FCC Test Report

Equipment	:	**Tablet Computer**
Brand Name	:	**Dell**
Model No.	:	**J42A**
FCC ID	:	**E2KJ42A**
Standard	:	**47 CFR FCC Part 15.247**
Frequency Range	:	**2400 MHz – 2483.5 MHz**
Equipment Class	:	**DTS**
Applicant **Manufacturer**	:	**Dell** **One Dell Way, Round Rock, Texas 78682, U.S.A.**

This report only contains BR and EDR mode test result.
The product sample received on Sep. 12, 2012 and completely tested on Oct. 11, 2012. 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	[dBuV]: 0.179522MHz 40.21(Margin 14.30dB) - AV 51.32 (Margin 13.19dB) - QP	FCC 15.207	Complied
3.2	15.247(a)	20dB Bandwidth	EDR: 1.38MHz	N/A	Complied
3.2	15.247(a)	Carrier Frequency Separation (ChS)	EDR: 1.002MHz	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)	EDR: 0.3157 sec	0.4 s within 0.4 x N	Complied
3.5	15.247(b)	RF Output Power (Maximum Peak Conducted Output Power)	Power [dBm] Basic: 8.55 EDR: 9.41	Power [dBm] Basic: 21 EDR: 21 LE: 30	Complied
3.6	15.247(c)	Transmitter Radiated Bandedge Emissions	Non-Restricted Bands: 2549.54MHz: 44.37dB Restricted Bands [dBuV/m at 3m]: 2483.50MHz 60.93 (Margin 13.07dB) - PK 52.65 (Margin 1.35dB) - 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]: 7440MHz 49.82 (Margin 4.18dB) - PK	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied

Revision History

Report No.	Version	Description	Issued Date
FR291203AD	Rev. 01	Initial issue of report	Oct. 15, 2012

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	v2.1 Basic	2402-2480	0-78 [79]	**8.55**
2400-2483.5	v2.1 + EDR	2402-2480	0-78 [79]	**9.41**
Note 1: Bluetooth EDR uses a combination of GFSK (1Mbps), π/4-DQPSK (2Mbps) and 8DPSK (3Mbps). Note 2: Bluetooth EDR uses as a system using FHSS modulation. Note 3: RF output power specifies that Maximum Peak Conducted Output Power.				

1.1.2 Antenna Information

Antenna Category	
☒	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	PIFA	1.6

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)**
☒ 78.30% - test mode single channel - DH5	1.06
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				
AC Adapter	Brand Name	LITEON	Model Name	PA-1300-04
	Power Rating	I/P: 100-240 V~1.0A (1,0A) 50-60 Hz ; O/P: 19V 1.58A (1,58A)		
Battery	Brand Name	DELL	Model Name	JD33K
	Power Rating	7.4Vdc, 27Wh	Type	Li-polymer

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

1.3 Support Equipment

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	25.8°C / 55%	06-Oct-12	
AC Conduction	CO04-HY	Bill	24.6°C / 51.5%	11-Oct-12	
Radiated Emission	03CH02-HY	Streak	24.1°C / 57%	02-Oct-12 ~ 05-Oct-12	

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**
v2.1 Basic	1	1 Mbps	BT-1M	**8.55**	BT-1M
v2.1 + EDR	1	2 Mbps	BT-2M	**9.34**	BT-3M
v2.1 + EDR	1	3 Mbps	BT-3M	**9.41**	
Note 1: Bluetooth EDR uses a combination of GFSK (1Mbps), π/4-DQPSK (2Mbps) and 8DPSK (3Mbps). Note 2: Bluetooth EDR uses as a system using FHSS modulation. Note 3: Bluetooth LE (Low Energy) using GFSK modulation for DTS digital modulation. Note 4: Modulation modes consist of BT-1M, BT-2M, 1 BT-3M, LE-1M FHSS BT-1M: GFSK (1Mbps), BT-2M: π/4-DQPSK (2Mbps), BT-3M: 8DPSK (3Mbps), LE-1M: GFSK (1Mbps) Note 5: RF output power specifies 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)**
v2.1 Bacic / EDR	BT-1M **/** BT-3M	2402-(F1), 2441-(F2), 2480-(F3)

2.3 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter					
Test Software Version		CBT 32			
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	8.31
BT-1M	1	2441	Default	1 Mbps	8.55
BT-1M	1	2480	Default	1 Mbps	7.82
BT-2M	1	2402	Default	2 Mbps	9.15
BT-2M	1	2441	Default	2 Mbps	9.34
BT-2M	1	2480	Default	2 Mbps	8.56
BT-3M	1	2402	Default	3 Mbps	9.24
BT-3M	1	2441	Default	3 Mbps	9.41
BT-3M	1	2480	Default	3 Mbps	8.66
Note 1: RF output power specifies that Maximum Peak Conducted Output Power.					

2.4 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	**Operating Mode Description**
1	Normal Link

The Worst Case Mode for Following Conformance Tests			
Tests Item	RF Output Power		
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	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-3M	1	3 Mbps	F1, F2, F3

The Worst Case Mode for Following Conformance Tests			
Tests Item	Number of Hopping Frequencies (N)		
Test Condition	Conducted measurement at transmit chains		
Modulation Mode	**Number of Transmit Chains (N_{TX})**	**Data Rate / MCS**	**Test Frequency**
BT-3M	1	3 Mbps	Hopping

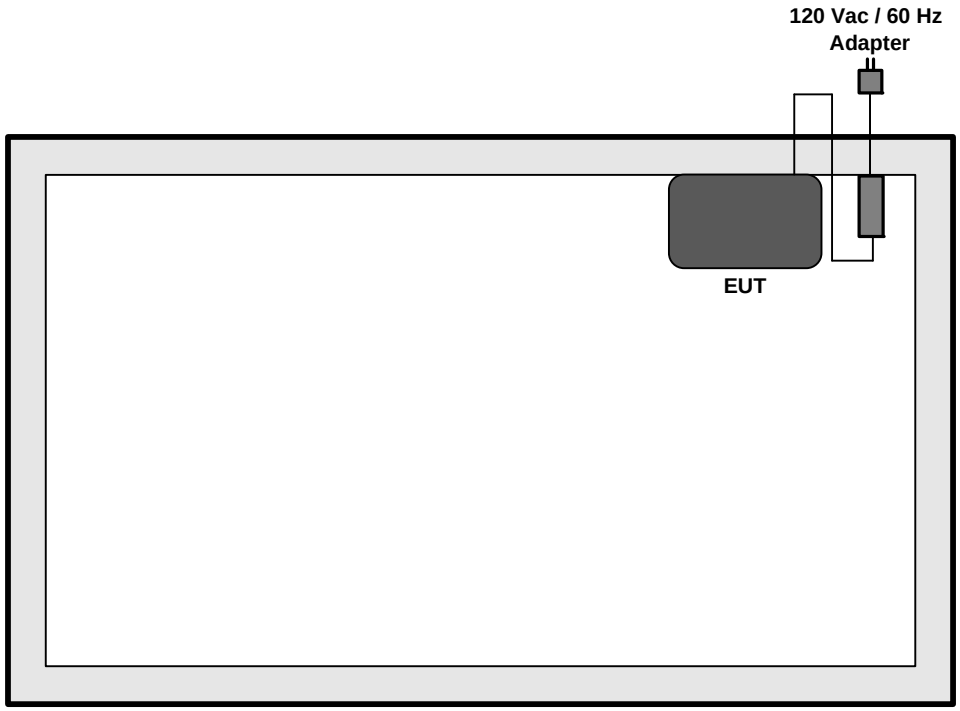
The Worst Case Mode for Following Conformance Tests			
Tests Item	Time of Occupancy (Dwell Time)		
Test Condition	Conducted measurement at transmit chains		
Modulation Mode	**Number of Transmit Chains (N_{TX})**	**Data Rate / MCS**	**Test Frequency**
BT-3M	1	3 Mbps	Hopping

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
BT-3M	1	3 Mbps	F1, F3

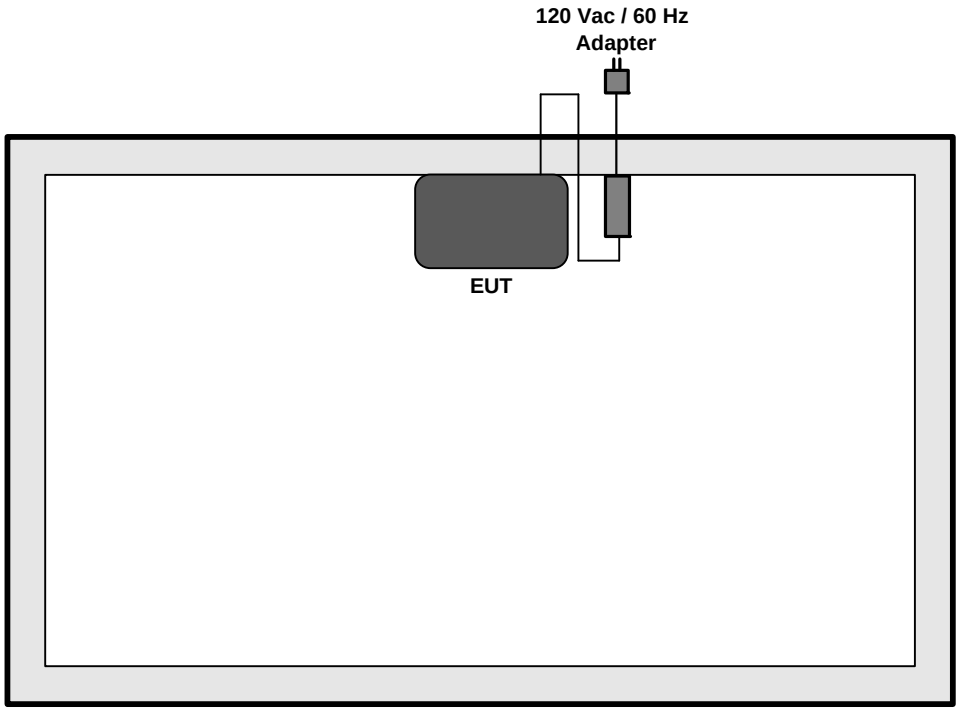
The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Unwanted Emissions		
Test Condition	Radiated measurement		
User Position	☐ EUT will be placed in fixed position.		
	☐ EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two 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 X plane.		
Operating Mode < 1GHz	☒ 1. Radio link (Bluetooth)		
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

