



**FCC 47 CFR PART 15 SUBPART C**

**CERTIFICATION TEST REPORT**

*For*

**Smart plug-NA (Zigbee)**

**MODEL NUMBER: 6A-PL-ZA-A0-01**

**FCC ID: 2AB2Q6PLZAA0**

**REPORT NUMBER: 4788108850.1-2**

**ISSUE DATE: May 18, 2018**

*Prepared for*

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*Prepared by*

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	5/18/2018	Initial Issue	

Summary of Test Results			
Clause	Test Items	FCC 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 (e)	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: LEEDARSON LIGHTING CO.,LTD.  
Address: XINGDA RD, XINGTAI INDUSTRIAL ZONE, CHANGTAI  
COUNTY, ZHANGZHOU, FUJIAN, 363900, CHINA

### Manufacturer Information

Company Name: LEEDARSON LIGHTING CO.,LTD.  
Address: XINGDA RD, XINGTAI INDUSTRIAL ZONE, CHANGTAI  
COUNTY, ZHANGZHOU, FUJIAN, 363900, CHINA

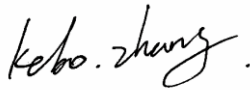
### EUT Description

Product Name: Smart plug-NA (Zigbee)  
Brand Name: N/A  
Model Name: 6A-PL-ZA-A0-01  
Sample Status: Normal  
Sample ID: 1118003  
Date Tested: August 20, 2017 ~May 18, 2018

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	PASS

Tested By:

Checked By:



Kebo Zhang  
Engineer

Shawn Wen  
Laboratory Leader

Approved By:



Stephen Guo  
Laboratory Manager

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB414788 D01 Radiated Test Site v01, ANSI C63.10-2013, 558074 D01 DTS Meas Guidance v04, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

## 3. FACILITIES AND ACCREDITATION

Test Location	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch.
Address	Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China
Accreditation Certificate	<p>UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. The Certificate Registration Number is 4102.01.</p> <p>UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The Designation Number is CN1187.</p> <p>UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. EMC Laboratory has been registered and fully described in a report filed with Industry Canada. The Company Number is 21320.</p>

## 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 recognize national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.90dB
Uncertainty for Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	2.2dB
Uncertainty for Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	4.52dB
Uncertainty for Radiation Emission test (1GHz to 26GHz)( include Fundamental emission)	5.04dB(1-6GHz)
	5.30dB (6GHz-18Gz)
	5.23dB (18GHz-26Gz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

Equipment	Smart Plug		
Model Name	6A-PL-ZA-A1		
Product Description	Operation Frequency	2405 MHz ~ 2480 MHz	
	Modulation Type		Data Rate
	O-QPSK		250kbs
Power supply	AC 120V 60Hz		
Hardware version	2.0		
Software version	SVN104		

### 5.2. MAXIMUM OUTPUT POWER

Mode	Frequency (MHz)	Channel Number	Max Output Power (dBm)
ZigBee	2405-2480	11-26 [16]	15.573

### 5.3. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
11	2405	15	2425	19	2445	23	2465
12	2410	16	2430	20	2450	24	2470
13	2415	17	2435	21	2455	25	2475
14	2420	18	2440	22	2460	26	2480

## 5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
ZigBee	CH 11, CH 19, CH 26	2405MHz, 2445MHz, 2480MHz

## 5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band				
Test Software		UartAssis		
Modulation Type	Transmit Antenna Number	Test Channel		
		CH 11	CH 19	CH 26
O-QPSK	1	17	17	17

## 5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2405-2480	PCB Antenna	1.95

Test Mode	Transmit and Receive Mode	Description
ZigBee	<input checked="" type="checkbox"/> 1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.

## 5.7. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	23 ~ 28°C
Voltage :	VL	N/A
	VN	AC 120V 60Hz
	VH	N/A

Note: VL= Lower Extreme Test Voltage  
VN= Nominal Voltage, AC 120V from Adapter.  
VH= Upper Extreme Test Voltage  
TN= Normal Temperature

## 5.8. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	Laptop	ThinkPad	T460S	SL10K24796 JS
2	USB TO RS232	N/A	N/A	N/A

### I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	N/A	N/A	N/A	N/A	N/A

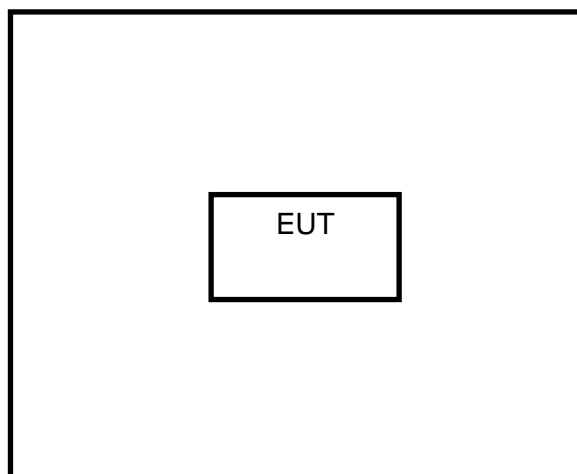
### ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	N/A	N/A	N/A	N/A

### TEST SETUP

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

### SETUP DIAGRAM FOR TEST



## 5.9. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions							
Instrument							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	EMI Test Receiver	R&S	ESR3	101961	Dec.20, 2016	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Two-Line V-Network	R&S	ENV216	101983	Dec.20, 2016	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Feb.10, 2017	Dec.12, 2017	Dec.11, 2018
Software							
Used	Description			Manufacturer	Name	Version	
<input checked="" type="checkbox"/>	Test Software for Conducted disturbance			Farad	EZ-EMC	Ver. UL-3A1	
Radiated Emissions							
Instrument							
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Feb. 24, 2017	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Jan.09, 2016	Jan.09, 2016	Jan.09, 2019
<input checked="" type="checkbox"/>	Preamplifier	HP	8447D	2944A09099	Feb. 13, 2017	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	EMI Measurement Receiver	R&S	ESR26	101377	Dec. 20, 2016	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Horn Antenna	TDK	HRN-0118	130939	Jan. 09, 2016	Jan. 09, 2016	Jan. 09, 2019
<input checked="" type="checkbox"/>	High Gain Horn Antenna	Schwarzbeck	BBHA-9170	691	Jan.06, 2016	Jan.06, 2016	Jan.06, 2019
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Jan. 14, 2017	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec. 20, 2016	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Loop antenna	Schwarzbeck	1519B	00008	Mar. 26, 2016	Mar. 26, 2016	Mar. 26, 2019
Software							
Used	Description			Manufacturer	Name	Version	
<input checked="" type="checkbox"/>	Test Software for Radiated disturbance			Farad	EZ-EMC	Ver. UL-3A1	
Other instruments							
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	Spectrum Analyzer	Keysight	N9030A	MY55410512	Dec. 20, 2016	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Power Meter	Keysight	N9031A	MY55416024	Feb. 13, 2017	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Power Sensor	Keysight	N9323A	MY55440013	Feb. 13, 2017	Dec.12, 2017	Dec.11, 2018

## 6. MEASUREMENT METHODS

No.	Test Item	KDB Name	Section
1	6 dB Bandwidth	KDB 558074 D01 DTS Meas Guidance v04	8.0
2	Peak Output Power	KDB 558074 D01 DTS Meas Guidance v04	9.1.1
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

## 7. ANTENNA PORT TEST RESULTS

### 7.1. ON TIME AND DUTY CYCLE

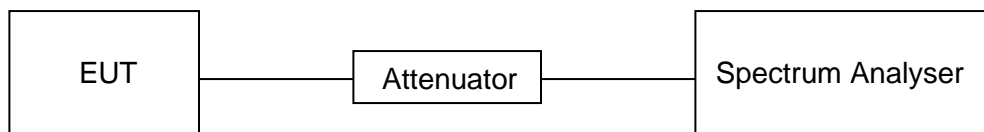
#### LIMITS

None; for reporting purposes only

#### PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

#### TEST SETUP

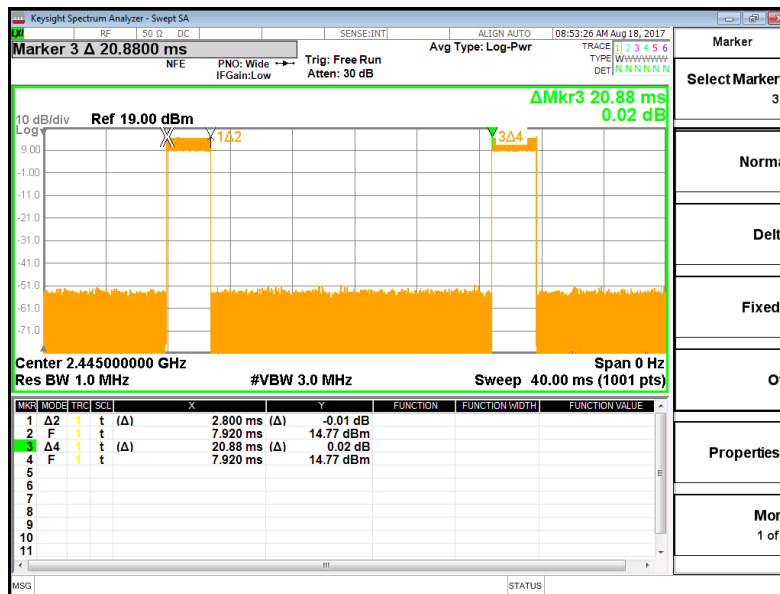


#### RESULTS

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (KHz)
ZigBee	2.80	20.88	0.134	13.4	8.73	0.357

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

#### ON TIME AND DUTY CYCLE MID CH



## 7.2. 6 dB DTS BANDWIDTH

### LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(a)(2)	6dB Bandwidth	$\geq 500\text{KHz}$	2400-2483.5

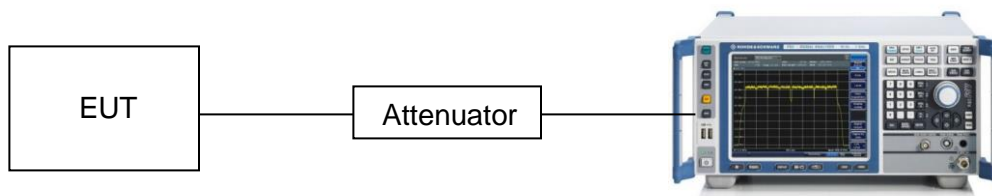
### TEST PROCEDURE

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

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
Trace	Max hold
Sweep	Auto couple

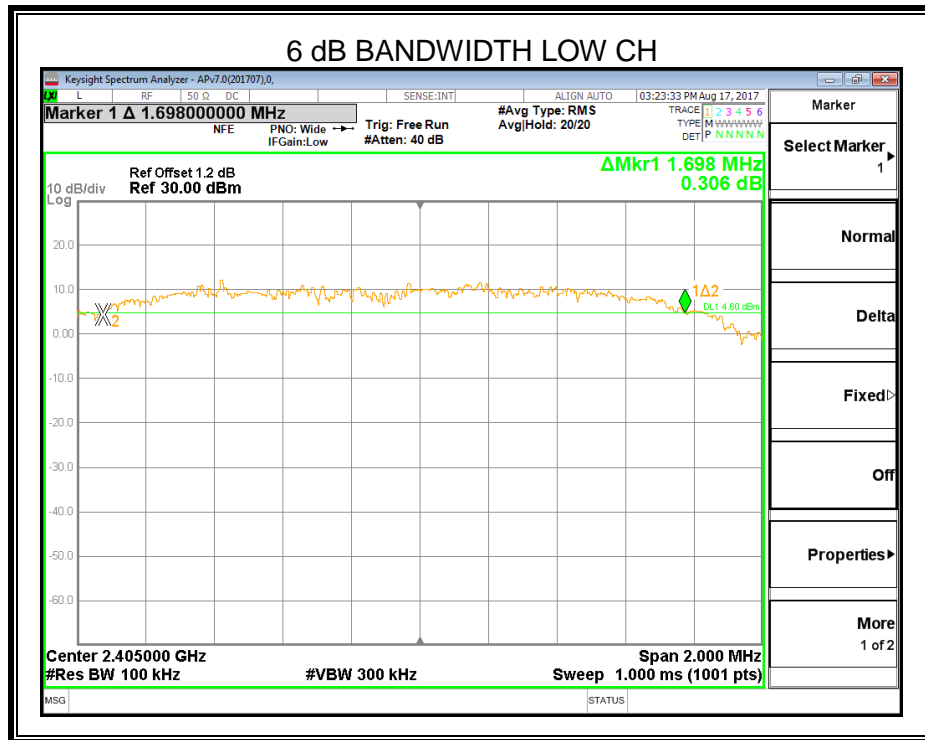
Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

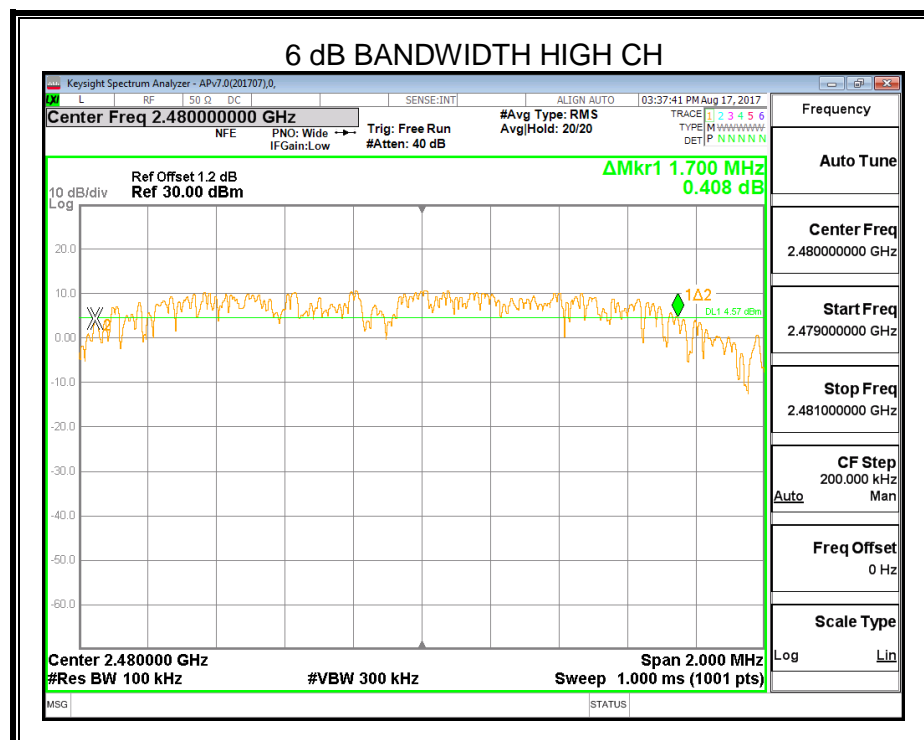
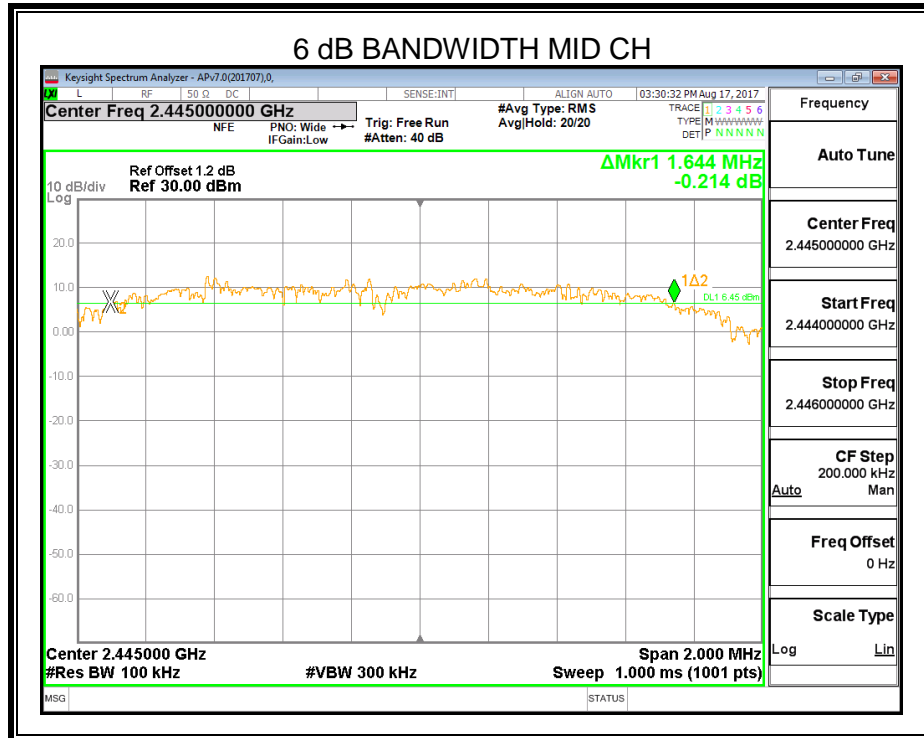
### TEST SETUP



## RESULTS

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
Low	2405	1.698	500	Pass
Middle	2445	1.644	500	Pass
High	2480	1.700	500	Pass





### 7.3. 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

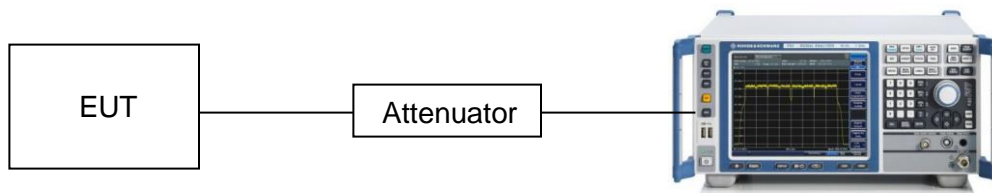
#### TEST PROCEDURE

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

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	$\geq$ DTS bandwidth
VBW	$\geq 3 \times$ RBW
Span	$3 \times$ RBW
Trace	Max hold
Sweep time	Auto couple.

