

FCC Test Report

Equipment : IP3092 series Communicator
Brand Name : TECOM
Model No. : IP3092
FCC ID : D6XIP3092
Standard : 47 CFR FCC Part 15.247
Applicant : TECOM CO.,LTD.
Manufacturer : 23, R&D Road 2 Science-Based Industrial Park
Hsin-Chu Taiwan

This report only contains BR and EDR mode test result.

The product sample received on Jul. 20, 2012 and completely tested on Sep. 14, 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:

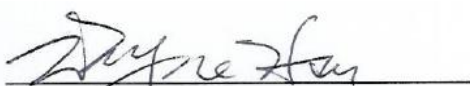

Wayne Hsu / Assistant Manager



Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information.....	5
1.2	Accessories	7
1.3	Support Equipment	7
1.4	Testing Applied Standards	7
1.5	Testing Location Information	8
1.6	Measurement Uncertainty	9
2	TEST CONFIGURATION OF EUT	10
2.1	The Worst Case Modulation Configuration	10
2.2	Test Channel Frequencies Configuration.....	10
2.3	The Worst Case Power Setting Parameter	11
2.4	The Worst Case Measurement Configuration	11
2.5	Test Setup Diagram	14
3	TRANSMITTER TEST RESULT	16
3.1	AC Power-line Conducted Emissions	16
3.2	20dB Bandwidth and Carrier Frequency Separation	19
3.3	Number of Hopping Frequencies.....	21
3.4	Time of Occupancy (Dwell Time).....	23
3.5	RF Output Power	25
3.6	Transmitter Radiated Bandedge Emissions	28
3.7	Transmitter Radiated Unwanted Emissions	32
4	TEST EQUIPMENT AND CALIBRATION DATA.....	43
5	CERTIFICATION OF TAF ACCREDITATION	45
	APPENDIX A. TEST PHOTOS	A5
	APPENDIX B. PHOTOGRAPHS OF EUT	B7

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	0.428MHz: 36.49dBuV (10.80dB) - AV 42.38dBuV (14.91dB) - QP	FCC 15.207	Complied
3.2	15.247(a)	20dB Bandwidth	EDR: 1.380 MHz	N/A	Complied
3.2	15.247(a)	Carrier Frequency Separation (ChS)	EDR: 1.002MHz	ChS $\geq$ 20 dB BW x 2/3.	Complied
3.3	15.247(a)	Number of Hopping Frequencies (N)	Max: 79 Min: 75	N $\geq$ 15	Complied
3.4	15.247(a)	Time of Occupancy (Dwell Time)	EDR: 0.3285 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: 5.23 EDR: 3.11	Power [dBm] Basic: 21 EDR: 21 LE: 30	Complied
3.6	15.247(c)	Transmitter Radiated Bandedge Emissions	Non-Restricted Bands: 2399.96MHz: 32.44dB Restricted Bands [dBuV/m at 3m]: 2375.99MHz 60.36 (Margin 13.64dB) - PK 48.53 (Margin 5.47dB) - 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]: 7323MHz 49.65 (Margin 4.35dB) - PK	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied



Report No. : FR272301

Revision History

[illegible]

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]	5.23
2400-2483.5	v2.1 + EDR	2402-2480	0-78 [79]	3.11
Note 1: Bluetooth EDR uses a combination of GFSK (1Mbps), $\pi/4$ -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	
☐	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	Internal	PCB	3.39

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)
☒ 81.91% - test mode single channel - DH5	0.87
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				
I.T.E. Power Supply	Brand Name	LEI	Model Name	MU24-B120200-A1
	Power Rating	I/P: 100-240V~50/60Hz 1.0A ; O/P: 12V 2.0A		

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	iPad 2	APPLE	A1396	N/A
2	Earphone + Mic Phone	i-Acon	HOH-323-BK	N/A
3	USB 2.0 Flash Disk	Transcend	JetFlash V85	DoC
4	Micro SD Card (Insert into EUT)	Transcend	16G	DoC
5	Personal computer*2 (Remote Workstation)	DELL	DCTA	DoC
6	LCD Monitor*2 (Remote Workstation)	DELL	E198WFPF	DoC
7	(USB) Keyboard*2 (Remote Workstation)	DELL	SK-8175	DoC
8	(USB) Mouse*2 (Remote Workstation)	DELL	MOC5UO	DoC
9	iPad 2 (Remote Workstation)	APPLE	A1396	N/A

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
Conducted Emission	CO01-NH	Eddie	22°C / 54%	20-Jul-12
RF Conducted	TH01-HY	Ian	25.8°C / 46%	14-Sep-12
Radiated Emission	03CH02-HY	Hsiao	24°C / 63%	12-Sep-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	5.23	BT-1M
v2.1 + EDR	1	2 Mbps	BT-2M	2.81	
v2.1 + EDR	1	3 Mbps	BT-3M	3.11	
Note 1: Bluetooth EDR uses a combination of GFSK (1Mbps), $\pi/4$ -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: $\pi/4$ -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 Basic / EDR	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		Dos Command			
Worst Modulation Mode	Number of Transmit Chains (N_{TX})	Frequency (MHz)	Power Setting	Data Rate	RF Output Power (dBm)
BT-1M	1	2402	63	1 Mbps	3.18
BT-1M	1	2441	63	1 Mbps	4.44
BT-1M	1	2480	63	1 Mbps	5.23
BT-2M	1	2402	120	2 Mbps	1.42
BT-2M	1	2441	120	2 Mbps	2.14
BT-2M	1	2480	120	2 Mbps	2.81
BT-3M	1	2402	120	3 Mbps	1.61
BT-3M	1	2441	120	3 Mbps	2.46
BT-3M	1	2480	120	3 Mbps	3.11
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

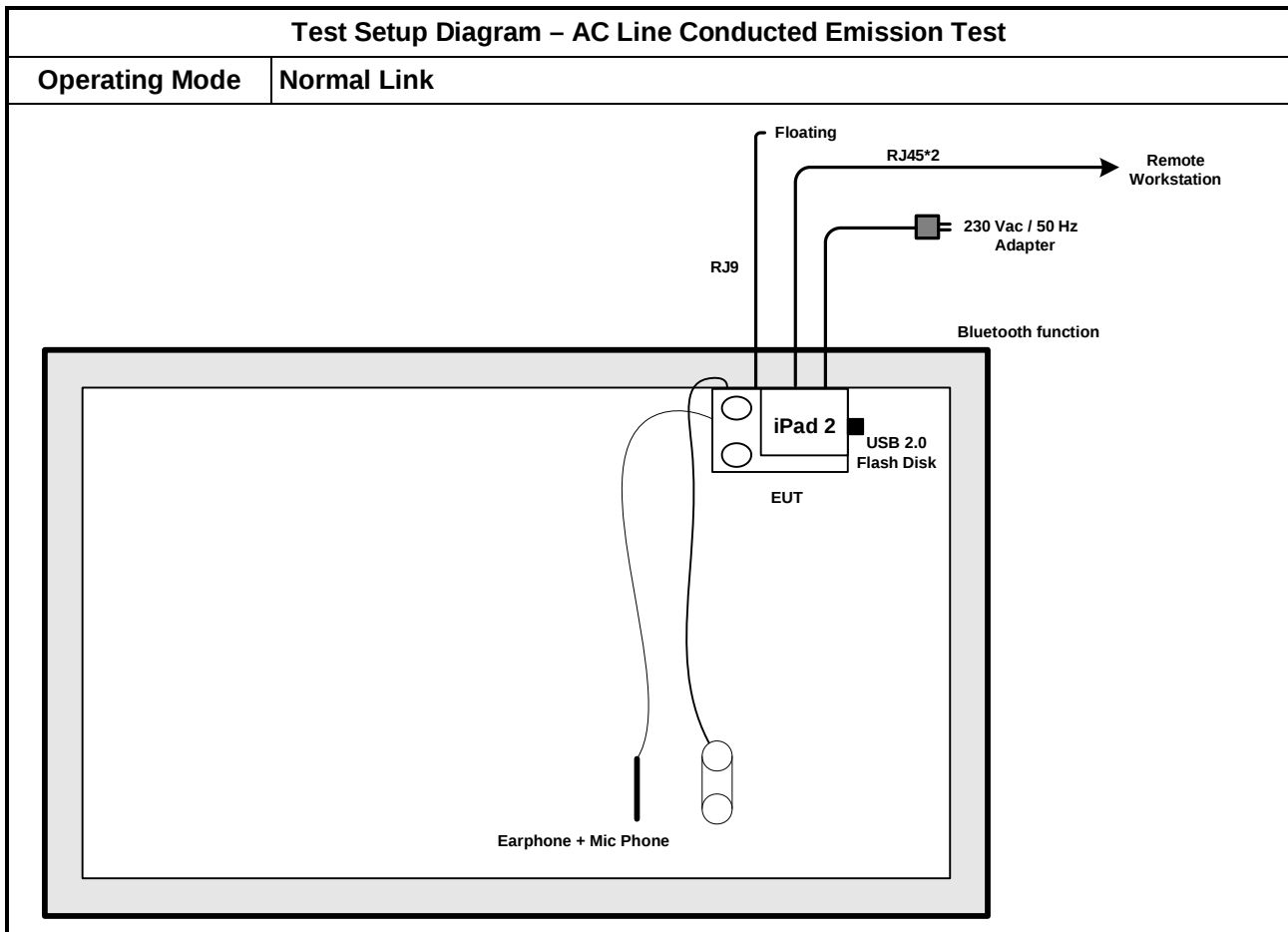
The Worst Case Mode for Following Conformance Tests			
Tests Item	Number of Hopping Frequencies (N)		
Test Condition	Conducted measurement at transmit chains		
Modulation Mode	Number of Transmit Chains (N_{TX})	Data Rate / MCS	Test Frequency
BT-3M	1	3 Mbps	Hopping

