

TEST REPORT

FCC ID : OGX-D311
Applicant : Guangzhou Shiyuan Electronics Co., Ltd.
Address : No.192,Kezhu Road,Science Park,Guangzhou,Guangdong,China
Manufacturer : the same as above
Address : the same as above
Equipment Under Test (EUT) :
 Product Name : Android Dongle
 Model No. : D311, D39
Rules : FCC CFR47 Part 15 C Section 15.247:2010

Date of Test : May 2~7,2013

Date of Issue : May 7,2013

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.

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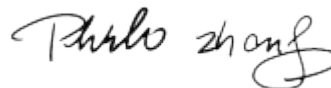
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2 Test Summary

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
Emissions from the restricted bands	15.247(d)	PASS
Antenna Requirement	15.203	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

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4 General Information

4.1 General Description of E.U.T.

Product Name	: Android Dongle
Model No.	: D311, D39
Model Difference	: Only the appearance color is different.
Operation Frequency	: 2412MHz ~ 2462MHz
Oscillator	: Crystal 32.768KHz and 24MHz for CPU,40MHz for RF module
Antenna Gain	: 2dBi
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., HT40:150Mbps 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	: DC5V, 1.5A powered from adapter (INPUT:AC 100-240V, 50/60Hz 0.4A)
Adapter	: Manufacturer: HUONIU Model:HNB050150U

4.3 Description of Support Units

Table 1 Tests Carried Out Under FCC part 15.247

Test Items	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
	802.11n HT40	150 Mbps	3/7/9	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
	802.11n HT40	150 Mbps	3/7/9	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
	802.11n HT40	150 Mbps	3/9	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
	802.11n HT40	150 Mbps	3/7/9	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
	802.11n HT40	150 Mbps	3/7/9	TX
Receiver Spurious Emissions	802.11b	11 Mbps	1/6/11	RX
	802.11g	54 Mbps	1/6/11	RX
	802.11n HT20	72 Mbps	1/6/11	RX
	802.11n HT40	150 Mbps	3/7/9	RX

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 Meod
Radiation Emission, 9KHz ~ 1GHz	Normal link
Conduction Emission, 0.15MHz to 30MHz	Normal link

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 applicable for adapter:

Test Voltage	Input voltage
Rated voltage-15%	AC 102V
normal	AC 120V
Rated voltage+15%	AC 138V

The follow condition is not applicable.

Test voltage	Test Voltage
Rated voltage	N/A

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	101155	Aug. 13,2012	Aug. 13,2013
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	Aug. 13,2012	Aug. 13,2013
3.	Cable	LARGE	RF300	EW02014-3	Aug.14,2012	Aug. 14,2013
3m Semi-anechoic Chamber for Radiation(TDK) (Test Frequency:32.768kHz~1000MHz)						
Item	Equipment	Manufacturer	Model No.	Serial No	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	Aug.09,2012	Aug.09,2013
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Aug. 13,2012	Aug. 13,2013
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	Aug.11,2012	Aug.11,2013
4	Amplifier	Compliance pirection systems inc	PAP-0203	22024	Apr.07,2013	Apr.07,2014
5	Cable	HUBER+SUHNE R	CBL2	525178	Sep.15,2012	Sep.15,2013
3m Semi-anechoic Chamber for Radiation Emissions (Test Frequency:Above 1GHz)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer	Agilent	E7405A	MY45114943	Aug. 13,2012	Aug. 13,2013
2.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Aug. 13,2012	Aug. 13,2013
3.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	399	Aug. 13,2012	Aug. 13,2013
4.	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Apr.07,2013	Apr.07,2014
5.	Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-148	Aug. 13,2012	Aug. 13,2013
6.	10m Coaxial Cable with N- plug	SCHWARZBECK	AK 9515 H	-	Aug. 13,2012	Aug. 13,2013

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 (Bilog antenna 30M~1000MHz)
	± 4.74 dB (Horn antenna 1000M~25000MHz)
Conducted Spurious Emissions test	± 3.64 dB (AC mains 150KHz~30MHz)

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:	51 % RH
Atmospheric Pressure:	1012 mbar

EUT Operation:

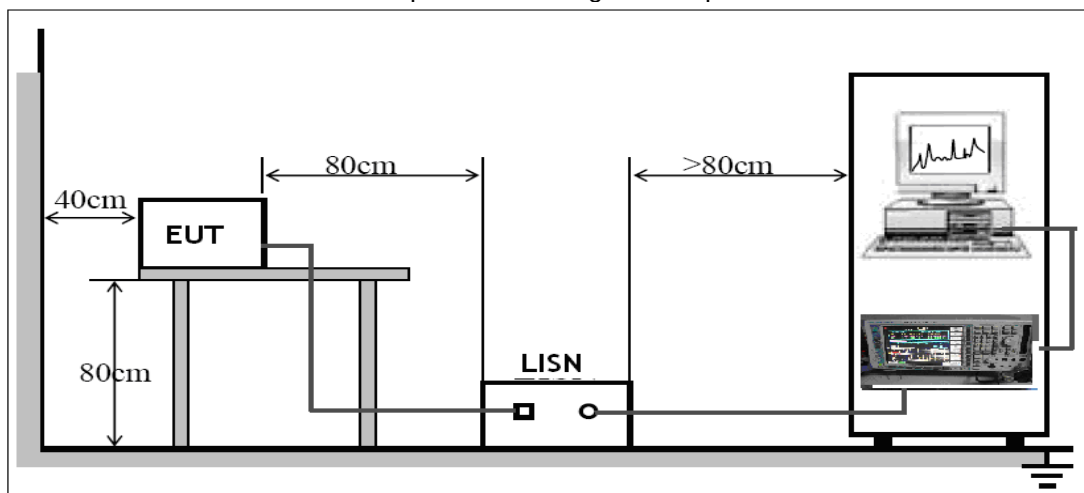
The pre-test was performed in Normal linking(Wifi) mode, so the worst data were shown as follow.

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.

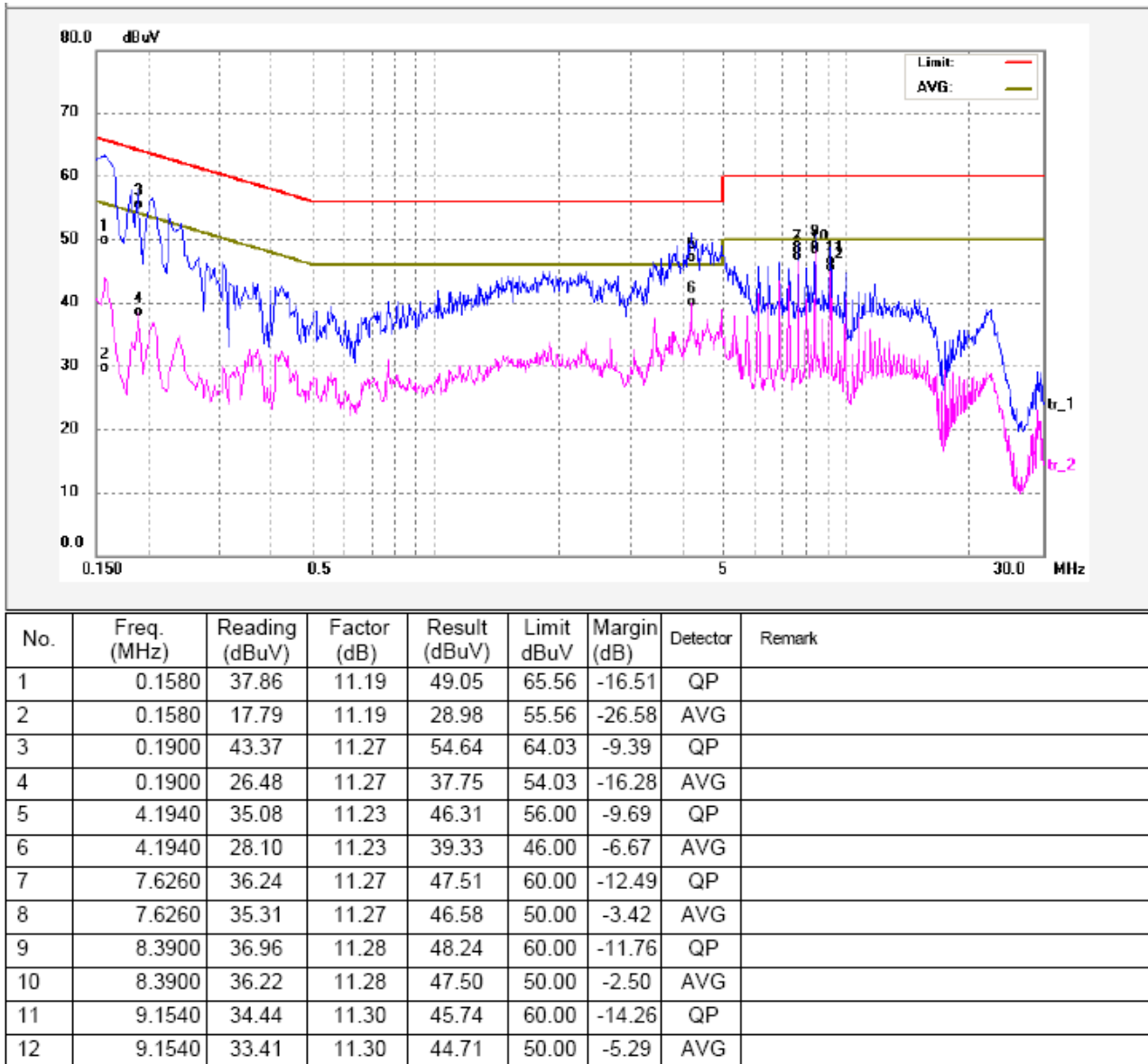


6.3 Conducted Emission Test Result

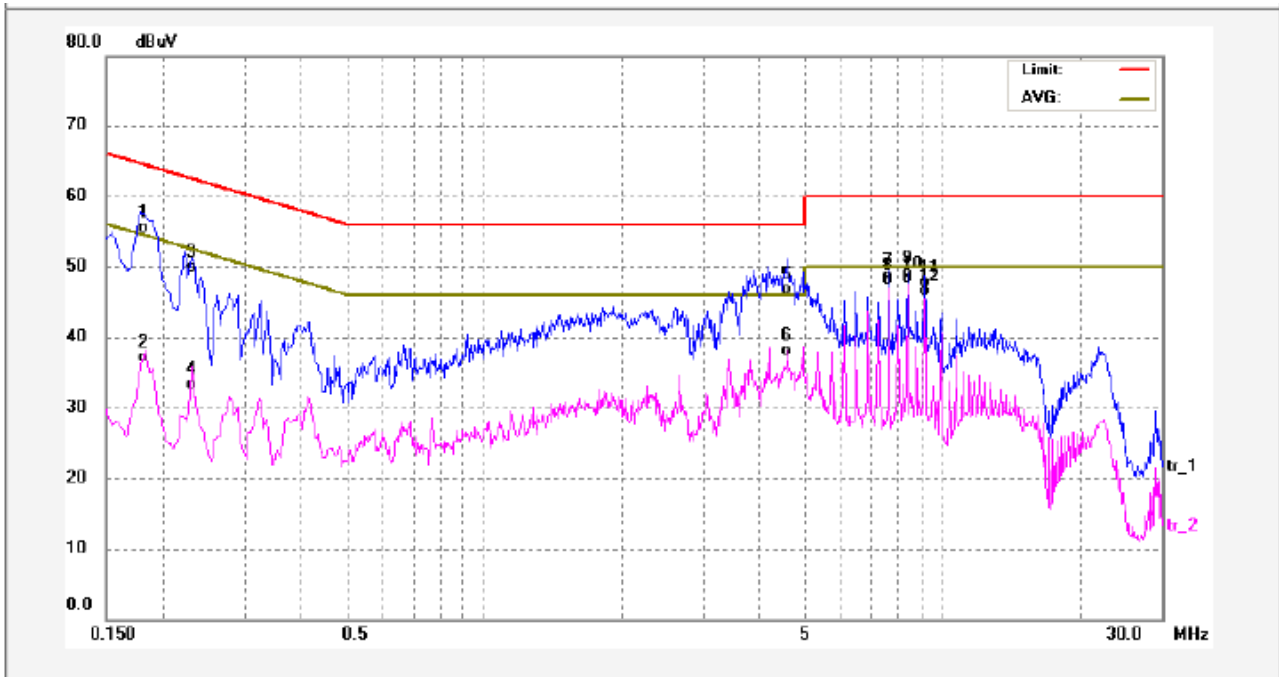
An initial pre-scan was performed on the live and neutral lines.

Test Mode: Normal linking(Wifi)

Live line:



Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1806	43.53	11.25	54.78	64.45	-9.67	QP	
2	0.1806	25.11	11.25	36.36	54.45	-18.09	AVG	
3	0.2300	37.90	11.30	49.20	62.45	-13.25	QP	
4	0.2300	21.26	11.30	32.56	52.45	-19.89	AVG	
5	4.5739	34.65	11.23	45.88	56.00	-10.12	QP	
6	4.5739	26.00	11.23	37.23	46.00	-8.77	AVG	
7	7.6260	36.72	11.27	47.99	60.00	-12.01	QP	
8	7.6260	35.98	11.27	47.25	50.00	-2.75	AVG	
9	8.3900	36.97	11.28	48.25	60.00	-11.75	QP	
10	8.3900	36.21	11.28	47.49	50.00	-2.51	AVG	
11	9.1500	35.57	11.30	46.87	60.00	-13.13	QP	
12	9.1500	34.34	11.30	45.64	50.00	-4.36	AVG	

7 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209
& 15.247

Test Method: ANSI C63.4:2003

Test Result: PASS

Frequency Range: 32.768kHz to 25GHz

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 4.3

7.1 EUT Operation :

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1012 mbar

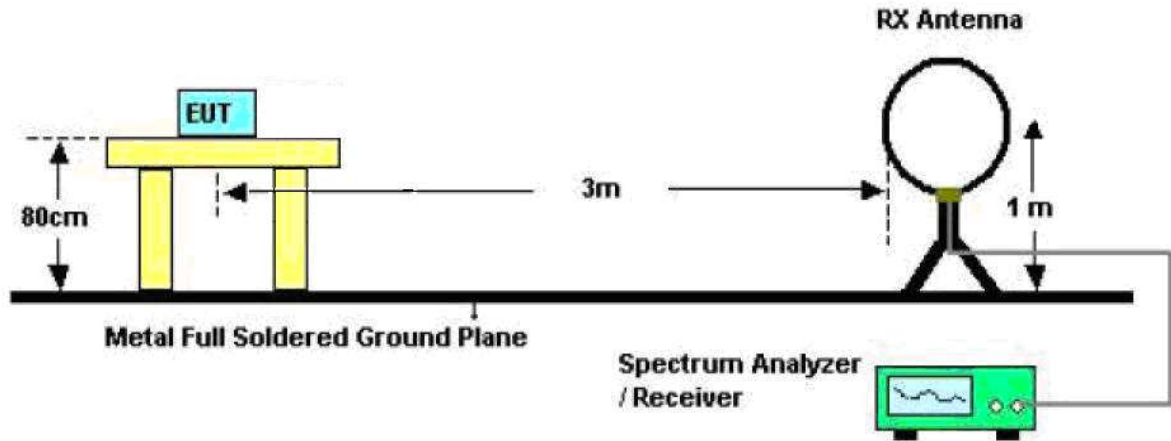
EUT Operation:

The pre-test was performed in Normal linking(Wifi) mode, so the worst data were shown as follow.

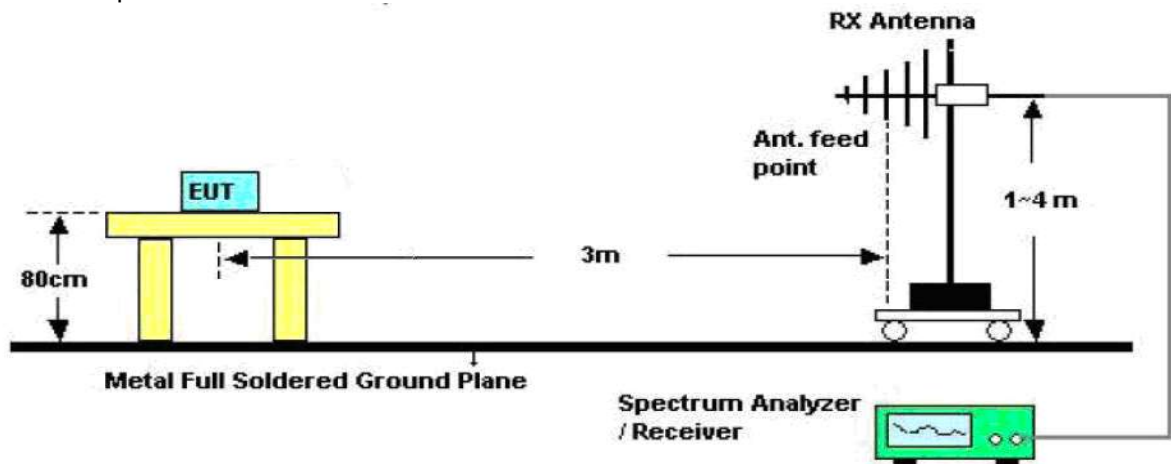
7.2 Test Setup

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

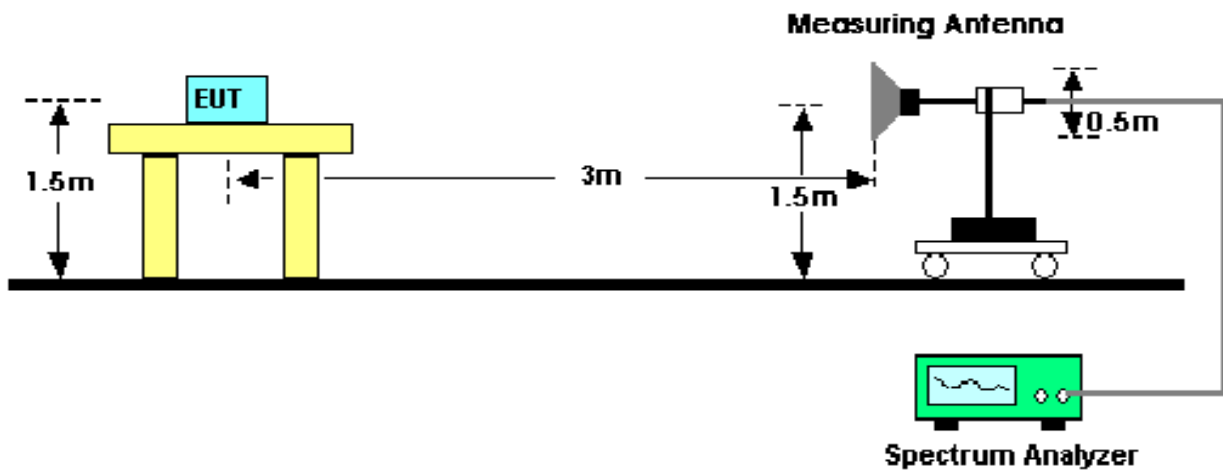
The test setup for emission measurement below 30MHz.



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 32.768KHz 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.

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

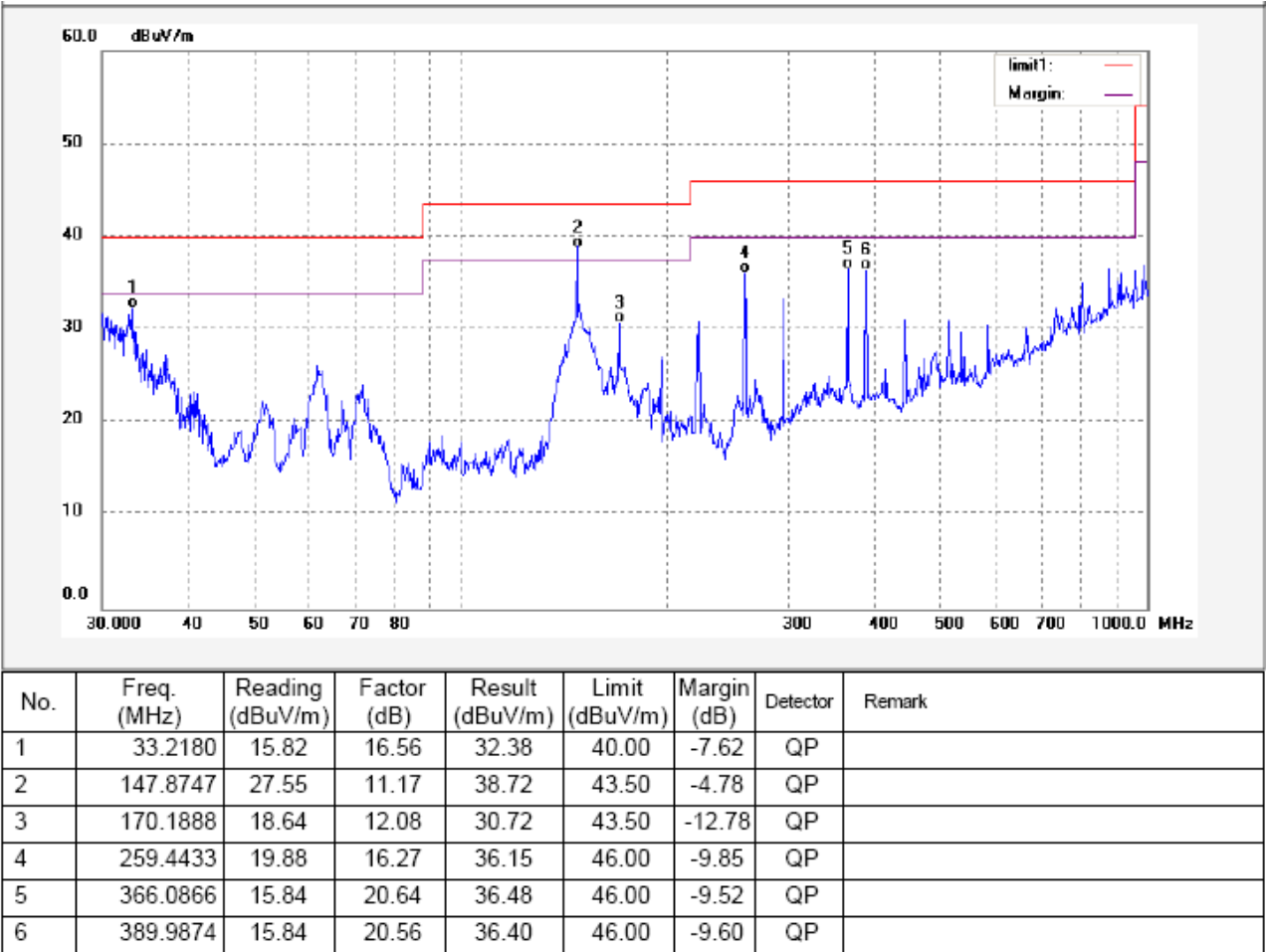
Test Frequency : Below 30MHz

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

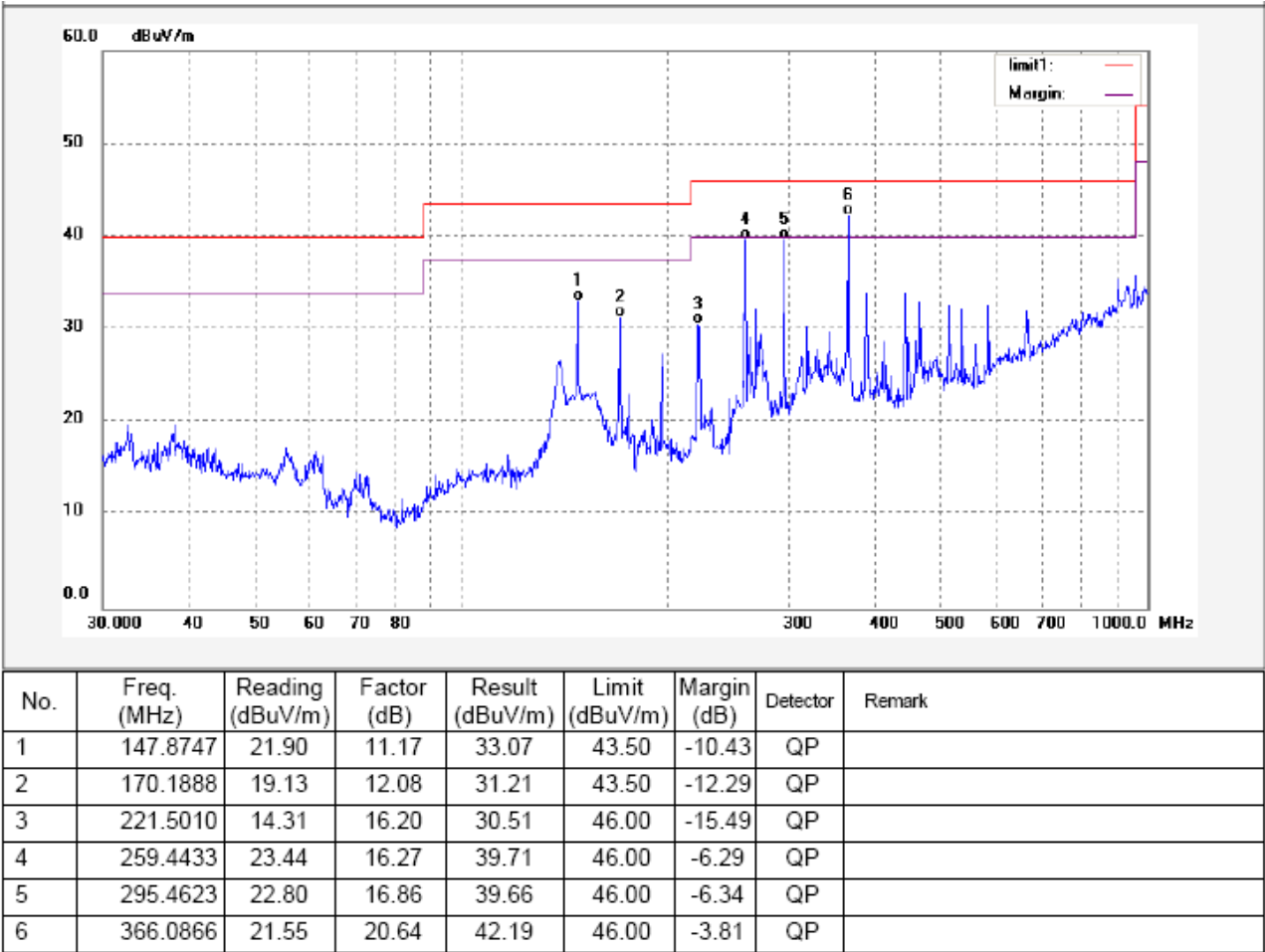
Test Frequency : 30MHz ~ 1000MHz

Test Mode:normal link

Antenna polarization: Vertical



Antenna polarization: Horizontal



Test Frequency: From 1GHz -18GHz

Test mode: Continuously Transmit

The emissions which are more than 20dB below the limit do not show in the report. The below are the Fundamentals and Harmonics which are the higher emissions recorded.

Modulation:TX 11b

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
2412	AV	Vertical	68.76		(Fund.)	1.6	10
4824	AV	Vertical	45.32	54	-8.68	1.8	70
7236	AV	Vertical	47.24	54	-6.76	1.9	145
9648	AV	Vertical	45.21	54	-8.79	2.4	110
2412	AV	Horizontal	72.52		(Fund.)	1.8	45
4824	AV	Horizontal	44.21	54	-9.79	2	170
7236	AV	Horizontal	40.35	54	-13.65	2	110
9648	AV	Horizontal	39.54	54	-14.46	1.9	140
2412	PK	Vertical	84.26		(Fund.)	1.7	35
4824	PK	Vertical	57.23	74	-16.77	2.5	105
7236	PK	Vertical	59.64	74	-14.36	2.1	135
9648	PK	Vertical	56.21	74	-17.79	2.1	215
2412	PK	Horizontal	78.53		(Fund.)	2.4	105
4824	PK	Horizontal	43.21	74	-30.79	3	145
7236	PK	Horizontal	10.25	74	-63.75	2.4	115
9648	PK	Horizontal	43.25	74	-30.75	2	45
2437	AV	Vertical	71.63		(Fund.)	1.8	40
4874	AV	Vertical	47.52	54	-6.48	1.7	115
7311	AV	Vertical	45.21	54	-8.79	1.7	125
9748	AV	Vertical	42.02	54	-11.98	1.7	70
2437	AV	Horizontal	65.01		(Fund.)	2	185
4874	AV	Horizontal	43.24	54	-10.76	1.7	150
7311	AV	Horizontal	44.15	54	-9.85	1.9	325
9748	AV	Horizontal	37.15	54	-16.85	1.8	160
2437	PK	Vertical	78.39		(Fund.)	1.8	50
4874	PK	Vertical	60.25	74	-13.75	1.7	125
7311	PK	Vertical	57.15	74	-16.85	1.8	145
9748	PK	Vertical	57.21	74	-16.79	1.8	195
2437	PK	Horizontal	72.22		(Fund.)	2	55
4874	PK	Horizontal	57.21	74	-16.79	2.5	130

7311	PK	Horizontal	56.54	74	-17.46	2.1	165
9748	PK	Horizontal	52.11	74	-21.89	2.2	115
2462	AV	Vertical	72.58		(Fund.)	1.9	190
4924	AV	Vertical	46.32	54	-7.68	1.8	25
7386	AV	Vertical	43.15	54	-10.85	1.8	155
9848	AV	Vertical	45.58	54	-8.42	1.8	130
2462	AV	Horizontal	66.15		(Fund.)	2.3	185
4924	AV	Horizontal	40.98	54	-13.02	2	210
7386	AV	Horizontal	41.56	54	-12.44	2.1	175
9848	AV	Horizontal	42.81	54	-11.19	2	220
2462	PK	Vertical	79.63		(Fund.)	2	230
4924	PK	Vertical	61.23	74	-12.77	1.9	65
7386	PK	Vertical	56.48	74	-17.52	2	155
9848	PK	Vertical	57.25	74	-16.75	2	175
2462	PK	Horizontal	73.61		(Fund.)	2.3	235
4924	PK	Horizontal	55.66	74	-18.34	2.8	145
7386	PK	Horizontal	54.25	74	-19.75	2.4	195
9848	PK	Horizontal	54.16	74	-19.84	2.5	235

Modulation:TX 11g

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
2412	AV	Vertical	72.13		(Fund.)	1.6	10
4824	AV	Vertical	46.16	54	-7.84	1.8	70
7236	AV	Vertical	48.76	54	-5.24	1.9	145
9648	AV	Vertical	44.29	54	-9.71	2.4	110
2412	AV	Horizontal	65.38		(Fund.)	1.8	45
4824	AV	Horizontal	43.52	54	-10.48	2	170
7236	AV	Horizontal	40.81	54	-13.19	2	110
9648	AV	Horizontal	39.33	54	-14.67	1.9	140
2412	PK	Vertical	78.39		(Fund.)	1.7	35
4824	PK	Vertical	57.27	74	-16.73	2.5	105
7236	PK	Vertical	59.58	74	-14.42	2.1	135
9648	PK	Vertical	56.69	74	-17.31	2.1	215
2412	PK	Horizontal	72.61		(Fund.)	2.4	105
4824	PK	Horizontal	43.77	74	-30.23	3	145
7236	PK	Horizontal	40.65	74	-33.35	2.4	115
9648	PK	Horizontal	43.51	74	-30.49	2	45
2437	AV	Vertical	73.51		(Fund.)	1.8	40

4874	AV	Vertical	47.65	54	-6.35	1.7	115
7311	AV	Vertical	45.16	54	-8.84	1.7	125
9748	AV	Vertical	42.29	54	-11.71	1.7	70
2437	AV	Horizontal	66.81		(Fund.)	2	185
4874	AV	Horizontal	43.01	54	-10.99	1.7	150
7311	AV	Horizontal	43.52	54	-10.48	1.9	325
9748	AV	Horizontal	37.18	54	-16.82	1.8	160
2437	PK	Vertical	79.63		(Fund.)	1.8	50
4874	PK	Vertical	59.38	74	-14.62	1.7	125
7311	PK	Vertical	56.37	74	-17.63	1.8	145
9748	PK	Vertical	56.39	74	-17.61	1.8	195
2437	PK	Horizontal	73.65		(Fund.)	2	55
4874	PK	Horizontal	56.44	74	-17.56	2.5	130
7311	PK	Horizontal	55.09	74	-18.91	2.1	165
9748	PK	Horizontal	51.91	74	-22.09	2.2	115
2462	AV	Vertical	66.18		(Fund.)	1.9	190
4924	AV	Vertical	45.17	54	-8.83	1.8	25
7386	AV	Vertical	42.61	54	-11.39	1.8	155
9848	AV	Vertical	44.18	54	-9.82	1.8	130
2462	AV	Horizontal	64.37		(Fund.)	2.3	185
4924	AV	Horizontal	39.25	54	-14.75	2	210
7386	AV	Horizontal	40.17	54	-13.83	2.1	175
9848	AV	Horizontal	41.66	54	-12.34	2	220
2462	PK	Vertical	76.15		(Fund.)	2	230
4924	PK	Vertical	60.25	74	-13.75	1.9	65
7386	PK	Vertical	55.73	74	-18.27	2	155
9848	PK	Vertical	56.37	74	-17.63	2	175
2462	PK	Horizontal	69.37		(Fund.)	2.3	235
4924	PK	Horizontal	54.63	74	-19.37	2.8	145
7386	PK	Horizontal	53.29	74	-20.71	2.4	195
9848	PK	Horizontal	53.18	74	-20.82	2.5	235

Modulation: TX 11n HT20

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
2412	AV	Vertical	71.38		(Fund.)	1.6	10
4824	AV	Vertical	44.37	54	-9.63	1.8	70

7236	AV	Vertical	46.17	54	-7.83	1.9	145
9648	AV	Vertical	42.38	54	-11.62	2.4	110
2412	AV	Horizontal	67.39		(Fund.)	1.8	45
4824	AV	Horizontal	41.68	54	-12.32	2	170
7236	AV	Horizontal	39.18	54	-14.82	2	110
9648	AV	Horizontal	38.12	54	-15.88	1.9	140
2412	PK	Vertical	82.17		(Fund.)	1.7	35
4824	PK	Vertical	55.37	74	-18.63	2.5	105
7236	PK	Vertical	57.49	74	-16.51	2.1	135
9648	PK	Vertical	52.18	74	-21.82	2.1	215
2412	PK	Horizontal	73.60		(Fund.)	2.4	105
4824	PK	Horizontal	41.17	74	-32.83	3	145
7236	PK	Horizontal	43.72	74	-30.28	2.4	115
9648	PK	Horizontal	40.18	74	-33.82	2	45
2437	AV	Vertical	72.33		(Fund.)	1.8	40
4874	AV	Vertical	47.65	54	-6.35	1.7	115
7311	AV	Vertical	43.86	54	-10.14	1.7	125
9748	AV	Vertical	40.19	54	-13.81	1.7	70
2437	AV	Horizontal	68.54		(Fund.)	2	185
4874	AV	Horizontal	40.37	54	-13.63	1.7	150
7311	AV	Horizontal	40.08	54	-13.92	1.9	325
9748	AV	Horizontal	35.72	54	-18.28	1.8	160
2437	PK	Vertical	83.61		(Fund.)	1.8	50
4874	PK	Vertical	55.78	74	-18.22	1.7	125
7311	PK	Vertical	53.62	74	-20.38	1.8	145
9748	PK	Vertical	52.77	74	-21.23	1.8	195
2437	PK	Horizontal	74.56		(Fund.)	2	55
4874	PK	Horizontal	53.31	74	-20.69	2.5	130
7311	PK	Horizontal	52.62	74	-21.38	2.1	165
9748	PK	Horizontal	49.27	74	-24.73	2.2	115
2462	AV	Vertical	58.61		(Fund.)	1.9	190
4924	AV	Vertical	43.08	54	-10.92	1.8	25
7386	AV	Vertical	40.29	54	-13.71	1.8	155
9848	AV	Vertical	41.56	54	-12.44	1.8	130
2462	AV	Horizontal	53.17		(Fund.)	2.3	185
4924	AV	Horizontal	36.77	54	-17.23	2	210
7386	AV	Horizontal	38.62	54	-15.38	2.1	175
9848	AV	Horizontal	39.33	54	-14.67	2	220

2462	PK	Vertical	70.33		(Fund.)	2	230
4924	PK	Vertical	59.13	74	-14.87	1.9	65
7386	PK	Vertical	52.37	74	-21.63	2	155
9848	PK	Vertical	54.48	74	-19.52	2	175
2462	PK	Horizontal	64.32		(Fund.)	2.3	235
4924	PK	Horizontal	51.21	74	-22.79	2.8	145
7386	PK	Horizontal	50.76	74	-23.24	2.4	195
9848	PK	Horizontal	50.63	74	-23.37	2.5	235

Modulation: TX 11n HT40

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
2422	AV	Vertical	63.56		(Fund.)	1.6	10
4844	AV	Vertical	44.37	54	-9.63	1.8	70
7266	AV	Vertical	46.17	54	-7.83	1.9	145
9688	AV	Vertical	42.38	54	-11.62	2.4	110
2422	AV	Horizontal	54.29		(Fund.)	1.8	45
4844	AV	Horizontal	41.68	54	-12.32	2	170
7266	AV	Horizontal	39.18	54	-14.82	2	110
9688	AV	Horizontal	38.12	54	-15.88	1.9	140
2422	PK	Vertical	77.18		(Fund.)	1.7	35
4844	PK	Vertical	55.37	74	-18.63	2.5	105
7266	PK	Vertical	57.49	74	-16.51	2.1	135
9688	PK	Vertical	52.18	74	-21.82	2.1	215
2422	PK	Horizontal	70.37		(Fund.)	2.4	105
4844	PK	Horizontal	41.17	74	-32.83	3	145
7266	PK	Horizontal	43.72	74	-30.28	2.4	115
9688	PK	Horizontal	40.18	74	-33.82	2	45
2442	AV	Vertical	64.17		(Fund.)	1.8	40
4884	AV	Vertical	47.65	54	-6.35	1.7	115
7326	AV	Vertical	43.86	54	-10.14	1.7	125
9768	AV	Vertical	40.19	54	-13.81	1.7	70
2442	AV	Horizontal	55.31		(Fund.)	2	185
4884	AV	Horizontal	40.37	54	-13.63	1.7	150
7326	AV	Horizontal	40.08	54	-13.92	1.9	325
9768	AV	Horizontal	35.72	54	-18.28	1.8	160
2442	PK	Vertical	78.42		(Fund.)	1.8	50
4884	PK	Vertical	55.78	74	-18.22	1.7	125
7326	PK	Vertical	53.62	74	-20.38	1.8	145

