

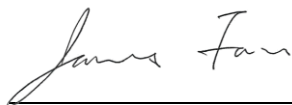
FCC Test Report

Equipment : 1X1 802.11b/g/n-BT4.0 Combo PCIe MoB Module
Brand Name : LITE-ON
Model No. : SS335
FCC ID : PPQ-SS335
Standard : 47 CFR FCC Part 15.247
Operating Band : 2400 MHz – 2483.5 MHz
FCC Classification : DSS
Applicant : Lite-On Technology Corp.
4F, 90, Chien 1 Road, Chung Ho, New Taipei City 23585,
Taiwan, R.O.C.

The product sample received on Jul. 24, 2014 and completely tested on Aug. 04, 2014. 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:



James Fan / Assistant Manager



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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]:0.151MHz 39.12 (Margin 16.84dB) - AV 47.01 (Margin 18.95dB) - QP	FCC 15.207	Complied
3.2	15.247(a)	20dB Bandwidth	BR:0.9391 MHz EDR:1.2826 MHz	N/A	Complied
3.2	15.247(a)	Carrier Frequency Separation (ChS)	BR:1.0029 MHz EDR:1.0029 MHz	ChS $\geq$ BW _{20dB} x2/3.	Complied
3.3	15.247(a)	Number of Hopping Frequencies (N)	79	N $\geq$ 15	Complied
3.4	15.247(a)	Time of Occupancy (Dwell Time)	EDR:0.314 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] BR:4.31 EDR:7.43	Power [dBm] BR:21 EDR:21	Complied
3.6	15.247(c)	Emissions in non-restricted frequency bands	Out-of -band emissions are 20dB below the highest power	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied
3.7	15.247(c)	Transmitter Unwanted Emissions	Restricted Bands [dBuV/m at 3m]: 298.69MHz 44.83 (Margin 1.17dB) - QP	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied

Revision History

[illegible]

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information				
Frequency Range (MHz)	Bluetooth Mode	Ch. Frequency (MHz)	Channel Number	RF Output Power (dBm)
2400-2483.5	BR / EDR	2402-2480	0-78 [79]	7.43
Note 1: Bluetooth BR uses a GFSK (1Mbps). Note 2: Bluetooth EDR uses a combination of $\pi/4$ -DQPSK (2Mbps) and 8DPSK (3Mbps). Note 3: RF output power specifies that Maximum Peak Conducted Output Power. Note 4: TX diversity function is not supported. Bluetooth signal is always transmitted through AUX path.				

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.
☒	External antenna (dedicated antennas)
☒	RF connector provided
☒	Unique antenna connector. (e.g., MMCX, U.FL, IPX, and RP-SMA, RP-N type...)
☐	Standard antenna connector. (e.g., SMA, N, BNC, and TNC type...)

Antenna General Information					
No.	Model	Ant. Cat.	Ant. Type	Connector	Gain (dBi)
1	Aux	External	PIFA	U.FL	3.62

Note: an extended coax cable was supplied for this antenna with below info.:

- ✧ Cable loss: 1dB
- ✧ Connector type: U.FL

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)
☐	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)
☒ 78.46% - test mode single channel - BR-1Mbps	1.05
☒ 79.15% - test mode single channel - EDR-2Mbps	1.02
☒ 78.38% - test mode single channel - EDR-3Mbps	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.	

1.1.5 EUT Operational Condition

Power Supply Type	3.3Vdc from host.
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1.2 Accessories and Support Equipment

N/A

1.3 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

1.4 Testing Location Information

Testing Location				
☒	Sporton Lab	ADD :	No. 52, Hwa Ya 1 st 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
☒	ICC Lab	ADD :	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Hsiang, Tao Yuan Hsein 333, Taiwan (R.O.C.)	
		TEL :	886-3-271-8666	FAX : 886-3-318-0155
Test Condition		Test Site No.	Test Engineer	Test Date
RF Conducted		TH01-HY	Mark Liao	Aug. 04, 2014
AC Conduction*		CO01-WS	Peter Lin	Aug. 01, 2014
Radiated Emission*		03CH01-WS	Haru Yang Anderson Hong	Jul. 31, 2014

Note: * Sporton Lab subcontracts this test item to ICC lab (TAF:2732).

ICC lab is a TAF accreditation test firm and also is an approved provider of Sporton Lab.

➤ FCC site registration No.: 657002

➤ IC site registration No.: 10807A-1

1.5 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, 6dB bandwidth		±1.42 %	N/A
RF output power, conducted		±0.63 dB	N/A
Power density, conducted		±0.81 dB	N/A
All emissions, radiated	30 – 1000 MHz	±3.90 dB	N/A
	1 – 25 GHz	±4.20 dB	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 Mode	Transmit Chains (N _{TX})	Data Rate	Modulation Mode	RF Output Power (dBm)	Worst Mode
BR	1	1 Mbps	BR-1Mbps	4.31	BR-3Mbps
EDR	1	2 Mbps	EDR-2Mbps	7.02	
EDR	1	3 Mbps	EDR-3Mbps	7.43	

2.2 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter			
Test Software Version	BtUSB_V18.12.8		
Modulation Mode	2402 MHz	2440 MHz	2480 MHz
BR,1Mbps	8	8	8
EDR,2Mbps	8	8	8
EDR,3Mbps	8	8	8

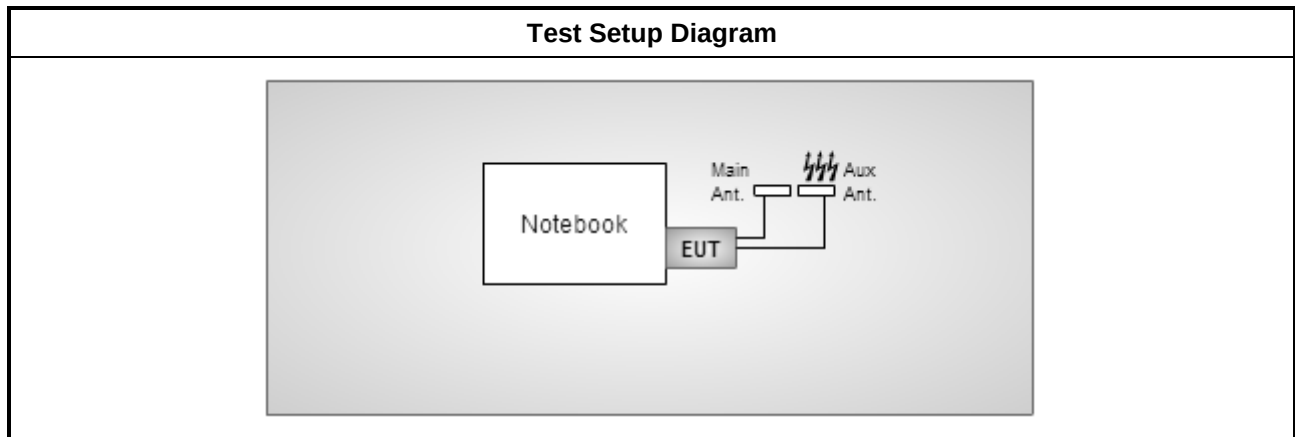
2.3 The Worst Case Measurement Configuration

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	Radio link (BT)

The Worst Case Mode for Following Conformance Tests	
Tests Item	RF Output Power, 20dB Bandwidth, Carrier Frequency Separation (ChS) Number of Hopping Frequencies (N), Time of Occupancy (Dwell Time)
Test Condition	Conducted measurement at transmit chains
Modulation Mode	BR-1Mbps, EDR-3Mbps

The Worst Case Mode for Following Conformance Tests	
Tests Item	Transmitter Radiated Unwanted Emissions Transmitter Radiated Bandedge Emissions
Test Condition	Radiated measurement
Operating Mode	☒ 1. Radio link (BT)
Modulation Mode	BR-1Mbps, EDR-3Mbps

2.4 Test Setup Diagram



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.

