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RADIO TEST REPORT

Report No:STS1804130W09

Issued for

Linkplay Technology Inc.

8F-8036, Qianren Building, No.7, Yingcui Road, Jiangning District, Nanjing, China

Product Name:	Wireless Smart Audio Module
Brand Name:	Linkplay
Model Name:	A88
Series Model:	A88-2
FCC ID:	2ANOG-A88
IC ID:	23153-A88
Test Standard:	FCC Part 15.247
	RSS-247 Issue 2, February 2017

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TEST RESULT CERTIFICATION

Applicant's name : Linkplay Technology Inc.
 Address..... : 8F-8036, Qianren Building, No.7, Yingcui Road, Jiangning District, Nanjing, China
Manufacture's Name : Linkplay Technology Inc.
 Address..... : 8F-8036, Qianren Building, No.7, Yingcui Road, Jiangning District, Nanjing, China

Product description

Product Name : Wireless Smart Audio Module
 Brand Name : Linkplay
 Model Name..... : A88
 Series Model : A88-2

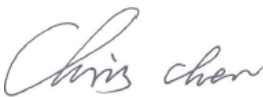
Test Standards : FCC Part15.247
 RSS-247 Issue 2, February 2017

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..... : 13 Apr. 2018 ~26 Apr. 2018
 Date of Issue : 26 Apr. 2018
 Test Result : **Pass**

Testing Engineer : 

 (Chris chen)

Technical Manager : 

 (Sean she)

Authorized Signatory : 

 (Vita Li)

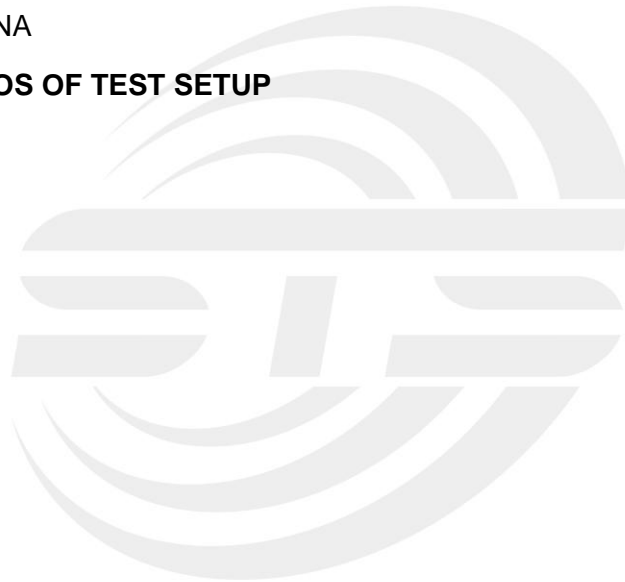




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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	26 Apr. 2018	STS1804130W09	ALL	Initial Issue





1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

KDB 558074 D01 DTS Meas Guidance v04 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) RSS-247 Issue 2, February 2017	6dB&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	

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

CNAS Registration No.: L7649; FCC Registration No.: 625569

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

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded 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	Conducted Emission (9KHz-150KHz)	$\pm 2.88\text{dB}$
2	Conducted Emission (150KHz-30MHz)	$\pm 2.67\text{dB}$
3	RF power,conducted	$\pm 0.71\text{dB}$
4	Spurious emissions,conducted	$\pm 0.63\text{dB}$
5	All emissions,radiated (9KHz-30MHz)	$\pm 3.02\text{dB}$
6	All emissions,radiated (30MHz-200MHz)	$\pm 3.80\text{dB}$
7	All emissions,radiated (200MHz-1000MHz)	$\pm 3.97\text{dB}$
8	All emissions,radiated(>1G)	$\pm 3.03\text{dB}$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name	Wireless Smart Audio Module	
Trade Name	Linkplay	
Model Name	A88	
Series Model	A88-2	
Model Difference	The shipping package labels are different.	
Product Description	The EUT is a Wireless Smart Audio Module	
	Operation Frequency:	802.11b/g/n20: 2412~2462 MHz
	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
	Number Of Channel:	802.11b/g/n20:11CH
	Antenna Designation:	Please see Note 3
	Antenna Gain (dBi):	ANT A: 1.43dBi. ANT B: 1.43dBi. Total gain=4.44dBi
	Duty Cycle:	>98%
Channel List	Please refer to the Note 2.	
Power Rating	DC 5V	
Hardware version	V04	
Software version	WMB20170414	
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	
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

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, 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)	
Channel	Freq.(MHz)
01	2412
06	2437
11	2462

4 KDB 662911 D01 Multiple Transmitter Output v02r01
 2) Directional Gain Calculations for In-Band Measurements
 a) Basic methodology with NANT transmit antennas, each with the same directional gain GANT dBi, being driven by NANT transmitter outputs of equal power. Directional gain is to be computed as follows:
 (i) If any transmit signals are correlated with each other,
 Directional gain = GANT + 10 log(NANT) dBi
 (ii) If all transmit signals are completely uncorrelated with each other,
 Directional gain = GANT
 ANT A=1.43 dBi
 ANT B=1.43 dB

GANT + 10 log(NANT) dBi
 Directional gain= 1.43+10log2=4.44dBi

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Total (dBi)
	Linkplay	A88	PIFA Antenna	N/A	ANT A: 1.43dBi ANT B: 1.43dBi	4.44



2.2 DESCRIPTION OF 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
- (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.

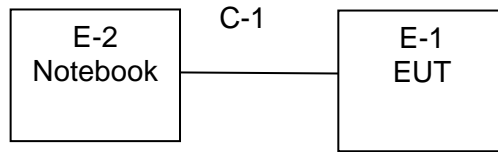
AC Conducted Emission

Test Case	
AC Conducted Emission	Mode10: Keeping WIFI TX

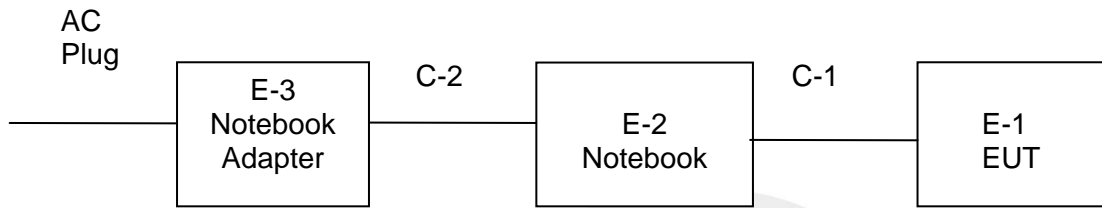


2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiation Test Set



conduction Test Set





2.4 DESCRIPTION OF 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.

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
E-2	Notebook	HP	500-320cx	N/A	N/A
E-3	Notebook Adapter	HP	HSTNN-CA15	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
C-1	USB Cable	NO	100cm	N/A
C-2	DC Cable	NO	110cm	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
EMI Test Receiver	R&S	ESW	101535	2017.06.01	2018.05.31
Bilog Antenna	TESEQ	CBL6111D	34678	2017.11.02	2018.11.01
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-1343	2017.10.27	2018.10.26
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	N/A	2018.03.11	2019.03.10
Temperature & Humidity	HH660	Mieo	N/A	2017.10.15	2018.10.14
Temperature & Humidity	HH660	Mieo	N/A	2017.10.15	2018.10.14
Pre-mpifier (0.1M-3GHz)	EM	EM330	60538	2018.03.11	2019.03.10
PreAmplifier (1G-26.5GHz)	Agilent	8449B	60538	2017.10.15	2018.10.14
Passive Loop (9K--30MHz)	ZHNAN	ZN3090C	16035	2018.03.11	2019.03.10
Low frequency cable	EM	R01	N/A	2018.03.11	2019.03.10
Low frequency cable	EM	R06	N/A	2018.03.11	2019.03.10
High frequency cable	SCHWARZBECK	R04	N/A	2018.03.11	2019.03.10
High frequency cable	SCHWARZBECK	R02	N/A	2018.03.11	2019.03.10
Semi-anechoic chamber	Changling	966	N/A	2017.10.15	2018.10.14
trun table	EM	SC100_1	60531	N/A	N/A
Antnna mast	EM	SC100	N/A	N/A	N/A
Max-full Antenna Corp	MF	MFA-440H	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	2017.10.15	2018.10.14
LISN	R&S	ENV216	101242	2017.10.15	2018.10.14
conduction Cable	EM	C01	N/A	2018.03.11	2019.03.10
Temperature & Humidity	Mieo	HH660	N/A	2017.10.15	2018.10.14



RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2017.10.15	2018.10.14
Power Meter	R&S	NRP	100510	2017.10.15	2018.10.14
Spectrum Analyzer	Agilent	N9020A	MY51110105	2018.03.08	2019.03.07
Signal Analyzer	Agilent	N9020A	MY49100060	2017.10.15	2018.10.14

Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.





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.

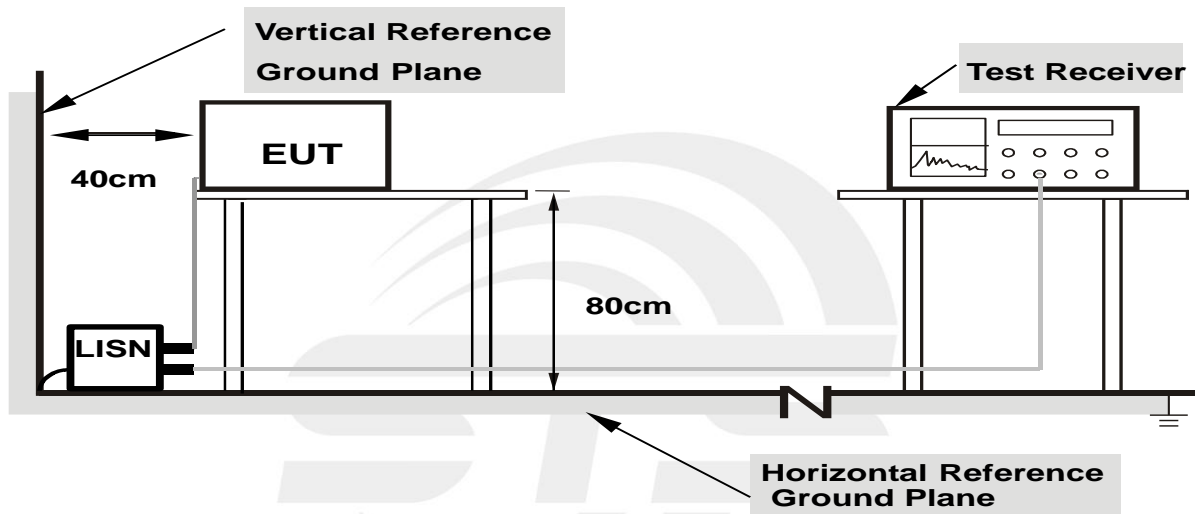
The following table is the setting of the receiver

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

3.1.2 TEST PROCEDURE

- 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.
- 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.
- 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.
- LISN at least 80 cm from nearest part of EUT chassis.
- 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

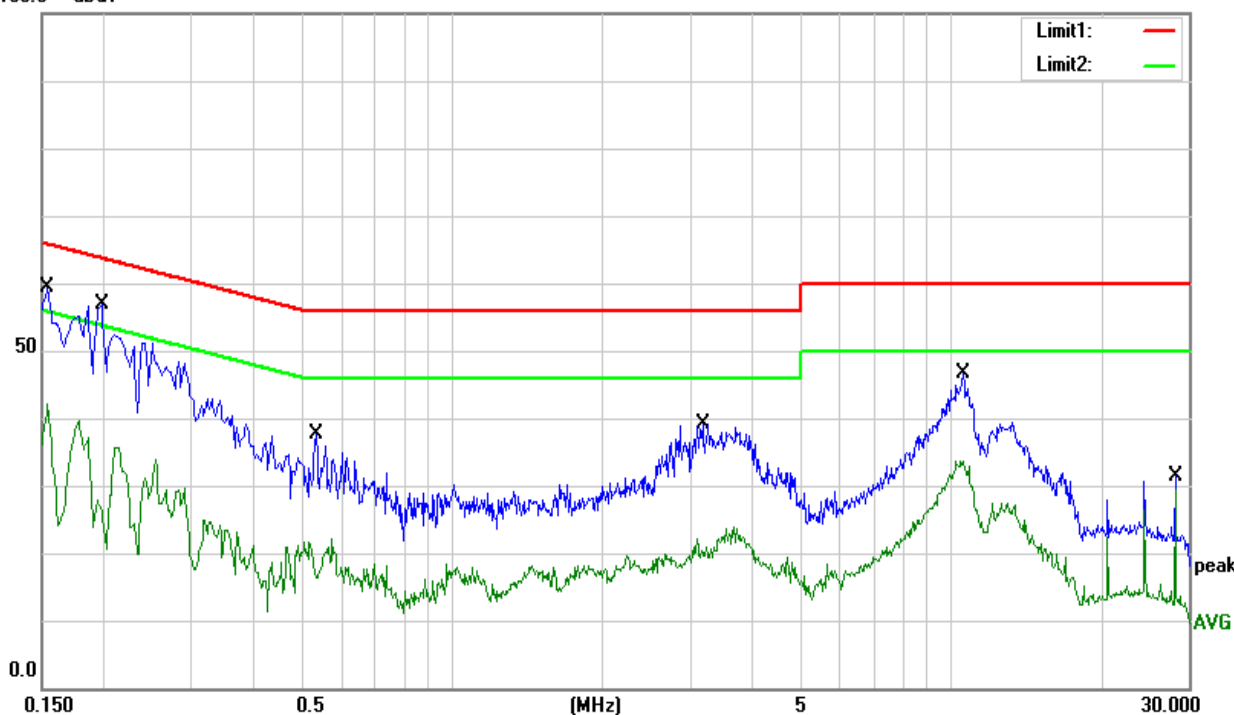
Temperature:	24 °C	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Phase:	L
Test Mode:	Mode 10		

