



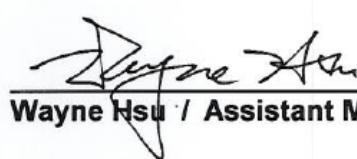
FCC / IC Radio Test Report

Applicant : Qualcomm Atheros, Inc.
Manufacturer : 1700 Technology Drive, San Jose, CA95110
Equipment : 1X1 802.11b/g/n-BT4.0 PCIe/USB M.2 Combo Module
Brand Name : Qualcomm Atheros
Model No. : QCNFA335
FCC ID : PPD-QCNFA335
IC ID : 4104A-QCNFA335
Standard : 47 CFR FCC Part 15.247
 RSS-210 Issue 8
Operating Band : 2400 MHz – 2483.5 MHz

The product sample received on Aug. 27, 2013 and completely tested on Oct. 5, 2013. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:



Wayne Hsu / Assistant Manager





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APPENDIX A. TEST PHOTOS

APPENDIX B. PHOTOGRAPHS OF EUT



Summary of Test Result

Conformance Test Specifications					
Report Clause	Ref. Std. Clause	Description	Measured	Limit	Result
1.1.3	15.203	Antenna Requirement	Antenna connector mechanism complied	According to FCC 15.203	Complied
3.1	15.247(a) / RSS-210 A8.1 / RSS-Gen 4.6.1	20dB Bandwidth	EDR: 1.2874 MHz	N/A	Complied
		99% Bandwidth	EDR: 1.1736 MHz		
		Carrier Frequency Separation (ChS)	EDR: 1 MHz	ChS \geq BW _{20dB} x2/3.	Complied
3.2	15.247(a) / RSS-210 A8.1	Number of Hopping Frequencies (N)	Max: 79 Min: 20	N \geq 15	Complied
3.3	15.247(a) / RSS-210 A8.1	Time of Occupancy (Dwell Time)	EDR: 0.316 sec	0.4 s within 0.4 x N	Complied
3.4	15.247(b) / RSS-210 A8.4	RF Output Power (Maximum Peak Conducted Output Power)	BR: 5.43 dBm EDR: 8.37 dBm	BR:21 dBm EDR:21 dBm	Complied
3.5	15.247(d) / RSS-210 A8.5	Emission in Non-Restricted Frequency Bands	Non Restricted Bands: 2545.12MHz: 42.45dB	Non-Restricted Bands: > 20 dBc	Complied
3.6.5	15.247(d) / RSS-210 A8.5	Emission in Restricted Frequency Bands	Restricted Bands 31.940 MHz 36.34 dBuV/m @ 3 m - PK	Restricted Bands: According to FCC 15.209 / RSS-Gen 6.1	Complied
3.7	15.207 / RSS-Gen 7.2.4	AC Power-line Conducted Emissions	0.1954980 MHz 43.77 dBuV - AV 56.14 dBuV - QP	According to FCC 15.207 / RSS-Gen 7.2.4	Complied



Revision History

1 General Description

1.1 Information

1.1.1 RF General Information (Bluetooth)

RF General Information					
Frequency Range (MHz)	Ch. Freq. (MHz)	Channel Number	Bluetooth Mode	RF Output Power (dBm)	Co-location
2400~2483.5	2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480	0-78 [79]	BR-1Mbps	5.43	No
			EDR-2Mbps	7.96	
			EDR-3Mbps	8.37	

Note 1: Bluetooth BR uses a GFSK (1Mbps).

Note 2: Bluetooth EDR uses a combination of $\pi/4$ -DQPSK (2Mbps) and 8DPSK (3Mbps).

Note 3: RF output power specifies that Maximum Peak Conducted Output Power.

Note 4: Co-location, Co-location is generally defined as simultaneously transmitting (co-transmitting) antennas within 20 cm of each other. (i.e., EUT has simultaneously co-transmitting that operating 2.4GHz and 5GHz.)

1.1.2 WLAN/ BT coexistence mode

- There are two HW variants for this module. The pretesting is conducted and test data from worst case is recorded in test report.

HW version 032: Dual Antenna	1X1 WLAN + BT: WLAN/BT concurrent at different antenna port and 18MHz separation between WLAN and BT fundamental. The WLAN is transmitted by the Chain 0 and the BT is transmitted by the Chain 1.
HW version 232: Single antenna	1X1 WLAN + BT: WLAN/BT 18MHz separation between WLAN and BT fundamental.
Note : Verified two HW versions and version 032 is the worst case. Record the worst case results in this report.	



1.1.3 Antenna Information

Antenna Category		
<input checked="" type="checkbox"/>	External antenna (dedicated antennas)	
	<input checked="" type="checkbox"/> RF connector provided	
	<input checked="" 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. Type	Frequency Band	Maximum Gain (dBi)
1	PIFA	2400~2483.5MHz	3.62
2	Dipole	2400~2483.5MHz	3.20

1.1.4 Type of EUT

Identify EUT	
EUT Serial Number	N/A
Presentation of Equipment	<input type="checkbox"/> Production ; <input type="checkbox"/> Pre-Production ; <input checked="" 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:

1.1.5 Test Signal Duty Cycle

Operated 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"/>	78.72% - test mode single channel - DH5

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.

1.1.6 EUT Operational Condition

Supply Voltage	<input type="checkbox"/> AC mains	<input checked="" type="checkbox"/> DC	
Type of DC Source	<input type="checkbox"/> Internal DC supply	<input checked="" type="checkbox"/> Host	<input type="checkbox"/> Battery



1.2 Support Equipment

Support Equipment - Conducted Emissions				
No.	Equipment	Brand Name	Model Name	Serial No.
1	Notebook	DELL	E5530	DoC
2	(USB) Mouse	Microsoft	1113	DoC
3	(USB) Printer	EPSON	C61	DoC
4	Bluetooth Earphone	Sony Ericsson	Z354	PY7DDA-1-2
5	Test Fixture	--	--	--
6	Wireless AP (Remote Workstation)	ASUS	RT-AC66U	MSQ-RTAC66U

Support Equipment - Radiated Emissions				
No.	Equipment	Brand Name	Model Name	Serial No.
1	Notebook	DELL	E5520	DoC
2	Test Fixture	--	--	--

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 Subpart C 15.247
- ◆ RSS-210 Issue 8
- ◆ RSS-GEN Issue 3
- ◆ ANSI C63.10-2009
- ◆ FCC DA-00-0705

1.4 Testing Location Information

Testing Location				
	HWA YA	ADD	FAX : 886-3-327-0973	
<input checked="" type="checkbox"/>		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		
Test Condition		Test Site No.	Test Engineer	Test Environment
AC Conduction		CO04-HY	Zeus	23°C / 52%
RF Conducted		TH06-HY	Cain	20.4°C / 67.0%
Radiated Emission		03CH03-HY	Eddie	21.9°C / 51.2%



