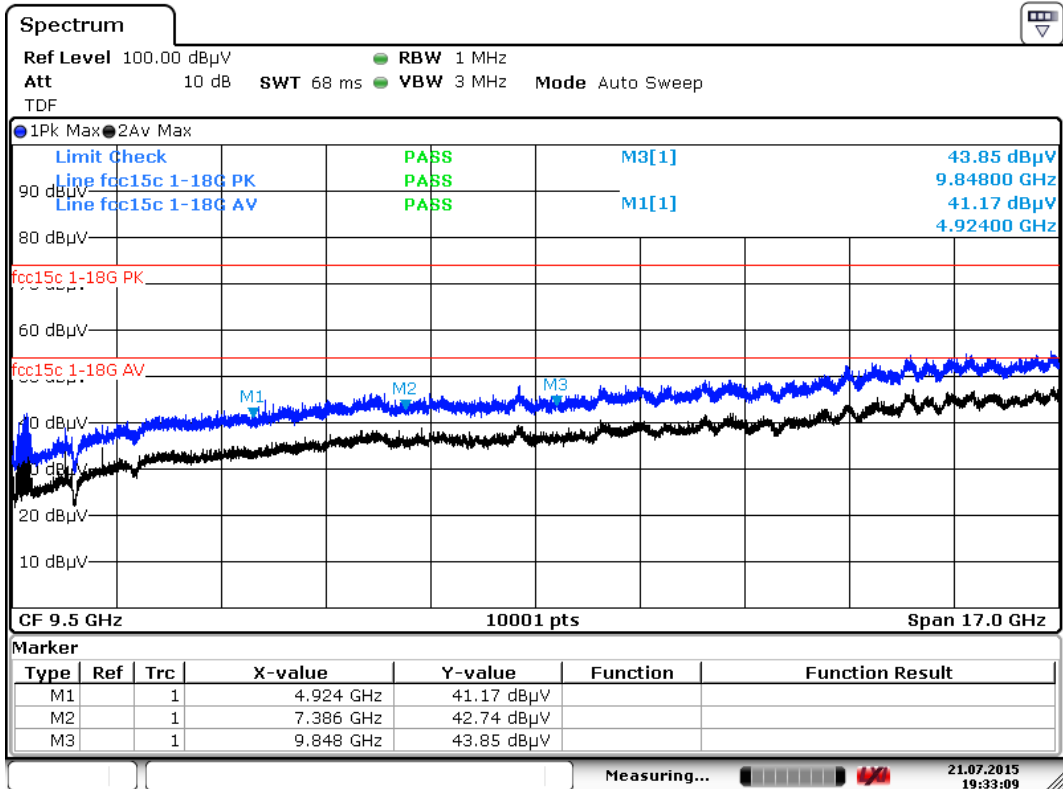


802.11g 2462MHz

Horizontal:

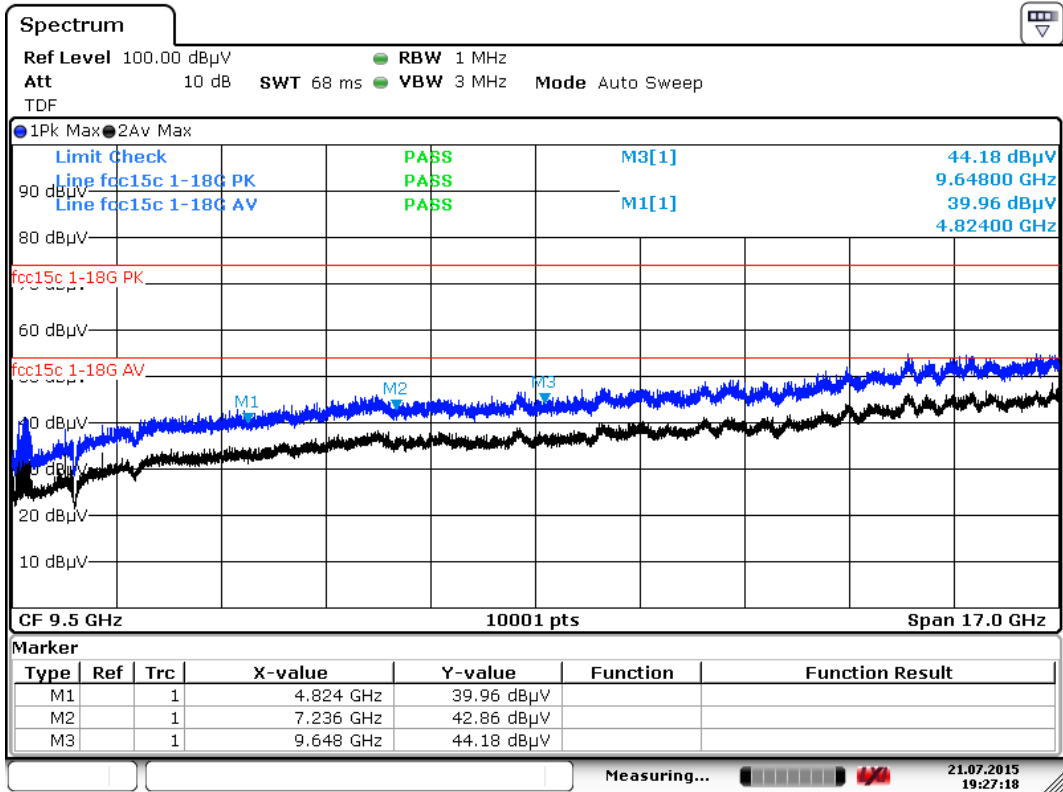


Vertical:

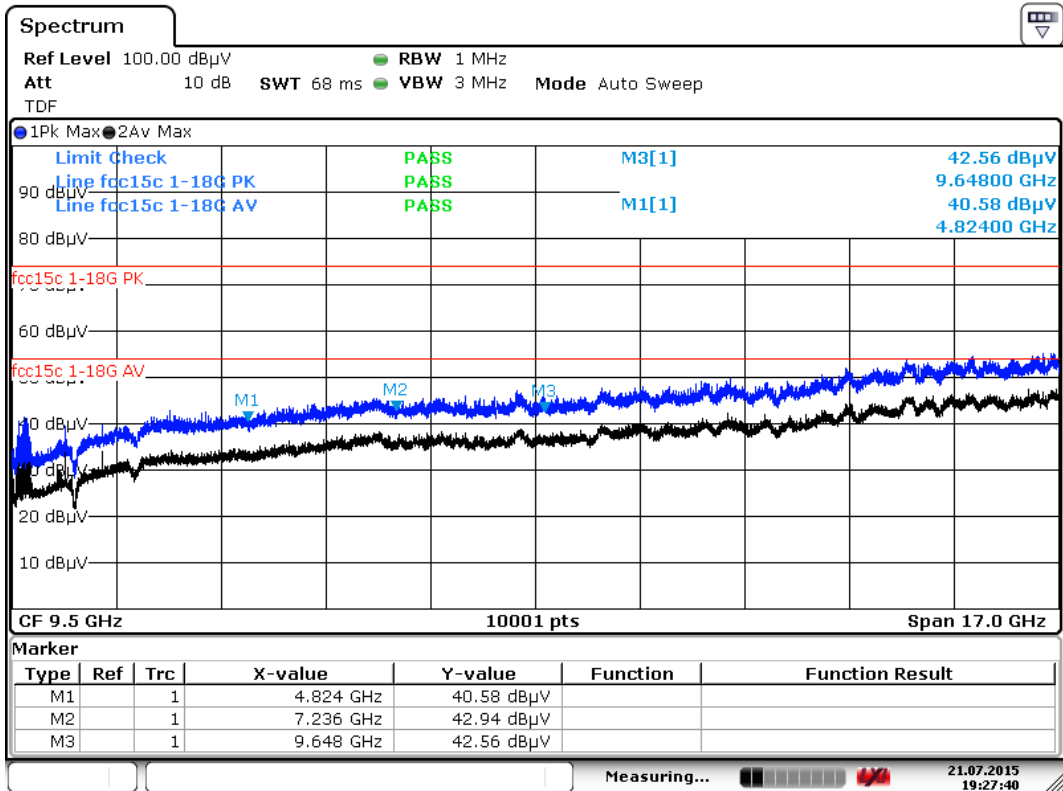


802.11n 2412MHz

Horizontal:

