

TEST REPORT

Product : Food Temperature Probe
Trade mark : V-MARK
Model/Type reference : VRKRTS03WREG01
Serial Number : N/A
Report Number : EED32M00045501
FCC ID : 2AQ7V-VMHTPWREG01
Date of Issue : May 21, 2020
Test Standards : 47 CFR Part 15 Subpart C
Test result : PASS

Prepared for:

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Date:

May 21, 2020



Check No.:3970381388

2 Version

Version No.	Date	Description
00	May 21, 2020	Original

3 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15 Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	N/A
Conducted Peak Output Power	47 CFR Part 15 Subpart C Section 15.247 (b)(3)	ANSI C63.10-2013	PASS
6dB Occupied Bandwidth	47 CFR Part 15 Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013	PASS
Power Spectral Density	47 CFR Part 15 Subpart C Section 15.247 (e)	ANSI C63.10-2013	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15 Subpart C Section 15.247(d)	ANSI C63.10-2013	PASS
RF Conducted Spurious Emissions	47 CFR Part 15 Subpart C Section 15.247(d)	ANSI C63.10-2013	PASS
Radiated Spurious Emissions	47 CFR Part 15 Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15 Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Duty Cycle	ANSI C63.10-2013	ANSI C63.10-2013	PASS

Remark:

Test according to ANSI C63.4-2014 & ANSI C63.10-2013.

The tested sample(s) and the sample information are provided by the client.

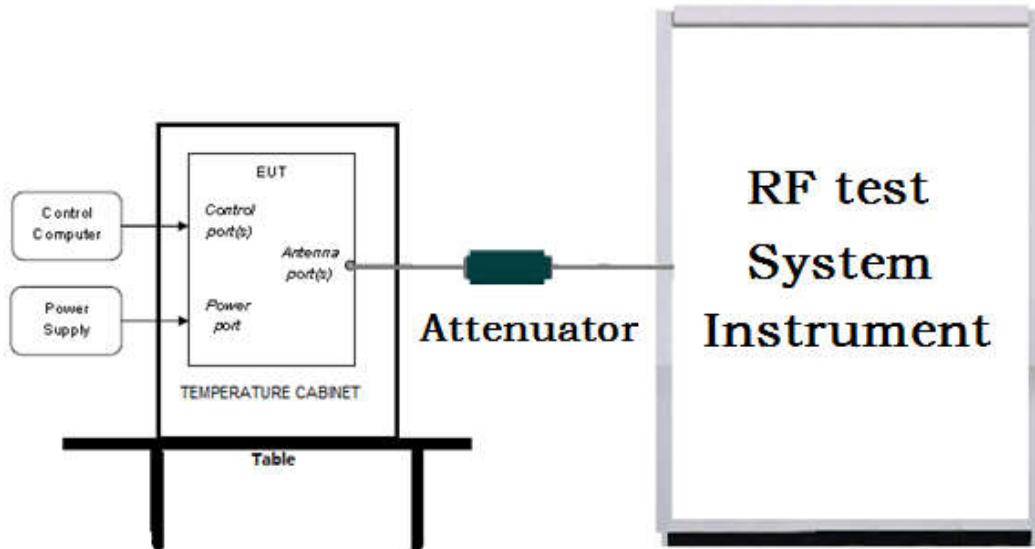
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5 Test Requirement

5.1 Test setup

5.1.1 For Conducted test setup



5.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

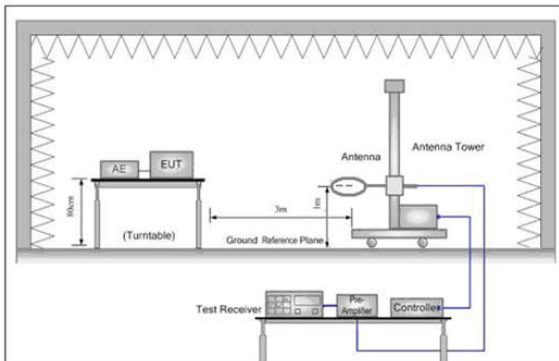


Figure 1. Below 30MHz

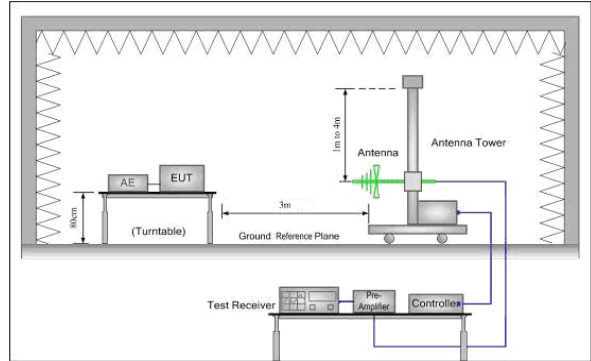


Figure 2. 30MHz to 1GHz

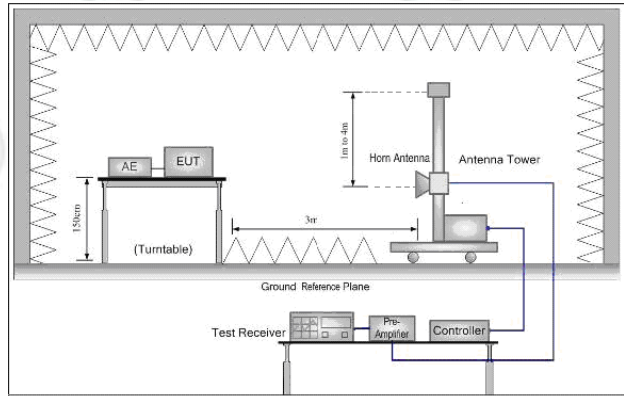


Figure 3. Above 1GHz

5.1.3 For Conducted Emissions test setup
Conducted Emissions setup

N/A

5.2 Test Environment

Operating Environment:	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010mbar

5.3 Test Condition

Test Mode	Tx	RF Channel		
		Low(L)	Middle(M)	High(H)
OQPSK	2400MHz ~2485MHz	Channel 1	Channel 8	Channel 16
		2405MHz	2440MHz	2480MHz

6 General Information

6.1 Client Information

Applicant:	V-MARK Enterprises Ltd.
Address of Applicant:	400-601 West Broadway, Vancouver, British Columbia, Canada
Manufacturer:	Senpu Fishing Tackle Co., Ltd.
Address of Manufacturer:	Floor 2 No 2 Building Fucheng Industrial Park, 82nd Shilian lu, Shiji Town, Panyu District, GuangZhou

6.2 General Description of EUT

Product Name:	Food Temperature Probe	
Model No.(EUT):	VRKRTS03WREG01	
Trade Mark:	V-MARK	
EUT Supports Radios application:	2405-2480MHz (2405MHz/2440MHz/2480MHz)	
Power Supply:	Battery	AAA 1.5V*2
Sample Received Date:	Mar. 16, 2020	
Sample tested Date:	Mar. 16, 2020 to Apr. 13, 2020	

6.3 Product Specification subjective to this standard

Operation Frequency:	2405MHz to 2480MHz
Channel Numbers:	16
Type of Modulation:	OQPSK
Test Power Grade:	Default
Test Software of EUT:	Default
Antenna Type and Gain:	Type: PCB Antenna Gain:2dBi
Test Voltage:	DC 3V

Operation Frequency each of channel

Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2405	7	2435	13	2465
2	2410	8	2440	14	2470
3	2415	9	2445	15	2475
4	2420	10	2450	16	2480
5	2425	11	2455		
6	2430	12	2460		

6.4 Description of Support Units

The EUT has been tested independently

6.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd

Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China

Telephone: +86 (0) 755 33683668 Fax: +86 (0) 755 33683385

No tests were sub-contracted.

FCC Designation No.: CN1164

6.6 Deviation from Standards

None.

6.7 Abnormalities from Standard Conditions

None.

6.8 Other Information Requested by the Customer

None.