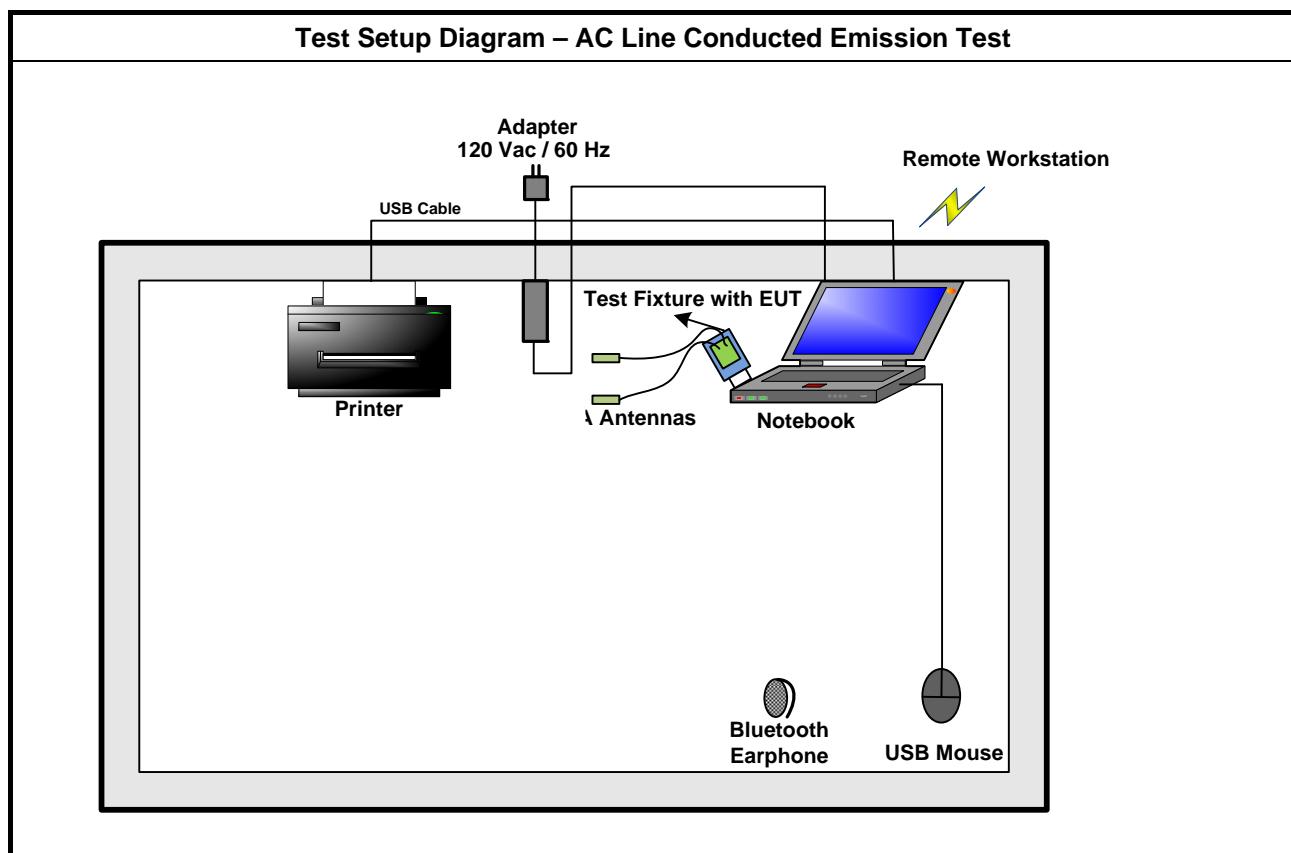
1.5 Measurement Uncertainty

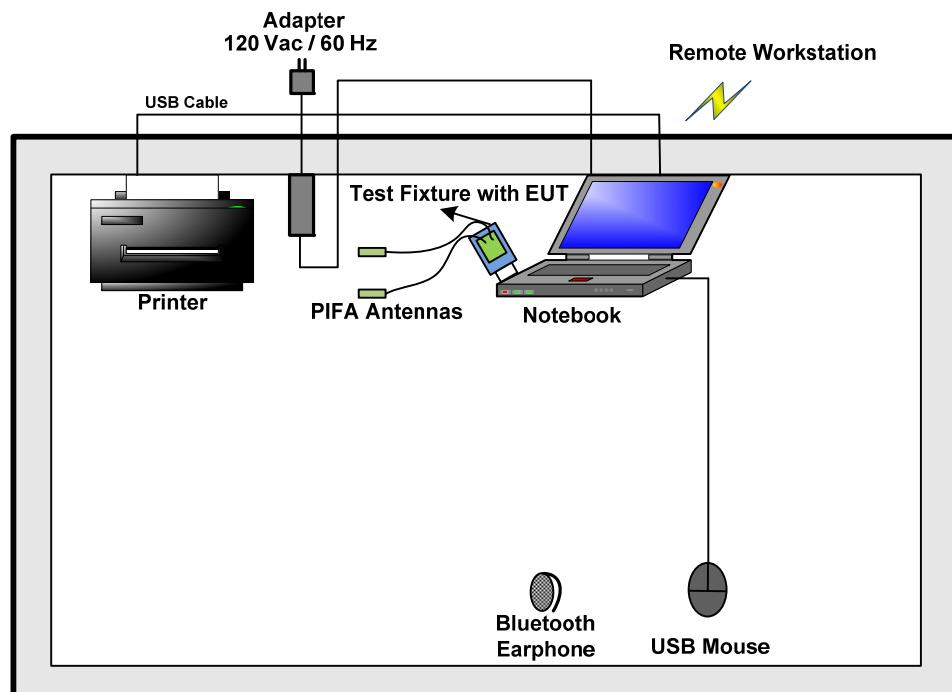
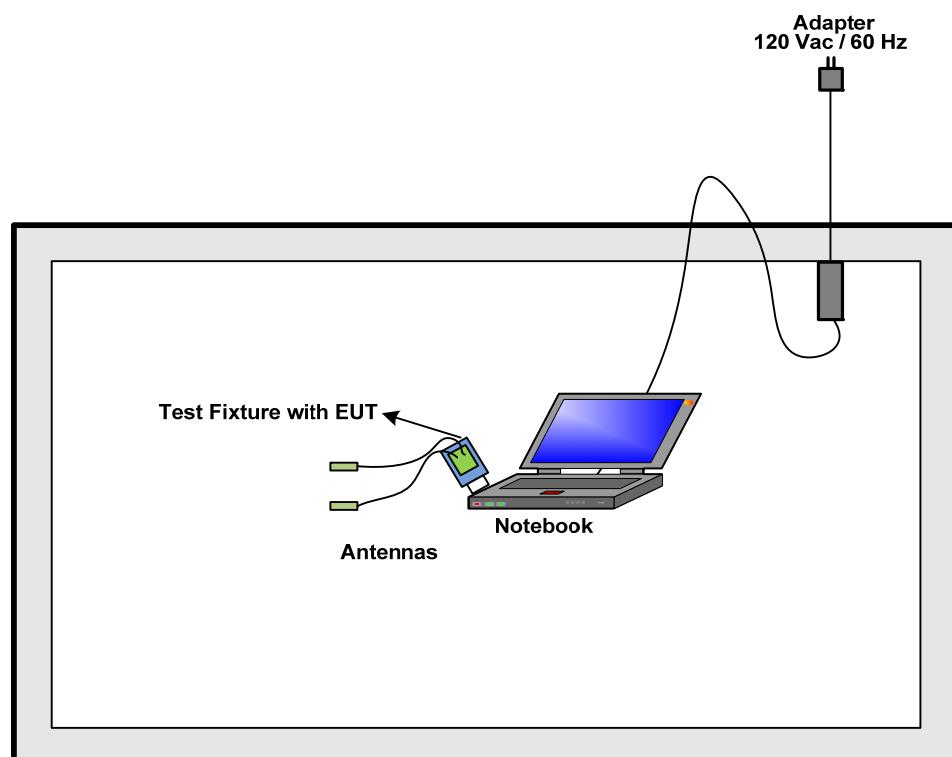
ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

