S T S L A B

RADIO TEST REPORT

Report No:STS1911035W01

Issued for

Koller Products

19919 Shawnee Mission Parkway, Shawnee, KS 66218, United States

Product Name:	LED LIGHT
Brand Name:	N/A
Model Name:	ASZEL100（The model number of the Adapter is: HS06-0501000US. Koller Part No. for the Adapter is ASZEC7S.）
Series Model:	N/A
FCC ID:	2AVK4ASZEL100
Test Standard:	FCC Part 15.247

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TEST RESULT CERTIFICATION

Applicant's Name ..... :	Koller Products
Address ..... :	19919 Shawnee Mission Parkway, Shawnee, KS 66218, United States
Manufacture's Name ..... :	NINGBO ERWAN IMP. & EXP. CO., LTD.
Address ..... :	NO. 2 (12-6), LANE 28 BAIZHANG EAST ROAD, YINZHOU, NINGBO, CHINA
Product Description	
Product Name ..... :	LED LIGHT
Brand Name..... :	N/A
Model Name ..... :	ASZEL100（The model number of the Adapter is: HS06-0501000US. Koller Part No. for the Adapter is ASZEC7S.）
Series Model..... :	N/A
Test Standards ..... :	FCC Part15.247
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 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 ..... :	15 Nov. 2019 ~ 21 Nov. 2019
Date of Issue ..... :	22 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	22 Nov. 2019	STS1911035W01	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			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	--
15.247 (a)(2)	6dB Bandwidth	PASS	--
15.247 (b)(3)	Output Power	PASS	--
15.247 (c)	Radiated Spurious Emission	PASS	--
15.247 (d)	Conducted Spurious & Band Edge Emission	PASS	--
15.247 (e)	Power Spectral Density	PASS	--
15.205	Restricted Band Edge Emission	PASS	--
Part 15.247(d)/part 15.209(a)	Band Edge Emission	PASS	--
15.203	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. : 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>LED LIGHT</td></tr>
<tr><td>Trade Name</td><td>N/A</td></tr>
<tr><td>Model Name</td><td>ASZEL100（The model number of the Adapter is: HS06-0501000US. Koller Part No. for the Adapter is ASZEC7S.）</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 LED LIGHT
<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>2 dBi</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>Adapter</td><td>Input: 100-240VAC, 50/60Hz, 0.2A
Output: 5V DC, 1000mA</td></tr>
<tr><td>Power Rating</td><td>5V 1000mA</td></tr>
<tr><td>Hardware version number</td><td>N/A</td></tr>
<tr><td>Software versionnumber</td><td>N/A</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	N/A	ASZEL100 (The model number of the Adapter is: HS06-0501000 US. Koller Part No. for the Adapter is ASZEC7S.)	PCB	N/A	2 dBi	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

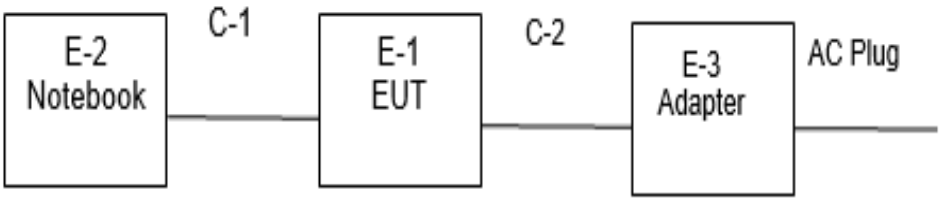
Note:
(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported
(2) We have be tested for all avaiable U.S. voltage and frequencies(For 120V,50/60Hz and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V /60Hz is shown in the report

AC Conducted Emission

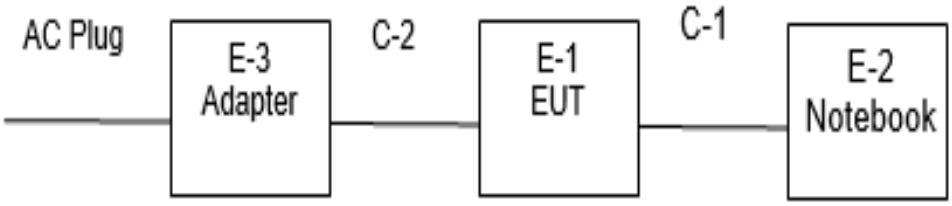
Test Case	
AC Conducted Emission	Mode10: Keeping WIFI TX

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-2	Adapter	N/A	(The model number of the Adapter is: HS06-0501000US. Koller Part No. for the Adapter is ASZEC7S.)	N/A	N/A
C-1	DC Cable	N/A	110cm	N/A	N/A

Support units

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
E-3	Notebook	DELL	VOSTRO.3800	N/A	N/A
C-2	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-3G Hz)	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.

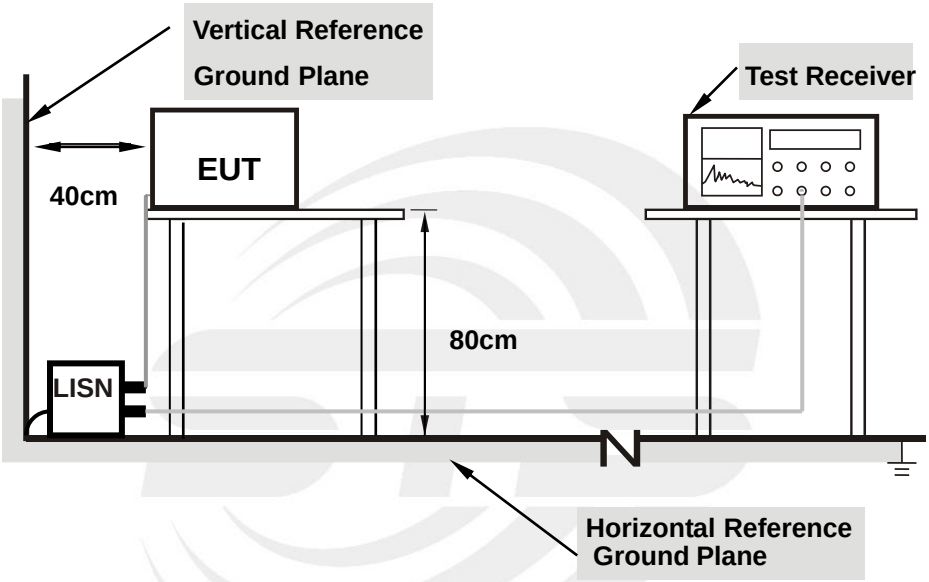
The following table is the setting of the receiver

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

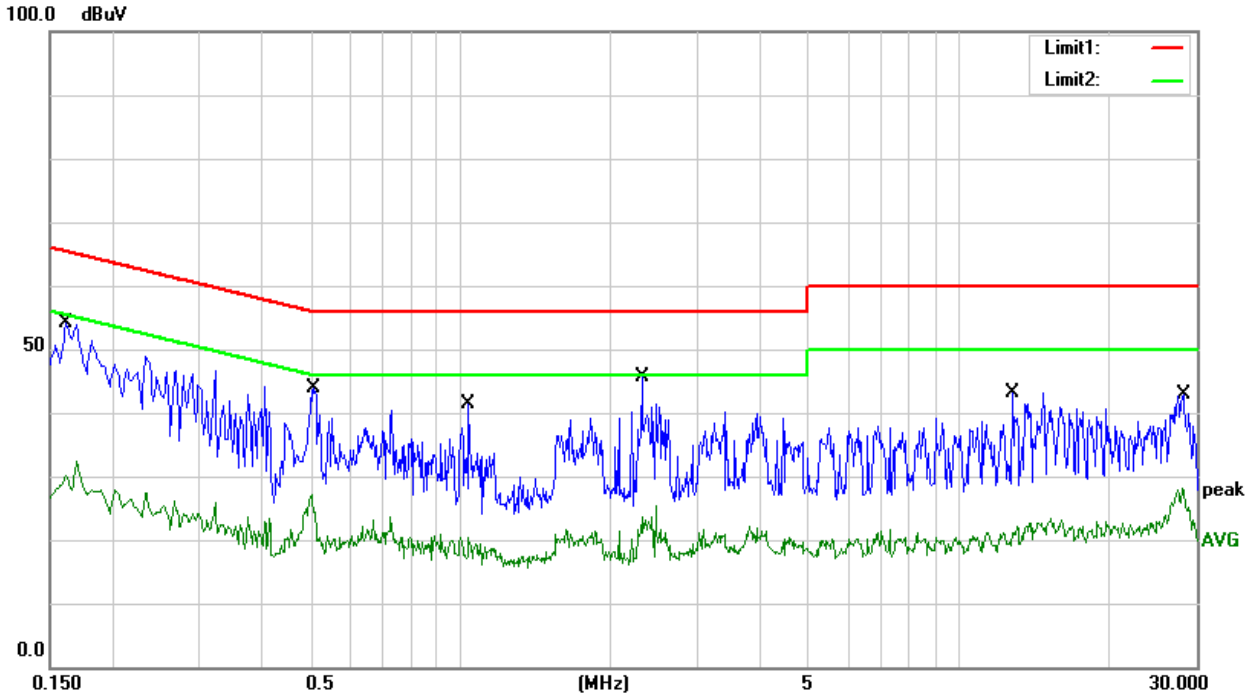
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.5 TEST RESULT

Temperature:	26.2(C)	Relative Humidity:	48%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	0.1620	33.53	20.58	54.11	65.36	-11.25	QP
2	0.1620	11.68	20.58	32.26	55.36	-23.10	AVG
3	0.5100	24.00	19.99	43.99	56.00	-12.01	QP
4	0.5100	7.19	19.99	27.18	46.00	-18.82	AVG
5	1.0420	21.96	19.43	41.39	56.00	-14.61	QP
6	1.0420	1.36	19.43	20.79	46.00	-25.21	AVG
7	2.3140	25.49	20.01	45.50	56.00	-10.50	QP
8	2.3140	5.40	20.01	25.41	46.00	-20.59	AVG
9	12.8340	22.53	20.66	43.19	60.00	-16.81	QP
10	12.8340	1.57	20.66	22.23	50.00	-27.77	AVG
11	28.2100	21.07	21.86	42.93	60.00	-17.07	QP
12	28.2100	6.15	21.86	28.01	50.00	-21.99	AVG

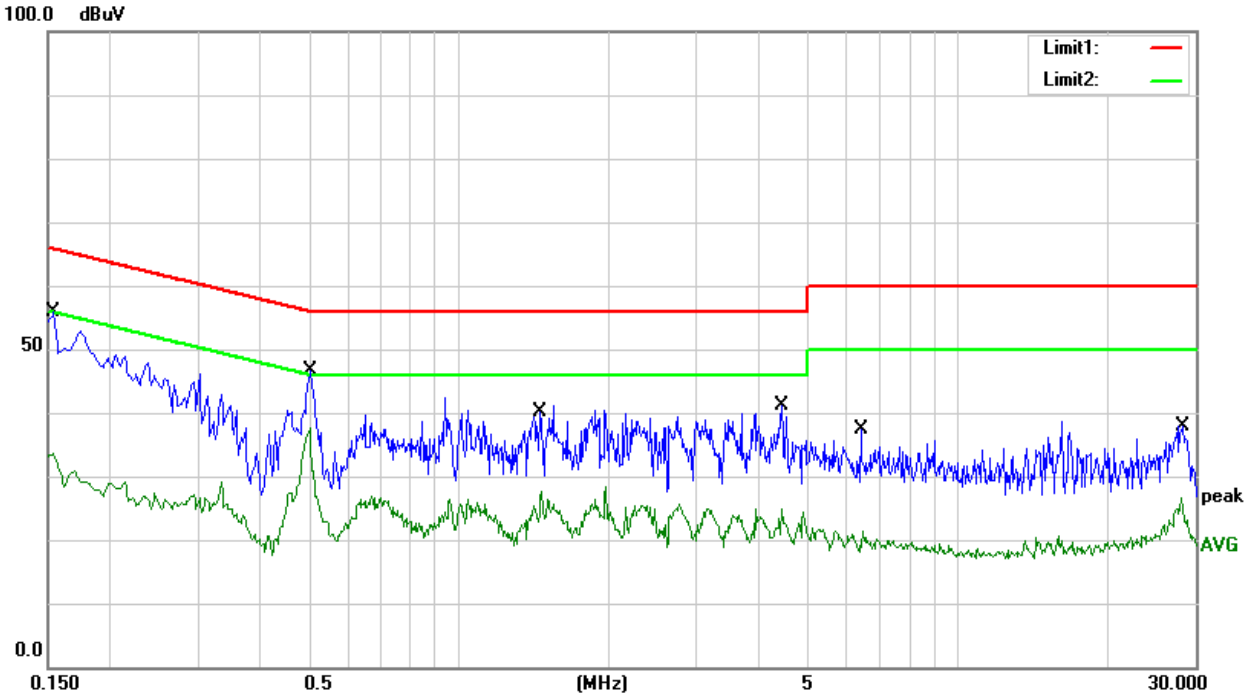
Remark:
1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit



Temperature:	26.2(C)	Relative Humidity:	48%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	0.1540	35.17	20.59	55.76	65.78	-10.02	QP
2	0.1540	13.02	20.59	33.61	55.78	-22.17	AVG
3	0.5060	26.62	19.98	46.60	56.00	-9.40	QP
4	0.5060	17.55	19.98	37.53	46.00	-8.47	AVG
5	1.4620	20.55	19.65	40.20	56.00	-15.80	QP
6	1.4620	7.97	19.65	27.62	46.00	-18.38	AVG
7	4.4420	20.86	20.34	41.20	56.00	-14.80	QP
8	4.4420	4.59	20.34	24.93	46.00	-21.07	AVG
9	6.4100	16.97	20.33	37.30	60.00	-22.70	QP
10	6.4100	1.10	20.33	21.43	50.00	-28.57	AVG
11	28.3140	16.01	21.87	37.88	60.00	-22.12	QP
12	28.3140	4.72	21.87	26.59	50.00	-23.41	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) 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/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 2412 MHz Upper Band Edge: 2462 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

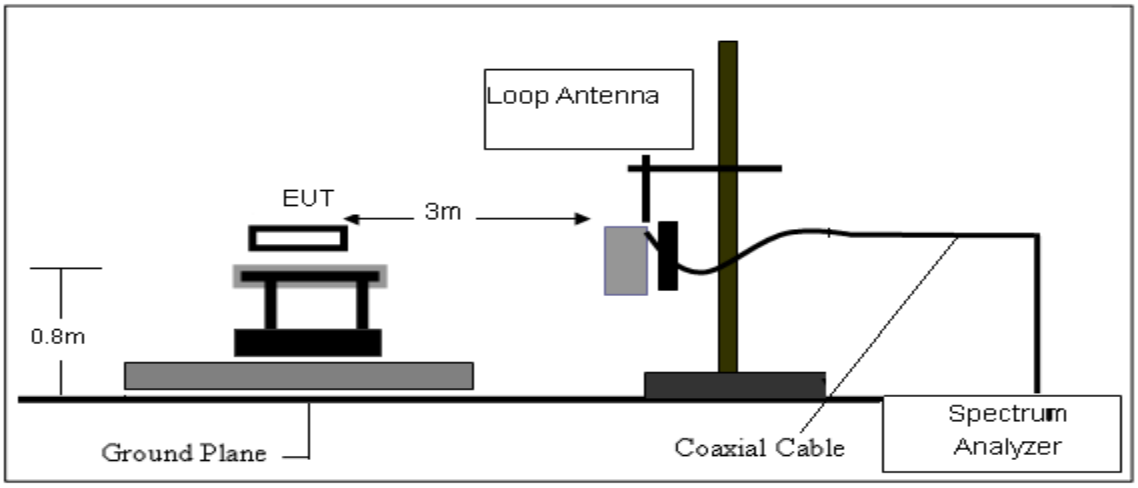
a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz
b. The EUT was placed on the top of a rotating table 0.8 meters(above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber. The table was rotated 360 degrees to determine the position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

