



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

CERTIFICATION TEST REPORT

For

miscellaneous control device

MODEL NUMBER: 9290022406

**FCC ID: 2AGBW9290022406X
IC: 20812-2406X**

REPORT NUMBER: 4788989144.1-4

ISSUE DATE: May 29, 2019

Prepared for

**Signify (China) Investment Co., Ltd.
Building no.9, Lane 888, Tianlin Road, Minhang District Shanghai China**

Prepared by

**UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch
Building 10, Innovation Technology Park, No. 1, Li Bin Road,
Song Shan Lake Hi-Tech Development Zone, Dongguan, People's Republic of China
Tel: +86 769-22038881
Fax: +86 769 33244054
Website: www.ul.com**



Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V0	5/29/2019	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 (d)	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 6.8	Pass



TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	6
2. TEST METHODOLOGY	7
3. FACILITIES AND ACCREDITATION	7
4. CALIBRATION AND UNCERTAINTY	8
4.1. <i>MEASURING INSTRUMENT CALIBRATION</i>	8
4.2. <i>MEASUREMENT UNCERTAINTY</i>	8
5. EQUIPMENT UNDER TEST	9
5.1. <i>DESCRIPTION OF EUT</i>	9
5.2. <i>MAXIMUM OUTPUT POWER</i>	9
5.3. <i>CHANNEL LIST</i>	9
5.4. <i>TEST CHANNEL CONFIGURATION</i>	10
5.5. <i>THE WORSE CASE POWER SETTING PARAMETER</i>	10
5.6. <i>DESCRIPTION OF AVAILABLE ANTENNAS</i>	10
5.7. <i>TEST ENVIRONMENT</i>	10
5.8. <i>DESCRIPTION OF TEST SETUP</i>	11
5.9. <i>MEASURING INSTRUMENT AND SOFTWARE USED</i>	12
6. MEASUREMENT METHODS	13
7. ANTENNA PORT TEST RESULTS	14
7.1. <i>ON TIME AND DUTY CYCLE</i>	14
7.2. <i>6 dB DTS BANDWIDTH AND 99% BANDWIDTH</i>	16
7.3. <i>PEAK CONDUCTED OUTPUT POWER</i>	18
7.4. <i>POWER SPECTRAL DENSITY</i>	19
7.5. <i>CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS</i>	21
8. RADIATED TEST RESULTS	23
8.1. <i>RESTRICTED BANDEDGE</i>	28
8.2. <i>SPURIOUS EMISSIONS (1~3GHz)</i>	32
8.3. <i>SPURIOUS EMISSIONS (3~18GHz)</i>	38
8.4. <i>SPURIOUS EMISSIONS 18G ~ 26GHz</i>	44
8.5. <i>SPURIOUS EMISSIONS 30M ~ 1 GHz</i>	46
8.6. <i>SPURIOUS EMISSIONS BELOW 30M</i>	48
9. AC POWER LINE CONDUCTED EMISSIONS	51



10. ANTENNA REQUIREMENTS.....	54
11. APPENDIXES.....	55
Appendix A): 6dB Bandwidth	55
Appendix B): Occupied Bandwidth	57
Appendix C): Maximum Conducted Output Power	59
Appendix D): Band-edge for RF Conducted Emissions.....	60
Appendix E): RF Conducted Spurious Emissions	62
Appendix F): Maximum Power Spectral Density	68



1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: Signify (China) Investment Co., Ltd.
Address: Building no.9, Lane 888, Tianlin Road, Minhang District Shanghai
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: miscellaneous control device
Model: 9290022406
Sample Status: Normal
Brand: /
Sample Received Date: April 28, 2019
Date of Tested: April 28~ May 28, 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

Tested By:

Checked By:

Kebo Zhang
Engineer Project Associate

Shawn Wen
Laboratory Leader

Approved By:

Stephen Guo
Laboratory Manager



2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB 558074 D01 15.247 Meas Guidance v05r02, 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. 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>
---------------------------	---

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	miscellaneous control device		
Model	9290022406		
Product Description	Operation Frequency	2405 MHz ~ 2480 MHz	
	Modulation Type	Data Rate	
	O-QPSK	250kbps	
Power supply	AC 120V,60Hz		

5.2. MAXIMUM OUTPUT POWER

Mode	Frequency (MHz)	Channel Number	Max Output Power (dBm)	EIRP (dBm)
ZigBee	2405-2480	11-26 [16]	9.594	11.194

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	LCH, MCH, HCH	2405MHz, 2445MHz, 2480MHz

5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worst 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	13	13	13

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2405-2480	Internal Antenna	1.6

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	50 ~ 70%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	22 ~ 28°C
Voltage :	VL	N/A
	VN	AC 120V,60Hz
	VH	N/A

Note: VL= Lower Extreme Test Voltage
VN= Nominal Voltage
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	/	/	/

I/O CABLES

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

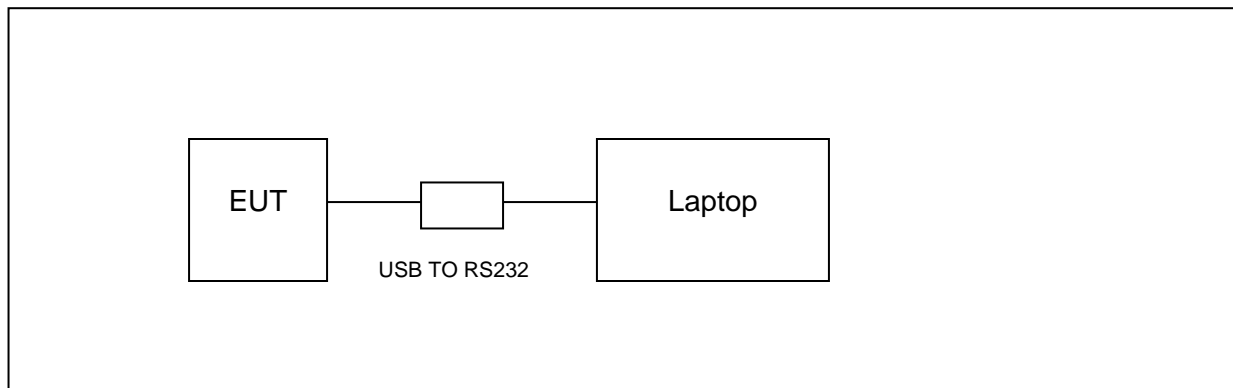
ACCESSORY

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





5.9. 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	Jan.07, 2019	Jan.07, 2022
<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 v05r02	8.2
2	Peak Output Power	KDB 558074 D01 15.247 Meas Guidance v05r02	8.3.1.3
3	Power Spectral Density	KDB 558074 D01 15.247 Meas Guidance v05r02	8.4
4	Out-of-band emissions in non-restricted bands	KDB 558074 D01 15.247 Meas Guidance v05r02	8.5
5	Out-of-band emissions in restricted bands	KDB 558074 D01 15.247 Meas Guidance v05r02	8.6
6	Band-edge	KDB 558074 D01 15.247 Meas Guidance v05r02	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

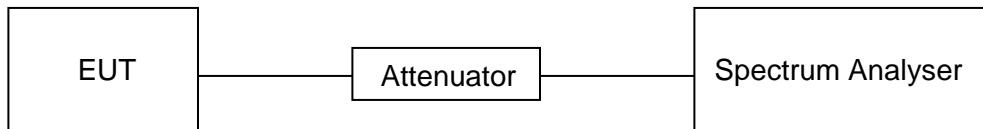
LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



TEST ENVIRONMENT

Temperature	23.2°C	Relative Humidity	62%
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)
ZigBee	2.84	21.18	0.134	13.4	8.73	0.352	0.500

Note:

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

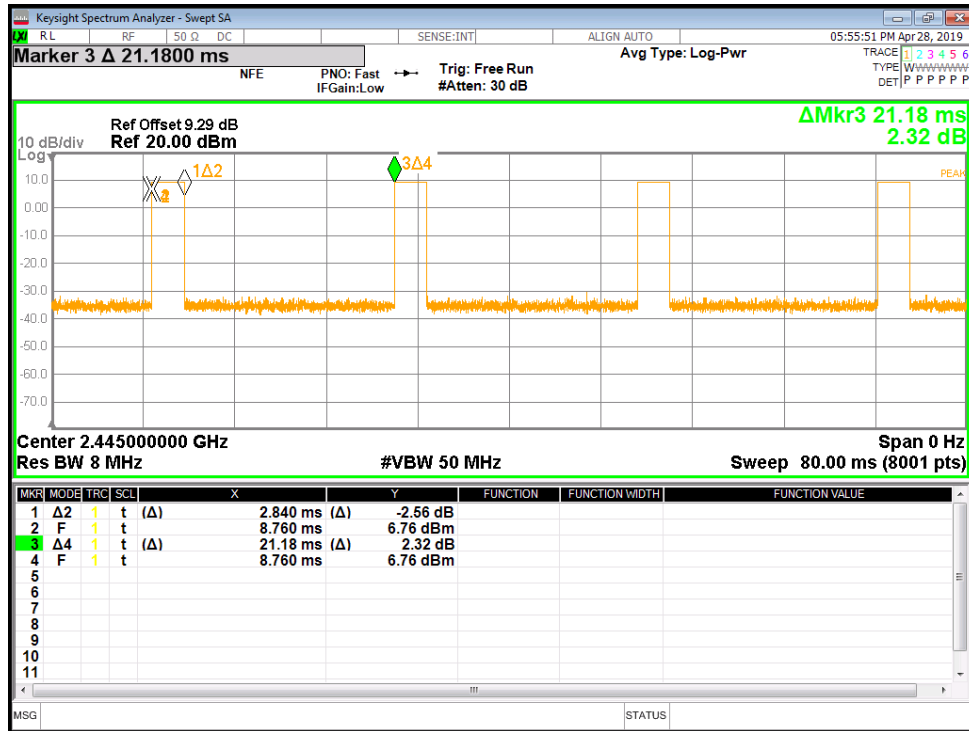
Where: x is Duty Cycle(Linear)

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

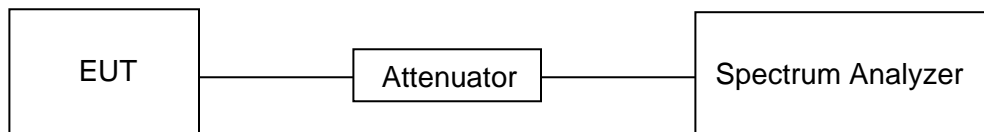
TEST PROCEDURE

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	62%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V,60HZ

RESULTS

Please refer to appendix A and B.



7.3. PEAK CONDUCTED OUTPUT POWER

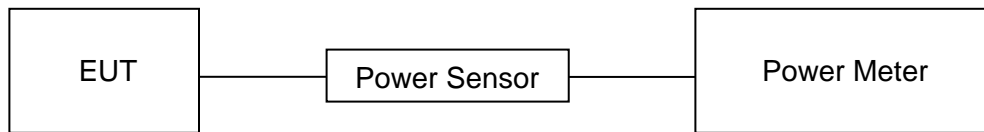
LIMITS

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 (d)	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	62%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V,60HZ

RESULTS

Please refer to appendix C.



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

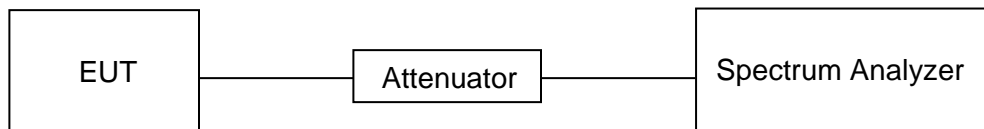
Connect the UUT to the spectrum analyser and use the following settings:

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





Temperature	23.2°C	Relative Humidity	62%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V,60HZ

RESULTS

Please refer to appendix F.

7.5. CONDUCTED BANDEGE 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:

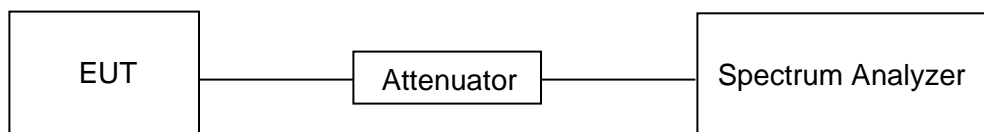
Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	100kHz
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

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	62%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V,60HZ

RESULTS

Please refer to appendix D and E.



8. RADIATED TEST RESULTS

LIMITS

Please refer to FCC §15.205 and §15.209

Please refer to ISED 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.

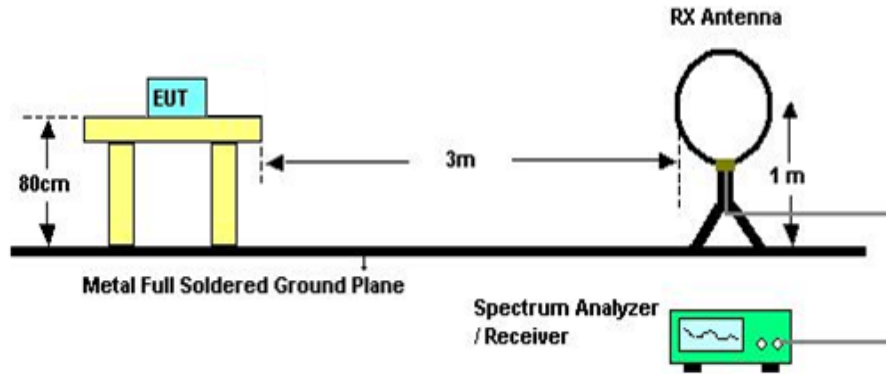
Note: The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites.
Radiation Disturbance Test Limit for FCC (Above 1G)

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

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

TEST SETUP AND PROCEDURE

Below 30MHz

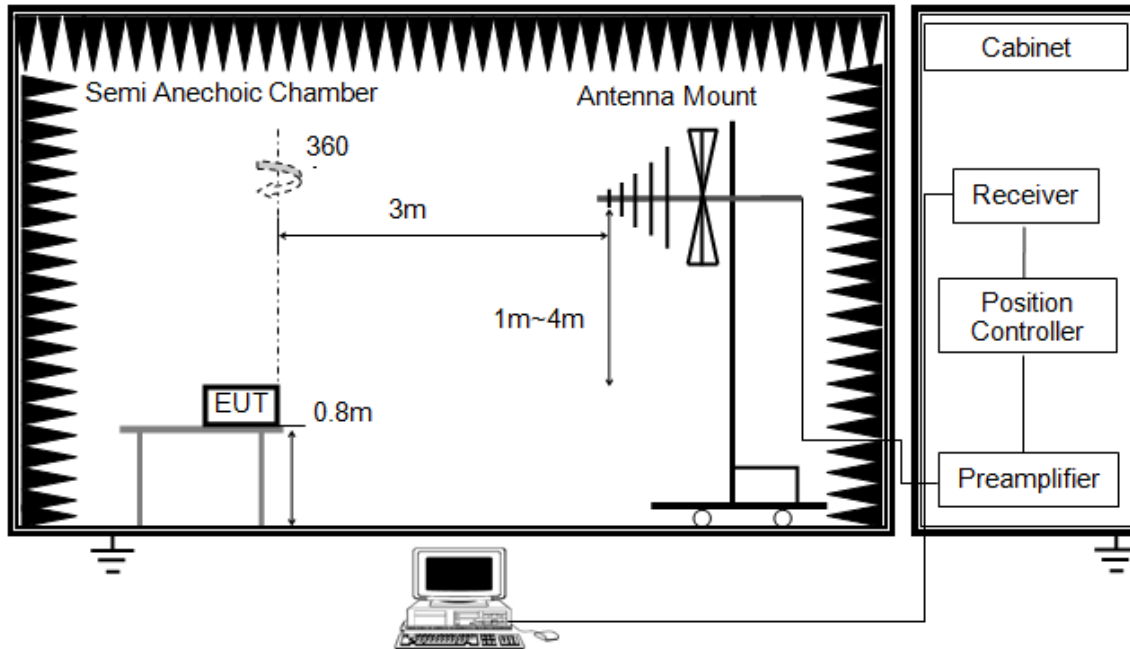


The setting of the spectrum analyser

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 area test site, adequate comparison measurements were confirmed against 30m open are test 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 based on KDB 414788.