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

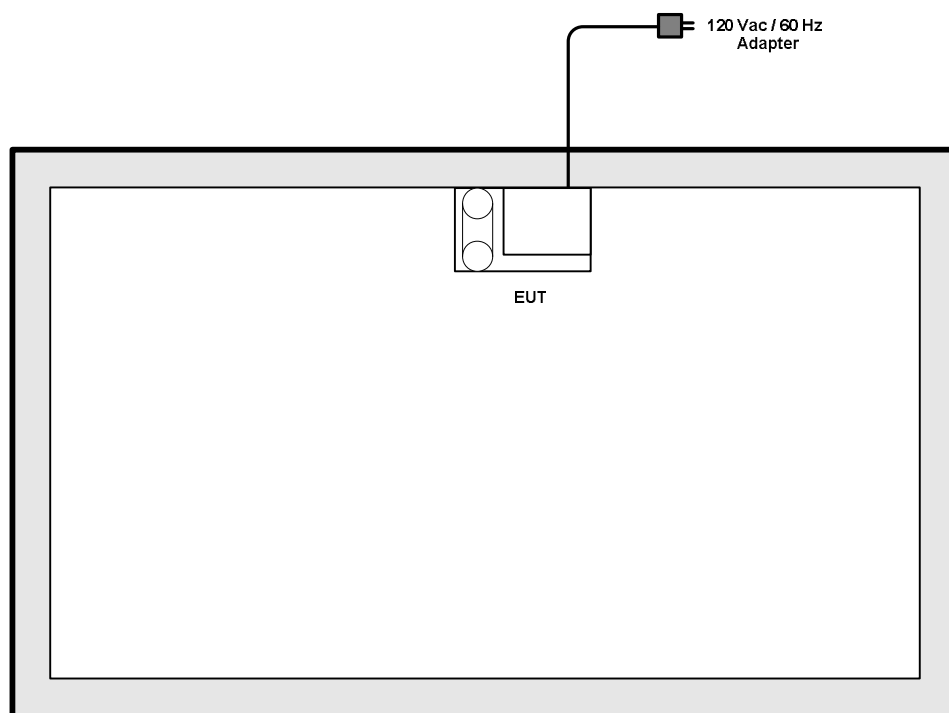
The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Unwanted Emissions		
Test Condition	Radiated measurement		
User Position	☒ EUT will be placed in fixed position.		
	☐ EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two 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 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



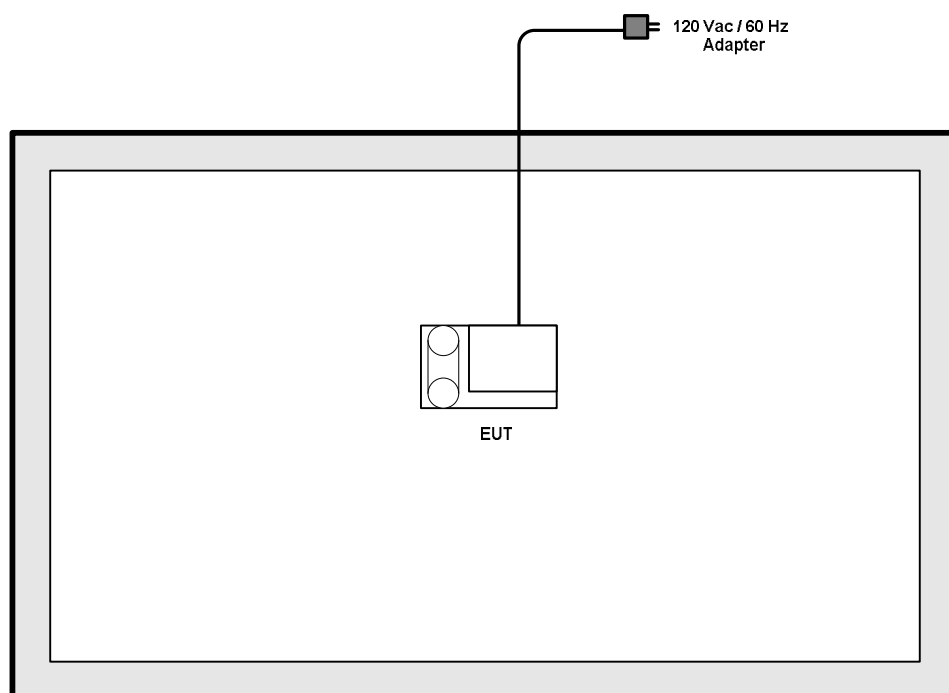
Test Setup Diagram - Radiated Test (Below 1GHz)

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.

