FCC Test Report

Equipment	:	**Bluetooth Mouse**
Brand Name	:	**ACROX**
Model No.	:	**BK4**
FCC ID	:	**PRDMU18**
Standard	:	**47 CFR FCC Part 15.247**
Applicant Manufacturer	:	**ACROX Technologies Co., Ltd. 4F., No.89, Minshan St., Neihu Dist., Taipei City 114**

This report only contains BR mode test result.
The product sample received on Feb. 05, 2013 and completely tested on Mar. 01, 2013. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

Wayne Hsu / Assistant Manager

Testing Laboratory
1190

Table of Contents

Summary of Test Result

Conformance Test Specifications					
Report Clause	**Ref. Std. Clause**	**Description**	**Measured**	**Limit**	**Result**
1.1.2	15.203	Antenna Requirement	Antenna connector mechanism complied	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	The EUT consumes DC power. Not applicable for this test.	FCC 15.207	N/A
3.2	15.247(a)	20dB Bandwidth	1.120 MHz	N/A	Complied
3.2	15.247(a)	Carrier Frequency Separation (ChS)	1.000 MHz	ChS ≥ 20 dB BW x 2/3.	Complied
3.3	15.247(a)	Number of Hopping Frequencies (N)	Max: 79 Min: 75	N ≥ 15	Complied
3.4	15.247(a)	Time of Occupancy (Dwell Time)	0.3185 sec	0.4 s within 0.4 x N	Complied
3.5	15.247(b)	RF Output Power (that Maximum Peak Conducted Output Power)	Power [dBm] Basic: 1.41	Power [dBm] Basic: 21 EDR: 21 LE: 30	Complied
3.6	15.247(c)	Transmitter Radiated Bandedge Emissions	Non-Restricted Bands: 2500.12MHz: 55.12dB Restricted Bands [dBuV/m at 3m]: 2390MHz 44.54 (Margin 29.46dB) - PK 31.60 (Margin 22.40dB) - AV	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied
3.7	15.247(c)	Transmitter Radiated Unwanted Emissions	Restricted Bands [dBuV/m at 3m]: 2491MHz 52.70 (Margin 1.30dB) - AV	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied

Revision History

Report No.	Version	Description	Issued Date
FR320502	Rev. 01	Initial issue of report	Mar. 06, 2013

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information				
Frequency Range (MHz)	**Bluetooth Version**	**Ch. Frequency (MHz)**	**Channel Number**	**RF Output Power (dBm)**
2400-2483.5	v3.0 Basic	2402-2480	0-78 [79]	1.41
Note 1: Bluetooth uses GFSK (1Mbps) modulation for FHSS modulation. Note 2: RF output power specifies that Maximum Peak Conducted Output Power.				

1.1.2 Antenna Information

Antenna Category	
☐	Equipment placed on the market without antennas
☒	Integral antenna (antenna permanently attached)
	☐ Temporary RF connector provided
	☒ No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.

Antenna General Information			
Ant. No.	**Ant. Cat.**	**Ant. Type**	**$G_{ANT\ (dBi)}$**
1	Integral	PCB	-1.2

1.1.3 Type of EUT

Identify EUT	
EUT Serial Number	N/A
Presentation of Equipment	☐ Production ; ☒ Pre-Production ; ☒ Prototype
Type of EUT	
☒	Stand-alone
☐	Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.: …
☐	Plug-in radio (EUT intended for a variety of host systems) Host System - Brand Name / Model No.: …
☐	Other:

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
☒ Operated normally hopping mode for worst duty cycle	
☒ Operated test mode for worst duty cycle	
Test Signal Duty Cycle (x)	**Power Duty Factor [dB] – (10 log 1/x)**
☒ 79.23% - test mode single channel - DH5	1.01
Bluetooth ACL packets can be 1, 3, or 5 time slots. The DH1 packet can cover a single time slot. The DH3 packet can cover up to 3 time slots. The DH5 packet can cover up to 5 time slots. Operate DH5 at maximum dwell time and maximum duty cycle.	

1.2 Accessories

Accessories Information				
-	-	-	-	-

Note: Regarding to more detail and other information, please refer to user manual.

1.3 Support Equipment

Support Equipment - Conducted Emissions				
No.	**Equipment**	**Brand Name**	**Model Name**	**Serial No.**
1	-	-	-	-

Reminder: In the Radiated Emissions tested the EUT was tested alone.

1.4 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15
- ANSI C63.10-2009
- FCC Public Notice DA 00-705
- FCC KDB 412172 - Guidelines for Determining the ERP and EIRP

1.5 Testing Location Information

Testing Location					
☒	HWA YA	ADD :	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C		
		TEL :	886-3-327-3456	FAX :	886-3-327-0973

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-HY	Ian Du	23°C / 65%	Mar. 01, 2013
Radiated Emission	03CH05-HY	Daniel Hsu	25°C / 65%	Feb. 26, 2013

Test site registered number [643075] with FCC.
Test site registered number [4086B-1] with IC.

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty			
Test Item		Uncertainty	Limit
AC power-line conducted emissions		±2.26 dB	N/A
Emission bandwidth,		±1.42 %	N/A
RF output power, conducted		±0.63 dB	N/A
Unwanted emissions, conducted	30 – 1000 MHz	±0.51 dB	N/A
	1 – 18 GHz	±0.67 dB	N/A
	18 – 40 GHz	±0.83 dB	N/A
	40 – 200 GHz	N/A	N/A
All emissions, radiated	30 – 1000 MHz	±2.56 dB	N/A
	1 – 18 GHz	±3.59 dB	N/A
	18 – 40 GHz	±3.82 dB	N/A
	40 – 200 GHz	N/A	N/A
Temperature		±0.8 °C	N/A
Humidity		±3 %	N/A
DC and low frequency voltages		±3 %	N/A
Time		±1.42 %	N/A
Duty Cycle		±1.42 %	N/A

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Worst Modulation Used for Conformance Testing					
Bluetooth Version	**Number of Transmit Chains (N_{TX})**	**Data Rate**	**Modulation Mode**	**RF Output Power (dBm)**	**Worst Modulation Mode**
v3.0 Basic	1	1 Mbps	BT-1M	**1.41**	BT-1M
Note 1: Bluetooth uses GFSK (1Mbps) modulation for FHSS modulation. Note 2: Modulation modes consist of FHSS BT-1M: GFSK (1Mbps), Note 3: RF output power specifies that that Maximum Peak Conducted Output Power.					

2.2 Test Channel Frequencies Configuration

Test Channel Frequencies Configuration		
Bluetooth Version	**Worst Modulation Mode**	**Test Channel Frequencies (MHz) – FX (Frequencies Abbreviations)**
v3.0 Bacic	BT-1M	2402-(F1), 2441-(F2), 2480-(F3)

2.3 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter					
Test Software Version		Ampak RFTestTool, VER:3.5			
Worst Modulation Mode	**Number of Transmit Chains (N_{TX})**	**Frequency (MHz)**	**Power Setting**	**Data Rate**	**RF Output Power (dBm)**
BT-1M	1	2402	Default	1 Mbps	-0.36
BT-1M	1	2441	Default	1 Mbps	1.41
BT-1M	1	2480	Default	1 Mbps	1.12
Note 1: RF output power specifies that that Maximum Peak Conducted Output Power.					

2.4 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests			
Tests Item	RF Output Power 20dB Bandwidth Carrier Frequency Separation (ChS)		
Test Condition	Conducted measurement at transmit chains		
Modulation Mode	**Number of Transmit Chains (N_{TX})**	**Data Rate / MCS**	**Test Frequency**
BT-1M	1	1 Mbps	F1, F2, F3

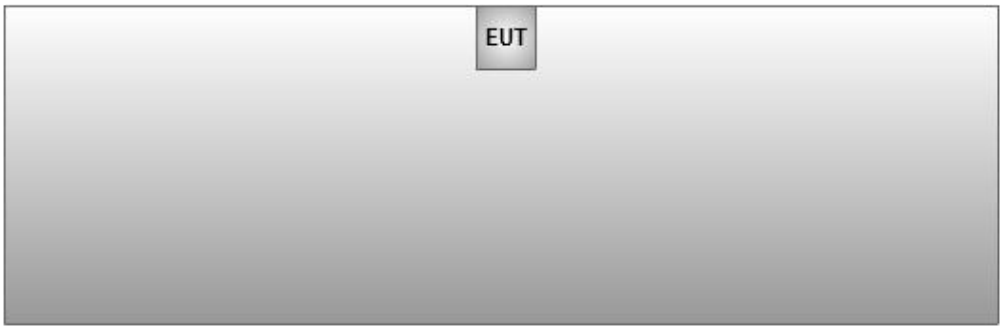
The Worst Case Mode for Following Conformance Tests			
Tests Item	Number of Hopping Frequencies (N) Time of Occupancy (Dwell Time)		
Test Condition	Conducted measurement at transmit chains		
Modulation Mode	**Number of Transmit Chains (N_{TX})**	**Data Rate / MCS**	**Test Frequency**
BT-1M	1	1 Mbps	Hopping

