RADIO TEST REPORT

Report No:STS1911294W01

Issued for

Viper Design, LLC

85 Cude Lane, Madison, TN 37115, United States Of America

Product Name:	WiFi Module
Brand Name:	Viper
Model Name:	VDWIFI-RTL
Series Model:	N/A
FCC ID:	2AB7YVDW24DRTL
IC ID:	20699-VPW24DRTL
Test Standard:	FCC Part 15.247
	RSS-247 Issue 2, February 2017

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

TEST RESULT CERTIFICATION

Applicant's Name ..... :	Viper Design, LLC
Address ..... :	85 Cude Lane, Madison, TN 37115, United States Of America
Manufacture's Name ..... :	Viper Design, LLC
Address ..... :	85 Cude Lane, Madison, TN 37115, United States Of America

Product Description

Product Name ..... :	WiFi Module
Brand Name ..... :	Viper
Model Name ..... :	VDWIFI-RTL
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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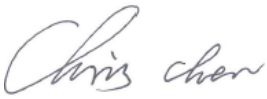
Date of Test ..... :	
Date (s) of performance of tests ..... :	04 Nov. 2019 ~ 06 Nov. 2019
Date of Issue ..... :	07 Nov. 2019
Test Result ..... :	**Pass**

Testing Engineer : 

(Chris Chen)

Technical Manager : 

(Sunday Hu)

Authorized Signatory : 

(Vita Li)

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Revision History

Rev.	Issue Date	Report No.	Effect Page	Contents
00	07 Nov. 2019	STS1911294W01	ALL	Initial Issue

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:
KDB 558074 D01 15.247 Meas Guidance v05r02

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. : A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District,Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration Number: 625569

IC test Firm Registration Number: 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	Uncertainty
1	RF output power, conducted	±0.68dB
2	Unwanted Emissions, conducted	±2.988dB
3	All emissions, radiated 30-1GHz	±6.7dB
4	All emissions, radiated 1G-6GHz	±5.5dB
5	All emissions, radiated>6G	±5.8dB
6	Conducted Emission (9KHz-150KHz)	±4.43dB
7	Conducted Emission (150KHz-30MHz)	±5dB

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

<table>
<tr><td>Product Name</td><td>WiFi Module</td></tr>
<tr><td>Trade Name</td><td>Viper</td></tr>
<tr><td>Model Name</td><td>VDWIFI-RTL</td></tr>
<tr><td>Series Model</td><td>N/A</td></tr>
<tr><td>Model Difference</td><td>N/A</td></tr>
<tr><td>Product Description</td><td>The EUT is a WiFi Module
<table>
<tr><td>Operation Frequency:</td><td>802.11b/g/n 20: 2412~2462 MHz</td></tr>
<tr><td>Modulation Type:</td><td>802.11b(DSSS):CCK,DQPSK,DBPSK
802.11g(OFDM):BPSK,QPSK,16-QAM,64-QAM
802.11n(OFDM):BPSK,QPSK,16-QAM,64-QAM</td></tr>
<tr><td>Bit Rate of Transmitter:</td><td>802.11b:11/5.5/2/1 Mbps
802.11g:54/48/36/24/18/12/9/6Mbps
802.11n(20MHz):
65/58.5/52/39/26/19.5/13/6.5Mbps</td></tr>
<tr><td>Number of Channel:</td><td>802.11b/g/n20: 11CH</td></tr>
<tr><td>Antenna Designation:</td><td>Please see Note 3.</td></tr>
<tr><td>AntennaGain (dBi):</td><td>0dBi</td></tr>
<tr><td>Duty Cycle:</td><td>>98%</td></tr>
</table></td></tr>
<tr><td>Channel List</td><td>Please refer to the Note 2.</td></tr>
<tr><td>Power Rating</td><td>Input: DC 3.3V</td></tr>
<tr><td>Hardware version number</td><td>Rev 04</td></tr>
<tr><td>Software versionnumber</td><td>V1.0</td></tr>
<tr><td>Connecting I/O Port(s)</td><td>Please refer to the User's Manual</td></tr>
</table>

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	Frequency
01	2412
02	2417
03	2422
04	2427
05	2432
06	2437
07	2442
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, themiddle frequency, and the highest frequency of channel were selected to perform the test, and the selectedchannel see below:
Carrier Frequency Channel

2.4GHz Test Frequency:

For 802.11b/g/n (HT20)	
Channel	Freq.(MHz)
01	2412
06	2437
11	2462

3

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	Viper	VDWIFI-RTL	PCB	N/A	0dBi	WLAN 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

Note:

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

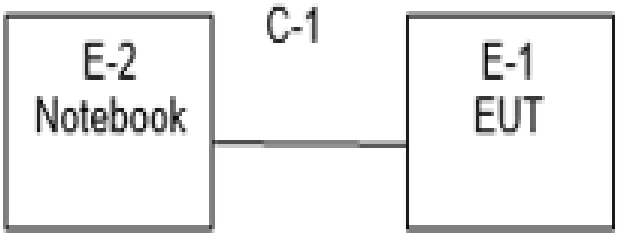
(2) We have be tested for all avaiable U.S. voltage and frequencies(For 120V,50/60Hz and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V /60Hz is shown in the report

AC Conducted Emission

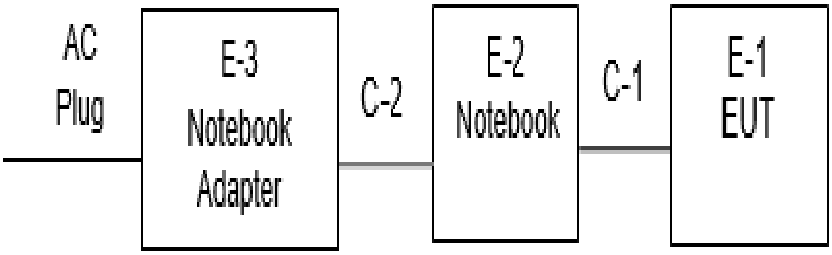
Test Case	
AC Conducted Emission	Mode10: Keeping WIFI TX

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiation Test Set



conduction Test Set



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
E-3	Adapter	N/A	N/A	N/A	N/A
C-2	DC Cable	N/A	110cm	N/A	N/A

Support units

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

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2019.7.29	2020.7.28
Signal Analyzer	Agilent	N9020A	MY51110105	2019.03.02	2020.03.01
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 (18G-40GHz)	A-INFO	LB-180400-KF	J211020657	2018.03.11	2021.03.10
Pre-Amplifier(0.1M-3GHz)	EM	EM330	060665	2019.10.9	2020.10.8
Pre-Amplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK2018080901	2019.10.12	2020.10.11
Temperature & Humidity	HH660	Mieo	N/A	2019.10.12	2020.10.11
turn table	EM	SC100_1	60531	N/A	N/A
Antenna mast	EM	SC100	N/A	N/A	N/A
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 RE)			

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2019.7.29	2020.7.28
LISN	R&S	ENV216	101242	2019.10.9	2020.10.8
LISN	EMCO	3810/2NM	23625	2019.10.9	2020.10.8
Temperature & Humidity	HH660	Mieo	N/A	2019.10.12	2020.10.11
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 CE)			

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2019.10.9	2020.10.8
Signal Analyzer	Agilent	N9020A	MY49100060	2019.10.9	2020.10.8
Temperature & Humidity	HH660	Mieo	N/A	2019.10.12	2020.10.11
Test SW	FARAD	LZ-RF /LzRf-3A3			

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) limit in the table below has to be followed.

FREQUENCY (MHz)	Conducted Emissionlimit (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.

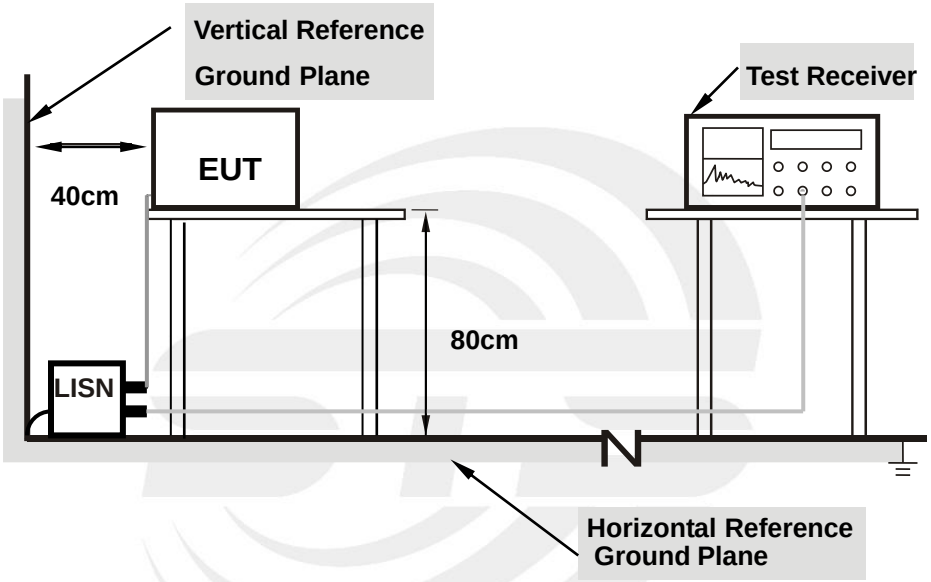
The following table is the setting of the receiver

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

3.1.4EUT OPERATING CONDITIONS

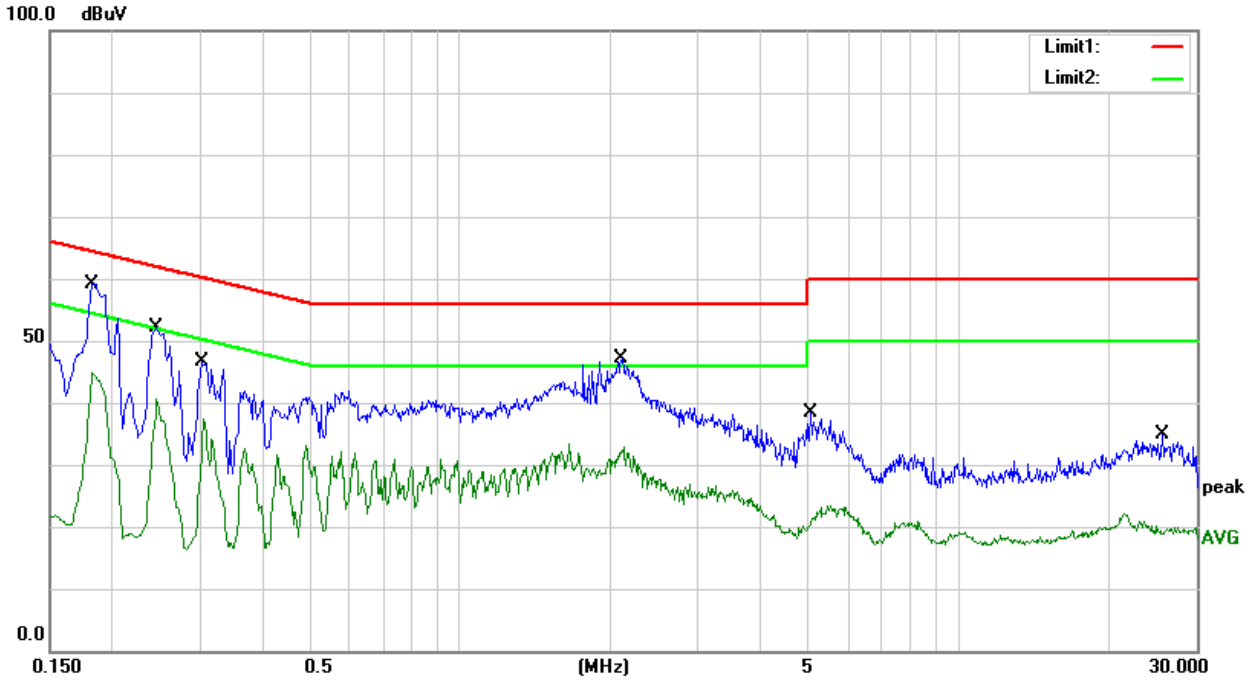
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.5 TEST RESULT

Temperature:	24.3(C)	Relative Humidity:	54%RH
Test Voltage:	AC 120V/60Hz	Phase:	L
Test Mode:	Mode 10		

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1820	38.52	20.56	59.08	64.39	-5.31	QP
2	0.1820	24.17	20.56	44.73	54.39	-9.66	AVG
3	0.2460	31.86	20.25	52.11	61.89	-9.78	QP
4	0.2460	20.48	20.25	40.73	51.89	-11.16	AVG
5	0.3020	26.63	20.04	46.67	60.19	-13.52	QP
6	0.3020	17.38	20.04	37.42	50.19	-12.77	AVG
7	2.1180	27.18	19.96	47.14	56.00	-8.86	QP
8	2.1180	12.84	19.96	32.80	46.00	-13.20	AVG
9	5.0540	17.89	20.41	38.30	60.00	-21.70	QP
10	5.0540	3.07	20.41	23.48	50.00	-26.52	AVG
11	25.6780	13.26	21.62	34.88	60.00	-25.12	QP
12	25.6780	-0.75	21.62	20.87	50.00	-29.13	AVG

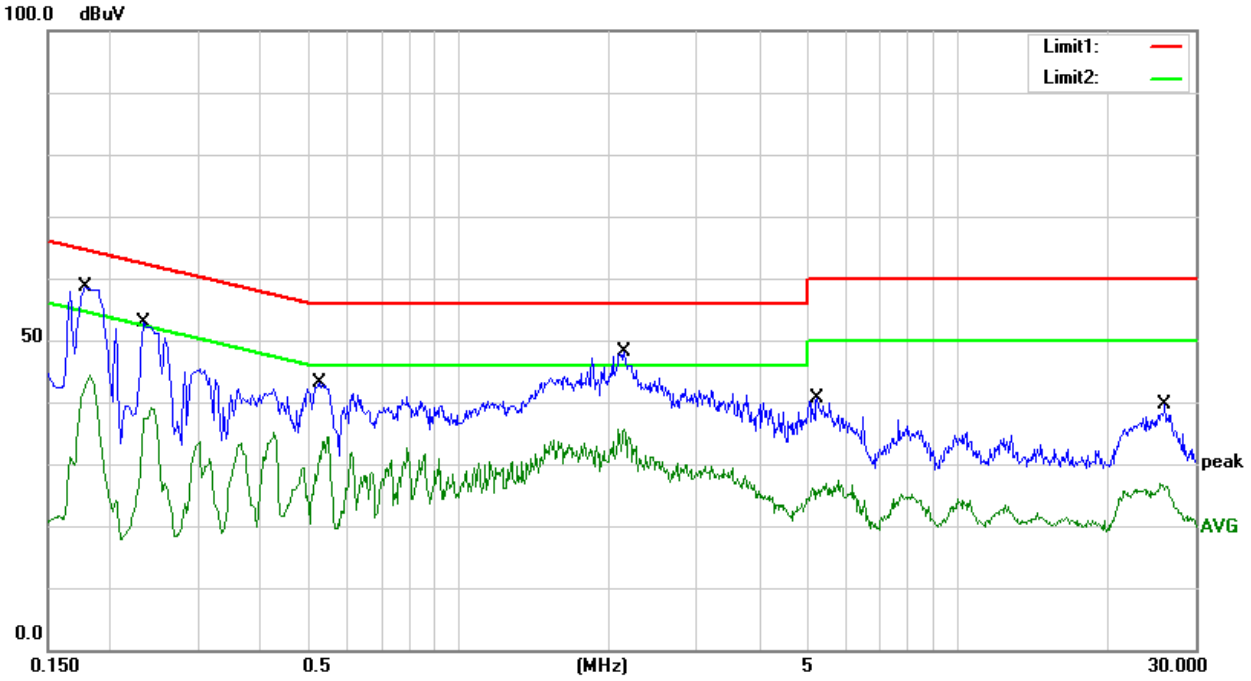
Remark:
1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit



Temperature:	24.3(C)	Relative Humidity:	54%RH
Test Voltage:	AC 120V/60Hz	Phase:	N
Test Mode:	Mode 10		

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1780	38.13	20.54	58.67	64.58	-5.91	QP
2	0.1780	23.77	20.54	44.31	54.58	-10.27	AVG
3	0.2340	32.52	20.33	52.85	62.31	-9.46	QP
4	0.2340	18.68	20.33	39.01	52.31	-13.30	AVG
5	0.5260	23.13	20.00	43.13	56.00	-12.87	QP
6	0.5260	14.48	20.00	34.48	46.00	-11.52	AVG
7	2.1540	28.21	19.97	48.18	56.00	-7.82	QP
8	2.1540	15.58	19.97	35.55	46.00	-10.45	AVG
9	5.2460	20.15	20.39	40.54	60.00	-19.46	QP
10	5.2460	7.01	20.39	27.40	50.00	-22.60	AVG
11	26.0140	17.89	21.65	39.54	60.00	-20.46	QP
12	26.0140	5.17	21.65	26.82	50.00	-23.18	AVG

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



3.2 RADIATED EMISSION MEASUREMENT

3.2.1RADIATED 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).

