



STC Test Report

Date : 2012-07-23

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No. : MH186654

Applicant (SHM004):

SHENZHEN MANIWAY ELECTRONICS LIMITED
BLDG.8, SANLIAN HEBEI INDUSTRIAL ESTATE,
LONGHUA STREET, BAO'AN DIST., SHENZHEN,
CHINA

Manufacturer:

SHENZHEN MANIWAY ELECTRONICS LIMITED
BLDG.8, SANLIAN HEBEI INDUSTRIAL ESTATE,
LONGHUA STREET, BAO'AN DIST., SHENZHEN,
CHINA

Description of Sample(s):

Product: 2.1CH BLUETOOTH SPEAKER
Brand Name: MANIWAY
Model Number: MW-1239
FCC ID: OG5MW1239

Date Sample(s) Received:

2012-04-26

Date Tested:

2012-04-28 to 2012-05-22

Investigation Requested:

Perform ElectroMagnetic Interference measurement in
accordance with FCC 47CFR [Codes of Federal Regulations]
Part 15: 2011 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):

For additional models details, see page 3.
For FM, Aux in function data refer to the test report with
application number MH187119.

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.

10 Dai Wang Street, Taipo Industrial Estate, N.T., Hong Kong

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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

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

Product:	2.1CH BLUETOOTH SPEAKER
Manufacturer:	SHENZHEN MANIWAY ELECTRONICS LIMITED BLDG.8, SANLIAN HEBEI INDUSTRIAL ESTATE, LONGHUA STREET, BAO'AN DIST., SHENZHEN, CHINA
Brand Name:	MANIWAY
Model Number:	MW-1239
Additional Brand Name(s):	ALPHALINE, TECHNICAL PRO
Additional Model Number(s):	10890, BLUET7
Input Voltage:	120Va.c. 60Hz

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is a SHENZHEN MANIWAY ELECTRONICS LIMITED, 2.1CH BLUETOOTH SPEAKER. modulation by IC; the type is GFSK and the USB port only for communication with USB flash drive and charging.

1.3 Date of Order

2012-04-26

1.4 Submitted Sample(s):

1 Sample

1.5 Test Duration

2012-04-28 to 2012-05-22

1.6 Country of Origin

China

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1.7 RF Module Details

Module Model Number: OVC3860
Module FCC ID:
Module Transmission Type: Bluetooth V2.0
Modulation: FHSS (GFSK only)
Data Rates: 1MBps: GFSK
Frequency Range: 2400-2483.5MHz
Carrier Frequencies: 2402MHz – 2480MHz

Module information (provided by manufacturer)

1.8 Antenna Details

Antenna Type: PCB Layout Inverted F
Antenna Length: N/A
Antenna Gain: 0dBi

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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: 2011 Regulations 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
Output Power of Fundamental Emissions	FCC 47CFR 15.247(b)(1)	ANSI C63.4:2009	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RF Spurious Emission	FCC 47CFR 15.247(c)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Spurious Emissions	FCC 47CFR 15.209	ANSI C63.4:2009	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AC Mains Conducted Emissions	FCC 47CFR 15.207	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Number of Operating Channel	FCC 47CFR 15.247(a)(2)(b)(1)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Band-edge compliance of Conducted Emission	FCC 47CFR 15.247(c)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pseudorandom Hopping Algorithm	FCC 47CFR 15.247(a)(1)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Time of Occupancy	FCC 47CFR 15.247(a)(1)(iii)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20dB Bandwidth	FCC 47CFR 15.247(a)(1)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hopping Channel Separation	FCC 47CFR 15.247(a)(1)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note: N/A – Not Applicable

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2.3 Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate in the table below is the worst case rate with respect to the specific test item.

Investigation has been done on all the possible configurations for searching the worst cases.

The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate
Max. Conducted Output Power	GFSK	1MBps
Hopping Channel Separation	GFSK	1MBps
Number of Hopping Frequency	GFSK	1MBps
Dwell Time	DH1	1MBps
Radiated Emissions Below 1GHz	GFSK	1MBps
Radiated Emission Above 1GHz	GFSK	1MBps
Band Edge Emissions	GFSK	1MBps

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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)(1)
Test Method:	N/A
Test Date:	2012-05-21
Mode of Operation:	Tx mode

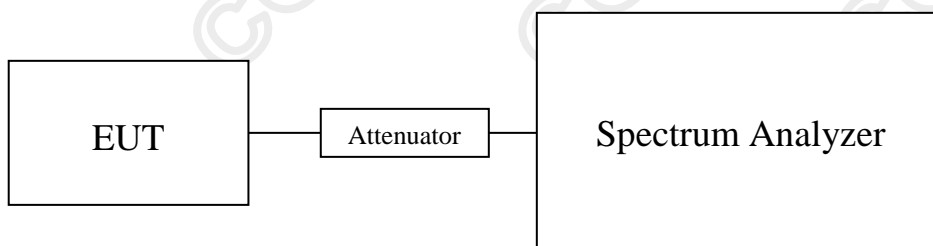
Test Method:

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 dBm.

Spectrum Analyzer Setting:

RBW = 3 MHz, VBW = 3MHz, Sweep = Auto, Span = 10MHz
Detector = Peak, Trace = Max. hold

Test Setup:



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

The maximum peak output power shall not exceed the following limits:
For frequency hopping systems employing at least 75 hopping channels: 1 Watt
For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 Watts
For Digital Transmission systems in 2400-2483.5 MHz Band: 1 Watt

Results of Tx mode (GFSK) (Fundamental Power): Pass
Maximum conducted output power

Transmitter Frequency (MHz)	Maximum conducted output power (dBm)
2402	-0.59

Transmitter Frequency (MHz)	Maximum conducted output power (dBm)
2442	-0.84

Transmitter Frequency (MHz)	Maximum conducted output power (dBm)
2480	-0.75

Limit: 0.125W (125mW)

Calculated measurement uncertainty : 30MHz to 1GHz 1.7dB
1GHz to 18GHz 1.7dB

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3.1.2 Radiated Spurious Emissions

Test Requirement: FCC 47CFR 15.209
Test Method: ANSI C63.4:2009
Test Date: 2012-05-22
Mode of Operation: Tx mode / Bluetooth communication mode / USB mode (Connected to USB flash drive)

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, 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.

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Spectrum Analyzer Setting:

9KHz – 30MHz (Pk & Av)

RBW: 10kHz
VBW: 30kHz
Sweep: Auto
Span: Fully capture the emissions being measured
Trace: Max. hold

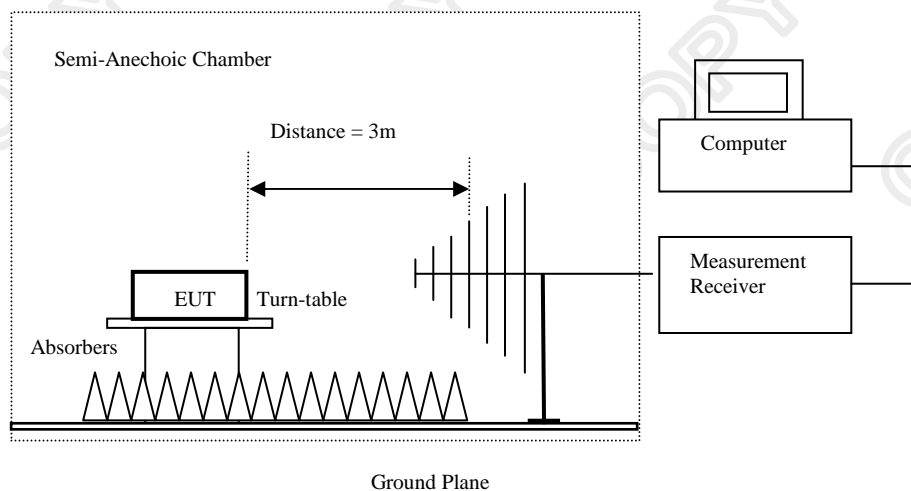
30MHz – 1GHz (QP)

RBW: 120kHz
VBW: 120kHz
Sweep: Auto
Span: Fully capture the emissions being measured
Trace: Max. hold

Above 1GHz (Pk & Av)

RBW: 3MHz
VBW: 3MHz
Sweep: Auto
Span: Fully capture the emissions being measured
Trace: Max. hold

Test Setup:



Absorbers placed on top of the ground plane are for measurements above 1000MHz only.

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

Frequency Range	Quasi-Peak Limits
[MHz]	[$\mu\text{V/m}$]
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
Above 960	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) (9kHz – 30MHz): PASS

Field Strength of Spurious Emissions						
Average Value						
Frequency	Measured Level	Correction Factor	Field Strength	Field Strength	Limit	E-Field Polarity
MHz	dB μV	dB/m	dB $\mu\text{V/m}$	$\mu\text{V/m}$	$\mu\text{V/m}$	
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx Mode (2402.0 MHz) (30MHz – 1000MHz): PASS

Field Strength of Spurious Emissions						
Average Value						
Frequency	Measured Level	Correction Factor	Field Strength	Field Strength	Limit	E-Field Polarity
MHz	dB μV	dB/m	dB $\mu\text{V/m}$	$\mu\text{V/m}$	$\mu\text{V/m}$	
Emissions detected are more than 20 dB below the FCC Limits						

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

Field Strength of Harmonic 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
3202.9	13.7	38.7	52.4	74.0	-21.6	Vertical
4804.0	8.1	41.5	49.6	74.0	-24.4	Horizontal
6405.8	6.9	45.9	52.8	74.0	-21.2	Vertical
Field Strength of Harmonic 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
3202.9	10.6	38.7	49.3	54.0	-4.7	Vertical
4804.0	5.3	41.5	46.8	54.0	-7.2	Horizontal
6405.8	3.6	45.9	49.5	54.0	-4.5	Vertical

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Result of Tx Mode (2441.0 MHz) (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 μ V/m	Limit μ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx Mode (2441.0 MHz) (30MHz – 1000MHz): 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 μ V/m	Limit μ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx Mode (2441.0 MHz) (Above 1GHz): Pass

Field Strength of Harmonic 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
3254.8	12.9	38.9	51.8	74.0	-22.2	Vertical
4882.0	7.8	41.4	49.2	74.0	-24.8	Horizontal
6509.5	6.2	46.4	52.6	74.0	-21.4	Vertical
Field Strength of Harmonic 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
3254.8	9.4	38.9	48.3	54.0	-5.7	Vertical
4882.0	3.4	41.4	44.8	54.0	-9.2	Horizontal
6509.5	2.3	46.4	48.7	54.0	-5.3	Vertical

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Result of Tx Mode (2480.0 MHz) (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 μ V/m	Limit μ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx Mode (2480.0 MHz) (30MHz – 1000MHz): 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 μ V/m	Limit μ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

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

Field Strength of Harmonic 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
3306.7	23.5	39.0	62.5	74.0	-11.5	Vertical
4960.0	5.3	41.4	46.7	74.0	-27.3	Horizontal
6613.4	7.7	46.9	54.6	74.0	-19.4	Vertical
Field Strength of Harmonic 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
3306.7	10.6	39	49.6	54.0	-4.4	Vertical
4960.0	-3.0	41.4	38.4	54.0	-15.6	Horizontal
6613.4	3.2	46.9	50.1	54.0	-3.9	Vertical

Remarks:

* 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 : 30MHz to 1GHz 5.1dB
1GHz to 18GHz 5.1dB