The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Bandedge Emissions		
Test Condition	Radiated measurement		
Modulation Mode	**Number of Transmit Chains (N_{TX})**	**Data Rate / MCS**	**Test Frequency**
BT-1M	1	1 Mbps	F1, F3

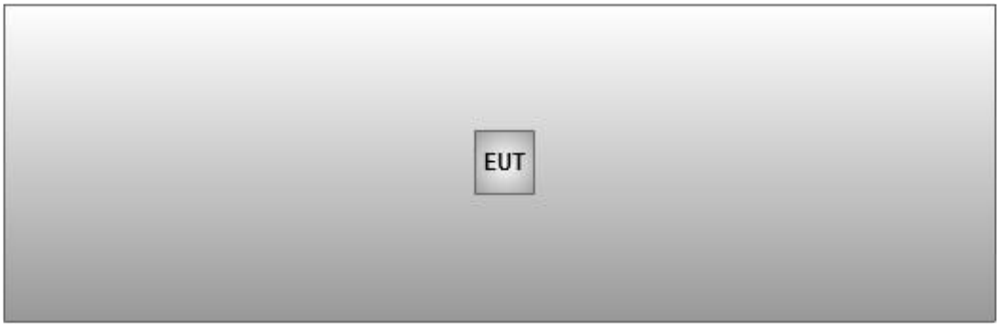
The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Unwanted Emissions		
Test Condition	Radiated measurement		
User Position	☒ EUT will be placed in fixed position.		
	☐ EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two or three orthogonal planes.		
	☐ EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed three orthogonal planes. Worst orthogonal planes of EUT is Z plane.		
Operating Mode < 1GHz	☒ 1. Normal Link		
Modulation Mode	**Data Rate / MCS**		**Test Frequency**
BT-1M	1 Mbps		F1, F2, F3
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
			

2.5 Test Setup Diagram

Test Setup Diagram - Radiated Test (Below 1GHz)	
Operating Mode	**Normal Link**



Test Setup Diagram - Radiated Test (Above 1GHz)	
Operating Mode	**Transmit**



3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

3.1.2 Measuring Instruments

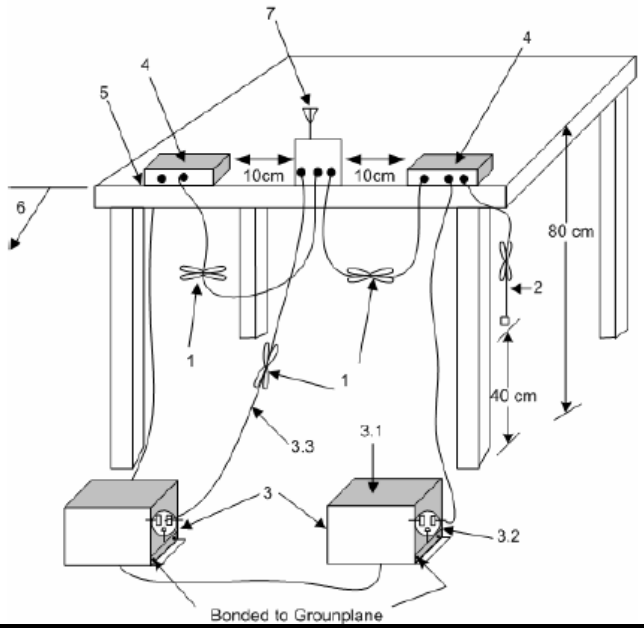
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

Test Method
☒ Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions.

3.1.4 Test Setup

AC Power-line Conducted Emissions



3.1.5 Test Result of AC Power-line Conducted Emissions

The transmitter is battery powered; there is no need to do this testing.

3.2 20dB Bandwidth and Carrier Frequency Separation

3.2.1 20dB Bandwidth and Carrier Frequency Separation Limit

20dB Bandwidth and Carrier Frequency Separation Limit for Frequency Hopping Systems	
☐	902-928 MHz Band:
	☐ N ≥ 50 and 20 dB bandwidth < 250 kHz
	☐ 50 > N ≥ 25 and 250kHz ≤ 20 dB bandwidth ≤ 500 kHz
☒	2400-2483.5 MHz Band:
	☐ N ≥ 79 and ChS ≥ MAX (20 dB bandwidth, 25 kHz).
	☒ N ≥ 15 and ChS ≥ MAX (20 dB bandwidth x 2/3, 25 kHz).
☐	5725-5850 MHz Band: N ≥ 79 and 20 dB bandwidth ≤ 1 MHz
N: Number of Hopping Frequencies **ChS**: Hopping Channel Separation	

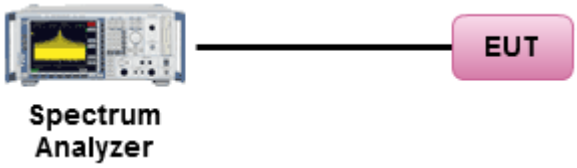
3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method		
☒	Refer as ANSI C63.10, clause 6.9.1 for 20 dB bandwidth measurement.	
☒	Refer as ANSI C63.10, clause 7.7.2 for carrier frequency separation measurement.	
☒	For conducted measurement.	
	☒	For conducted measurements on devices with single transmit chains.
	☐	For conducted measurements on devices with multiple transmit chains using options given below:
		☐ Option 1: Multiple transmit chains measurements need to be performed on one of the active transmit chains (antenna outputs). All measurement had be performed on transmit chains 1.
		☐ Option 2: Multiple transmit chains measurements need to be performed on each transmit chains individually (antenna outputs). All measurement had be performed on all transmit chains.
		☐ Option 3: A power splitter/combiner shall be used to combine all the transmit chains (antenna outputs) into a single test point and record a single test point EBW.
☐	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level.	

3.2.4 Test Setup

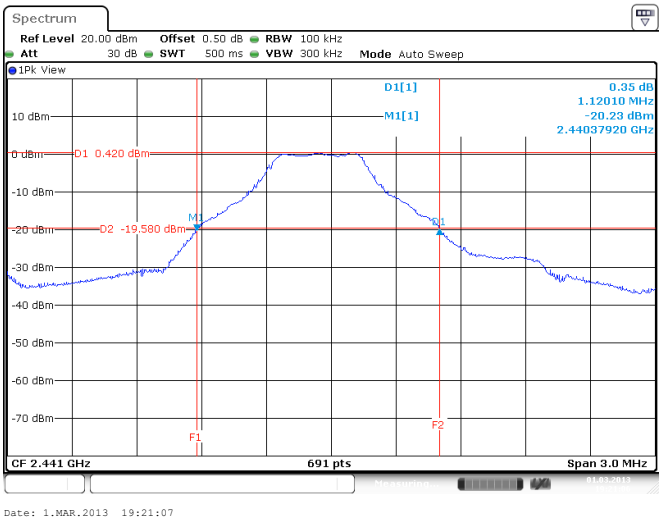
20dB Bandwidth and Carrier Frequency Separation


3.2.5 Test Result of 20dB Bandwidth and Carrier Frequency Separation

20dB Bandwidth and Carrier Frequency Separation Result					
Modulation Mode	Freq. (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)
BT-1M	2402	1.107	0.973	1.000	0.738
BT-1M	2441	1.120	0.981	1.000	0.747
BT-1M	2480	1.107	0.977	1.000	0.738
Result		Complied			

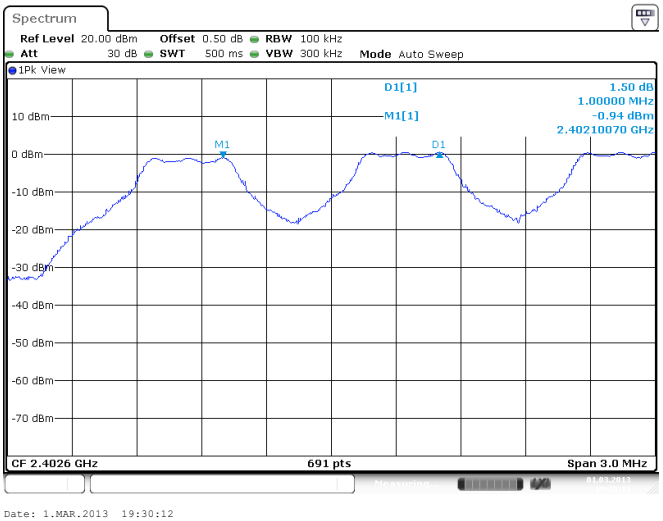
Worst 20dB Bandwidth Plots

BT-1M – F2



Worst Carrier Frequency Separation Plots

BT-1M – F2



3.3 Number of Hopping Frequencies

3.3.1 Number of Hopping Frequencies Limit

Number of Hopping Frequencies Limit for Frequency Hopping Systems	
☐	902-928 MHz Band:
	☐ N ≥ 50 and 20 dB bandwidth < 250 kHz
	☐ 50 > N ≥ 25 and 250kHz ≤ 20 dB bandwidth ≤ 500 kHz
☒	2400-2483.5 MHz Band:
	☐ N ≥ 79 and ChS ≥ MAX (20 dB bandwidth, 25 kHz).
	☒ N ≥ 15 and ChS ≥ MAX (20 dB bandwidth x 2/3, 25 kHz).
☐	5725-5850 MHz Band: N ≥ 79
N: Number of Hopping Frequencies **ChS**: Hopping Channel Separation	