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
Unwanted emissions, conducted	30 – 1000 MHz	±0.51 dB	N/A
	1 – 18 GHz	±0.67 dB	N/A
	18 – 40 GHz	±0.83 dB	N/A
	40 – 200 GHz	N/A	N/A
All emissions, radiated	30 – 1000 MHz	±2.56 dB	N/A
	1 – 18 GHz	±3.59 dB	N/A
	18 – 40 GHz	±3.82 dB	N/A
	40 – 200 GHz	N/A	N/A
Temperature		±0.8 °C	N/A
Humidity		±3 %	N/A
DC and low frequency voltages		±3 %	N/A
Time		±1.42 %	N/A
Duty Cycle		±1.42 %	N/A

2 Test Configuration of EUT

2.1 Test Setup Diagram



Test Setup Diagram - Radiated Test (Below 1GHz)**Test Setup Diagram - Radiated Test (Above 1GHz)**

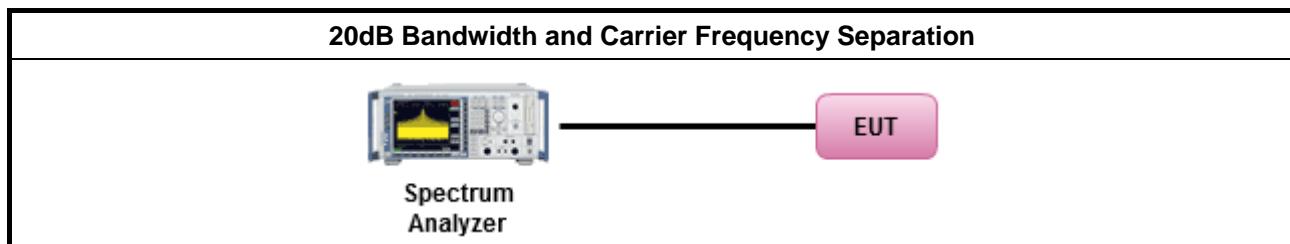
3 Transmitter Test Result

3.1 20dB Bandwidth and Carrier Frequency Separation

3.1.1 Test Procedures

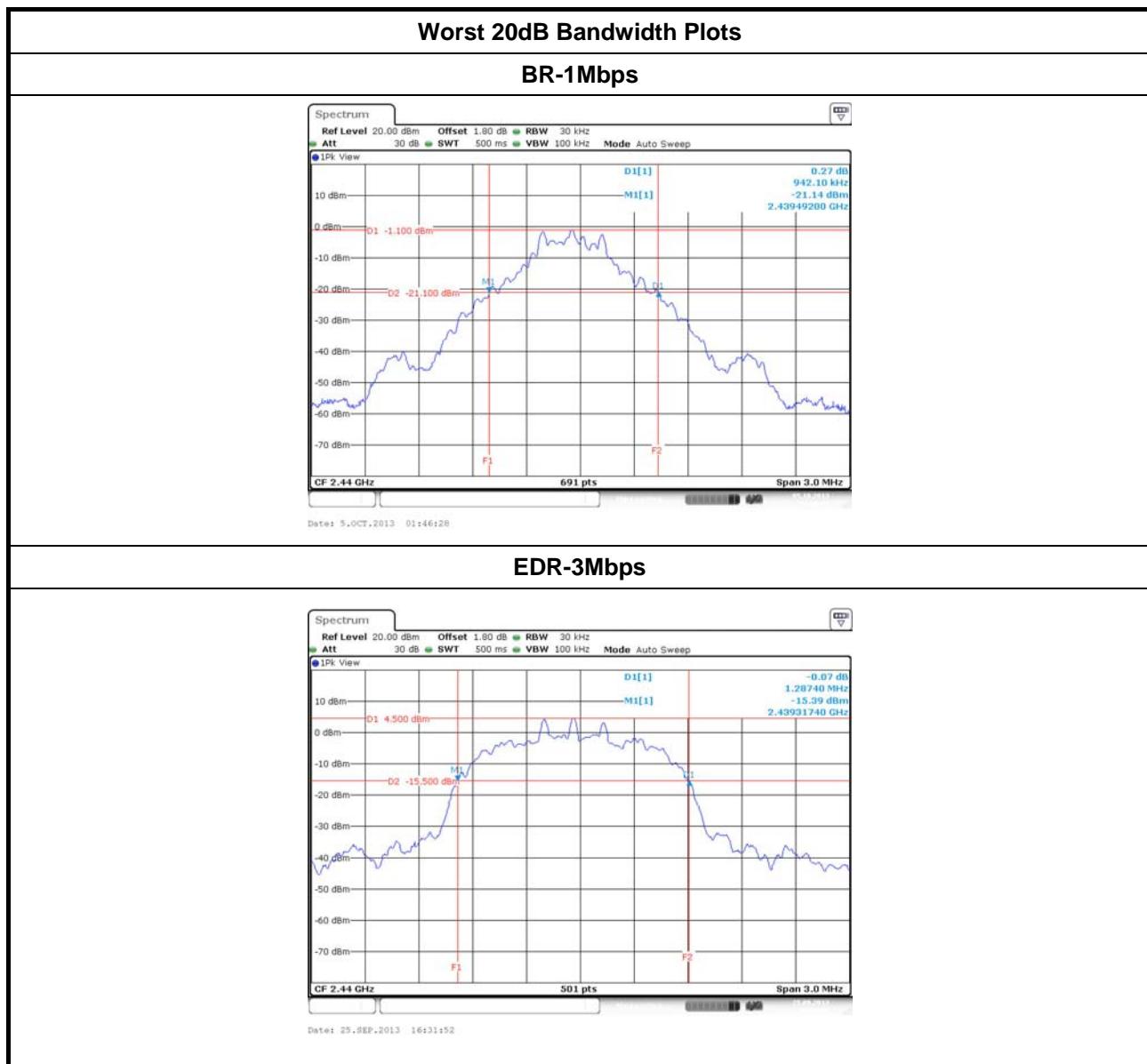
Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.9.1 for 20 dB bandwidth measurement.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 7.7.2 for carrier frequency separation measurement.
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/>	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

3.1.2 Test Setup



3.1.3 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	0.9421	0.87265	1	0.628
BR-1Mbps	2440	0.9421	0.87699	1	0.628
BR-1Mbps	2480	0.9421	0.87699	1	0.628
EDR-3Mbps	2402	1.2754	1.1736	1	0.850
EDR-3Mbps	2440	1.2874	1.1736	1	0.858
EDR-3Mbps	2480	1.2814	1.1736	1	0.854
Result			Complied		