LIMITS OF RESTRICTED FREQUENCY BANDS

FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (GHz)
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

For Radiated Emission

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/QP/AV
Start Frequency	9 KHz/150KHz(Peak/QP/AV)
Stop Frequency	150KHz/30MHz(Peak/QP/AV)
RB / VB (emission in restricted band)	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz); 200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/QP
Start Frequency	30 MHz(Peak/QP)
Stop Frequency	1000 MHz (Peak/QP)
RB / VB (emission in restricted band)	120 KHz / 300 KHz

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 / 3 MHz(Peak) 1 MHz/1/T MHz(AVG)

For Restricted band

Spectrum Parameter	Setting
Detector	Peak/AV
Start/Stop Frequency	Lower Band Edge: 2310 to 2425 MHz Upper Band Edge: 2450 to 2500 MHz
RB / VB	1 MHz / 3 MHz(Peak) 1 MHz/1/T MHz(AVG)

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

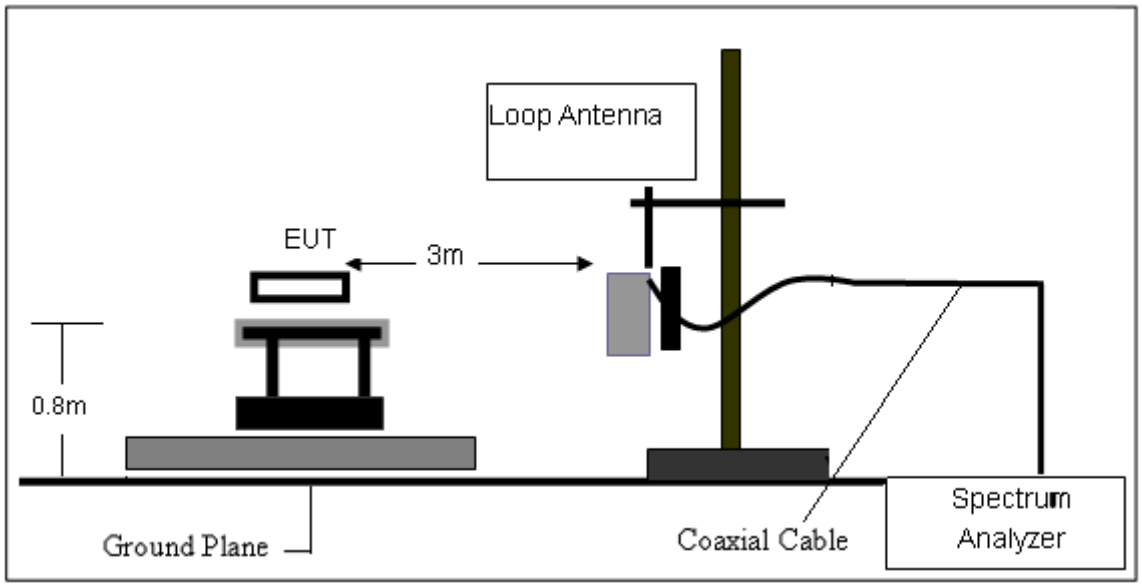
a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz
b. The EUT was placed on the top of a rotating table 0.8 meters(above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber. The table was rotated 360 degrees to determine the position 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:

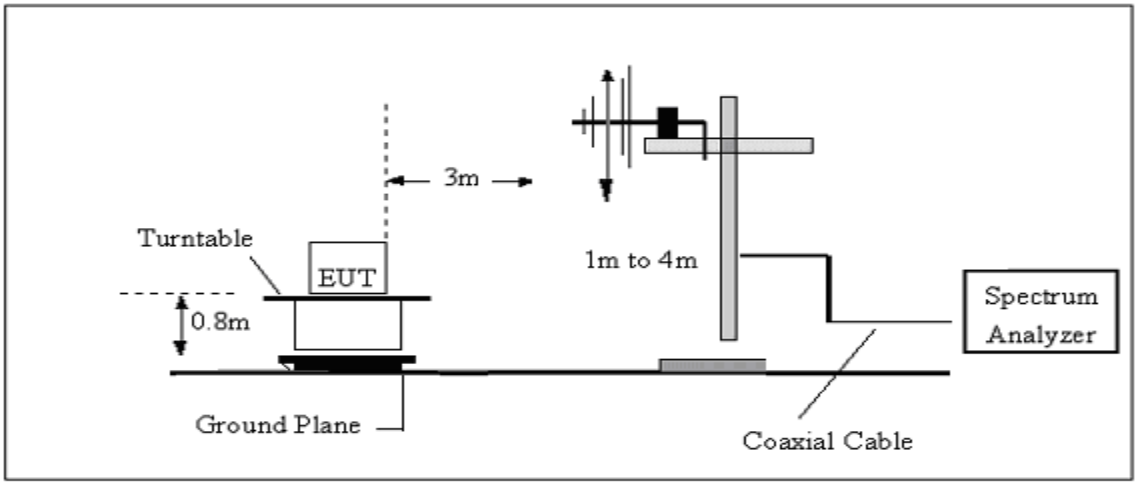
Both horizontal and vertical antenna polarities were testedand performed test to three orthogonal axis. The worst case emissions were reported

3.2.3 TEST SETUP

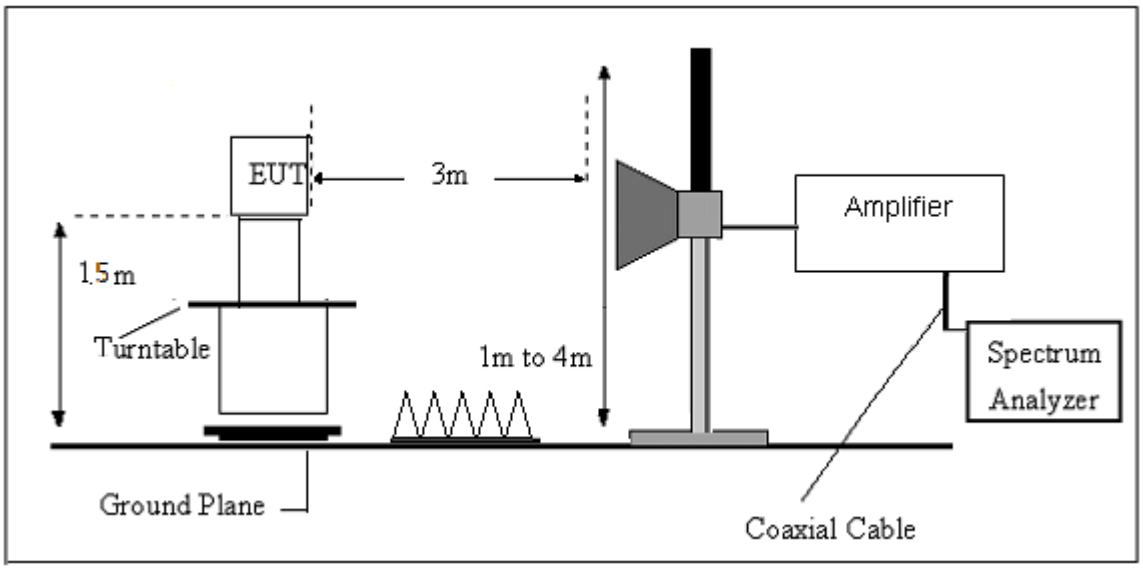
（A）Radiated Emission Test-Up Frequency Below 30MHz



（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 theAmplifier 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

3.2.6 TEST RESULT

9KHz-30MHz

Temperature:	23.3(C)	Relative Humidtity:	48%RH
Test Voltage:	DC 3.3V	Polarization:	--
Test Mode:	TX Mode		

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

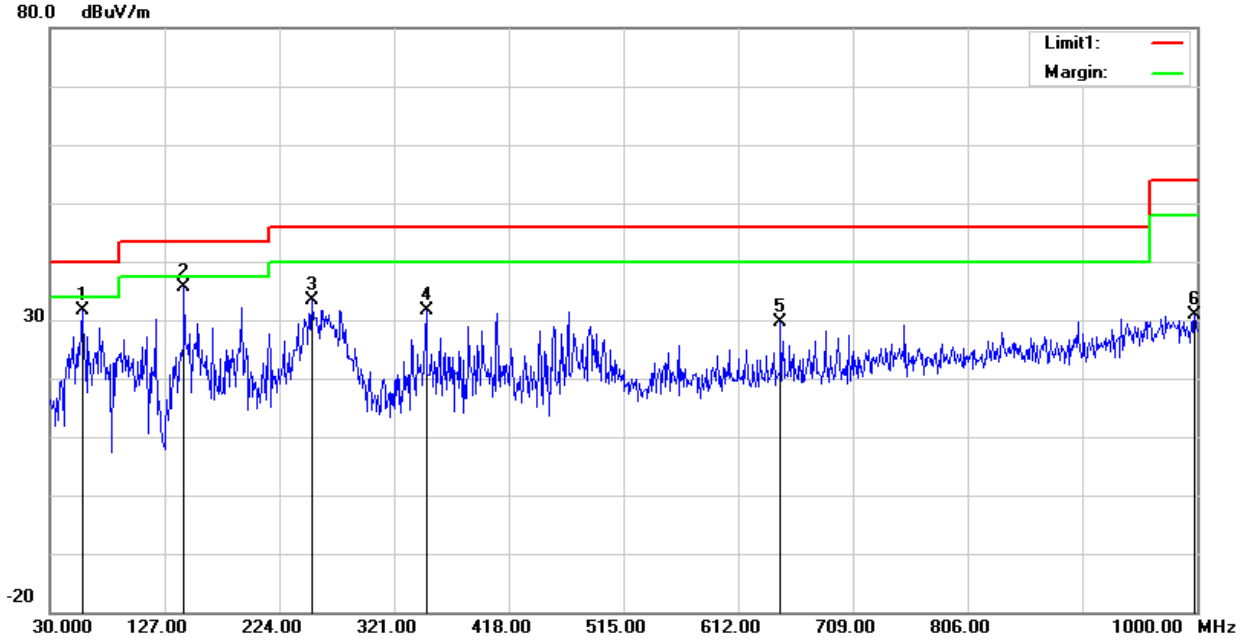
(30MHz - 1000MHz)

Temperature:	23.3(C)	Relative Humidtity:	48%RH
Test Voltage:	DC 3.3V	Phase:	Horizontal
Test Mode:	Mode 1/2/3/4/5/6/7/8/9 (Mode 3 worst mode)		

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	57.1600	57.17	-25.45	31.72	40.00	-8.28	QP
2	143.4900	53.97	-18.23	35.74	43.50	-7.76	QP
3	251.1600	49.21	-15.95	33.26	46.00	-12.74	QP
4	348.1600	44.80	-13.13	31.67	46.00	-14.33	QP
5	647.8900	34.56	-4.88	29.68	46.00	-16.32	QP
6	998.0600	28.81	2.04	30.85	54.00	-23.15	QP

Remark:

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

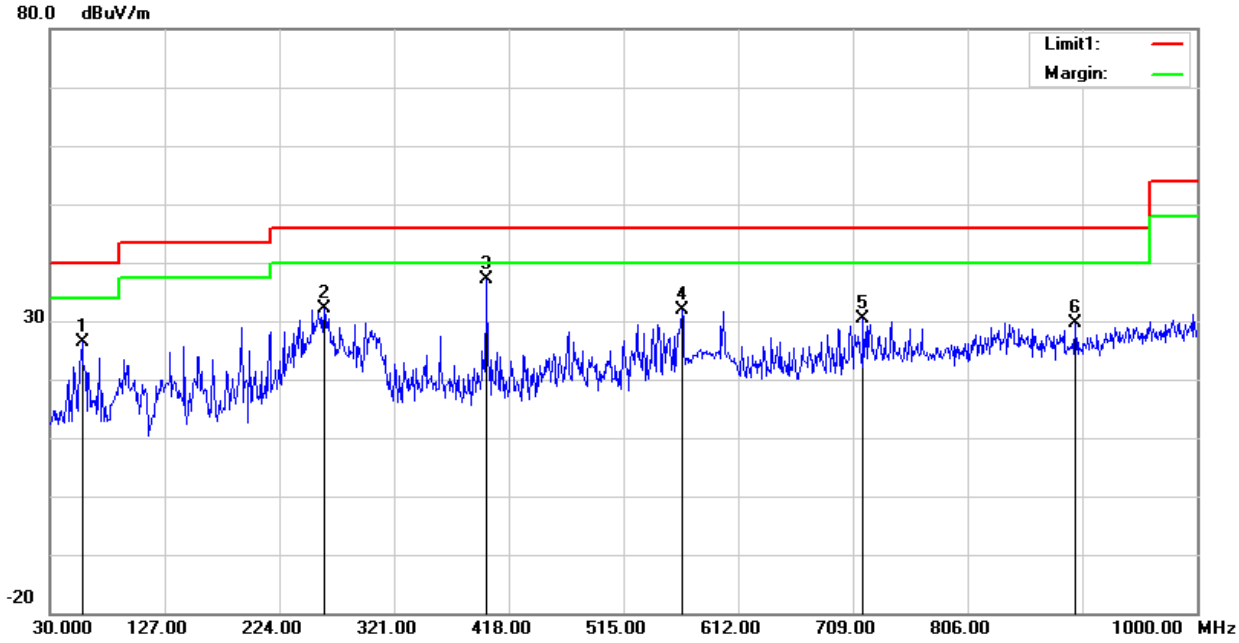


Temperature:	23.3(C)	Relative Humidtity:	48%RH
Test Voltage:	DC 3.3V	Phase:	Vertical
Test Mode:	Mode 1/2/3/4/5/6/7/8/9 (Mode 3 worst mode)		

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	57.1600	51.94	-25.45	26.49	40.00	-13.51	QP
2	261.8300	46.80	-14.77	32.03	46.00	-13.97	QP
3	399.5700	48.39	-11.16	37.23	46.00	-8.77	QP
4	564.4700	37.47	-5.54	31.93	46.00	-14.07	QP
5	717.7300	33.84	-3.38	30.46	46.00	-15.54	QP
6	897.1800	30.13	-0.52	29.61	46.00	-16.39	QP

Remark:.

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



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

802.11b

Frequency	Meter Reading	Amplifier	Loss	Antenna Factor	Orrected Factor	Emission Level	Limits	Margin	Detector	Comment
(MHz)	(dBμV)	（dB）	（dB）	（dB/m）	（dB）	(dBμV/m)	(dBμV/m)	(dB)	Type	
Low Channel (802.11b/2412 MHz)										
3264.77	61.83	44.70	6.70	28.20	-9.80	52.03	74.00	-21.97	PK	Vertical
3264.77	51.00	44.70	6.70	28.20	-9.80	41.20	54.00	-12.80	AV	Vertical
3264.59	61.58	44.70	6.70	28.20	-9.80	51.78	74.00	-22.22	PK	Horizontal
3264.59	50.57	44.70	6.70	28.20	-9.80	40.77	54.00	-13.23	AV	Horizontal
4824.43	58.35	44.20	9.04	31.60	-3.56	54.79	74.00	-19.21	PK	Vertical
4824.43	49.75	44.20	9.04	31.60	-3.56	46.19	54.00	-7.81	AV	Vertical
4824.38	59.12	44.20	9.04	31.60	-3.56	55.56	74.00	-18.44	PK	Horizontal
4824.38	49.13	44.20	9.04	31.60	-3.56	45.57	54.00	-8.43	AV	Horizontal
5359.83	49.07	44.20	9.86	32.00	-2.34	46.73	74.00	-27.27	PK	Vertical
5359.83	39.11	44.20	9.86	32.00	-2.34	36.77	54.00	-17.23	AV	Vertical
5359.80	48.11	44.20	9.86	32.00	-2.34	45.77	74.00	-28.23	PK	Horizontal
5359.80	39.36	44.20	9.86	32.00	-2.34	37.02	54.00	-16.98	AV	Horizontal
7235.96	54.92	43.50	11.40	35.50	3.40	58.32	74.00	-15.68	PK	Vertical
7235.96	44.07	43.50	11.40	35.50	3.40	47.47	54.00	-6.53	AV	Vertical
7235.67	54.68	43.50	11.40	35.50	3.40	58.08	74.00	-15.92	PK	Horizontal
7235.73	44.44	43.50	11.40	35.50	3.40	47.84	54.00	-6.16	AV	Vertical
Middle Channel (802.11b/2437 MHz)										
3264.63	60.88	44.70	6.70	28.20	-9.80	51.08	74.00	-22.92	PK	Vertical
3264.63	50.75	44.70	6.70	28.20	-9.80	40.95	54.00	-13.05	AV	Vertical
3264.74	62.17	44.70	6.70	28.20	-9.80	52.37	74.00	-21.63	PK	Horizontal
3264.74	50.42	44.70	6.70	28.20	-9.80	40.62	54.00	-13.38	AV	Horizontal
4874.36	59.06	44.20	9.04	31.60	-3.56	55.50	74.00	-18.50	PK	Vertical
4874.36	50.17	44.20	9.04	31.60	-3.56	46.61	54.00	-7.39	AV	Vertical
4874.46	58.44	44.20	9.04	31.60	-3.56	54.88	74.00	-19.12	PK	Horizontal
4874.46	49.87	44.20	9.04	31.60	-3.56	46.31	54.00	-7.69	AV	Horizontal
5359.61	48.70	44.20	9.86	32.00	-2.34	46.36	74.00	-27.64	PK	Vertical
5359.61	39.10	44.20	9.86	32.00	-2.34	36.76	54.00	-17.24	AV	Vertical
5359.74	48.18	44.20	9.86	32.00	-2.34	45.84	74.00	-28.16	PK	Horizontal
5359.74	38.81	44.20	9.86	32.00	-2.34	36.47	54.00	-17.53	AV	Horizontal
7310.69	54.49	43.50	11.40	35.50	3.40	57.89	74.00	-16.11	PK	Vertical
7310.69	43.77	43.50	11.40	35.50	3.40	47.17	54.00	-6.83	AV	Vertical
7310.84	53.78	43.50	11.40	35.50	3.40	57.18	74.00	-16.82	PK	Horizontal
7310.84	43.70	43.50	11.40	35.50	3.40	47.10	54.00	-6.90	AV	Horizontal

High Channel (802.11b/2462 MHz)										
3264.64	62.31	44.70	6.70	28.20	-9.80	52.51	74.00	-21.49	PK	Vertical
3264.64	51.74	44.70	6.70	28.20	-9.80	41.94	54.00	-12.06	AV	Vertical
3264.77	62.17	44.70	6.70	28.20	-9.80	52.37	74.00	-21.63	PK	Horizontal
3264.77	49.94	44.70	6.70	28.20	-9.80	40.14	54.00	-13.86	AV	Horizontal
4924.53	58.55	44.20	9.04	31.60	-3.56	54.99	74.00	-19.01	PK	Vertical
4924.53	50.32	44.20	9.04	31.60	-3.56	46.76	54.00	-7.24	AV	Vertical
4924.51	59.39	44.20	9.04	31.60	-3.56	55.83	74.00	-18.17	PK	Horizontal
4924.51	49.45	44.20	9.04	31.60	-3.56	45.89	54.00	-8.11	AV	Horizontal
5359.79	49.01	44.20	9.86	32.00	-2.34	46.67	74.00	-27.33	PK	Vertical
5359.79	39.77	44.20	9.86	32.00	-2.34	37.43	54.00	-16.57	AV	Vertical
5359.85	47.24	44.20	9.86	32.00	-2.34	44.90	74.00	-29.10	PK	Horizontal
5359.85	39.42	44.20	9.86	32.00	-2.34	37.08	54.00	-16.92	AV	Horizontal
7385.86	54.23	43.50	11.40	35.50	3.40	57.63	74.00	-16.37	PK	Vertical
7385.86	44.11	43.50	11.40	35.50	3.40	47.51	54.00	-6.49	AV	Vertical
7385.79	54.43	43.50	11.40	35.50	3.40	57.83	74.00	-16.17	PK	Horizontal
7385.79	44.71	43.50	11.40	35.50	3.40	48.11	54.00	-5.89	AV	Horizontal

