



FCC 47 CFR PART 15 SUBPART C 15.247

TEST REPORT

FOR

WIFI TO UART

Model : PTA-1508

Trade Name : FT

Issued to

Further Tech. Co., Ltd.

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235, Taipei, Taiwan

Issued by

WH Technology Corp.



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Test Firm Registration: 749714		

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**APPENDIX 1 PHOTOS OF TEST CONFIGURATION
PHOTOS OF EUT**



1. General Information

Applicant : Further Tech. Co., Ltd.

Address : Rm. 6, 16F., No.872, Zhongzheng Rd., Zhonghe Dist., New Taipei City 235, Taipei, Taiwan

Manufacturer : Further Tech. (Shenzhen) Co., LTD.

Address : Room 806, Block B, Shenghui Building, NO.67, Anshun RD., Xishan, Baoan, Shenzhen, China

EUT : WiFi to UART

Model Name : PTA-1508

Model Differences : N/A

Is here with confirmed to comply with the requirements set out in the FCC Rules and Regulations Part 15 Subpart C and the measurement procedures were according to ANSI C63.10-2013. The said equipment in the configuration described in this report shows the maximum emission levels emanating

FCC part 15 subpart C

Receipt Date : 02/01/2018

Final Test Date : 02/27/2018

Tested By:

Reviewed by:

Feb. 27, 2018

Date

Bell Wei/ Engineer

Feb. 28, 2018

Date

Mike Lee / Manager
Designation Number: TW1083



2. Report of Measurements and Examinations

2.1 List of Measurements and Examinations

FCC Rule	Description of Test	Result
15.203	Antenna Requirement	Pass
15.207	Conducted Emission	Pass
15.209 15.247(d)	Radiated Emission	Pass
15.247(a)(2)	6dB Bandwidth	Pass
15.247(b)	Maximum Peak Output Power	Pass
15.247(d)	100kHz Bandwidth of Frequency Band Edges	Pass
15.247(e)	Power Spectral Density	Pass
1.1307 1.1310 2.1091 2.1093	RF Exposure Compliance	Pass



3. Test Configuration of Equipment under Test

3.1 Description of the tested samples

EUT Name : WiFi to UART

Model Number : PTA-1508

FCCID : 2ABL3-PTA1508

Receipt Date : 02/01/2018

Input Voltage : 5Vdc

Power From : ☐Inside ☐Outside
☐Adaptor ☐Battery ☐AC Power Source ☒DC Power Source
☐Support Unit PC

Operate Frequency : Refer to the channel list as described below (2.412 ~2.462 GHz)

Modulation Technique : 802.11b: CCK/QPSK/BPSK
802.11g/n: BPSK/QPSK/16QAM/64QAM

Number of Channels : 11

Channel spacing : ☐N/A ☒ 5 MHz

Operating Mode : ☐Simplex ☒ Half Duplex

Antenna Type : PCB Antenna

Channel bandwidth : 5 MHz

Antenna gain : 2.83 dBi



3.2 Carrier Frequency of Channels

802.11b, 802.11g, 802.11n HT 20 (2412MHz~2462MHz)

Channel	Frequency(MHz)	Channel	Frequency(MHz)
01	2412	07	2442
02	2417	08	2447
03	2422	09	2452
04	2427	10	2457
05	2432	11	2462
06	2437	---	---



3.3 Test Mode and Test Software

- a. During testing, the interface cables and equipment positions were varied according to ANSI C63.10.
- b. The complete test system included Notebook and EUT for RF test.
- c. An executive "QATEST" under XP was executed to keep transmitting and receiving data via Wireless.
- d. The following test modes were performed for test:
 - 802.11b/g/n HT20: CH01: 2412MHz, CH06: 2437MHz, CH11: 2462MHz



3.4 TEST Methodology & General Test Procedures

All testing as described bellowed were performed in accordance with ANSI C63.10:2013 and FCC CFR 47 Part 15 Subpart C.

Conducted Emissions

The EUT is placed on a wood table, which is at 0.8 m above ground plane acceding to clause 15.207 and requirements of ANSI C63.10:2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz are using CISPR Quasi-Peak / Average detectors.

Radiated Emissions

The EUT is a placed on a turn table, which is 0.8 m or 1.5m above ground plane. The turntable was rotated through 360 degrees to determine the position of maximum emission level. The EUT is placed at 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

- 1) Putting the EUT on the platform and turning on the EUT (on/off button on the bottom of the EUT).
- 2) Setting test channel described as “Channel setting and operating condition”, and testing channel by channel.
- 3) For the maximum output power measurement, we followed the method of measurement KDB558074 D01.
- 4) For the spurious emission test based on ANSI(2014), at the frequency where below 1GHz used quasi-peak detector mode; where above 1GHz used the peak and average detector mode. IF the peak value may be under average limit, the average mode will not be performed.



3.5 Measurement Uncertainty

Measurement Item	Uncertainty
Radiated emission	$\pm 4.11\text{dB}$
Peak Output Power(conducted)	$\pm 1.38\text{dB}$
Peak Output Power(Radiated)	$\pm 1.70\text{dB}$
Power Spectral Density	$\pm 1.39\text{dB}$
Radiated emission(3m)	$\pm 4.11\text{dB}$
Radiated emission(10m)	$\pm 3.89\text{dB}$

3.6 Description of the Support Equipments

Setup Diagram

See test photographs attached in appendix 1 for the actual connections between EUT and support equipment.

Support Equipment

Peripherals Devices:

OUTSIDE SUPPORT EQUIPMENT							
No.	Equipment	Model	Serial No.	FCC ID/ BSMI ID	Trade name	Data Cable	Power Cord
1.	Lap top	7457	7457A82	DOC	lenovo	N/A	N/A
2.	AC adapter	QX6.5W75 100FG	N/A	VOC	Stos	N/A	N/A
INSIDE SUPPORT EQUIPMENT							
No.	Equipment	Model	Serial No.	FCC ID/ BSMI ID	Trade name	Data Cable	Power Cord
1.	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: All the above equipment /cable were placed in worse case position to maximize emission signals during emission test

Grounding: Grounding was in accordance with the manufacturer's requirement and conditions for the intended use.



4. Test and measurement equipment

4.1 calibration

The measuring equipment utilized to perform the tests documented in the report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2 equipment

The following list contains measurement equipment used for testing. The equipment conforms to the requirement of CISPR 16-1, ANSI C63.2 and. Other required standards.

Calibration of all test and measurement, including any accessories that may effect such calibration, is checked frequently to ensure the accuracy. Adjustments are made and correction factors are applied in accordance with the instructions contained in the respective.



TABLELIST OF TEST AND MEASUREMENT EQUIPMENT

Test Site	Instrument	Manufacturer	Model No.	S/N	Next Cal. Date
Conduction	Spectrum (9K--3GHz)	R&S	FSP3	833387/010	2018/09/20
	EMI Receiver	R&S	ESHS10	830223/008	2018/06/06
	LISN	Rolf Heine Hochfrequenztechnik	NNB-2/16z	98062	2018/06/11
	ISN	Schwarzbeck	8-Wire ISN CAT5	CAT5-8158-0094	2018/09/21
	RF Cable	N/A	N/A	EMI-3	2018/10/19
Radiation	Bilog antenna (30M-1G)	ETC	MCTD2786B	BLB16M04004/JB-5-004	2018/05/18
	Double Ridged Guide Horn antenna (1G-18G)	ETC	MCTD 1209	DRH15N02009	2018/11/23
	Horn antenna (18G-26G)	com-power	AH-826	81000	2018/08/16
	LOOP Antenna (Below 30M)	com-power	AL-130	17117	2018/10/04
	Pre amplifier (30M-1G)	EMC INSTRUMENT	EMC9135	980334	2018/05/03
	Microwave Preamplifier (1G-18G)	EMC INSTRUMENT	EMC051845	980108&A T -18001	2018/10/23
	Pre amplifier (18G~26G)	MITEQ	JS4-18002600-3 0-5A	808329	2018/08/09



	EMI Test Receiver	R&S	ESVS30 (20M-1000MHz)	826006/00 2	2018/11/28
	RF Cable (open site)	EMCI	N male on end of both sides (EMI4)	30m	2018/10/19
	RF CABLE (1~26G)	HARBOUT INDUSTRIES	LL142MI(4M+4M)	NA	2018/04/17
	RF CABLE (1~26G)	HARBOUR INDUSTRIES	LL142MI(7M)	NA	2018/08/09
	Spectrum (9K--7GHz)	R&S	FSP7	830180/00 6	2018/04/14
	Spectrum (9K--40GHz)	AGILENT	8564EC	4046A003 2	2018/03/01
Software	e3	AUDIX	N/A	N/A	N/A
SG	SINGAL GENERATOR (100k-1GHz)	HP	8648A	3619U004 26	N/A

***CALIBRATION INTERVAL OF INSTRUMENTS LISTED ABOVE IS ONE YEAR**



5. Antenna Requirements

5.1 Standard Applicable

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

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

5.2 Antenna Construction and Directional Gain

WiFi 802.11b/g/n:

Antenna Type: PCB Antenna

Antenna Gain: 2.83 dBi



6. Test of Conducted Emission

6.1 Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz on the 120 VAC power and return leads of the EUT according to the methods defined in ANSI C63.10-2013 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 2.2. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

Frequency (MHz)	Quasi Peak (dB μ V)	Average (dB μ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

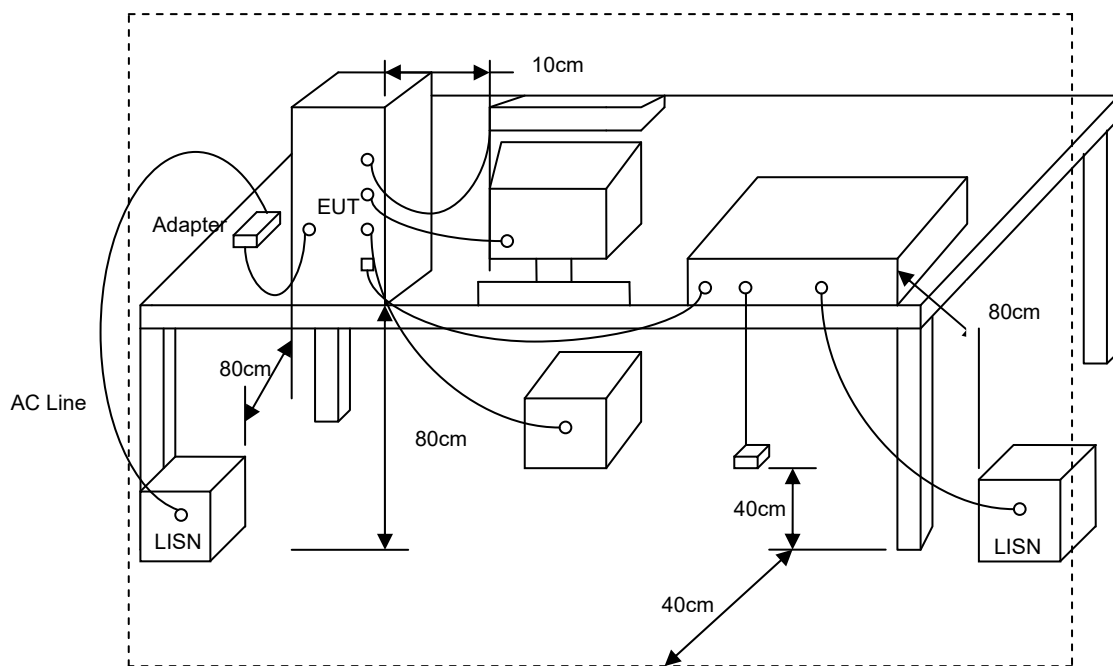
*Decreases with the logarithm of the frequency.

6.2 Test Procedures

- The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- Connect EUT to the power mains through a line impedance stabilization network (LISN).
- All the support units are connecting to the other LISN.
- The LISN provides 50 ohm coupling impedance for the measuring instrument.
- The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
- Both sides of AC line were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.



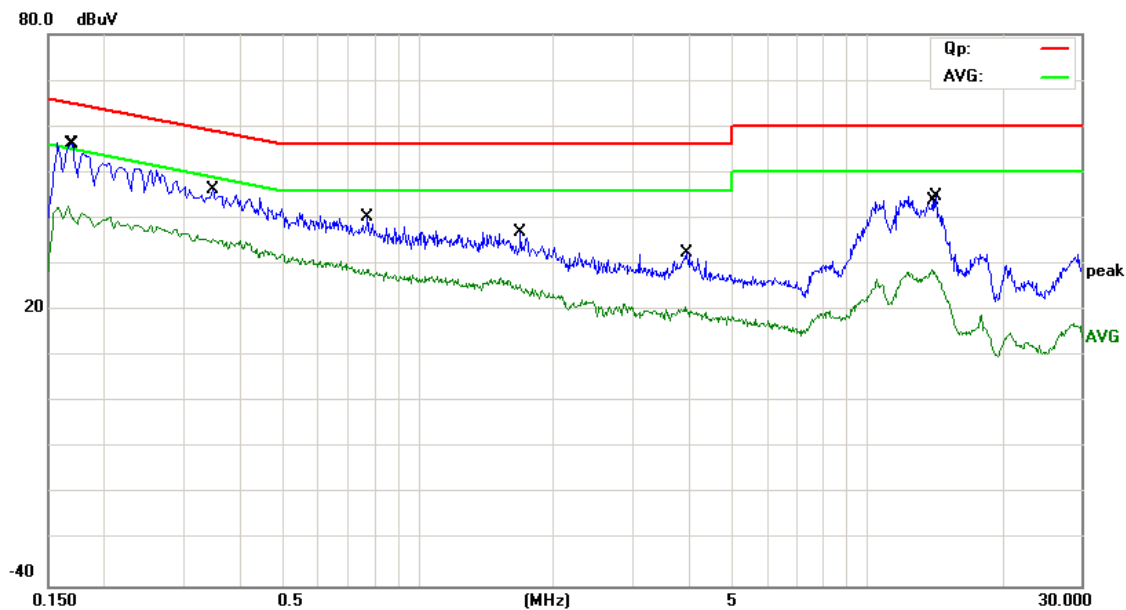
6.3 Typical Test Setup





6.4 Test Result and Data

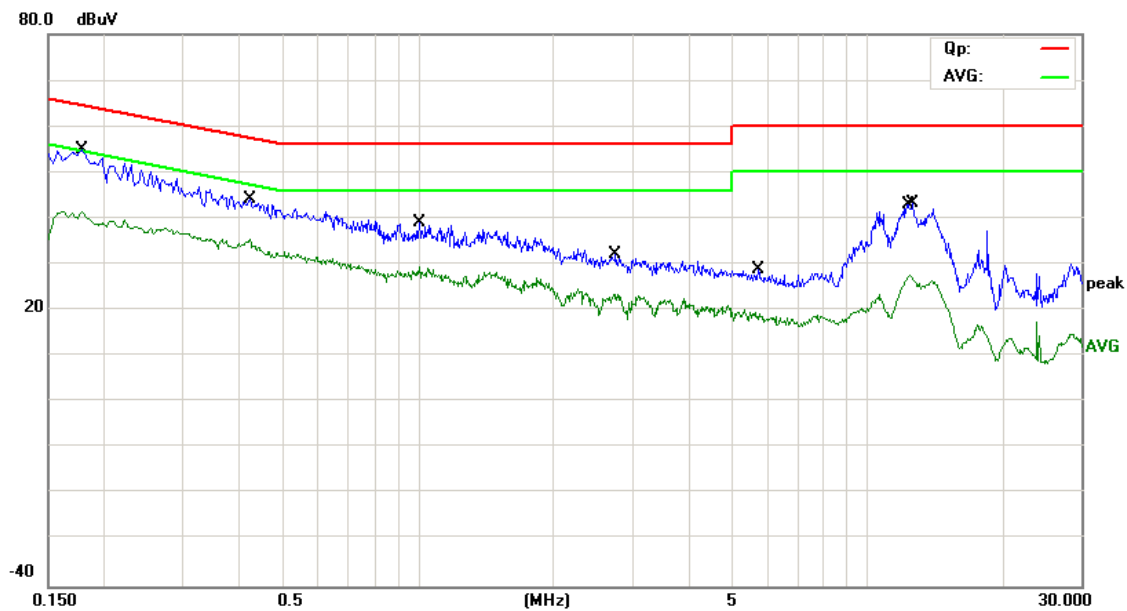
Power	:	DC 5V	Pol/Phase	:	LINE
Test Mode 1	:	802.11 b CH11 TX (Worst)	Temperature	:	26 °C
Memo	:		Humidity	:	55 %



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
		MHz	Level	Factor	ment			Detector
			dBuV	dB	dBuV	dBuV	dB	
1		0.1660	32.90	9.61	42.51	55.16	-12.65	AVG
2	*	0.1700	46.63	9.61	56.24	64.96	-8.72	QP
3		0.3500	36.57	9.59	46.16	58.96	-12.80	QP
4		0.3500	25.72	9.59	35.31	48.96	-13.65	AVG
5		0.7740	30.67	9.60	40.27	56.00	-15.73	QP
6		0.7780	19.24	9.60	28.84	46.00	-17.16	AVG
7		1.6900	27.22	9.60	36.82	56.00	-19.18	QP
8		1.6900	15.93	9.60	25.53	46.00	-20.47	AVG
9		3.9260	11.18	9.62	20.80	46.00	-25.20	AVG
10		3.9700	22.73	9.62	32.35	56.00	-23.65	QP
11		13.9460	19.07	9.70	28.77	50.00	-21.23	AVG
12		14.2140	35.06	9.70	44.76	60.00	-15.24	QP



Power	:	DC 5V	Pol/Phase	:	NEUTRAL
Test Mode 1	:	802.11 b CH11 TX (Worst)	Temperature	:	26 °C
Memo	:		Humidity	:	55 %



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1	*	0.1780	45.20	9.61	54.81	64.58	-9.77	QP
2		0.1780	31.94	9.61	41.55	54.58	-13.03	AVG
3		0.4220	34.46	9.59	44.05	57.41	-13.36	QP
4		0.4220	25.87	9.59	35.46	47.41	-11.95	AVG
5		1.0060	29.40	9.60	39.00	56.00	-17.00	QP
6		1.0060	19.80	9.60	29.40	46.00	-16.60	AVG
7		2.7340	13.82	9.61	23.43	46.00	-22.57	AVG
8		2.7540	22.48	9.61	32.09	56.00	-23.91	QP
9		5.7220	19.32	9.64	28.96	60.00	-31.04	QP
10		5.7460	9.63	9.64	19.27	50.00	-30.73	AVG
11		12.3580	33.35	9.69	43.04	60.00	-16.96	QP
12		12.5060	17.89	9.70	27.59	50.00	-22.41	AVG



7. Test of Radiated Emission

7.1 Test Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

Frequency (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

7.2 Test Procedures

- The EUT was placed on a rotatable table top 0.8 meter above ground.
- The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- The table was rotated 360 degrees to determine the position of the highest radiation.
- The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in

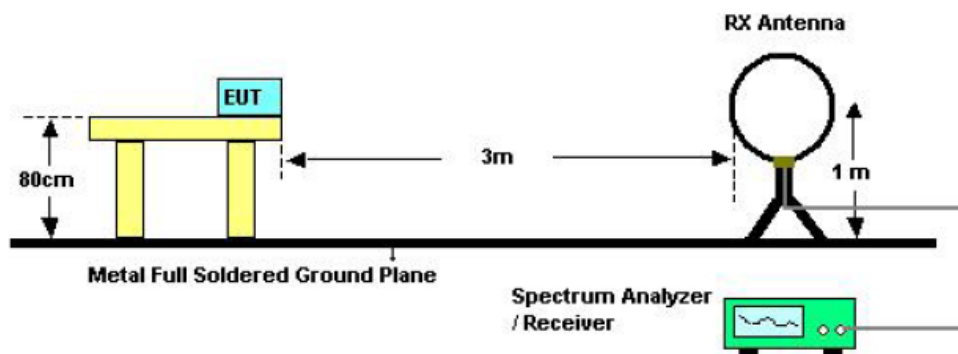


average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

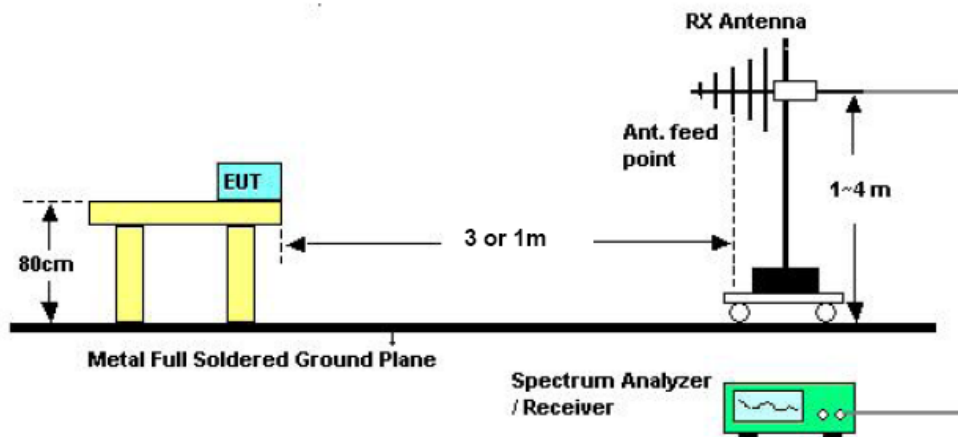
- i. "Cone of radiation" has been considered to be 3dB bandwidth of the measurement antenna.

7.3 Typical Test Setup

For radiated emissions below 30MHz



For radiated emissions above 30MHz



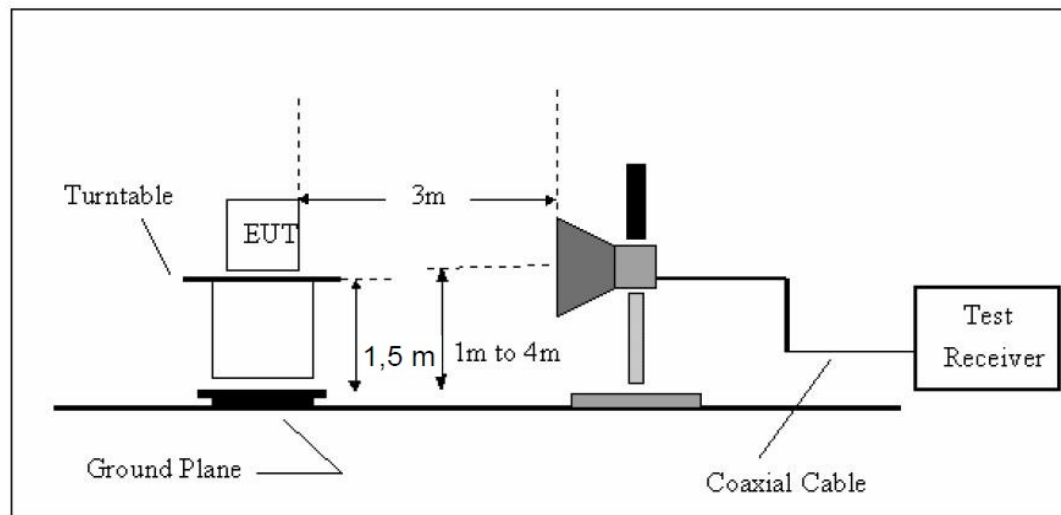
Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].



