



STC Test Report

Date : 2013-03-21

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No. : DM110001

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-1328
FCC ID: OG5MW1328

Date Sample(s) Received: 2012-12-26

Date Tested: 2013-01-02 to 2013-03-20

Investigation Requested: Perform ElectroMagnetic Interference measurement in
accordance with FCC 47CFR [Codes of Federal Regulations]
Part 15: 2012 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 model(s) details, see page 3



LONG Yun Jian, Along
Authorized Signatory
ElectroMagnetic Compatibility Department
For and on behalf of
STC (Dongguan) Company Limited

The Hong Kong Standards and Testing Centre Ltd.

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1.0 General Details

1.1 Test Laboratory

STC (Dongguan) Company Limited
EMC Laboratory
68 Fumin Nan Road, Dalang, Dongguan, China

Telephone: (86 769) 81119888
Fax: (86 769) 81116222

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-1328
Additional Model Number(s): MANIWAY,DOOME
Additional Brand Name(s): MW-1329, BT1
Input Voltage: 12Vd.c. with Jack
The AC/DC adaptor was provided by the applicant with following details:
Brand name: N/A; Model no.: PS36IBCAY3000S, PS36IBCAK3000U; Input: 100-240Va.c.
50/60Hz 1.0A; Output: 12Vd.c. 3000mA.
Remark: Test was conducted with AC/DC adaptor model no.: PS36IBCAY3000S

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is a SHENZHEN MANIWAY ELECTRONICS LIMITED, 2.1CH BLUETOOTH SPEAKER. The EUT consists of the Bluetooth device communication function, an Aux input and a type A USB receptacle for connecting USB flash drive. The EUT is able to transfer audio signal through Bluetooth communication with a Bluetooth device. The transmission signals were digital modulated with channel frequency range 2402-2480MHz (Refer to 1.7 for details)

1.3 Date of Order

2012-12-26

1.4 Submitted Sample(s):

1 Sample

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1.5 Test Duration

2013-01-02 to 2013-03-20

1.6 Country of Origin

China

1.7 RF Module Details

Module Model Number:	F-3088
Module FCC ID:	
Module Transmission Type:	Bluetooth V2.1+EDR
Modulation:	FHSS (GFSK / $\pi/4$ -DQPSK / 8DPSK)
Data Rates:	1Mbps: GFSK 2 Mbps: $\pi/4$ -DQPSK 3 Mbps: 8DPSK
Frequency Range:	2400-2483.5MHz
Carrier Frequencies:	2402MHz – 2480MHz

Module Specification (specification provided by manufacturer)

1.8 Antenna Details

Antenna Type:	PCB Layout Inverted F
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: 2012 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 Conducted 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	ANSI C63.4:2009	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)(2)	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 / $\pi/4$ -DQPSK / 8DPSK	1MBps / 2MBps / 3MBps
Hopping Channel Separation	8DPSK	3MBps
Number of Hopping Frequency	8DPSK	3MBps
Dwell Time	DH1 / DH3 / DH5	3MBps
Radiated Emissions Below 1GHz	GFSK	1MBps
Radiated Emission Above 1GHz	GFSK	1MBps
Band Edge Emissions	GFSK / $\pi/4$ -DQPSK / 8DPSK	1MBps / 2MBps / 3MBps

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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:	2013-01-02
Mode of Operation:	Tx mode

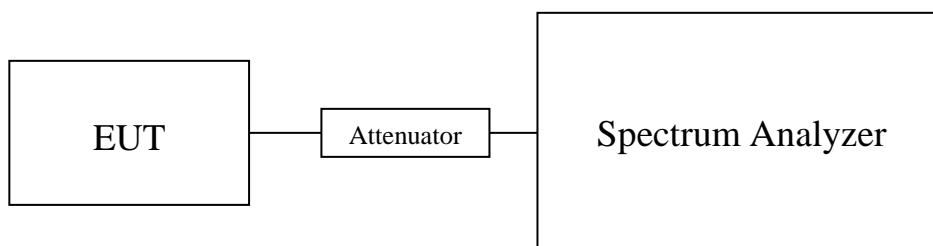
Test Method:

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 exceeded 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 Bluetooth Communication mode (GFSK) (Fundamental Power): Pass Maximum conducted output power

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2402	0.00202

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2441	0.00206

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2480	0.00219

Results of Bluetooth Communication mode ($\pi/4$ -DQPSK) (Fundamental Power): Pass Maximum conducted output power

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2402	0.00184

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2442	0.00174

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2480	0.00174

Results of Bluetooth Communication mode (8 DPSK) (Fundamental Power): Pass Maximum conducted output power

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2402	0.00183

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2442	0.00179

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2480	0.00181

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:	2013-03-20
Mode of Operation:	Tx mode / Aux in (Connected to iPod) / Bluetooth Communication mode / USB mode (Connected to USB flash drive) / Infrared remote control on mode

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 STC (Dongguan) Company Ltd. 68 Fumin Nan Road, Dalang, Dongguan, Guangdong, PRC with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 629686.

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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

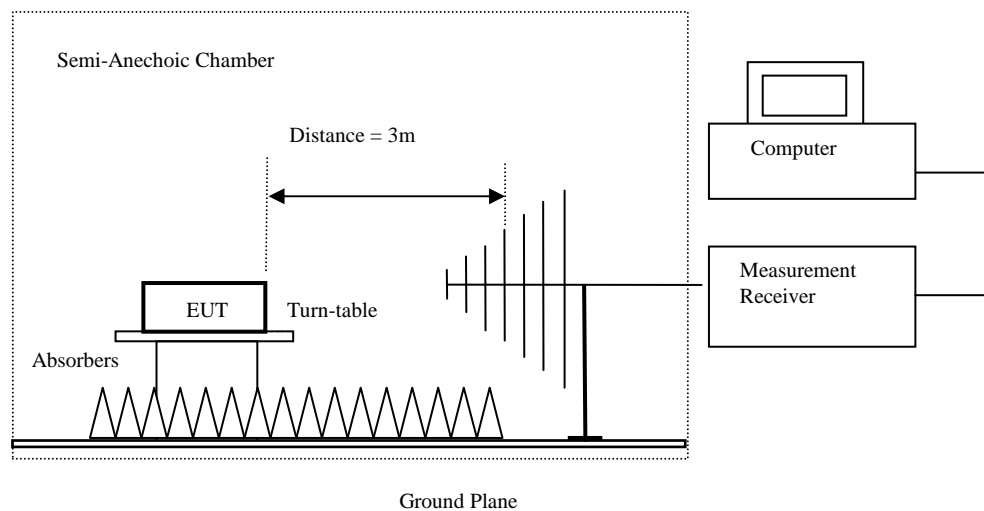
30MHz – 1GHz (QP)

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.
- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used.

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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) (GFSK mode) (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) (GFSK mode) (30MHz – 1GHz): 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) (GFSK mode) (Above 1GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dB μV	dB/m	dB $\mu\text{V/m}$	dB $\mu\text{V/m}$	dB $\mu\text{V/m}$	
4804.0	13.1	41.5	54.6	74.0	19.4	Horizontal
4804.0	14.2	41.5	55.7	74.0	18.3	Vertical
7206.0	6.6	48.8	55.4	74.0	18.6	Horizontal
7206.0	6.0	48.8	54.8	74.0	19.2	Vertical

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Result of Tx mode (2402.0 MHz) (GFSK mode) (Above 1GHz): 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	-2.7	41.5	38.8	54.0	15.2	Horizontal
4804.0	-2.2	41.5	39.3	54.0	14.7	Vertical
7206.0	-8.6	48.8	40.2	54.0	13.8	Horizontal
7206.0	-9.1	48.8	39.7	54.0	14.3	Vertical

Result of Tx mode (2441.0 MHz) (GFSK mode) (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						

Results of Tx mode (2441.0 MHz) (GFSK mode) (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) (GFSK mode) (Above 1GHz): 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
4882.0	14.1	41.4	55.5	74.0	18.5	Horizontal
4882.0	14.8	41.4	56.2	74.0	17.8	Vertical
7323.0	7.9	48.7	56.6	74.0	17.4	Horizontal
7323.0	6.1	48.7	54.8	74.0	19.2	Vertical

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Result of Tx mode (2441.0 MHz) (GFSK mode) (Above 1GHz): 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
4882.0	-1.7	41.4	39.7	54.0	14.3	Horizontal
4882.0	-2.0	41.4	39.4	54.0	14.6	Vertical
7323.0	-8.9	48.7	39.8	54.0	14.2	Horizontal
7323.0	-9.3	48.7	39.4	54.0	14.6	Vertical

Result of Tx mode (2480.0 MHz) (GFSK mode) (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						

Results of Tx mode (2480.0 MHz) (GFSK mode) (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) (GFSK mode) (Above 1GHz): 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
4960.0	14.9	41.4	56.3	74.0	17.7	Horizontal
4960.0	14.3	41.4	55.7	74.0	18.3	Vertical
7440.0	8.3	48.6	56.9	74.0	17.1	Horizontal
7440.0	7.9	48.6	56.5	74.0	17.5	Vertical

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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
2400.0	35.5	35.4	70.9	74.0	3.1	Vertical
2483.5	28.3	35.4	63.7	74.0	10.3	Vertical

Result of Tx mode (2480.0 MHz) (GFSK mode) (Above 1GHz): 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
4960.0	-1.2	41.4	40.2	54.0	13.8	Horizontal
4960.0	-1.5	41.4	39.9	54.0	14.1	Vertical
7440.0	-9.0	48.6	39.6	54.0	14.4	Horizontal
7440.0	-8.8	48.6	39.8	54.0	14.2	Vertical

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
2400.0	14.7	35.4	50.1	54.0	3.9	Vertical
2483.5	8.1	35.4	43.5	54.0	10.5	Vertical

Result of Tx mode (2402.0 MHz) ($\pi/4$ -DQPSK mode) (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 (2402.0 MHz) ($\pi/4$ -DQPSK mode) (30MHz – 1GHz): 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 (2402.0 MHz) ($\pi/4$ -DQPSK mode) (Above 1GHz): Pass

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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
4804.0	14.6	41.5	56.1	74.0	17.9	Horizontal
4804.0	14.2	41.5	55.7	74.0	18.3	Vertical
7206.0	5.8	48.8	54.6	74.0	19.4	Horizontal
7206.0	7.5	48.8	56.3	74.0	17.7	Vertical

Result of Tx mode (2402.0 MHz) ($\pi/4$ -DQPSK mode) (Above 1GHz): 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	-1.5	41.5	40.0	54.0	14.0	Horizontal
4804.0	-0.5	41.5	41.0	54.0	13.0	Vertical
7206.0	-8.1	48.8	40.7	54.0	13.3	Horizontal
7206.0	-7.4	48.8	41.4	54.0	12.6	Vertical

Result of Tx mode (2441.0 MHz) ($\pi/4$ -DQPSK mode) (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						

Results of Tx mode (2441.0 MHz) ($\pi/4$ -DQPSK mode) (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						

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Result of Tx mode (2441.0 MHz) ($\pi/4$ -DQPSK mode) (Above 1GHz): 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
4882.0	14.3	41.4	55.7	74.0	18.3	Horizontal
4882.0	13.2	41.4	54.6	74.0	19.4	Vertical
7323.0	6.7	48.7	55.4	74.0	18.6	Horizontal
7323.0	7.9	48.7	56.6	74.0	17.4	Vertical

Result of Tx mode (2441.0 MHz) ($\pi/4$ -DQPSK mode) (Above 1GHz): 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
4882.0	-2.0	41.4	39.4	54.0	14.6	Horizontal
4882.0	-2.5	41.4	38.9	54.0	15.1	Vertical
7323.0	-10.3	48.7	38.4	54.0	15.6	Horizontal
7323.0	-9.1	48.7	39.6	54.0	14.4	Vertical

Result of Tx mode (2480.0 MHz) ($\pi/4$ -DQPSK mode) (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						

Results of Tx mode (2480.0 MHz) ($\pi/4$ -DQPSK mode) (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						

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Result of Tx mode (2480.0 MHz) ($\pi/4$ -DQPSK mode) (Above 1GHz): 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
4960.0	14.5	41.4	55.9	74.0	18.1	Horizontal
4960.0	13.3	41.4	54.7	74.0	19.3	Vertical
7440.0	7.7	48.6	56.3	74.0	17.7	Horizontal
7440.0	7.3	48.6	55.9	74.0	18.1	Vertical

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
2400.0	36.8	35.4	72.2	74.0	1.8	Vertical
2483.5	26.9	35.4	62.3	74.0	11.7	Vertical

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
4960.0	-1.6	41.4	39.8	54.0	14.2	Horizontal
4960.0	-2.2	41.4	39.2	54.0	14.8	Vertical
7440.0	-7.1	48.6	41.5	54.0	12.5	Horizontal
7440.0	-7.8	48.6	40.8	54.0	13.2	Vertical

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
2400.0	16.7	35.4	52.1	54.0	1.9	Vertical
2483.5	6.8	35.4	42.2	54.0	11.8	Vertical

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Result of Tx mode (2402.0 MHz) (8DPSK) (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 (2402.0 MHz) (8DPSK) (30MHz – 1GHz): 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 (2402.0 MHz) (8DPSK) (Above 1GHz): 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
4804.0	14.9	41.5	56.4	74.0	17.6	Horizontal
4804.0	13.9	41.5	55.4	74.0	18.6	Vertical
7206.0	7.3	48.8	56.1	74.0	17.9	Horizontal
7206.0	6.5	48.8	55.3	74.0	18.7	Vertical

Result of Tx mode (2402.0 MHz) (8DPSK) (Above 1GHz): 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	-0.8	41.5	40.7	54.0	13.3	Horizontal
4804.0	-2.0	41.5	39.5	54.0	14.5	Vertical
7206.0	-8.0	48.8	40.8	54.0	13.2	Horizontal
7206.0	-9.1	48.8	39.7	54.0	14.3	Vertical

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Result of Tx mode (2441.0 MHz) (8DPSK) (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 μV/m	Limit μV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Results of Tx mode (2441.0 MHz) (8DPSK) (30MHz – 1000MHz): PASS

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

Result of Tx mode (2441.0 MHz) (8DPSK) (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
4882.0	14.3	41.4	55.7	74.0	18.3	Horizontal
4882.0	15.1	41.4	56.5	74.0	17.5	Vertical
7323.0	7.2	48.7	55.9	54.0	-1.9	Horizontal
7323.0	7.9	48.7	56.6	54.0	-2.6	Vertical

Result of Tx mode (2441.0 MHz) (8DPSK) (Above 1GHz): Pass

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
4882.0	-1.5	41.4	39.9	54.0	14.1	Horizontal
4882.0	-0.9	41.4	40.5	54.0	13.5	Vertical
7323.0	-7.1	48.7	41.6	54.0	12.4	Horizontal
7323.0	-8	48.7	40.7	54.0	13.3	Vertical

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Result of Tx mode (2480.0 MHz) (8DPSK) (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 μV/m	Limit μV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Results of Tx mode (2480.0 MHz) (8DPSK) (30MHz – 1000MHz): PASS

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

Result of Tx mode (2480.0 MHz) (8DPSK) (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
4960.0	14.3	41.4	55.7	74.0	18.3	Horizontal
4960.0	12.8	41.4	54.2	74.0	19.8	Vertical
7440.0	7.6	48.6	56.2	74.0	17.8	Horizontal
7440.0	6.0	48.6	54.6	74.0	19.4	Vertical

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
2400.0	34.6	35.4	70.0	74.0	4.0	Vertical
2483.5	27.2	35.4	62.6	74.0	11.4	Vertical

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Result of Tx mode (2480.0 MHz) (8DPSK) (Above 1GHz): 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
4960.0	-0.8	41.4	40.6	54.0	13.4	Horizontal
4960.0	-1.9	41.4	39.5	54.0	14.5	Vertical
7440.0	-8.8	48.6	39.8	54.0	14.2	Horizontal
7440.0	-9.2	48.6	39.4	54.0	14.6	Vertical

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
2400.0	14.7	35.4	50.1	54.0	3.9	Vertical
2483.5	7.1	35.4	42.5	54.0	11.5	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 - 1GHz): 4.6dB

(1GHz - 26GHz): 4.4dB

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]:

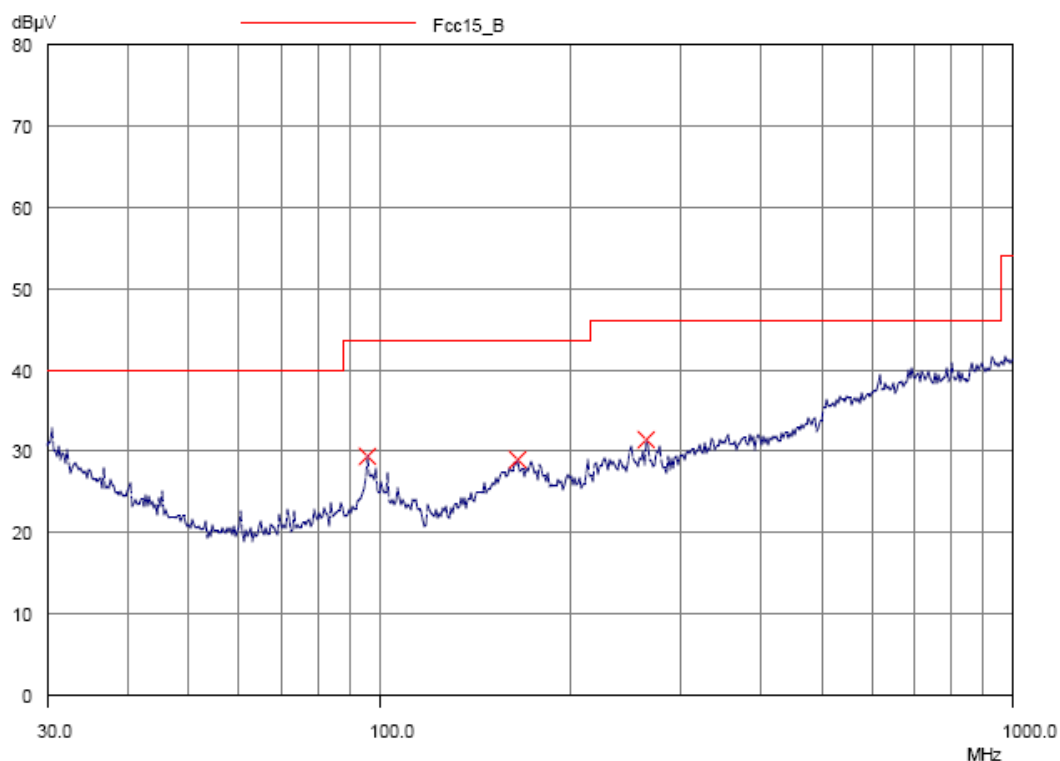
Frequency Range	Quasi-Peak Limits
[MHz]	[$\mu\text{V/m}$]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above 960	500

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 Aux in mode (Connected to iPod) (30MHz – 1GHz): Pass

Please refer to the following table for result details

Horizontal



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Result of Aux in mode (Connected to iPod) (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
96.1	Horizontal	29.4	43.5	29.5	150
166.1	Horizontal	29.0	43.5	28.2	150
264.0	Horizontal	31.5	46.0	37.6	200

