

FCC TEST REPORT

Reference No. : WTS13S1008306E
FCC ID : 2ABCRHLT102
Applicant : China Hualu Information Industry Co.,Ltd.
Address : No. 1 Hua Road, Dalian Hi-Tech Zone, Dalian, China
Manufacturer : Howell Techonlogy CO.,LTD.
Address : No.9 Building,Xinxintianyuan industrial park,Xinsha road,Shajin Town,Shenzhen,China

Equipment Under Test (EUT) :

Product Name : MID
Model No. : HLT102

Rules : FCC CFR47 Part 15 C Section 15.247:2012

Date of Test : Oct 28~Nov 14, 2013

Date of Issue : Nov 23, 2013

Test Result : PASS*

Remark:

* The sample detailed above has been tested to the requirements of FCC rules mentioned above.

The test results have been reviewed against the directives above and found to meet their essential requirements.

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company.

The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

PERPARED BY:

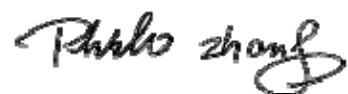
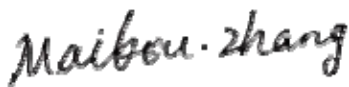
Waltek Services (Shenzhen) Co., Ltd.

1/F, Fukangtai Building, West of Baima Road., Songgang Street, Bao'an District,
Shenzhen, China

Tel: +86-755-83551033 Fax: +86-755-83552400

Compiled by:

Approved by:



Maikou Zhang / Project Engineer

Philo Zhong / Manager

2 Test Summary

Test Items	Test Requirement	Result
Radiated Emissions	15.205(a) 15.209(a)	PASS
Conducted Emissions	15.207(a)	PASS
6dB Bandwidth	15.247(a)(2)	PASS
Maximum Peak Output Power	15.247(b)(3),(4)	PASS
Power Spectral Density	15.247(e)	PASS
Band Edge	15.247(d)	PASS
Emissions from out of band	15.247(d)	PASS
Antenna Requirement	15.203	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

3 Contents

	Page
1 COVER PAGE	1
2 TEST SUMMARY.....	2
3 CONTENTS.....	3
4 GENERAL INFORMATION	5
4.1 GENERAL DESCRIPTION OF E.U.T.....	5
4.2 DETAILS OF E.U.T.....	5
4.3 TEST MODE	5
4.4 TEST FACILITY	6
4.5 TEST LOCATION.....	6
4.6 GENERAL CONDITION	6
5 EQUIPMENT USED DURING TEST.....	7
5.1 EQUIPMENTS LIST	7
5.2 MEASUREMENT UNCERTAINTY.....	7
5.3 TEST EQUIPMENT CALIBRATION	7
6 CONDUCTED EMISSION.....	8
6.1 E.U.T. OPERATION.....	8
6.2 EUT SETUP	8
6.3 CONDUCTED EMISSION TEST RESULT.....	9
7 RADIATED EMISSIONS.....	11
7.1 EUT OPERATION :	11
7.2 TEST SETUP	12
7.3 SPECTRUM ANALYZER SETUP	13
7.4 TEST PROCEDURE.....	14
7.5 CORRECTED AMPLITUDE & MARGIN CALCULATION	14
7.6 SUMMARY OF TEST RESULTS	15
8 BAND EDGE MEASUREMENT	27
8.1 TEST PRODUCE	27
8.2 TEST RESULT	28
9 6 DB BANDWIDTH MEASUREMENT.....	31
9.1 TEST PROCEDURE:.....	31
9.2 TEST RESULT:	31
10 MAXIMUM PEAK OUTPUT POWER	36
10.1 TEST PROCEDURE:.....	36
10.2 TEST RESULT:.....	36
11 POWER SPECTRAL DENSITY.....	42
11.1 TEST RESULT:.....	42
12 EMISSIONS FROM OUT OF BAND.....	48
12.1 TEST PROCEDURE:	48
12.2 TEST RESULT:.....	48
13 ANTENNA REQUIREMENT.....	58
14 RF EXPOSURE	59
14.1 REQUIMENTS:	59
14.2 THE PROCEDURES / LIMIT	59
14.3 MPE CALCULATION METHOD.....	60
15 PHOTOGRAPHS – TEST SETUP.....	61

15.1 CONDUCTED EMISSION 61

15.2 RADIATED EMISSION..... 61

16 PHOTOGRAPHS - CONSTRUCTIONAL DETAILS..... 63

16.1 EUT –APPEARANCE VIEW 63

16.2 ADAPTER – VIEW..... 66

16.3 EUT- INTERNAL VIEW..... 67

16.4 RF MODULE 69

4 General Information

4.1 General Description of E.U.T.

Product Name	: MID
Model No.	: HLT102
Operation Frequency	: 2412MHz ~ 2462MHz
Antenna Gain	: 0dBi
Type of modulation	: IEEE 802.11b (CCK/QPSK/BPSK, 11Mbps max.) IEEE 802.11g (BPSK/QPSK/16QAM/64QAM, 54Mbps max.) IEEE 802.11n (BPSK/QPSK/16QAM/64QAM, HT20: 72Mbps max.)
Note	: All the modulation modes were tested, all the test data deeply conform to the rules and the data of the worst mode are recorded in the following pages.

4.2 Details of E.U.T.

Technical Data	: (1)DC 7.4V, 3000*2mAh powered by Internal lithium battery (2)DC 9V, 1.6A powered by external adapter (adapter input: AC 100-240V~, 50/60Hz, 0.35A)
-----------------------	--

4.3 Test Mode

Table 1 Tests Carried Out Under FCC part 15.247

Test Items	Test Mode	Data Rate	Channel	TX/RX
Maximum Peak Output Power	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	72 Mbps	1/6/11	TX
Power Spectral Density	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	72 Mbps	1/6/11	TX
6 dB Bandwidth	802.11b	11 Mbps	1/11	TX
	802.11g	54 Mbps	1/11	TX
	802.11n HT20	72 Mbps	1/11	TX
Band Emissions	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	72 Mbps	1/6/11	TX
Transmitter Spurious Emissions	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	72 Mbps	1/6/11	TX

Note :Parameters set by test software during channel & power tests, the software provided by the customer was used to set the operating channels as well as the output power level. The RF output power set is the power expected by the manufacturer and is going to be fixed on the firmware of the final product .

Table 2 Tests Carried Out Under FCC part 15.207 & FCC part 15.209

Test Item	Test Mode
Radiation Emission, 30MHz ~ 1GHz	transmit
Conduction Emission, 0.15MHz to 30MHz	transmit

4.4 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 7760A**

Waltek Services(Shenzhen) Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files.

Registration number 7760A, July 12, 2012.

- **FCC – Registration No.: 880581**

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, May 26, 2011.

4.5 Test Location

Waltek Services(Shenzhen) Co., Ltd. at 1/F, Fukangtai Building, West Baima Rd.,Songgang Street, Baoan District, Shenzhen, China

4.6 General condition

Ambient Condition: 25.5 °C 58 %RH

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

The follow condition is not applicable for adapter:

Test Voltage	Input voltage
Rated voltage-15%	AC -V
normal	AC -V
Rated voltage+15%	AC -V

The follow condition is applicable.

Test voltage	Test Voltage
Rated voltage	DC7.4V

5 Equipment Used during Test

5.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer	Agilent	E7405A	MY45114943	Spe.21,2013	Spe.20,2014
2.	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Spe.21,2013	Spe.20,2014
3.	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Spe.21,2013	Spe.20,2014
4.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Spe.21,2013	Spe.20,2014
5.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	399	Spe.21,2013	Spe.20,2014
6.	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Spe.21,2013	Spe.20,2014
7.	Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-148	Spe.21,2013	Spe.20,2014
8.	Cable	Top	EWO2014-7	-	Spe.21,2013	Spe.20,2014
9.	Cable	Top	TYPE16(13M)	-	Spe.21,2013	Spe.20,2014
10.	DC POWER SUPPLY	LWDQGS	PS-303D		Spe.21,2013	Spe.20,2014
11.	Humidity Chamber	GTH-225-40-1P	IAA061213		Spe.21,2013	Spe.20,2014
12.	Spectrum Analyzer	ROHDE & SCHWARZ	FSL6		Spe.21,2013	Spe.20,2014

5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (30M~1000MHz)
	± 4.74 dB (1000M~25000MHz)

5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

6 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.4:2003
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class:	Class B
Limit:	66-56 dB μ V between 0.15MHz & 0.5MHz 56 dB μ V between 0.5MHz & 5MHz 60 dB μ V between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

6.1 E.U.T. Operation

Operating Environment:

Temperature:	25.5 °C
Humidity:	50 % RH
Atmospheric Pressure:	1010 mbar

EUT Operation:

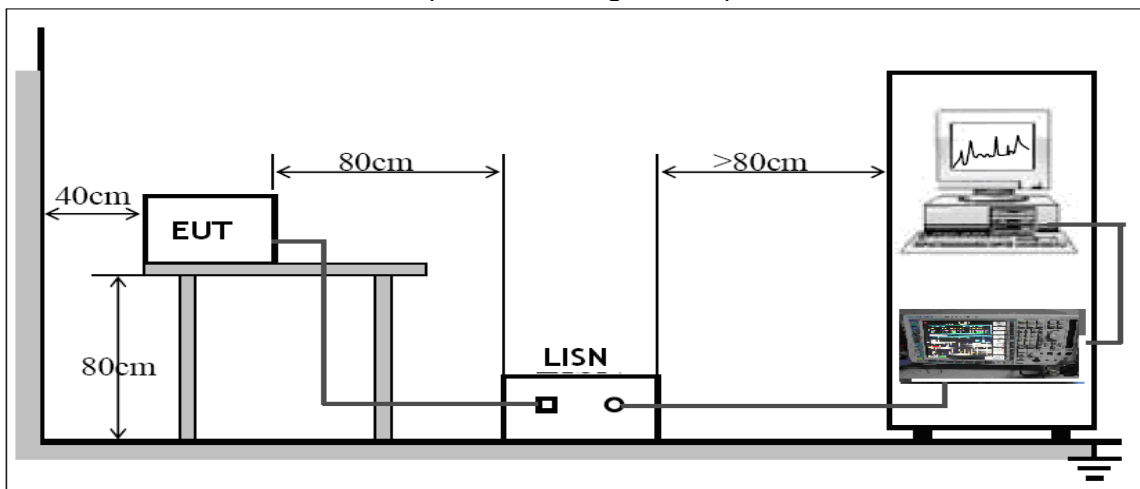
The pre-test was performed in wifi transmit mode, and the test data were shown as follow.

The EUT was tested according to ANSI C63.4:2003. The frequency spectrum from 150kHz to 30MHz was investigated.

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.2 EUT Setup

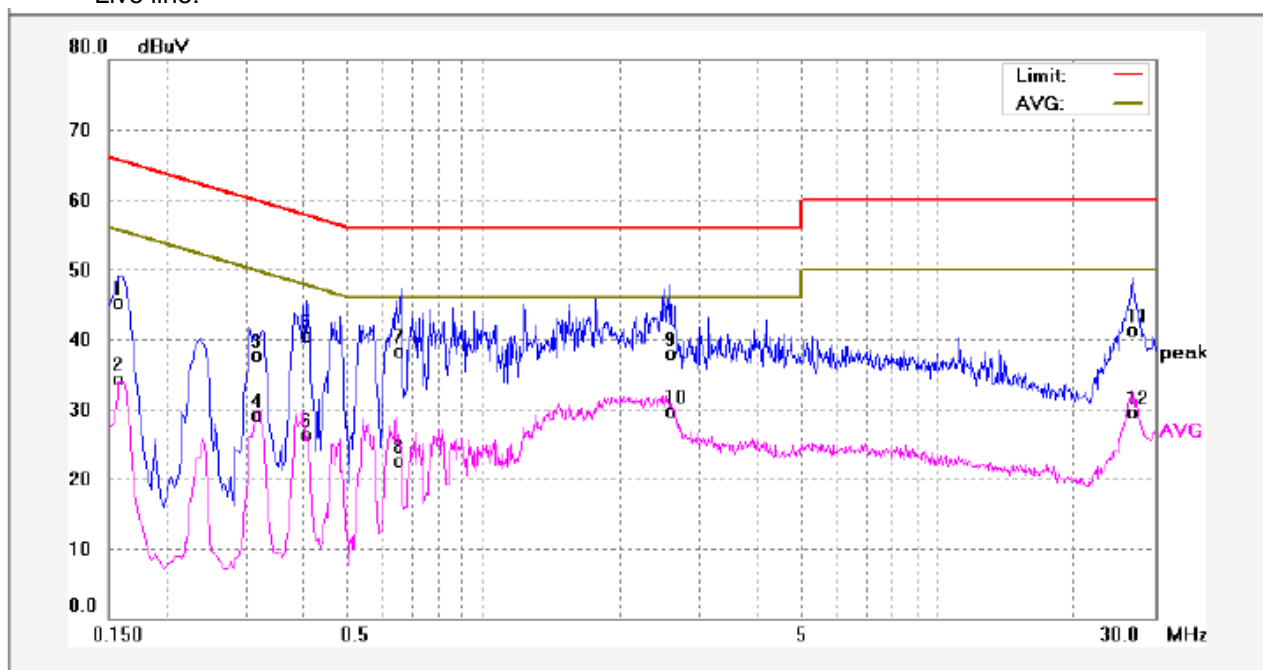
The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003.



6.3 Conducted Emission Test Result

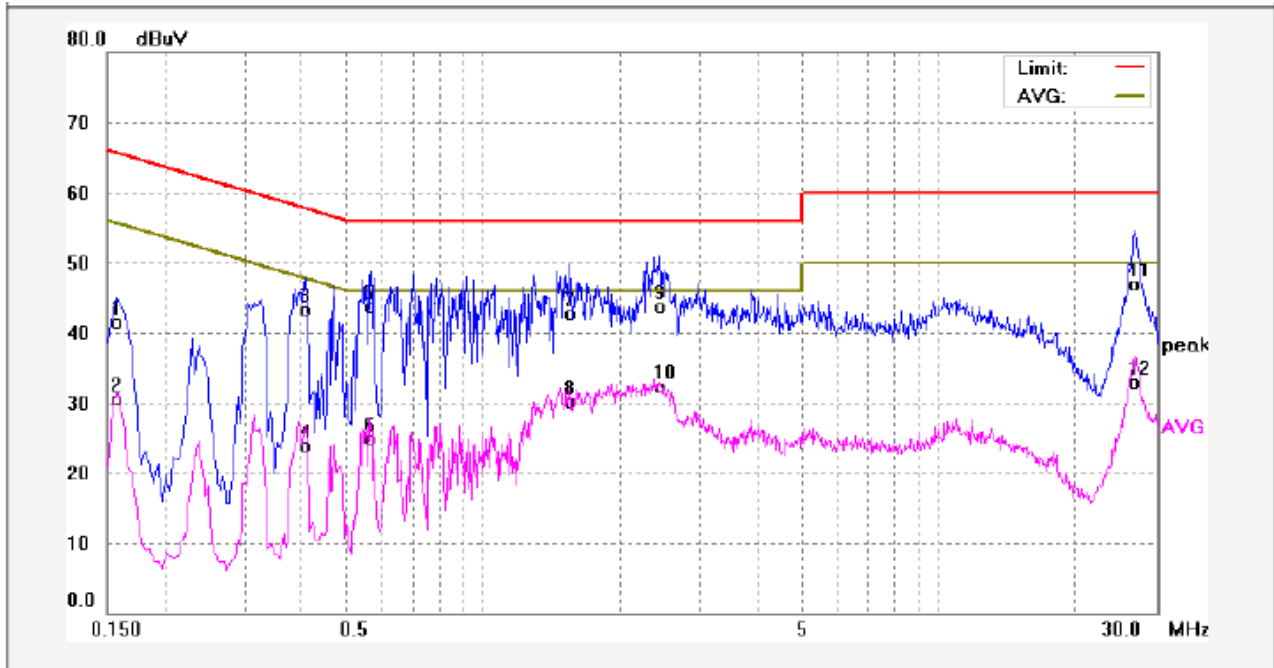
An initial pre-scan was performed on the live and neutral lines.

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Remark
1	0.1580	35.52	9.81	45.33	65.56	-20.23	QP	
2	0.1580	24.51	9.81	34.32	55.56	-21.24	AVG	
3	0.3180	27.77	9.88	37.65	59.76	-22.11	QP	
4	0.3180	19.20	9.88	29.08	49.76	-20.68	AVG	
5	0.4100	30.54	9.90	40.44	57.65	-17.21	QP	
6	0.4100	16.37	9.90	26.27	47.65	-21.38	AVG	
7	0.6580	28.34	9.95	38.29	56.00	-17.71	QP	
8	0.6580	12.59	9.95	22.54	46.00	-23.46	AVG	
9	2.5820	27.93	10.02	37.95	56.00	-18.05	QP	
10	2.5820	19.72	10.02	29.74	46.00	-16.26	AVG	
11	26.8060	29.44	11.86	41.30	60.00	-18.70	QP	
12	26.8060	17.62	11.86	29.48	50.00	-20.52	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	31.75	9.81	41.56	65.56	-24.00	QP	
2	0.1580	20.76	9.81	30.57	55.56	-24.99	AVG	
3	0.4100	33.40	9.90	43.30	57.65	-14.35	QP	
4	0.4100	13.91	9.90	23.81	47.65	-23.84	AVG	
5	0.5700	33.71	9.94	43.65	56.00	-12.35	QP	
6	0.5700	14.96	9.94	24.90	46.00	-21.10	AVG	
7	1.5580	32.63	10.00	42.63	56.00	-13.37	QP	
8	1.5580	20.17	10.00	30.17	46.00	-15.83	AVG	
9	2.4420	33.76	10.01	43.77	56.00	-12.23	QP	
10	2.4420	22.21	10.01	32.22	46.00	-13.78	AVG	
11	26.7060	35.14	11.84	46.98	60.00	-13.02	QP	
12	26.7060	21.06	11.84	32.90	50.00	-17.10	AVG	

7 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209
& 15.247

Test Method: ANSI C63.4:2003

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

Test mode: see section 4.4

7.1 EUT Operation :

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1010 mbar

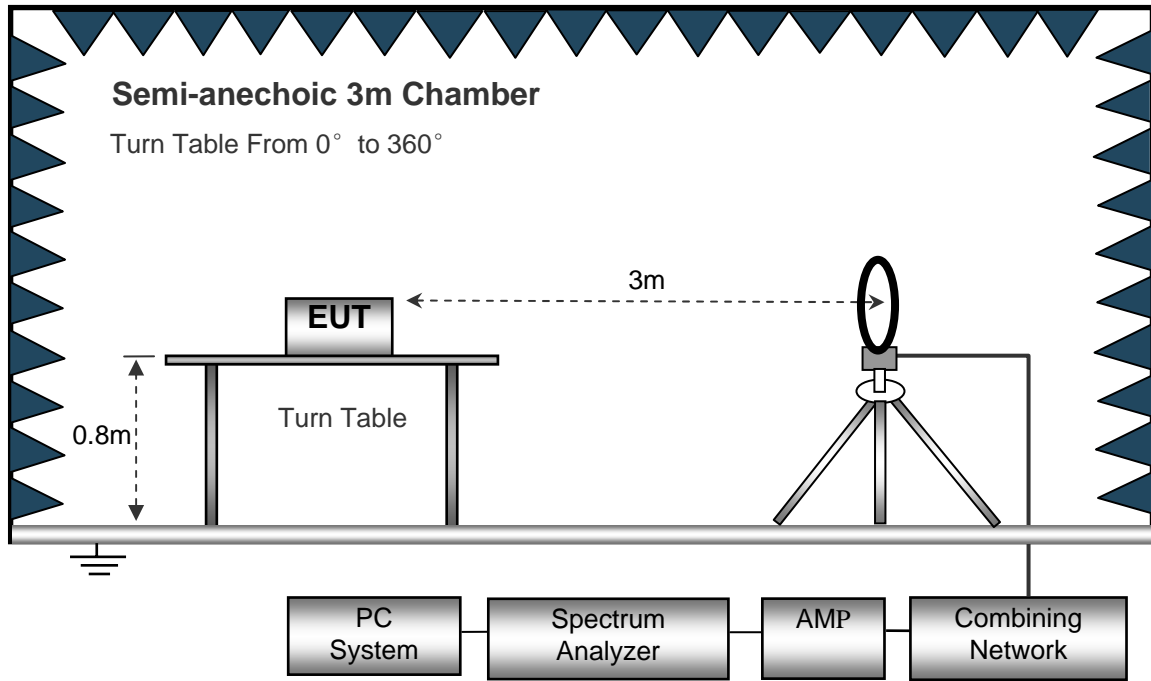
EUT Operation :

The EUT was tested in Wifi Continuously transmit mode.

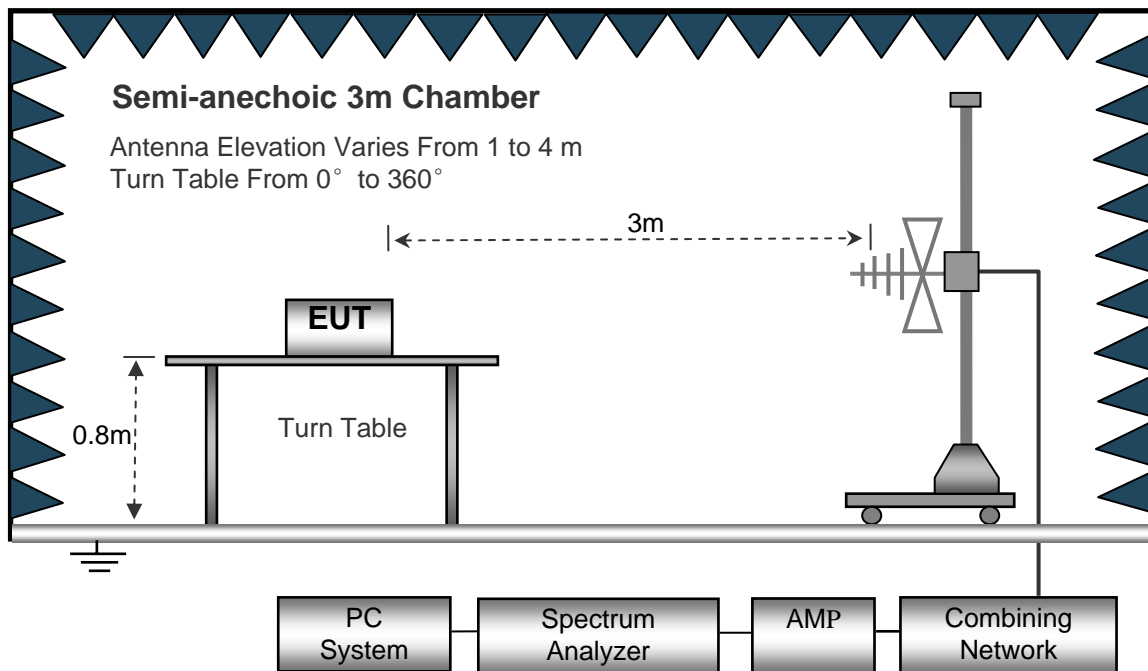
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003.

