



RADIO TEST REPORT

Report No:STS1906135W04

Issued for

Shenzhen AEE Aviation Technology Co.,Ltd.

AEE Hi-Tech Park,Tangtou Crossroads,Songbai Road,Shiyan
Town,Bao' an District Shenzhen,P.R.C.

Product Name:	MACH4
Brand Name:	AEE
Model Name:	X70
Series Model:	N/A
FCC ID:	2AGZGX70001
Test Standard:	FCC Part 15.407

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TEST RESULT CERTIFICATION

Applicant's Name..... : Shenzhen AEE Aviation Technology Co.,Ltd.
Address : AEE Hi-Tech Park,Tangtou Crossroads,Songbai Road,Shiyan Town,Bao' an District Shenzhen,P.R.C.
Manufacture's Name..... : Shenzhen AEE Aviation Technology Co.,Ltd.
Address : AEE Hi-Tech Park,Tangtou Crossroads,Songbai Road,Shiyan Town,Bao' an District Shenzhen,P.R.C.

Product Description

Product Name..... : MACH4
Brand Name : AEE
Model Name : X70
Series Model..... : N/A

Test Standards..... : FCC Part15.407

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..... : 11 June. 2019 ~ 07 Nov. 2019

Date of Issue..... : 07 Nov. 2019

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

Testing Engineer :

(Chris Chen)

Technical Manager :

(Sunday Hu)

Authorized Signatory :

(Vita Li)





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**Revision History**

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	07 Nov. 2019	STS1906135W04	ALL	Initial Issue





1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

§ 15.407, KDB 789033 D02 General U-NII Test Procedures New Rules v02r01

FCC Part 15.407		
FCC standard	Test Item	Results
15.207	AC Conducted Emission	PASS
§ 15.407 (2) (26 dB) / § 15.407 (e) (6 dB) / § 15.407 (a) (99%)	26dB/6dB & 99% Bandwidth	PASS
15.407(a) (1).(2).(3).(4).(5)	Maximum Conducted Output Power	PASS
15.407(b) & 15.209	Radiated Emission And (bandedge Emissions) Measurement	PASS
15.407(b)7	Conducted Emission And (bandedge Emissions) Measurement	PASS
15.407(a) (1).(2).(3).(4).(5)	Power Spectral Density	PASS
15.407(c)	Automatically Discontinue Transmission	PASS
15.203/15.204	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 $y \pm U$, 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	RF output power, conducted	$\pm 0.71\text{dB}$
2	Unwanted Emissions, conducted	$\pm 0.63\text{dB}$
3	All emissions, radiated 30-200MHz	$\pm 3.43\text{dB}$
4	All emissions, radiated 200MHz-1GHz	$\pm 3.57\text{dB}$
5	All emissions, radiated >1G	$\pm 4.13\text{dB}$
6	Conducted Emission (9KHz-150KHz)	$\pm 3.18\text{dB}$
7	Conducted Emission (150KHz-30MHz)	$\pm 2.70\text{dB}$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	MACH4
Trade Name	AEE
Model Name	X70
Series Model	N/A
Model Difference	N/A
Product Description	The EUT is a MACH4
	Operation Frequency: 5740MHz~5830MHz
	Modulation Type: 64QAM, 16QAM, QPSK, BPSK
	Antenna Designation: See Note 2
	Max.Output Power(Conducted): 16.305dBm
	More details of EUT technical specification, please refer to the User's Manual.
Test Channel	Please refer to the Note 2.
Adapter	Input: 100V~240V Output: 24V
Battery	Rated Voltage: 22.2V Charge Limit: 25.2V Capacity: 14000mAh
Hardware version number	V1.0
Software version number	1.0
Connecting I/O Port(s)	Please refer to the User's Manual

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



1. Operation Frequency of channel	
Channel	Frequency
01	5740
02	5750
03	5760
04	5770
05	5780
06	5790
07	5800
08	5810
09	5820
10	5830

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

5GHz:

Channel	Freq.(MHz)
01	5740
06	5790
10	5830

2. 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 G_{ANT} 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,

$$\text{Directional gain} = G_{ANT} + 10 \log(NANT) \text{ dBi}$$

(ii) If all transmit signals are completely uncorrelated with each other,

$$\text{Directional gain} = G_{ANT}$$

ANT A=2.5 dBi

ANT B=2.5 dBi

$G_{ANT} + 10 \log(NANT) \text{ dBi}$

Directional gain= $2.5+10\log 2=5.51\text{dBi}$

Ant	Brand	Model Name	Ant Type	Connector	Gain (dBi)	NOTE
A	AEE	X70	Dipole	N/A	Ant A:2.5 dBi Ant B:2.5 dBi Directional gain= $2.5+10\log 2=5.51\text{dBi}$	Ant.



2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Worst Mode	Description	Data Rate
Mode 1	CH1	1 Mbps
Mode 2	CH6	1 Mbps
Mode 3	CH10	1 Mbps

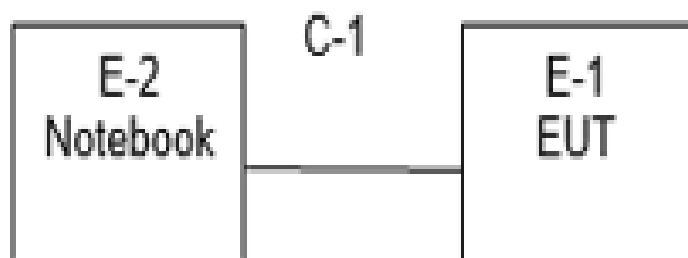
- Note: (1) The measurements are performed at the highest, middle, lowest available channels.
(2) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported
(3) We have been tested for all available U.S. voltage and frequencies (For 120V, 50/60Hz and 240V, 50/60Hz) for which the device is capable of operation.

AC Conducted Emission

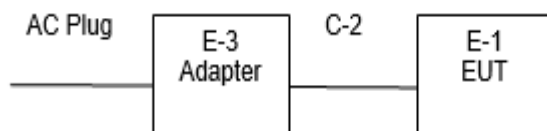
Test Case	
AC Conducted Emission	Mode 4: Keeping TX

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



Conducted Emission Test





2.4 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

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

Necessary accessories

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
E-3	Adapter	N/A	SK-200023	N/A	N/A
C-2	DC Cable	N/A	110cm	N/A	N/A

Support units

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

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

**2.5 EQUIPMENTS 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	ESCI	101427	2018.10.13, 2019.7.29	2019.10.12, 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(0.1 M-3GHz)	EM	EM330	060665	2018.10.13, 2019.10.9	2019.10.12, 2020.10.8
Pre-Amplifier (1G-18GHz)	SKET	LNPA-01018G-4 5	SK2018080901	2018.10.13, 2019.10.12	2019.10.12, 2020.10.11
Temperature & Humidity	HH660	Mieo	N/A	2018.10.11, 2019.10.09	2019.10.10, 2020.10.08
turn table	EM	SC100_1	60531	N/A	N/A
Antenna mast	EM	SC100	N/A	N/A	N/A
Test SW	BULUN	BL410-E/18.905			

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2018.10.13, 2019.7.29	2019.10.12, 2020.7.28
LISN	R&S	ENV216	101242	2018.10.11, 2019.10.09	2019.10.10, 2020.10.08
LISN	EMCO	3810/2NM	23625	2018.10.11, 2019.10.09	2019.10.10, 2020.10.08
Temperature & Humidity	HH660	Mieo	N/A	2018.10.11, 2019.10.09	2019.10.10, 2020.10.08
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	2018.10.13, 2019.10.9	2019.10.12, 2020.10.8
Signal Analyzer	Agilent	N9020A	MY49100060	2018.10.13, 2019.10.9	2019.10.12, 2020.10.8
Temperature & Humidity	HH660	Mieo	N/A	2018.10.11, 2019.10.09	2019.10.10, 2020.10.08
Test SW	FARAD	LZ-RF /LzRf-3A3			



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class B (dBuV)		Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	56.00	46.00	CISPR
5.0 -30.0	60.00	50.00	CISPR

0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

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

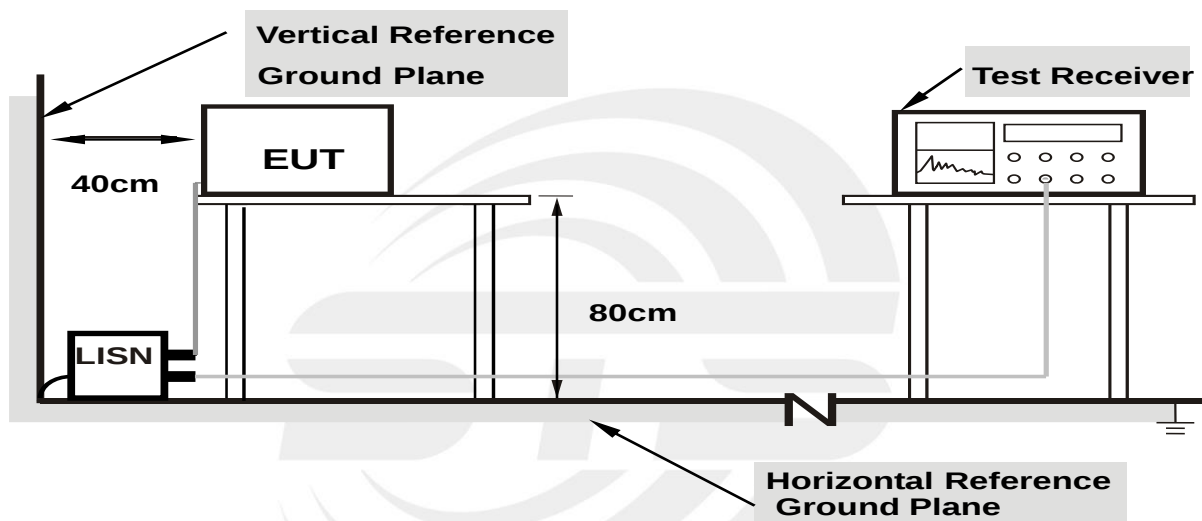
3.1.2 TEST PROCEDURE

- The EUT was placed 0.8 meters from the horizontal 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 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 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

3.1.5 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.