6.9 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.9 x 10 ⁻⁸
2	RF power, conducted	0.46dB (30MHz-1GHz)
		0.55dB (1GHz-18GHz)
3	Radiated Spurious emission test	4.3dB (30MHz-1GHz)
		4.5dB (1GHz-12.75GHz)
4	Conduction emission	3.5dB (9kHz to 150kHz)
		3.1dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	3.8%
7	DC power voltages	0.026%

7 Equipment List

RF test system					
Equipment	Manufacturer	Mode No.	Serial Number	Cal. Date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
Spectrum Analyzer	Keysight	N9010A	MY54510339	02-17-2020	02-16-2021
Signal Generator	Keysight	N5182B	MY53051549	02-17-2020	02-16-2021
Temperature/ Humidity Indicator	biaozhi	HM10	1804186	07-26-2019	07-25-2020
High-pass filter	Sinoscite	FL3CX03WG18N M12-0398-002	---	---	---
High-pass filter	MICRO-TRONICS	SPA-F-63029-4	---	---	---
DC Power	Keysight	E3642A	MY56376072	02-17-2020	02-16-2021
PC-1	Lenovo	R4960d	---	---	---
BT&WI-FI Automatic control	R&S	OSP120	101374	02-17-2020	02-16-2021
RF control unit	JS Tonscend	JS0806-2	158060006	02-17-2020	02-16-2021
BT&WI-FI Automatic test software	JS Tonscend	JS1120-3	---	---	---

3M Semi/full-anechoic Chamber					
Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
3M Chamber & Accessory Equipment	TDK	SAC-3	---	05-24-2019	05-23-2022
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-618	07-26-2019	07-25-2020
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-076	04-25-2018	04-24-2021
Receiver	R&S	ESCI7	100938-003	10-21-2019	10-20-2020
Multi device Controller	matur	NCD/070/107 11112	---	---	---
Temperature/ Humidity Indicator	Shanghai qixiang	HM10	1804298	07-26-2019	07-25-2020
Cable line	Fulai(7M)	SF106	5219/6A	---	---
Cable line	Fulai(6M)	SF106	5220/6A	---	---
Cable line	Fulai(3M)	SF106	5216/6A	---	---
Cable line	Fulai(3M)	SF106	5217/6A	---	---

3M full-anechoic Chamber					
Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
RSE Automatic test software	JS Tonscend	JS36-RSE	10166	06-19-2019	06-18-2020
Receiver	Keysight	N9038A	MY57290136	03-05-2020	03-04-2021
Spectrum Analyzer	Keysight	N9020B	MY57111112	03-05-2020	03-04-2021
Spectrum Analyzer	Keysight	N9030B	MY57140871	03-05-2020	03-04-2021
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-1148	04-25-2018	04-24-2021
Horn Antenna	Schwarzbeck	BBHA 9170	9170-832	04-25-2018	04-24-2021
Horn Antenna	ETS-LINDGREN	3117	00057407	07-10-2018	07-09-2021
Preamplifier	EMCI	EMC184055SE	980596	05-22-2019	05-21-2020
Preamplifier	EMCI	EMC001330	980563	05-08-2019	05-07-2020
Preamplifier	JS Tonscend	980380	EMC051845 SE	01-09-2020	01-08-2021
Temperature/ Humidity Indicator	biaozhi	GM1360	EE1186631	04-30-2019	04-29-2020
Fully Anechoic Chamber	TDK	FAC-3	---	01-17-2018	01-16-2021
Filter bank	JS Tonscend	JS0806-F	188060094	04-10-2018	04-09-2021
Cable line	Times	SFT205-NMSM-2.50M	394812-0001	---	---
Cable line	Times	SFT205-NMSM-2.50M	394812-0002	---	---
Cable line	Times	SFT205-NMSM-2.50M	394812-0003	---	---
Cable line	Times	SFT205-NMSM-2.50M	393495-0001	---	---
Cable line	Times	EMC104-NMNM-1000	SN160710	---	---
Cable line	Times	SFT205-NMSM-3.00M	394813-0001	---	---
Cable line	Times	SFT205-NMNM-1.50M	381964-0001	---	---
Cable line	Times	SFT205-NMSM-7.00M	394815-0001	---	---
Cable line	Times	HF160-KMKM-3.00M	393493-0001	---	---

8 Radio Technical Requirements Specification

Reference documents for testing:

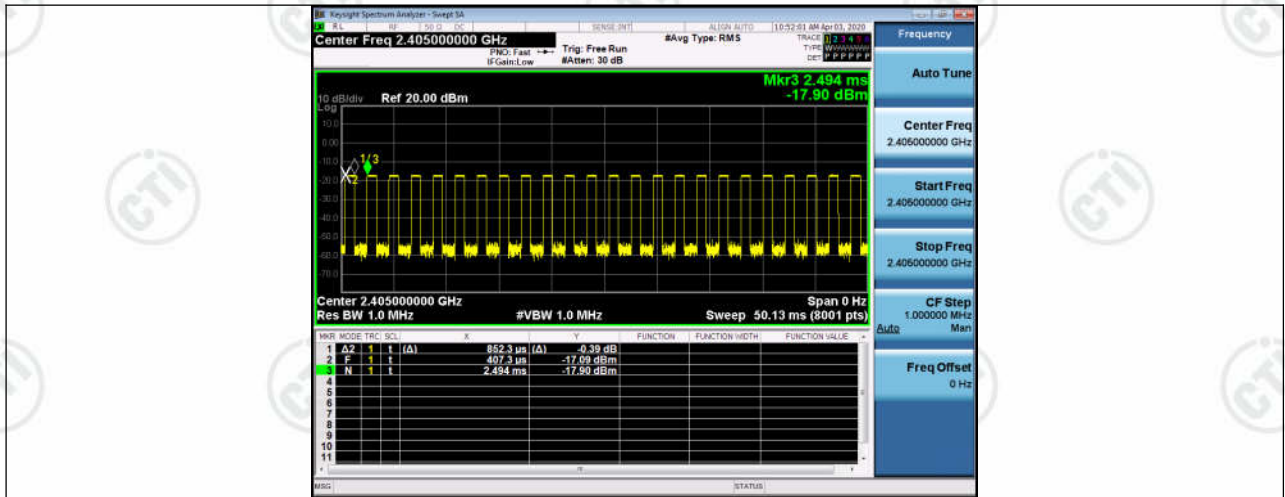
No.	Identity	Document Title
1	FCC Part15C (2015)	Subpart C-Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Test Results List:

Test Requirement	Test method	Test item	Verdict	Note
Part15C Section 15.247 (b)(3)	ANSI 63.10	Conducted Peak Output Power	PASS	Appendix A)
Part15C Section 15.247 (a)(2)	ANSI 63.10	6dB Occupied Bandwidth	PASS	Appendix B)
Part15C Section 15.247(d)	ANSI 63.10	Band-edge for RF Conducted Emissions	PASS	Appendix C)
Part15C Section 15.247(d)	ANSI 63.10	RF Conducted Spurious Emissions	PASS	Appendix D)
Part15C Section 15.247 (e)	ANSI 63.10	Power Spectral Density	PASS	Appendix E)
Part15C Section 15.203/15.247 (c)	ANSI 63.10	Antenna Requirement	PASS	Appendix F)
Part15C Section 15.207	ANSI 63.10	AC Power Line Conducted Emission	N/A	N/A
Part15C Section 15.205/15.209	ANSI 63.10	Restricted bands around fundamental frequency (Radiated Emission)	PASS	Appendix G)
Part15C Section 15.205/15.209	ANSI 63.10	Radiated Spurious Emissions	PASS	Appendix H)

EUT DUTY CYCLE

Duty Cycle		
TX ON(ms)	TX ALL(ms)	Duty Cycle(%)
0.8523	2.0867	40.84%



Appendix A): 6dB Occupied Bandwidth

Test Limit

According to §15.247(a)(2) and RSS-247 section 5.2(a)

6 dB Bandwidth :

Limit	Shall be at least 500kHz
-------	--------------------------

Occupied Bandwidth(99%) : For reporting purposes only.

Test Procedure

Test method Refer as KDB 558074 D01 , section 8.1 and ANSI 63.10:2013 clause 6.9.2 & 6.9.3.

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 100kHz, VBW = 300kHz and Detector = Peak, to measurement 6 dB Bandwidth .
4. SA set RBW = 30kHz, VBW = 100kHz and Detector = Peak, to measurement 99% Bandwidth.
5. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test report.