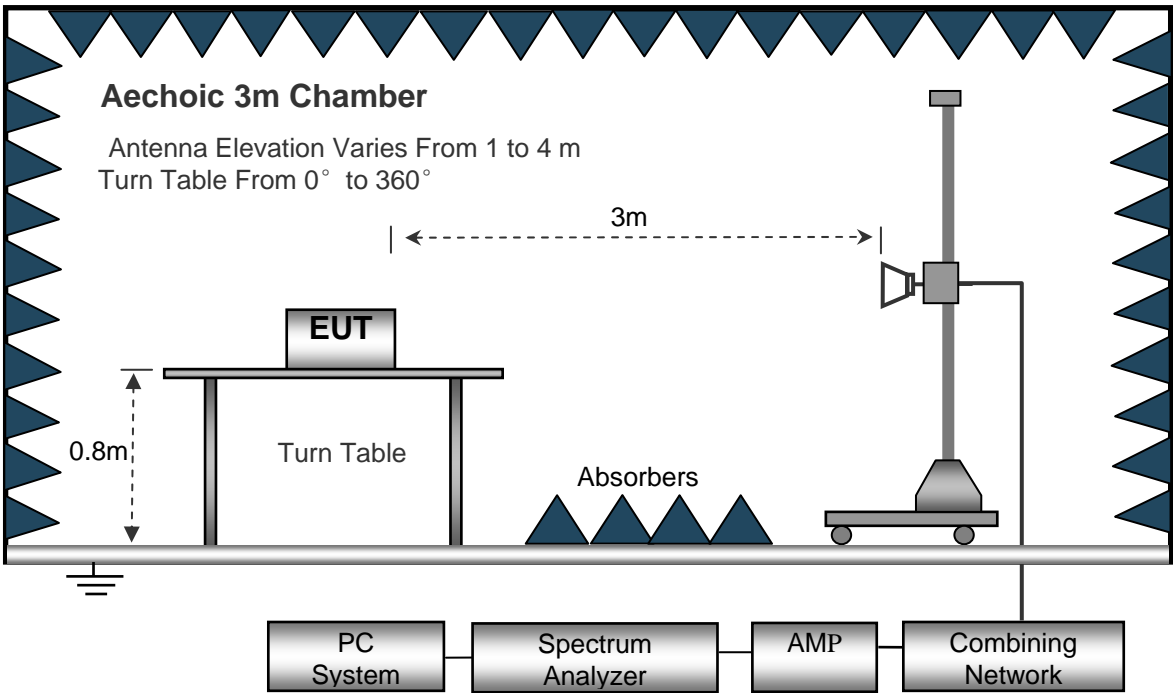
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

According to FCC Part15 Rules, the system was tested from 9KHz to 25000MHz.

Below 30MHz

- Sweep SpeedAuto
- IF Bandwidth10KHz
- Video Bandwidth10KHz
- Resolution Bandwidth10KHz

30MHz ~ 1GHz

- Sweep SpeedAuto
- IF Bandwidth120 KHz
- Video Bandwidth100KHz
- Quasi-Peak Adapter Bandwidth120 KHz
- Quasi-Peak Adapter ModeNormal
- Resolution Bandwidth100KHz

Above 1GHz

- Sweep SpeedAuto
- IF Bandwidth120 KHz
- Video Bandwidth3MHz
- Quasi-Peak Adapter Bandwidth120 KHz
- Quasi-Peak Adapter ModeNormal
- Resolution Bandwidth1MHz

7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in X axis,so the worst data were shown as follow.
8. A 2.4GHz high –pass filter is used during radiated emissions above 1GHz measurement.

7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

7.6 Summary of Test Results

Test Frequency : Below 30MHz

The measurements were more than 20 dB below the limit and not reported.

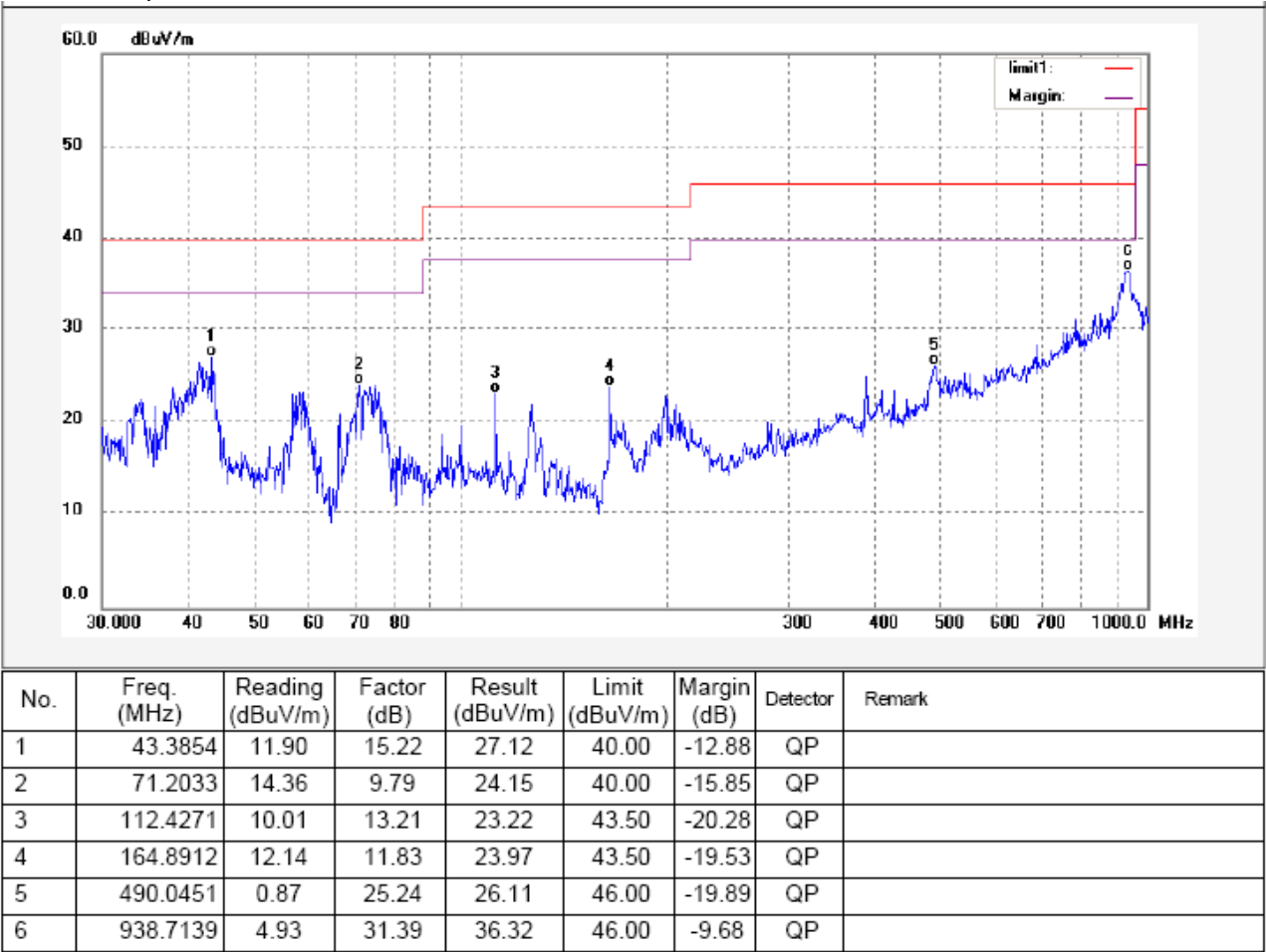
Test Frequency : 30MHz ~ 1000MHz

Remark: The pre-test was performed at TX 11b, TX 11g and TX 11n HT20 mode, and the worst is TX 11b mode, so the data shown is that mode's only.

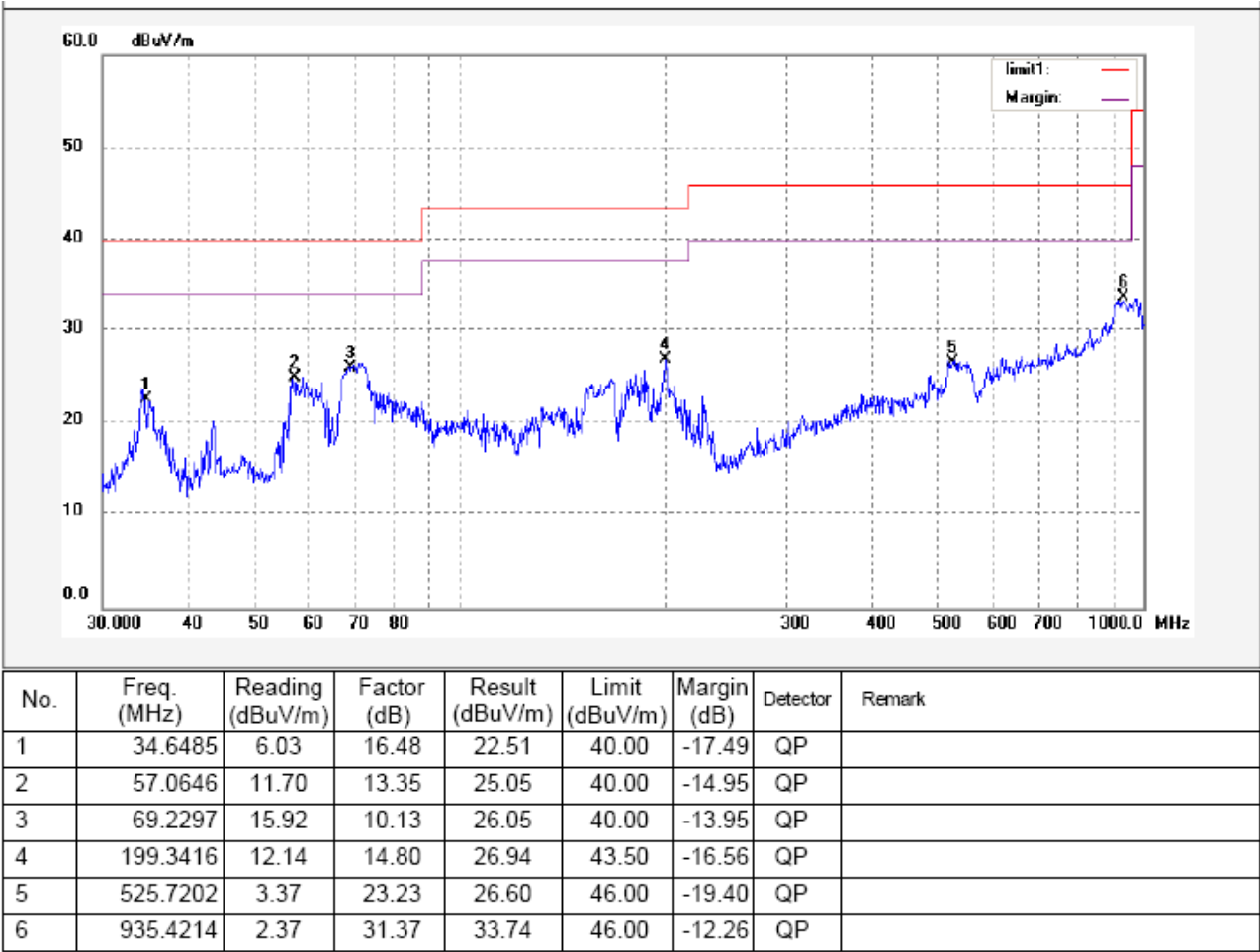
Test mode: Wifi Continuously Transmit (Power input by battery)