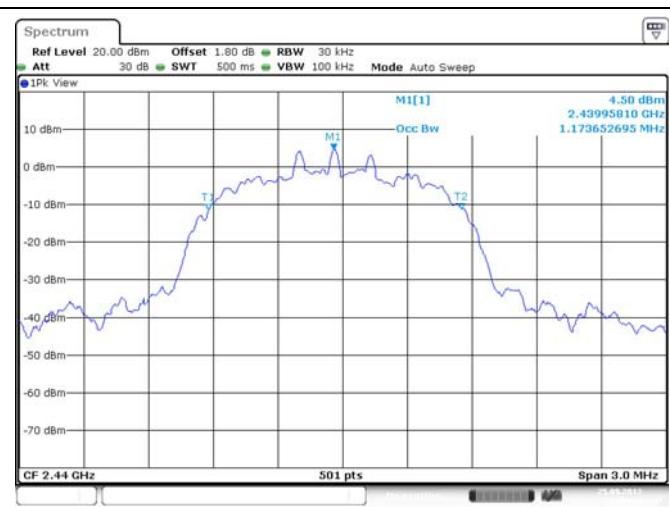


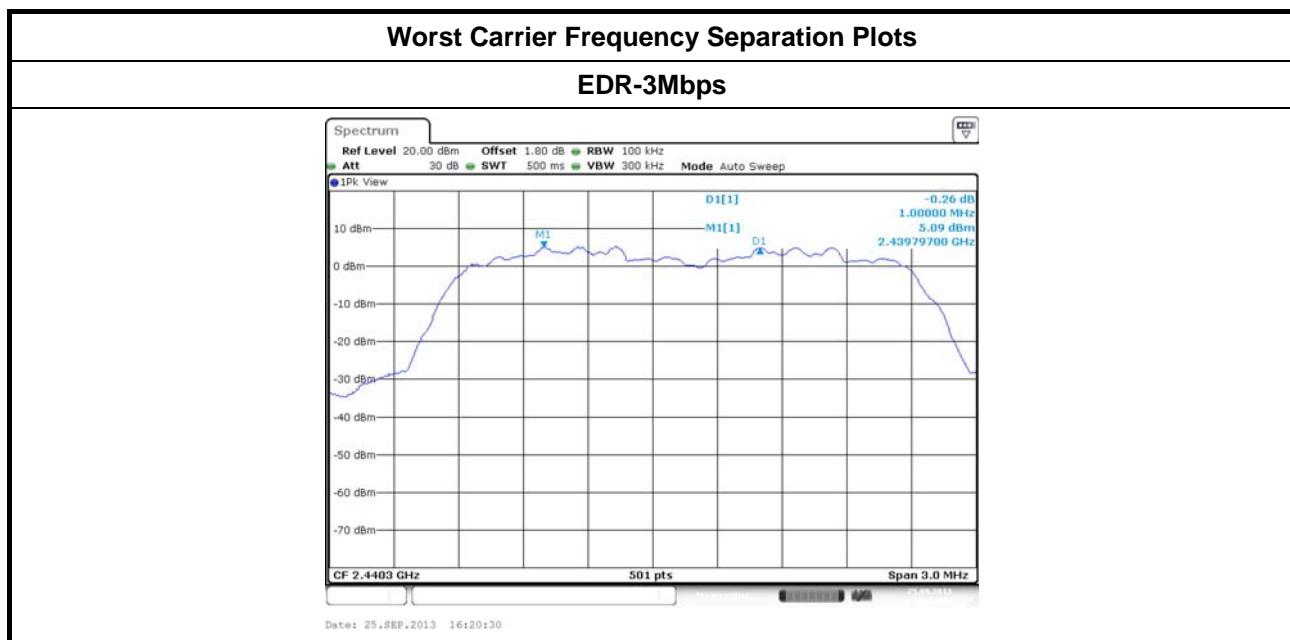
Worst 99% Bandwidth Plots

BR-1Mbps



EDR-3Mbps



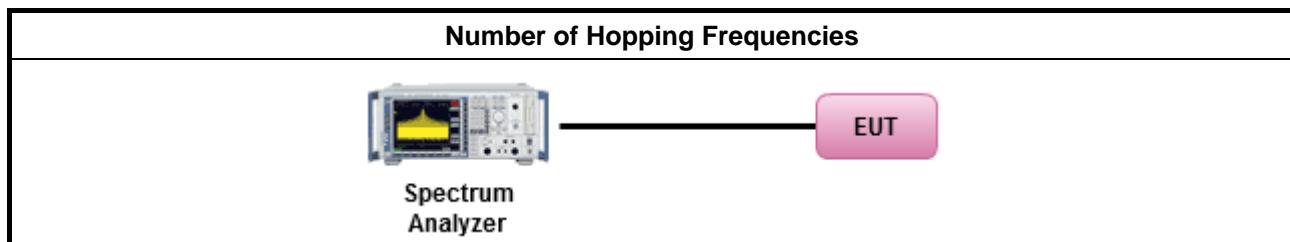


3.2 Number of Hopping Frequencies

3.2.1 Test Procedures

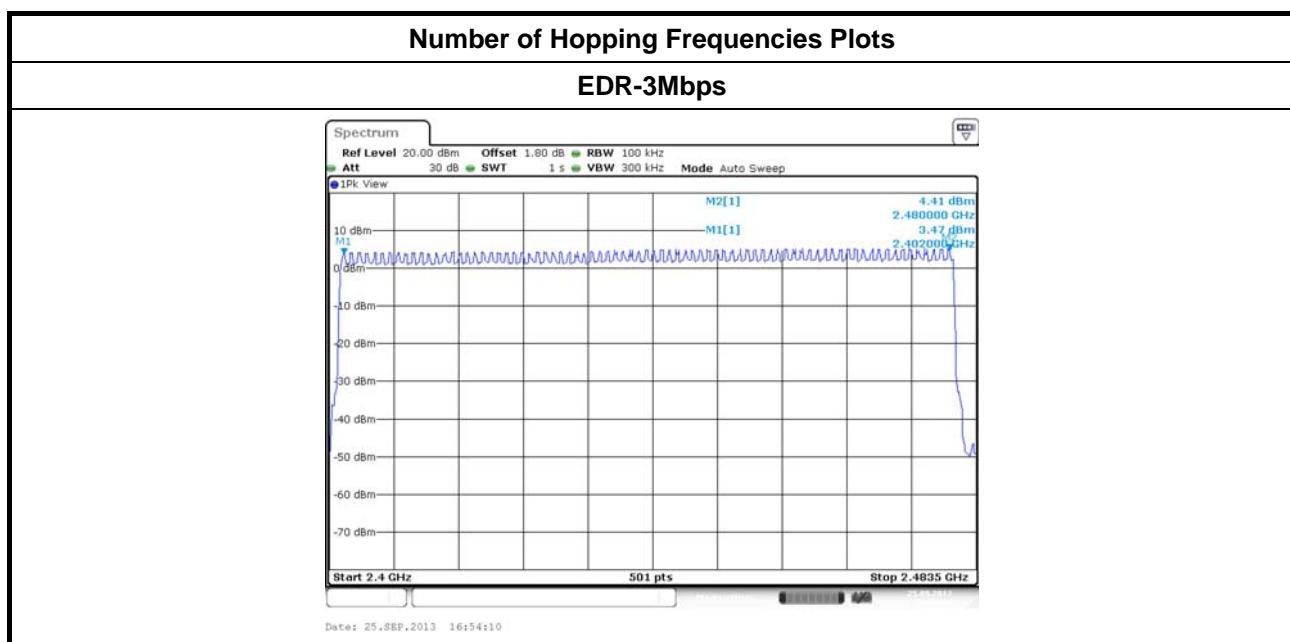
Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 7.7.3 for number of hopping frequencies measurement.
<input checked="" type="checkbox"/> For conducted measurement.
<input checked="" type="checkbox"/> The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

3.2.2 Test Setup



3.2.3 Test Result of Number of Hopping Frequencies

Number of Hopping Frequencies Result				
Modulation Mode	Hopping	Freq. (MHz)	Hopping Channel Number (N)	Hopping Channel Number Limits
EDR-3Mbps	Non-AFH	2402-2480	79	15
EDR-3Mbps	AFH	2402-2480	20	15
Result		Complied		

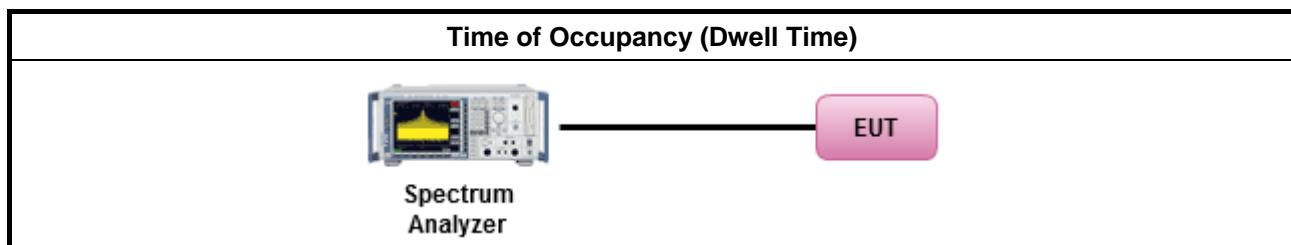


3.3 Time of Occupancy (Dwell Time)

3.3.1 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 7.7.4 for dwell time measurement.
<input checked="" type="checkbox"/>	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.
<input checked="" type="checkbox"/>	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.
<input checked="" type="checkbox"/>	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.
<input checked="" type="checkbox"/>	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 $3.37 \times 31.6 = 106.5$ within 31.6 seconds
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/>	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

