FCC PART 15 SUBPART C

CERTIFICATION TEST REPORT

For

Bluetooth to 0-10V Bridge

MODEL NUMBER: CTBRCB03JM03-PC

FCC ID: 2AJ9LCTRCB0XJM0XXXX

REPORT NUMBER: 4788485263.1

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Prepared for

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	08/25/2018	Initial Issue	--

Summary of Test Results			
Clause	Test Items	FCC/IC Rules	Test Results
1	6db DTS Bandwidth	FCC 15.247 (a) (2)	Pass
2	Peak Conducted Power	FCC 15.247 (b) (3)	Pass
3	Power Spectral Density	FCC 15.247 (3)	Pass
4	Conducted Band edge And Spurious emission	FCC 15.247 (d)	Pass
5	Radiated Band edges and Spurious emission	FCC 15.247 (d) FCC 15.209 FCC 15.205	Pass
6	Conducted Emission Test For AC Power Port	FCC 15.207	Pass
7	Antenna Requirement	FCC 15.203	Pass

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	Fulham Electronic Co., Ltd
Address:	No.9 Xingchang Road, Nanshao District,Changping Science Area, Beijing, China

Manufacturer Information

Company Name:	Fulham Electronic Co., Ltd
Address:	No.9 Xingchang Road, Nanshao District,Changping Science Area, Beijing, China

EUT Description

EUT Name:	Bluetooth to 0-10V Bridge
Model:	CTBRCB03JM03-PC
Brand Name:	FULHAM
Sample Status:	Normal
Sample ID:	1102464
Sample Received Date:	15 June 2018
Date of Tested:	15 June 2018 ~ 22 June 2018

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC Part 15 Subpart C	**PASS**

Tested By: Leo li

Leo li
Engineer Project Associate

Checked By: Shawn Wen

Shawn Wen
Laboratory Leader

Approved By: Stephen Guo

Stephen Guo
Laboratory Manager

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with 558074 D01 DTS Meas Guidance v04, 414788 D01 Radiated Test Site v01, FCC CFR 47 Part 2, FCC CFR 47 Part 15 and ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	**A2LA (Certificate No.: 4338.01)** Shenzhen STS Test Services Co., Ltd. has been assessed and proved to be in compliance with A2LA. **CNAS (Registration No.: L7649)** Shenzhen STS Test Services Co., Ltd. has been assessed and proved to be in compliance with CNAS. **FCC (FCC Designation No.: 625569)** Shenzhen STS Test Services Co., Ltd. has been recognized to perform compliance testing on equipment subject to the Commission's Delcaration of Conformity (DoC) and Certification rules **IC(Company No.: 12108A)** Shenzhen STS Test Services Co., Ltd. has been registered and fully described in a report filed with Industry Canada. The Company Number is 12108A.

Note 1: All tests measurement facilities use to collect the measurement data are located at Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

Note 2: The test anechoic chamber in Shenzhen STS Test Services Co., Ltd. had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. 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	Conducted Emission (9KHz-150KHz)	±2.88dB
2	Conducted Emission (150KHz-30MHz)	±2.67dB
3	RF power,conducted	±0.71dB
4	Spurious emissions,conducted	±0.63dB
5	All emissions,radiated (9KHz-30MHz)	±3.02dB
6	All emissions,radiated (30MHz-200MHz)	±3.80dB
7	All emissions,radiated (200MHz-1000MHz)	±3.97dB
8	All emissions,radiated(>1G)	±3.03dB

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name	Bluetooth to 0-10V Bridge		
EUT Description	The device is a Lighting Controller with wireless		
Model	CTBRCB03JM03-PC		
Series Model	CTBRCB03JM03-PC -XXX,CTBRCB02JM02, CTBRCB02JM02-XXX		
Model Difference	1. PCB layout is the same, the main and the secondary difference in the main model can adjust the light color, the secondary can only adjust the light. 2. Where suffix xxx may be any alphanumeric character 0 to 9 or A to Z to indicate cosmetic variations, or may be blank.		
Product Description (Bluetooth)	Operation Frequency	2402 MHz ~ 2480 MHz	
	Modulation Type		Data Rate
	GFSK		1Mbps
Power Supply	Input	AC 120-277V, 50/60Hz	
	Output	600W; Series Model :600W	
Bluetooth Version	BT V5.0		
Hardware Version	1.2 & 1.0		
Software Version	2.9		

5.2. MAXIMUM OUTPUT POWER

Frequency Range (MHz)	Number of Transmit Chains (NTX)	Bluetooth Mode	Frequency (MHz)	Channel Number	Max PK Conducted Power (dBm)
2400-2483.5	1	BLE	2402-2480	0-39[40]	-0.31

5.3. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	11	2424	22	2446	33	2468
01	2404	12	2426	23	2448	34	2470
02	2406	13	2428	24	2450	35	2472
03	2408	14	2430	25	2452	36	2474
04	2410	15	2432	26	2454	37	2476
05	2412	16	2434	27	2456	38	2478
06	2414	17	2436	28	2458	39	2480
07	2416	18	2438	29	2460		
08	2418	19	2440	30	2462		
09	2420	20	2442	31	2464		
10	2422	21	2444	32	2466		

5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
GFSK	CH 00, CH 19, CH 39	2402MHz, 2440MHz, 2480MHz

5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band				
Modulation Type	Transmit Antenna Number	Test Channel		
		CH 00	CH 19	CH 39
GFSK	1	Default	Default	Default

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2402-2480	PIFA Antenna	1.0

Test Mode	Transmit and Receive Mode	Description
GFSK	☒1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.

5.7. WORST-CASE CONFIGURATIONS

Bluetooth Mode	Modulation Technology	Modulation Type	Data Rate (Mbps)
BLE	DTS	GFSK	1Mbit/s

5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	Notebook	HP	500-320cx	N/A

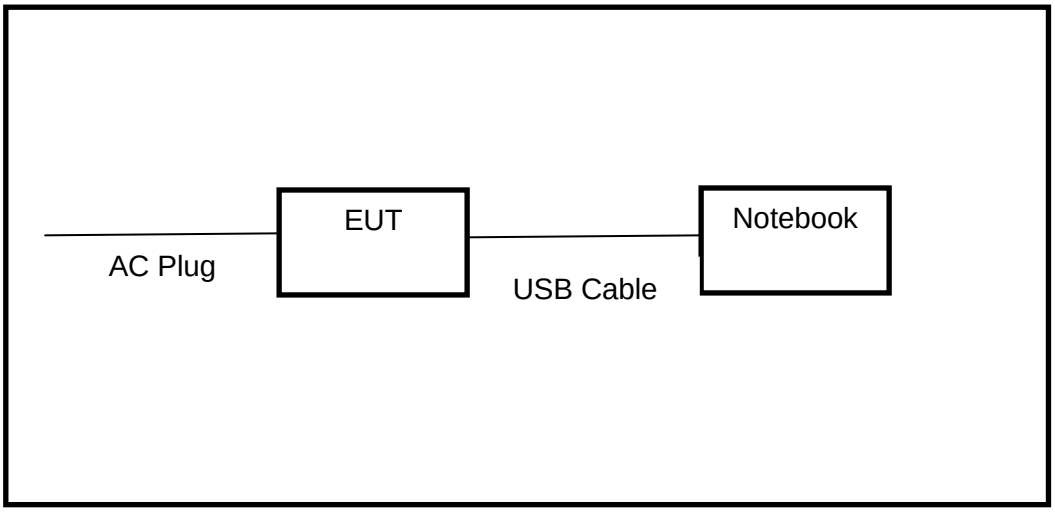
I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(cm)	Remarks
1	USB Cable	N/A	N/A	100	N/A

TEST SETUP

The EUT can work in an engineer mode with a software through a Laptop.

SETUP DIAGRAM FOR TESTS



6. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
🗸	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 & Humitidy	Mieo	HH660	N/A	2017.10.15	2018.10.14
Radiated Emissions						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
🗸	EMI Test Receiver	R&S	ESCI	102086	2017.10.15	2018.10.14
🗸	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 & Humitidy	HH660	Mieo	N/A	2017.10.15	2018.10.14
🗸	Temperature & Humitidy	HH660	Mieo	N/A	2017.10.15	2018.10.14
🗸	Pre-mplifier (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

Other instruments						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☗	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

7. MEASUREMENT METHODS

No.	Test Item	KDB Name	Section
1	6dB Bandwidth and 99% Bandwidth	KDB 558074 D01 DTS Meas Guidance v04	8.0
2	Peak Output Power	KDB 558074 D01 DTS Meas Guidance v04	9.1.3
3	Power Spectral Density	KDB 558074 D01 DTS Meas Guidance v04	10.2
4	Out-of-band emissions in non-restricted bands	KDB 558074 D01 DTS Meas Guidance v04	11.0
5	Out-of-band emissions in restricted bands	KDB 558074 D01 DTS Meas Guidance v04	12.1
6	Band-edge	KDB 558074 D01 DTS Meas Guidance v04	13.3.2
7	Conducted Emission Test For AC Power Port	ANSI C63.10-2013	7.3

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

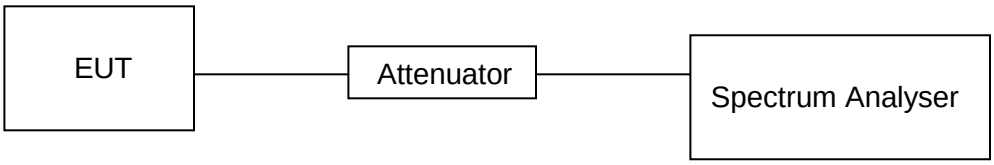
LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



TEST ENVIRONMENT

Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz

RESULTS

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/B Minimum VBW (KHz)
GFSK	0.408	0.622	0.656	65.59	1.83	2.45

Note: Duty Cycle Correction Factor=10log(1/x).
Where: x is Duty Cycle(Linear)
Where: B is On Time

ON TIME AND DUTY CYCLE MID CH

8.2. 6 dB BANDWIDTH & 99% BANDWIDTH

LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(a)(2)	6dB Bandwidth	>= 500KHz	2400-2483.5

TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	For 6 dB Bandwidth :100K For 99% Bandwidth :1% to 5% of the occupied bandwidth
VBW	For 6dB Bandwidth : ≥3 × RBW For 99% Bandwidth : approximately 3×RBW
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and 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 and 99% relative to the maximum level measured in the fundamental emission.