Test Channel: 2412MHz

Antenna polarization: Vertical

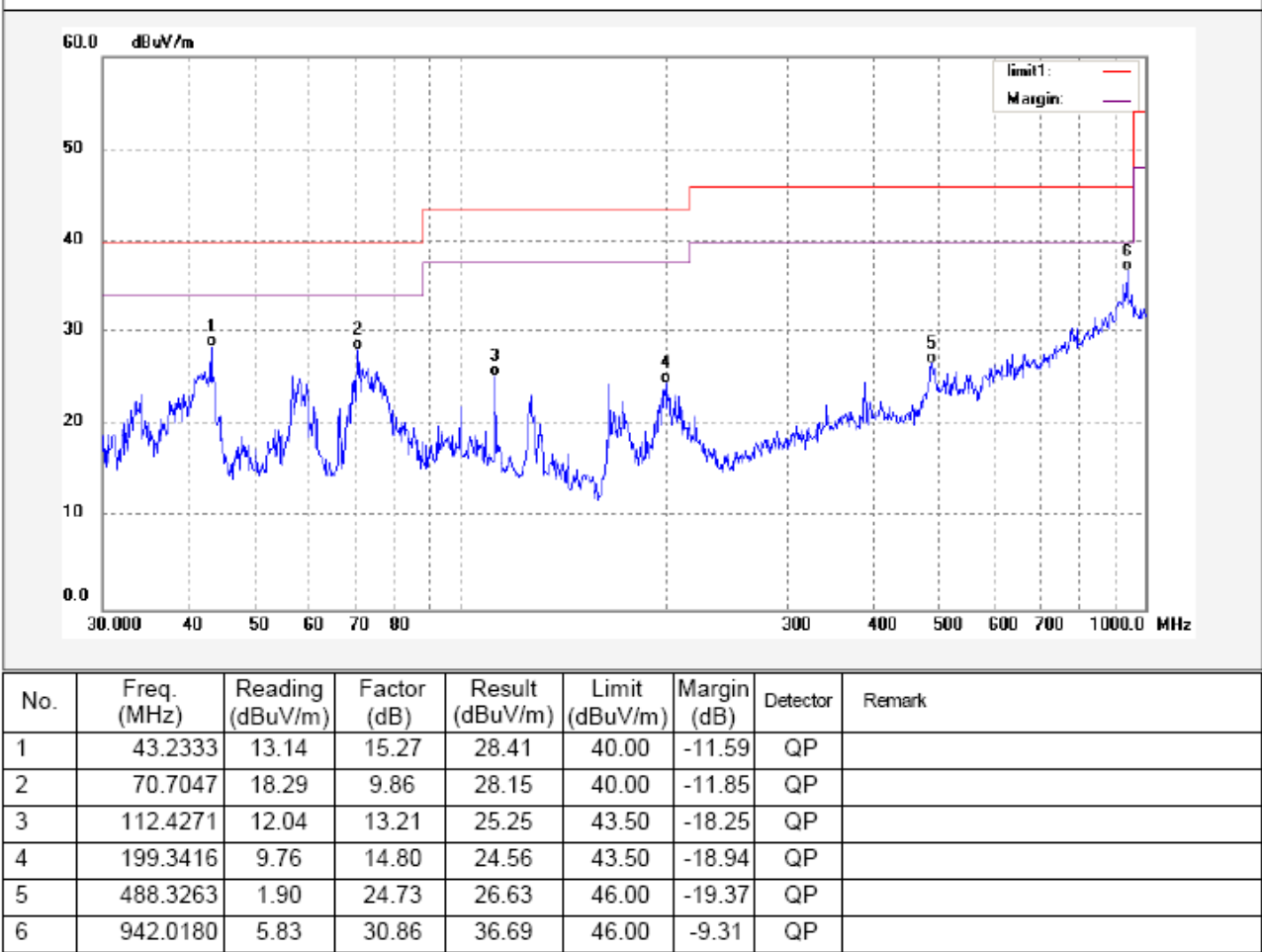


Antenna polarization: Horizontal

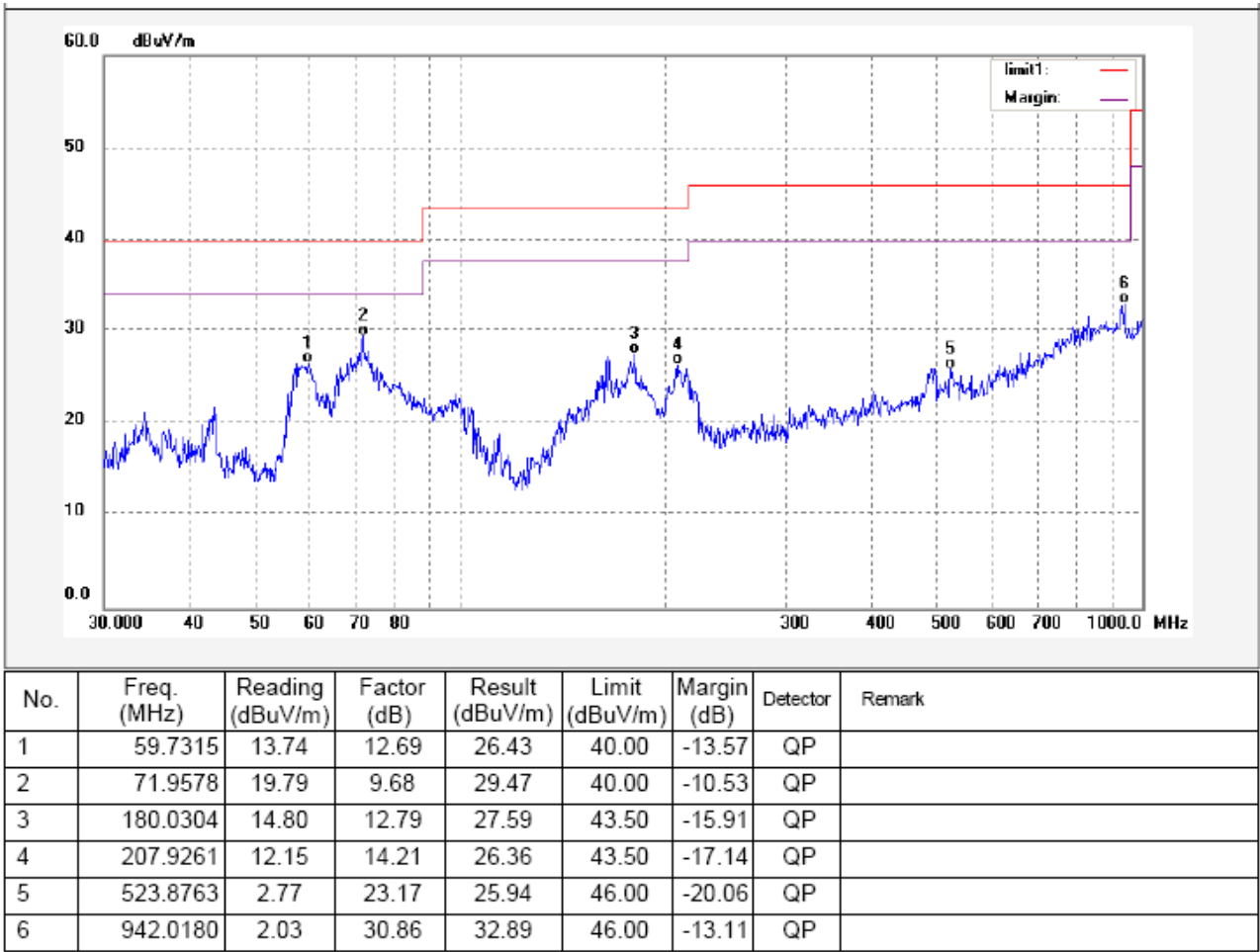


Test Channel: 2437MHz

Antenna polarization: Vertical

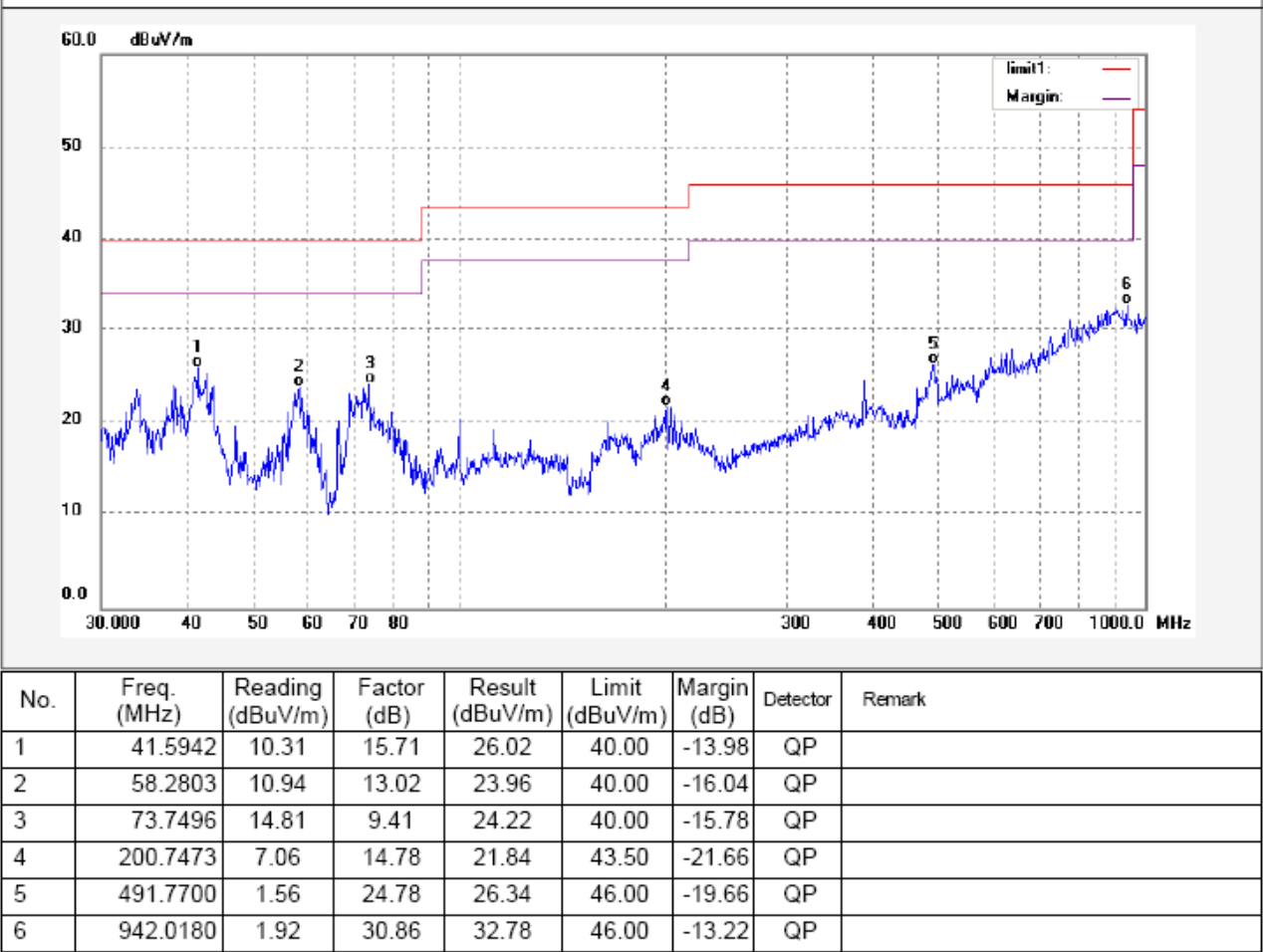


Antenna polarization: Horizontal

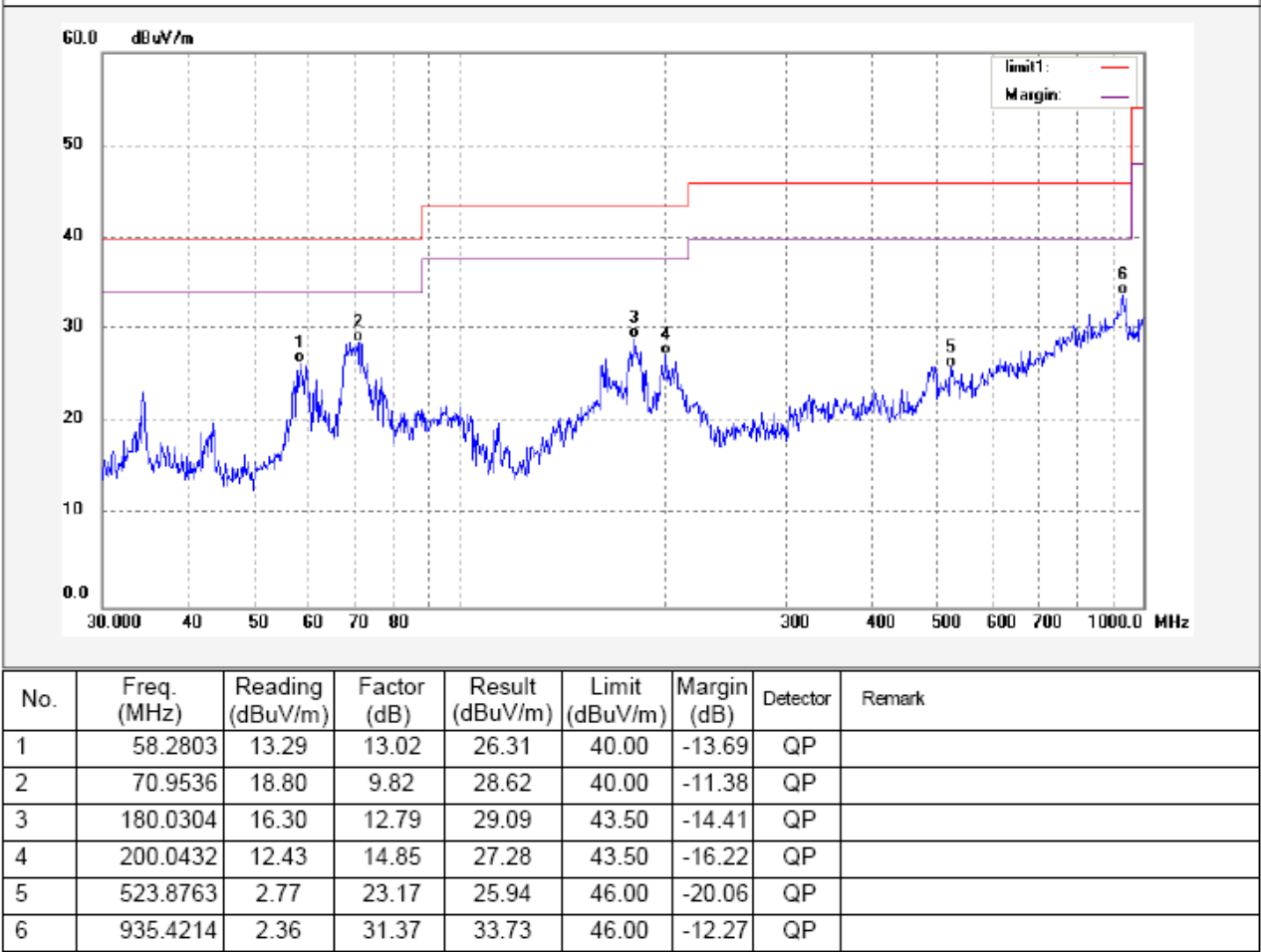


Test Channel: 2462MHz

Antenna polarization: Vertical



Antenna polarization: Horizontal



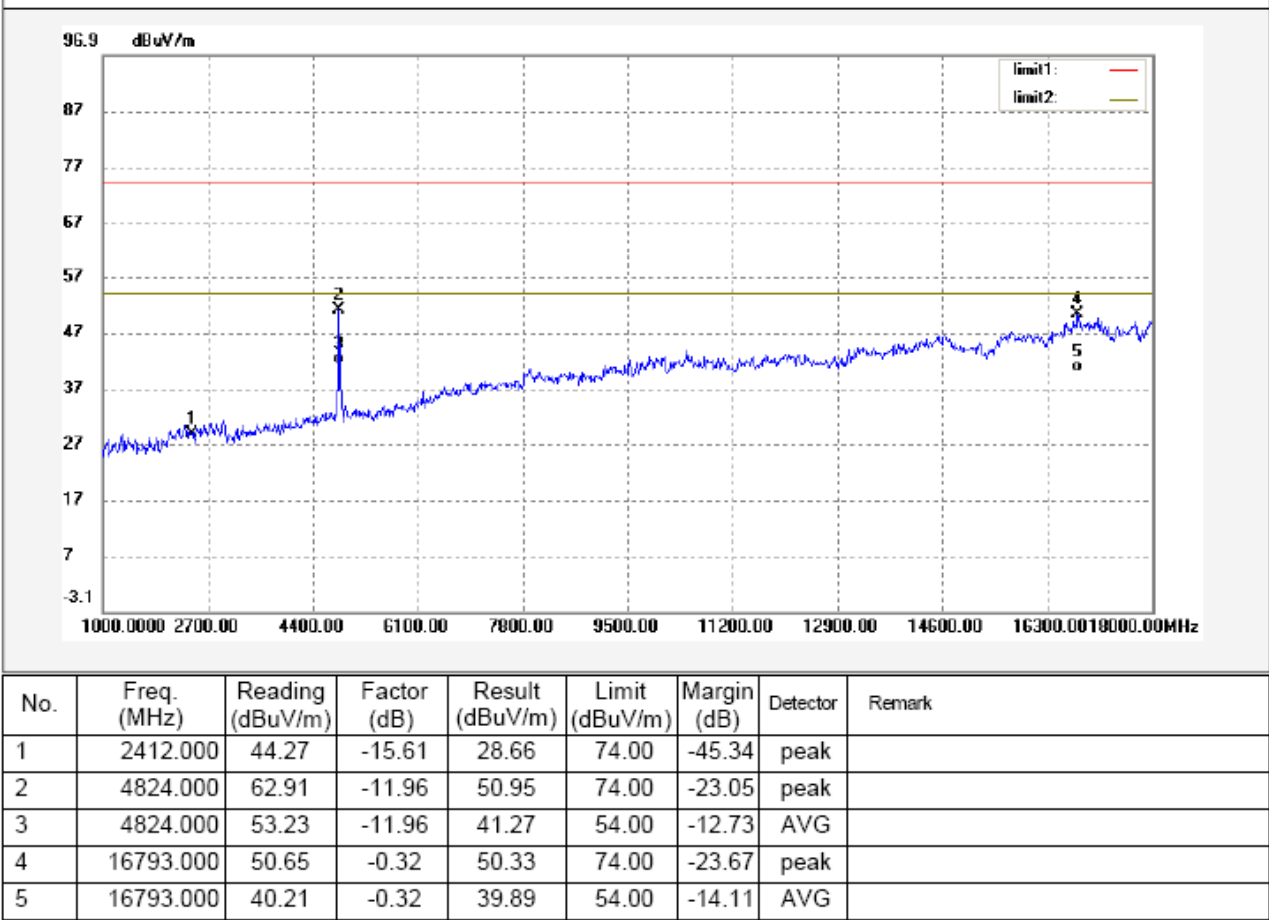
Test Frequency: From 1GHz -18GHz

Remark: The pre-test was performed at TX 11b, TX 11g and TX 11n HT20 mode, and the worst is TX 11b mode, so the data shown is that mode's only.

Test mode: Wifi Continuously Transmit

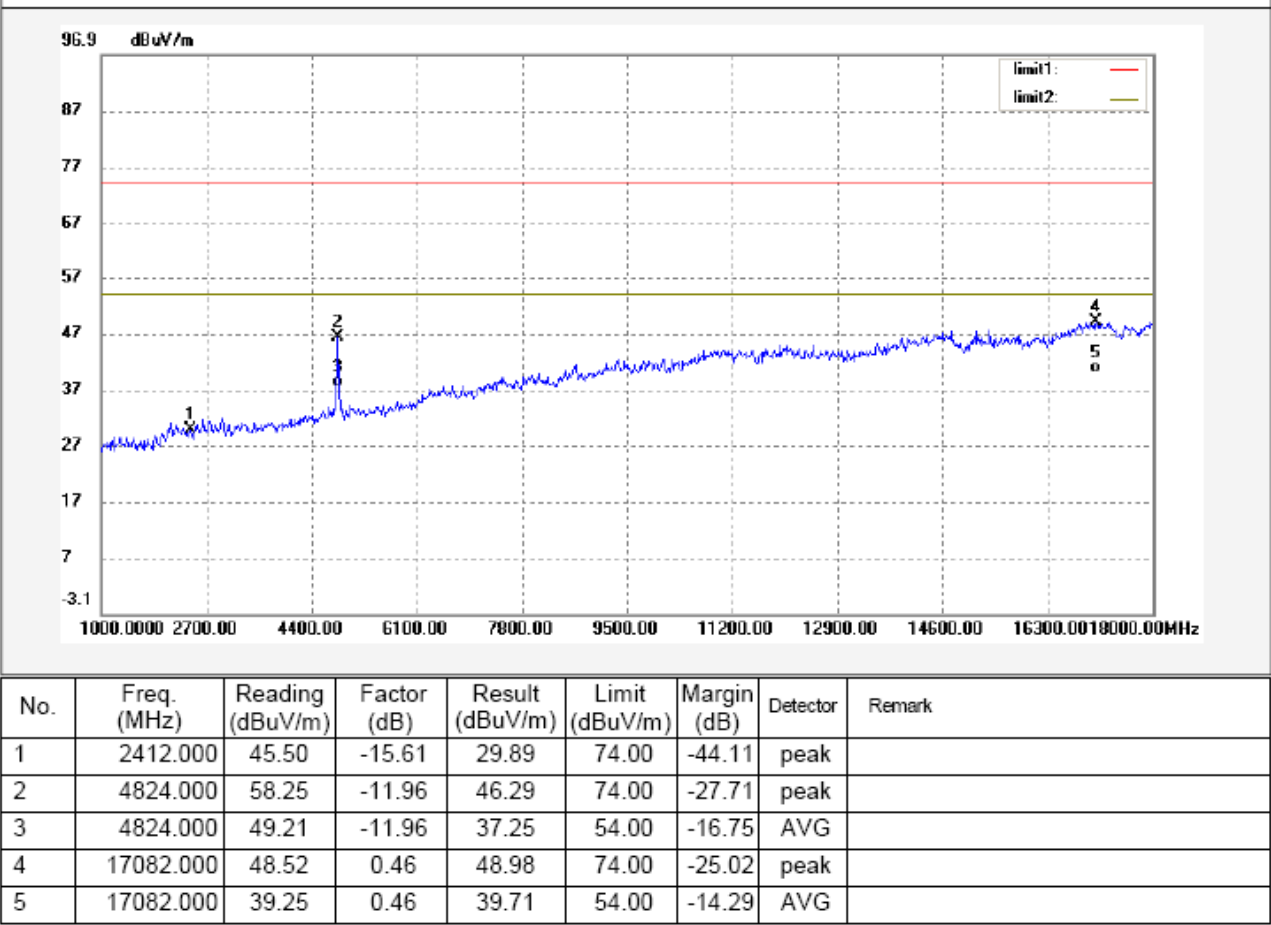
Modulation:TX 11b, Test Channel: 2412MHz

Antenna polarization: Vertical



Remark: 2.4GHz high-pass filter is used during radiated emissions above 1GHz measurement.

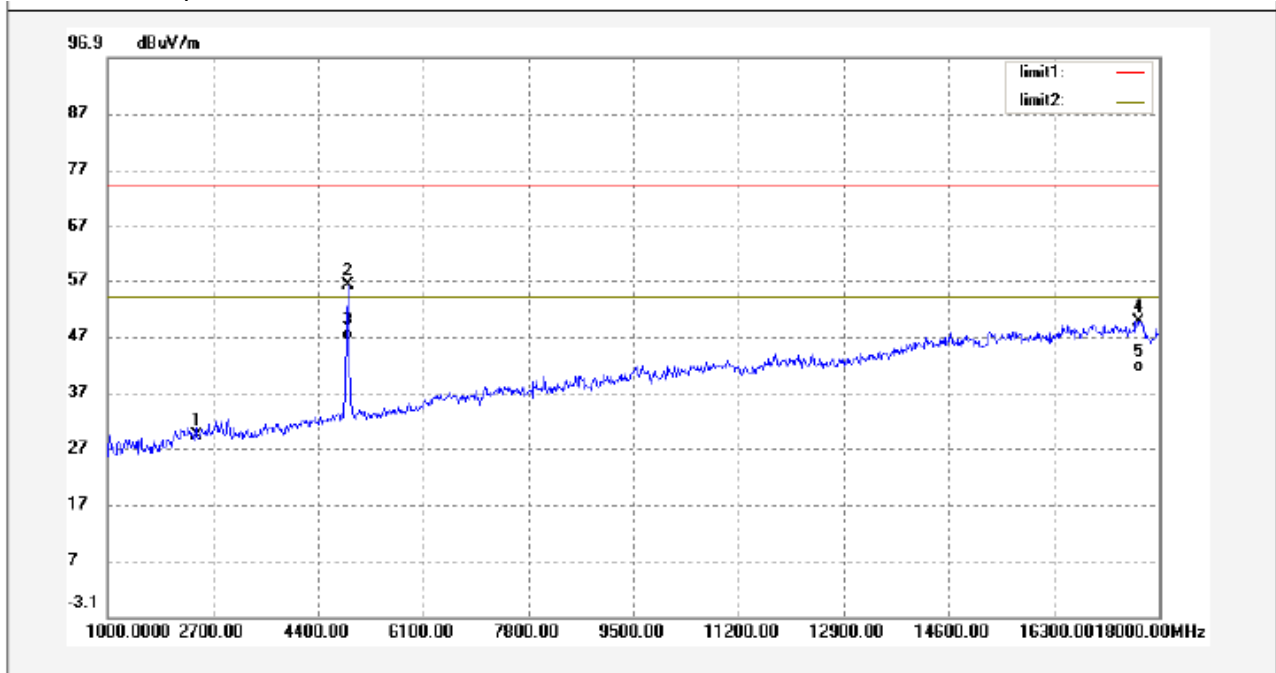
Antenna polarization: Horizontal



Remark: 2.4GHz high-pass filter is used during radiated emissions above 1GHz measurement.

Modulation:TX 11b, Test Channel: 2437MHz

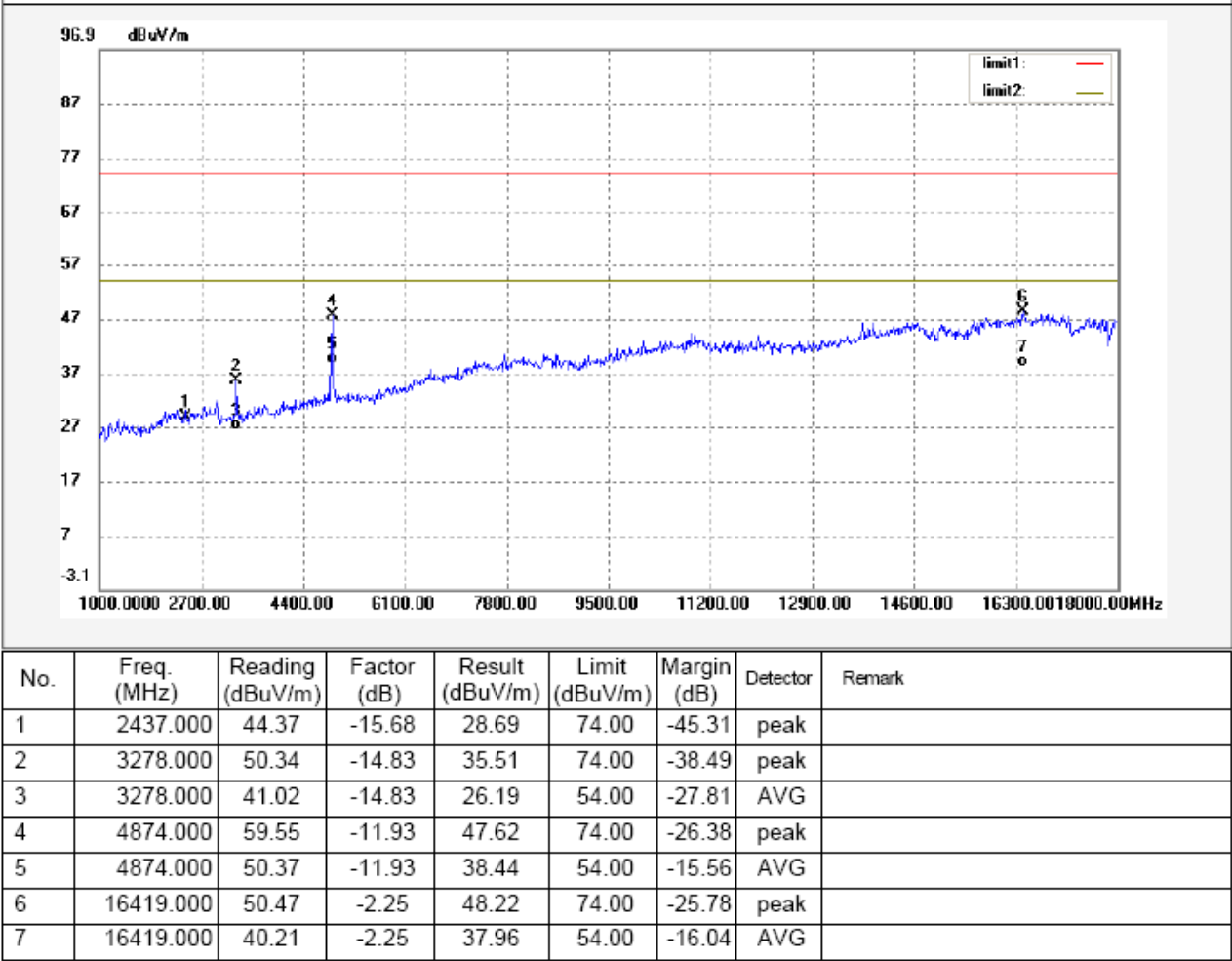
Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2437.000	44.86	-15.68	29.18	74.00	-44.82	peak	
2	4874.000	67.90	-11.93	55.97	74.00	-18.03	peak	
3	4874.000	58.21	-11.93	46.28	54.00	-7.72	AVG	
4	17660.000	46.20	3.32	49.52	74.00	-24.48	peak	
5	17660.000	37.20	3.32	40.52	54.00	-13.48	AVG	

Remark: 2.4GHz high-pass filter is used during radiated emissions above 1GHz measurement.

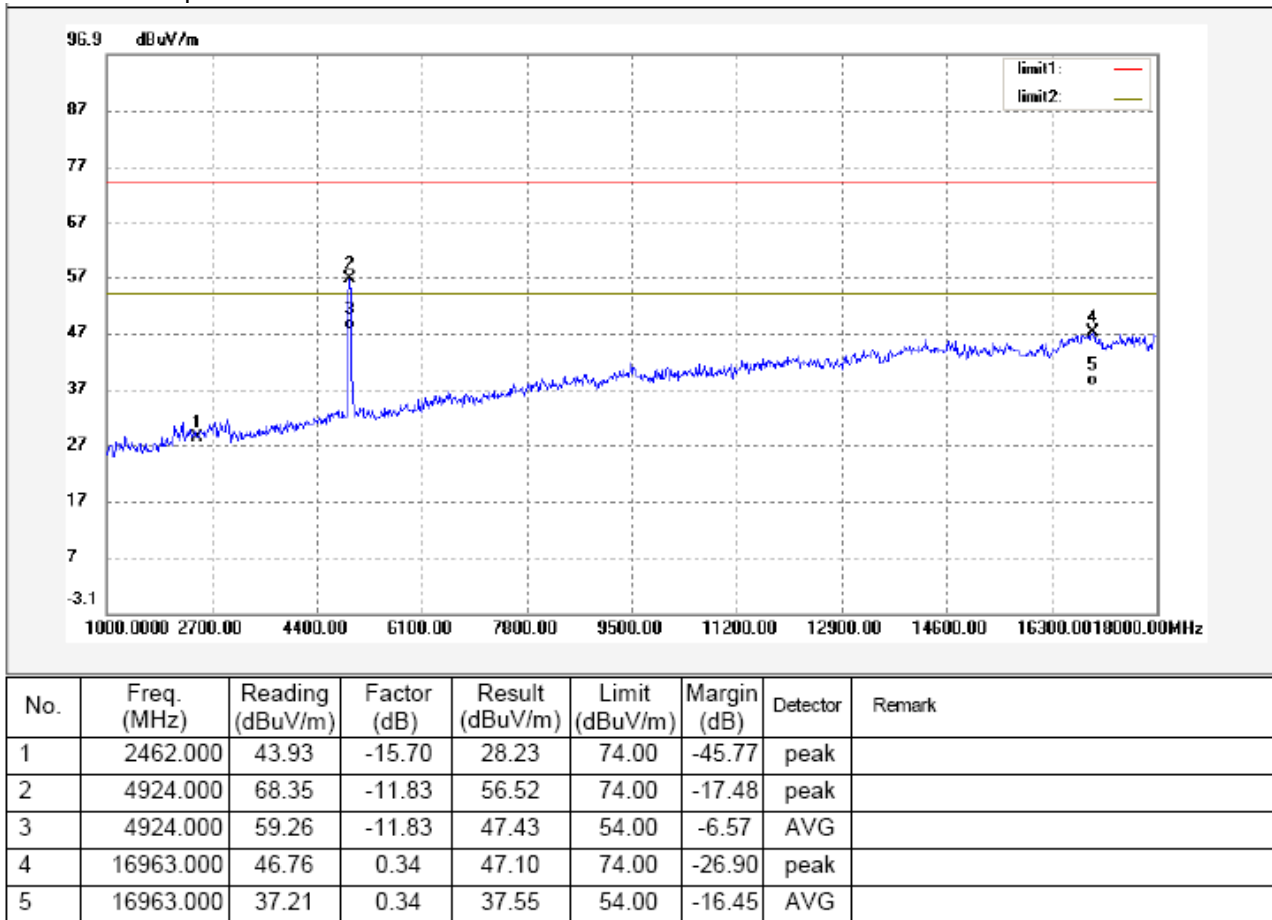
Antenna polarization: Horizontal



Remark: 2.4GHz high-pass filter is used during radiated emissions above 1GHz measurement.

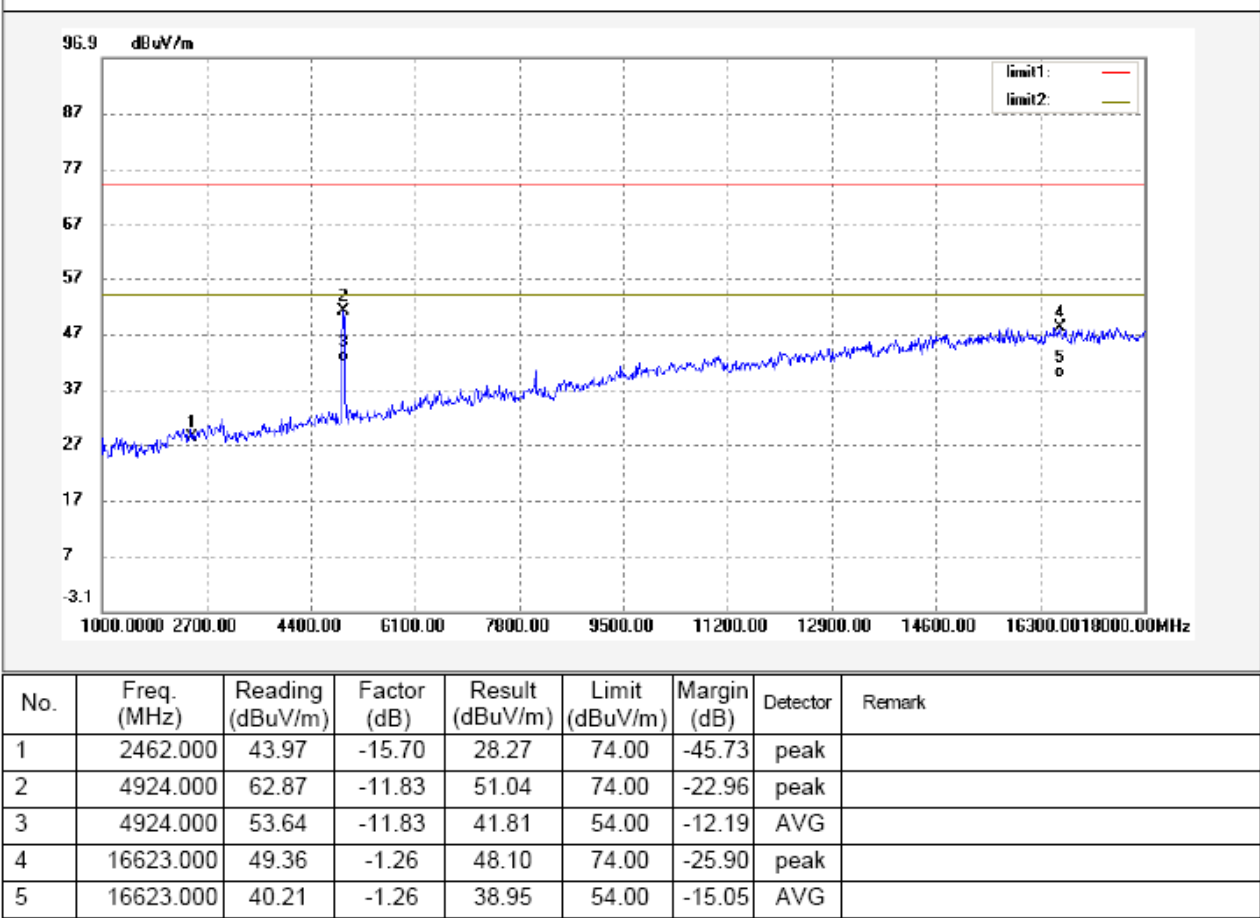
Modulation:TX 11b, Test Channel: 2462MHz

Antenna polarization: Vertical



Remark: 2.4GHz high-pass filter is used during radiated emissions above 1GHz measurement.