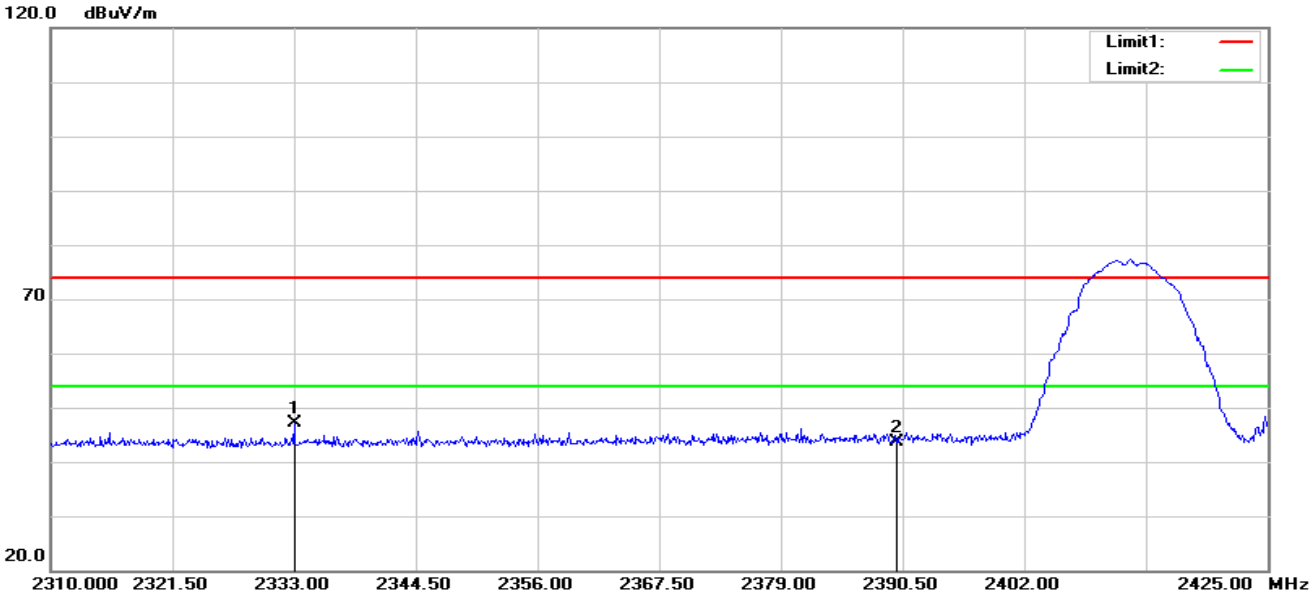
Remark:

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

3.2.6 TEST RESULTS(Band edge Requirements)

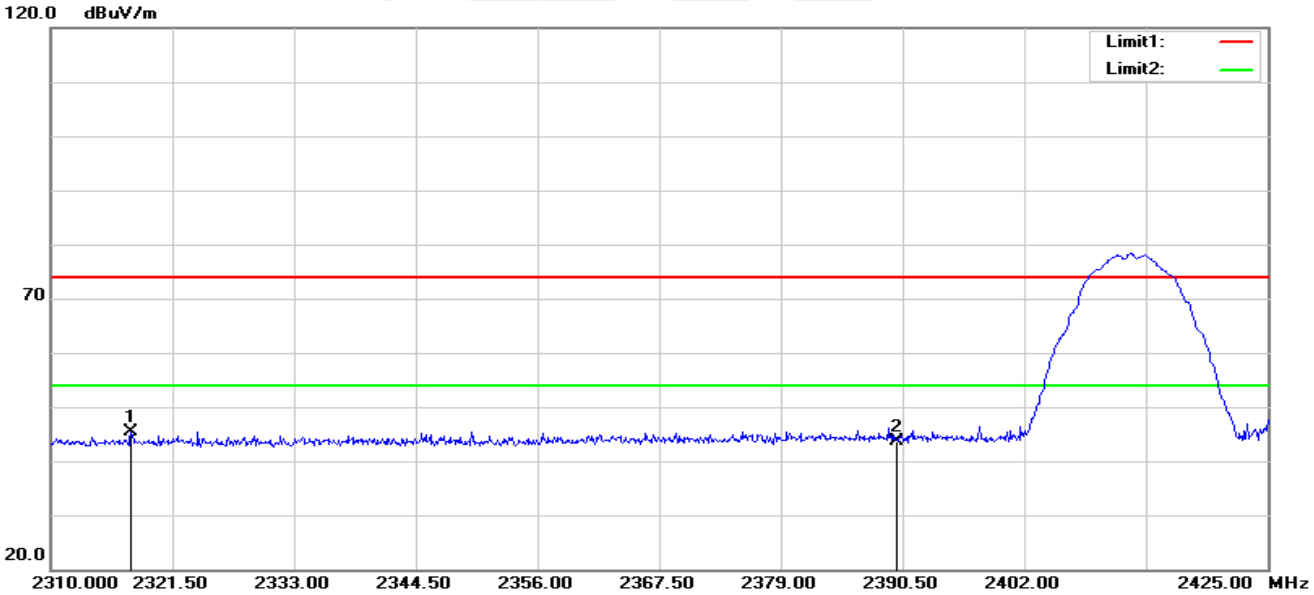
802.11b-Low

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2333.000	43.49	3.65	47.14	74.00	-26.86	peak
2	2390.000	39.21	4.34	43.55	74.00	-30.45	peak

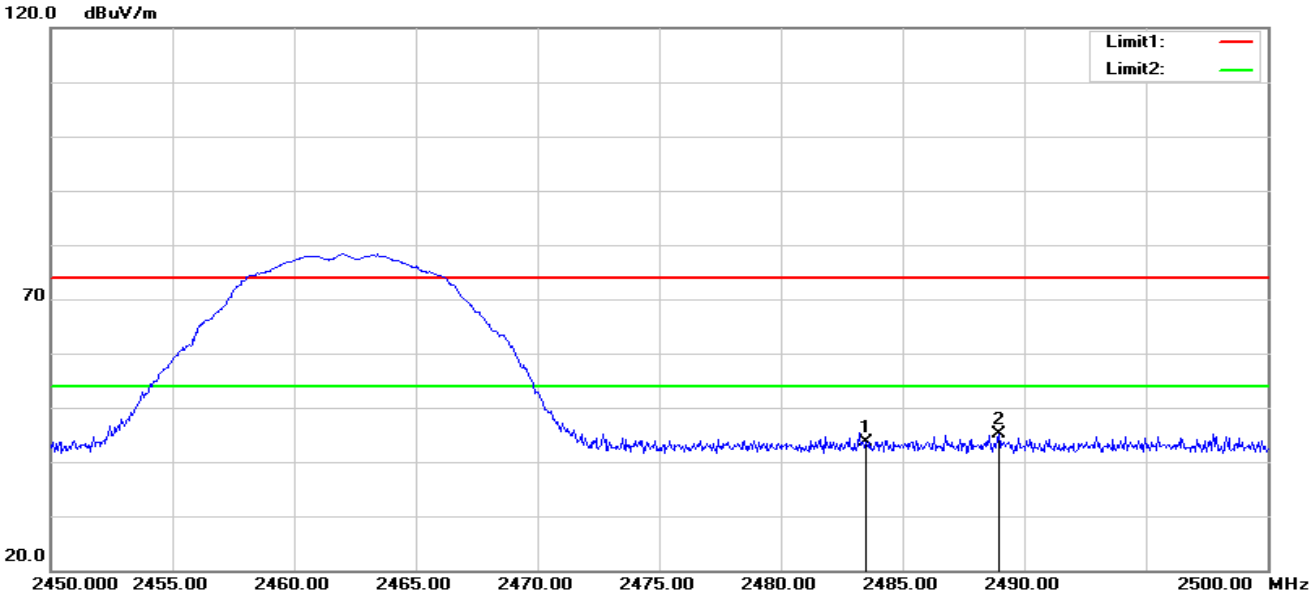
Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2317.590	41.76	3.57	45.33	74.00	-28.67	peak
2	2390.000	39.24	4.34	43.58	74.00	-30.42	peak

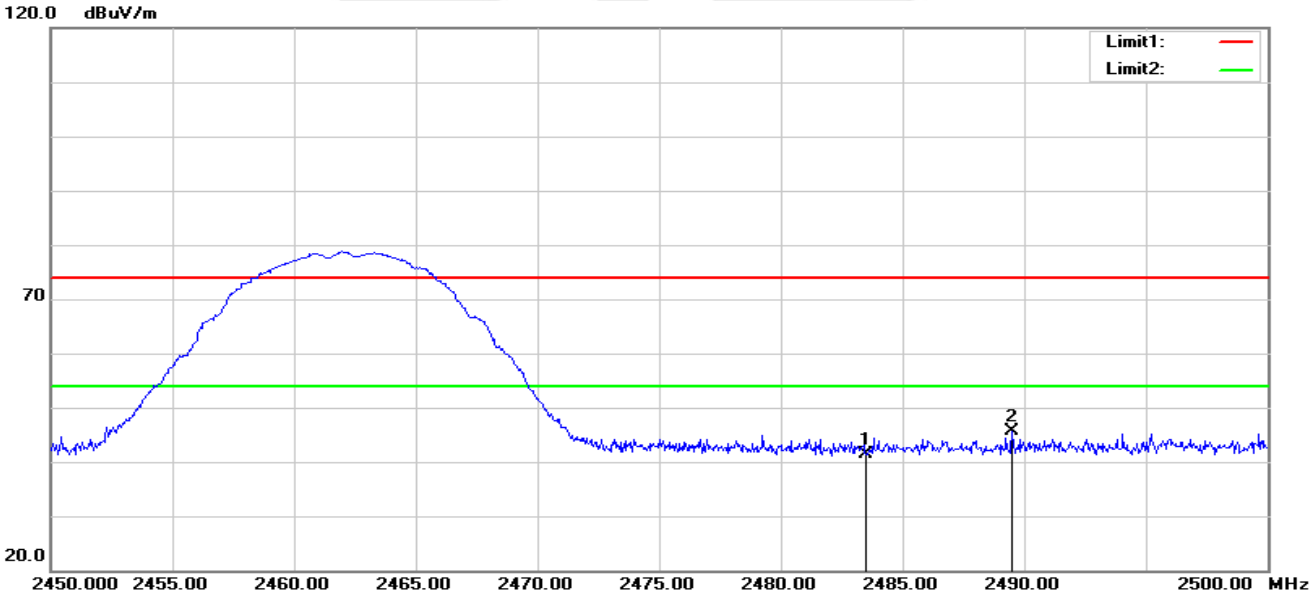
802.11b-High

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	38.98	4.60	43.58	74.00	-30.42	peak
2	2488.950	40.45	4.62	45.07	74.00	-28.93	peak

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	36.81	4.60	41.41	74.00	-32.59	peak
2	2489.500	40.99	4.62	45.61	74.00	-28.39	peak

Note: 802.11b, 802.11g, 802.11n (HT-20) mode all have been tested, the worst case is 802.11b, only show the worst case.

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 2412 MHz Upper Band Edge: 2462to 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 802.11b, is connected 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.

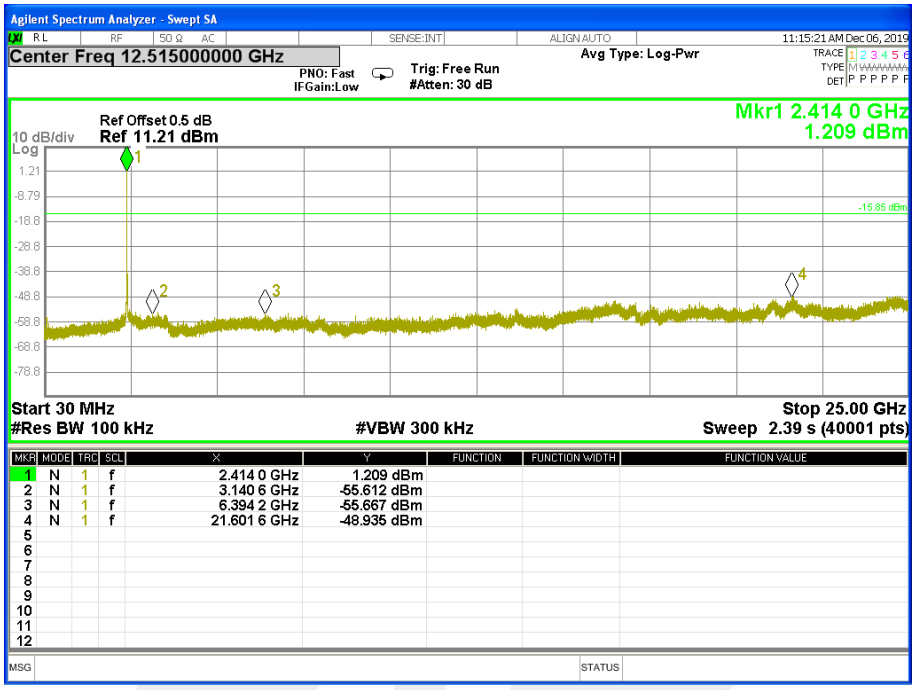
4.5 EUT OPERATION CONDITIONS

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.

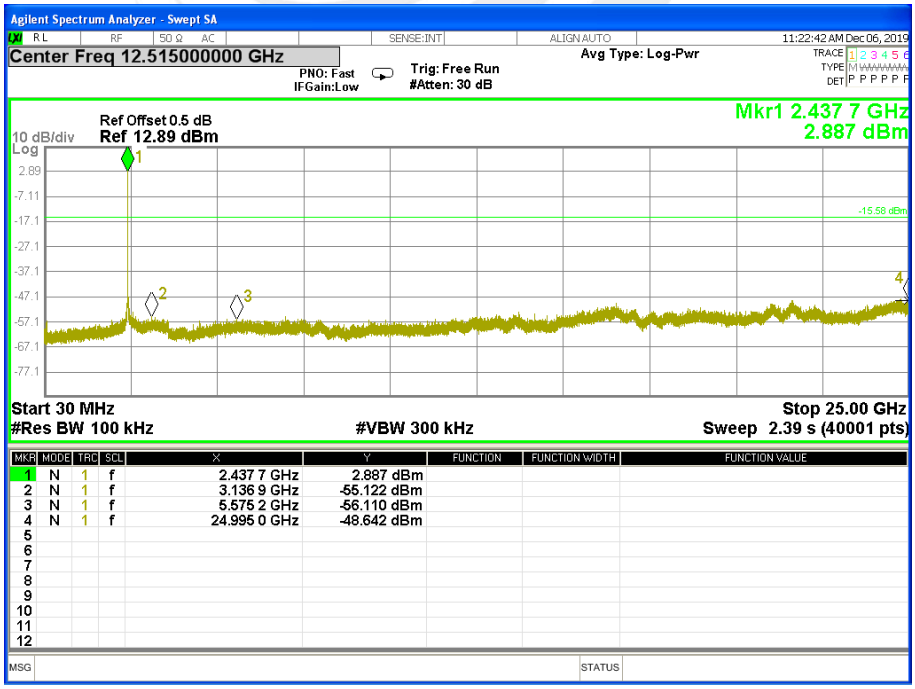
4.6 TEST RESULTS

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

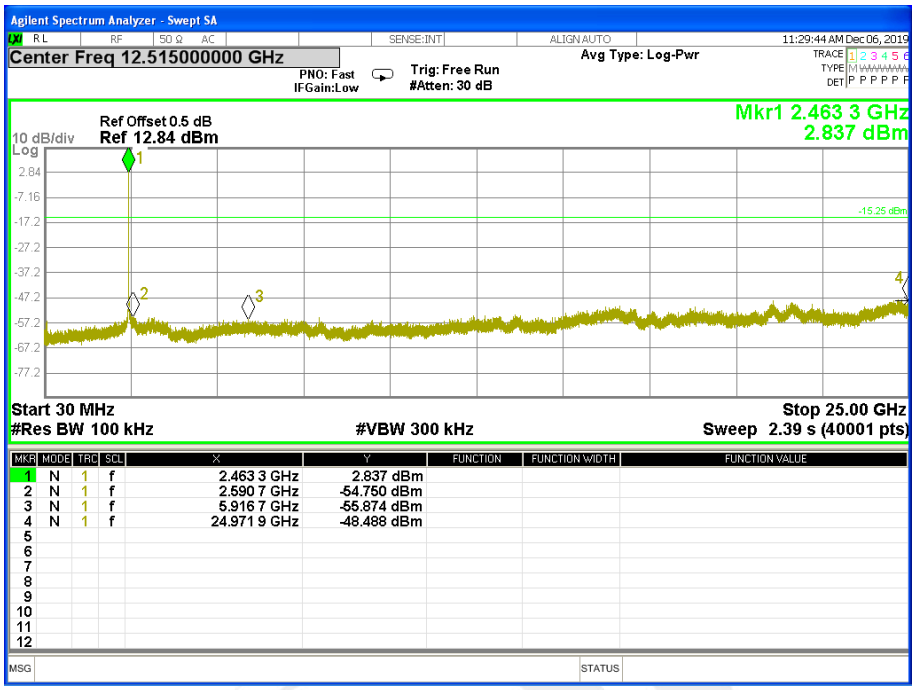
CH 01



CH 06

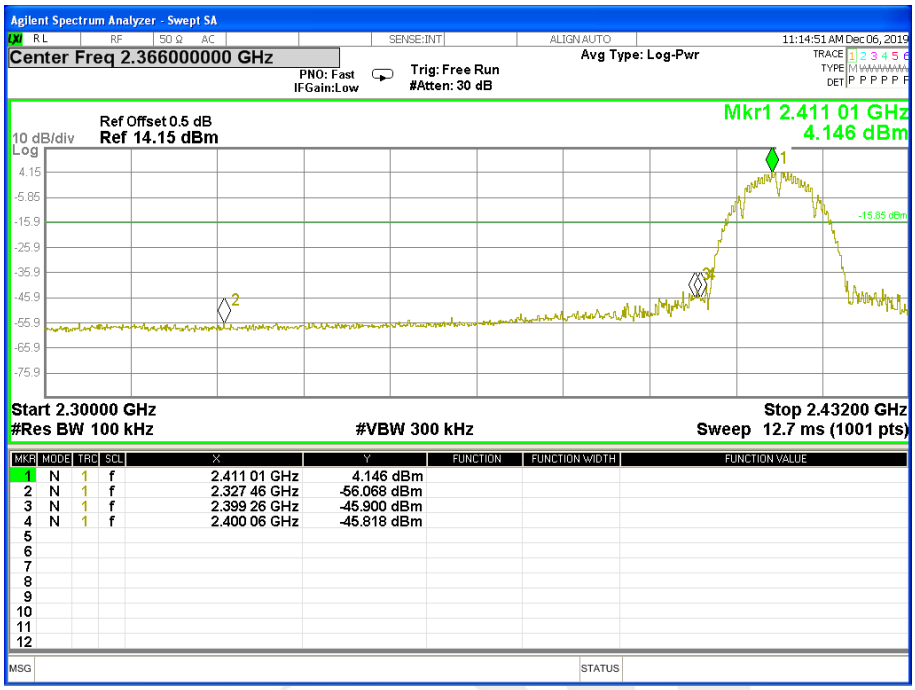


CH 11

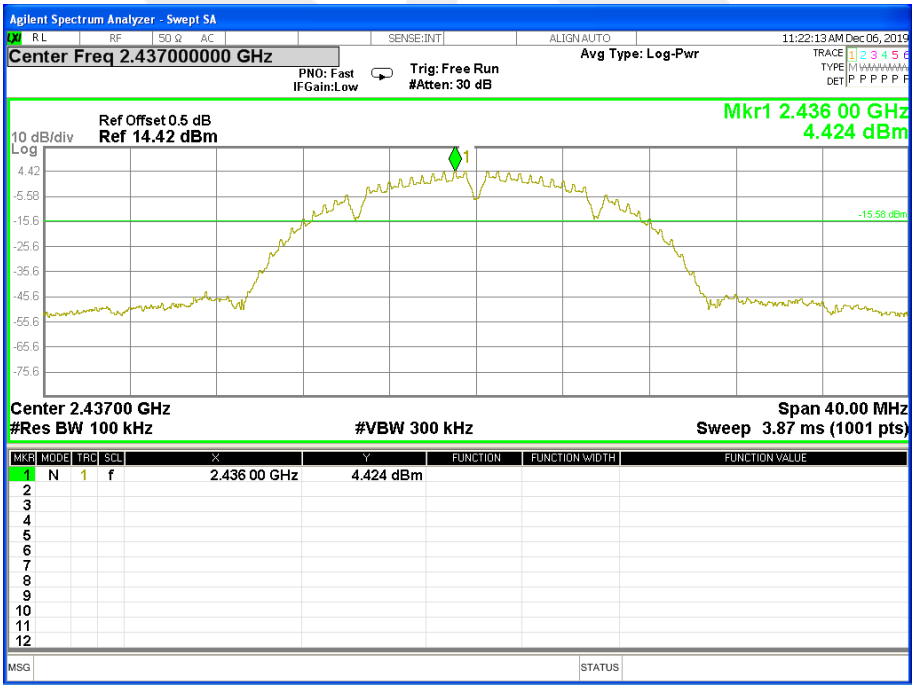

Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
11:29:44 AM Dec 06, 2019
Ref Offset 0.5 dB
10 dB/div
Log
Ref 12.84 dBm
Mkr1 2.463 3 GHz
2.837 dBm
-15.25 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.39 s (40001 pts)
1 N 1 f 2.463 3 GHz 2.837 dBm
2 N 1 f 2.590 7 GHz -54.750 dBm
3 N 1 f 5.916 7 GHz -55.874 dBm
4 N 1 f 24.971 9 GHz -48.488 dBm