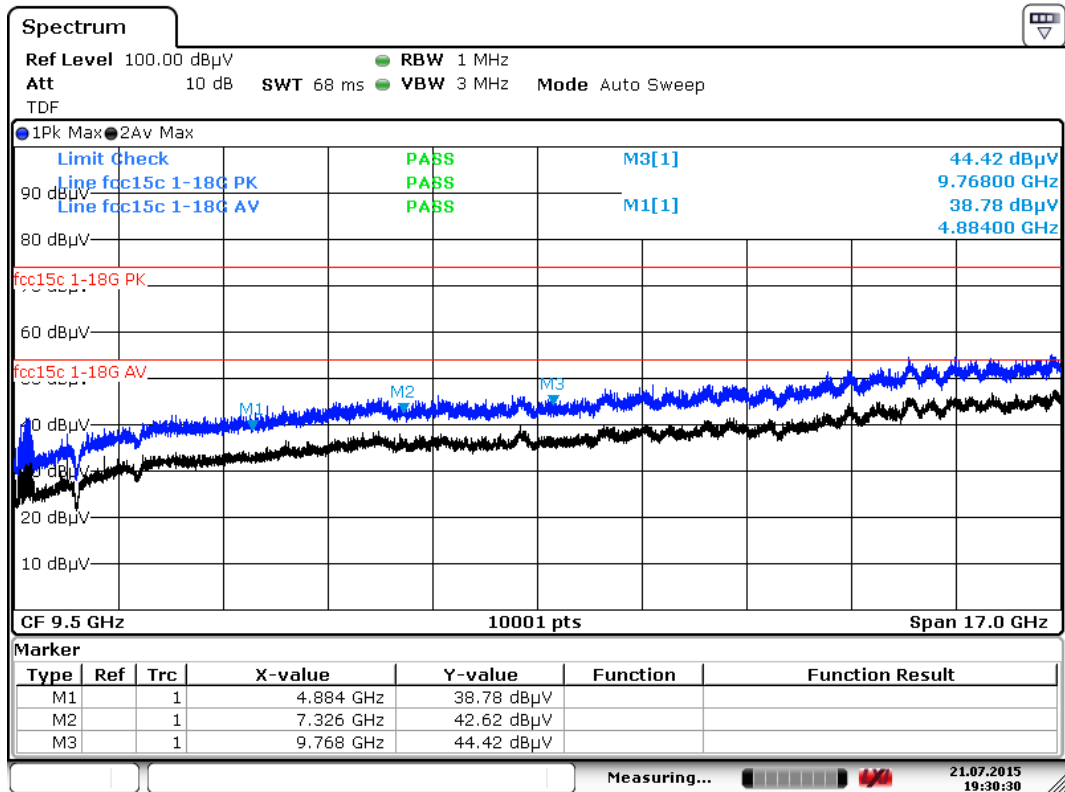


Vertical:

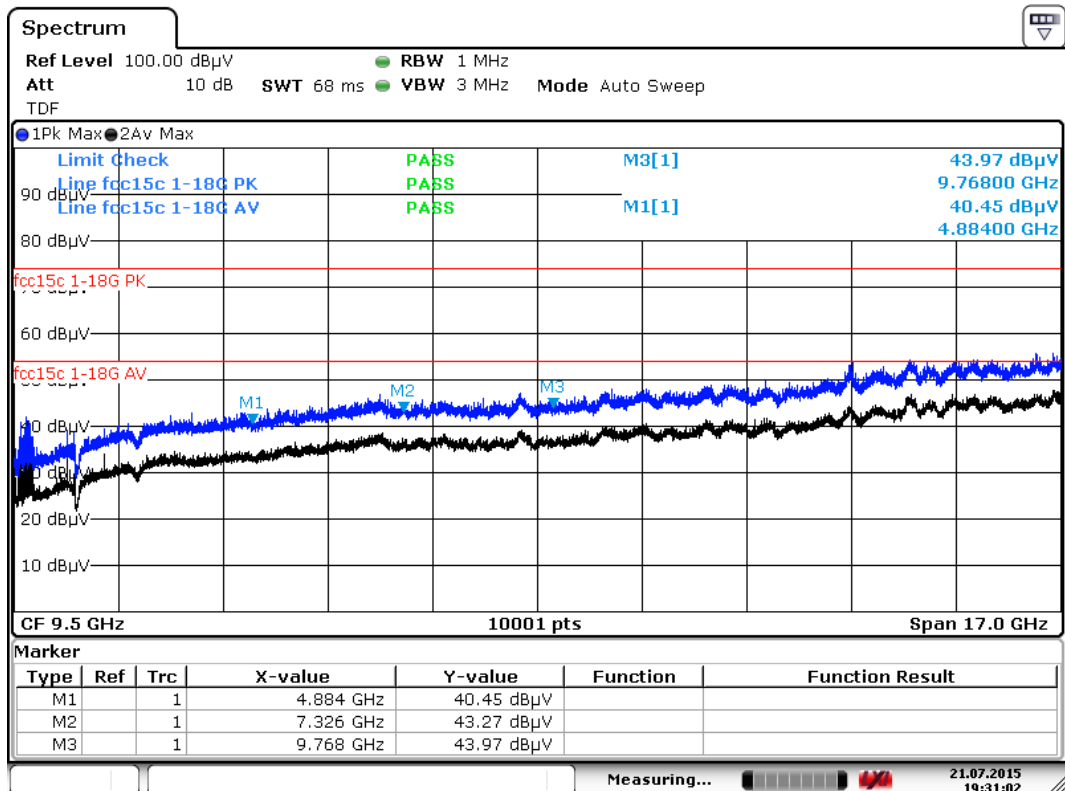


802.11n 2442MHz

Horizontal:

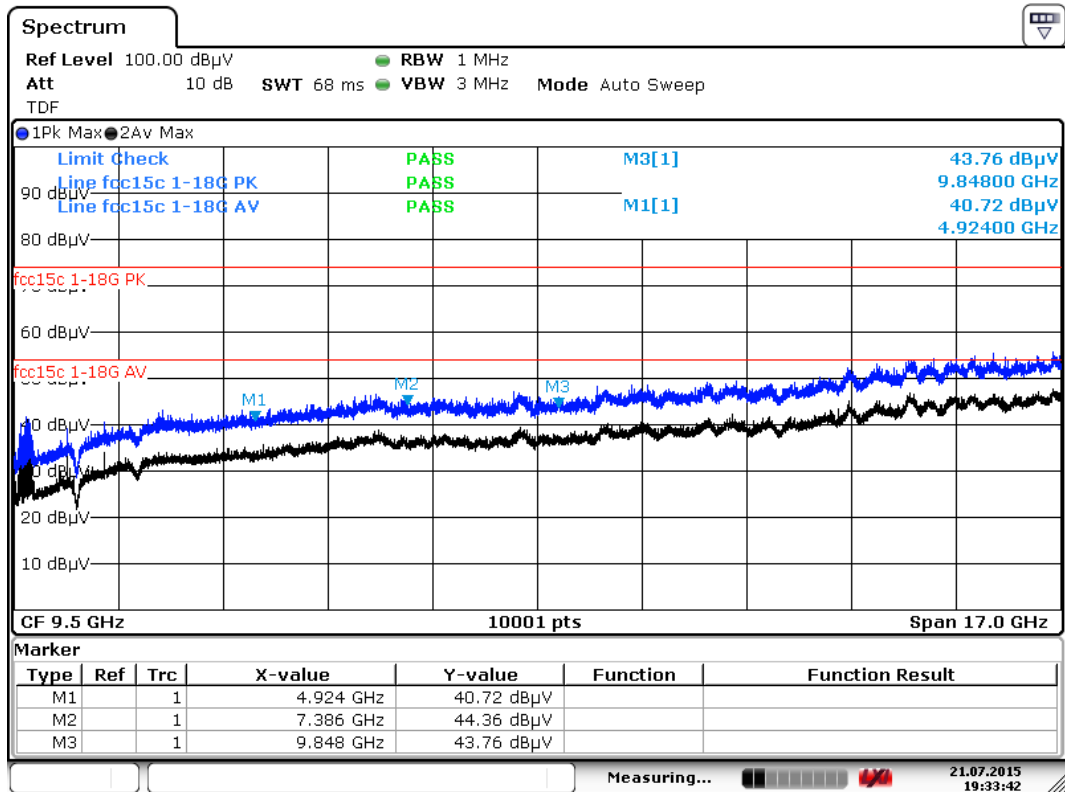


Vertical:

