

FCC Test Report

Equipment : BOOMTUBE NFC Bluetooth Mini Speaker
Brand Name : GOODZ2
Model No. : FWS217
FCC ID : 2AA5C-FWS217
Standard : 47 CFR FCC Part 15.247
Operating Band : 2400 MHz – 2483.5 MHz
FCC Classification : DSS
Applicant : CviLux Corporation
9F., No.9, Lane 3, Sec 1, Chung-Cheng East Road,
Tamshui, New Taipei City 25147, Taiwan

The product sample received on Mar. 28, 2015 and completely tested on Mar. 23, 2016. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 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]: 0.400MHz 25.84 (Margin 22.02dB) - AV 39.34 (Margin 18.52dB) - QP	FCC 15.207	Complied
3.2	15.247(a)	20dB Bandwidth	1.265 MHz	N/A	Complied
3.2	15.247(a)	Carrier Frequency Separation (ChS)	1.003 MHz	$ChS \geq BW_{20dB} \times 2/3$	Complied
3.3	15.247(a)	Number of Hopping Frequencies (N)	Max:79 Min:20	$N \geq 15$	Complied
3.4	15.247(a)	Time of Occupancy (Dwell Time)	0.313 sec	0.4 s within $0.4 \times N$	Complied
3.5	15.247(b)	RF Output Power (Maximum Peak Conducted Output Power)	Power [dBm] -2.38	Power [dBm] 21	Complied
3.6	15.247(d)	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(d)	Transmitter Unwanted Emissions	Restricted Bands [dBuV/m at 3m]: 2483.50MHz 52.93 (Margin 1.07dB) - AV	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 V2.1	2402-2480	0-78 [79]	-2.38
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.				

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.	Ant. Cat.	Ant. Type	Connector	Gain (dBi)
1	Integral	Printed	No Connector	-1.07

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)
☒ 78.38% - test mode single channel – GFSK	1.06
☒ 78.08% - test mode single channel – 8DPSK	1.07
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	From host: 5Vdc, 500mA (for charging only) From lithium battery: Brand: Hetech Electronics (HK) CO., LTD Model: NA16500-1100mAh Rating: 3.7V, 1100mAh
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1.2 Accessories and Support Equipment

Accessories				
No.	Equipment	Brand Name	Model Name	Spec.
1	Lithium battery	Hetech Electronics (HK)CO.,LTD	NA16500-1100mAh	Rating: 3.7Vdc, 1100mAh.
2	Micro USB cable	---	---	0.47m non-shielded w/o core.

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	DELL	Latitude E6440	DoC
2	Bluetooth Tester	ROHDE&SCHWARZ	CBT	---

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 C63.10-2013
- ♦ FCC Public Notice DA 00-705

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 : 886-3-327-3456 FAX : 886-3-327-0973		
Test Condition		Test Site No.	Test Engineer	Test Date
RF Conducted		TH01-HY	Jack Li	23°C / 64%
AC Conduction		CO01-WS*	Sky Huang	21°C / 59%
Radiated Emission		03CH01-WS*	Aska Huang	20-22°C / 61-65%
		Test site registered number [181692] with FCC.		
		Test site registered number [10807A-1] with IC.		

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.

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	±3.66 dB	N/A
	Above 1GHz	±5.63 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	-2.38	EDR-1Mbps
EDR	1	2 Mbps	EDR-2Mbps	-3.83	
EDR	1	3 Mbps	EDR-3Mbps	-3.45	

2.2 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter			
Test Software Version / Instrument		CBT / BK3256 RF Test v1.3	
Modulation Mode		2402 MHz	2441 MHz
BR,1Mbps		Max	Max
EDR,2Mbps		Max	Max
EDR,3Mbps		Max	Max

2.3 The Worst Case Measurement Configuration

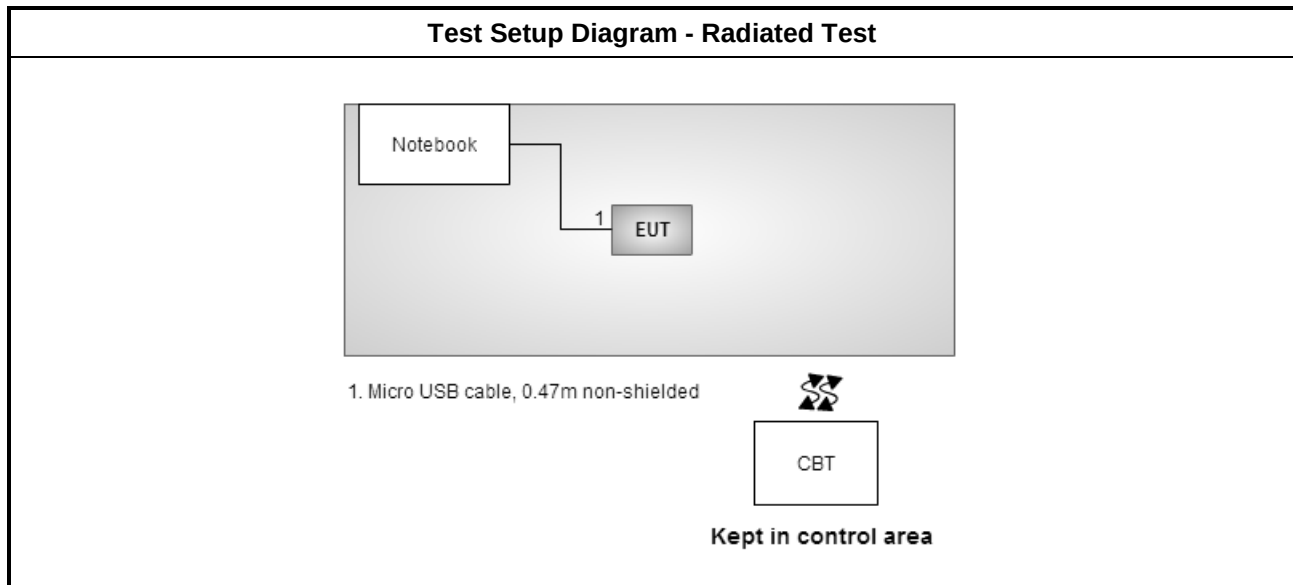
The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
1	USB charging + Radio link

The Worst Case Mode for Following Conformance Tests	
Tests Item	RF Output Power, 20dB Bandwidth, Carrier Frequency Separation (ChS)
Test Condition	Conducted measurement at transmit chains
Modulation Mode	BR-1Mbps, EDR-2Mbps, EDR-3Mbps

The Worst Case Mode for Following Conformance Tests	
Tests Item	Number of Hopping Frequencies (N), Time of Occupancy (Dwell Time), Emissions in Non-Restricted Frequency Bands
Test Condition	Conducted measurement at transmit chains
Modulation Mode	EDR-3Mbps

The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Unwanted Emissions Transmitter Radiated Bandedge 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 three orthogonal planes. The worst planes is X.		
	☐ EUT will be a battery-powered devices and operating multiple positions. EUT shall be performed two or three orthogonal planes. The worst planes is Y.		
Operating Mode	☒ 1. USB charging + Radio link		
Modulation Mode	BR-1Mbps, EDR-3Mbps		
Orthogonal Planes of EUT	X Plane	Y Plane	Z Plane
			

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.