Band edge

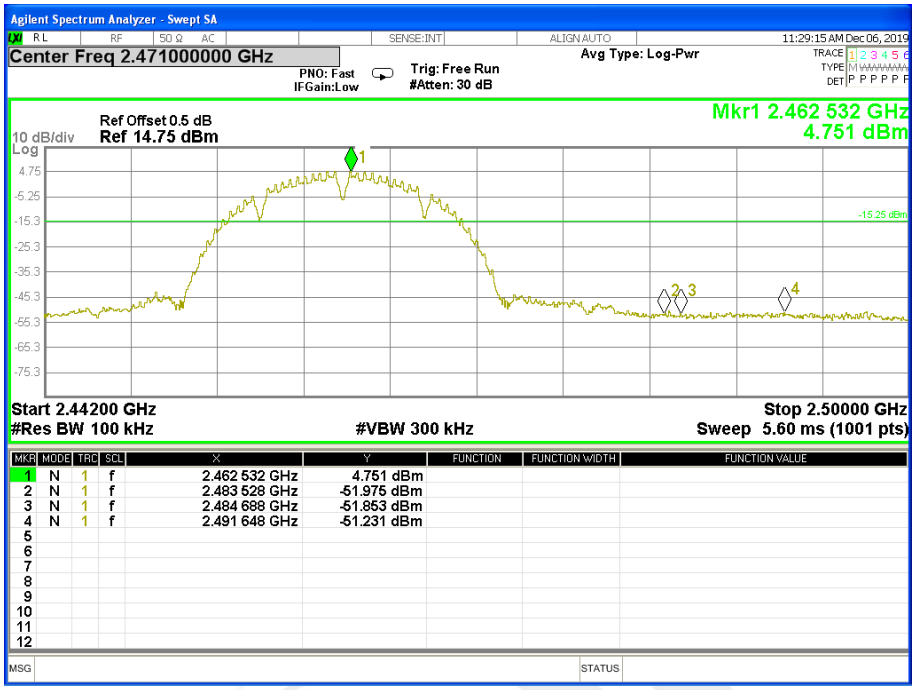
CH 01



CH 06

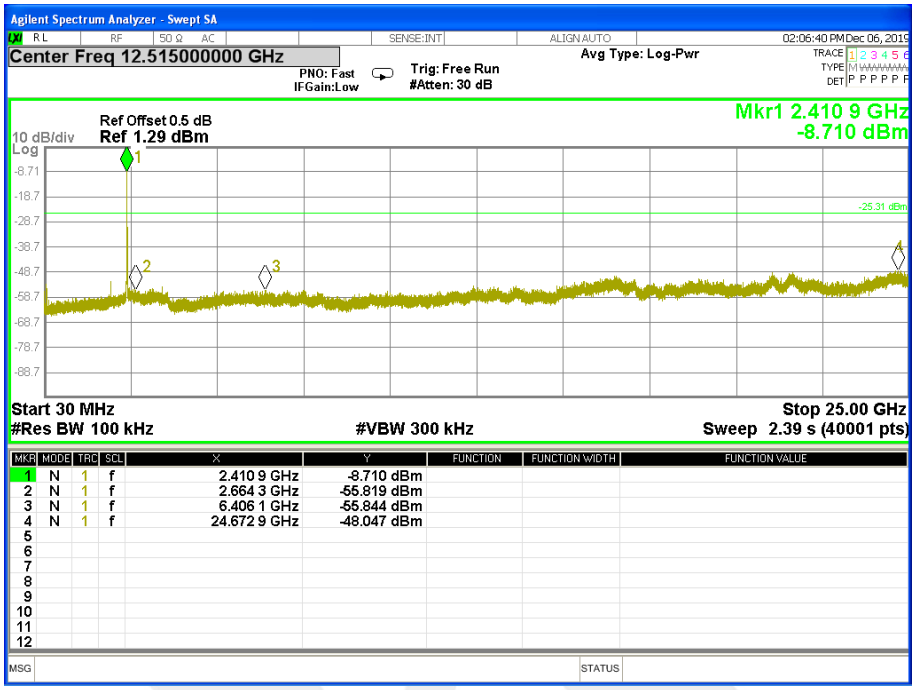


CH 11

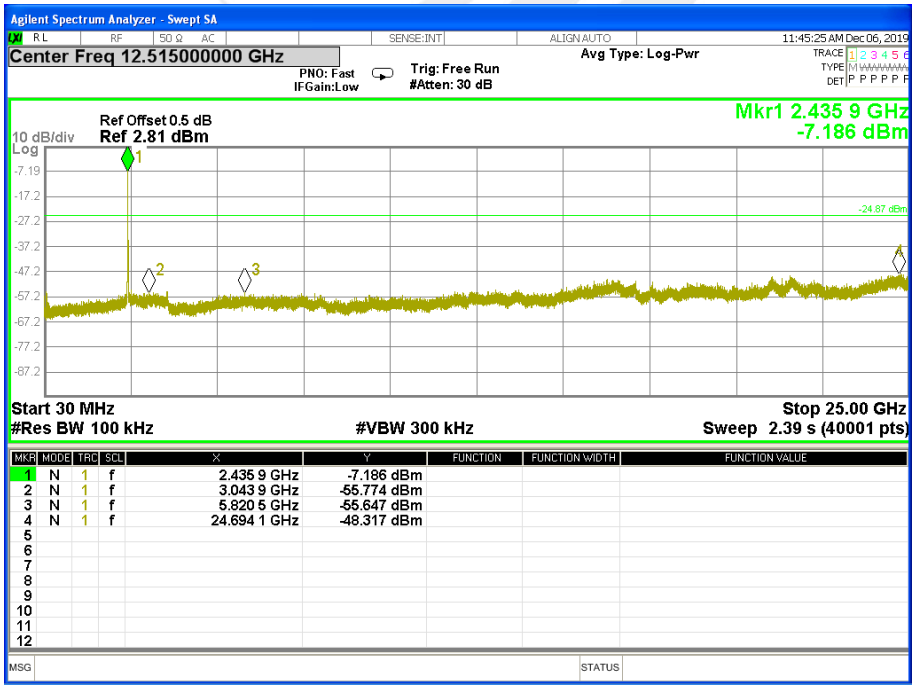

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.471000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
11:29:15 AM Dec 06, 2019
Ref Offset 0.5 dB
10 dB/div
Log
Ref 14.75 dBm
Mkr1 2.462 532 GHz
4.751 dBm
-15.25 dBm
Start 2.44200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 5.60 ms (1001 pts)
1 N 1 f 2.462 532 GHz 4.751 dBm
2 N 1 f 2.483 528 GHz -51.975 dBm
3 N 1 f 2.484 688 GHz -51.853 dBm
4 N 1 f 2.491 648 GHz -51.231 dBm

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

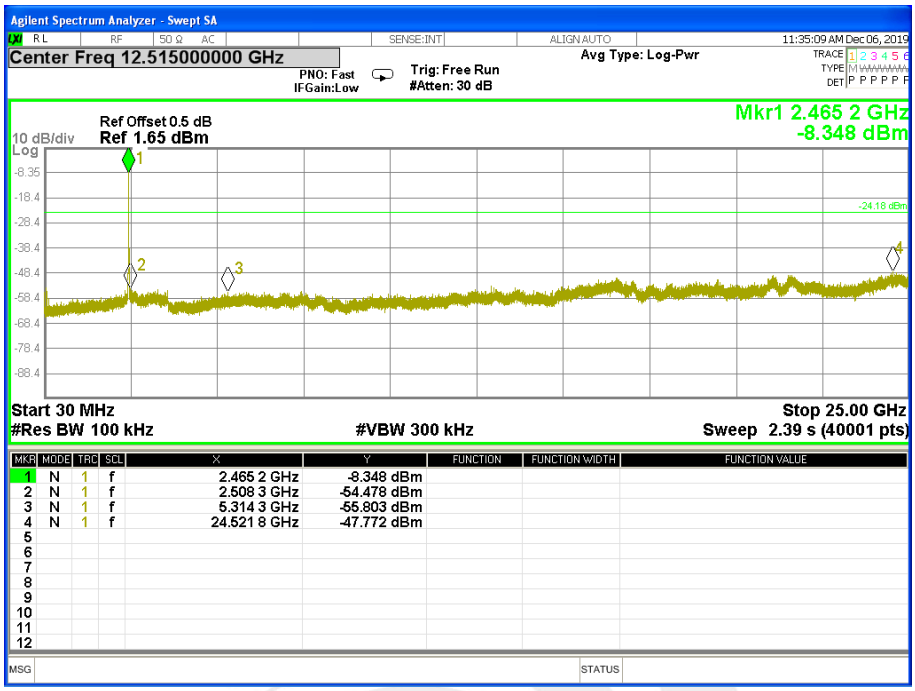
CH 01



CH06

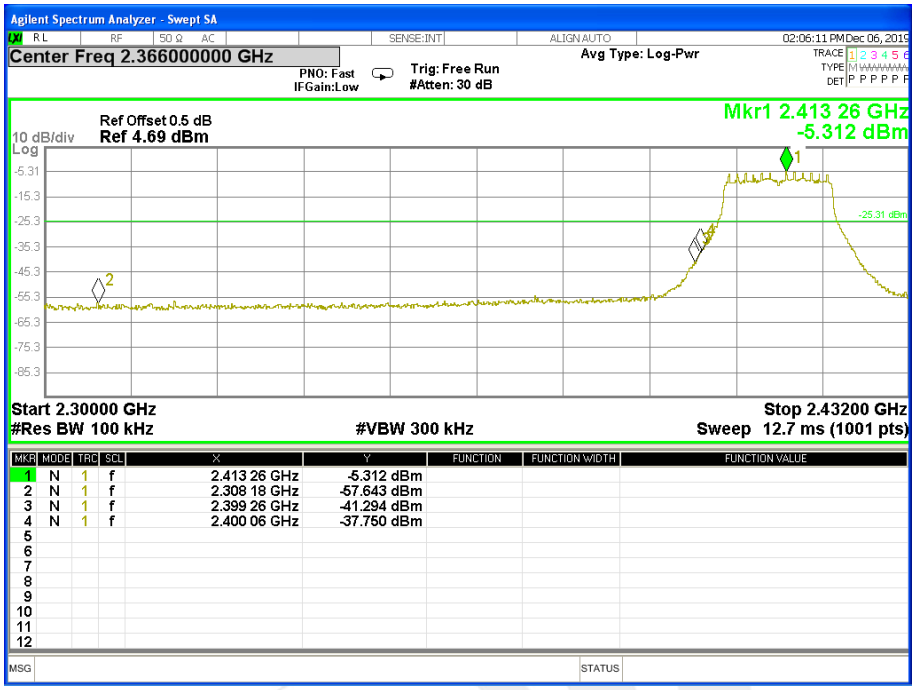


CH 11

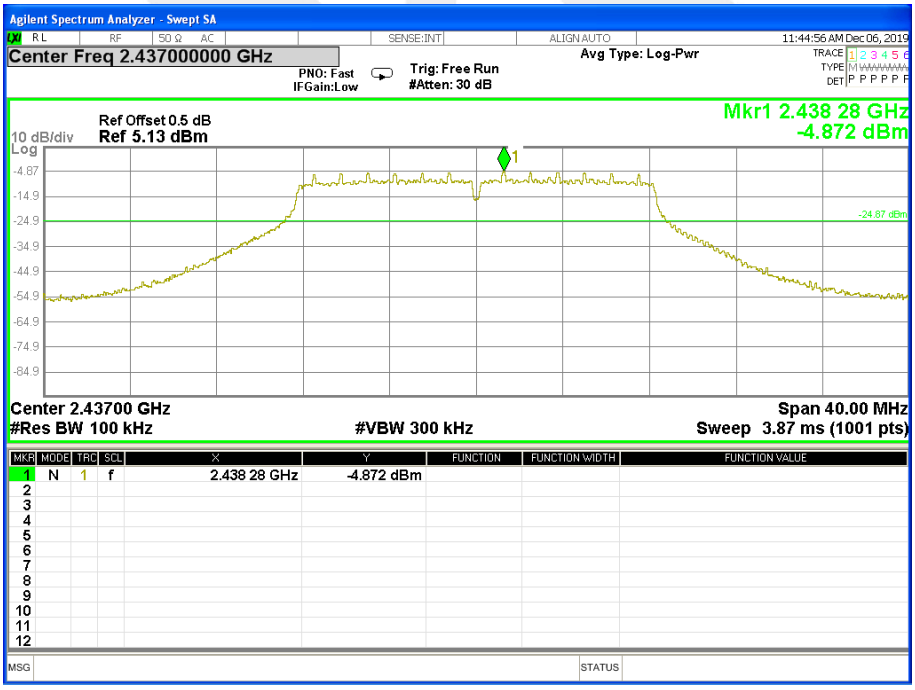

Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
11:35:09 AM Dec 06, 2019
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P P P P P P
Ref Offset 0.5 dB
10 dB/div
Log
Ref 1.65 dBm
Mkr1 2.465 2 GHz
-8.348 dBm
-8.35
-18.4
-28.4
-38.4
-48.4
-58.4
-68.4
-78.4
-88.4
-24.18 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.39 s (40001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.465 2 GHz -8.348 dBm
2 N 1 f 2.508 3 GHz -54.478 dBm
3 N 1 f 5.314 3 GHz -55.803 dBm
4 N 1 f 24.521 8 GHz -47.772 dBm
5
6
7
8
9
10
11
12
MSG
STATUS

Band edge

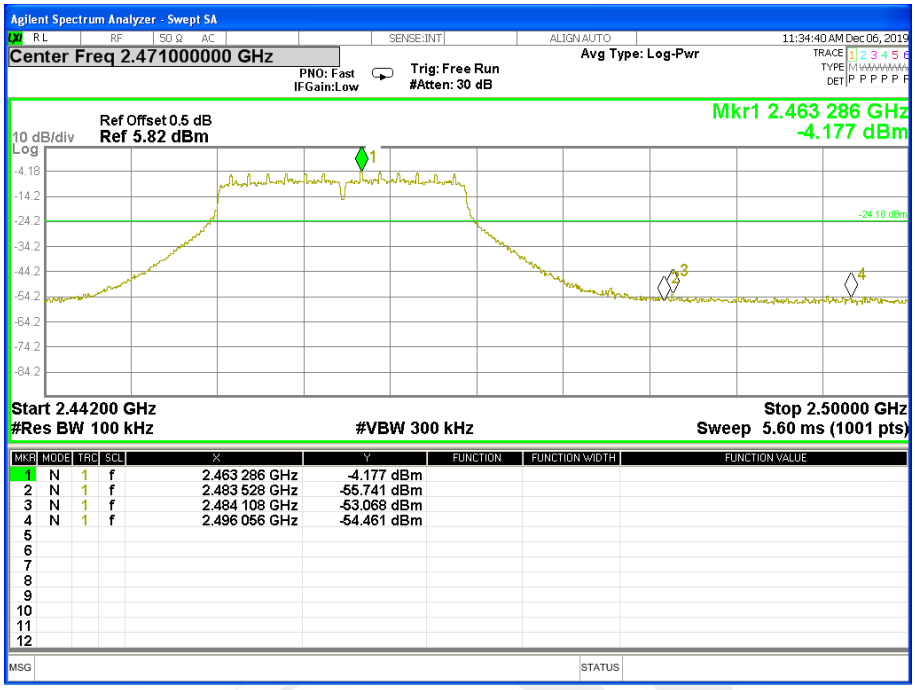
CH 01



CH 06

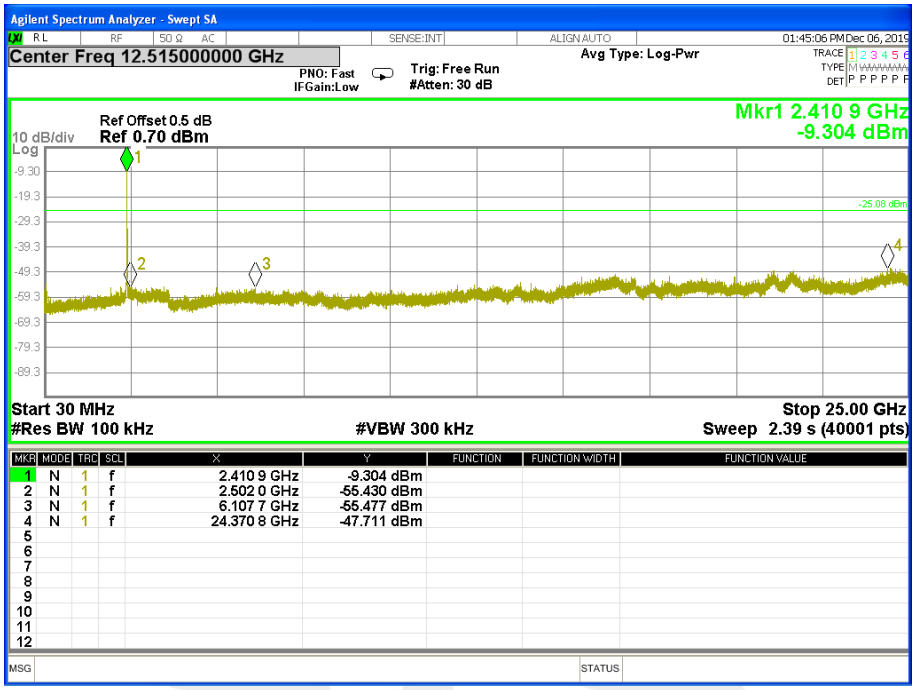


CH11

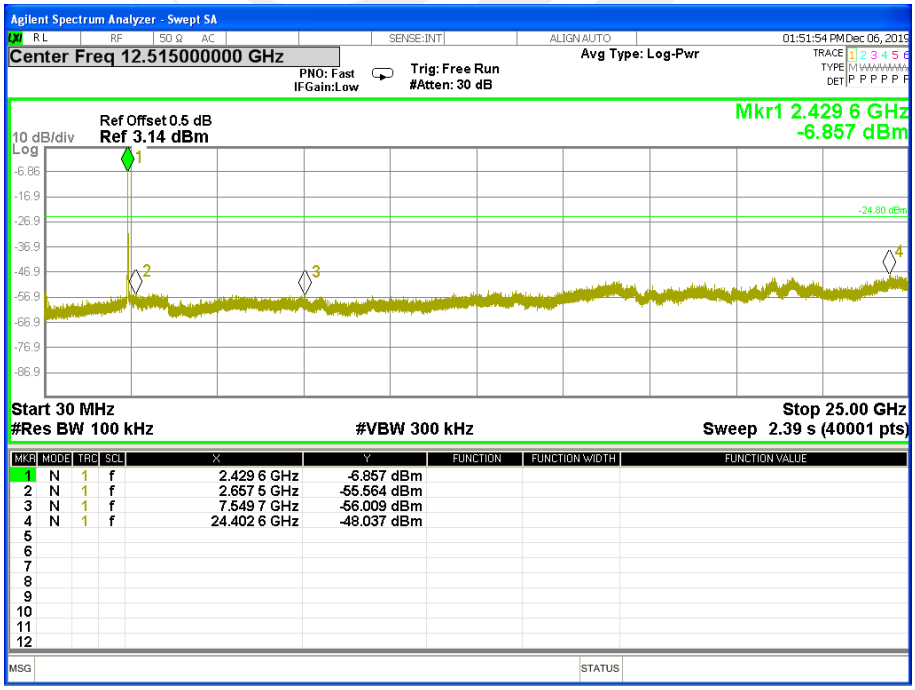

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.471000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
11:34:40 AM Dec 06, 2019
Ref Offset 0.5 dB
10 dB/div
Log
Ref 5.82 dBm
Mkr1 2.463 286 GHz
-4.177 dBm
-24.18 dBm
Start 2.44200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 5.60 ms (1001 pts)
1 N 1 f 2.463 286 GHz -4.177 dBm
2 N 1 f 2.483 528 GHz -55.741 dBm
3 N 1 f 2.484 108 GHz -53.068 dBm
4 N 1 f 2.496 056 GHz -54.461 dBm