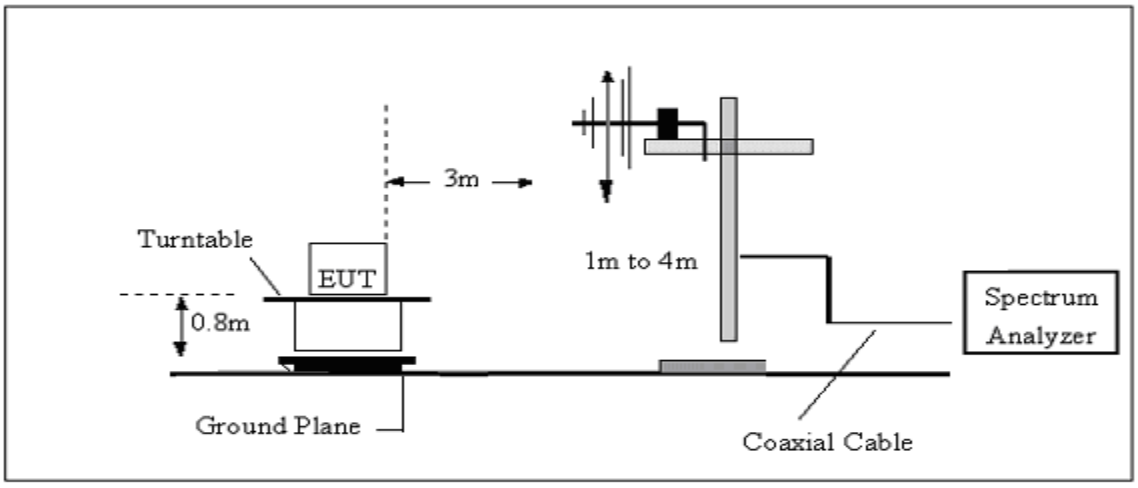
Both horizontal and vertical antenna polarities were testedand performed test to three orthogonal axis. The worst case emissions were reported

3.2.3 TEST SETUP

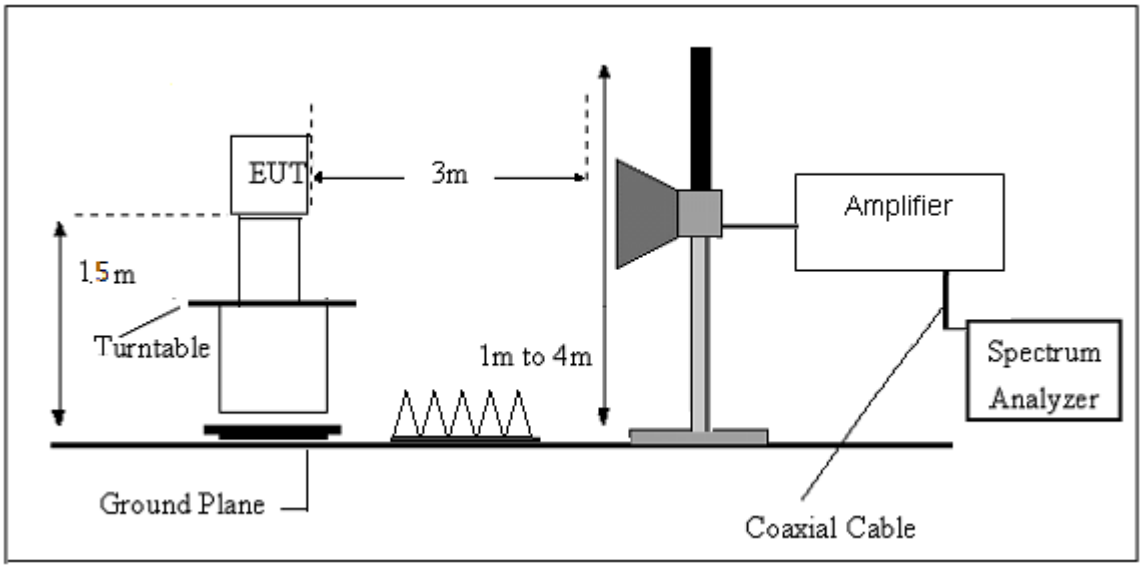
（A）Radiated Emission Test-Up Frequency Below 30MHz



（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:	24.5(C)	Relative Humidtity:	54%RH
Test Voltage:	AC 120V/60Hz	Polarization:	--
Test Mode:	TX Mode		

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

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

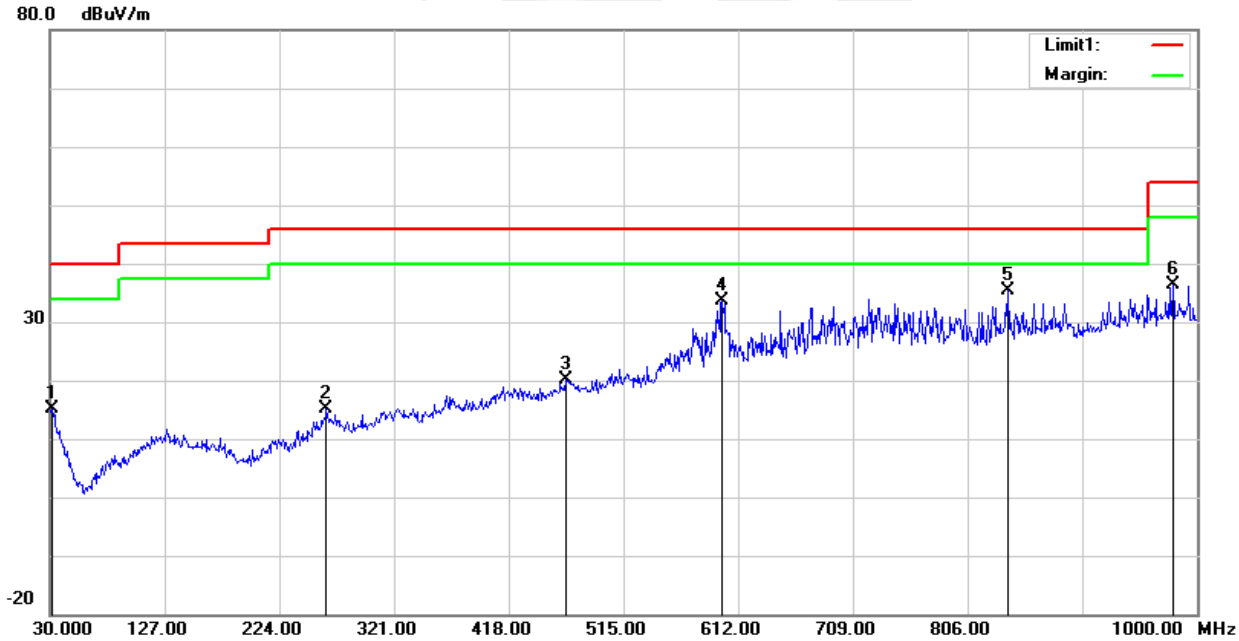
(30MHz - 1000MHz)

Temperature:	24.5(C)	Relative Humidtity:	54%RH
Test Voltage:	AC 120V/60Hz	Phase:	Horizontal
Test Mode:	Mode 1/2/3/4/5/6/7/8/9 (Mode 1 worst mode)		

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	31.9400	28.95	-13.86	15.09	40.00	-24.91	QP
2	264.2550	29.80	-14.75	15.05	46.00	-30.95	QP
3	466.9850	29.23	-9.14	20.09	46.00	-25.91	QP
4	598.4200	39.46	-5.85	33.61	46.00	-12.39	QP
5	839.9500	35.82	-0.34	35.48	46.00	-10.52	QP
6	979.6300	33.80	2.65	36.45	54.00	-17.55	QP

Remark:

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

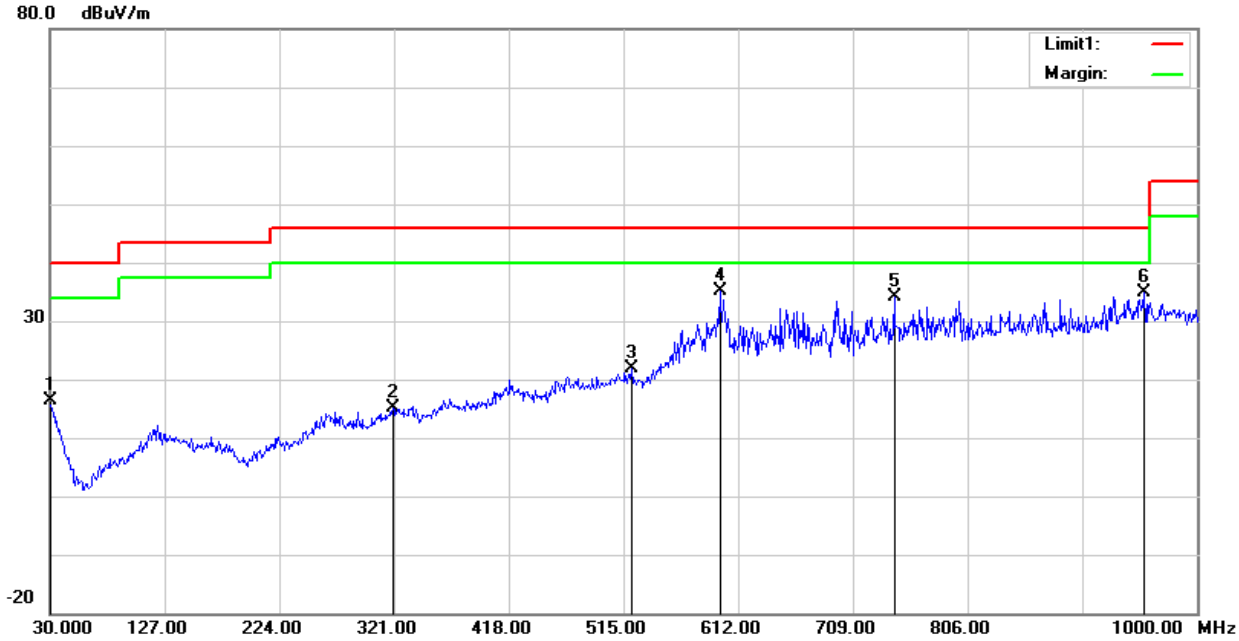


Temperature:	24.5(C)	Relative Humidtity:	54%RH
Test Voltage:	AC 120V/60Hz	Phase:	Vertical
Test Mode:	Mode 1/2/3/4/5/6/7/8/9 (Mode 1 worst mode)		

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	30.0000	29.35	-12.85	16.50	40.00	-23.50	QP
2	320.0300	29.23	-14.00	15.23	46.00	-30.77	QP
3	521.7900	29.53	-7.75	21.78	46.00	-24.22	QP
4	596.9650	40.95	-5.84	35.11	46.00	-10.89	QP
5	743.9200	36.22	-2.13	34.09	46.00	-11.91	QP
6	955.8650	33.24	1.70	34.94	46.00	-11.06	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)										
3264.85	61.91	44.70	6.70	28.20	-9.80	52.11	74.00	-21.89	PK	Vertical
3264.85	50.95	44.70	6.70	28.20	-9.80	41.15	54.00	-12.85	AV	Vertical
3264.83	62.22	44.70	6.70	28.20	-9.80	52.42	74.00	-21.58	PK	Horizontal
3264.83	51.29	44.70	6.70	28.20	-9.80	41.49	54.00	-12.51	AV	Horizontal
4824.32	58.33	44.20	9.04	31.60	-3.56	54.77	74.00	-19.23	PK	Vertical
4824.32	49.76	44.20	9.04	31.60	-3.56	46.20	54.00	-7.80	AV	Vertical
4824.45	58.53	44.20	9.04	31.60	-3.56	54.97	74.00	-19.03	PK	Horizontal
4824.45	49.43	44.20	9.04	31.60	-3.56	45.87	54.00	-8.13	AV	Horizontal
5359.76	48.20	44.20	9.86	32.00	-2.34	45.86	74.00	-28.14	PK	Vertical
5359.76	39.16	44.20	9.86	32.00	-2.34	36.82	54.00	-17.18	AV	Vertical
5359.87	48.44	44.20	9.86	32.00	-2.34	46.10	74.00	-27.90	PK	Horizontal
5359.87	38.49	44.20	9.86	32.00	-2.34	36.15	54.00	-17.85	AV	Horizontal
7235.68	53.86	43.50	11.40	35.50	3.40	57.26	74.00	-16.74	PK	Vertical
7235.68	44.30	43.50	11.40	35.50	3.40	47.70	54.00	-6.30	AV	Vertical
7235.67	54.12	43.50	11.40	35.50	3.40	57.52	74.00	-16.48	PK	Horizontal
7235.68	44.39	43.50	11.40	35.50	3.40	47.79	54.00	-6.21	AV	Horizontal
Middle Channel (802.11b/2437 MHz)										
3264.81	62.27	44.70	6.70	28.20	-9.80	52.47	74.00	-21.53	PK	Vertical
3264.81	51.15	44.70	6.70	28.20	-9.80	41.35	54.00	-12.65	AV	Vertical
3264.80	60.89	44.70	6.70	28.20	-9.80	51.09	74.00	-22.91	PK	Horizontal
3264.80	50.17	44.70	6.70	28.20	-9.80	40.37	54.00	-13.63	AV	Horizontal
4874.48	58.62	44.20	9.04	31.60	-3.56	55.06	74.00	-18.94	PK	Vertical
4874.48	50.05	44.20	9.04	31.60	-3.56	46.49	54.00	-7.51	AV	Vertical
4874.33	58.61	44.20	9.04	31.60	-3.56	55.05	74.00	-18.95	PK	Horizontal
4874.33	49.89	44.20	9.04	31.60	-3.56	46.33	54.00	-7.67	AV	Horizontal
5359.77	48.88	44.20	9.86	32.00	-2.34	46.54	74.00	-27.46	PK	Vertical
5359.77	39.39	44.20	9.86	32.00	-2.34	37.05	54.00	-16.95	AV	Vertical
5359.66	48.38	44.20	9.86	32.00	-2.34	46.04	74.00	-27.96	PK	Horizontal
5359.66	39.14	44.20	9.86	32.00	-2.34	36.80	54.00	-17.20	AV	Horizontal
7310.79	54.25	43.50	11.40	35.50	3.40	57.65	74.00	-16.35	PK	Vertical
7310.79	44.57	43.50	11.40	35.50	3.40	47.97	54.00	-6.03	AV	Vertical
7310.88	54.34	43.50	11.40	35.50	3.40	57.74	74.00	-16.26	PK	Horizontal
7310.88	44.48	43.50	11.40	35.50	3.40	47.88	54.00	-6.12	AV	Horizontal