For radiated emissions frequency above 1GHz



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

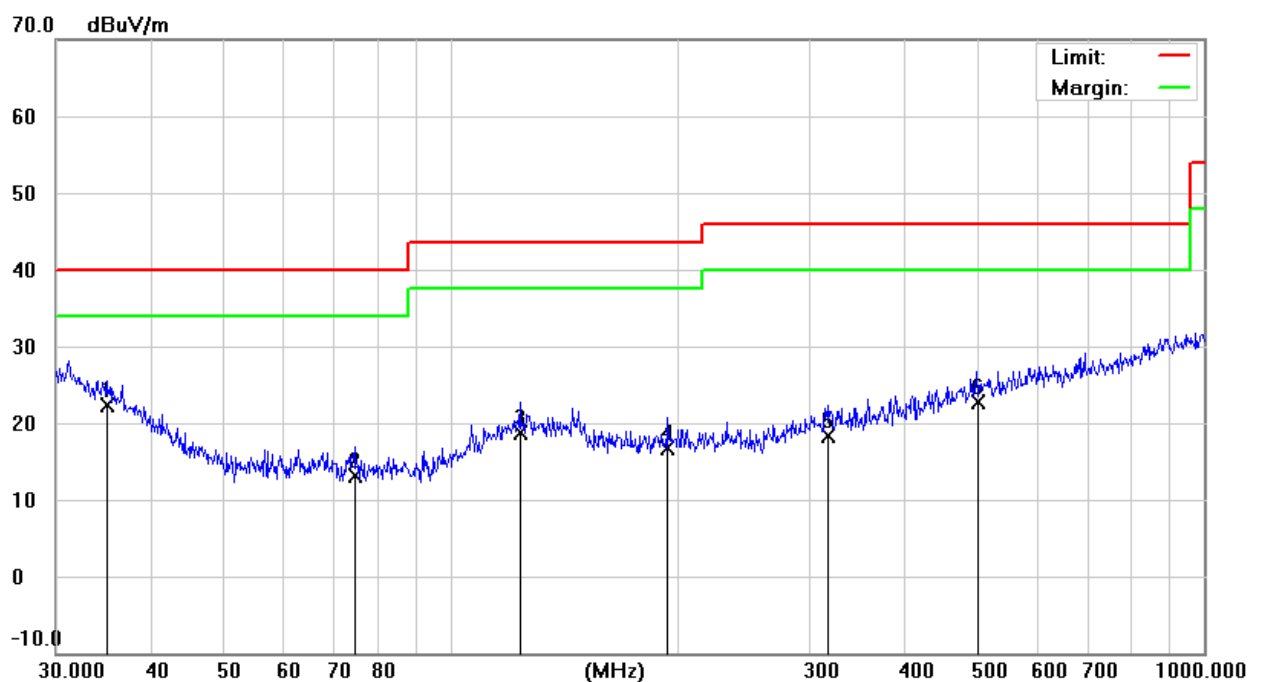


7.4 Test Result and Data (9kHz ~ 30MHz)

The 9kHz - 30MHz spurious emission is under limit 20dB more.

7.5 Test Result and Data (30MHz ~ 1GHz, worst emissions found)

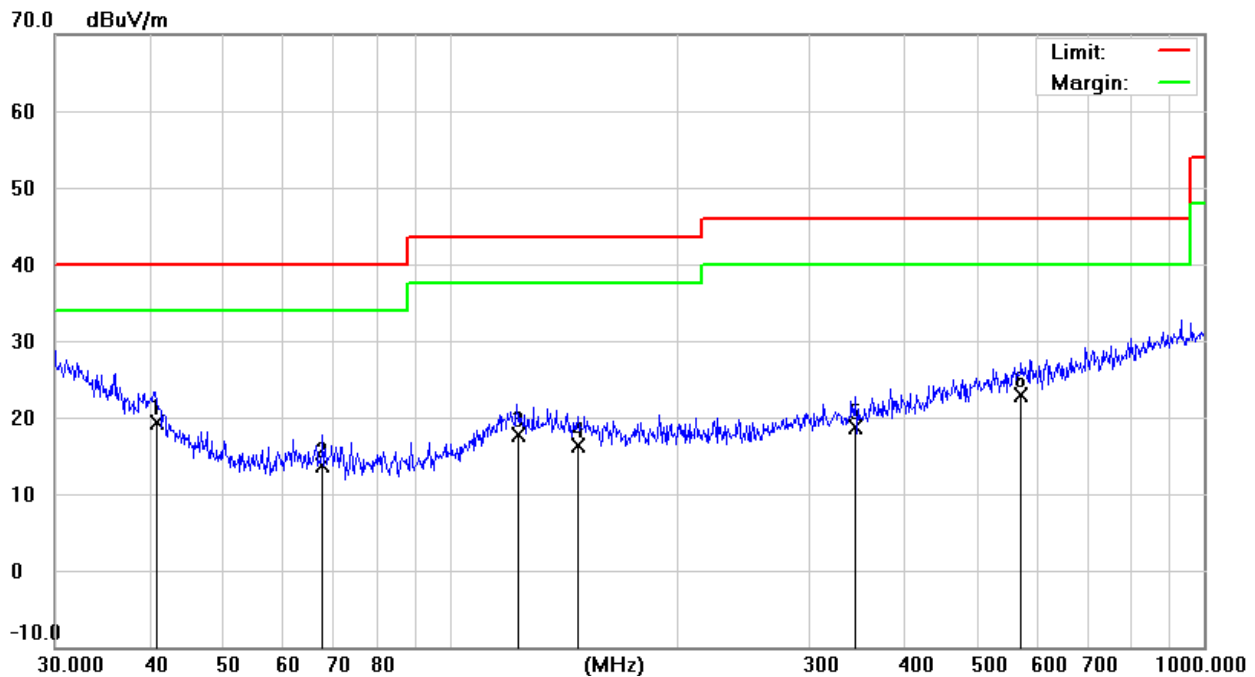
Power	: DC 5V	Pol/Phase	: HORIZONTAL
Test Mode 1	: 802.11 b CH11 TX (Worst)	Temperature	: 25 °C
Memo	:	Humidity	: 66 %



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1	*	35.0048	4.90	17.50	22.40	40.00	-17.60	QP
2		74.6568	4.80	8.21	13.01	40.00	-26.99	QP
3		123.6984	4.80	13.95	18.75	43.50	-24.75	QP
4		194.4534	4.60	12.03	16.63	43.50	-26.87	QP
5		316.5889	4.50	13.82	18.32	46.00	-27.68	QP
6		499.4246	5.01	17.69	22.70	46.00	-23.30	QP



Power	: DC 5V	Pol/Phase	: VERTICAL
Test Mode 1	: 802.11 b CH11 TX (Worst)	Temperature	: 25 °C
Memo	:	Humidity	: 66 %



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
		MHz	Level	Factor	ment			Detector
			dBuV	dB	dBuV/m	dBuV/m	dB	
1	*	40.7016	6.01	13.34	19.35	40.00	-20.65	QP
2		67.9128	5.60	8.15	13.75	40.00	-26.25	QP
3		122.8339	3.80	13.91	17.71	43.50	-25.79	QP
4		147.9214	3.50	12.85	16.35	43.50	-27.15	QP
5		345.5952	4.40	14.37	18.77	46.00	-27.23	QP
6		572.6144	4.50	18.50	23.00	46.00	-23.00	QP



7.6 Test Result and Data (Above 1GHz)

Power	:	DC 5V	Pol/Phase	:	H/V
Test Mode 1	:	802.11b, 1Mbps, CH1 TX	Temperature	:	25 °C
Memo	:		Humidity	:	66 %

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4824.00	65.85	-6.06	59.79	74.00	-14.21	PEAK
4824.00	51.35	-6.06	45.29	54.00	-8.71	AVERAGE
7236.00	50.66	0.18	50.84	74.00	-23.16	PEAK
7236.00	42.00	0.18	42.18	54.00	-11.82	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4824.00	62.45	-6.06	56.39	74.00	-17.61	PEAK
4824.00	52.11	-6.06	46.05	54.00	-7.95	AVERAGE
7236.00	51.23	0.18	51.41	74.00	-22.59	PEAK
7236.00	40.11	0.18	40.29	54.00	-13.71	AVERAGE



Power	:	DC 5V	Pol/Phase	:	H/V
Test Mode 1	:	802.11b, 1Mbps, CH6 TX	Temperature	:	25 °C
Memo	:		Humidity	:	66 %

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4874.00	62.11	-5.93	56.18	74.00	-17.82	PEAK
4874.00	51.86	-5.93	45.93	54.00	-8.07	AVERAGE
7311.00	53.12	0.51	53.63	74.00	-20.37	PEAK
7311.00	39.01	0.51	39.52	54.00	-14.48	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4874.00	60.45	-5.93	54.52	74.00	-19.48	PEAK
4874.00	51.52	-5.93	45.59	54.00	-8.41	AVERAGE
7311.00	52.45	0.51	52.96	74.00	-21.04	PEAK
7311.00	39.65	0.51	40.16	54.00	-13.84	AVERAGE



Power	:	DC 5V	Pol/Phase	:	H/V
Test Mode 1	:	802.11b, 1Mbps, CH11 TX	Temperature	:	25 °C
Memo	:		Humidity	:	66 %

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4924.00	60.36	-5.70	54.66	74.00	-19.34	PEAK
4924.00	49.43	-5.70	43.73	54.00	-10.27	AVERAGE
7386.00	52.18	0.81	52.99	74.00	-21.01	PEAK
7386.00	38.27	0.81	39.08	54.00	-14.92	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4924.00	58.46	-5.70	52.76	74.00	-21.24	PEAK
4924.00	45.49	-5.70	39.79	54.00	-14.21	AVERAGE
7386.00	51.22	0.81	52.03	74.00	-21.97	PEAK
7386.00	37.12	0.81	37.93	54.00	-16.07	AVERAGE



Power	:	DC 5V	Pol/Phase	:	H/V
Test Mode 1	:	802.11g, 6Mbps, CH1 TX	Temperature	:	25 °C
Memo	:		Humidity	:	66 %

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4824.00	59.34	-6.06	53.28	74.00	-20.72	PEAK
4824.00	46.03	-6.06	39.97	54.00	-14.03	AVERAGE
7236.00	52.18	0.18	52.36	74.00	-21.64	PEAK
7236.00	38.42	0.18	38.60	54.00	-15.40	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4824.00	59.96	-6.06	53.90	74.00	-20.10	PEAK
4824.00	45.23	-6.06	39.17	54.00	-14.83	AVERAGE
7236.00	52.67	0.18	52.85	74.00	-21.15	PEAK
7236.00	37.32	0.18	37.50	54.00	-16.50	AVERAGE



Power	:	DC 5V	Pol/Phase	:	H/V
Test Mode 1	:	802.11g, 6Mbps, CH6 TX	Temperature	:	25 °C
Memo	:		Humidity	:	66 %

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4874.00	59.44	-5.93	53.51	74.00	-20.49	PEAK
4874.00	48.52	-5.93	42.59	54.00	-11.41	AVERAGE
7311.00	51.67	0.51	52.18	74.00	-21.82	PEAK
7311.00	37.65	0.51	38.16	54.00	-15.84	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4874.00	59.41	-5.93	53.48	74.00	-20.52	PEAK
4874.00	47.22	-5.93	41.29	54.00	-12.71	AVERAGE
7311.00	50.66	0.51	51.17	74.00	-22.83	PEAK
7311.00	38.37	0.51	38.88	54.00	-15.12	AVERAGE



Power	:	DC 5V	Pol/Phase	:	H/V
Test Mode 1	:	802.11g, 6Mbps, CH11 TX	Temperature	:	25 °C
Memo	:		Humidity	:	66 %

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4924.00	63.64	-5.70	57.94	74.00	-16.06	PEAK
4924.00	50.55	-5.70	44.85	54.00	-9.15	AVERAGE
7386.00	52.27	0.81	53.08	74.00	-20.92	PEAK
7386.00	38.33	0.81	39.14	54.00	-14.86	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4924.00	59.11	-5.70	53.41	74.00	-20.59	PEAK
4924.00	47.12	-5.70	41.42	54.00	-12.58	AVERAGE
7386.00	53.45	0.81	54.26	74.00	-19.74	PEAK
7386.00	40.67	0.81	41.48	54.00	-12.52	AVERAGE



Power	:	DC 5V	Pol/Phase	:	H/V
Test Mode 1	:	802.11n HT20, 7.2Mbps, CH1 TX	Temperature	:	25 °C
Memo	:		Humidity	:	66 %

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4824.00	62.86	-6.06	56.80	74.00	-17.20	PEAK
4824.00	50.14	-6.06	44.08	54.00	-9.92	AVERAGE
7236.00	52.63	0.18	52.81	74.00	-21.19	PEAK
7236.00	38.88	0.18	39.06	54.00	-14.94	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4824.00	62.47	-6.06	56.41	74.00	-17.59	PEAK
4824.00	50.15	-6.06	44.09	54.00	-9.91	AVERAGE
7236.00	52.65	0.18	52.83	74.00	-21.17	PEAK
7236.00	39.43	0.18	39.61	54.00	-14.39	AVERAGE



Power	:	DC 5V	Pol/Phase	:	H/V
Test Mode 1	:	802.11n HT20, 7.2Mbps, CH6 TX	Temperature	:	25 °C
Memo	:		Humidity	:	66 %

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4874.00	63.66	-5.93	57.73	74.00	-16.27	PEAK
4874.00	50.27	-5.93	44.34	54.00	-9.66	AVERAGE
7311.00	52.42	0.51	52.93	74.00	-21.07	PEAK
7311.00	40.09	0.51	40.60	54.00	-13.40	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4874.00	63.25	-5.93	57.32	74.00	-16.68	PEAK
4874.00	49.47	-5.93	43.54	54.00	-10.46	AVERAGE
7311.00	52.29	0.51	52.80	74.00	-21.20	PEAK
7311.00	41.31	0.51	41.82	54.00	-12.18	AVERAGE



Power	:	DC 5V	Pol/Phase	:	H/V
Test Mode 1	:	802.11n HT20, 7.2Mbps, CH11 TX	Temperature	:	25 °C
Memo	:		Humidity	:	66 %

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4924.00	60.33	-5.70	54.63	74.00	-19.37	PEAK
4924.00	50.21	-5.70	44.51	54.00	-9.49	AVERAGE
7386.00	52.27	0.81	53.08	74.00	-20.92	PEAK
7386.00	37.54	0.81	38.35	54.00	-15.65	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4924.00	61.28	-5.70	55.58	74.00	-18.42	PEAK
4924.00	49.75	-5.70	44.05	54.00	-9.95	AVERAGE
7386.00	53.52	0.81	54.33	74.00	-19.67	PEAK
7386.00	37.36	0.81	38.17	54.00	-15.83	AVERAGE

The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Loss – Preamplifier Factor.

As shown in Section, for frequencies above 1000 MHz. the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

No any other emissions level which are attenuated less than 20dB below the limit. According to 15.31(o), The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this Part. Hence there no other emissions have been reported.



8. 6dB Bandwidth Measurement Data

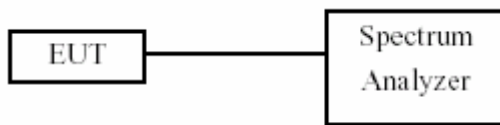
8.1 Test Limit

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

8.2 Test Procedures

- a. The transmitter output was connected to the spectrum analyzer.
- b. Set RBW of spectrum analyzer to 1~5% of the emission bandwidth and VBW $\geq 3 \times$ RBW.
- c. The 6 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.
- d. The 6dB Bandwidth was measured and recorded.

8.3 Test Setup Layout





8.4 Test Result and Data

Test Date: Feb. 25, 2018

Temperature: 24°C

Atmospheric pressure: 996 pha

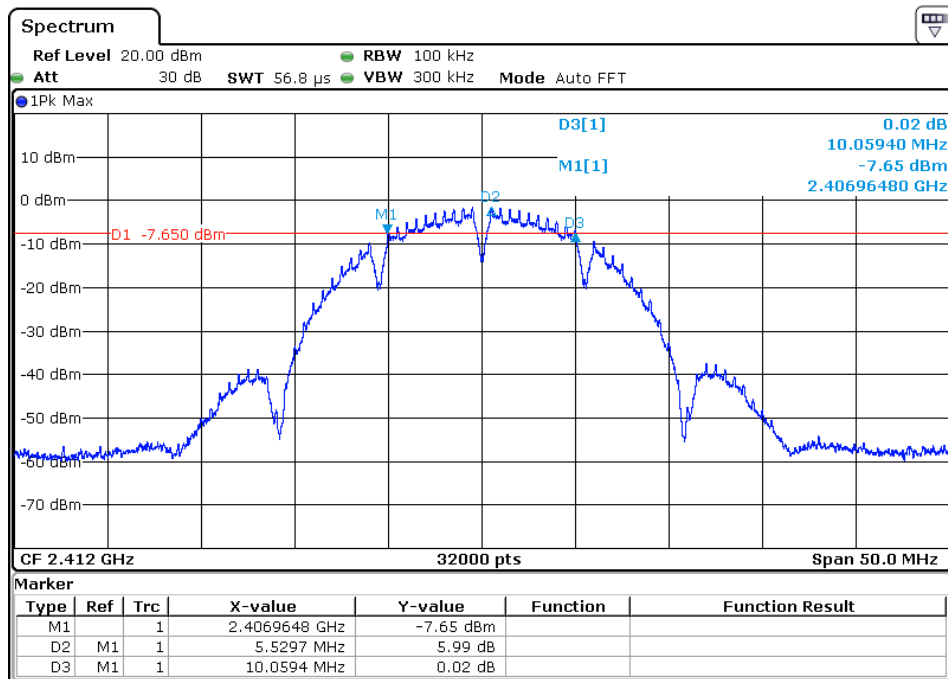
Humidity: 58%

Modulation Standard	Channel	Frequency (MHz)	6dB Bandwidth (MHz)
802.11b (1Mbps)	01	2412	10.0594
	06	2437	10.0594
	11	2462	10.0609
802.11g (6Mbps)	01	2412	16.5359
	06	2437	16.5516
	11	2462	16.4875
802.11n HT20 (7.2Mbps)	01	2412	17.7953
	06	2437	17.7984
	11	2462	17.7984



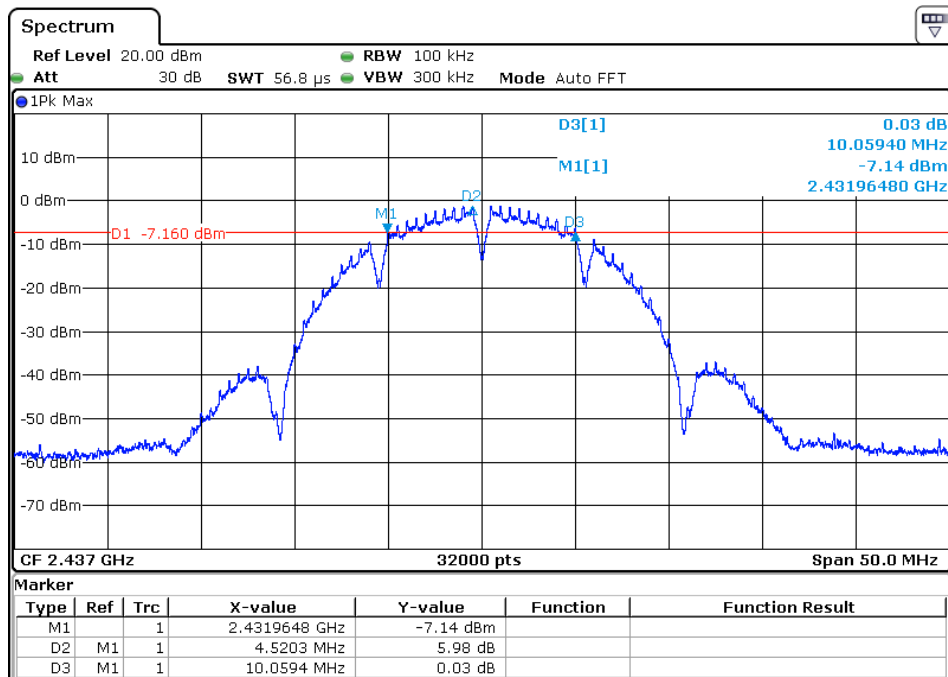
Modulation Standard: 802.11b (1Mbps)

Channel: 01



Modulation Standard: 802.11b (1Mbps)

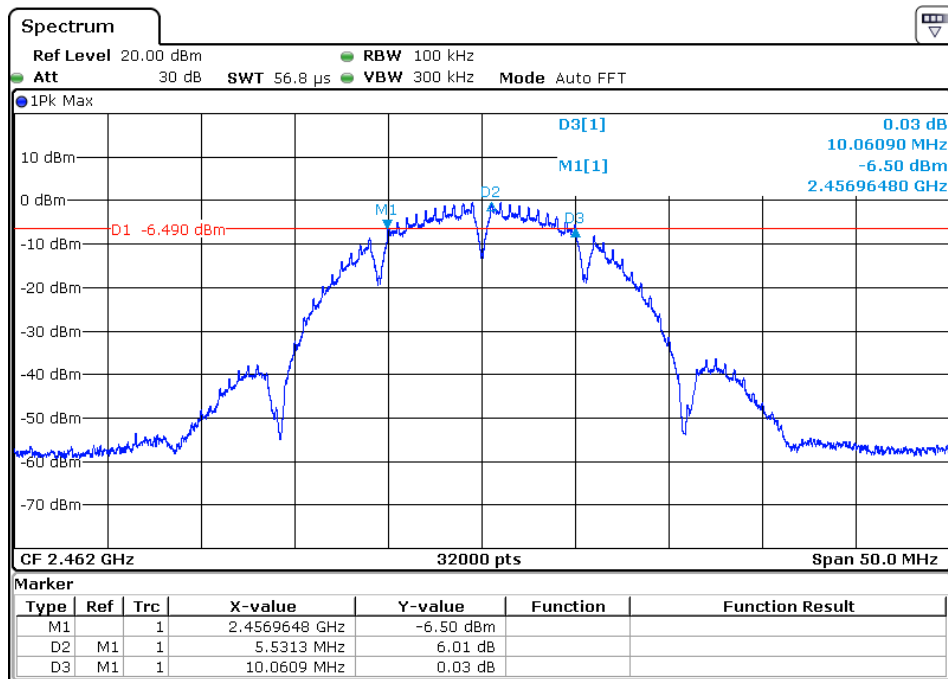
Channel: 06





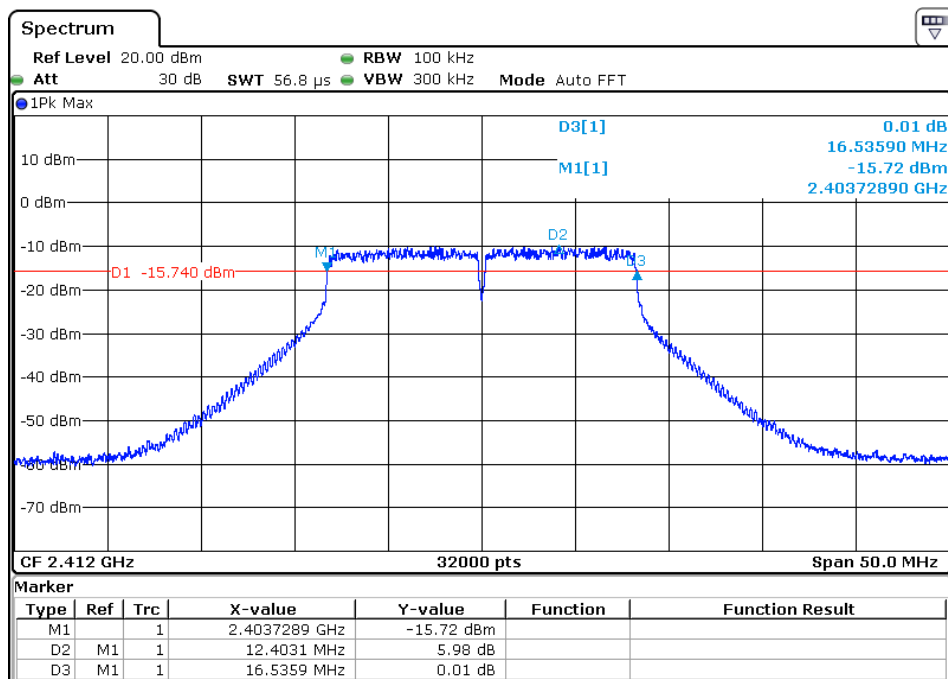
Modulation Standard: 802.11b (1Mbps)

Channel: 11



Modulation Standard: 802.11g (6Mbps)