Test Setup



Test Result

6dB Bandwidth

Channel	6dB Bandwidth [MHz]	Verdict
LCH	1.778	PASS
MCH	1.795	PASS
HCH	1.732	PASS

99%OBW

Channel	99% OBW[MHz]	Verdict
LCH	2.6074	PASS
MCH	2.6104	PASS
HCH	2.5823	PASS

Test Graphs
6dB Bandwidth

Graphs	
LCH	<p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.405000000 GHz Center Freq: 2.405000000 GHz Radio Std: None</p> <p>Ref Offset 19.6 dB Ref 20.00 dBm</p> <p>Span 5.2 MHz</p> <p>Occupied Bandwidth Total Power 8.81 dBm</p> <p>2.6988 MHz</p> <p>Transmit Freq Error -98.085 kHz OBW Power 99.00 %</p> <p>x dB Bandwidth 1.778 MHz x dB -6.00 dB</p>
MCH	<p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.440000000 GHz Center Freq: 2.440000000 GHz Radio Std: None</p> <p>Ref Offset 19.77 dB Ref 20.00 dBm</p> <p>Span 5.2 MHz</p> <p>Occupied Bandwidth Total Power 8.60 dBm</p> <p>2.6935 MHz</p> <p>Transmit Freq Error -106.62 kHz OBW Power 99.00 %</p> <p>x dB Bandwidth 1.795 MHz x dB -6.00 dB</p>
HCH	<p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.480000000 GHz Center Freq: 2.480000000 GHz Radio Std: None</p> <p>Ref Offset 19.77 dB Ref 15.00 dBm</p> <p>Span 5.2 MHz</p> <p>Occupied Bandwidth Total Power 7.89 dBm</p> <p>2.6659 MHz</p> <p>Transmit Freq Error -105.79 kHz OBW Power 99.00 %</p> <p>x dB Bandwidth 1.732 MHz x dB -6.00 dB</p>

99%OBW

Graphs	
LCH	<p>Keyight Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.405000000 GHz</p> <p>Ref Offset 19.6 dB Ref 20.00 dBm</p> <p>Center 2.405 GHz #Res BW 30 kHz</p> <p>Span 5.2 MHz Sweep 5.867 ms</p> <p>Occupied Bandwidth 2.6074 MHz</p> <p>Total Power 9.28 dBm</p> <p>Transmit Freq Error -99.327 kHz</p> <p>x dB Bandwidth 1.466 MHz</p> <p>OBW Power 99.00 %</p> <p>Freq Offset 0 Hz</p>
MCH	<p>Keyight Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.440000000 GHz</p> <p>Ref Offset 19.77 dB Ref 20.00 dBm</p> <p>Center 2.44 GHz #Res BW 30 kHz</p> <p>Span 5.2 MHz Sweep 5.867 ms</p> <p>Occupied Bandwidth 2.6104 MHz</p> <p>Total Power 9.01 dBm</p> <p>Transmit Freq Error -103.23 kHz</p> <p>x dB Bandwidth 1.801 MHz</p> <p>OBW Power 99.00 %</p> <p>Freq Offset 0 Hz</p>
HCH	<p>Keyight Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.480000000 GHz</p> <p>Ref Offset 19.77 dB Ref 10.00 dBm</p> <p>Center 2.48 GHz #Res BW 30 kHz</p> <p>Span 5.2 MHz Sweep 5.867 ms</p> <p>Occupied Bandwidth 2.5823 MHz</p> <p>Total Power 8.42 dBm</p> <p>Transmit Freq Error -111.58 kHz</p> <p>x dB Bandwidth 1.808 MHz</p> <p>OBW Power 99.00 %</p> <p>Freq Offset 0 Hz</p>

Appendix B): Conducted Peak Output Power

Test Limit

According to §15.247(b) and RSS-247 section 5.4(d)

Peak output power :

For systems using digital modulation in the 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt(30 dBm), base on the use of antennas with directional gain not exceed 6 dBi If transmitting antennas of directional gain greater than 6dBi are used the peak output power the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

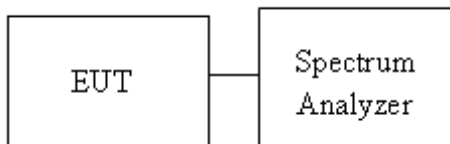
Limit	<input checked="" type="checkbox"/> Antenna not exceed 6 dBi : 30dBm <input type="checkbox"/> Antenna with DG greater than 6 dBi [Limit = 30 – (DG – 6)] <input type="checkbox"/> Point-to-point operation
-------	---

Test Procedure

Test method Refer as KDB 558074 D01 , section 9.1.2.

1. The EUT RF output connected to spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT.
3. Spectrum analyzer settings are as follows:
 - a) Set the RBW \geq DTS bandwidth.
 - b) Set VBW \geq [3 \times RBW].
 - c) Set span \geq [3 \times RBW].
 - d) Sweep time = auto couple.
 - e) Detector = peak.
 - f) Trace mode = max hold.
 - g) Allow trace to fully stabilize.
 - h) Use peak marker function to determine the peak amplitude level
4. Measure and record the result in the test report.

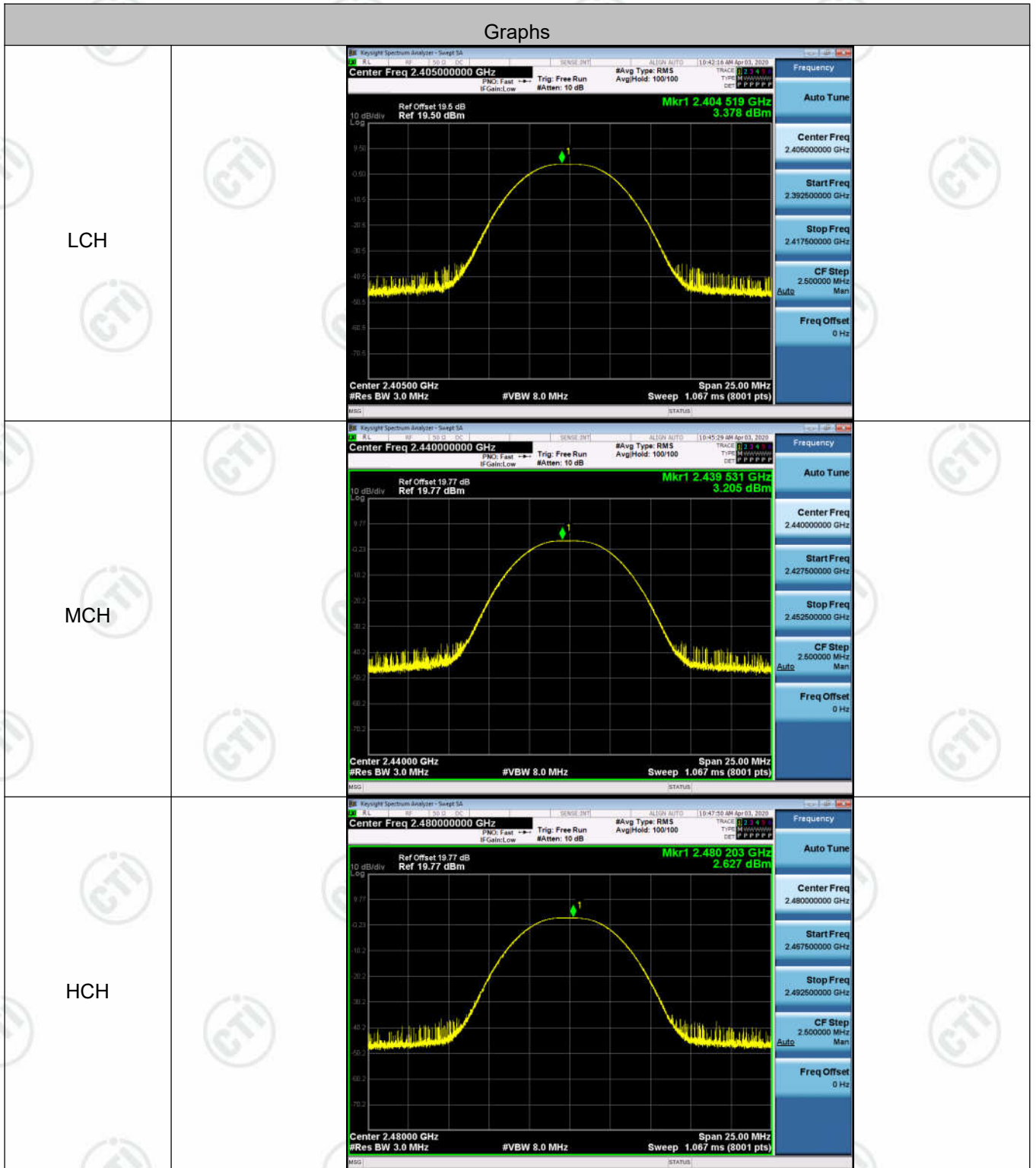
Test Setup



Test Result

Channel	Conduct Peak Power[dBm]	Verdict
LCH	3.378	PASS
MCH	3.205	PASS
HCH	2.627	PASS

Test Graphs



Appendix C): Band-edge for RF Conducted Emissions

Test Limit

According to §15.247(d) and RSS-247 section 5.5

In any 100 kHz bandwidth outside the authorized frequency band,

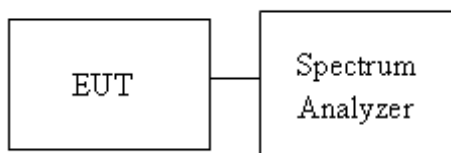
Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Test Procedure

Test method Refer as KDB 558074 D01 , Section 11.