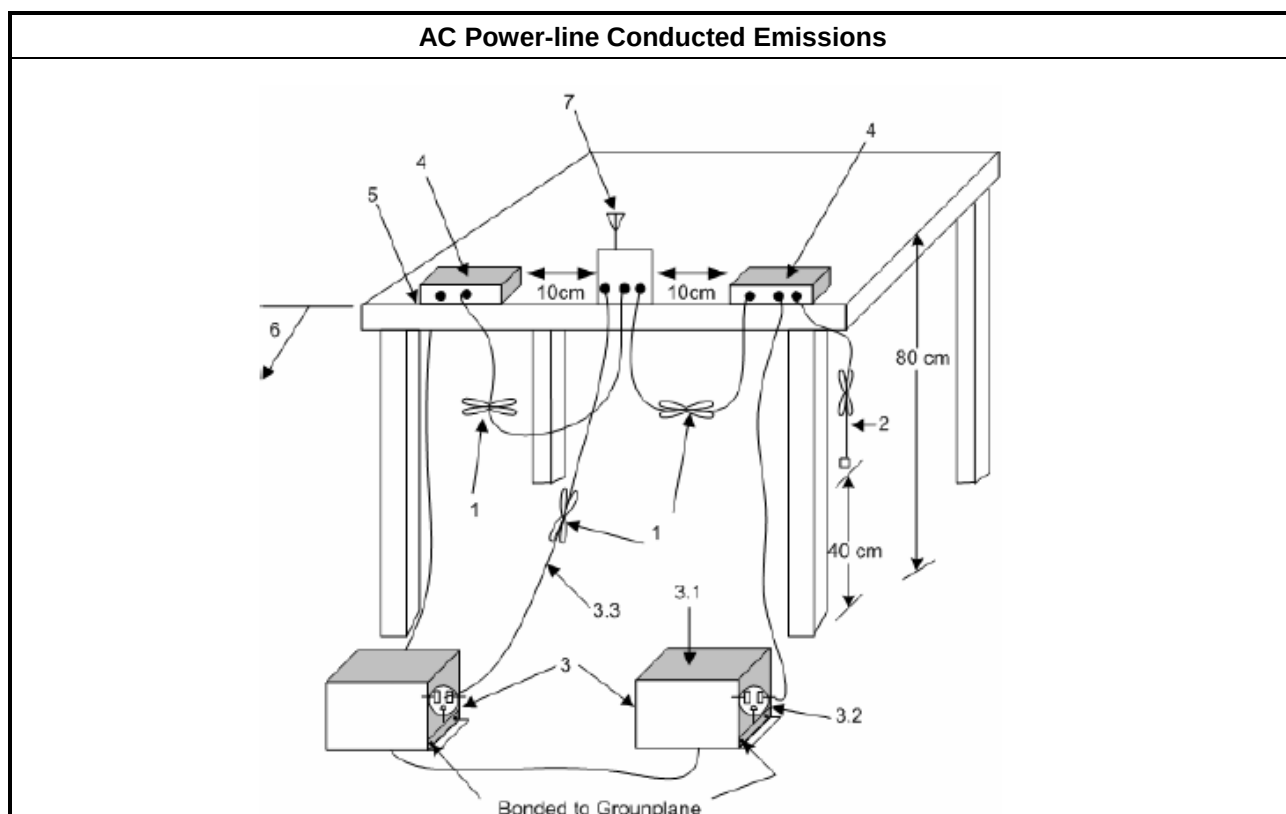
3.1.2 Measuring Instruments

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

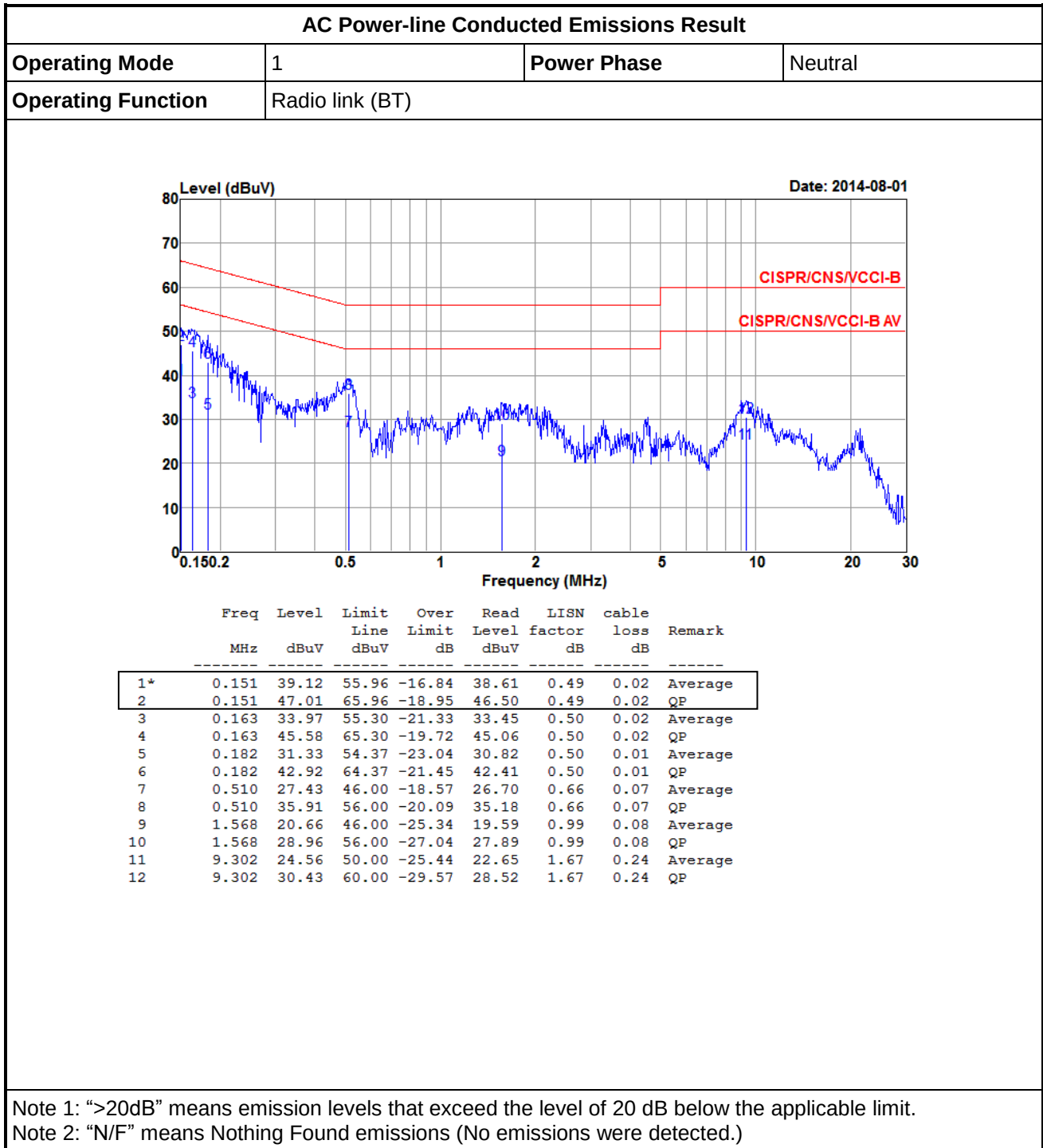
3.1.3 Test Procedures

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

3.1.4 Test Setup

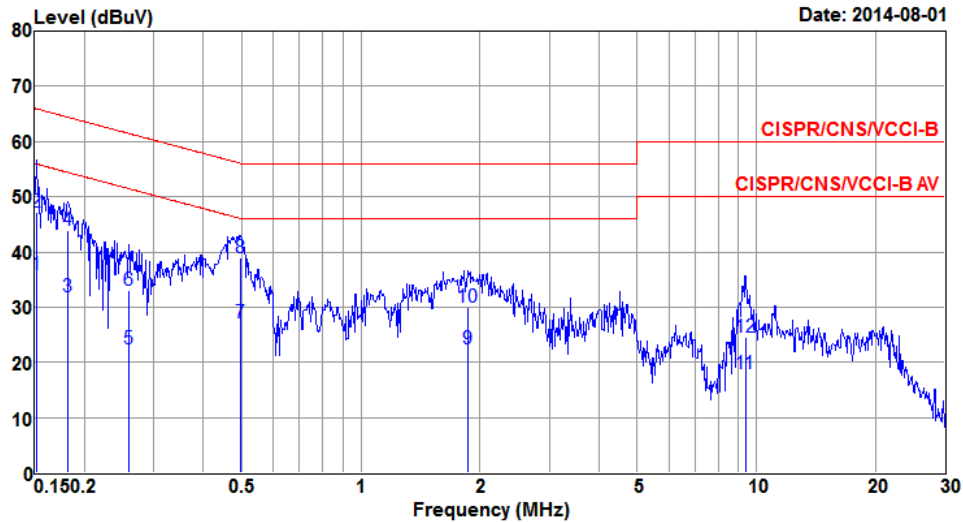


3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	Radio link (BT)		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.152	35.80	55.91	-20.11	35.37	0.41	0.02	Average
2	0.152	47.28	65.91	-18.63	46.85	0.41	0.02	QP
3	0.182	31.83	54.42	-22.59	31.40	0.42	0.01	Average
4	0.182	43.82	64.42	-20.60	43.39	0.42	0.01	QP
5	0.259	22.31	51.47	-29.16	21.84	0.46	0.01	Average
6	0.259	33.15	61.47	-28.32	32.68	0.46	0.01	QP
7	0.497	27.24	46.05	-18.81	26.60	0.58	0.06	Average
8*	0.497	38.94	56.05	-17.11	38.30	0.58	0.06	QP
9	1.868	22.35	46.00	-23.65	21.33	0.98	0.04	Average
10	1.868	29.99	56.00	-26.01	28.97	0.98	0.04	QP
11	9.401	17.83	50.00	-32.17	15.93	1.66	0.24	Average
12	9.401	24.52	60.00	-35.48	22.62	1.66	0.24	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	
☒	2400-2483.5 MHz Band:
☐	$N \geq 75$ and ChS $\geq$ MAX (20 dB bandwidth, 25 kHz).
☒	$N \geq 15$ and ChS $\geq$ MAX (20 dB bandwidth x 2/3, 25 kHz).
N: Number of Hopping Frequencies; ChS: Hopping Channel Separation	