Below 1G and above 30MHz

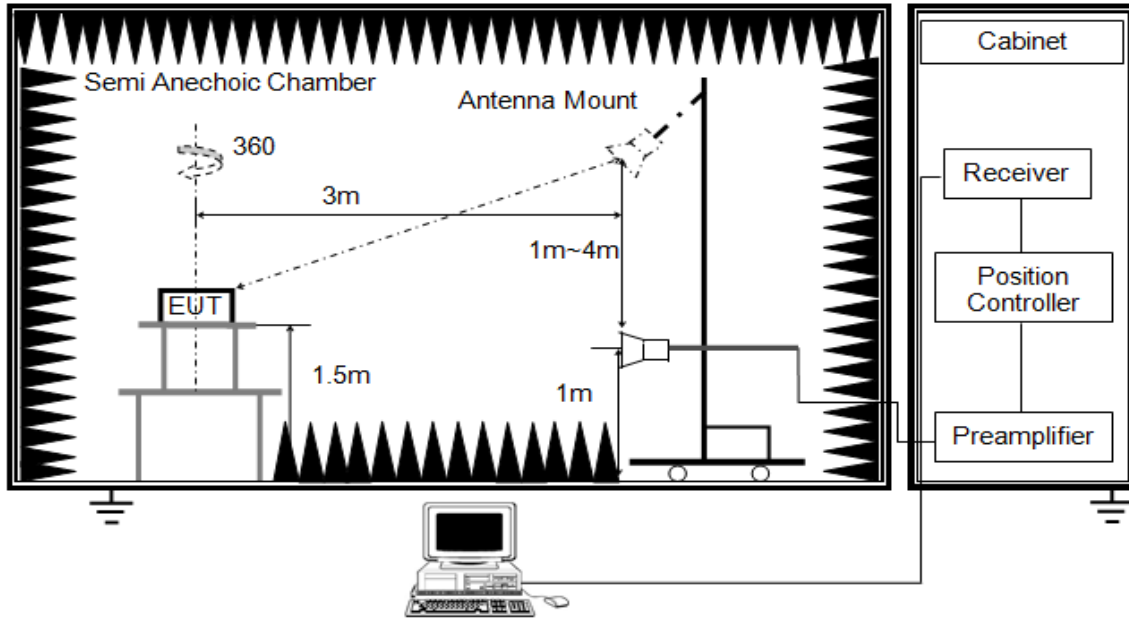


The setting of the spectrum analyser

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

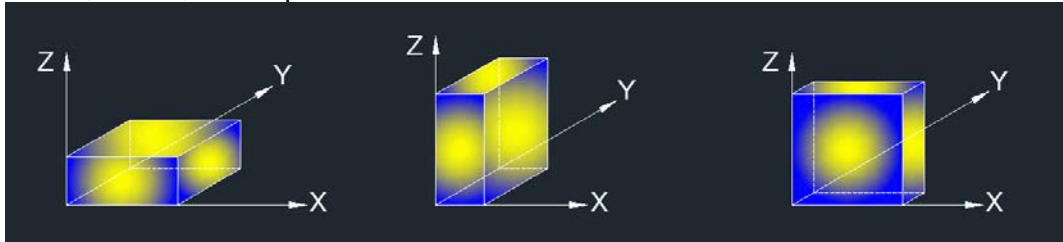


The setting of the spectrum analyser

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

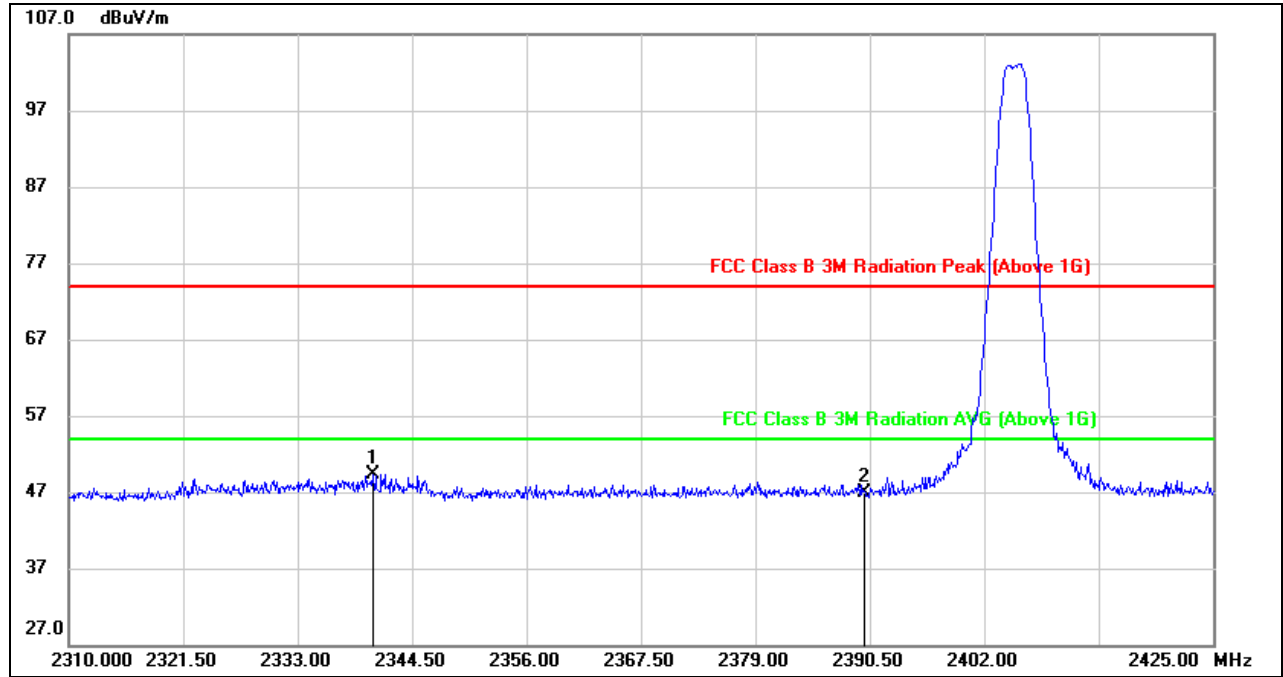
Temperature	23.5C	Relative Humidity	54%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V,60HZ

RESULTS



8.1. RESTRICTED BANDEDGE

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

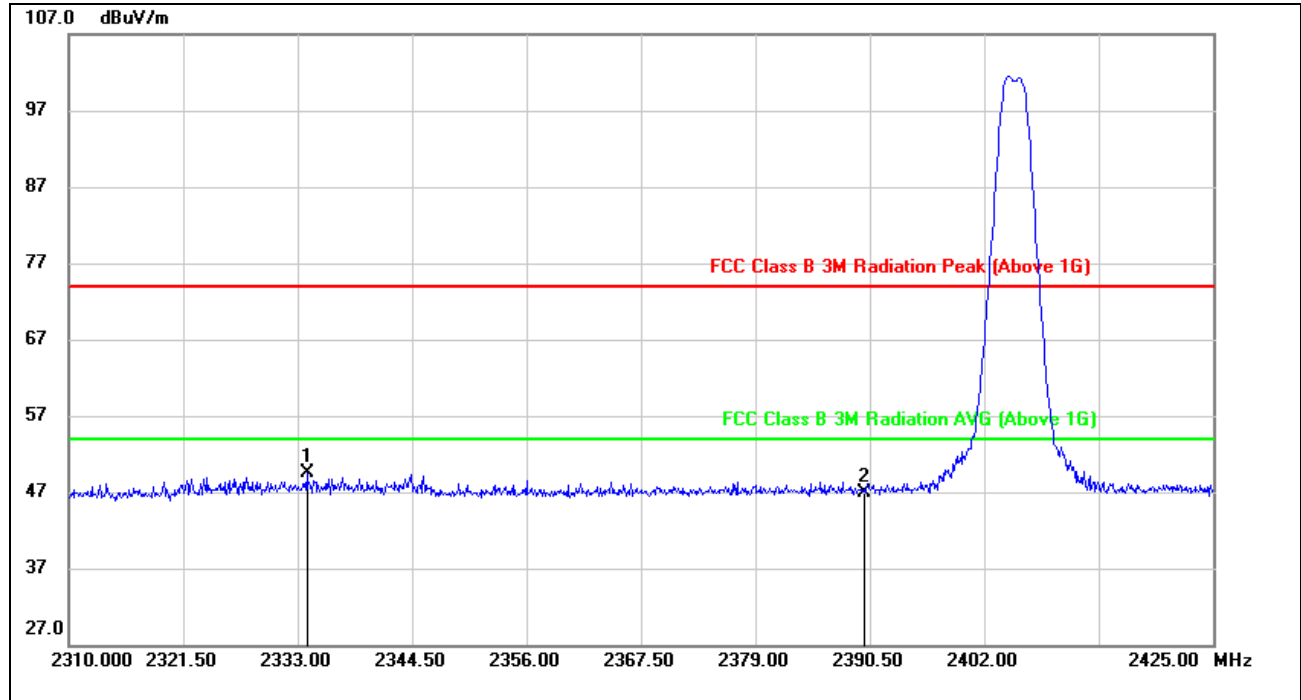


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2340.590	16.61	32.77	49.38	74.00	-24.62	peak
2	2390.000	14.03	32.94	46.97	74.00	-27.03	peak

- 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)

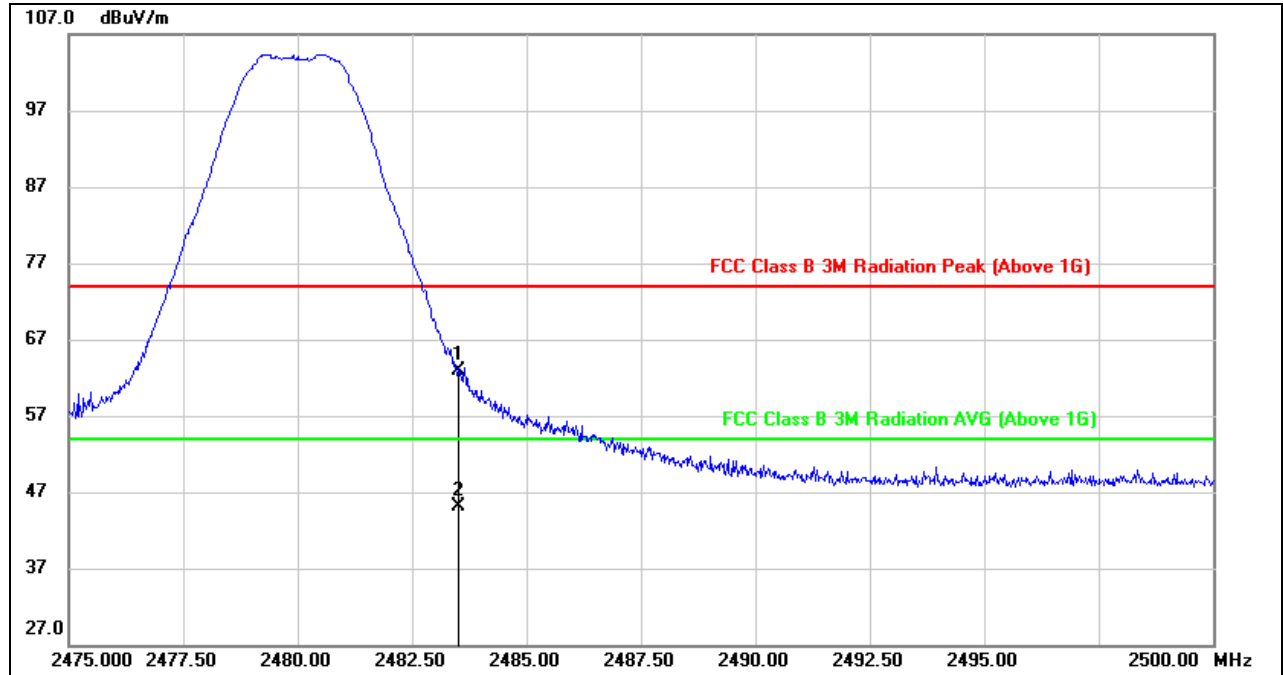


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2333.920	16.67	32.75	49.42	74.00	-24.58	peak
2	2390.000	13.96	32.94	46.90	74.00	-27.10	peak

- 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)

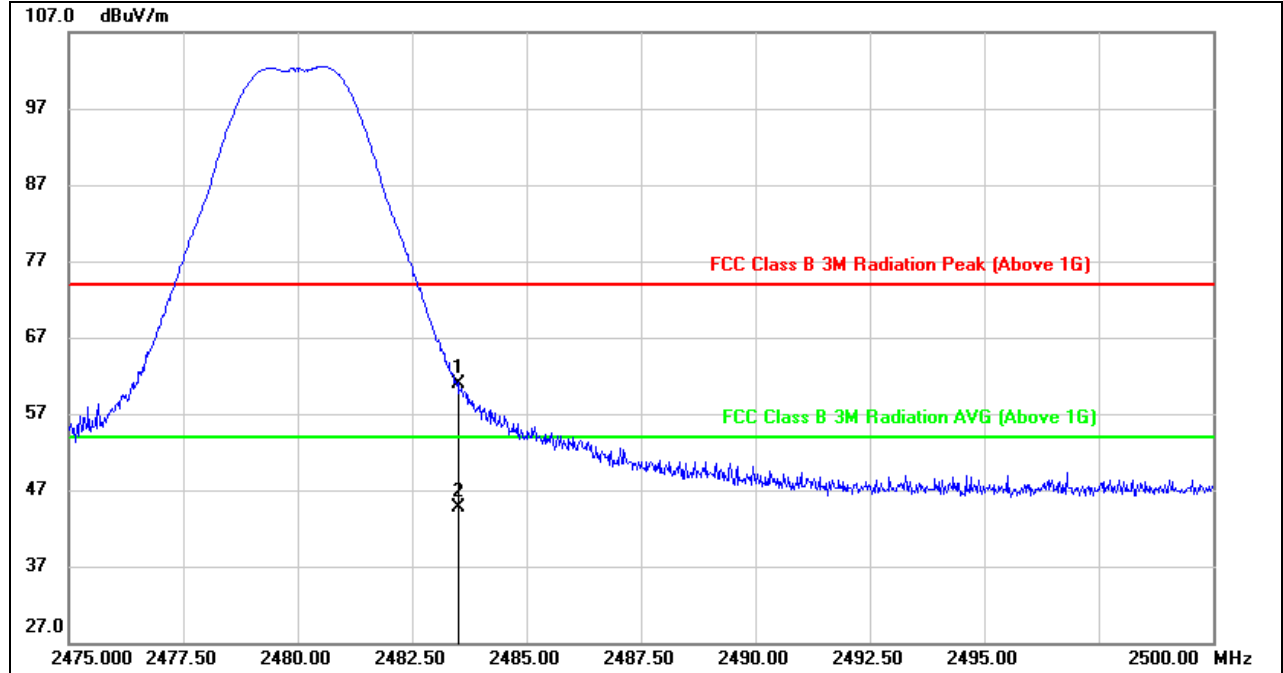


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	29.26	33.58	62.84	74.00	-11.16	peak
2	2483.500	11.56	33.58	45.14	54.00	-8.86	AVG

- 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 duty cycle, please refer to clause 7.1.
 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, VERTICAL)



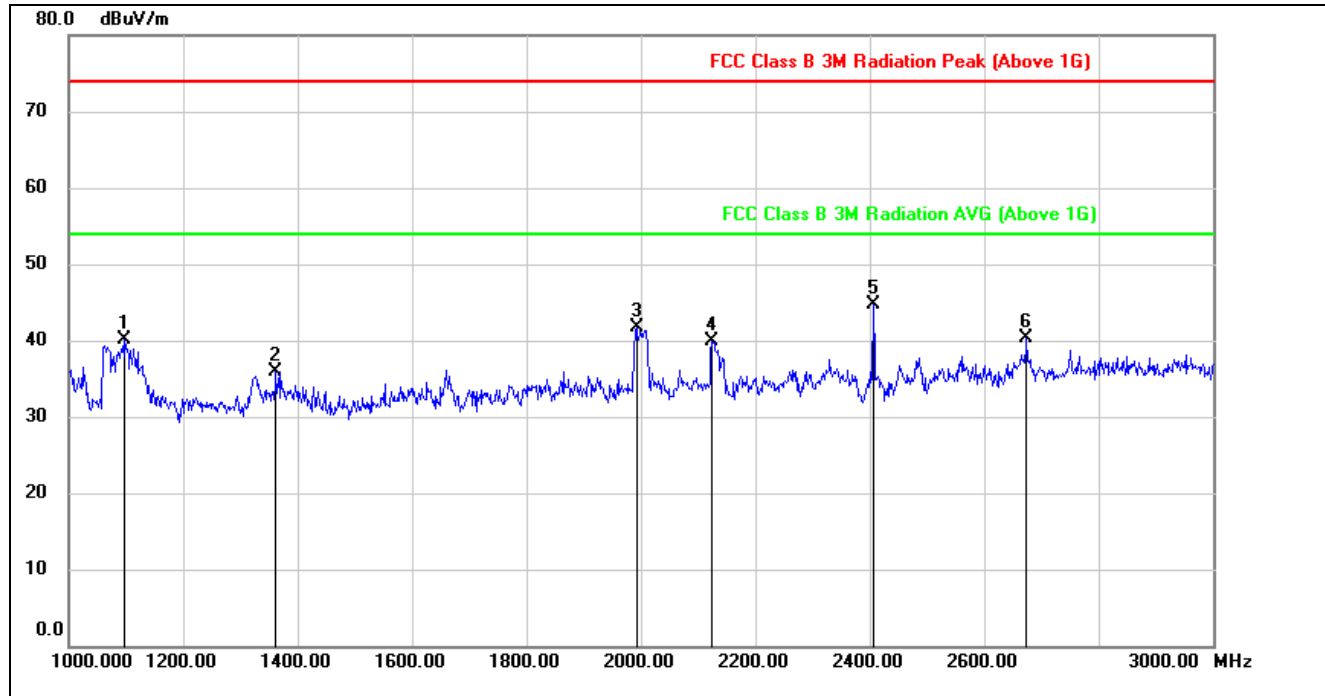
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	27.42	33.58	61.00	74.00	-13.00	peak
2	2483.500	11.13	33.58	44.71	54.00	-9.29	AVG

- 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 duty cycle, please refer to clause 7.1.
 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 (1~3GHz)

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)

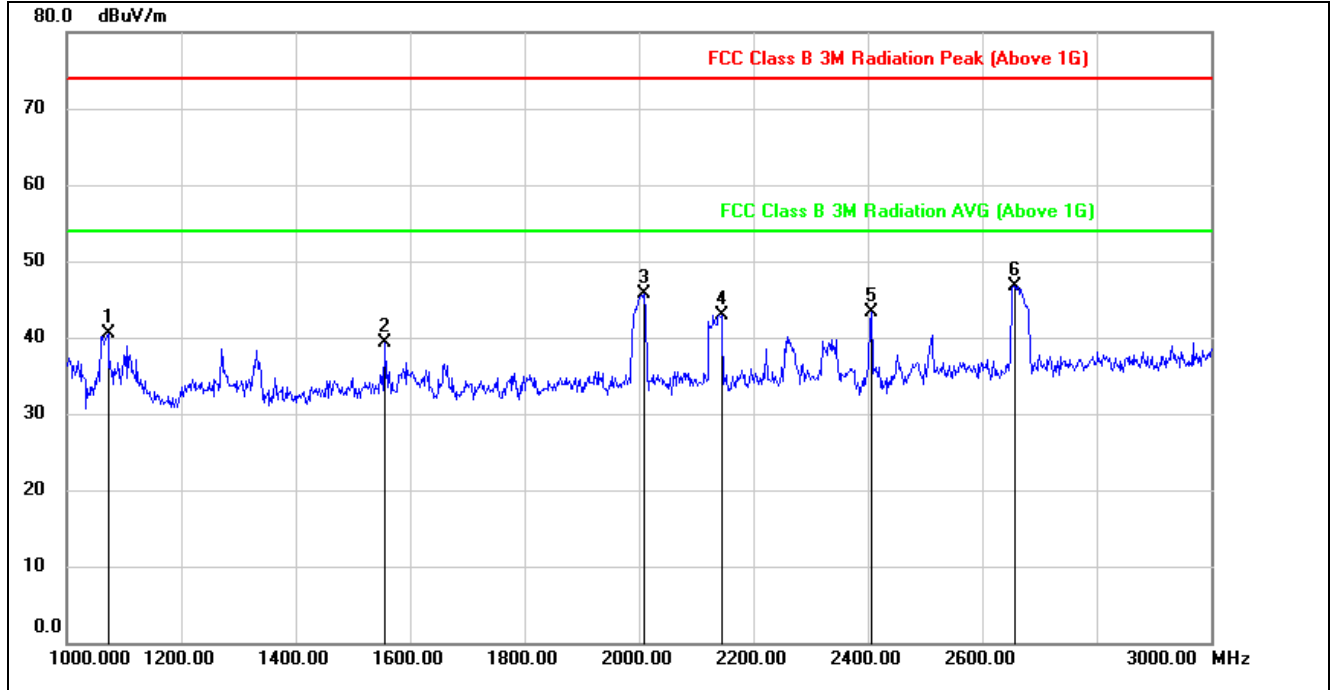


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1096.000	53.30	-13.15	40.15	74.00	-33.85	peak
2	1362.000	47.72	-11.89	35.83	74.00	-38.17	peak
3	1992.000	51.08	-9.42	41.66	74.00	-32.34	peak
4	2124.000	48.38	-8.47	39.91	74.00	-34.09	peak
5	2406.000	51.63	-6.95	44.68	74.00	-29.32	peak
6	2674.000	46.42	-6.13	40.29	74.00	-33.71	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. 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)