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
0.1540	49.54	9.79	59.33	65.78	-6.45	QP
0.1540	32.32	9.79	42.11	55.78	-13.67	AVG
0.1980	47.22	9.78	57.00	63.69	-6.69	QP
0.1980	15.53	9.78	25.31	53.69	-28.38	AVG
0.5340	27.56	10.00	37.56	56.00	-18.44	QP
0.5340	6.35	10.00	16.35	46.00	-29.65	AVG
3.1820	29.36	9.81	39.17	56.00	-16.83	QP
3.1820	9.94	9.81	19.75	46.00	-26.25	AVG
10.5860	36.42	10.21	46.63	60.00	-13.37	QP
10.5860	23.51	10.21	33.72	50.00	-16.28	AVG
28.2260	21.11	10.24	31.35	60.00	-28.65	QP
28.2260	19.03	10.24	29.27	50.00	-20.73	AVG

Remark:

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

100.0 dBuV





Temperature:	24 °C	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Phase:	N
Test Mode:	Mode 10		

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
0.1700	45.74	9.79	55.53	64.96	-9.43	QP
0.1700	29.39	9.79	39.18	54.96	-15.78	AVG
0.3220	35.41	10.18	45.59	59.66	-14.07	QP
0.3220	8.10	10.18	18.28	49.66	-31.38	AVG
0.9380	19.49	9.81	29.30	56.00	-26.70	QP
0.9380	2.05	9.81	11.86	46.00	-34.14	AVG
3.7380	27.83	9.82	37.65	56.00	-18.35	QP
3.7380	10.91	9.82	20.73	46.00	-25.27	AVG
10.5500	35.01	10.21	45.22	60.00	-14.78	QP
10.5500	21.28	10.21	31.49	50.00	-18.51	AVG
16.1860	24.15	10.29	34.44	60.00	-25.56	QP
16.1860	7.81	10.29	18.10	50.00	-31.90	AVG

Remark:

- All readings are Quasi-Peak and Average values.
- Margin = Result (Result = Reading + Factor) - Limit

100.0 dBuV





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 (micovolts/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

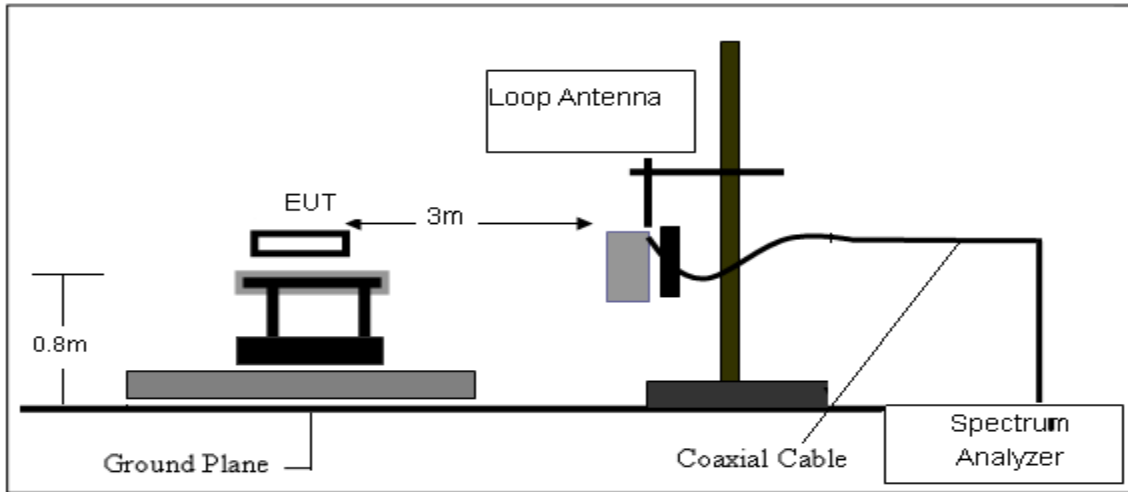
- a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters(above 1GHz is 1.5 m) above the ground at a 3 meter anechoic 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:

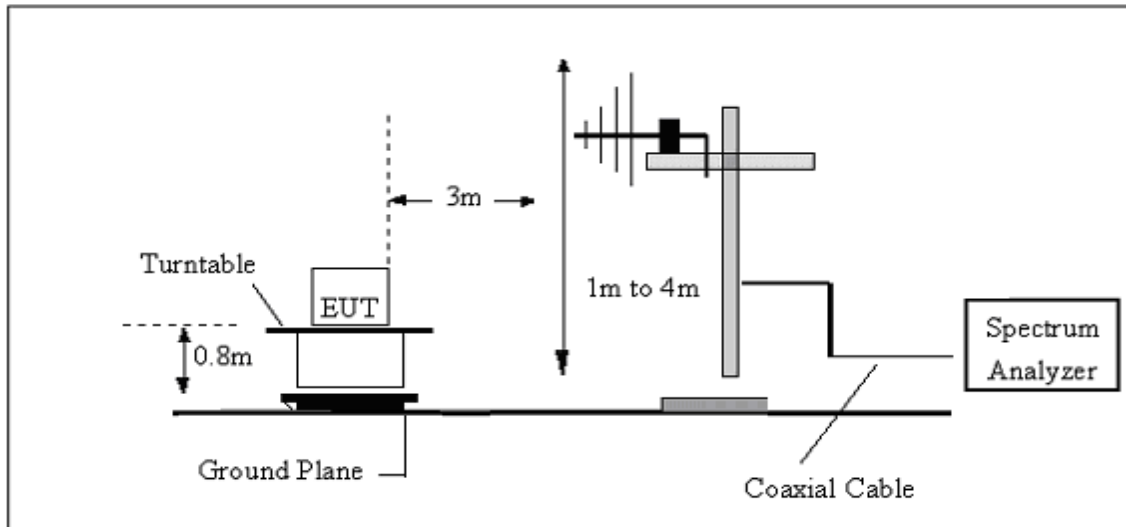
Both horizontal and vertical antenna polarities were tested and performed test to three orthogonal axis. The worst case emissions were reported

3.2.3 TEST SETUP

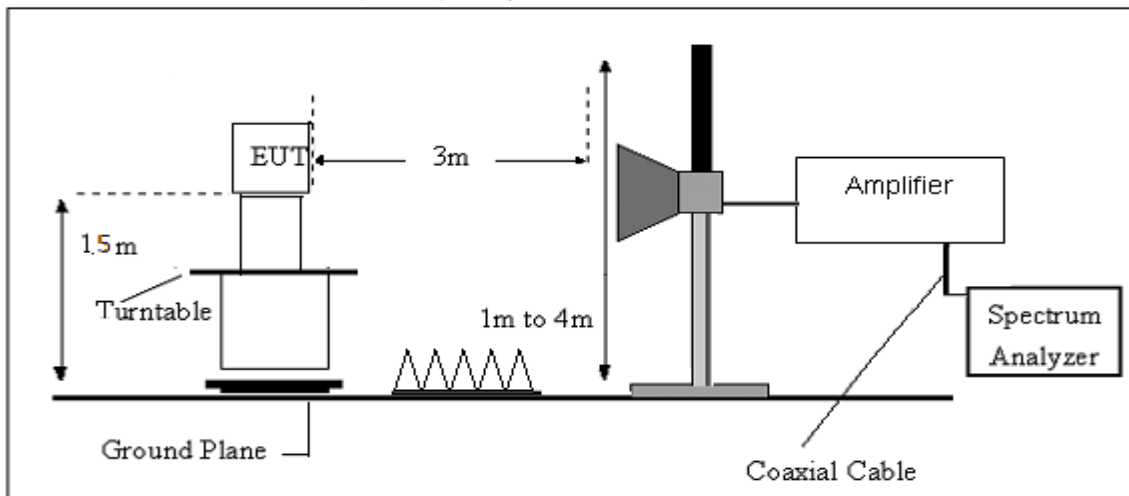
(A) Radiated Emission Test-Up Frequency Below 30MHz



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

$$\text{Factor} = \text{AF} + \text{CL} - \text{AG}$$





3.2.6 TEST RESULT

9KHz-30MHz

Temperature:	20 °C	Relative Humidity:	48%
Test Voltage :	DC 5V	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 = $40 \log(\text{specific distance}/\text{test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.



(30MHz - 1000MHz)

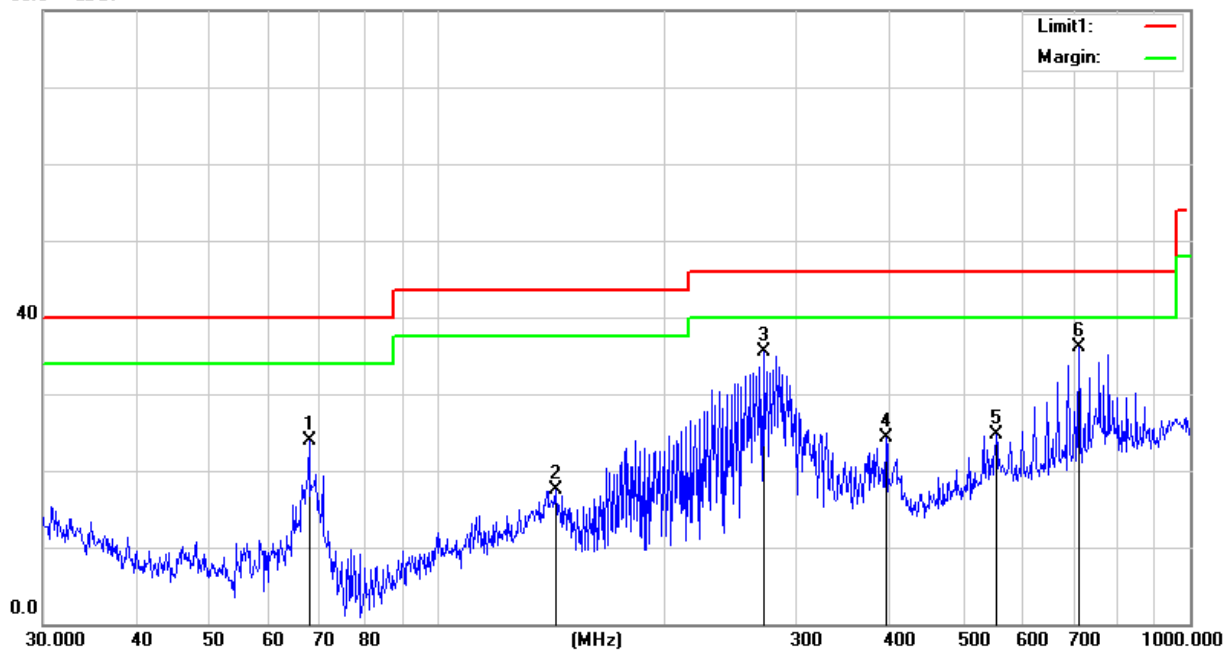
Temperature:	24.5 °C	Relative Humidity:	63%
Test Voltage :	DC 5V	Polarization :	Horizontal
Test Mode :	Mode 1/2/3/4/5/6/7/8/9(Mode 7 worst mode)		

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
67.6751	48.03	-24.16	23.87	40.00	-16.13	QP
143.8295	35.12	-17.69	17.43	43.50	-26.07	QP
271.3246	50.99	-15.52	35.47	46.00	-10.53	QP
394.8545	35.97	-11.58	24.39	46.00	-21.61	QP
552.8832	31.47	-6.71	24.76	46.00	-21.24	QP
711.6734	41.10	-4.94	36.16	46.00	-9.84	QP

Remark:

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

80.0 dBuV





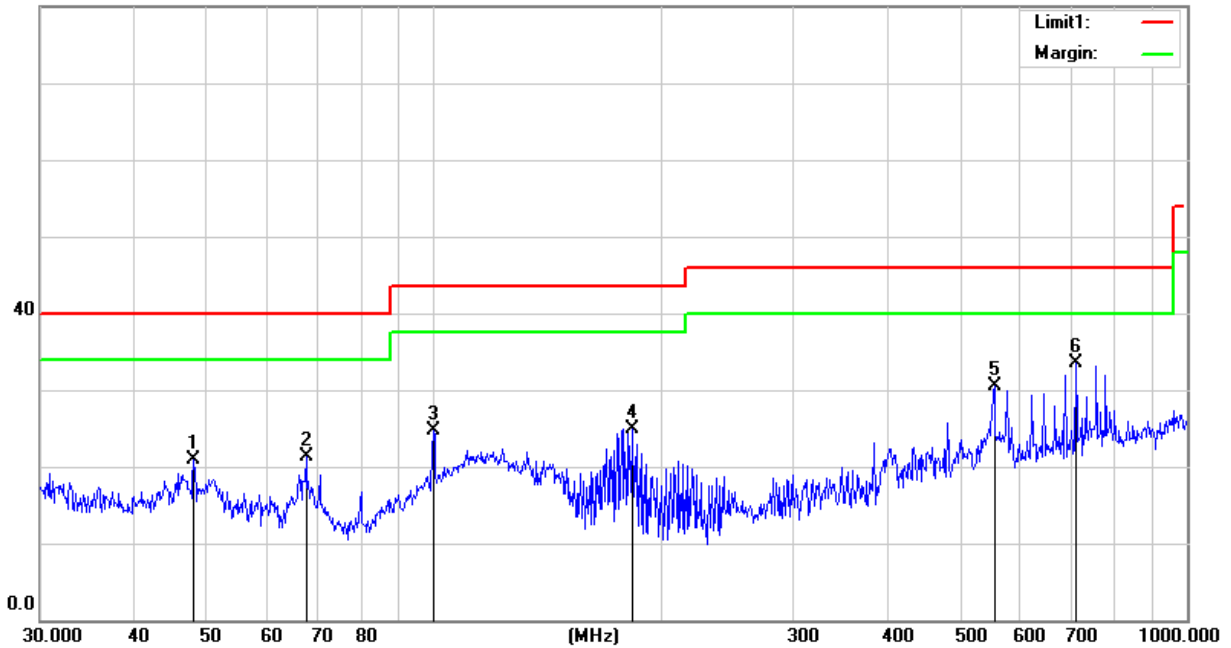
Temperature:	24.5 °C	Relative Humidity:	63%
Test Voltage :	DC 5V	Polarization :	Vertical
Test Mode :	Mode 1/2/3/4/5/6/7/8/9(Mode 7worst mode)		

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
47.9940	41.44	-20.45	20.99	40.00	-19.01	QP
67.6751	45.54	-24.16	21.38	40.00	-18.62	QP
99.8777	43.82	-19.20	24.62	43.50	-18.88	QP
183.2005	44.67	-19.70	24.97	43.50	-18.53	QP
554.8254	37.19	-6.67	30.52	46.00	-15.48	QP
711.6734	38.38	-4.94	33.44	46.00	-12.56	QP

Remark:.