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

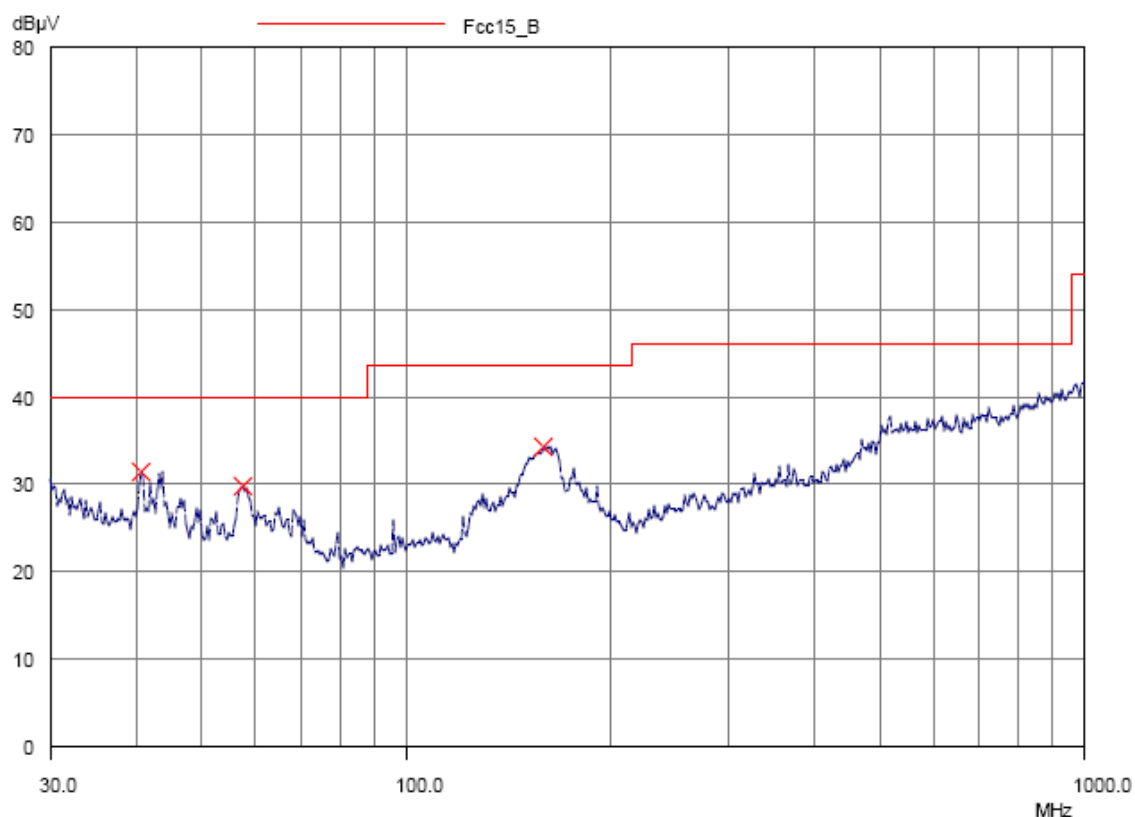
Frequency Range	Quasi-Peak Limits
[MHz]	[$\mu\text{V/m}$]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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 Aux in mode (Connected to iPod) (30MHz – 1GHz): Pass

Please refer to the following table for result details

Vertical



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Result of Aux in mode (Connected to iPod) (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
40.8	Vertical	31.6	40.0	38.0	100
57.5	Vertical	30.0	40.0	31.6	100
160.2	Vertical	34.4	43.5	52.5	150

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

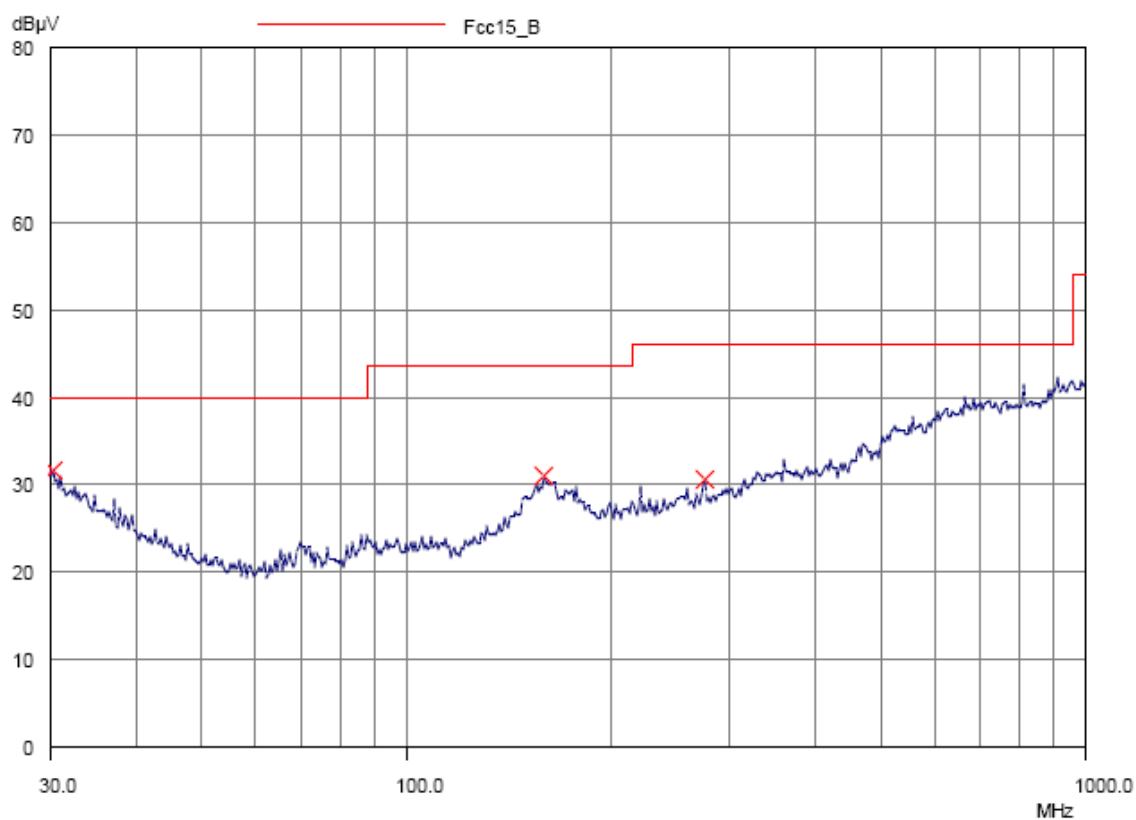
Frequency Range	Quasi-Peak Limits
[MHz]	[$\mu\text{V/m}$]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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 (30MHz – 1GHz): Pass

Please refer to the following table for result details

Horizontal



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Result of Bluetooth Communication mode (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
30.2	Horizontal	31.8	40.0	38.9	100
159.9	Horizontal	31.1	43.5	35.9	150
274.1	Horizontal	30.8	46.0	34.7	200

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

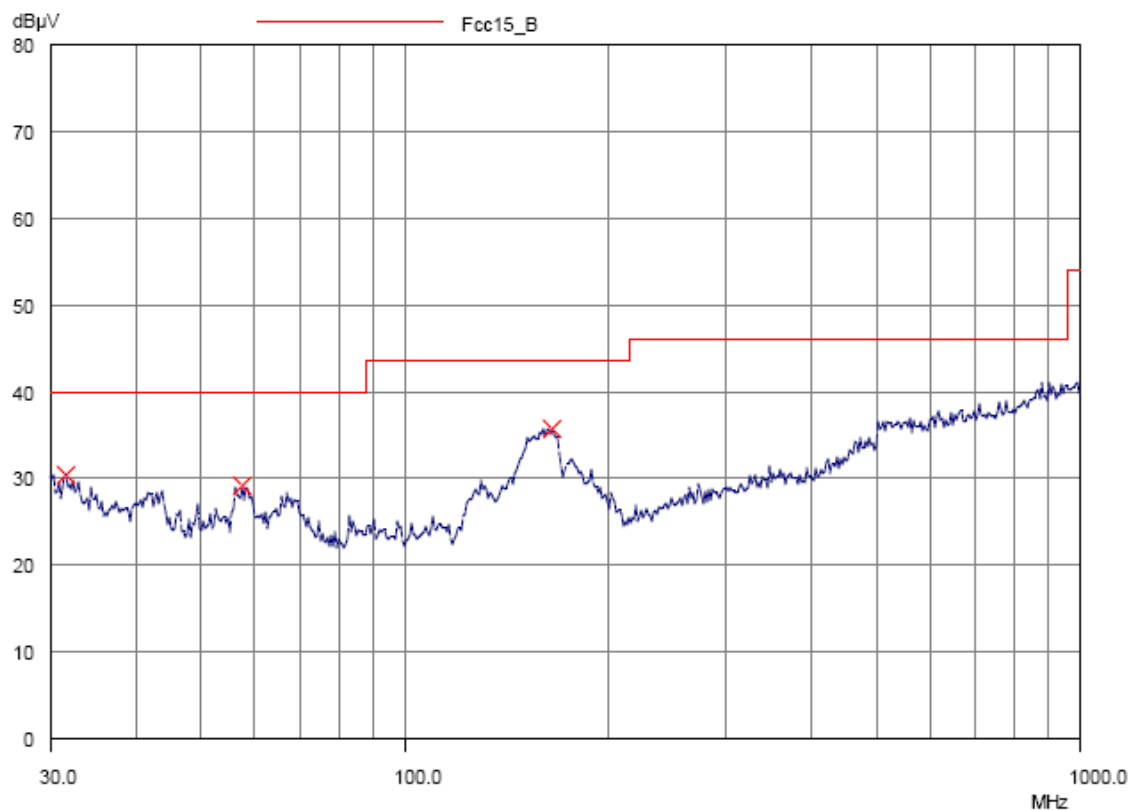
Frequency Range	Quasi-Peak Limits
[MHz]	[$\mu\text{V/m}$]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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 (30MHz – 1GHz): Pass

Please refer to the following table for result details

Vertical



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Result of Bluetooth Communication mode (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
31.6	Vertical	30.5	40.0	33.5	100
57.7	Vertical	29.3	40.0	29.2	100
166.3	Vertical	35.9	43.5	62.4	150

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

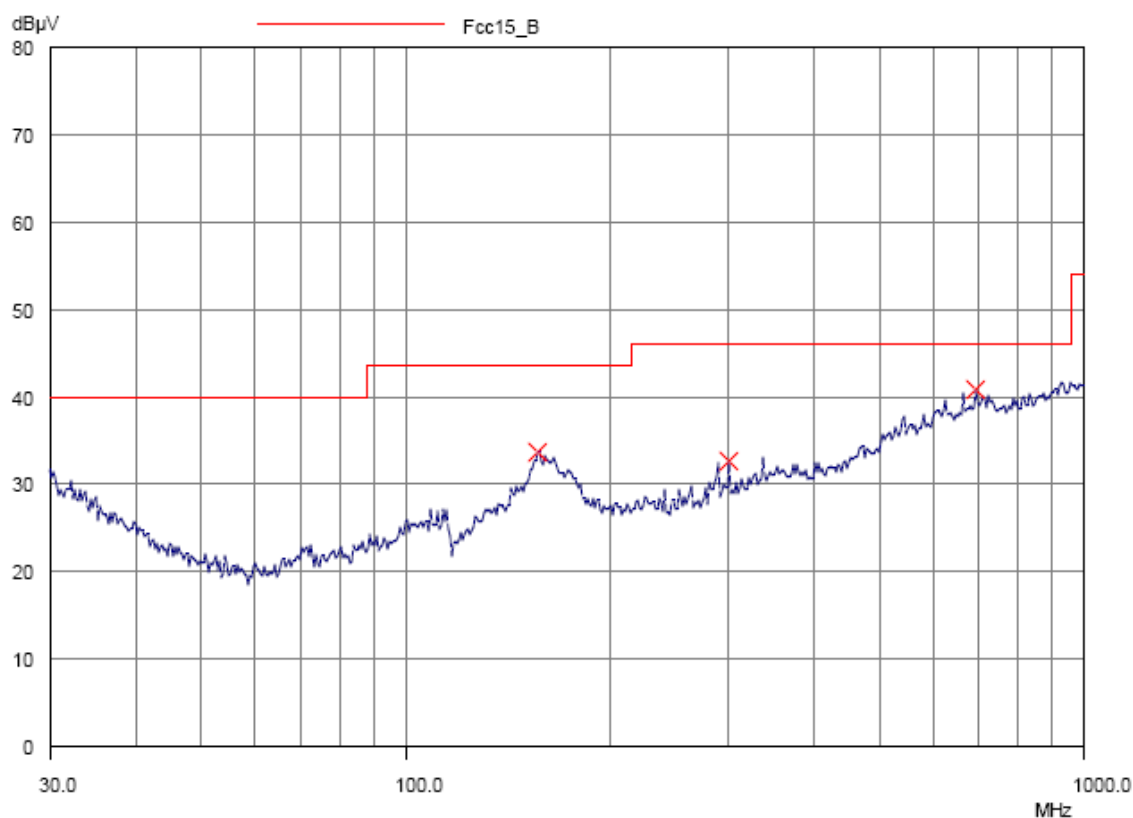
Frequency Range	Quasi-Peak Limits
[MHz]	[$\mu\text{V/m}$]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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 USB mode (Connected to USB flash drive) (30MHz – 1GHz): Pass

Please refer to the following table for result details

Horizontal



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Result of USB mode (Connected to USB flash drive) (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
157.3	Horizontal	33.7	43.5	48.4	150
300.1	Horizontal	32.7	46.0	43.2	200
694.3	Horizontal	41.0	46.0	112.2	200

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

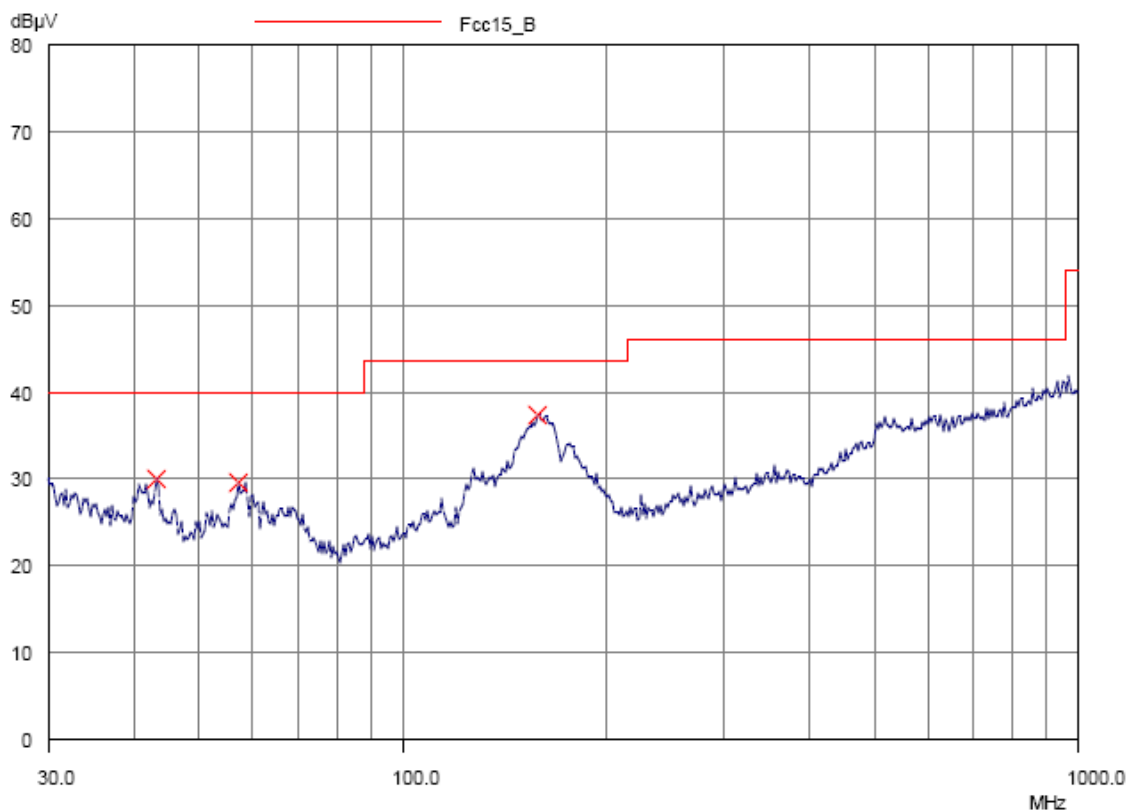
Frequency Range	Quasi-Peak Limits
[MHz]	[$\mu\text{V/m}$]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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 USB mode (Connected to USB flash drive) (30MHz – 1GHz): Pass

Please refer to the following table for result details

Vertical



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Result of USB mode (Connected to USB flash drive) (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
43.3	Vertical	30.0	40.0	31.6	100
57.2	Vertical	29.7	40.0	30.5	100
159.2	Vertical	37.5	43.5	75.0	150

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

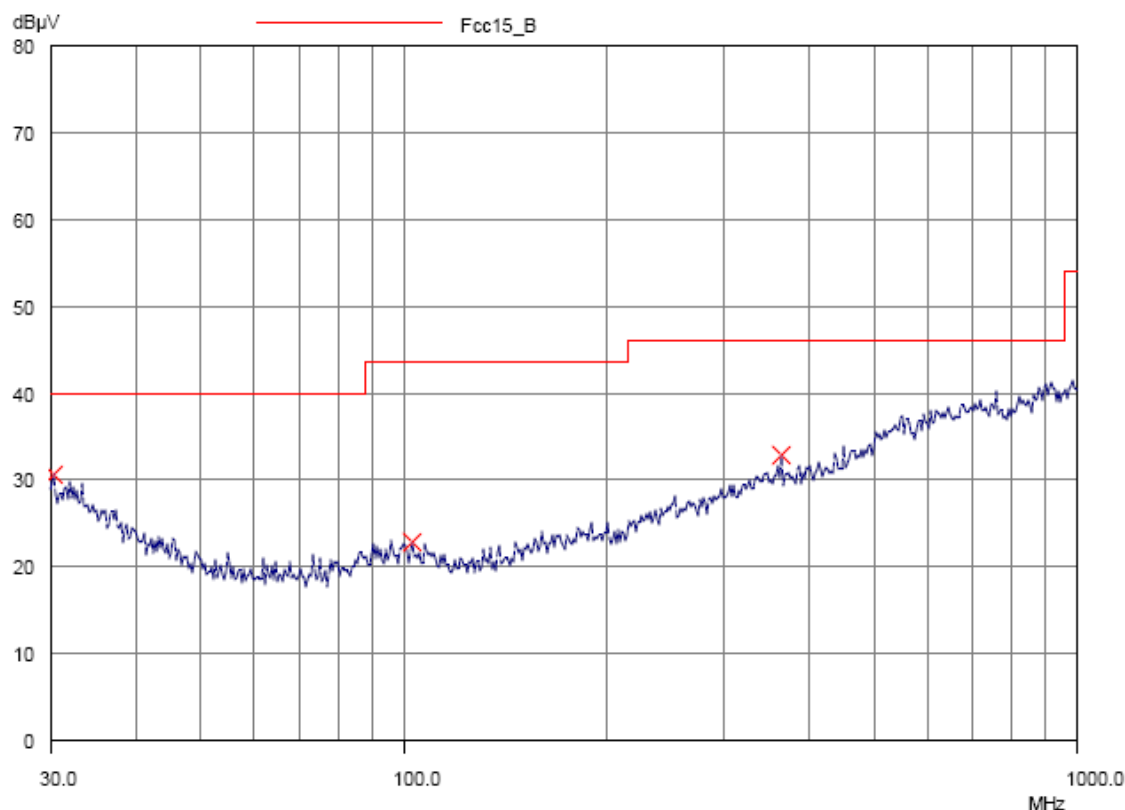
Frequency Range	Quasi-Peak Limits
[MHz]	[μ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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 Infrared remote control on mode (30MHz – 1GHz): Pass

Please refer to the following table for result details

Horizontal



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Result of Infrared remote control on mode (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
30.2	Horizontal	30.7	40.0	34.3	100
103.5	Horizontal	22.9	43.5	14.0	150
363.4	Horizontal	32.9	46.0	44.2	200

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

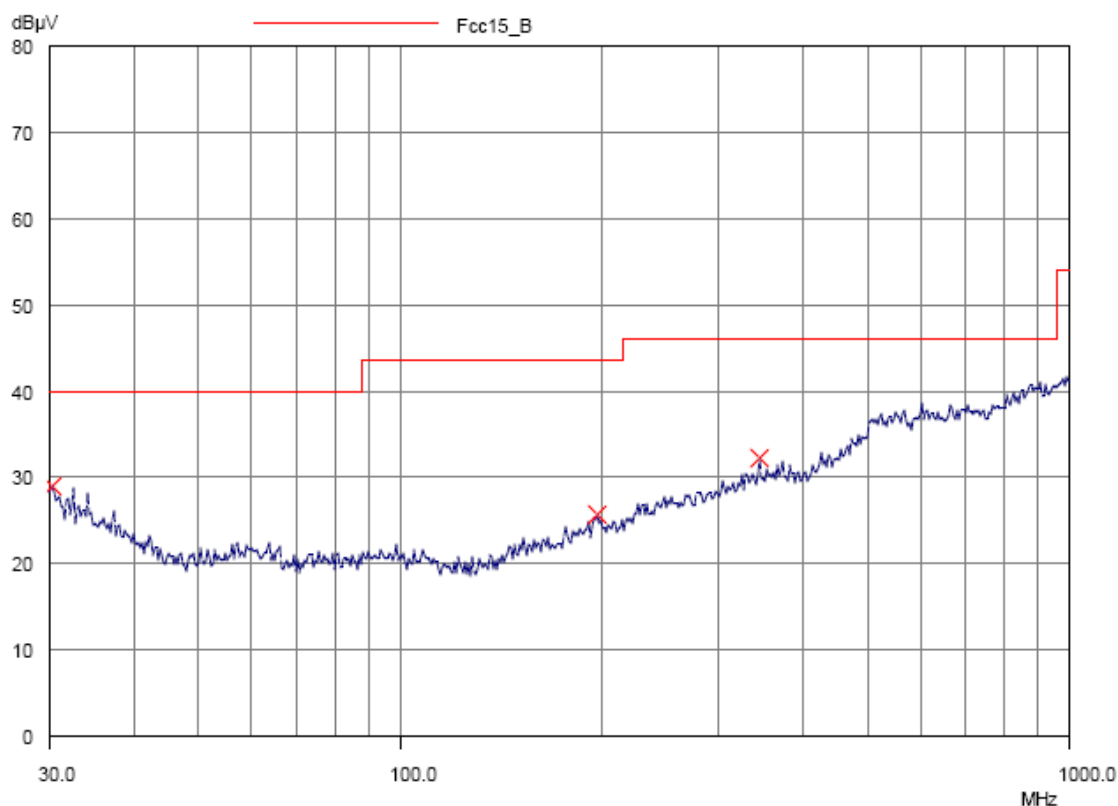
Frequency Range	Quasi-Peak Limits
[MHz]	[$\mu\text{V/m}$]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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 Infrared remote control on mode (30MHz – 1GHz): Pass