High Channel (802.11b/2462 MHz)										
3264.63	61.94	44.70	6.70	28.20	-9.80	52.14	74.00	-21.86	PK	Vertical
3264.63	51.32	44.70	6.70	28.20	-9.80	41.52	54.00	-12.48	AV	Vertical
3264.71	61.93	44.70	6.70	28.20	-9.80	52.13	74.00	-21.87	PK	Horizontal
3264.71	50.37	44.70	6.70	28.20	-9.80	40.57	54.00	-13.43	AV	Horizontal
4924.34	58.50	44.20	9.04	31.60	-3.56	54.94	74.00	-19.06	PK	Vertical
4924.34	50.27	44.20	9.04	31.60	-3.56	46.71	54.00	-7.29	AV	Vertical
4924.40	58.66	44.20	9.04	31.60	-3.56	55.10	74.00	-18.90	PK	Horizontal
4924.40	49.16	44.20	9.04	31.60	-3.56	45.60	54.00	-8.40	AV	Horizontal
5359.78	48.48	44.20	9.86	32.00	-2.34	46.14	74.00	-27.86	PK	Vertical
5359.78	39.16	44.20	9.86	32.00	-2.34	36.82	54.00	-17.18	AV	Vertical
5359.57	47.73	44.20	9.86	32.00	-2.34	45.39	74.00	-28.61	PK	Horizontal
5359.57	39.28	44.20	9.86	32.00	-2.34	36.94	54.00	-17.06	AV	Horizontal
7385.76	54.02	43.50	11.40	35.50	3.40	57.42	74.00	-16.58	PK	Vertical
7385.76	43.76	43.50	11.40	35.50	3.40	47.16	54.00	-6.84	AV	Vertical
7385.68	54.08	43.50	11.40	35.50	3.40	57.48	74.00	-16.52	PK	Horizontal
7385.68	44.35	43.50	11.40	35.50	3.40	47.75	54.00	-6.25	AV	Horizontal

Remark:

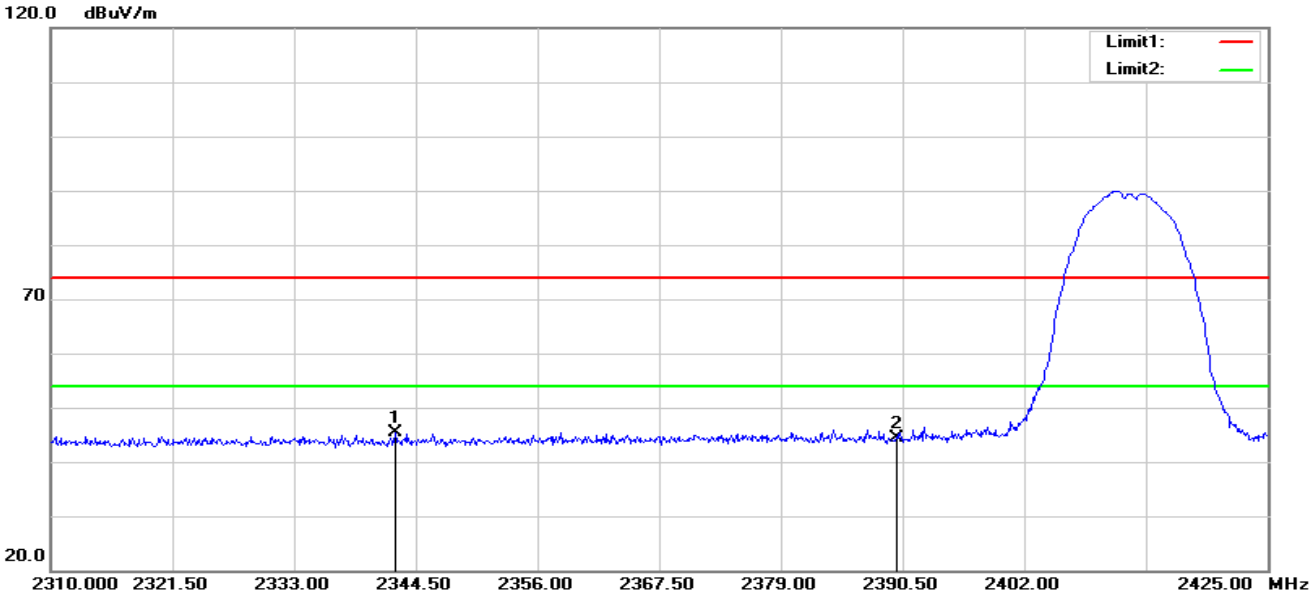
1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
2. Scan with 802.11b, 802.11g, 802.11n (HT-20), the worst case is 802.11b.
   Emission Level = Reading + Factor
   Margin = Limit - Emission Level

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)

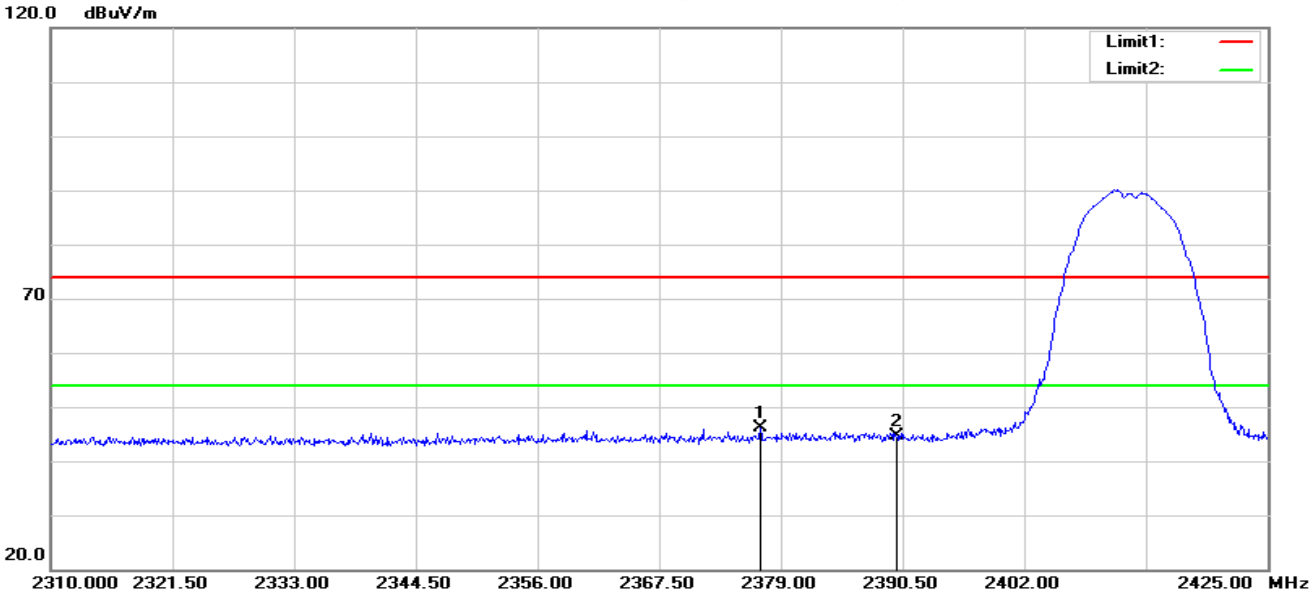
802.11b-Low

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2342.545	41.71	3.70	45.41	74.00	-28.59	peak
2	2390.000	39.98	4.34	44.32	74.00	-29.68	peak

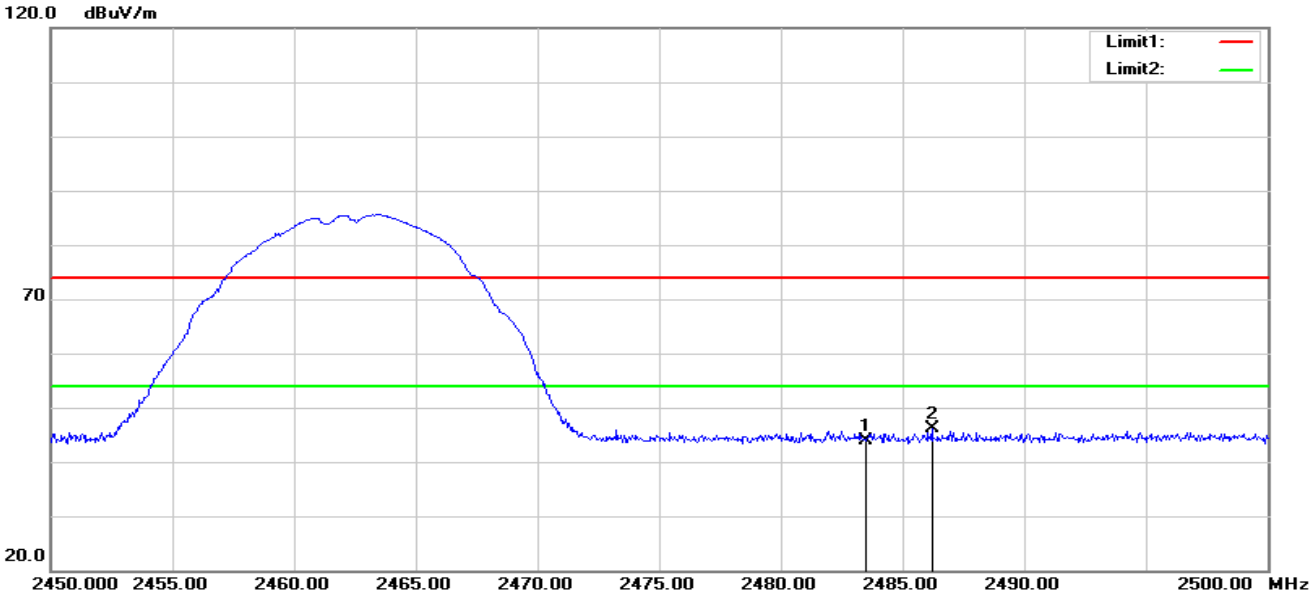
Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2377.102	41.91	4.14	46.05	74.00	-27.95	peak
2	2390.000	40.32	4.34	44.66	74.00	-29.34	peak

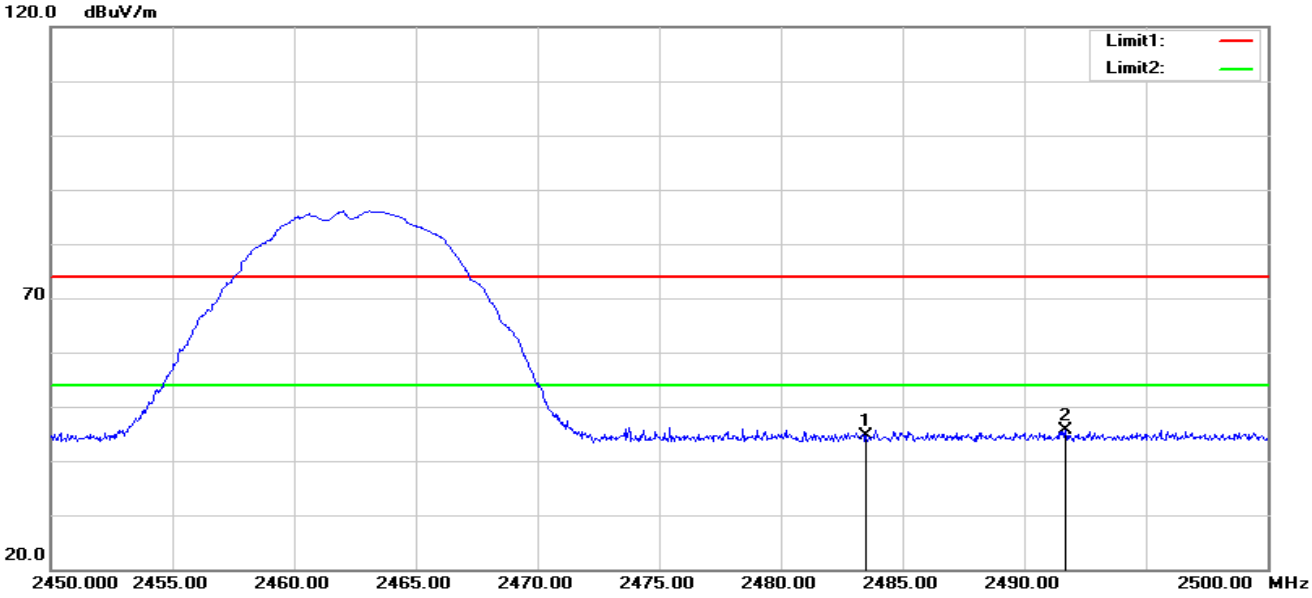
802.11b-High

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	39.30	4.60	43.90	74.00	-30.10	peak
2	2486.200	41.46	4.61	46.07	74.00	-27.93	peak

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	39.91	4.60	44.51	74.00	-29.49	peak
2	2491.725	40.97	4.63	45.60	74.00	-28.40	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), 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 2432 MHz Upper Band Edge: 2442 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 Adapter, 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.

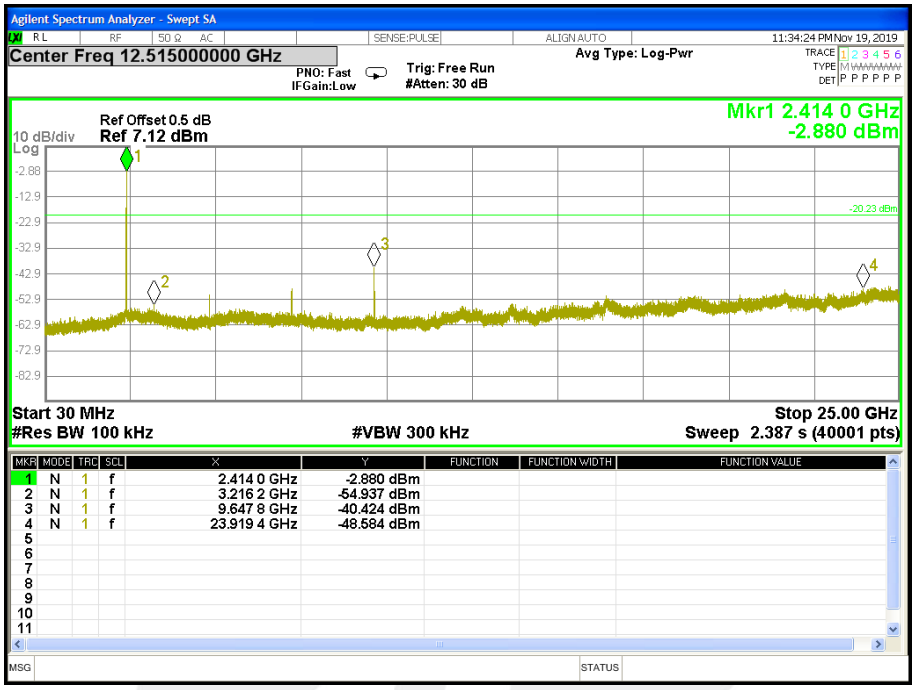
4.5 EUT OPERATION CONDITIONS

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.