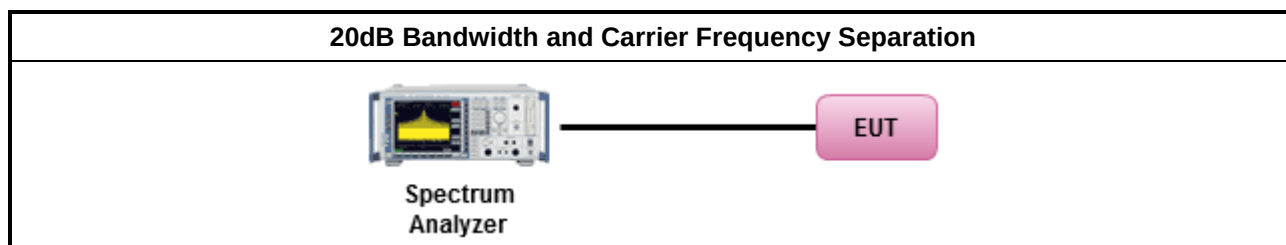
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

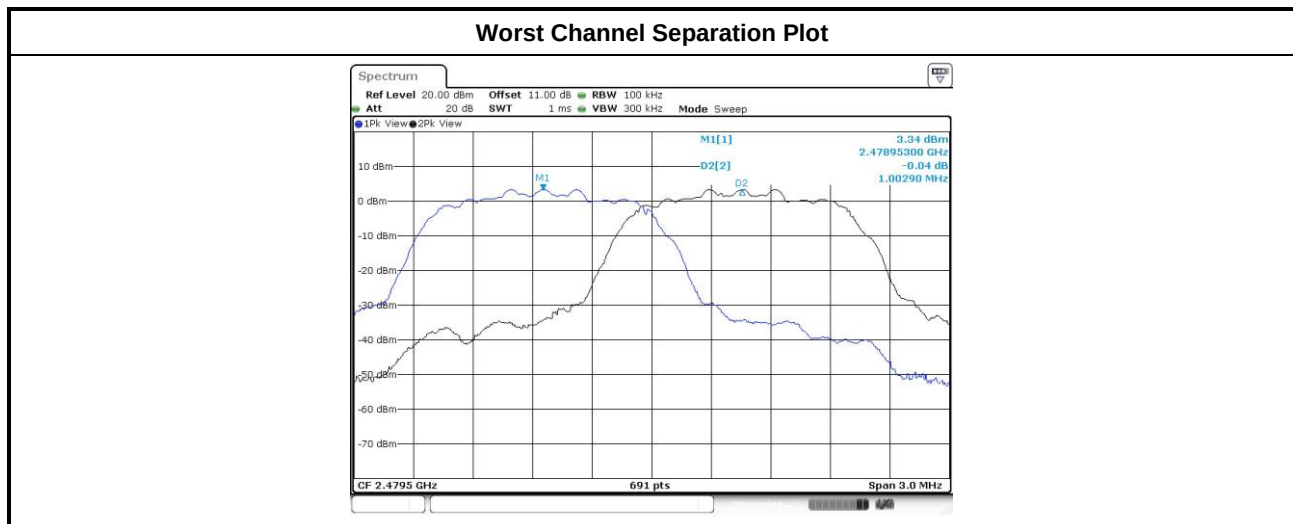
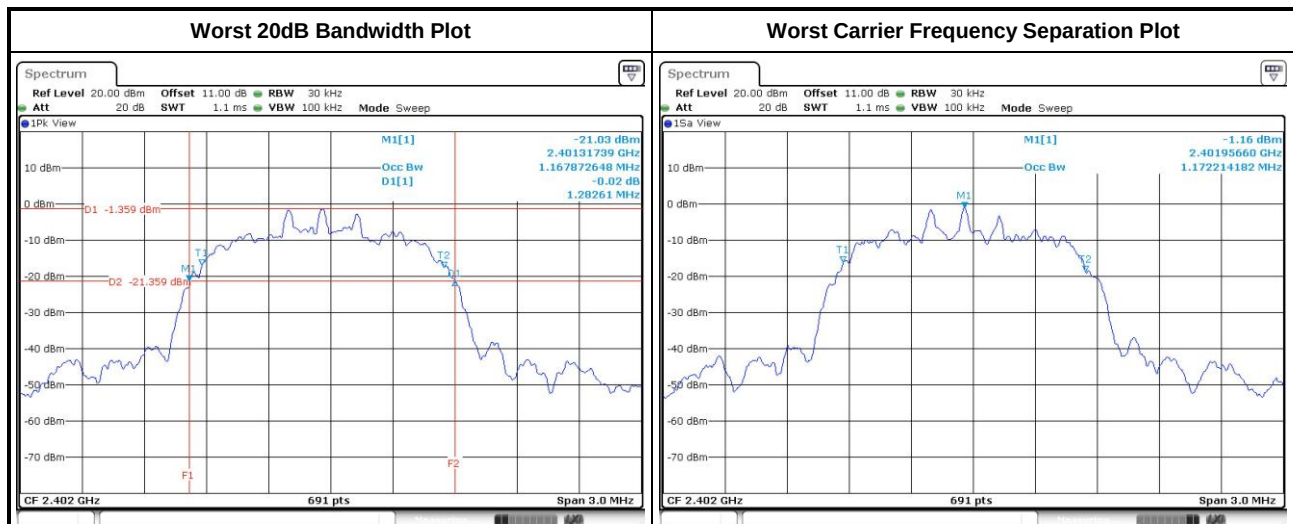
Test Method	
☒	Refer as ANSI C63.10, clause 6.9.1 for 20 dB bandwidth measurement.
☒	Refer as ANSI C63.10, clause 7.7.2 for carrier frequency separation measurement.
☒	For conducted measurement.
☒	The EUT supports single transmit chain and measurements performed on this transmit chain.
☐	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

3.2.4 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)
BR,1Mbps	2402	0.9391	0.8770	1.0029	0.626
BR,1Mbps	2441	0.9391	0.8770	1.0029	0.626
BR,1Mbps	2480	0.9391	0.8857	1.0029	0.626
EDR-2Mbps	2402	1.2826	1.1722	1.0029	0.855
EDR-2Mbps	2441	1.2783	1.1722	1.0029	0.852
EDR-2Mbps	2480	1.2783	1.1722	1.0029	0.852
EDR-3Mbps	2402	1.2826	1.1679	1.0029	0.855
EDR-3Mbps	2441	1.2826	1.1679	1.0029	0.855
EDR-3Mbps	2480	1.2826	1.1722	1.0029	0.855
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	
☒	2400-2483.5 MHz Band:
☐	$N \geq 75$ and ChS $\geq$ MAX (20 dB bandwidth, 25 kHz).
☒	$N \geq 15$ and ChS $\geq$ MAX (20 dB bandwidth x 2/3, 25 kHz).
N: Number of Hopping Frequencies; ChS: Hopping Channel Separation	

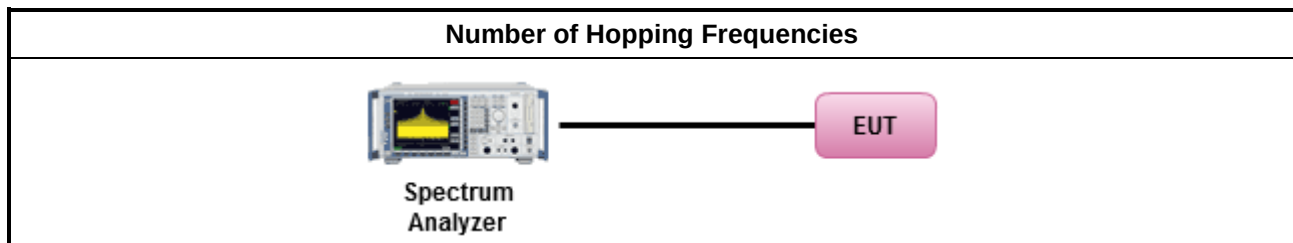
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

