TEST REPORT

Date: 2015-05-15
Report No.: 60.870.15.006.01F

Applicant:	Acoustic Arc International Ltd. Unit 110-112, 1/F., Philips Electronics Bldg., No.5 Science Park East Avenue, Hong Kong Science Park, Shatin, New Territories, Hong Kong	
Description of Samples:	Model name:	4.0 Bluetooth Wireless Headphone
	Model no.:	CL7400BT
	FCCID:	VHC-AAI-BH1250-00
Date Samples Received:	2015-04-27	
Date Tested:	2015-04-28 to 2015-05-14	
Investigation Requested:	FCC Part 15 Subpart C, Section 15.247	
Conclusions:	The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.	
Remarks:	---	

Checked by: Approved by:-

Ray Cheung	John Zhi
Project Engineer	Project Manager
Wireless & Telecom department	Wireless & Telecom department

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1.0 General Details

1.1 Test Laboratory

TUV SUD Certification and Testing (China) Co., Ltd
Building 12&13, Zhiheng Wisdomland Business Park, Nantou
Checkpoint Road 2, Shenzhen, 518052
Registration Number: 502708

Tested By:

Ray Cheung

1.2 Applicant Details

Applicant

Acoustic Arc International Ltd.
Unit 110-112, 1/F., Philips Electronics Bldg., No.5 Science Park East Avenue, Hong Kong Science Park, Shatin, New Territories, Hong Kong

Manufacturers

Acoustic Arc International Ltd.
Unit 110-112, 1/F., Philips Electronics Bldg., No.5 Science Park East Avenue, Hong Kong Science Park, Shatin, New Territories, Hong Kong

1.3 Equipment Under Test [EUT]

Description of EUT

Product Description:	4.0 Bluetooth Wireless Headphone
Model No.:	CL7400BT
Brand Name:	---
FCC ID:	VHC-AAI-BH1250-00
Rating:	3.7 VDC, 1000mAh
Operated Frequency:	2402 – 2480 MHz
No. of Operated Channel:	40
Modulation:	GFSK
Accessories and Auxiliary Equipments:	- Mobile Phone
Antenna Type:	Integral
Manufacture of Antenna:	Acoustic Arc International Ltd.
Antenna Gain:	0 dBi
Antenna Model:	---

General Operation of EUT

The Equipment Under Test (EUT) is a Wireless Headphone with 4.0 Bluetooth function.

1.4 Related Submittal(s) Grants

This is a signal application subject to Certificate Authorization.

2.0 Technical Details

2.1 Investigations Requested

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15 and ANSI C63.4: 2009

2.2 Test Standards and Results Summary Tables

Test Condition	Test Requirement	Test Result	
		Pass	N/A
6dB Bandwidth Measurement	Section 15.247 (a2)	☒	☐
Power Spectral Density	Section 15.247 (e)	☒	☐
Band Edge Measurement	Section 15.247	☒	☐
Maximum Output Power	Section 15.247 (b3)	☒	☐
Out of Band Emission	Section 15.247 (d)	☒	☐
Radiated Emission in Restricted Band	Section 15.247 (d)	☒	☐
Conducted Emission on AC Mains	Section 15.207	☐	☒
RF Exposure	Section 15.247 (i)	☒	☐
Antenna Requirement	Section 15.203	☒ See note 1	☐

Note 1 : The EUT uses a permanently attached antenna, which in accordance to Section 15.203, is considered sufficient to comply with the provisions of this section.

Remark: N/A - Not Applicable

3.0 Test Methodology

3.1 Radiated Emission

The sample was placed 0.8m above the ground plane on a standard emission test site *. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

3.2 Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

FS = R + System Factor
System Factor = AF + CF + FA – PA

Where FS = Net Field Strength in dBuV/m at 3 meters.
R = Reading of Spectrum Analyzer / Test Receiver in dBuV.
AF = Antenna Factor in dB.
CF = Cable Attenuation Factor in dB.
FA = Filter Attenuation Factor in dB.
PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

3.3 Conducted Emissions

The test was performed in accordance with ANSI C63.4: 2003, with the following: initial measurements were performed in peak and average detection modes on the live line of personal computer, any emissions recorded within 30dB of the relevant limit lines were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

4.0 Test Results

4.1 6 dB Bandwidth Measurement

Test Requirement:	FCC part 15 section 15.247 (a2)
Test Date:	2015-05-12
Mode of Operation:	Transmitting continuously mode
Detector Function:	Max Hold

Result: PASS

Test Setup:

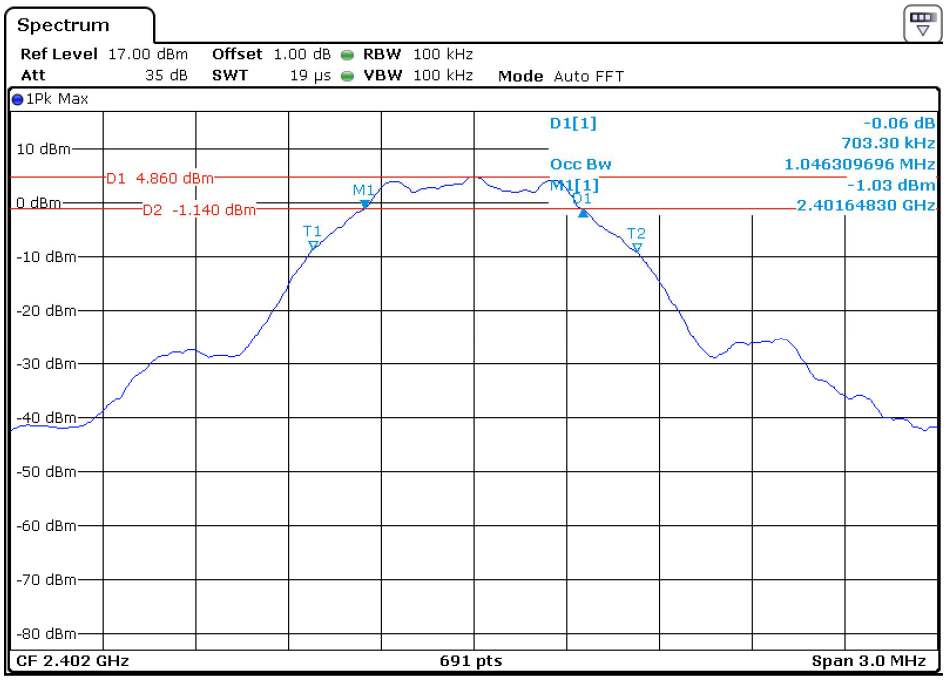
The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

Channel	Measured frequency (MHz)	6dB Bandwidth (MHz)
Lowest	2402	1.046
Middle	2440	1.046
Highest	2480	1.046

This result is used for checking the systems using digital modulation techniques may operate in the 2400–2483.5 MHz.