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

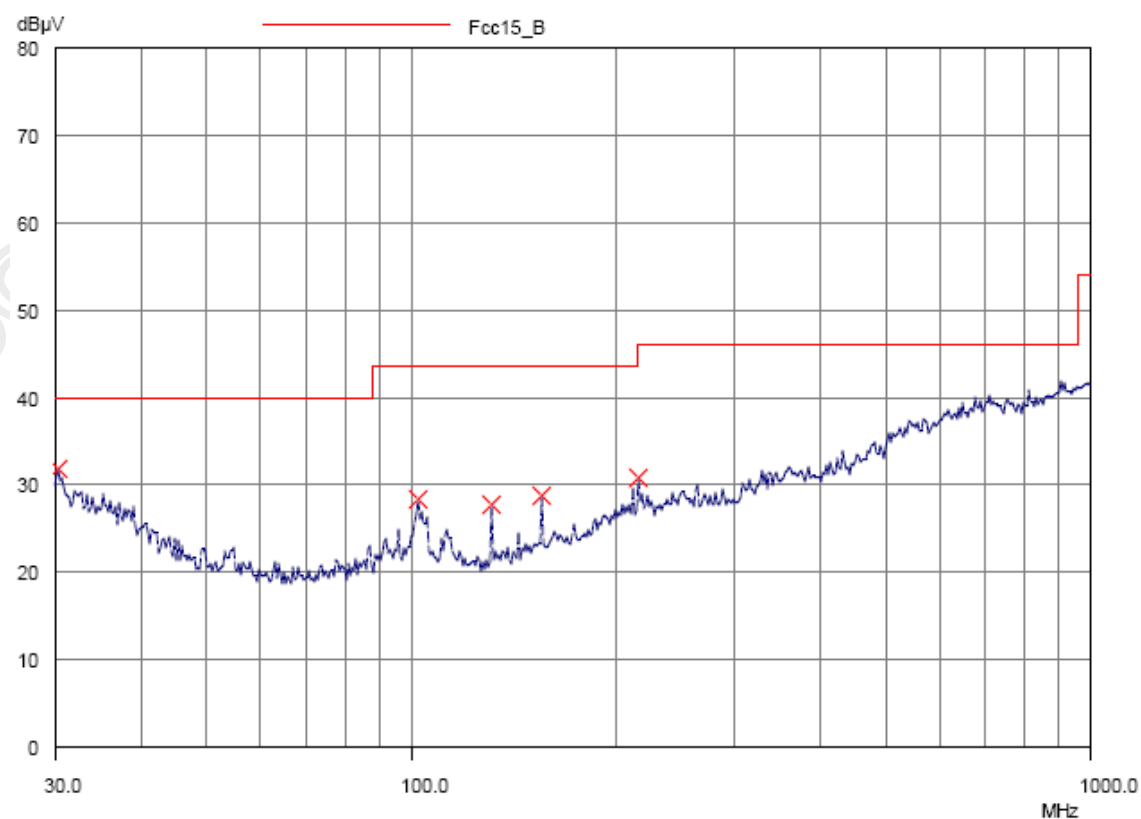
Frequency Range [MHz]	Quasi-Peak Limits [$\mu\text{V/m}$]
30-88	100
88-216	150
216-960	200
Above 960	500

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.

Results of Bluetooth communication mode: PASS

Please refer to the following table for result details

Horizontal



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Results of Bluetooth communication mode: 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
30.3	Horizontal	31.8	40.0	38.9	100
102.7	Horizontal	28.5	43.5	26.6	150
132.0	Horizontal	27.8	43.5	24.5	150
156.0	Horizontal	28.8	43.5	27.5	150
216.0	Horizontal	30.9	46.0	35.1	200

Remarks:

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 5.2dB
1GHz to 18GHz 5.1dB

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

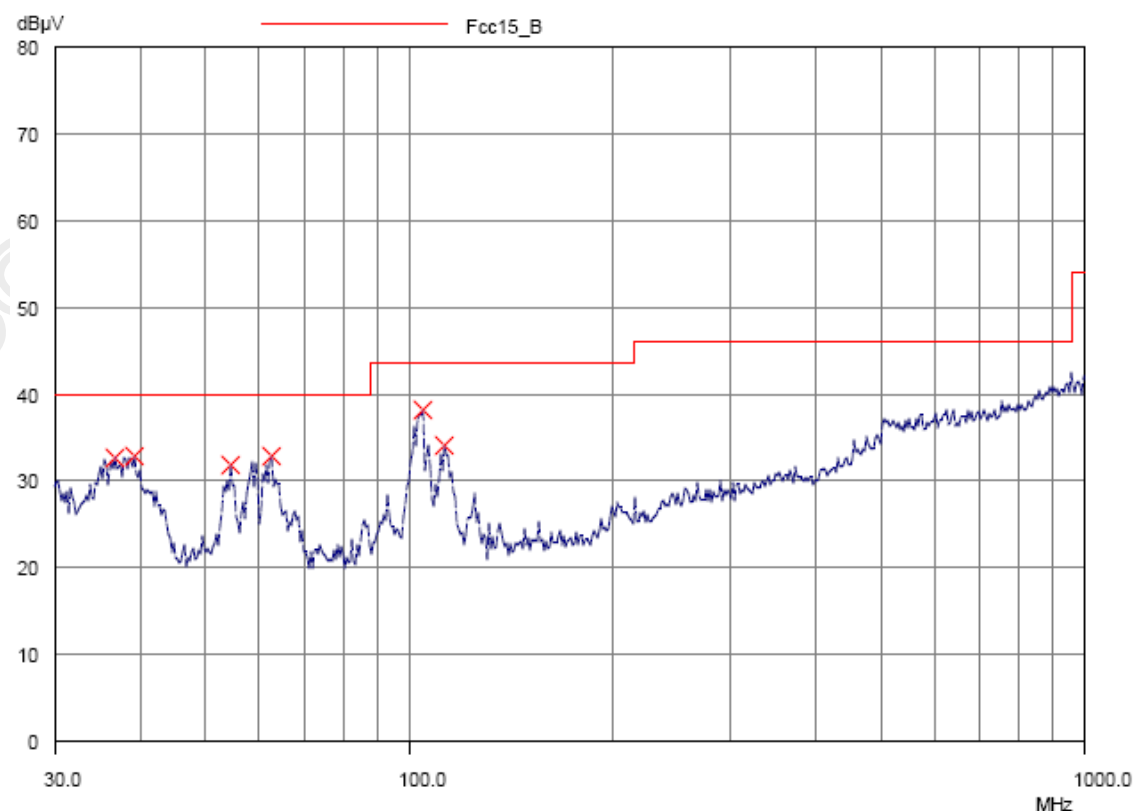
Frequency Range [MHz]	Quasi-Peak Limits [$\mu\text{V/m}$]
30-88	100
88-216	150
216-960	200
Above 960	500

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.

Results of Bluetooth communication mode: PASS

Please refer to the following table for result details

Vertical



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Results of Bluetooth communication mode: 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
36.8	Vertical	32.8	40.0	43.7	100
39.3	Vertical	33.0	40.0	44.7	100
54.6	Vertical	31.8	40.0	38.9	100
62.8	Vertical	33.0	40.0	44.7	100
105.2	Vertical	38.2	43.5	81.3	150
113.0	Vertical	34.2	43.5	51.3	150

Remarks:

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 5.2dB
1GHz to 18GHz 5.1dB

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

Frequency Range [MHz]	Quasi-Peak Limits [μV/m]
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.

Results of Bluetooth communication mode (1 GHz to18 GHz): PASS

Emissions detected are more than 20 dB below the limit line(s)

Remarks:

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 5.2dB
1GHz to 18GHz 5.1dB

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

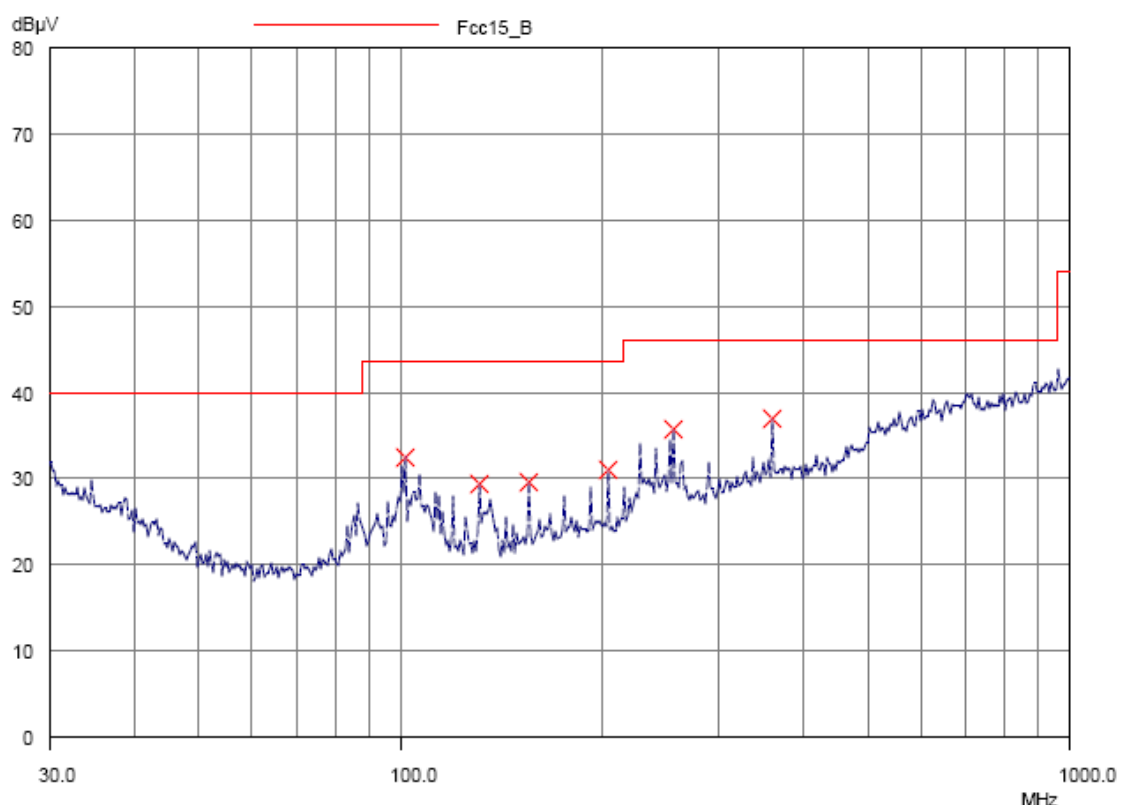
Frequency Range [MHz]	Quasi-Peak Limits [$\mu\text{V/m}$]
30-88	100
88-216	150
216-960	200
Above 960	500

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.