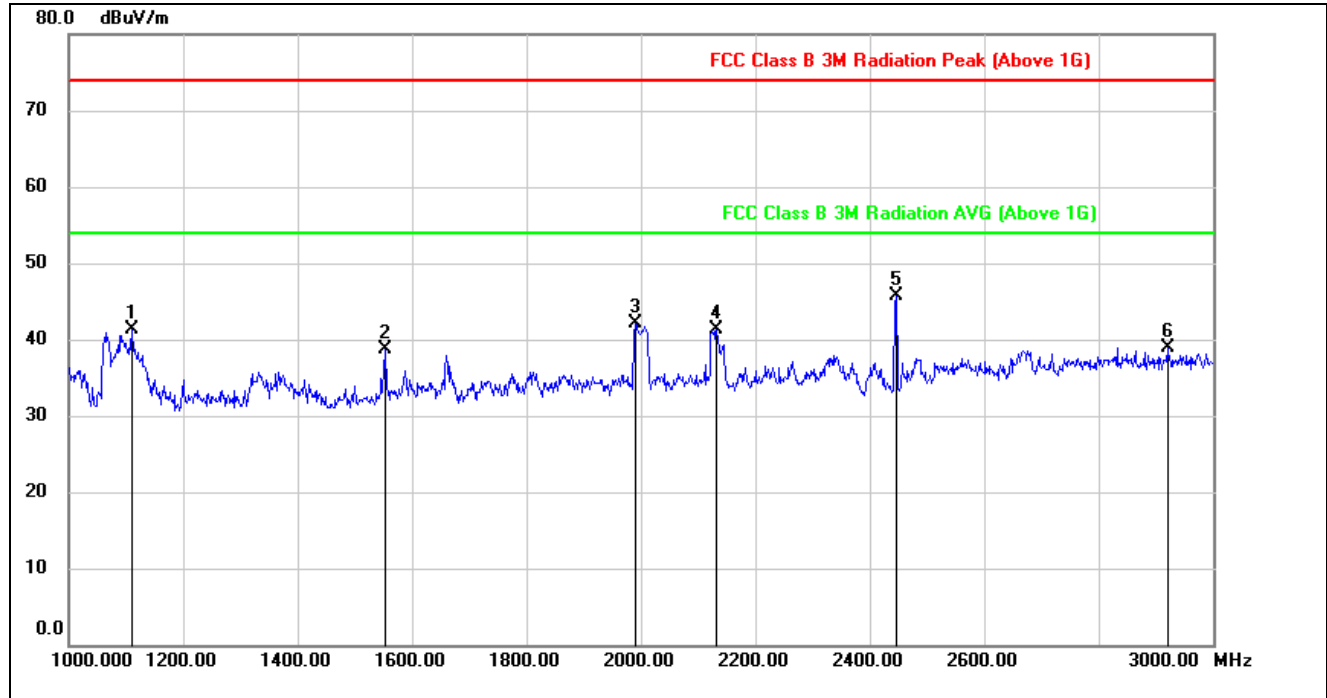


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1072.000	53.61	-13.20	40.41	74.00	-33.59	peak
2	1556.000	50.49	-11.25	39.24	74.00	-34.76	peak
3	2008.000	55.03	-9.36	45.67	74.00	-28.33	peak
4	2144.000	51.35	-8.36	42.99	74.00	-31.01	peak
5	2406.000	50.22	-6.95	43.27	74.00	-30.73	peak
6	2656.000	52.99	-6.24	46.75	74.00	-27.25	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. 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)

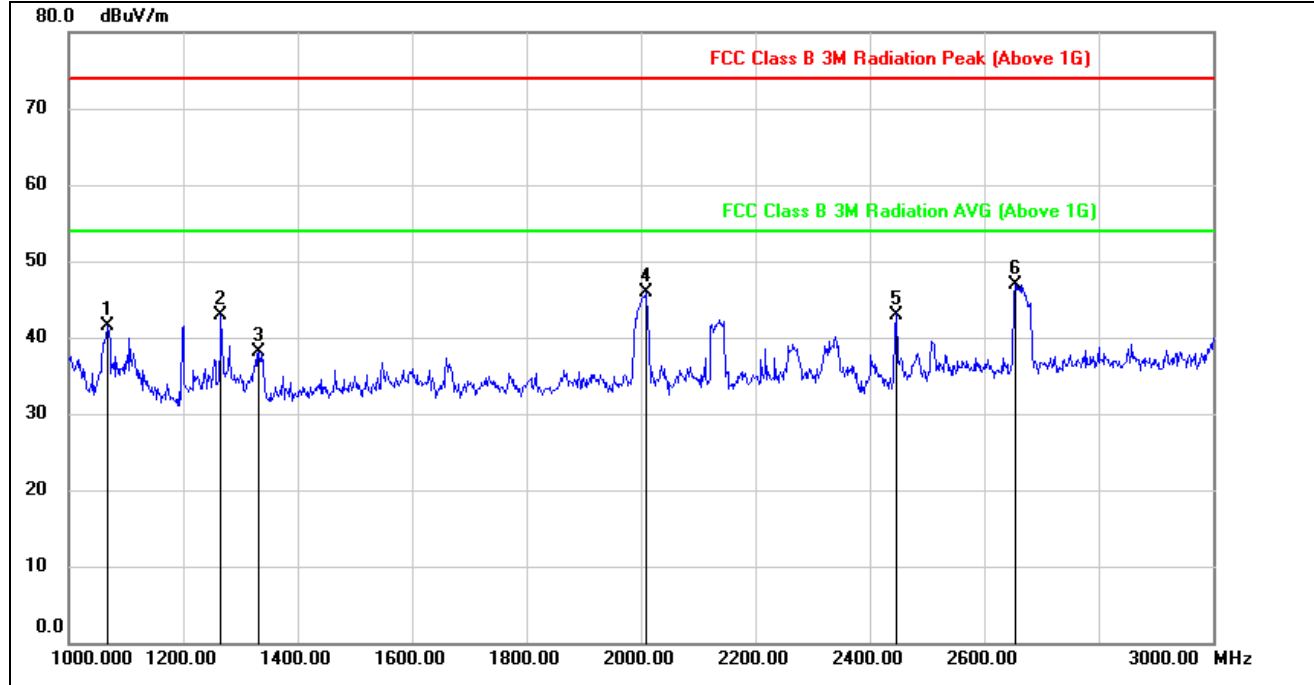


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1110.000	54.29	-13.04	41.25	74.00	-32.75	peak
2	1554.000	50.03	-11.26	38.77	74.00	-35.23	peak
3	1990.000	51.61	-9.42	42.19	74.00	-31.81	peak
4	2132.000	49.70	-8.42	41.28	74.00	-32.72	peak
5	2446.000	52.38	-6.62	45.76	74.00	-28.24	peak
6	2920.000	43.66	-4.66	39.00	74.00	-35.00	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. 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)

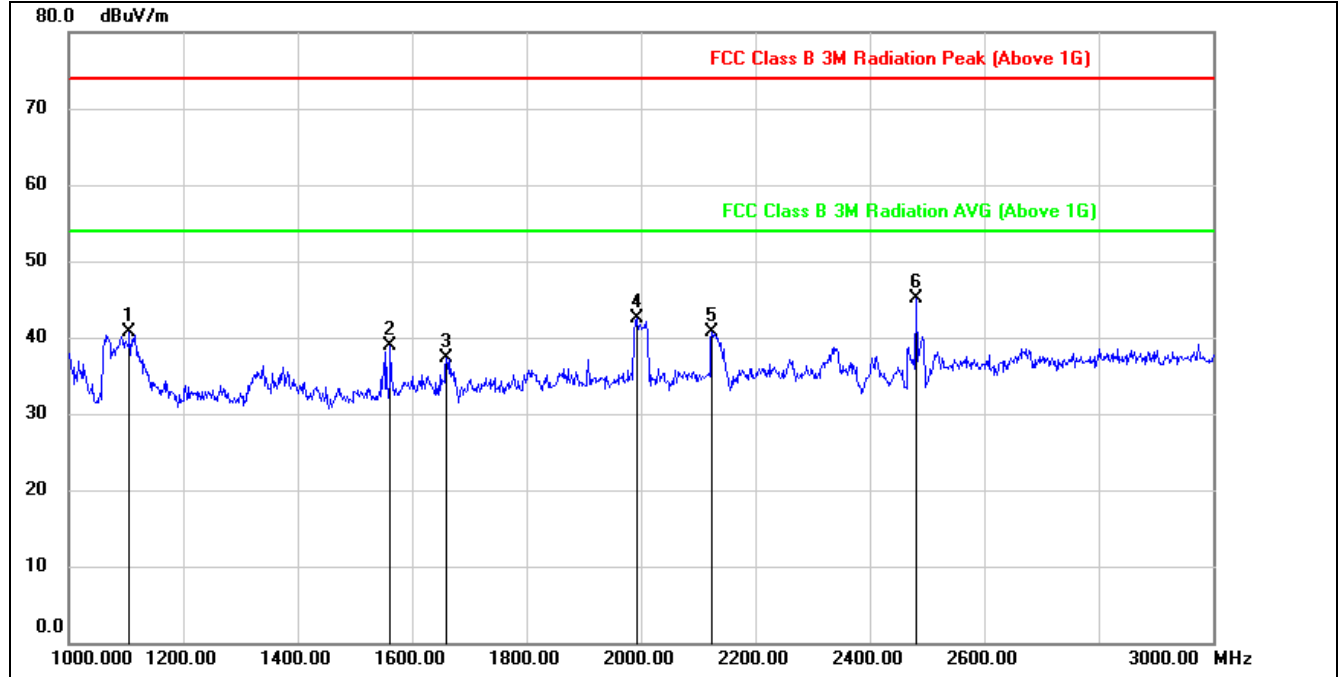


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1068.000	54.73	-13.21	41.52	74.00	-32.48	peak
2	1266.000	54.82	-11.97	42.85	74.00	-31.15	peak
3	1332.000	50.02	-11.86	38.16	74.00	-35.84	peak
4	2008.000	55.33	-9.36	45.97	74.00	-28.03	peak
5	2446.000	49.62	-6.62	43.00	74.00	-31.00	peak
6	2654.000	53.20	-6.26	46.94	74.00	-27.06	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. 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)

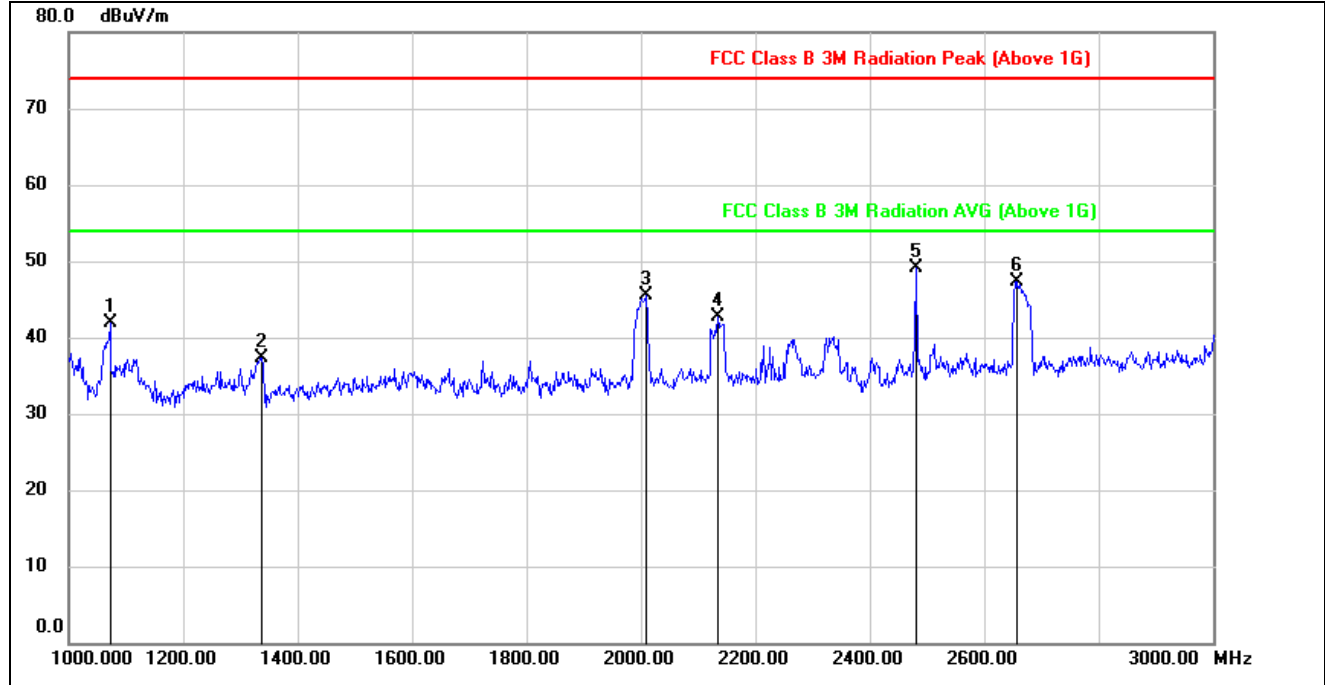


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1106.000	53.80	-13.08	40.72	74.00	-33.28	peak
2	1562.000	50.16	-11.18	38.98	74.00	-35.02	peak
3	1660.000	47.98	-10.69	37.29	74.00	-36.71	peak
4	1992.000	51.86	-9.42	42.44	74.00	-31.56	peak
5	2124.000	49.20	-8.47	40.73	74.00	-33.27	peak
6	2480.000	51.36	-6.34	45.02	74.00	-28.98	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. 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)



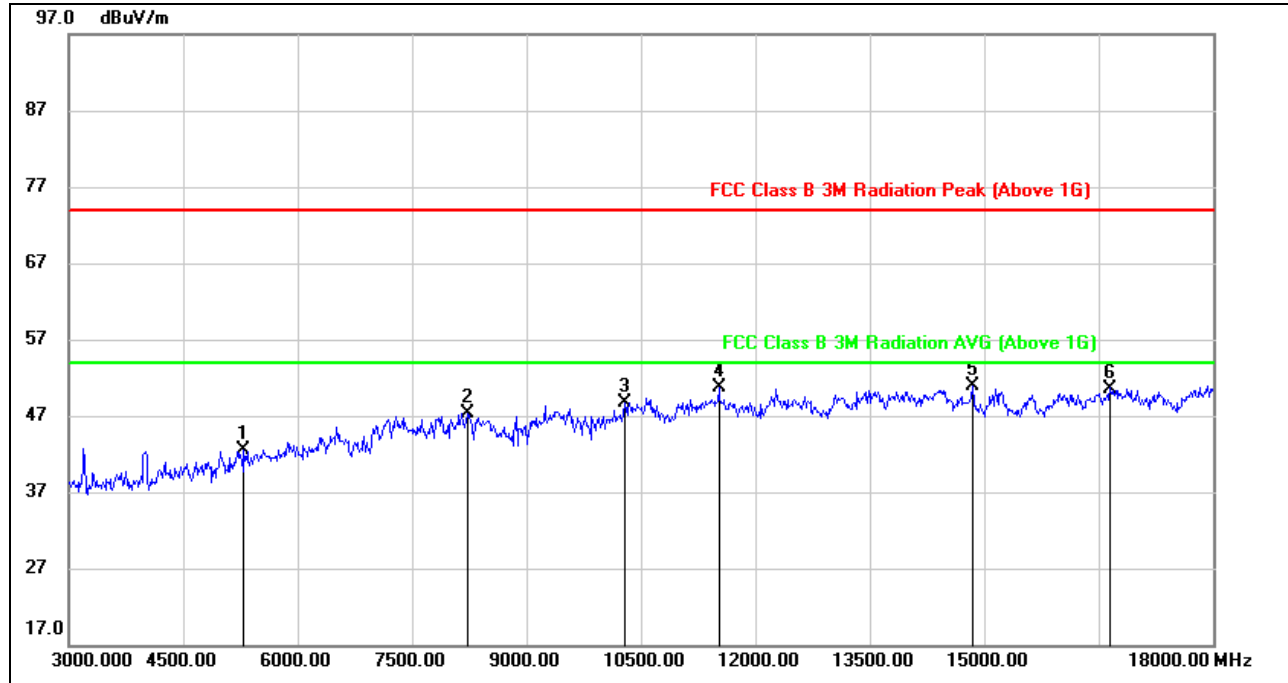
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1072.000	55.03	-13.20	41.83	74.00	-32.17	peak
2	1338.000	49.24	-11.87	37.37	74.00	-36.63	peak
3	2008.000	54.95	-9.36	45.59	74.00	-28.41	peak
4	2134.000	51.11	-8.42	42.69	74.00	-31.31	peak
5	2482.000	55.41	-6.32	49.09	74.00	-24.91	peak
6	2658.000	53.56	-6.23	47.33	74.00	-26.67	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. 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.