Please refer to the following table for result details

Vertical



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Result of Infrared remote control on mode (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
30.3	Vertical	29.1	40.0	28.5	100
197.3	Vertical	25.7	43.5	19.3	150
344.4	Vertical	32.2	46.0	40.7	200

Remarks:

Calculated measurement uncertainty (30MHz – 1GHz): 4.6dB

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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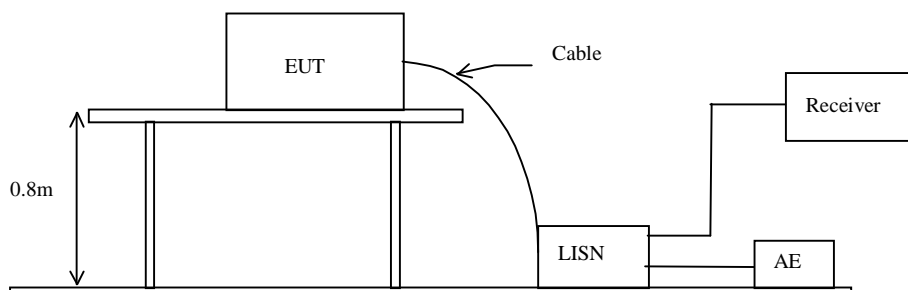
3.1.3 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement:	FCC 47CFR 15.207
Test Method:	ANSI C63.4:2009
Test Date:	2013-03-19 to 2013-03-20
Mode of Operation:	Aux in mode / Bluetooth communication mode / USB mode (Connected to USB flash drive)
Test Voltage:	117Va.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):

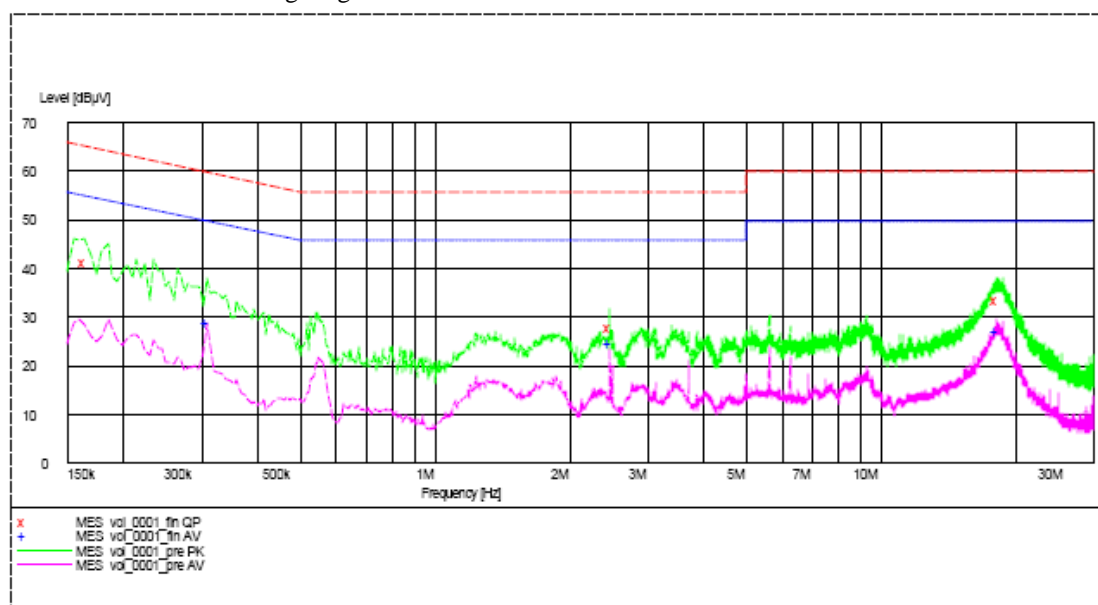
Frequency Range [MHz]	Quasi-Peak Limits [dBμV]	Average [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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 Aux in mode (Connected to iPod) (L): PASS

Please refer to the following diagram for individual results.



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Results of Aux in mode (Connected to iPod) (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	0.165	41.3	65.0	-*-	-*-
Live	2.475	28.0	56.0	-*-	-*-
Live	18.180	33.5	60.0	-*-	-*-
Live	0.310	-*-	-*-	28.9	50.0
Live	2.475	-*-	-*-	24.6	46.0
Live	18.185	-*-	-*-	27.2	50.0

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Limit for Conducted Emissions (FCC 47 CFR 15.207):

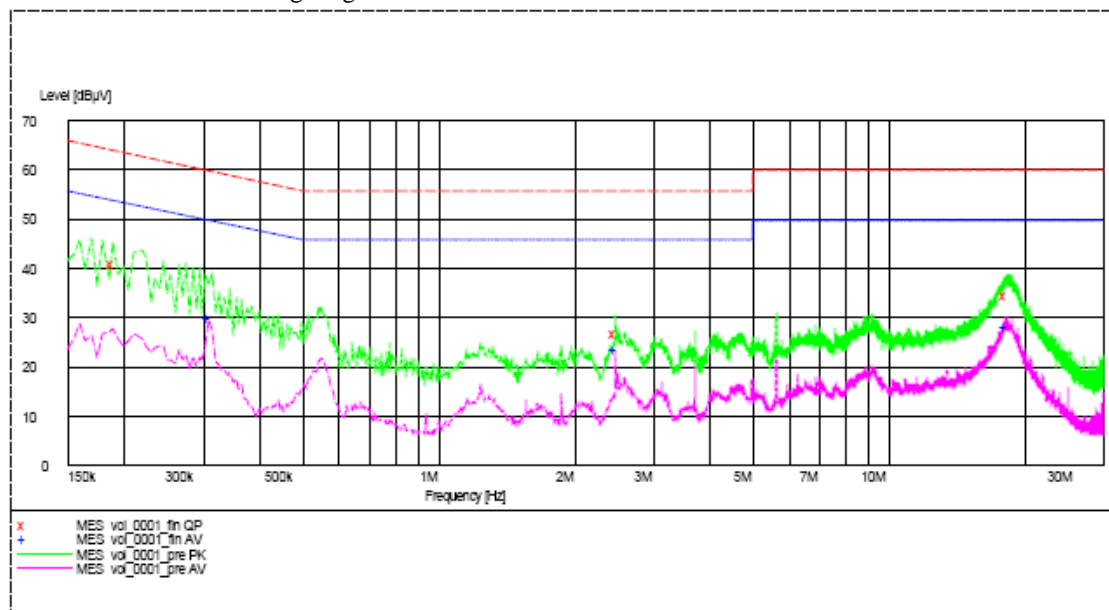
Frequency Range [MHz]	Quasi-Peak Limits [dBμV]	Average [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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.

Results of Aux in mode (Connected to iPod) (N): PASS

Please refer to the following diagram for individual results.



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Results of Aux in mode (Connected to iPod) (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	0.190	40.9	64.0	-*-	-*-
Neutral	2.480	26.7	56.0	-*-	-*-
Neutral	18.265	34.6	60.0	-*-	-*-
Neutral	0.310	-*-	-*-	30.0	50.0
Neutral	2.475	-*-	-*-	23.7	46.0
Neutral	18.150	-*-	-*-	28.2	50.0

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Limit for Conducted Emissions (FCC 47 CFR 15.207):

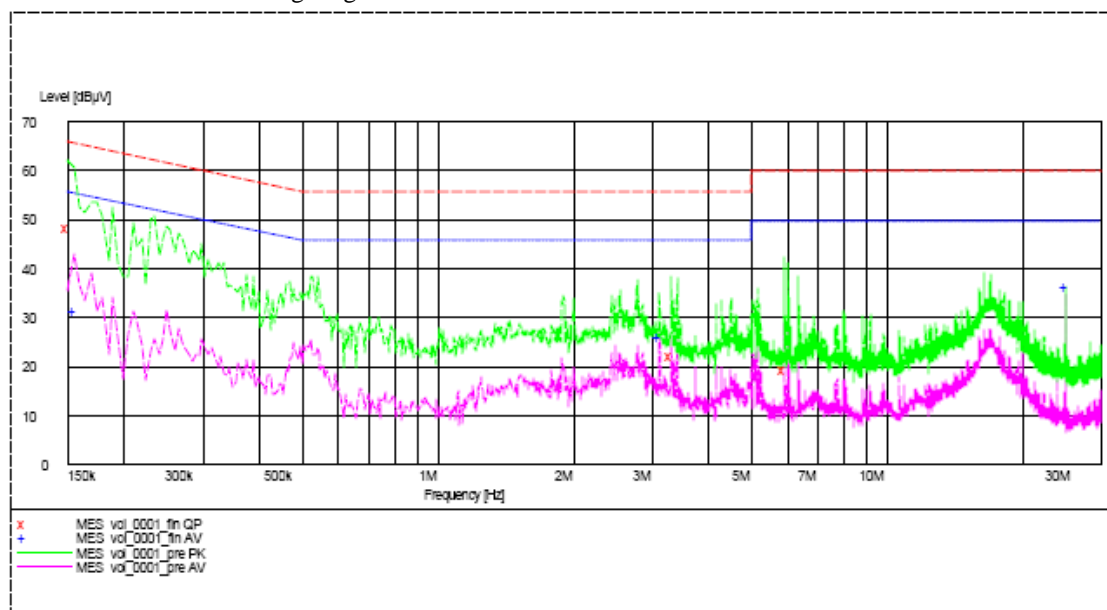
Frequency Range [MHz]	Quasi-Peak Limits [dBμV]	Average [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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.

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	0.155	-*-	-*-	31.4	56.0
Live	3.120	-*-	-*-	26.2	46.0
Live	25.050	-*-	-*-	36.2	50.0
Live	0.150	48.5	66.0	-*-	-*-
Live	3.310	22.4	56.0	-*-	-*-
Live	5.930	19.4	60.0	-*-	-*-

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Limit for Conducted Emissions (FCC 47 CFR 15.207):

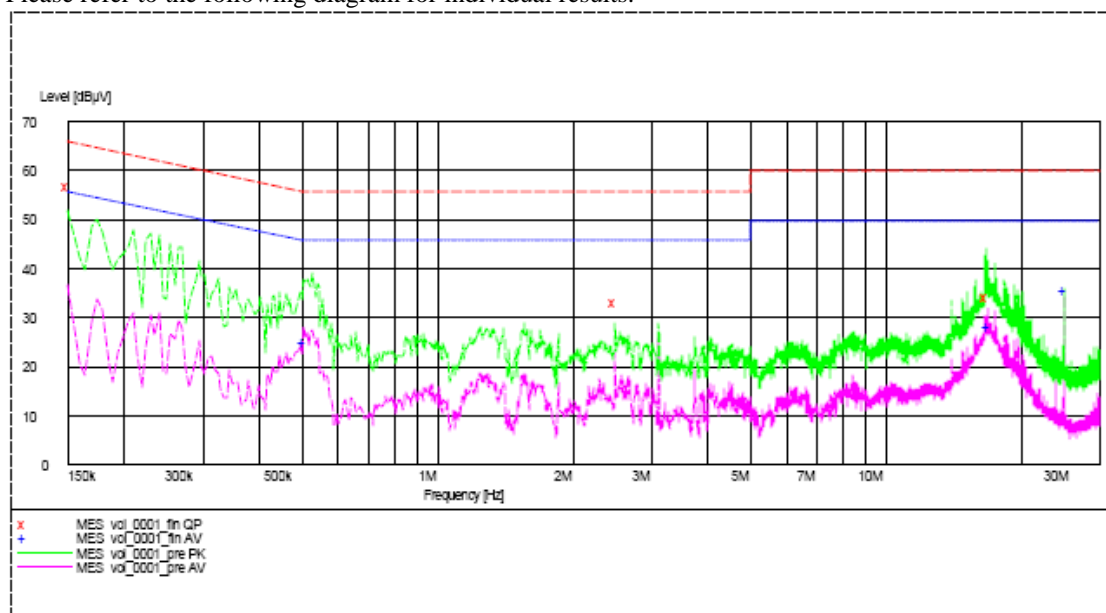
Frequency Range [MHz]	Quasi-Peak Limits [dBμV]	Average [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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.

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	0.505	-*-	-*-	25.1	46.0
Neutral	16.955	-*-	-*-	28.2	50.0
Neutral	25.060	-*-	-*-	35.7	50.0
Neutral	0.150	56.8	66.0	-*-	-*-
Neutral	2.495	33.3	56.0	-*-	-*-
Neutral	16.745	34.3	60.0	-*-	-*-

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Limit for Conducted Emissions (FCC 47 CFR 15.207):

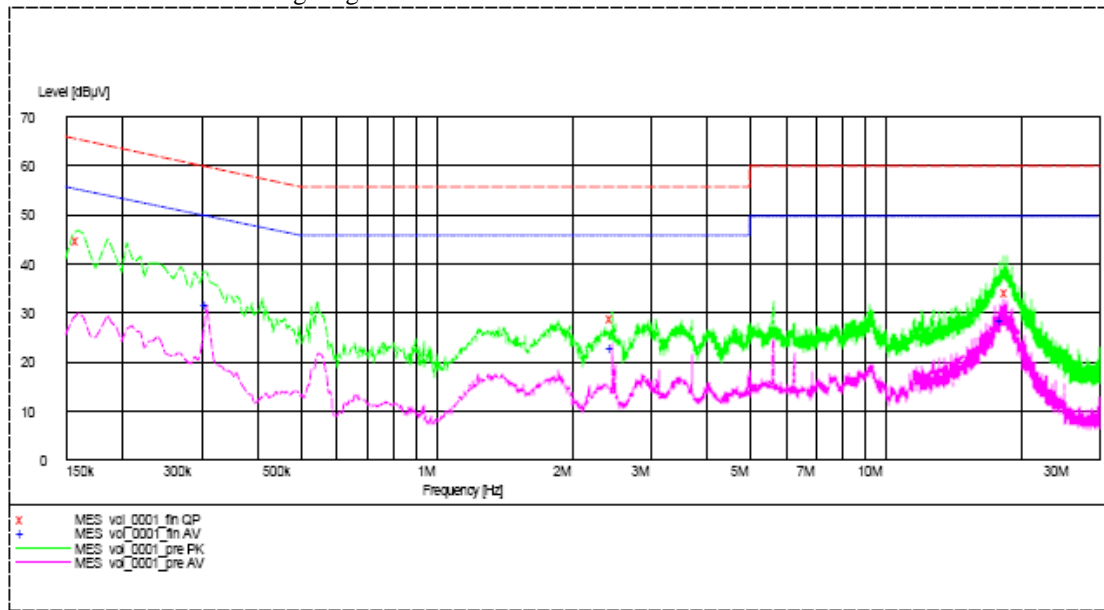
Frequency Range [MHz]	Quasi-Peak Limits [dBμV]	Average [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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.

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	0.160	44.8	66.0	-*-	-*-
Live	2.475	29.0	56.0	-*-	-*-
Live	18.720	34.1	60.0	-*-	-*-
Live	0.310	-*-	-*-	31.6	50.0
Live	2.475	-*-	-*-	23.0	46.0
Live	18.275	-*-	-*-	28.6	50.0

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Limit for Conducted Emissions (FCC 47 CFR 15.207):

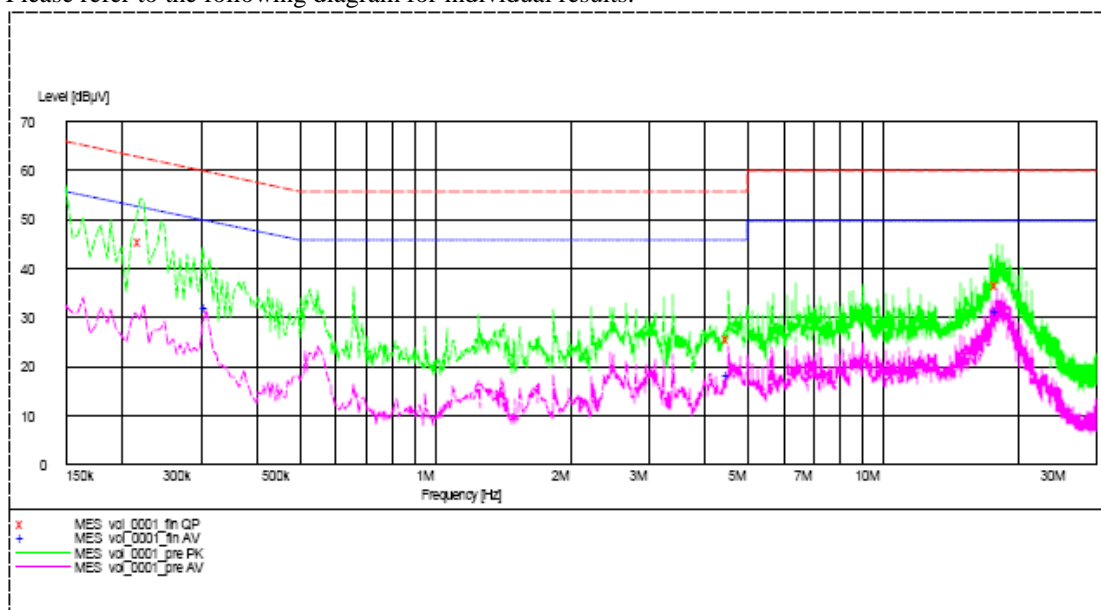
Frequency Range [MHz]	Quasi-Peak Limits [dB μ V]	Average [dB μ V]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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.