Limits for 6 dB bandwidth [Section 15.247 (a2)]:
The minimum 6 dB bandwidth shall be at least 500 kHz.

Result data graph shows 6 dB bandwidth, CF = 2.402GHz, BW = 1.046 MHz



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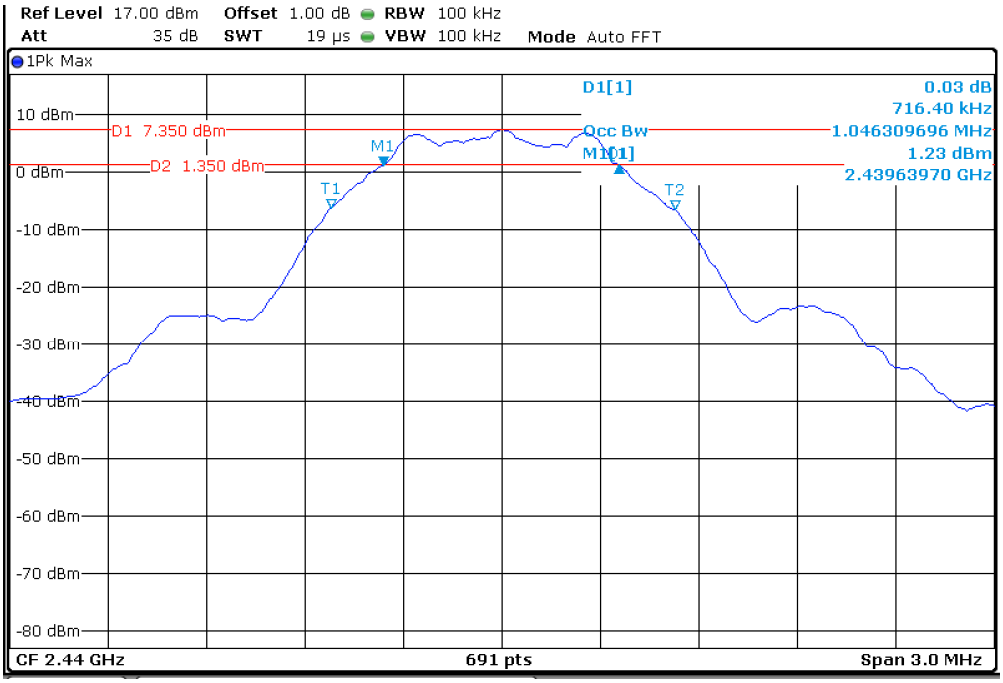
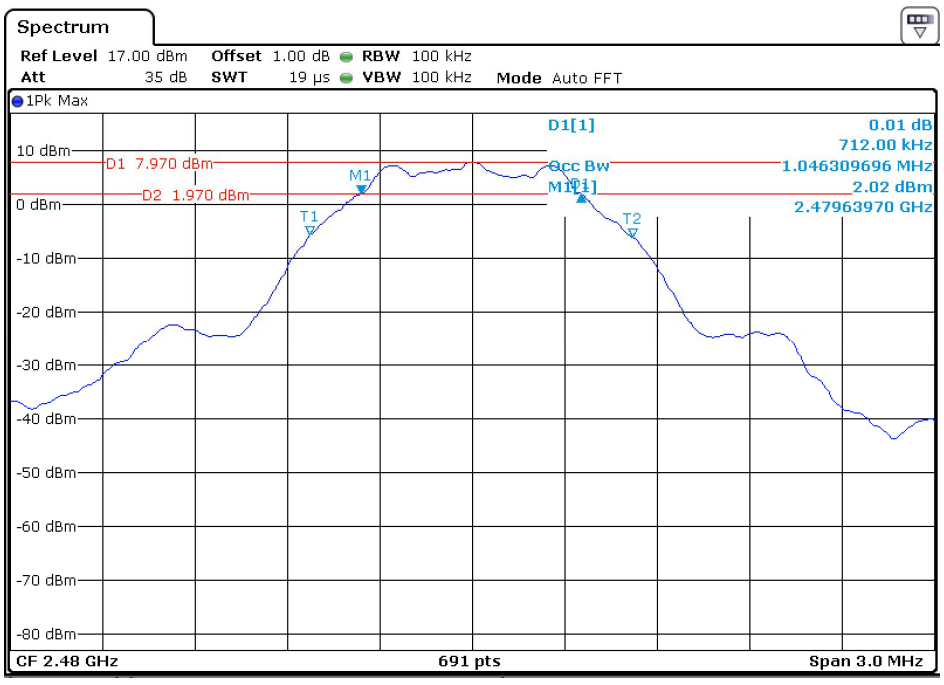
3/F, West Wing, Phase 2, 10 Science Park West Avenue, Shatin, Hong Kong

Result data graph shows 6 dB bandwidth, CF = 2.440GHz, BW = 1.046 MHz



Result data graph shows 6 dB bandwidth, CF = 2.48GHz, BW = 1.046 MHz



4.2 Power Spectral Density

Test Requirement:	FCC part 15 section 15.247 (e)
Test Date:	2015-05-12
Mode of Operation:	Transmitting continuously mode
Detector Function:	Peak

Result : PASS

Measured Result :

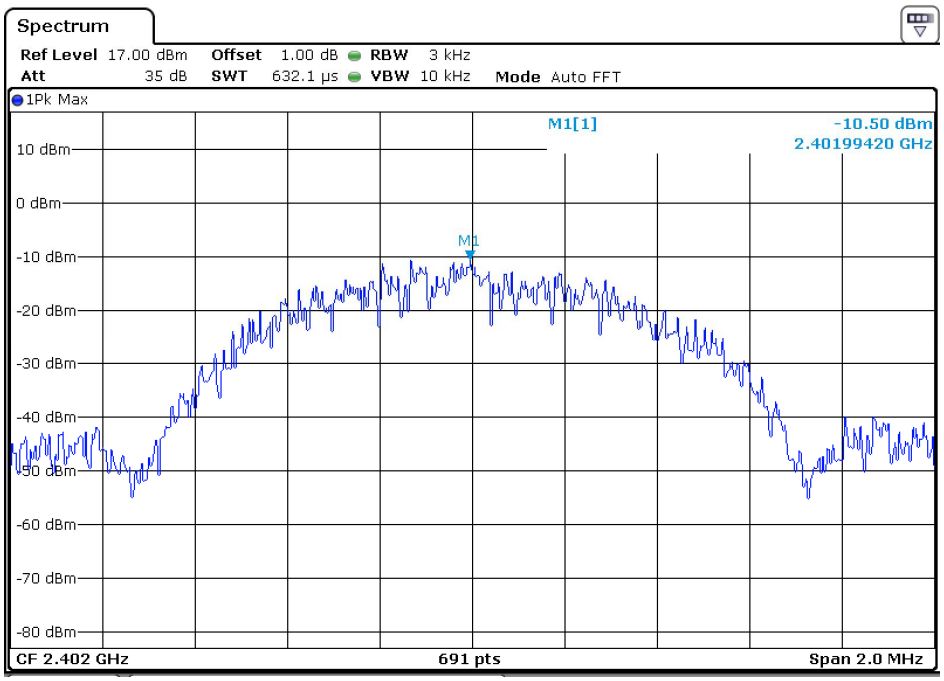
Test mode	Test channel	Reading (dBm)	Limit (dBm)
BLE	Low channel (2402MHz)	-10.50	8
	Middle channel (2440MHz)	-7.90	8
	High channel (2480MHz)	-7.39	8

Note: 1. Above testing data has been considered with 0.2dB cable loss which between antenna port and spectrum.

