



FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

2.4GHz Digital Headphone

Model: DHP380, DHP380A

Marketing Name: ADH300

Brand: ARKON

Test Report Number:

C170526Z02-RP1

Prepared for

ARKON ELECTRONICS(HUIZHOU)CO.,LIMITED

**NO.4 Taihao Road,High-tech Industrial Park,Sandong Town,Huicheng
District,Huizhou,Guangdong,China**

Prepared by

Compliance Certification Services (Shenzhen) Inc.

No.10-1, Mingkeda Logistics Park, No.18 Huanguan South Rd.,
Guan Lan Town, Baoan District, Shenzhen, China

TEL: 86-755-28055000

FAX: 86-755-28055221

E-Mail: service@ccssz.com

Issued Date: July 3, 2017



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Revision History

Rev.	Issue Data	Revisions	Effect Page	Revised By
00	March 26, 2018	Initial Issue	ALL	Sinphy Xie



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1. TEST RESULT CERTIFICATION

Product:	2.4GHz Digital Headphone
Model:	DHP380, DHP380A
Marketing Name:	ADH300
Brand:	ARKON
Tested:	April 5~June 30, 2017
Applicant:	ARKON ELECTRONICS(HUIZHOU)CO.,LIMITED NO.4 Taihao Road,High-tech Industrial Park,Sandong Town,Huicheng District,Huizhou,Guangdong,China
Manufacturer:	ARKON ELECTRONICS(HUIZHOU)CO.,LIMITED NO.4 Taihao Road,High-tech Industrial Park,Sandong Town,Huicheng District,Huizhou,Guangdong,China

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C	No non-compliance noted

We hereby certify that:

The above equipment was tested by Compliance Certification Services (Shenzhen) Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.207, 15.209 and 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by:

Sunday Hu
Supervisor of EMC Dept.
Compliance Certification Service (Shenzhen)
Inc.

Reviewed by:

Ruby Zhang
Supervisor of Report Dept.
Compliance Certification Service (Shenzhen)
Inc.



2. EUT DESCRIPTION

Product	2.4GHz Digital Headphone
Model Number	DHP380, DHP380A
Marketing Name	ADH300
Brand	ARKON
Model Discrepancy	DHP380 is identical with DHP380A, the only difference lies in the colour.
Identify Number	C170526Z02-RP1
Power Supply	5.0V DC from an external power adapter
Adapter 1 Manufacturer/Model No.	Manufacturer: Dongguan Yinli Electronics Co., Ltd. Model Number.: YLJXA-T050055 Adapter input: 100-240V AC,50/60Hz, 0.5A Max Output: 5.0V DC, 550mA
Adapter 2 Manufacturer/Model No.	Manufacturer: Csec Model Number.:CS3B050055FU Adapter input: 100-240V AC,50/60Hz, 200mA Output: 5.0V DC, 550mA
Received Date	May 26, 2017
Frequency Range	2406MHz~2472MHz
Transmit Power	6.59dBm
Modulation Technique	GFSK
Number of Channels	31 Channels
Number of Hopping Channels	15 Channels
Antenna Specification	Integrated Antenna(s) with -2dBi gain (Max)
Temperature Range	-10°C ~ +50°C

Note: This submittal(s) (test report) is intended for FCC ID: 2APBSDHP381A-001T filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



3. TEST METHODOLOGY

3.1 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Test program used the teraterm-4.87 software to control the EUT for staying in continuous transmitting and receiving mode is programmed.

The following test mode(s) were scanned during the preliminary test below 1G:

Test Item	Test mode	Worse mode
Conducted Emission	Mode 1: Charge	<input type="checkbox"/>
	Mode 2: Play music	<input checked="" type="checkbox"/>
Radiated Emission	Mode 1: Continuously Transmitting	<input checked="" type="checkbox"/>

Above 1G, Channel Low (2406MHz) 、 Mid (2444MHz) and High (2472MHz) were chosen for full testing for GFSK.



4. FACILITIES AND ACCREDITATIONS

4.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

- No.10-1, Mingkeda Logistics Park, No.18, Huanguan South Rd., Guan Lan Town, Baoan District, Shenzhen, China**

The sites are constructed in conformance with the requirements of ANSI C63.10:2013, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

4.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

USA	A2LA
China	CNAS

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

USA	FCC
Japan	VCCI(C-4815, R-4320, T-2317, G-10624)
Canada	INDUSTRY CANADA

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccssz.com>

4.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Parameter	Uncertainty
Radiated Emission, 30 to 200 MHz Test Site : 966(2)	+/-3.6880dB
Radiated Emission, 200 to 1000 MHz Test Site : 966(2)	+/-3.6695dB
Radiated Emission, 1 to 8 GHz	+/-5.1782dB
Radiated Emission, 8 to 18 GHz	+/-5.2173dB
Conducted Emissions	+/-3.6836dB
Band Width	178kHz
Peak Output Power MU	+/-1.906dB
Band Edge MU	+/-0.182dB
Channel Separation MU	416.178Hz
Duty Cycle MU	0.054ms
Frequency Stability MU	226Hz

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

The measured result is above (below) the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance (non-compliance) is more probable than non-compliance) with the specification limit.



5. SETUP OF EQUIPMENT UNDER TEST

5.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

5.2 SUPPORT EQUIPMENT

No.	Equipment	Model No.	Serial No.	FCC ID	Brand	Data Cable	Power Cord
1	IPOD	A1285	YM91546Y3QY	N/A	APPLE	Unshielded 2.00m	N/A

Notes:

Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



6. FCC PART 15.247 REQUIREMENTS

6.1 20DB BANDWIDTH

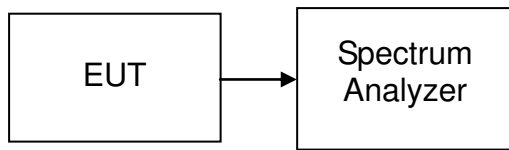
None; for reporting purpose only.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY55370330	02/21/2017	02/20/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST CONFIGURATION



TEST PROCEDURE

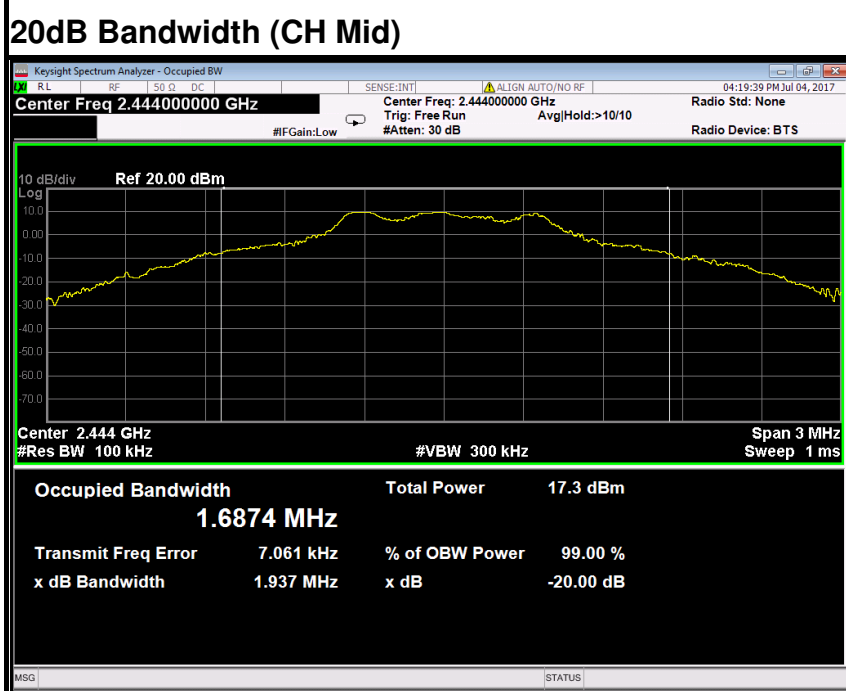
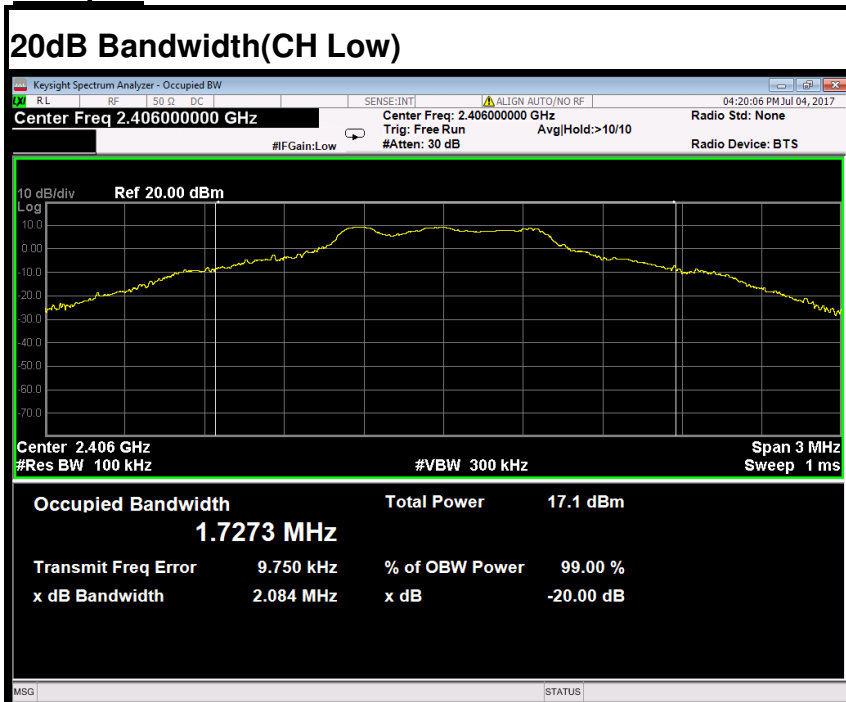
1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT, then connect a low loss RF cable from antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=30kHz, VBW=100kHz, Span=3MHz, Sweep = auto.
4. Mark the peak frequency and 20dB (upper and lower) frequency.
5. Repeat until all the test channels are investigated.

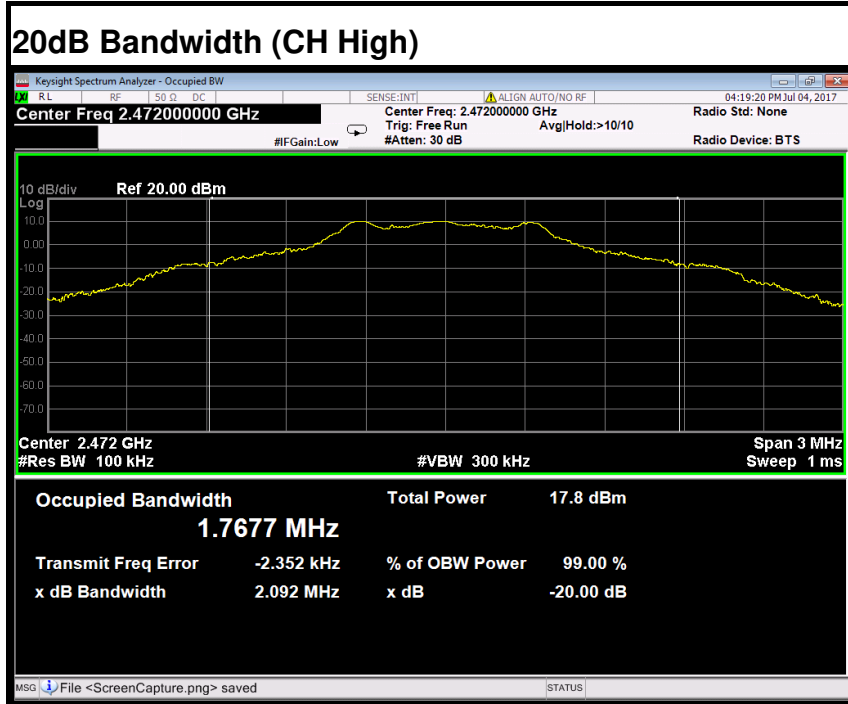
TEST RESULTS

No non-compliance noted



Test plot







6.2 ANTENNA GAIN

MEASUREMENT

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal BT devices, the GFSK mode is used.