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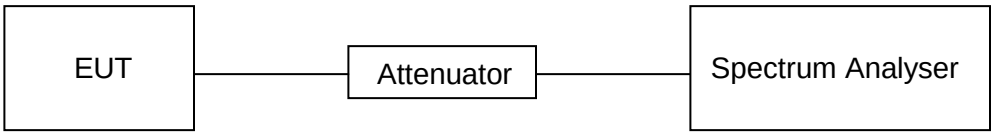
TEST SETUP



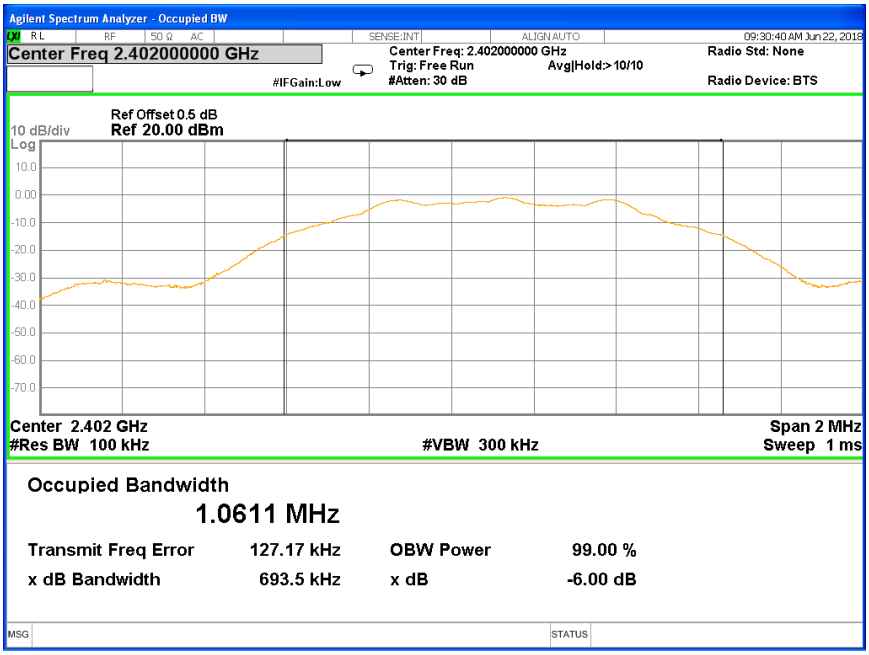
TEST ENVIRONMENT

Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz

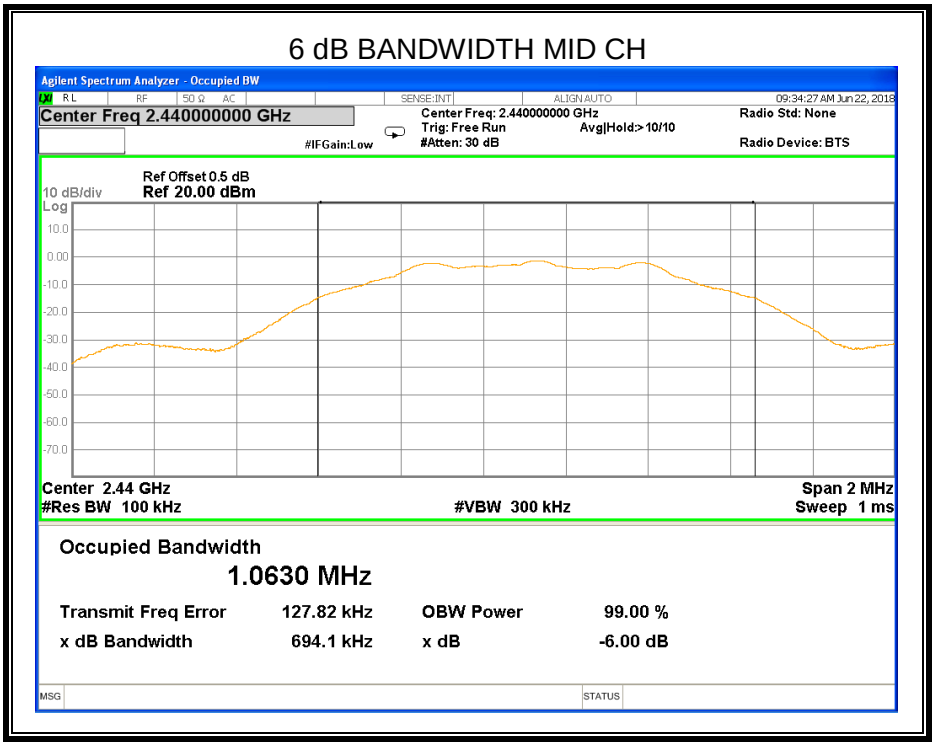
RESULTS

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
Low	2402	0.694	500	Pass
Middle	2440	0.694	500	Pass
High	2480	0.686	500	Pass

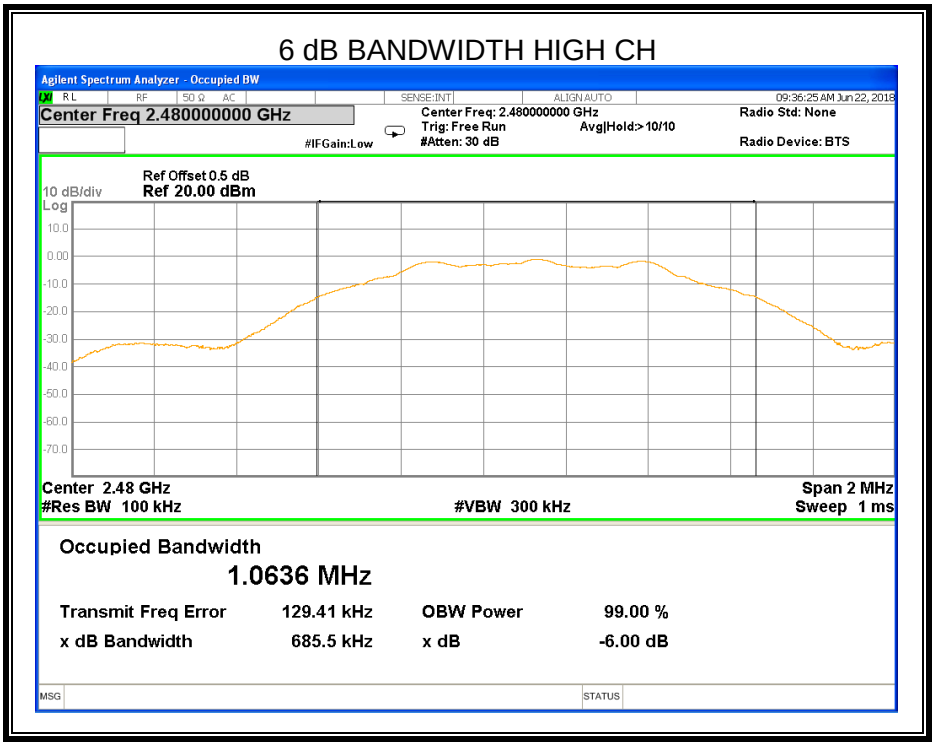
6 dB BANDWIDTH LOW CH



6 dB BANDWIDTH MID CH



6 dB BANDWIDTH HIGH CH



8.3. PEAK CONDUCTED OUTPUT POWER

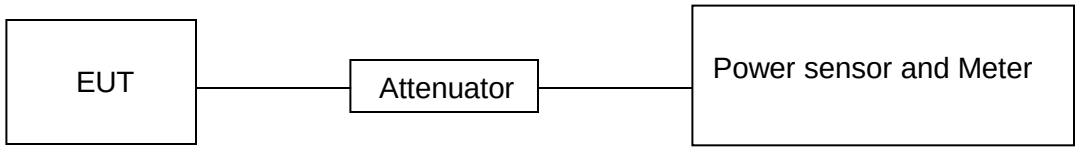
LIMITS

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

TEST PROCEDURE

Place the EUT on the table and set it in the transmitting mode.
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.
Measure peak power each channel.