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.
2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.
3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Test Setup



Result Table

Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
LCH	-0.887	-59.928	-20.89	PASS
HCH	-1.858	-50.170	-21.86	PASS

Test Graphs



Appendix D): RF Conducted Spurious Emissions

Test Limit

According to §15.247(d) and RSS-247 section 5.5

In any 100 kHz bandwidth outside the authorized frequency band,

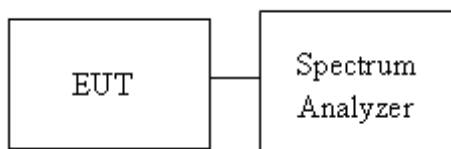
Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Test Procedure

Test method Refer as KDB 558074 D01 , Section 11.

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.
2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.
3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

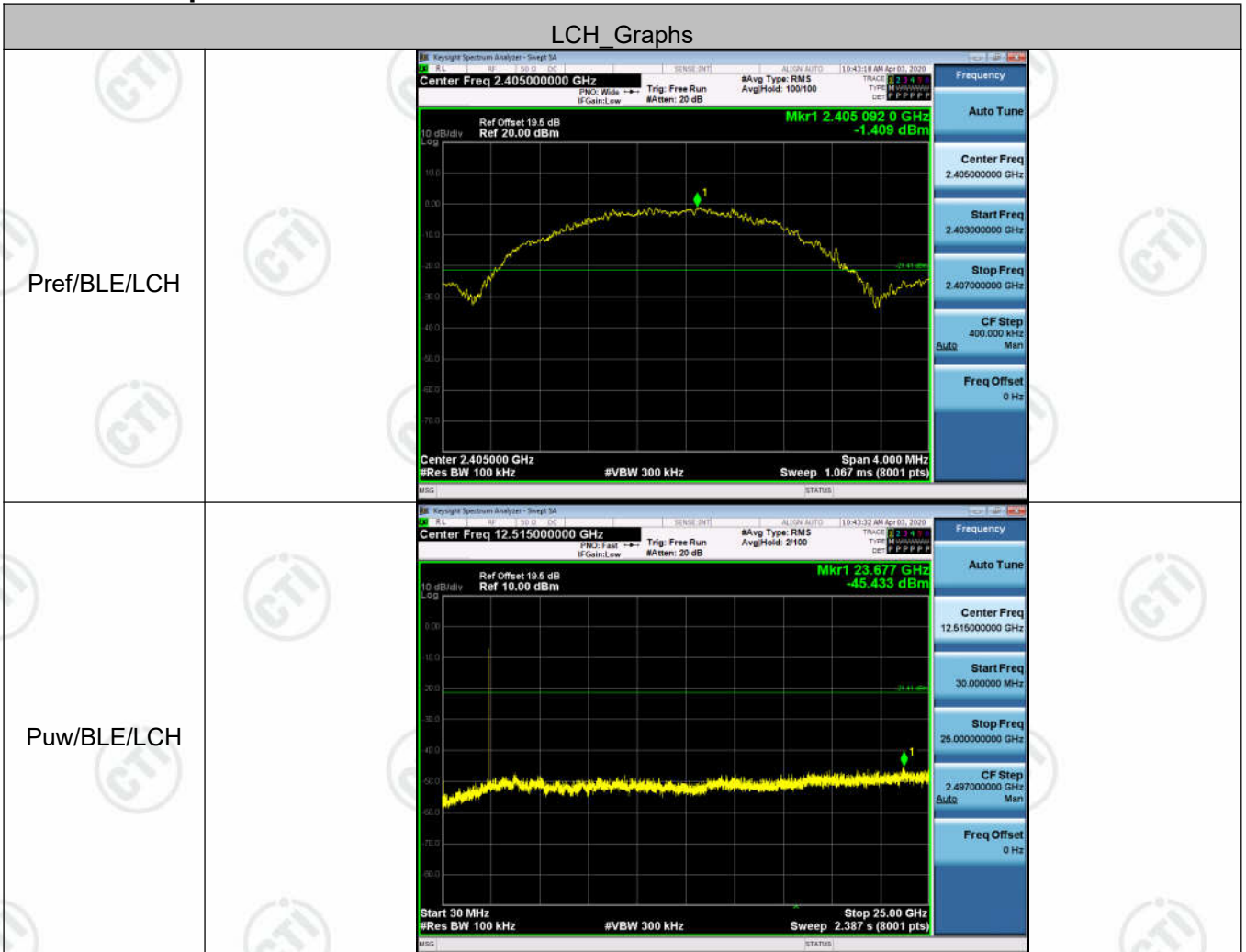
Test Setup

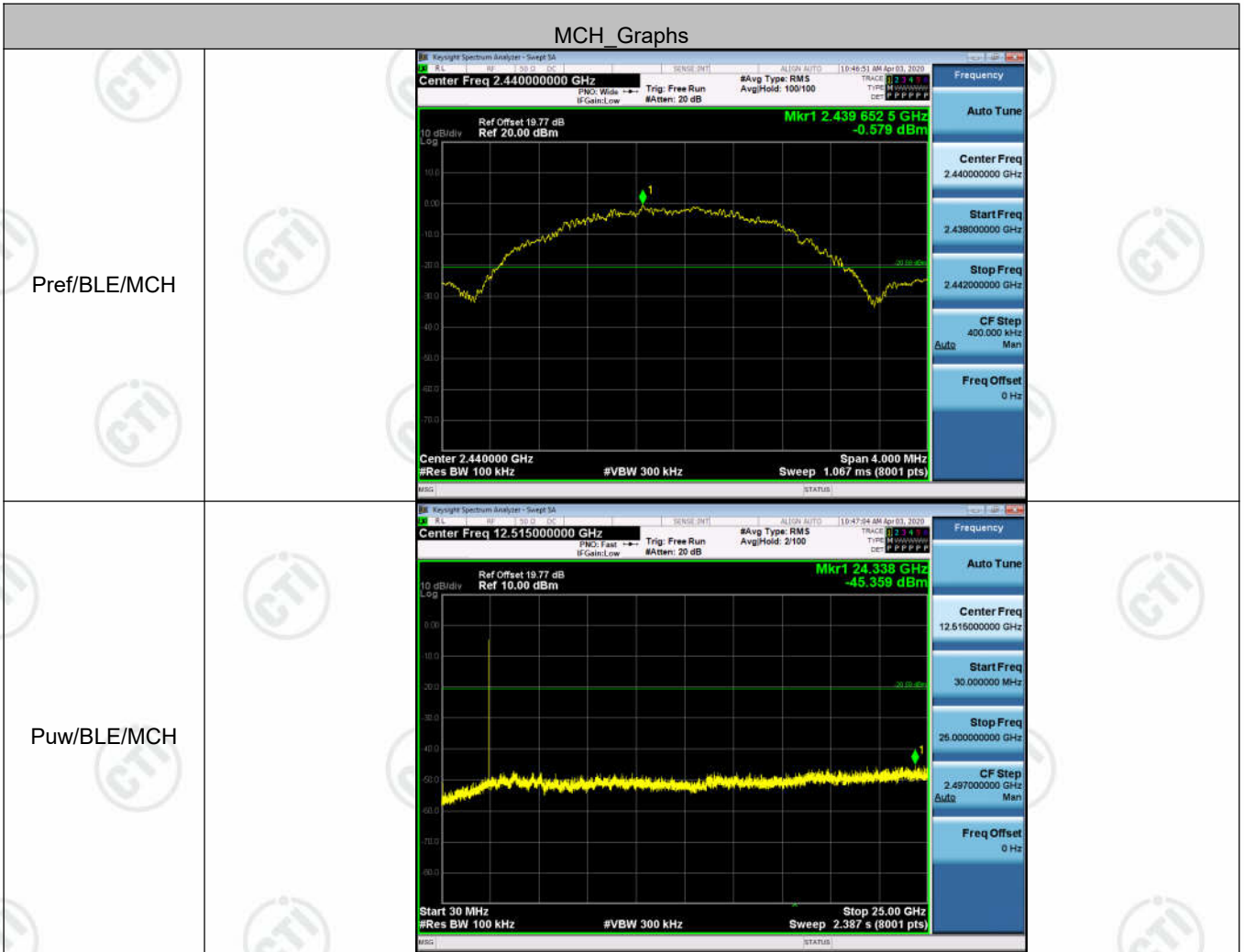


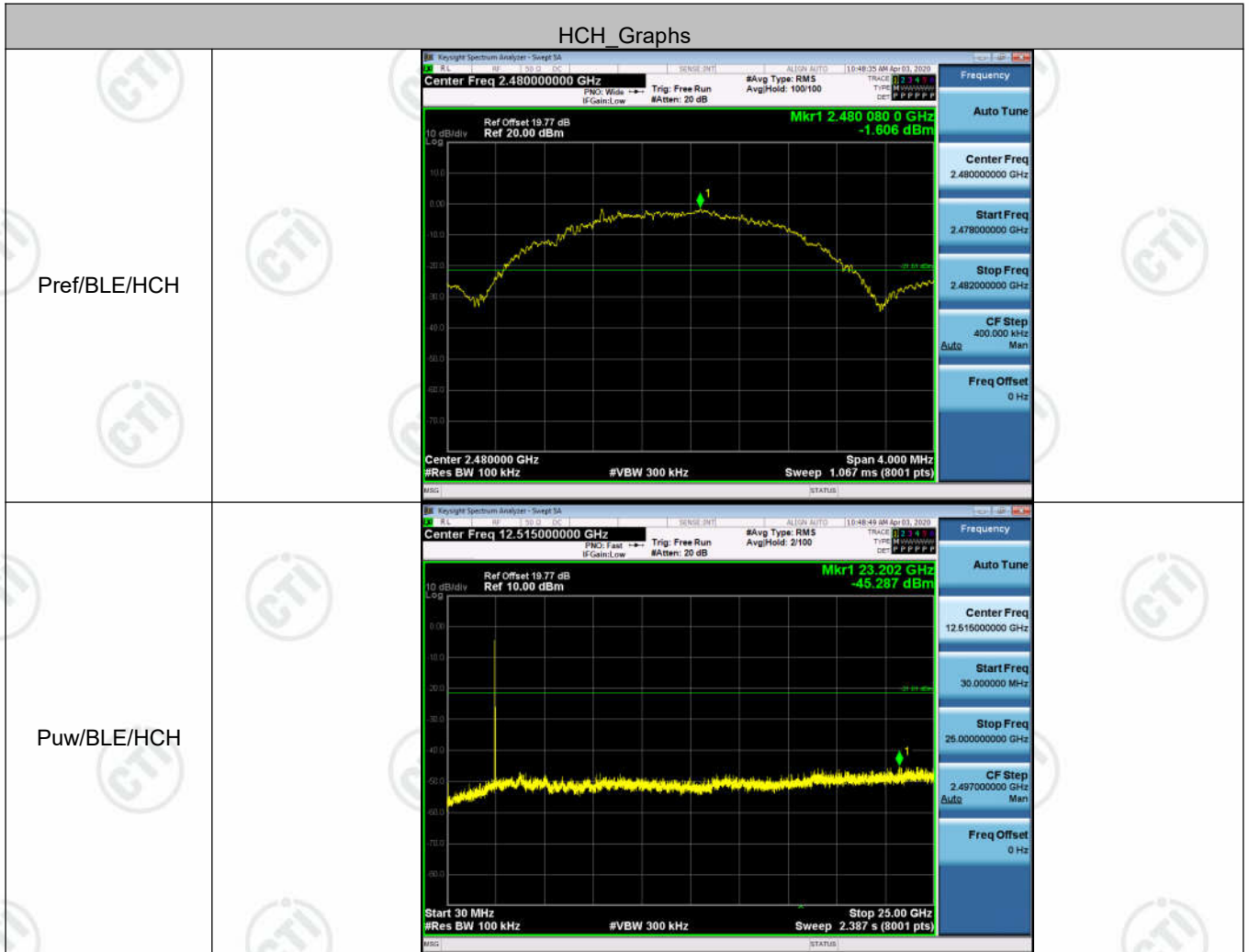
Result Table

Channel	Pref [dBm]	Puw[dBm]	Verdict
LCH	-1.409	<Limit	PASS
MCH	-0.579	<Limit	PASS
HCH	-1.606	<Limit	PASS

Test Graphs







Appendix E): Power Spectral Density

Test Limit

According to §15.247(e) and RSS-247 section 5.2(b)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Limit	<input checked="" type="checkbox"/> Antenna not exceed 6 dBi : 8dBm <input type="checkbox"/> Antenna with DG greater than 6 dBi [Limit = 8 – (DG – 6)] <input type="checkbox"/> Point-to-point operation :
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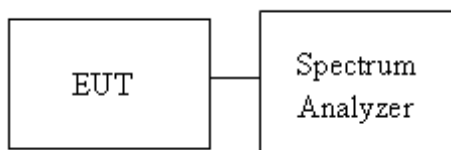