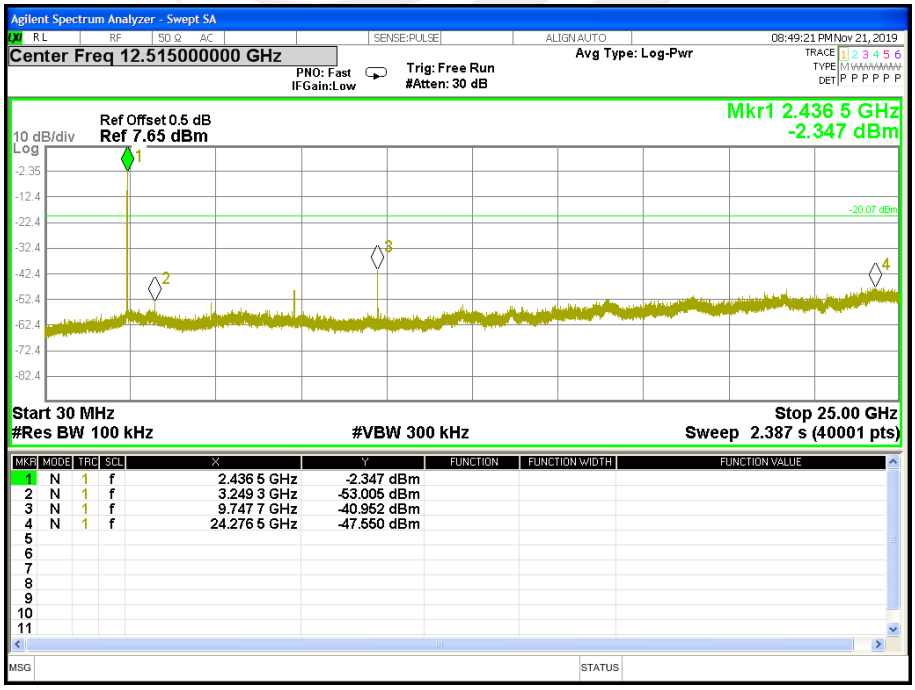
4.6 TEST RESULTS

Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX b Mode /CH01, CH06, CH11

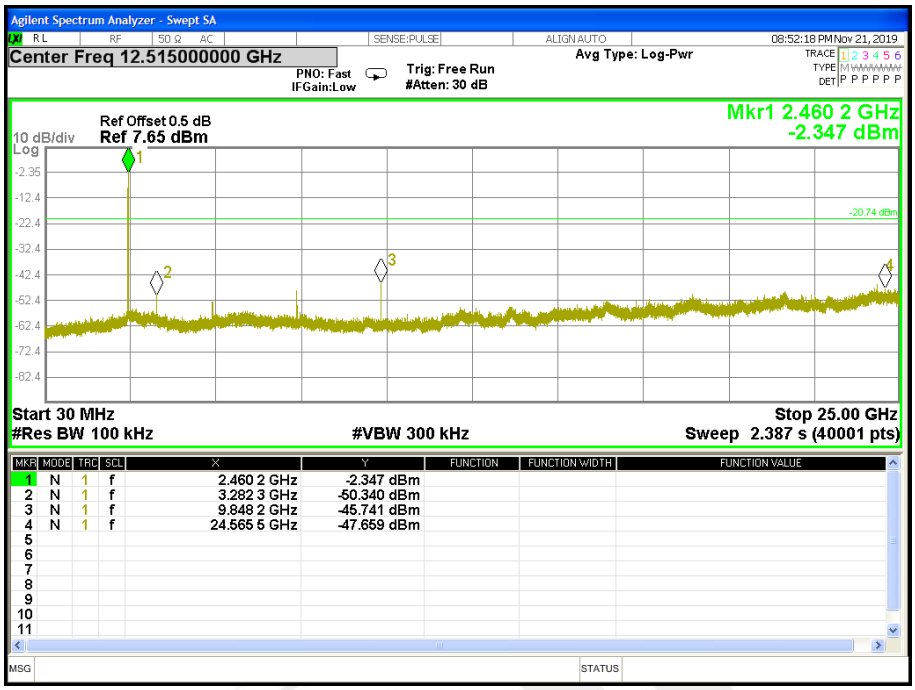
CH 01



CH 06

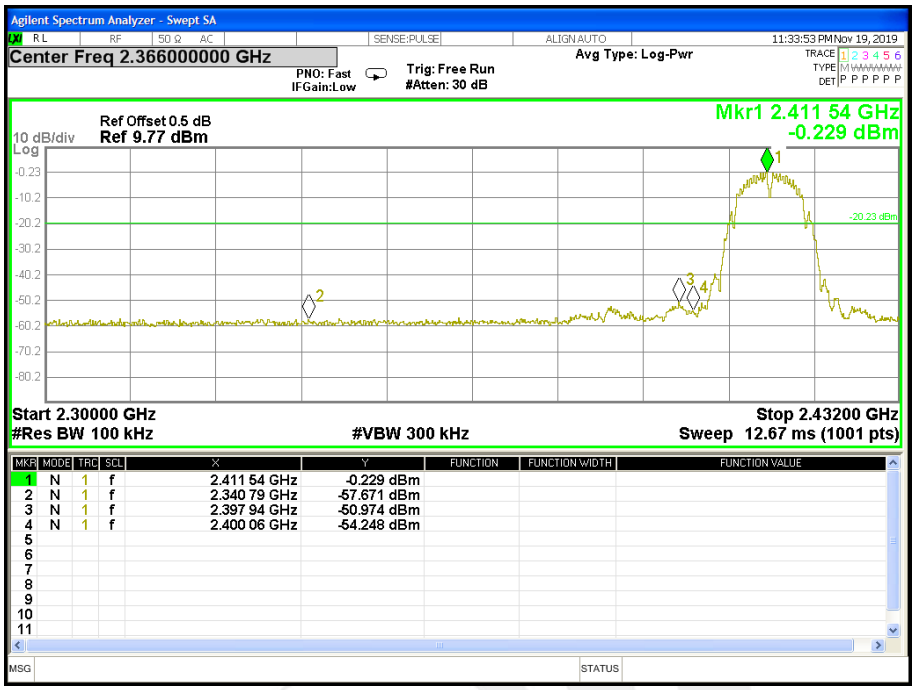


CH 11

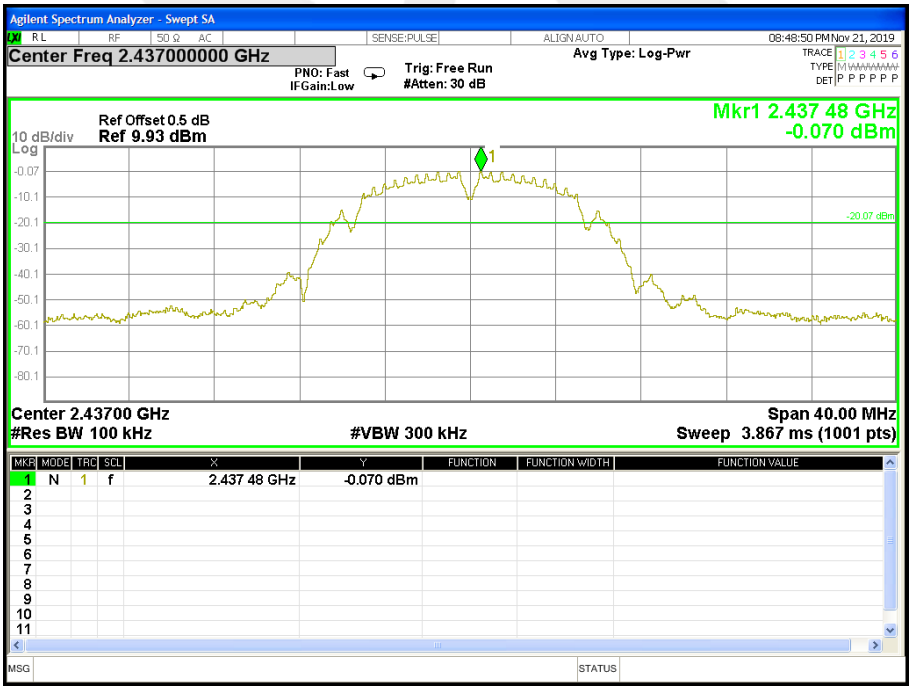

Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
08:52:18 PM Nov 21, 2019
Ref Offset 0.5 dB
10 dB/div
Ref 7.65 dBm
Mkr1 2.460 2 GHz
-2.347 dBm
-20.74 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (40001 pts)
1 N 1 f 2.460 2 GHz -2.347 dBm
2 N 1 f 3.282 3 GHz -50.340 dBm
3 N 1 f 9.848 2 GHz -45.741 dBm
4 N 1 f 24.565 5 GHz -47.659 dBm

Band edge

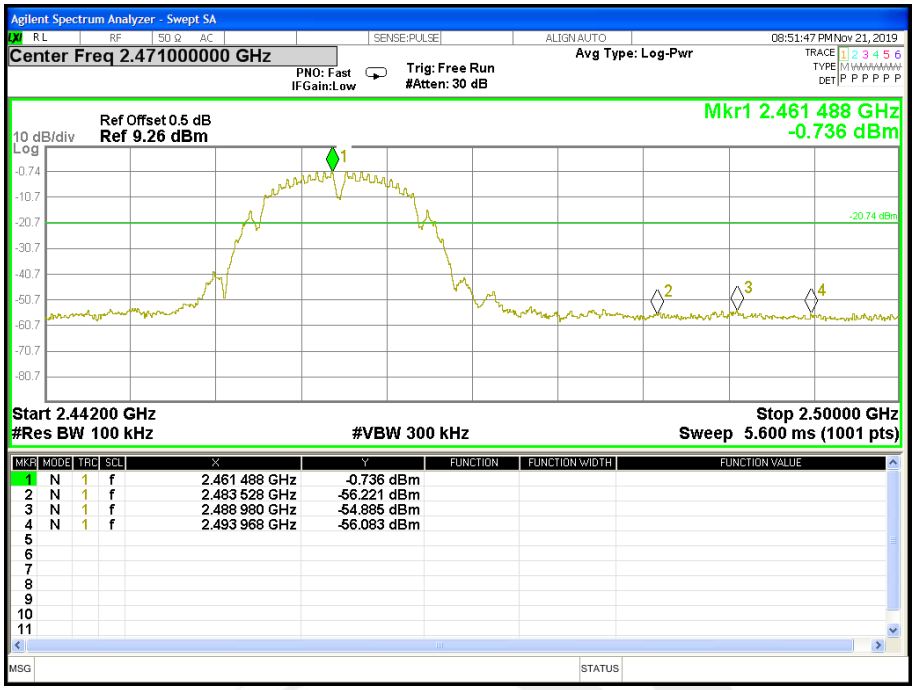
CH 01



CH 06

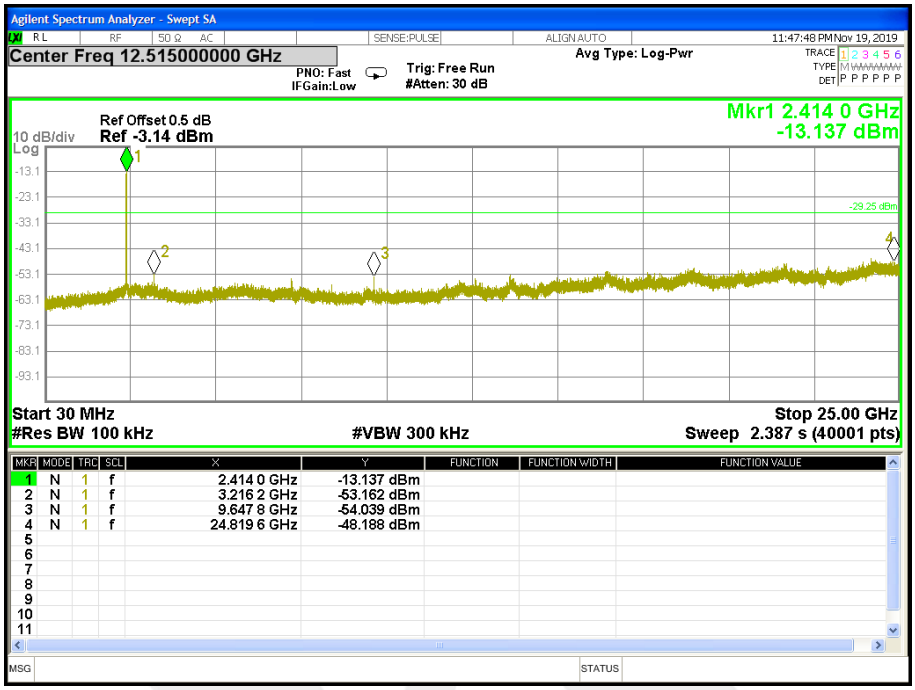


CH 11

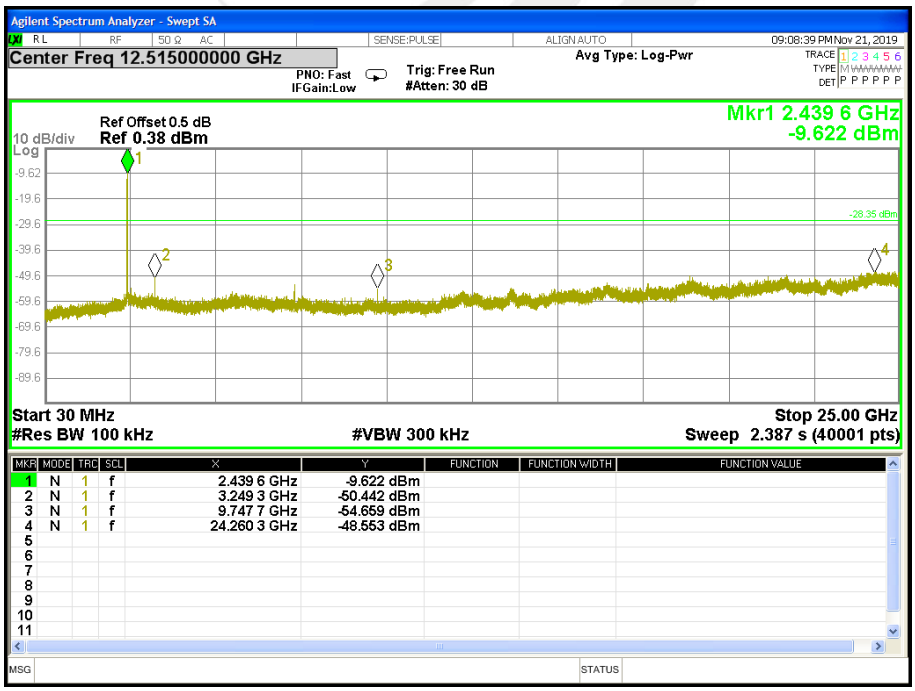

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.471000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
08:51:47 PM Nov 21, 2019
Ref Offset 0.5 dB
10 dB/div
Ref 9.26 dBm
Log
Mkr1 2.461 488 GHz
-0.736 dBm
-20.74 dBm
Start 2.44200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 5.600 ms (1001 pts)
1 N 1 f 2.461 488 GHz -0.736 dBm
2 N 1 f 2.483 528 GHz -56.221 dBm
3 N 1 f 2.488 980 GHz -54.885 dBm
4 N 1 f 2.493 968 GHz -56.083 dBm

Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX g Mode /CH01, CH06, CH11

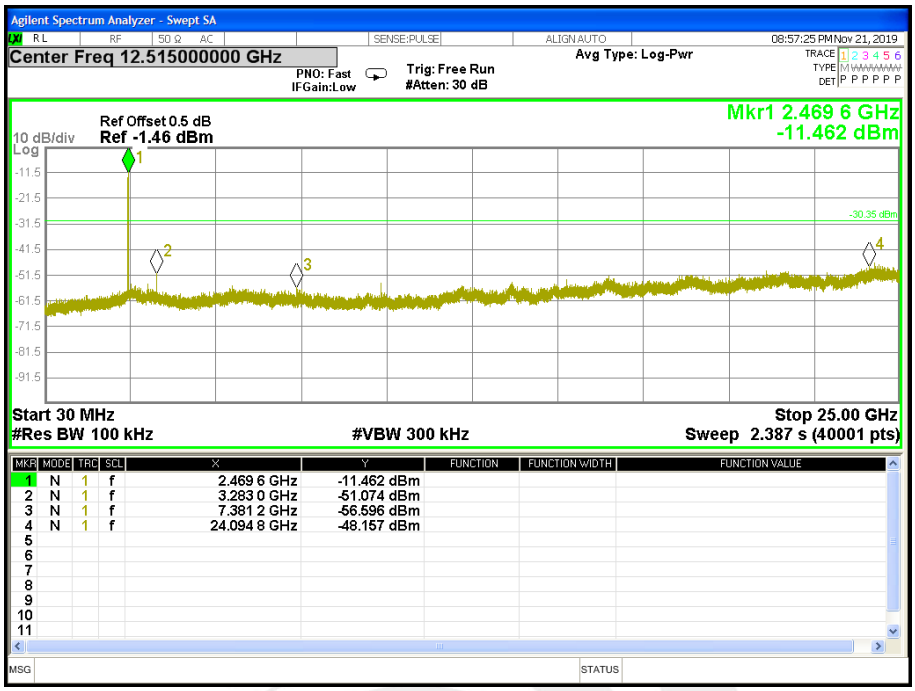
CH 01



CH06

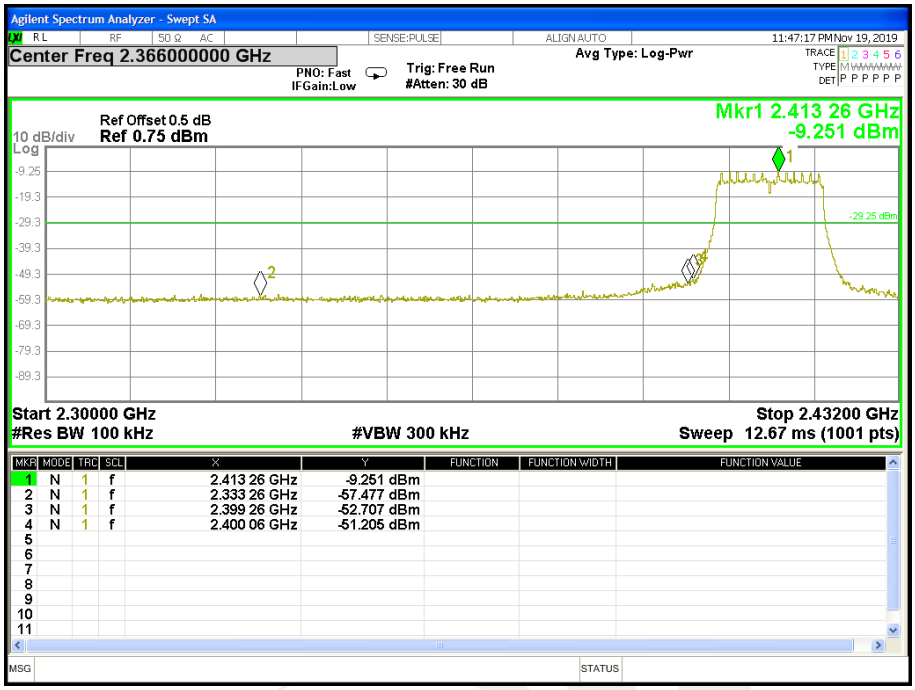


CH 11

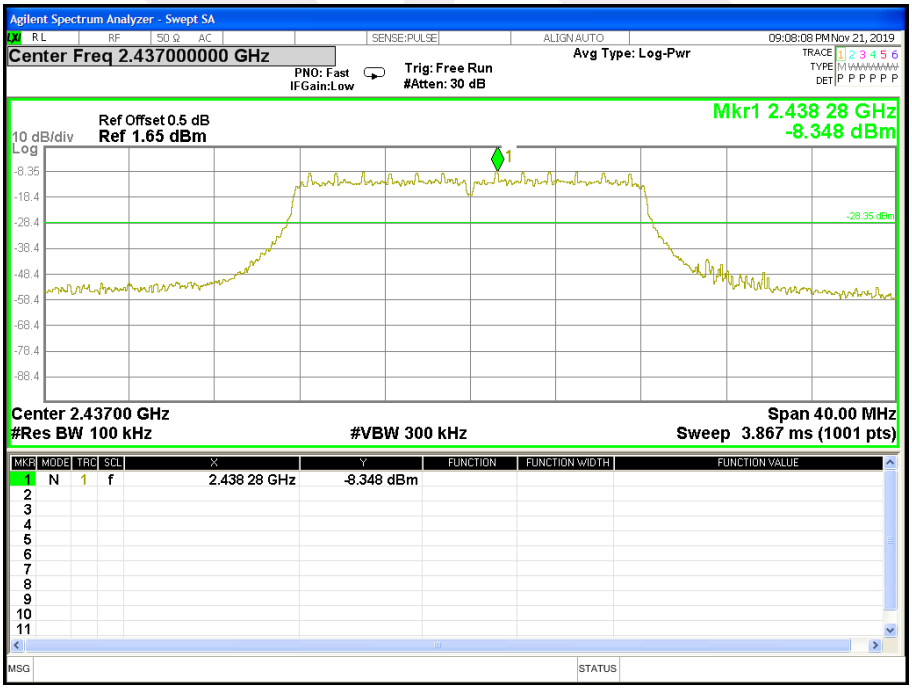

Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
08:57:25 PM Nov 21, 2019
Ref Offset 0.5 dB
10 dB/div
Ref -1.46 dBm
Mkr1 2.469 6 GHz
-11.462 dBm
-30.35 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (40001 pts)
1 N 1 f 2.469 6 GHz -11.462 dBm
2 N 1 f 3.283 0 GHz -51.074 dBm
3 N 1 f 7.381 2 GHz -56.596 dBm
4 N 1 f 24.094 8 GHz -48.157 dBm

Band edge

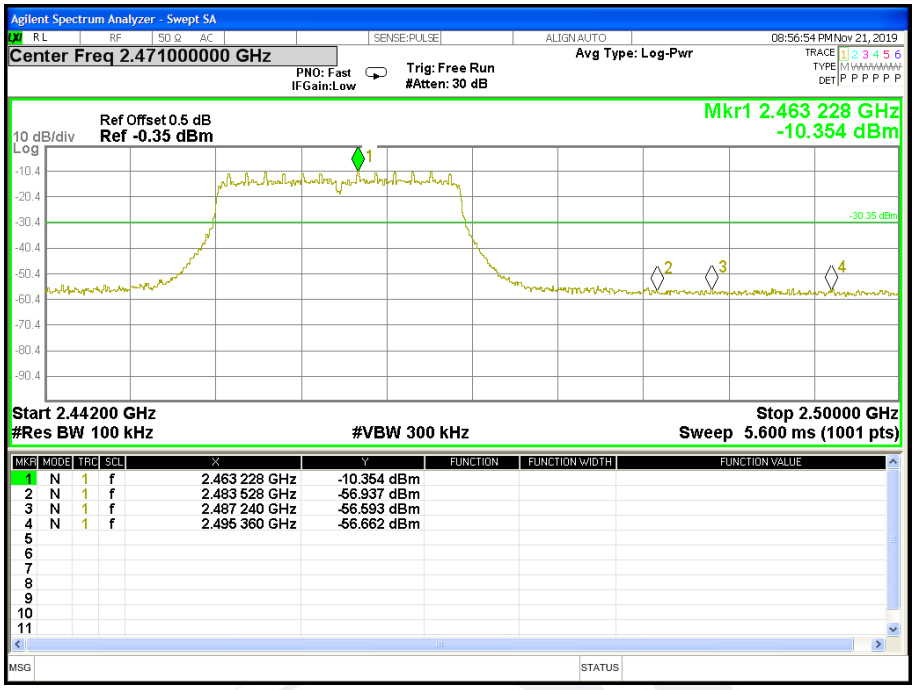
CH 01



CH06

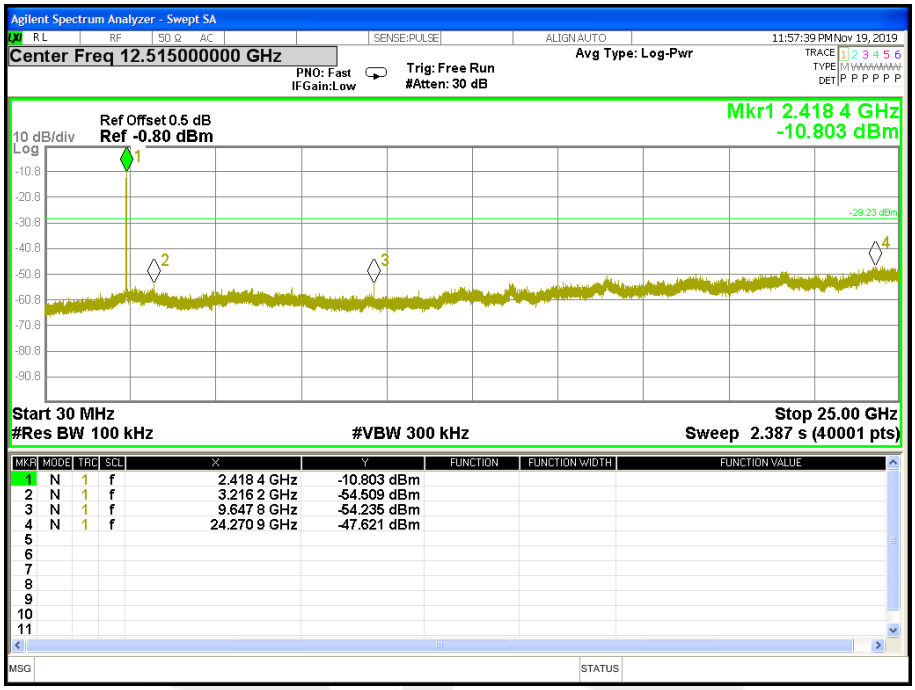


CH11

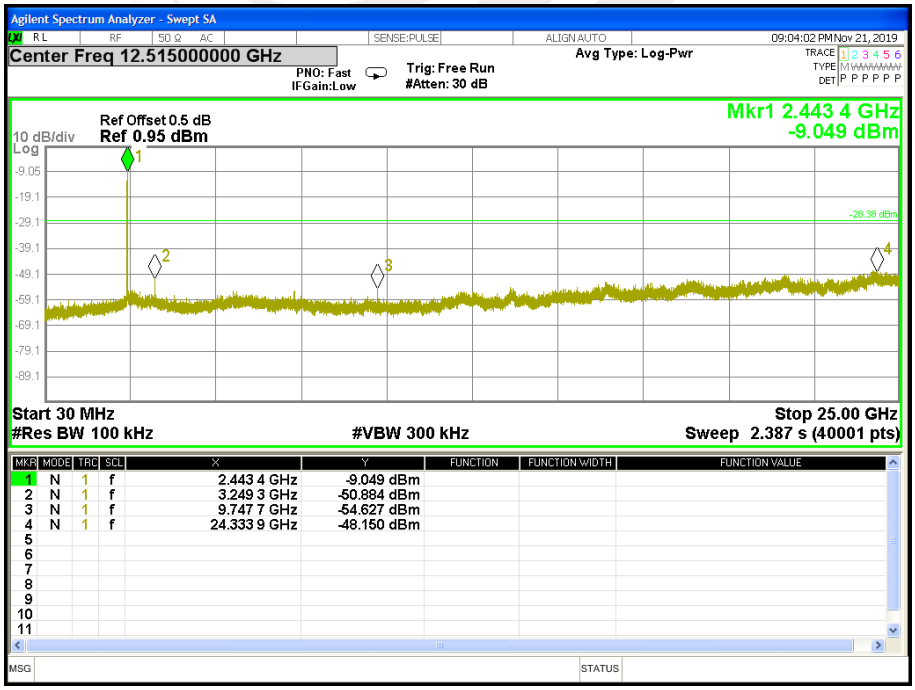

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.471000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
08:56:54 PM Nov 21, 2019
Ref Offset 0.5 dB
10 dB/div
Ref -0.35 dBm
Mkr1 2.463 228 GHz
-10.354 dBm
-30.35 dBm
Start 2.44200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 5.600 ms (1001 pts)
1 N 1 f 2.463 228 GHz -10.354 dBm
2 N 1 f 2.483 528 GHz -56.937 dBm
3 N 1 f 2.487 240 GHz -56.593 dBm
4 N 1 f 2.495 360 GHz -56.662 dBm

Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX n Mode(20M) /CH01, CH06, CH11