TEST SETUP



TEST ENVIRONMENT

Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz

RESULTS

Test Channel	Frequency	Maximum Conducted Output Power(PK)	LIMIT
	(MHz)	(dBm)	dBm
Low	2402	-0.31	30
Middle	2440	-0.54	30
High	2480	-0.72	30

8.4. POWER SPECTRAL DENSITY

LIMITS

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC §15.247 (e)	Power Spectral Density	8 dBm in any 3 kHz band	2400-2483.5

TEST PROCEDURE

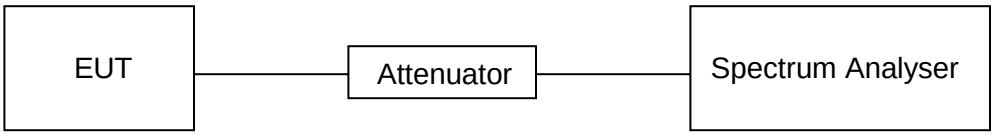
Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	3 kHz ≤ RBW ≤ 100kHz
VBW	≥3 × RBW
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST SETUP



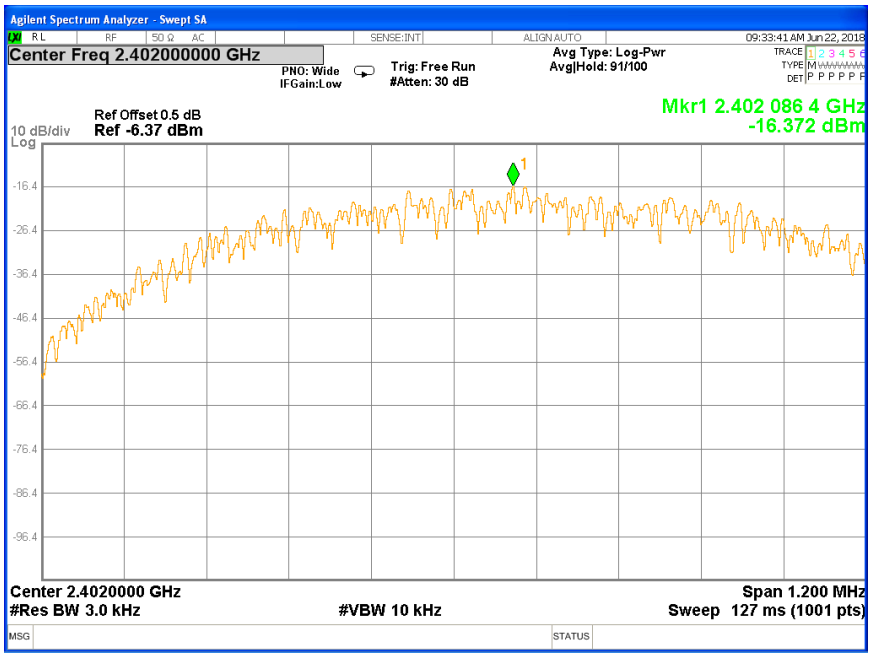
TEST ENVIRONMENT

Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz

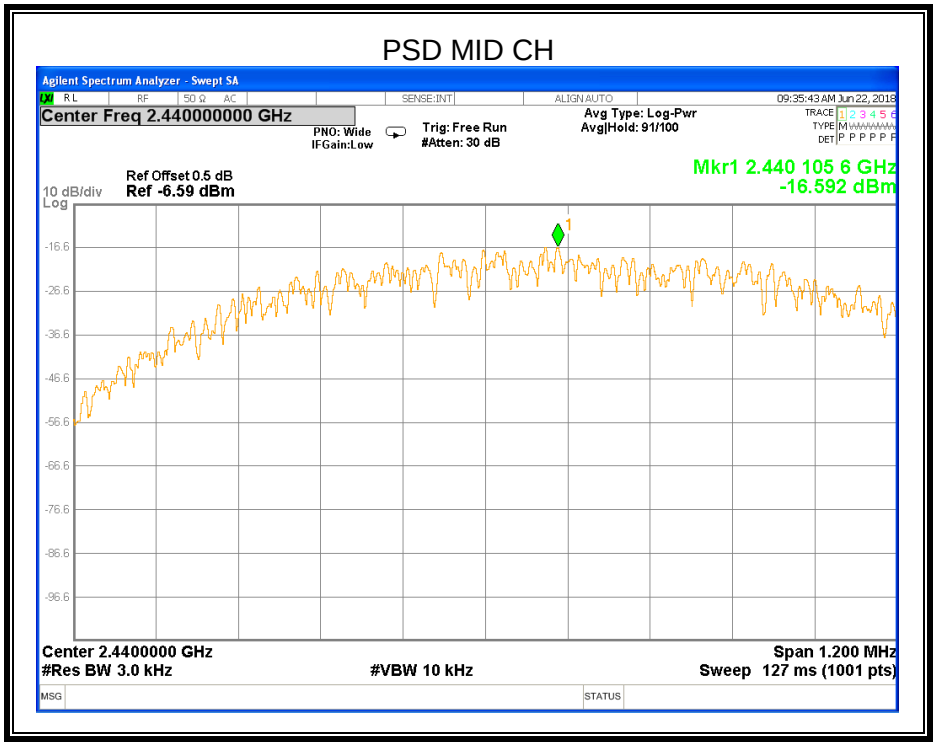
RESULTS

Test Channel	Frequency	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low	2402MHz	-16.372	8	PASS
Middle	2440MHz	-16.592	8	PASS
High	2480MHz	-16.428	8	PASS

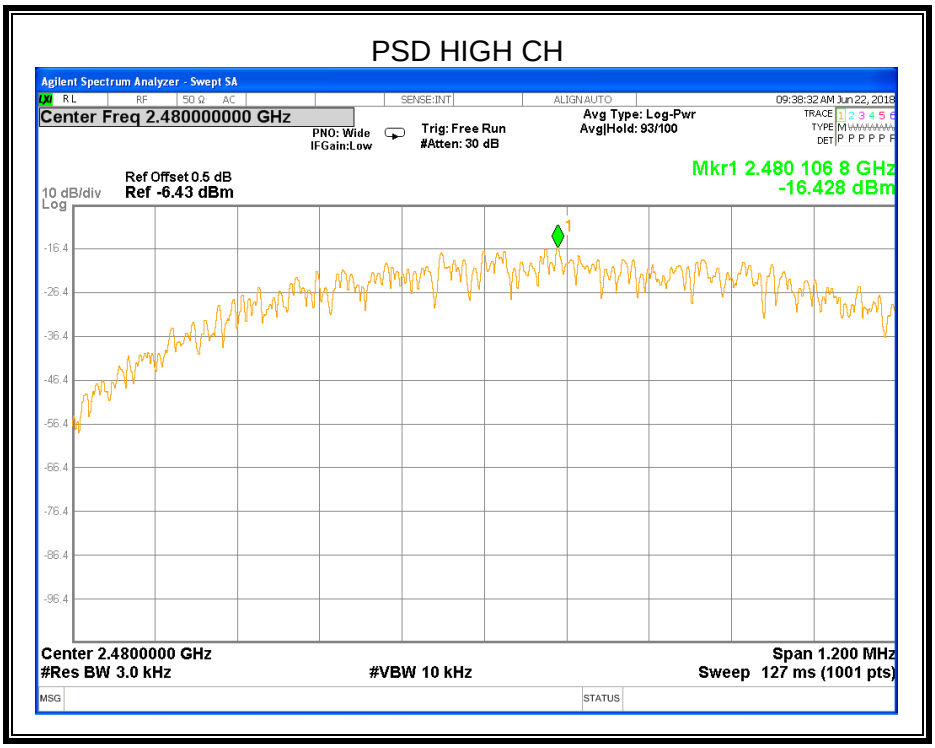
PSD LOW CH



PSD MID CH



PSD HIGH CH



8.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

LIMITS

FCC Part15 (15.247) , Subpart C		
Section	Test Item	Limit
FCC §15.247 (d)	Conducted Bandedge and Spurious Emissions	at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

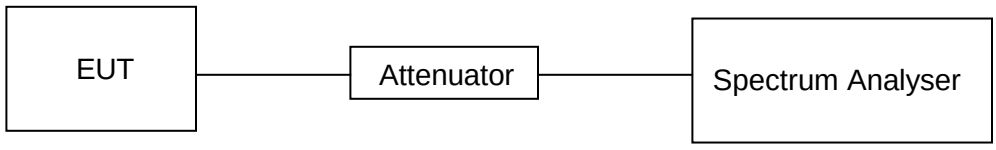
Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100K
VBW	≥3 × RBW
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum PSD level.

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100K
VBW	≥3 × RBW
measurement points	≥span/RBW
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum amplitude level**.**

