

FCC Test Report

Equipment : Bluetooth stereo headset
Brand Name : Sennheiser
Model No. : URBANITE XL WIRELESS
FCC ID : DMOHD4BT4
Standard : 47 CFR FCC Part 15.247
Operating Band : 2400 MHz – 2483.5 MHz
FCC Classification : DSS
Applicant : Sennheiser Communications A/S
Industriparken 27, Ballerup 2750 , Denmark

The product sample received on Aug. 18, 2014 and completely tested on Sep. 01, 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:

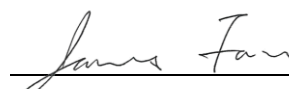

James Fan / Assistant Manager



Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information.....	5
1.2	Accessories and Support Equipment	7
1.3	Testing Applied Standards	7
1.4	Testing Location Information	8
1.5	Measurement Uncertainty	8
2	TEST CONFIGURATION OF EUT.....	9
2.1	The Worst Case Modulation Configuration	9
2.2	The Worst Case Power Setting Parameter	9
2.3	The Worst Case Measurement Configuration.....	9
2.4	Test Setup Diagram	10
3	TRANSMITTER TEST RESULT	11
3.1	AC Power-line Conducted Emissions	11
3.2	20dB Bandwidth and Carrier Frequency Separation.....	14
3.3	Number of Hopping Frequencies	16
3.4	Time of Occupancy (Dwell Time)	18
3.5	RF Output Power.....	20
3.6	Emissions in Non-restricted Frequency Bands	23
3.7	Transmitter Radiated Unwanted Emissions	28
4	TEST EQUIPMENT AND CALIBRATION DATA	45

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]:0.1516180MHz 44.88 (Margin 11.03dB) - AV 53.73 (Margin 12.18dB) - QP	FCC 15.207	Complied
3.2	15.247(a)	20dB Bandwidth	1.2696 MHz	N/A	Complied
3.2	15.247(a)	Carrier Frequency Separation (ChS)	1.0029 MHz	$ChS \geq BW_{20dB} \times 2/3$.	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)	0.319 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] 8.56	Power [dBm] 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
0	15.247(c)	Transmitter Unwanted Emissions	Restricted Bands [dBuV/m at 3m]: 48.43MHz 34.42 (Margin 5.58dB) - PK	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 (V4.0)	2402-2480	0-78 [79]	8.56
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: Low energy mode is not supported. Note 4: RF output power specifies that Maximum Peak Conducted Output Power. Note 5: The device supports wireless and wired earphone function. When the audio cable is connected with device and host, wireless function will be disabled. Thus, audio cable is not evaluated with device in this report.				

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	Gain (dBi)
1	Integral	Printed	2

1.1.3 Type of EUT

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

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
☒ Operated normally hopping mode for worst duty cycle	
☒ Operated test mode for worst duty cycle	
Test Signal Duty Cycle (x)	Power Duty Factor [dB] – (10 log 1/x)
☒ 79.65% - normally hopping - BR-1Mbps	0.99
☒ 80.65% - normally hopping - EDR-2Mbps	0.93
☒ 80.43% - normally hopping - EDR-3Mbps	0.95
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

Supply Supply Type	3.7Vdc from battery.
--------------------	----------------------

1.2 Accessories and Support Equipment

Accessories				
No.	Equipment	Brand Name	Model Name	Specification
1	Lithium battery	Synergy	AHB62254OPCT-02	Rating: 3.7Vdc, 600mAh
2	Micro USB Cable	---	---	1.2m shielded w/o core.
3	Audio cable	---	---	1.2m

Support Equipment				
No.	Equipment	Brand Name	Model Name	Serial No.
1	Notebook	DELL	E6430	---

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
Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-HY	Aaron Liang	24°C / 64%	Sep. 01, 2014
AC Conduction	CO04-HY	Skys Huang	22°C / 64%	Aug. 29, 2014
Radiated Emission	03CH03-HY	Mark Liao	25°C / 65%	Aug. 26 ~ Aug. 27, 2014

➤ FCC site registration No.: 643075

➤ IC site registration No.: 4086B-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	8.56	BT-1M
EDR	1	2 Mbps	EDR-2Mbps	7.89	
EDR	1	3 Mbps	EDR-3Mbps	8.06	
Note 1: Bluetooth BR uses a combination of GFSK (1Mbps).					
Note 2: Bluetooth EDR uses a combination of $\pi/4$ -DQPSK (2Mbps) and 8DPSK (3Mbps).					
Note 3: Modulation modes consist below configuration:					
FHSS BR-1Mbps: GFSK (1Mbps), EDR-2Mbps: $\pi/4$ -DQPSK (2Mbps), EDR-3Mbps: 8DPSK(3Mbps)					
Note 4: RF output power specifies that Maximum Peak Conducted Output Power.					

2.2 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter			
Test Software Version	Blue Test3: 2.5.0.93		
Modulation Mode	2402 MHz	2440 MHz	2480 MHz
BR,1Mbps	255,63	255,63	255,63
EDR,2Mbps	255,125	255,125	255,125
EDR,3Mbps	255,125	255,125	255,125

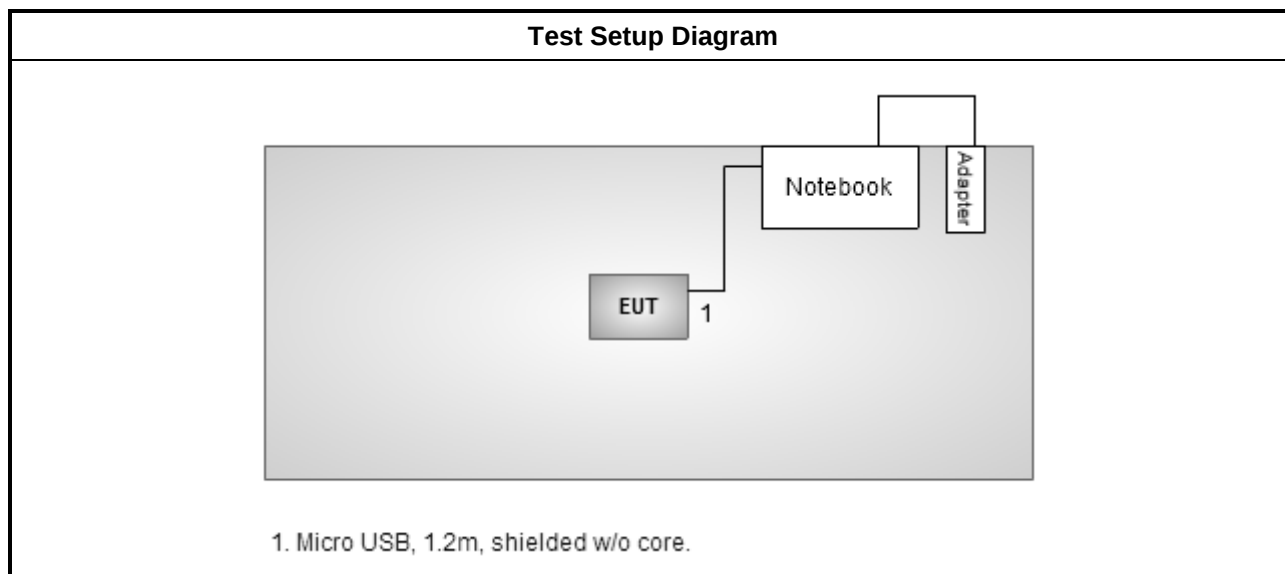
2.3 The Worst Case Measurement Configuration

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), charging with NB via USB

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
Operating Mode	Operating Mode Description
1	Radio link (BT), charging with NB via USB

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 Z.		
	☒ EUT is a battery-powered devices and operating multiple positions. EUT shall be performed two or three orthogonal planes. The worst planes is Z.		
Modulation Mode	BR-1Mbps, EDR-3Mbps		
Operating Mode	☒ 1. Radio link (BT), charging with NB via USB		
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.