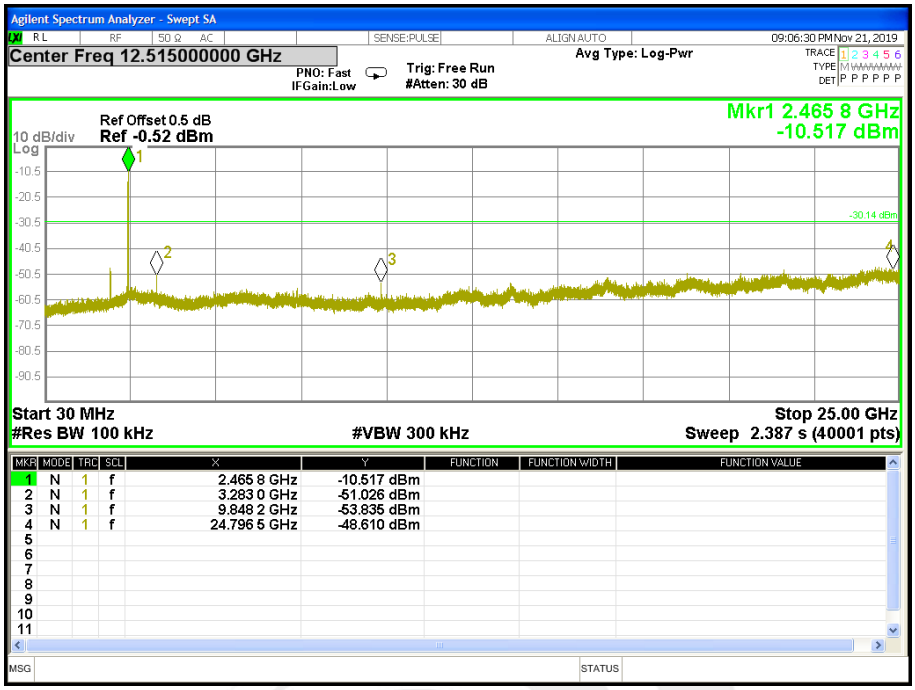
CH 01



CH 06

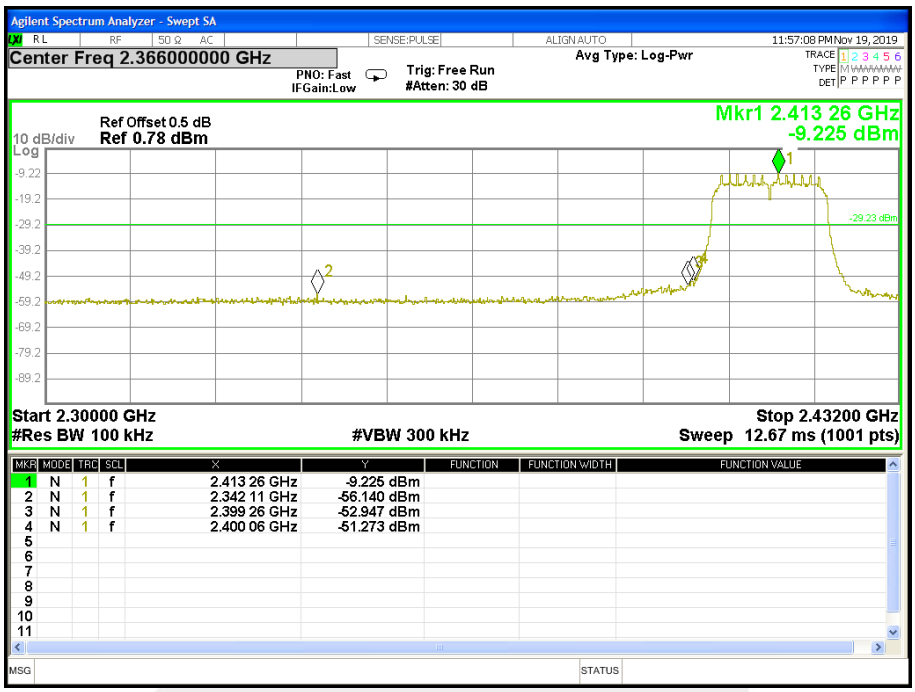


CH 11

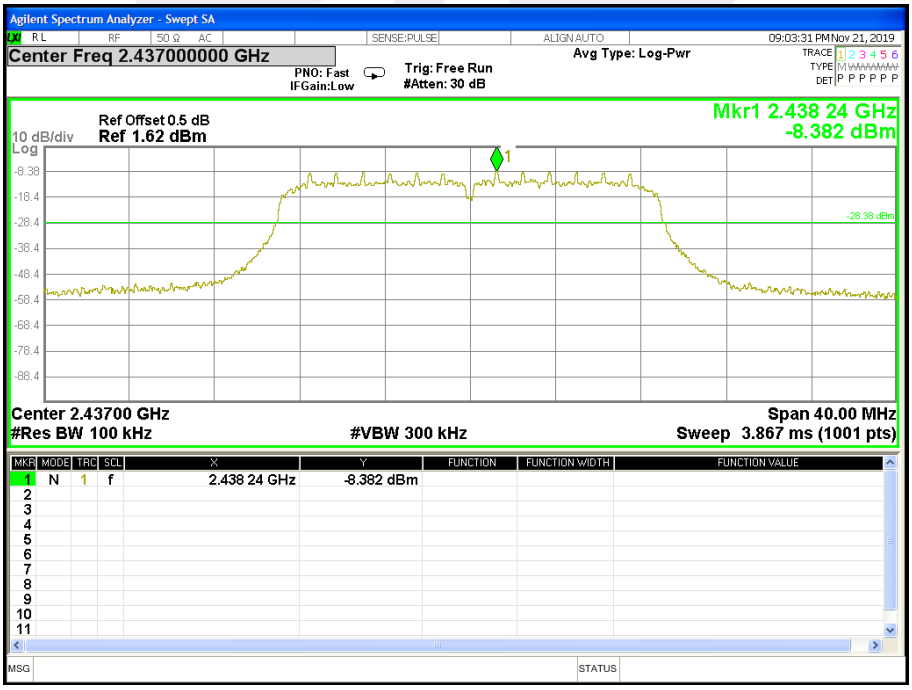

Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
09:06:30 PM Nov 21, 2019
Ref Offset 0.5 dB
10 dB/div
Ref -0.52 dBm
Mkr1 2.465 8 GHz
-10.517 dBm
-30.14 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (40001 pts)
1 N 1 f 2.465 8 GHz -10.517 dBm
2 N 1 f 3.283 0 GHz -51.026 dBm
3 N 1 f 9.848 2 GHz -53.835 dBm
4 N 1 f 24.796 5 GHz -48.610 dBm

Band edge

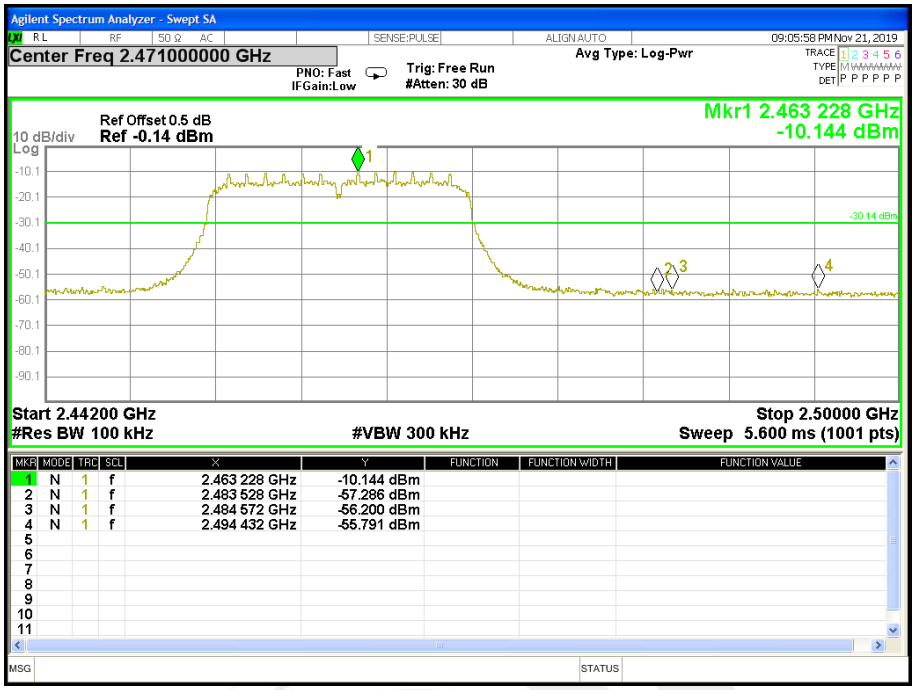
CH 01



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
09:05:58 PM Nov 21, 2019
Ref Offset 0.5 dB
10 dB/div
Ref -0.14 dBm
Mkr1 2.463 228 GHz
-10.144 dBm
-30.14 dBm
Start 2.44200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 5.600 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.463 228 GHz -10.144 dBm
2 N 1 f 2.483 528 GHz -57.286 dBm
3 N 1 f 2.484 572 GHz -56.200 dBm
4 N 1 f 2.494 432 GHz -55.791 dBm
MSG
STATUS

5. POWER SPECTRAL DENSITY TEST

5.1 LIMIT

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

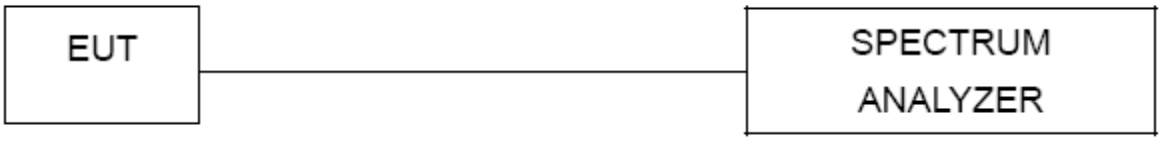
5.2 TEST PROCEDURE

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

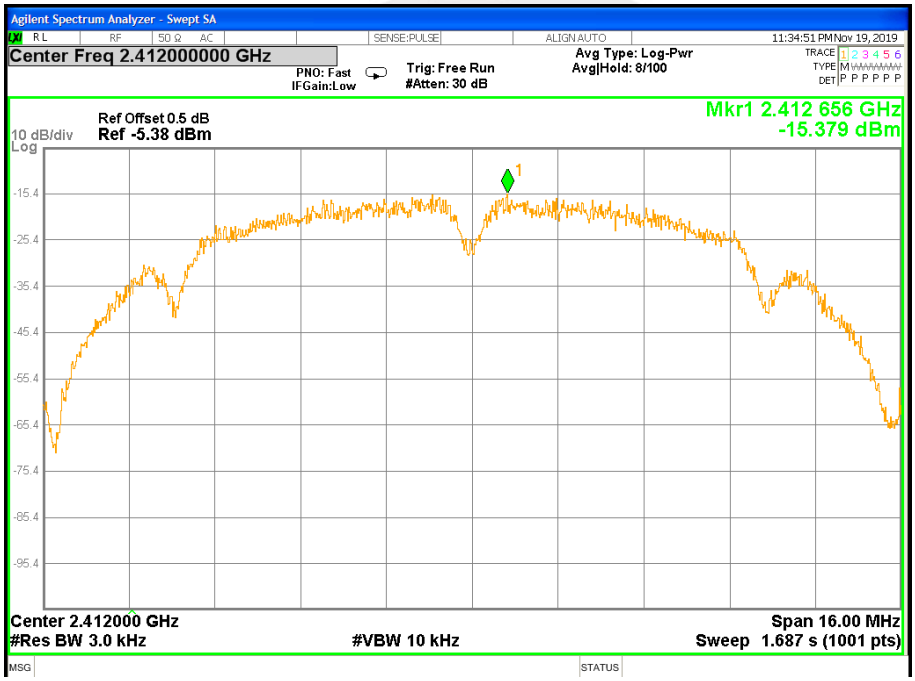
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

5.6 TEST RESULTS

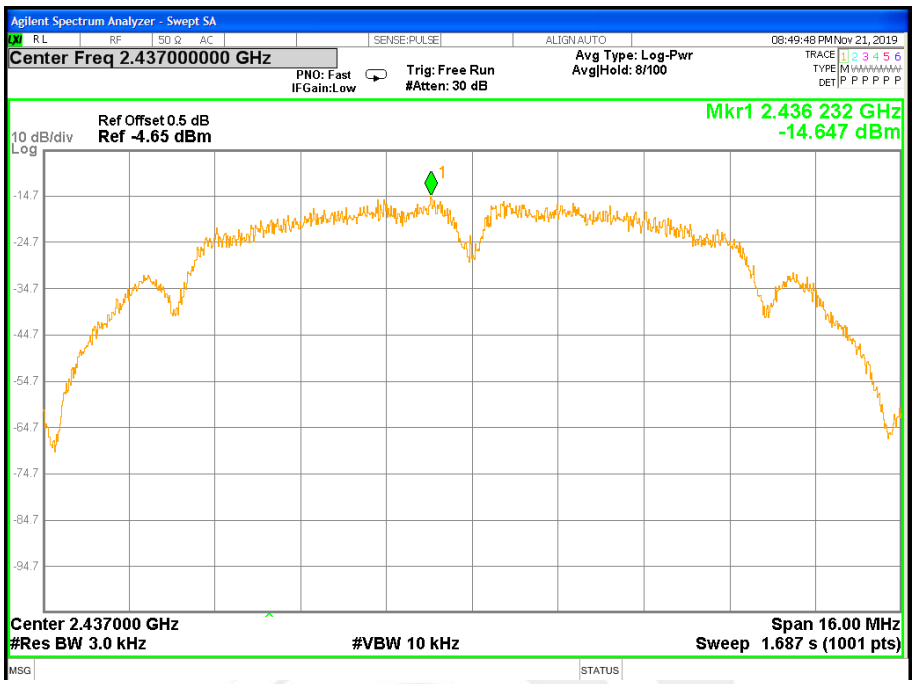
Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX b Mode /CH01, CH06, CH11

Frequency	Power Density (dBm/3kHz)	Limit (dBm/3KHz)	Result
2412 MHz	-15.379	≤8	PASS
2437 MHz	-14.647	≤8	PASS
2462 MHz	-15.469	≤8	PASS

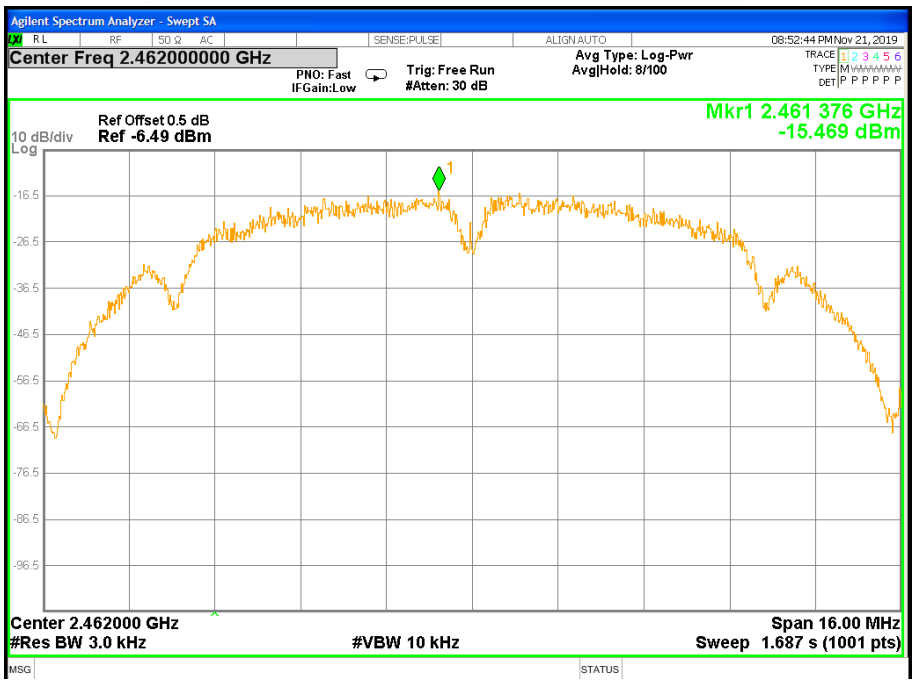
TX CH01



TX CH06



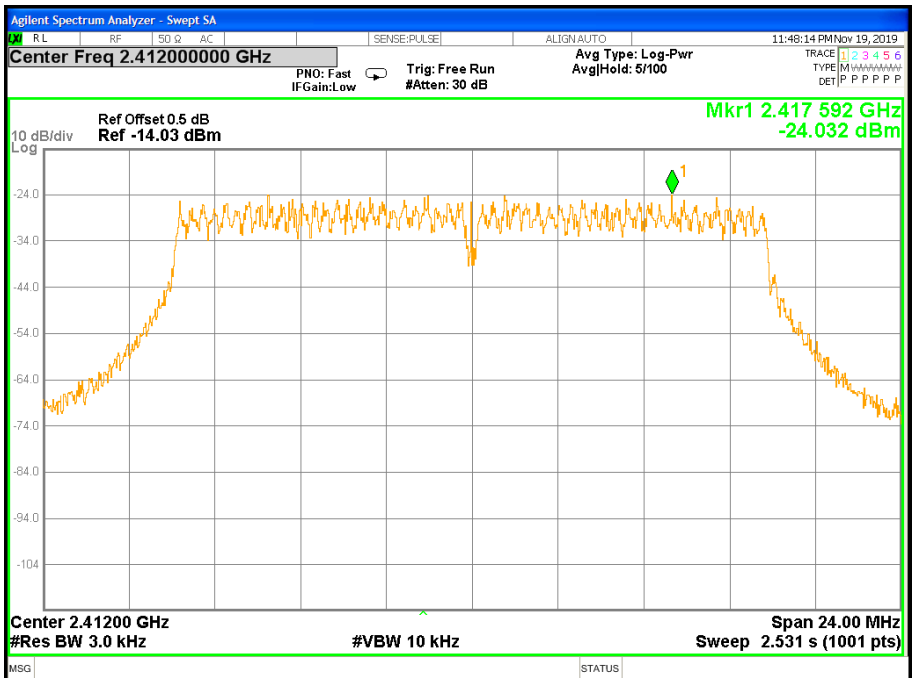
TX CH11



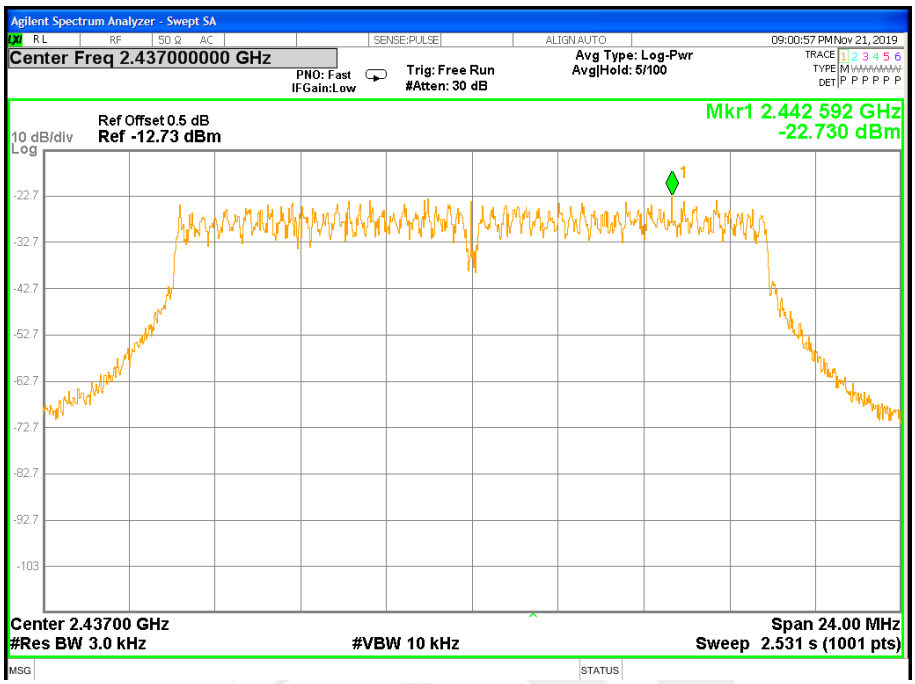
Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX g Mode /CH01, CH06, CH11