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

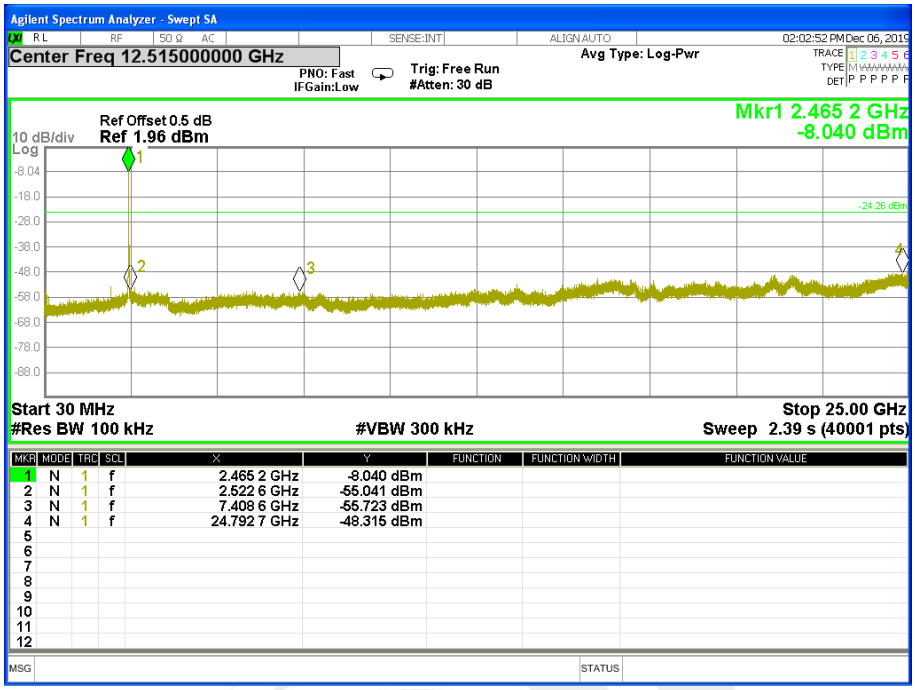
CH 01



CH 06

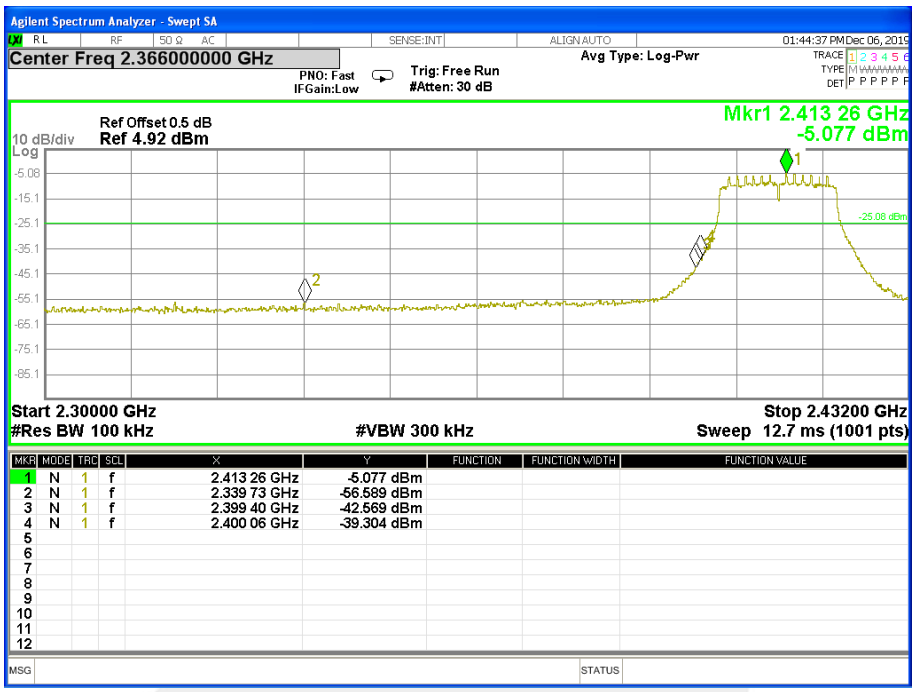


CH 11

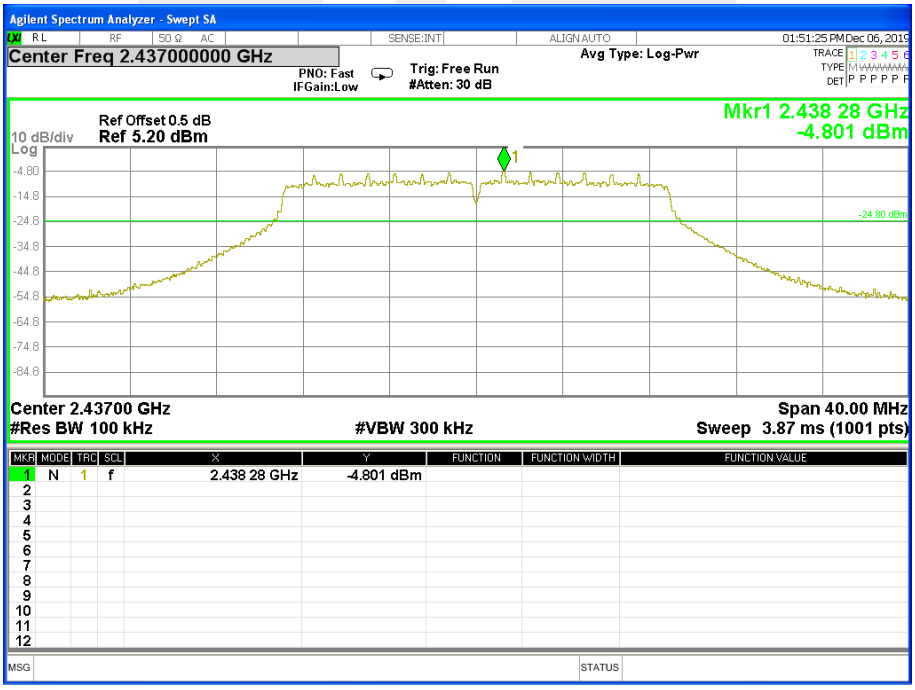

Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
02:02:52 PM Dec 06, 2019
Ref Offset 0.5 dB
10 dB/div
Log
Ref 1.96 dBm
Mkr1 2.465 2 GHz
-8.040 dBm
-24.26 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.39 s (40001 pts)
1 N 1 f 2.465 2 GHz -8.040 dBm
2 N 1 f 2.522 6 GHz -55.041 dBm
3 N 1 f 7.408 6 GHz -55.723 dBm
4 N 1 f 24.792 7 GHz -48.315 dBm

Band edge

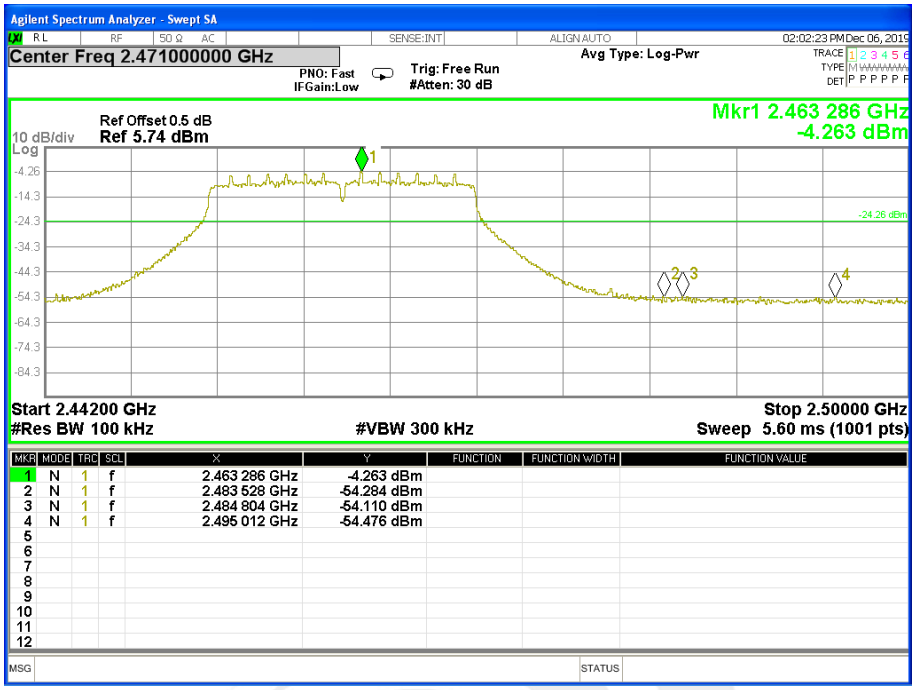
CH 01



CH 06



CH 11


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.471000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
02:02:23 PM Dec 06, 2019
Ref Offset 0.5 dB
10 dB/div
Ref 5.74 dBm
Log
Mkr1 2.463 286 GHz
-4.263 dBm
-24.26 dBm
Start 2.44200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 5.60 ms (1001 pts)
1 N 1 f 2.463 286 GHz -4.263 dBm
2 N 1 f 2.483 528 GHz -54.284 dBm
3 N 1 f 2.484 804 GHz -54.110 dBm
4 N 1 f 2.495 012 GHz -54.476 dBm

5. POWER SPECTRAL DENSITY TEST

5.1 LIMIT

FCC Part15.247 , Subpart C RSS-247 Issue 2				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e) RSS-247 Issue 2	Power Spectral Density	≤8 dBm (RBW ≥3KHz)	2400-2483.5	PASS

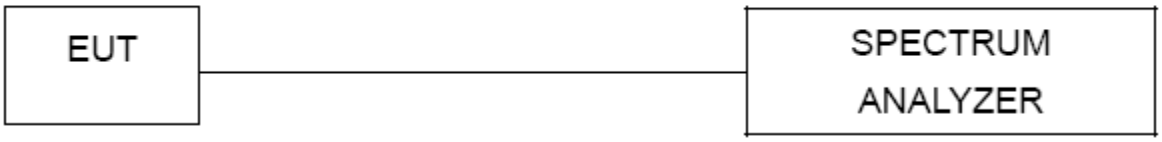
5.2 TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the 100 kHz ≥ RBW ≥3 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP



5.5 EUT OPERATION CONDITIONS

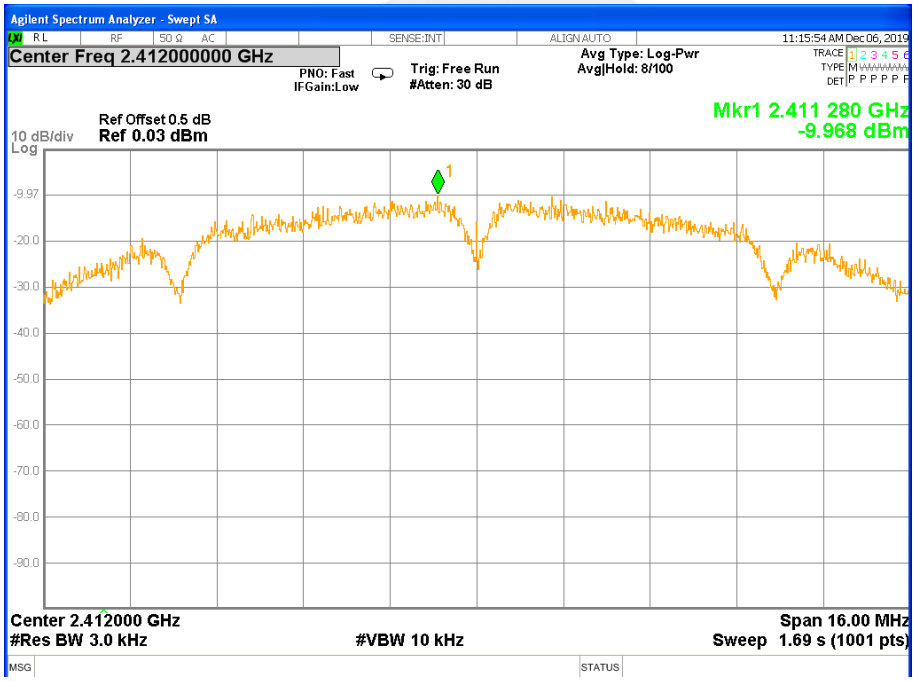
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

5.6 TEST RESULTS

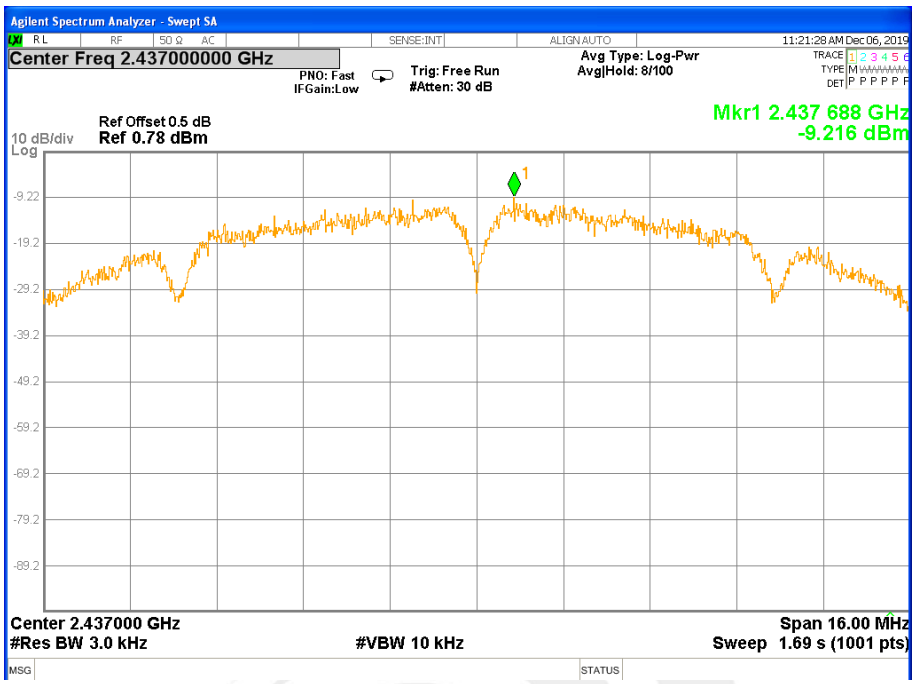
Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	DC 3.3V	Test Mode:	TX b Mode /CH01, CH06, CH11

Frequency	Power Density (dBm/3kHz)	Limit (dBm/3KHz)	Result
2412 MHz	-9.968	≤8	PASS
2437 MHz	-9.216	≤8	PASS
2462 MHz	-9.315	≤8	PASS