MEASUREMENT PARAMETERS

Measurement parameter	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	3 MHz
Video bandwidth	3 MHz
Trace-Mode	Max hold

LIMITS

FCC	IC
Antenna Gain	
6 dBi	

TEST RESULTS

GFSK

T_{nom}	V_{nom}	Lowest channel 2406MHz	Middle channel 2444MHz	Highest channel 2472MHz
Conducted power [dBm] Measured with GFSK modulation		2.21	3.24	4.13
Radiated power [dBm] Measured with GFSK modulation		-0.95	0.37	1.69
Gain [dBi] Calculated		-3.16	-2.87	-2.44
Measurement uncertainty		± 1.5 dB (cond.) / ± 3 dB (rad.)		



6.3 PEAK POWER

LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

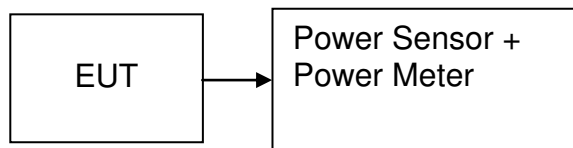
1. For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
2. Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6dBi.
3. 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.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Power Meter	Anritsu	ML2495A	1204003	02/21/2017	02/20/2018
Power Sensor	Anritsu	MA2411B	1126150	02/21/2017	02/20/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the RF Power Meter. The RF Power Meter is set to the peak power detection.



TEST RESULTS

No non-compliance noted

Test Data

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Peak/AVG	Result
Low	2406	4.62	0.00290	0.125	AVG	PASS
Mid	2444	5.59	0.00362			PASS
High	2472	6.59	0.00456			PASS
Low	2406	4.79	0.00301	0.125	Peak	PASS
Mid	2444	5.73	0.00374			PASS
High	2472	6.73	0.00471			PASS



6.4 PEAK POWER SPECTRAL DENSITY

LIMIT

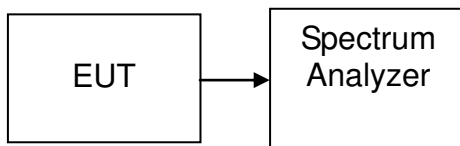
1. For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.
2. The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY55370330	02/21/2017	02/20/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST RESULTS

Not applicable. Since the EUT is FHSS device.



6.5 BAND EDGES MEASUREMENT

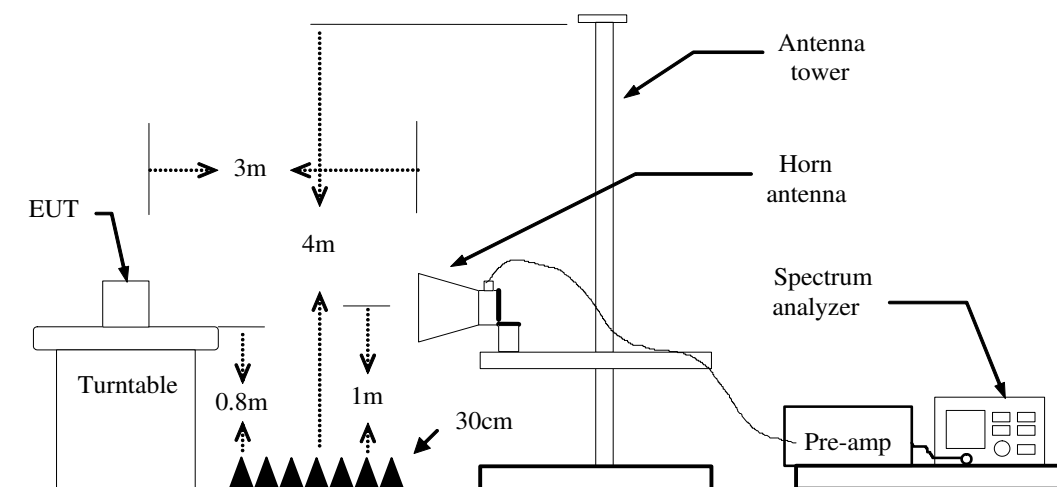
LIMIT

According to §15.247(c), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions 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).

MEASUREMENT EQUIPMENT USED

Radiated Emission Test Site 966(2)						
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration	
PSA Series Spectrum Analyzer	Agilent	E4446A	US44300399	02/21/2017	02/20/2018	
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2017	02/20/2018	
Amplifier	EMEC	EM330	060661	03/18/2017	03/17/2018	
High Noise Amplifier	Agilent	8449B	3008A01838	02/21/2017	02/20/2018	
Loop Antenna	COM-POWER	AL-130	121044	09/25/2016	09/24/2017	
Bilog Antenna	SCHAFFNER	CBL6143	5082	02/21/2017	02/20/2018	
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02/28/2017	02/27/2018	
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02/28/2017	02/27/2018	
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R	
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R	
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R	
Controller	CT	N/A	N/A	N.C.R	N.C.R	
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2017	02/20/2018	
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2				

Test Configuration





TEST PROCEDURE

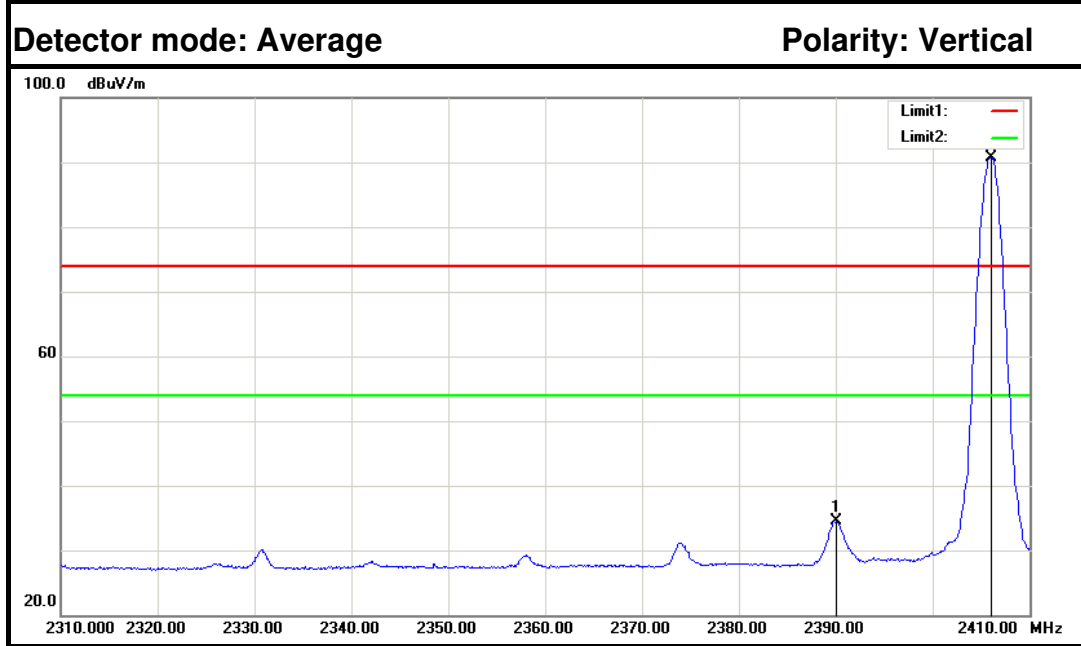
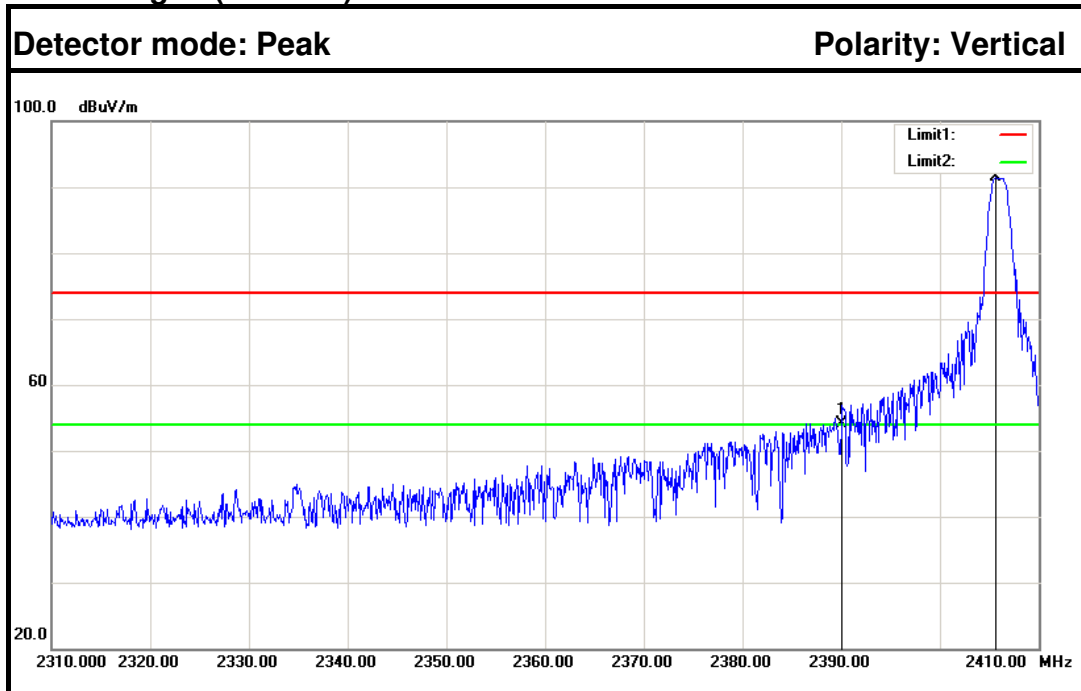
1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
 - (b) AVERAGE: RBW=1MHz / VBW=1/T / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

TEST RESULTS

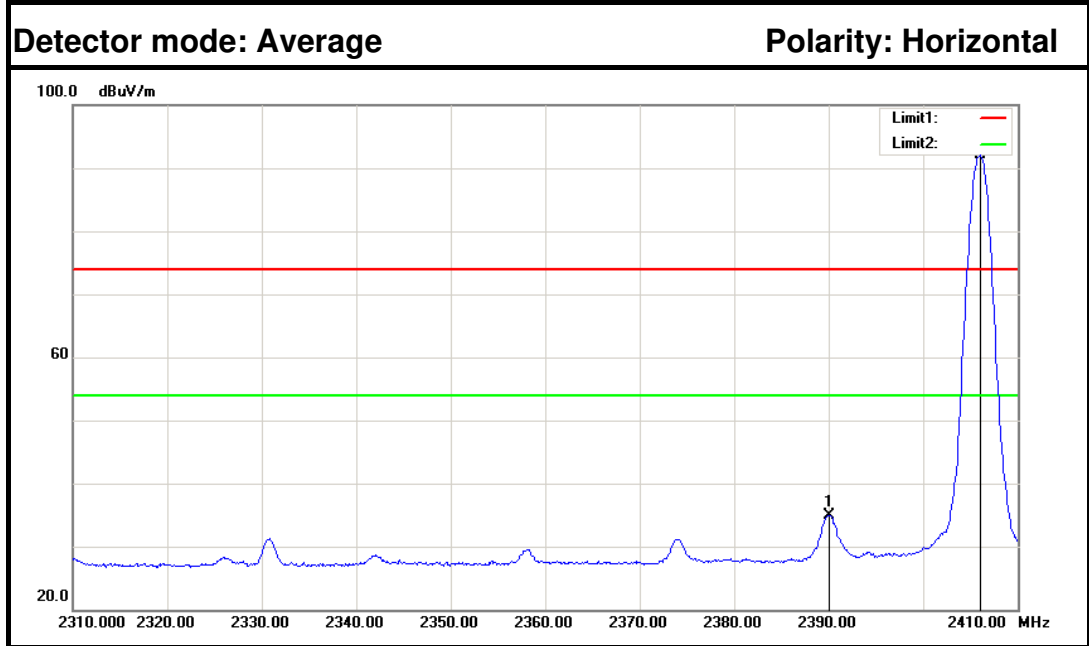
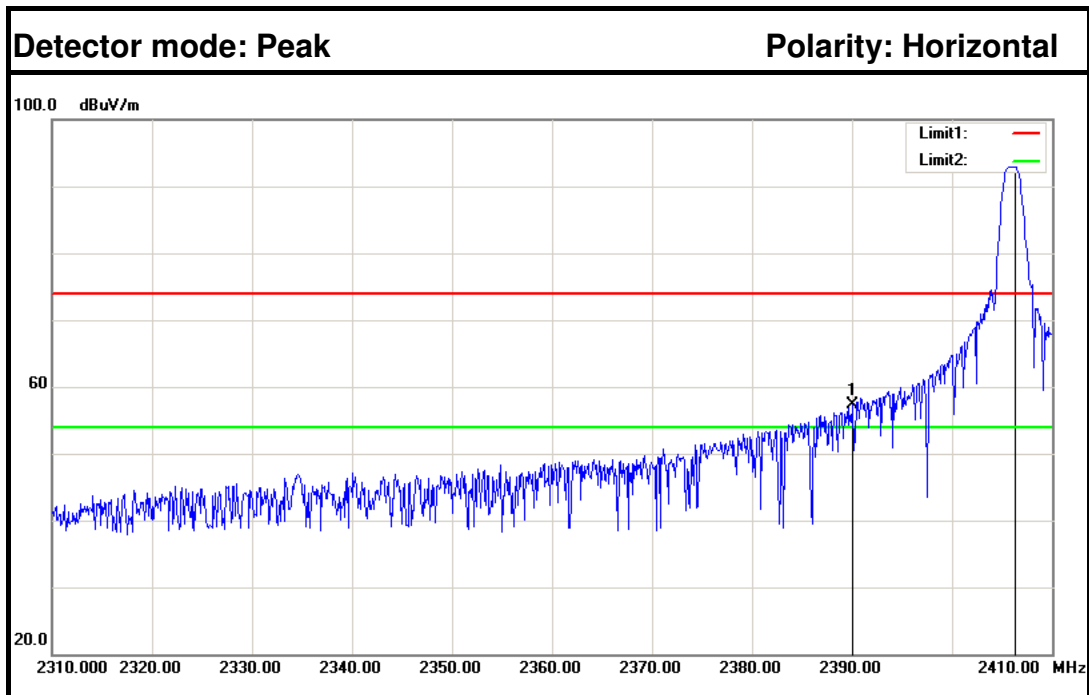
Refer to attach spectrum analyzer data chart.