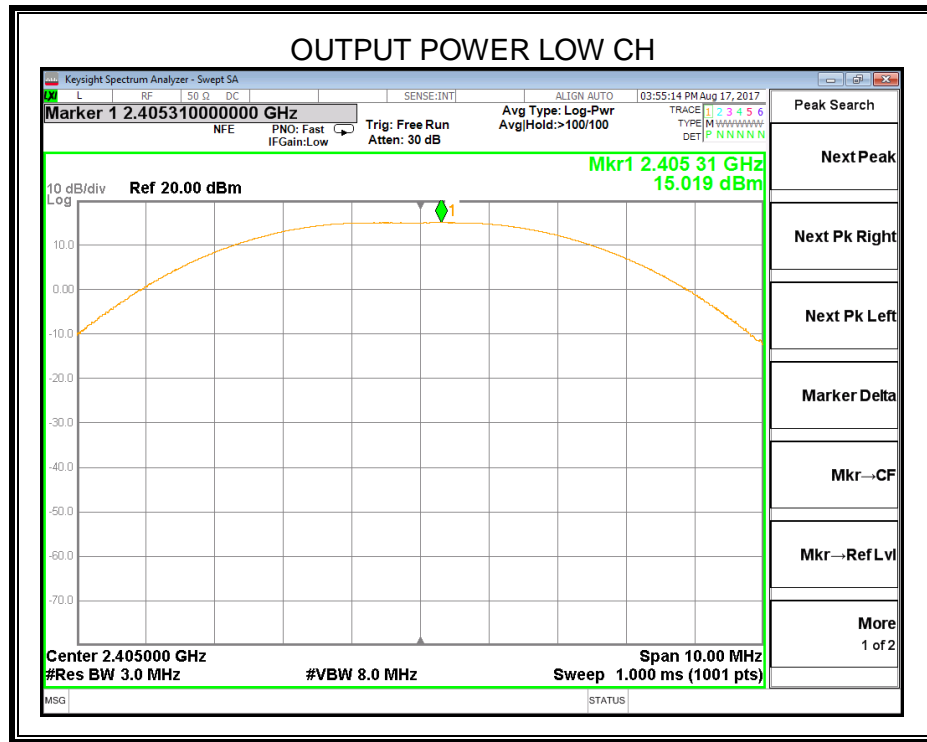
Allow trace to fully stabilize and use peak marker function to determine the peak amplitude level.

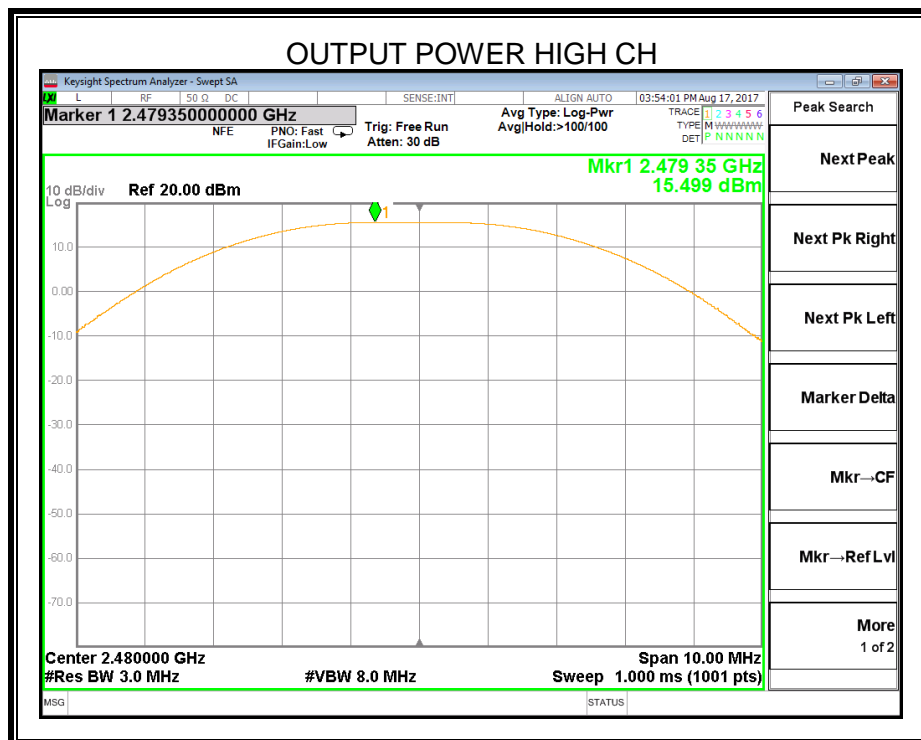
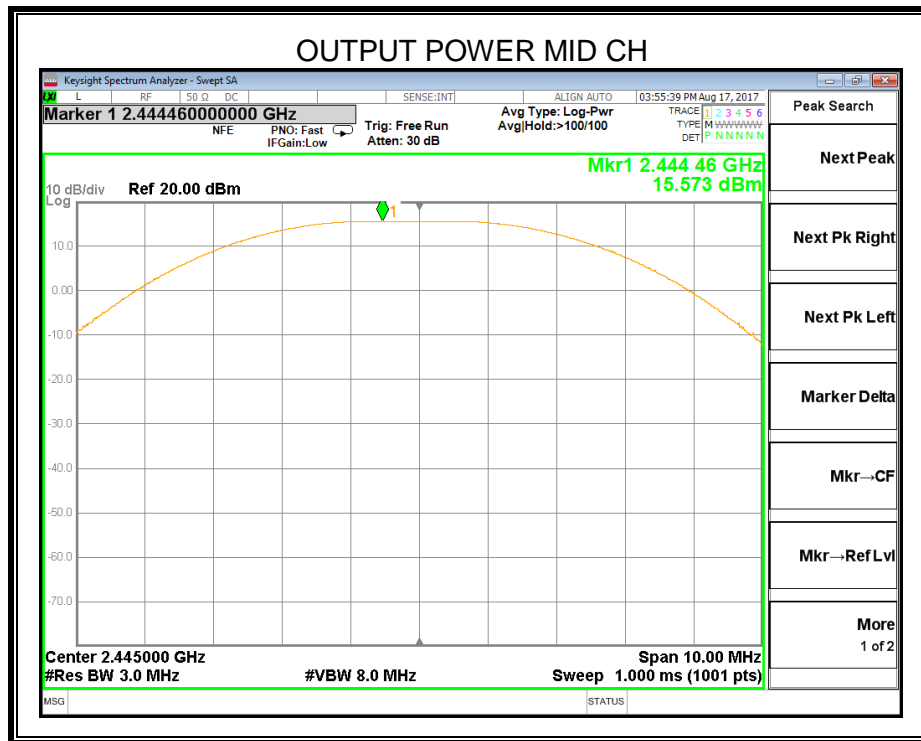
#### TEST SETUP



## RESULTS

Test Channel	Frequency	Maximum Conducted Output Power(PK)	LIMIT
	(MHz)	(dBm)	dBm
Low	2405	15.019	30
Middle	2445	15.573	30
High	2480	15.499	30





## 7.4. 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

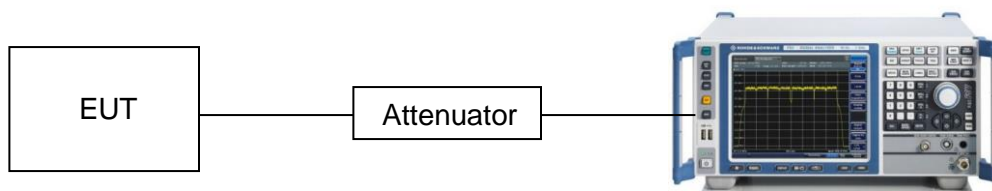
Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	$3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
VBW	$\geq 3 \times \text{RBW}$
Span	$1.5 \times \text{DTS bandwidth}$
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.

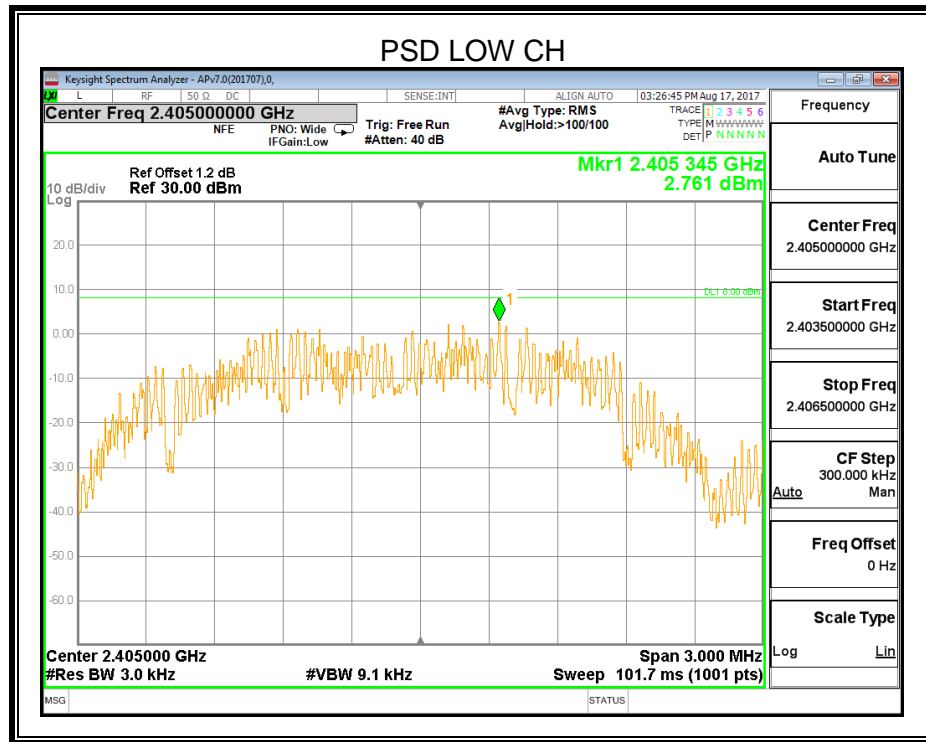
If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

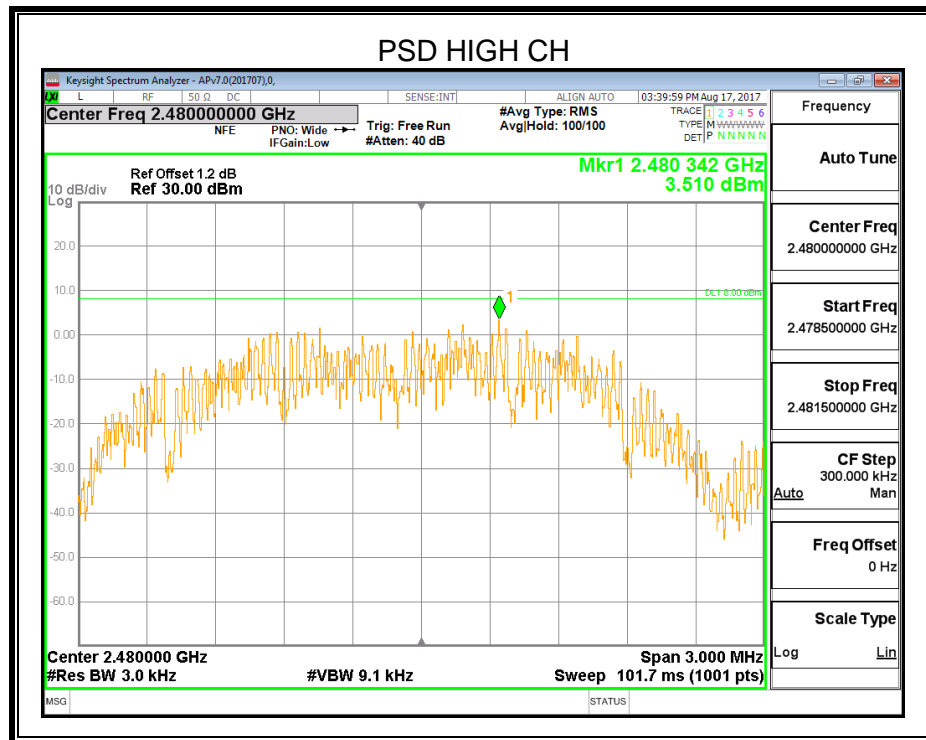
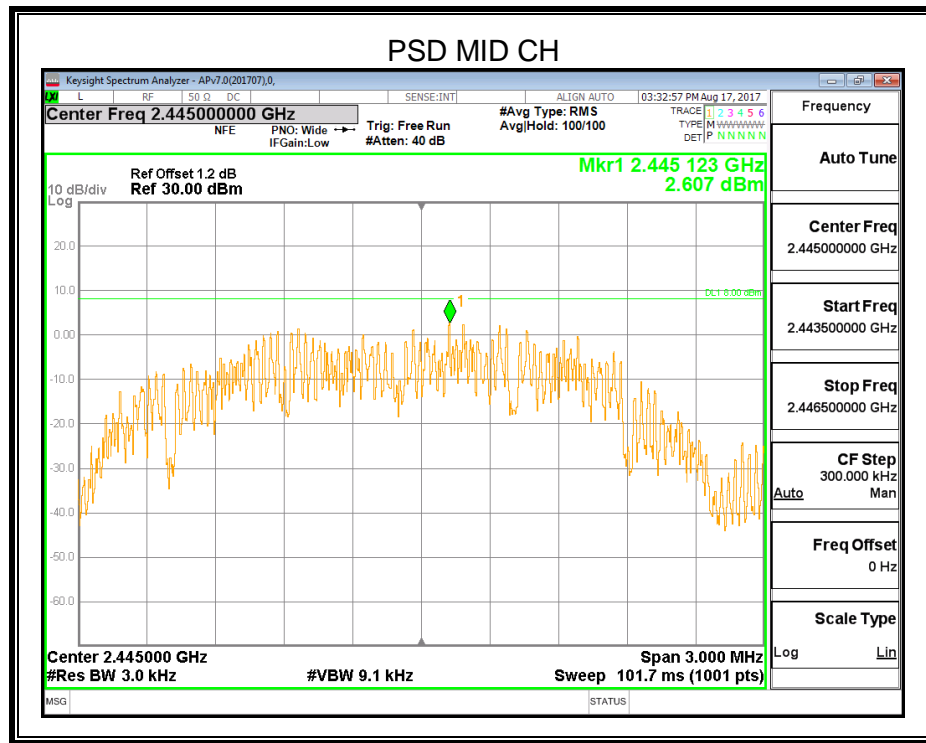
### TEST SETUP



