STC Test Report

Date: 2015-09-22

No.: MH191896

Applicant:	Hip Shing Electronics Ltd. Units 1.2&3, 20/F., New Treasure Centre, 10 Ng Fong Street, San Po Kong, Kowloon, Hong Kong
Manufacturer:	Dongguan Zhi Cheng Electronic Products Co., Ltd. No. 11 Shangbao Road, 188 Industrial Zone, Pingshan, Tangxia, Dongguan, Guangdong, China
Description of Sample(s):	Submitted sample(s) said to be Product: DAB+/DAB/FM/Internet Digital Radio and Spotify Brand Name: REVO Model Number: SUPERSYSTEM FCC ID: BZAWDFB0920H3
Date Sample(s) Received:	2015-09-09
Date Tested:	2015-09-10 to 2015-09-17
Investigation Requested:	Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2014. FCC KDB Publication 558074 D01 DTS Meas Guidance v03r02 and ANSI C63.4:2009 for FCC Certification.
Conclusion(s):	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.
Remark(s):	Bluetooth DTS (GFSK)

Dr. LEE Kam Chuen
Authorized Signatory
ElectroMagnetic Compatibility Department
For and on behalf of
The Hong Kong Standards and Testing Centre Ltd.

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1.0 General Details

1.1 Test Laboratory

The Hong Kong Standards and Testing Centre Ltd.
EMC Laboratory
10 Dai Wang Street, Taipo Industrial Estate
New Territories, Hong Kong

Telephone: 852 2666 1888
Fax: 852 2664 4353

1.2 Equipment Under Test [EUT] Description of Sample(s)

Product:	DAB+/DAB/FM/Internet Digital Radio and Spotify
Manufacturer:	Dongguan Zhi Cheng Electronic Products Co., Ltd. No. 11 Shangbao Road, 188 Industrial Zone, Pingshan, Tangxia, Dongguan, Guangdong, China
Brand Name:	REVO
Model Number:	SUPERSYSTEM
Rating:	Input: 100-240Va.c. 50/60Hz 1.5A, Output: 18Vd.c. 3300mA

The AC/DC adaptor was provided by the applicant with following details:-
Brand name: REVO Model no.: GPE060D-180330D

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is a DAB+/DAB/FM/Internet Digital Radio and Spotify, modulation by IC; and type is frequency hopping speed spectrum Modulation.

1.3 Date of Order

2015-09-09

1.4 Submitted Sample(s):

1 Sample

1.5 Test Duration

2015-09-10 to 2015-09-17

1.6 Country of Origin

China

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1.7 RF Module Details

Module Model Number: JS-BTM8645
Module FCC ID: N/A
Module Transmission Type: Bluetooth DTS
Modulation: GFSK
Data Rates: 1Mbps
Frequency Range: 2400-2483.5MHz
Carrier Frequencies: 2402MHz – 2480MHz

Module Specification (specification provided by manufacturer)

1.8 Antenna Details

Antenna Type: Meander line antenna
Antenna Gain: 2.12dBi

1.9 Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

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2.0 Technical Details

2.1 Investigations Requested

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2014 Regulations. FCC KDB Publication 558074 D01 DTS Meas Guidance v03r02 and ANSI C63.4:2009 for FCC Certification.

2.2 Test Standards and Results Summary Tables

EMISSION
Results Summary

Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Fail	N/A
Maximum Peak Output Power	FCC 47CFR 15.247(b)(3)	FCC KDB Publication 558074 D01 DTS Meas Guidance v03r02	N/A	☒	☐	☐
Radiated Spurious Emissions	FCC 47CFR 15.209	ANSI C63.4:2009	N/A	☒	☐	☐
AC Mains Conducted Emissions	FCC 47CFR 15.207	ANSI C63.4:2009	N/A	☒	☐	☐
Power Spectral Density	FCC 47CFR 15.247(e)	FCC KDB Publication 558074 D01 DTS Meas Guidance v03r02	N/A	☒	☐	☐
6dB Bandwidth	FCC 47CFR 15.247(a)(2)	FCC KDB Publication 558074 D01 DTS Meas Guidance v03r02	N/A	☒	☐	☐
Band Edge Emissions (Radiated)	FCC 47CFR 15.247(d)	FCC KDB Publication 558074 D01 DTS Meas Guidance v03r02	N/A	☒	☐	☐
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	☒	☐	☐
RF Exposure	FCC 47CFR 15.247(i)	N/A	N/A	☒	☐	☐

Note: N/A - Not Applicable

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3.0 Test Results

3.1 Emission

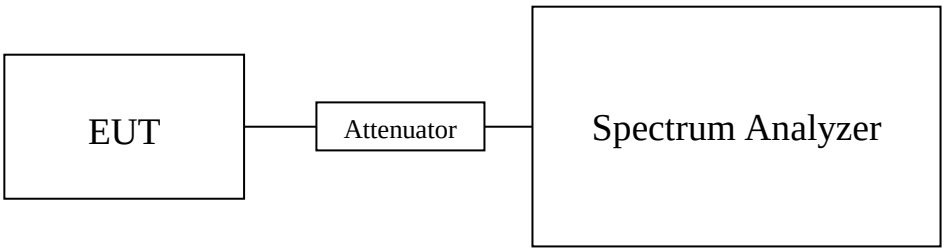
3.1.1 Maximum Peak Output Power

Test Requirement:	FCC 47CFR 15.247(b)(3)
Test Method:	FCC KDB Publication 558074 D01 DTS Meas Guidance v03r02
Test Date:	2015-09-10
Mode of Operation:	Bluetooth DTS Tx mode

Test Method:

The RF output of the EUT was connected to the spectrum analyzer. All the attenuation or cable loss will be added to the measured maximum output power. The results are recorded in mW.

Test Setup:



Note: a temporary antenna connector was soldered to the RF output.

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Limits for Peak Output Power of Fundamental & Harmonics Emissions [FCC 47CFR 15.247]:

For Digital Transmission systems in 2400-2483.5 MHz Band: 1 Watt (30dBm)

Results of BT DTS Tx Mode (2402MHz to 2480MHz) : Pass (TX Unit) (GFSK)
Maximum conducted output power

Channel	Frequency(MHz)	Output Power(Watt)
0	2402	0.002023
20	2442	0.002153
39	2480	0.002023

Calculated measurement uncertainty	:	30MHz to 1GHz	1.7dB
		1GHz to 26GHz	1.7dB

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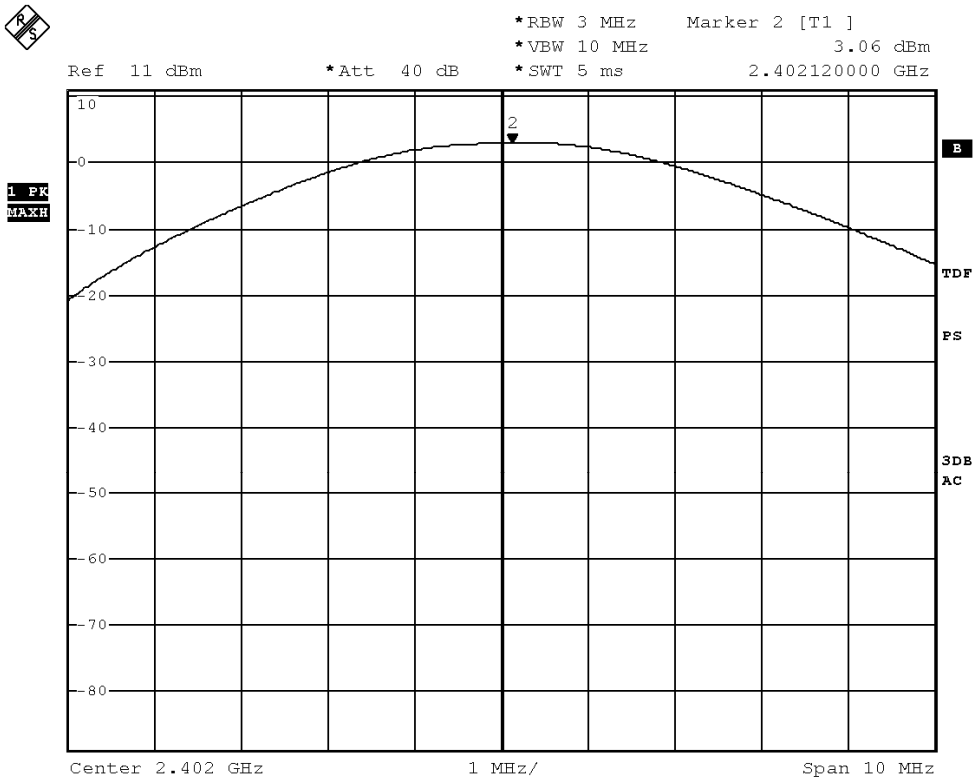
Test plot of Maximum Peak Conducted Output Power :

Bluetooth Communication mode (BT DTS-GFSK, 2402MHz)



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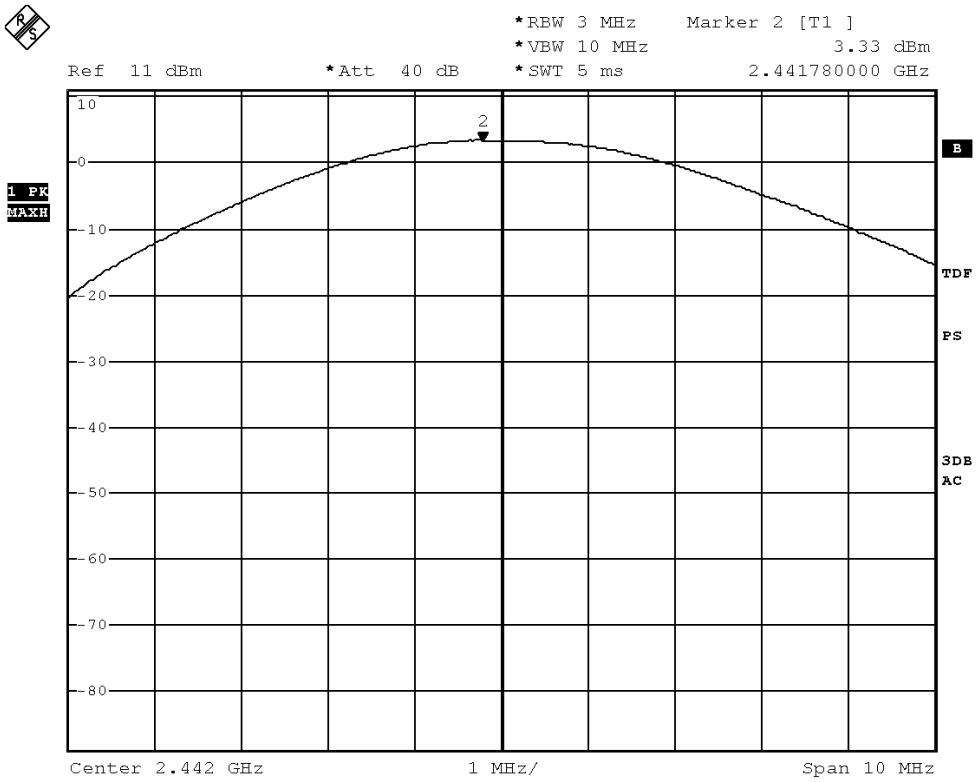
Bluetooth Communication mode (BT DTS-GFSK, 2442MHz)