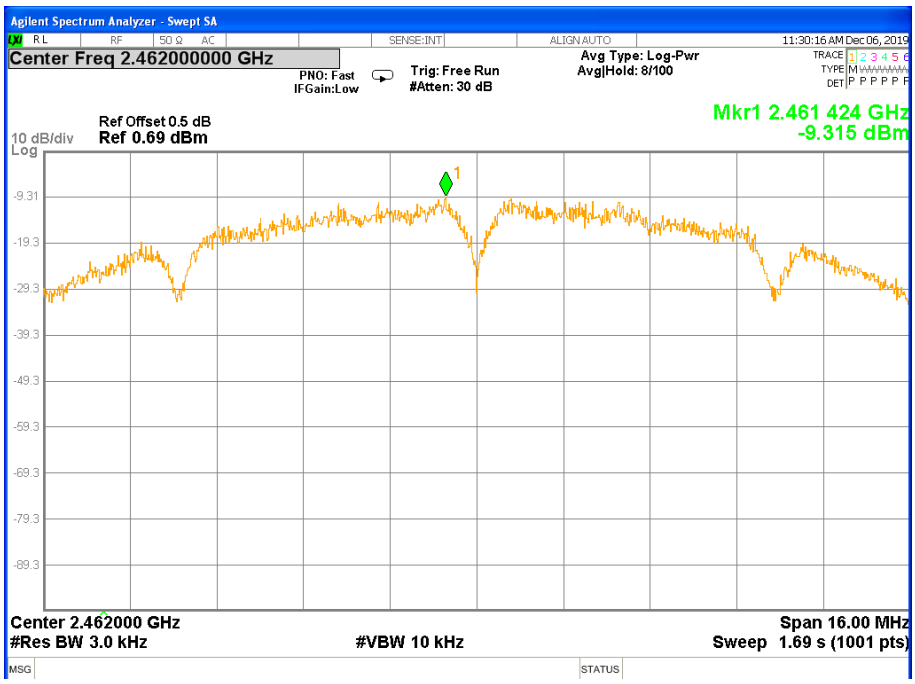
TX CH01



TX CH06



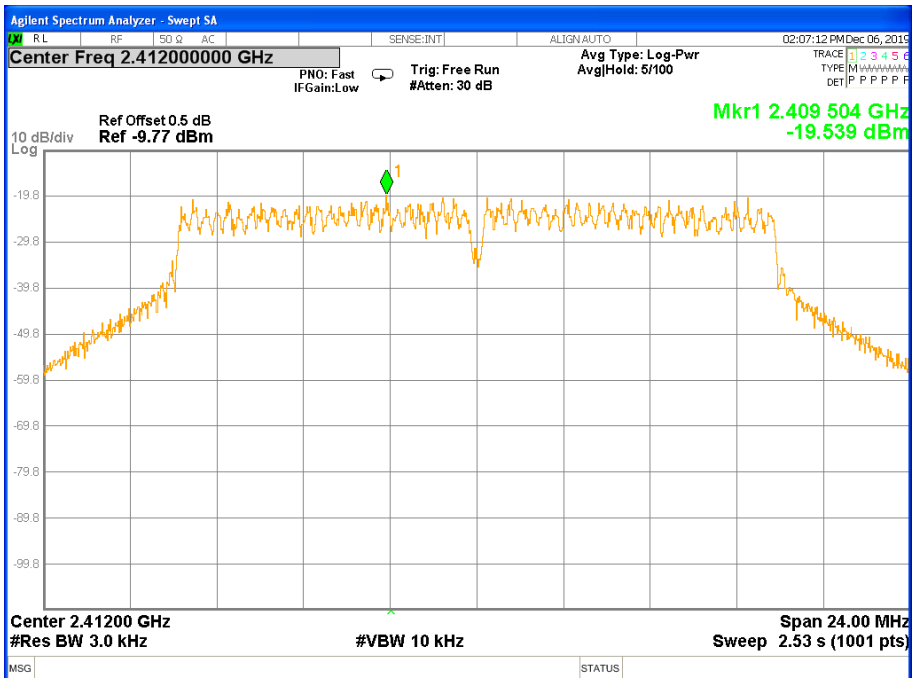
TX CH11



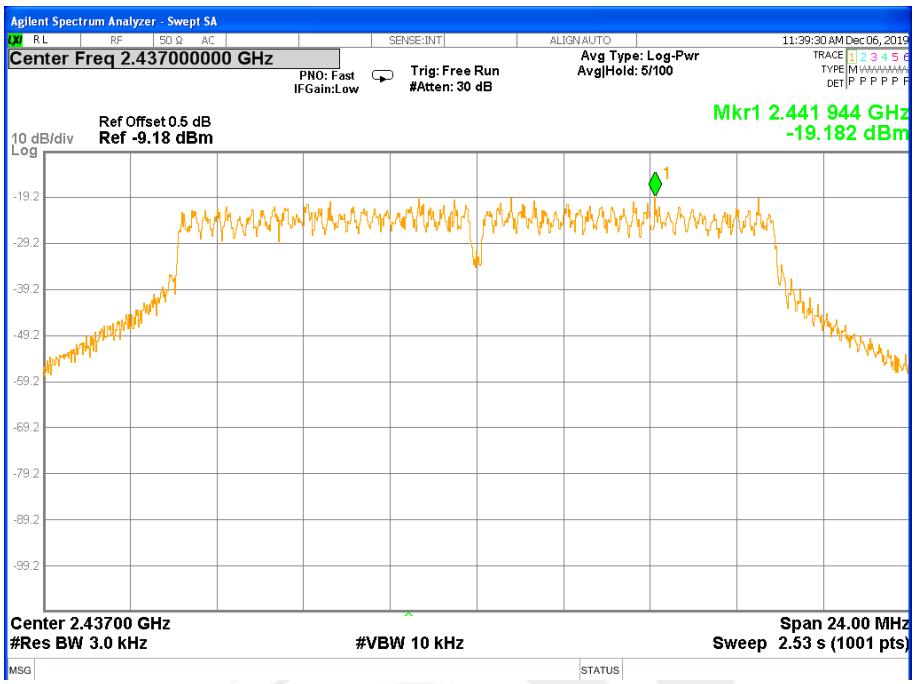
Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	DC 3.3V	Test Mode:	TX g Mode /CH01, CH06, CH11

Frequency	Power Density (dBm/3kHz)	Limit (dBm/3KHz)	Result
2412 MHz	-19.539	≤8	PASS
2437 MHz	-19.182	≤8	PASS
2462 MHz	-13.838	≤8	PASS

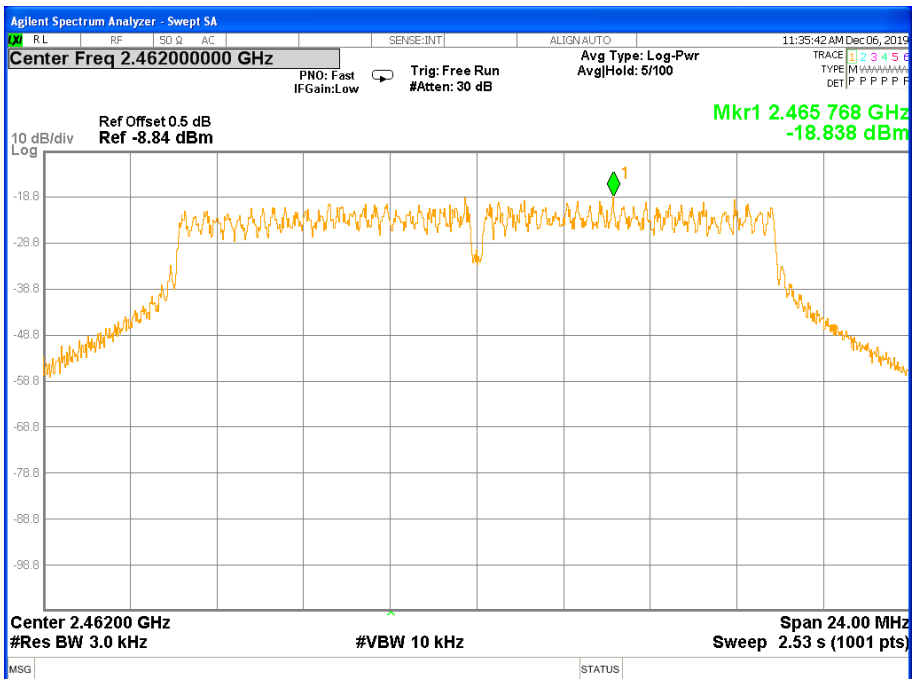
TX CH01



TX CH06



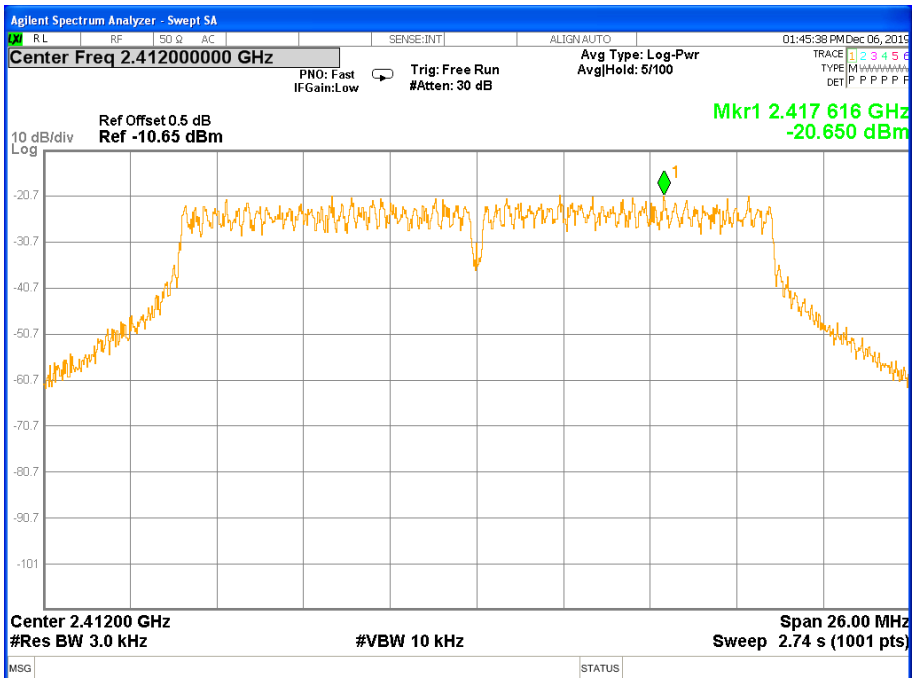
TX CH11



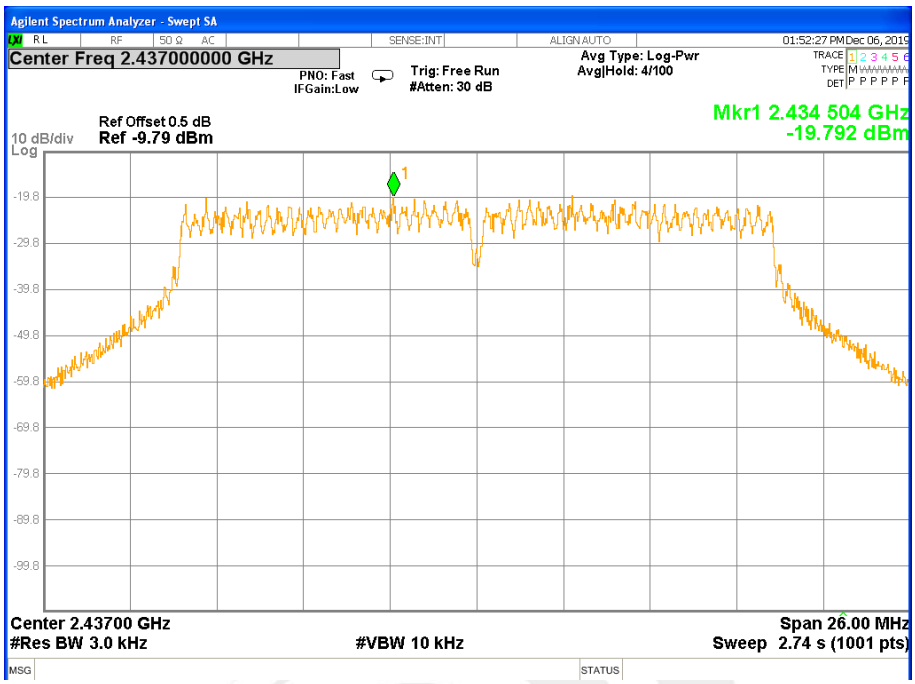
Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	DC 3.3V	Test Mode:	TX n Mode(20M) /CH01, CH06, CH11

Frequency	Power Density (dBm/3kHz)	Limit (dBm/3KHz)	Result
2412 MHz	-20.65	≤8	PASS
2437 MHz	-19.792	≤8	PASS
2462 MHz	-18.789	≤8	PASS

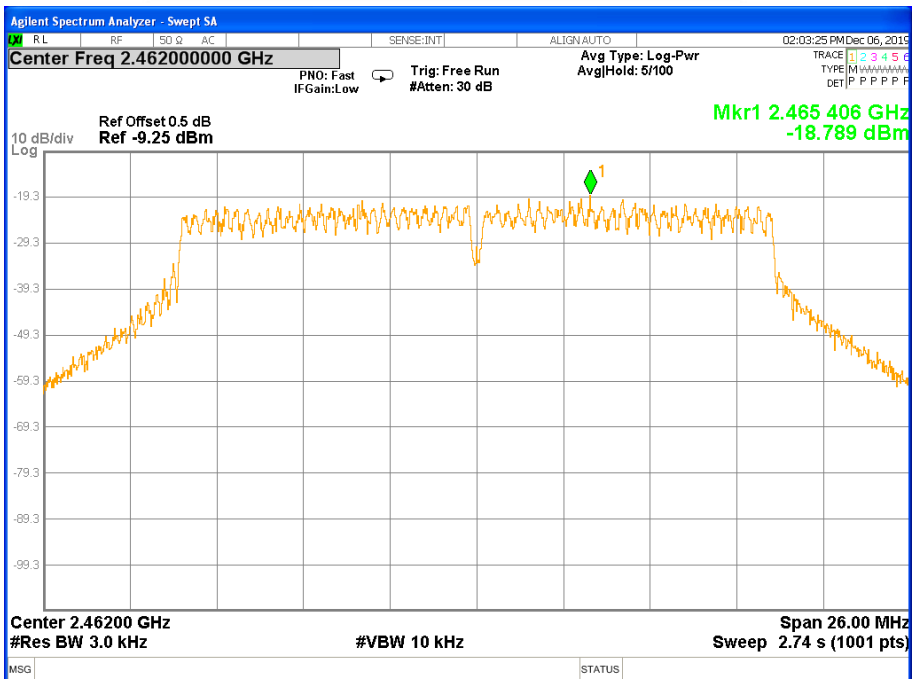
TX CH01



TX CH06



TX CH11



6. BANDWIDTH TEST

6.1 LIMIT

FCC Part 15.247,Subpart C RSS-Gen Clause 6.7				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	≥500KHz (6dB bandwidth)	2400-2483.5	PASS
RSS-Gen Clause 6.7	99% Bandwidth	For reporting purposes only.	2400-2483.5	PASS

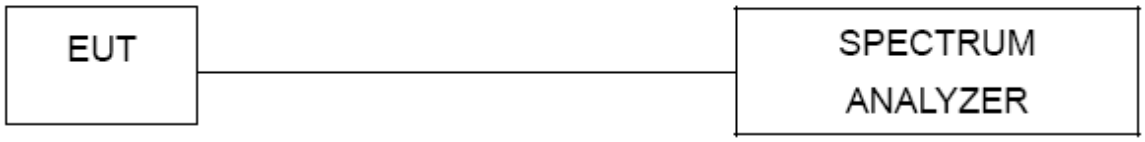
6.2 TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW to: 100 kHz ≥ RBW ≥ 3 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 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.

6.6 TEST RESULTS

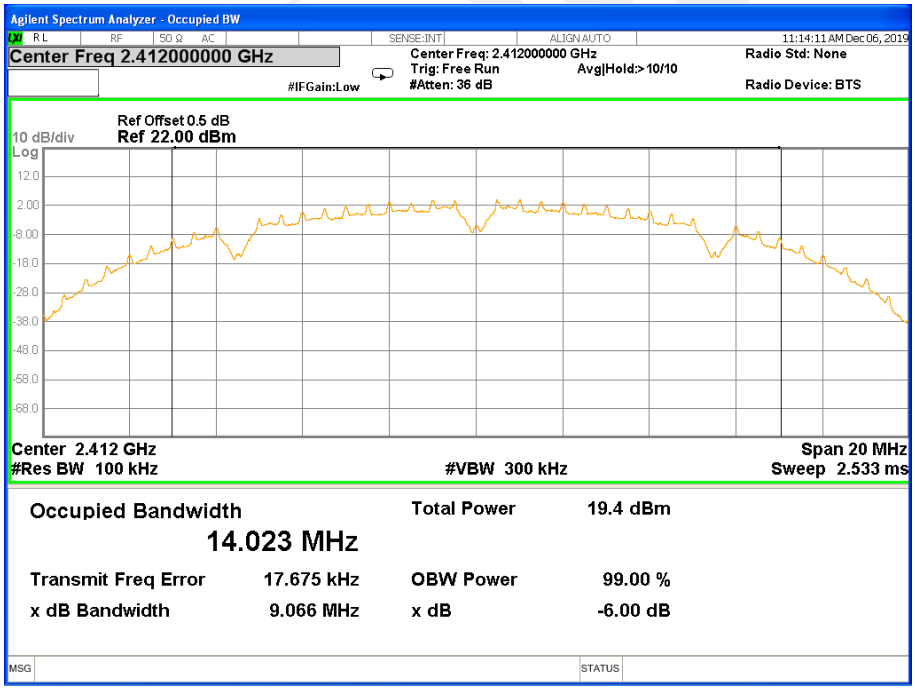
Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	DC 3.3V	Test Mode:	TX b Mode /CH01, CH06, CH11

Remark: PEAK DETECTOR IS USED

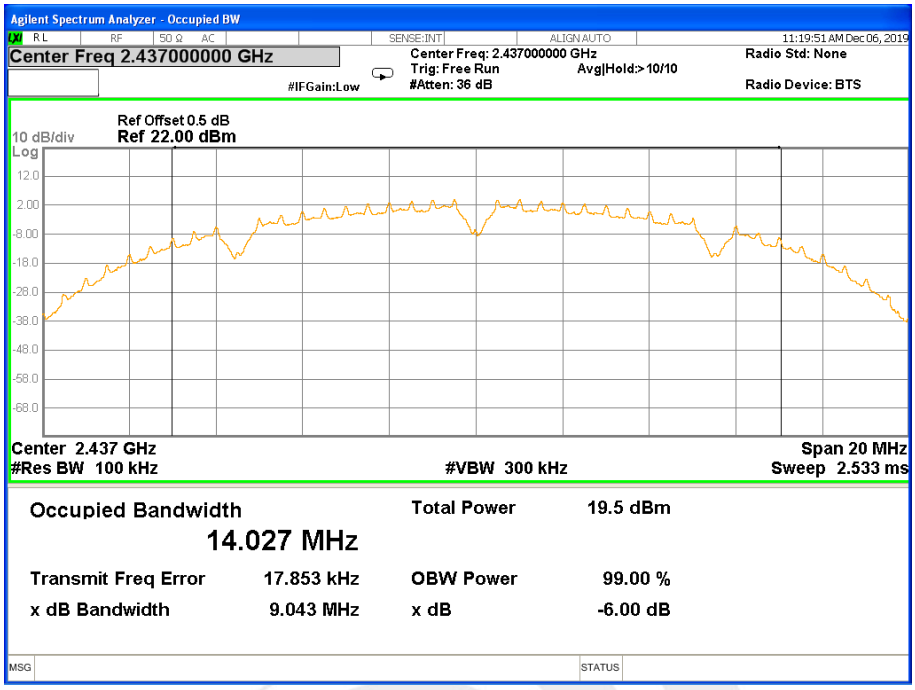
Frequency	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Channel Separation (KHz)	Result
2412 MHz	9.066	14.049	>=500KHz	PASS
2437 MHz	9.043	14.055	>=500KHz	PASS
2462 MHz	9.054	14.049	>=500KHz	PASS