8.3. SPURIOUS EMISSIONS (3~18GHz)

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)

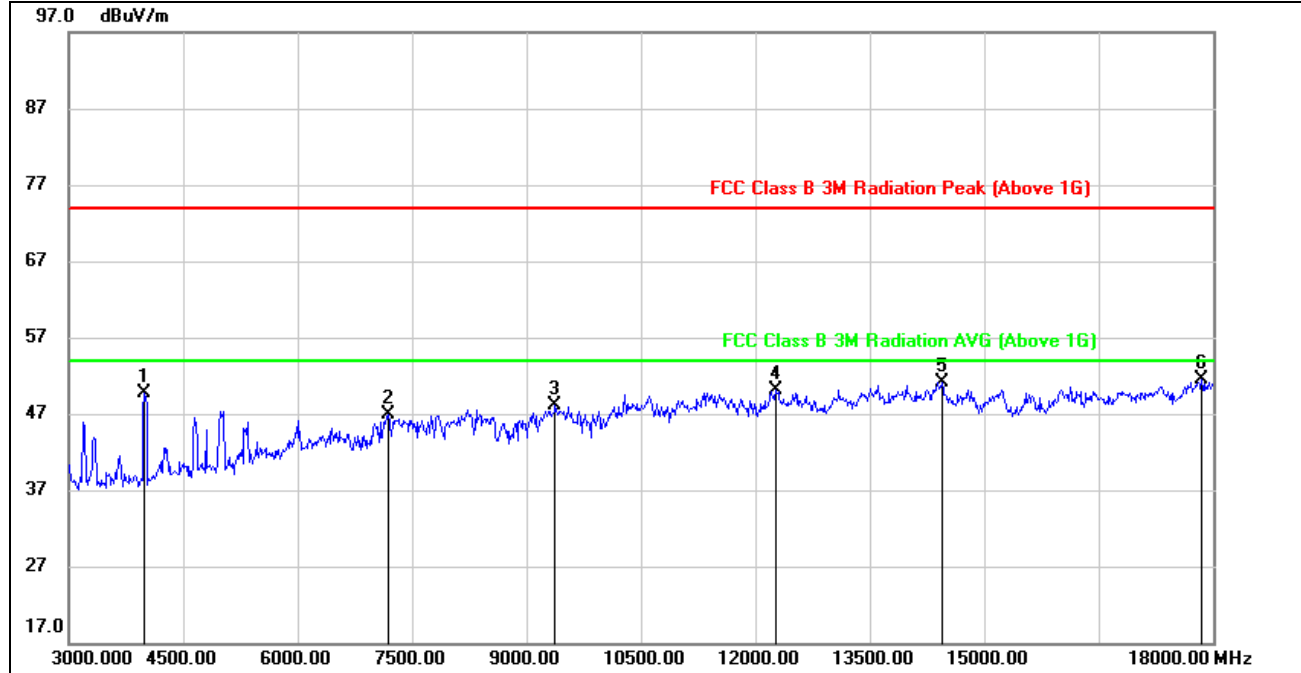


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5295.000	40.85	1.60	42.45	74.00	-31.55	peak
2	8220.000	37.92	9.40	47.32	74.00	-26.68	peak
3	10290.000	37.25	11.51	48.76	74.00	-25.24	peak
4	11520.000	36.52	14.10	50.62	74.00	-23.38	peak
5	14850.000	35.33	15.59	50.92	74.00	-23.08	peak
6	16650.000	31.00	19.60	50.60	74.00	-23.40	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. AVG: $VBW=1/Ton$ where: ton is transmit duration.
 4. For duty cycle, please refer to clause 7.1.
 5. The High Pass filter loss factor already add into the correct factor.
 6. Proper operation of the transmitter prior to adding the filter to the measurement chain.



HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)

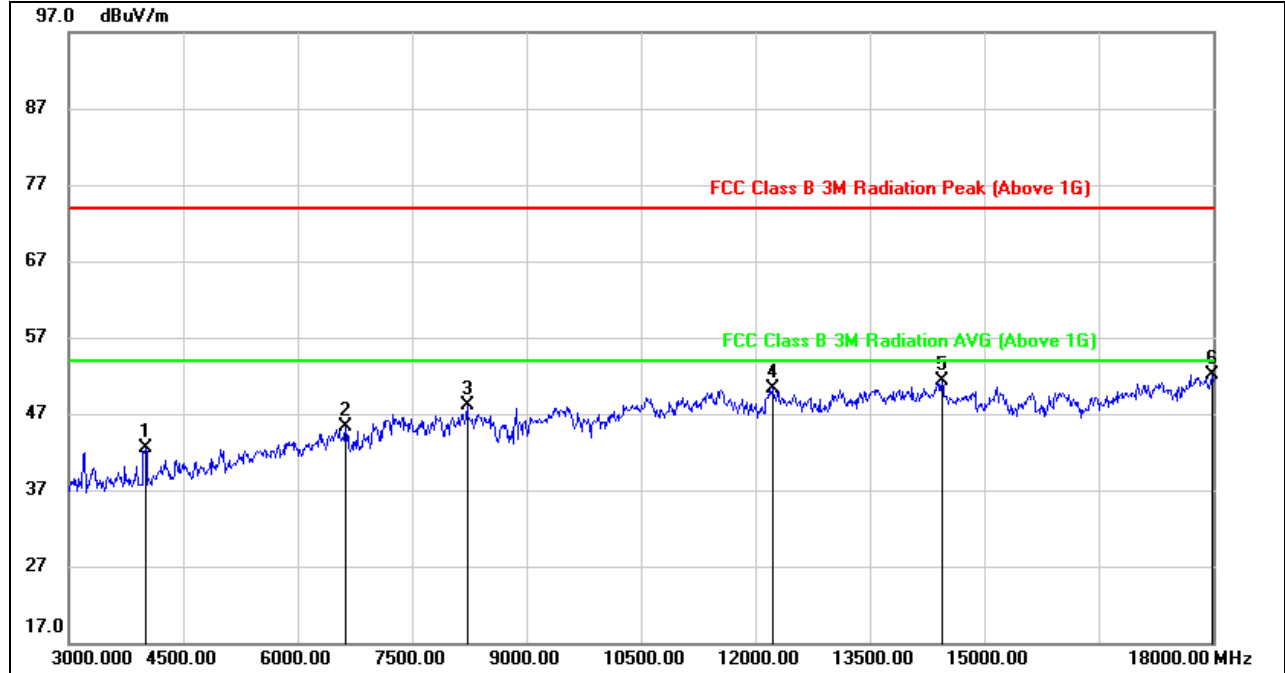


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3990.000	52.67	-2.95	49.72	74.00	-24.28	peak
2	7185.000	39.93	6.88	46.81	74.00	-27.19	peak
3	9375.000	37.90	10.14	48.04	74.00	-25.96	peak
4	12270.000	35.69	14.34	50.03	74.00	-23.97	peak
5	14445.000	34.83	16.37	51.20	74.00	-22.80	peak
6	17850.000	28.22	23.19	51.41	74.00	-22.59	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. AVG: $VBW=1/Ton$ where: ton is transmit duration.
 4. For duty cycle, please refer to clause 7.1.
 5. The High Pass filter loss factor already add into the correct factor.
 6. Proper operation of the transmitter prior to adding the filter to the measurement chain.



HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)

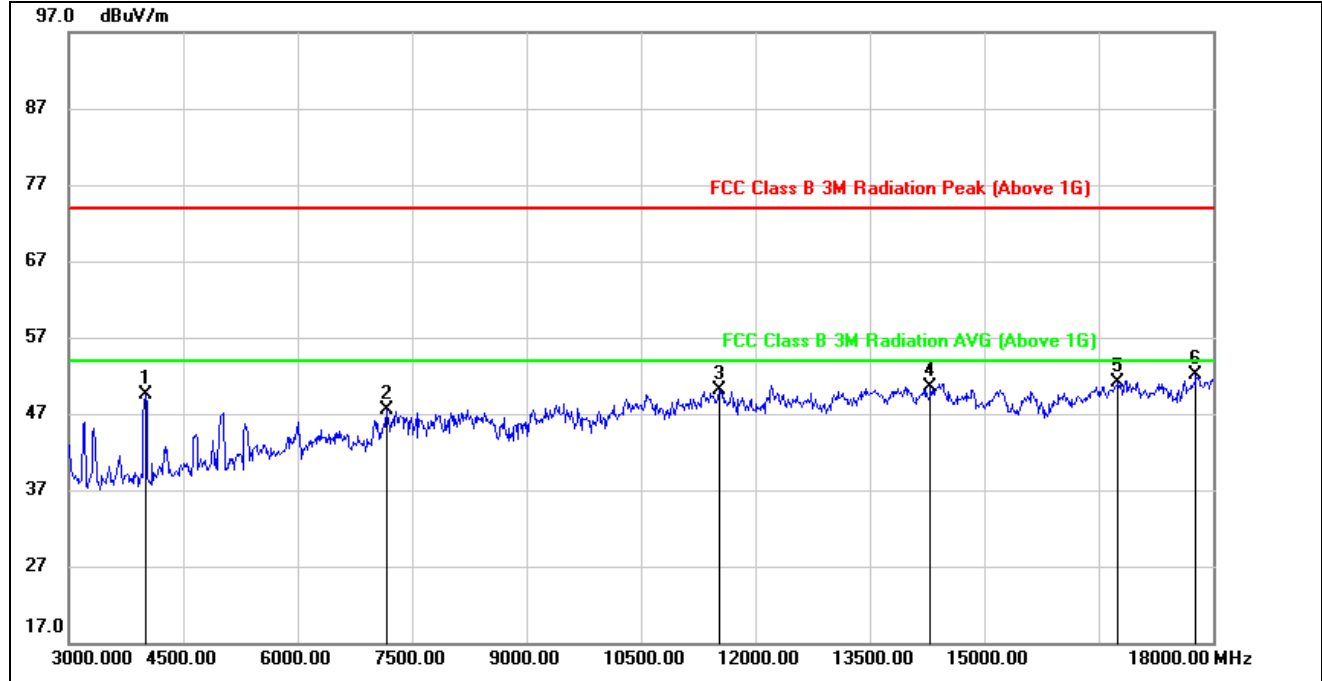


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4005.000	45.47	-2.94	42.53	74.00	-31.47	peak
2	6630.000	39.33	5.97	45.30	74.00	-28.70	peak
3	8220.000	38.64	9.40	48.04	74.00	-25.96	peak
4	12225.000	35.96	14.28	50.24	74.00	-23.76	peak
5	14445.000	34.87	16.37	51.24	74.00	-22.76	peak
6	17985.000	28.84	23.25	52.09	74.00	-21.91	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. AVG: $VBW=1/Ton$ where: ton is transmit duration.
 4. For duty cycle, please refer to clause 7.1.
 5. The High Pass filter loss factor already add into the correct factor.
 6. Proper operation of the transmitter prior to adding the filter to the measurement chain.



HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)

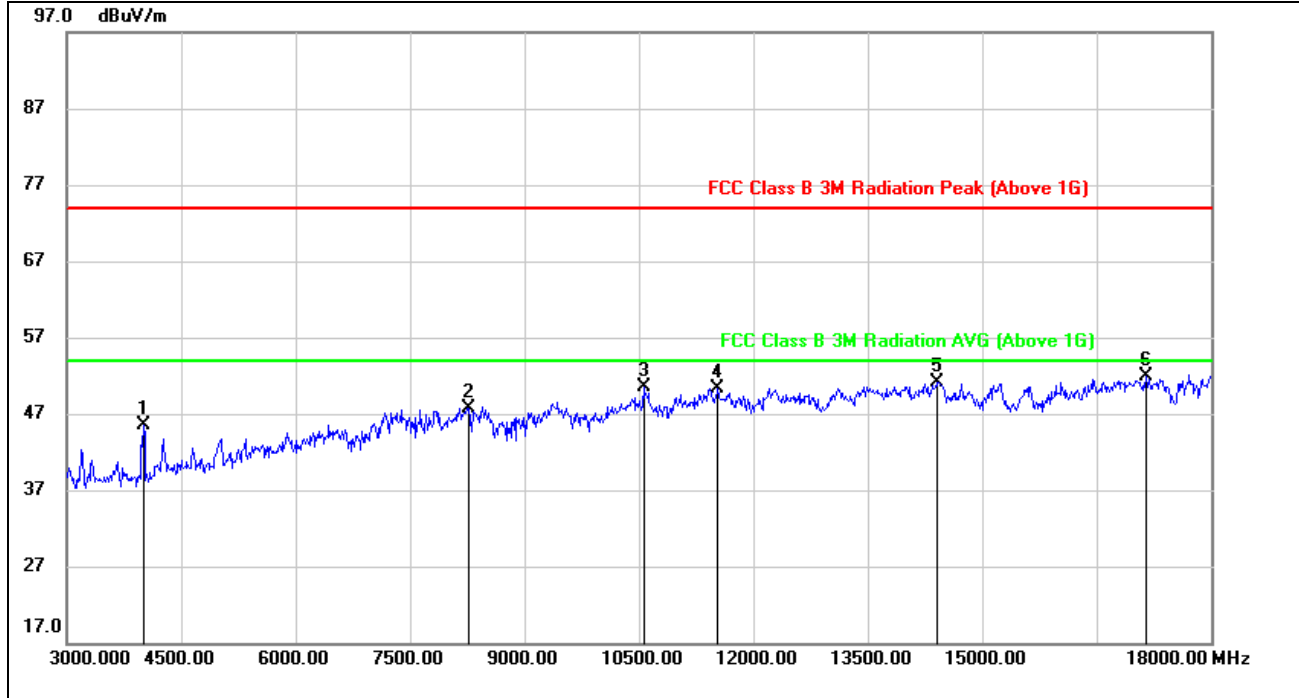


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4005.000	52.49	-2.94	49.55	74.00	-24.45	peak
2	7170.000	40.71	6.87	47.58	74.00	-26.42	peak
3	11535.000	36.08	14.10	50.18	74.00	-23.82	peak
4	14295.000	34.20	16.31	50.51	74.00	-23.49	peak
5	16755.000	31.15	19.87	51.02	74.00	-22.98	peak
6	17775.000	29.06	22.97	52.03	74.00	-21.97	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. AVG: $VBW=1/Ton$ where: ton is transmit duration.
 4. For duty cycle, please refer to clause 7.1.
 5. The High Pass filter loss factor already add into the correct factor.
 6. Proper operation of the transmitter prior to adding the filter to the measurement chain.



HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)

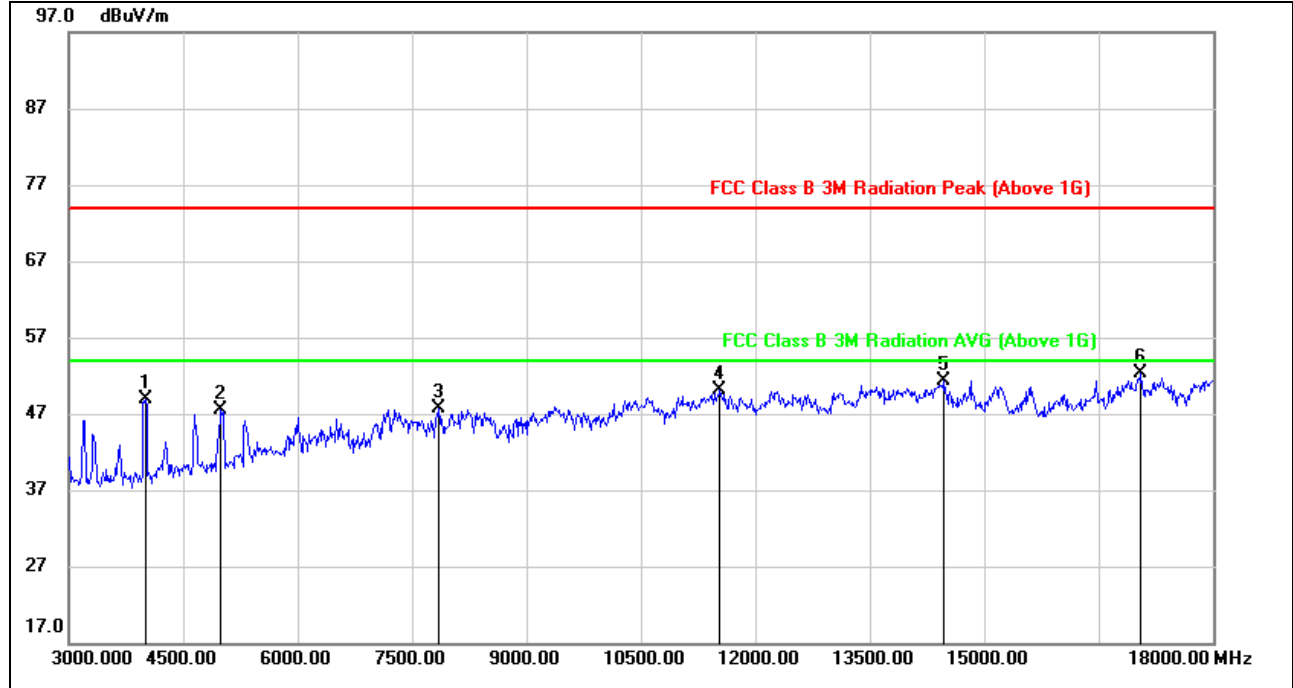


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4005.000	48.41	-2.94	45.47	74.00	-28.53	peak
2	8265.000	38.78	8.91	47.69	74.00	-26.31	peak
3	10560.000	38.16	12.37	50.53	74.00	-23.47	peak
4	11535.000	36.29	14.10	50.39	74.00	-23.61	peak
5	14400.000	34.68	16.43	51.11	74.00	-22.89	peak
6	17145.000	31.07	20.88	51.95	74.00	-22.05	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. AVG: VBW=1/Ton where: ton is transmit duration.
 4. For duty cycle, please refer to clause 7.1.
 5. The High Pass filter loss factor already add into the correct factor.
 6. Proper operation of the transmitter prior to adding the filter to the measurement chain.



HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)



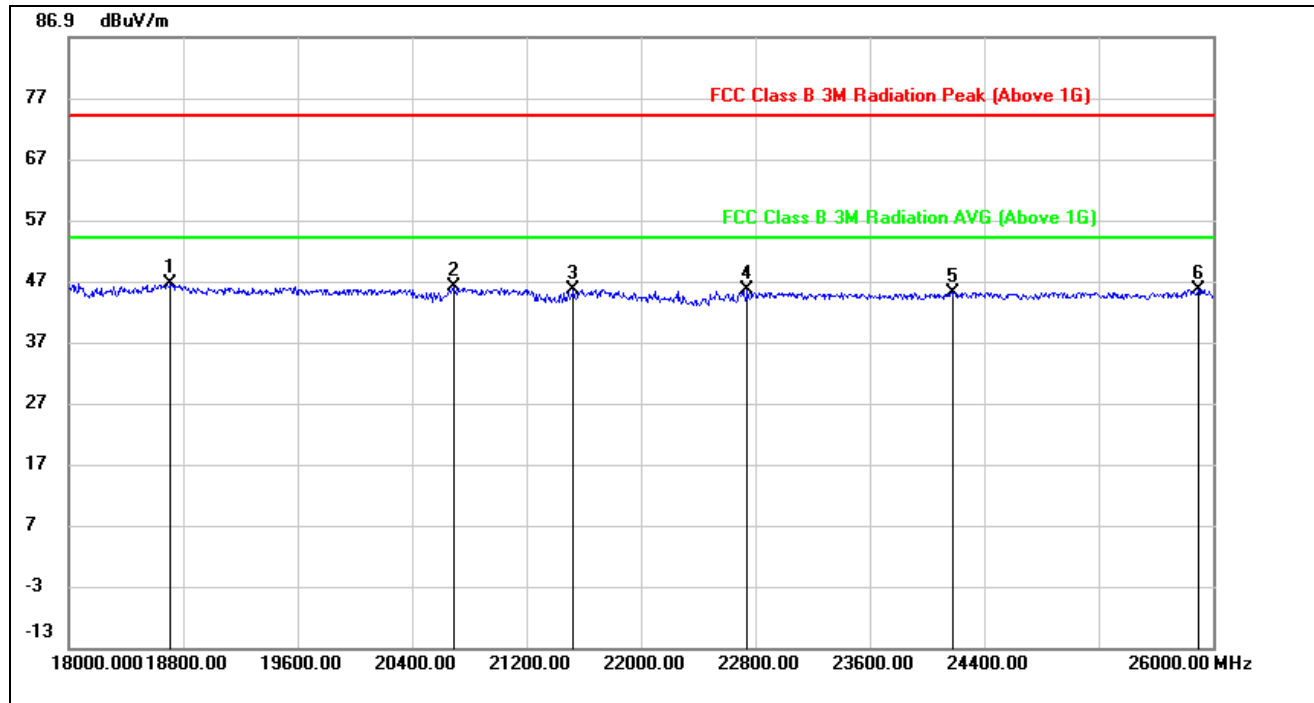
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4005.000	51.78	-2.94	48.84	74.00	-25.16	peak
2	4995.000	47.08	0.46	47.54	74.00	-26.46	peak
3	7845.000	38.93	8.68	47.61	74.00	-26.39	peak
4	11535.000	35.95	14.10	50.05	74.00	-23.95	peak
5	14475.000	34.96	16.33	51.29	74.00	-22.71	peak
6	17055.000	31.67	20.57	52.24	74.00	-21.76	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. 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.



8.4. SPURIOUS EMISSIONS 18G ~ 26GHz

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

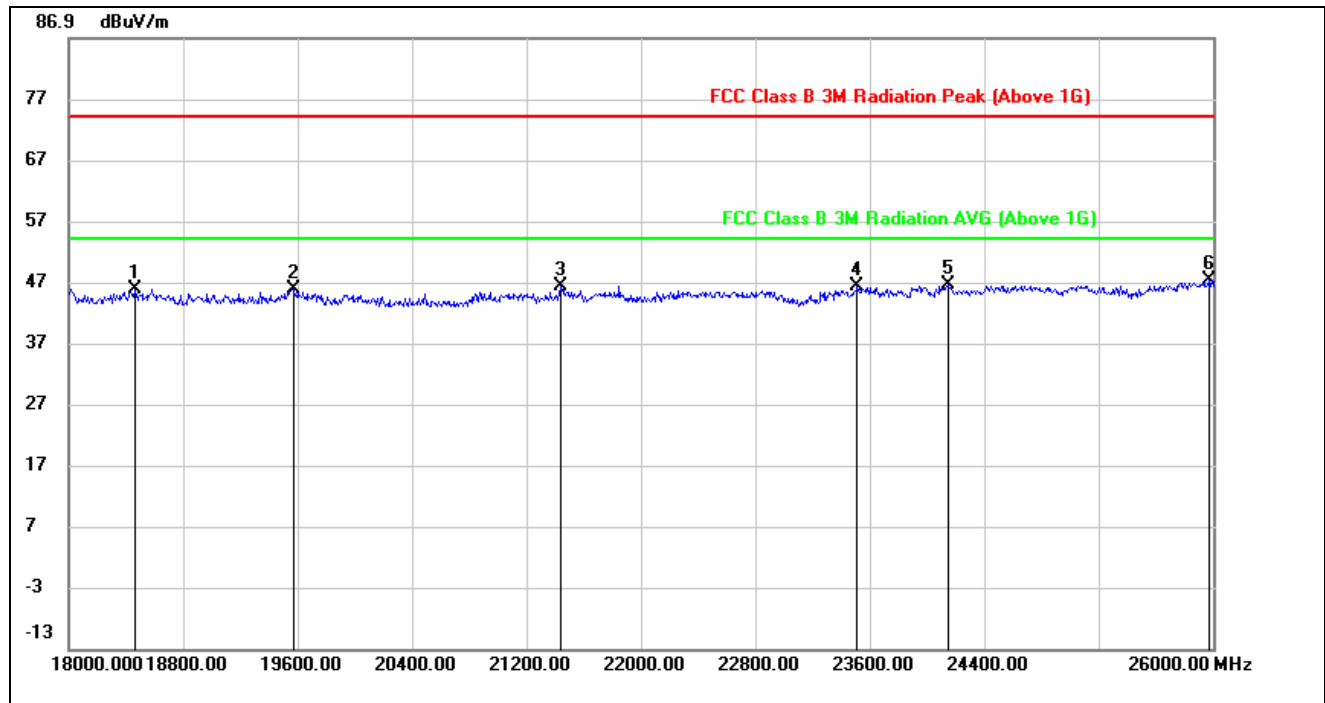


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	18712.000	51.23	-4.76	46.47	74.00	-27.53	peak
2	20696.000	51.14	-5.08	46.06	74.00	-27.94	peak
3	21528.000	51.42	-5.78	45.64	74.00	-28.36	peak
4	22744.000	51.18	-5.74	45.44	74.00	-28.56	peak
5	24176.000	48.85	-3.71	45.14	74.00	-28.86	peak
6	25896.000	47.59	-1.99	45.60	74.00	-28.40	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. Proper operation of the transmitter prior to adding the filter to the measurement chain.



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



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	18464.000	50.20	-4.39	45.81	74.00	-28.19	peak
2	19568.000	50.54	-4.67	45.87	74.00	-28.13	peak
3	21440.000	51.91	-5.71	46.20	74.00	-27.80	peak
4	23512.000	51.01	-4.76	46.25	74.00	-27.75	peak
5	24152.000	50.31	-3.76	46.55	74.00	-27.45	peak
6	25968.000	49.60	-2.31	47.29	74.00	-26.71	peak

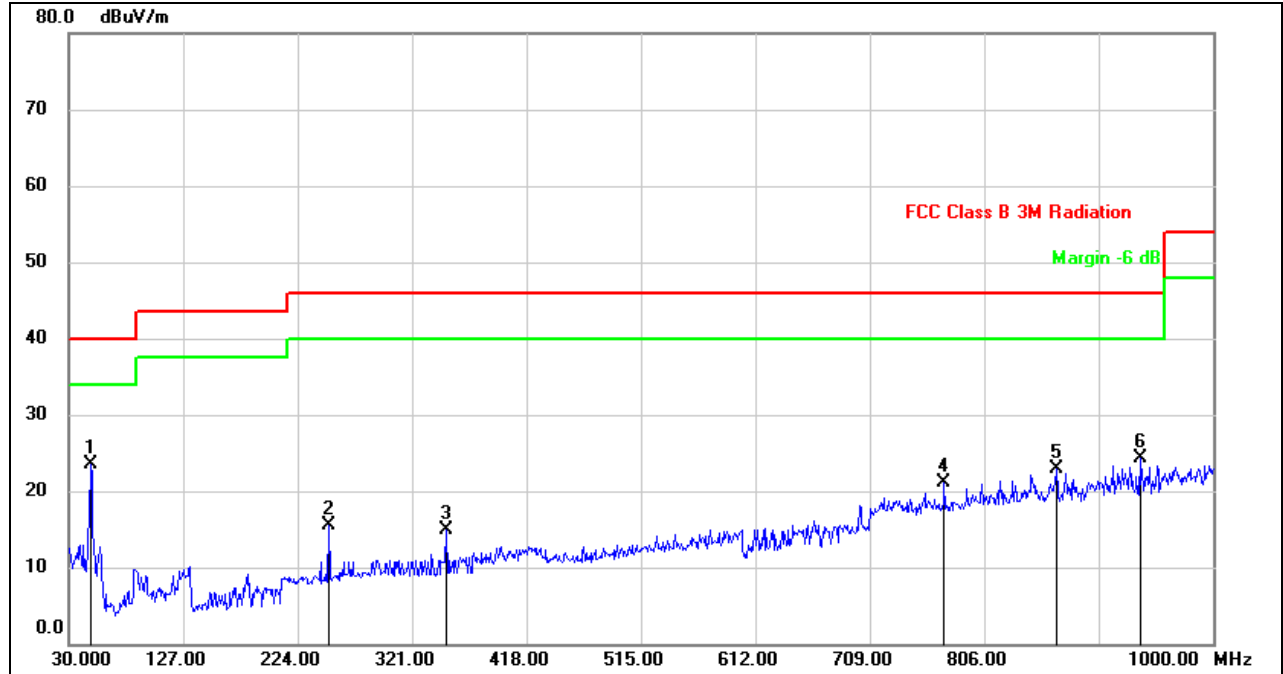
- Note: 1. Measurement = Reading Level + Correct Factor.
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Peak: Peak detector.
 4. Proper operation of the transmitter prior to adding the filter to the measurement chain.

Note: All test mode has been tested, only the worst data record in the report.



8.5. SPURIOUS EMISSIONS 30M ~ 1 GHz

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

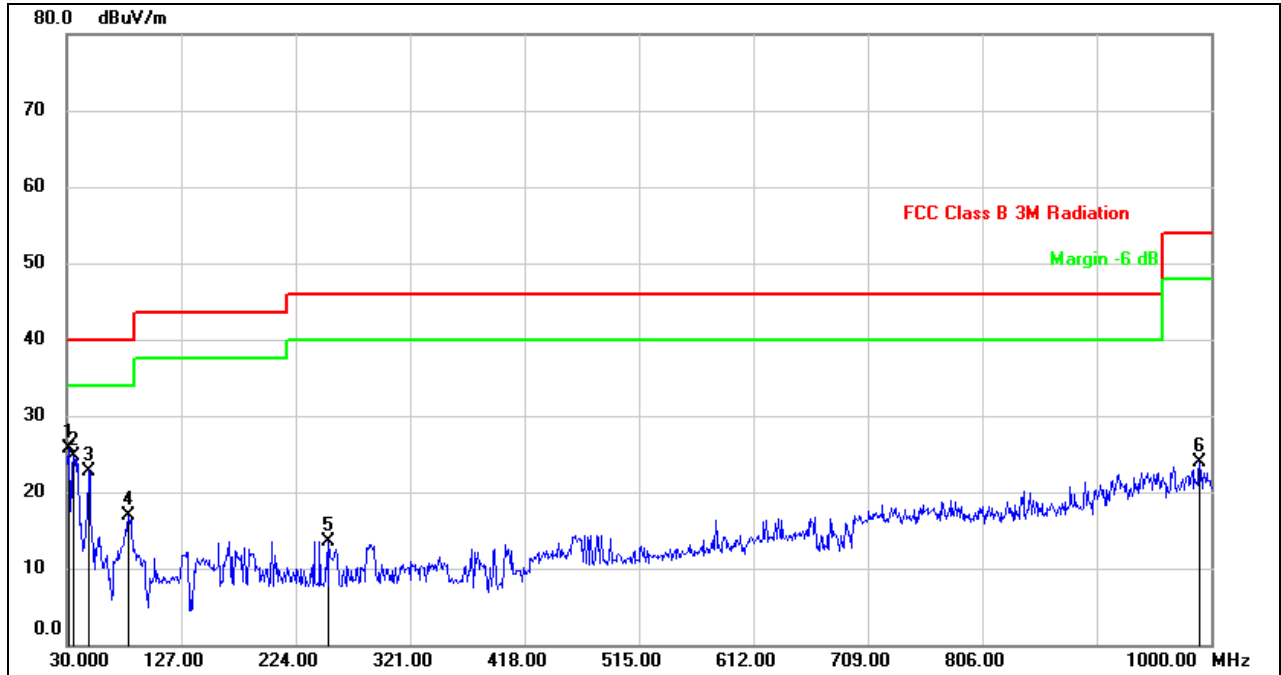


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	48.4300	41.76	-18.30	23.46	40.00	-16.54	QP
2	250.1900	31.64	-16.12	15.52	46.00	-30.48	QP
3	350.1000	27.97	-13.16	14.81	46.00	-31.19	QP
4	772.0500	26.88	-5.78	21.10	46.00	-24.90	QP
5	867.1100	27.33	-4.50	22.83	46.00	-23.17	QP
6	937.9200	27.88	-3.64	24.24	46.00	-21.76	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	31.9400	43.05	-17.29	25.76	40.00	-14.24	QP
2	35.8200	42.24	-17.63	24.61	40.00	-15.39	QP
3	48.4300	41.10	-18.30	22.80	40.00	-17.20	QP
4	82.3800	37.57	-20.70	16.87	40.00	-23.13	QP
5	252.1300	29.62	-16.07	13.55	46.00	-32.45	QP
6	990.3000	27.00	-3.06	23.94	54.00	-30.06	QP

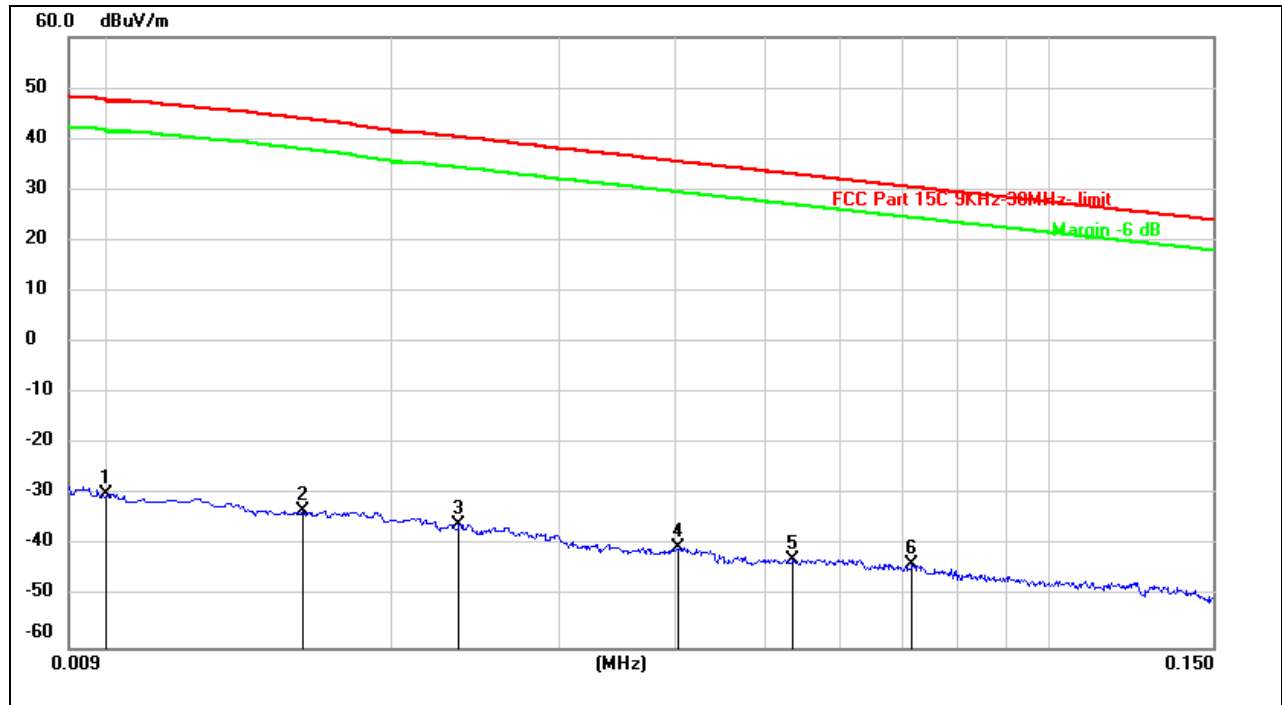
- Note: 1. Result Level = Read Level + Correct Factor.
 2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
 3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

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

8.6. SPURIOUS EMISSIONS BELOW 30M

SPURIOUS EMISSIONS (LOW CHANNEL, LOOP ANTENNA FACE ON TO THE EUT, WORST-CASE CONFIGURATION)

9kHz~ 150kHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0100	71.68	-101.40	-29.72	47.60	-77.32	peak
2	0.0160	68.27	-101.37	-33.10	43.99	-77.09	peak
3	0.0235	65.52	-101.36	-35.84	40.35	-76.19	peak
4	0.0403	61.12	-101.43	-40.31	35.50	-75.81	peak
5	0.0534	58.86	-101.49	-42.63	33.08	-75.71	peak
6	0.0714	57.91	-101.57	-43.66	30.54	-74.20	peak

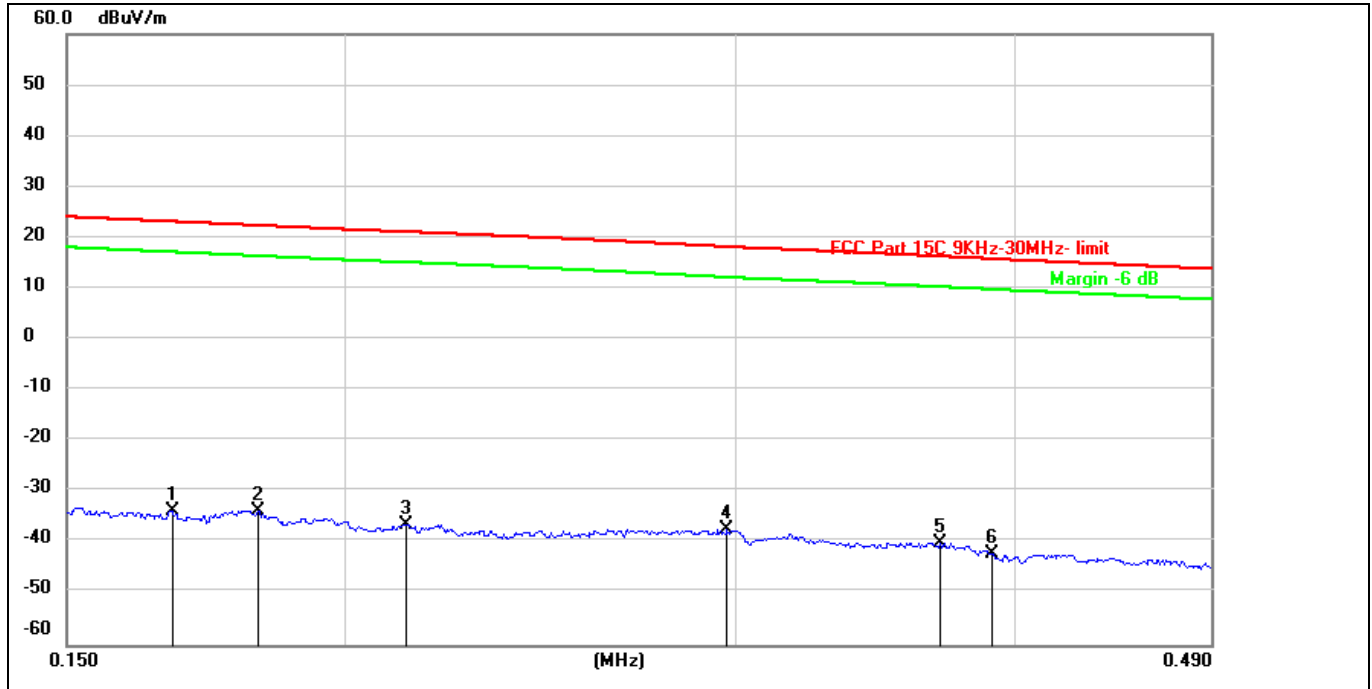
Note: 1. Measurement = Reading Level + Correct Factor.