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	0.220	45.4	63.0	-*-	-*-
Neutral	4.545	25.8	56.0	18.5	46.0
Neutral	18.080	36.9	60.0	-*-	-*-
Neutral	0.310	-*-	-*-	32.0	50.0
Neutral	18.080	-*-	-*-	31.4	50.0

Remarks:

Calculated measurement uncertainty (0.15MHz – 30MHz): 3.2dB

-*- 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:	2012-12-31
Mode of Operation:	Communication 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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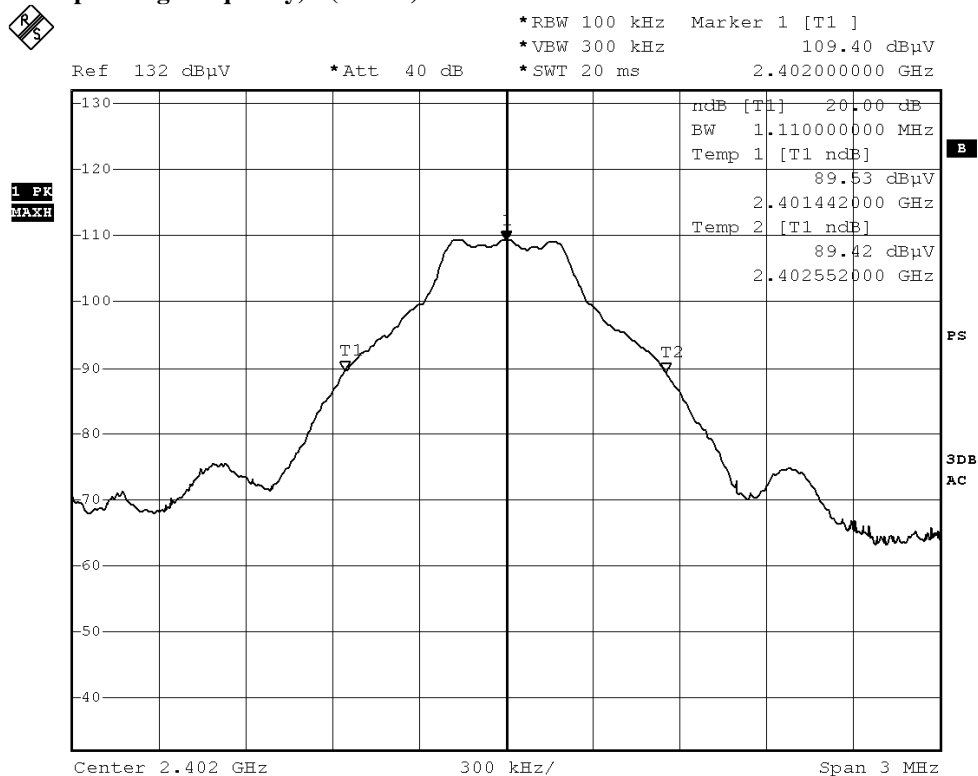
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.110	Within 2400-2483.5

(Lowest Operating Frequency) - (GFSK)



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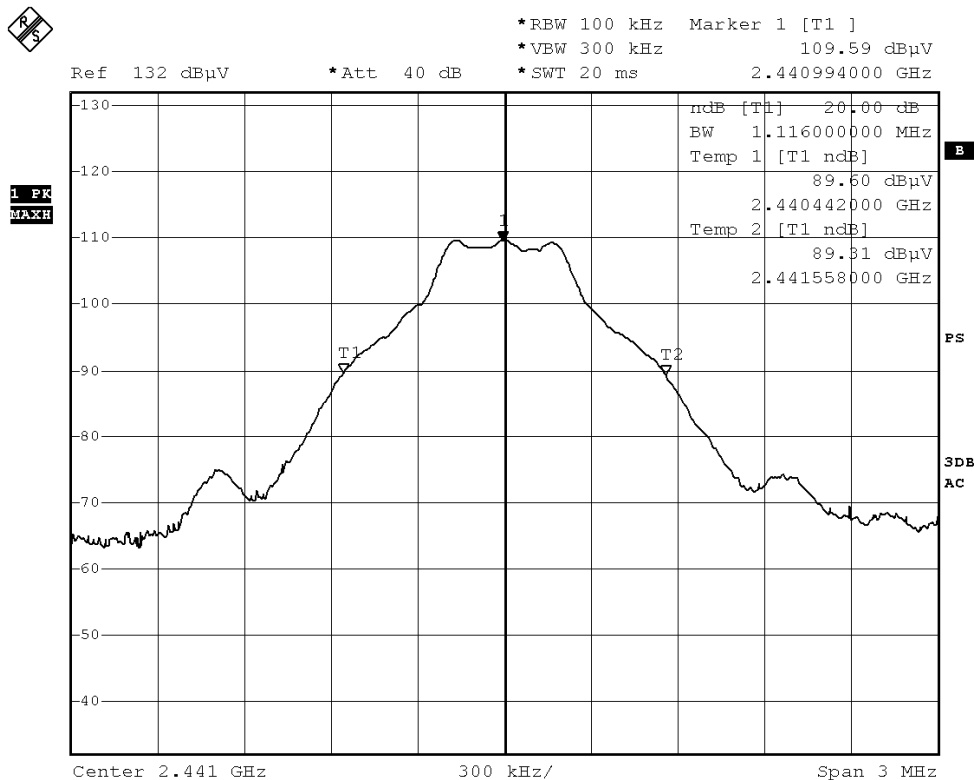
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.116	Within 2400-2483.5

(Middle Operating Frequency) - (GFSK)



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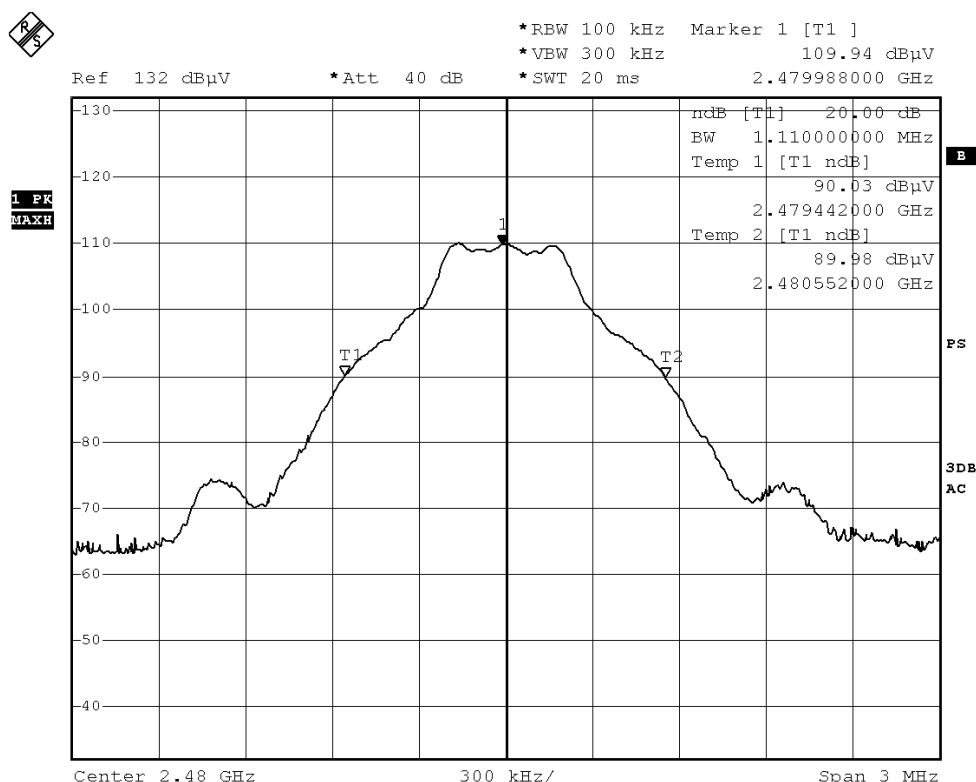
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	1.110	Within 2400-2483.5

(Highest Operating Frequency) - (GFSK)



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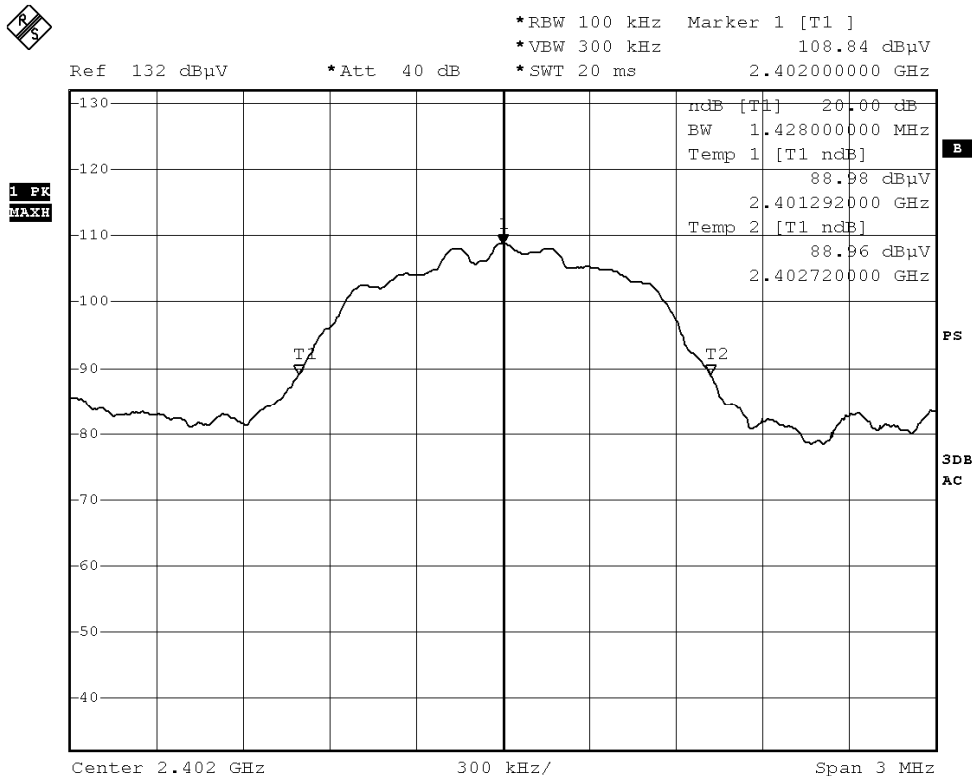
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.428	Within 2400-2483.5

(Lowest Operating Frequency) - ($\pi/4$ DQPSK)



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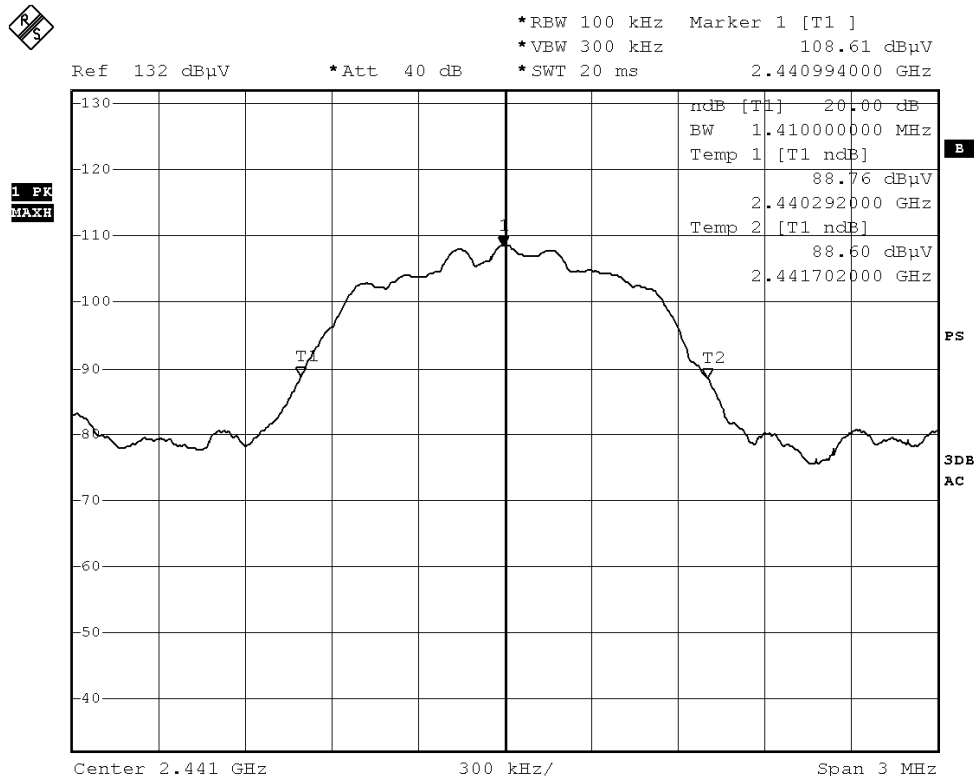
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.41	Within 2400-2483.5

(Middle Operating Frequency) - ($\pi/4$ DQPSK)



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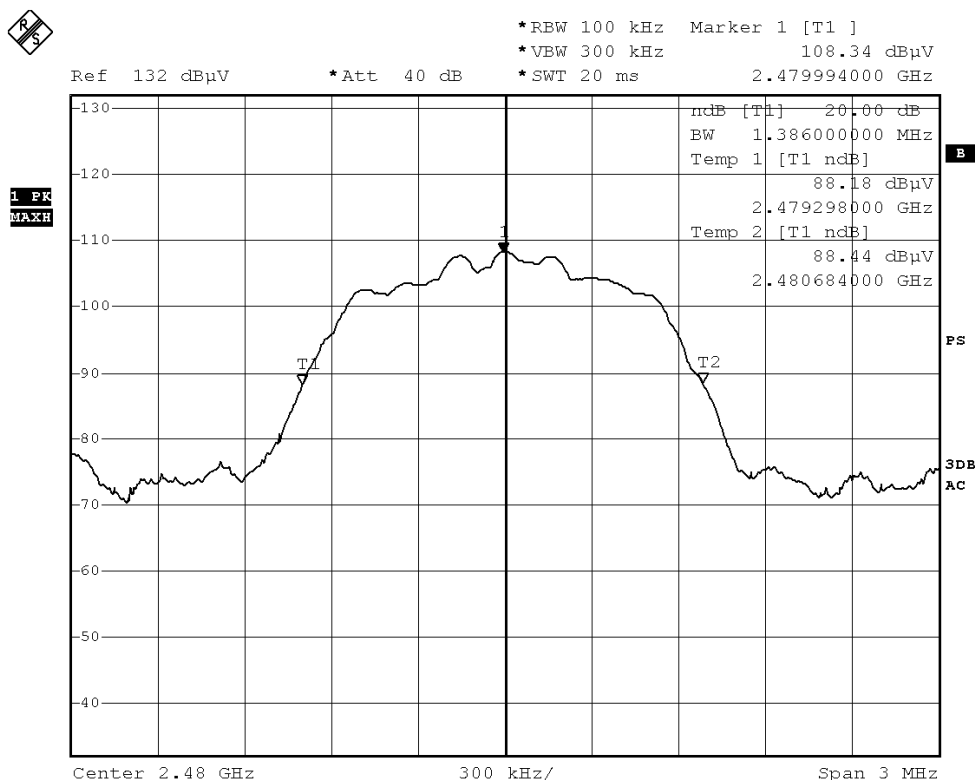
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	1.386	Within 2400-2483.5

(Highest Operating Frequency) - ($\pi/4$ DQPSK)



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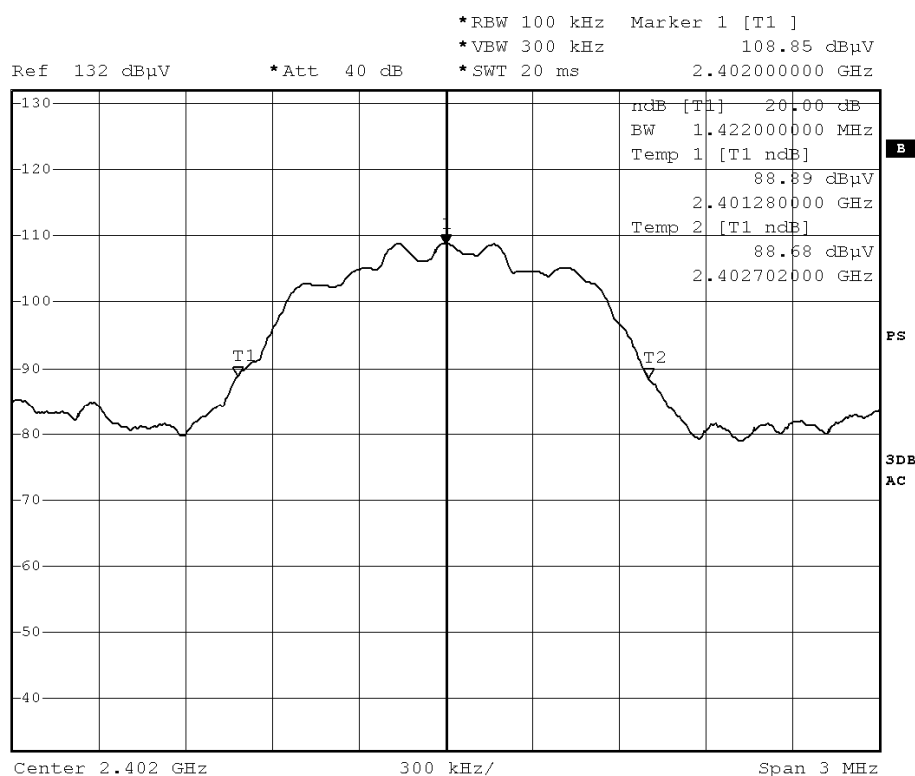
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.422	Within 2400-2483.5

(Lowest Operating Frequency) - (8DPSK)



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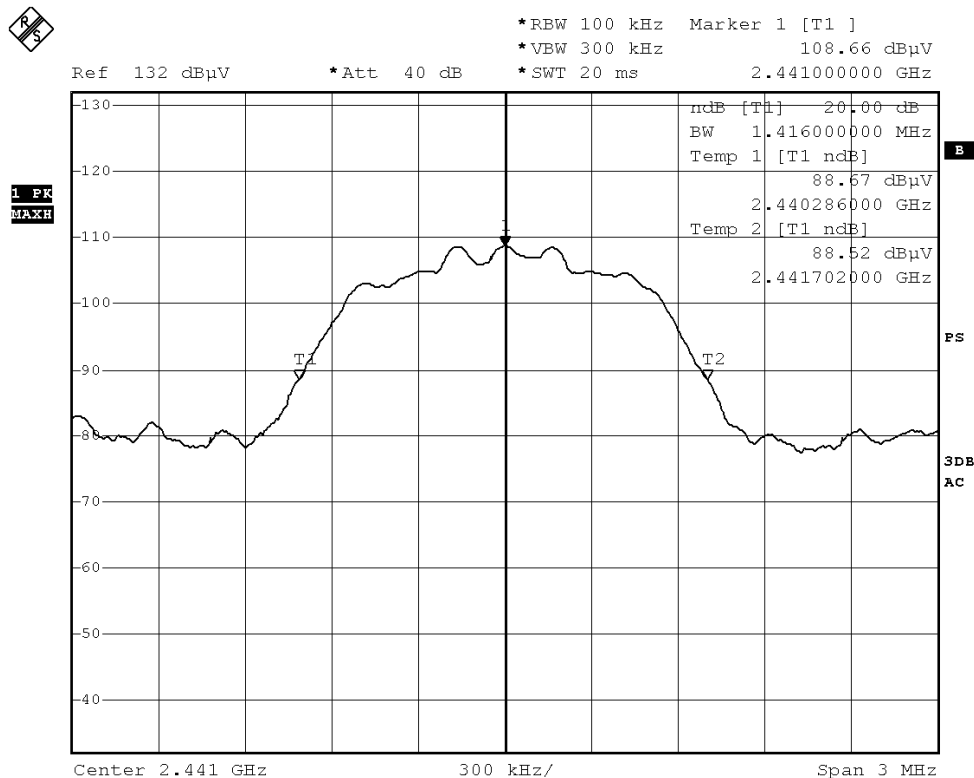
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.416	Within 2400-2483.5

(Middle Operating Frequency) - (8DPSK)



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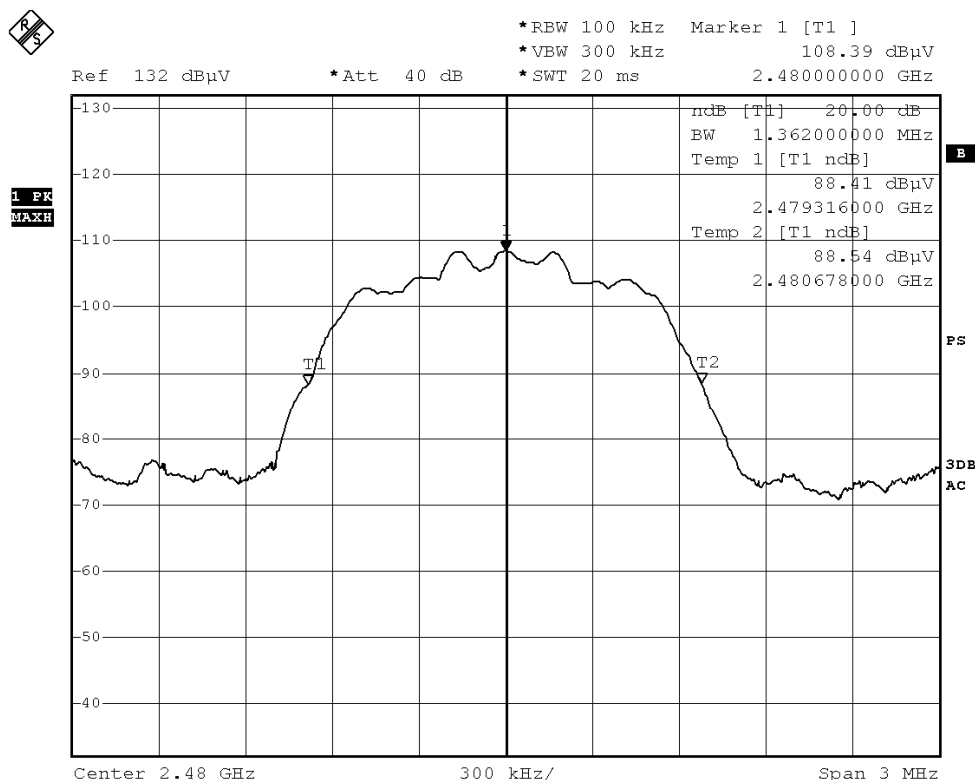
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	1.362	Within 2400-2483.5