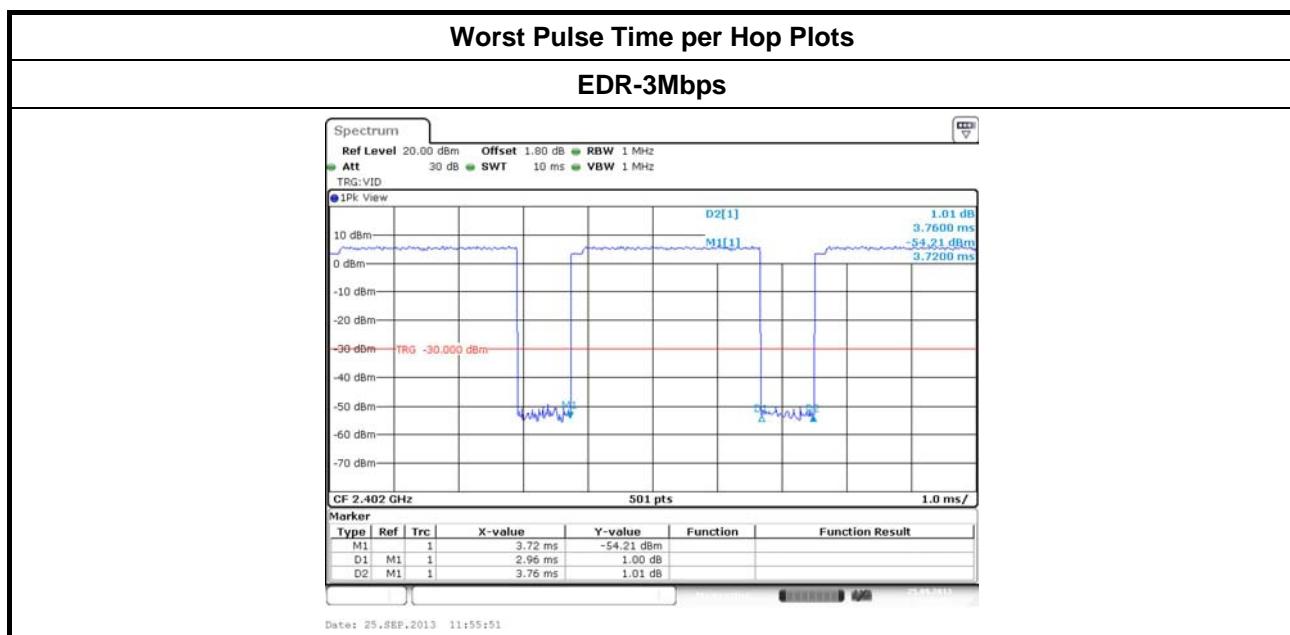
3.3.2 Test Setup



3.3.3 Test Result of Time of Occupancy (Dwell Time)

Time of Occupancy (Dwell Time) Result							
Modulation Mode	Hopping	Freq. (MHz)	Actual Number of Hopping Freq. (N)	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	Non-AFH	Hopping	79	2.96	106.7	0.316	0.4
EDR-3Mbps	AFH	Hopping	20	2.96	106.7	0.316	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.

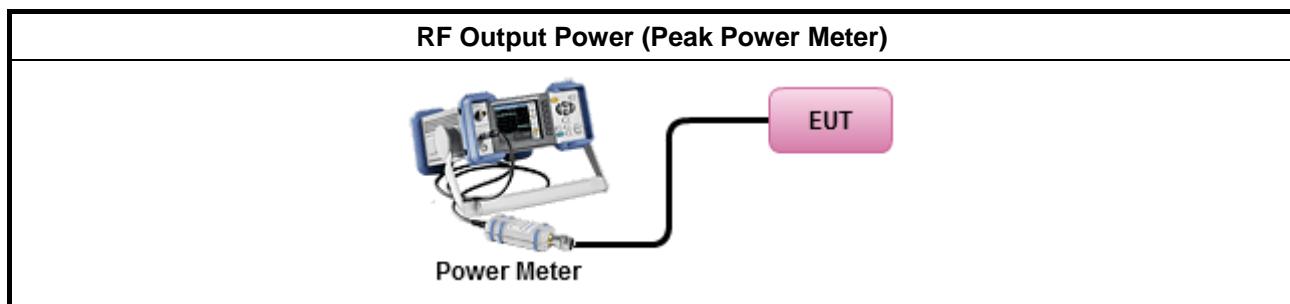


3.4 RF Output Power

3.4.1 Test Procedures

Test Method	
<input checked="" type="checkbox"/> Maximum Peak Conducted Output Power	
<input type="checkbox"/> Refer as FCC DA 00-0705, spectrum analyzer for peak power.	
<input checked="" type="checkbox"/> Refer as FCC DA 00-0705, peak power meter for peak power.	
<input type="checkbox"/> Refer as ANSI C63.10, clause 6.10.2.1 a) for peak power meter.	
<input type="checkbox"/> Refer as ANSI C63.10, clause 6.10.2.1 a) for spectrum analyzer - (RBW \geq EBW).	
<input checked="" type="checkbox"/> For conducted measurement.	
<input checked="" type="checkbox"/> The EUT supports single transmit chain and measurements performed on this transmit chain.	
<input type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.	

3.4.2 Test Setup



3.4.3 The worst case investigated

Worst Modulation Used for Conformance Testing					
Bluetooth	Transmit Chains (N_{TX})	Data Rate	Modulation Mode	Conducted Power (dBm)	Worst Mode
BR	1	1 Mbps	BR-1Mbps	5.43	EDR-3Mbps
EDR	1	2 Mbps	EDR-2Mbps	7.96	
EDR	1	3 Mbps	EDR-3Mbps	8.37	

Note 1: Modulation modes consist of BR-1Mbps, EDR-2Mbps, EDR-3Mbps

FHSS BR-1Mbps: GFSK (1Mbps), EDR-2Mbps: $\pi/4$ -DQPSK (2Mbps), EDR-3Mbps: 8DPSK(3Mbps)



3.4.4 Test Result of Maximum Peak Conducted Output Power

Maximum Peak Conducted Output Power Result							
Condition			RF Output Power (dBm)				
Antenna	Modulation Mode	Freq. (MHz)	RF Output Power	Power Limit	Antenna Gain (dBi)	EIRP Power	EIRP Limit
PIFA	BR-1Mbps	2402	4.42	21	3.62	8.04	27
	BR-1Mbps	2440	4.96	21	3.62	8.58	27
	BR-1Mbps	2480	5.43	21	3.62	9.05	27
	EDR-3Mbps	2402	7.44	21	3.62	11.06	27
	EDR-3Mbps	2440	7.87	21	3.62	11.49	27
	EDR-3Mbps	2480	8.37	21	3.62	11.99	27
Dipole	BR-1Mbps	2402	4.42	21	3.20	7.62	27
	BR-1Mbps	2440	4.96	21	3.20	8.16	27
	BR-1Mbps	2480	5.43	21	3.20	8.63	27
	EDR-3Mbps	2402	7.44	21	3.20	10.64	27
	EDR-3Mbps	2440	7.87	21	3.20	11.07	27
	EDR-3Mbps	2480	8.37	21	3.20	11.57	27
Result			Complied				