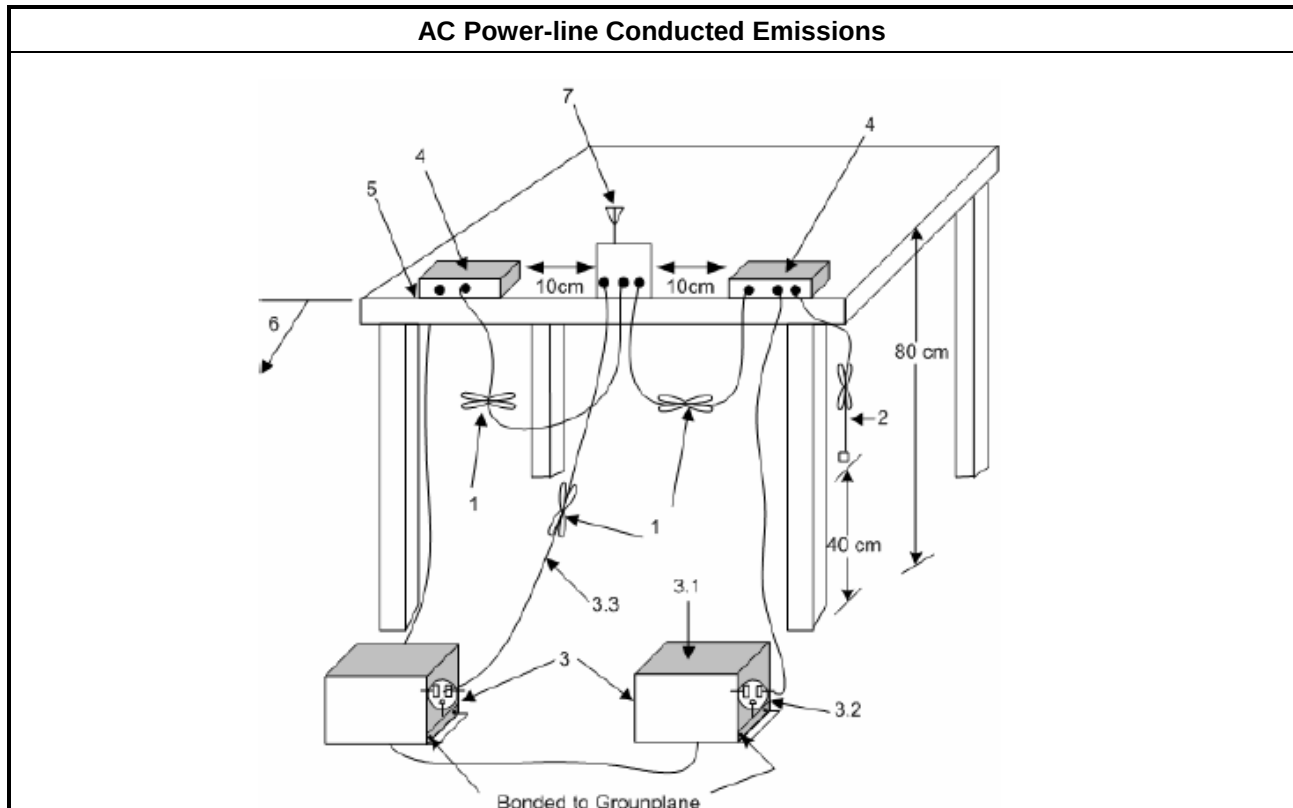
3.1.2 Measuring Instruments

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

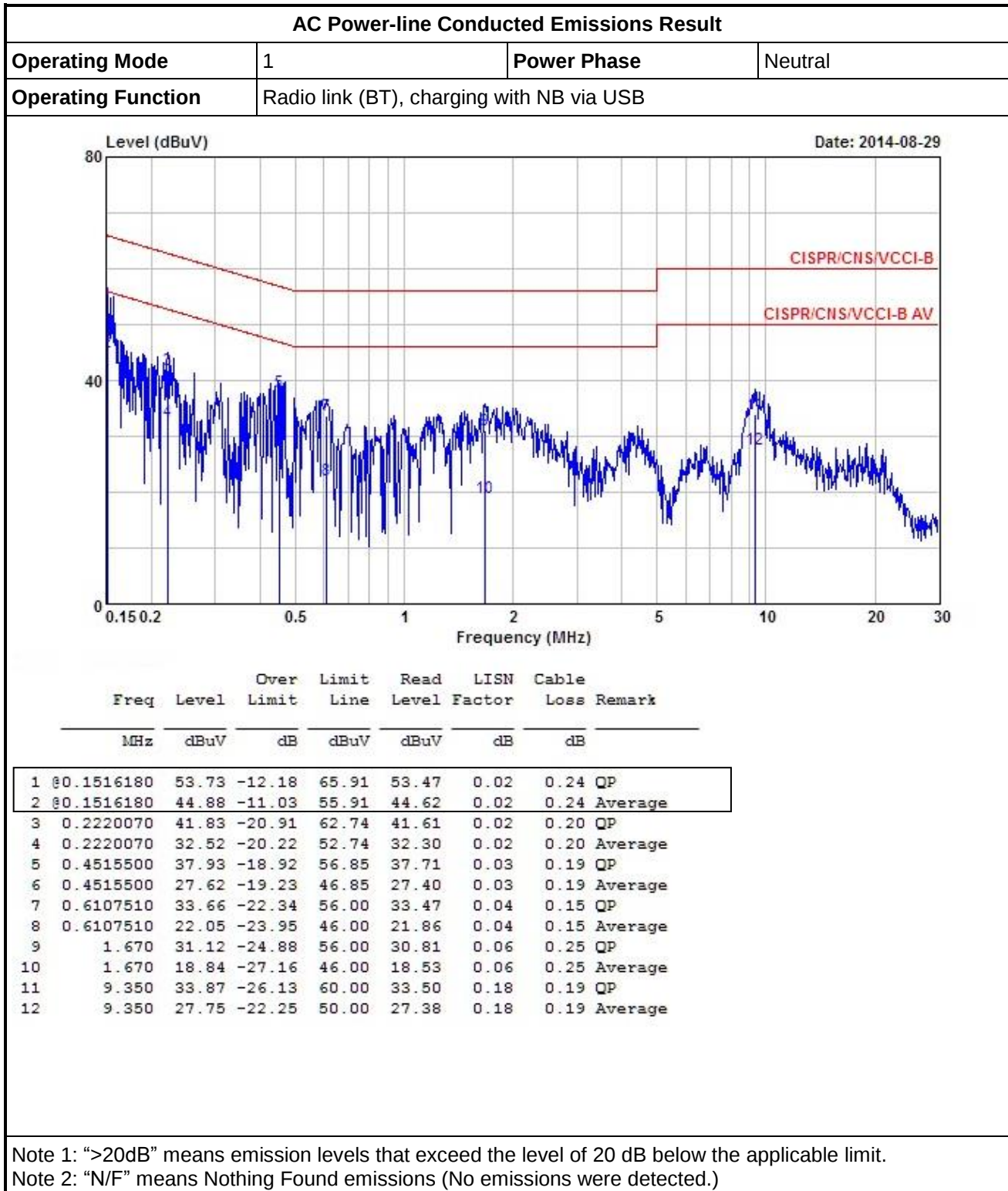
3.1.3 Test Procedures

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

3.1.4 Test Setup

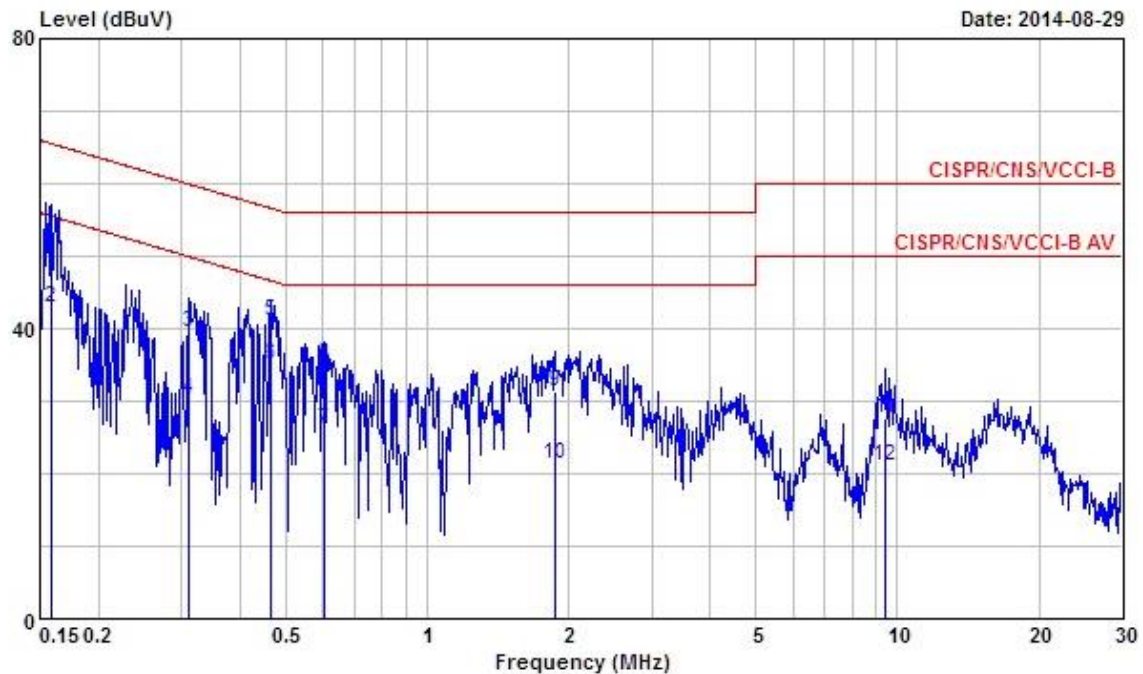


3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	Radio link (BT), charging with NB via USB		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1590020	53.53	-11.99	65.52	53.27	0.03	0.23	QP
2	0.1590020	43.02	-12.50	55.52	42.76	0.03	0.23	Average
3	0.3117360	39.54	-20.38	59.92	39.31	0.03	0.20	QP
4	0.3117360	30.23	-19.69	49.92	30.00	0.03	0.20	Average
5	0.4636720	41.15	-15.48	56.63	40.94	0.03	0.18	QP
6	0.4636720	35.00	-11.63	46.63	34.79	0.03	0.18	Average
7	0.6011200	25.96	-20.04	46.00	25.76	0.04	0.16	Average
8	0.6011200	35.02	-20.98	56.00	34.82	0.04	0.16	QP
9	1.870	31.36	-24.64	56.00	31.01	0.07	0.28	QP
10	1.870	21.23	-24.77	46.00	20.88	0.07	0.28	Average
11	9.450	27.60	-32.40	60.00	27.23	0.18	0.19	QP
12	9.450	20.99	-29.01	50.00	20.62	0.18	0.19	Average

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

Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)

3.2 20dB Bandwidth and Carrier Frequency Separation

3.2.1 20dB Bandwidth and Carrier Frequency Separation Limit

20dB Bandwidth and Carrier Frequency Separation Limit for Frequency Hopping Systems	
☒	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	

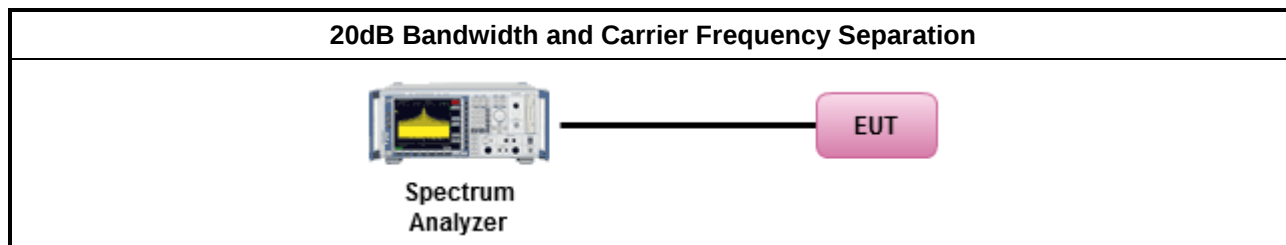
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

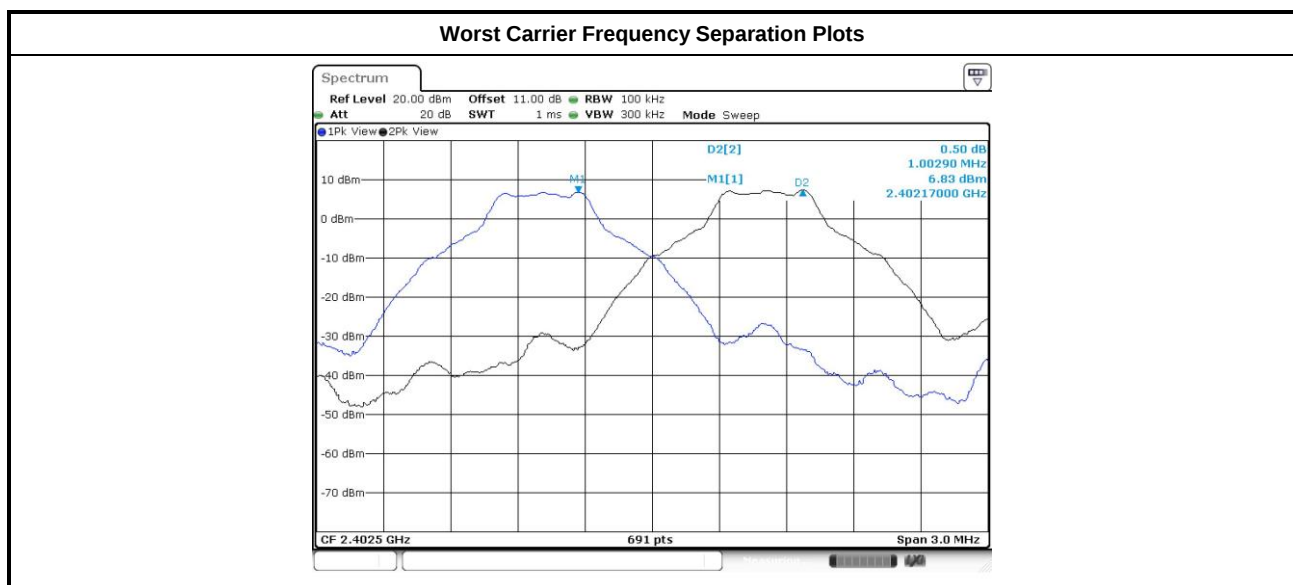
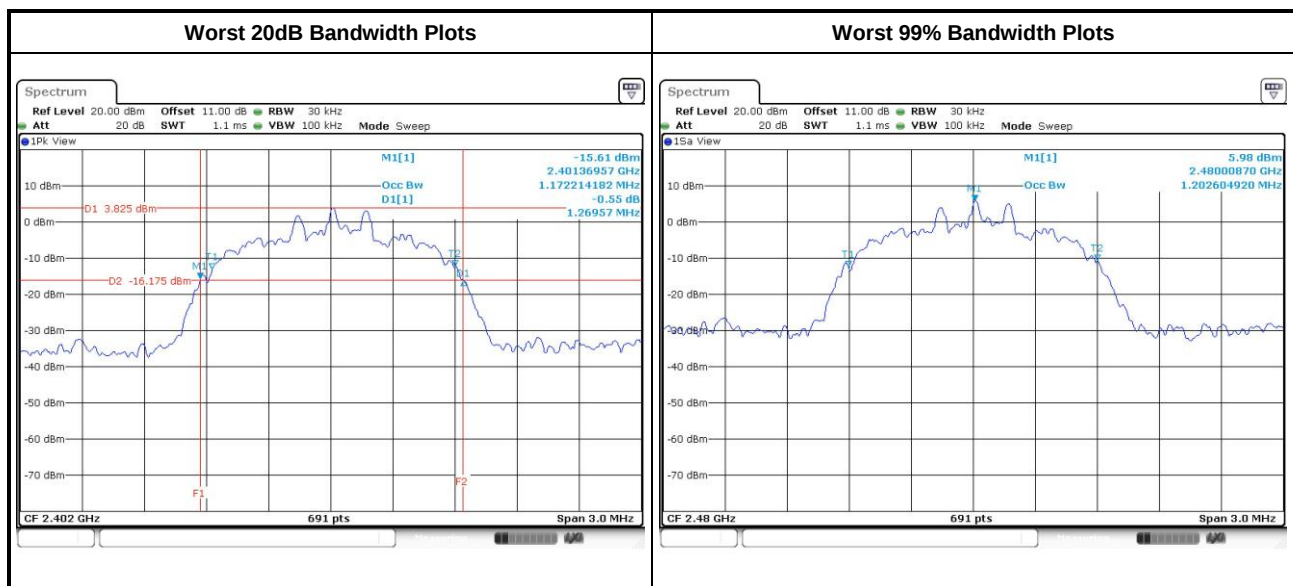
Test Method	
☒	Refer as ANSI C63.10, clause 6.9.1 for 20 dB bandwidth measurement.
☒	Refer as ANSI C63.10, clause 7.7.2 for carrier frequency separation measurement.
☒	For conducted measurement.
☒	The EUT supports single transmit chain and measurements performed on this transmit chain.
☐	The EUT supports 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	0.9435	0.8640	1.0029	0.629
BR,1Mbps	2441	0.9391	0.8596	1.0029	0.626
BR,1Mbps	2480	0.9348	0.8596	1.0029	0.623
EDR-3Mbps	2402	1.2696	1.1722	1.0029	0.846
EDR-3Mbps	2441	1.2609	1.1983	1.0029	0.841
EDR-3Mbps	2480	1.2565	1.2026	1.0029	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	