Results of USB mode (Connected to USB flash drive): PASS

Please refer to the following table for result details

Horizontal



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Results of USB mode (Connected to USB flash drive): 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
102.3	Horizontal	32.6	43.5	42.7	150
132.0	Horizontal	29.4	43.5	29.5	150
156.0	Horizontal	29.6	43.5	30.2	150
204.0	Horizontal	31.0	43.5	35.5	150
255.6	Horizontal	35.9	46.0	62.4	200
360.0	Horizontal	37.0	46.0	70.8	200

Remarks:

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 5.2dB
1GHz to 18GHz 5.1dB

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

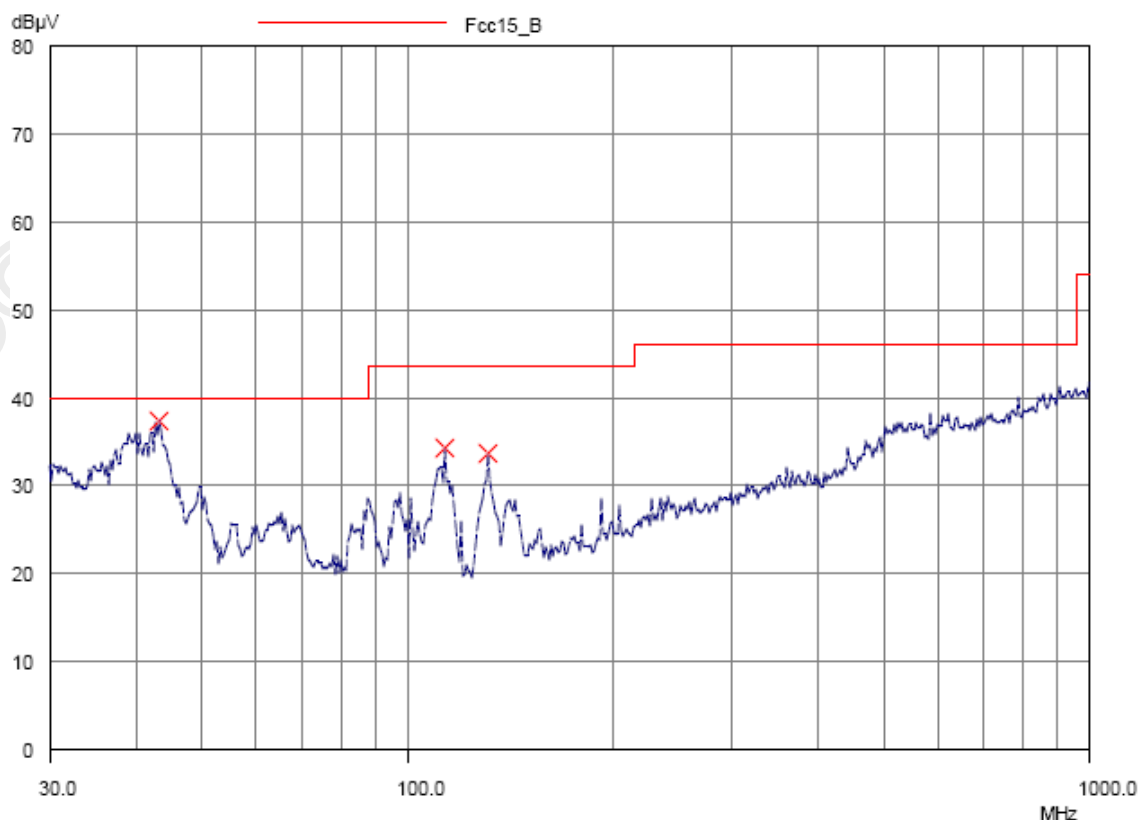
Frequency Range [MHz]	Quasi-Peak Limits [$\mu\text{V/m}$]
30-88	100
88-216	150
216-960	200
Above 960	500

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.

Results of USB mode (Connected to USB flash drive): PASS

Please refer to the following table for result details

Vertical



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Results of USB mode (Connected to USB flash drive): 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
43.4	Vertical	37.5	40.0	75.0	100
113.9	Vertical	34.4	43.5	52.5	150
132.1	Vertical	33.7	43.5	48.4	150

Remarks:

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty	:	30MHz to 1GHz	5.2dB
		1GHz to 18GHz	5.1dB

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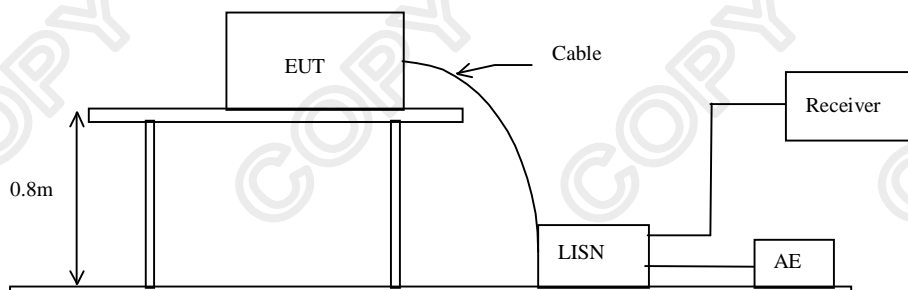
3.1.3 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement:	FCC 47CFR 15.207
Test Method:	ANSI C63.4:2009
Test Date:	2012-04-28
Mode of Operation:	Tx mode / Bluetooth communication mode / USB mode (Connected to USB flash drive)
Test Voltage:	117V _{a.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):

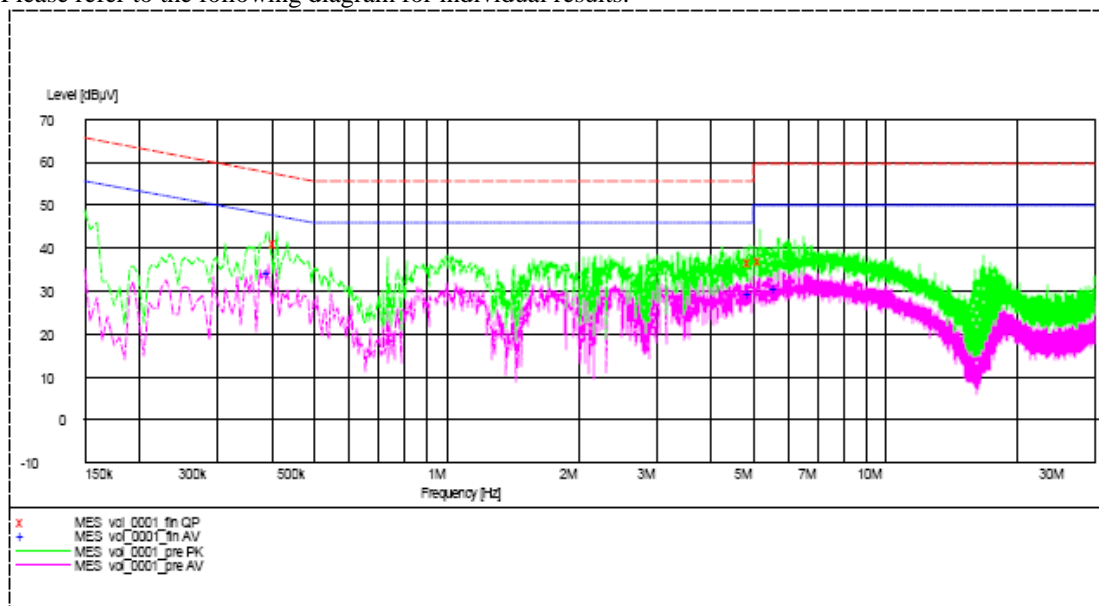
Frequency Range [MHz]	Quasi-Peak Limits [dBμV]	Average [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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.

Results of Tx mode (L): Pass

Please refer to the following diagram for individual results.



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Results of Tx mode (L): Pass

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	0.395	-*-	-*-	34.4	48.0
Live	0.410	41.1	58.0	-*-	-*-
Live	4.920	37.0	56.0	29.5	46.0
Live	5.175	37.1	60.0	-*-	-*-
Live	5.665	-*-	-*-	30.8	50.0

Remarks:

Calculated measurement uncertainty : 3.97dB

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

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Limit for Conducted Emissions (FCC 47 CFR 15.207):

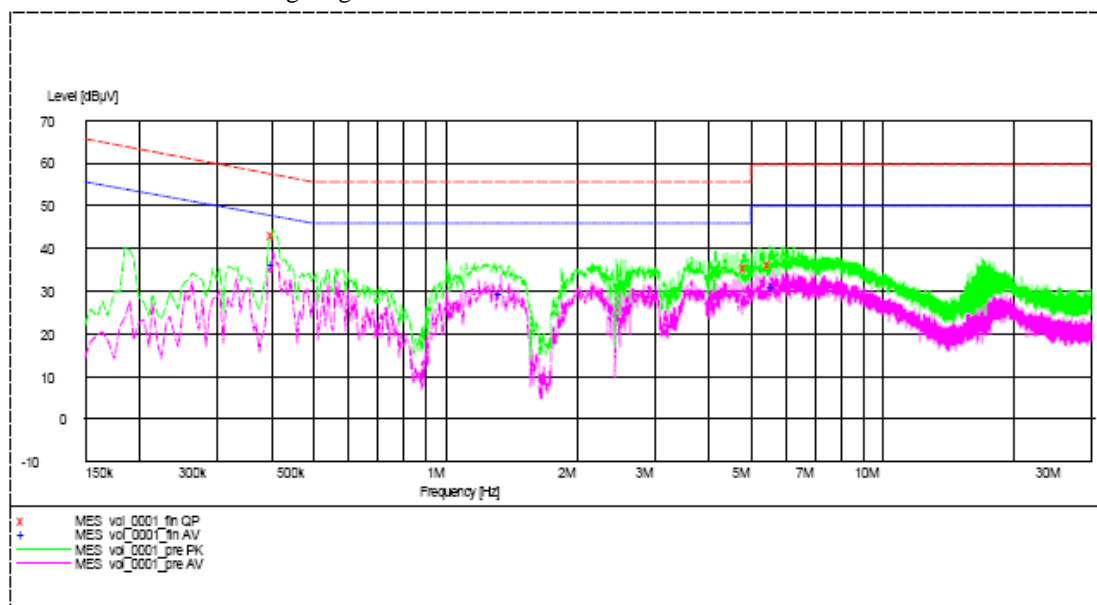
Frequency Range [MHz]	Quasi-Peak Limits [dBμV]	Average [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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.

Results of Tx mode (N): Pass

Please refer to the following diagram for individual results.



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Results of Tx mode (N): Pass

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
Neutral	0.405	43.0	58.0	35.5	48.0
Neutral	1.340	-*-	-*-	29.4	46.0
Neutral	4.885	35.7	56.0	-*-	-*-
Neutral	5.545	36.5	60.0	-*-	-*-
Neutral	5.640	-*-	-*-	31.3	50.0

Remarks:

Calculated measurement uncertainty : 3.97dB

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

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Limit for Conducted Emissions (FCC 47 CFR 15.207):

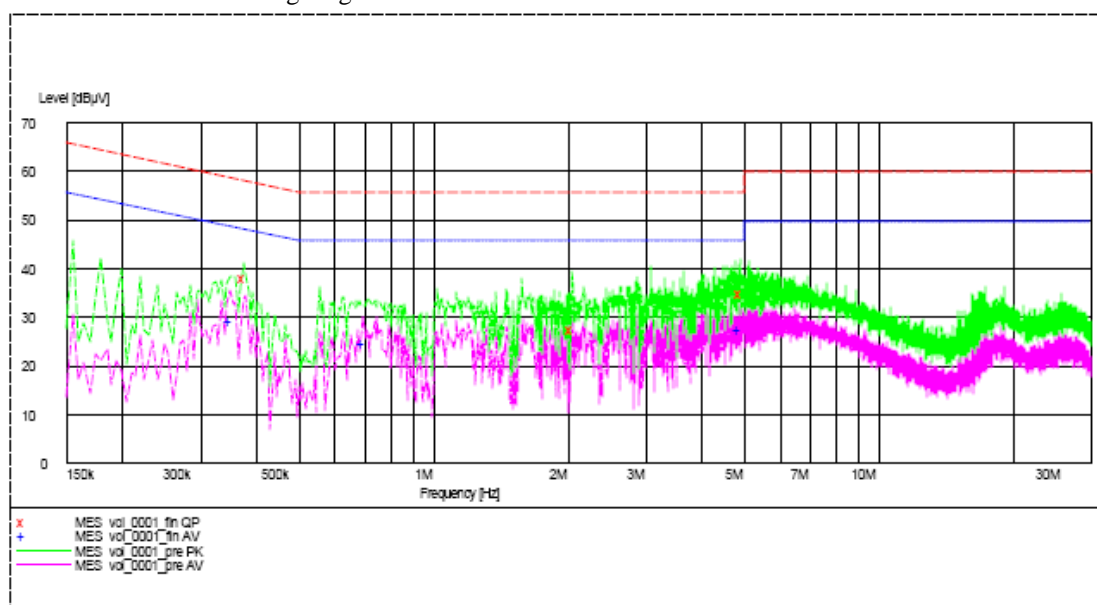
Frequency Range [MHz]	Quasi-Peak Limits [dBμV]	Average [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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.