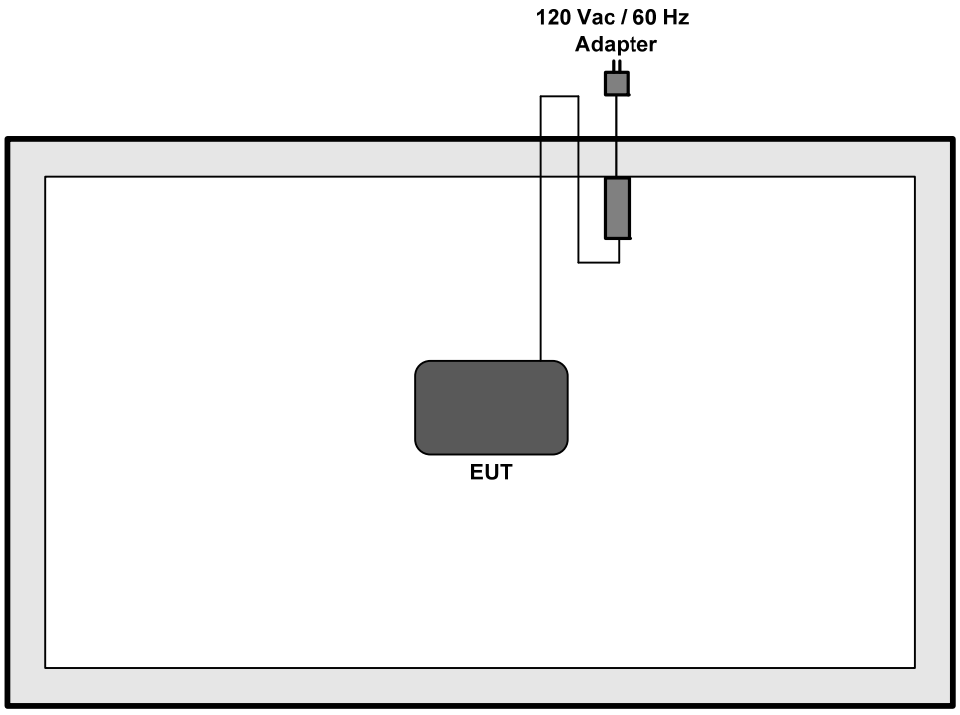
Test Setup Diagram – AC Line Conducted Emission Test	
Operating Mode 1	**Normal Link**



Test Setup Diagram - Radiated Test (Below 1GHz)	
Operating Mode	**Radio link (Bluetooth)**



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



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

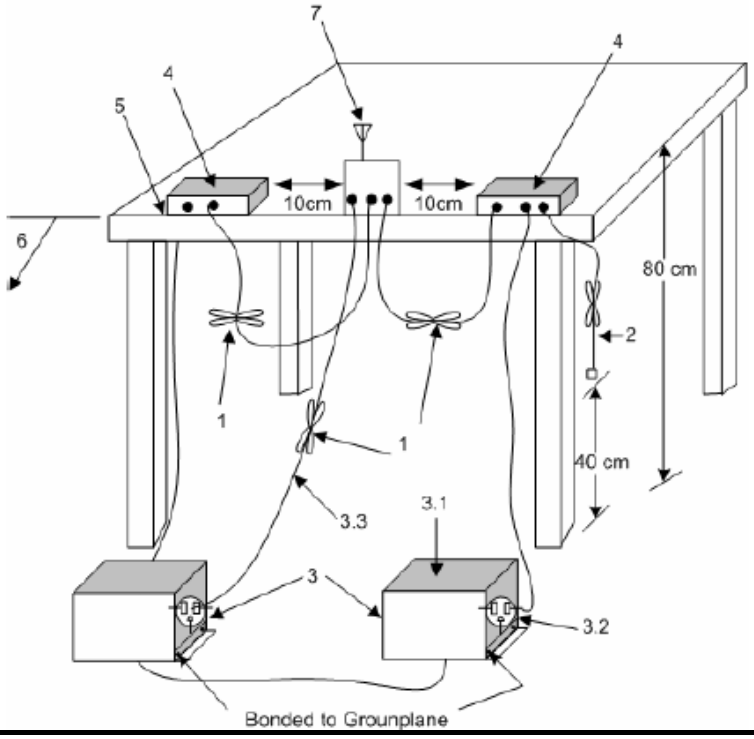
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

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

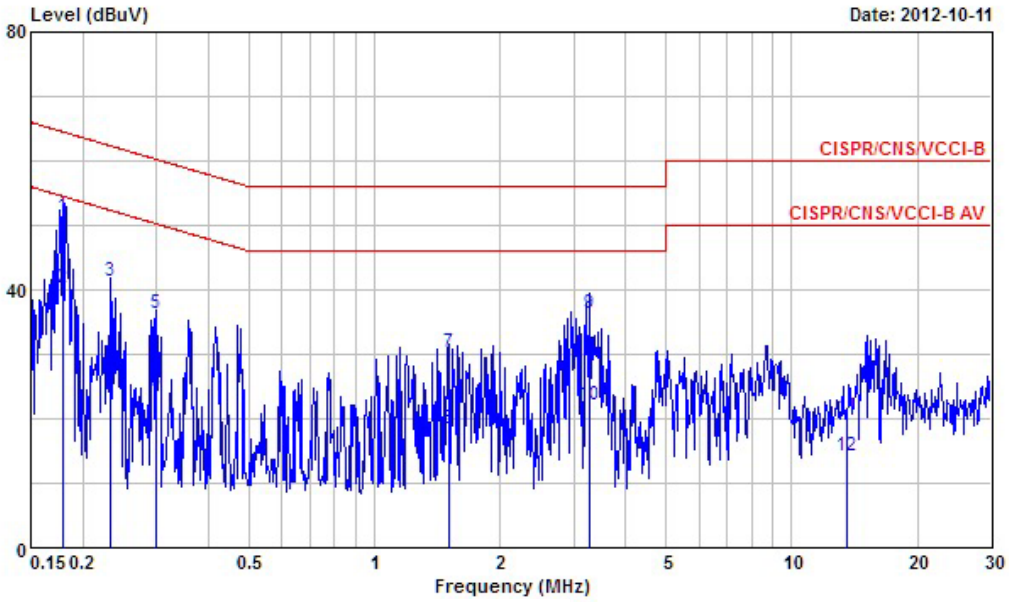
3.1.4 Test Setup

AC Power-line Conducted Emissions



3.1.5 Test Result of AC Power-line Conducted Emissions

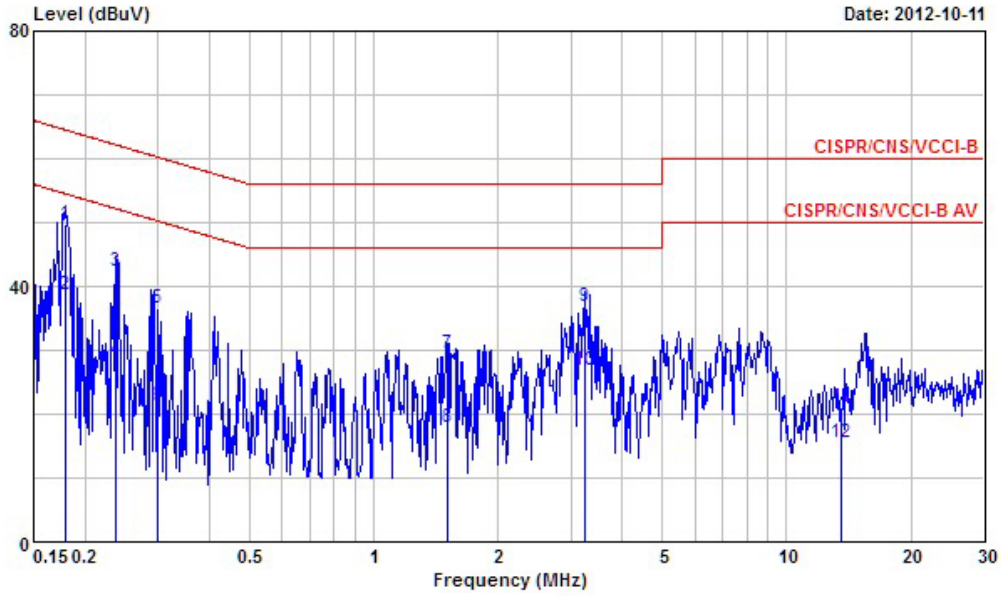
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral
Operating Function	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	@0.1795220	51.32	-13.19	64.51	50.91	0.11	0.30	QP
2	@0.1795220	40.21	-14.30	54.51	39.80	0.11	0.30	Average
3	0.2328500	41.21	-21.14	62.35	40.80	0.11	0.30	QP
4	0.2328500	27.22	-25.13	52.35	26.81	0.11	0.30	Average
5	0.2986930	36.29	-23.99	60.28	35.89	0.10	0.30	QP
6	0.2986930	24.09	-26.19	50.28	23.69	0.10	0.30	Average
7	1.510	30.30	-25.70	56.00	29.82	0.12	0.36	QP
8	1.510	18.42	-27.58	46.00	17.94	0.12	0.36	Average
9	3.280	36.35	-19.65	56.00	35.88	0.14	0.33	QP
10	3.280	22.02	-23.98	46.00	21.55	0.14	0.33	Average
11	13.560	20.21	-39.79	60.00	19.54	0.27	0.40	QP
12	13.560	14.27	-35.73	50.00	13.60	0.27	0.40	Average