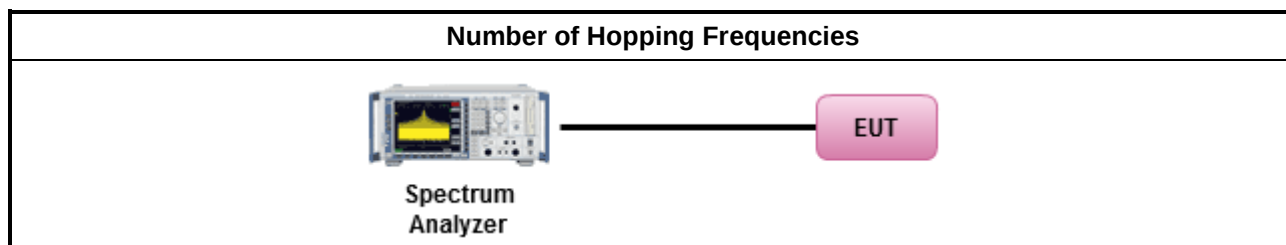
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

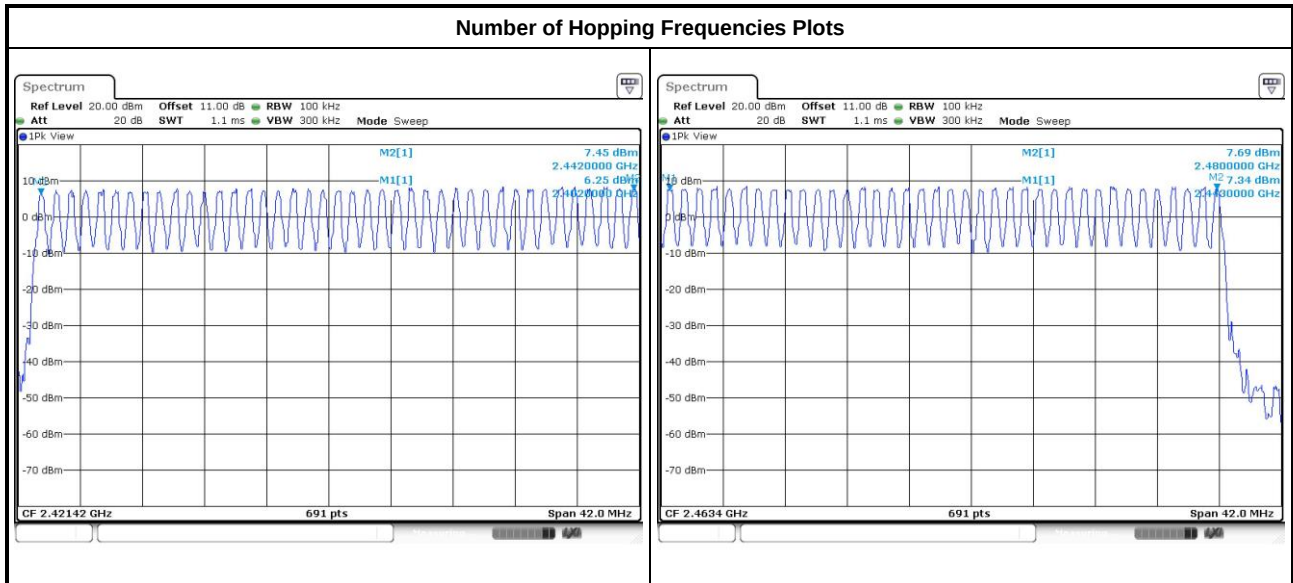
Test Method	
☒	Refer as ANSI C63.10, clause 7.7.3 for number of hopping frequencies measurement.
☒	For conducted measurement.
☒	The EUT supports single transmit chain and measurements performed on this transmit chain.
☐	The EUT supports diversity transmitting and the results on transmit chain port 1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

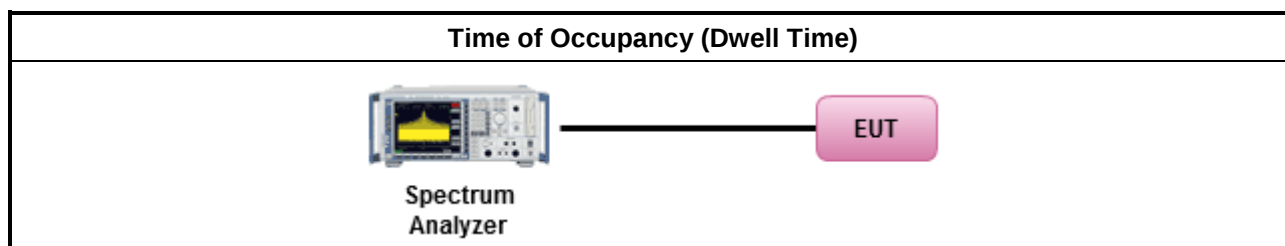
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

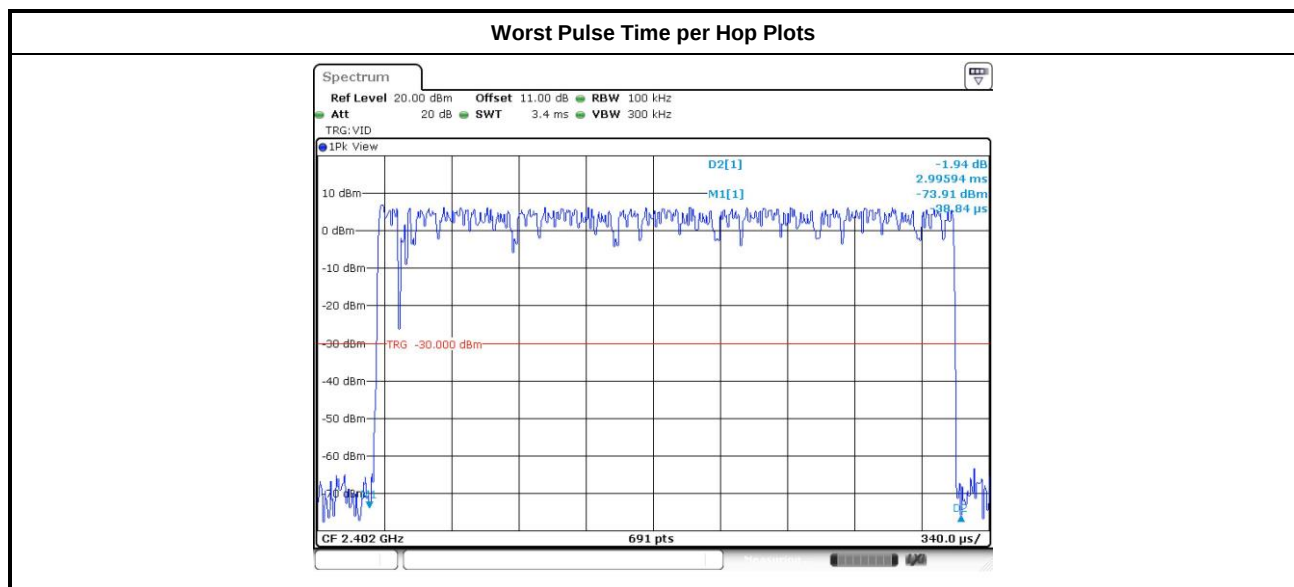
Test Method	
☒	Refer as ANSI C63.10, clause 7.7.4 for dwell time measurement.
☒	Bluetooth ACL packets can be 1, 3, or 5 time slots. Following as dwell time. Operate DH5 at maximum dwell time and maximum duty cycle.
☒	The DH1 packet can cover a single time slot. A maximum length packet has duration of 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)
BR-1Mbps	2402	2.99	106.7	0.319	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	

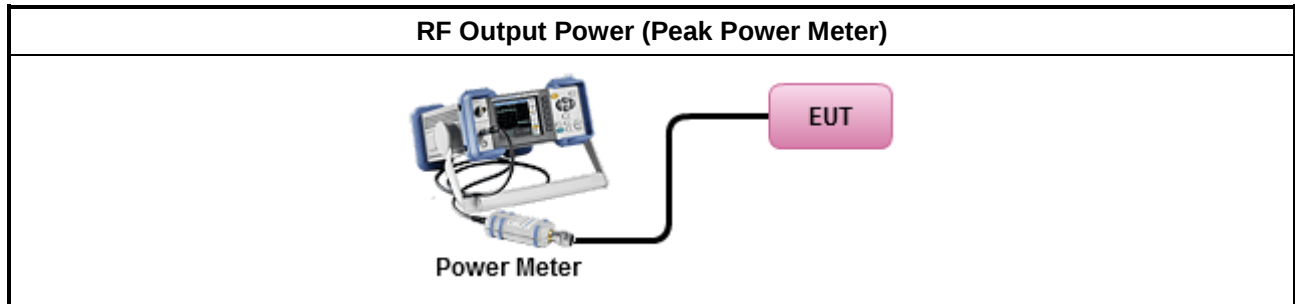
3.5.2 Measuring Instruments

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	6.99	21	2.00	8.99	27
BR-1Mbps	2440	8.38	21	2.00	10.38	27
BR-1Mbps	2480	8.56	21	2.00	10.56	27
EDR-2Mbps	2402	5.95	21	2.00	7.95	27
EDR-2Mbps	2440	7.73	21	2.00	9.73	27
EDR-2Mbps	2480	7.89	21	2.00	9.89	27
EDR-3Mbps	2402	6.25	21	2.00	8.25	27
EDR-3Mbps	2441	7.85	21	2.00	9.85	27
EDR-3Mbps	2480	8.06	21	2.00	10.06	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	6.84	21	2.00	8.84	27
BR-1Mbps	2440	8.27	21	2.00	10.27	27
BR-1Mbps	2480	8.47	21	2.00	10.47	27
EDR-2Mbps	2402	3.93	21	2.00	5.93	27
EDR-2Mbps	2440	6.09	21	2.00	8.09	27
EDR-2Mbps	2480	6.29	21	2.00	8.29	27
EDR-3Mbps	2402	3.97	21	2.00	5.97	27
EDR-3Mbps	2441	6.11	21	2.00	8.11	27
EDR-3Mbps	2480	6.30	21	2.00	8.30	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

