STC Test Report

Date : 2015-07-21
No. : HM169818

Applicant	Heng Yu Electronic Manufacturing Co., Ltd. Room 1503-5, Nan Fung Commercial Centre, 19 Lam Lok Street, Kowloon Bay, Hong Kong.
Manufacturer:	Zhuhai Heng Yu New Technology Company Limited. Heng Ke Campus, Jin Hai Avenue, San Zao, Zhuhai, Guang Dong, P.R.C.: 8109040
Description of Sample(s):	Product: The Recreated Sinclair ZX Spectrum Brand Name: Elite Model No.: KYB-ZXSPECTRUMBT FCC ID: XENZXSPECTRUM
Date Sample(s) Received:	2015-05-07
Date Tested:	2015-05-21 to 2015-05-22
Investigation Requested:	Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2014 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):	---

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

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1.0 General Details

1.1 Test Laboratory

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

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

Product:	The Recreated Sinclair ZX Spectrum
Manufacturer:	Zhuhai Heng Yu New Technology Company Limited. Heng Ke Campus, Jin Hai Avenue, San Zao, Zhuhai, Guang Dong, P.R.C.: 8109040
Brand Name:	Elite
Model Number:	KYB-ZXSPECTRUMBT
Input Voltage:	5.0Vd.c. (powered by USB) 2.4Vd.c. (“AA” Size Rechargeable Battery x 2)

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is a bluetooth keyboard of Heng Yu Electronic Manufacturing Co., Ltd.. The RF signal was modulation by IC; and type of modulation use is frequency hopping spread spectrum Modulation.

1.3 Date of Order

2015-05-07

1.4 Submitted Sample(s):

1 Sample

1.5 Test Duration

2015-05-21 to 2015-05-22

1.6 Country of Origin

China

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1.7 RF Module Details

Module Model Number:	BM52HIDBR
Module FCC ID:	N/A
Module Transmission Type:	Bluetooth V3.0
Modulation:	FHSS (GFSK / π/4-DQPSK / 8DPSK)
Data Rates:	1MBps: GFSK
	2 MBps: π/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 antenna
Antenna Length:	30 mm
Antenna Gain:	-2dBi

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2.0 Technical Details

2.1 Investigations Requested

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2014 Regulations 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	☒	☐	☐
RF Conducted Spurious Emission*	FCC 47CFR 15.247(d)	N/A	N/A	☒	☐	☐
Radiated Spurious Emissions	FCC 47CFR 15.209	ANSI C63.4:2009	N/A	☒	☐	☐
AC Mains Conducted Emissions	FCC 47CFR 15.207	ANSI C63.4:2009	N/A	☒	☐	☐
Number of Operating Channel	FCC 47CFR 15.247 (b)(1)	N/A	N/A	☒	☐	☐
Band-edge compliance of Conducted Emission*	FCC 47CFR 15.247(d)	N/A	N/A	☒	☐	☐
Pseudorandom Hopping Algorithm	FCC 47CFR 15.247(a)(1)	N/A	N/A	☒	☐	☐
Time of Occupancy*	FCC 47CFR 15.247(a)(1)(iii)	N/A	N/A	☒	☐	☐
20dB Bandwidth*	FCC 47CFR 15.247(a)(2)	N/A	N/A	☒	☐	☐
Hopping Channel Separation*	FCC 47CFR 15.247(a)(1)	N/A	N/A	☒	☐	☐
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	☒	☐	☐

*Remark: The conducted measurements were performed with a temporary antenna connector soldered to the RF Output of the EUT.

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 / π/4-DQPSK / 8DPSK	1MBps / 2MBps / 3MBps
Hopping Channel Separation	GFSK / π/4-DQPSK / 8DPSK	1MBps / 2MBps / 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 / π/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:	2015-05-22
Mode of Operation:	Tx mode

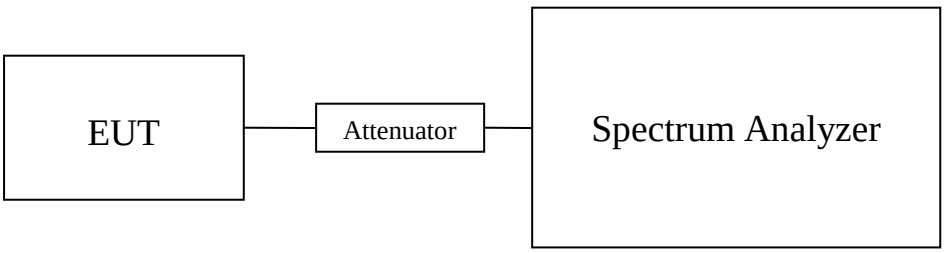
Test Method:

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	0.00157

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2441	0.00175

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2480	0.00149

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

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2402	0.00118

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2442	0.00113

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2480	0.00126

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

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2402	0.00116

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2442	0.00117

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2480	0.00120

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:	2015-05-22
Mode of Operation:	Bluetooth communication 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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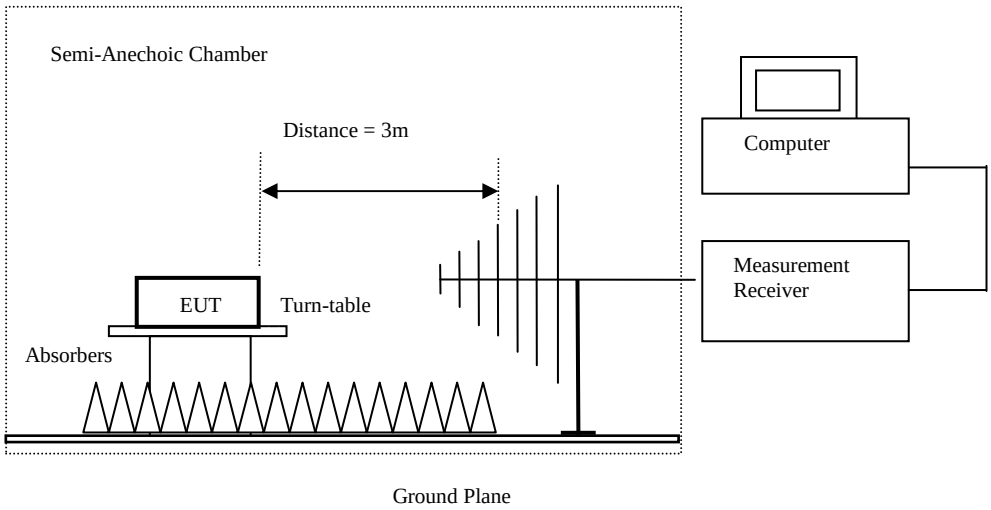
Spectrum Analyzer Setting:

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

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

Result of Bluetooth communication mode (2402.0 MHz) (GFSK mode) (9kHz – 30MHz): Pass

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

Result of Bluetooth communication mode (2402.0 MHz) (GFSK mode) (9kHz – 30MHz): Pass

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

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

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

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Result of Bluetooth communication mode (2402.0 MHz) (GFSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4804.0	11.6	32.1	43.7	74.0	30.3	Horizontal
7206.0	7.8	38.6	46.4	77.6	31.2	Horizontal

Result of Bluetooth communication mode (2402.0 MHz) (GFSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4804.0	7.1	32.1	39.2	54.0	14.8	Horizontal
7206.0	2.3	38.6	40.9	62.3	21.4	Horizontal

Result of Bluetooth communication mode (2441.0 MHz) (GFSK mode) (9kHz – 30MHz): Pass

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

Result of Bluetooth communication mode (2441.0 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	dBuV	dB/m	dBuV/m	uV/m	uV/m	
Emissions detected are more than 20 dB below the FCC Limits						

Result of Bluetooth communication mode (2441.0 MHz) (GFSK mode) (30MHz – 1GHz): Pass

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

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Result of Bluetooth communication mode (2441.0 MHz) (GFSK mode) (1GHz – 18GHz): 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	10.8	32.1	42.9	74.0	31.1	Horizontal
7323.0	6.6	38.6	45.2	74.0	28.8	Horizontal

Result of Bluetooth communication mode (2441.0 MHz) (GFSK mode) (1GHz – 18GHz): 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	7.2	32.1	39.3	54.0	14.7	Horizontal
7323.0	2.3	38.6	40.9	54.0	13.1	Horizontal

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

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

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

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

Result of Bluetooth communication mode (2480.0 MHz) (GFSK mode) (30MHz – 1GHz): Pass

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

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Result of Bluetooth communication mode (2480.0 MHz) (GFSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4960.0	11.9	32.0	43.9	74.0	30.1	Horizontal
7440.0	7.3	38.6	45.9	74.0	28.1	Horizontal

Result of Bluetooth communication mode (2480.0 MHz) (GFSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4960.0	8.3	32.0	40.3	54.0	13.7	Horizontal
7440.0	2.9	38.6	41.5	54.0	12.5	Horizontal

Result of Bluetooth communication mode Band Edge measurement (GFSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
2399.0	17.5	27.6	45.1	46.3	1.2	Horizontal
2484.1	15.0	27.5	42.5	74.0	31.5	Horizontal

Result of Bluetooth communication mode Band Edge measurement (GFSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
2399.0	10.9	27.6	38.5	38.9	0.4	Horizontal
2484.1	10.6	27.5	38.1	54.0	15.9	Horizontal

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Result of Bluetooth communication mode (2402.0 MHz) (π/4-DQPSK mode) (9kHz – 30MHz): Pass

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

Result of Bluetooth communication mode (2402.0 MHz) (π/4-DQPSK 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	dBuV	dB/m	dBuV/m	uV/m	uV/m	
Emissions detected are more than 20 dB below the FCC Limits						

Result of Bluetooth communication mode (2402.0 MHz) (π/4-DQPSK mode) (30MHz – 1GHz): Pass

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

Result of Bluetooth communication mode (2402.0 MHz) (π/4-DQPSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4804.0	10.2	32.1	42.3	74.0	31.7	Horizontal
7206.0	6.5	38.6	45.1	76.7	31.6	Horizontal

Result of Bluetooth communication mode (2402.0 MHz) (π/4-DQPSK mode) (1 – 18GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4804.0	7.0	32.1	39.1	54.0	14.9	Horizontal
7206.0	1.7	38.6	40.3	61.1	20.8	Horizontal

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Result of Bluetooth communication mode (2441.0 MHz) (π/4-DQPSK mode) (9kHz – 30MHz): Pass

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

Result of Bluetooth communication mode (2441.0 MHz) (π/4-DQPSK mode) (9kHz – 30MHz): Pass

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

Result of Bluetooth communication mode (2441.0 MHz) (π/4-DQPSK mode) (30MHz – 1GHz): Pass

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

Result of Bluetooth communication mode (2441.0 MHz) (π/4-DQPSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency	Measured	Correction	Field	Limit	Margin	E-Field
	Level @3m	Factor	Strength	@3m		Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4882.0	11.0	32.1	43.1	74.0	30.9	Horizontal
7323.0	5.7	38.6	44.3	74.0	29.7	Horizontal

Result of Bluetooth communication mode (2441.0 MHz) (π/4-DQPSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency	Measured	Correction	Field	Limit	Margin	E-Field
	Level @3m	Factor	Strength	@3m		Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4882.0	7.6	32.1	39.7	54.0	14.3	Horizontal
7323.0	1.9	38.6	40.5	54.0	13.5	Horizontal

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Result of Bluetooth communication mode (2480.0 MHz) (π/4-DQPSK mode) (9kHz – 30MHz): Pass

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

Result of Bluetooth communication mode (2480.0 MHz) (π/4-DQPSK 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	dBuV	dB/m	dBuV/m	uV/m	uV/m	
Emissions detected are more than 20 dB below the FCC Limits						

Result of Bluetooth communication mode (2480.0 MHz) (π/4-DQPSK mode) (30MHz – 1GHz): Pass

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

Result of Bluetooth communication mode (2480.0 MHz) (π/4-DQPSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4960.0	11.3	32.0	43.3	74.0	30.7	Horizontal
7440.0	4.6	38.6	43.2	74.0	30.8	Horizontal

Result of Bluetooth communication mode (2480.0 MHz) (π/4-DQPSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4960.0	7.5	32.0	39.5	54.0	14.5	Horizontal
7440.0	1.7	38.6	40.3	54.0	13.7	Horizontal

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Result of Bluetooth communication mode Band Edge measurement (π/4-DQPSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
2399.0	18.5	27.6	46.1	76.7	30.6	Horizontal
2485.0	16.5	27.5	44.0	74.0	30.0	Horizontal

Result of Bluetooth communication mode Band Edge measurement (π/4-DQPSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
2399.0	11.7	27.6	39.3	61.1	21.8	Horizontal
2485.0	12.0	27.5	39.5	54.0	14.5	Horizontal

Result of Bluetooth communication mode (2402.0 MHz) (8DPSK mode) (9kHz – 30MHz): Pass

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

Result of Bluetooth communication mode (2402.0 MHz) (8DPSK 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	dBuV	dB/m	dBuV/m	uV/m	uV/m	
Emissions detected are more than 20 dB below the FCC Limits						

Result of Bluetooth communication mode (2402.0 MHz) (8DPSK mode) (30MHz – 1GHz): Pass

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

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Result of Bluetooth communication mode (2402.0 MHz) (8DPSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4804.0	11.4	32.1	43.5	74.0	30.5	Horizontal
7206.0	4.7	38.6	43.3	76.1	32.8	Horizontal

Result of Bluetooth communication mode (2402.0 MHz) (8DPSK mode) (1 – 18GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4804.0	7.0	32.1	39.1	54.0	14.9	Horizontal
7206.0	1.9	38.6	40.5	59.5	19.0	Horizontal

Result of Bluetooth communication mode (2441.0 MHz) (8DPSK mode) (9kHz – 30MHz): Pass

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

Result of Bluetooth communication mode (2441.0 MHz) (8DPSK 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	dBuV	dB/m	dBuV/m	uV/m	uV/m	
Emissions detected are more than 20 dB below the FCC Limits						

Result of Bluetooth communication mode (2441.0 MHz) (8DPSK mode) (30MHz – 1GHz): Pass

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

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Result of Bluetooth communication mode (2441.0 MHz) (8DPSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4882.0	11.8	32.1	43.9	74.0	30.1	Horizontal
7323.0	5.5	38.6	44.1	74.0	29.9	Horizontal

Result of Bluetooth communication mode (2441.0 MHz) (8DPSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4882.0	7.6	32.1	39.7	54.0	14.3	Horizontal
7323.0	2.6	38.6	41.2	54.0	12.8	Horizontal

Result of Bluetooth communication mode (2480.0 MHz) (8DPSK mode) (9kHz – 30MHz): Pass

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

Result of Bluetooth communication mode (2480.0 MHz) (8DPSK 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	dBuV	dB/m	dBuV/m	uV/m	uV/m	
Emissions detected are more than 20 dB below the FCC Limits						

Result of Bluetooth communication mode (2480.0 MHz) (8DPSK mode) (30MHz – 1GHz): Pass

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

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Result of Bluetooth communication mode (2480.0 MHz) (8DPSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4960.0	12.1	32.0	44.1	74.0	29.9	Horizontal
7440.0	4.6	38.6	43.2	74.0	30.8	Horizontal

Result of Bluetooth communication mode (2480.0 MHz) (8DPSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
4960.0	7.5	32.0	39.5	54.0	14.5	Horizontal
7440.0	2.9	38.6	41.5	54.0	12.5	Horizontal

Result of Bluetooth communication mode Band Edge measurement (8DPSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
2398.0	18.9	27.6	46.5	76.1	29.6	Horizontal
2485.0	16.0	27.5	43.5	74.0	30.5	Horizontal