Results of Bluetooth communication mode (L): Pass

Please refer to the following diagram for individual results.



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Results of Bluetooth communication mode (L): Pass

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	0.350	-*-	-*-	29.3	49.0
Live	0.375	38.2	58.0	-*-	-*-
Live	0.695	-*-	-*-	24.8	46.0
Live	2.055	27.4	56.0	-*-	-*-
Live	4.885	-*-	-*-	27.6	46.0
Live	4.920	34.9	56.0	-*-	-*-

Remarks:

Calculated measurement uncertainty : 3.97dB

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

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Limit for Conducted Emissions (FCC 47 CFR 15.207):

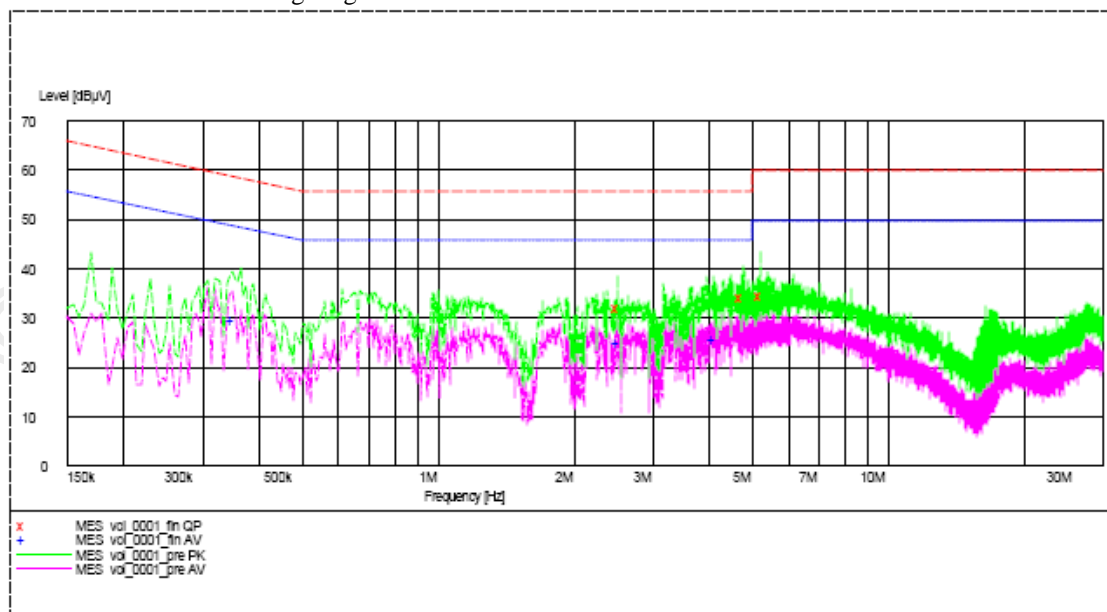
Frequency Range [MHz]	Quasi-Peak Limits [dBμV]	Average [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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.

Results of Bluetooth communication mode (N): Pass

Please refer to the following diagram for individual results.



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Results of Bluetooth communication mode (N): Pass

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
Neutral	0.350	-*-	-*-	29.8	49.0
Neutral	2.510	32.0	56.0	25.1	46.0
Neutral	4.120	-*-	-*-	25.9	46.0
Neutral	4.760	34.3	56.0	-*-	-*-
Neutral	5.240	34.5	60.0	-*-	-*-

Remarks:

Calculated measurement uncertainty : 3.97dB

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

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Limit for Conducted Emissions (FCC 47 CFR 15.207):

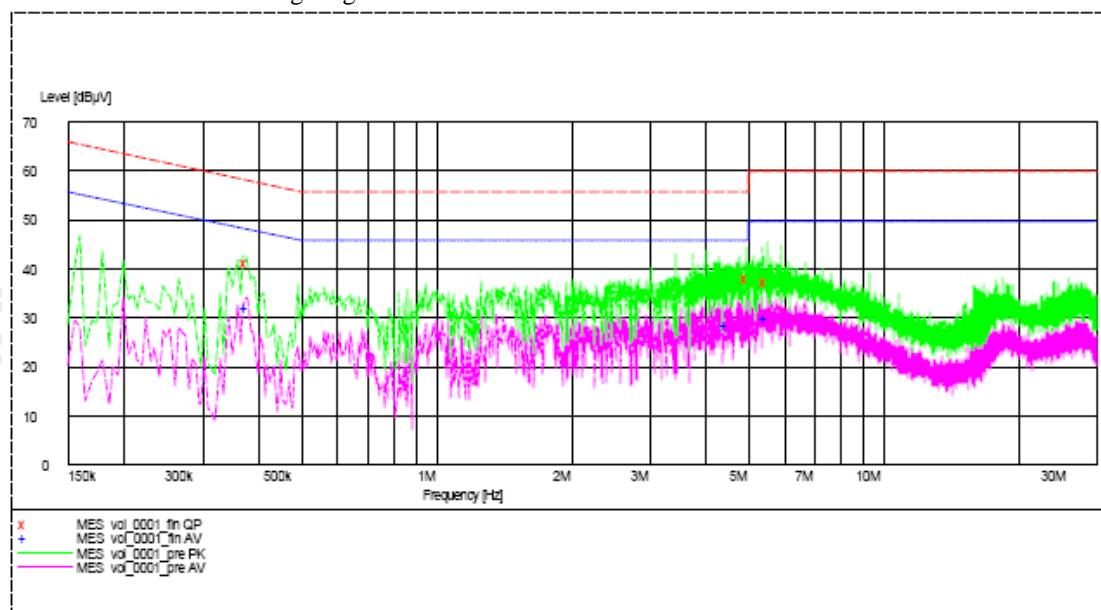
Frequency Range [MHz]	Quasi-Peak Limits [dBμV]	Average [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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.

Results of USB mode (Connected to USB flash drive) (L): Pass

Please refer to the following diagram for individual results.



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Results of USB mode (Connected to USB flash drive) (L): Pass

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	0.375	41.4	58.0	32.0	48.0
Live	4.455	-*-	-*-	28.7	46.0
Live	4.950	38.3	56.0	-*-	-*-
Live	5.480	37.5	60.0	29.9	50.0

Remarks:

Calculated measurement uncertainty : 3.97dB

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

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Limit for Conducted Emissions (FCC 47 CFR 15.207):

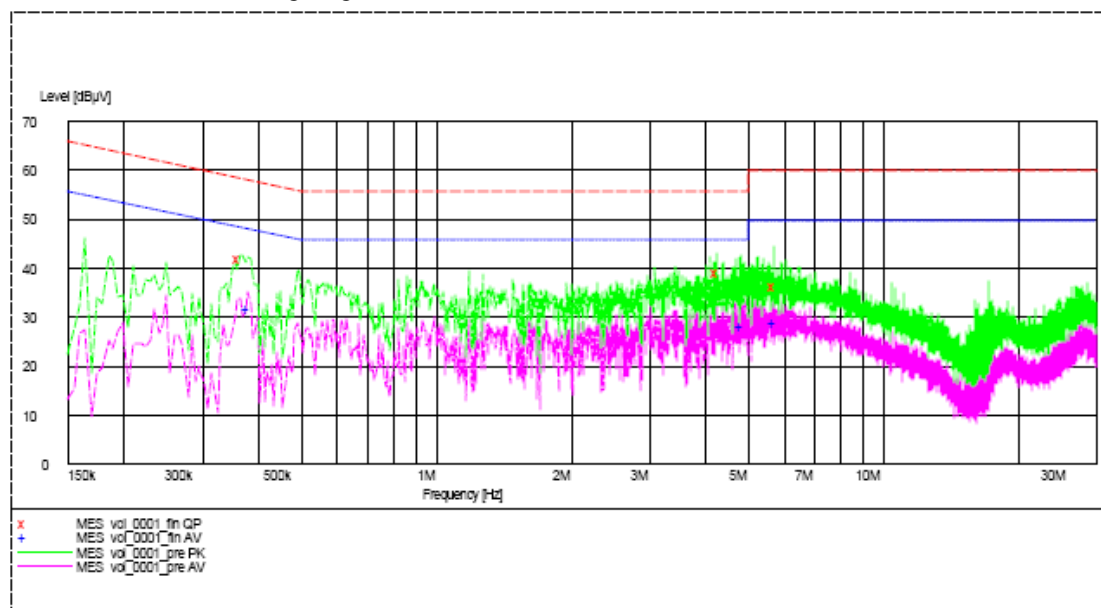
Frequency Range [MHz]	Quasi-Peak Limits [dBμV]	Average [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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.

Results of USB mode (Connected to USB flash drive) (N): Pass

Please refer to the following diagram for individual results.



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Results of USB mode (Connected to USB flash drive) (N): Pass

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
Neutral	0.365	41.9	59.0	-*-	-*-
Neutral	0.380	-*-	-*-	31.9	48.0
Neutral	4.265	39.1	56.0	-*-	-*-
Neutral	4.815	-*-	-*-	28.2	46.0
Neutral	5.710	36.4	60.0	28.8	50.0

Remarks:

Calculated measurement uncertainty : 3.97dB

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

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3.1.4 20dB Bandwidth Measurement

Test Requirement: FCC 47CFR 15.247(a)(1)
Test Method: ANSI C63.4:2009
Test Date: 2012-05-12
Mode of Operation: Tx mode

Remark:

The result has been done on all the possible configurations for searching the worst cases.