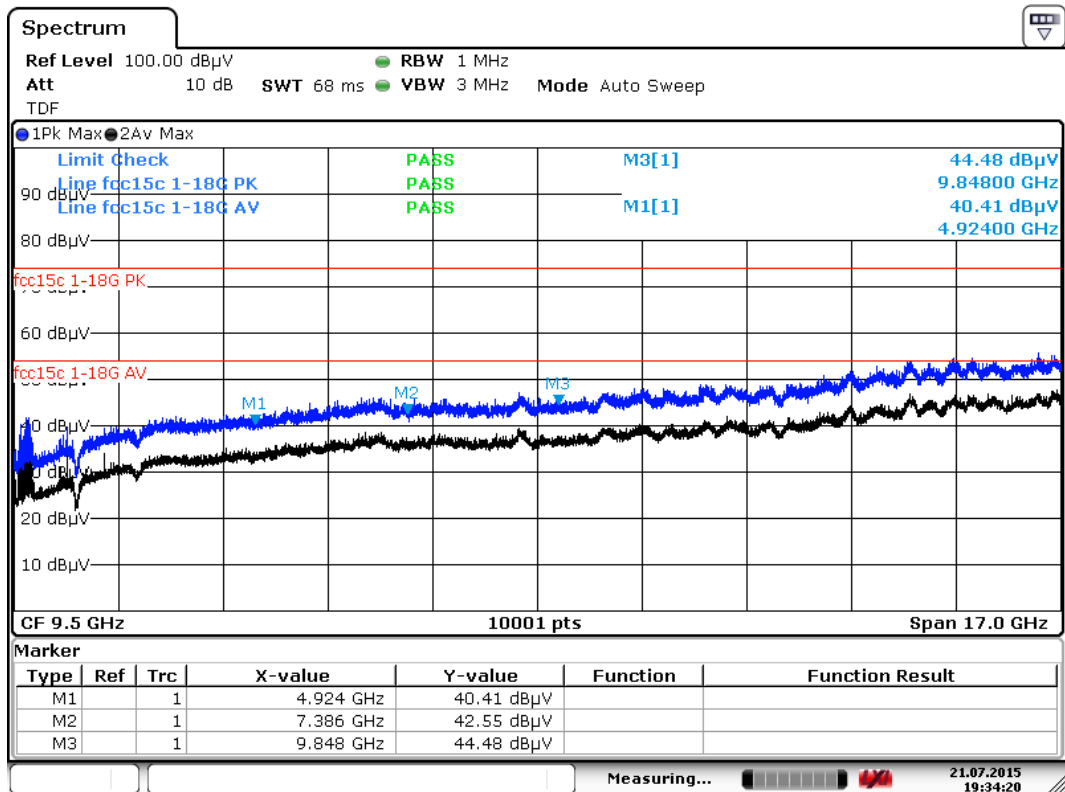


802.11n 2462MHz

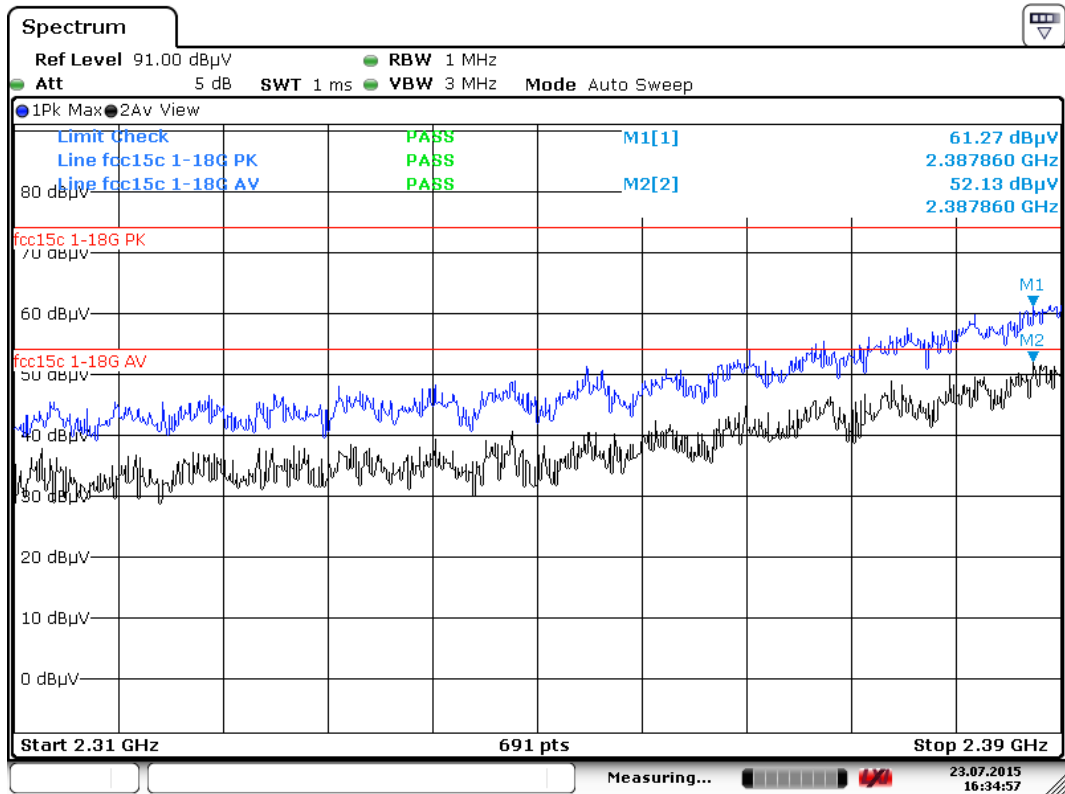
Horizontal:



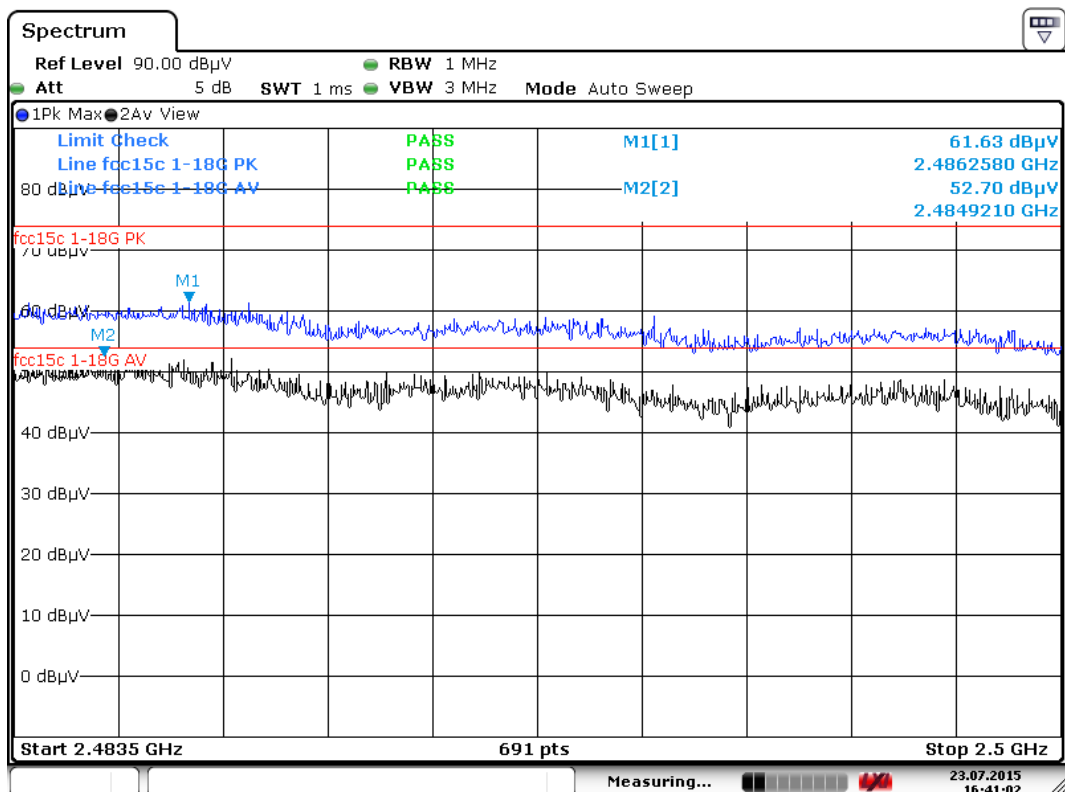
Vertical:



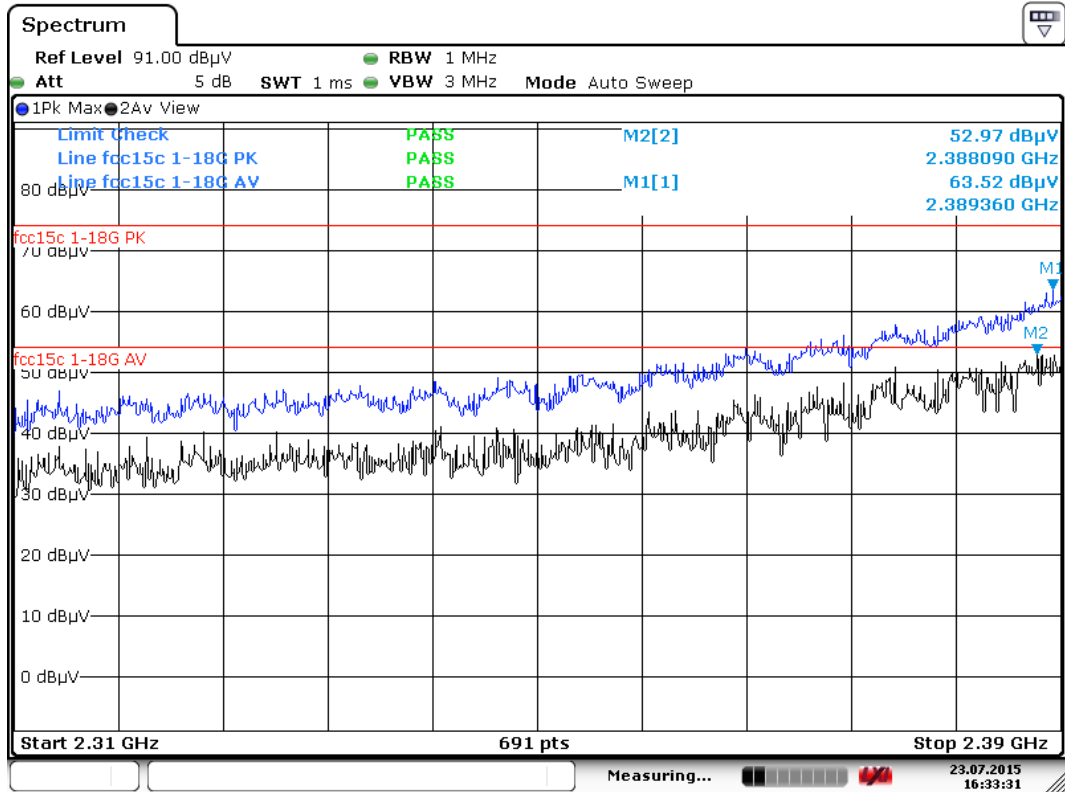
9.5 Radiated Emissions which fall in the restricted bands  
802.11b  
2412MHz