3.1.6 TEST RESULTS

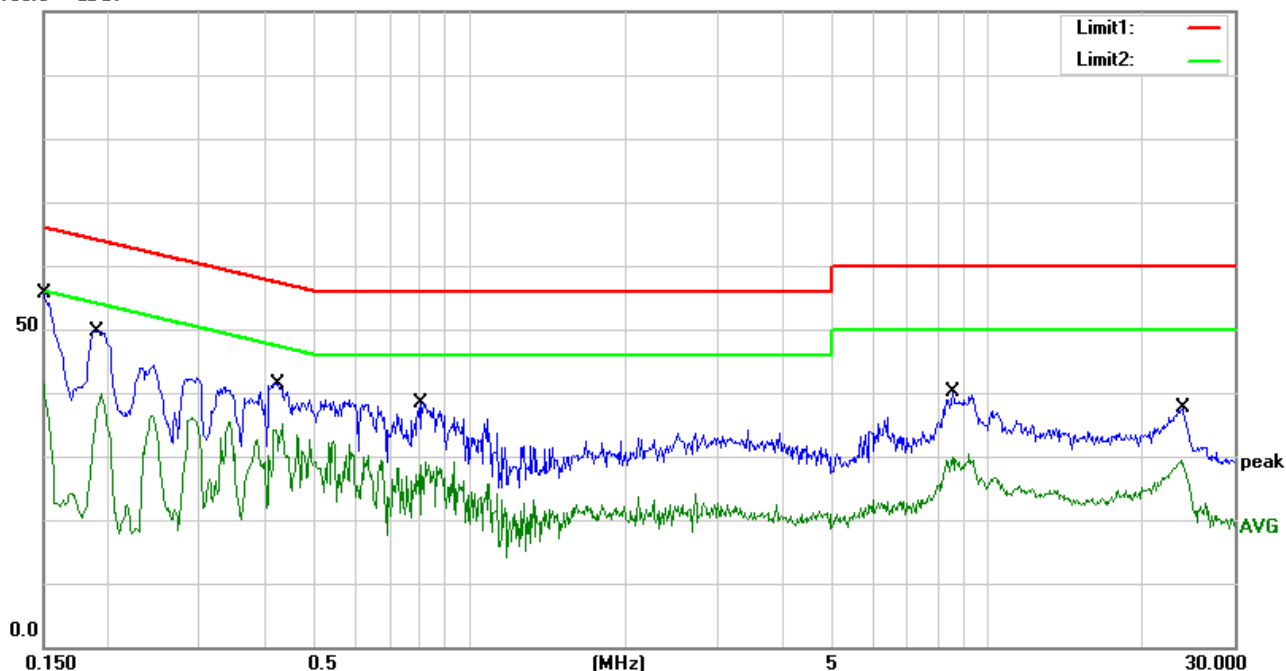
Temperature:	26(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Phase:	L
Test Mode :	Mode 4		

No.	Frequency (MHz)	Reading (dBUV)	Correct Factor(dB)	Result (dBUV)	Limit (dBUV)	Margin (dB)	Height (cm)
1	0.1500	35.94	19.66	55.60	66.00	-10.40	QP
2	0.1500	4.36	19.66	24.02	56.00	-31.98	AVG
3	0.1900	30.04	19.65	49.69	64.04	-14.35	QP
4	0.1900	16.63	19.65	36.28	54.04	-17.76	AVG
5	0.4260	21.61	19.69	41.30	57.33	-16.03	QP
6	0.4260	12.84	19.69	32.53	47.33	-14.80	AVG
7	0.8060	18.71	19.59	38.30	56.00	-17.70	QP
8	0.8060	1.37	19.59	20.96	46.00	-25.04	AVG
9	8.5580	20.73	19.35	40.08	60.00	-19.92	QP
10	8.5580	6.17	19.35	25.52	50.00	-24.48	AVG
11	23.8500	17.33	20.27	37.60	60.00	-22.40	QP
12	23.8500	0.30	20.27	20.57	50.00	-29.43	AVG

Remark:

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

100.0 dBUV





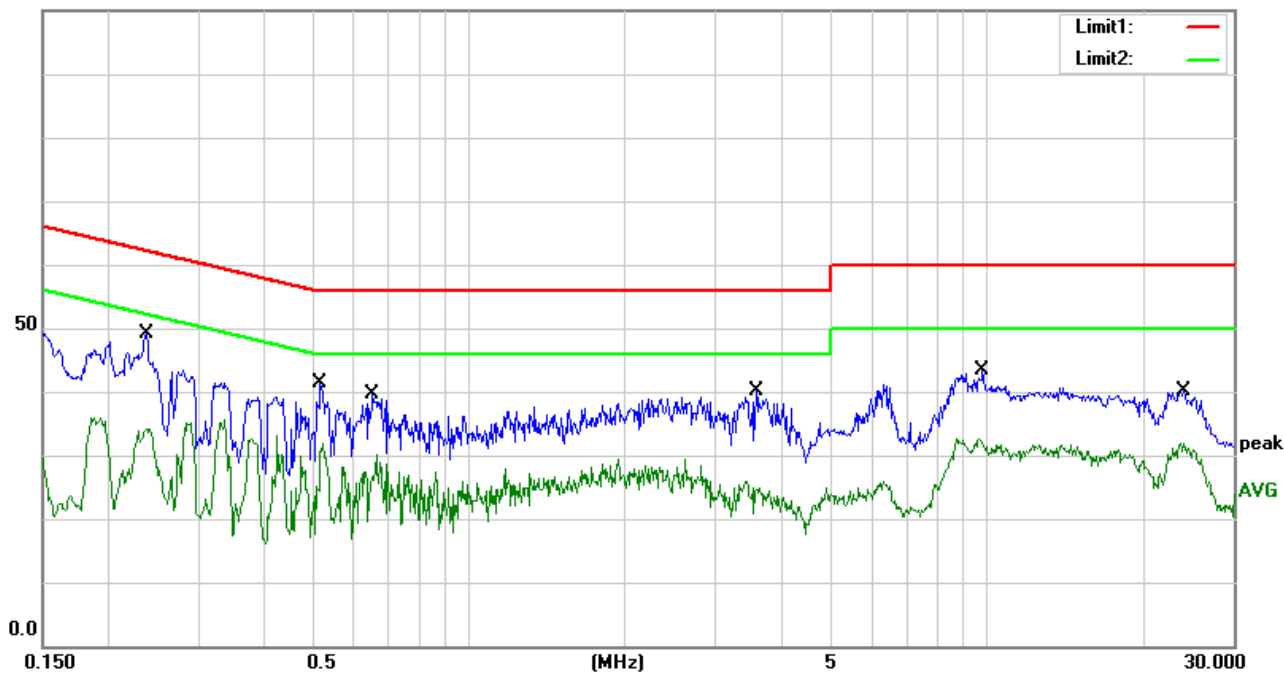
Temperature:	26(C)	Relative Humidity:	60%RH
Test Voltage	AC 120V/60Hz	Phase:	N
Test Mode	Mode 4		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Height (cm)
1	0.2380	29.66	19.59	49.25	62.17	-12.92	QP
2	0.2380	16.10	19.59	35.69	52.17	-16.48	AVG
3	0.5180	21.89	19.55	41.44	56.00	-14.56	QP
4	0.5180	8.57	19.55	28.12	46.00	-17.88	AVG
5	0.6540	20.11	19.62	39.73	56.00	-16.27	QP
6	0.6540	6.21	19.62	25.83	46.00	-20.17	AVG
7	3.5980	20.77	19.43	40.20	56.00	-15.80	QP
8	3.5980	5.34	19.43	24.77	46.00	-21.23	AVG
9	9.8580	24.02	19.41	43.43	60.00	-16.57	QP
10	9.8580	12.32	19.41	31.73	50.00	-18.27	AVG
11	24.0380	19.91	20.28	40.19	60.00	-19.81	QP
12	24.0380	5.60	20.28	25.88	50.00	-24.12	AVG

Remark:

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

100.0 dBuV





3.2 RADIATED EMISSION AND (BANDEDGE) MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

In case the emission fall within the restricted band specified on 15.407(b)7& 15.205/209(a), then the (a); limit in the table below has to be followed.

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 (Above 1000MHz)

FREQUENCY (MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	68.2	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15E.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

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

For Band edge

Spectrum Parameter	Setting
Detector	Peak
RB / VB (emission in restricted band)	1 MHz / 1 MHz, AV=1 MHz /3 MHz



Receiver Parameter	Setting
Attenuation	Auto
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

- 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.
- 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.
- 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
- 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.
- 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.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

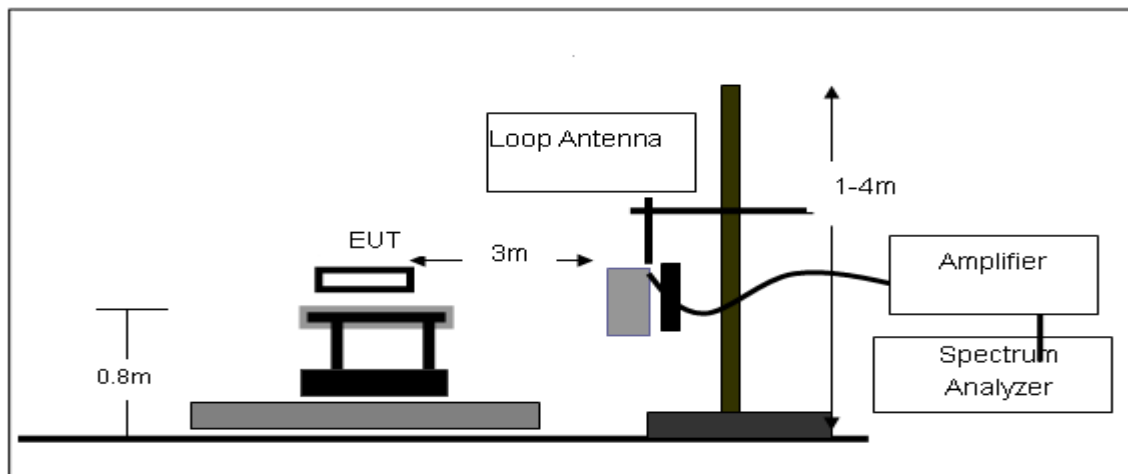
Both horizontal and vertical antenna polarities were tested and performed test to three orthogonal axis. The worst case emissions were reported

