INDUSTRY CANADA RSS-247

TEST REPORT

For

DIRECT DRIVE TURNTABLE

Model Number: TT

Trade Name : CAMBRIDGE AUDIO

Issued for

Audio Partnership PLC

Gallery Court, Hankey Place, London, SE1 4BB, United Kingdom

Issued by

Compliance Certification Services Inc.
Tainan Lab.
No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)
TEL: +886-6-5802201
FAX: +886-6-5802202
http://www.ccsrf.com
E-Mail : service@ccsrf.com

Issued Date: September 19, 2018

Note: *This report shall not be reproduced except in full, without the written approval of Compliance Certification Services Inc. This document may be altered or revised by Compliance Certification Services Inc. personnel only, and shall be noted in the revision section of the document. The client should not use it to claim product endorsement by TAF or any government agencies. The test results of this report relate only to the tested sample identified in this report.*

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	July 05, 2018	Initial Issue	All Page	Gina Lin
01	September 14, 2018	See the following note rev.01	ALL	Gina Lin
02	September 19, 2018	See the following note rev.02	Page5	Gina Lin

Note:

※ Rev.00 Issue Date: July 05, 2018
Original Report

※ Rev.01 Issue Date: September 14, 2018
Update typo.

※ Rev.02 Issue Date: September 19, 2018
Revise Transmit Data Rate.

TABLE OF CONTENTS

TITLE PAGE NO.

1. TEST REPORT CERTIFICATION

Applicant	:	**Audio Partnership PLC** Gallery Court, Hankey Place, London, SE1 4BB, United Kingdom
Manufacturer	:	**HANCHIH ELECTRONICS(SHENZHEN) CO.,LTD** XINGYE FIRST ROAD 60#, FENGHUANG INDUSTRIAL DISTRICT, FUYONG TOWN,BAOAN COUNTY, SHENZHEN CITY, GUANG DONG PROVINCE, CHINA
Equipment Under Test	:	DIRECT DRIVE TURNTABLE
Model Number	:	TT
Brand Name	:	CAMBRIDGE AUDIO
Date of Test	:	May 30, 2018 ~ June 25, 2018

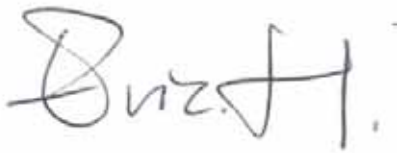
APPLICABLE STANDARD	
Standard	**Test Result**
IC RSS-247 Issue 2 : 2017	PASS

WE HEREBY CERTIFY THAT: The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Jeter Wu
Assistant Manager

Reviewed by:



Eric Huang
Section Manager

2. EUT DESCRIPTION

Product Name	DIRECT DRIVE TURNTABLE
Model Number	TT
Brand Name	CAMBRIDGE AUDIO
Received Date	May 22, 2018
Frequency Range	DSSS Mode : 2402MHz~2480MHz
Transmit Power	DSSS Mode：6.30dBm (4.26874mW)
Channel Spacing	DSSS Mode : 2 MHz
Channel Number	DSSS Mode : 40 Channels
Transmit Data Rate	DSSS Mode：1 Mbps
Type of Modulation	DSSS
Antenna Type	Manufacturer: Audio Partnership PLC Type: ANTENNA WIFI FOR FPC Model: 520122-0010-23R Gain: 1.24 dBi
Power Rating	AC100-240V, 60/50Hz
Hardware Version	V1.0
Software Version	V1.0

Remark : *1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*
2. For more details, please refer to the User's manual of the EUT.

3. DESCRIPTION OF TEST MODES

The EUT (DIRECT DRIVE TURNTABLE) had been tested under operating condition.

Conducted Emission / Radiated Emission Test (Below 1 GHz)

1. The following test modes were scanned during the preliminary test:

No.	Pre-Test Mode
1	Normal Operating

2. After the preliminary scan, the following test mode was found to produce the highest emission level.

Final Test Mode		
Emission	Radiated Emission	TX
	Conducted Emission	Normal Operating

Remark : *Then, the above highest emission mode of the configuration of the EUT and cable was chosen for all final test items.*

Conducted / Radiated Emission Test (Above 1 GHz)

DSSS mode

The EUT had been tested under operating condition.

There are three channels have been tested as following:

Channel	Frequency (MHz)
Low	2402
Middle	2442
High	2480

DSSS mode: 1Mbps long data rates (worst case) were chosen for full testing.

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with IC RSS-247 Issue 2 (February 2017), IC RSS-Gen Issue 5 (April 2018), ANSI C63.4: 2014 and ANSI C63.10: 2013.

This submittal(s) (test report) is intended for IC Certification No: **9095A-TT030** filing to comply with Industry CANADA RSS247.

5. FACILITIES AND ACCREDITATION

5.1 FACILITIES

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

No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.4: 2014 and ANSI C63.10: 2013 and CISPR 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4, CISPR 16-1-5.

5.2 ACCREDITATIONS

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

Taiwan	TAF

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

Canada	Industry Canada
Germany	TUV NORD
Taiwan	BSMI
USA	FCC

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

5.3 MEASUREMENT UNCERTAINTY

The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4-2.

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz Test Site : OATS-6	±3.3456dB
Radiated Emission, 200 to 1000 MHz Test Site : OATS-6	±2.6828dB
Radiated Emission, 1 to 8 GHz	± 2.6485dB
Radiated Emission, 8 to 18 GHz	± 2.6852dB
Radiated Emission, 18 to 26.5 GHz	± 2.6485dB
Radiated Emission, 26 to 40 GHz	± 3.0295dB
Power Line Conducted Emission	±1.91dB
Band Width	136.49kHz
Peak Output Power MU	±1.904dB
Band Edge MU	±0.302dBuV
Channel Separation MU	361.69Hz
Duty Cycle MU	0.064ms
Frequency Stability MU	0.223kHz

This measurement uncertainty is confidence of approximately 95%, k=2

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

For EMI test

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	Speaker System	T.C.SATR	TCS2285	DoC	Power cable, unshd, 1.4m
2	Speaker System	KINYO	BTS-672	DoC	N/A

No.	Signal cable description	
A	AC Power Cable	Unshielded, 1.8m 1 pcs
B	Audio Cable	Shielded, 1.0m 1 pcs

For RF test

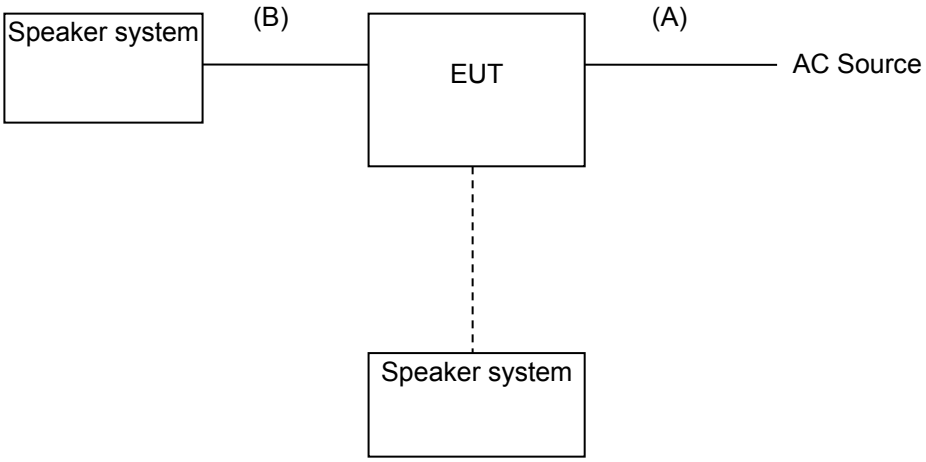
No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	Note Book	Acer	AS 3830TG	DoC	Power cable, unshd, 1.6m
2	Speaker System	T.C.SATR	TCS2285	DoC	Power cable, unshd, 1.4m

No.	Signal cable description	
A	Power Cable	Unshielded, 1.6m 1 pcs
B	Audio Cable	Unshielded, 1.0m 1 pcs
C	Command Cable	Unshielded, 0.25m 1 pcs
D	USB Cable	Shielded, 1.7m 1 pcs.

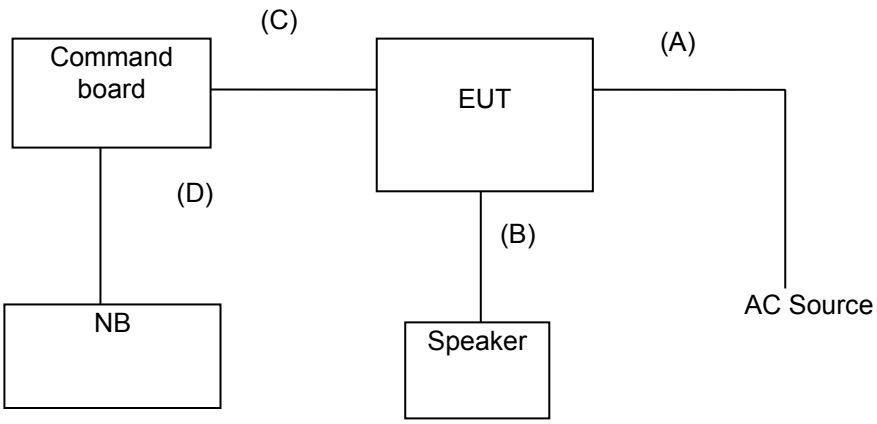
Note:
1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3) shd. = shielded; unshd. = unshielded

SETUP DIAGRAM FOR TESTS

EMI



RF



EUT OPERATING CONDITION

RF Setup

1. Set up all computers like the setup diagram.
2. 2. The “CSR BlueSuite 2.6.4”,“Blue Test 3” software was used for testing.
3. Choose Transport “SPI” and Port “USB SPI (600373)”.

TX Mode:

GFSK(DH1):
CFG PKT > Packet Type : 4 , Packet Type : 27
TXDATA1 > LO Freq : 2402 (2402,2441,2480), Power : 180,0

GFSK(DH3):
CFG PKT > Packet Type : 11 , Packet Type : 183
TXDATA1 > LO Freq : 2402 (2402,2441,2480), Power : 180,0

GFSK(DH5):
CFG PKT > Packet Type : 15 , Packet Type : 339
TXDATA1 > LO Freq : 2402 (2402,2441,2480), Power : 180,0

8-DPSK(3DH1):
CFG PKT > Packet Type : 24 , Packet Type : 83
TXDATA1 > LO Freq : 2402 (2402,2441,2480), Power : 255,50 (180,0)

8-DPSK(3DH3):
CFG PKT > Packet Type : 27 , Packet Type : 552
TXDATA1 > LO Freq : 2402 (2402,2441,2480), Power : 255,50 (180,0)

8-DPSK(3DH5):
CFG PKT > Packet Type : 31 , Packet Type : 1021
TXDATA1 > LO Freq : 2402 (2402,2441,2480), Power : 255,50 (180,0)

DSSS:
BLE TEST TX > Channel :0 (0,20,39)
Length : 37
Bit pattern : 0

RX Mode:

GFSK, 8-DPSK:
RXDATA1

DSSS:
BLE TEST RX

4. All of the function are under run.
5 .Start test.

7. IC RSS-247 REQUIREMENTS

7.1 6dB BANDWIDTH

LIMITS

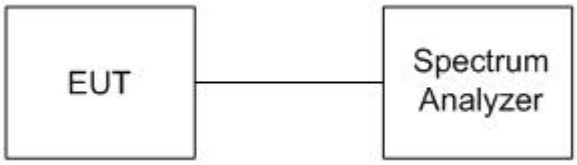
RSS-247 Issue 2 § 5.2 For digital modulation systems, the minimum -6dB bandwidth shall be at least 500kHz.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	07/05/2017	07/04/2018
SMA Cable + 10dB Attenuator	CCS	SMA + 10dB Att	O6	01/22/2018	01/21/2019

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

TEST SETUP



TEST PROCEDURE

The transmitter output was connected to a spectrum analyzer. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

TEST RESULTS

Model Name	TT	Test By	Ted Huang
Temp & Humidity	25.6°C, 57%	Test Date	2018/6/21

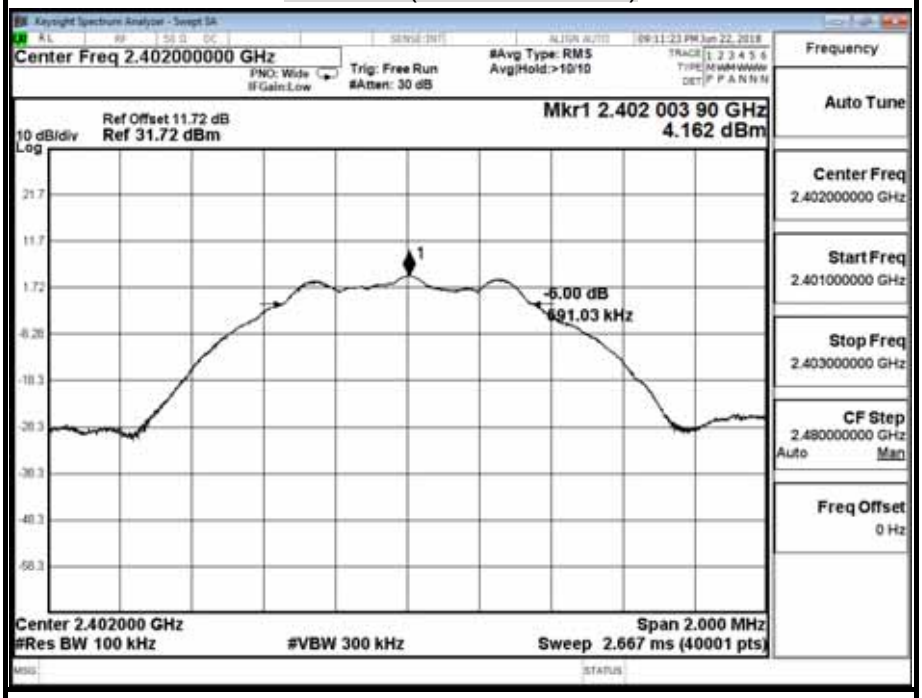
DSSS mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (kHz)	Pass / Fail
Low	2402	691.03	500	PASS
Middle	2442	686.74	500	PASS
High	2480	705.12	500	PASS