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

80.0 dBuV





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

802.11n(HT20) Low Channel (Antenna A+B)

Meter		Antenna		Orrected	Emission					
Frequency	Reading	Amplifier	Loss	Factor	Factor	Level	Limits	Margin	Detector	
(MHz)	(dBμV)	(dB)	(dB)	(dB/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	Type	Comment
Low Channel (2412 MHz)										
3264.67	48.07	44.70	6.70	28.20	-9.80	38.27	74.00	-35.73	PK	Vertical
3264.67	39.60	44.70	6.70	28.20	-9.80	29.80	54.00	-24.20	AV	Vertical
3264.77	48.29	44.70	6.70	28.20	-9.80	38.49	74.00	-35.51	PK	Horizontal
3264.77	38.13	44.70	6.70	28.20	-9.80	28.33	54.00	-25.67	AV	Horizontal
4824.48	58.97	44.20	9.04	31.60	-3.56	55.41	74.00	-18.59	PK	Vertical
4824.48	38.95	44.20	9.04	31.60	-3.56	35.39	54.00	-18.61	AV	Vertical
4824.53	59.17	44.20	9.04	31.60	-3.56	55.61	74.00	-18.39	PK	Horizontal
4824.53	38.33	44.20	9.04	31.60	-3.56	34.77	54.00	-19.23	AV	Horizontal
5359.79	44.98	44.20	9.86	32.00	-2.34	42.64	74.00	-31.36	PK	Vertical
5359.79	38.09	44.20	9.86	32.00	-2.34	35.75	54.00	-18.25	AV	Vertical
5359.62	45.68	44.20	9.86	32.00	-2.34	43.34	74.00	-30.66	PK	Horizontal
5359.62	37.90	44.20	9.86	32.00	-2.34	35.56	54.00	-18.44	AV	Horizontal
7235.82	51.83	43.50	11.40	35.50	3.40	55.23	74.00	-18.77	PK	Vertical
7235.82	32.48	43.50	11.40	35.50	3.40	35.88	54.00	-18.12	AV	Vertical
7235.85	51.64	43.50	11.40	35.50	3.40	55.04	74.00	-18.96	PK	Horizontal
7235.85	33.49	43.50	11.40	35.50	3.40	36.89	54.00	-17.11	AV	Horizontal



802.11n(HT20) Mid Channel (Antenna A+B)

Frequency (MHz)	Meter		Antenna		Orrected	Emission				
	Reading (dBμV)	Amplifier (dB)	Loss (dB)	Factor (dB/m)	Factor (dB)	Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Low Channel (2437 MHz)										
3264.72	48.58	44.70	6.70	28.20	-9.80	38.78	74.00	-35.22	PK	Vertical
3264.72	38.49	44.70	6.70	28.20	-9.80	28.69	54.00	-25.31	AV	Vertical
3264.86	48.69	44.70	6.70	28.20	-9.80	38.89	74.00	-35.11	PK	Horizontal
3264.86	39.09	44.70	6.70	28.20	-9.80	29.29	54.00	-24.71	AV	Horizontal
4874.41	59.20	44.20	9.04	31.60	-3.56	55.64	74.00	-18.36	PK	Vertical
4874.41	39.59	44.20	9.04	31.60	-3.56	36.03	54.00	-17.97	AV	Vertical
4874.55	59.40	44.20	9.04	31.60	-3.56	55.84	74.00	-18.16	PK	Horizontal
4874.55	39.48	44.20	9.04	31.60	-3.56	35.92	54.00	-18.08	AV	Horizontal
5359.67	45.21	44.20	9.86	32.00	-2.34	42.87	74.00	-31.13	PK	Vertical
5359.67	38.24	44.20	9.86	32.00	-2.34	35.90	54.00	-18.10	AV	Vertical
5359.63	45.11	44.20	9.86	32.00	-2.34	42.77	74.00	-31.23	PK	Horizontal
5359.63	38.06	44.20	9.86	32.00	-2.34	35.72	54.00	-18.28	AV	Horizontal
7310.82	50.82	43.50	11.40	35.50	3.40	54.22	74.00	-19.78	PK	Vertical
7310.82	33.47	43.50	11.40	35.50	3.40	36.87	54.00	-17.13	AV	Vertical
7310.83	51.48	43.50	11.40	35.50	3.40	54.88	74.00	-19.12	PK	Horizontal
7310.83	33.00	43.50	11.40	35.50	3.40	36.40	54.00	-17.60	AV	Horizontal



802.11n(HT20) High Channel (Antenna A+B)

Frequency (MHz)	Meter		Antenna		Orrected	Emission				
	Reading (dBμV)	Amplifier (dB)	Loss (dB)	Factor (dB/m)	Factor (dB)	Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Low Channel (2462 MHz)										
3264.62	48.14	44.70	6.70	28.20	-9.80	38.34	74.00	-35.66	PK	Vertical
3264.62	39.10	44.70	6.70	28.20	-9.80	29.30	54.00	-24.70	AV	Vertical
3264.79	48.60	44.70	6.70	28.20	-9.80	38.80	74.00	-35.20	PK	Horizontal
3264.79	39.03	44.70	6.70	28.20	-9.80	29.23	54.00	-24.77	AV	Horizontal
4924.57	58.64	44.20	9.04	31.60	-3.56	55.08	74.00	-18.92	PK	Vertical
4924.57	38.95	44.20	9.04	31.60	-3.56	35.39	54.00	-18.61	AV	Vertical
4924.53	59.41	44.20	9.04	31.60	-3.56	55.85	74.00	-18.15	PK	Horizontal
4924.53	39.52	44.20	9.04	31.60	-3.56	35.96	54.00	-18.04	AV	Horizontal
5359.87	45.49	44.20	9.86	32.00	-2.34	43.15	74.00	-30.85	PK	Vertical
5359.87	38.19	44.20	9.86	32.00	-2.34	35.85	54.00	-18.15	AV	Vertical
5359.82	46.54	44.20	9.86	32.00	-2.34	44.20	74.00	-29.80	PK	Horizontal
5359.82	37.37	44.20	9.86	32.00	-2.34	35.03	54.00	-18.97	AV	Horizontal
7385.77	50.99	43.50	11.40	35.50	3.40	54.39	74.00	-19.61	PK	Vertical
7385.77	33.68	43.50	11.40	35.50	3.40	37.08	54.00	-16.92	AV	Vertical
7385.85	50.86	43.50	11.40	35.50	3.40	54.26	74.00	-19.74	PK	Horizontal
7385.85	33.43	43.50	11.40	35.50	3.40	36.83	54.00	-17.17	AV	Horizontal

Remark:

- Factor = Antenna Factor + Cable Loss – Pre-amplifier.
- Scan with 802.11b, 802.11g, 802.11n (HT-20), all have been tested the antenna A and antenna B, the worst case is 802.11n (HT-20) of the antenna A+B.
 Emission Level = Meter Reading + Factor
 Margin = Limit - Emission Leve
- 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 (Band edge Requirements)

Frequency (MHz)	Meter		Antenna		Orrected Factor (dB)	Emission		Margin (dB)	Detector Type	Comment
	Reading (dBμV)	Amplifier (dB)	Loss (dB)	Factor (dB/m)		Level (dBμV/m)	Limits (dBμV/m)			
802.11b										
2390.00	67.33	43.80	4.91	25.90	-12.99	54.34	74.00	-19.66	PK	Vertical
2390.00	53.00	43.80	4.91	25.90	-12.99	40.01	54.00	-13.99	AV	Vertical
2390.00	68.54	43.80	4.91	25.90	-12.99	55.55	74.00	-18.45	PK	Horizontal
2390.00	52.18	43.80	4.91	25.90	-12.99	39.19	54.00	-14.81	AV	Horizontal
2483.50	69.92	43.80	5.12	25.90	-12.78	57.14	74.00	-16.86	PK	Vertical
2483.50	52.08	43.80	5.12	25.90	-12.78	39.30	54.00	-14.70	AV	Vertical
2483.50	70.31	43.80	5.12	25.90	-12.78	57.53	74.00	-16.47	PK	Horizontal
2483.50	52.14	43.80	5.12	25.90	-12.78	39.36	54.00	-14.64	AV	Horizontal
802.11g										
2390.00	66.63	43.80	4.91	25.90	-12.99	53.64	74.00	-20.36	PK	Vertical
2390.00	53.13	43.80	4.91	25.90	-12.99	40.14	54.00	-13.86	AV	Vertical
2390.00	65.88	43.80	4.91	25.90	-12.99	52.89	74.00	-21.11	PK	Horizontal
2390.00	53.46	43.80	4.91	25.90	-12.99	40.47	54.00	-13.53	AV	Horizontal
2483.50	66.28	43.80	5.12	25.90	-12.78	53.50	74.00	-20.50	PK	Vertical
2483.50	52.38	43.80	5.12	25.90	-12.78	39.60	54.00	-14.40	AV	Vertical
2483.50	65.95	43.80	5.12	25.90	-12.78	53.17	74.00	-20.83	PK	Horizontal
2483.50	53.11	43.80	5.12	25.90	-12.78	40.33	54.00	-13.67	AV	Horizontal
802.11n20										
2390.00	66.19	43.80	4.91	25.90	-12.99	53.20	74.00	-20.80	PK	Vertical
2390.00	53.13	43.80	4.91	25.90	-12.99	40.14	54.00	-13.86	AV	Vertical
2390.00	65.52	43.80	4.91	25.90	-12.99	52.53	74.00	-21.47	PK	Horizontal
2390.00	54.44	43.80	4.91	25.90	-12.99	41.45	54.00	-12.55	AV	Horizontal
2483.50	65.29	43.80	5.12	25.90	-12.78	52.51	74.00	-21.49	PK	Vertical
2483.50	53.47	43.80	5.12	25.90	-12.78	40.69	54.00	-13.31	AV	Vertical
2483.50	65.04	43.80	5.12	25.90	-12.78	52.26	74.00	-21.74	PK	Horizontal
2483.50	52.56	43.80	5.12	25.90	-12.78	39.78	54.00	-14.22	AV	Horizontal

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.
 Low measurement frequencies is range from 2300 to 2422 MHz, high measurement frequencies is range from 2452 to 2500 MHz.
 Only show the worst point data of the emissions in the frequency 2300-2422 MHz and 2452-2500 MHz.

4. CONDUCTED SPURIOUS & BAND EDGE EMISSION

4.1 APPLIED PROCEDURES / 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

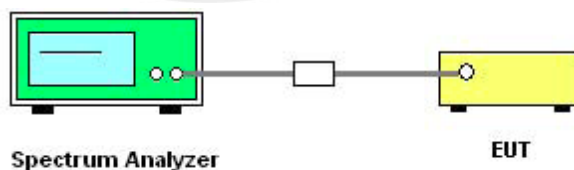
For Band edge

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 Battery, 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.



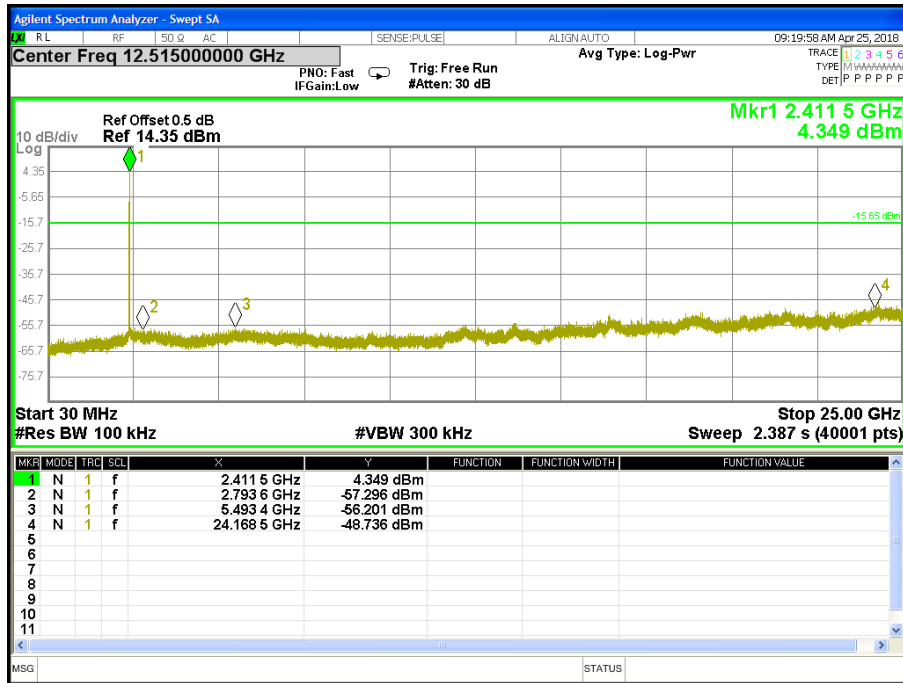
4.6 TEST RESULTS

NOTE: Antenna B Power> Antenna A Power, Both antenna A and B have been test, Only show the worst data of Antenna B

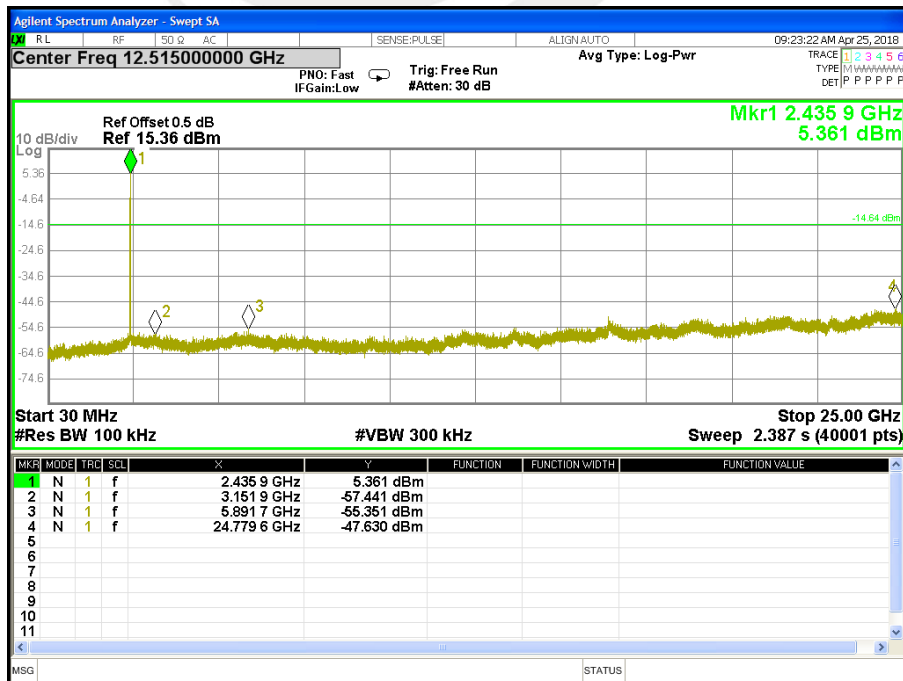
Temperature :	25 °C	Relative Humidity :	60%
Test Voltage :	DC 5V	Test Mode :	TX b Mode /CH01, CH06, CH11