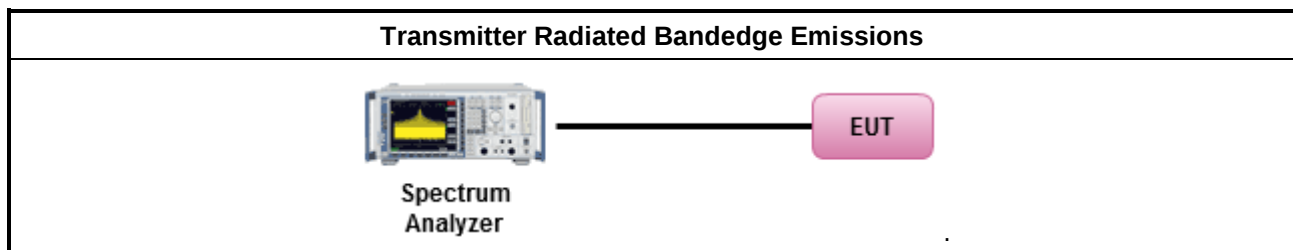
Reference level measurement

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

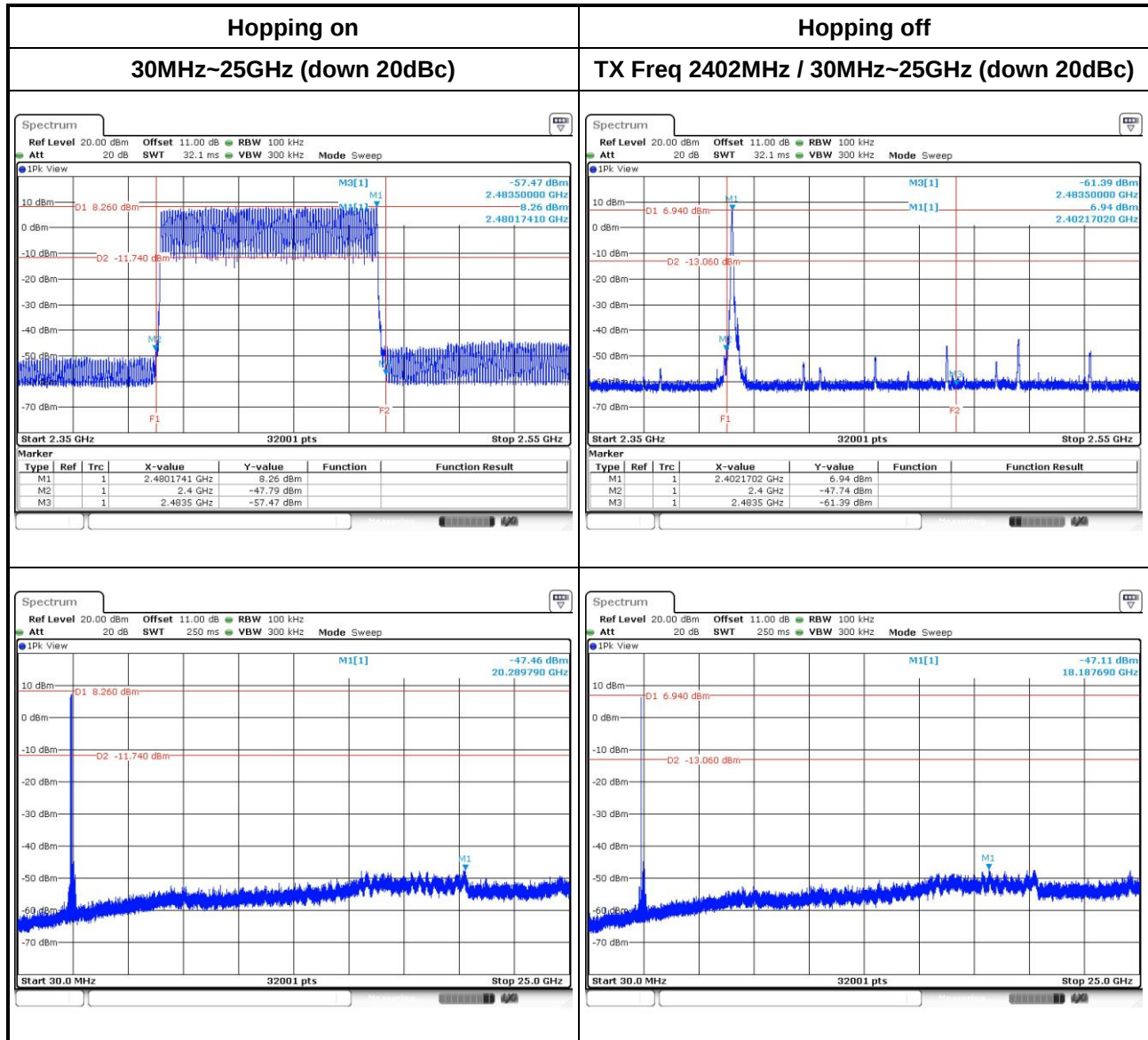
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.6.4 Test Setup



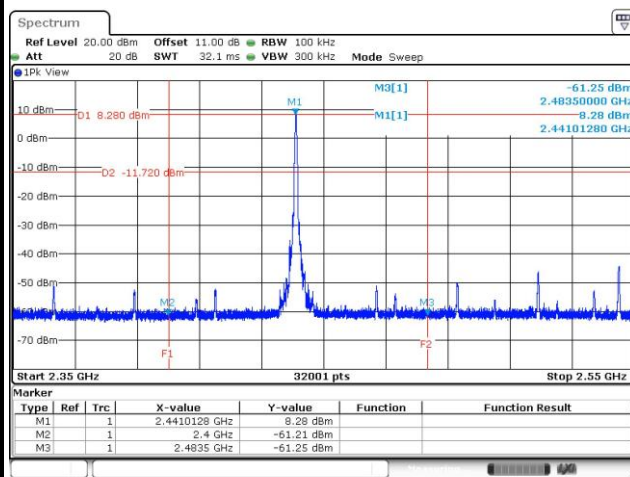
3.6.5 Test Result of Emissions in Non-restricted Frequency Bands

GFSK



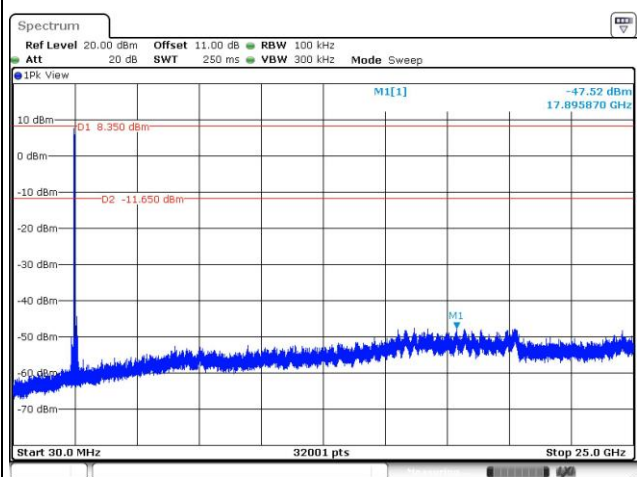
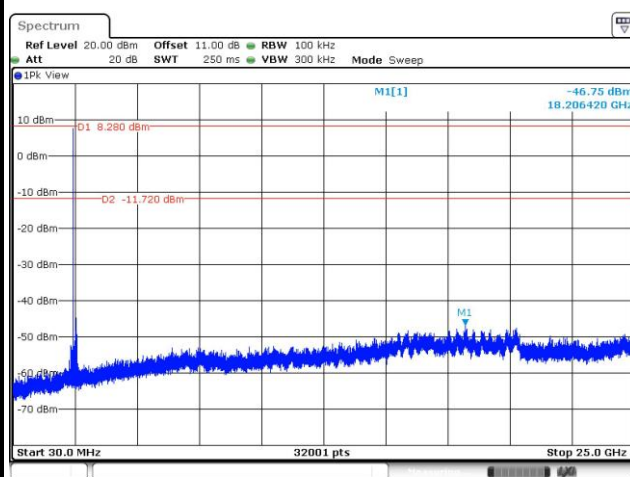
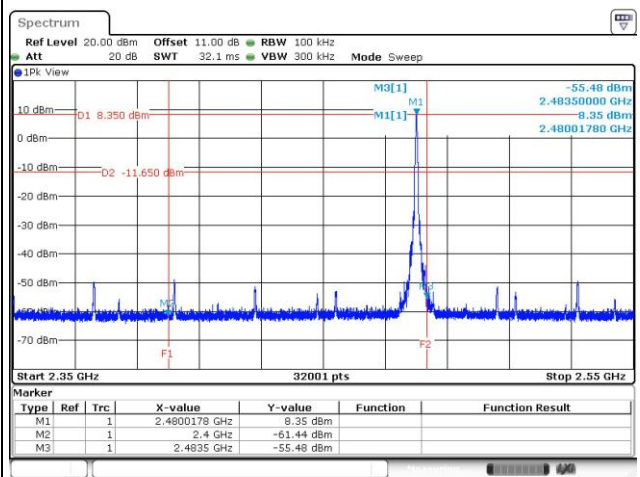
Hopping off