3.2.2 DEVIATION FROM TEST STANDARD

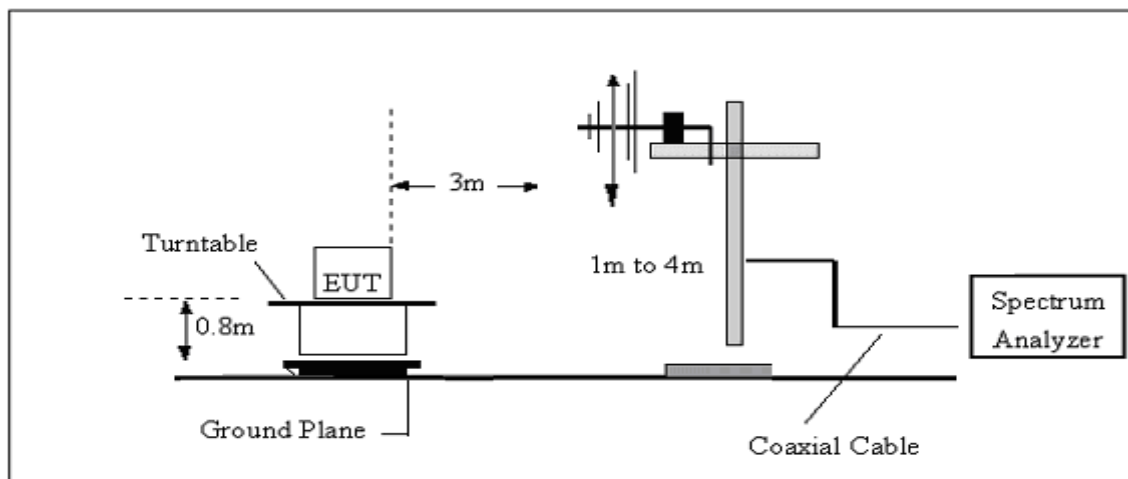
No deviation

3.2.3 TEST SETUP

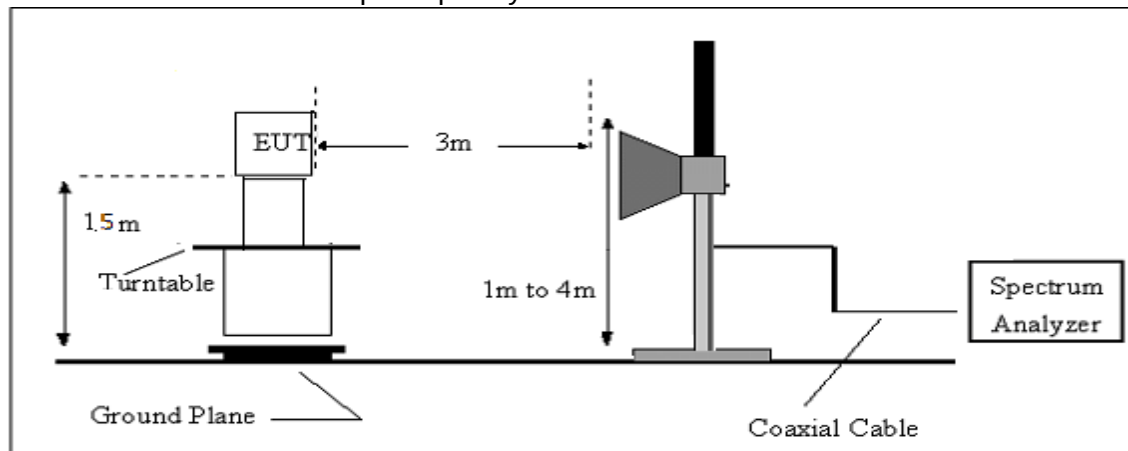
(A) Radiated Emission Test-Up Frequency Below 30MHz



(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 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.5 FIELD STRENGTH CALCULATION

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

$$FS = RA + AF + CL - AG$$

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

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

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

**3.2.6 TEST RESULTS (Between 9KHz – 30 MHz)**

Temperature:	23.4(C)	Relative Humidity:	56%RH
Test Voltage :	DC 22.2V from battery	Polarization :	--
Test Mode :	TX Mode		

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

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance/test distance})$ (dB);

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

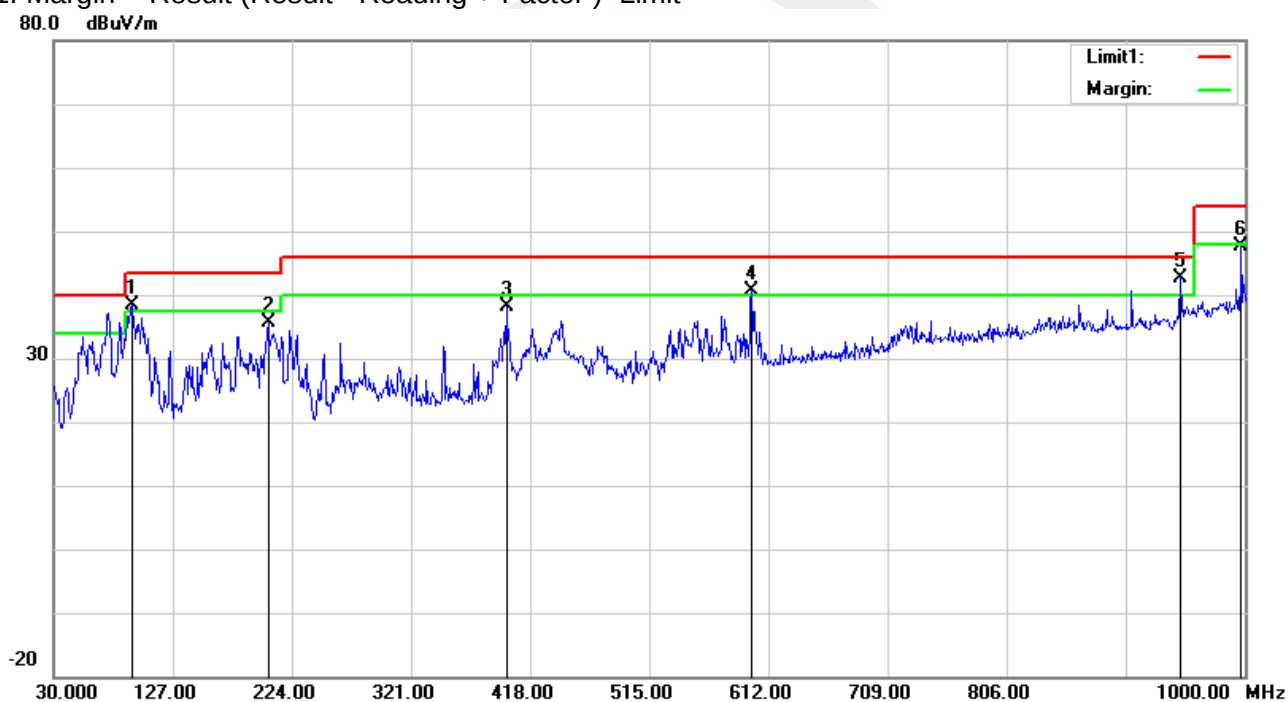
**3.2.7 TEST RESULTS (Between 30MHz – 1GHz)**

Temperature	23.4(C)	Relative Humidity:	56%RH
Test Voltage	DC 22.2V from battery	Polarization:	Horizontal
Test Mode	Mode 1/2/3 (Mode 1 worst mode)		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	94.0200	59.30	-20.89	38.41	43.50	-5.09	QP
2	204.6000	56.32	-20.80	35.52	43.50	-7.98	QP
3	398.6000	49.37	-11.20	38.17	46.00	-7.83	QP
4	598.4200	46.40	-5.85	40.55	46.00	-5.45	QP
5	947.6200	40.97	1.55	42.52	46.00	-3.48	QP
6	997.0900	45.58	2.04	47.62	54.00	-6.38	QP

Remark:

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





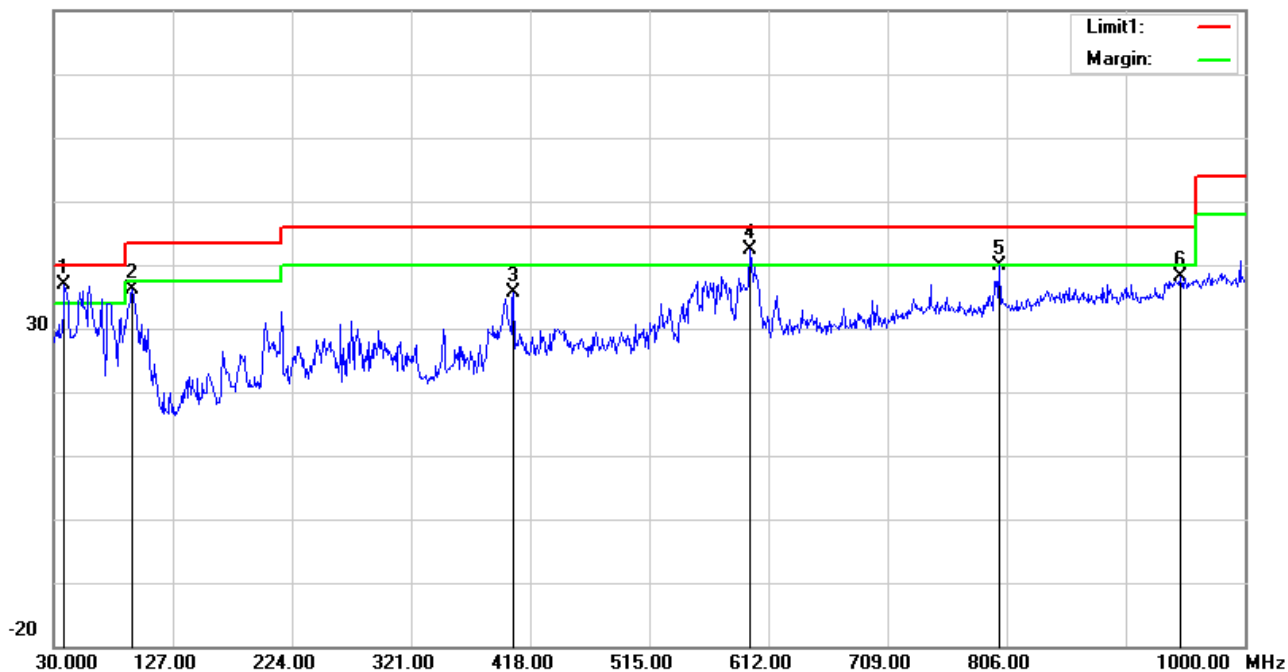
Temperature	23.4(C)	Relative Humidity:	56%RH
Test Voltage	DC 22.2V from battery	Polarization:	Vertical
Test Mode	Mode 1/2/3 (Mode 1 worst mode)		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	38.7300	54.34	-17.36	36.98	40.00	-3.02	QP
2	94.0200	56.98	-20.89	36.09	43.50	-7.41	QP
3	404.4200	46.54	-10.88	35.66	46.00	-10.34	QP
4	596.4800	48.20	-5.84	42.36	46.00	-3.64	QP
5	800.1800	41.91	-2.05	39.86	46.00	-6.14	QP
6	947.6200	36.60	1.55	38.15	46.00	-7.85	QP

