



STC Test Report

Date: 2016-04-05

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No.: MH192511

Applicant: Hip Shing Electronics Limited
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: Multimedia Speaker
Brand Name: ADCOM
Model Number: Luna
FCC ID: BZA0416LUNA

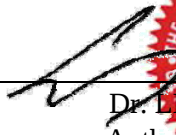
Date Sample(s) Received: 2016-03-22

Date Tested: 2016-03-28 to 2016-04-05

Investigation Requested: Perform ElectroMagnetic Interference measurement in
accordance with FCC 47CFR [Codes of Federal Regulations]
Part 15: 2015 and ANSI C63.10:2013 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.

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: Multimedia Speaker
Manufacturer: Dongguan Zhi Cheng Electronic Products Co., Ltd.
No. 11 Shangbao Road, 188 Industrial Zone, Pingshan,
Tangxia, Dongguan, Guangdong, China
Brand Name: ADCOM
Model Number: Luna
Rating: Input: 100-240Va.c. 50/60Hz 0.75A;
Output: 12Vd.c. 2000mA.

The AC/DC adaptor was provided by the applicant with following details:
Brand name: GPE; Model no.: GPE024C-120200-Z

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is a Multimedia Speaker. The transmission signal is digital modulated with channel frequency range 2402-2480MHz. The R.F. signal was modulated by IC; the type of modulation used was frequency hopping spread spectrum Modulation.

1.3 Date of Order

2016-03-22

1.4 Submitted Sample(s):

1 Sample

1.5 Test Duration

2016-03-28 to 2016-04-05

1.6 Country of Origin

China

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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: 2015 Regulations and ANSI C63.10:2013 for FCC Certification.

According FCC KDB 558074 DTS Measurement Guidance, Duty cycle $\geq 98\%$.

The device was realized by test software.

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
Output Power of Fundamental Emissions	FCC 47CFR 15.247(b)(3)	ANSI C63.10:2013	N/A	☒	☐	☐
Radiated Emissions	FCC 47CFR 15.209	ANSI C63.10:2013	N/A	☒	☐	☐
Conducted Emissions	FCC 47CFR 15.207	ANSI C63.10:2013	N/A	☒	☐	☐
Power Spectral Density	FCC 47CFR 15.247(e)	ANSI C63.10:2013	N/A	☒	☐	☐
6dB Bandwidth	FCC 47CFR 15.247(a)(2)	ANSI C63.10:2013	N/A	☒	☐	☐
Band Edge Emissions	FCC 47CFR 15.247(d)	ANSI C63.10:2013	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:	N/A
Test Date:	2016-03-31
Mode of Operation:	Tx mode

Test Method:

The RF output of the EUT was connected to the peak power sensor, and the level measured by the peak power sensor will be displayed on the computer. All the attenuation or cable loss will be added to the measured maximum output power. The results are recorded in W.

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 Tx Mode GFSK (2402MHz to 2480MHz) : Pass (Tx Unit) Maximum conducted output power		
Channel	Frequency(MHz)	Output Power(Watt)
Low	2402	0.002564
Middle	2442	0.002812
High	2480	0.002140

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

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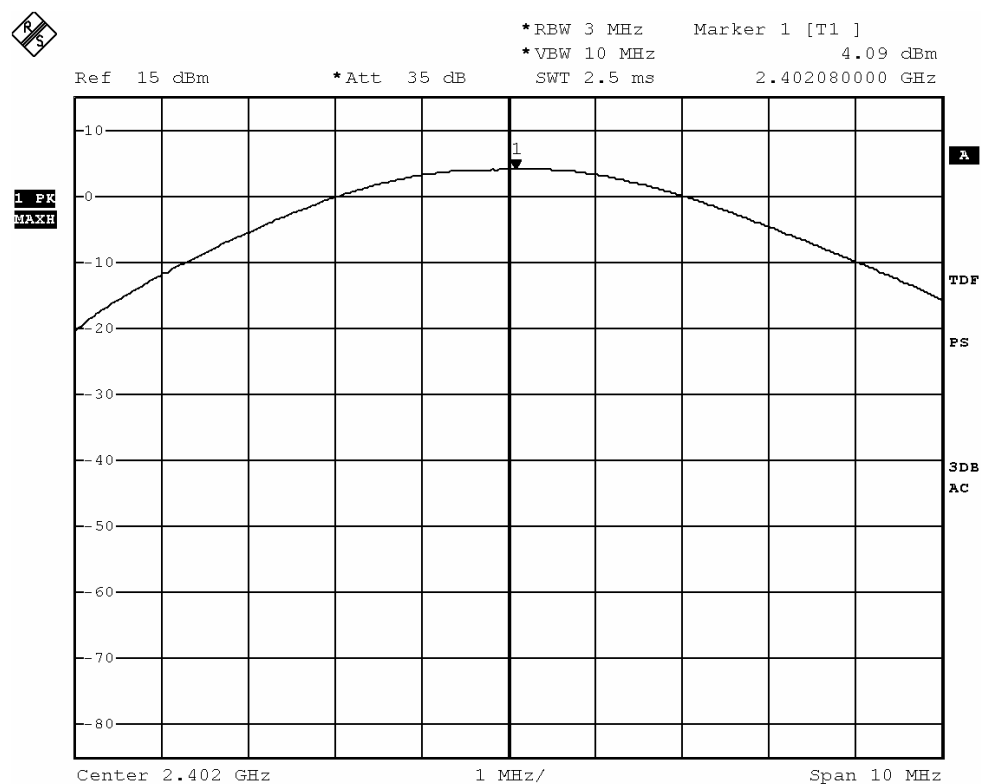
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Test plot of Maximum Peak Conducted Output Power :

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



BMP

Date: 28.MAR.2016 20:15:29

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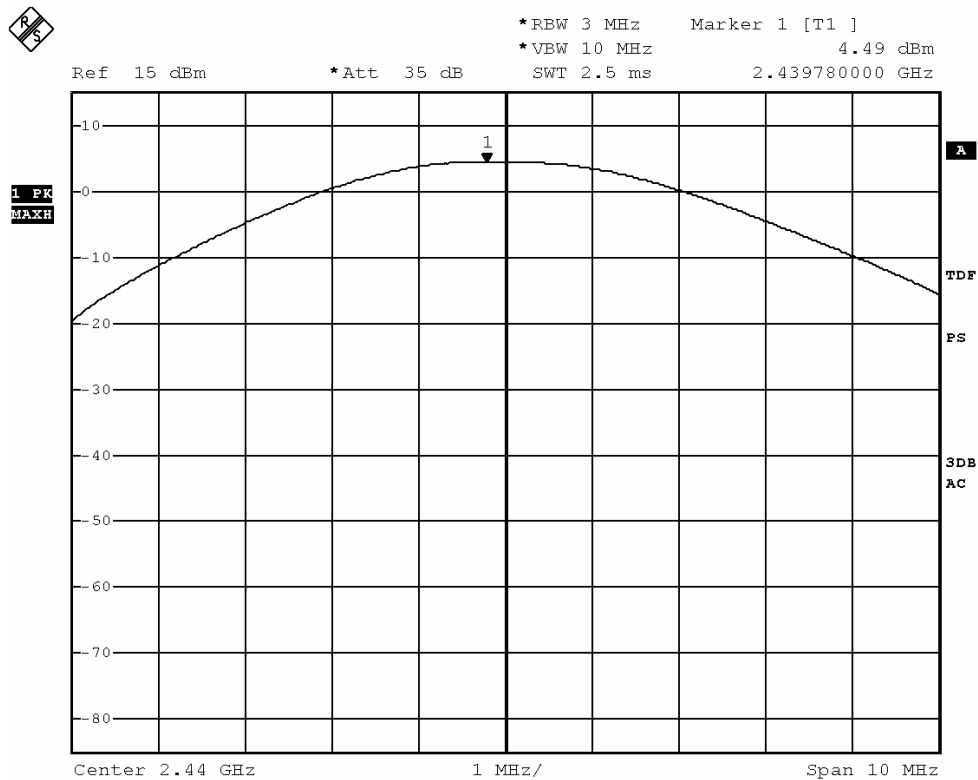
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Bluetooth Communication mode (BT DTS-GFSK, 2442MHz)



