



**CFR 47 FCC PART 15 SUBPART C
ISED RSS-247 ISSUE 2**

CERTIFICATION TEST REPORT

For

Smart Plug

MODEL NUMBER: 7A-PL-B-A1

FCC ID: 2AB2Q-7APLBA1

IC: 10256A-7APLBA1

REPORT NUMBER: 4788899177.1-4

ISSUE DATE: March 25, 2019

Prepared for

LEEDARSON LIGHTING CO., LTD.

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City, Fujian Province, P.R.China**

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	3/25/2019	Initial Issue	



Summary of Test Results			
Clause	Test Items	FCC/IC Rules	Test Results
1	6dB Bandwidth and 99% Occupied Bandwidth	FCC Part 15.247 (a) (2) RSS-247 Clause 5.2 (a) ISED RSS-Gen Clause 6.7	Pass
2	Peak Conducted Output Power	FCC Part 15.247 (b) (3) RSS-247 Clause 5.4 (e)	Pass
3	Power Spectral Density	FCC Part 15.247 (e) RSS-247 Clause 5.2 (b)	Pass
4	Conducted Bandedge and Spurious Emission	FCC Part 15.247 (d) RSS-247 Clause 5.5	Pass
5	Radiated Bandedge and Spurious Emission	FCC Part 15.247 (d) FCC Part 15.209 FCC Part 15.205 RSS-247 Clause 5.5 RSS-GEN Clause 8.9	Pass
6	Conducted Emission Test For AC Power Port	FCC Part 15.207 RSS-GEN Clause 8.8	Pass
7	Antenna Requirement	FCC Part 15.203 RSS-GEN Clause 8.3	Pass



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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: LEEDARSON LIGHTING CO., LTD.
Address: Xingtai Industrial Zone, Economic Development Zone, Changtai County, Zhangzhou City, Fujian Province, P.R.China

Manufacturer Information

Company Name: LEEDARSON LIGHTING CO., LTD.
Address: Xingtai Industrial Zone, Economic Development Zone, Changtai County, Zhangzhou City, Fujian Province, P.R.China

EUT Information

EUT Name: Smart Plug
Model: 7A-PL-B-A1
Brand Name: LEEDARSON
Sample Received Date: March 11, 2019
Date of Tested: March 11~ 20, 2019

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 FCC PART 15 SUBPART C	PASS
ISED RSS-247 Issue 2	PASS
ISED RSS-GEN Issue 5	PASS

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB 558074 D01 15.247 Meas Guidance v05r01, KDB 414788 D01 Radiated Test Site v01r01, CFR 47 FCC Part 2, CFR 47 FCC Part 15, ANSI C63.10-2013, ISED RSS-247 Issue 2 and ISED RSS-GEN Issue 5.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	<p>A2LA (Certificate No.: 4102.01) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA.</p> <p>FCC (FCC Designation No.: CN1187) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules</p> <p>IC(Company No.: 21320) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320.</p> <p>VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793.</p> <p>Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011</p>
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Note 1: All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

Note 2: 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 and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

Note 3: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30MHz had been correlated to measurements performed on an OFS.



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:

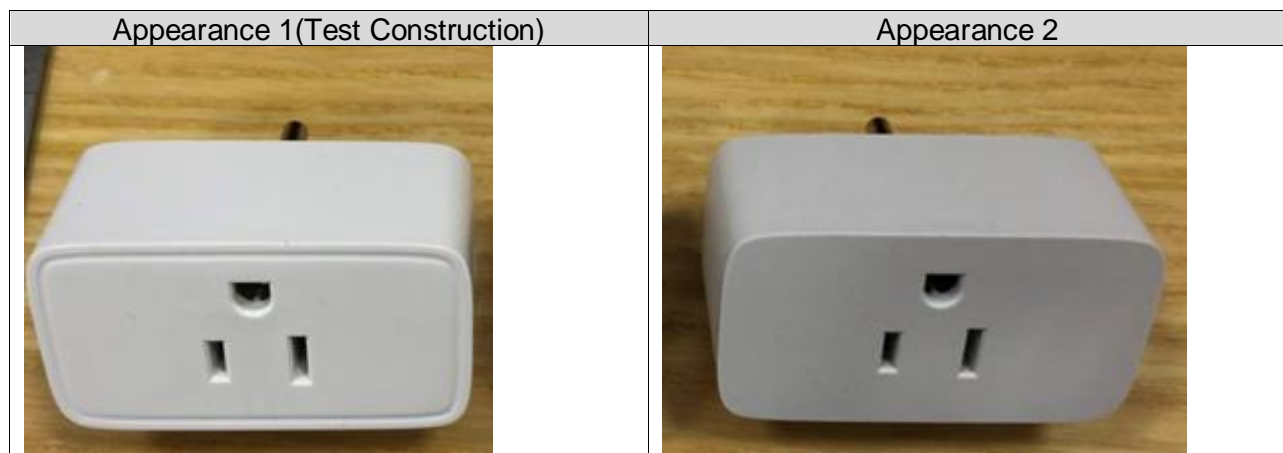
Test Item	Uncertainty
Conduction emission	3.62dB
Radiation Emission test(include Fundamental emission) (9kHz-30MHz)	2.2dB
Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	4.00dB
Radiation Emission test (1GHz to 26GHz)(include Fundamental emission)	5.78dB (1GHz-18Gz)
	5.23dB (18GHz-26Gz)
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

EUT Name	Smart Plug	
Model	7A-PL-B-A1	
Product Description	Operation Frequency	2402 MHz ~ 2480 MHz
	Modulation Type	Data Rate
	GFSK	1Mbps
Rated Input	AC 120V, 60Hz	
Remark	<p>1. There are four different choices for the end product and They have the same RF circuit and the performance , same technical construction including drive circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction. The difference lies only have different brands of relay and with or without the power analyzer chip.</p> <p>2. The end product will have two kinds of appearance, but the change of appearance is very small and the material is the same, the two kinds of appearance has been considered, so the test will show the worst case.</p>	

Test Construction	Description
Construction 1	AZ9481 Relay with power analyzer chip
Construction 2	AZ9481 Relay without power analyzer chip
Construction 3	HF7520 Relay with power analyzer chip
Construction 4	HF7520 Relay without power analyzer chip





5.2. MAXIMUM OUTPUT POWER

Bluetooth Mode	Frequency (MHz)	Channel Number	Max Output Power (dBm)	EIRP (dBm)
BLE	2402-2480	0-39[40]	5.862	8.622

5.3. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	11	2424	22	2446	33	2468
1	2404	12	2426	23	2448	34	2470
2	2406	13	2428	24	2450	35	2472
3	2408	14	2430	25	2452	36	2474
4	2410	15	2432	26	2454	37	2476
5	2412	16	2434	27	2456	38	2478
6	2414	17	2436	28	2458	39	2480
7	2416	18	2438	29	2460	/	/
8	2418	19	2440	30	2462	/	/
9	2420	20	2442	31	2464	/	/
10	2422	21	2444	32	2468	/	/



5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
GFSK	LCH, MCH, HCH	2402MHz, 2440MHz, 2480MHz

5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band				
Test Software		EMI_Test_Tool		
Modulation Type	Transmit Antenna Number	Test Channel		
		CH 0	CH 19	CH 39
GFSK	1	7	7	7

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2402-2480	Integral Antenna	2.76

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. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	40 ~ 60%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	22 ~ 28°C
Voltage :	VL	N/A
	VN	AC120V,60Hz
	VH	N/A

Note: VL= Lower Extreme Test Voltage
VN= Nominal Voltage
VH= Upper Extreme Test Voltage
TN= Normal Temperature



5.9. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

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

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	N/A	N/A	0.8	N/A

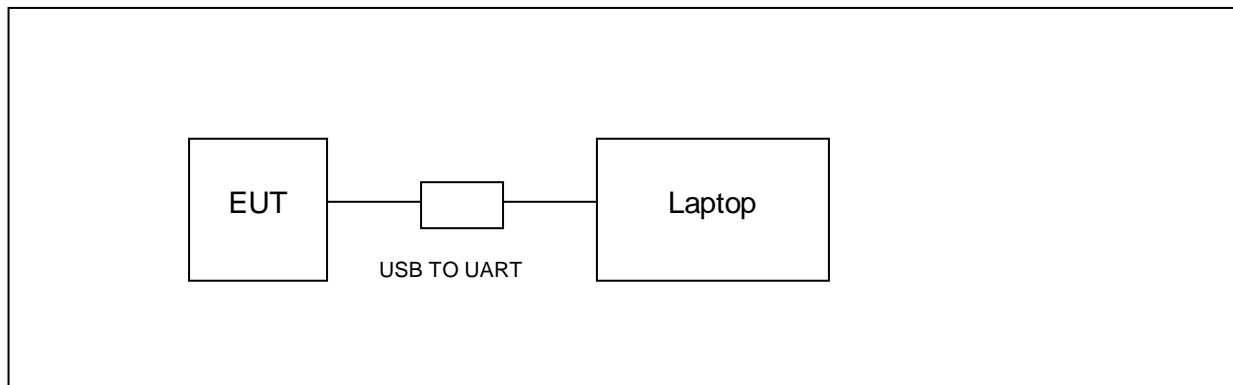
ACCESSORY

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 PC.

SETUP DIAGRAM FOR TEST



**5.10. MEASURING INSTRUMENT AND SOFTWARE USED**

Conducted Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	EMI Test Receiver	R&S	ESR3	101961	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Two-Line V-Network	R&S	ENV216	101983	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Dec.10,2018	Dec.10,2019
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.	Next Cal.
<input checked="" type="checkbox"/>	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Sep.17, 2018	Sep.17, 2021
<input checked="" type="checkbox"/>	Preamplifier	HP	8447D	2944A09099	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	EMI Measurement Receiver	R&S	ESR26	101377	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Horn Antenna	TDK	HRN-0118	130939	Sep.17, 2018	Sep.17, 2021
<input checked="" type="checkbox"/>	High Gain Horn Antenna	Schwarzbeck	BBHA-9170	691	Aug.11, 2018	Aug.11, 2021
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Loop antenna	Schwarzbeck	1519B	00008	Mar.26,2016	Mar.25, 2019
<input checked="" type="checkbox"/>	Band Reject Filter	Wainwright	WRCJV8-2350-2400-2483.5-2533.5-40SS	4	Dec.10, 2018	Dec.10, 2019
<input checked="" type="checkbox"/>	High Pass Filter	Wi	WHKX10-2700-3000-18000-40SS	23	Dec.10,2018	Dec.10,2019
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.	Next Cal.
<input checked="" type="checkbox"/>	Spectrum Analyzer	Keysight	N9030A	MY55410512	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Power Meter	Keysight	N9031A	MY55416024	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Power Sensor	Keysight	N9323A	MY55440013	Dec.10,2018	Dec.10,2019

6. MEASUREMENT METHODS

No.	Test Item	KDB Name	Section
1	6 dB Bandwidth	KDB 558074 D01 15.247 Meas Guidance v05r01	8.2
2	Peak Output Power	KDB 558074 D01 15.247 Meas Guidance v05r01	8.3.1.3
3	Power Spectral Density	KDB 558074 D01 15.247 Meas Guidance v05r01	8.4
4	Out-of-band emissions in non-restricted bands	KDB 558074 D01 15.247 Meas Guidance v05r01	8.5
5	Out-of-band emissions in restricted bands	KDB 558074 D01 15.247 Meas Guidance v05r01	8.6
6	Band-edge	KDB 558074 D01 15.247 Meas Guidance v05r01	8.7
7	Conducted Emission Test For AC Power Port	ANSI C63.10-2013	6.2
8	99% Bandwidth	ANSI C63.10-2013	6.9.3



7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

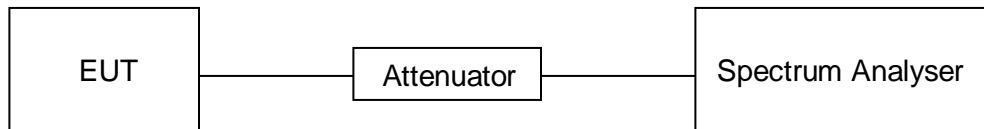
LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



TEST ENVIRONMENT

Temperature	23.2°C	Relative Humidity	59%
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/T Minimum VBW (kHz)	Final setting For VBW (kHz)
BLE	128.2	128.2	1	100	0	0.008	0.01

Note:

Duty Cycle Correction Factor= $10\log(1/x)$.

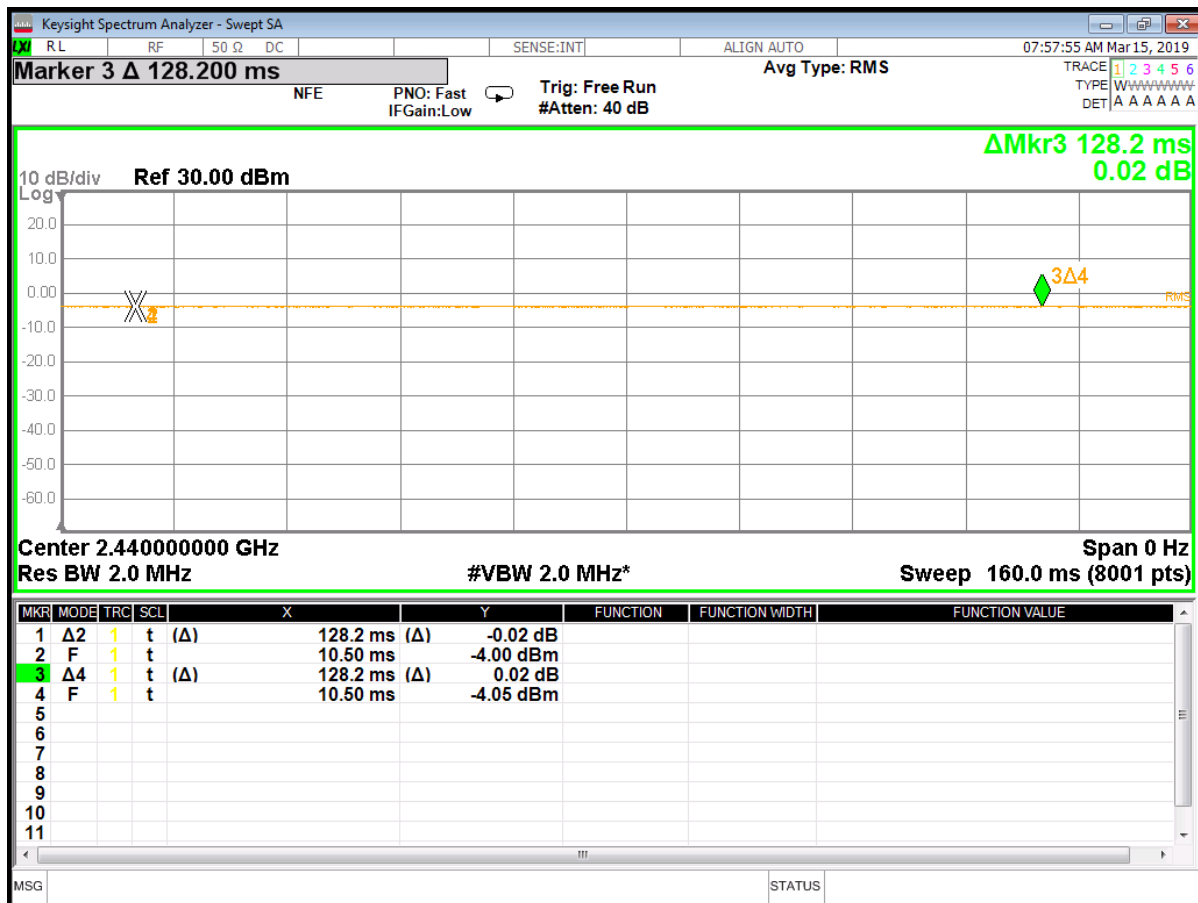
Where: x is Duty Cycle(Linear)

Where: T is On Time (transmit duration)

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



ON TIME AND DUTY CYCLE MID CH





7.2. 6 dB DTS BANDWIDTH AND 99% BANDWIDTH

LIMITS

CFR 47FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247(a)(2) ISED RSS-247 5.2 (a)	6dB Bandwidth	$\geq 500\text{kHz}$	2400-2483.5
ISED RSS-Gen Clause 6.7	99% Occupied Bandwidth	For reporting purposes only.	2400-2483.5

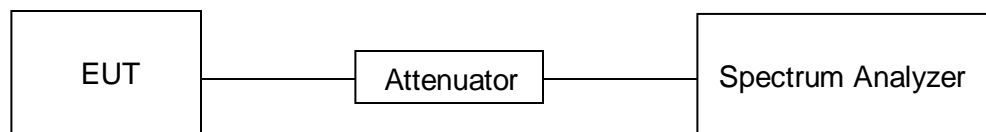
TEST PROCEDURE

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	For 6 dB Bandwidth :100K For 99% Occupied Bandwidth :1% to 5% of the occupied bandwidth
VBW	For 6dB Bandwidth : $\geq 3 \times \text{RBW}$ For 99% Occupied Bandwidth : approximately $3 \times \text{RBW}$
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/99% relative to the maximum level measured in the fundamental emission.

TEST SETUP



**TEST ENVIRONMENT**

Temperature	23.2°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V,60HZ

RESULTS

Please refer to appendix A and B.



7.3. PEAK CONDUCTED OUTPUT POWER

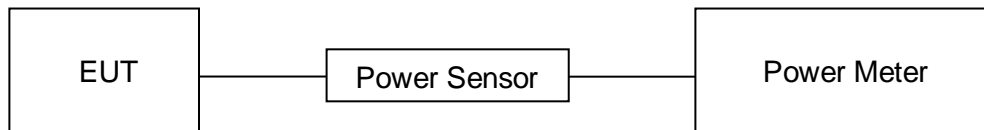
LIMITS

CFR 47 FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247(b)(3) ISED RSS-247 5.4 (e)	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	23.2°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V,60HZ



RESULTS

Test Channel	Maximum Conducted Output Power(PK)	EIRP	LIMIT
	(dBm)	(dBm)	dBm
Low	5.506	8.586	30
Middle	5.248	8.610	30
High	5.862	8.421	30

Note: EIRP=Maximum Conducted Output Power(PK) + Antenna Gain



7.4. POWER SPECTRAL DENSITY

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC §15.247 (e) ISED RSS-247 5.2 (b)	Power Spectral Density	8 dBm in any 3 kHz band	2400-2483.5

TEST PROCEDURE

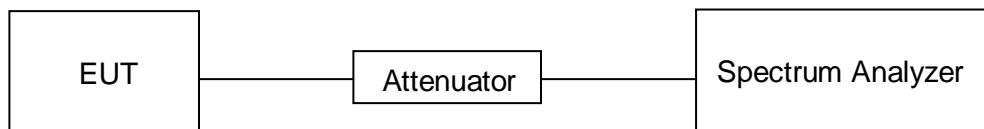
Connect the UUT to the spectrum analyser and use the following settings:

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 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	23.2°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V,60HZ

RESULTS

Please refer to appendix E.



7.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2		
Section	Test Item	Limit
CFR 47 FCC §15.247 (d) ISED RSS-247 5.5	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	100kHz
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

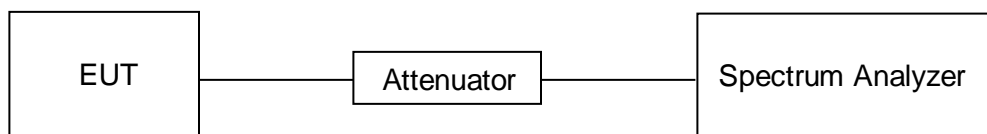
Use the peak marker function to determine the maximum PSD level.

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100kHz
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



TEST ENVIRONMENT

Temperature	23.2°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V,60HZ

RESULTS

Please refer to appendix C and D.



8. RADIATED TEST RESULTS

LIMITS

Please refer to CFR 47 FCC §15.205 and §15.209

Please refer to ISSED RSS-GEN Clause 8.9 and Clause 8.10

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.

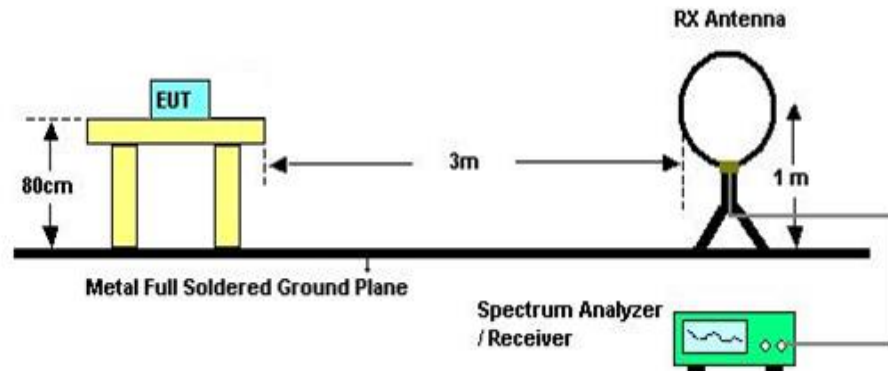
Radiation Disturbance Test Limit for FCC (Above 1G)

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

About Restricted bands of operation please refer to RSS-Gen section 8.10 and FCC §15.205 (a)

TEST SETUP AND PROCEDURE

Below 30MHz

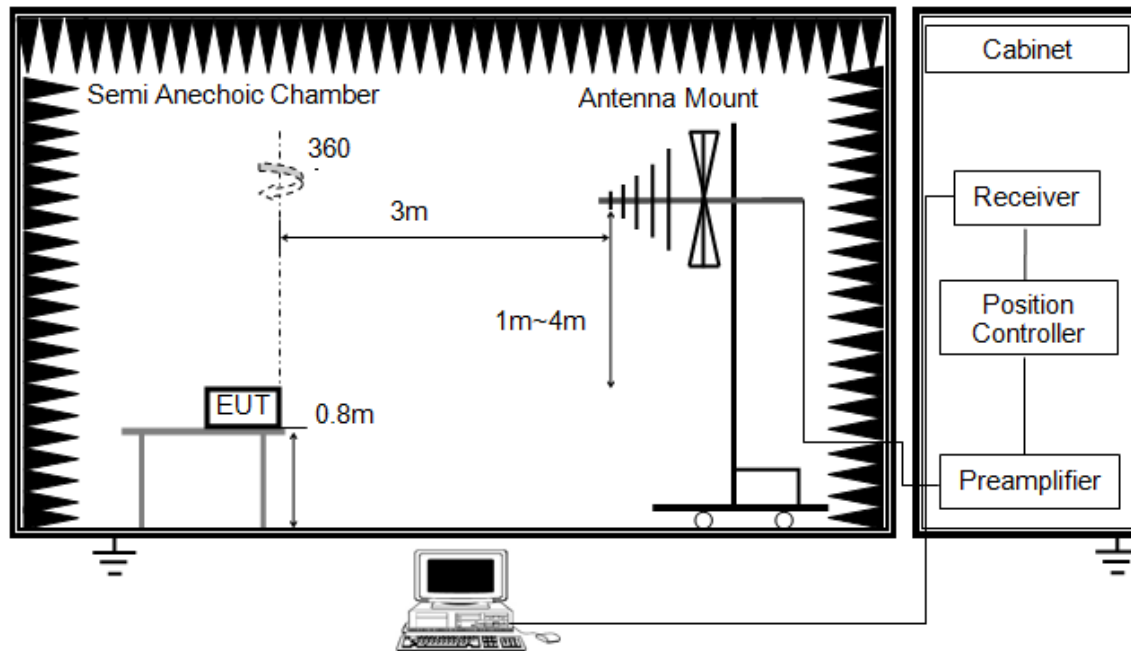


The setting of the spectrum analyser

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 80cm 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. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.

Below 1G and above 30MHz

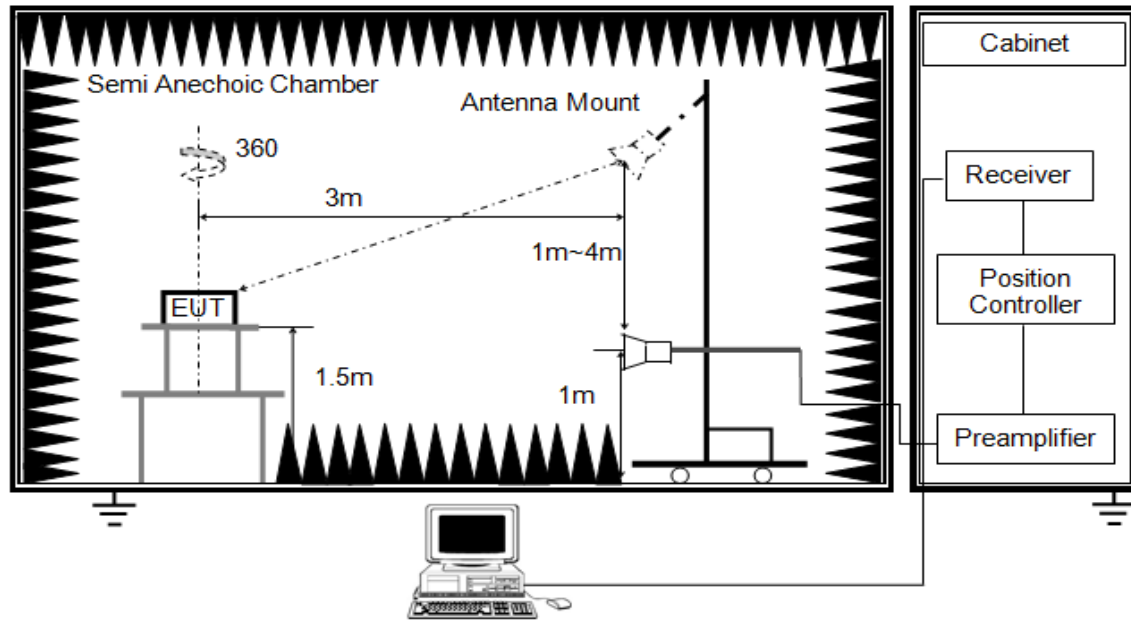


The setting of the spectrum analyser

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 80cm 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.

Above 1G

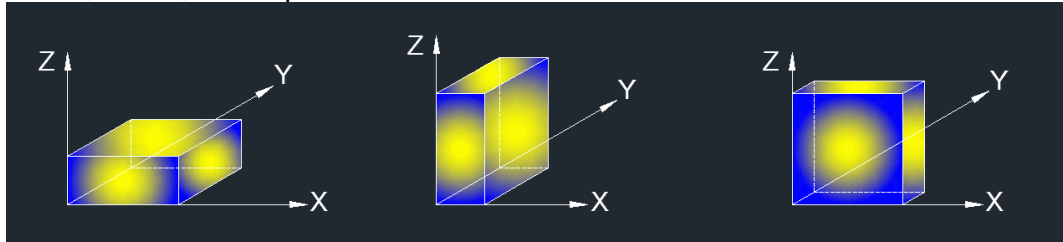


The setting of the spectrum analyser

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 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. For the Duty Cycle and Correction Factor please refer to clause 7.1.ON TIME AND DUTY CYCLE.

X axis, Y axis, Z axis positions:



Note 1: 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.