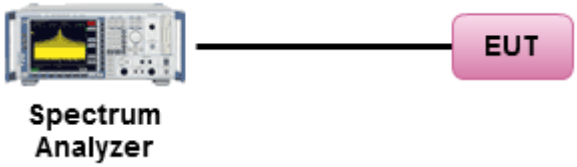
3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

Test Method		
☒	Refer as ANSI C63.10, clause 7.7.3 for number of hopping frequencies measurement.	
☒	For conducted measurement.	
	☒	For conducted measurements on devices with single transmit chains.
	☐	For conducted measurements on devices with multiple transmit chains using options given below:
		☐ Option 1: Multiple transmit chains measurements need to be performed on one of the active transmit chains (antenna outputs). All measurement had be performed on transmit chains 1.
		☐ Option 2: Multiple transmit chains measurements need to be performed on each transmit chains individually (antenna outputs). All measurement had be performed on all transmit chains.
		☐ Option 3: A power splitter/combiner shall be used to combine all the transmit chains (antenna outputs) into a single test point and record a single test point EBW.
☐	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level.	

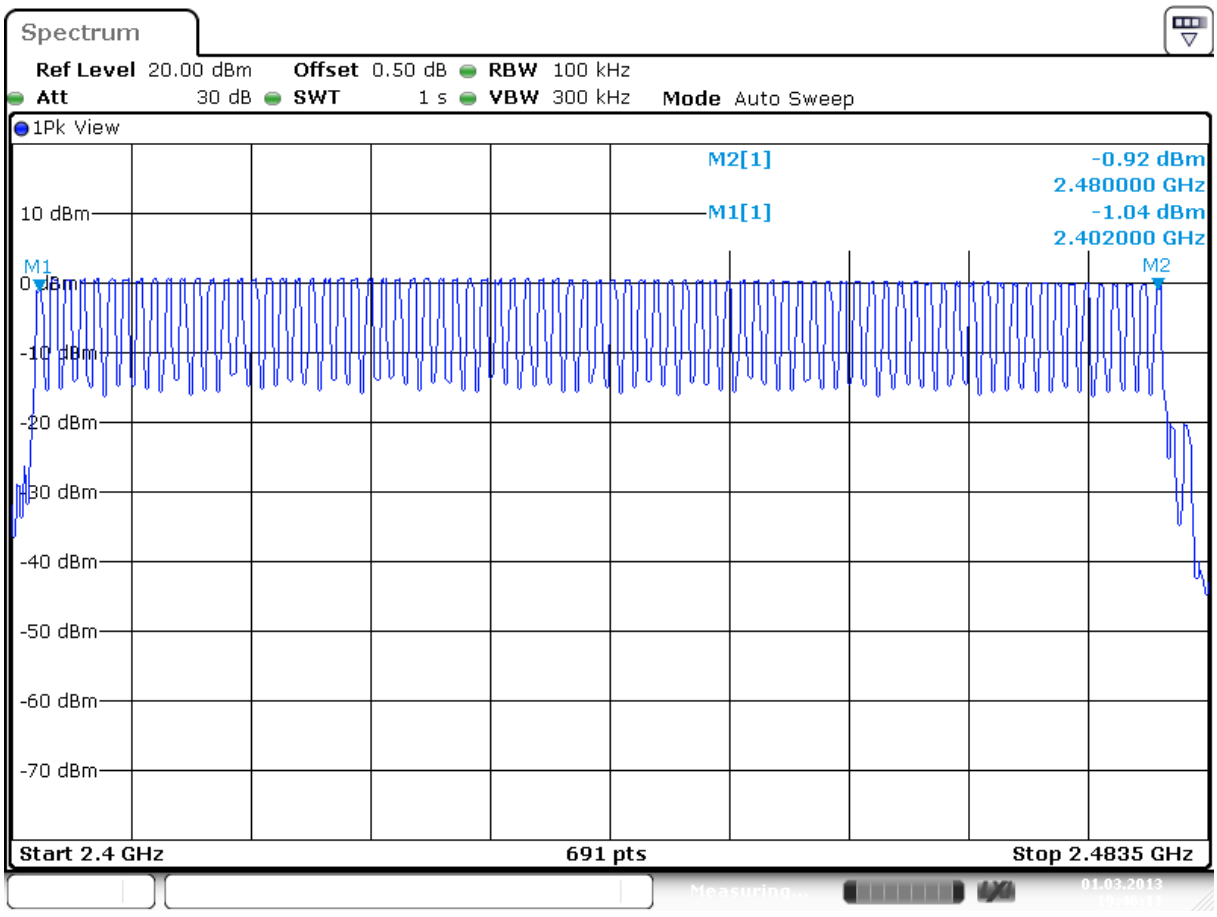
3.3.4 Test Setup

Number of Hopping Frequencies


3.3.5 Test Result of Number of Hopping Frequencies

Number of Hopping Frequencies Result			
Modulation Mode	**Freq. (MHz)**	**Hopping Channel Number (N)**	**Hopping Channel Number Limits**
BT-1M	2402-2480	79	75
Result	**Complied**		

Number of Hopping Frequencies Plots
BT-1M



Date: 1.MAR.2013 19:46:11

3.4 Time of Occupancy (Dwell Time)

3.4.1 Time of Occupancy (Dwell Time) Limit

Time of Occupancy (Dwell Time) Limit for Frequency Hopping Systems	
☐	902-928 MHz Band:
	☐ N ≥ 50 and 20 dB bandwidth < 250 kHz: Dwell time ≤ 0.4 sec within 20 sec
	☐ 50 > N ≥ 25 and 250kHz ≤ 20 dB bandwidth ≤ 500 kHz: Dwell time ≤ 0.4 sec within 10 sec
☒	2400-2483.5 MHz Band: Dwell time ≤ 0.4 second within 0.4 x N
☐	5725-5850 MHz Band: Dwell time ≤ 0.4 second within 30 sec
N: Number of Hopping Frequencies	

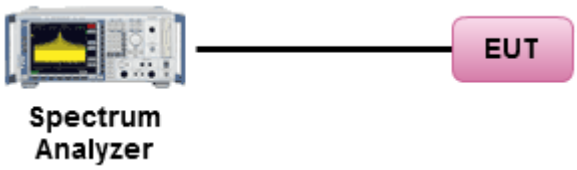
3.4.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

Test Method	
☒	Refer as ANSI C63.10, clause 7.7.4 for dwell time measurement.
☒	Bluetooth ACL packets can be 1, 3, or 5 time slots. Following as dwell time. Operate DH5 at maximum dwell time and maximum duty cycle.
	☒ The DH1 packet can cover a single time slot. A maximum length packet has duration of 1 time slots. The hopping rate is 1600 hops/second so the maximum dwell time is 1/1600 seconds, or 0.625ms. DH1 Packet permit maximum 1600 / 79 /2 = 10.12 hops per second in each channel (1 time slot RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 10.12 x 31.6 = 320 within 31.6 seconds.
	☒ The DH3 packet can cover up to 3 time slots. A maximum length packet has duration of 3 time slots. The hopping rate is 1600 hops/second so the maximum dwell time is 3/1600 seconds, or 1.875ms. DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 5.06 x 31.6 = 160 within 31.6 seconds.
	☒ The DH5 packet can cover up to 5 time slots. Operate DH5 at maximum dwell time and maximum duty cycle. A maximum length packet has duration of 5 time slots. The hopping rate is 1600 hops/second so the maximum dwell time is 5/1600 seconds, or 3.125ms. DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 3.37 x 31.6 = 106.6 within 31.6 seconds
☒	For conducted measurement.
	☒ For conducted measurements on devices with single transmit chains.
☐	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level.