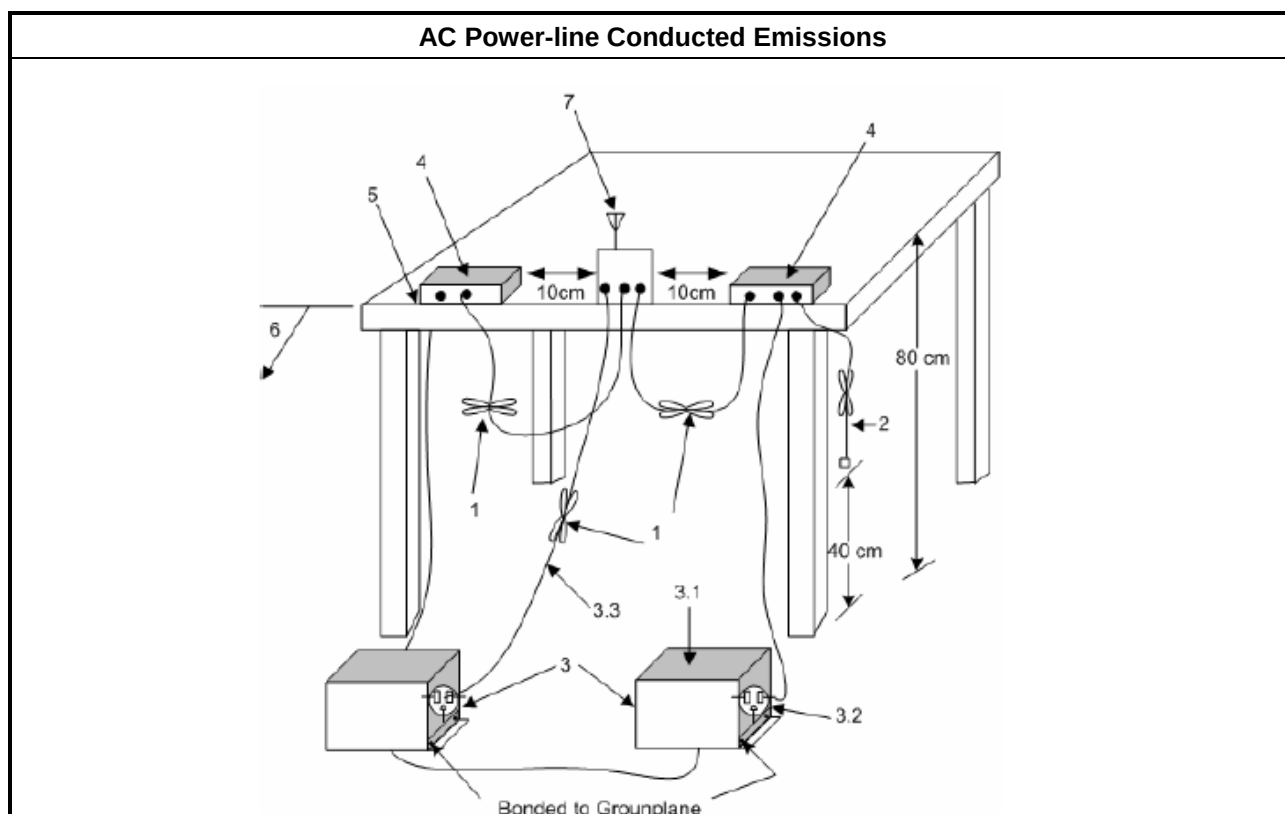
3.1.2 Measuring Instruments

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

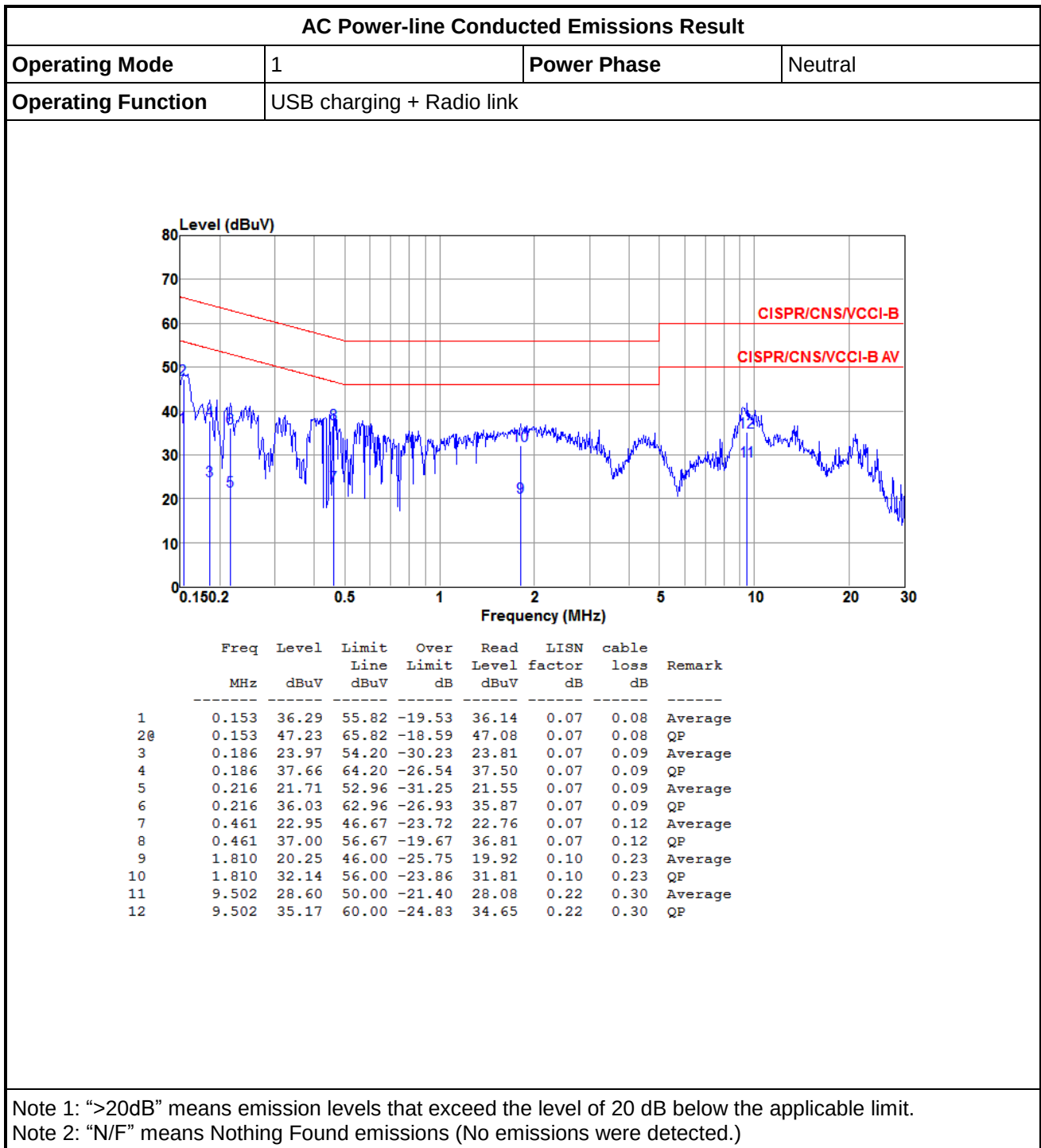
3.1.3 Test Procedures

Test Method
☒ Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.

3.1.4 Test Setup

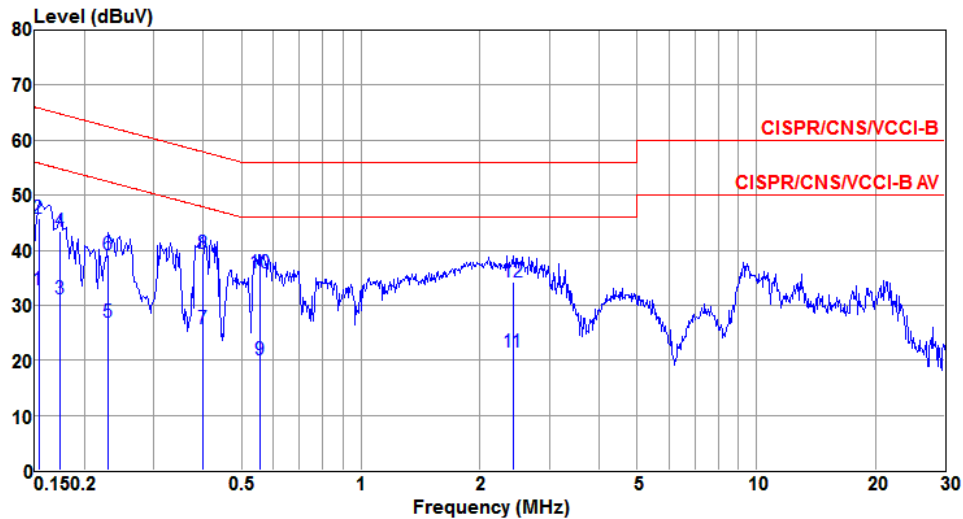


3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	USB charging + Radio link		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.153	32.75	55.82	-23.07	32.60	0.07	0.08	Average
2	0.153	45.88	65.82	-19.94	45.73	0.07	0.08	QP
3	0.174	31.11	54.77	-23.66	30.95	0.07	0.09	Average
4	0.174	43.34	64.77	-21.43	43.18	0.07	0.09	QP
5	0.230	26.85	52.44	-25.59	26.69	0.07	0.09	Average
6	0.230	39.21	62.44	-23.23	39.05	0.07	0.09	QP
7	0.400	25.84	47.86	-22.02	25.66	0.07	0.11	Average
8@	0.400	39.34	57.86	-18.52	39.16	0.07	0.11	QP
9	0.558	20.16	46.00	-25.84	19.96	0.07	0.13	Average
10	0.558	35.82	56.00	-20.18	35.62	0.07	0.13	QP
11	2.422	21.46	46.00	-24.54	21.09	0.11	0.26	Average
12	2.422	34.17	56.00	-21.83	33.80	0.11	0.26	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	

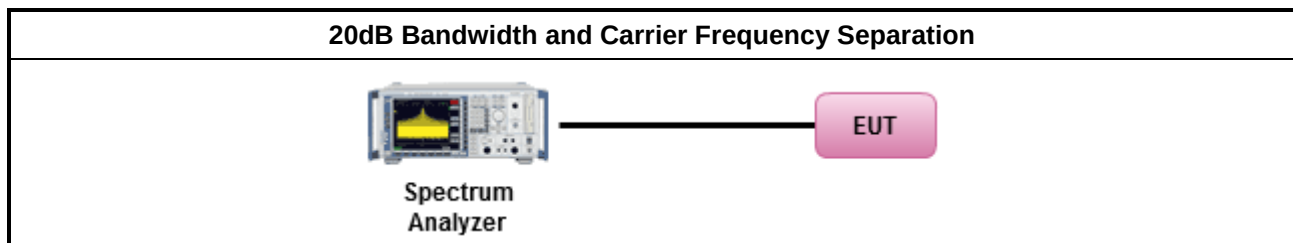
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

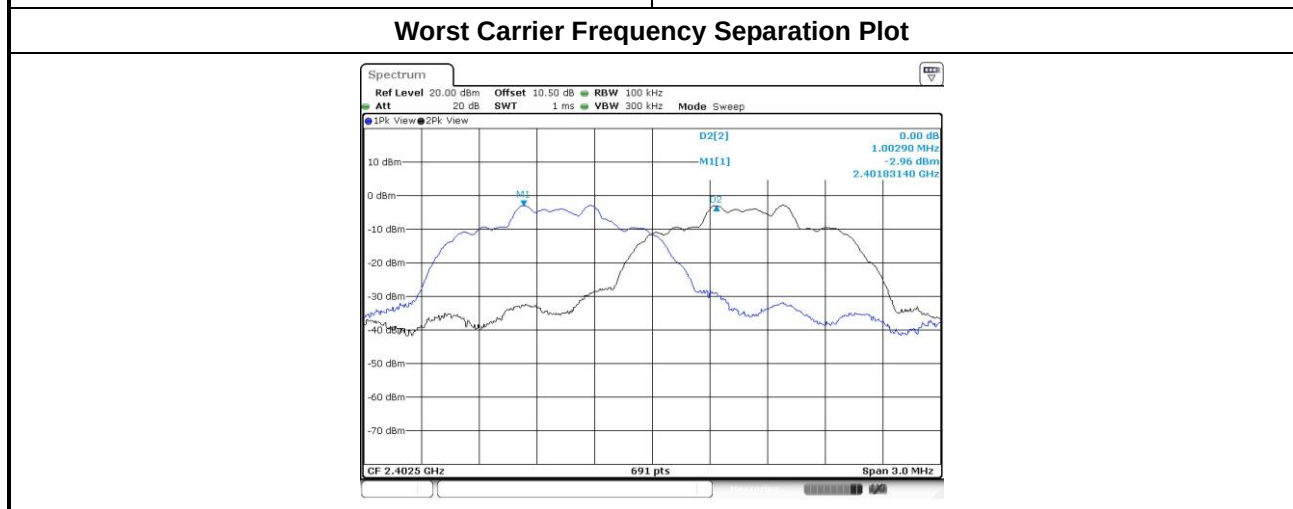
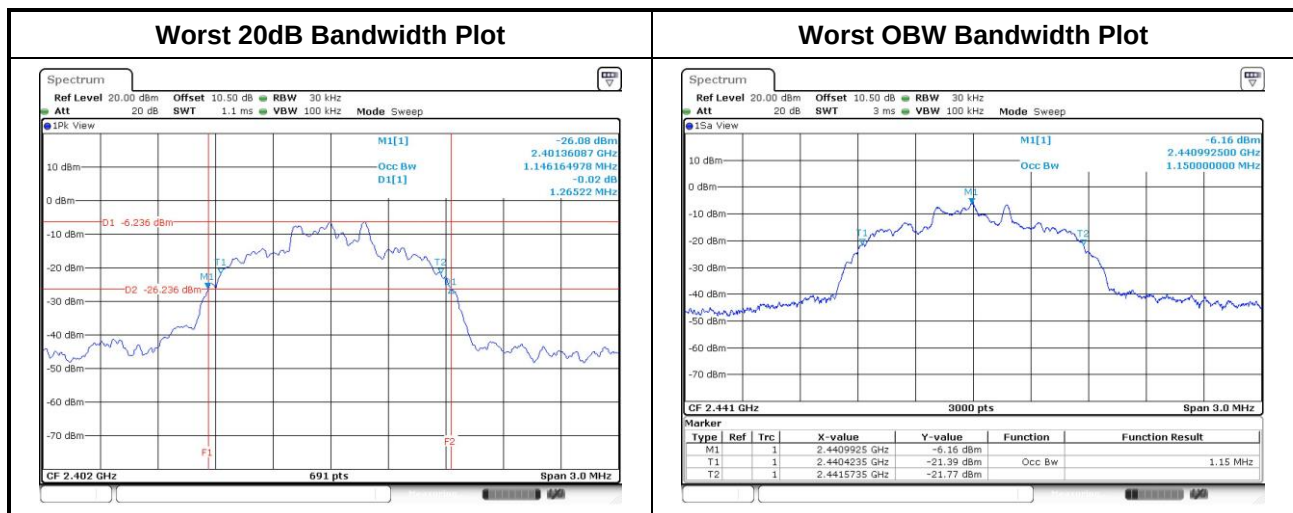
Test Method	
☒	Refer as ANSI C63.10, clause 6.9.1 for 20 dB bandwidth measurement.
☒	Refer as ANSI C63.10, clause 7.8.2 for carrier frequency separation measurement.
☒	For conducted measurement.
☒	The EUT supports single transmit chain and measurements performed on this transmit chain.
☐	The EUT supports 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	1.026	0.917	1.003	0.684
BR-1Mbps	2441	1.030	0.918	1.003	0.687
BR-1Mbps	2480	1.030	0.918	1.003	0.687
EDR-2Mbps	2402	1.248	1.148	1.003	0.832
EDR-2Mbps	2441	1.257	1.150	1.003	0.838
EDR-2Mbps	2480	1.209	1.144	1.003	0.806
EDR-3Mbps	2402	1.265	1.144	1.003	0.843
EDR-3Mbps	2441	1.252	1.146	1.003	0.835
EDR-3Mbps	2480	1.257	1.145	1.003	0.838
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	