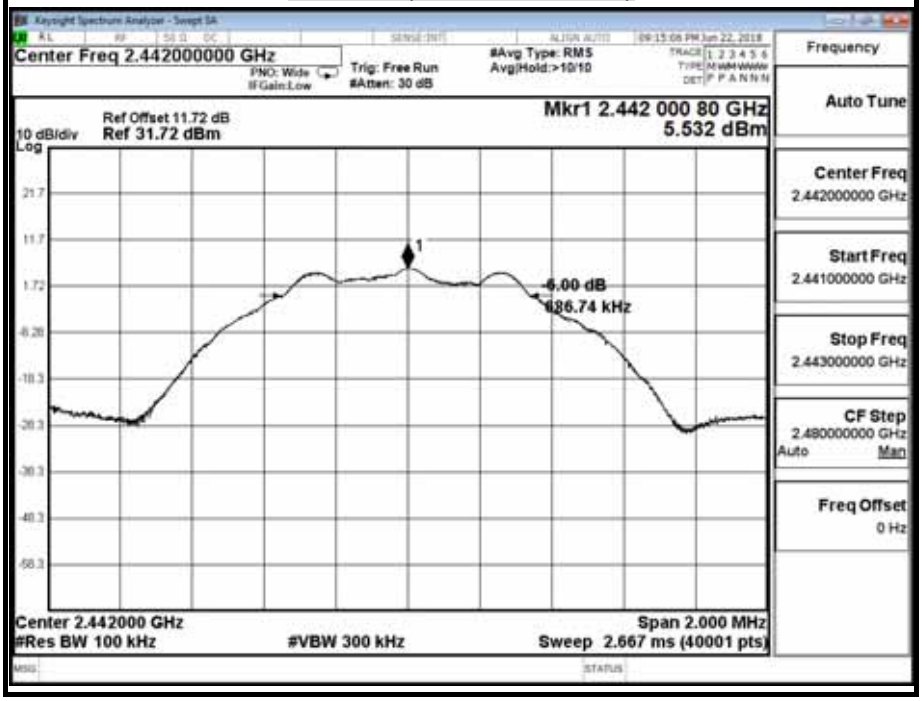
NOTE : 1. At finial test to get the worst-case emission at1Mbps long.
2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.

6dB BANDWIDTH

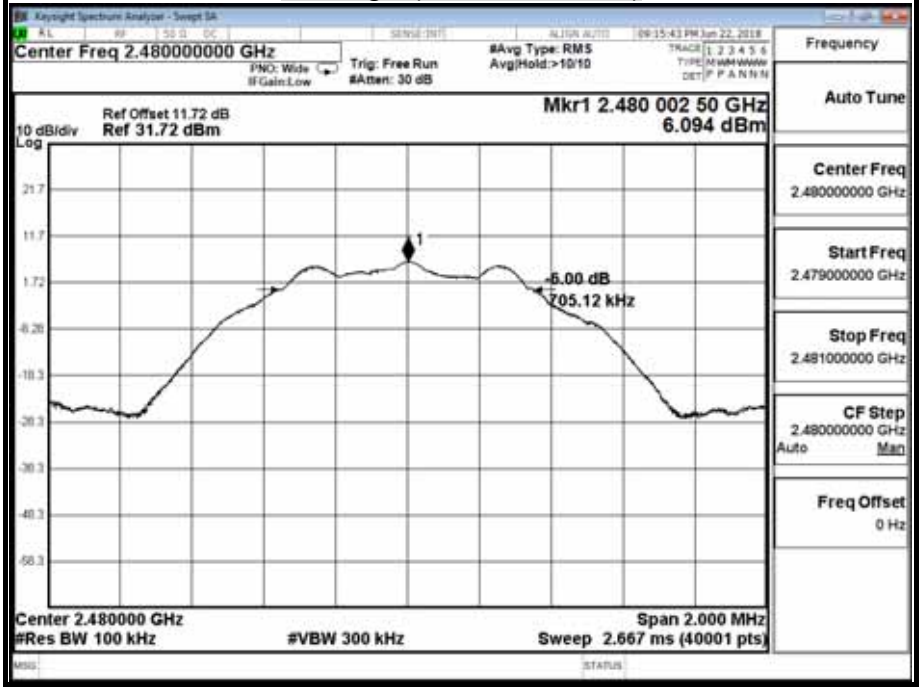
CH Low (DSSS MODE)



CH Mid (DSSS MODE)



CH High (DSSS MODE)



7.2 99% BANDWIDTH

LIMITS

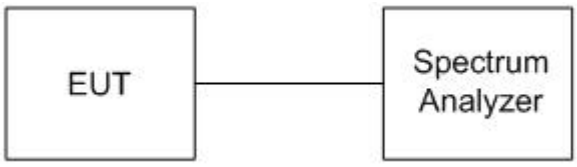
None; for reporting purposes only.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	07/05/2017	07/04/2018
SMA Cable + 10dB Attenuator	CCS	SMA + 10dB Att	O6	01/22/2018	01/21/2019

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

TEST SETUP



TEST PROCEDURE

1. The spectrum shall be set as follows :
   Span : The minimum span to fully display the emission and approximately 20dB below peak level.
   RBW : The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%.
   VBW: The video bandwidth shall be set to 3 times the resolution bandwidth.
   Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.
2. Compute the combined power of all signal responses contained in the trace by covering all the data points.
3. For 99% occupied BW, place the markers at the frequency at which 0.5% of the power lies to the right of the right marker and 0.5% of the power lies to the left of the left marker.
4. The 99% BW is the bandwidth between the right and left markers.

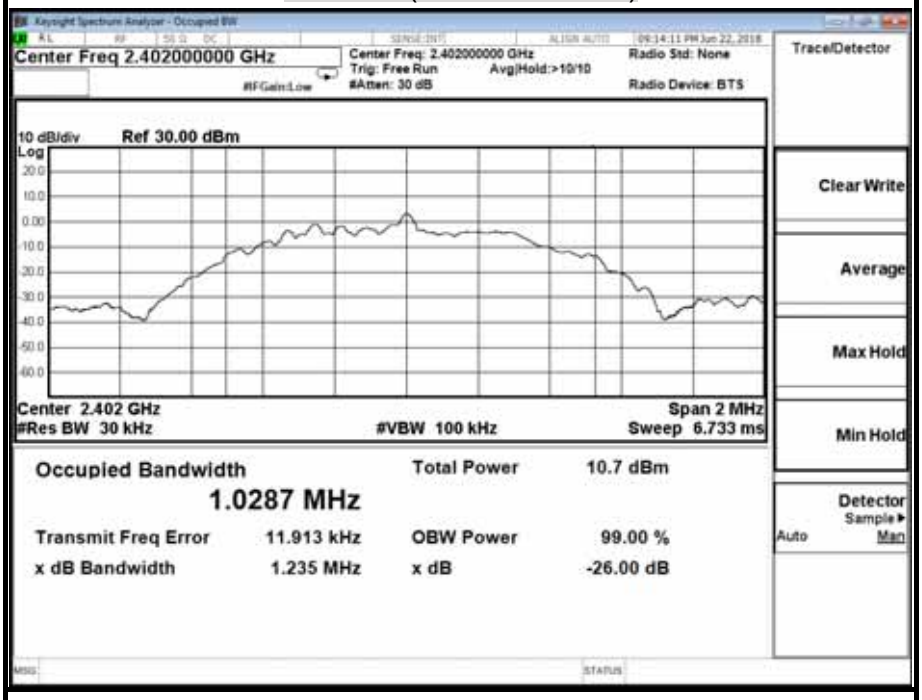
TEST RESULTS

Model Name	TT	Test By	Ted Huang
Temp & Humidity	25.6°C, 57%	Test Date	2018/6/21

Channel	Channel Frequency (MHz)	99% Occupied Power Bandwidth (kHz)
Low	2402	1028.70
Middle	2442	1026.50
High	2480	1030.90

99% BANDWIDTH

CH Low (DSSS MODE)



CH Mid (DSSS MODE)

CH High (DSSS MODE)

7.3 MAXIMUM PEAK OUTPUT POWER

LIMITS

RSS-247 Issue 2 § 5.4 For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	07/05/2018	07/04/2019
Power Meter	Anritsu	ML2487A	6K00003888	05/02/2018	05/01/2019
Power Sensor	Anritsu	MA2491A	033265	05/02/2018	05/01/2019
SMA Cable + 10dB Attenuator	CCS	SMA + 10dB Att	O6	01/22/2018	01/21/2019

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

TEST SETUP

TEST PROCEDURE

The tests were performed in accordance with KDB 558074 9.1.1

1. Set the RBW = 1 MHz.
2. Set the VBW ≥ 3 RBW
3. Set the span ≥ 1.5 x DTS bandwidth.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select peak detector). If the instrument does not have a band power function,
9. Sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS bandwidth.

TEST RESULTS

Model Name	TT	Test By	Ted Huang
Temp & Humidity	25.6°C, 57%	Test Date	2018/6/21

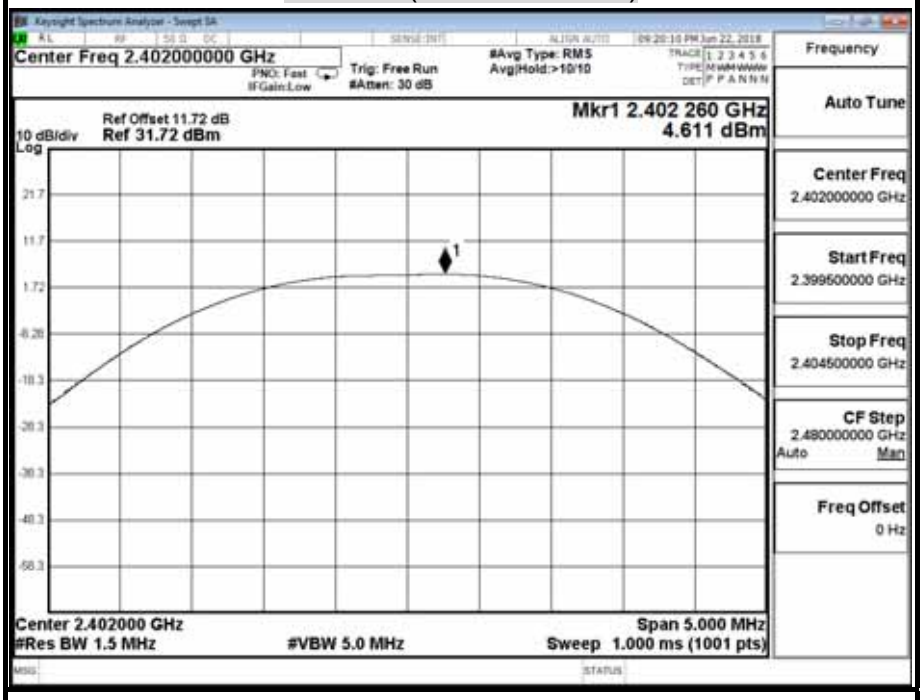
DSSS mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2402	4.61	30.00	PASS
Middle	2442	5.89	30.00	PASS
High	2480	6.30	30.00	PASS

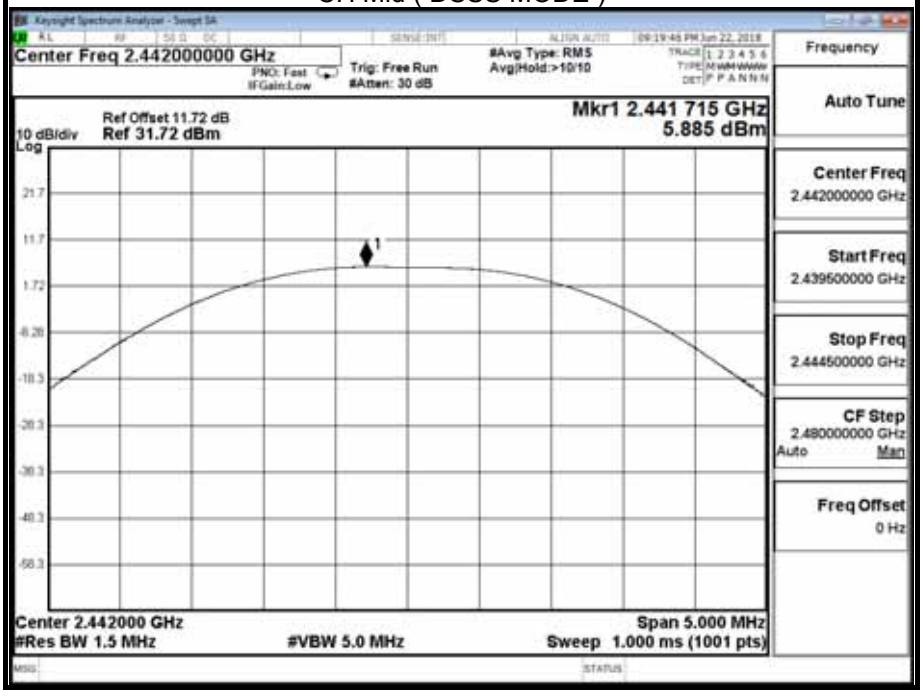
NOTE : 1. At finial test to get the worst-case emission at 1Mbps long.
2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

MAXIMUM PEAK OUTPUT POWER (DSSS MODE)

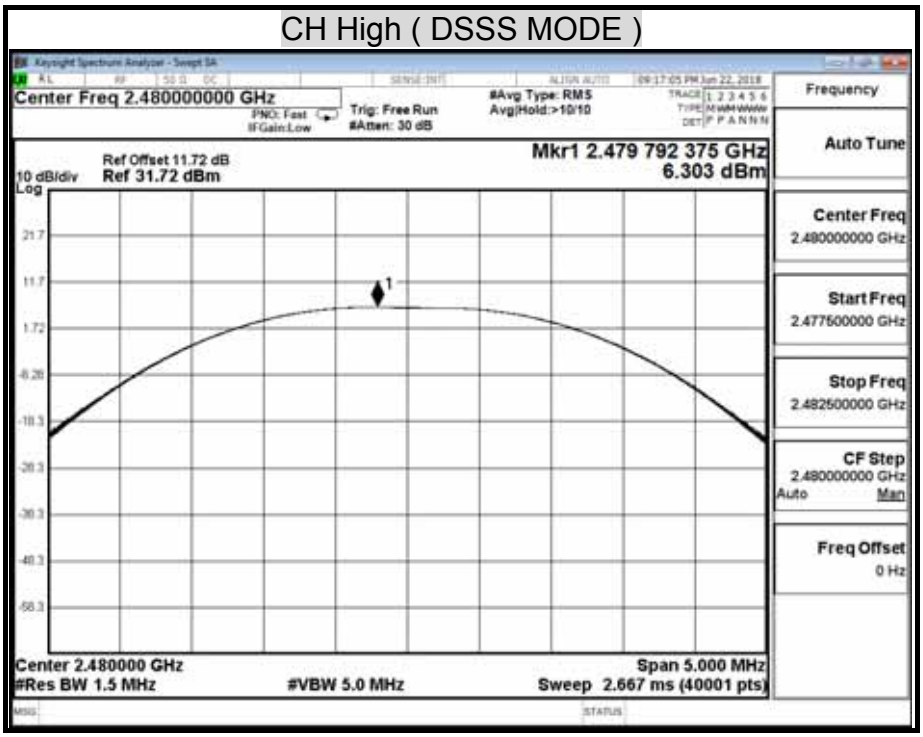
CH Low (DSSS MODE)



CH Mid (DSSS MODE)



CH High (DSSS MODE)



7.4 AVERAGE POWER

LIMITS

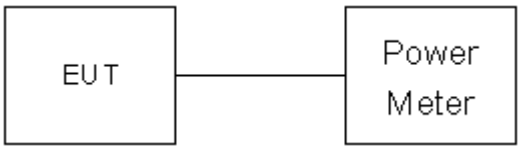
None; for reporting purposes only.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	07/05/2017	07/04/2018
SMA Cable + 10dB Attenuator	CCS	SMA + 10dB Att	O6	01/22/2018	01/21/2019

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

TEST SETUP



TEST PROCEDURE

The transmitter output is connected to the power meter. The power meter is set to the average power detection.