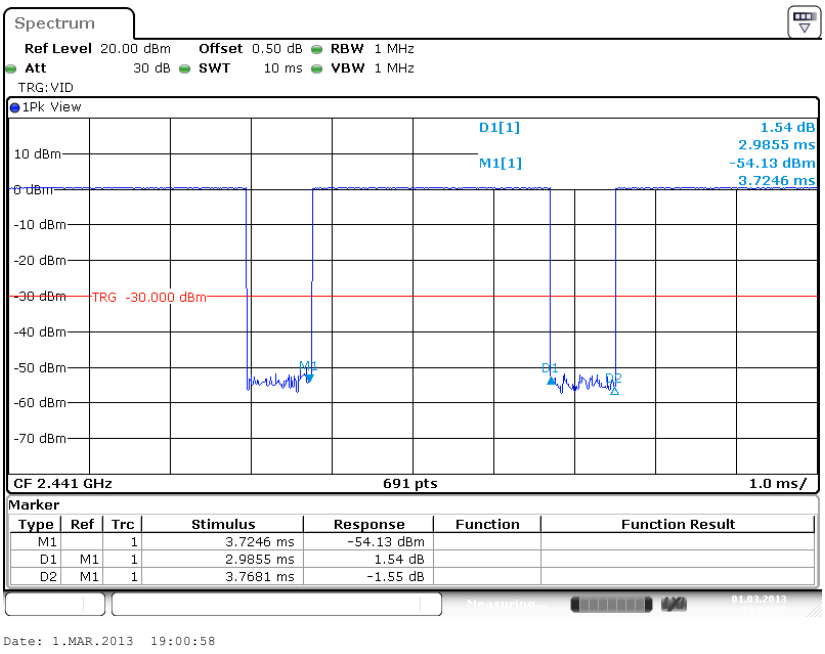
3.4.4 Test Setup

Time of Occupancy (Dwell Time)


3.4.5 Test Result of Time of Occupancy (Dwell Time)

Time of Occupancy (Dwell Time) Result					
Modulation Mode	**Freq. (MHz)**	**Pulse Time per Hop (ms)**	**Number of Pulse in [0.4 x N sec]**	**Dwell Time in [0.4 x N sec] (s)**	**Dwell Time Limits (s)**
BT-1M	2441	79	2.9855	0.3185	0.4000
Result		**Complied**			
Bluetooth ACL packets can be 1, 3, or 5 time slots. The DH1 packet can cover a single time slot. The DH3 packet can cover up to 3 time slots. The DH5 packet can cover up to 5 time slots. Operate DH5 at maximum dwell time and maximum duty cycle. A maximum length packet has duration of 5 time slots. The hopping rate is 1600 hops/second so the maximum dwell time is 5/1600 seconds, or 3.125ms.					

Worst Pulse Time per Hop Plots
BT-1M – F2 – DH5



3.5 RF Output Power

3.5.1 RF Output Power Limit

RF Output Power Limit for Frequency Hopping Systems	
Maximum Peak Conducted Output Power Limit	
☐	902-928 MHz Band:
	☐ For Hopping Channel: N ≥ 50
	☐ If G_{TX} ≤ 6 dBi, then P_{Out} ≤ 30 dBm (1 W)
	☐ If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6) dBm
	☐ For Hopping Channel: 50 > N ≥ 25
	☐ If G_{TX} ≤ 6 dBi, then P_{Out} ≤ 24 dBm (0.25 W)
	☐ If G_{TX} > 6 dBi, then P_{Out} = 24 – (G_{TX} – 6) dBm
☒	2400-2483.5 MHz Band:
	☐ For Hopping Channel: N ≥ 79
	☐ If G_{TX} ≤ 6 dBi, then P_{Out} ≤ 30 dBm (1 W)
	☐ If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6) dBm
	☒ For Hopping Channel: N ≥ 15
	☒ If G_{TX} ≤ 6 dBi, then P_{Out} ≤ 21 dBm (0.125 W)
	☐ If G_{TX} > 6 dBi, then P_{Out} = 21 – (G_{TX} – 6) dBm
☐	5725-5850 MHz Band:
	☐ For Hopping Channel: N ≥ 79
	☐ If G_{TX} ≤ 6 dBi, then P_{Out} ≤ 30 dBm (1 W)
	☐ If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6) dBm
e.i.r.p. Power Limit:	
☐	902-928 MHz Band:
	☐ For Hopping Channel: N ≥ 50 - P_{eirp} ≤ 36 dBm (4 W)
	☐ For Hopping Channel: 50 > N ≥ 25 - P_{eirp} ≤ 30 dBm (1 W)
☒	2400-2483.5 MHz Band:
	☐ For Hopping Channel: N ≥ 79 - P_{eirp} ≤ 36 dBm (4 W)
	☒ For Hopping Channel: 79 > N ≥ 15 - P_{eirp} ≤ 27 dBm (0.5 W)
☐	5725-5850 MHz Band:
	☐ For Hopping Channel: N ≥ 79 - P_{eirp} ≤ 36 dBm (4 W)
G_{TX} = the maximum transmitting antenna directional gain in dBi. **P_{eirp}** = e.i.r.p. Power in dBm. **N:** Number of Hopping Frequencies **ChS**: Hopping Channel Separation	

3.5.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.5.3 Test Procedures

Test Method	
☒	Maximum Peak Conducted Output Power
☐	Refer as FCC KDB 558074, clause 5.2.1.1 Option 1 (RBW ≥ EBW method).
☐	Refer as FCC KDB 558074, clause 5.2.1.2 Option 2 (integrated band power method).
☐	Refer as FCC DA 00-0705, spectrum analyzer for peak power.
☒	Refer as FCC DA 00-0705, peak power meter for peak power.
☒	Refer as ANSI C63.10, clause 6.10.2.1 a) for peak power meter.
☐	Refer as ANSI C63.10, clause 6.10.2.1 a) for spectrum analyzer - (RBW ≥ EBW).
☐	Refer as ANSI C63.10, clause 6.10.2.1 b) for spectrum analyzer - BW correction factor.

3.5.4 Test Setup

RF Output Power (Peak Power Meter)

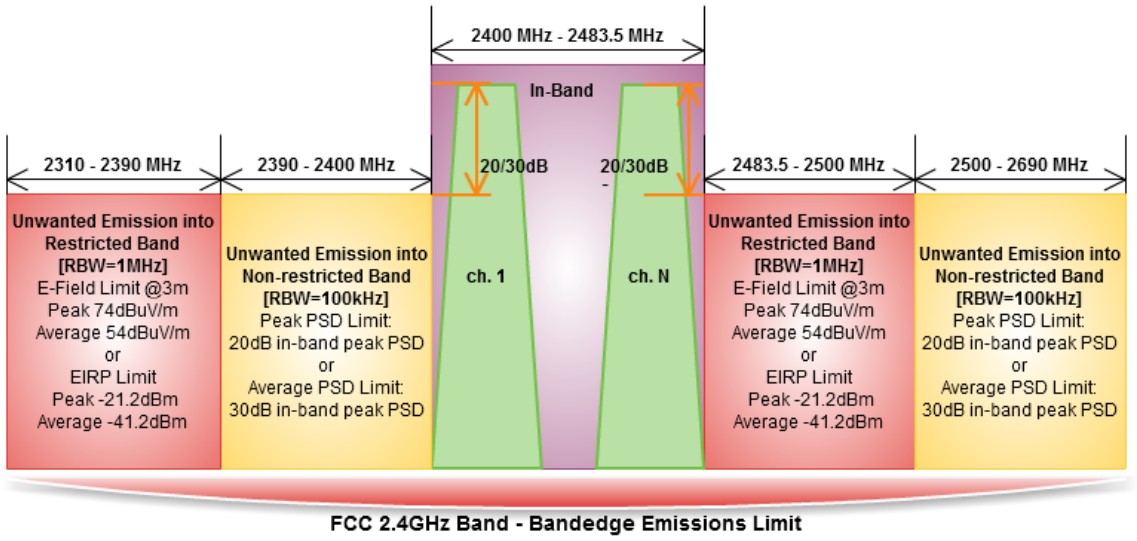
3.5.5 Test Result of Maximum Peak Conducted Output Power

Maximum Peak Conducted Output Power Result					
Directional Gain (dBi)	-1.2	**RF Output Power (dBm)**			
Modulation Mode	**Freq. (MHz)**	**RF Output Power**	**Power Limit**	**EIRP Power**	**EIRP Limit**
BT-1M	2402	-0.36	30	-1.56	36
BT-1M	2441	1.41	30	0.21	36
BT-1M	2480	1.12	30	-0.08	36
Result		**Complied**			
RF Output Power Limit for Frequency Hopping Systems					

3.6 Transmitter Radiated Bandedge Emissions

3.6.1 Transmitter Radiated Bandedge Emissions Limit

Transmitter Radiated Bandedge Emissions Limit



3.6.2 Measuring Instruments

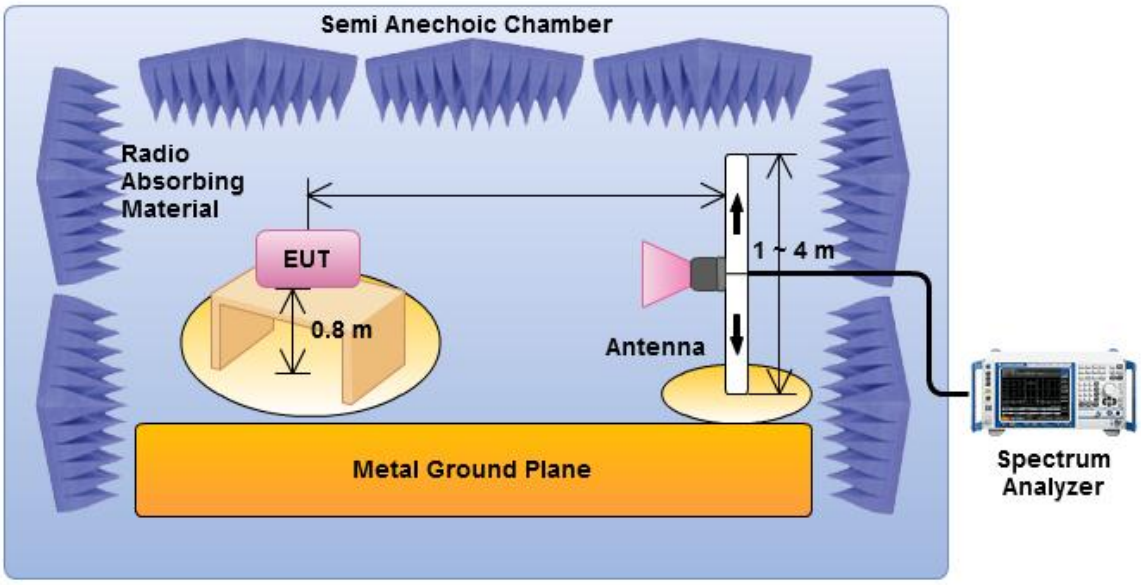
Refer a test equipment and calibration data table in this test report.