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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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	0.950	Within 2400-2483.5

20dB Bandwidth of Fundamental Emission on 2402MHz (GFSK)



*RBW 100 kHz Marker 1 [T1]

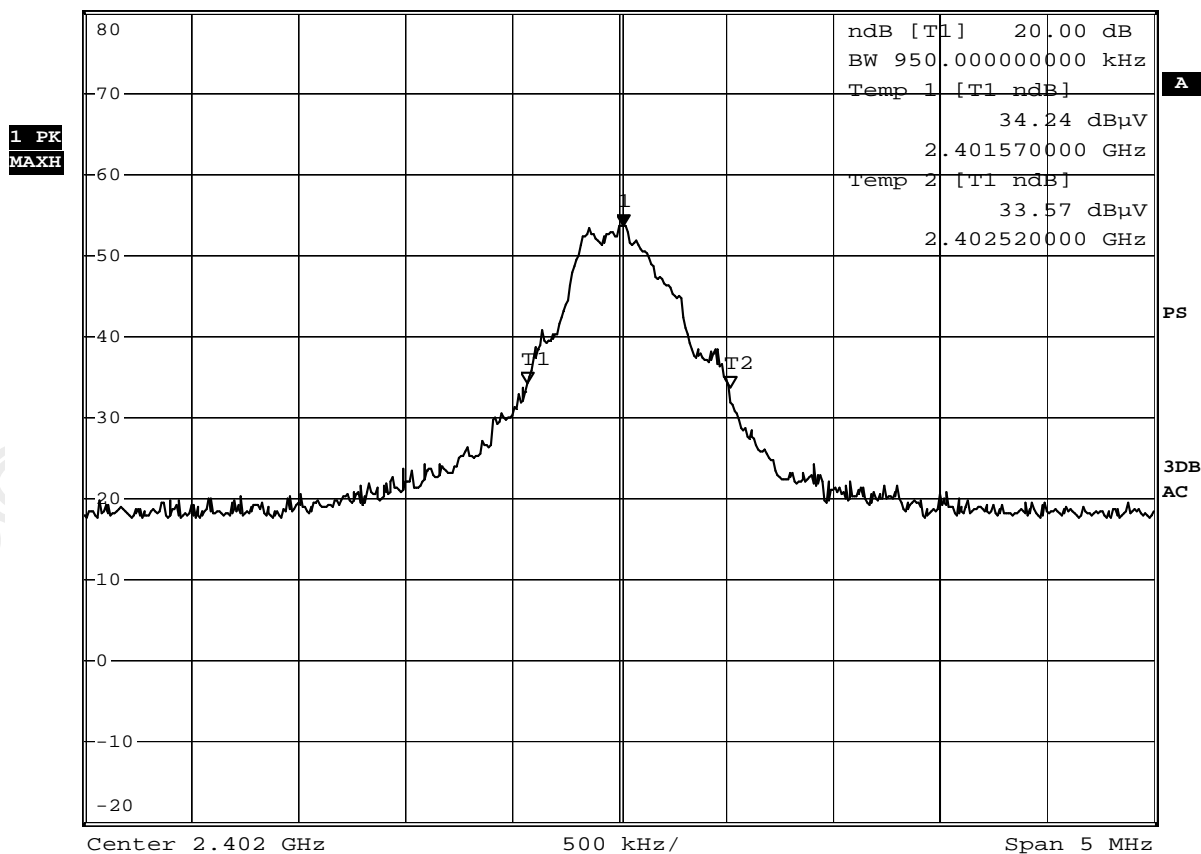
*VBW 300 kHz 53.74 dBμV

Ref 80 dBμV

*Att 10 dB

SWT 2.5 ms

2.402020000 GHz



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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	0.980	Within 2400-2483.5

20dB Bandwidth of Fundamental Emission on 2441MHz (GFSK)



*RBW 100 kHz Marker 1 [T1]

*VBW 300 kHz 57.03 dBμV

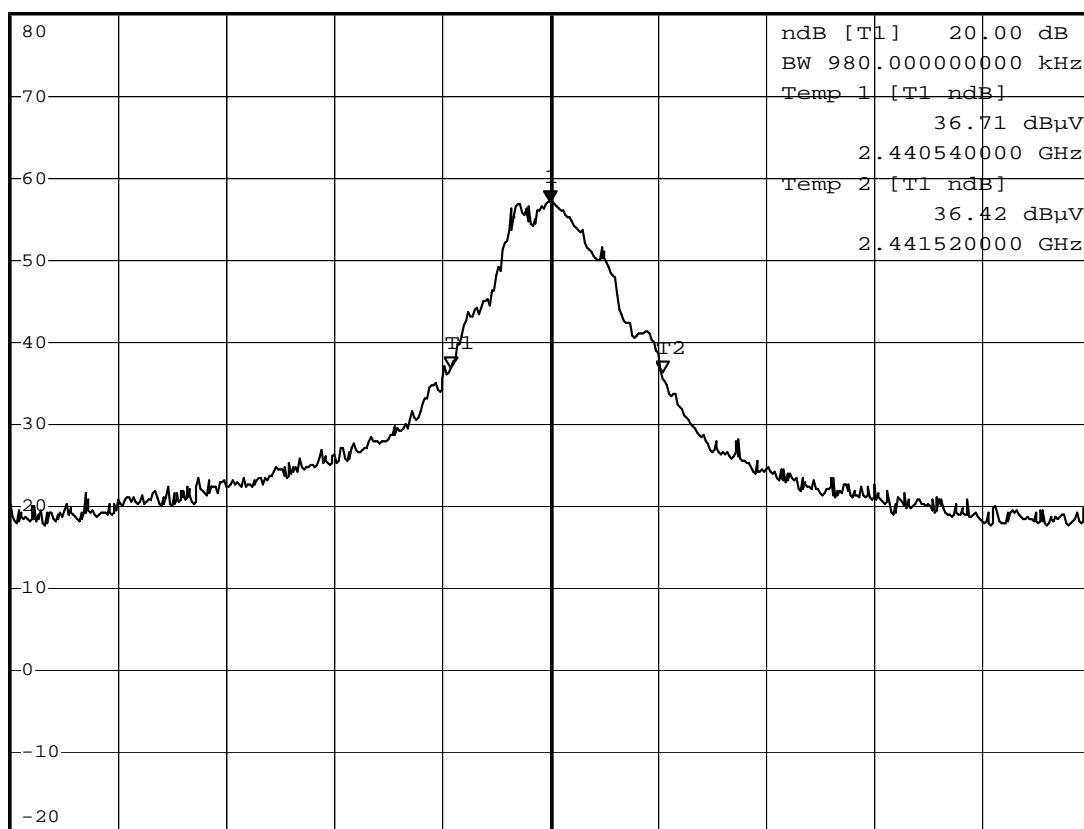
Ref 80 dBμV

*Att 10 dB

SWT 2.5 ms

2.441000000 GHz

1 PK
MAXH



Center 2.441 GHz

500 kHz/

Span 5 MHz

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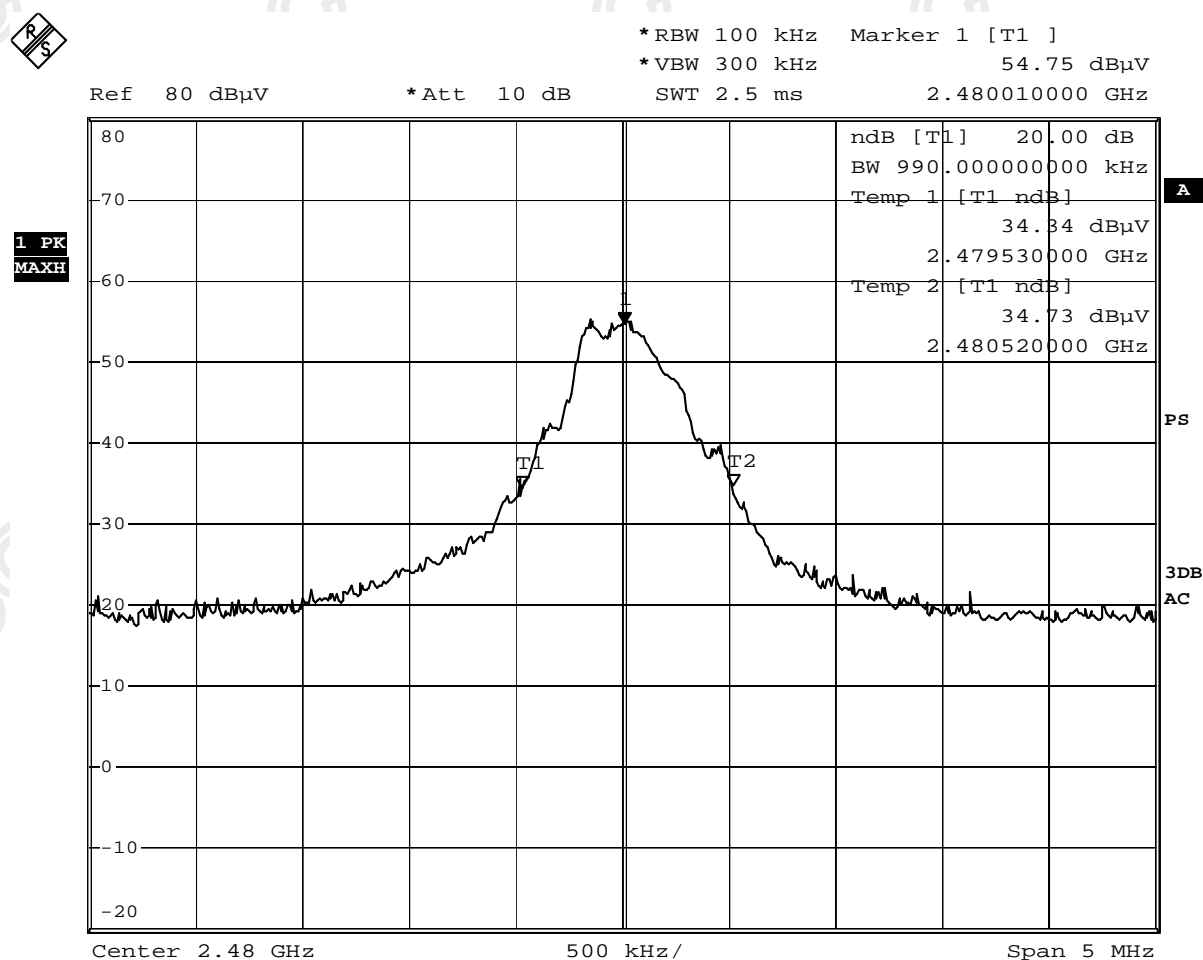
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480.0	0.990	Within 2400-2483.5

20dB Bandwidth of Fundamental Emission on 2480MHz (GFSK)



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Channel Centre Frequency

Requirements:

Frequency hopping system in the 2400-2483.5MHz band shall use at least 79 (Channel 0 to 78) non-overlapping channels.

The EUT operates in according with the Bluetooth system specification within the 2400 - 2483.5 MHz frequency band.

RF channels for Bluetooth systems are spaced 1 MHz and are ordered in channel number k. In order to comply with out-of-band regulations, a lower frequency guard band of 2.0 MHz and a higher frequency guard band of 3.5MHz is used.