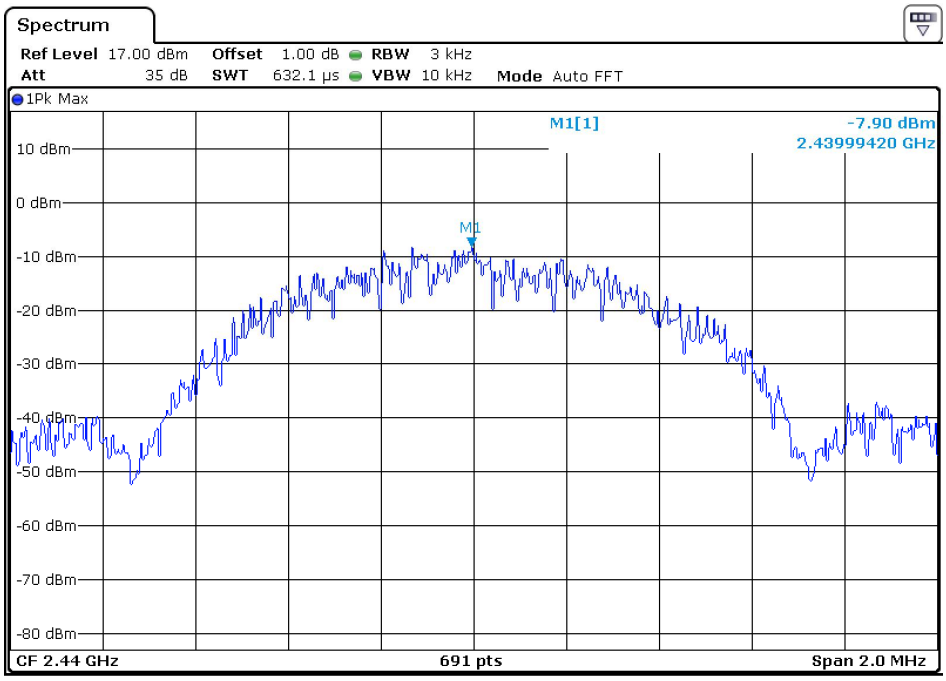
Limits for power spectral density [Section 15.247 (e)]:

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

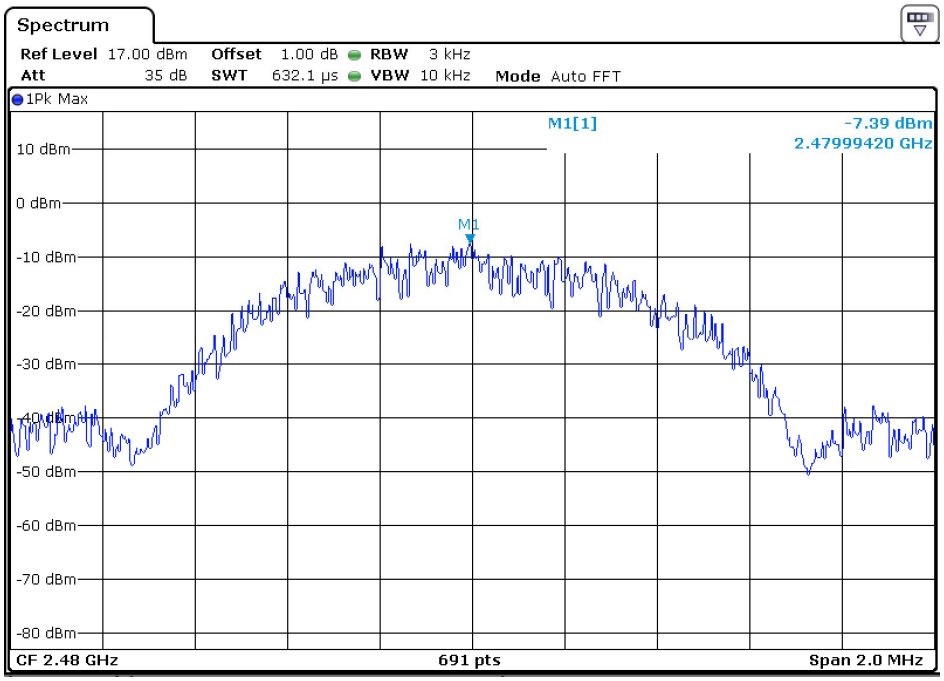
Result data graph shows Low channel power spectrum density is -10.50 dBm



Result data graph shows middle channel power spectrum density is -7.90dBm



Result data graph shows high channel power spectrum density is -7.39dBm



4.3 Band Edge Measurement

Test Requirement:	FCC part 15 section 15.247
Test Date:	2015-05-15
Mode of Operation:	Transmitting continuously mode.
Detector Function:	Max Hold

Result: PASS

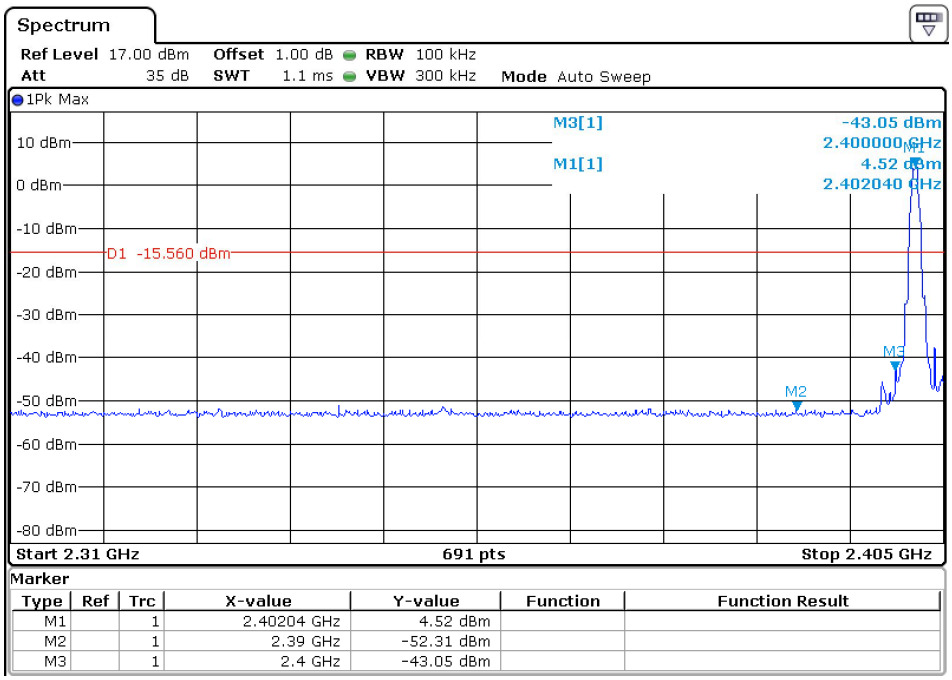
Measured Result :

