

FCC C2PC Test Report

Equipment : Bluetooth + ANC Headphone
Brand Name : Bang & Olufsen
Model No. : BeoPlay H8
FCC ID : TTUBEOPLAYH8
Standard : 47 CFR FCC Part 15.247
Operating Band : 2400 MHz – 2483.5 MHz
FCC Classification : DSS
Applicant : Bang & Olufsen A/S
Peter Bangs Vej 15, DK-7600 Struer, Denmark

The product sample received on Sep. 25, 2015 and completely tested on Oct. 07, 2015. 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:

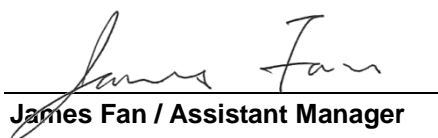

James Fan / Assistant Manager

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	7
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.....	10
2.4	Test Setup Diagram	10
3	TRANSMITTER TEST RESULT	11
3.1	AC Power-line Conducted Emissions	11
3.2	Transmitter Unwanted Emissions.....	14
4	TEST EQUIPMENT AND CALIBRATION DATA	21
	APPENDIX A. TEST PHOTOS	A1~A5

Summary of Test Result

Conformance Test Specifications					
Report Clause	Ref. Std. Clause	Description	Measured	Limit	Result
3.1	15.207	AC Power-line Conducted Emissions	[dBuV]: 0.165MHz 40.89 (Margin 14.32dB) - AV 50.44 (Margin 14.77dB) - QP	FCC 15.207	Complied
3.2	15.247(d)	Transmitter Unwanted Emissions	Restricted Bands [dBuV/m at 3m]: 937.92MHz 34.85 (Margin 11.15dB) - PK	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209.	Complied

Revision History

[illegible]

1 General Description

1.1 Information

This report is prepared for FCC class II Permissive change.

This report is issued as a supplementary report to original Sporton report no. FR4O2304. The difference compared with original design is adding copper foil on PCB. In this report, AC Power-line conducted emission and radiated emission tests had been re-tested and only its data was presented in the following sections.

1.1.1 RF General Information

RF General Information				
Frequency Range (MHz)	Bluetooth Mode	Ch. Frequency (MHz)	Channel Number	RF Output Power (dBm)
2400-2483.5	BR / EDR	2402-2480	0-78 [79]	4.76
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	
<input checked="" type="checkbox"/>	Integral antenna (antenna permanently attached)
<input type="checkbox"/>	Temporary RF connector provided
<input checked="" type="checkbox"/>	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.
<input type="checkbox"/>	External antenna (dedicated antennas)
<input type="checkbox"/>	RF connector provided
<input type="checkbox"/>	Unique antenna connector. (e.g., MMCX, U.FL, IPX, and RP-SMA, RP-N type...)
<input type="checkbox"/>	Standard antenna connector. (e.g., SMA, N, BNC, and TNC type...)

Antenna General Information				
No.	Ant. Cat.	Ant. Type	Connector	Gain (dBi)
1	Integral	CHIP	No Connector	1.99

1.1.3 Type of EUT

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

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
<input type="checkbox"/> Operated normally hopping mode for worst duty cycle	
<input checked="" type="checkbox"/> Operated test mode for worst duty cycle	
Test Signal Duty Cycle (x)	Power Duty Factor [dB] – (10 log 1/x)
<input checked="" type="checkbox"/> 79.58% - test mode single channel – DH1	0.99
<input checked="" type="checkbox"/> 79.58% - test mode single channel – DH3	0.99
<input checked="" type="checkbox"/> 79.35% - test mode single channel – DH5	1.00
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 battery: 3.7Vdc, 770mAh, 2.9Wh From host: 5Vdc
--------------------------	--

1.2 Accessories and Support Equipment

Accessories		
No.	Equipment	Description
1	USB to Micro USB cable	1.28m shielded w/o core
2	Audio cable	1.25m non-shielded w/o core

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	DELL	Latitude E6430	DoC

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				
<input checked="" type="checkbox"/>	Hwa Ya	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
AC Conduction	CO01-WS	Skys Huang	22°C / 58%	Oct. 07, 2015
Radiated Emission	03CH09-HY	Mark Liao	20-22°C / 62-65%	Sep. 25 ~ Oct. 05, 2015
Test site registered number [213289] with FCC.				
Test site registered number [4086G-1] with IC.				