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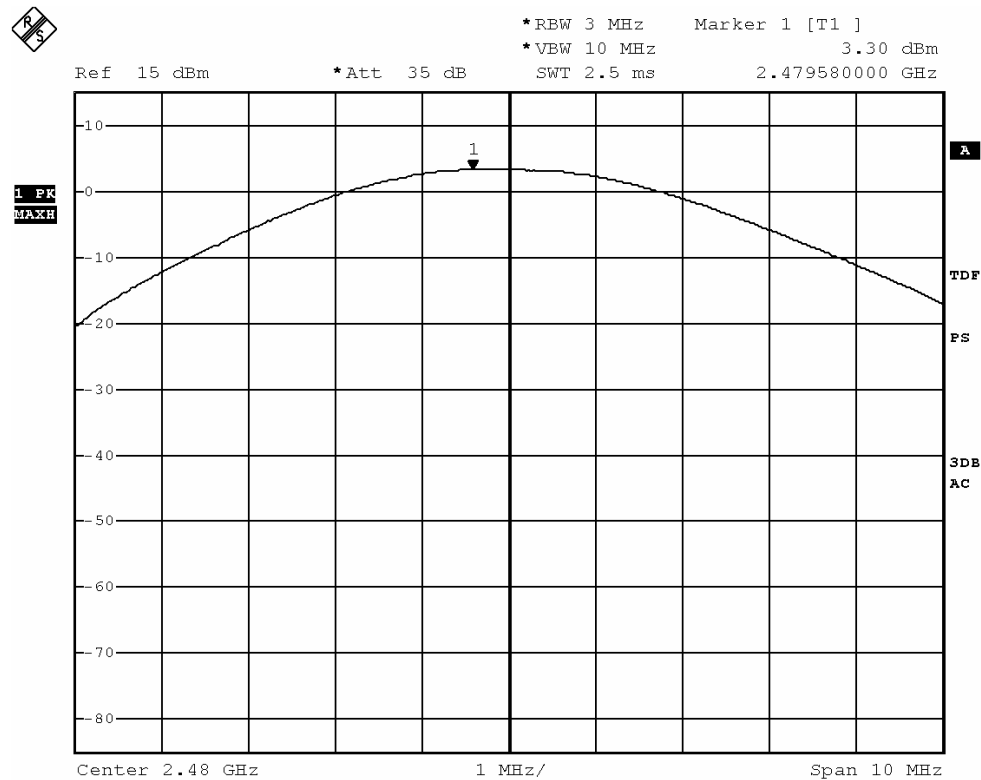
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Bluetooth Communication mode (BT DTS-GFSK, 2480MHz)



BMP

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3.1.2 Radiated Emissions

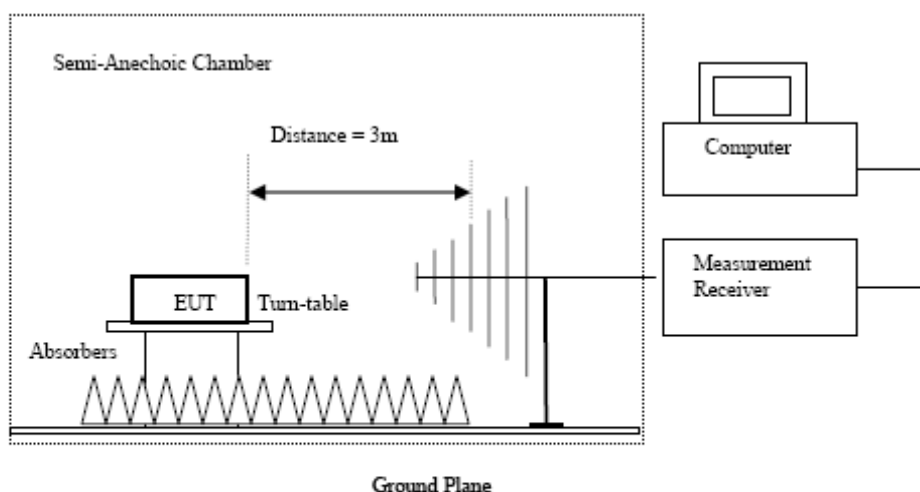
Test Requirement:	FCC 47CFR 15.209
Test Method:	ANSI C63.10:2013
Test Date:	2016-03-31
Mode of Operation:	Tx mode / Bluetooth mode

Test Method:

For emission measurements at or below 1 GHz, the sample was placed 0.8m above the ground plane of semi-anechoic Chamber*. For emission measurements above 1 GHz, the sample was placed 1.5m 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 Average Value						
Frequency MHz	Measured Level dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength dBμV/m	Limit dBμV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (2402.0 MHz) (GFSK) (1GHz-26GHz): 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
4804.0	15.0	41.5	56.5	74.0	17.5	Vertical
4804.0	13.1	42.4	55.5	74.0	18.5	Horizontal
7206.0	9.3	45.1	54.4	74.0	19.6	Vertical
7206.0	8.0	46.2	54.2	74.0	19.8	Horizontal
9612.0	7.0	48	55.0	74.0	19.0	Vertical
9612.0	6.1	48.8	54.9	74.0	19.1	Horizontal
12010.0	3.5	51.8	55.3	74.0	18.7	Vertical
12010.0	3.6	52.4	56.0	74.0	18.0	Horizontal

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Result of Tx mode (2402.0 MHz) (GFSK) (1GHz-26GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
4804.0	-1.3	41.5	40.2	54.0	13.8	Vertical
4804.0	-3.3	42.4	39.1	54.0	14.9	Horizontal
7206.0	-6.1	45.1	39.0	54.0	15.0	Vertical
7206.0	-7.3	46.2	38.9	54.0	15.1	Horizontal
9608.0	-9.1	48.0	38.9	54.0	15.1	Vertical
9608.0	-9.6	48.8	39.2	54.0	14.8	Horizontal
12010.0	-12.4	51.8	39.4	54.0	14.6	Vertical
12010.0	-12.1	52.4	40.3	54.0	13.7	Horizontal

Result of Tx mode (2440.0 MHz) (GFSK) (9kHz – 30MHz): Pass

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

Result of Tx mode (2442.0 MHz) (GFSK) (1GHz-26GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
4884.0	14.5	41.6	56.1	74.0	17.9	Vertical
4884.0	-37.2	42.5	5.3	74.0	68.7	Horizontal
7326.0	1.7	53.2	54.9	74.0	19.1	Vertical
7326.0	8.3	46.3	54.6	74.0	19.4	Horizontal
9768.0	6.9	48.1	55.0	74.0	19.0	Vertical
9768.0	5.4	48.9	54.3	74.0	19.7	Horizontal
12210.0	4.2	51.6	55.8	74.0	18.2	Vertical
12210.0	3.5	52.5	56.0	74.0	18.0	Horizontal

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Result of Tx mode (2442.0 MHz) (GFSK) (1GHz-26GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
4884.0	-0.5	41.6	41.1	54.0	12.9	Vertical
4884.0	-3.2	42.5	39.3	54.0	14.7	Horizontal
7326.0	-6.2	45.2	39.0	54.0	15.0	Vertical
7326.0	-7.1	46.3	39.2	54.0	14.8	Horizontal
9768.0	-8.8	48.1	39.3	54.0	14.7	Vertical
9768.0	-10.2	48.9	38.7	54.0	15.3	Horizontal
12210.0	-12.3	51.6	39.3	54.0	14.7	Vertical
12210.0	-13.6	52.5	38.9	54.0	15.1	Horizontal