Antenna polarization: Horizontal



Remark: 2.4GHz high-pass filter is used during radiated emissions above 1GHz measurement.

Test Frequency: Above 18GHz

The measurements were more than 20 dB below the limit and not reported.

8 Band Edge Measurement

Test Requirement:	Section 15.247(d) 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) and 15.205(c).
Test Method:	KDB558074 D01 v03r01 04/09/2013
Measurement Distance:	3m
Detector:	For Peak value: RBW = 1MHz VBW = 3MHz; Sweep = auto Detector function = peak Trace = max hold For Average value: RBW = 1MHz VBW=10Hz; Sweep = auto Detector function = Average Trace = max hold

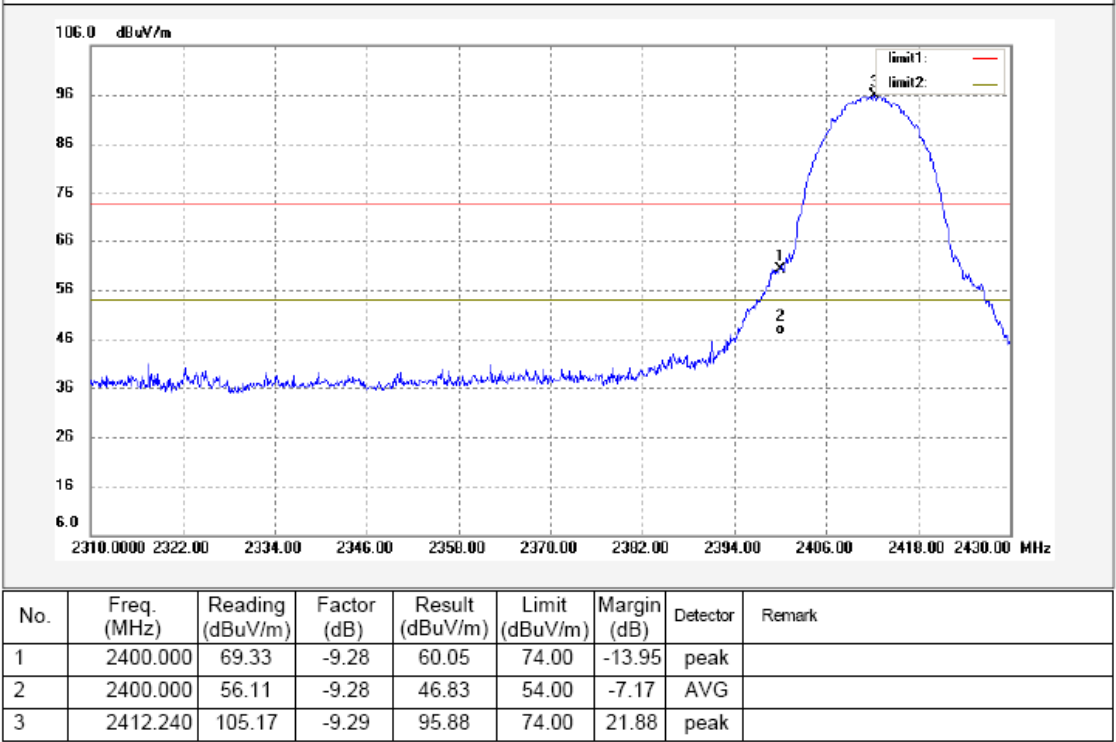
8.1 Test Produce

1. The EUT is placed on a turntable, which is 0.8m above the ground plane and worked at highest radiated power.
2. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. continuous transmitting

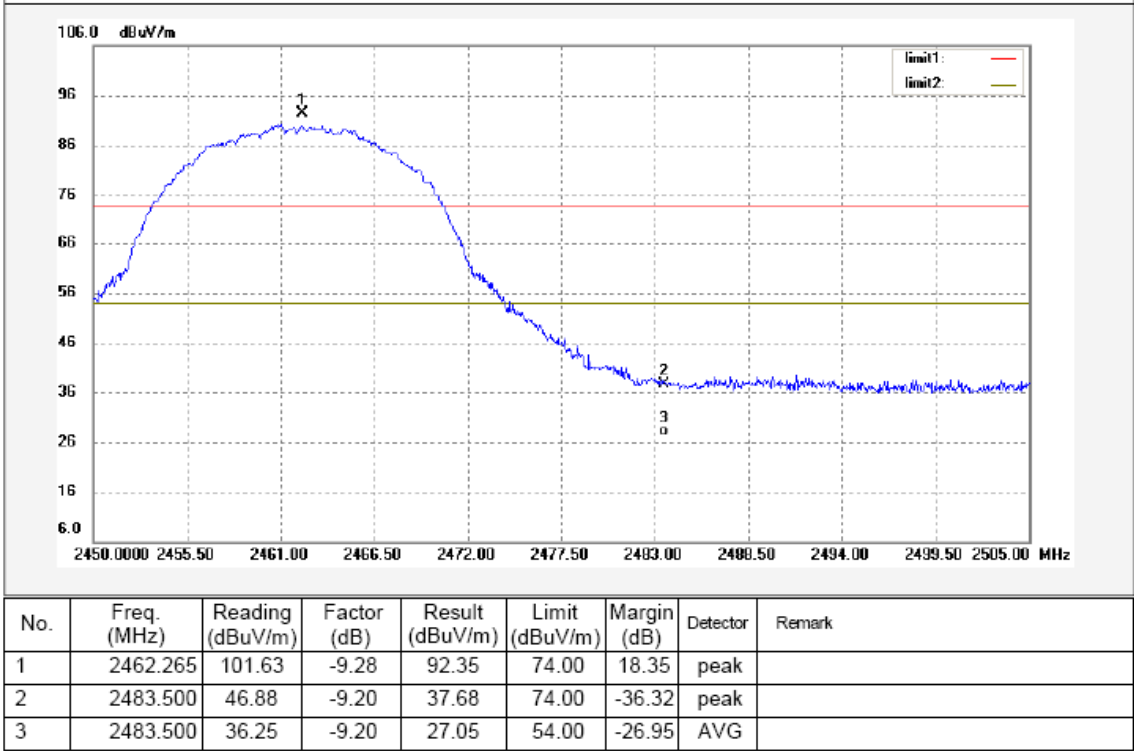
8.2 Test Result

Remark: the EUT was pretested at received antenna Vertical polarity, Horizontal polarity, and the worse case was the Vertical polarity, so the data show was the Vertical polarity only.

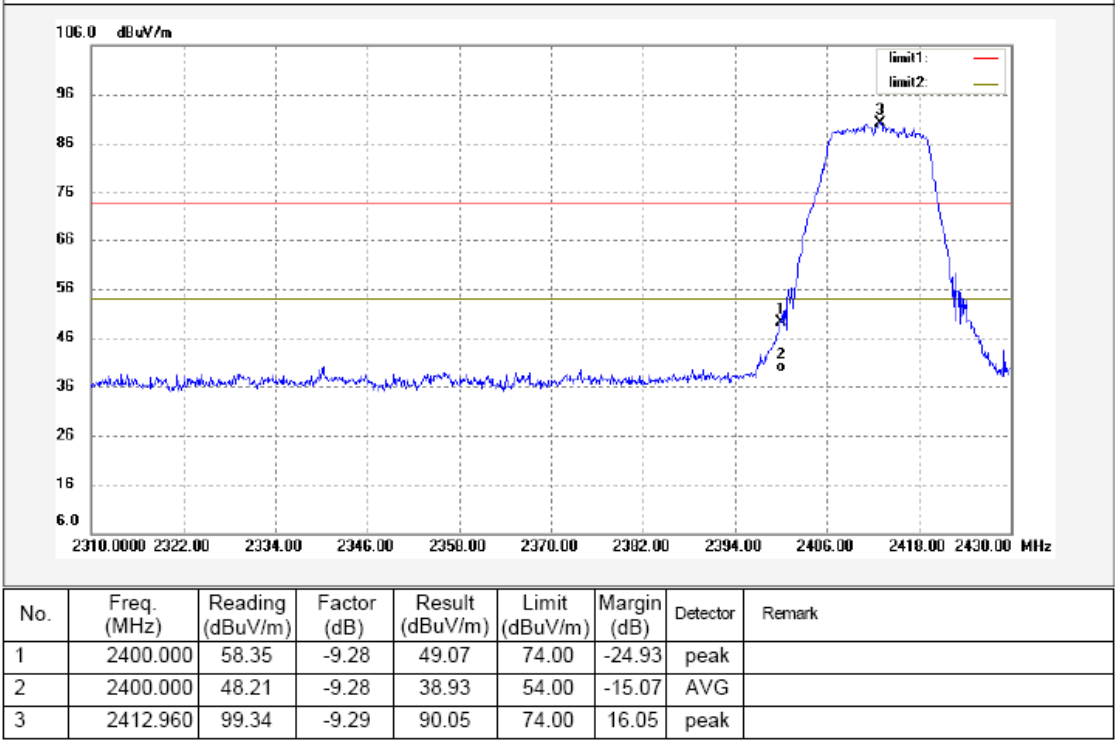
Mode: TX 11b channel 1



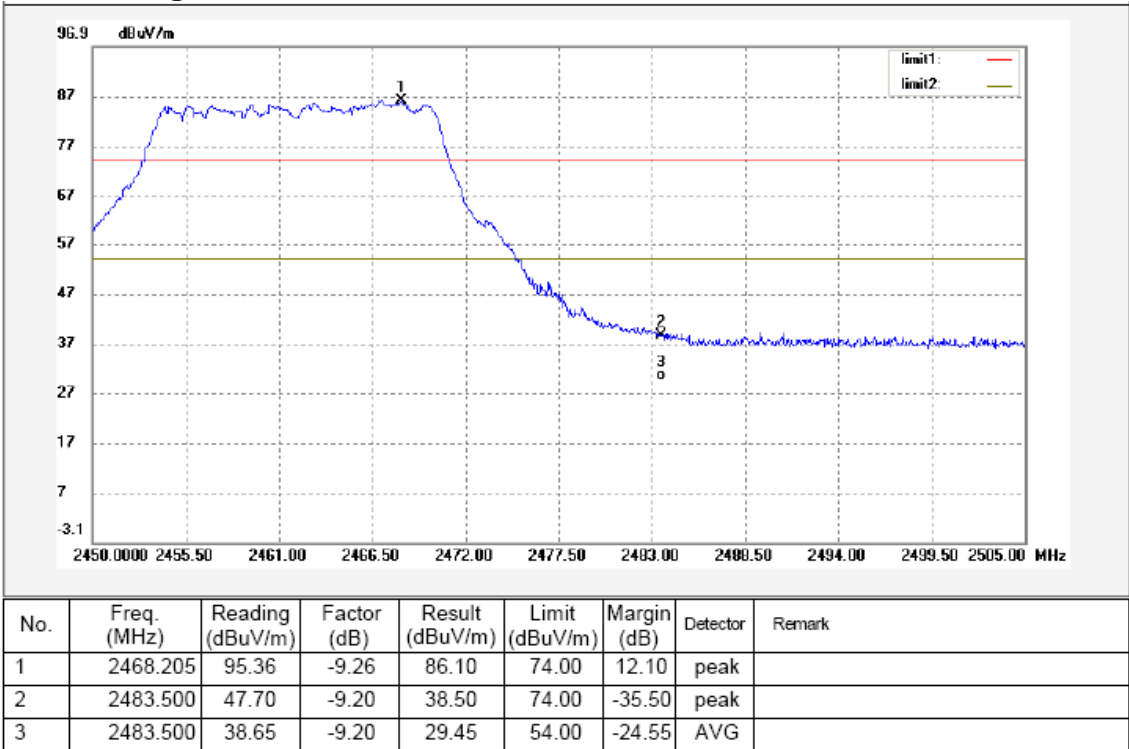
Mode: TX 11b channel 11



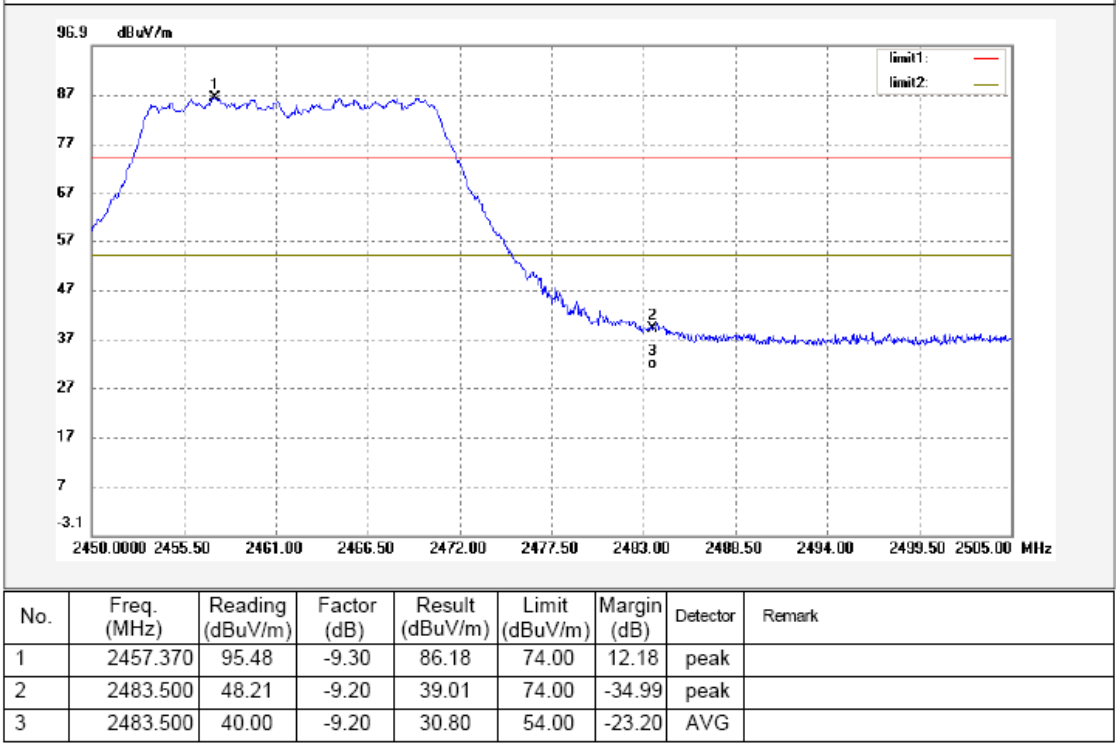
Mode: TX 11g channel 1



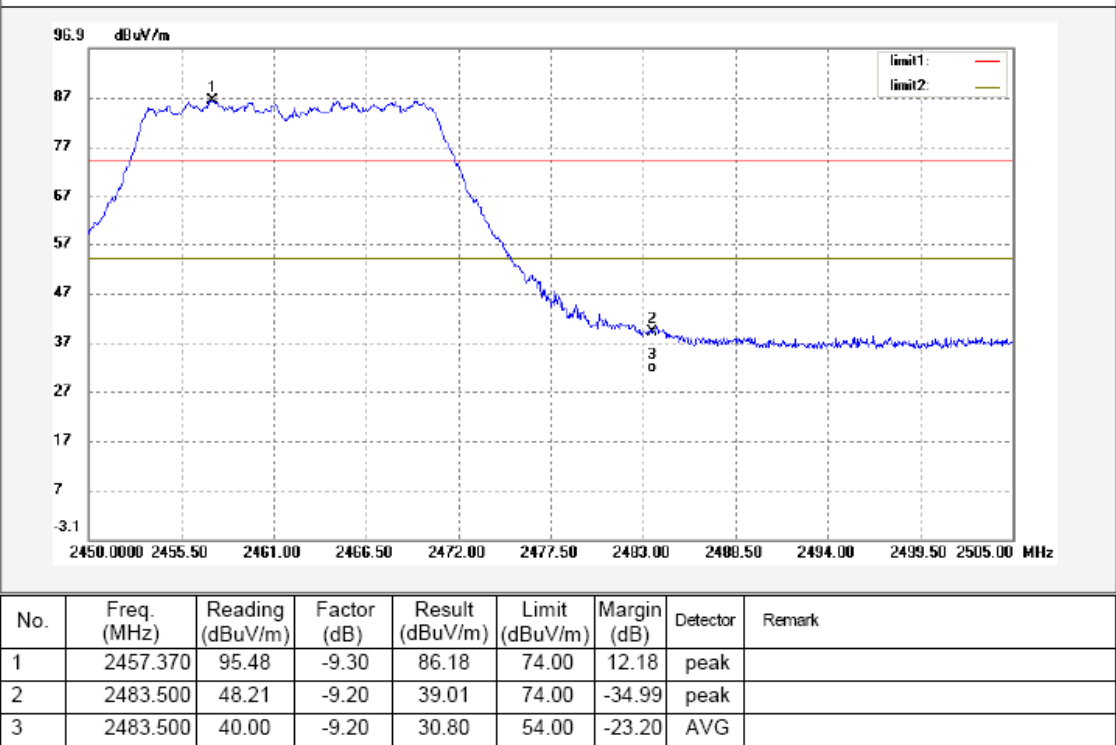
Mode: TX 11g channel 11



Mode: TX 11n HT 20 channel 1



Mode: TX 11n HT 20 channel 11



9 6 dB Bandwidth Measurement

Test Requirement:

FCC CFR47 Part 15 Section 15.247

Test Method:

KDB558074 D01 v03r01

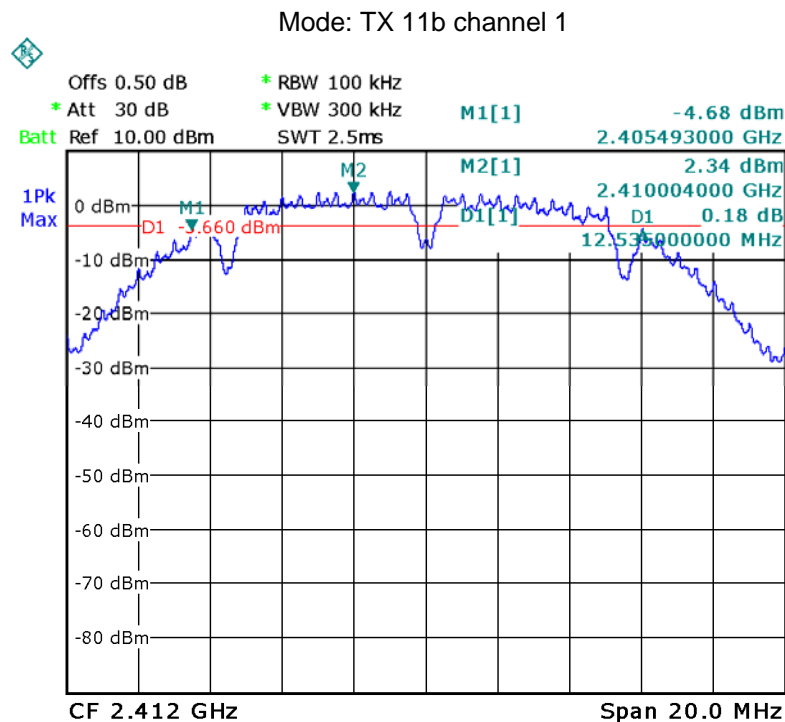
9.1 Test Procedure:

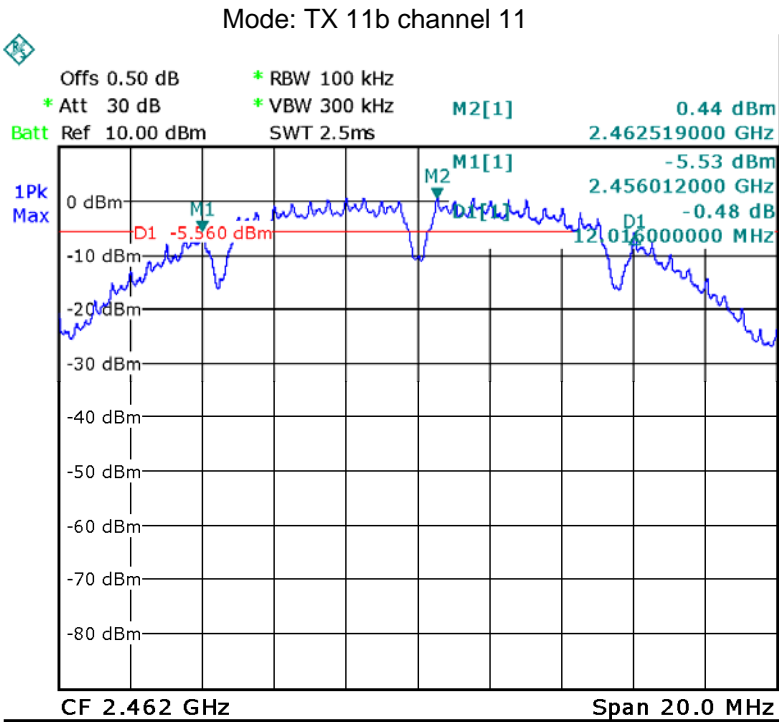
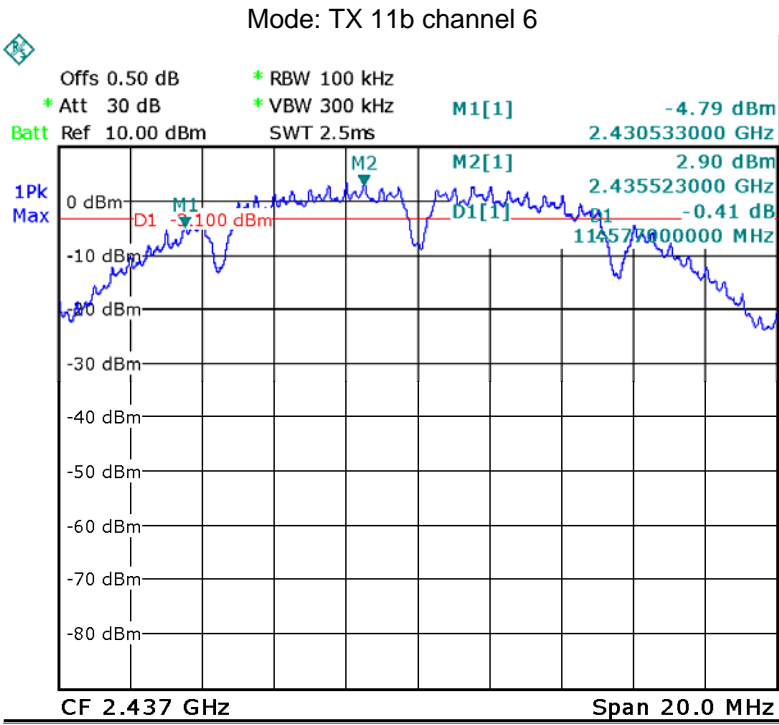
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 100kHz