3.4.5 Test Result of Maximum Average Conducted Output Power

Maximum Average Conducted Output Power Result							
Condition			RF Output Power (dBm)				
Antenna	Modulation Mode	Freq. (MHz)	RF Output Power	Power Limit	Antenna Gain (dBi)	EIRP Power	EIRP Limit
PIFA	BR-1Mbps	2402	4.06	21	3.62	7.68	27
	BR-1Mbps	2440	4.71	21	3.62	8.33	27
	BR-1Mbps	2480	5.15	21	3.62	8.77	27
	EDR-3Mbps	2402	4.34	21	3.62	7.96	27
	EDR-3Mbps	2440	4.86	21	3.62	8.48	27
	EDR-3Mbps	2480	5.41	21	3.62	9.03	27
Dipole	BR-1Mbps	2402	4.06	21	3.20	7.26	27
	BR-1Mbps	2440	4.71	21	3.20	7.91	27
	BR-1Mbps	2480	5.15	21	3.20	8.35	27
	EDR-3Mbps	2402	4.34	21	3.20	7.54	27
	EDR-3Mbps	2440	4.86	21	3.20	8.06	27
	EDR-3Mbps	2480	5.41	21	3.20	8.61	27
Result			Complied				

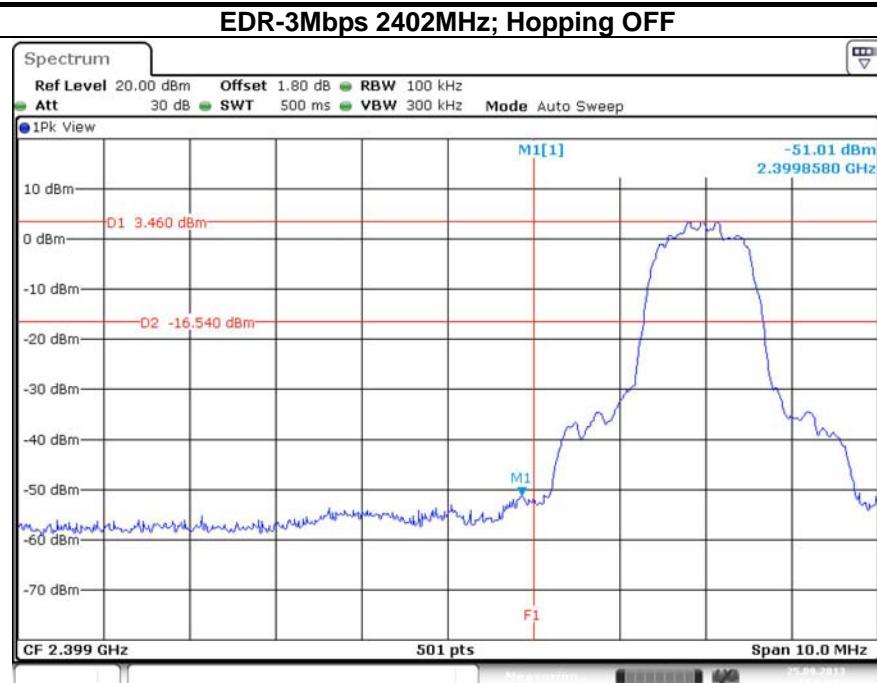


3.5 Emission in Non-Restricted Frequency Bands

3.5.1 Test Procedures

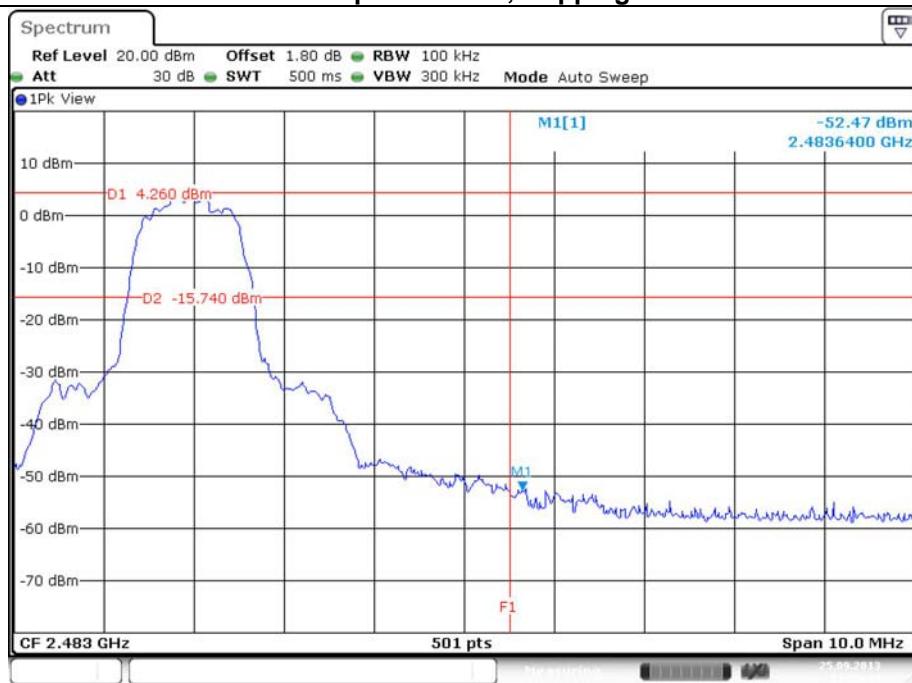
Test Method – General Information	
<input checked="" type="checkbox"/>	The average emission levels shall be measured in [duty cycle \geq 98 or duty factor].
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.9.2.2 bandedge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.
<input checked="" type="checkbox"/>	For the transmitter unwanted emissions shall be measured using following options below:
<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 checked="" type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). $VBW \geq 1/T$, 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 the transmitter bandedge emissions shall be measured using following options below:
<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 6.9.2 for band-edge testing.	
<input type="checkbox"/> Refer as ANSI C63.10, clause 6.9.3 for marker-delta method for band-edge measurements.	
<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 7.7.9 for band-edge testing into non-restricted bands.	
<input checked="" type="checkbox"/>	For radiated measurement, refer as ANSI C63.10, clause 6.6 for radiated emissions from above 1 GHz.

