STS LAB

RADIO TEST REPORT

Report No:STS1811031W03

Issued for

Innominds Software Inc

2055 Junction Avenue, Suite 122, San Jose CA 95131 USA

Product Name:	IOT Card, WiFi+BT, 2.4/5GHz
Brand Name:	Innominds
Model Name:	6001223
Series Model:	N/A
FCC ID:	2ARZI-IWB6001223
IC ID:	24585-IWB6001223
Test Standard:	FCC Part 15.247
	RSS-247 Issue 2, February 2017

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Shenzhen STS Test Services Co., Ltd.
1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong, China
TEL: +86-755 3688 6288 FAX: +86-755 3688 6277 E-mail:sts@stsapp.com

TEST RESULT CERTIFICATION

Applicant's name ..... : Innominds Software Inc

Address ..... : 2055 Junction Avenue, Suite 122, San Jose CA 95131 USA

Manufacture's Name ..... : Innominds Software Inc

Address ..... : 2055 Junction Avenue, Suite 122, San Jose CA 95131 USA

Product description

Product Name ..... : IOT Card, WiFi+BT, 2.4/5GHz

Brand Name ..... : Innominds

Model Name..... : 6001223

Series Model ..... : N/A

Test Standards ..... : FCC Part15.247

RSS-247 Issue 2, February 2017

Test procedure ..... : ANSI C63.10-2013

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC&IC requirements. And it is applicable only to the tested sample identified in the report.
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Date of Test..... :

Date (s) of performance of tests..... : 05 Nov. 2018 ~ 10 Jan. 2019

Date of Issue ..... : 10 Jan. 2019

Test Result ..... : **Pass**

Testing Engineer : Chris chen

(Chris chen)

Technical Manager : Sean She

(Sean she)

Authorized Signatory : Vita Li

(Vita Li)

TESTING CONSULTING SOLUTION CERTIFICATION STS APPROVAL

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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	10 Jan. 2019	STS1811031W03	ALL	Initial Issue

1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China
Tel: + 86-755 3688 6288 Fax:+ 86-755 3688 6277 Http://www.stsapp.com E-mail: sts@stsapp.com

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

KDB 558074 D01 DTS Meas Guidance v05 and KDB 558074 D01 DTS Meas Guidance v03r05

FCC Part 15.247,Subpart C RSS-247 Issue 2			
Standard Section	Test Item	Judgment	Remark
15.207 RSS-Gen Issue 5 April 2018	Conducted Emission	PASS	
15.247 (a)(2)	6dB Bandwidth	PASS	
1RSS-GEN clause 6.7	99% Bandwidth	PASS	
15.247 (b)(3) RSS-247 Issue 2, February 2017 (5.4)	Output Power	PASS	
15.247 (c) RSS-247 Issue 2, February 2017 (5.5)	Radiated Spurious Emission	PASS	
15.247 (d) RSS-247 Issue 2, February 2017 (5.5)	Conducted Spurious & Band Edge Emission	PASS	
15.247 (e) RSS-247 Issue 2, February 2017	Power Spectral Density	PASS	
15.205	Restricted Band Edge Emission	PASS	
Part 15.247(d)/part 15.209(a) RSS-247 Issue 2, February 2017	Band Edge Emission	PASS	
15.203 RSS-Gen Issue 5 April 2018	Antenna Requirement	PASS	
RSS-Gen Issue 5 April 2018	Frequency Stability	PASS	

NOTE:

(1) ”N/A” denotes test is not applicable in this Test Report

(2) all tests are according to ANSI C63.10-2013 .

1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd.
Add. : 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

FCC Registration No.: 625569

IC Registration No.: 12108A; A2LA Certificate No.: 4338.01;

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ± U，where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2，providing a level of confidence of approximately 95 %。

No.	Item	Uncertainly
1	RF output power,conducted	±0.71dB
2	Unwanted Emissions,conducted	±0.63dB
3	All emissions,radiated 30-200MHz	±3.43dB
4	All emissions,radiated 200MHz-1GHz	±3.57dB
5	All emissions,radiated>1G	±4.13dB
6	Conducted Emission(9KHz-150KHz)	±3.18dB
7	Conducted Emission(150KHz-30MHz)	±2.70dB

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	IOT Card, WiFi+BT, 2.4/5GHz
Trade Name	Innominds
Model Name	6001223
Series Model	N/A
Model Difference	N/A
Product Description	The EUT is a IOT Card, WiFi+BT, 2.4/5GHz Operation Frequency: 802.11b/g/n20: 2412~2462 MHz 802.11n(40MHz):2422~2452MHz Modulation Type: 802.11b(DSSS):CCK,DQPSK,DBPSK 802.11g(OFDM):BPSK,QPSK,16-QAM,64-QAM 802.11n(OFDM):BPSK,QPSK,16-QAM,64-QAM Bit Rate of Transmitter: 802.11b:11/5.5/2/1 Mbps 802.11g:54/48/36/24/18/12/9/6 Mbps 802.11n(20MHz): 65/58.5/52/39/26/19.5/13/6.5 Mbps 802.11n(40MHz): 135/121.5/108/81/54/40.5/37/13.5 Mbps Number Of Channel: 802.11b/g/n20:11CH 802.11n40:7CH Antenna Designation: Please see Note 3 Antenna Gain (dBi): 2.0dBi Duty Cycle: >98%
Channel List	Please refer to the Note 2.
Power Rating	Input: DC 1.8V~3.3V
Hardware version	R2.0 (DVT)
Software version	SW1
Radio Hardware version	MPLY.LR9.W1444,MD.LWTG.MP.V79.P4
Radio Software version	SC6531_W13.04.05_Release
Test Software	3.18.19
RF Power Setting TEST Software (power class)	2.4 GHz:802.11 b/g/n 20:12/10/9 2.4 GHz:802.11 n 40:9
Connecting I/O Port(s)	Please refer to the User's Manual

Note:

1 For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2

Operation Frequency of channel			
802.11b/g/n(20MHz)		Channel List for 802.11n(40MHz)	
Channel	Frequency	Channel	Frequency
01	2412	03	2422
02	2417	04	2427
03	2422	05	2432
04	2427	06	2437
05	2432	07	2442
06	2437	08	2447
07	2442	09	2452
08	2447		
09	2452		
10	2457		
11	2462		

3 Note:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:
Carrier Frequency Channel

2.4GHz Test Frequency:

For 802.11b/g/n (HT20)		For 802.11n (HT40)	
Channel	Freq.(MHz)	Channel	Freq.(MHz)
01	2412	03	2422
06	2437	06	2437
11	2462	09	2452

4

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	Pulse	W1043	Blade style antenna	RP-SMA Male	2.0	2.4GHz and 5 GHz antenna

2.2 DESCRIPTION OF THE TEST MODES

Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Worst Mode	Description	Data Rate
Mode 1	TX IEEE 802.11b CH1	1 Mbps
Mode 2	TX IEEE 802.11b CH6	1 Mbps
Mode 3	TX IEEE 802.11 b CH11	1 Mbps
Mode 4	TX IEEE 802.11g CH1	6 Mbps
Mode 5	TX IEEE 802.11g CH6	6 Mbps
Mode 6	TX IEEE 802.11g CH11	6 Mbps
Mode 7	TX IEEE 802.11n HT20 CH1	MCS 0
Mode 8	TX IEEE 802.11n HT20 CH6	MCS 0
Mode 9	TX IEEE 802.11n HT20 CH11	MCS 0
Mode 10	TX IEEE 802.11n HT40 CH3	MCS 0
Mode 11	TX IEEE 802.11n HT40 CH6	MCS 0
Mode 12	TX IEEE 802.11n HT40 CH9	MCS 0

Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

(2) We have be tested for all avaiable U.S. voltage and frequencies(For 120V,50/60Hz and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V/60Hz is shown in the report

(3) Controlled using a bespoke application on the laptop PC supplied by the customer. The application was used to enable a continuous transmission mode and to select the test channels, data rates and modulation schemes as required.

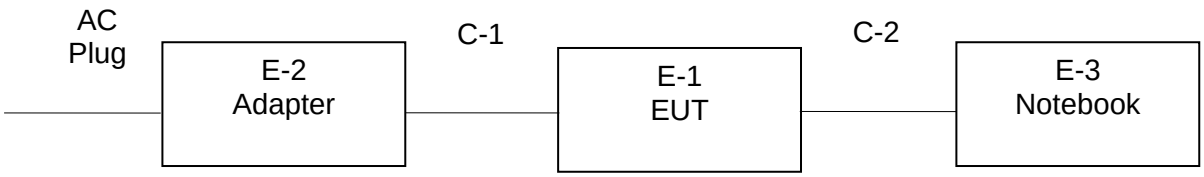
AC Conducted Emission

Test Case	
AC Conducted Emission	Mode13: Keeping WIFI TX

1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China
Tel: +86-755 3688 6288 Fax:+86-755 3688 6277 Http://www.stsapp.com E-mail: sts@stsapp.com

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious EmissionTest



Conducted Emission Test

2.4 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Necessary accessories

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
N/A	N/A	N/A	N/A	N/A	N/A

Support units

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
E-2	Adapter	N/A	N/A	N/A	N/A
E-3	Notebook	DELL	VOSTRO.3800	N/A	N/A
C-1	DC Cable	N/A	100cm	N/A	N/A
C-2	USB Cable	N/A	110cm	N/A	N/A

Note:

(1) The support equipment was authorized by Declaration of Confirmation.

(2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

(3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2018.10.13	2019.10.12
Signal Analyzer	Agilent	N9020A	MY51110105	2018.03.08	2019.03.07
Active loop Antenna	ZHINAN	ZN30900C	16035	2018.03.11	2021.03.10
Bilog Antenna	TESEQ	CBL6111D	34678	2017.11.02	2020.11.1
Horn Antenna	SCHWARZBECK	BBHA 9120D(1201)	9120D-1343	2018.10.19	2021.10.18
SHF-EHF Horn Antenna (15G-40GHz)	A-INFO	LB-180400-KF	J211020657	2018.03.11	2019.03.10
Pre-mplifier(0.1M-3GHz)	EM	EM330	060665	2018.10.13	2019.10.12
PreAmplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK2018080901	2018.10.13	2019.10.12
Temperature & Humitidy	HH660	Mieo	N/A	2018.10.11	2019.10.10
turn table	EM	SC100_1	60531	N/A	N/A
Antenna mast	EM	SC100	N/A	N/A	N/A

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2018.10.13	2019.10.12
LISN	R&S	ENV216	101242	2018.10.11	2019.10.10
LISN	EMCO	3810/2NM	23625	2018.10.11	2019.10.10
Temperature & Humitidy	HH660	Mieo	N/A	2018.10.11	2019.10.10

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2018.10.13	2019.10.12
Signal Analyzer	Agilent	N9020A	MY49100060	2018.10.13	2019.10.12
Temperature & Humitidy	HH660	Mieo	N/A	2018.10.11	2019.10.10

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

operating frequency band. In case the emission fall within the restricted band specified on Part 15. 207(a) and RSS-Gen Issue 5 limit in the table below has to be followed.