TEST ENVIRONMENT

Temperature	23.6°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V,60HZ

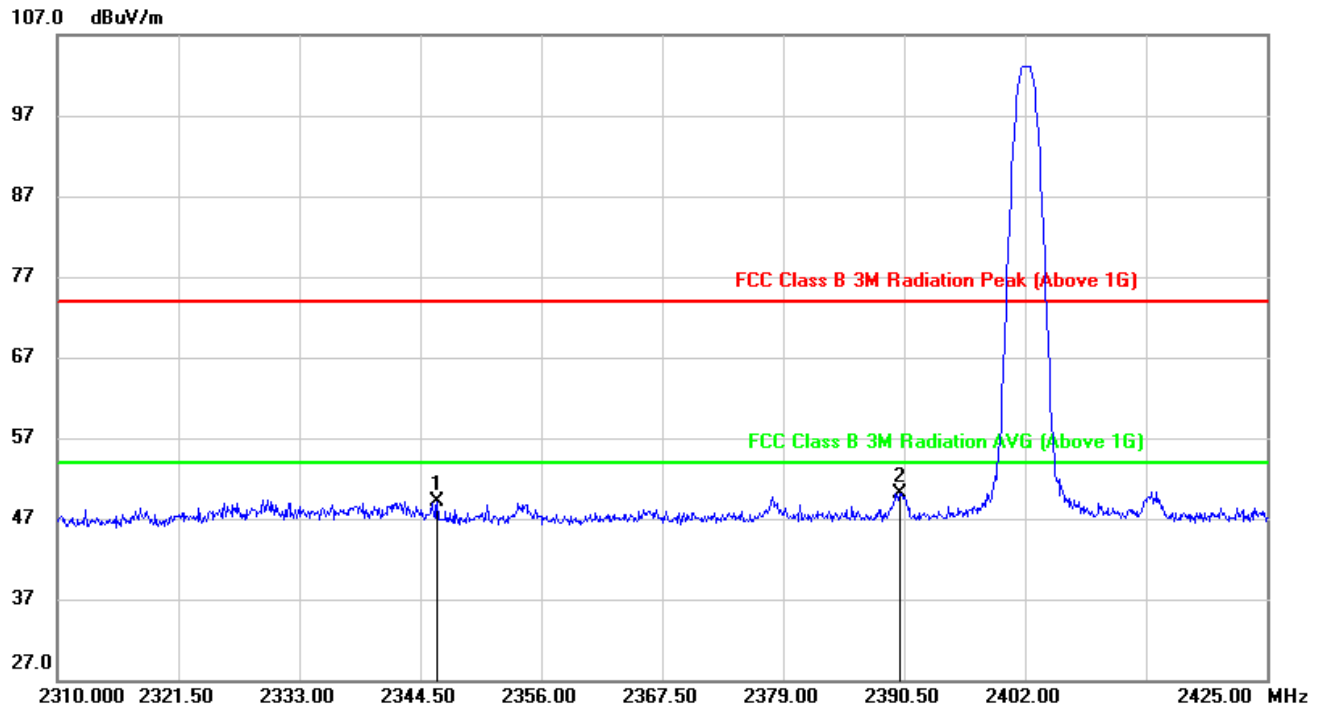
RESULTS



8.1. RESTRICTED BANDEGE

8.1.1. TEST CONSTRUCTION 3

RESTRICTED BANDEGE (LOW CHANNEL, HORIZONTAL)

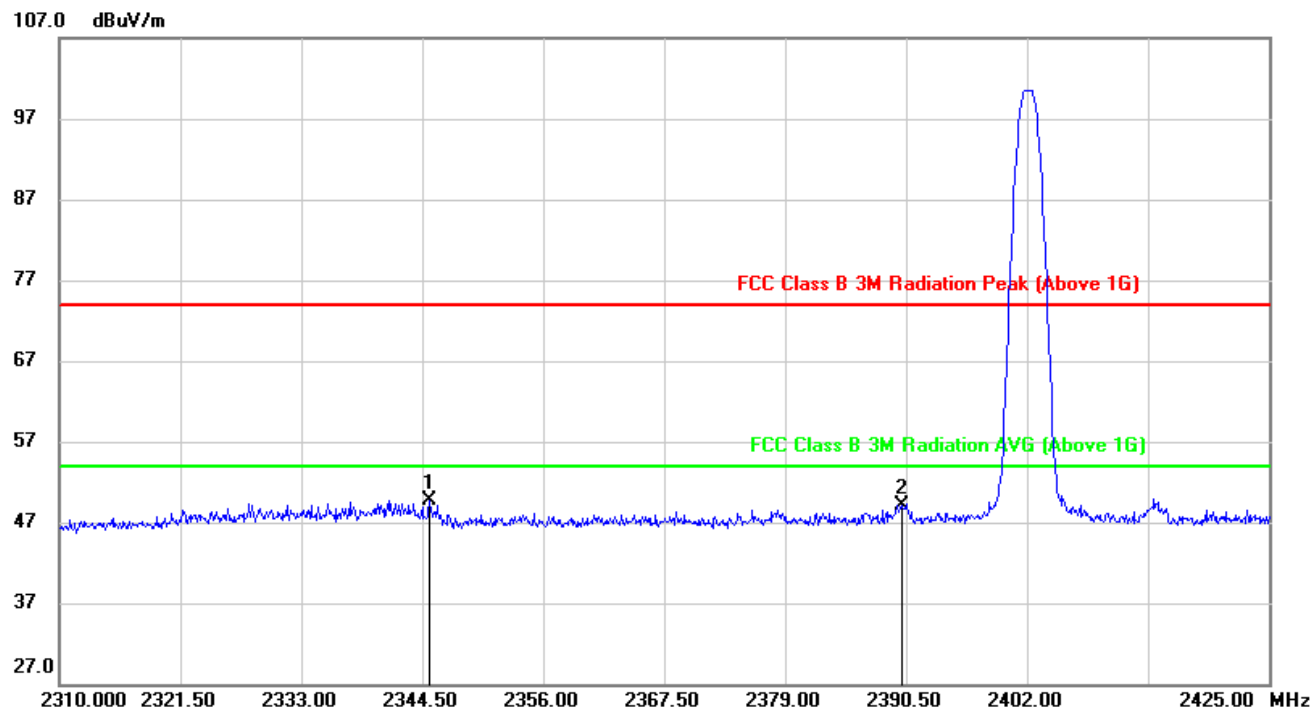


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2346.110	16.36	32.79	49.15	74.00	-24.85	peak
2	2390.000	17.14	32.94	50.08	74.00	-23.92	peak

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.

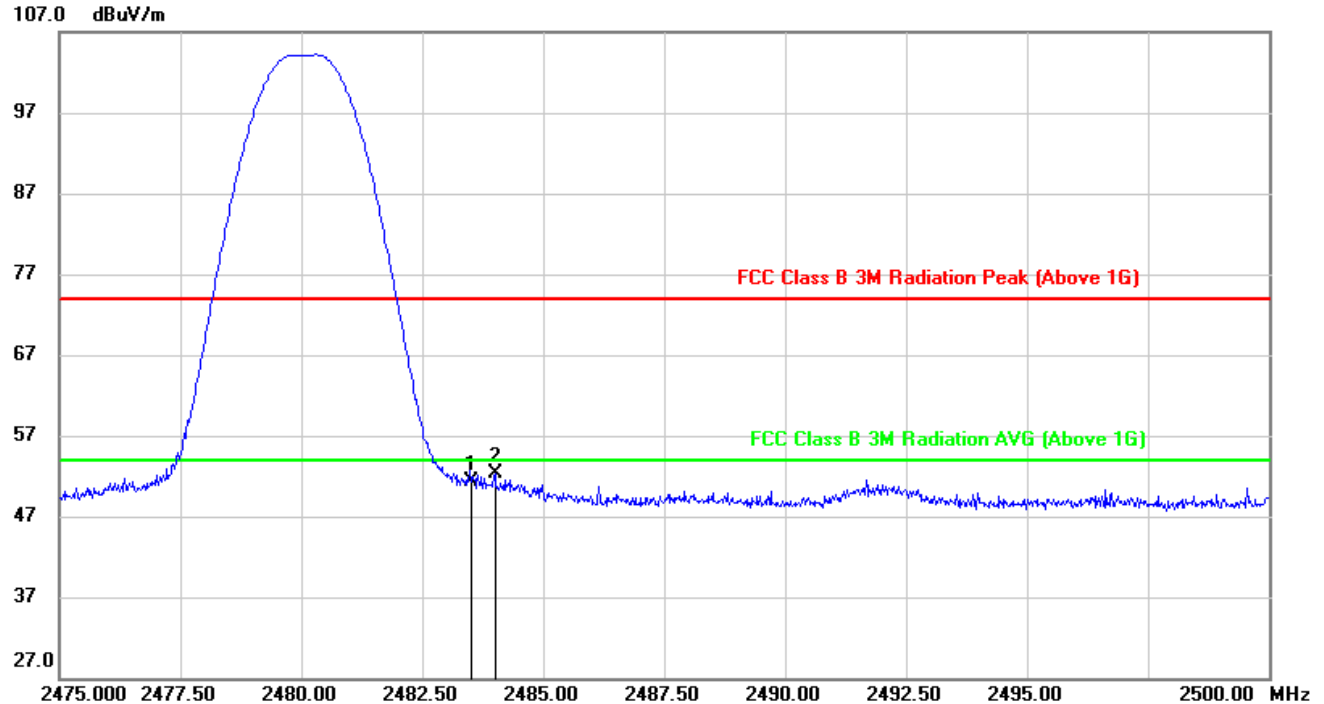


RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2329.550	15.47	32.74	48.21	74.00	-25.79	peak
2	2390.000	15.27	32.94	48.21	74.00	-25.79	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.

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

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	17.65	33.58	51.23	74.00	-22.77	peak
2	2484.000	18.80	33.58	52.38	74.00	-21.62	peak

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

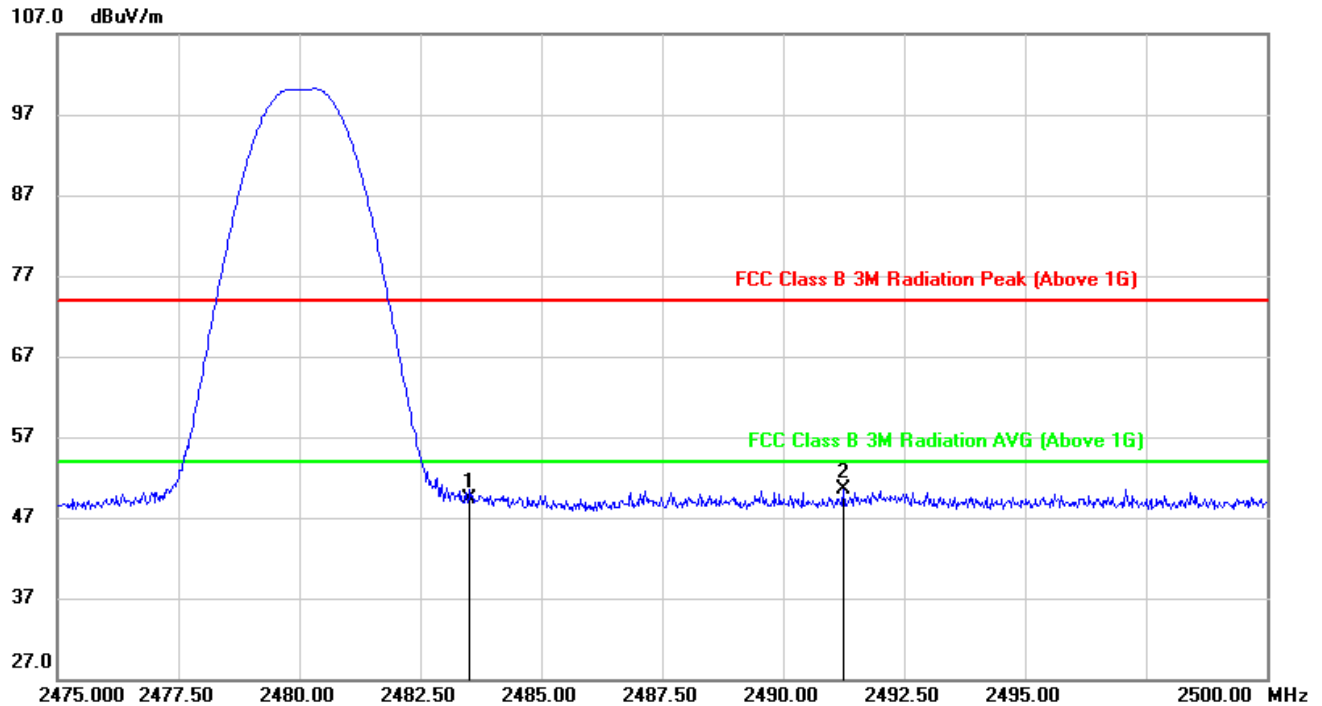
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

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.



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	15.75	33.58	49.33	74.00	-24.67	peak
2	2491.250	16.90	33.63	50.53	74.00	-23.47	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.

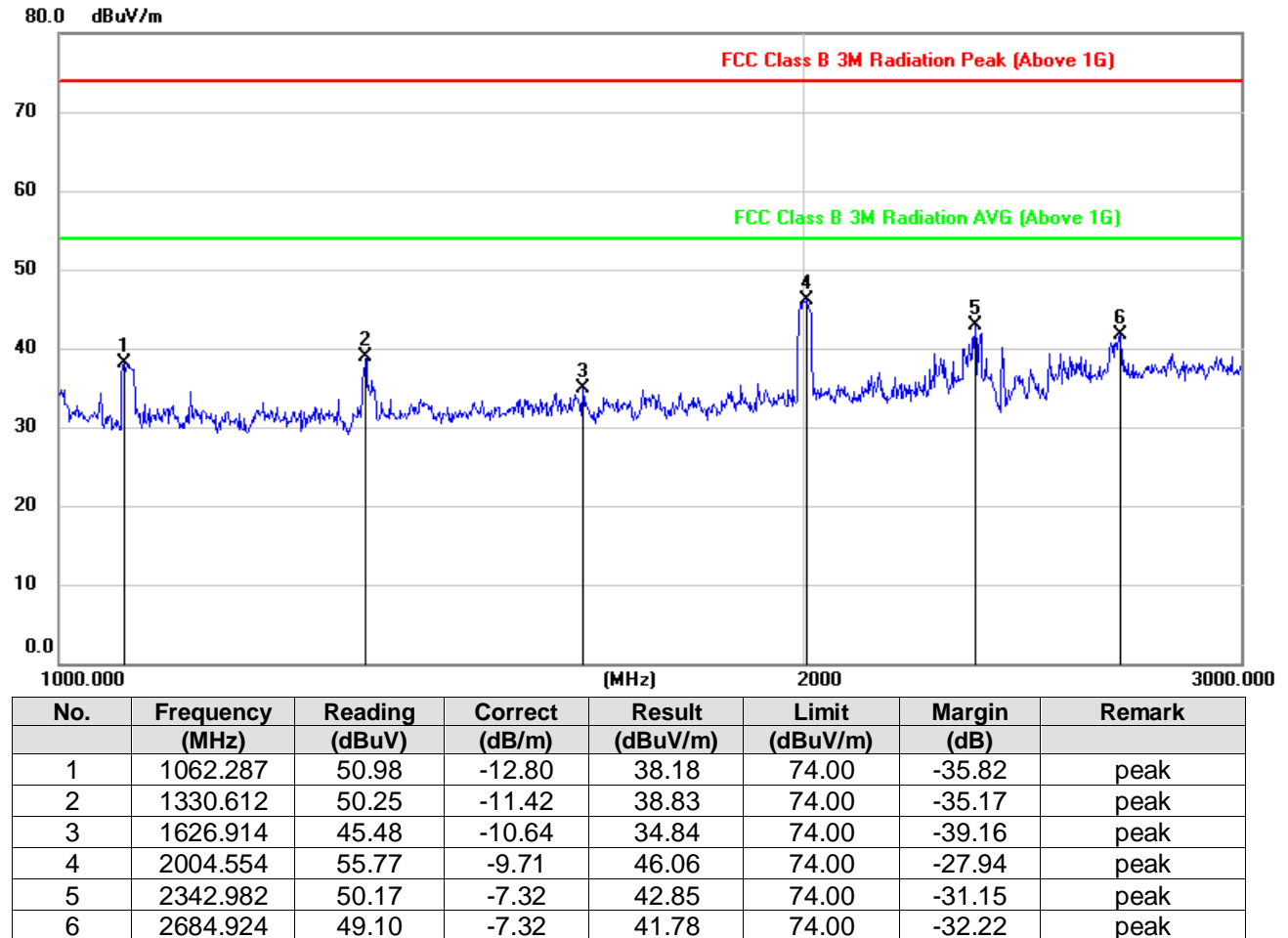
Note: All constructions have been tested, only the worst data record in the report.



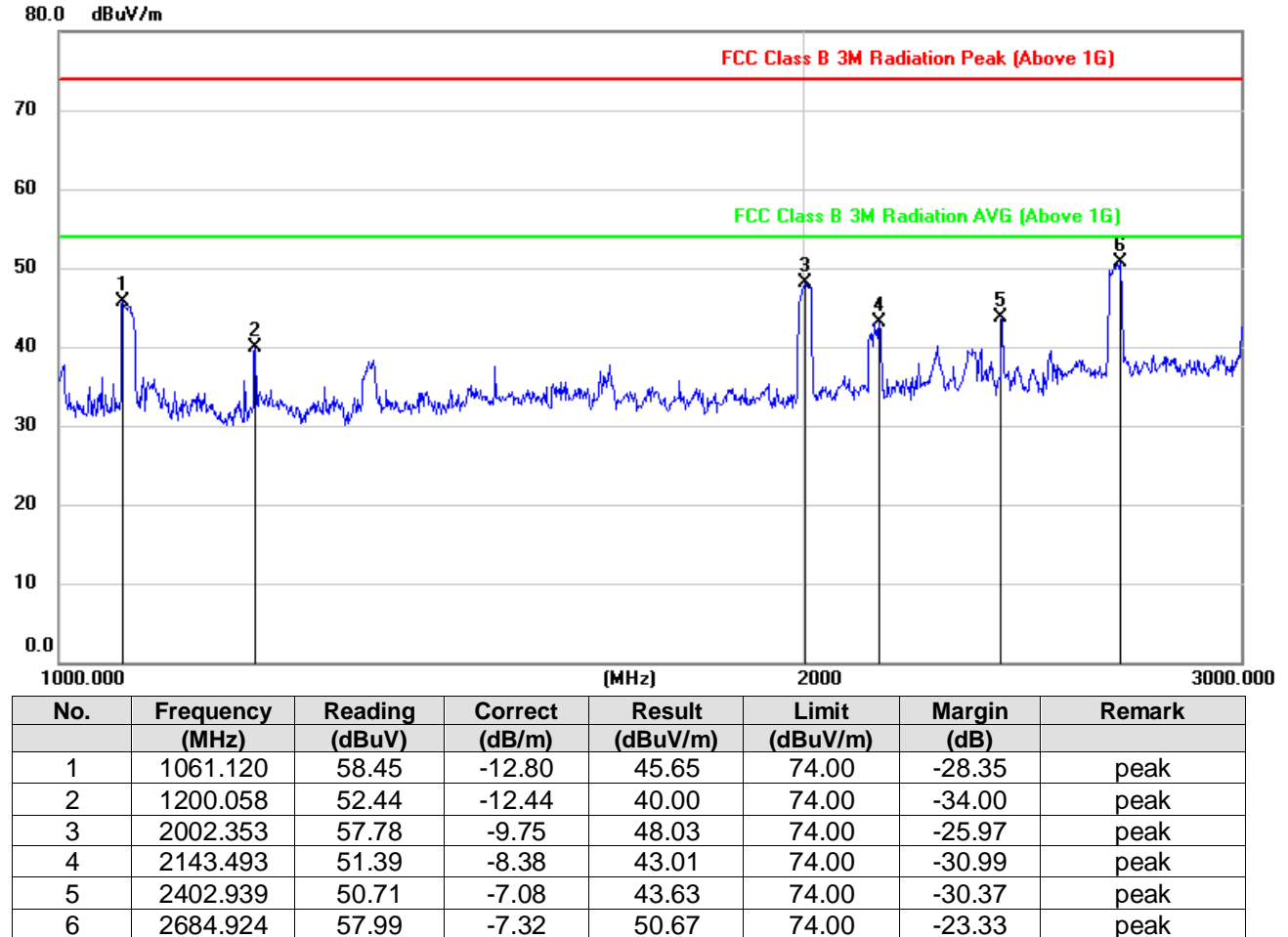
8.2. SPURIOUS EMISSIONS (1~3GHz)

8.2.1. TEST CONSTRUCTION 3

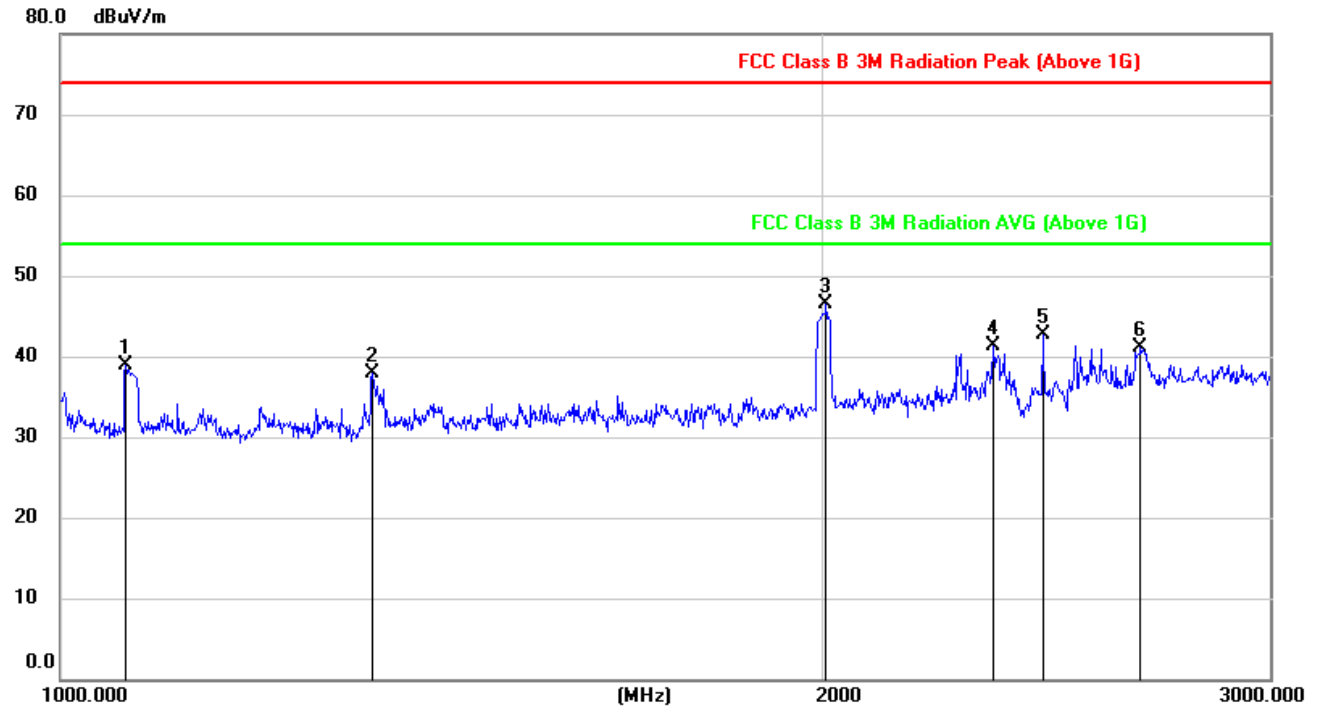
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



- Note: 1. Peak Result = 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. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for BRF losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

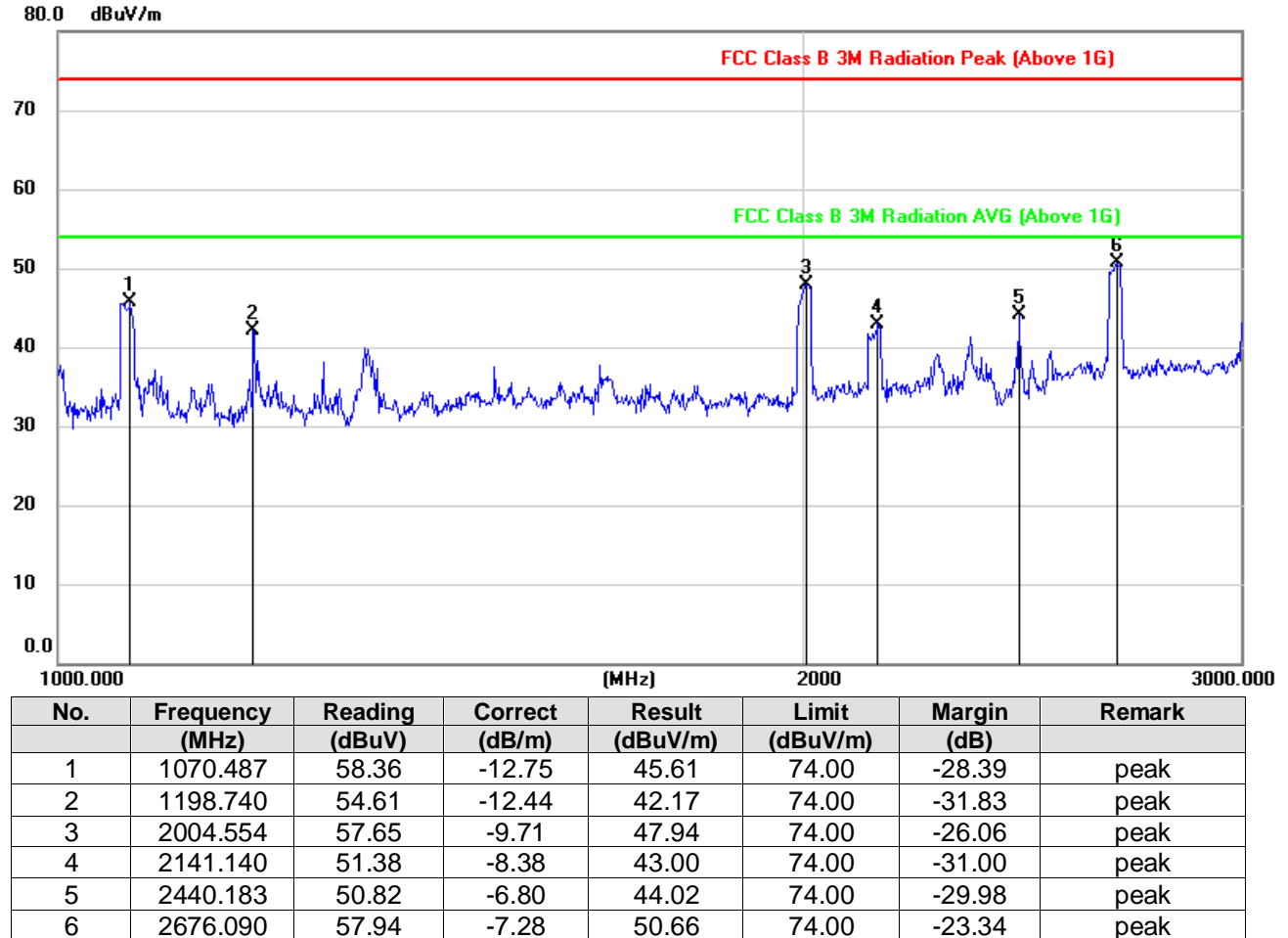
**HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)**

- Note: 1. Peak Result = 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. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for BRF losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

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

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1061.120	51.67	-12.80	38.87	74.00	-35.13	peak
2	1327.692	49.32	-11.40	37.92	74.00	-36.08	peak
3	2004.554	56.13	-9.71	46.42	74.00	-27.58	peak
4	2332.709	48.62	-7.37	41.25	74.00	-32.75	peak
5	2440.183	49.46	-6.80	42.66	74.00	-31.34	peak
6	2667.284	48.41	-7.22	41.19	74.00	-32.81	peak

- Note: 1. Peak Result = 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. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for BRF losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

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

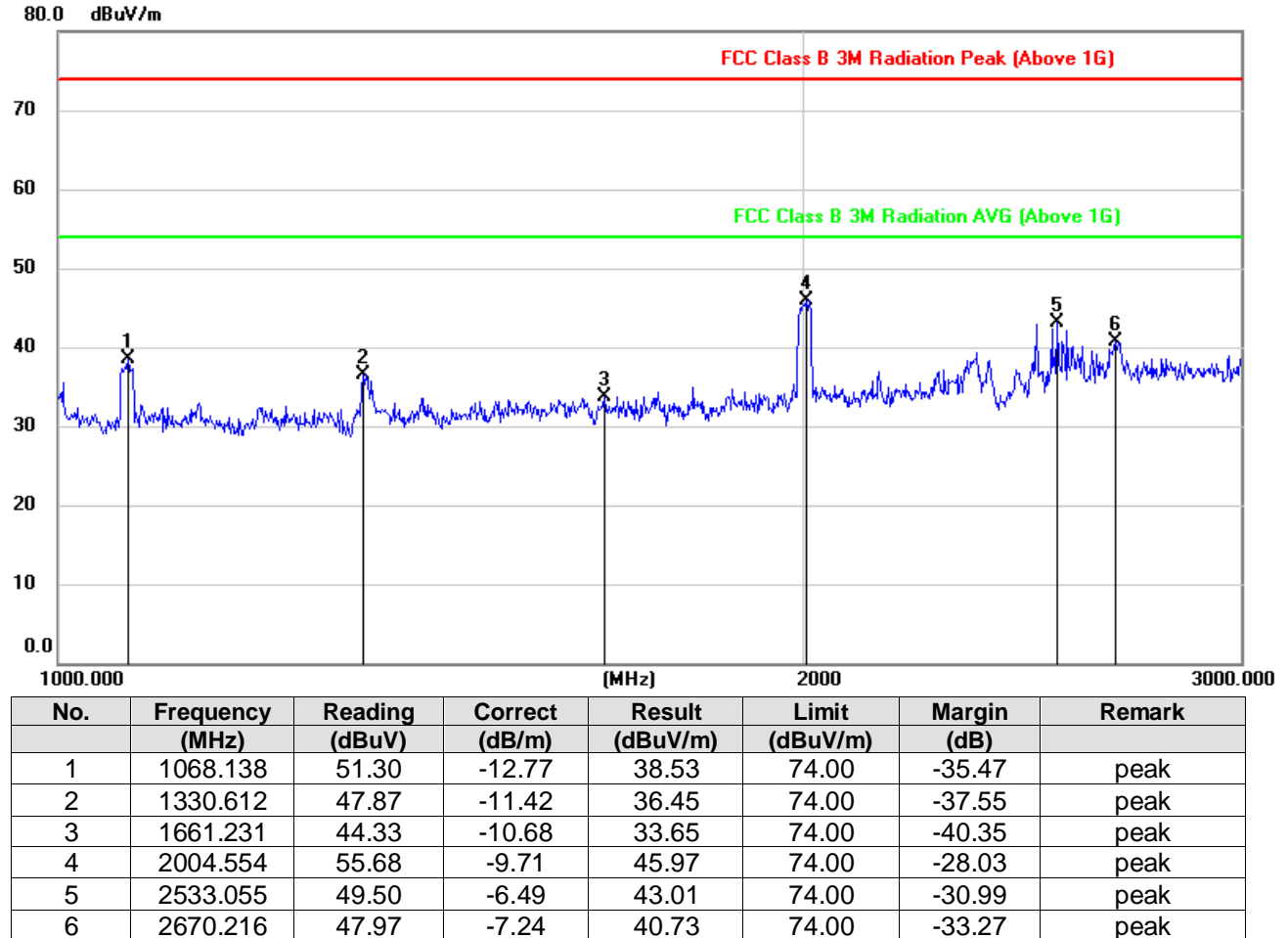
Note: 1. Peak Result = Reading Level + Correct Factor.