Refer to the figure, it shows the frequency of lower band edge and upper band edge separately.

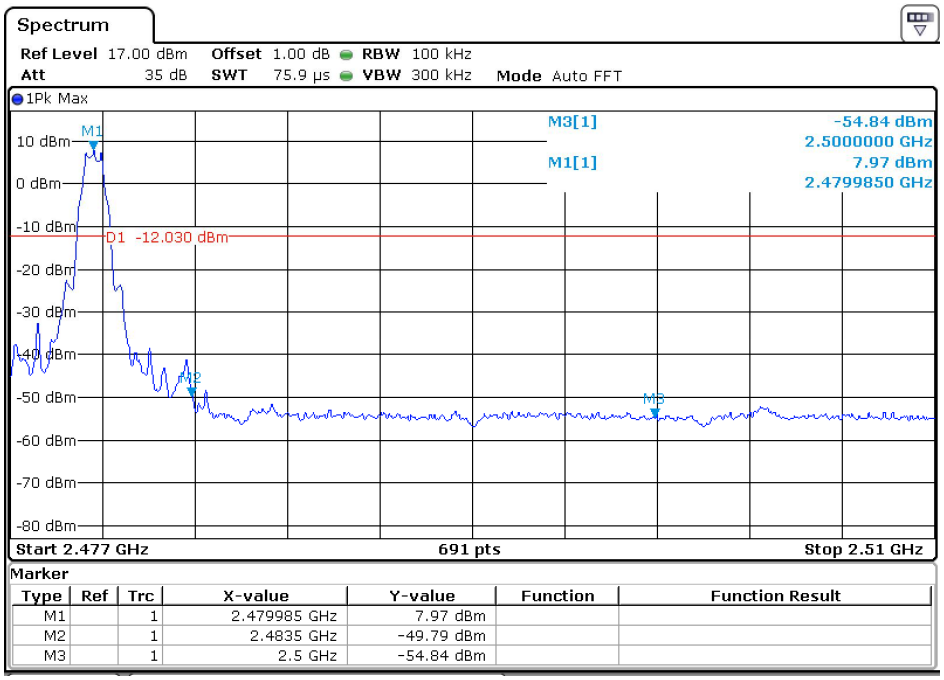
Limits of Band Edge for Carrier Frequencies Operated within the Bands [Section 15.247]:

The carrier frequencies should operate within 2400-2483.5MHz.

Result data graph shows the frequency of lowest channel.
Low Channel Mode



High Channel Mode



4.4 Maximum Output Power

Test Requirement:	FCC part 15 section 15.247 (b3)
Test Method:	ANSI C63.4:2009
Test Date:	2015-05-12
Mode of Operation:	Transmitting continuously mode
Detector Function:	Peak
Measurement BW:	RBW 1MHz ; VBW 3MHz

Test Procedure :

According to section 15.247(b)-power output of the CL7400BT, the measurement procedure PK2 was used, the following is the measurement procedure.

1. Set the span ≥ 1.5 x DTS bandwidth (6dB bandwidth).

2. Set RBW = 1 MHz, Set VBW =3 MHz.

3. Detector = peak; sweep time =auto couple.

4. Trace mode = max hold; allow the trace to fully stabilize.

5. 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, sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS bandwidth.

Result : PASS

Transmitting Mode: Transmits continuously

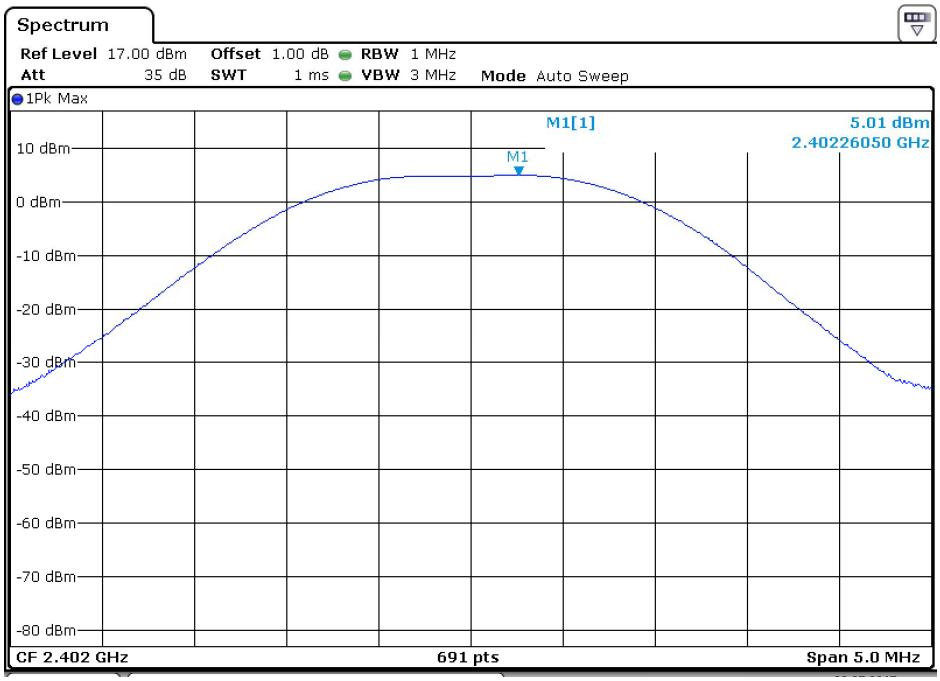
Test mode	Frequency MHz	Output Power dBm	Output Power mW	Limit mW
BLE	2402	5.01	3.17	1000
	2440	7.43	5.53	1000
	2480	8.11	6.47	1000

Note: Above testing data is base on the cable loss which between antenna port and spectrum is 0.2dB