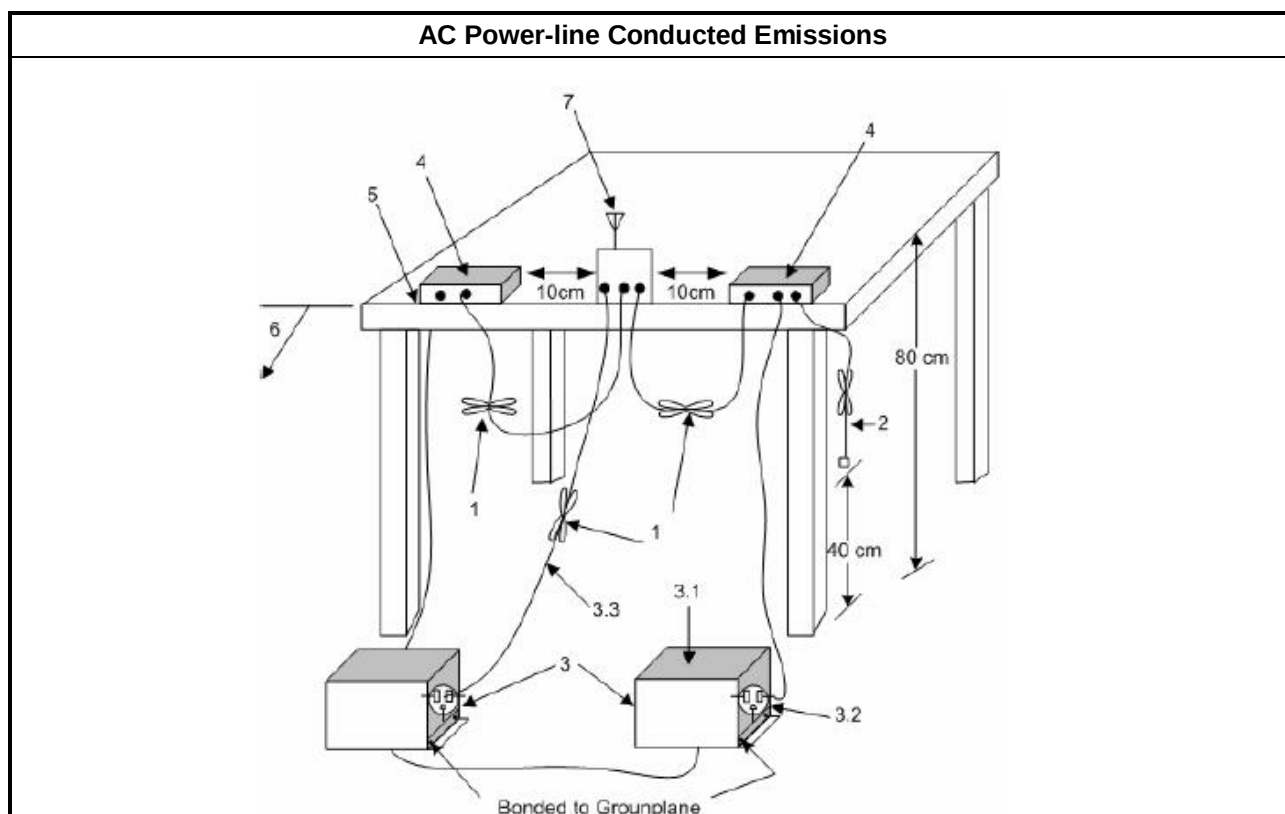
3.1.2 Measuring Instruments

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

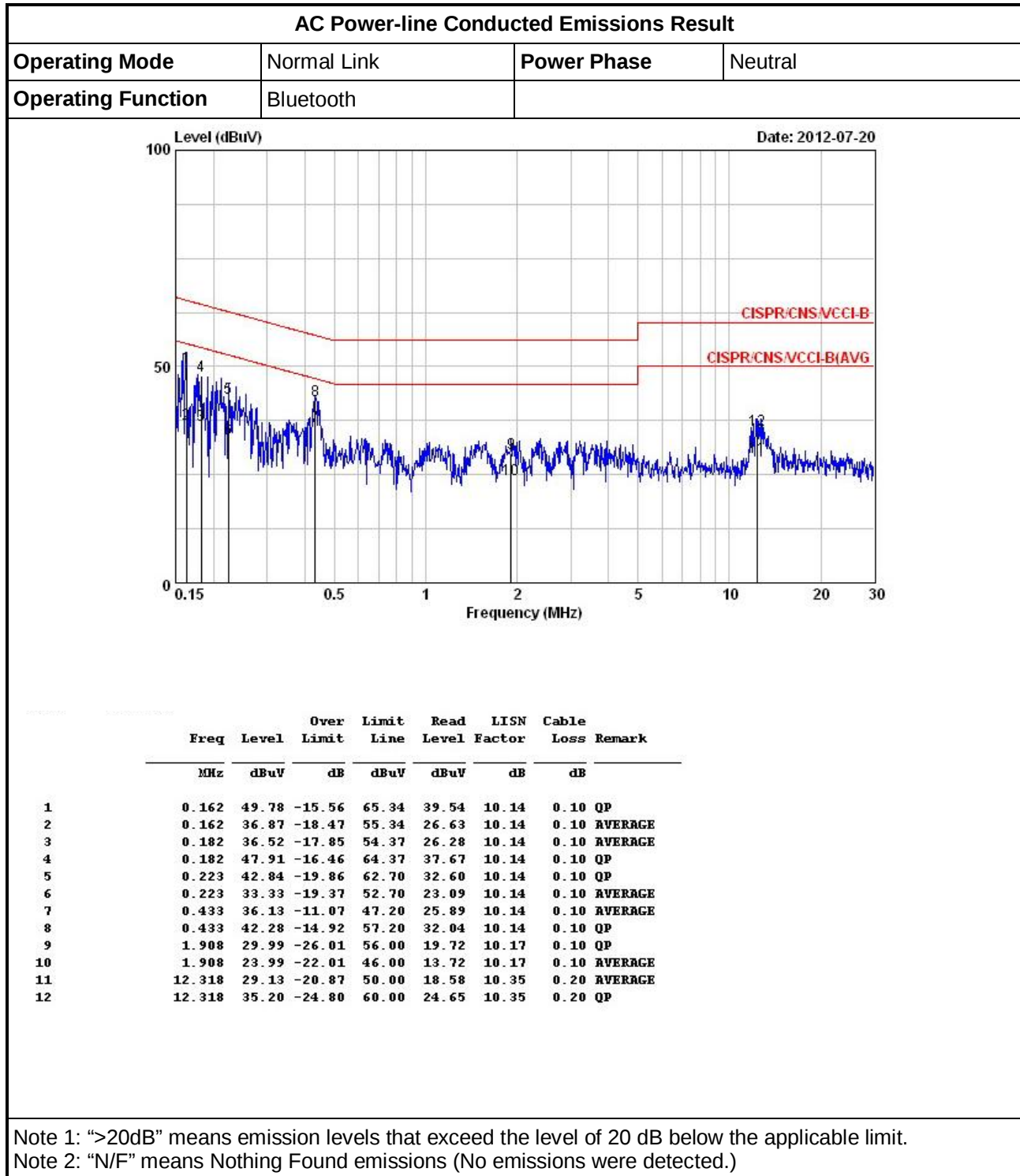
3.1.3 Test Procedures

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

3.1.4 Test Setup

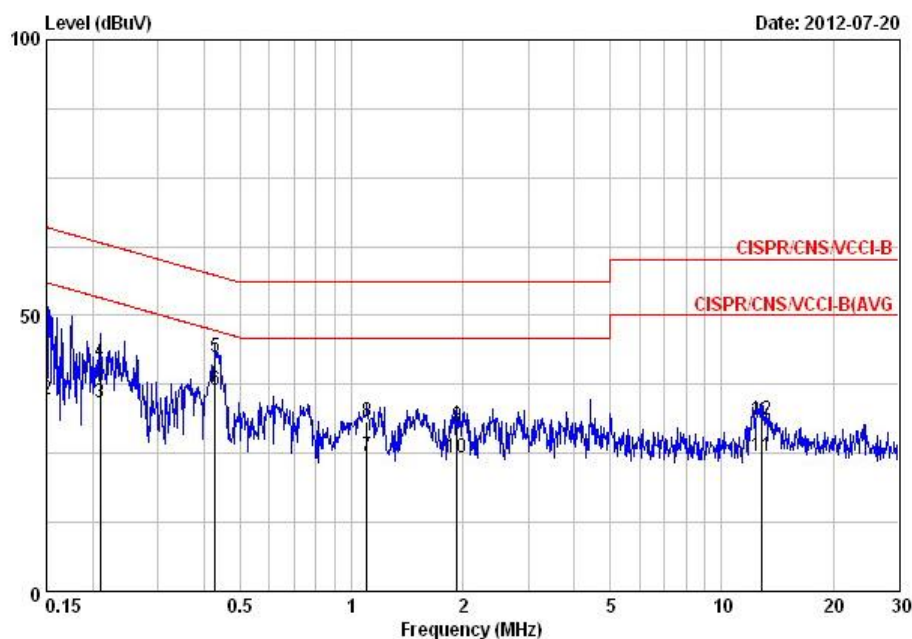


3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Operating Mode	Normal Link	Power Phase	Line
Operating Function	Bluetooth		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.150	48.82	-17.18	66.00	38.57	10.15	0.10	QP
2	0.150	34.70	-21.30	56.00	24.45	10.15	0.10	AVERAGE
3	0.209	34.29	-18.94	53.23	24.03	10.16	0.10	AVERAGE
4	0.209	41.71	-21.52	63.23	31.45	10.16	0.10	QP
5	0.428	42.38	-14.91	57.29	32.12	10.16	0.10	QP
6	0.428	36.49	-10.80	47.29	26.23	10.16	0.10	AVERAGE
7	1.100	24.60	-21.40	46.00	14.32	10.18	0.10	AVERAGE
8	1.100	30.63	-25.37	56.00	20.35	10.18	0.10	QP
9	1.928	29.79	-26.21	56.00	19.50	10.19	0.10	QP
10	1.928	24.09	-21.91	46.00	13.80	10.19	0.10	AVERAGE
11	12.852	24.62	-25.38	50.00	14.08	10.34	0.20	AVERAGE
12	12.852	30.93	-29.07	60.00	20.39	10.34	0.20	QP

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	

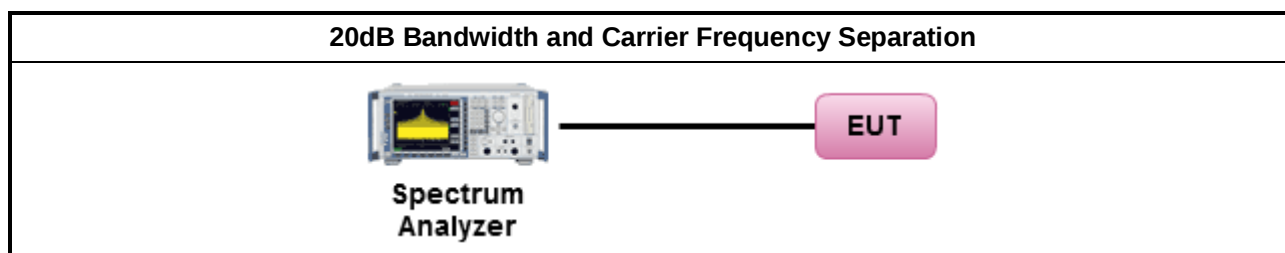
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

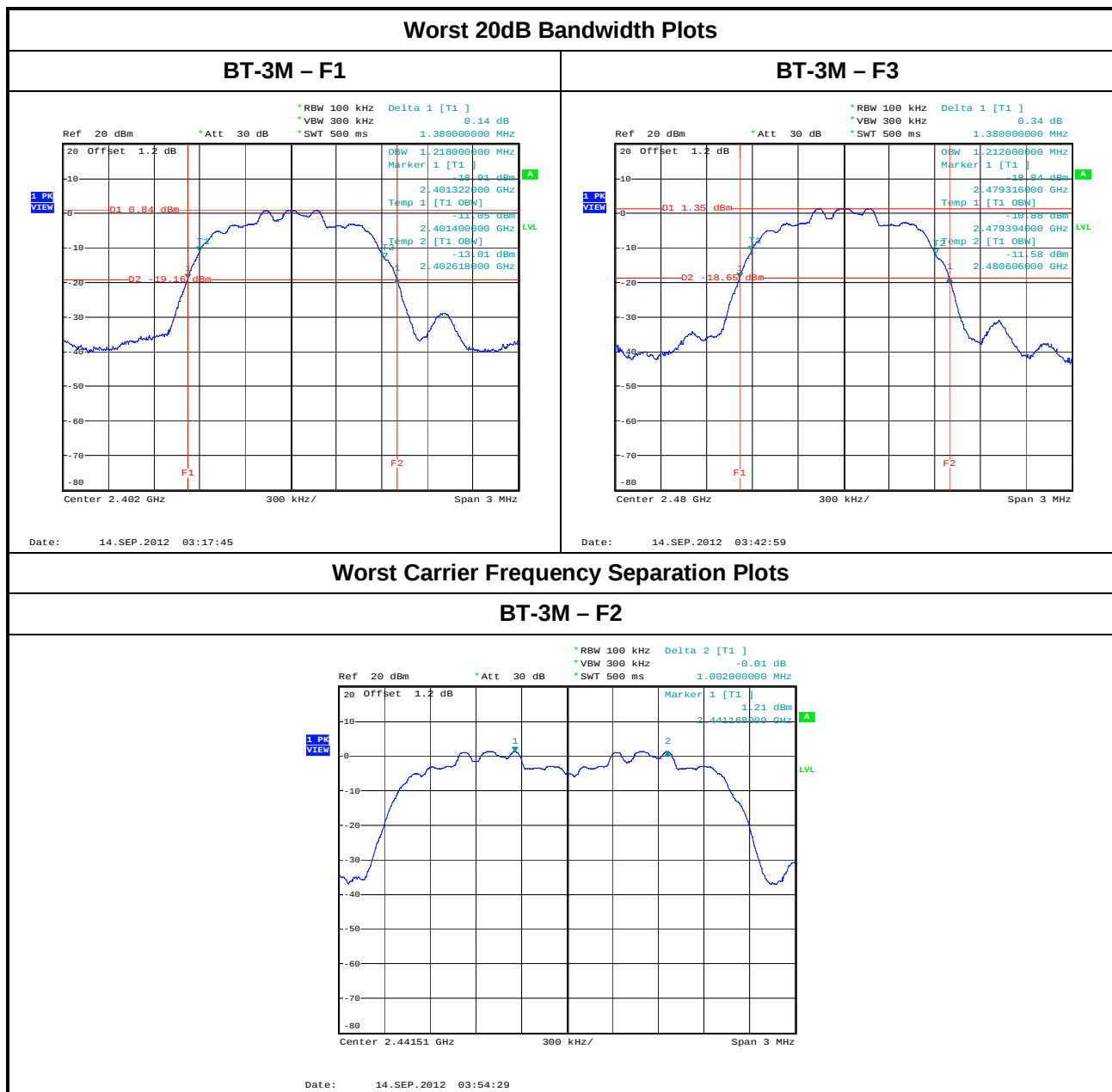
Test Method	
☒	Refer as ANSI C63.10, clause 6.9.1 for 20 dB bandwidth measurement.
☒	Refer as ANSI C63.10, clause 7.7.2 for carrier frequency separation measurement.
☒	For conducted measurement.
☒	For conducted measurements on devices with single transmit chains.
☐	For conducted measurements on devices 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



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	1.380	1.218	1.002	0.916
BT-3M	2441	1.380	1.218	1.002	0.924
BT-3M	2480	1.380	1.212	1.002	0.924
Result		Complied			



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:
☐	$N \geq 50$ and 20 dB bandwidth < 250 kHz
☐	$50 > N \geq 25$ and 250kHz $\leq$ 20 dB bandwidth $\leq$ 500 kHz
☒	2400-2483.5 MHz Band:
☐	$N \geq 79$ and ChS $\geq$ MAX (20 dB bandwidth, 25 kHz).
☒	$N \geq 15$ and ChS $\geq$ MAX (20 dB bandwidth x 2/3, 25 kHz).
☐	5725-5850 MHz Band: $N \geq 79$
N: Number of Hopping Frequencies ChS: Hopping Channel Separation	