The operating frequencies of each channel are as follows:

First RF channel start from 2400MHz + 2MHz guard band = 2402MHz

Frequency of RF Channel = 2402+k MHz, k = 0,...,78 (Channel separation = 1MHz)

Hopping Channel Separation

Requirements:

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Limit:

The measured minimum bandwidth * 2/3 = 0.66MHz * 2/3 = 440kHz

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Number of Hopping frequencies = 79 Channels (GFSK)



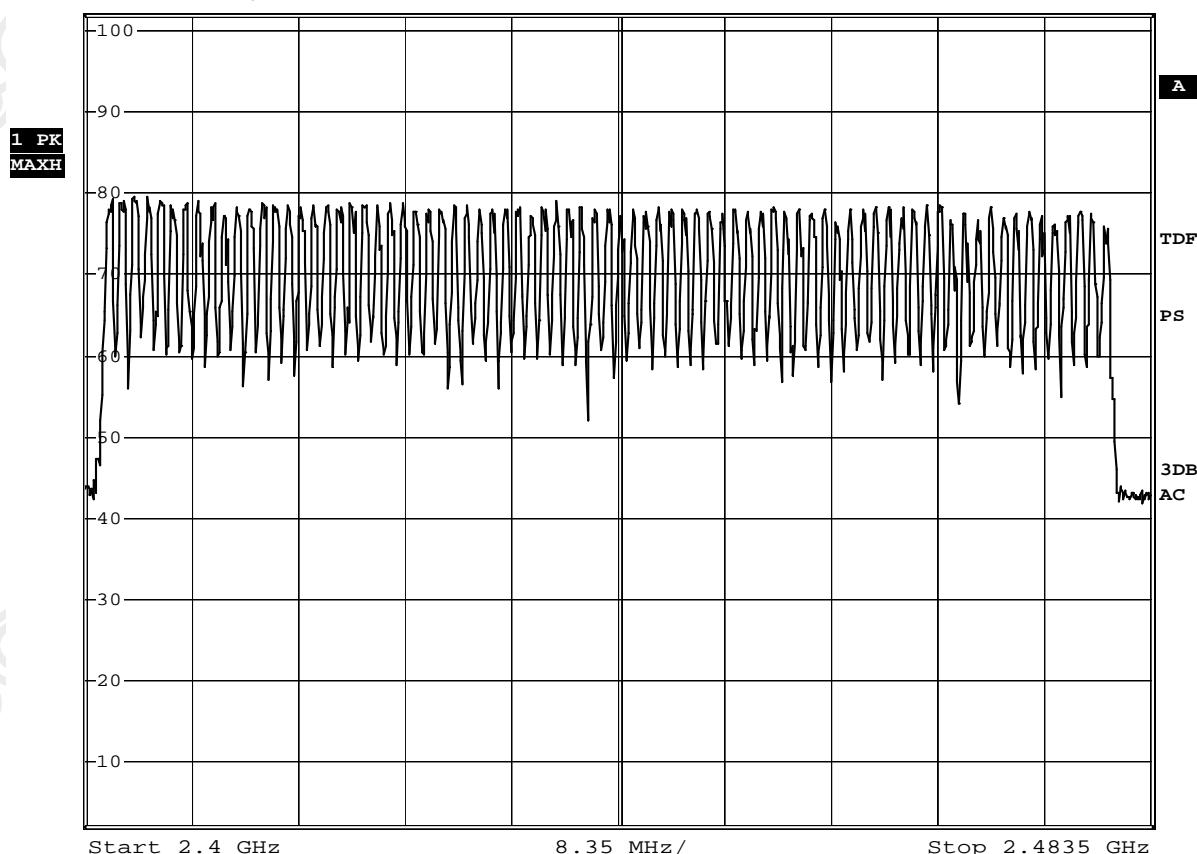
*RBW 100 kHz

*VBW 300 kHz

Ref 102 dBμV

*Att 10 dB

SWT 10 ms



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Channel Separation (Lowest) (GFSK)



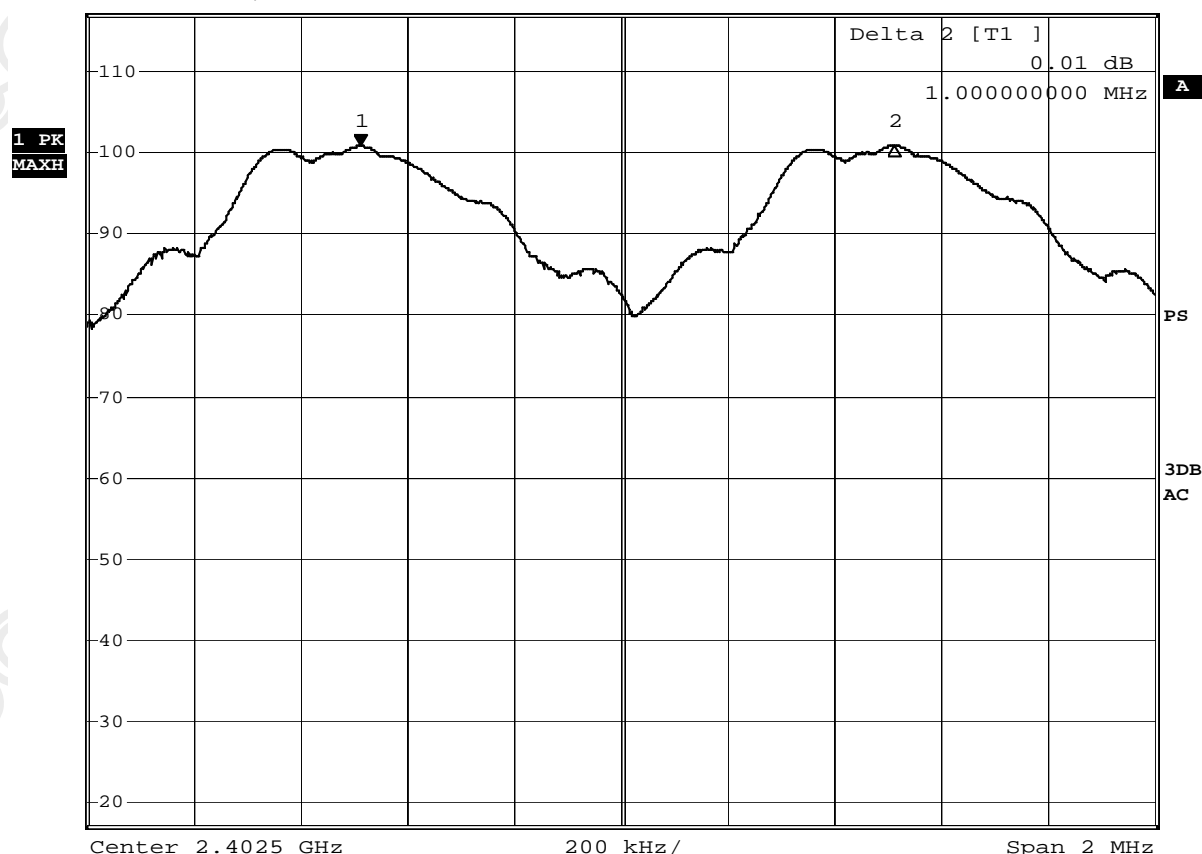
*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz 100.75 dBμV
SWT 5 ms 2.402010000 GHz

Ref 117 dBμV

*Att 25 dB

SWT 5 ms

2.402010000 GHz



Center 2.4025 GHz

200 kHz/

Span 2 MHz

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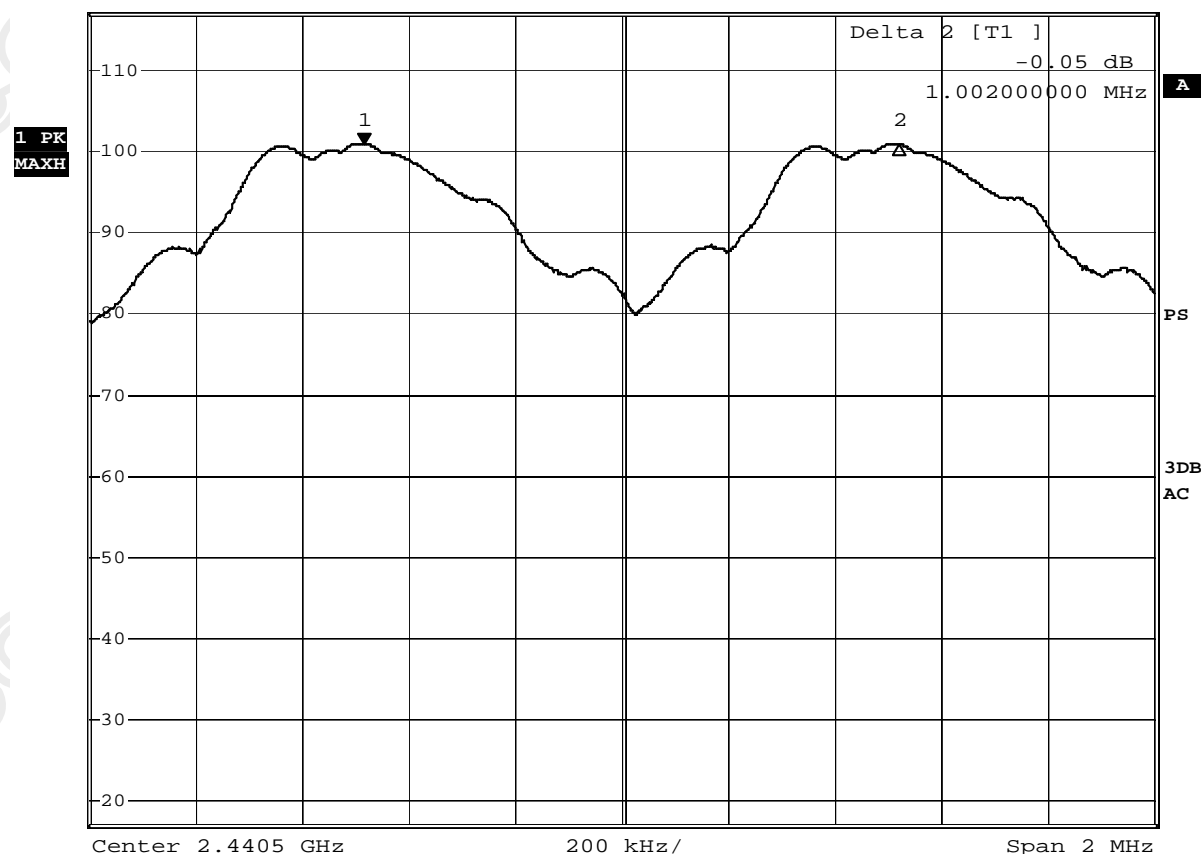
Channel Separation (Mid) (GFSK)



*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz 100.93 dBμV
SWT 5 ms 2.440016000 GHz

Ref 117 dBμV

*Att 25 dB



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Channel Separation (Highest) (GFSK)



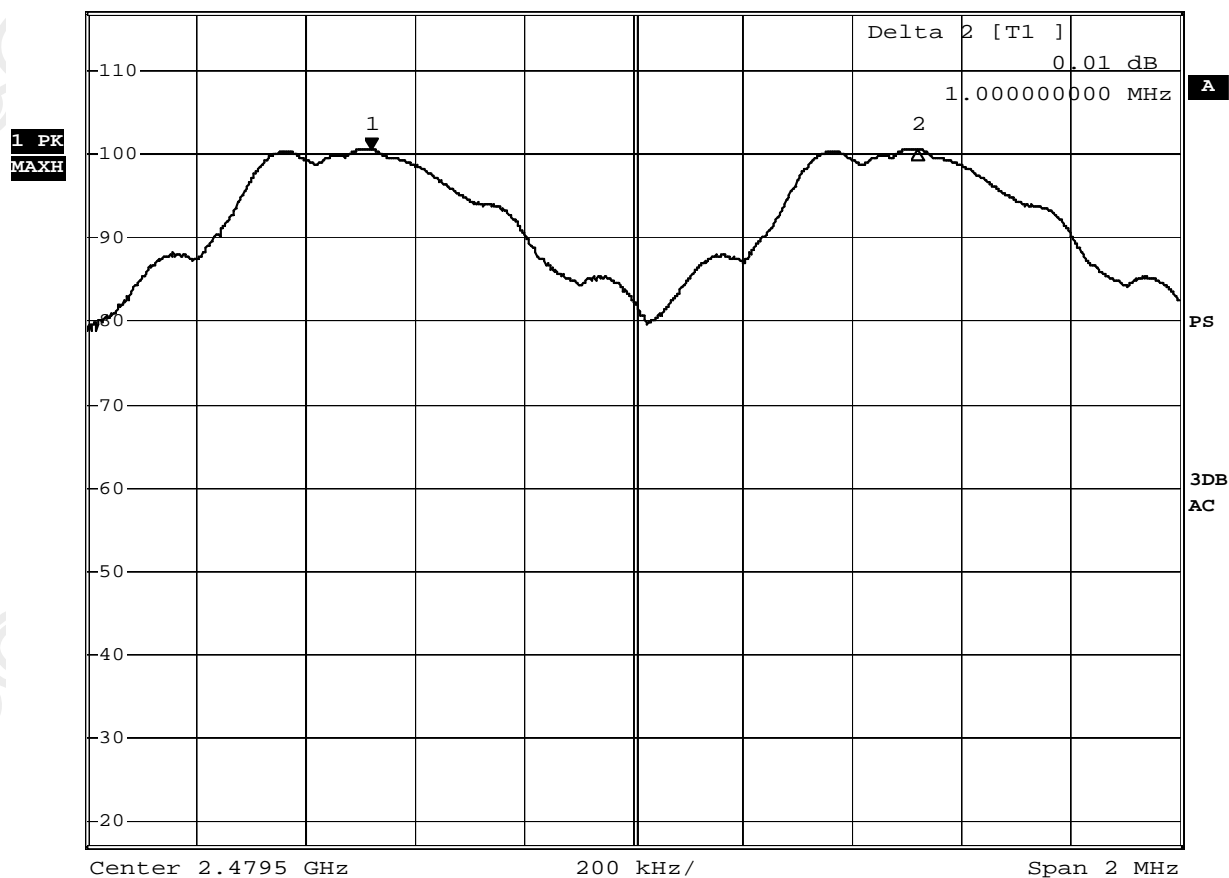
*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz 100.61 dBμV
SWT 5 ms 2.479018000 GHz