Remark:

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

80.0 dBuV/m



**3.2.8 TEST RESULTS (Above 1000 MHz)****Ant A+B**

Frequency (MHz)	Reading	Amplifier	Loss	Antenna Factor	Orrected Factor	Emission Level	Limit (dBuV/m)	Margin	Detector	Comment
	(dBuV)	(dB)	(dB)	(dB/m)	(dB)	(dBμV/m)		(dB)		
Low Channel (5740 MHz)										
3602.58	44.11	44.70	6.70	28.20	-9.80	34.31	68.20	-33.89	Pk	Vertical
3602.58	41.45	44.70	6.70	28.20	-9.80	31.65	54.00	-22.35	AV	Vertical
3605.90	44.87	44.70	6.70	28.20	-9.80	35.07	68.20	-33.13	Pk	Horizontal
3605.90	41.99	44.70	6.70	28.20	-9.80	32.19	54.00	-21.81	AV	Horizontal
4432.50	38.89	44.20	7.90	29.70	-6.60	32.29	68.20	-35.91	Pk	Vertical
4432.50	35.73	44.20	7.90	29.70	-6.60	29.13	54.00	-24.87	AV	Vertical
4421.55	39.35	44.20	7.90	29.70	-6.60	32.75	68.20	-35.45	Pk	Horizontal
4421.55	36.29	44.20	7.90	29.70	-6.60	29.69	54.00	-24.31	AV	Horizontal
8006.09	37.05	43.50	11.40	35.50	3.40	40.45	68.20	-27.75	Pk	Vertical
8006.09	33.99	43.50	11.40	35.50	3.40	37.39	54.00	-16.61	AV	Vertical
7998.30	37.91	43.50	11.40	35.50	3.40	41.31	68.20	-26.89	Pk	Horizontal
7998.30	33.68	43.50	11.40	35.50	3.40	37.08	54.00	-16.92	AV	Horizontal
11479.99	38.71	44.50	13.80	38.80	8.10	46.81	68.20	-21.39	Pk	Vertical
11479.99	36.37	44.50	13.80	38.80	8.10	44.47	54.00	-9.53	AV	Vertical
11479.94	39.60	44.50	13.80	38.80	8.10	47.70	68.20	-20.50	Pk	Horizontal
11479.94	35.71	44.50	13.80	38.80	8.10	43.81	54.00	-10.19	AV	Horizontal
12207.81	33.80	43.60	14.30	39.50	10.20	44.00	68.20	-24.20	Pk	Vertical
12207.81	29.94	43.60	14.30	39.50	10.20	40.14	54.00	-13.86	AV	Vertical
12226.69	34.04	43.60	14.30	39.50	10.20	44.24	68.20	-23.96	Pk	Horizontal
12226.69	30.50	43.60	14.30	39.50	10.20	40.70	54.00	-13.30	AV	Horizontal
14735.85	32.27	42.60	15.90	38.90	12.20	44.47	68.20	-23.73	Pk	Vertical
14735.85	29.29	42.60	15.90	38.90	12.20	41.49	54.00	-12.51	AV	Vertical
14718.26	32.23	42.60	15.90	38.90	12.20	44.43	68.20	-23.77	Pk	Horizontal
14718.26	28.93	42.60	15.90	38.90	12.20	41.13	54.00	-12.87	AV	Horizontal



Mid Channel (5790 MHz)										
3618.92	43.77	44.70	6.70	28.20	-9.80	33.97	68.20	-34.23	Pk	Vertical
3601.52	41.84	44.70	6.70	28.20	-9.80	32.04	54.00	-21.96	AV	Vertical
3602.83	44.65	44.70	6.70	28.20	-9.80	34.85	68.20	-33.35	Pk	Horizontal
3602.83	41.00	44.70	6.70	28.20	-9.80	31.20	54.00	-22.80	AV	Horizontal
4415.47	39.83	44.20	7.90	29.70	-6.60	33.23	68.20	-34.97	Pk	Vertical
4415.47	36.42	44.20	7.90	29.70	-6.60	29.82	54.00	-24.18	AV	Vertical
4432.51	39.54	44.20	7.90	29.70	-6.60	32.94	68.20	-35.26	Pk	Horizontal
4432.51	36.80	44.20	7.90	29.70	-6.60	30.20	54.00	-23.80	AV	Horizontal
8007.67	36.44	43.50	11.40	35.50	3.40	39.84	68.20	-28.36	Pk	Vertical
8007.67	34.06	43.50	11.40	35.50	3.40	37.46	54.00	-16.54	AV	Vertical
8006.13	37.19	43.50	11.40	35.50	3.40	40.59	68.20	-27.61	Pk	Horizontal
8006.13	33.77	43.50	11.40	35.50	3.40	37.17	54.00	-16.83	AV	Horizontal
11524.38	38.89	44.50	13.80	38.80	8.10	46.99	68.20	-21.21	Pk	Vertical
11524.38	36.96	44.50	13.80	38.80	8.10	45.06	54.00	-8.94	AV	Vertical
11524.66	39.28	44.50	13.80	38.80	8.10	47.38	68.20	-20.82	Pk	Horizontal
11524.66	36.61	44.50	13.80	38.80	8.10	44.71	54.00	-9.29	AV	Horizontal
12219.25	32.98	43.60	14.30	39.50	10.20	43.18	68.20	-25.02	Pk	Vertical
12219.25	30.18	43.60	14.30	39.50	10.20	40.38	54.00	-13.62	AV	Vertical
12226.45	33.74	43.60	14.30	39.50	10.20	43.94	68.20	-24.26	Pk	Horizontal
12226.45	30.67	43.60	14.30	39.50	10.20	40.87	54.00	-13.13	AV	Horizontal
14716.34	32.50	42.60	15.90	38.90	12.20	44.70	68.20	-23.50	Pk	Vertical
14716.34	29.87	42.60	15.90	38.90	12.20	42.07	54.00	-11.93	AV	Vertical
14731.29	32.67	42.60	15.90	38.90	12.20	44.87	68.20	-23.33	Pk	Horizontal
14731.29	28.92	42.60	15.90	38.90	12.20	41.12	54.00	-12.88	AV	Horizontal



High Channel (5830 MHz)										
3629.97	45.20	44.70	6.70	28.20	-9.80	35.40	68.20	-32.80	Pk	Vertical
3629.97	41.04	44.70	6.70	28.20	-9.80	31.24	54.00	-22.76	AV	Vertical
3624.27	43.86	44.70	6.70	28.20	-9.80	34.06	68.20	-34.14	Pk	Horizontal
3624.27	41.76	44.70	6.70	28.20	-9.80	31.96	54.00	-22.04	AV	Horizontal
4450.67	38.95	44.20	7.90	29.70	-6.60	32.35	68.20	-35.85	Pk	Vertical
4450.67	36.32	44.20	7.90	29.70	-6.60	29.72	54.00	-24.28	AV	Vertical
4433.10	39.82	44.20	7.90	29.70	-6.60	33.22	68.20	-34.98	Pk	Horizontal
4433.10	36.80	44.20	7.90	29.70	-6.60	30.20	54.00	-23.80	AV	Horizontal
8050.44	37.42	43.50	11.40	35.50	3.40	40.82	68.20	-27.38	Pk	Vertical
8050.44	34.27	43.50	11.40	35.50	3.40	37.67	54.00	-16.33	AV	Vertical
8030.36	36.72	43.50	11.40	35.50	3.40	40.12	68.20	-28.08	Pk	Horizontal
8030.36	34.27	43.50	11.40	35.50	3.40	37.67	54.00	-16.33	AV	Horizontal
11660.14	38.88	44.50	13.80	38.80	8.10	46.98	68.20	-21.22	Pk	Vertical
11660.14	36.21	44.50	13.80	38.80	8.10	44.31	54.00	-9.69	AV	Vertical
11660.08	40.09	44.50	13.80	38.80	8.10	48.19	68.20	-20.01	Pk	Horizontal
11660.08	37.13	44.50	13.80	38.80	8.10	45.23	54.00	-8.77	AV	Horizontal
12274.22	33.45	43.60	14.30	39.50	10.20	43.65	68.20	-24.55	Pk	Vertical
12274.22	30.96	43.60	14.30	39.50	10.20	41.16	54.00	-12.84	AV	Vertical
12261.04	33.98	43.60	14.30	39.50	10.20	44.18	68.20	-24.02	Pk	Horizontal
12261.04	29.77	43.60	14.30	39.50	10.20	39.97	54.00	-14.03	AV	Horizontal
14791.09	32.28	42.60	15.90	38.90	12.20	44.48	68.20	-23.72	Pk	Vertical
14791.09	28.85	42.60	15.90	38.90	12.20	41.05	54.00	-12.95	AV	Vertical
14775.61	31.76	42.60	15.90	38.90	12.20	43.96	68.20	-24.24	Pk	Horizontal
14775.61	28.54	42.60	15.90	38.90	12.20	40.74	54.00	-13.26	AV	Horizontal

Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
2. 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. All mode has been tested, only shown the worst case in this report.

3.2.9 Band Edge

Note: The main frequency is too far away from the restricted band and does not require testing.