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

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

Result of Tx mode (2480.0 MHz) (GFSK) (1GHz-26GHz): 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
4960.0	14.0	41.4	55.4	74.0	18.6	Vertical
4960.0	12.1	42.7	54.8	74.0	19.2	Horizontal
7440.0	9.2	45.6	54.8	74.0	19.2	Vertical
7440.0	8.2	46.5	54.7	74.0	19.3	Horizontal
9920.0	6.5	48.6	55.1	74.0	18.9	Vertical
9920.0	5.3	49.7	55.0	74.0	19.0	Horizontal
12400.0	4.0	51.7	55.7	74.0	18.3	Vertical
12400.0	3.4	52.7	56.1	74.0	17.9	Horizontal

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Result of Tx mode (2480.0 MHz) (GFSK) (1GHz-26GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
4960.0	-0.9	41.4	40.5	54.0	13.5	Vertical
4960.0	-3.7	42.7	39.0	54.0	15.0	Horizontal
7440.0	-6.6	45.6	39.0	54.0	15.0	Vertical
7440.0	-7.6	46.5	38.9	54.0	15.1	Horizontal
9920.0	-9.7	48.6	38.9	54.0	15.1	Vertical
9920.0	-11.0	49.7	38.7	54.0	15.3	Horizontal
12400.0	-12.5	51.7	39.2	54.0	14.8	Vertical
12400.0	-11.9	52.7	40.8	54.0	13.2	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]:

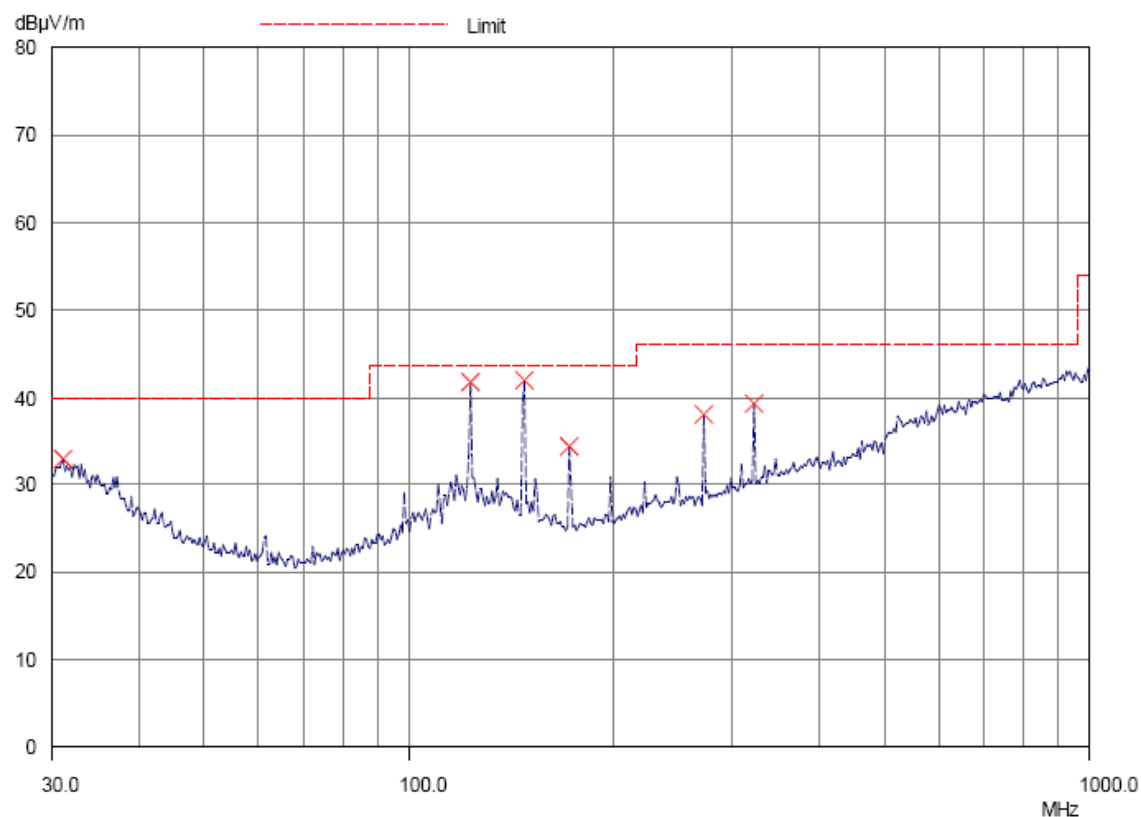
Frequency Range	Quasi-Peak Limits
[MHz]	[μ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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 (2402MHz, GFSK) (30MHz – 1GHz): Pass

Please refer to the following table for result details

Horizontal



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Result of Tx mode(2402MHz, GFSK) (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
31.0	Horizontal	33.0	40.0	44.7	100
122.9	Horizontal	40.6	43.5	107.2	150
147.5	Horizontal	41.5	43.5	118.9	150
172.1	Horizontal	34.4	43.5	52.5	150
270.4	Horizontal	38.1	46.0	80.4	200
319.5	Horizontal	39.3	46.0	92.3	200

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

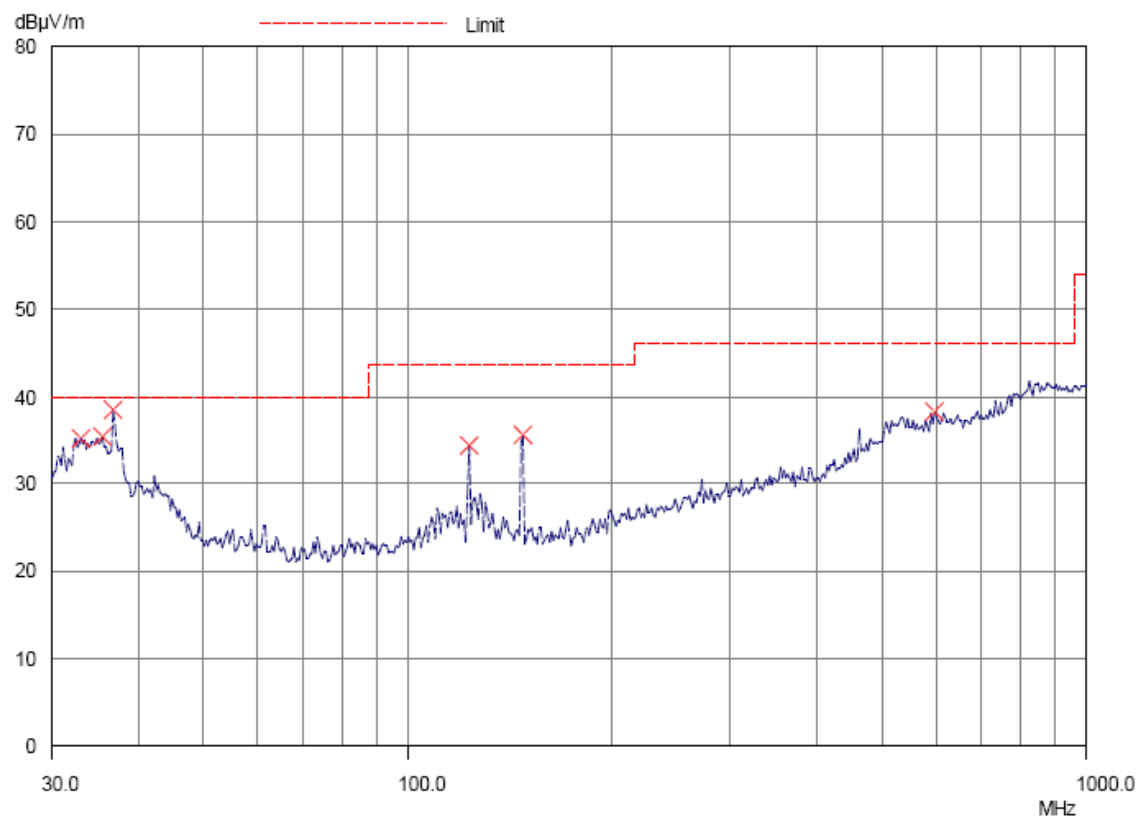
Frequency Range	Quasi-Peak Limits
[MHz]	[μ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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(2402MHz, GFSK) (30MHz – 1GHz): Pass