TEST RESULTS

Model Name	TT	Test By	Ted Huang
Temp & Humidity	25.6°C, 57%	Test Date	2018/6/21

DSSS mode

Channel	Channel Frequency (MHz)	Average Power (dBm)
Low	2402	2.11
Middle	2442	3.42
High	2480	3.94

7.5 POWER SPECTRAL DENSITY

LIMITS

RSS-247 Issue 2 § 5.4 For digital modulation systems, the transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of Section 5.4 (4), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	07/05/2017	07/04/2018
SMA Cable + 10dB Attenuator	CCS	SMA + 10dB Att	O6	01/22/2018	01/21/2019

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

TEST SETUP

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 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 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

Model Name	TT	Test By	Ted Huang
Temp & Humidity	25.6°C, 57%	Test Date	2018/6/21

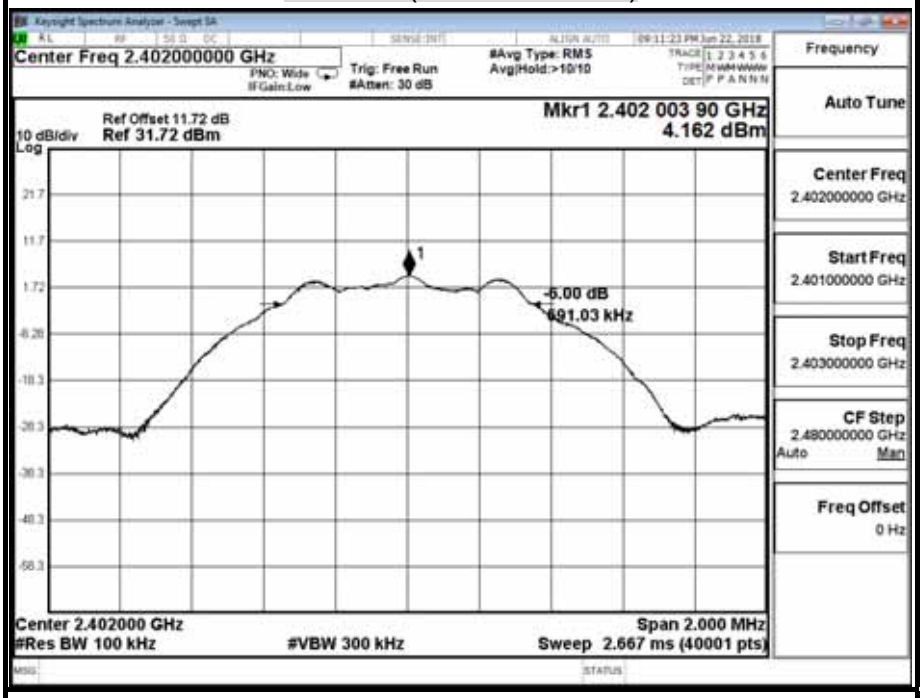
DSSS mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)	Result
Low	2402	4.16	8.00	-3.84	PASS
Middle	2442	5.53	8.00	-2.47	PASS
High	2480	6.09	8.00	-1.91	PASS

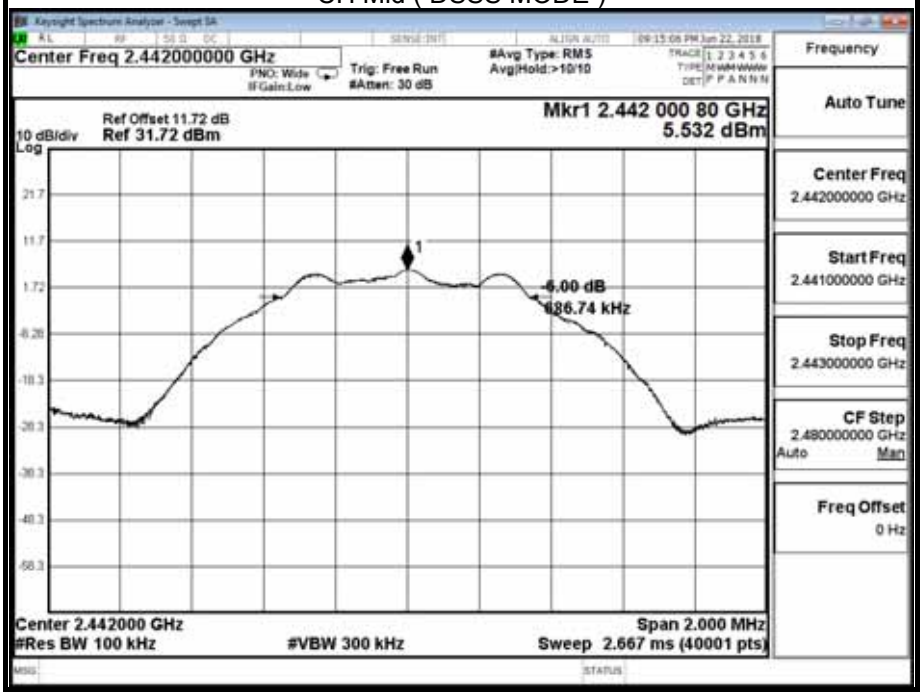
NOTE : 1. At finial test to get the worst-case emission at 1Mbps long.
2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

POWER SPECTRAL DENSITY

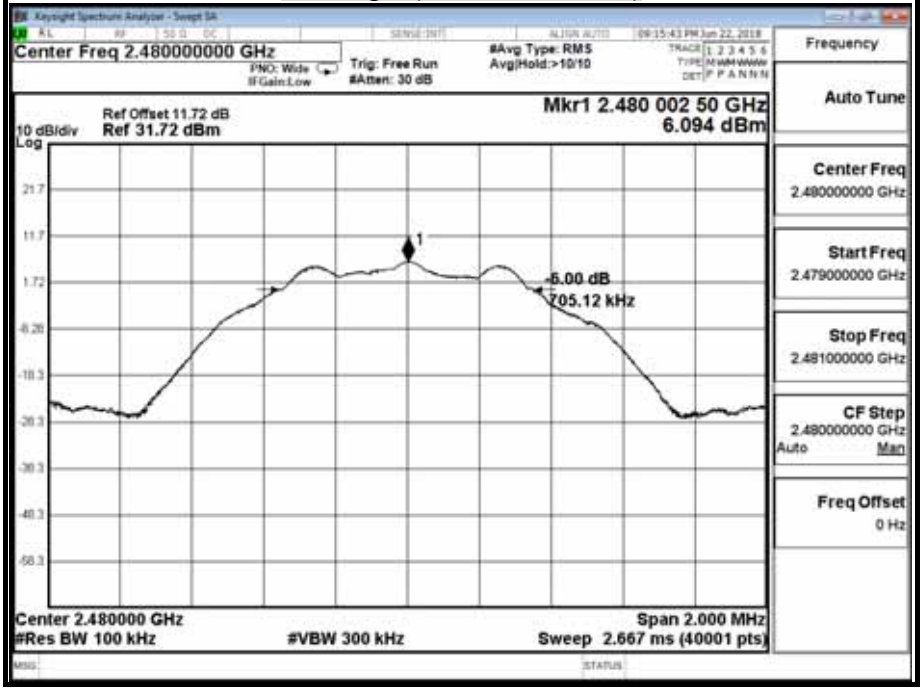
CH Low (DSSS MODE)



CH Mid (DSSS MODE)



CH High (DSSS MODE)



7.6 DUTY CYCLE

LIMIT

Nil (No dedicated limit specified in the Rules)

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	07/05/2017	07/04/2018
SMA Cable + 10dB Attenuator	CCS	SMA + 10dB Att	O6	01/22/2018	01/21/2019

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

TEST SETUP

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. The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

TEST RESULTS

No non-compliance noted.

Model Name	TT	Test By	Ted Huang
Temp & Humidity	25.6°C, 57%	Test Date	2018/6/21

DSSS Mode

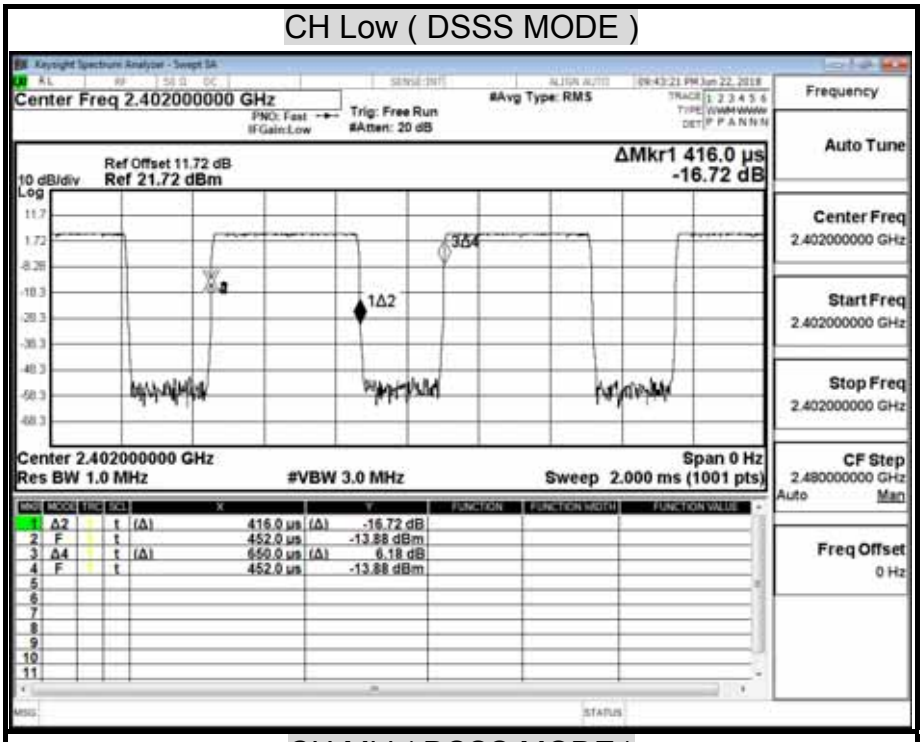
	us	Times	Ton	Total Ton time(ms)
Ton1	416.000	1	416	
Ton2		0	0	
Ton3			0	0.416
Tp				0.65

Ton	0.416
Tp(Ton+Toff)	0.65
Duty Cycle	0.64
Duty Factor	1.93820026

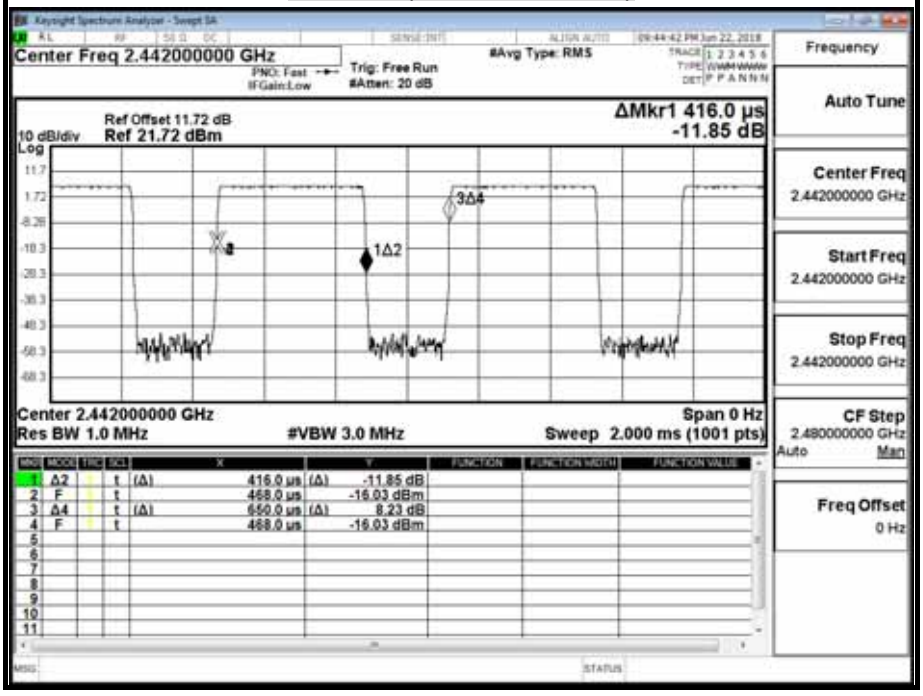
TEST PLOT

Duty Cycle

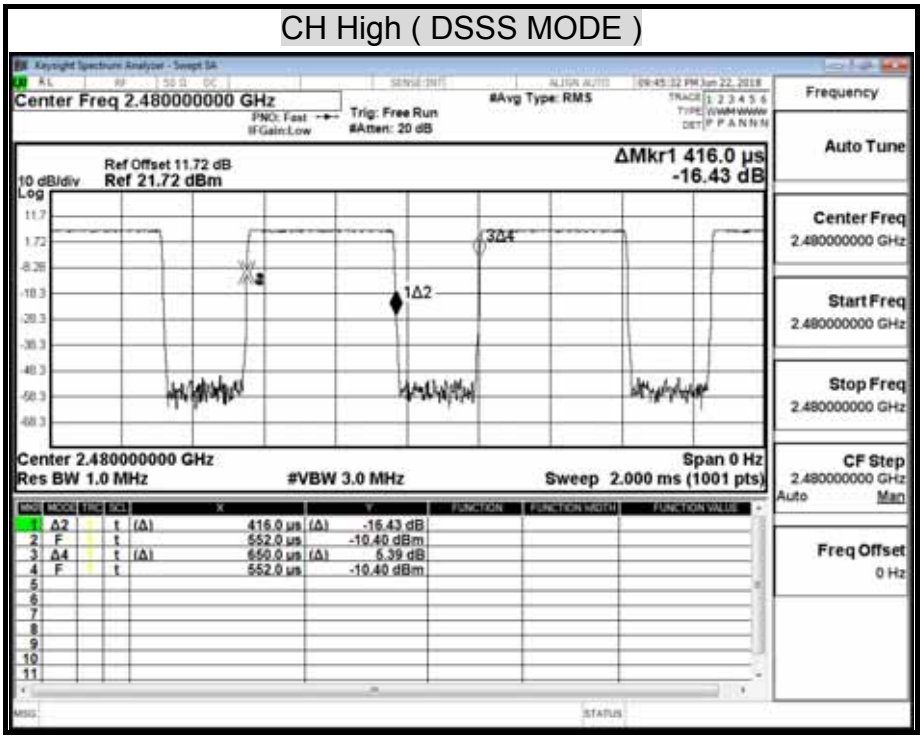
CH Low (DSSS MODE)