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Line
Operating Function	Normal Link		



	MHz	dBuV	dB	dBuV	dBuV	dB	less dB	Remark
1	@0.1786590	49.73	-14.82	64.55	49.20	0.23	0.30	QP
2	0.1786590	38.77	-15.78	54.55	38.24	0.23	0.30	Average
3	0.2365810	42.46	-19.76	62.22	41.93	0.23	0.30	QP
4	0.2365810	28.55	-23.67	52.22	28.02	0.23	0.30	Average
5	0.3008180	36.67	-23.55	60.22	36.15	0.22	0.30	QP
6	0.3008180	21.35	-28.87	50.22	20.83	0.22	0.30	Average
7	1.510	29.49	-26.51	56.00	28.89	0.24	0.36	QP
8	1.510	17.83	-28.17	46.00	17.23	0.24	0.36	Average
9	3.258	36.78	-19.22	56.00	36.17	0.28	0.33	QP
10	3.258	26.80	-19.20	46.00	26.19	0.28	0.33	Average
11	13.560	20.94	-39.06	60.00	20.06	0.48	0.40	QP
12	13.560	15.52	-34.48	50.00	14.64	0.48	0.40	Average

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

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

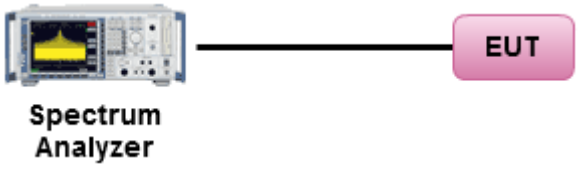
3.2.2 Measuring Instruments

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

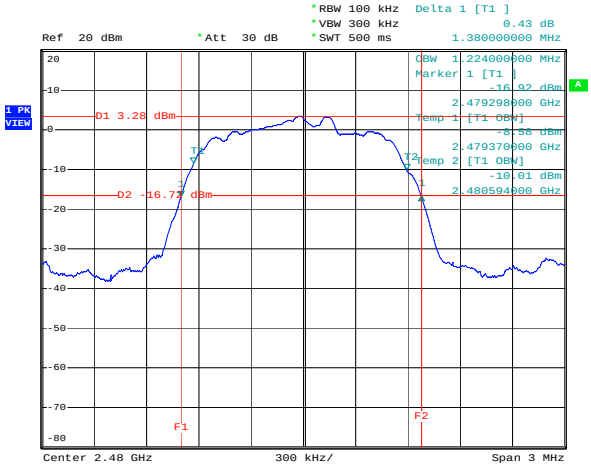
20dB Bandwidth and Carrier Frequency Separation


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-3M	2402	1.368	1.212	1.002	0.916
BT-3M	2441	1.338	1.182	1.002	0.924
BT-3M	2480	1.380	1.224	1.002	0.924
Result		Complied			

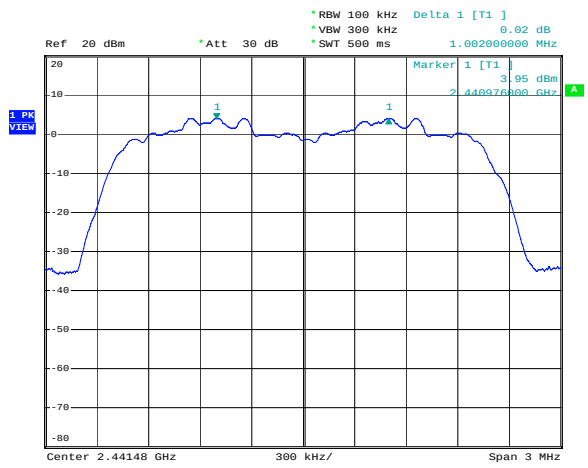
Worst 20dB Bandwidth Plots

BT-3M – F3



Worst Carrier Frequency Separation Plots

BT-3M – F3



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	

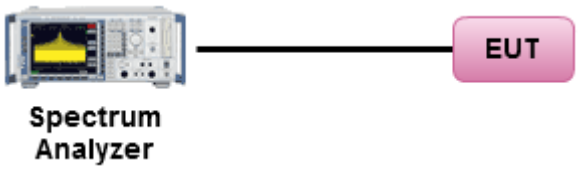
3.3.2 Measuring Instruments

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

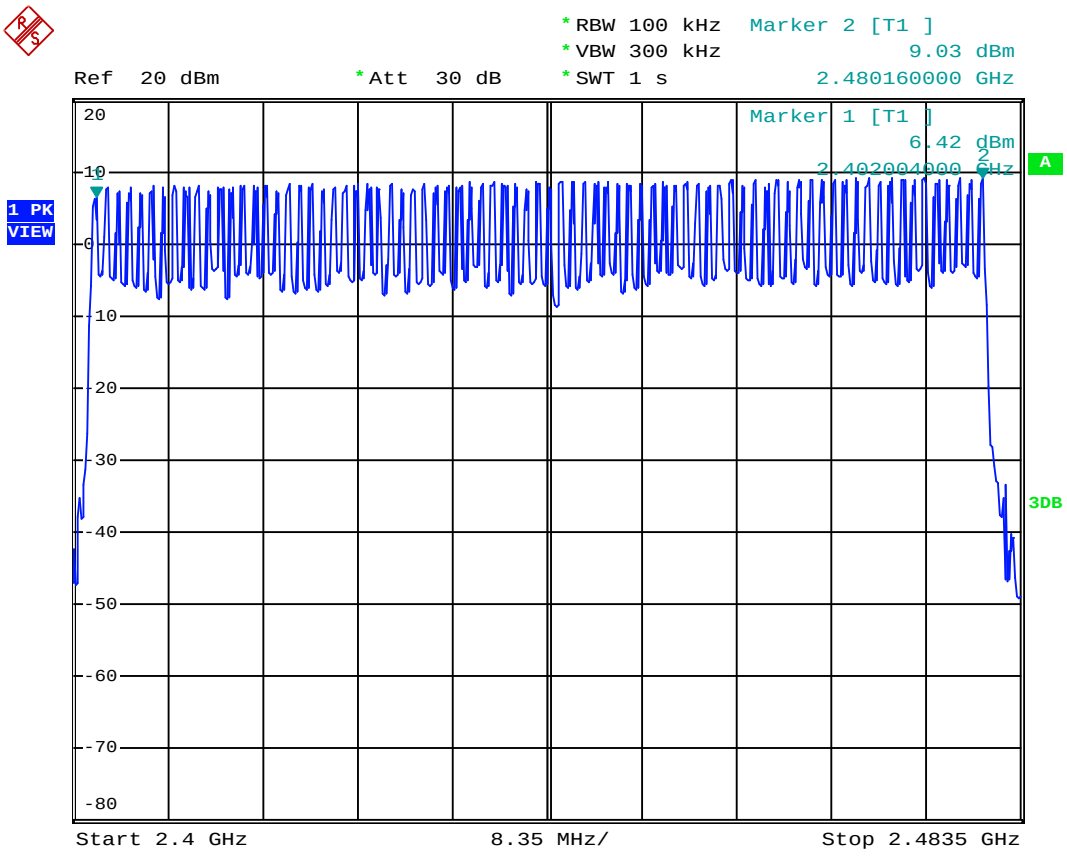
Number of Hopping Frequencies


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-3M	2402-2480	79	75
Result	**Complied**		

Number of Hopping Frequencies Plots

BT-3M



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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
☒ 2400-2483.5 MHz Band: Dwell time ≤ 0.4 second within 0.4 x N
N: Number of Hopping Frequencies

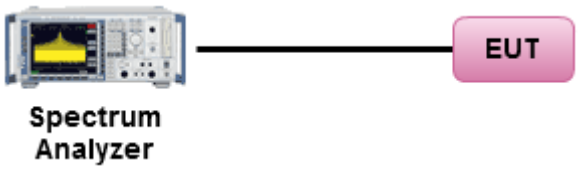
3.4.2 Measuring Instruments

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.
☒	The EUT supports single transmit chain and measurements performed on this transmit chain.
☒	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