3.6.3 Test Procedures

Test Method – General Information		
☒	The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].	
☒	Refer as ANSI C63.10, clause 6.9.2.2 bandedge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.	
☒	For the transmitter unwanted emissions shall be measured using following options below:	
	☒	For unwanted emissions into non-restricted bands, 20 dB relative to the in-band peak output power in 100 kHz.
	☒	For unwanted emissions into restricted bands.
		☐ Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). – Duty cycle ≥ 98%.
		☒ Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
		☒ Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.
☒	For the transmitter bandedge emissions shall be measured using following options below:	
	☒	Refer as ANSI C63.10, clause 6.9.2 for band-edge testing.
	☐	Refer as ANSI C63.10, clause 6.9.3 for marker-delta method for band-edge measurements.
	☒	Refer as ANSI C63.10, clause 7.7.9 for band-edge testing into non-restricted bands.

3.6.4 Test Setup

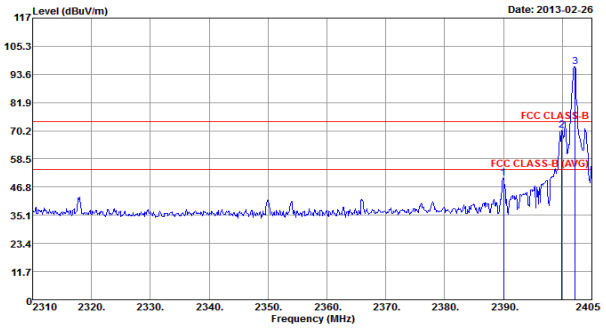
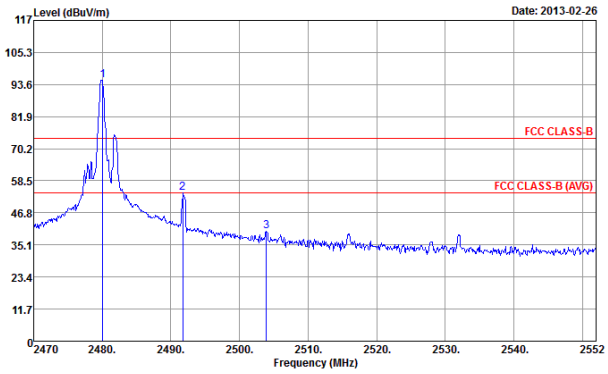
Transmitter Radiated Bandedge Emissions



Electric field tests shall be performed in transmitter bandedge emissions using a calibrated horn antenna.

3.6.5 Test Result of Transmitter Radiated Bandedge Emissions

Transmitter Radiated Bandedge Emissions Result								
Modulation	BT-1M		**Non-restricted Band Emissions**					
Non-restricted Band (MHz)	**Test Ch. Freq. (MHz)**	**In-band PSD [i] (dBuV/100kHz)**	**NBE Freq. (MHz)**	**Out-band PSD [o] (dBuV/100kHz)**	**[i] – [o] (dB)**	**Limit (dB)**	**Level Type**	**Pol. note 1**
2390-2400	2402	96.88	2399.51	40.46	56.42	20	PK	H
2500-2690	2480	95.27	2500.12	40.15	55.12	20	PK	H

Low Bandedge	Up Bandedge
	

Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)

Transmitter Radiated Bandedge Emissions Result								
Modulation	BT-1M		**Restricted Band Emissions**					
Restricted Band (MHz)	**Test Ch. Freq. (MHz)**	**In-band PSD [i] (dBuV/1MHz)**	**RBE Freq. (MHz)**	**Measure Distance (m)**	**Out-Band Level (dBuV/m)**	**Limit (dBuV/m)**	**Level Type**	**Pol. note 1**
2310-2390	2402	97.21	2390	3	44.54	74	PK	H
2310-2390	2402	96.69	2390	3	31.60	54	AV	H
2483.5-2500	2480	95.77	2483.5	3	43.12	74	PK	H
2483.5-2500	2480	95.25	2483.5	3	30.71	54	AV	H

Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).
Note 2: the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log (dwell time/100 ms) [-30dB]

3.7 Transmitter Radiated Unwanted Emissions

3.7.1 Transmitter Radiated Unwanted Emissions Limit

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Un-restricted Band Emissions Limit	
RF output power procedure	**Limit (dB)**
Peak output power procedure	20
Average output power procedure	30

Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

3.7.2 Measuring Instruments

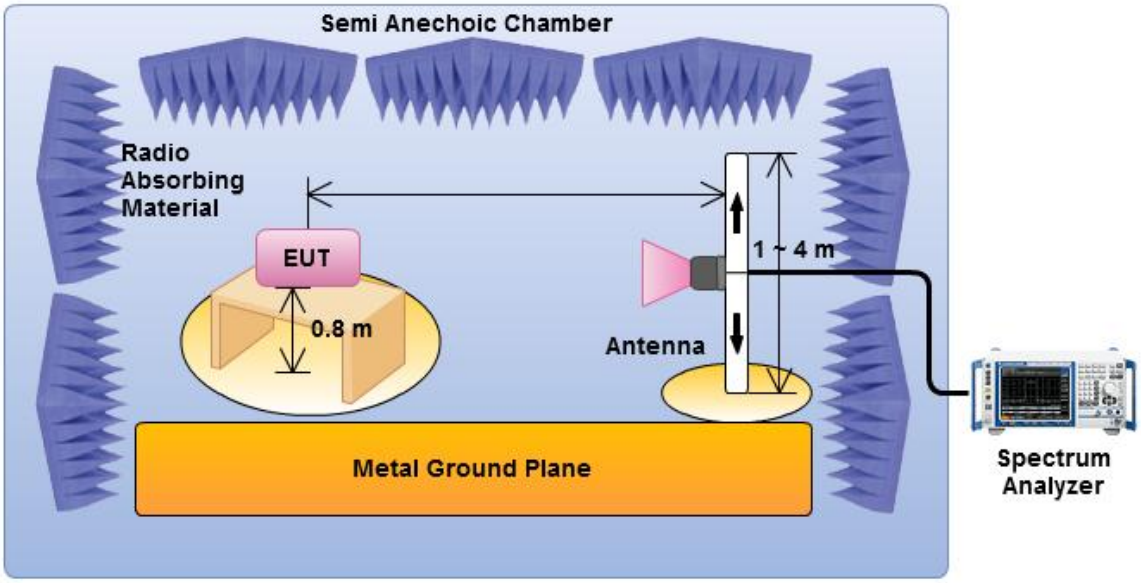
Refer a test equipment and calibration data table in this test report.

3.7.3 Test Procedures

Test Method – General Information			
☒	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).		
	☒	Measurements in the frequency range 10 GHz - 18GHz are typically made at a closer distance 1m, because the instrumentation noise floor is typically close to the radiated emission limit.	
	☒	Measurements in the frequency range above 18 GHz - 25GHz are typically made at a closer distance 0.5m, because the instrumentation noise floor is typically close to the radiated emission limit.	
☒	The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].		
☒	For the transmitter unwanted emissions shall be measured using following options below:		
	☒	Refer as FCC DA 00-0705, for spurious radiated emissions. The dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log (dwell time/100 ms)	
	☒	For unwanted emissions into non-restricted bands, 20 dB relative to the in-band peak output power in 100 kHz.	
	☒	For unwanted emissions into restricted bands.	
		☐	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW) – Duty cycle ≥ 98%.
		☒	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
		☒	Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.
☐	Refer as FCC DA 00-0705, for conducted measurement.		
☒	For radiated measurement.		
	☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz.	
	☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz.	
	☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions from above 1 GHz.	