9768	PK	Vertical	52.77	74	-21.23	1.8	195
2442	PK	Horizontal	71.35		(Fund.)	2	55
4884	PK	Horizontal	53.31	74	-20.69	2.5	130
7326	PK	Horizontal	52.62	74	-21.38	2.1	165
9768	PK	Horizontal	49.27	74	-24.73	2.2	115
2452	AV	Vertical	62.18		(Fund.)	1.9	190
4904	AV	Vertical	43.08	54	-10.92	1.8	25
7356	AV	Vertical	40.29	54	-13.71	1.8	155
9808	AV	Vertical	41.56	54	-12.44	1.8	130
2452	AV	Horizontal	58.72		(Fund.)	2.3	185
4904	AV	Horizontal	36.77	54	-17.23	2	210
7356	AV	Horizontal	38.62	54	-15.38	2.1	175
9808	AV	Horizontal	39.33	54	-14.67	2	220
2452	PK	Vertical	73.66		(Fund.)	2	230
4904	PK	Vertical	59.13	74	-14.87	1.9	65
7356	PK	Vertical	52.37	74	-21.63	2	155
9808	PK	Vertical	54.48	74	-19.52	2	175
2452	PK	Horizontal	66.29		(Fund.)	2.3	235
4904	PK	Horizontal	51.21	74	-22.79	2.8	145
7356	PK	Horizontal	50.76	74	-23.24	2.4	195
9808	PK	Horizontal	50.63	74	-23.37	2.5	235

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 V03 R01 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

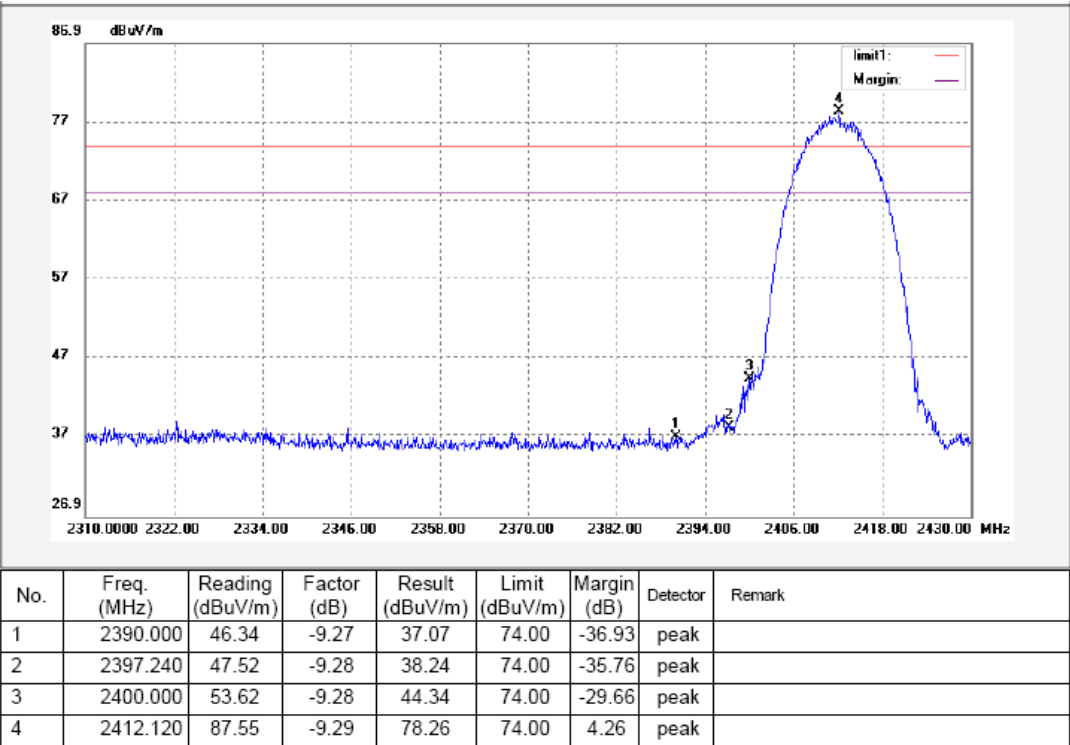
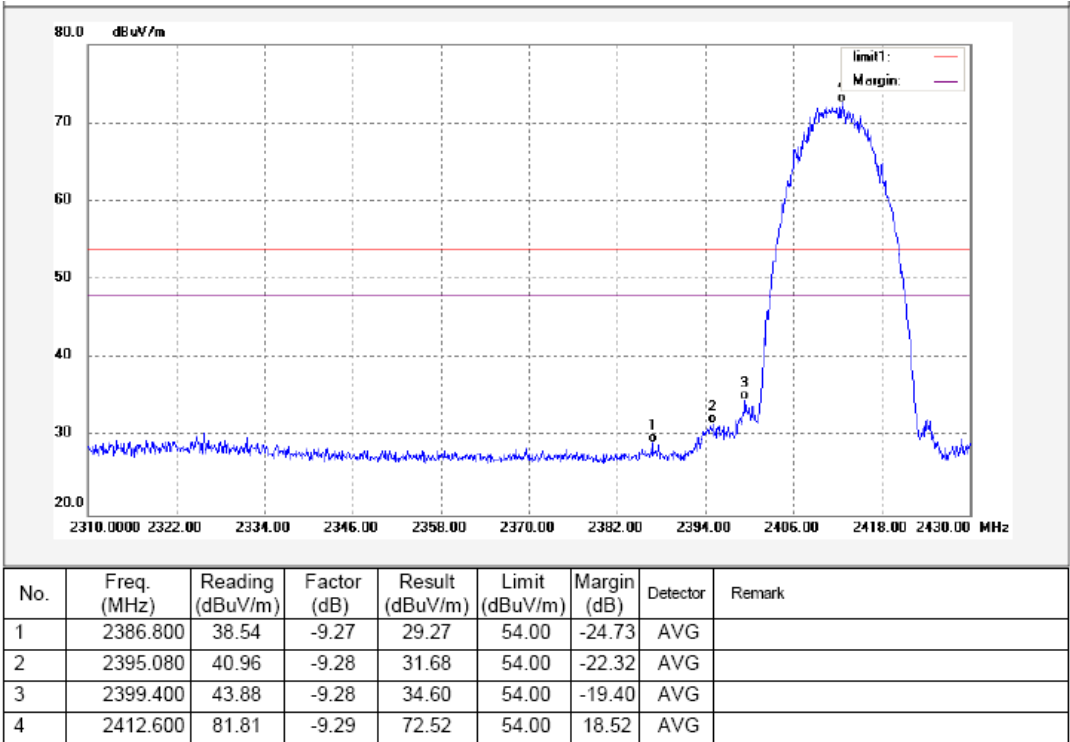
8.1 Test Produce

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.

8.2 Test Result

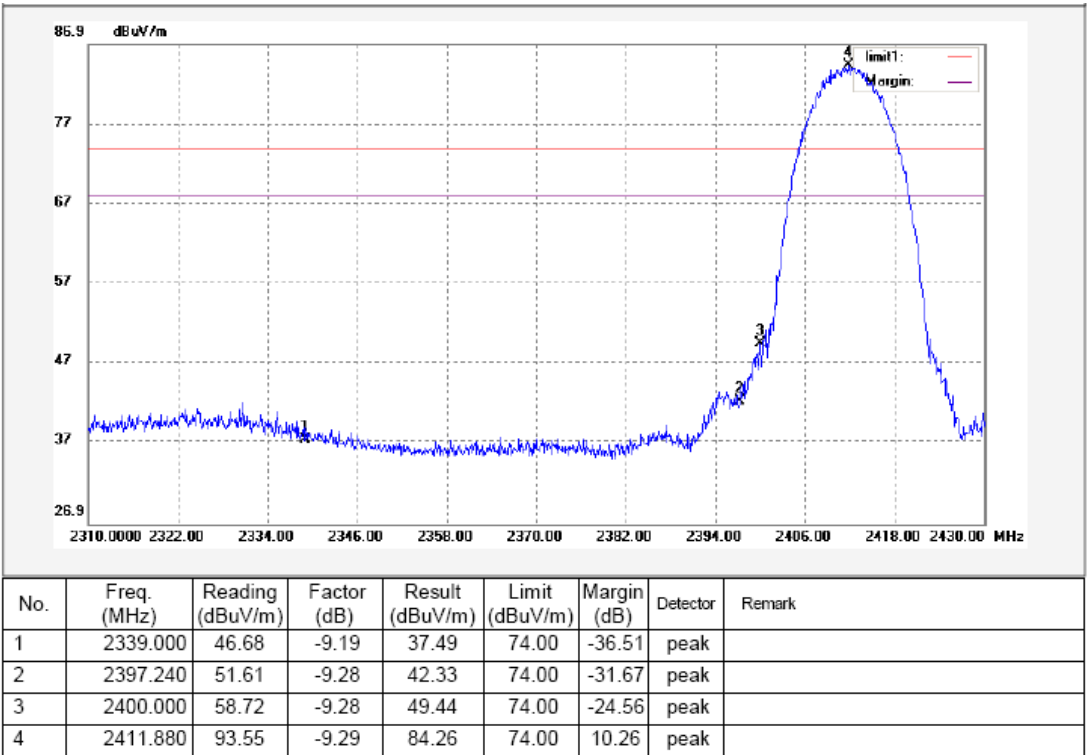
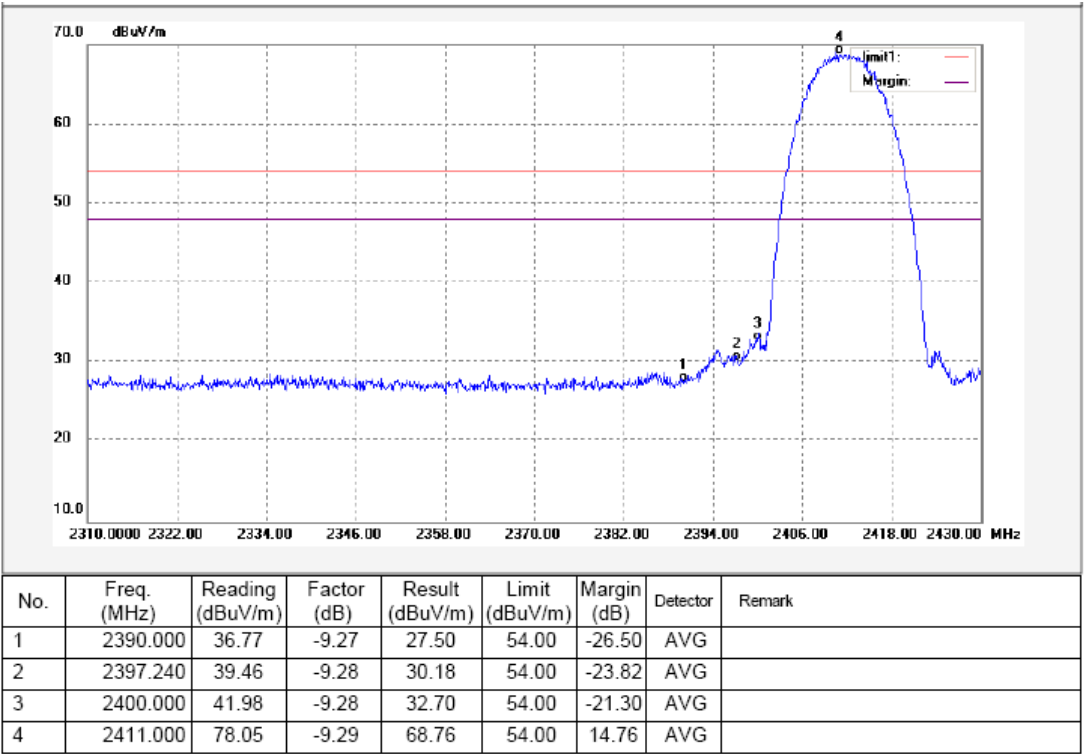
Mode: TX 11b channel 1

Antenna Polarization:Horizontal



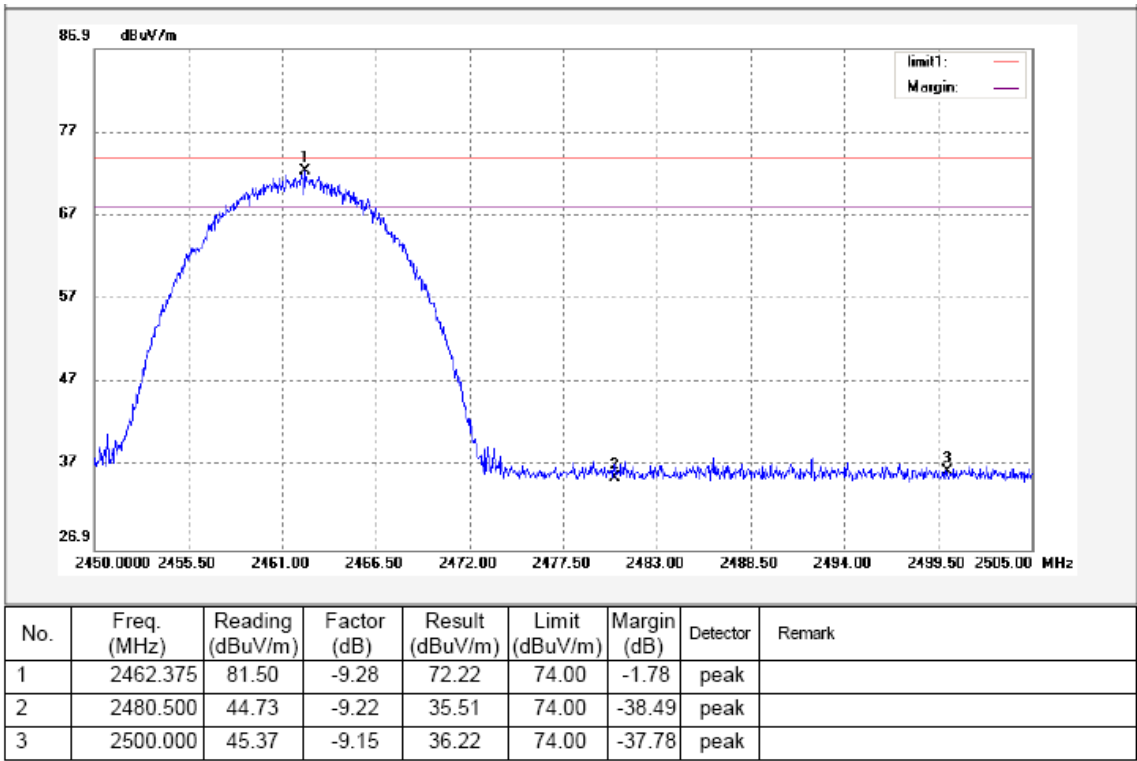
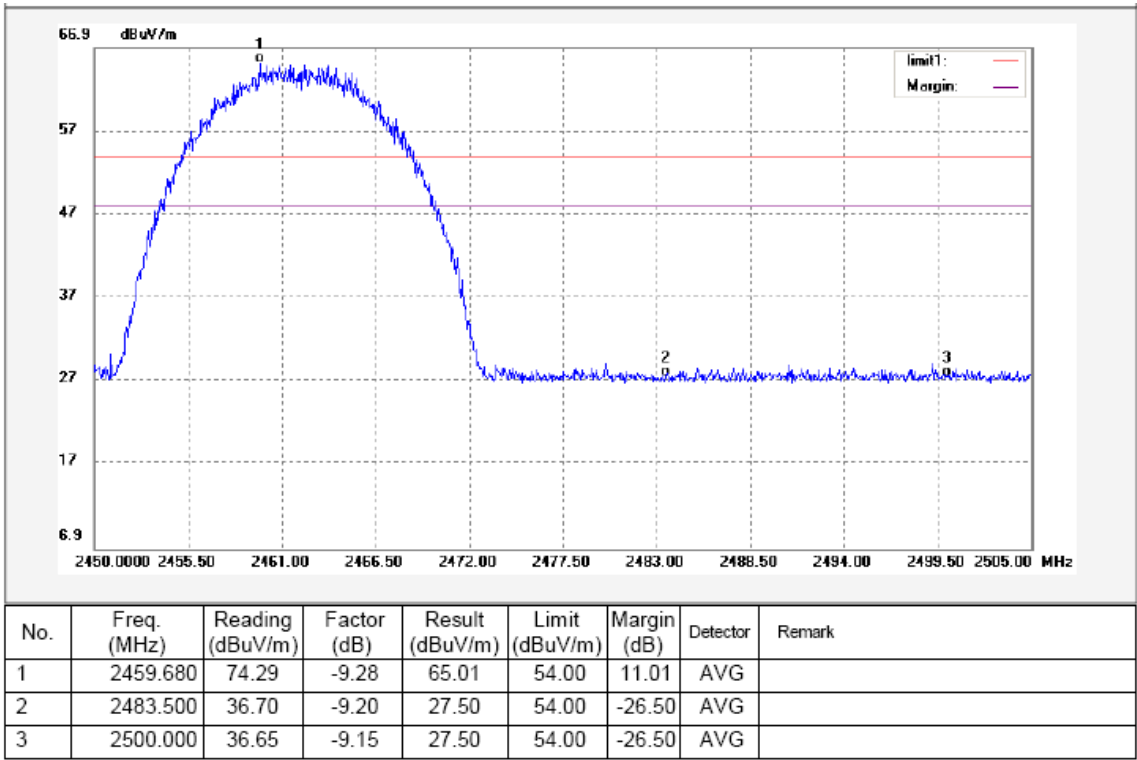
Mode: TX 11b channel 1

Antenna Polarization:Vertical



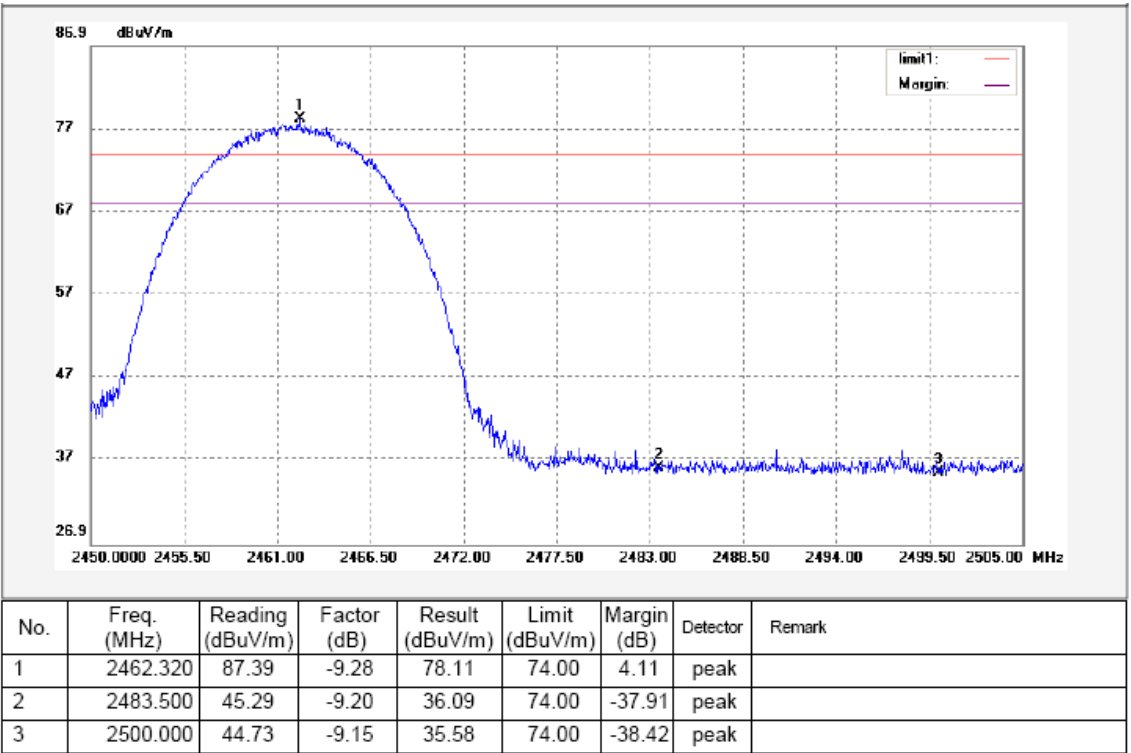
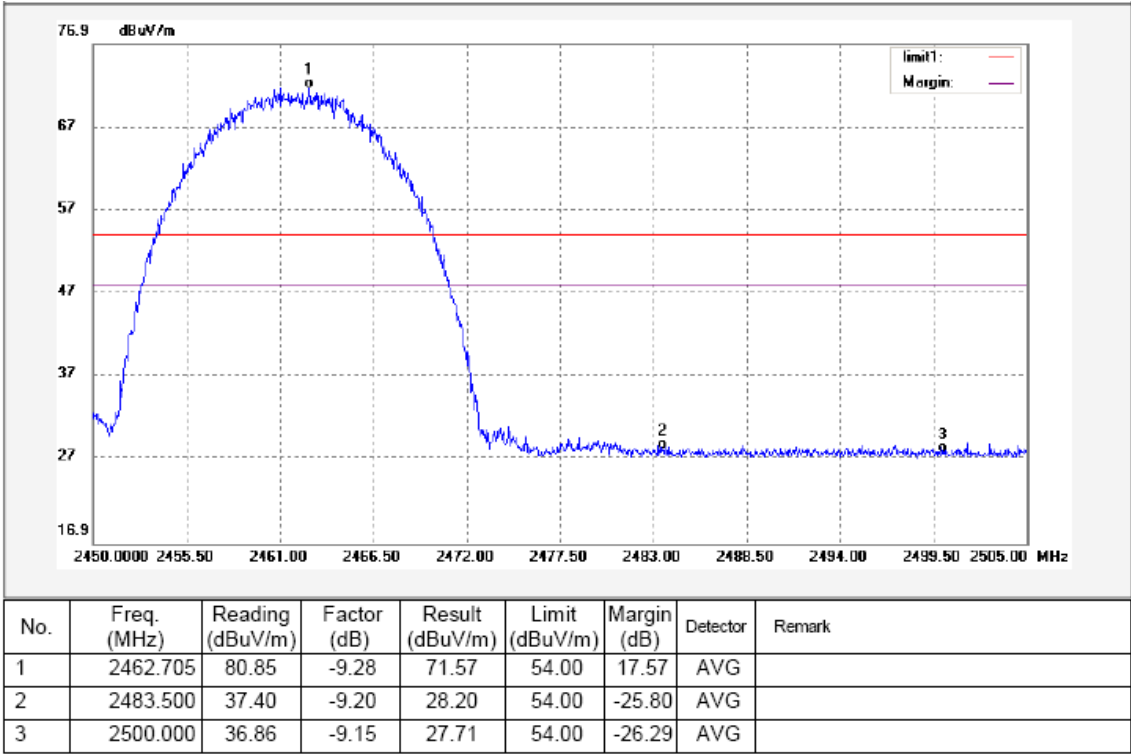
Mode: TX 11b channel 11

Antenna Polarization:Horizontal



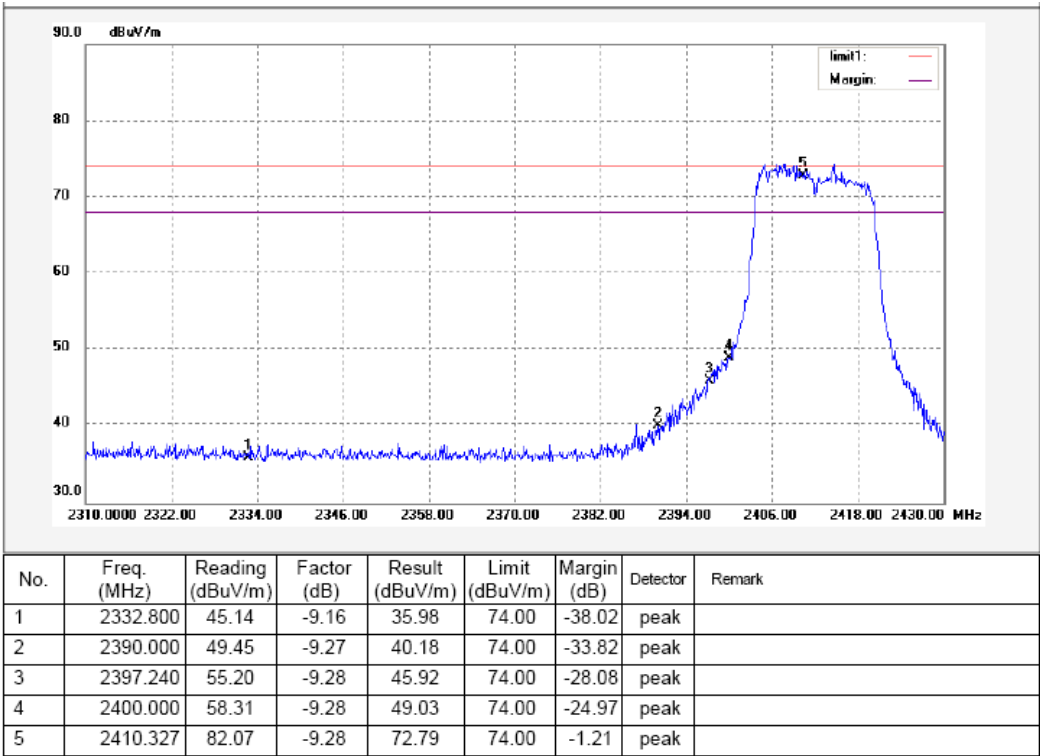
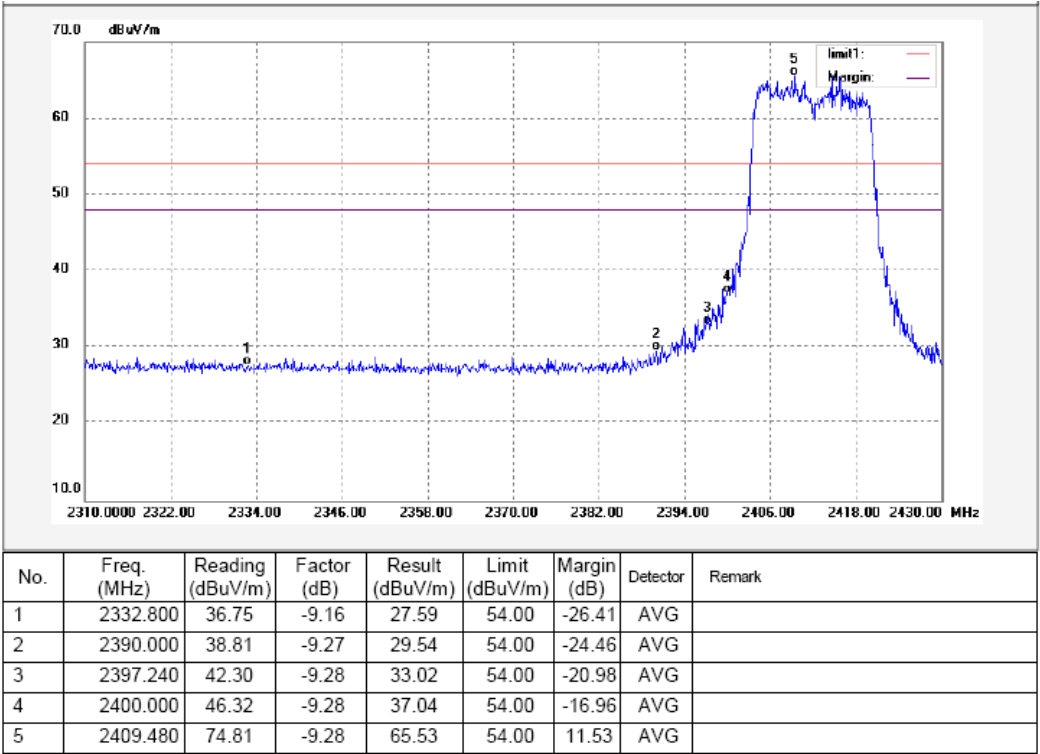
Mode: TX 11b channel 11

Antenna Polarization:Vertical



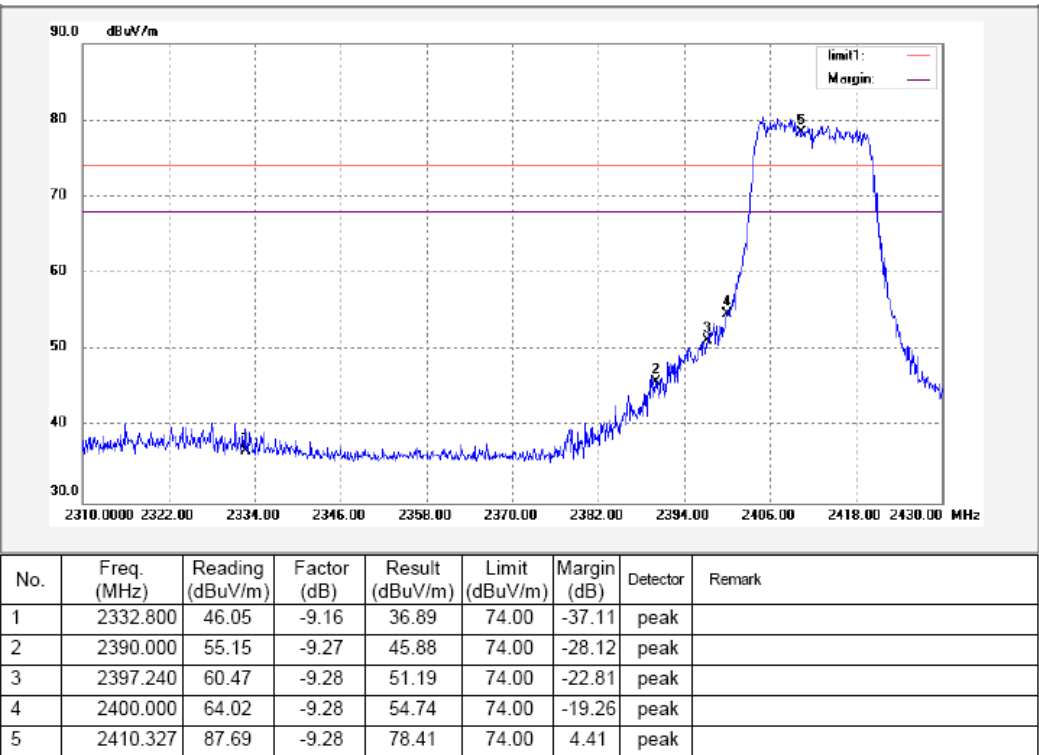
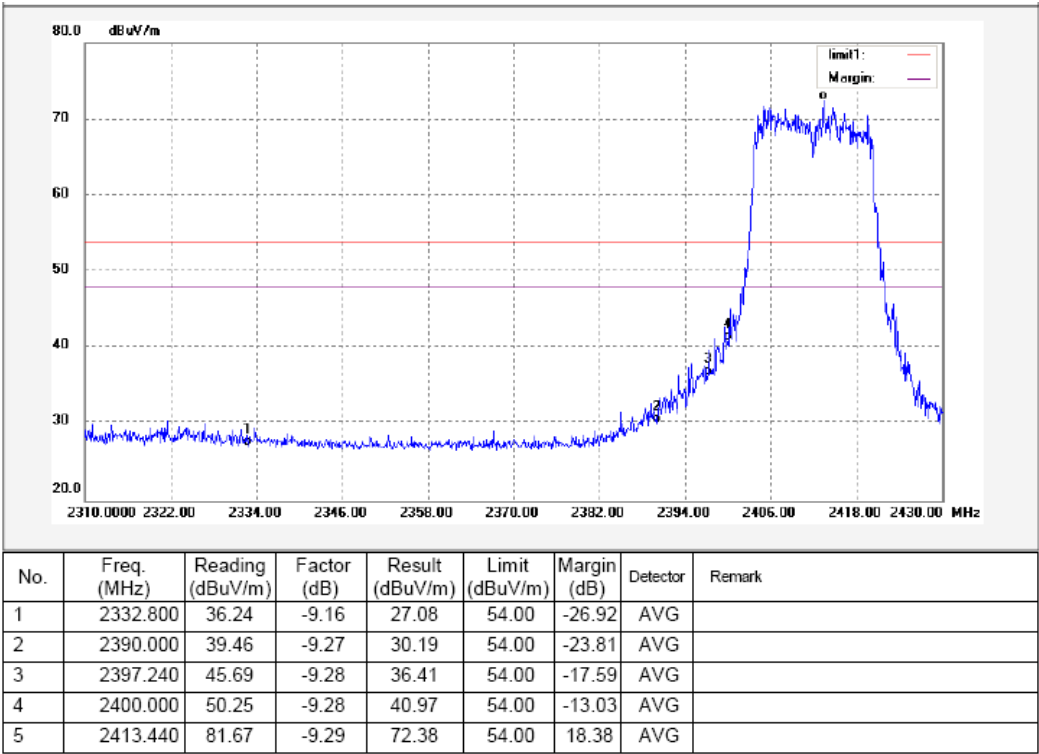
Mode: TX 11g channel 1

Antenna Polarization:Horizontal



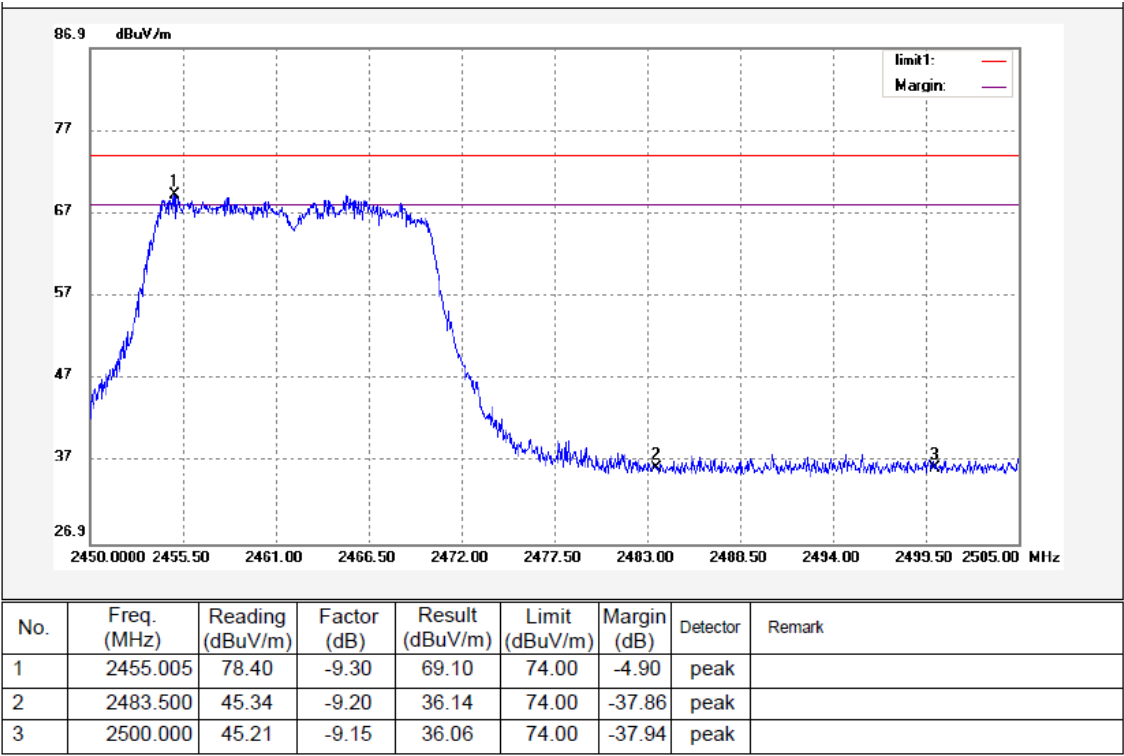
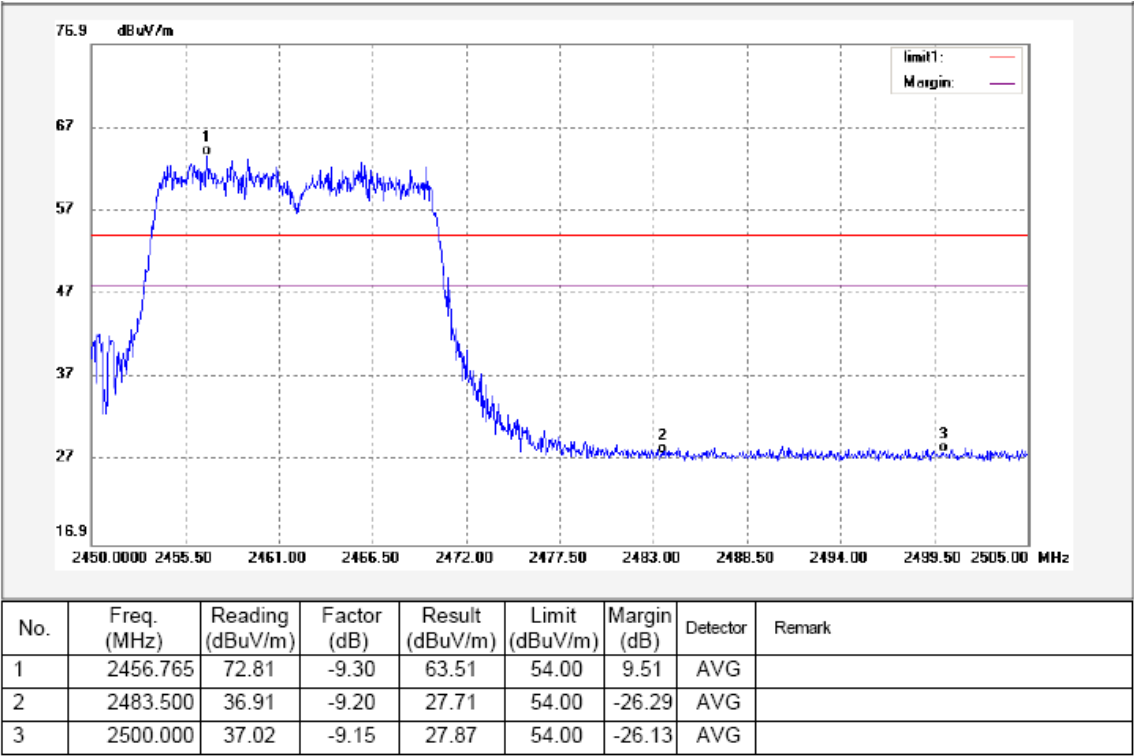
Mode: TX 11g channel 1