3.4.4 Test Setup

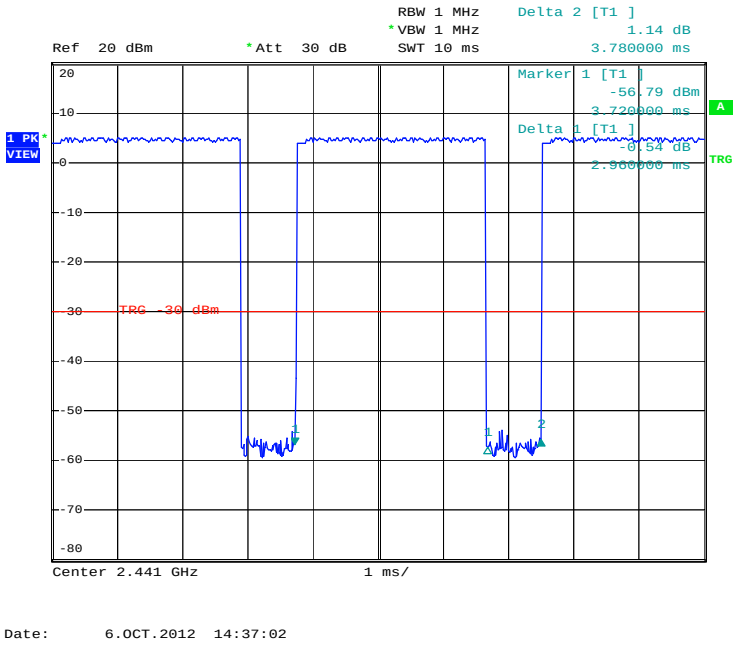
Time of Occupancy (Dwell Time)


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-3M	2441	2.96	106.6	0.3157	0.4
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-3M – 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			
☒	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
e.i.r.p. Power Limit:			
☒	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)	
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 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 FCC KDB 558074, clause 2 for conducted measurement.	
	☒	The EUT supports single transmit chain and measurements performed on this transmit chain.
	☒	The EUT supports diversity transmitting and the results on transmit chain port is the worst case.

3.5.4 Test Setup

RF Output Power (Peak Power Meter)

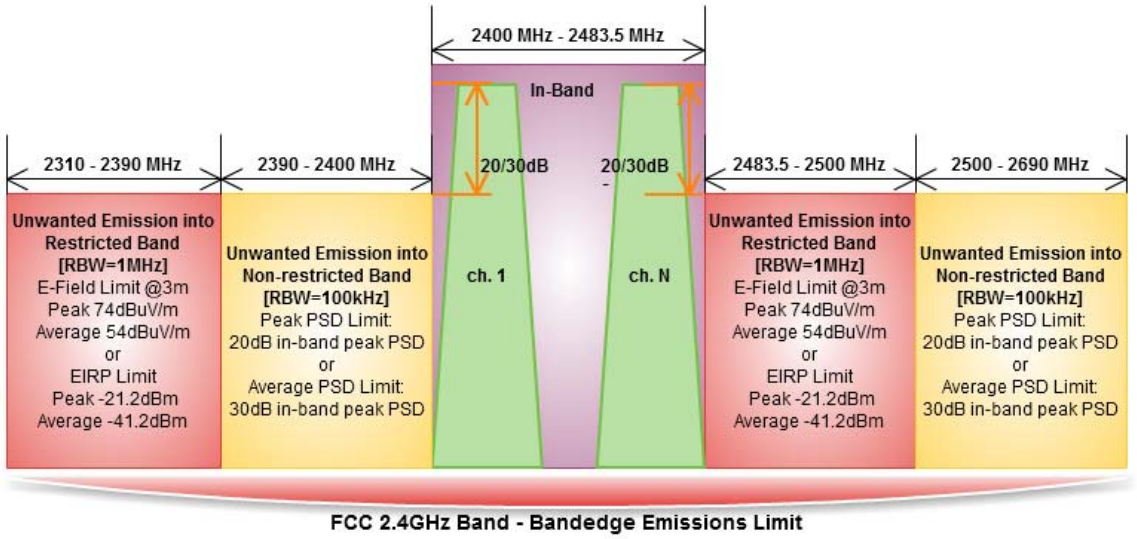

3.5.5 Test Result of Maximum Peak Conducted Output Power

Maximum Peak Conducted Output Power Result						
Condition		RF Output Power (dBm)				
Modulation Mode	Freq. (MHz)	RF Output Power	Power Limit	Antenna Gain (dBi)	EIRP Power	EIRP Limit
BT-1M	2402	8.31	30	1.6	9.91	36
BT-1M	2441	8.55	30	1.6	10.15	36
BT-1M	2480	7.82	30	1.6	9.42	36
BT-3M	2402	9.24	30	1.6	10.84	36
BT-3M	2441	9.41	30	1.6	11.01	36
BT-3M	2480	8.66	30	1.6	10.26	36
Result		Complied				

3.6 Transmitter Radiated Bandedge Emissions

3.6.1 Transmitter Radiated Bandedge Emissions Limit

Transmitter Radiated Bandedge Emissions Limit



FCC 2.4GHz Band - Bandedge Emissions Limit

3.6.2 Measuring Instruments

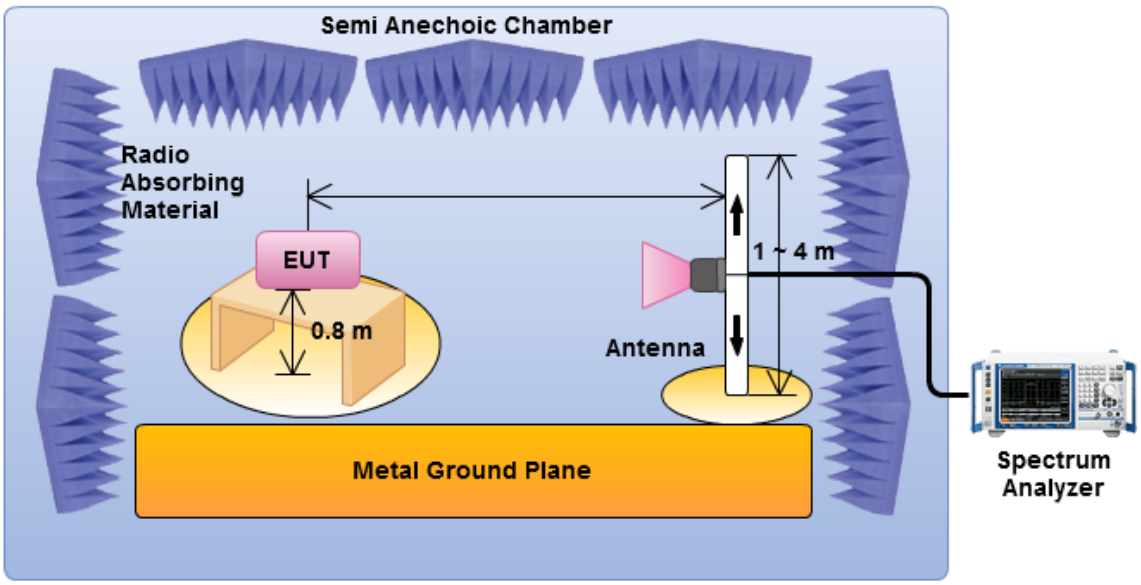
Refer a test equipment and calibration data table in this test report.

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. 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.
	☒	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.
☒	For radiated measurement, refer as ANSI C63.10, clause 6.5 for radiated emissions from above 1 GHz.	

3.6.4 Test Setup

Transmitter Radiated Bandedge Emissions

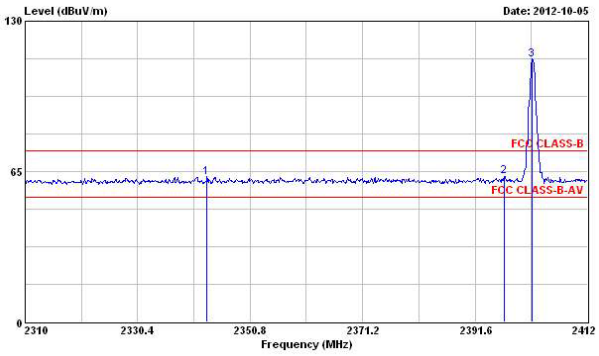


Electric field tests shall be performed in transmitter bandedge emissions using a calibrated horn antenna.