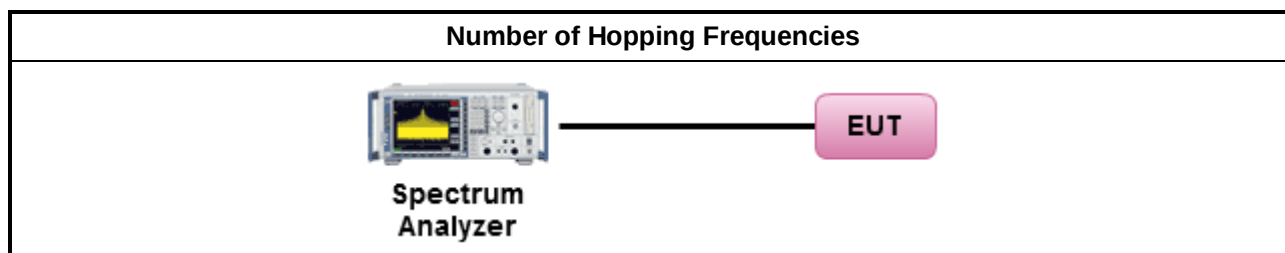
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

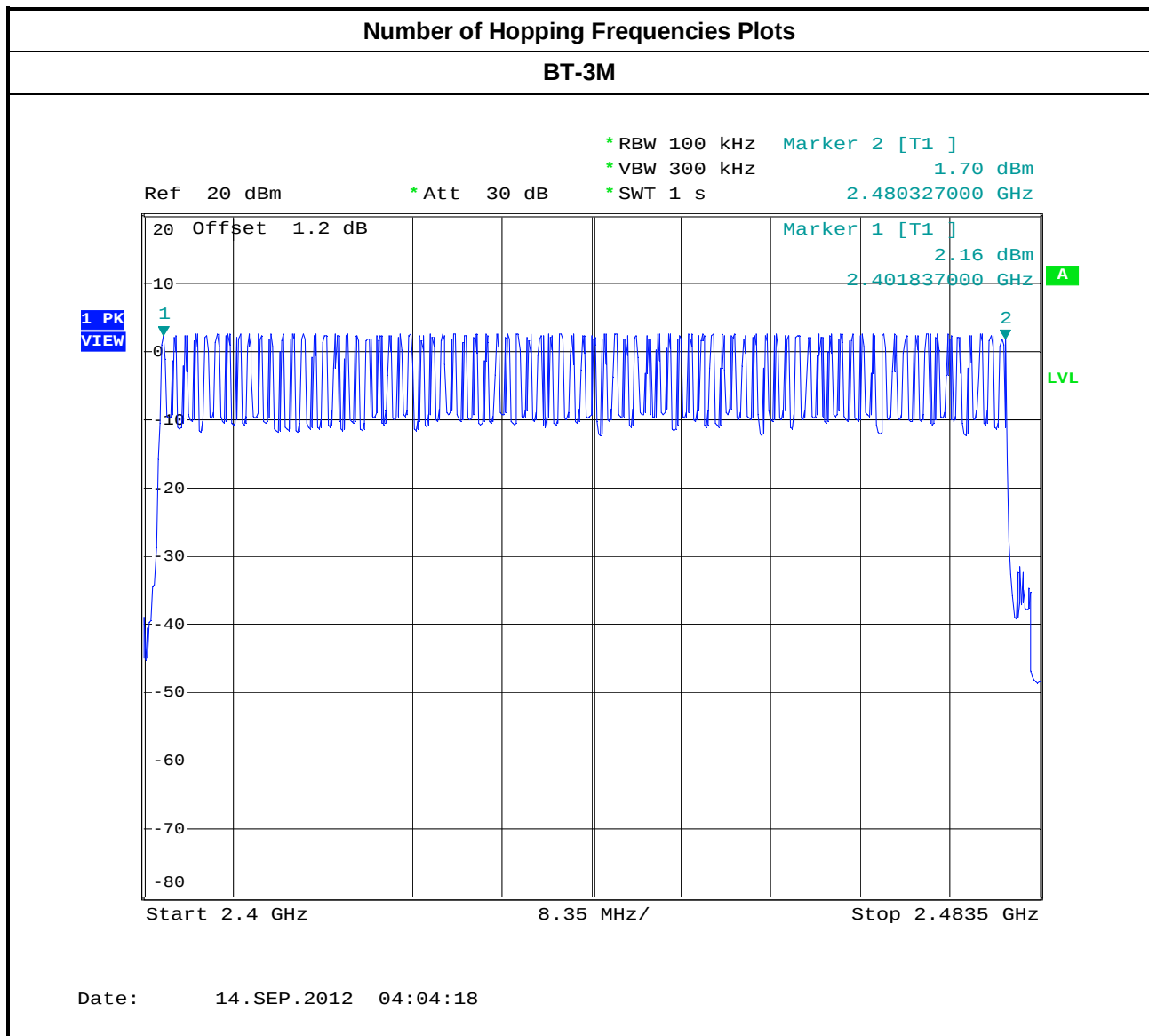
Test Method	
☒	Refer as ANSI C63.10, clause 7.7.3 for number of hopping frequencies measurement.
☒	For conducted measurement.
☒	For conducted measurements on devices with single transmit chains.
☐	For conducted measurements on devices with multiple transmit chains using options given below:
☐	Option 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



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		



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:
☐	$N \geq 50$ and 20 dB bandwidth < 250 kHz: Dwell time ≤ 0.4 sec within 20 sec
☐	$50 > N \geq 25$ and 250kHz $\leq$ 20 dB bandwidth $\leq$ 500 kHz: Dwell time ≤ 0.4 sec within 10 sec
☒	2400-2483.5 MHz Band: Dwell time ≤ 0.4 second within $0.4 \times N$
☐	5725-5850 MHz Band: Dwell time ≤ 0.4 second within 30 sec
N: Number of Hopping Frequencies	

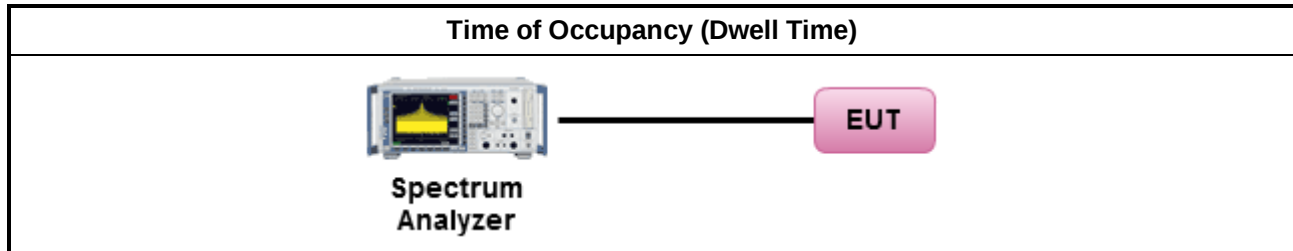
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

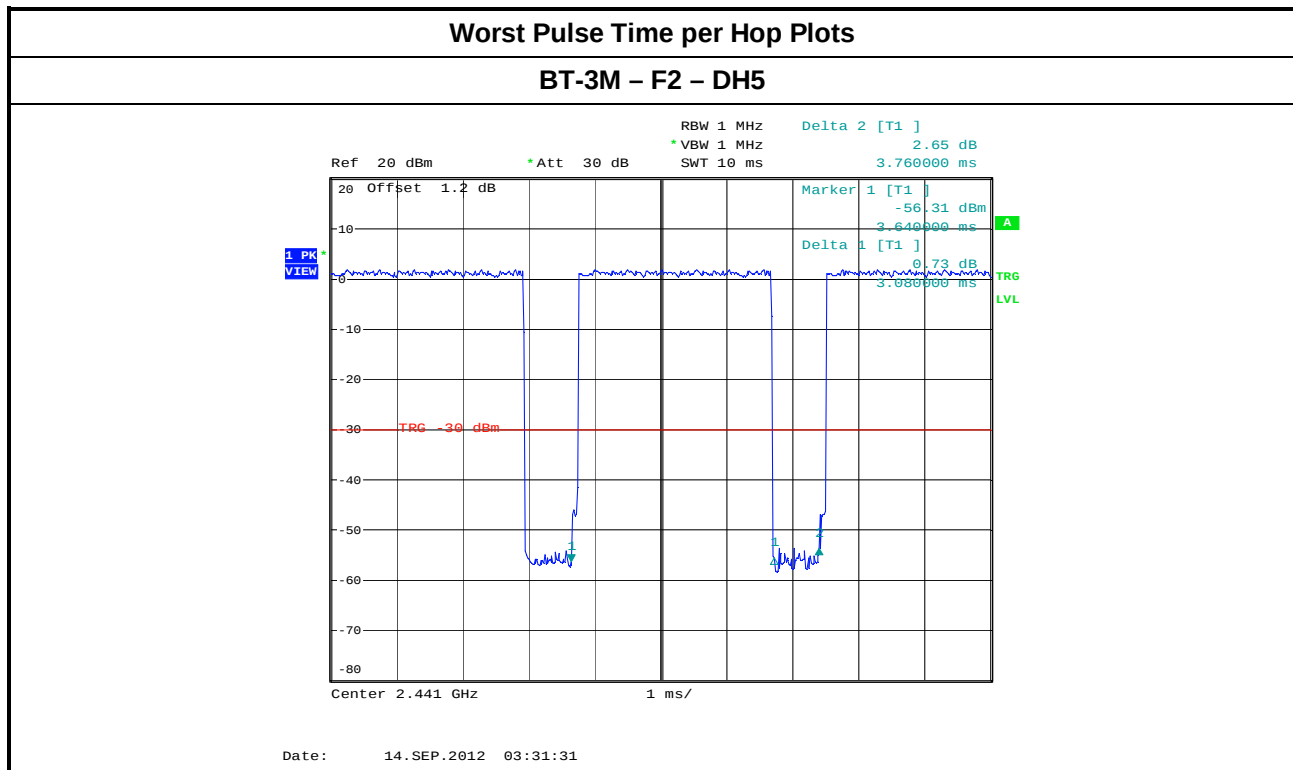
Test Method	
☒	Refer as ANSI C63.10, clause 7.7.4 for dwell time measurement.
☒	Bluetooth ACL packets can be 1, 3, or 5 time slots. Following as dwell time. Operate DH5 at maximum dwell time and maximum duty cycle.
☒	The DH1 packet can cover a single time slot. A maximum length packet has duration of 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 $10.12 \times 31.6 = 320$ 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 $5.06 \times 31.6 = 160$ 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 $3.37 \times 31.6 = 106.6$ 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



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 × N sec]	Dwell Time in [0.4 × N sec] (s)	Dwell Time Limits (s)
BT-3M	2441	3.08	106.6	0.3285	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.					