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

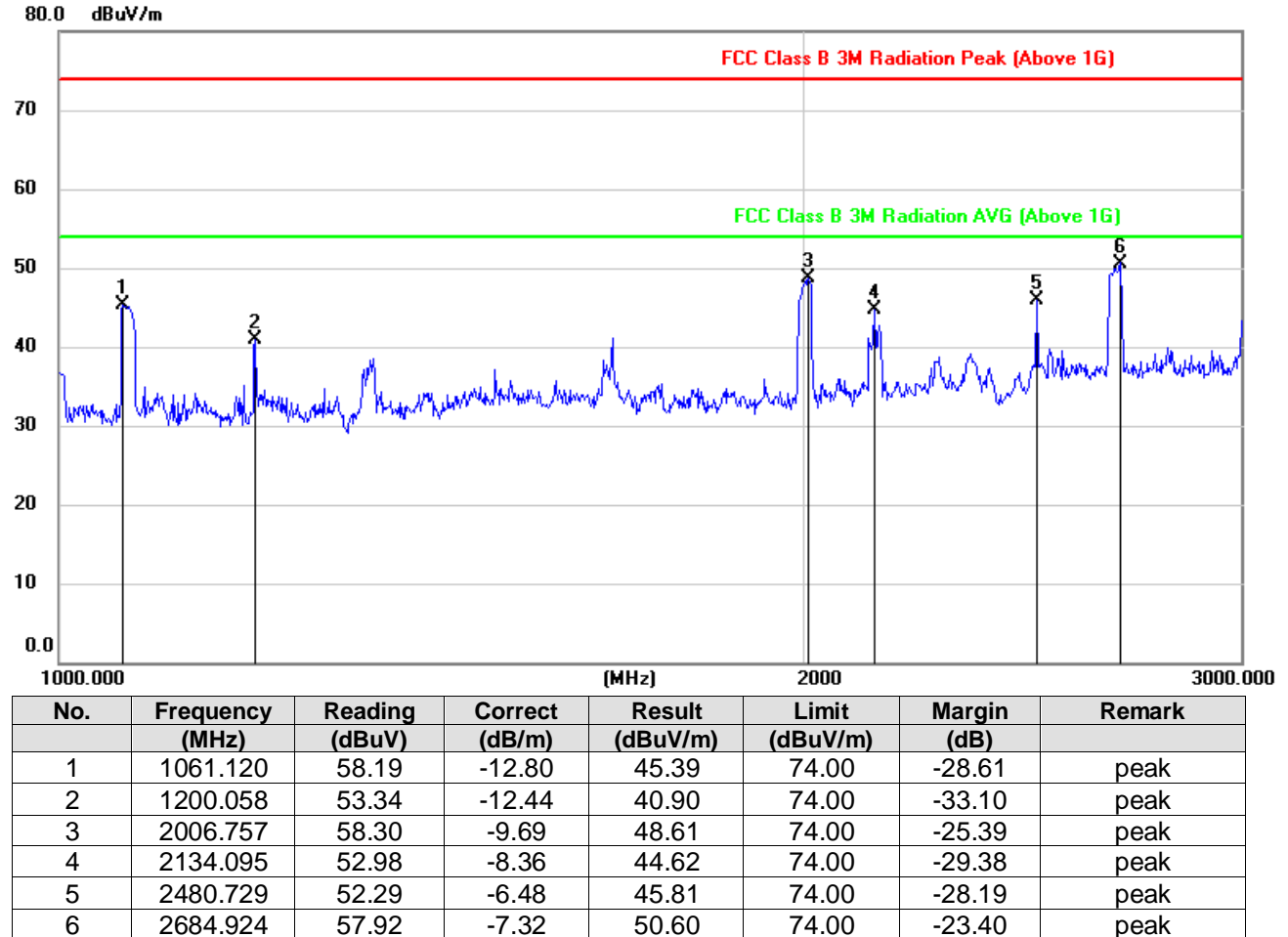
3. Peak: Peak detector.

4. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for BRF losses.

5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

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

- Note: 1. Peak Result = 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. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for BRF losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

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

Note: 1. Peak Result = 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. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for BRF losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

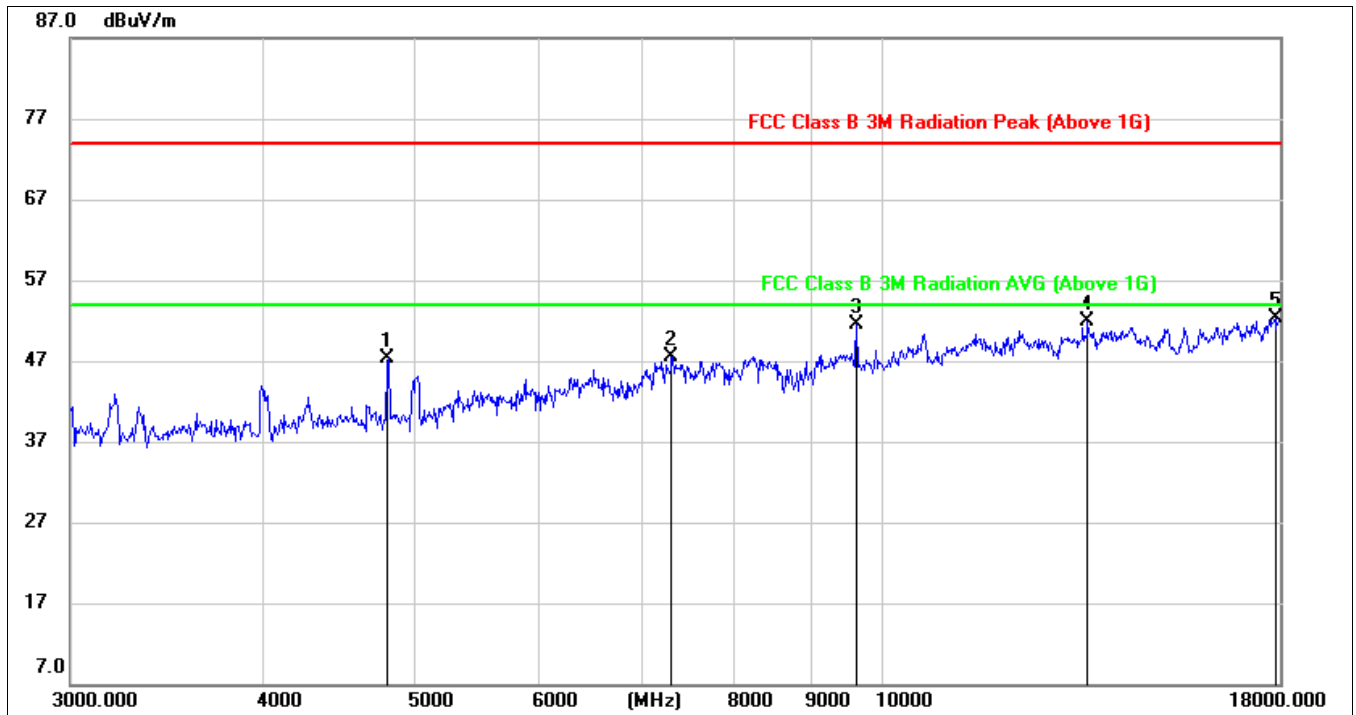
Note: All constructions have been tested, only the worst data record in the report.



8.3. SPURIOUS EMISSIONS (3~18GHz)

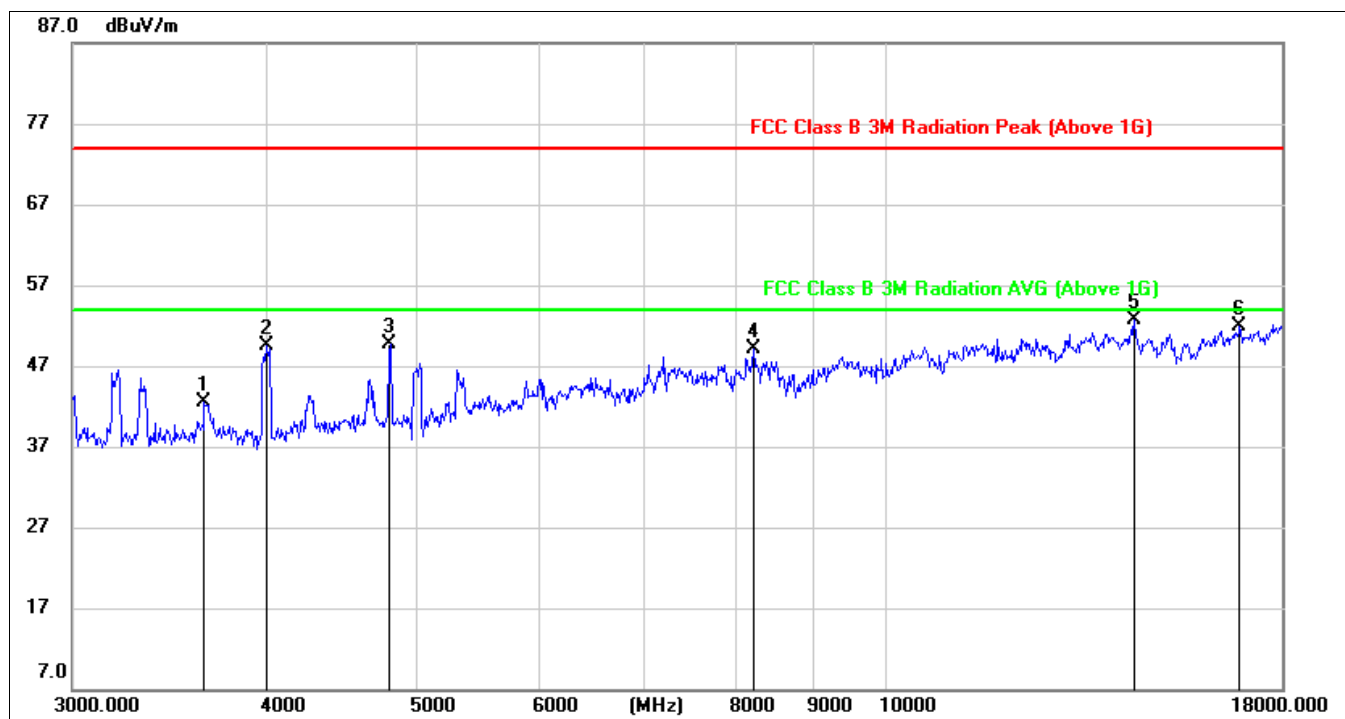
8.3.1. TEST CONSTRUCTION 3

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



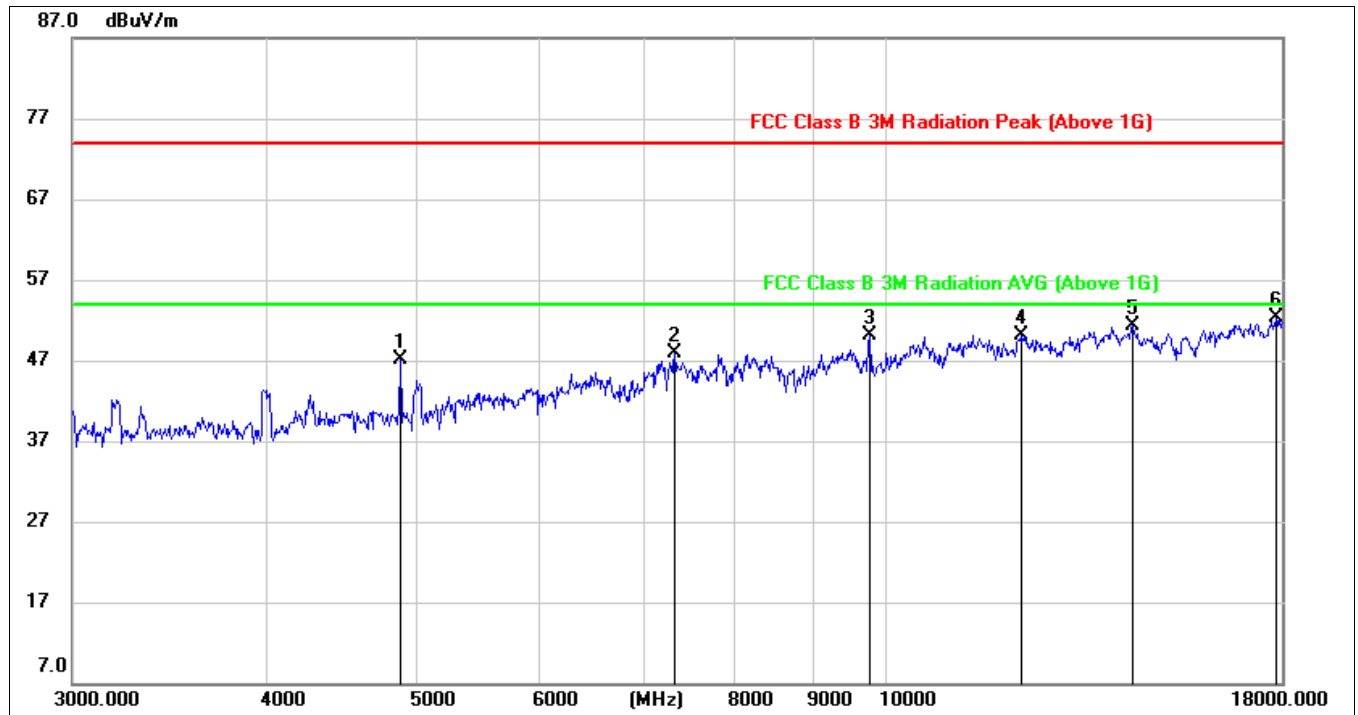
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4805.903	47.57	-0.24	47.33	74.00	-26.67	peak
2	7309.075	40.27	7.17	47.44	74.00	-26.56	peak
3	9614.342	41.46	10.00	51.46	74.00	-22.54	peak
4	13562.027	35.92	15.92	51.84	74.00	-22.16	peak
5	17871.455	29.19	23.18	52.37	74.00	-21.63	peak

- Note: 1. Peak Result = 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. The High Pass filter loss factor already add into the correct factor.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

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

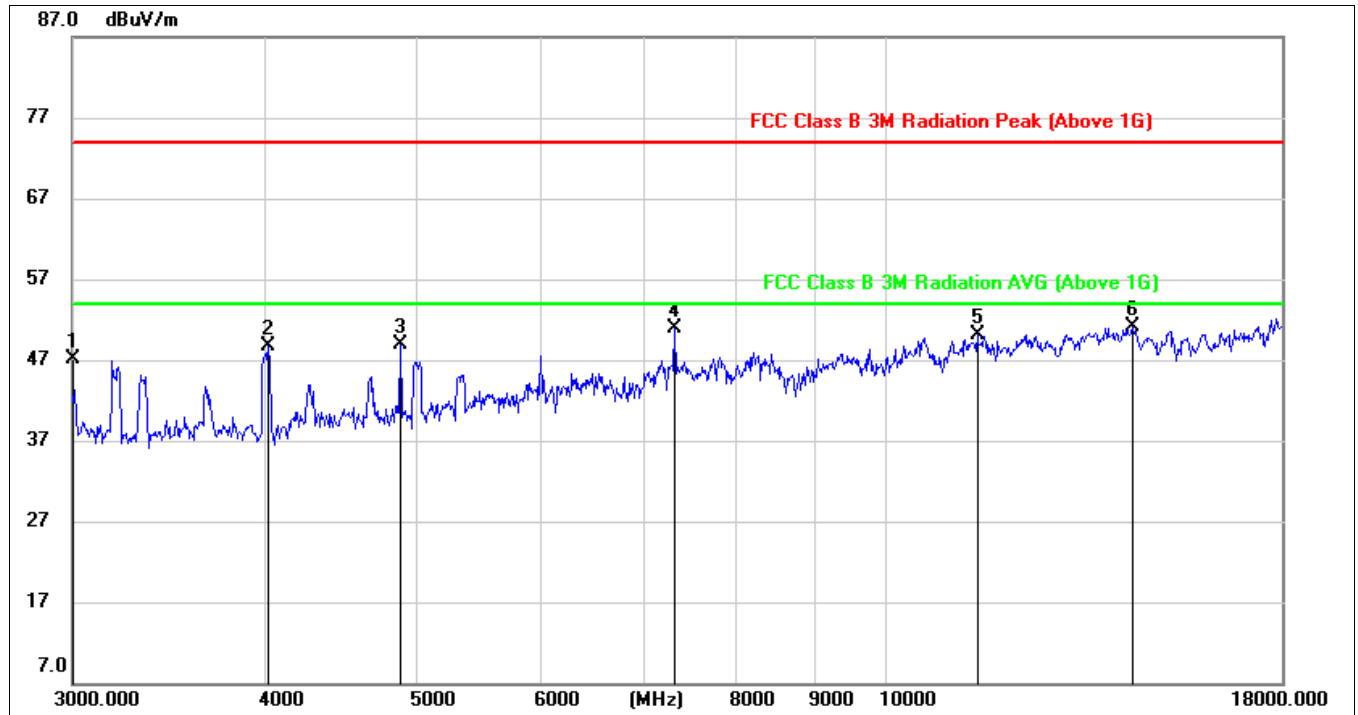
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3647.033	45.83	-3.30	42.53	74.00	-31.47	peak
2	4003.166	52.47	-2.94	49.53	74.00	-24.47	peak
3	4805.903	49.87	-0.24	49.63	74.00	-24.37	peak
4	8226.601	39.83	9.33	49.16	74.00	-24.84	peak
5	14465.653	36.44	16.35	52.79	74.00	-21.21	peak
6	16936.176	31.88	20.08	51.96	74.00	-22.04	peak

- Note: 1. Peak Result = 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. The High Pass filter loss factor already add into the correct factor.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

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

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4875.288	47.29	-0.12	47.17	74.00	-26.83	peak
2	7322.183	40.64	7.22	47.86	74.00	-26.14	peak
3	9770.638	40.04	10.15	50.19	74.00	-23.81	peak
4	12223.395	35.83	14.26	50.09	74.00	-23.91	peak
5	14439.758	35.01	16.39	51.40	74.00	-22.60	peak
6	17839.462	29.12	23.21	52.33	74.00	-21.67	peak

Note: 1. Peak Result = 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. The High Pass filter loss factor already add into the correct factor.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

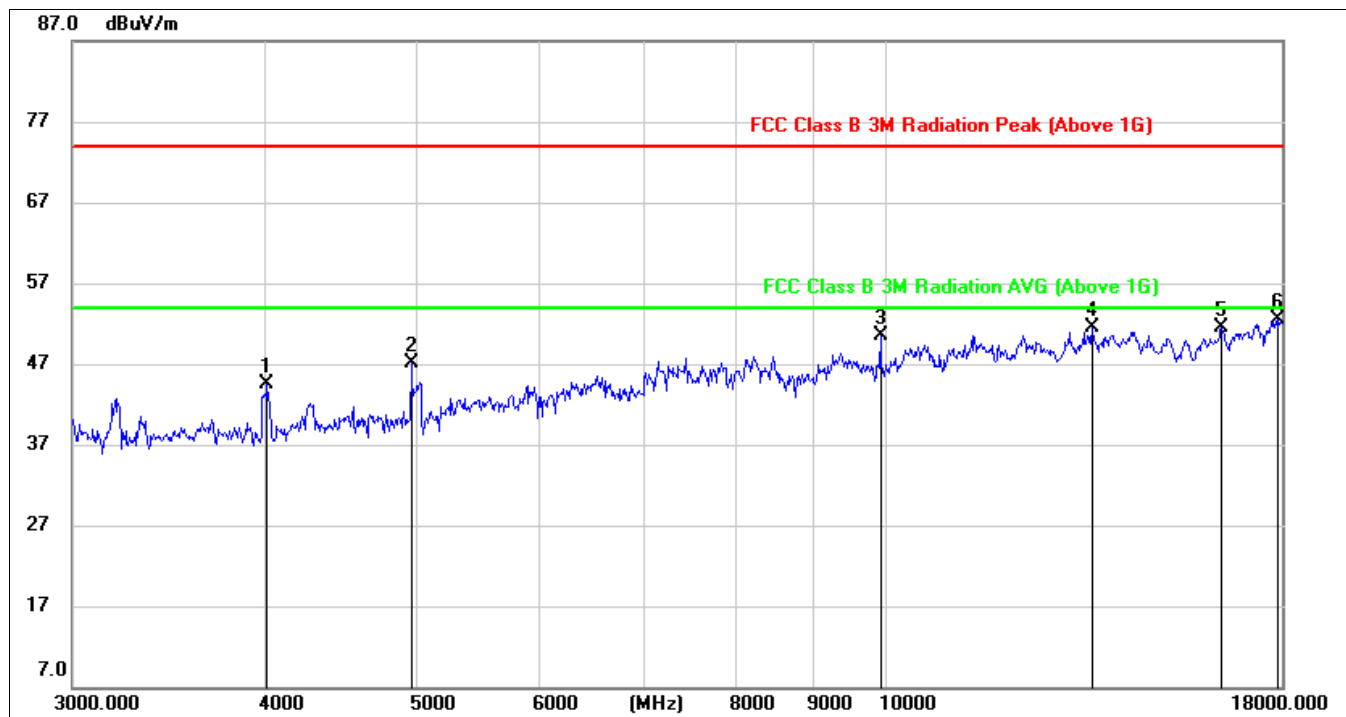
**HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3000.000	51.44	-4.26	47.18	74.00	-26.82	peak
2	4010.345	51.66	-2.93	48.73	74.00	-25.27	peak
3	4875.288	48.95	-0.12	48.83	74.00	-25.17	peak
4	7322.183	43.78	7.22	51.00	74.00	-23.00	peak
5	11459.836	36.39	13.78	50.17	74.00	-23.83	peak
6	14413.908	34.69	16.41	51.10	74.00	-22.90	peak

- Note: 1. Peak Result = 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. The High Pass filter loss factor already add into the correct factor.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.



HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)

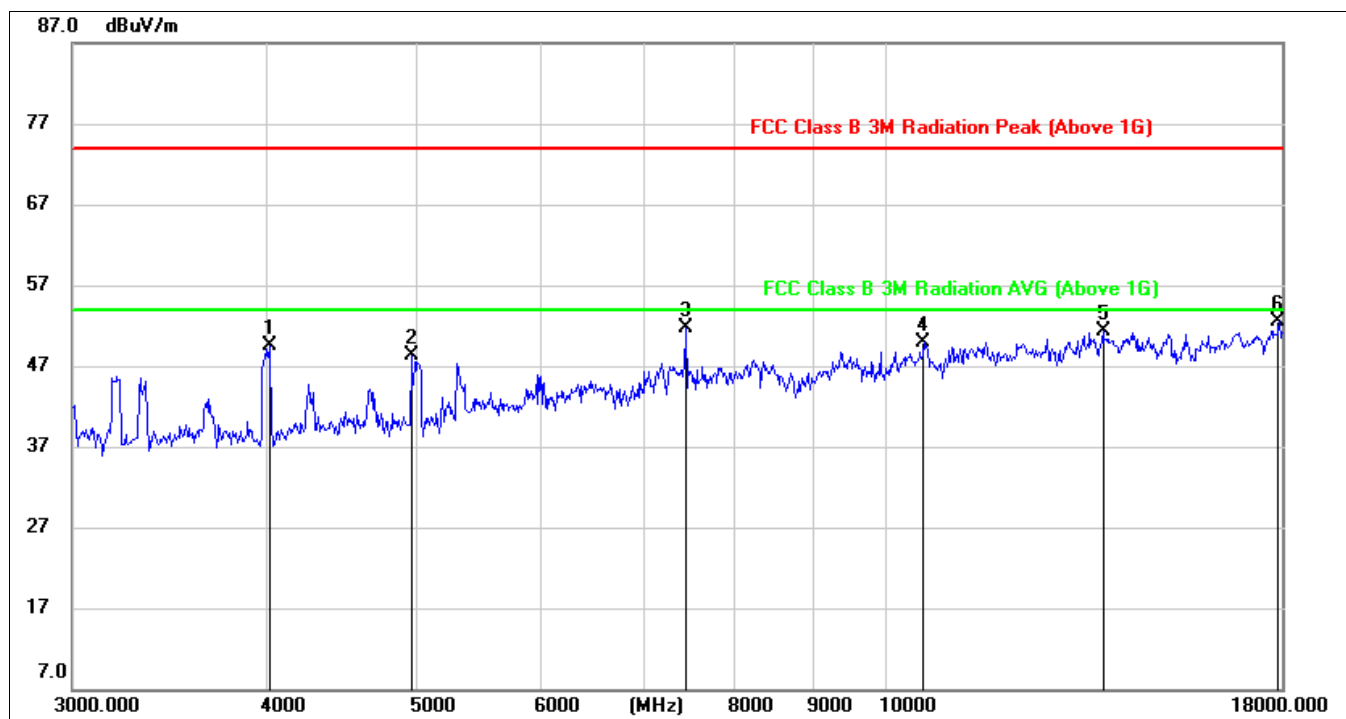


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4003.166	47.50	-2.94	44.56	74.00	-29.44	peak
2	4954.543	46.91	0.22	47.13	74.00	-26.87	peak
3	9947.282	40.02	10.51	50.53	74.00	-23.47	peak
4	13610.714	35.39	16.06	51.45	74.00	-22.55	peak
5	16487.055	32.62	18.85	51.47	74.00	-22.53	peak
6	17935.612	29.29	23.19	52.48	74.00	-21.52	peak

Note: 1. Peak Result = 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. The High Pass filter loss factor already add into the correct factor.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.



HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4017.537	52.38	-2.94	49.44	74.00	-24.56	peak
2	4954.543	48.01	0.22	48.23	74.00	-25.77	peak
3	7454.561	44.25	7.36	51.61	74.00	-22.39	peak
4	10591.067	37.29	12.69	49.98	74.00	-24.02	peak
5	13807.216	34.50	16.76	51.26	74.00	-22.74	peak
6	17935.612	29.39	23.19	52.58	74.00	-21.42	peak

Note: 1. Peak Result = 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. The High Pass filter loss factor already add into the correct factor.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

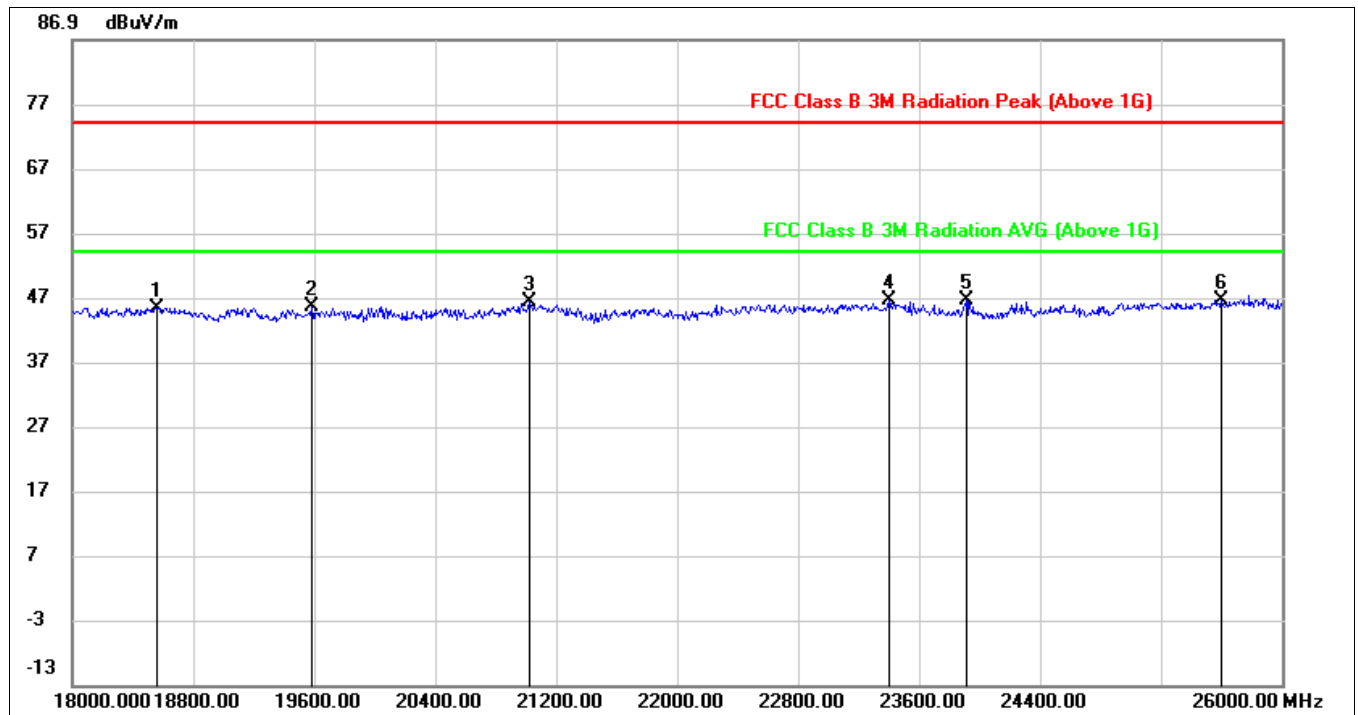
Note: All constructions have been tested, only the worst data record in the report.



8.4. SPURIOUS EMISSIONS 18G ~ 26GHz

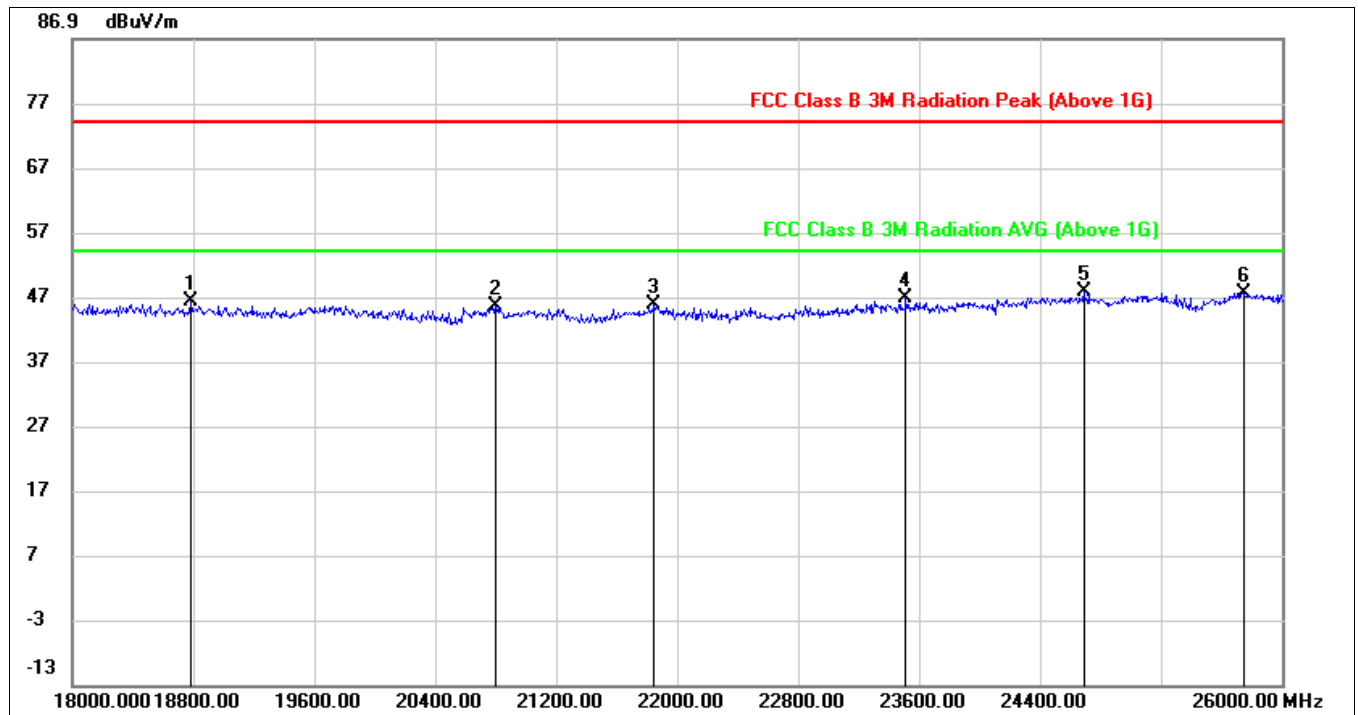
8.4.1. TEST CONSTRUCTION 3

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



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	18560.000	49.87	-4.49	45.38	74.00	-28.62	peak
2	19584.000	50.17	-4.64	45.53	74.00	-28.47	peak
3	21024.000	51.62	-5.30	46.32	74.00	-27.68	peak
4	23400.000	51.42	-4.96	46.46	74.00	-27.54	peak
5	23912.000	50.82	-4.23	46.59	74.00	-27.41	peak
6	25600.000	48.26	-1.62	46.64	74.00	-27.36	peak

- Note: 1. Peak Result = 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.

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

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	18784.000	51.05	-4.84	46.21	74.00	-27.79	peak
2	20800.000	50.73	-5.15	45.58	74.00	-28.42	peak
3	21848.000	51.76	-5.95	45.81	74.00	-28.19	peak
4	23512.000	51.51	-4.76	46.75	74.00	-27.25	peak
5	24688.000	49.89	-2.11	47.78	74.00	-26.22	peak
6	25752.000	48.94	-1.35	47.59	74.00	-26.41	peak

Note: 1. Peak Result = 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. Proper operation of the transmitter prior to adding the filter to the measurement chain.

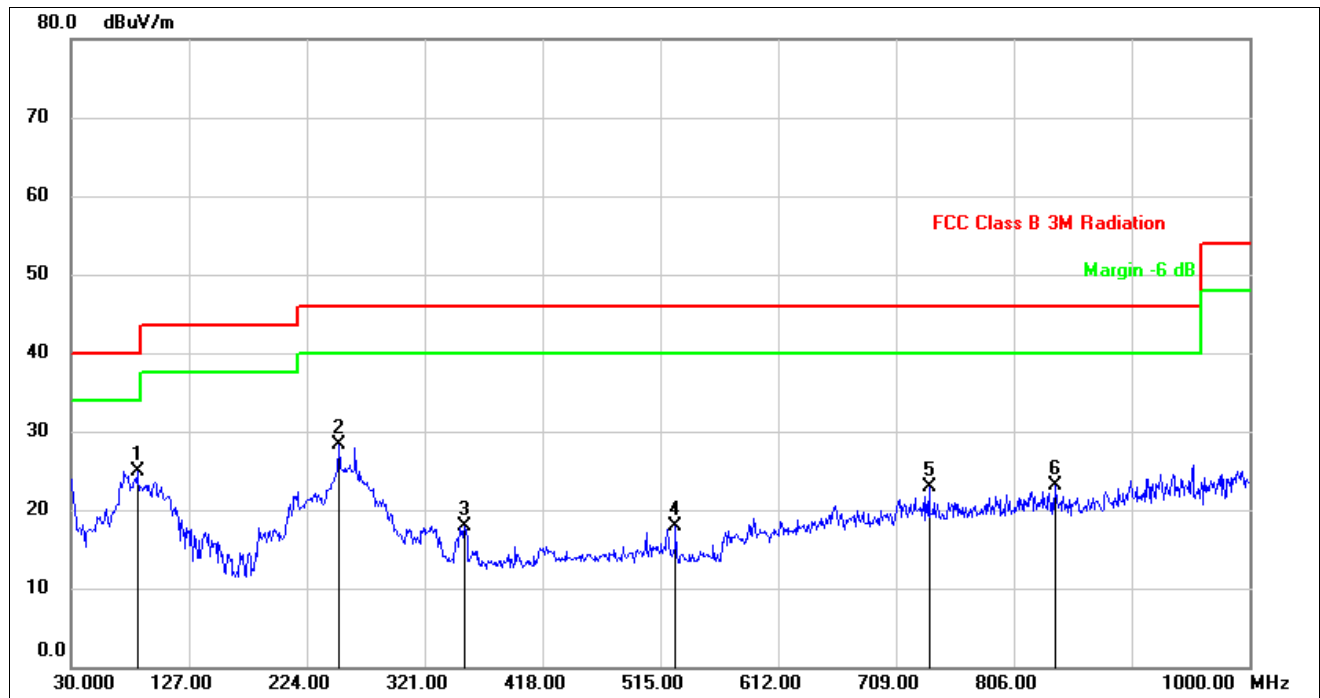
Note: All constructions and test modes have been tested, only the worst data record in the report.



8.5. SPURIOUS EMISSIONS 30M ~ 1 GHz

8.5.1. TEST CONSTRUCTION 1

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

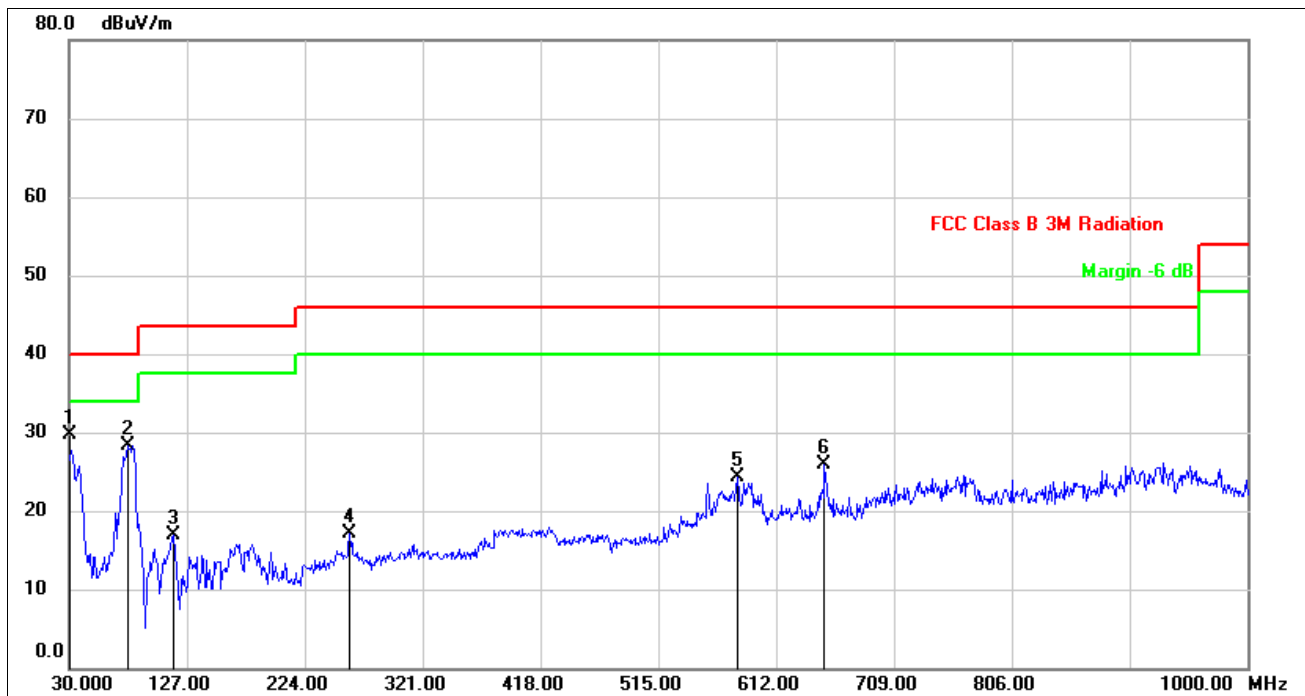


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	84.3200	45.66	-20.67	24.99	40.00	-15.01	QP
2	250.1900	44.06	-15.76	28.30	46.00	-17.70	QP
3	353.9800	30.59	-12.75	17.84	46.00	-28.16	QP
4	527.6100	27.43	-9.46	17.97	46.00	-28.03	QP
5	736.1599	28.77	-5.78	22.99	46.00	-23.01	QP
6	839.9500	27.32	-4.28	23.04	46.00	-22.96	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.



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



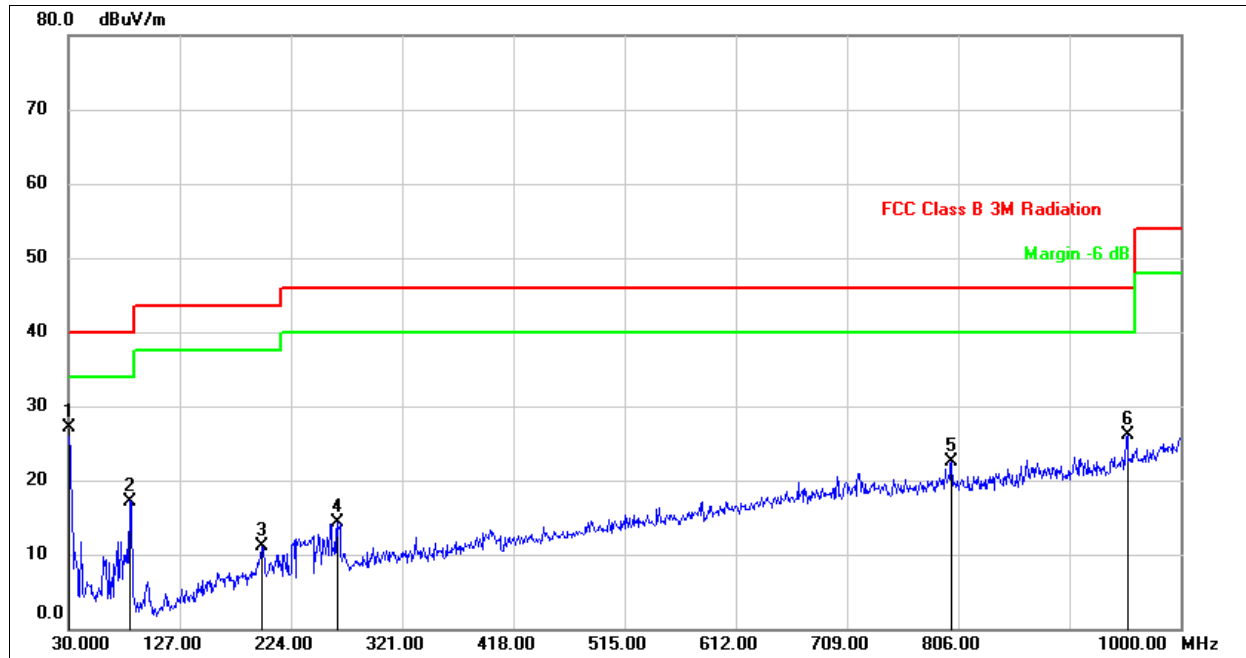
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.0000	46.42	-16.80	29.62	40.00	-10.38	QP
2	78.5000	48.64	-20.27	28.37	40.00	-11.63	QP
3	115.3600	37.85	-20.93	16.92	43.50	-26.58	QP
4	260.8599	32.43	-15.34	17.09	46.00	-28.91	QP
5	579.9900	32.58	-8.35	24.23	46.00	-21.77	QP
6	651.7700	33.14	-7.20	25.94	46.00	-20.06	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



8.5.2. TEST CONSTRUCTION 2

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

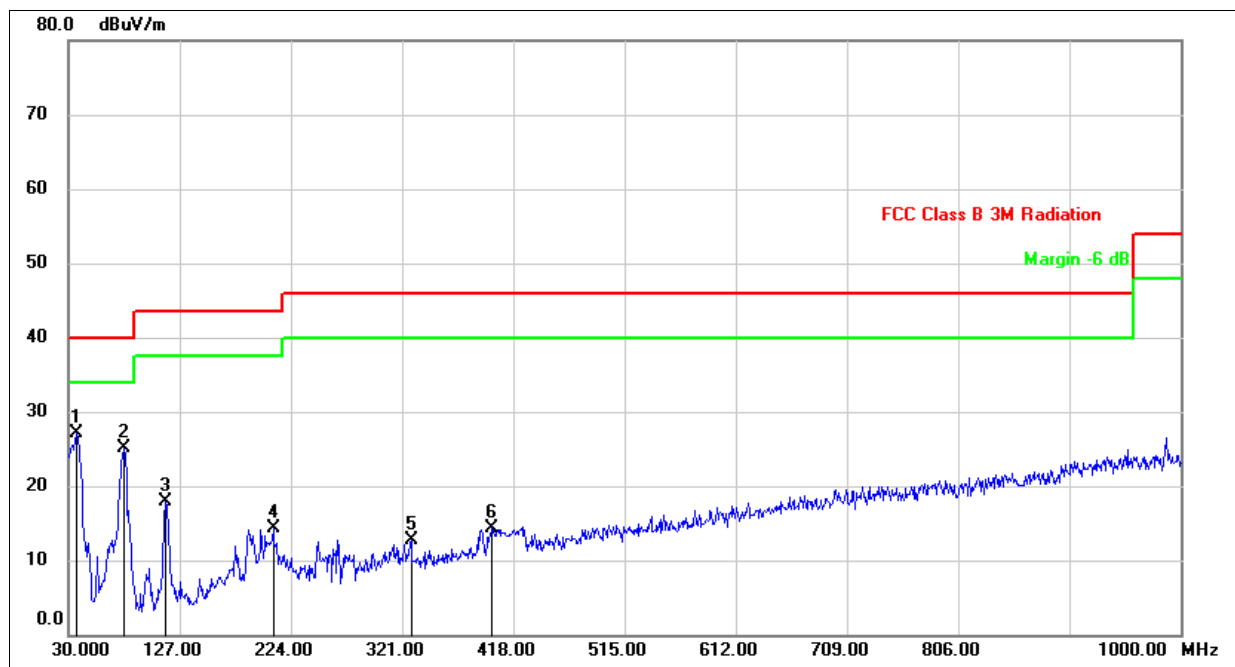


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.0000	43.89	-16.80	27.09	40.00	-12.91	QP
2	83.3500	37.78	-20.58	17.20	40.00	-22.80	QP
3	198.7800	27.04	-15.90	11.14	43.50	-32.36	QP
4	264.7400	29.43	-15.13	14.30	46.00	-31.70	QP
5	800.1800	27.38	-4.87	22.51	46.00	-23.49	QP
6	953.4400	29.08	-3.01	26.07	46.00	-19.93	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.



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



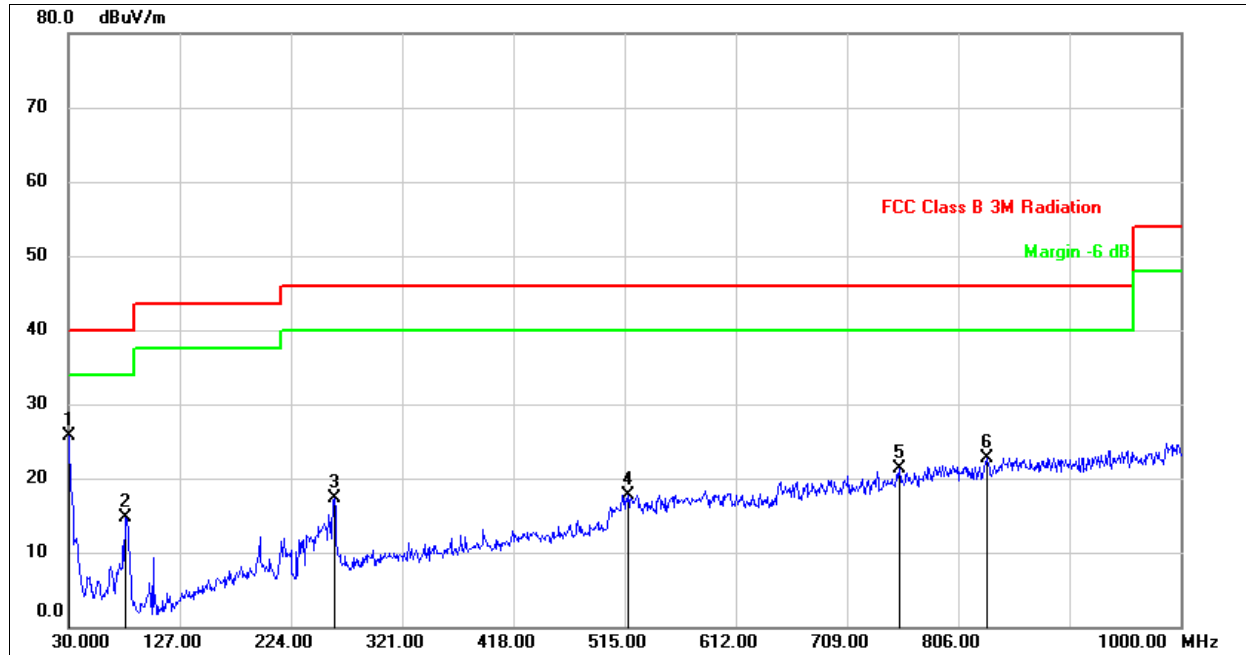
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	36.7900	44.69	-17.51	27.18	40.00	-12.82	QP
2	78.5000	45.34	-20.27	25.07	40.00	-14.93	QP
3	114.3900	38.96	-21.01	17.95	43.50	-25.55	QP
4	208.4800	30.22	-15.88	14.34	43.50	-29.16	QP
5	328.7600	26.01	-13.21	12.80	46.00	-33.20	QP
6	399.5700	26.47	-12.07	14.40	46.00	-31.60	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



8.5.3. TEST CONSTRUCTION 3

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

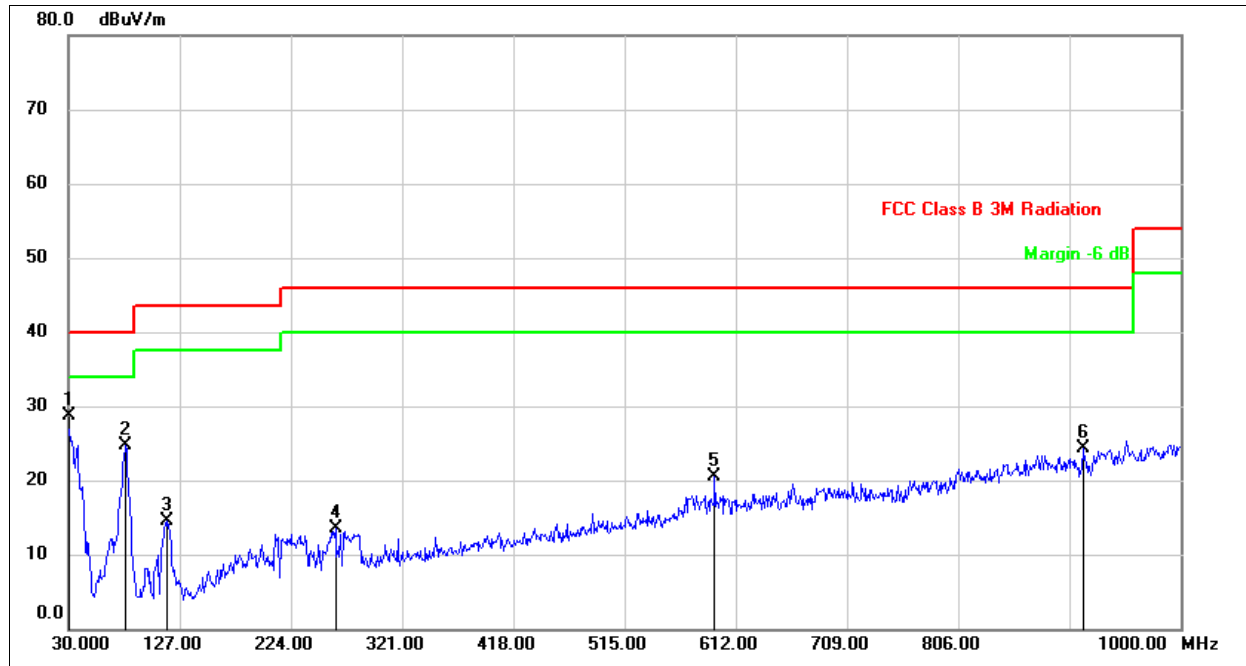


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.9700	42.61	-16.95	25.66	40.00	-14.34	QP
2	79.4700	34.94	-20.28	14.66	40.00	-25.34	QP
3	261.8299	32.53	-15.29	17.24	46.00	-28.76	QP
4	517.9099	27.41	-9.67	17.74	46.00	-28.26	QP
5	754.5900	26.86	-5.58	21.28	46.00	-24.72	QP
6	831.2199	27.26	-4.49	22.77	46.00	-23.23	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.