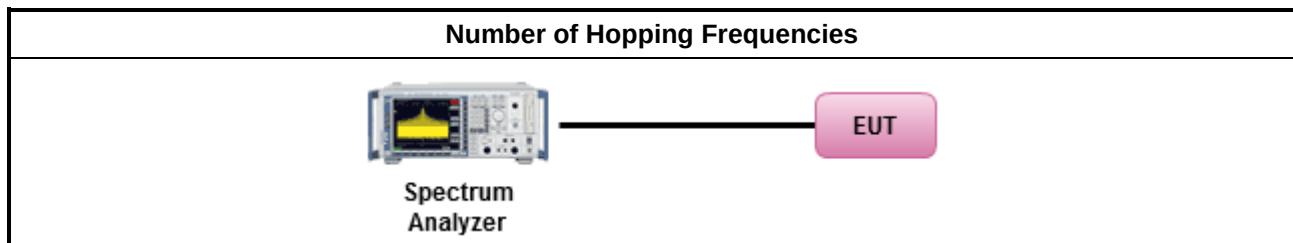
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

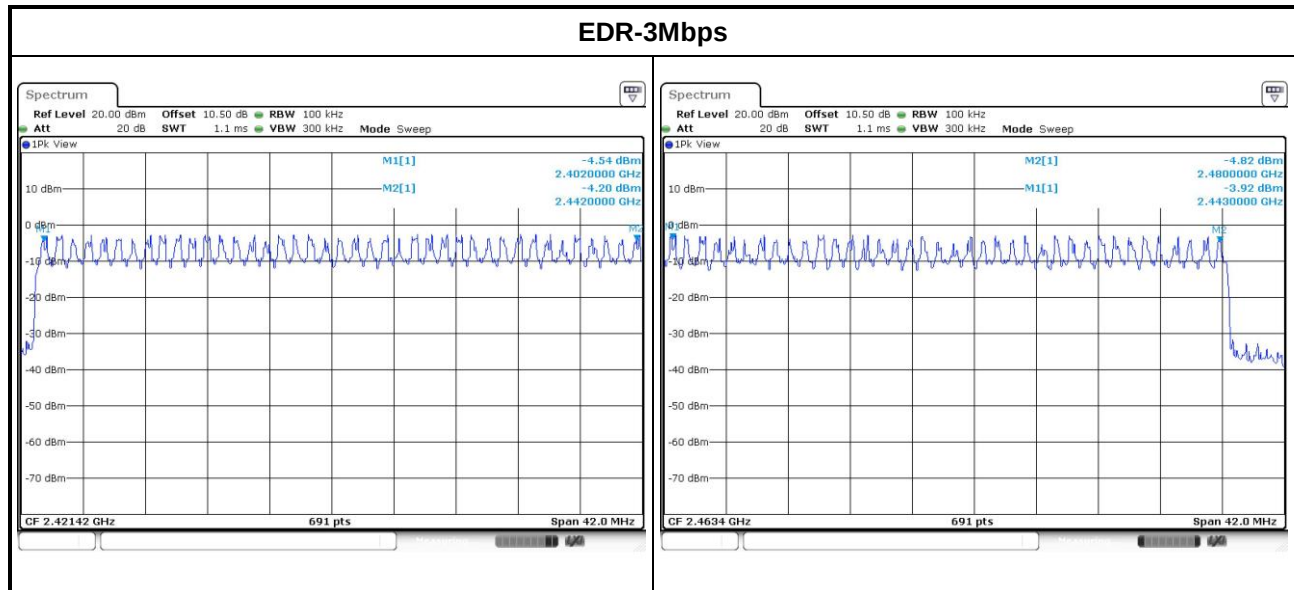
Test Method	
☒	Refer as ANSI C63.10, clause 7.8.3 for number of hopping frequencies measurement.
☒	For conducted measurement.
☒	The EUT supports single transmit chain and measurements performed on this transmit chain.
☐	The EUT supports diversity transmitting and the results on transmit chain port 1 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	

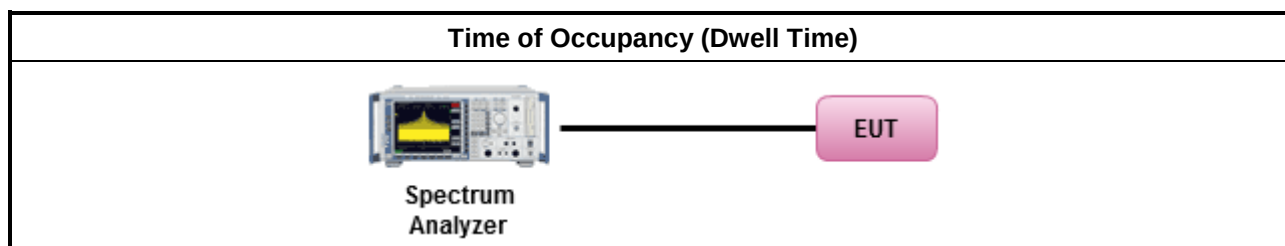
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

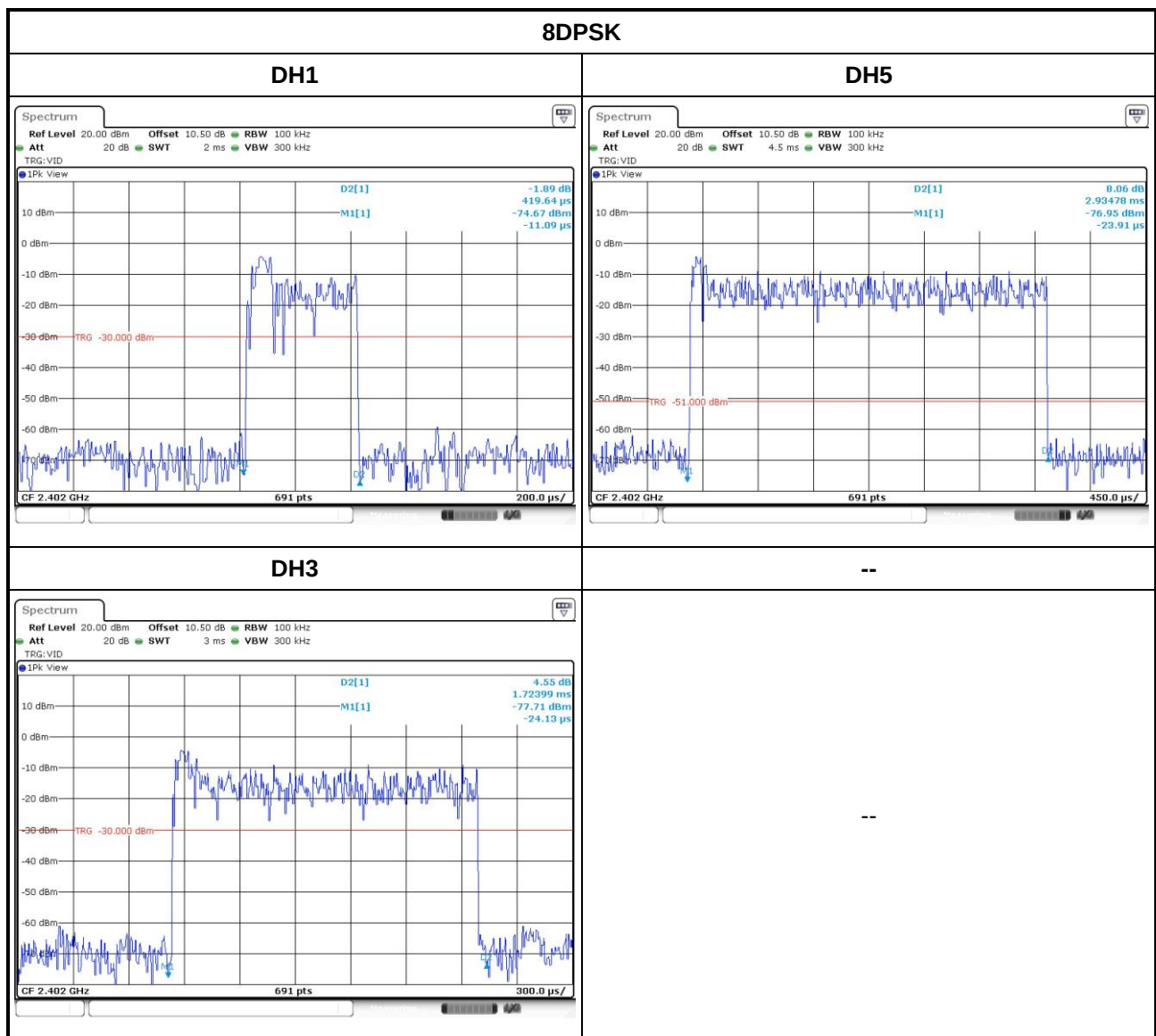
Test Method	
☒	Refer as ANSI C63.10, clause 7.8.4 for dwell time measurement.
☒	Bluetooth ACL packets can be 1, 3, or 5 time slots. Following as dwell time. Operate DH5 at maximum dwell time and maximum duty cycle.
☒	The DH1 packet can cover a single time slot. A maximum length packet has duration of 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 TX, 1 time slot RX). 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 TX, 1 time slot RX). 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	2402	2.93	106.7	0.313	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	

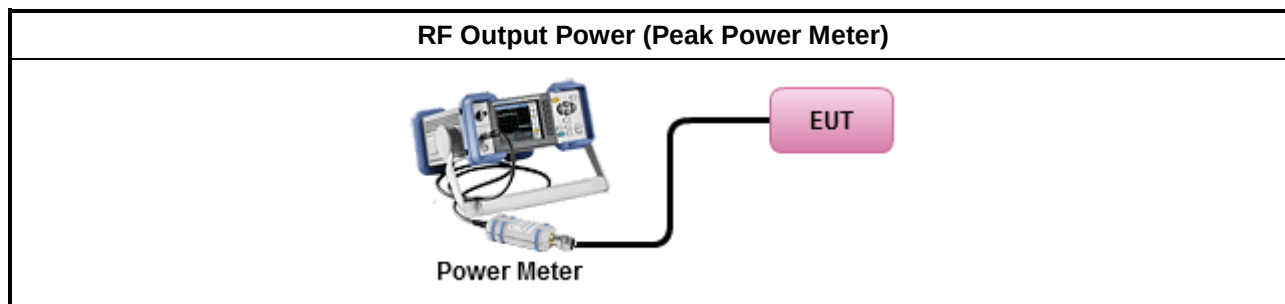
3.5.2 Measuring Instruments

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 for peak power meter.
☐	Refer as ANSI C63.10, clause 6.10.2.1 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	-2.58	21	-1.07	-3.65	27
BR-1Mbps	2441	-2.38	21	-1.07	-3.45	27
BR-1Mbps	2480	-2.68	21	-1.07	-3.75	27
EDR-2Mbps	2402	-4.02	21	-1.07	-5.09	27
EDR-2Mbps	2441	-3.83	21	-1.07	-4.90	27
EDR-2Mbps	2480	-4.19	21	-1.07	-5.26	27
EDR-3Mbps	2402	-3.45	21	-1.07	-4.52	27
EDR-3Mbps	2441	-3.52	21	-1.07	-4.59	27
EDR-3Mbps	2480	-3.84	21	-1.07	-4.91	27
Result		Complied				

Maximum Average Conducted Output Power Result						
Condition		RF Output Power (dBm)				
Modulation Mode	Freq. (MHz)	Average Power	Duty Factor (dB)	RF Output Power	Antenna Gain (dBi)	EIRP Power
BR-1Mbps	2402	-3.92	1.06	-2.86	-1.07	-3.93
BR-1Mbps	2441	-3.74	1.06	-2.68	-1.07	-3.75
BR-1Mbps	2480	-4.04	1.06	-2.98	-1.07	-4.05
EDR-2Mbps	2402	-7.48	1.08	-6.40	-1.07	-7.47
EDR-2Mbps	2441	-7.36	1.08	-6.28	-1.07	-7.35
EDR-2Mbps	2480	-7.76	1.08	-6.68	-1.07	-7.75
EDR-3Mbps	2402	-7.38	1.07	-6.31	-1.07	-7.38
EDR-3Mbps	2441	-7.28	1.07	-6.21	-1.07	-7.28
EDR-3Mbps	2480	-7.71	1.07	-6.64	-1.07	-7.71