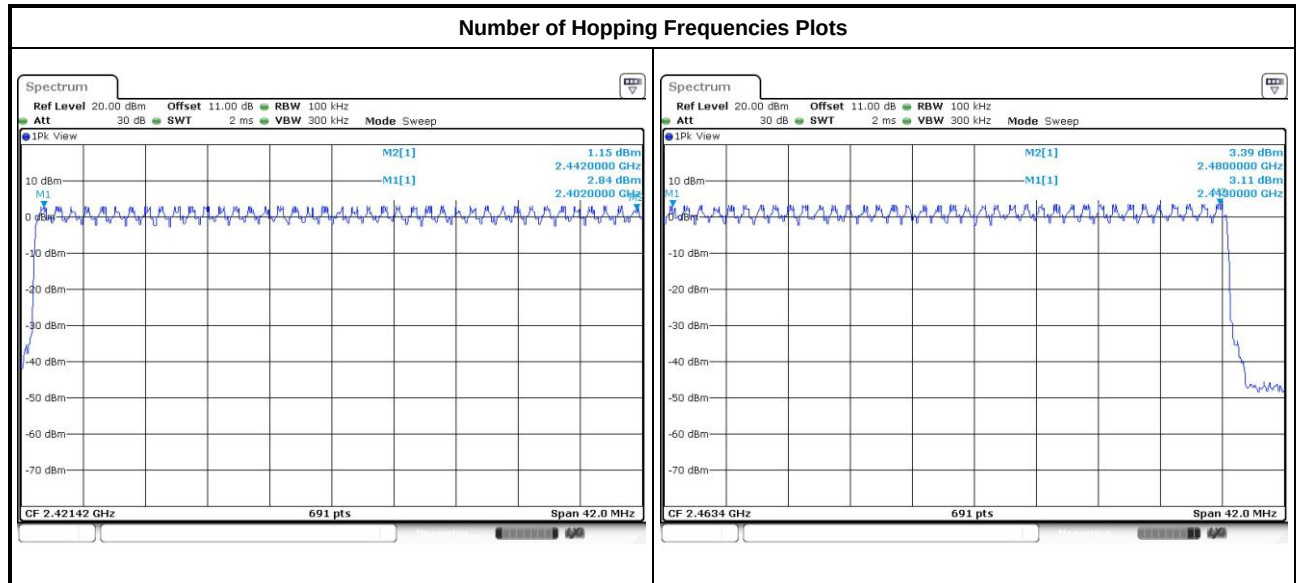
Test Method	
☒	Refer as ANSI C63.10, clause 7.7.3 for number of hopping frequencies measurement.
☒	For conducted measurement.
☒	The EUT supports single transmit chain and measurements performed on this transmit chain.
☐	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

3.3.4 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
EDR-3Mbps	2402-2480	79	15
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	
☒	2400-2483.5 MHz Band: Dwell time ≤ 0.4 second within $0.4 \times N$
N: Number of Hopping Frequencies	

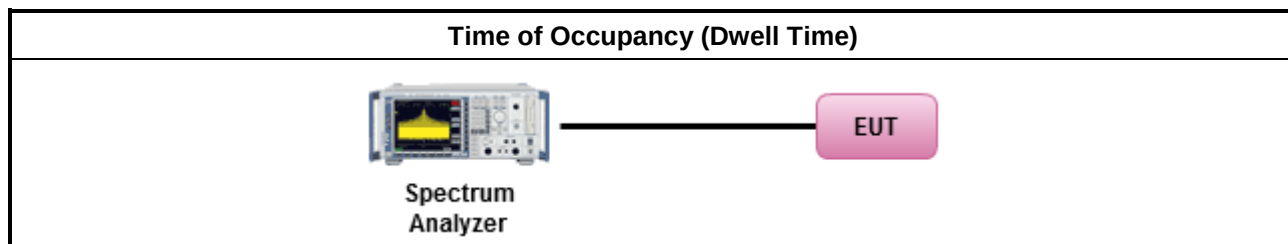
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

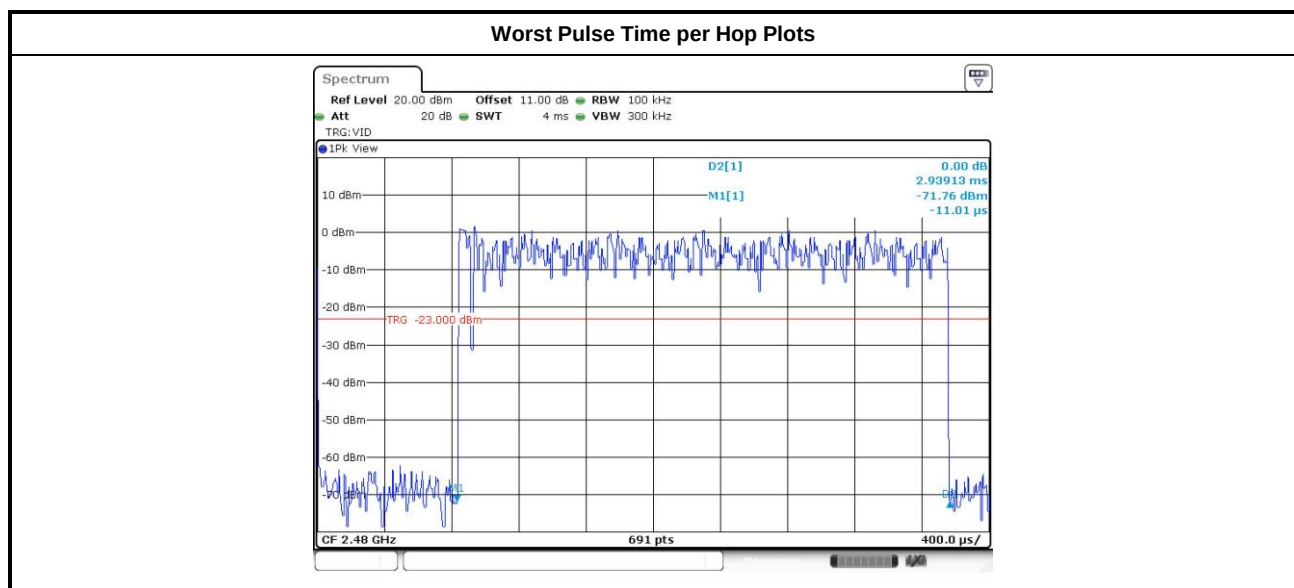
Test Method	
☒	Refer as ANSI C63.10, clause 7.7.4 for dwell time measurement.
☒	Bluetooth ACL packets can be 1, 3, or 5 time slots. Following as dwell time. Operate DH5 at maximum dwell time and maximum duty cycle.
☒	The DH1 packet can cover a single time slot. A maximum length packet has duration of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



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)
EDR-3Mbps	2480	2.94	106.7	0.314	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	
☒ 2400-2483.5 MHz Band:	
☐	For Hopping Channel: $N \geq 75$
☐	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
e.i.r.p. Power Limit:	
☒ 2400-2483.5 MHz Band:	
☐	For Hopping Channel: $N \geq 75 - P_{eirp} \leq 36$ dBm (4 W)
☒	For Hopping Channel: $75 > N \geq 15 - P_{eirp} \leq 27$ 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	

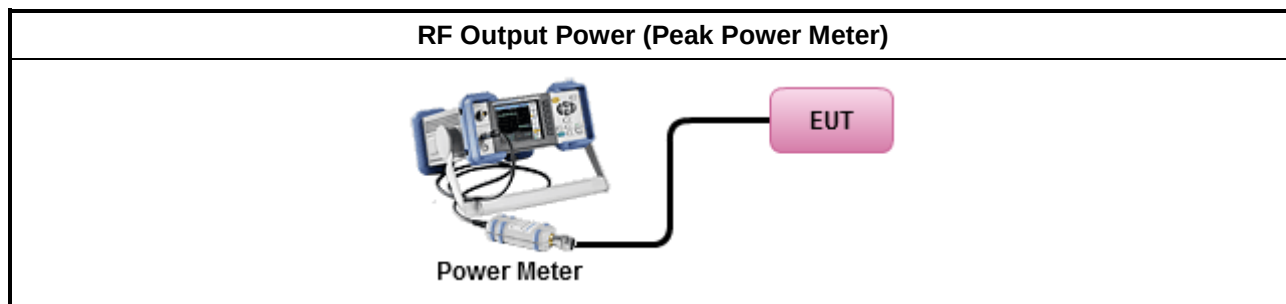
3.5.2 Measuring Instruments

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 $\geq$ EBW).
☒ 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.