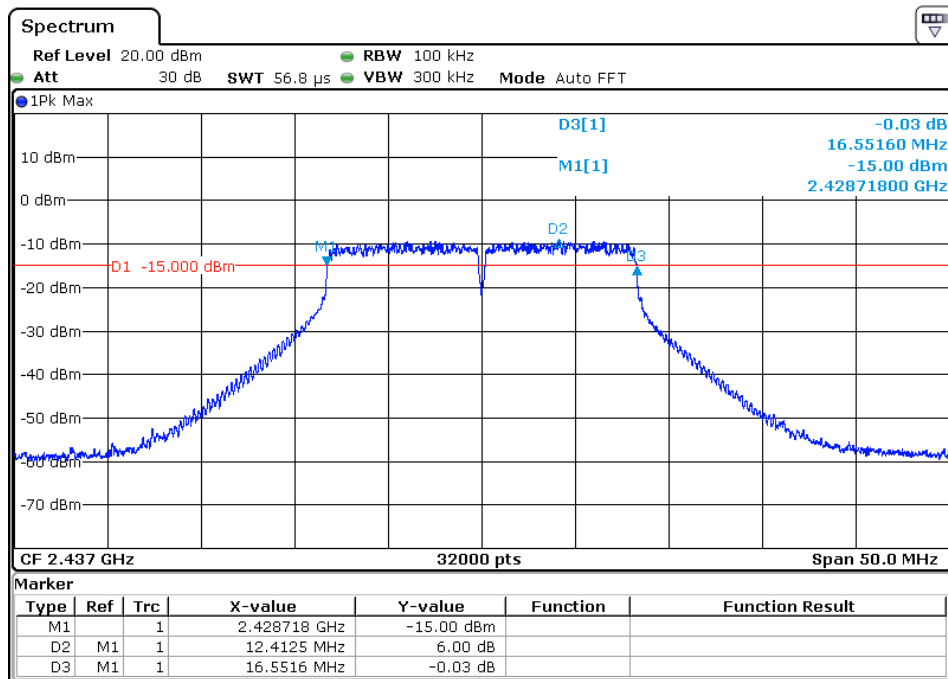
Channel: 01





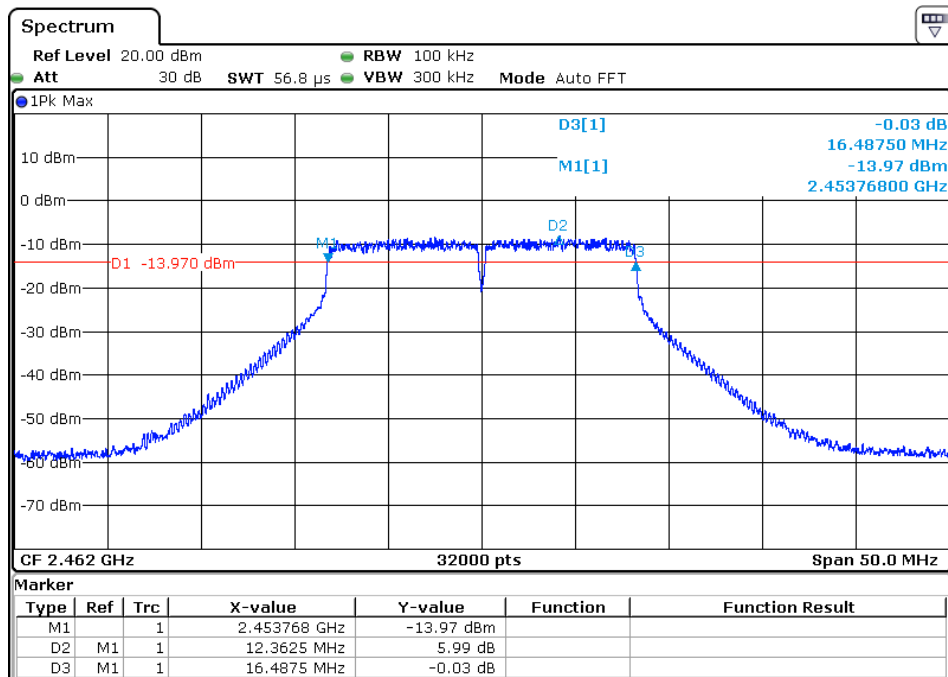
Modulation Standard: 802.11g (6Mbps)

Channel: 06



Modulation Standard: 802.11g (6Mbps)

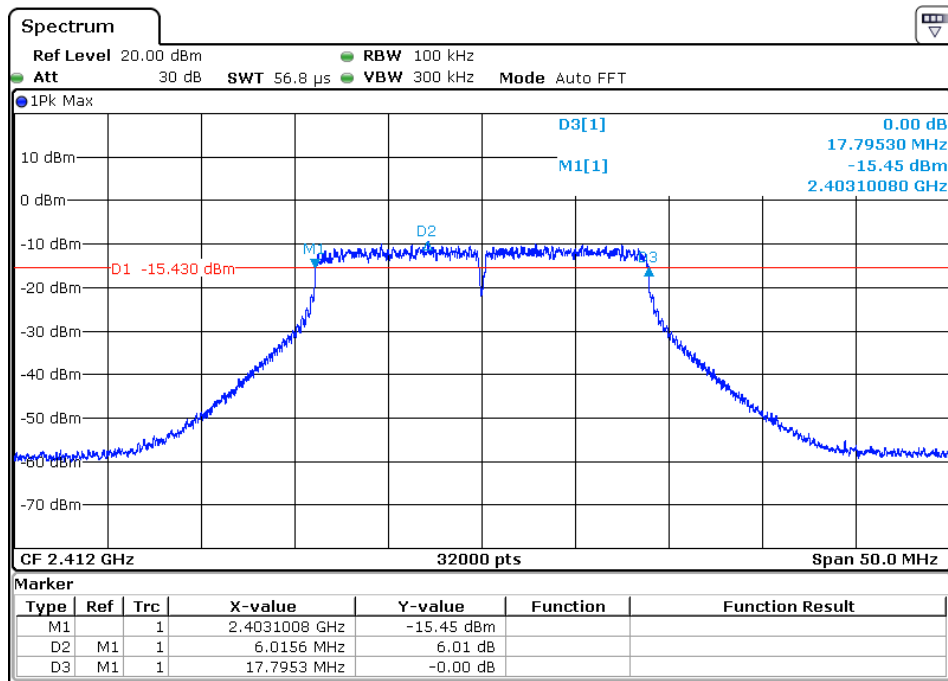
Channel: 11





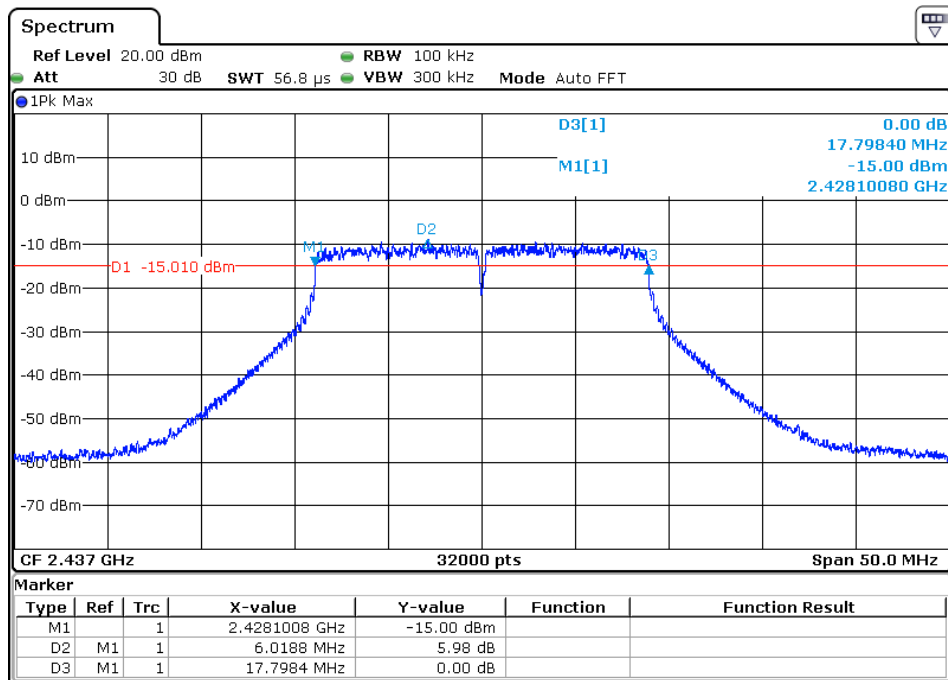
Modulation Standard: 802.11n HT20 (7.2Mbps)

Channel: 01



Modulation Standard: 802.11n HT20 (7.2Mbps)

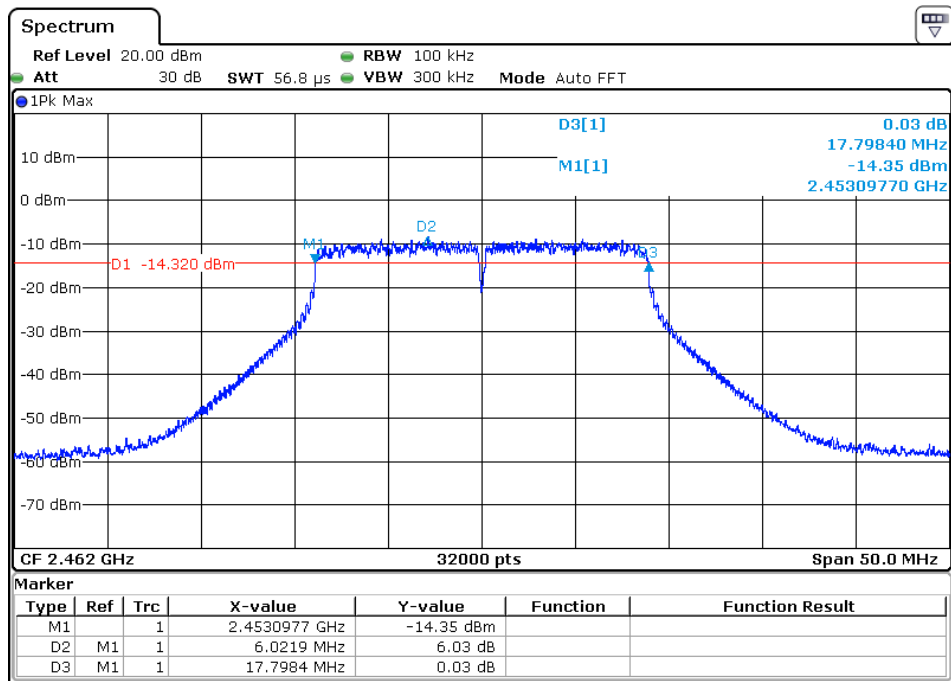
Channel: 06





Modulation Standard: 802.11n HT20 (7.2Mbps)

Channel: 11





9. Maximum Peak Output Power

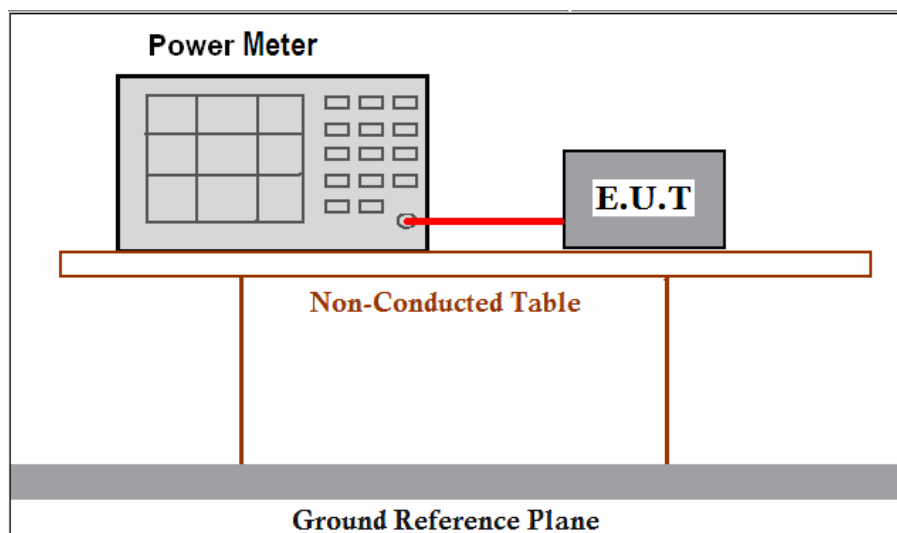
9.1 Test Limit

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

9.2 Test Procedures

According to FCC/KDB-558074 D01 v04 Measurement using an RF average power meter.

9.3 Test Setup Layout





9.4 Test Result and Data

Test Date: Feb. 25, 2018

Temperature: 24°C

Atmospheric pressure: 996 pha

Humidity: 58%

Modulation Standard	Channel	Frequency (MHz)	Peak Power Output (dBm)	LIMIT (dBm)	LIMIT (W)
802.11b (1Mbps)	01	2412	13.02	30	1
	06	2437	13.15	30	1
	11	2462	13.24	30	1
802.11g (6Mbps)	01	2412	13.75	30	1
	06	2437	13.89	30	1
	11	2462	13.97	30	1
802.11n HT20 (7.2Mbps)	01	2412	14.26	30	1
	06	2437	14.58	30	1
	11	2462	14.45	30	1



10. Power Spectral Density

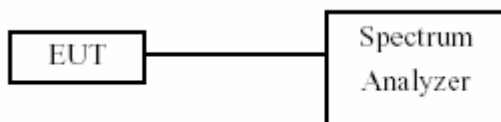
10.1 Test Limit

The Maximum of Power Spectral Density Measurement is 8dBm

10.2 Test Procedures

- a. The transmitter output was connected to spectrum analyzer.
- b. The spectrum analyzer's resolution bandwidth were set at 3KHz RBW and 30KHz VBW as that of the fundamental frequency. Set the sweep time=auto couple.
- c. The power spectral density was measured and recorded.

10.3 Test Setup Layout





10.4 Test Result and Data

Test Date: Feb. 25, 2018

Temperature: 24°C

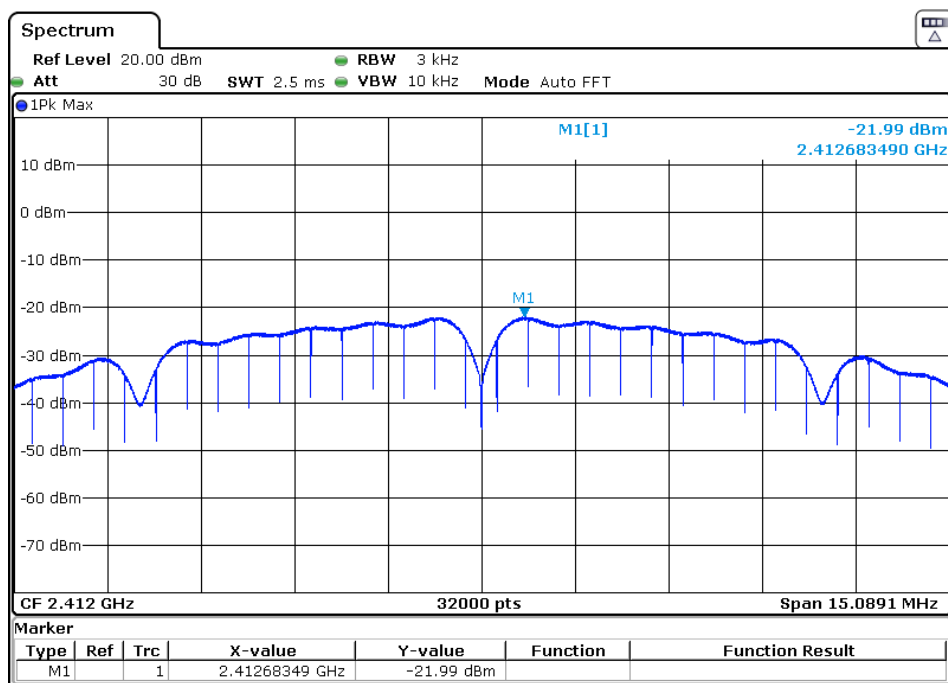
Atmospheric pressure: 996 pha

Humidity: 58%

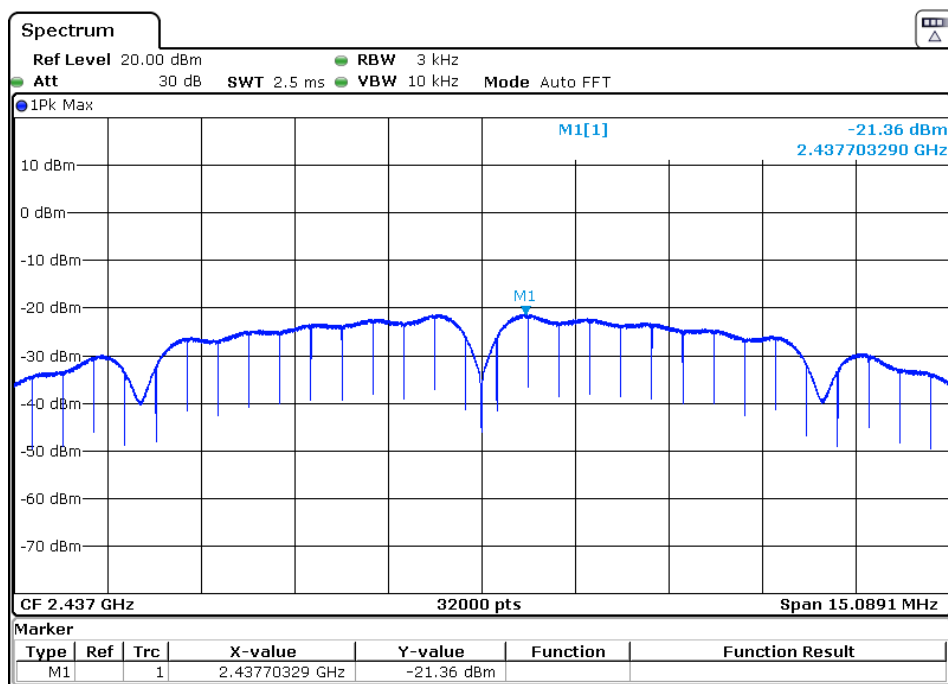
Modulation Standard	Channel	Frequency (MHz)	Measured Power Density (dBm)
802.11b (1Mbps)	01	2412	-21.99
	06	2437	-21.36
	11	2462	-20.51
802.11g (6Mbps)	01	2412	-24.45
	06	2437	-23.52
	11	2462	-23.01
802.11n HT20 (7.2Mbps)	01	2412	-23.80
	06	2437	-22.83
	11	2462	-22.27



Modulation Standard: 802.11b (1Mbps)
Channel: 01



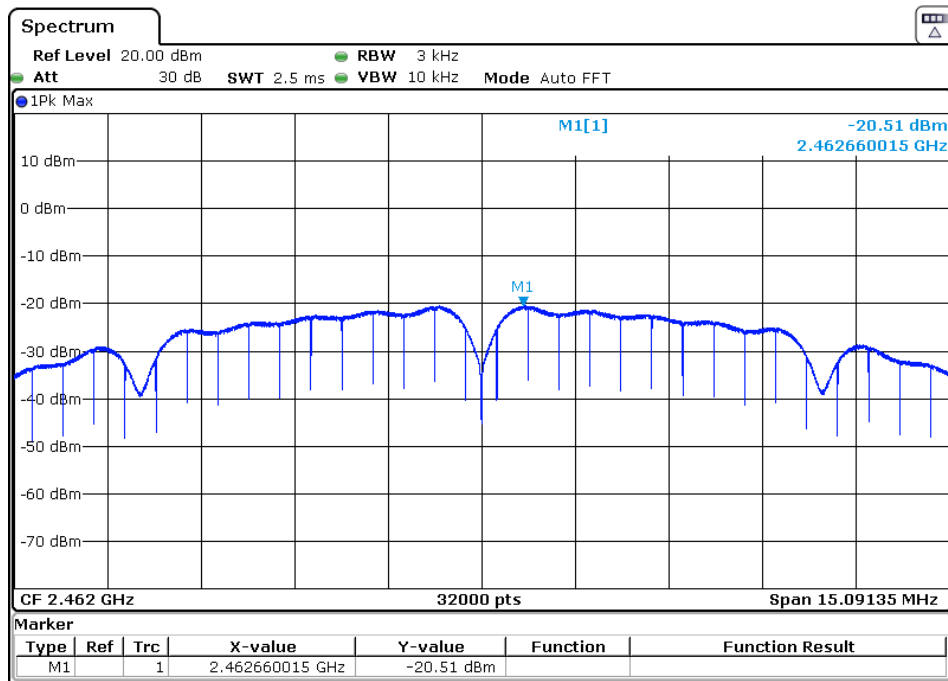
Modulation Standard: 802.11b (1Mbps)
Channel: 06





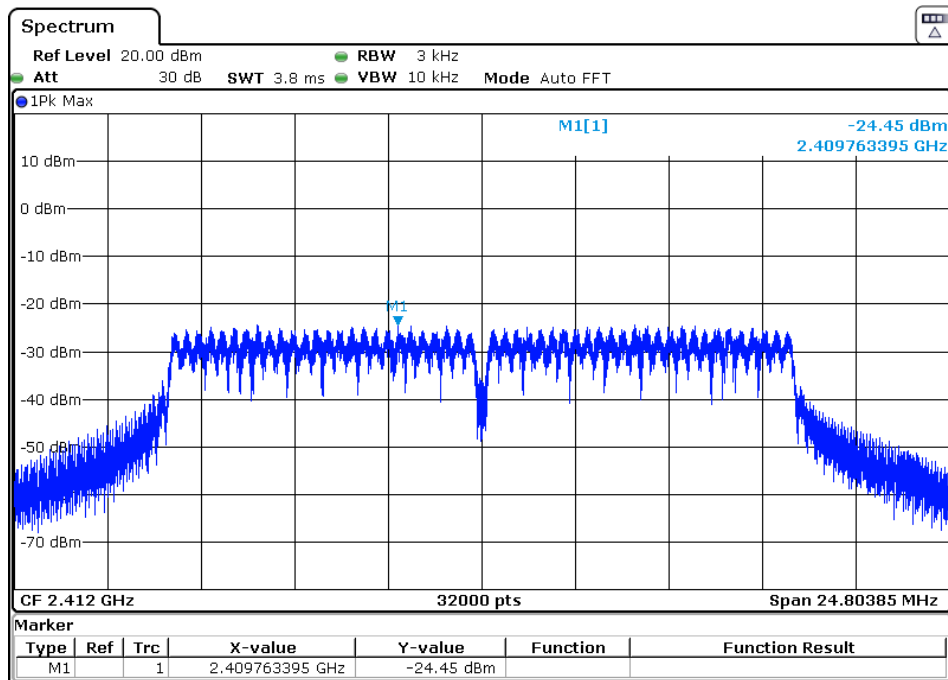
Modulation Standard: 802.11b (1Mbps)

Channel: 11



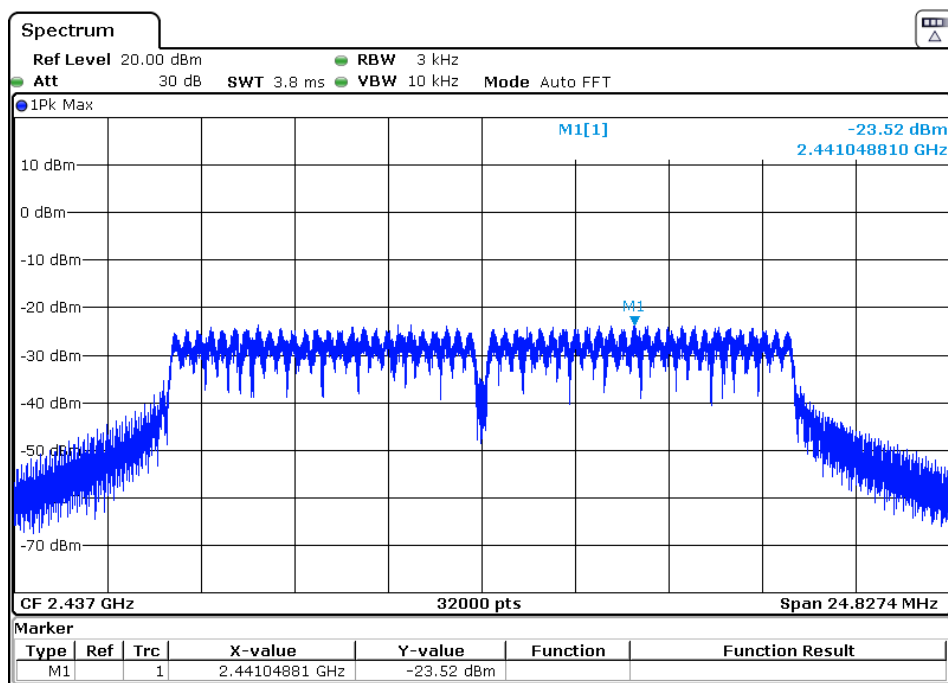
Modulation Standard: 802.11g (6Mbps)