## RESULTS

Frequency	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2405 MHz	2.761	8	PASS
2445 MHz	2.607	8	PASS
2480 MHz	3.510	8	PASS





## 7.5. CONDUCTED BANDEGE 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:

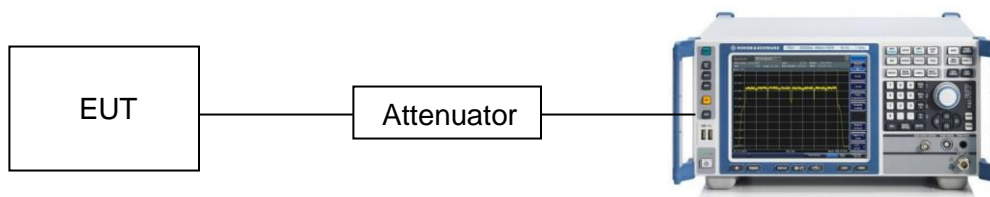
Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

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

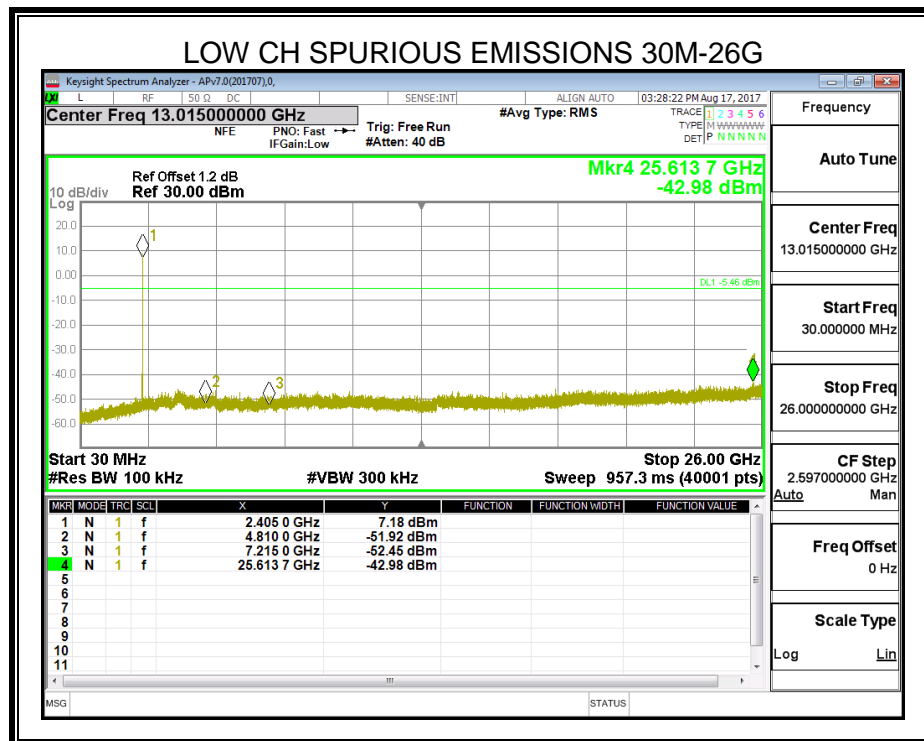
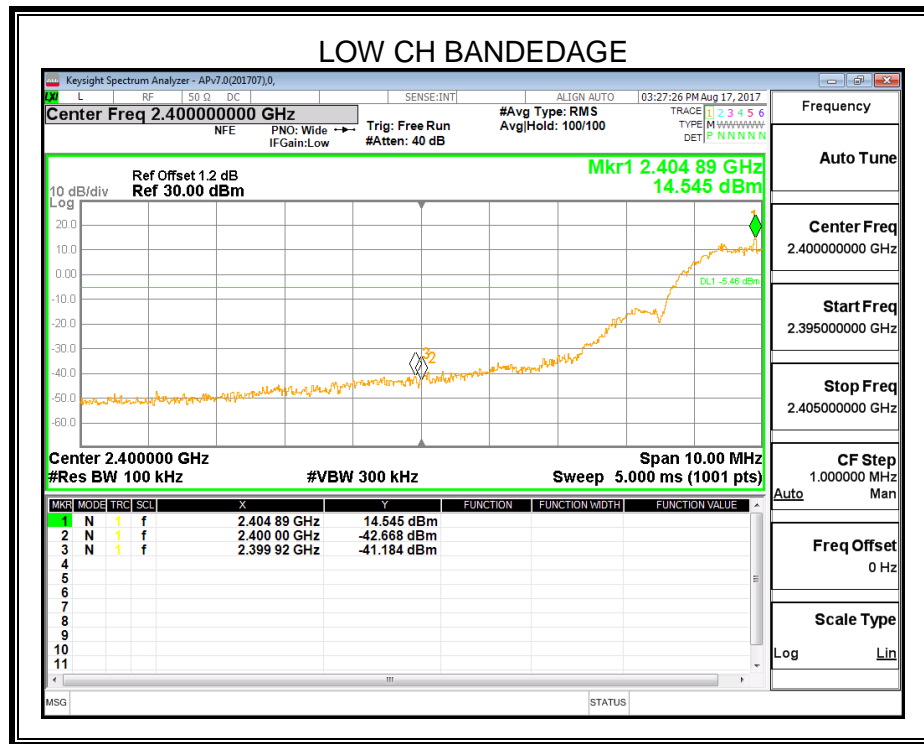
Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
measurement points	$\geq \text{span}/\text{RBW}$
Trace	Max hold
Sweep time	Auto couple.

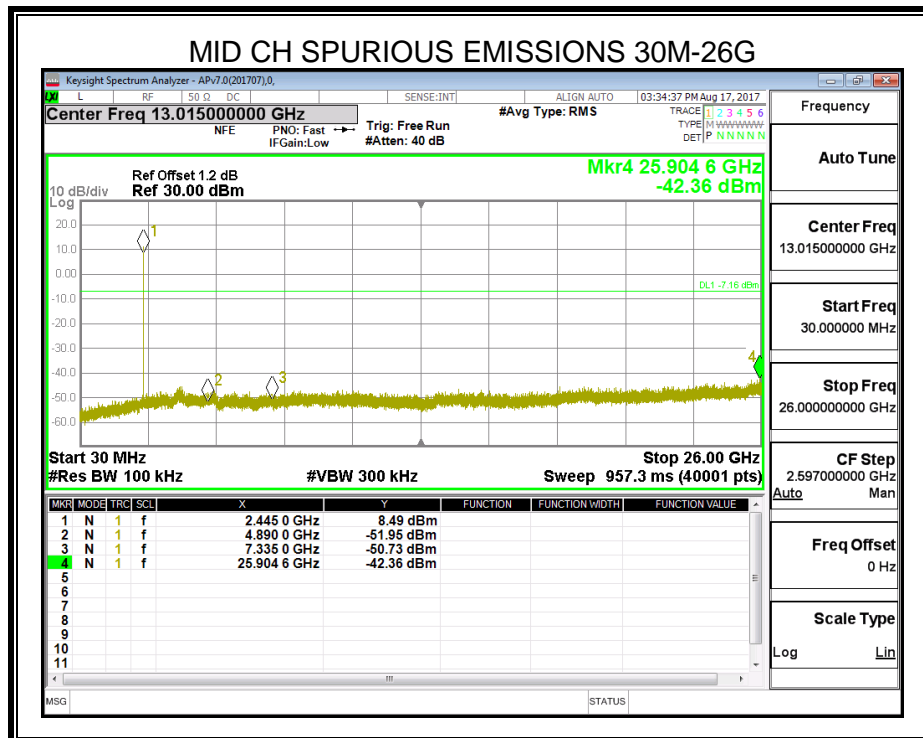
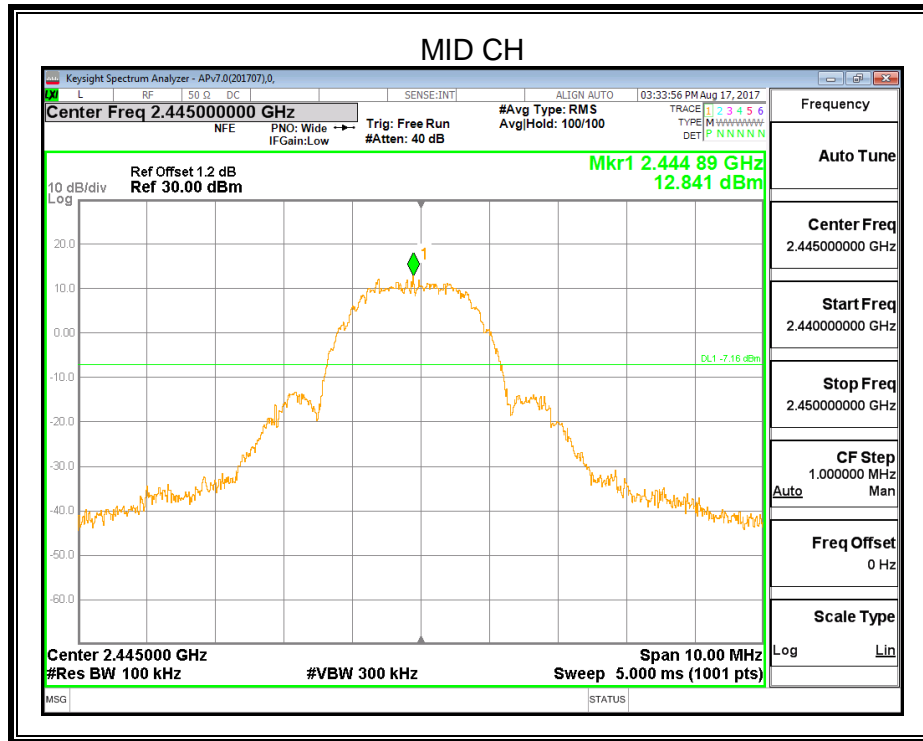
Use the peak marker function to determine the maximum amplitude level.

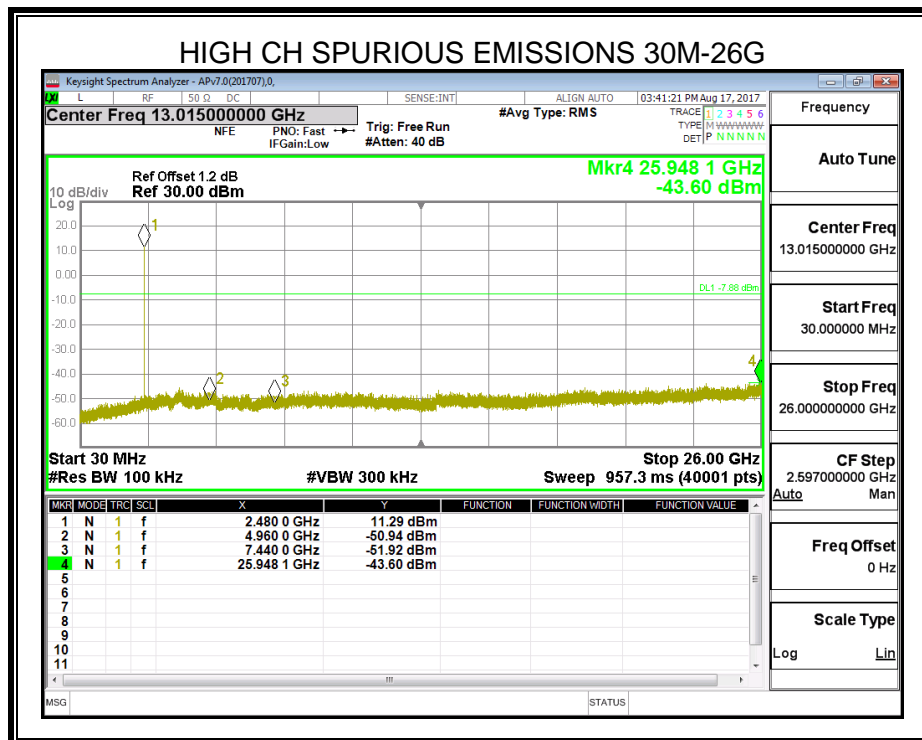
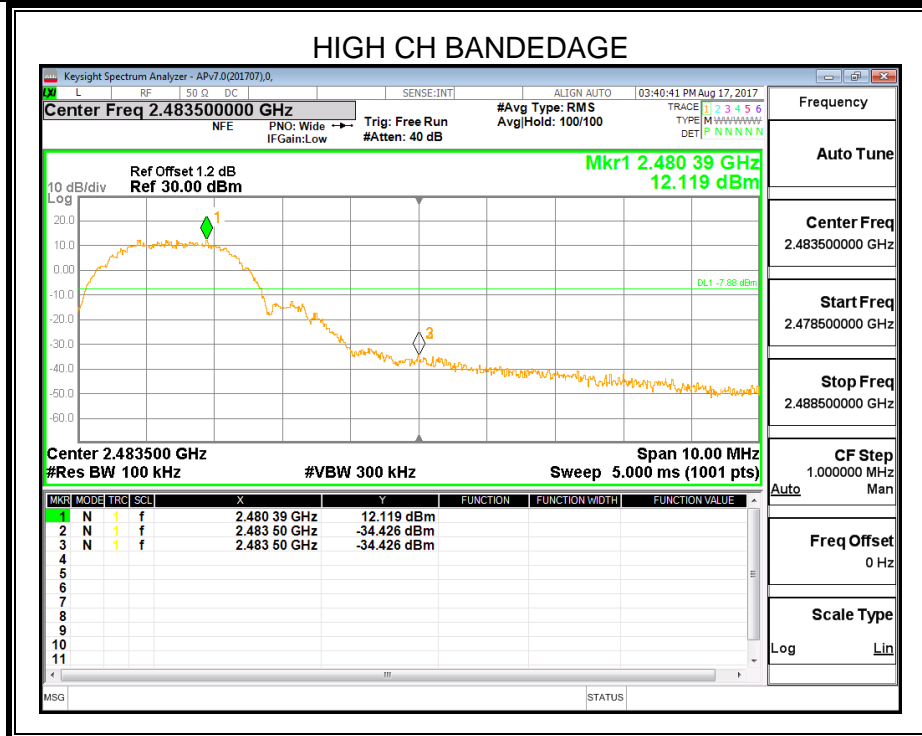
### TEST SETUP



## RESULTS







## 8. RADIATED TEST RESULTS

### LIMITS

Please refer to FCC §15.205 and §15.209

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.

Note: The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites.