Antenna B

CH 01

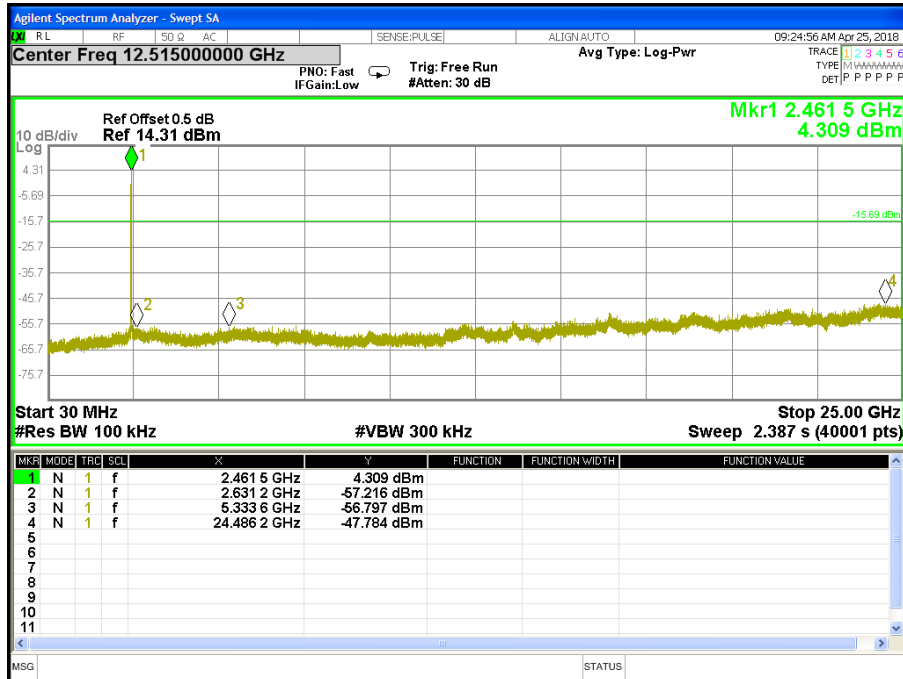


CH 06





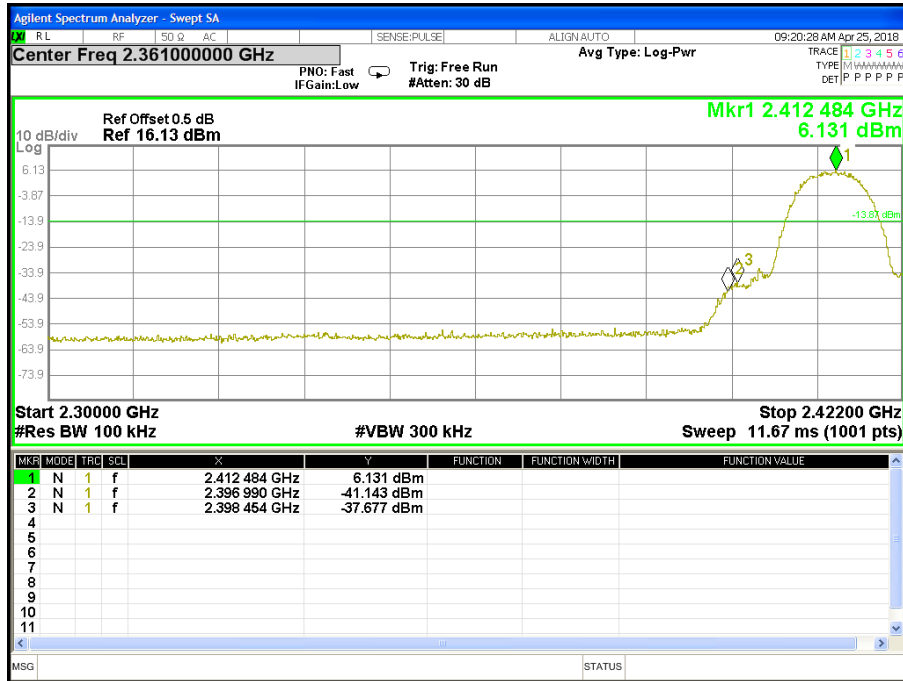
CH 11



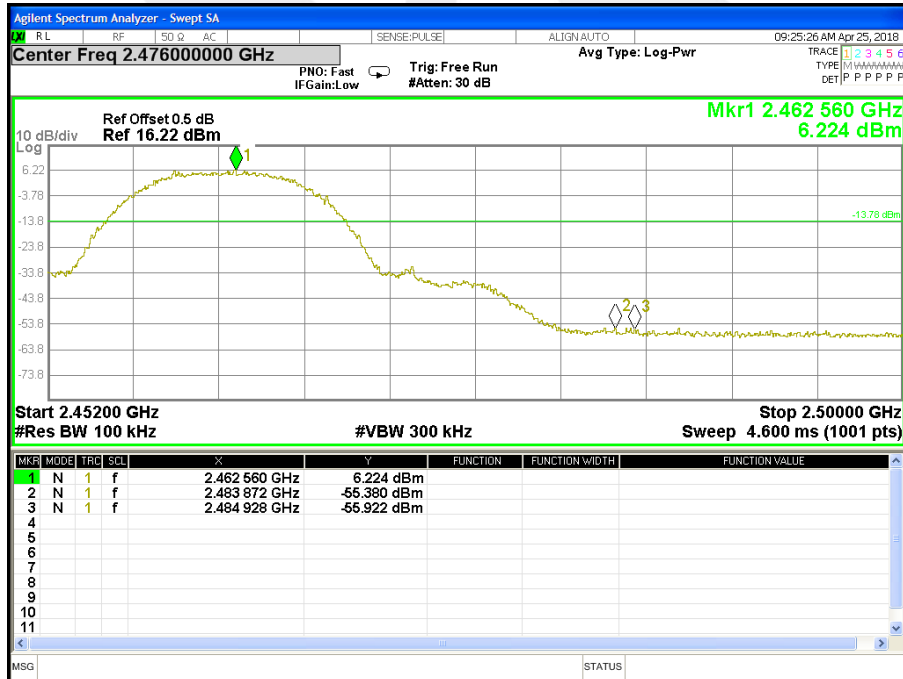


Band edge

CH 01



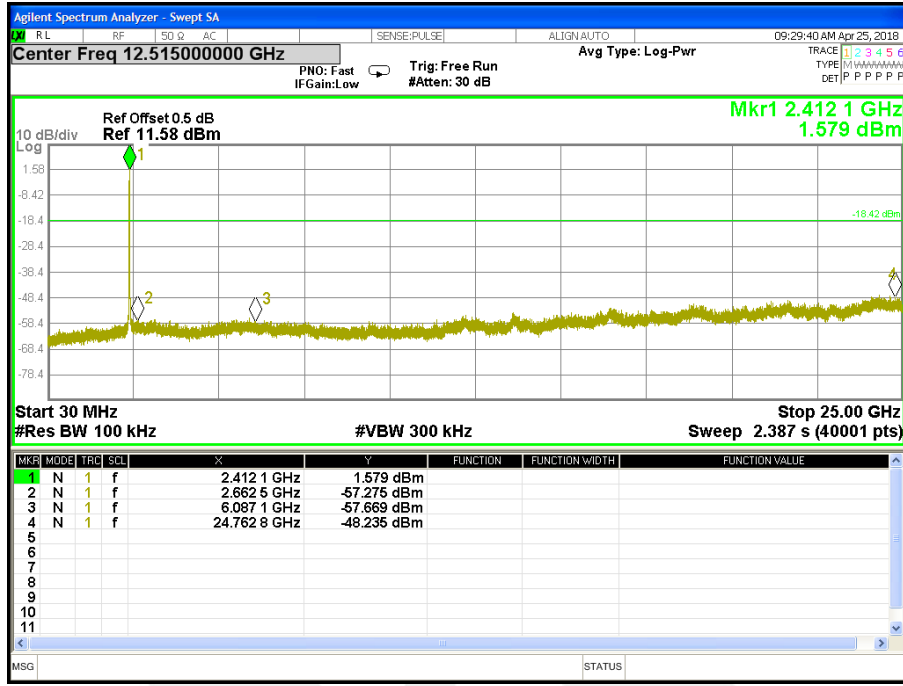
CH 11



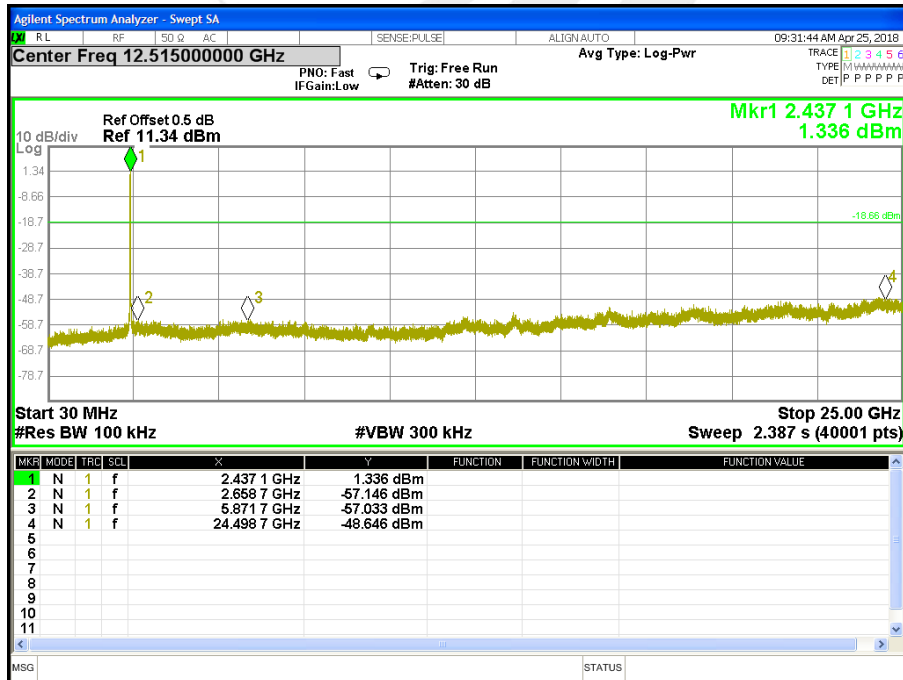


Temperature :	25 °C	Relative Humidity :	60%
Test Voltage :	DC 5V	Test Mode :	TX g Mode /CH01, CH06, CH11