TEST SETUP

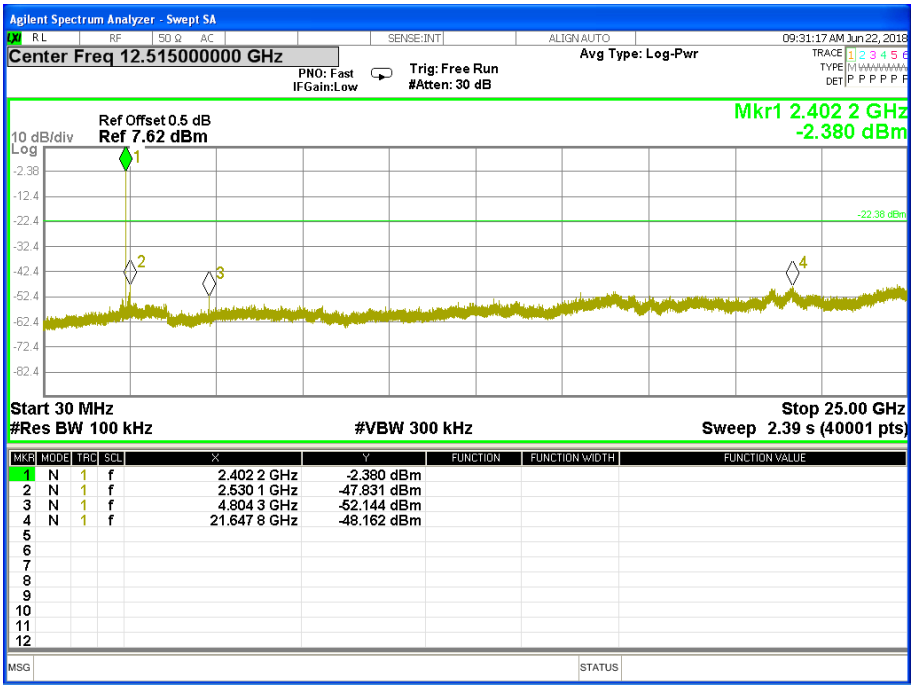


TEST ENVIRONMENT

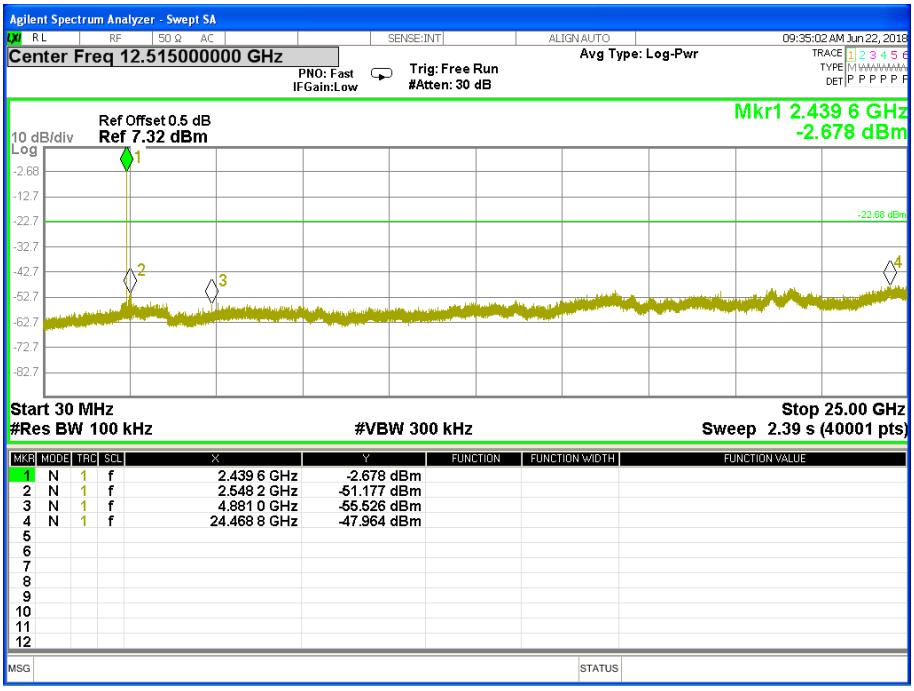
Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz

RESULTS

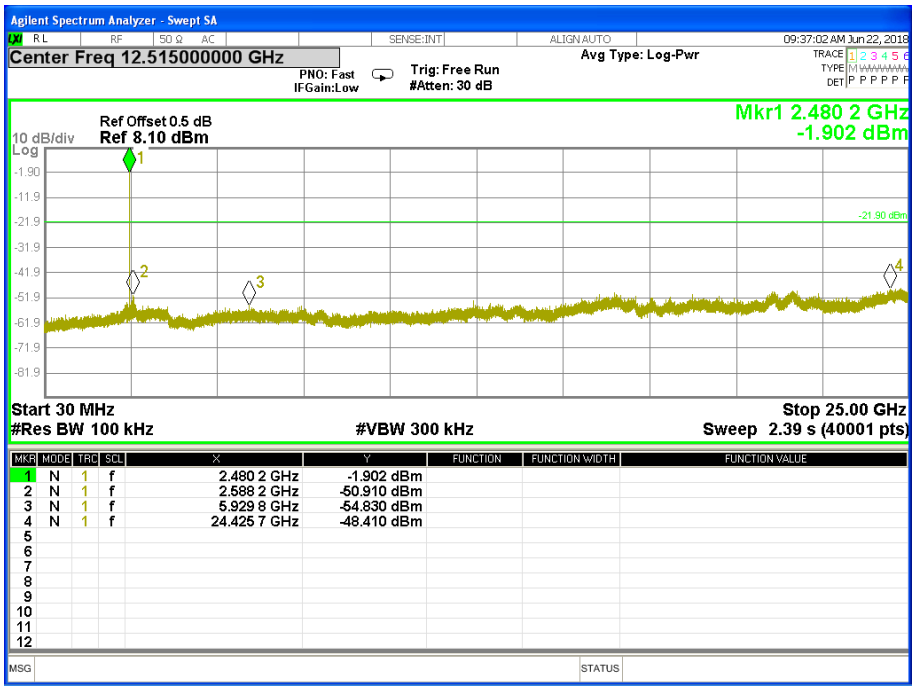
LOW CH SPURIOUS EMISSIONS 30M-25G



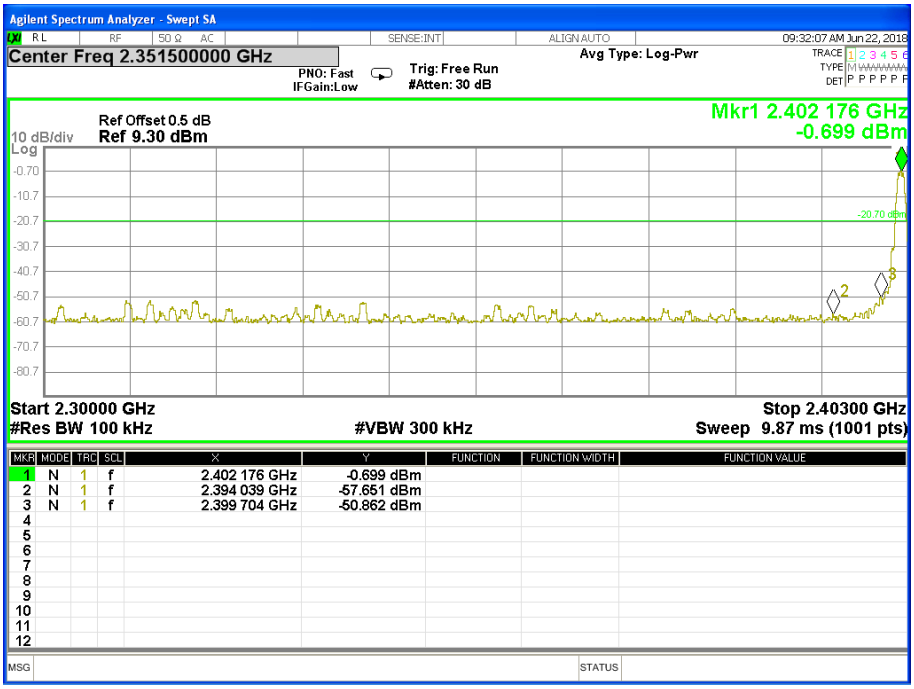
Mid CH SPURIOUS EMISSIONS 30M-25G



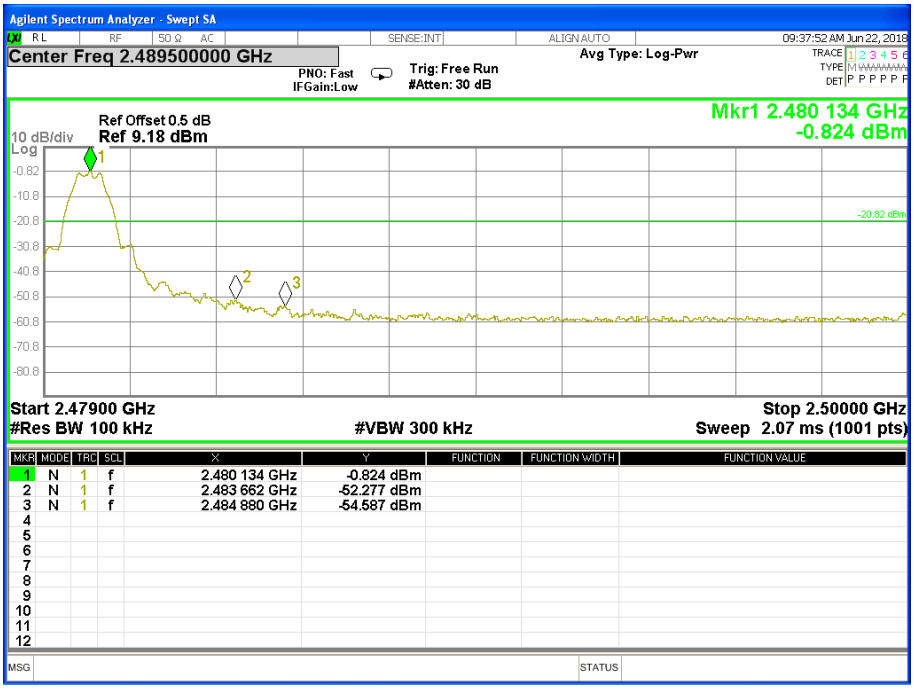
HIGH CH SPURIOUS EMISSIONS 30M-25G



LOW CH BANDEDAGE



HIGH CH BANDEDAGE



9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

Please refer to FCC §15.205 and §15.209

Please refer to RSS-GEN Clause 8.9 (Transmitter)

Radiation Disturbance Test Limit for FCC (Class B)(9KHz-1GHz)

Frequency (MHz)	Field Strength (microvolts/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
960~1000	500	3

Note: 1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). This paragraph (f) shall not apply to Access BPL devices operating below 30 MHz.