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

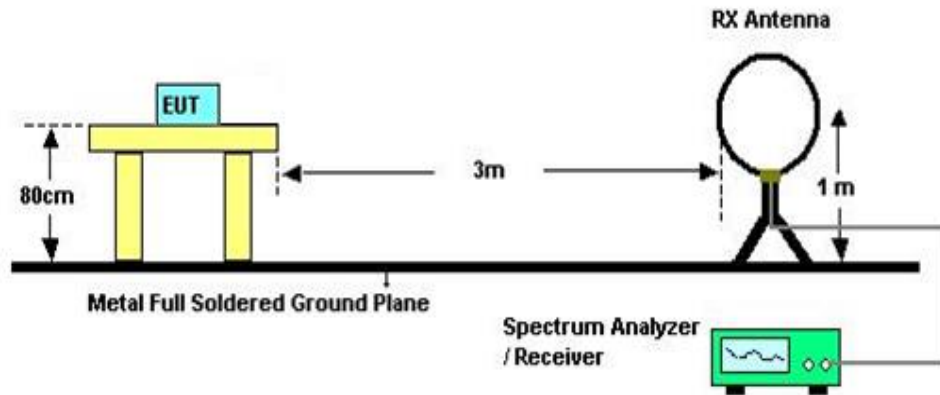
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
<sup>1</sup> 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
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	( <sup>2</sup> )
13.36-13.41			

Note: <sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup>Above 38.6c

## TEST SETUP AND PROCEDURE

Below 30MHz

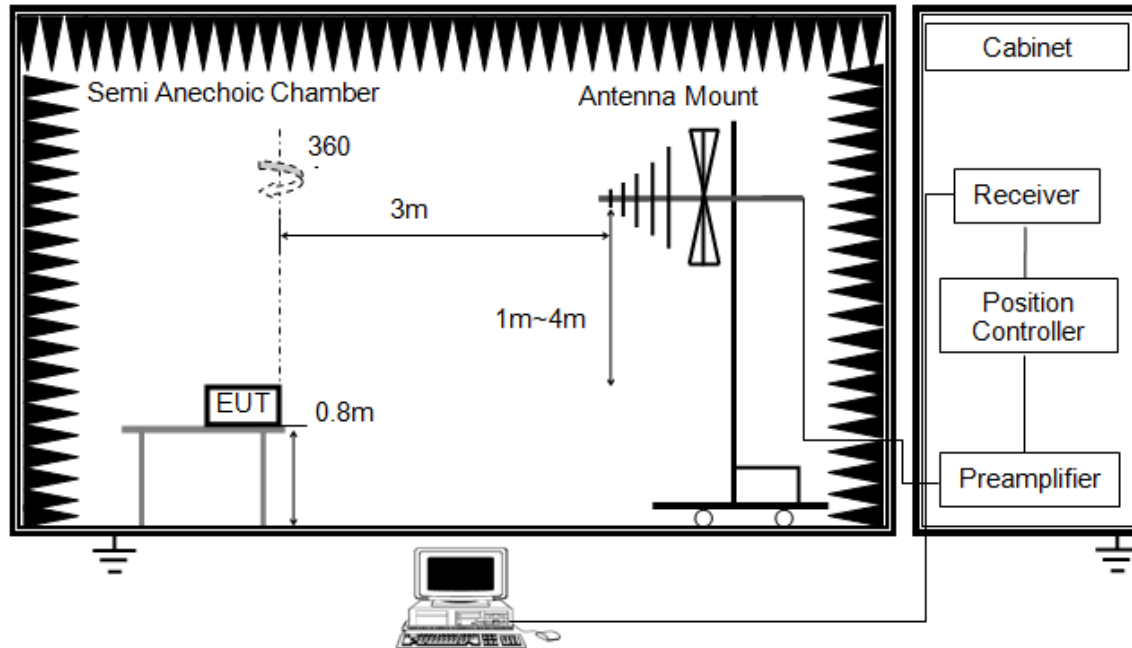


The setting of the spectrum analyser

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
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 0.8m 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. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
6. 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 and average 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 and average detector and reported.
7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

Below 1G and above 30MHz

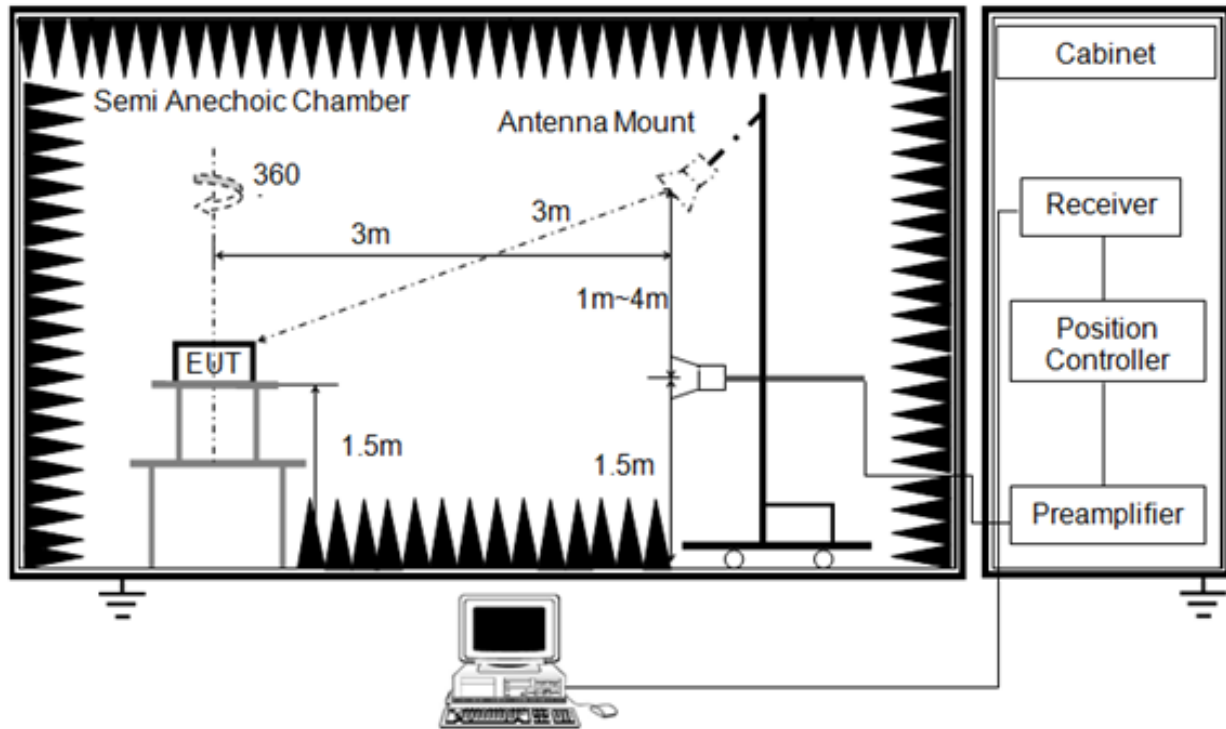


The setting of the spectrum analyser

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 0.8m 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 (1.5 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 0.8m 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.

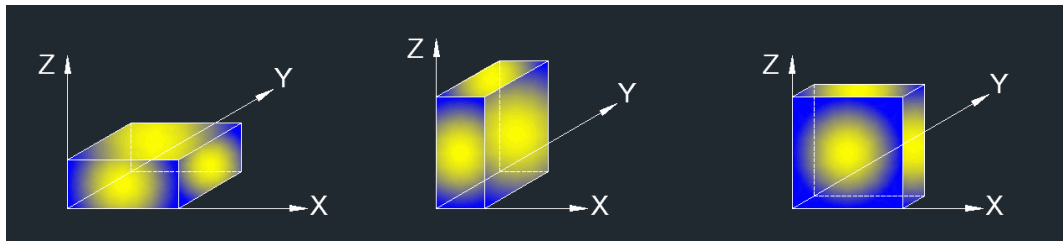
6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with  $1/T \leq$  video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 7.1.ON TIME AND DUTY CYCLE.

If that calculated VBW is not available on the analyzer then the next higher value should be used.

In this case 500Hz should be used.

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

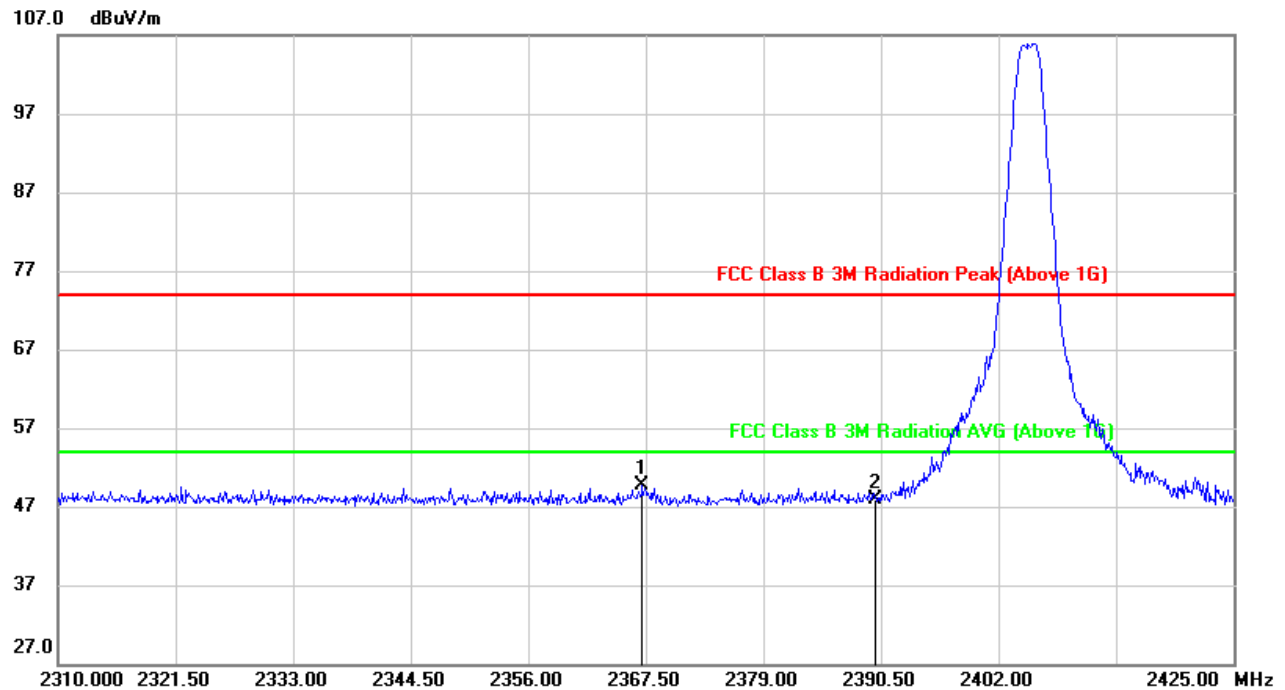
X axis, Y axis, Z axis positions:



Note: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

## 8.1. RESTRICTED BANDEDGE

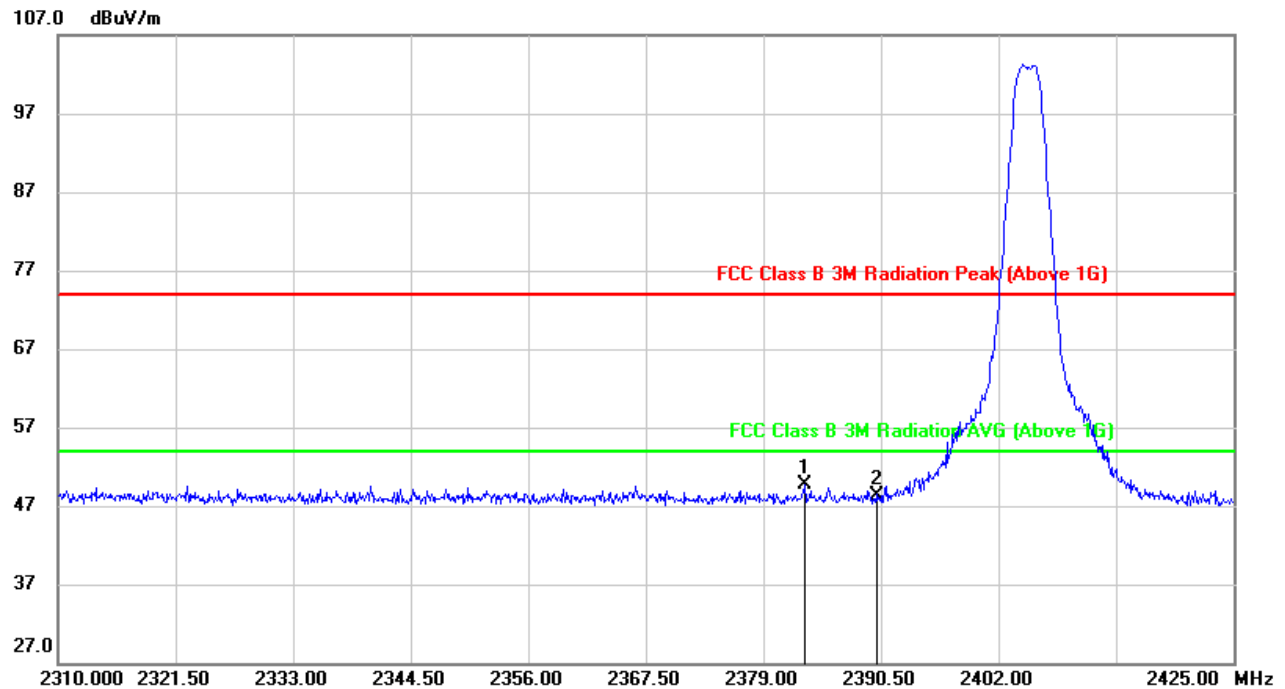
### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2367.155	16.49	33.30	49.79	74.00	-24.21	peak
2	2390.000	14.80	33.14	47.94	74.00	-26.06	peak

- Note: 1. Measurement = Reading Level + Correct Factor.  
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 3. Peak: Peak detector.  
 4. AVG: VBW=1/Ton where: ton is transmit duration.  
 5. For the Duty Cycle please refer to clause 7.1.ON TIME AND DUTY CYCLE.  
 6. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

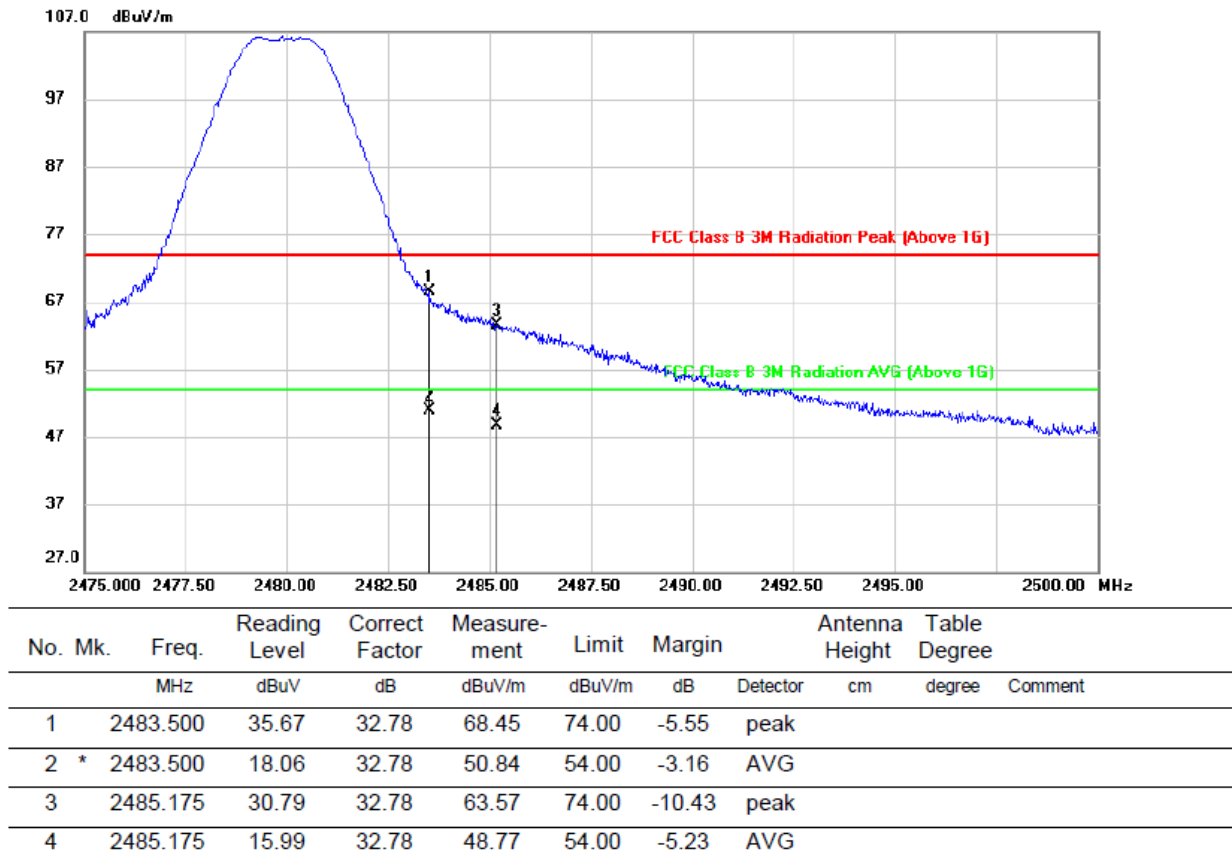
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2383.025	16.44	33.30	49.74	74.00	-24.26	peak
2	2390.000	15.16	33.24	48.40	74.00	-25.60	peak