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: $N \geq 50$
☐	☐ If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)
☐	☐ If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ dBm
☐	For Hopping Channel: $50 > N \geq 25$
☐	☐ If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 24$ 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: $N \geq 79$
☐	☐ If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)
☐	☐ If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ dBm
☒	For Hopping Channel: $N \geq 15$
☒	☒ If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 21$ dBm (0.125 W)
☐	☐ If $G_{TX} > 6$ dBi, then $P_{Out} = 21 - (G_{TX} - 6)$ dBm
☐ 5725-5850 MHz Band:	
☐	For Hopping Channel: $N \geq 79$
☐	☐ If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ 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: $N \geq 50 - P_{eirp} \leq 36$ dBm (4 W)
☐	For Hopping Channel: $50 > N \geq 25 - P_{eirp} \leq 30$ dBm (1 W)
☒ 2400-2483.5 MHz Band:	
☐	For Hopping Channel: $N \geq 79 - P_{eirp} \leq 36$ dBm (4 W)
☒	For Hopping Channel: $79 > N \geq 15 - P_{eirp} \leq 27$ dBm (0.5 W)
☐ 5725-5850 MHz Band:	
☐	For Hopping Channel: $N \geq 79 - P_{eirp} \leq 36$ 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	

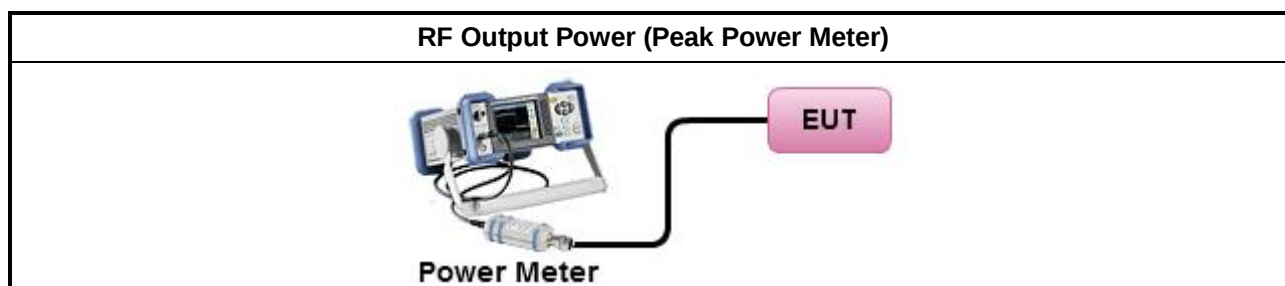
3.5.2 Measuring Instruments

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 $\geq$ 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 $\geq$ EBW).
☐	Refer as ANSI C63.10, clause 6.10.2.1 b) for spectrum analyzer - BW correction factor.

3.5.4 Test Setup



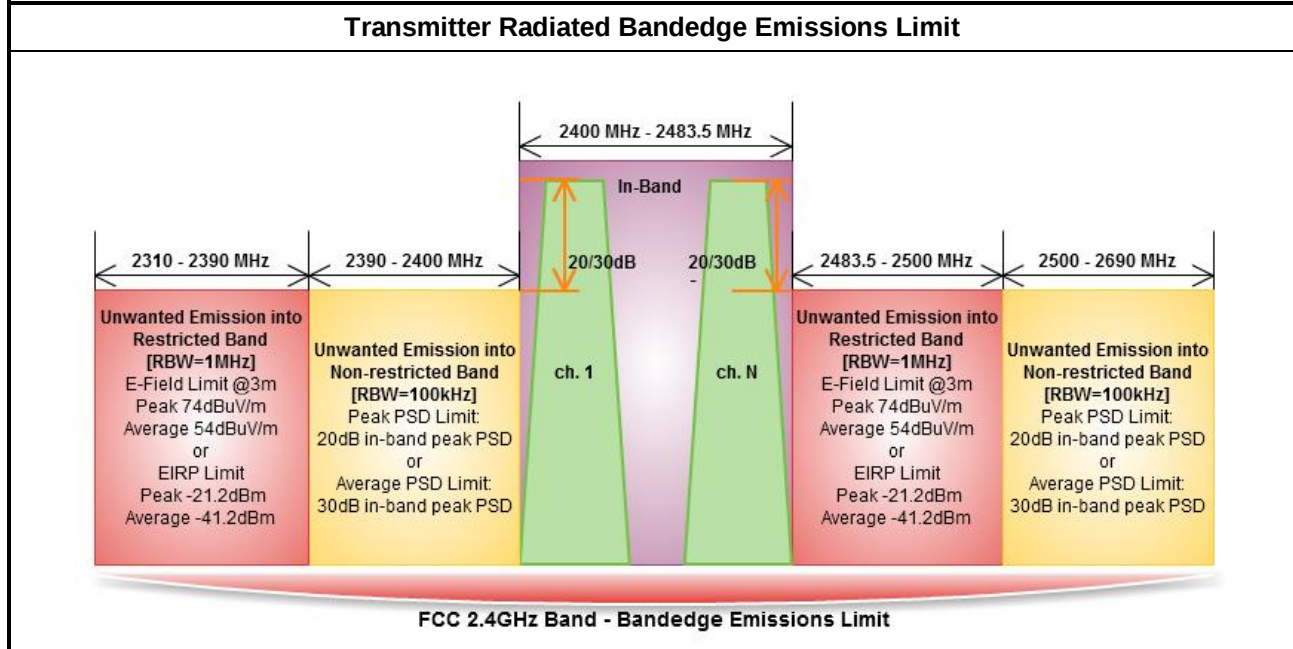
3.5.5 Test Result of Maximum Peak Conducted Output Power

Maximum Peak Conducted Output Power Result					
Directional Gain (dBi)	3.39	RF Output Power (dBm)			
Modulation Mode	Freq. (MHz)	RF Output Power	Power Limit	EIRP Power	EIRP Limit
BT-1M	2402	3.18	30	6.57	36
BT-1M	2441	4.44	30	7.83	36
BT-1M	2480	5.23	30	8.62	36
Result		Complied			
RF Output Power Limit for Frequency Hopping Systems					

Maximum Peak Conducted Output Power Result					
Directional Gain (dBi)	3.39	RF Output Power (dBm)			
Modulation Mode	Freq. (MHz)	RF Output Power	Power Limit	EIRP Power	EIRP Limit
BT-3M	2402	1.61	30	5.00	36
BT-3M	2441	2.46	30	5.85	36
BT-3M	2480	3.11	30	6.50	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



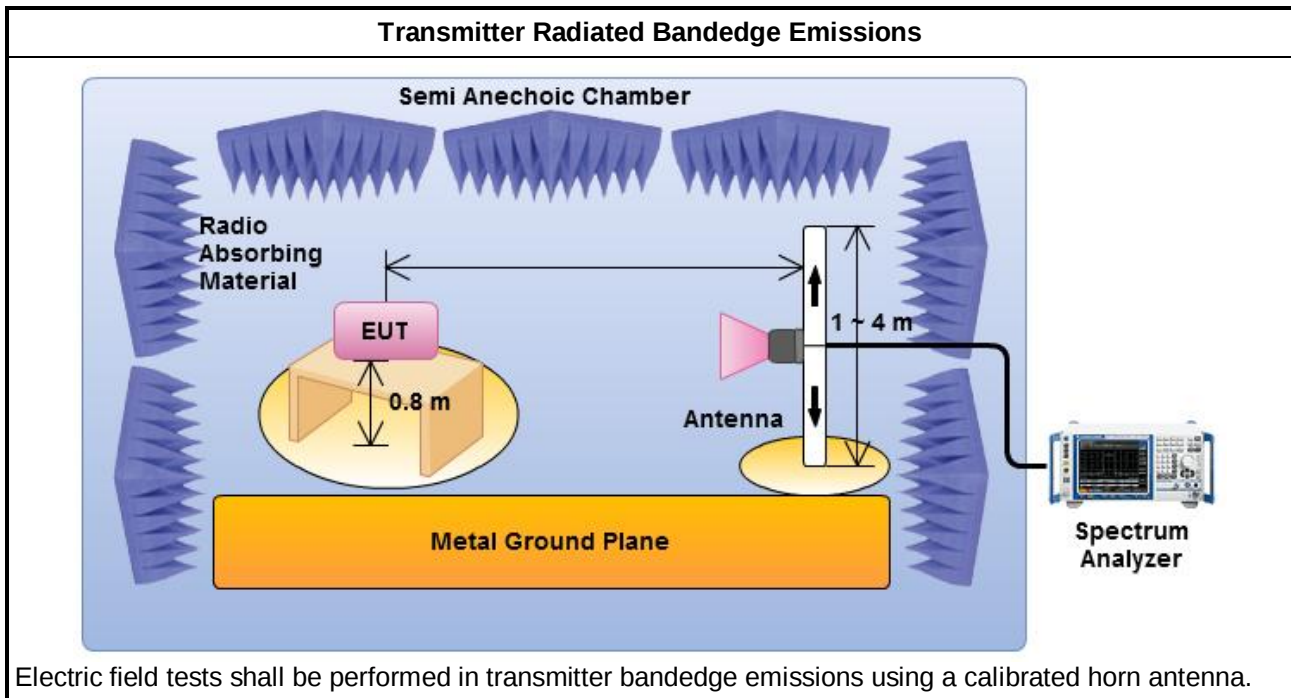
3.6.2 Measuring Instruments

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

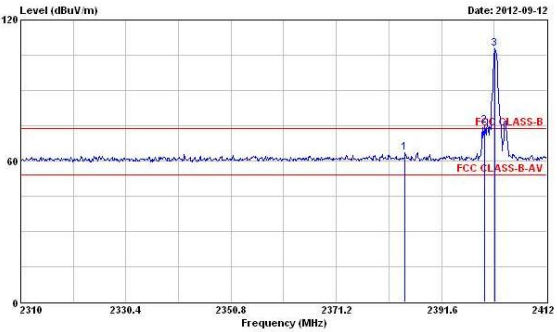
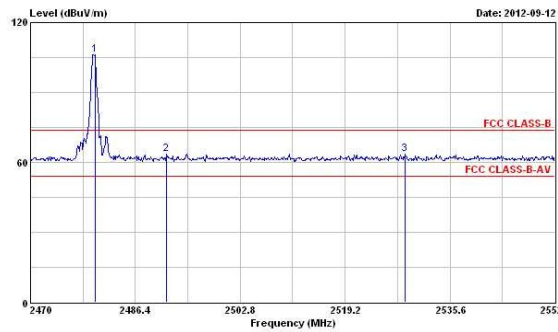
3.6.3 Test Procedures