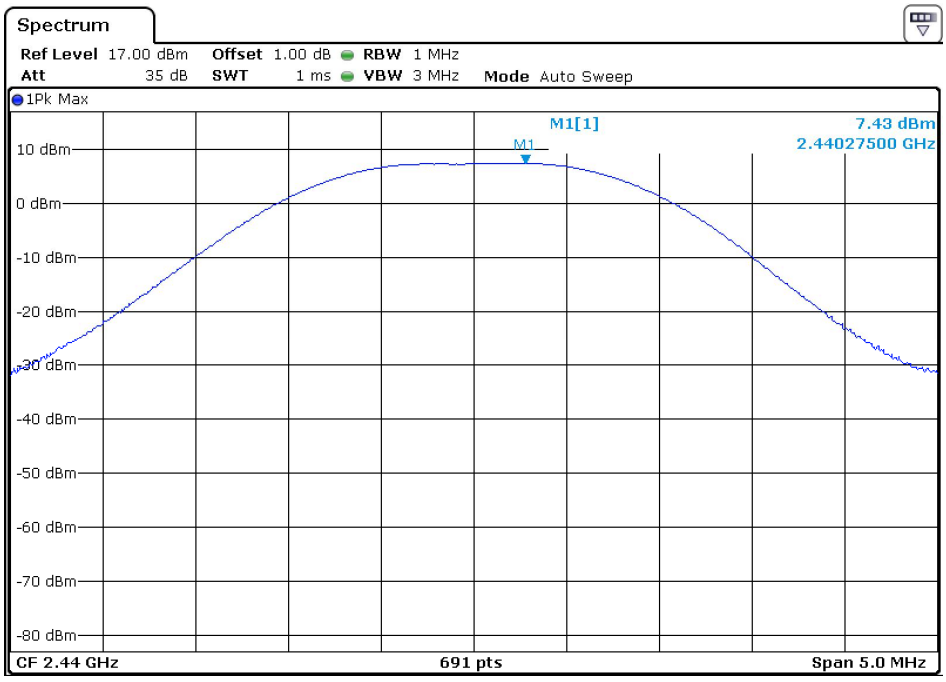
Limits for Maximum Output Power [Section 15.247 (b3)]:

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

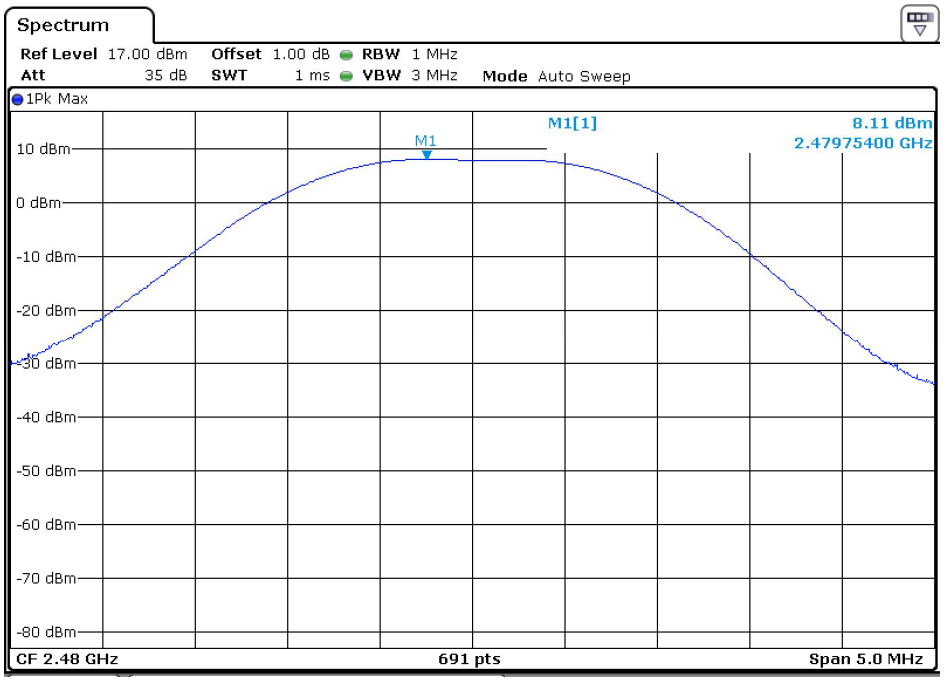
Result data graph shows Low channel conducted power = 5.01dBm



Result data graph shows middle channel conducted power = 7.43dBm



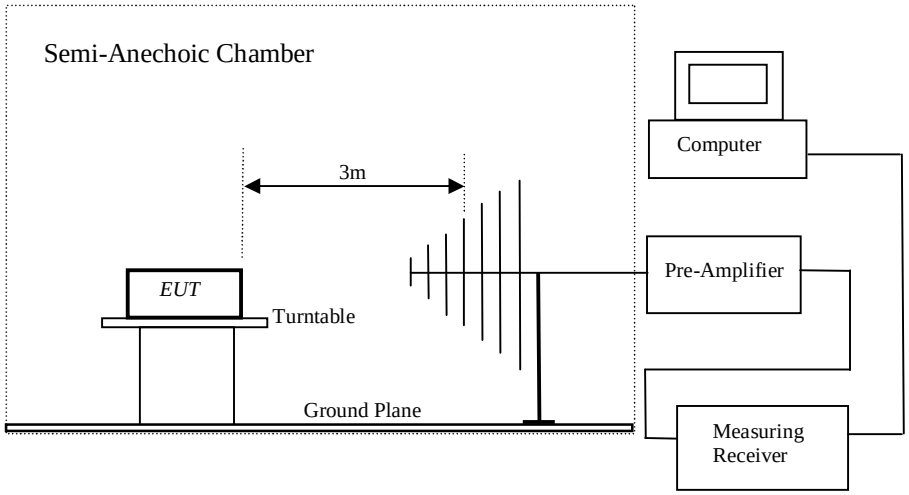
Result data graph shows high channel conducted power = 8.11dBm



4.5 Out of Band Emissions and Emissions in Restricted Bands

Test Requirement:	FCC part 15 section 15.247 (d)
Test Method:	ANSI C63.4:2009
Test Date:	2015-05-12
Mode of Operation:	Transmitting continuously mode
Detector Function:	Peak
Measurement BW:	RBW 100KHz ; VBW 300KHz

Test Setup:



Result : PASS

Out of Frequency Band Emissions:

For out of band emissions that are close to or exceed 20dB attenuation requirement, and emission falls into restricted band, radiated emission was performed in order to show compliance with the general radiated emission requirement.

Result Summary:

Refer to the emission data graph, result shows that the significant emissions detected are with more than 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

Limits for Out of Frequency Band Emission [Section 15.247 (d)]:

In any 100kHz 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 100kHz bandwidth within the band that contains the highest level of the desired power. Attenuation below the general limits specified in Section 15.209(a) is not required.