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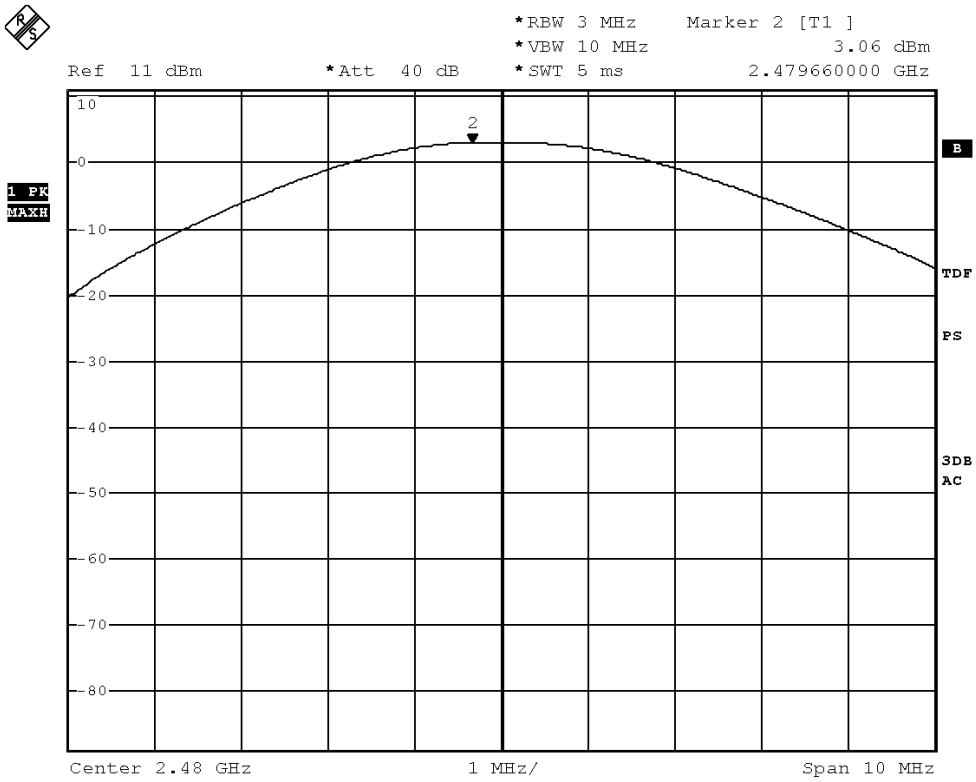
Bluetooth Communication mode (BT DTS-GFSK, 2480MHz)



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3.1.2 Radiated Emissions

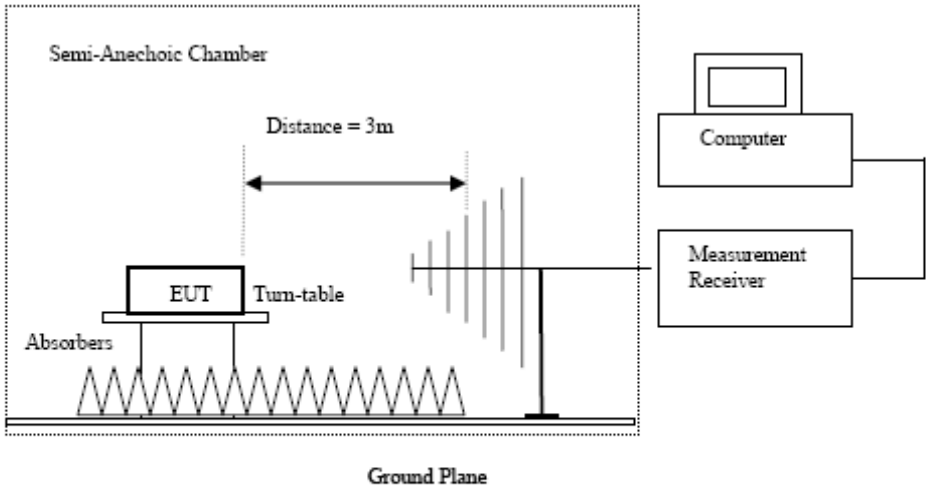
Test Requirement:	FCC 47CFR 15.209
Test Method:	ANSI C63.4:2009
Test Date:	2015-09-17
Mode of Operation:	Tx mode / Bluetooth Communication mode (GFSK)

Test Method:

The sample was placed 0.8m above the ground plane of semi-anechoic Chamber*. 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.

* Semi-Anechoic chamber located on the G/F of The Hong Kong Standards and Testing Centre Ltd. with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

Test Setup:



- Absorbers placed on top of the ground plane are for measurements above 1000MHz only.
- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used, 9kHz to 30MHz loop antennas are used.

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Limits for Radiated Emissions [FCC 47 CFR 15.247 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [µV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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 of Tx mode (2402.0 MHz) (GFSK) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (2402.0 MHz) (GFSK) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dBµV/m	E-Field Polarity
2402.0	97.3	36.6	133.9	N/A	N/A	Vertical
4804.0	15.6	41.5	57.1	74.0	16.9	Vertical
4804.0	12.9	42.4	55.3	74.0	18.7	Horizontal
7206.0	8.0	45.1	53.1	74.0	21.0	Vertical
7206.0	8.2	46.2	54.4	74.0	19.6	Horizontal
9608.0	6.3	48.0	54.3	74.0	19.7	Vertical
9608.0	4.8	48.8	53.6	74.0	20.4	Horizontal
12010.0	4.1	51.5	55.6	74.0	18.4	Vertical
12010.0	2.9	52.4	55.3	74.0	18.7	Horizontal

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Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dBµV/m	E-Field Polarity
2402.0	93.1	36.6	129.7	N/A	N/A	Vertical
4804.0	0.2	41.5	41.7	54.0	12.3	Vertical
4804.0	-2.8	42.4	39.7	54.0	14.4	Horizontal
7206.0	-7.5	45.1	37.6	54.0	16.4	Vertical
7206.0	-5.4	46.2	40.8	54.0	13.2	Horizontal
9608.0	-9.1	48.0	38.9	54.0	15.1	Vertical
9608.0	-11.5	48.8	37.3	54.0	16.7	Horizontal
12010.0	-11.6	51.5	39.9	54.0	14.1	Vertical
12010.0	-11.5	52.4	40.92	54.0	13.1	Horizontal

Result of Tx mode (2442.0 MHz) (GFSK) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (2442.0 MHz) (GFSK) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dBµV/m	E-Field Polarity
2442.0	97.1	36.6	133.7	N/A	N/A	Vertical
4884.0	15.1	41.6	56.7	74.0	17.3	Vertical
4884.0	12.3	42.5	54.8	74.0	19.2	Horizontal
7326.0	1.5	45.2	46.7	74.0	27.3	Vertical
7326.0	8.3	46.3	54.6	74.0	19.4	Horizontal
9768.0	6.1	48.1	54.2	74.0	19.8	Vertical
9768.0	6.3	48.9	55.2	74.0	18.8	Horizontal
12210.0	4.0	51.6	55.6	74.0	18.4	Vertical
12210.0	3.7	52.5	56.2	74.0	17.8	Horizontal

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Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
2442.0	92.9	36.6	129.5	N/A	N/A	Vertical
4884.0	-0.3	41.6	41.3	54.0	12.7	Vertical
4884.0	-3.0	42.5	39.5	54.0	14.5	Horizontal
7326.0	-5.0	45.2	40.2	54.0	13.8	Vertical
7326.0	-6.4	46.3	39.9	54.0	14.1	Horizontal
9768.0	-9.2	48.1	38.9	54.0	15.1	Vertical
9768.0	-8.3	48.9	40.6	54.0	13.4	Horizontal
12210.0	-11.4	51.6	40.2	54.0	13.8	Vertical
12210.0	-10.7	52.5	41.9	54.0	12.2	Horizontal

Result of Tx mode (2480.0 MHz) (GFSK) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (2480.0 MHz) (GFSK) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
2480.0	96.9	36.6	133.5	N/A	N/A	Vertical
4960.0	14.9	41.4	56.3	74.0	17.7	Vertical
4960.0	11.5	42.7	54.2	74.0	19.8	Horizontal
7440.0	7.6	45.6	53.2	74.0	20.8	Vertical
7440.0	9.2	46.5	55.7	74.0	18.3	Horizontal
9920.0	5.3	48.6	53.9	74.0	20.1	Vertical
9920.0	5.17	49.7	54.9	74.0	19.1	Horizontal
12400.0	4.0	51.7	55.7	74.0	18.3	Vertical
12400.0	3.3	52.7	56.0	74.0	18.0	Horizontal

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Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dBµV/m	E-Field Polarity
2480.0	92.7	36.6	129.3	N/A	N/A	Vertical
4960.0	-0.4	41.4	41.1	54.0	13.0	Vertical
4960.0	-2.9	42.7	39.8	54.0	14.2	Horizontal
7440.0	-7.9	45.6	37.7	54.0	16.3	Vertical
7440.0	6.2	46.5	52.7	54.0	1.3	Horizontal
9920.0	-10.4	48.6	38.2	54.0	15.8	Vertical
9920.0	-9.5	49.7	40.2	54.0	13.8	Horizontal
12400.0	-11.7	51.7	40.0	54.0	14.0	Vertical
12400.0	-12.4	52.7	40.28	54.0	13.7	Horizontal

Remarks:

No additional spurious emissions found between lowest internal used/generated frequency and 30 MHz

* Denotes restricted band of operation.

Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty (9kHz-30MHz): 2.0dB

(30MHz -1GHz): 4.9dB

(1GHz -6GHz): 4.02dB

(6GHz -26.5GHz): 4.03dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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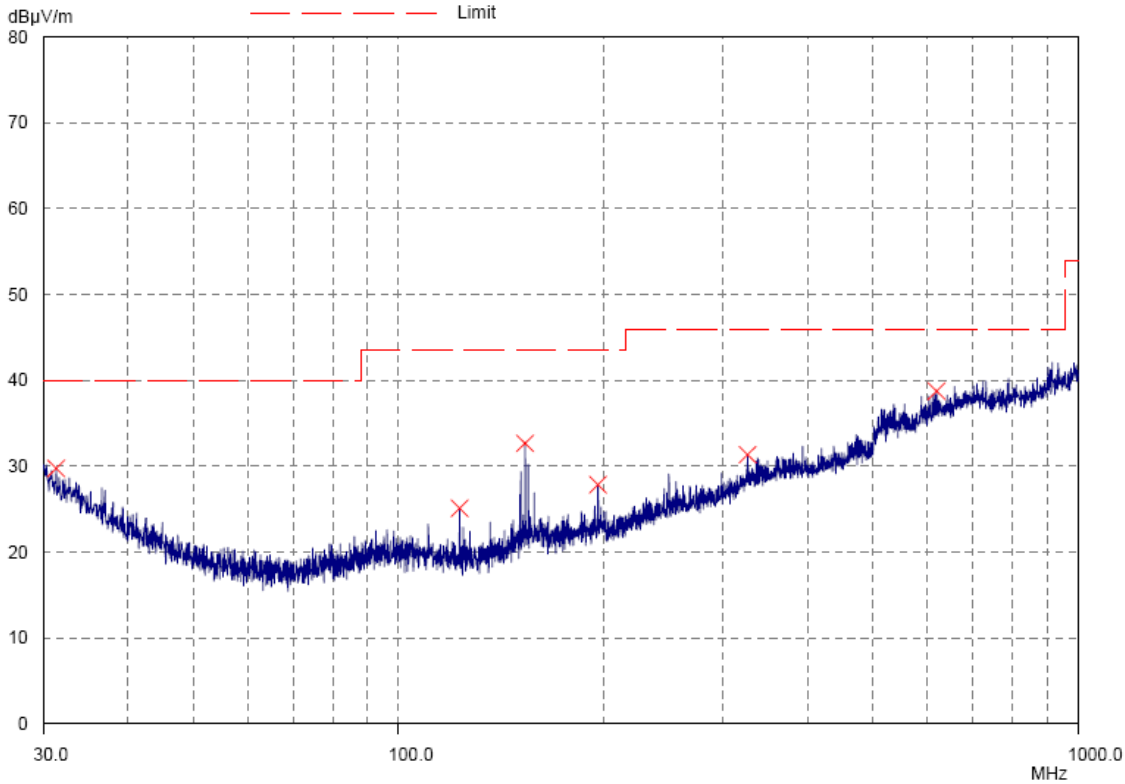
Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range	Quasi-Peak Limits
[MHz]	[µV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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 of Bluetooth Communication mode (2402.0 MHz) (30MHz – 1GHz): Pass
Please refer to the following table for result details

Horizontal



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Result of Bluetooth Communication mode (2402.0 MHz) (30MHz – 1GHz): Pass

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dBμV/m	Limit @3m dBμV/m	Level @3m μV/m	Limit @3m μV/m
31.3	Horizontal	29.7	40.0	30.5	100
122.9	Horizontal	25.1	43.5	18.0	150
153.5	Horizontal	32.7	43.5	43.2	150
196.6	Horizontal	27.8	43.5	24.5	150
326.4	Horizontal	31.4	46.0	37.2	200
619.2	Horizontal	38.7	46.0	86.1	200

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Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

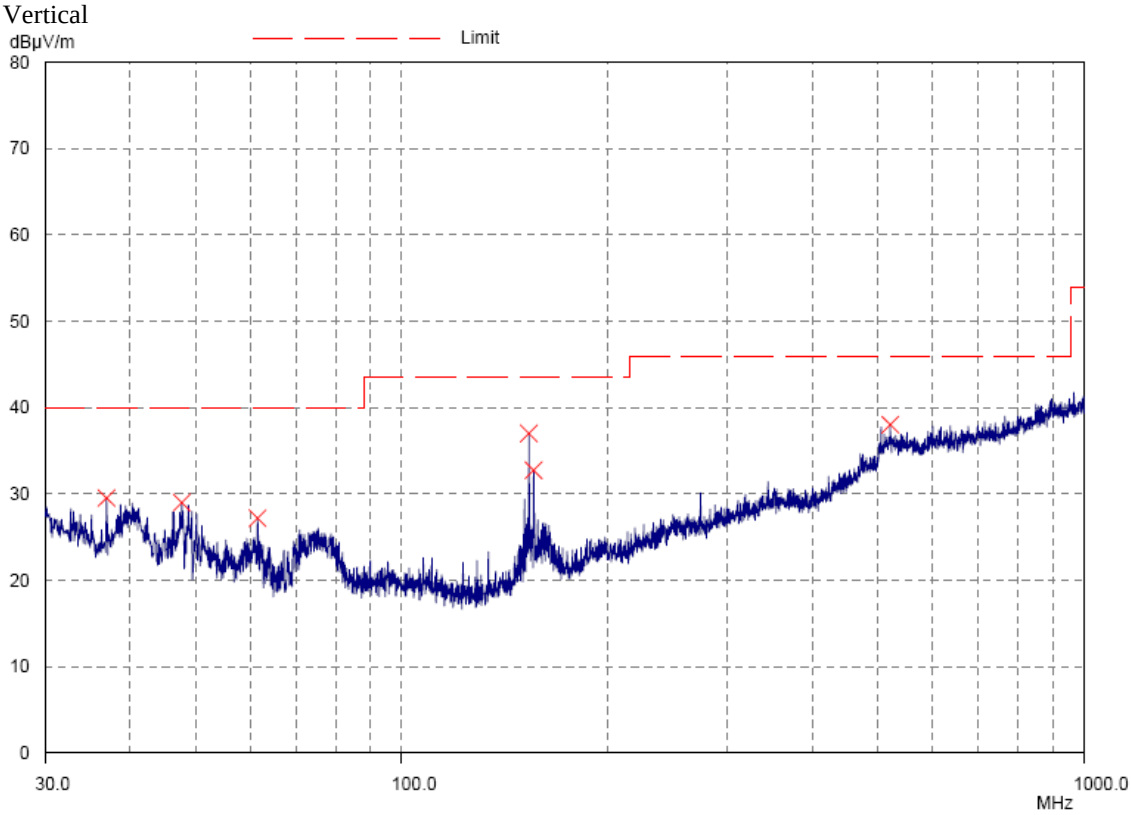
Frequency Range	Quasi-Peak Limits
[MHz]	[µV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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 of Bluetooth Communication mode (2402.0 MHz) (30MHz – 1GHz): Pass

Please refer to the following table for result details

Vertical



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Result of Bluetooth Communication mode (2402.0 MHz) (30MHz – 1GHz): Pass

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dBμV/m	Limit @3m dBμV/m	Level @3m μV/m	Limit @3m μV/m
36.9	Vertical	29.5	40.0	29.9	100
47.6	Vertical	29.0	40.0	28.2	100
61.4	Vertical	27.2	40.0	22.9	100
153.6	Vertical	37.0	43.5	70.8	150
156.1	Vertical	32.7	43.5	43.2	150
520.2	Vertical	38.0	46.0	79.4	200

Remarks:
Calculated measurement uncertainty (30MHz – 1GHz): 4.9dB
Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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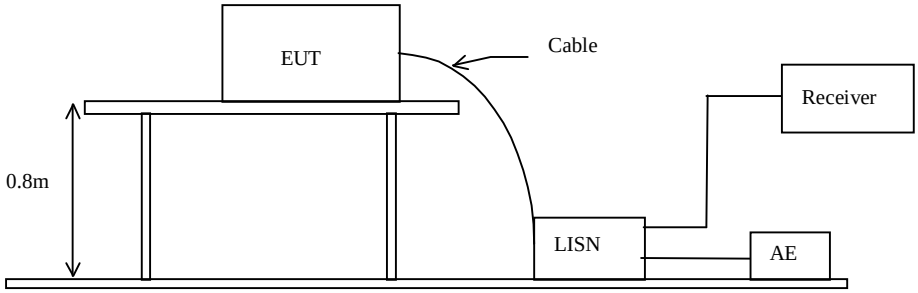
3.1.3 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement:	FCC 47CFR 15.207
Test Method:	ANSI C63.4:2009
Test Date:	2015-09-15
Mode of Operation:	Bluetooth Communication mode (GFSK)
Test Voltage:	120Va.c., 60Hz

Test Method:

The test was performed in accordance with ANSI C63.4: 2009, with the following: an initial measurement was performed in peak and average detection mode on the live line, any emissions recorded within 30dB of the relevant limit line 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.

Test Setup:



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Limit for Conducted Emissions (FCC 47 CFR 15.207):

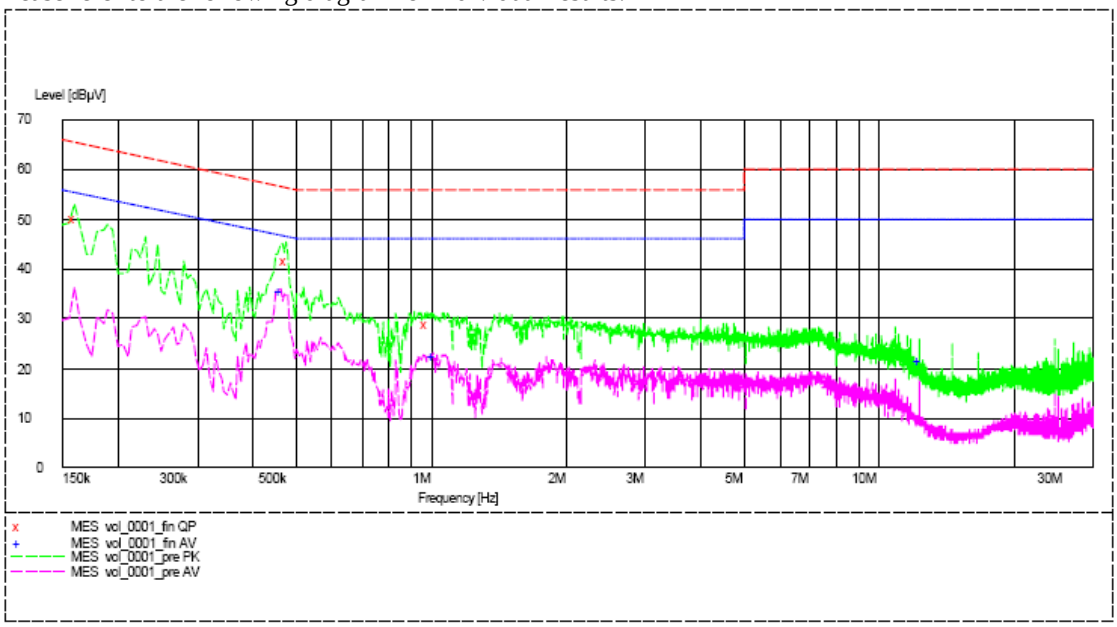
Frequency Range [MHz]	Quasi-Peak Limits [dBµV]	Average [dBµV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* Decreases with the logarithm of the frequency.