Antenna Polarization:Vertical



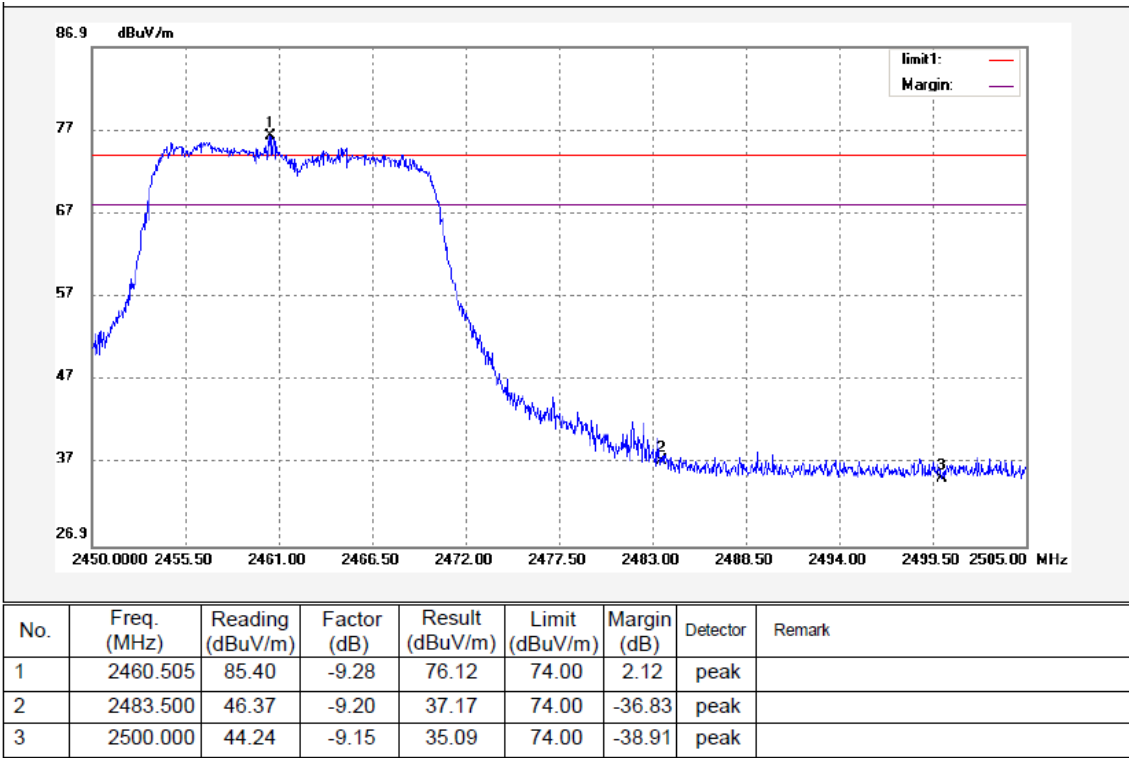
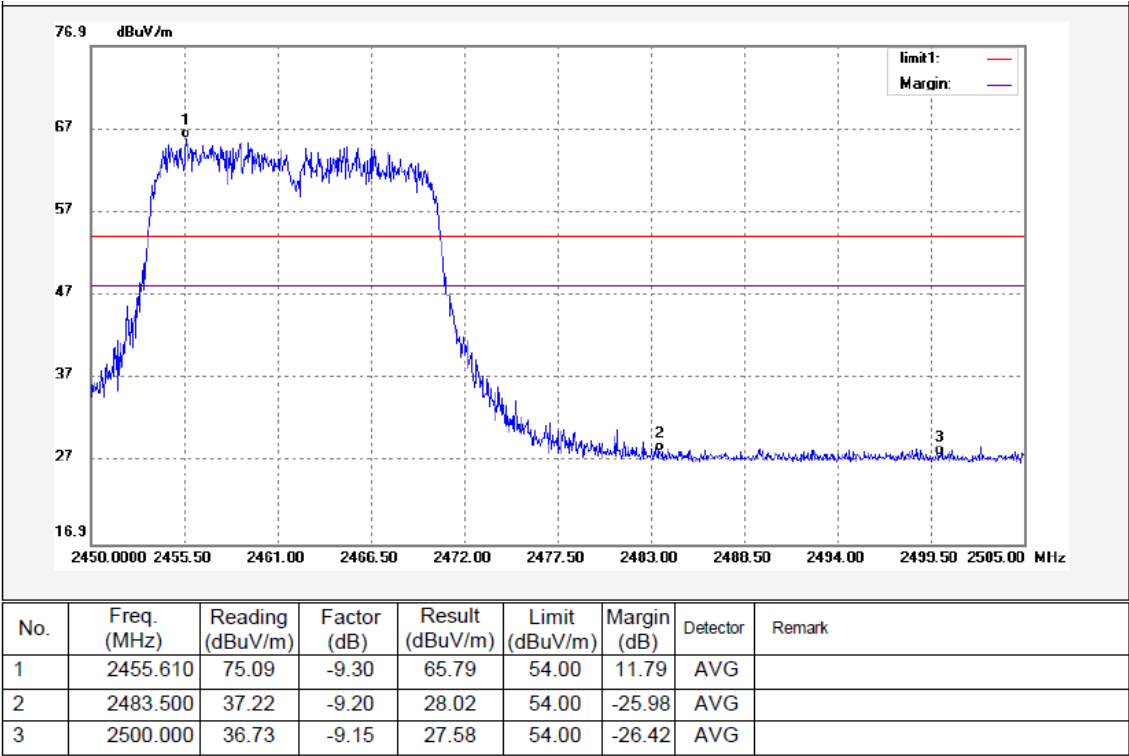
Mode: TX 11g channel 11

Antenna Polarization:Horizontal



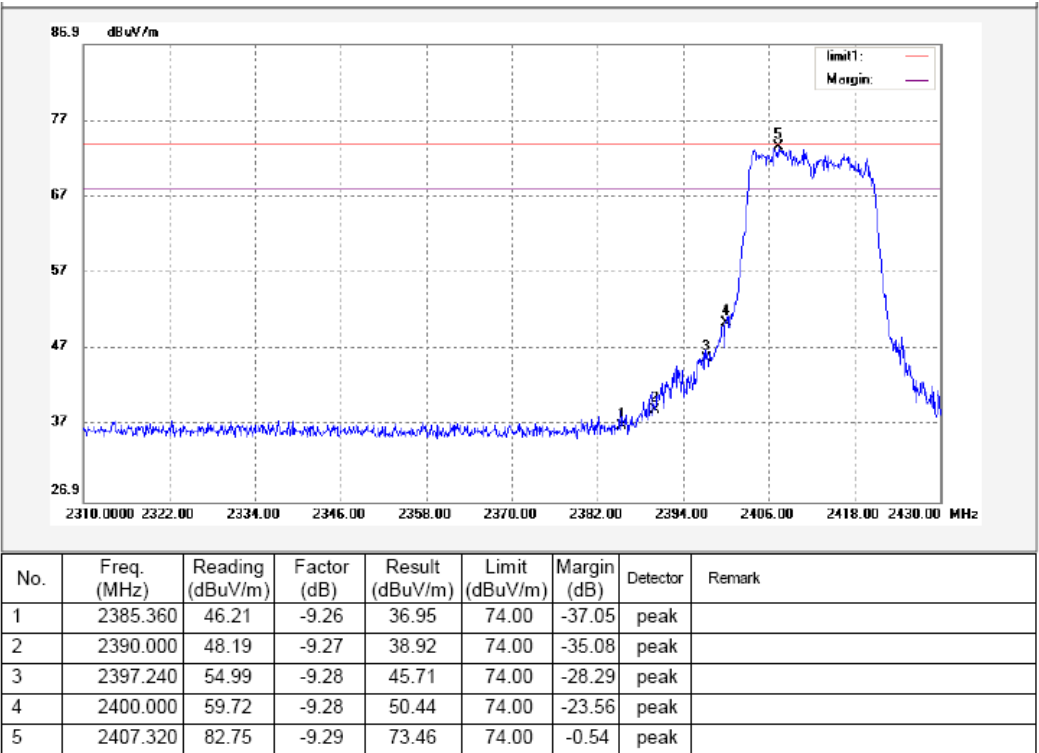
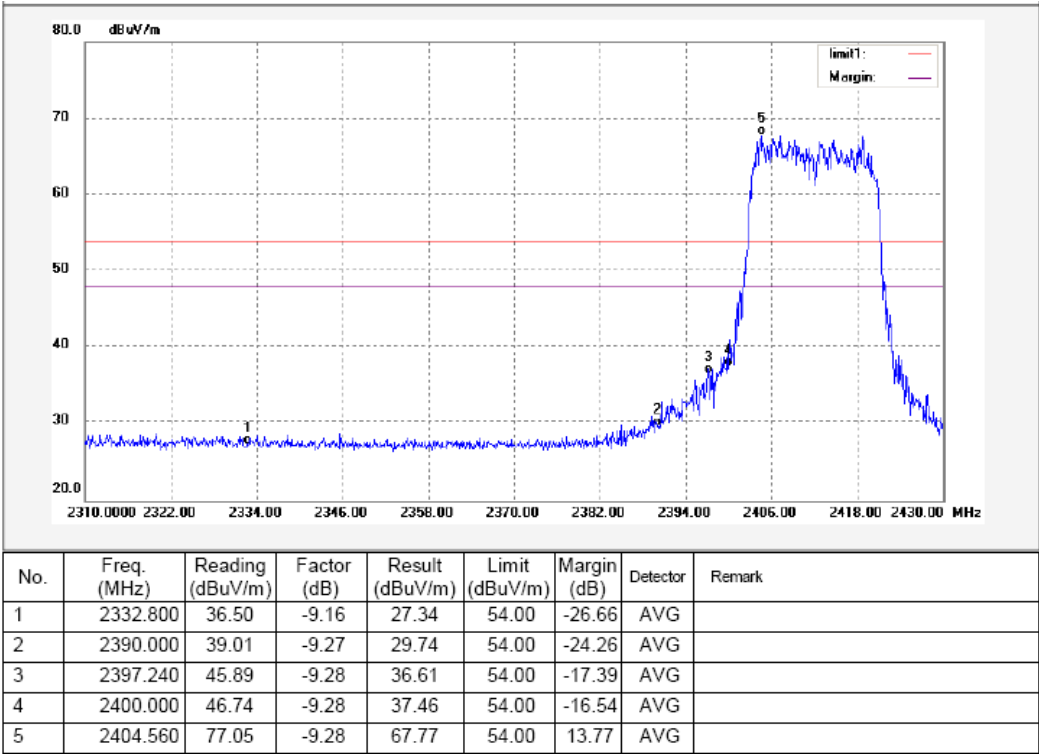
Mode: TX 11g channel 11

Antenna Polarization:Vertical



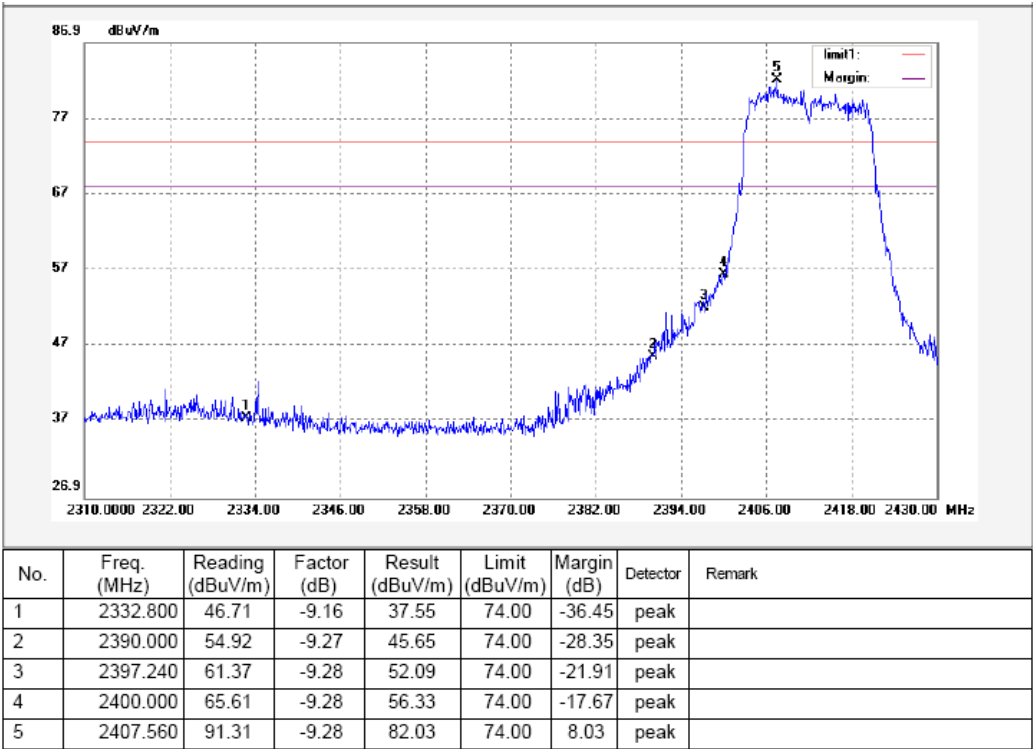
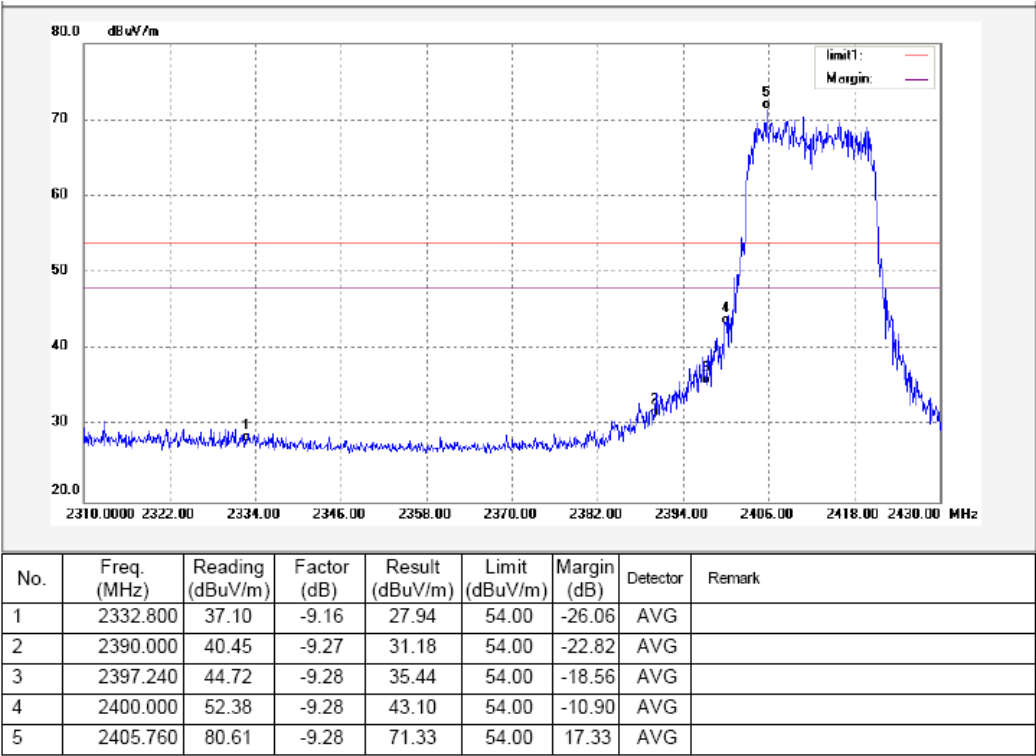
Mode: TX 11n HT 20 channel 1

Antenna Polarization:Horizontal



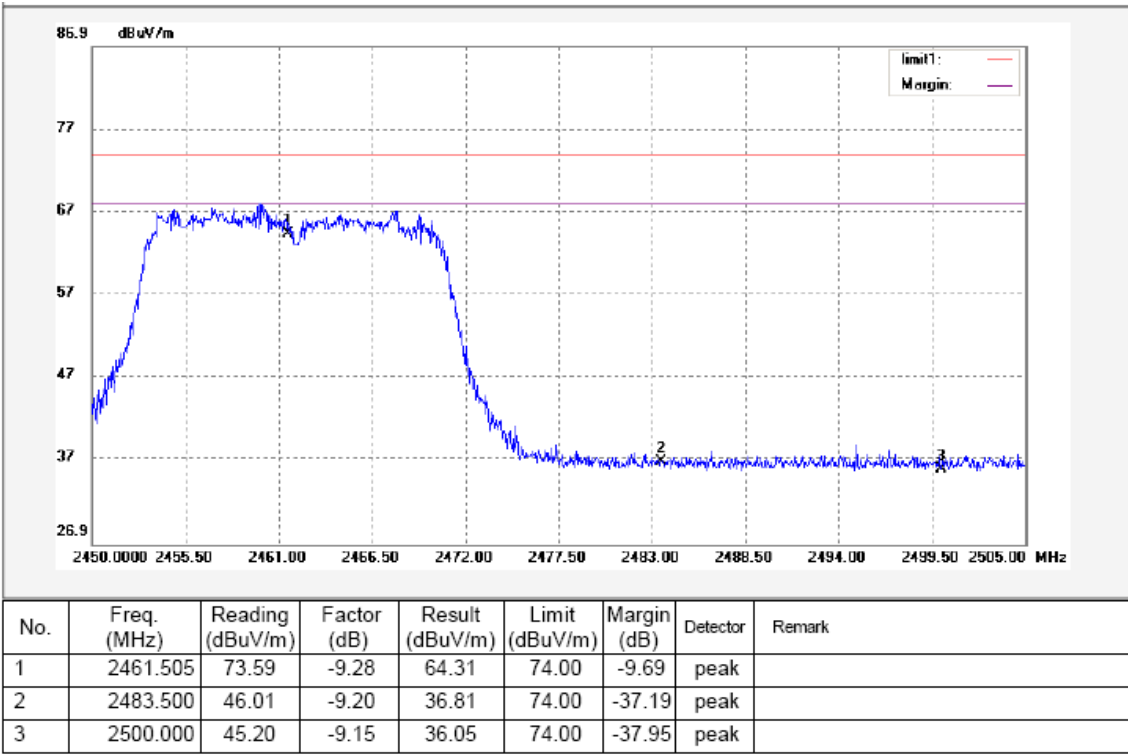
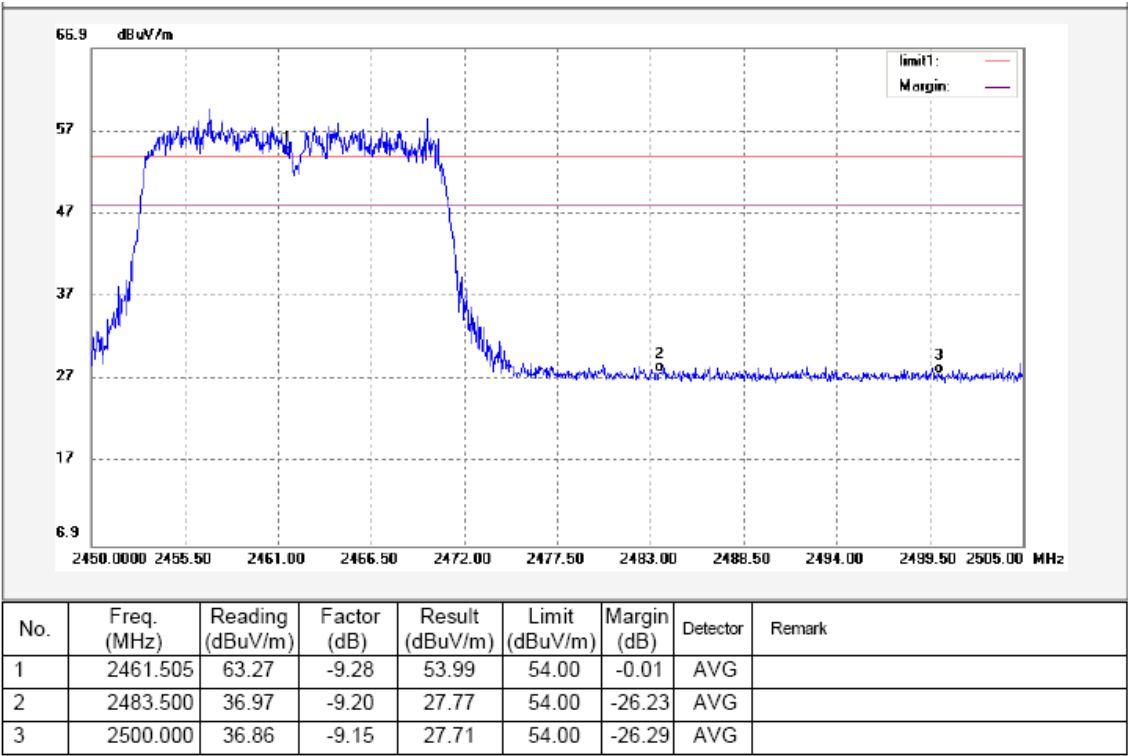
Mode: TX 11n HT 20 channel 1

Antenna Polarization:Vertical



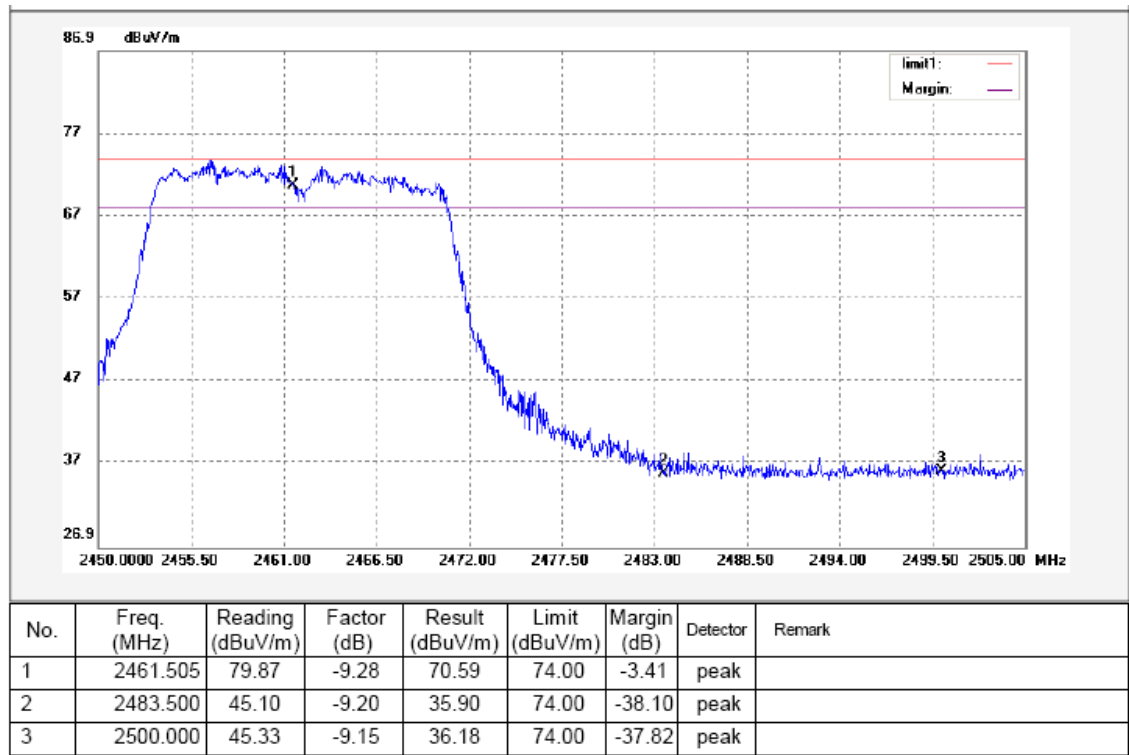
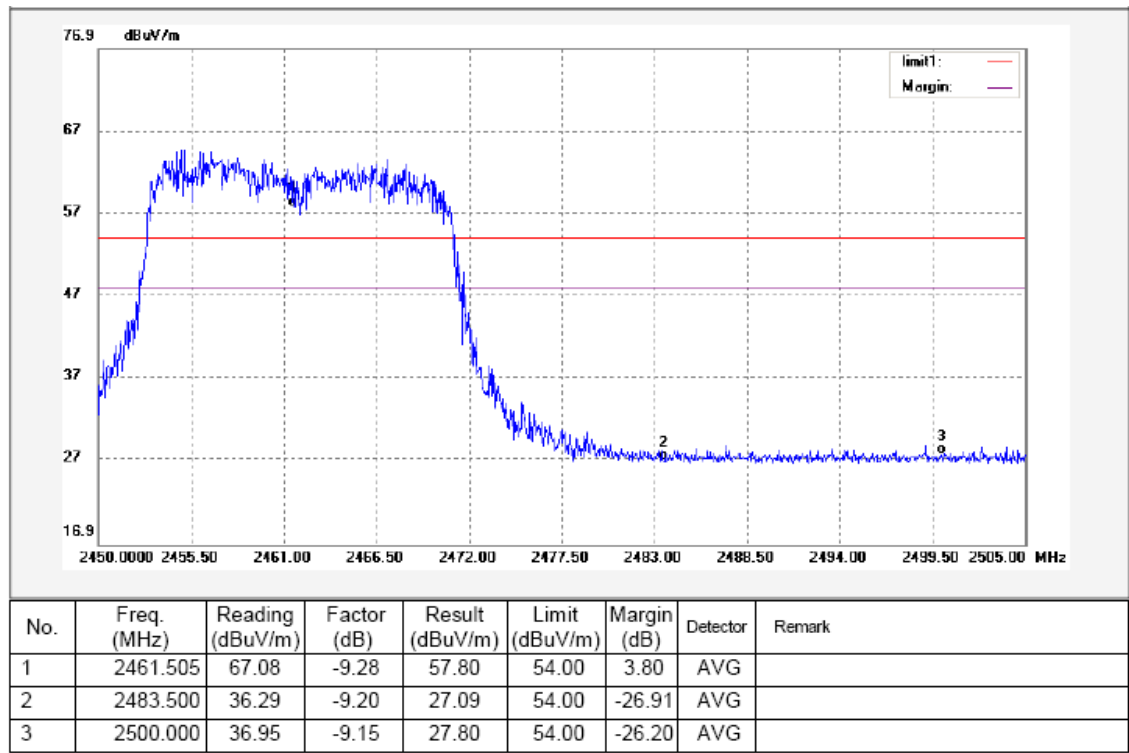
Mode: TX 11n HT 20 channel 11

Antenna Polarization:Horizontal



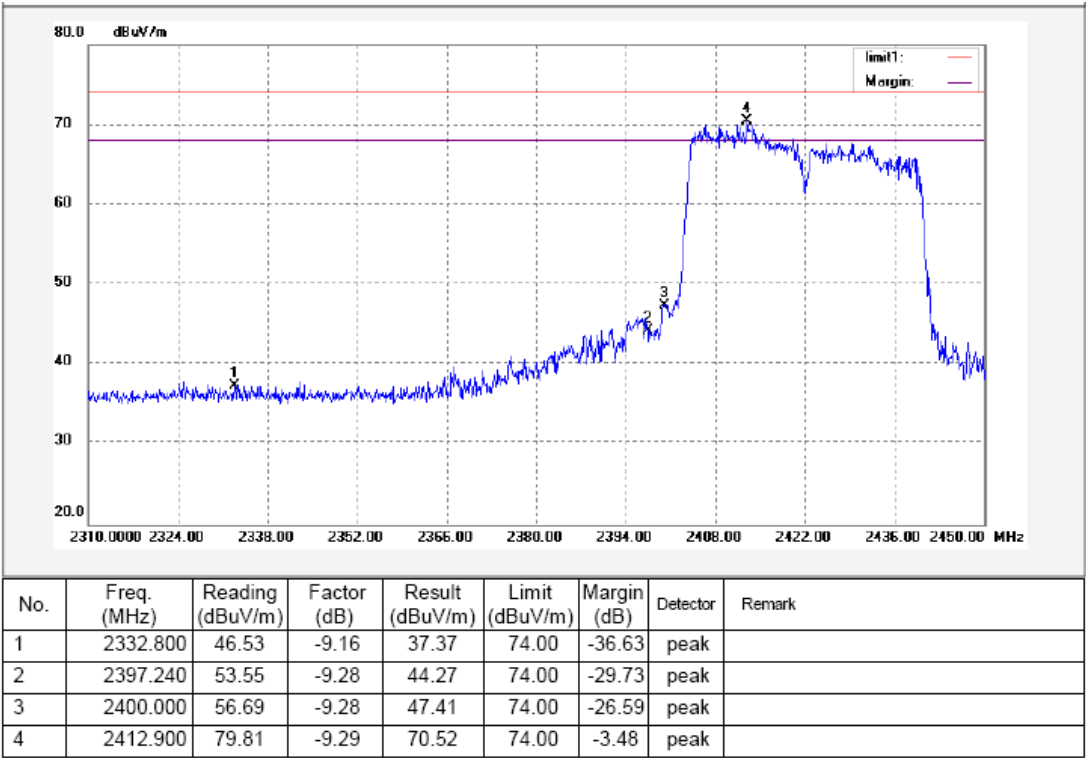
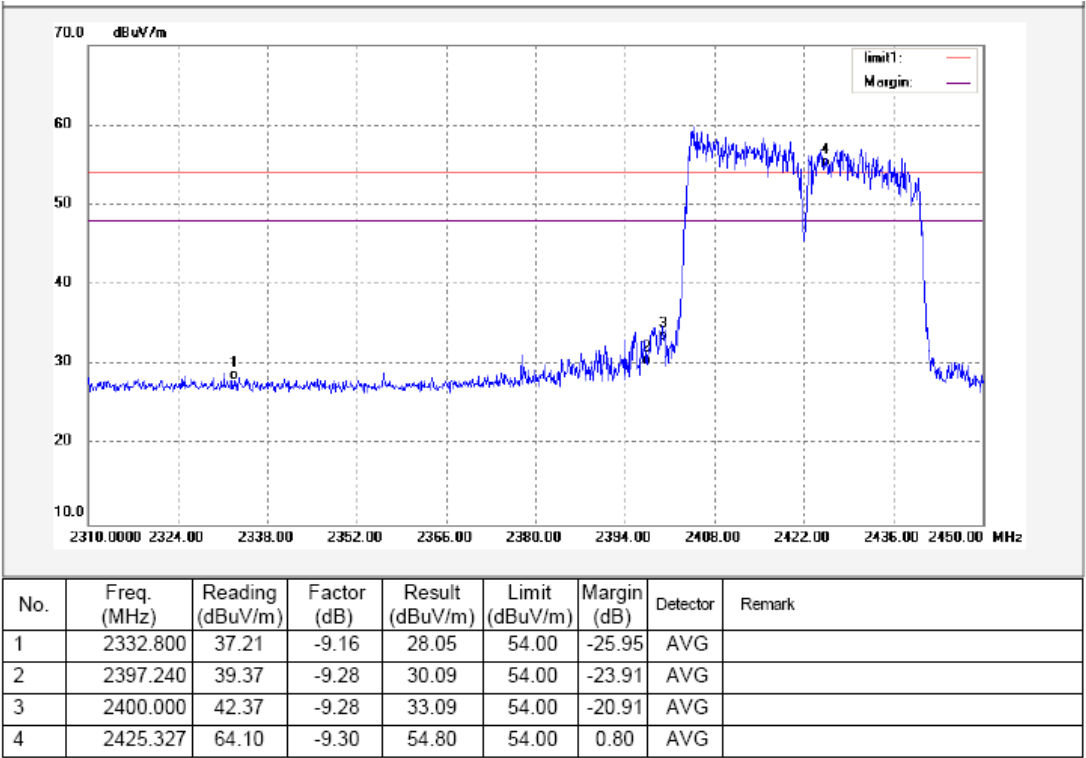
Mode: TX 11n HT 20 channel 11

Antenna Polarization:Vertical



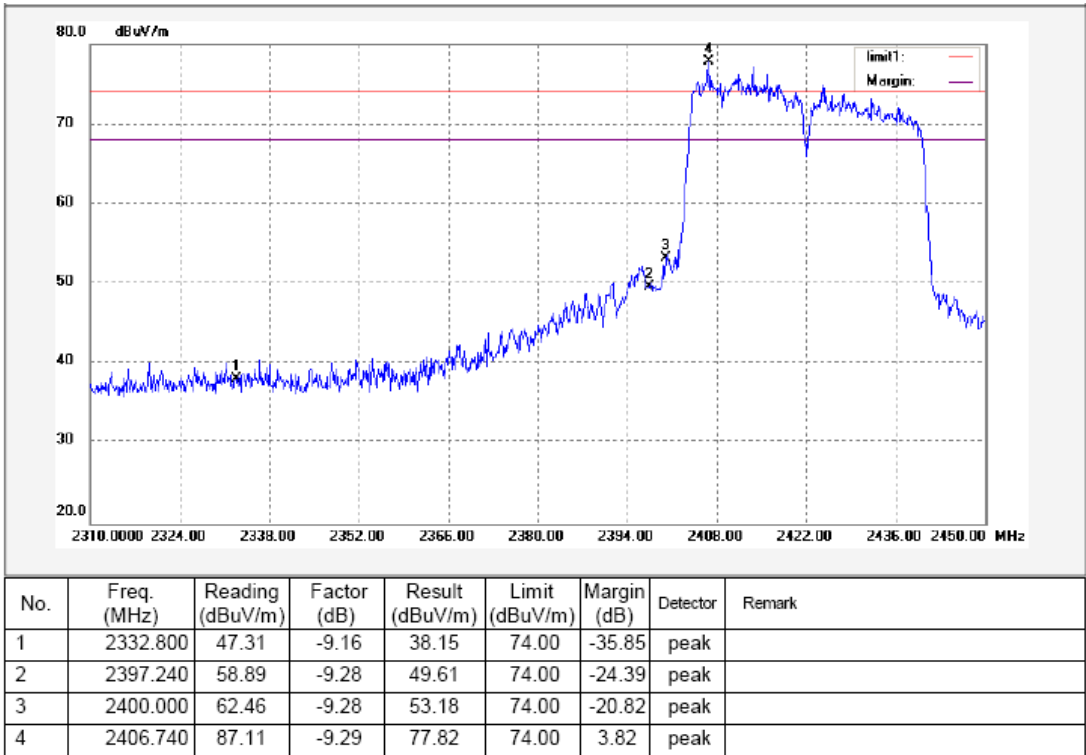
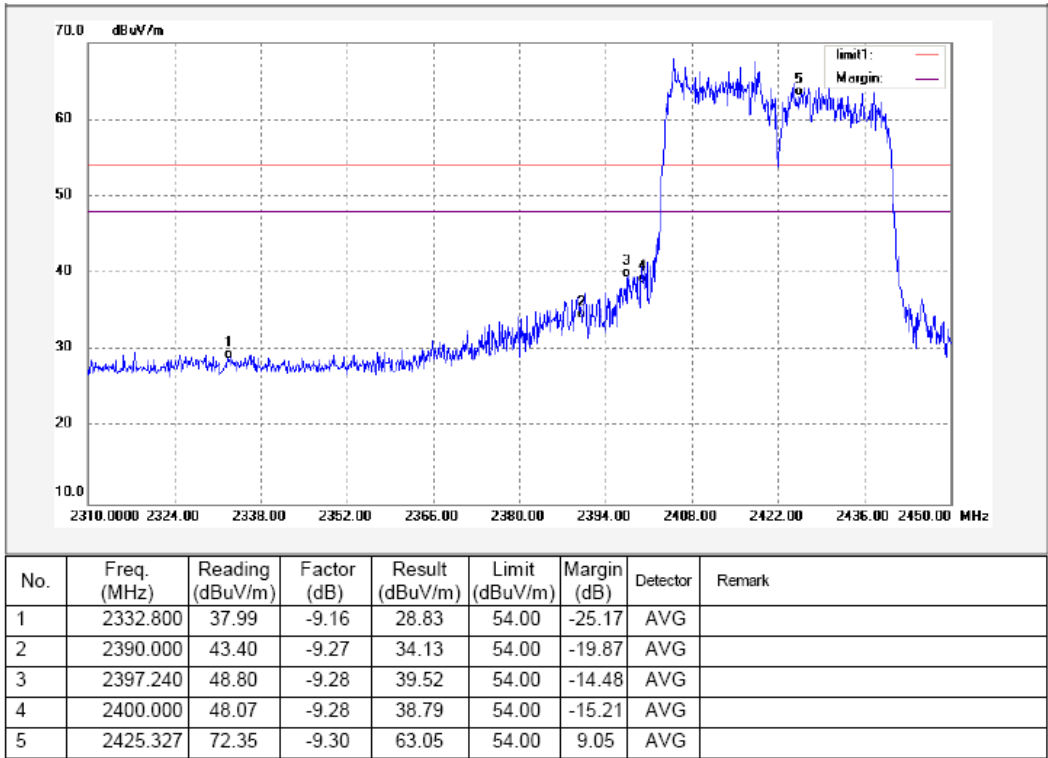
Mode: TX 11n HT 40 channel 3