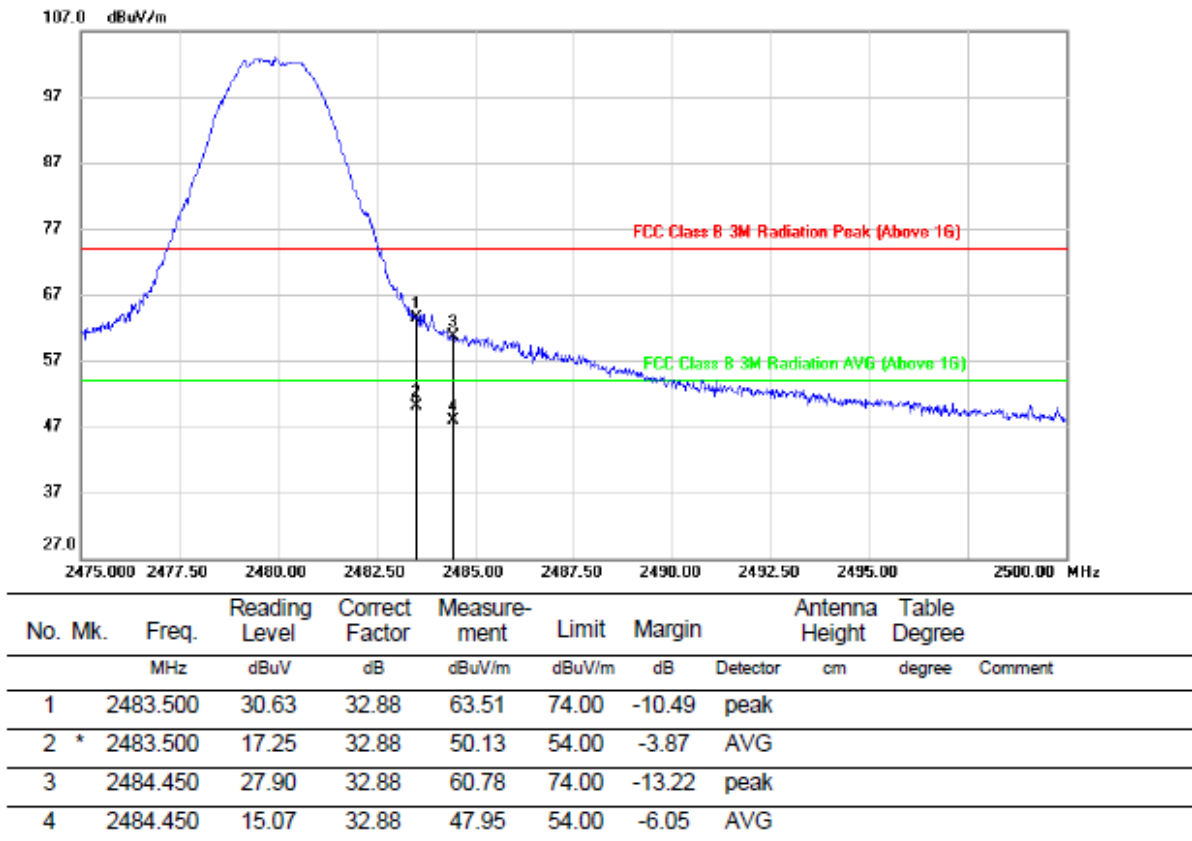
Note: 1. Measurement = Reading Level + Correct Factor.  
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 3. Peak: Peak detector.  
 4. AVG: VBW=1/Ton where: ton is transmit duration.  
 6. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



Note: 1. Measurement = Reading Level + Correct Factor.  
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 3. Peak: Peak detector.  
 4. AVG: VBW=1/Ton where: ton is transmit duration.  
 5. For the Duty Cycle please refer to clause 7.1.ON TIME AND DUTY CYCLE.  
 6. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

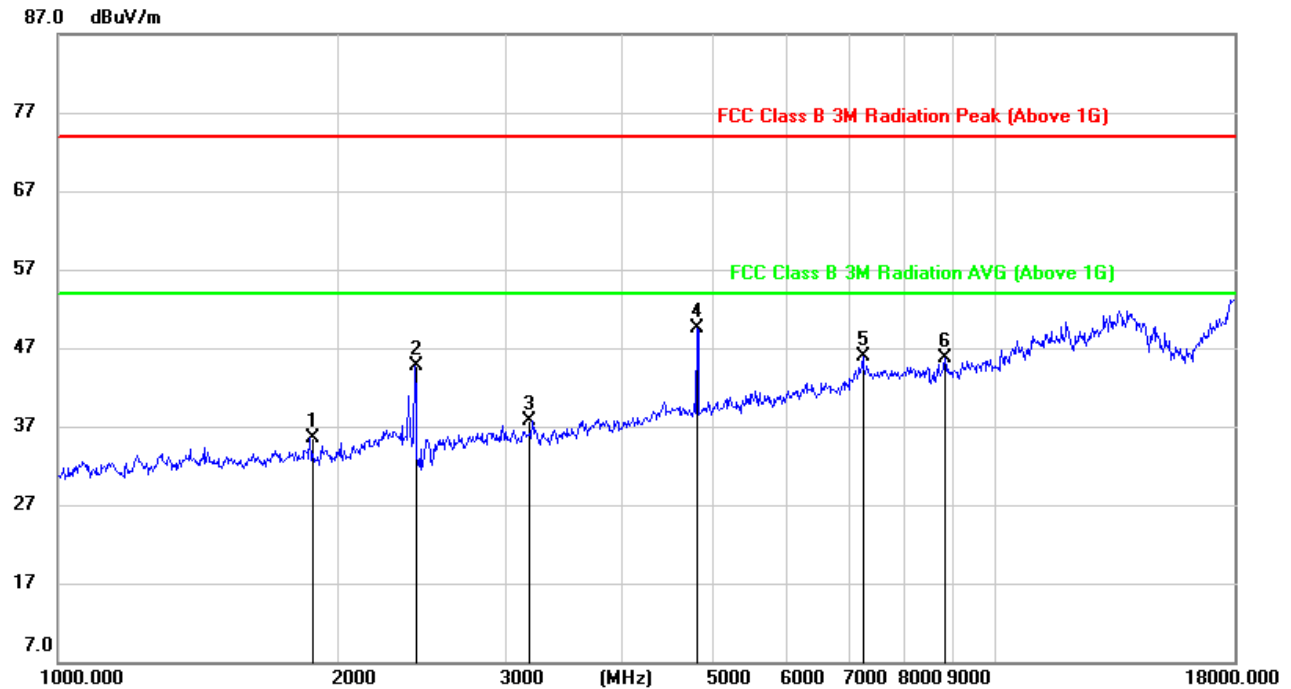
**RESTRICTED BANDEGE (HIGH CHANNEL, VERTICAL)**



Note: 1. Measurement = Reading Level + Correct Factor.  
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
3. Peak: Peak detector.  
4. AVG: VBW=1/Ton where: ton is transmit duration.  
5. For the Duty Cycle please refer to clause 7.1.ON TIME AND DUTY CYCLE.  
6. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

## 8.2. SPURIOUS EMISSIONS (1~18GHz)

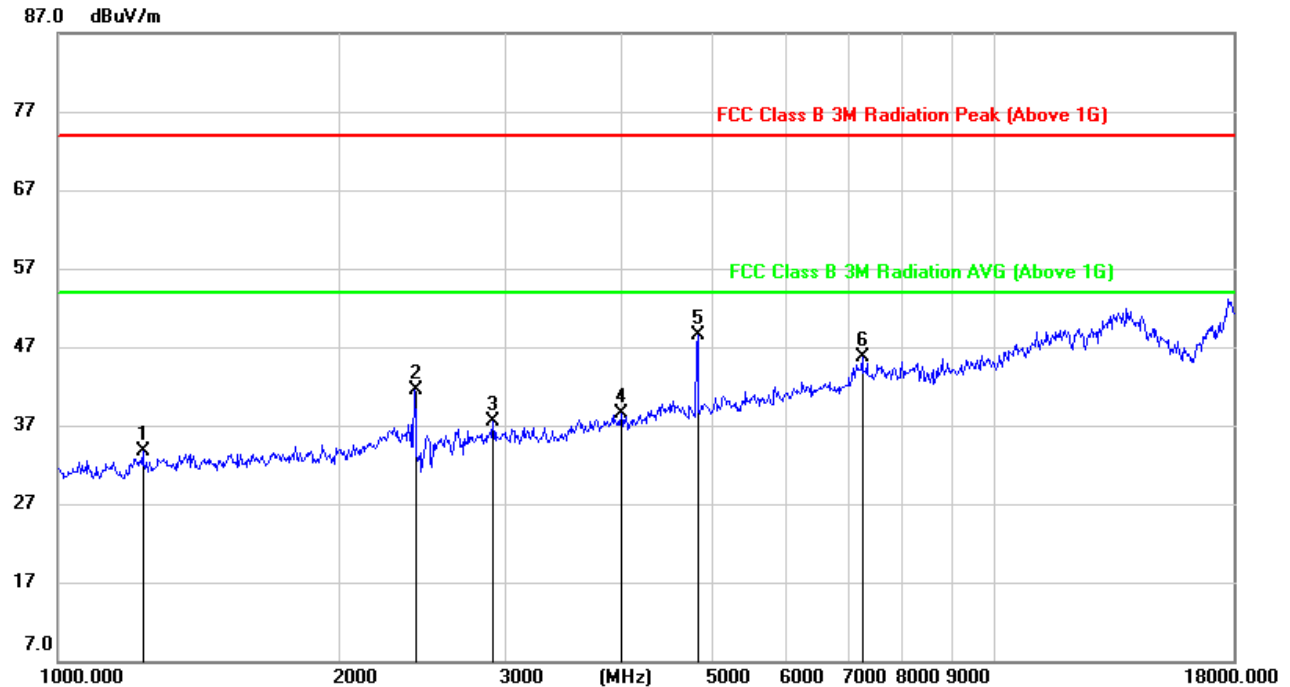
### HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1861.588	47.02	-11.55	35.47	74.00	-38.53	peak
2	2407.703	53.67	-9.02	44.65	74.00	-29.35	peak
3	3205.345	44.07	-6.35	37.72	74.00	-36.28	peak
4	4804.110	51.34	-1.76	49.58	74.00	-24.42	peak
5	7242.052	39.98	5.93	45.91	74.00	-28.09	peak
6	8840.472	37.86	7.78	45.64	74.00	-28.36	peak

Note: 1. Measurement = Reading Level + Correct Factor.  
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 3. Peak: Peak detector.  
 4. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

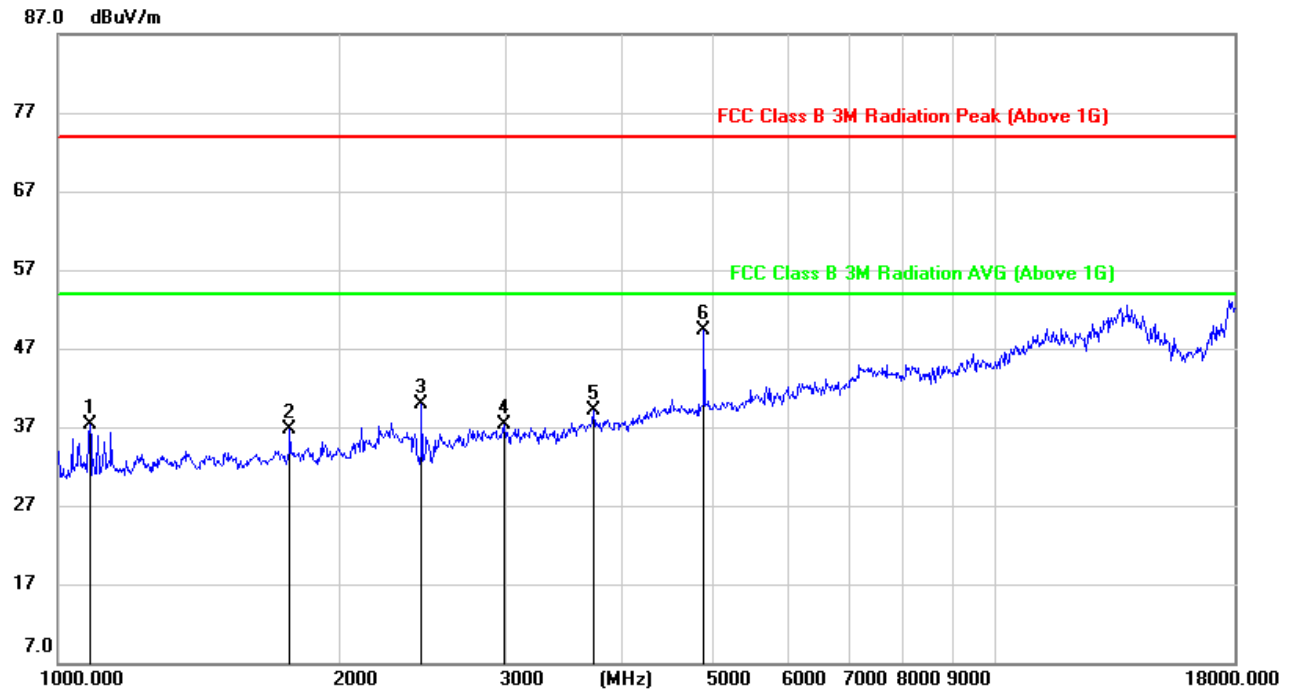
### HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1231.345	47.01	-13.28	33.73	74.00	-40.27	peak
2	2407.703	50.35	-8.92	41.43	74.00	-32.57	peak
3	2913.740	44.71	-7.16	37.55	74.00	-36.45	peak
4	4004.339	42.83	-4.40	38.43	74.00	-35.57	peak
5	4831.962	49.88	-1.41	48.47	74.00	-25.53	peak
6	7242.052	39.77	5.86	45.63	74.00	-28.37	peak

Note: 1. Measurement = Reading Level + Correct Factor.  
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 3. Peak: Peak detector.  
 4. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