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram.

Result of Bluetooth Communication mode (L): PASS

Please refer to the following diagram for individual results.



Conductor	Frequency	Quasi-peak		Average	
		Level	Limit	Level	Limit
Live or Neutral	MHz	dBµV	dBµV	dBµV	dBµV
Live	0.160	50.4	66.0	-*-	-*-
Live	0.475	41.6	56.0	-*-	-*-
Live	0.980	28.9	56.0	-*-	-*-
Live	0.460	-*-	-*-	35.6	47.0
Live	1.010	-*-	-*-	22.6	46.0
Live	12.290	-*-	-*-	21.5	50.0

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Limit for Conducted Emissions (FCC 47 CFR 15.207):

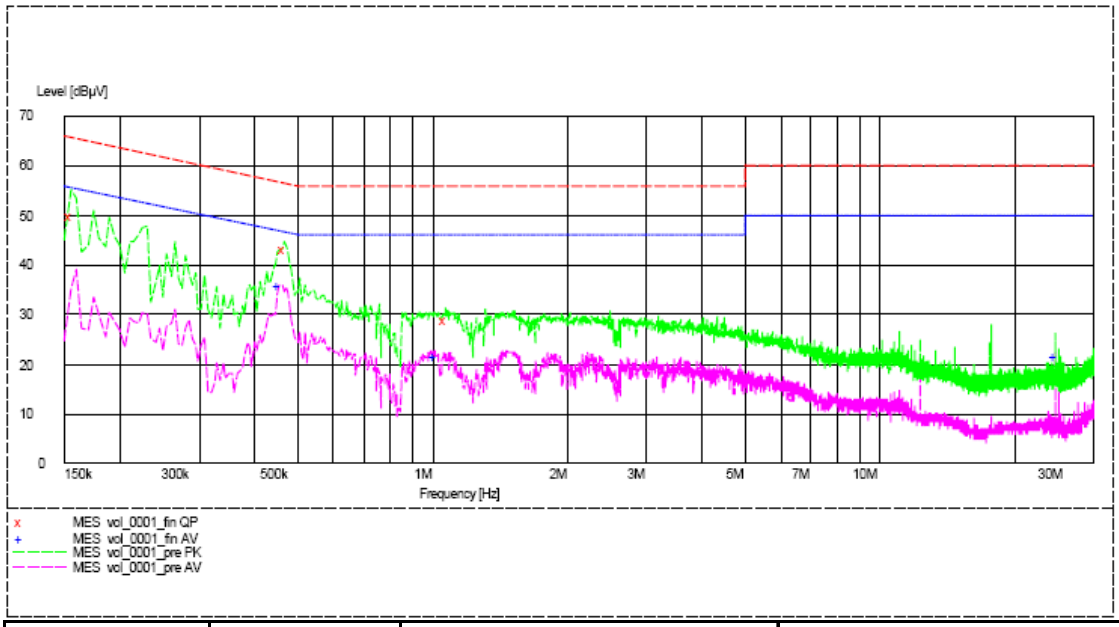
Frequency Range [MHz]	Quasi-Peak Limits [dBµV]	Average [dBµV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* Decreases with the logarithm of the frequency.

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram.

Result of Bluetooth Communication mode (N): PASS

Please refer to the following diagram for individual results.



Conductor Live or Neutral	Frequency MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Average Level dBµV	Average Limit dBµV
Neutral	0.155	50.0	66.0	-*-	-*-
Neutral	0.465	43.3	57.0	-*-	-*-
Neutral	1.070	29.1	56.0	-*-	-*-
Neutral	0.455	-*-	-*-	25.8	47.0
Neutral	1.010	-*-	-*-	21.6	46.0
Neutral	24.575	-*-	-*-	21.7	50.0

Remarks:

Calculated measurement uncertainty (0.15MHz – 30MHz): 3.25dB

-*- Emission(s) that is far below the corresponding limit line.

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3.1.4 Power Spectral Density

Test Requirement:	FCC 47CFR 15.247(e)
Test Method:	FCC KDB Publication 558074 D01 DTS Meas Guidance v03r02
Test Date:	2015-09-10
Mode of Operation:	Bluetooth DTS Tx mode

Test Method:

The RF output of the EUT was connected to the spectrum analyzer. Set the fundamental frequency as the center frequency of the spectral analyzer. Use RBW=3kHz , VBW= 10KHz , Set the span to 1.5 times the DTS channel bandwidth. Detector = peak, Sweep time = auto couple , Trace mode = max hold. Measure the Power Spectral Density (PSD) and record the results in dBm.

Test Setup:

As Test Setup of clause 3.1.1 in this test report.

Test Limit:

The maximum power spectral density (PSD) shall not exceeded 8dBm in any 3kHz band.

Results of Bluetooth DTS Mode (Tx:2402MHz to 2480MHz) : Pass (TX Unit)
Maximum power spectral density

Transmitter Frequency (MHz)	Maximum Power spectral density level / 3kHz band (dBm)	Maximum Power spectral density / 3kHz band limit
2402.0	-17.15	**8dBm**
2442.0	-16.64	**8dBm**
2480.0	-16.93	**8dBm**

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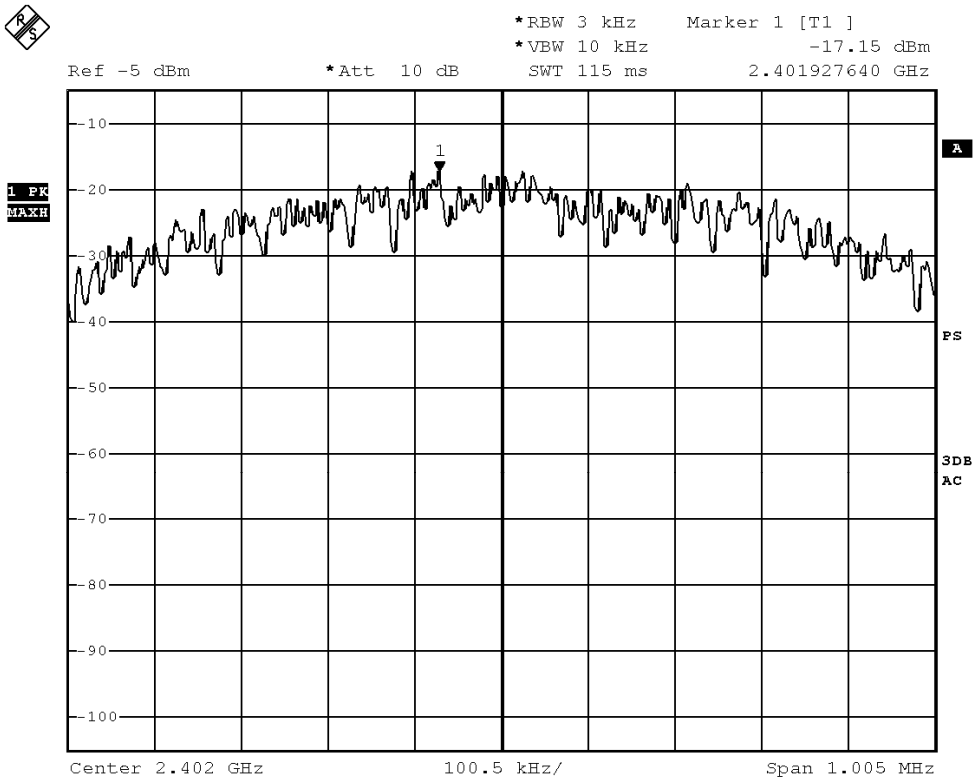
Bluetooth DTS mode (Tx: 2402MHz to 2480MHz)
2402.0 MHz



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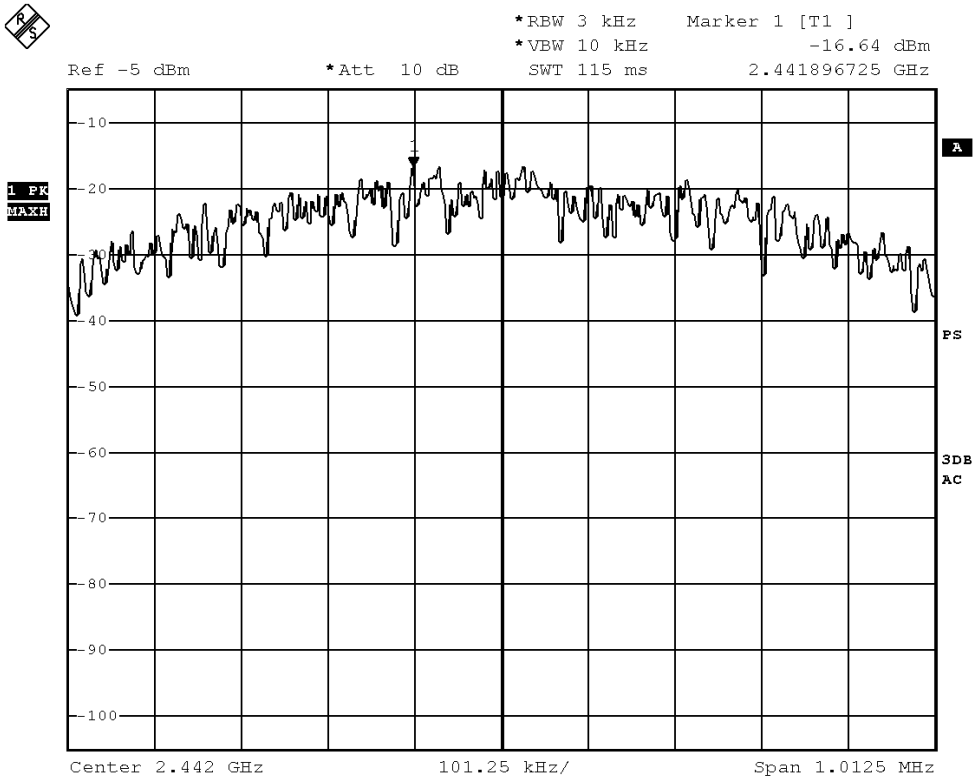
2442.0 MHz