Antenna B
CH 01

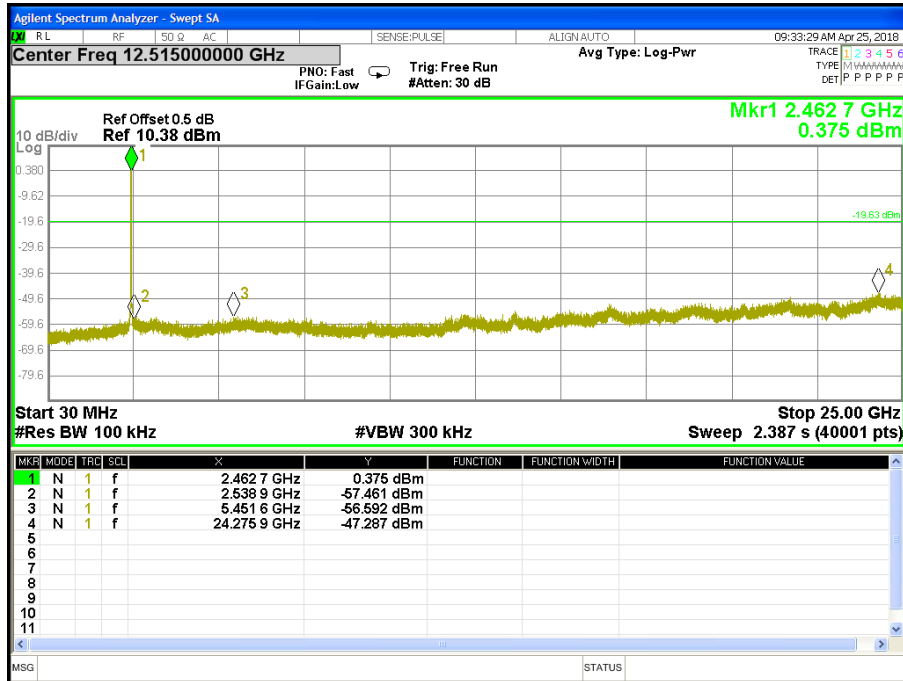


CH06





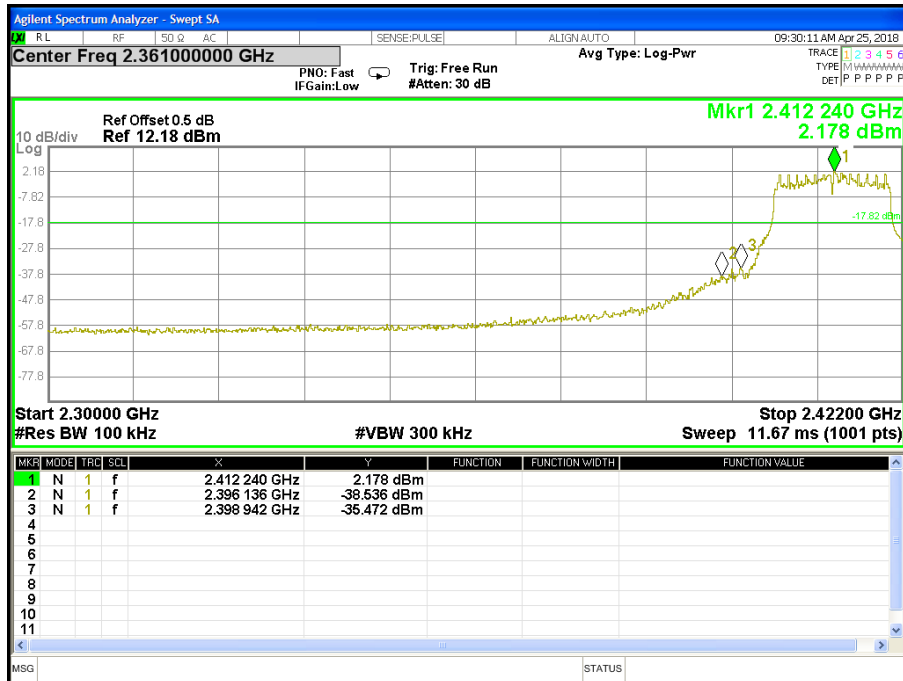
CH 11



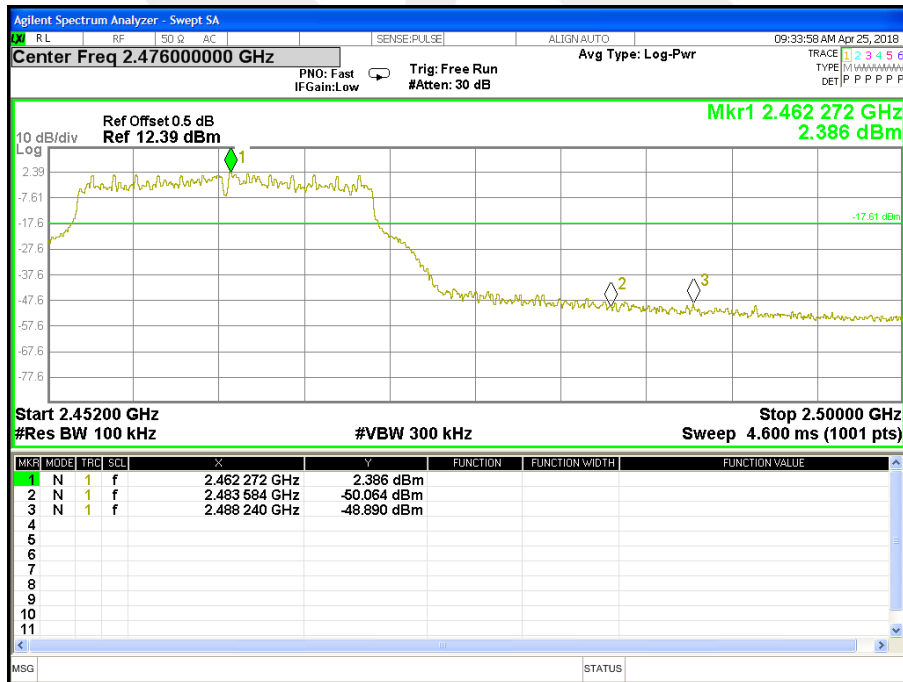


Band edge

CH 01



CH11

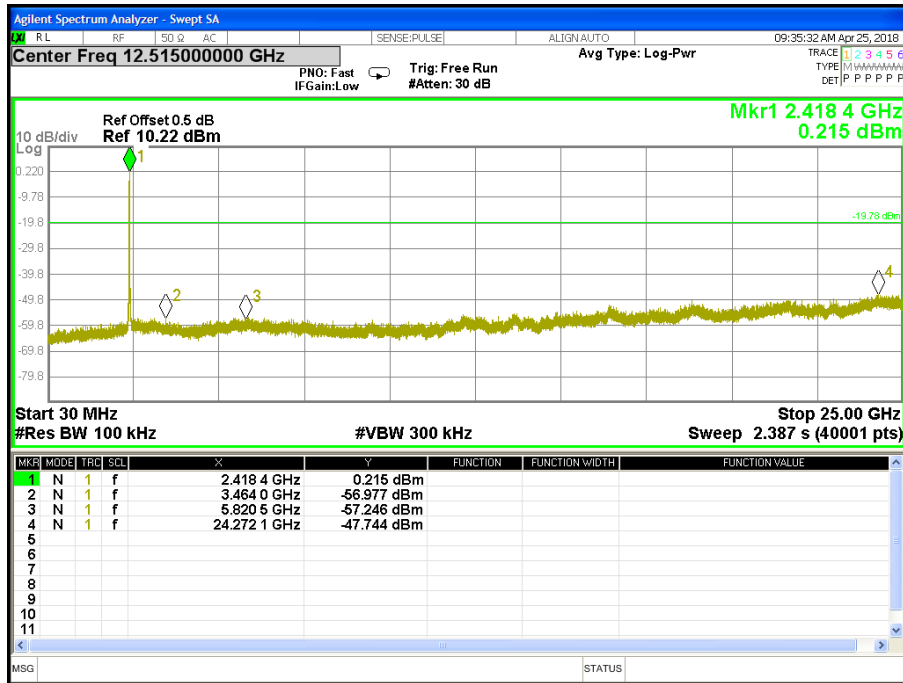




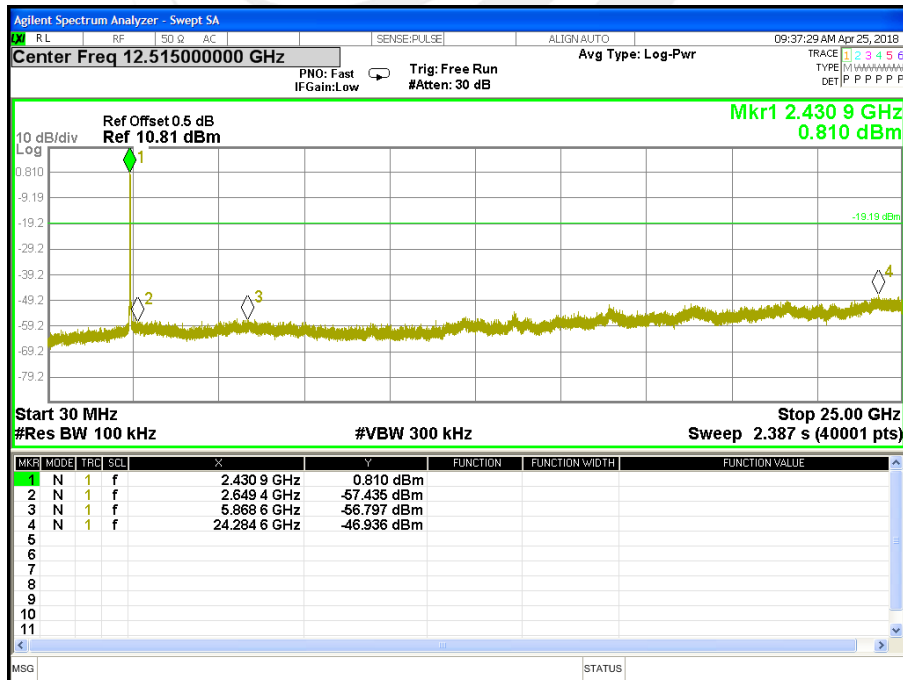
Temperature :	25 °C	Relative Humidity :	60%
Test Voltage :	DC 5V	Test Mode :	TX n Mode(20M) /CH01, CH06, CH11

Antenna B

CH 01

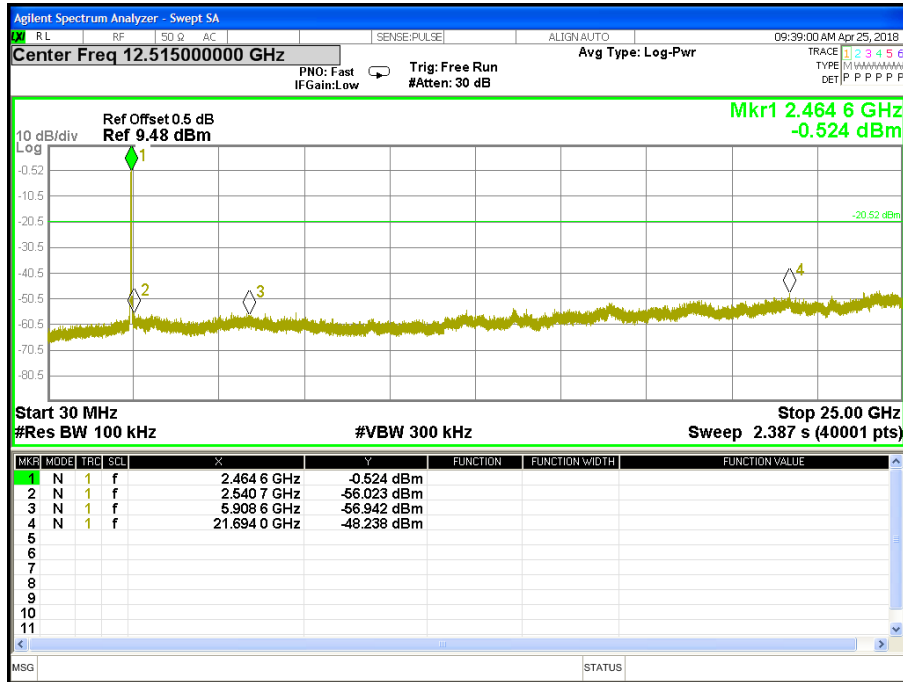


CH 06





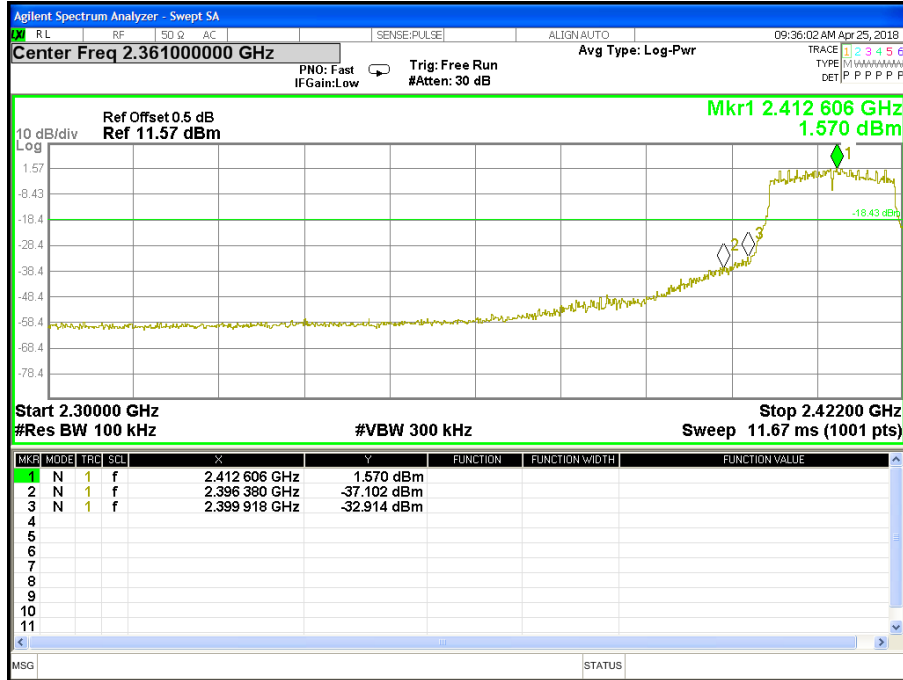
CH 11



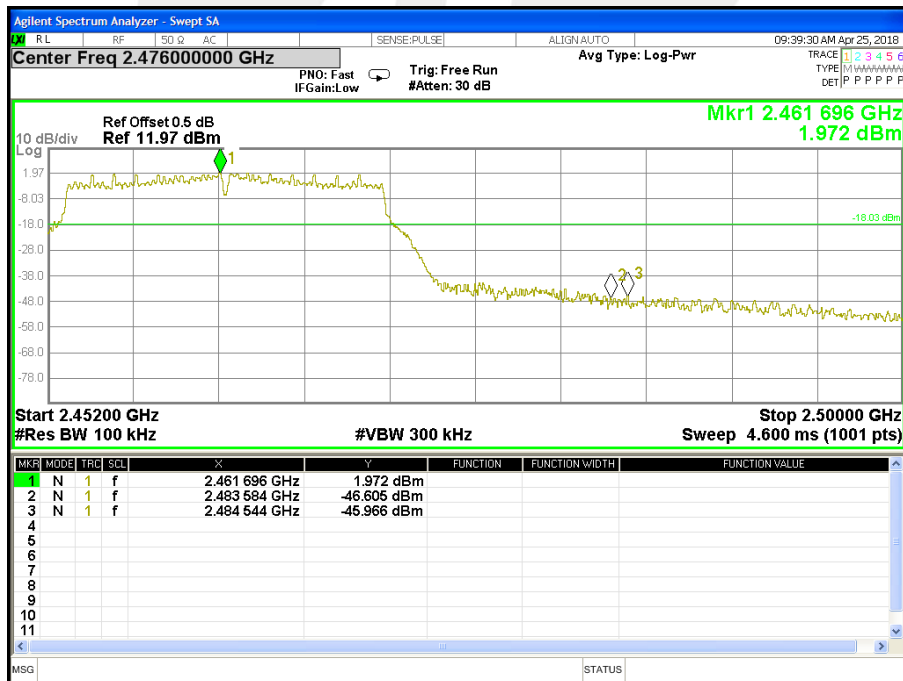


Band edge

CH 01



CH 11





5. POWER SPECTRAL DENSITY TEST

5.1 APPLIED PROCEDURES / LIMIT

FCC Part 15.247, 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 ≥ 3 KHz)	2400-2483.5	PASS

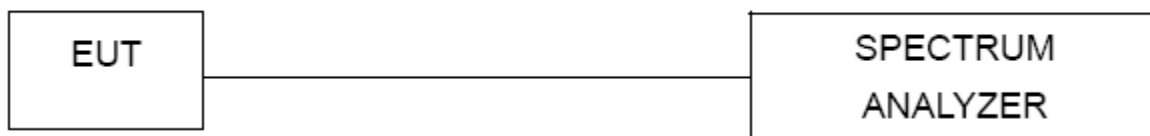
5.2 TEST PROCEDURE

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 $100 \text{ kHz} \geq \text{RBW} \geq 3 \text{ kHz}$.
4. Set the $\text{VBW} \geq 3 \times \text{RBW}$.
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