FREQUENCY (MHz)	Conducted Emission limit (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

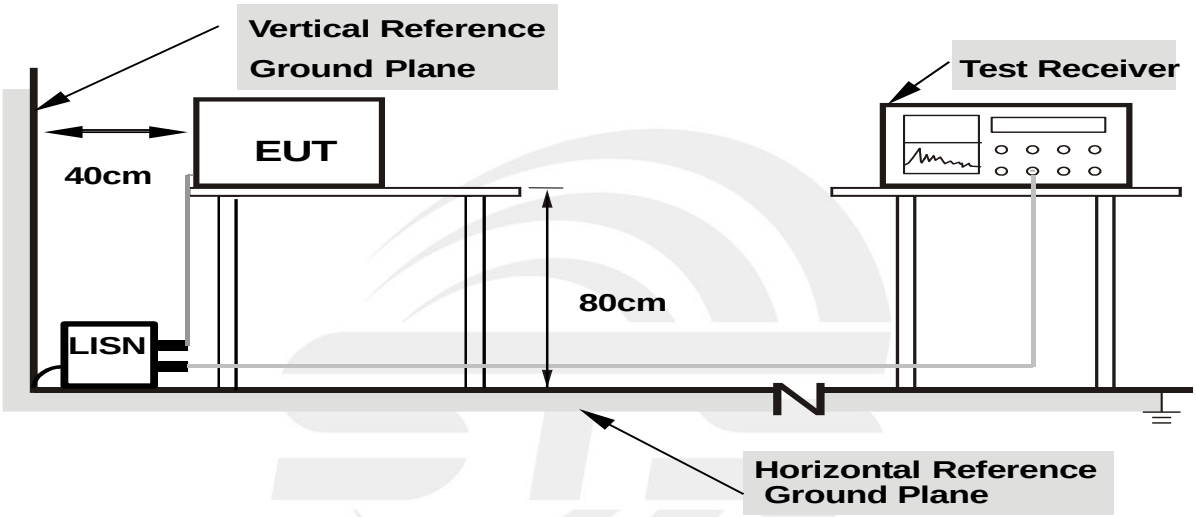
The following table is the setting of the receiver

Receiver Parameters	**Setting**
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

a. The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.4 EUT OPERATING CONDITIONS

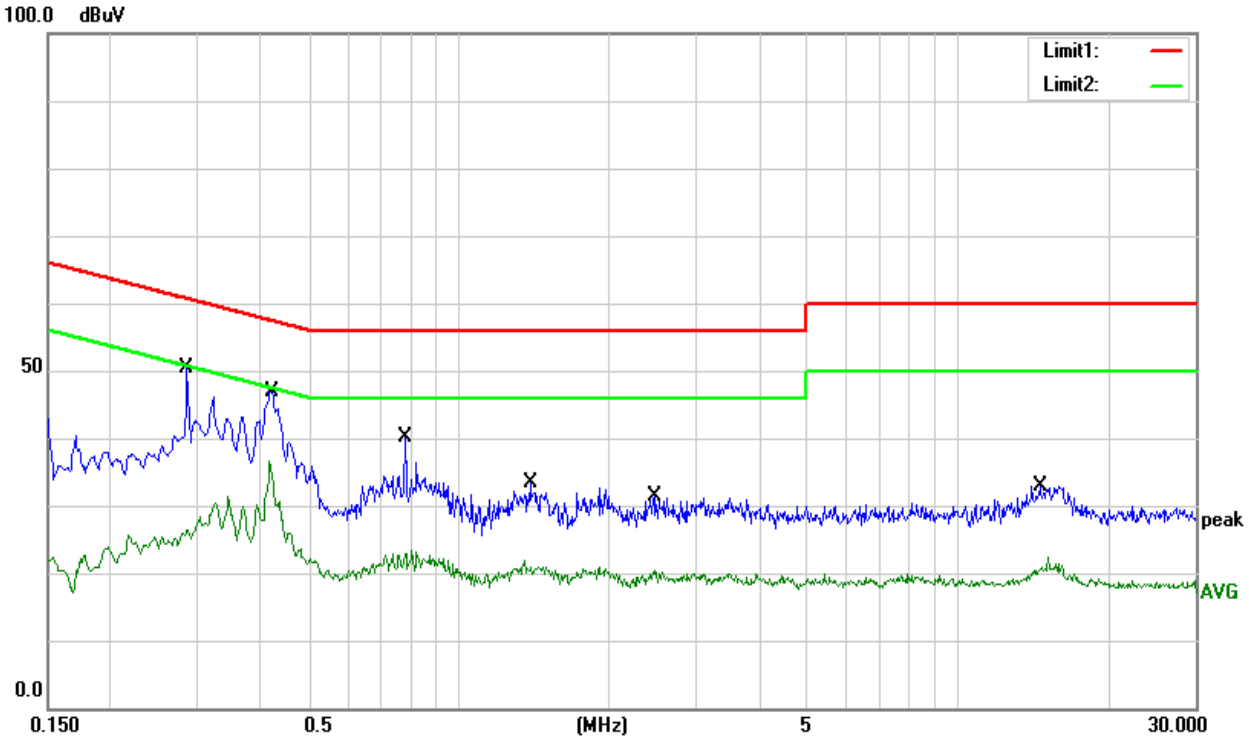
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.5 TEST RESULT

Temperature:	25.2 ℃	Relative Humidity:	58%
Test Voltage:	AC 120V/60Hz	Phase:	L
Test Mode:	Mode 13		

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
0.2860	29.69	20.66	50.35	60.64	-10.29	QP
0.2860	10.67	20.66	31.33	50.64	-19.31	AVG
0.4220	26.51	20.49	47.00	57.41	-10.41	QP
0.4220	16.09	20.49	36.58	47.41	-10.83	AVG
0.7820	19.88	20.23	40.11	56.00	-15.89	QP
0.7820	3.19	20.23	23.42	46.00	-22.58	AVG
1.3940	13.20	20.12	33.32	56.00	-22.68	QP
1.3940	1.75	20.12	21.87	46.00	-24.13	AVG
2.4700	11.24	20.02	31.26	56.00	-24.74	QP
2.4700	0.24	20.02	20.26	46.00	-25.74	AVG
14.6660	13.00	19.98	32.98	60.00	-27.02	QP
14.6660	2.50	19.98	22.48	50.00	-27.52	AVG

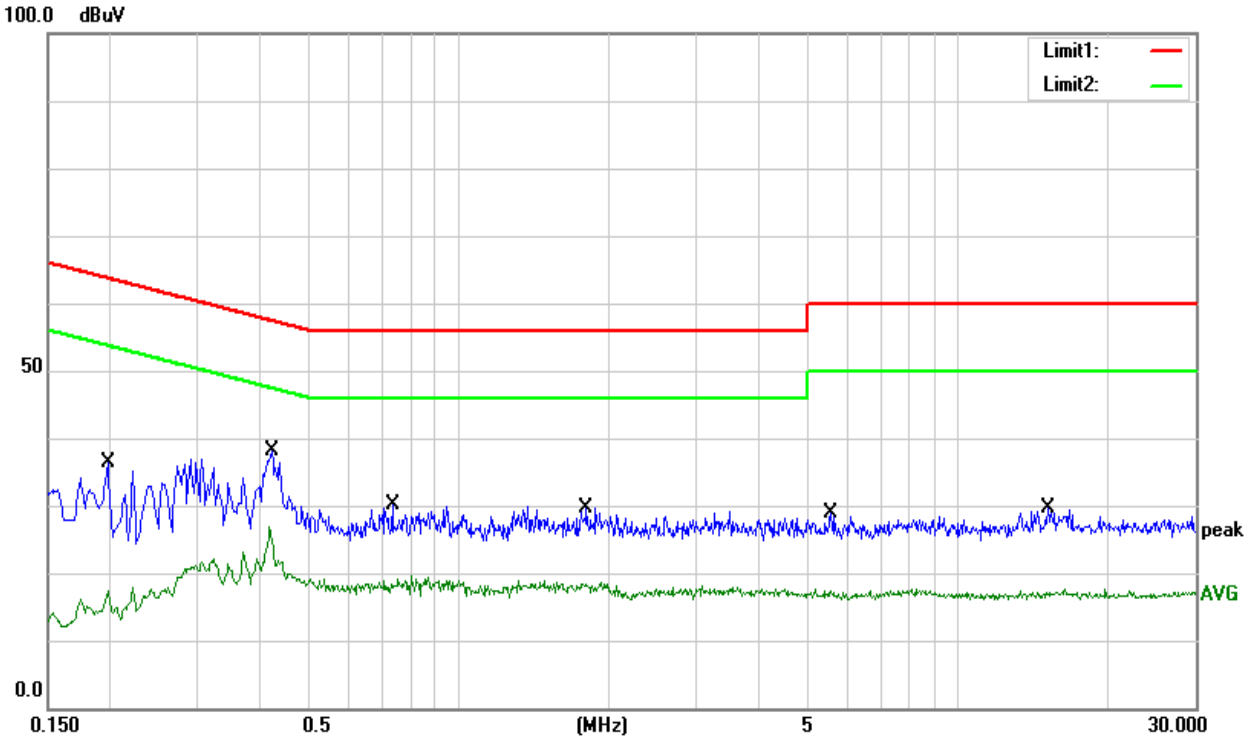
Remark:
1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit



Temperature:	25.2 ℃	Relative Humidity:	58%
Test Voltage:	AC 120V/60Hz	Phase:	N
Test Mode:	Mode 13		

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
0.1980	16.12	20.23	36.35	63.69	-27.34	QP
0.1980	-1.50	20.23	18.73	53.69	-34.96	AVG
0.4220	17.63	20.49	38.12	57.41	-19.29	QP
0.4220	6.33	20.49	26.82	47.41	-20.59	AVG
0.7380	10.01	20.24	30.25	56.00	-25.75	QP
0.7380	-0.57	20.24	19.67	46.00	-26.33	AVG
1.8060	9.47	20.08	29.55	56.00	-26.45	QP
1.8060	-1.50	20.08	18.58	46.00	-27.42	AVG
5.5900	8.93	19.92	28.85	60.00	-31.15	QP
5.5900	-2.48	19.92	17.44	50.00	-32.56	AVG
15.1980	9.59	19.97	29.56	60.00	-30.44	QP
15.1980	-2.43	19.97	17.54	50.00	-32.46	AVG

Remark:
1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS

in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205(a)&209(a) and RSS-247 Issue 2 limit in the table and according to ANSI C63.10-2013 below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

Frequencies (MHz)	Field Strength (micorvolts/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

LIMITS OF RADIATED EMISSION MEASUREMENT (1000MHz-25GHz)

FREQUENCY (MHz)	(dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

For Radiated Emission

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/AV
Start Frequency	1000 MHz(Peak/AV)
Stop Frequency	10th carrier hamonic(Peak/AV)
RB / VB (emission in restricted band)	1 MHz /3MHz

For Band edge

Spectrum Parameter	Setting
Detector	Peak/AV
Start/Stop Frequency	Lower Band Edge: 2300 to 2422 MHz Upper Band Edge: 2452 to 2500 MHz
RB / VB (emission in restricted band)	1 MHz /3MHz