Test Procedure

Test method Refer as KDB 558074 D01 , Section 10.2

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 3kHz, VBW = 10kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = Peak, Sweep Time = Auto and Trace = Max hold.
4. The path loss and Duty Factor were compensated to the results for each measurement by SA.
5. Mark the maximum level.

Measure and record the result of power spectral density. in the test report.

Test Setup



Result Table

Channel	PSD [dBm]	Verdict
LCH	-12.383	PASS
MCH	-13.589	PASS
HCH	-14.046	PASS

Test Graphs

Graphs	
LCH	<p>KeySight Spectrum Analyzer - Sweep SA Center Freq 2.40500000 GHz Ref Offset 19.6 dB Ref 10.00 dBm Mkr1 2.405 165.0 GHz -12.383 dBm Center 2.405000 GHz #Res BW 3.0 kHz #VBW 10 kHz Sweep 284.8 ms (8001 pts) Span 2.700 MHz</p>
MCH	<p>KeySight Spectrum Analyzer - Sweep SA Center Freq 2.44000000 GHz Ref Offset 19.77 dB Ref 10.00 dBm Mkr1 2.439 958.2 GHz -13.589 dBm Center 2.440000 GHz #Res BW 3.0 kHz #VBW 10 kHz Sweep 284.8 ms (8001 pts) Span 2.700 MHz</p>
HCH	<p>KeySight Spectrum Analyzer - Sweep SA Center Freq 2.48000000 GHz Ref Offset 19.77 dB Ref 10.00 dBm Mkr1 2.479 957.5 GHz -14.046 dBm Center 2.480000 GHz #Res BW 3.0 kHz #VBW 10 kHz Sweep 284.8 ms (8001 pts) Span 2.700 MHz</p>

Appendix F): Antenna Requirement

15.203 requirement:

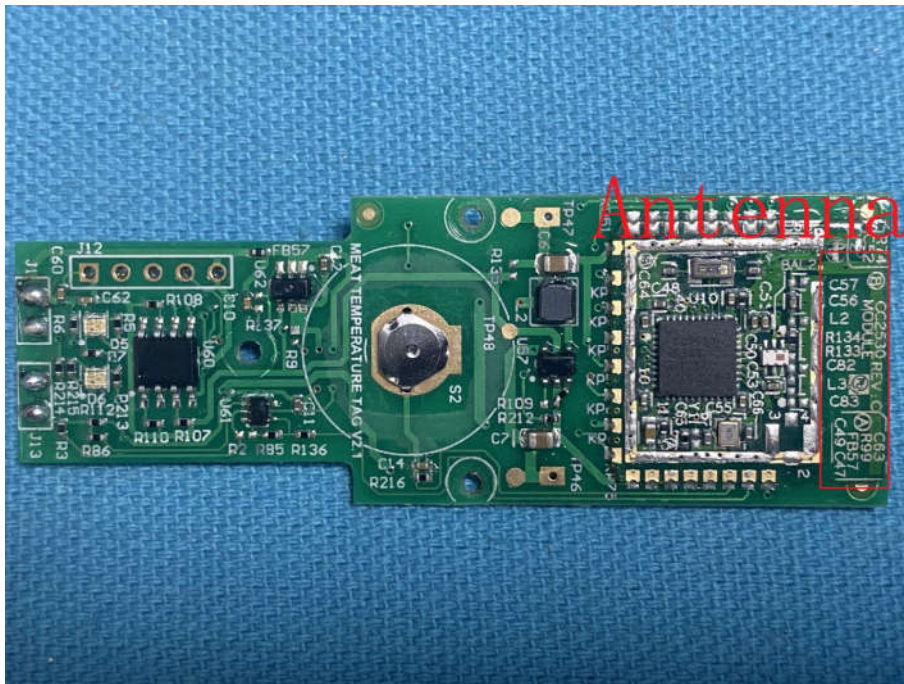
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

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.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2dBi.