Result of Bluetooth communication mode Band Edge measurement (8DPSK π/4-DQPSK mode) (1GHz – 18GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m	
2398.0	11.5	27.6	39.1	59.5	20.4	Horizontal
2485.0	12.2	27.5	39.7	54.0	14.3	Horizontal

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: (9kHz – 30MHz): 2.4dB
(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]	[μV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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

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

Radiated Emissions Quasi-Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dBuV/m	
54.9	1.4	9.5	10.9	40.0	29.1	Vertical
121.4	2.1	9.3	11.4	43.5	32.1	Vertical
200.3	1.7	13.6	15.3	43.5	28.2	Horizontal
477.6	0.9	22.5	23.4	46.0	22.6	Horizontal
531.1	2.1	23.8	25.9	46.0	20.1	Horizontal
679.9	1.3	27	28.3	46.0	17.7	Horizontal

Result of On mode connected to PC with charging function (30MHz – 1GHz): Pass

Radiated Emissions Quasi-Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dBuV/m	
66.1	3.1	9.2	12.3	40.0	27.7	Vertical
130.2	1.2	8.8	10.0	43.5	33.5	Vertical
211.4	4.2	14.2	18.4	43.5	25.1	Vertical
541.3	1.1	24.1	25.2	46.0	20.8	Vertical
654.7	2.3	25.7	28.0	46.0	18.0	Vertical
861.3	2.1	29.2	31.3	46.0	14.7	Horizontal

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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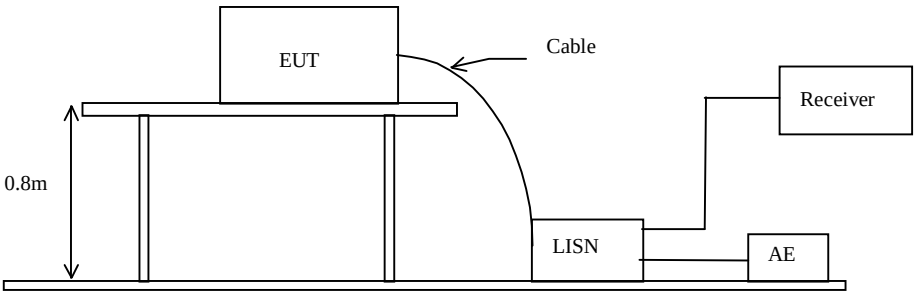
3.1.3 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement:	FCC 47CFR 15.207
Test Method:	ANSI C63.4:2009
Test Date:	2015-05-21
Mode of Operation:	On mode connected to PC with charging function
Test Voltage:	120Va.c., 60Hz

Test Method:

The test was performed in accordance with ANSI C63.4: 2009, with the following: an initial measurement was performed in peak and average detection mode on the live line, any emissions recorded within 30dB of the relevant limit line were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

Test Setup:



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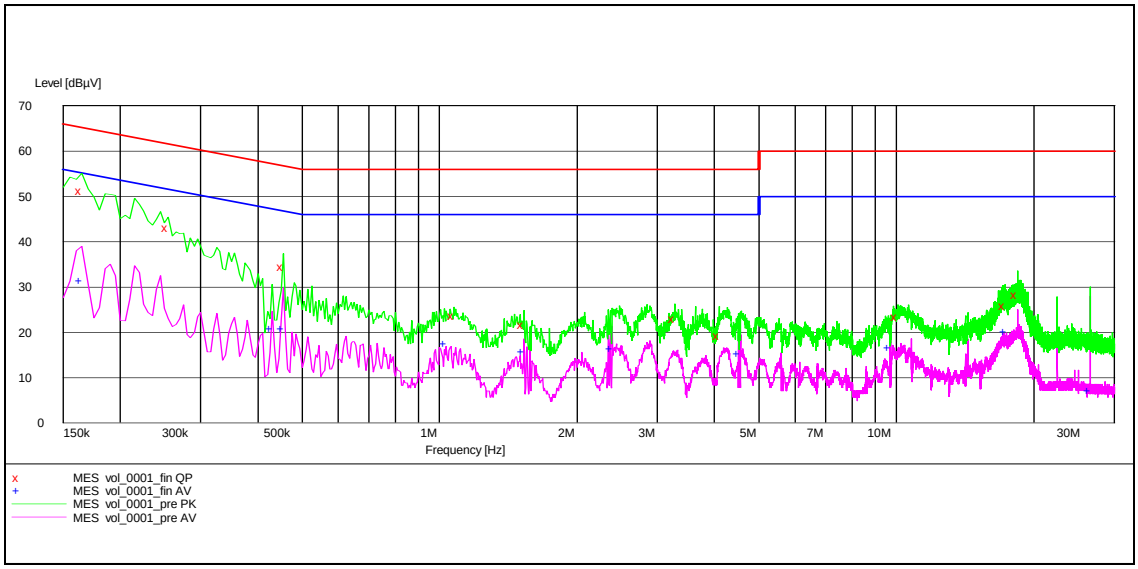
Limit for Conducted Emissions (FCC 47 CFR 15.207):

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

* Decreases with the logarithm of the frequency.

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

Results of On mode connected to PC with charging function - Live: PASS
Please refer to the following diagram for individual results.



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Results of On mode connected to PC with charging function - Live: PASS

Conductor	Frequency	Quasi-peak		Average	
		Level	Limit	Level	Limit
Live or Neutral	MHz	dBμV	dBμV	dBμV	dBμV
Live	0.165	51.2	65.0	31.5	55.0
Live	0.255	43.1	62.0	-*-	-*-
Live	0.430	-*-	-*-	20.9	47.0
Live	0.455	34.6	57.0	20.9	47.0
Live	1.035	-*-	-*-	17.4	46.0
Live	1.075	23.8	56.0	-*-	-*-
Live	1.530	21.8	56.0	15.7	46.0
Live	2.390	-*-	-*-	16.5	46.0
Live	3.270	23.1	56.0	-*-	-*-
Live	4.095	19.3	56.0	-*-	-*-
Live	4.540	-*-	-*-	15.3	46.0
Live	9.725	-*-	-*-	16.6	50.0
Live	10.090	23.6	60.0	-*-	-*-
Live	17.315	25.9	60.0	-*-	-*-
Live	17.415	-*-	-*-	20.2	50.0
Live	18.435	28.3	60.0	-*-	-*-
Live	26.625	-*-	-*-	7.1	50.0

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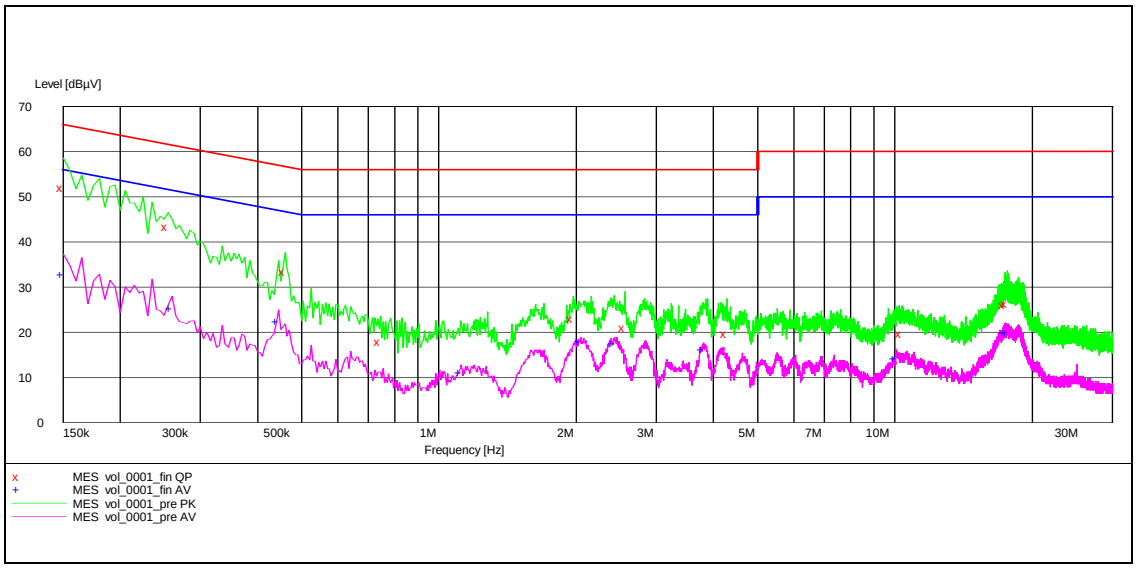
Results of On mode connected to PC with charging function - Neutral: PASS
Please refer to the following diagram for individual results.



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Results of On mode connected to PC with charging function - Neutral: PASS

Conductor	Frequency	Quasi-peak		Average	
		Level	Limit	Level	Limit
Live or Neutral	MHz	dBμV	dBμV	dBμV	dBμV
Neutral	0.150	51.9	66.0	32.8	56.0
Neutral	0.255	43.4	62.0	-*-	-*-
Neutral	0.260	-*-	-*-	25.2	51.0
Neutral	0.445	-*-	-*-	22.5	47.0
Neutral	0.460	33.4	57.0	-*-	-*-
Neutral	0.745	18.0	56.0	-*-	-*-
Neutral	1.120	-*-	-*-	11.0	46.0
Neutral	1.970	23.1	56.0	-*-	-*-
Neutral	2.050	-*-	-*-	17.9	46.0
Neutral	2.430	-*-	-*-	17.5	46.0
Neutral	2.560	21.0	56.0	-*-	-*-
Neutral	3.805	-*-	-*-	16.1	46.0
Neutral	4.285	19.8	56.0	-*-	-*-
Neutral	10.060	-*-	-*-	14.1	50.0
Neutral	10.385	19.8	60.0	-*-	-*-
Neutral	17.470	26.1	60.0	20.0	50.0
Neutral	17.670	26.4	60.0	-*-	-*-
Neutral	17.730	-*-	-*-	19.9	50.0

Remarks:
Calculated measurement uncertainty (0.15MHz – 30MHz): 3.25dB
-*- Emission(s) that is far below the corresponding limit line.

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3.1.4 20dB Bandwidth Measurement

Test Requirement:	FCC 47CFR 15.247(a)(1)
Test Method:	ANSI C63.4:2009
Test Date:	2015-05-22
Mode of Operation:	Bluetooth 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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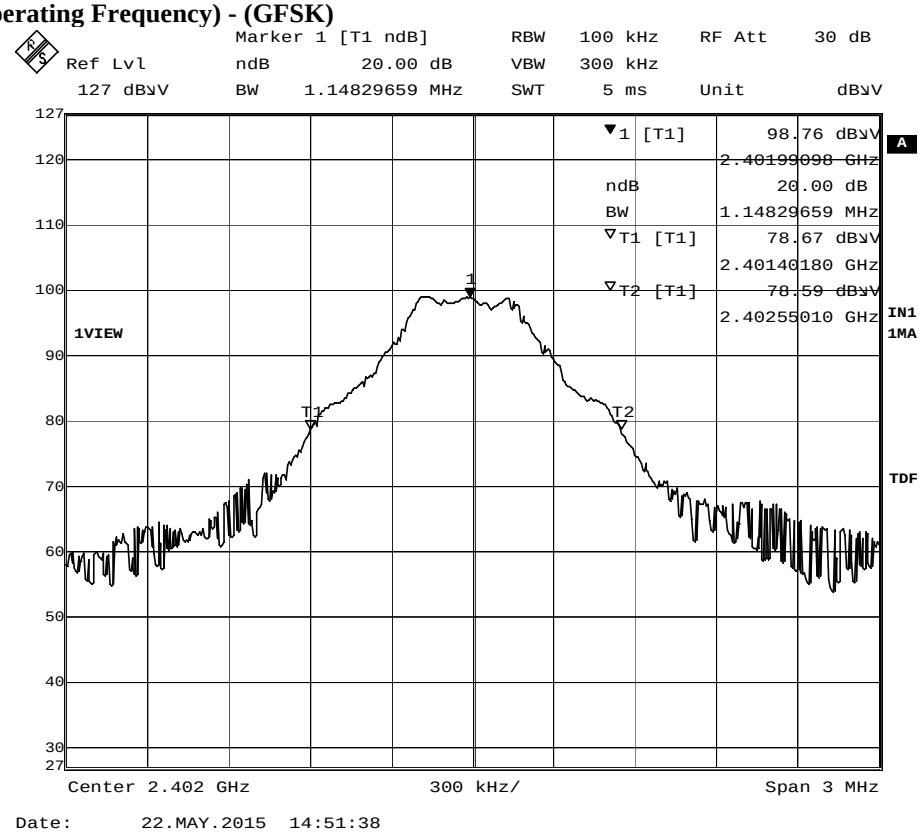
Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.15	Within 2400-2483.5

(Lowest Operating Frequency) - (GFSK)



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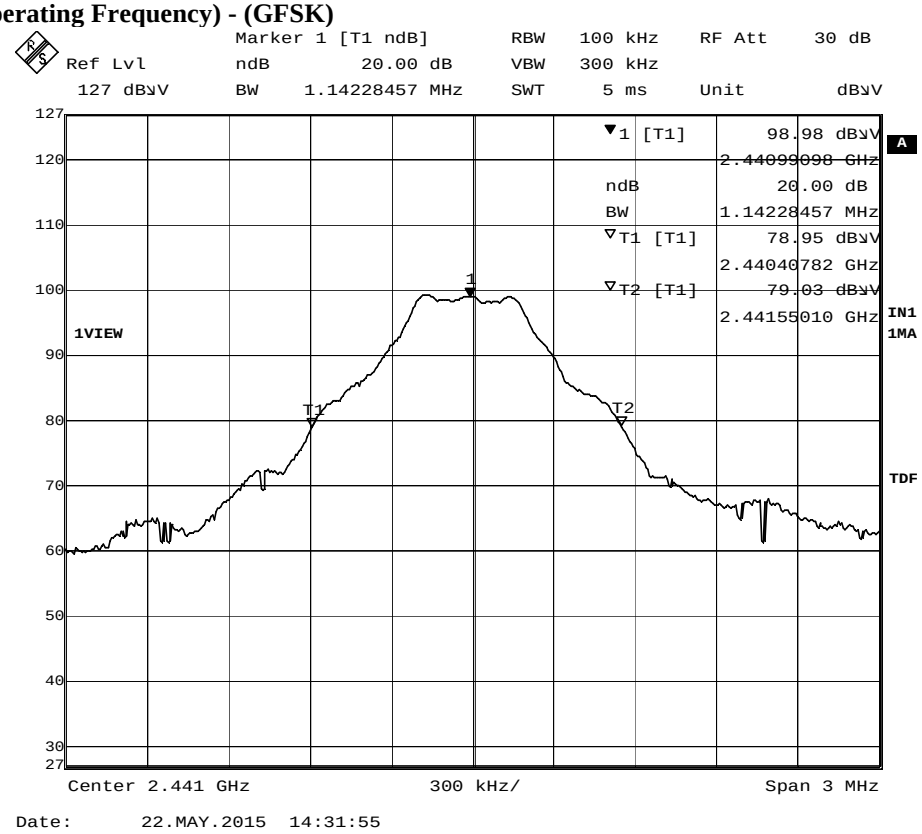
Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.14	Within 2400-2483.5

(Middle Operating Frequency) - (GFSK)