Ref 117 dBμV

*Att 25 dB

SWT 5 ms

2.479018000 GHz



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



*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz 100.78 dBμV
SWT 15 ms 2.402051000 GHz

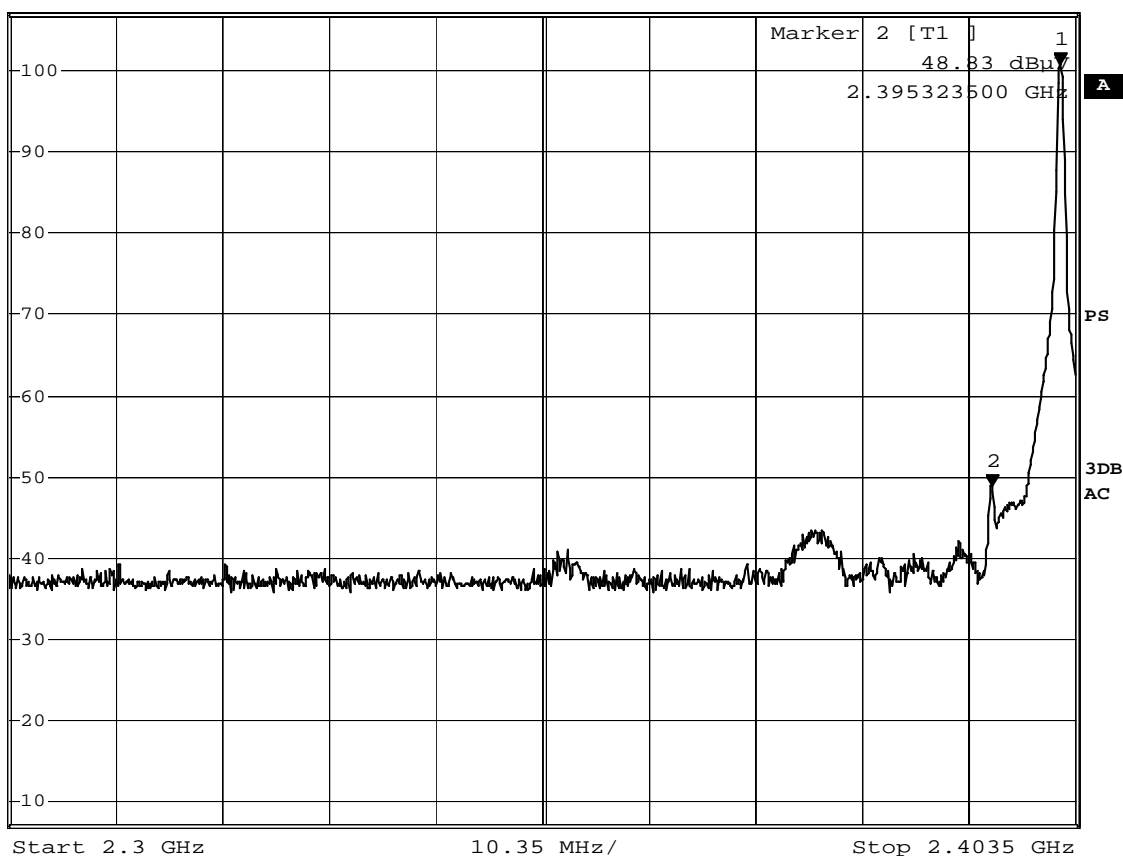
Ref 107 dBμV

*Att 15 dB

SWT 15 ms

2.402051000 GHz

1 PK
MAXH



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

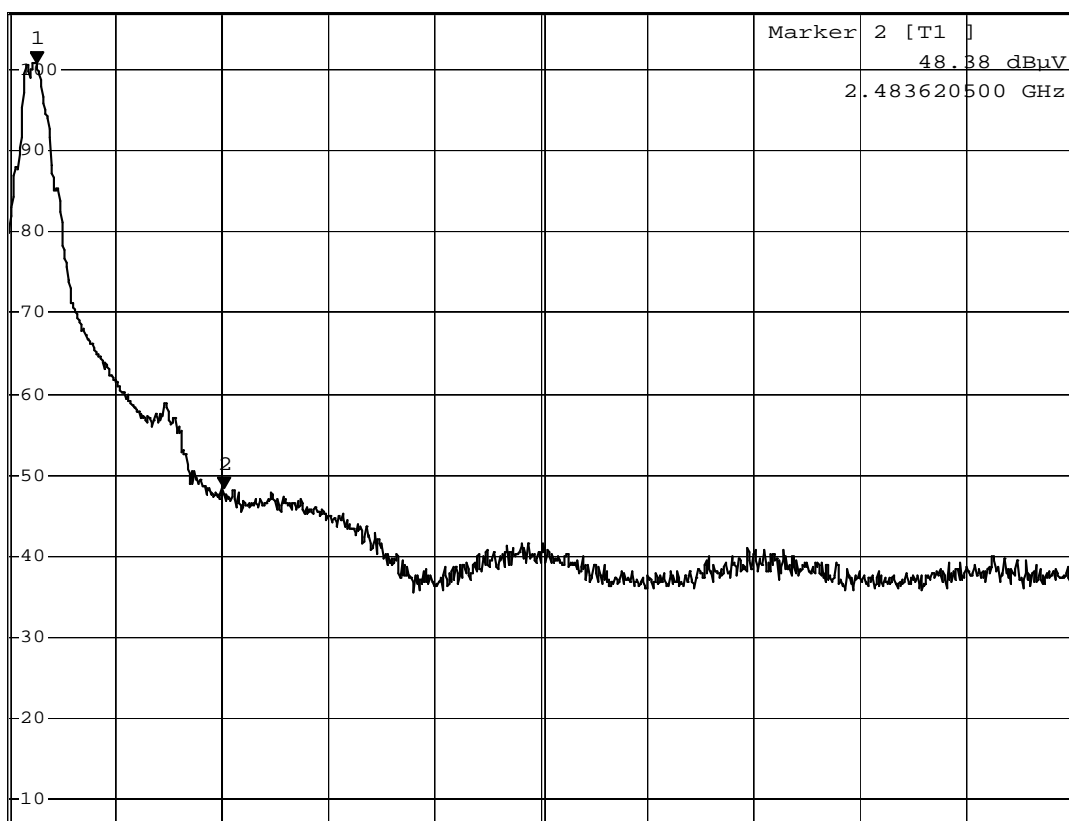


*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz 100.93 dBμV
SWT 5 ms 2.480012500 GHz

Ref 107 dBμV

*Att 15 dB

1 PK
MAXH



Start 2.4795 GHz

2.05 MHz/

Stop 2.5 GHz

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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:

The EUT has 1 Antenna which is permanently attached to the main unit and attached on PCB board, the antenna gain = 0 dBi. All component install on inside of EUT. User unable to remove or changed the Antenna.

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Pseudorandom Hopping Algorithm

Requirements:

The channel frequencies shall be selected from a pseudorandom ordered list of hopping frequencies. Each frequency must be used equally by the transmitter.

EUT Pseudorandom Hopping Algorithm

The EUT is a Bluetooth device, the Pseudo-random hopping pattern; hopping characteristics and algorithm are based on the Bluetooth specification.

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Occupancy Time

Requirements:

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channel employed.
No requirements for Digital Transmission System.

Measurement Data: Number of RF channel: 79
Observed duration of occupancy: $0.4 \times 79 = 31.6\text{s}$
Period observed: 2s
Duration of short burst: $152\mu\text{s}$

Maximum Time of occupancy: $(10 \times 0.000152) / 2 \times 31.6 = 0.14$

See fig. A to B.

Remark: The Occupancy Time of the Lowest, Middle and Highest operating frequency has been examined and the worst case test result is recorded in this test report.

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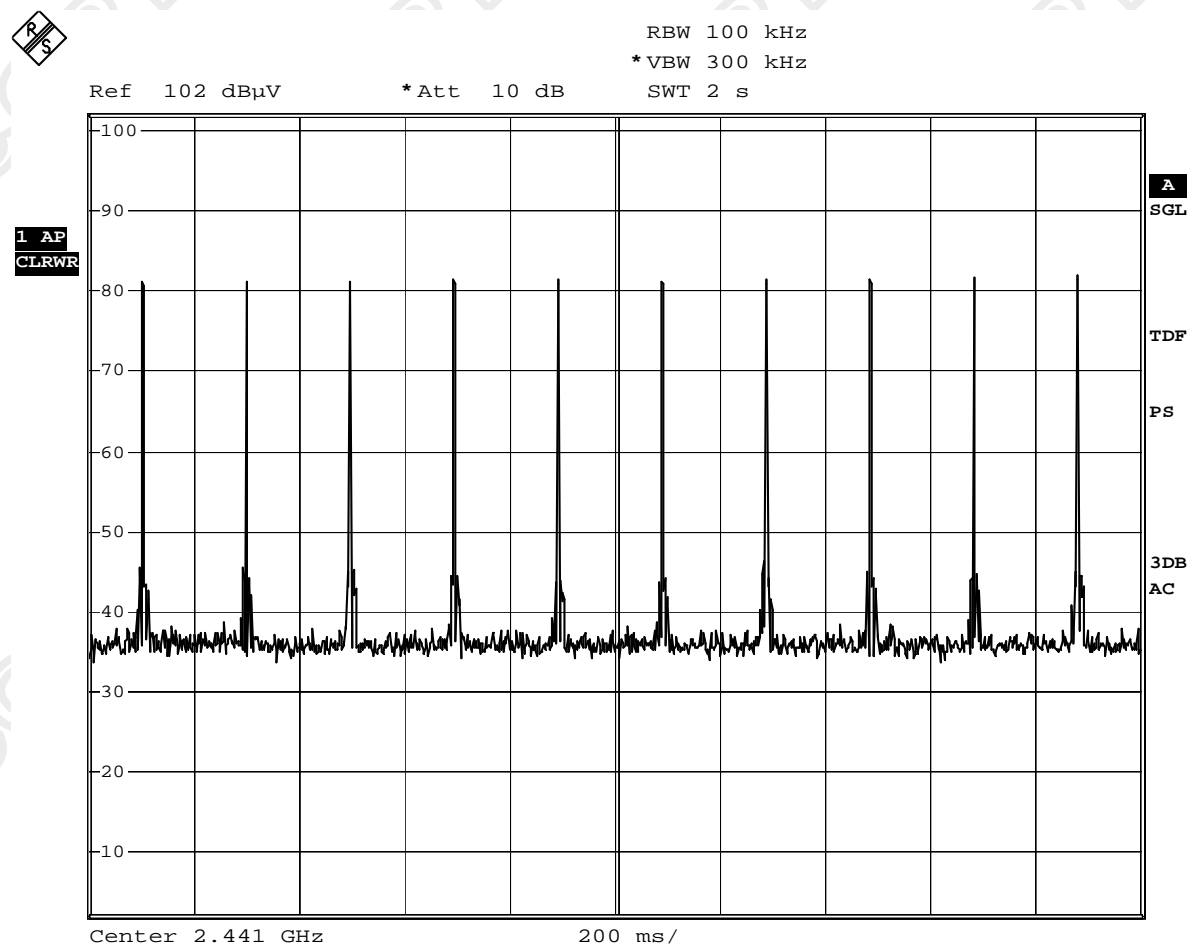
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Fig. A Pulse Train