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

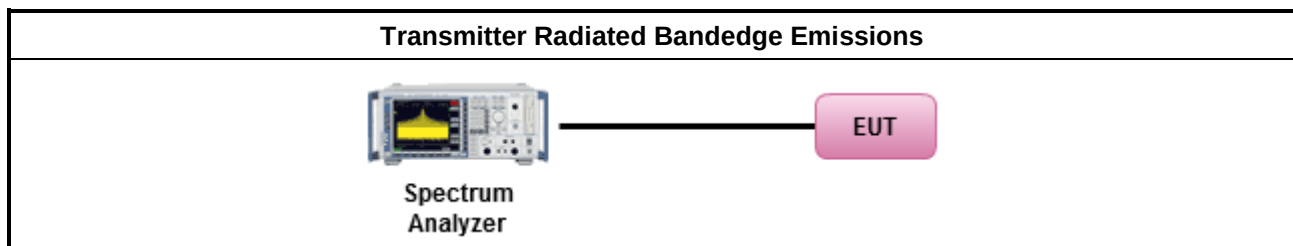
Reference level measurement

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

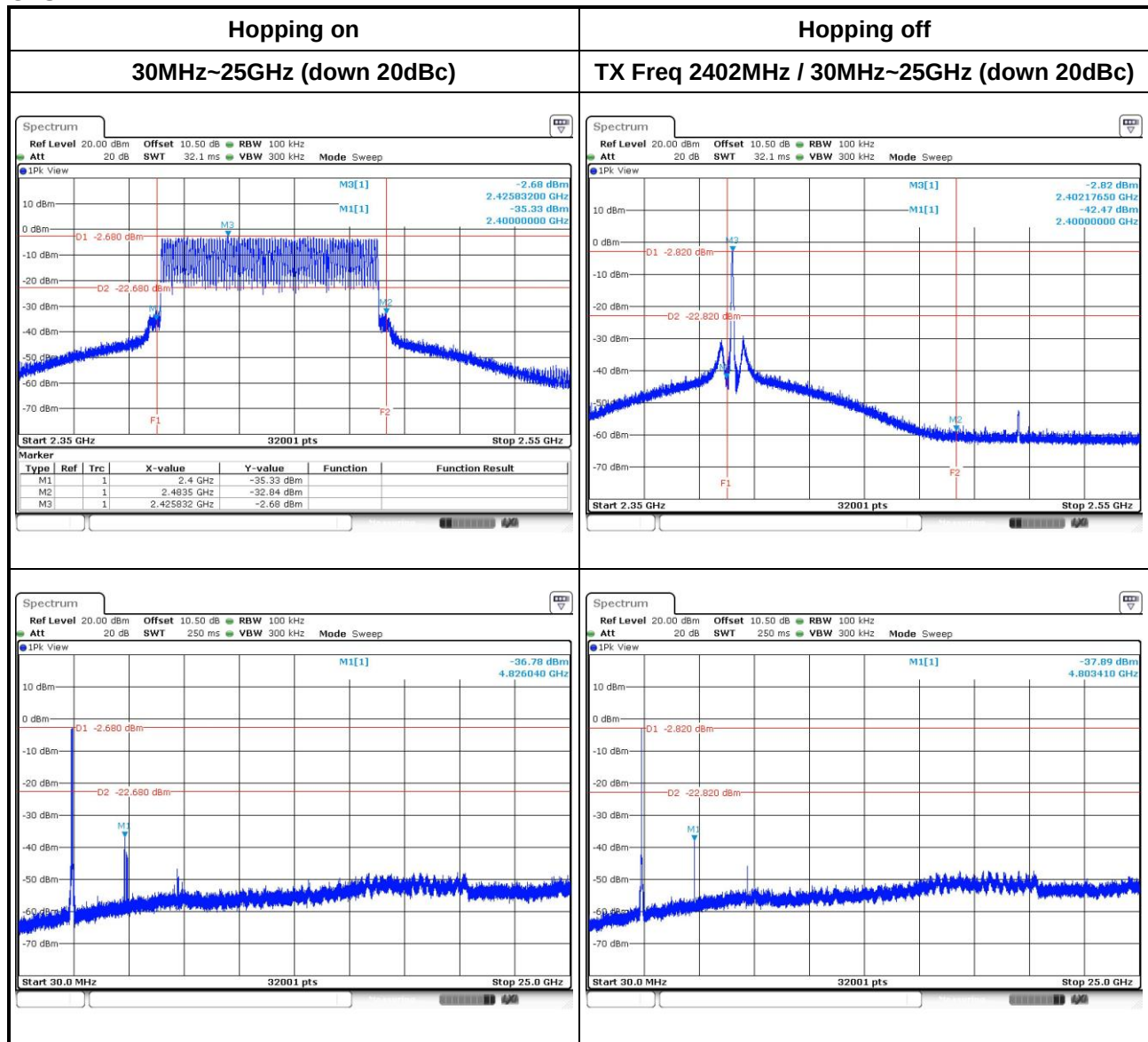
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.6.4 Test Setup



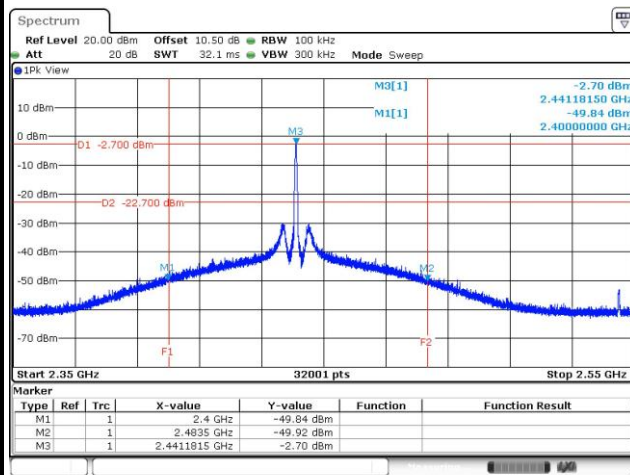
3.6.5 Test Result of Emissions in Non-Restricted Frequency Bands

GFSK



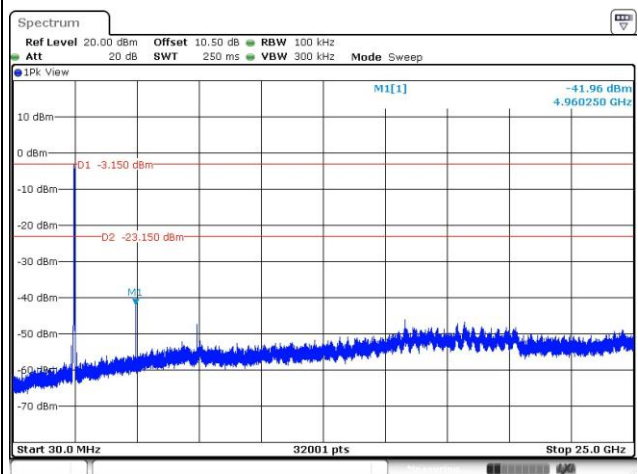
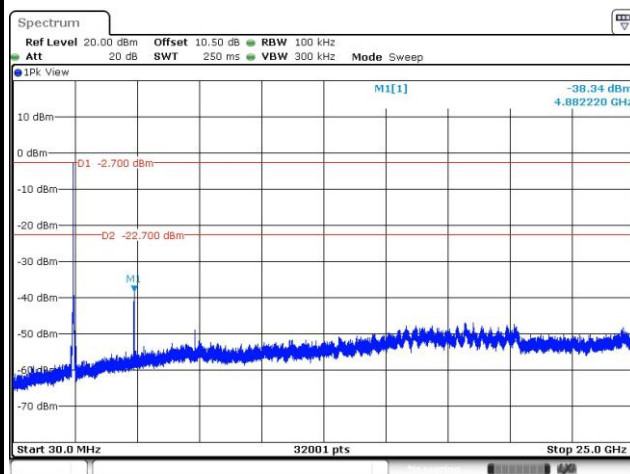
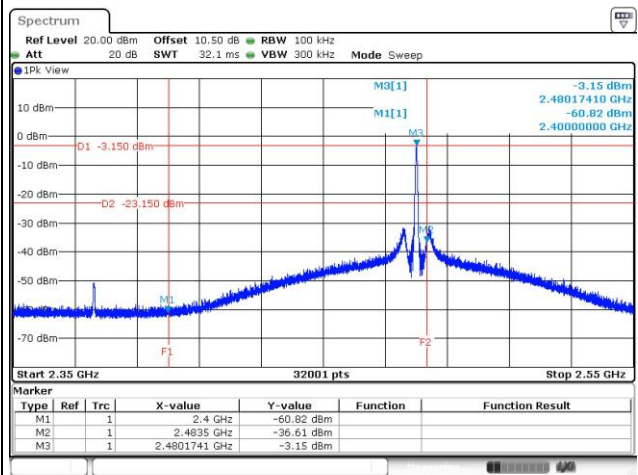
Hopping off