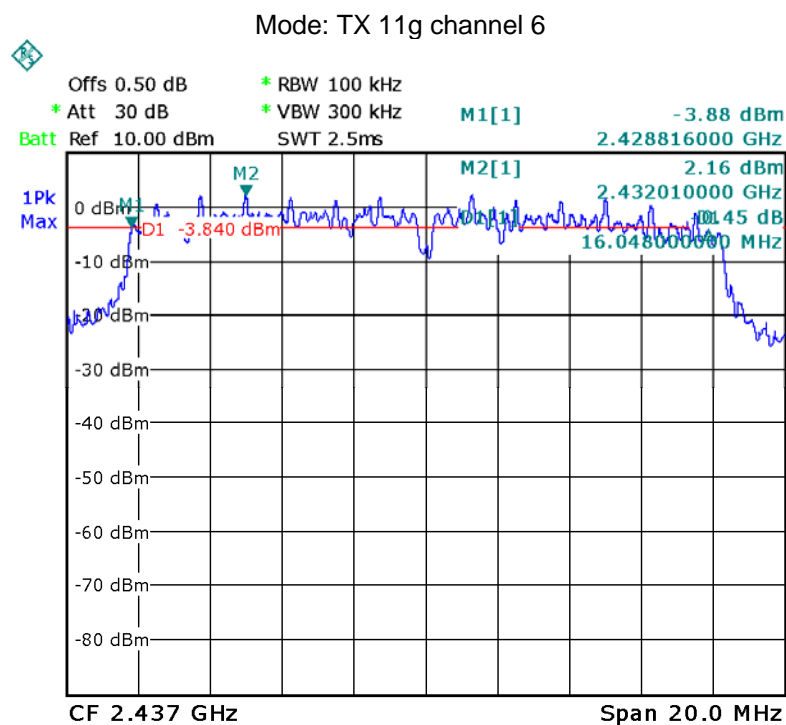
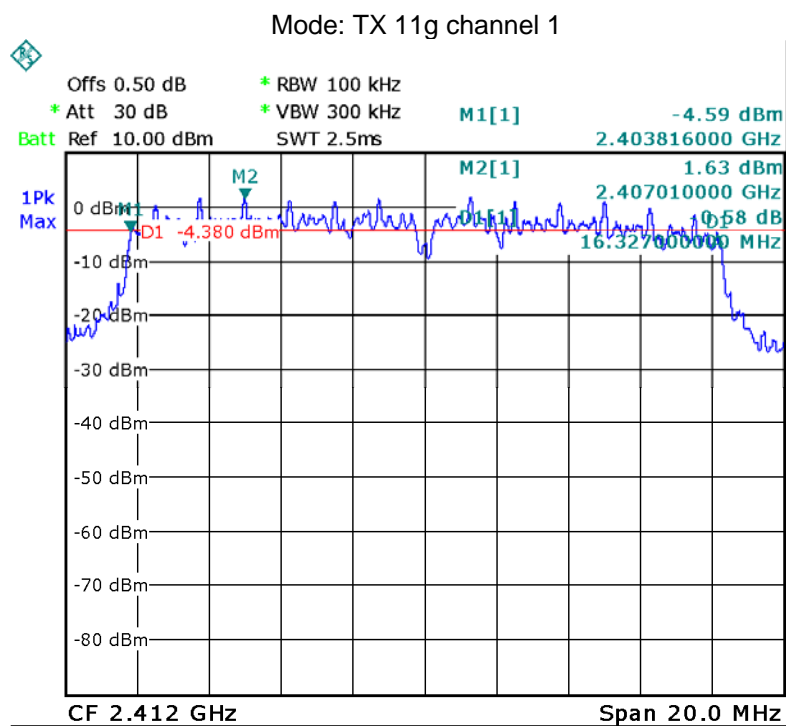
9.2 Test Result:

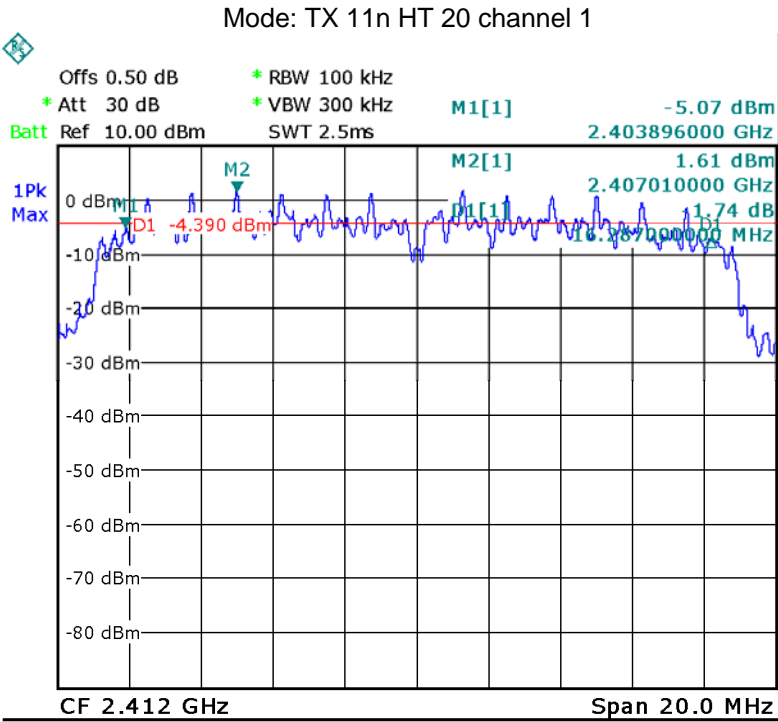
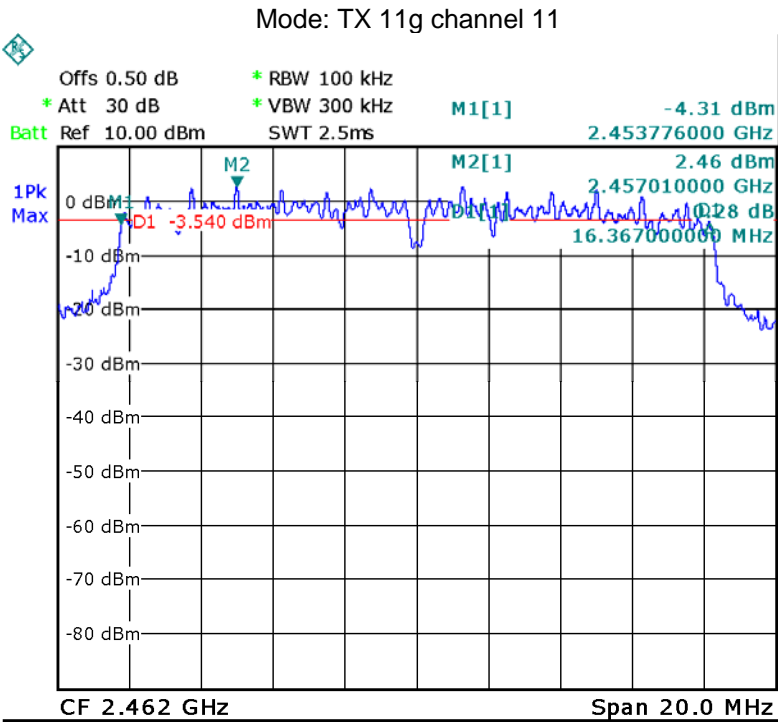
Operation mode	Bandwidth (MHz)		
TX 11b	Channel 1	Channel 6	Channel 11
	12.535	11.457	12.016
TX 11g	Channel 1	Channel 6	Channel 11
	16.327	16.048	16.367
TX 11n HT 20	Channel 1	Channel 6	Channel 11
	16.287	15.729	16.008

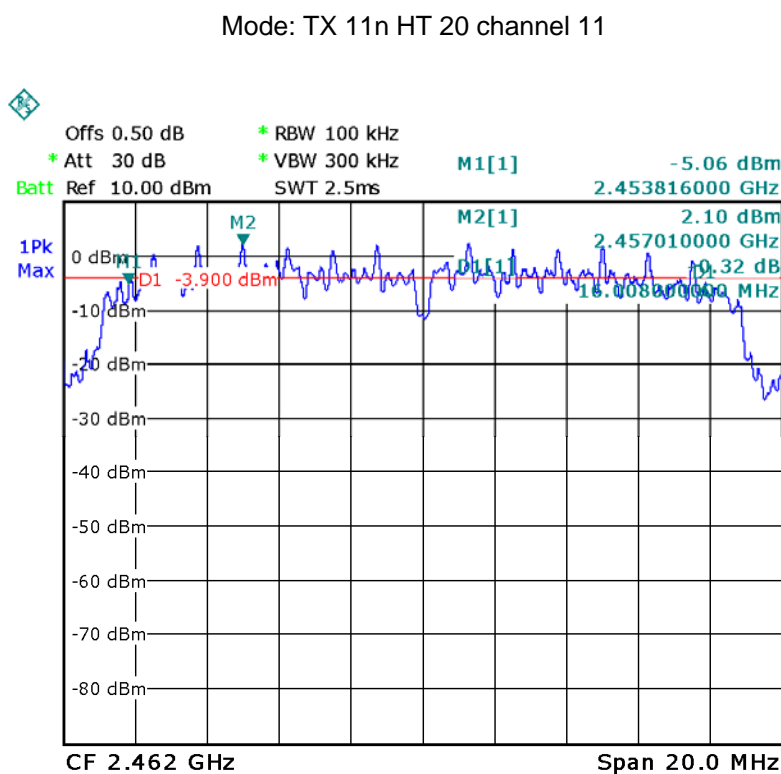
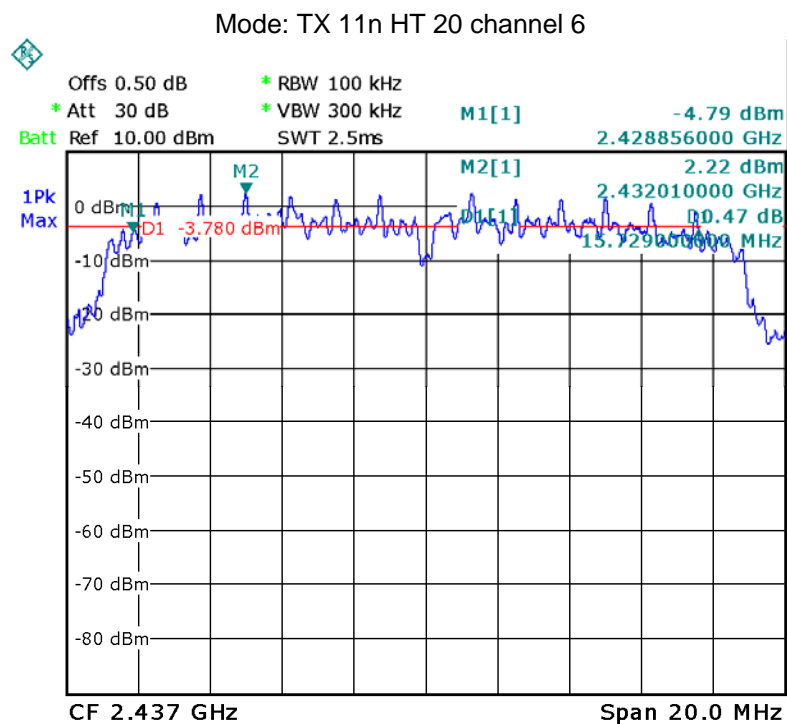
Test result plot as follows:











10 Maximum Peak Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB558074 D01 v03r01

10.1 Test Procedure:

KDB558074 D01 V02 10/04/2012 section 8.1.2 Option 2

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1 MHz. VBW = 3 MHz. Sweep = auto; Detector Function = Peak, Set the span to fully encompass the DTS bandwidth.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

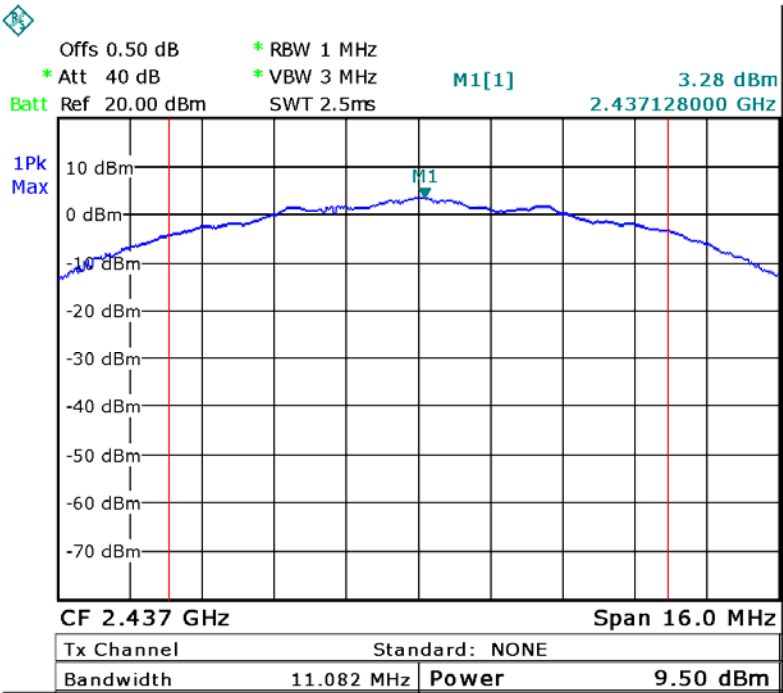
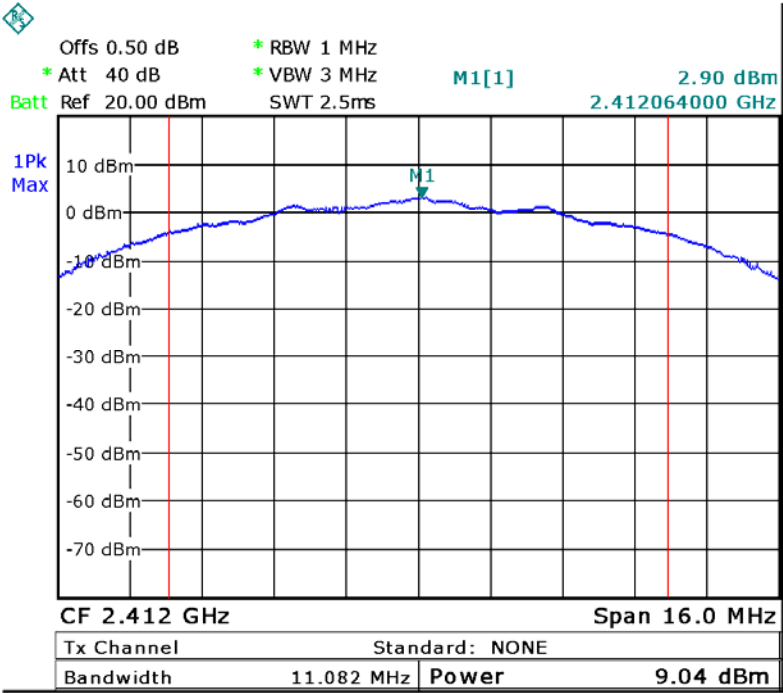
10.2 Test Result:

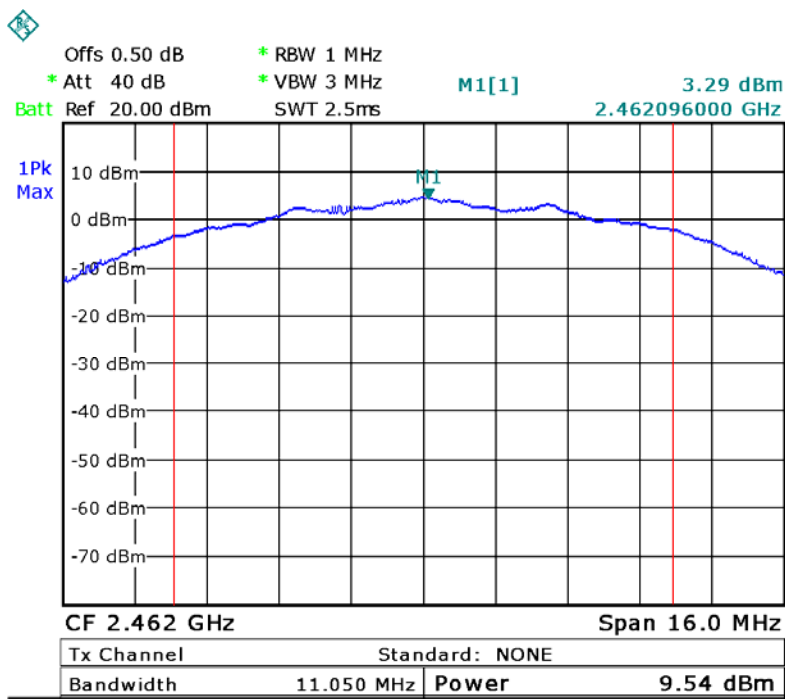
Test mode :TX 11b		
10 Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
9.04	9.50	9.54
Limit		
1W/30dBm		

Test mode :TX 11g		
10 Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
9.03	9.58	9.71
Limit		
1W/30dBm		

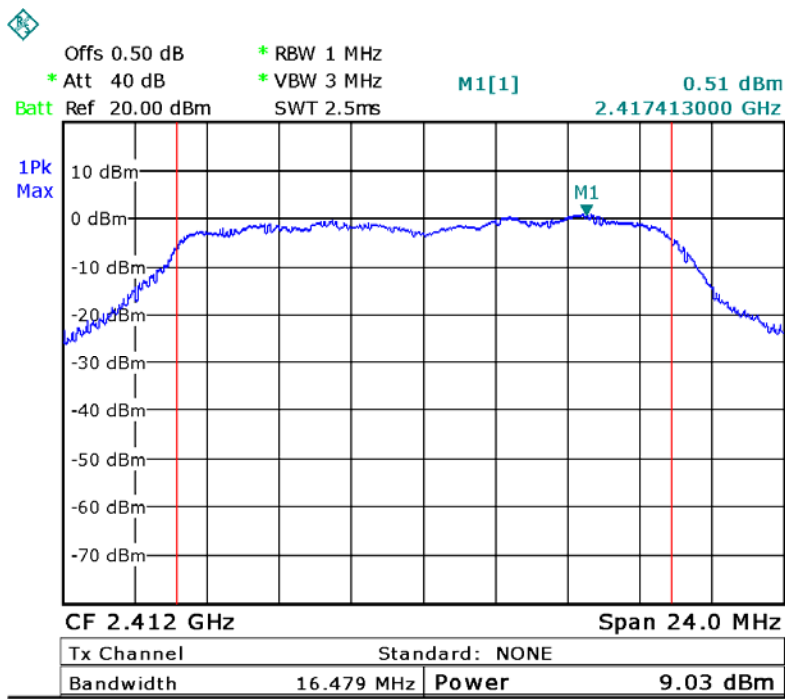
Test mode :TX 11n HT 20		
10 Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
8.04	8.91	8.42
Limit		
1W/30dBm		

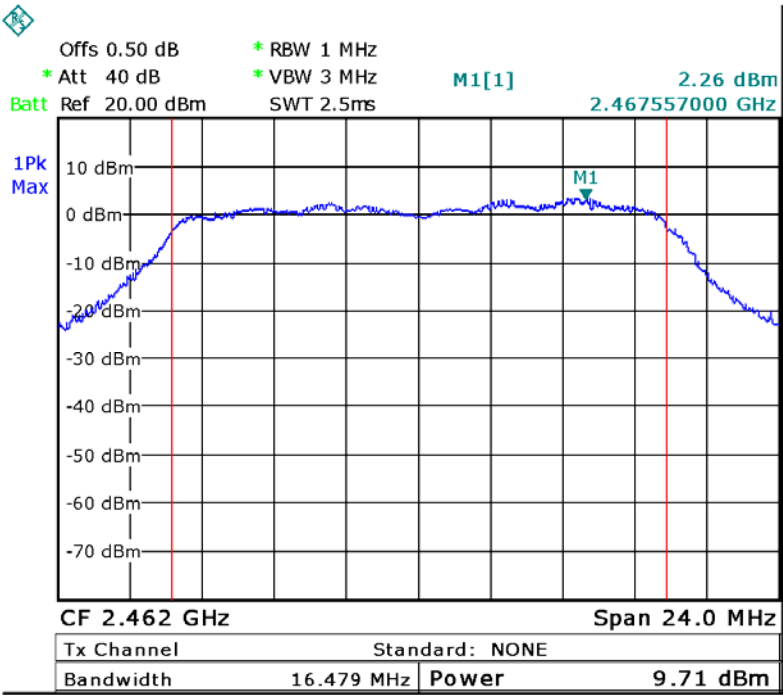
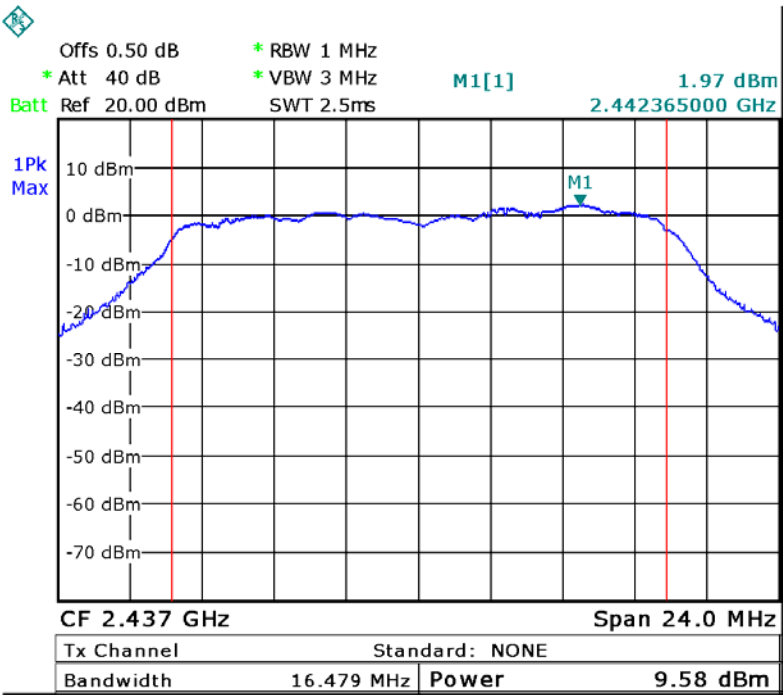
Test mode :TX 11b