Receiver Parameter	Setting
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

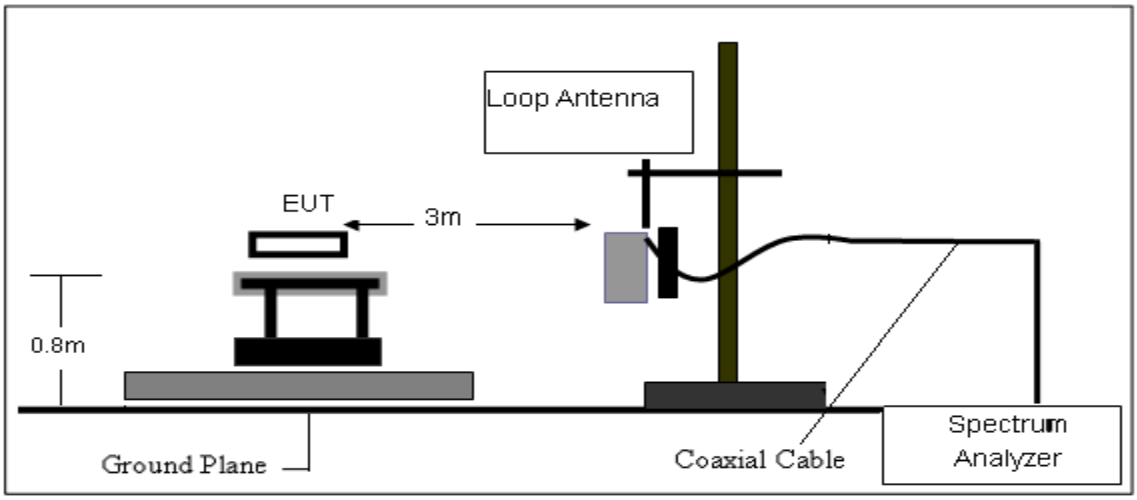
a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 meters(above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. Horizontal and vertical polarizations of the antenna are set to make the measurement
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

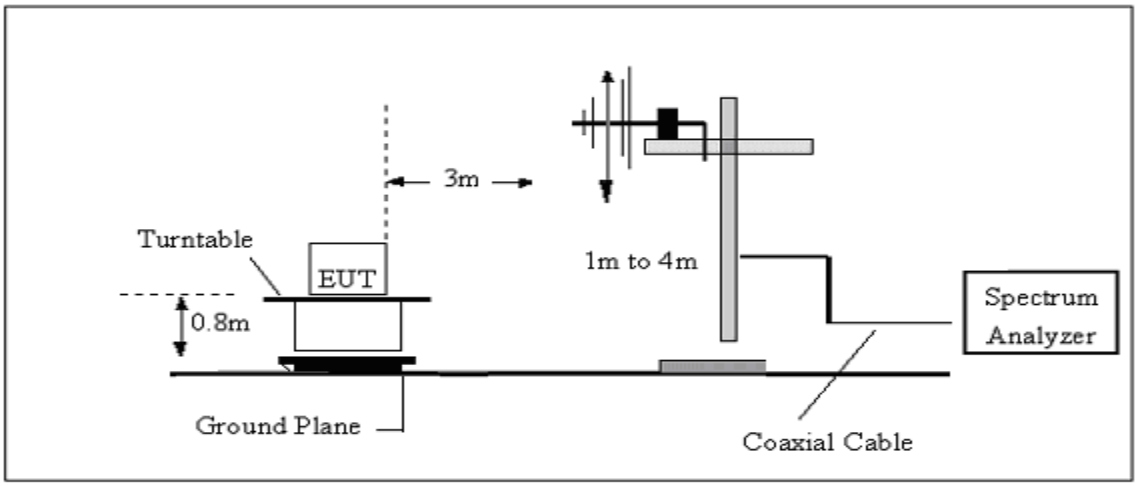
Both horizontal and vertical antenna polarities were tested and performed test to three orthogonal axis. The worst case emissions were reported

3.2.3 TEST SETUP

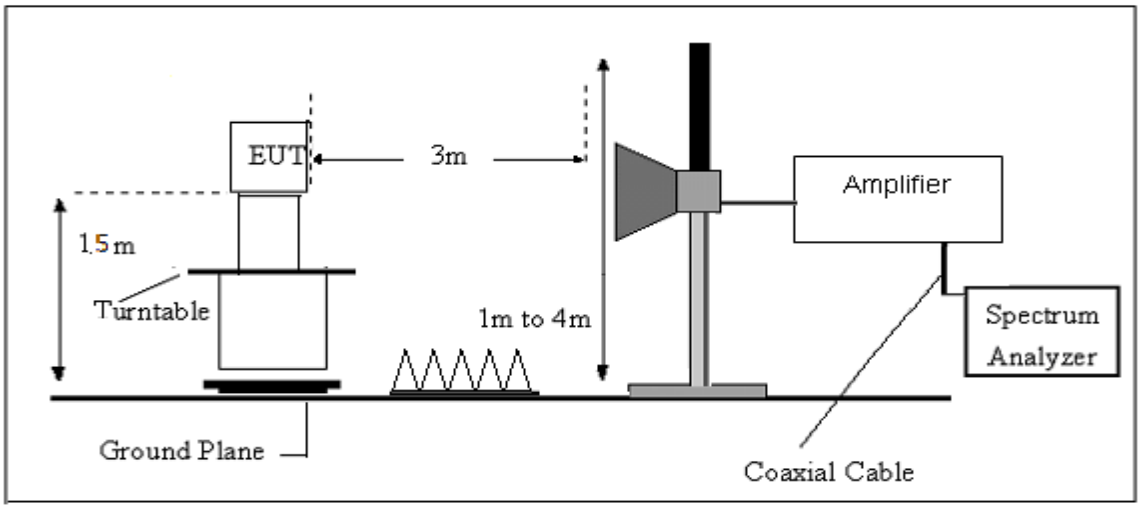
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz



（C）Radiated Emission Test-Up Frequency Above 1GHz



3.2.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.5 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

Frequency	FS	RA	AF	CL	AG	Factor
(MHz)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(dB)	(dB)
300	40	58.1	12.2	1.6	31.9	-18.1

Factor=AF+CL-AG

1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China
Tel: + 86-755 3688 6288 Fax:+ 86-755 3688 6277 Http://www.stsapp.com E-mail: sts@stsapp.com

3.2.6 TEST RESULT

9KHz-30MHz

Temperature:	24.5 ℃	Relative Humidtity:	53%
Test Voltage :	DC 3.3V	Polarization :	--
Test Mode :	TX Mode		

Freq. (MHz)	Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	State P/F	Test Result
--	--	--	--	--	PASS
--	--	--	--	--	PASS

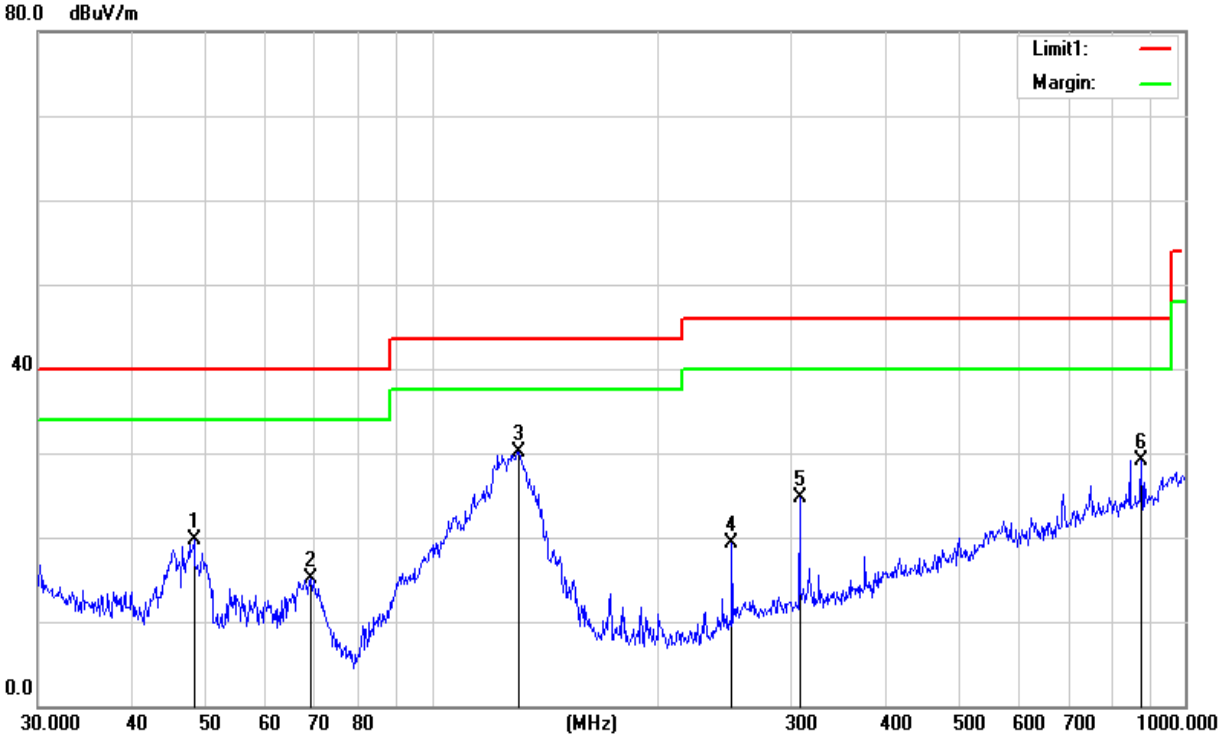
Note:
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

(30MHz - 1000MHz)

Temperature:	24.5 ℃	Relative Humidtity:	53%
Test Voltage :	DC 3.3V	Polarization :	Horizontal
Test Mode :	Mode 1/2/3/4/5/6/7/8/9/10/11/12(Mode 1-1M worst mode)		

Frequency	Reading	Correct	Result	Limit	Margin	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
48.3318	40.39	-20.62	19.77	40.00	-20.23	QP
69.1141	39.23	-24.12	15.11	40.00	-24.89	QP
130.3790	47.72	-17.55	30.17	43.50	-13.33	QP
250.3012	35.64	-16.29	19.35	46.00	-26.65	QP
307.8313	39.30	-14.57	24.73	46.00	-21.27	QP
875.2470	31.74	-2.56	29.18	46.00	-16.82	QP