4. CONDUCTED SPURIOUS EMISSIONS AND BANDEDGE

4.1 LIMIT

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band:
 - (i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

4.2 TEST PROCEDURE

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	1000 KHz/3000 KHz
Trace-Mode:	Max hold

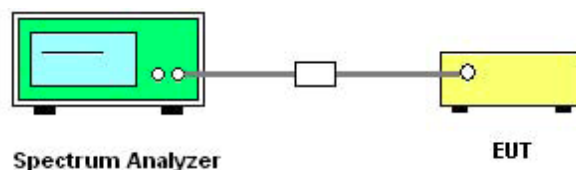
For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 5700 to 5725 MHz Upper Band Edge: 5850 to 5870 MHz
RB / VB (emission in restricted band)	1000 KHz/3000 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) = 1000 kHz. In order to make an accurate measurement, set the span greater than RBW.



4.5 EUT OPERATION CONDITIONS

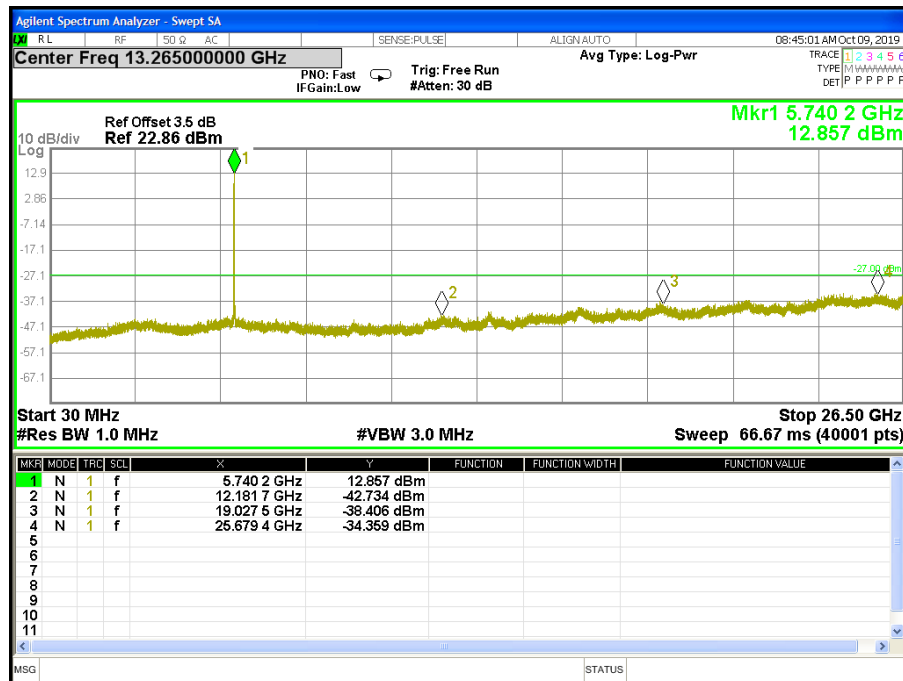
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

4.6 TEST RESULTS

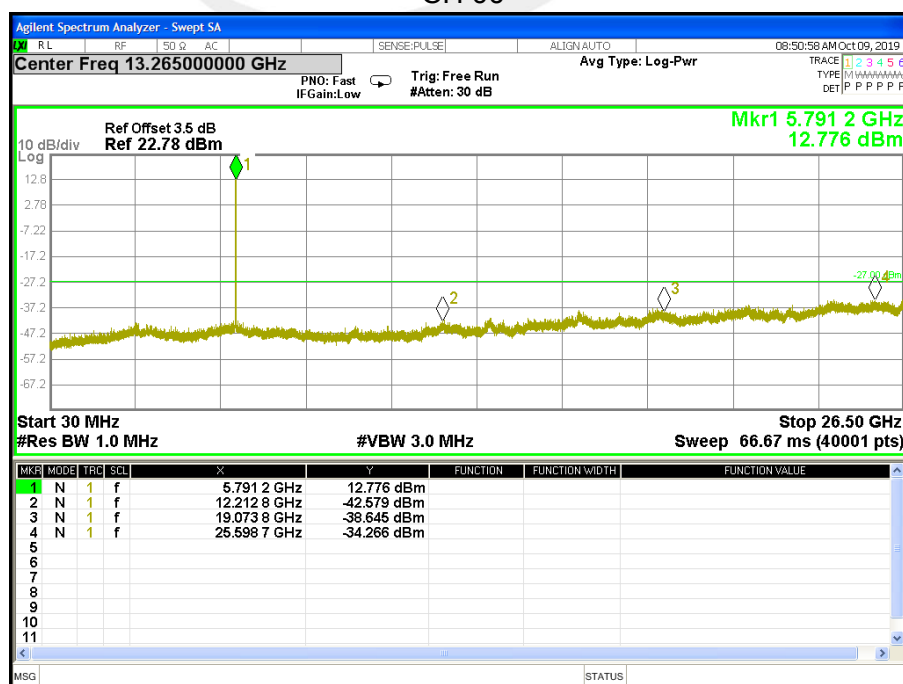
Note: All mode has been tested, only shown the worst case in this report.

Temperature:	25°C	Relative Humidity:	60%
Test Voltage:	DC 22.2V from battery	Test Mode:	CH01, CH06, CH10/Ant A