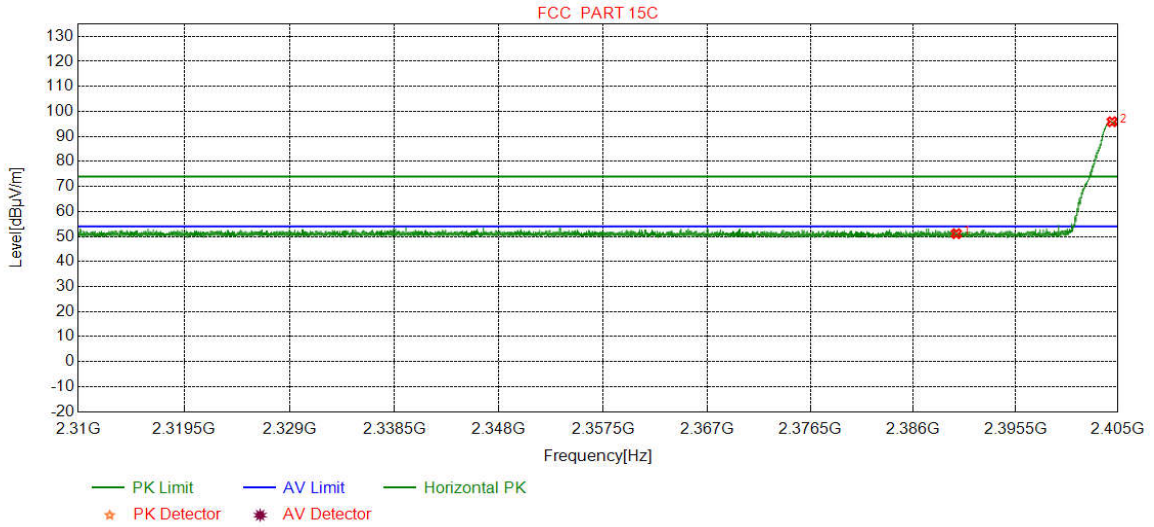
Appendix G): Restricted bands around fundamental frequency (Radiated)

Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Test Procedure:	<p>Below 1GHz test procedure as below:</p> <ol style="list-style-type: none"> The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel <p>Above 1GHz test procedure as below:</p> <ol style="list-style-type: none"> Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter). Test the EUT in the lowest channel , the Highest channel The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case. Repeat above procedures until all frequencies measured was complete. 				
Limit:	Frequency	Limit (dB μ V/m @3m)	Remark		
	30MHz-88MHz	40.0	Quasi-peak Value		
	88MHz-216MHz	43.5	Quasi-peak Value		
	216MHz-960MHz	46.0	Quasi-peak Value		
	960MHz-1GHz	54.0	Quasi-peak Value		
	Above 1GHz	54.0	Average Value		
		74.0	Peak Value		

Test plot as follows:

Mode:	OQPSK	Channel:	2405
Remark:	PK		

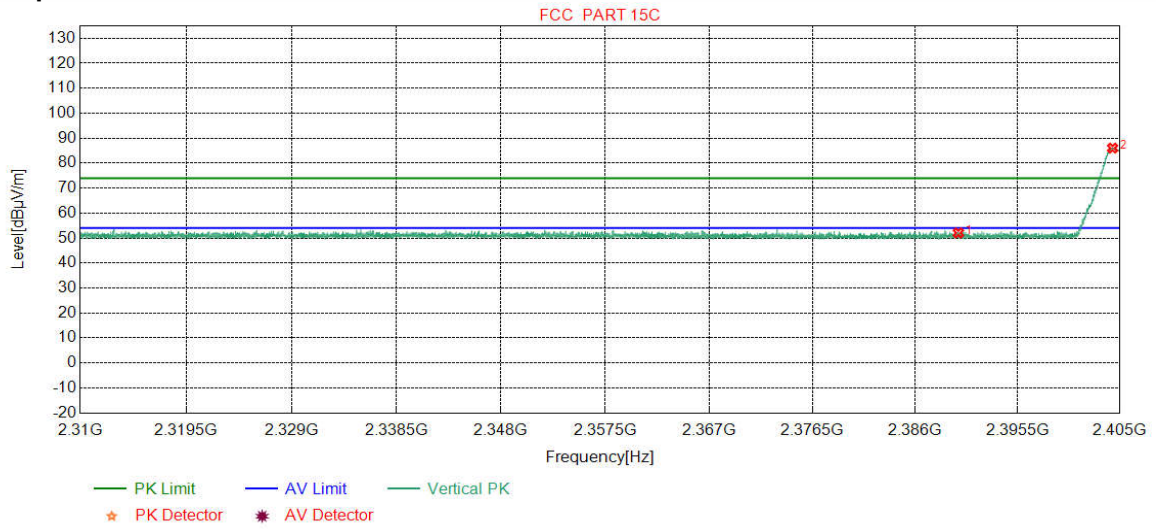
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-43.12	48.63	51.13	74.00	22.87	Pass	Horizontal
2	2404.4743	32.27	13.32	-43.12	93.40	95.87	74.00	-21.87	Pass	Horizontal

Mode:	OQPSK	Channel:	2405
Remark:	PK		

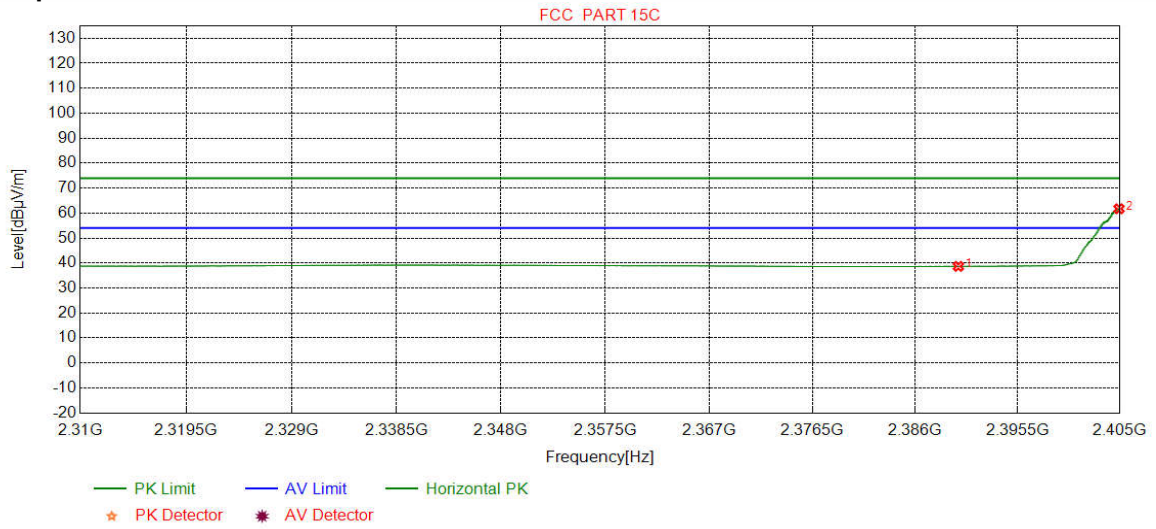
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-43.12	49.57	52.07	74.00	21.93	Pass	Vertical
2	2404.3286	32.27	13.32	-43.12	83.55	86.02	74.00	-12.02	Pass	Vertical