Test Plot
Band Edges (CH Low)



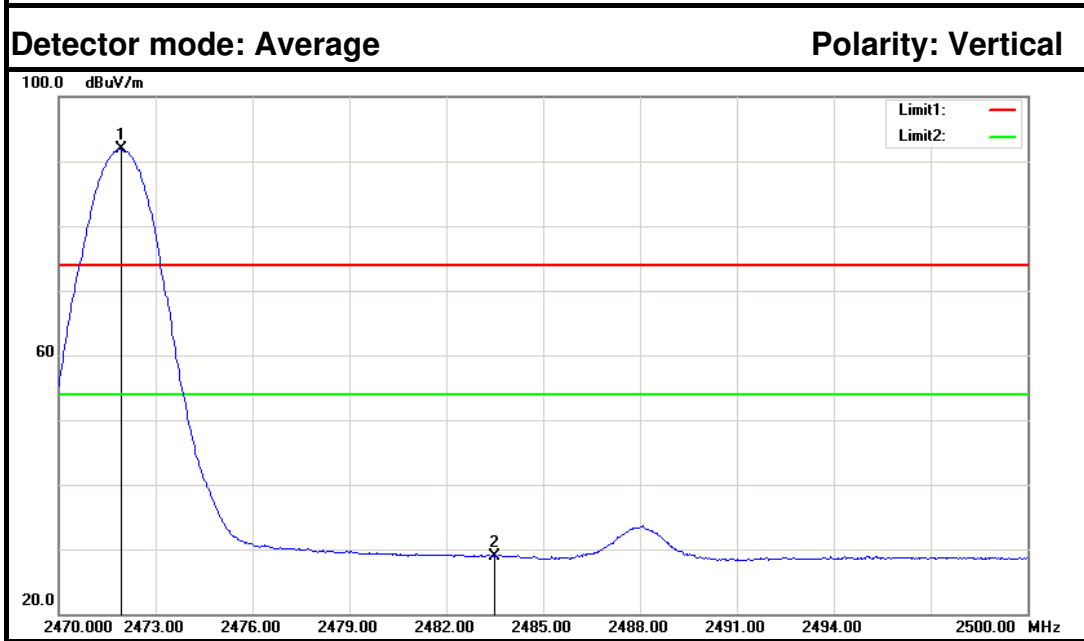
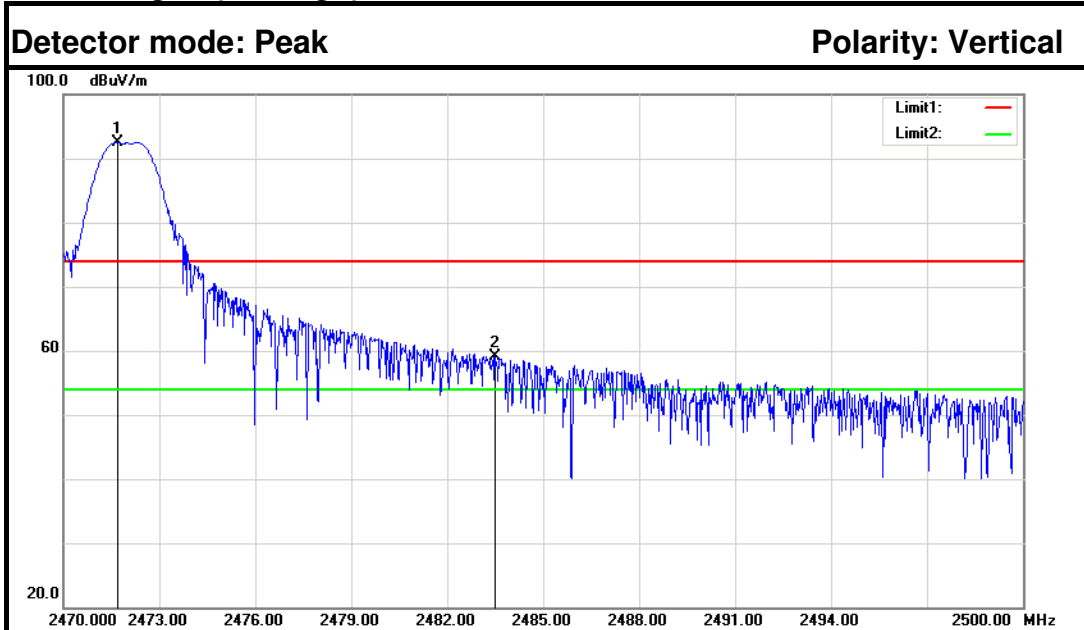
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	57.00	-2.86	54.14	74.00	-19.86	Peak	Vertical
2.2	2405.700	94.19	-2.78	91.41	---	---	Peak	Vertical
3.3	2390.000	37.44	-2.86	34.58	54.00	-19.42	Average	Vertical
4.4	2406.000	93.57	-2.78	90.79	---	---	Average	Vertical



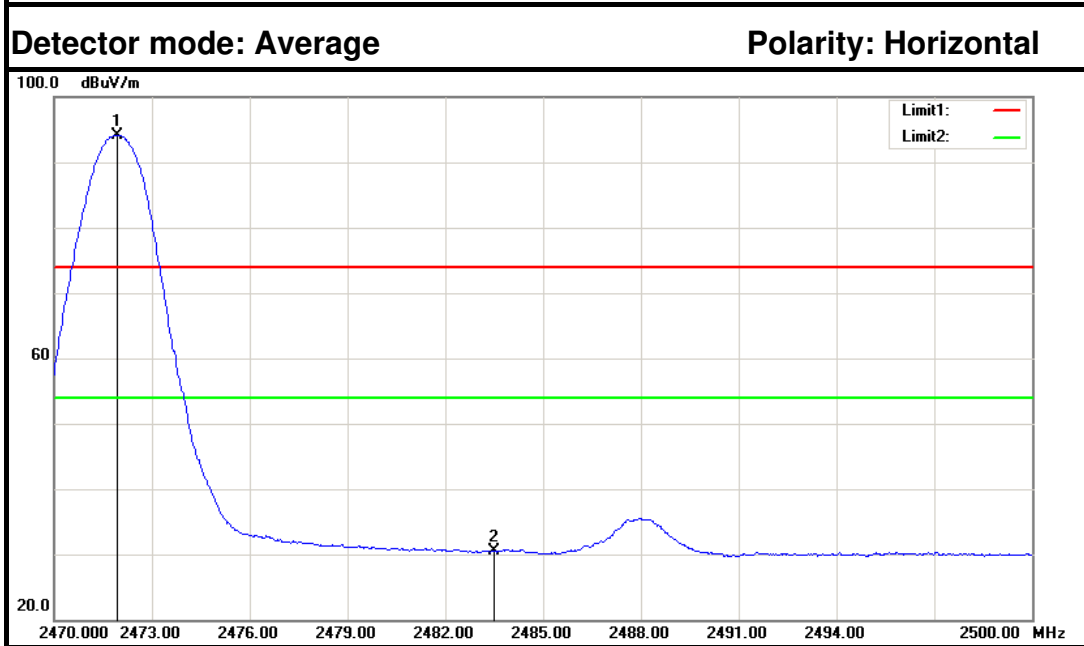
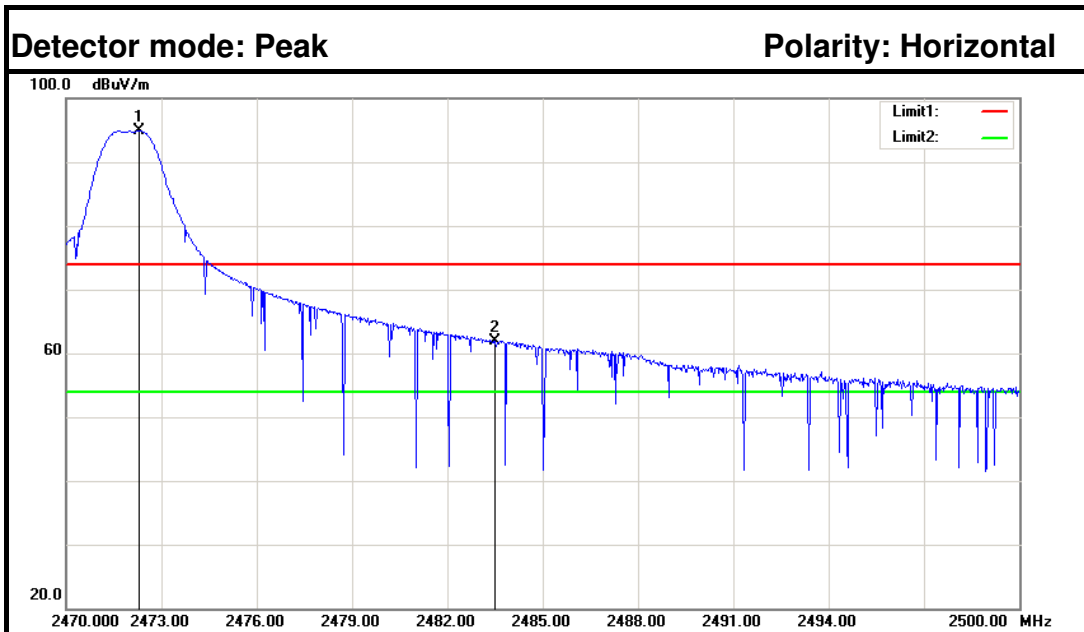
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.1	2390.000	60.07	-2.86	57.21	74.00	-16.79	Peak	Horizontal
2.2	2406.300	95.72	-2.77	92.95	---	---	Peak	Horizontal
3.3	2390.000	37.75	-2.86	34.89	54.00	-19.11	Average	Horizontal
4.4	2406.100	94.81	-2.77	92.04	---	---	Average	Horizontal



Band Edges (CH-High)



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2471.710	94.90	-2.41	92.49	---	---	Peak	Vertical
2.	2483.500	61.37	-2.35	59.02	74.00	-14.98	Peak	Vertical
3.	2471.950	94.28	-2.41	91.87	---	---	Average	Vertical
4.	2483.500	31.21	-2.35	28.86	54.00	-25.14	Average	Vertical



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.1	2472.280	97.26	-2.41	94.85	---	---	Peak	Horizontal
2.2	2483.500	64.22	-2.35	61.87	74.00	-12.13	Peak	Horizontal
3.3	2471.950	96.61	-2.41	94.20	---	---	Average	Horizontal
4.4	2483.500	32.79	-2.35	30.44	54.00	-23.56	Average	Horizontal



6.6 FREQUENCY SEPARATION

LIMIT

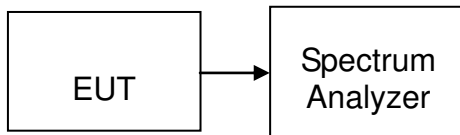
According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY55370330	02/21/2017	02/20/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel.
4. Set the spectrum analyzer as RBW=30kHz, VBW=30kHz, Adjust Span to 4 MHz, Sweep = auto.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