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

3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.



150kHz ~ 490kHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.1672	67.95	-101.66	-33.71	23.15	-56.86	peak
2	0.1829	67.92	-101.69	-33.77	22.36	-56.13	peak
3	0.2132	65.22	-101.74	-36.52	21.12	-57.64	peak
4	0.2972	64.52	-101.85	-37.33	18.16	-55.49	peak
5	0.3703	61.93	-101.93	-40.00	16.30	-56.30	peak
6	0.3911	59.85	-101.95	-42.10	15.78	-57.88	peak

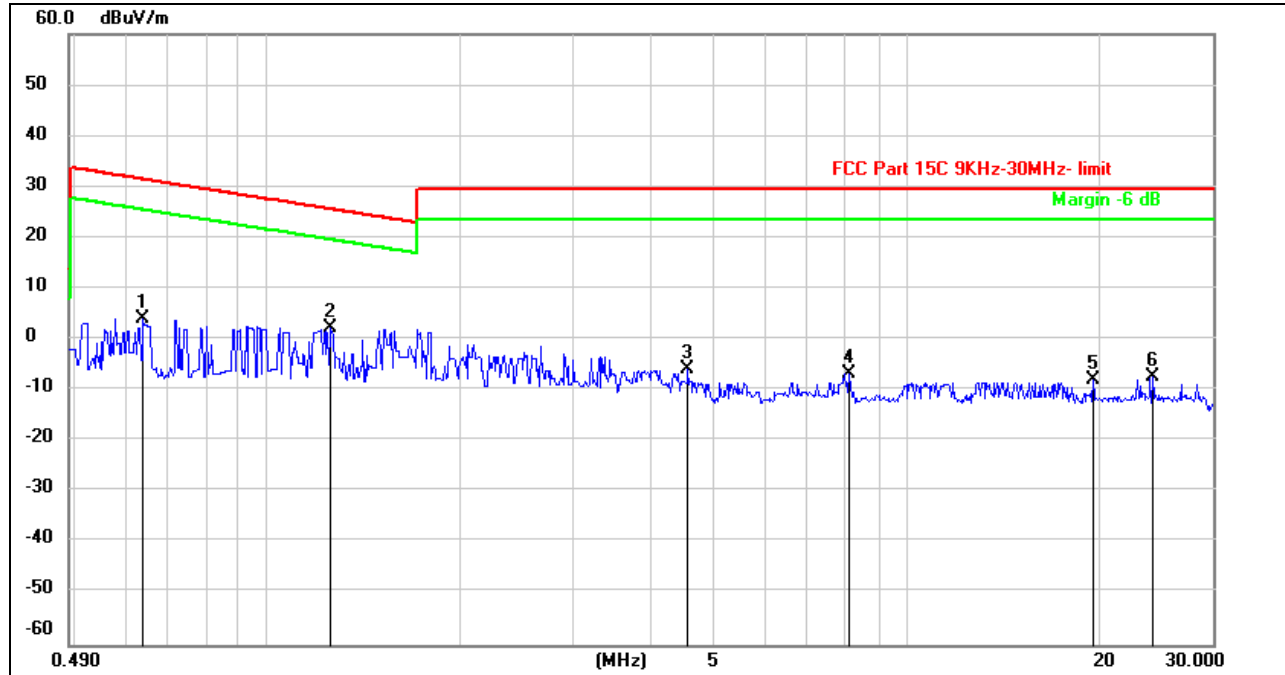
Note: 1. Measurement = Reading Level + Correct Factor.

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

3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.



490kHz ~ 30MHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.6401	66.03	-62.09	3.94	31.50	-27.56	peak
2	1.2573	64.55	-62.15	2.40	25.62	-23.22	peak
3	4.5384	55.47	-61.41	-5.94	29.54	-35.48	peak
4	8.1331	54.30	-61.06	-6.76	29.54	-36.30	peak
5	19.4939	53.04	-60.85	-7.81	29.54	-37.35	peak
6	24.1570	53.08	-60.52	-7.44	29.54	-36.98	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. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

Note: All test mode has been tested, only the worst data record in the report.

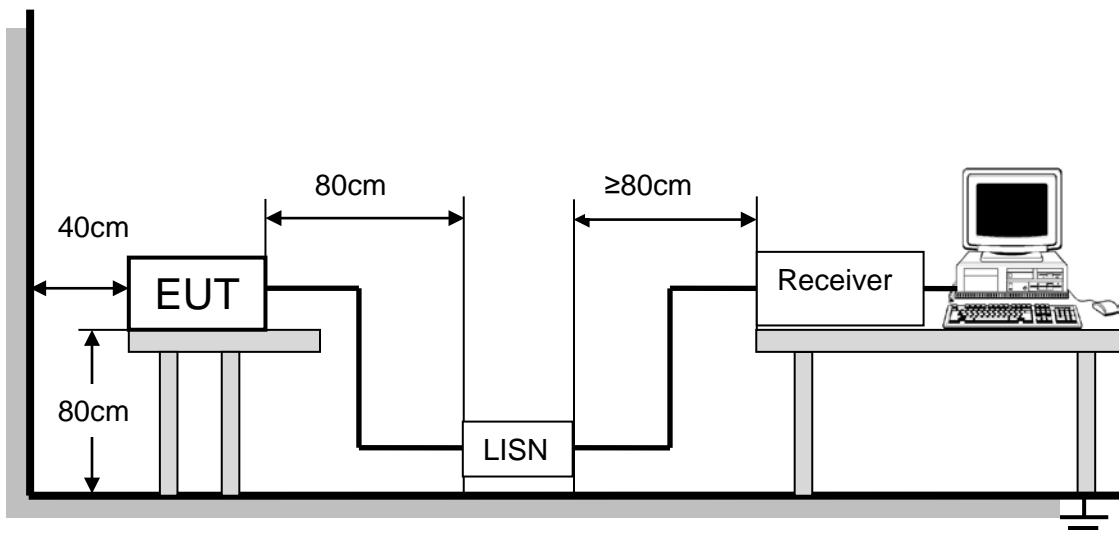
9. AC POWER LINE CONDUCTED EMISSIONS

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



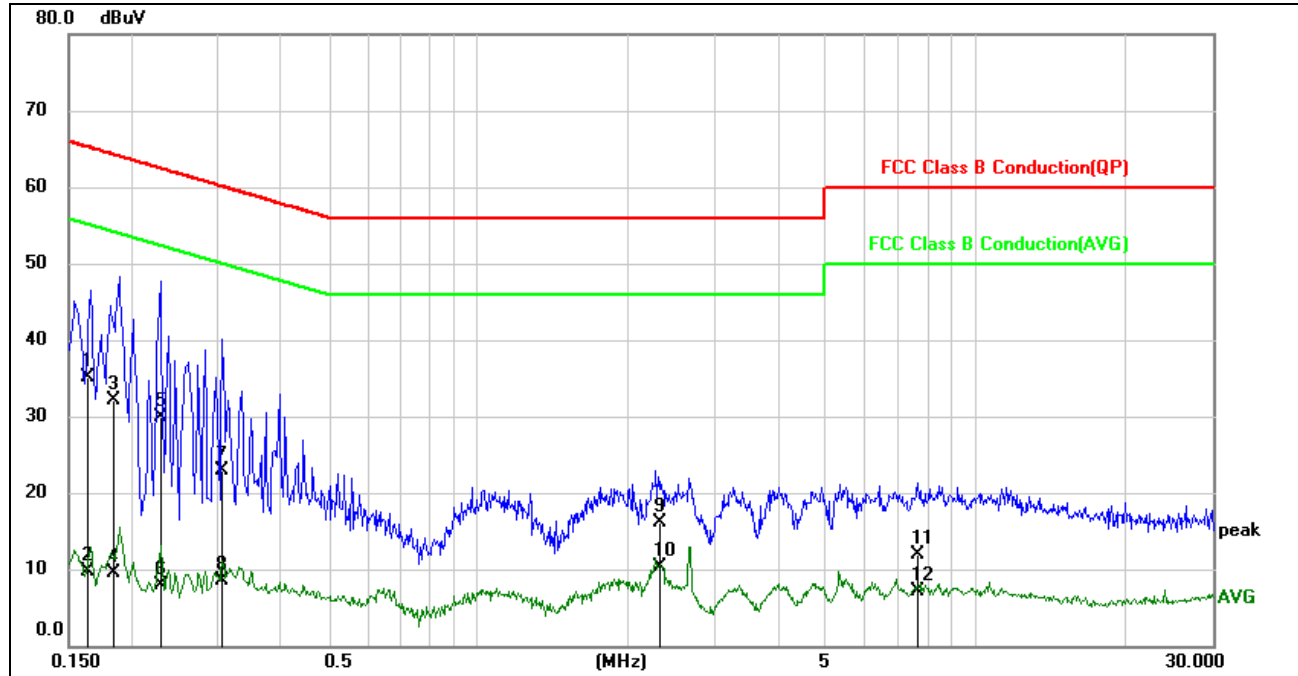
The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3)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



TEST RESULTS

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

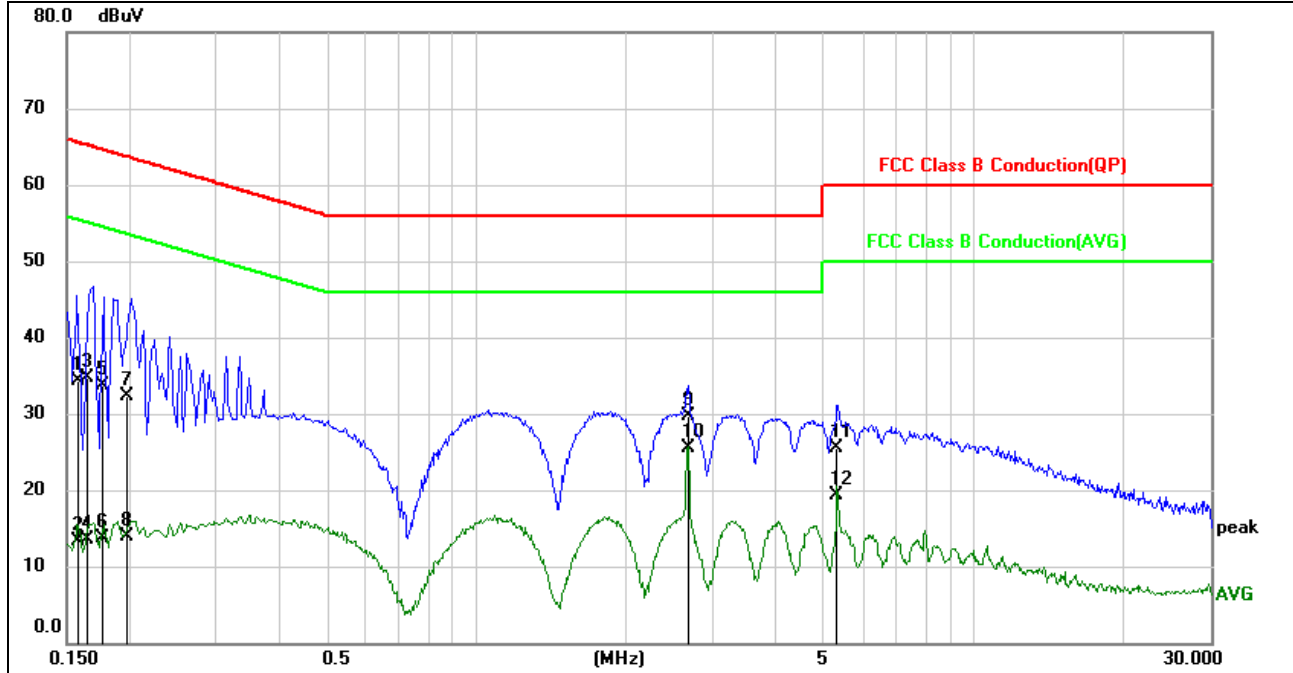


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1639	25.57	9.61	35.18	65.26	-30.08	QP
2	0.1639	0.12	9.61	9.73	55.26	-45.53	AVG
3	0.1854	22.51	9.60	32.11	64.24	-32.13	QP
4	0.1854	-0.13	9.60	9.47	54.24	-44.77	AVG
5	0.2281	20.30	9.60	29.90	62.52	-32.62	QP
6	0.2281	-1.72	9.60	7.88	52.52	-44.64	AVG
7	0.3044	13.34	9.60	22.94	60.12	-37.18	QP
8	0.3044	-1.13	9.60	8.47	50.12	-41.65	AVG
9	2.3198	6.43	9.63	16.06	56.00	-39.94	QP
10	2.3198	0.64	9.63	10.27	46.00	-35.73	AVG
11	7.6846	2.18	9.71	11.89	60.00	-48.11	QP
12	7.6846	-2.51	9.71	7.20	50.00	-42.80	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	0.1583	24.68	9.61	34.29	65.55	-31.26	QP
2	0.1583	3.67	9.61	13.28	55.55	-42.27	AVG
3	0.1650	25.19	9.61	34.80	65.21	-30.41	QP
4	0.1650	3.85	9.61	13.46	55.21	-41.75	AVG
5	0.1765	24.04	9.61	33.65	64.65	-31.00	QP
6	0.1765	4.00	9.61	13.61	54.65	-41.04	AVG
7	0.1979	22.66	9.60	32.26	63.70	-31.44	QP
8	0.1979	4.31	9.60	13.91	53.70	-39.79	AVG
9	2.6650	19.97	9.64	29.61	56.00	-26.39	QP
10	2.6650	15.79	9.64	25.43	46.00	-20.57	AVG
11	5.3297	15.78	9.68	25.46	60.00	-34.54	QP
12	5.3297	9.60	9.68	19.28	50.00	-30.72	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 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