3.5.4 Test Setup



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
BR-1Mbps	2402	4.19	21	3.62	7.81	27
BR-1Mbps	2440	4.27	21	3.62	7.89	27
BR-1Mbps	2480	4.31	21	3.62	7.93	27
EDR-2Mbps	2402	6.75	21	3.62	10.37	27
EDR-2Mbps	2441	6.81	21	3.62	10.43	27
EDR-2Mbps	2480	7.02	21	3.62	10.64	27
EDR-3Mbps	2402	7.04	21	3.62	10.66	27
EDR-3Mbps	2440	7.32	21	3.62	10.94	27
EDR-3Mbps	2480	7.43	21	3.62	11.05	27
Result		Complied				

Maximum Average 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
BR-1Mbps	2402	4.08	21	3.62	7.70	27
BR-1Mbps	2440	4.16	21	3.62	7.78	27
BR-1Mbps	2480	4.19	21	3.62	7.81	27
EDR-2Mbps	2402	4.09	21	3.62	7.71	27
EDR-2Mbps	2441	4.25	21	3.62	7.87	27
EDR-2Mbps	2480	4.56	21	3.62	8.18	27
EDR-3Mbps	2402	4.06	21	3.62	7.68	27
EDR-3Mbps	2440	4.20	21	3.62	7.82	27
EDR-3Mbps	2480	4.52	21	3.62	8.14	27
Result		Complied				

Note: Average power is for reference only.

3.6 Emissions in non-restricted frequency bands

3.6.1 Emissions in non-restricted frequency bands limit

Peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz

3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

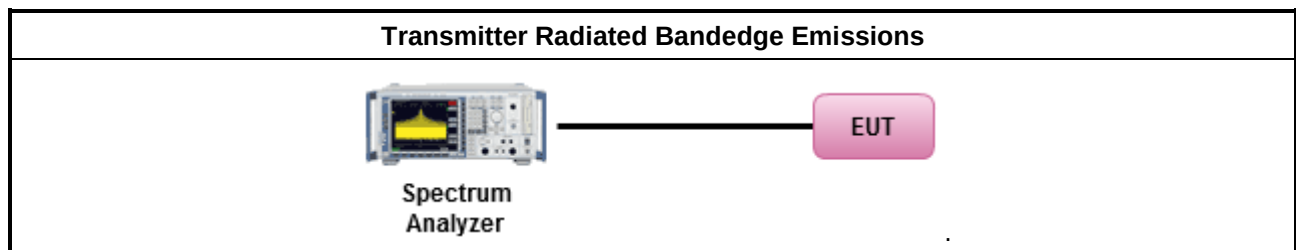
Reference level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Use the peak marker function to determine the maximum PSD level

Emission level measurement

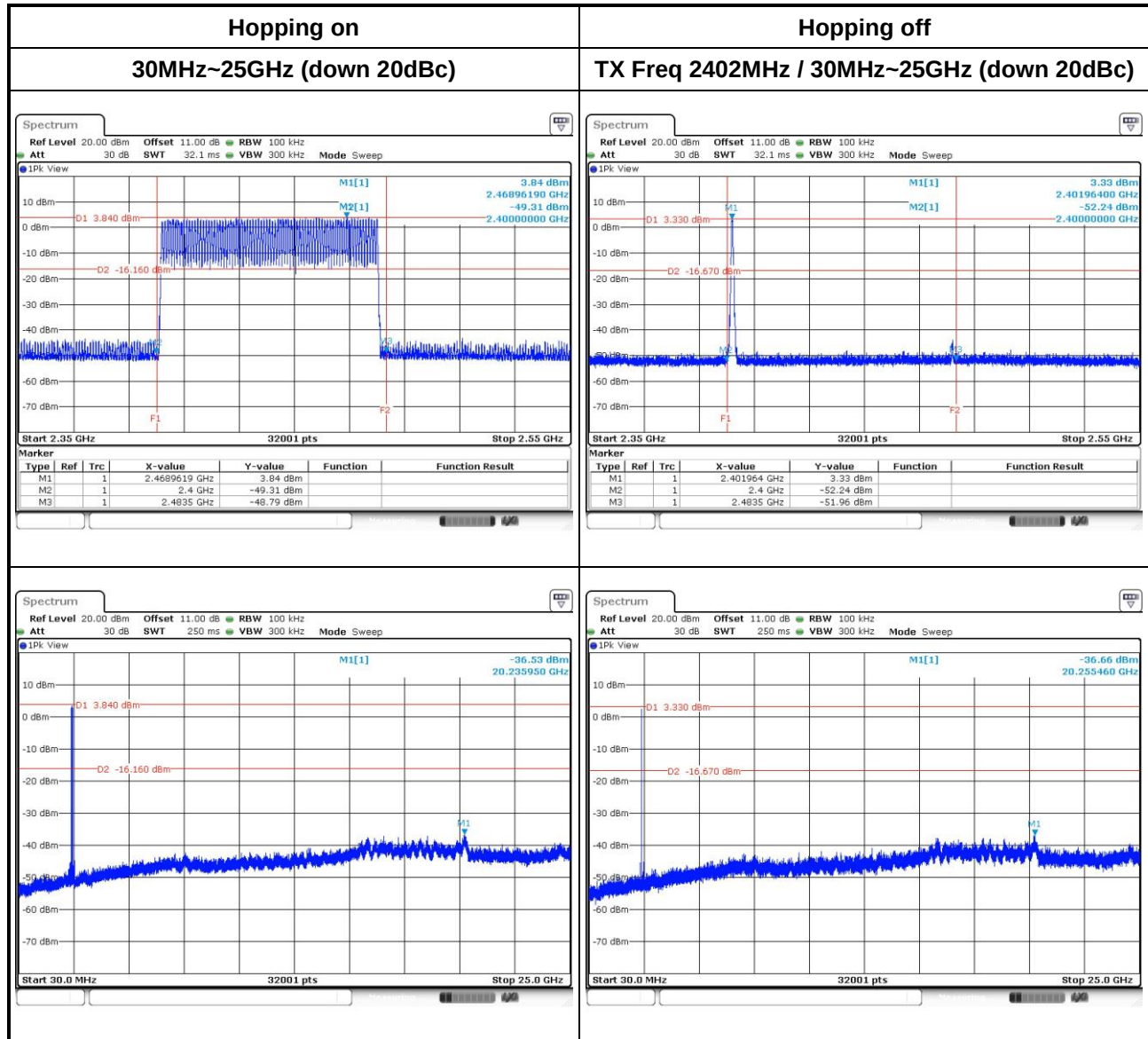
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.6.4 Test Setup



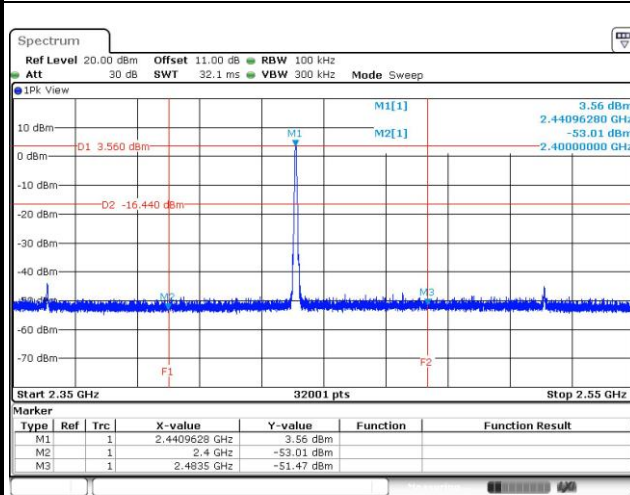
3.6.5 Test Result of Emissions in non-restricted frequency bands

GFSK



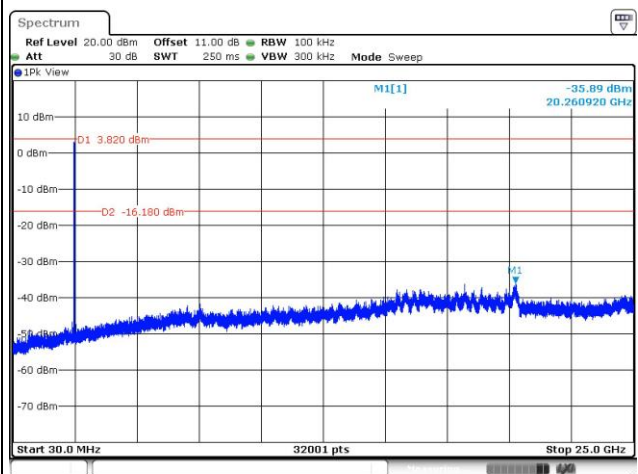
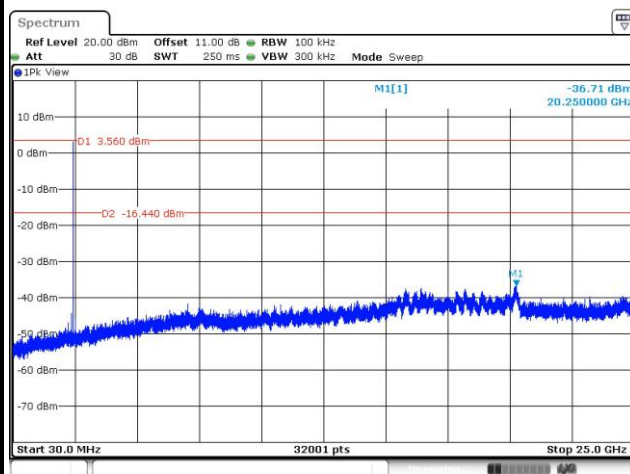
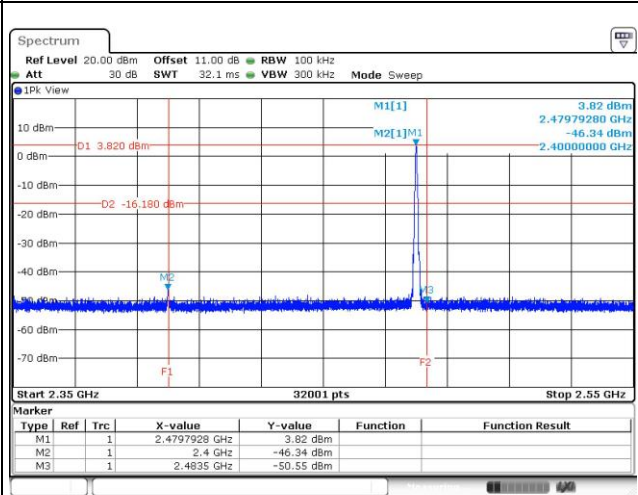
Hopping off