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	±3.62 dB	N/A
	Above 1GHz	±5.60 dB	N/A
Temperature		±0.8 °C	N/A
Humidity		±3 %	N/A
DC and low frequency voltages		±3 %	N/A
Time		±1.42 %	N/A
Duty Cycle		±1.42 %	N/A

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration




Worst Modulation Used for Conformance Testing					
Bluetooth Mode	Transmit Chains (N _{TX})	Data Rate	Modulation Mode	RF Output Power (dBm)	Worst Mode
BR	1	1 Mbps	BR-1Mbps	4.76	EDR-1Mbps
EDR	1	2 Mbps	EDR-2Mbps	3.24	
EDR	1	3 Mbps	EDR-3Mbps	3.84	

2.2 The Worst Case Power Setting Parameter

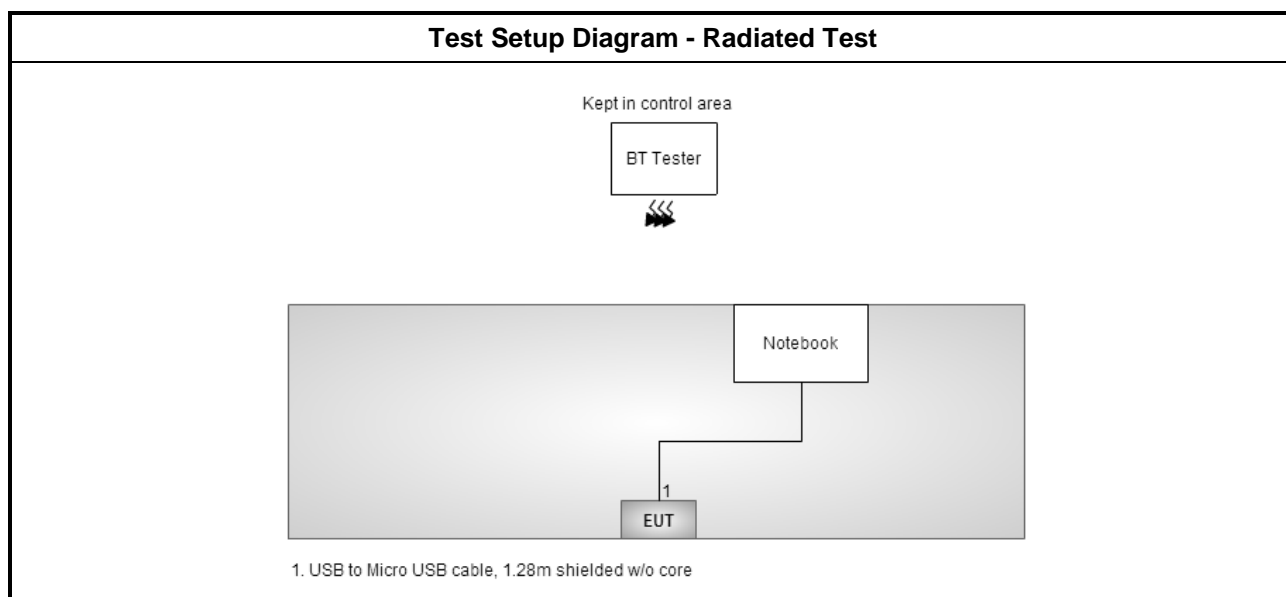
The Worst Case Power Setting Parameter			
Test Software Version / Instrument		Software: Bluetest 3, Bluetooth Tester: R&S CBT	
Modulation Mode		2402 MHz	2440 MHz
BR,1Mbps		Default	Default
EDR,2Mbps		Default	Default
EDR,3Mbps		Default	Default

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	Transmitter Radiated Unwanted Emissions		
Test Condition	Radiated measurement		
User Position	<input type="checkbox"/> EUT will be placed in fixed position.		
	<input checked="" type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two orthogonal planes. The worst planes is Y.		
	<input type="checkbox"/> 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	<input checked="" type="checkbox"/> 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.