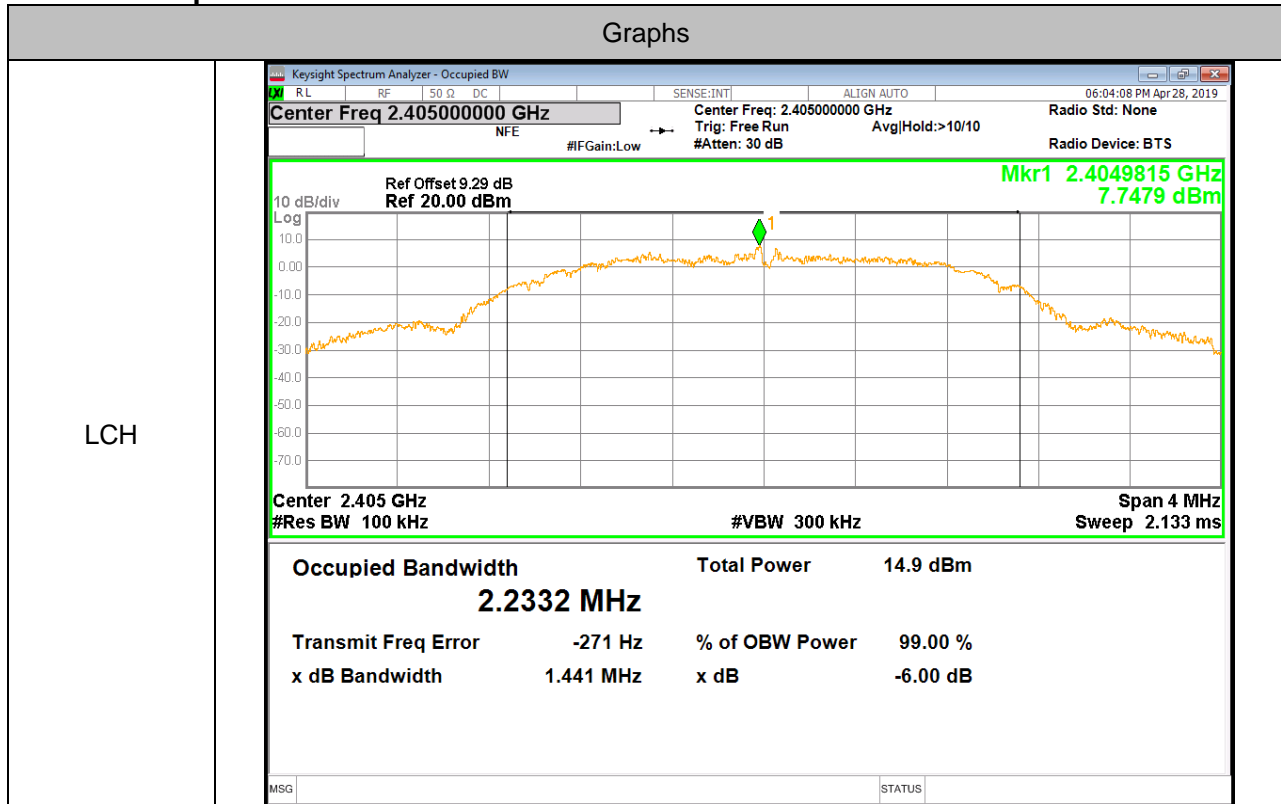
11. APPENDIXES

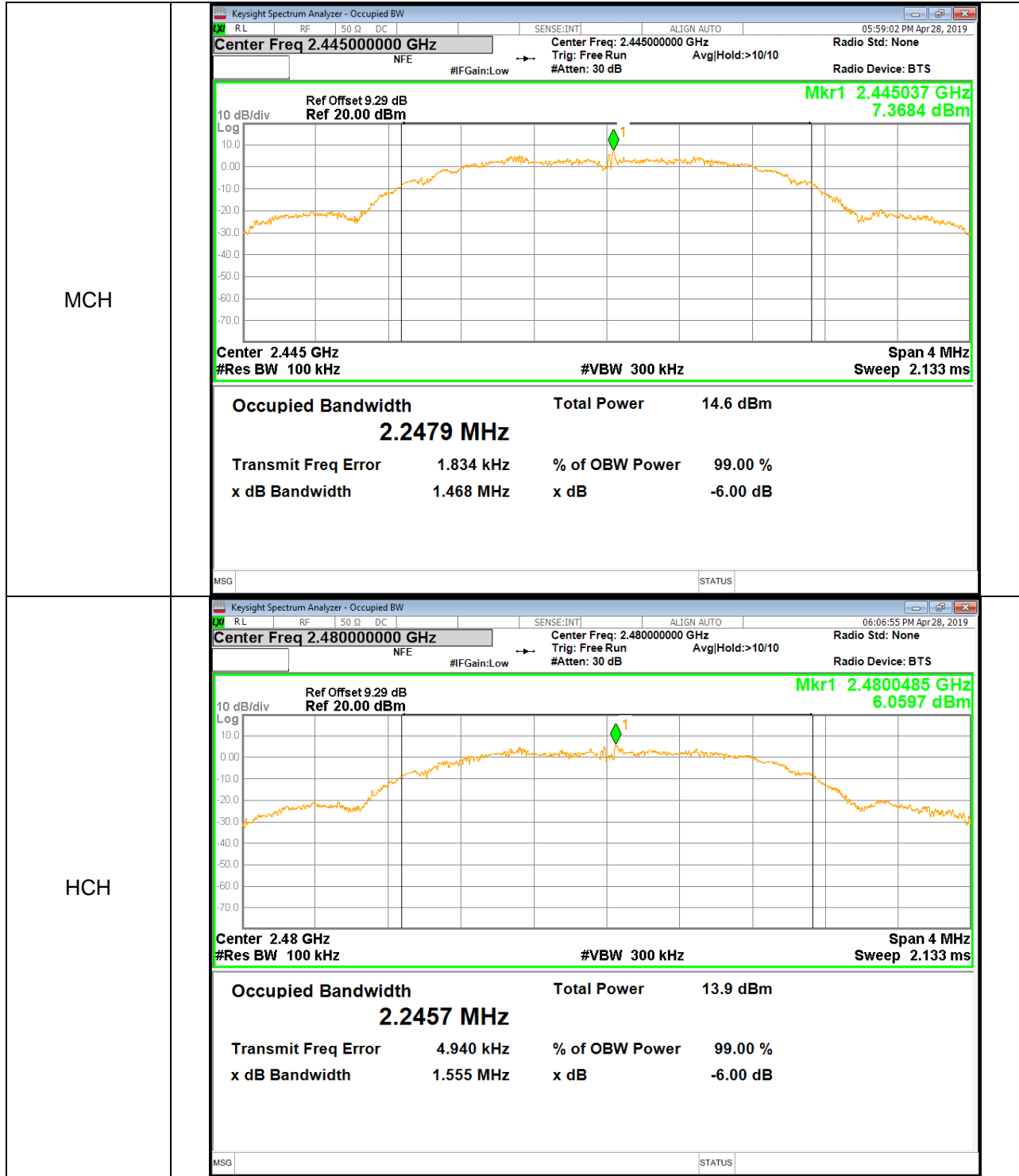
Appendix A): 6dB Bandwidth

Test Result

Mode	Channel	6dB Bandwidth [MHz]	Verdict
ZigBee	LCH	1.441	PASS
ZigBee	MCH	1.468	PASS
ZigBee	HCH	1.555	PASS

Test Graphs





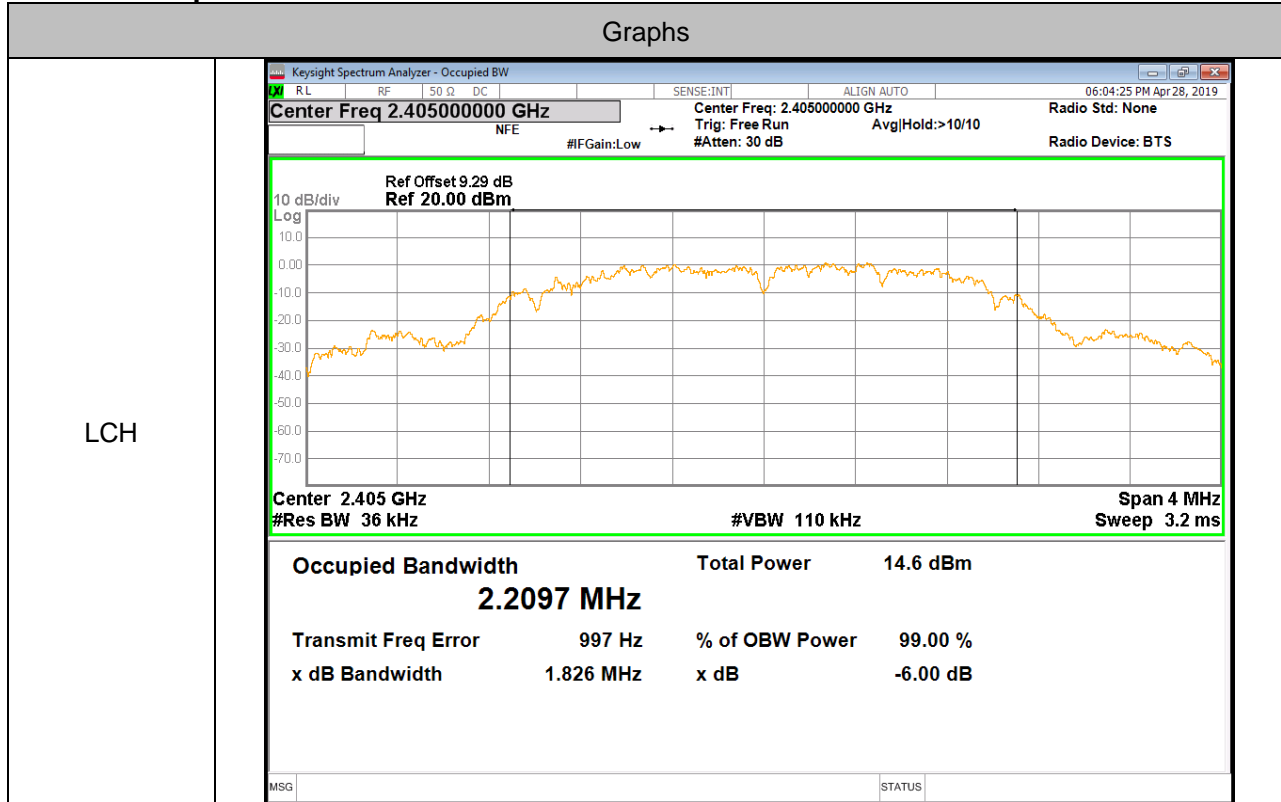


Appendix B): Occupied Bandwidth

Test Result

Mode	Channel	99% OBW[MHz]	Verdict
ZigBee	LCH	2.2097	PASS
ZigBee	MCH	2.2016	PASS
ZigBee	HCH	2.2194	PASS

Test Graphs





MCH	<p>Keysight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.445000000 GHz</p> <p>Center Freq: 2.445000000 GHz</p> <p>Trig: Free Run</p> <p>#Atten: 30 dB</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset 9.29 dB</p> <p>Ref 20.00 dBm</p> <p>10 dB/div</p> <p>Log</p> <p>Center 2.445 GHz</p> <p>#Res BW 36 kHz</p> <p>#VBW 110 kHz</p> <p>Span 4 MHz</p> <p>Sweep 3.2 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>14.4 dBm</td> </tr> <tr> <td colspan="3" style="text-align: center;">2.2016 MHz</td> </tr> <tr> <td>Transmit Freq Error</td> <td>-20.202 kHz</td> <td>% of OBW Power 99.00 %</td> </tr> <tr> <td>x dB Bandwidth</td> <td>1.553 MHz</td> <td>x dB -6.00 dB</td> </tr> </table>	Occupied Bandwidth	Total Power	14.4 dBm	2.2016 MHz			Transmit Freq Error	-20.202 kHz	% of OBW Power 99.00 %	x dB Bandwidth	1.553 MHz	x dB -6.00 dB
Occupied Bandwidth	Total Power	14.4 dBm											
2.2016 MHz													
Transmit Freq Error	-20.202 kHz	% of OBW Power 99.00 %											
x dB Bandwidth	1.553 MHz	x dB -6.00 dB											
HCH	<p>Keysight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.480000000 GHz</p> <p>Center Freq: 2.480000000 GHz</p> <p>Trig: Free Run</p> <p>#Atten: 30 dB</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset 9.29 dB</p> <p>Ref 20.00 dBm</p> <p>10 dB/div</p> <p>Log</p> <p>Center 2.48 GHz</p> <p>#Res BW 36 kHz</p> <p>#VBW 110 kHz</p> <p>Span 4 MHz</p> <p>Sweep 3.2 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>13.8 dBm</td> </tr> <tr> <td colspan="3" style="text-align: center;">2.2194 MHz</td> </tr> <tr> <td>Transmit Freq Error</td> <td>-9.168 kHz</td> <td>% of OBW Power 99.00 %</td> </tr> <tr> <td>x dB Bandwidth</td> <td>1.471 MHz</td> <td>x dB -6.00 dB</td> </tr> </table>	Occupied Bandwidth	Total Power	13.8 dBm	2.2194 MHz			Transmit Freq Error	-9.168 kHz	% of OBW Power 99.00 %	x dB Bandwidth	1.471 MHz	x dB -6.00 dB
Occupied Bandwidth	Total Power	13.8 dBm											
2.2194 MHz													
Transmit Freq Error	-9.168 kHz	% of OBW Power 99.00 %											
x dB Bandwidth	1.471 MHz	x dB -6.00 dB											



Appendix C): Maximum Conducted Output Power

Test Result

Mode	Channel	Level [dBm]	EIRP [dBm]	Verdict
ZigBee	LCH	9.594	11.194	PASS
ZigBee	MCH	9.242	10.842	PASS
ZigBee	HCH	8.675	10.275	PASS

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

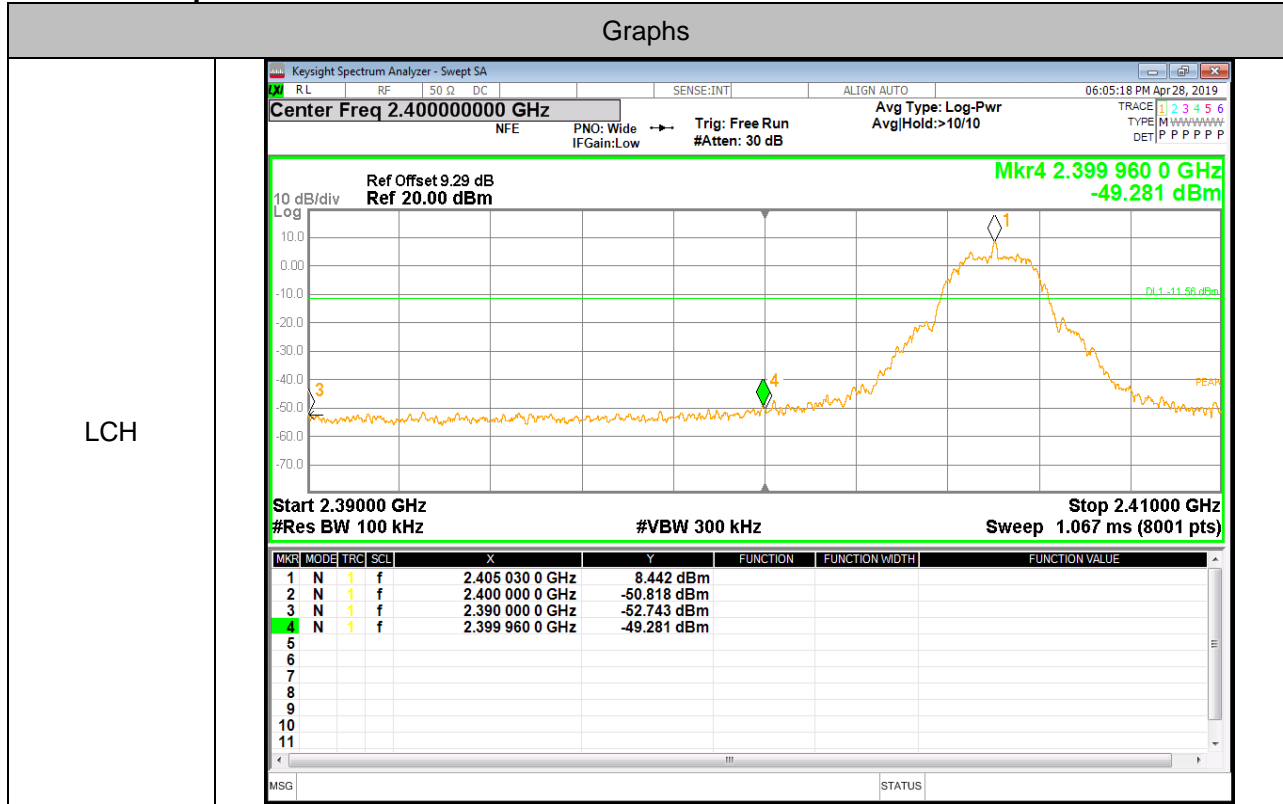


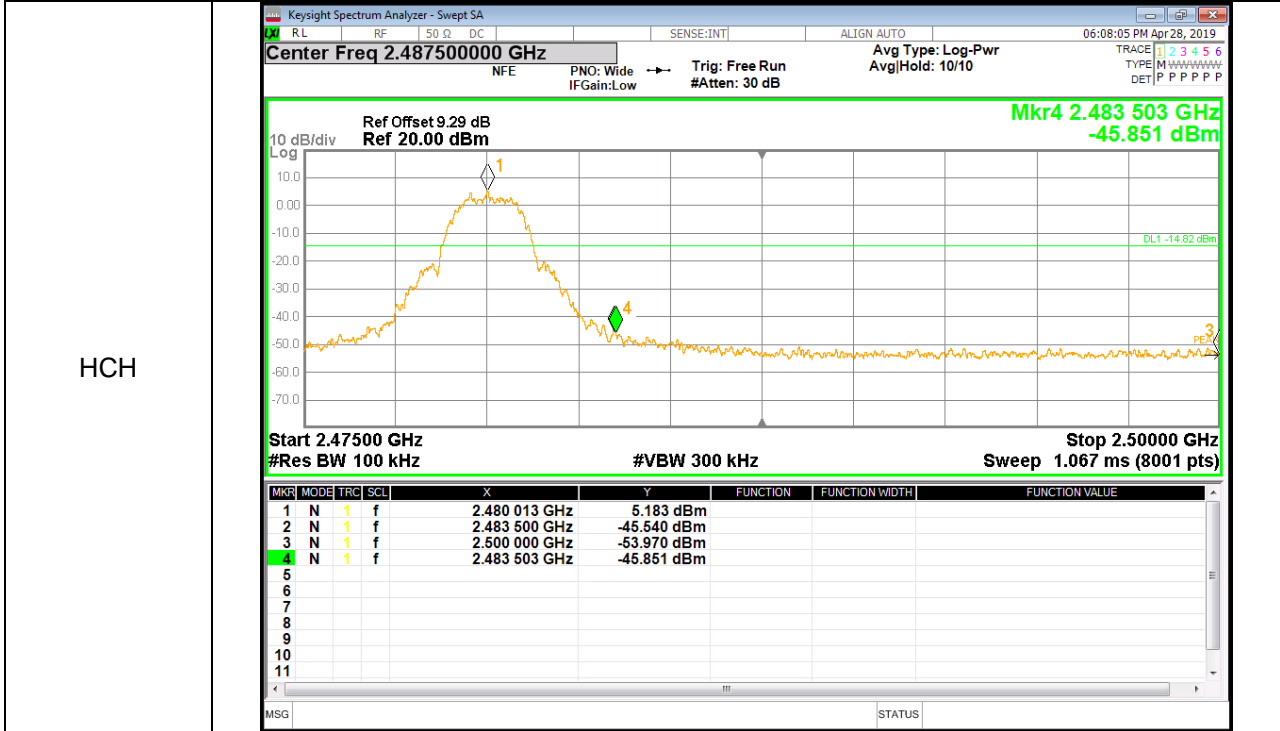
Appendix D): Band-edge for RF Conducted Emissions

Result Table

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
ZigBee	LCH	8.442	-49.281	-11.56	PASS
ZigBee	HCH	5.183	-45.851	-14.82	PASS