3.5.2 Test Result of Emission in Non-Restricted Frequency Bands-for Conducted Measurement



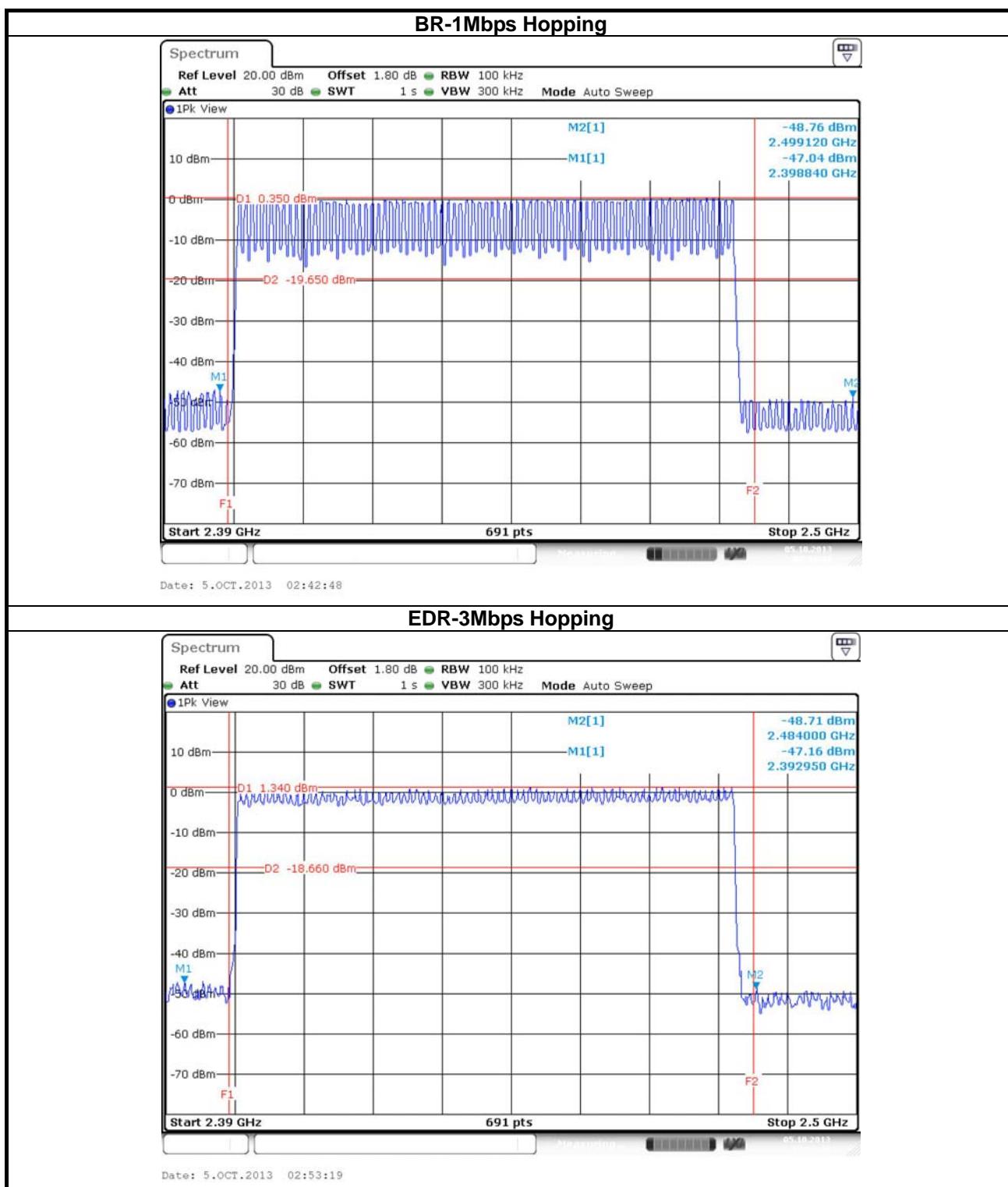
Date: 25.SEP.2013 11:54:53

EDR-3Mbps 2480MHz; Hopping OFF



Date: 25.SEP.2013 11:53:44

Note : The worst case investigated that is the EDR-3Mbps Mode.





3.5.3 Test Result of Emission in Non-Restricted Frequency Bands-for PIFA Ant.

BR-1Mbps						
Test Freq. (MHz)	In-band PSD [i] (dBuV/100kHz)	Freq. (MHz)	Out-band PSD [o] (dBuV/100kHz)	[i] – [o] (dB)	Limit (dB)	Pol.
2402	98.68	2395.17	54.06	44.62	20	V
2480	97.90	2545.12	55.45	42.45	20	V

Note 1: Measurement worst emissions of receive antenna polarization
Note 2: The worst case investigated that is the BR-1Mbps Mode.

3.5.4 Test Result of Emission in Non-Restricted Frequency Bands-for Dipole Ant.

EDR-3Mbps						
Test Freq. (MHz)	In-band PSD [i] (dBuV/100kHz)	Freq. (MHz)	Out-band PSD [o] (dBuV/100kHz)	[i] – [o] (dB)	Limit (dB)	Pol.
2402	100.53	2398.33	51.23	49.30	20	H
2480	99.35	2547.68	50.94	48.41	20	H

Note 1: Measurement worst emissions of receive antenna polarization.
Note 2: The worst case investigated that is the EDR-3Mbps Mode.

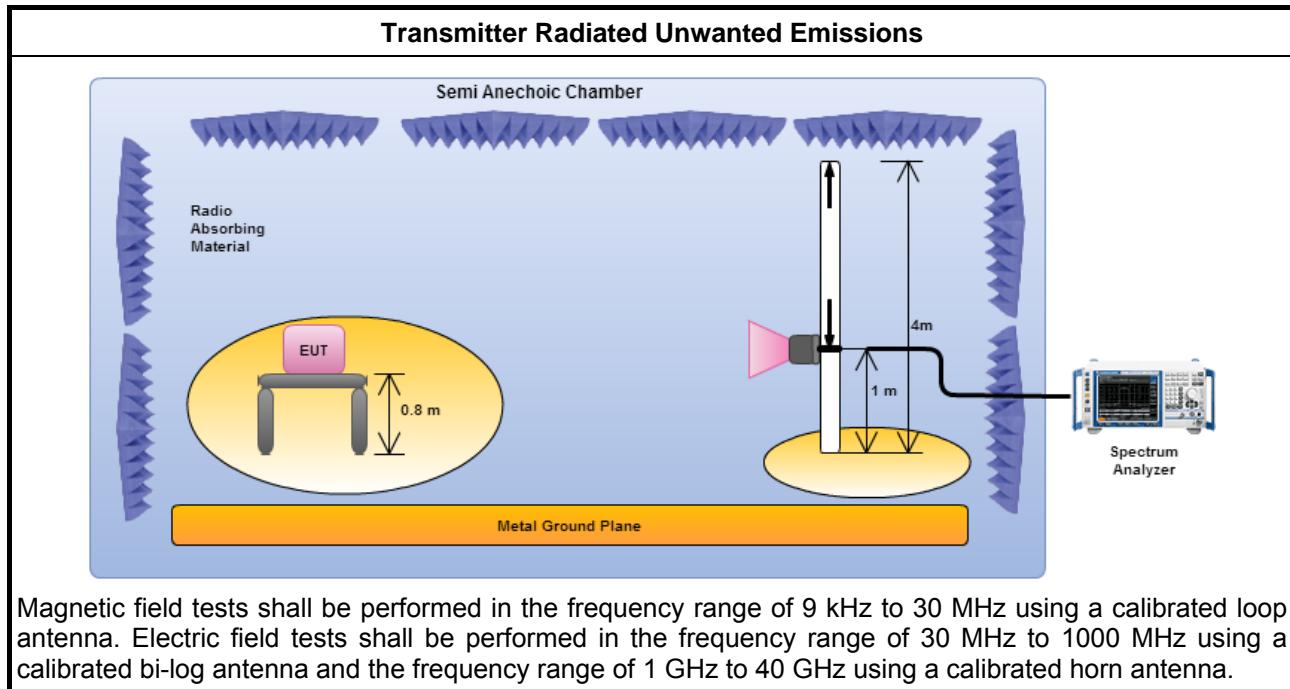


3.6 Emission in Restricted Frequency Bands

3.6.1 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"/>	Measurements in the frequency range 10 GHz - 18GHz are typically made at a closer distance 1m, because the instrumentation noise floor is typically close to the radiated emission limit.
<input checked="" type="checkbox"/>	Measurements in the frequency range above 18 GHz - 25GHz are typically made at a closer distance 0.5m, because the instrumentation noise floor is typically close to the radiated emission limit.
<input checked="" type="checkbox"/>	The average emission levels shall be measured in [duty cycle \geq 98 or duty factor].
<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. <ul style="list-style-type: none"><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. <ul style="list-style-type: none"><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.