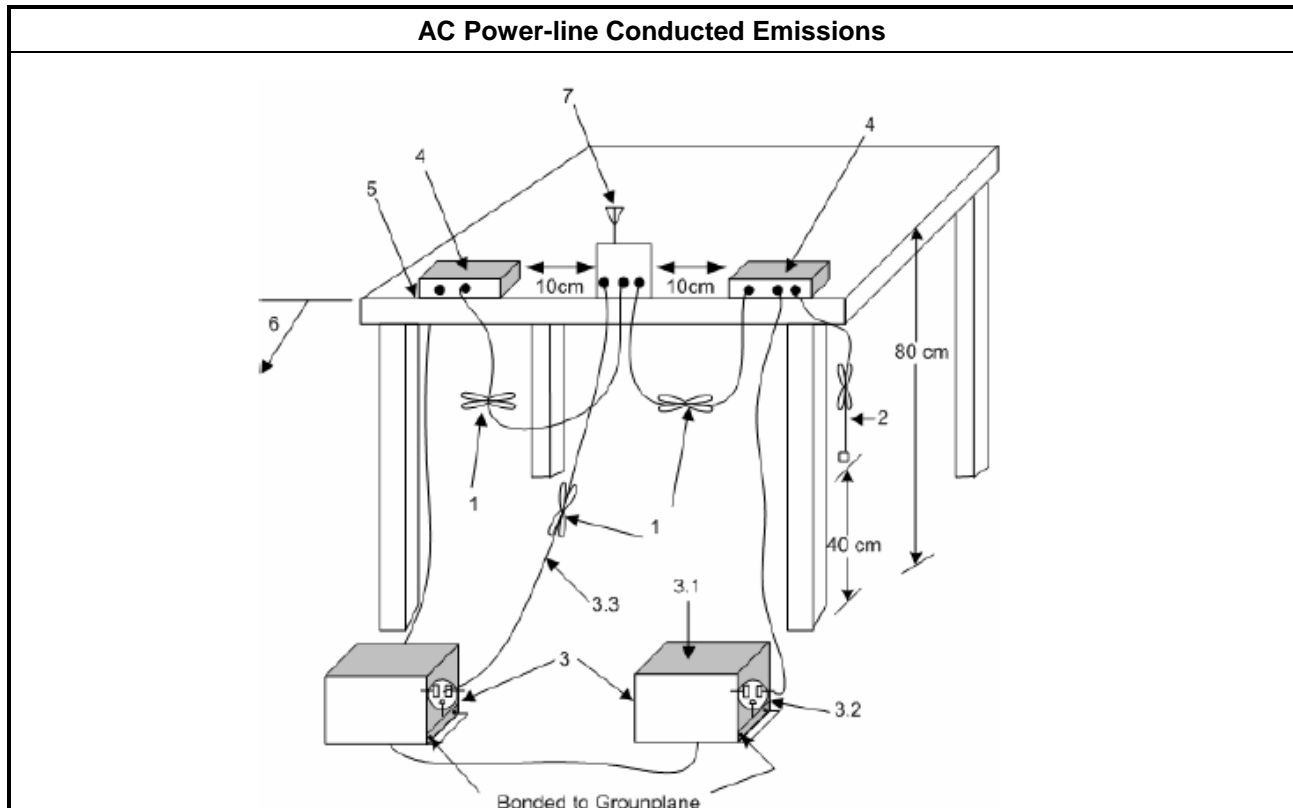
3.1.2 Measuring Instruments

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

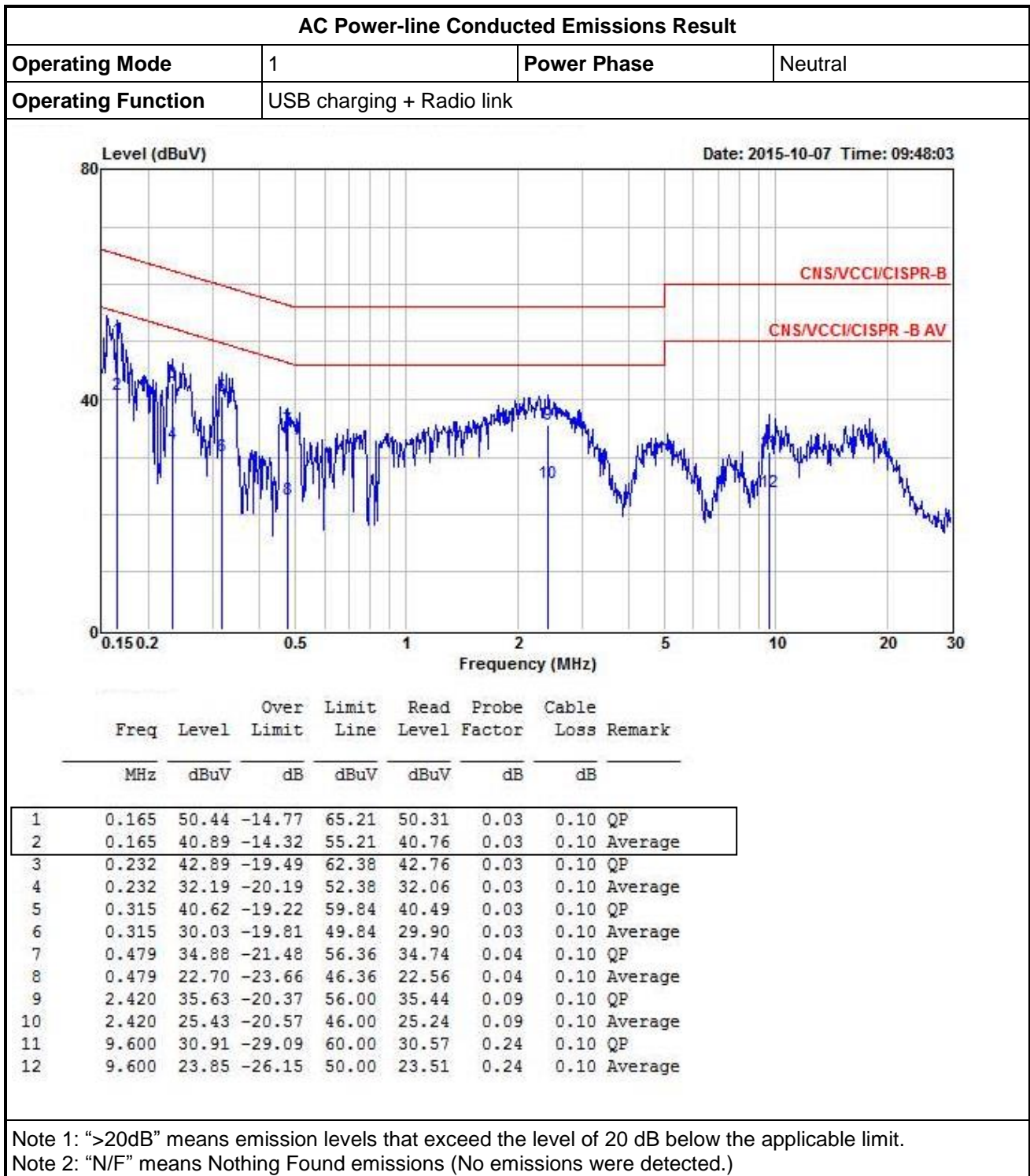
3.1.3 Test Procedures

Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.

3.1.4 Test Setup

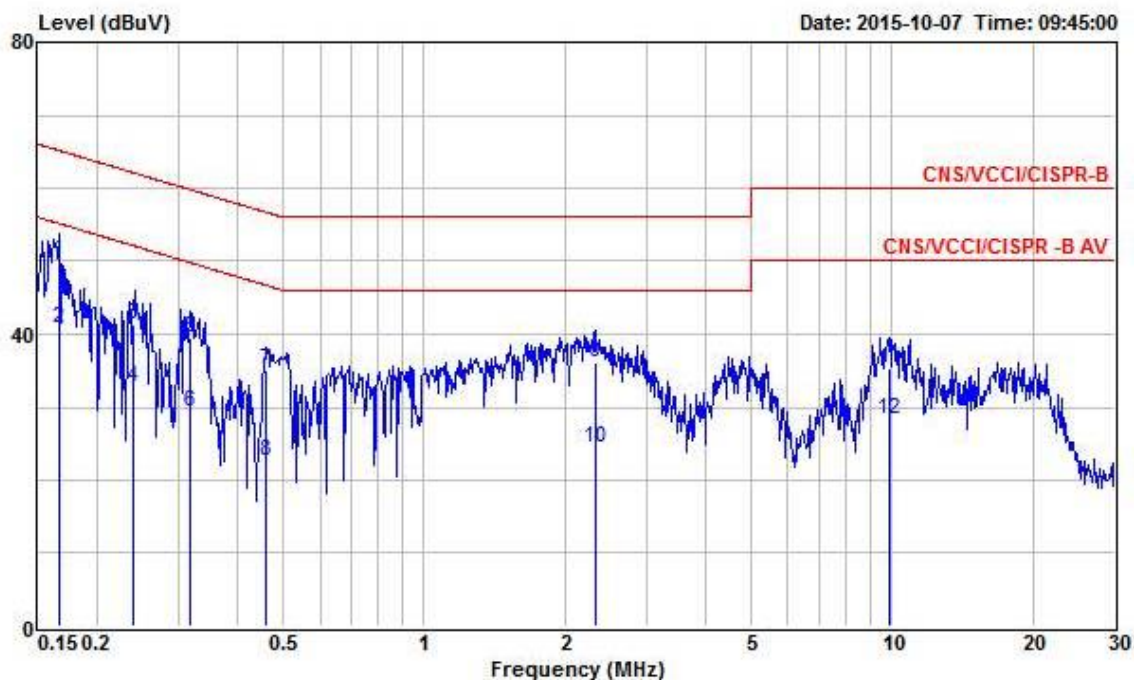


3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

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



	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.166	50.06	-15.10	65.16	49.91	0.05	0.10	QP
2	0.166	40.83	-14.33	55.16	40.68	0.05	0.10	Average
3	0.240	41.29	-20.81	62.10	41.15	0.04	0.10	QP
4	0.240	32.66	-19.44	52.10	32.52	0.04	0.10	Average
5	0.317	39.51	-20.28	59.79	39.37	0.04	0.10	QP
6	0.317	29.46	-20.33	49.79	29.32	0.04	0.10	Average
7	0.461	35.14	-21.53	56.67	35.00	0.04	0.10	QP
8	0.461	22.56	-24.11	46.67	22.42	0.04	0.10	Average
9	2.320	36.03	-19.97	56.00	35.84	0.09	0.10	QP
10	2.320	24.39	-21.61	46.00	24.20	0.09	0.10	Average
11	9.910	35.20	-24.80	60.00	34.85	0.25	0.10	QP
12	9.910	28.42	-21.58	50.00	28.07	0.25	0.10	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 Transmitter Unwanted Emissions

3.2.1 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.