Channel: 01

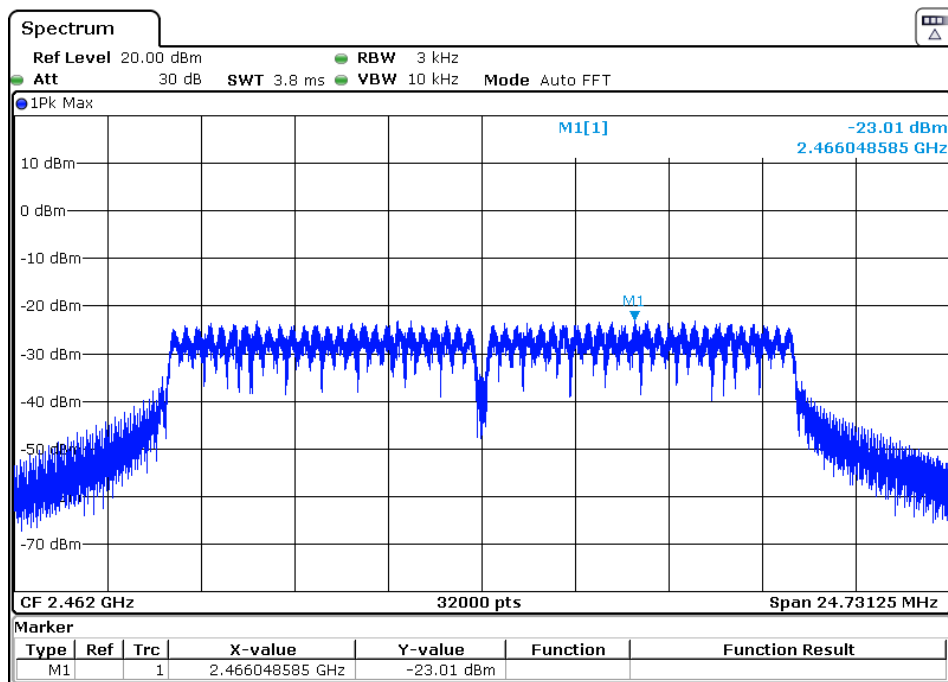




Modulation Standard: 802.11g (6Mbps)
Channel: 06



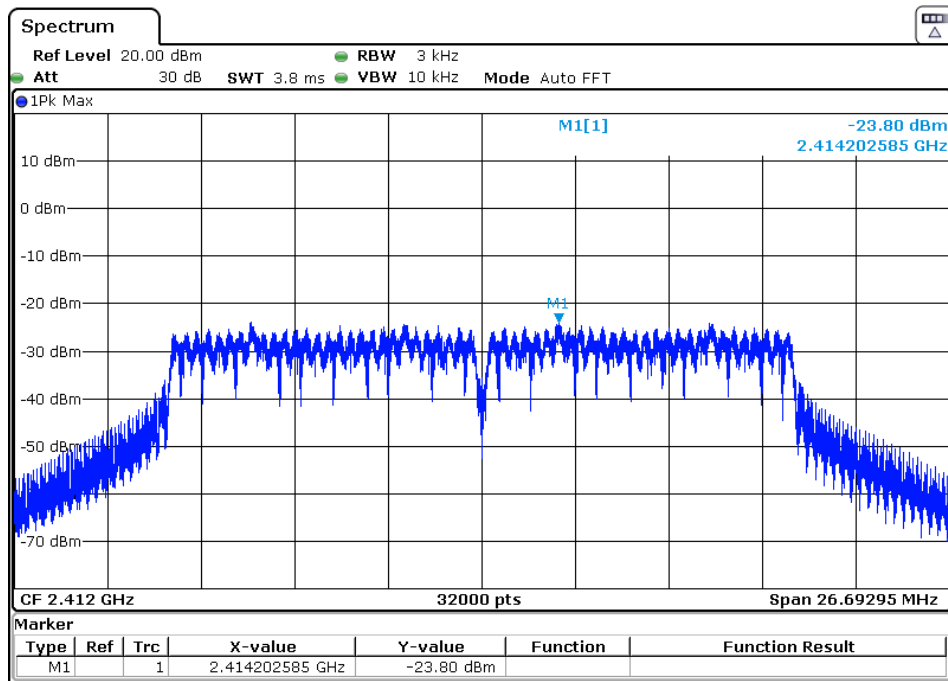
Modulation Standard: 802.11g (6Mbps)
Channel: 11





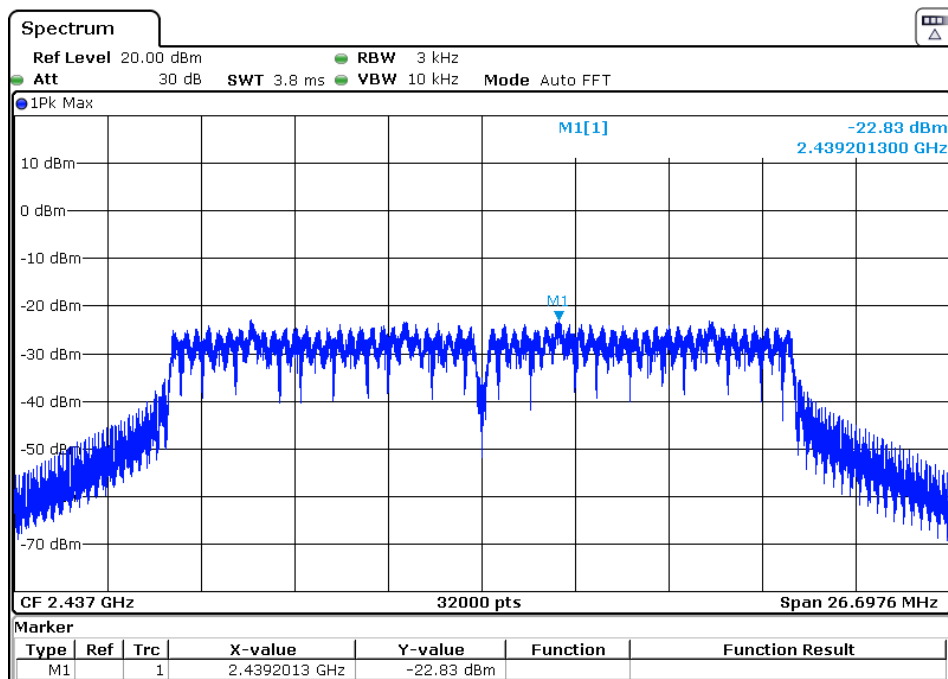
Modulation Standard: 802.11n HT20 (7.2Mbps)

Channel: 01



Modulation Standard: 802.11n HT20 (7.2Mbps)

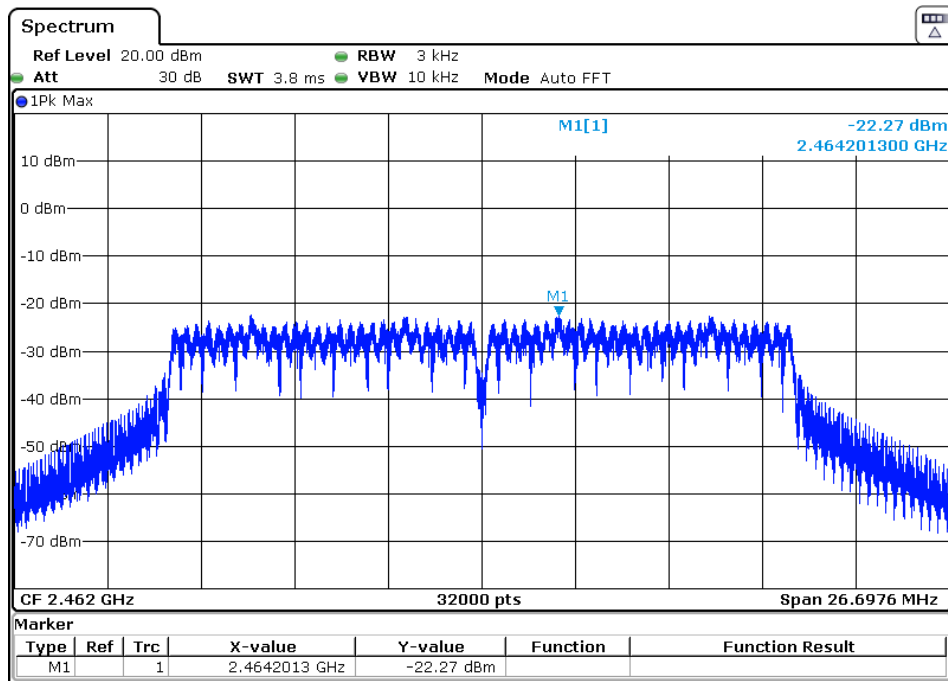
Channel: 06





Modulation Standard: 802.11n HT20 (7.2Mbps)

Channel: 11





11. Band Edges Measurement

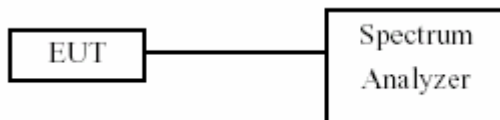
11.1 Test Limit

Below -30dB of the highest emission level of operating band (In 100 kHz Resolution Bandwidth)

11.2 Test Procedure

- a. The transmitter output was connected to the spectrum analyzer via a low lose cable.
- b. Set RBW of spectrum analyzer to 100 KHz and VBW of spectrum analyzer to 300 KHz with convenient frequency span including 100 KHz bandwidth from band edge.
- c. Peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20dB relative to the maximum measured in-band peak PSD level.
- d. The band edges was measured and recorded.

11.3 Test Setup Layout





11.4 Test Result and Data

Test Date: Feb. 25, 2018

Temperature: 24°C

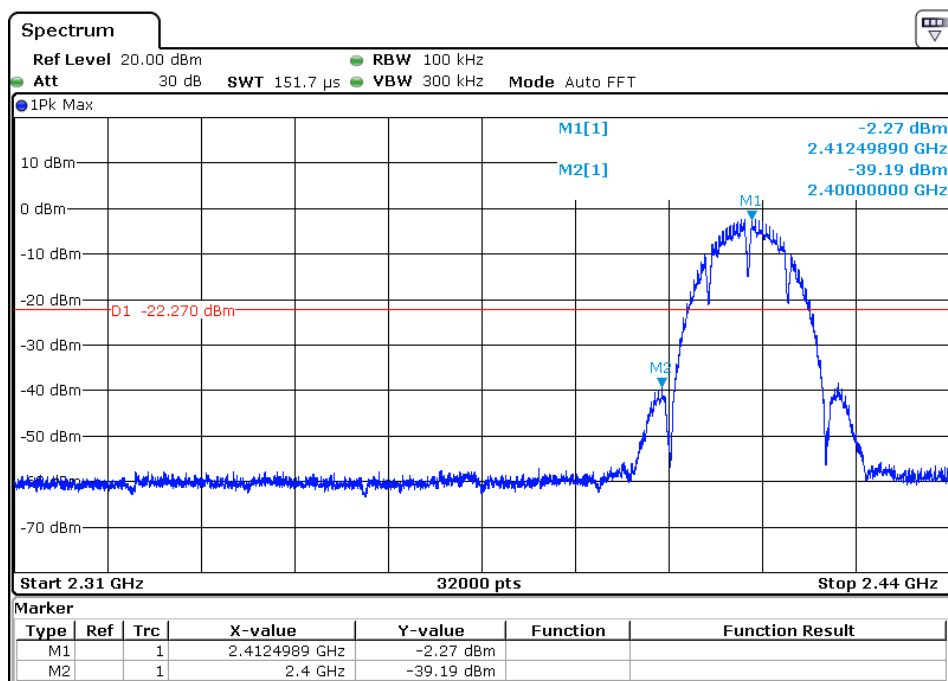
Atmospheric pressure: 996 pha

Humidity: 58%

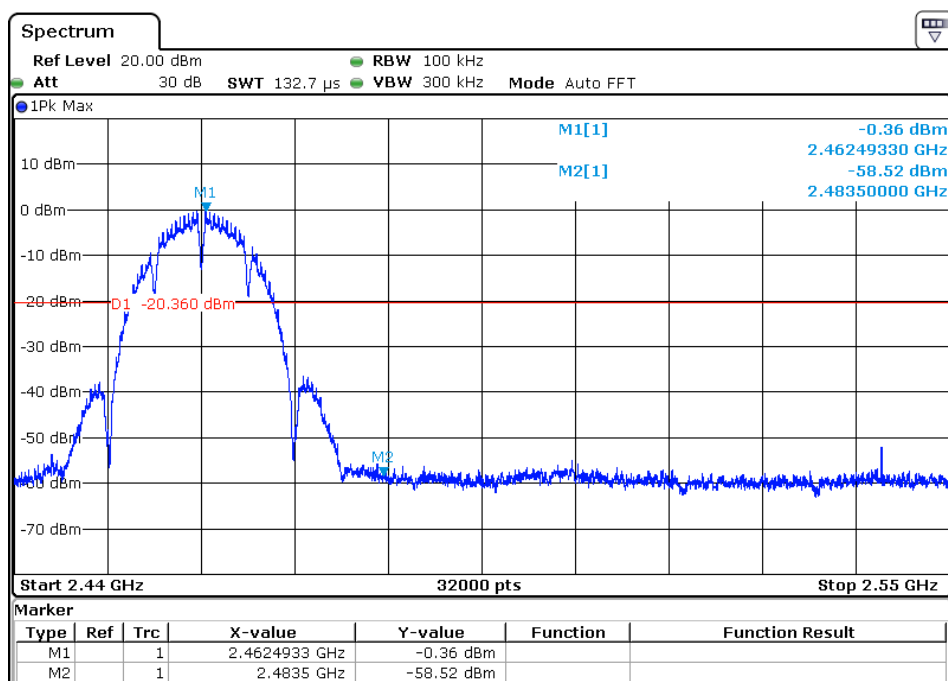
Modulation Standard	Channel	Frequency (MHz)	maximum value in frequency (MHz)	maximum value (dBm)
802.11b (1Mbps)	01	2412	2400.00	-39.19
	11	2462	2483.50	-58.52
802.11g (6Mbps)	01	2412	2400.00	-40.46
	11	2462	2483.50	-58.24
802.11n HT20 (7.2Mbps)	01	2412	2400.00	-38.17
	11	2462	2483.50	-59.87



Modulation Standard: 802.11b (1Mbps)
Channel: 01



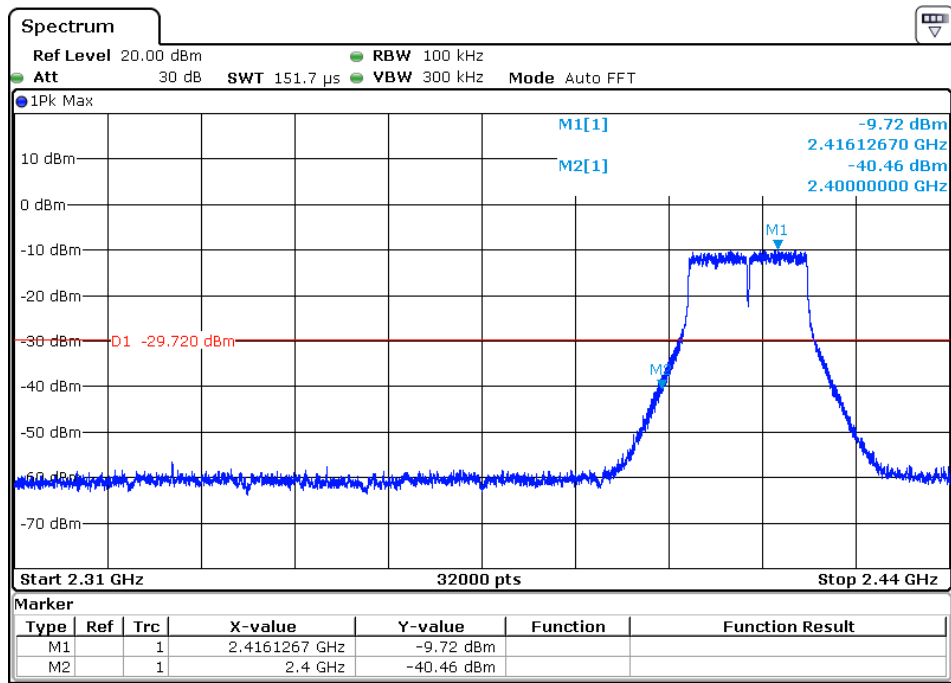
Modulation Standard: 802.11b (1Mbps)
Channel: 11





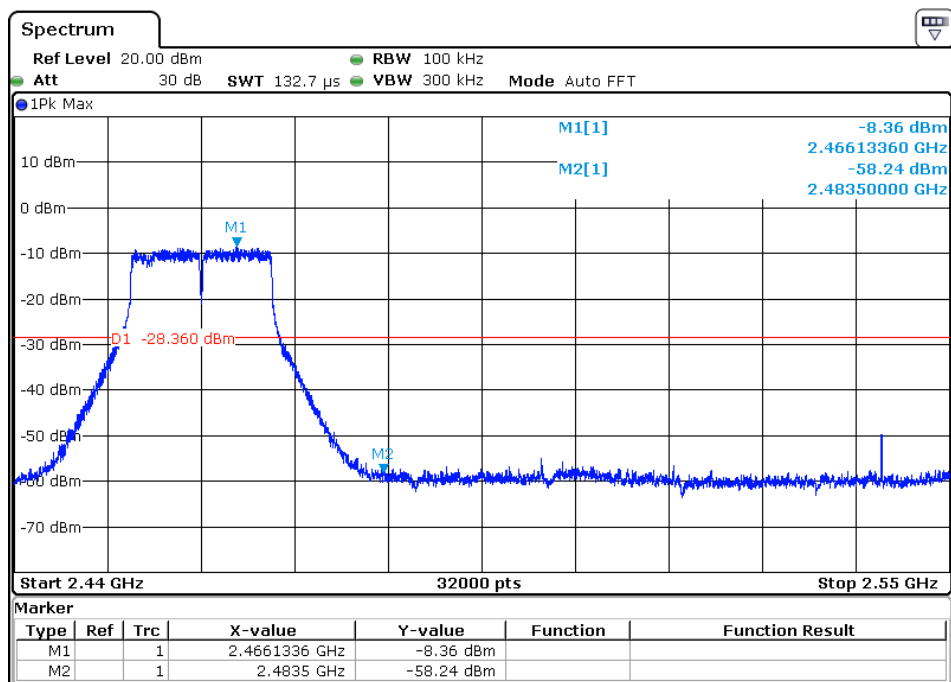
Modulation Standard: 802.11g (6Mbps)

Channel: 1



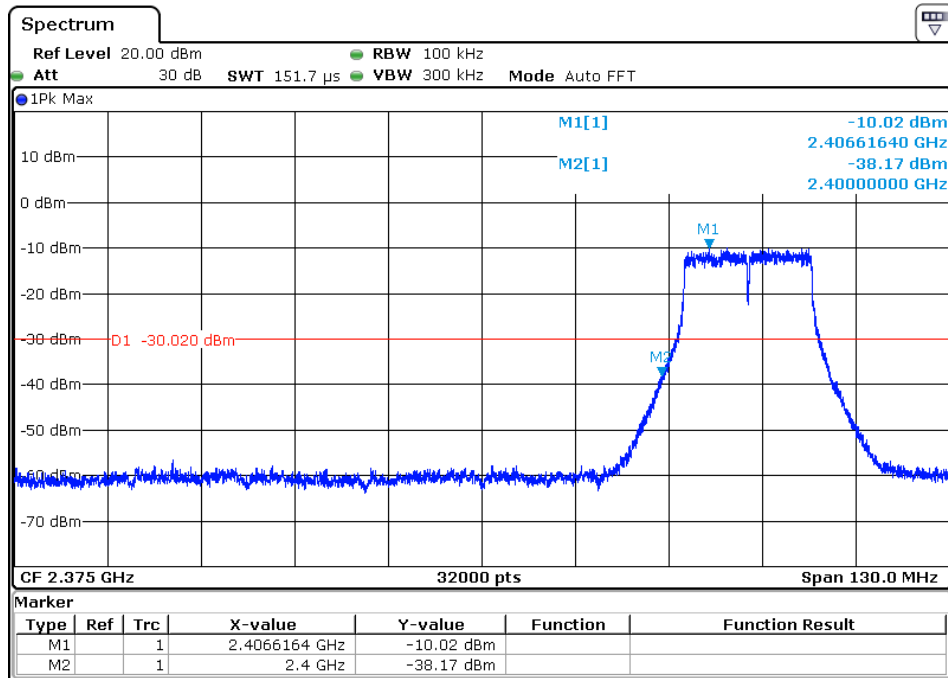
Modulation Standard: 802.11g (6Mbps)

Channel: 11



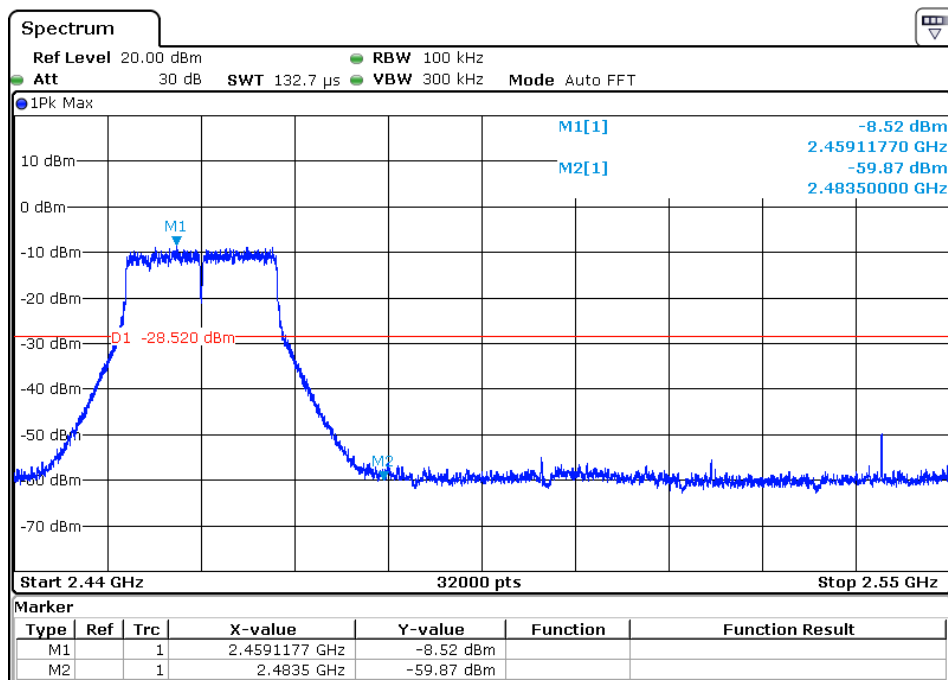
Modulation Standard: 802.11n HT20 (7.2Mbps)

Channel: 01



Modulation Standard: 802.11n HT20 (7.2Mbps)

Channel: 11





11.5 Restrict Band Emission Measurement Data

Power	:	DC 5V	Pol/Phase	:	H/V
Test Mode 1	:	Tx	Temperature	:	26 °C
Memo	:		Humidity	:	55 %

IEEE 802.11b mode with 1Mbps data rate

Channel 1						Fundamental Frequency: 2412 MHz				
Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result (dBuV/m)	Remark	Limit (dBuV/m)		Margin (dB)	Table Deg.	Ant High (m)
						Peak	Ave			
						Peak	Ave			
2390.00	H	53.68	-14.08	39.60	Peak	74	--	-34.40	0	1.5
2390.00	H	44.77	-14.08	30.69	Ave	--	54	-23.31	0	1.5
2351.88	V	54.05	-14.05	40.00	Peak	74	--	-34.00	360	1.5
2351.88	V	43.85	-14.05	29.80	Ave	--	54	-24.20	360	1.5
Channel 11						Fundamental Frequency: 2462 MHz				
Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result (dBuV/m)	Remark	Limit (dBuV/m)		Margin (dB)	Table Deg.	Ant High (m)
						Peak	Ave			
						Peak	Ave			
2483.50	H	53.37	-13.79	39.58	Peak	74	--	-34.42	356	1.5
2483.50	H	42.55	-13.79	28.76	Ave	--	54	-25.24	356	1.5
2493.74	V	51.28	-13.83	37.45	Peak	74	--	-36.55	360	1.5
2493.74	V	41.98	-13.83	28.15	Ave	--	54	-25.85	360	1.5



IEEE 802.11g mode with 6 Mbps data rate

Channel 1						Fundamental Frequency: 2412 MHz				
Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result (dBuV/m)	Remark	Limit (dBuV/m)		Margin (dB)	Table Deg.	Ant High (m)
						Peak	Ave			
2390.00	H	55.04	-14.08	40.96	Peak	74	--	-33.04	0	1.5
2390.00	H	44.25	-14.08	30.17	Ave	--	54	-23.83	0	1.5
2349.53	V	58.11	-14.05	44.06	Peak	74	--	-29.94	360	1.5
2349.53	V	49.58	-14.05	35.53	Ave	--	54	-18.47	360	1.5
Channel 11						Fundamental Frequency: 2462 MHz				
Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result (dBuV/m)	Remark	Limit (dBuV/m)		Margin (dB)	Table Deg.	Ant High (m)
						Peak	Ave			
2483.50	H	56.37	-13.79	42.58	Peak	74	--	-31.42	0	1.5
2483.50	H	44.06	-13.79	30.27	Ave	--	54	-23.73	0	1.5
2496.23	V	52.68	-13.83	38.85	Peak	74	--	-35.15	2	1.5
2496.23	V	41.74	-13.83	27.91	Ave	--	54	-26.09	2	1.5

IEEE 802.11n HT20 mode with 7.2Mbps data rate

Channel 1						Fundamental Frequency: 2412 MHz				
Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result (dBuV/m)	Remark	Limit (dBuV/m)		Margin (dB)	Table Deg.	Ant High (m)
						Peak	Ave			
2390.00	H	55.28	-14.08	41.20	Peak	74	--	-32.80	0	1.5
2390.00	H	44.36	-14.08	30.28	Ave	--	54	-23.72	0	1.5
2387.61	V	58.01	-14.03	43.98	Peak	74	--	-30.02	360	1.5
2387.61	V	49.55	-14.03	35.52	Ave	--	54	-18.48	360	1.5
Channel 11						Fundamental Frequency: 2462 MHz				
Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result (dBuV/m)	Remark	Limit (dBuV/m)		Margin (dB)	Table Deg.	Ant High (m)
						Peak	Ave			
2483.50	H	54.15	-13.79	40.36	Peak	74	--	-33.64	3	1.5
2483.50	H	45.23	-13.79	31.44	Ave	--	54	-22.56	3	1.5
2493.43	V	53.41	-13.83	39.58	Peak	74	--	-34.42	360	1.5
2493.43	V	42.63	-13.83	28.80	Ave	--	54	-25.20	360	1.5



Note:

1. Emission level = Reading level + Correction factor
2. Correction factor : Antenna factor, Cable loss, Pre-Amp, etc.
3. All emissions as described above were determining by rotating the EUT through three orthogonal axes to maximizing the emissions if the EUT belongs to hand-held or body-worn devices.
4. Measurements above 1000 MHz, Peak detector setting:
1 MHz RBW with 1 MHz VBW (Peak Detector).
5. Measurements above 1000 MHz, Average detector setting:
1 MHz RBW with 10Hz VBW (RMS Detector).
6. Peak detector measurement data will represent the worst case results.
7. Where limits are specified for both average and peak detector functions, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.