Test Method – General Information	
☒	The average emission levels shall be measured in [duty cycle $\geq$ 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 $\geq$ 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

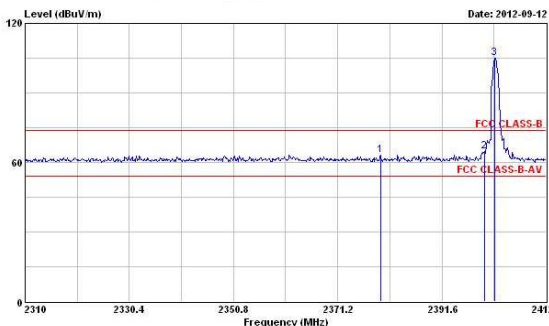
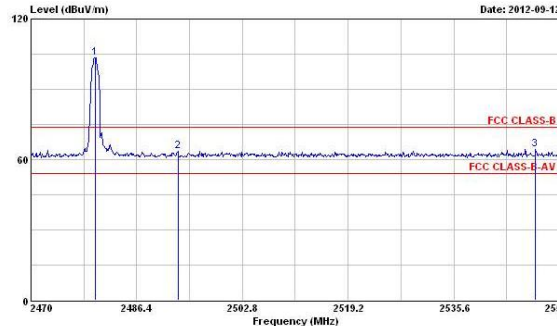


3.6.5 Test Result of Transmitter Radiated Bandedge Emissions

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	107.62	2399.96	75.18	32.44	20	PK	V
2500-2690	2480	106.36	2528.63	63.61	42.75	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	107.63	2380.48	3	60.36	74	PK	V
2310-2390	2402	105.05	2375.99	3	48.53	54	AV	V
2483.5-2500	2480	106.52	2483.50	3	64.56	74	PK	V
2483.5-2500	2480	103.91	2483.50	3	25.39	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	105.12	2379.56	63.10	42.02	20	PK	V
2500-2690	2480	103.49	2548.31	64.32	39.17	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	105.20	2383.75	3	59.98	74	PK	V
2310-2390	2402	99.27	2375.99	3	47.76	54	AV	V
2483.5-2500	2480	103.60	2483.61	3	65.98	74	PK	V
2483.5-2500	2480	97.55	2483.50	3	27.30	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.

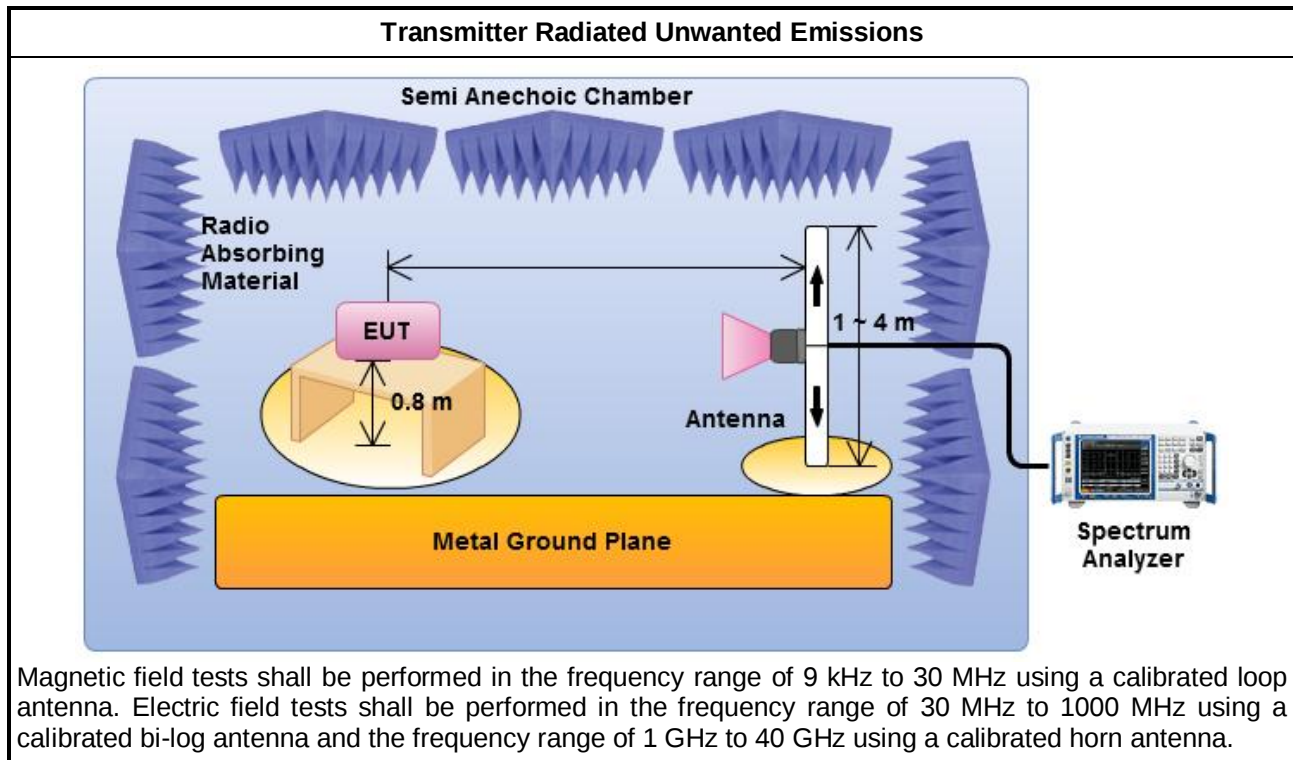
3.7.2 Measuring Instruments

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 $\geq$ 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 $20\log(\text{dwell time}/100 \text{ ms})$
☒	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 $\geq$ 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.