Remark:
1. Margin = Result (Result =Reading + Factor)–Limit

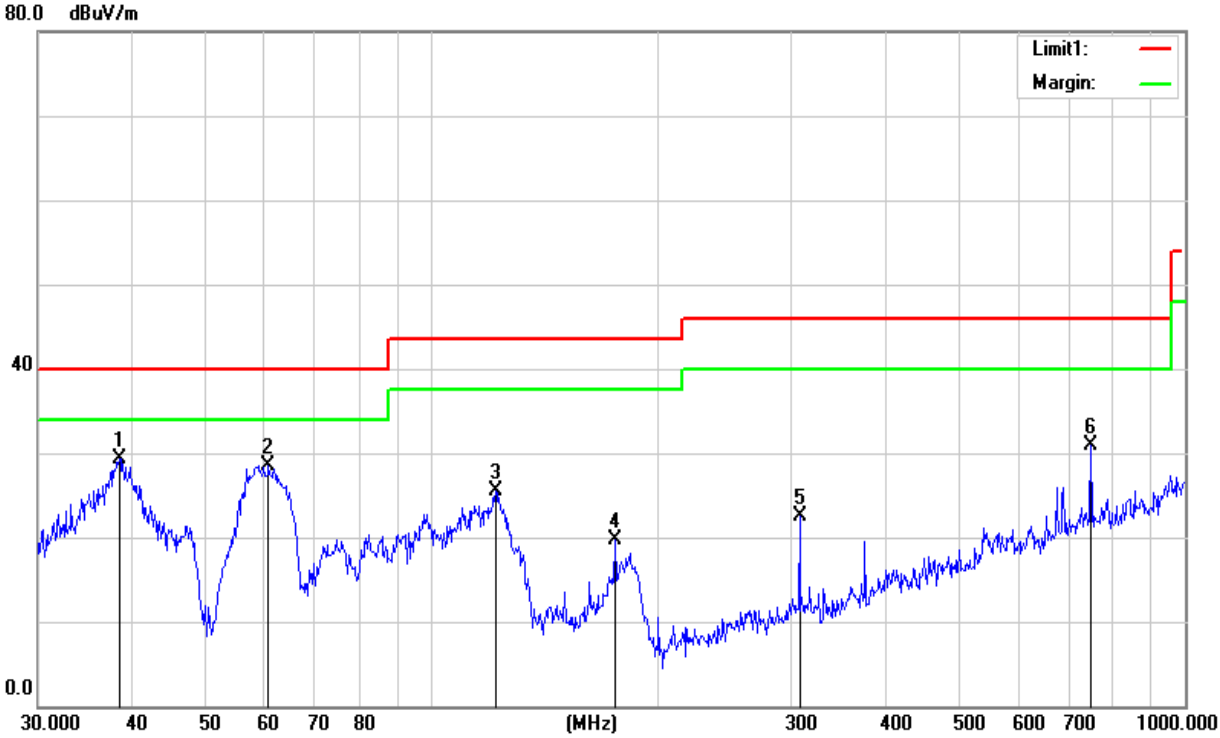


Temperature:	24.5 ℃	Relative Humidtity:	53%
Test Voltage :	DC 3.3V	Polarization :	Vertical
Test Mode :	Mode 1/2/3/4/5/6/7/8/9/10/11/12(Mode 1-1M worst mode)		

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
38.4810	44.88	-15.54	29.34	40.00	-10.66	QP
60.7044	52.86	-24.33	28.53	40.00	-11.47	QP
121.5486	43.12	-17.67	25.45	43.50	-18.05	QP
175.0368	39.07	-19.38	19.69	43.50	-23.81	QP
307.8313	37.01	-14.57	22.44	46.00	-23.56	QP
750.1083	34.46	-3.56	30.90	46.00	-15.10	QP

Remark:.

1. Margin = Result (Result =Reading + Factor)–Limit



(1000MHz-25GHz) Restricted band and Spurious emission Requirements

802.11b Low Channel

Frequency (MHz)	Meter Reading (dBμV)	Amplifier (dB)	Loss (dB)	Antenna Factor (dB/m)	Orrected Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Low Channel (2412 MHz)										
3264.73	61.57	44.70	6.70	28.20	-9.80	51.77	74.00	-22.23	PK	Vertical
3264.73	50.23	44.70	6.70	28.20	-9.80	40.43	54.00	-13.57	AV	Vertical
3264.67	61.14	44.70	6.70	28.20	-9.80	51.34	74.00	-22.66	PK	Horizontal
3264.67	50.80	44.70	6.70	28.20	-9.80	41.00	54.00	-13.00	AV	Horizontal
4824.41	58.76	44.20	9.04	31.60	-3.56	55.20	74.00	-18.80	PK	Vertical
4824.41	49.89	44.20	9.04	31.60	-3.56	46.33	54.00	-7.67	AV	Vertical
4824.34	58.47	44.20	9.04	31.60	-3.56	54.91	74.00	-19.09	PK	Horizontal
4824.34	49.48	44.20	9.04	31.60	-3.56	45.92	54.00	-8.08	AV	Horizontal
5359.69	49.41	44.20	9.86	32.00	-2.34	47.07	74.00	-26.93	PK	Vertical
5359.69	39.23	44.20	9.86	32.00	-2.34	36.89	54.00	-17.11	AV	Vertical
5359.63	47.51	44.20	9.86	32.00	-2.34	45.17	74.00	-28.83	PK	Horizontal
5359.63	39.24	44.20	9.86	32.00	-2.34	36.90	54.00	-17.10	AV	Horizontal
7235.69	54.22	43.50	11.40	35.50	3.40	57.62	74.00	-16.38	PK	Vertical
7235.69	44.04	43.50	11.40	35.50	3.40	47.44	54.00	-6.56	AV	Vertical
7235.87	53.56	43.50	11.40	35.50	3.40	56.96	74.00	-17.04	PK	Horizontal
7235.74	43.74	43.50	11.40	35.50	3.40	47.14	54.00	-6.86	AV	Horizontal

802.11b Mid Channel

Frequency (MHz)	Meter Reading (dBμV)	Amplifier (dB)	Loss (dB)	Antenna Factor (dB/m)	Orrected Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Low Channel (2437 MHz)										
3264.76	61.67	44.70	6.70	28.20	-9.80	51.87	74.00	-22.13	PK	Vertical
3264.76	51.05	44.70	6.70	28.20	-9.80	41.25	54.00	-12.75	AV	Vertical
3264.74	61.79	44.70	6.70	28.20	-9.80	51.99	74.00	-22.01	PK	Horizontal
3264.74	50.90	44.70	6.70	28.20	-9.80	41.10	54.00	-12.90	AV	Horizontal
4874.45	58.57	44.20	9.04	31.60	-3.56	55.01	74.00	-18.99	PK	Vertical
4874.45	49.84	44.20	9.04	31.60	-3.56	46.28	54.00	-7.72	AV	Vertical
4874.47	59.38	44.20	9.04	31.60	-3.56	55.82	74.00	-18.18	PK	Horizontal
4874.47	50.50	44.20	9.04	31.60	-3.56	46.94	54.00	-7.06	AV	Horizontal
5359.66	49.25	44.20	9.86	32.00	-2.34	46.91	74.00	-27.09	PK	Vertical
5359.66	39.07	44.20	9.86	32.00	-2.34	36.73	54.00	-17.27	AV	Vertical
5359.75	48.51	44.20	9.86	32.00	-2.34	46.17	74.00	-27.83	PK	Horizontal
5359.75	38.56	44.20	9.86	32.00	-2.34	36.22	54.00	-17.78	AV	Horizontal
7310.72	53.52	43.50	11.40	35.50	3.40	56.92	74.00	-17.08	PK	Vertical
7310.72	43.97	43.50	11.40	35.50	3.40	47.37	54.00	-6.63	AV	Vertical
7310.75	53.54	43.50	11.40	35.50	3.40	56.94	74.00	-17.06	PK	Horizontal
7310.75	43.99	43.50	11.40	35.50	3.40	47.39	54.00	-6.61	AV	Horizontal

802.11b High Channel

Frequency (MHz)	Meter Reading (dBμV)	Amplifier (dB)	Loss (dB)	Antenna Factor (dB/m)	Orrected Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Low Channel (2462 MHz)										
3264.88	62.01	44.70	6.70	28.20	-9.80	52.21	74.00	-21.79	PK	Vertical
3264.88	50.97	44.70	6.70	28.20	-9.80	41.17	54.00	-12.83	AV	Vertical
3264.77	61.78	44.70	6.70	28.20	-9.80	51.98	74.00	-22.02	PK	Horizontal
3264.77	50.41	44.70	6.70	28.20	-9.80	40.61	54.00	-13.39	AV	Horizontal
4924.28	59.25	44.20	9.04	31.60	-3.56	55.69	74.00	-18.31	PK	Vertical
4924.28	49.42	44.20	9.04	31.60	-3.56	45.86	54.00	-8.14	AV	Vertical
4924.53	58.85	44.20	9.04	31.60	-3.56	55.29	74.00	-18.71	PK	Horizontal
4924.53	49.33	44.20	9.04	31.60	-3.56	45.77	54.00	-8.23	AV	Horizontal
5359.82	48.19	44.20	9.86	32.00	-2.34	45.85	74.00	-28.15	PK	Vertical
5359.82	38.94	44.20	9.86	32.00	-2.34	36.60	54.00	-17.40	AV	Vertical
5359.85	47.31	44.20	9.86	32.00	-2.34	44.97	74.00	-29.03	PK	Horizontal
5359.85	38.49	44.20	9.86	32.00	-2.34	36.15	54.00	-17.85	AV	Horizontal
7385.86	54.30	43.50	11.40	35.50	3.40	57.70	74.00	-16.30	PK	Vertical
7385.86	44.31	43.50	11.40	35.50	3.40	47.71	54.00	-6.29	AV	Vertical
7385.75	54.16	43.50	11.40	35.50	3.40	57.56	74.00	-16.44	PK	Horizontal
7385.75	44.07	43.50	11.40	35.50	3.40	47.47	54.00	-6.53	AV	Horizontal

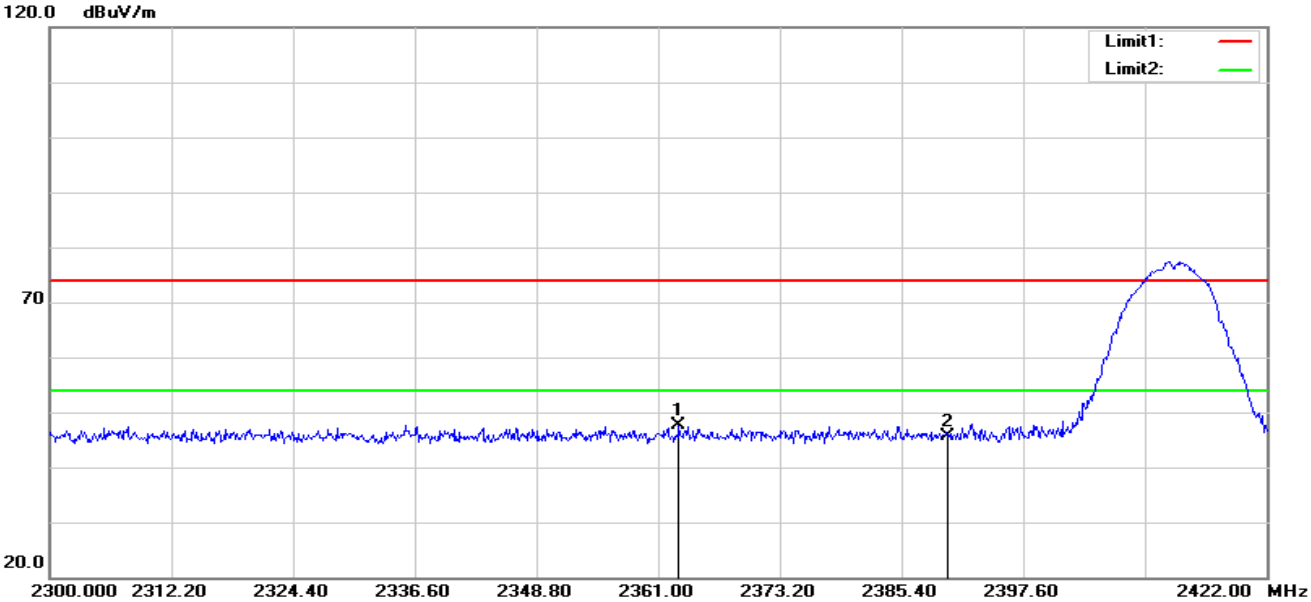
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
2. Scan with 802.11b, 802.11g, 802.11n (HT-20), 802.11n (HT-40) the worst case is 802.11b.
   Emission Level = Reading + Factor
   Margin = Limit - Emission Leve
3. The frequency emission of peak points that did not show above the forms are at least 20dB below the limit, the frequency emission is mainly from the environment noise.