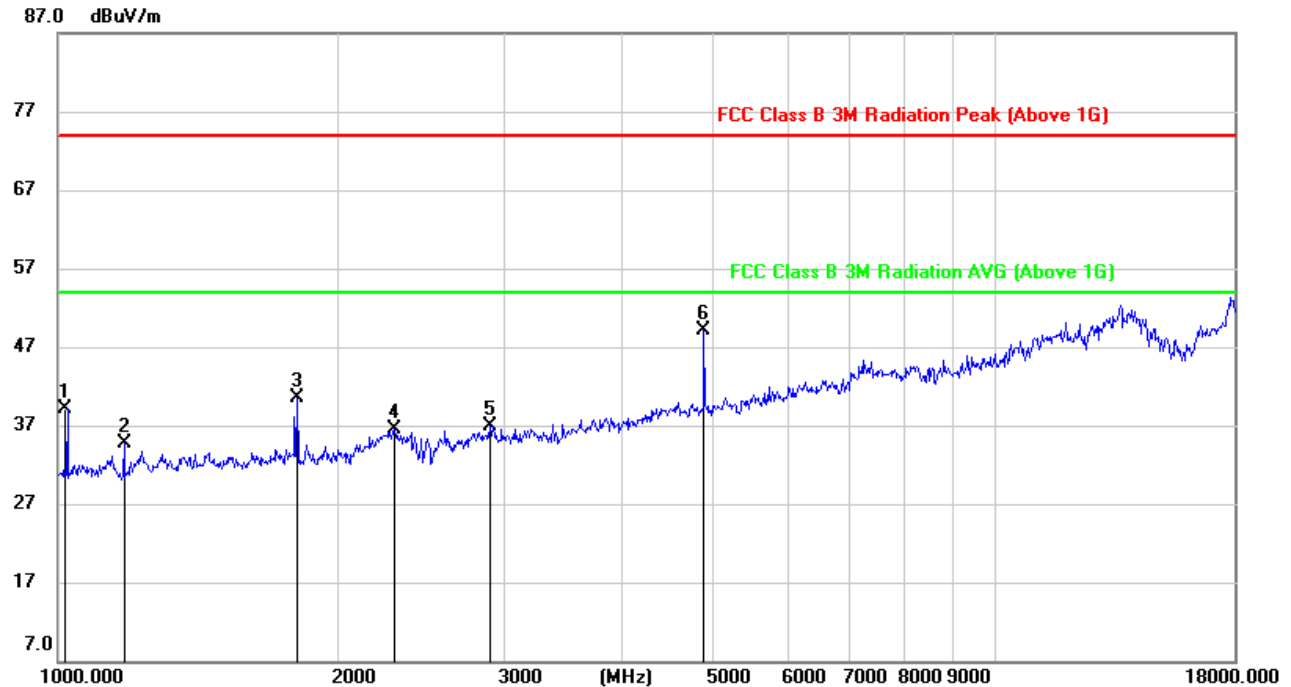
### HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1081.166	51.27	-14.02	37.25	74.00	-36.75	peak
2	1767.212	48.54	-11.88	36.66	74.00	-37.34	peak
3	2442.751	49.16	-9.18	39.98	74.00	-34.02	peak
4	2990.531	44.54	-7.15	37.39	74.00	-36.61	peak
5	3725.195	43.88	-4.87	39.01	74.00	-34.99	peak
6	4888.151	50.11	-0.79	49.32	74.00	-24.68	peak

Note: 1. Measurement = Reading Level + Correct Factor.  
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
3. Peak: Peak detector.  
4. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

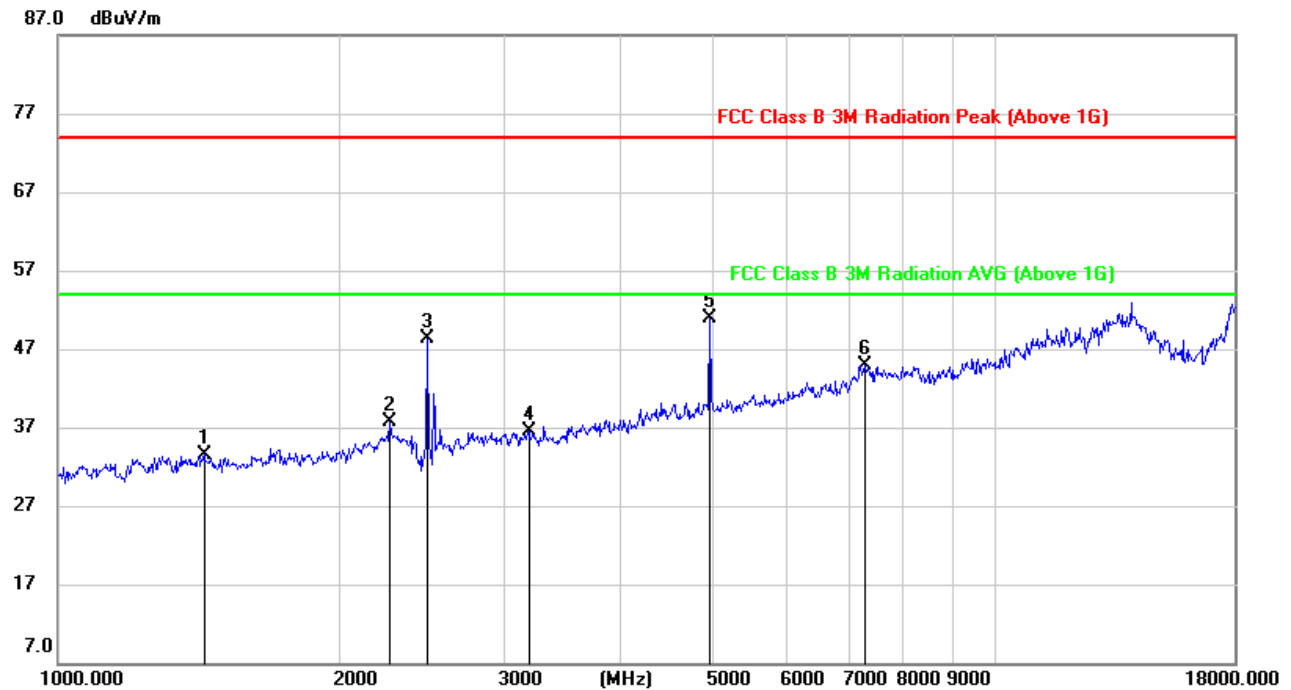
### HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1023.392	53.53	-14.49	39.04	74.00	-34.96	peak
2	1175.697	48.54	-13.78	34.76	74.00	-39.24	peak
3	1798.127	52.37	-11.77	40.60	74.00	-33.40	peak
4	2292.256	44.76	-8.17	36.59	74.00	-37.41	peak
5	2888.584	44.07	-7.19	36.88	74.00	-37.12	peak
6	4888.151	49.98	-0.86	49.12	74.00	-24.88	peak

Note: 1. Measurement = Reading Level + Correct Factor.  
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
3. Peak: Peak detector.  
4. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

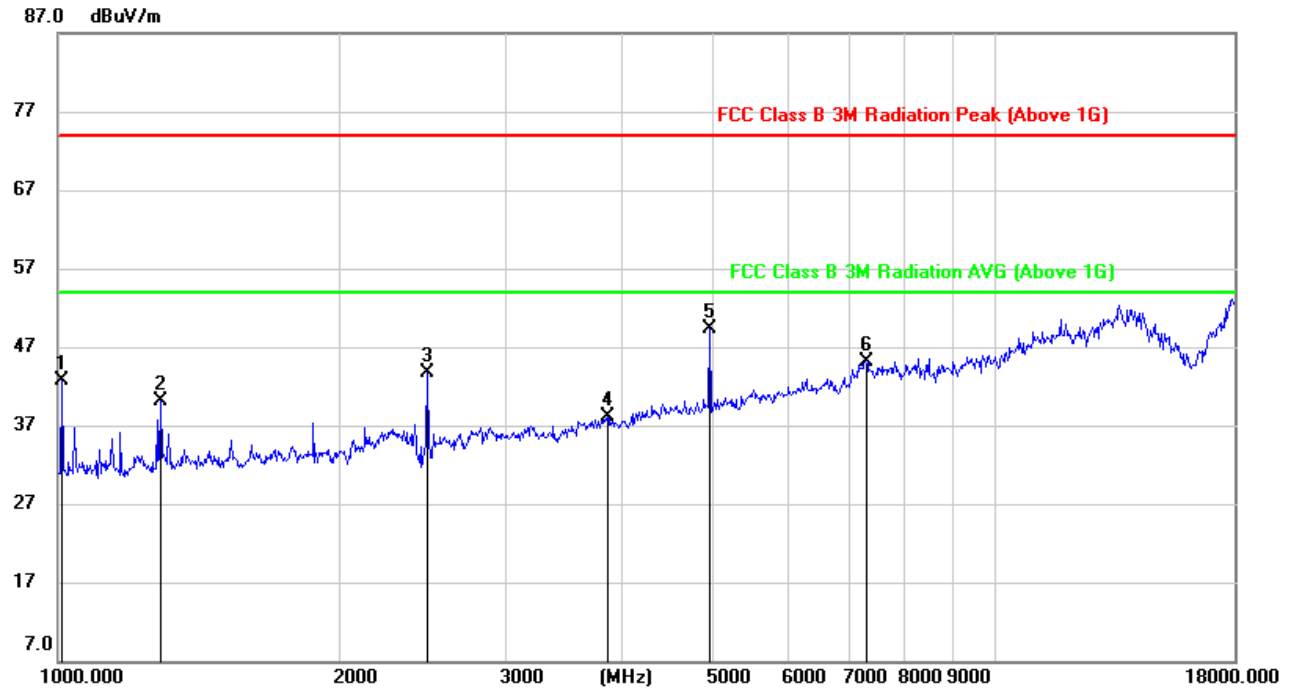
### HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1431.046	46.30	-12.70	33.60	74.00	-40.40	peak
2	2259.367	46.14	-8.35	37.79	74.00	-36.21	peak
3	2478.310	57.44	-9.21	48.23	74.00	-25.77	peak
4	3177.671	43.01	-6.46	36.55	74.00	-37.45	peak
5	4959.307	51.66	-0.78	50.88	74.00	-23.12	peak
6	7263.015	38.96	5.95	44.91	74.00	-29.09	peak

Note: 1. Measurement = Reading Level + Correct Factor.  
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 3. Peak: Peak detector.  
 4. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

### HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)

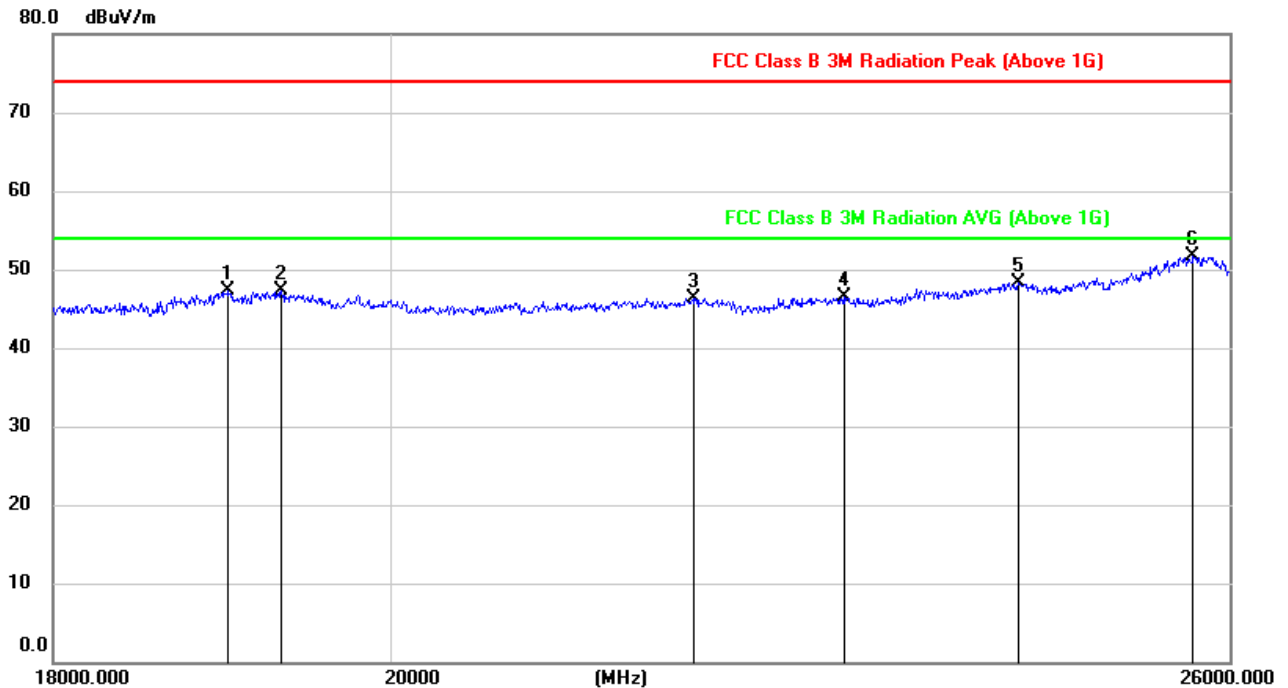


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1008.709	57.17	-14.53	42.64	74.00	-31.36	peak
2	1289.627	53.11	-13.05	40.06	74.00	-33.94	peak
3	2478.310	52.83	-9.11	43.72	74.00	-30.28	peak
4	3856.668	42.62	-4.42	38.20	74.00	-35.80	peak
5	4959.307	50.06	-0.76	49.30	74.00	-24.70	peak
6	7305.122	39.26	5.93	45.19	74.00	-28.81	peak

Note: 1. Measurement = Reading Level + Correct Factor.  
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 3. Peak: Peak detector.  
 4. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

### 8.3. SPURIOUS EMISSIONS 18G ~ 26GHz

#### SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



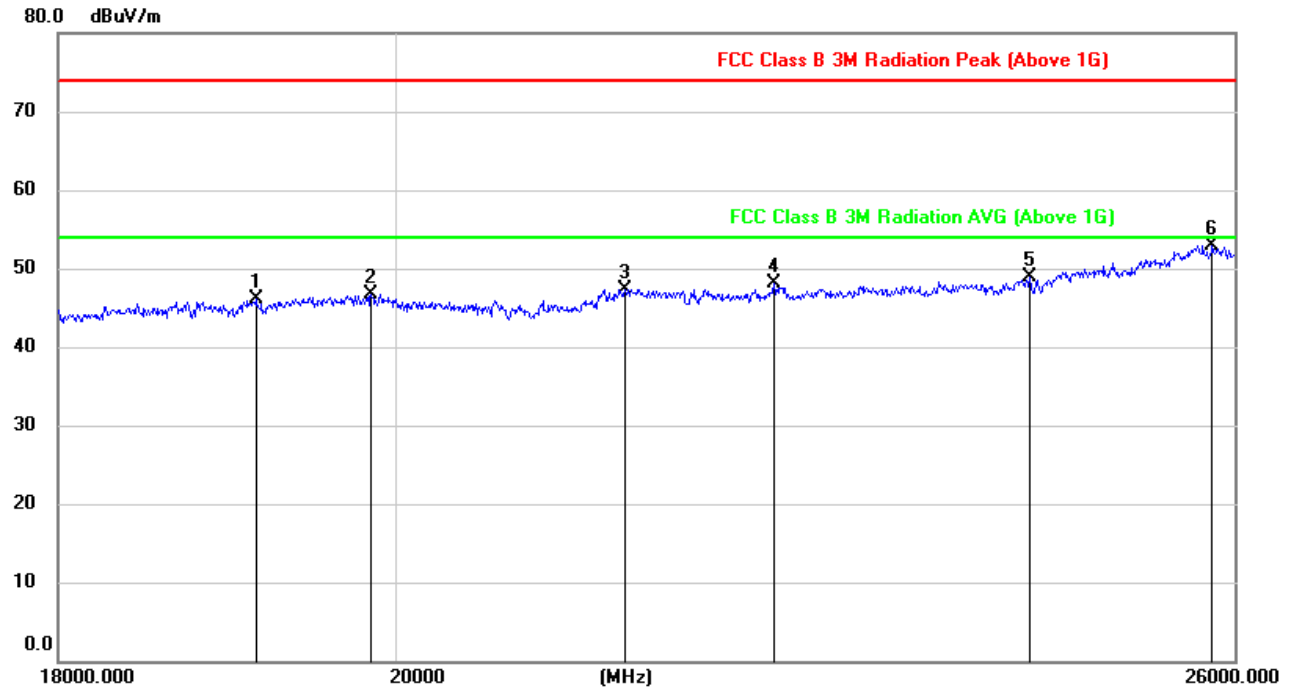
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	19013.757	52.62	-5.23	47.39	74.00	-26.61	peak
2	19331.007	52.83	-5.58	47.25	74.00	-26.75	peak
3	21986.179	50.76	-4.47	46.29	74.00	-27.71	peak
4	23045.783	49.86	-3.43	46.43	74.00	-27.57	peak
5	24334.767	50.95	-2.65	48.30	74.00	-25.70	peak
6	25705.297	52.47	-0.82	51.65	74.00	-22.35	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

**SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)**



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	19147.067	51.44	-5.43	46.01	74.00	-27.99	peak
2	19849.654	52.09	-5.33	46.76	74.00	-27.24	peak
3	21490.589	52.08	-4.69	47.39	74.00	-26.61	peak
4	22518.026	52.05	-3.87	48.18	74.00	-25.82	peak
5	24388.518	51.55	-2.55	49.00	74.00	-25.00	peak
6	25818.977	53.73	-0.74	52.99	74.00	-21.01	peak

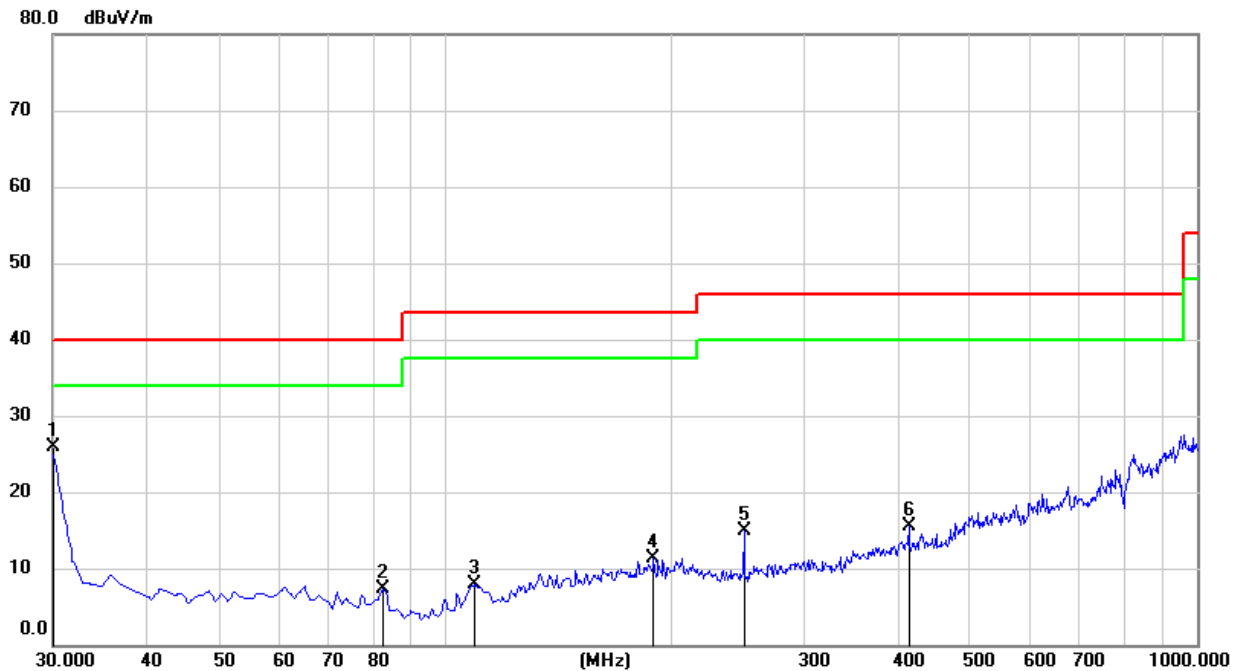
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

## 8.4. SPURIOUS EMISSIONS 30M ~ 1 GHz

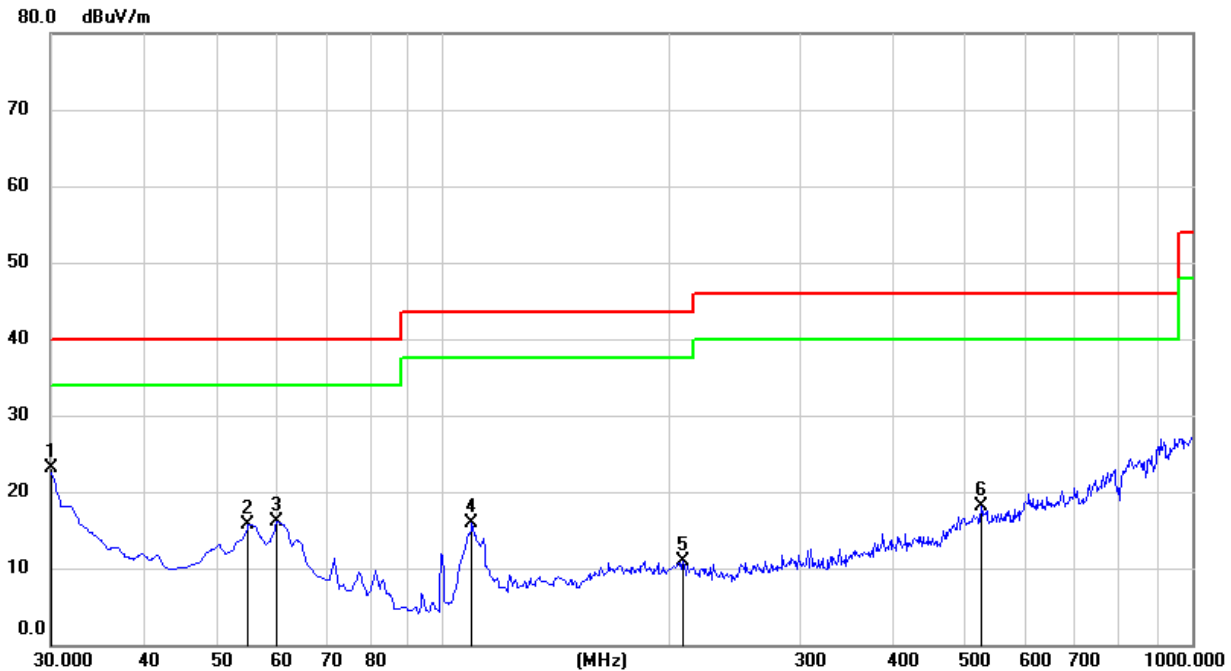
### SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.0000	40.16	-14.33	25.83	40.00	-14.17	QP
2	82.3800	24.94	-17.72	7.22	40.00	-32.78	QP
3	109.5400	24.86	-16.87	7.99	43.50	-35.51	QP
4	189.0800	23.95	-12.58	11.37	43.50	-32.13	QP
5	250.1900	28.14	-13.31	14.83	46.00	-31.17	QP
6	414.1200	25.27	-9.86	15.41	46.00	-30.59	QP

Note: 1. Result Level = Read Level + Correct Factor.  
 2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.  
 3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.  
 4. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

**SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)**



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.0000	37.47	-14.33	23.14	40.00	-16.86	QP
2	55.2200	32.30	-16.51	15.79	40.00	-24.21	QP
3	60.0700	32.63	-16.52	16.11	40.00	-23.89	QP
4	109.5400	32.80	-16.87	15.93	43.50	-27.57	QP
5	209.4500	23.44	-12.60	10.84	43.50	-32.66	QP
6	522.7600	25.60	-7.40	18.20	46.00	-27.80	QP

Note: 1. Result Level = Read Level + Correct Factor.

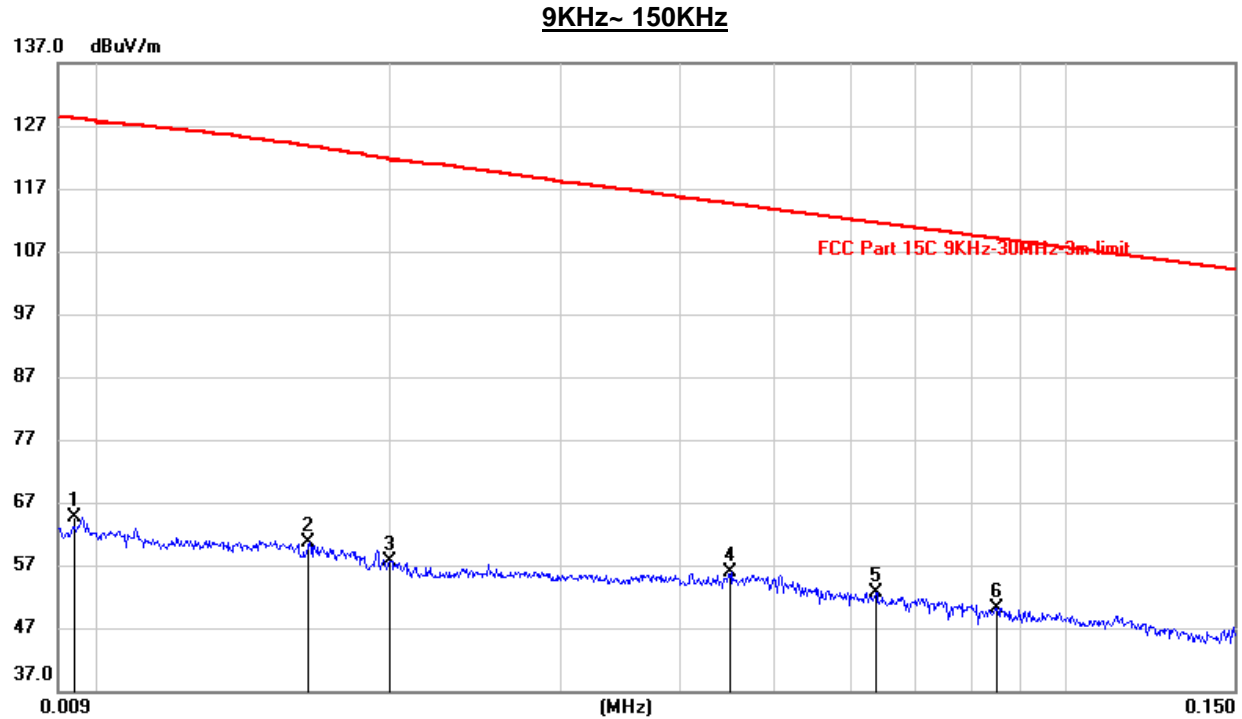
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

4. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

## 8.5. SPURIOUS EMISSIONS BELOW 30M

### SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)



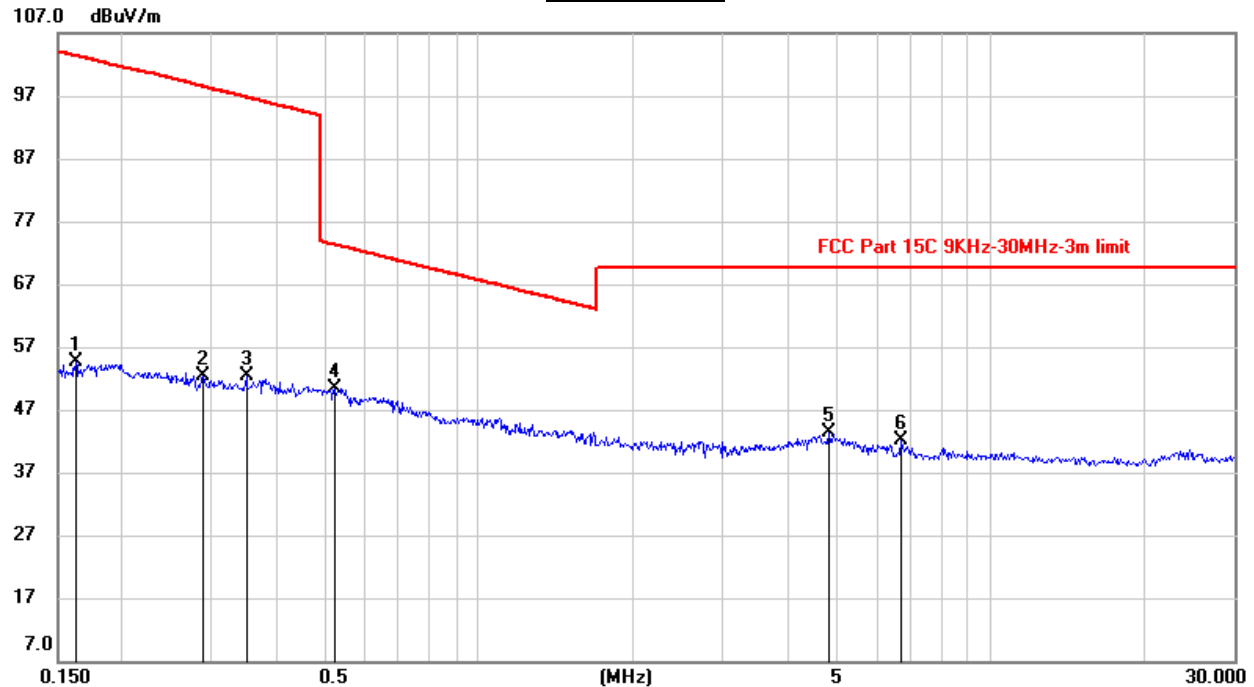
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0094	44.40	20.26	64.66	128.06	-63.40	peak
2	0.0164	40.26	20.27	60.53	123.75	-63.22	peak
3	0.0200	37.44	20.31	57.75	121.58	-63.83	peak
4	0.0449	35.68	20.31	55.99	114.61	-58.62	peak
5	0.0637	32.38	20.31	52.69	111.54	-58.85	peak
6	0.0850	29.85	20.27	50.12	109.03	-58.91	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

**150KHz ~ 30M**



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.1621	34.11	20.41	54.52	103.41	-48.89	peak
2	0.2878	32.16	20.31	52.47	98.49	-46.02	peak
3	0.3502	31.98	20.29	52.27	96.81	-44.54	peak
4	0.5237	30.23	20.25	50.48	73.26	-22.78	peak
5	4.8224	22.62	20.86	43.48	69.54	-26.06	peak
6	6.6977	21.21	20.90	42.11	69.54	-27.43	peak