(Highest Operating Frequency) - (8DPSK)



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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 = 1.428MHz * 2/3 = 952kHz



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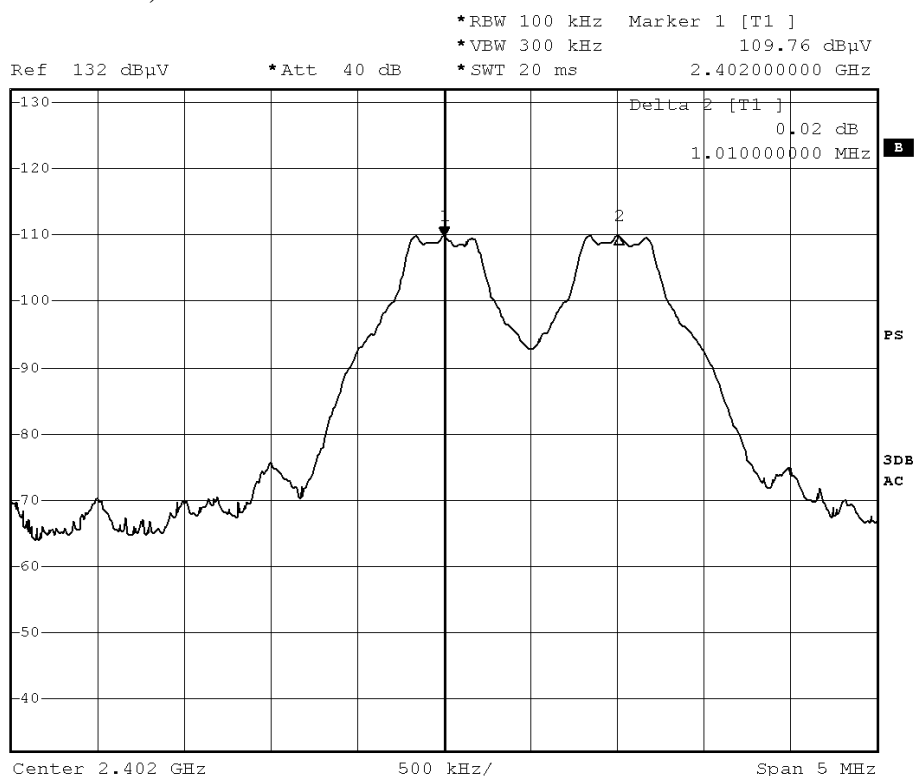
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Channel separation = 1MHz (>952kHz) (GFSK)

Channel 0 – Channel 1, Pass



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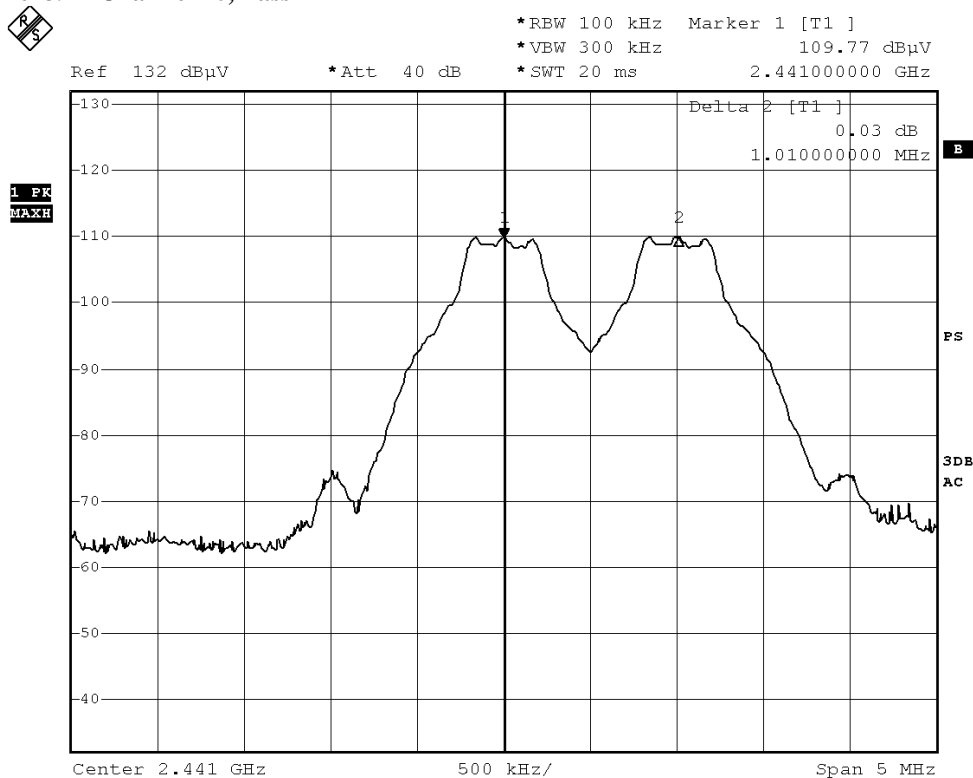
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Channel 39 – Channel 40, Pass



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Channel 78 – Channel 79, Pass

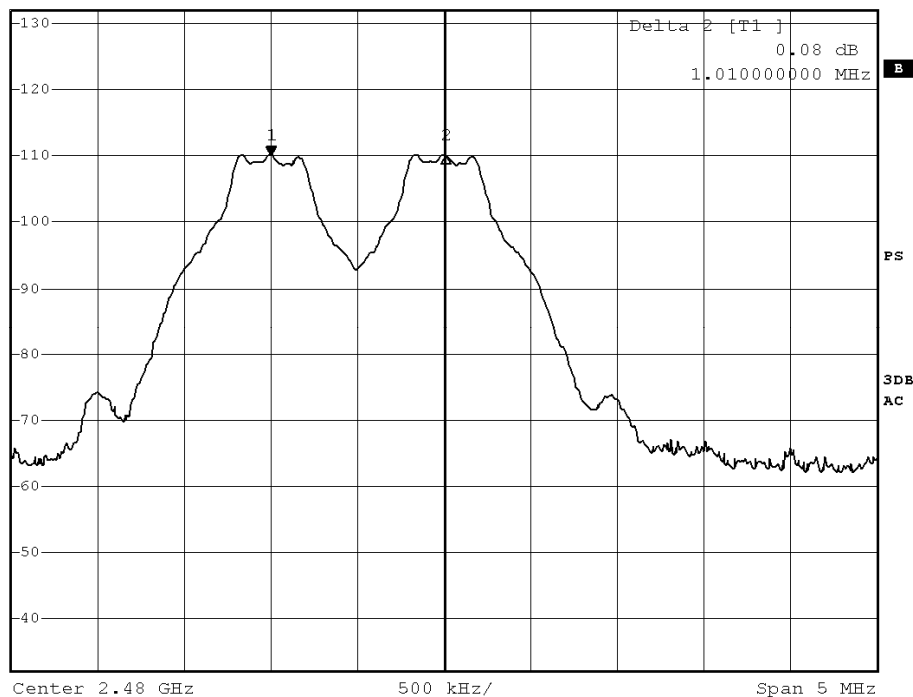


*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz 110.06 dBμV
*SWT 20 ms 2.479000000 GHz

Ref 132 dBμV

*Att 40 dB

2.479000000 GHz



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Channel separation = 1MHz (>952kHz) ($\pi/4$ DQPSK)

Channel 0 – Channel 1, Pass

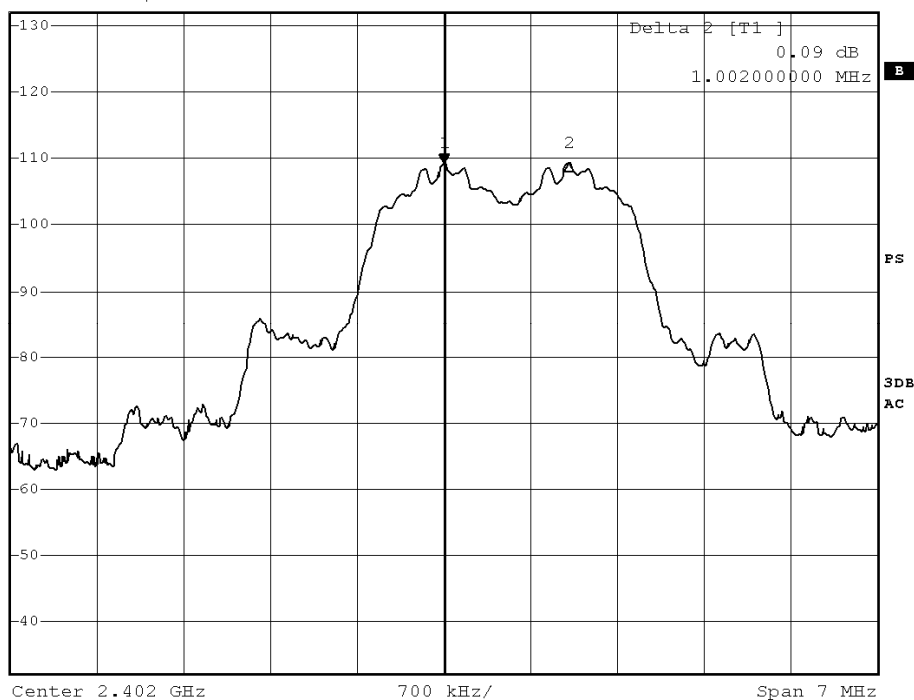


*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz 109.19 dBμV
*SWT 20 ms 2.402000000 GHz

Ref 132 dBμV

*Att 40 dB

2.402000000 GHz



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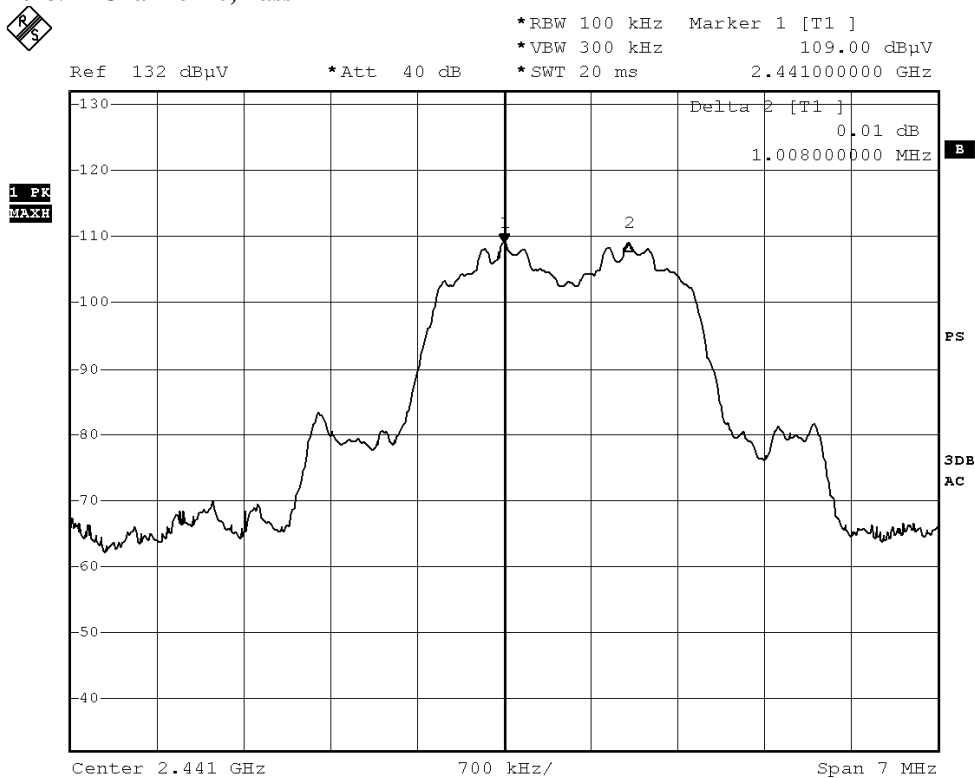
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Channel 39 – Channel 40, Pass



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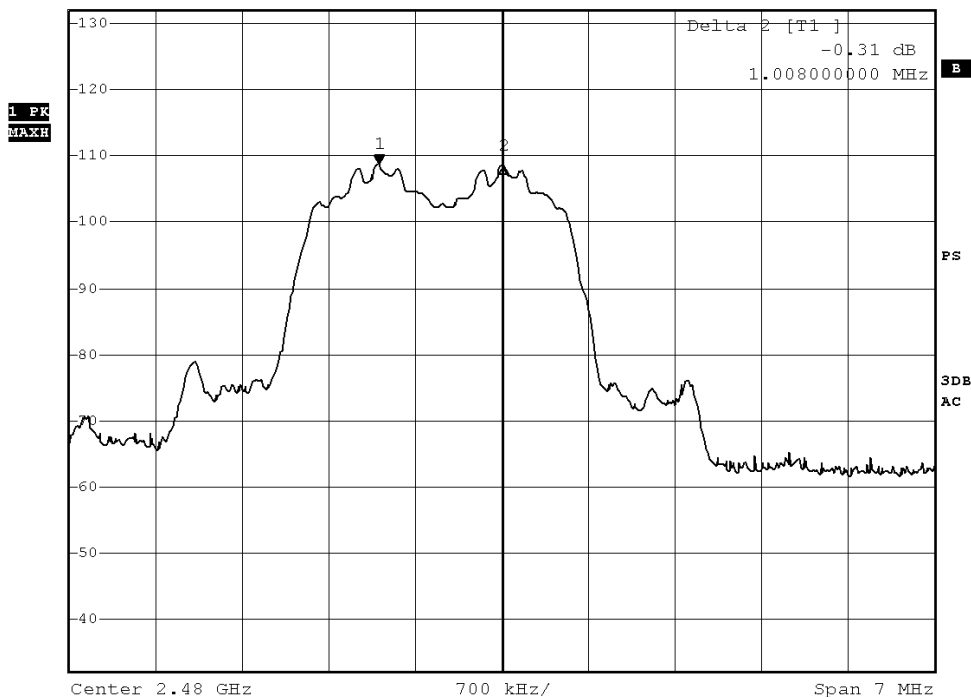
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Channel 78 – Channel 79, Pass



Ref 132 dBμV *Att 40 dB *RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz 108.75 dBμV
*SWT 20 ms 2.479006000 GHz



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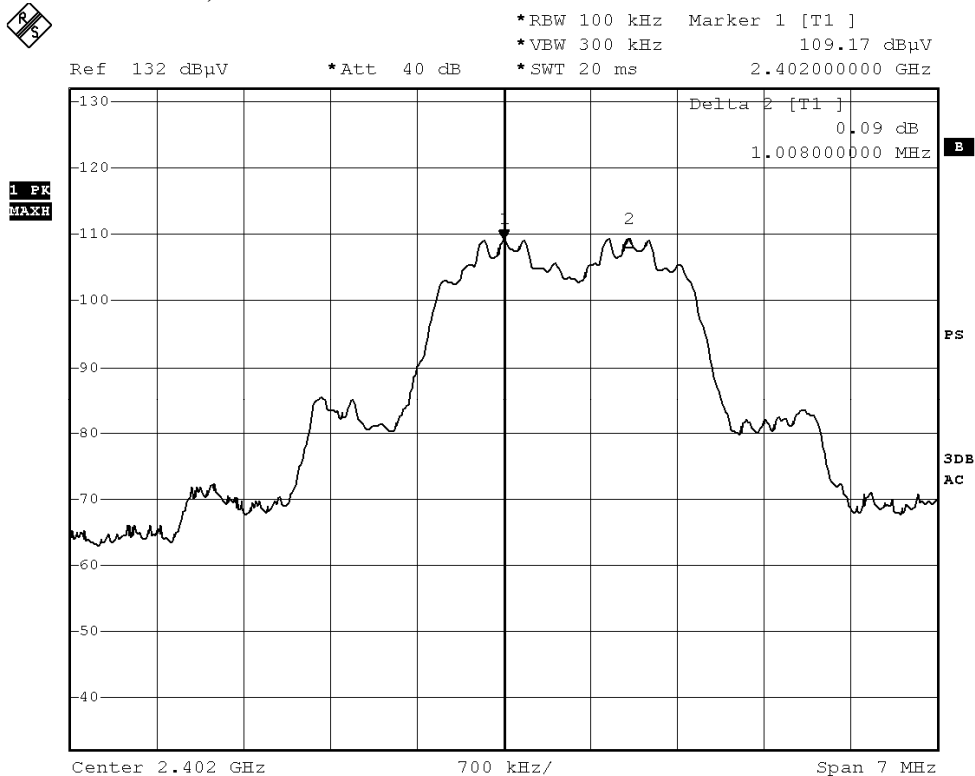
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Channel separation = 1MHz (>952kHz) (8DPSK)

Channel 0 – Channel 1, Pass



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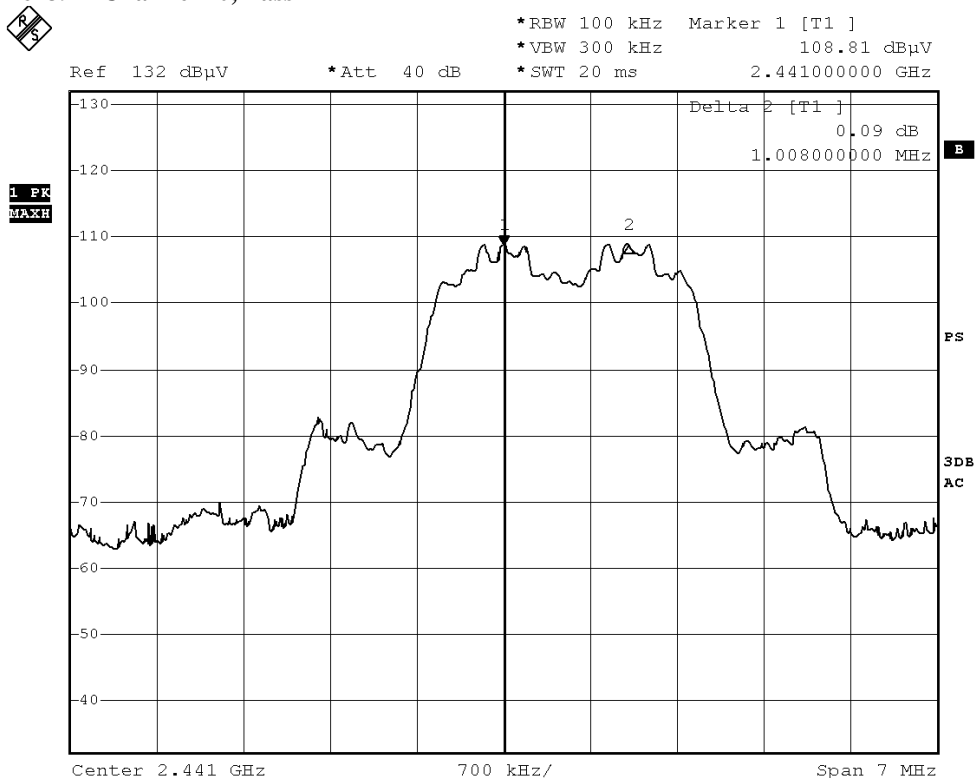
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Channel 39 – Channel 40, Pass