Radiation Disturbance Test Limit for FCC (Above 1G)

Frequency (MHz)	dB(uV/m) (at 3 meters)	
	Peak	Average
Above 1000	74	54

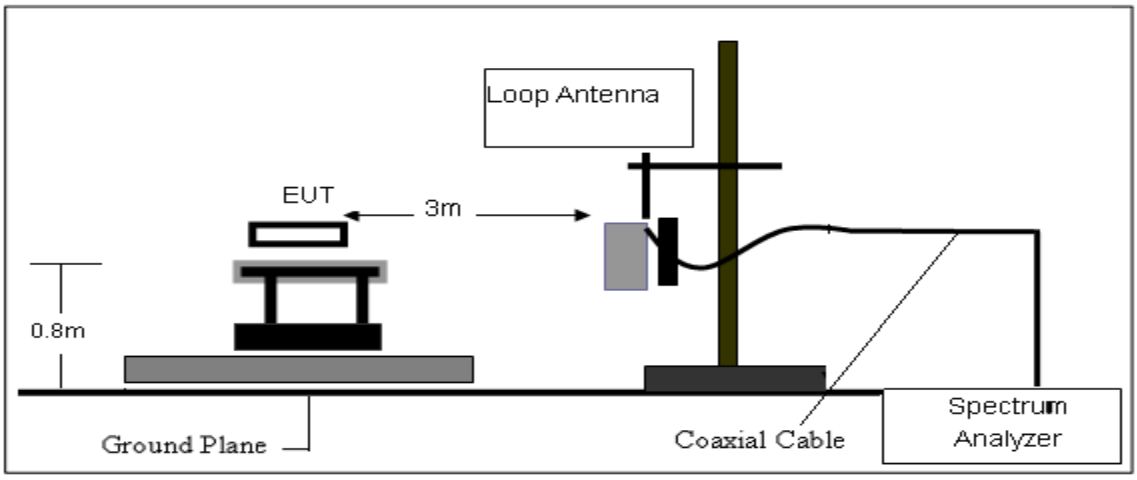
Restricted bands of operation

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]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	([2])
13.36-13.41			

Note: [1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2]Above 38.6c

TEST SETUP AND PROCEDURE

Below 30MHz



The setting of the spectrum analyser

RBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
VBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
Sweep	Auto
Detector	Peak/QP/ Average
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013

2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

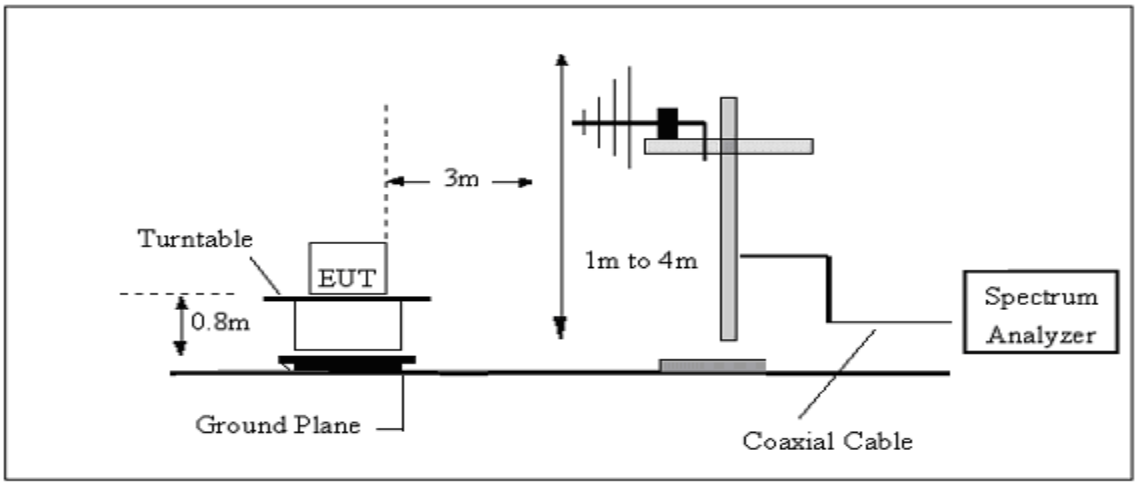
3. The EUT was placed on a turntable with 0.8 meter above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement below 1GHz, 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 emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

6. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

Below 1G



The setting of the spectrum analyser

RBW	120K
VBW	300K
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

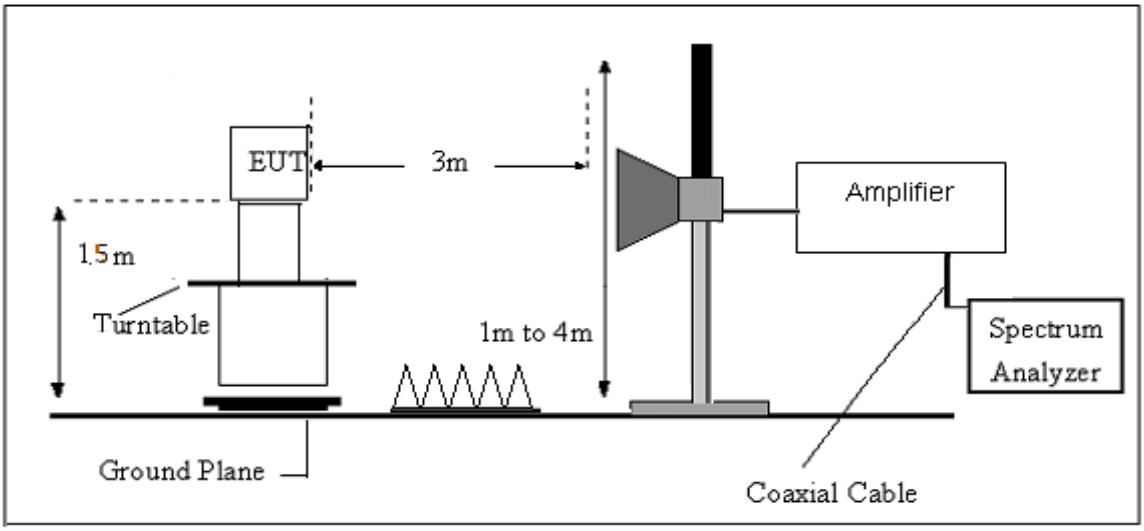
3. The EUT was placed on a turntable with 0.8 meter above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement below 1GHz, 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 emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

6. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration)

ABOVE 1G



The setting of the spectrum analyser

RBW	1M
VBW	PEAK: 3M AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 1.5m above ground.

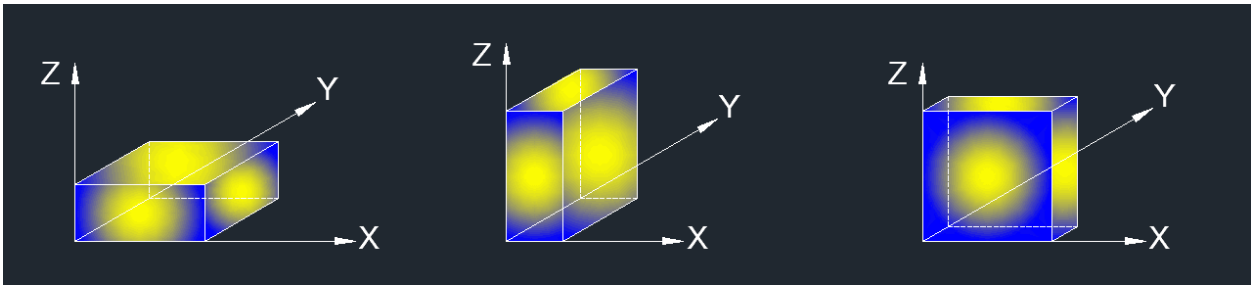
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.

6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements.

7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

X axis, Y axis, Z axis positions:



8.The EUT as shown in Figure 1 is the worst mode, the report only shown the worst mode data.

TEST ENVIRONMENT

Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz

9.2. RESTRICTED BANDEDGE

Frequency (MHz)	Reading (dBµV)	Amplifier （dB）	Loss （dB）	Antenna Factor （dB/m）	Corrected Factor （dB）	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Detector Type	Comment
GFSK										
2390.00	67.94	43.80	4.91	25.90	-12.99	54.95	74.00	-19.05	PK	Vertical
2390.00	53.59	43.80	4.91	25.90	-12.99	40.60	54.00	-13.40	AV	Vertical
2390.00	69.26	43.80	4.91	25.90	-12.99	56.27	74.00	-17.73	PK	Horizontal
2390.00	53.10	43.80	4.91	25.90	-12.99	40.11	54.00	-13.89	AV	Horizontal
2483.50	69.65	43.80	5.12	25.90	-12.78	56.87	74.00	-17.13	PK	Vertical
2483.50	52.51	43.80	5.12	25.90	-12.78	39.73	54.00	-14.27	AV	Vertical
2483.50	70.57	43.80	5.12	25.90	-12.78	57.79	74.00	-16.21	PK	Horizontal
2483.50	52.87	43.80	5.12	25.90	-12.78	40.09	54.00	-13.91	AV	Horizontal
Low measurement frequencies is range from 2300 to 2403 MHz, high measurement frequencies is range from 2479 to 2500 MHz. Only show the worst point data of the emissions in the frequency 2300-2403 MHz and 2479-2500 MHz.										