3.2.6 TEST RESULTS (Restricted band Requirements)

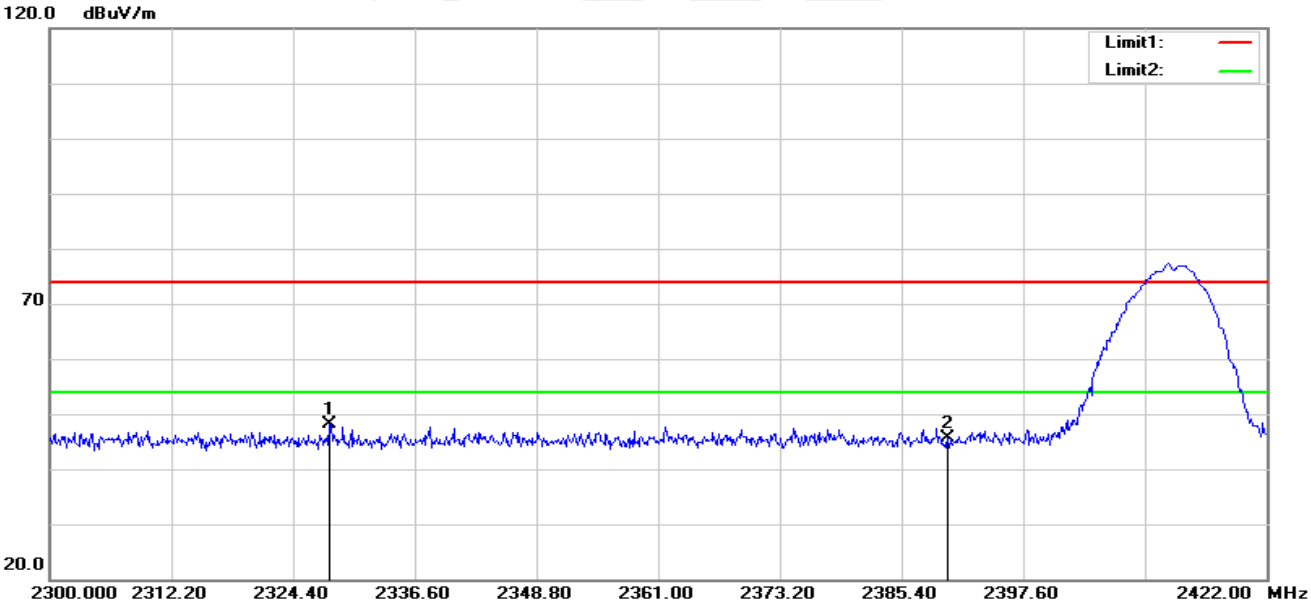
802.11b-Low

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2363.074	58.46	-10.94	47.52	74.00	-26.48	peak
2	2390.000	56.42	-10.75	45.67	74.00	-28.33	peak

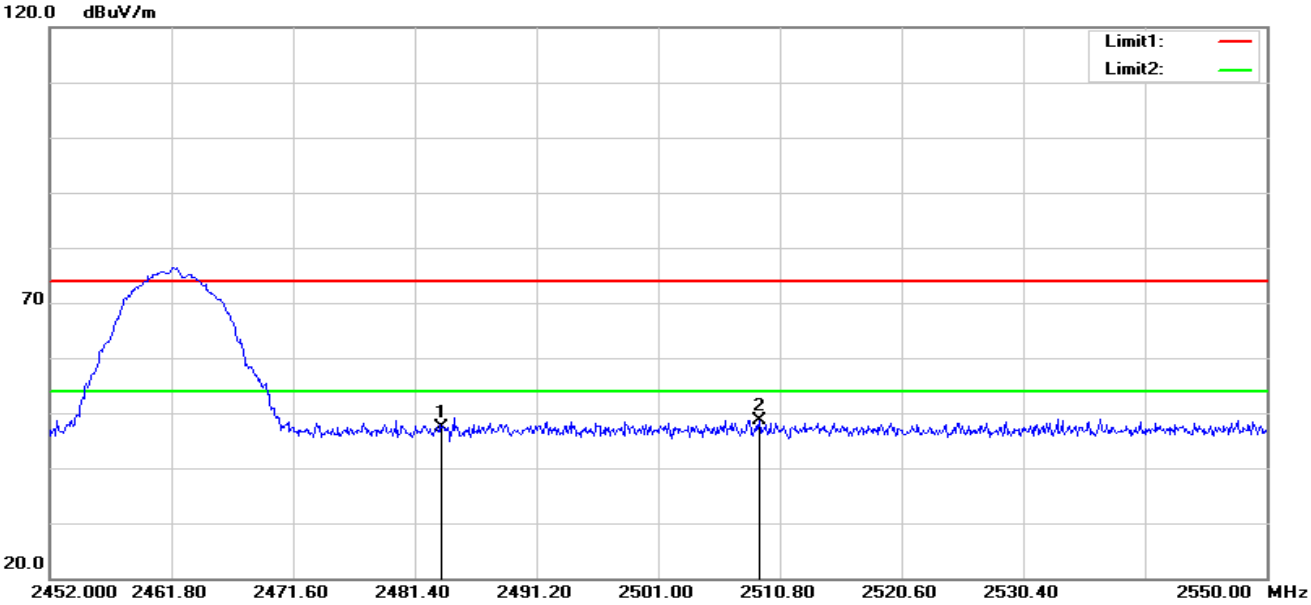
Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2328.060	59.32	-11.16	48.16	74.00	-25.84	peak
2	2390.000	56.26	-10.75	45.51	74.00	-28.49	peak

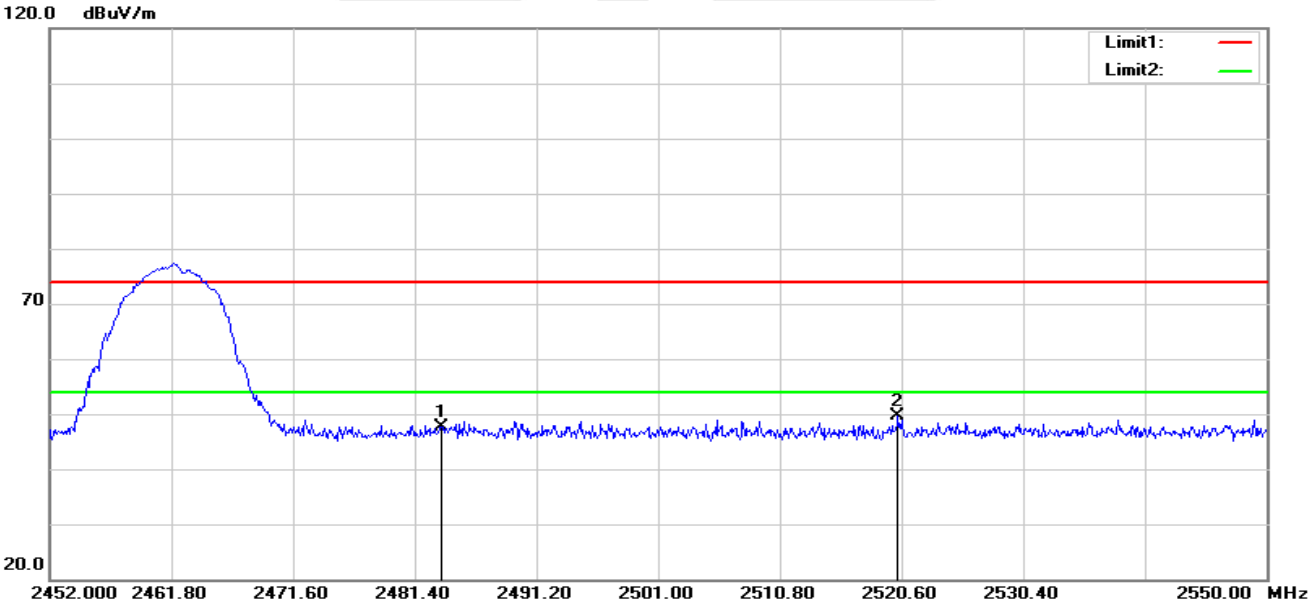
802.11b-High

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	57.73	-10.29	47.44	74.00	-26.56	peak
2	2509.134	58.79	-10.19	48.60	74.00	-25.40	peak

Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	57.88	-10.29	47.59	74.00	-26.41	peak
2	2520.306	59.68	-10.16	49.52	74.00	-24.48	peak

Note: 802.11b, 802.11g, 802.11n(HT20), 802.11n(HT40) mode all have been test, the worst mode is 802.11b, only show the worst mode.

4. CONDUCTED SPURIOUS & BAND EDGE EMISSION

4.1 LIMIT

According to FCC section 15.247(d) and RSS-247 Issue 2, 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.

4.2 TEST PROCEDURE

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

.

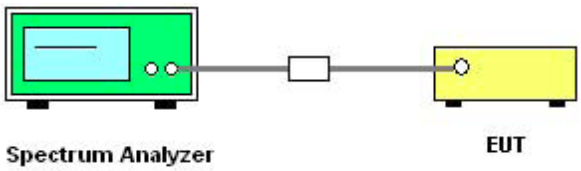
For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 2300 to 2422 MHz Upper Band Edge: 2452 to 2500 MHz
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

4.3 DEVIATION FROM STANDARD

No deviation.