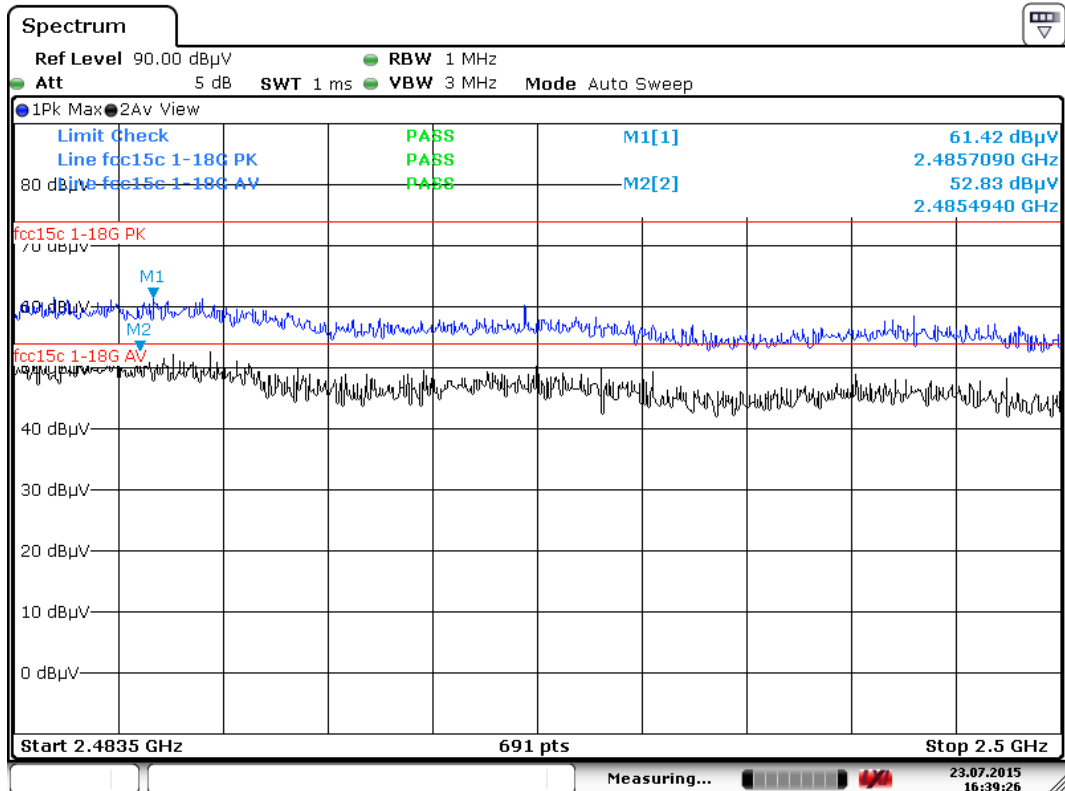
2462MHz



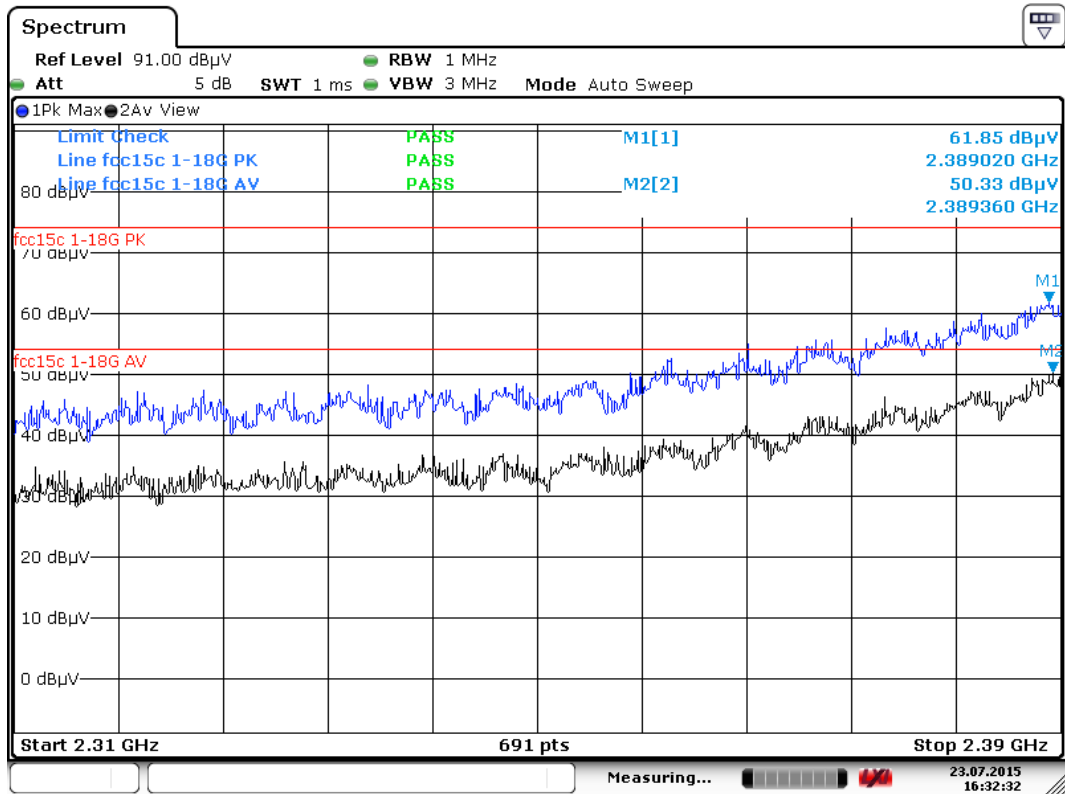
802.11g  
2412MHz



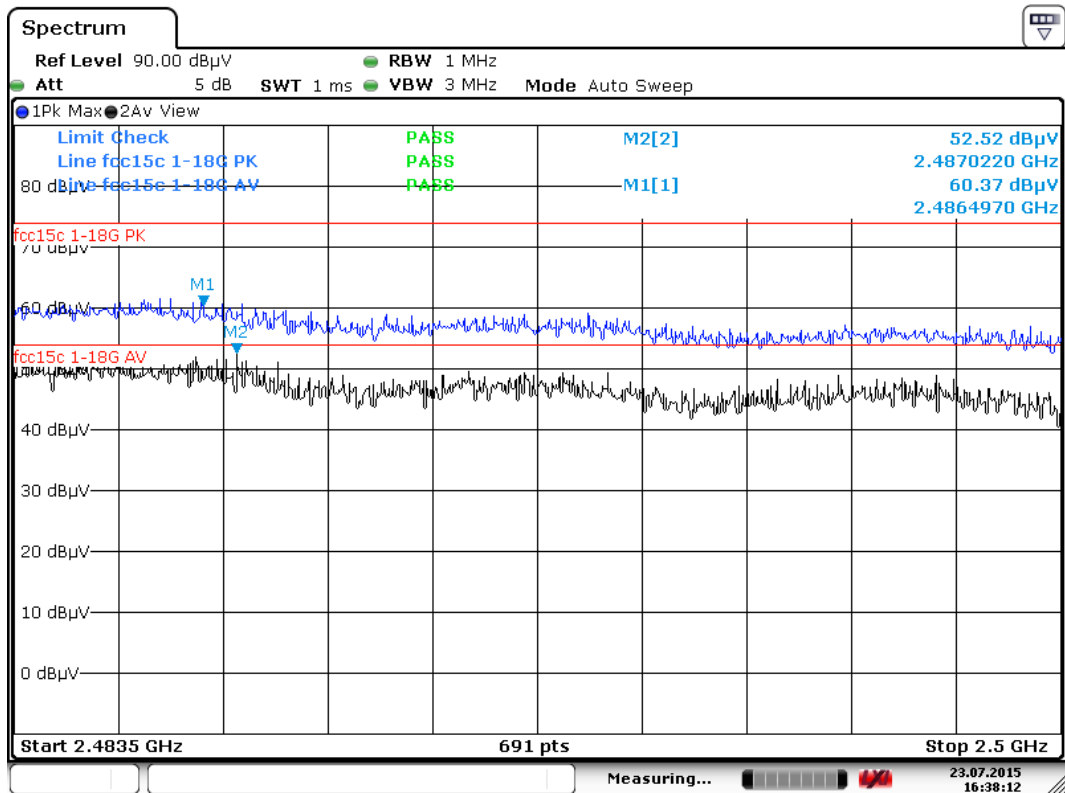
2462MHz



802.11n(HT20)  
2412MHz



2462MHz

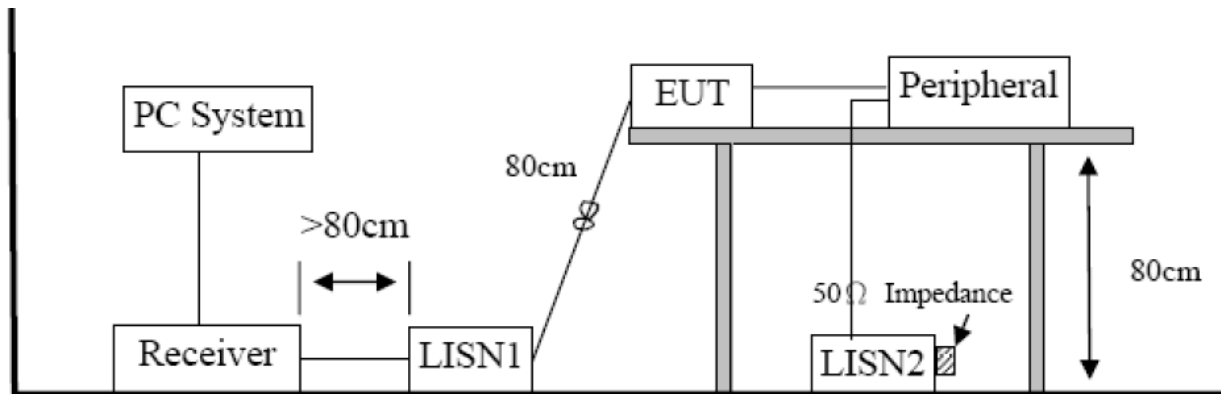


## 10 POWER LINE CONDUCTED EMISSIONS

### 10.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	EMI Receiver	R&S	ESU8	100316	2014/11/26	1 Year
2	LISN 1	R&S	ENV216	101109	2014/11/26	1 Year
3	LISN 1	R&S	ESH2-Z5	100309	2014/11/26	1 Year
4	Pulse Limiter	R&S	ESH3-Z2	101242	2014/11/26	1 Year