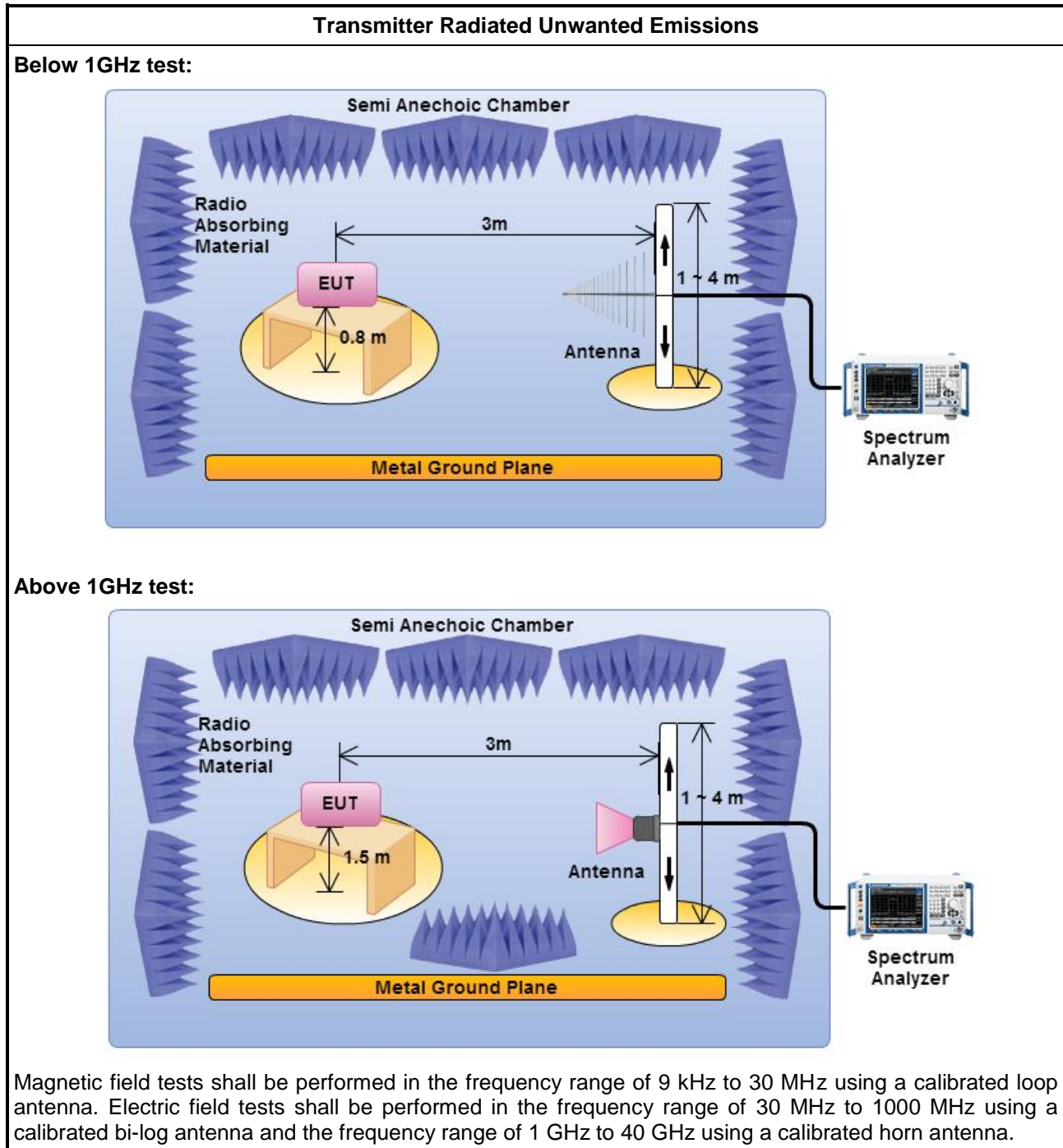
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

Test Method – General Information	
<input checked="" type="checkbox"/>	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).
<input checked="" type="checkbox"/>	For the transmitter unwanted emissions shall be measured using following options below:
<input checked="" type="checkbox"/>	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 $20\log(\text{dwell time}/100 \text{ ms})$
<input checked="" type="checkbox"/>	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.
<input checked="" type="checkbox"/>	For unwanted emissions into restricted bands.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). $\text{VBW} \geq 1/T$, where T is pulse time.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.
<input checked="" type="checkbox"/>	For radiated measurement.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.6 for radiated emissions from above 1 GHz.