Limit for Radiated Emission Falling in Restricted Bands [Section 15.209]:

Frequency (MHz)	Field Strength [μV/m]	Field Strength [dBμV/m]
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
Above 960	500	54.0

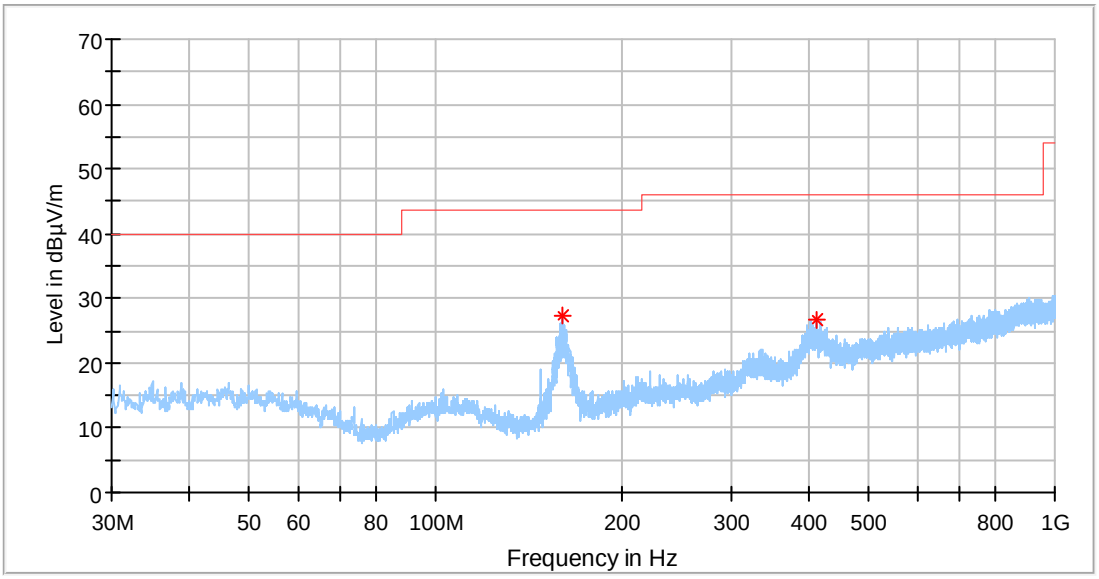
Radiated emissions, which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209.

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Result : PASS

All Emission and Emissions Fall into Restricted Band were recorded as below:

Below 1GHz emissions
Vertical Polarity



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
160.040625	27.37	43.50	16.13	V
411.755625	26.83	46.00	19.17	V

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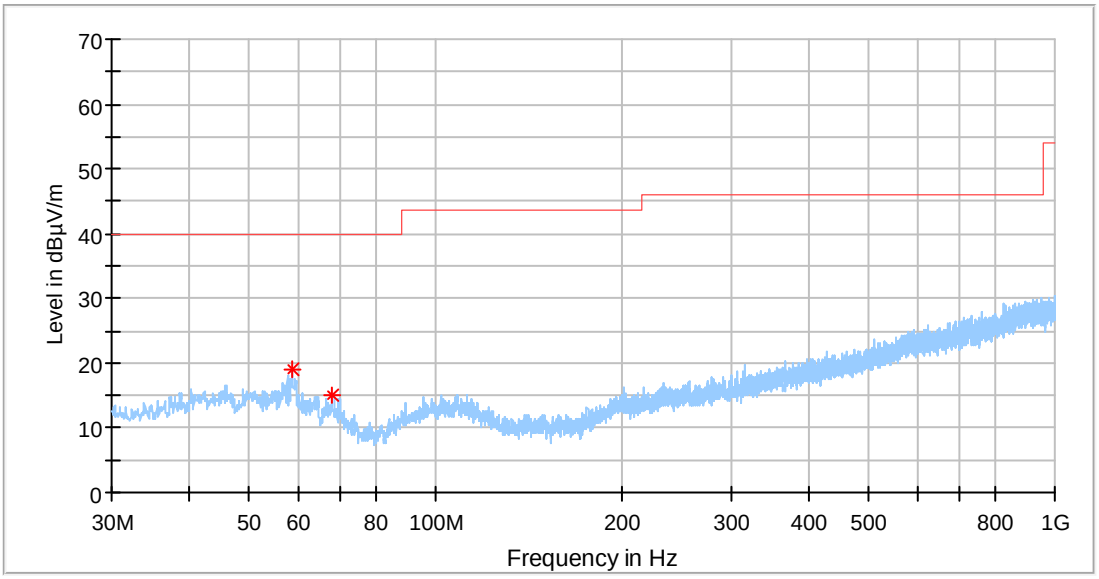
Result : PASS

All Emission and Emissions Fall into Restricted Band were recorded as below:

Below 1GHz emissions
Horizontal Polarity

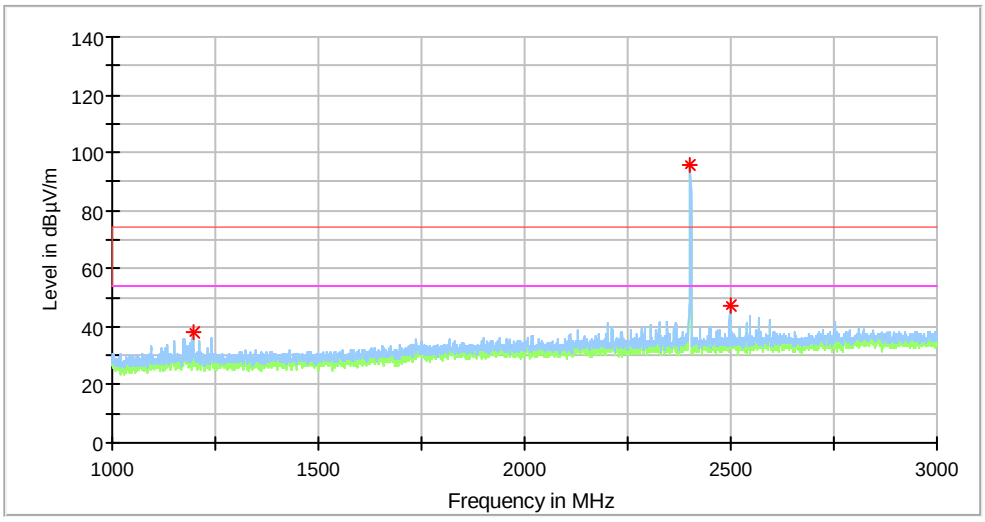


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
58.736250	19.06	40.00	20.94	H
68.315000	14.98	40.00	25.02	H