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

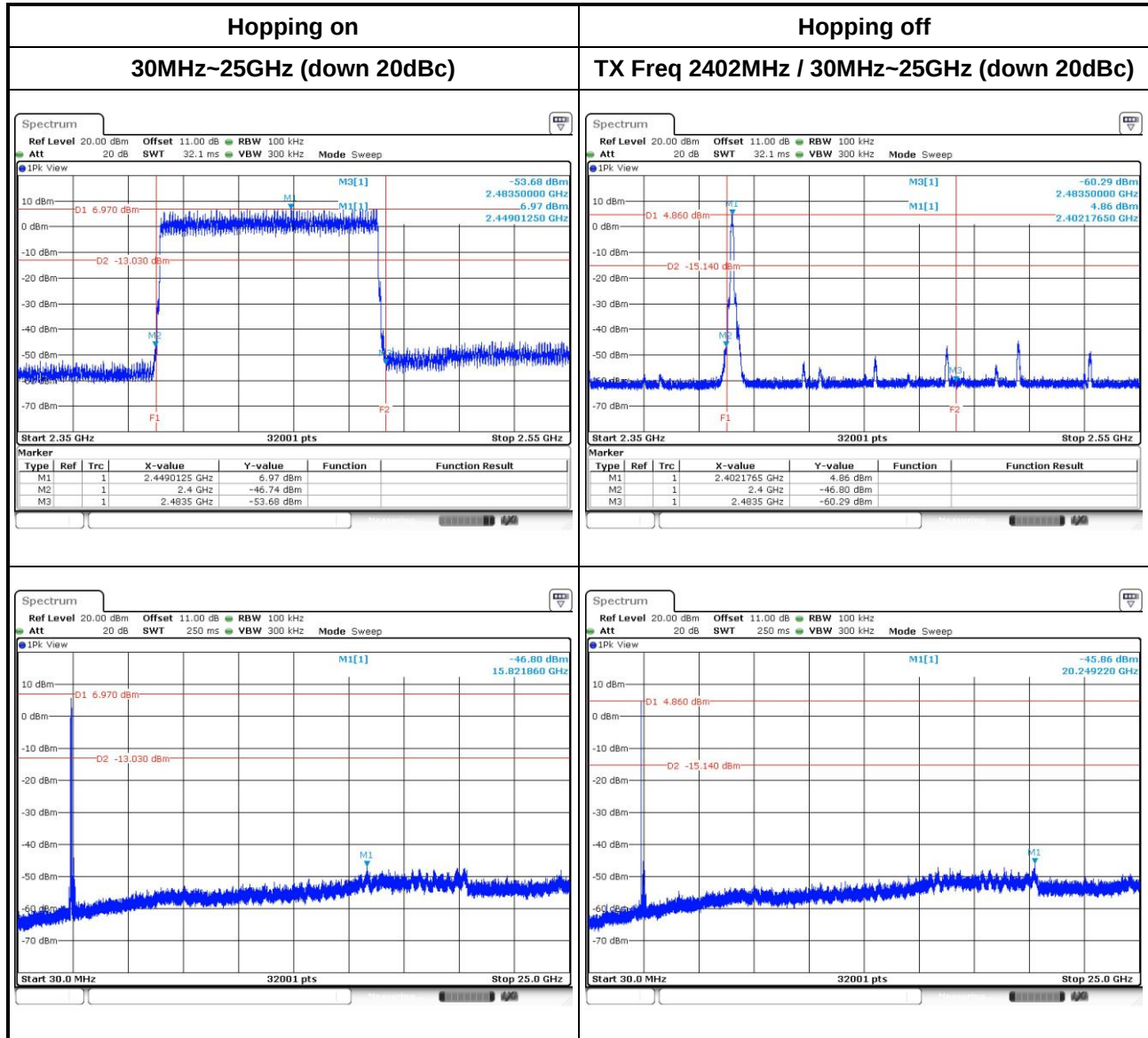


Hopping off

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

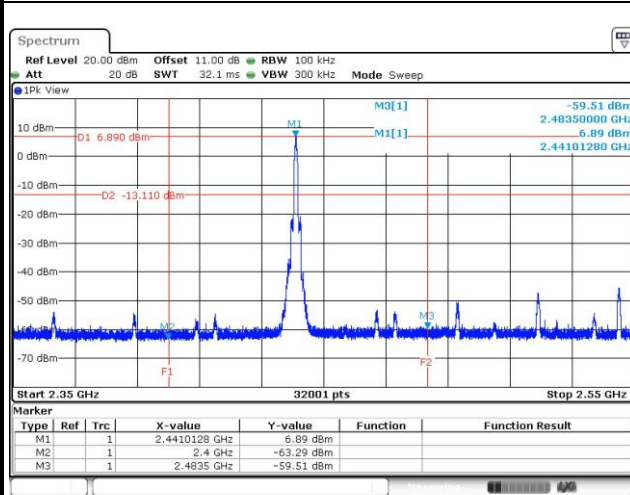


8DPSK



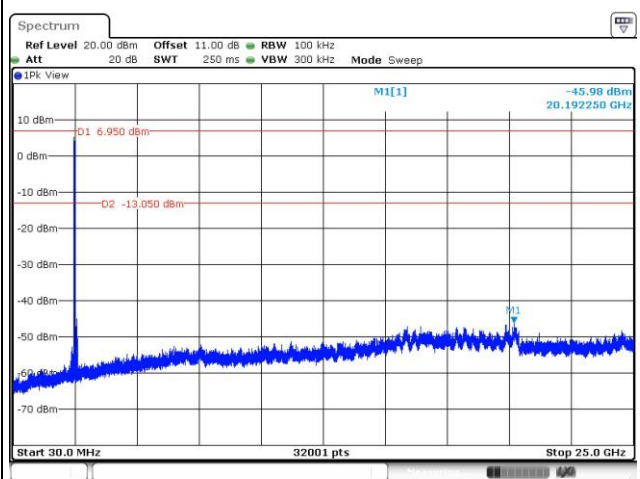
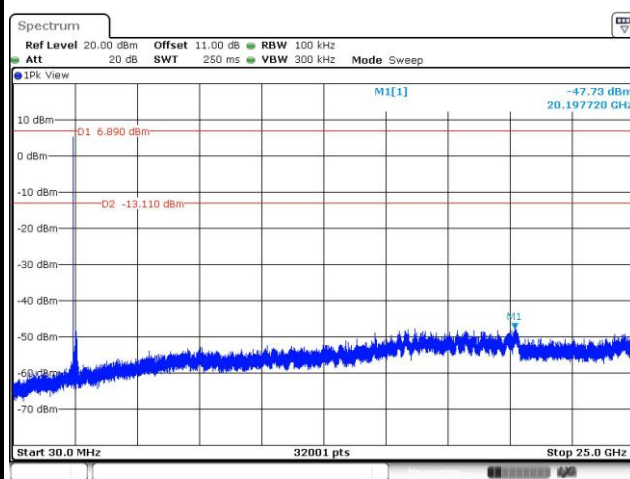
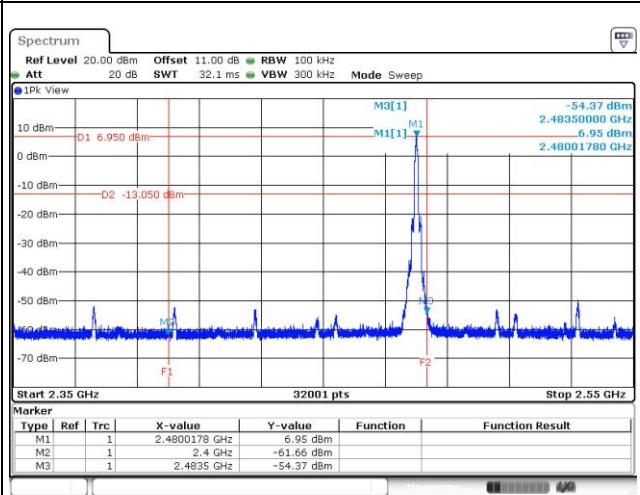
Hopping off

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

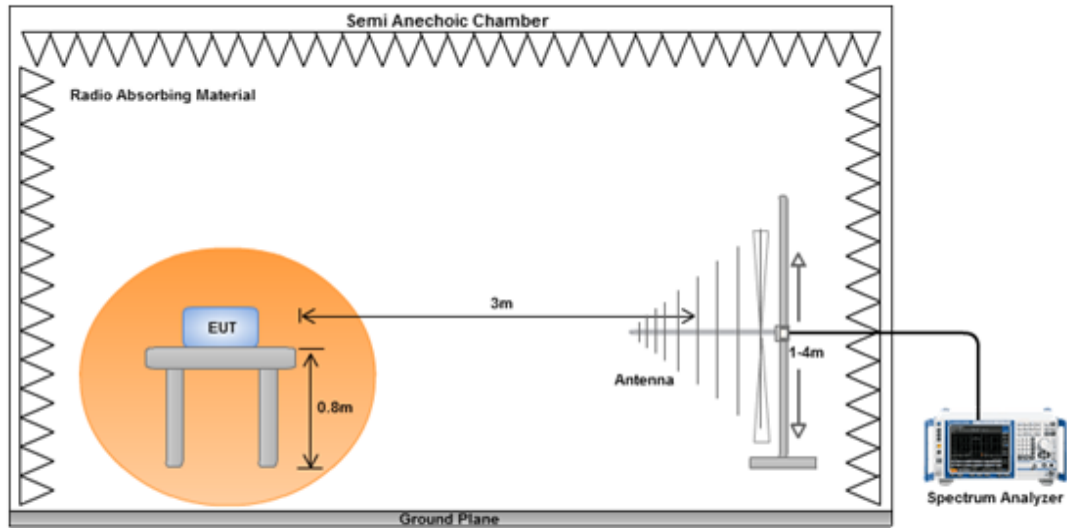
Refer a test equipment and calibration data table in this test report.

3.7.3 Test Procedures

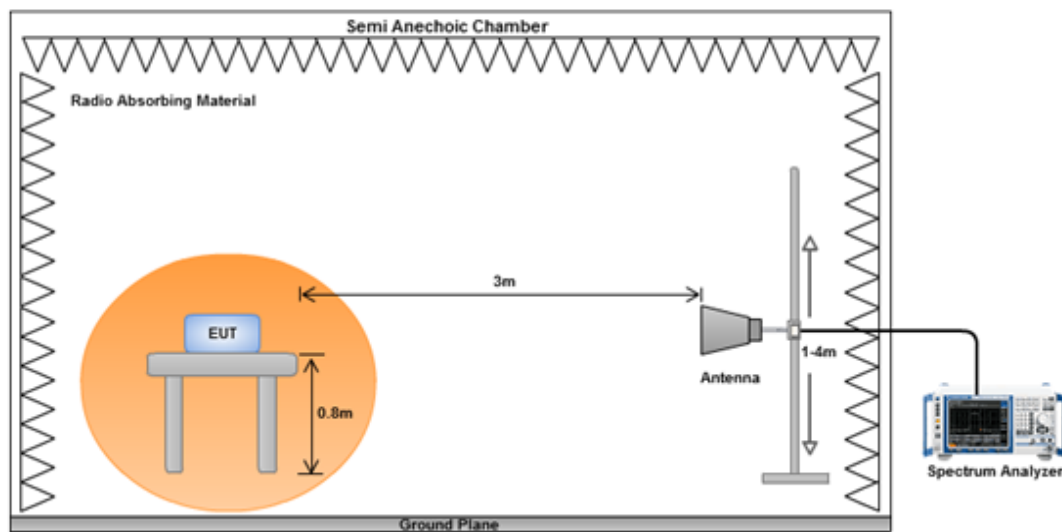
Test Method – General Information	
☒	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, 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