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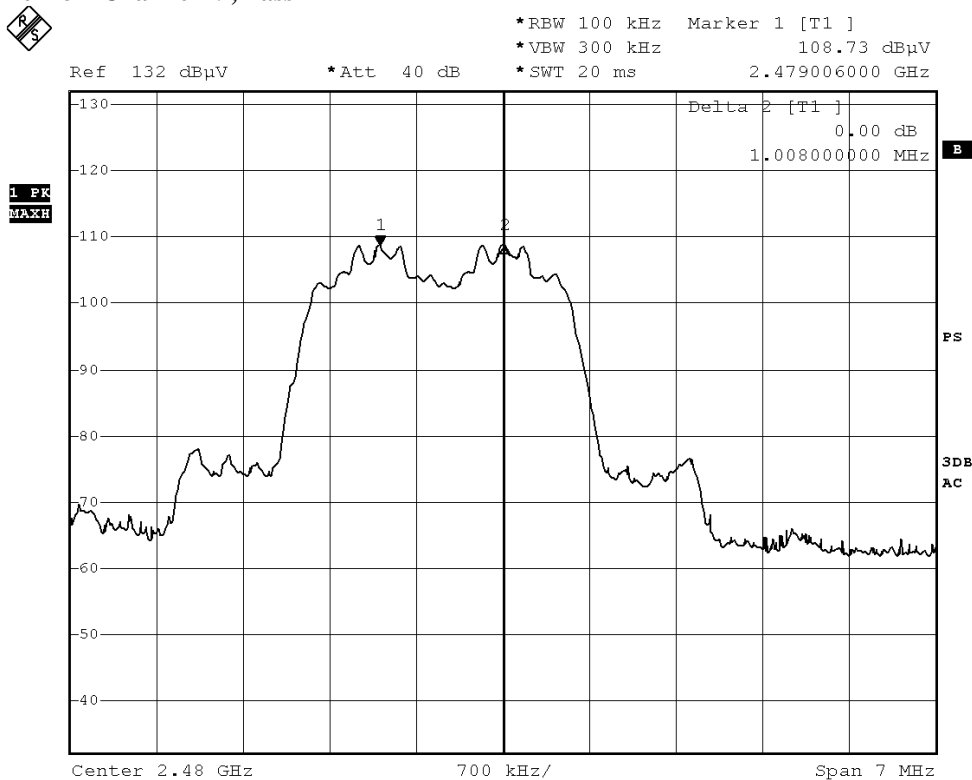
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Channel 78 – Channel 79, Pass



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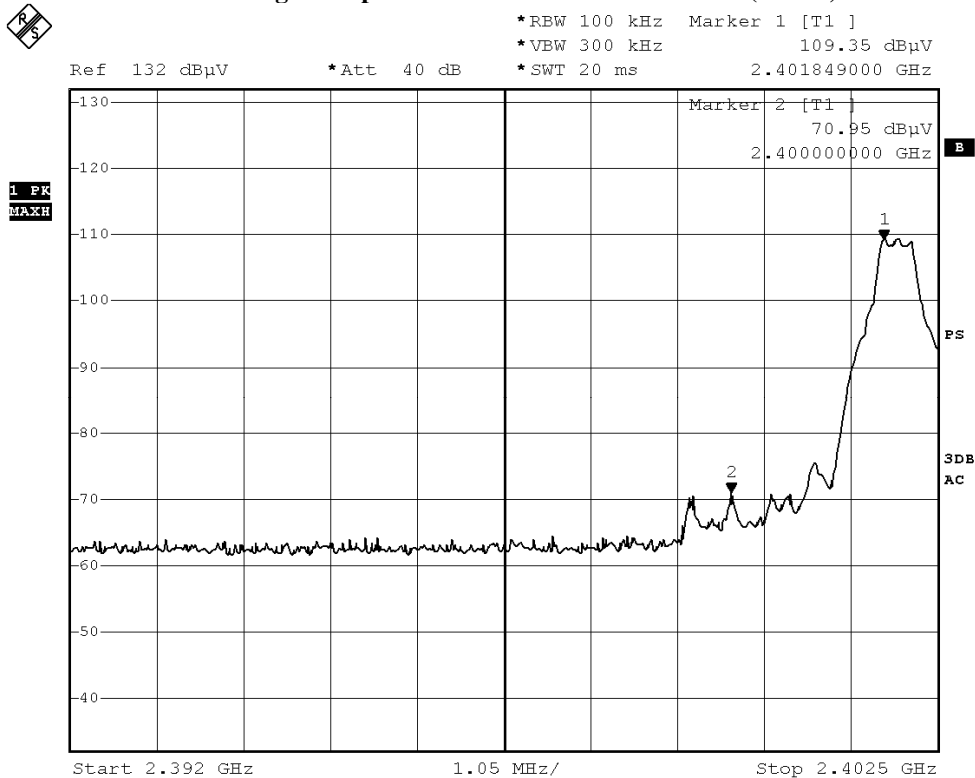
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Band-edge Compliance of RF Emissions – Lowest (GFSK)



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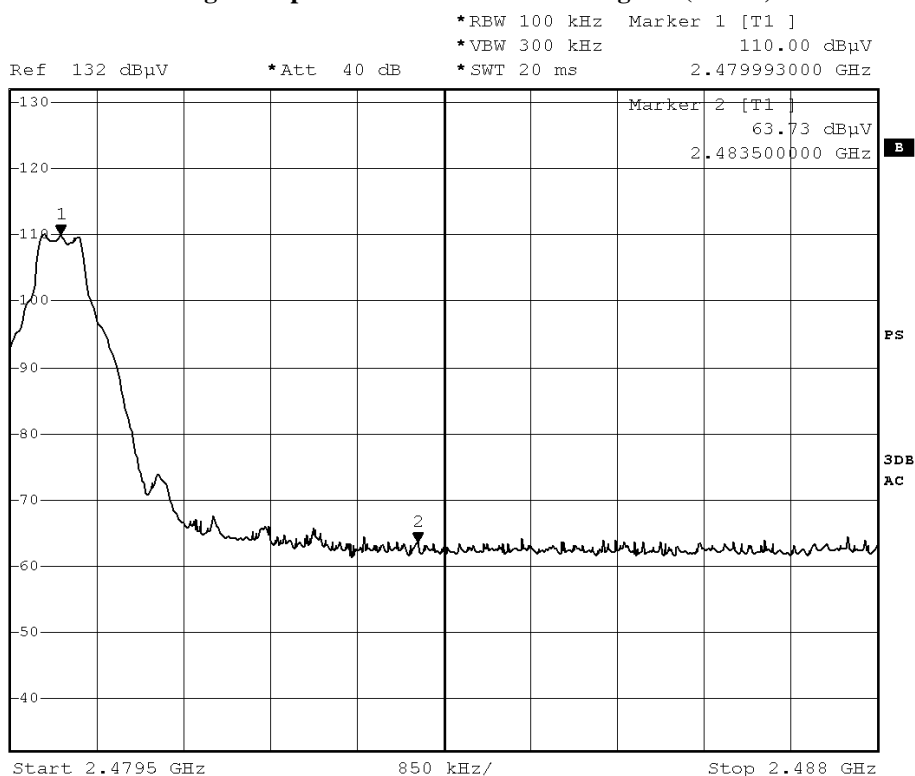
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Band-edge Compliance of RF Emissions – Highest (GFSK)



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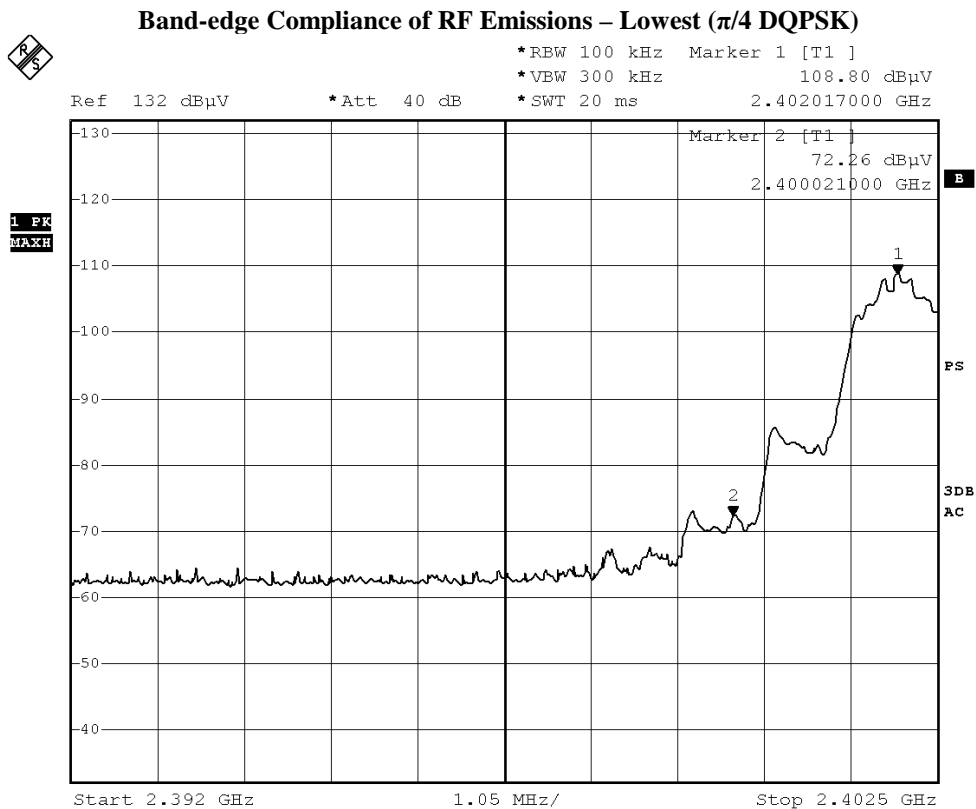


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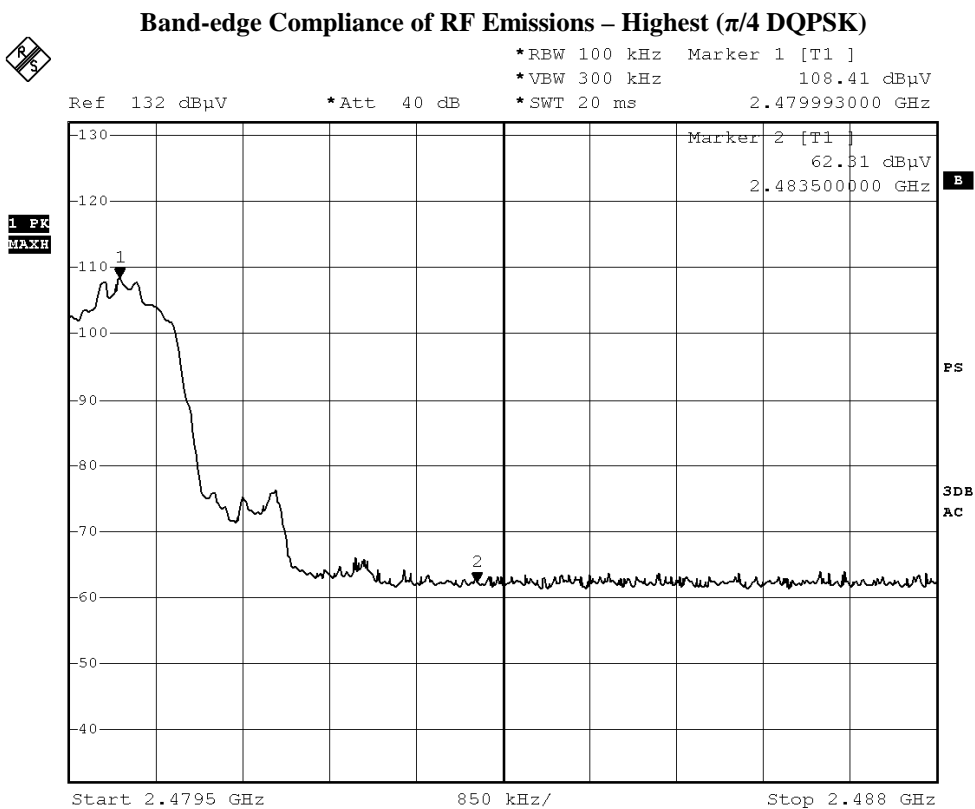


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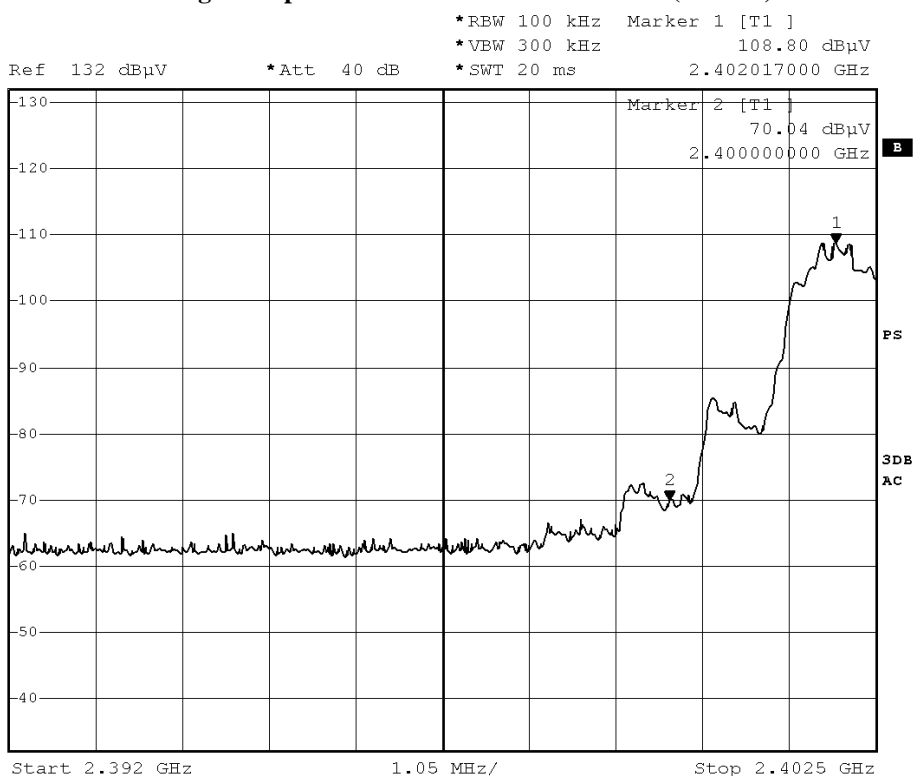
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Band-edge Compliance of RF Emissions – Lowest (8DPSK)



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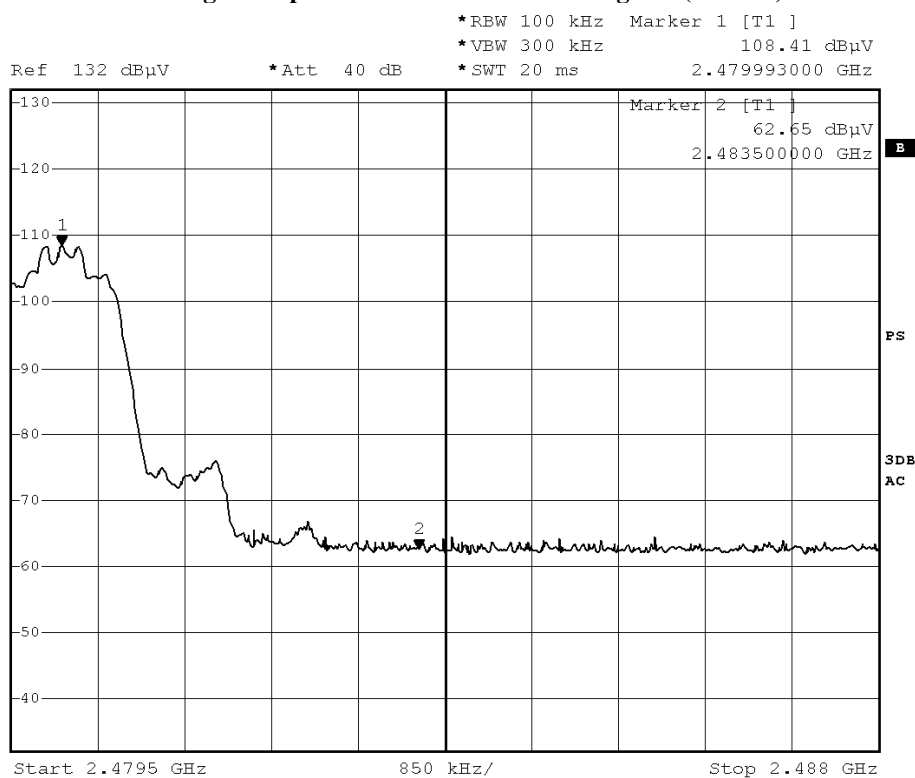
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Band-edge Compliance of RF Emissions – Highest (8DPSK)



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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 [Inverted-F Antenna (PCB layout)] which is permanently attached to the main unit and attached on PCB board, the antenna gain = 0dBi. 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 (Dwell time)

Requirements:

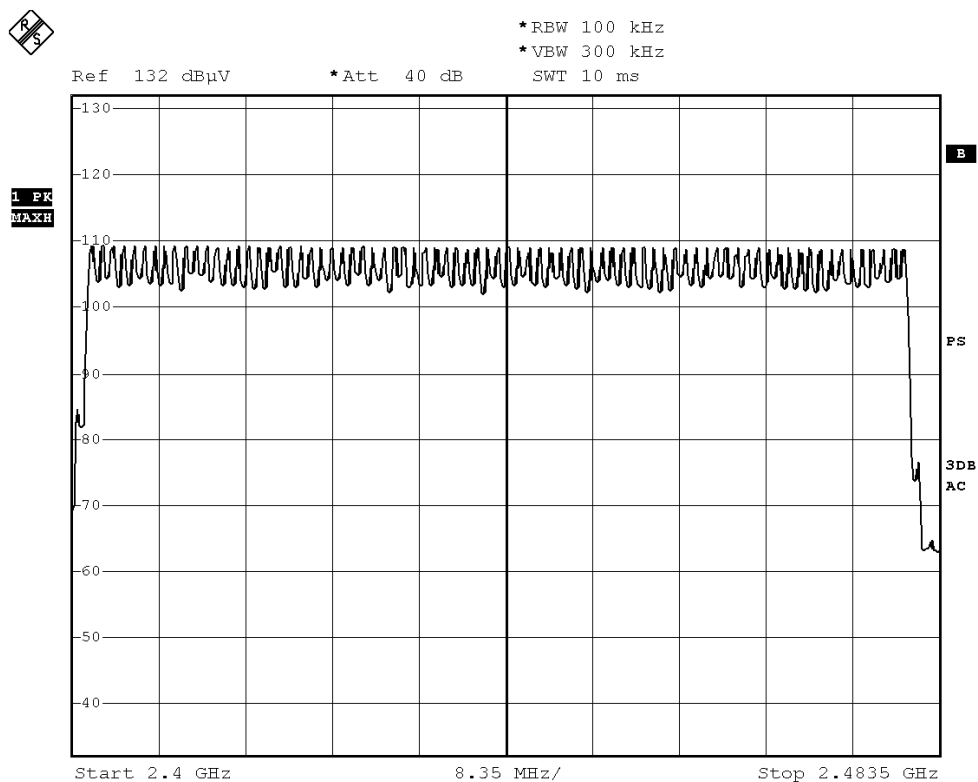
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channel employed.
No requirements for Digital Transmission System.