4.4 TEST SETUP



The EUT which is powered by the DC Power, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

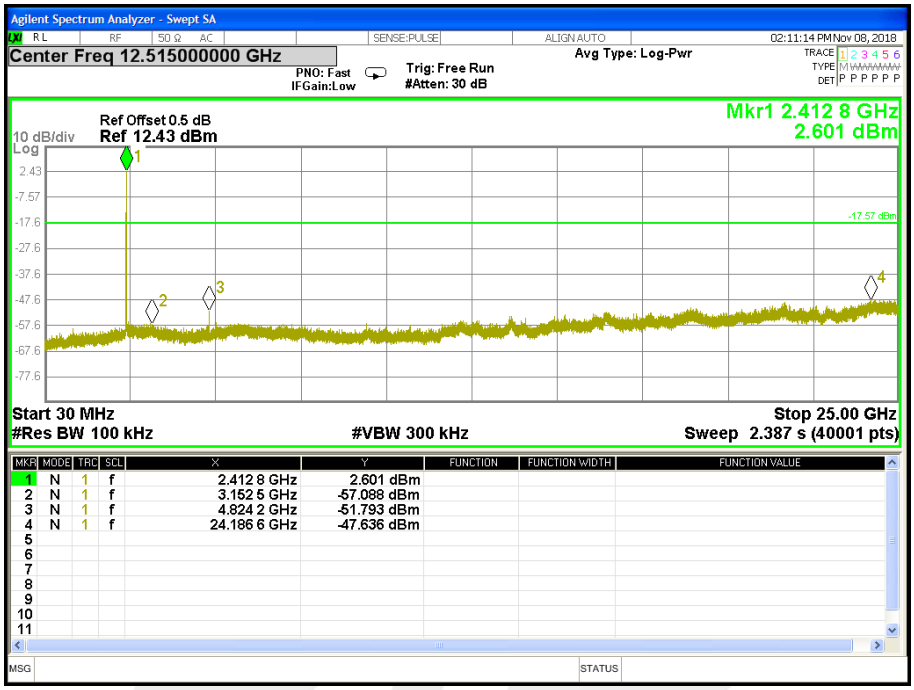
4.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

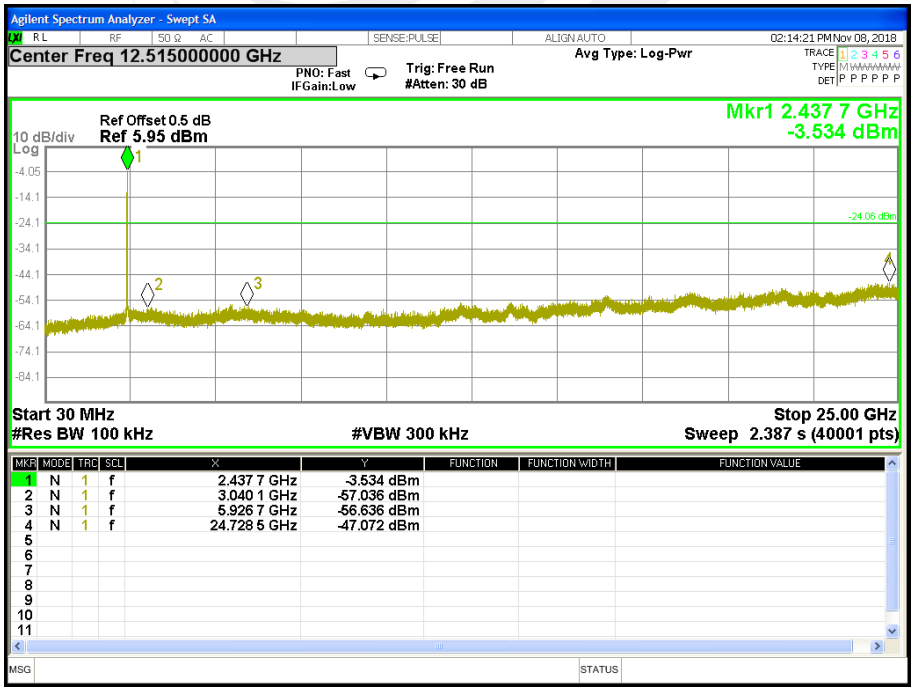
4.6 TEST RESULTS

Temperature :	25 ℃	Relative Humidity :	60%
Test Voltage :	DC 3.3V	Test Mode :	TX b Mode /CH01, CH06, CH11

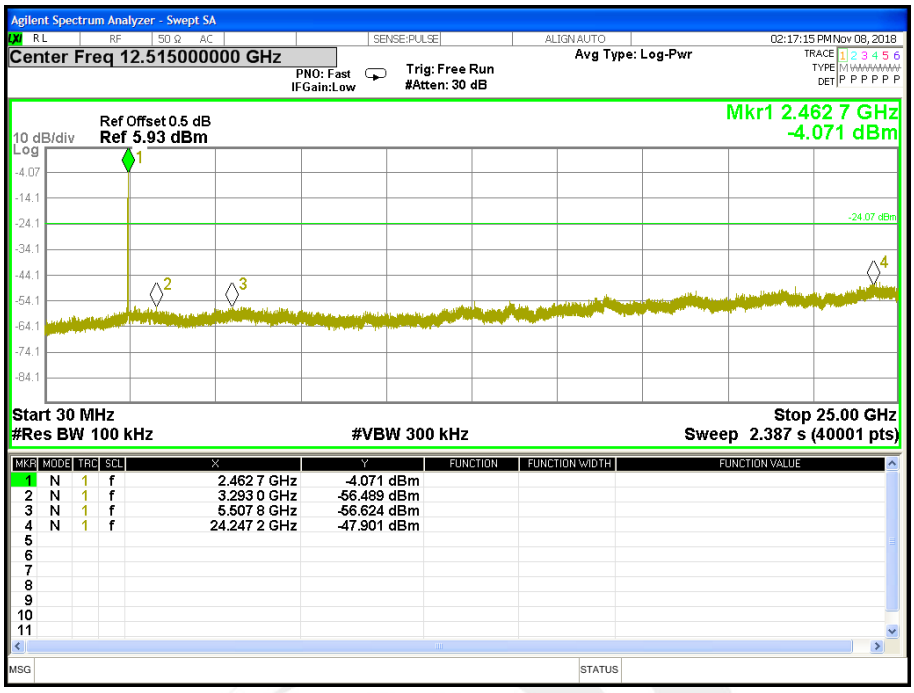
CH 01



CH 06

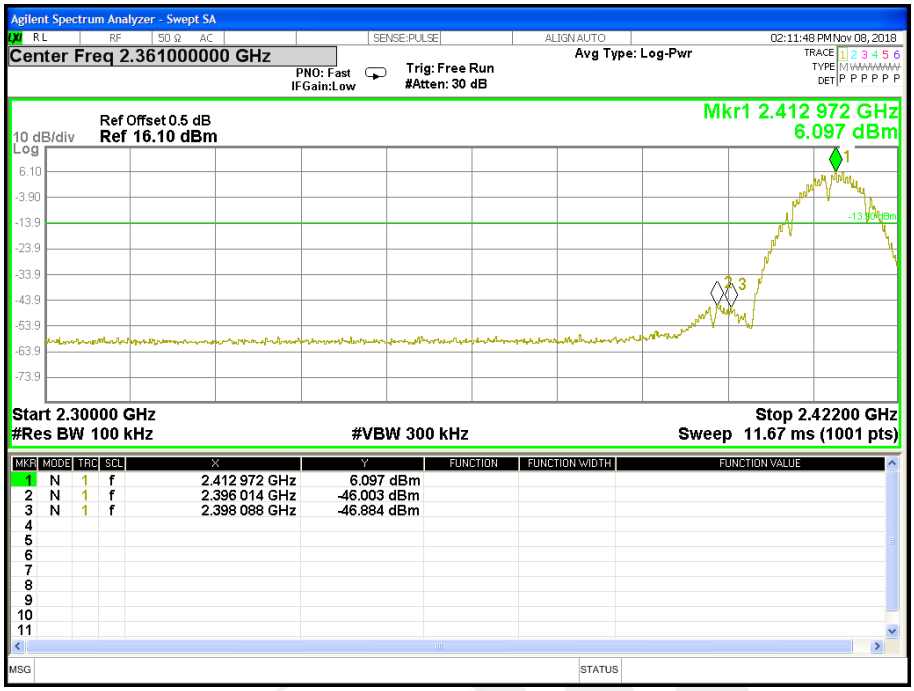


CH 11

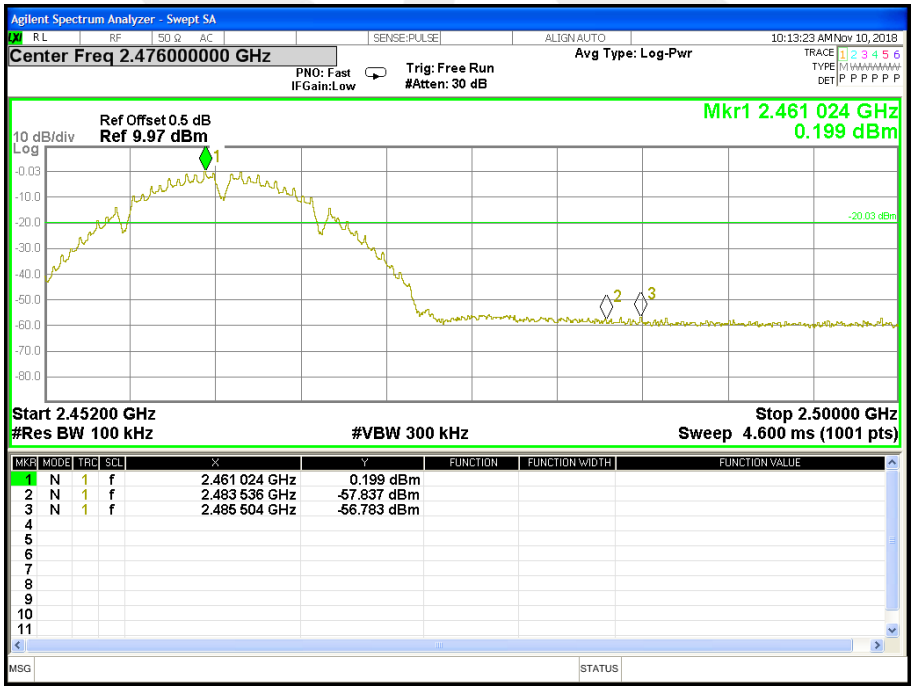

Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
02:17:15 PM Nov 08, 2018
Ref Offset 0.5 dB
10 dB/div
Ref 5.93 dBm
Mkr1 2.462 7 GHz
-4.071 dBm
-24.07 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (40001 pts)
1 N 1 f 2.462 7 GHz -4.071 dBm
2 N 1 f 3.293 0 GHz -56.489 dBm
3 N 1 f 5.507 8 GHz -56.624 dBm
4 N 1 f 24.247 2 GHz -47.901 dBm