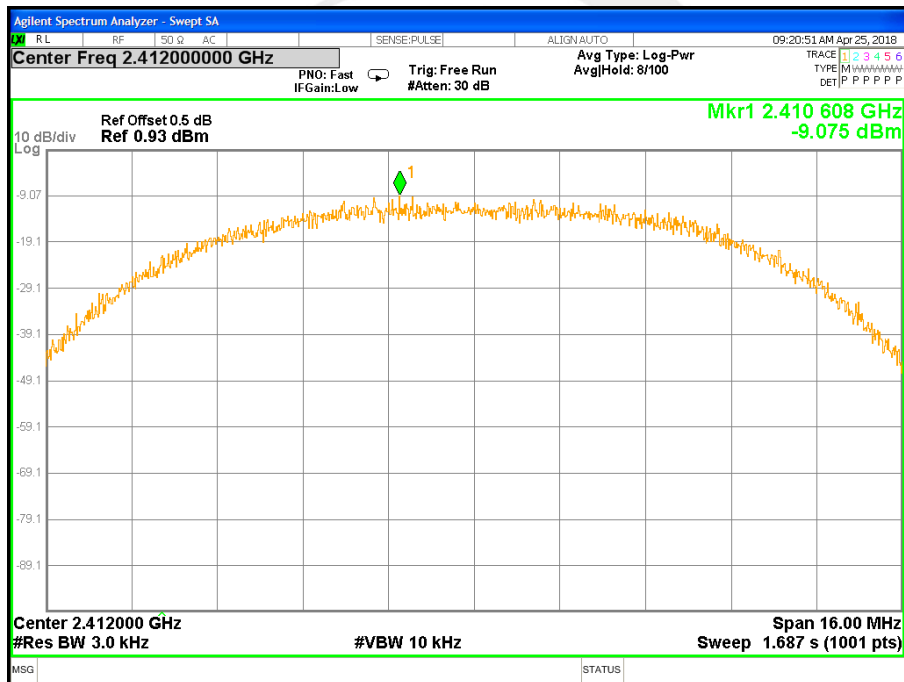
Temperature :	25 °C	Relative Humidity :	60%
Test Voltage :	DC 5V	Test Mode :	TX b Mode /CH01, CH06, CH11

NOTE: Antenna B Power > Antenna A Power, Both antenna A and B have been test, Only show the worst data of Antenna B, 802.11b/g model can't transmit at the same time.

Frequency	Power Density			Limit (dBm)	Result
	ANT A (dBm)	ANT B (dBm)	TOTAL (dBm)		
2412	-10.10	-9.08	--	≤8	PASS
2437	-10.18	-9.13	--	≤8	PASS
2462	-9.66	-8.56	--	≤8	PASS

Antenna B

TX CH01

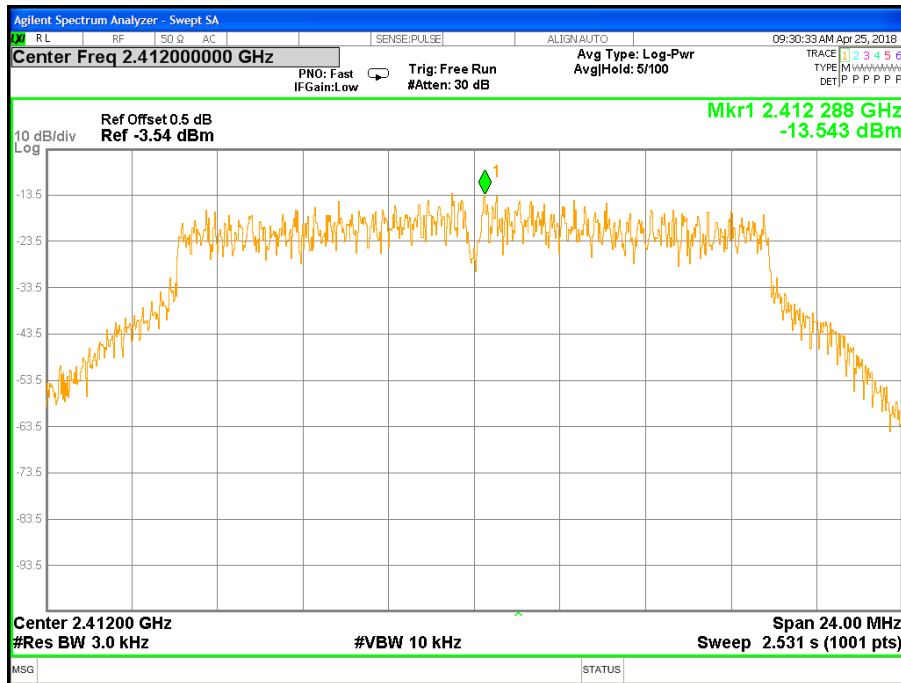




Temperature :	25 °C	Relative Humidity :	60%
Test Voltage :	DC 5V	Test Mode :	TX g Mode /CH01, CH06, CH11

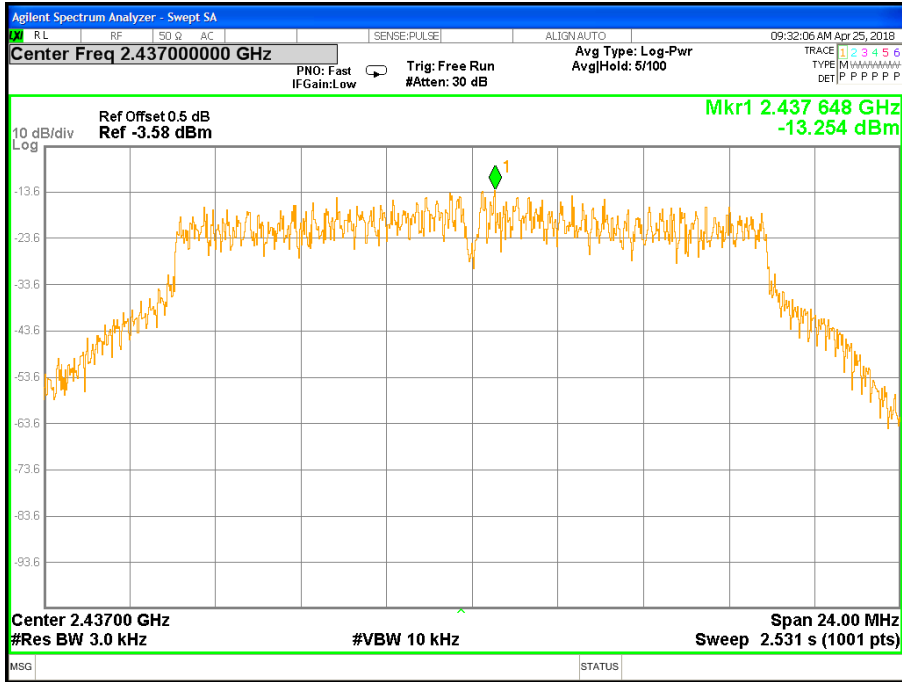
Frequency	Power Density			Limit (dBm)	Result
	ANT A (dBm)	ANT B (dBm)	TOTAL (dBm)		
2412	-13.69	-13.54	--	≤8	PASS
2437	-13.39	-13.25	--	≤8	PASS
2462	-13.25	-13.11	--	≤8	PASS

Antenna B
TX CH01

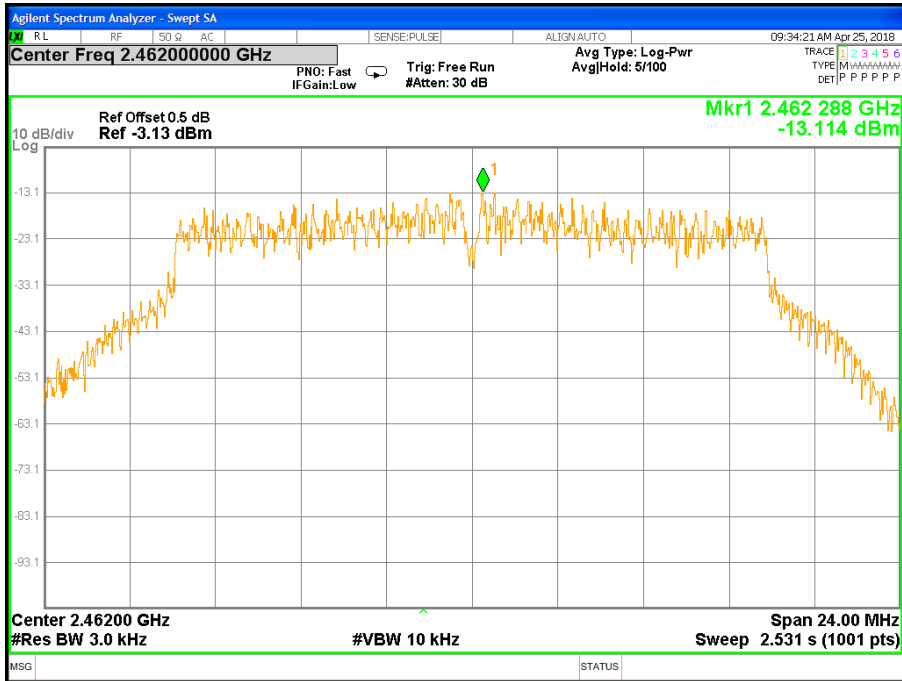




TX CH06



TX CH11



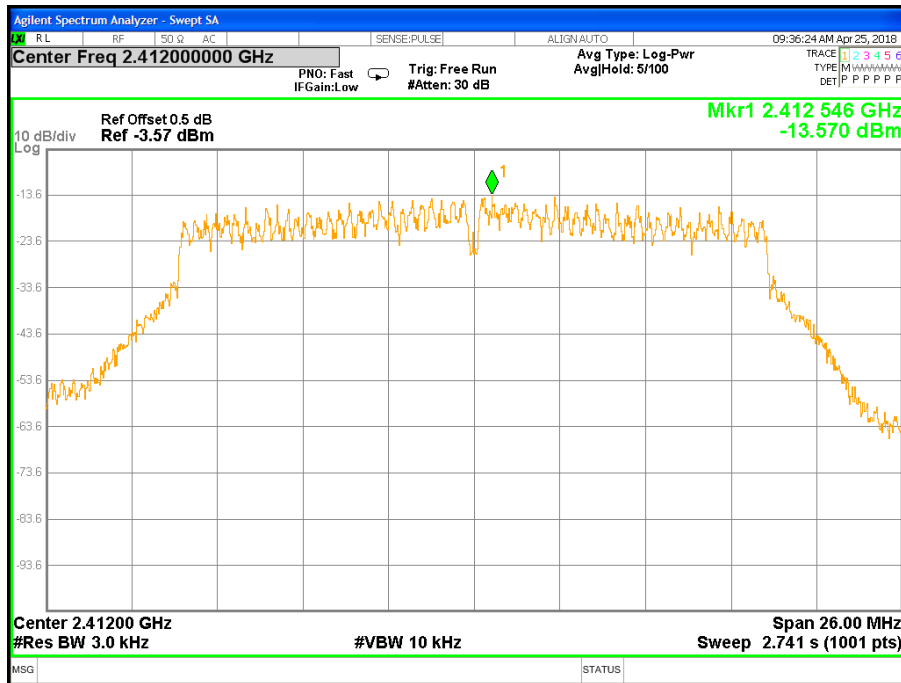


Temperature :	25 °C	Relative Humidity :	60%
Test Voltage :	DC 5V	Test Mode :	TX n Mode(20M) /CH01, CH06, CH11

Frequency	Power Density			Limit (dBm)	Result
	ANT A (dBm)	ANT B (dBm)	TOTAL (dBm)		
2412	-13.74	-13.57	-10.64	≤8	PASS
2437	-13.41	-13.36	-10.37	≤8	PASS
2462	-13.96	-13.86	-10.90	≤8	PASS