Result : PASS

All Emission and Emissions Fall into Restricted Band were recorded as below:

Above 1GHz Emission test data
Vertical Polarity (Low Channel)



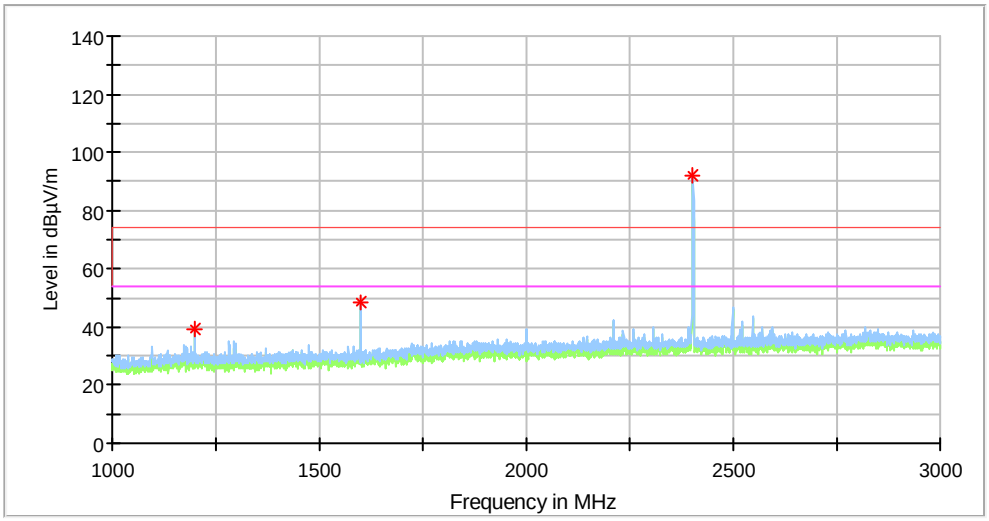
Remark: Only background noise was measured from 3GHz-26GHz.

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
1196.500000	37.81	74.00	36.19	V
2498.500000	47.53	74.00	26.47	V

Result : PASS

All Emission and Emissions Fall into Restricted Band were recorded as below:

Above 1GHz Emission test data
Hortizontal Polarity (Low Channel)



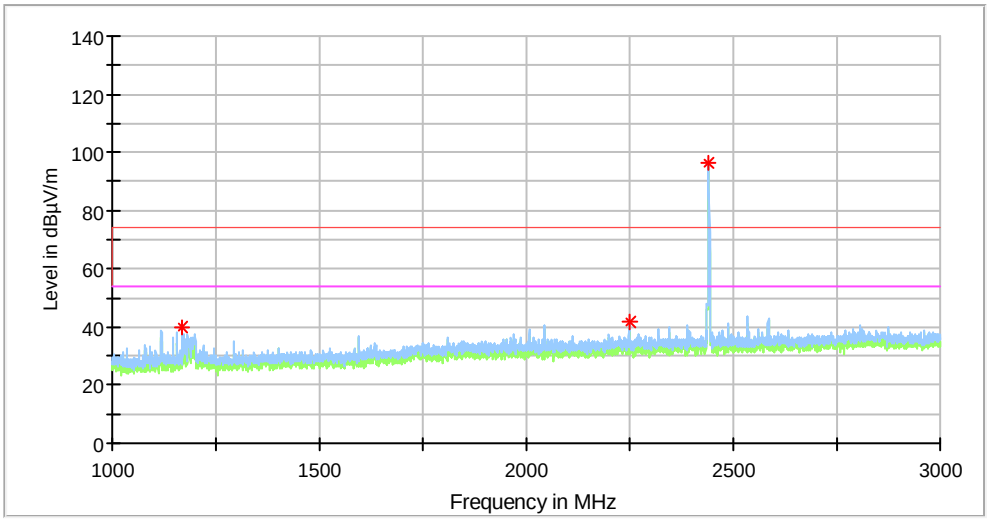
Remark: Only background noise was measured from 3GHz-26GHz.

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
1199.000000	39.01	74.00	34.99	H
1598.500000	48.32	74.00	25.68	H

Result : PASS

All Emission and Emissions Fall into Restricted Band were recorded as below:

Above 1GHz Emission test data
Vertical Polarity (Middle Channel)



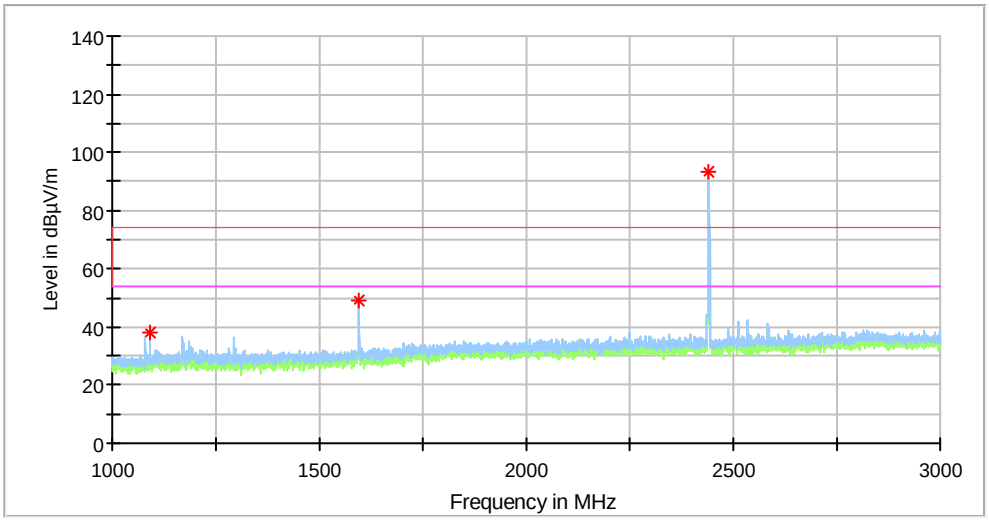
Remark: Only background noise was measured from 3GHz-26GHz.