Band edge

CH 01

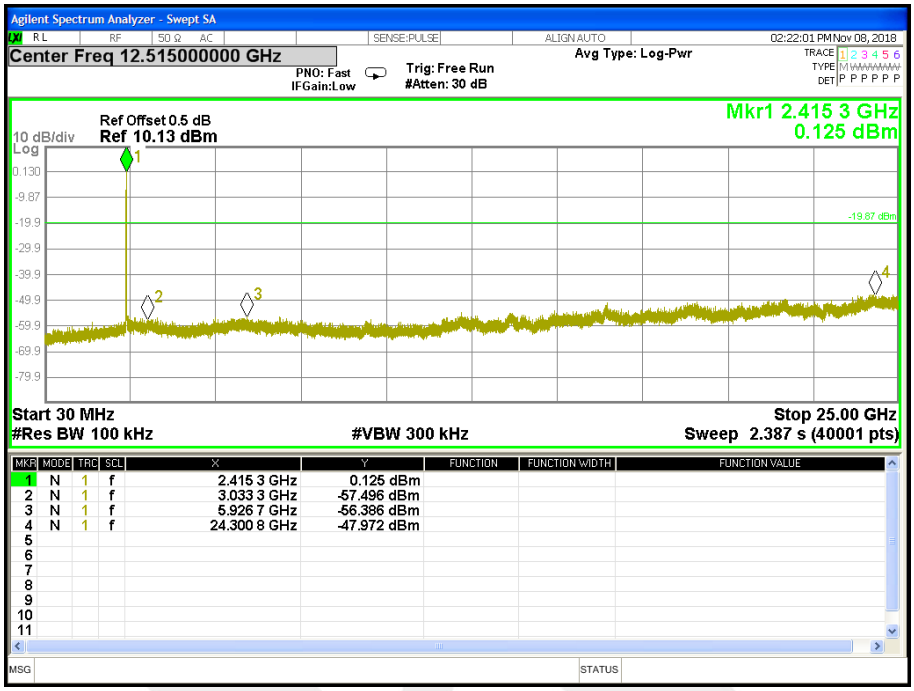


CH 11

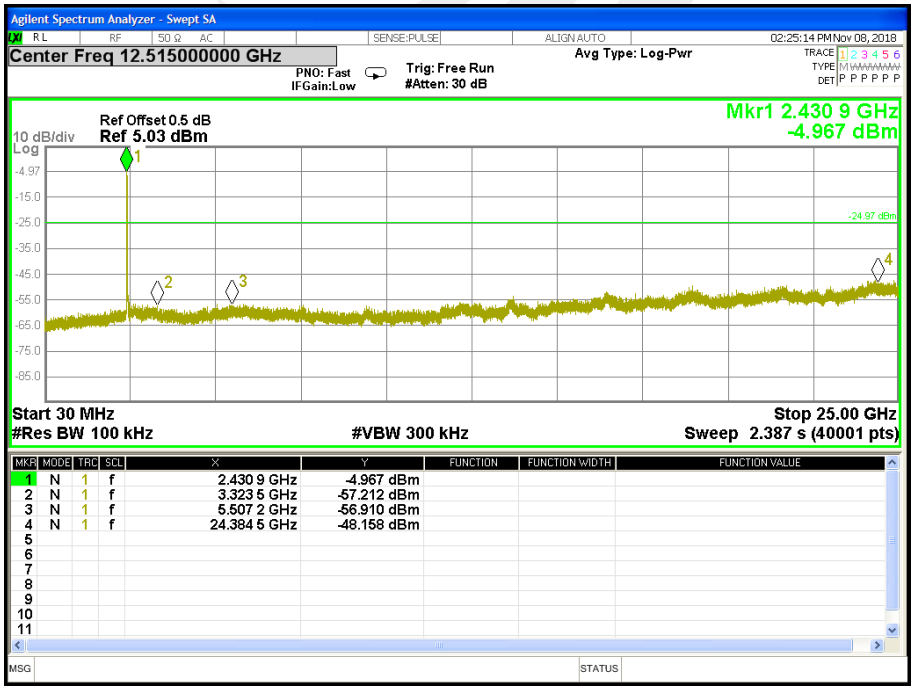


Temperature :	25 ℃	Relative Humidity :	60%
Test Voltage :	DC 3.3V	Test Mode :	TX g Mode /CH01, CH06, CH11

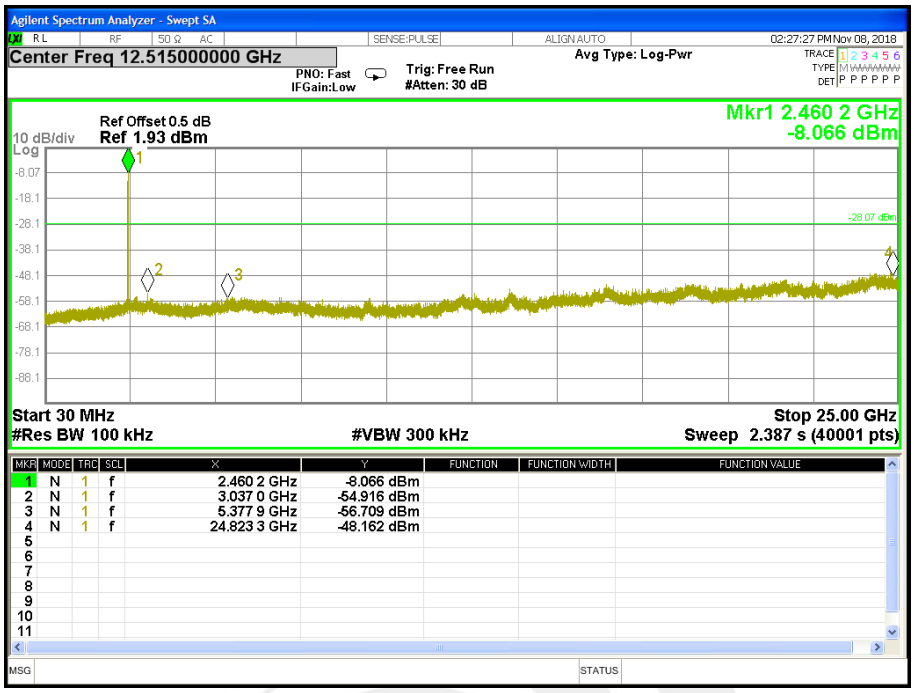
CH 01



CH06

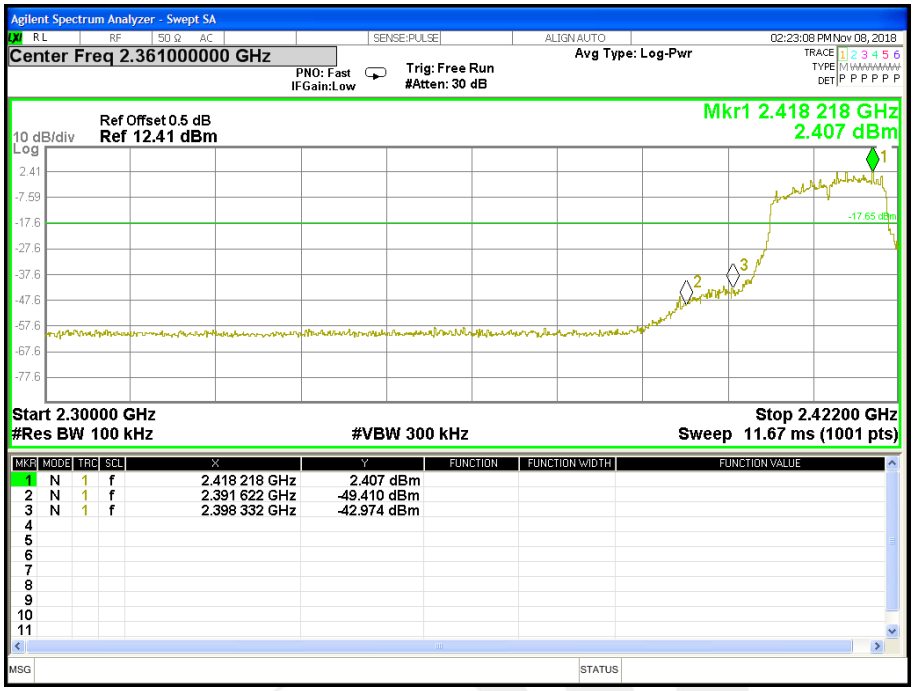


CH 11

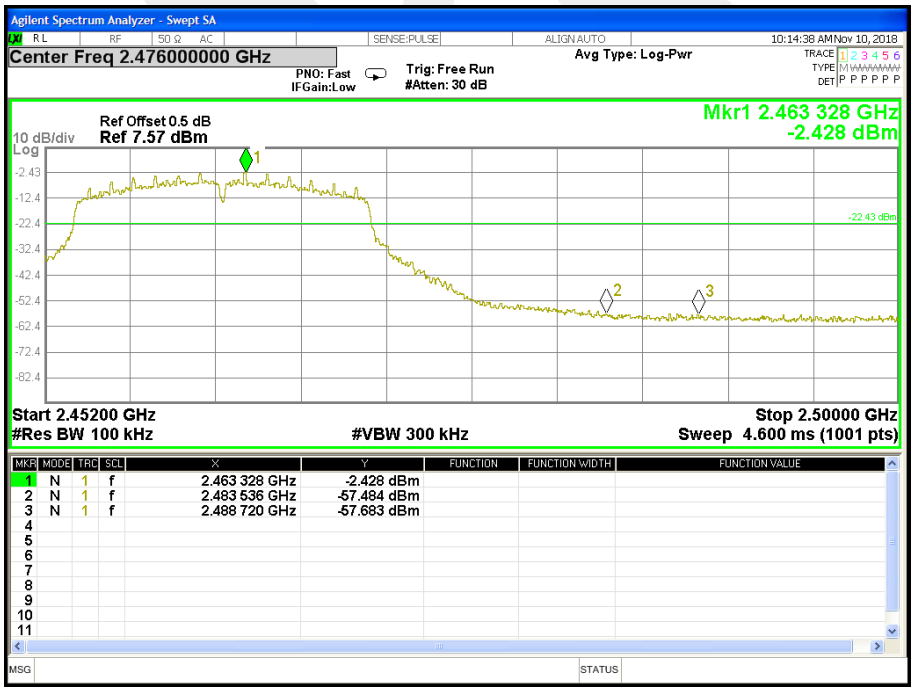

Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
02:27:27 PM Nov 08, 2018
Ref Offset 0.5 dB
10 dB/div
Ref 1.93 dBm
Log
Mkr1 2.460 2 GHz
-8.066 dBm
-28.07 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (40001 pts)
1 N 1 f 2.460 2 GHz -8.066 dBm
2 N 1 f 3.037 0 GHz -54.916 dBm
3 N 1 f 5.377 9 GHz -56.709 dBm
4 N 1 f 24.823 3 GHz -48.162 dBm