CH Mid (DSSS MODE)



CH High (DSSS MODE)



7.7 CONDUCTED SPURIOUS EMISSION

LIMITS

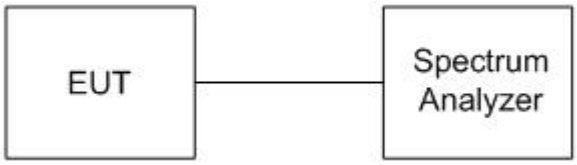
RSS-247 Issue 2 § 5.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. Attenuation below the general field strength limits specified in RSS-Gen is not required.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	07/05/2017	07/04/2018
SMA Cable + 10dB Attenuator	CCS	SMA + 10dB Att	O6	01/22/2018	01/21/2019

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

TEST SETUP



TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

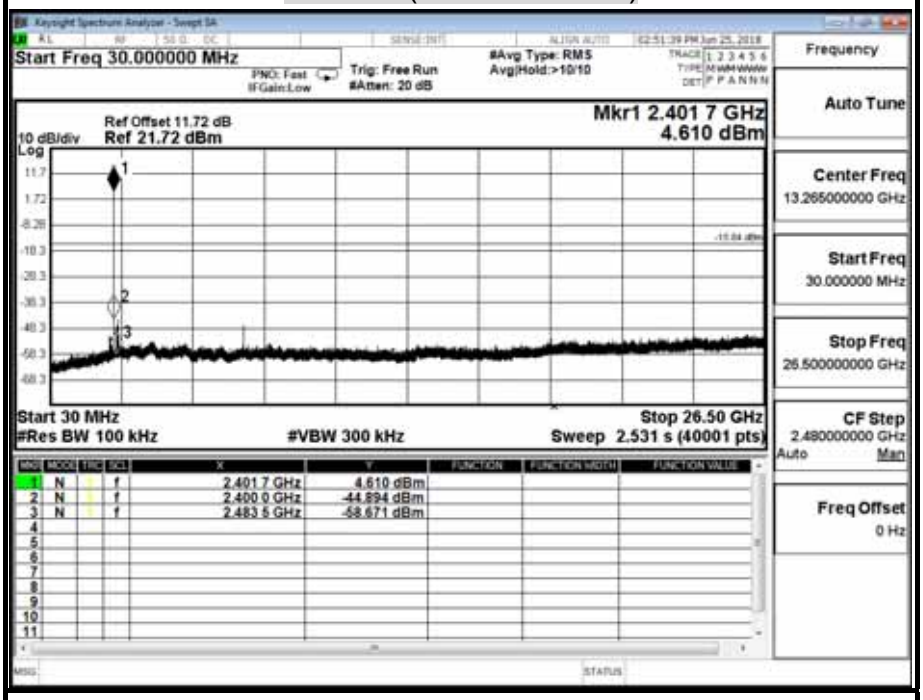
The spectrum from 30 MHz to 26.5 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

TEST RESULTS

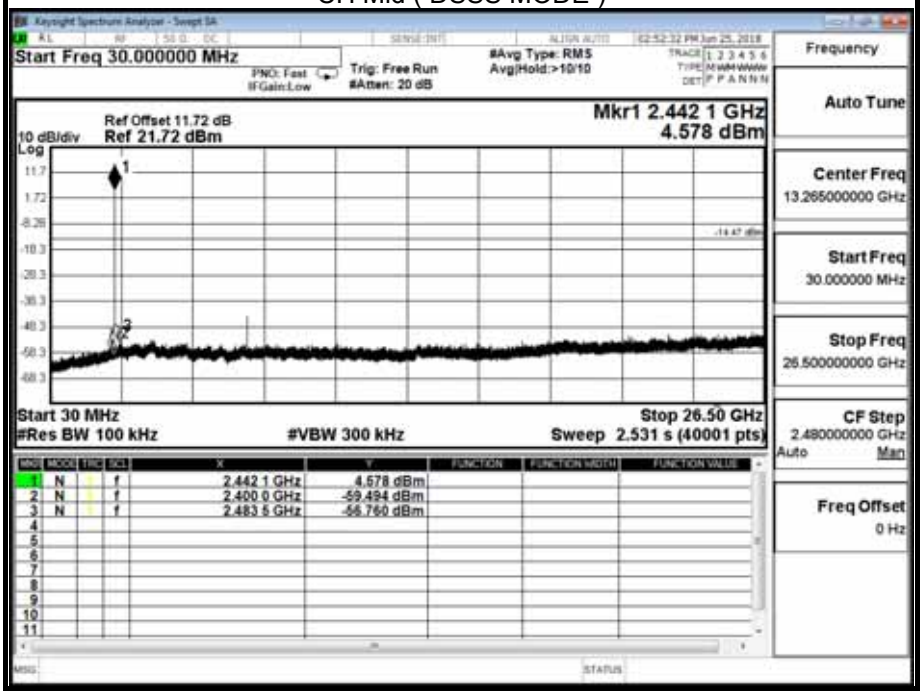
Model Name	TT	Test By	Ted Huang
Temp & Humidity	25.6°C, 57%	Test Date	2018/6/21

OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

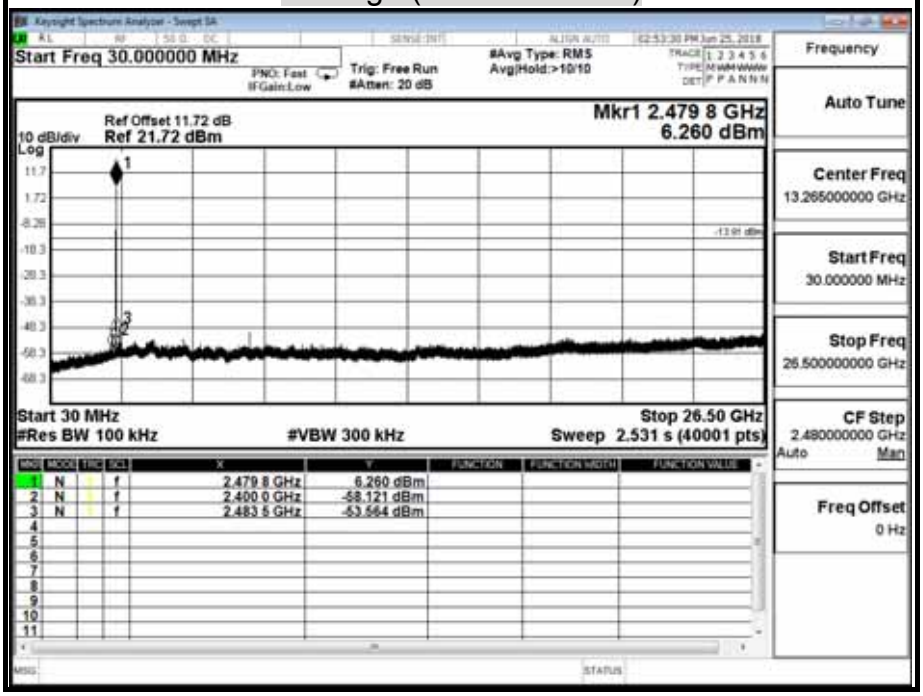
CH Low (DSSS MODE)



CH Mid (DSSS MODE)

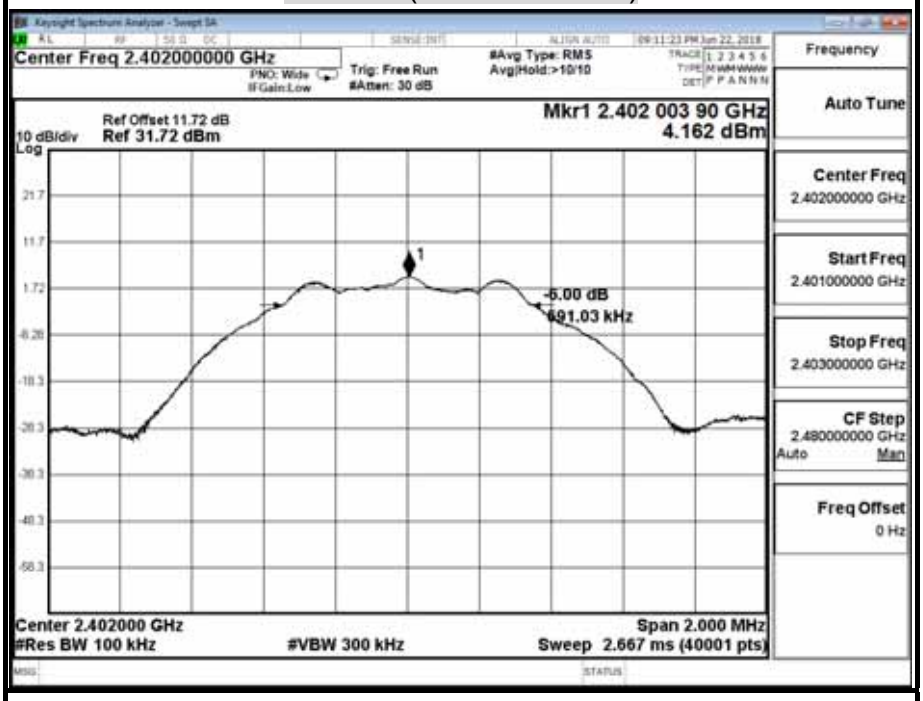


CH High (DSSS MODE)

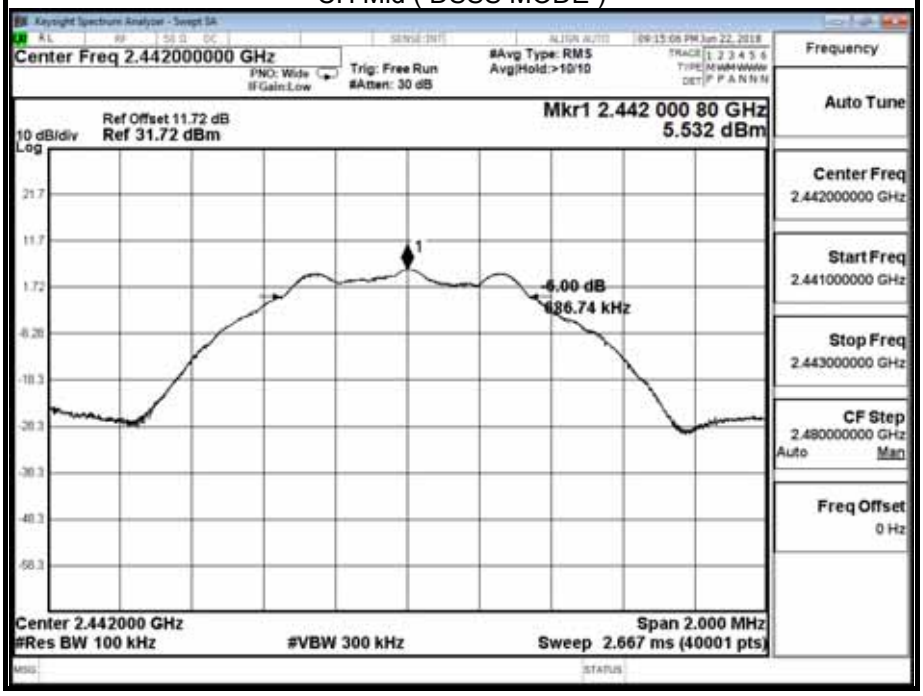


(REFERENCE LEVEL)

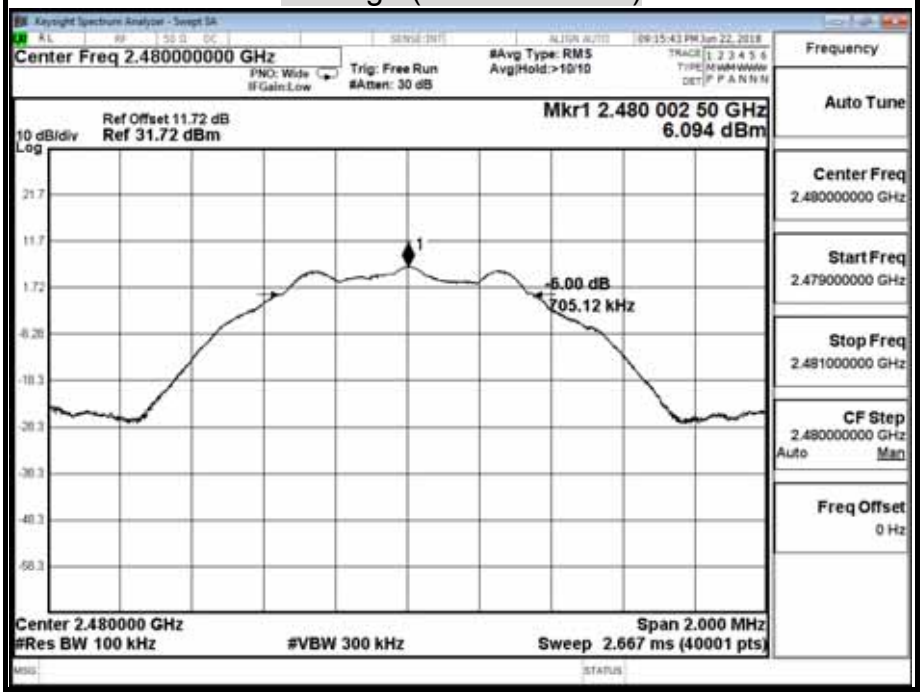
CH Low (DSSS MODE)



CH Mid (DSSS MODE)



CH High (DSSS MODE)



7.7 RADIATED EMISSION

LIMITS

RSS-Gen Issue 5, Only radiocommunication receivers operating in stand-alone mode within the band 30-960 MHz, as well as scanner receivers, are subject to Industry Canada requirements.