CH 01

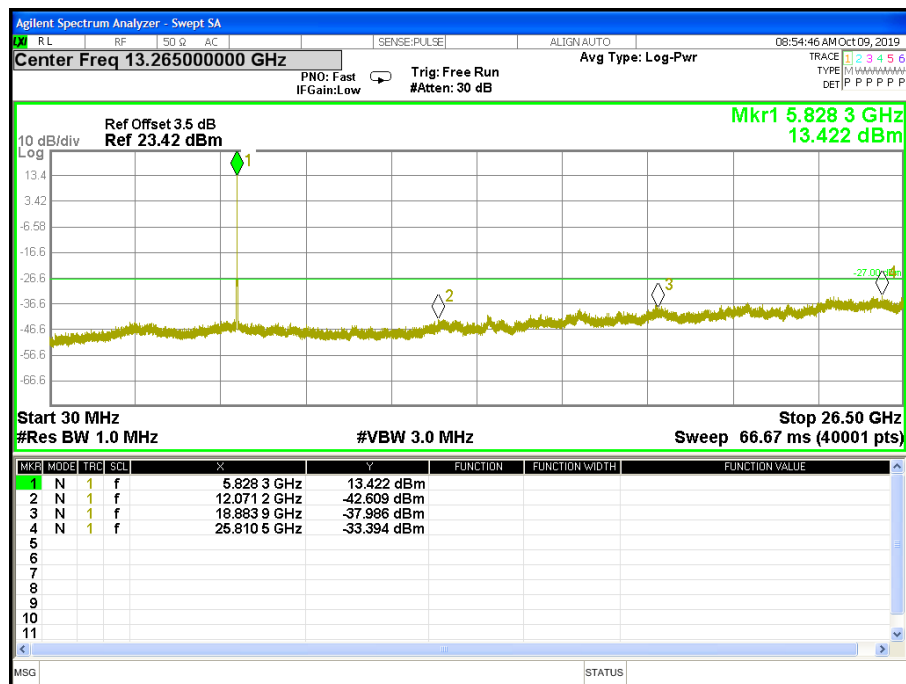


CH 06





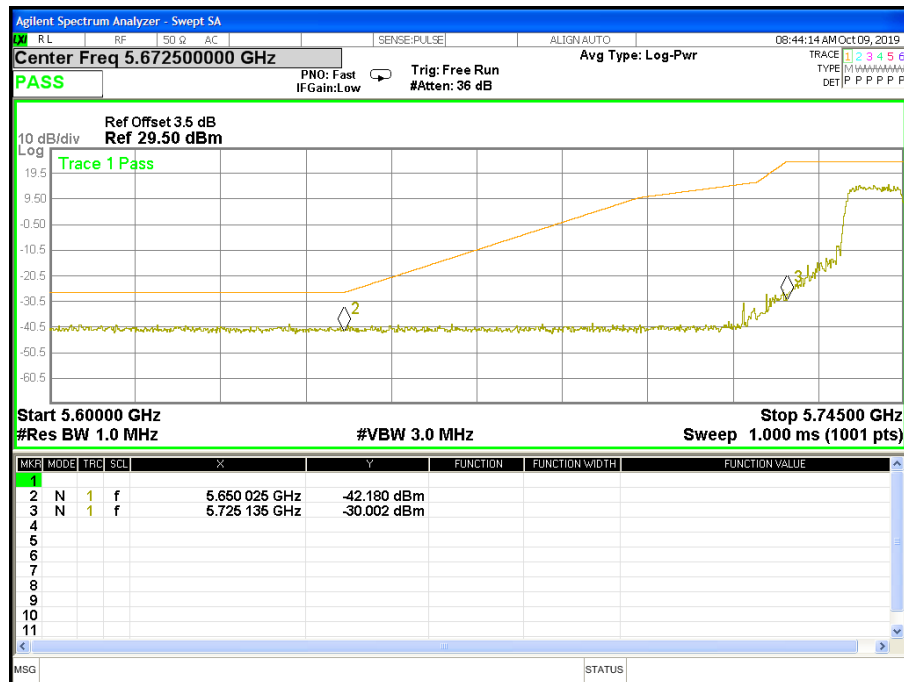
CH 10



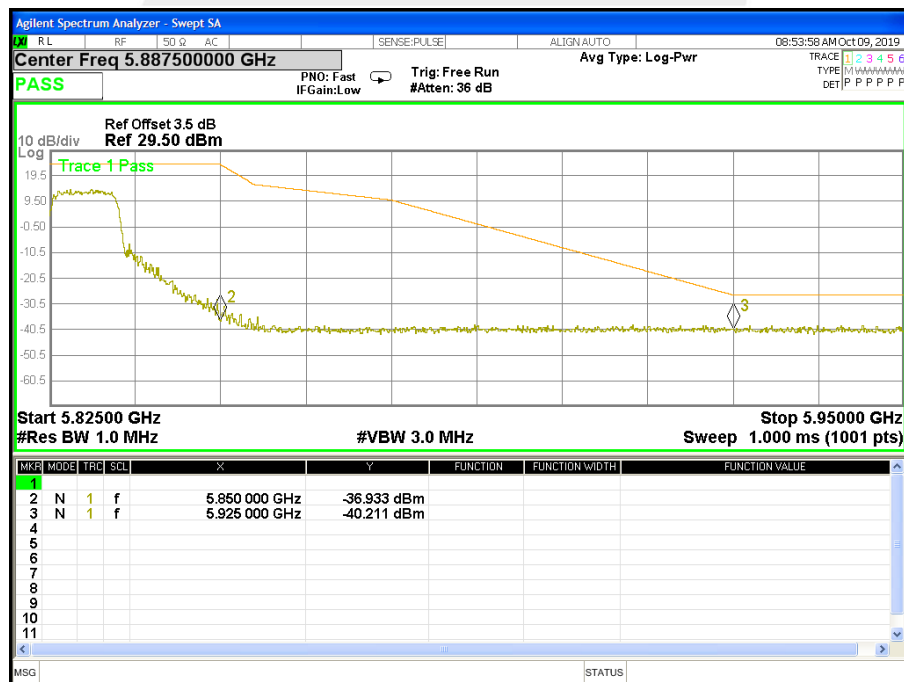


Band edge

CH 01



CH 10





5. POWER SPECTRAL DENSITY TEST

5.1 LIMIT

1. For mobile and portable client devices in the 5.15-5.25 GHz band, , the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
2. For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
3. For the band 5.725-5.850 GHz, the peak power spectral density shall not exceed 30 dBm in any 500KHz band. If transmitting antenna directional gain is greater than 6 dBi, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2 TEST PROCEDURE

1. The setting follows Method SA-1 of FCC KDB D02 General UNII Test Procedures New Rules v01r03.

For devices operating in the band, the rules specify a measurement bandwidth of 500 kHz.

Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used.

The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (*i.e.*, 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:

- a) Set $RBW \geq 1/T$, where T is defined in section II.B.I.a).
- b) Set $VBW \geq 3 RBW$.
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10 \log (500\text{kHz}/RBW)$ to the measured result, whereas $RBW (< 500 \text{ kHz})$ is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10 \log (1\text{MHz}/RBW)$ to the measured result, whereas $RBW (< 1 \text{ MHz})$ is the reduced resolution bandwidth of spectrum analyzer set during measurement.
- e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since $RBW=100 \text{ KHZ}$ is available on nearly all spectrum analyzers.



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 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.





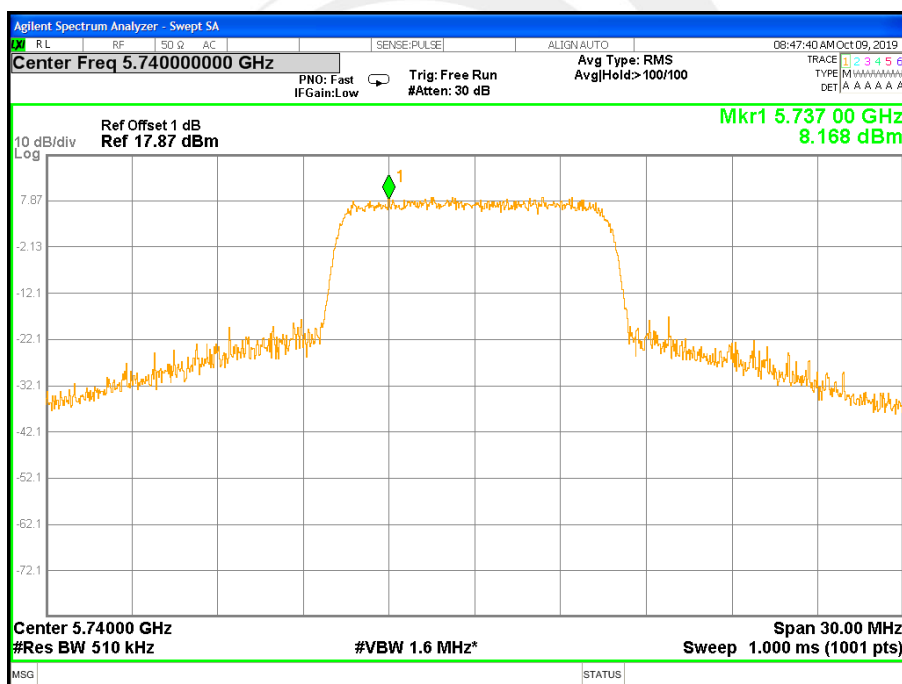
5.6 TEST RESULTS

Note: All mode has been tested, only shown the worst case in this report.

Temperature:	25°C	Relative Humidity:	60%
Test Voltage:	DC 22.2V from battery	Test Mode:	CH01, CH06, CH10/Ant A

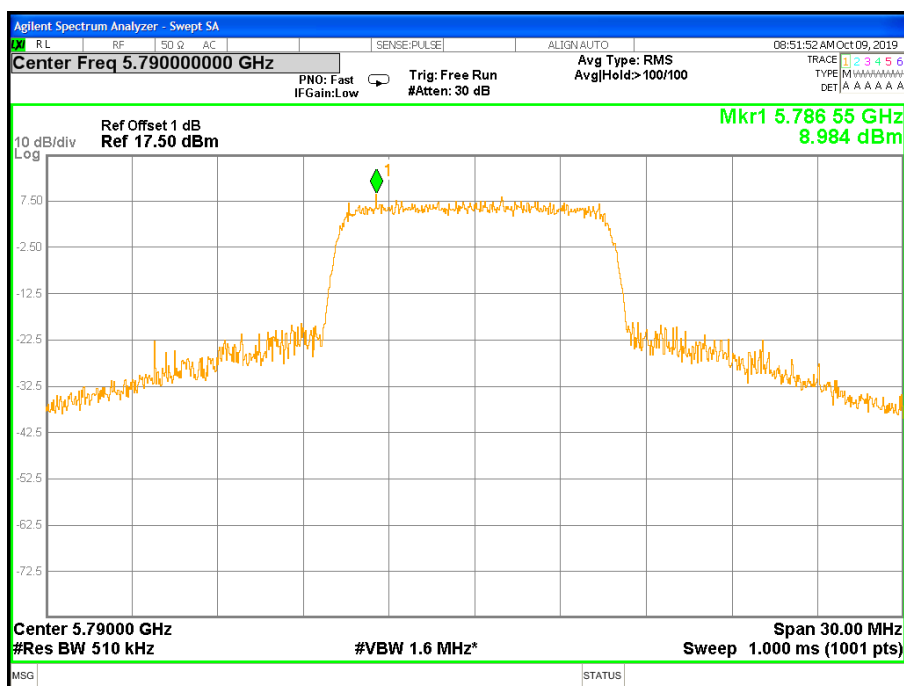
Frequency	Ant_A Power Density(dBm)	Ant_B Power Density(dBm)	Ant_A Duty cycle factor	Ant_B Duty cycle factor	Ant_A Power Density(dBm)	Ant_B Power Density(dBm)	Power Density Total(dBm)	Limit	Result
5740	8.168	9.382	1.3	1.3	9.468	10.682	13.128	30	PASS
5790	8.984	8.502	1.3	1.3	10.284	9.802	13.060	30	PASS
5830	7.750	9.101	1.3	1.3	9.050	10.401	12.788	30	PASS

TX CH01

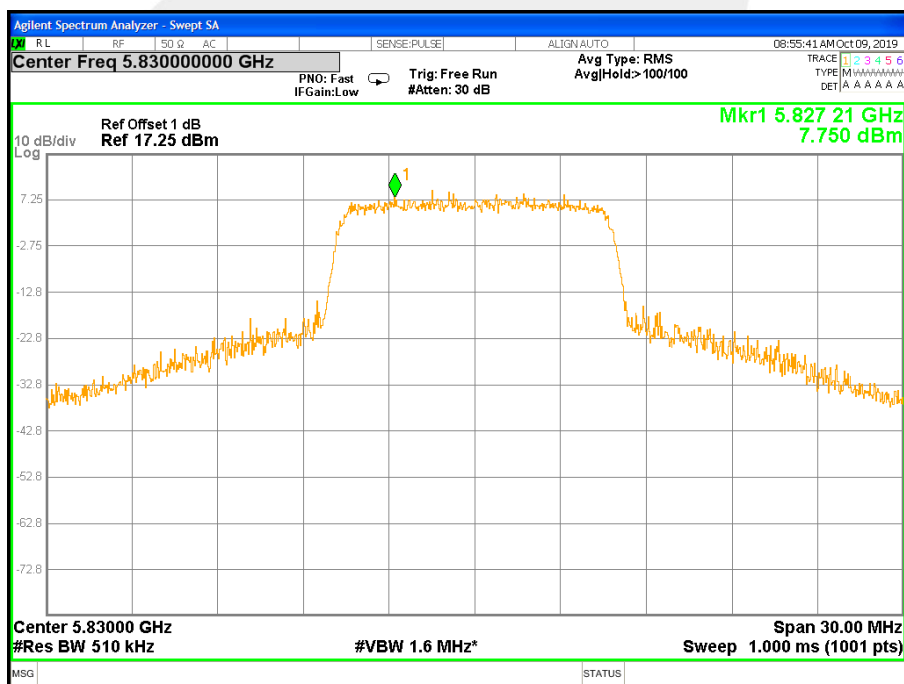




TX CH06



TX CH10





6. BANDWIDTH MEASUREMENT

6.1 EMISSION BANDWIDTH (EBW) 26 BANDWID PROCEDURES / LIMIT

See list of measuring instruments of this test report.

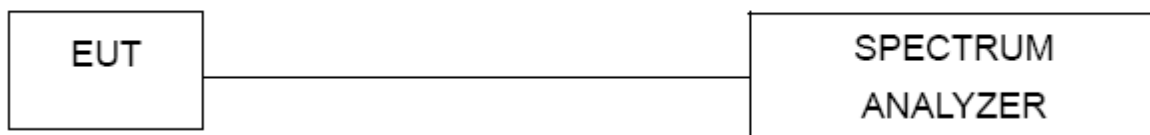
6.1.1 TEST PROCEDURE

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01
2. Set RBW = approximately 1% of the emission bandwidth.
3. Set the VBW $\geq$ RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



6.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



6.1.5 TEST RESULTS

Note: All mode has been tested, only shown the worst case in this report.