Antenna Polarization:Horizontal



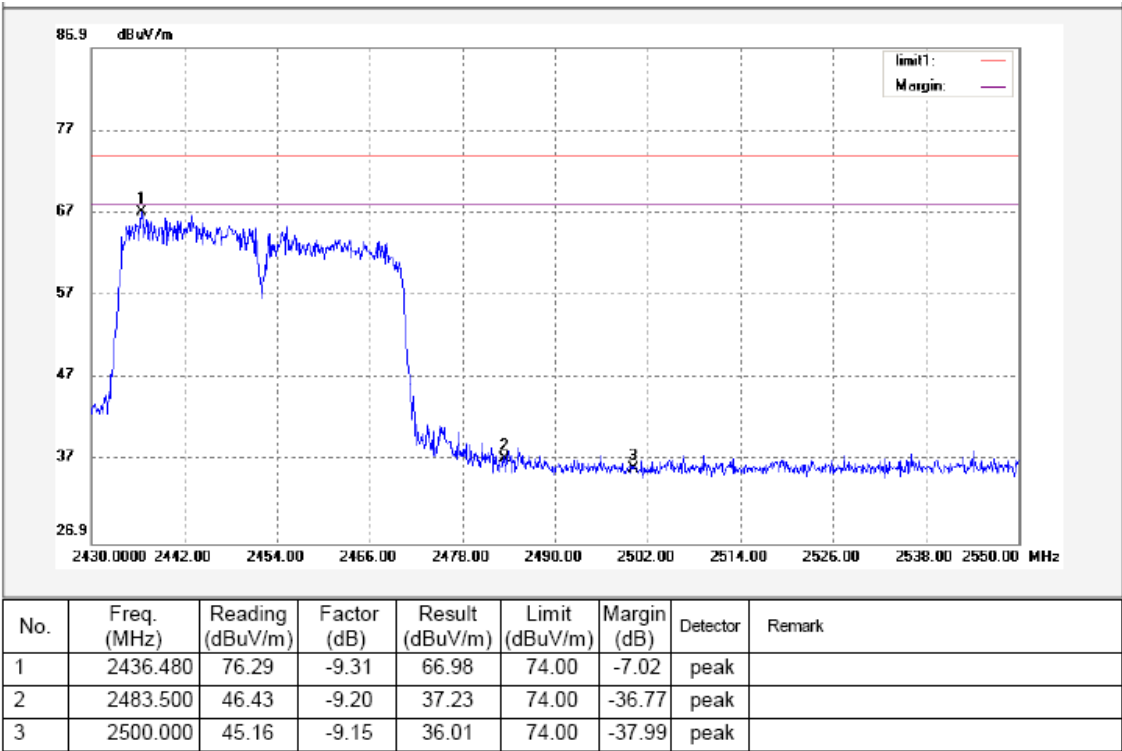
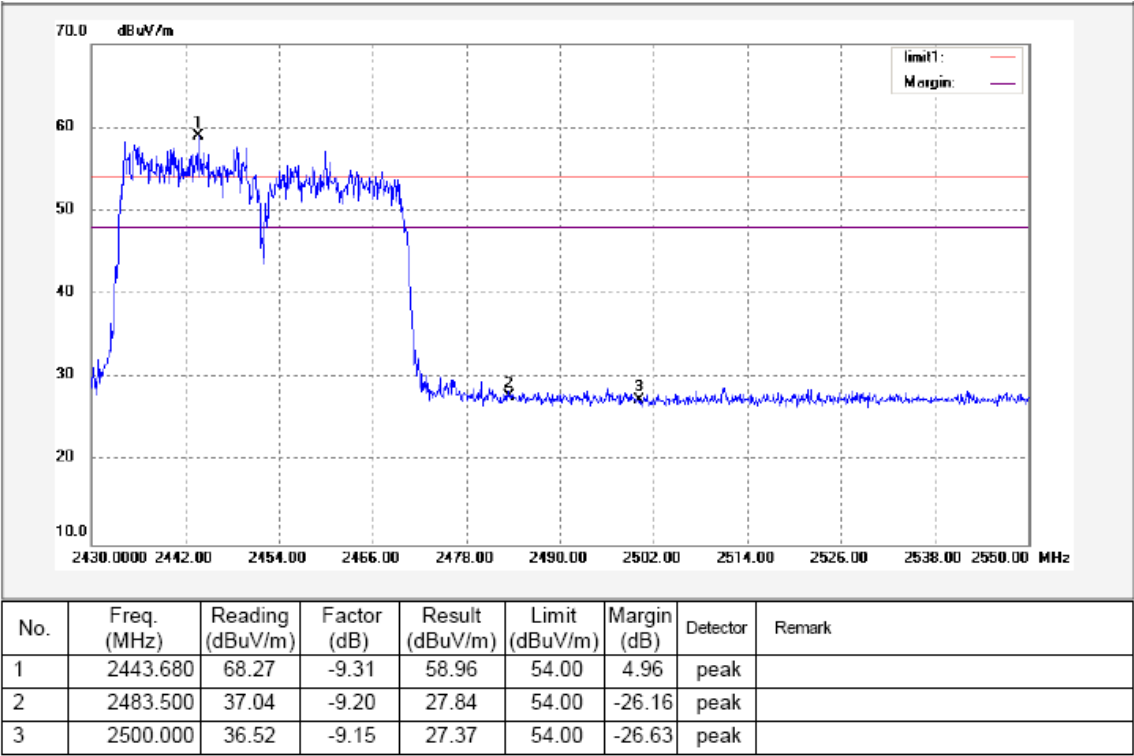
Mode: TX 11n HT 40 channel 3

Antenna Polarization:Vertical



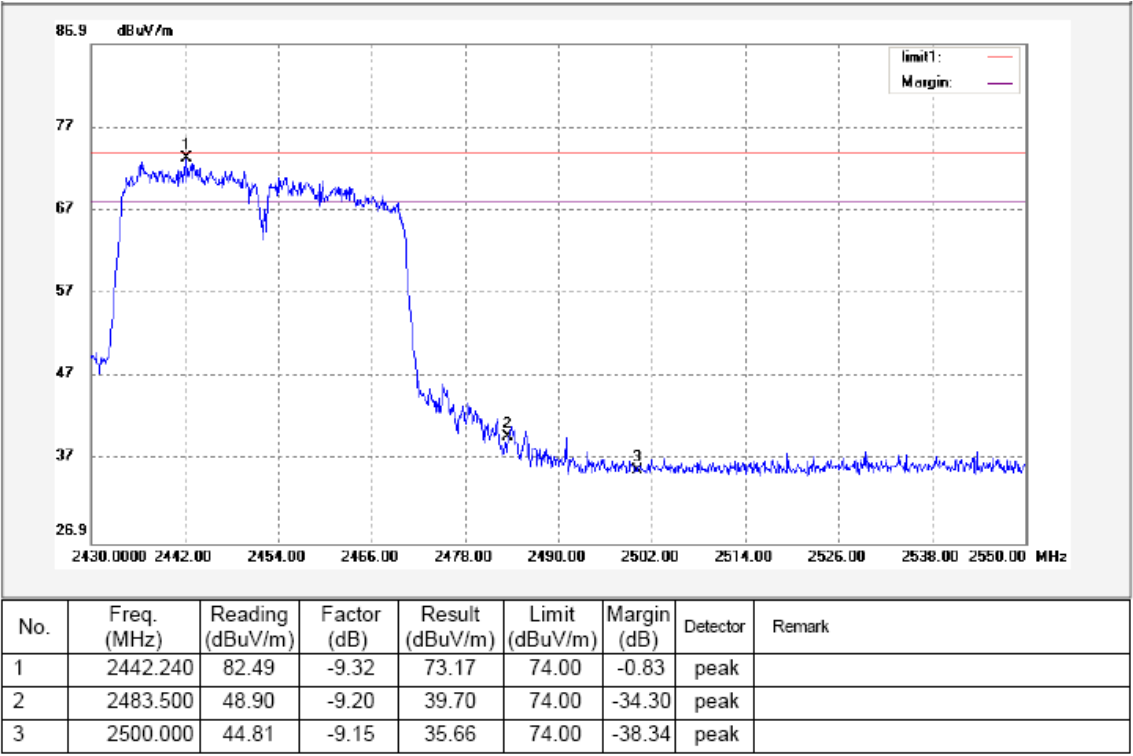
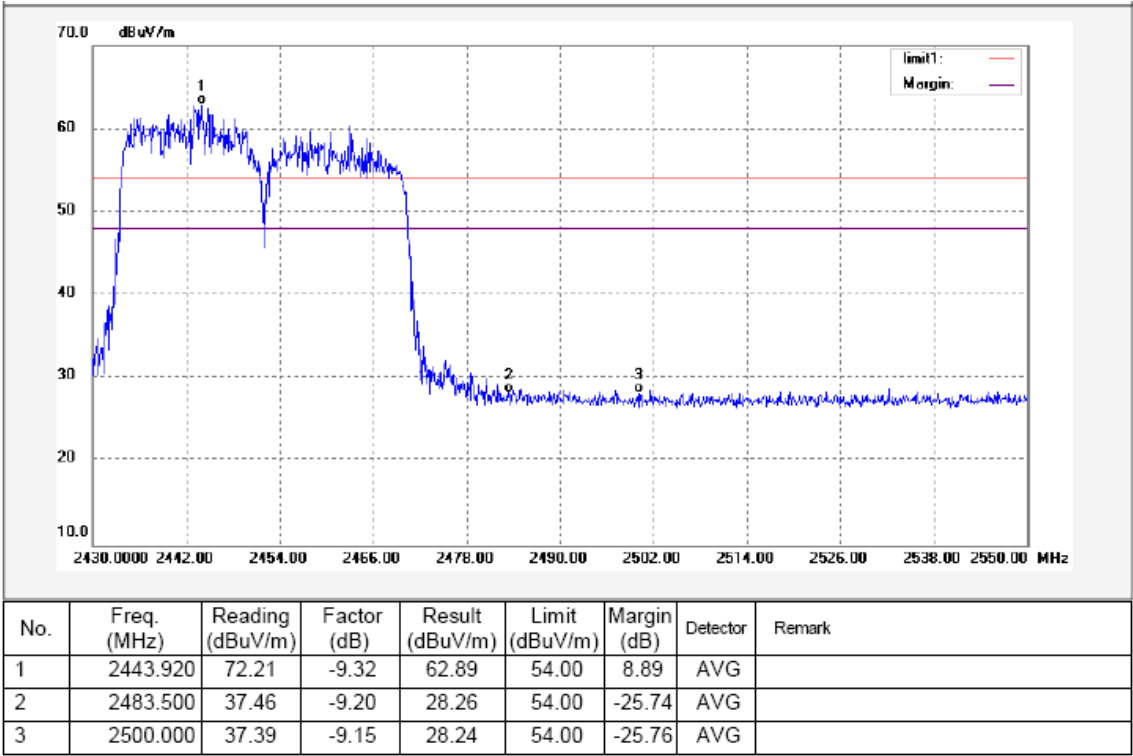
Mode: TX 11n HT 40 channel 9

Antenna Polarization:Horizontal



Mode: TX 11n HT 40 channel 9

Antenna Polarization:Vertical



9 6 dB Bandwidth Measurement

Test Requirement:

FCC CFR47 Part 15 Section 15.247

Test Method:

KDB558074 D01 V03 R01 04/09/2013

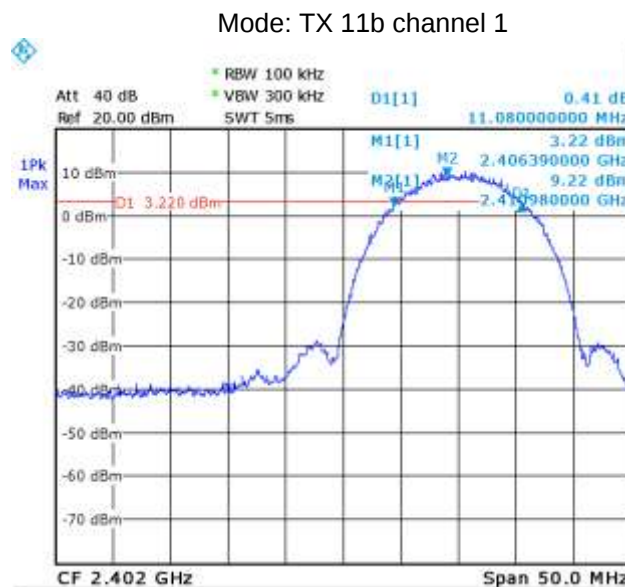
9.1 Test Procedure:

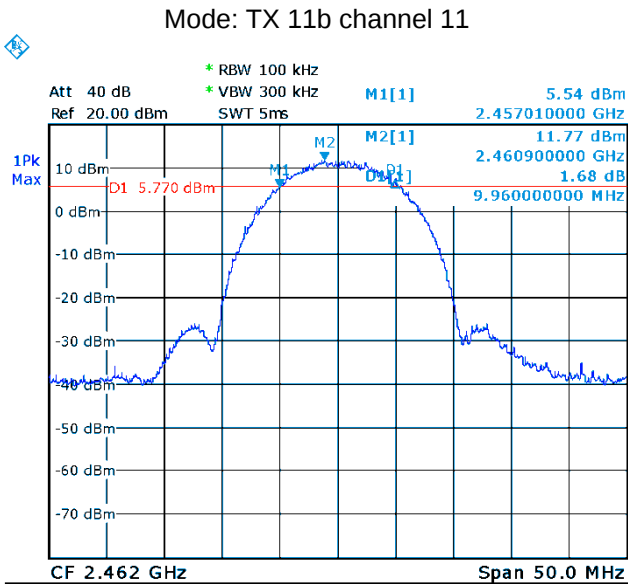
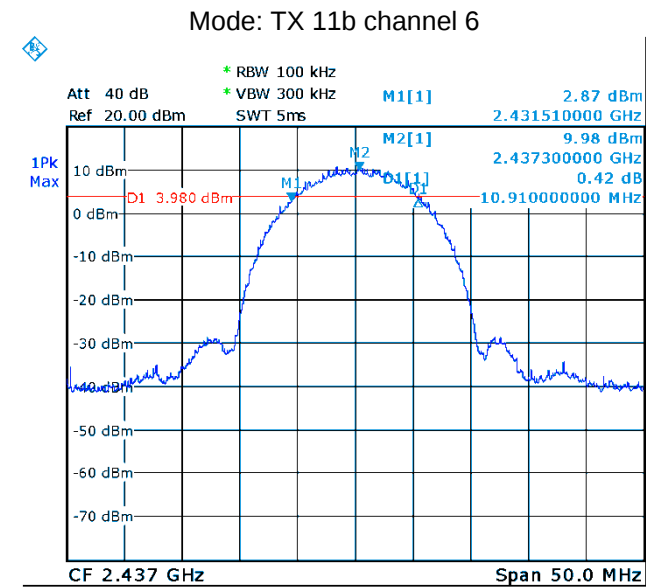
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

9.2 Test Result:

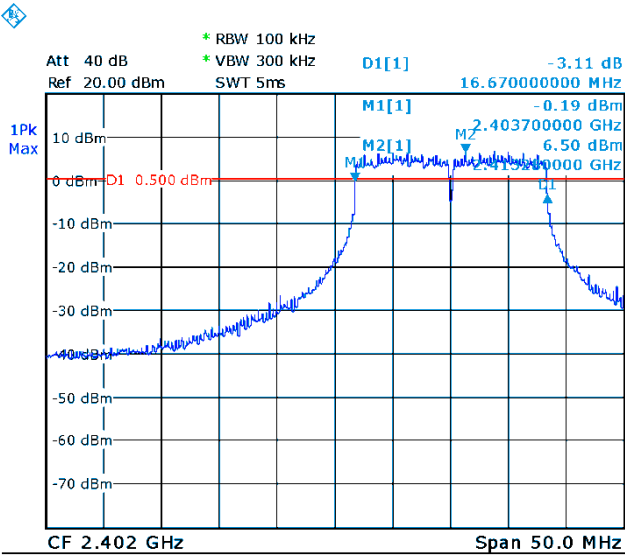
Operation mode	Bandwidth (MHz)		
	Channel 1	Channel 6	Channel 11
TX 11b	11.08	10.91	9.96
TX 11g	Channel 1	Channel 6	Channel 11
	16.670	16.62	16.55
TX 11n HT 20	Channel 1	Channel 6	Channel 11
	17.76	17.79	17.74
TX 11n HT 40	Channel 3	Channel 7	Channel 9
	36.15	36.29	36.01

Test result plot as follows:

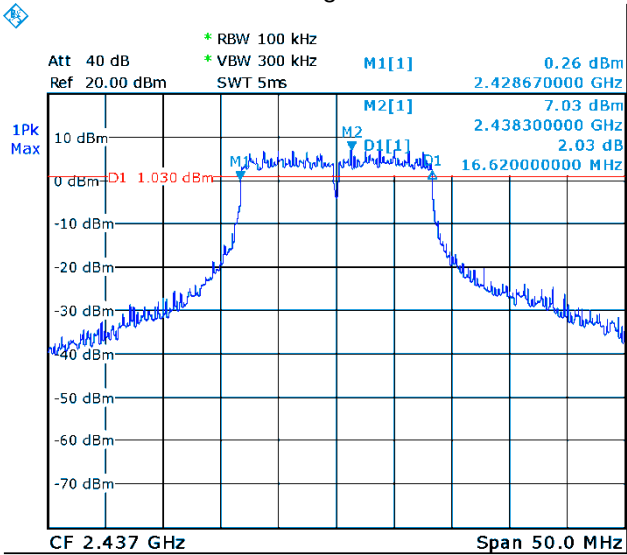




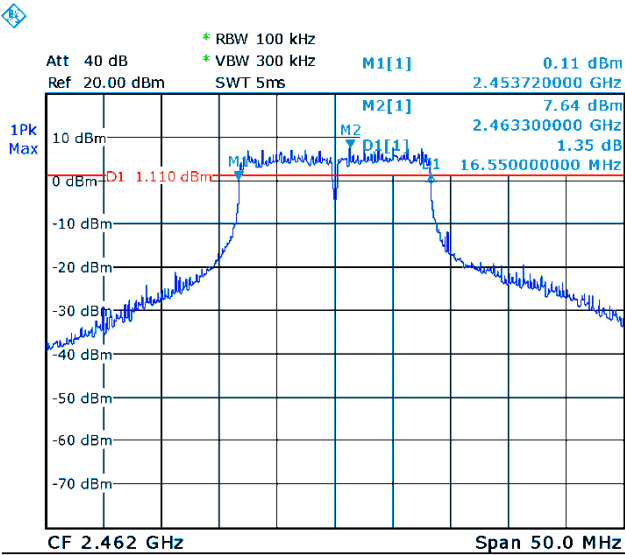
Mode: TX 11g channel 1



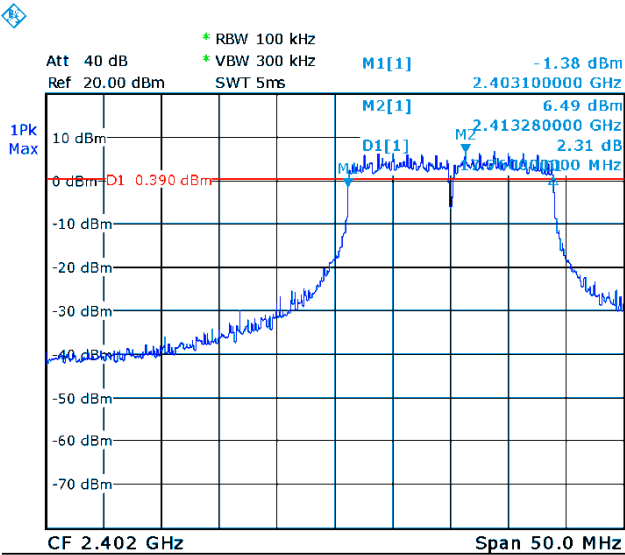
Mode: TX 11g channel 6

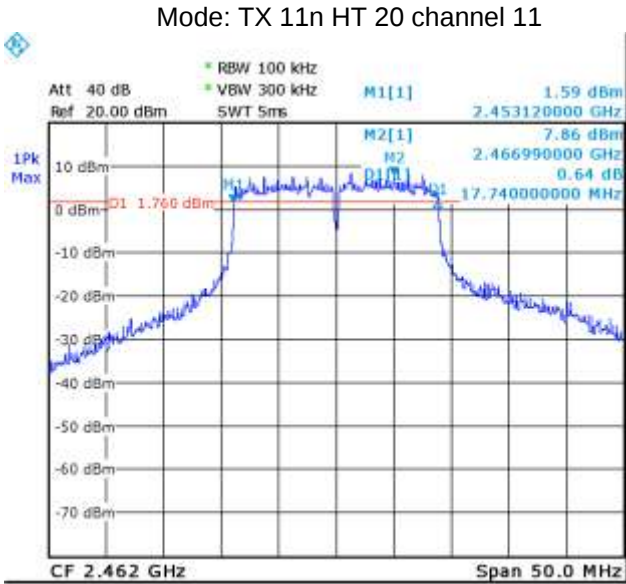
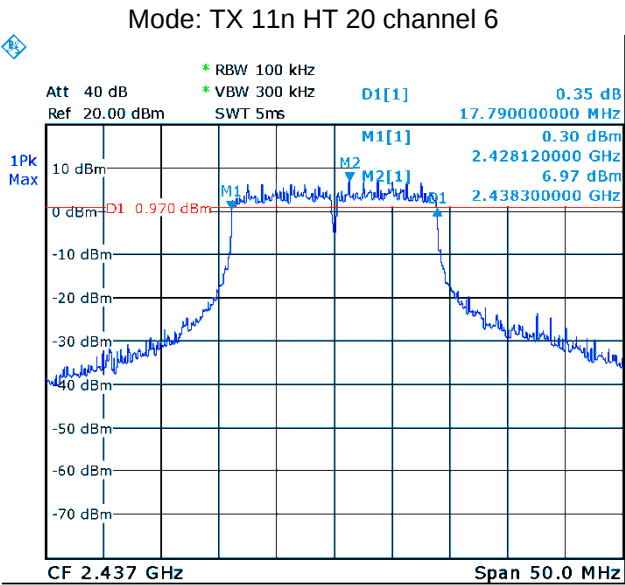


Mode: TX 11g channel 11

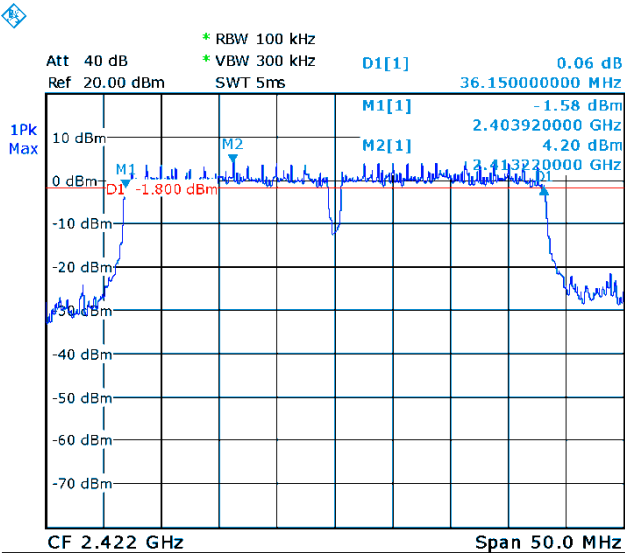


Mode: TX 11n HT 20 channel 1

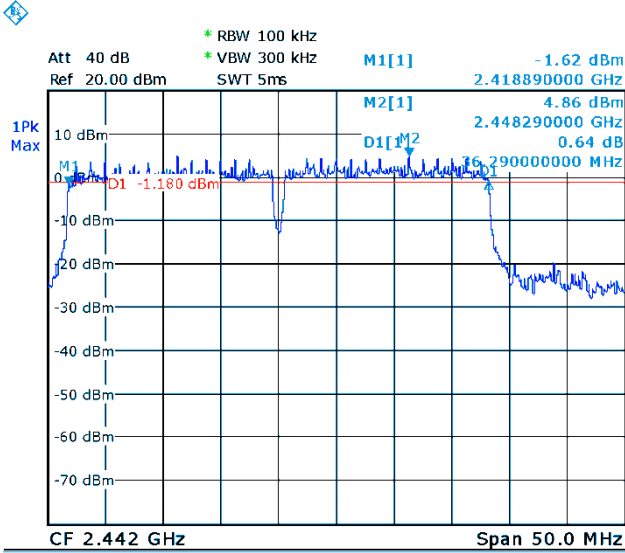




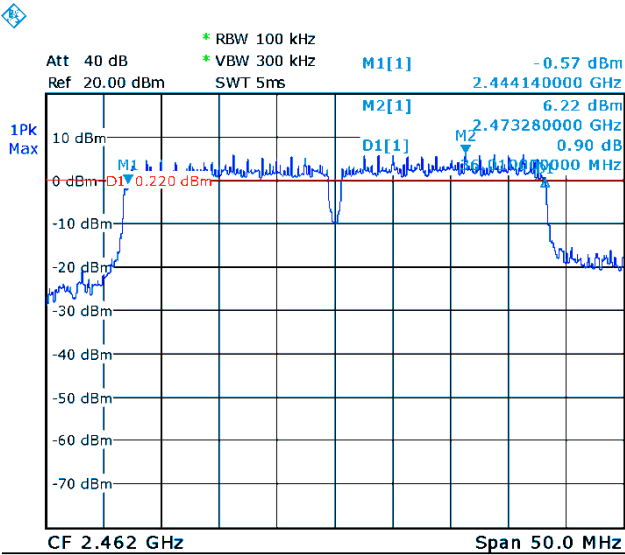
Mode: TX 11n HT 40 channel 3



Mode: TX 11n HT 40 channel 7



Mode: TX 11n HT 40 channel 9



10 Maximum Peak Output Power

Test Requirement:

FCC CFR47 Part 15 Section 15.247

Test Method:

KDB558074 D01 V03 R01 04/09/2013

10.1 Test Procedure:

KDB558074 D01 V03 R01 04/09/2013

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 = 10 MHz. VBW = 10 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:

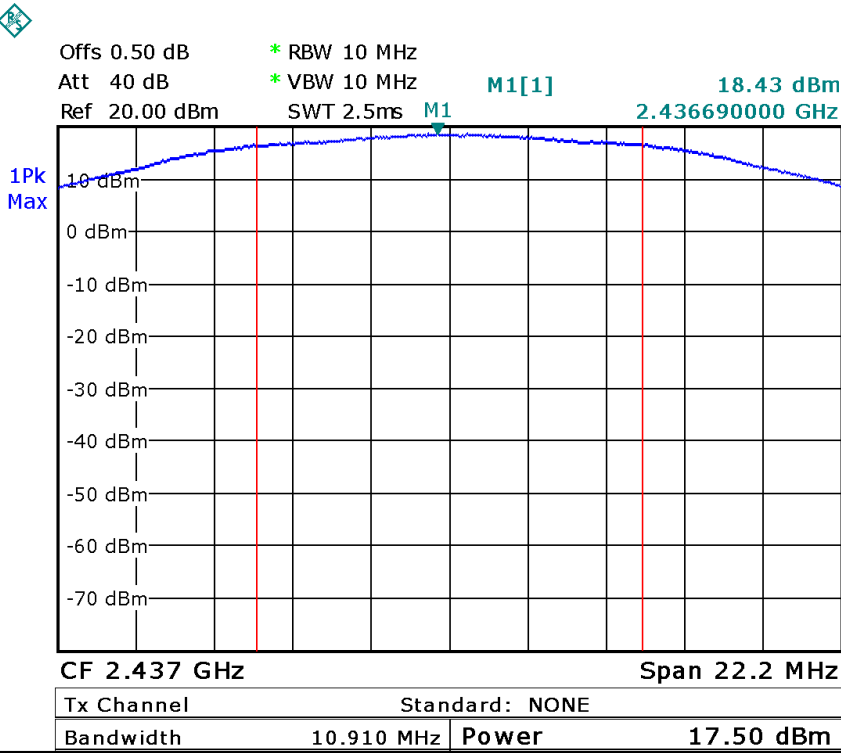
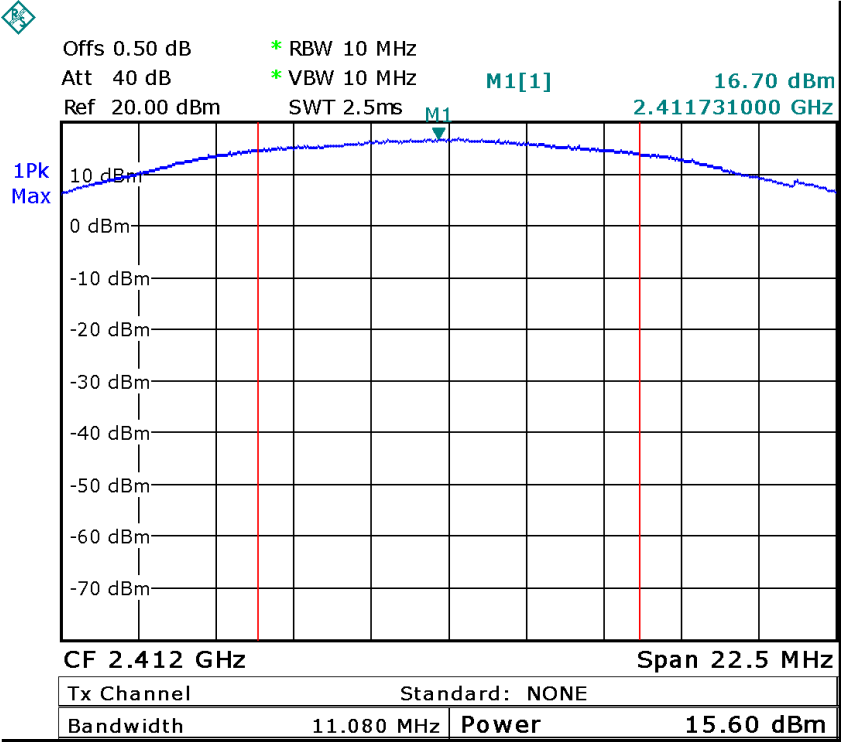
Test mode :TX 11b		
10 Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
15.60	17.50	17.91
Limit		
1W/30dBm		

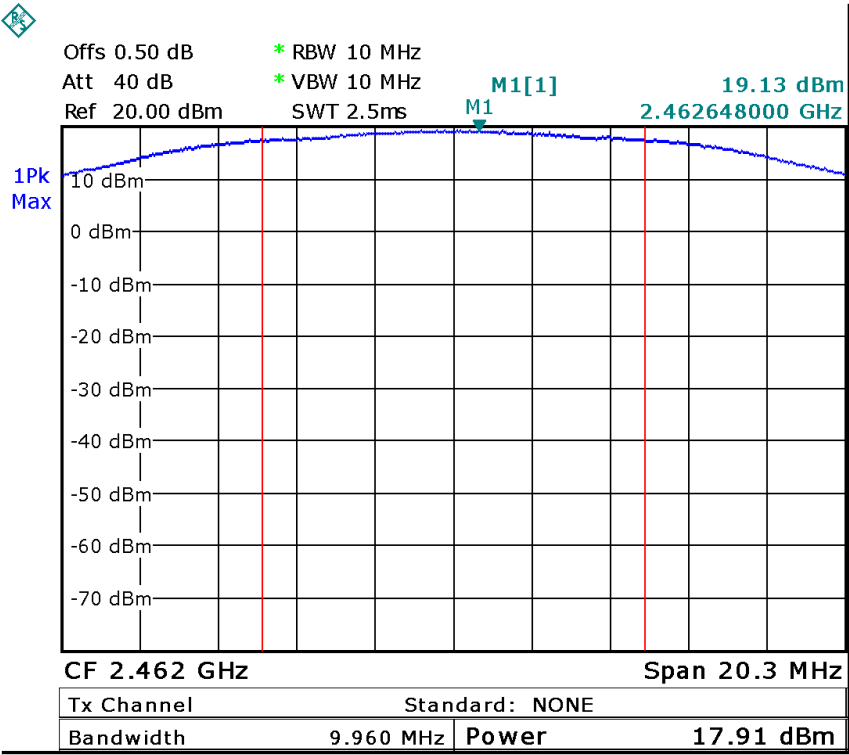
Test mode :TX 11g		
10 Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
22.56	22.61	23.20
Limit		
1W/30dBm		

Test mode :TX 11n HT 20		
10 Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
21.22	21.93	21.97
Limit		
1W/30dBm		

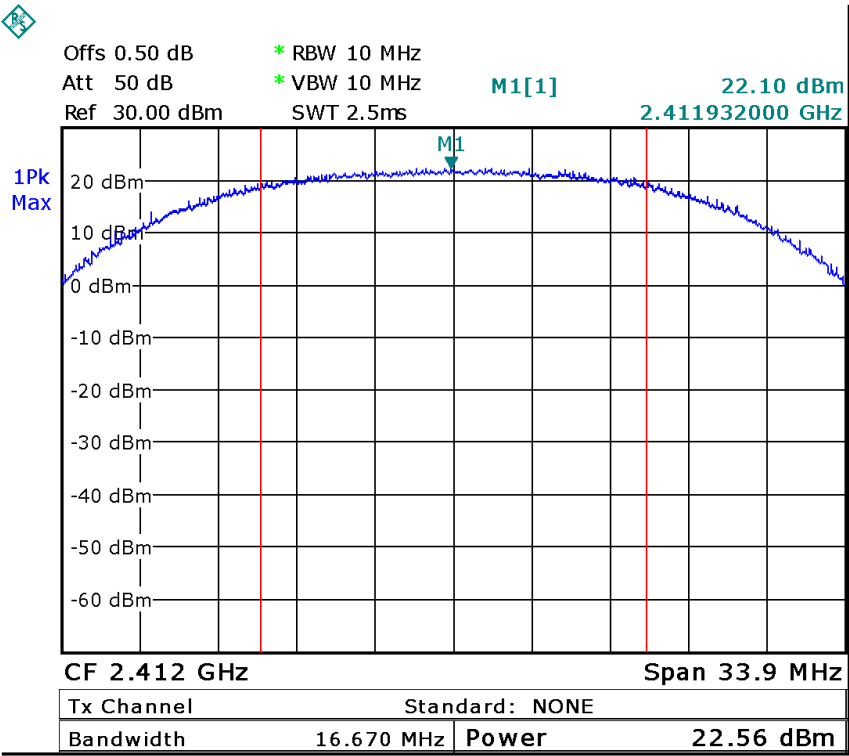
Test mode :TX 11n HT 40		
10 Maximum Peak Output Power (dBm)		
2422MHz	2442MHz	2452MHz
20.60	21.68	22.23
Limit		
1W/30dBm		

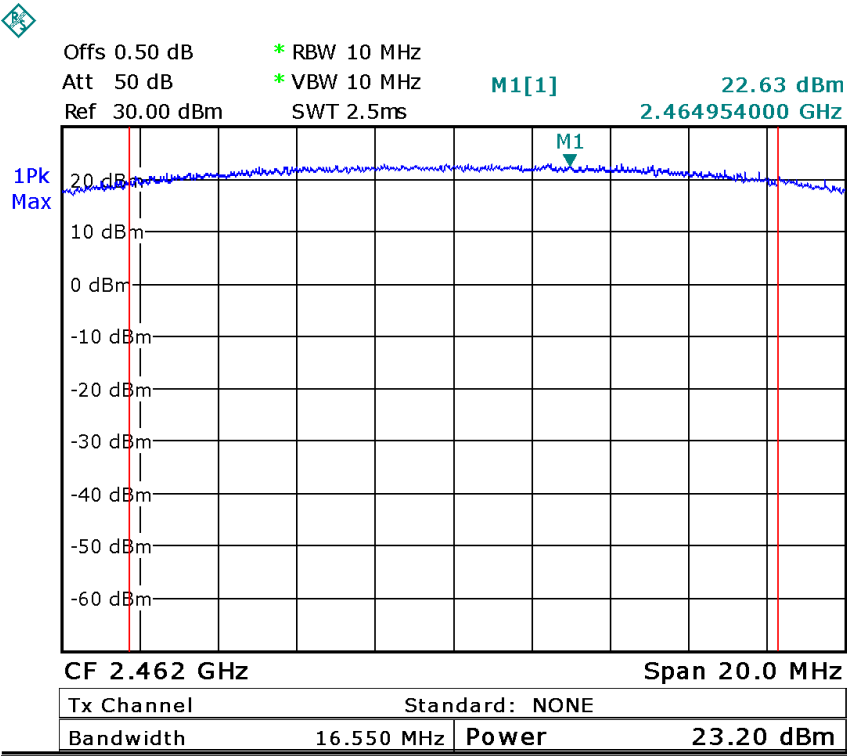
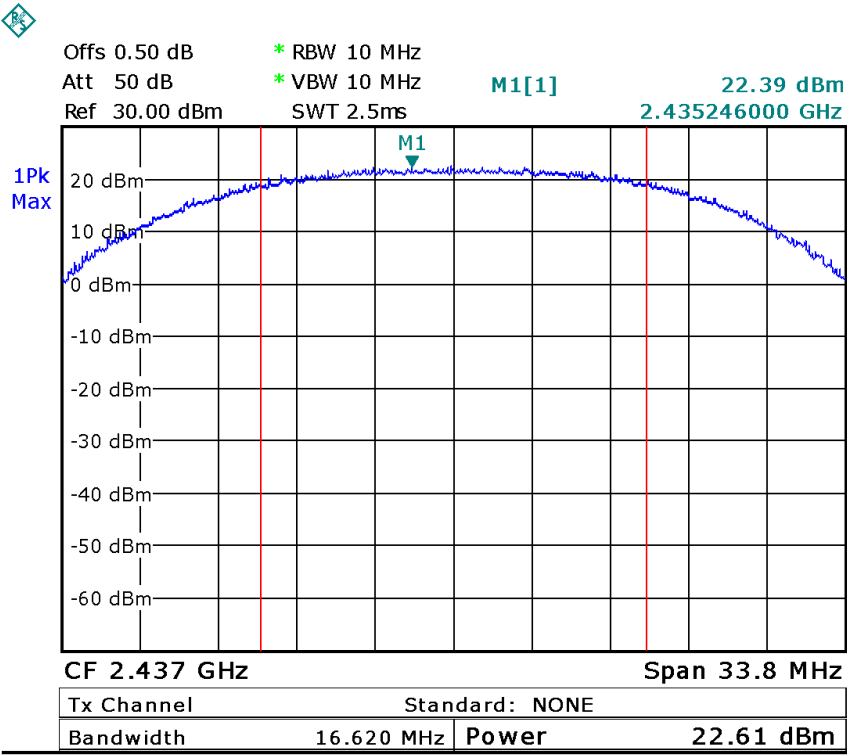
Test mode :TX 11b