TEST RESULTS

No non-compliance noted

Test Data

Channel Separation (MHz)	Two-thirds of the 20 dB Bandwidth (kHz)	Channel Separation Limit	Result
2.000	1394.667	> Two-thirds of the 20 dB Bandwidth	Pass

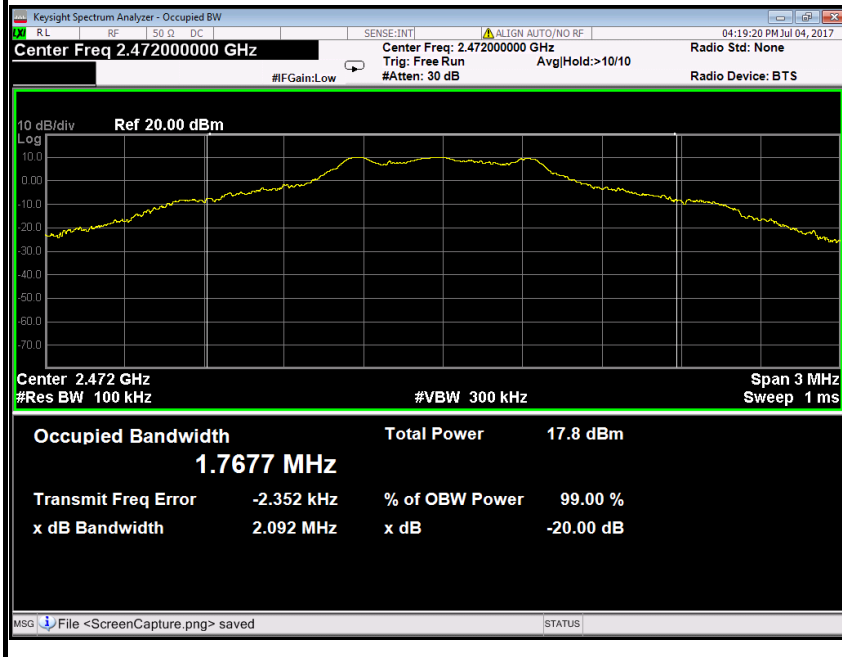


Test Plot

Measurement of Channel Separation



20 dB bandwidth(CH High)





6.7 NUMBER OF HOPPING FREQUENCY

LIMIT

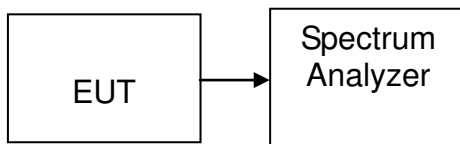
According to §15.247(a)(1)(ii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY55370330	02/21/2017	02/20/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = 1ms.
4. Set the spectrum analyzer as RBW, VBW=300kHz,
5. Max hold, view and count how many channel in the band.

TEST RESULTS

No non-compliance noted

Test Data

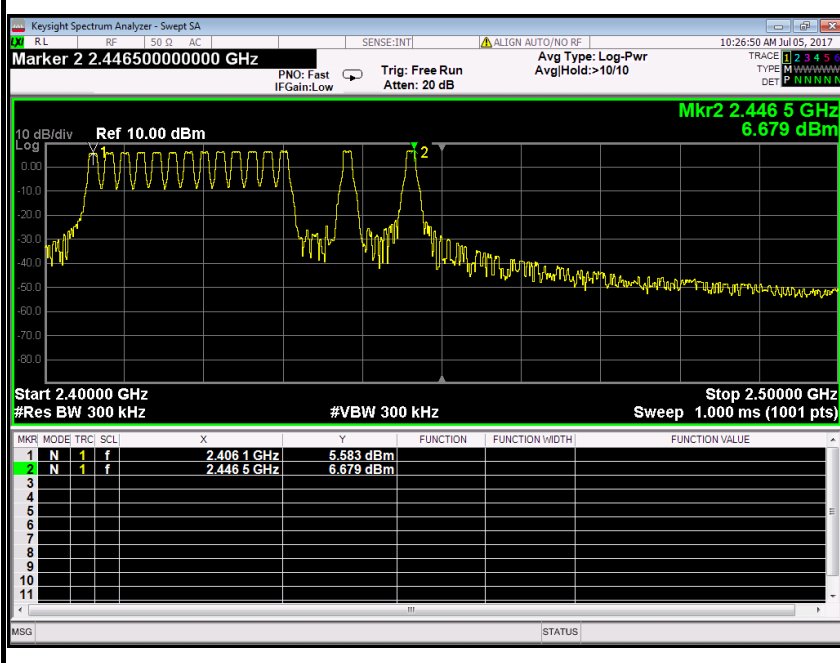
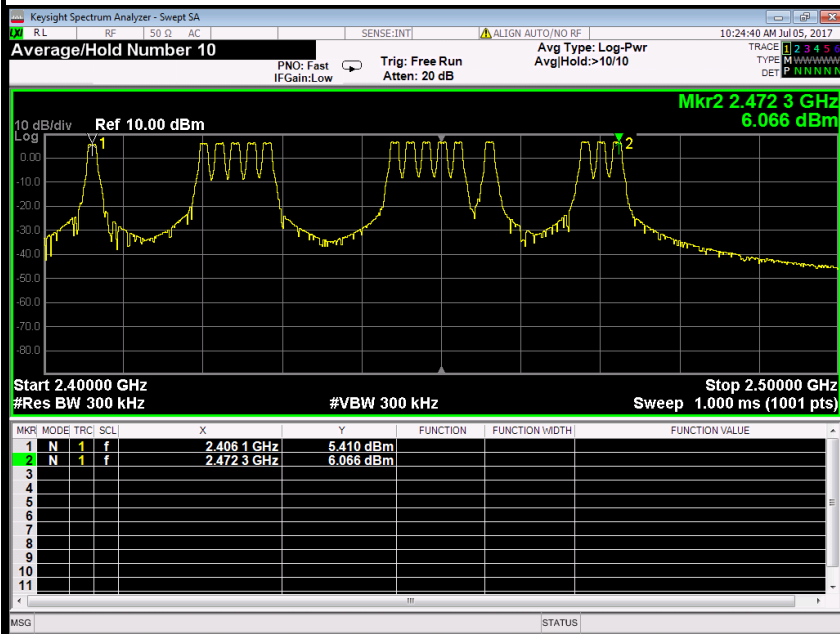
Result (No. of CH)	Limit (No. of CH)	Result
15	>15	PASS

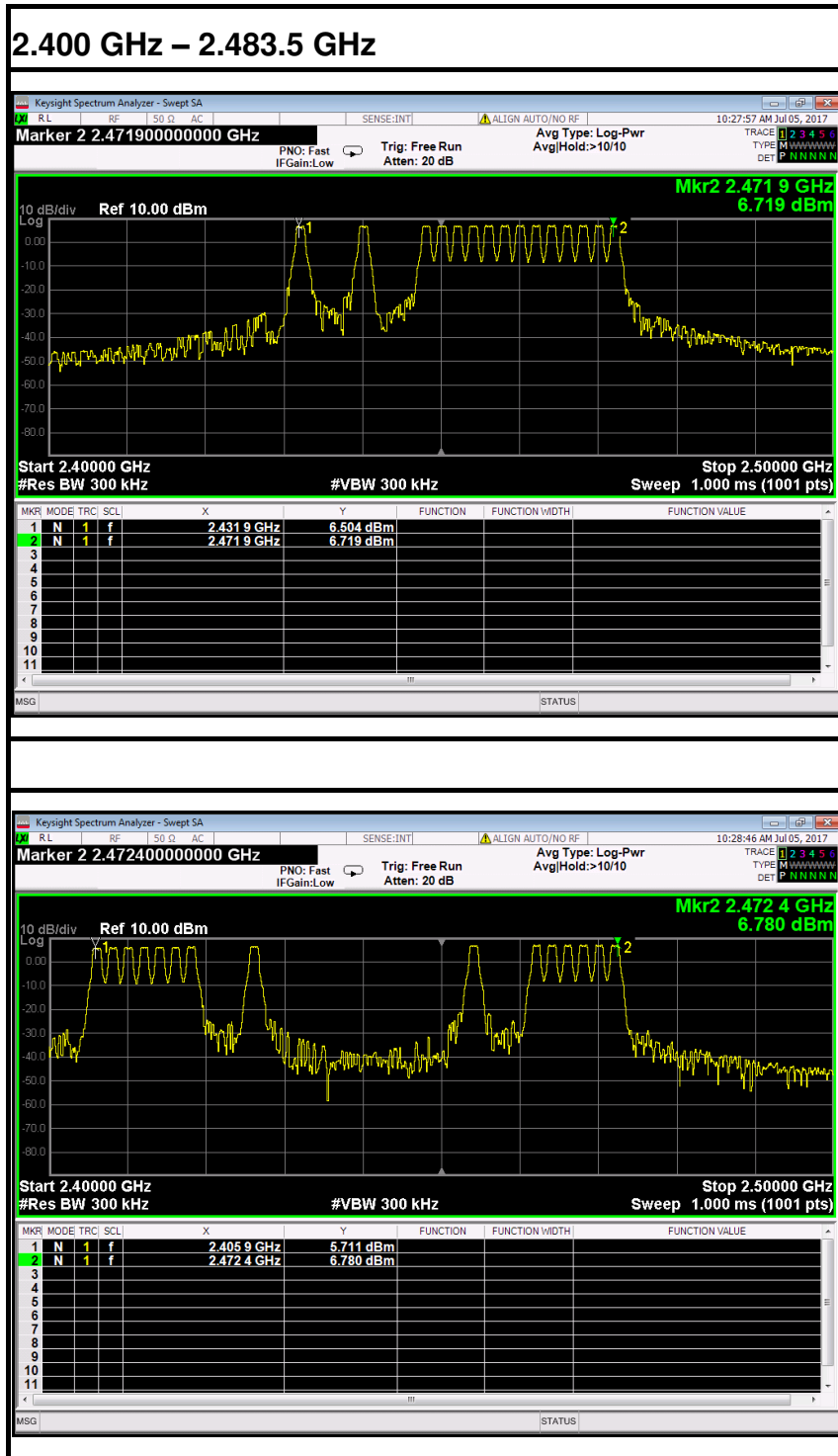


Test Plot

Channel Number

2.400 GHz – 2.483.5 GHz







6.8 TIME OF OCCUPANCY (DWELL TIME)

LIMIT

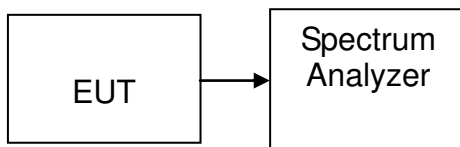
According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY55370330	02/21/2017	02/20/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=1MHz, Span = 0Hz, Sweep = auto.
5. Repeat above procedures until all frequency measured were complete.