Please refer to the following table for result details

Vertical



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Result of Tx mode (2402MHz, GFSK) (30MHz – 1GHz): Pass

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dB μ V/m	Limit @3m dB μ V/m	Level @3m μ V/m	Limit @3m μ V/m
32.9	Vertical	35.1	40.0	56.9	100
35.4	Vertical	35.5	40.0	59.6	100
36.9	Vertical	38.2	40.0	81.3	100
122.9	Vertical	34.3	43.5	51.9	150
147.5	Vertical	35.7	43.5	61.0	150
593.1	Vertical	38.2	46.0	81.3	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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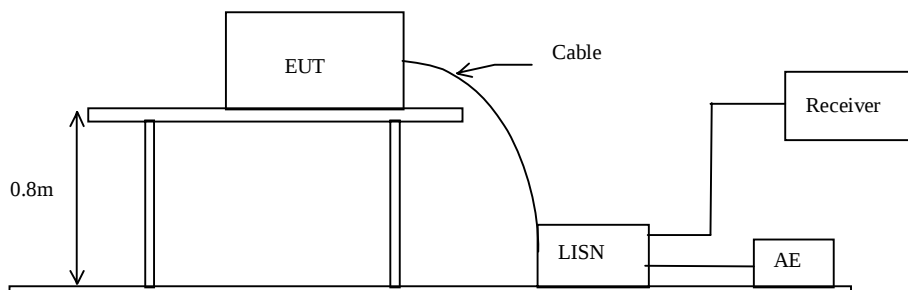
3.1.3 AC Mains Conducted Emissions (0.15MHz to 30MHz)

Test Requirement:	FCC 47CFR 15.207
Test Method:	ANSI C63.10:2013
Test Date:	2016-03-29
Mode of Operation:	Bluetooth mode
Test Voltage:	120V a.c. 60Hz

Test Method:

The test was performed in accordance with ANSI C63.10:2013, 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):

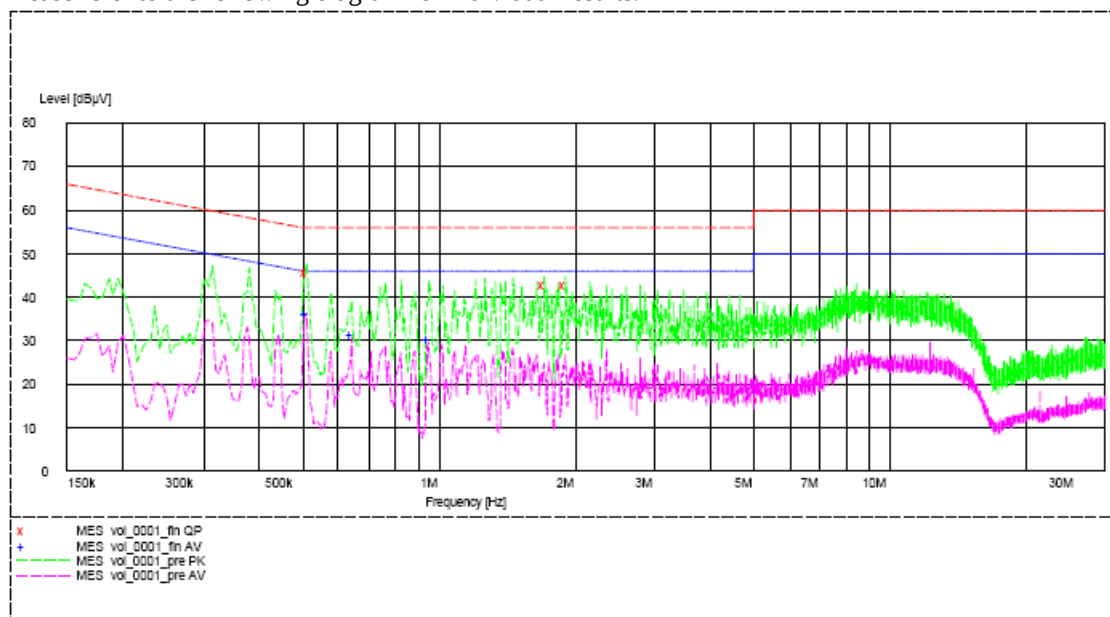
Frequency Range [MHz]	Quasi-Peak Limits [dB μ V]	Average [dB μ V]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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 mode (L): PASS

Please refer to the following diagram for individual results.



Conductor Live or Neutral	Frequency MHz	Quasi-peak		Average	
		Level dB μ V	Limit dB μ V	Level dB μ V	Limit dB μ V
Live	0.510	45.9	56.0	-*-	-*-
Live	1.715	42.6	56.0	-*-	-*-
Live	1.910	42.5	56.0	-*-	-*-
Live	0.510	-*-	-*-	36.4	46.0
Live	0.640	-*-	-*-	31.5	46.0
Live	0.950	-*-	-*-	30.2	46.0

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Limit for Conducted Emissions (FCC 47 CFR 15.207):

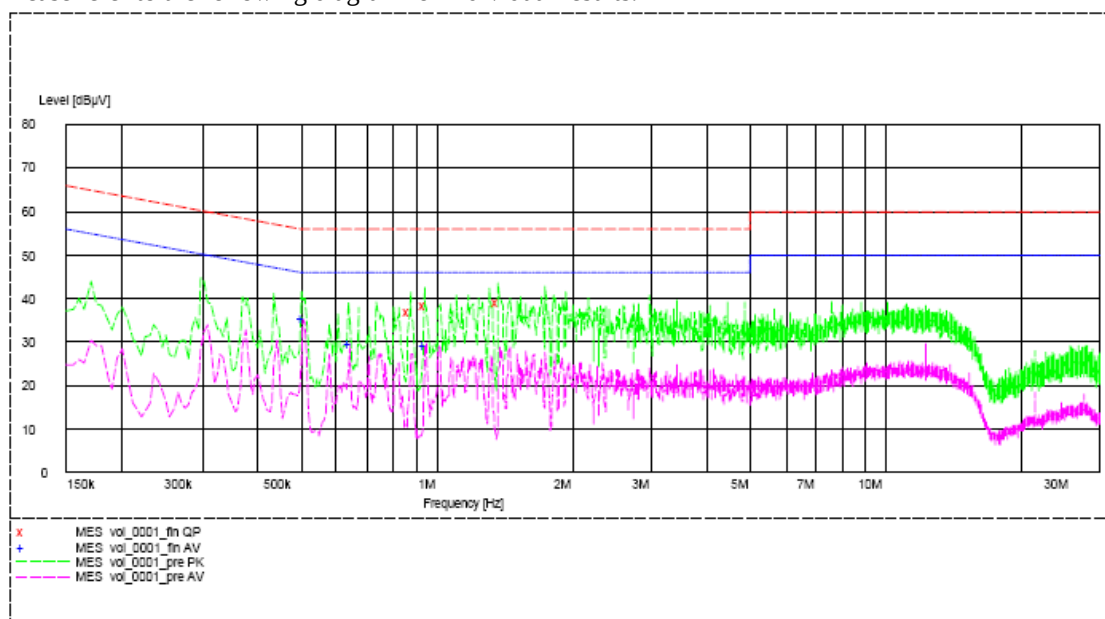
Frequency Range [MHz]	Quasi-Peak Limits [dBμV]	Average [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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 mode (N): PASS

Please refer to the following diagram for individual results.