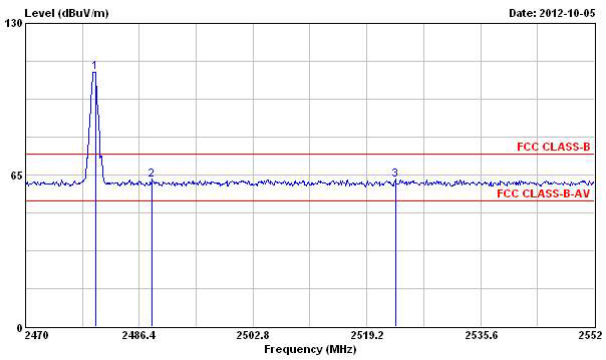
3.6.5 Test Result of Transmitter Radiated Bandedge Emissions

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	113.40	2396.80	62.80	50.60	20	PK	V
2500-2690	2480	109.04	2523.30	62.97	46.07	20	PK	V

Low Bandedge



Up Bandedge



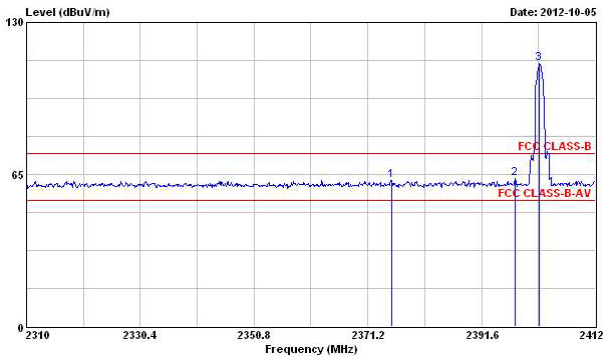
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)

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	113.97	2379.26	3	58.79	74	PK	V
2310-2390	2402	112.70	2389.87	3	46.64	54	AV	V
2483.5-2500	2480	110.10	2483.50	3	60.93	74	PK	V
2483.5-2500	2480	109.08	2483.50	3	52.65	54	AV	V

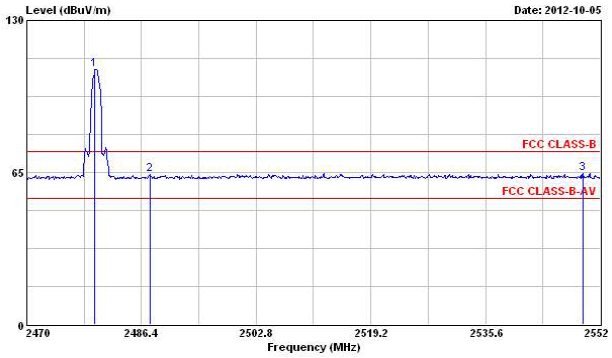
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).
Note 2: the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log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

Transmitter Radiated Bandedge Emissions Result								
Modulation	BT-3M		**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	112.61	2397.62	63.10	49.51	20	PK	V
2500-2690	2480	108.87	2549.54	64.50	44.37	20	PK	V

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-3M		**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	113.39	2333.15	3	58.21	74	PK	V
2310-2390	2402	108.89	2382.01	3	46.52	54	AV	V
2483.5-2500	2480	109.54	2483.61	3	61.05	74	PK	V
2483.5-2500	2480	105.19	2483.50	3	52.18	54	AV	V

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

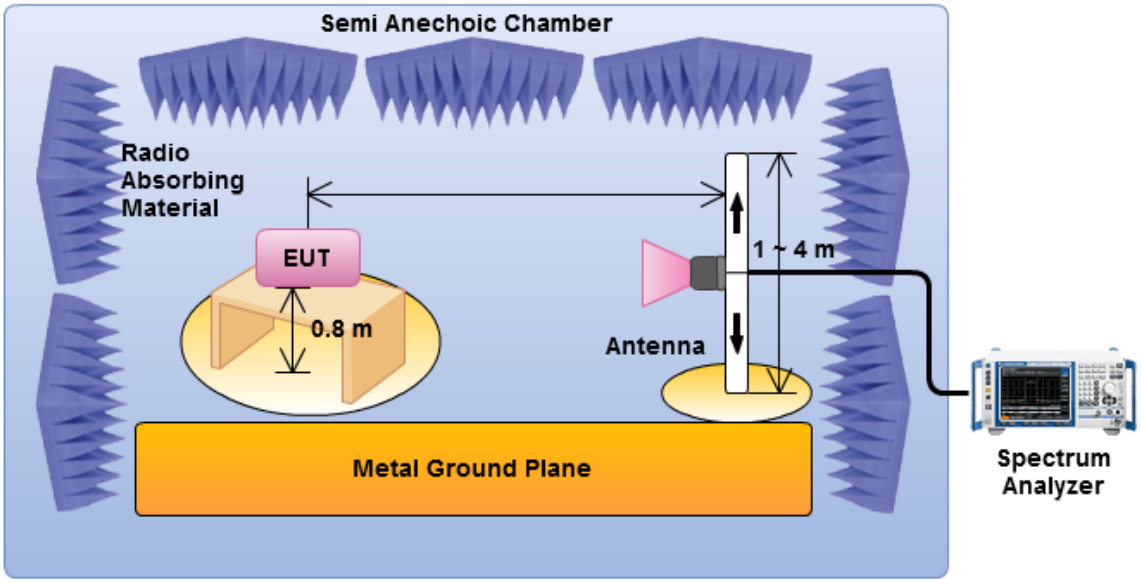
Refer a test equipment and calibration data table in this test report.

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



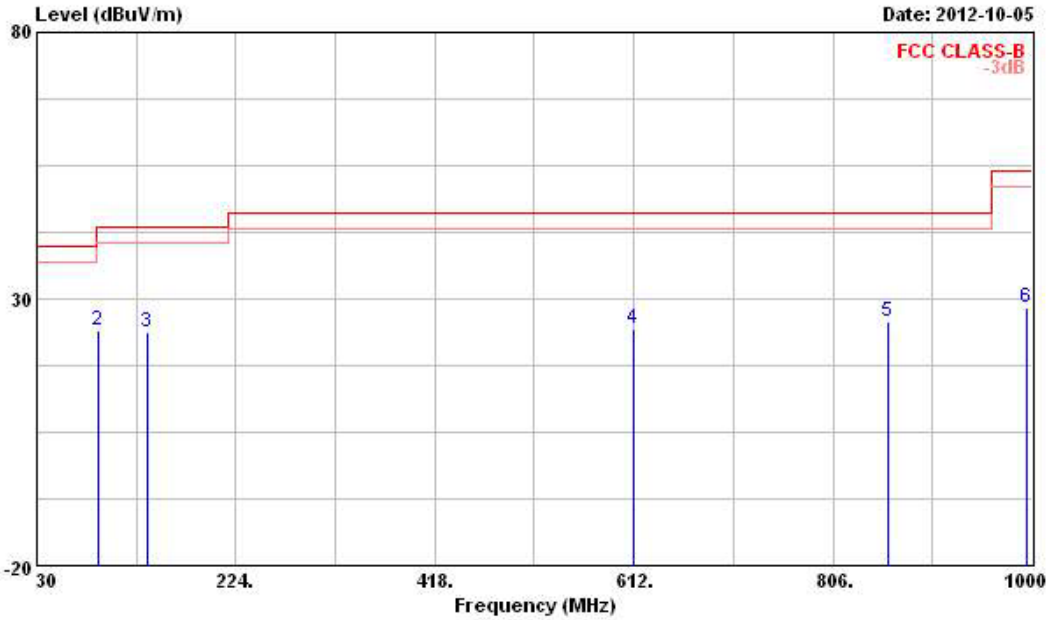
Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna. Electric field tests shall be performed in the frequency range of 30 MHz to 1000 MHz using a calibrated bi-log antenna and the frequency range of 1 GHz to 40 GHz using a calibrated horn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

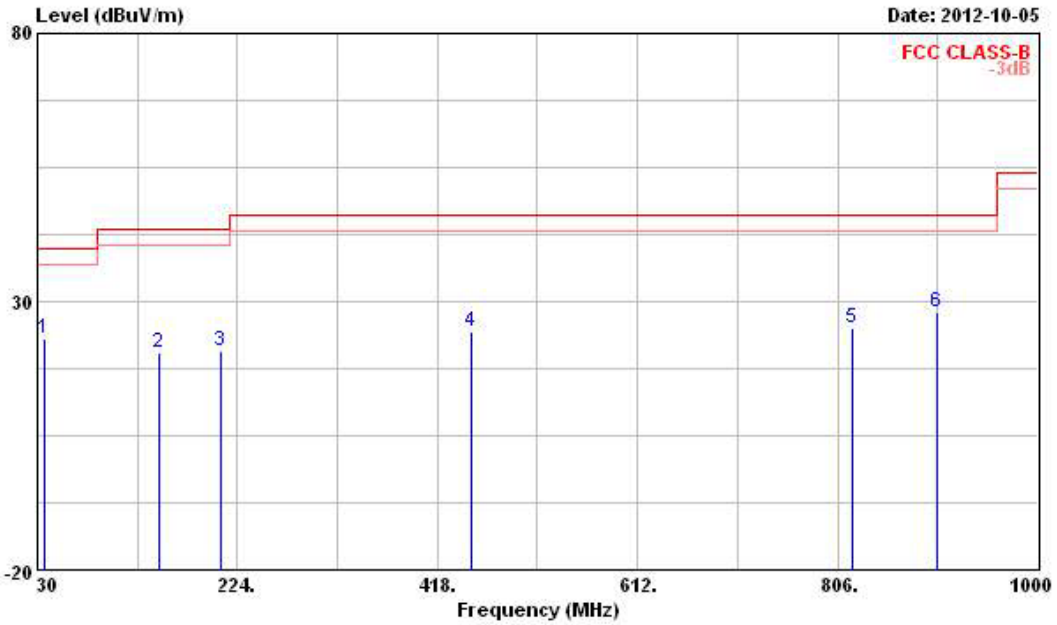
Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Operating Mode	1	**Polarization**	V
Operating Function	Radio link (Bluetooth)		