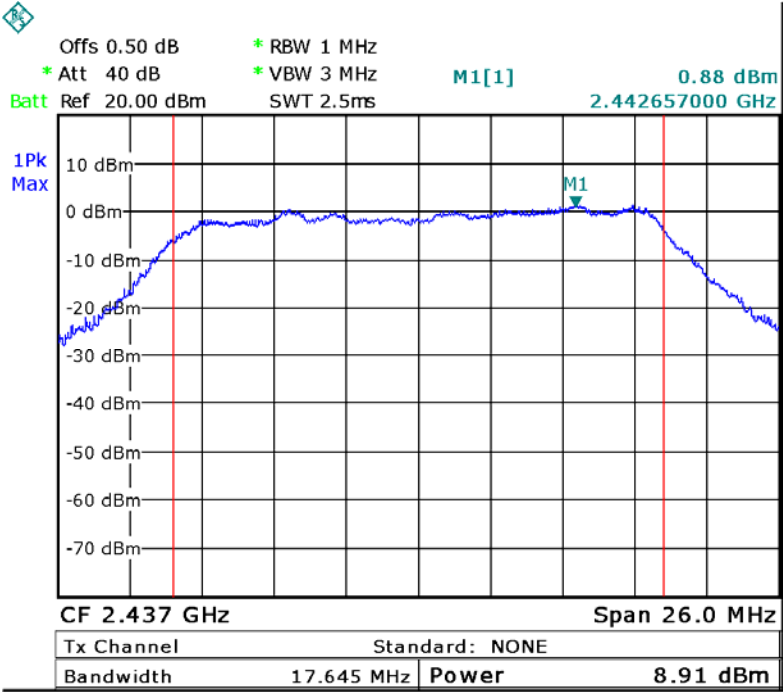
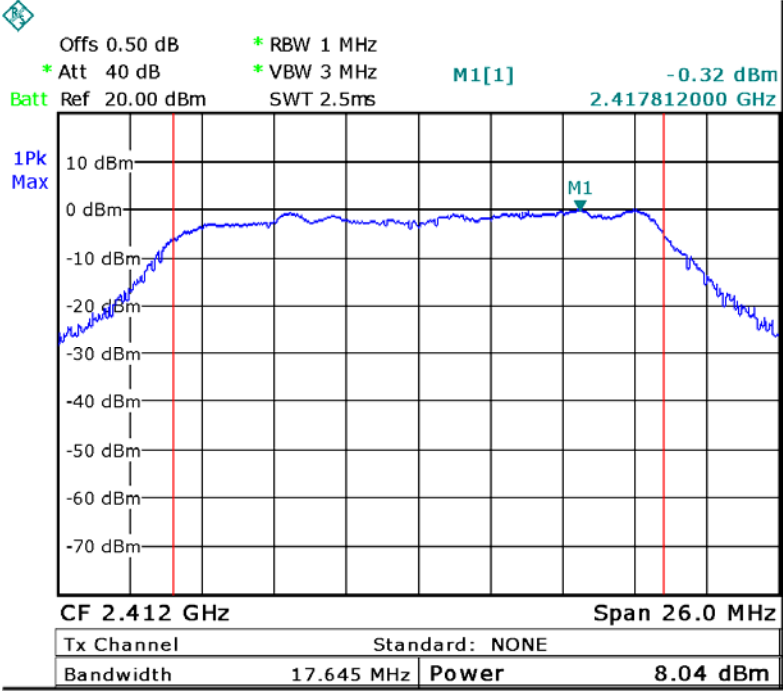


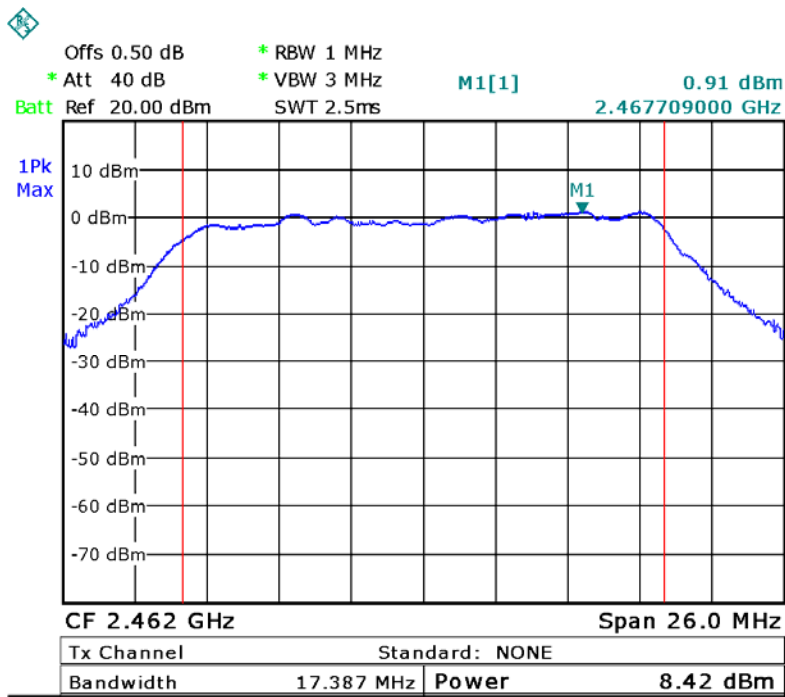
Test mode :TX 11g





Test mode :TX 11n HT 20





11 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB558074 D01 v03r01

Test Procedure:

KDB558074 D01 v03r01 04/09/2013 section 9.1 Option 1

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1kHz. VBW = 3kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section
Submit this plot.

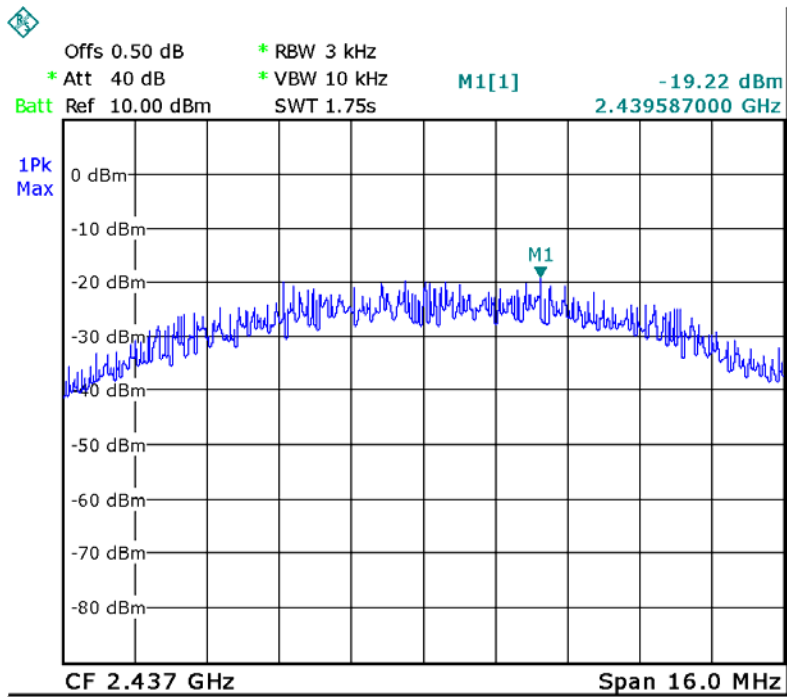
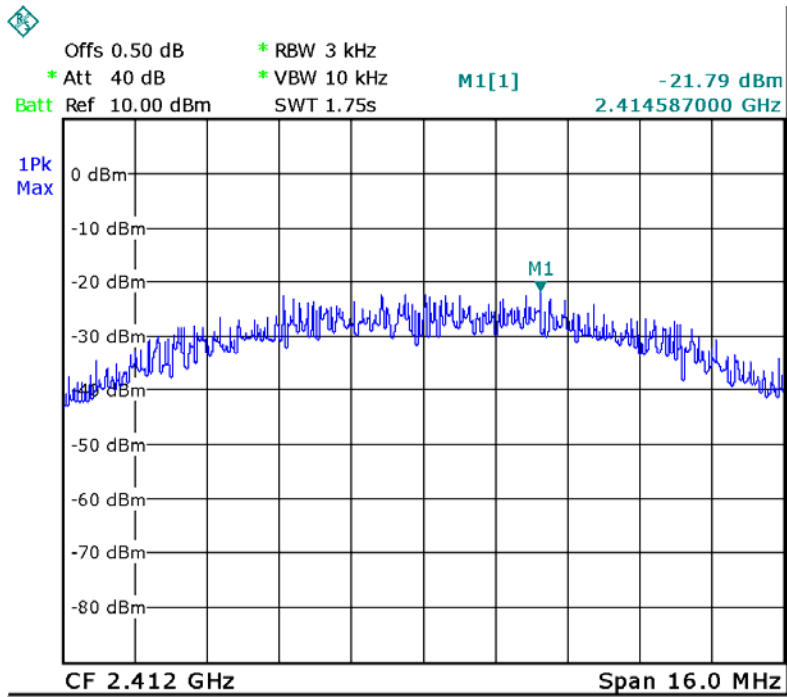
11.1 Test Result:

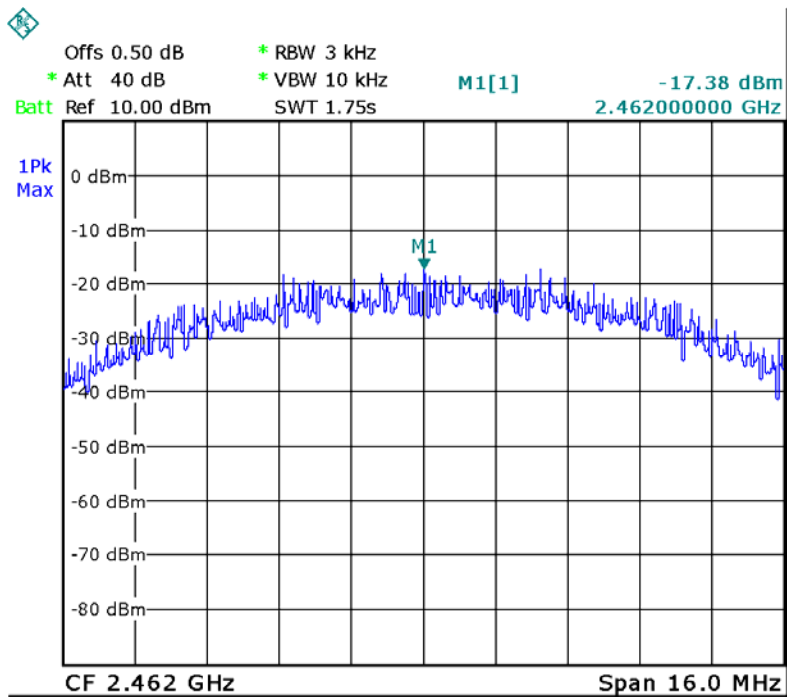
Test mode :TX 11b		
10 Maximum Peak Output Power (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-21.79	-19.22	-17.38
Limit		
8dBm per 3kHz		

Test mode :TX 11g		
10 Maximum Peak Output Power (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-23.68	-23.93	-22.11
Limit		
8dBm per 3kHz		

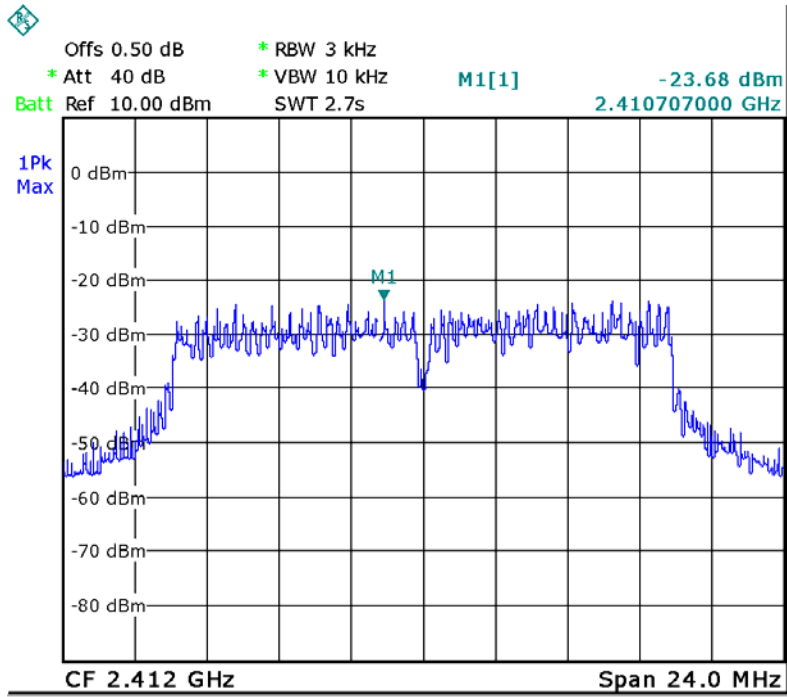
Test mode :TX 11n HT 20		
10 Maximum Peak Output Power (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-24.78	-23.30	-21.81
Limit		
8dBm per 3kHz		

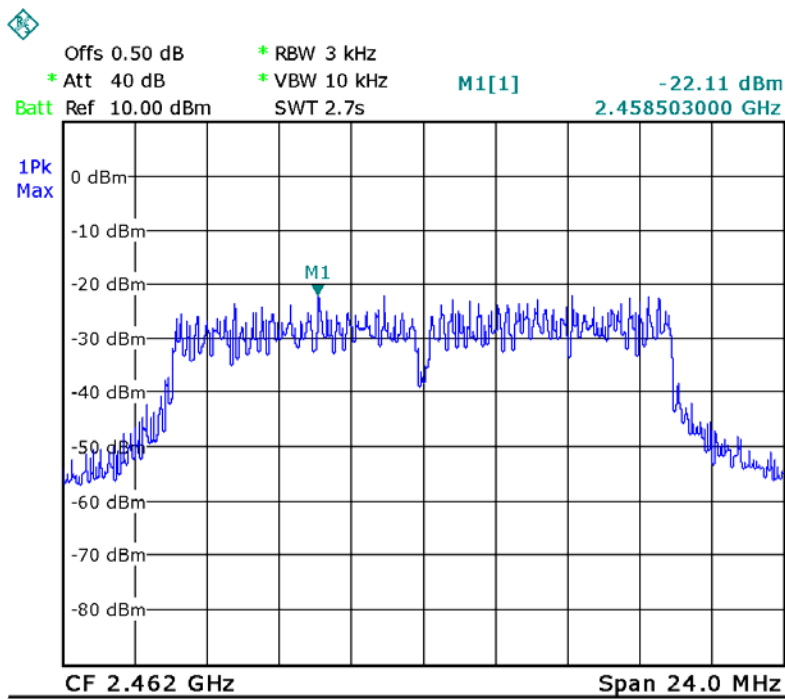
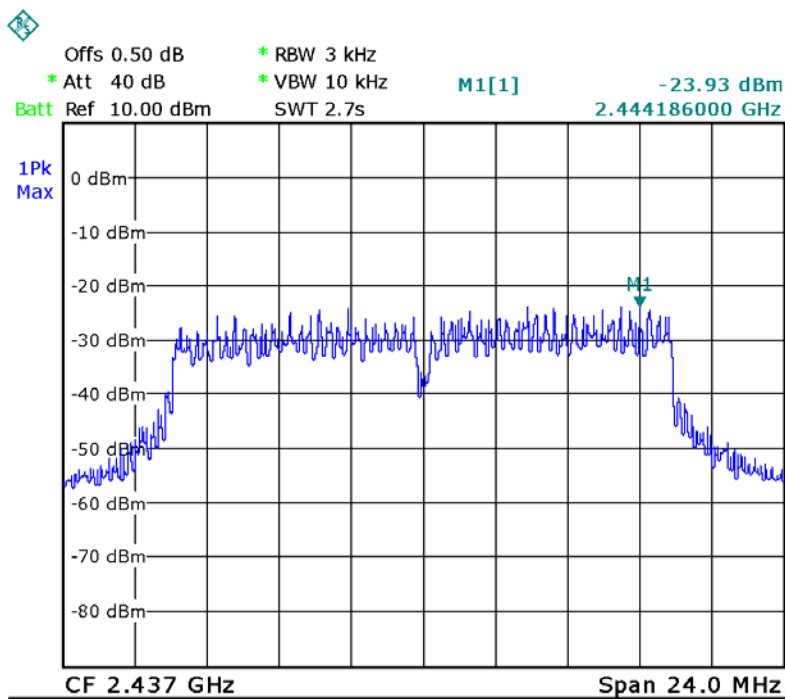
Test mode :TX 11b



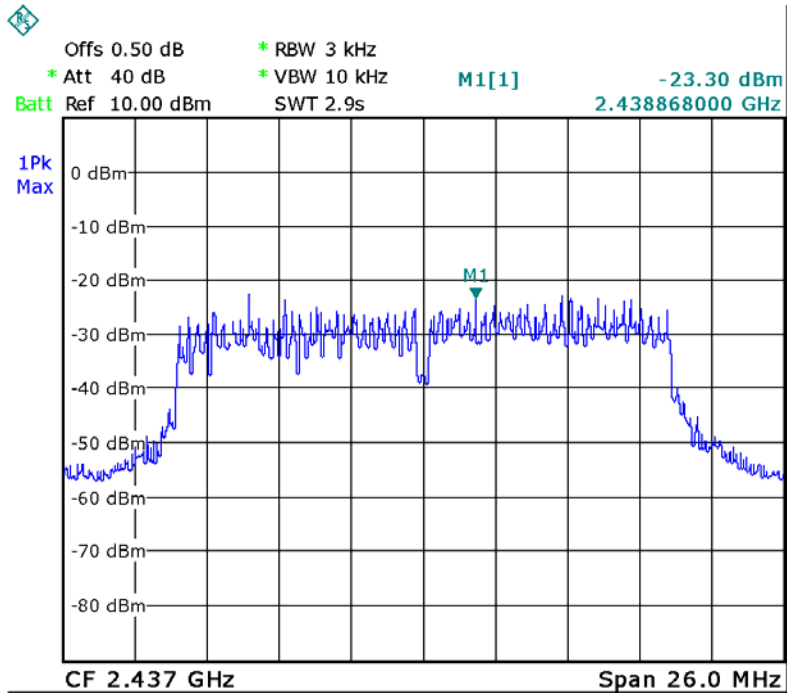
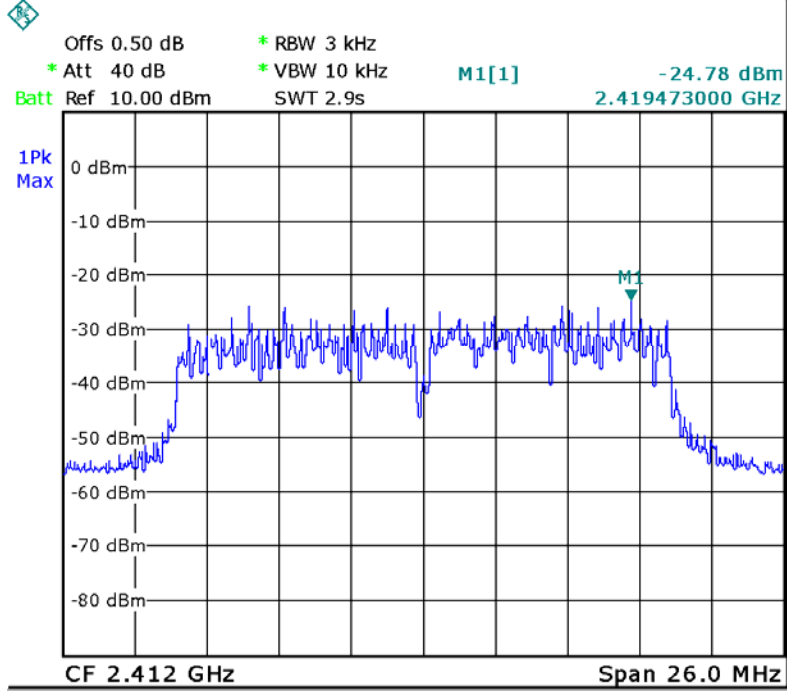


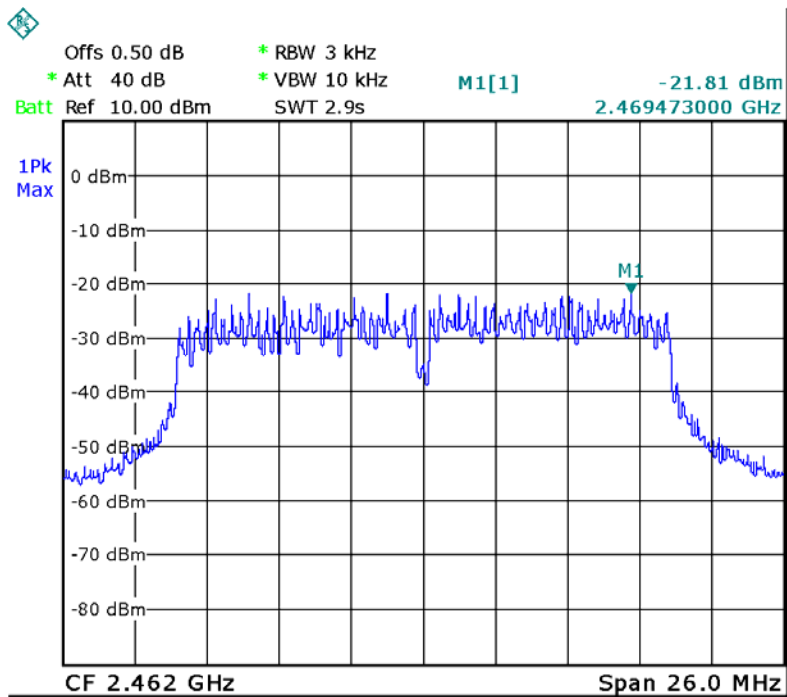
Test mode :TX 11g





Test mode :TX 11n HT 20





12 Emissions from out of band

Test Requirement:	FCC CFR47 Part 15 Section 15.247(d)
Test Method:	KDB558074 D01 v03r01
Test Limit:	Emissions produced by the device outside the authorized frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the fundamental.
Test Mode:	Test in fixing operating frequency at lower, middle, upper channel.

12.1 Test Procedure:

KDB558074 D01 v03r01 04/09/2013 section 10.1 clause1

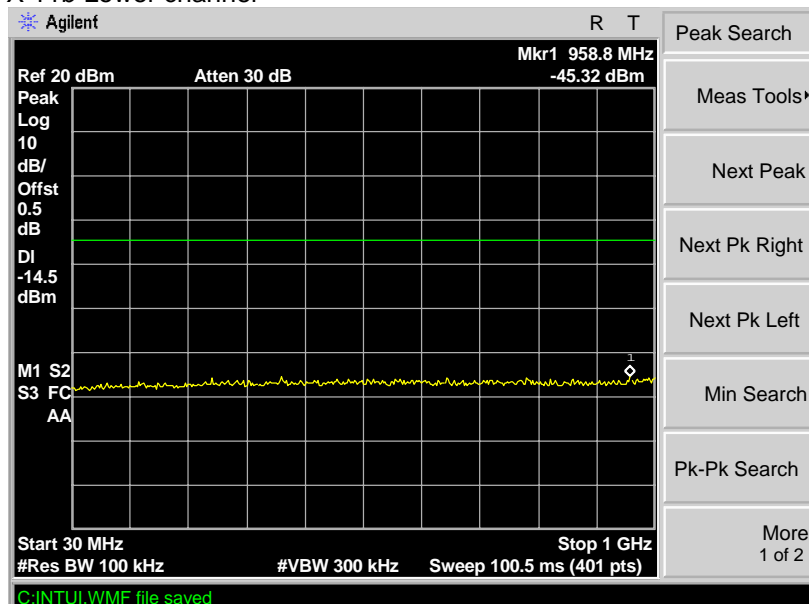
The maximum peak conducted output power procedure was used to demonstrate compliance to 15.247(b)(3) requirements, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz. This measurement was performed over a frequency range that spans from the lowest frequency generated in the device up to and including the tenth harmonic of the highest fundamental frequency.