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

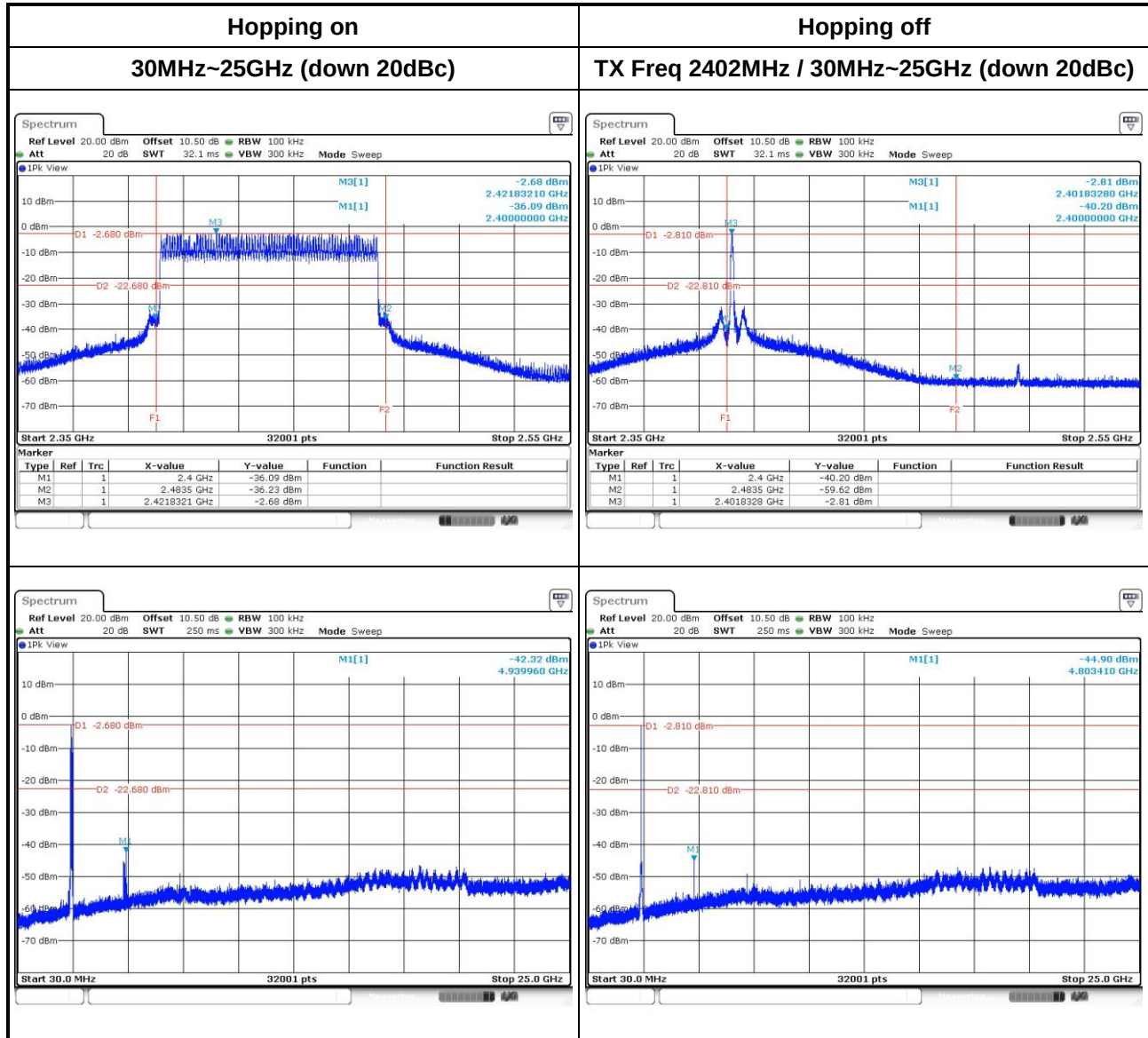


Hopping off

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

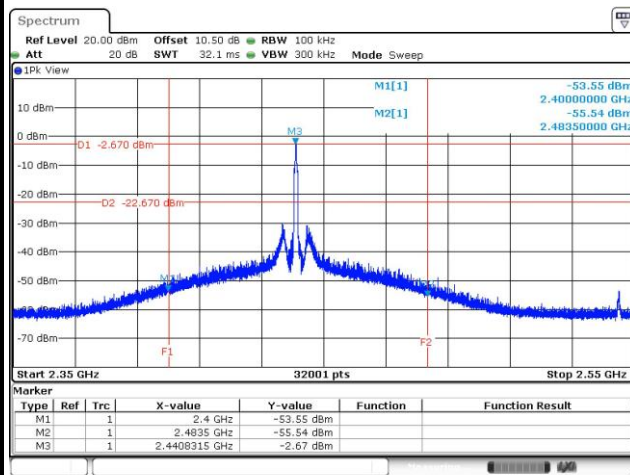


8DPSK



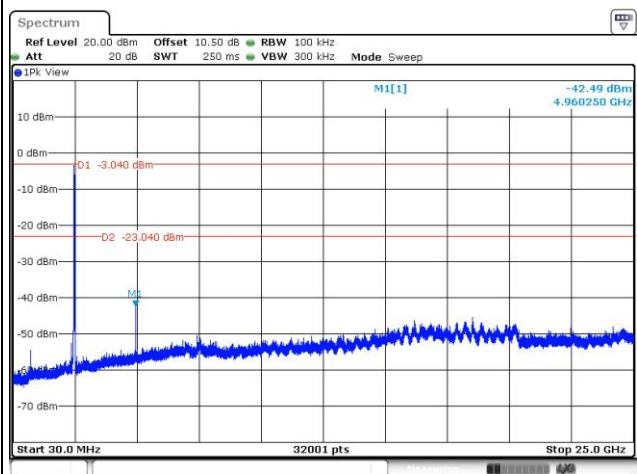
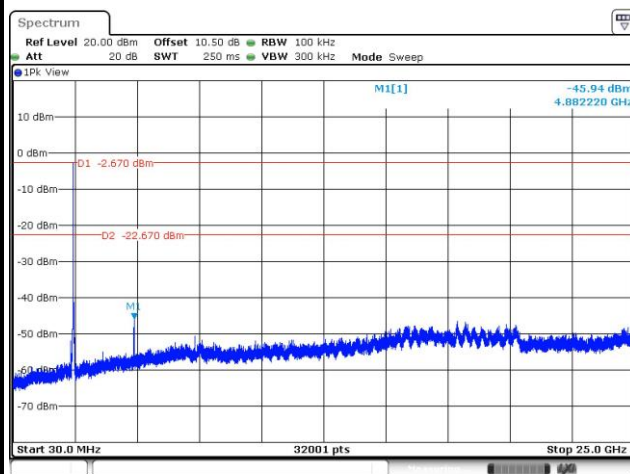
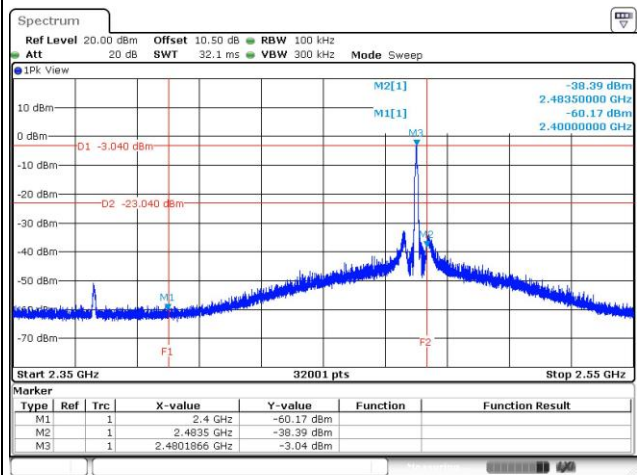
Hopping off

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



Hopping off

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



3.7 Transmitter 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.

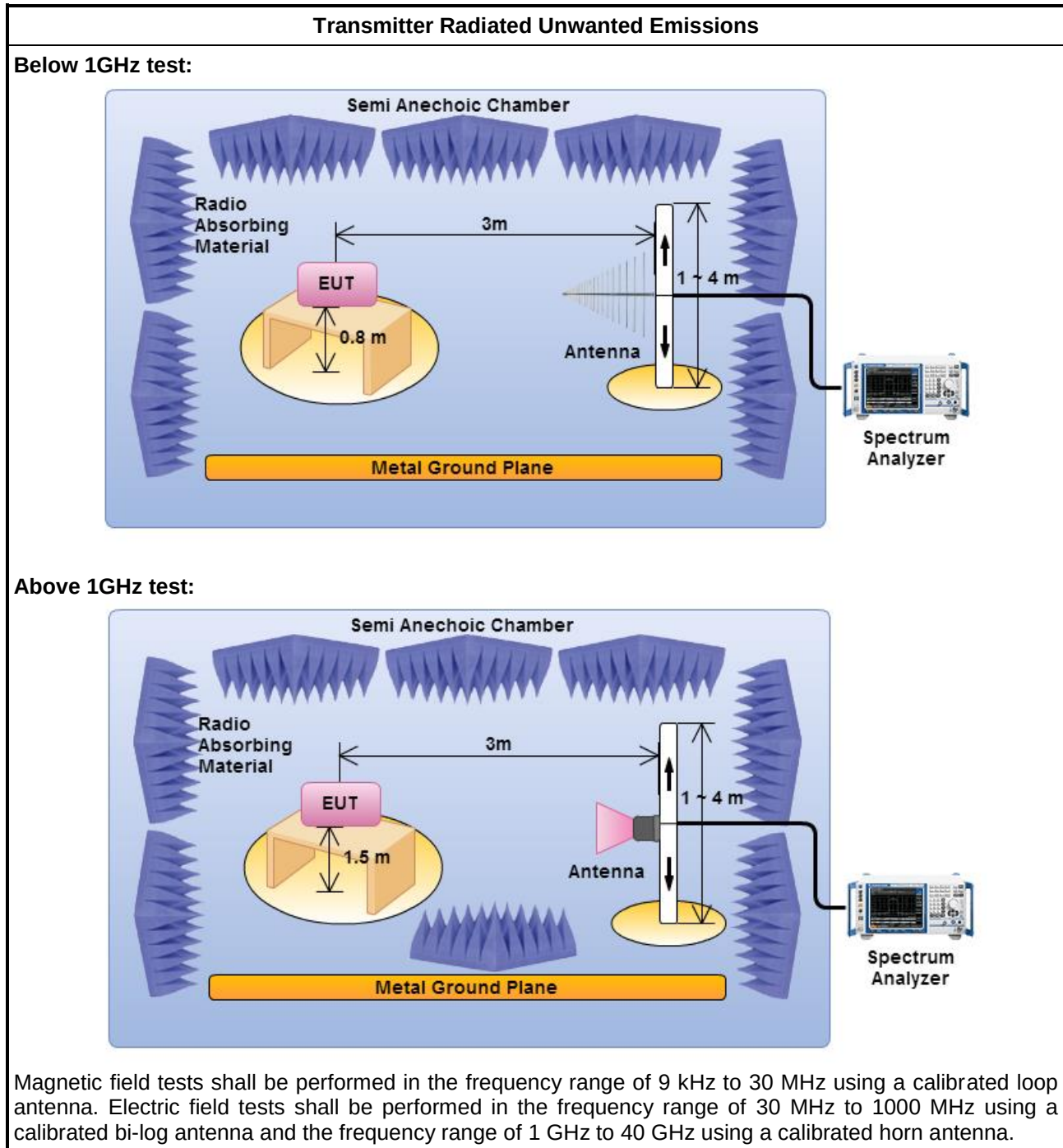
3.7.2 Measuring Instruments

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 4.1.4.2.3 (Reduced VBW). $\text{VBW} \geq 1/T$, where T is pulse time.
☒	Refer as ANSI C63.10, clause 4.1.4.2.4 average value of pulsed emissions.
☒	Refer as ANSI C63.10, clause 4.1.4.2.2 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.

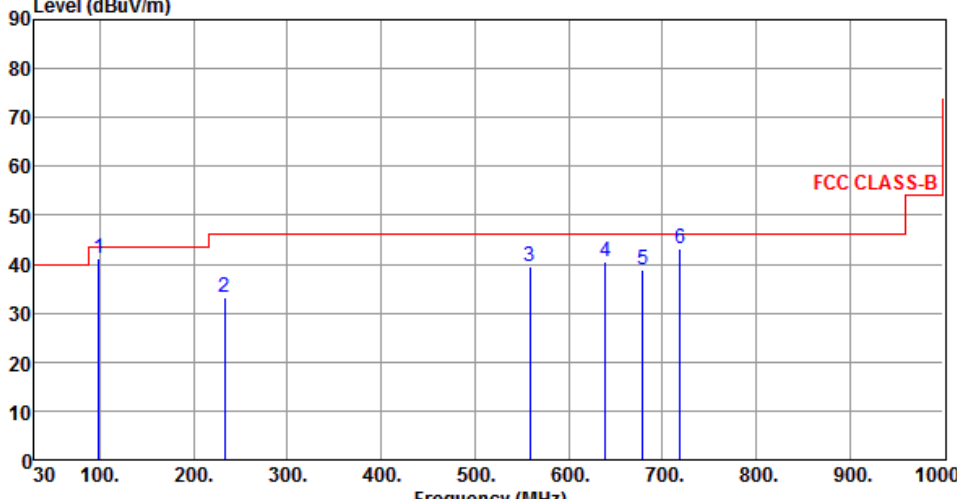
3.7.4 Test Setup



3.7.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

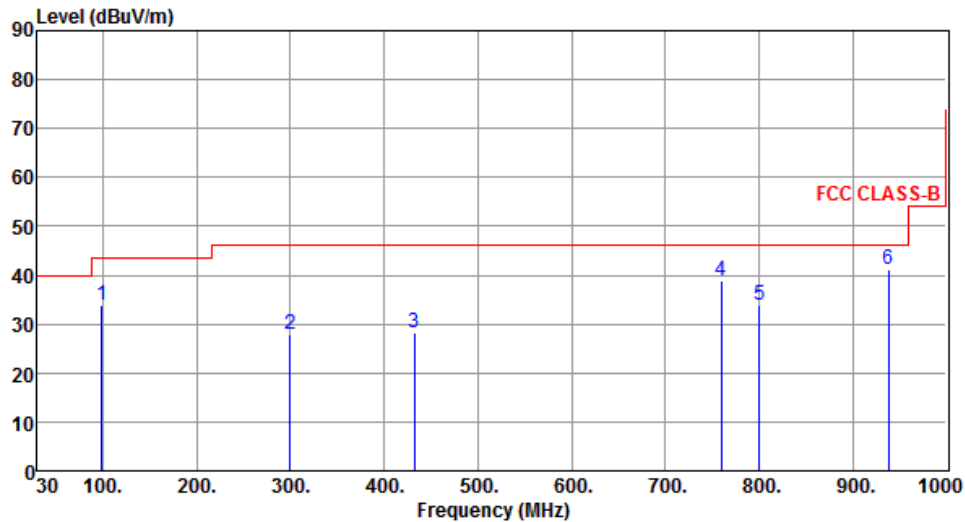
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