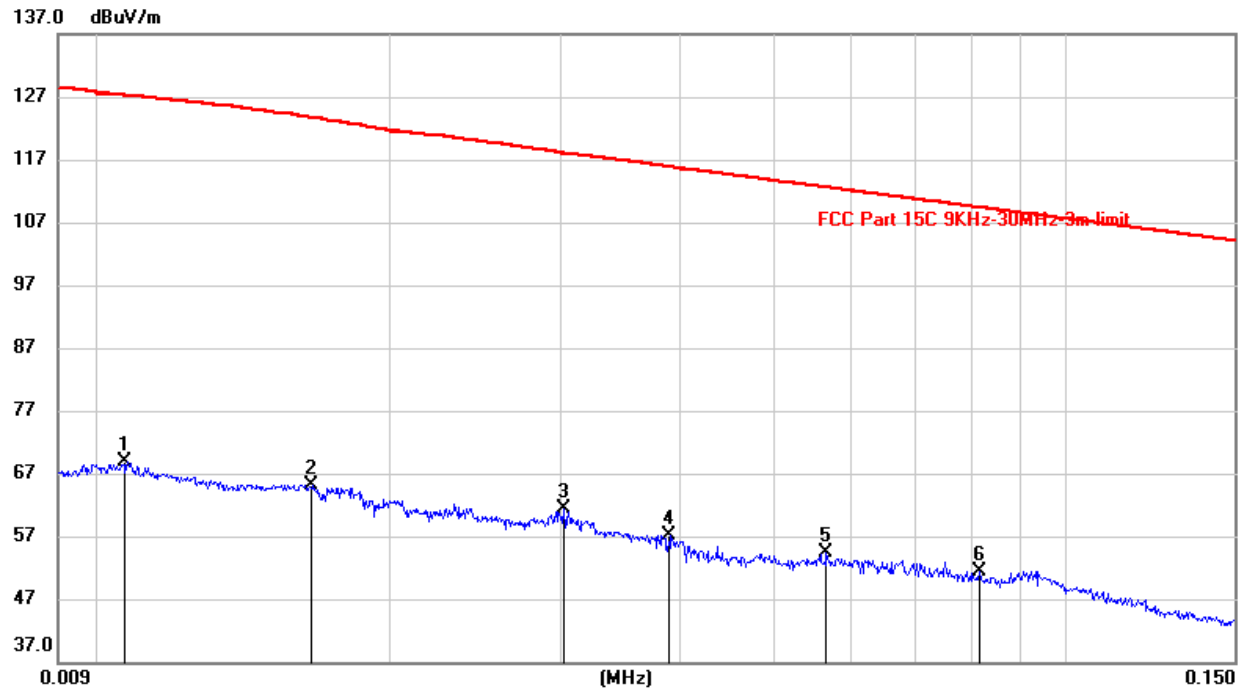
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

**SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)**

**9KHz~ 150KHz**



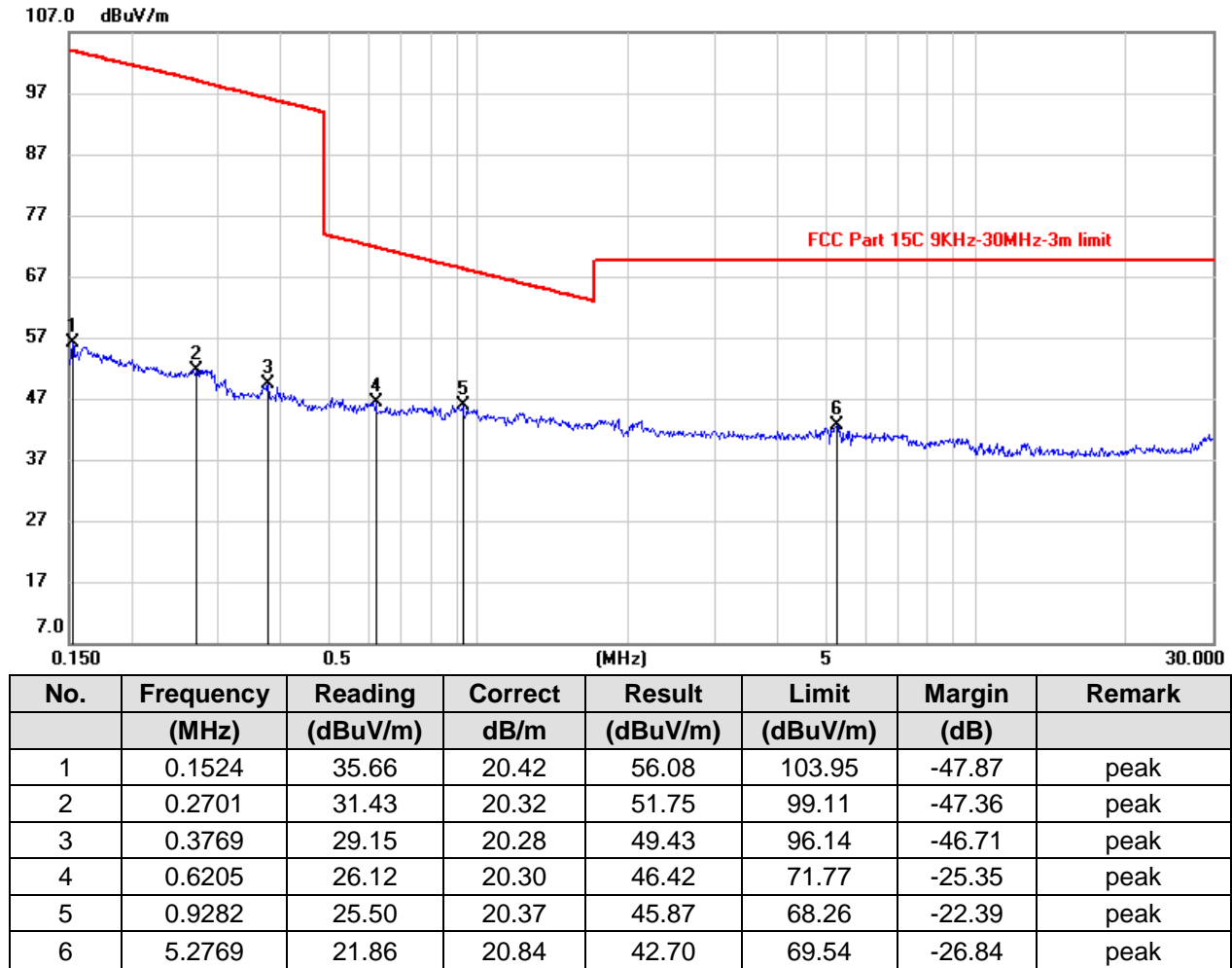
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0106	48.54	20.22	68.76	127.24	-58.48	peak
2	0.0165	44.79	20.27	65.06	123.69	-58.63	peak
3	0.0302	40.96	20.31	61.27	118.01	-56.74	peak
4	0.0388	36.94	20.31	57.25	115.86	-58.61	peak
5	0.0565	34.07	20.31	54.38	112.59	-58.21	peak
6	0.0816	31.20	20.28	51.48	109.38	-57.90	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

**150KHz ~ 30M**



Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. Only the worst case emission will be recorder, if it complies with the limit, the other emissions deemed to comply with the limit.

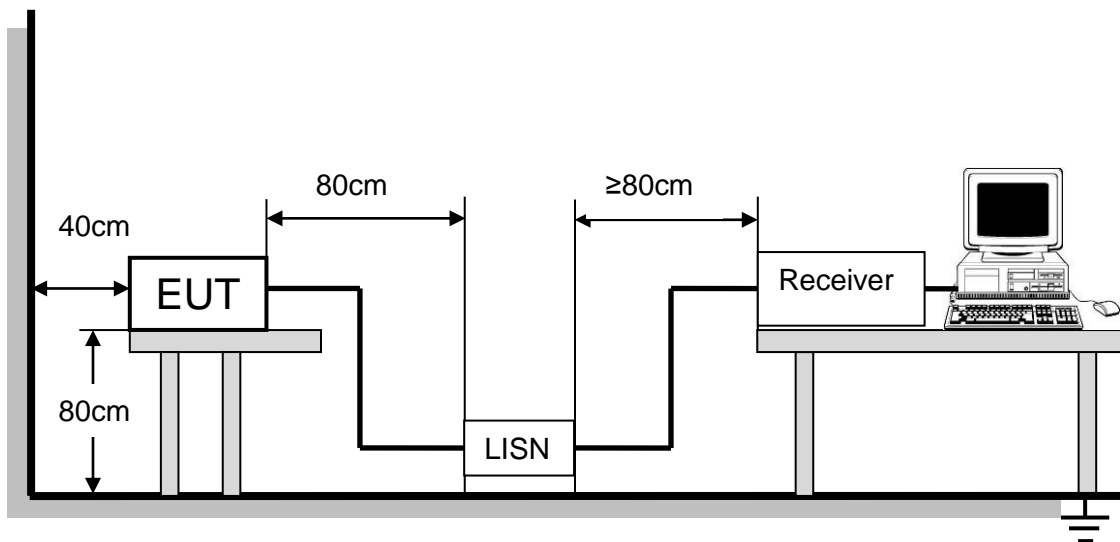
## 9. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

Please refer to FCC §15.207 (a).

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

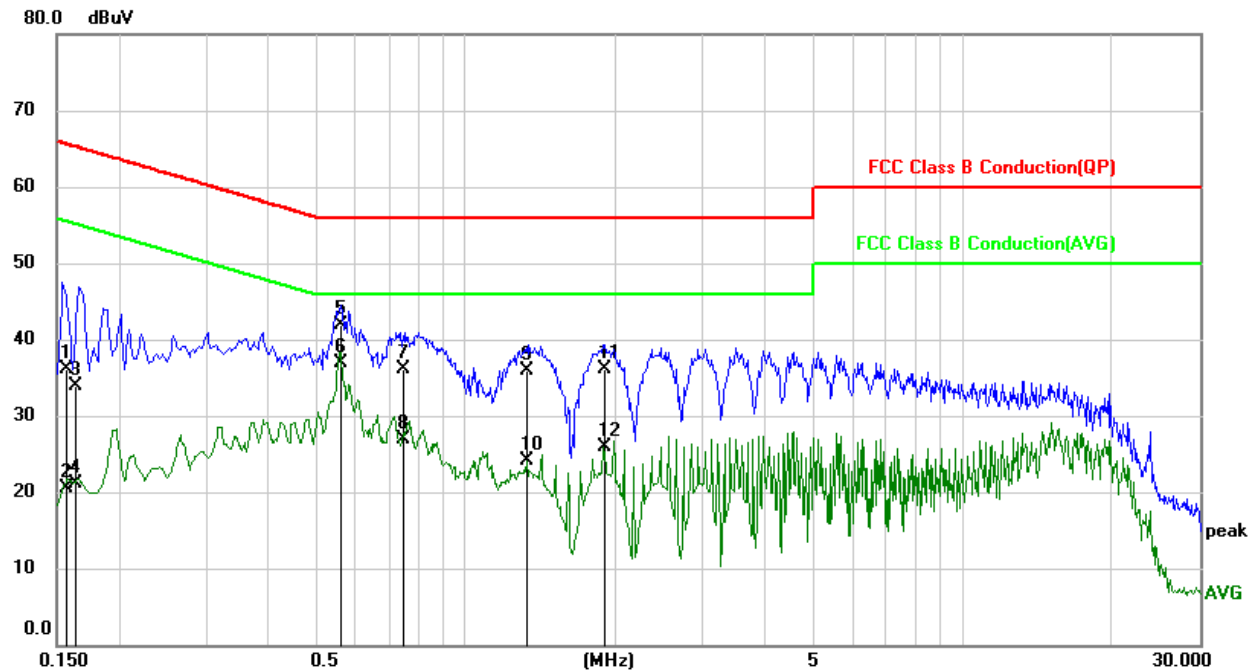


The EUT is put on a table of non-conducting material that is 0.8m high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2003. 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 RESULTS (MID CHANNEL, WORST-CASE CONFIGURATION)**

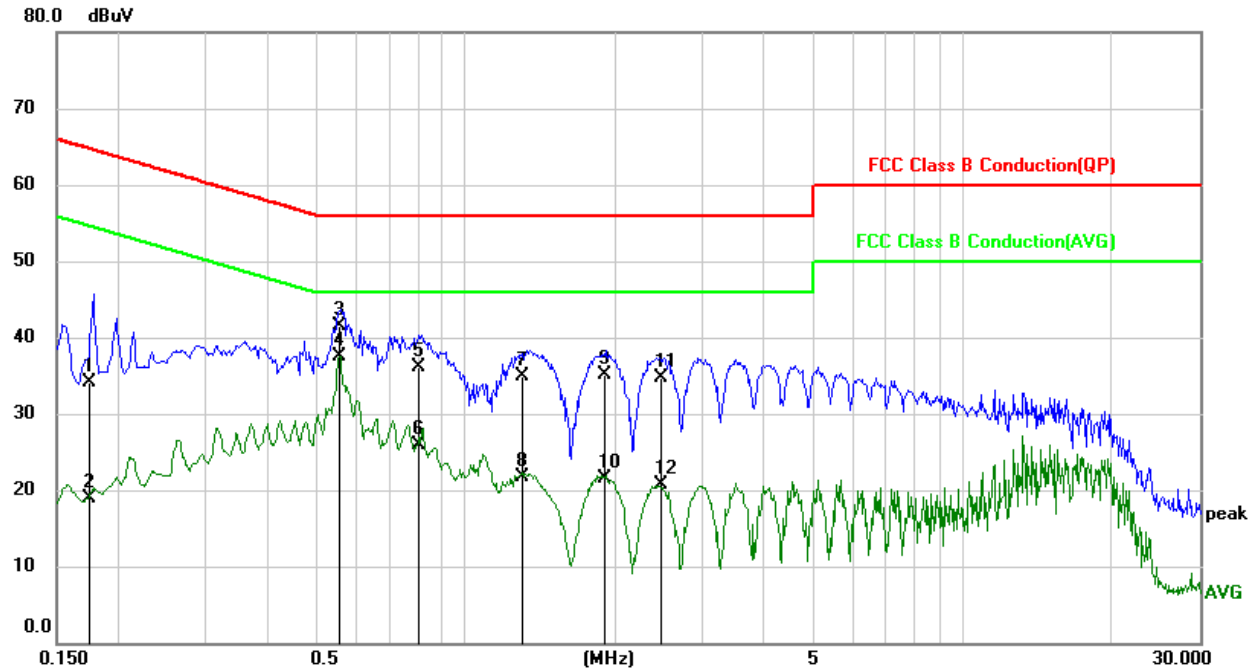
## **LINE N RESULTS**



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1568	26.45	9.65	36.10	65.63	-29.53	QP
2	0.1568	10.84	9.65	20.49	55.63	-35.14	AVG
3	0.1635	24.35	9.64	33.99	65.28	-31.29	QP
4	0.1635	11.42	9.64	21.06	55.28	-34.22	AVG
5	0.5630	32.15	9.66	41.81	56.00	-14.19	QP
6	0.5630	27.29	9.66	36.95	46.00	-9.05	AVG
7	0.7466	26.43	9.66	36.09	56.00	-19.91	QP
8	0.7466	17.21	9.66	26.87	46.00	-19.13	AVG
9	1.3266	26.26	9.67	35.93	56.00	-20.07	QP
10	1.3266	14.35	9.67	24.02	46.00	-21.98	AVG
11	1.8951	26.44	9.67	36.11	56.00	-19.89	QP
12	1.8951	16.22	9.67	25.89	46.00	-20.11	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 (MHz)	Reading (dBuV)	Correct dB	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1736	24.51	9.66	34.17	64.79	-30.62	QP
2	0.1736	9.23	9.66	18.89	54.79	-35.90	AVG
3	0.5569	31.75	9.66	41.41	56.00	-14.59	QP
4	0.5569	27.94	9.66	37.60	46.00	-8.40	AVG
5	0.7987	26.43	9.67	36.10	56.00	-19.90	QP
6	0.7987	16.21	9.67	25.88	46.00	-20.12	AVG
7	1.3045	25.23	9.67	34.90	56.00	-21.10	QP
8	1.3045	12.09	9.67	21.76	46.00	-24.24	AVG
9	1.8950	25.39	9.68	35.07	56.00	-20.93	QP
10	1.8950	11.81	9.68	21.49	46.00	-24.51	AVG
11	2.4636	24.98	9.68	34.66	56.00	-21.34	QP
12	2.4636	10.94	9.68	20.62	46.00	-25.38	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.

Note: All the modulation and channels had been tested, but only the worst data recorded in the report.

## 10. ANTENNA REQUIREMENTS

### Applicable requirements

Please refer to FCC §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. 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 provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### Antenna Connector

EUT has a PCB antenna without antenna connector.

### Antenna Gain

The antenna gain of EUT is less than 6 dBi.

**END OF REPORT**

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