RSS-Gen Issue 5 § 8.10 (b) Unwanted emissions that fall into restricted bands of Table 6 shall comply with the limits specified in RSS-Gen.

RSS-Gen Issue 5 Table 6: Restricted Frequency Bands (Note)

MHz	MHz	MHz	GHz
0.090 - 0.110	13.36 – 13.41	1645.5 - 1646.5	9.0 - 9.2
2.1735 – 2.1905	16.42 - 16.423	1660 -1710	9.3 - 9.5
3.020 – 3.026	16.69475 - 16.69525	1718.8 - 1722.2	10.6 -12.7
4.125 - 4.128	16.80425 - 16.80475	2200 - 2300	13.25 -13.4
4.17725 - 4.17775	25.5 - 25.67	2310 - 2390	14.47 – 14.5
4.20725 - 4.20775	37.5 - 38.25	2655 - 2900	15.35 -16.2
5.677 – 5.683	73 - 74.6	3260 - 3267	17.7 - 21.4
6.215 – 6.218	74.8 - 75.2	3332 - 3339	22.01 - 23.12
6.26775 – 6.26825	108 -138	3345.8 - 3358	23.6 - 24.0
6.31175 - 6.31225	156.52475 - 156.52525	3500 - 4400	31.2 - 31.8
8.291 - 8.294	156.7 - 156.9	4500 - 5150	36.43 - 36.5
8.362 - 8.366	240 - 285	5350 - 5460	Above 38.6
8.37625 - 8.38675	322 -335.4	7250 - 7750	
8.41425 - 8.41475	399.9 - 410	8025 - 8500	
12.29 - 12.293	608 - 614		
12.51975 - 12.52025	960 - 1427		
12.57675 - 12.57725	1435 – 1626.5		

Note: *Certain frequency bands listed in Table 6 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in the 200 and 300 series RSSs, such as RSS-247 and RSS-310, which contain the requirements that apply to licence-exempt radio apparatus.*

RSS-Gen Issue 5 Table 2: Receiver Radiated Limits

Frequency (MHz)	Field Strength (μv/m at 3 metres)*
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

Note: ******* *Measurements for compliance with limits in the above table may be performed at distances other than 3 metres, in accordance with Section 6.5.*

RSS-Gen Issue 5 Table 4: General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Above 30MHz

Frequency (MHz)	Field Strength (μv/m at 3 metres)
30 - 88	100
88 - 216	150
216 - 960	200
Above 960*	500

Note: *Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the specific RSS.*
** Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.*

RSS-Gen Issue 5 Table 5: General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Below 30 MHz

Frequency	Electric Field Strength (μV/m)	Magnetic Field Strength (H-Field) (μA /m)	Measurement Distance (metres)
9 - 490 kHz	2,400/F (F in kHz)	2,400/337F (F in kHz)	300
490 - 1,705 kHz	24,000/F (F in kHz)	24,000/337F (F in kHz)	30
1.705 - 30 MHz	30	N/A	30

Note: *The emission limits for the bands 9-90 kHz and 110-490 kHz are based on measurements employing an average detector. Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the relevant RSS.*

TEST EQUIPMENT

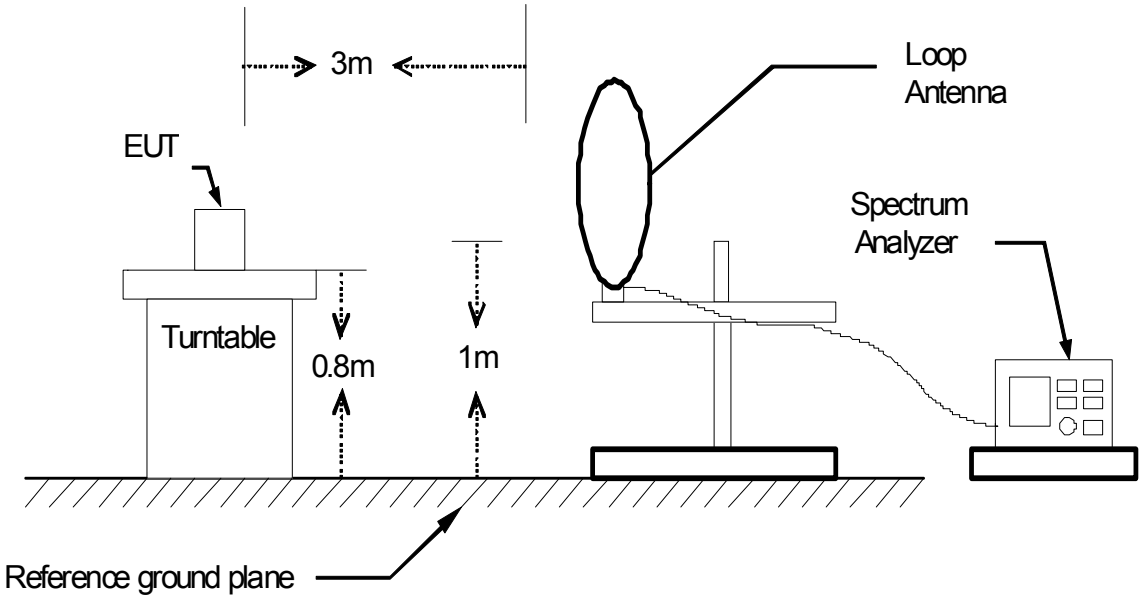
Chamber Room #966					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Active Loop Antenna	ETS-LINDREN	6502	8905-2356	07/20/2017	07/19/2019
Amplifier	HP	8447F	2443A01671	01/22/2018	01/21/2019
Bi-Log Antenna	Sunol	JB1	A070506-2	02/09/2018	02/08/2019
Cable	Rosnol+Suhner	SUCOFLEX 104PEA	SN25737 /4PEA	01/27/2018	01/26/2019
Double Ridged Guide Horn Antenna	ETS-LINDGREN	3116	00078900	03/20/2017	03/19/2019
EMI Test Receiver	R&S	ESCI	100960	10/31/2017	10/30/2018
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	07/05/2017	07/04/2018
Hi-Pass Filter	MICRO-TRONICS	BRM50702-01	018	01/22/2018	01/21/2019
Horn Antenna	Com-Power	AH-118	071032	04/19/2018	04/18/2019
Pre-Amplifier	EMCI	EMC012645	980098	01/22/2018	01/21/2019

Remark: *1. Each piece of equipment is scheduled for calibration once a year.*

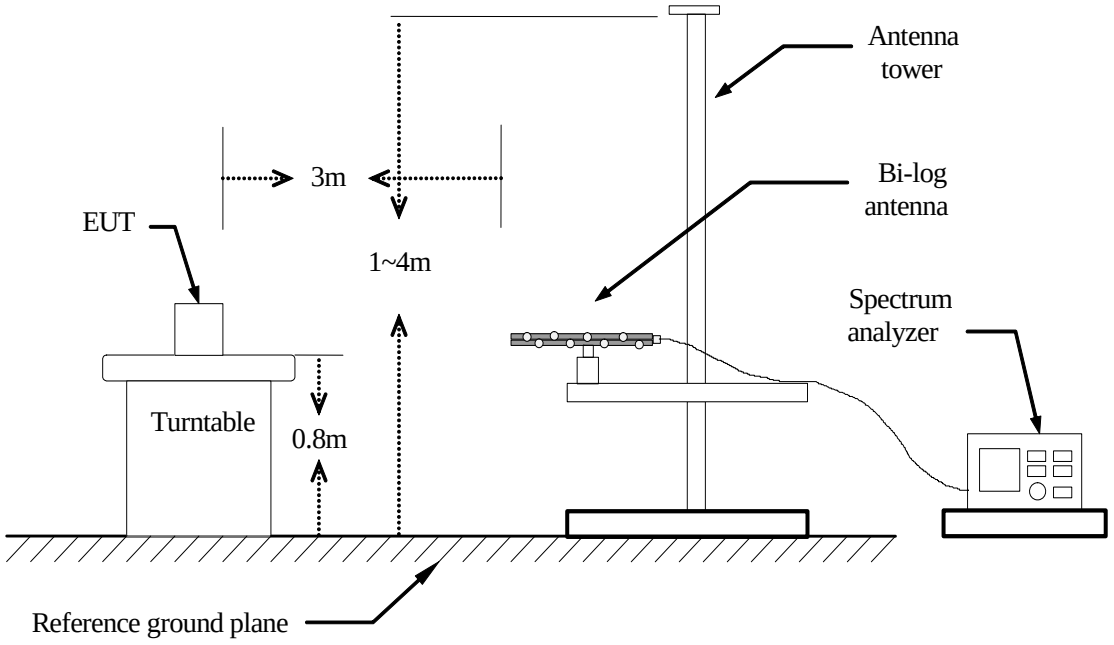
TEST SETUP

The diagram below shows the test setup that is utilized to make the measurements for emission below 1GHz.

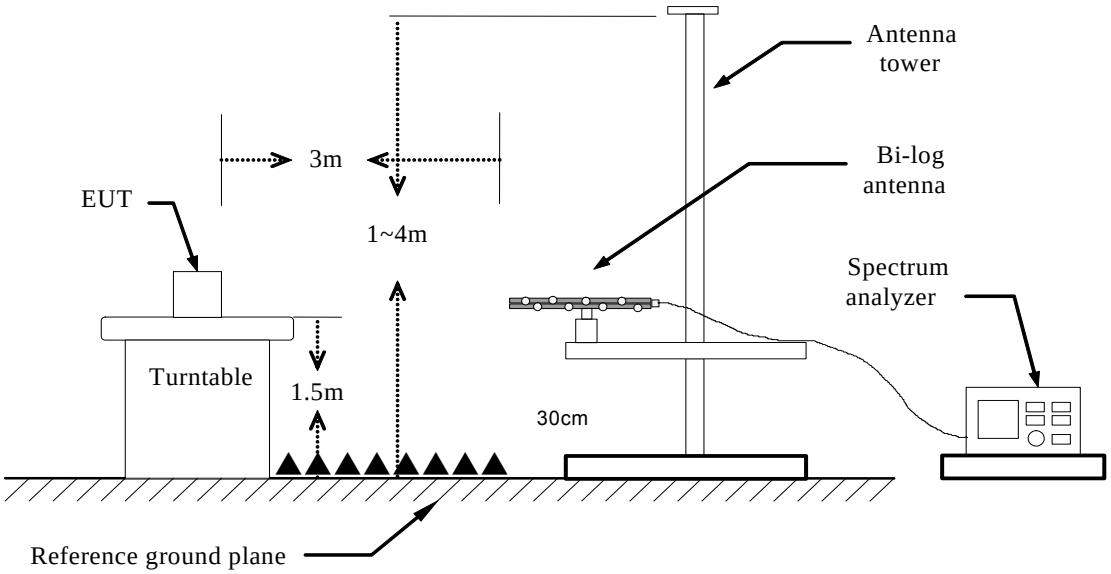
9kHz ~ 30MHz



30MHz ~ 1GHz



The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.



TEST PROCEDURE

1. The EUT was placed on the top of a rotating table 0.8/1.5 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
2. White measuring the radiated emission below 1GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. White measuring the radiated emission above 1GHz, the EUT was set 3 meters away from the interference-receiving antenna
3. The antenna is a broadband antenna, and its 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 polarization of the antenna are set to make the measurement.
4. 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 table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 dB 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 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Remark：

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.

2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.