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

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.0000	45.51	-16.80	28.71	40.00	-11.29	QP
2	79.4700	44.91	-20.28	24.63	40.00	-15.37	QP
3	115.3600	35.38	-20.93	14.45	43.50	-29.05	QP
4	262.8000	28.76	-15.24	13.52	46.00	-32.48	QP
5	593.5700	28.77	-8.21	20.56	46.00	-25.44	QP
6	914.6400	27.87	-3.55	24.32	46.00	-21.68	QP

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

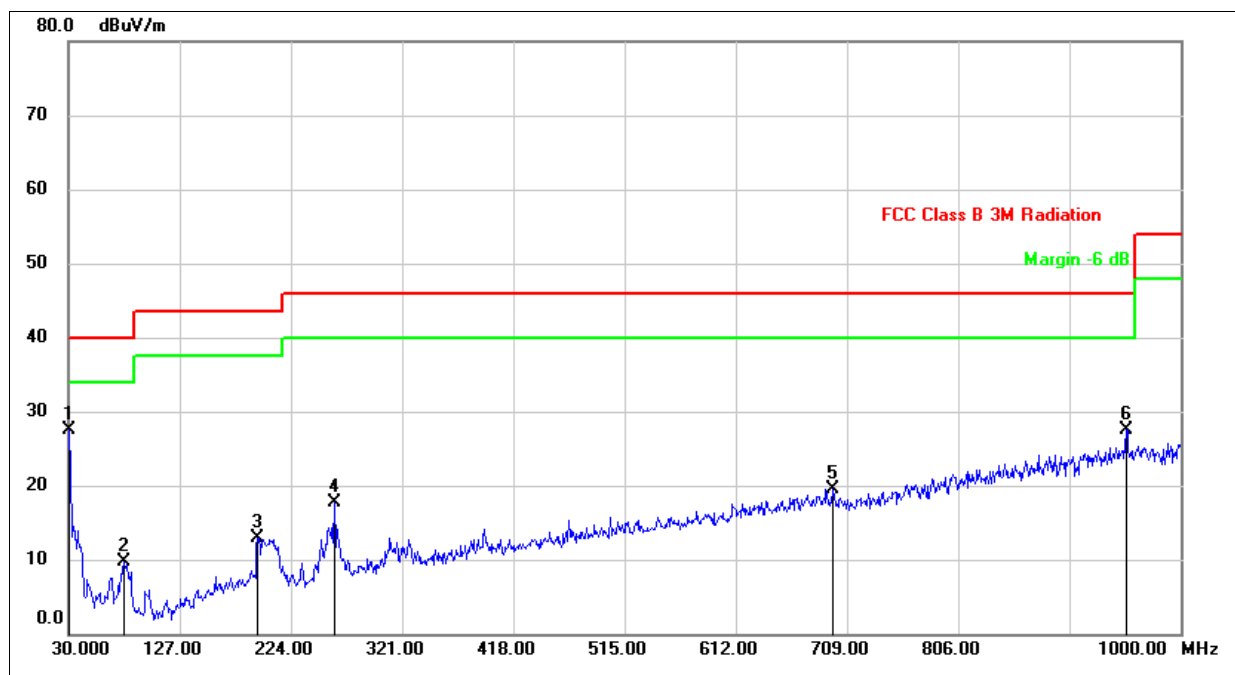
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

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



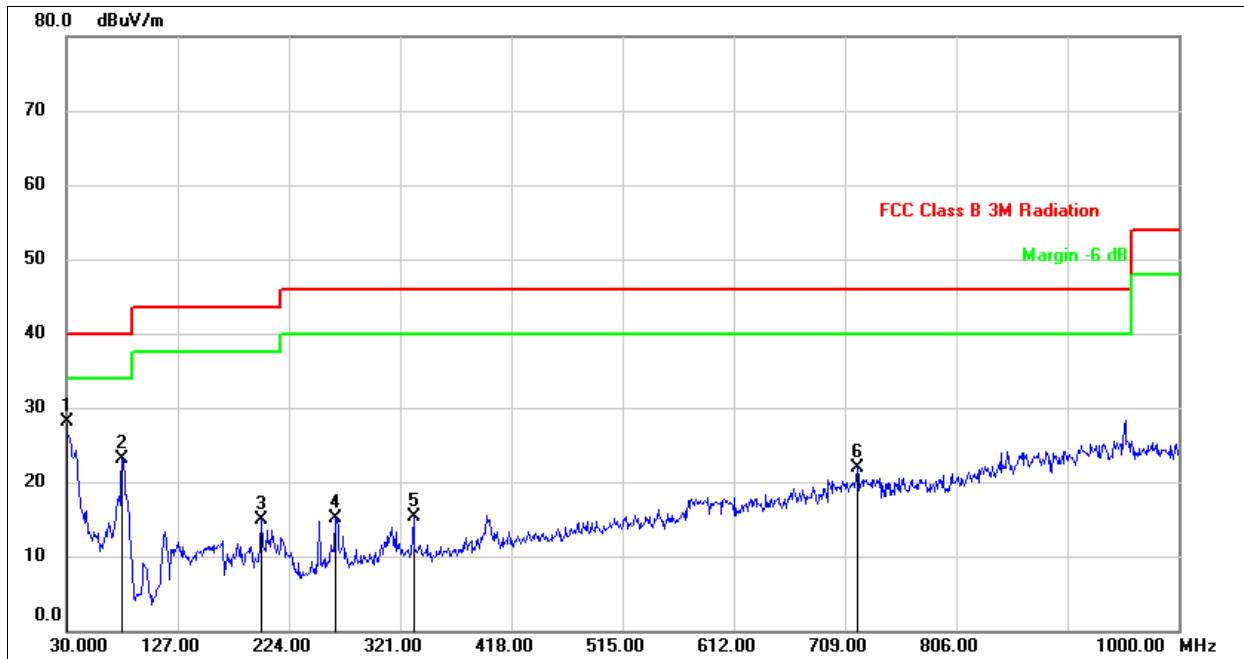
8.5.4. TEST CONSTRUCTION 4

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



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.9700	44.43	-16.95	27.48	40.00	-12.52	QP
2	78.5000	30.02	-20.27	9.75	40.00	-30.25	QP
3	194.9000	28.90	-16.02	12.88	43.50	-30.62	QP
4	261.8299	32.92	-15.29	17.63	46.00	-28.37	QP
5	696.3900	25.81	-6.29	19.52	46.00	-26.48	QP
6	952.4700	30.60	-3.00	27.60	46.00	-18.40	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.

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

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.0000	44.89	-16.80	28.09	40.00	-11.91	QP
2	78.5000	43.45	-20.27	23.18	40.00	-16.82	QP
3	199.7500	30.86	-15.89	14.97	43.50	-28.53	QP
4	264.7400	30.33	-15.13	15.20	46.00	-30.80	QP
5	332.6400	28.36	-13.15	15.21	46.00	-30.79	QP
6	719.6700	27.65	-5.73	21.92	46.00	-24.08	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

Note: All test modes have been tested, only the worst data record in the report.

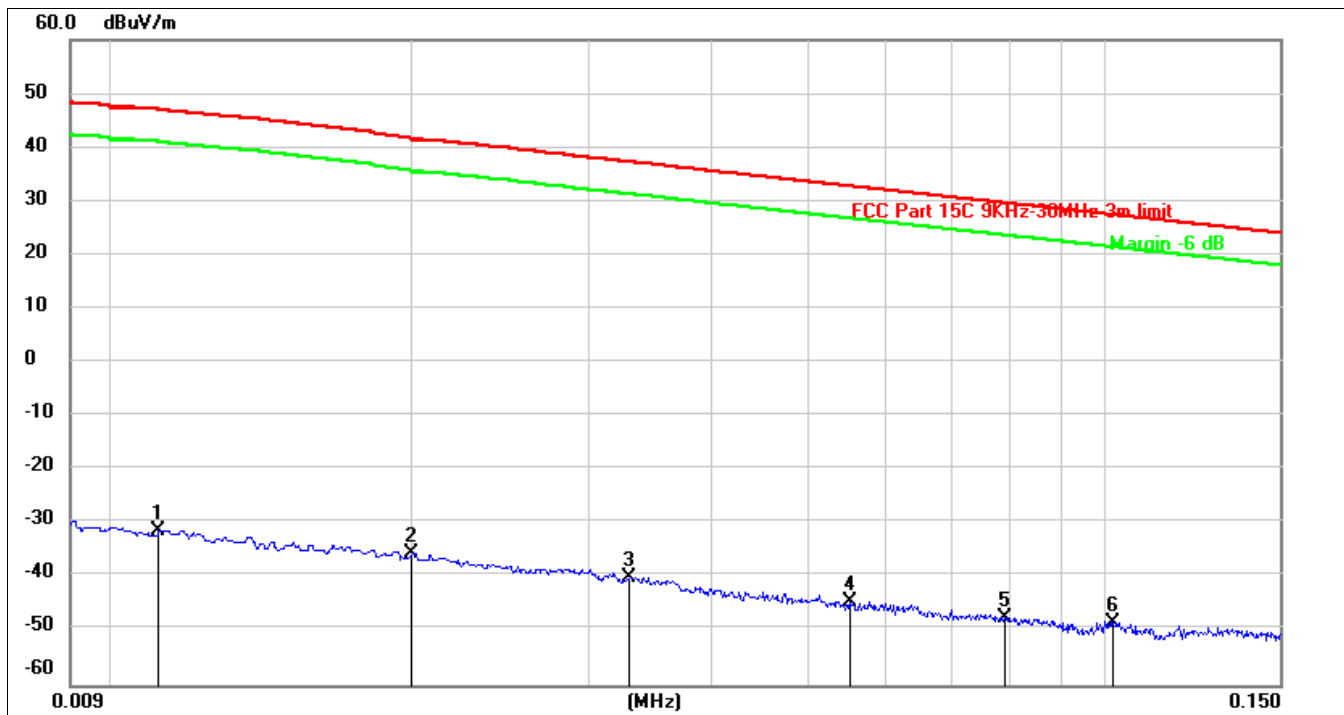


8.6. SPURIOUS EMISSIONS BELOW 30M

8.6.1. TEST CONSTRUCTION 3

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

9kHz~150kHz

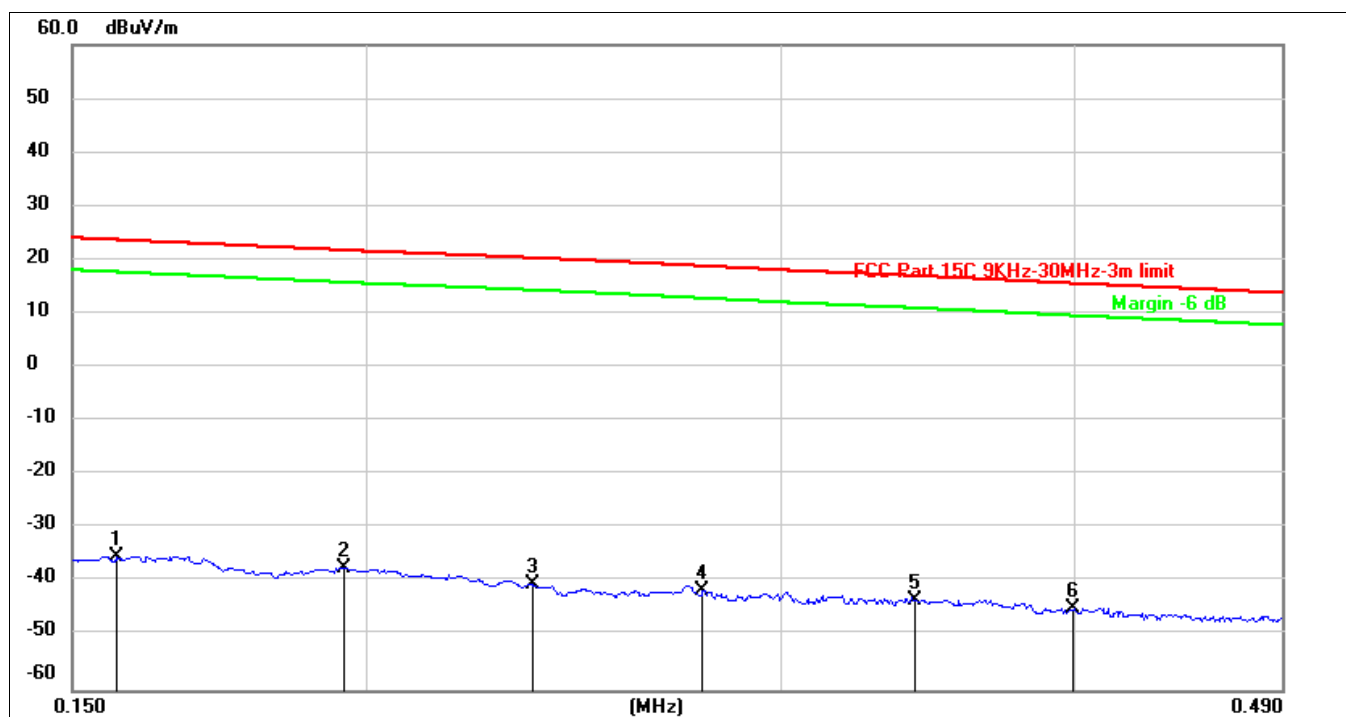


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0111	69.95	-101.39	-31.44	46.94	-78.38	peak
2	0.0200	65.86	-101.34	-35.48	41.58	-77.06	peak
3	0.0330	61.38	-101.40	-40.02	37.31	-77.33	peak
4	0.0551	56.95	-101.50	-44.55	32.81	-77.36	peak
5	0.0791	54.21	-101.63	-47.42	29.64	-77.06	peak
6	0.1019	53.35	-101.79	-48.44	27.44	-75.88	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. All the modes had been tested, but only the worst data were recorded in the report.
3. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

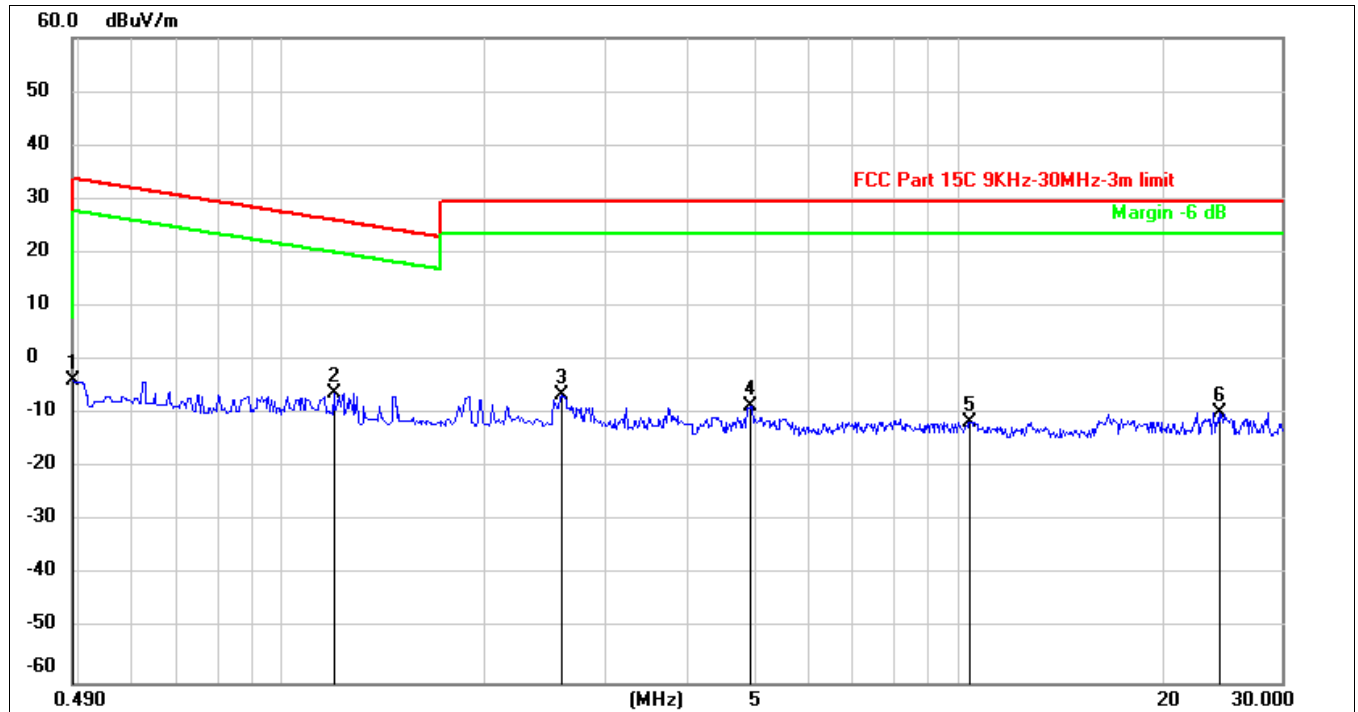


150kHz ~ 490kHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.1565	66.53	-101.65	-35.12	23.72	-58.84	peak
2	0.1955	64.35	-101.71	-37.36	21.78	-59.14	peak
3	0.2353	61.50	-101.78	-40.28	20.34	-60.62	peak
4	0.2782	60.29	-101.83	-41.54	18.83	-60.37	peak
5	0.3421	58.60	-101.90	-43.30	17.01	-60.31	peak
6	0.3996	57.08	-101.96	-44.88	15.57	-60.45	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. All the modes had been tested, but only the worst data were recorded in the report.
3. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

**490kHz ~ 30MHz**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.4900	58.22	-62.06	-3.84	13.80	-17.64	peak
2	1.1915	56.07	-62.18	-6.11	26.08	-32.19	peak
3	2.5935	55.11	-61.68	-6.57	29.54	-36.11	peak
4	4.9165	52.88	-61.48	-8.60	29.54	-38.14	peak
5	10.4054	49.34	-60.82	-11.48	29.54	-41.02	peak
6	24.3045	50.80	-60.51	-9.71	29.54	-39.25	peak

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

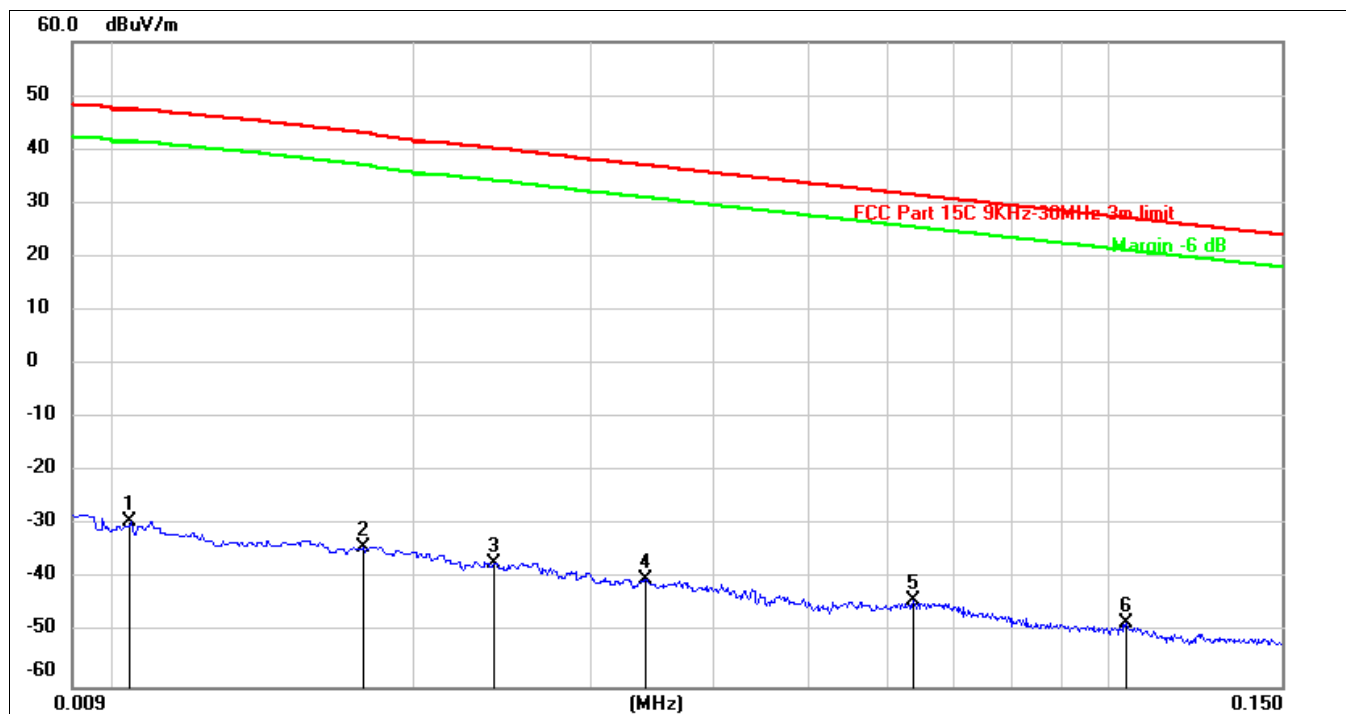
2. All the modes had been tested, but only the worst data were recorded in the report.

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



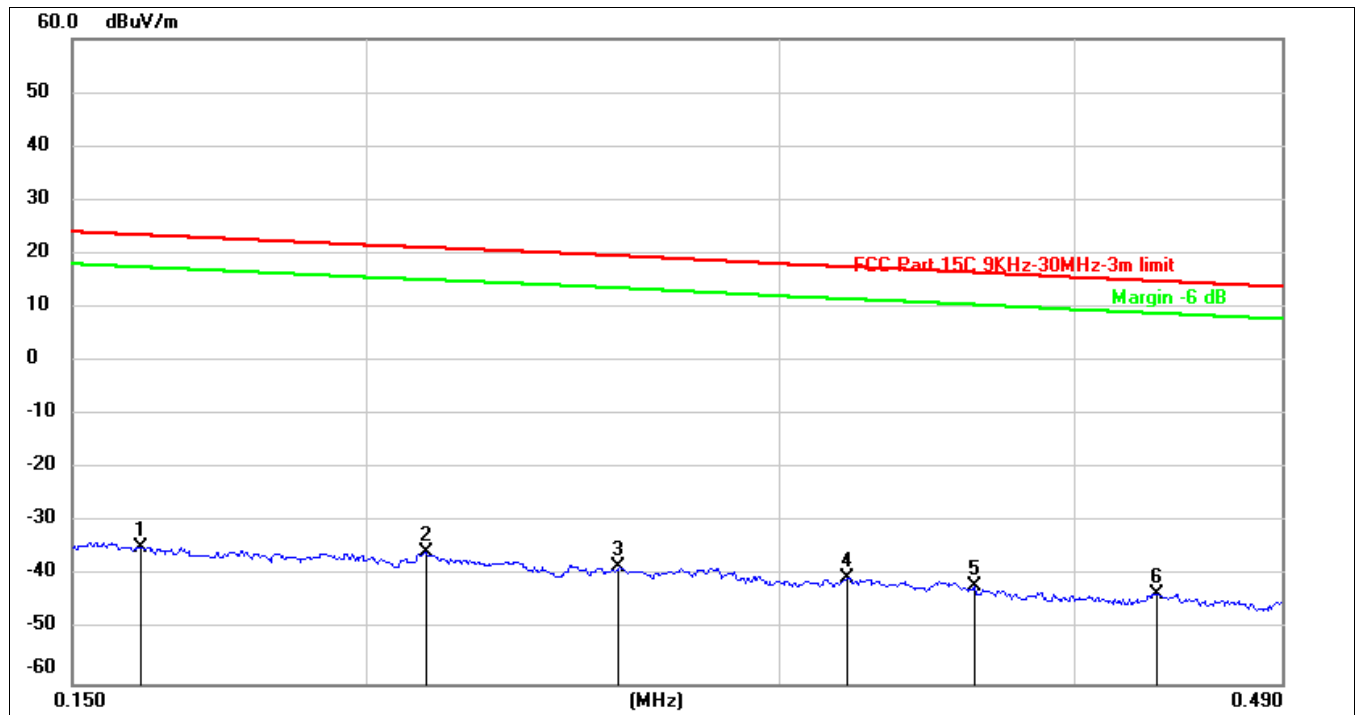
SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)

9kHz~ 150kHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0103	72.18	-101.40	-29.22	47.42	-76.64	peak
2	0.0177	67.35	-101.35	-34.00	42.96	-76.96	peak
3	0.0240	64.43	-101.36	-36.93	40.17	-77.10	peak
4	0.0342	61.43	-101.41	-39.98	37.01	-76.99	peak
5	0.0636	57.54	-101.54	-44.00	31.56	-75.56	peak
6	0.1043	53.57	-101.78	-48.21	27.25	-75.46	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. All the modes had been tested, but only the worst data were recorded in the report.
3. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

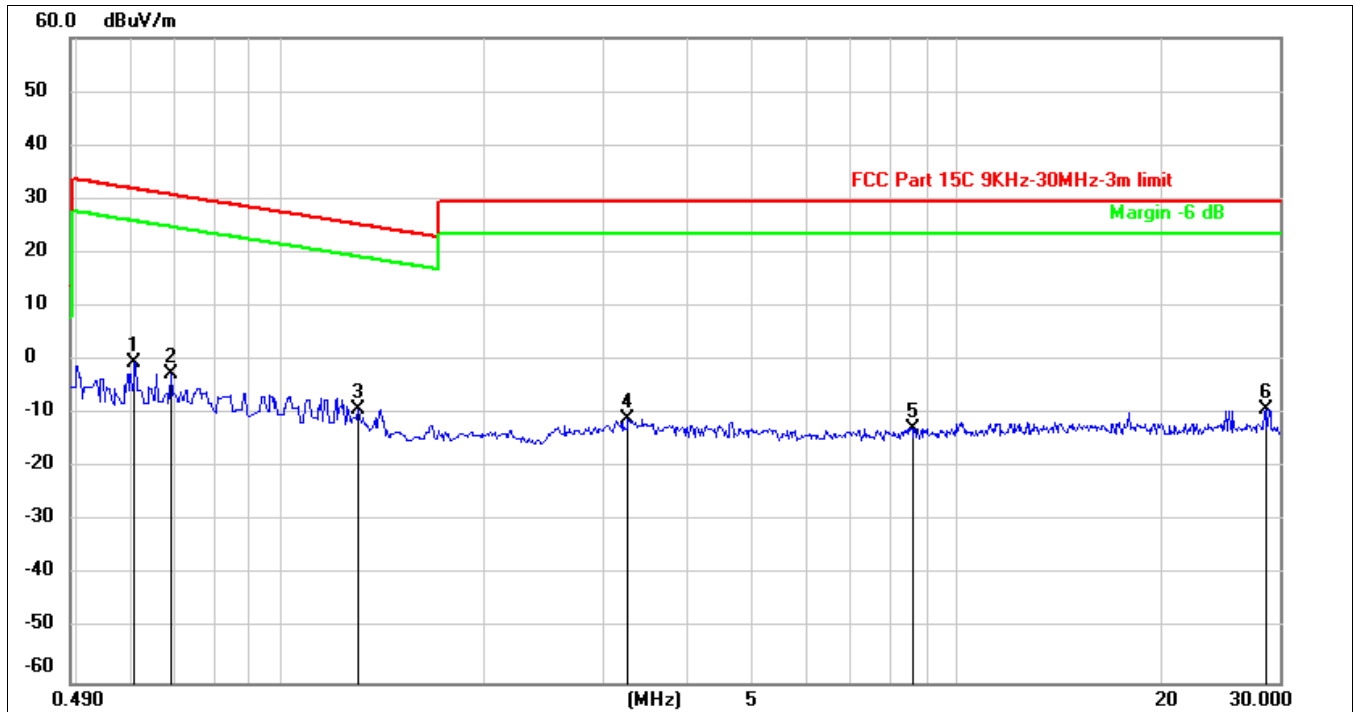
**150kHz ~ 490kHz**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.1604	67.14	-101.65	-34.51	23.50	-58.01	peak
2	0.2121	66.09	-101.73	-35.64	21.15	-56.79	peak
3	0.2560	63.49	-101.80	-38.31	19.61	-57.92	peak
4	0.3205	61.44	-101.88	-40.44	17.55	-57.99	peak
5	0.3628	59.95	-101.93	-41.98	16.49	-58.47	peak
6	0.4334	58.67	-101.99	-43.32	14.91	-58.23	peak

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

2. All the modes had been tested, but only the worst data were recorded in the report.

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

**490kHz ~ 30MHz**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.6094	61.68	-62.09	-0.41	31.91	-32.32	peak
2	0.6895	59.57	-62.10	-2.53	30.84	-33.37	peak
3	1.3044	53.01	-62.14	-9.13	25.30	-34.43	peak
4	3.2656	50.61	-61.51	-10.90	29.54	-40.44	peak
5	8.6051	48.39	-61.00	-12.61	29.54	-42.15	peak
6	28.6721	50.96	-60.10	-9.14	29.54	-38.68	peak

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

2. All the modes had been tested, but only the worst data were recorded in the report.

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

Note: All constructions and test modes have been tested, only the worst data record in the report.