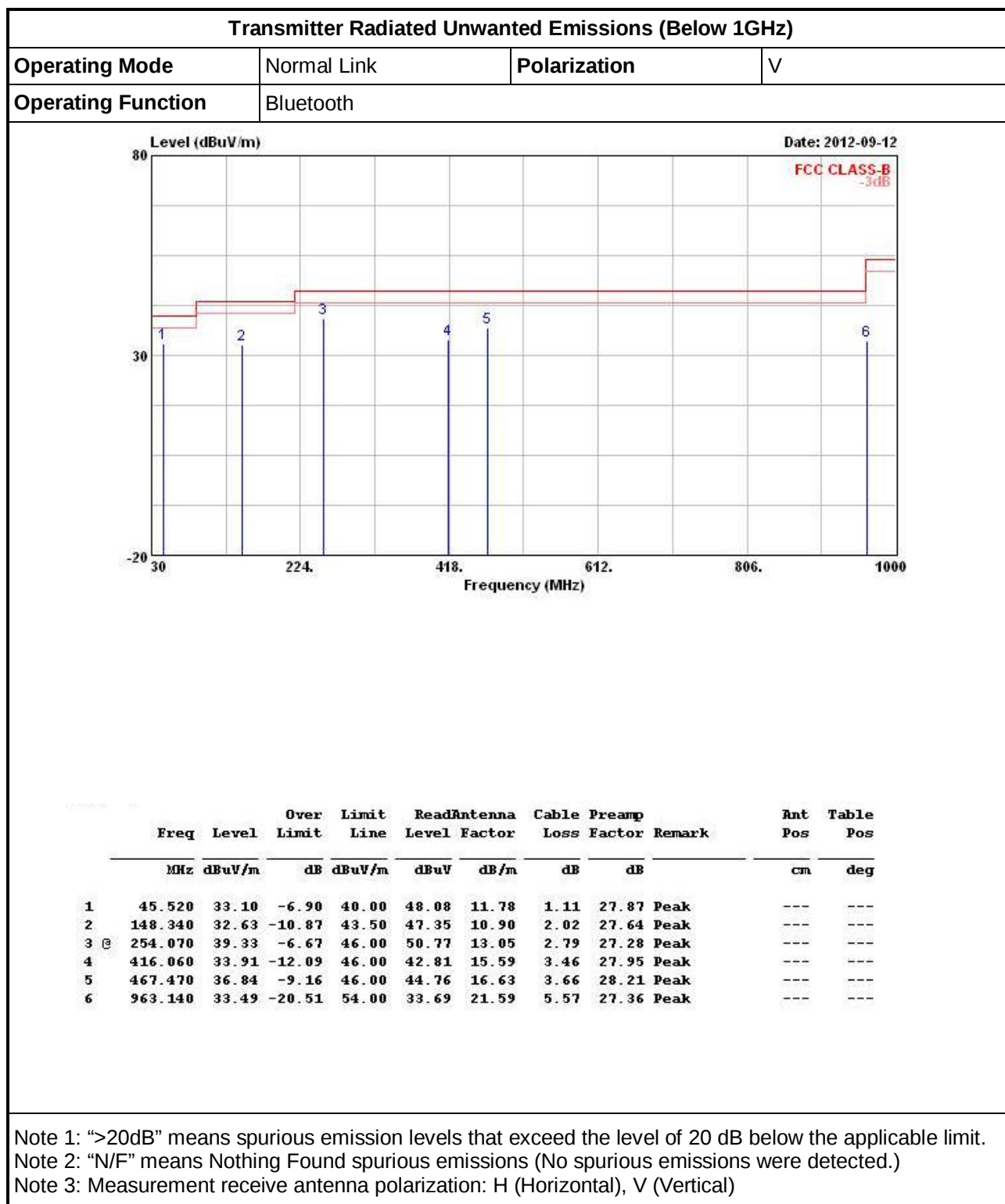
3.7.4 Test Setup



3.7.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

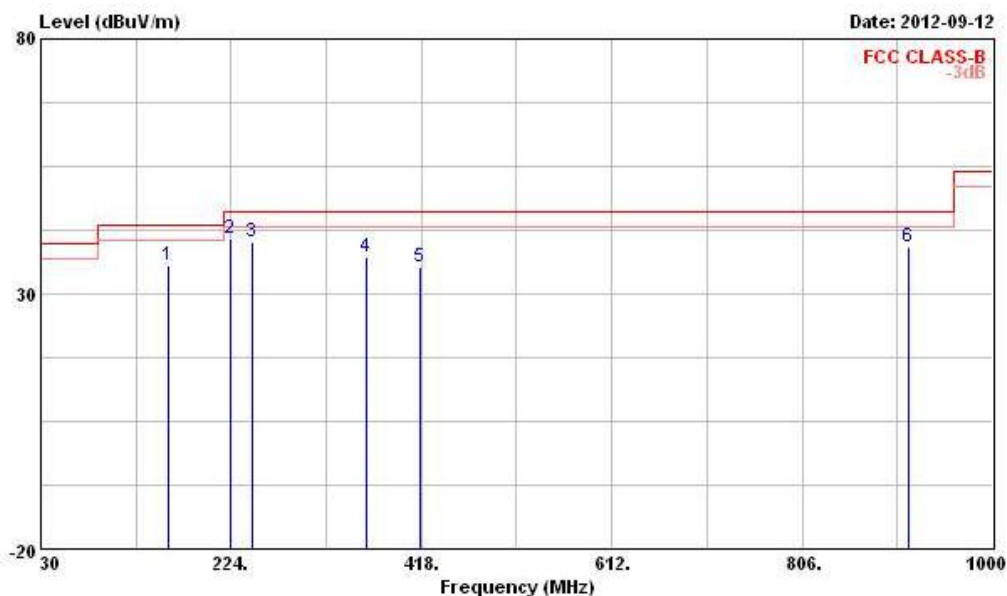
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

3.7.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)



Transmitter Radiated Unwanted Emissions (Below 1GHz)

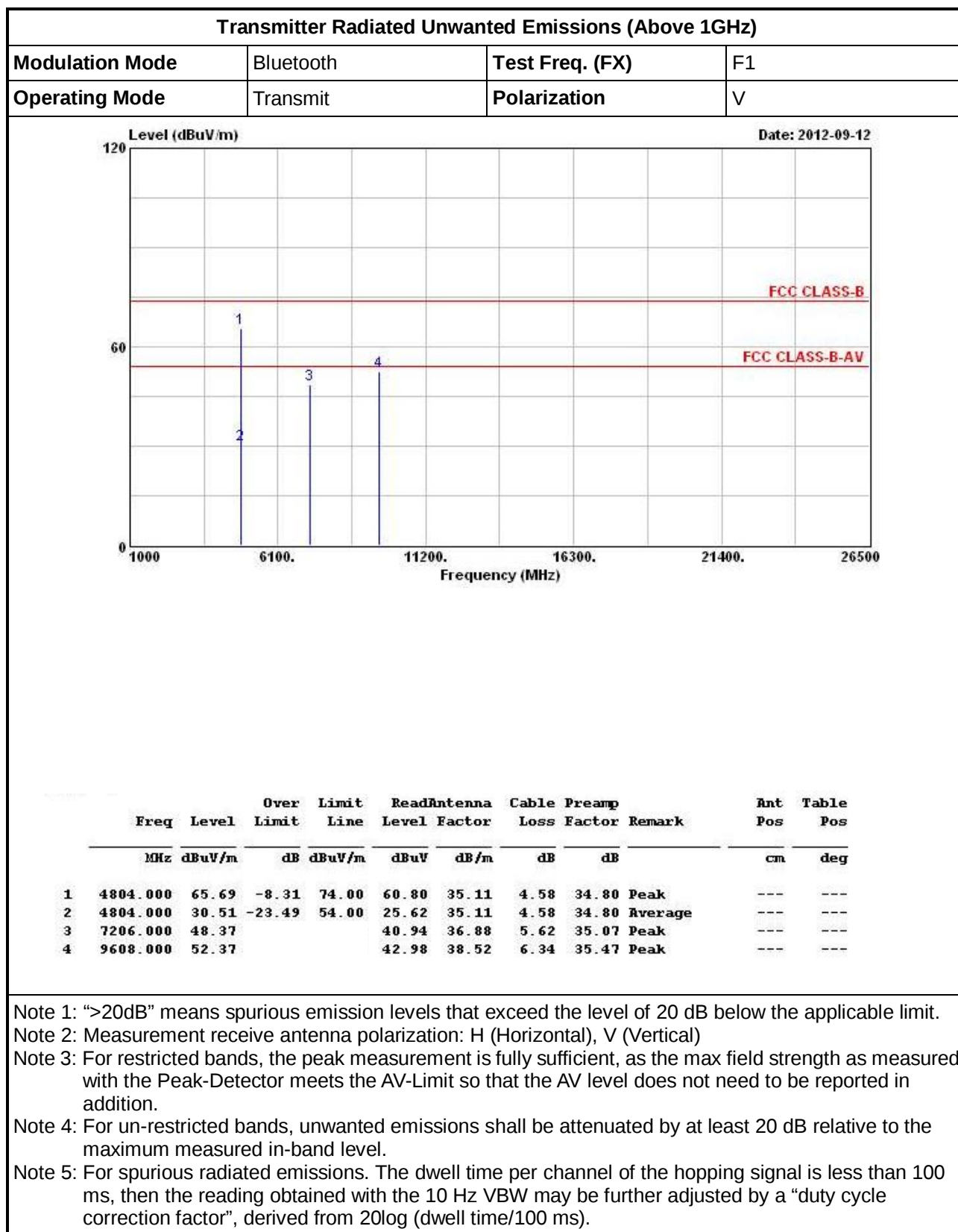
Operating Mode	Normal Link	Polarization	H
Operating Function	Bluetooth		



	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	159.980	35.70	-7.80	43.50	50.66	10.55	2.08	27.59	Peak	---	---
2	223.030	40.94	-5.06	46.00	53.59	12.11	2.59	27.35	Peak	---	---
3	245.340	40.20	-5.80	46.00	51.92	12.84	2.74	27.30	Peak	---	---
4	362.710	37.32	-8.68	46.00	47.01	14.68	3.23	27.60	Peak	---	---
5	416.060	35.32	-10.68	46.00	44.22	15.59	3.46	27.95	Peak	---	---
6	913.670	39.19	-6.81	46.00	41.04	20.37	5.33	27.55	Peak	---	---

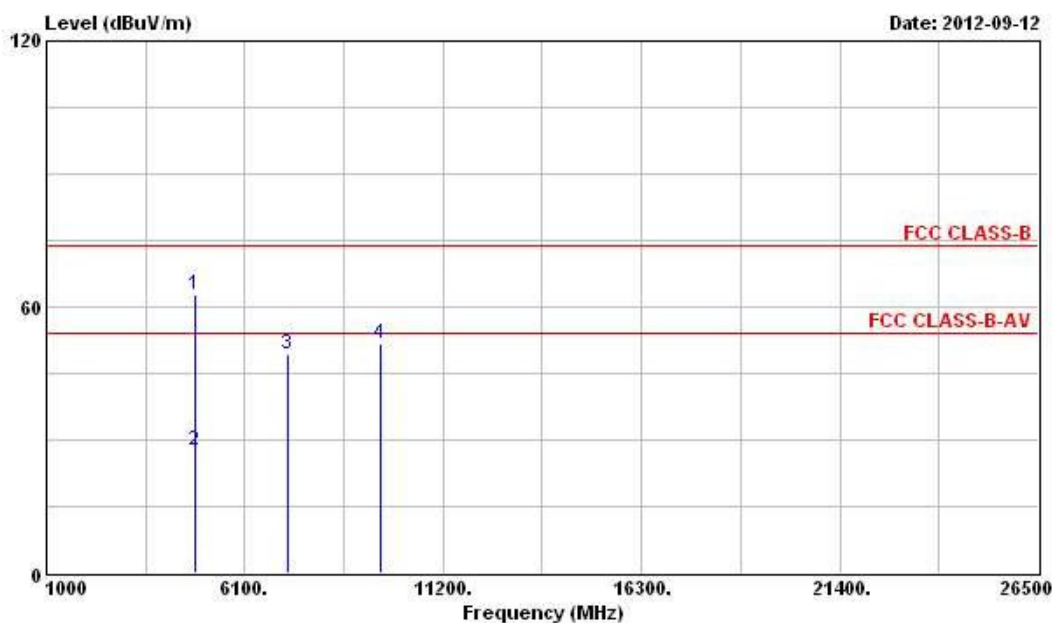
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

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	H

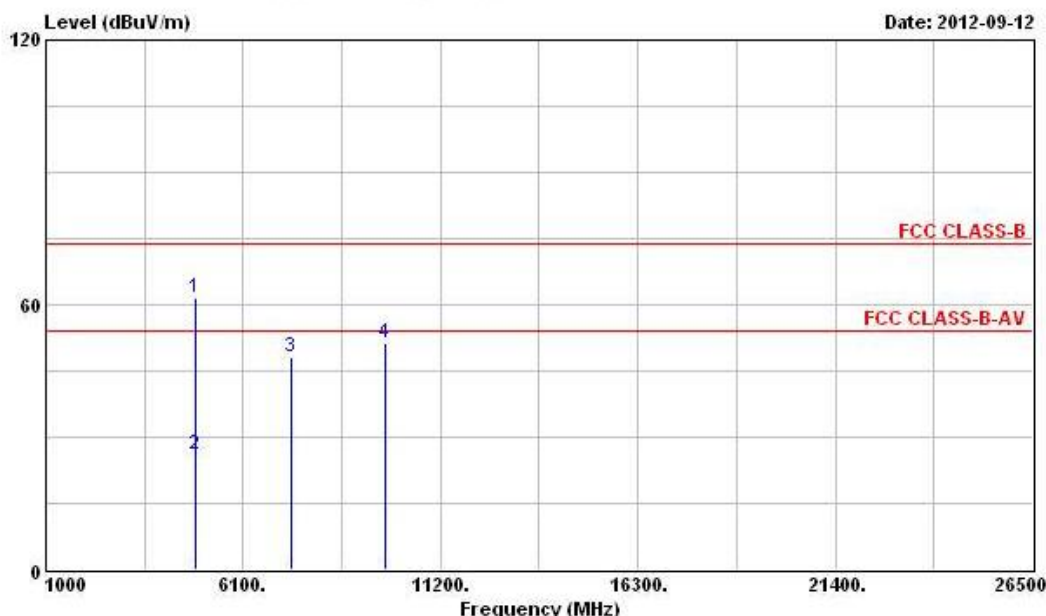


	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	4804.000	62.77	-11.23	74.00	57.26	35.73	4.58	34.80 Peak	---	---
2	4804.000	27.59	-26.41	54.00	22.08	35.73	4.58	34.80 Average	---	---
3	7206.000	49.33			40.94	37.84	5.62	35.07 Peak	---	---
4	9608.000	51.83			41.64	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 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 $20\log(\text{dwell time}/100 \text{ ms})$.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	Bluetooth	Test Freq. (FX)	F2
Operating Mode	Transmit	Polarization	V