Conductor Live or Neutral	Frequency MHz	Quasi-peak		Average	
		Level dBμV	Limit dBμV	Level dBμV	Limit dBμV
Neutral	0.875	37.1	56.0	-*-	-*-
Neutral	0.940	38.4	56.0	-*-	-*-
Neutral	1.375	39.0	56.0	-*-	-*-
Neutral	0.505	-*-	-*-	35.4	46.0
Neutral	0.640	-*-	-*-	29.7	46.0
Neutral	0.945	-*-	-*-	29.0	46.0

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: ANSI C63.10:2013
Test Date: 2016-03-28
Mode of Operation: 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 Tx Mode GFSK (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	-11.43	8dBm
2442.0	-10.93	8dBm
2480.0	-12.06	8dBm

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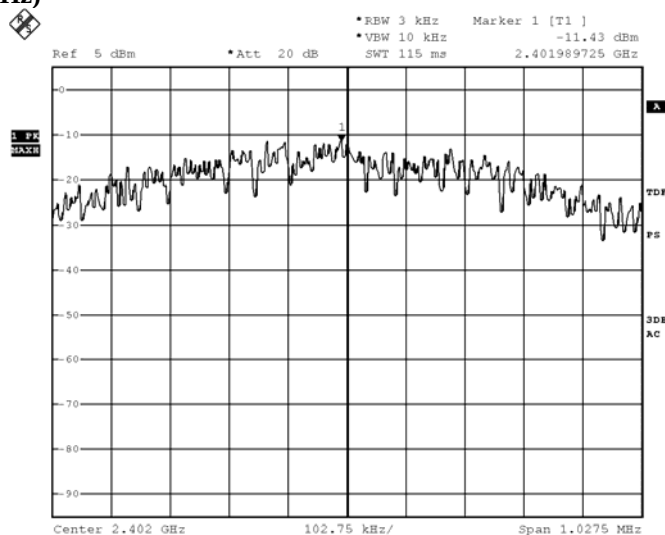
Date: 2016-04-05

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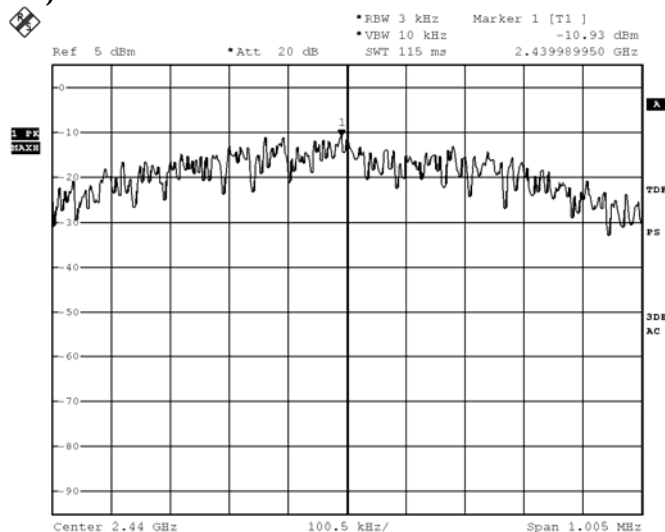
Tx mode GFSK (Tx: 2402MHz to 2480MHz)

CH 0 (2402.0 MHz)



BMP
Date: 28.MAR.2016 20:22:59

CH 19 (2442.0 MHz)



BMP
Date: 28.MAR.2016 20:23:35

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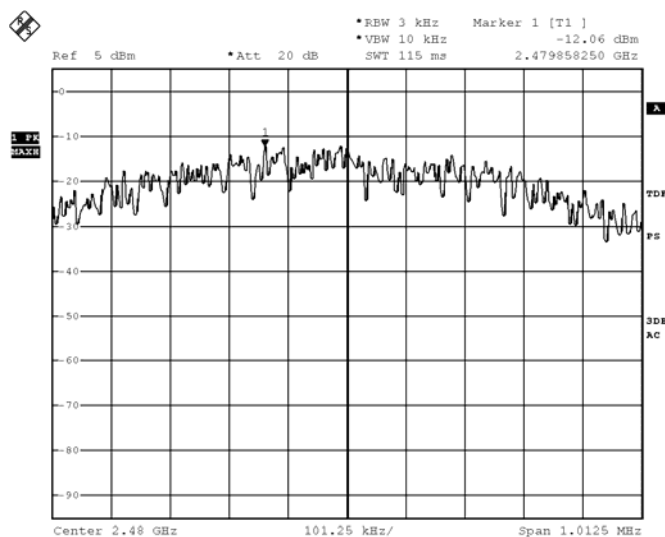
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CH 39 (2480.0 MHz)



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3.1.5 6dB Spectrum Bandwidth Measurement

Test Requirement:	FCC 47CFR 15.247(a)(2)
Test Method:	ANSI C63.10:2013
Test Date:	2016-03-28
Mode of Operation:	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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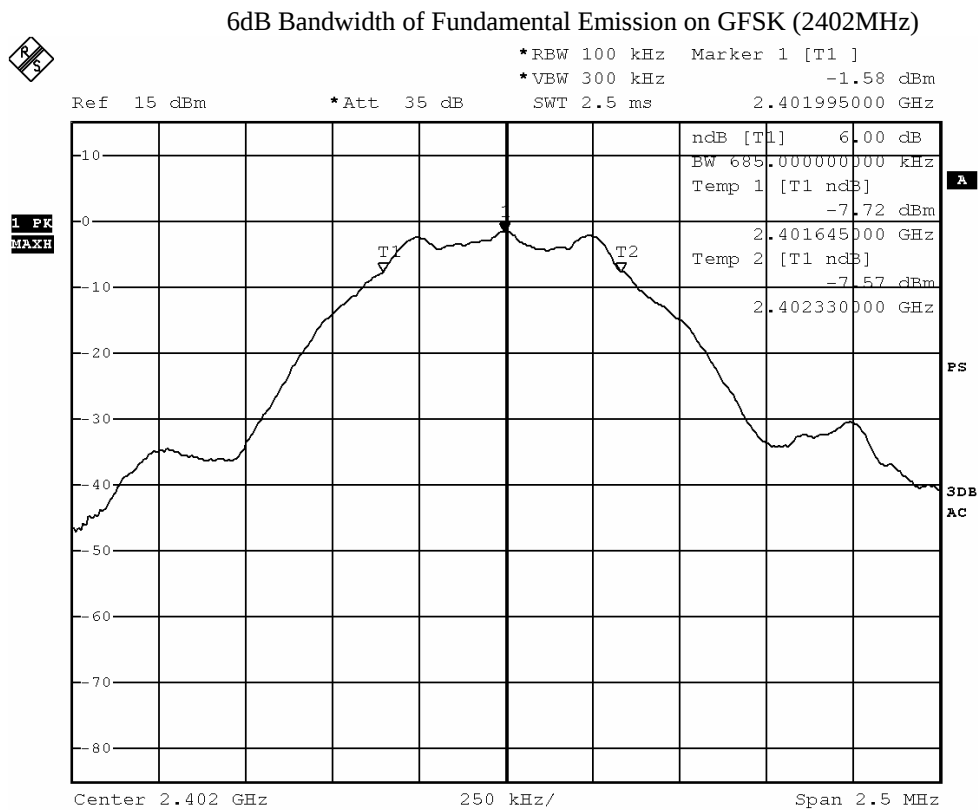
Date: 2016-04-05

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Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [KHz]	FCC Limits [kHz]
2402.0	685.0	> 500