3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

TEST RESULTS

Below 1 GHz (9kHz ~ 30MHz)

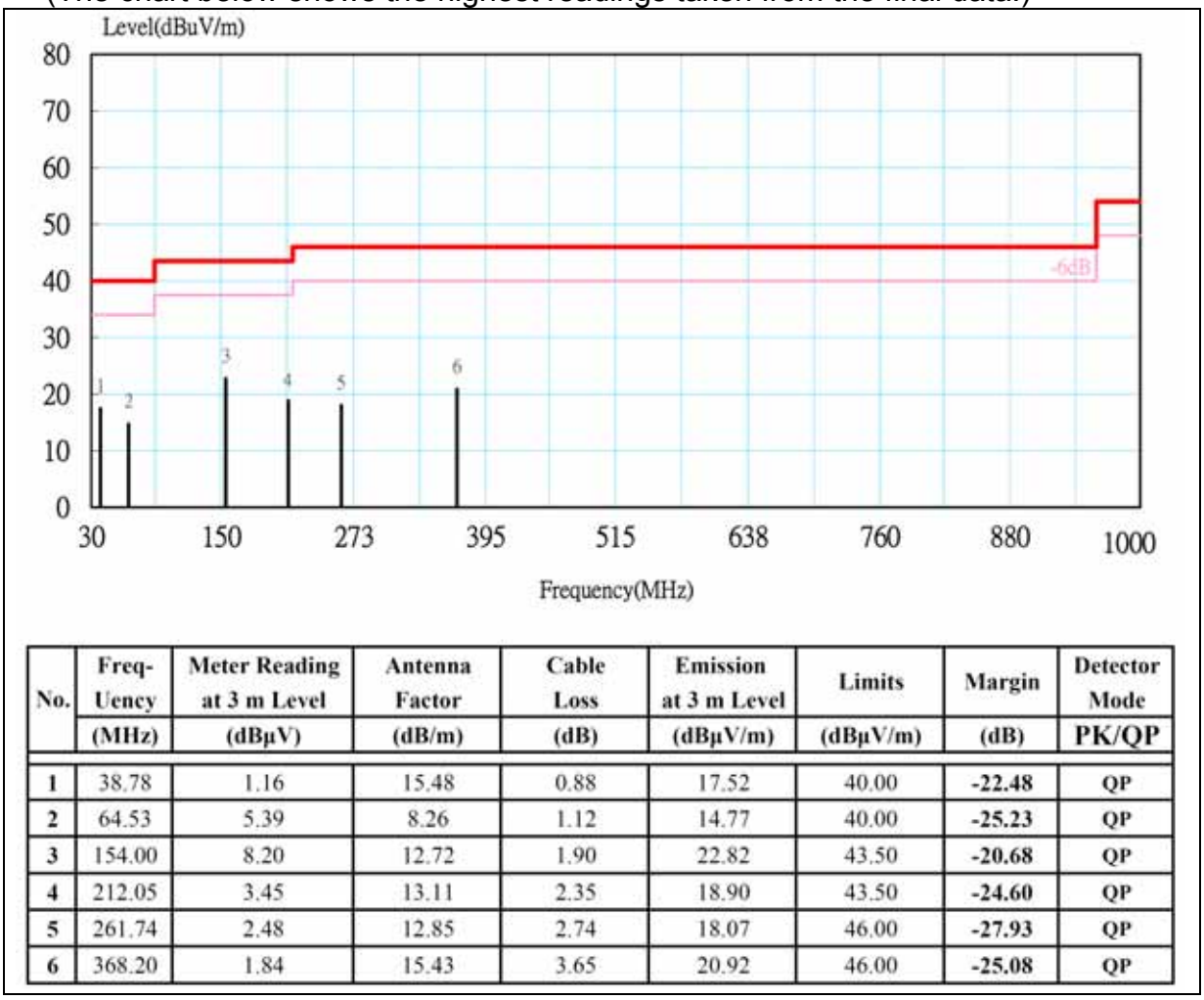
No emission found between lowest internal used/generated frequency to 30MHz.

Below 1 GHz (30MHz ~ 1GHz)

Product Name	DIRECT DRIVE TURNTABLE	Test Date	2018/6/25
Model	TT	Test By	Ted Huang
Test Mode	TX	TEMP& Humidity	26.5°C, 52%

Horizontal

(The chart below shows the highest readings taken from the final data.)



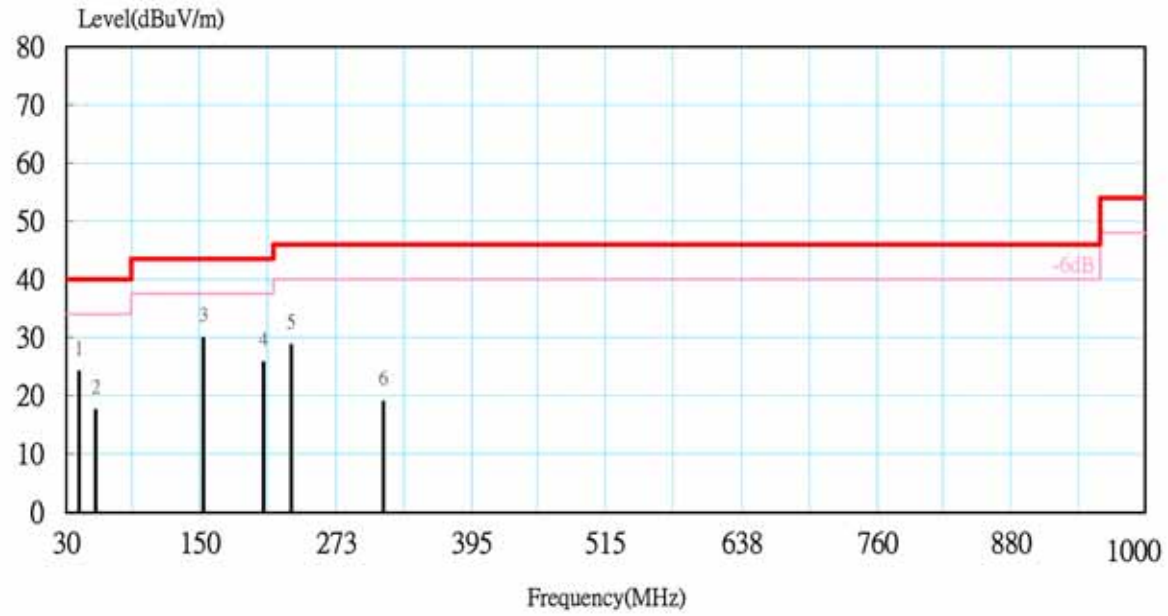
No.	Freq-Uency (MHz)	Meter Reading at 3 m Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Emission at 3 m Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Detector Mode PK/QP
1	38.78	1.16	15.48	0.88	17.52	40.00	**-22.48**	QP
2	64.53	5.39	8.26	1.12	14.77	40.00	**-25.23**	QP
3	154.00	8.20	12.72	1.90	22.82	43.50	**-20.68**	QP
4	212.05	3.45	13.11	2.35	18.90	43.50	**-24.60**	QP
5	261.74	2.48	12.85	2.74	18.07	46.00	**-27.93**	QP
6	368.20	1.84	15.43	3.65	20.92	46.00	**-25.08**	QP

Note: 1. QP= Quasi-peak Reading.
2. The other emission levels were very low against the limit

Product Name	DIRECT DRIVE TURNTABLE	Test Date	2018/6/25
Model	TT	Test By	Ted Huang
Test Mode	TX	TEMP& Humidity	26.5°C, 52%

Vertical

(The chart below shows the highest readings taken from the final data.)



No.	Freq-Uency (MHz)	Meter Reading at 3 m Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Emission at 3 m Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Detector Mode PK/QP
1	41.25	9.47	13.76	0.90	24.14	40.00	**-15.86**	QP
2	56.45	8.28	8.15	1.06	17.49	40.00	**-22.51**	QP
3	153.35	15.26	12.73	1.90	29.89	43.50	**-13.61**	QP
4	207.65	10.21	13.18	2.31	25.70	43.50	**-17.80**	QP
5	232.51	13.40	12.78	2.51	28.69	46.00	**-17.31**	QP
6	315.40	1.44	14.32	3.18	18.94	46.00	**-27.06**	QP

Note: 1. QP= Quasi-peak Reading.
2. The other emission levels were very low against the limit

Above 1 GHz

Product Name	DIRECT DRIVE TURNTABLE	Test Date	2018/6/21
Model	TT	Test By	Ted Huang
Test Mode	DSSS TX (CH Low)	TEMP& Humidity	25.6°C, 57%

Horizontal

	TX / DSSS mode / CH Low				Measurement Distance at 3m				Horizontal polarity	
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1176.86	59.56	25.14	2.02	45.28	0.42	41.86	74.00	-32.14	P
*	1176.86	49.28	25.14	2.02	45.28	0.42	31.58	54.00	-22.42	A
*	4803.72	61.09	32.91	4.37	44.32	0.22	54.28	74.00	-19.72	P
*	4803.72	54.61	32.91	4.37	44.32	0.22	47.80	54.00	-6.20	A
	7205.37	59.21	38.70	5.50	44.04	0.27	59.65	74.00	-14.35	P
	7205.37	50.79	38.70	5.50	44.04	0.27	51.22	54.00	-2.78	A

Product Name	DIRECT DRIVE TURNTABLE	Test Date	2018/6/21
Model	TT	Test By	Ted Huang
Test Mode	DSSS TX (CH Low)	TEMP& Humidity	25.6°C, 57%

Vertical

	TX / DSSS mode / CH Low				Measurement Distance at 3m				Vertical polarity	
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1327.78	60.68	25.78	2.16	45.16	0.44	43.90	74.00	-30.10	P
*	1327.78	52.92	25.78	2.16	45.16	0.44	36.14	54.00	-17.86	A
*	4803.88	62.20	32.91	4.37	44.32	0.22	55.39	74.00	-18.61	P
*	4803.88	59.71	32.91	4.37	44.32	0.22	52.90	54.00	-1.10	A
	7205.45	59.69	38.70	5.50	44.04	0.27	60.12	74.00	-13.88	P
	7205.45	52.08	38.70	5.50	44.04	0.27	52.52	54.00	-1.48	A

REMARK:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:
   Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.

Product Name	DIRECT DRIVE TURNTABLE	Test Date	2018/6/21
Model	TT	Test By	Ted Huang
Test Mode	DSSS TX (CH Middle)	TEMP& Humidity	25.6°C, 57%

Horizontal

	TX / DSSS mode / CH Middle				Measurement Distance at 3m				Horizontal polarity	
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1176.78	60.48	25.14	2.02	45.29	0.42	42.78	74.00	-31.22	P
*	1176.78	50.38	25.14	2.02	45.29	0.42	32.68	54.00	-21.32	A
*	4883.73	60.27	33.15	4.42	44.34	0.23	53.73	74.00	-20.27	P
*	4883.73	53.96	33.15	4.42	44.34	0.23	47.42	54.00	-6.58	A
*	7325.37	56.71	39.11	5.53	43.93	0.27	57.68	74.00	-16.32	P
*	7325.37	46.32	39.11	5.53	43.93	0.27	47.30	54.00	-6.70	A

Product Name	DIRECT DRIVE TURNTABLE	Test Date	2018/6/21
Model	TT	Test By	Ted Huang
Test Mode	DSSS TX (CH Middle)	TEMP& Humidity	25.6°C, 57%

Vertical

	TX / DSSS mode / CH Middle				Measurement Distance at 3m				Vertical polarity	
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1326.46	60.28	25.77	2.16	45.16	0.44	43.49	74.00	-30.51	P
*	1326.46	53.06	25.77	2.16	45.16	0.44	36.27	54.00	-17.73	A
*	4883.67	63.50	33.15	4.42	44.34	0.23	56.96	74.00	-17.04	P
*	4883.67	58.91	33.15	4.42	44.34	0.23	52.37	54.00	-1.63	A
*	7325.38	58.13	39.11	5.53	43.93	0.27	59.10	74.00	-14.90	P
*	7325.38	48.83	39.11	5.53	43.93	0.27	49.80	54.00	-4.20	A

REMARK:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:
   Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.

Product Name	DIRECT DRIVE TURNTABLE	**Test Date**	2018/6/21
Model	TT	**Test By**	Ted Huang
Test Mode	DSSS TX (CH High)	**TEMP& Humidity**	25.6°C, 57%

Horizontal

	TX / DSSS mode / CH High				**Measurement Distance at 3m**				**Horizontal polarity**	
	Freq.	**Reading**	**AF**	**Cable Loss**	**Pre-amp**	**Filter**	**Level**	**Limit**	**Margin**	**Mark**
	(MHz)	**(dBμV)**	**(dB/m)**	**(dB)**	**(dB)**	**(dB)**	**(dBμV/m)**	**(dBμV/m)**	**(dB)**	**(P/Q/A)**
*	1177.43	60.58	25.15	2.02	45.28	0.42	42.88	74.00	-31.12	P
*	1177.43	50.78	25.15	2.02	45.28	0.42	33.08	54.00	-20.92	A
*	4959.76	59.99	33.38	4.46	44.36	0.24	53.70	74.00	-20.30	P
*	4959.76	53.82	33.38	4.46	44.36	0.24	47.53	54.00	-6.47	A
*	7439.37	56.33	39.49	5.56	43.83	0.27	57.82	74.00	-16.18	P
*	7439.37	48.01	39.49	5.56	43.83	0.27	49.50	54.00	-4.50	A

Product Name	DIRECT DRIVE TURNTABLE	**Test Date**	2018/6/21
Model	TT	**Test By**	Ted Huang
Test Mode	DSSS TX (CH High)	**TEMP& Humidity**	25.6°C, 57%

Vertical

	TX / DSSS mode / CH High				**Measurement Distance at 3m**				**Vertical polarity**	
	Freq.	**Reading**	**AF**	**Cable Loss**	**Pre-amp**	**Filter**	**Level**	**Limit**	**Margin**	**Mark**
	(MHz)	**(dBμV)**	**(dB/m)**	**(dB)**	**(dB)**	**(dB)**	**(dBμV/m)**	**(dBμV/m)**	**(dB)**	**(P/Q/A)**
*	1327.74	60.96	25.78	2.16	45.16	0.44	44.18	74.00	-29.82	P
*	1327.74	53.58	25.78	2.16	45.16	0.44	36.80	54.00	-17.20	A
*	4959.80	64.00	33.38	4.46	44.36	0.24	57.71	74.00	-16.29	P
*	4959.80	59.81	33.38	4.46	44.36	0.24	53.53	54.00	-0.47	A
*	7439.27	56.83	39.49	5.56	43.83	0.27	58.32	74.00	-15.68	P
*	7439.27	48.98	39.49	5.56	43.83	0.27	50.47	54.00	-3.53	A

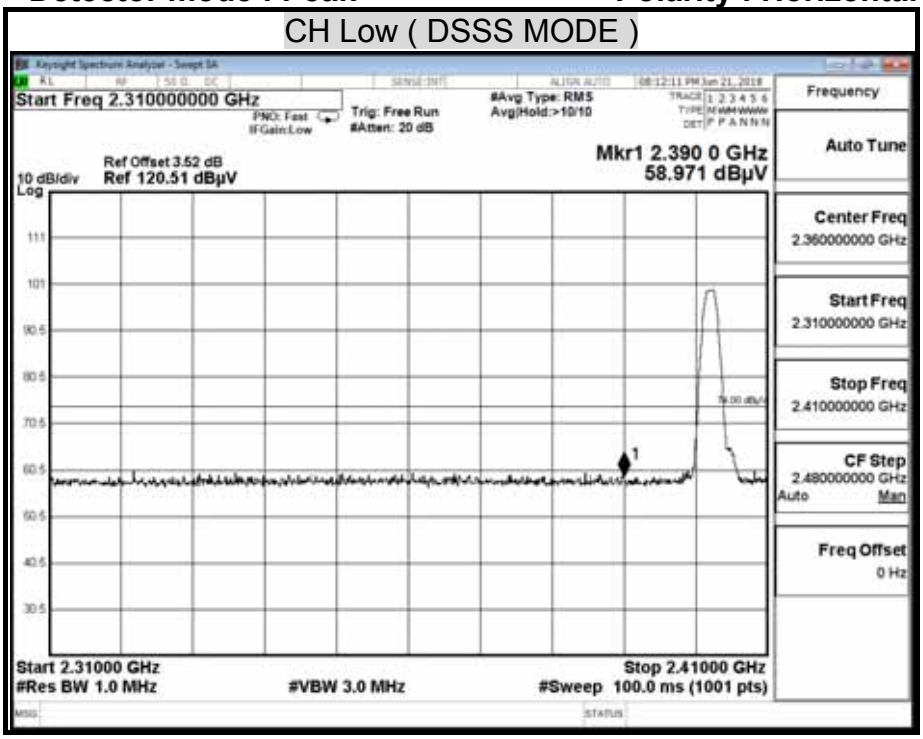
REMARK:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:
   Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.