3.7.4 Test Setup

Transmitter Radiated Unwanted Emissions



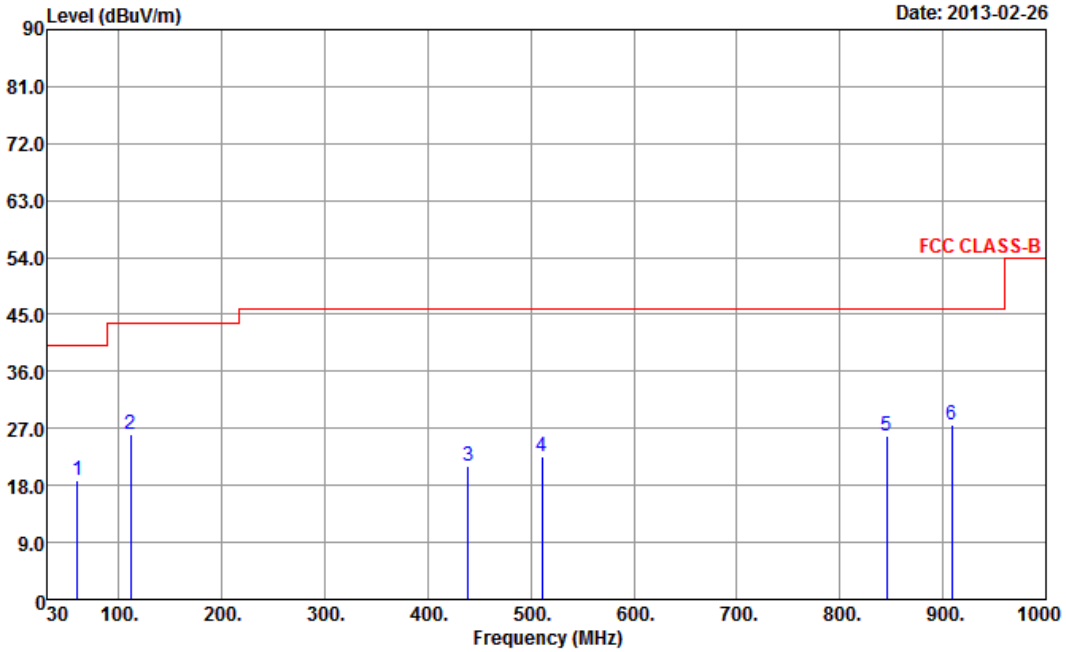
Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna. Electric field tests shall be performed in the frequency range of 30 MHz to 1000 MHz using a calibrated bi-log antenna and the frequency range of 1 GHz to 40 GHz using a calibrated horn antenna.

3.7.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

3.7.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

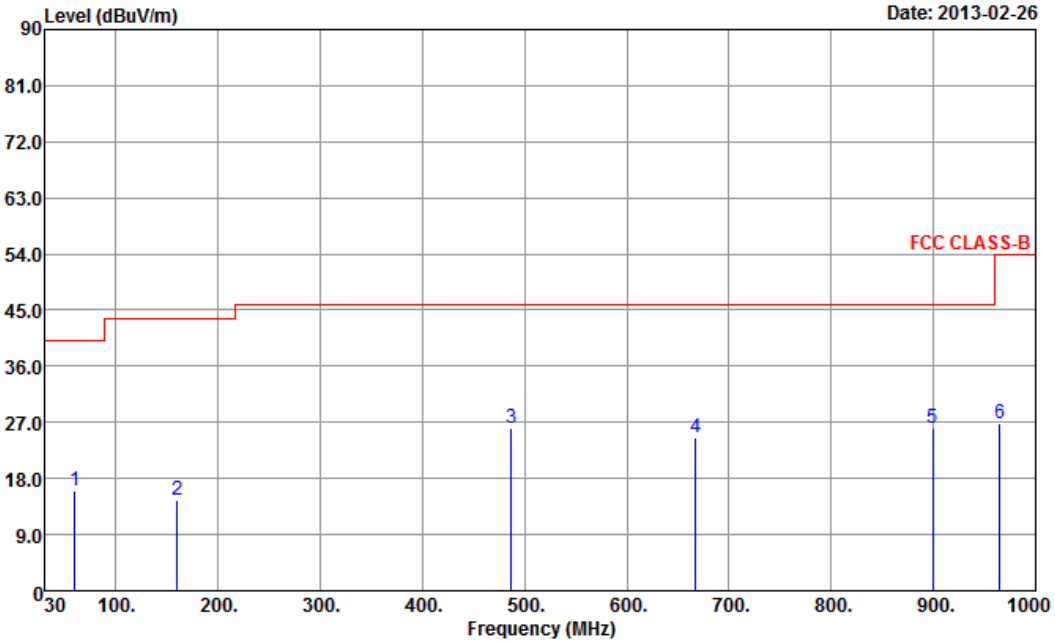
Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Operating Mode	Normal Link	**Polarization**	V
Operating Function	Bluetooth		



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	60.07	18.89	-21.11	40.00	43.65	6.00	0.83	31.59	---	---	Peak
2	111.48	26.05	-17.45	43.50	45.04	11.38	1.15	31.52	---	---	Peak
3	439.34	21.14	-24.86	46.00	32.97	16.89	2.25	30.97	---	---	Peak
4	511.12	22.66	-23.34	46.00	32.88	18.21	2.26	30.69	---	---	Peak
5	845.77	25.77	-20.23	46.00	29.26	23.36	2.85	29.70	---	---	Peak
6	908.82	27.52	-18.48	46.00	31.74	23.56	2.24	30.02	---	---	Peak

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Operating Mode	Normal Link	**Polarization**	H
Operating Function	Bluetooth		

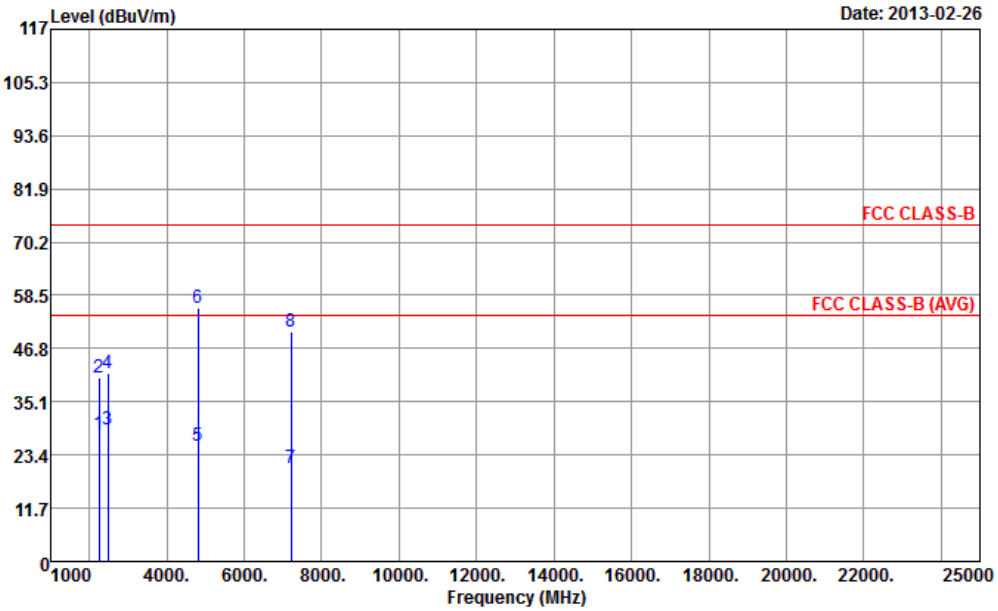


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	60.07	16.03	-23.97	40.00	40.79	6.00	0.83	31.59	---	---	Peak
2	159.98	14.50	-29.00	43.50	33.87	10.50	1.35	31.22	---	---	Peak
3	486.87	26.07	-19.93	46.00	36.53	17.84	2.36	30.66	---	---	Peak
4	667.29	24.57	-21.43	46.00	31.92	20.27	2.53	30.15	---	---	Peak
5	899.12	26.05	-19.95	46.00	29.75	23.28	3.01	29.99	---	---	Peak
6	965.08	26.90	-27.10	54.00	29.00	25.00	2.92	30.02	---	---	Peak