### 10.2 Block diagram of test setup



### 10.3 Limits

Frequency [MHz]	Limit - QP [dB(μV)]	Limit - AV [dB(μV)]
0,15 – 0,50	66 to 56 *	56 to 46 *
0,50 – 5	56	46
5 – 30	60	50

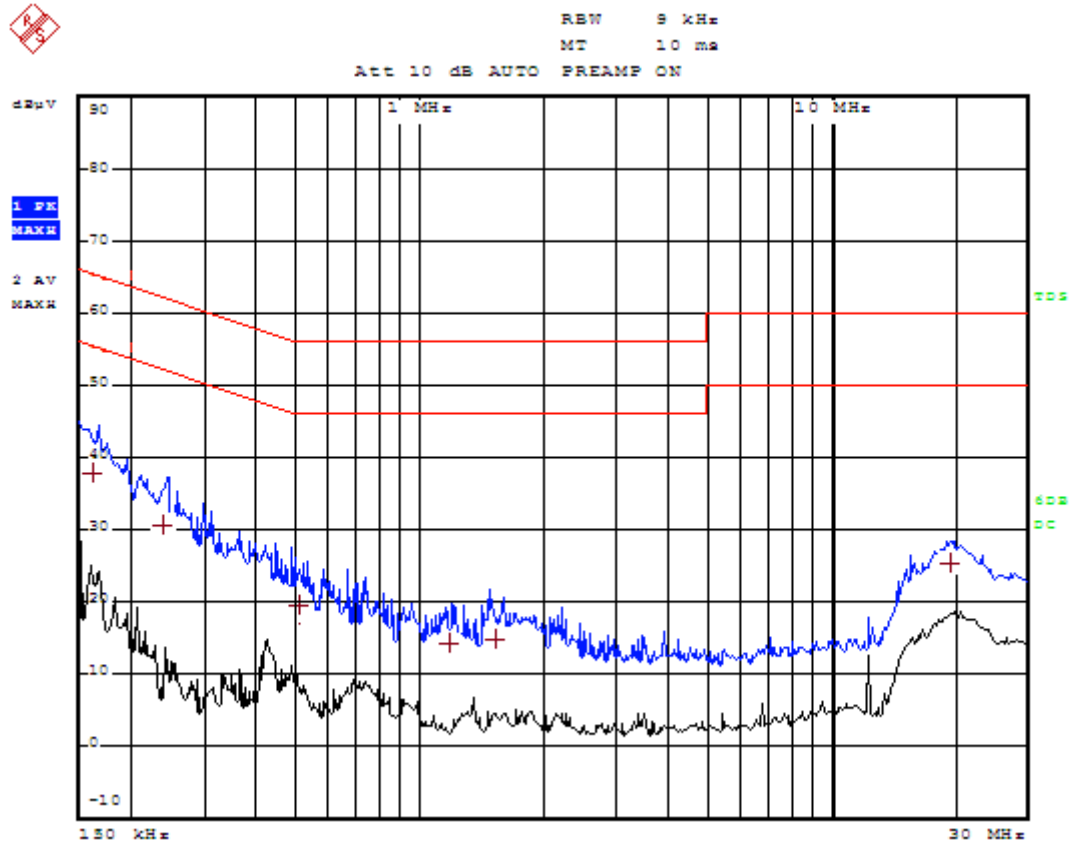
Note 1: \* Limits decreasing linearly with the logarithm of the frequency

Note 2: The lower limit shall apply at the transition frequencies.

Note 3: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Compliance test in continuous transmitting mode with 802.11b (rate 11 Mbps) as the worst case was found.



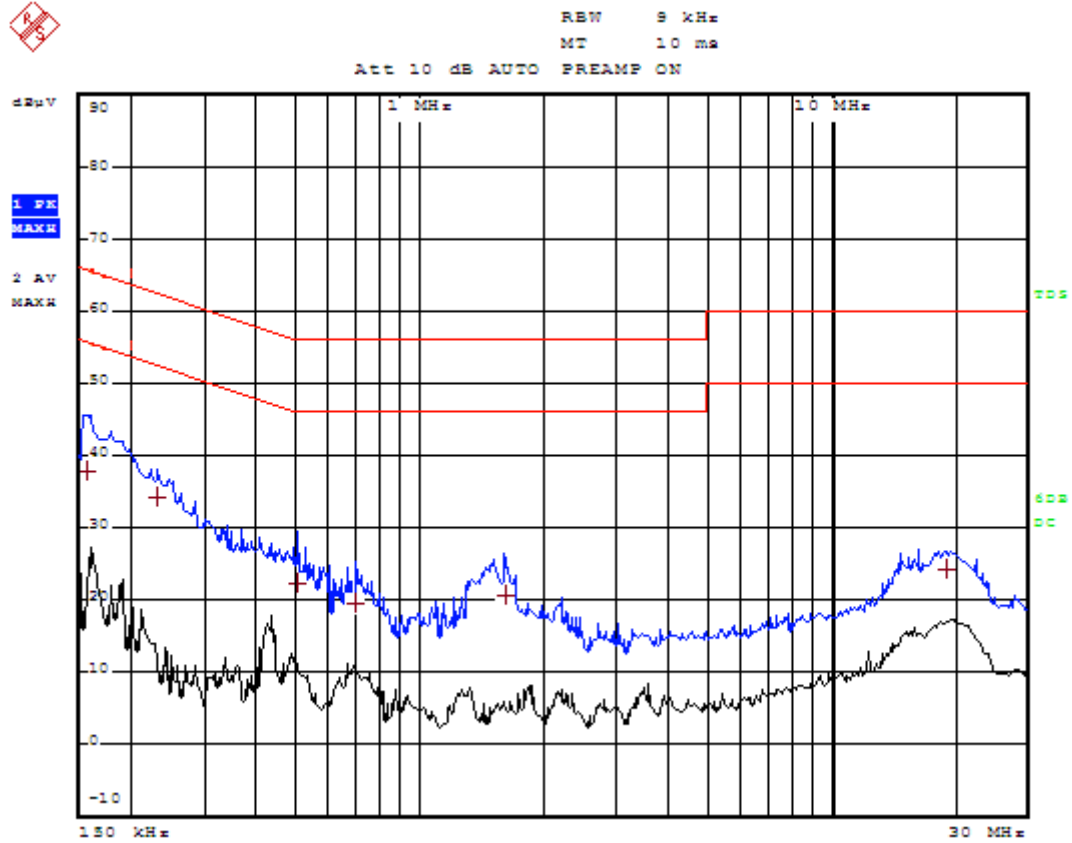
10.4 Test results  
Live:



Trace	Frequency(MHz)	Level (dBµV/m)	Margin(dB)
QP	0.163	38.43	-27.20
QP	0.246	32.42	-30.84
QP	0.525	18.55	-37.45
QP	1.456	15.25	-40.75
QP	1.601	16.45	-39.55
QP	19.624	27.56	-32.44

No other significant emissions were measured at the frequency range of interest employing both the QP and AV detectors.

Neutral:



Trace	Frequency(MHz)	Level (dBµV/m)	Margin(dB)
QP	0.171	38.56	-26.84
QP	0.242	35.42	-27.95
QP	0.502	22.45	-33.55
QP	0.701	19.32	-36.68
QP	1.741	21.95	-34.05
QP	18.544	25.16	-34.84

No other significant emissions were measured at the frequency range of interest employing both the QP and AV detectors.

## 11 ANTENNA REQUIREMENT

### 11.1 Limits

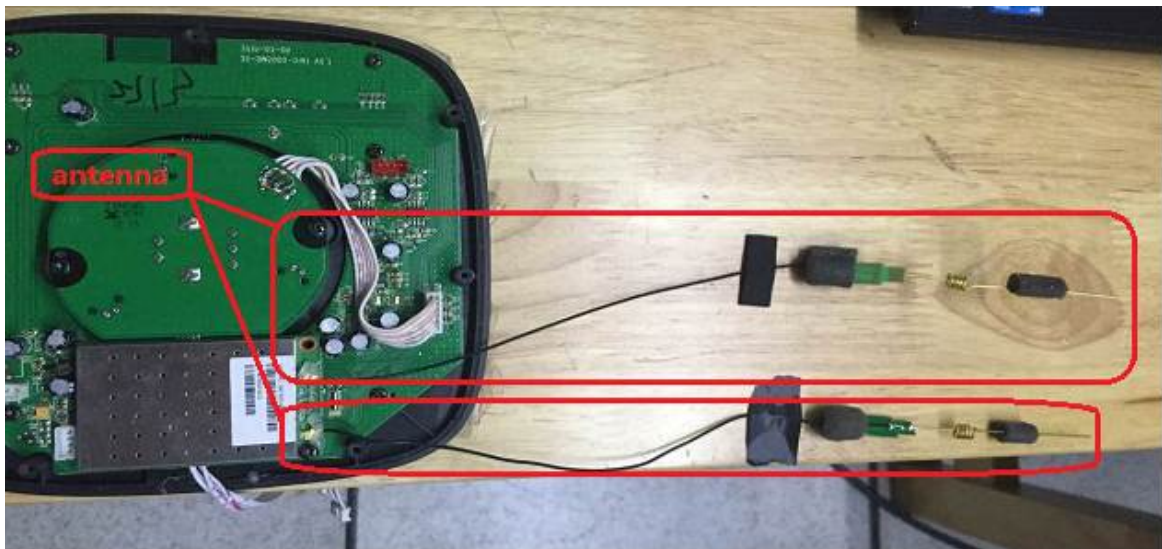
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 11.2 Test results

The antenna is an integral and no consideration of replacement.