6dB Bandwidth

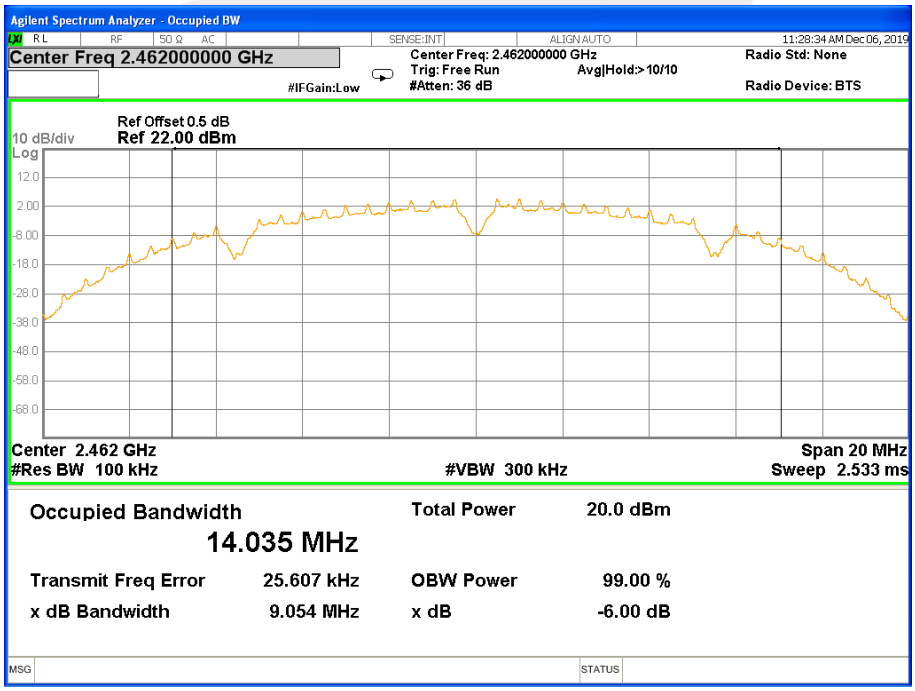
TX CH 01



TX CH 06

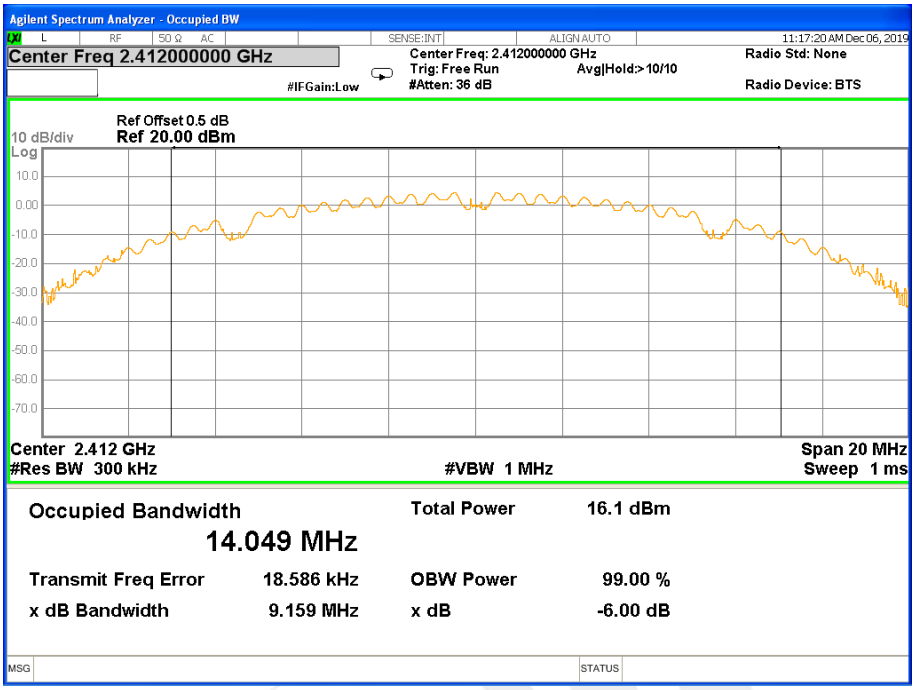


TX CH 11

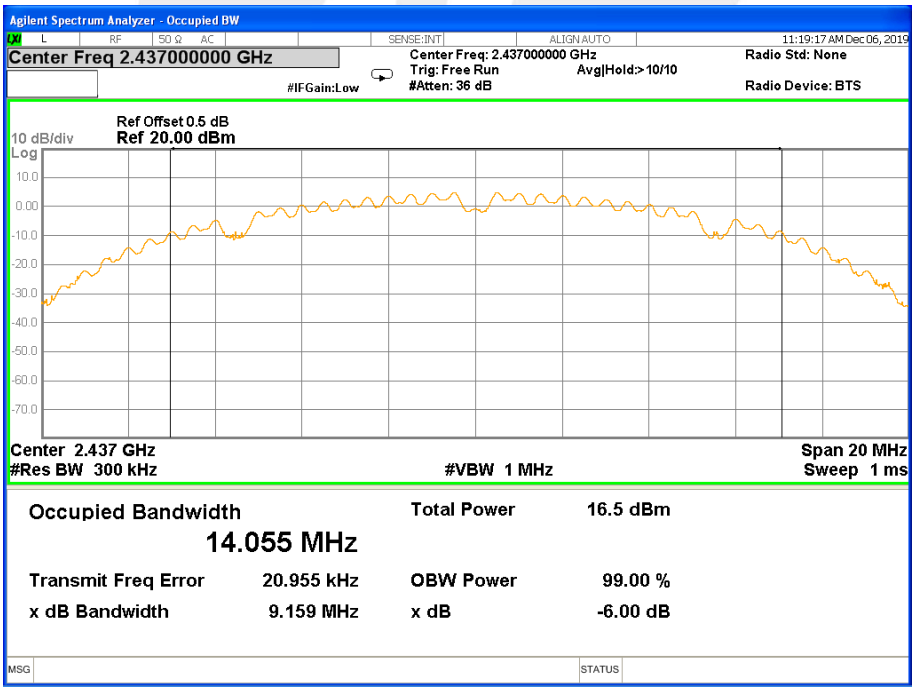


99% Bandwidth

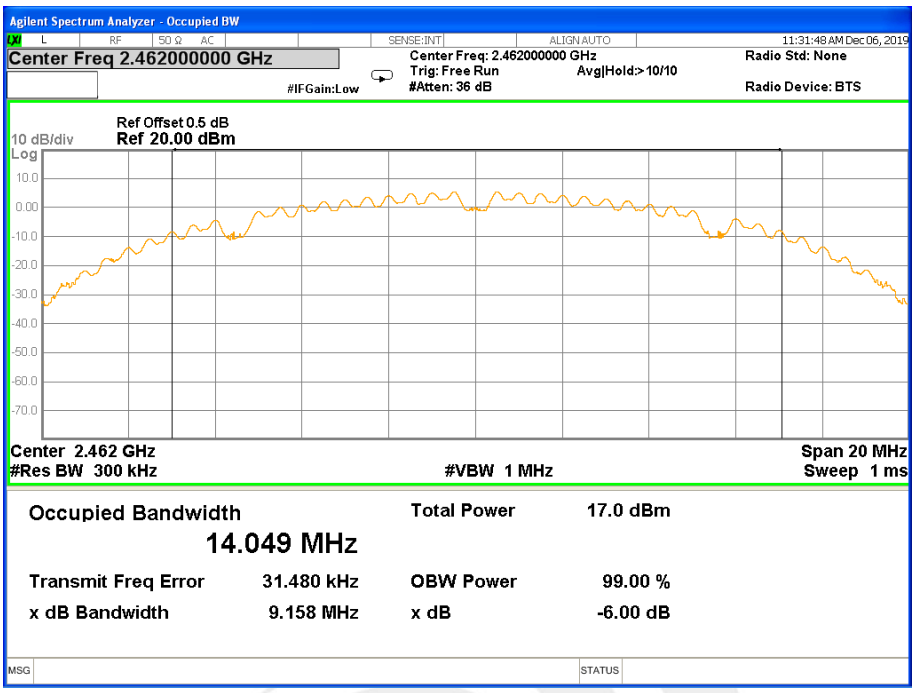
TX CH 01



TX CH 06



TX CH 11

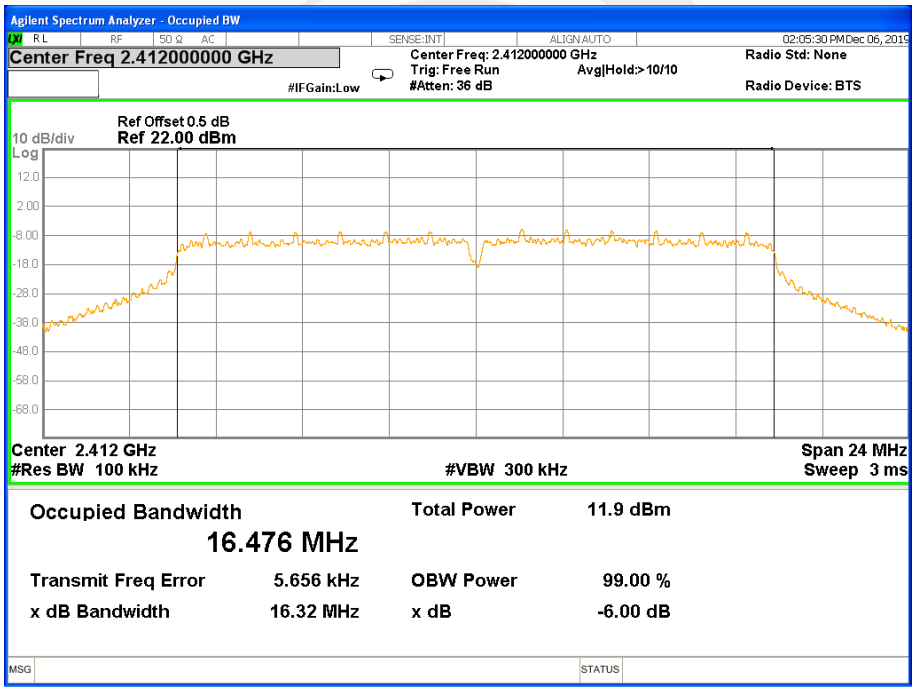

Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.462000000 GHz
Center Freq: 2.462000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 36 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
11:31:48 AM Dec 06, 2019
Ref Offset 0.5 dB
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.462 GHz
#Res BW 300 kHz
#VBW 1 MHz
Span 20 MHz
Sweep 1 ms
Occupied Bandwidth
14.049 MHz
Total Power 17.0 dBm
Transmit Freq Error 31.480 kHz
OBW Power 99.00 %
x dB Bandwidth 9.158 MHz
x dB -6.00 dB
MSG
STATUS

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

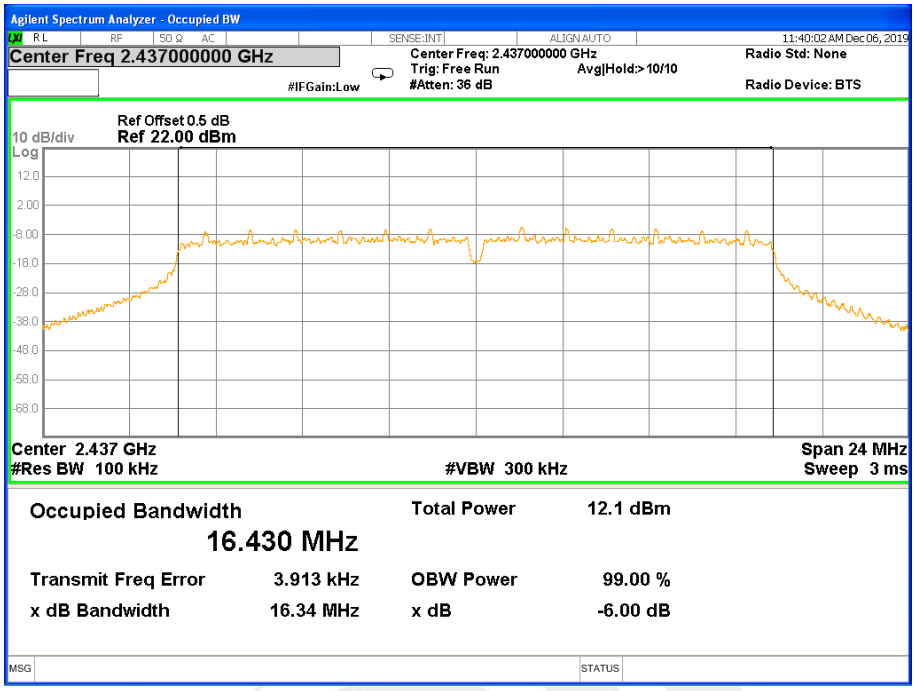
Frequency	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Channel Separation (KHz)	Result
2412 MHz	16.32	16.83	>=500KHz	PASS
2437 MHz	16.34	16.85	>=500KHz	PASS
2462 MHz	16.33	16.89	>=500KHz	PASS