3.7.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Transmitter Radiated Unwanted Emissions (Below 1GHz)																																																																															
Modulation Mode		BR-1Mbps			Test Freq. (MHz)		2402																																																																								
Polarization		H																																																																													
Level (dBUV/m)  <table><thead><tr><th></th><th>Freq. MHz</th><th>Emission level dBUV/m</th><th>Limit dBUV/m</th><th>Margin dB</th><th>SA reading dBUV</th><th>Factor dB</th><th>Remark</th><th>ANT High cm</th><th>Turn Table deg</th></tr></thead><tbody><tr><td>1</td><td>98.87</td><td>41.23</td><td>43.50</td><td>-2.27</td><td>62.73</td><td>-21.50</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>2</td><td>232.73</td><td>33.36</td><td>46.00</td><td>-12.64</td><td>51.78</td><td>-18.42</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>3</td><td>558.65</td><td>39.50</td><td>46.00</td><td>-6.50</td><td>49.81</td><td>-10.31</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>4</td><td>639.16</td><td>40.68</td><td>46.00</td><td>-5.32</td><td>49.53</td><td>-8.85</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>5</td><td>679.00</td><td>38.78</td><td>46.00</td><td>-7.22</td><td>47.10</td><td>-8.32</td><td>QP</td><td>137</td><td>61</td></tr><tr><td>6</td><td>718.70</td><td>43.20</td><td>46.00</td><td>-2.80</td><td>50.85</td><td>-7.65</td><td>Peak</td><td>---</td><td>---</td></tr></tbody></table>											Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg	1	98.87	41.23	43.50	-2.27	62.73	-21.50	Peak	---	---	2	232.73	33.36	46.00	-12.64	51.78	-18.42	Peak	---	---	3	558.65	39.50	46.00	-6.50	49.81	-10.31	Peak	---	---	4	639.16	40.68	46.00	-5.32	49.53	-8.85	Peak	---	---	5	679.00	38.78	46.00	-7.22	47.10	-8.32	QP	137	61	6	718.70	43.20	46.00	-2.80	50.85	-7.65	Peak	---	---
	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg																																																																						
1	98.87	41.23	43.50	-2.27	62.73	-21.50	Peak	---	---																																																																						
2	232.73	33.36	46.00	-12.64	51.78	-18.42	Peak	---	---																																																																						
3	558.65	39.50	46.00	-6.50	49.81	-10.31	Peak	---	---																																																																						
4	639.16	40.68	46.00	-5.32	49.53	-8.85	Peak	---	---																																																																						
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6	718.70	43.20	46.00	-2.80	50.85	-7.65	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)

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



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	98.87	33.82	43.50	-9.68	55.32	-21.50	Peak	---	---
2	299.66	27.97	46.00	-18.03	43.76	-15.79	Peak	---	---
3	432.00	28.38	46.00	-17.62	41.01	-12.63	QP	110	211
4	759.44	38.94	46.00	-7.06	45.79	-6.85	Peak	---	---
5	800.18	33.95	46.00	-12.05	40.47	-6.52	Peak	---	---
6	937.92	41.11	46.00	-4.89	45.78	-4.67	Peak	---	---

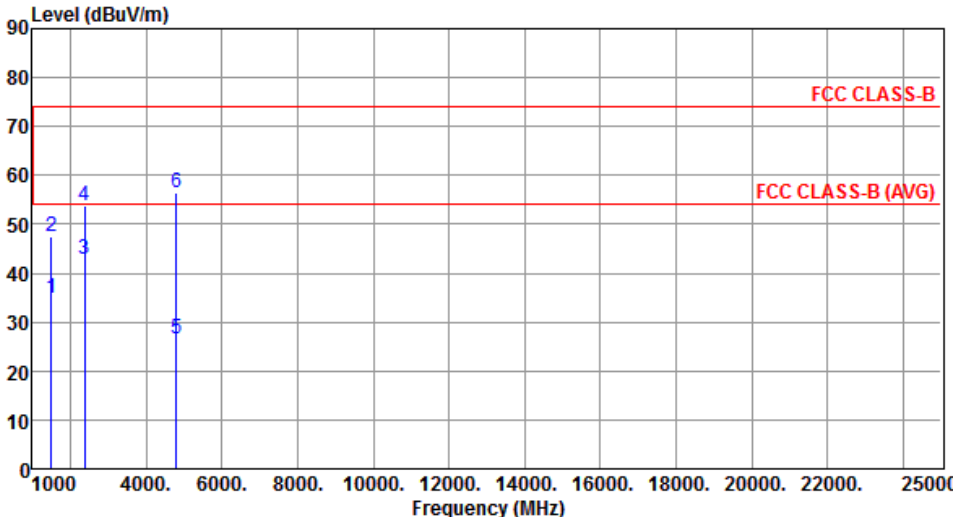
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

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 GFSK

Transmitter Radiated Unwanted Emissions (Above 1GHz)									
Modulation Mode	BR-1Mbps				Test Freq. (MHz)	2402			
Operating Function	Transmit				Polarization	H			



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1500.00	34.73	54.00	-19.27	41.56	-6.83	Average	100	168
2	1500.00	47.36	74.00	-26.64	54.19	-6.83	Peak	100	168
3	2390.00	42.81	54.00	-11.19	46.16	-3.35	Average	100	240
4	2390.00	53.94	74.00	-20.06	57.29	-3.35	Peak	100	240
5	4804.00	26.48	54.00	-27.52	22.95	3.53	Average	100	196
6	4804.00	56.58	74.00	-17.42	53.05	3.53	Peak	100	196

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)

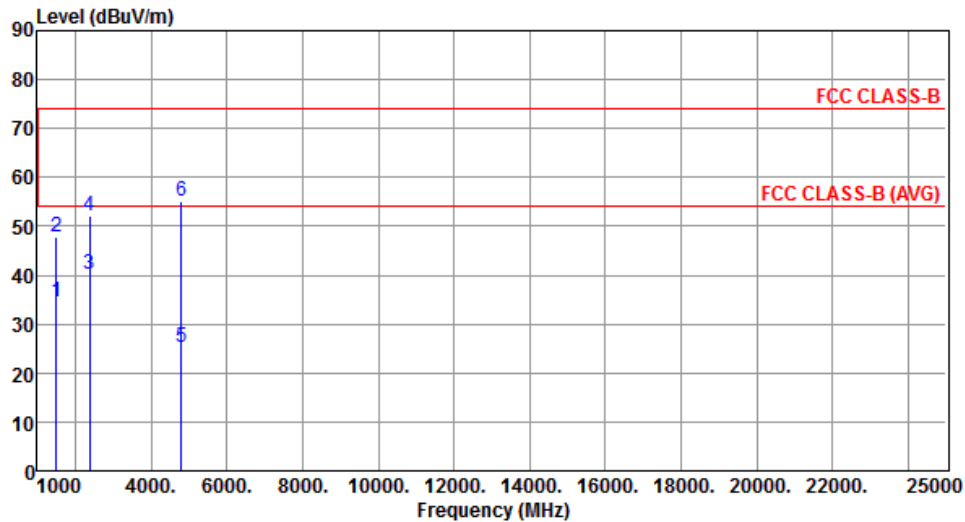
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: Average emission obtained from the worst average correction factor = $20 \log ((1s/1600 \times 5)/100ms) = -30.1dB$ or Average emission setting: RBW=1MHz; VBW $\geq 1/T$, where T is "Pulse On Time", e.g., DH5 VBW $\geq 1/3.125ms$, VBW=1kHz.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	BR-1Mbps	Test Freq. (MHz)	2402
Operating Function	Transmit	Polarization	V



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1500.00	34.54	54.00	-19.46	41.37	-6.83	Average	100	171
2	1500.00	47.74	74.00	-26.26	54.57	-6.83	Peak	100	171
3	2390.00	40.06	54.00	-13.94	43.41	-3.35	Average	100	104
4	2390.00	52.04	74.00	-21.96	55.39	-3.35	Peak	100	104
5	4804.00	25.11	54.00	-28.89	21.58	3.53	Average	100	152
6	4804.00	55.21	74.00	-18.79	51.68	3.53	Peak	100	152

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)

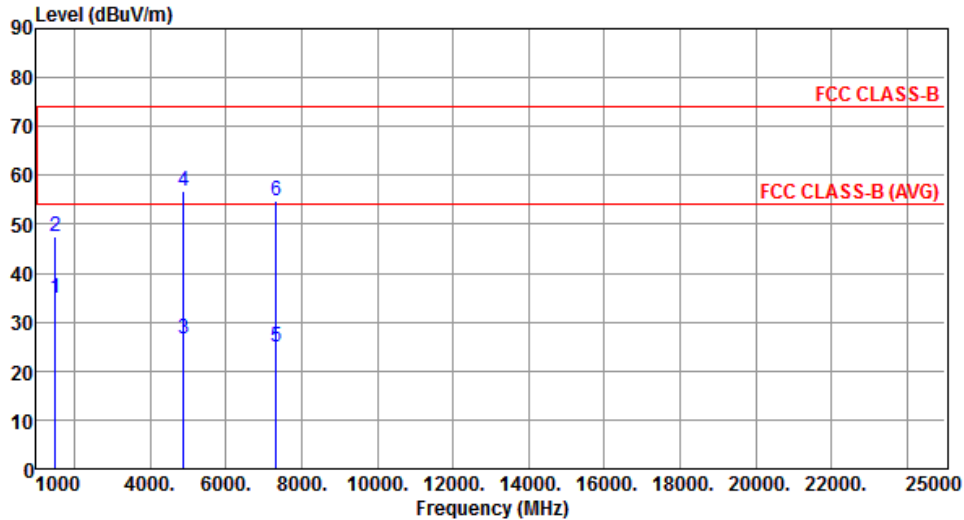
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: Average emission obtained from the worst average correction factor = $20 \log ((1s/1600x5)/100ms) = -30.1dB$ or Average emission setting: RBW=1MHz; VBW $\geq 1/T$, where T is "Pulse On Time", e.g., DH5 VBW $\geq 1/3.125ms$, VBW=1kHz.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	BR-1Mbps	Test Freq. (MHz)	2441
Operating Function	Transmit	Polarization	H



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1500.00	34.84	54.00	-19.16	41.67	-6.83	Average	100	138
2	1500.00	47.44	74.00	-26.56	54.27	-6.83	Peak	100	138
3	4882.00	26.61	54.00	-27.39	22.83	3.78	Average	185	119
4	4882.00	56.71	74.00	-17.29	52.93	3.78	Peak	185	119
5	7323.00	24.84	54.00	-29.16	16.41	8.43	Average	100	235
6	7323.00	54.94	74.00	-19.06	46.51	8.43	Peak	100	235

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)

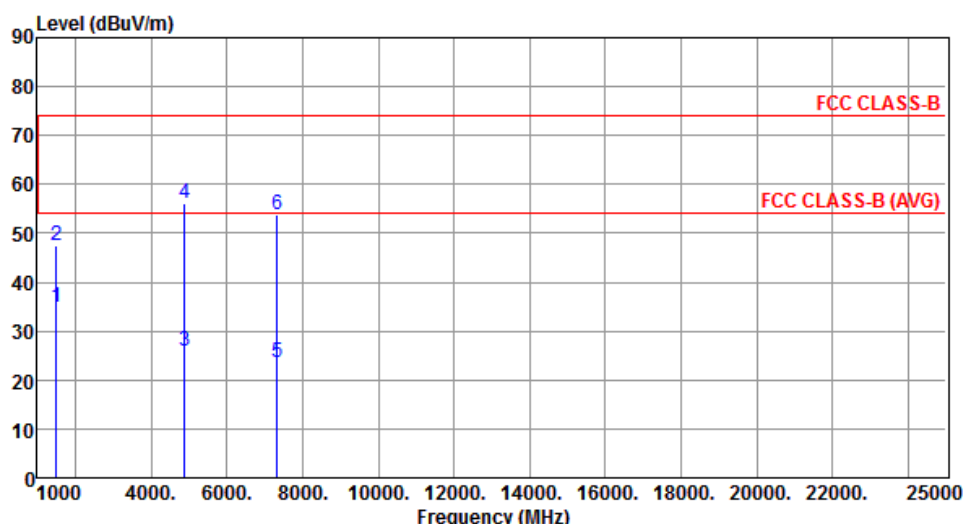
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: Average emission obtained from the worst average correction factor = $20 \log ((1s/1600x5)/100ms) = -30.1dB$ or Average emission setting: RBW=1MHz; VBW $\geq 1/T$, where T is "Pulse On Time", e.g., DH5 VBW $\geq 1/3.125ms$, VBW=1kHz.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	BR-1Mbps	Test Freq. (MHz)	2441
Operating Function	Transmit	Polarization	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1500.00	34.88	54.00	-19.12	41.71	-6.83	Average	100	188
2	1500.00	47.51	74.00	-26.49	54.34	-6.83	Peak	100	188
3	4882.00	25.87	54.00	-28.13	22.09	3.78	Average	100	358
4	4882.00	55.97	74.00	-18.03	52.19	3.78	Peak	100	358
5	7323.00	23.71	54.00	-30.29	15.28	8.43	Average	100	196
6	7323.00	53.81	74.00	-20.19	45.38	8.43	Peak	100	196