Antenna Assembly	Type	Internal, assembly antenna	
	Gain	Mains (one)	Max. 3,75 dBi
	Mains (two)	Max. 3,75 dBi	



## 12 TEST SETUP AND ARRANGEMENT

The photograph shows the tested device.



Figure 2 Conducted measurement Test setup



Figure 3 Conducted Emission test setup

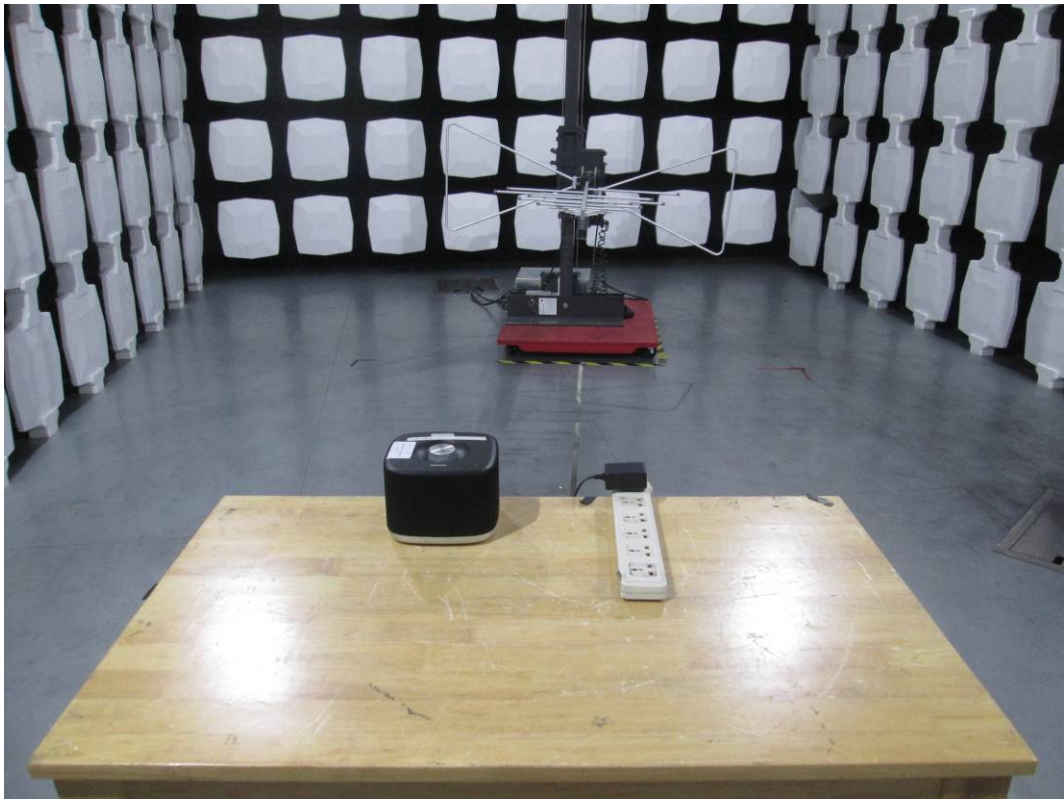


Figure 4 Radiated emission test setup (below 1 GHz)

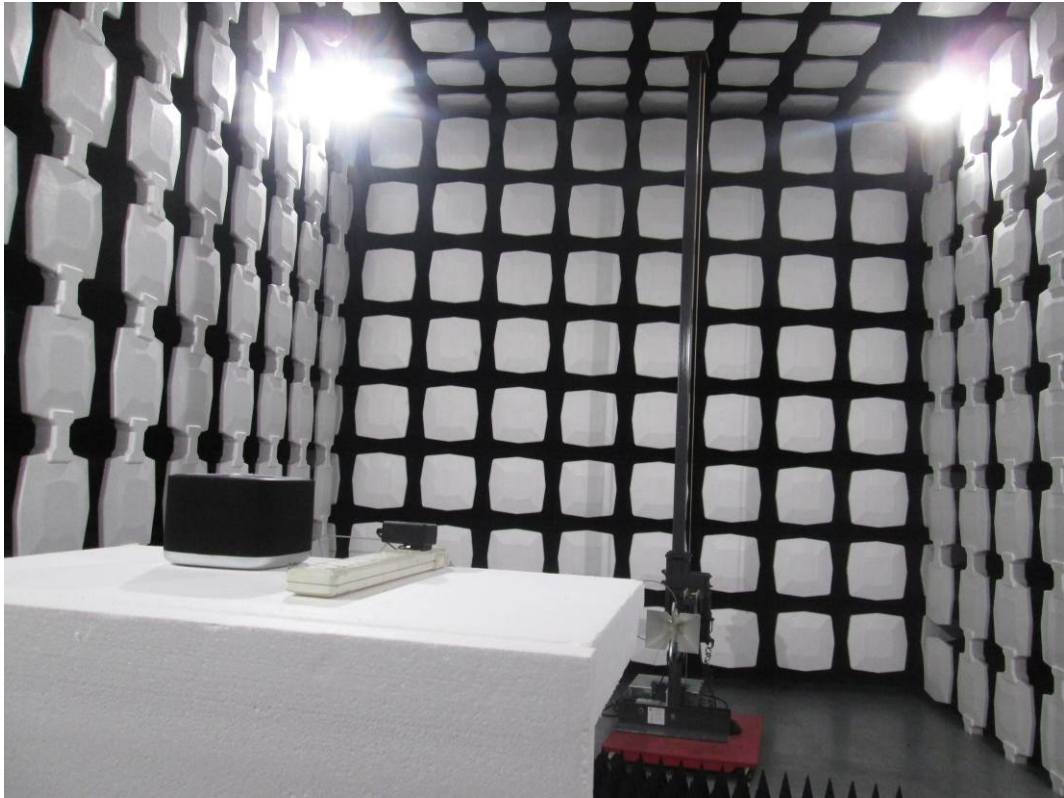


Figure 5 Radiated emission test setup (above 1 GHz)

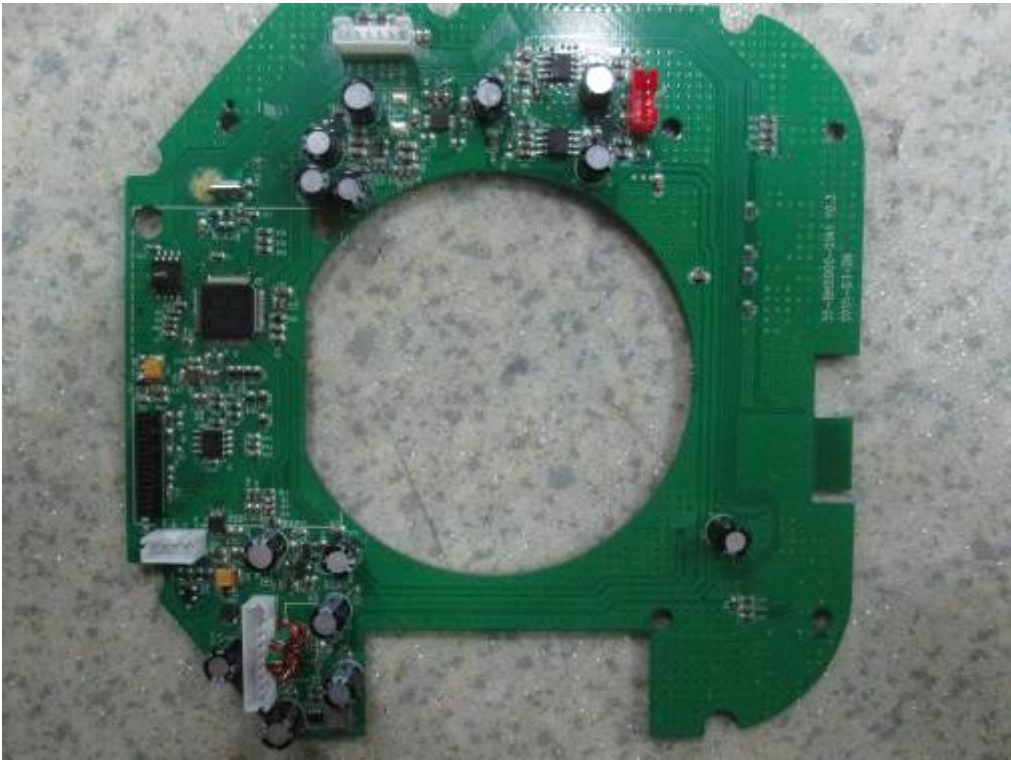
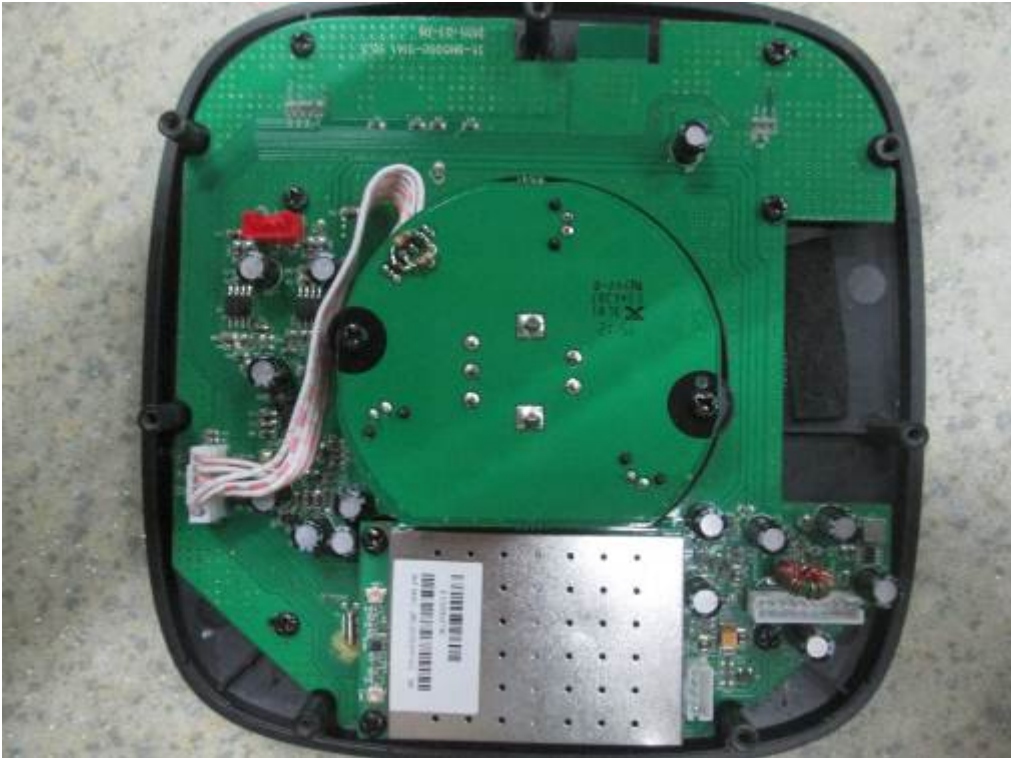
13 PHOTOS OF EUT