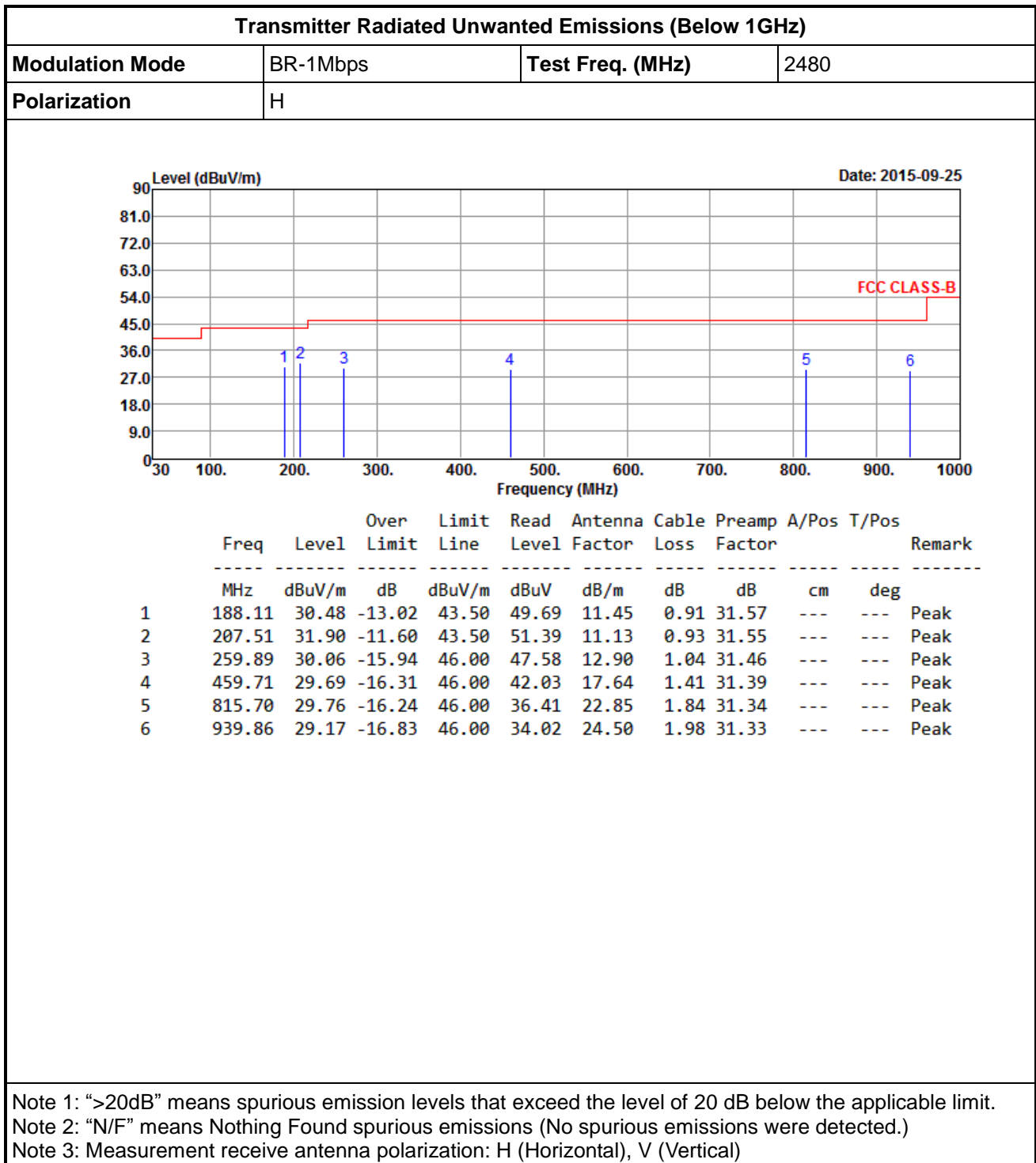
3.2.4 Test Setup



3.2.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

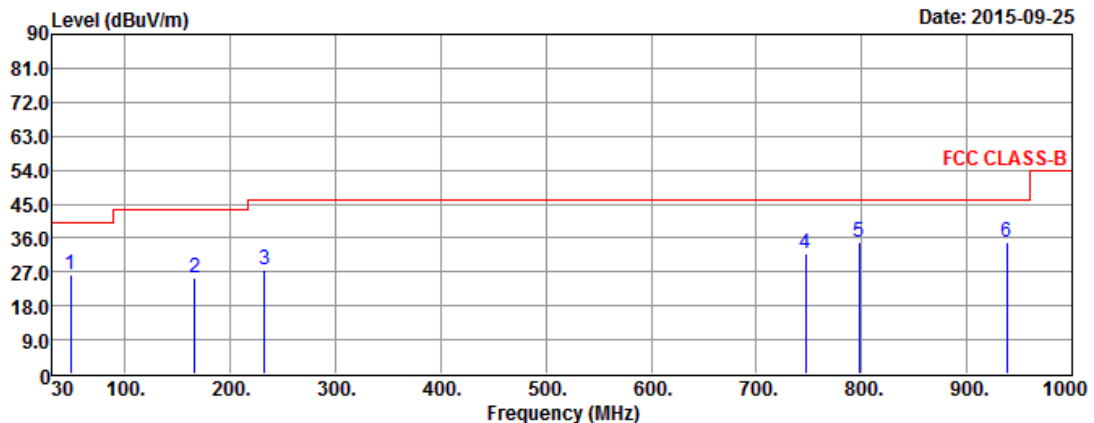
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