Restricted Band Edges

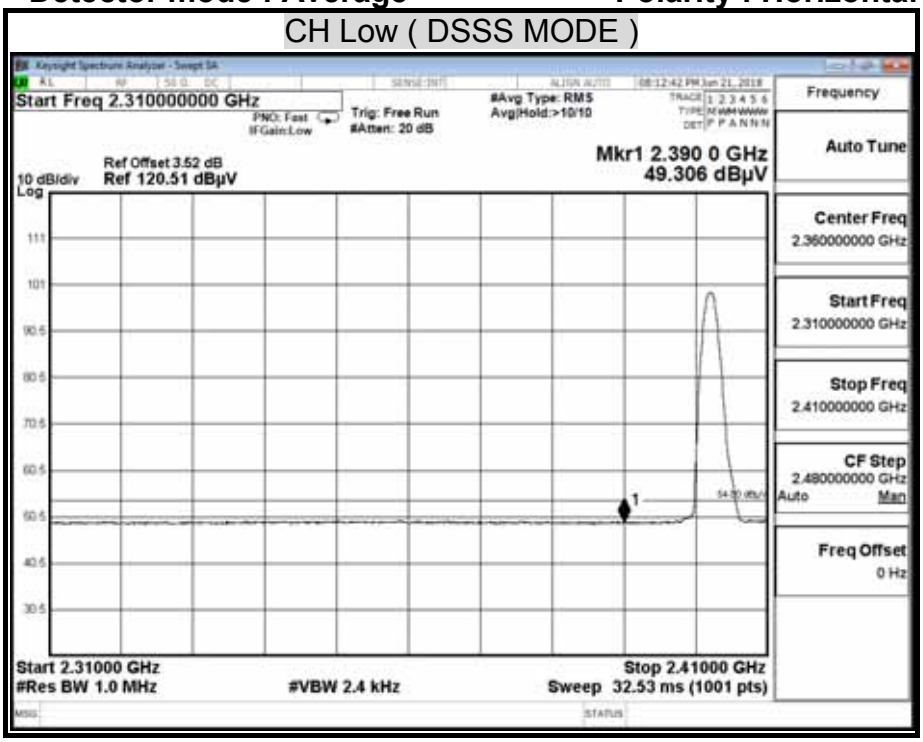
Detector mode : Peak **Polarity : Horizontal**

CH Low (DSSS MODE)



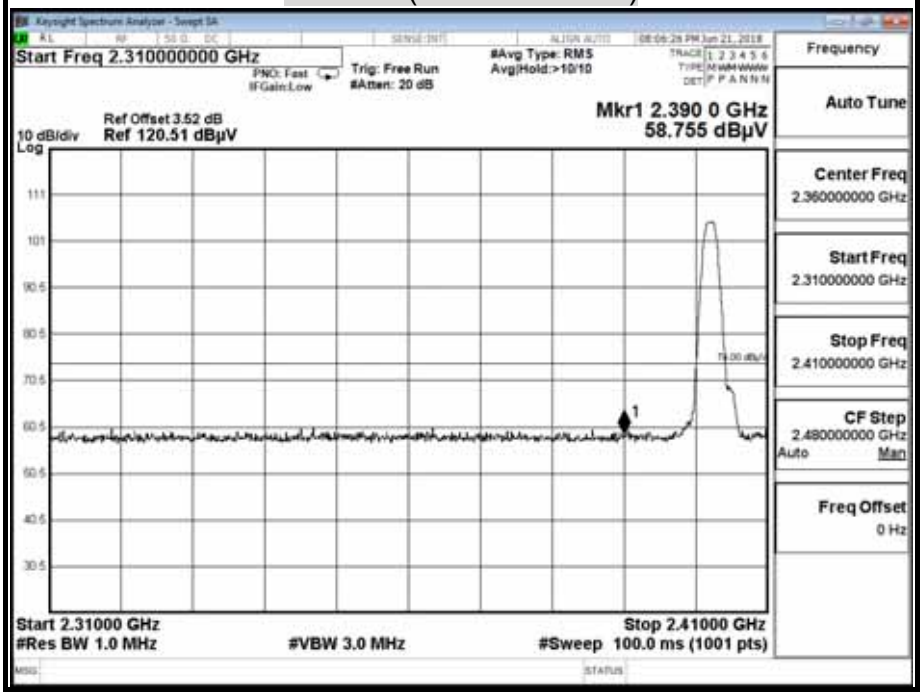
Detector mode : Average **Polarity : Horizontal**

CH Low (DSSS MODE)



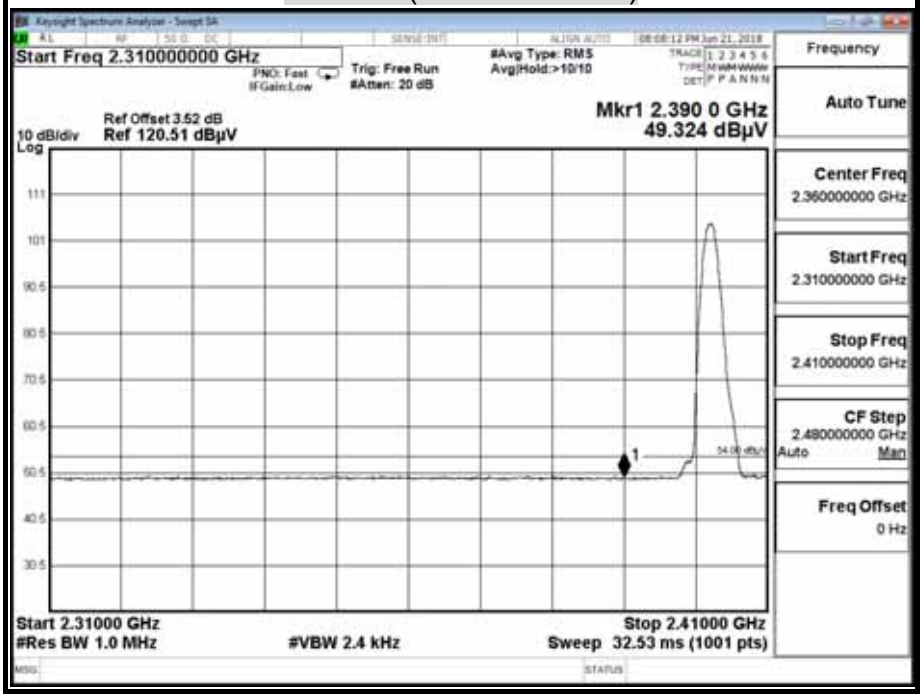
Detector mode : Peak **Polarity : Vertical**

CH Low (DSSS MODE)



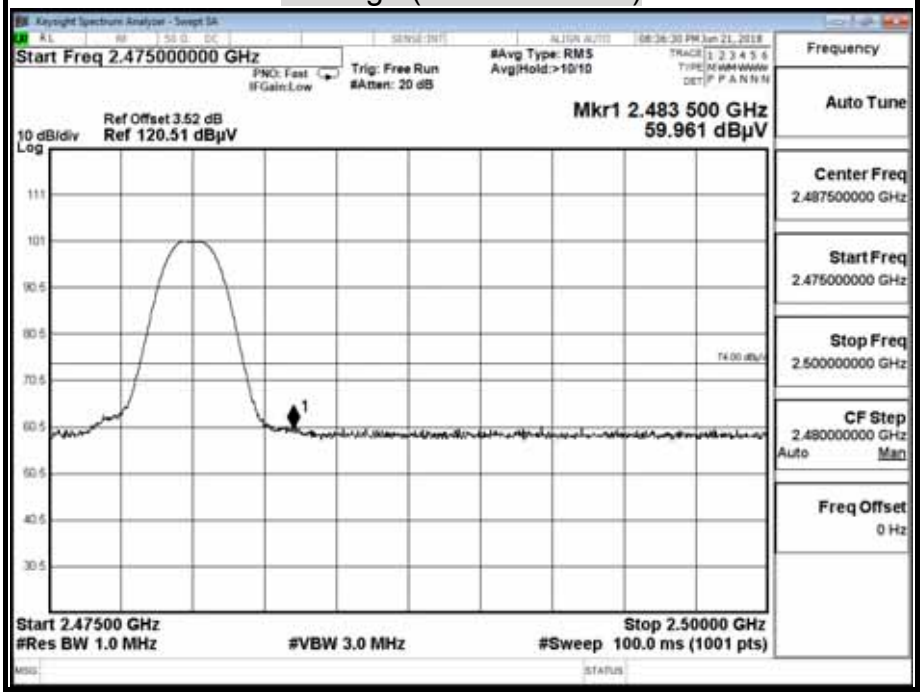
Detector mode : Average **Polarity : Vertical**

CH Low (DSSS MODE)



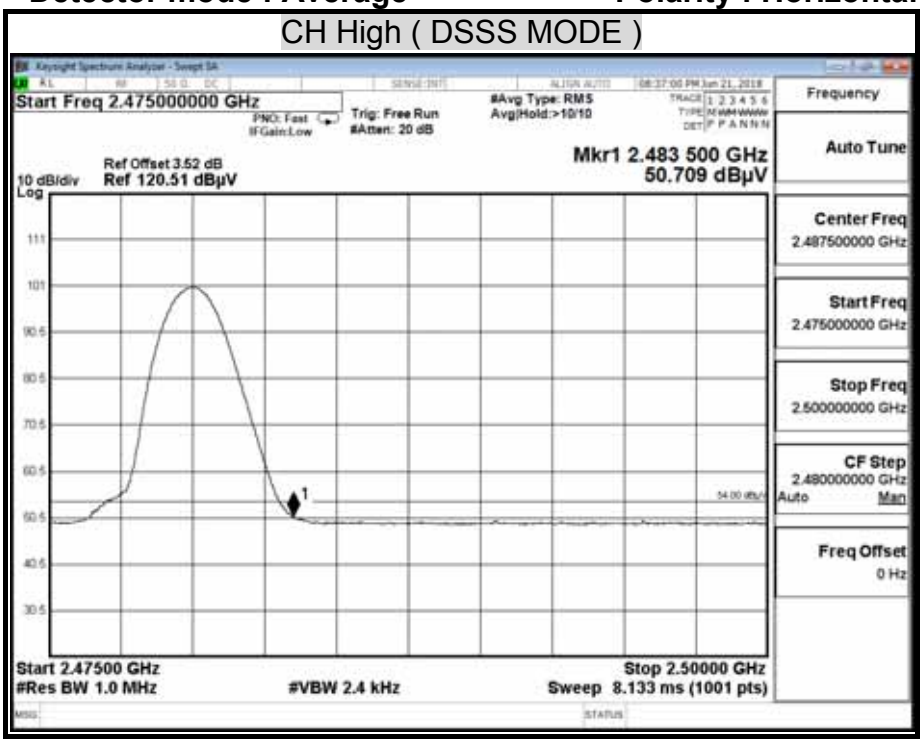
Detector mode : Peak **Polarity : Horizontal**

CH High (DSSS MODE)



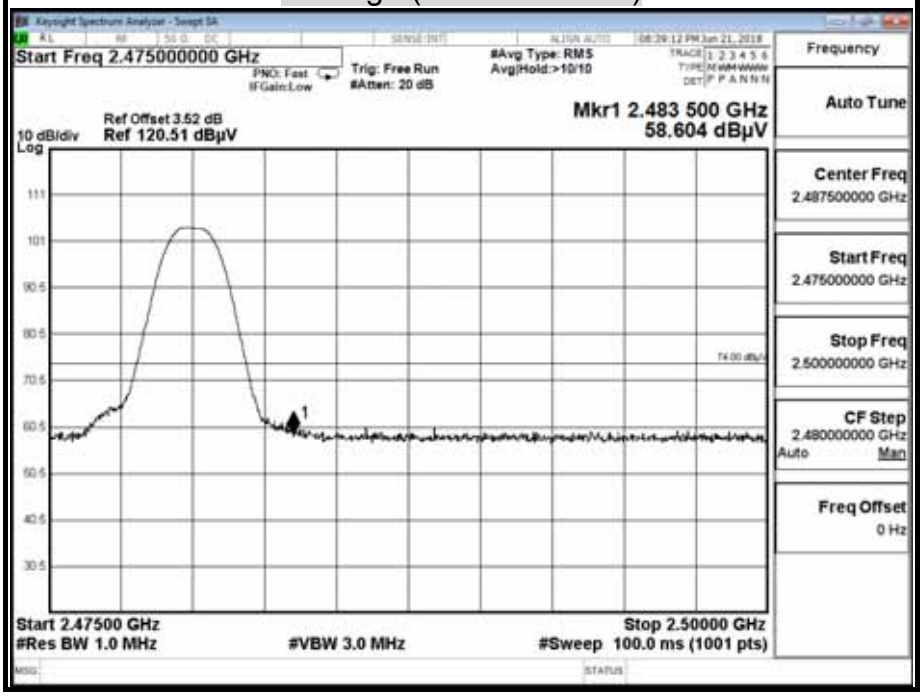
Detector mode : Average **Polarity : Horizontal**

CH High (DSSS MODE)