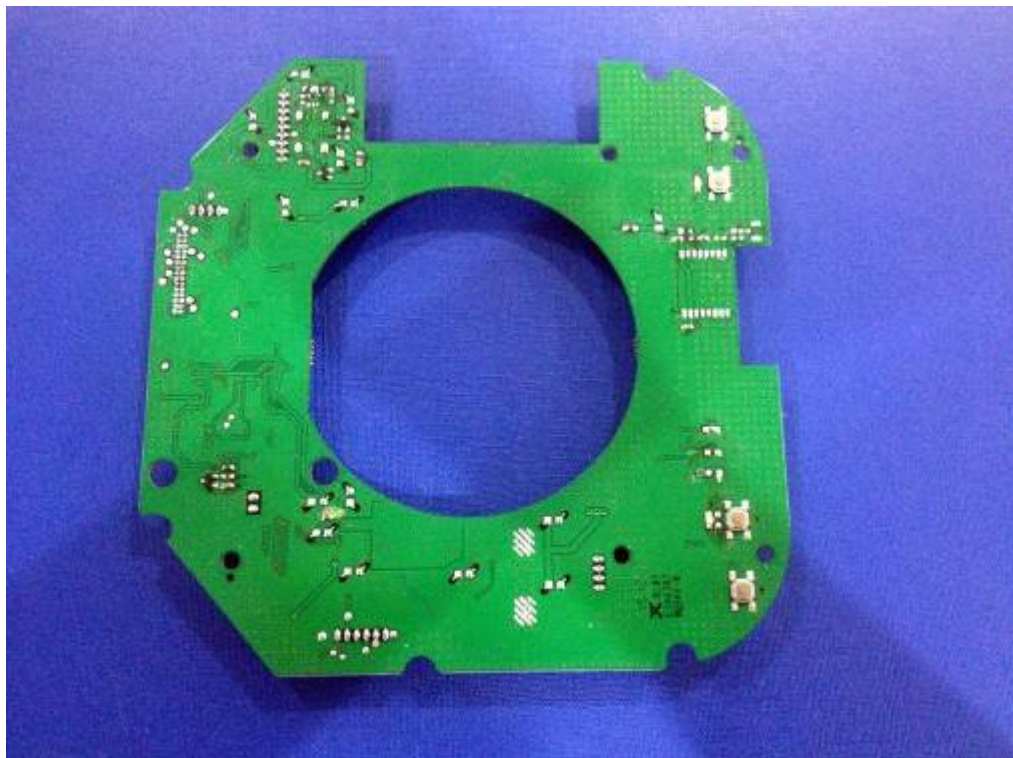
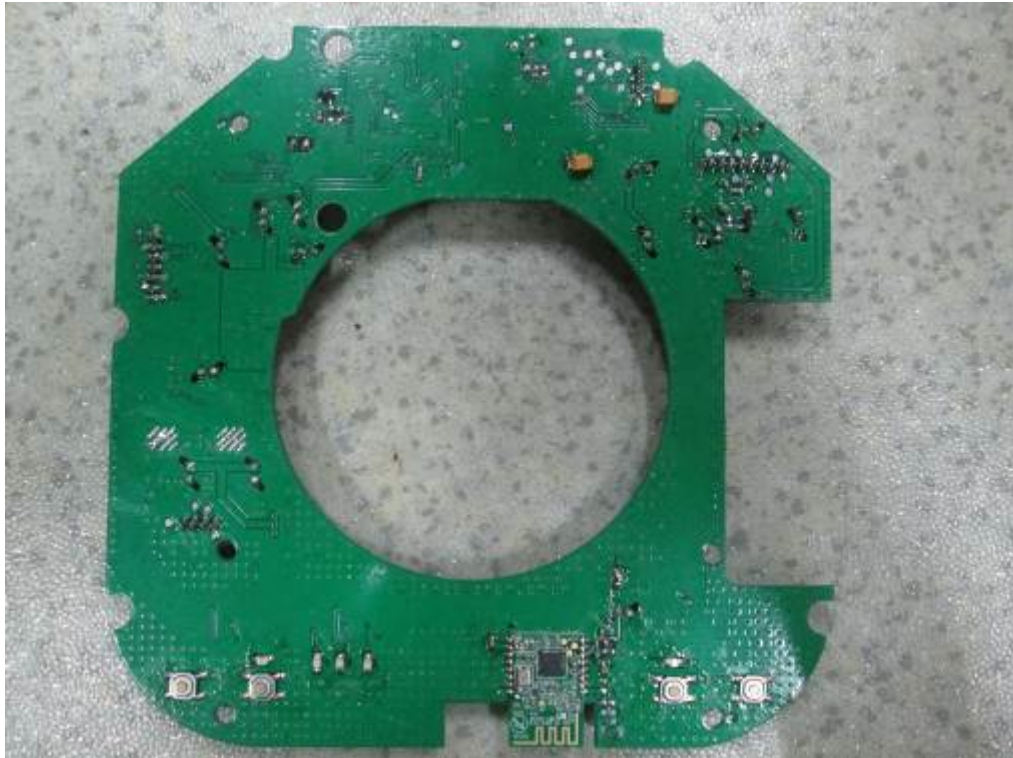
Internal Photos:

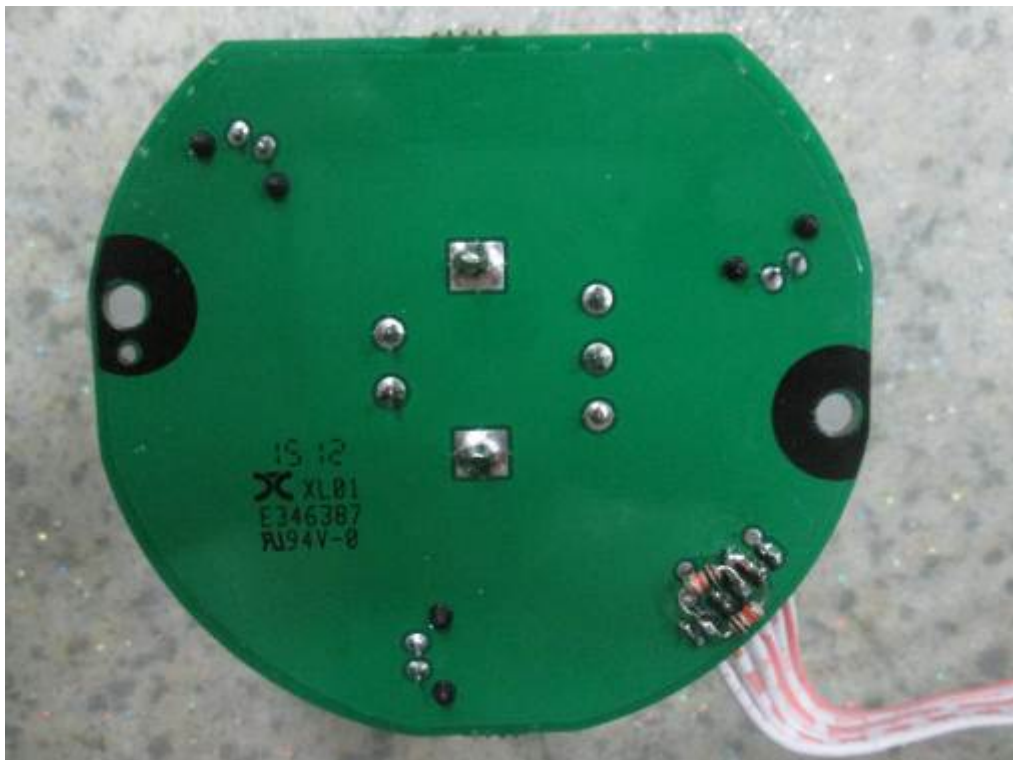






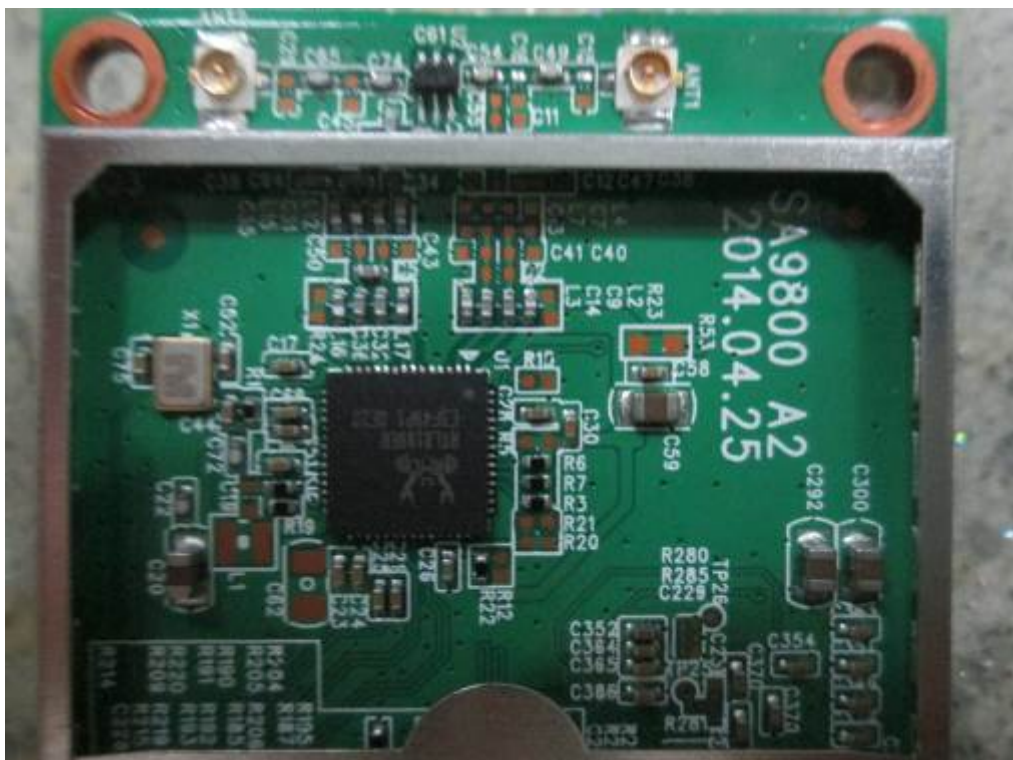




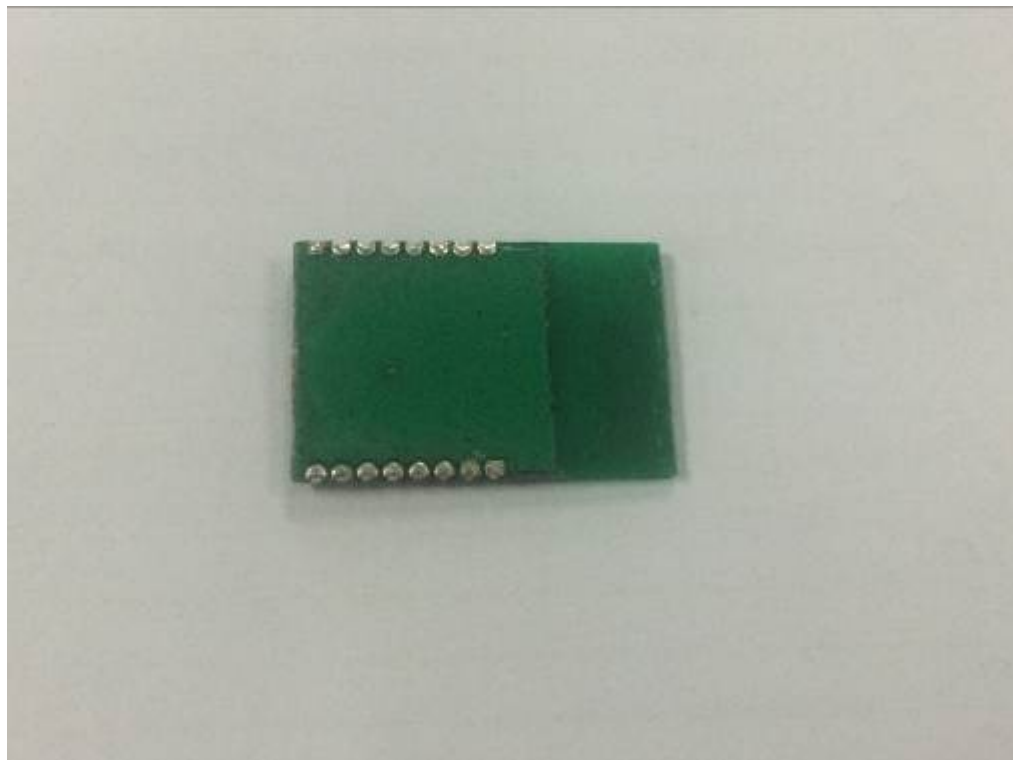




Wi-Fi module



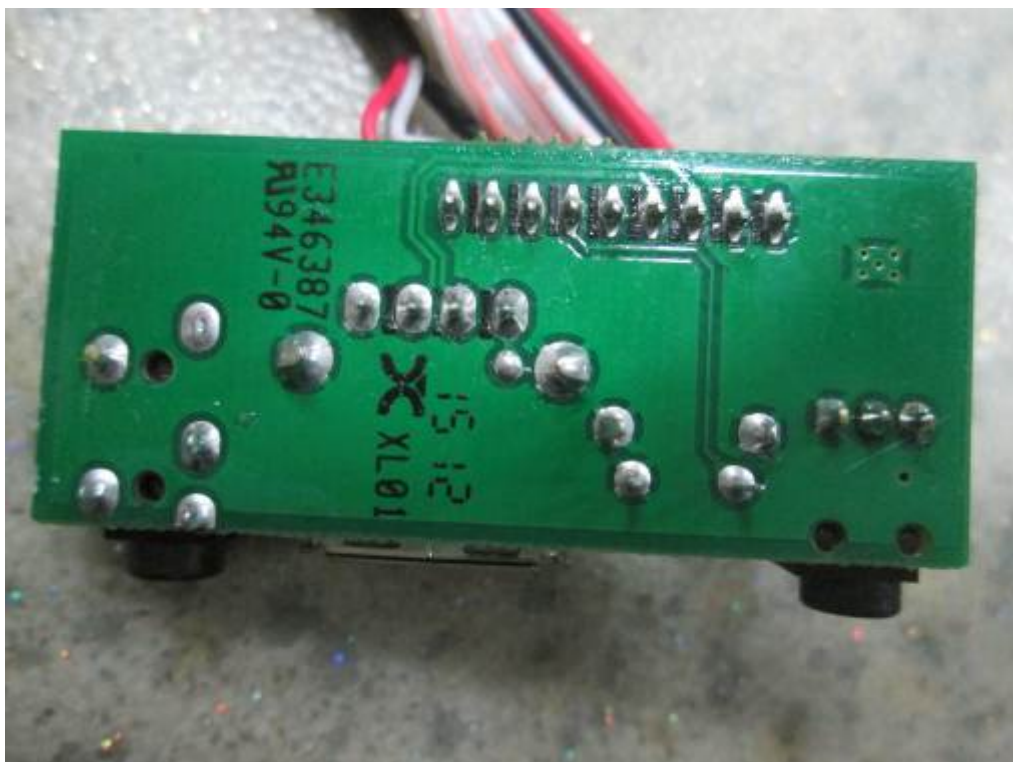
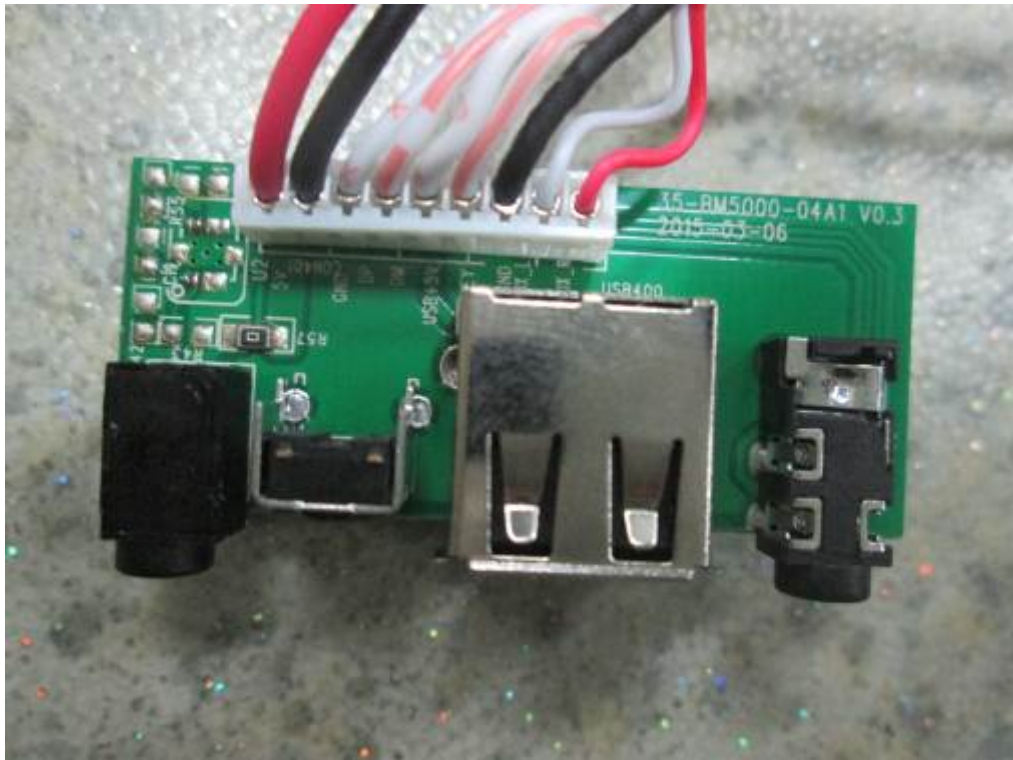
Wi-Fi module



Bluetooth module









Wi-Fi antenna