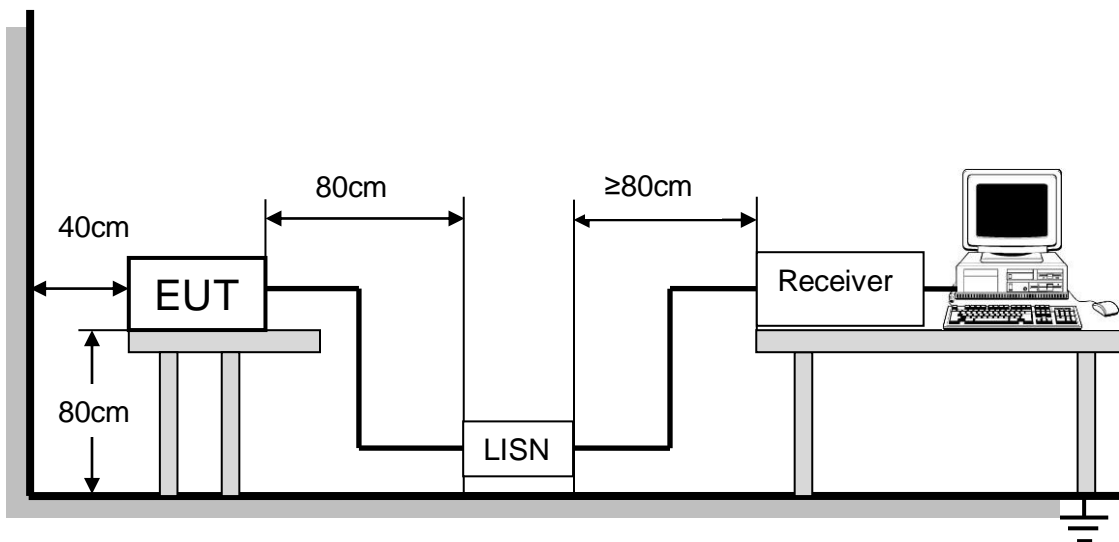
9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

Please refer to CFR 47 FCC §15.207 (a) and ISED RSS-Gen Clause 8.8

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

TEST SETUP AND PROCEDURE

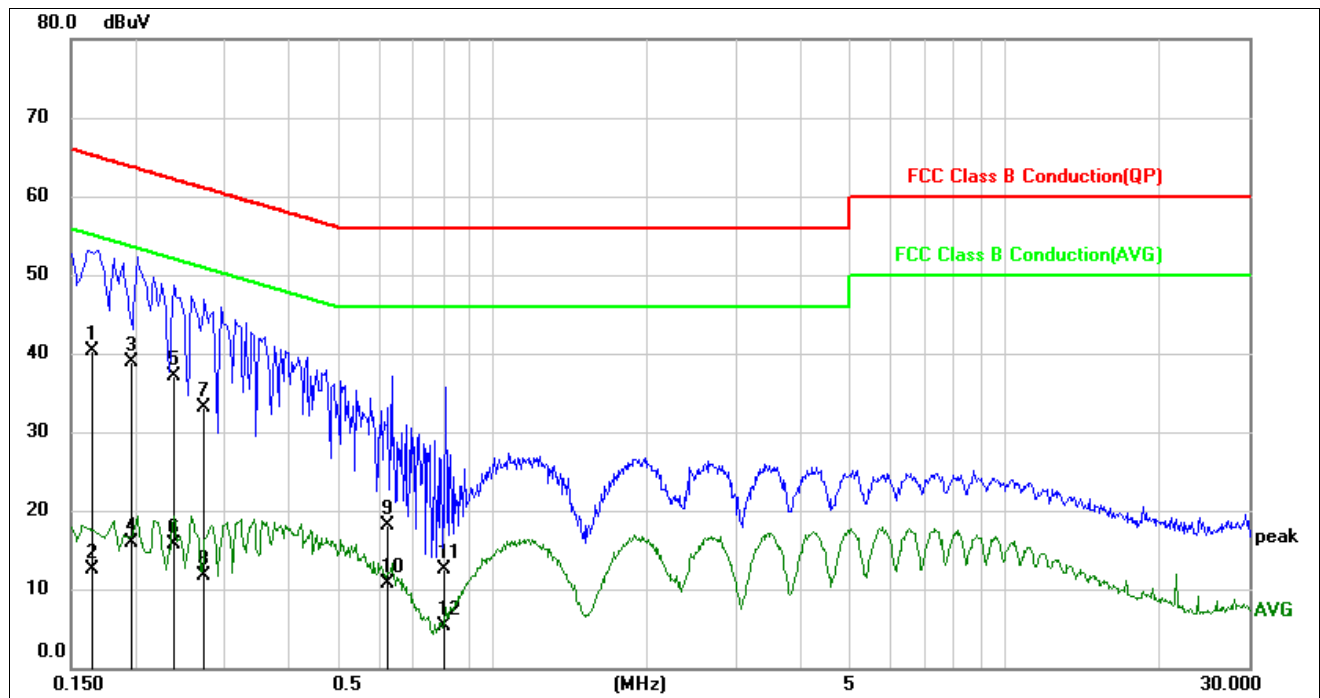


The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 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.



9.1. TEST CONSTRUCTION 1

LINE N RESULTS (LOW CHANNEL, WORST-CASE CONFIGURATION)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1652	30.65	9.60	40.25	65.20	-24.95	QP
2	0.1652	2.85	9.60	12.45	55.20	-42.75	AVG
3	0.1975	29.23	9.60	38.83	63.72	-24.89	QP
4	0.1975	6.21	9.60	15.81	53.72	-37.91	AVG
5	0.2367	27.54	9.60	37.14	62.21	-25.07	QP
6	0.2367	6.05	9.60	15.65	52.21	-36.56	AVG
7	0.2708	23.51	9.60	33.11	61.09	-27.98	QP
8	0.2708	2.13	9.60	11.73	51.09	-39.36	AVG
9	0.6299	8.59	9.60	18.19	56.00	-37.81	QP
10	0.6299	1.16	9.60	10.76	46.00	-35.24	AVG
11	0.8046	2.83	9.60	12.43	56.00	-43.57	QP
12	0.8046	-4.39	9.60	5.21	46.00	-40.79	AVG

Note: 1. Result = Reading +Correct Factor.

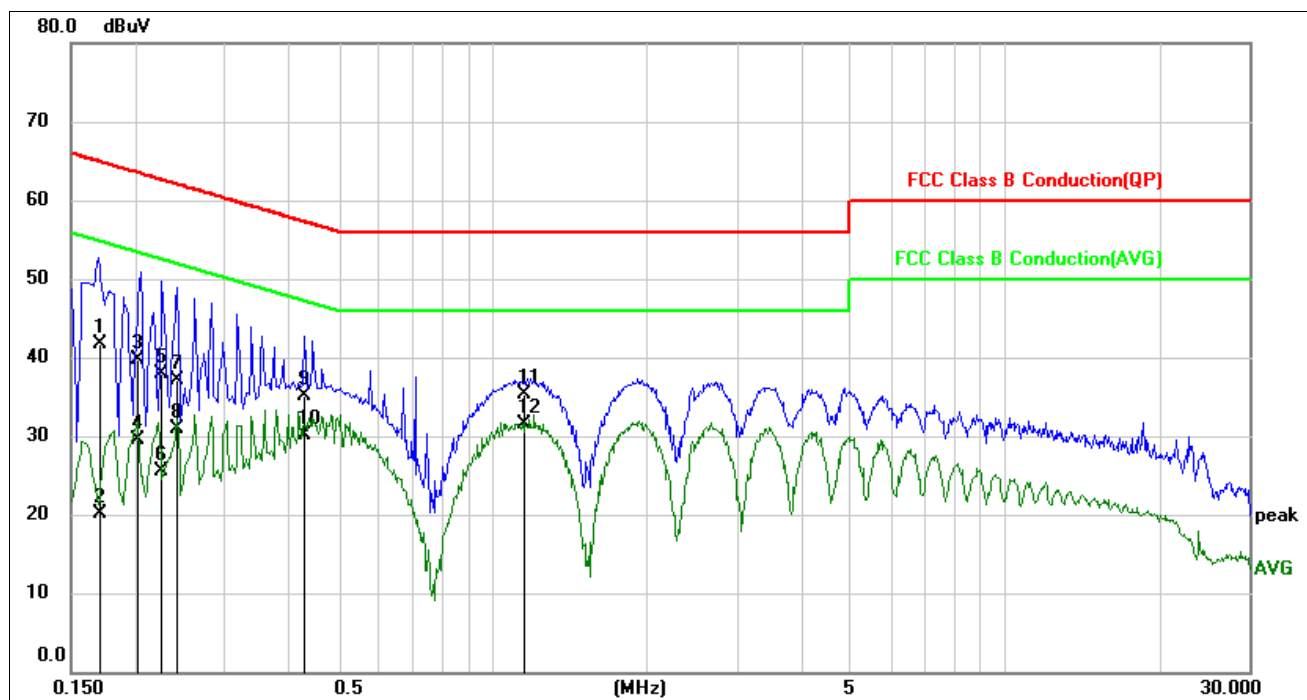
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

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 (LOW CHANNEL, WORST-CASE CONFIGURATION)



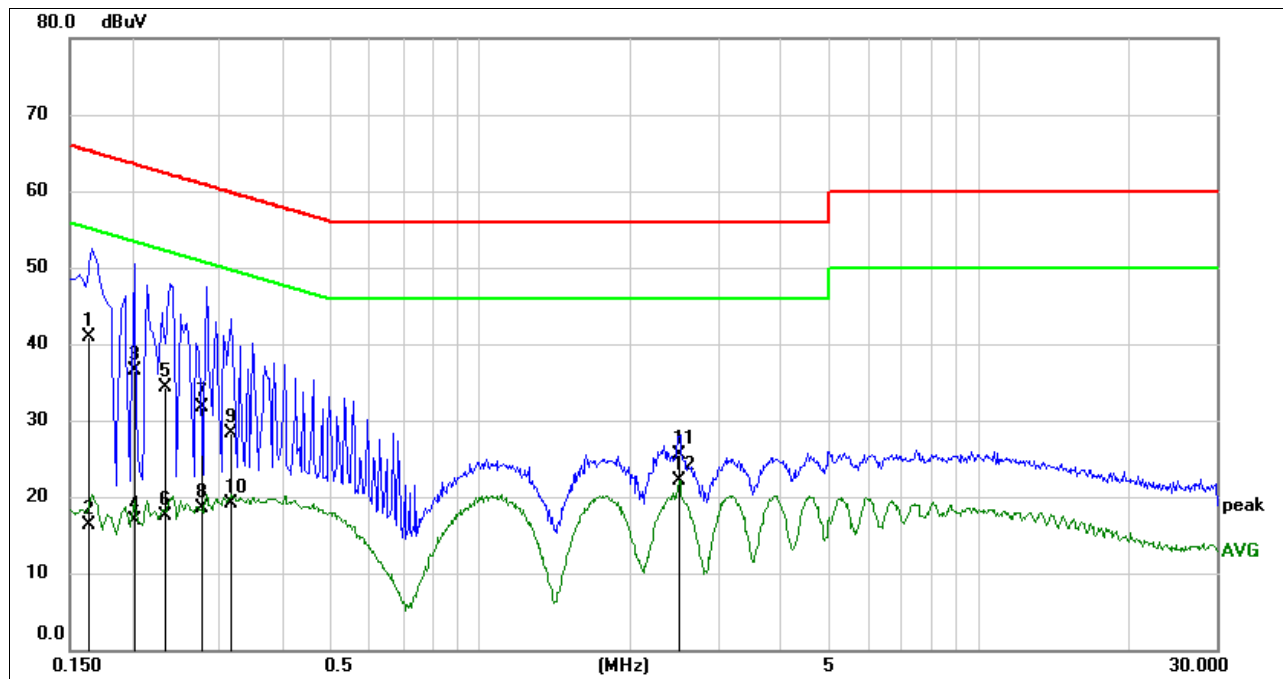
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1715	32.13	9.61	41.74	64.89	-23.15	QP
2	0.1715	10.48	9.61	20.09	54.89	-34.80	AVG
3	0.2017	30.03	9.60	39.63	63.54	-23.91	QP
4	0.2017	19.96	9.60	29.56	53.54	-23.98	AVG
5	0.2255	28.29	9.60	37.89	62.61	-24.72	QP
6	0.2255	15.90	9.60	25.50	52.61	-27.11	AVG
7	0.2411	27.59	9.60	37.19	62.06	-24.87	QP
8	0.2411	21.32	9.60	30.92	52.06	-21.14	AVG
9	0.4264	25.50	9.60	35.10	57.32	-22.22	QP
10	0.4264	20.57	9.60	30.17	47.32	-17.15	AVG
11	1.1526	25.75	9.61	35.36	56.00	-20.64	QP
12	1.1526	21.84	9.61	31.45	46.00	-14.55	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.



9.2. TEST CONSTRUCTION 2

LINE N RESULTS (LOW CHANNEL, WORST-CASE CONFIGURATION)



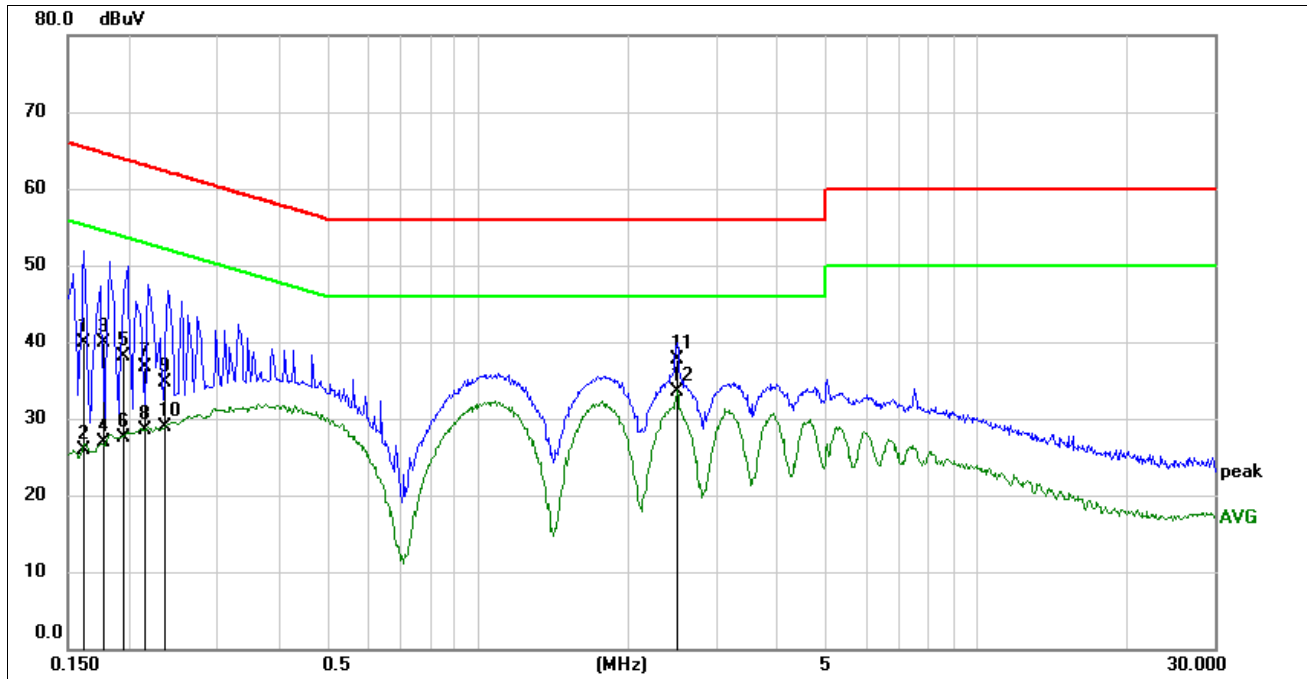
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1636	31.23	9.60	40.83	65.28	-24.45	QP
2	0.1636	6.68	9.60	16.28	55.28	-39.00	AVG
3	0.2013	26.83	9.60	36.43	63.56	-27.13	QP
4	0.2013	7.29	9.60	16.89	53.56	-36.67	AVG
5	0.2340	24.68	9.60	34.28	62.31	-28.03	QP
6	0.2340	7.98	9.60	17.58	52.31	-34.73	AVG
7	0.2775	22.05	9.60	31.65	60.89	-29.24	QP
8	0.2775	8.87	9.60	18.47	50.89	-32.42	AVG
9	0.3175	18.64	9.60	28.24	59.77	-31.53	QP
10	0.3175	9.58	9.60	19.18	49.77	-30.59	AVG
11	2.5088	15.89	9.64	25.53	56.00	-30.47	QP
12	2.5088	12.41	9.64	22.05	46.00	-23.95	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.

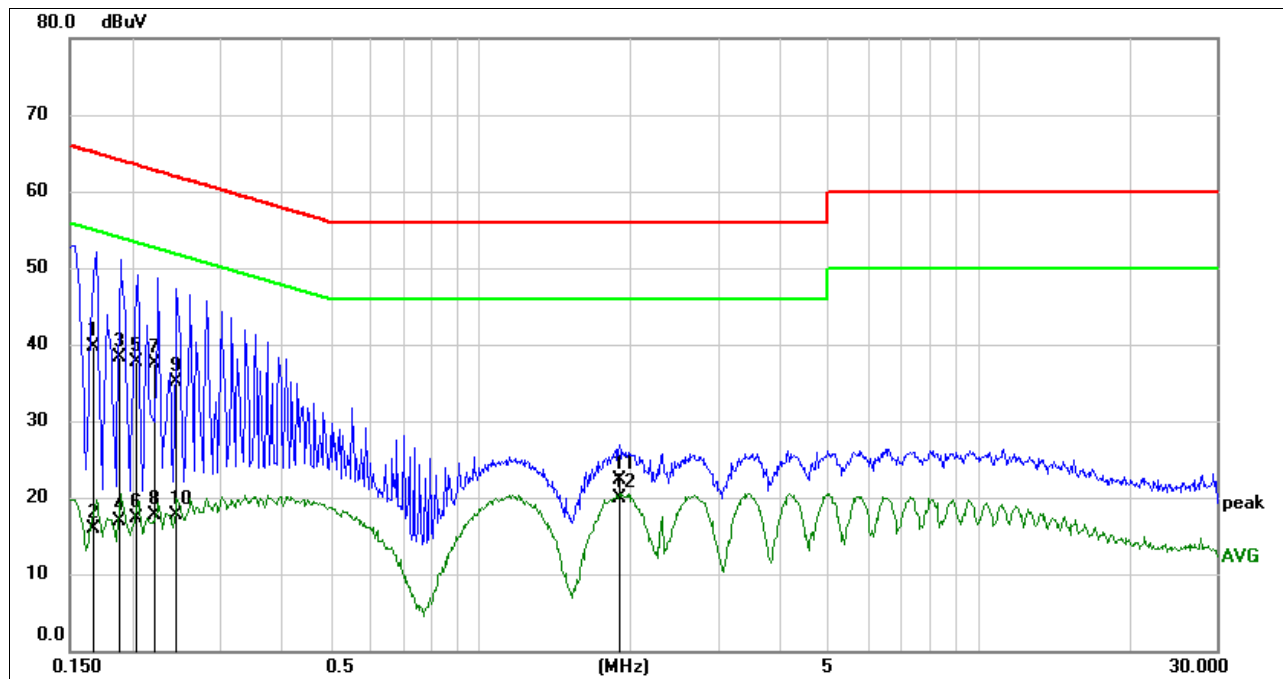
**LINE L RESULTS (LOW CHANNEL, WORST-CASE CONFIGURATION)**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1611	30.24	9.61	39.85	65.41	-25.56	QP
2	0.1611	16.28	9.61	25.89	55.41	-29.52	AVG
3	0.1774	30.26	9.61	39.87	64.61	-24.74	QP
4	0.1774	17.24	9.61	26.85	54.61	-27.76	AVG
5	0.1939	28.54	9.60	38.14	63.87	-25.73	QP
6	0.1939	18.00	9.60	27.60	53.87	-26.27	AVG
7	0.2140	27.05	9.60	36.65	63.05	-26.40	QP
8	0.2140	18.83	9.60	28.43	53.05	-24.62	AVG
9	0.2350	25.03	9.60	34.63	62.27	-27.64	QP
10	0.2350	19.40	9.60	29.00	52.27	-23.27	AVG
11	2.5078	27.98	9.64	37.62	56.00	-18.38	QP
12	2.5078	23.94	9.64	33.58	46.00	-12.42	AVG



9.3. TEST CONSTRUCTION 3

LINE N RESULTS (LOW CHANNEL, WORST-CASE CONFIGURATION)



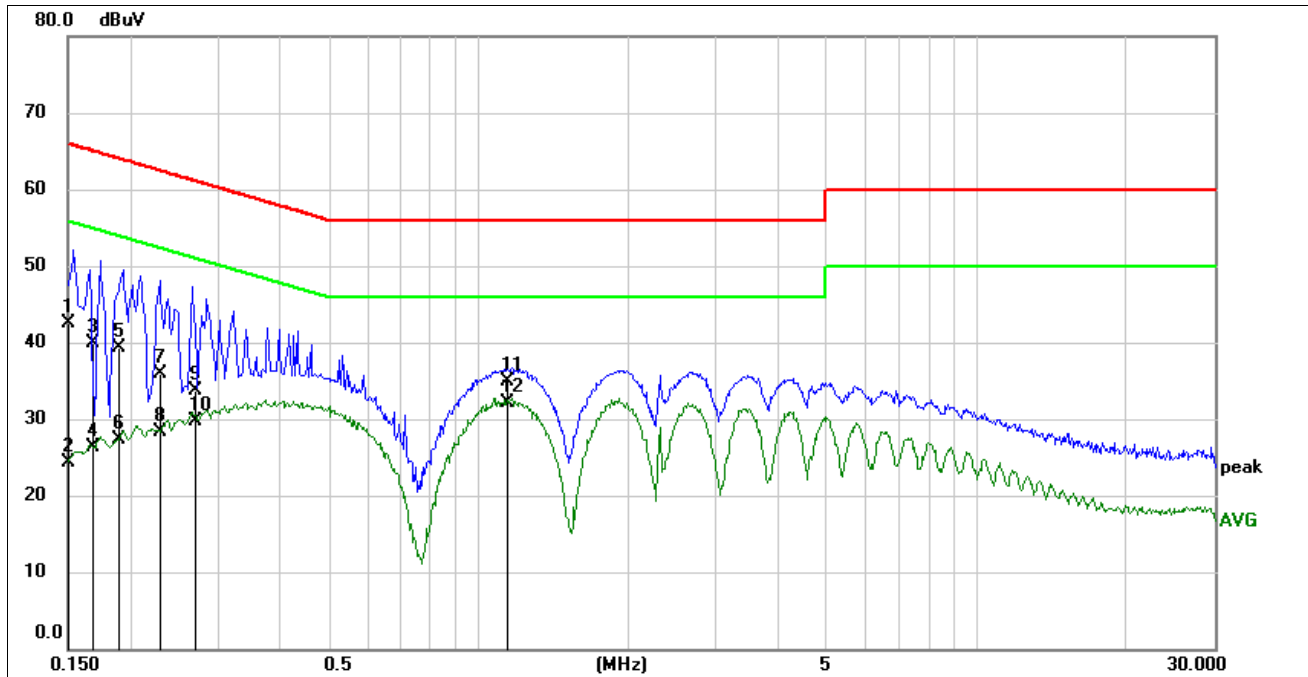
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1665	30.08	9.60	39.68	65.13	-25.45	QP
2	0.1665	6.27	9.60	15.87	55.13	-39.26	AVG
3	0.1880	28.68	9.60	38.28	64.12	-25.84	QP
4	0.1880	7.26	9.60	16.86	54.12	-37.26	AVG
5	0.2039	28.18	9.60	37.78	63.45	-25.67	QP
6	0.2039	7.78	9.60	17.38	53.45	-36.07	AVG
7	0.2220	27.86	9.60	37.46	62.74	-25.28	QP
8	0.2220	8.04	9.60	17.64	52.74	-35.10	AVG
9	0.2449	25.55	9.60	35.15	61.93	-26.78	QP
10	0.2449	8.04	9.60	17.64	51.93	-34.29	AVG
11	1.9125	12.75	9.63	22.38	56.00	-33.62	QP
12	1.9125	10.37	9.63	20.00	46.00	-26.00	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.

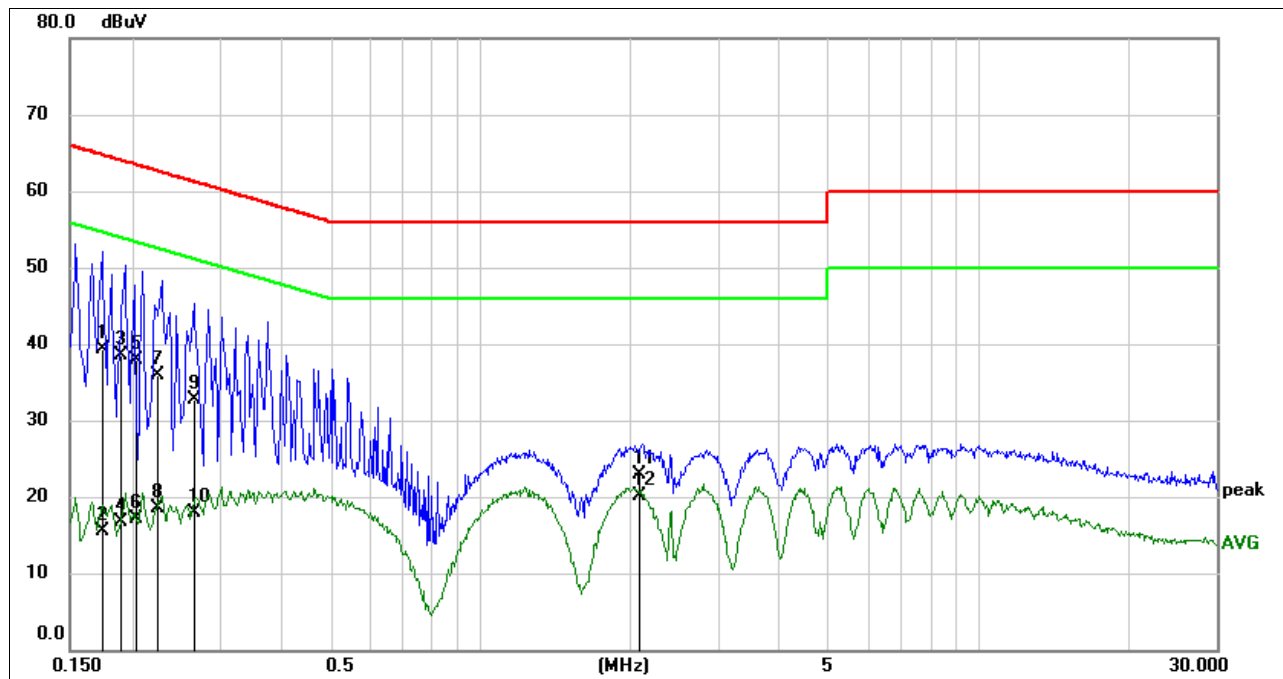
**LINE L RESULTS (LOW CHANNEL, WORST-CASE CONFIGURATION)**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1505	32.86	9.61	42.47	65.97	-23.50	QP
2	0.1505	14.75	9.61	24.36	55.97	-31.61	AVG
3	0.1691	30.34	9.61	39.95	65.00	-25.05	QP
4	0.1691	16.66	9.61	26.27	55.00	-28.73	AVG
5	0.1893	29.78	9.60	39.38	64.07	-24.69	QP
6	0.1893	17.67	9.60	27.27	54.07	-26.80	AVG
7	0.2288	26.36	9.60	35.96	62.49	-26.53	QP
8	0.2288	18.61	9.60	28.21	52.49	-24.28	AVG
9	0.2709	24.10	9.60	33.70	61.09	-27.39	QP
10	0.2709	20.18	9.60	29.78	51.09	-21.31	AVG
11	1.1429	25.37	9.61	34.98	56.00	-21.02	QP
12	1.1429	22.49	9.61	32.10	46.00	-13.90	AVG



9.4. TEST CONSTRUCTION 4

LINE N RESULTS (LOW CHANNEL, WORST-CASE CONFIGURATION)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1734	29.72	9.60	39.32	64.80	-25.48	QP
2	0.1734	5.95	9.60	15.55	54.80	-39.25	AVG
3	0.1901	28.87	9.60	38.47	64.03	-25.56	QP
4	0.1901	7.16	9.60	16.76	54.03	-37.27	AVG
5	0.2055	28.35	9.60	37.95	63.39	-25.44	QP
6	0.2055	7.47	9.60	17.07	53.39	-36.32	AVG
7	0.2252	26.24	9.60	35.84	62.62	-26.78	QP
8	0.2252	8.81	9.60	18.41	52.62	-34.21	AVG
9	0.2654	23.08	9.60	32.68	61.26	-28.58	QP
10	0.2654	8.24	9.60	17.84	51.26	-33.42	AVG
11	2.0938	13.30	9.63	22.93	56.00	-33.07	QP
12	2.0938	10.53	9.63	20.16	46.00	-25.84	AVG

Note: 1. Result = Reading +Correct Factor.