6dB Bandwidth

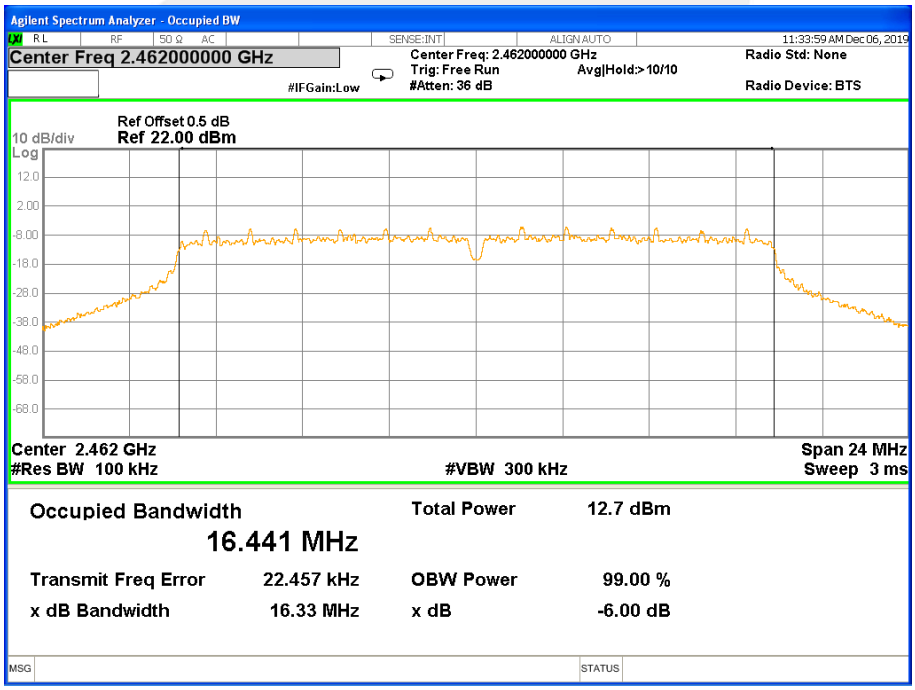
TX CH 01



TX CH 06

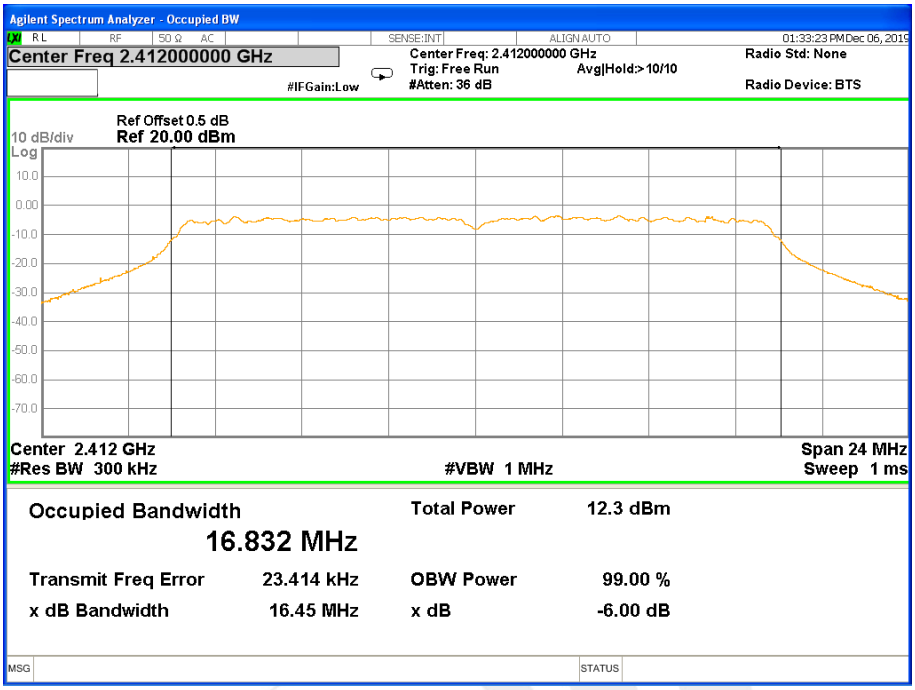


TX CH 11

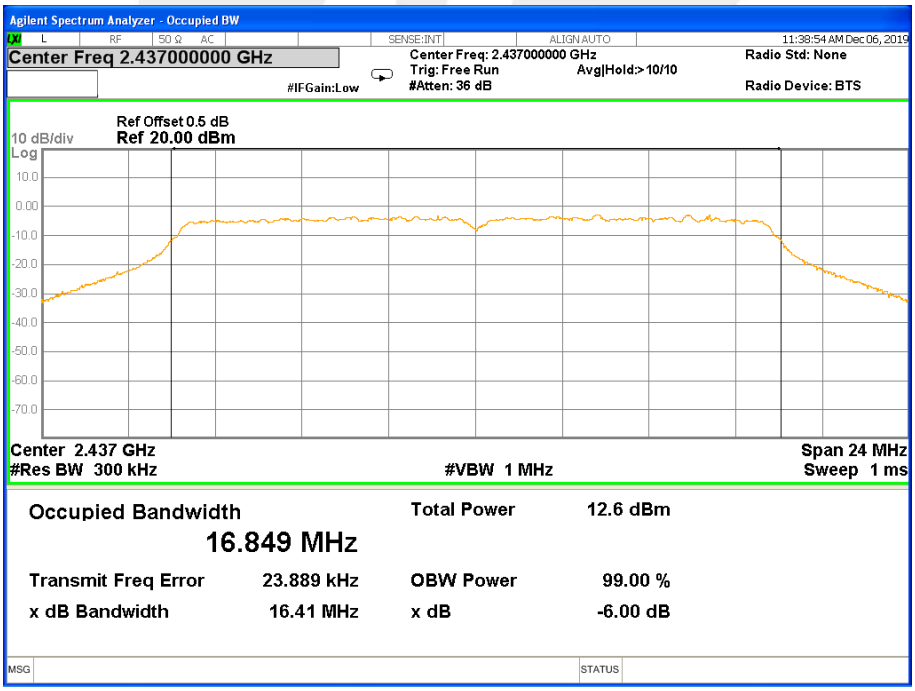


99% Bandwidth

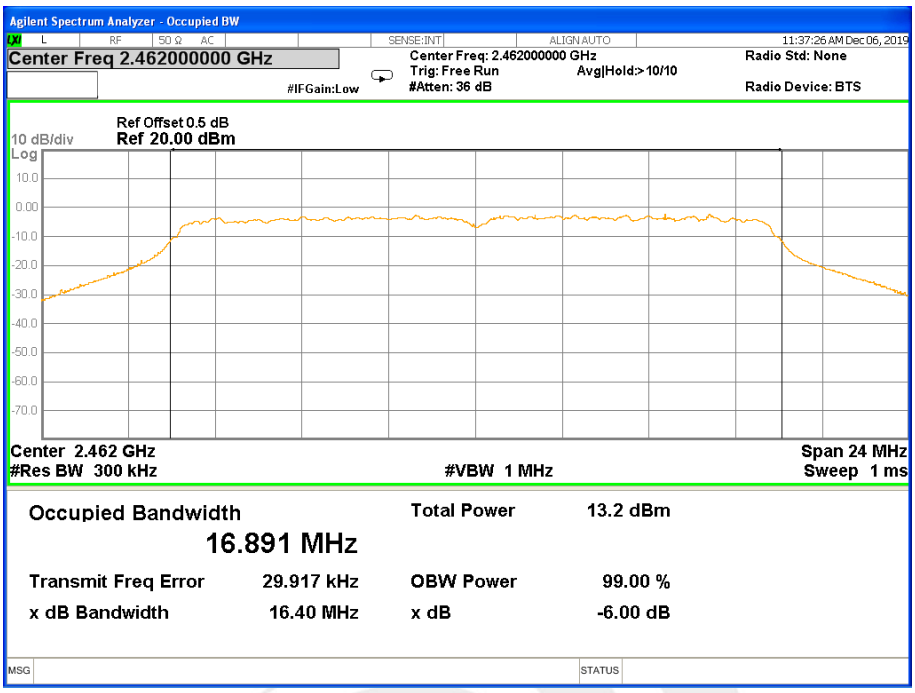
TX CH 01



TX CH 06



TX CH 11

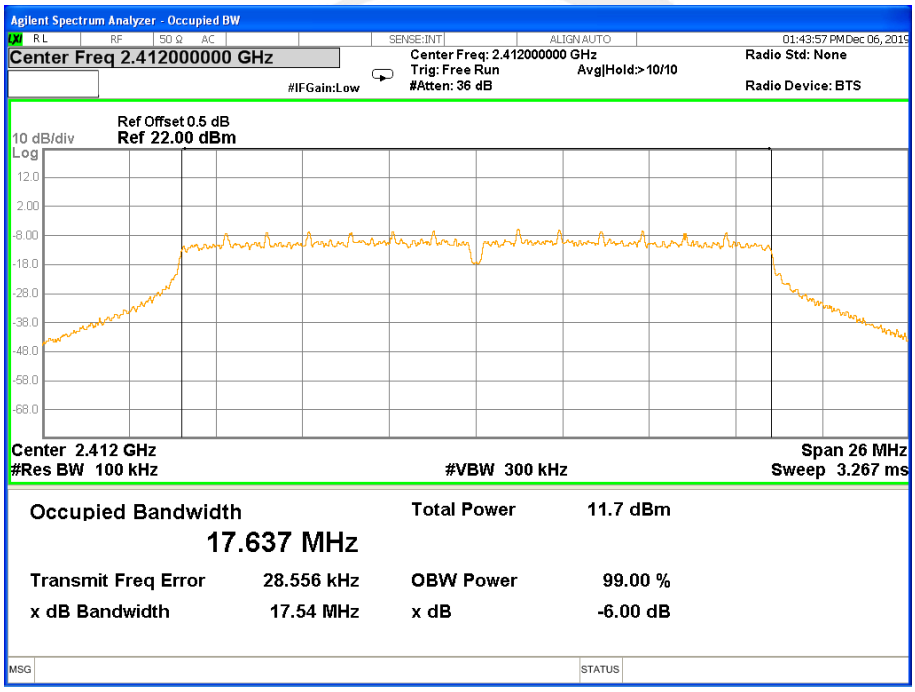

Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.462000000 GHz
Center Freq: 2.462000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 36 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
11:37:26 AM Dec 06, 2019
Ref Offset 0.5 dB
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.462 GHz
#Res BW 300 kHz
#VBW 1 MHz
Span 24 MHz
Sweep 1 ms
Occupied Bandwidth
16.891 MHz
Total Power 13.2 dBm
Transmit Freq Error 29.917 kHz
OBW Power 99.00 %
x dB Bandwidth 16.40 MHz
x dB -6.00 dB
MSG
STATUS

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

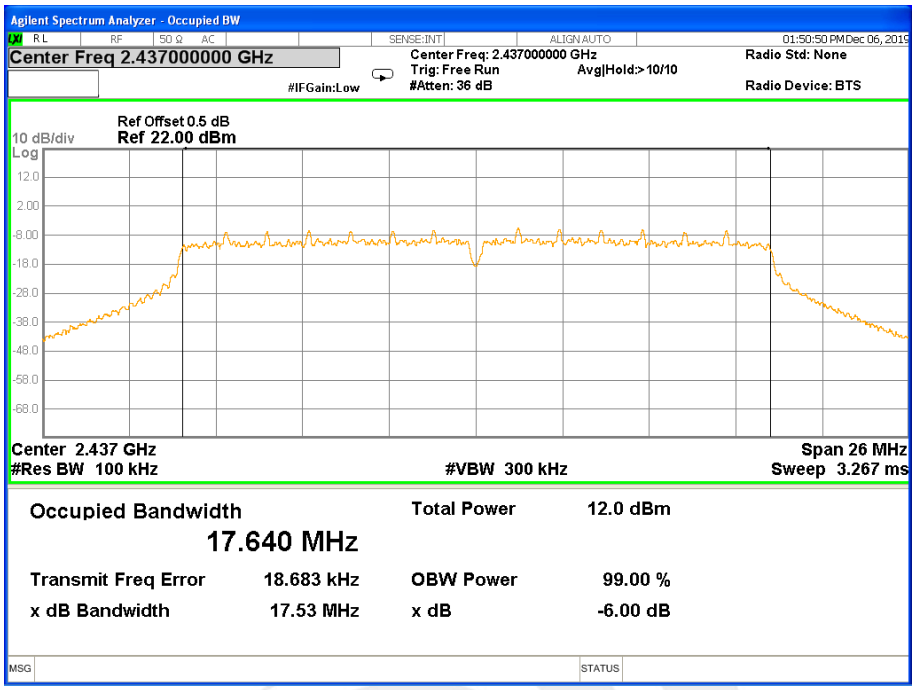
Frequency	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Channel Separation (KHz)	Result
2412 MHz	17.54	17.93	>=500KHz	PASS
2437 MHz	17.53	18.08	>=500KHz	PASS
2462 MHz	17.54	18.01	>=500KHz	PASS

6dB Bandwidth

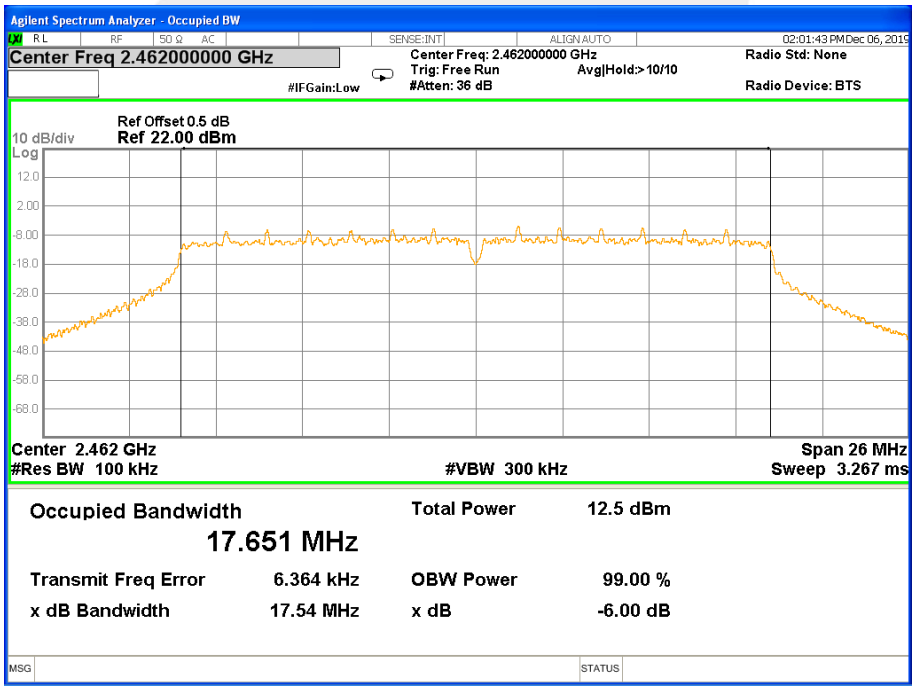
TX CH 01



TX CH 06

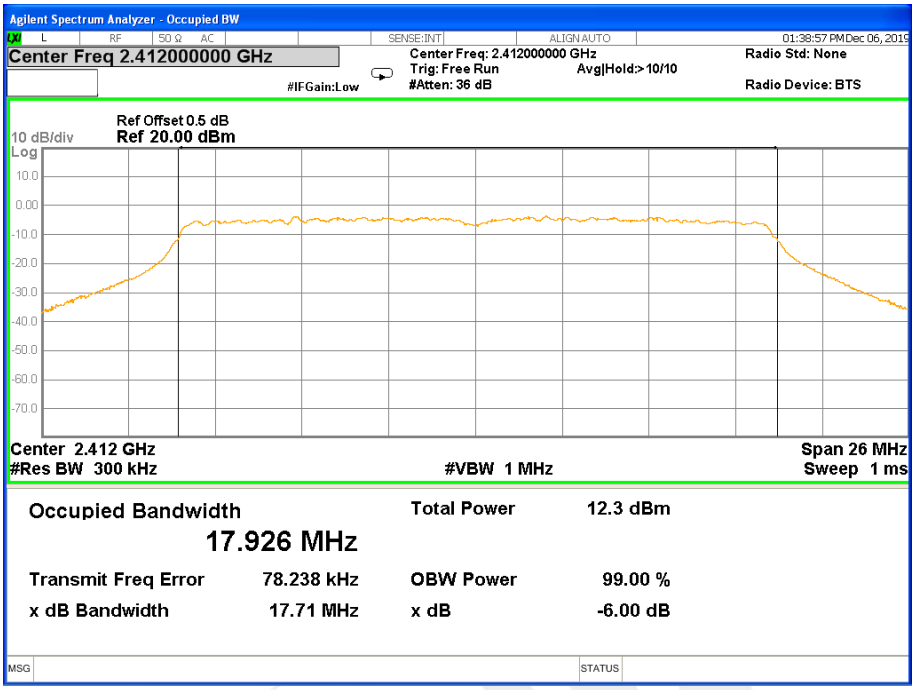


TX CH 11

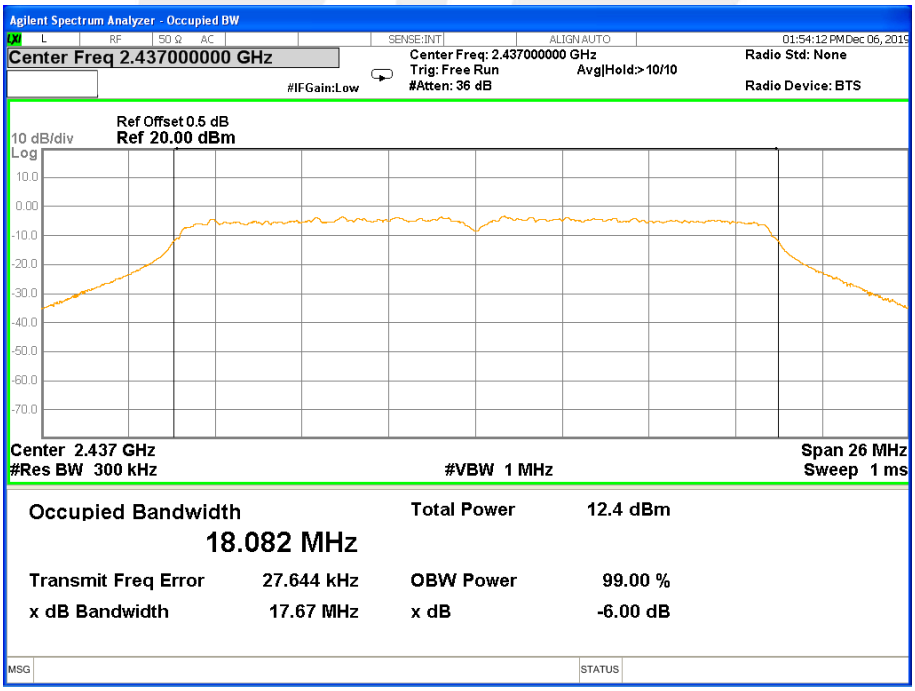


99% Bandwidth

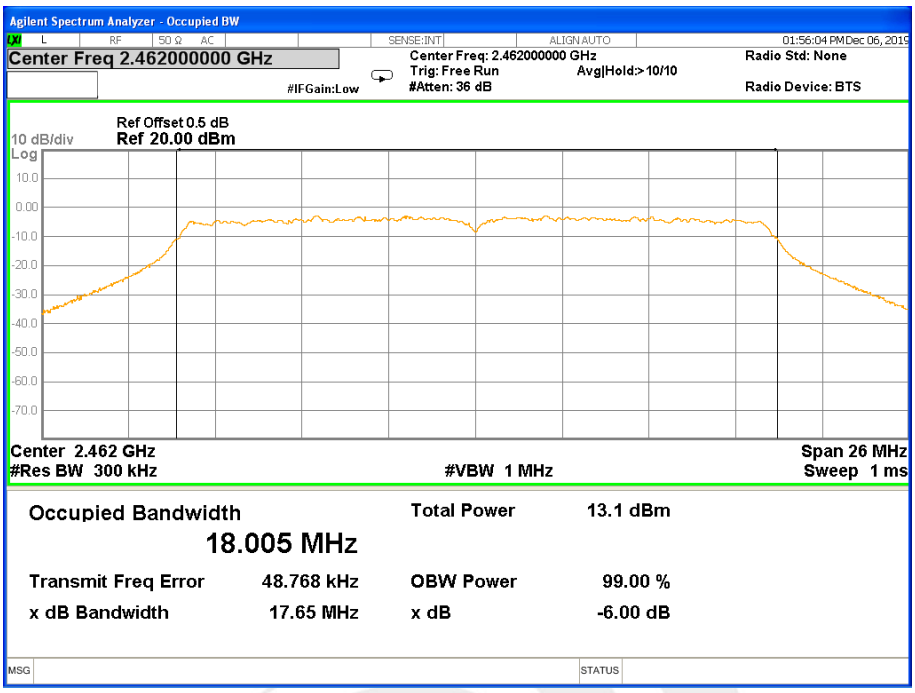
TX CH 01



TX CH 06



TX CH 11


Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.462000000 GHz
Center Freq: 2.462000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 36 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Ref Offset 0.5 dB
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.462 GHz
#Res BW 300 kHz
#VBW 1 MHz
Span 26 MHz
Sweep 1 ms
Occupied Bandwidth
18.005 MHz
Total Power 13.1 dBm
Transmit Freq Error 48.768 kHz
OBW Power 99.00 %
x dB Bandwidth 17.65 MHz
x dB -6.00 dB
MSG
STATUS

7. PEAK OUTPUT POWER TEST

7.1 LIMIT

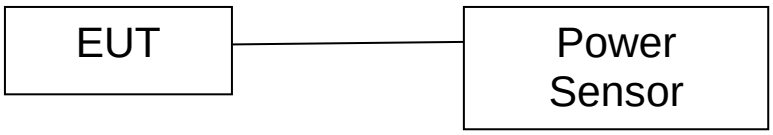
FCC Part15.247,Subpart C RSS-247 Issue 2				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3) RSS-247 Issue 2	Output Power	1 watt or 30dBm	2400-2483.5	PASS

7.2 TEST PROCEDURE

One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.
RBW ≥ DTS bandwidth
The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:
a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ [3 × RBW].
c) Set span ≥ [3 × RBW].
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.
Integrated band power method:
The following procedure can be used when the maximum available RBW of the instrument is less than the
DTS bandwidth:
a) Set the RBW = 1 MHz.
b) Set the VBW ≥ [3 × RBW].
c) Set the span ≥ [1.5 × DTS bandwidth].
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select the peak detector). If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS CHANNEL BANDWIDTH.
KPM1 Peak power meter method:
The maximum peak conducted output power may be measured using a broadband peak rf power meter. The power meter shall have a video bandwidth that is greater than or equal to the dts bandwidth and shall use a fast-responding diode detector.

7.3 DEVIATION FROM STANDARD
No deviation.

7.4 TEST SETUP



7.5 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.

7.6 TEST RESULTS

Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	DC 3.3V		

Mode	Test Channe	Frequency	Peak Conducted Output Power	Average Conducted Output Power	LIMIT
		(MHz)	(dBm)	(dBm)	dBm
TX 802.11b	CH01	2412	15.79	13.09	30
	CH06	2437	16.24	13.45	30
	CH11	2462	17.37	13.71	30
TX 802.11g	CH01	2412	15.06	6.05	30
	CH06	2437	15.51	6.37	30
	CH11	2462	15.99	6.60	30
TX 802.11n20	CH01	2412	15.43	5.93	30
	CH06	2437	15.64	6.29	30
	CH11	2462	16.08	6.58	30

8. ANTENNA REQUIREMENT

8.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible partyshall be used with the device.

8.2 EUT ANTENNA

The EUT antenna is PCB Antenna. It comply with the standard requirement.

9.FREQUENCY STABILITY

9.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

The frequency tolerance of the carrier signal shall be maintained within +/-0.02% of the operating frequency over a temperature variation of -30 degrees to 50 degrees C at normal supply voltage,and for a variation in primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees.

9.2 TEST PROCEDURE

1.The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2.Turn the EUT on and couple its output to spectrum analyzer.
3.Turn the EUT off and set the chamber to the highest temperature specified.
4.Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize,turn the EUT on and measure the operating frequency after 2,5,and 10 minutes.
5.Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6.The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes.The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

9.3 TEST RESULT

Channel 16 (2437MHz)

Voltage vs. Frequency Stability

Voltage vs. Frequency Stability Voltage(V)	Measurement Frequency(MHz)
3.795	2437.0034
3.3	2437.0027
2.805	2437.0034
Max.Deviation(MHz)	0.0034
Max.Deviation(ppm)	1.40

Rated working voltage:DC 3.3V

Temperature vs. Frequency Stability

Temperature(℃)	Measurement Frequency(MHz)
-30	2437.0038
-20	2437.0036
-10	2437.0035
0	2437.0036
10	2437.0033
20	2437.0038
30	2437.0031
40	2437.0036
50	2437.0032
Max.Deviation(MHz)	0.0038
Max.Deviation(ppm)	1.56

APPENDIX-PHOTOS OF TEST SETUP

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

※※※※※END OF THE REPORT※※※※※