Dwell Time = Pulse Duration * hop rate / number of channel * observation duration

Observed duration: 0.4s x 79 = 31.6s

Measurement Data:

Channel Occupied in 8DPSK: 79 of 79 Channel



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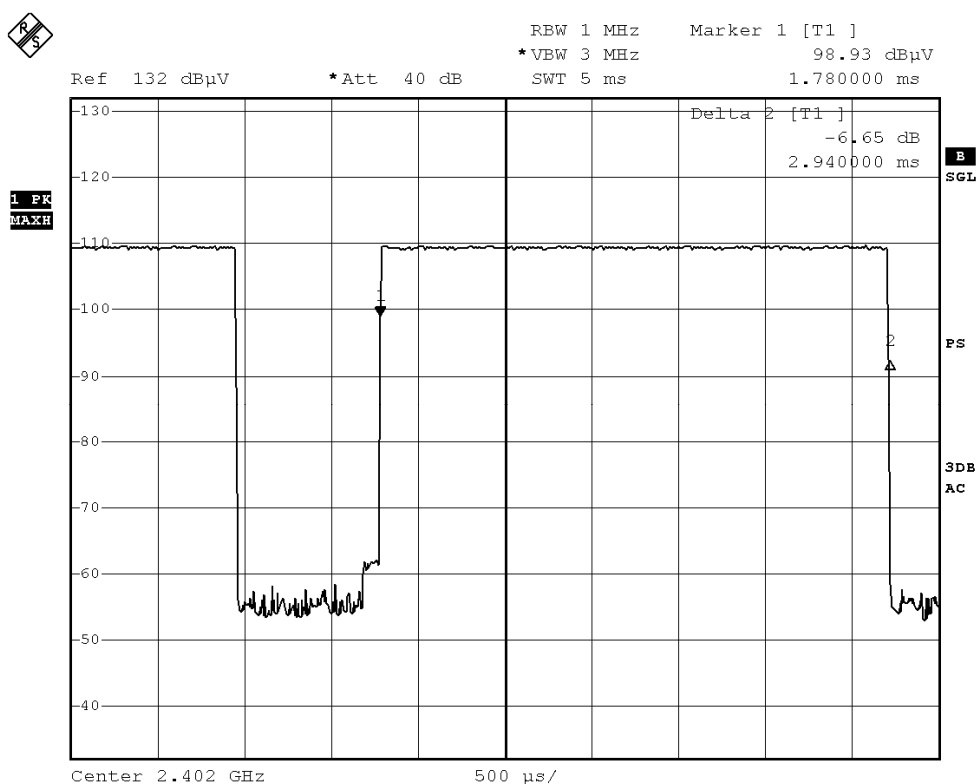
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DH5 Packet:

DH5 Packet permit maximum $1600/79/6 = 3.37$ hops per second in each channel (5 time slots RX, 1 time slot TX). The Dwell time is the time duration of the pulse times $3.37 \times 31.6 = 106.6$ within 31.6 seconds

Fig. A
[Pulse duration of Lowest Channel]



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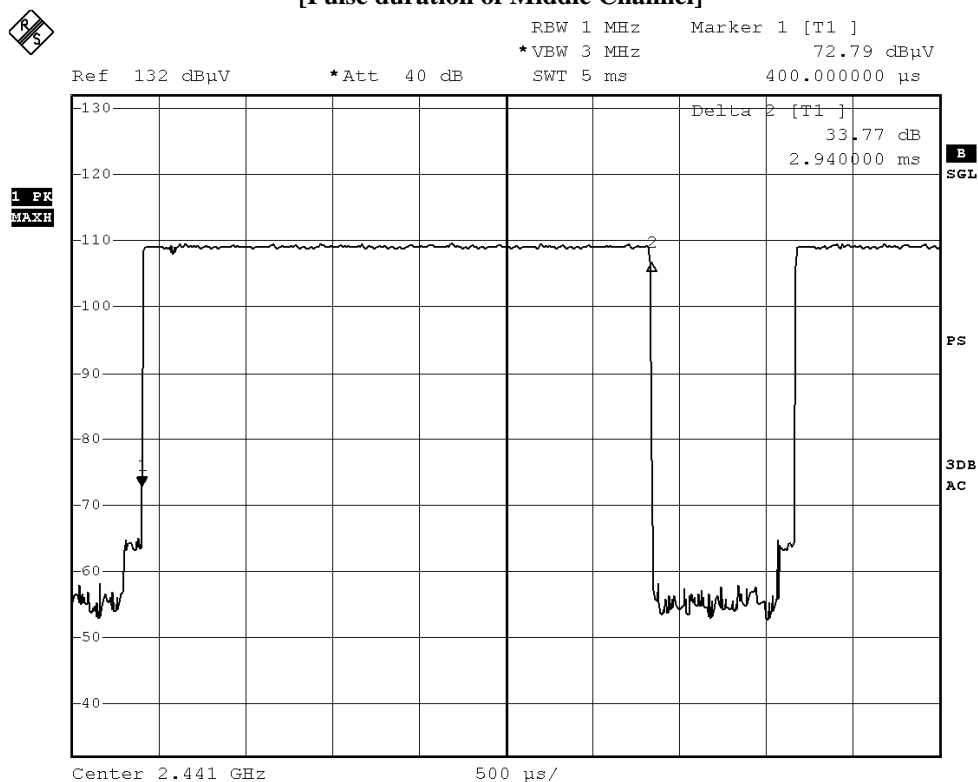
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Fig. B
[Pulse duration of Middle Channel]



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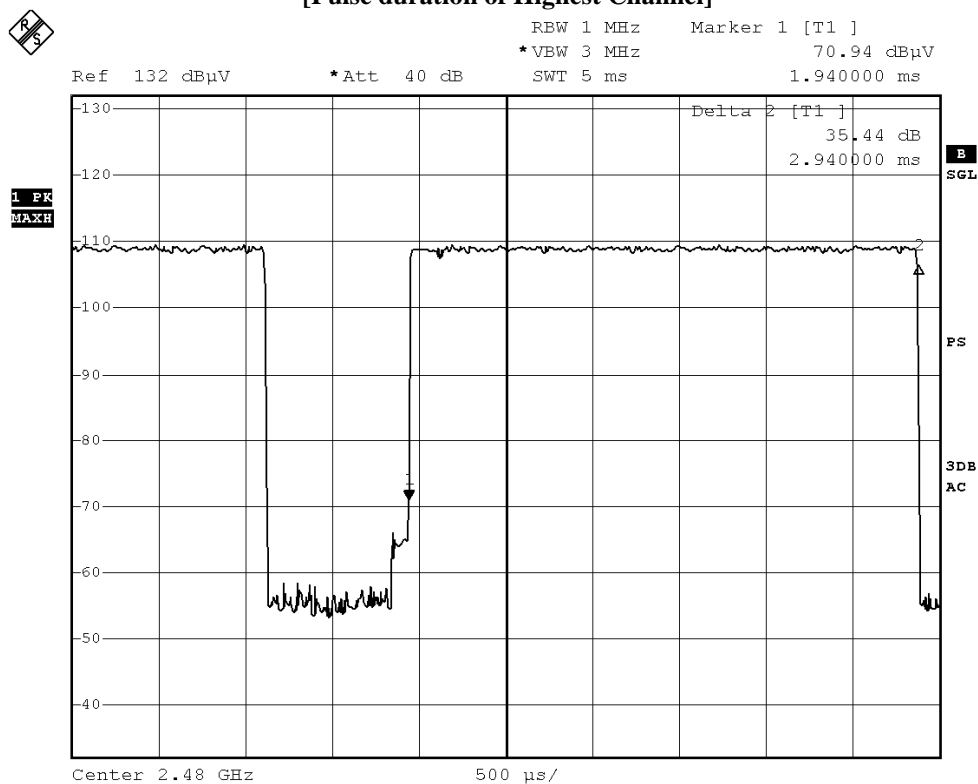
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Fig. C
[Pulse duration of Highest Channel]



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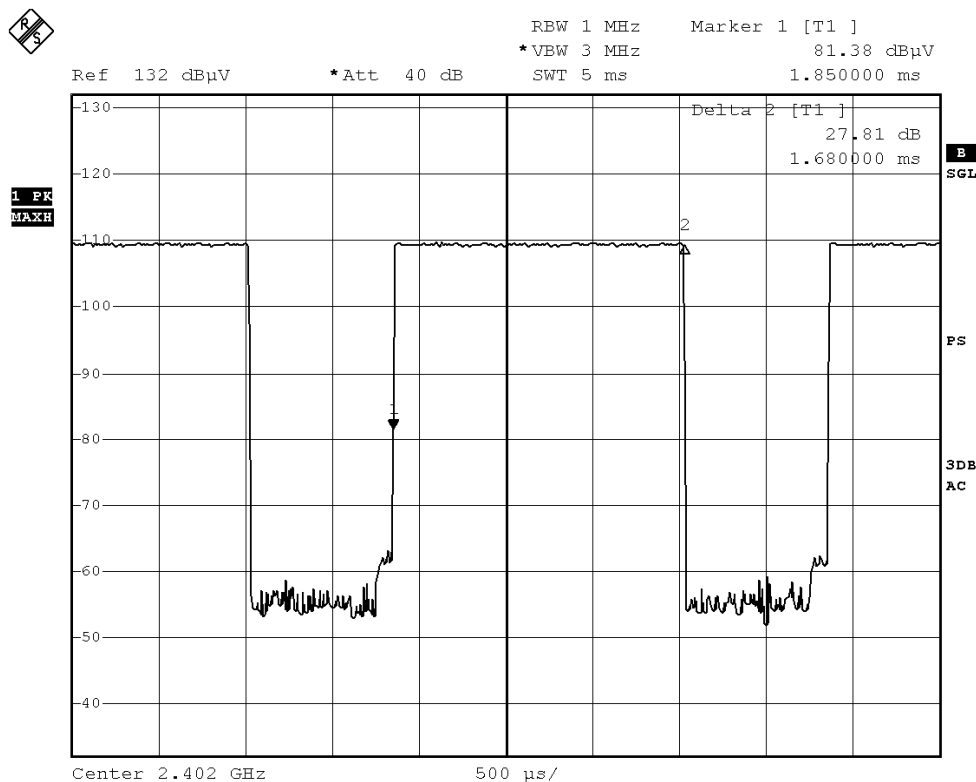
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DH3 Packet:

DH3 Packet permit maximum $1600/79/4 = 5.06$ hops per second in each channel (3 time slots RX, 1 time slot TX). The Dwell time is the time duration of the pulse times $5.06 \times 31.6 = 160$ within 31.6 seconds

Fig. D
[Pulse duration of Lowest Channel]



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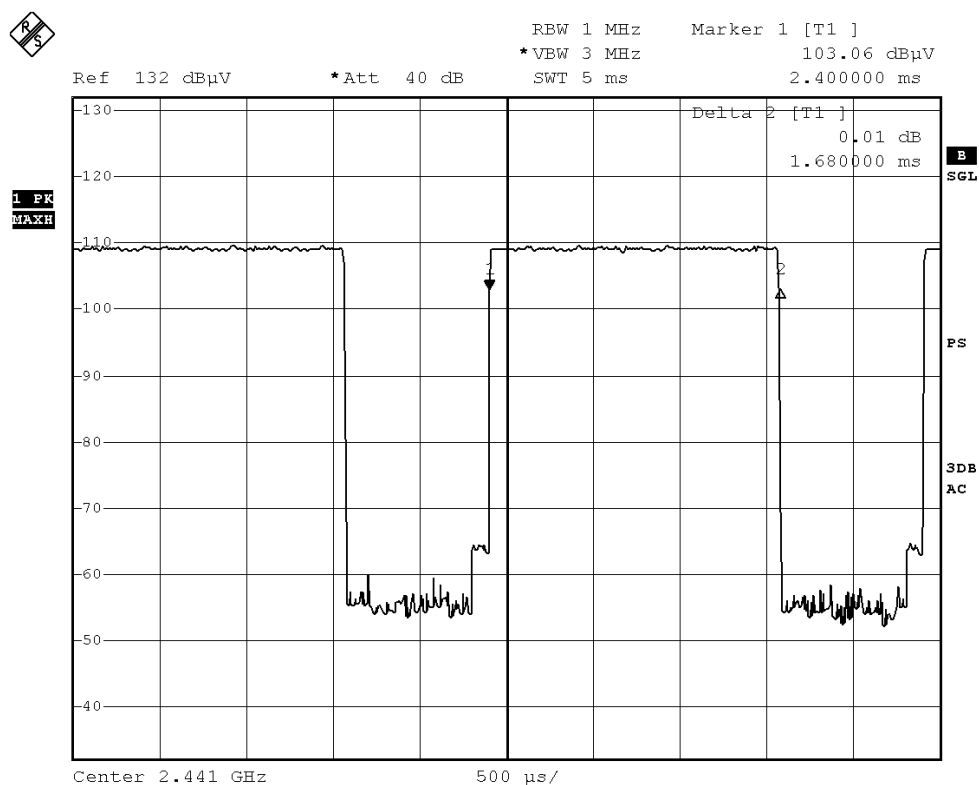
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Fig. E
[Pulse duration of Middle Channel]



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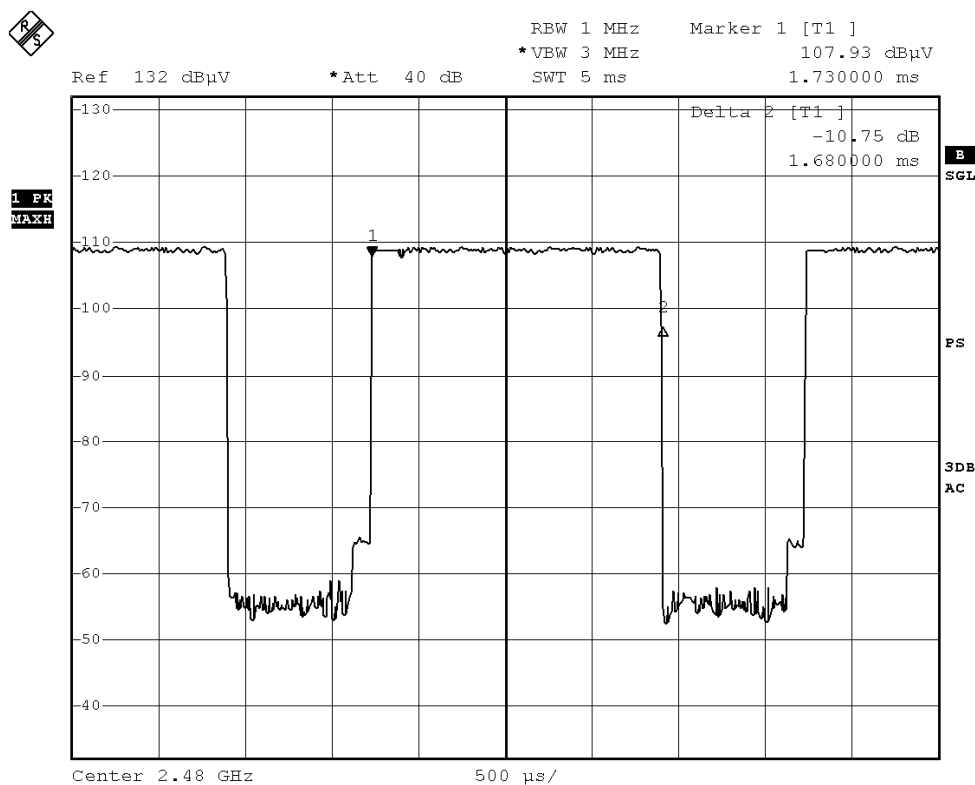
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Fig. F
[Pulse duration of Highest Channel]



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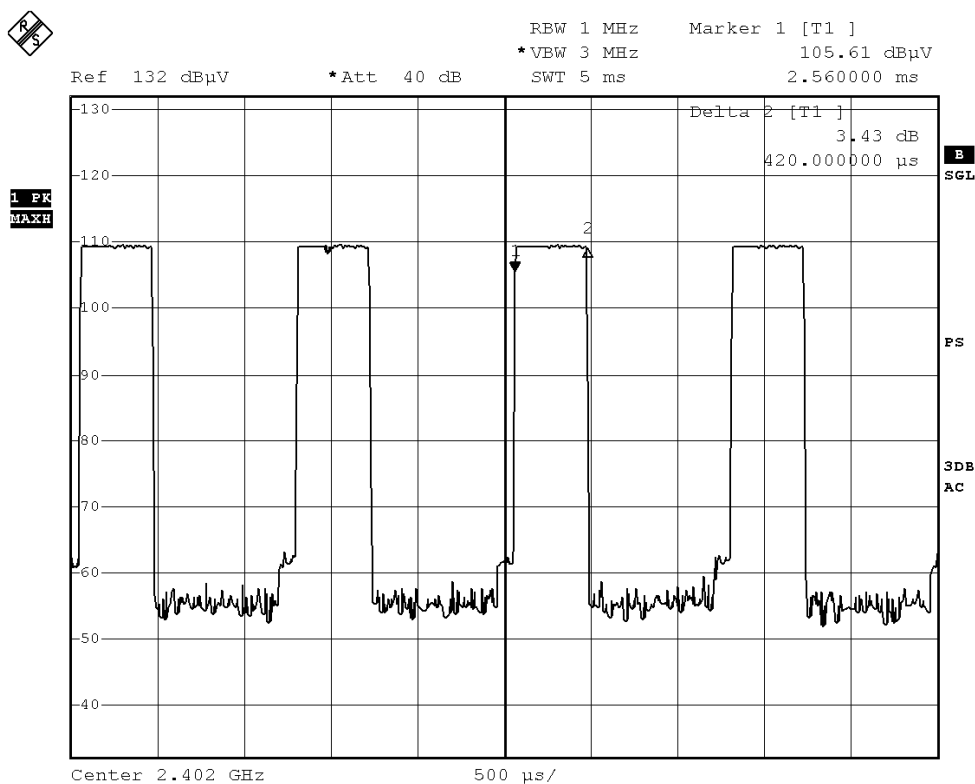
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DH1 Packet:

DH1 Packet permit maximum $1600/79/2 = 10.12$ hops per second in each channel (3 time slots RX, 1 time slot TX). The Dwell time is the time duration of the pulse times $10.12 \times 31.6 = 320$ within 31.6 seconds

Fig. G
[Pulse duration of Lowest Channel]



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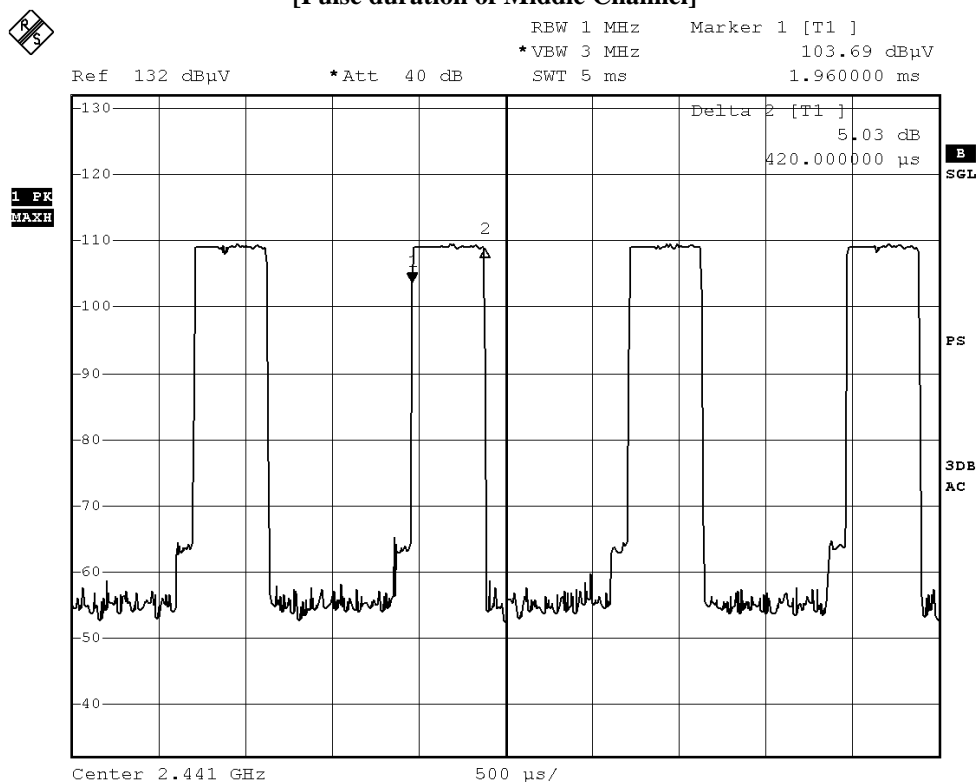
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Fig. H
[Pulse duration of Middle Channel]



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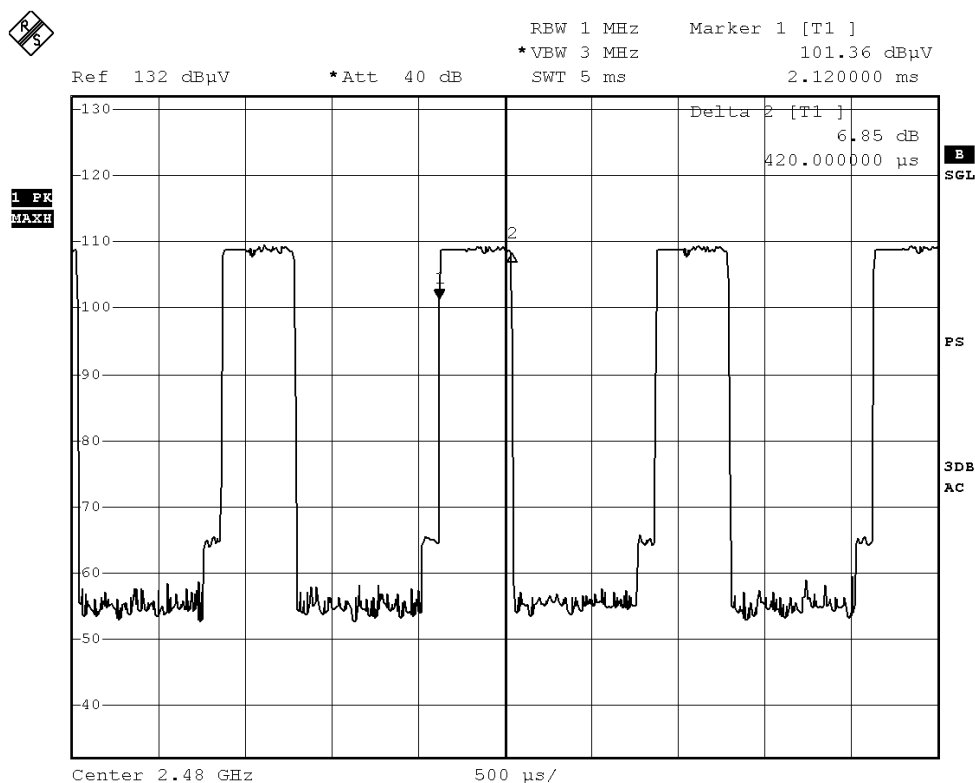
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Fig. I
[Pulse duration of Highest Channel]