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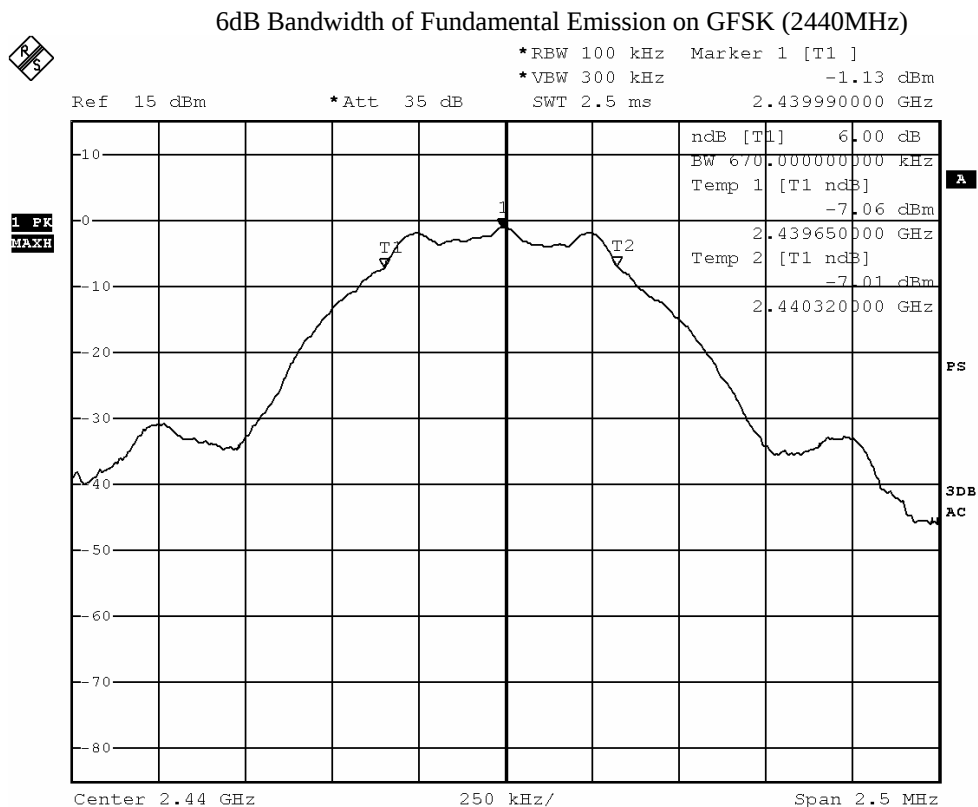
Date: 2016-04-05

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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [KHz]	FCC Limits [kHz]
2442.0	670.0	> 500



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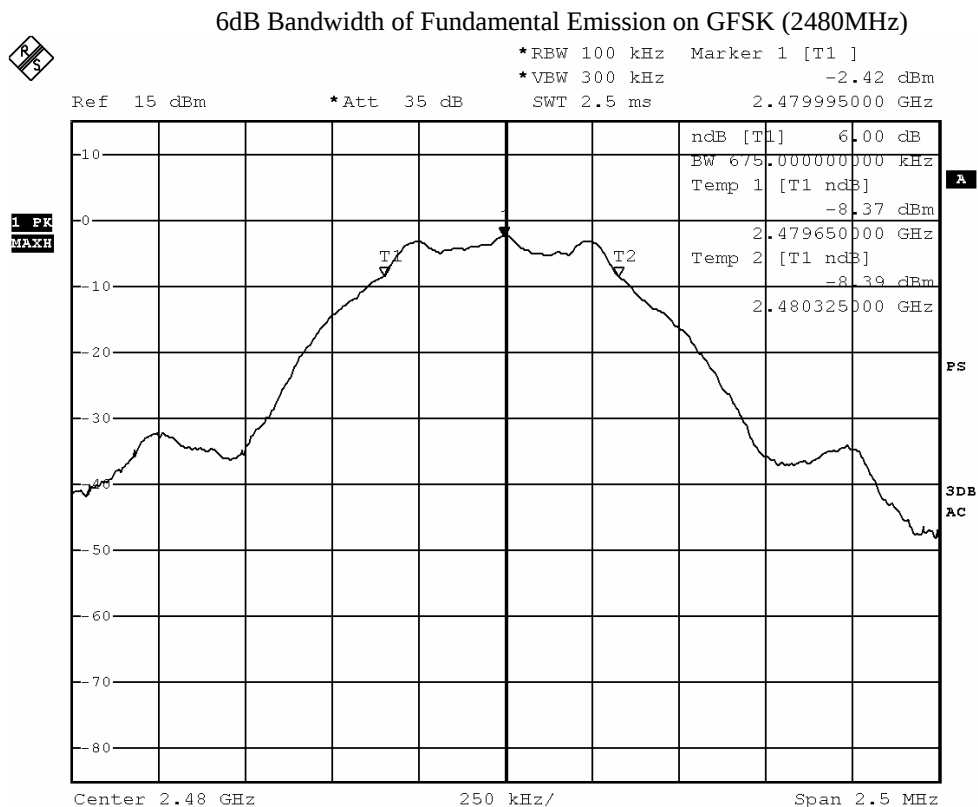
Date: 2016-04-05

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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [KHz]	FCC Limits [kHz]
2480.0	675.0	> 500



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3.1.6 Band Edges Measurement

Test Requirement:	FCC 47CFR 15.247
Test Method:	ANSI C63.10:2013
Test Date:	2016-03-28
Mode of Operation:	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 are set to 100kHz and VBW are set to 300kHz 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:

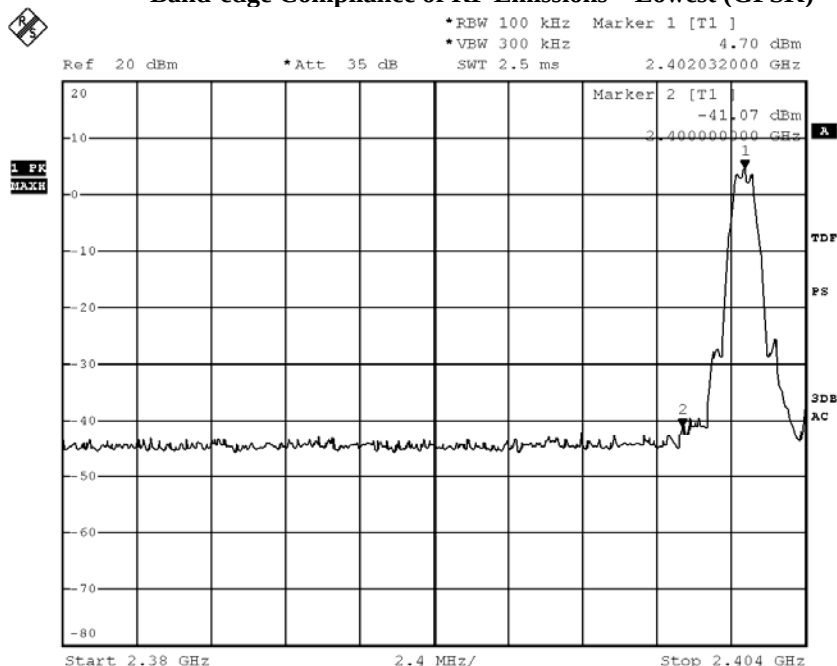
Limit :

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.

Remark: Emissions under the fixed frequency mode and hopping mode have been investigated, the worst-case measurement results were recorded in the test report

Frequency Range	Radiated Emission Attenuated below the Fundamental
[MHz]	[dB]
2400 – Lowest Fundamental (2402)	45.77

Band-edge Compliance of RF Emissions – Lowest (GFSK)