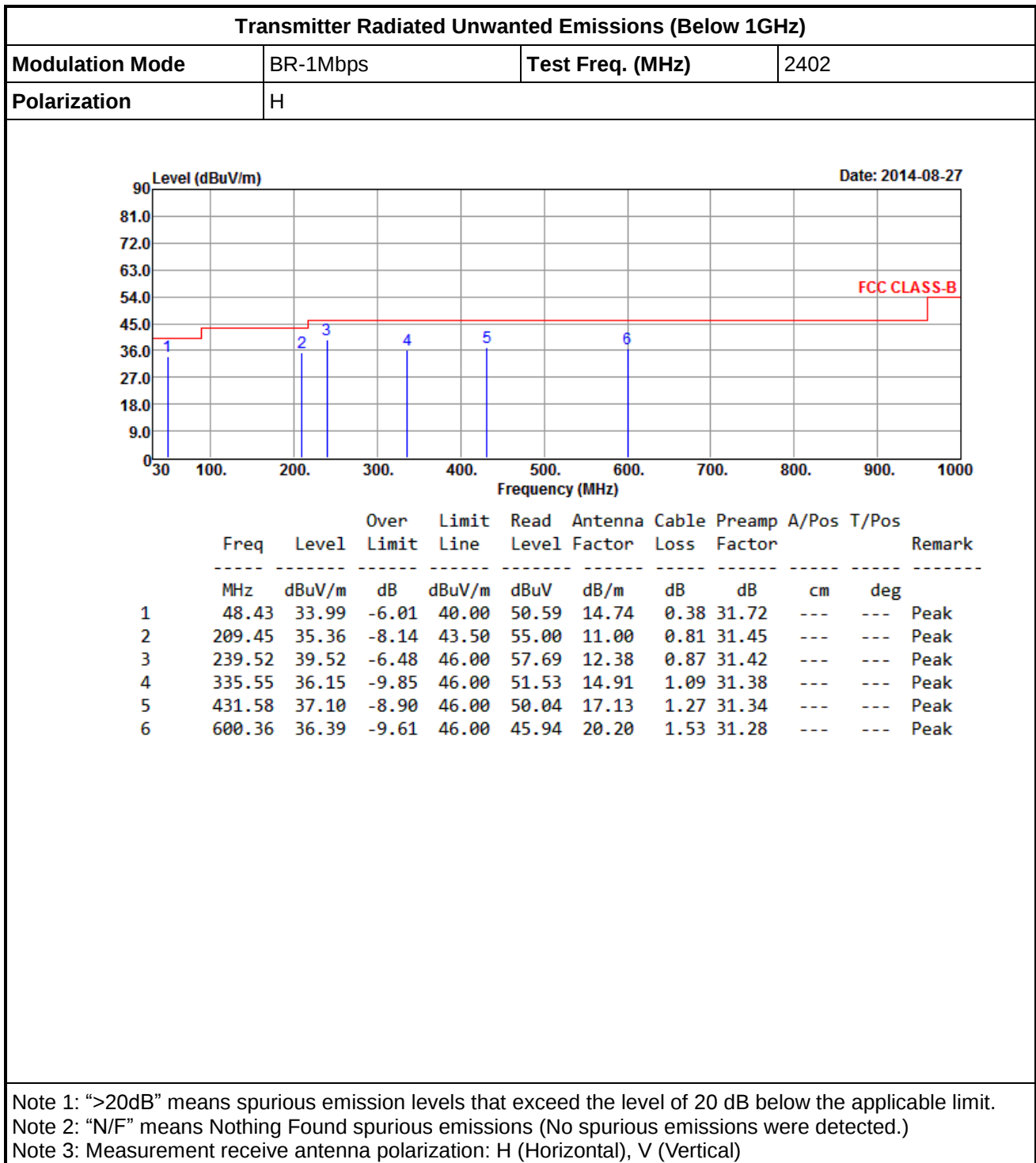
Radiated Emissions above 1 GHz



3.7.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

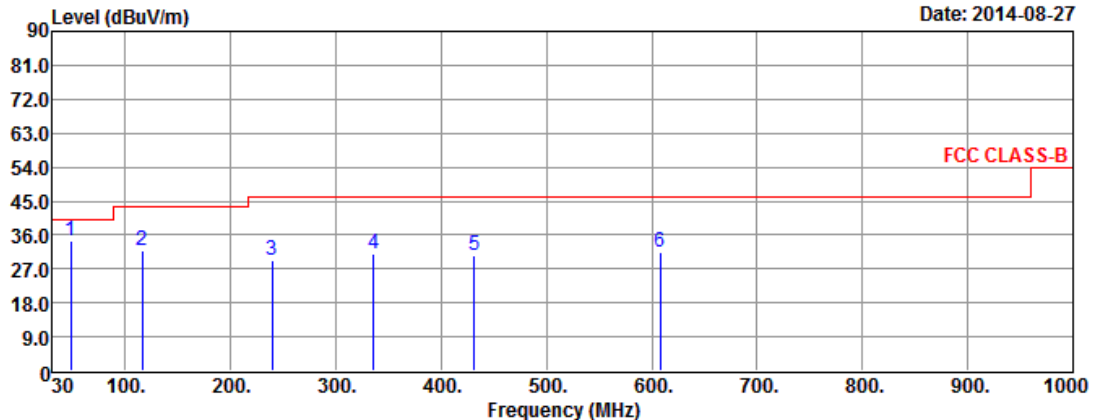
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

3.7.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)



Transmitter Radiated Unwanted Emissions (Below 1GHz)

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



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamplifier	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	48.43	34.42	-5.58	40.00	51.02	14.74	0.38	31.72	---	---	Peak
2	116.33	32.03	-11.47	43.50	51.55	11.43	0.61	31.56	---	---	Peak
3	239.52	29.41	-16.59	46.00	47.58	12.38	0.87	31.42	---	---	Peak
4	335.55	30.91	-15.09	46.00	46.29	14.91	1.09	31.38	---	---	Peak
5	431.58	30.42	-15.58	46.00	43.36	17.13	1.27	31.34	---	---	Peak
6	608.12	31.47	-14.53	46.00	40.90	20.30	1.54	31.27	---	---	Peak

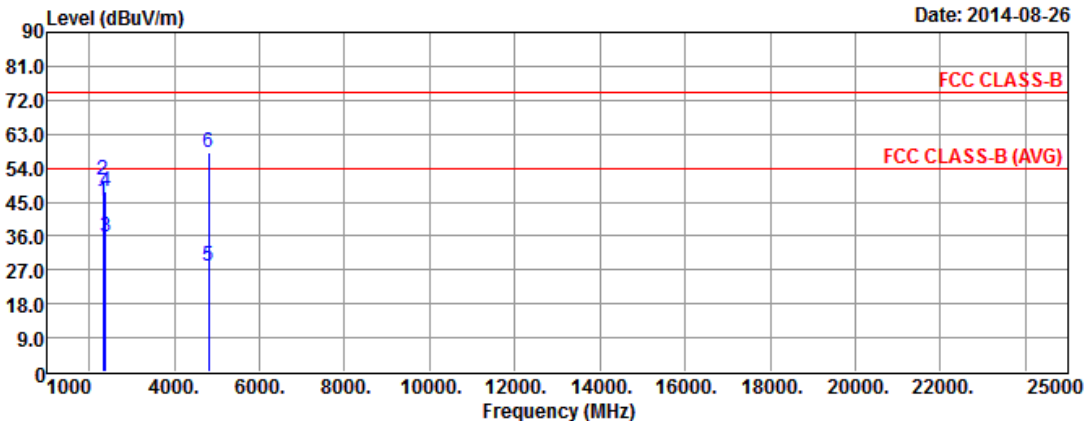
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

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				



Date: 2014-08-26

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamplifier	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2323.00	45.07	-8.93	54.00	49.01	26.48	4.45	34.87	---	---	Average
2	2323.00	50.71	-23.29	74.00	54.65	26.48	4.45	34.87	---	---	Peak
3	2390.00	35.54	-18.46	54.00	39.22	26.64	4.51	34.83	---	---	Average
4	2390.00	47.80	-26.20	74.00	51.48	26.64	4.51	34.83	---	---	Peak
5	4804.00	28.13	-25.87	54.00	23.17	30.99	7.88	33.91	---	---	Average
6	4804.00	58.23	-15.77	74.00	53.27	30.99	7.88	33.91	---	---	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)

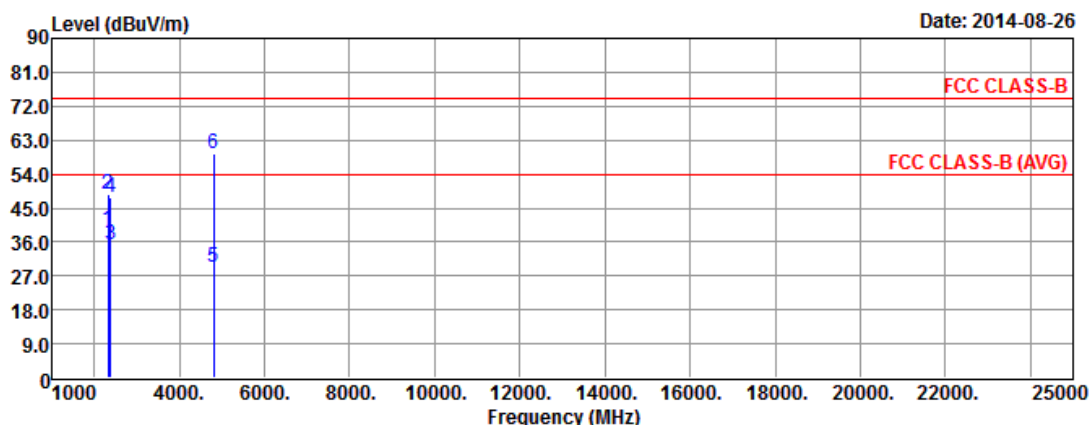
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: 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	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamplifier	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2323.00	39.23	-14.77	54.00	43.17	26.48	4.45	34.87	---	---	Average
2	2323.00	48.62	-25.38	74.00	52.56	26.48	4.45	34.87	---	---	Peak
3	2390.00	35.48	-18.52	54.00	39.16	26.64	4.51	34.83	---	---	Average
4	2390.00	47.74	-26.26	74.00	51.42	26.64	4.51	34.83	---	---	Peak
5	4804.00	29.33	-24.67	54.00	24.37	30.99	7.88	33.91	---	---	Average
6	4804.00	59.43	-14.57	74.00	54.47	30.99	7.88	33.91	---	---	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)

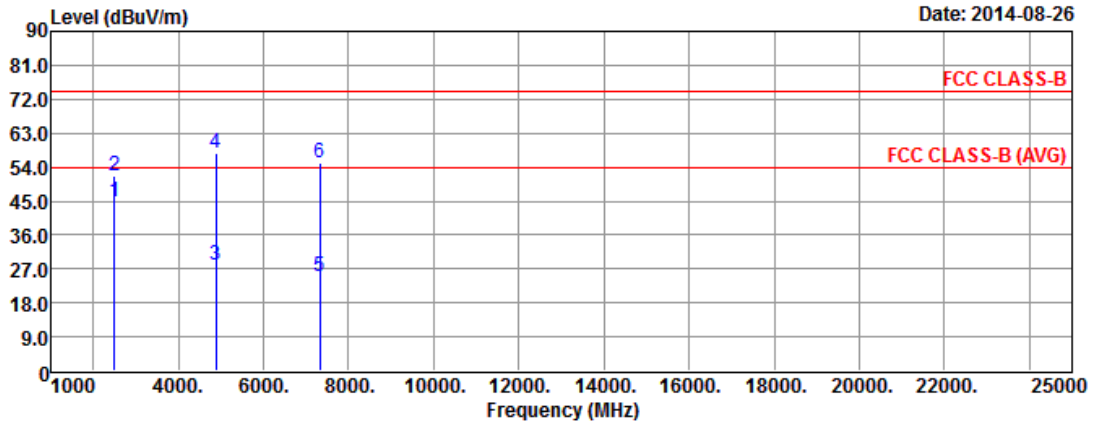
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: 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	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2492.00	44.60	-9.40	54.00	47.86	26.88	4.63	34.77	---	---	Average
2	2492.00	51.66	-22.34	74.00	54.92	26.88	4.63	34.77	---	---	Peak
3	4882.00	27.78	-26.22	54.00	22.66	31.11	7.89	33.88	---	---	Average
4	4882.00	57.88	-16.12	74.00	52.76	31.11	7.89	33.88	---	---	Peak
5	7323.00	25.12	-28.88	54.00	15.78	35.75	8.47	34.88	---	---	Average
6	7323.00	55.22	-18.78	74.00	45.88	35.75	8.47	34.88	---	---	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)

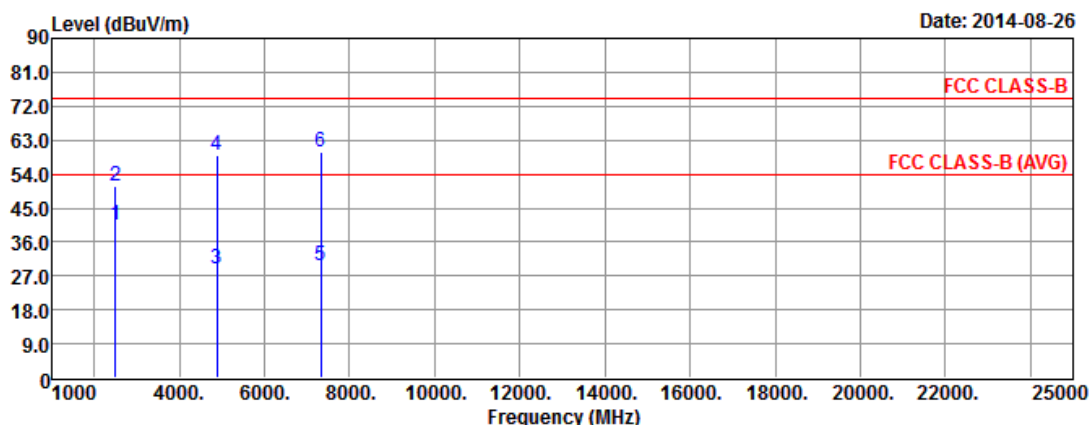
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: 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	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamplifier	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2492.00	40.53	-13.47	54.00	43.79	26.88	4.63	34.77	---	---	Average
2	2492.00	50.63	-23.37	74.00	53.89	26.88	4.63	34.77	---	---	Peak
3	4882.00	28.72	-25.28	54.00	23.60	31.11	7.89	33.88	---	---	Average
4	4882.00	58.82	-15.18	74.00	53.70	31.11	7.89	33.88	---	---	Peak
5	7323.00	29.69	-24.31	54.00	20.35	35.75	8.47	34.88	---	---	Average
6	7323.00	59.79	-14.21	74.00	50.45	35.75	8.47	34.88	---	---	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)