Mode:	OQPSK	Channel:	2405
Remark:	AV		

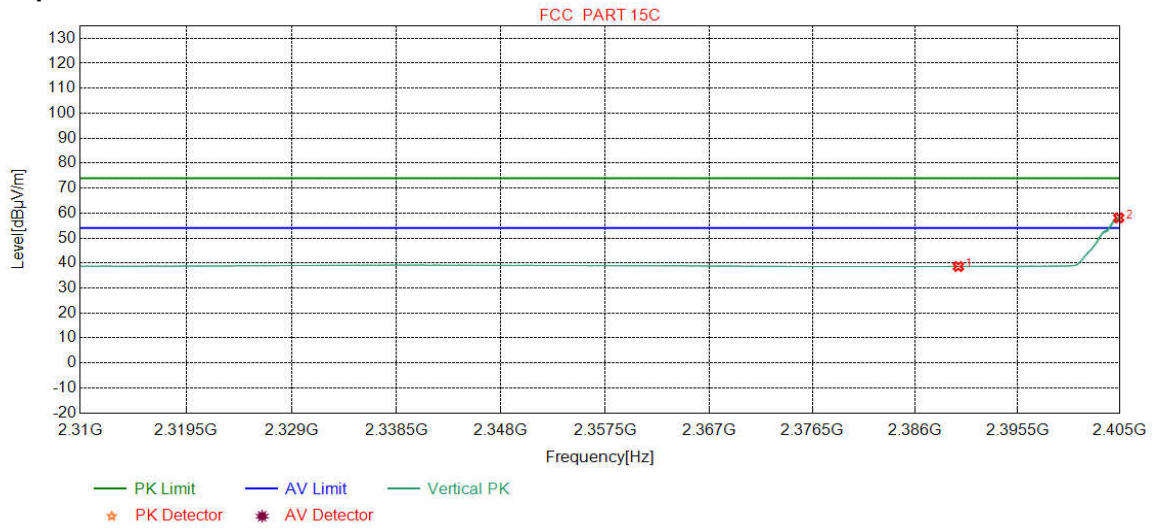
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-43.12	36.17	38.67	54.00	15.33	Pass	Horizontal
2	2404.9303	32.27	13.32	-43.12	59.26	61.73	54.00	-7.73	Pass	Horizontal

Mode:	OQPSK	Channel:	2405
Remark:	AV		

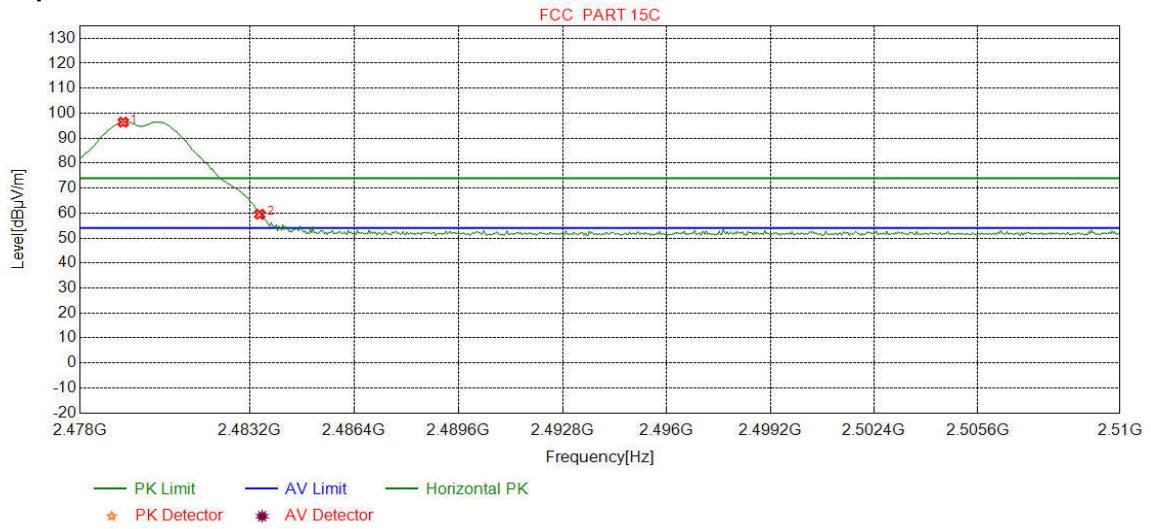
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-43.12	36.10	38.60	54.00	15.40	Pass	Vertical
2	2404.9050	32.27	13.32	-43.12	55.61	58.08	54.00	-4.08	Pass	Vertical

Mode:	OQPSK	Channel:	2480
Remark:	PK		

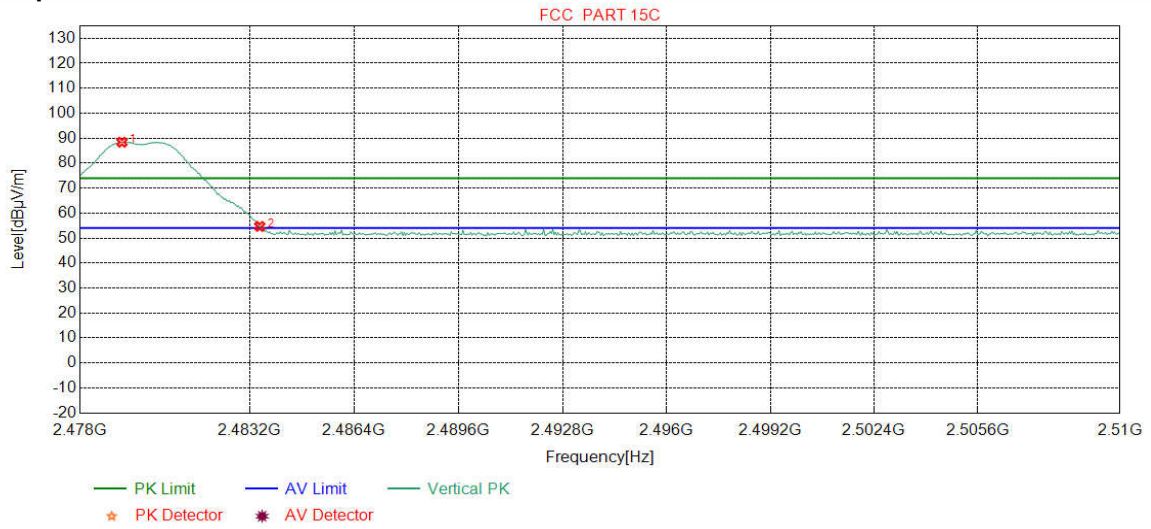
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2479.3217	32.37	13.40	-43.11	93.73	96.39	74.00	-22.39	Pass	Horizontal
2	2483.5000	32.38	13.38	-43.11	56.88	59.53	74.00	14.47	Pass	Horizontal

Mode:	OQPSK	Channel:	2480
Remark:	PK		

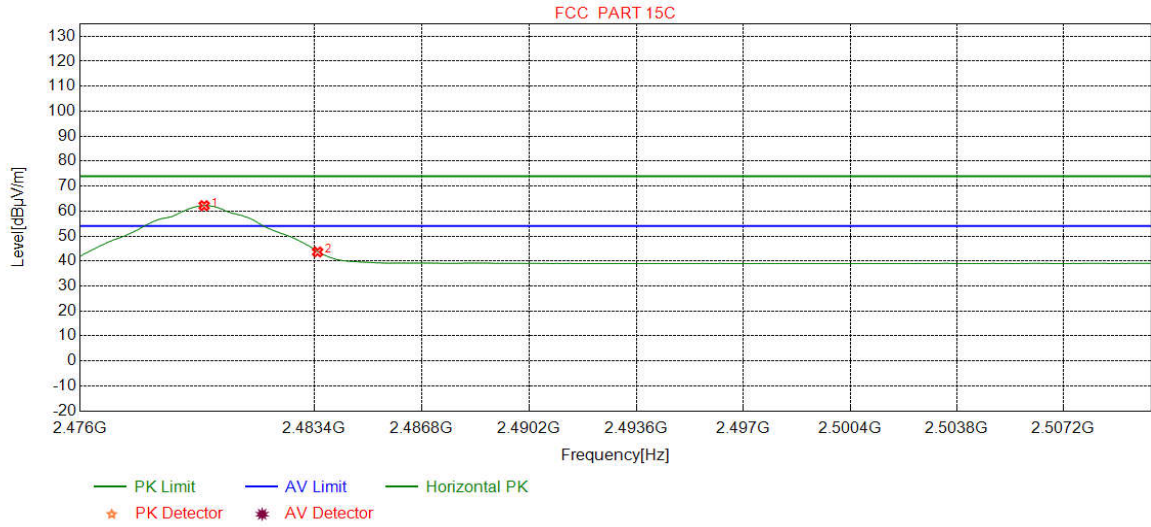
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2479.2816	32.37	13.40	-43.11	85.72	88.38	74.00	-14.38	Pass	Vertical
2	2483.5000	32.38	13.38	-43.11	52.02	54.67	74.00	19.33	Pass	Vertical