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

3.7.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for BT-1M

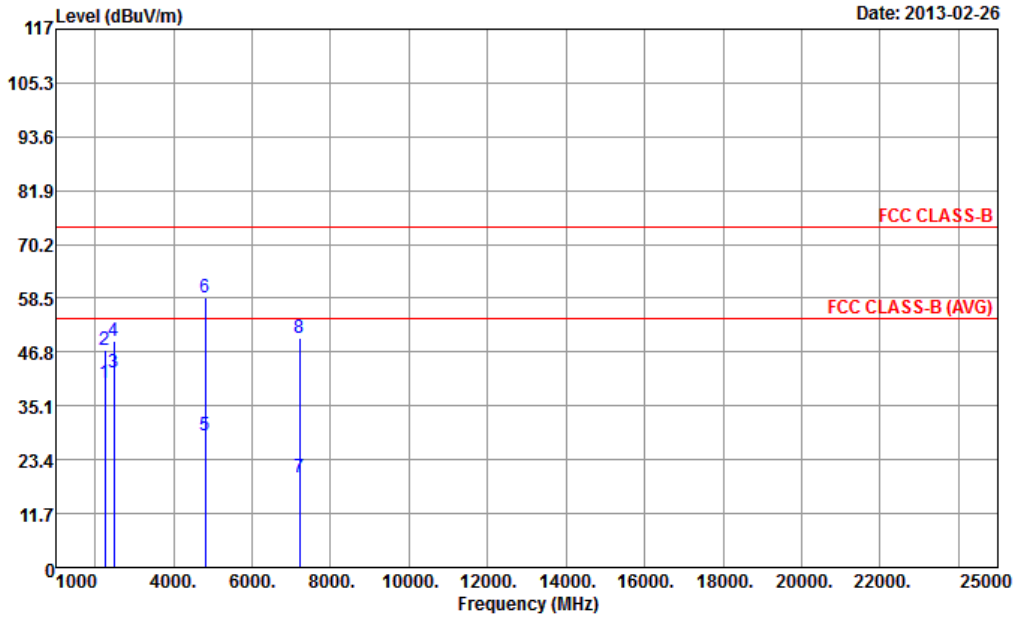
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	Bluetooth	**Test Freq. (FX)**	F1
Operating Mode	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2245.00	27.97	-26.03	54.00	27.55	31.99	4.49	36.06	---	---	Average
2	2245.00	40.44	-33.56	74.00	40.02	31.99	4.49	36.06	---	---	Peak
3	2485.90	28.95	-25.05	54.00	27.85	32.28	4.63	35.81	---	---	Average
4	2485.90	41.39	-32.61	74.00	40.29	32.28	4.63	35.81	---	---	Peak
5	4804.00	25.58	-28.42	54.00	19.78	34.26	6.50	34.96	---	---	Average
6	4804.00	55.68	-18.32	74.00	49.88	34.26	6.50	34.96	---	---	Peak
7	7206.00	20.53	-33.47	54.00	11.23	36.06	8.22	34.98	---	---	Average
8	7206.00	50.63	-23.37	74.00	41.33	36.06	8.22	34.98	---	---	Peak

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.
Note 5: For spurious radiated emissions. The dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log (dwell time/100 ms).

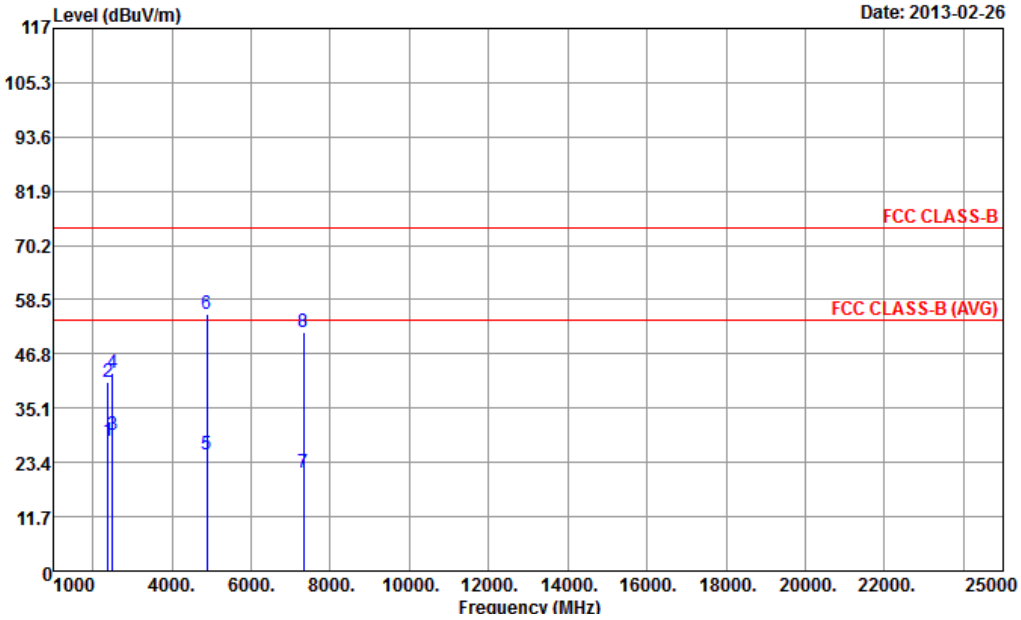
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	Bluetooth	**Test Freq. (FX)**	F1
Operating Mode	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2245.00	40.12	-13.88	54.00	39.70	31.99	4.49	36.06	---	---	Average
2	2245.00	47.41	-26.59	74.00	46.99	31.99	4.49	36.06	---	---	Peak
3	2485.90	42.46	-11.54	54.00	41.36	32.28	4.63	35.81	---	---	Average
4	2485.90	49.08	-24.92	74.00	47.98	32.28	4.63	35.81	---	---	Peak
5	4804.00	28.66	-25.34	54.00	22.86	34.26	6.50	34.96	---	---	Average
6	4804.00	58.76	-15.24	74.00	52.96	34.26	6.50	34.96	---	---	Peak
7	7206.00	19.61	-34.39	54.00	10.31	36.06	8.22	34.98	---	---	Average
8	7206.00	49.71	-24.29	74.00	40.41	36.06	8.22	34.98	---	---	Peak

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.
Note 5: For spurious radiated emissions. The dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log (dwell time/100 ms).

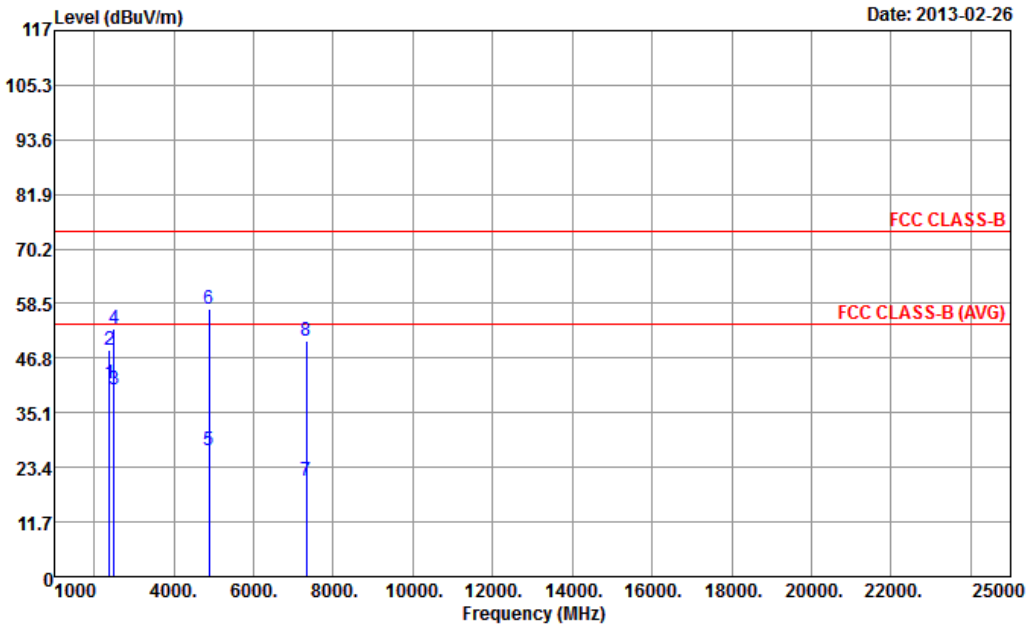
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	Bluetooth	**Test Freq. (FX)**	F2
Operating Mode	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2388.00	28.09	-25.91	54.00	27.26	32.17	4.57	35.91	---	---	Average
2	2388.00	40.64	-33.36	74.00	39.81	32.17	4.57	35.91	---	---	Peak
3	2492.00	29.49	-24.51	54.00	28.37	32.29	4.64	35.81	---	---	Average
4	2492.00	42.79	-31.21	74.00	41.67	32.29	4.64	35.81	---	---	Peak
5	4882.00	25.21	-28.79	54.00	19.38	34.28	6.53	34.98	---	---	Average
6	4882.00	55.31	-18.69	74.00	49.48	34.28	6.53	34.98	---	---	Peak
7	7323.00	21.30	-32.70	54.00	11.86	36.04	8.43	35.03	---	---	Average
8	7323.00	51.40	-22.60	74.00	41.96	36.04	8.43	35.03	---	---	Peak

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.
Note 5: For spurious radiated emissions. The dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log (dwell time/100 ms).