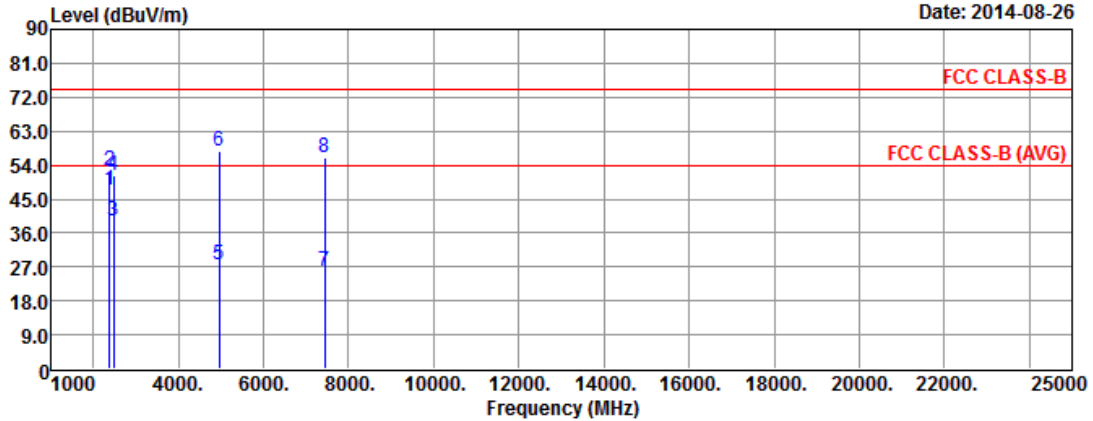
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: 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	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2375.00	47.35	-6.65	54.00	51.09	26.60	4.50	34.84	---	---	Average
2	2375.00	52.39	-21.61	74.00	56.13	26.60	4.50	34.84	---	---	Peak
3	2483.50	38.98	-15.02	54.00	42.28	26.86	4.62	34.78	---	---	Average
4	2483.50	51.28	-22.72	74.00	54.58	26.86	4.62	34.78	---	---	Peak
5	4960.00	27.70	-26.30	54.00	22.42	31.24	7.90	33.86	---	---	Average
6	4960.00	57.80	-16.20	74.00	52.52	31.24	7.90	33.86	---	---	Peak
7	7440.00	25.82	-28.18	54.00	16.23	35.98	8.57	34.96	---	---	Average
8	7440.00	55.92	-18.08	74.00	46.33	35.98	8.57	34.96	---	---	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)

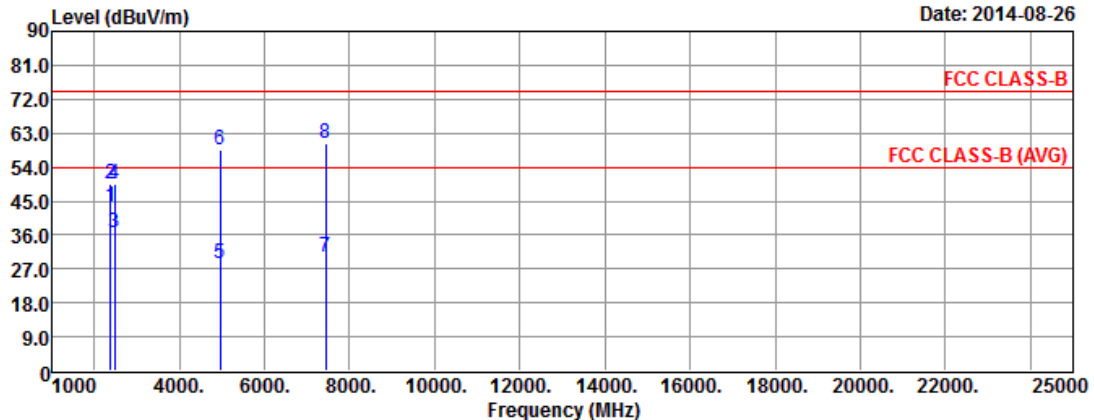
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: 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



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2375.00	43.33	-10.67	54.00	47.07	26.60	4.50	34.84	---	---	Average
2	2375.00	49.59	-24.41	74.00	53.33	26.60	4.50	34.84	---	---	Peak
3	2483.50	36.71	-17.29	54.00	40.01	26.86	4.62	34.78	---	---	Average
4	2483.50	49.51	-24.49	74.00	52.81	26.86	4.62	34.78	---	---	Peak
5	4960.00	28.30	-25.70	54.00	23.02	31.24	7.90	33.86	---	---	Average
6	4960.00	58.40	-15.60	74.00	53.12	31.24	7.90	33.86	---	---	Peak
7	7440.00	29.97	-24.03	54.00	20.38	35.98	8.57	34.96	---	---	Average
8	7440.00	60.07	-13.93	74.00	50.48	35.98	8.57	34.96	---	---	Peak

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

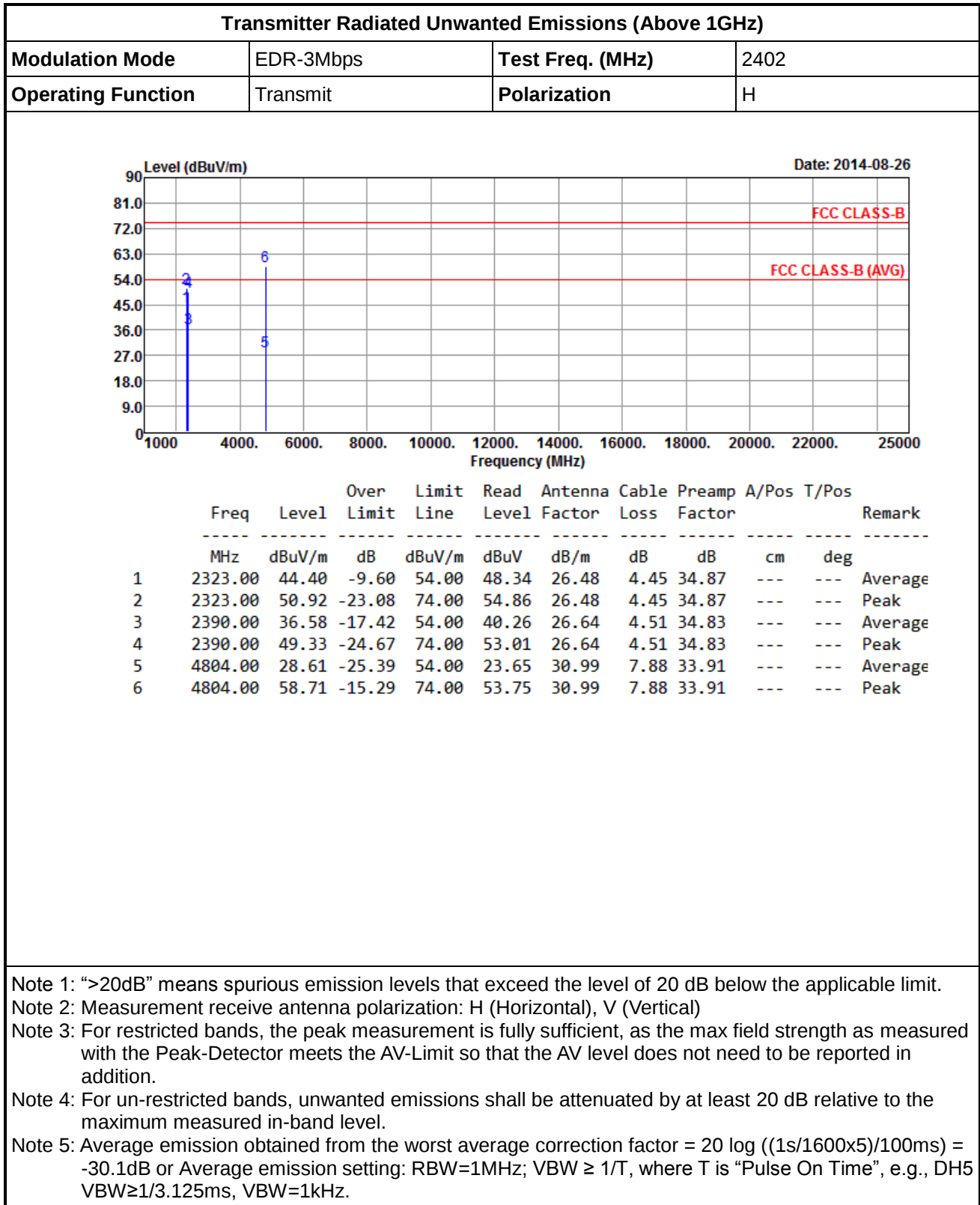
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

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.

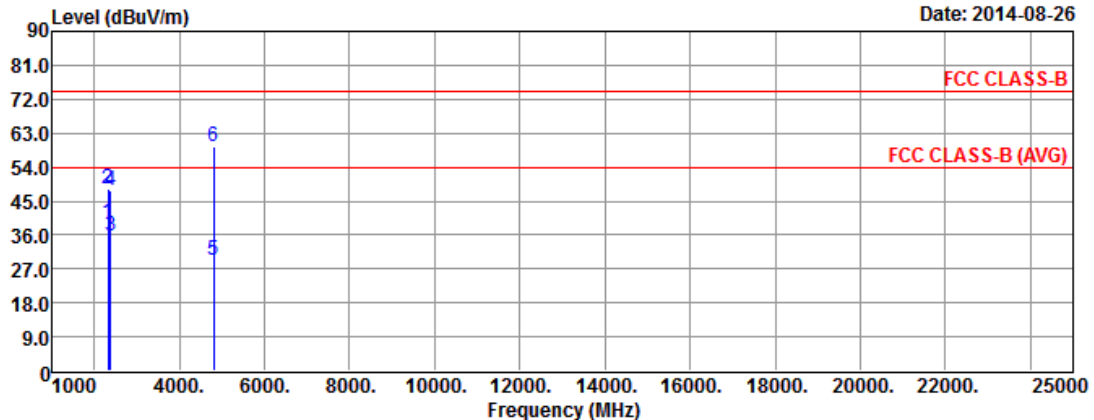
Note 5: Average emission obtained from the worst average correction factor = $20 \log ((1s/1600x5)/100ms) = -30.1dB$ or Average emission setting: RBW=1MHz; VBW $\geq 1/T$, where T is "Pulse On Time", e.g., DH5 VBW $\geq 1/3.125ms$, VBW=1kHz.