BMP

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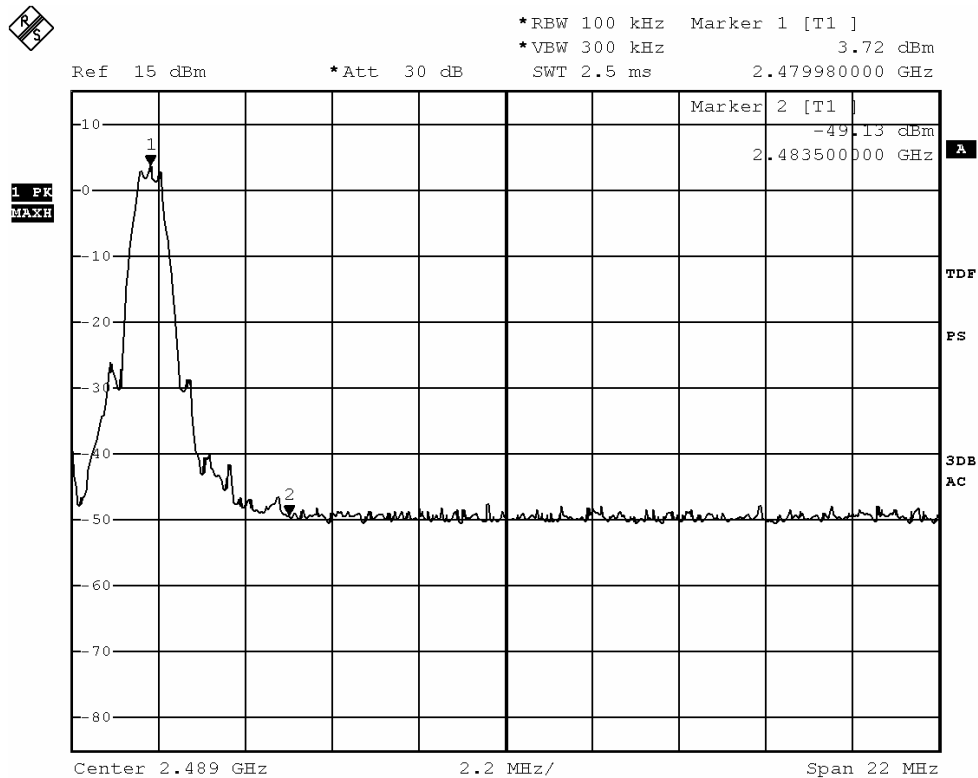
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Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	52.85

Band-edge Compliance of RF Emissions – Highest (GFSK)



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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)-GFSK

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2390.0	14.4	36.8	51.2	74.0	22.8	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2390.0	2.2	36.8	39.0	54.0	15.0	Vertical

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

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2483.5	28.5	36.8	65.3	74.0	8.7	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2483.5	4.8	36.8	41.6	54.0	12.4	Vertical

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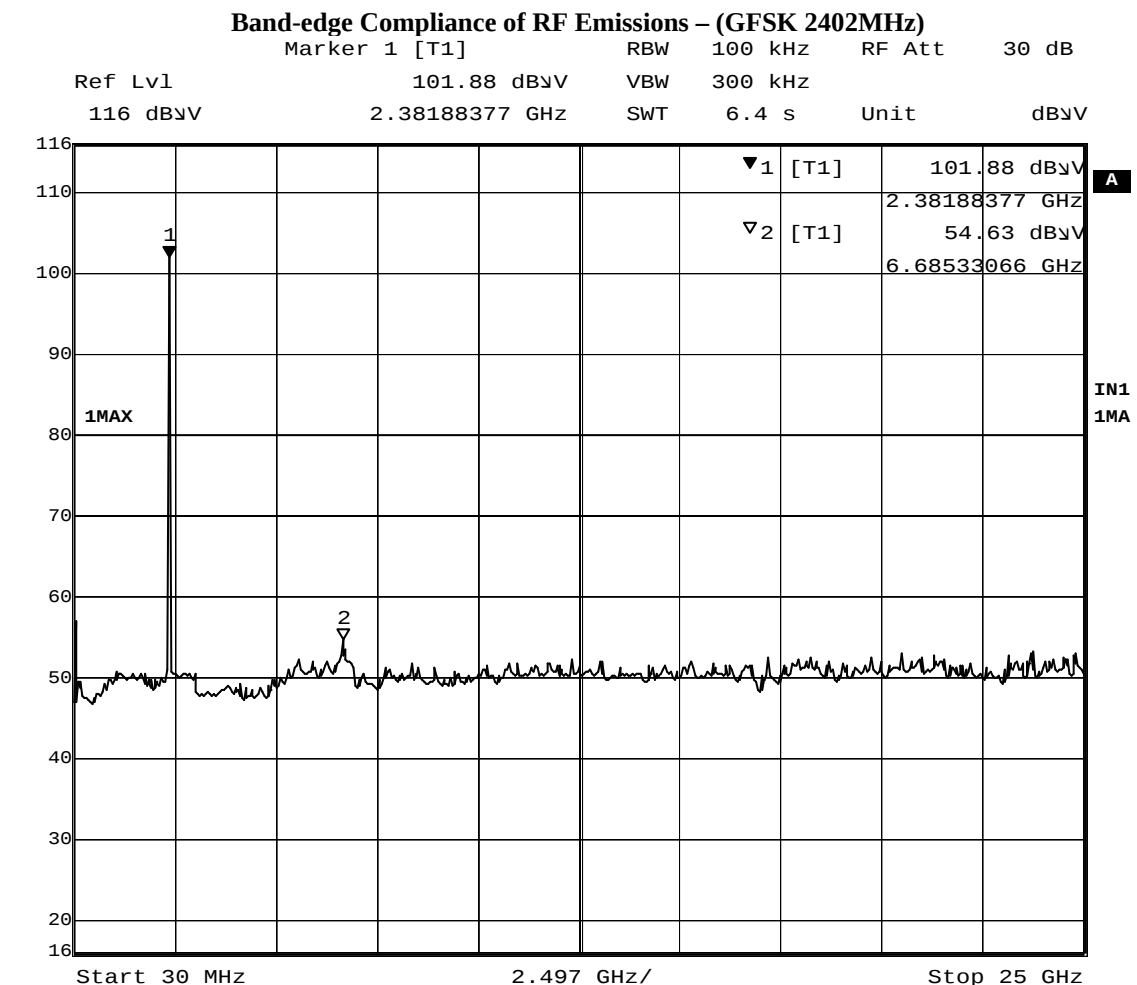
No.: MH192511

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.

Remark: Emissions under the fixed frequency mode and hopping mode have been investigated, the worst-case measurement results were recorded in the test report



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3.1.7 RF Exposure

Test Requirement: FCC 47CFR 15.247(i)
Test Date: 2016-04-04
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 = 2.249 mW

$$\begin{aligned} P_d &= PG / 4\pi R^2 = (2.812 \times 1.58) / 12.566 \times (20)^2 \\ &= (4.443) / 12.566 \times 400 = 4.443 / 5026.4 \\ &= 0.000884 \text{ mW/cm}^2 \end{aligned}$$

where:

- *Pd = power density in mW/cm²
- * G = Antenna numeric gain (1.58); Log G = g/10 (g = 2dBi).
- * P = Conducted RF power to antenna (2.812mW).
- * R = Minimum allowable distance.(20 cm)

- *The power density Pd = 0.000884mW/cm² is less than 1 mW/cm² (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
EMD062	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA	ETS-LINDGREN	3117	00075933	2014/11/15	2016/11/15
EMD131	PYRAMIDAL STANDARD GAIN HORN ANTENNA	A-INFOAW	JXTXLB-42-15-C-KF	J2021100721001	2015/06/27	2017/06/27
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	--	2015/09/25	2016/09/25
EM320	BICONILOG ANTENNA	ETS-LINDGREN	3142D	00094856	2014/08/06	2016/08/06
EMD124	LOOP ANTENNA	EMCO	6502	00104905	2014/04/28	2016/04/28
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2015/06/01	2016/06/01
EM529	MICROWAVE FREQUENCY CABLE	SUHNER	SUCOFLEX 104	238296	2014/07/24	2016/07/24

Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM119	LISN	R & S	ESH3-Z5	0831.5518.52	2015/10/22	2016/10/22
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	2016/01/12	2017/01/12
EM154	SHIELDING ROOM	SIEMENS MATSUSHITA COMPONENTS	N/A	803-740-057-99A	2012/02/03	2017/02/03

Remarks:-

CM Corrective Maintenance
N/A Not Applicable
TBD To Be Determined

The Hong Kong Standards and Testing Centre Ltd.