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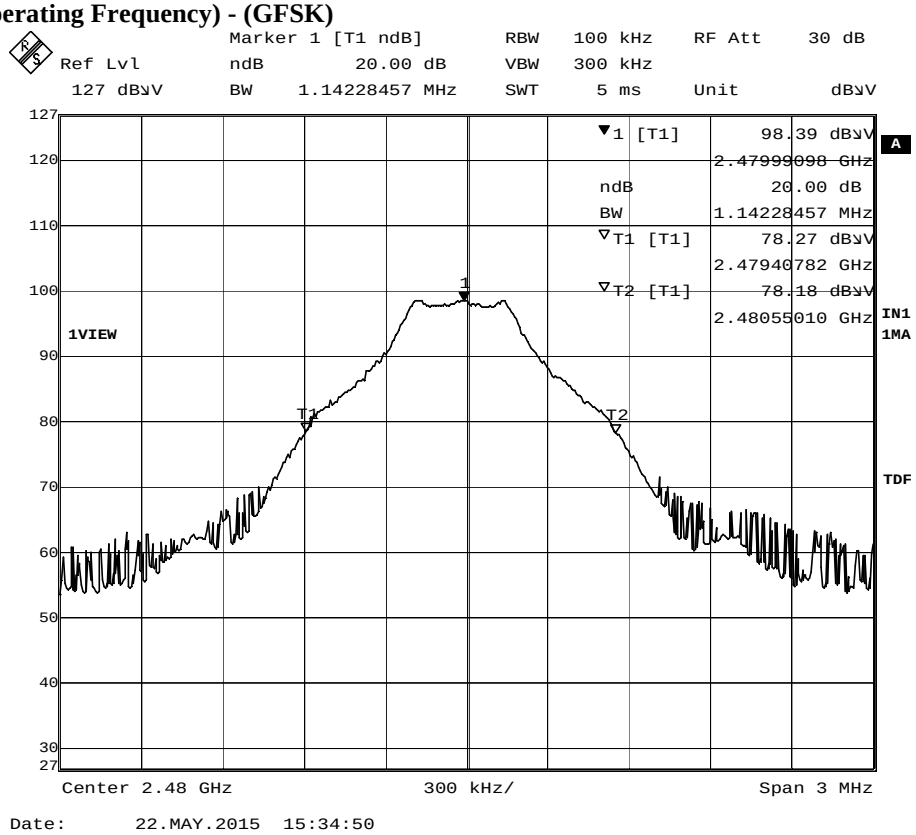
Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	1.14	Within 2400-2483.5

(Highest Operating Frequency) - (GFSK)



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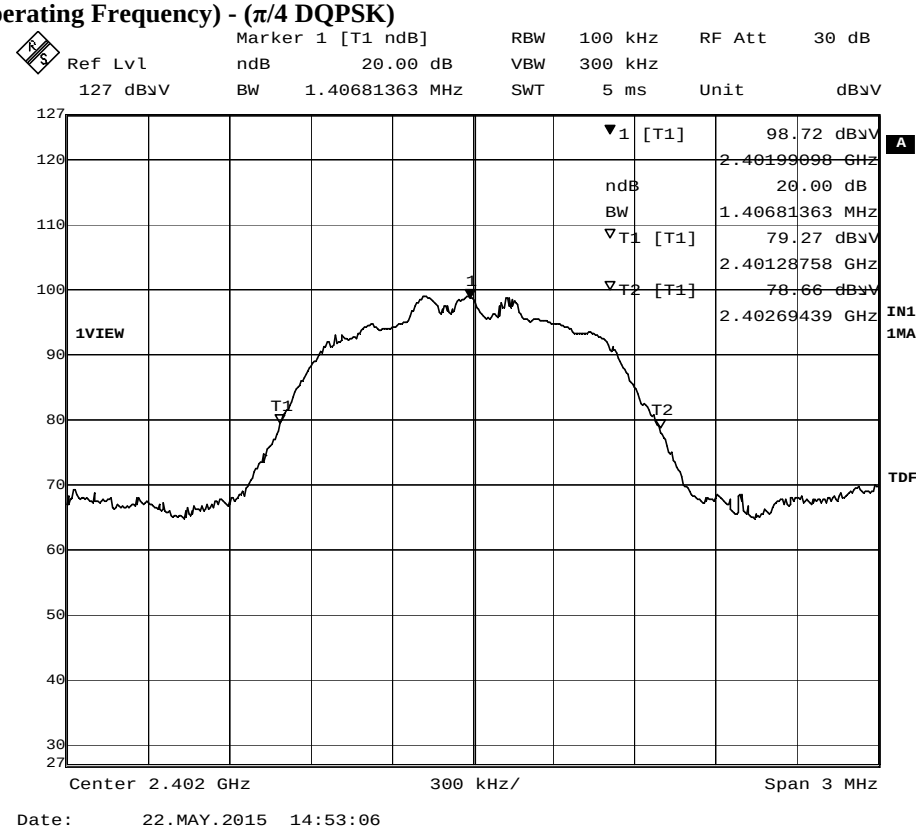
Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.41	Within 2400-2483.5

(Lowest Operating Frequency) - (π/4 DQPSK)



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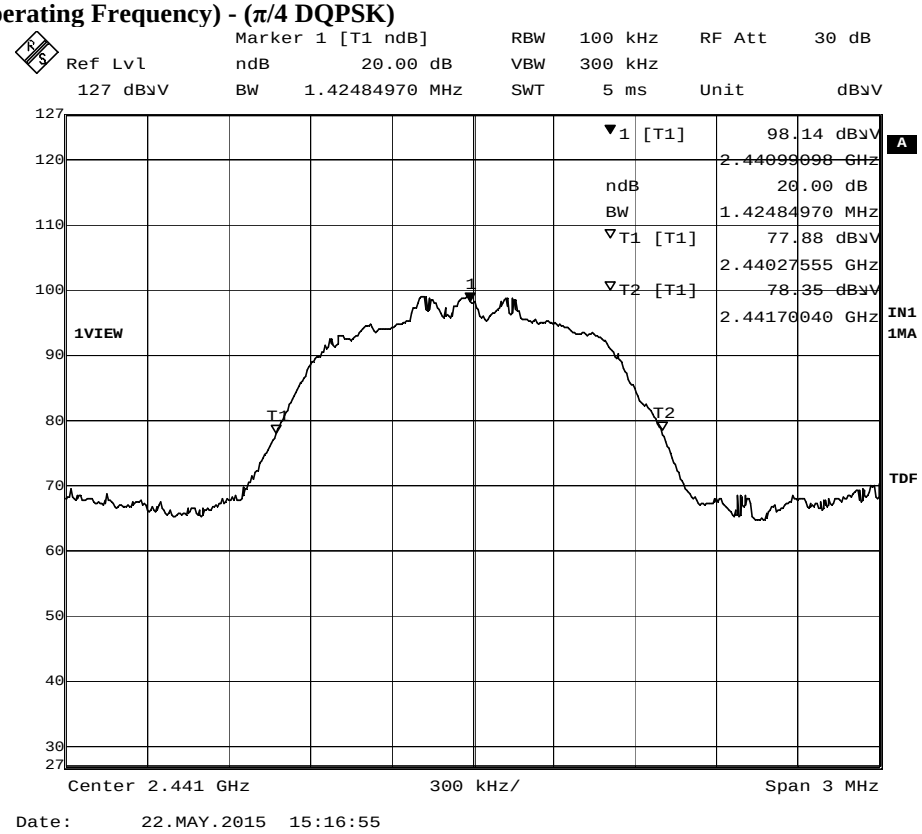
Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.42	Within 2400-2483.5

(Middle Operating Frequency) - (π/4 DQPSK)



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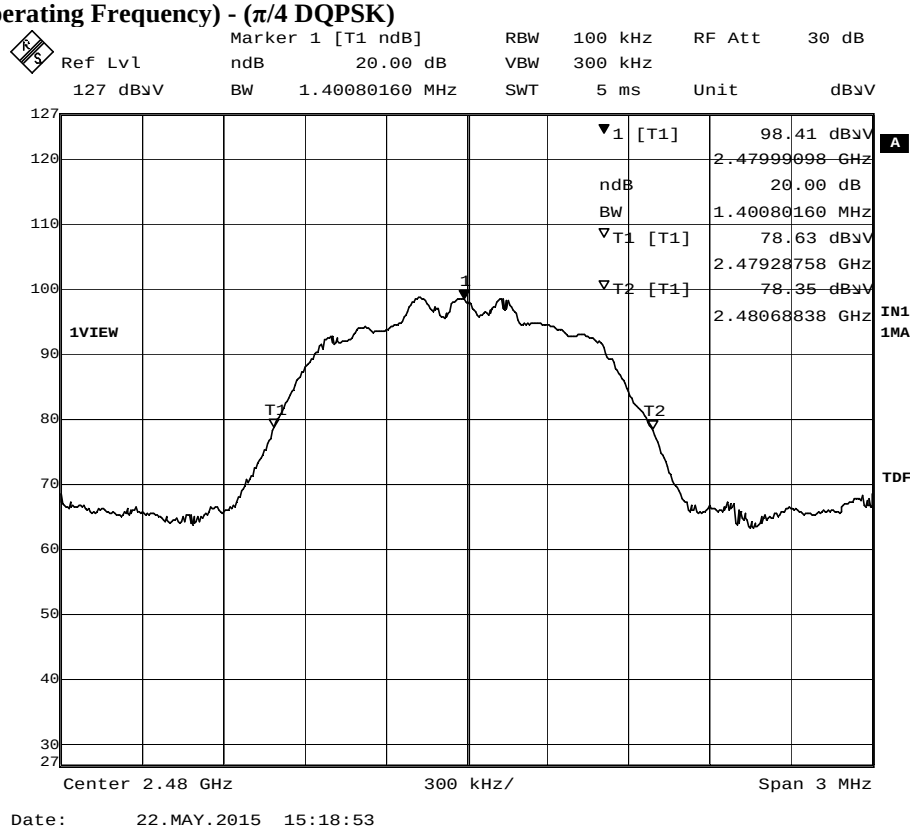
Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	1.40	Within 2400-2483.5

(Highest Operating Frequency) - (π/4 DQPSK)



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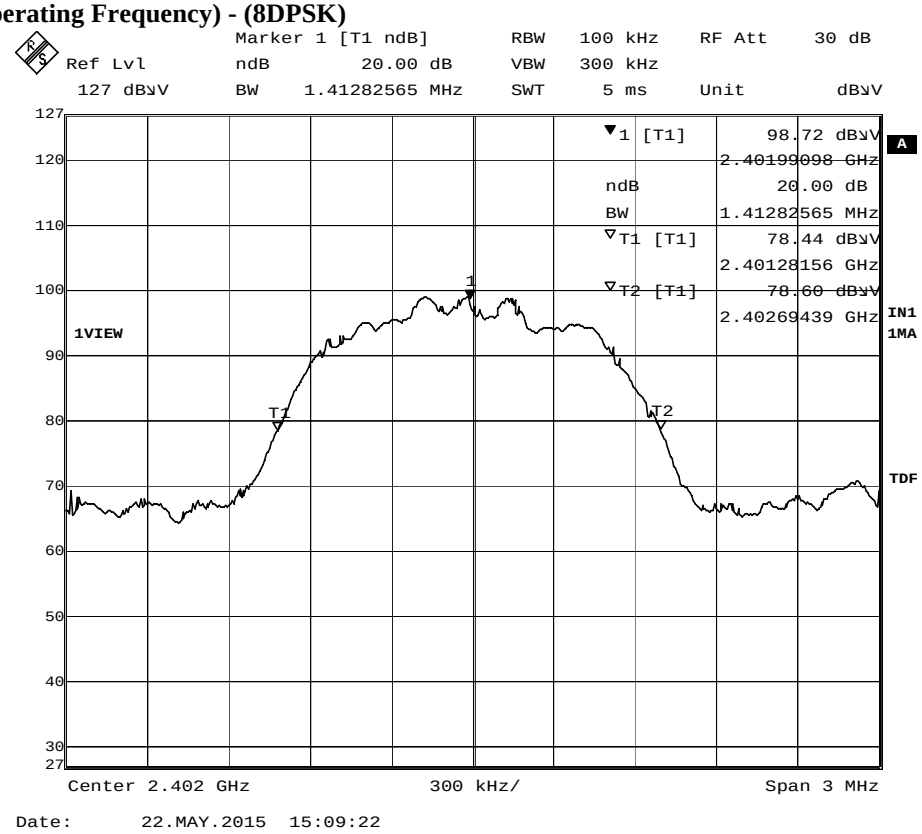
Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.41	Within 2400-2483.5

(Lowest Operating Frequency) - (8DPSK)



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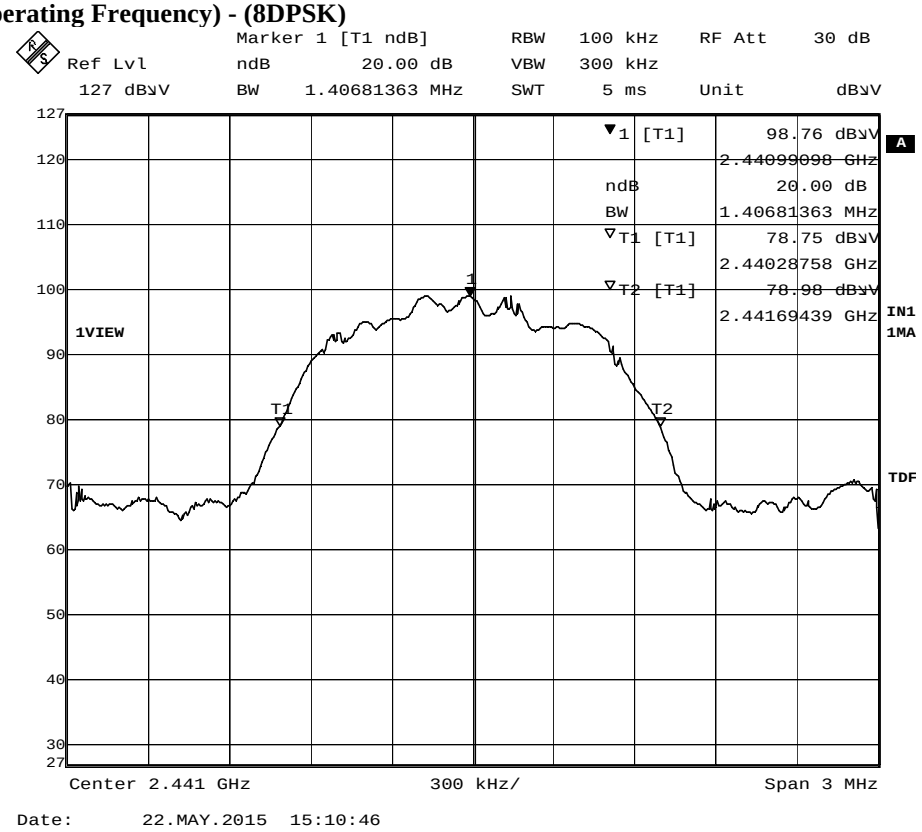
Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.41	Within 2400-2483.5

(Middle Operating Frequency) - (8DPSK)