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	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamplifier	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2323.00	39.11	-14.89	54.00	43.05	26.48	4.45	34.87	---	---	Average
2	2323.00	48.16	-25.84	74.00	52.10	26.48	4.45	34.87	---	---	Peak
3	2390.00	35.85	-18.15	54.00	39.53	26.64	4.51	34.83	---	---	Average
4	2390.00	47.99	-26.01	74.00	51.67	26.64	4.51	34.83	---	---	Peak
5	4804.00	29.17	-24.83	54.00	24.21	30.99	7.88	33.91	---	---	Average
6	4804.00	59.27	-14.73	74.00	54.31	30.99	7.88	33.91	---	---	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)

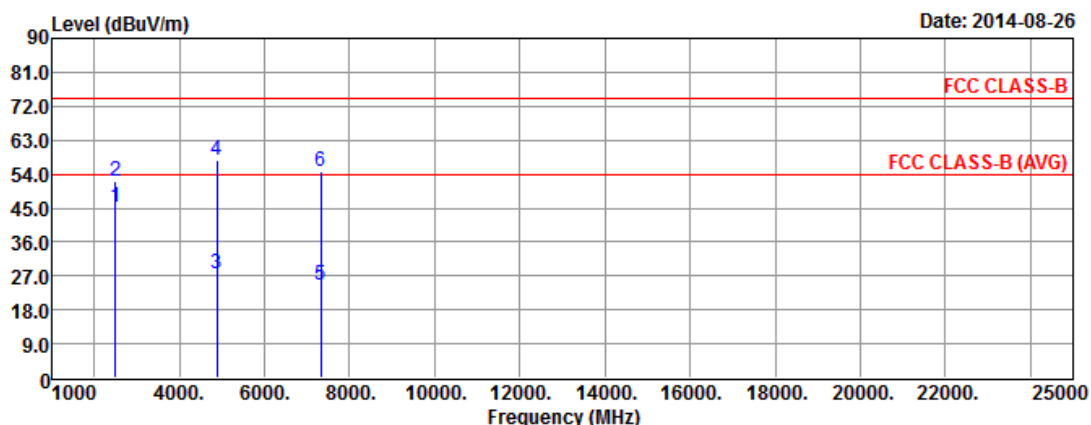
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: 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	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2492.00	45.06	-8.94	54.00	48.32	26.88	4.63	34.77	---	---	Average
2	2492.00	51.97	-22.03	74.00	55.23	26.88	4.63	34.77	---	---	Peak
3	4882.00	27.64	-26.36	54.00	22.52	31.11	7.89	33.88	---	---	Average
4	4882.00	57.74	-16.26	74.00	52.62	31.11	7.89	33.88	---	---	Peak
5	7323.00	24.65	-29.35	54.00	15.31	35.75	8.47	34.88	---	---	Average
6	7323.00	54.75	-19.25	74.00	45.41	35.75	8.47	34.88	---	---	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)

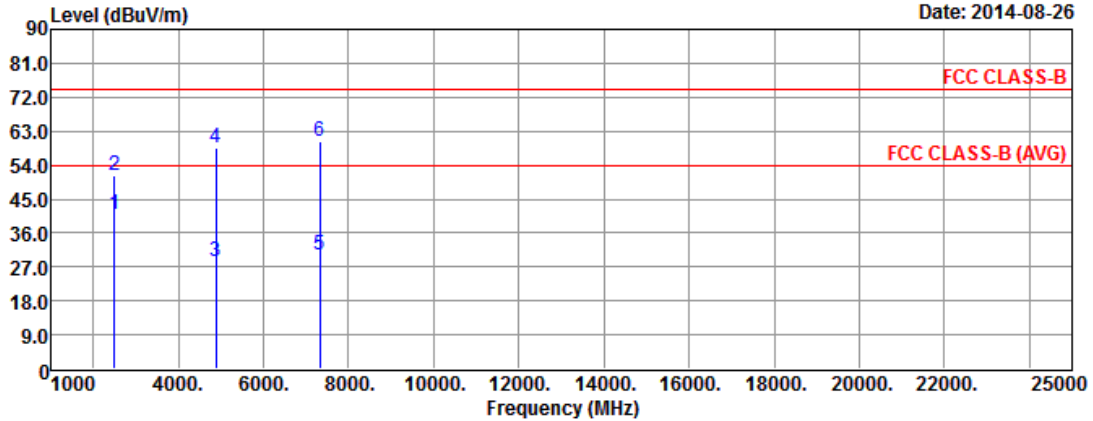
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: 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	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamplifier	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2492.00	40.97	-13.03	54.00	44.23	26.88	4.63	34.77	---	---	Average
2	2492.00	51.11	-22.89	74.00	54.37	26.88	4.63	34.77	---	---	Peak
3	4882.00	28.42	-25.58	54.00	23.30	31.11	7.89	33.88	---	---	Average
4	4882.00	58.52	-15.48	74.00	53.40	31.11	7.89	33.88	---	---	Peak
5	7323.00	30.08	-23.92	54.00	20.74	35.75	8.47	34.88	---	---	Average
6	7323.00	60.18	-13.82	74.00	50.84	35.75	8.47	34.88	---	---	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)

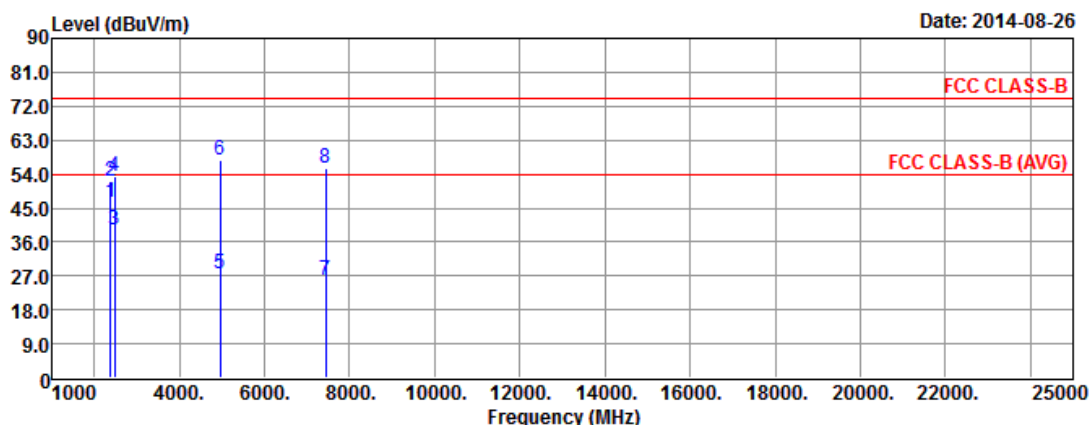
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: 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	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2375.00	46.49	-7.51	54.00	50.23	26.60	4.50	34.84	---	---	Average
2	2375.00	52.06	-21.94	74.00	55.80	26.60	4.50	34.84	---	---	Peak
3	2483.50	39.19	-14.81	54.00	42.49	26.86	4.62	34.78	---	---	Average
4	2483.50	53.25	-20.75	74.00	56.55	26.86	4.62	34.78	---	---	Peak
5	4960.00	27.64	-26.36	54.00	22.36	31.24	7.90	33.86	---	---	Average
6	4960.00	57.74	-16.26	74.00	52.46	31.24	7.90	33.86	---	---	Peak
7	7440.00	25.66	-28.34	54.00	16.07	35.98	8.57	34.96	---	---	Average
8	7440.00	55.76	-18.24	74.00	46.17	35.98	8.57	34.96	---	---	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)

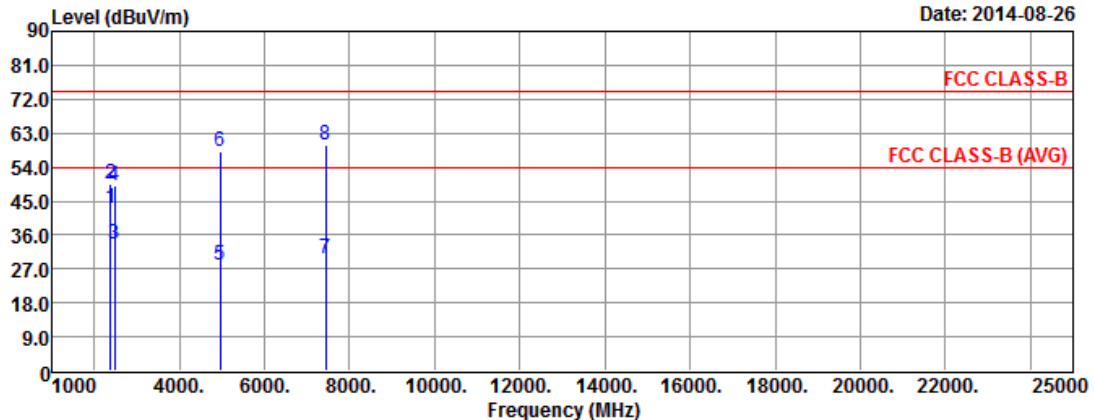
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: 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	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2375.00	43.14	-10.86	54.00	46.88	26.60	4.50	34.84	---	---	Average
2	2375.00	49.33	-24.67	74.00	53.07	26.60	4.50	34.84	---	---	Peak
3	2483.50	33.58	-20.42	54.00	36.88	26.86	4.62	34.78	---	---	Average
4	2483.50	49.12	-24.88	74.00	52.42	26.86	4.62	34.78	---	---	Peak
5	4960.00	27.94	-26.06	54.00	22.66	31.24	7.90	33.86	---	---	Average
6	4960.00	58.04	-15.96	74.00	52.76	31.24	7.90	33.86	---	---	Peak
7	7440.00	29.61	-24.39	54.00	20.02	35.98	8.57	34.96	---	---	Average
8	7440.00	59.71	-14.29	74.00	50.12	35.98	8.57	34.96	---	---	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: 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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz ~ 2.75GHz	Mar. 26, 2014	Conduction (CO04-HY)
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	JAN. 21, 2014	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz ~ 30MHz	Apr. 21, 2014	Conduction (CO04-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	7.61183201e+012	9kHz ~ 30MHz	Oct. 30, 2013	Conduction (CO04-HY)
ISN	TESEQ	ISN T800	30330	9kHz ~ 30MHz	Mar. 06, 2014	Conduction (CO04-HY)
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
CDN	TESEQ	M016	25100	150kHz ~ 26MHz	Feb. 25, 2014	Conduction (CO04-HY)
CDN	TESEQ	M016	25103	150kHz ~ 26MHz	Feb. 25, 2014	Conduction (CO04-HY)
50 ohm terminal	N/A	N/A	TM012	N/A	Feb. 25, 2014	Conduction (CO04-HY)
50 ohm terminal	N/A	N/A	CON-04-02	N/A	Feb. 25, 2014	Conduction (CO04-HY)
50 ohm terminal	N/A	N/A	CON-04-03	N/A	Feb. 25, 2014	Conduction (CO04-HY)
50 ohm terminal	N/A	N/A	CON-01-04	N/A	Feb. 25, 2014	Conduction (CO04-HY)
ISN	TESEQ	ISN T400	21653	150kHz ~ 30MHz	Jun. 26, 2014	Conduction (CO04-HY)
Software	Audix	E3	3	Conducted	NCR	Conduction (CO04-HY)



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	Nov. 30, 2013	Radiation (03CH03-HY)
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	May. 05, 2014	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	Aug. 20, 2014	Radiation (03CH03-HY)
Spectrum	R&S	FSP40	100004	9kHz ~ 40GHz	Mar. 27, 2014	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30MHz ~ 1GHz	Sep. 21, 2013	Radiation (03CH03-HY)
Horn Antenna	ETS • LINDGREN	3115	6741	1GHz ~ 18GHz	Jun. 11, 2014	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz ~ 40GHz	Jan. 10, 2014	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Nov. 16, 2013	Radiation (03CH03-HY)
RF Cable-high	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz ~ 40GHz	Dec. 11, 2013	Radiation (03CH03-HY)
Turn Table	EM Electronics	EM Electronics	060615	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	MF	MF-7802	MF780208179	1 ~ 4 m	N/A	Radiation (03CH03-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Amplifier	EM	EM18G40G	060604	18GHz ~ 40GHz	Oct. 17.2013	Radiation (03CH03-HY)
Loop Antenna	TESEQ	HLA 6120	31244	9kHz ~ 30MHz	Dec. 02, 2012	Radiation (03CH03-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSV 40	101063	9KHz~40GHz	Feb. 17, 2014	Conducted (TH01-HY)
Spectrum Analyzer	Agilent	N9010A	MY53400091	9KHz~44GHz	Oct. 07, 2013	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100℃	Nov. 21, 2013	Conducted (TH01-HY)
Signal Generator	R&S	SMB100A	175727	10MHz ~ 40GHz	Jan. 07, 2014	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	1207366	300MHz ~ 40GHz	Oct. 24, 2013	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	1241002	300MHz ~ 40GHz	Oct. 24, 2013	Conducted (TH01-HY)
DC Power Source	G.W.	GPS-3030DD	GEN865896	DC 0V ~ 30V	Nov. 21, 2013	Conducted (TH01-HY)
AC Power Source	G.W	APS-9102	EL920581	AC 0V ~ 300V	Jul. 15, 2014	Conducted (TH01-HY)