Temperature:	25°C	Relative Humidity:	60%
Test Voltage:	DC 22.2V from battery	Test Mode:	CH01, CH06, CH10/Ant A

Frequency (MHz)	26dB Bandwidth (MHz)	Pass/Fail
5740	10.01	Pass
5790	10.03	Pass
2830	9.95	Pass

Test plot see next section





6.2 OCCUPIED BANDWIDTH (99%) TEST APPLIED PROCEDURES / LIMIT

The following procedure shall be used for measuring (99 %) power bandwidth:

6.2.1 TEST PROCEDURE

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures v02r01.

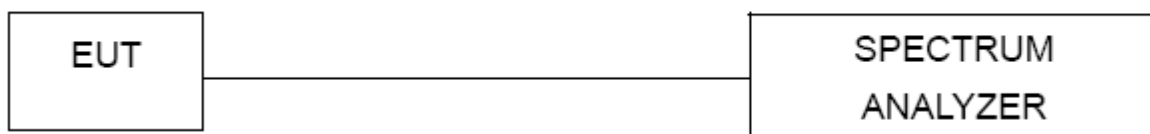
The following procedure shall be used for measuring (99 %) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW $\geq 3 \cdot$ RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

6.2.2 DEVIATION FROM STANDARD

No deviation.

6.2.3 TEST SETUP



6.2.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



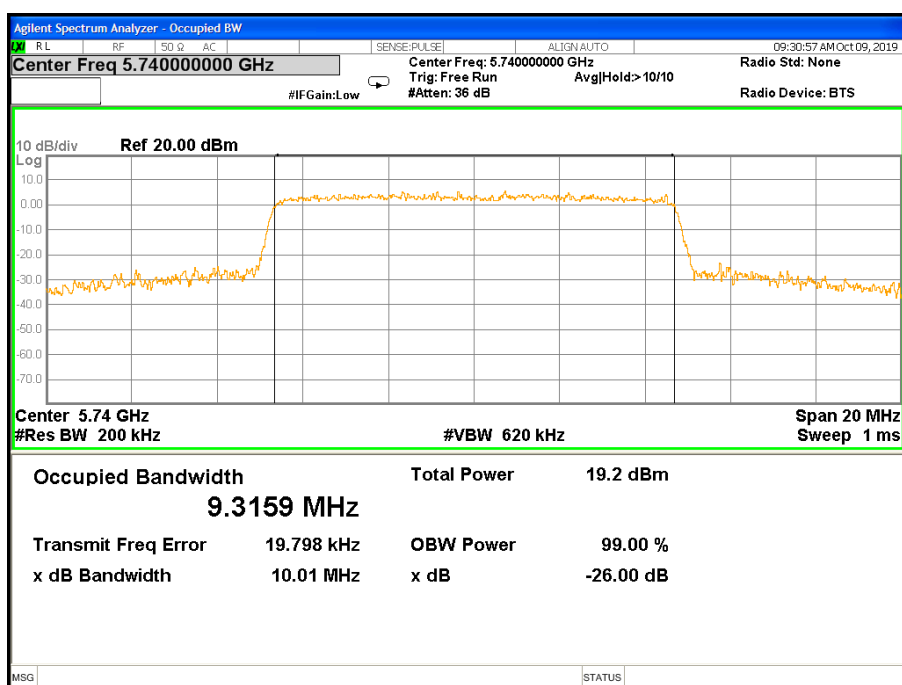
6.2.5 TEST RESULTS

Note: All mode has been tested, only shown the worst case in this report.

Temperature:	25°C	Relative Humidity:	60%
Test Voltage:	DC 22.2V from battery	Test Mode:	CH01, CH06, CH10/Ant A

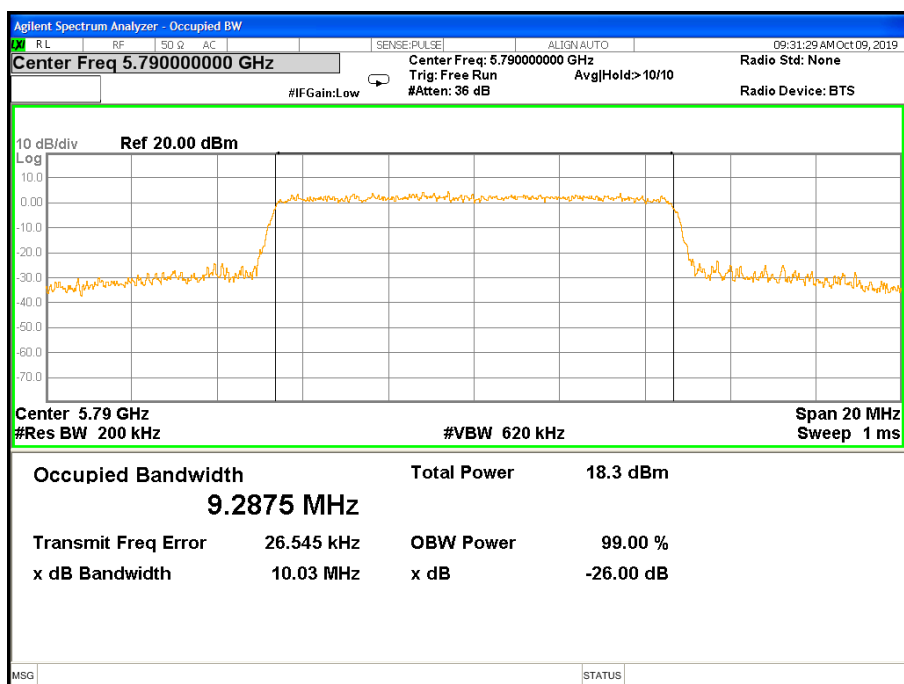
Frequency (MHz)	99% Bandwidth (MHz)	Pass/Fail
5740	9.32	Pass
5790	9.29	Pass
2830	9.31	Pass

TX CH 01

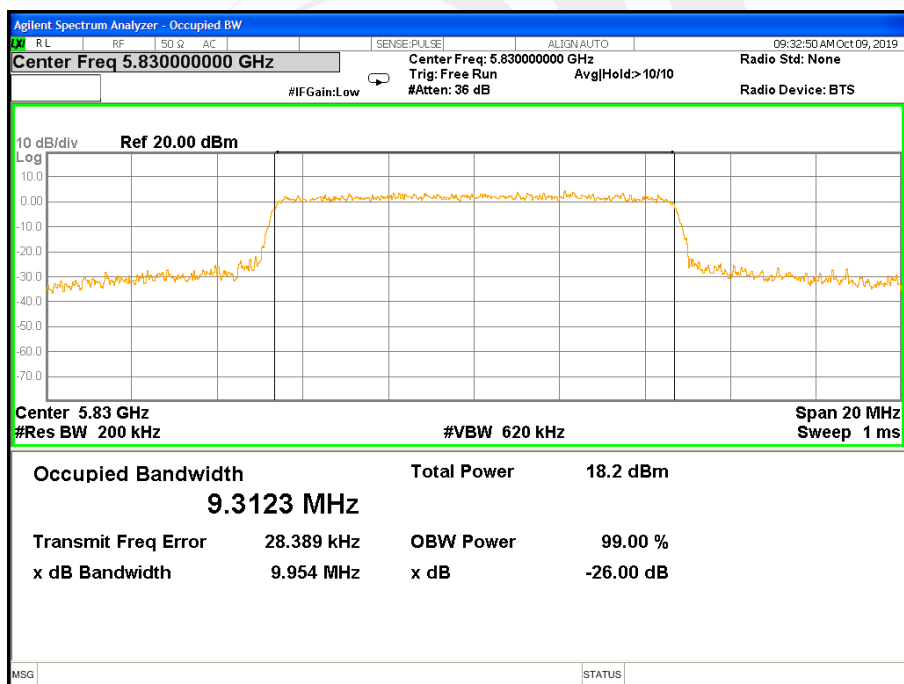




TX CH 06



TX CH 10



6.3 MINIMUM EMISSION BANDWIDTH(6 DB) PROCEDURES / LIMIT

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.725-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

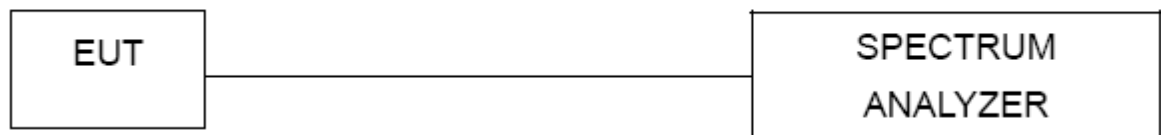
6.3.1 TEST PROCEDURE

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures v02r01.
 - a) Set RBW = 100 kHz.
 - b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
 - c) Detector = Peak.
 - d) Trace mode = max hold.
 - e) Sweep = auto couple.
 - f) Allow the trace to stabilize.
 - g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.3.2 DEVIATION FROM STANDARD

No deviation.

6.3.3 TEST SETUP



6.3.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



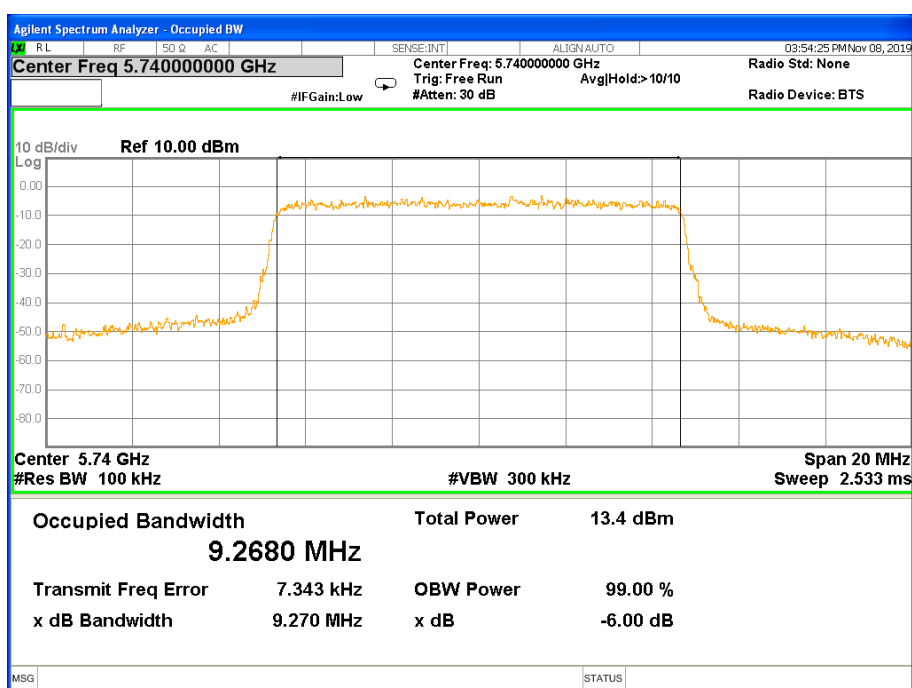
6.3.5 TEST RESULTS

Note: All mode has been tested, only shown the worst case in this report.