Frequency	Power Density (dBm/3kHz)	Limit (dBm/3KHz)	Result
2412 MHz	-24.032	≤8	PASS
2437 MHz	-22.73	≤8	PASS
2462 MHz	-23.842	≤8	PASS

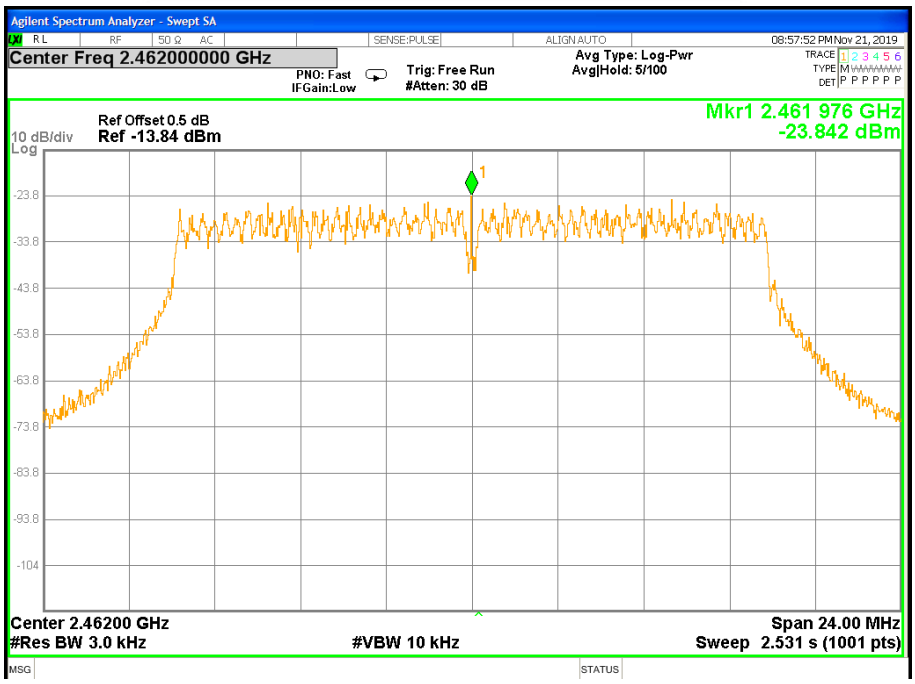
TX CH01



TX CH06



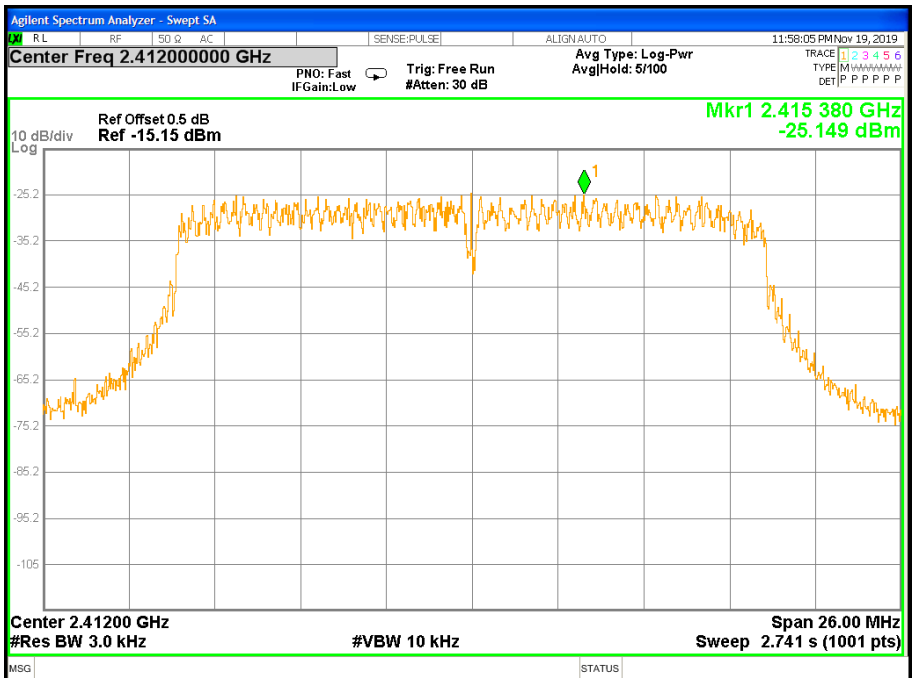
TX CH11



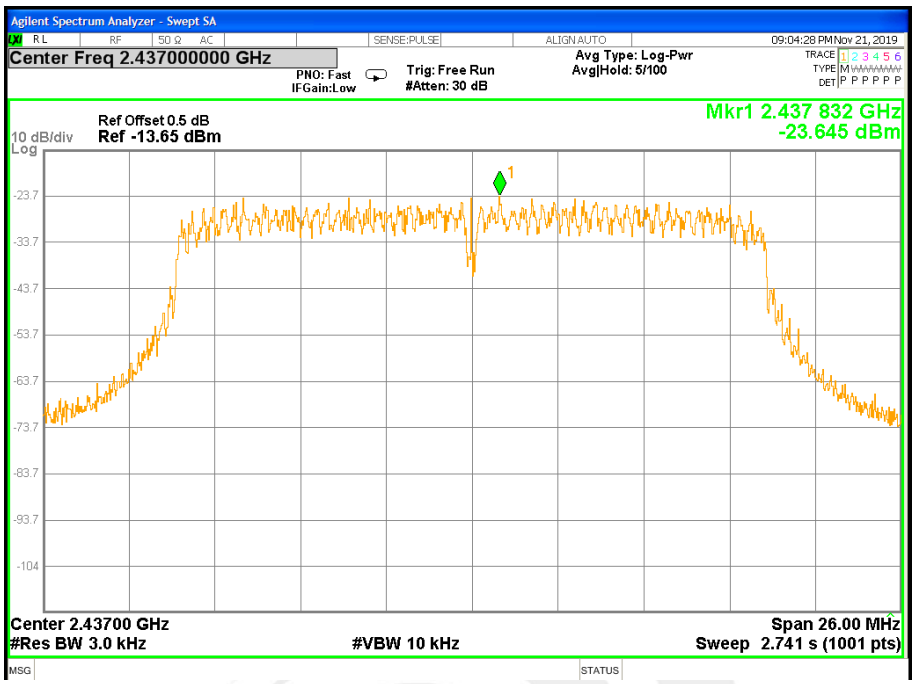
Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX n Mode(20M) /CH01, CH06, CH11

Frequency	Power Density (dBm/3kHz)	Limit (dBm/3KHz)	Result
2412 MHz	-25.149	≤8	PASS
2437 MHz	-23.645	≤8	PASS
2462 MHz	-23.983	≤8	PASS

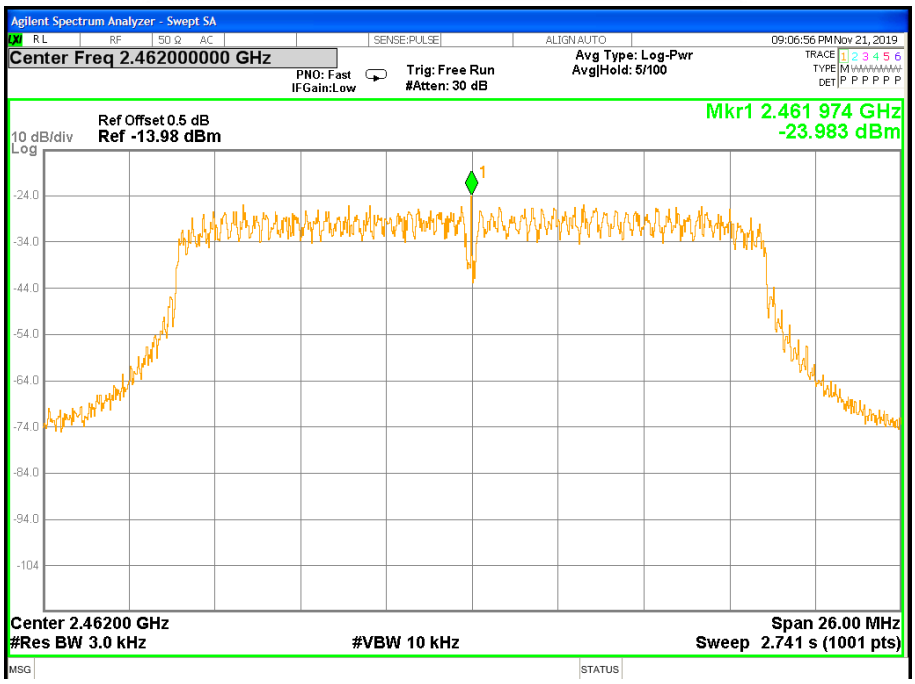
TX CH01



TX CH06



TX CH11



6. BANDWIDTH TEST

6.1 LIMIT

FCC Part15.247,Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	≥500KHz (6dB bandwidth)	2400-2483.5	PASS

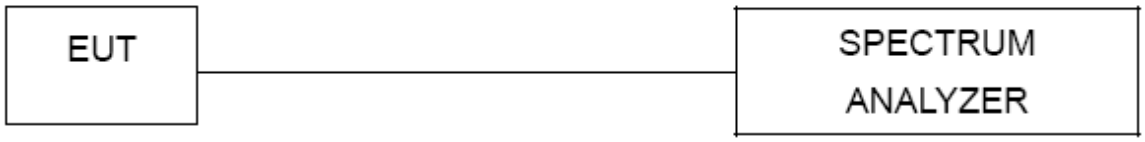
6.2 TEST PROCEDURE

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≥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.

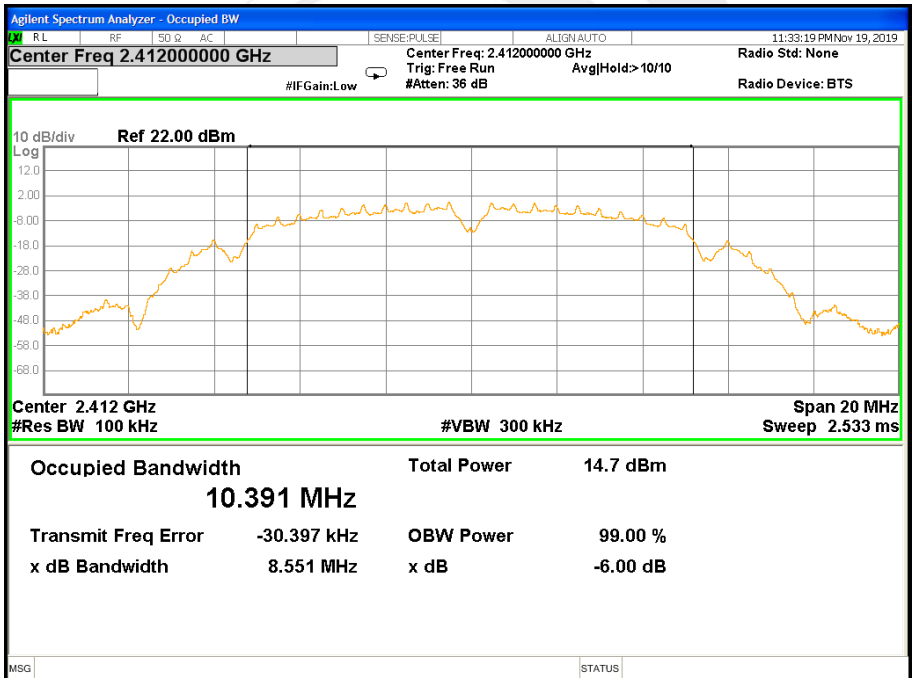
6.6 TEST RESULTS

Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX b Mode /CH01, CH06, CH11

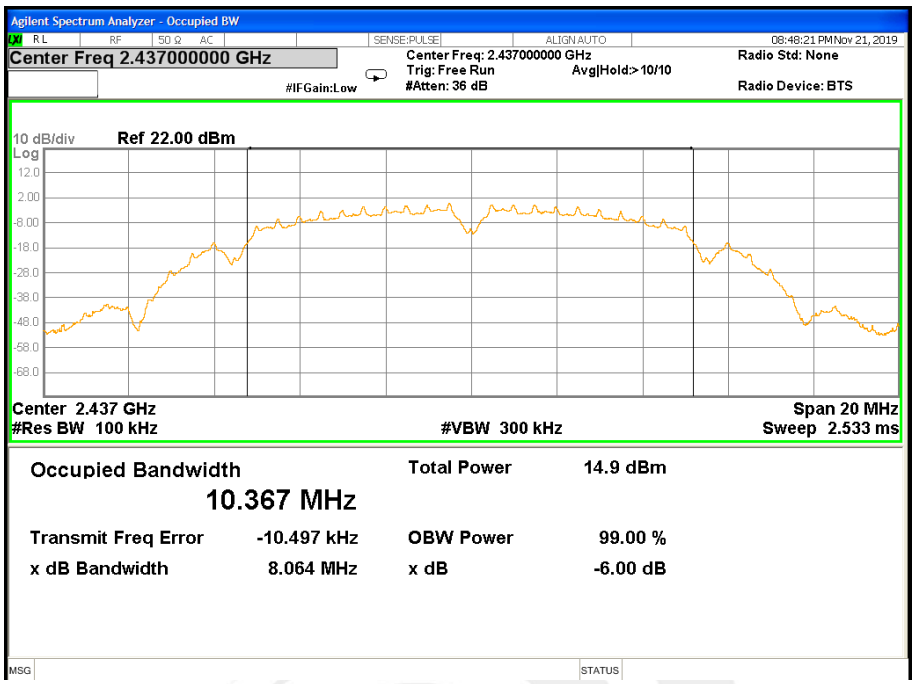
Remark: PEAK DETECTOR IS USED

Frequency	6dB Bandwidth	Channel Separation	Result
	(MHz)	(KHz)	
2412 MHz	8.551	≥500KHz	PASS
2437 MHz	8.064	≥500KHz	PASS
2462 MHz	8.069	≥500KHz	PASS