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)

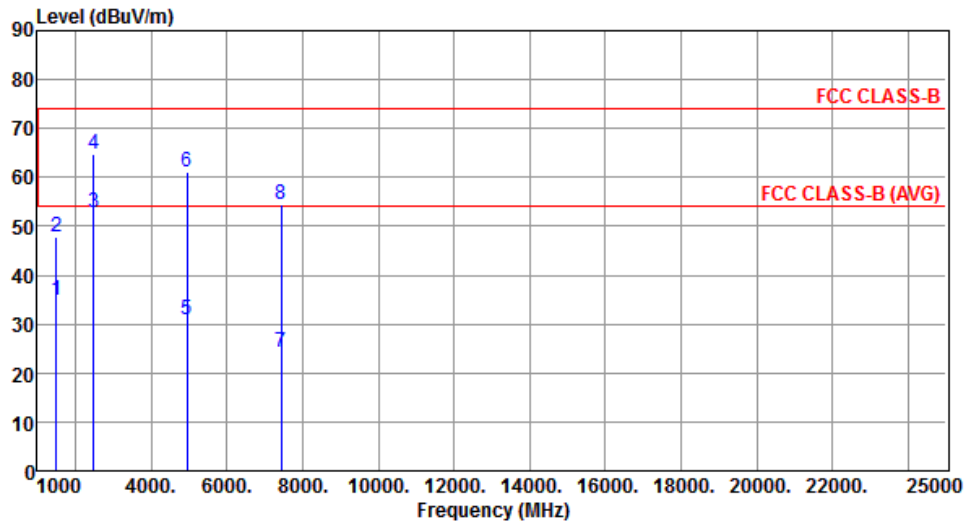
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: Average emission obtained from the worst average correction factor = $20 \log ((1s/1600x5)/100ms) = -30.1dB$ or Average emission setting: RBW=1MHz; VBW $\geq 1/T$, where T is "Pulse On Time", e.g., DH5 VBW $\geq 1/3.125ms$, VBW=1kHz.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	BR-1Mbps	Test Freq. (MHz)	2480
Operating Function	Transmit	Polarization	H



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1500.00	34.84	54.00	-19.16	41.67	-6.83	Average	100	127
2	1500.00	47.83	74.00	-26.17	54.66	-6.83	Peak	100	127
3	2483.50	52.93	54.00	-1.07	55.86	-2.93	Average	100	133
4	2483.50	64.77	74.00	-9.23	67.70	-2.93	Peak	100	133
5	4960.00	30.96	54.00	-23.04	26.92	4.04	Average	100	118
6	4960.00	61.06	74.00	-12.94	57.02	4.04	Peak	100	118
7	7440.00	24.34	54.00	-29.66	15.78	8.56	Average	100	179
8	7440.00	54.44	74.00	-19.56	45.88	8.56	Peak	100	179

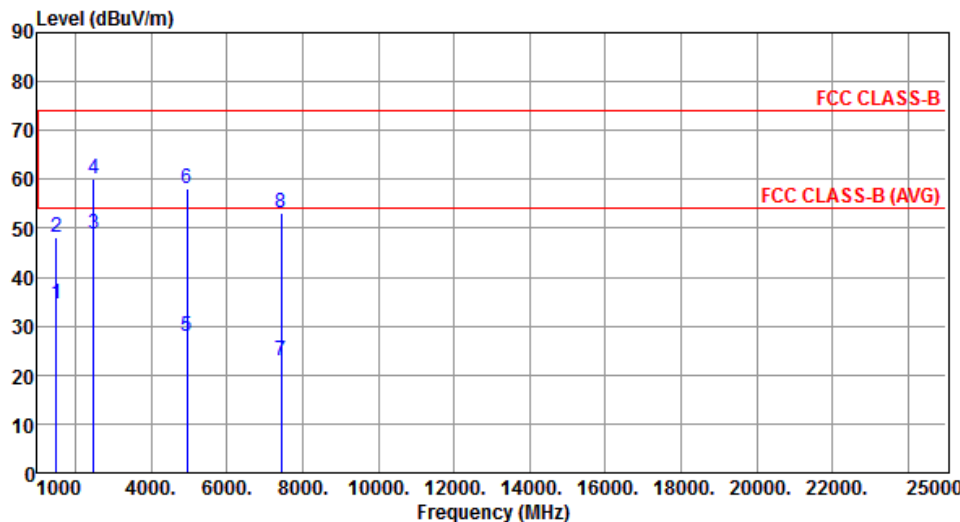
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

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.

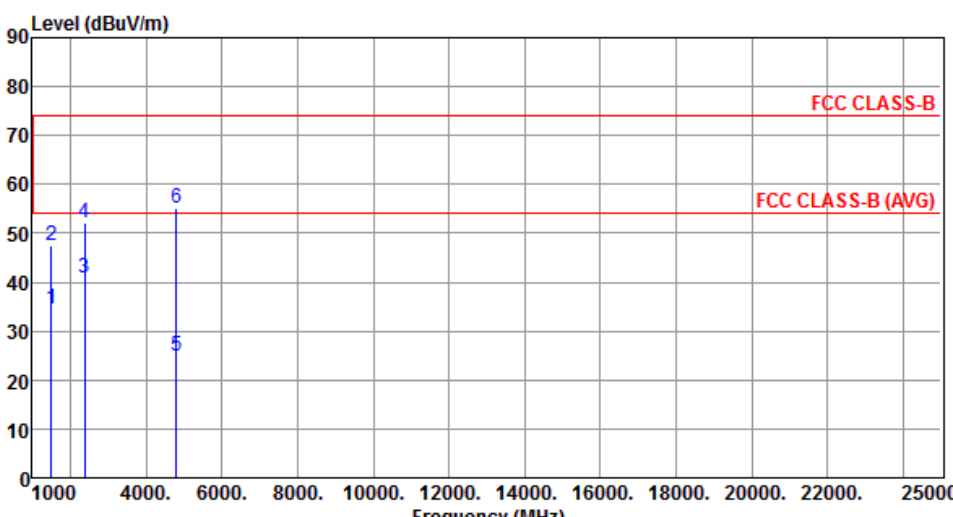
Note 4: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

Note 5: Average emission obtained from the worst average correction factor = $20 \log ((1s/1600x5)/100ms) = -30.1dB$ or Average emission setting: RBW=1MHz; VBW $\geq 1/T$, where T is "Pulse On Time", e.g., DH5 VBW $\geq 1/3.125ms$, VBW=1kHz.

Transmitter Radiated Unwanted Emissions (Above 1GHz)																																																																																																			
Modulation Mode	BR-1Mbps				Test Freq. (MHz)	2480																																																																																													
Operating Function	Transmit				Polarization	V																																																																																													
Level (dBuV/m)  <table><thead><tr><th></th><th>Freq. MHz</th><th>Emission level dBuV/m</th><th>Limit dBuV/m</th><th>Margin dB</th><th>SA reading dBuV</th><th>Factor dB</th><th>Remark</th><th>ANT High cm</th><th>Turn Table deg</th></tr></thead><tbody><tr><td>1</td><td>1500.00</td><td>34.64</td><td>54.00</td><td>-19.36</td><td>41.47</td><td>-6.83</td><td>Average</td><td>124</td><td>148</td></tr><tr><td>2</td><td>1500.00</td><td>48.12</td><td>74.00</td><td>-25.88</td><td>54.95</td><td>-6.83</td><td>Peak</td><td>124</td><td>148</td></tr><tr><td>3</td><td>2483.50</td><td>48.85</td><td>54.00</td><td>-5.15</td><td>51.78</td><td>-2.93</td><td>Average</td><td>106</td><td>80</td></tr><tr><td>4</td><td>2483.50</td><td>60.09</td><td>74.00</td><td>-13.91</td><td>63.02</td><td>-2.93</td><td>Peak</td><td>106</td><td>80</td></tr><tr><td>5</td><td>4960.00</td><td>28.06</td><td>54.00</td><td>-25.94</td><td>24.02</td><td>4.04</td><td>Average</td><td>100</td><td>307</td></tr><tr><td>6</td><td>4960.00</td><td>58.16</td><td>74.00</td><td>-15.84</td><td>54.12</td><td>4.04</td><td>Peak</td><td>100</td><td>307</td></tr><tr><td>7</td><td>7440.00</td><td>23.02</td><td>54.00</td><td>-30.98</td><td>14.46</td><td>8.56</td><td>Average</td><td>100</td><td>213</td></tr><tr><td>8</td><td>7440.00</td><td>53.12</td><td>74.00</td><td>-20.88</td><td>44.56</td><td>8.56</td><td>Peak</td><td>100</td><td>213</td></tr></tbody></table>											Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg	1	1500.00	34.64	54.00	-19.36	41.47	-6.83	Average	124	148	2	1500.00	48.12	74.00	-25.88	54.95	-6.83	Peak	124	148	3	2483.50	48.85	54.00	-5.15	51.78	-2.93	Average	106	80	4	2483.50	60.09	74.00	-13.91	63.02	-2.93	Peak	106	80	5	4960.00	28.06	54.00	-25.94	24.02	4.04	Average	100	307	6	4960.00	58.16	74.00	-15.84	54.12	4.04	Peak	100	307	7	7440.00	23.02	54.00	-30.98	14.46	8.56	Average	100	213	8	7440.00	53.12	74.00	-20.88	44.56	8.56	Peak	100	213
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3.7.8 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 8DPSK

Transmitter Radiated Unwanted Emissions (Above 1GHz)									
Modulation Mode	EDR-3Mbps				Test Freq. (MHz)	2402			
Operating Function	Transmit				Polarization	H			



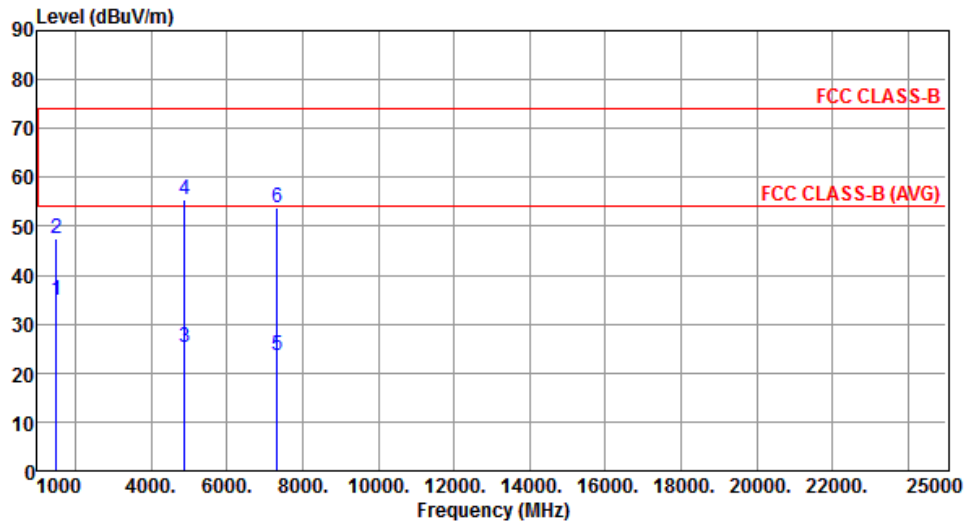
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1500.00	34.44	54.00	-19.56	41.27	-6.83	Average	100	153
2	1500.00	47.32	74.00	-26.68	54.15	-6.83	Peak	100	153
3	2390.00	40.89	54.00	-13.11	44.24	-3.35	Average	100	239
4	2390.00	52.07	74.00	-21.93	55.42	-3.35	Peak	100	239
5	4804.00	24.97	54.00	-29.03	21.44	3.53	Average	100	185
6	4804.00	55.07	74.00	-18.93	51.54	3.53	Peak	100	185

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: Average emission obtained from the worst average correction factor = $20 \log ((1s/1600 \times 5)/100ms) = -30.1dB$ or Average emission setting: RBW=1MHz; VBW $\geq 1/T$, where T is "Pulse On Time", e.g., DH5 VBW $\geq 1/3.125ms$, VBW=1kHz.