TEST RESULTS

No non-compliance noted

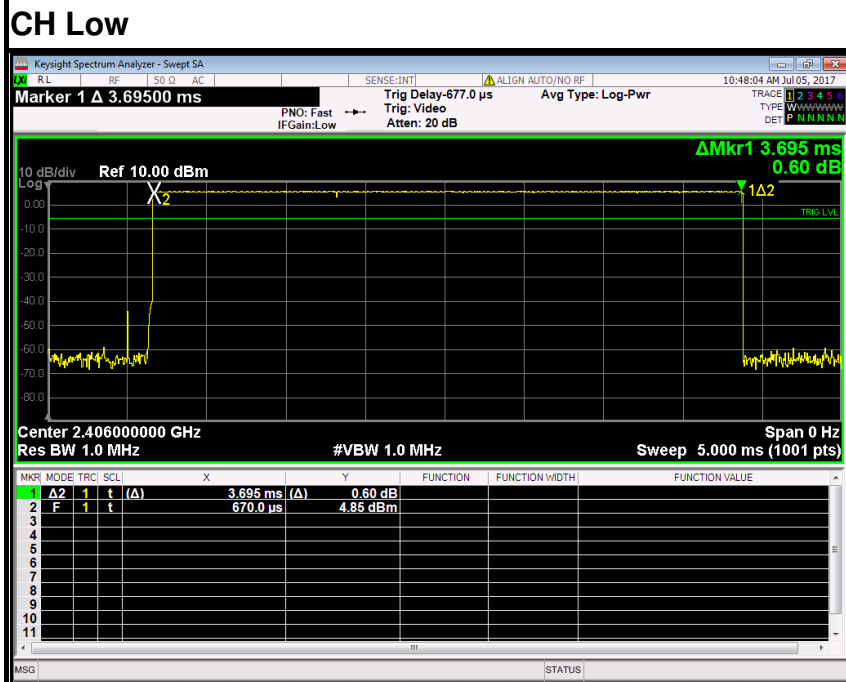
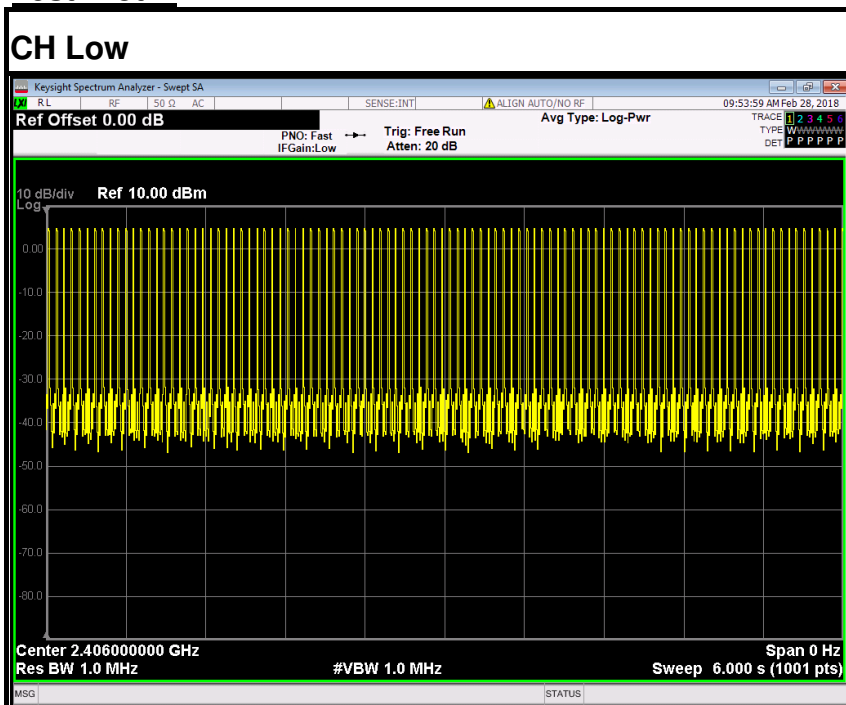
Test Data

CH Low: $3.695 * (104/6) * 15 * 0.4 = 384.28$ (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	3.695	384.28	6	400.00	PASS



Test Plot





6.9 SPURIOUS EMISSIONS

6.9.1. CONDUCTED MEASUREMENT

LIMIT

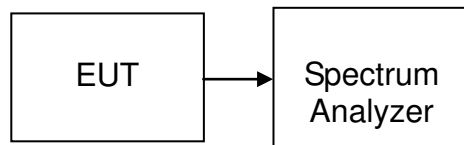
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY55370330	02/21/2017	02/20/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

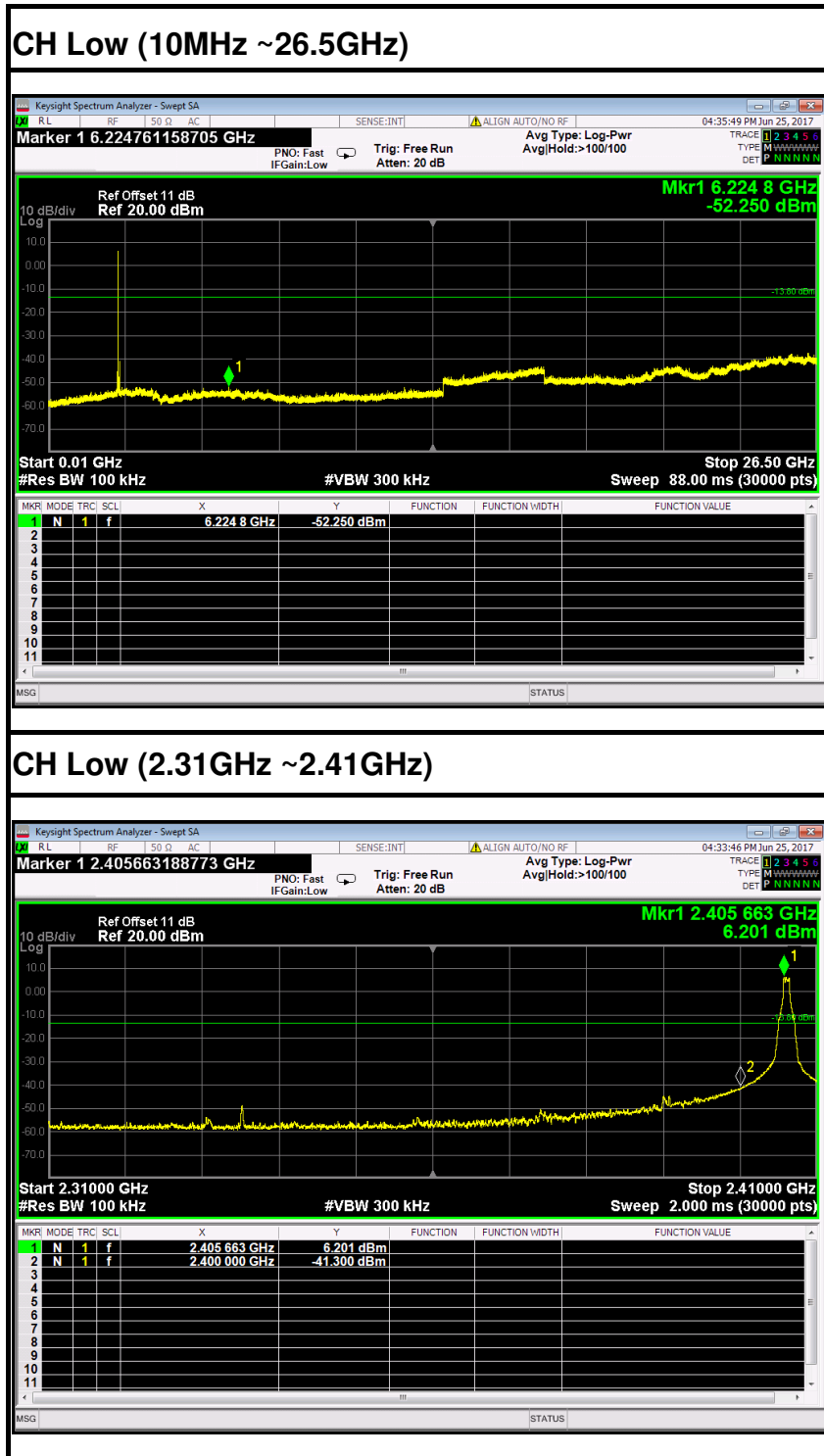
Measurements are made over the 30MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.

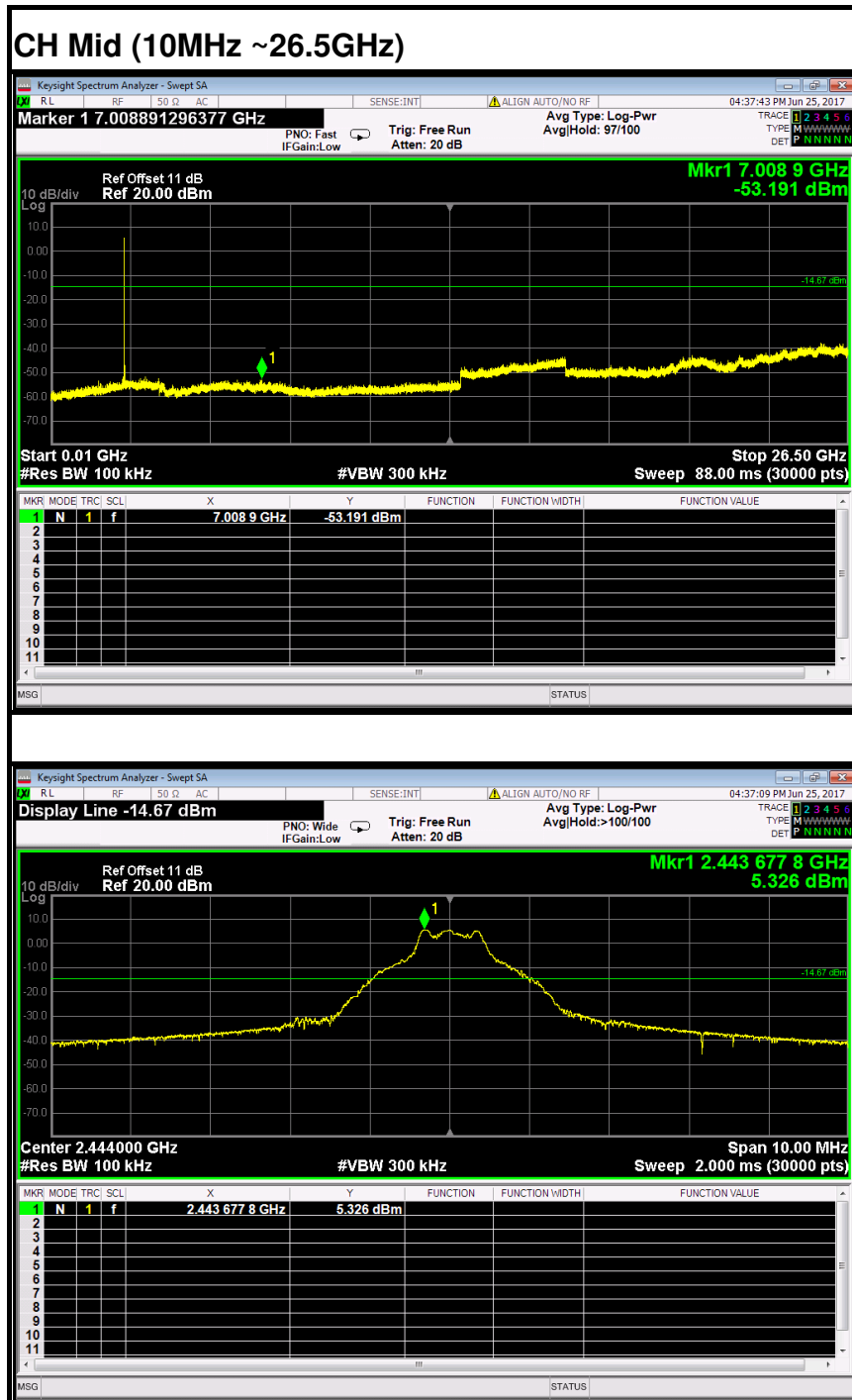
TEST RESULTS

No non-compliance noted



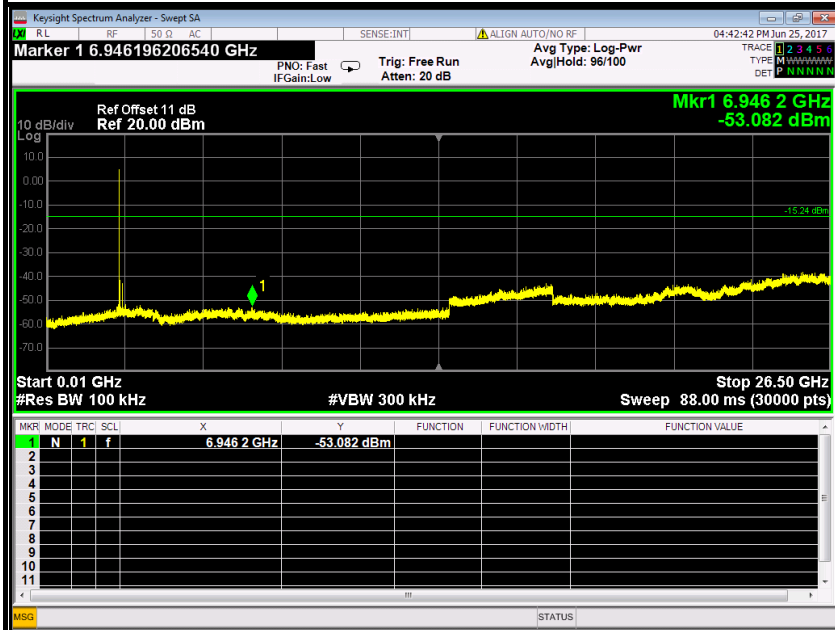
Test Plot



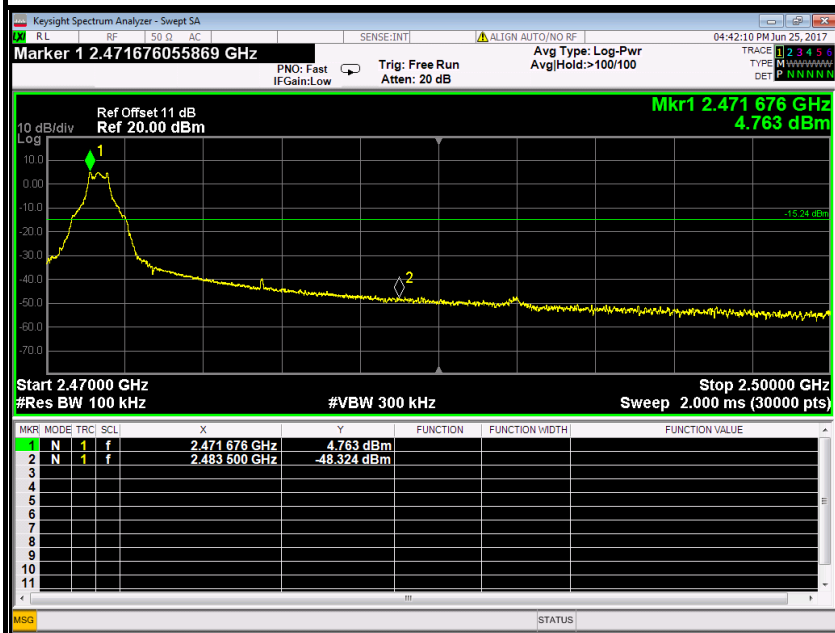




CH High (10MHz ~26.5GHz)