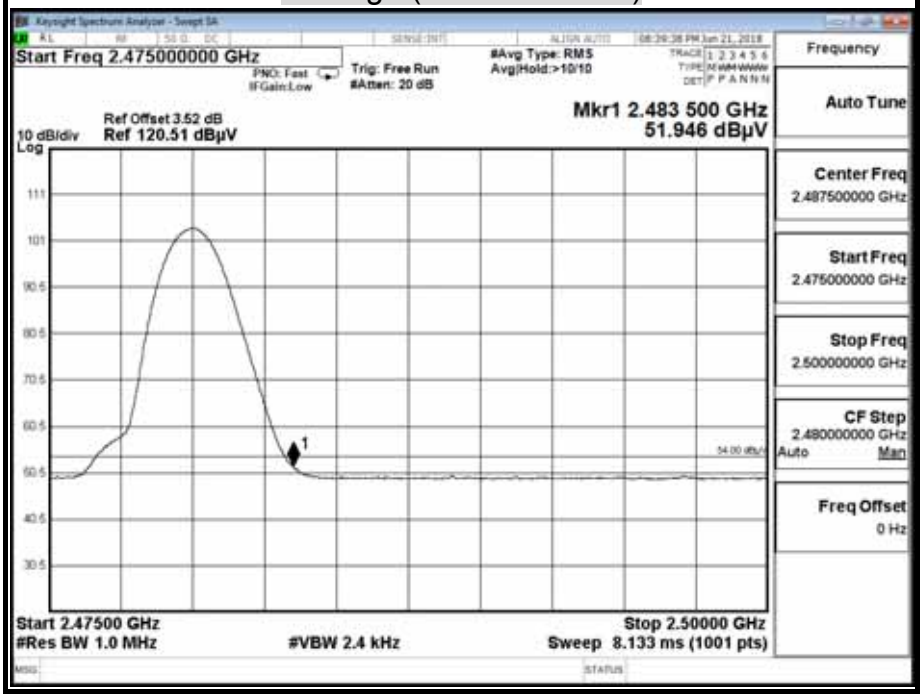
Detector mode : Peak **Polarity : Vertical**

CH High (DSSS MODE)



Detector mode : Average **Polarity : Vertical**

CH High (DSSS MODE)



7.8 CONDUCTED EMISSION

LIMITS

RSS-Gen Issue 5, A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits in Table 3.

Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in Table 3 below. The more stringent limit applies at the frequency range boundaries.

The conducted emissions shall be measured in accordance with the reference publication mentioned in Section 3.

RSS-Gen Issue 5 Table 3: AC Power Lines Conducted Emissions Limits

Frequency Range (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average**
0.15 - 0.50	66 to 56*	56 to 46*
0.50 - 5.00	56	46
5.00 - 30.0	60	50

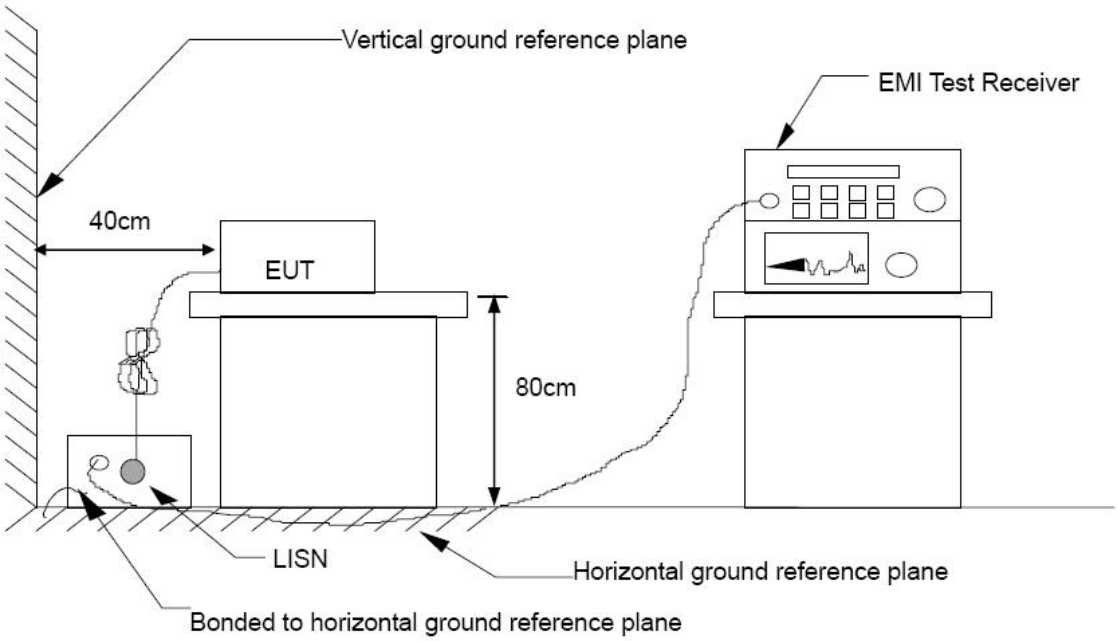
Note: ** The level decreases linearly with the logarithm of the frequency.*
*** A linear average detector is required.*

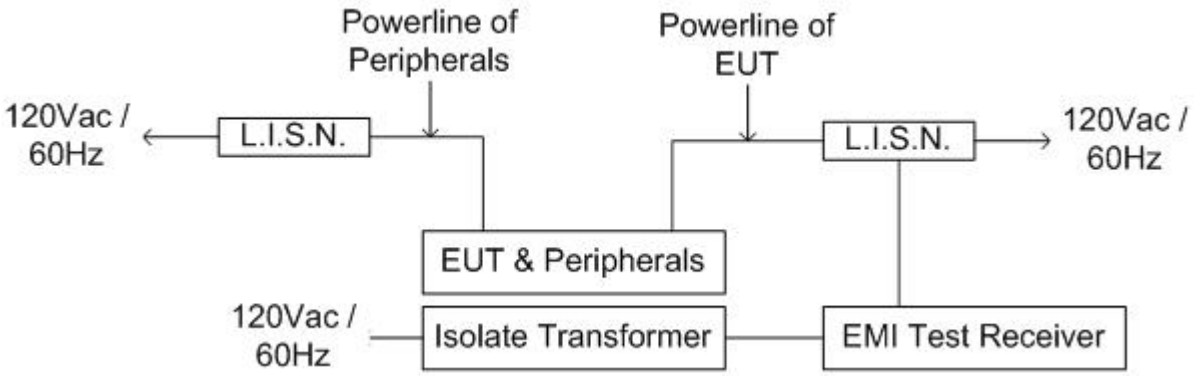
TEST EQUIPMENT

Conducted Emission room #1					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
BNC Coaxial Cable	CCS	BNC50	11	01/24/2018	01/23/2019
EMI Test Receiver	R&S	ESCS 30	100348	01/31/2018	01/30/2019
LISN	SCHWARZBECK	NNLK8130	8130124	12/01/2017	11/30/2018
LISN	FCC	FCC-LISN-50-32-2	08009	05/24/2018	05/23/2019
Pulse Limiter	R&S	ESH3-Z2	100116	01/24/2018	01/23/2019
Test S/W	e-3 (5.04211j)				

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

TEST SETUP





TEST PROCEDURE

The basic test procedure was in accordance with ANSI C63.10:2013.

The test procedure is performed in a 4m × 3m × 2.4m (L×W×H) shielded room.

The EUT along with its peripherals were placed on a 1.0m (W) × 1.5m (L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.

The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.

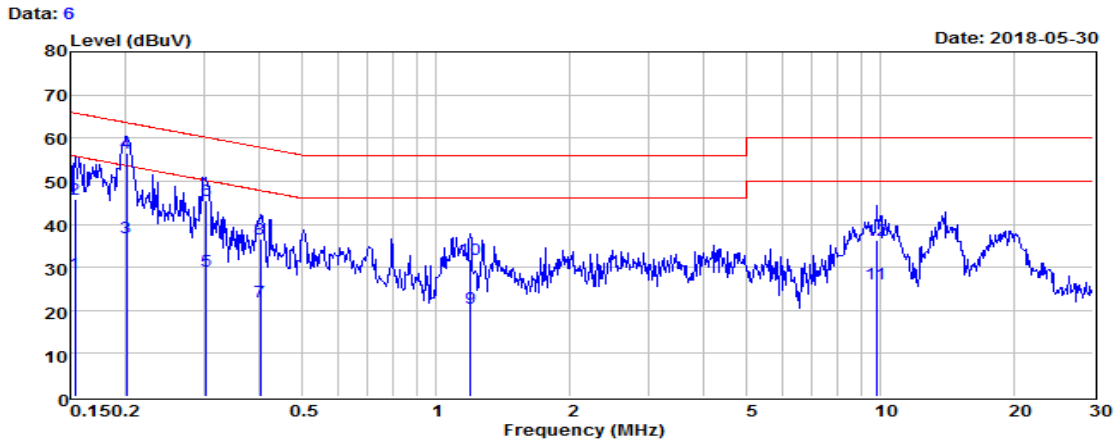
The EUT was located so that the distance between the boundary of the EUT and the closest surface of the LISN is 0.8 m. Where a mains flexible cord was provided by the manufacturer shall be 1 m long, or if in excess of 1 m, the excess cable was folded back and forth as far as possible so as to form a bundle not exceeding 0.4 m in length.

TEST RESULTS

Model No.	TT	Test Mode	Normal Operation
Environmental Conditions	25.3℃, 54% RH	Resolution Bandwidth	9 kHz
Tested by	Peter Chu		

LINE

(The chart below shows the highest readings taken from the final data.)



Condition: LINE
POWER : 120Vac /60Hz
M/N : TT
MODE : Normal Operation
ENGINEER : Peter.Chu
TEMP : 25.3
HUMDIDITY: 54%
REMARK : FCC PART 15 SUBPART B:2014

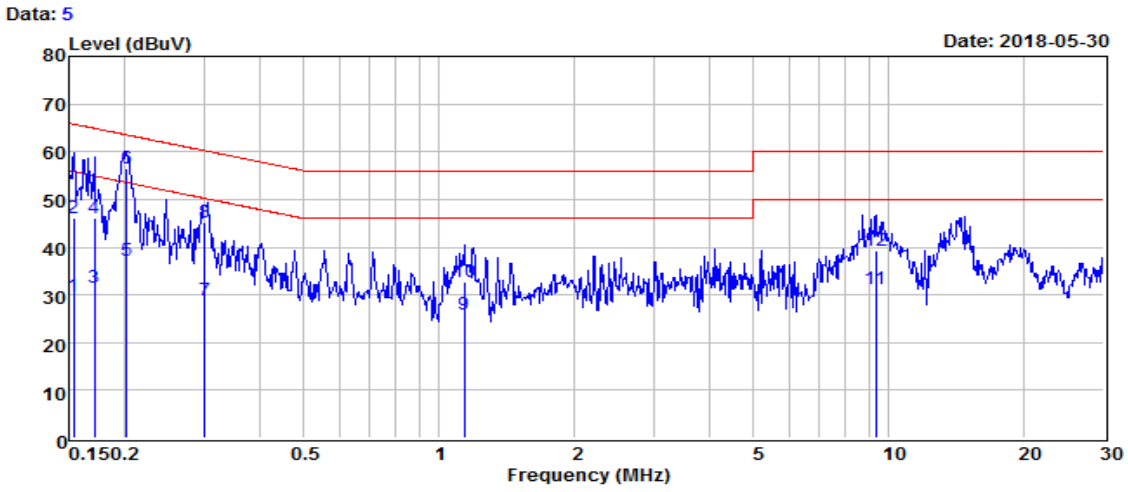
	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.15	19.91	8.66	0.05	28.62	55.78	-27.16	Average
2	0.15	36.96	8.66	0.05	45.67	65.78	-20.11	QP
3	0.20	28.13	8.67	0.05	36.85	53.58	-16.73	Average
4	0.20	47.80	8.67	0.05	56.52	63.58	-7.06	QP
5	0.30	20.25	8.72	0.07	29.04	50.13	-21.09	Average
6	0.30	36.76	8.72	0.07	45.55	60.13	-14.58	QP
7	0.40	13.18	8.76	0.07	22.01	47.81	-25.80	Average
8	0.40	27.84	8.76	0.07	36.67	57.81	-21.14	QP
9	1.19	11.64	8.86	0.11	20.61	46.00	-25.39	Average
10	1.19	22.88	8.86	0.11	31.85	56.00	-24.15	QP
11	9.76	16.73	9.14	0.24	26.11	50.00	-23.89	Average
12	9.76	27.00	9.14	0.24	36.38	60.00	-23.62	QP

REMARKS： 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)
2. Over Limit (dBuV) = Measured Level (dBuV) – Limits (dBuV)

Model No.	TT	Test Mode	Normal Operation
Environmental Conditions	25.3℃, 54% RH	Resolution Bandwidth	9 kHz
Tested by	Peter Chu		

NEUTRAL

(The chart below shows the highest readings taken from the final data.)



Condition: NEUTRAL
POWER : 120Vac /60Hz
M/N : TT
MODE : Normal Operation
ENGINEER : Peter.Chu
TEMP : 25.3
HUMDIDITY: 54%
REMARK : FCC PART 15 SUBPART B:2014

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.15	21.08	8.67	0.05	29.80	55.78	-25.98	Average
2	0.15	37.24	8.67	0.05	45.96	65.78	-19.82	QP
3	0.17	22.91	8.68	0.05	31.64	54.90	-23.26	Average
4	0.17	37.34	8.68	0.05	46.07	64.90	-18.83	QP
5	0.20	28.52	8.69	0.05	37.26	53.54	-16.28	Average
6	0.20	47.66	8.69	0.05	56.40	63.54	-7.14	QP
7	0.30	20.14	8.74	0.07	28.95	50.24	-21.29	Average
8	0.30	36.52	8.74	0.07	45.33	60.24	-14.91	QP
9	1.14	16.81	8.88	0.11	25.80	46.00	-20.20	Average
10	1.14	23.86	8.88	0.11	32.85	56.00	-23.15	QP
11	9.35	21.85	9.14	0.23	31.22	50.00	-18.78	Average
12	9.35	29.85	9.14	0.23	39.22	60.00	-20.78	QP

REMARKS： 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)
2. Over Limit (dBuV) = Measured Level (dBuV) – Limits (dBuV)