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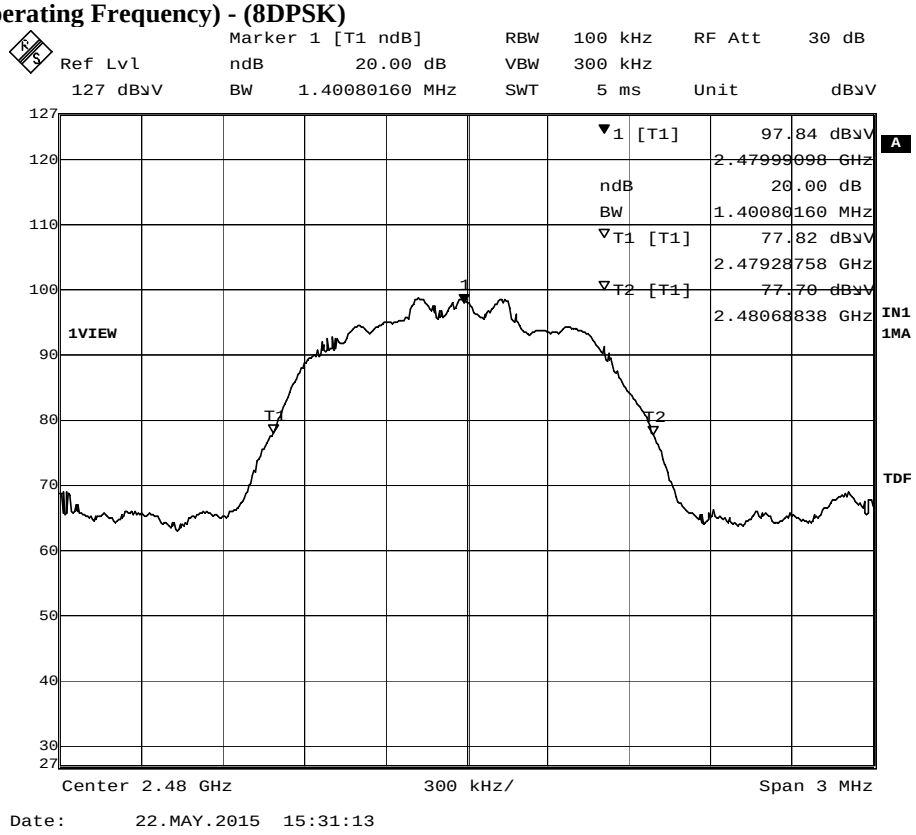
Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	1.40	Within 2400-2483.5

(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 = 1.42MHz * 2/3 = 947kHz

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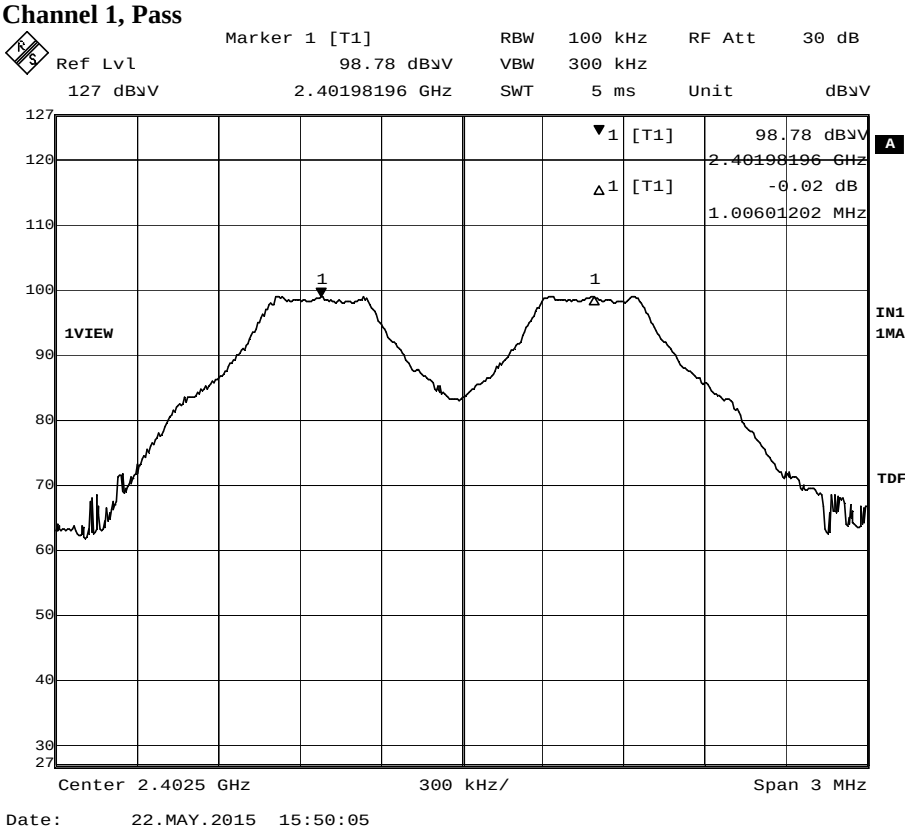
Channel separation = 1.01MHz (GFSK)

Channel 0 – Channel 1, Pass



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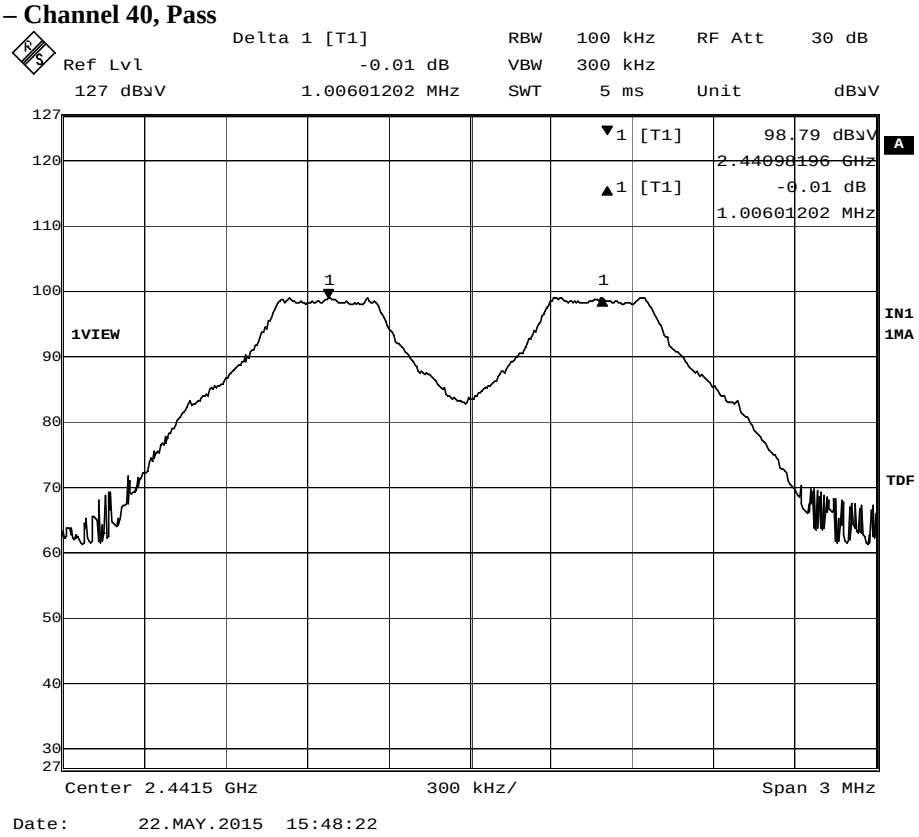
Channel separation = 1.01MHz (GFSK)

Channel 38 – Channel 40, Pass



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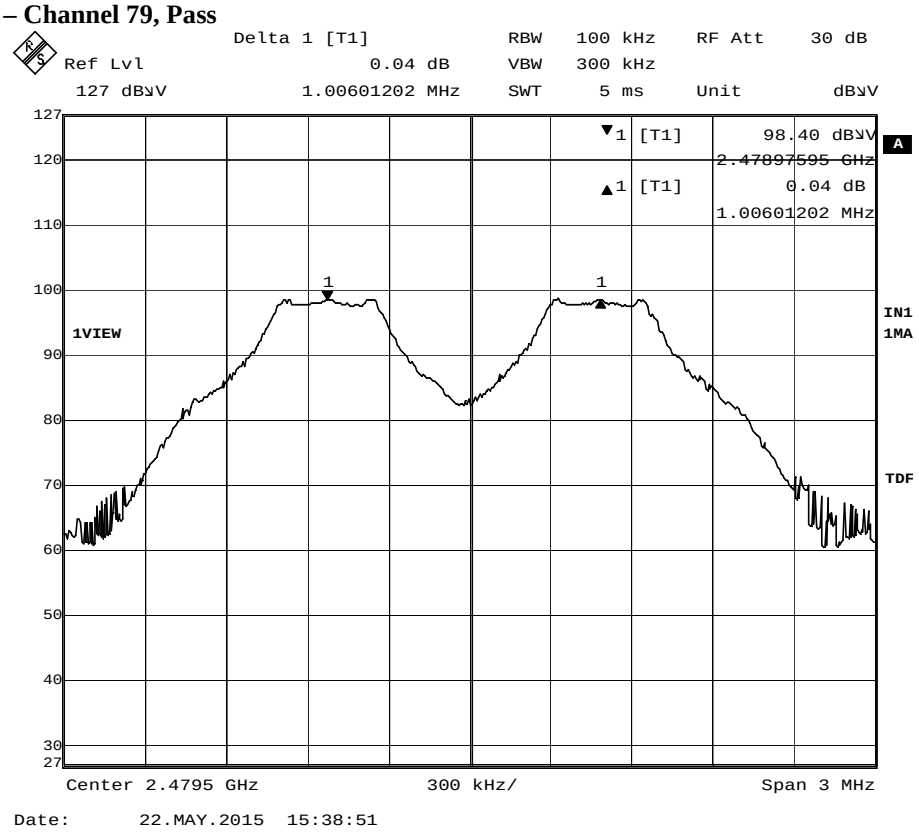
Channel separation = 1.01MHz (GFSK)

Channel 78 – Channel 79, Pass



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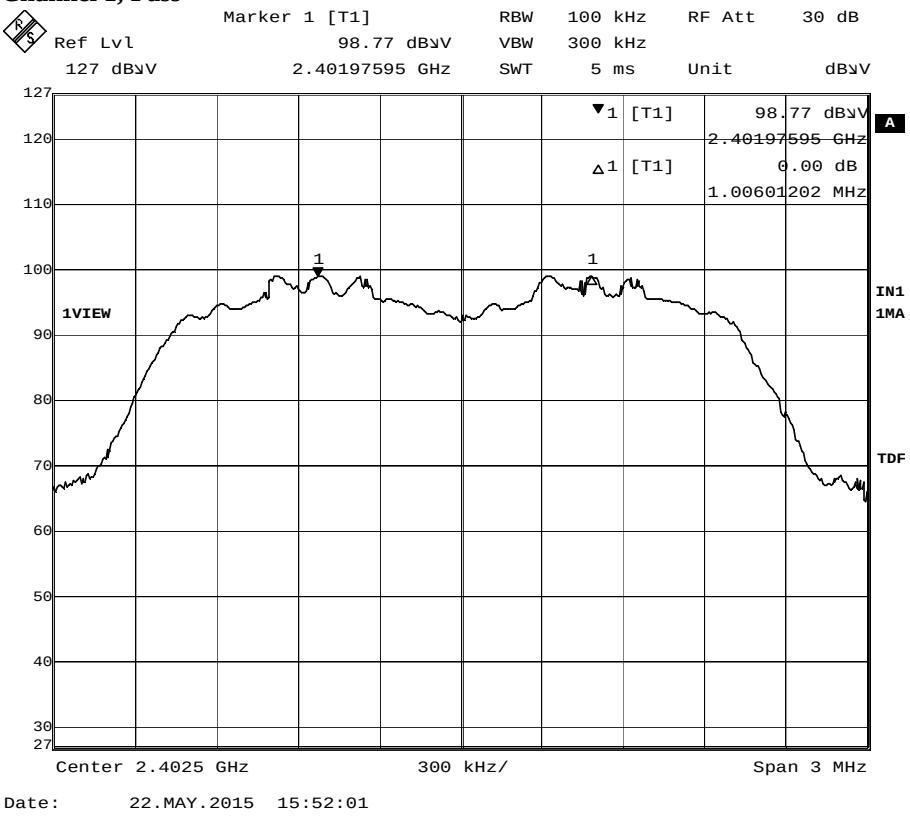
Channel separation = 1.01MHz (π/4 DQPSK)

Channel 0 – Channel 1, Pass



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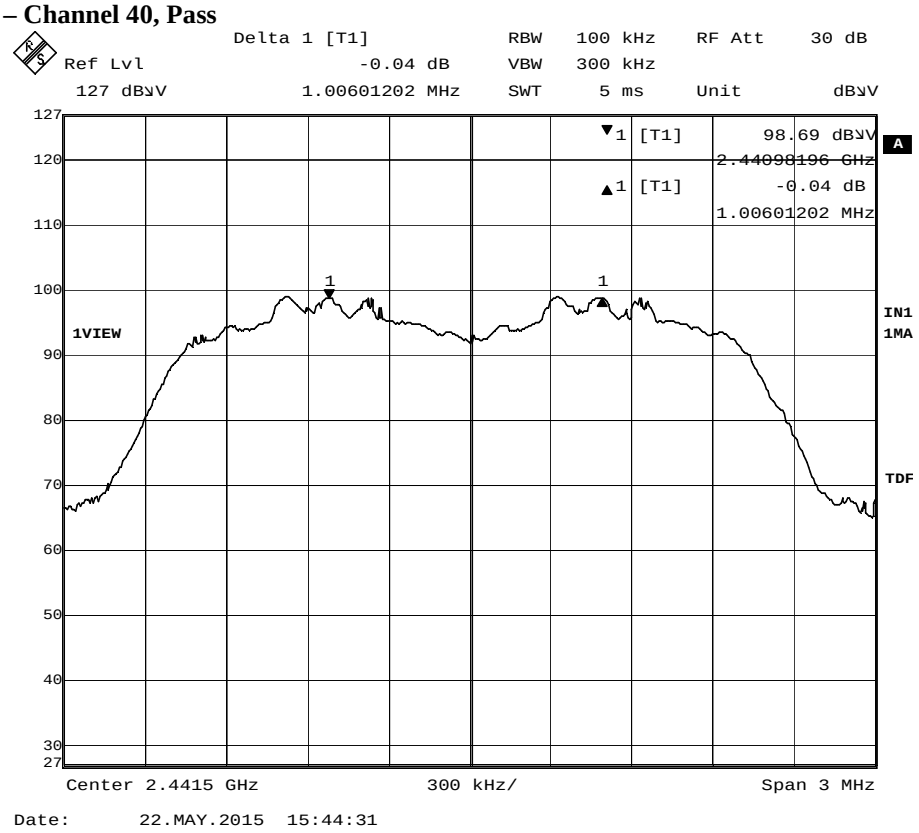
Channel separation = 1.01MHz (π/4 DQPSK)

Channel 39 – Channel 40, Pass



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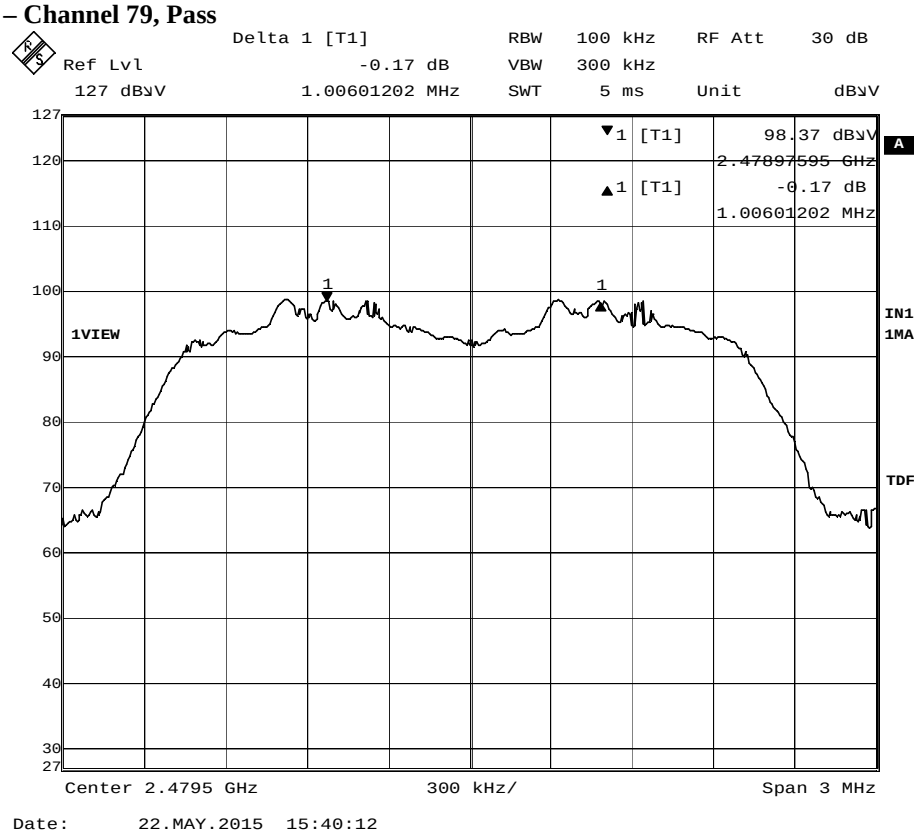
Channel separation = 1.01MHz (π/4 DQPSK)