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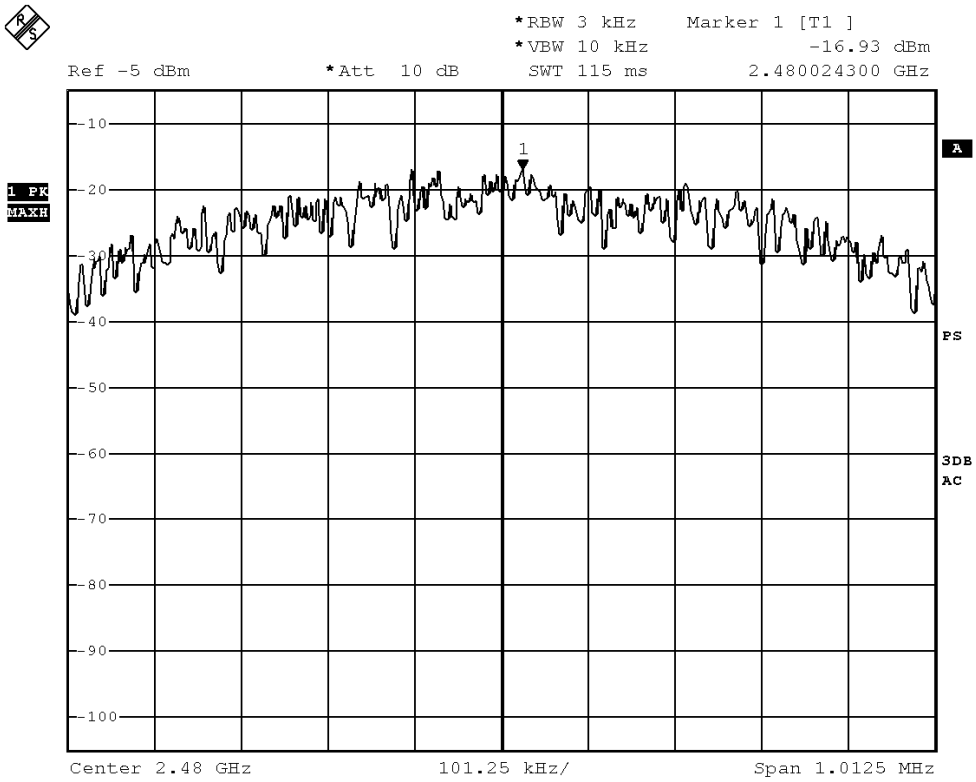
2480.0 MHz



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3.1.5 6dB Bandwidth Measurement

Test Requirement:	FCC 47CFR 15.247(a)(2)
Test Method:	FCC KDB Publication 558074 D01 DTS Meas Guidance v03r02
Test Date:	2015-09-11
Mode of Operation:	Bluetooth DTS Tx mode

Test Method:

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.

Test Setup:

As Test Setup of clause 3.1.1 in this test report.

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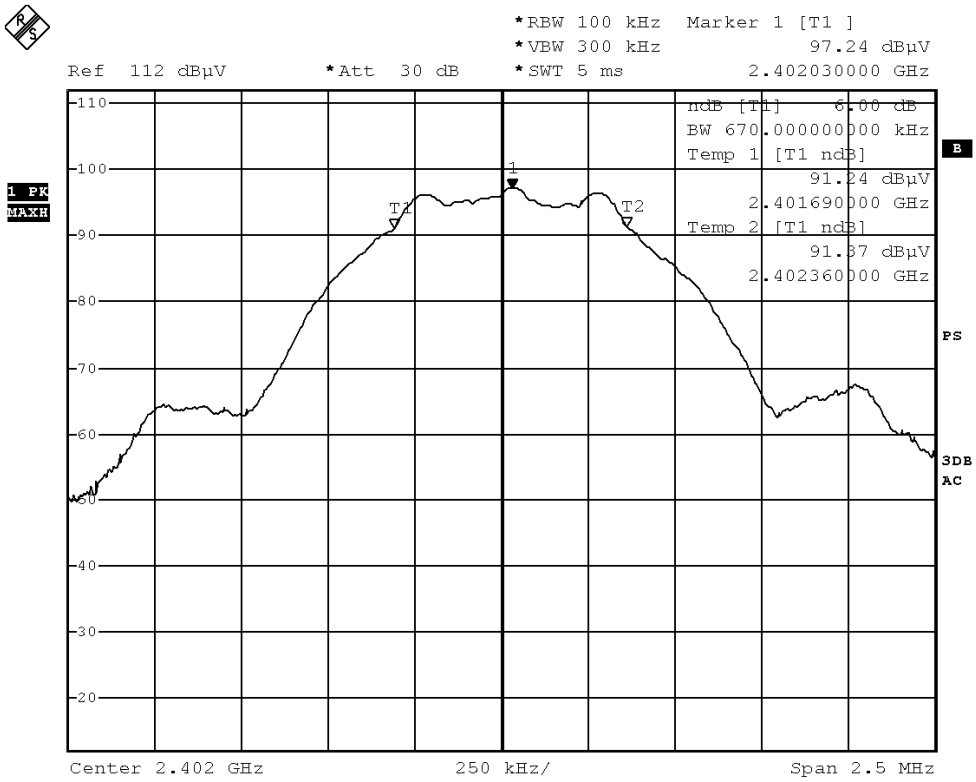
Limits for 6dB Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [kHz]	FCC Limits [kHz]
2402.0	670	> 500

6 dB Bandwidth Plot on Configuration Bluetooth DTS (GFSK: 2402MHz)



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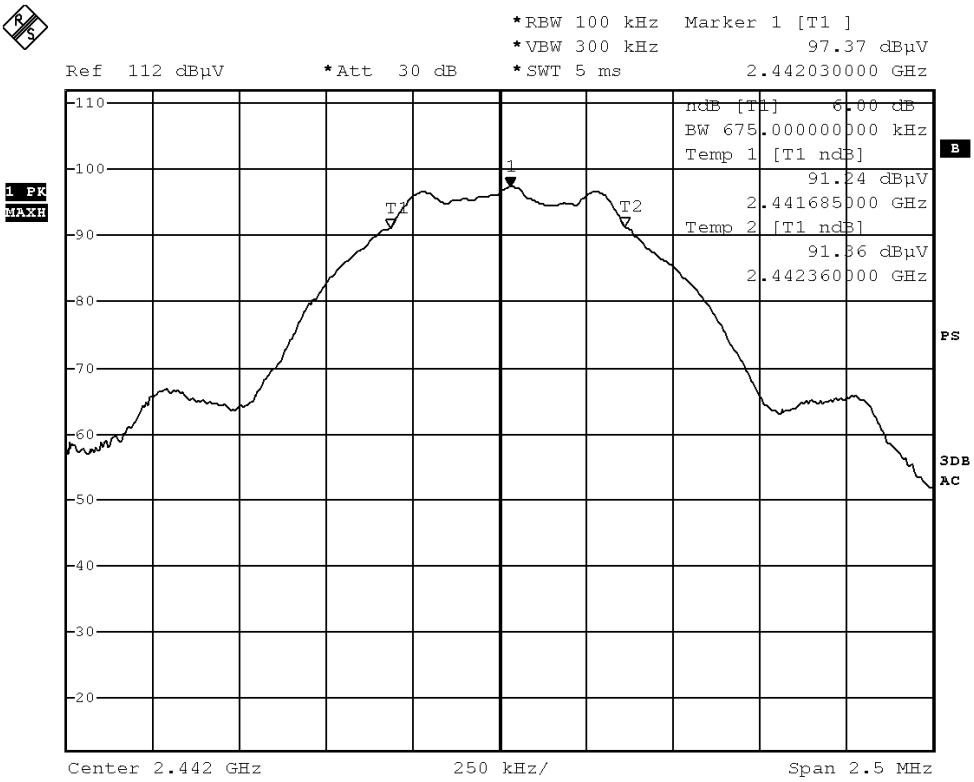
Limits for 6dB Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [kHz]	FCC Limits [kHz]
2442.0	675	> 500

6 dB Bandwidth Plot on Configuration Bluetooth DTS (GFSK: 2442MHz)



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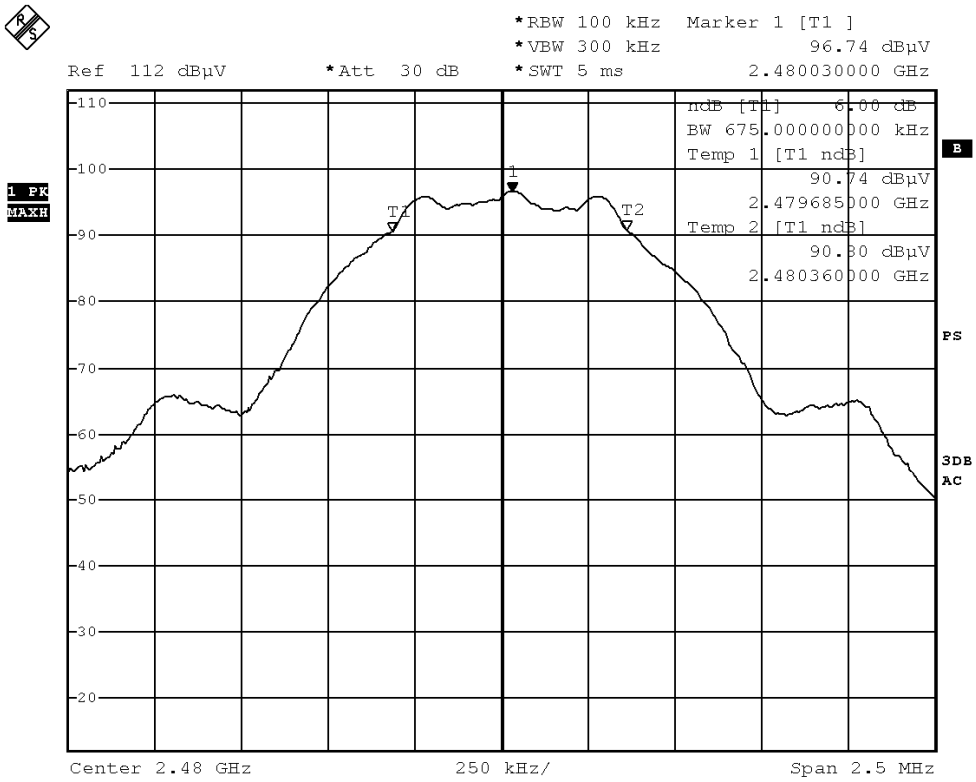
Limits for 6dB Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [kHz]	FCC Limits [kHz]
2480.0	675	> 500

6 dB Bandwidth Plot on Configuration Bluetooth DTS (GFSK: 2480MHz)



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3.1.6 Band Edges Measurement

Test Requirement:	FCC 47CFR 15.247
Test Method:	FCC KDB Publication 558074 D01 DTS Meas Guidance v03r02
Test Date:	2015-09-10
Mode of Operation:	Bluetooth DTS Tx mode

Test Method:

The band edge 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. The RBW and VBW are set to 100kHz for this measurement.