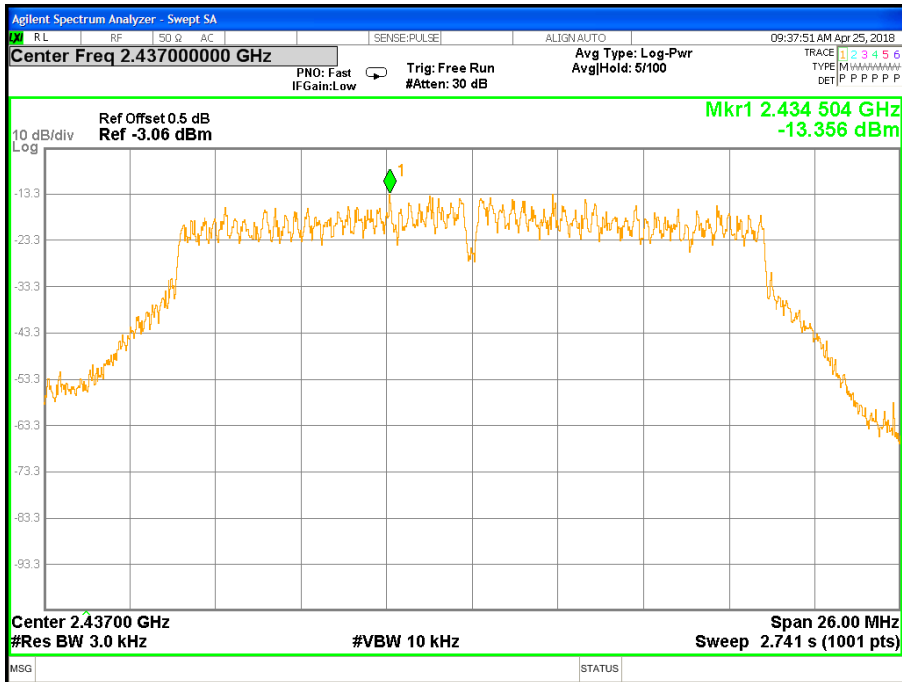
Antenna B

TX CH01

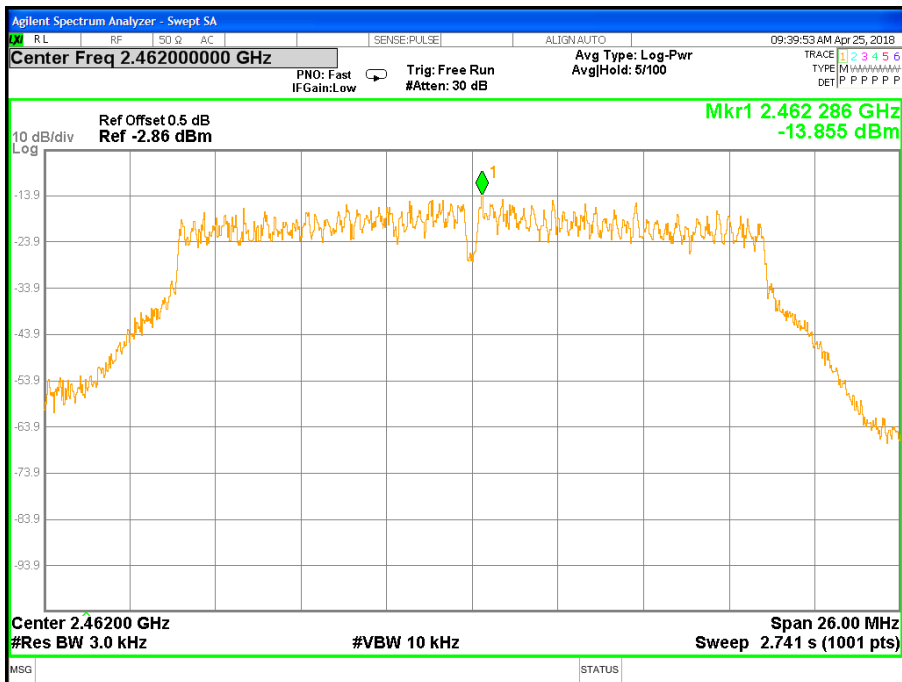




TX CH06



TX CH11





6. BANDWIDTH TEST

6.1 APPLIED PROCEDURES / LIMIT

FCC Part 15.247, Subpart C RSS-247 Issue 2				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2) RSS-247 Issue 2	Bandwidth	$\geq 500\text{KHz}$ (6dB&99% bandwidth)	2400-2483.5	PASS

6.2 TEST PROCEDURE

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW \geq 3RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.

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

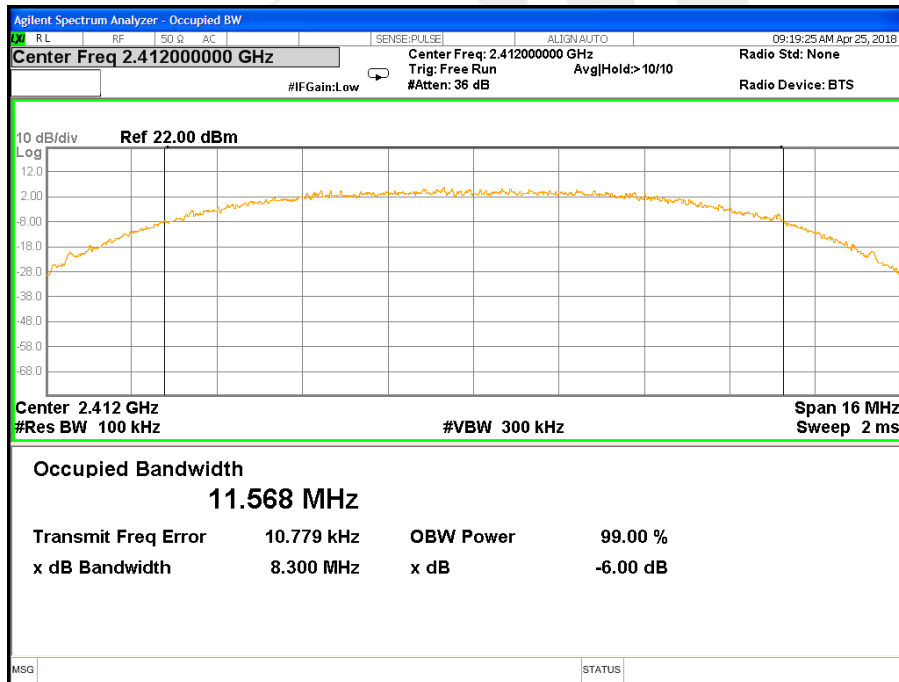
Temperature :	25 °C	Relative Humidity :	60%
Test Voltage :	DC 5V	Test Mode :	TX b Mode /CH01, CH06, CH11

Remark: PEAK DETECTOR IS USED

NOTE: Antenna B Power > Antenna A Power, Both antenna A and B have been test, Only show the worst data of Antenna B

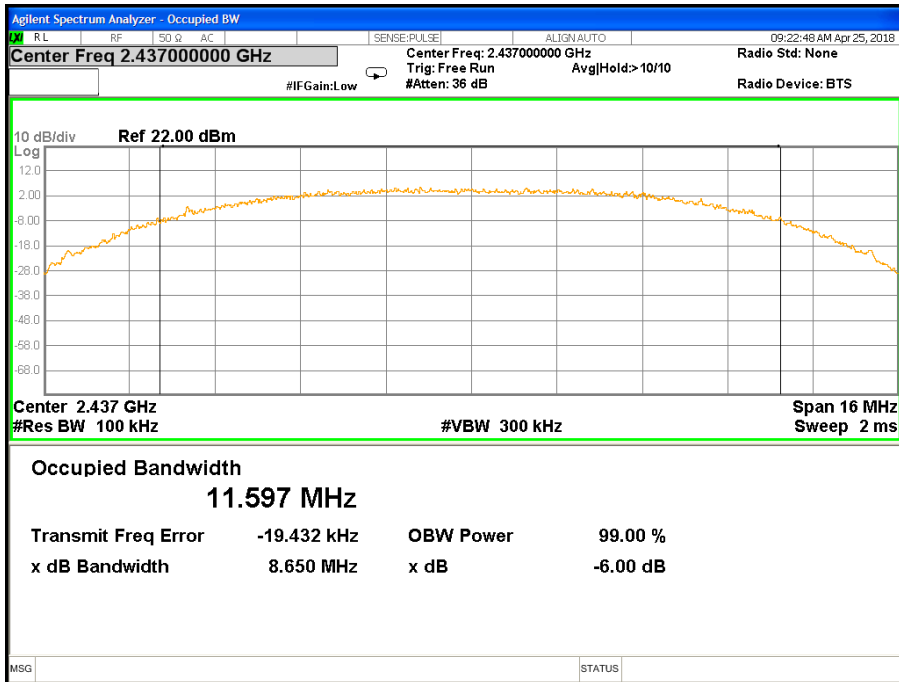
Frequency	6dB Bandwidth (MHz)		99% Bandwidth (MHz)		Channel Separation (KHz)	Result
	ANTENNA -A	ANTENNA -B	ANTENNA -A	ANTENNA -B		
2412 MHz	8.289	8.300	11.558	11.568	≥500KHz	PASS
2437 MHz	8.642	8.650	11.589	11.597	≥500KHz	PASS
2462 MHz	8.547	8.556	11.580	11.594	≥500KHz	PASS

Antenna B
TX CH 01

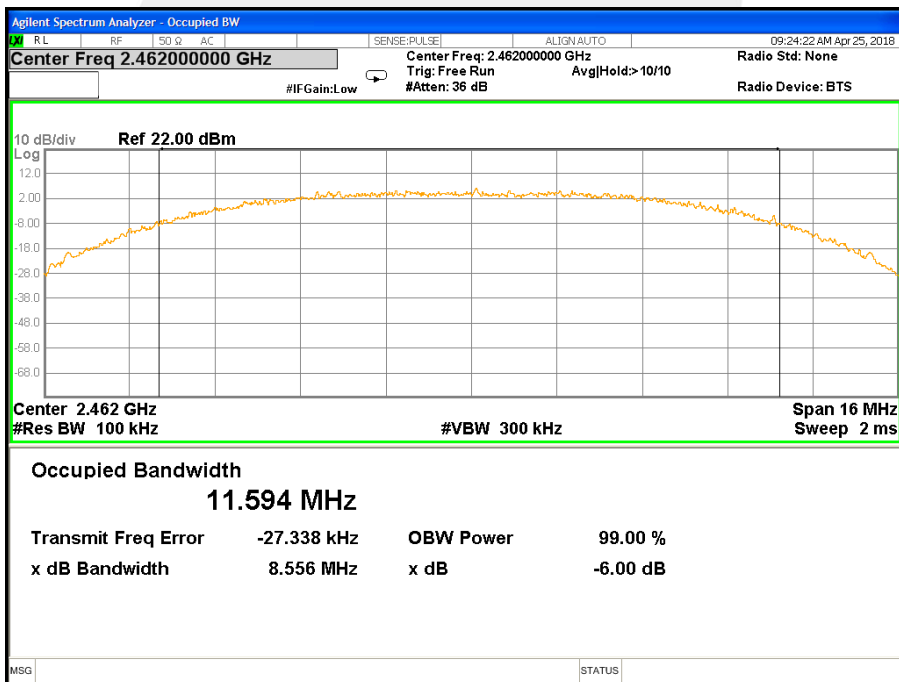




TX CH 06



TX CH 11



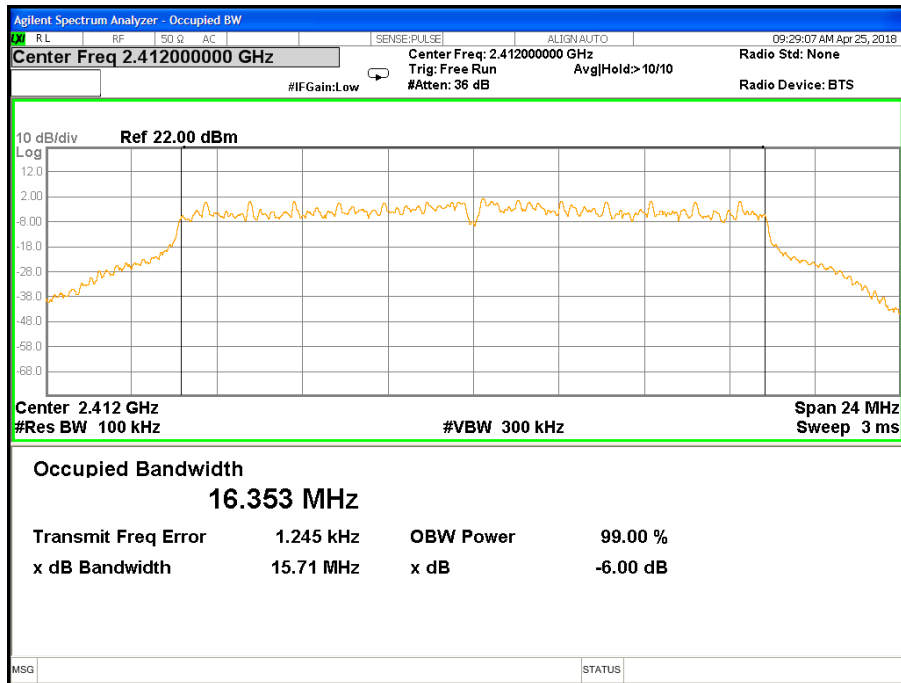


Temperature :	25 °C	Relative Humidity :	60%
Test Voltage :	DC 5V	Test Mode :	TX g Mode /CH01, CH06, CH11

Frequency	6dB Bandwidth (MHz)		99% Bandwidth (MHz)		Channel Separation (KHz)	Result
	ANTENNA -A	ANTENNA -B	ANTENNA -A	ANTENNA -B		
2412 MHz	15.62	15.71	16.342	16.353	≥500KHz	PASS
2437 MHz	15.59	15.70	16.347	16.355	≥500KHz	PASS
2462 MHz	15.64	15.74	16.335	16.356	≥500KHz	PASS