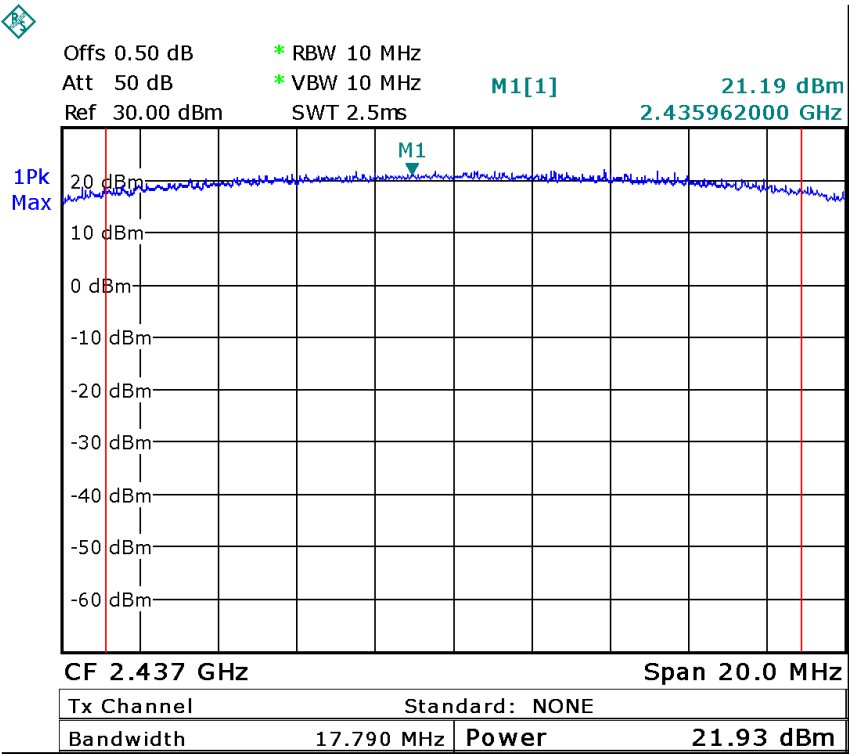
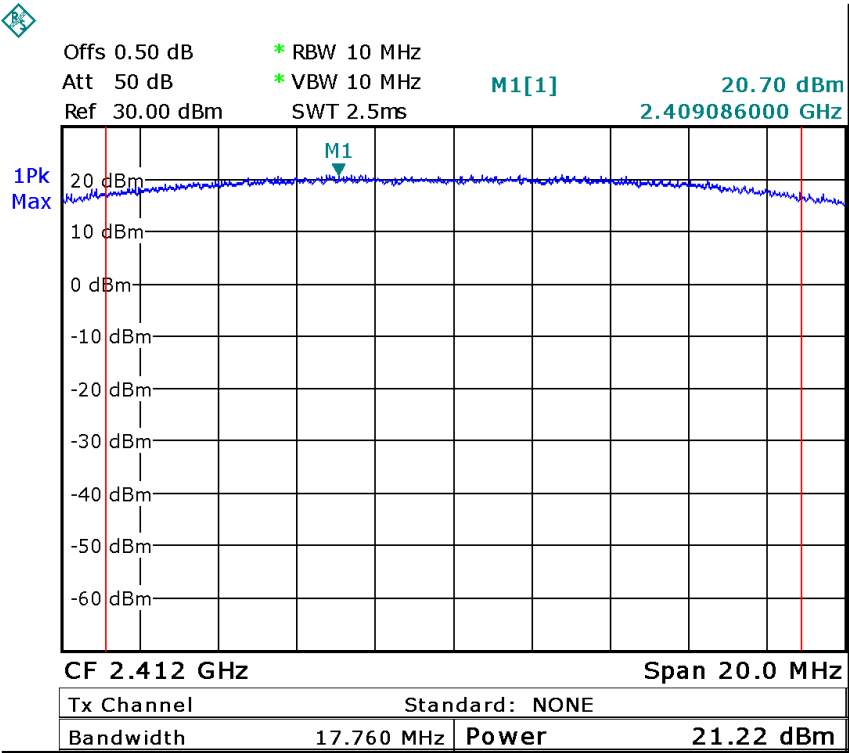


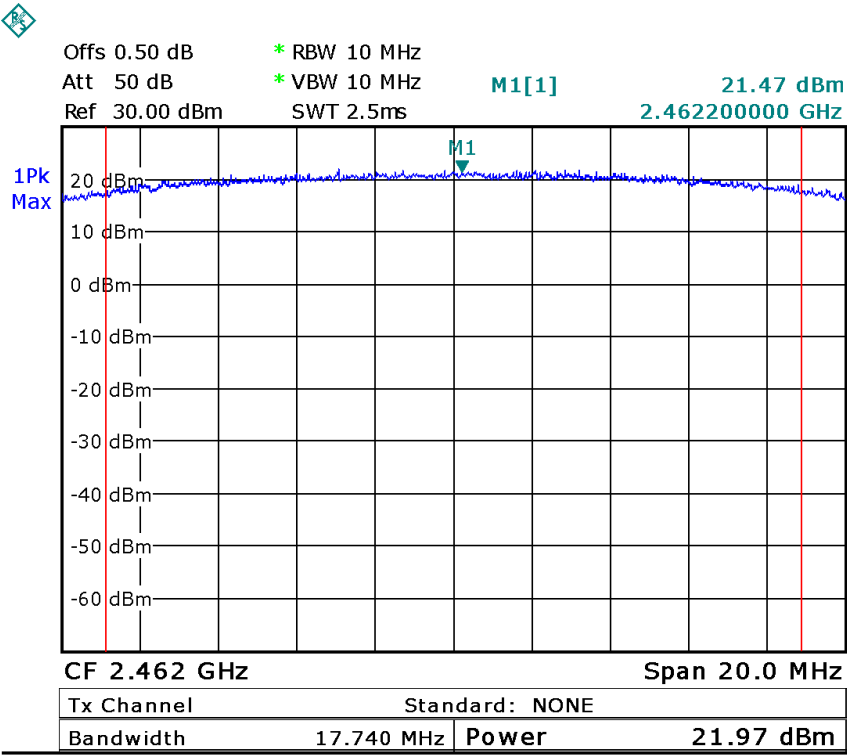
Test mode :TX 11g



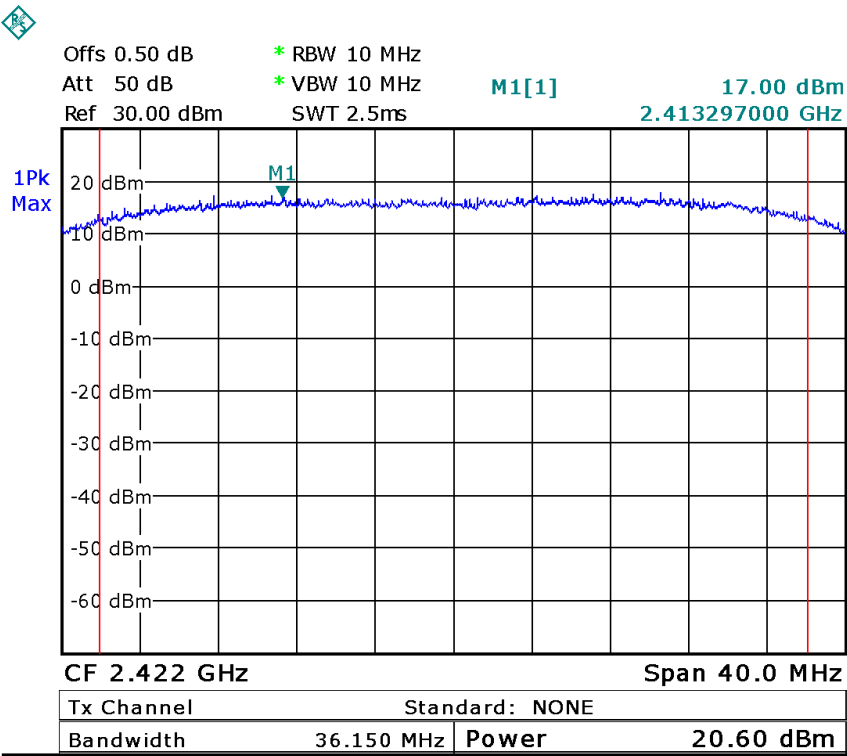


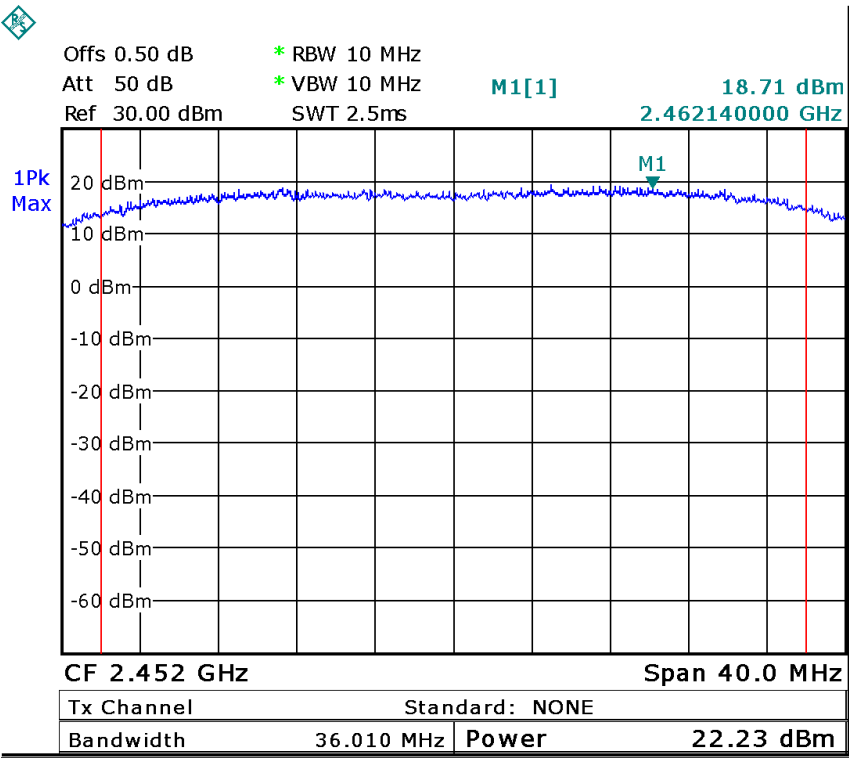
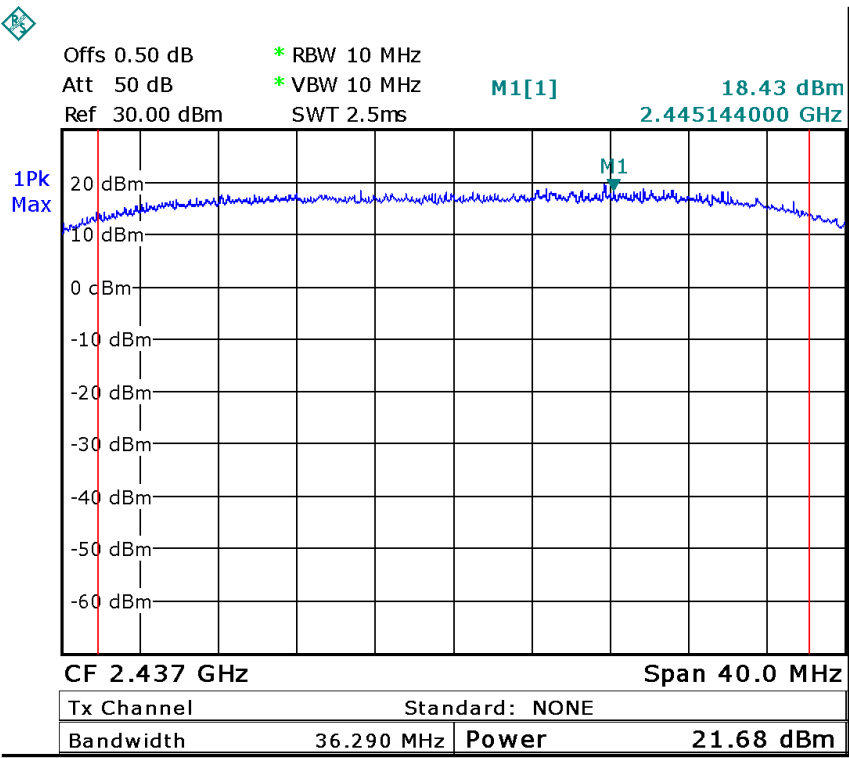
Test mode :TX 11n HT 20





Test mode :TX 11n HT 40





11 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB558074 D01 V03 R01 04/09/2013

11.1 Test Procedure:

KDB558074 D01 V03 R01 04/09/2013

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 = 3kHz. VBW = 300kHz , 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.

11.2 Test Result:

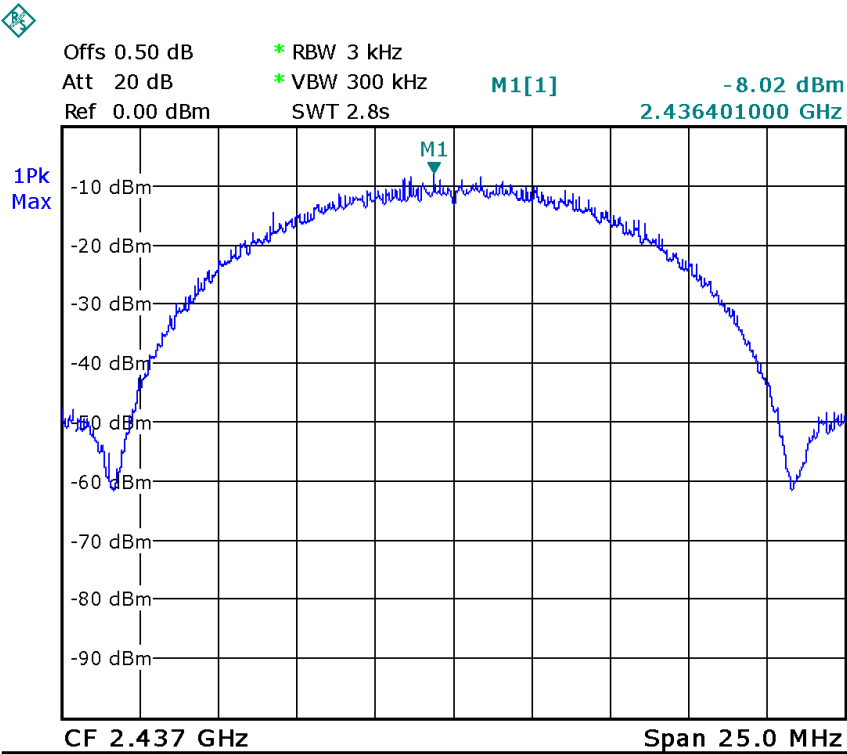
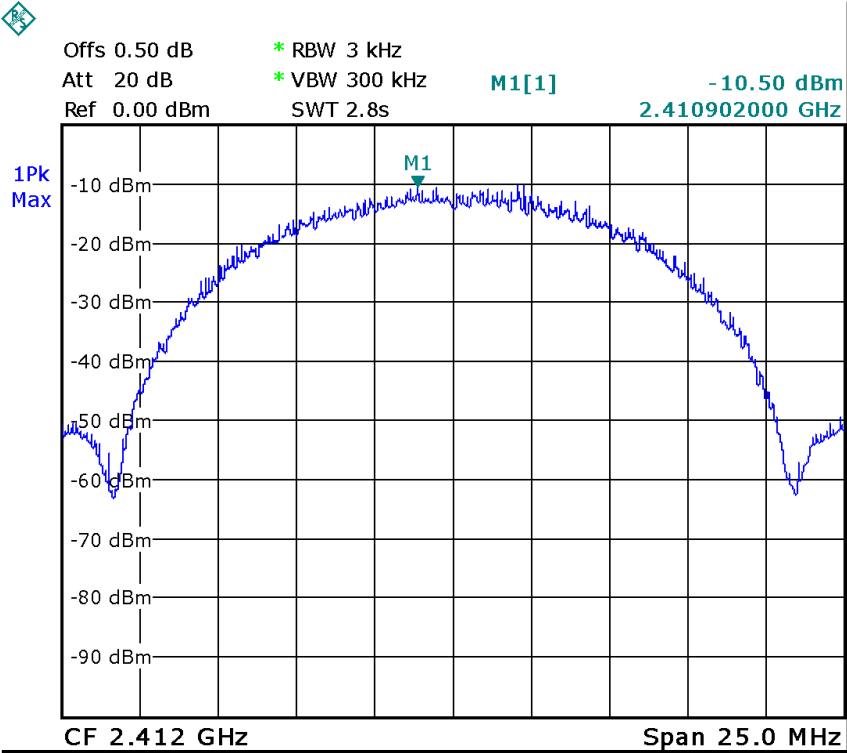
Test mode :TX 11b		
10 Maximum Peak Output Power (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-10.50	-8.02	-5.85
Limit		
8dBm per 3kHz		

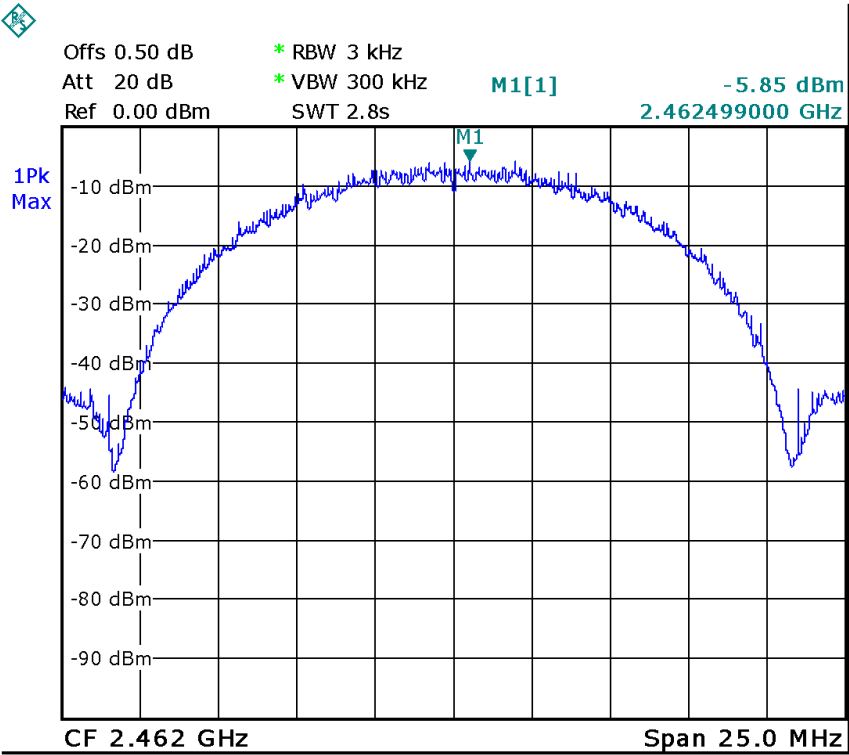
Test mode :TX 11g		
10 Maximum Peak Output Power (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-13.89	-13.30	-13.06
Limit		
8dBm per 3kHz		

Test mode :TX 11n HT 20		
10 Maximum Peak Output Power (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-15.86	-14.04	-11.22
Limit		
8dBm per 3kHz		

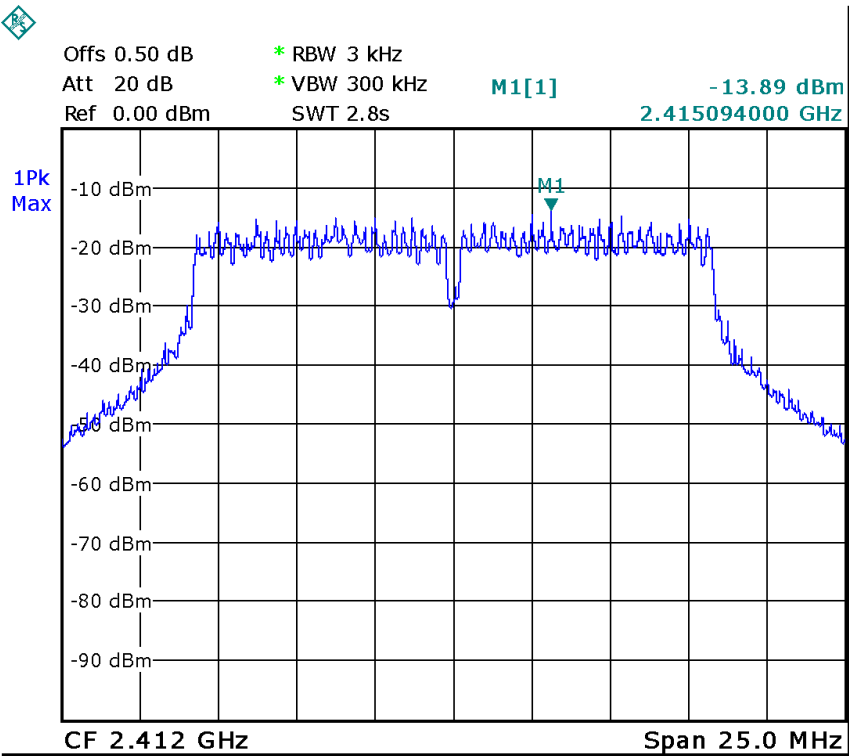
Test mode :TX 11n HT 40		
10 Maximum Peak Output Power (dBm per 3kHz)		
2422MHz	2442MHz	2452MHz
-19.25	-16.21	-17.15
Limit		
8dBm per 3kHz		

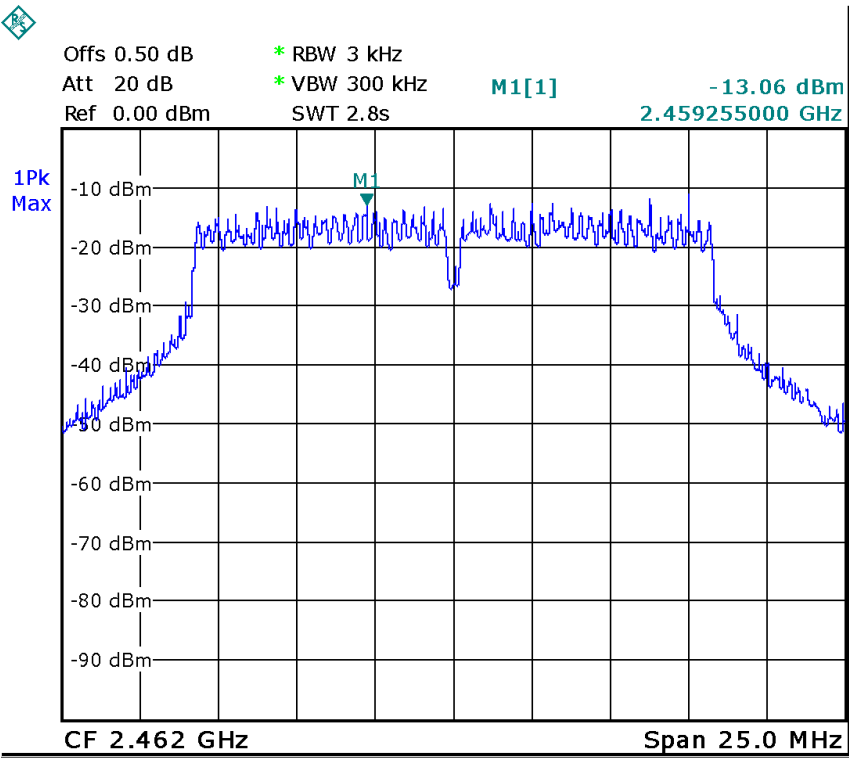
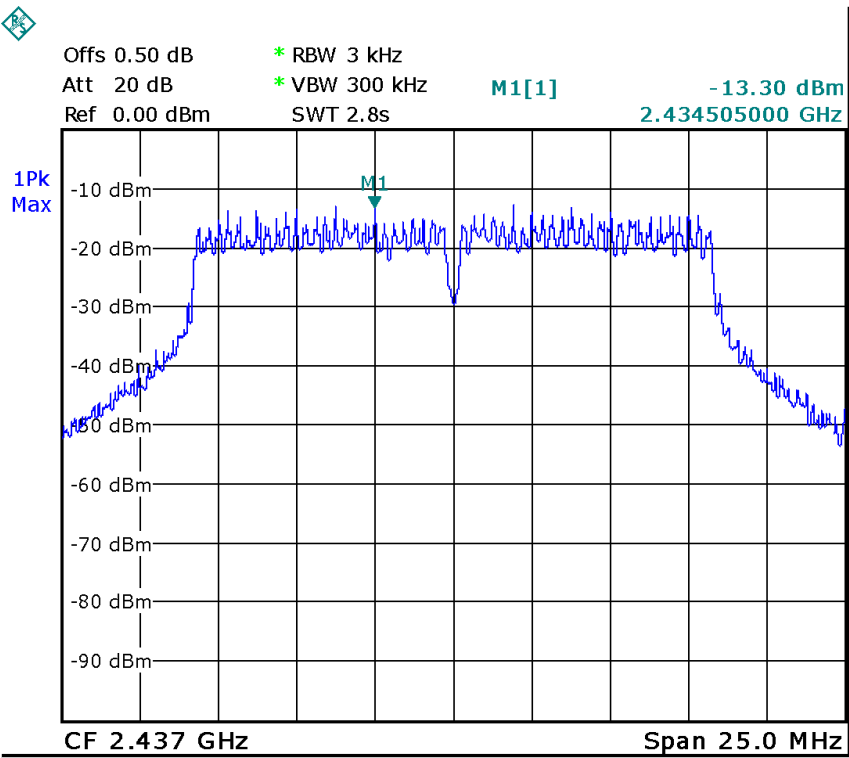
Test mode :TX 11b



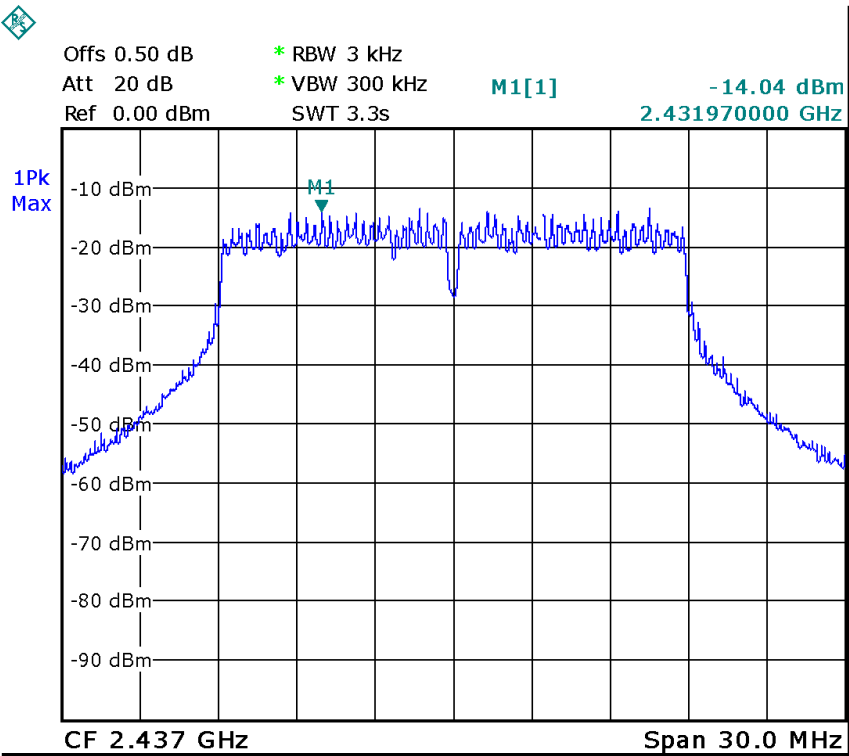
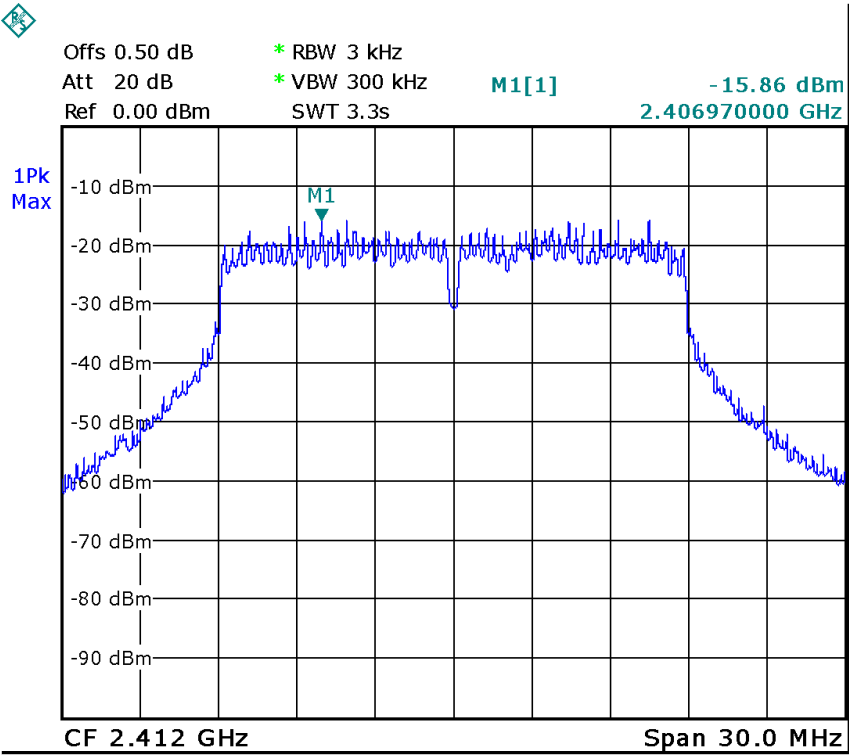


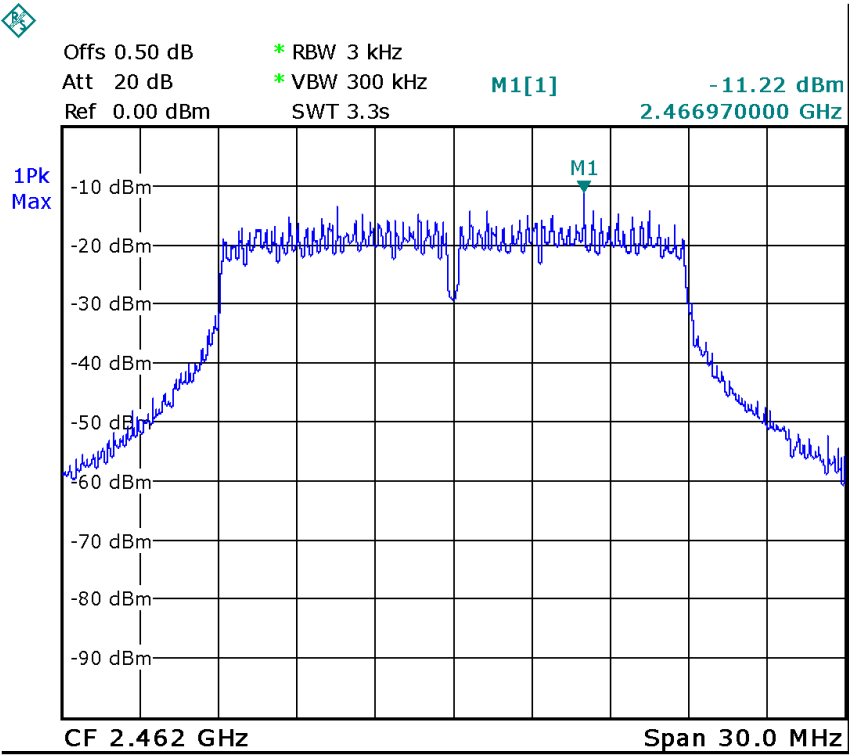
Test mode :TX 11g



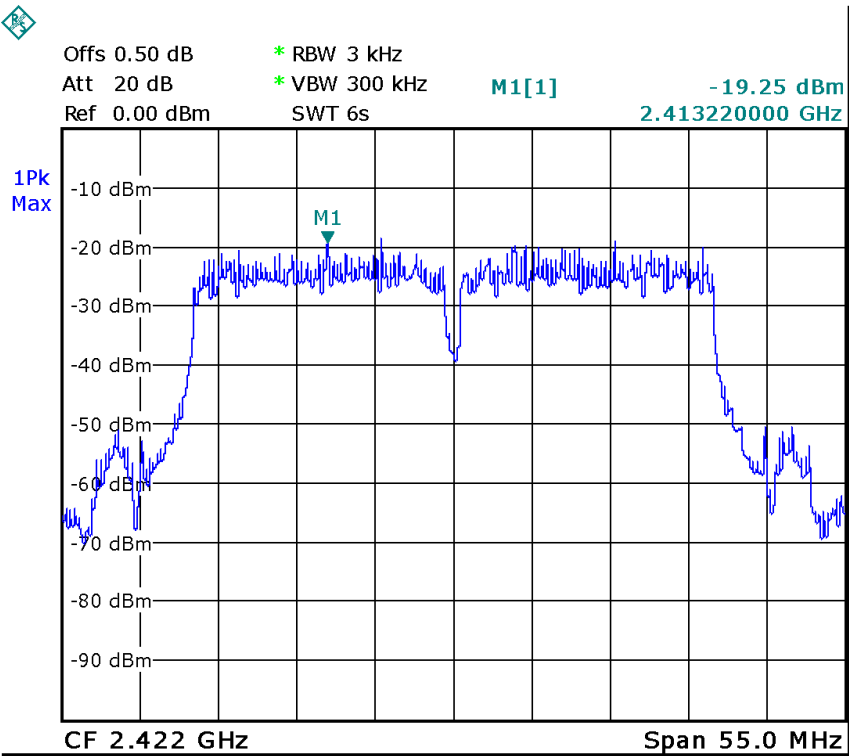


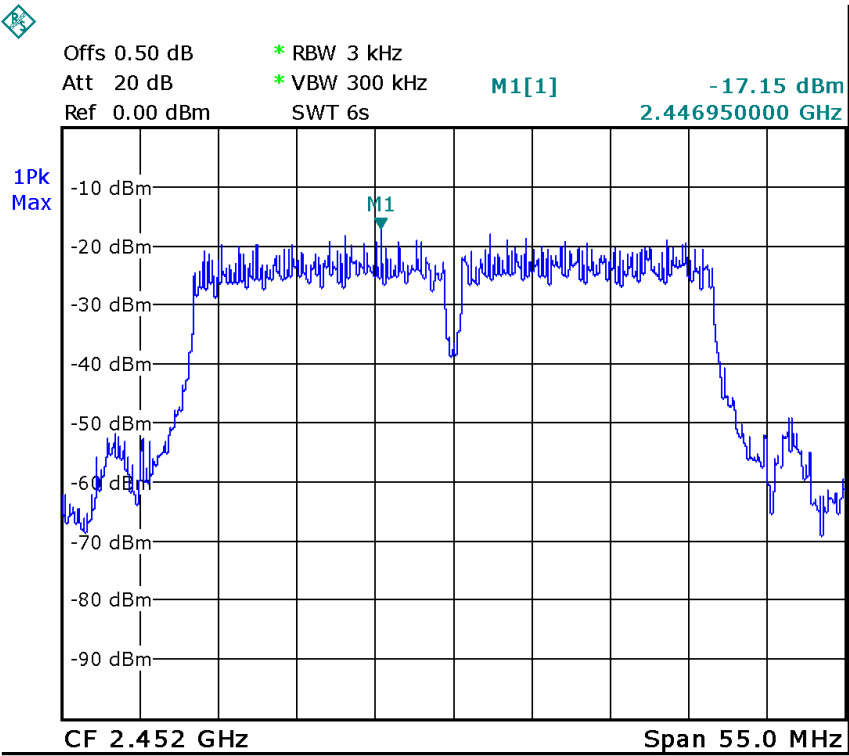
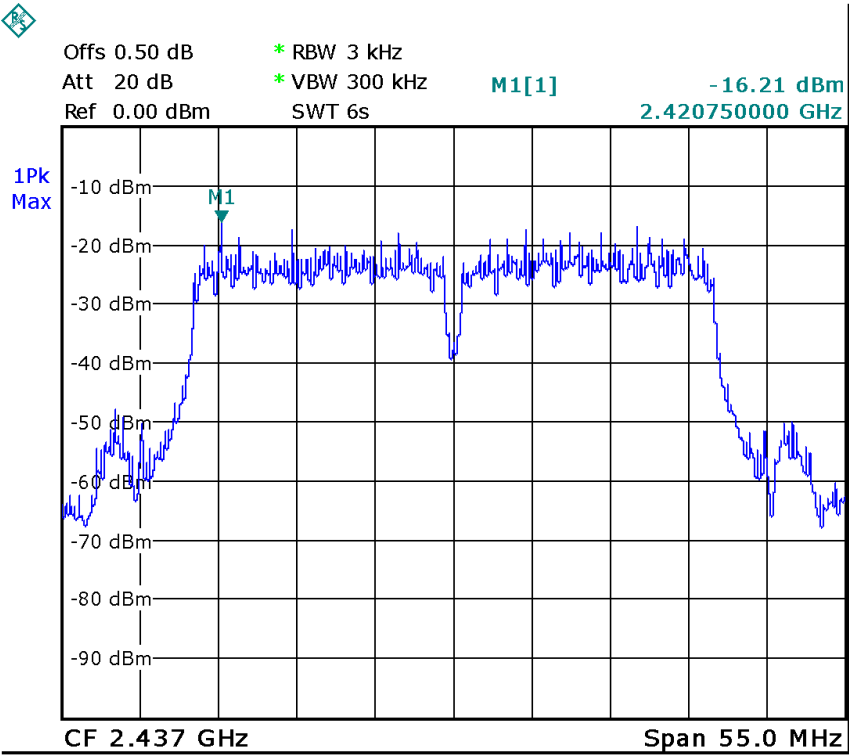
Test mode :TX 11n HT 20





Test mode :TX 11n HT 40





12 Emissions from out of band

Test Requirement:	FCC CFR47 Part 15 Section 15.247(d)
Test Method:	KDB558074 D01 V03 R01 04/09/2013
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 V03 R01 04/09/2013

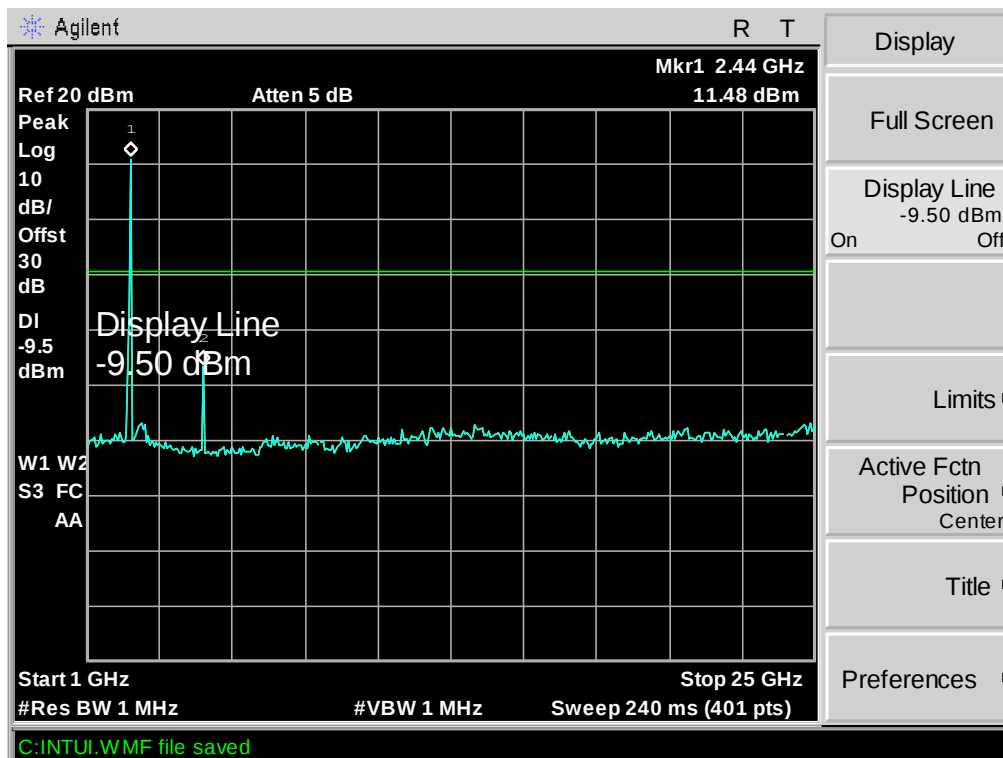
The maximum peak conducted output power procedure was used to demonstrate compliance to 15.247(b)(3) requirements, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level 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.