Test Setup:

As Test Setup of clause 3.1.2 in this test report.

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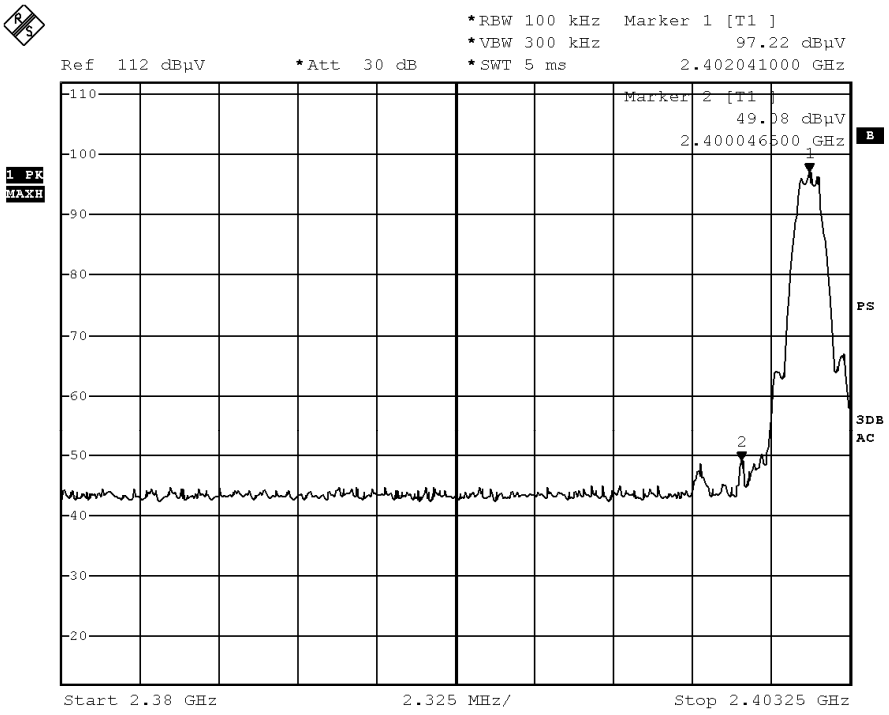
Band-edge Compliance of RF Conducted Emissions Measurement:

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.

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	48.14

Band-edge Compliance of RF Conducted Emissions – Lowest
(GFSK: Bluetooth DTS mode 2402MHz)



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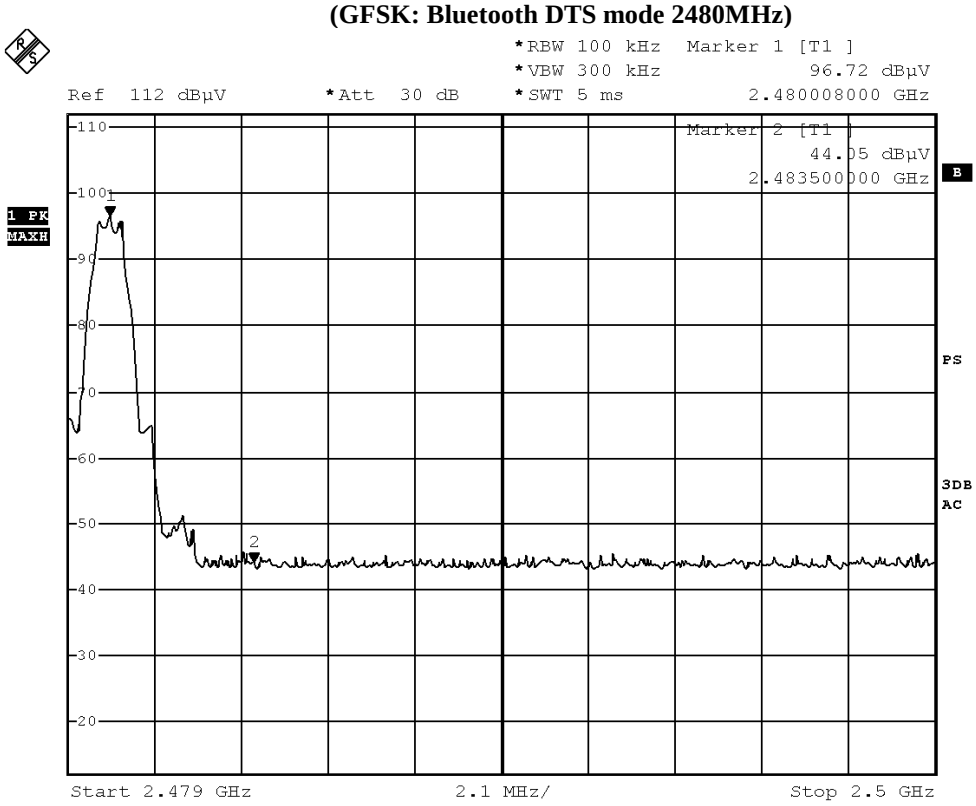
Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	52.67

Band-edge Compliance of RF Conducted Emissions – Highest (GFSK: Bluetooth DTS mode 2480MHz)



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Band-edge Compliance of RF Radiated Emissions 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 5.205(c)).

Result：Band-edge Compliance of RF Radiated Emissions (Lowest)

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
2400.0	22.6	36.8	59.4	74.0	14.6	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
2400.0	2.5	36.8	39.3	54.0	14.7	Vertical

Result：Band-edge Compliance of RF Radiated Emissions (Highest)

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
2483.5	25.7	36.8	62.5	74.0	11.5	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
2483.5	5.3	36.8	42.1	54.0	11.9	Vertical

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3.1.7 Antenna Requirement

Test Requirements: § 15.203

Test Specification:

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

Test Results:

This is Meander line antenna. There is no external antenna, the antenna gain = 2.12dBi.
All component install on inside of EUT. User unable to remove or changed the Antenna.

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3.1.8 RF Exposure

Test Requirement:	FCC 47CFR 15.247(i)
Test Date:	2015-09-17
Mode of Operation:	Tx mode

Test Method:

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

Test Results:

The EUT complied with the requirement(s) of this section.
EUT meets the requirements of these sections as proven through MPE calculation
The MPE calculation for EUT @ 20cm
Based on the highest P =2.153 mW

Pd = PG/ 4pi*R^2 = (2.153x 1.63)/12.566* $(20)^2$
= (3.5093)/12.566x 400= 3.4017/5026.4
= 0.000698mW/cm^2

where:
*Pd = power density in mW/cm2
* G = Antenna numeric gain (1.63); Log G = g/10 (g = 2.12dBi).
* P = Conducted RF power to antenna (2.153 mW).
* R = Minimum allowable distance.(20 cm)

*The power density Pd = 0.000698mW/cm^2 is less than 1 mW/cm^2 (listed MPE limit)
*The SAR evaluation is not needed (this is a desk top device, R> 20 cm)
* The EUT(antenna) must be 0.2 meters away from the General Population.

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Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM299	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA	ETS-LINDGREN	3115	00114120	2014/01/15	2016/01/25
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2014/01/23	2016/01/23
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM216	MINI MAST SYSTEM	EMCO	2075	00026842	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2014/09/29	2015/09/29
EM320	BICONILOG ANTENNA	ETS-LINDGREN	3142D	00094856	2014/08/06	2016/08/06
EM022	LOOP ANTENNA	EMCO	6502	1189-2424	2014/01/15	2016/01/15
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2015/06/01	2016/06/01
RE03	ANTENNA CONNECTOR	N/A	N/A	N/A	2015-9-28	2016-9-27

Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM232	LISN	SCHAFFNER	NNB41	04/100082	2014/12/08	2015/12/08
EM145	EMI TEST RECEIVER	R & S	ESCS 30	830245/021	2015/06/01	2016/06/01
EM179	IMPULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	357-8810.52/54	2015/01/14	2016/01/14
EM154	SHIELDING ROOM	SIEMENS MATSUSHITA COMPONENTS	N/A	803-740-057-99A	2012/02/03	2017/02/03