CH High(2.475GHz ~2.5GHz)





6.9.2. RADIATED EMISSIONS

LIMIT

1. Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (mV/m)	Measurement Distance (m)
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
Above 960	500	3

Note: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

2. In the above emission table, the tighter limit applies at the band edges.

Frequency (Hz)	Field Strength (μ V/m at 3-meter)	Field Strength (dB μ V/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

**MEASUREMENT EQUIPMENT USED**

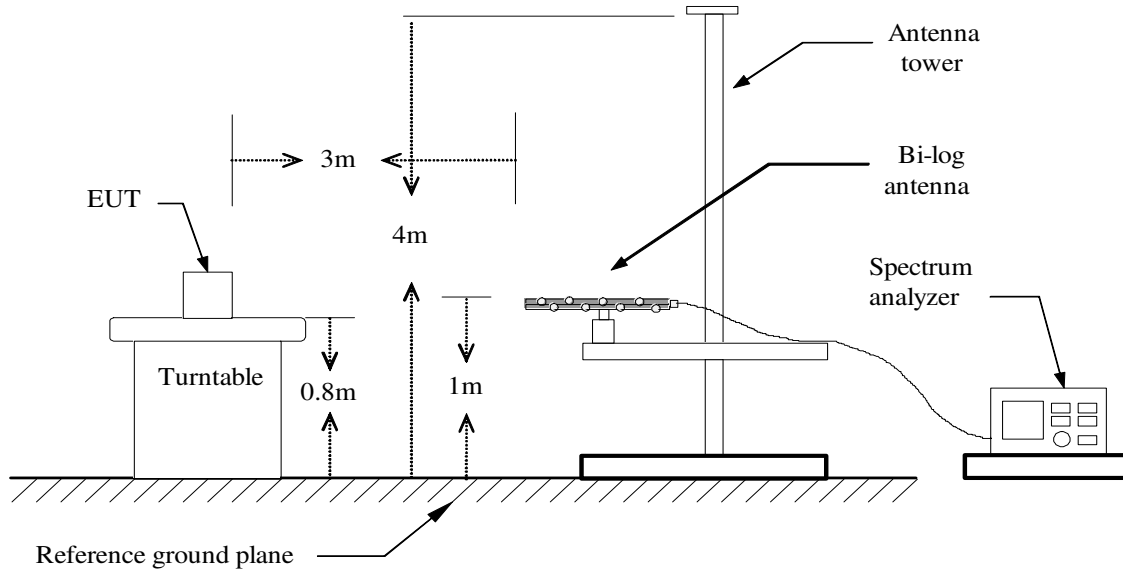
Radiated Emission Test Site 966(2)					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
PSA Series Spectrum Analyzer	Agilent	E4446A	US44300399	02/21/2017	02/20/2018
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2017	02/20/2018
Amplifier	EMEC	EM330	060661	03/18/2017	03/17/2018
High Noise Amplifier	Agilent	8449B	3008A01838	02/21/2017	02/20/2018
Loop Antenna	COM-POWER	AL-130	121044	09/25/2016	09/24/2017
Bilog Antenna	SCHAFFNER	CBL6143	5082	02/21/2017	02/20/2018
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02/28/2017	02/27/2018
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02/28/2017	02/27/2018
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2017	02/20/2018
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

Remark: Each piece of equipment is scheduled for calibration once a year.

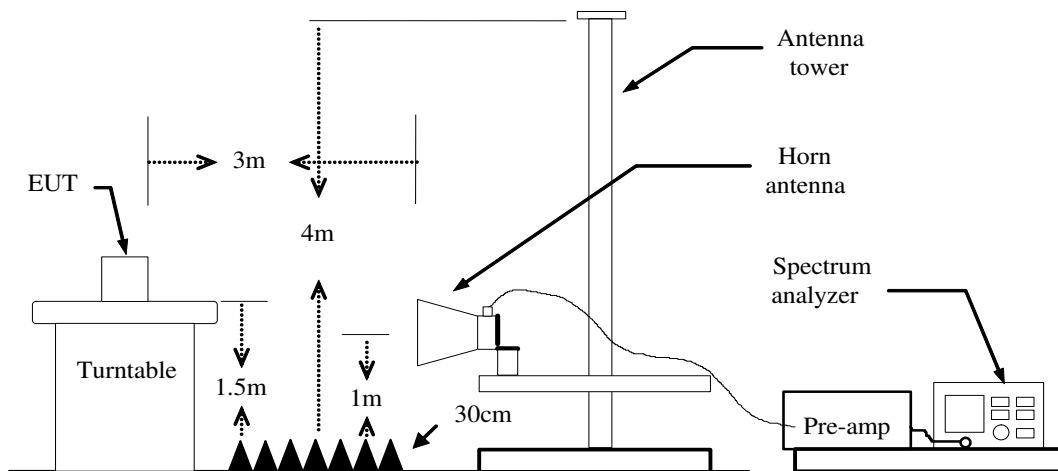


TEST CONFIGURATION

Below 1 GHz



Above 1 GHz





TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m or 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.



TEST RESULTS

Below 1 GHz

Test Mode: TX / GFSK(CH Low)

Tested by: Saber Huang

Ambient temperature: 24°C Relative humidity: 52% RH

Date: June 12, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
59.9487	44.89	-23.96	20.93	40.00	-19.07	V	QP
129.0612	43.14	-20.79	22.35	43.50	-21.15	V	QP
319.9087	42.38	-18.93	23.45	46.00	-22.55	V	QP
404.4200	39.39	-15.88	23.51	46.00	-22.49	V	QP
451.1012	39.12	-15.43	23.69	46.00	-22.31	V	QP
489.2950	38.87	-14.36	24.51	46.00	-21.49	V	QP
55.8262	47.35	-22.92	24.43	40.00	-15.57	H	QP
143.0050	40.26	-21.40	18.86	43.50	-24.64	H	QP
219.8774	40.07	-20.36	19.71	46.00	-26.29	H	QP
279.2900	45.31	-20.40	24.91	46.00	-21.09	H	QP
503.6025	40.34	-14.32	26.02	46.00	-19.98	H	QP
749.4974	37.43	-11.20	26.23	46.00	-19.77	H	QP

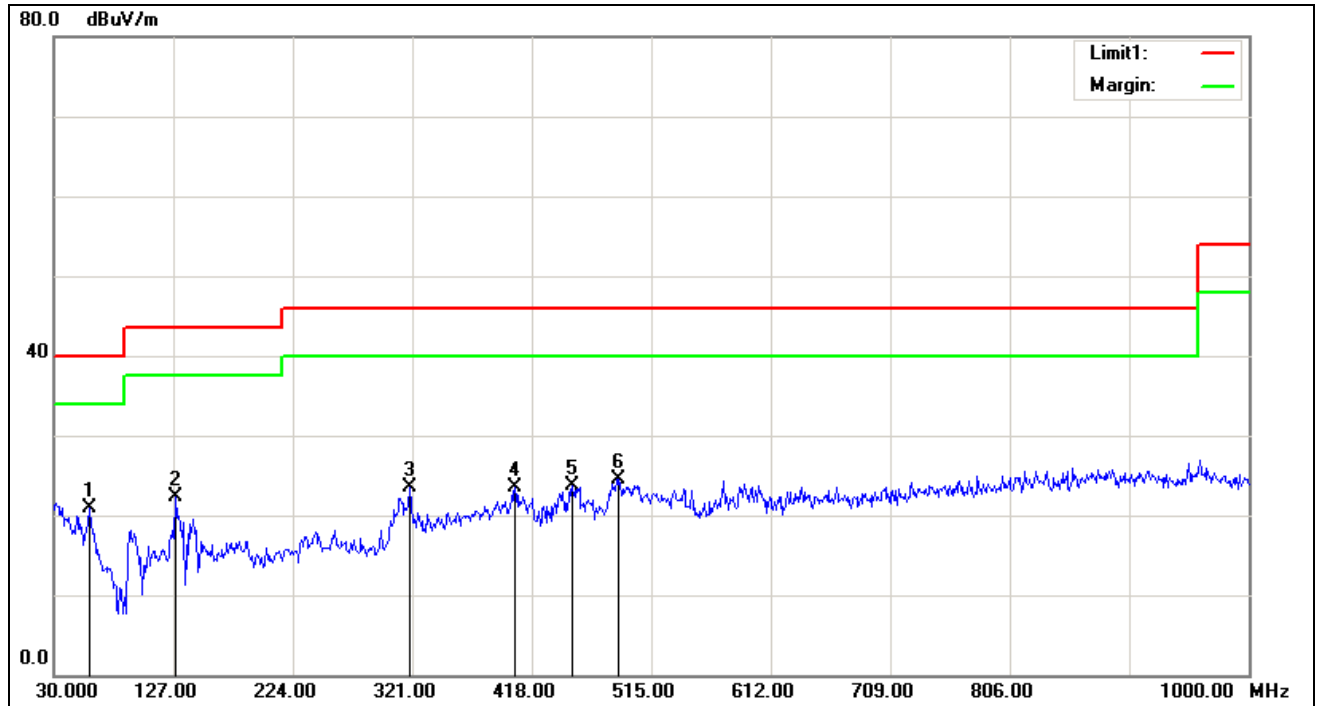
****Remark:** No emission found between lowest internal used/generated frequency to 30MHz.