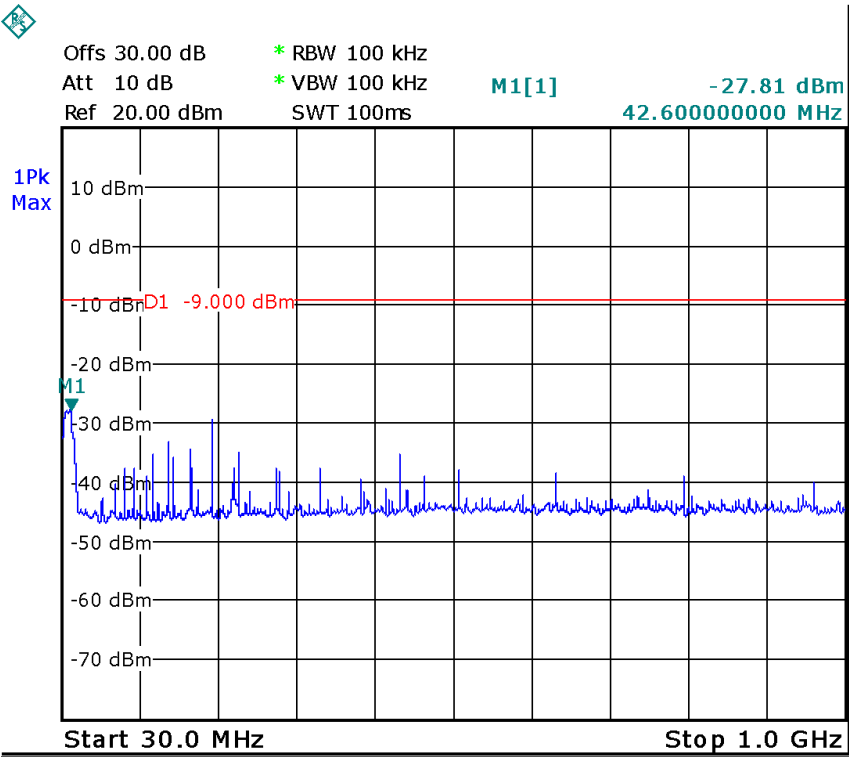
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set to span from the lowest frequency generated in the device up to and including the tenth harmonic of the highest fundamental frequency
3. For below 1GHz, Set RBW = 100kHz and VBW = 100kHz.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

12.2 Test Result:

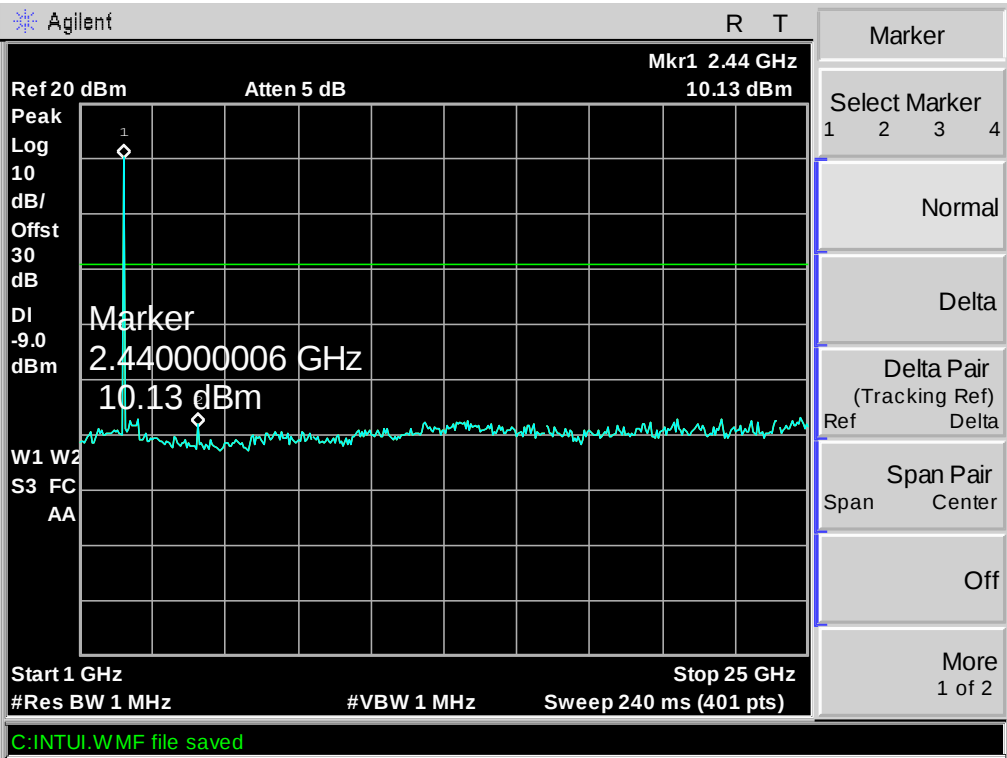
Remark: For emissions below 30MHz, no emission higher than background level, so the data does not show in the report.