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	30.000	27.27	-12.73	40.00	38.11	16.22	0.89	27.95	Peak	---	---
2	90.140	24.24	-19.26	43.50	41.01	9.50	1.58	27.85	Peak	---	---
3	137.670	23.67	-19.83	43.50	37.19	12.18	1.98	27.68	Peak	---	---
4	611.030	24.34	-21.66	46.00	28.47	20.04	4.27	28.44	Peak	---	---
5	859.350	25.82	-20.18	46.00	28.34	20.13	5.09	27.74	Peak	---	---
6	994.180	28.21	-25.79	54.00	27.44	22.36	5.66	27.25	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	1	**Polarization**	H
Operating Function	Radio link (Bluetooth)		

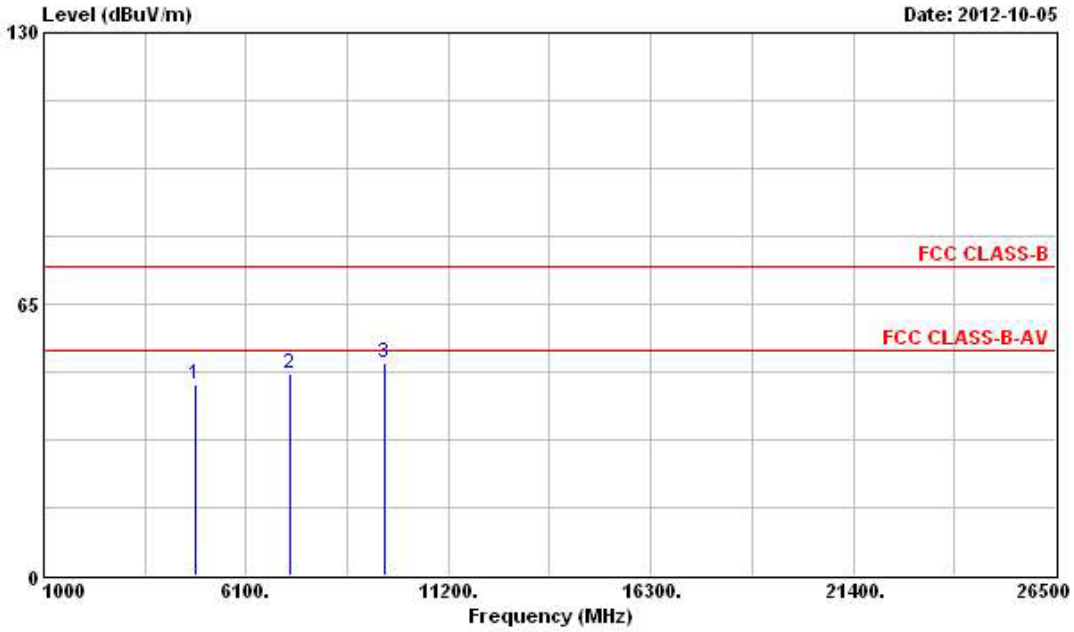


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	36.790	23.09	-16.91	40.00	36.09	13.92	1.00	27.92	Peak	---	---
2	148.340	20.39	-23.11	43.50	35.11	10.90	2.02	27.64	Peak	---	---
3	207.510	20.88	-22.62	43.50	34.19	11.60	2.48	27.39	Peak	---	---
4	450.980	24.41	-21.59	46.00	32.67	16.29	3.58	28.13	Peak	---	---
5	820.550	25.11	-20.89	46.00	27.80	20.22	4.96	27.87	Peak	---	---
6	902.030	28.08	-17.92	46.00	30.32	20.10	5.26	27.60	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)

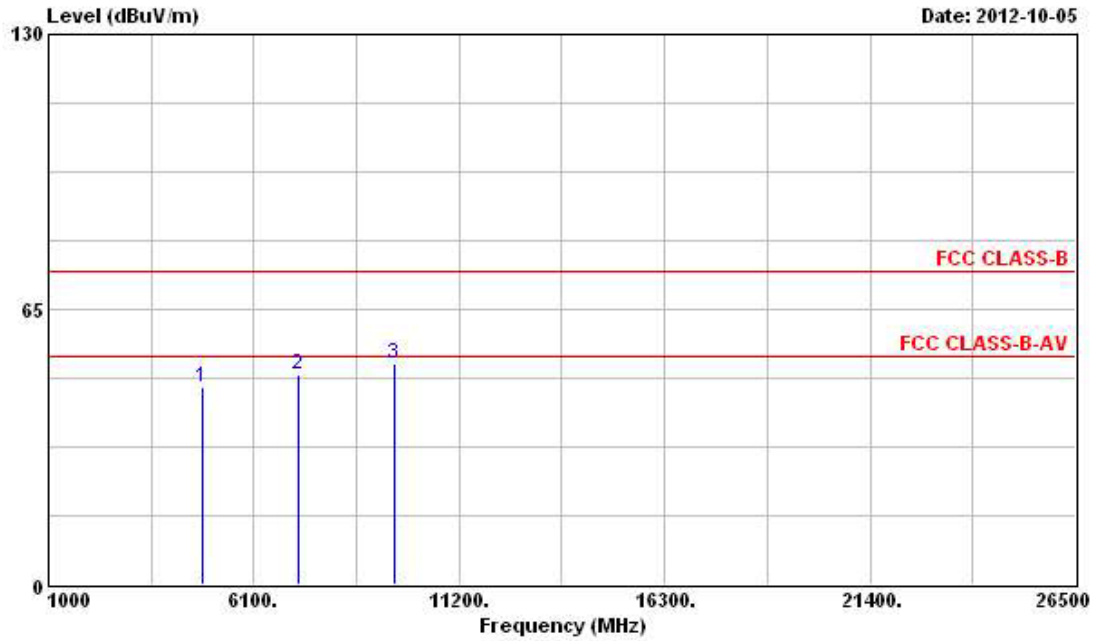
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	BT-1M	**Test Freq. (FX)**	F1
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	4804.000	45.60	-8.40	54.00	40.71	35.11	4.58	34.80	PK	---	---
2	7206.000	48.22			40.79	36.88	5.62	35.07	Peak	---	---
3	9608.000	51.07			41.68	38.52	6.34	35.47	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 (item 2 and 3) 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).

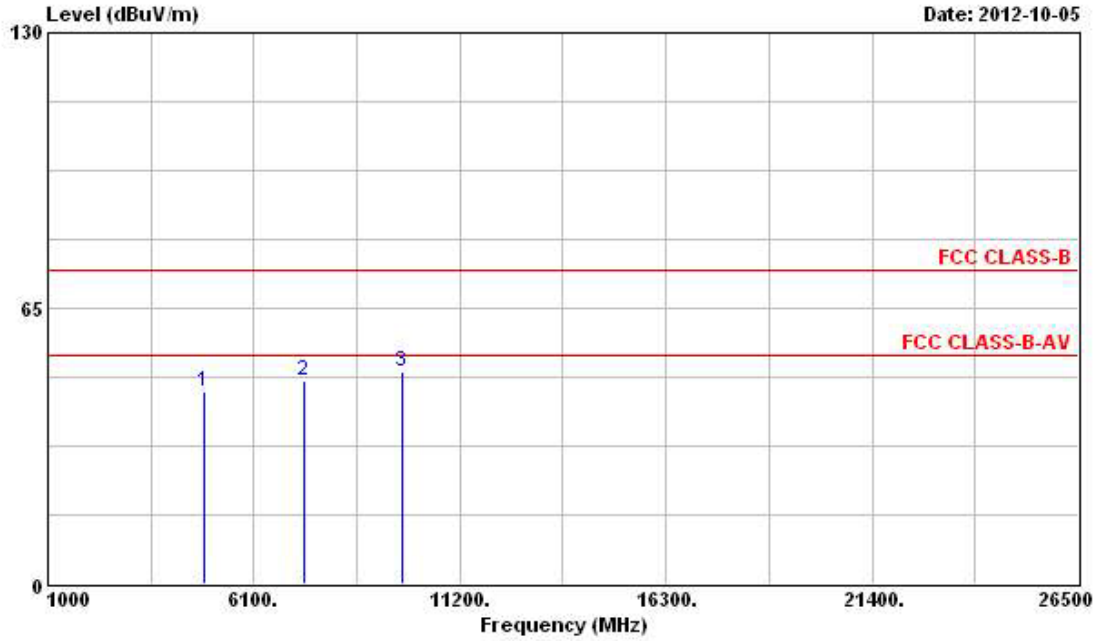
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	BT-1M	**Test Freq. (FX)**	F1
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	4804.000	46.65	-7.35	54.00	41.14	35.73	4.58	34.80	PK	---	---
2	7206.000	49.57			41.18	37.84	5.62	35.07	Peak	---	---
3	9608.000	52.35			42.16	39.32	6.34	35.47	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 (item 2 and 3) 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).