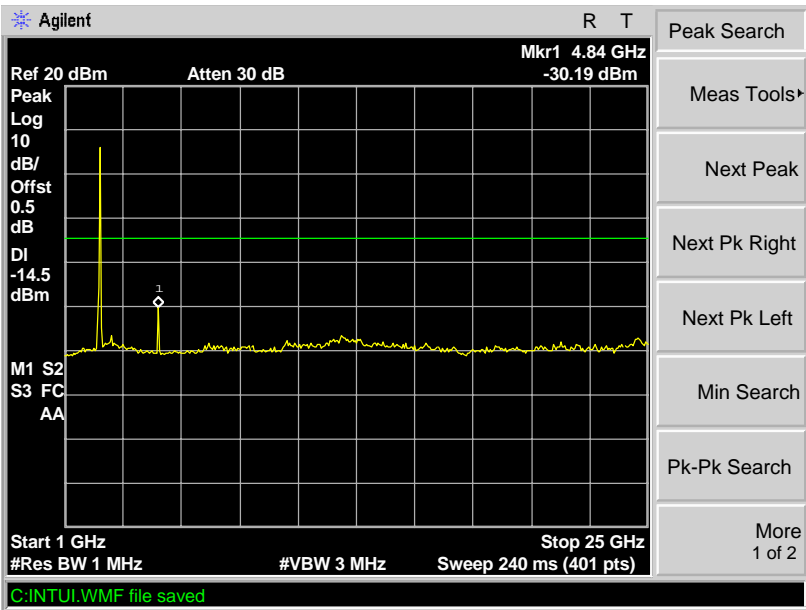
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set to span from the lowest frequency generated in the device up to and including the tenth harmonic of the highest fundamental frequency
3. For below 1GHz, Set RBW = 100kHz and VBW = 100kHz. Sweep = auto. For above 1GHz, Set RBW = 1000kHz and VBW = 1000kHz. Sweep = auto.
4. mark the worst point and record.

12.2 Test Result:

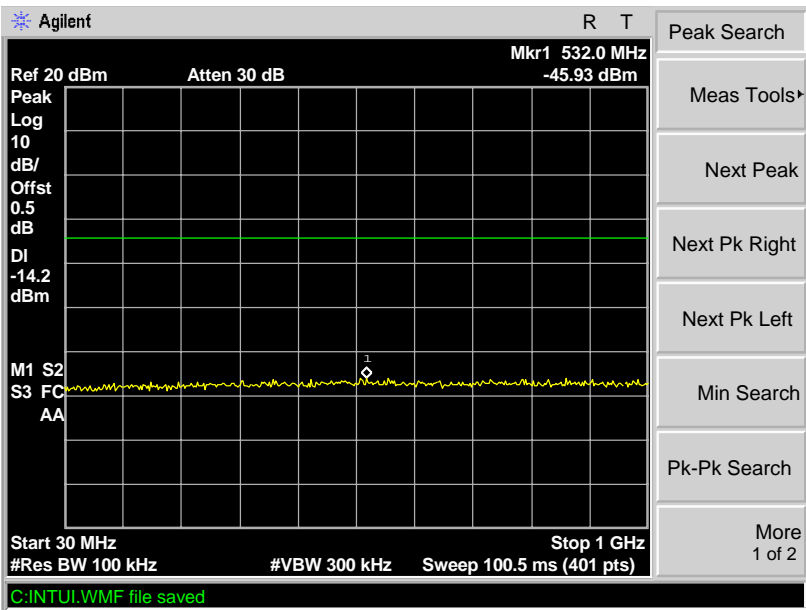
Remark: For emissions below 30MHz, no emission higher than background level, so the data does not show in the report.