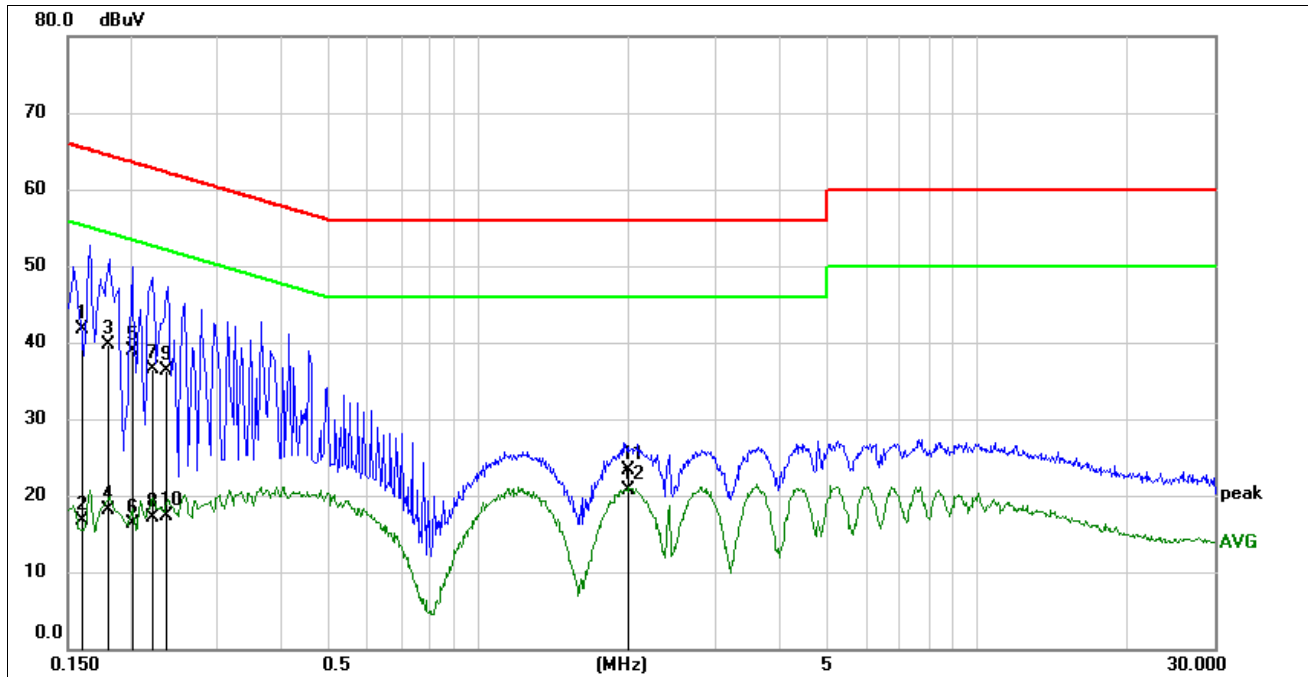
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

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 (LOW CHANNEL, WORST-CASE CONFIGURATION)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1612	32.14	9.61	41.75	65.40	-23.65	QP
2	0.1612	7.16	9.61	16.77	55.40	-38.63	AVG
3	0.1801	30.08	9.61	39.69	64.48	-24.79	QP
4	0.1801	8.41	9.61	18.02	54.48	-36.46	AVG
5	0.2008	29.30	9.60	38.90	63.58	-24.68	QP
6	0.2008	6.74	9.60	16.34	53.58	-37.24	AVG
7	0.2210	26.93	9.60	36.53	62.78	-26.25	QP
8	0.2210	7.59	9.60	17.19	52.78	-35.59	AVG
9	0.2354	26.73	9.60	36.33	62.26	-25.93	QP
10	0.2354	7.66	9.60	17.26	52.26	-35.00	AVG
11	2.0059	13.62	9.62	23.24	56.00	-32.76	QP
12	2.0059	11.05	9.62	20.67	46.00	-25.33	AVG

Note: All test modes have been tested, only the worst data record 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.

RESULTS

Complies



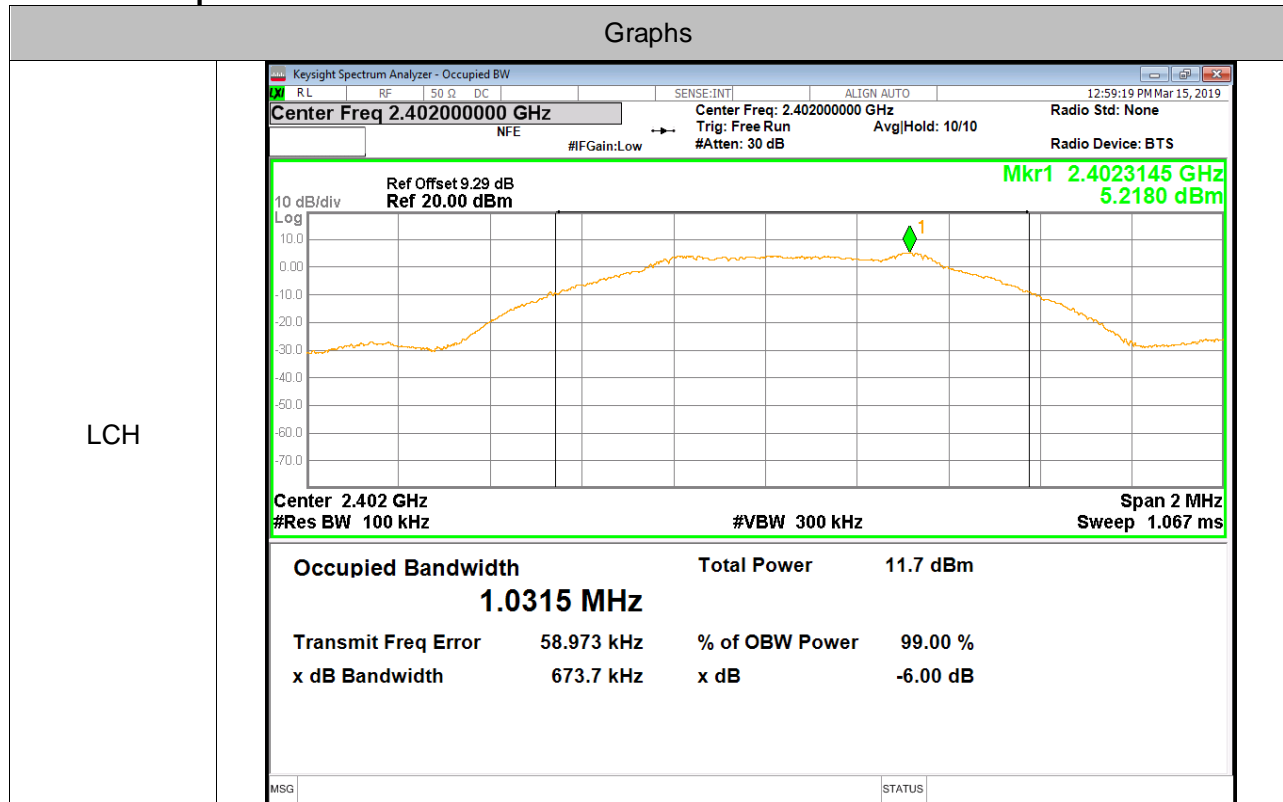
11. APPENDIXES

Appendix A): 6dB Bandwidth

Test Result

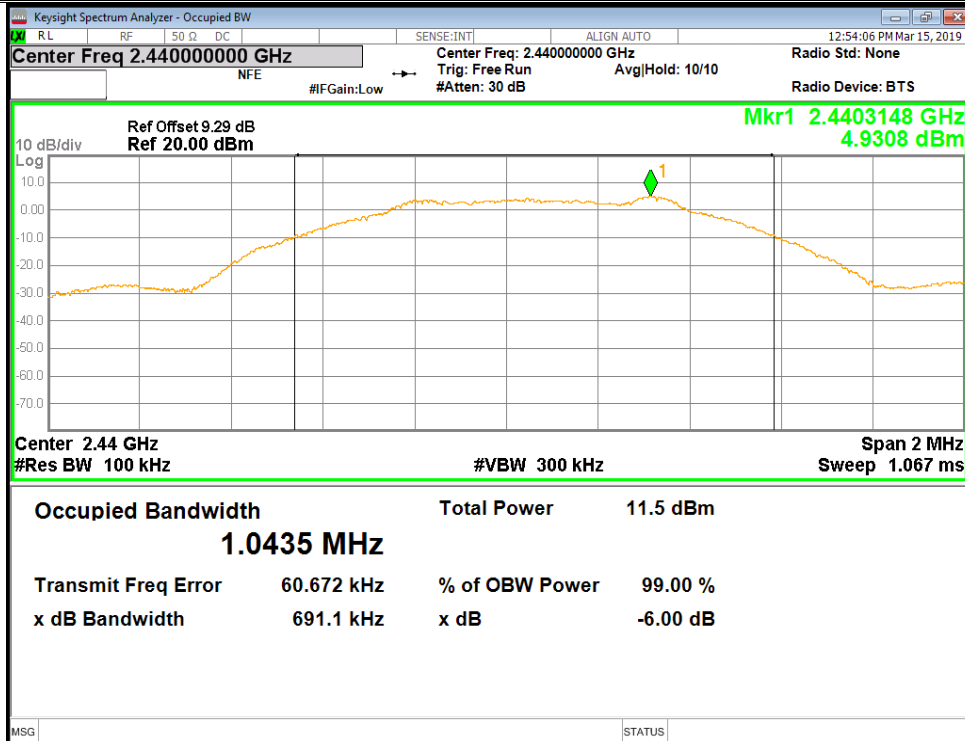
Mode	Channel	6dB Bandwidth [MHz]	Verdict
BLE	LCH	0.6737	PASS
BLE	MCH	0.6911	PASS
BLE	HCH	0.6696	PASS

Test Graphs

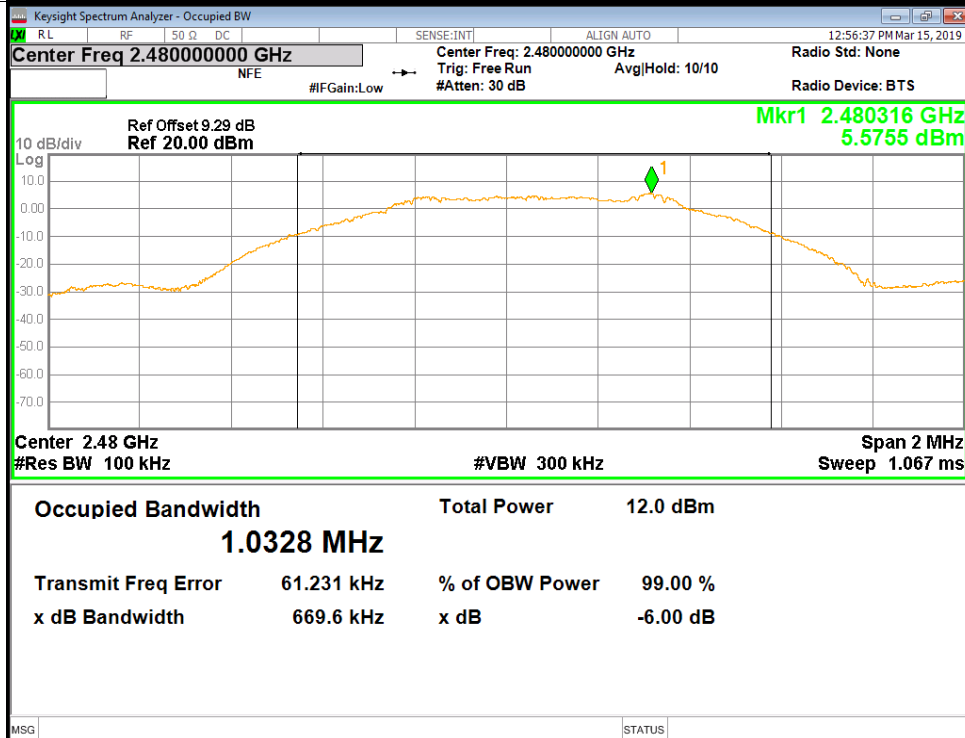




MCH



HCH



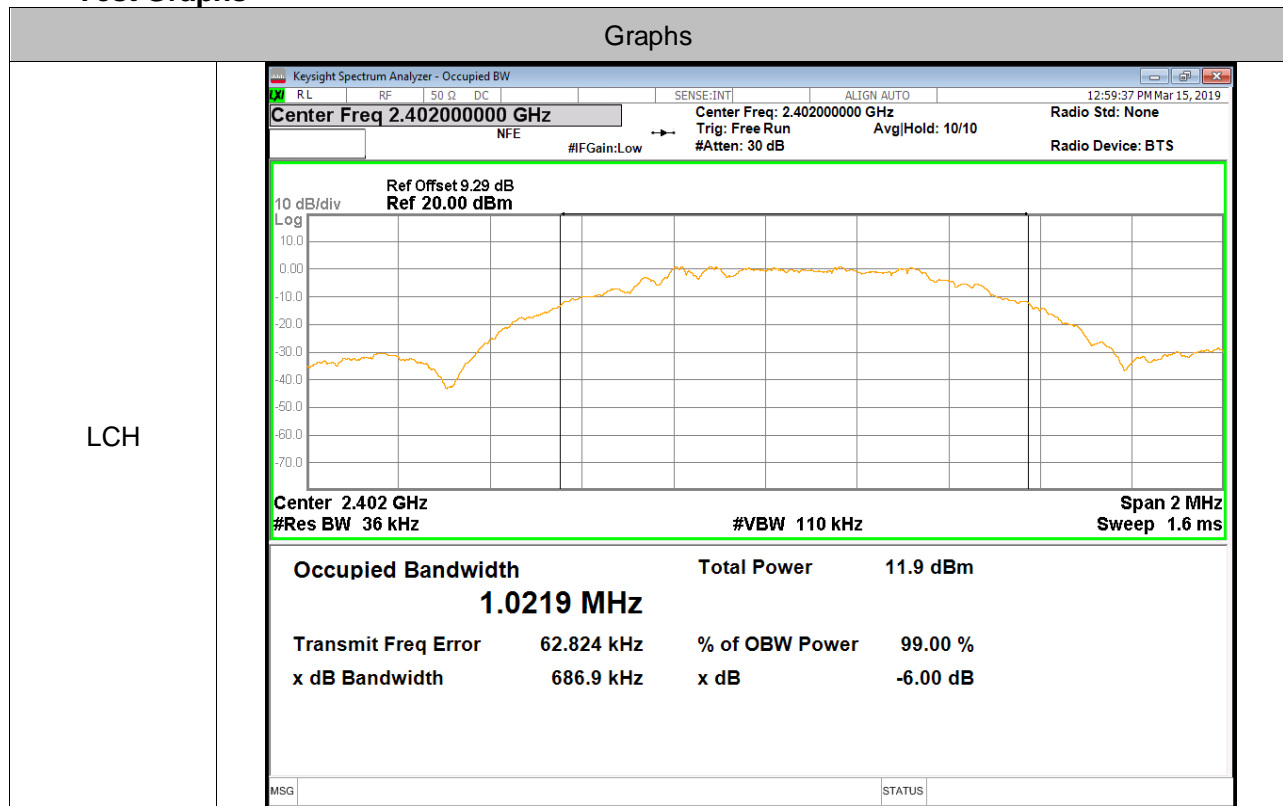


Appendix B): Occupied Bandwidth

Test Result

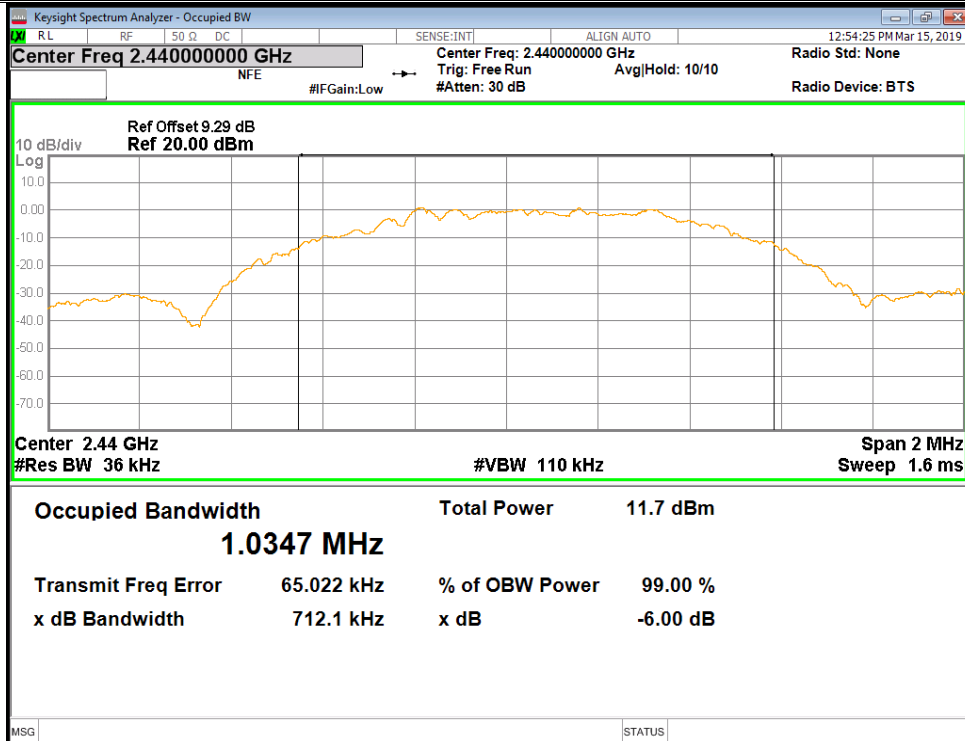
Mode	Channel	99% OBW[MHz]	Verdict
BLE	LCH	1.0219	PASS
BLE	MCH	1.0347	PASS
BLE	HCH	1.0232	PASS

Test Graphs

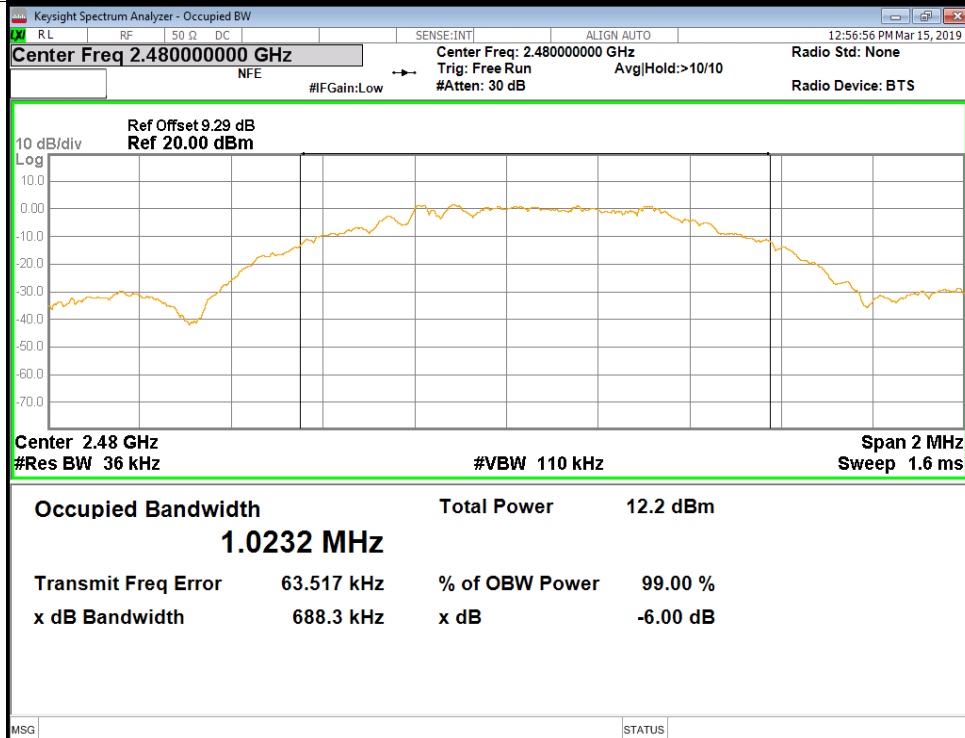




MCH



HCH



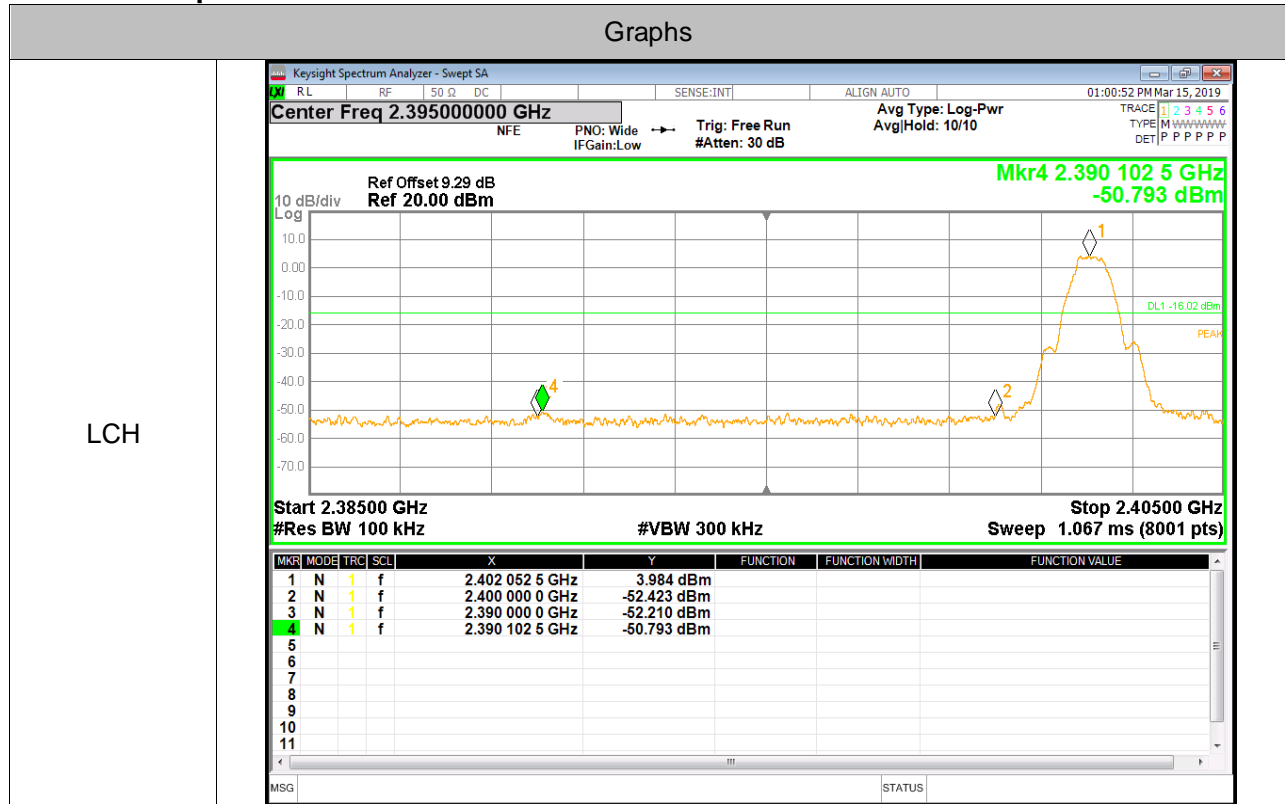


Appendix C): Band-edge for RF Conducted Emissions

Result Table

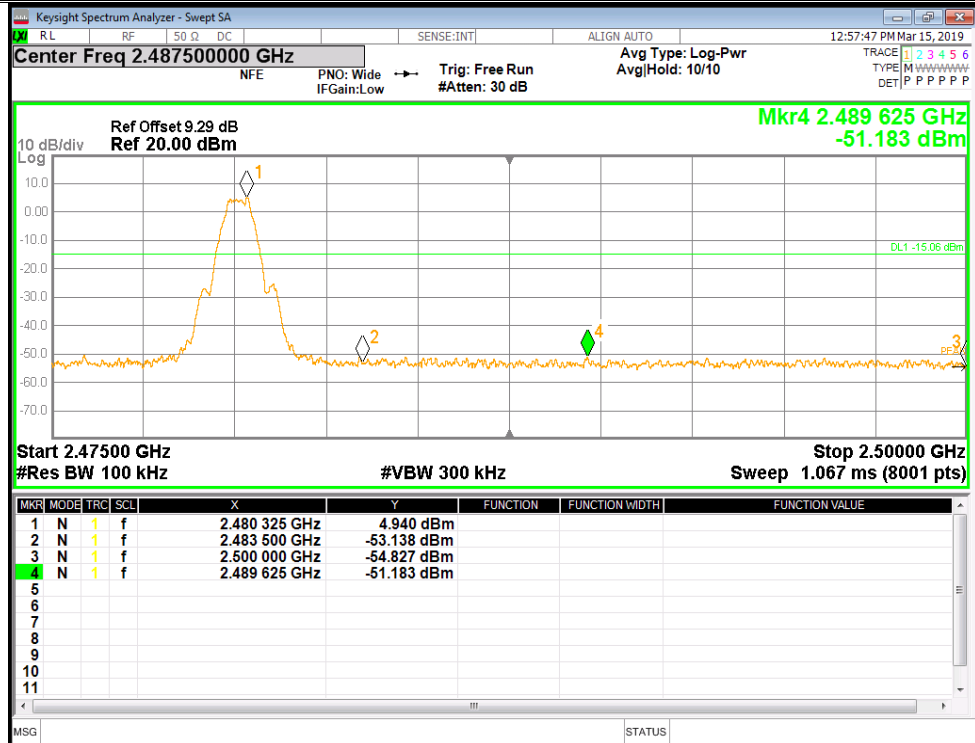
Mode	Channel	Verdict
BLE	LCH	PASS
BLE	HCH	PASS