9.3. **SPURIOUS EMISSIONS Above 1GHz**

Low Channel

Frequency (MHz)	Reading (dBµV)	Amplifier （dB）	Loss （dB）	Antenna Factor （dB/m）	Corrected Factor （dB）	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Detector Type	Comment
Low Channel (2402 MHz)										
3264.87	47.88	44.70	6.70	28.20	-9.80	38.08	74.00	-35.92	PK	Vertical
3264.87	38.87	44.70	6.70	28.20	-9.80	29.07	54.00	-24.93	AV	Vertical
3264.62	49.07	44.70	6.70	28.20	-9.80	39.27	74.00	-34.73	PK	Horizontal
3264.62	38.21	44.70	6.70	28.20	-9.80	28.41	54.00	-25.59	AV	Horizontal
4804.53	59.58	44.20	9.04	31.60	-3.56	56.02	74.00	-17.98	PK	Vertical
4804.53	38.43	44.20	9.04	31.60	-3.56	34.87	54.00	-19.13	AV	Vertical
4804.51	58.26	44.20	9.04	31.60	-3.56	54.70	74.00	-19.30	PK	Horizontal
4804.51	38.63	44.20	9.04	31.60	-3.56	35.07	54.00	-18.93	AV	Horizontal
5359.86	45.48	44.20	9.86	32.00	-2.34	43.14	74.00	-30.86	PK	Vertical
5359.86	37.37	44.20	9.86	32.00	-2.34	35.03	54.00	-18.97	AV	Vertical
5359.85	46.22	44.20	9.86	32.00	-2.34	43.88	74.00	-30.12	PK	Horizontal
5359.85	38.12	44.20	9.86	32.00	-2.34	35.78	54.00	-18.22	AV	Horizontal
7205.74	51.41	43.50	11.40	35.50	3.40	54.81	74.00	-19.19	PK	Vertical
7205.74	32.83	43.50	11.40	35.50	3.40	36.23	54.00	-17.77	AV	Vertical
7205.83	51.90	43.50	11.40	35.50	3.40	55.30	74.00	-18.70	PK	Horizontal
7205.83	33.98	43.50	11.40	35.50	3.40	37.38	54.00	-16.62	AV	Horizontal

Mid Channel

Frequency (MHz)	Reading (dBμV)	Amplifier （dB）	Loss （dB）	Antenna Factor （dB/m）	Corrected Factor （dB）	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Mid Channel (2440 MHz)										
3264.61	48.52	44.70	6.70	28.20	-9.80	38.72	74.00	-35.28	PK	Vertical
3264.61	39.57	44.70	6.70	28.20	-9.80	29.77	54.00	-24.23	AV	Vertical
3264.69	47.96	44.70	6.70	28.20	-9.80	38.16	74.00	-35.84	PK	Horizontal
3264.69	37.94	44.70	6.70	28.20	-9.80	28.14	54.00	-25.86	AV	Horizontal
4880.30	59.29	44.20	9.04	31.60	-3.56	55.73	74.00	-18.27	PK	Vertical
4880.30	38.47	44.20	9.04	31.60	-3.56	34.91	54.00	-19.09	AV	Vertical
4880.50	58.42	44.20	9.04	31.60	-3.56	54.86	74.00	-19.14	PK	Horizontal
4880.50	39.05	44.20	9.04	31.60	-3.56	35.49	54.00	-18.51	AV	Horizontal
5359.79	45.00	44.20	9.86	32.00	-2.34	42.66	74.00	-31.34	PK	Vertical
5359.79	38.38	44.20	9.86	32.00	-2.34	36.04	54.00	-17.96	AV	Vertical
5359.71	46.39	44.20	9.86	32.00	-2.34	44.05	74.00	-29.95	PK	Horizontal
5359.71	38.23	44.20	9.86	32.00	-2.34	35.89	54.00	-18.11	AV	Horizontal
7310.95	50.96	43.50	11.40	35.50	3.40	54.36	74.00	-19.64	PK	Vertical
7310.95	32.79	43.50	11.40	35.50	3.40	36.19	54.00	-17.81	AV	Vertical
7310.89	51.18	43.50	11.40	35.50	3.40	54.58	74.00	-19.42	PK	Horizontal
7310.89	33.12	43.50	11.40	35.50	3.40	36.52	54.00	-17.48	AV	Horizontal

High Channel

Frequency (MHz)	Reading (dBμV)	Amplifier （dB）	Loss （dB）	Antenna Factor （dB/m）	Corrected Factor （dB）	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
High Channel (2480 MHz)										
3264.83	49.06	44.70	6.70	28.20	-9.80	39.26	74.00	-34.74	PK	Vertical
3264.83	37.89	44.70	6.70	28.20	-9.80	28.09	54.00	-25.91	AV	Vertical
3264.83	48.24	44.70	6.70	28.20	-9.80	38.44	74.00	-35.56	PK	Horizontal
3264.83	38.30	44.70	6.70	28.20	-9.80	28.50	54.00	-25.50	AV	Horizontal
4960.42	58.11	44.20	9.04	31.60	-3.56	54.55	74.00	-19.45	PK	Vertical
4960.42	39.10	44.20	9.04	31.60	-3.56	35.54	54.00	-18.46	AV	Vertical
4960.42	58.49	44.20	9.04	31.60	-3.56	54.93	74.00	-19.07	PK	Horizontal
4960.42	38.89	44.20	9.04	31.60	-3.56	35.33	54.00	-18.67	AV	Horizontal
5359.88	44.97	44.20	9.86	32.00	-2.34	42.63	74.00	-31.37	PK	Vertical
5359.88	37.92	44.20	9.86	32.00	-2.34	35.58	54.00	-18.42	AV	Vertical
5359.81	46.26	44.20	9.86	32.00	-2.34	43.92	74.00	-30.08	PK	Horizontal
5359.81	38.02	44.20	9.86	32.00	-2.34	35.68	54.00	-18.32	AV	Horizontal
7439.84	51.23	43.50	11.40	35.50	3.40	54.63	74.00	-19.37	PK	Vertical
7439.84	32.83	43.50	11.40	35.50	3.40	36.23	54.00	-17.77	AV	Vertical
7439.80	50.94	43.50	11.40	35.50	3.40	54.34	74.00	-19.66	PK	Horizontal
7439.80	33.47	43.50	11.40	35.50	3.40	36.87	54.00	-17.13	AV	Horizontal

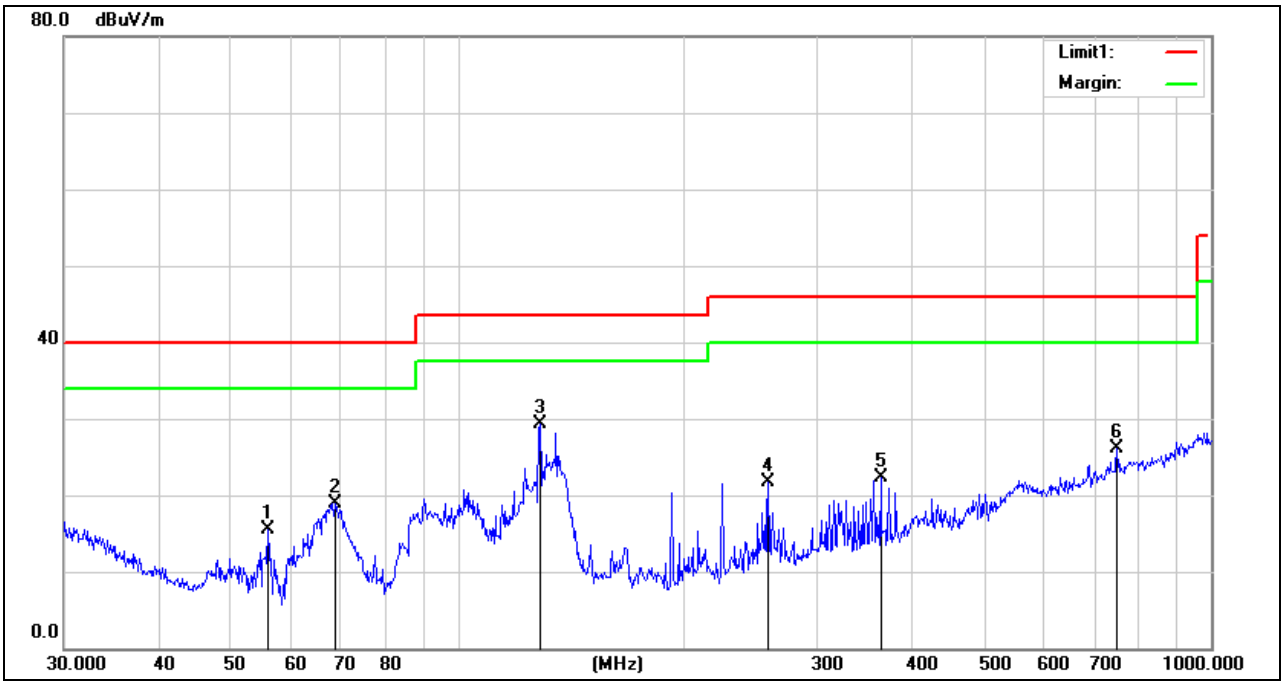
Note:

1) Factor = Antenna Factor + Cable Loss – Pre-amplifier.
   Emission Level = Reading + Factor

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.