Notes:

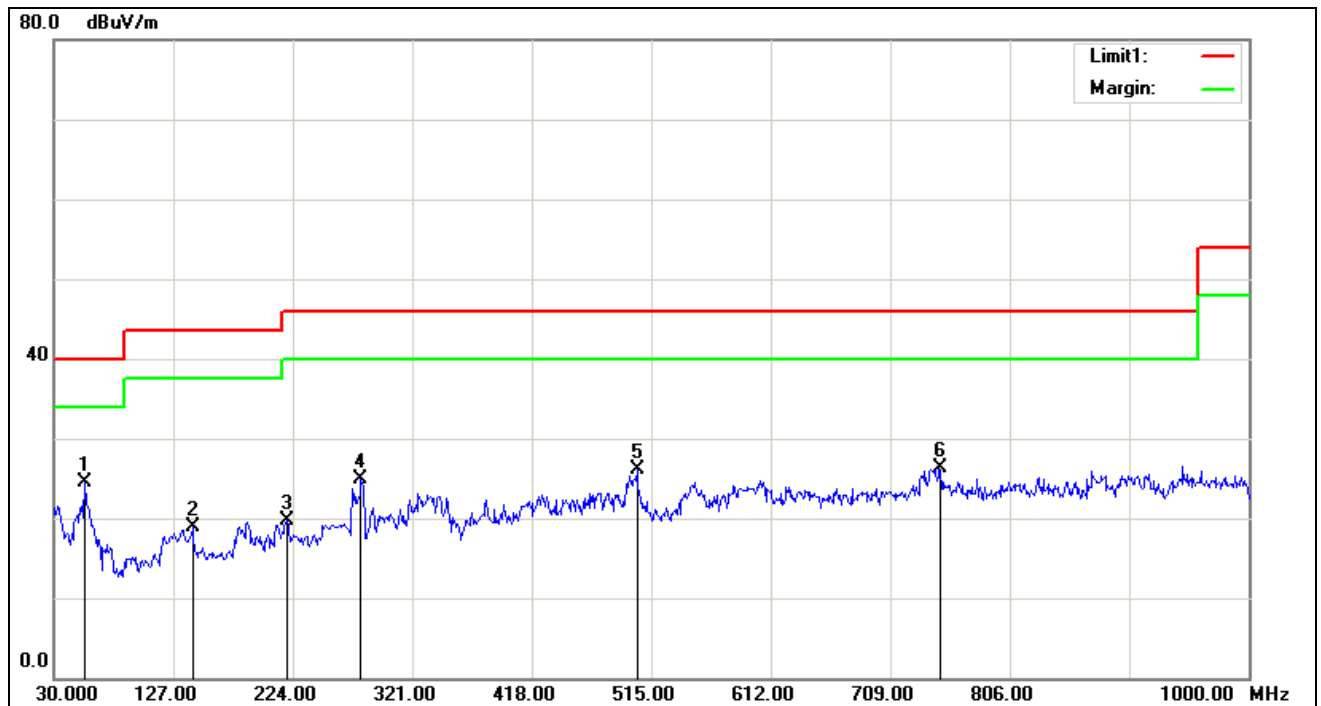
1. Measuring frequencies from 9kHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30MHz to 1GHz were made with an instrument using Peak/Quasi-peak detector mode.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 120kHz.
5. Frequency (MHz). = Emission frequency in MHz
Reading (dBuV) = Receiver reading
Correction Factor(dB/m) = Antenna factor + Cable loss – Amplifier gain
Actual FS (dBuV/m) = Reading (dBuV) + Corr. Factor (dB/m)
Limit (dBuV/m) = Limit stated in standard
Margin(dB) = Measured (dBuV/m) – Limits (dBuV/m)
Antenna Pole(V/H) = Current carrying line of reading



Vertical



Horizontal





Above 1 GHz

Test Mode: GFSK (CH Low)

Tested by: Saber Huang

Ambient temperature: 24°C **Relative humidity:** 52% RH

Date: June 26, 2017

Frequency (MHz)	Reading (dBµV)	Correction Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1810.000	48.88	-6.21	42.67	74.00	-31.33	V	peak
3772.000	41.67	0.63	42.30	74.00	-31.70	V	peak
4672.000	40.28	3.91	44.19	74.00	-29.81	V	peak
4816.000	43.47	4.38	47.85	74.00	-26.15	V	peak
5374.000	40.37	5.65	46.02	74.00	-27.98	V	peak
5941.000	39.38	6.06	45.44	74.00	-28.56	V	peak
2566.000	45.44	-2.14	43.30	74.00	-30.70	H	peak
3376.000	41.89	-0.73	41.16	74.00	-32.84	H	peak
3997.000	40.65	1.58	42.23	74.00	-31.77	H	peak
4807.000	47.10	4.35	51.45	74.00	-22.55	H	peak
5689.000	40.07	5.95	46.02	74.00	-27.98	H	peak
6868.000	39.20	7.49	46.69	74.00	-27.31	H	peak

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
 - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.
 - b. AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.
5. Frequency (MHz) = Emission frequency in MHz
 Reading (dBµV/m) =Uncorrected Analyzer / Receiver Reading
 Correction Factor (dB) = Antenna factor + Cable loss – Amplifier gain
 Limit (dBµV/m) = Limit stated in standard
 Margin (dB) = Result (dBµV/m)- Limit (dBµV/m)
 Pk = Peak Reading
 AV. = Average Reading
 Remark = Mark Peak Reading or Average Reading



Test Mode: GFSK (CH Mid)

Tested by: Saber Huang

Ambient temperature: 24°C **Relative humidity:** 52% RH

Date: June 26, 2017

Frequency (MHz)	Reading (dBµV)	Correction Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1333.000	45.87	-7.30	38.57	74.00	-35.43	V	peak
3178.000	42.87	-1.06	41.81	74.00	-32.19	V	peak
3790.000	41.17	0.70	41.87	74.00	-32.13	V	peak
4888.000	42.73	4.61	47.34	74.00	-26.66	V	peak
5617.000	40.64	5.92	46.56	74.00	-27.44	V	peak
6571.000	38.78	7.01	45.79	74.00	-28.21	V	peak
1288.000	46.13	-7.47	38.66	74.00	-35.34	H	peak
2566.000	45.05	-2.14	42.91	74.00	-31.09	H	peak
3358.000	42.46	-0.76	41.70	74.00	-32.30	H	peak
4888.000	45.68	4.61	50.29	74.00	-23.71	H	peak
5302.000	39.35	5.52	44.87	74.00	-29.13	H	peak
5509.000	40.74	5.87	46.61	74.00	-27.39	H	peak

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
 - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.
 - b. AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.
5. Frequency (MHz) = Emission frequency in MHz
 Reading (dBµV/m) =Uncorrected Analyzer / Receiver Reading
 Correction Factor (dB) = Antenna factor + Cable loss – Amplifier gain
 Limit (dBµV/m) = Limit stated in standard
 Margin (dB) = Result (dBµV/m)- Limit (dBµV/m)
 Pk = Peak Reading
 AV. = Average Reading
 Remark = Mark Peak Reading or Average Reading



Test Mode: GFSK (CH High)

Tested by: Saber Huang

Ambient temperature: 24°C Relative humidity: 52% RH

Date: June 26, 2017

Frequency (MHz)	Reading (dBµV)	Correction Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1513.000	45.23	-6.86	38.37	74.00	-35.63	V	peak
3106.000	42.93	-1.18	41.75	74.00	-32.25	V	peak
4537.000	40.32	3.47	43.79	74.00	-30.21	V	peak
4942.000	43.74	4.79	48.53	74.00	-25.47	V	peak
5608.000	39.91	5.92	45.83	74.00	-28.17	V	peak
6193.000	39.60	6.39	45.99	74.00	-28.01	V	peak
2539.000	45.11	-2.19	42.92	74.00	-31.08	H	peak
2836.000	43.92	-1.66	42.26	74.00	-31.74	H	peak
3430.000	41.95	-0.64	41.31	74.00	-32.69	H	peak
3925.000	40.89	1.27	42.16	74.00	-31.84	H	peak
4636.000	39.69	3.79	43.48	74.00	-30.52	H	peak
4942.000	47.21	4.79	52.00	74.00	-22.00	H	peak

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
 - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.
 - b. AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.
5. Frequency (MHz) = Emission frequency in MHz
 Reading (dBµV/m) =Uncorrected Analyzer / Receiver Reading
 Correction Factor (dB) = Antenna factor + Cable loss – Amplifier gain
 Limit (dBµV/m) = Limit stated in standard
 Margin (dB) = Result (dBµV/m)- Limit (dBµV/m)
 Pk = Peak Reading
 AV. = Average Reading
 Remark = Mark Peak Reading or Average Reading



6.10 POWERLINE CONDUCTED EMISSIONS

LIMIT

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

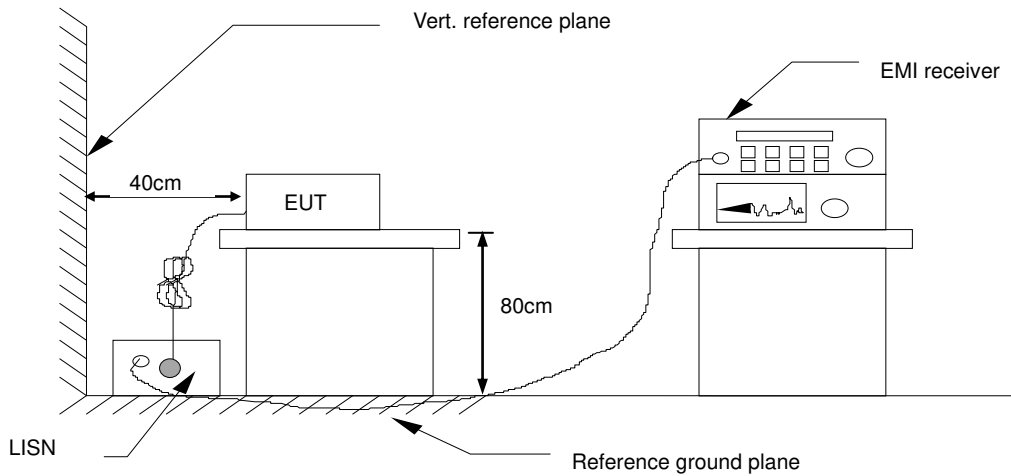
MEASUREMENT EQUIPMENT USED

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/11/2017	02/10/2018
LISN(EUT)	ROHDE&SCHWARZ	ENV216	101543-WX	02/11/2017	02/10/2018
LISN	EMCO	3825/2	8901-1459	02/12/2017	02/11/2018
Temp. / Humidity Meter	VICTOR	HTC-1	N/A	02/15/2017	02/14/2018
Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE			

Remark: Each piece of equipment is scheduled for calibration once a year.



TEST CONFIGURATION



See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

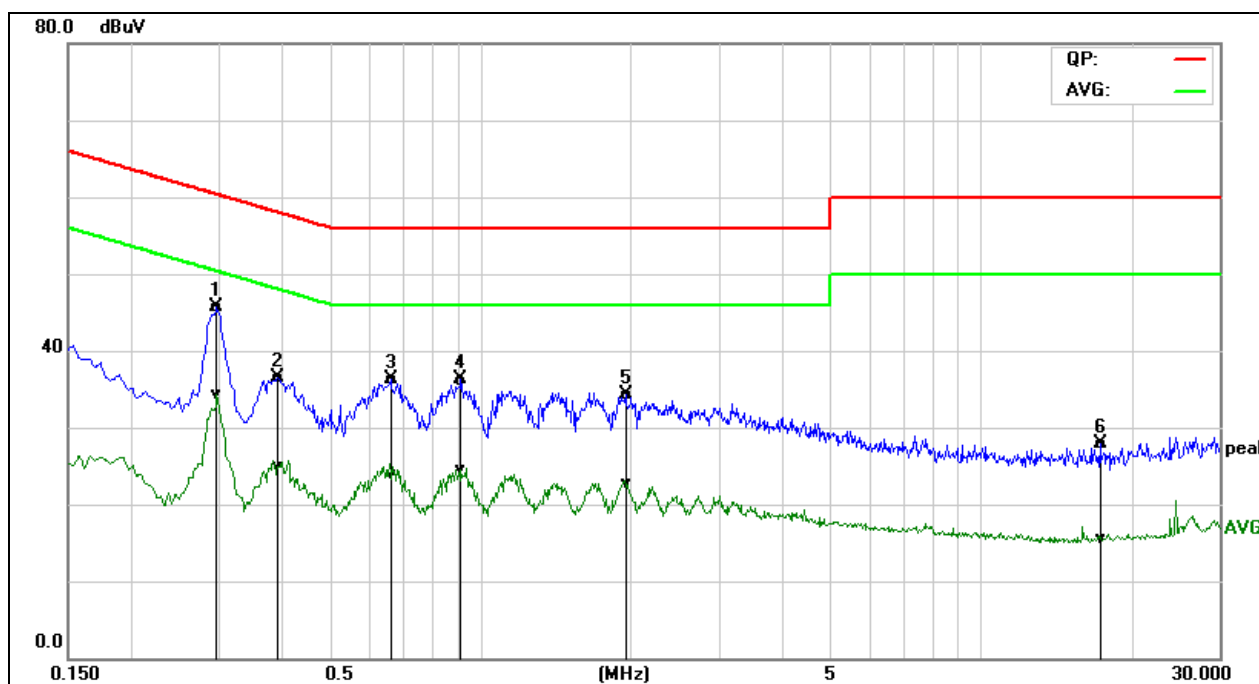
TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.