Channel 78 – Channel 79, Pass



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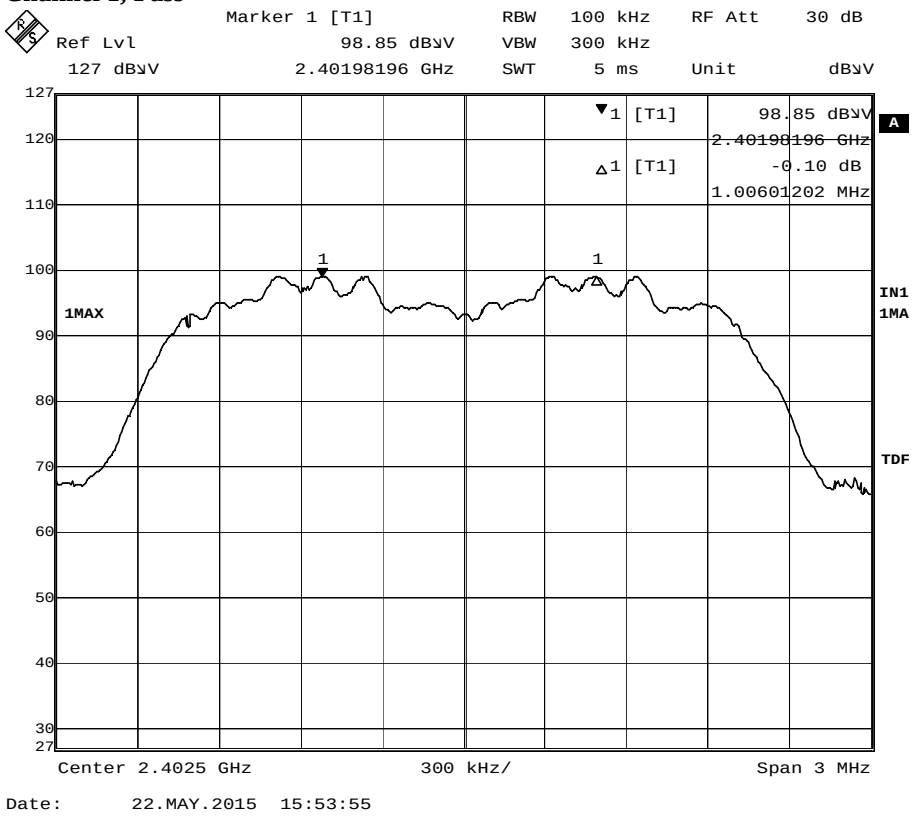
Channel separation = 1.01MHz (8DPSK)

Channel 0 – Channel 1, Pass



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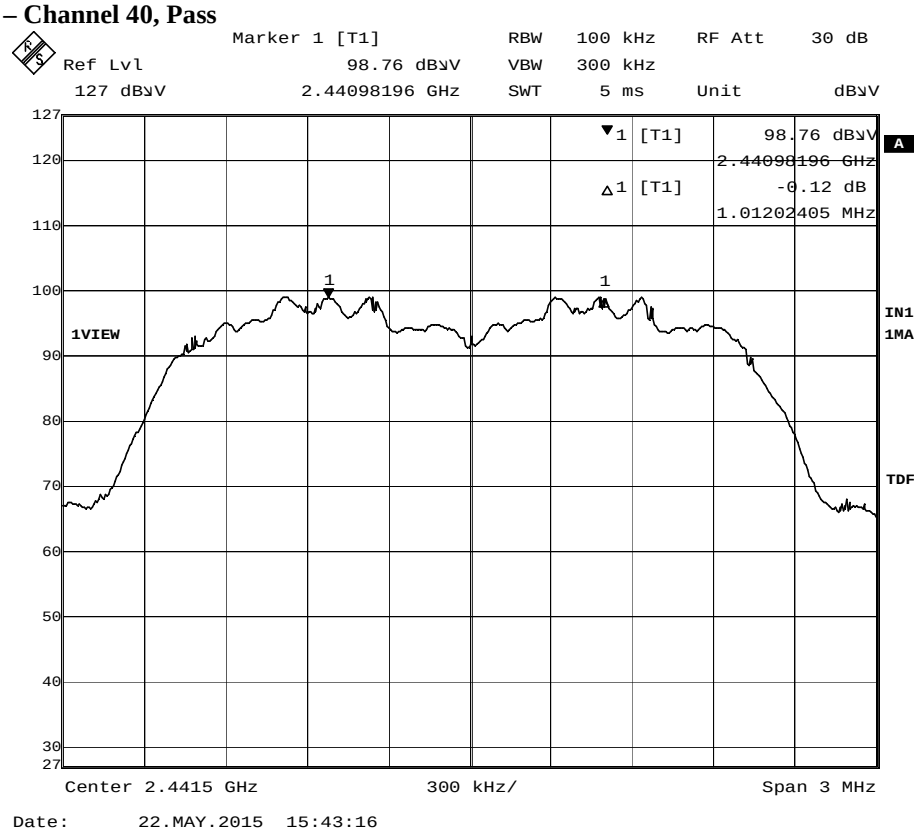
Channel separation = 1.01MHz (8DPSK)

Channel 39 – Channel 40, Pass



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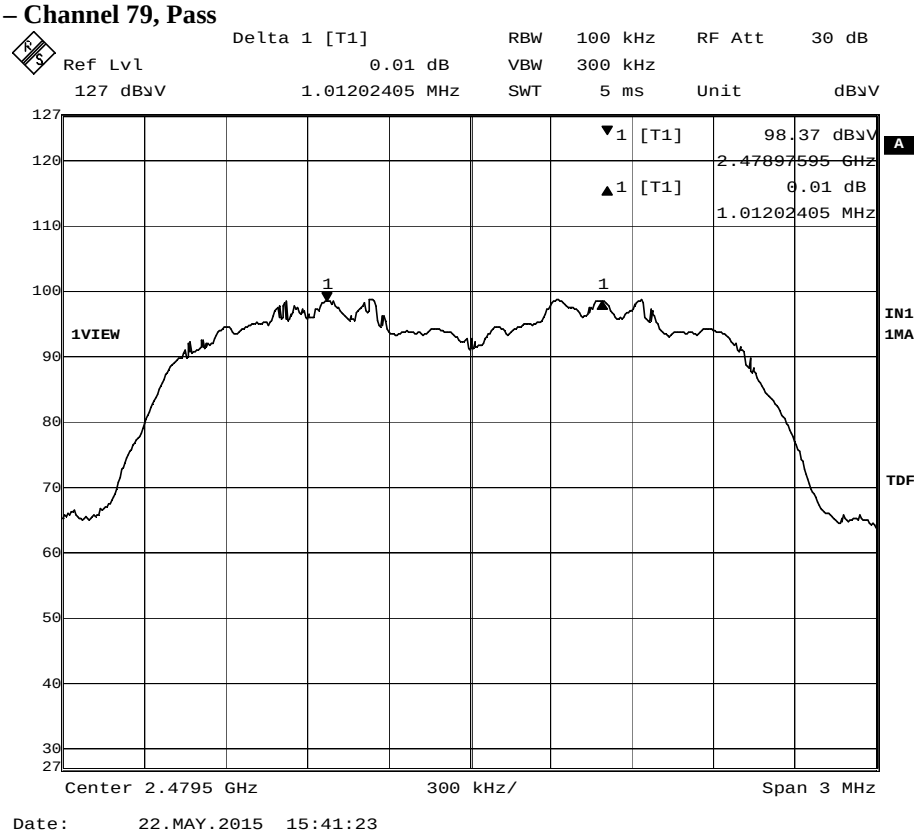
Channel separation = 1.01MHz (8DPSK)

Channel 78 – Channel 79, Pass



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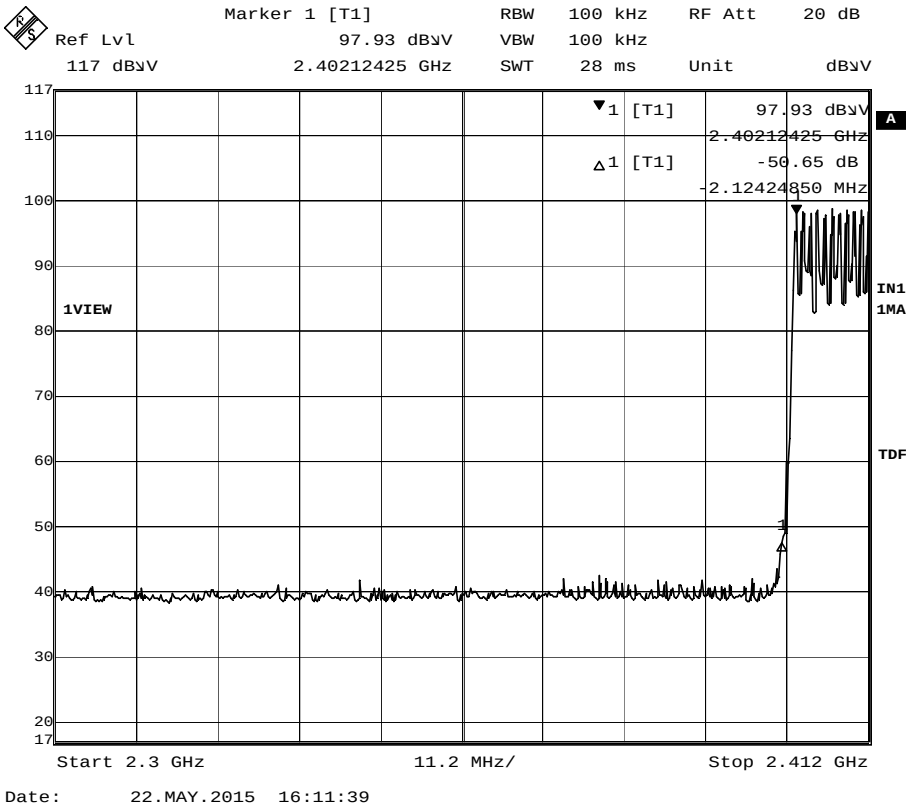
Band-edge Compliance of RF Emissions – Lowest (GFSK)
(50.7dB reduction at lower band edge)



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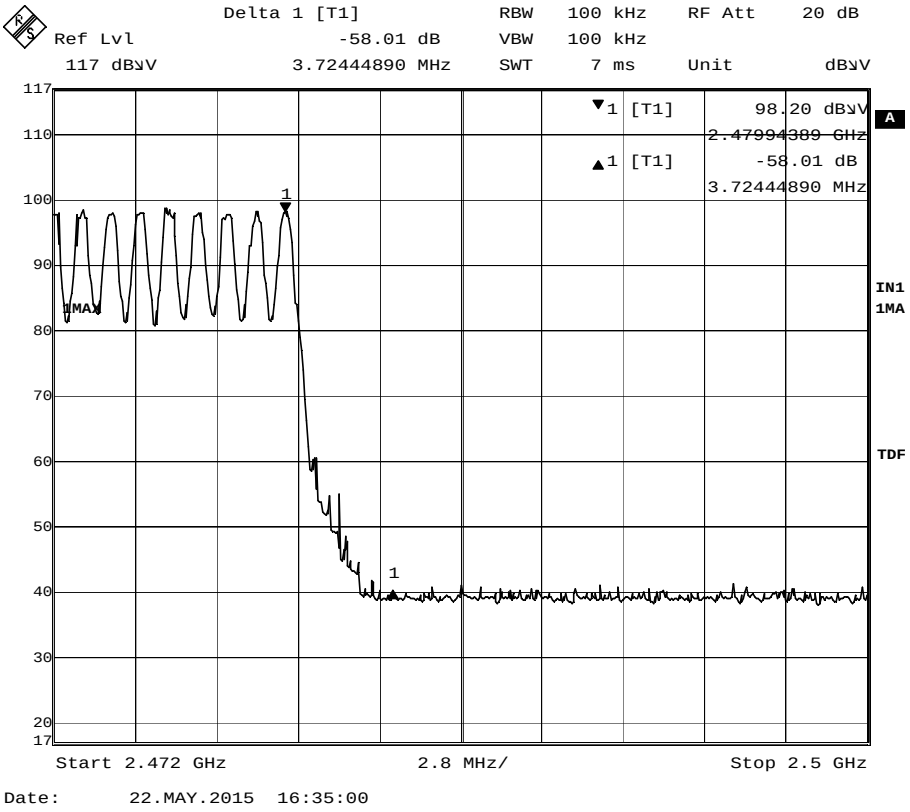
Band-edge Compliance of RF Emissions – Highest (GFSK)
(58.0dB reduction at upper band edge)



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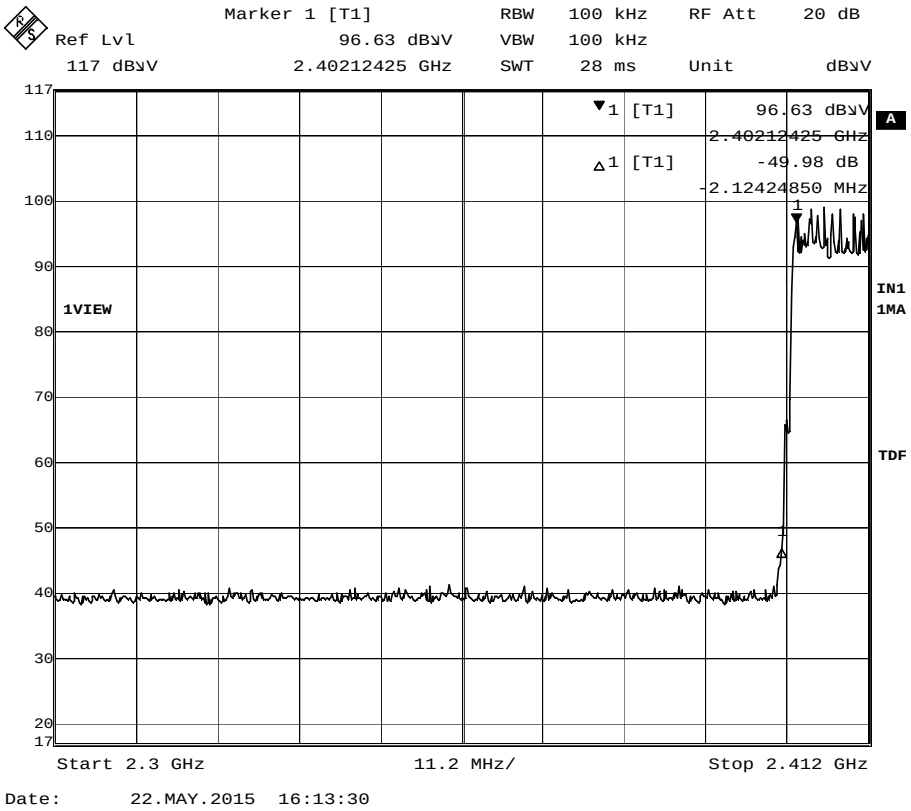
Band-edge Compliance of RF Emissions – Lowest (π/4 DQPSK)
(50.0dB reduction at lower band edge)