TX Freq 2441MHz / 30MHz~25GHz (down 20dBc)

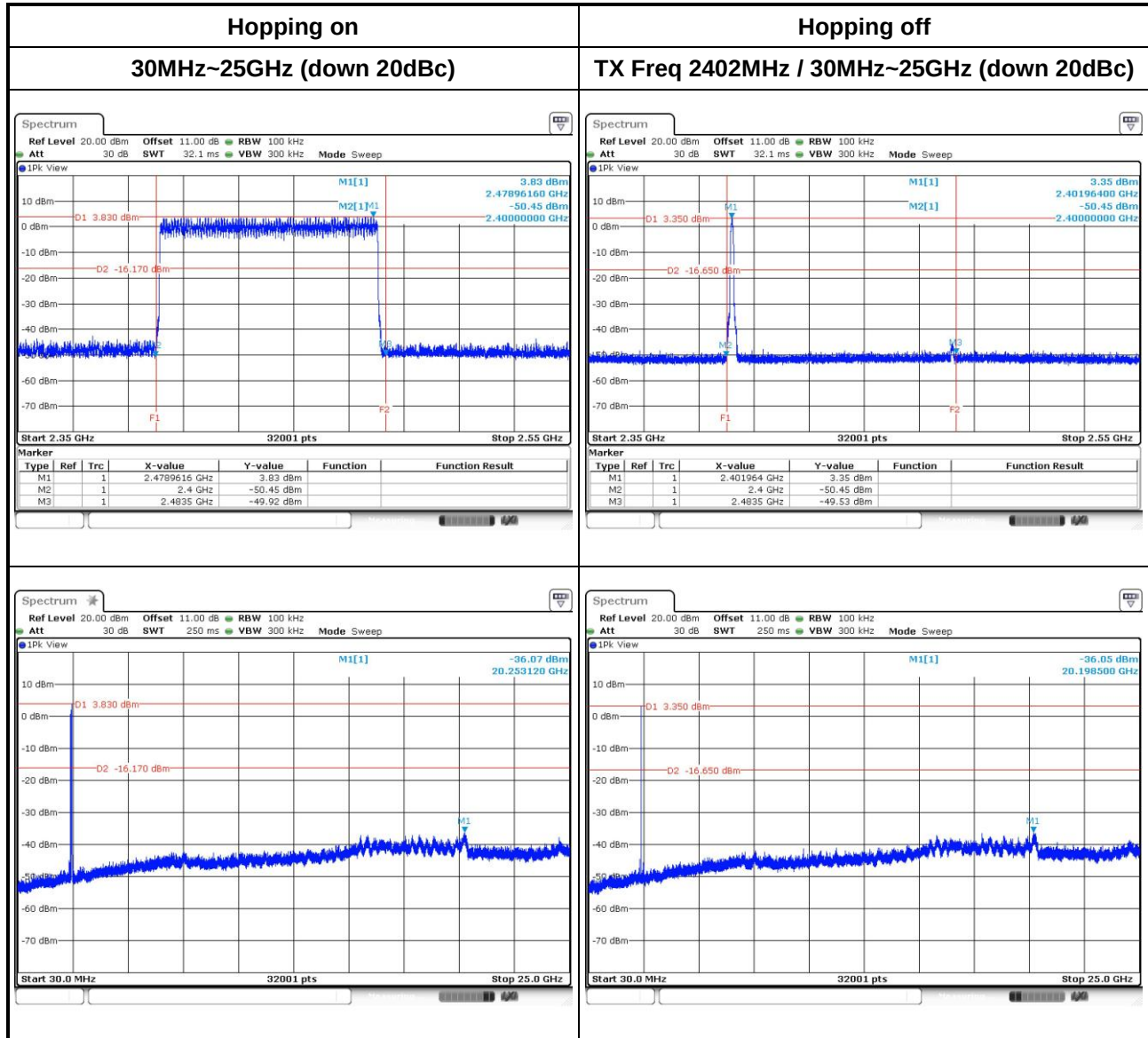


Hopping off

TX Freq 2480MHz / 30MHz~25GHz (down 20dBc)

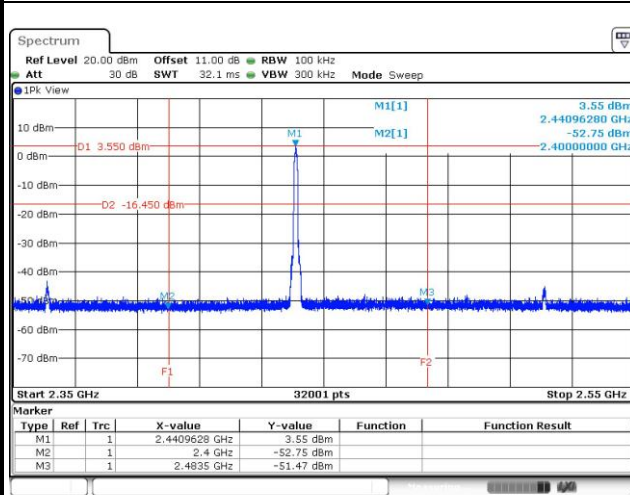


8DPSK



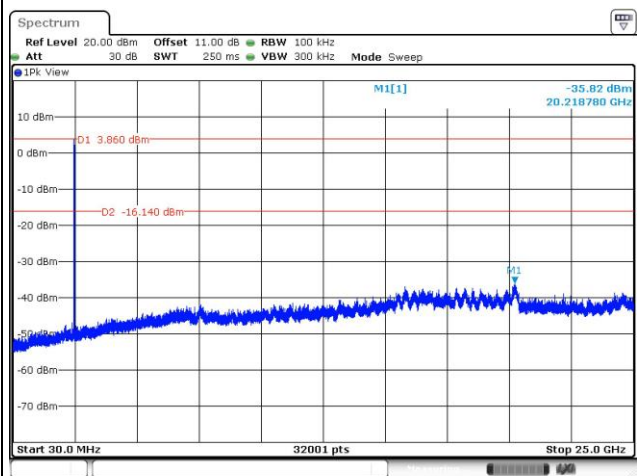
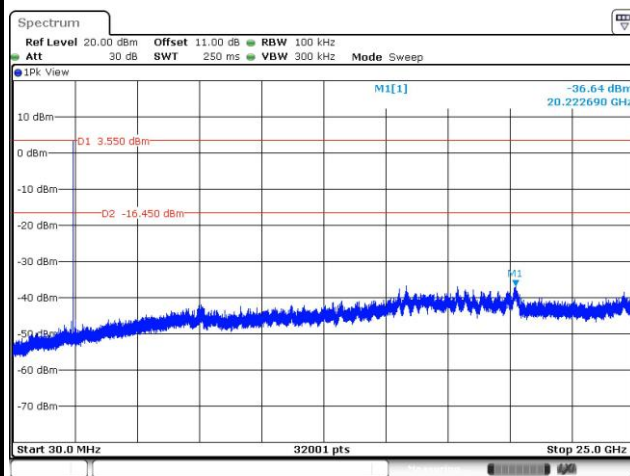
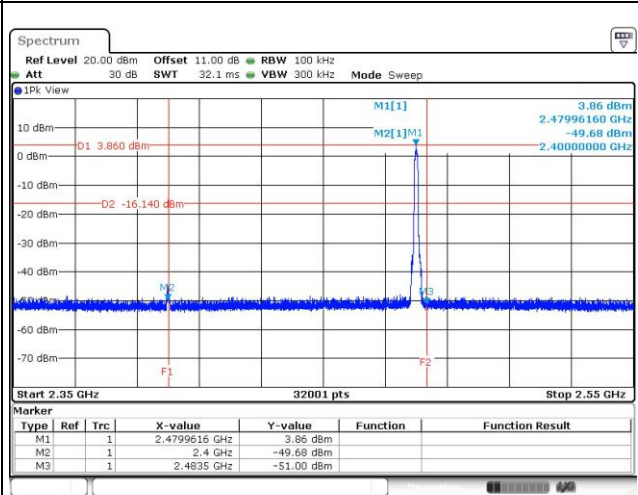
Hopping off