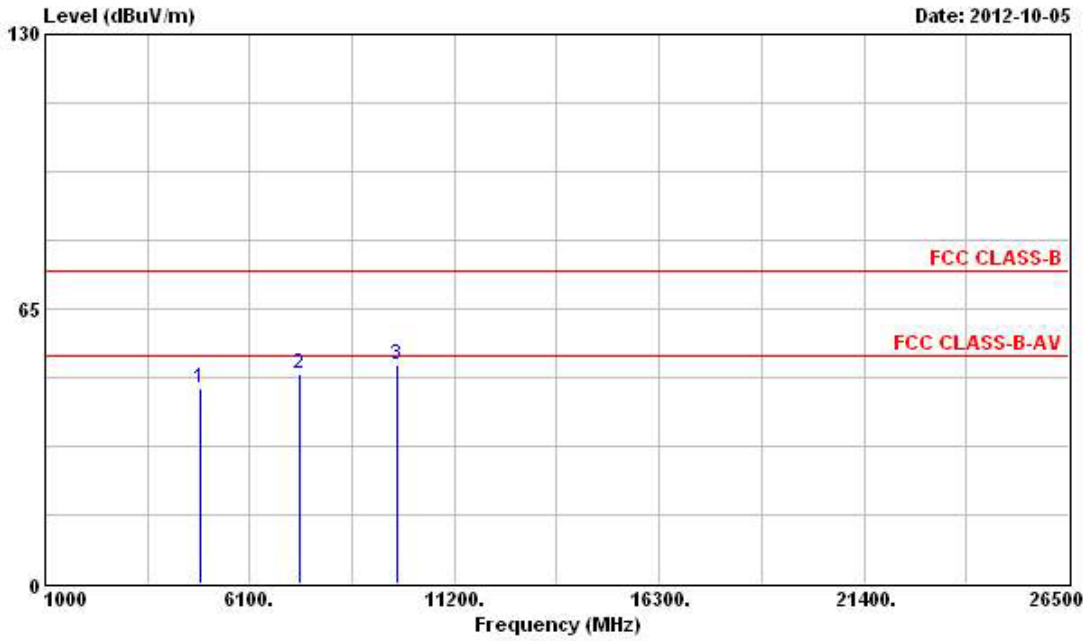
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	BT-1M	**Test Freq. (FX)**	F2
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	4882.000	45.26	-8.74	54.00	40.22	35.18	4.64	34.78	PK	---	---
2 @	7323.000	47.70	-6.30	54.00	40.23	36.93	5.64	35.10	PK	---	---
3	9764.000	50.09			40.48	38.73	6.36	35.48	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 (item 3) 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).

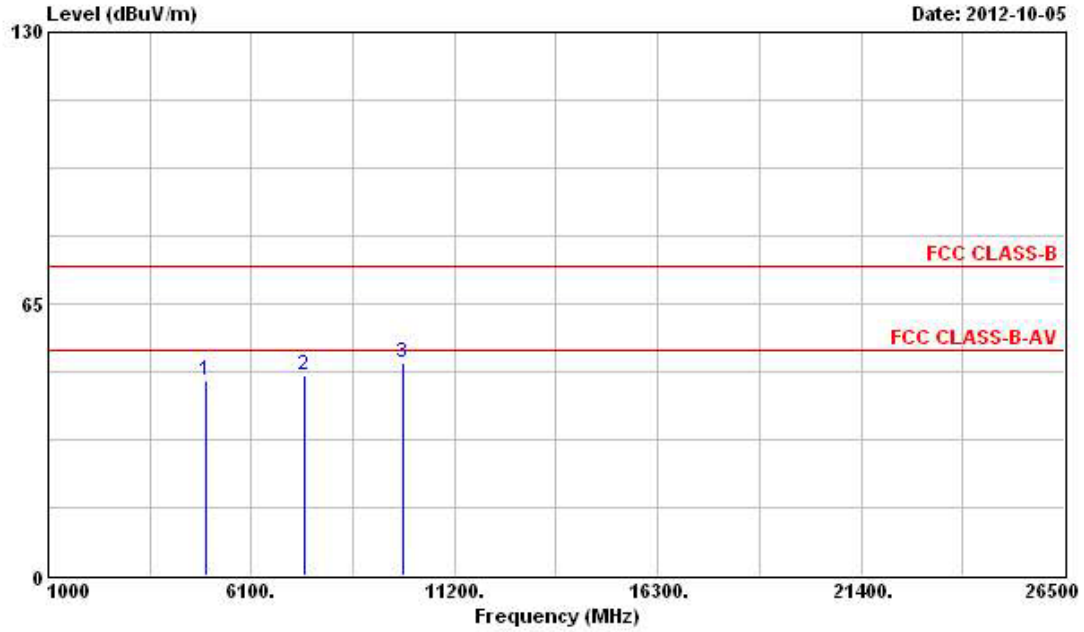
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	BT-1M	**Test Freq. (FX)**	F2
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	4882.000	46.35	-7.65	54.00	40.66	35.83	4.64	34.78	PK	---	---
2 @	7323.000	49.65	-4.35	54.00	41.24	37.87	5.64	35.10	PK	---	---
3	9764.000	51.73			41.32	39.53	6.36	35.48	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 (item 3) 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).

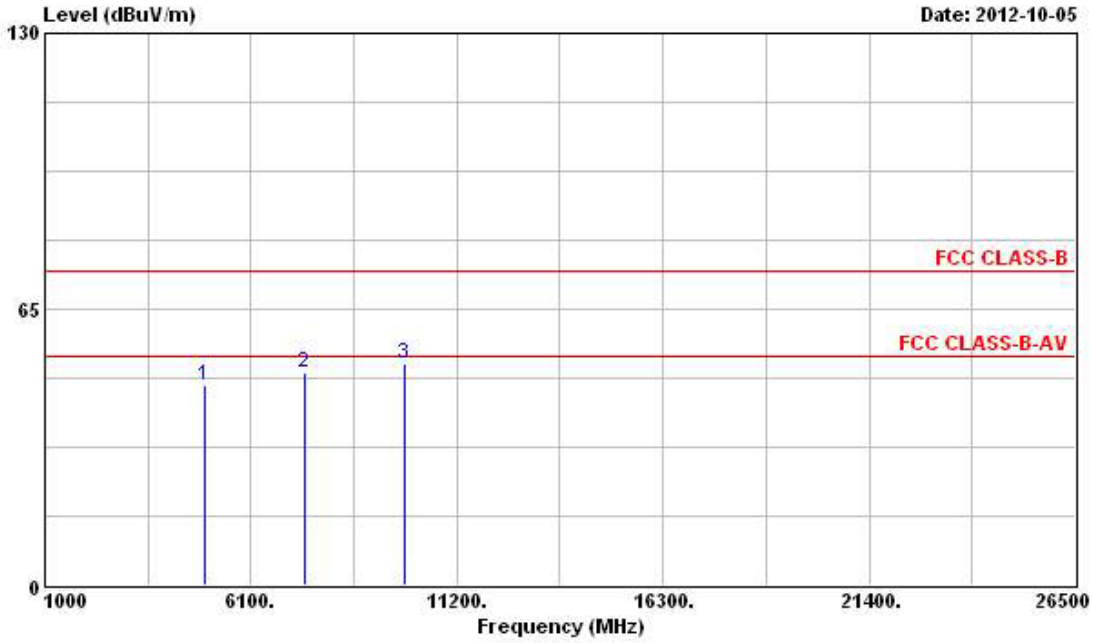
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	BT-1M	**Test Freq. (FX)**	F3
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	4960.000	46.81	-7.19	54.00	41.59	35.27	4.71	34.76	PK	---	---
2 @	7440.000	48.08	-5.92	54.00	40.59	36.98	5.65	35.14	PK	---	---
3	9920.000	50.82			41.00	38.92	6.39	35.49	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 (item 3) 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	BT-1M	**Test Freq. (FX)**	F3
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	4960.000	47.09	-6.91	54.00	41.19	35.95	4.71	34.76	PK	---	---
2 @	7440.000	49.82	-4.18	54.00	41.42	37.89	5.65	35.14	PK	---	---
3	9920.000	51.96			41.34	39.72	6.39	35.49	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 (item 3) 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
EMC Receiver	R&S	ESCS 30	100132	9kHz ~ 2.75GHz	Feb. 08, 2012	Conduction (CO01-HY)
LISN	TESEQ	NNB-52	27380	9kHz ~ 30MHz	Apr. 09, 2012	Conduction (CO01-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	2001/009	9kHz ~ 30MHz	Feb. 20, 2012	Conduction (CO01-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832010001	9kHz ~ 30MHz	Mar. 02, 2012	Conduction (CO01-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 40	100305	9KHz~40GHz	Feb. 21, 2012	Conducted (TH01-HY)
Spectrum Analyzer	R&S	FSV 40	15195-01-00	9KHz~40GHz	Jan. 06, 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℃	Dec. 07, 2011	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100302	10MHz ~ 40GHz	Nov. 22, 2011	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	1027452	300MHz ~ 40GHz	Jan. 12, 2012	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	1124009	300MHz ~ 40GHz	Jan. 12, 2012	Conducted (TH01-HY)
RF Cable-2m	HUBER+SUHNER	SUCOFLEX_104	SN 345672/4	1GHz ~ 26.5GHz	Dec. 03, 2011	Conducted (TH01-HY)
RF Cable-3m	HUBER+SUHNER	SUCOFLEX_104	SN 345668/4	1GHz ~ 26.5GHz	Dec. 03, 2011	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	FSP40	100593	9kHz ~ 40GHz	Sep. 14, 2012	Radiation (03CH02-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	May 10, 2012	Radiation (03CH02-HY)
Amplifier	Agilent	8447D	2944A11146	100kHz ~ 1.3GHz	Jul. 23, 2012	Radiation (03CH02-HY)
Amplifier	Agilent	8449B	3008A02373	1GHz ~ 26.5GHz	Aug. 10, 2012	Radiation (03CH02-HY)
Horn Antenna	ETS-LINDGREN	3117	00091920	1GHz ~ 18GHz	Nov. 15, 2011	Radiation (03CH02-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz ~ 40GHz	Jan.13, 2012	Radiation (03CH02-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz ~ 1GHz	Nov. 11, 2011	Radiation (03CH02-HY)
RF Cable-high	SUHNER	SUCOFLEX106	03CH02-HY	1GHz ~ 40GHz	Mar. 06, 2012	Radiation (03CH02-HY)
Bilog Antenna	SCHAFFNER	CBL61128	2723	30MHz ~ 2GHz	Oct. 22, 2011	Radiation (03CH02-HY)
Turn Table	HD	DS 420	420/649/00	0~ 360 degree	N/A	Radiation (03CH02-HY)
Antenna Mast	HD	MA 240	240/559/00	1 ~ 4 m	N/A	Radiation (03CH02-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 (03CH02-HY)