Remarks:-

N/A Not Applicable or Not Available

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Appendix B

Photographs of EUT

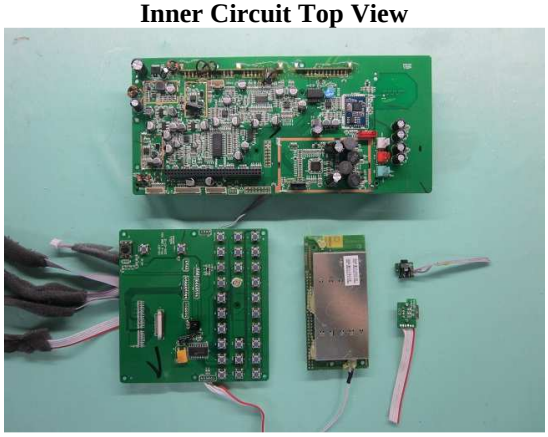
Front View of the product

Rear View of the product

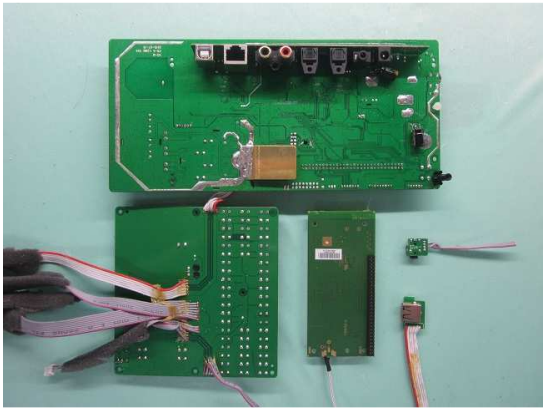
Inside View of the product

Inside View of the product

Inner Circuit Top View



Inner Circuit Bottom View



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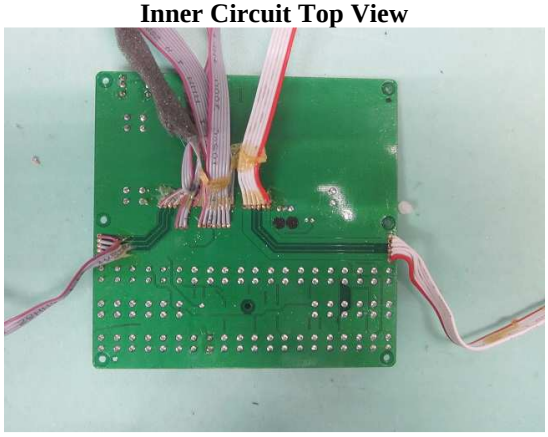
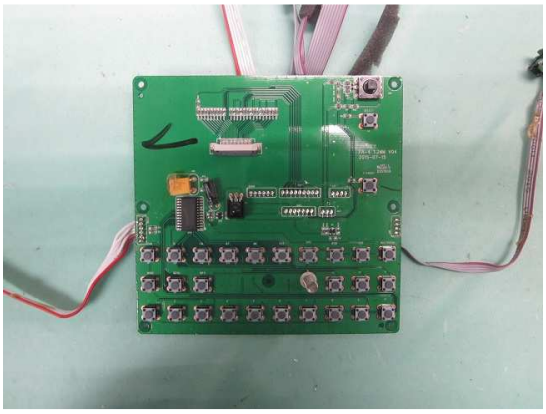
Photographs of EUT

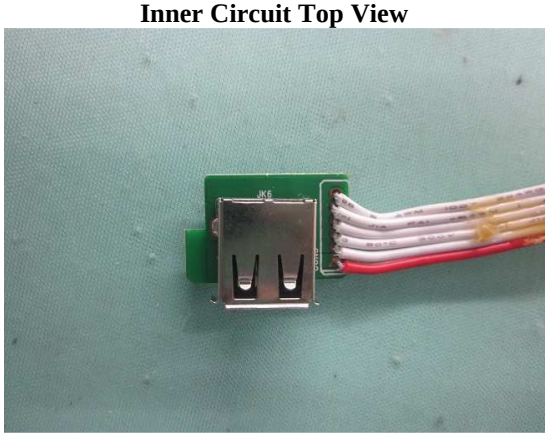
Inner Circuit Top View



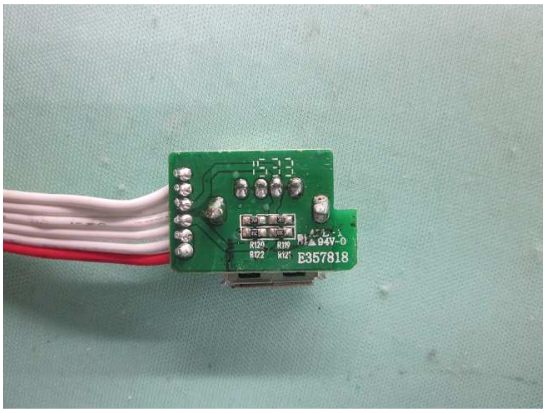
Inner Circuit Bottom View



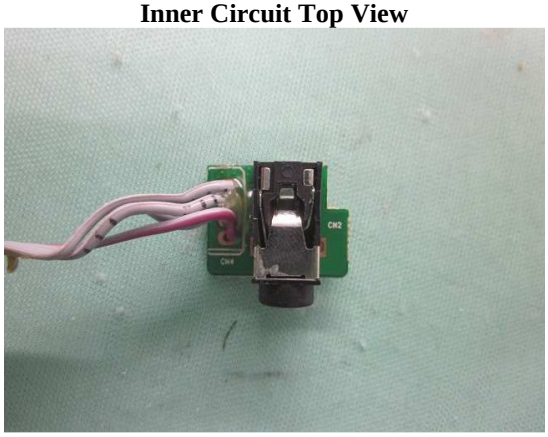
Inner Circuit Top View



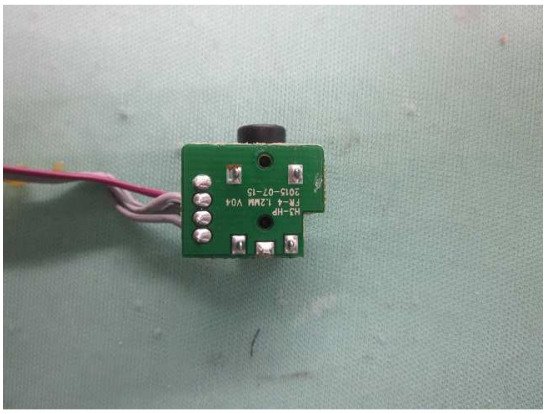
Inner Circuit Bottom View



Inner Circuit Top View



Inner Circuit Bottom View



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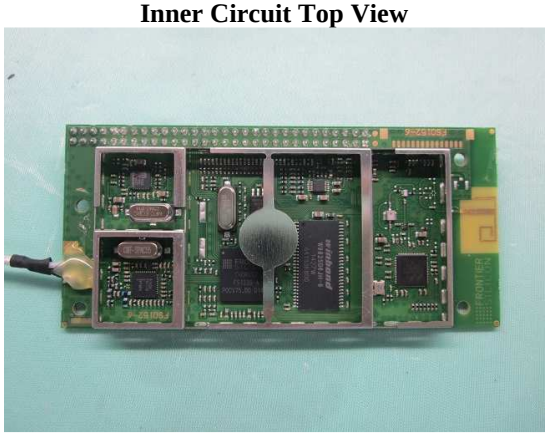
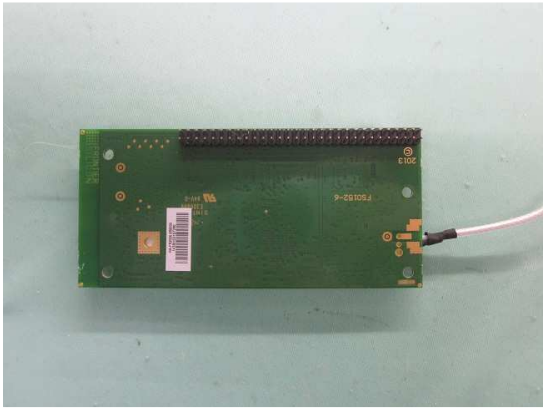
Photographs of EUT

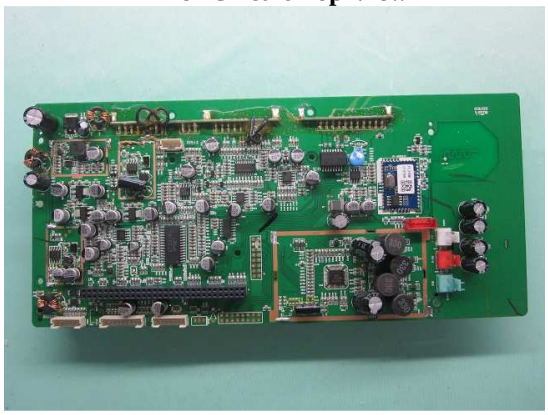
Inner Circuit Top View



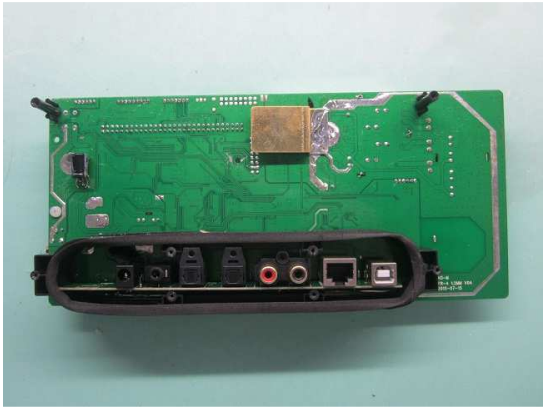
Inner Circuit Bottom View



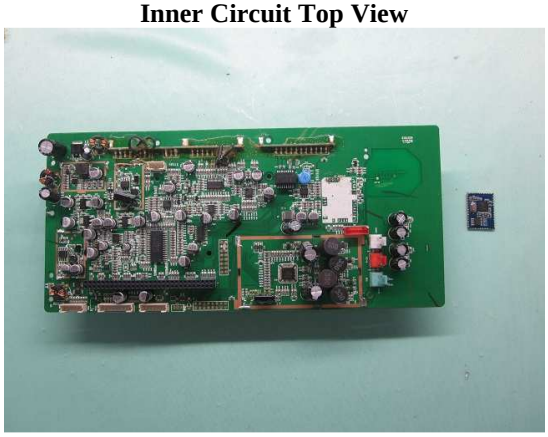
Inner Circuit Top View



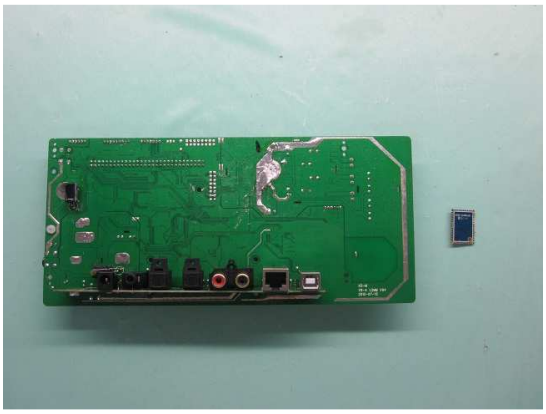
Inner Circuit Bottom View



Inner Circuit Top View



Inner Circuit Bottom View



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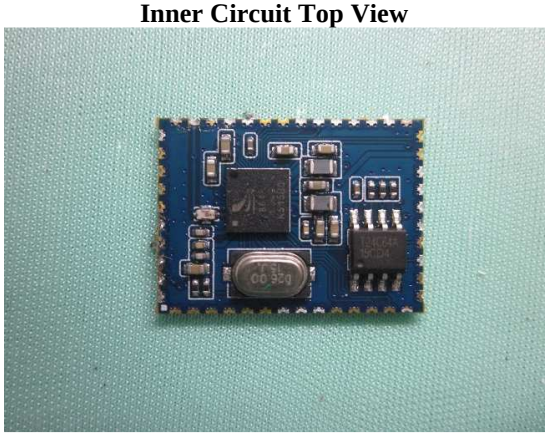
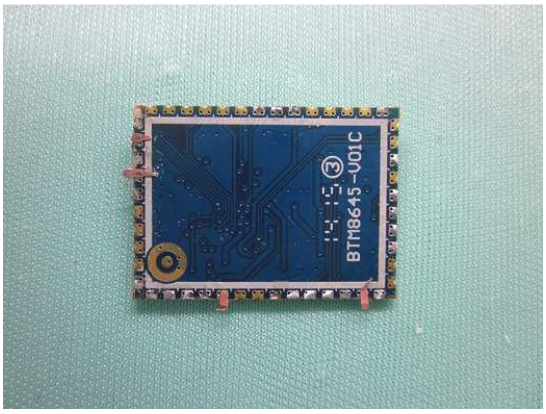
Inner Circuit Top View