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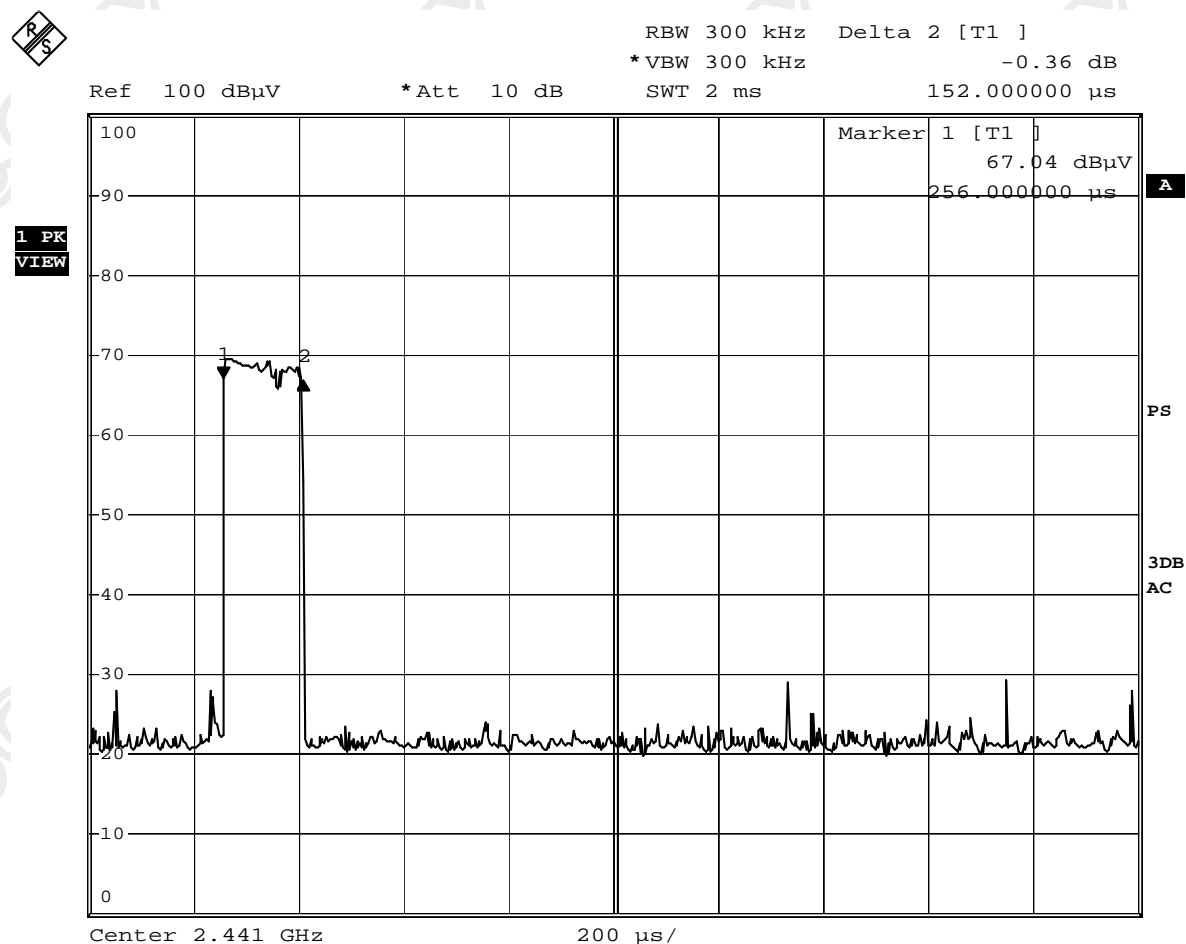
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Fig B. Single Pulse



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Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM276	Broadband Horn Antenna	A-INFOMW	JXTXLB-10180-SF	J2031090903007	2010/08/21	2013/08/21
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-Linggren	FACT-3	--	2011/10/25	2012/10/25
EM219	BICONILOG ANTENNA	EMCO	3142C	00029071	2011/03/01	2013/03/01
EM229	EMI Test Receiver	R&S	ESIB40	100248	2012/05/03	2013/05/03
EM022	LOOP ANTENNA	EMCO	6502	1189-2424	2010/09/07	2012/09/07
EM293	MXA Signal Analyzer	Agilent Technologies	MY50510152	N/A	2011/11/10	2012/11/10

Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM197	LISN	EMCO	4825/2	1193	2012/05/16	2013/05/16
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	100072	2012/05/03	2013/05/03
EM179	IMPULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	357-8810.52/54	2012/01/27	2013/01/27
EM154	SHIELDING ROOM	SIEMENS MATSUSHITA COMPONENTS	N/A	803-740-057-99A	2012/01/27	2013/01/27

Remarks:-

CM Corrective Maintenance

N/A Not Applicable or Not Available

TBD To Be Determined

Appendix B

Ancillary Equipment

ITEM NO.	DESCRIPTION	MODEL NO.	FCC ID	REMARK
1	USB flash drive	27115	N/A	8GB

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Appendix C

Photographs of EUT

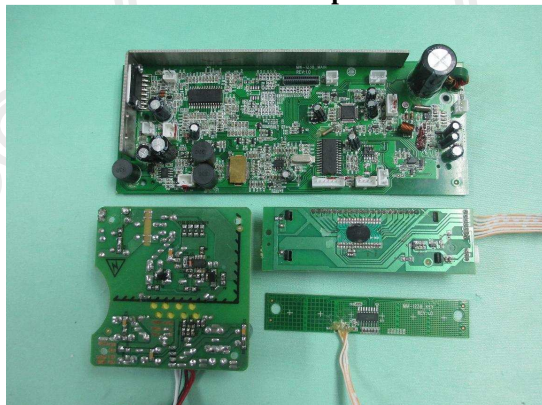
Front View of the product



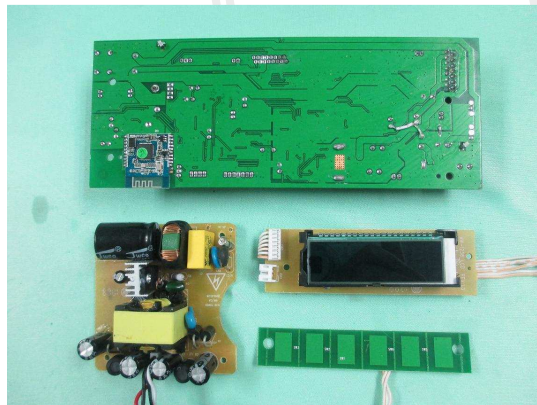
Rear View of the product



Inner Circuit Top View



Inner Circuit Bottom View



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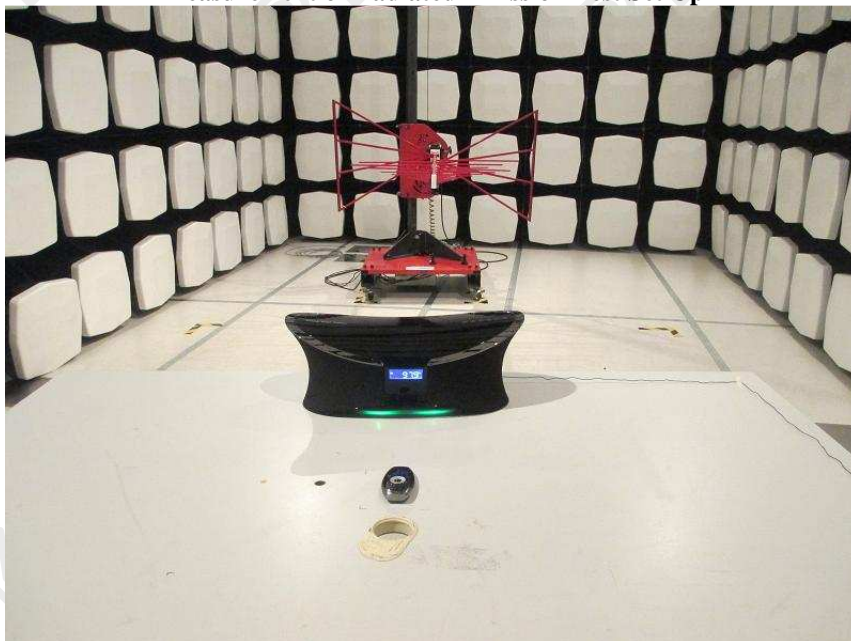
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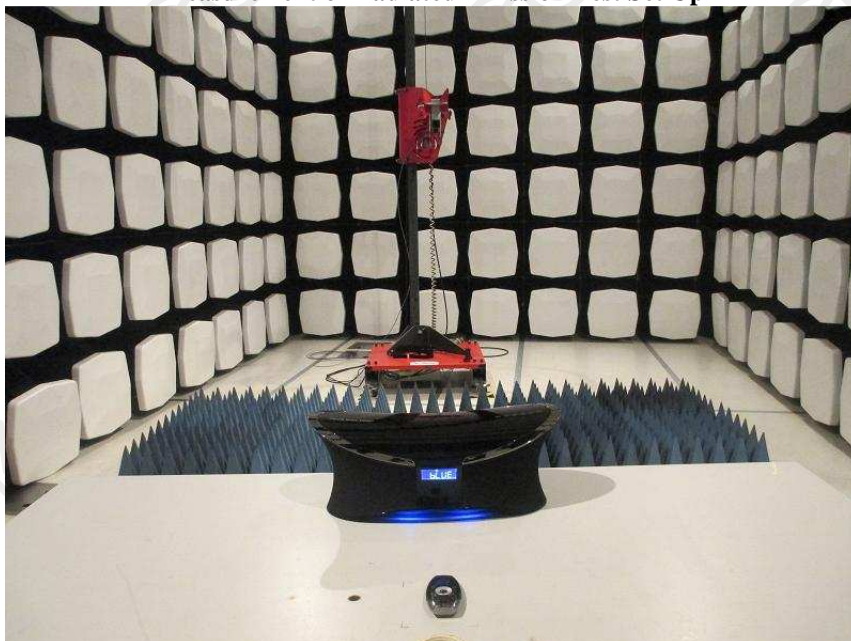
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Photographs of EUT

Measurement of Radiated Emission Test Set Up



Measurement of Radiated Emission Test Set Up



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Photographs of EUT

Measurement of Conducted Emission Test Set Up



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