9.4. SPURIOUS EMISSIONS 30M ~ 1 GHz

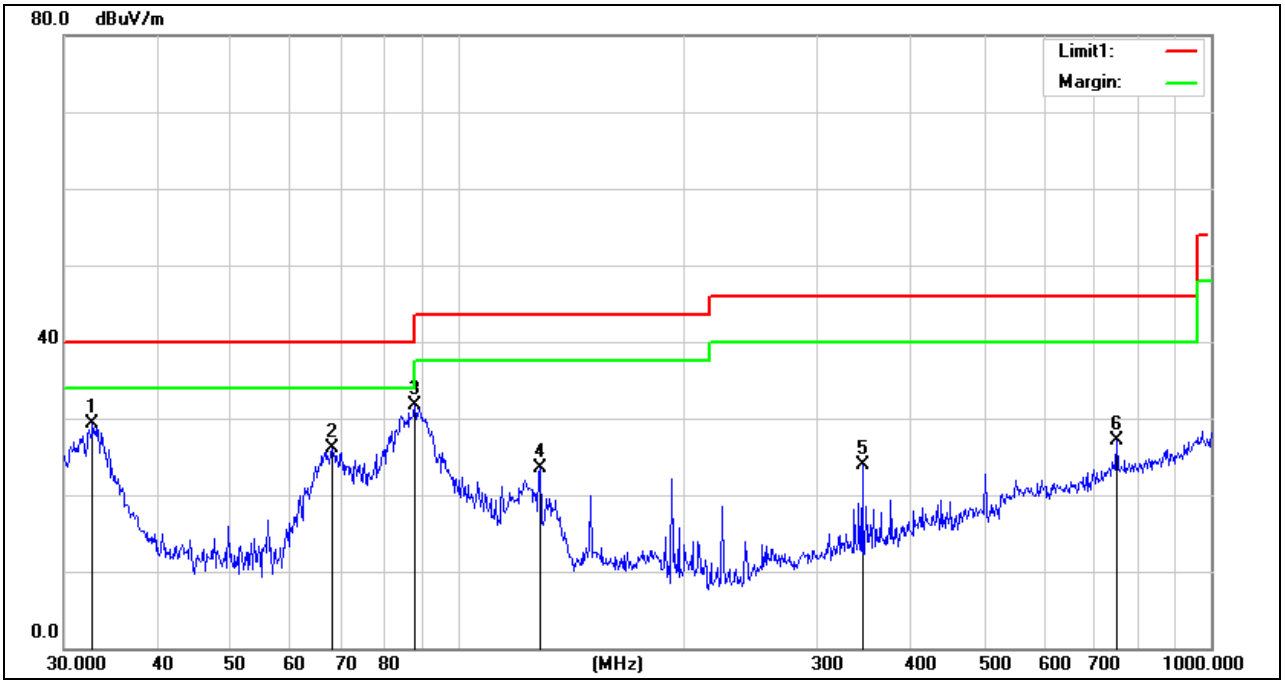
SPURIOUS EMISSIONS (HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	56.0007	38.66	-23.19	15.47	40.00	-24.53	QP
2	68.6310	43.12	-24.14	18.98	40.00	-21.02	QP
3	128.5630	46.93	-17.56	29.37	43.50	-14.13	QP
4	258.3264	36.91	-15.27	21.64	46.00	-24.36	QP
5	364.2595	35.39	-13.03	22.36	46.00	-23.64	QP
6	750.1083	29.70	-3.56	26.14	46.00	-19.86	QP

Note: Measurement = Reading Level + Correct Factor.

SPURIOUS EMISSIONS (VERTICAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	32.7486	41.83	-12.60	29.23	40.00	-10.77	QP
2	68.1514	50.28	-24.15	26.13	40.00	-13.87	QP
3	87.7248	52.50	-20.77	31.73	40.00	-8.27	QP
4	128.5630	40.97	-17.56	23.41	43.50	-20.09	QP
5	344.3855	37.65	-13.83	23.82	46.00	-22.18	QP
6	750.1083	30.66	-3.56	27.10	46.00	-18.90	QP

Note: Measurement = Reading Level + Correct Factor.

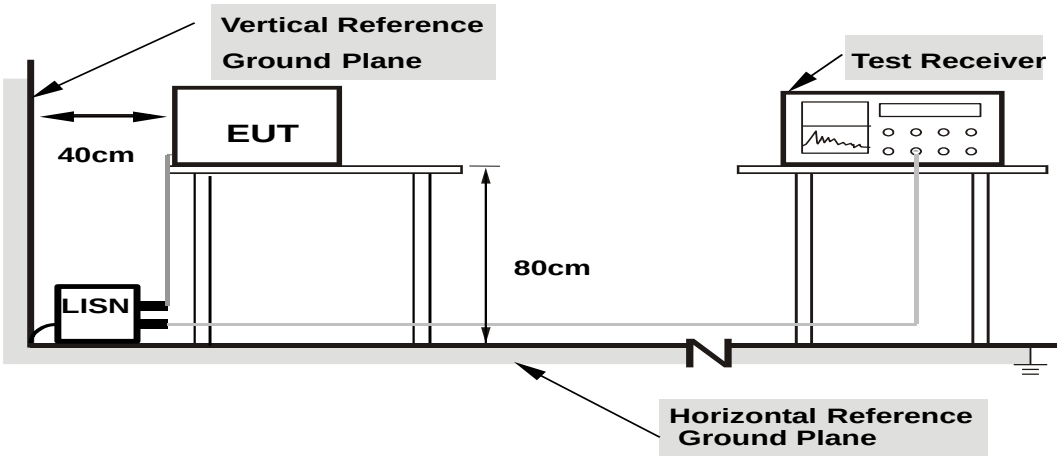
10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

Please refer to FCC §15.207 (a) and RSS-Gen Clause 8.8

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

TEST SETUP AND PROCEDURE



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

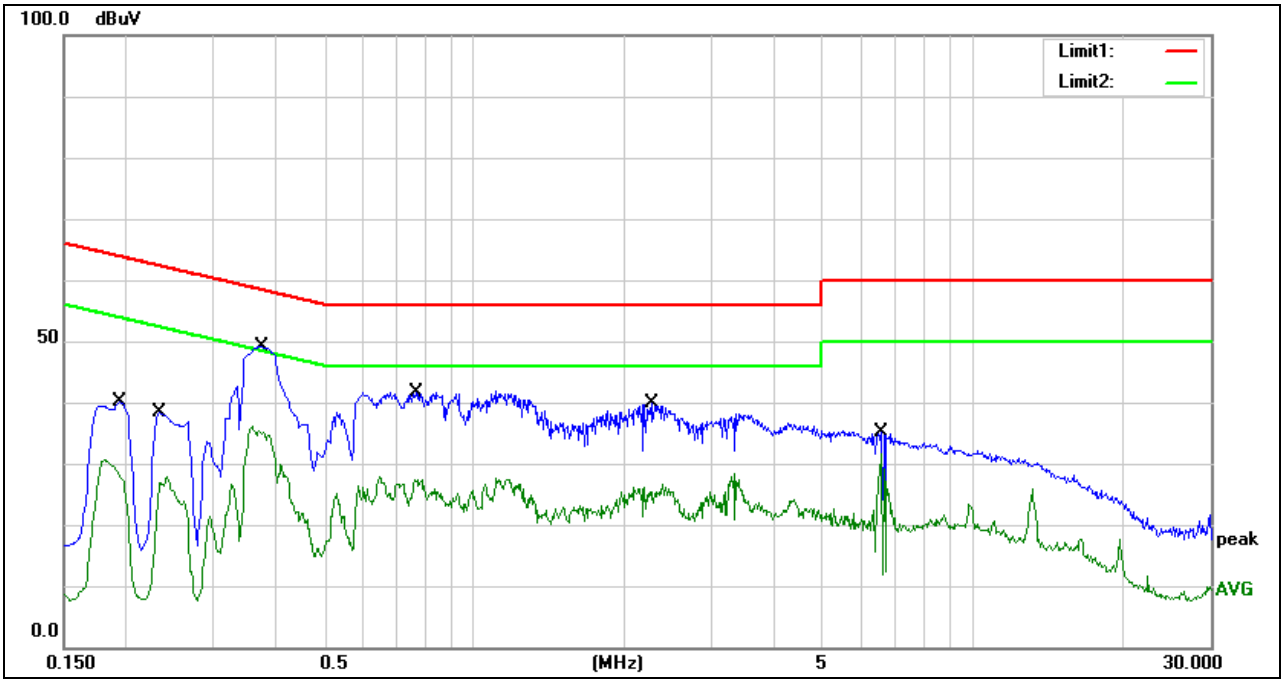
The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 7 and 13 of ANSI C63.10-2013.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST ENVIRONMENT

Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz

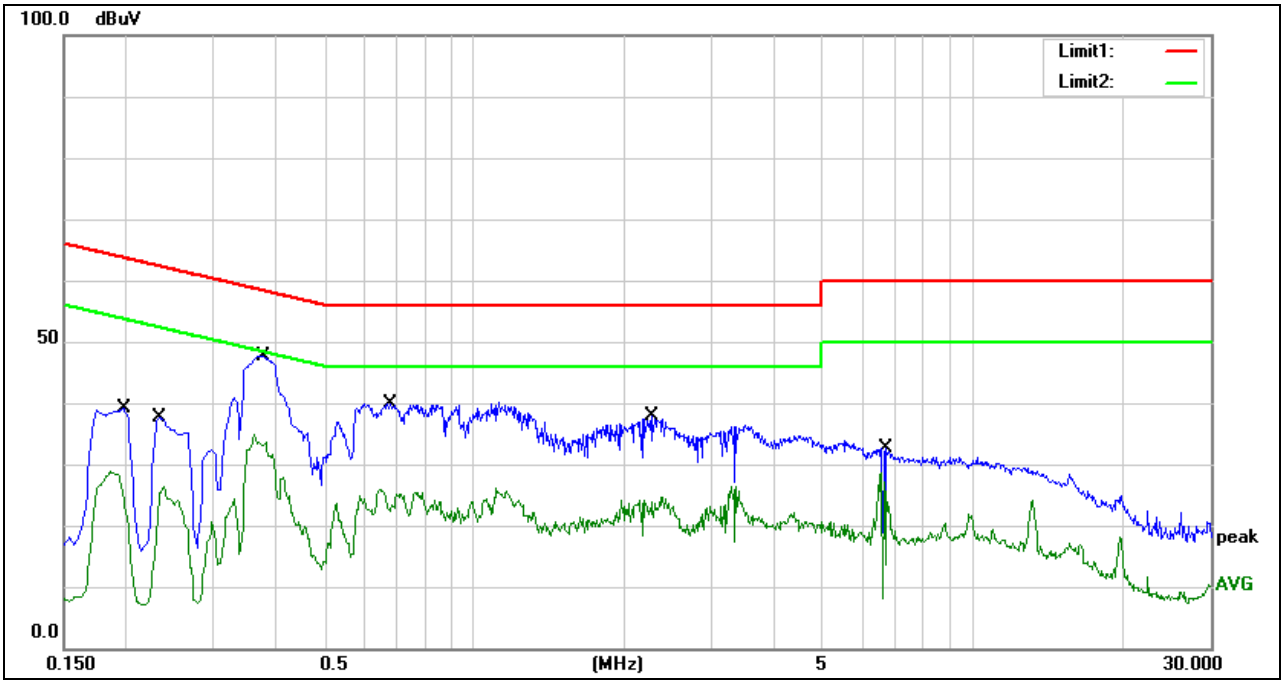
LINE N RESULTS



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1940	30.39	9.78	40.17	63.86	-23.69	QP
2	0.1940	20.79	9.78	30.57	53.86	-23.29	AVG
3	0.2340	28.39	9.93	38.32	62.31	-23.99	QP
4	0.2340	17.98	9.93	27.91	52.31	-24.40	AVG
5	0.3740	39.05	10.08	49.13	58.41	-9.28	QP
6	0.3740	26.10	10.08	36.18	48.41	-12.23	AVG
7	0.7660	31.75	9.83	41.58	56.00	-14.42	QP
8	0.7660	17.46	9.83	27.29	46.00	-18.71	AVG
9	2.2780	29.96	9.80	39.76	56.00	-16.24	QP
10	2.2780	16.92	9.80	26.72	46.00	-19.28	AVG
11	6.5820	25.15	9.88	35.03	60.00	-24.97	QP
12	6.5820	21.80	9.88	31.68	50.00	-18.32	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

LINE L RESULTS



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.1980	29.43	9.78	39.21	63.69	-24.48	QP
2	0.1980	18.97	9.78	28.75	53.69	-24.94	AVG
3	0.2340	27.81	9.93	37.74	62.31	-24.57	QP
4	0.2340	16.37	9.93	26.30	52.31	-26.01	AVG
5	0.3780	37.62	10.08	47.70	58.32	-10.62	QP
6	0.3780	24.73	10.08	34.81	48.32	-13.51	AVG
7	0.6780	30.05	9.86	39.91	56.00	-16.09	QP
8	0.6780	15.58	9.86	25.44	46.00	-20.56	AVG
9	2.2780	28.08	9.80	37.88	56.00	-18.12	QP
10	2.2780	14.78	9.80	24.58	46.00	-21.42	AVG
11	6.7060	22.81	9.88	32.69	60.00	-27.31	QP
12	6.7060	18.64	9.88	28.52	50.00	-21.48	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

11. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §15.203

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

ANTENNA CONNECTOR

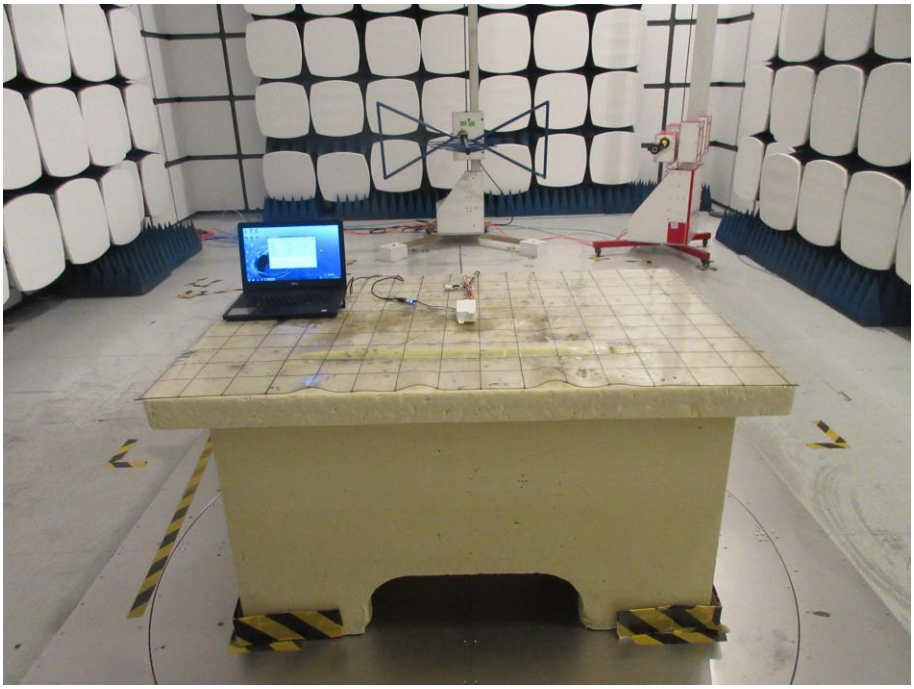
EUT has a PIFA antenna without antenna connector.

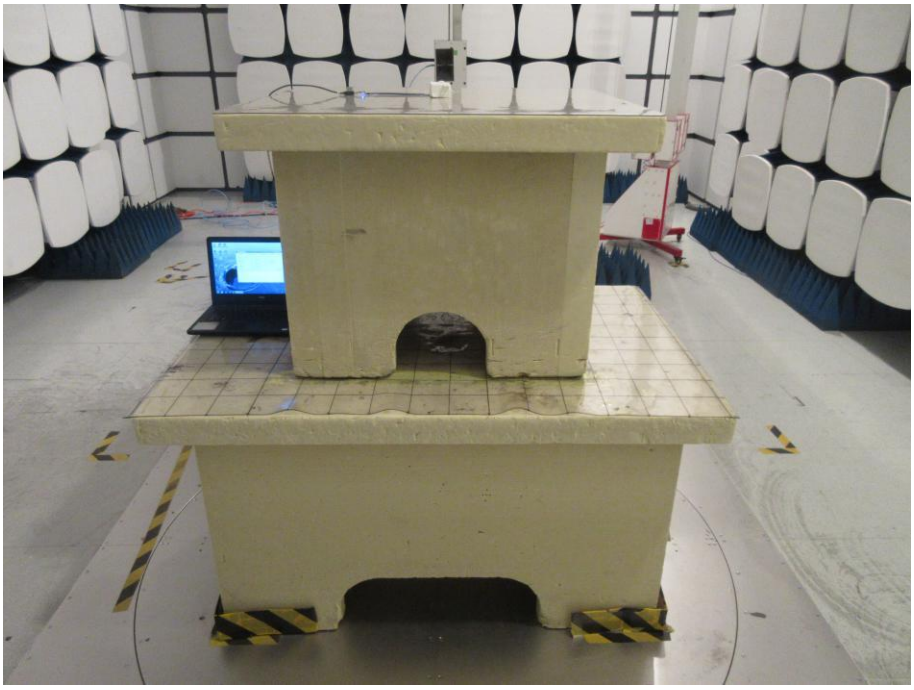
ANTENNA GAIN

The antenna gain of EUT is less than 6 dBi.

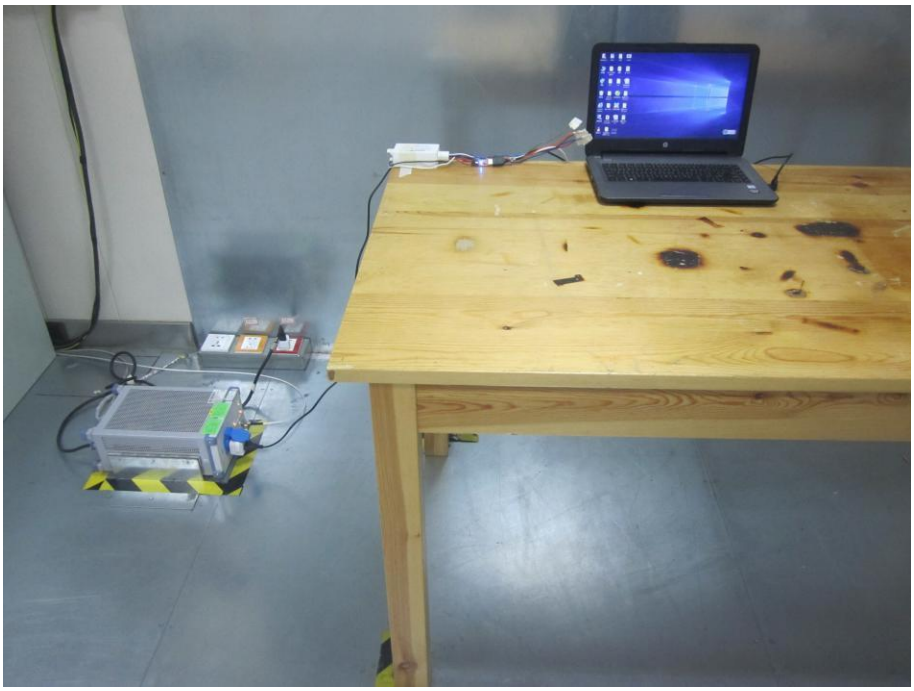
Test photos

Radiation





Conduction



END OF REPORT