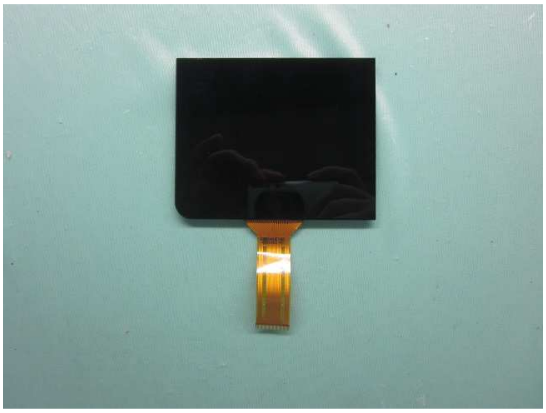


Inner Circuit Bottom View

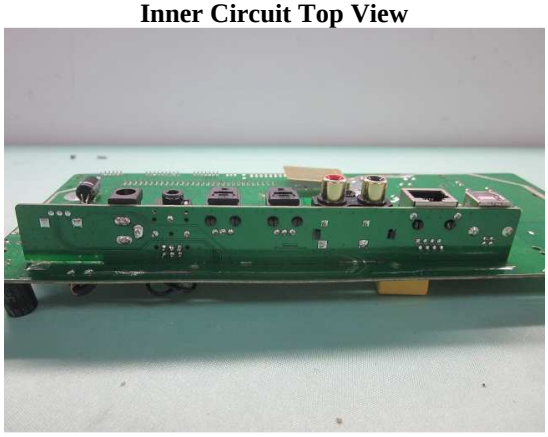


Inner Circuit Top View

Inner Circuit Bottom View



Inner Circuit Top View



Inner Circuit Bottom View

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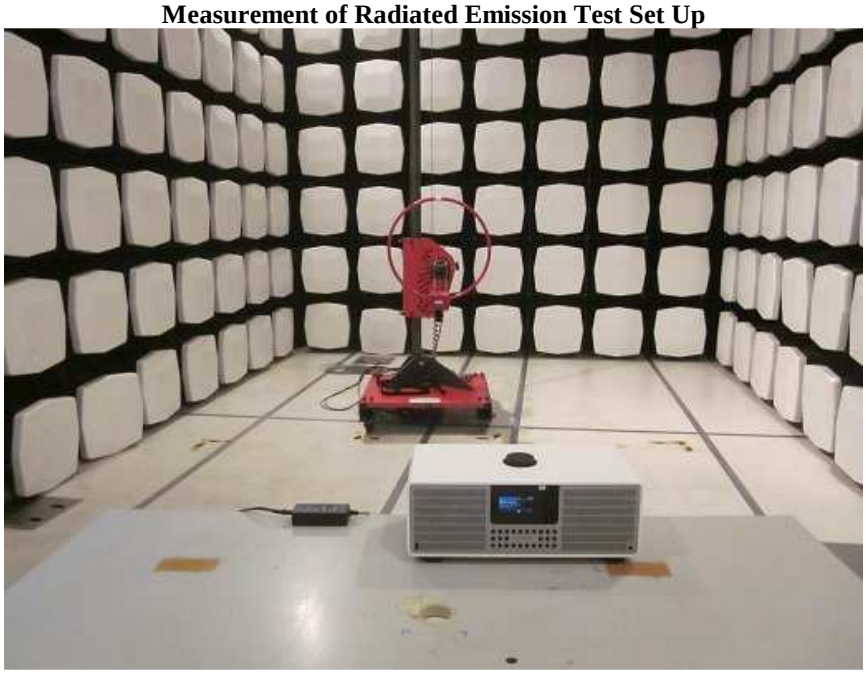
Measurement of Radiated Emission Test Set Up



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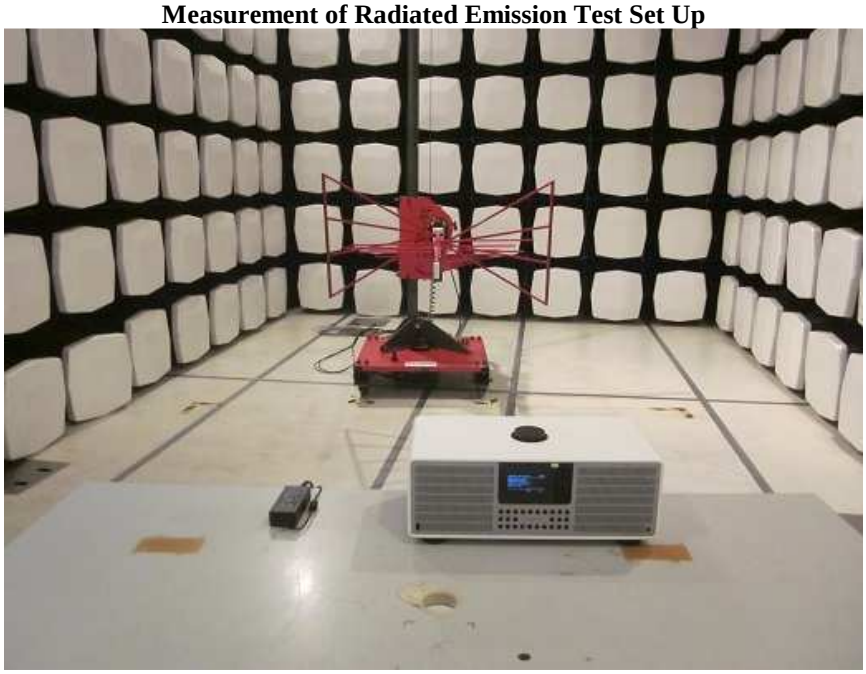

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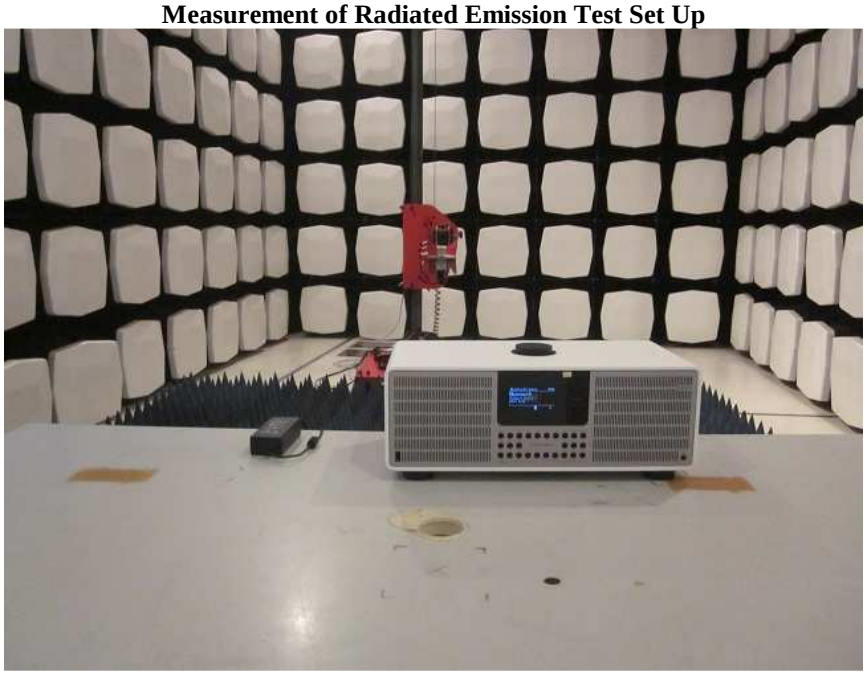
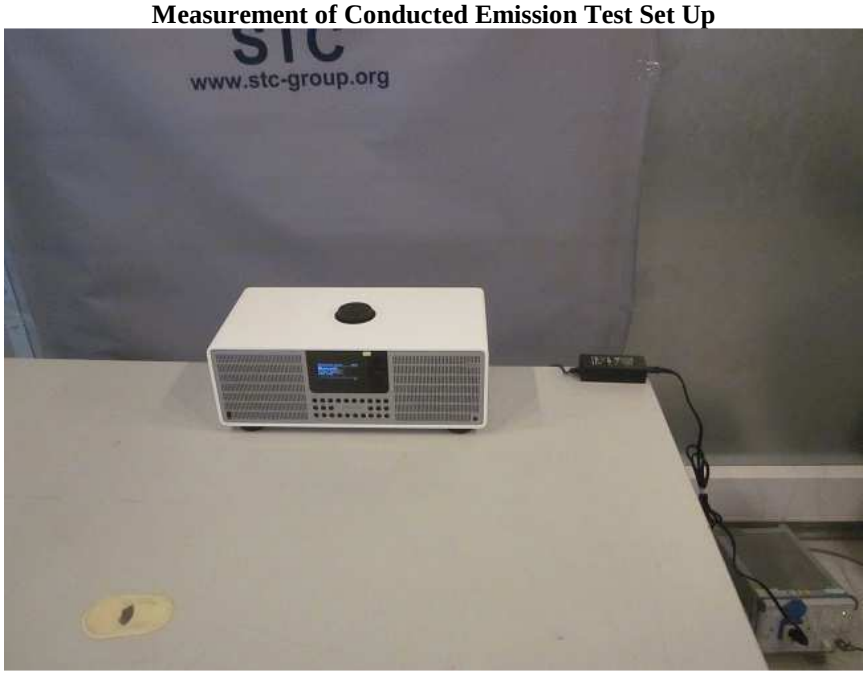
Measurement of Radiated Emission Test Set Up



Measurement of Conducted Emission Test Set Up



******* End of Test Report *******

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