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Appendix B

Photographs of EUT

Front View of the product



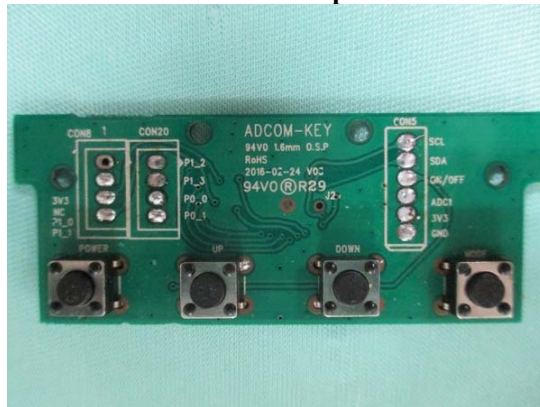
Rear View of the product



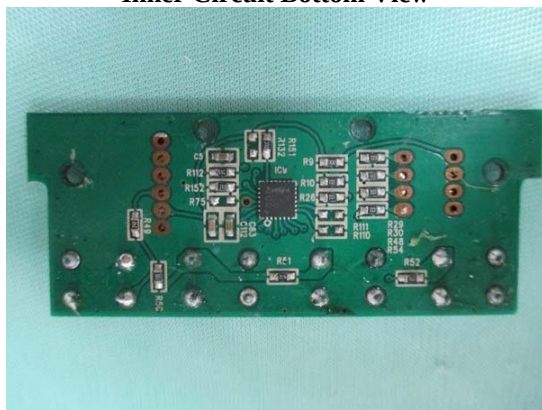
Inside View of the product



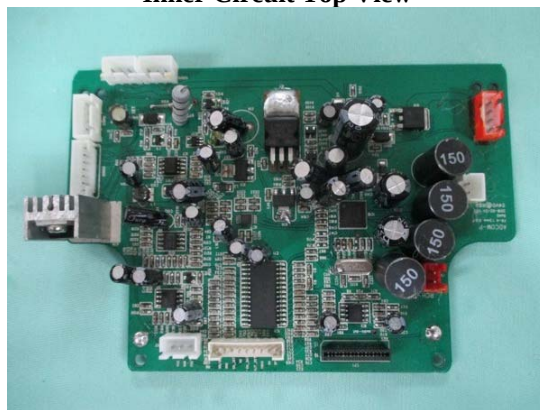
Inner Circuit Top View



Inner Circuit Bottom View



Inner Circuit Top View



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Photographs of EUT

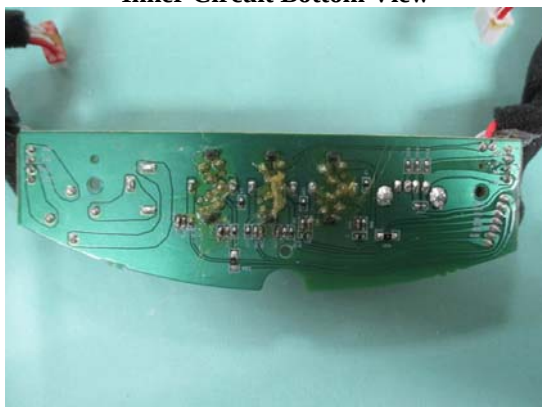
Inner Circuit Bottom View



Inner Circuit Top View



Inner Circuit Bottom View



Inner Circuit Top View



Inner Circuit Bottom View



Inner Circuit Top View



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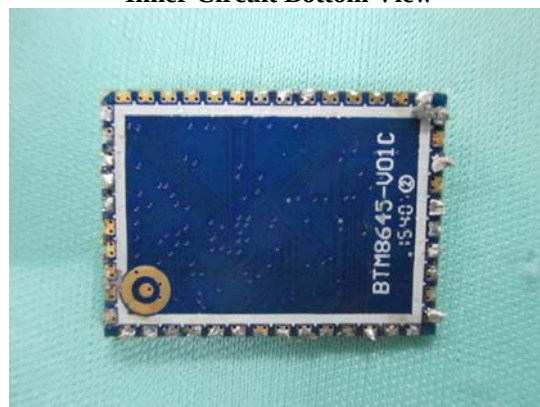
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Photographs of EUT

Inner Circuit Top View



Inner Circuit Bottom View



Inner Circuit Top View



Inner Circuit Bottom View



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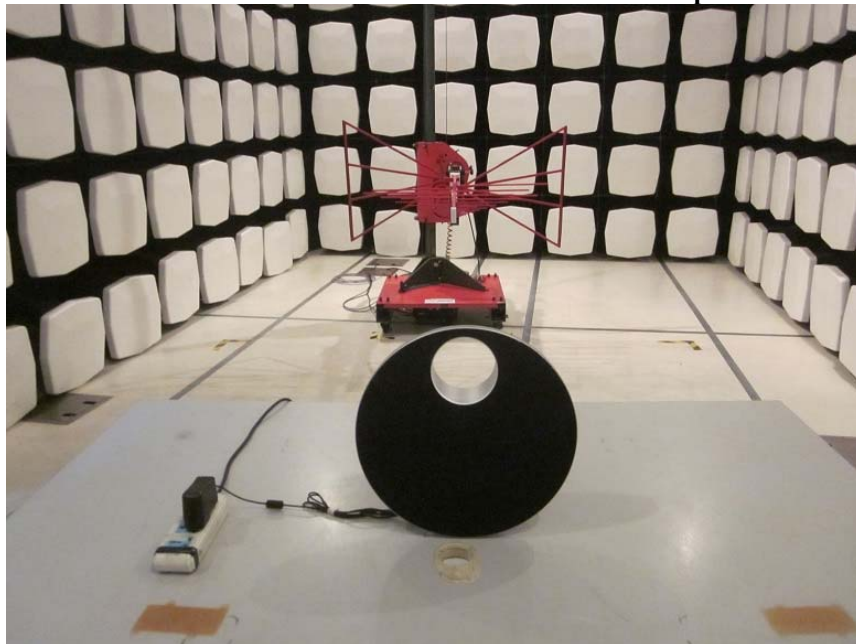
No.: MH192511

Photographs of EUT

Measurement of Radiated Emission Test Set Up



Measurement of Radiated Emission Test Set Up



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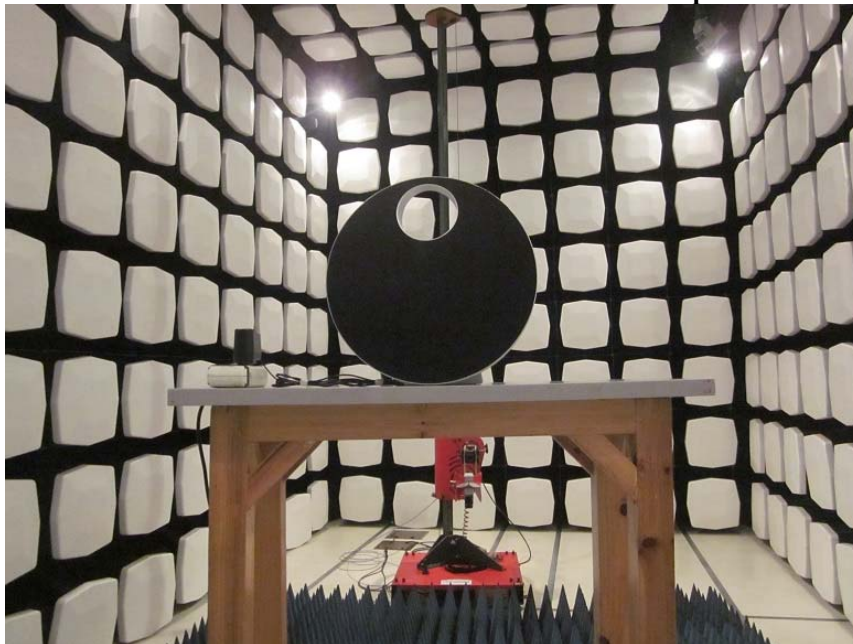
Date: 2016-04-05

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Photographs of EUT

Measurement of Radiated Emission Test Set Up



Measurement of Conducted Emission Test Set Up



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