TX Freq 2441MHz / 30MHz~25GHz (down 20dBc)



Hopping off

TX Freq 2480MHz / 30MHz~25GHz (down 20dBc)



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

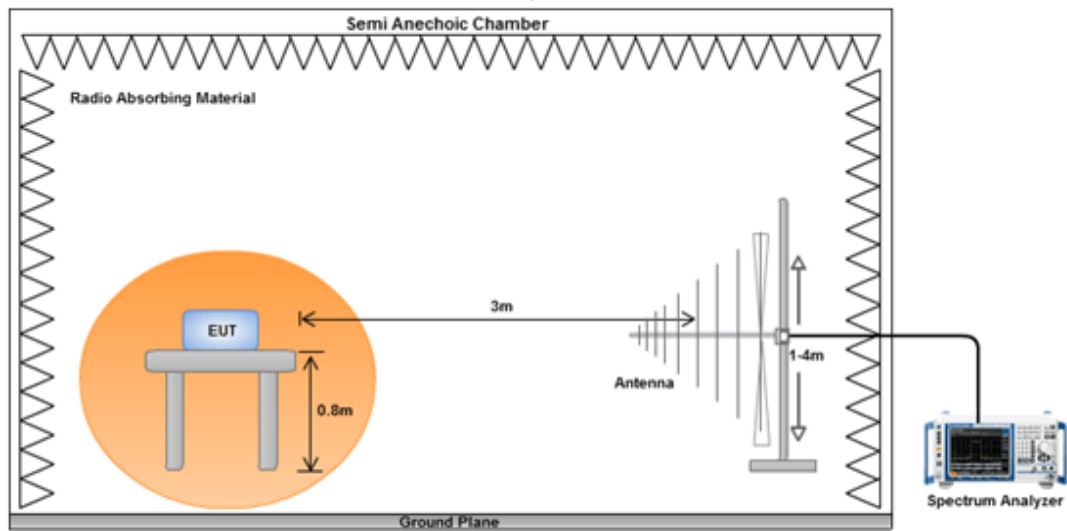
Refer a test equipment and calibration data table in this test report.

3.7.3 Test Procedures

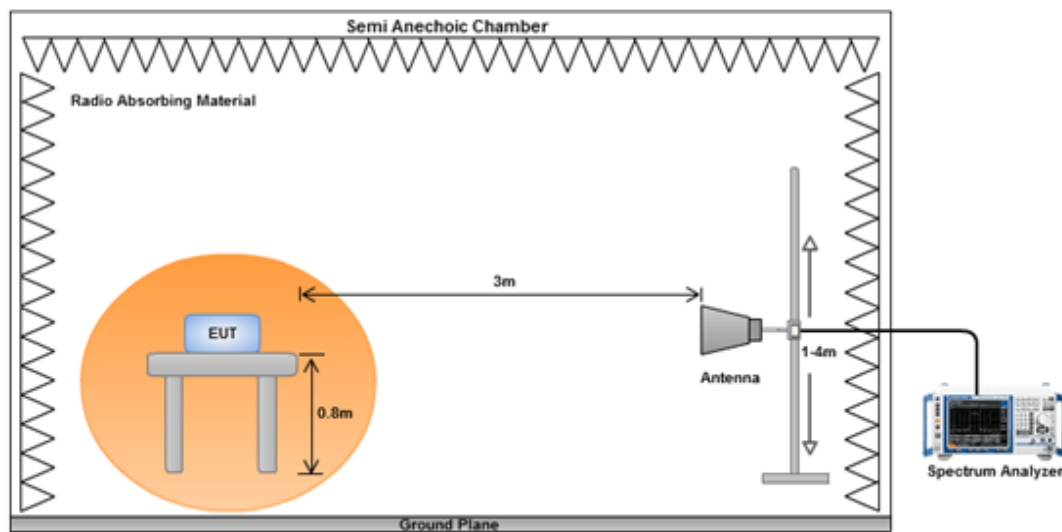
Test Method – General Information	
☒	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, 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).
☒	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. 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). $\text{VBW} \geq 1/T$, where T is pulse time.
☒	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 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 6.6 for radiated emissions from above 1 GHz.

3.7.4 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz

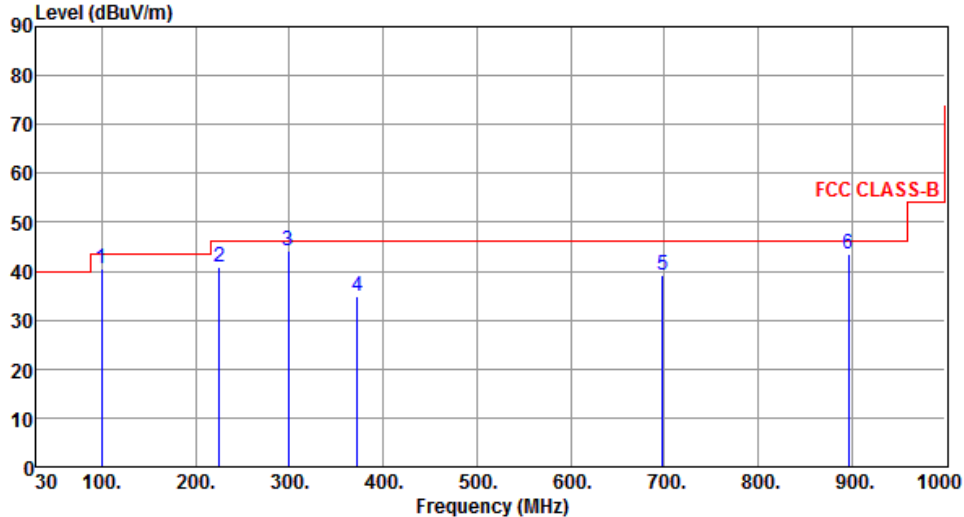


3.7.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

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)

Modulation	BR-3Mbps	Test Freq. (MHz)	2480
Polarization	Horizontal		



The graph displays the radiated unwanted emissions level in dBuV/m against frequency in MHz from 30 to 1000 MHz. A red line represents the FCC CLASS-B limit, which is 40 dBuV/m from 30 MHz to 100 MHz, then steps up to 45 dBuV/m from 100 MHz to 1000 MHz. Six test results are plotted as blue vertical lines, labeled 1 through 6, corresponding to the data in the table below. All test results are well below the FCC limit.

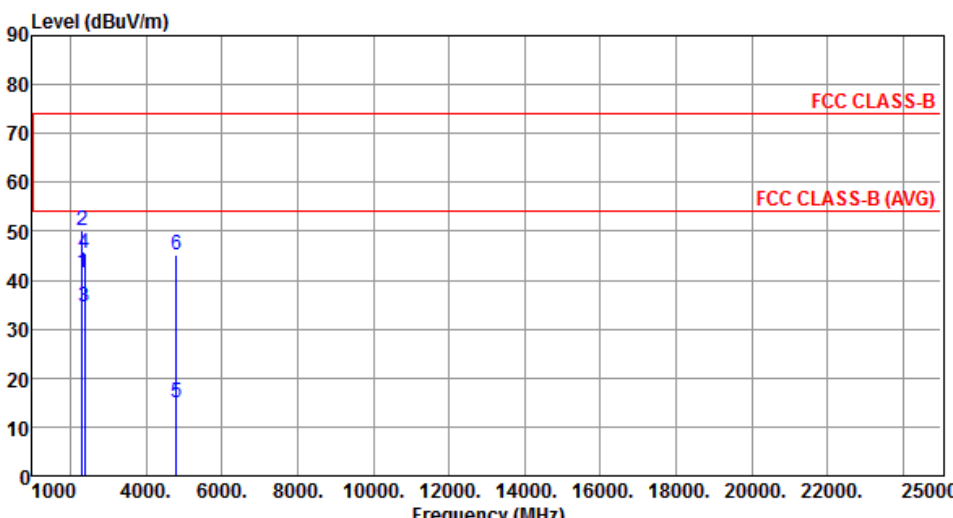
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	99.84	40.57	43.50	-2.93	62.42	-21.85	Peak	---	---
2	224.97	40.93	46.00	-5.07	59.78	-18.85	Peak	---	---
3	298.69	44.24	46.00	-1.76	60.43	-16.19	Peak	---	---
4	372.41	34.80	46.00	-11.20	49.23	-14.43	Peak	---	---
5	698.33	39.27	46.00	-6.73	47.53	-8.26	Peak	---	---
6	896.19	43.56	46.00	-2.44	49.11	-5.55	QP	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	BR-3Mbps	Test Freq. (MHz)	2441
Polarization	Vertical		
Level (dBuV/m)			