	Freq	Level	Over Limit	Limit Line	ReadAntenna 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	61.41	-12.59	74.00	56.37	35.18	4.64	34.78	Peak	---	---
2	4882.000	26.23	-27.77	54.00	21.19	35.18	4.64	34.78	Average	---	---
3 @	7323.000	48.30	-5.70	54.00	40.83	36.93	5.64	35.10	PK	---	---
4	9764.000	51.18			41.57	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)

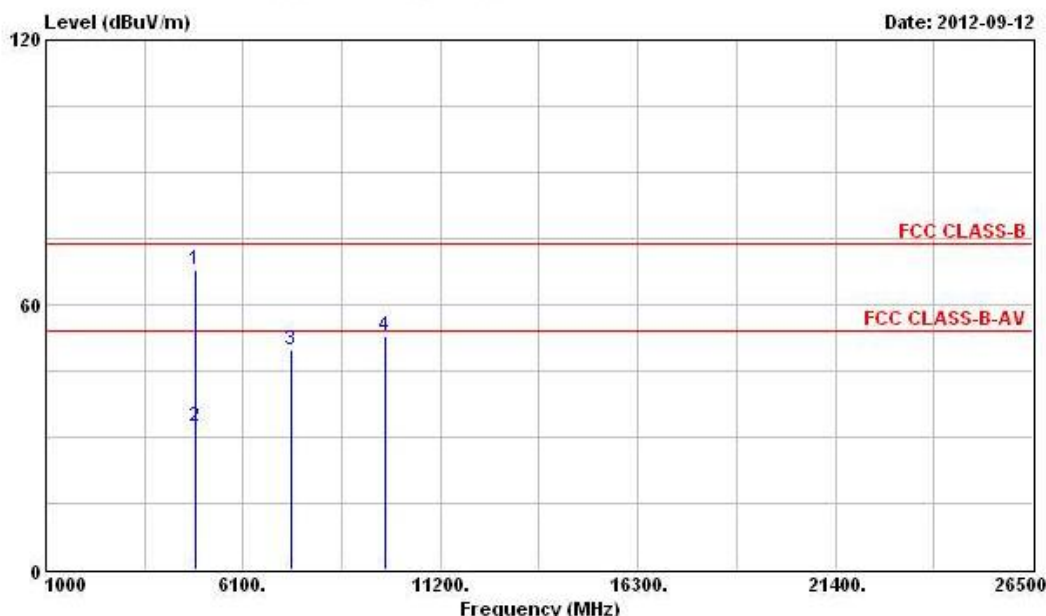
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 4: For un-restricted bands, unwanted emissions 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 $20\log(\text{dwell time}/100 \text{ ms})$.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	Bluetooth	Test Freq. (FX)	F2
Operating Mode	Transmit	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1 @	4882.000	67.74	-6.26	74.00	62.05	35.83	4.64	34.78	Peak	---
2	4882.000	32.56	-21.44	54.00	26.87	35.83	4.64	34.78	Average	---
3 @	7323.000	49.65	-4.35	54.00	41.24	37.87	5.64	35.10	PK	---
4	9764.000	53.04			42.63	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)

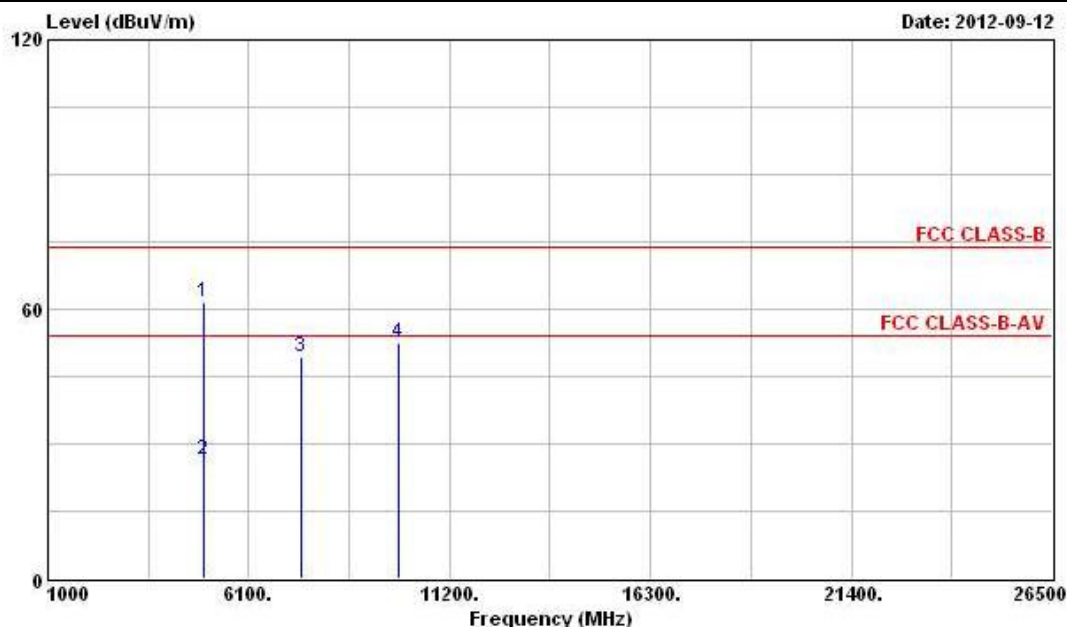
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 4: For un-restricted bands, unwanted emissions 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 $20\log(\text{dwell time}/100 \text{ ms})$.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	Bluetooth	Test Freq. (FX)	F3
Operating Mode	Transmit	Polarization	V



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	4960.000	61.74	-12.26	74.00	56.52	35.27	4.71	34.76 Peak	---	---
2	4960.000	26.56	-27.44	54.00	21.34	35.27	4.71	34.76 Average	---	---
3	7440.000	49.16	-4.84	54.00	41.67	36.98	5.65	35.14 PK	---	---
4	9920.000	52.34			42.52	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)

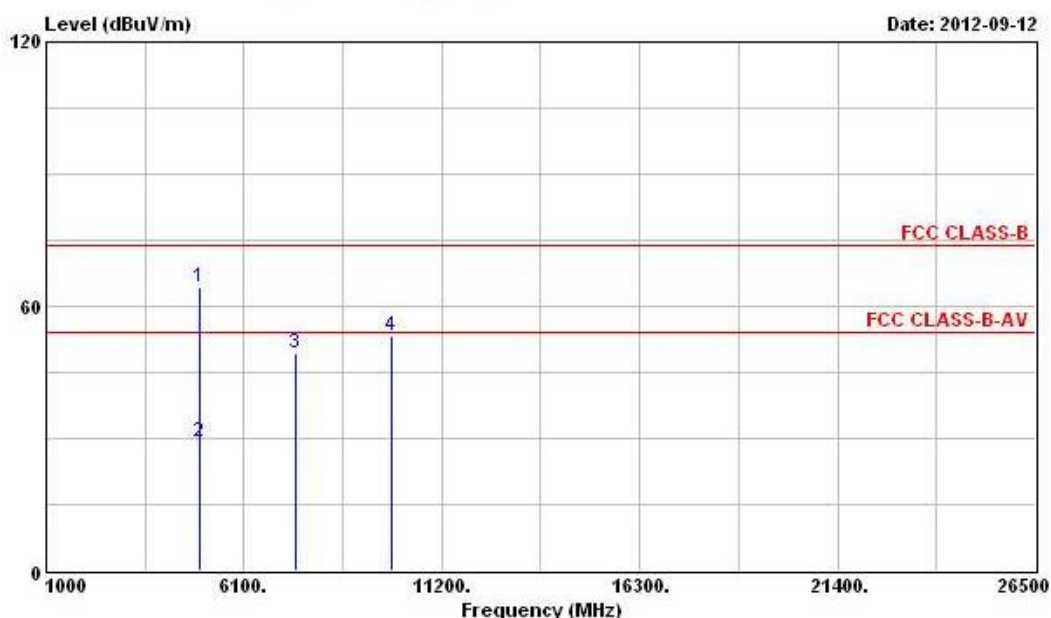
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 4: For un-restricted bands, unwanted emissions 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 $20\log(\text{dwell time}/100 \text{ ms})$.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	Bluetooth	Test Freq. (FX)	F3
Operating Mode	Transmit	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna 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	64.25	-9.75	74.00	58.35	35.95	4.71	34.76	Peak	---	---
2	4960.000	29.07	-24.93	54.00	23.17	35.95	4.71	34.76	Average	---	---
3	7440.000	49.18	-4.82	54.00	40.78	37.89	5.65	35.14	PK	---	---
4	9920.000	53.23			42.61	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 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 $20\log(\text{dwell time}/100 \text{ ms})$.

4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Test Receiver	R&S	ESCS 30	100357	9 kHz ~ 2.75 GHz	Nov. 18, 2011	Conduction (CO01-NH)
LISN	SCHAFFNER	NNB41	04/10053	9 kHz ~ 30 MHz	Nov. 17, 2011	Conduction (CO01-NH)
Power Filter	CORCOM	MR12030	N/A	30A*2	N/A	Conduction (CO01-NH)
RF Cable-CON	Suhner Switzerland	RG223/U	CB004	9 kHz ~ 30 MHz	Dec. 13, 2011	Conduction (CO01-NH)

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	FSP 40	100305	9KHz~40GHz	Feb. 21, 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)
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 Arrangement with Foreign Authorities



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

P1, total 24 pages