3.2.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)



Transmitter Radiated Unwanted Emissions (Below 1GHz)

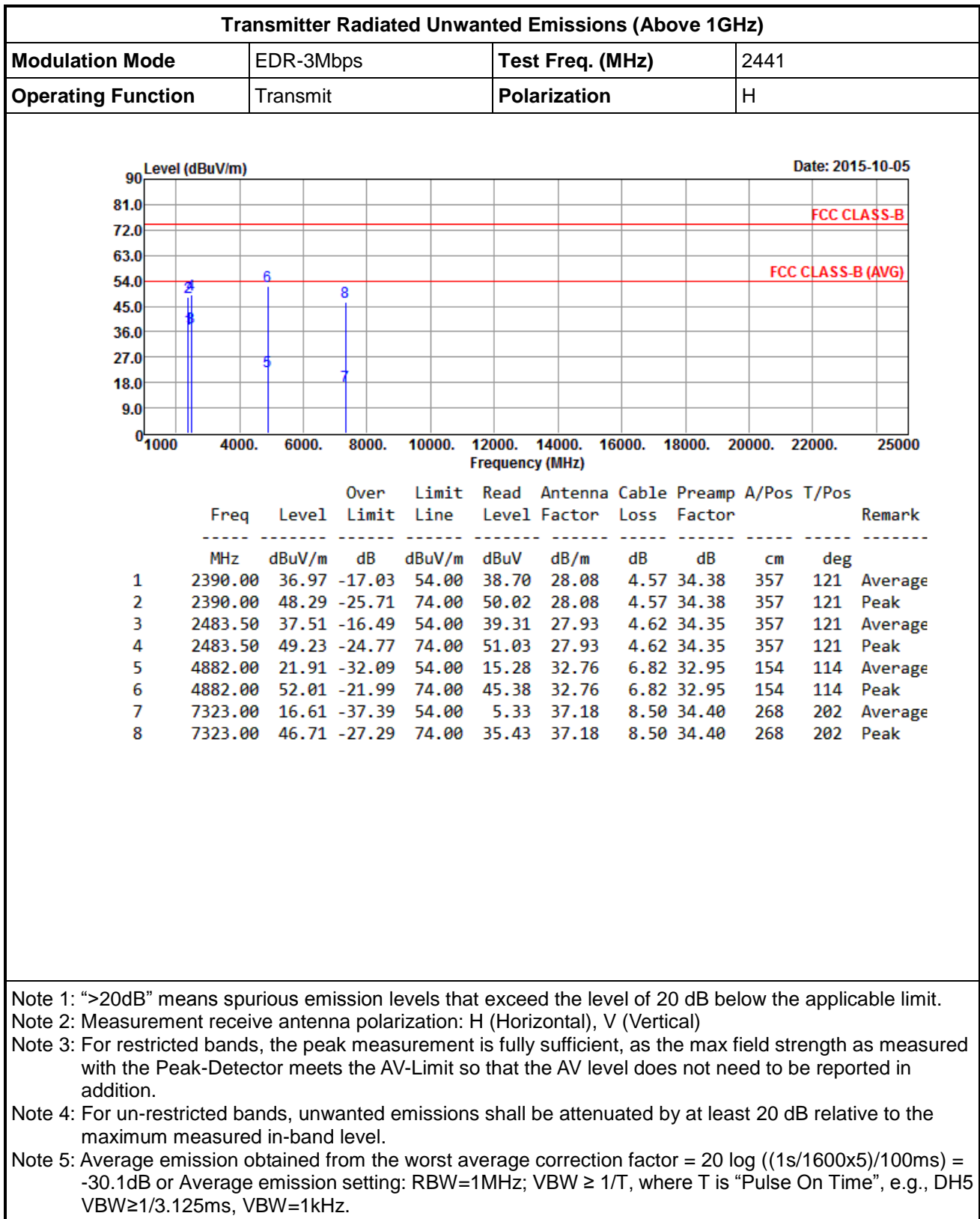
Modulation Mode	BR-1Mbps	Test Freq. (MHz)	2480
Polarization	V		