3.7.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for GFSK

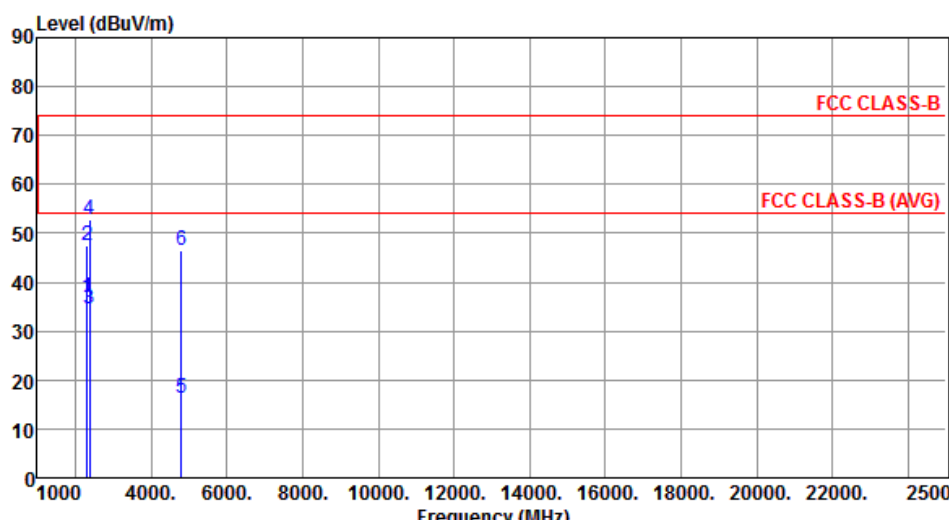
Modulation	BR-1Mbps	Test Freq. (MHz)	2402
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2321.00	41.56	54.00	-12.44	45.52	-3.96	Average	---	---
2	2321.00	50.06	74.00	-23.94	54.02	-3.96	Peak	---	---
3	2390.00	34.66	54.00	-19.34	38.34	-3.68	Average	---	---
4	2390.00	45.62	74.00	-28.38	49.30	-3.68	Peak	---	---
5	4804.00	14.92	54.00	-39.08	9.96	4.96	Average	---	---
6	4804.00	45.02	74.00	-28.98	40.06	4.96	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	BR-1Mbps	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
	MHz	level	dBuV/m	dB	reading	dB		High	Table
		dBuV/m			dBuV			cm	deg
1	2321.00	36.76	54.00	-17.24	40.72	-3.96	Average	---	---
2	2321.00	47.42	74.00	-26.58	51.38	-3.96	Peak	---	---
3	2390.00	34.37	54.00	-19.63	38.05	-3.68	Average	---	---
4	2390.00	52.91	74.00	-21.09	56.59	-3.68	Peak	---	---
5	4804.00	16.28	54.00	-37.72	11.32	4.96	Average	---	---
6	4804.00	46.38	74.00	-27.62	41.42	4.96	Peak	---	---

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Modulation	BR-1Mbps	Test Freq. (MHz)	2441
Polarization	Horizontal		
Level (dBUV/m)			

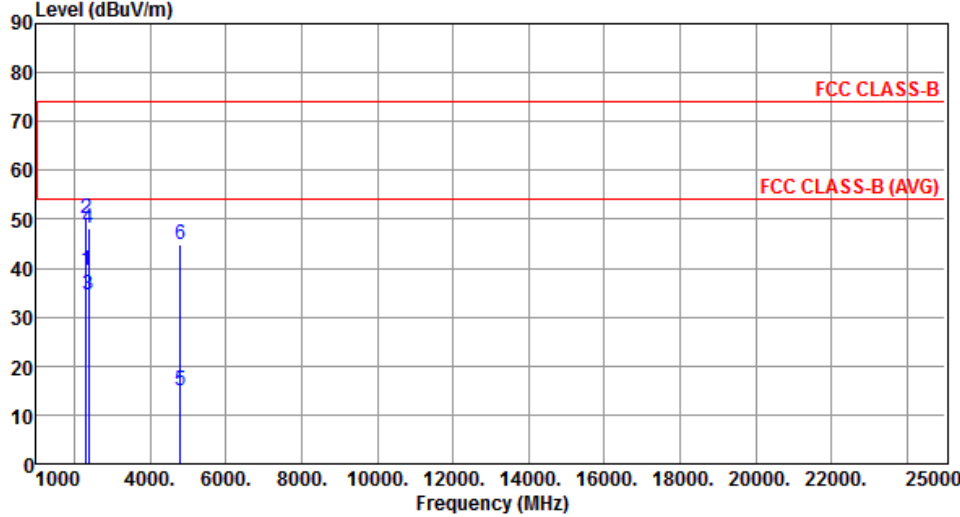
Modulation	BR-1Mbps	Test Freq. (MHz)	2441
Polarization	Vertical		
Level (dBuV/m) </			

Modulation	BR-1Mbps		Test Freq. (MHz)		2480				
Polarization	Horizontal								
Level (dBUV/m)									

Modulation	BR-1Mbps	Test Freq. (MHz)	2480						
Polarization	Vertical								
Level (dBuV/m) <									

3.7.8 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 8DPSK

Modulation	BR-3Mbps	Test Freq. (MHz)	2402
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2321.00	39.65	54.00	-14.35	43.61	-3.96	Average	---	---
2	2321.00	50.17	74.00	-23.83	54.13	-3.96	Peak	---	---
3	2390.00	34.63	54.00	-19.37	38.31	-3.68	Average	---	---
4	2390.00	48.12	74.00	-25.88	51.80	-3.68	Peak	---	---
5	4804.00	14.88	54.00	-39.12	9.92	4.96	Average	---	---
6	4804.00	44.98	74.00	-29.02	40.02	4.96	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	BR-3Mbps	Test Freq. (MHz)	2402
Polarization	Vertical		
Level (dBuV/m)			

Modulation	BR-3Mbps	Test Freq. (MHz)	2441
Polarization	Horizontal		
Level (dBUV/m)			

Modulation	BR-3Mbps	Test Freq. (MHz)	2441
Polarization	Vertical		
Level (dBuV/m) </			

Modulation	BR-3Mbps	Test Freq. (MHz)	2480
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	BR-3Mbps	Test Freq. (MHz)	2480
Polarization	Vertical		
Level (dBUV/m)			

4 Test Equipment and Calibration Data

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
EMC Receiver	R&S	ESCS 30	100169	Oct. 15, 2013	Oct. 14, 2014
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 23, 2013	Nov. 22, 2014
LISN (Support Unit)	SCHWARZBECK	Schwarzbeck 8127	8127-666	Dec. 04, 2013	Dec. 03, 2014
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Apr. 23, 2014	Apr. 22, 2015
50 ohm terminal (Support Unit)	NA	50	04	Apr. 18, 2014	Apr. 17, 2015
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-HY)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV 40	101013	Jan. 25, 2014	Jan. 24, 2015
Power Sensor	Anritsu	MA2411B	0917017	Jan. 28, 2014	Jan. 27, 2015
Power Meter	Anritsu	ML2495A	0949003	Jan. 28, 2014	Jan. 27, 2015
RF Cable-2m	HUBER+SUHNER	SUCOFLEX_104	SN 345675/4	Dec. 02, 2013	Dec. 01, 2014
DC Power Source	G.W.	GPC-6030D	C671845	Jul. 26, 2014	Jul. 25, 2015
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Jan. 25, 2014	Jan. 24, 2015
Receiver	R&S	ESR3	101658	Jan. 10, 2014	Jan. 09, 2015
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jan. 02, 2014	Jan. 01, 2015
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Feb. 13, 2014	Feb. 12, 2015
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Dec. 27, 2013	Dec. 26, 2014
Preamplifier	Burgeon	BPA-530	SN:100219	Nov. 28, 2013	Nov. 27, 2014
Preamplifier	Agilent	83017A	MY39501308	Dec. 16, 2013	Dec. 15, 2014
Preamplifier	WM	TF-130N-R1	923365	Oct. 23, 2013	Oct. 22, 2014
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 16, 2013	Dec. 15, 2014
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 16, 2013	Dec. 15, 2014
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 16, 2013	Dec. 15, 2014
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 16, 2013	Dec. 15, 2014
Note: Calibration Interval of instruments listed above is one year.					

Loop Antenna	R&S	HFH2-Z2	100330	Nov. 15, 2012	Nov. 14, 2014
Note: Calibration Interval of instruments listed above is two year.					