Band edge

CH 01

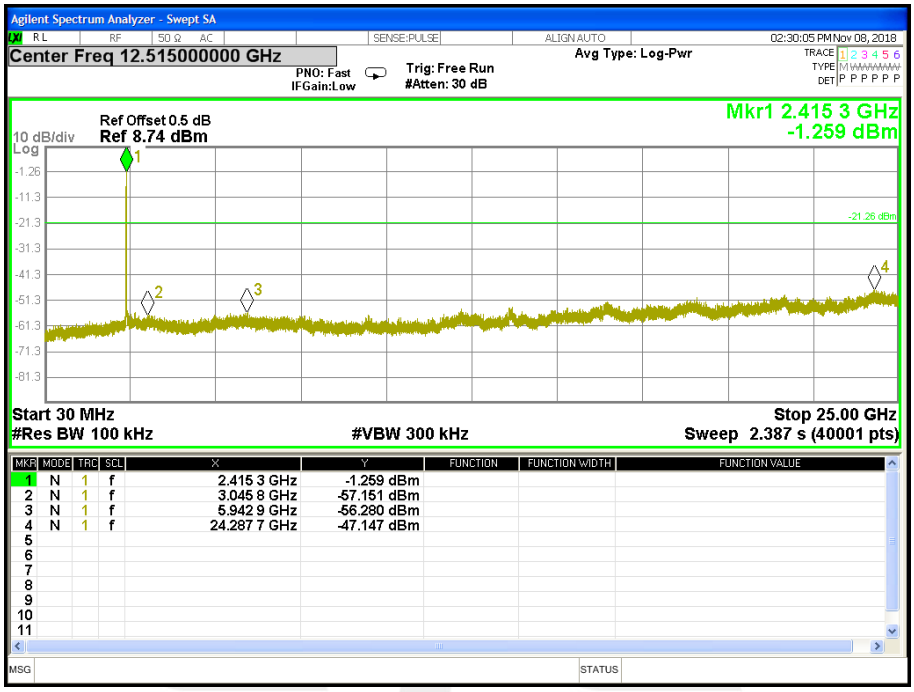


CH11

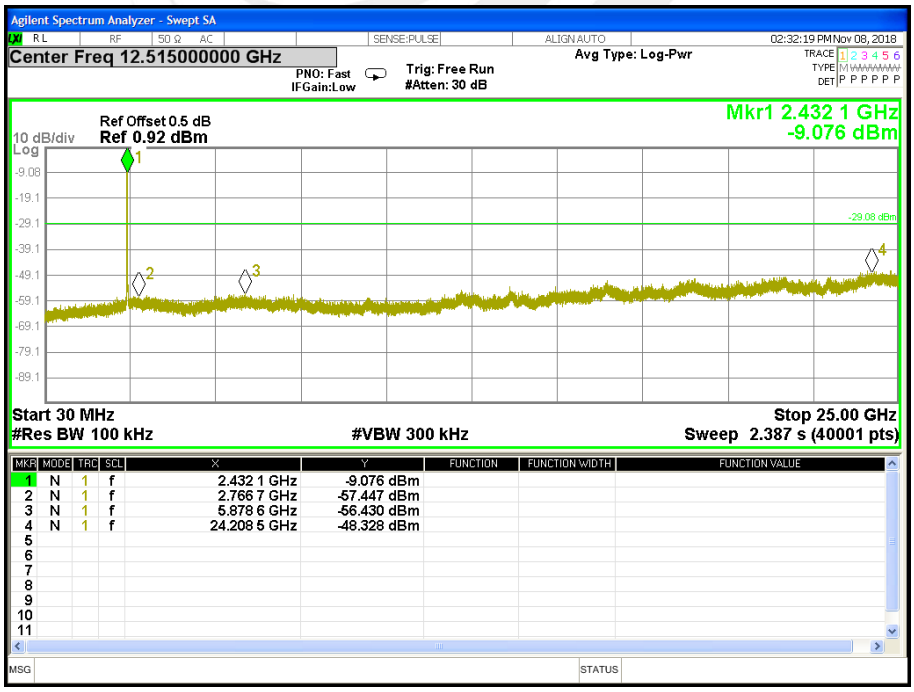


Temperature :	25 ℃	Relative Humidity :	60%
Test Voltage :	DC 3.3V	Test Mode :	TX n Mode(20M) /CH01, CH06, CH11

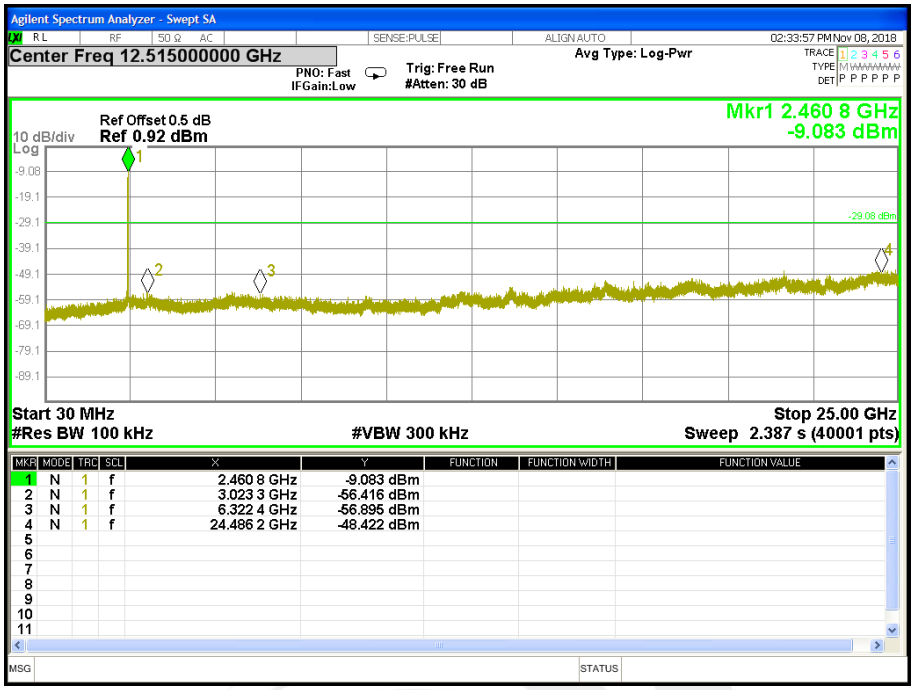
CH 01



CH 06

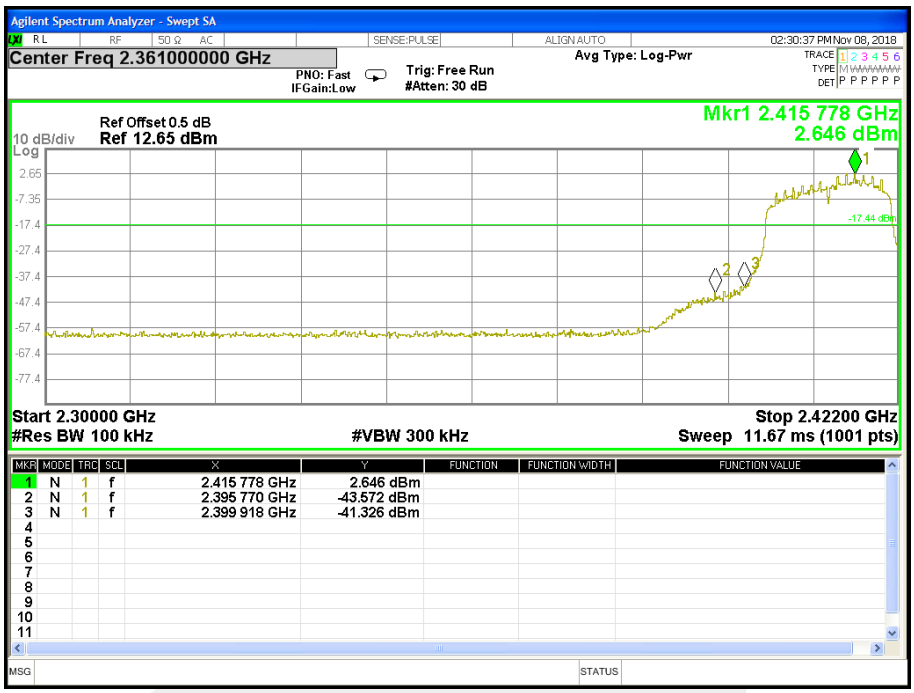


CH 11

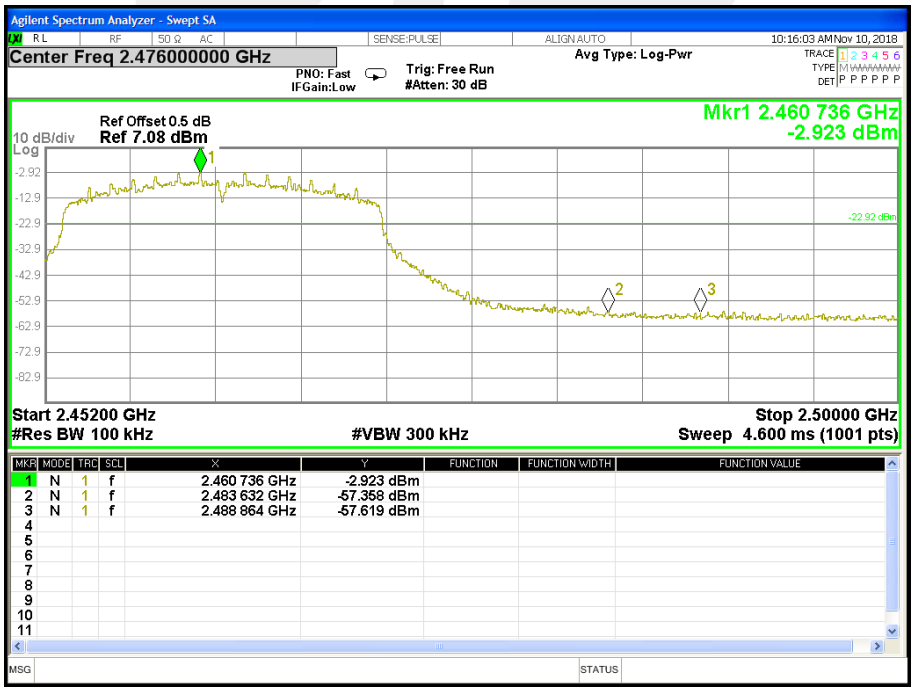

Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
02:33:57 PM Nov 08, 2018
Ref Offset 0.5 dB
10 dB/div
Ref 0.92 dBm
Mkr1 2.460 8 GHz
-9.083 dBm
-29.08 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (40001 pts)
1 N 1 f 2.460 8 GHz -9.083 dBm
2 N 1 f 3.023 3 GHz -56.416 dBm
3 N 1 f 6.322 4 GHz -56.895 dBm
4 N 1 f 24.486 2 GHz -48.422 dBm

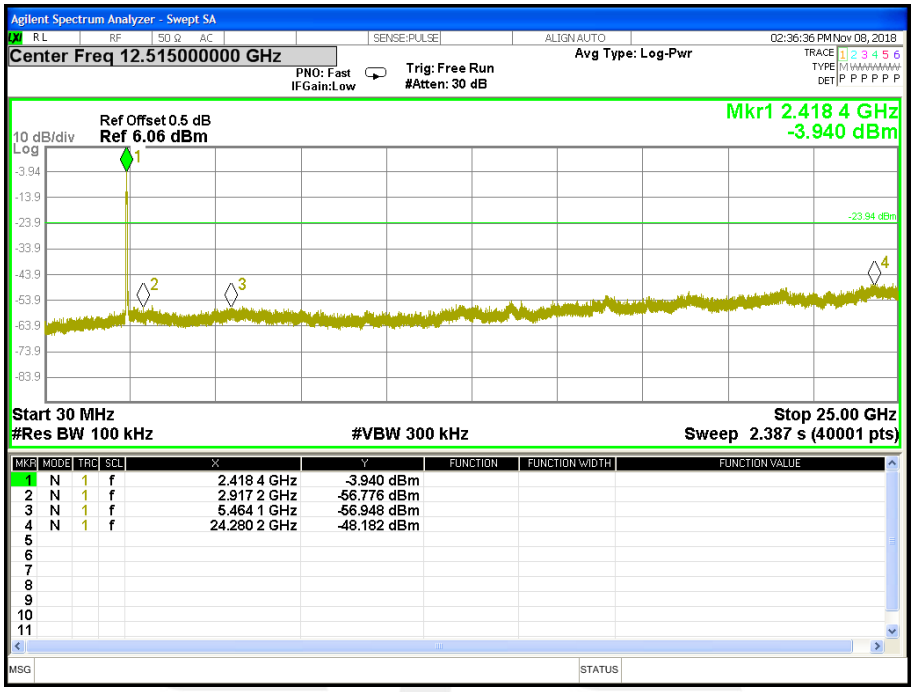
Band edge

CH 01



CH 11



Temperature:	25 ℃	Relative Humidity:	60%
Test Voltage:	DC 3.3V	Test Mode:	TX n Mode(40M) /CH03, CH06, CH09

CH 03