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
1167.500000	39.65	74.00	34.35	V
2248.500000	41.58	74.00	32.42	V
2440.500000	96.50	74.00	-22.50	V

Result : PASS

All Emission and Emissions Fall into Restricted Band were recorded as below:

Above 1GHz Emission test data
Horizontal Polarity (Middle Channel)



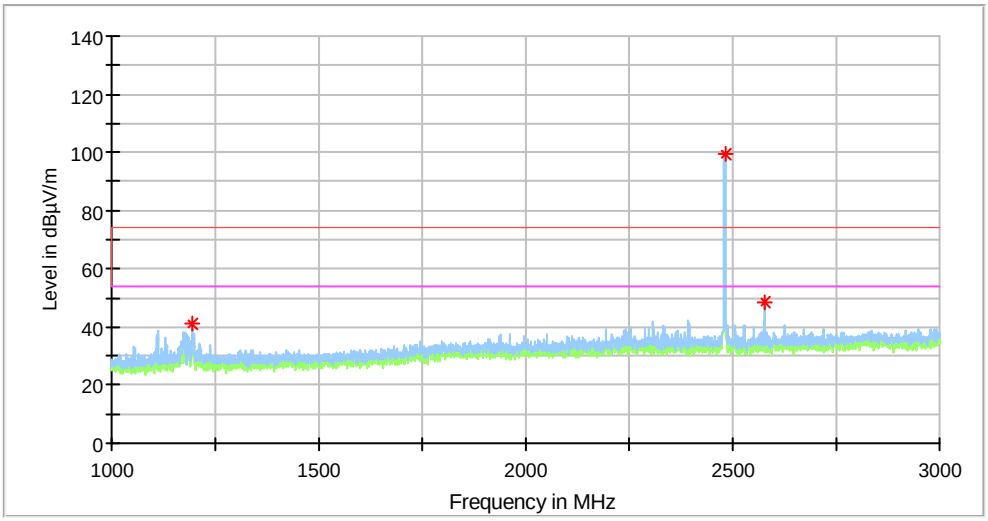
Remark: Only background noise was measured from 3GHz-26GHz.

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
1091.500000	38.07	74.00	35.93	H
1595.000000	49.10	74.00	24.90	H

Result : PASS

All Emission and Emissions Fall into Restricted Band were recorded as below:

Above 1GHz Emission test data
Vertical Polarity (High Channel)



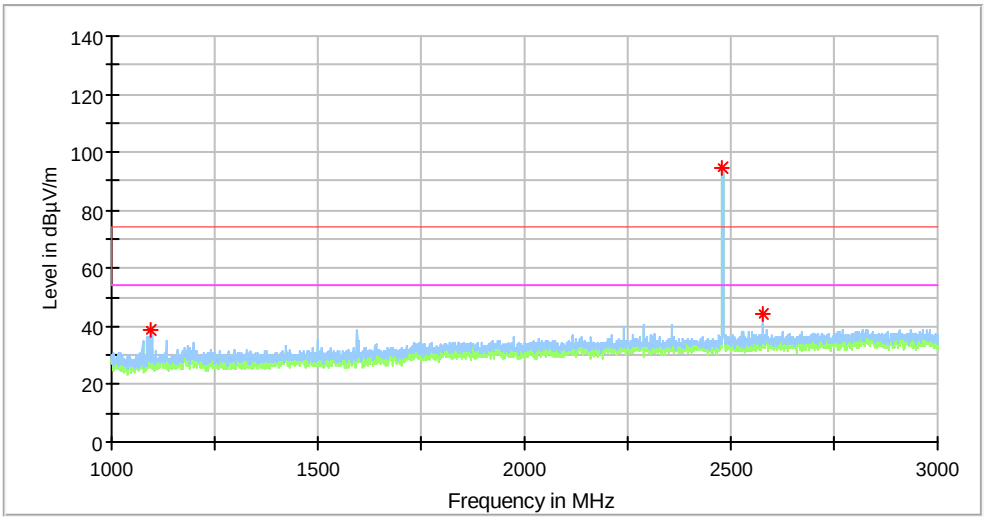
Remark: Only background noise was measured from 3GHz-26GHz.

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
1194.500000	41.27	74.00	32.73	V
2576.500000	48.58	74.00	25.42	V

Result : PASS

All Emission and Emissions Fall into Restricted Band were recorded as below:

Above 1GHz Emission test data
Horizontal Polarity (High Channel)



Remark: Only background noise was measured from 3GHz-26GHz.

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
1096.500000	38.48	74.00	35.52	H
2576.500000	44.41	74.00	29.59	H

Remarks:

1. " * " Radiated emissions which fall in the restricted bands as defined in Section 15.205(a).

2. Emission level with more than 20dB below the FCC required limit is not mentioned in table.

3. Delta to Limit = Field strength (dBµV/m) – Limit (dBµV/m).

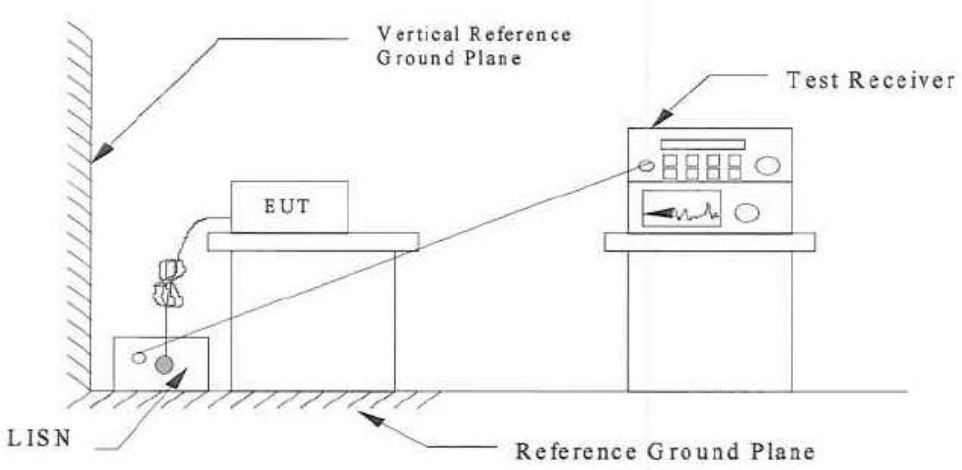
4. Calculated measurement uncertainty: 9kHz -30MHz: 3.88dB.
30MHz -1GHz: 4.91dB.
1GHz -18GHz: 4.89dB.

4.6 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement:	FCC part 15 Section 15.207 Class B
Test Method:	ANSI C63.4:2009
Test Date:	---
Mode of Operation:	---
Detector Function:	CISPR Quasi Peak
Measurement BW:	---
Worst Case Channel:	---

Results : N/A

Test Setup:



Limits for Conducted Emission [Section 15.207]:

Frequency Range [MHz]	Quasi-Peak Limit [dBμV]	Average Limit [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* Decreases with the logarithm of the frequency.

Remarks:
Calculated measurement uncertainty: ±2.8dB
The result shown the worst case of the connection.

5.0 List of Measurement Equipment

Radiated Emission

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2015-8-17
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2017-8-17
Horn Antenna	Rohde & Schwarz	HF907	102294	2017-8-17
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2015-8-17
Spectrum Analyzer	Agilent	E7405A	MY45111421	2015-8-19
Spectrum Analyzer	R&S	FSV40	101031	2015-8-17
3m Semi-anechoic chamber	TDK	9X6X6	----	2019-5-29

N/A Not Applicable or Not Available