Mode:	OQPSK	Channel:	2480
Remark:	AV		

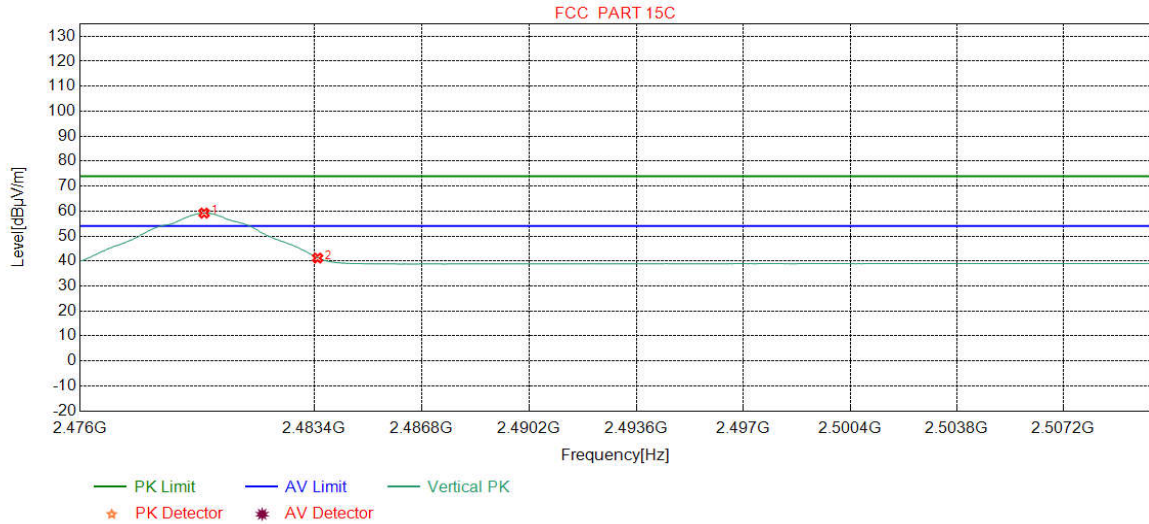
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2479.9149	32.37	13.39	-43.10	59.53	62.19	54.00	-8.19	Pass	Horizontal
2	2483.5000	32.38	13.38	-43.11	40.99	43.64	54.00	10.36	Pass	Horizontal

Mode:	OQPSK	Channel:	2480
Remark:	AV		

Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2479.9149	32.37	13.39	-43.10	56.53	59.19	54.00	-5.19	Pass	Vertical
2	2483.5000	32.38	13.38	-43.11	38.54	41.19	54.00	12.81	Pass	Vertical

Note:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading - Correct Factor

Correct Factor = Preamplifier Factor - Antenna Factor - Cable Factor

Appendix H): Radiated Spurious Emissions

Receiver Setup:					
	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Test Procedure:					
Below 1GHz test procedure as below:					
a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.					
Above 1GHz test procedure as below:					
g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).; h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case. j. Repeat above procedures until all frequencies measured was complete.					
Limit:					
	Frequency	Field strength (microvolt/meter)	Limit (dBµV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.					

**Radiated Spurious Emissions test Data:
 Radiated Emission below 1GHz**

Mode:			OQPSK					Channel:		2440	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	34.9475	10.70	0.65	-31.43	44.11	24.03	40.00	15.97	Pass	H	PK
2	130.0170	7.70	1.33	-32.02	44.49	21.50	43.50	22.00	Pass	H	PK
3	195.0135	10.43	1.64	-31.94	46.28	26.41	43.50	17.09	Pass	H	PK
4	360.0270	14.52	2.27	-31.84	42.05	27.00	46.00	19.00	Pass	H	PK
5	649.9890	19.40	3.10	-32.07	41.09	31.52	46.00	14.48	Pass	H	PK
6	974.9715	22.55	3.75	-30.95	37.52	32.87	54.00	21.13	Pass	H	PK
7	35.5296	10.87	0.66	-31.41	43.60	23.72	40.00	16.28	Pass	V	PK
8	150.0010	7.55	1.45	-32.01	48.53	25.52	43.50	17.98	Pass	V	PK
9	195.0135	10.43	1.64	-31.94	46.61	26.74	43.50	16.76	Pass	V	PK
10	360.0270	14.52	2.27	-31.84	43.28	28.23	46.00	17.77	Pass	V	PK
11	649.9890	19.40	3.10	-32.07	40.68	31.11	46.00	14.89	Pass	V	PK
12	974.9715	22.55	3.75	-30.95	36.62	31.97	54.00	22.03	Pass	V	PK

Transmitter Emission above 1GHz

Mode:			OQPSK					Channel:		2405	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1856.0856	30.75	3.38	-42.84	51.86	43.15	74.00	30.85	Pass	H	PK
2	2942.3942	33.11	4.40	-43.11	51.43	45.83	74.00	28.17	Pass	H	PK
3	3960.0640	33.77	4.34	-43.01	49.64	44.74	74.00	29.26	Pass	H	PK
4	5014.1343	34.51	4.84	-42.79	50.76	47.32	74.00	26.68	Pass	H	PK
5	6029.2019	35.81	5.26	-42.59	49.24	47.72	74.00	26.28	Pass	H	PK
6	7216.2811	36.32	5.81	-42.16	51.91	51.88	74.00	22.12	Pass	H	PK
7	1933.2933	31.26	3.42	-43.04	50.46	42.10	74.00	31.90	Pass	V	PK
8	2917.3917	33.07	4.39	-43.11	50.74	45.09	74.00	28.91	Pass	V	PK
9	3807.0538	33.65	4.37	-43.04	51.25	46.23	74.00	27.77	Pass	V	PK
10	5389.1593	34.89	4.84	-42.64	49.11	46.20	74.00	27.80	Pass	V	PK
11	5922.1948	35.68	5.18	-42.61	49.85	48.10	74.00	25.90	Pass	V	PK
12	7014.2676	36.11	5.69	-42.20	49.62	49.22	74.00	24.78	Pass	V	PK

Mode:			OQPSK					Channel:		2440	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1773.8774	30.21	3.27	-42.70	50.98	41.76	74.00	32.24	Pass	H	PK
2	3048.0032	33.22	4.83	-43.10	50.46	45.41	74.00	28.59	Pass	H	PK
3	4101.0734	33.94	4.32	-42.95	49.36	44.67	74.00	29.33	Pass	H	PK
4	5018.1345	34.52	4.84	-42.79	50.87	47.44	74.00	26.56	Pass	H	PK
5	6377.2251	35.88	5.38	-42.53	50.20	48.93	74.00	25.07	Pass	H	PK
6	7671.3114	36.53	6.20	-42.14	48.76	49.35	74.00	24.65	Pass	H	PK
7	2076.3076	31.81	3.57	-43.19	50.39	42.58	74.00	31.42	Pass	V	PK
8	3047.0031	33.22	4.84	-43.11	51.05	46.00	74.00	28.00	Pass	V	PK
9	4984.1323	34.50	4.82	-42.80	50.86	47.38	74.00	26.62	Pass	V	PK
10	6353.2235	35.87	5.45	-42.53	50.18	48.97	74.00	25.03	Pass	V	PK
11	7913.3276	36.43	6.04	-42.18	49.34	49.63	74.00	24.37	Pass	V	PK
12	9737.4492	37.69	6.73	-42.09	49.17	51.50	74.00	22.50	Pass	V	PK

Mode:			OQPSK					Channel:		2480	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1709.4709	29.78	3.21	-42.67	50.90	41.22	74.00	32.78	Pass	H	PK
2	3424.0283	33.37	4.50	-43.10	49.55	44.32	74.00	29.68	Pass	H	PK
3	4629.1086	34.50	4.92	-42.80	49.73	46.35	74.00	27.65	Pass	H	PK
4	5011.1341	34.51	4.83	-42.79	51.00	47.55	74.00	26.45	Pass	H	PK
5	7485.2990	36.59	5.93	-42.11	49.46	49.87	74.00	24.13	Pass	H	PK
6	8519.3680	36.64	6.42	-41.99	48.92	49.99	74.00	24.01	Pass	H	PK
7	1668.4668	29.51	3.16	-42.73	51.94	41.88	74.00	32.12	Pass	V	PK
8	3729.0486	33.58	4.30	-43.05	49.70	44.53	74.00	29.47	Pass	V	PK
9	5000.1333	34.50	4.82	-42.80	51.04	47.56	74.00	26.44	Pass	V	PK
10	6096.2064	35.82	5.26	-42.59	50.22	48.71	74.00	25.29	Pass	V	PK
11	7656.3104	36.54	6.16	-42.13	49.72	50.29	74.00	23.71	Pass	V	PK
12	9144.4096	37.67	6.45	-42.03	49.17	51.26	74.00	22.74	Pass	V	PK

Note:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading - Correct Factor

Correct Factor = Preamplifier Factor - Antenna Factor - Cable Factor

3) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.