Test Graphs





HCH



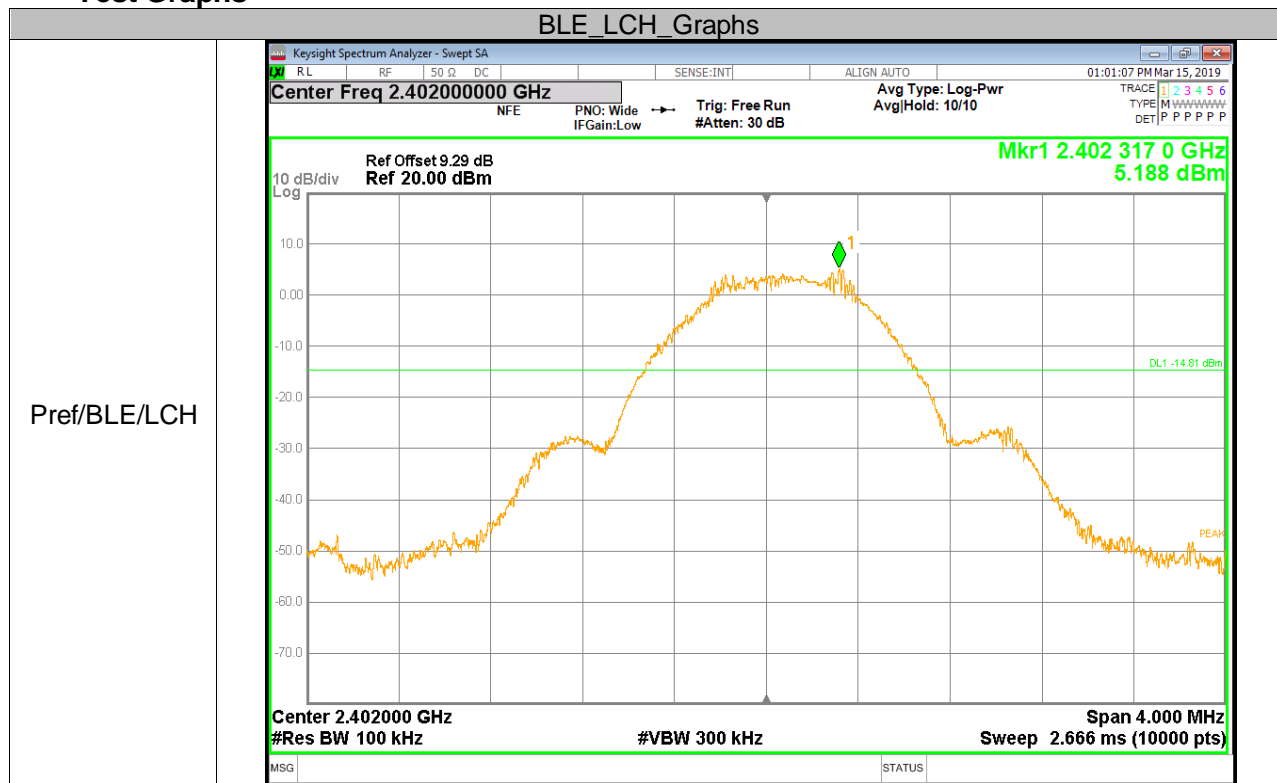


Appendix D): RF Conducted Spurious Emissions

Result Table

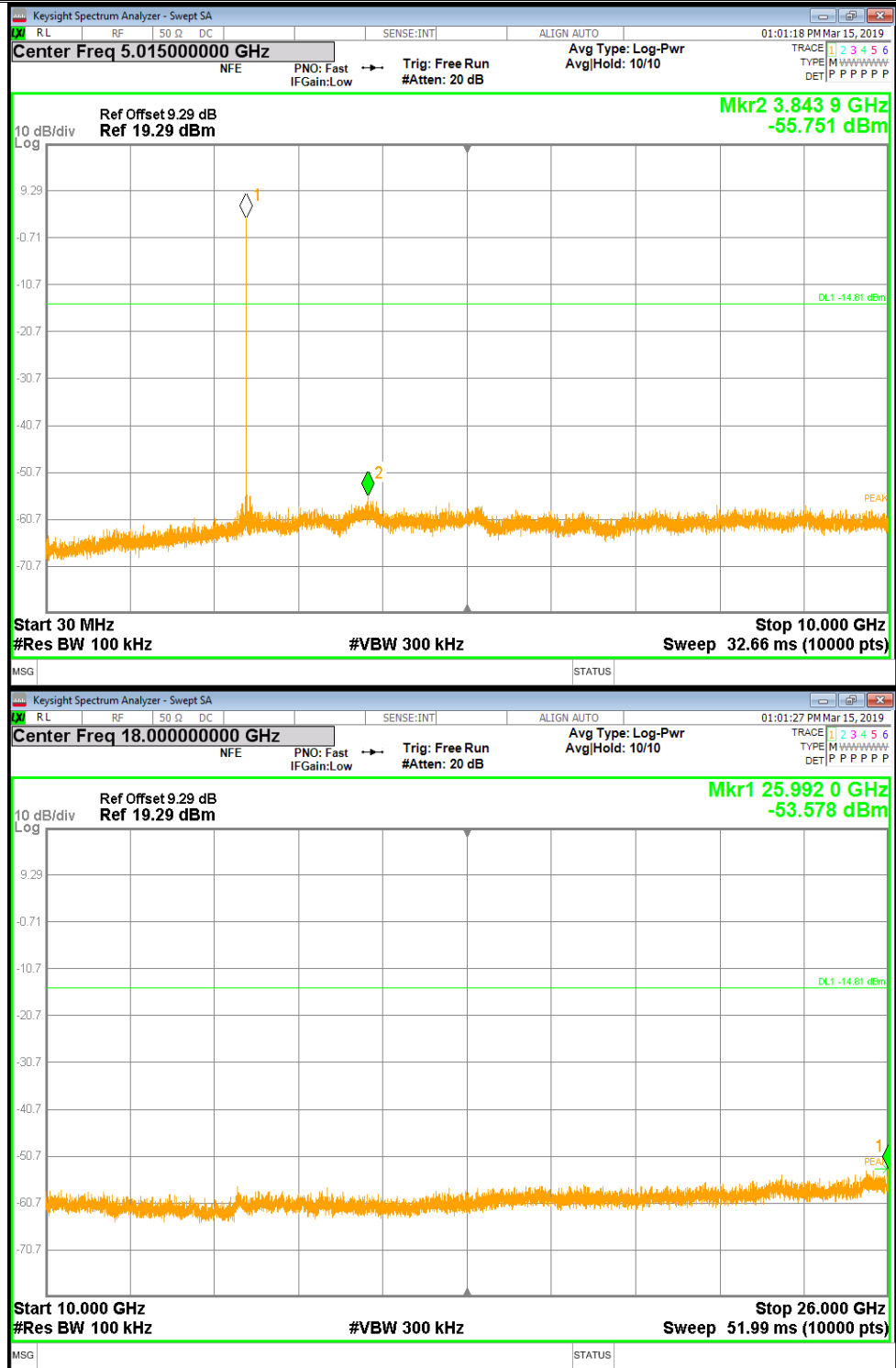
Mode	Channel	Verdict
BLE	LCH	PASS
BLE	MCH	PASS
BLE	HCH	PASS

Test Graphs





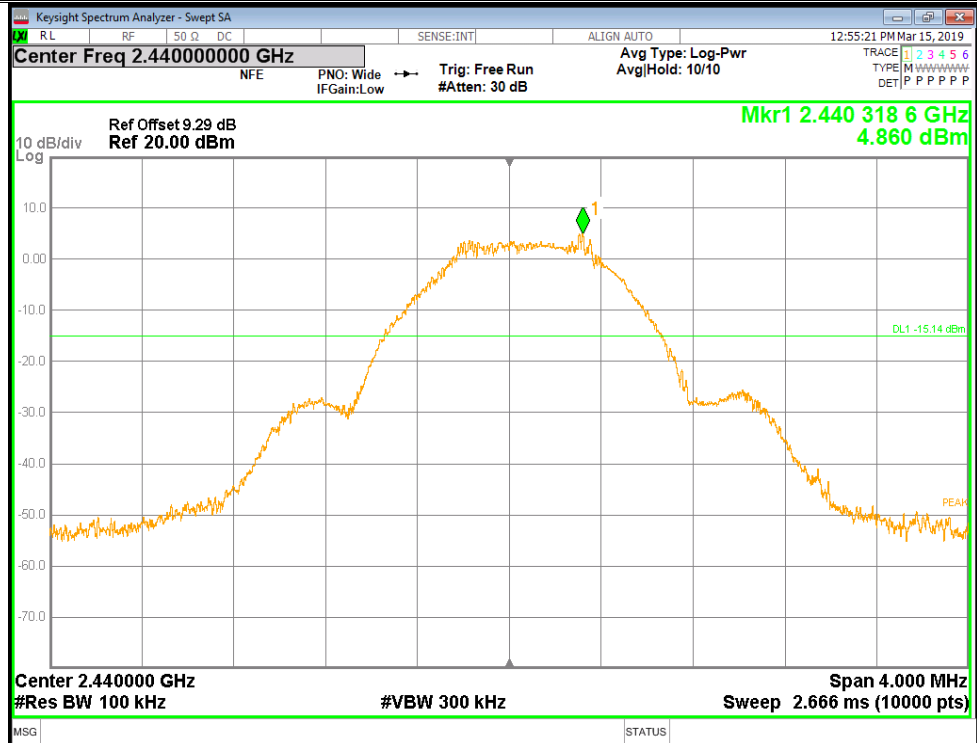
Puw/BLE/LCH



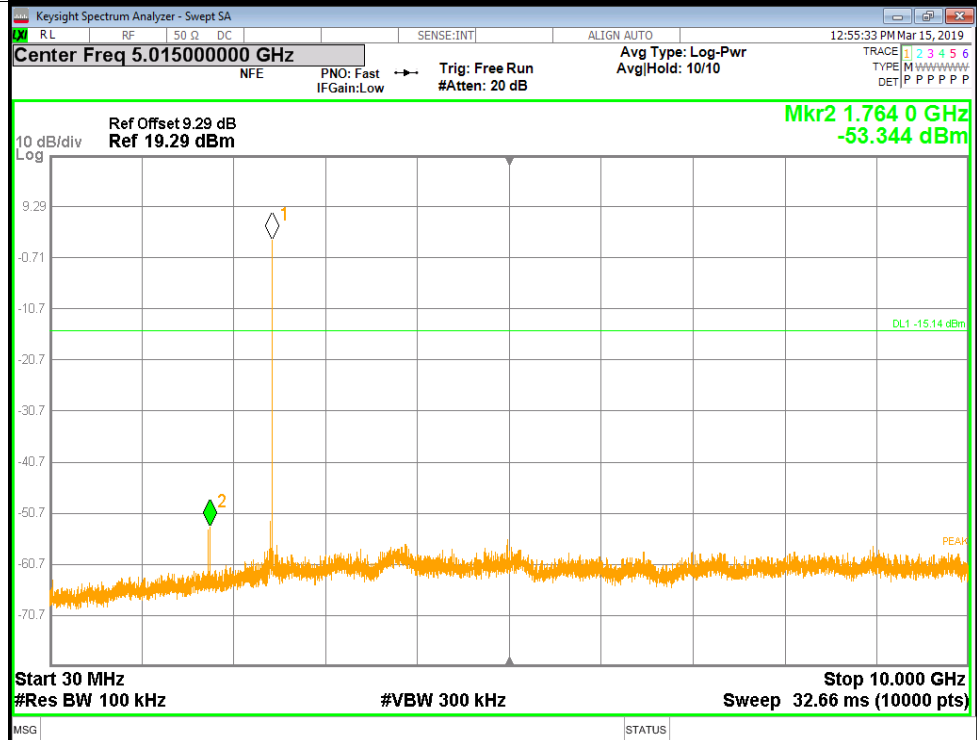
BLE_MCH_Graphs

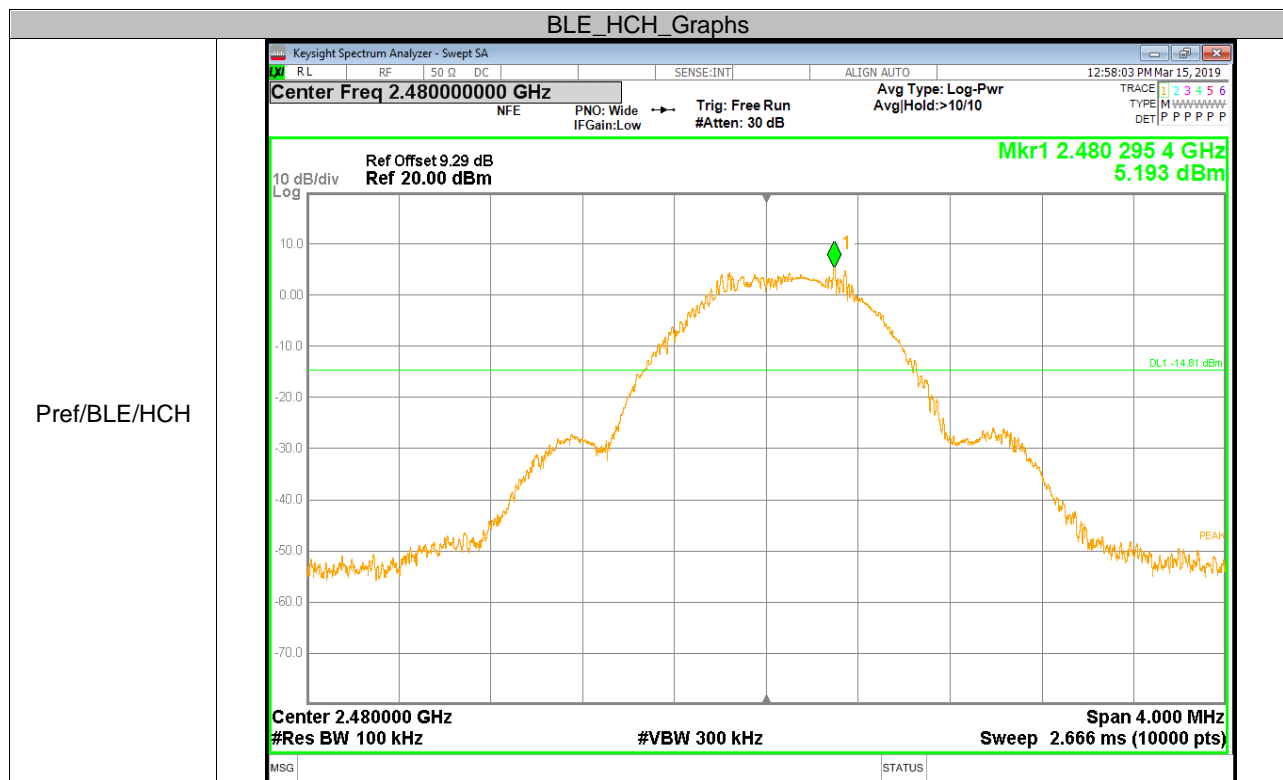
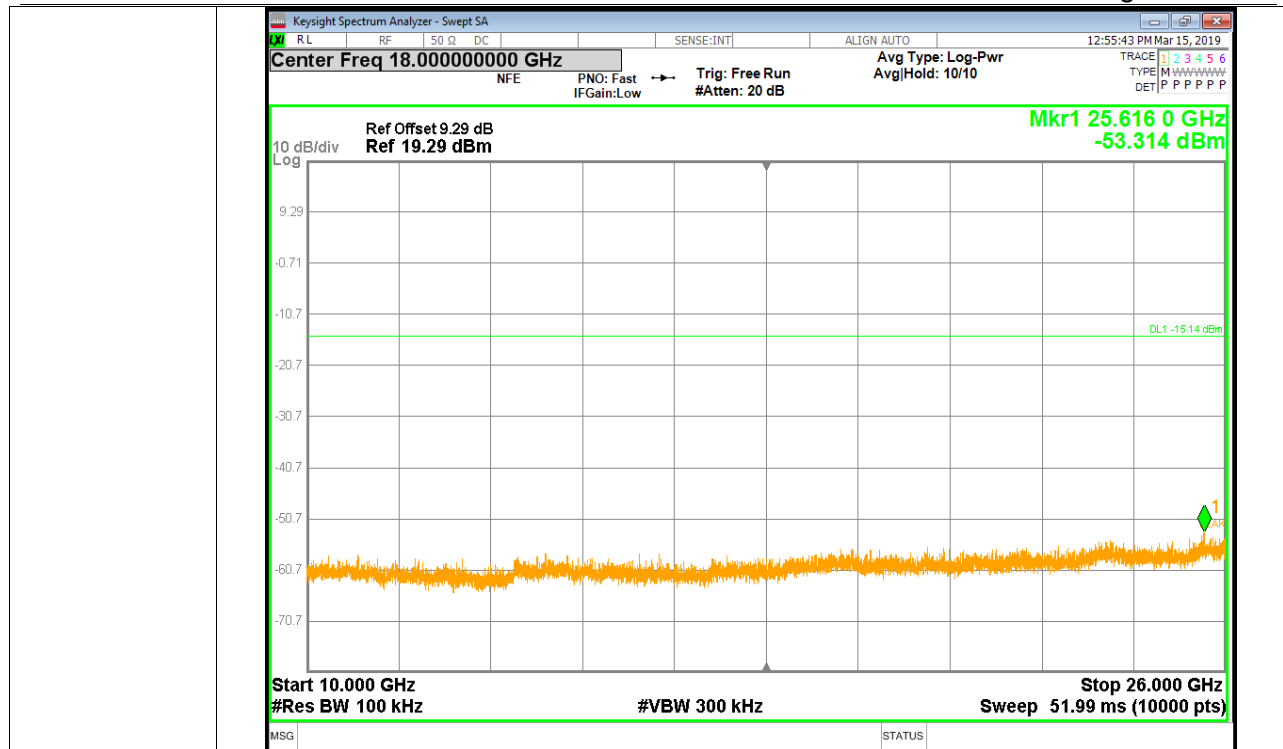


Pref/BLE/MCH



Puw/BLE/MCH

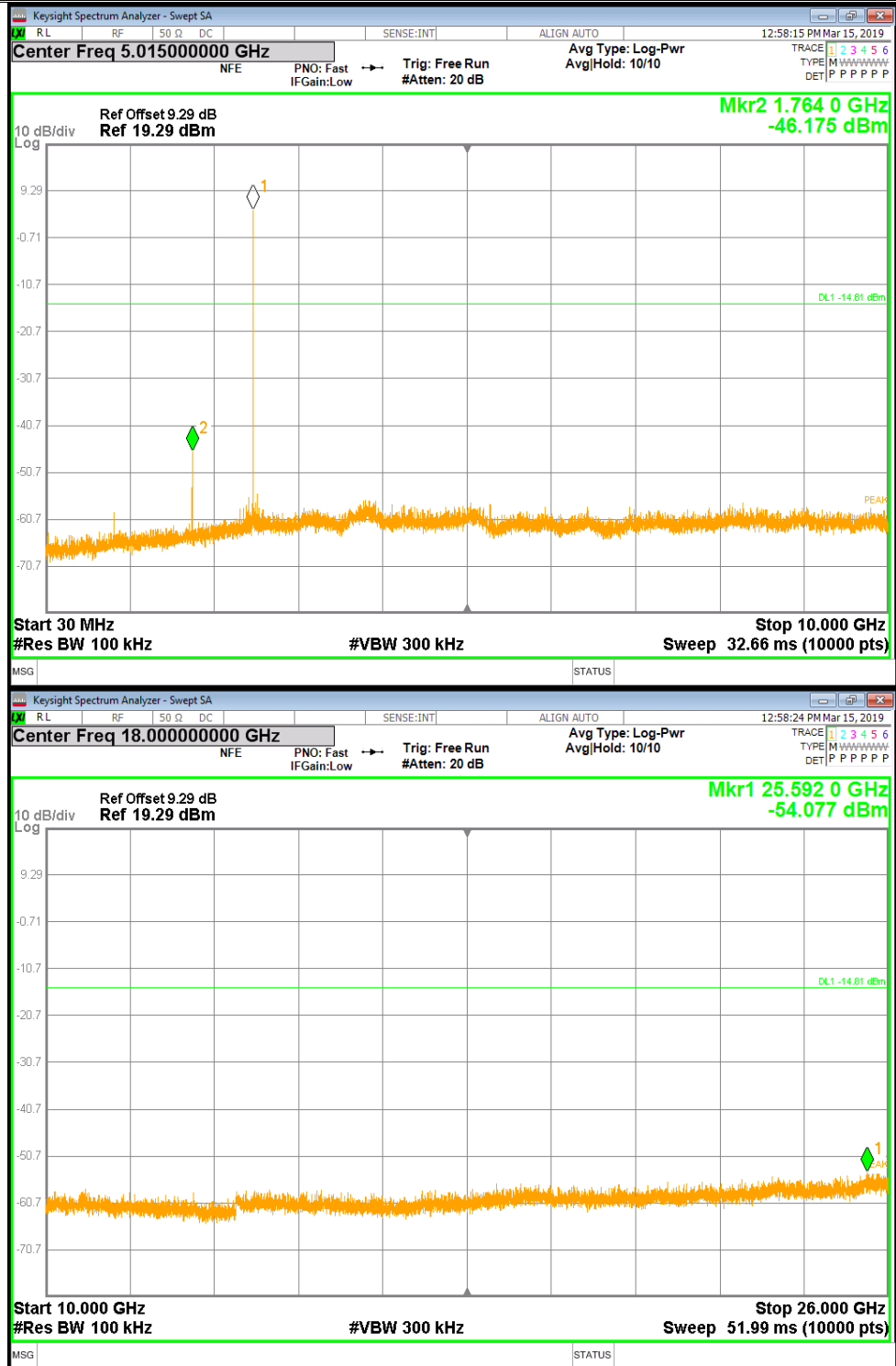




Pref/BLE/HCH



Puw/BLE/HCH



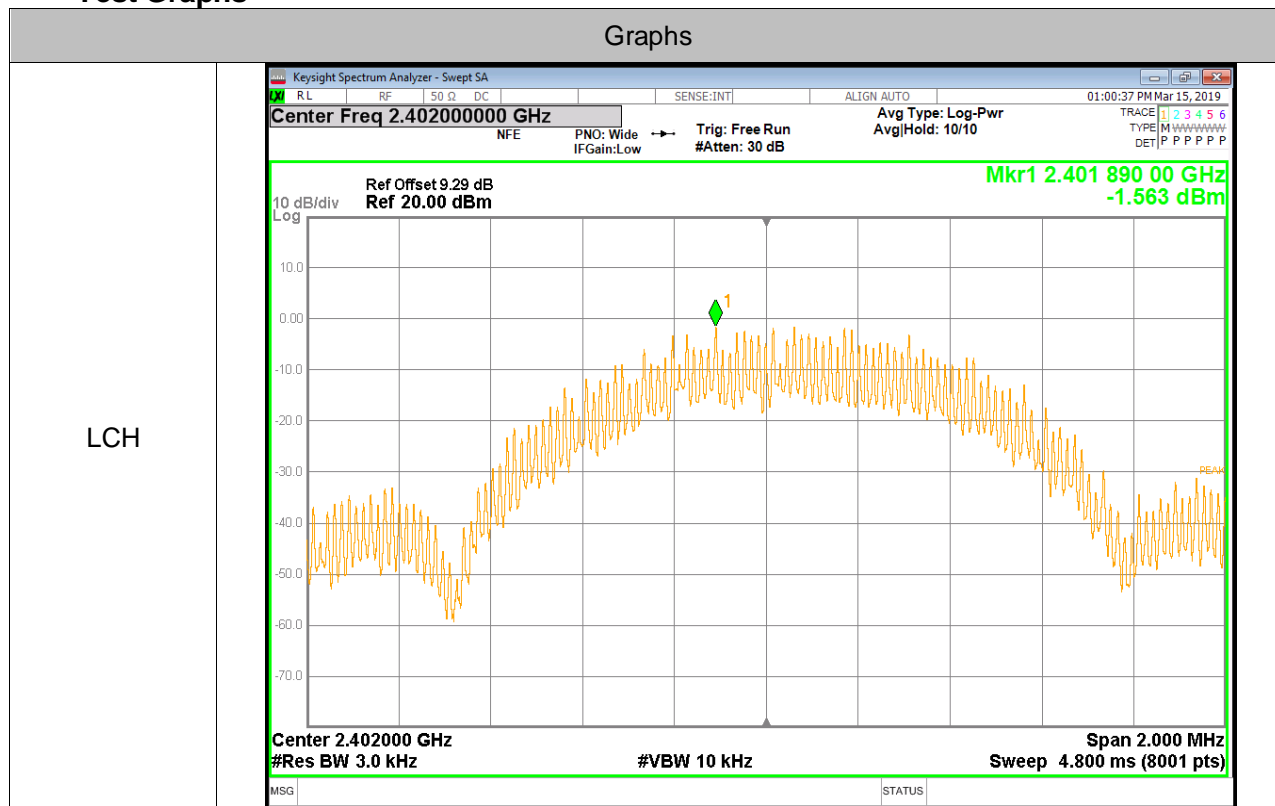


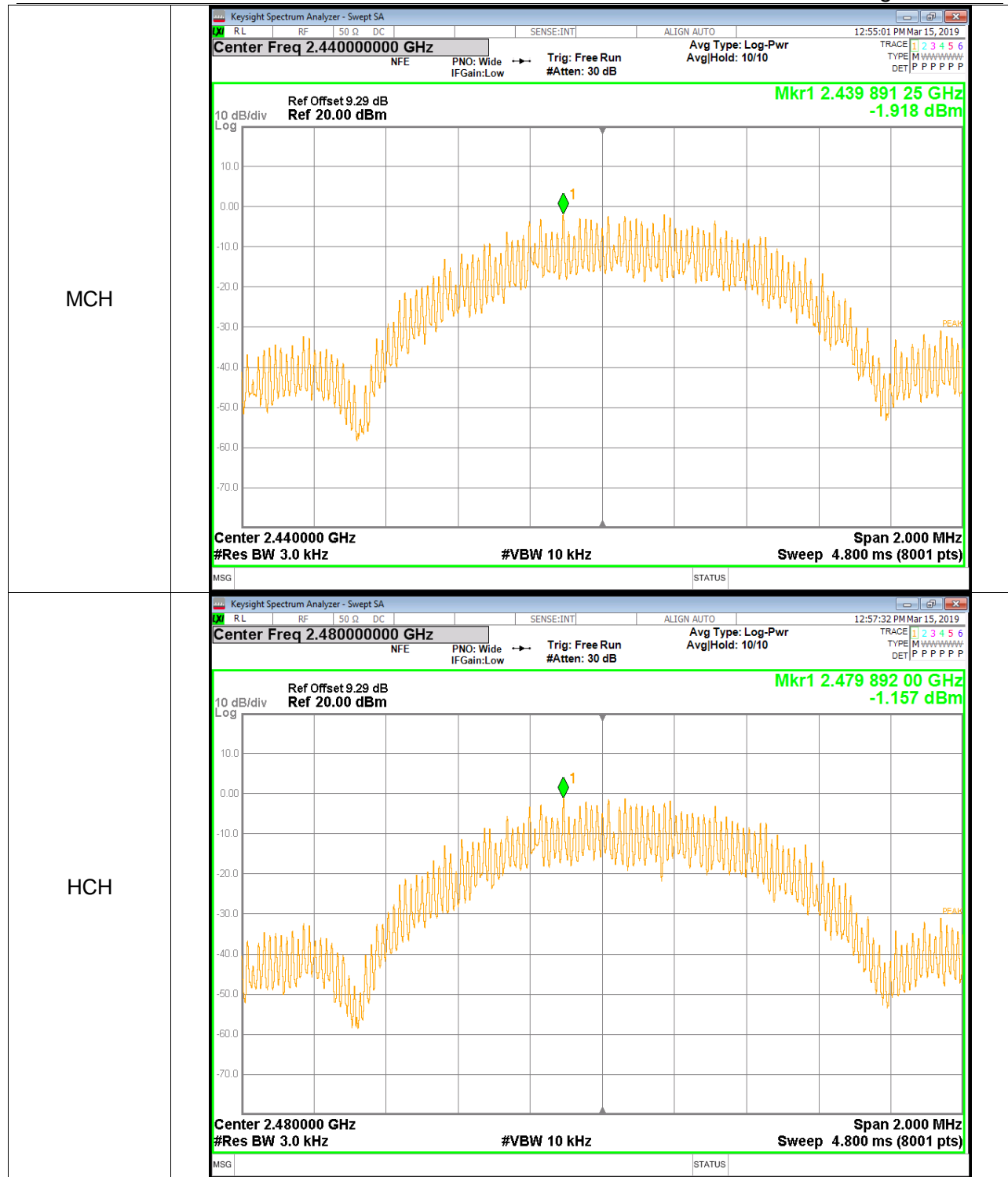
Appendix E): Maximum Power Spectral Density

Result Table

Mode	Channel	PSD [dBm]	Verdict
BLE	LCH	-1.563	PASS
BLE	MCH	-1.918	PASS
BLE	HCH	-1.157	PASS

Test Graphs





END OF REPORT