Time of occupancy (Dwell Time):

Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)	Test Results
DH5	2402	2.940	0.313	0.400	Complies
DH5	2441	2.940	0.313	0.400	Complies
DH5	2480	2.940	0.313	0.400	Complies
DH3	2402	1.680	0.269	0.400	Complies
DH3	2441	1.680	0.269	0.400	Complies
DH3	2480	1.680	0.269	0.400	Complies
DH1	2402	0.420	0.135	0.400	Complies
DH1	2441	0.420	0.135	0.400	Complies
DH1	2480	0.420	0.135	0.400	Complies

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Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EMD015	Signal Generator	MARCONI INSTRUMENTS	2030	112191/012	2013.03.15	2014.03.15
EMD036	EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	100388	2012.07.06	2013.07.06
EMD061	Biconilog Antenna	ETS.LINDGREN	3142C	00060439	2012.11.03	2014.11.03
EMD062	Double-Ridged Waveguide (1GHz – 18GHz)	ETS.LINDGREN	3117	00075933	2012.11.28	2014.11.28
EMD084	MULTI-DVICE CONTROLLER	ETS.LINDGREN	2090	00060107	N/A	N/A
EMD088	Video Contol Unit	ETS.LINDGREN	Y21953A	2601073	N/A	N/A
EMD093	Monitor	ViewSonic	VA9036	Q8X064201876	N/A	N/A
EMD102	Intelligent Frequency	Ainuo Instrument Co., Ltd	AN97005SS	79707454	N/A	N/A
EMD105	FACT-3 EMC Chamber	ETS.LINDGREN	FACT-3	3803	N/A	N/A
EMD124	Loop Antenna	ETS-Lindgren	6502	00104905	2012.03.26	2014.03.26
EMD131	Standard Gain Horn Antenna (18GHz – 26.5GHz)	Chengdu AINFO Inc.	JTXSLB-42-15-C-KF	J2021100721001	2013.01.25	2015.01.25

Conducted Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EMD003	IMPULSEGRENZER PULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	100071	2013.03.15	2014.03.15
EMD004	ZWEILEITER-V-NETZNACHBILDUNG TWO-LINE V-NETWORK	ROHDE & SCHWARZ	ESH3-Z5	100102	2013.03.15	2014.03.15
EMD022	EMI Test Receiver	ROHDE & SCHWARZ	ESCS 30	100314	2013.03.15	2014.03.15
EMD103	Intelligent Frequency	Ainuo Instrument Co., Ltd	AN97005SS	79707455	N/A	N/A
EMD106	Shielding Room #1	ETS.LINDGREN	RFD-100	3802	N/A	N/A

Remarks:-

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

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Appendix B

Ancillary Equipment

ITEM NO.	DESCRIPTION	MODEL NO.	FCC ID	REMARK
1	DELL COMPUTER	DMC	N/A	N/A
2	DELL MONITOR	E551C	ARSCM356N	RESOLUTION:800x600(DURING TESTING) 1.0M UNSHIEDED POWER CORD CONNECTED TO THE COMPUTER 2.8M SHIEDED CABLE CONNECTED TO THE COMPUTER
3	DELL KEYBOARD	SK-8110	N/A	1.8M SHIEDED COILED CABLE CONNECTED TO THE COMPUTER
4	DELL MOUSE	N/A	N/A	2.4M UNSHIEDED CABLE CONNECTED TO THE COMPUTER
5	LASER PRINTER	HP LaserJet 1020 Plus	N/A	1.8M UNSHIEDED POWER CORD 2.8M SHIEDED CABLE (BUNDLED TO 1M) CONNECTED TO THE COMPUTER
6	iPod Touch	A1367	BCG-E2407	N/A
7	Imation USB Flash drive	N/A	N/A	8GB

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Appendix C

Photographs of EUT

Front View of the product



Rear View of the product



Front View of the product



Front View of the product



IR remote - Front View of the product



IR remote - Rear View of the product



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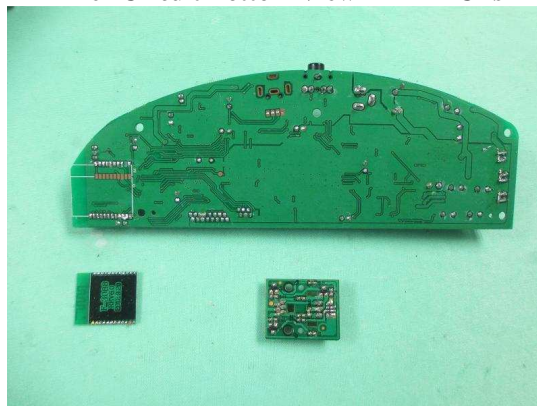
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Photographs of EUT

Inner Circuit Top View – All PCBs



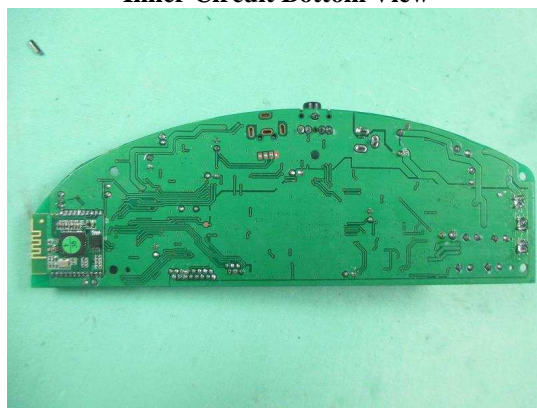
Inner Circuit Bottom View - - All PCBs



Inner Circuit Top View



Inner Circuit Bottom View



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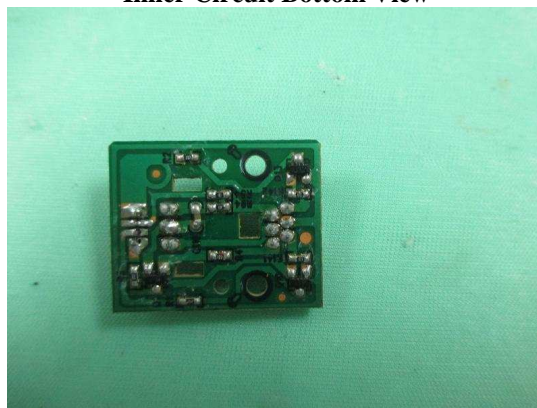
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Photographs of EUT

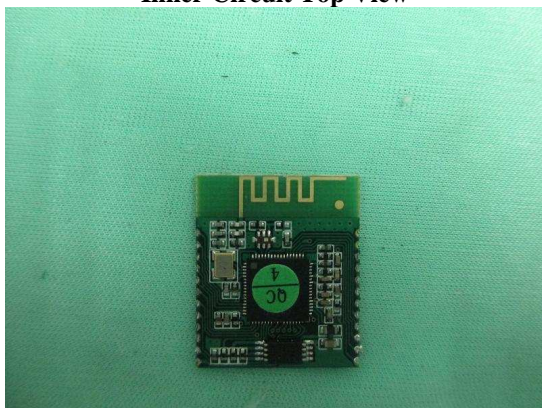
Inner Circuit Top View



Inner Circuit Bottom View



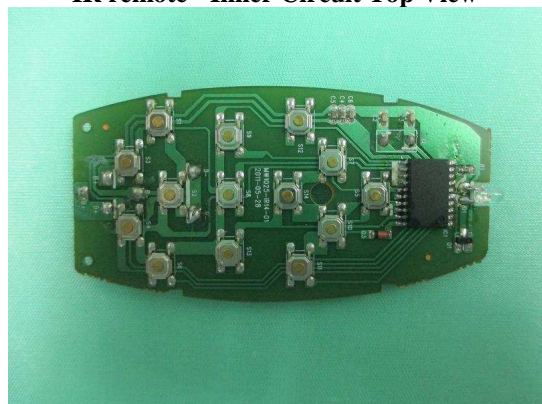
Inner Circuit Top View



Inner Circuit Bottom View



IR remote - Inner Circuit Top View



IR remote - Inner Circuit Bottom View



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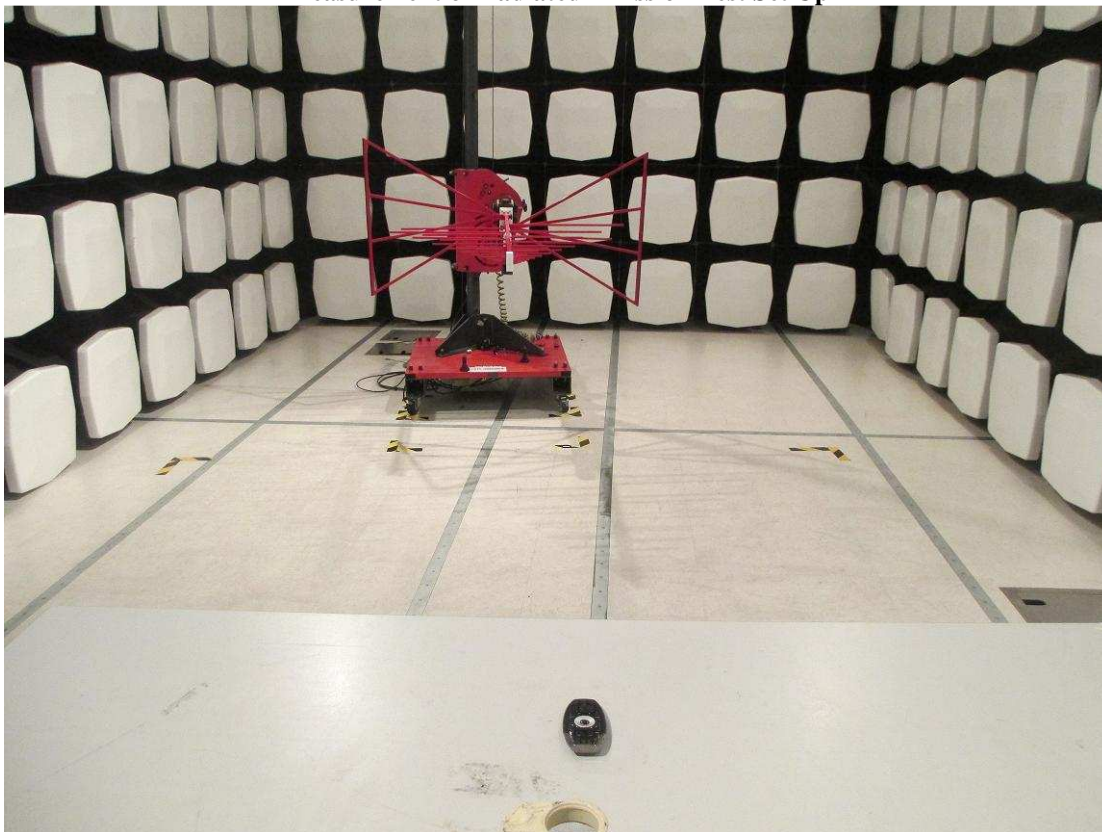
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Photographs of EUT

Measurement of Radiated Emission Test Set Up



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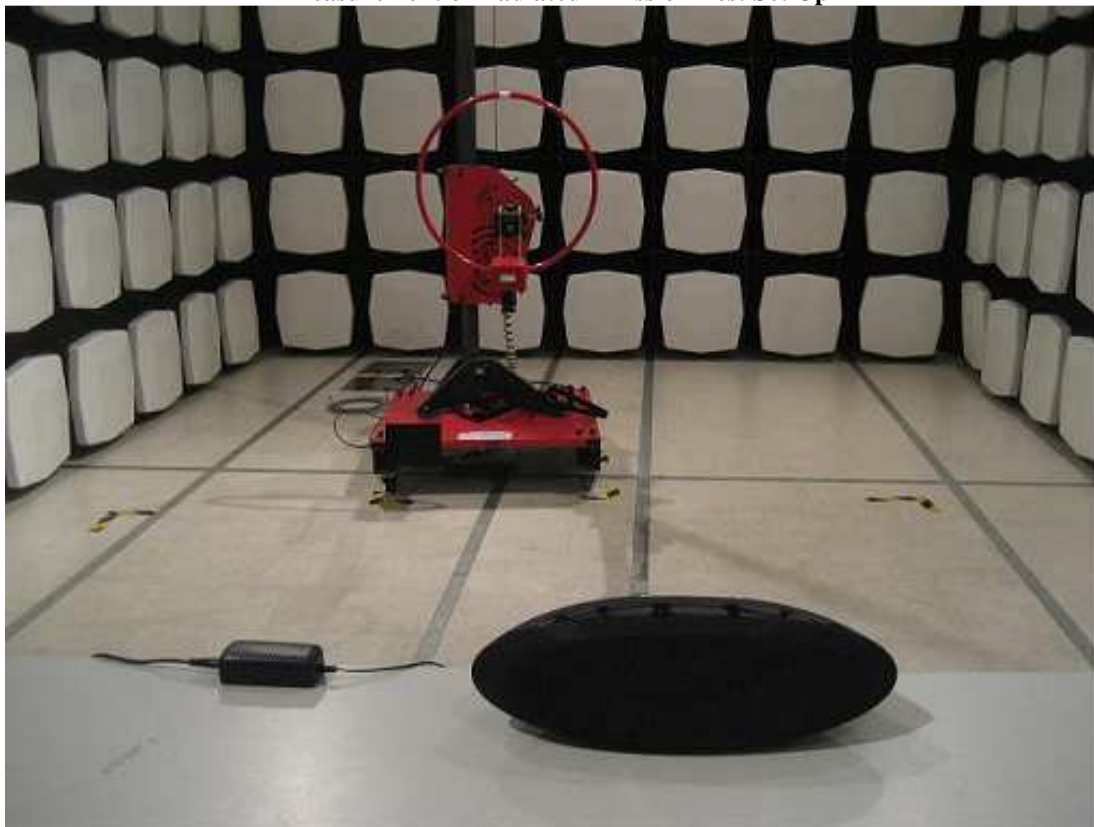
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Photographs of EUT

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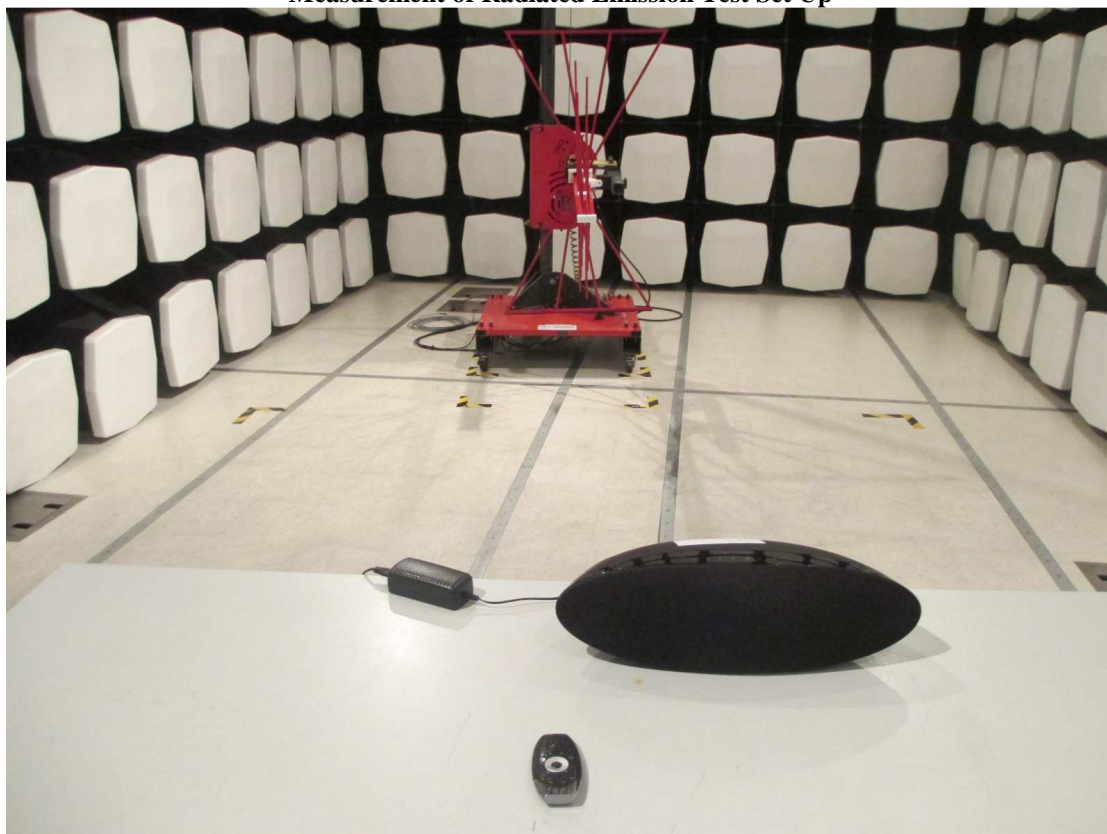
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Photographs of EUT

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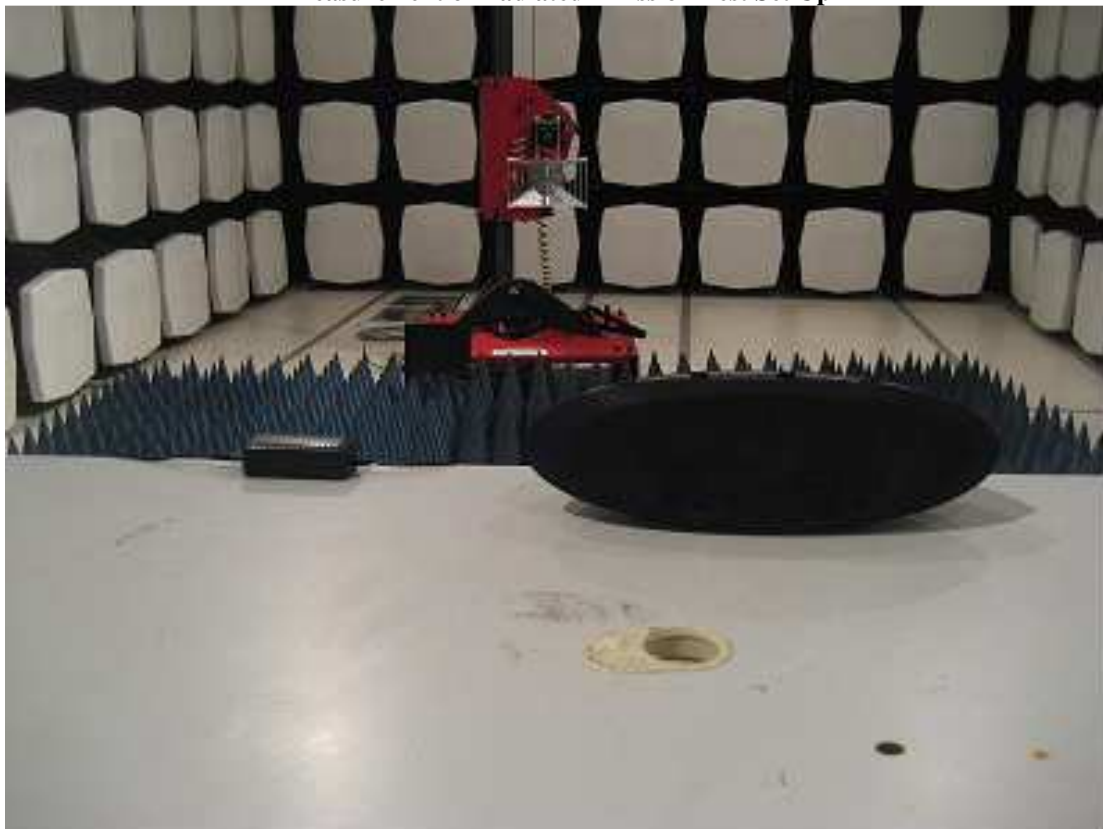
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Photographs of EUT

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Photographs of EUT

Measurement of Conducted Emission Test Set Up



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