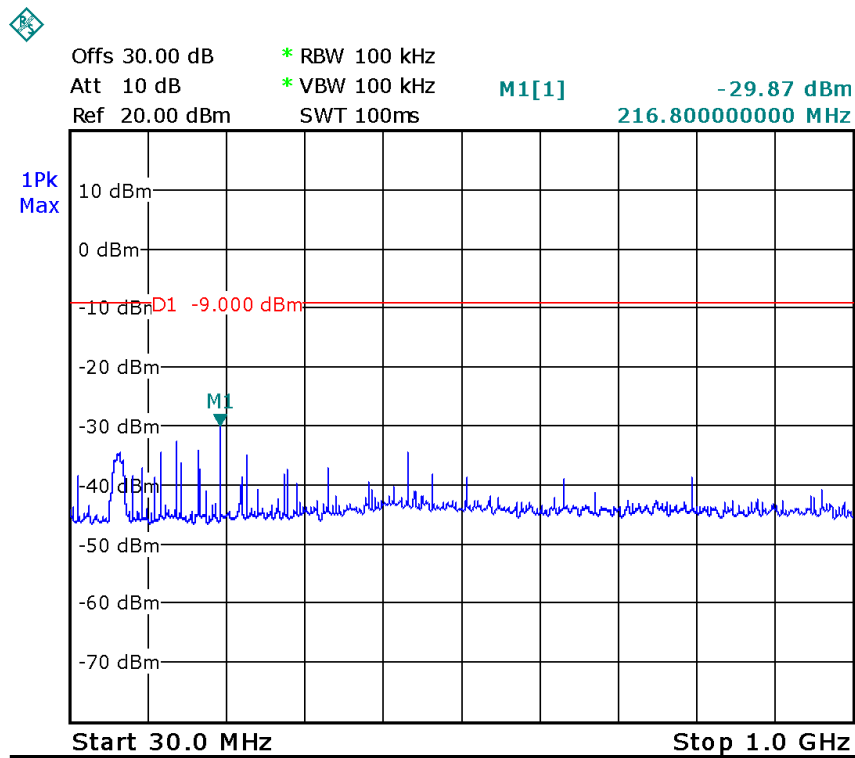
Test mode :TX 11b Lower channel



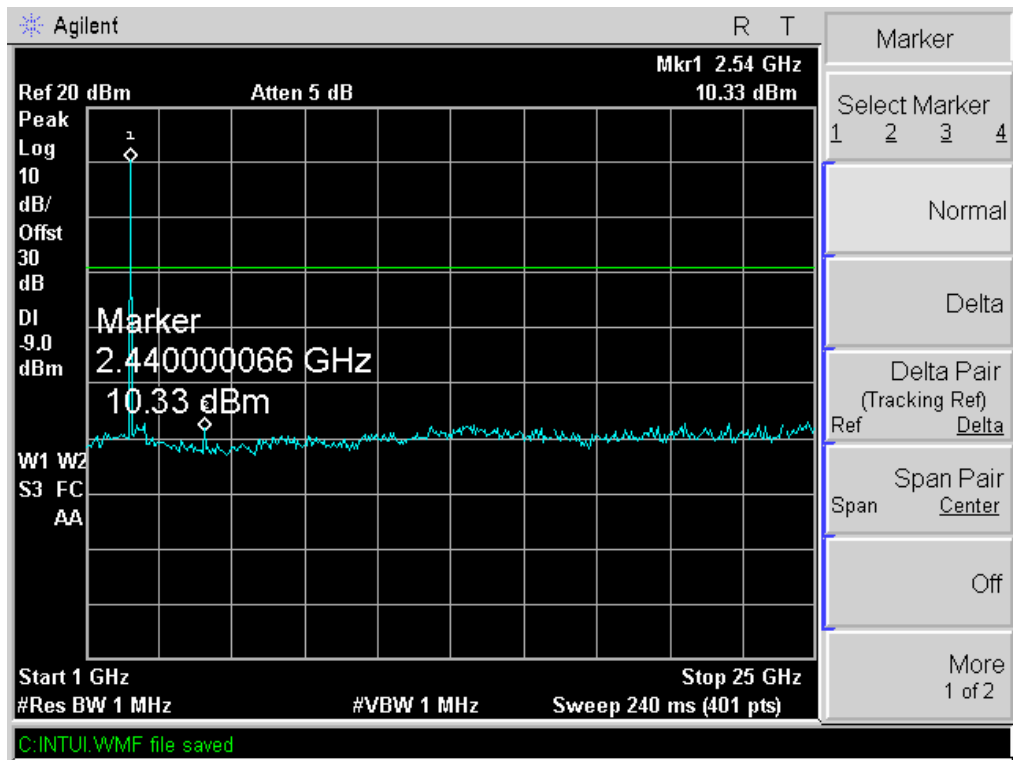


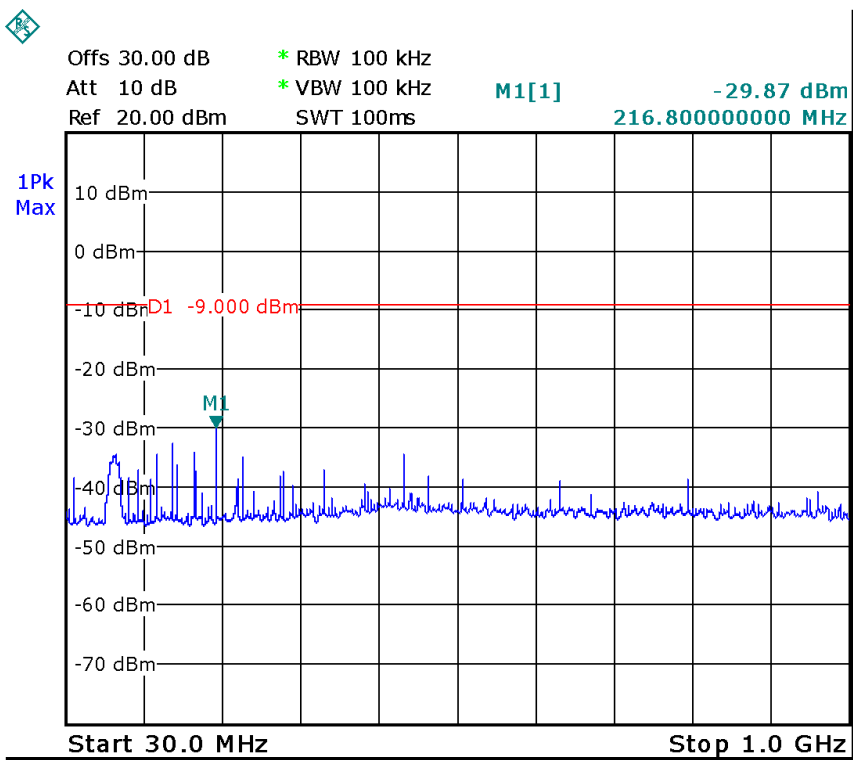
Test mode :TX 11b Middle channel



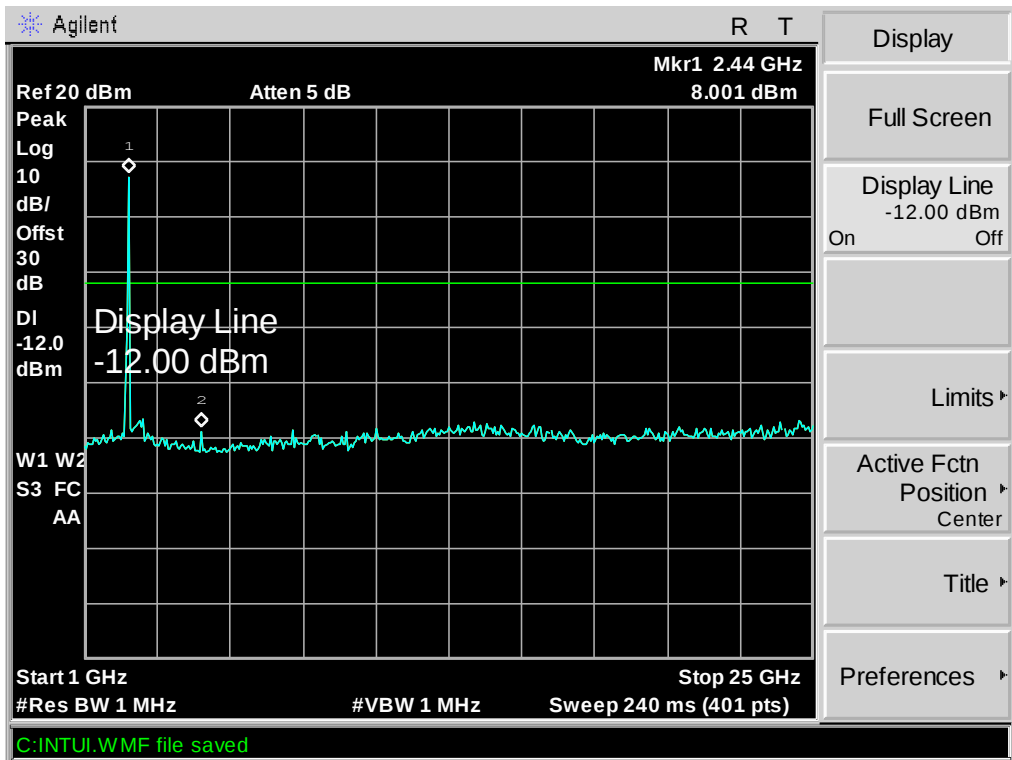


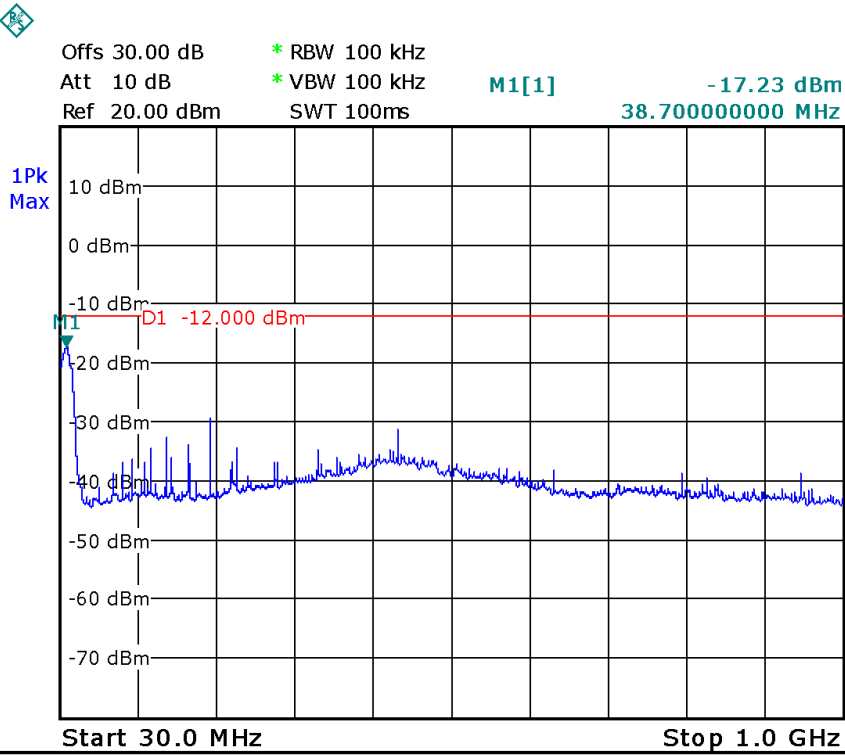
Test mode :TX 11b Upper channel



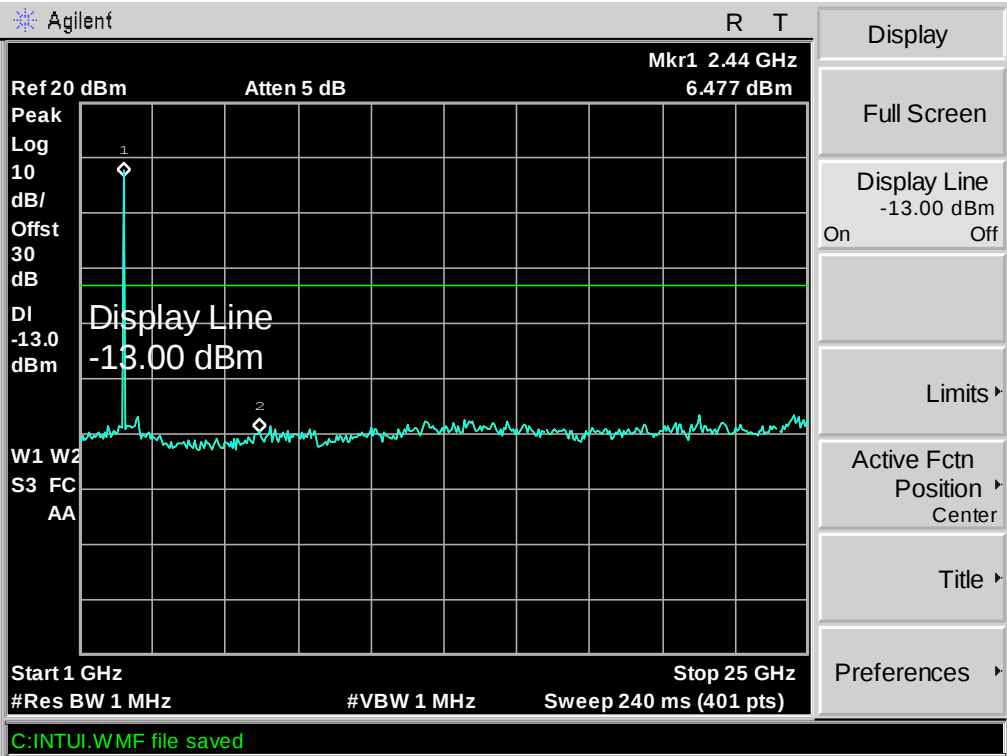


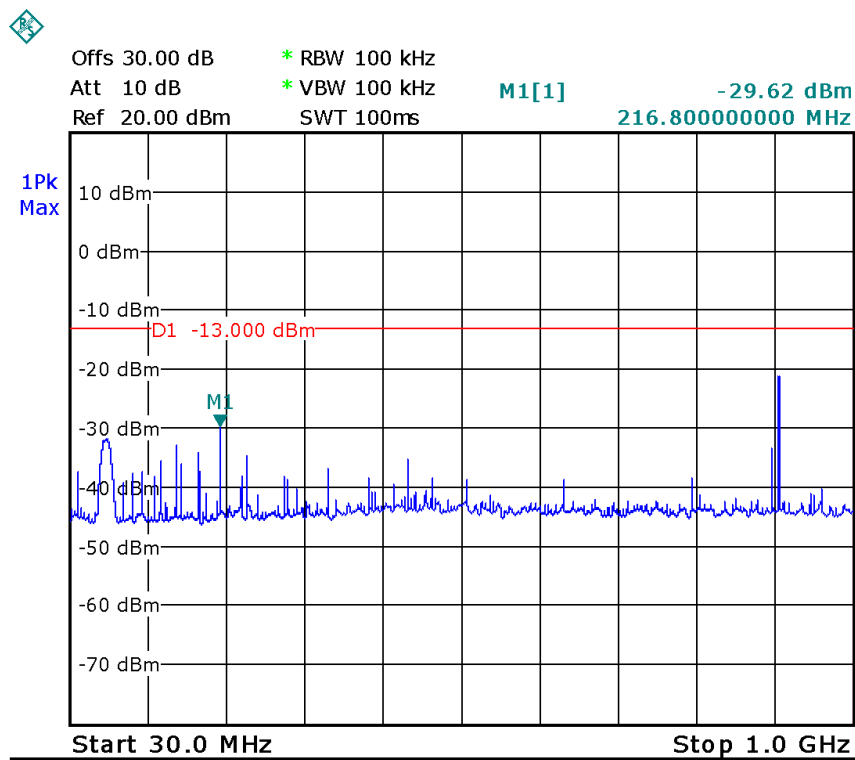
Test mode :TX 11g Lower channel



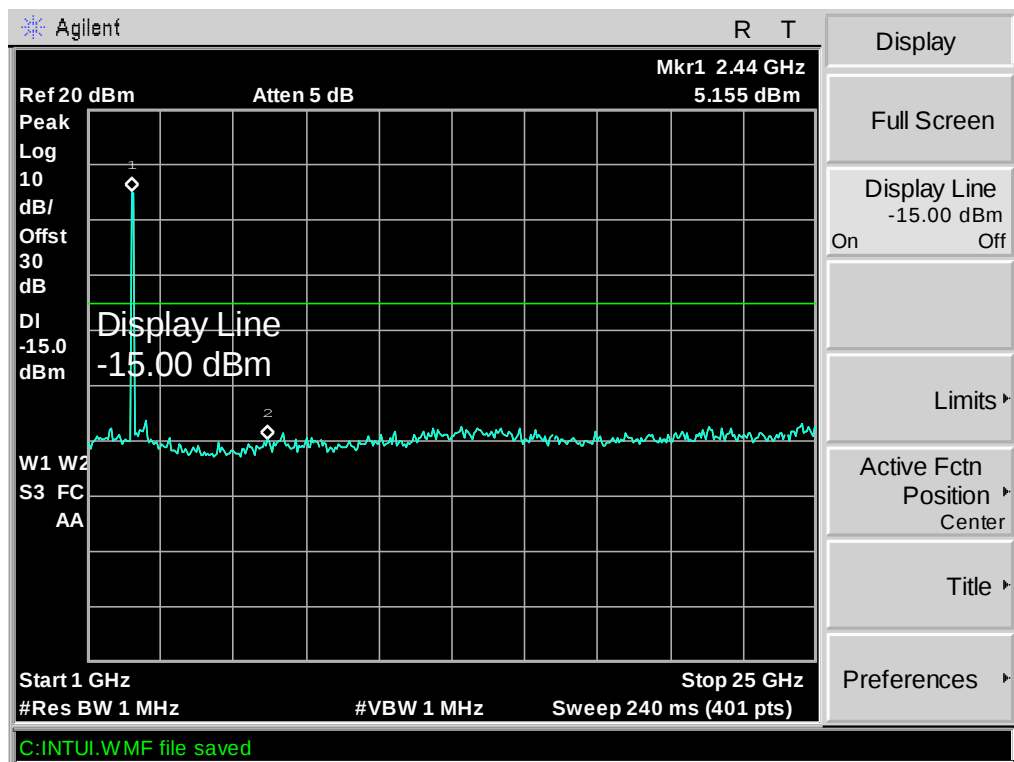


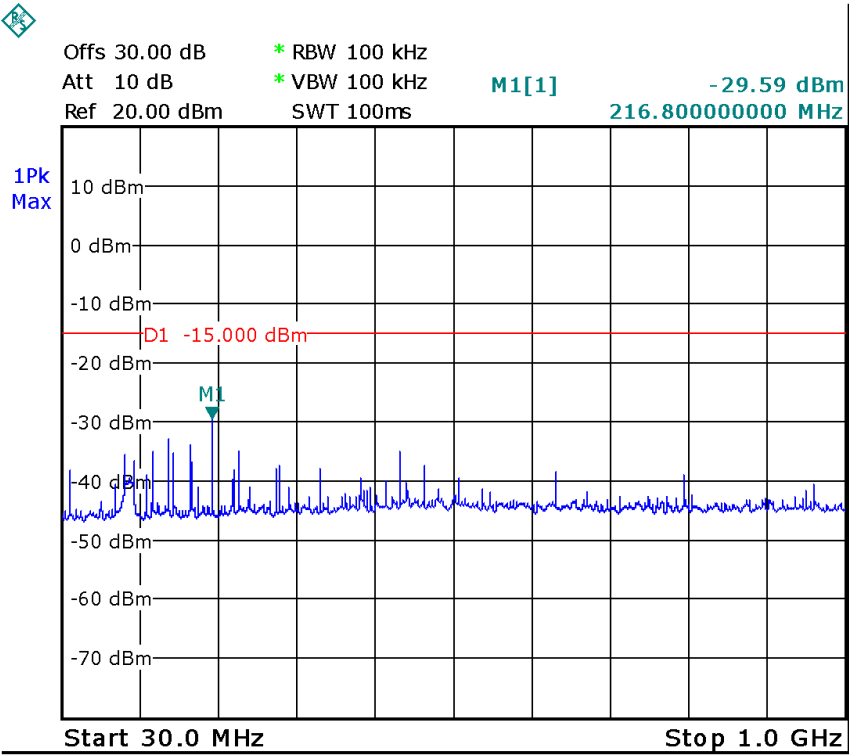
Test mode :TX 11g Middle channel



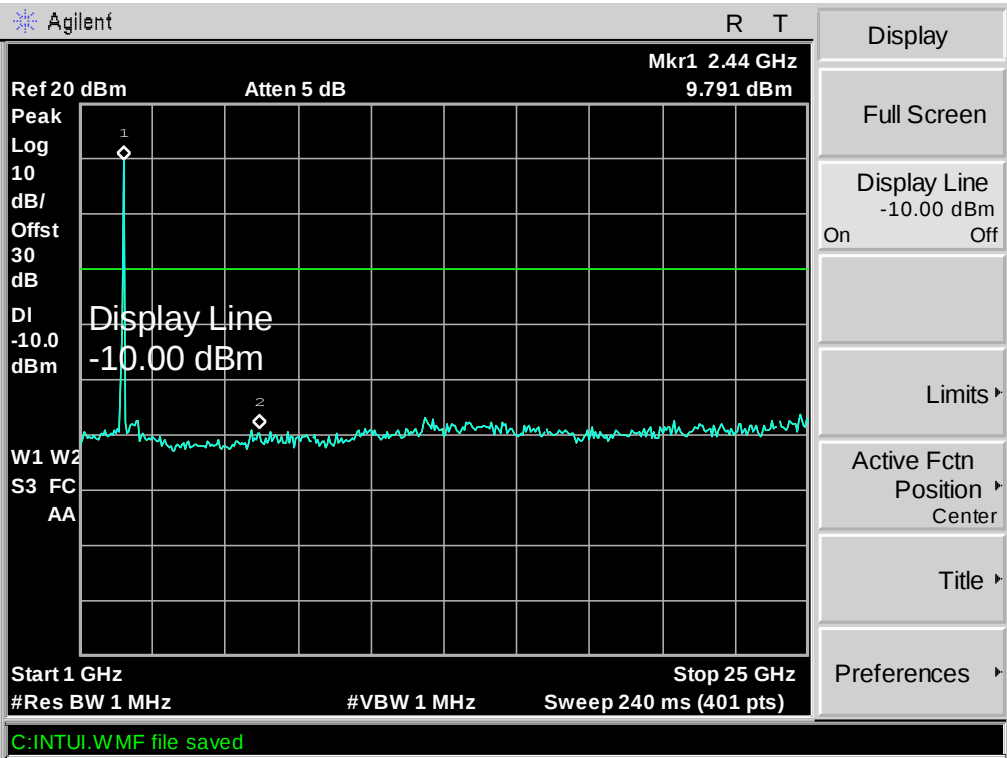


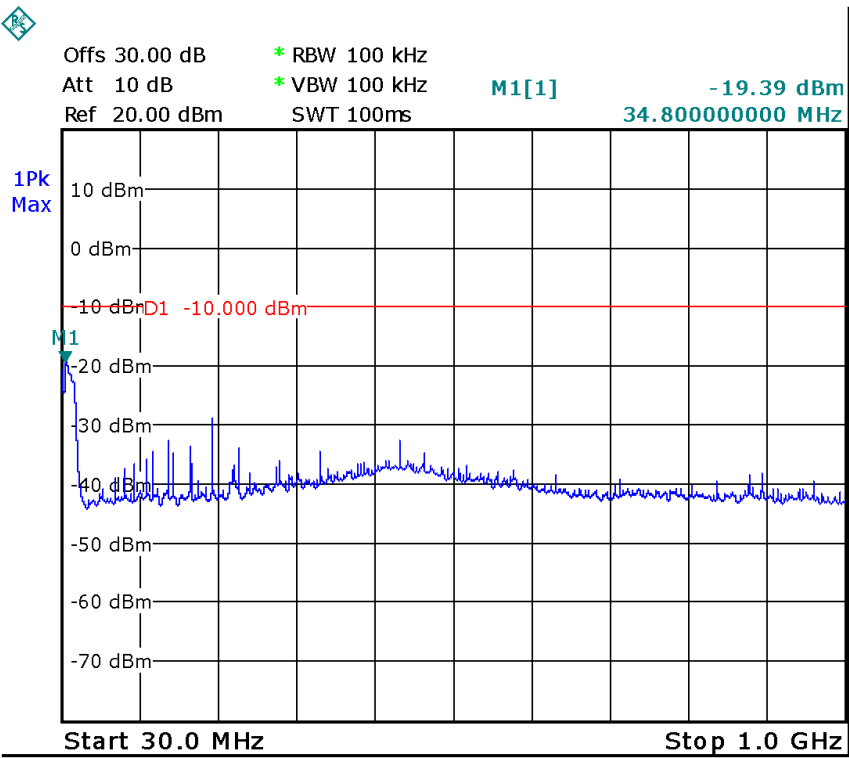
Test mode :TX 11g Upper channel



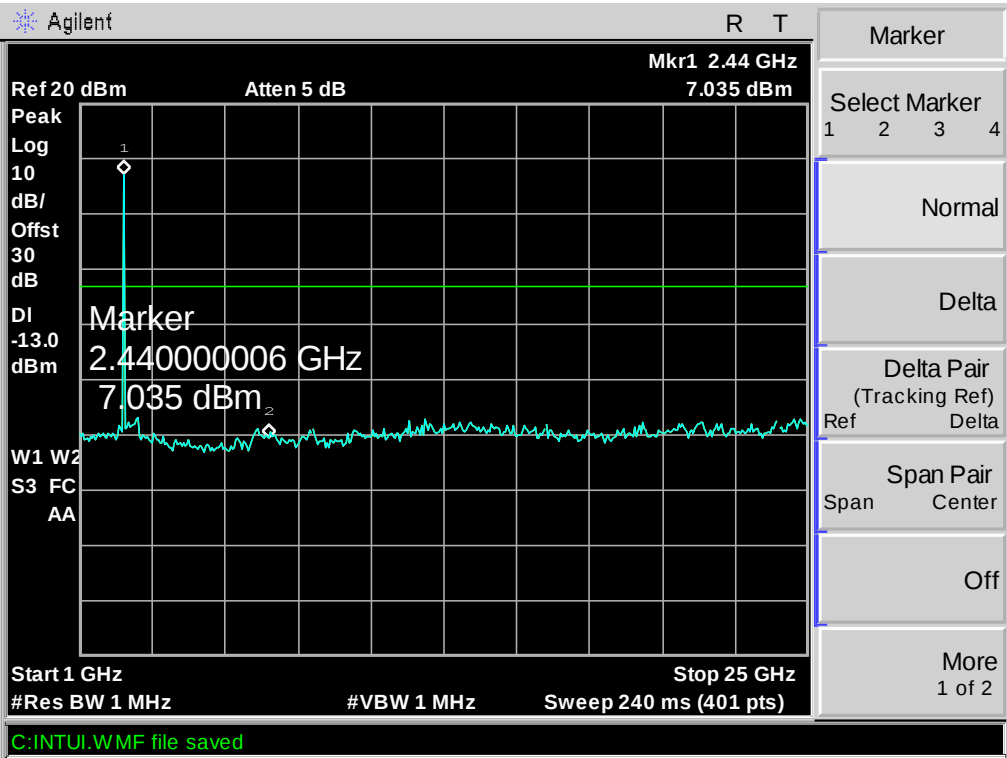


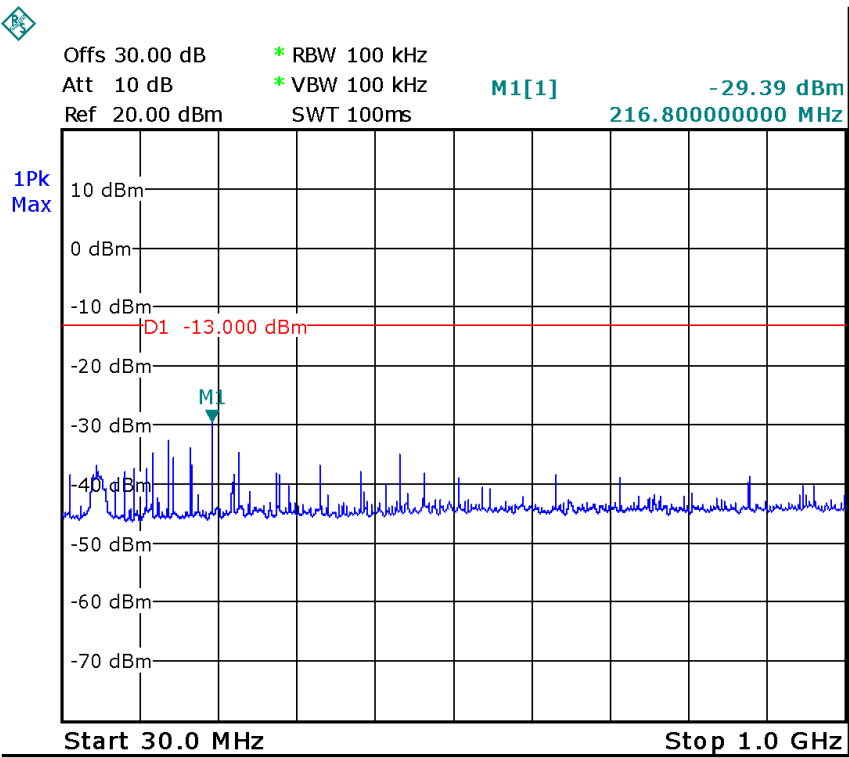
Test mode :TX 11n HT20 Lower channel



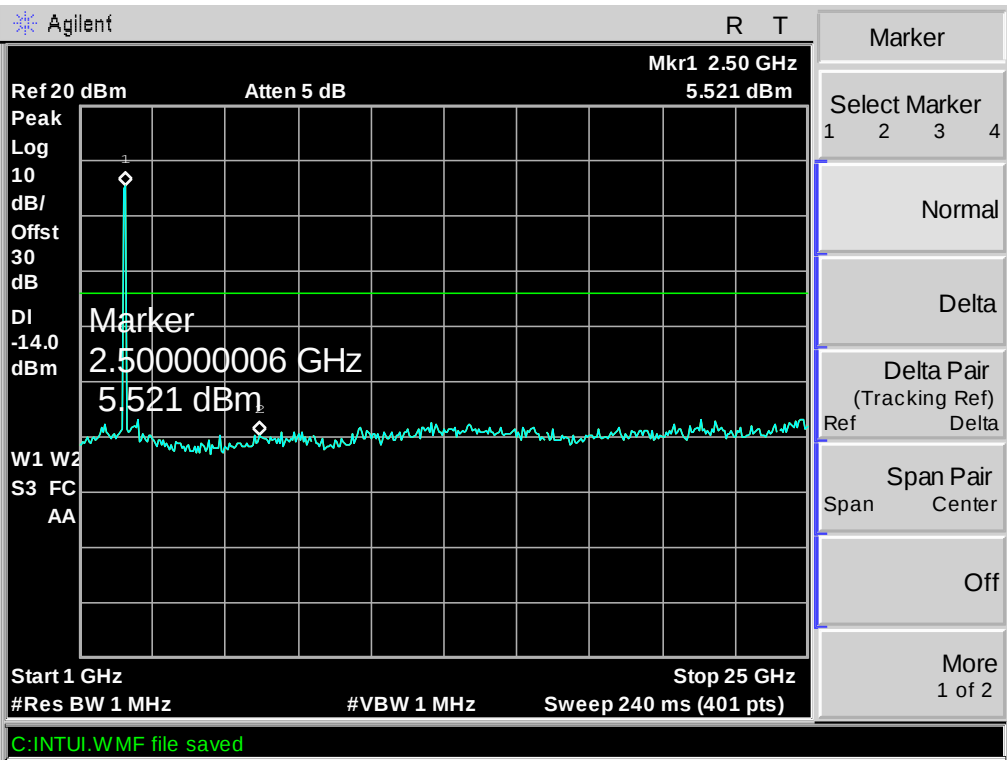


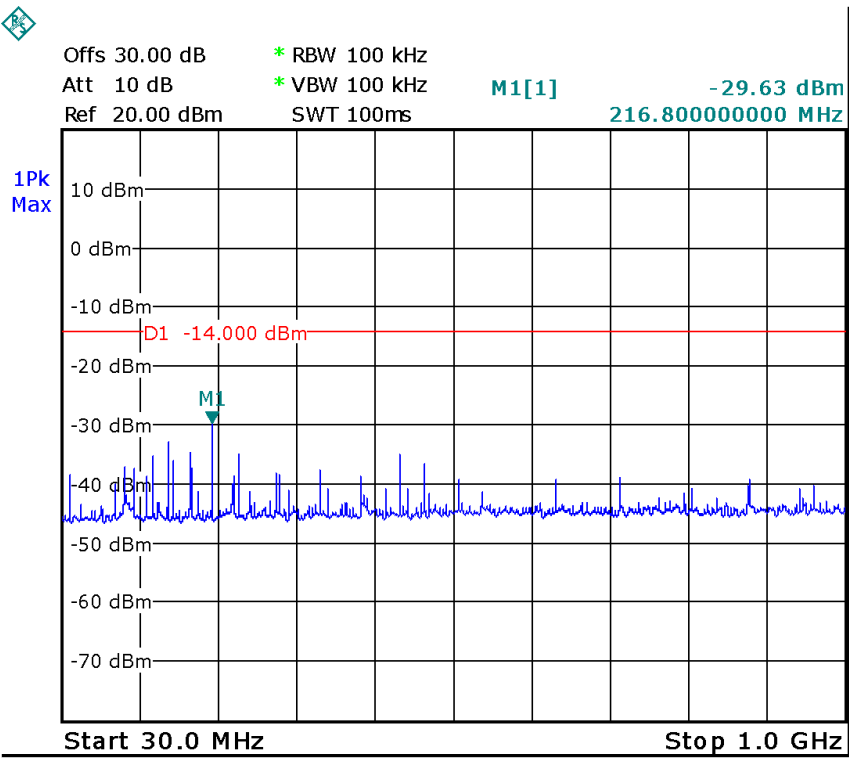
Test mode :TX 11n HT20 Middle channel



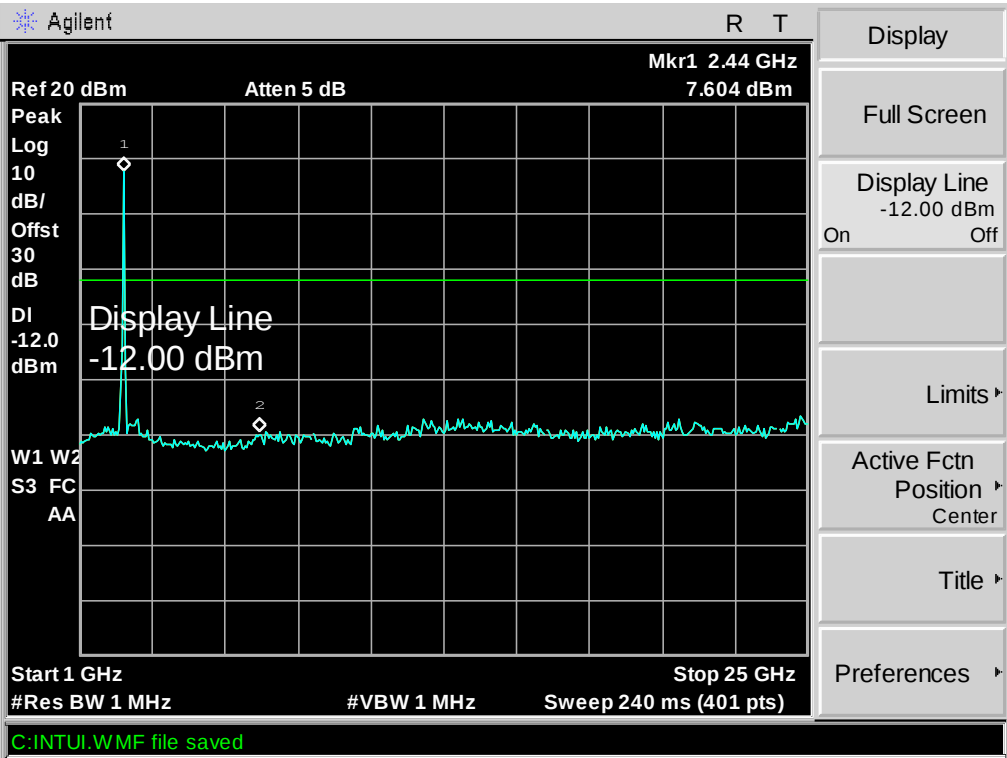


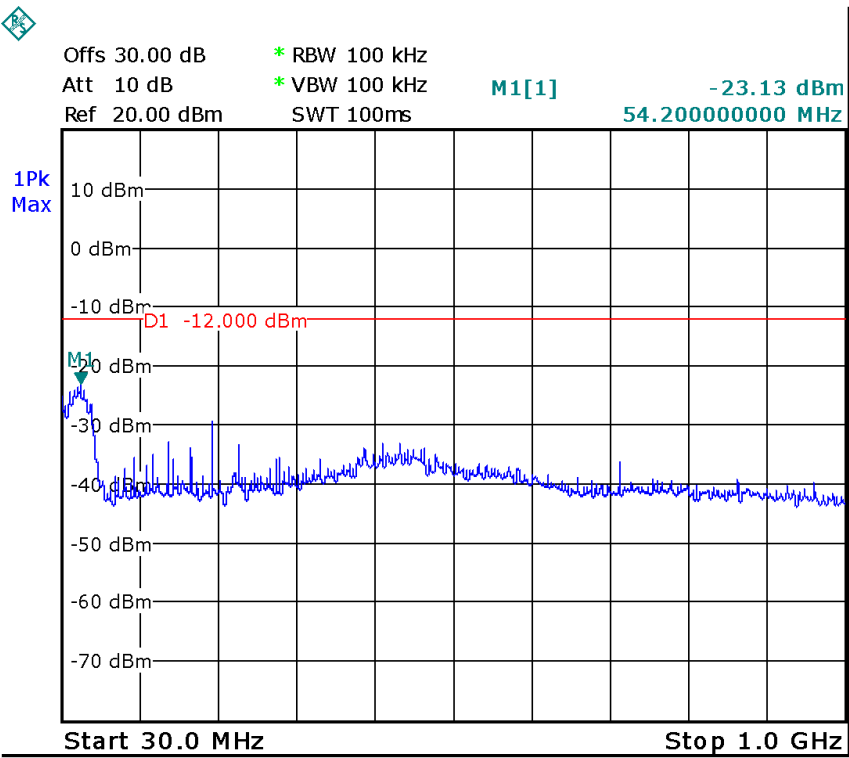
Test mode :TX 11n HT20 Upper channel



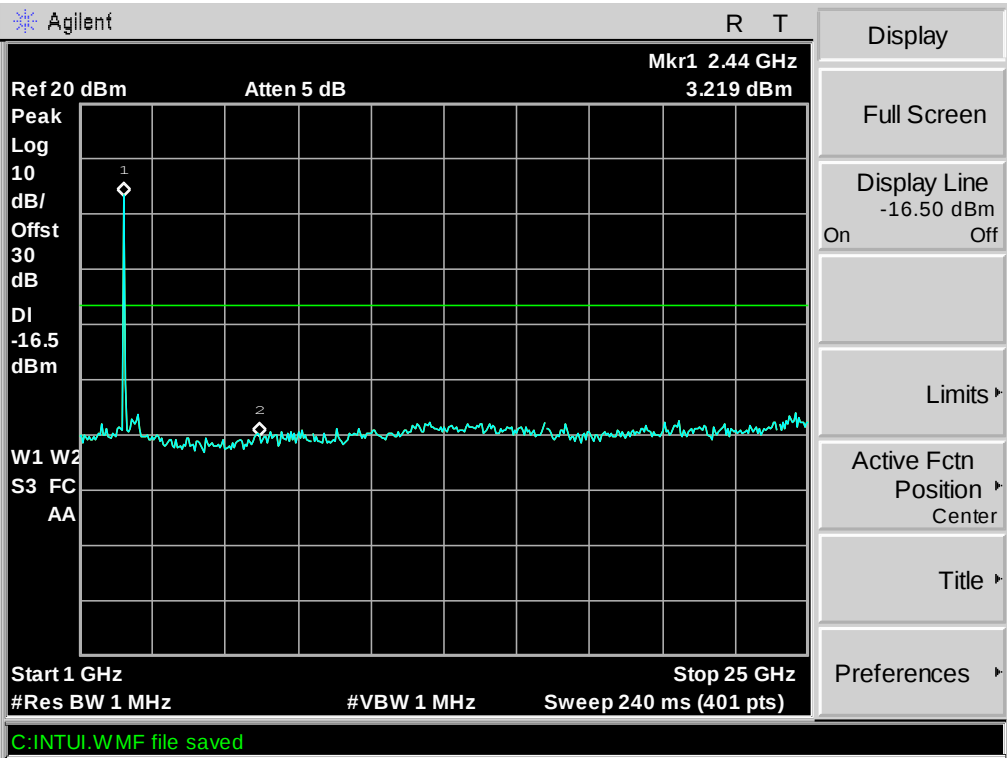


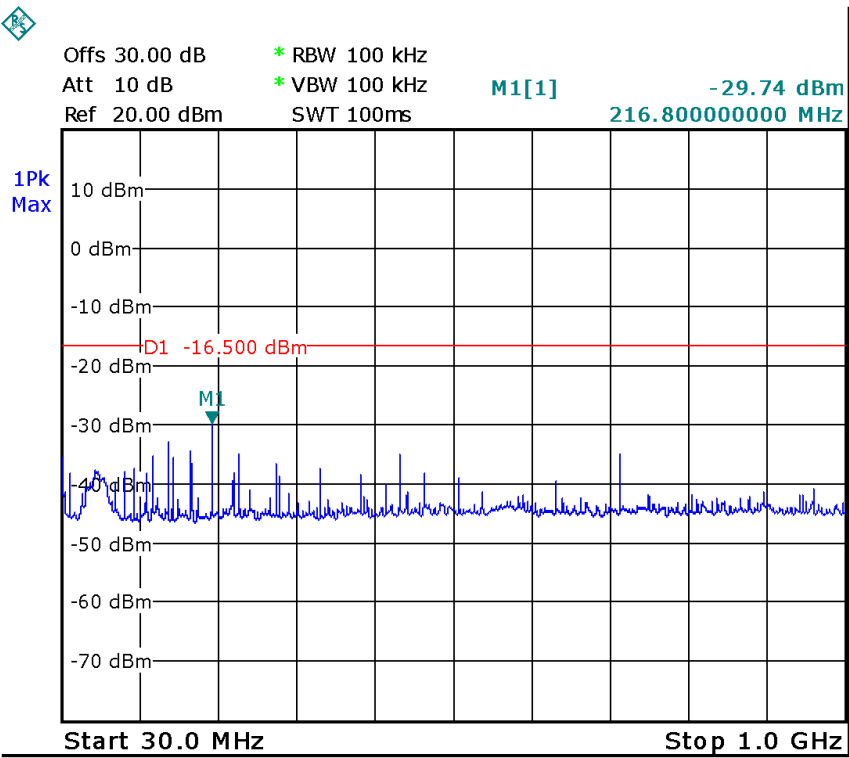
Test mode :TX 11n HT40 Lower channel



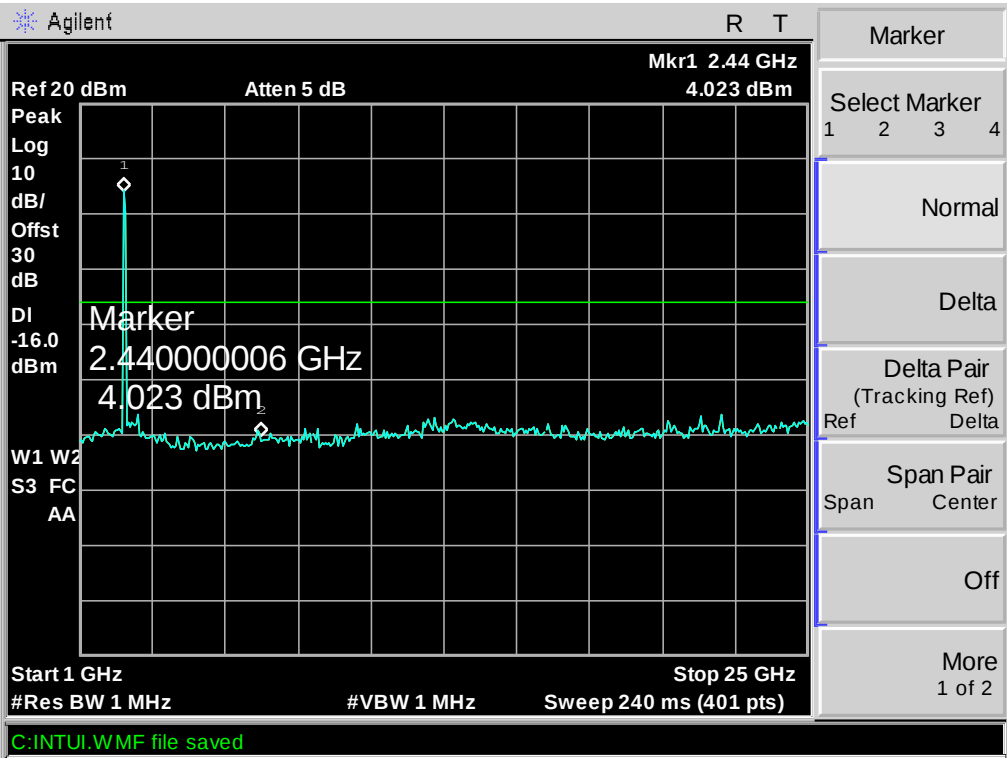


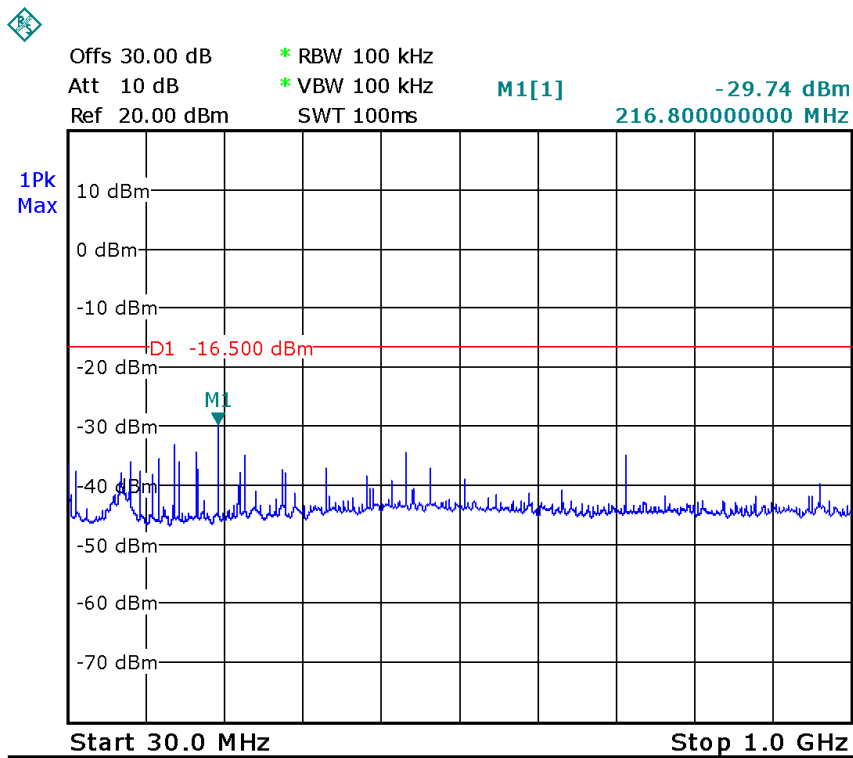
Test mode : TX 11n HT40 Middle channel





Test mode : TX 11n HT40 Upper channel





13 Emissions from the restricted bands

Test Requirement: FCC CFR47 Part 15 Section 15.247(d)
 Test Method: KDB558074 D01 V03 R01 04/09/2013
 Test Limit: 15.205&15.209

Converting the above equation to the logarithmic equivalent yields:
 $EIRP = E + 20\log(d) - 104.8$, for example: $E=74\text{dBuV/m(PK)}$, then the
 caculated EIRP is -21.26dBm(PK) . If $E=54\text{dBuV/m(AV)}$, then the
 caculated EIRP is -41.26dBm(AV) . This relationship can be used to
 determine correspondent field strength levels from EIRP levels
 measured at the distances specified in §15.209(a).

Test Mode: Test in fixing operating frequency at lower, middle, upper channel.

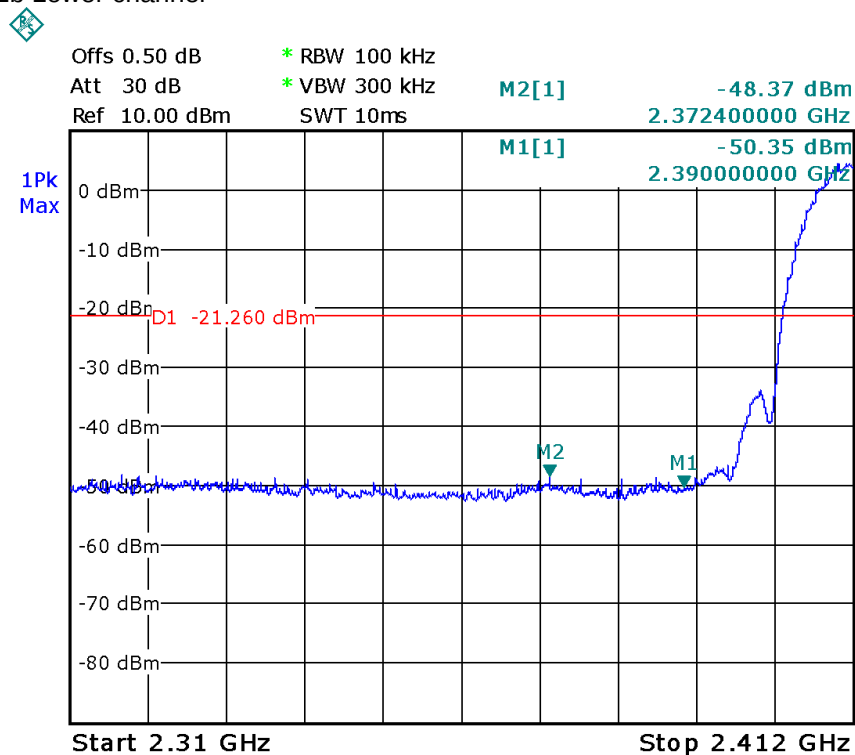
13.1 Test Procedure:

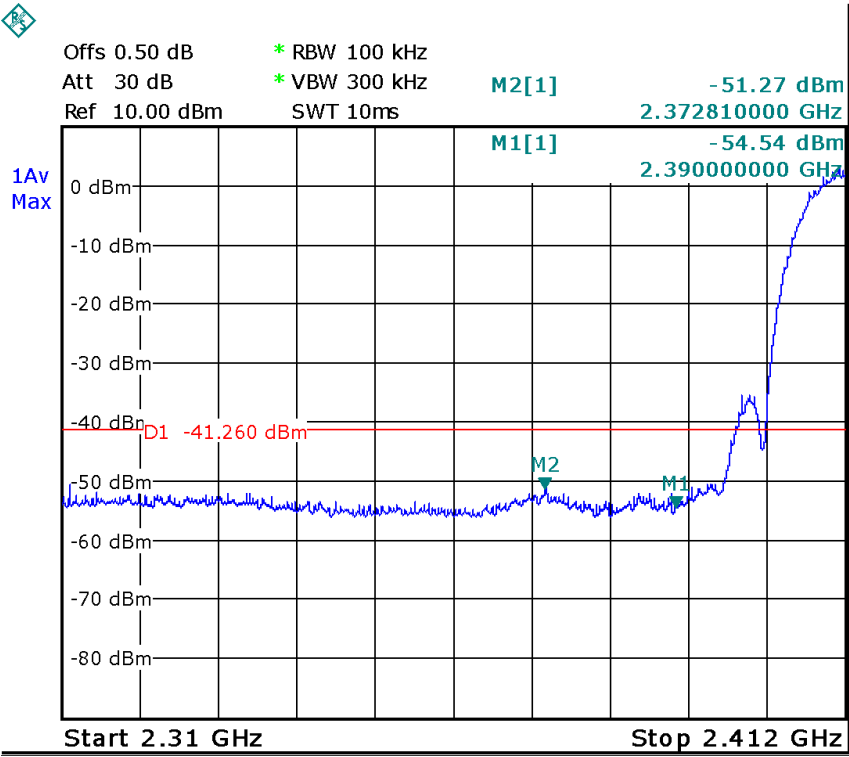
KDB558074 D01 V03 R01 04/09/2013

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. Set RBW = 100kHz and VBW = 300kHz. Sweep = auto.
4. mark the worst point and record.

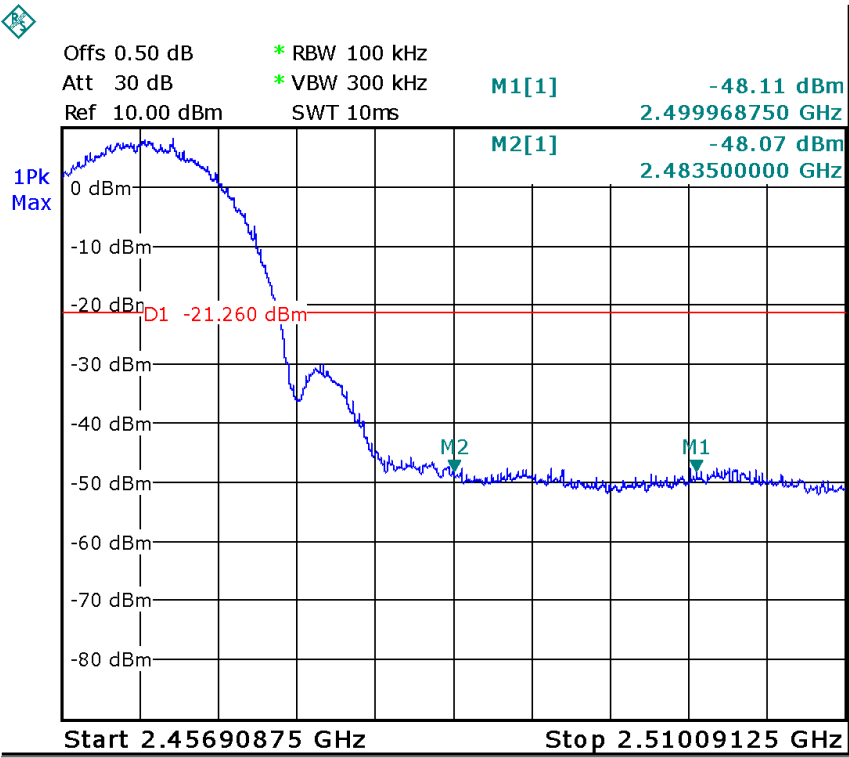
13.2 Test Result:

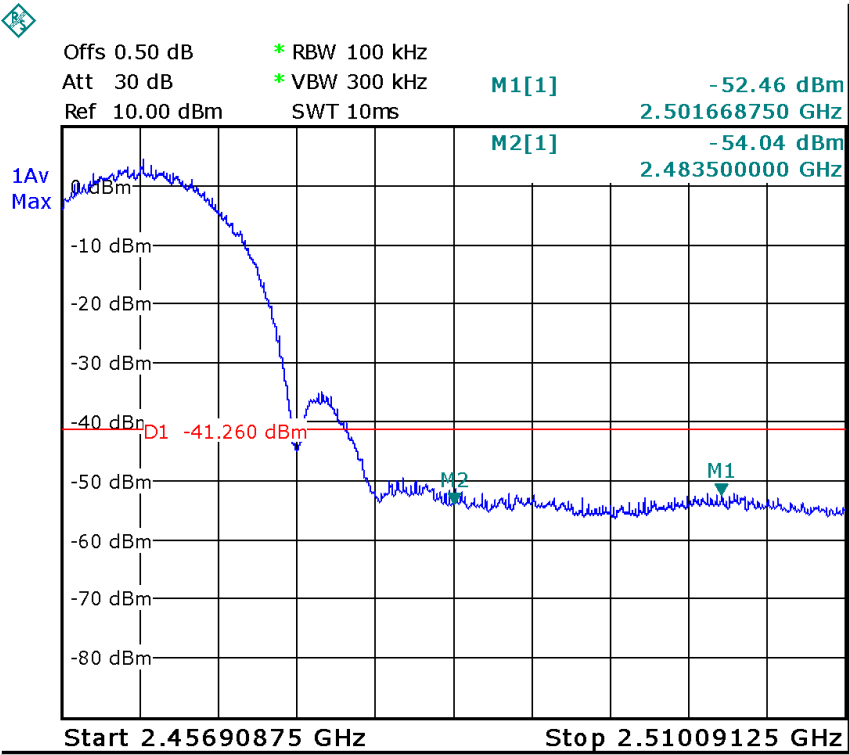
Test mode : TX 11b Lower channel



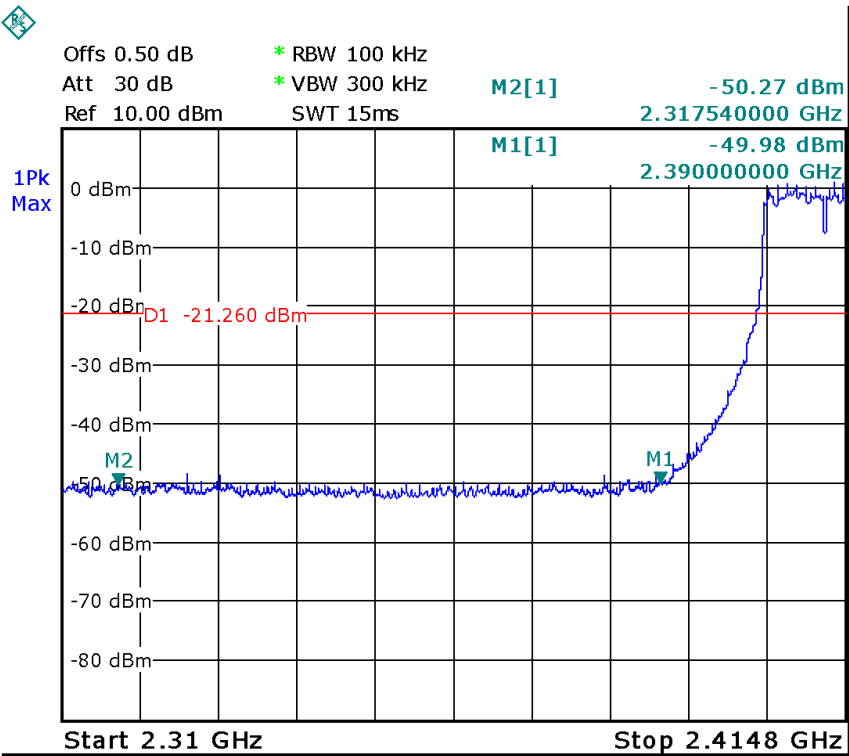


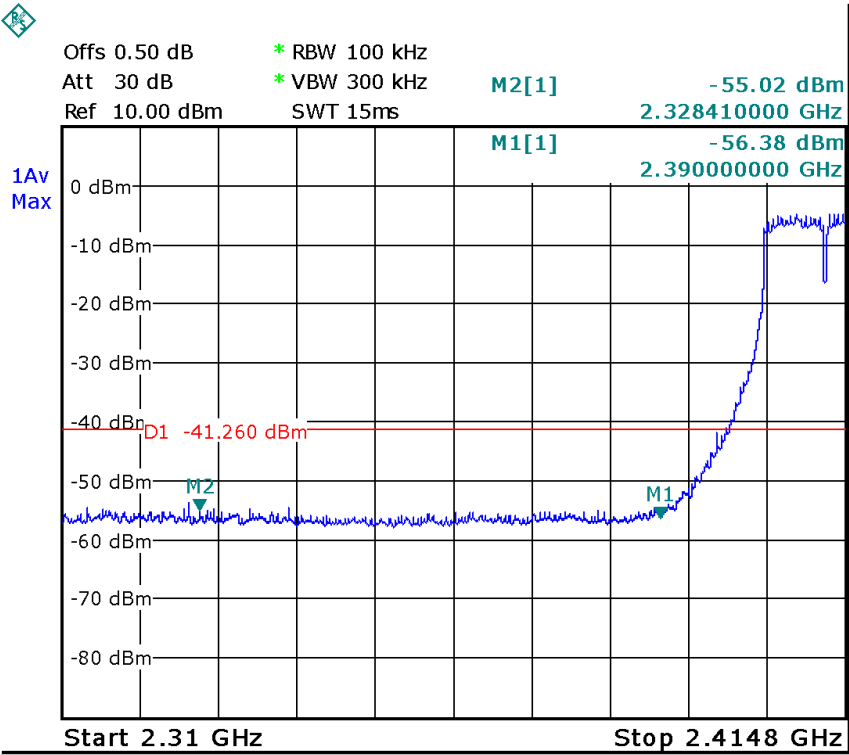
Test mode : TX 11b Upper channel



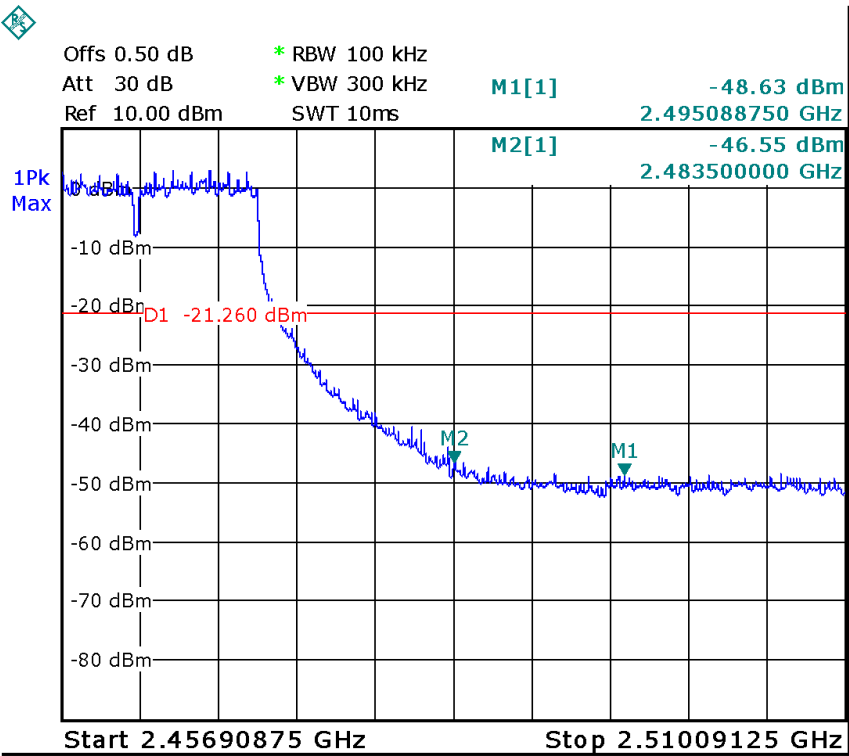


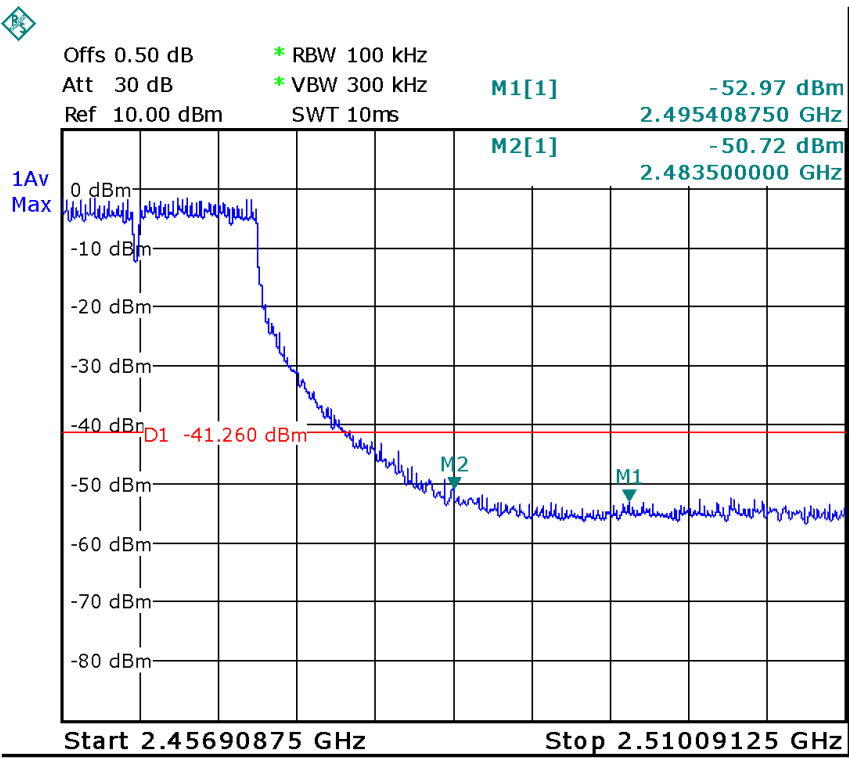
Test mode : TX 11g Lower channel



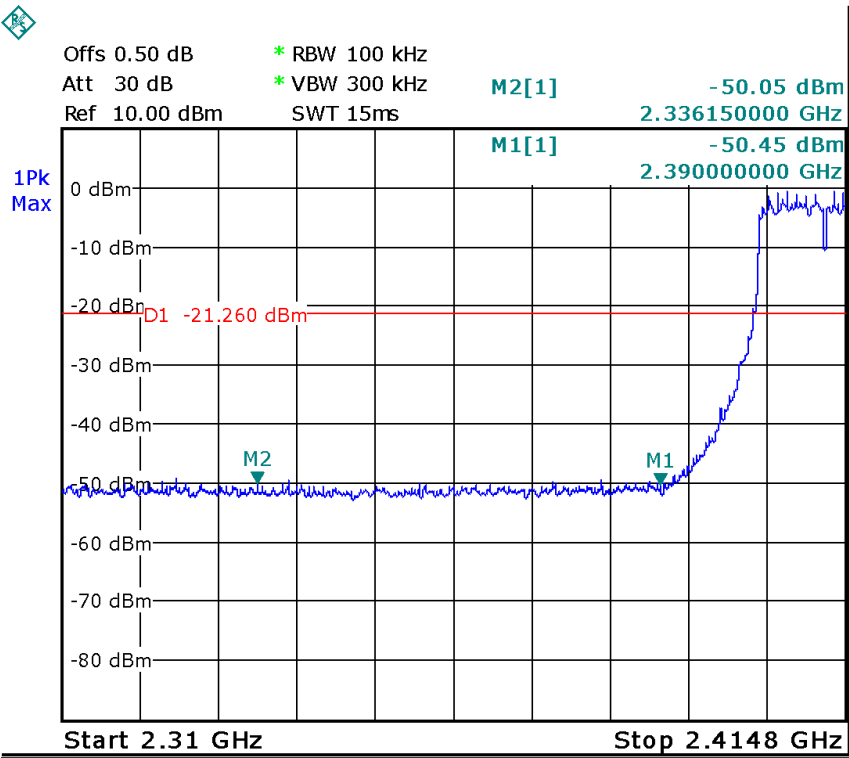


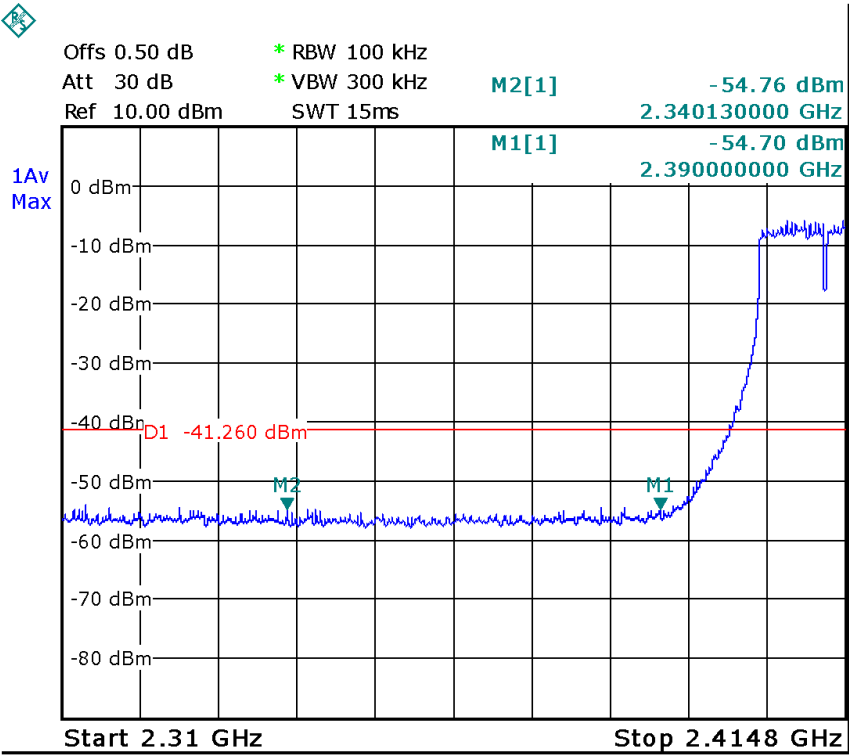
Test mode : TX 11g Upper channel



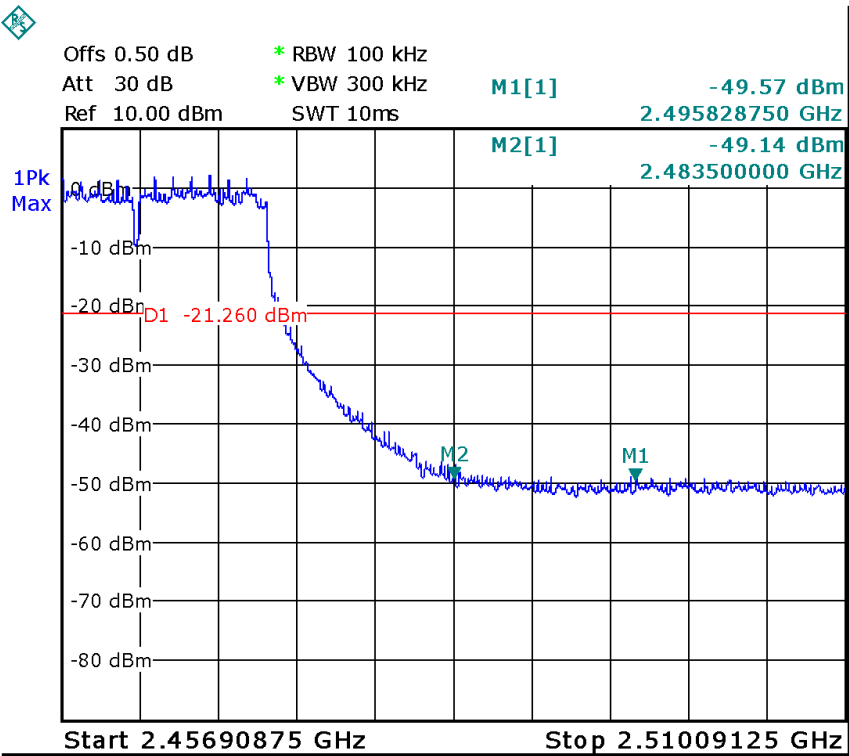


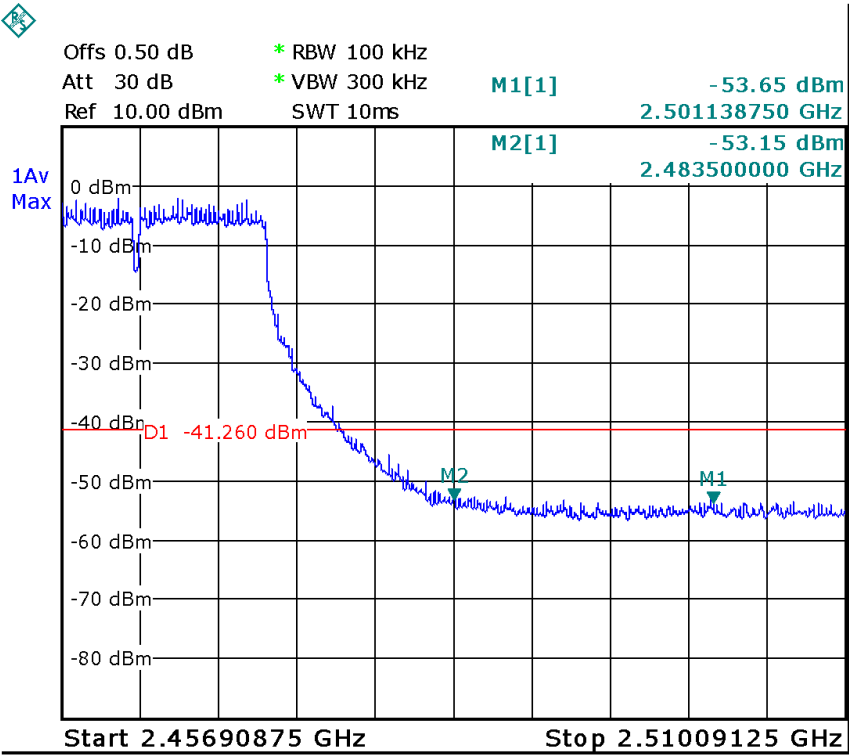
Test mode : TX 11n HT20 Lower channel



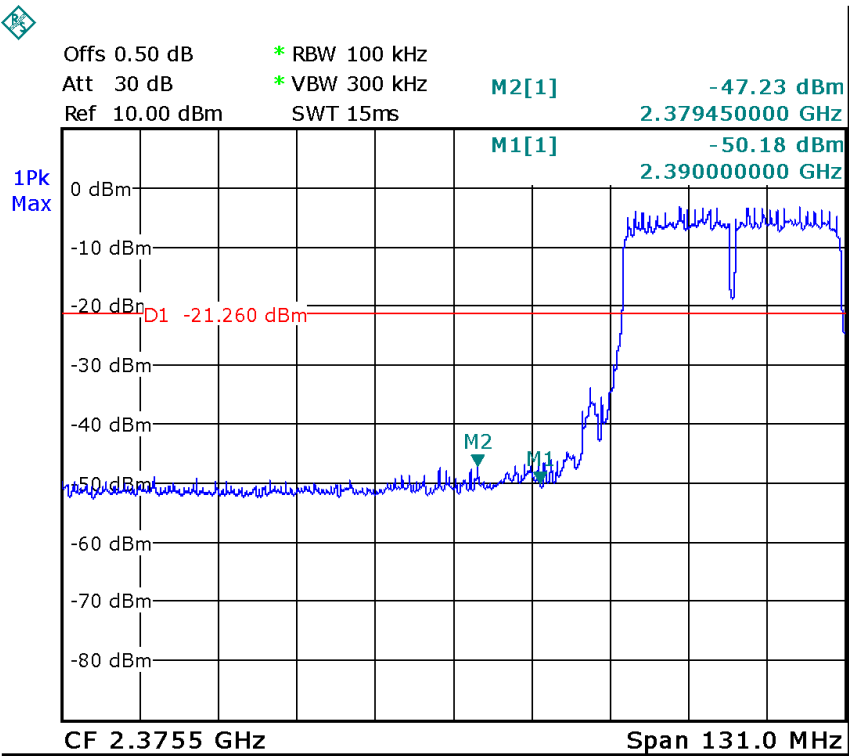


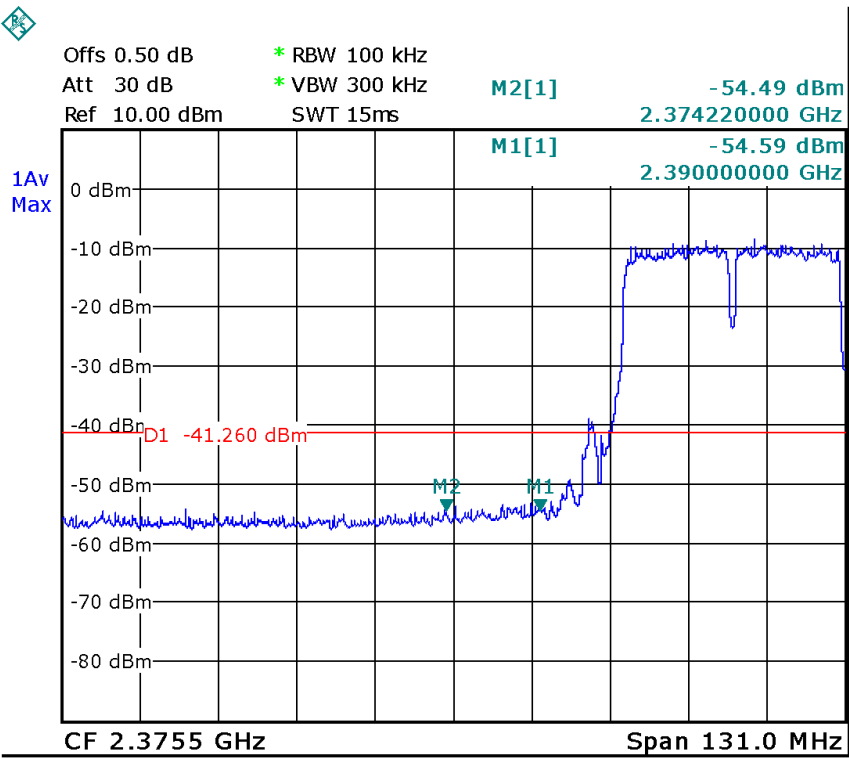
Test mode : TX 11n HT20 Upper channel



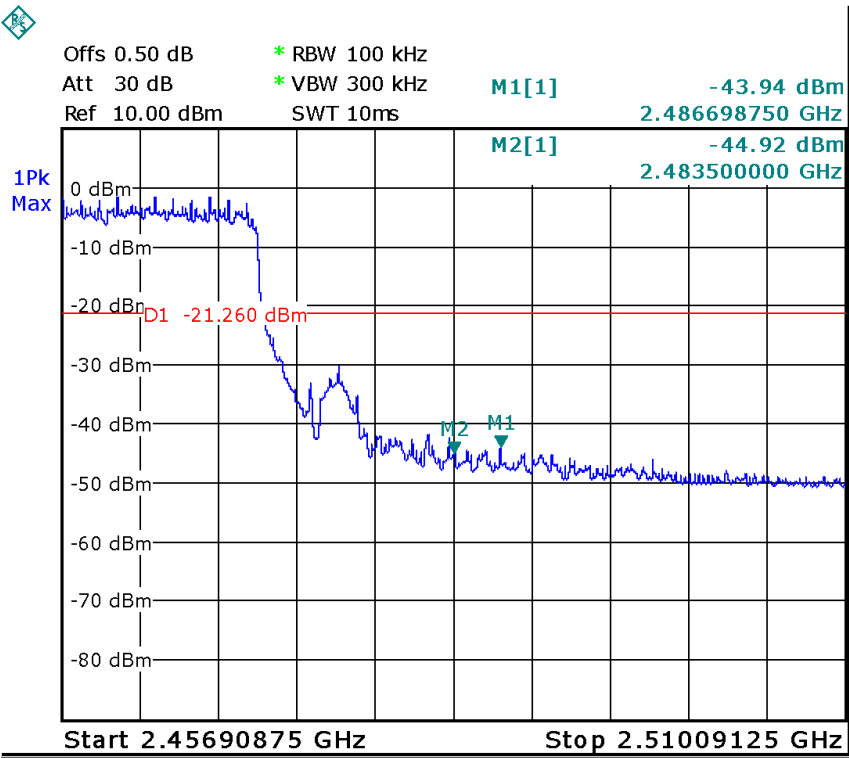


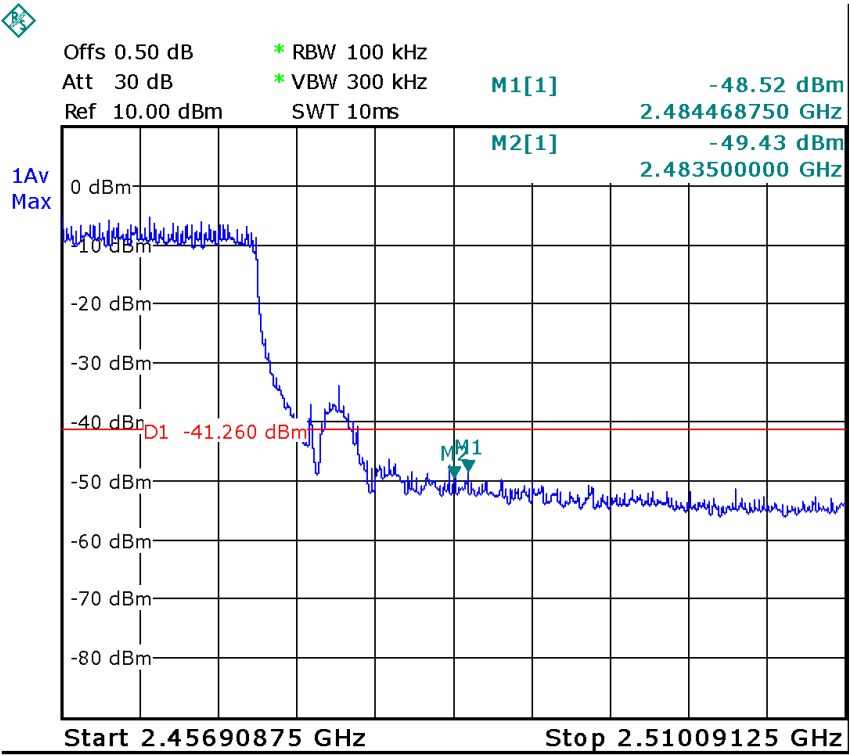
Test mode : TX 11n HT40 Lower channel





Test mode : TX 11n TH40 Upper channel





14 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 internal antenna, fulfill the requirement of this section.

15 RF Exposure

Test Requirement: FCC Part 1.1307

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

15.1 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.

15.2 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

15.3 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	1.585	17.91	61.80	0.019	1
802.11g	1.585	23.20	208.93	0.066	1
802.11n HT 20	1.585	21.97	157.40	0.050	1
802.11n HT 40	1.585	22.23	167.11	0.053	1

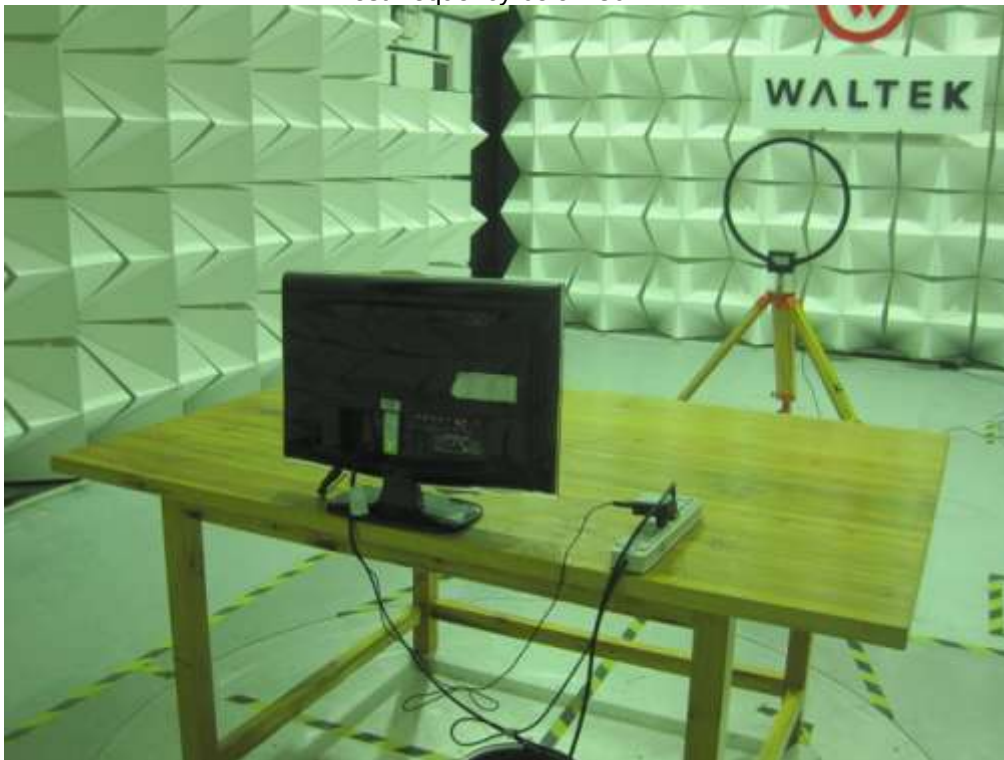
16 Photographs – Test Setup

16.1 Conducted Emission

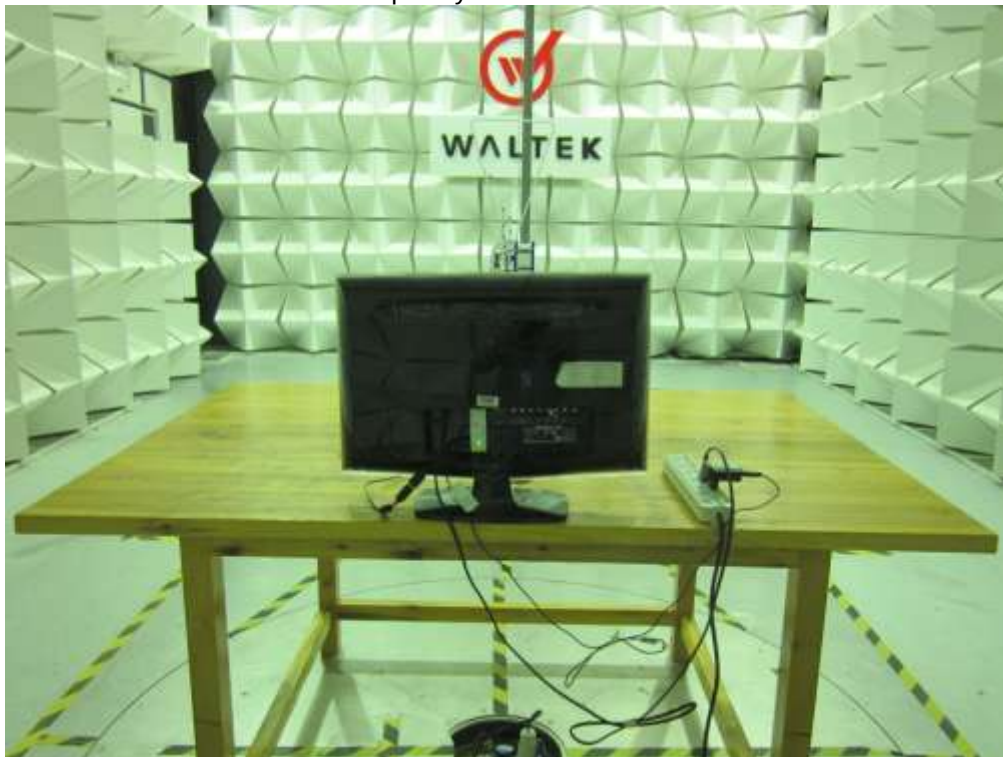


16.2 Radiated Emission

Test frequency below 30MHz



Test frequency from 30MHz to 1GHz

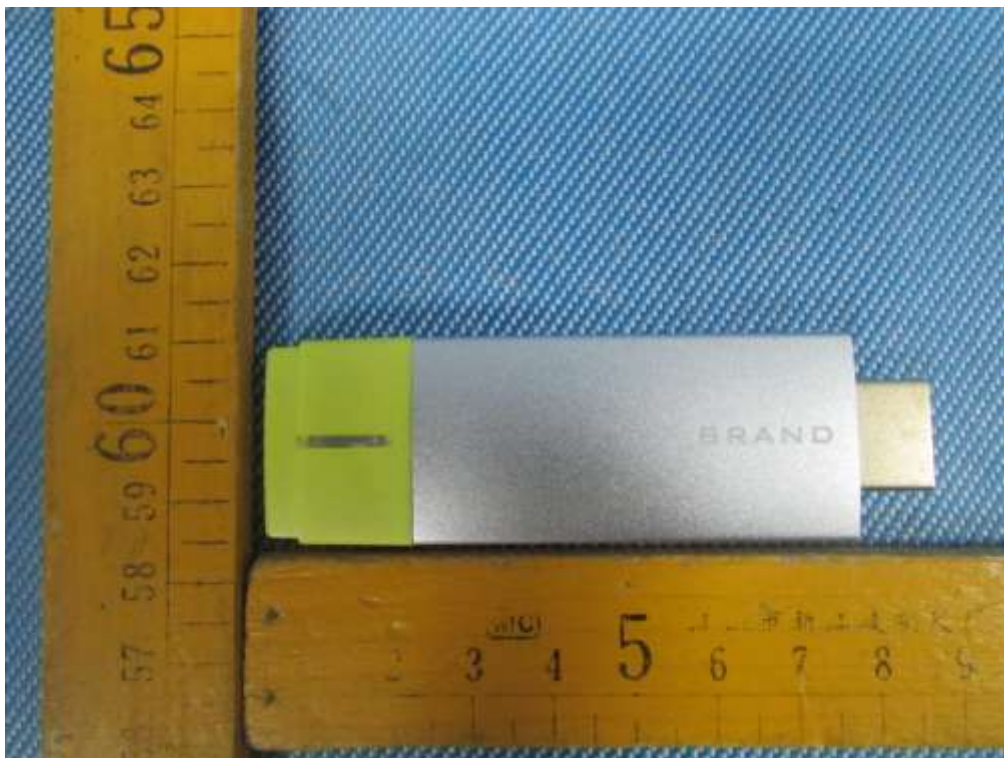


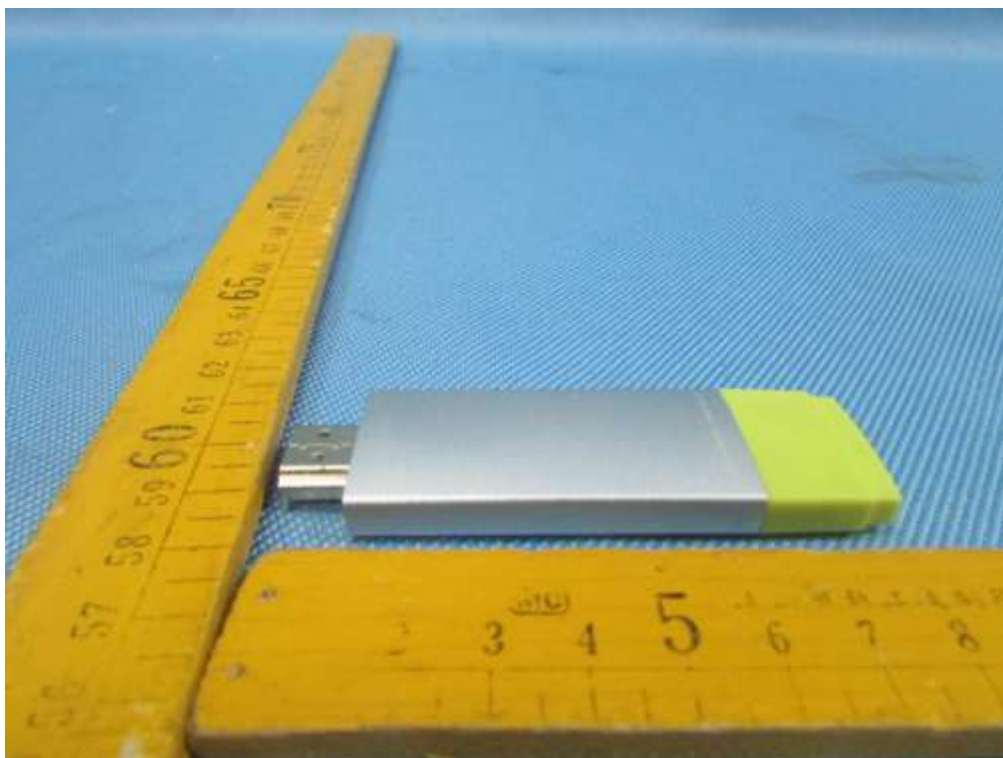
Test frequency above 1GHz



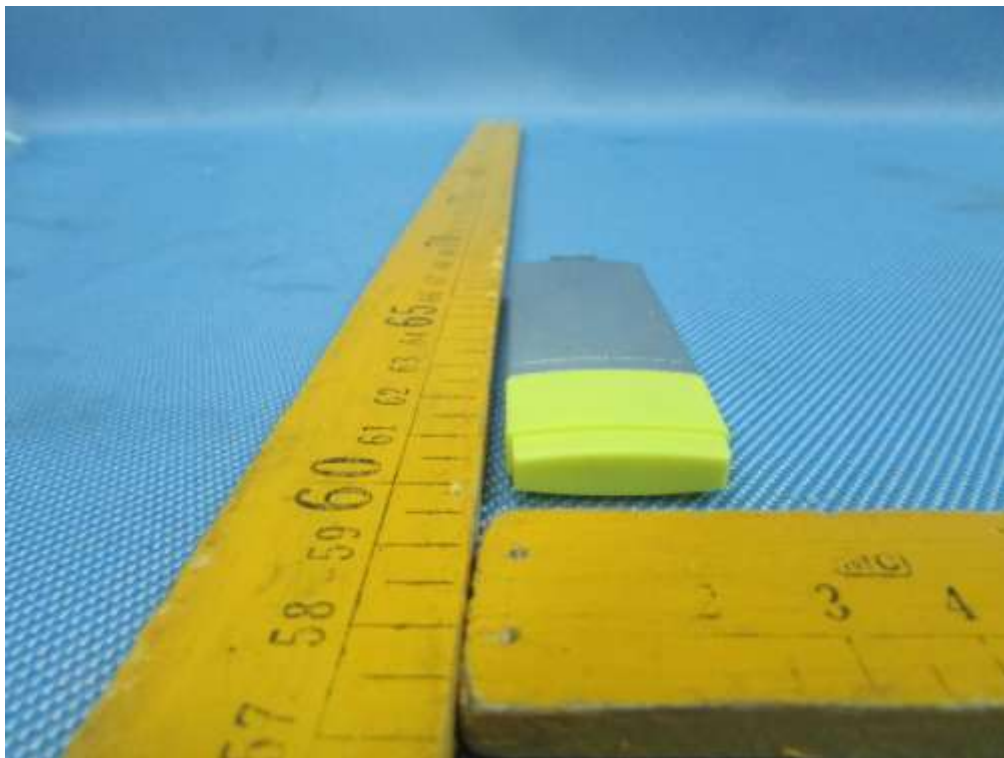
17 Photographs - Constructional Details

17.1 EUT – External View

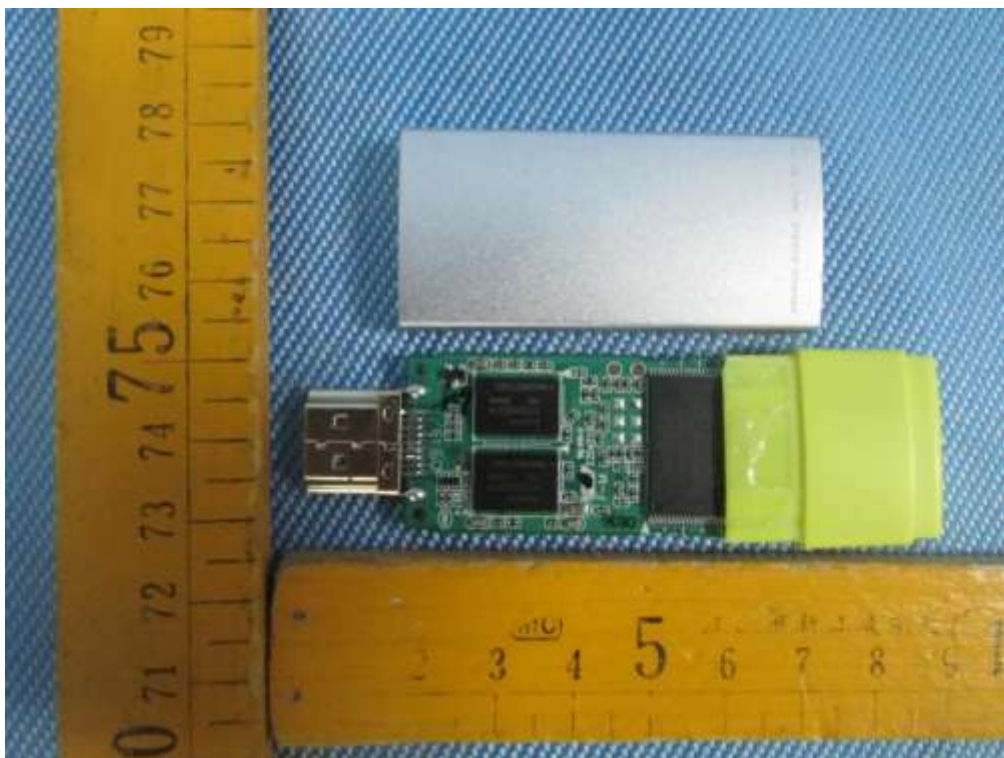


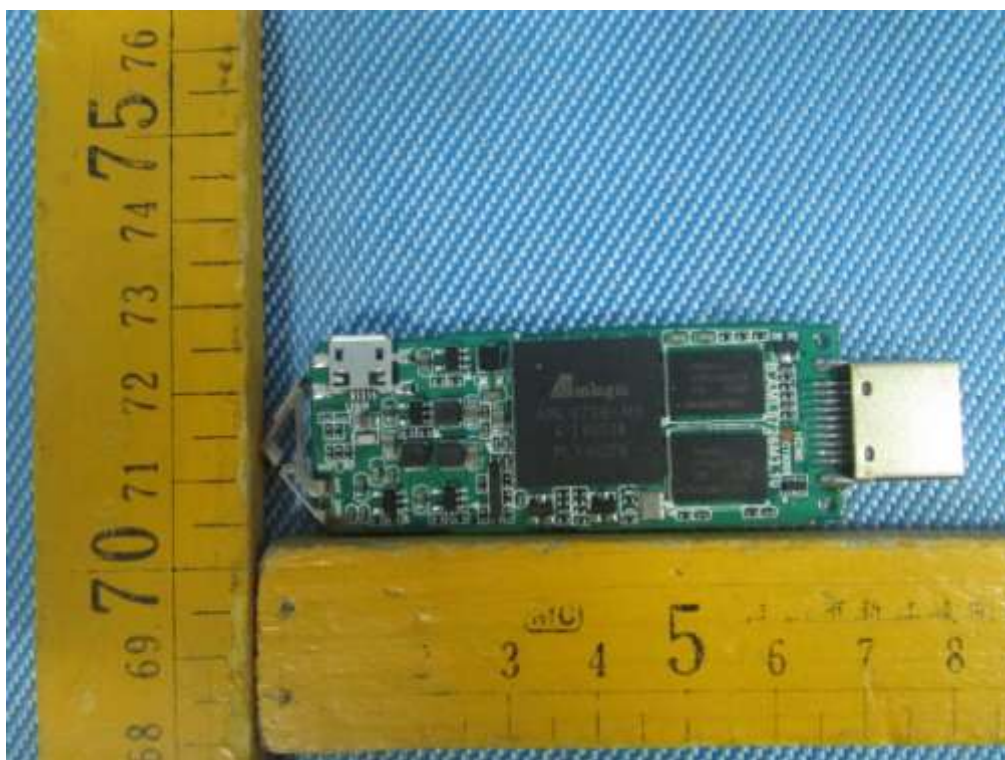
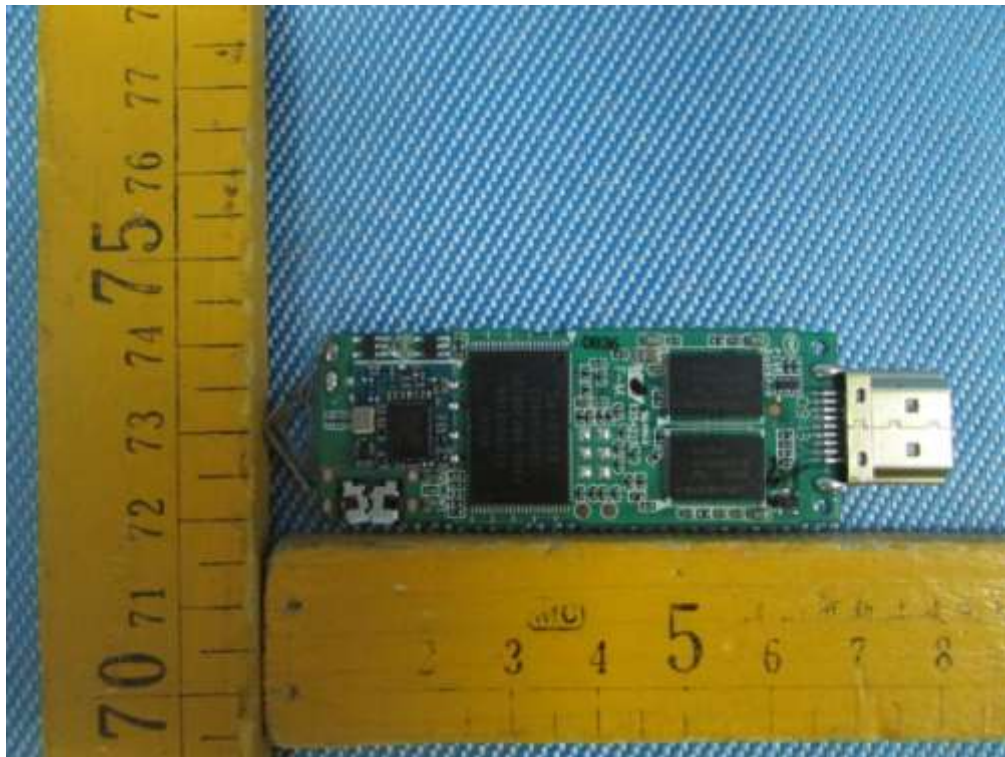




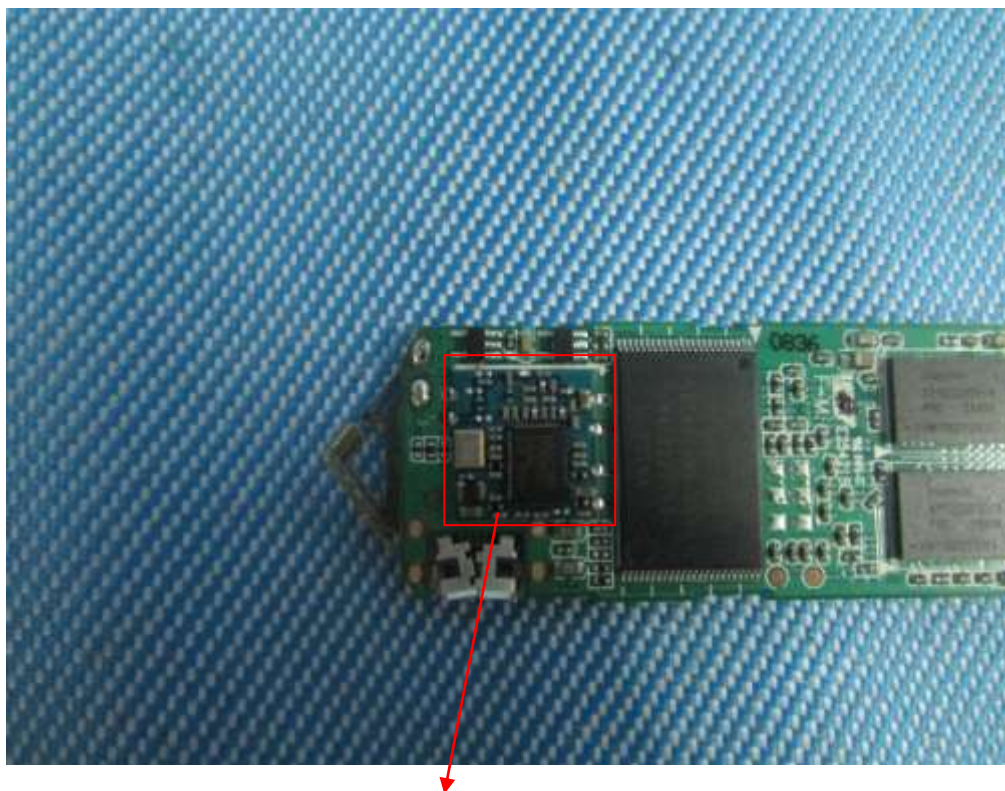


17.2 EUT- Internal View

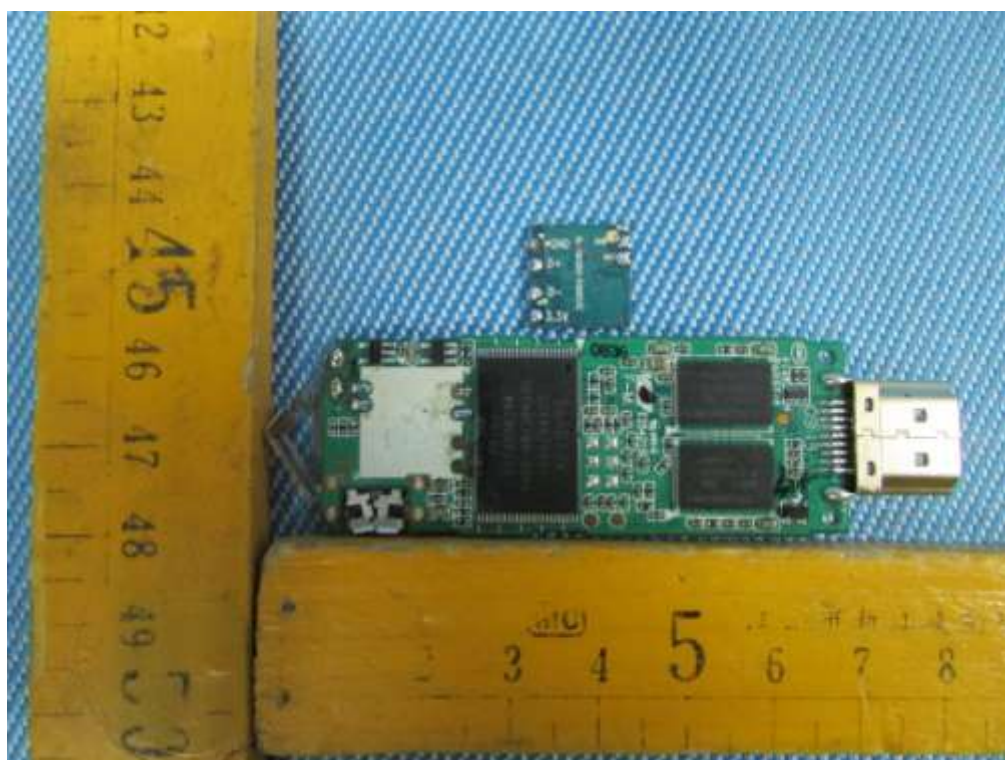




17.3 EUT- RF module



RF module



==End of test report==