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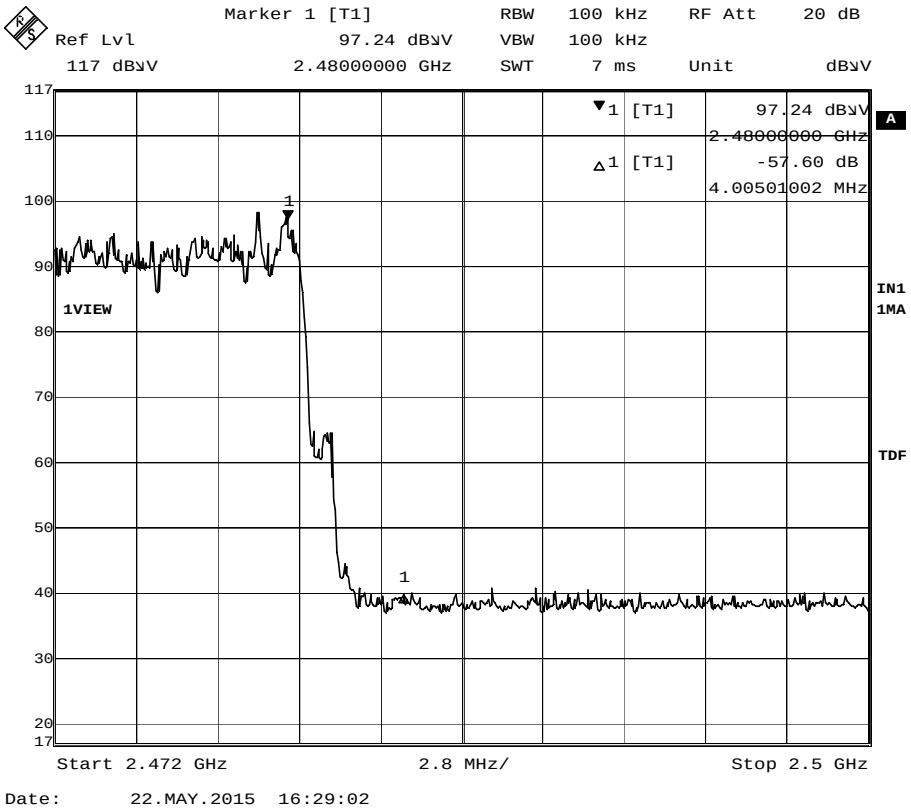
Band-edge Compliance of RF Emissions – Highest (π/4 DQPSK)
(57.6dB reduction at upper band edge)



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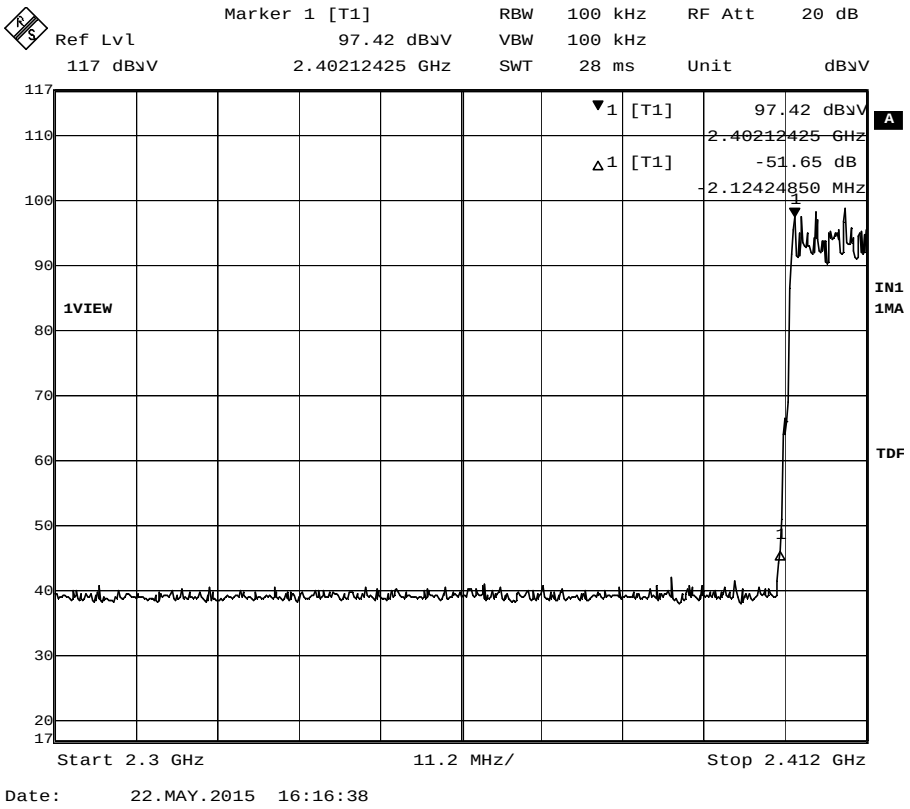
Band-edge Compliance of RF Emissions – Lowest (8DPSK)
(51.7dB reduction at lower band edge)



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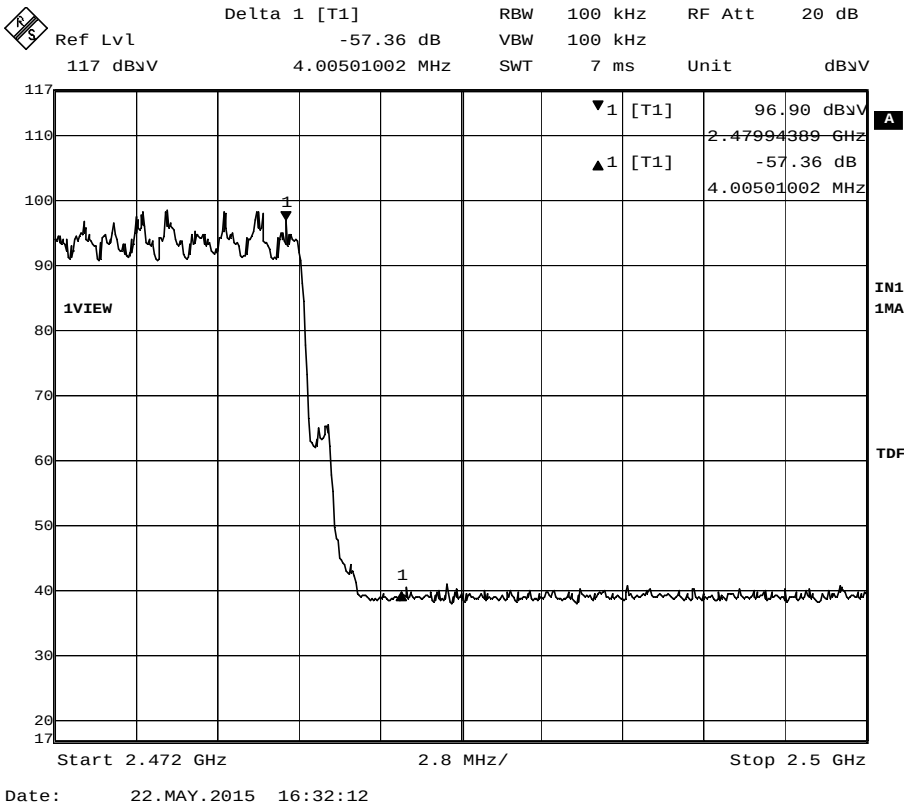
Band-edge Compliance of RF Emissions – Highest (8DPSK)
(57.4dB reduction at upper band edge)



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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 =-2.0dBi. 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:

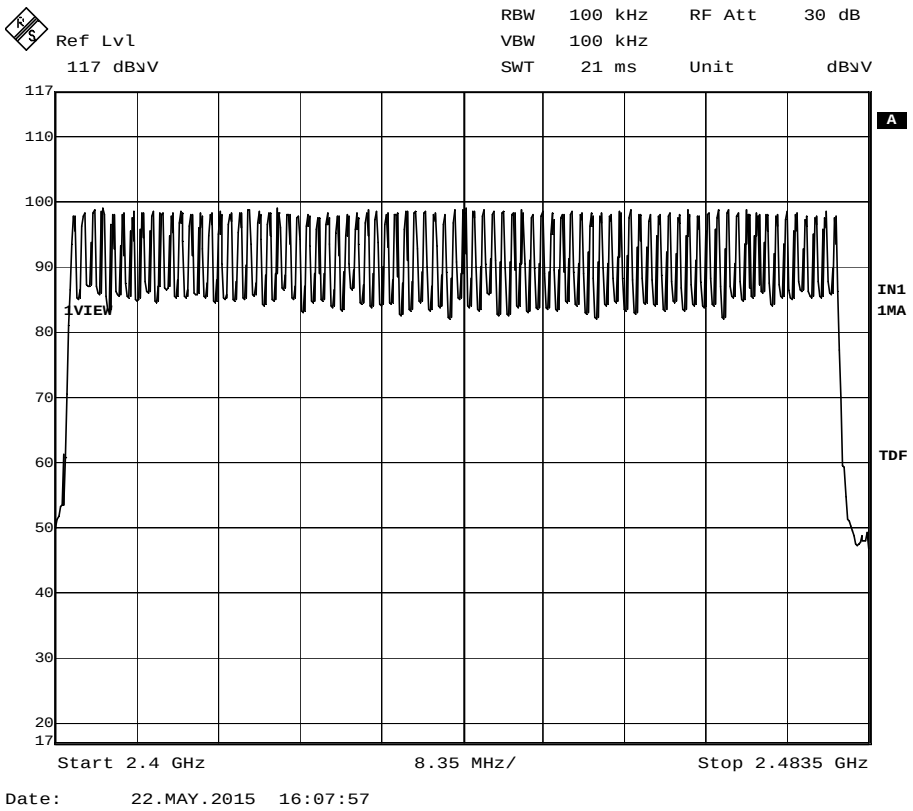
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channel employed.
No requirements for Digital Transmission System.

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

Observed duration: 0.4s x79 = 31.6s

Measurement Data:

Channel Occupied in 8DPSK: 79 of 79 Channel



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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 x 31.6 = 106.6 within 31.6 seconds

Fig. A
[Pulse duration of Lowest Channel]

Pulse duration = 2.896ms

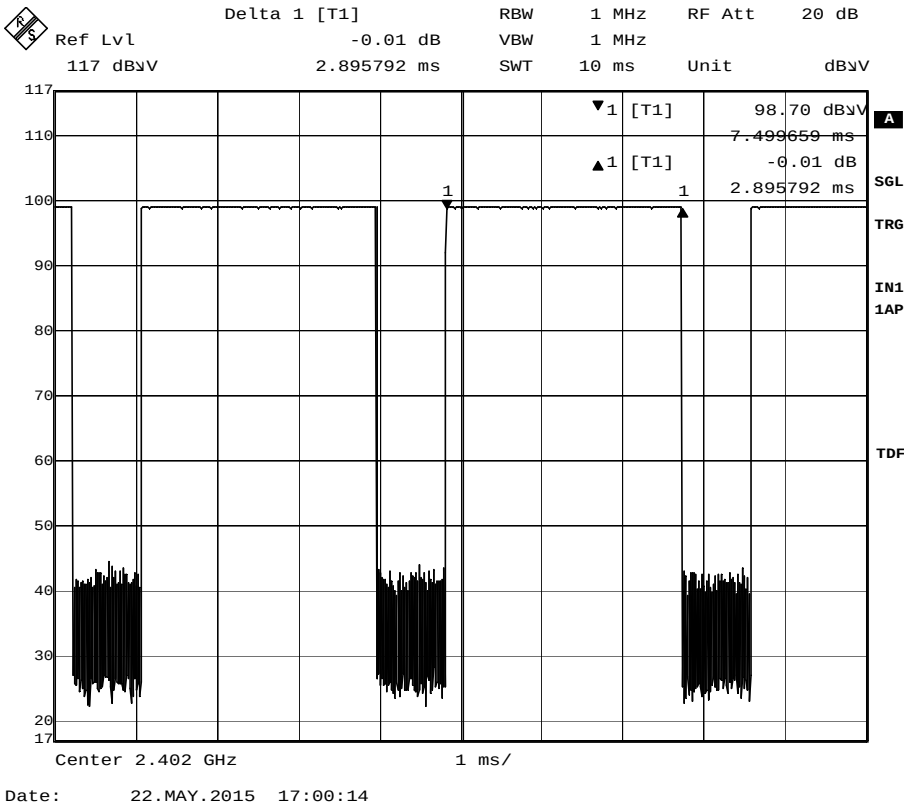

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Fig. B
[Pulse duration of Middle Channel]
Pulse duration = 2.896ms

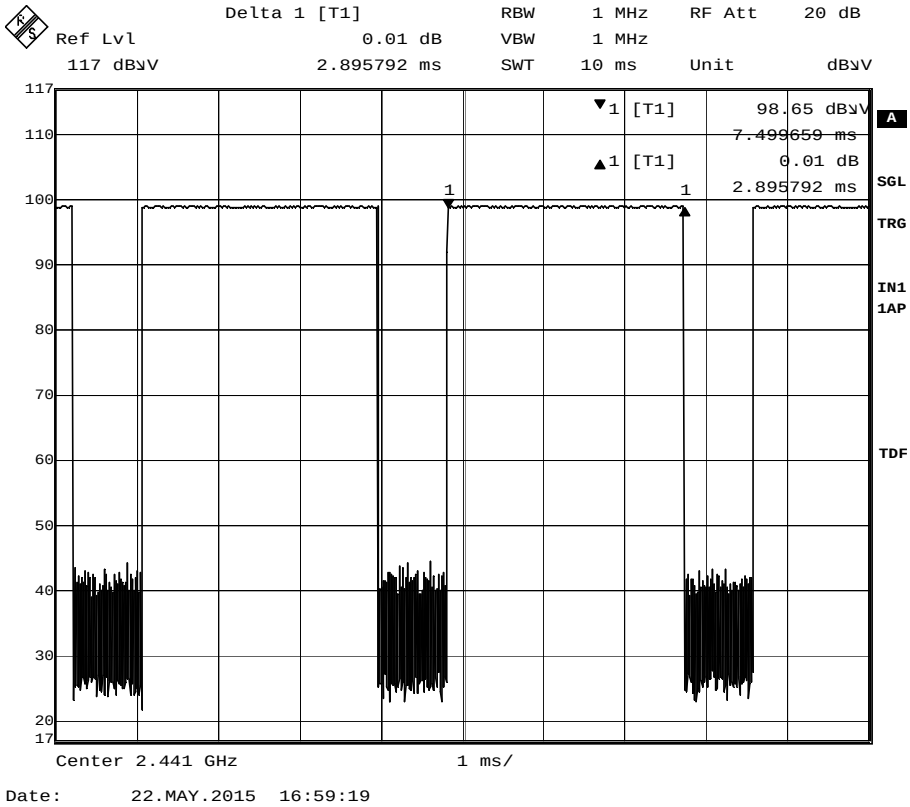

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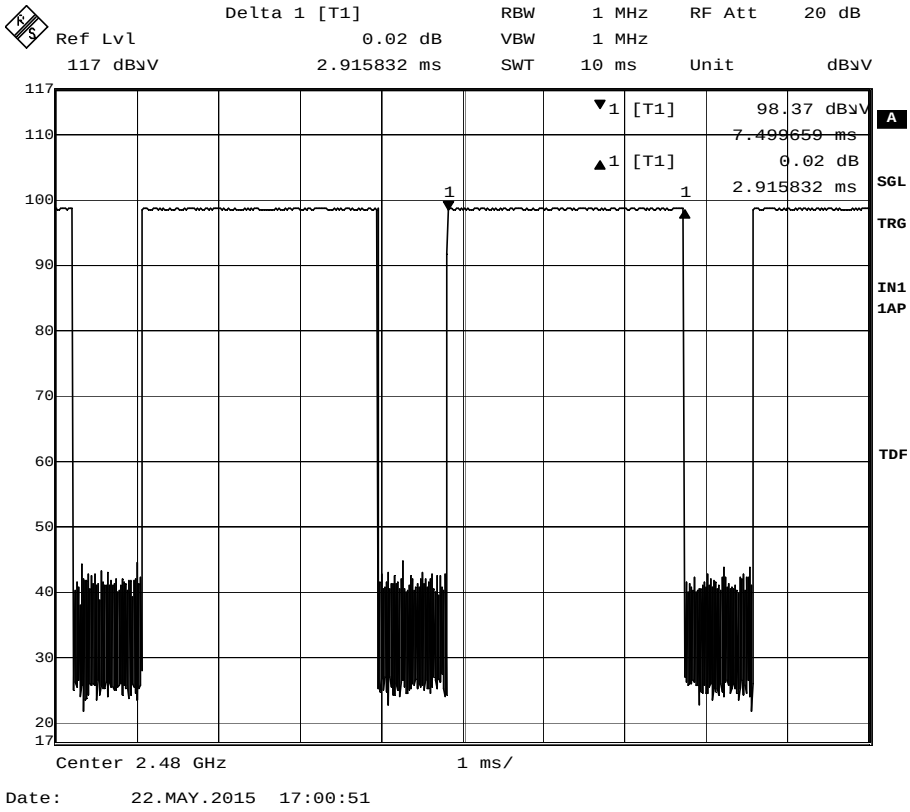
Fig. C
[Pulse duration of Highest Channel]
Pulse duration = 2.896ms