Temperature:	25°C	Relative Humidity:	60%
Test Voltage:	DC 22.2V from battery	Test Mode:	CH01, CH06, CH10/Ant A

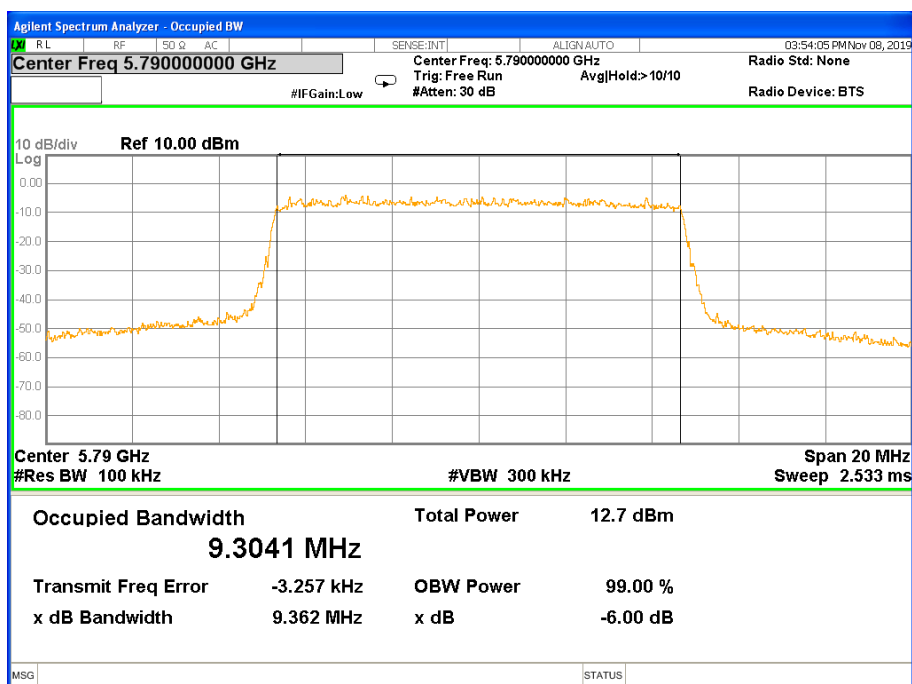
Frequency (MHz)	6dB Bandwidth (MHz)	Limit	Pass/Fail
5740	9.27	≥500KHz	Pass
5790	9.36	≥500KHz	Pass
2830	9.29	≥500KHz	Pass

TX CH 01

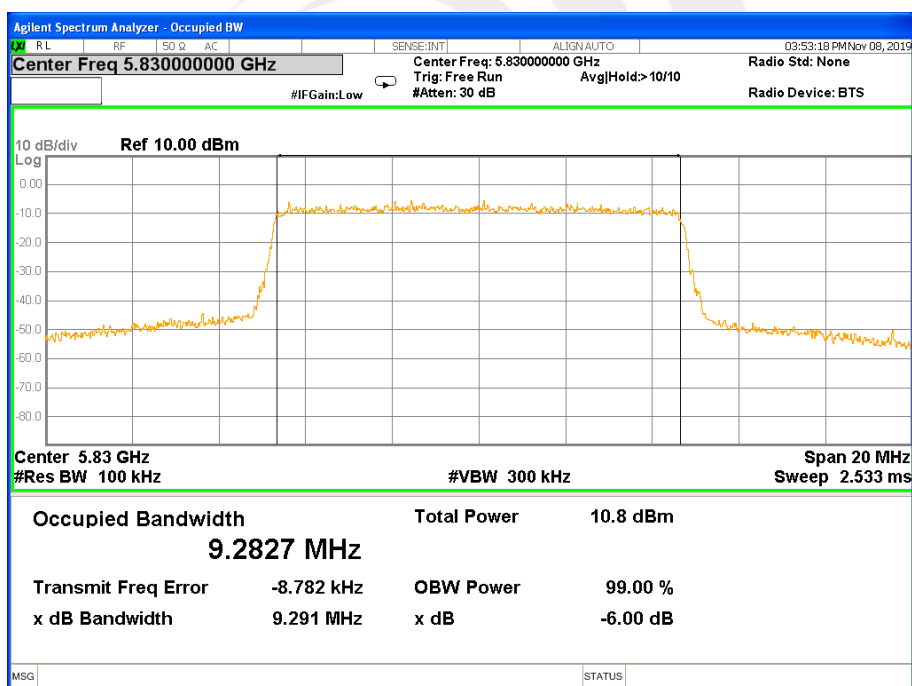




TX CH 06



TX CH 10



7. MAXIMUM CONDUCTED OUTPUT POWER

7.1 LIMIT

For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz, If transmitting antennas of directional gain greater than 6 dBi are used.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used.

FCC Part15 (15.407) , Subpart E				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.407(a) (1) (iv)	Peak Output Power	0.25 watt	5150-5250	PASS
		The lesser of 250 mW or 11 dBm + 10 log (26 dB emission bandwidth)	5250-5350 5470-5725	
15.407(a) (3)		1 watt	5725-5825	

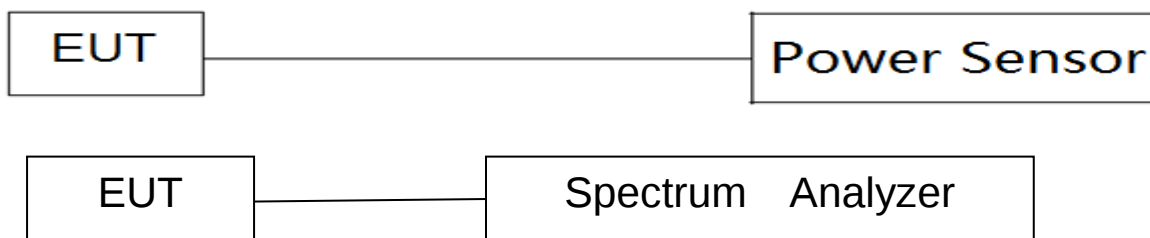
7.2 TEST PROCEDURE

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 5 Unless otherwise a special operating condition is specified in the follows during the testing.

**7.6 TEST RESULTS**

Frequency (MHz)	Ant_A AV Power (dBm)	Ant B_AV Power (dBm)	Ant_A Duty cycle factor(dB)	Ant_B Duty cycle factor(dB)	AV Power (dBm)	AV Power B(dBm)	AV Power Total(dBm)	LIMIT (dBm)
5740	13.21	10.30	1.30	1.30	14.51	11.60	16.305	30
5790	12.12	7.43	1.30	1.30	13.42	8.73	14.690	30
5830	11.18	7.22	1.30	1.30	12.48	8.52	13.947	30

Note:

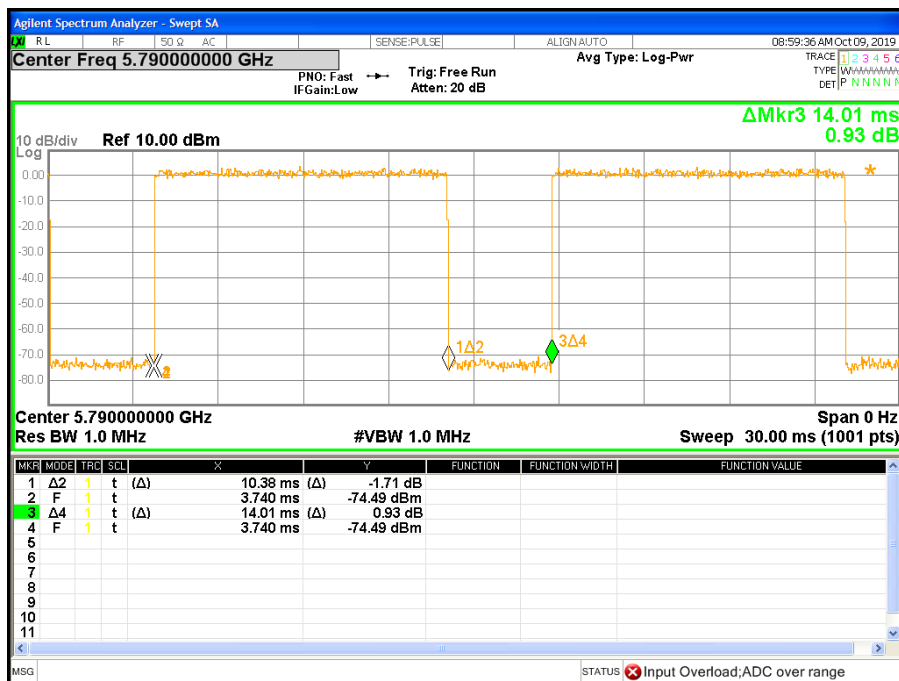
1. For the band 5.740-5.830 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W.





Duty cycle

Ton (ms)	Tp (ms)	Duty cycle(%)	Duty factor(dB)
10.380	14.010	74.09%	1.30





8. AUTOMATICALLY DISCONTINUE TRANSMISSION

8.1 LIMIT OF AUTOMATICALLY DISCONTINUE TRANSMISSION

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

8.2 TEST RESULT OF AUTOMATICALLY DISCONTINUE TRANSMISSION

During no any information transmission, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission





9. ANTENNA REQUIREMENT

9.1 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 party shall be used with the device.

9.2 EUT ANTENNA

The EUT antenna is Dipole 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*****