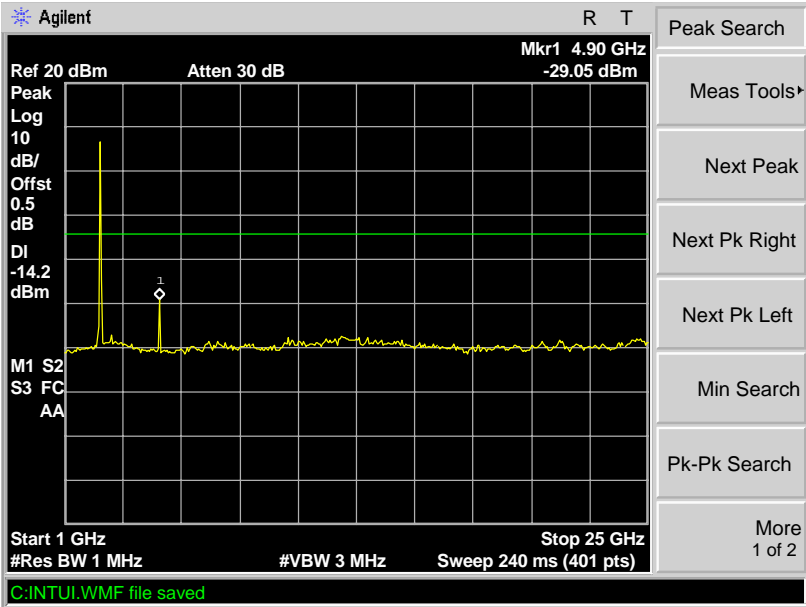
Test mode : TX 11b Lower channel



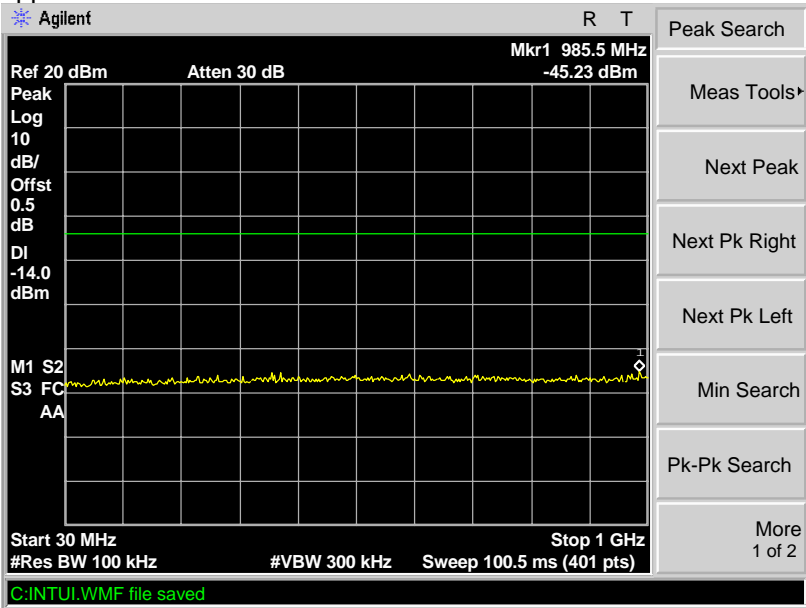


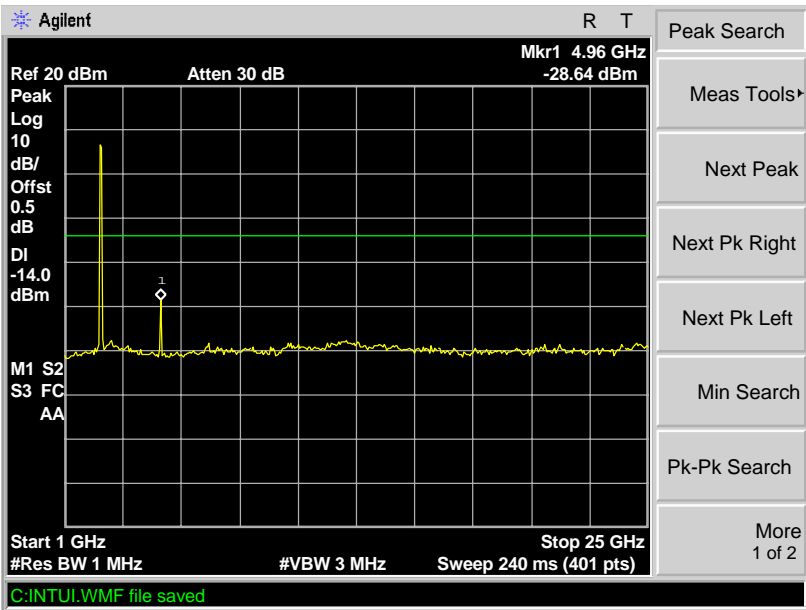
Test mode :TX 11b Middle channel



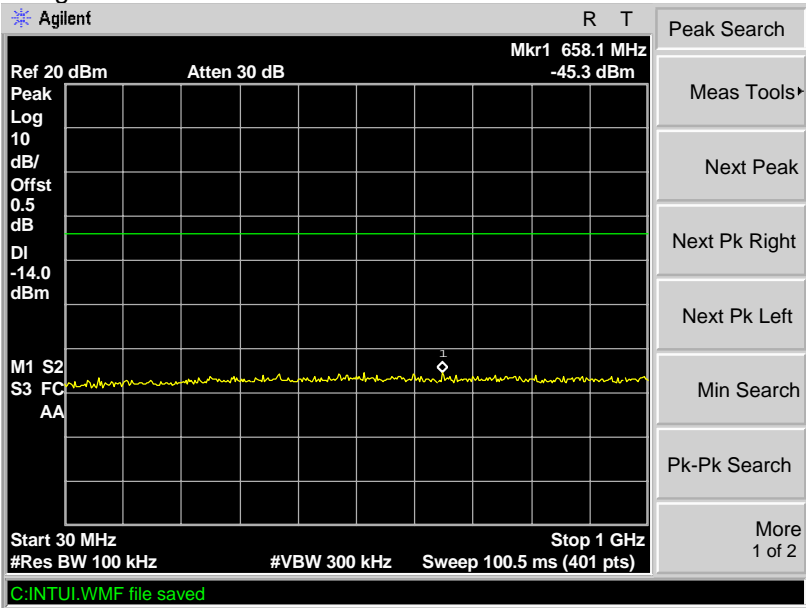


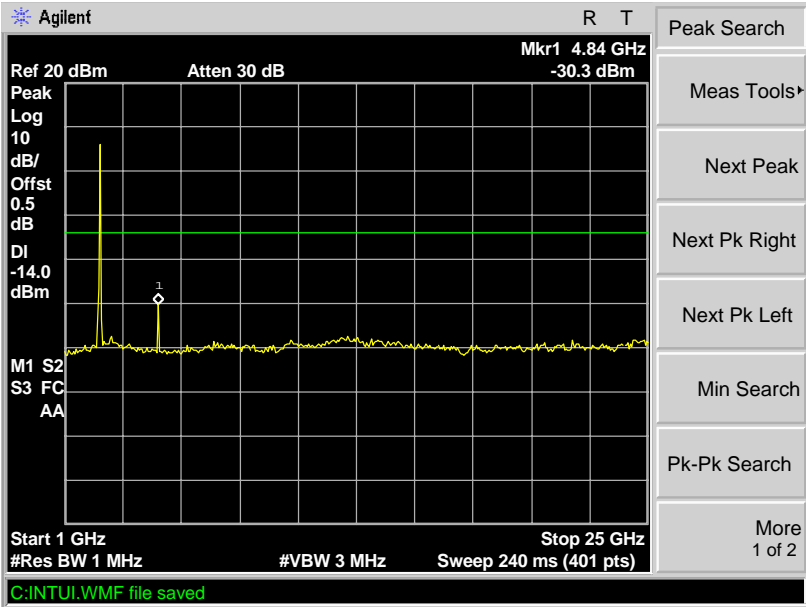
Test mode :TX 11b Upper channel



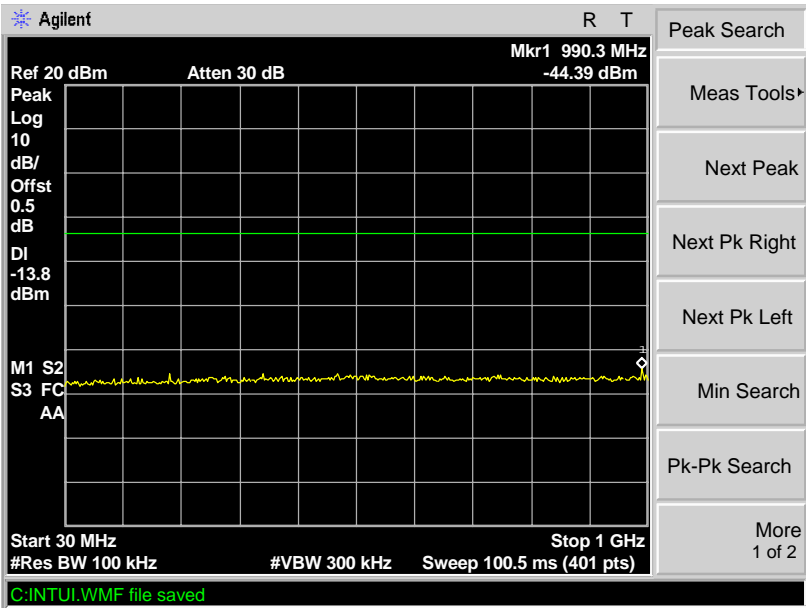


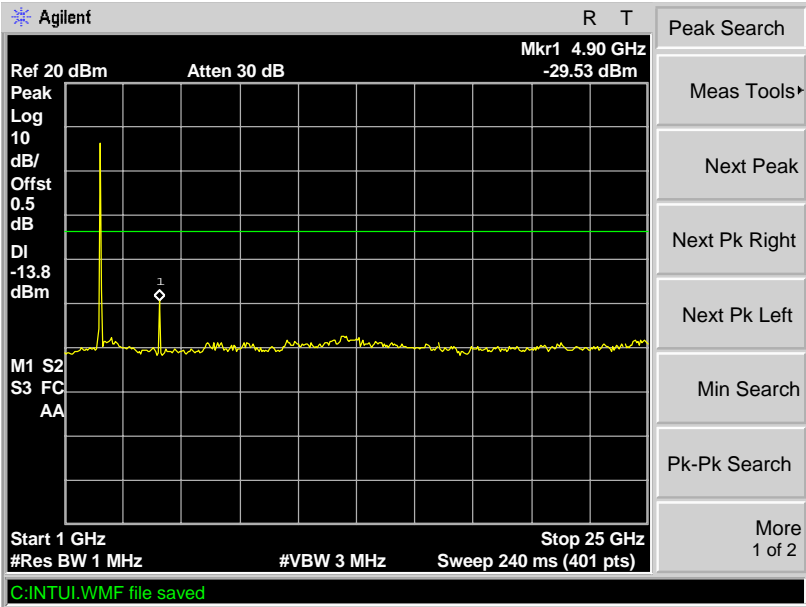
Test mode :TX 11g Lower channel



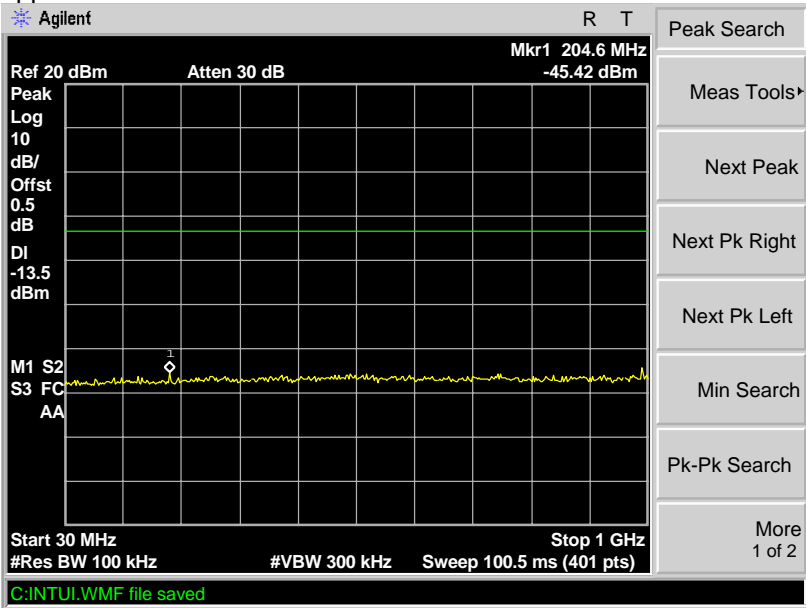


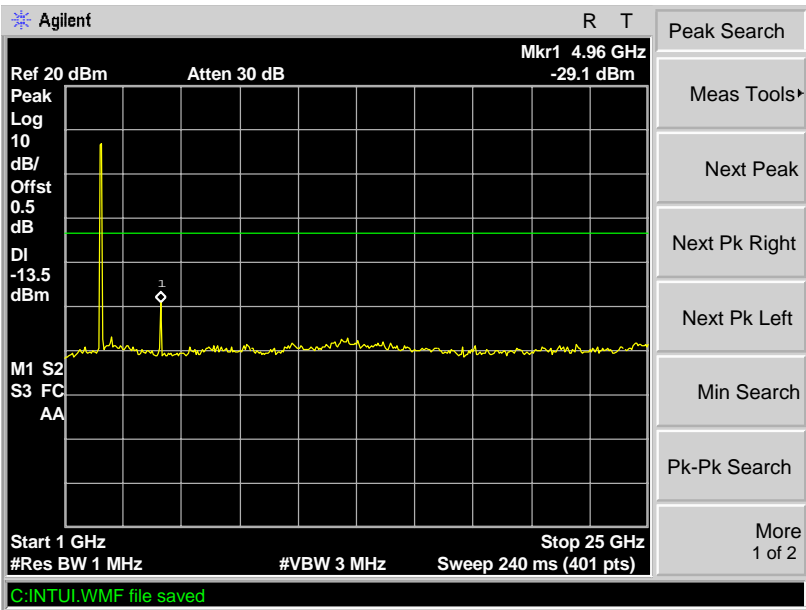
Test mode :TX 11g Middle channel



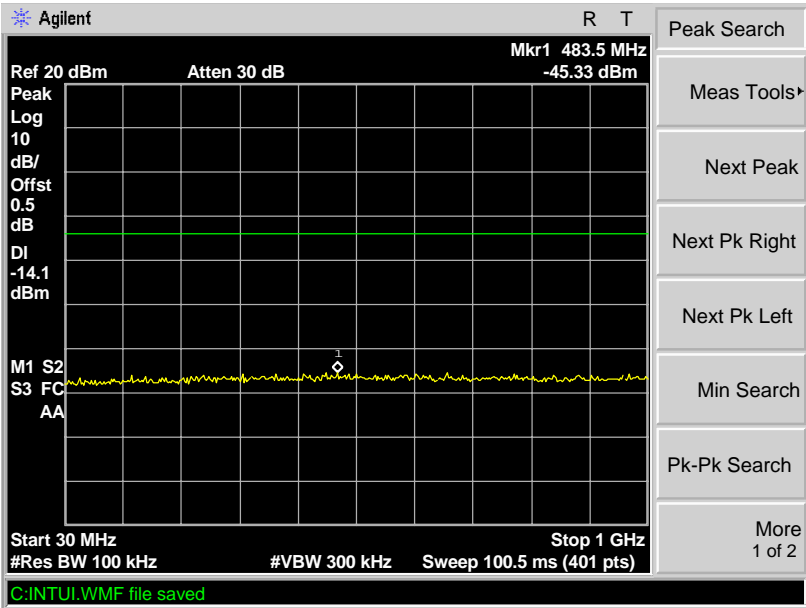


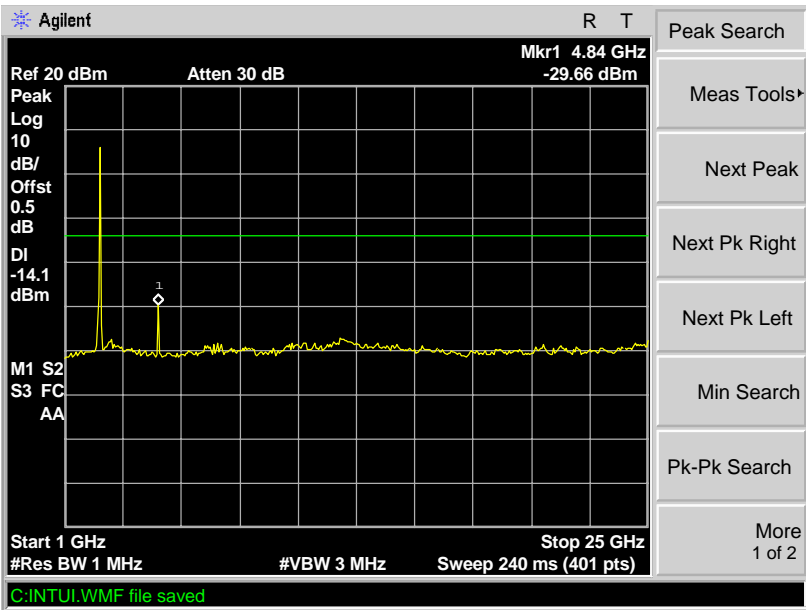
Test mode :TX 11g Upper channel



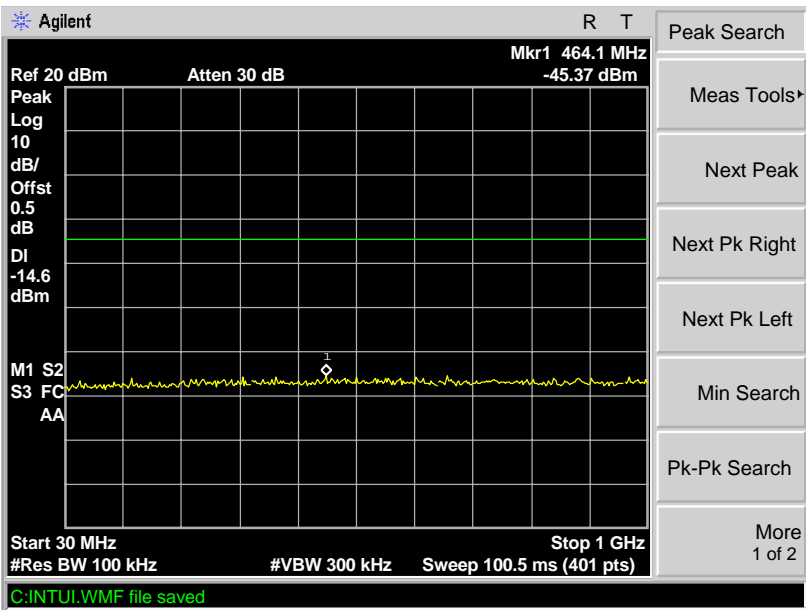


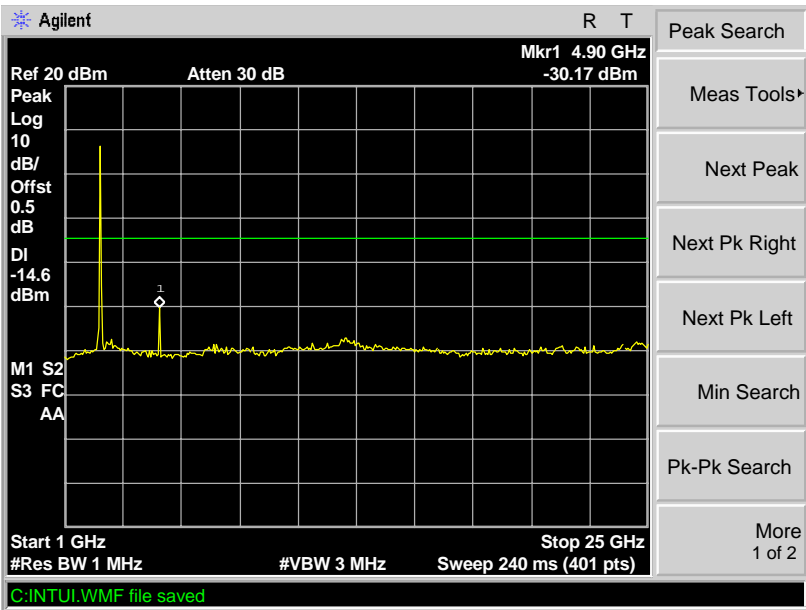
Test mode :TX 11n HT20 Lower channel



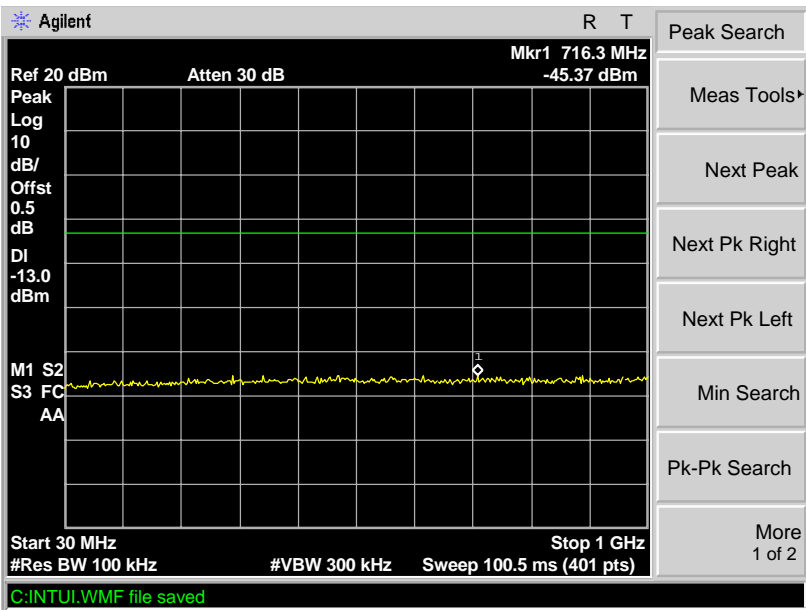


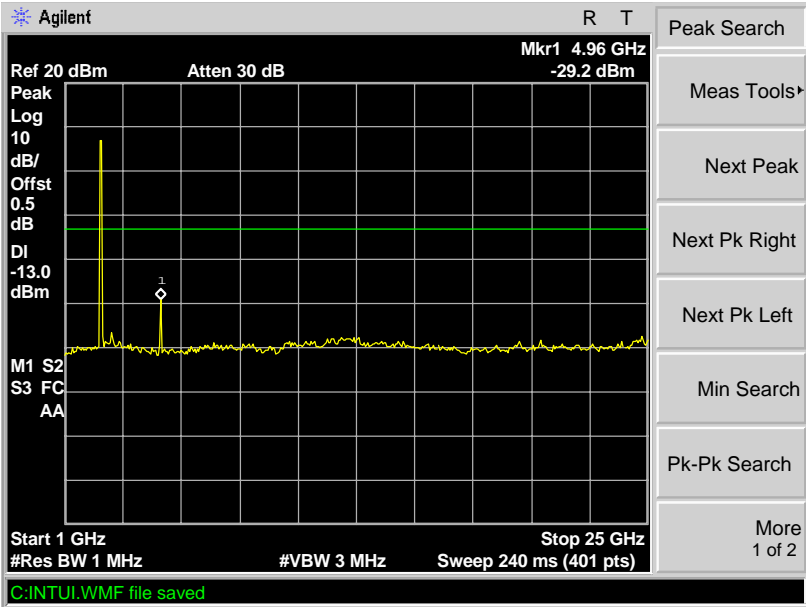
Test mode :TX 11n HT20 Middle channel





Test mode :TX 11n HT20 Upper channel





13 Antenna Requirement

According to the FCC Part 15 Paragraph 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. This product has a PCB antenna, fulfill the requirement of this section.

14 RF Exposure

Test Requirement: FCC Part 1.1307

Test Mode: The EUT work in test mode(Tx).

14.1 Requirements:

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

14.2 The procedures / limit

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

14.3 MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Peak RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

Operation Mode	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
802.11b	1	9.54	8.994975815	0.001789451	1
802.11g	1	9.71	9.354056741	0.001860887	1
802.11n HT 20	1	8.91	7.78036551	0.001547818	1

15 Photographs – Test Setup

15.1 Conducted Emission



15.2 Radiated Emission

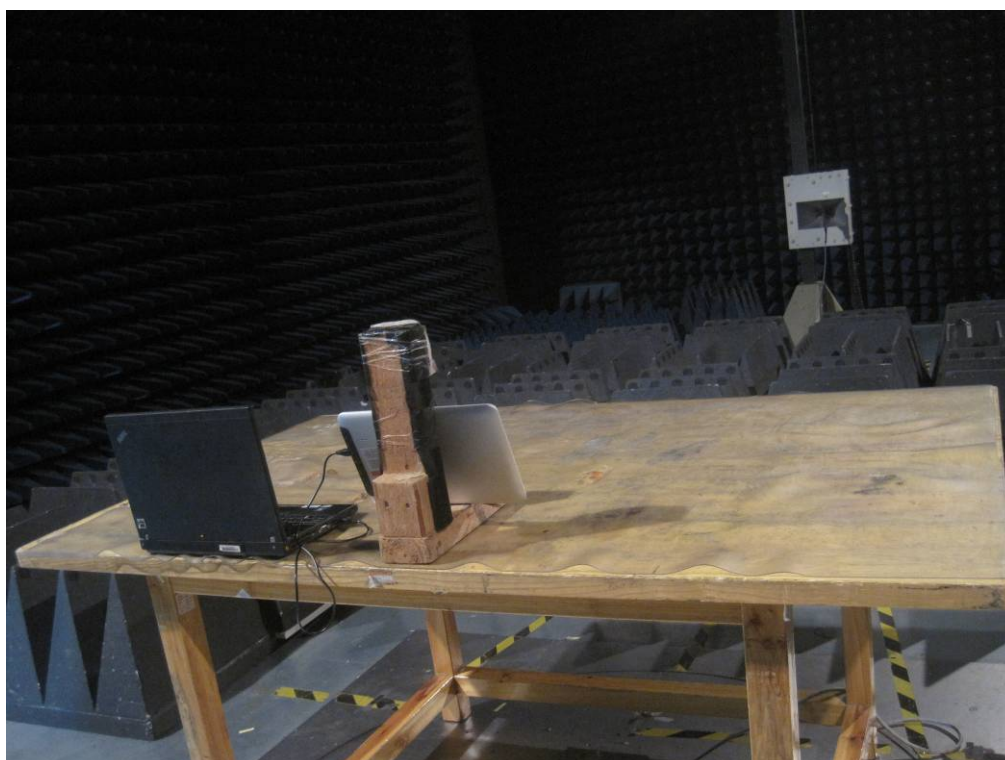
Test frequency below 30MHz



Test frequency from 30MHz to 1GHz



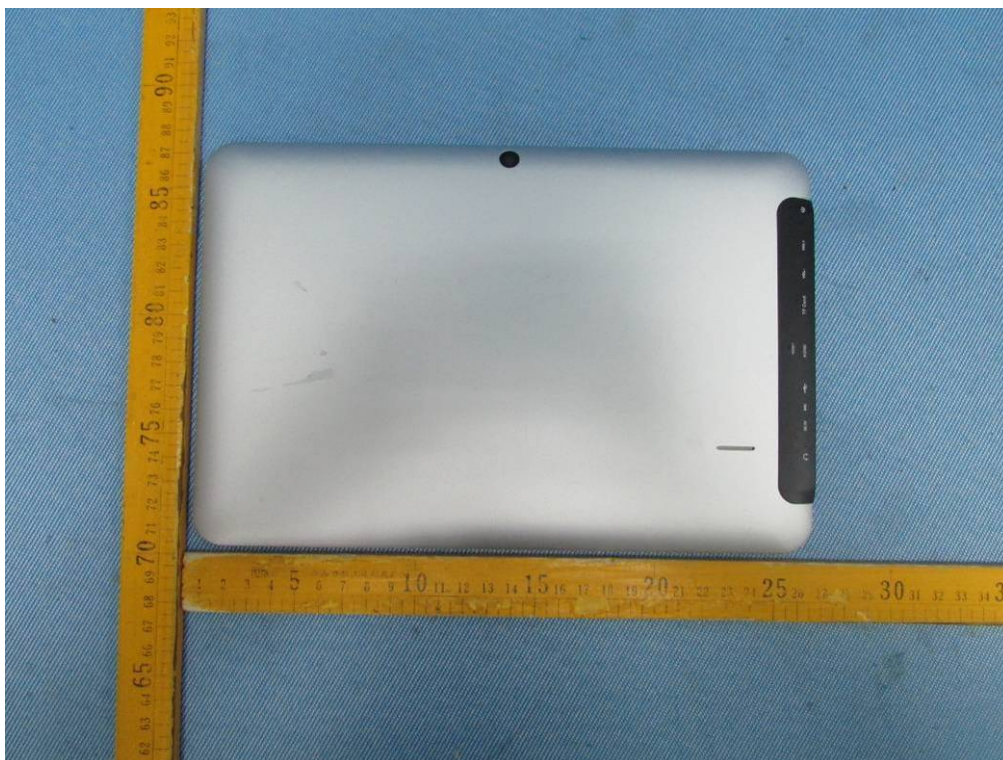
Test frequency above 1GHz



16 Photographs - Constructional Details

16.1 EUT –Appearance View





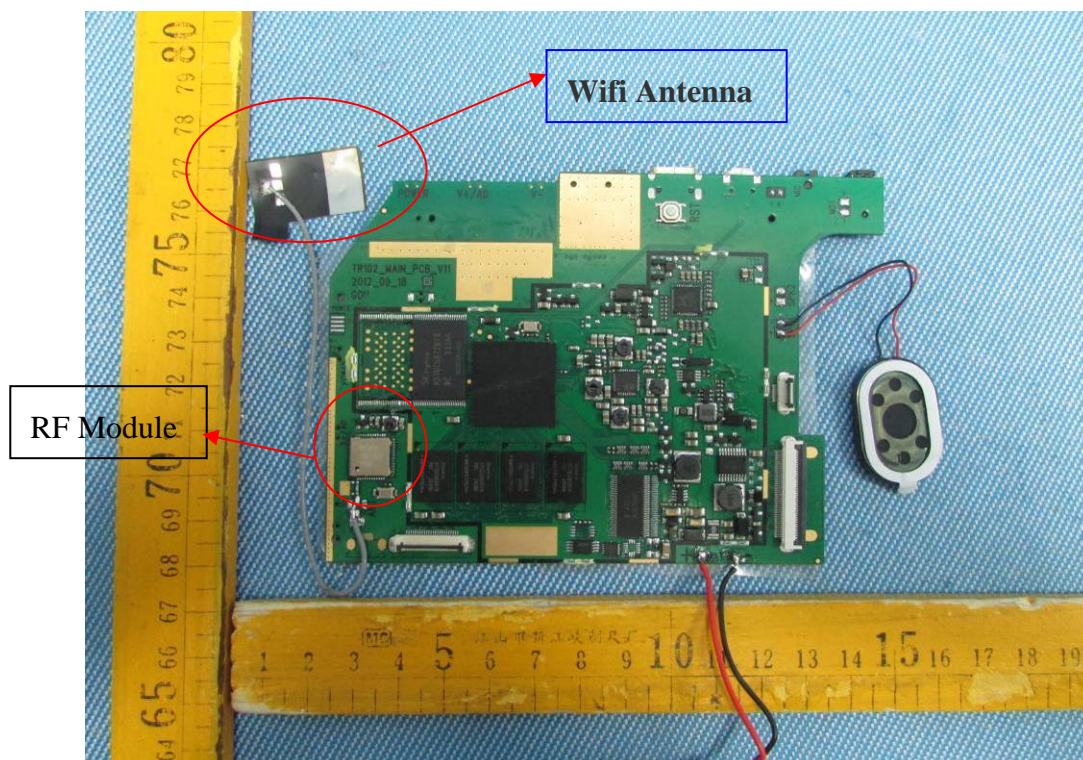
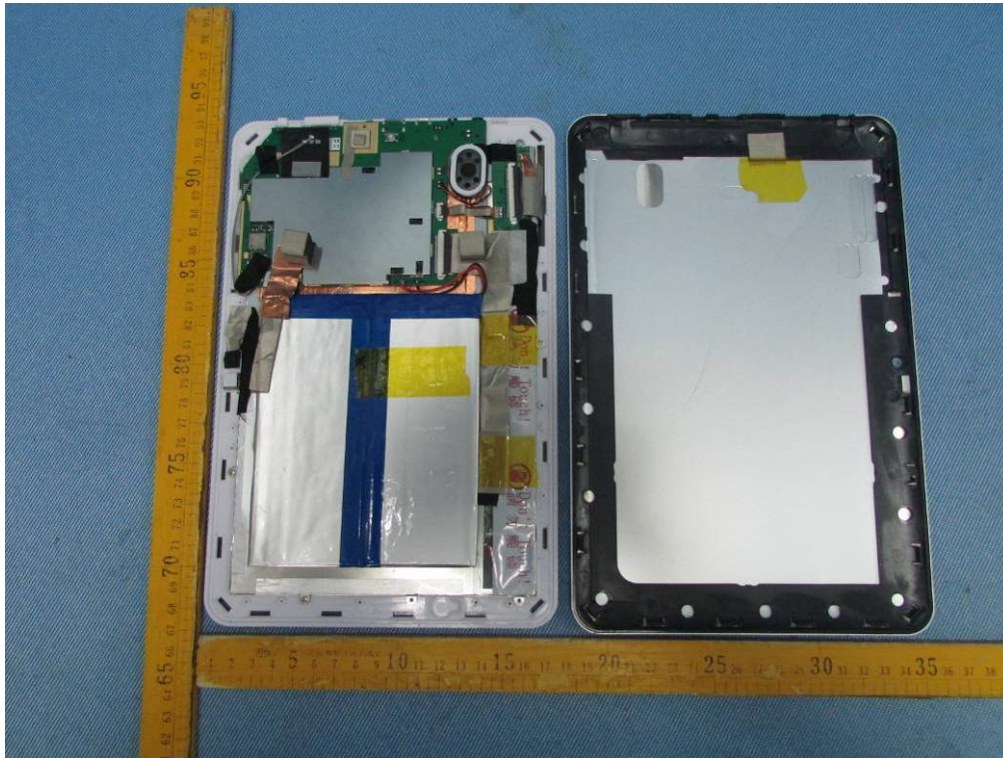


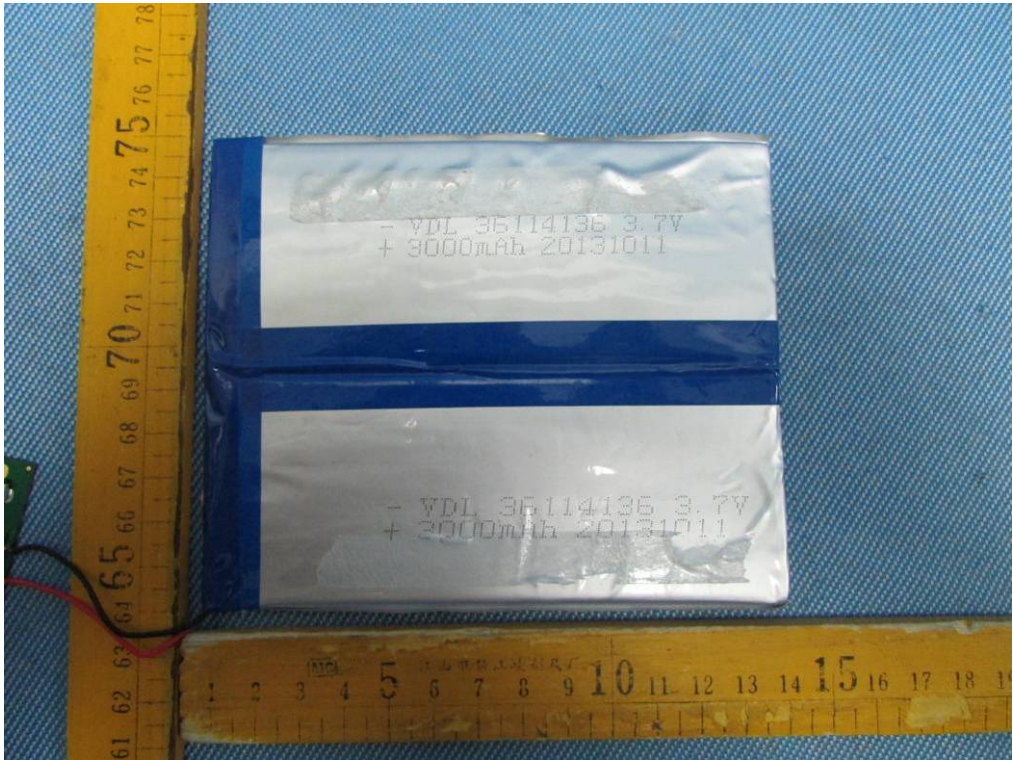
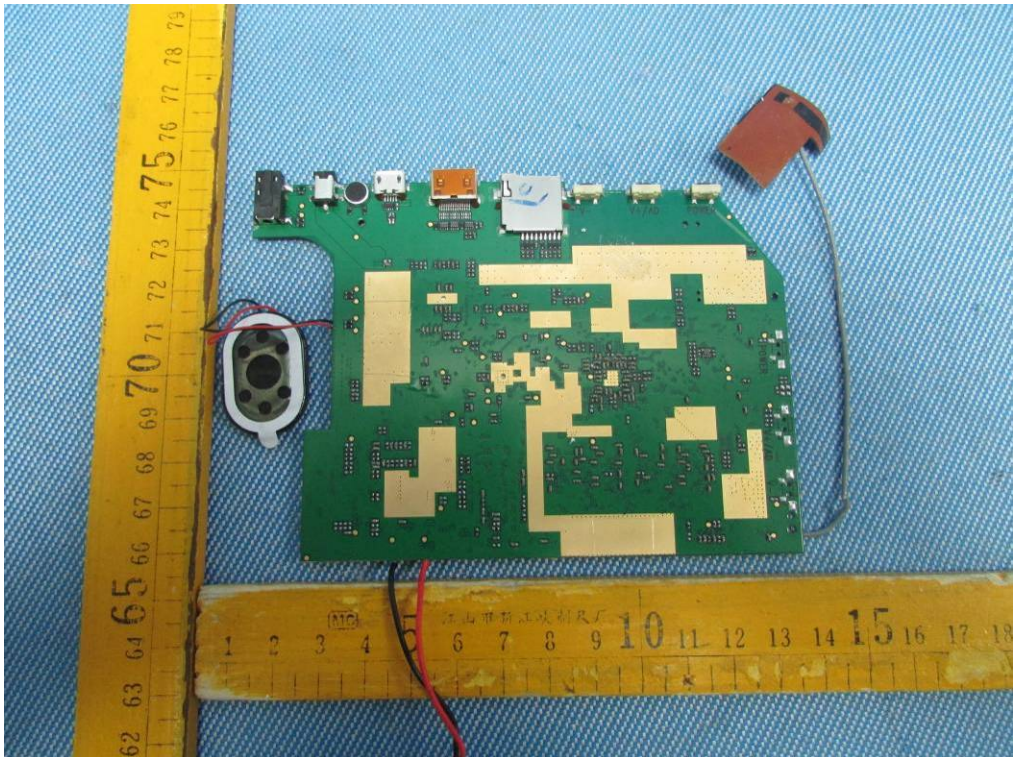


16.2 Adapter – View

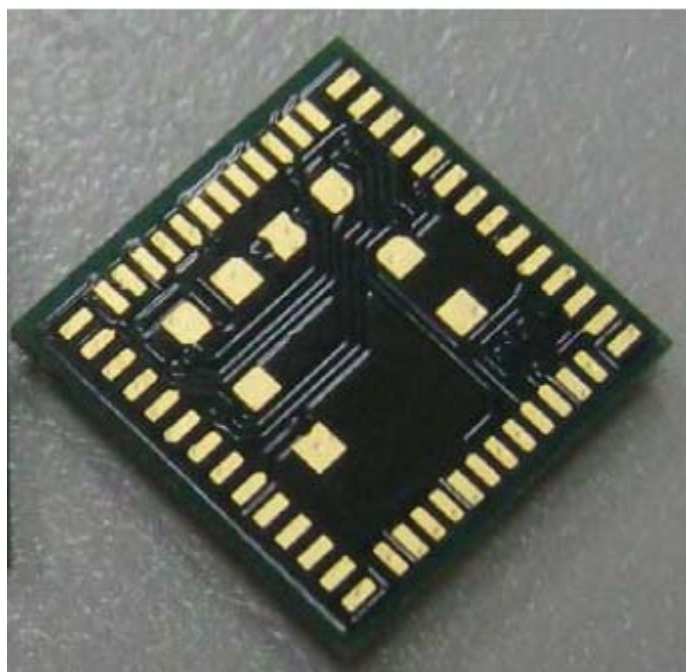
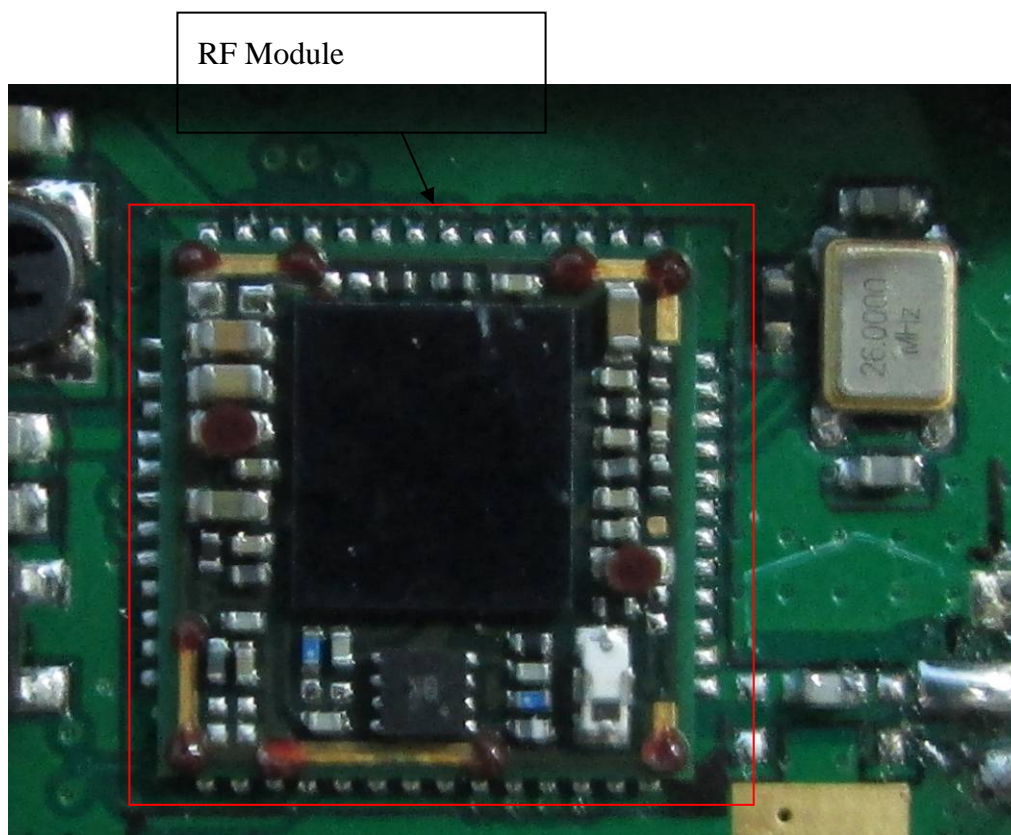


16.3 EUT- Internal View





16.4 RF Module



==End of test report==