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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 x 31.6 = 160 within 31.6 seconds

Fig. D
[Pulse duration of Lowest Channel]
Pulse duration = 1.660ms

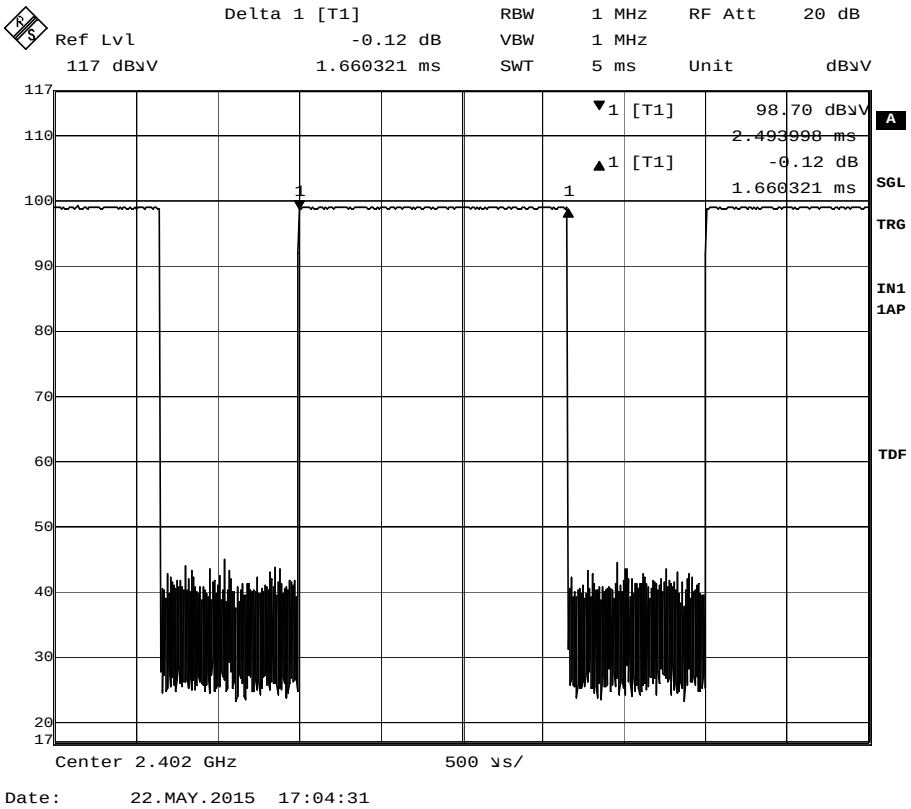

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Fig. E
[Pulse duration of Middle Channel]
Pulse duration = 1.660ms

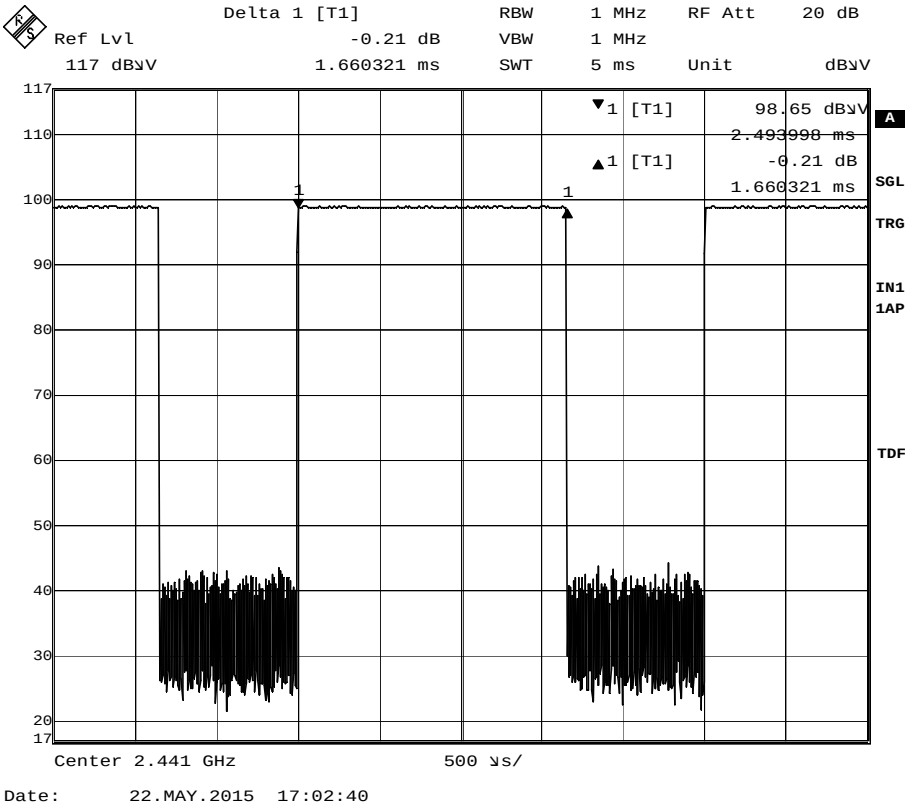

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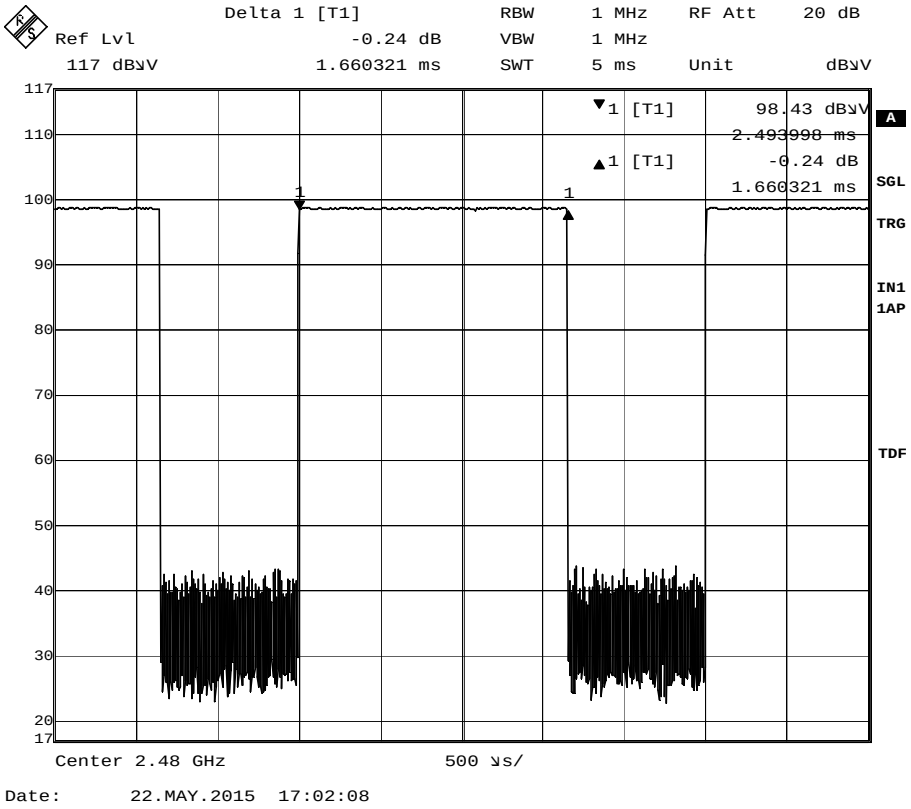
Fig. F
[Pulse duration of Highest Channel]
Pulse duration = 1.660ms



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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 x 31.6 = 320 within 31.6 seconds

Fig. G
[Pulse duration of Lowest Channel]
Pulse duration = 0.391ms

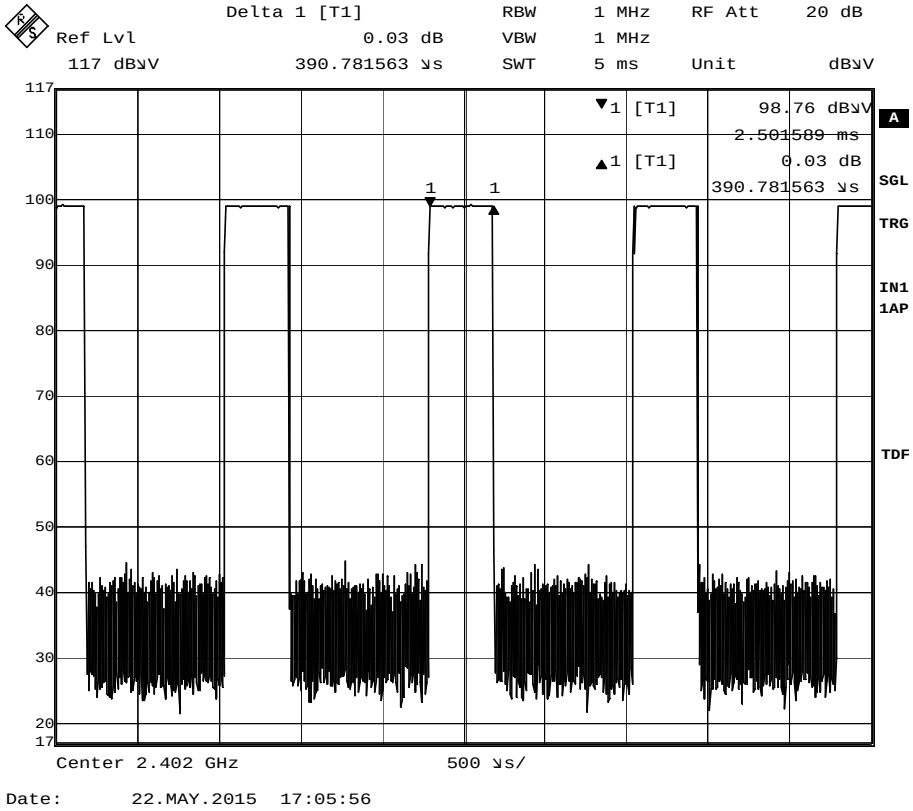

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Fig. H
[Pulse duration of Middle Channel]
Pulse duration = 0.391ms

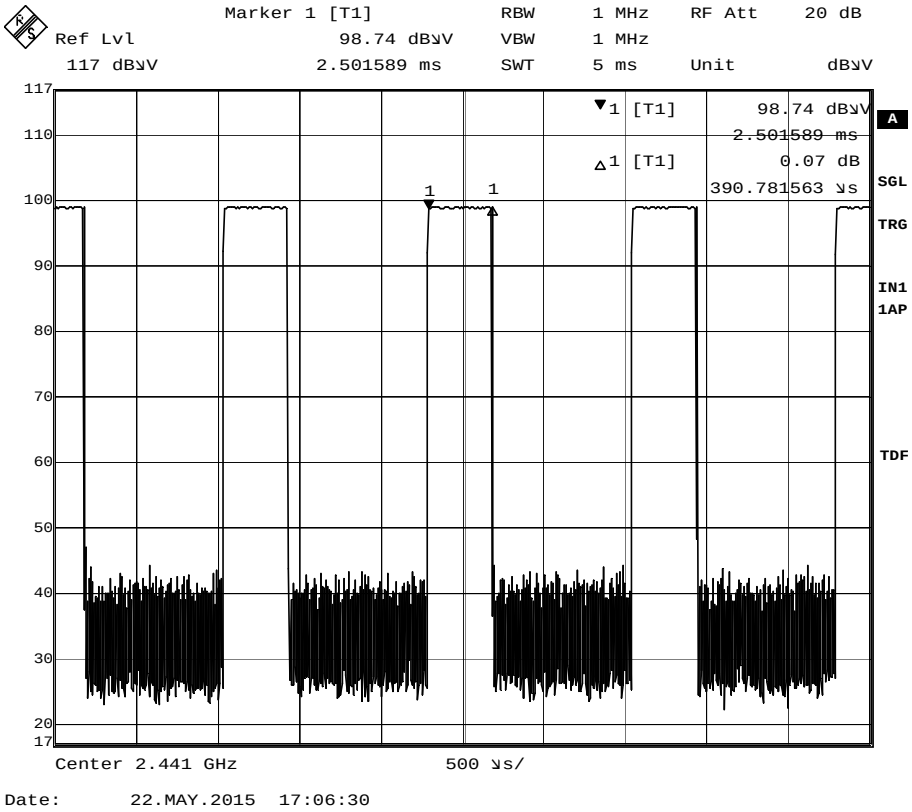

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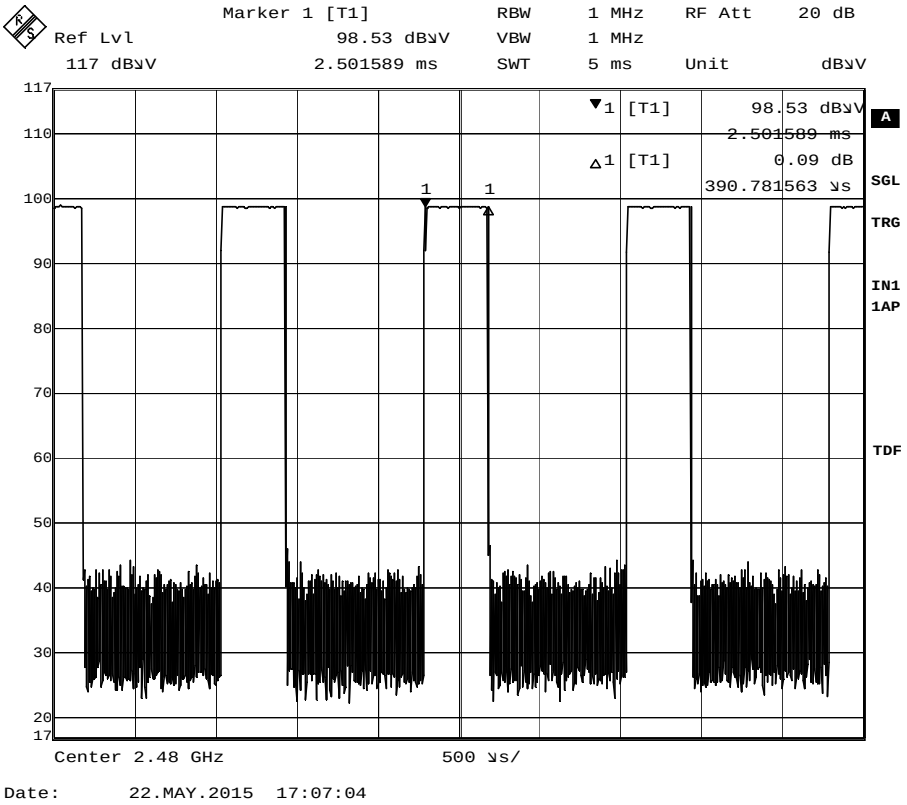
Fig. I
[Pulse duration of Highest Channel]
Pulse duration = 0.391ms