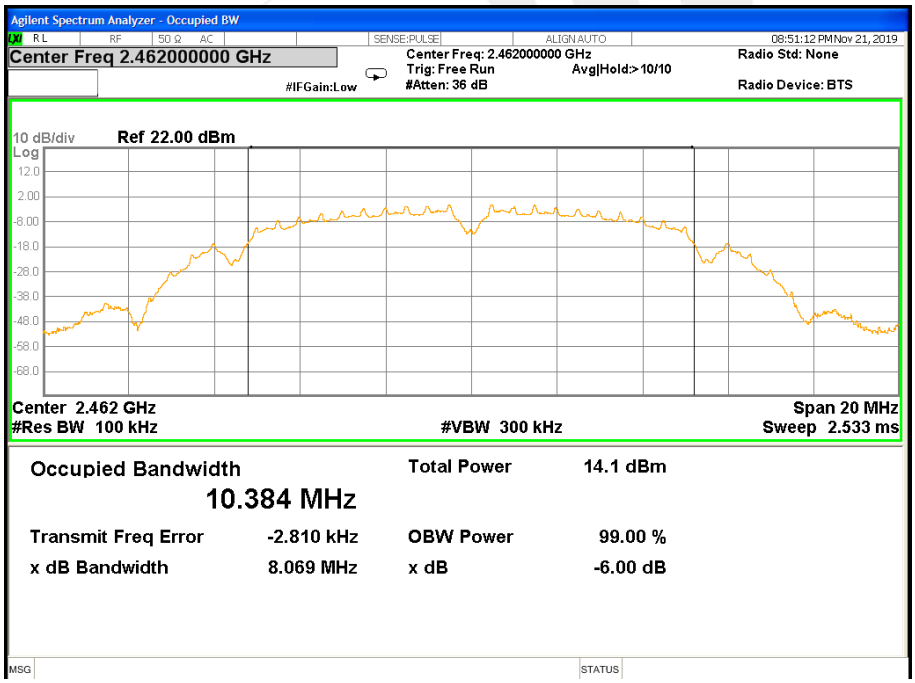
TX CH 01



TX CH 06



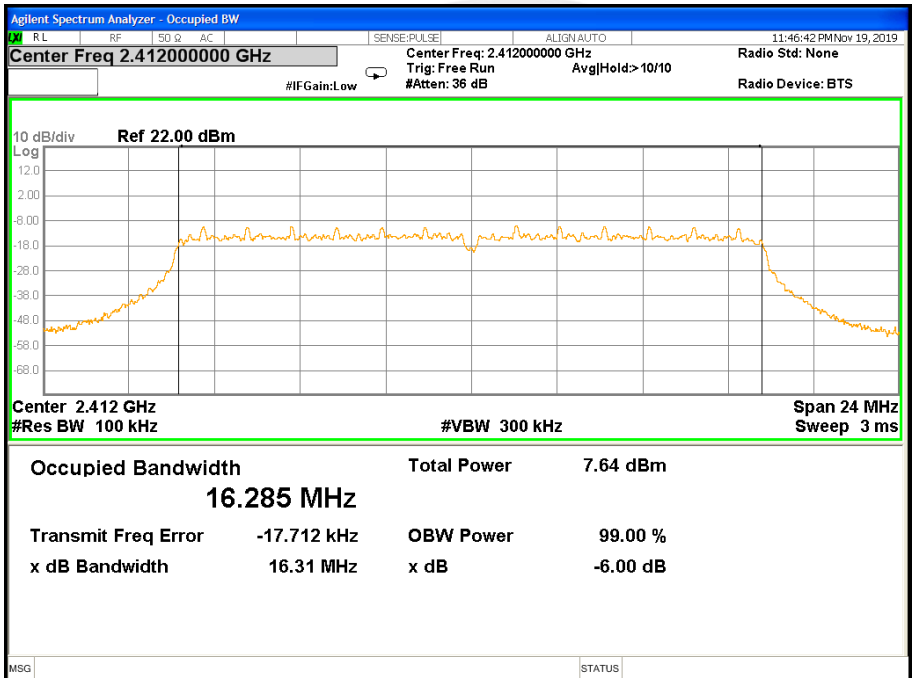
TX CH 11



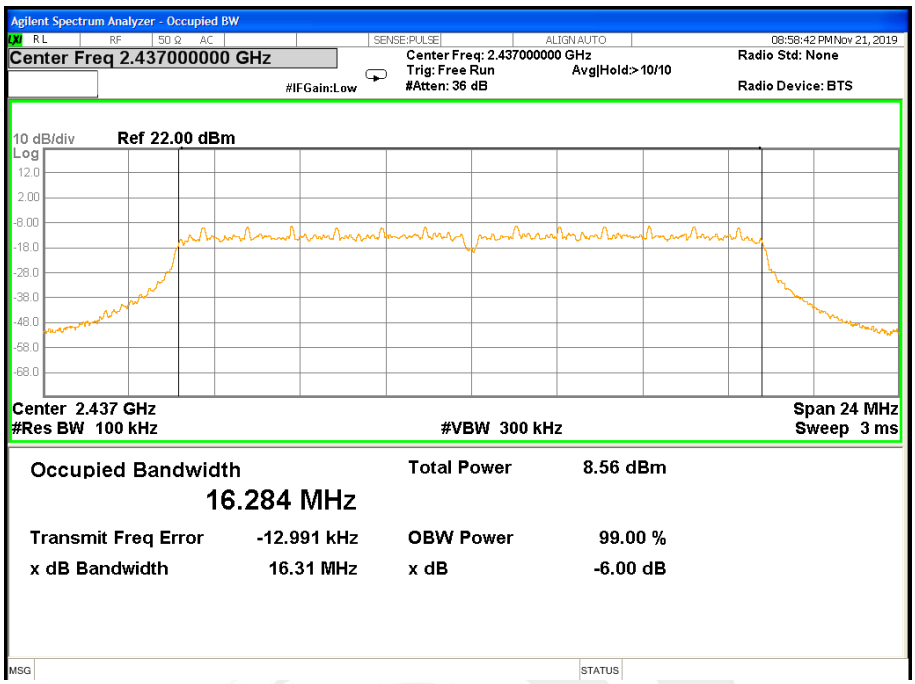
Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX g Mode /CH01, CH06, CH11

Frequency	6dB Bandwidth	Channel Separation	Result
	(MHz)	(KHz)	
2412 MHz	16.31	≥500KHz	PASS
2437 MHz	16.31	≥500KHz	PASS
2462 MHz	16.31	≥500KHz	PASS

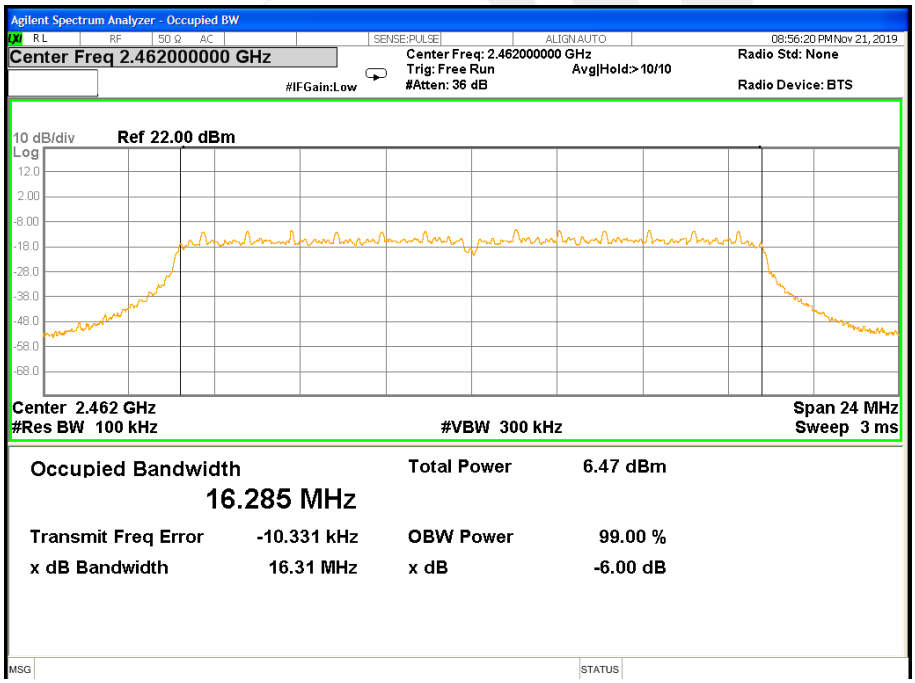
TX CH 01



TX CH 06



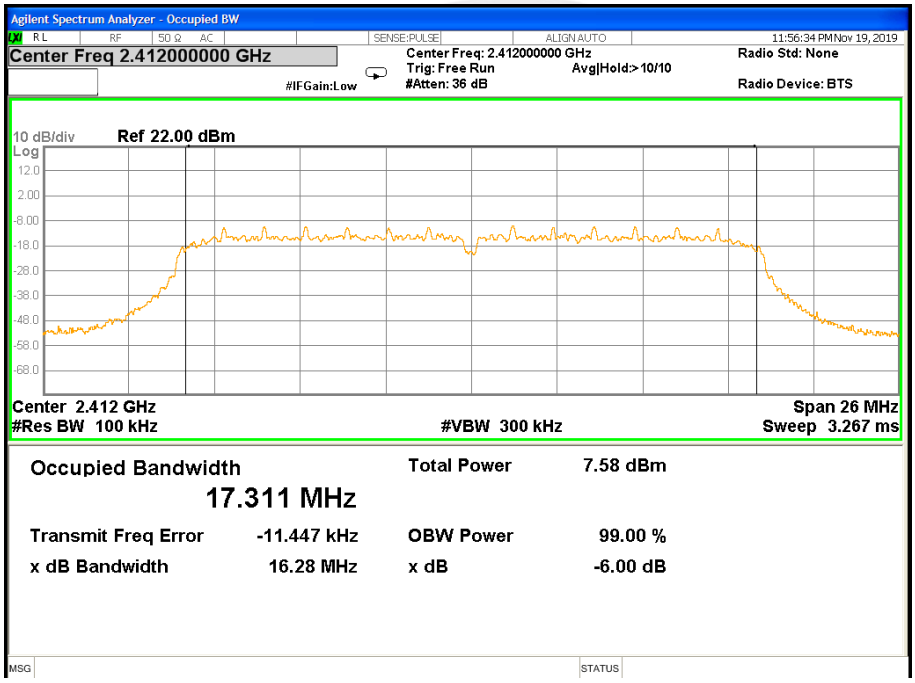
TX CH 11



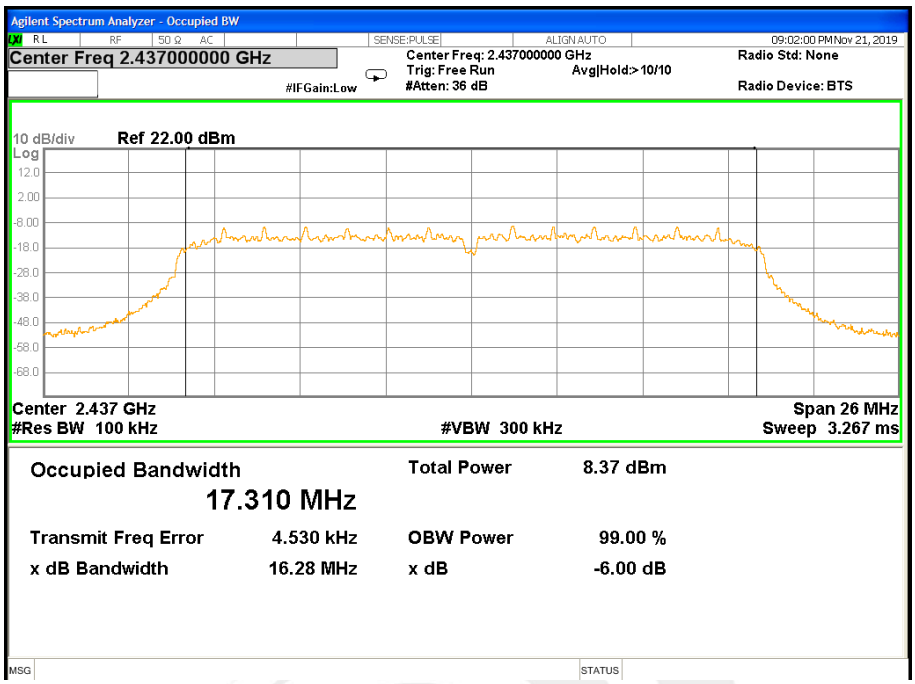
Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX n Mode(20M) /CH01, CH06, CH11

Frequency	6dB Bandwidth	Channel Separation	Result
	(MHz)	(KHz)	
2412 MHz	16.28	≥500KHz	PASS
2437 MHz	16.28	≥500KHz	PASS
2462 MHz	16.28	≥500KHz	PASS

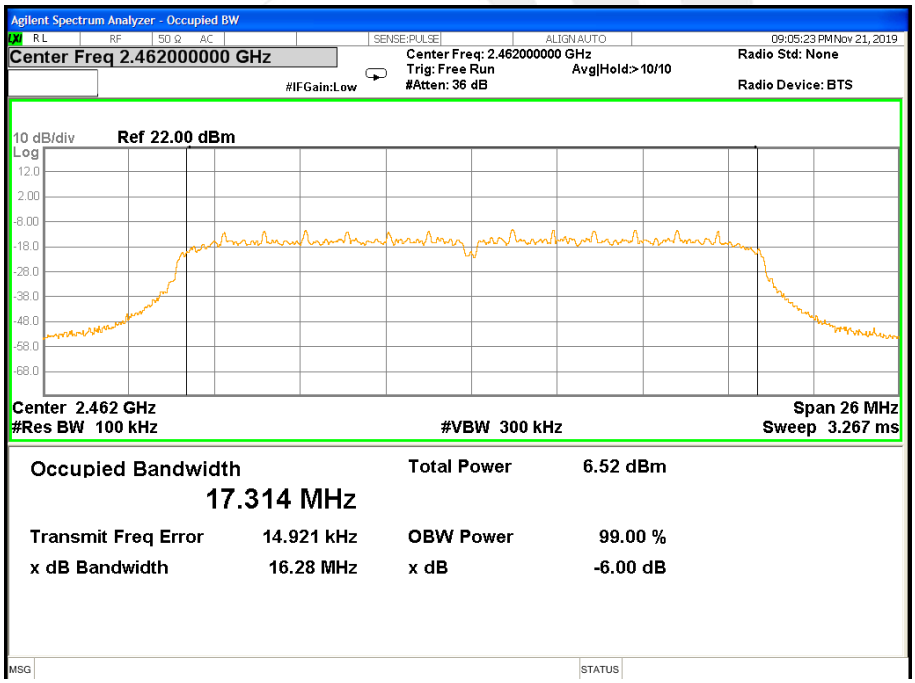
TX CH 01



TX CH 06



TX CH 11



7. PEAK OUTPUT POWER TEST

7.1 LIMIT

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

7.2 TEST PROCEDURE

a. The EUT was directly connected to the Power Sensor&PC

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:	AC 120V/60Hz		

Mode	Test Channe	Frequency	Peak Conducted Output Power	Average Conducted Output Power	LIMIT
		(MHz)	(dBm)	(dBm)	dBm
TX 802.11b	CH01	2412	13.47	9.77	30
	CH06	2437	12.21	8.51	30
	CH11	2462	11.94	8.00	30
TX 802.11g	CH01	2412	13.29	3.77	30
	CH06	2437	11.90	2.27	30
	CH11	2462	10.16	0.70	30
TX 802.11n20	CH01	2412	12.78	3.59	30
	CH06	2437	11.69	2.42	30
	CH11	2462	10.32	1.03	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.

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※※※※※