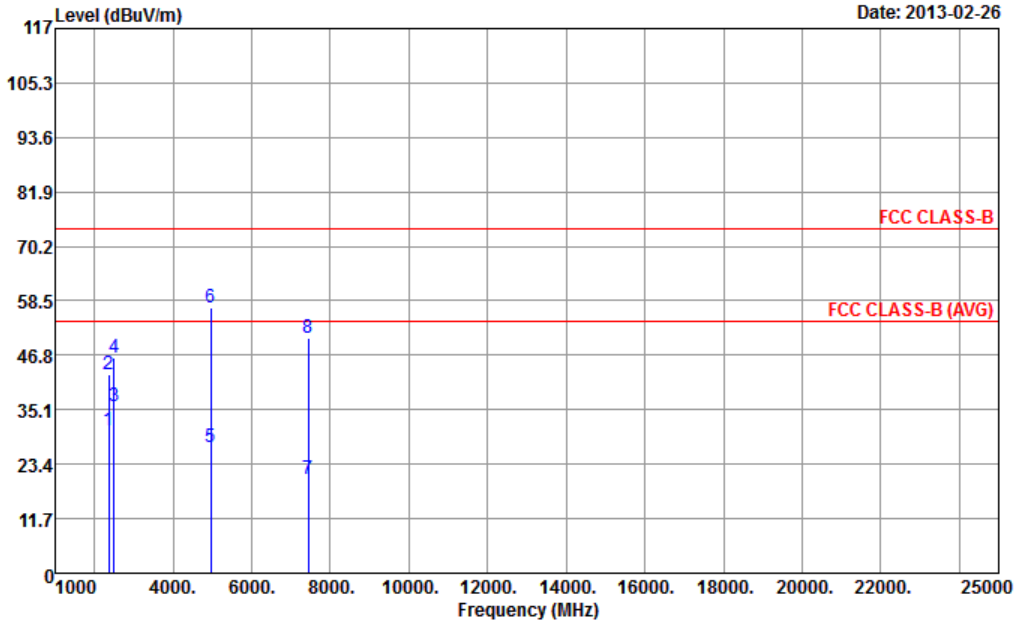
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	Bluetooth	**Test Freq. (FX)**	F2
Operating Mode	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2388.00	41.30	-12.70	54.00	40.47	32.17	4.57	35.91	---	---	Average
2	2388.00	48.63	-25.37	74.00	47.80	32.17	4.57	35.91	---	---	Peak
3	2492.00	40.17	-13.83	54.00	39.05	32.29	4.64	35.81	---	---	Average
4	2492.00	53.23	-20.77	74.00	52.11	32.29	4.64	35.81	---	---	Peak
5	4882.00	27.21	-26.79	54.00	21.38	34.28	6.53	34.98	---	---	Average
6	4882.00	57.31	-16.69	74.00	51.48	34.28	6.53	34.98	---	---	Peak
7	7323.00	20.57	-33.43	54.00	11.13	36.04	8.43	35.03	---	---	Average
8	7323.00	50.67	-23.33	74.00	41.23	36.04	8.43	35.03	---	---	Peak

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.
Note 5: For spurious radiated emissions. The dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log (dwell time/100 ms).

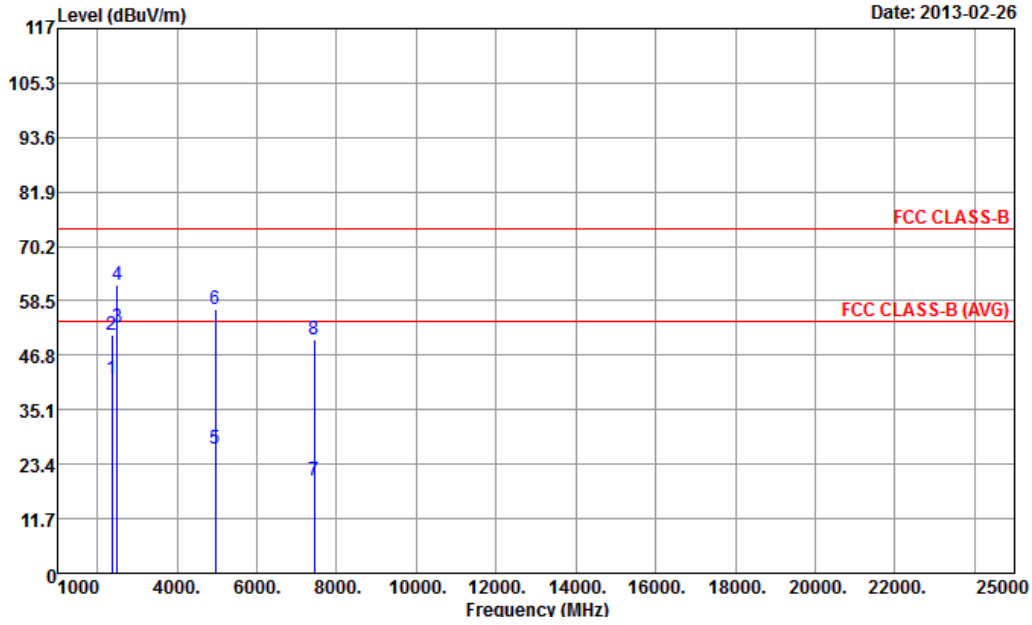
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	Bluetooth	**Test Freq. (FX)**	F3
Operating Mode	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2371.00	30.52	-23.48	54.00	29.74	32.15	4.56	35.93	---	---	Average
2	2371.00	42.81	-31.19	74.00	42.03	32.15	4.56	35.93	---	---	Peak
3	2491.00	35.92	-18.08	54.00	34.81	32.29	4.63	35.81	---	---	Average
4	2491.00	46.15	-27.85	74.00	45.04	32.29	4.63	35.81	---	---	Peak
5	4960.00	26.89	-27.11	54.00	21.02	34.29	6.57	34.99	---	---	Average
6	4960.00	56.99	-17.01	74.00	51.12	34.29	6.57	34.99	---	---	Peak
7	7440.00	20.29	-33.71	54.00	10.70	36.01	8.66	35.08	---	---	Average
8	7440.00	50.39	-23.61	74.00	40.80	36.01	8.66	35.08	---	---	Peak

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.
Note 5: For spurious radiated emissions. The dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log (dwell time/100 ms).

Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	Bluetooth	**Test Freq. (FX)**	F3
Operating Mode	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2371.00	41.70	-12.30	54.00	40.92	32.15	4.56	35.93	---	---	Average
2	2371.00	51.23	-22.77	74.00	50.45	32.15	4.56	35.93	---	---	Peak
3	2491.00	52.70	-1.30	54.00	51.59	32.29	4.63	35.81	---	---	Average
4	2491.00	61.99	-12.01	74.00	60.88	32.29	4.63	35.81	---	---	Peak
5	4960.00	26.69	-27.31	54.00	20.82	34.29	6.57	34.99	---	---	Average
6	4960.00	56.79	-17.21	74.00	50.92	34.29	6.57	34.99	---	---	Peak
7	7440.00	20.03	-33.97	54.00	10.44	36.01	8.66	35.08	---	---	Average
8	7440.00	50.13	-23.87	74.00	40.54	36.01	8.66	35.08	---	---	Peak

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.
Note 5: For spurious radiated emissions. The dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log (dwell time/100 ms).

4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSV 40	101486	9KHz~40GHz	Nov. 14, 2012	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Jun. 19, 2012	Conducted (TH01-HY)
AC Power Source	G.W	APS-9102	EL920581	AC 0V ~ 300V	Jul. 02, 2012	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100℃	Nov. 21, 2012	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jun. 26, 2012	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	1027452	300MHz ~ 40GHz	Sep. 08, 2012	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	1124009	300MHz ~ 40GHz	Sep. 08, 2012	Conducted (TH01-HY)
RF Cable-2m	HUBER+SUHNER	SUCOFLEX_104	SN 345675/4	1GHz ~ 26.5GHz	NA	Conducted (TH01-HY)
RF Cable-3m	HUBER+SUHNER	SUCOFLEX_104	SN 345669/4	1GHz ~ 26.5GHz	NA	Conducted (TH01-HY)

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP	100055	9Kz – 40GHz	Jun. 06, 2012	Radiation (03CH05-HY)
Receiver	R&S	ESIB26	100337	20Hz – 26.5GHz	Jun. 21, 2012	Radiation (03CH05-HY)
3m Semi Anechoic Chamber	TDK	SAC-3M	03CH05-HY	30 MHz - 1 GHz 3m	N/A	Radiation (03CH05-HY)
Amplifier	COM-POWER	PA-103	161050	1 MHz ~ 1 GHz	Mar. 20, 2012	Radiation (03CH05-HY)
Amplifier	Agilent	8449B	3008A02665	1GHz – 26.5 GHz	Aug. 28, 2012	Radiation (03CH05-HY)
Horn Antenna	ETS-LINDGREN	3117	66584	1GHz~18GHz	Aug. 09, 2012	Radiation (03CH05-HY)
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170517	18G~40G	Jan. 14, 2013	Radiation (03CH05-HY)
RF Cable-R03m	Jye Bao	RG142	03CH05-HY	30 MHz - 1 GHz	Oct. 14, 2012	Radiation (03CH05-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX104	03CH05-HY	1GHz~40GHz	Oct. 14, 2012	Radiation (03CH05-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2725	30 MHz - 1 GHz	Oct. 06, 2012	Radiation (03CH05-HY)
Turn Table	HD	HD100	420/611	0 - 360 degree	N/A	Radiation (03CH05-HY)
Antenna Mast	HD	HD100	240/666	1 m - 4 m	N/A	Radiation (03CH05-HY)

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	R&S	HFH2-Z2	860004/0001	9 kHz ~ 30 MHz	Jul. 03, 2012	Radiation (03CH05-HY)

Note: Calibration Interval of instruments listed above is two year.