Time of occupancy (Dwell Time):

Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)	Test Results
DH5	2402	2.896	0.308	0.400	Complies
DH5	2442	2.896	0.308	0.400	Complies
DH5	2480	2.916	0.308	0.400	Complies
DH3	2402	1.660	0.267	0.400	Complies
DH3	2442	1.660	0.267	0.400	Complies
DH3	2480	1.660	0.267	0.400	Complies
DH1	2402	0.391	0.125	0.400	Complies
DH1	2442	0.391	0.125	0.400	Complies
DH1	2480	0.391	0.125	0.400	Complies

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Appendix A

List of Measurement Equipment

LIST OF MEASUREMENT EQUIPMENT

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM299	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA	ETS-LINDGREN	3115	00114120	2014/01/15	2016/01/15
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2014/01/23	2016/01/23
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM216	MINI MAST SYSTEM	EMCO	2075	00026842	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2014/09/29	2015/09/29
EM320	BICONILOG ANTENNA	ETS-LINDGREN	3142D	00094856	2014/08/06	2016/08/06
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2014/05/26	2015/05/26
EM022	LOOP ANTENNA	EMCO	6502	1189-2424	2014/01/15	2016/01/15

Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM119	LISN	R & S	ESH3-Z5	0831.5518.52	2014/05/26	2015/05/26
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	100072	2014/05/26	2015/05/26
EM179	IMPULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	357-8810.52/54	2015/01/14	2016/01/14
EM154	SHIELDING ROOM	SIEMENS MATSUSHITA COMPONENTS	N/A	803-740-057-99A	2012/02/03	2017/02/03

Remarks:-

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	LENOVO COMPUTER	M2B	N/A	N/A
2	LENOVO KEYBOARD	KU-0225	N/A	1.8M SHIELDED COILED CABLE CONNECTED TO THE COMPUTER
3	DELL MOUSE	N/A	N/A	2.4M UNSHIELDED CABLE CONNECTED TO THE COMPUTER
4	PHILIPS MONITOR	170S7FB/00	N/A	N/A

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Appendix C

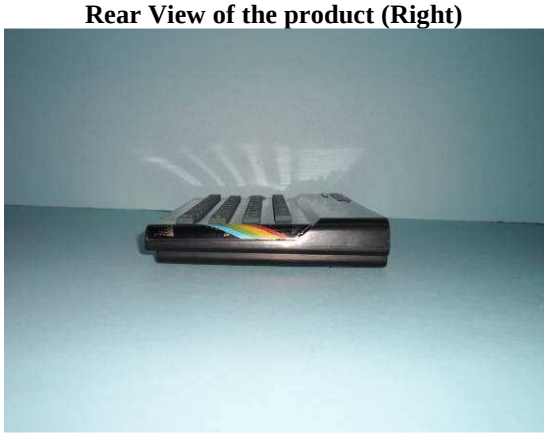
Photographs of EUT

Front View of the product

Back View of the product

Rear View of the product (Left)

Rear View of the product (Right)



Top View of the product

Bottom View of the product

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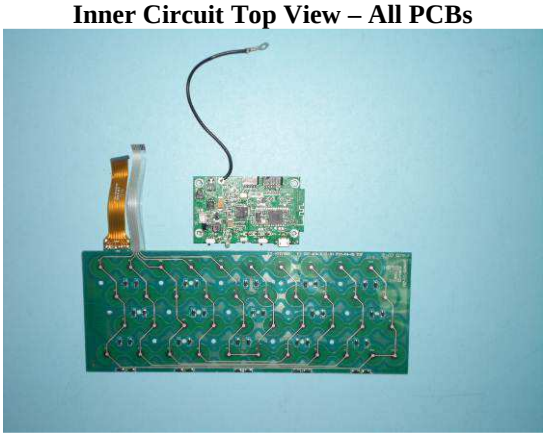
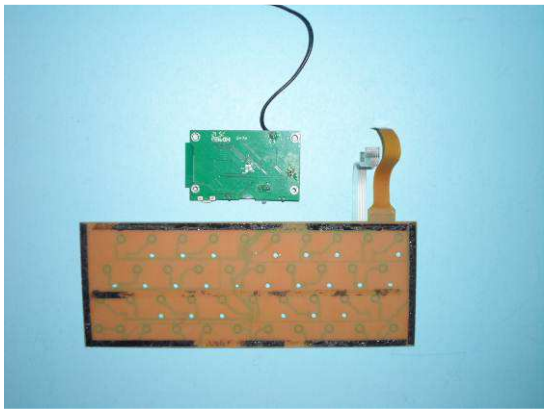
Photographs of EUT

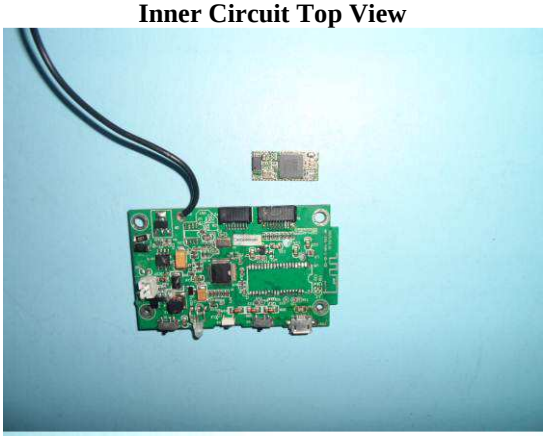
Inner Circuit Top View – All PCBs



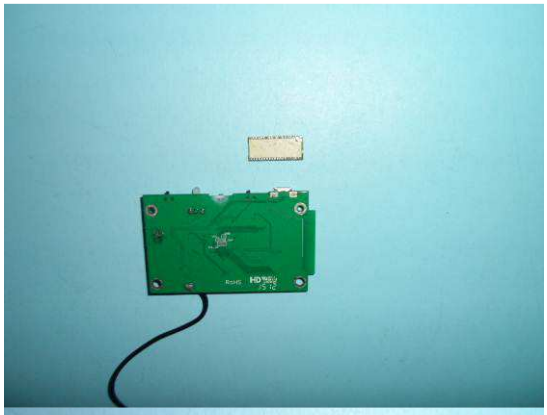
Inner Circuit Bottom View - – All PCBs

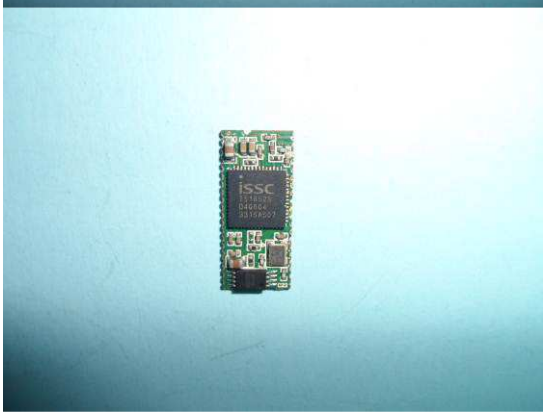


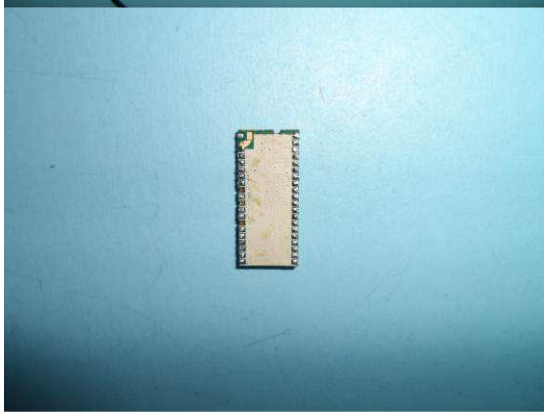
Inner Circuit Top View



Inner Circuit Bottom View







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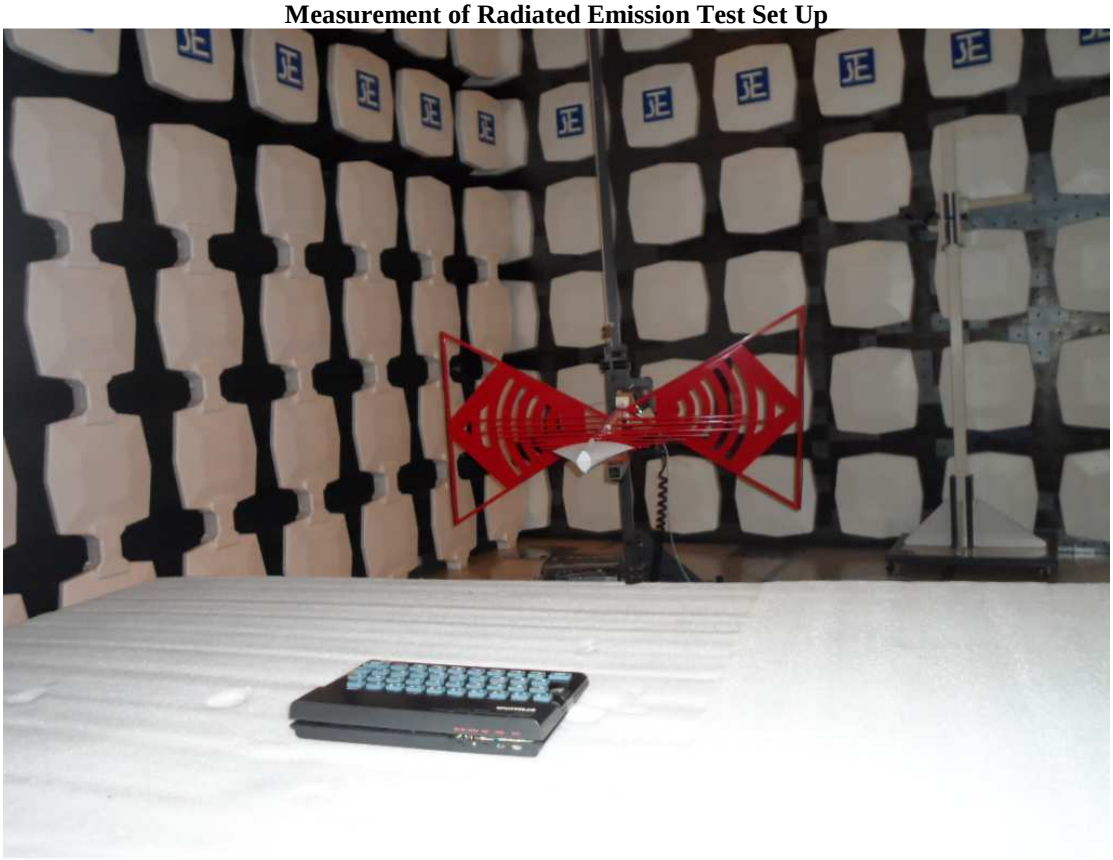
Photographs of EUT

Measurement of Radiated Emission Test Set Up



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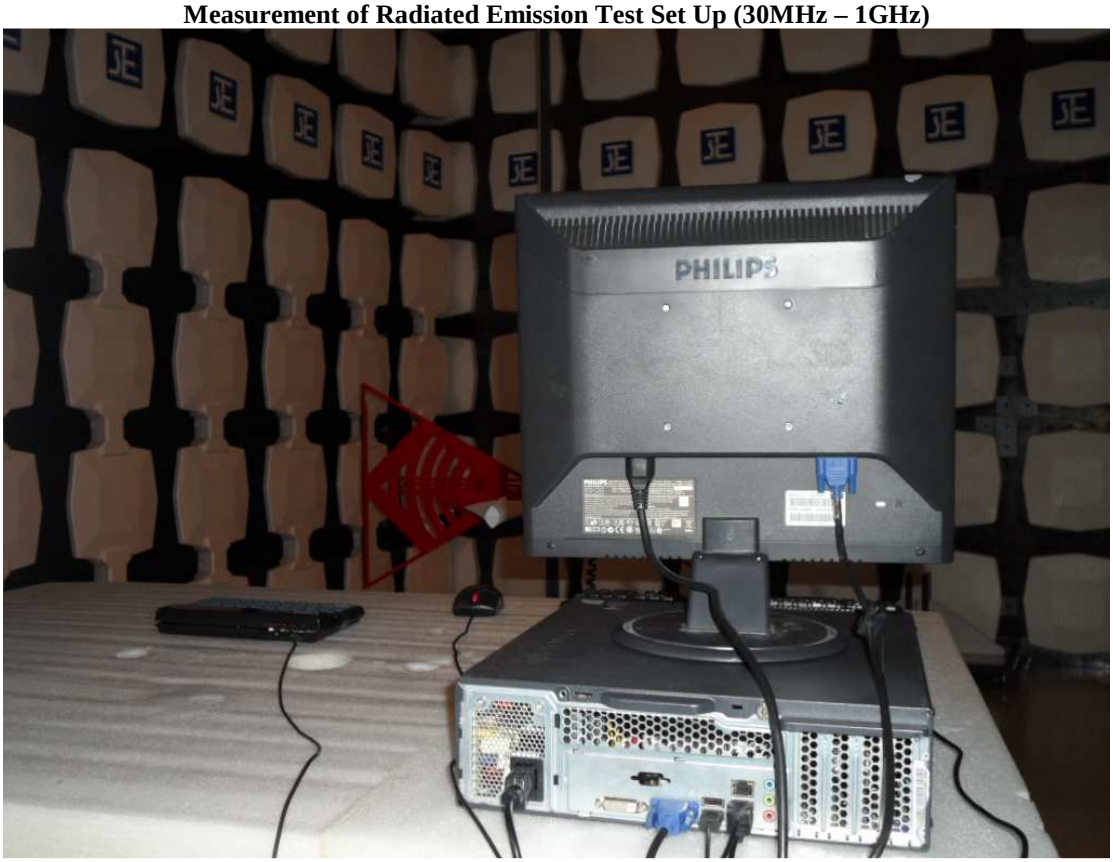
Photographs of EUT

Measurement of Radiated Emission Test Set Up (30MHz – 1GHz)



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Photographs of EUT

Measurement of Radiated Emission Test Set Up

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Photographs of EUT

Measurement of Conducted Emission Test Set Up

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

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STC Test Report

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6. Sample submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.

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8. Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.

9. Subject to the variable length of retention time for test data and report stored hereinto as to otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of this test report for a period of three years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after the retention period. Under no circumstances shall we be liable for damages of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.

10. Issuance records of the Report are available on the internet at www.stc-group.org. Further enquiry of validity or verification of the Reports should be addressed to the Company.