12. Conducted Spurious Emission

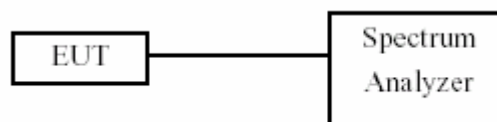
Test Requirement: FCC Part 15 C section 15.247

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Based on either an RF conducted or a radiated measurement. Provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Method: ANSI C63.10: Clause 6.7

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

Test Configuration:



Test Procedure:

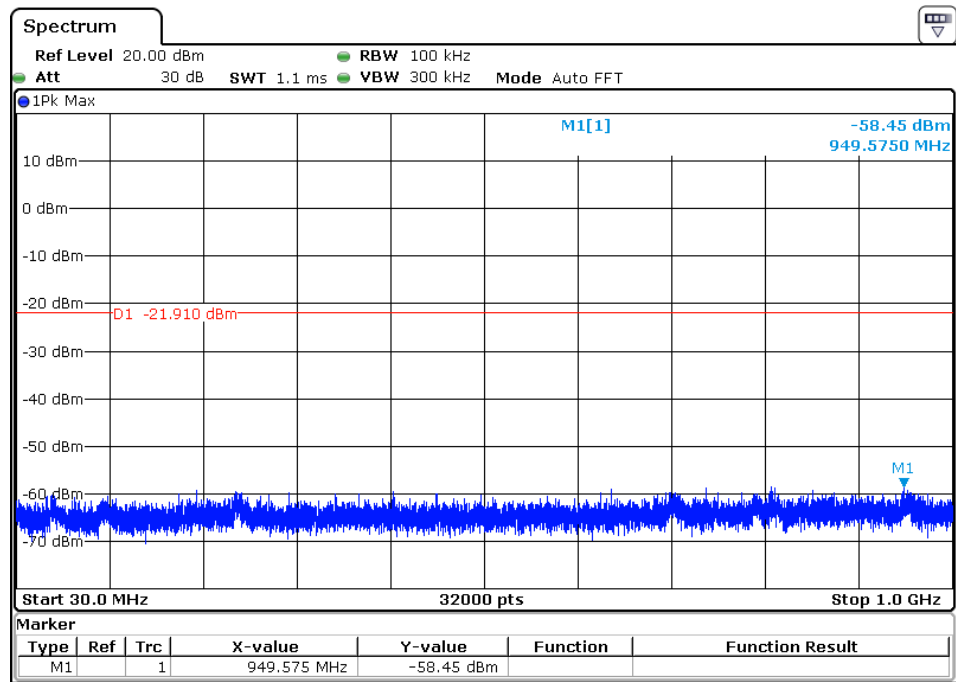
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer or power meter.
2. Set the spectrum analyzer: RBW=100 KHz, VBW = 300KHz. Sweep = auto; Detector Function = Peak. Trace = Max Hold, Scan up through 10th harmonic.
3. Measure the Conducted Spurious Emissions of the test frequency with special test status.
4. Repeat until all the test status is investigated.
5. Report the worse case.



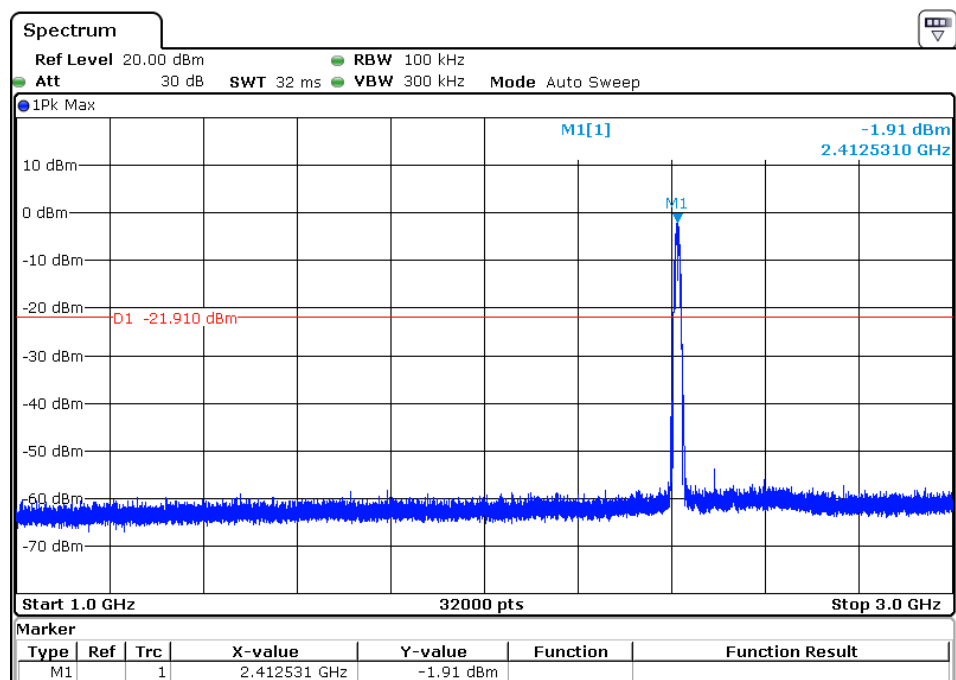
802.11b mode with 1Mbps data rate

Channel 1: 2.412GHz:

30 MHz to 1 GHz

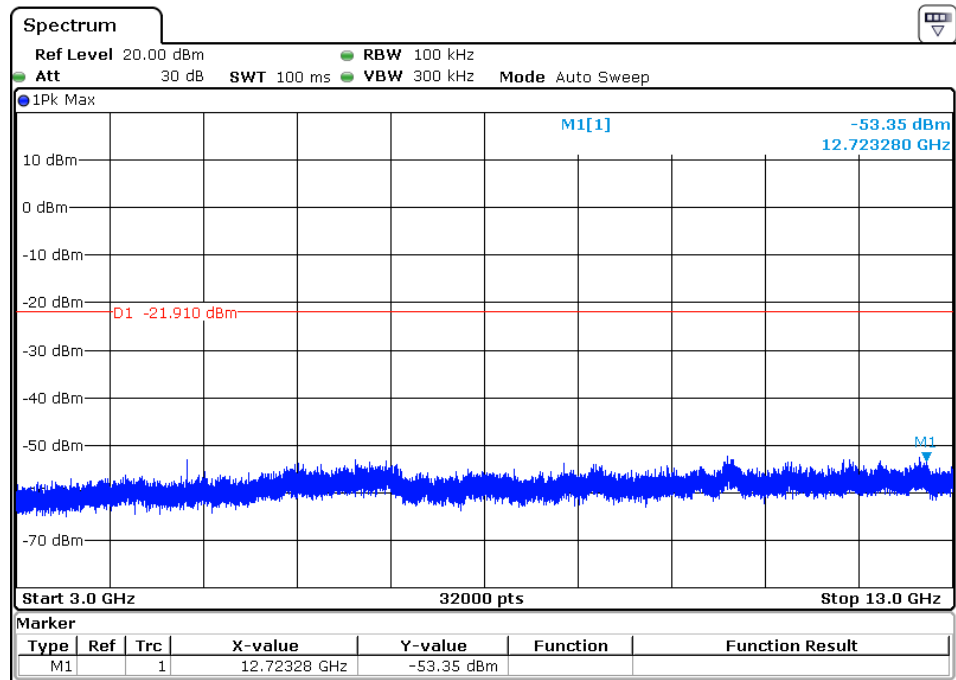


1GHz to 3 GHz

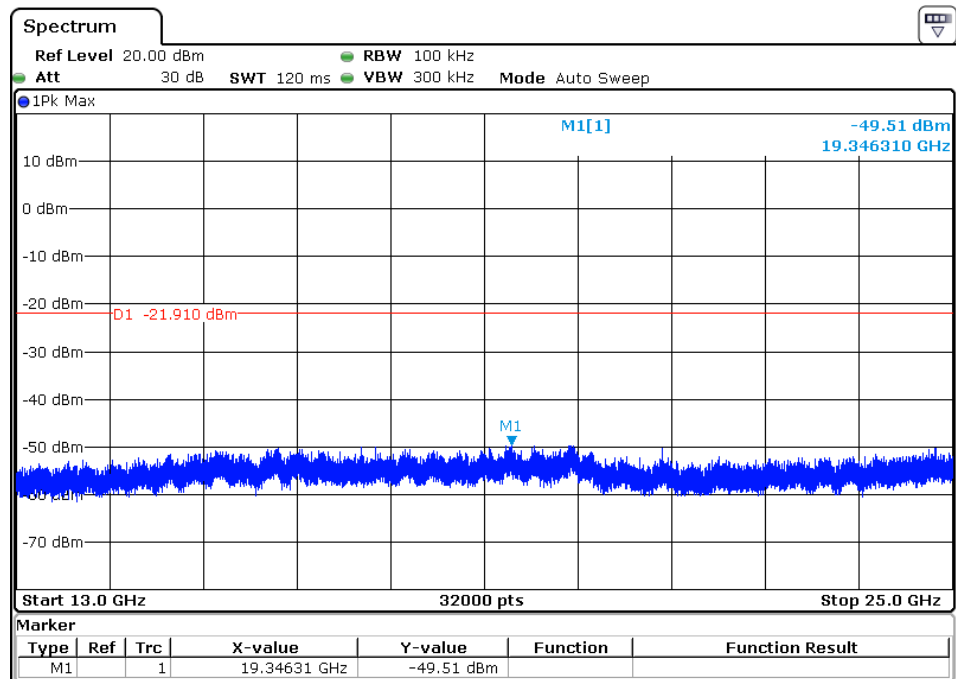




3 GHz to 13 GHz



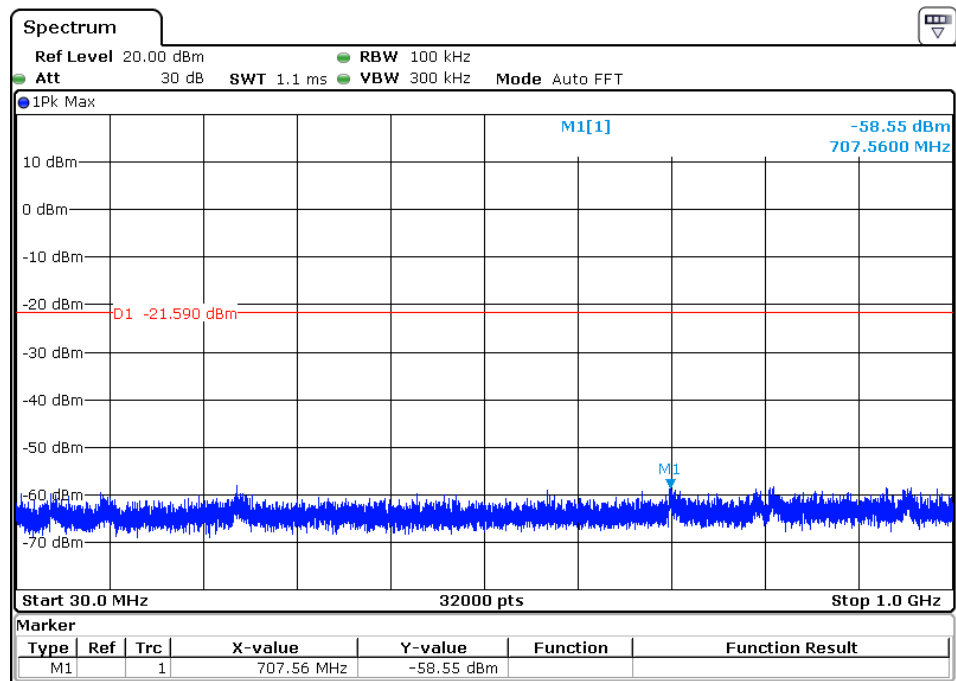
13GHz to 25 GHz



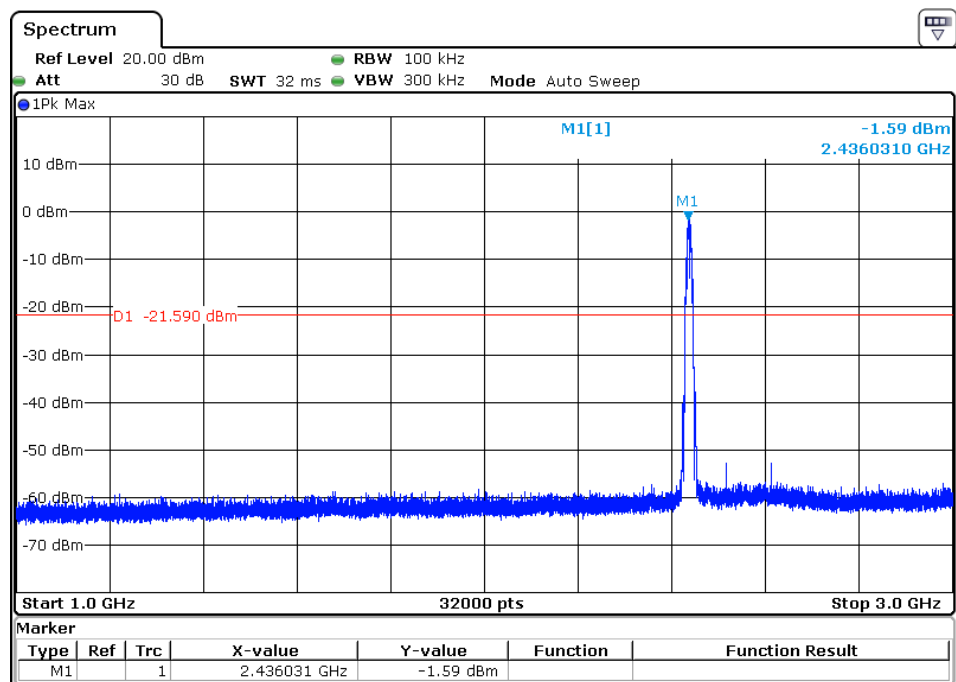


Channel 6: 2.437GHz:

30 MHz to 1 GHz

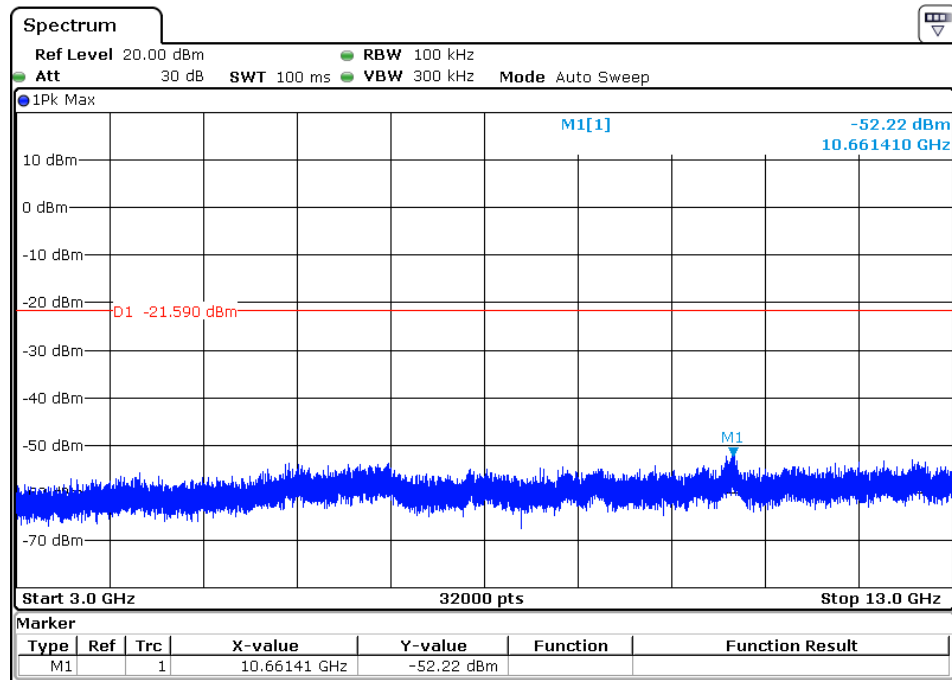


1GHz to 3 GHz

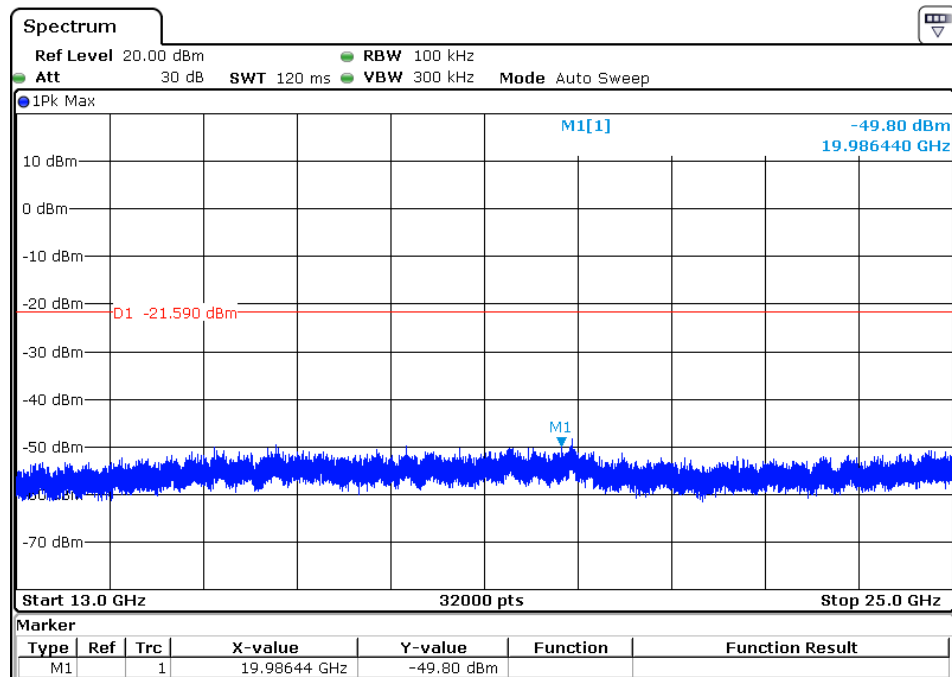




3 GHz to 13 GHz



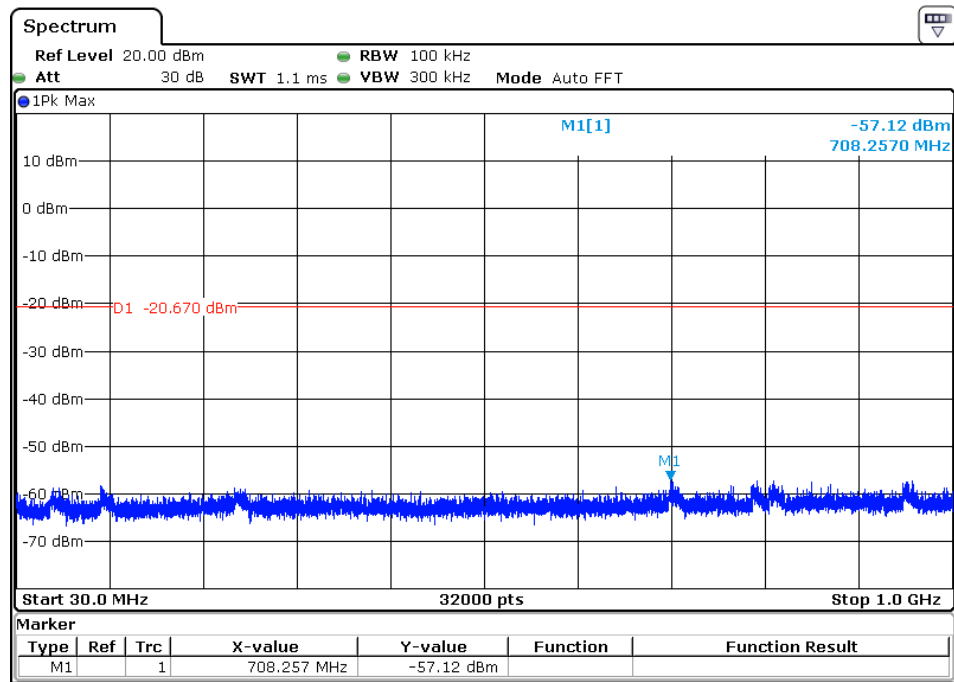
13GHz to 25 GHz



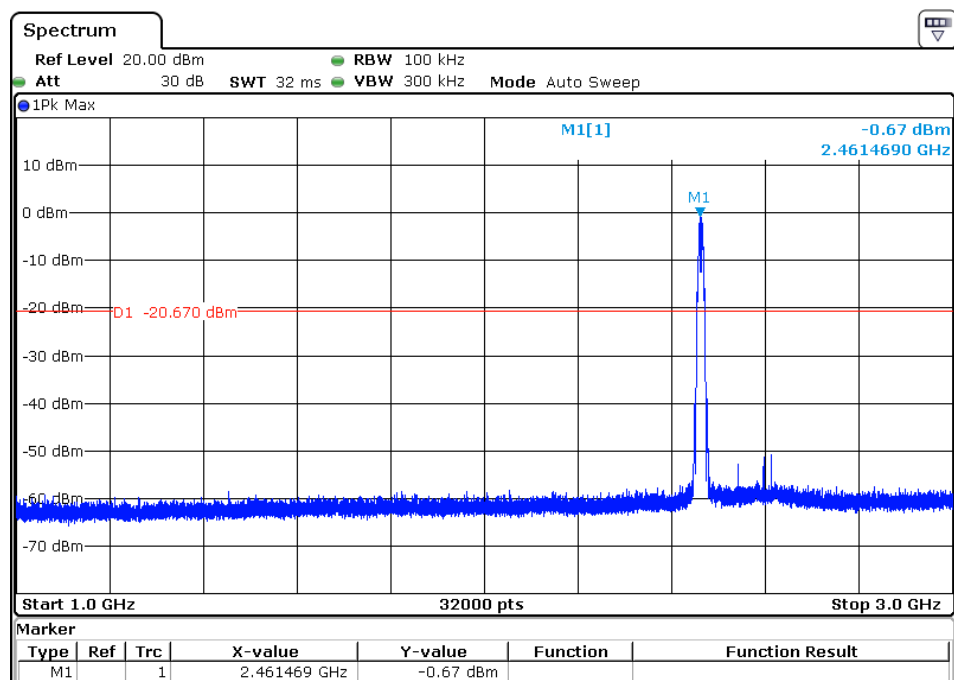


Channel 11:2.462 GHz

30 MHz to 1 GHz

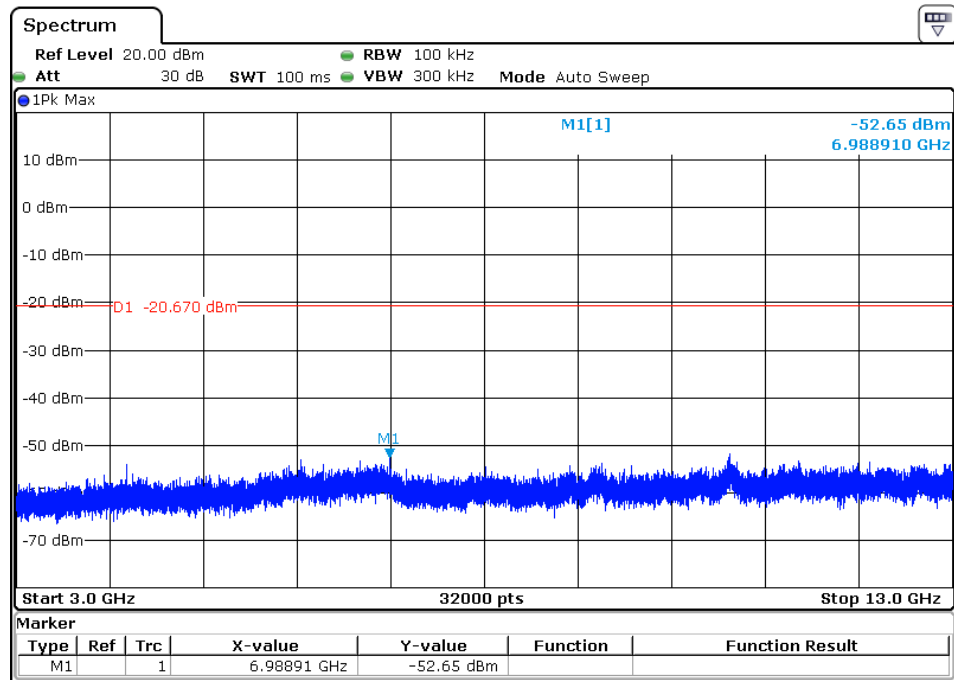


1GHz to 3 GHz

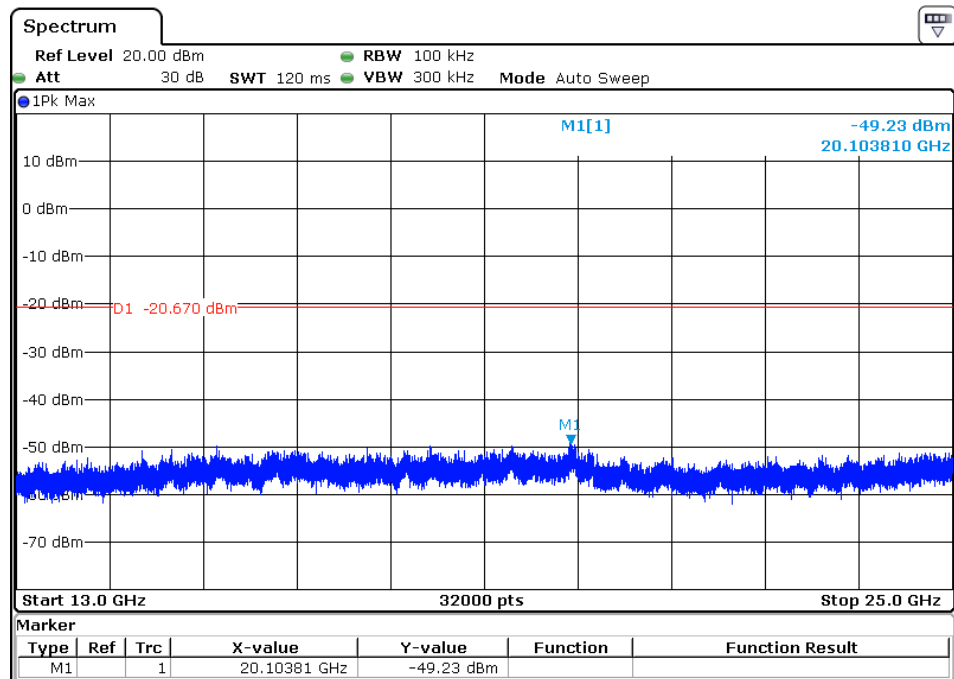




3 GHz to 13 GHz



13GHz to 25 GHz

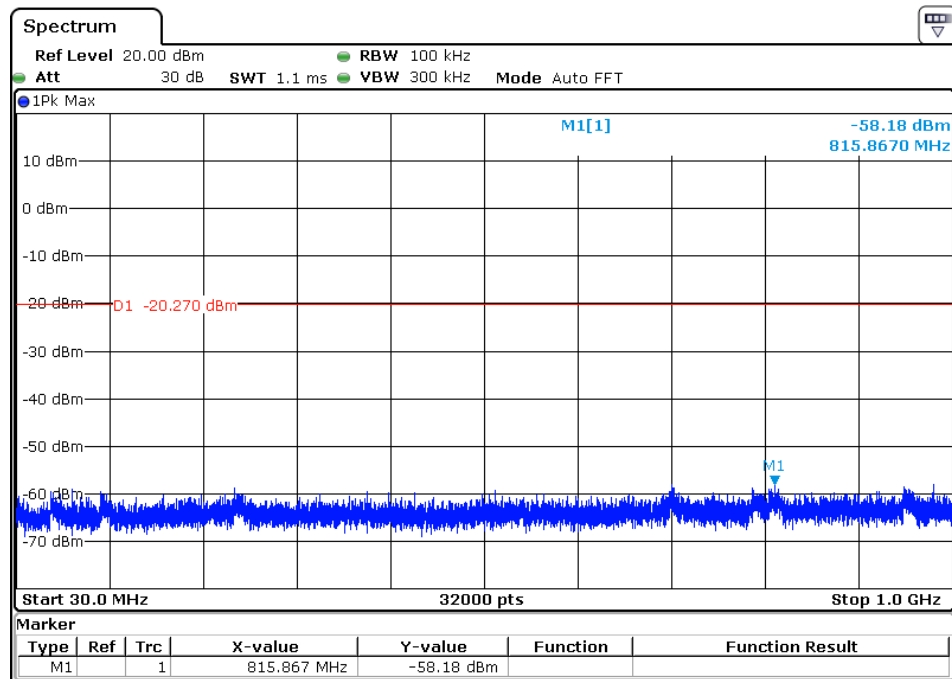




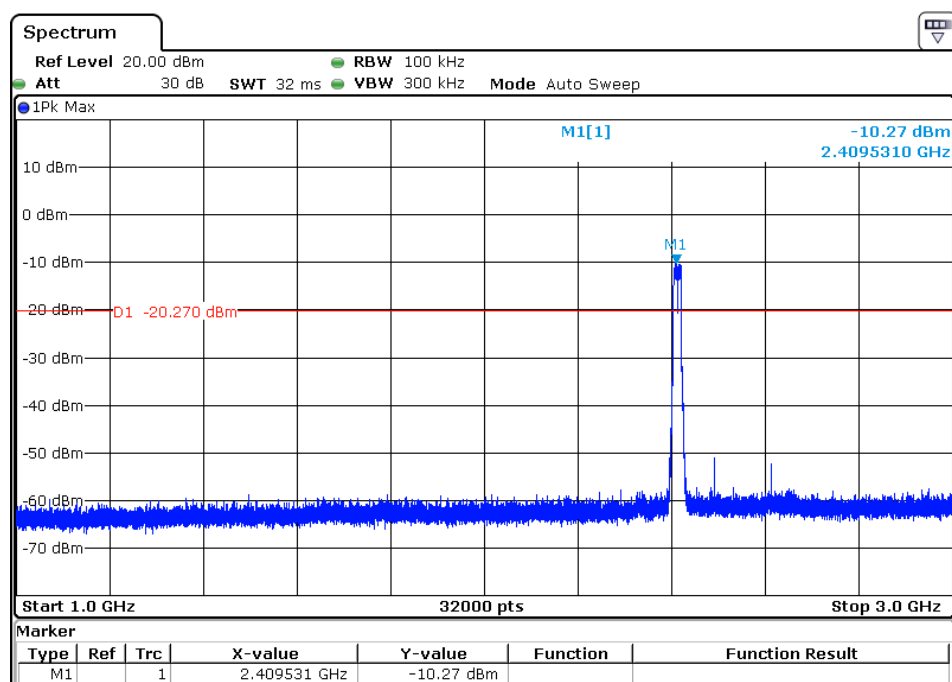
802.11g mode with 6Mbps data rate

Channel 1: 2.412GHz:

30 MHz to 1 GHz

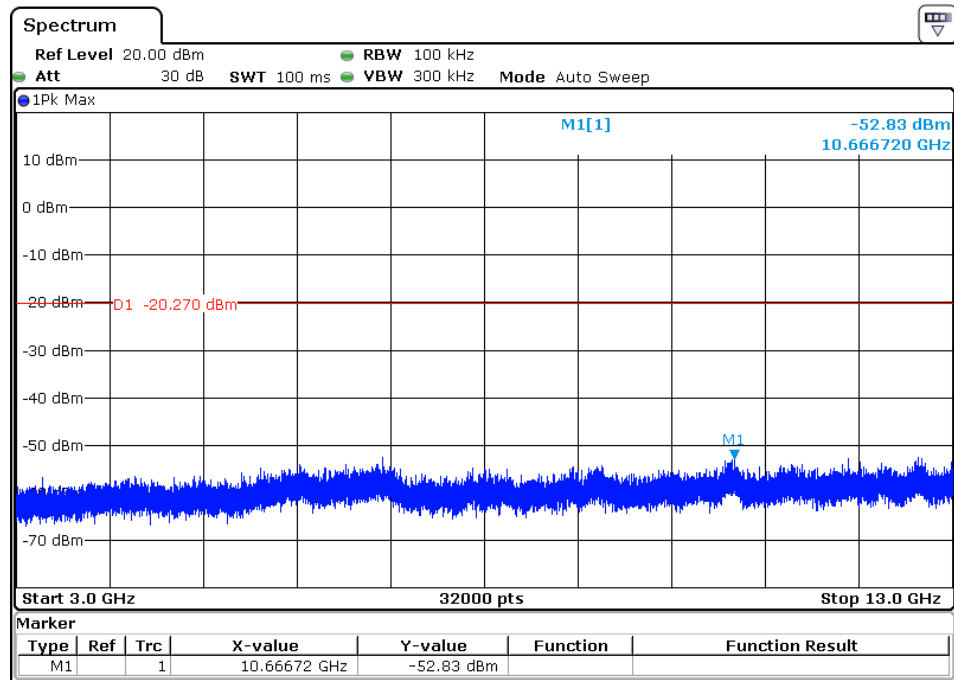


1GHz to 3 GHz

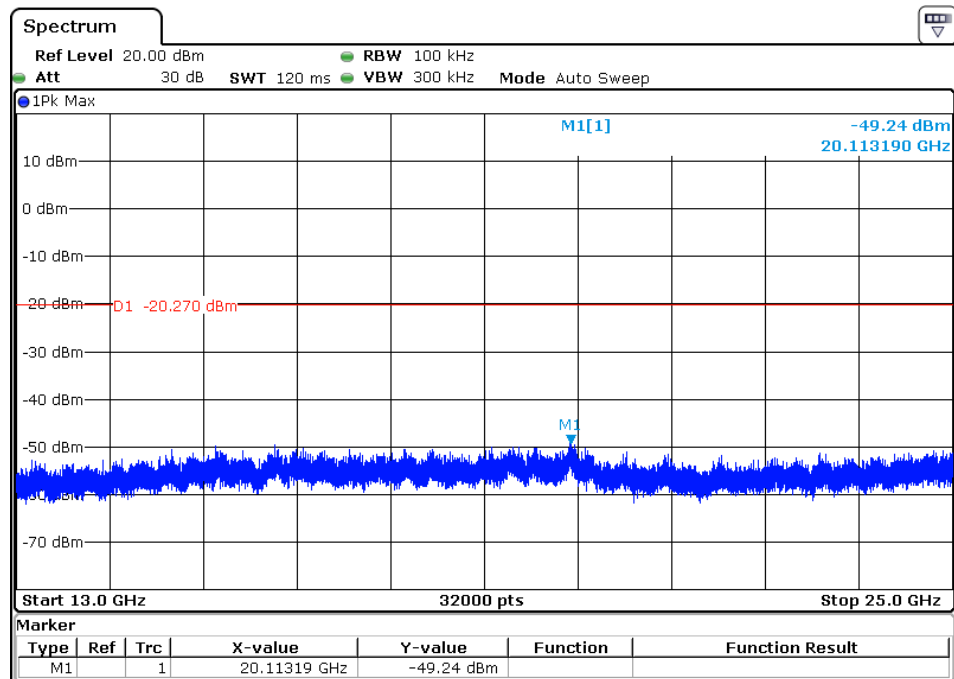




3 GHz to 13 GHz



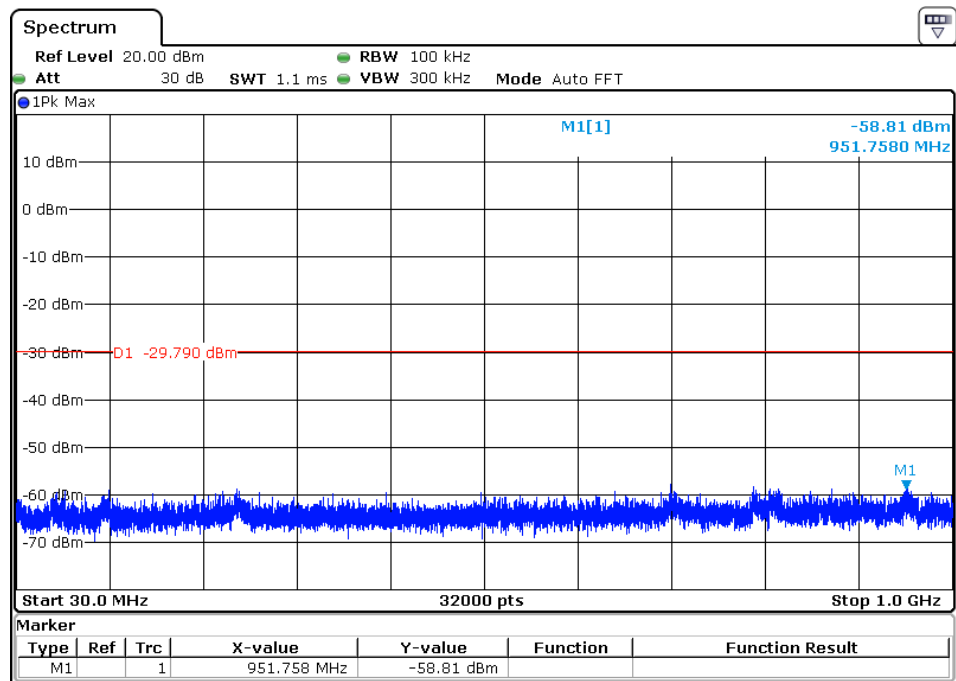
13GHz to 25 GHz



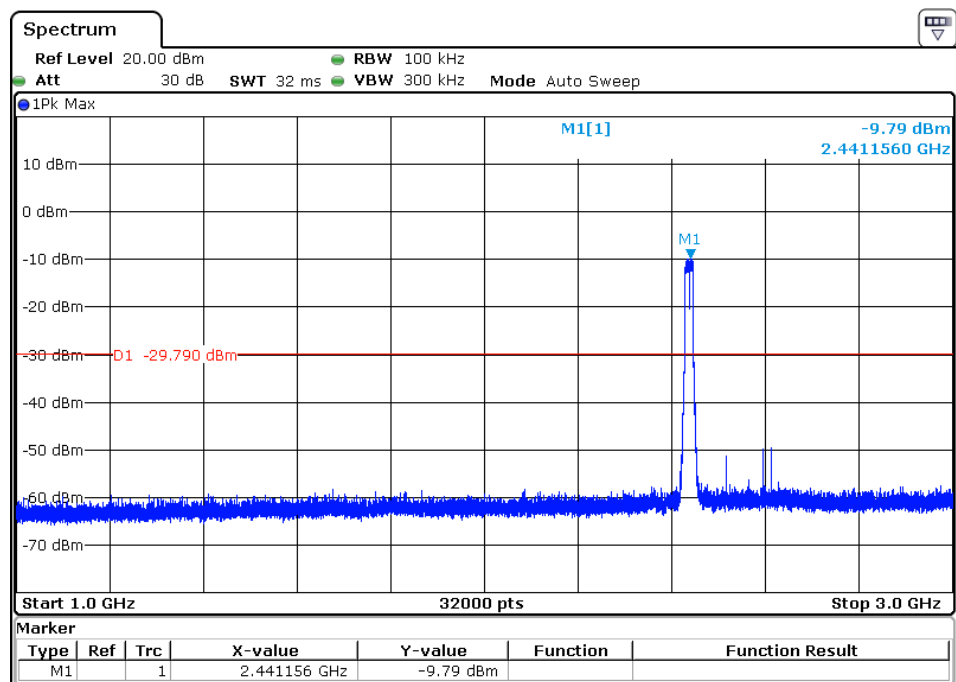


Channel 6: 2.437GHz:

30 MHz to 1 GHz

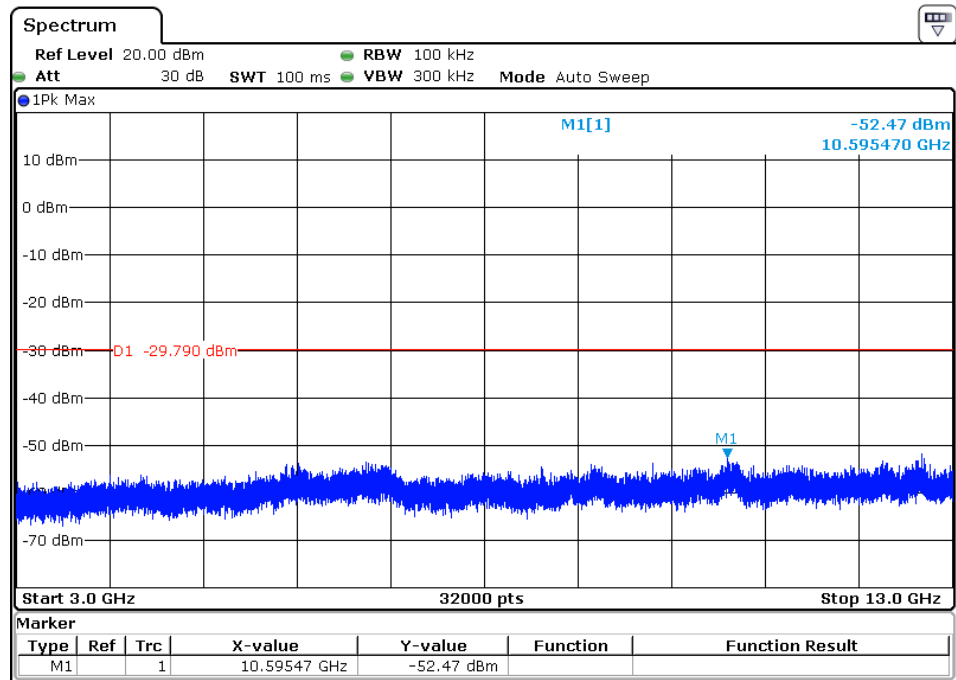


1GHz to 3 GHz

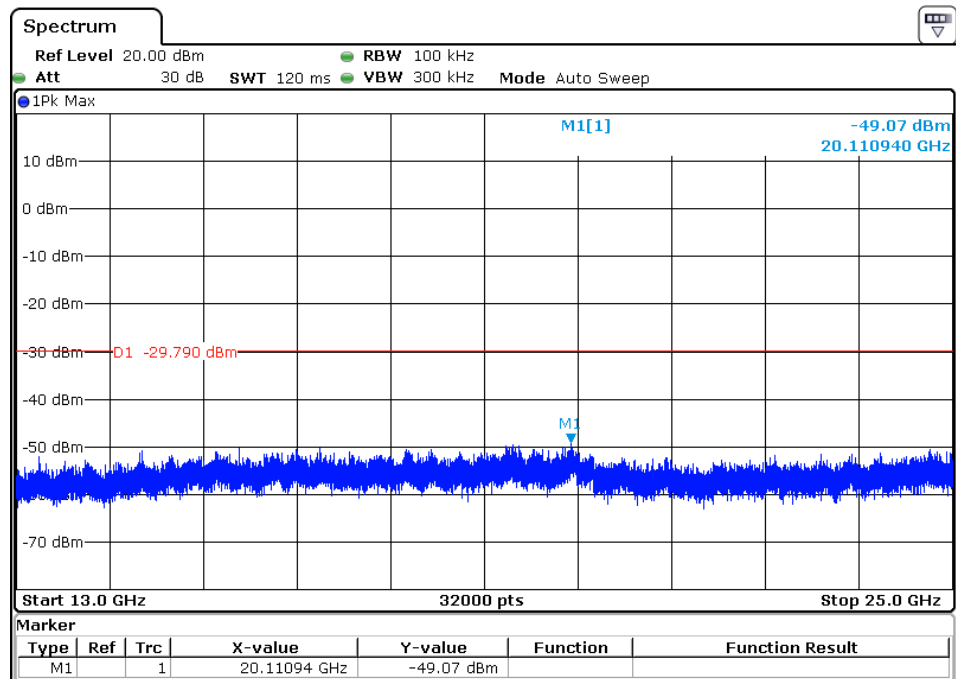




3 GHz to 13 GHz



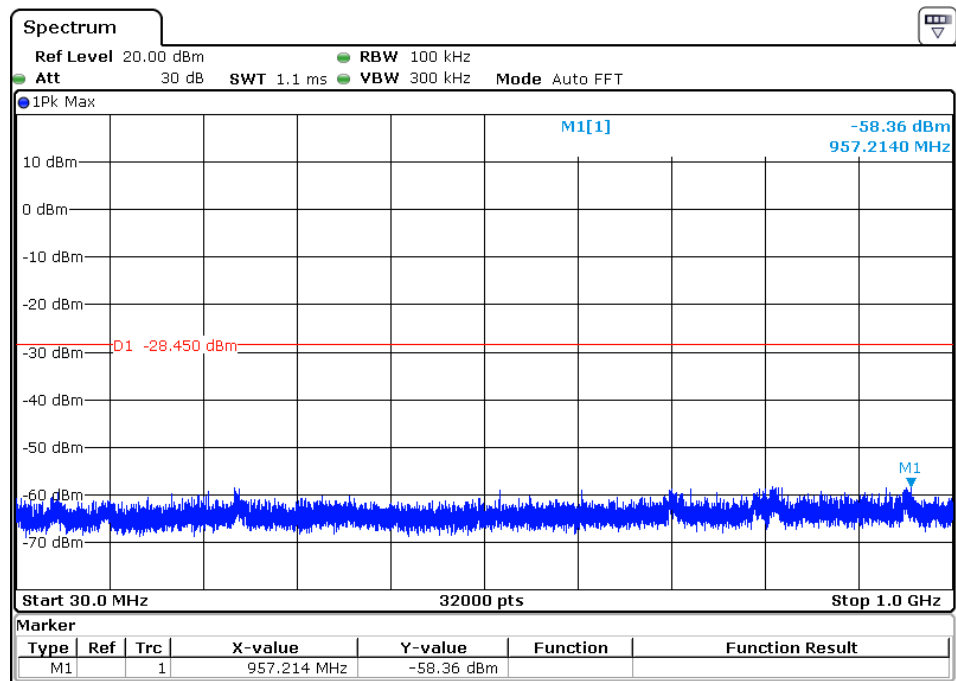
13GHz to 25 GHz



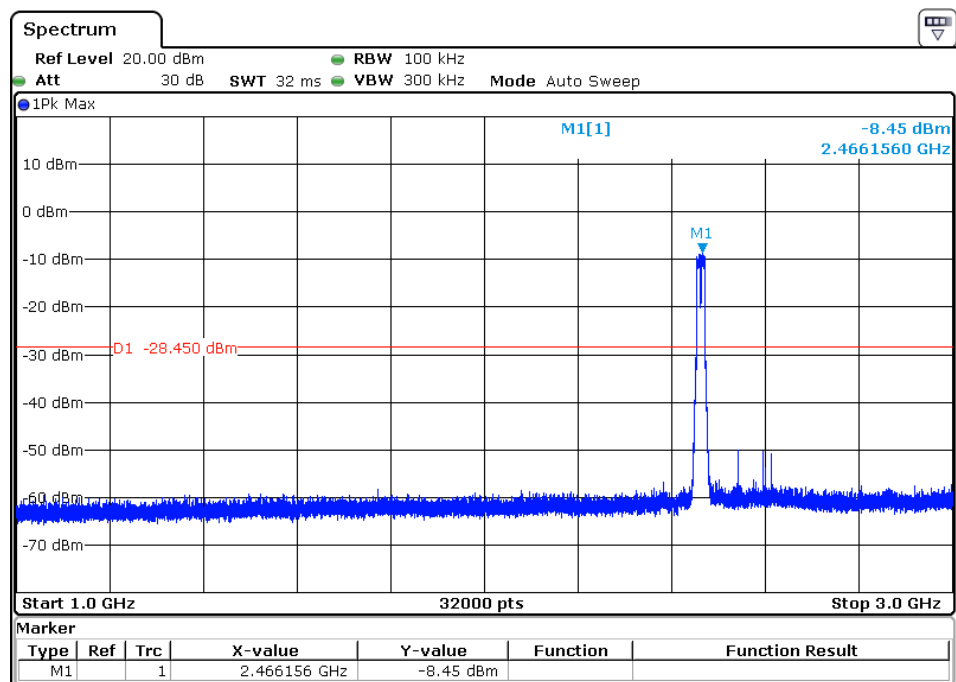


Channel 11:2.462 GHz

30 MHz to 1 GHz

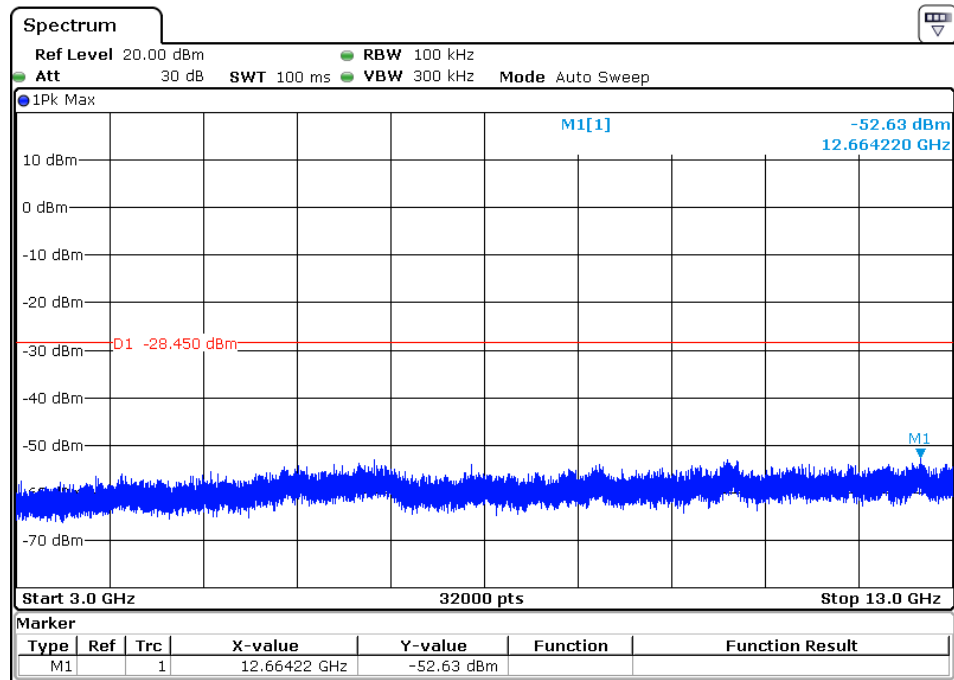


1GHz to 3 GHz

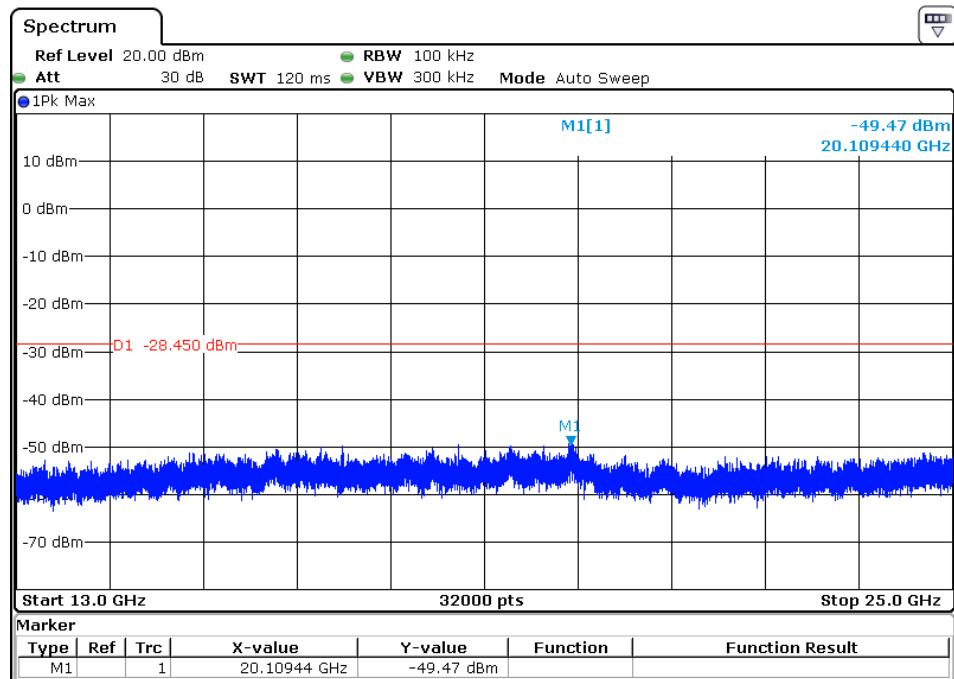




3 GHz to 13 GHz



13GHz to 25 GHz

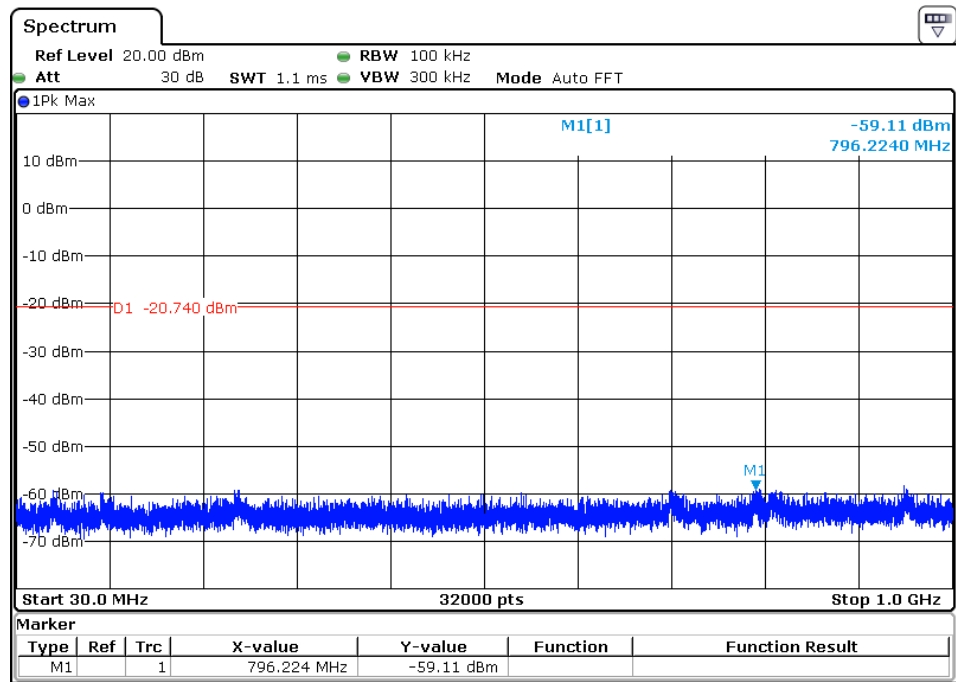




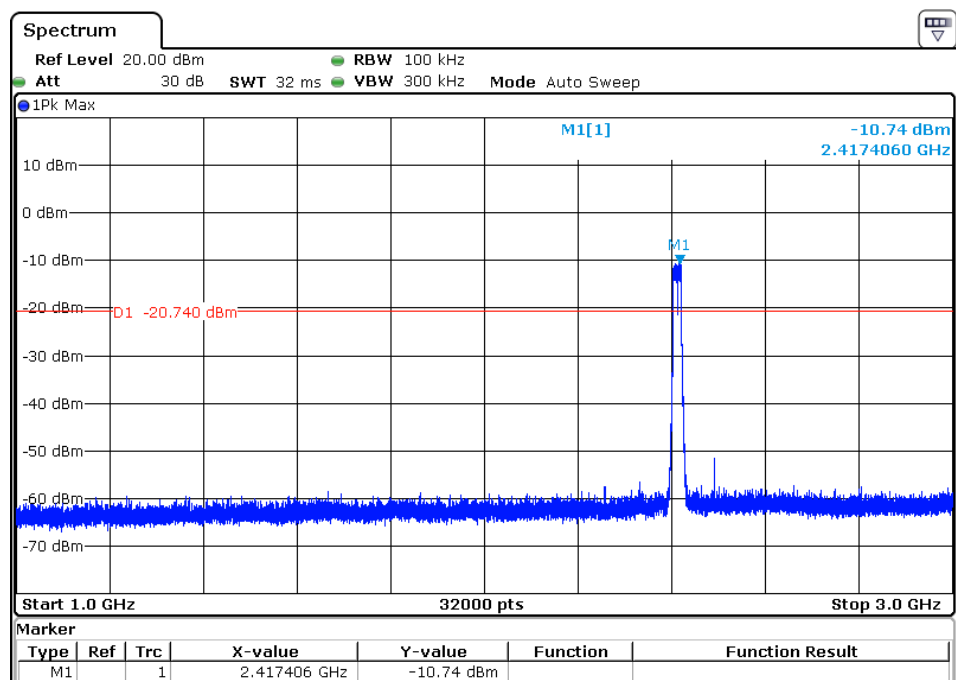
802.11n(HT20) mode with 7.2Mbps data rate

Channel 1: 2.412GHz:

30 MHz to 1 GHz

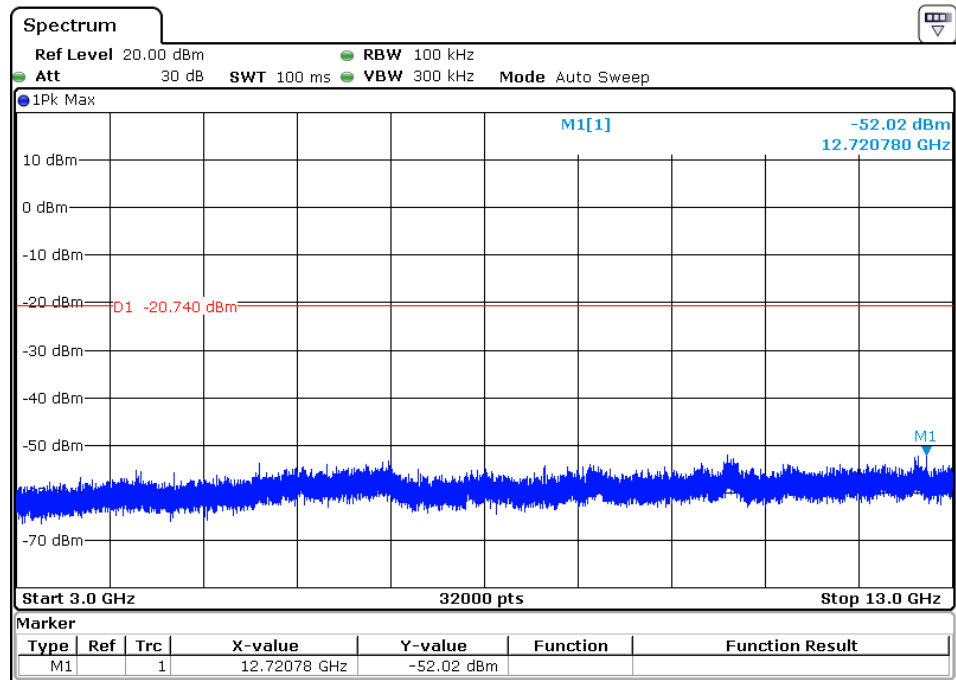


1GHz to 3 GHz

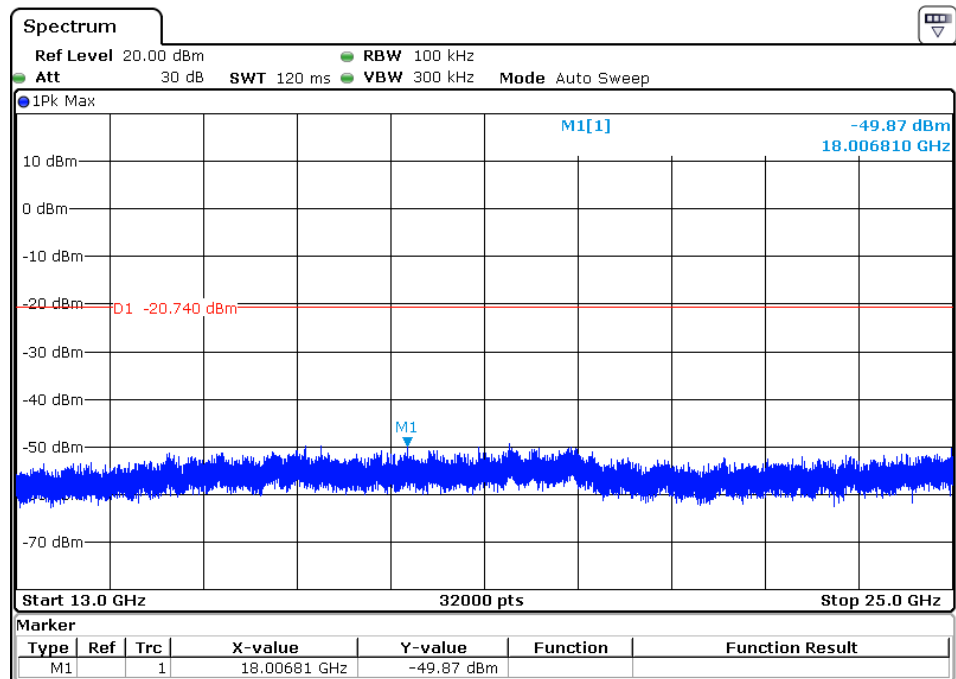




3 GHz to 13 GHz



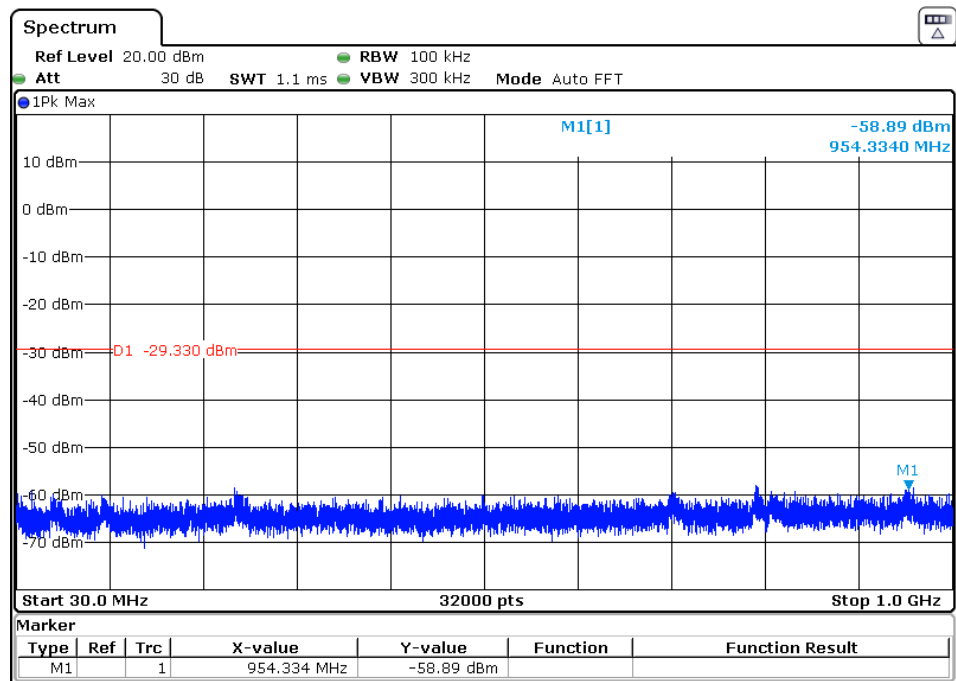
13GHz to 25 GHz



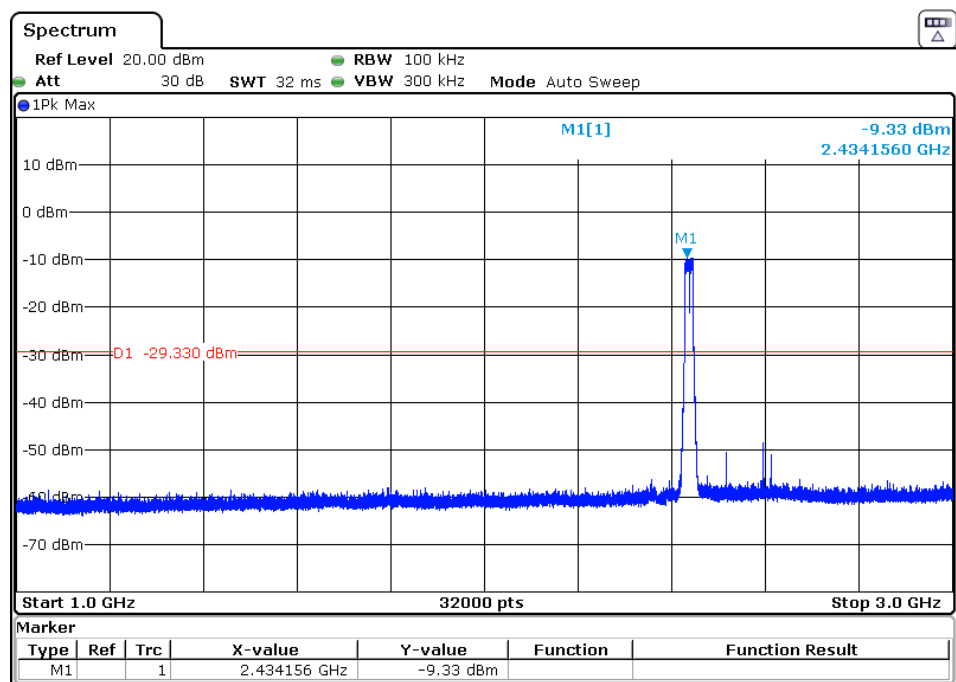


Channel 6: 2.437GHz:

30 MHz to 1 GHz

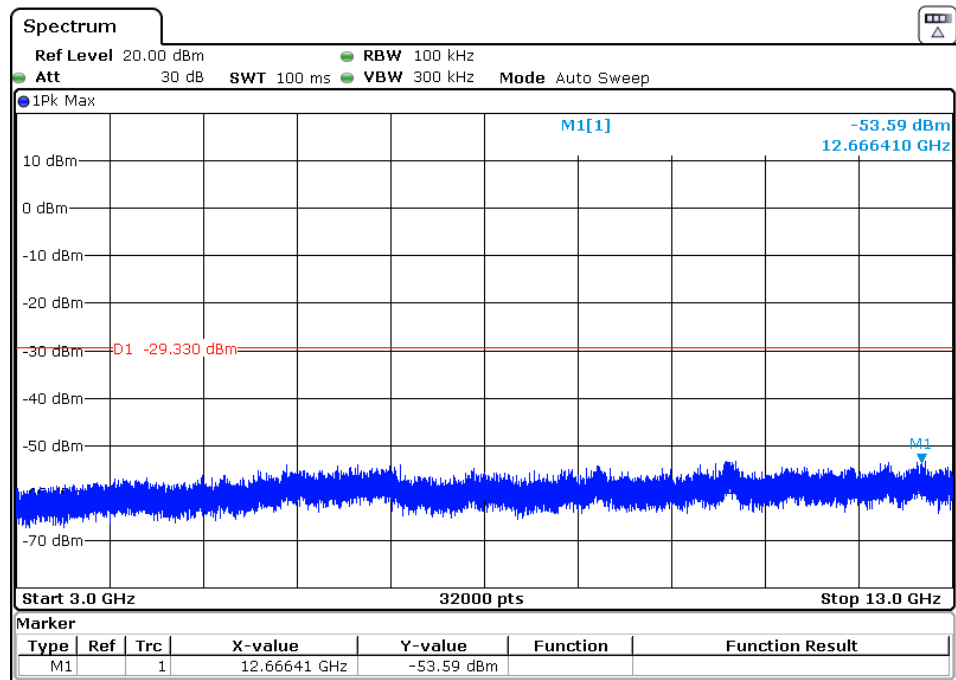


1GHz to 3 GHz

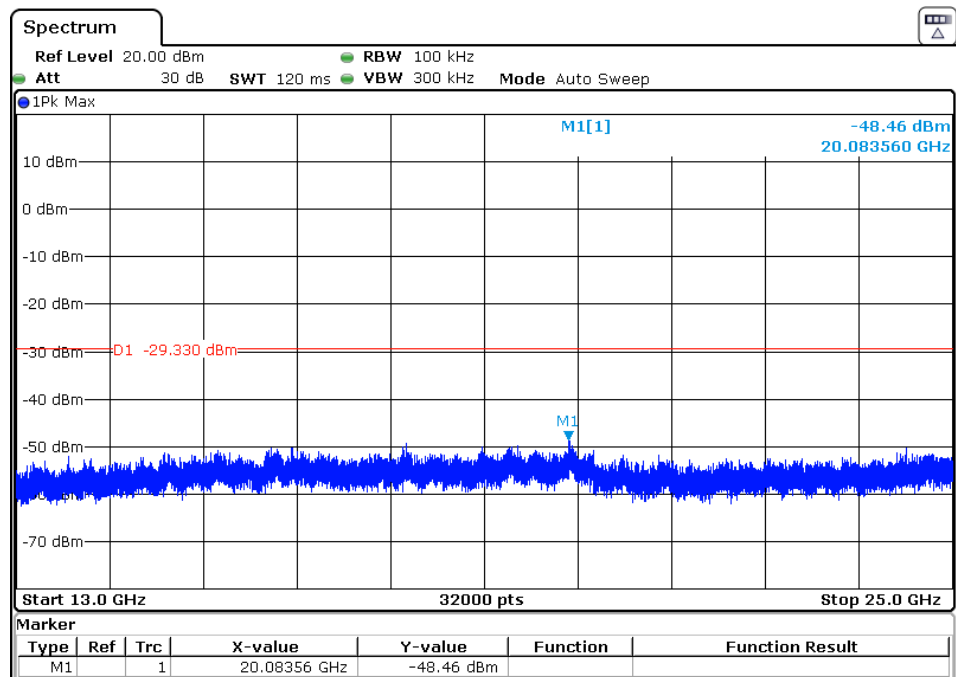




3 GHz to 13 GHz



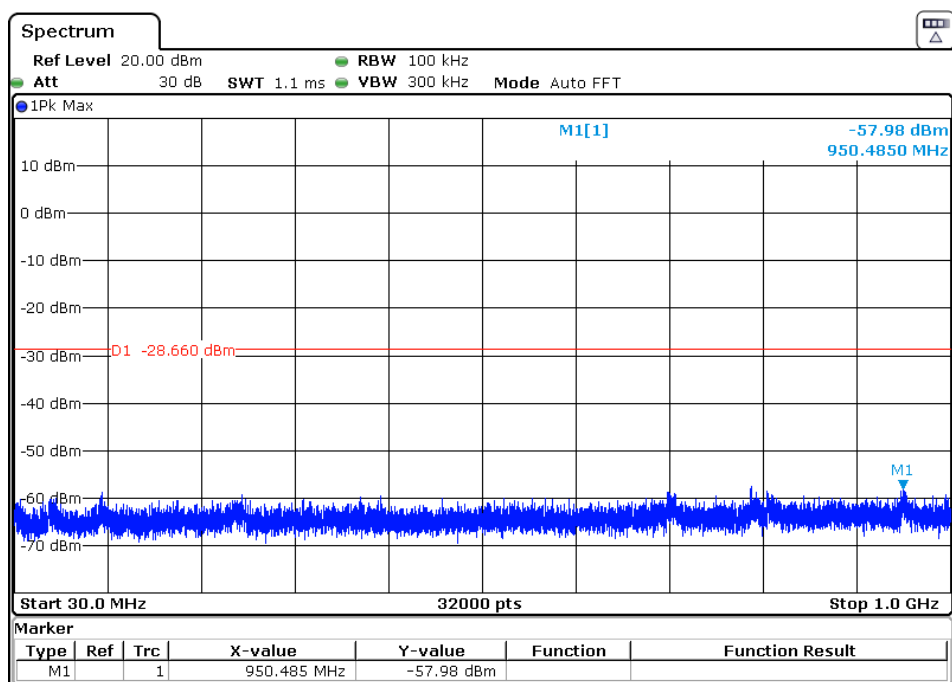
13GHz to 25 GHz



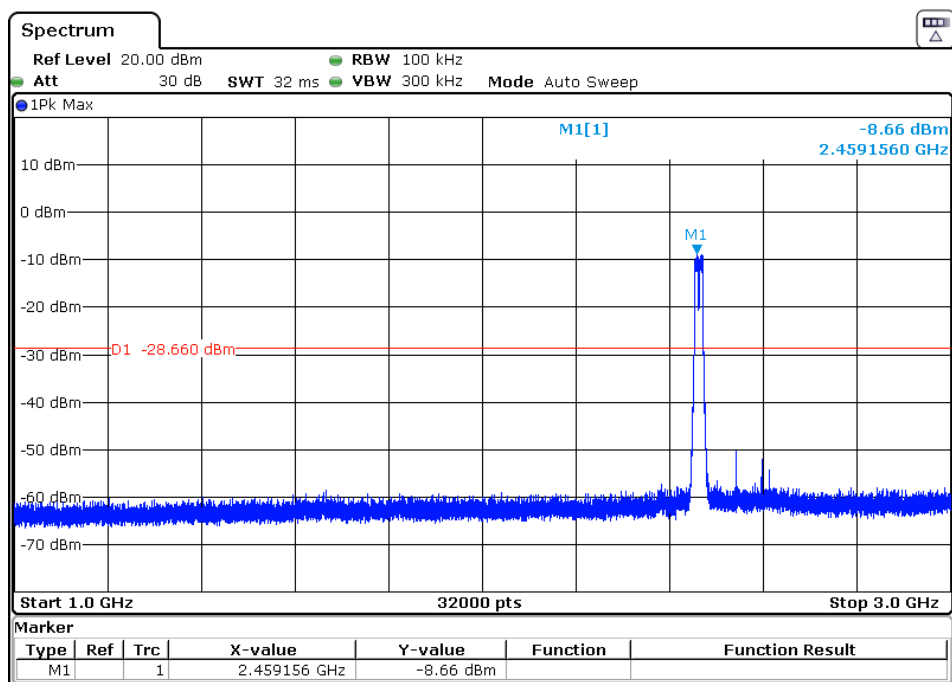


Channel 11:2.462 GHz

30 MHz to 1 GHz

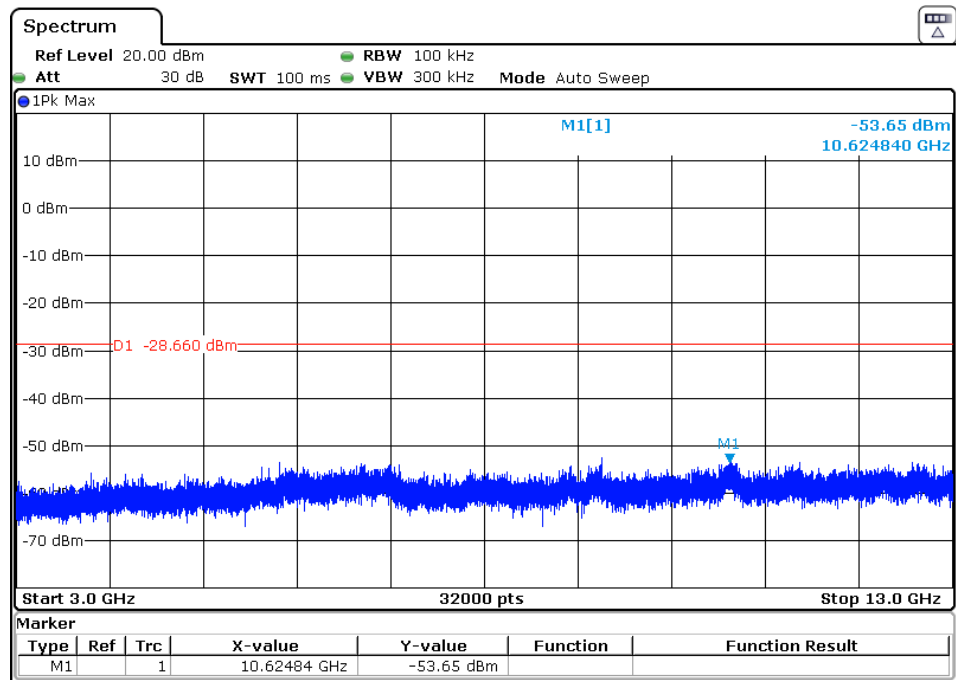


1GHz to 3 GHz

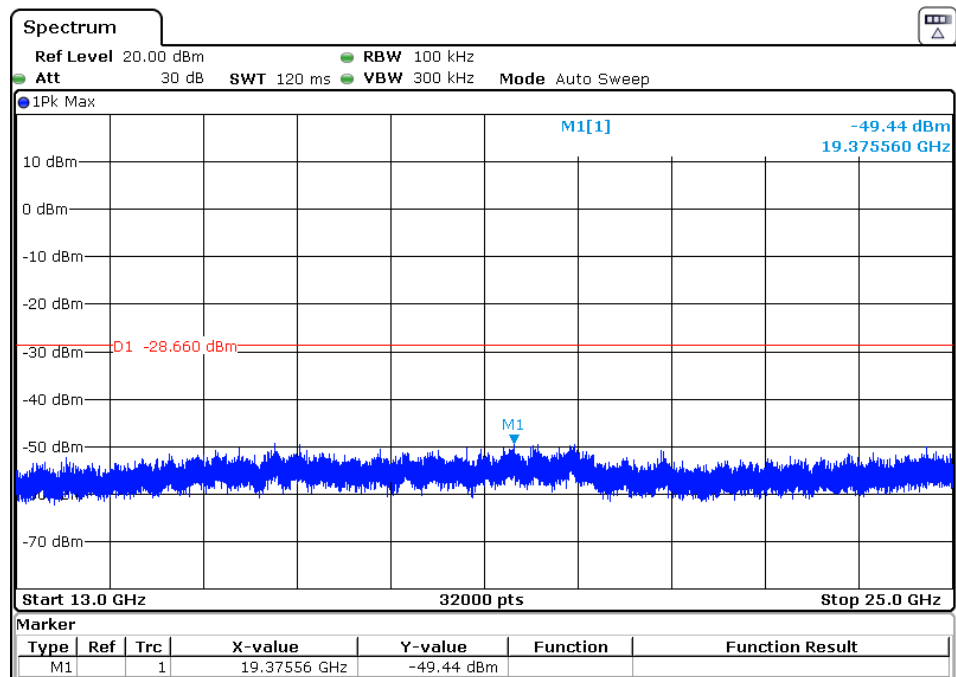




3 GHz to 13 GHz



13GHz to 25 GHz





APPENDIX 1

PHOTOS OF TEST CONFIGURATION

RE 1GHz below



RE 1GHz above



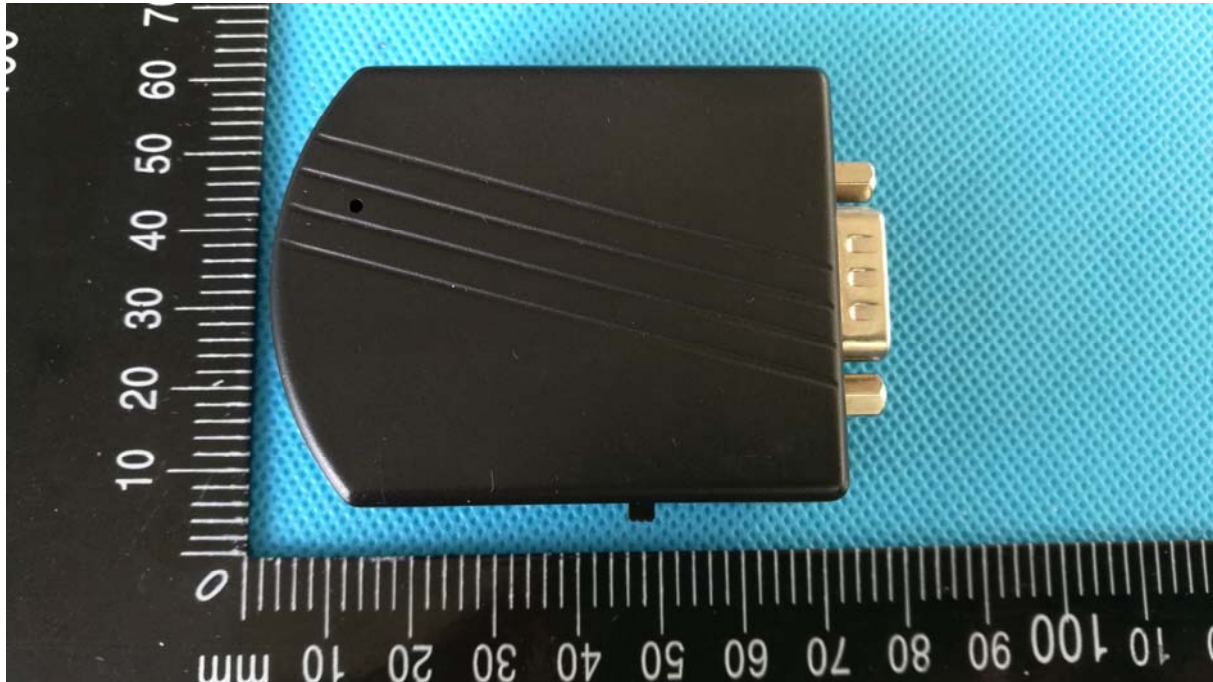


CE



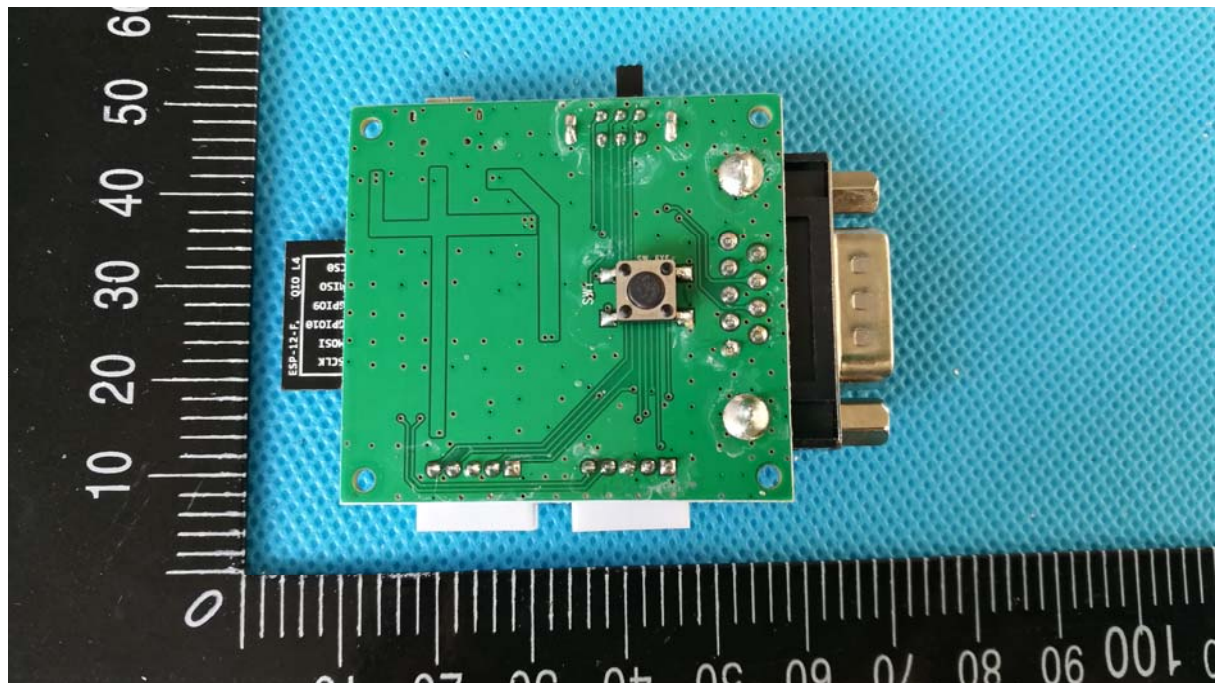
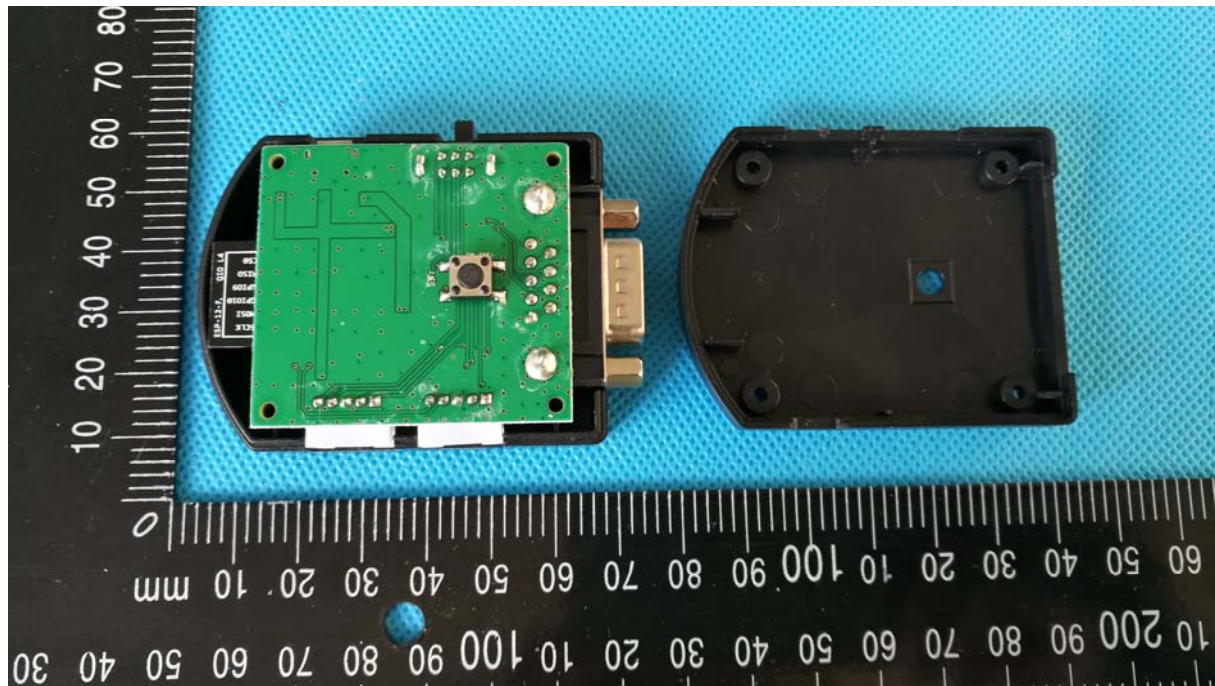


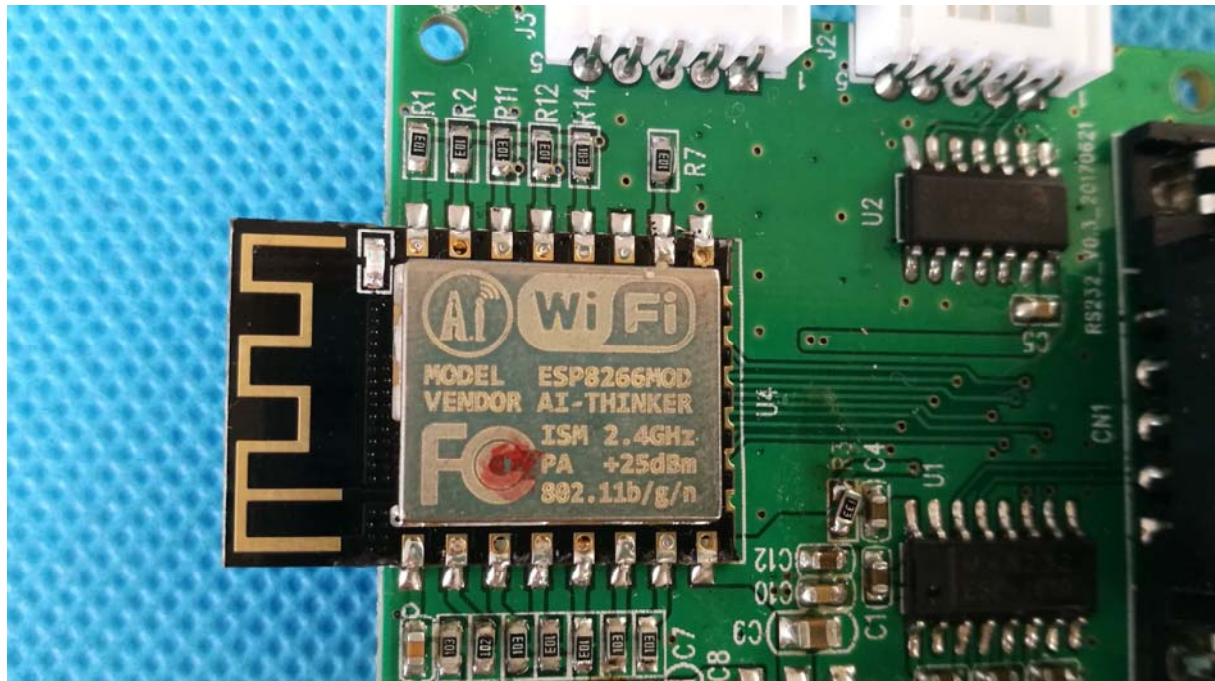
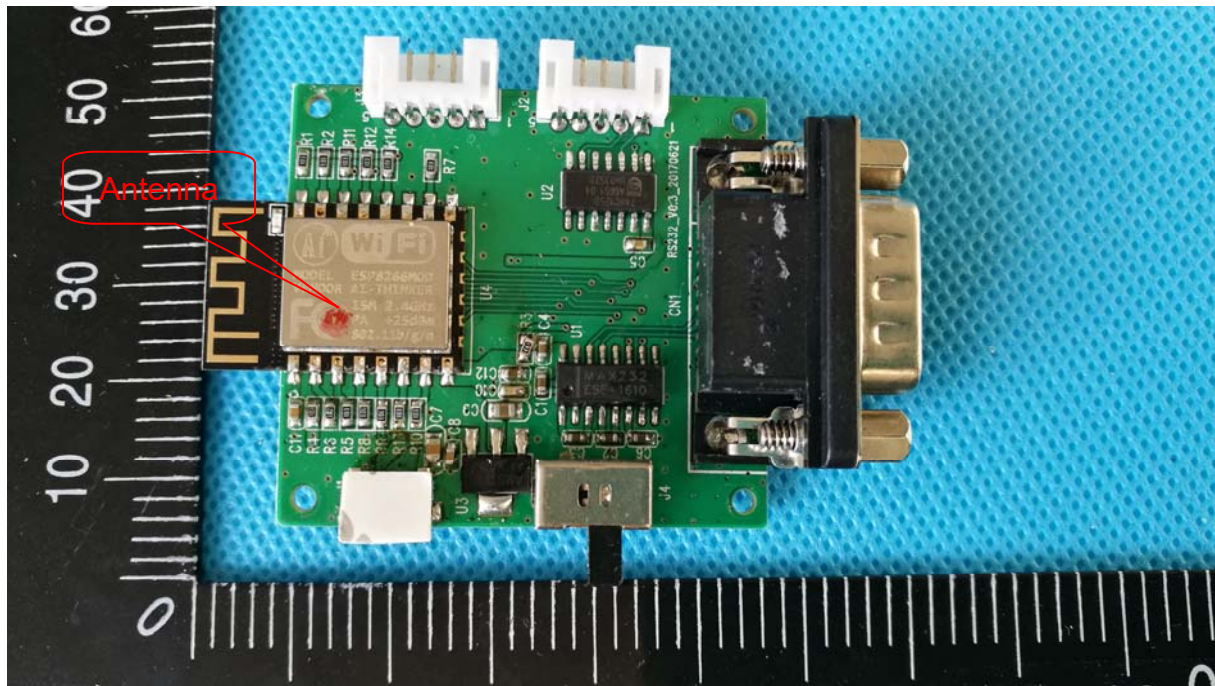
PHOTOS OF EUT

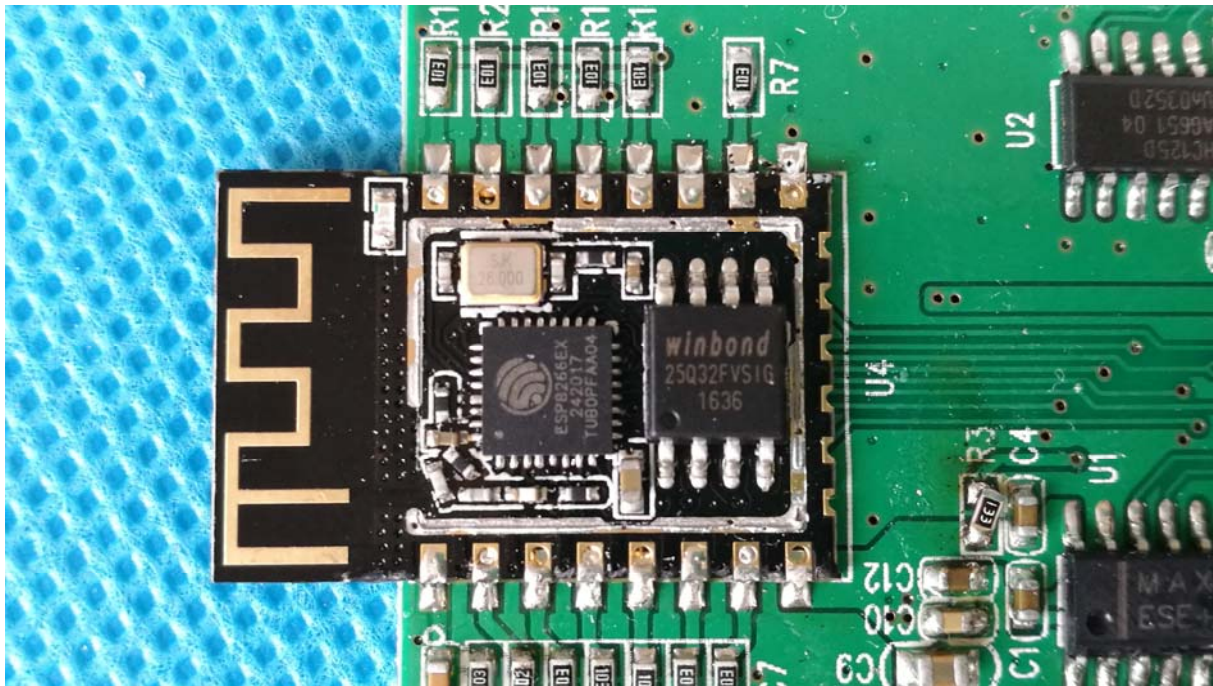












****End of report****