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

5 Certification of TAF Accreditation

Certificate No. : L1190-120405

財團法人全國認證基金會
Taiwan Accreditation Foundation

Certificate of Accreditation

This is to certify that

Sporton International Inc.
EMC & Wireless Communications Laboratory
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

is accredited in respect of laboratory

Accreditation Criteria	:	ISO/IEC 17025:2005
Accreditation Number	:	1190
Originally Accredited	:	December 15, 2003
Effective Period	:	January 10, 2010 to January 09, 2013
Accredited Scope	:	Testing Field, see described in the Appendix
Specific Accreditation Program	:	Accreditation Program for Designated Testing Laboratory for Commodities Inspection Accreditation Program for Telecommunication Equipment Testing Laboratory Accreditation Program for BSMI Mutual Recognition Arrangment with Foreign Authorities

Jay-San Chen
President, Taiwan Accreditation Foundation
Date:April 05, 2012

P1, total 24 pages

Annex

Declaration for Bluetooth Device acc to Part 15.247

1 Output power and channel separation of a Bluetooth device in the different operating modes:

The different operating modes (data-mode, acquisition-mode) of a Bluetooth device has no influence on the output power and the channel spacing. There is only one transmitter which is driven by identical input parameters concerning these two parameters.
Only a different hopping sequence will be used. For this reason the check of these RF parameters in one op-mode is sufficient.

2 Frequency range of a Bluetooth device:

Hereby we declare that the maximum frequency of this device is: 2402 – 2480 MHz. This is according to the Bluetooth Core Specification (+ critical errata) for devices which will be operated in the USA.
This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/04-E). Other frequency ranges (e.g. for Spain, France, Japan) which are allowed according the Core Specification are not supported by this device.

3 Co-ordination of the hopping sequence in data mode to avoid simultaneous occupancy by multiple transmitters:

Bluetooth units which want to communicate with other units must be organised in a structure called piconet. This piconet consist of max. 8 Bluetooth units. One unit is the master the other seven are the slaves. The master co-ordinates frequency occupation in this piconet for all units. As the master hop sequence is derived from its BD address which is unique for each Bluetooth device, additional masters intending to establish new piconets will always use different hop sequences.

4 Example of a hopping sequence in data mode:

Example of a 79 hopping sequence in data mode:
40, 21, 44, 23, 42, 53, 46, 55, 48, 33, 52, 35, 50, 65, 54, 67,
56, 37, 60, 39, 58, 69, 62, 71, 64, 25, 68, 27, 66, 57, 70, 59,
72, 29, 76, 31, 74, 61, 78, 63, 01, 41, 05, 43, 03, 73, 07, 75,
09, 45, 13, 47, 11, 77, 15, 00, 64, 49, 66, 53, 68, 02, 70, 06,
01, 51, 03, 55, 05, 04

5 Equally average use of frequencies in data mode and behaviour for short transmissions:

The generation of the hopping sequence in connection mode depends essentially on two input values:
1. LAP/UAP of the master of the connection
2. Internal master clock

The LAP (lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24 MSB's of the 48 BD_ADDRESS.

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronisation with other units only offset are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5 µs. The clock has a cycle of about one day (23h30). In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire
LAP (24 bits), 4 LSB's (4 bits) (Input 1) and the 27 MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR- operations) are performed to generate the sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behaviour:
The first connection between the two devices is established, a hopping sequence was generated. For transmitting the wanted data the complete hopping sequence was not used. The connection ended.
The second connection will be established. A new hopping sequence is generated. Due to the fact that the Bluetooth clock has a different value, because the period between the two transmission is longer (and it cannot be shorter) than the minimum resolution of the clock (312.5 µs). The hopping sequence will always differ from the first one.

6 Receiver input bandwidth and behaviour for repeated single or multiple packets:

The input bandwidth of the receiver is 1 MHz. In every connection one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence (see chapter 5). The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master.
Additionally the type of connection (e.g. single or multislot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.
Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

7 Dwell time in data mode

The dwell time of 0.3797s within a 30 second period in data mode is independent from the packet type (packet length). The calculation for a 30 second period is a follows:

Dwell time = time slot length * hop rate / number of hopping channels *30s

Example for a DH1 packet (with a maximum length of one time slot) Dwell time = 625 µs * 1600 1/s / 79 * 30s = 0.3797s (in a 30s period)

For multislot packet the hopping is reduced according to the length of the packet. Example for a DH5 packet (with a maximum length of five time slots)
Dwell time = 5 * 625 µs * 1600 * 1/5 *1/s / 79 * 30s = 0.3797s (in a 30s period). This is according the Bluetooth Core Specification V 1.0B (+ critical errata) for all Bluetooth devices. Therefor all Bluetooth devices **comply** with the FCC dwell time requirement in data mode. This was checked during the Bluetooth Qualification tests. The Dwell time in hybrid mode is measured and stated in the test report.

8 Channel Separation in hybrid mode

The nominal channel spacing of the Bluetooth system is 1Mhz independent of the operating mode.
The maximum “initial carrier frequency tolerance” which is allowed for Bluetooth is fcenter = 75 kHz.
This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/07-E) for three frequencies (2402, 2441, 2480 MHz).
Additionally an example for the channel separation is given in the test report

9 Derivation and examples for a hopping sequence in hybrid mode

For the generation of the inquiry and page hop sequences the same procedures as described for the data mode are used (see chapter 5), but this time with different input vectors:

- For the inquiry hop sequence, a predefined fixed address is always used. This results in the same 32 frequencies used by all devices doing an inquiry but every time with a different start frequency and phase in this sequence.
- For the page hop sequence, the device address of the paged unit is used as input vector. This results in the use of a subset of 32 frequencies which is specific for that initial state of the connection establishment between the two units. A page to different devices would result in a different subset of 32 frequencies.

So it is ensured that also in hybrid mode the frequency use equally averaged.

Example of a hopping sequence in inquiry mode:
48, 50, 09, 13, 52, 54,41, 45, 56, 58, 11, 15, 60, 62, 43, 47, 00, 02, 64, 68, 04, 06, 17, 21, 08, 10, 66, 70, 12, 14, 19, 23

Example of a hopping sequence in paging mode:
08, 57, 68, 70, 51, 02, 42, 40, 04, 61, 44, 46, 63, 14, 50, 48, 16, 65, 52, 54, 67, 18, 58, 56, 20, 53, 60, 62, 55, 06, 66, 64

10 Receiver input bandwidth and synchronisation in hybrid mode:

The receiver input bandwidth is the same as in the data mode (1 MHz). When two Bluetooth devices establish contact for the first time, one device sends an inquiry access code, the other device is scanning for this inquiry access code. If two devices have been connected previously and want to start a new transmission, a similar procedure takes place. The only difference is, instead of the inquiry access code, an special access code, derived from the BD_ADDRESS of the paged device will be, will be sent by the master of this connection.
Due to the fact that both units have been connected before (in the inquiry procedure) the paging unit has timing and frequency information about the page scan of the paged unit. For this reason the time to establish the connection is reduced considerable.

11 Spread rate / data rate of the direct sequence signal

The Spread rate / Data rate in inquiry and paging mode can be defined via the access code. The access code is the only criterion for the system to check if there is a valid transmission or not. If you regard the presence of a valid access code as one bit of information, and compare it with the length of the access code of 68 bits, the Spread rate
/ Data rate will be 68/1.

12 Spurious emission in hybrid mode

The dwell time in hybrid mode is shorter than in data mode. For this reason the spurious emissions average level in data mode is worst case. The spurious emissions peak level is the same for both modes.

13 Peak power spectral density measurement

Since the transmitter is only active for some milliseconds on one channel you would get a result with many interruptions if using a sweep time of e.g. 1s as stated in the FCC rules. Therefore a fast sweep in maxhold function is used instead and the EUT is activated several times until the measurement curve has stabilized.