Transmitter Radiated Unwanted Emissions (Above 1GHz)									
Modulation Mode	EDR-3Mbps				Test Freq. (MHz)	2402			
Operating Function	Transmit				Polarization	V			
Level (dBUV/m) <									

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	EDR-3Mbps	Test Freq. (MHz)	2441
Operating Function	Transmit	Polarization	H



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1500.00	34.91	54.00	-19.09	41.74	-6.83	Average	100	141
2	1500.00	47.60	74.00	-26.40	54.43	-6.83	Peak	100	141
3	4882.00	25.36	54.00	-28.64	21.58	3.78	Average	180	120
4	4882.00	55.46	74.00	-18.54	51.68	3.78	Peak	180	120
5	7323.00	23.64	54.00	-30.36	15.21	8.43	Average	100	231
6	7323.00	53.74	74.00	-20.26	45.31	8.43	Peak	100	231

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)

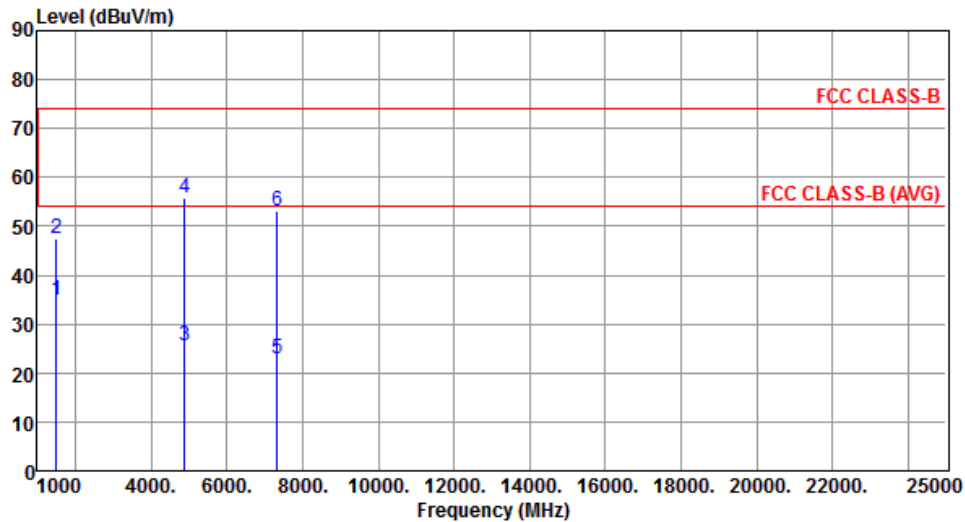
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: Average emission obtained from the worst average correction factor = $20 \log ((1s/1600x5)/100ms) = -30.1dB$ or Average emission setting: RBW=1MHz; VBW $\geq 1/T$, where T is "Pulse On Time", e.g., DH5 VBW $\geq 1/3.125ms$, VBW=1kHz.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	EDR-3Mbps	Test Freq. (MHz)	2441
Operating Function	Transmit	Polarization	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1500.00	34.84	54.00	-19.16	41.67	-6.83	Average	100	186
2	1500.00	47.44	74.00	-26.56	54.27	-6.83	Peak	100	186
3	4882.00	25.54	54.00	-28.46	21.76	3.78	Average	100	356
4	4882.00	55.64	74.00	-18.36	51.86	3.78	Peak	100	356
5	7323.00	23.04	54.00	-30.96	14.61	8.43	Average	100	192
6	7323.00	53.14	74.00	-20.86	44.71	8.43	Peak	100	192

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)

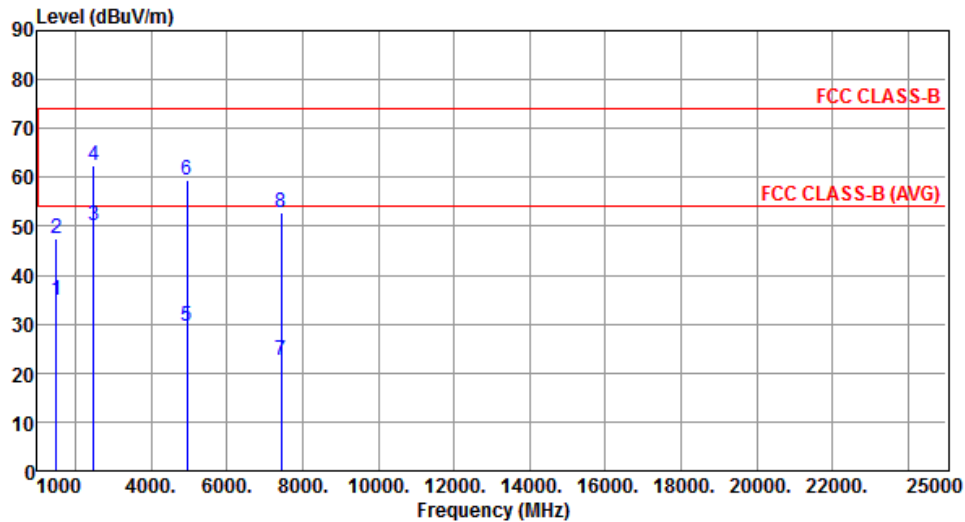
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: Average emission obtained from the worst average correction factor = $20 \log ((1s/1600x5)/100ms) = -30.1dB$ or Average emission setting: RBW=1MHz; VBW $\geq 1/T$, where T is "Pulse On Time", e.g., DH5 VBW $\geq 1/3.125ms$, VBW=1kHz.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	EDR-3Mbps	Test Freq. (MHz)	2480
Operating Function	Transmit	Polarization	H



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1500.00	34.89	54.00	-19.11	41.72	-6.83	Average	100	125
2	1500.00	47.62	74.00	-26.38	54.45	-6.83	Peak	100	125
3	2483.50	50.03	54.00	-3.97	52.96	-2.93	Average	100	131
4	2483.50	62.54	74.00	-11.46	65.47	-2.93	Peak	100	131
5	4960.00	29.41	54.00	-24.59	25.37	4.04	Average	100	116
6	4960.00	59.51	74.00	-14.49	55.47	4.04	Peak	100	116
7	7440.00	22.74	54.00	-31.26	14.18	8.56	Average	100	175
8	7440.00	52.84	74.00	-21.16	44.28	8.56	Peak	100	175

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)

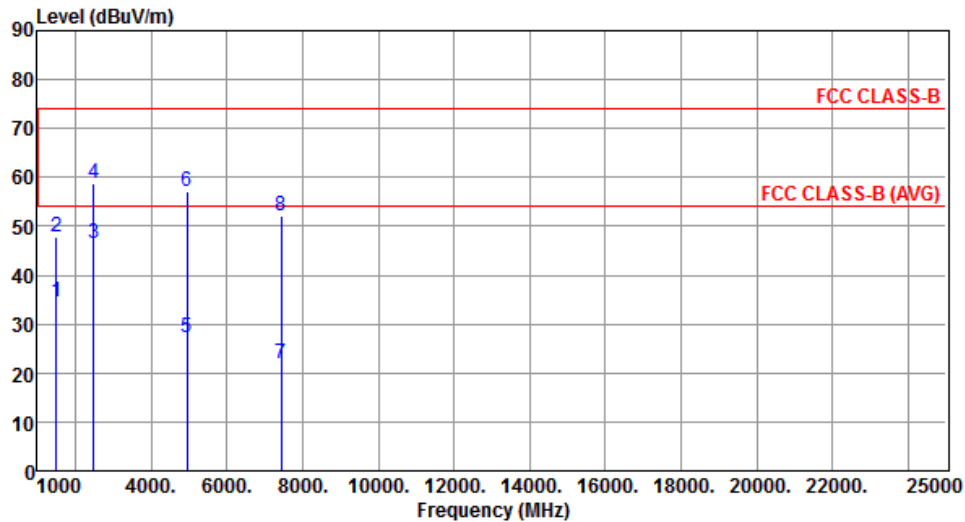
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: Average emission obtained from the worst average correction factor = $20 \log ((1s/1600x5)/100ms) = -30.1dB$ or Average emission setting: RBW=1MHz; VBW $\geq 1/T$, where T is "Pulse On Time", e.g., DH5 VBW $\geq 1/3.125ms$, VBW=1kHz.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	EDR-3Mbps	Test Freq. (MHz)	2480
Operating Function	Transmit	Polarization	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1500.00	34.51	54.00	-19.49	41.34	-6.83	Average	122	141
2	1500.00	47.88	74.00	-26.12	54.71	-6.83	Peak	122	141
3	2483.50	46.42	54.00	-7.58	49.35	-2.93	Average	106	79
4	2483.50	58.78	74.00	-15.22	61.71	-2.93	Peak	106	79
5	4960.00	27.10	54.00	-26.90	23.06	4.04	Average	100	305
6	4960.00	57.20	74.00	-16.80	53.16	4.04	Peak	100	305
7	7440.00	21.94	54.00	-32.06	13.38	8.56	Average	100	210
8	7440.00	52.04	74.00	-21.96	43.48	8.56	Peak	100	210

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: Average emission obtained from the worst average correction factor = $20 \log ((1s/1600x5)/100ms) = -30.1dB$ or Average emission setting: RBW=1MHz; VBW $\geq 1/T$, where T is "Pulse On Time", e.g., DH5 VBW $\geq 1/3.125ms$, VBW=1kHz.

4 Test Equipment and Calibration Data

Test Site : SPORTON Lab (SPORTON International Inc.)

Test Item	RF Conducted				
Test Site	(TH01-HY)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101500	May 06, 2015	May 05, 2016
Power Sensor	Anritsu	MA2411B	0917017	Feb. 04, 2016	Feb. 03, 2017
Power Meter	Anritsu	ML2495A	0949003	Feb. 04, 2016	Feb. 03, 2017
Bluetooth Tester	ROHDE&SCHWARZ	CBT	100959	Mar. 02, 2016	Mar. 02, 2017
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA

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

Test Site : ICC Lab (International Certification Corp.)

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	Dec. 13, 2015	Dec. 12, 2016
Receiver	R&S	ESR3	101658	Nov. 04, 2015	Nov. 03, 2016
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Aug. 20, 2015	Aug. 19, 2016
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 16, 2015	Dec. 15, 2016
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016
Loop Antenna	R&S	HFH2-Z2	11900	Nov. 16, 2015	Nov. 15, 2016
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 10, 2015	Dec. 09, 2016
Preamplifier	Burgeon	BPA-530	SN:100219	Sep. 10, 2015	Sep. 09, 2016
Preamplifier	Agilent	83017A	MY39501308	Oct. 02, 2015	Oct. 01, 2016
Preamplifier	EMC	EMC184045B	980192	Sep. 01, 2015	Aug. 31, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 10, 2015	Dec. 09, 2016
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 10, 2015	Dec. 09, 2016
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 10, 2015	Dec. 09, 2016
Measurement Software	AUDIX	e3	6.120210g	NA	NA

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

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. 21, 2015	Oct. 20, 2016
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 13, 2015	Nov. 12, 2016
RF Cable-CON	EMC	EMCCFD300-BM-BM-6000	50821	Dec. 21, 2015	Dec. 20, 2016
Measurement Software	AUDIX	e3	6.120210k	NA	NA

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