Test Data

Model No.	DHP380	RBW,VBW	9 kHz
Environmental Conditions	22°C, 45% RH	Test Mode	Mode 2
Tested by	Will Wei	Line	L1
Test Date	June 16, 2017	Test Voltage	AC 120V/60Hz



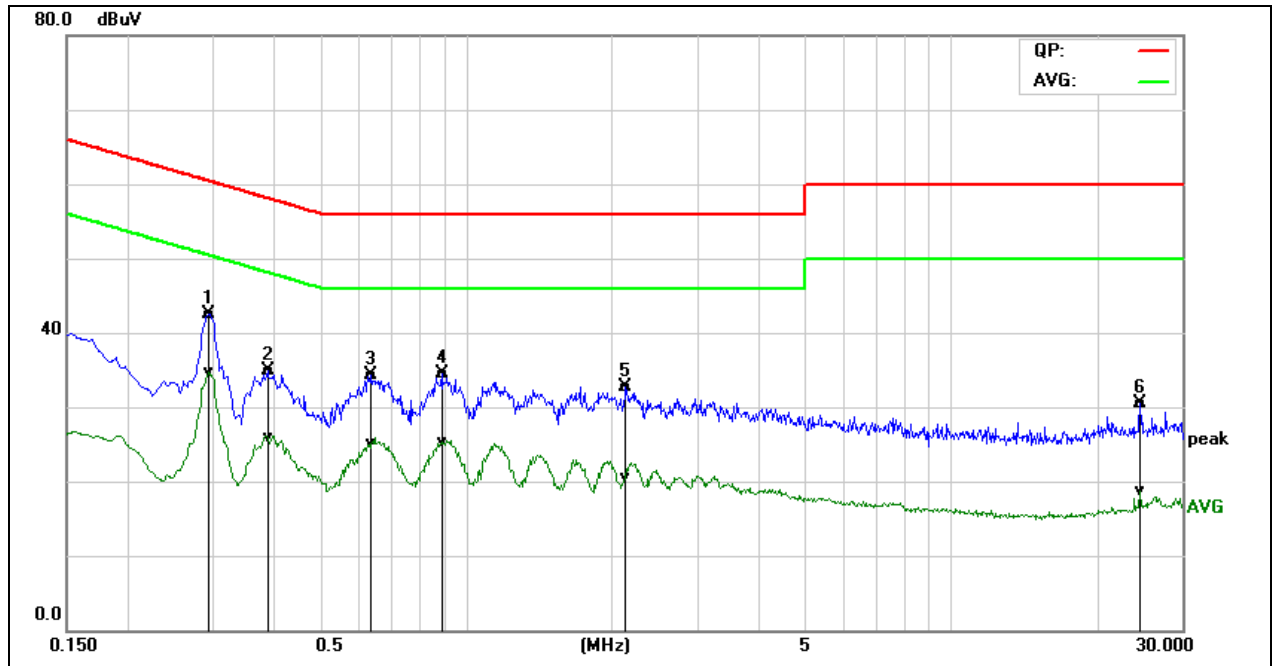
Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
0.2980	26.13	14.62	19.61	45.74	34.23	60.30	50.30	-14.56	-16.07	Pass
0.3940	16.89	5.26	19.57	36.46	24.83	57.98	47.98	-21.52	-23.15	Pass
0.6620	16.66	4.35	19.59	36.25	23.94	56.00	46.00	-19.75	-22.06	Pass
0.9140	16.63	4.98	19.57	36.20	24.55	56.00	46.00	-19.80	-21.45	Pass
1.9580	14.67	3.00	19.72	34.39	22.72	56.00	46.00	-21.61	-23.28	Pass
17.3140	7.67	-4.73	20.15	27.82	15.42	60.00	50.00	-32.18	-34.58	Pass

Note:

1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Peak detector, Quasi-peak detector and average detector.
3. “---” denotes the emission level was or more than 2dB below the Average limit.
4. The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;
5. L1= Line One (Live Line)



Model No.	DHP380	RBW,VBW	9 kHz
Environmental Conditions	22°C, 45% RH	Test Mode	Mode 2
Tested by	Will Wei	Line	L2
Test Date	June 16, 2017	Test Voltage	AC 120V/60Hz



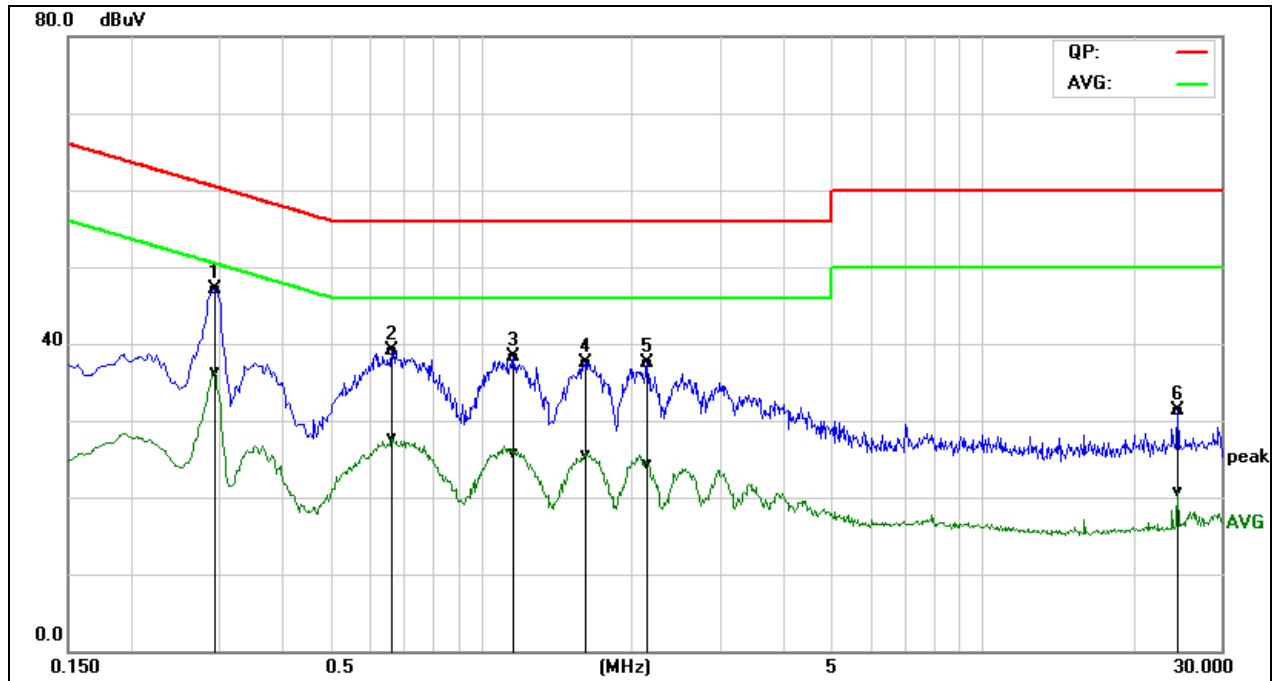
Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
0.2940	23.00	15.13	19.54	42.54	34.67	60.41	50.41	-17.87	-15.74	Pass
0.3899	15.33	6.40	19.53	34.86	25.93	58.06	48.07	-23.20	-22.14	Pass
0.6380	14.77	5.61	19.59	34.36	25.20	56.00	46.00	-21.64	-20.80	Pass
0.8940	14.89	5.68	19.57	34.46	25.25	56.00	46.00	-21.54	-20.75	Pass
2.1420	13.07	0.80	19.72	32.79	20.52	56.00	46.00	-23.21	-25.48	Pass
24.5780	9.94	-1.91	20.61	30.55	18.70	60.00	50.00	-29.45	-31.30	Pass

Note:

1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Peak detector, Quasi-peak detector and average detector.
3. “---” denotes the emission level was or more than 2dB below the Average limit.
4. The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;
5. L2 = Line Two (Neutral Line)



Model No.	DHP380	RBW,VBW	9 kHz
Environmental Conditions	22°C, 45% RH	Test Mode	Mode 2
Tested by	Will Wei	Line	L1
Test Date	May 27, 2017	Test Voltage	AC 240V/50Hz



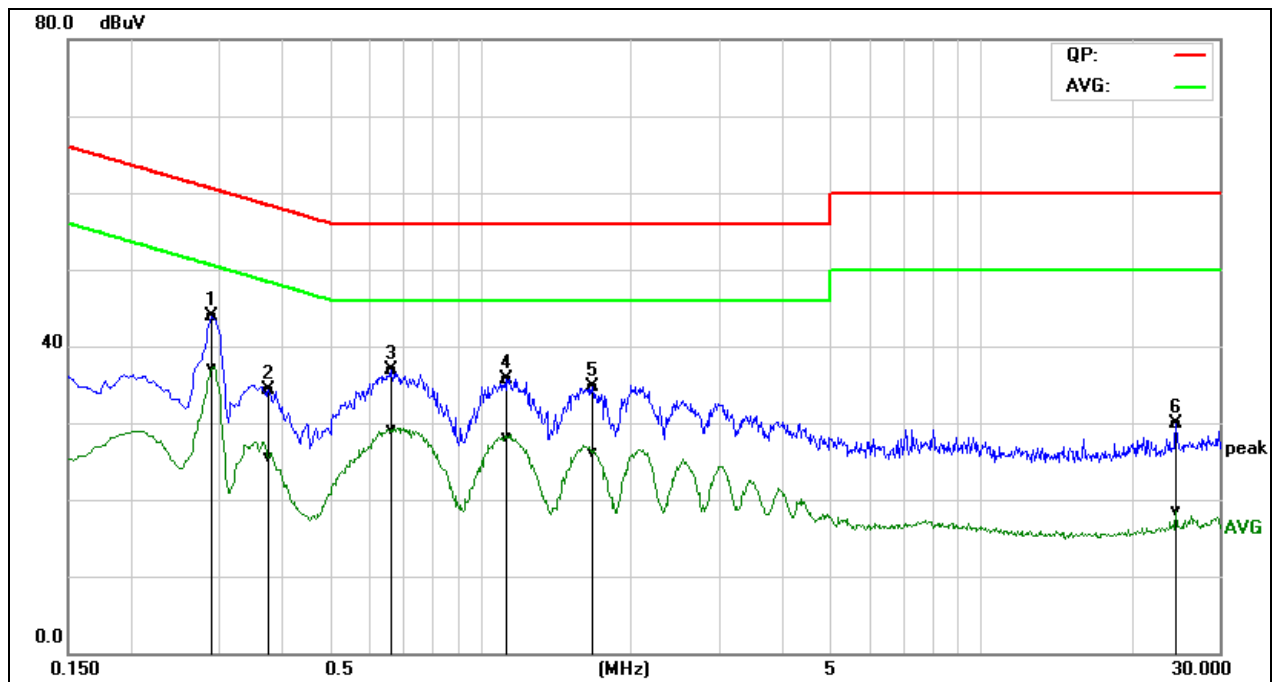
Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
0.2940	27.48	16.79	19.61	47.09	36.40	60.41	50.41	-13.32	-14.01	Pass
0.6620	19.54	8.11	19.59	39.13	27.70	56.00	46.00	-16.87	-18.30	Pass
1.1620	18.71	6.17	19.58	38.29	25.75	56.00	46.00	-17.71	-20.25	Pass
1.6260	17.92	5.77	19.65	37.57	25.42	56.00	46.00	-18.43	-20.58	Pass
2.1500	17.73	4.68	19.72	37.45	24.40	56.00	46.00	-18.55	-21.60	Pass
24.5780	10.82	0.24	20.43	31.25	20.67	60.00	50.00	-28.75	-29.33	Pass
17.3140	7.67	-4.73	20.15	27.82	15.42	60.00	50.00	-32.18	-34.58	Pass

Note:

1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Peak detector, Quasi-peak detector and average detector.
3. “---” denotes the emission level was or more than 2dB below the Average limit.
4. The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;
5. L1= Line One (Live Line)



Model No.	DHP380	RBW,VBW	9 kHz
Environmental Conditions	22°C, 45% RH	Test Mode	Mode 2
Tested by	Will Wei	Line	L2
Test Date	May 27, 2017	Test Voltage	AC 240V/50Hz



Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
0.2900	24.45	17.55	19.54	43.99	37.09	60.52	50.52	-16.53	-13.43	Pass
0.3780	14.77	5.94	19.53	34.30	25.47	58.32	48.32	-24.02	-22.85	Pass
0.6620	17.30	9.49	19.59	36.89	29.08	56.00	46.00	-19.11	-16.92	Pass
1.1340	16.12	8.44	19.57	35.69	28.01	56.00	46.00	-20.31	-17.99	Pass
1.6780	14.95	6.49	19.67	34.62	26.16	56.00	46.00	-21.38	-19.84	Pass
24.5780	9.22	-2.07	20.61	29.83	18.54	60.00	50.00	-30.17	-31.46	Pass

Note:

1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Peak detector, Quasi-peak detector and average detector.
3. “---” denotes the emission level was or more than 2dB below the Average limit.
4. The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;
5. L2 = Line Two (Neutral Line)