	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	48.43	26.21	-13.79	40.00	42.78	14.71	0.53	31.81	---	---	Peak
2	165.80	25.49	-18.01	43.50	42.77	13.45	0.87	31.60	---	---	Peak
3	232.73	27.75	-18.25	46.00	46.23	12.04	0.98	31.50	---	---	Peak
4	746.83	31.80	-14.20	46.00	39.15	22.24	1.77	31.36	---	---	Peak
5	797.27	34.70	-11.30	46.00	41.64	22.58	1.82	31.34	---	---	Peak
6	937.92	34.85	-11.15	46.00	39.72	24.48	1.98	31.33	---	---	Peak

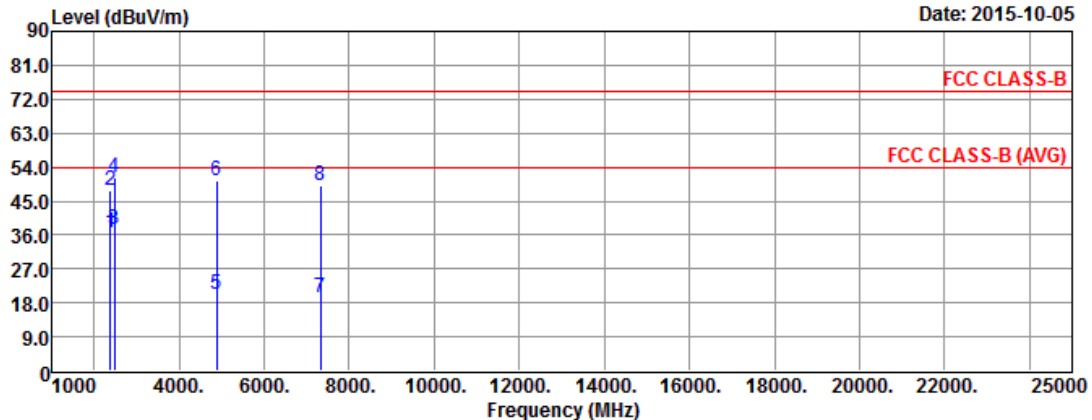
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

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



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	2390.00	36.72	-17.28	54.00	38.45	28.08	4.57	34.38	311	222	Average
2	2390.00	47.89	-26.11	74.00	49.62	28.08	4.57	34.38	311	222	Peak
3	2483.50	37.56	-16.44	54.00	39.36	27.93	4.62	34.35	311	222	Average
4	2483.50	51.23	-22.77	74.00	53.03	27.93	4.62	34.35	311	222	Peak
5	4882.00	20.22	-33.78	54.00	13.59	32.76	6.82	32.95	309	138	Average
6	4882.00	50.32	-23.68	74.00	43.69	32.76	6.82	32.95	309	138	Peak
7	7323.00	19.20	-34.80	54.00	7.92	37.18	8.50	34.40	326	217	Average
8	7323.00	49.30	-24.70	74.00	38.02	37.18	8.50	34.40	326	217	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

Test Item	Radiated Emission				
Test Site	966 chamber / (03CH09-HY)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
3m Semi Anechoic Chamber	TDK	SAC-3M	03CH09-HY	Jul. 01, 2015	Jun. 30, 2016
Amplifier	EMC	EMC9135	980232	Jan. 27, 2015	Jan. 26, 2016
Amplifier	EMC	EMC051845	980240	Mar. 04, 2015	Mar. 03, 2016
Spectrum	KEYSIGHT	N9010A	MY54200885	Jul. 15, 2015	Jul. 14, 2016
Bilog Antenna	TESEQ	CBL 6112D	35418	Mar. 30, 2015	Mar. 29, 2016
Horn Antenna	AARONIA AG	POWERLOG 70180	05192	Jan. 05, 2015	Jan. 04, 2016
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170614	Dec. 29, 2014	Dec. 28, 2015
RF Cable-R03m	Jye Bao	RG142	CB021	Jul. 23, 2015	Jul. 22, 2016
RF Cable-high	Jye Bao	RG142	03CH09-HY	Jul. 23, 2015	Jul. 22, 2016
Turn Table	Chain Tek	T-200S	1308028	N/A	N/A
Antenna Mast	Chain Tek	MBS-400	1308049	N/A	N/A
Bluetooth Tester	ROHDE&SCHWARZ	CBT	100959	Mar. 03, 2015	Mar. 02, 2016
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Conducted Emission				
Test Site	Conduction room / (CO01-HY)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
EMC Receiver	R&S	ESCS 30	100132	Nov. 07, 2014	Nov. 06, 2015
LISN	MessTec	NNB-2/16Z	2001/004	Nov. 04, 2014	Nov. 03, 2015
EMI Filter	LINDGREN	LRE-2060	1004	N/A	N/A
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832010001	Feb. 27, 2015	Feb. 26, 2016
Bluetooth Tester	ROHDE&SCHWARZ	CBT	100959	Mar. 03, 2015	Mar. 01, 2016
Note: Calibration Interval of instruments listed above is one year.					