Test Graphs





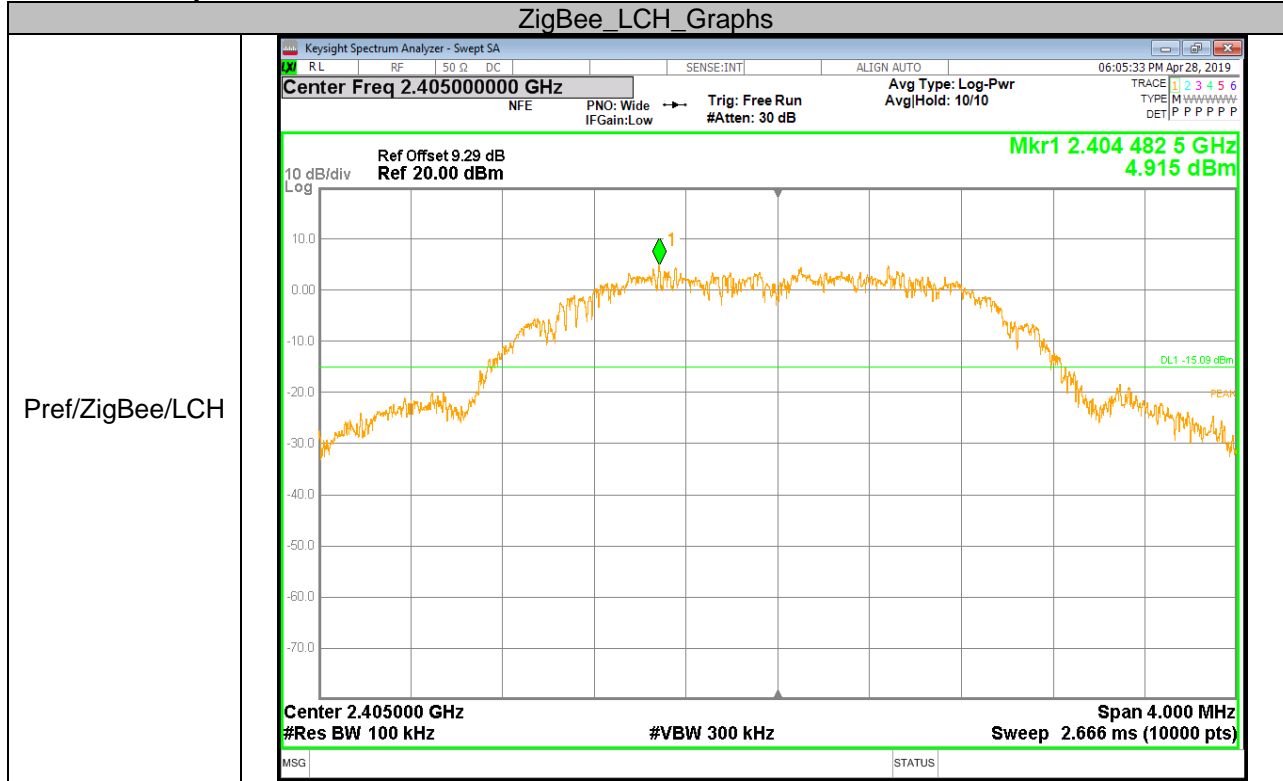


Appendix E): RF Conducted Spurious Emissions

Result Table

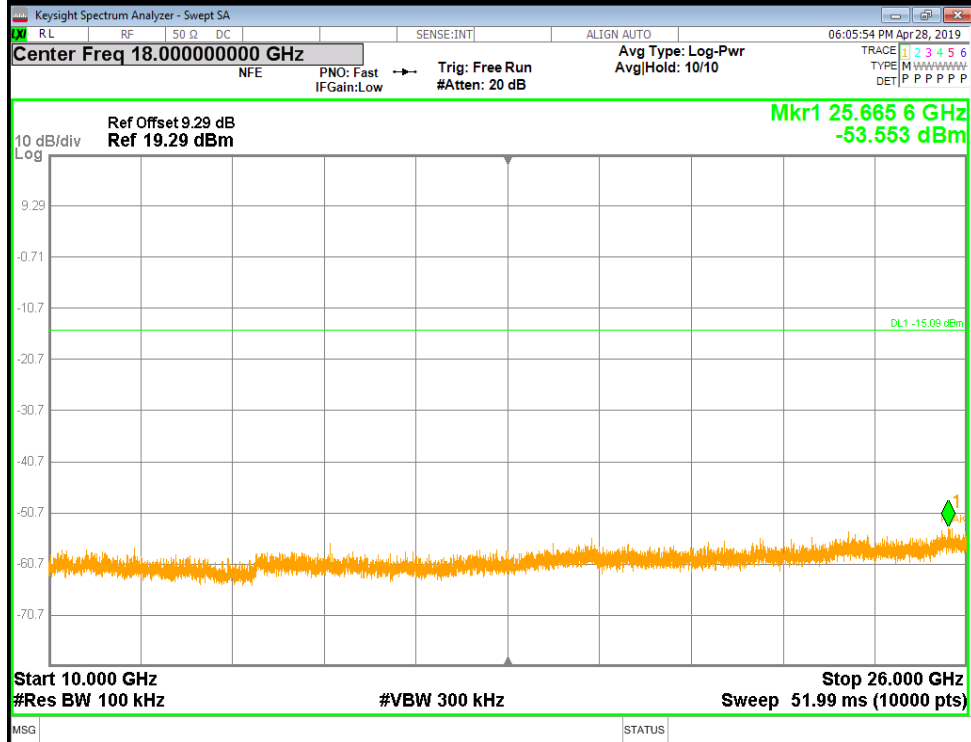
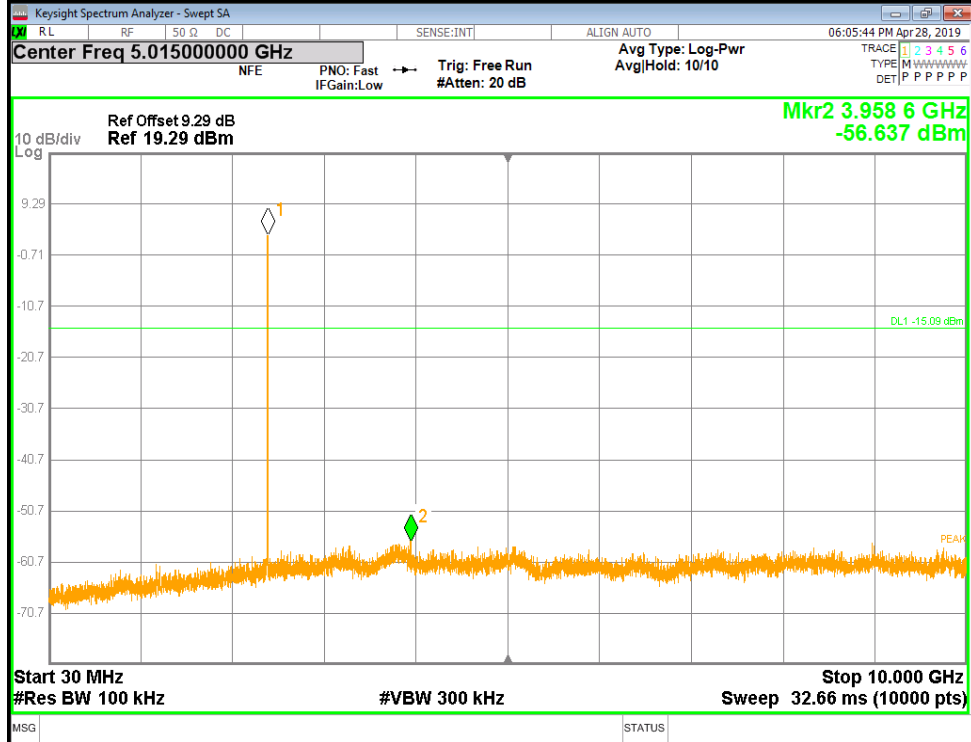
Mode	Channel	Pref [dBm]	Puw[dBm]	Verdict
ZigBee	LCH	4.915	<Limit	PASS
ZigBee	MCH	3.954	<Limit	PASS
ZigBee	HCH	5.225	<Limit	PASS

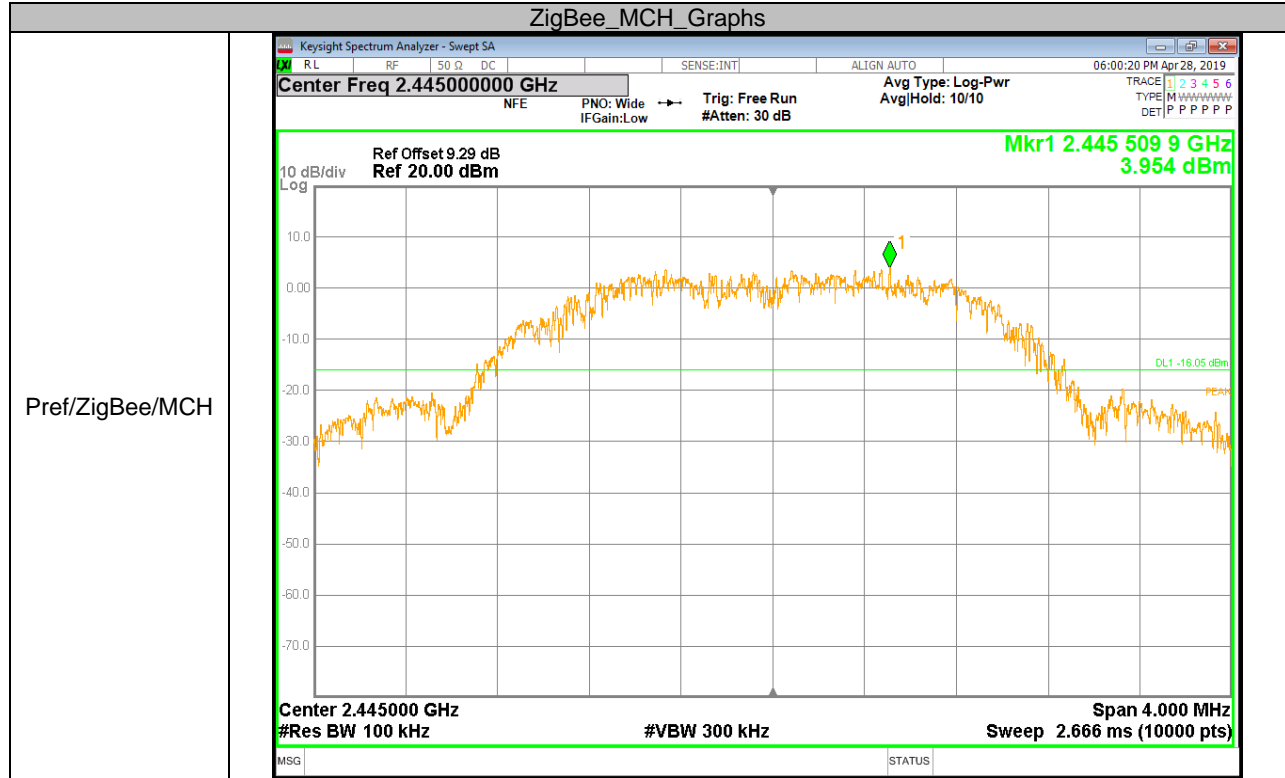
Test Graphs





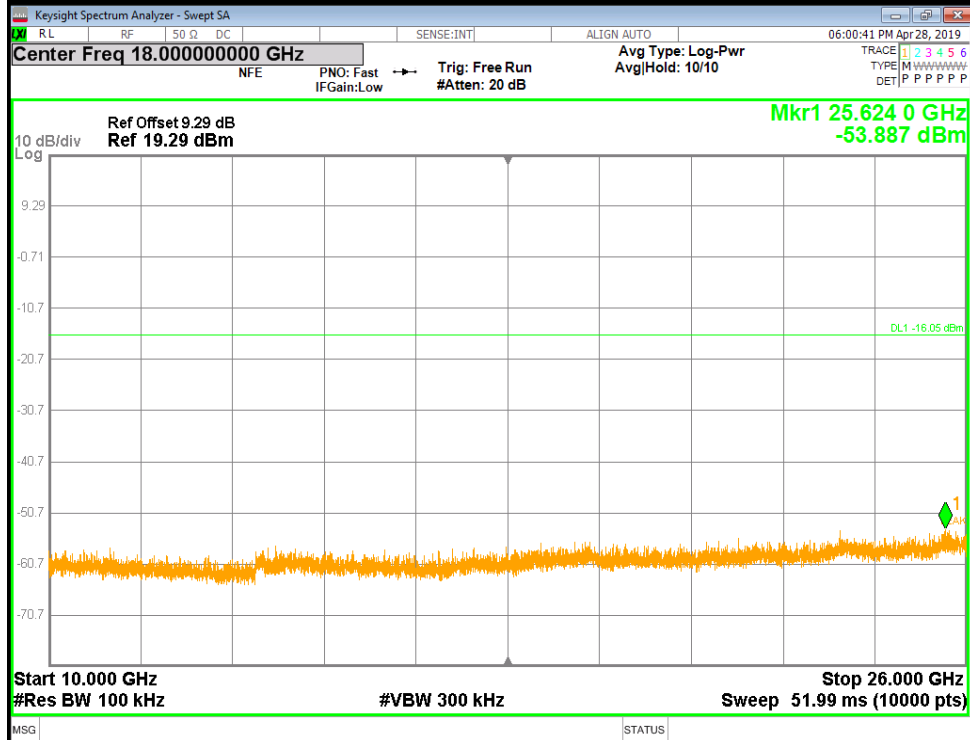
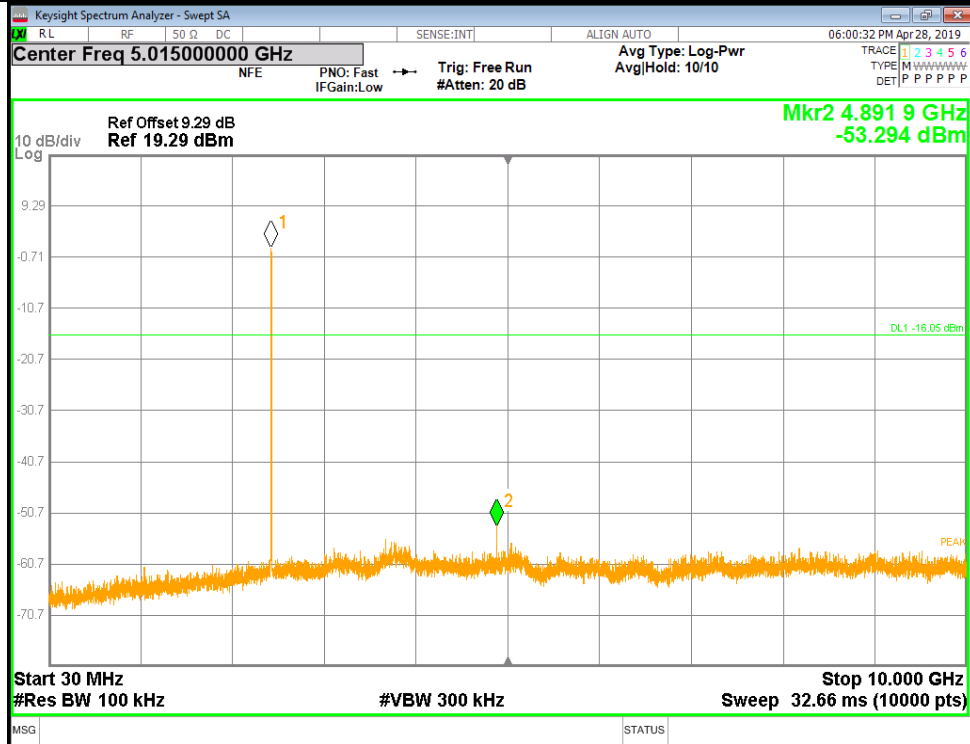
Puw/ZigBee/LCH





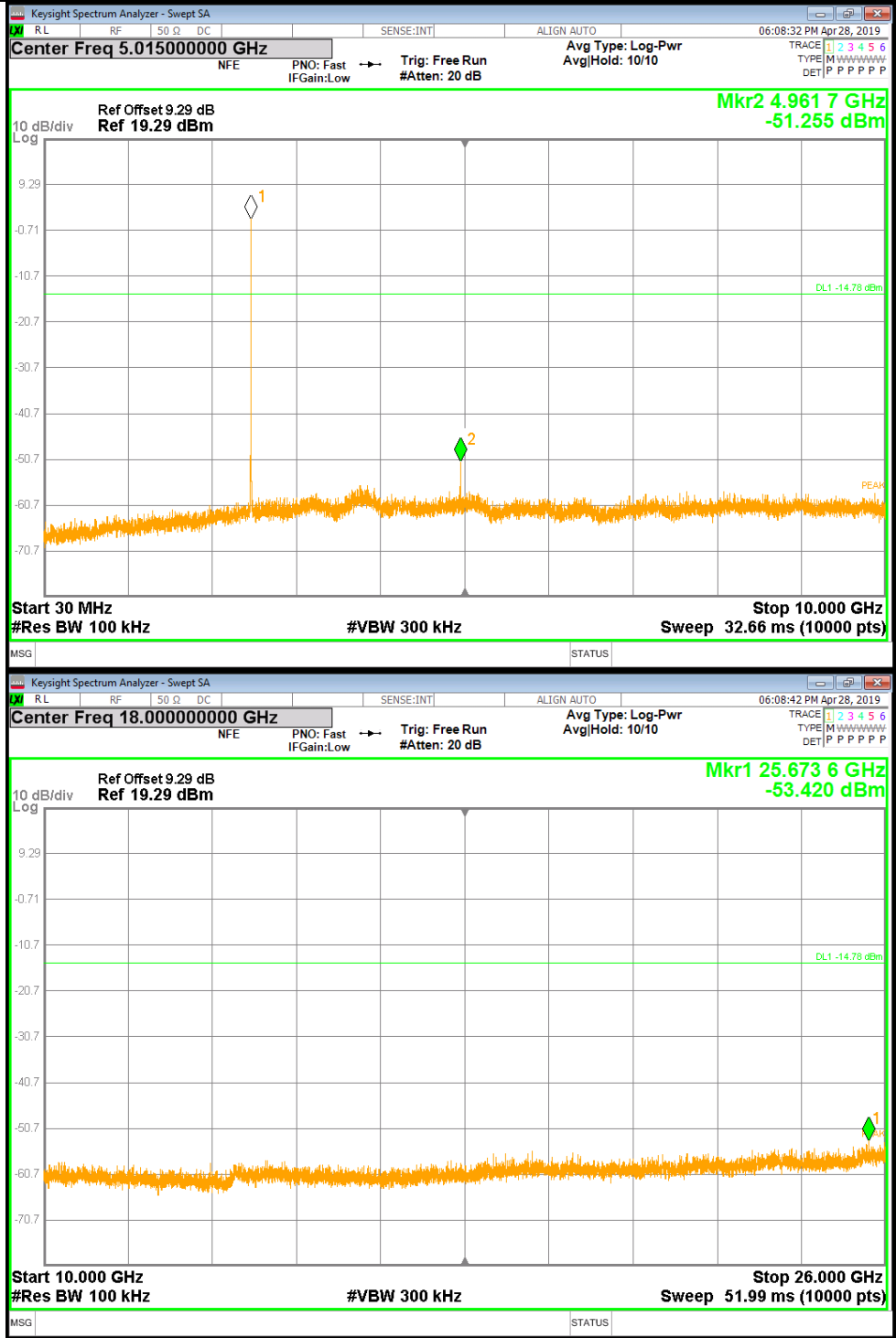


Puw/ZigBee/MCH





Puw/ZigBee/HCH





Appendix F): Maximum Power Spectral Density

Result Table

Mode	Channel	PSD [dBm]	Verdict
ZigBee	LCH	-3.106	PASS
ZigBee	MCH	-3.256	PASS
ZigBee	HCH	-3.962	PASS

Test Graphs