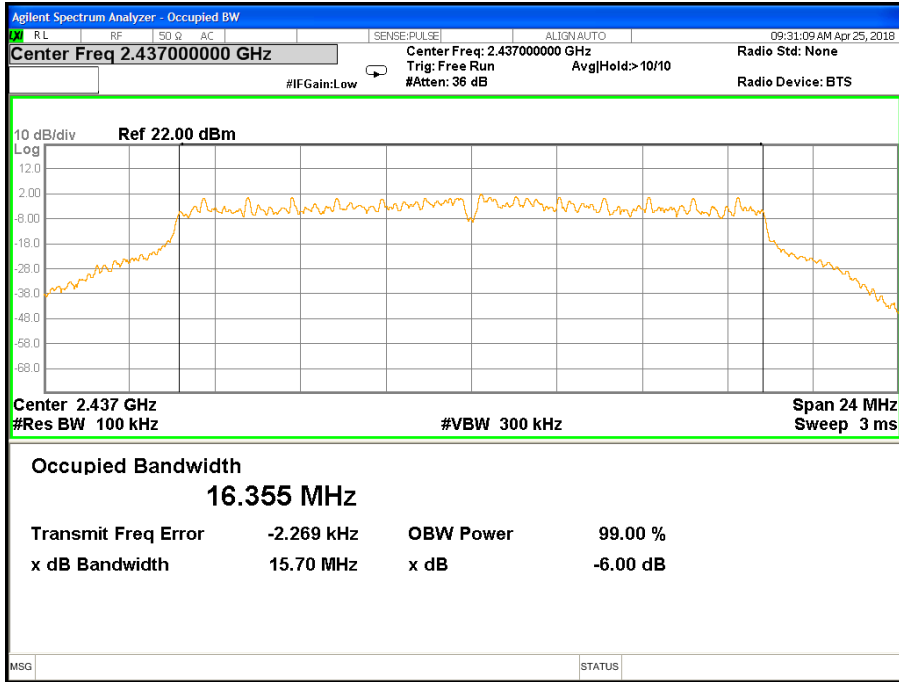
Antenna B

TX CH 01

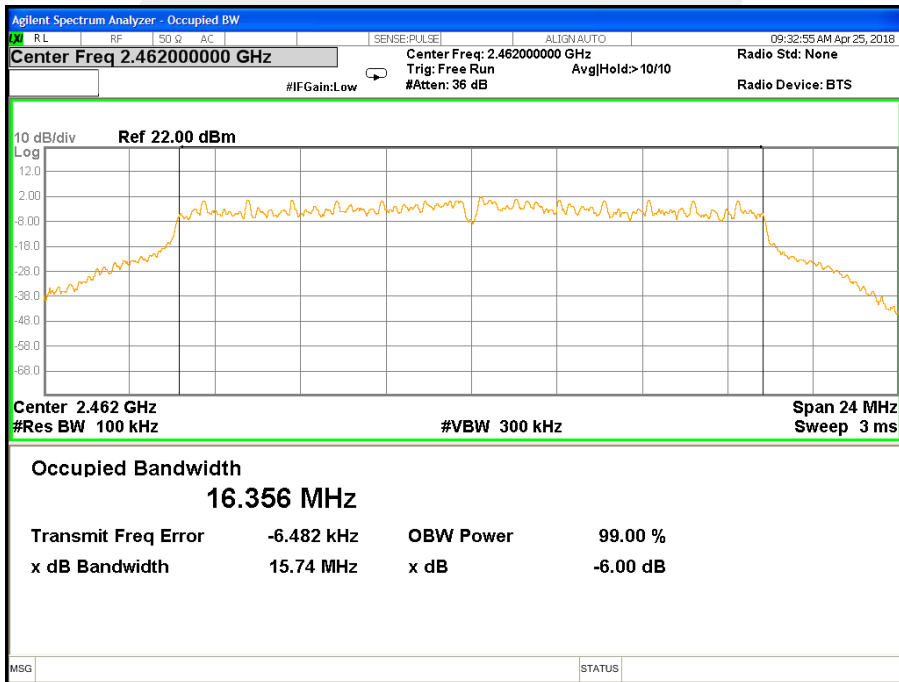




TX CH 06



TX CH 11



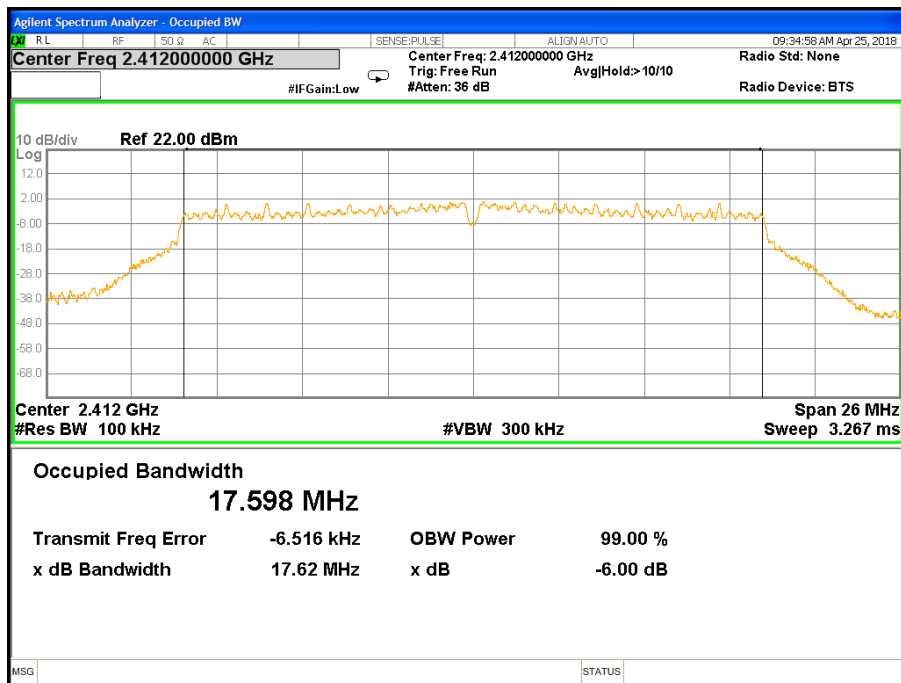


Temperature :	25 °C	Relative Humidity :	60%
Test Voltage :	DC 5V	Test Mode :	TX n Mode(20M) /CH01, CH06, CH11

Frequency	6dB Bandwidth (MHz)		99% Bandwidth (MHz)		Channel Separation (KHz)	Result
	ANTENNA -A	ANTENNA -B	ANTENNA -A	ANTENNA -B		
2412 MHz	17.51	17.62	17.582	17.598	≥500KHz	PASS
2437 MHz	17.53	17.66	17.597	17.615	≥500KHz	PASS
2462 MHz	17.50	17.65	17.585	17.597	≥500KHz	PASS

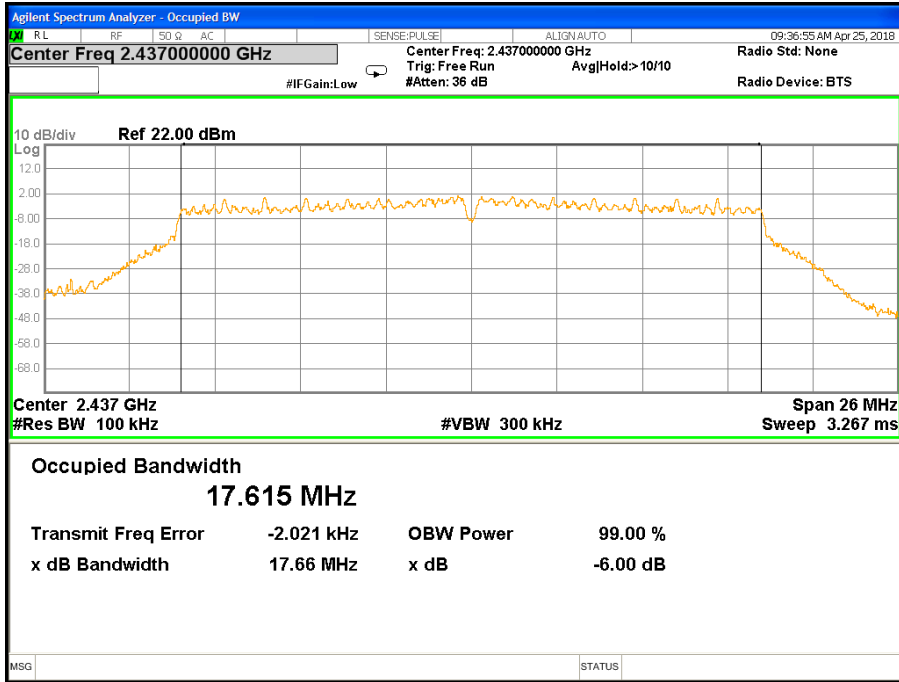
Antenna B

TX CH 01

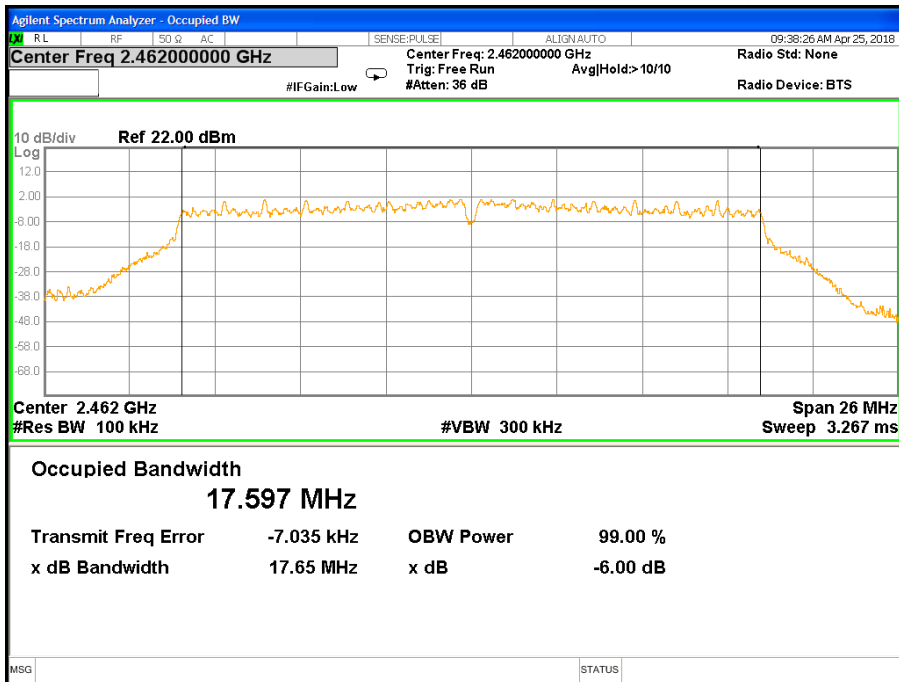




TX CH 06



TX CH 11





7. PEAK OUTPUT POWER TEST

7.1 APPLIED PROCEDURES / LIMIT

FCC Part 15.247, 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

- a. The EUT was directly connected to the Power Meter

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 °C	Relative Humidity :	60%
Test Voltage :	DC 5V		

Note: Antenna B Power > Antenna A Power, Both antenna A and B have been test, 802.11b/g model can't transmit at the same time, 802.11n(HT20) can transmit at the same time.

TX 802.11b Mode					
Test Channe	Frequency	ANT A	ANT B	ANT A+ANT B	LIMIT
	(MHz)	(dBm)	(dBm)	(dBm)	dBm
CH01	2412	15.17	15.21	--	30
CH06	2437	15.10	15.24	--	30
CH11	2462	15.03	15.16	--	30

TX 802.11g Mode					
Test Channe	Frequency	ANT A	ANT B	ANT A+ANT B	LIMIT
	(MHz)	(dBm)	(dBm)	(dBm)	dBm
CH01	2412	14.13	14.23	--	30
CH06	2437	14.18	14.30	--	30
CH11	2462	15.21	14.35	--	30

TX 802.11n20 Mode					
Test Channe	Frequency	ANT A	ANT B	ANT A+ANT B	LIMIT
	(MHz)	(dBm)	(dBm)	(dBm)	dBm
CH01	2412	14.11	14.20	17.17	30
CH06	2437	14.02	14.15	17.10	30
CH11	2462	13.95	14.06	17.02	30



8. ANTENNA REQUIREMENT

8.1 STANDARD REQUIREMENT

15.203 and RSS-Gen Issue 5 requirement: For intentional device, according to 15.203 and RSS-Gen Issue 5: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

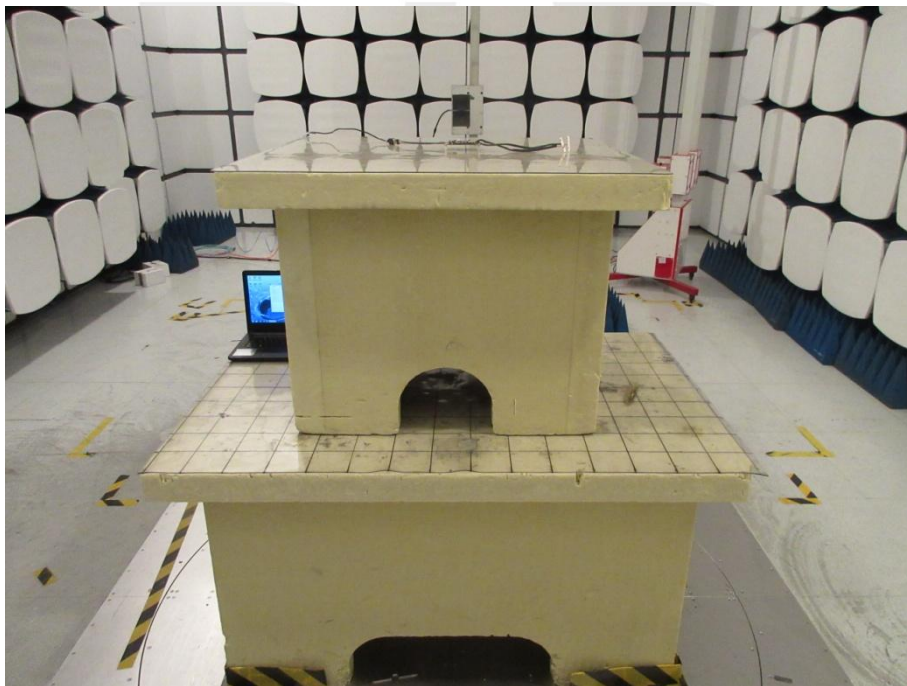
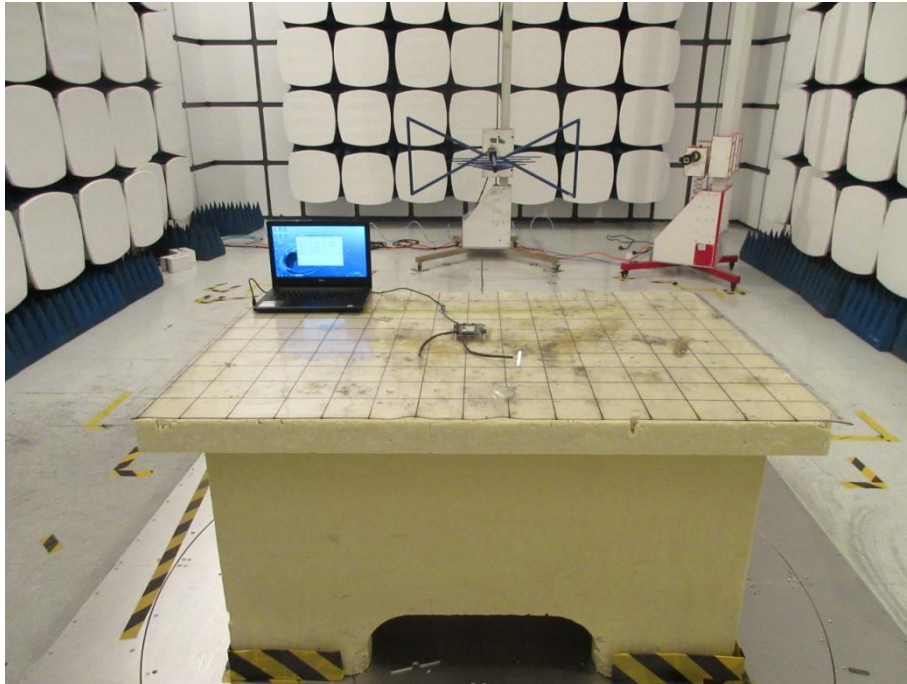
8.2 EUT ANTENNA

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



APPENDIX - PHOTOS OF TEST SETUP

Radiated Measurement Photos





Conducted Measurement Photos



*****END OF THE REPORT*****