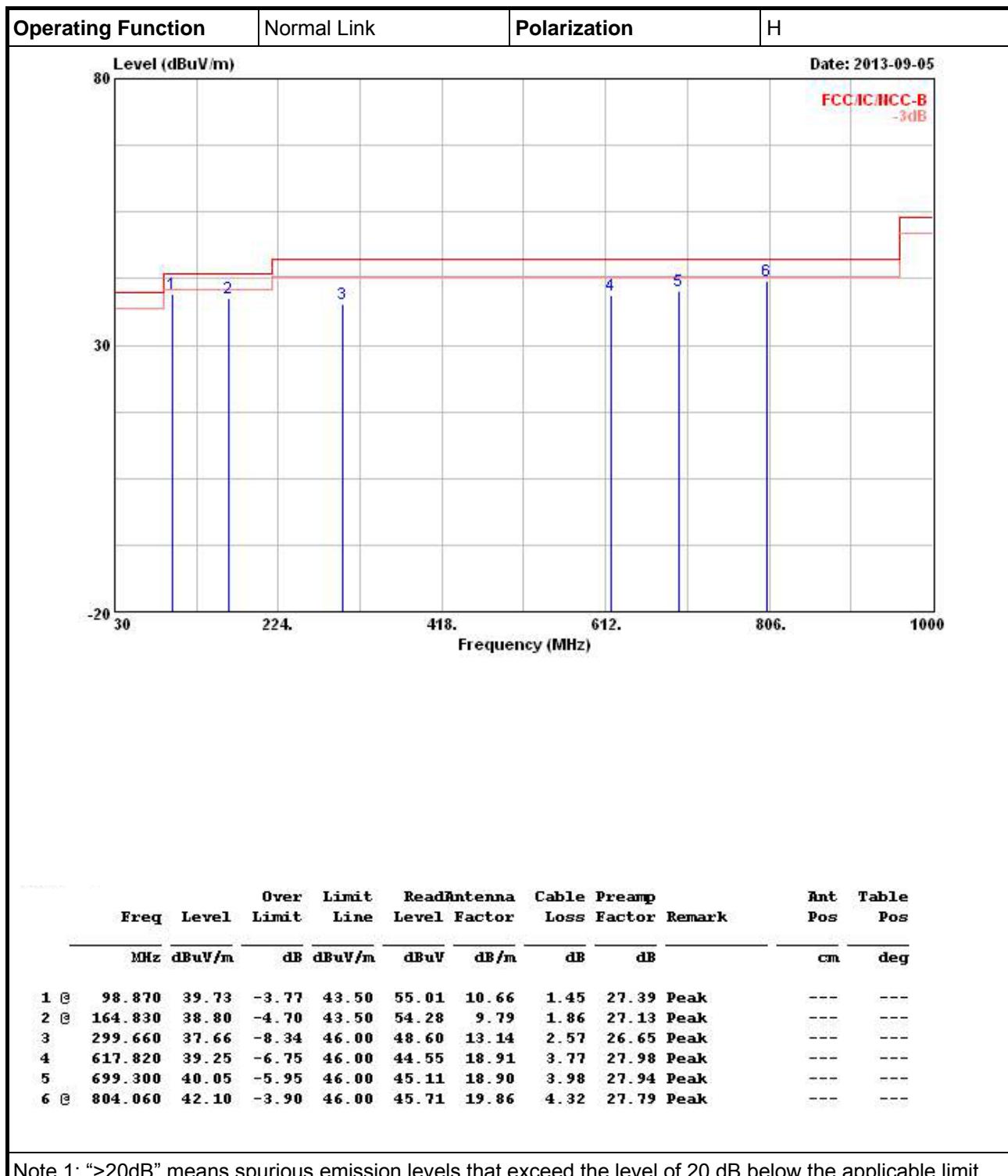
3.6.2 Test Setup

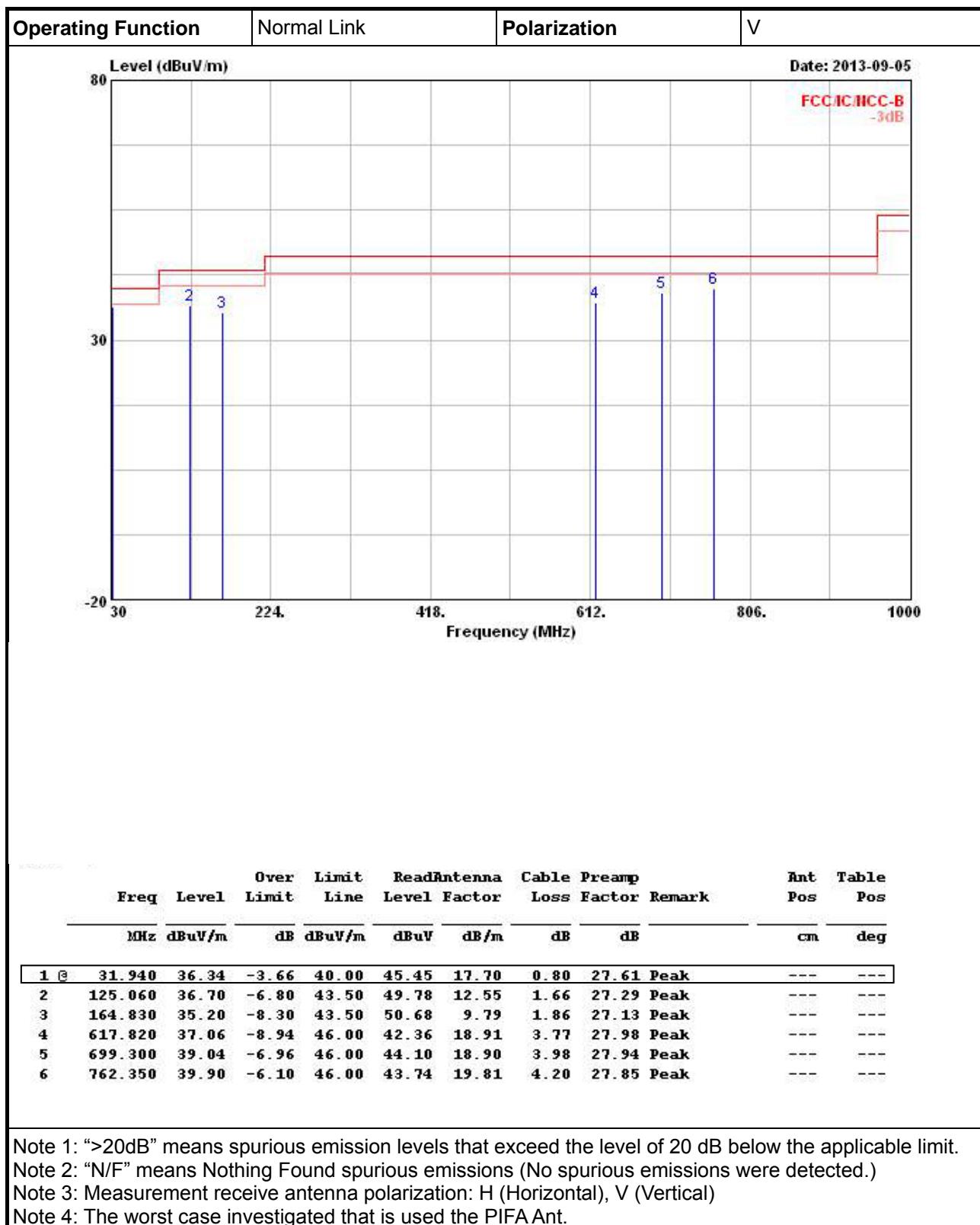


3.6.3 Emission in Restricted Frequency Bands (Below 30MHz)

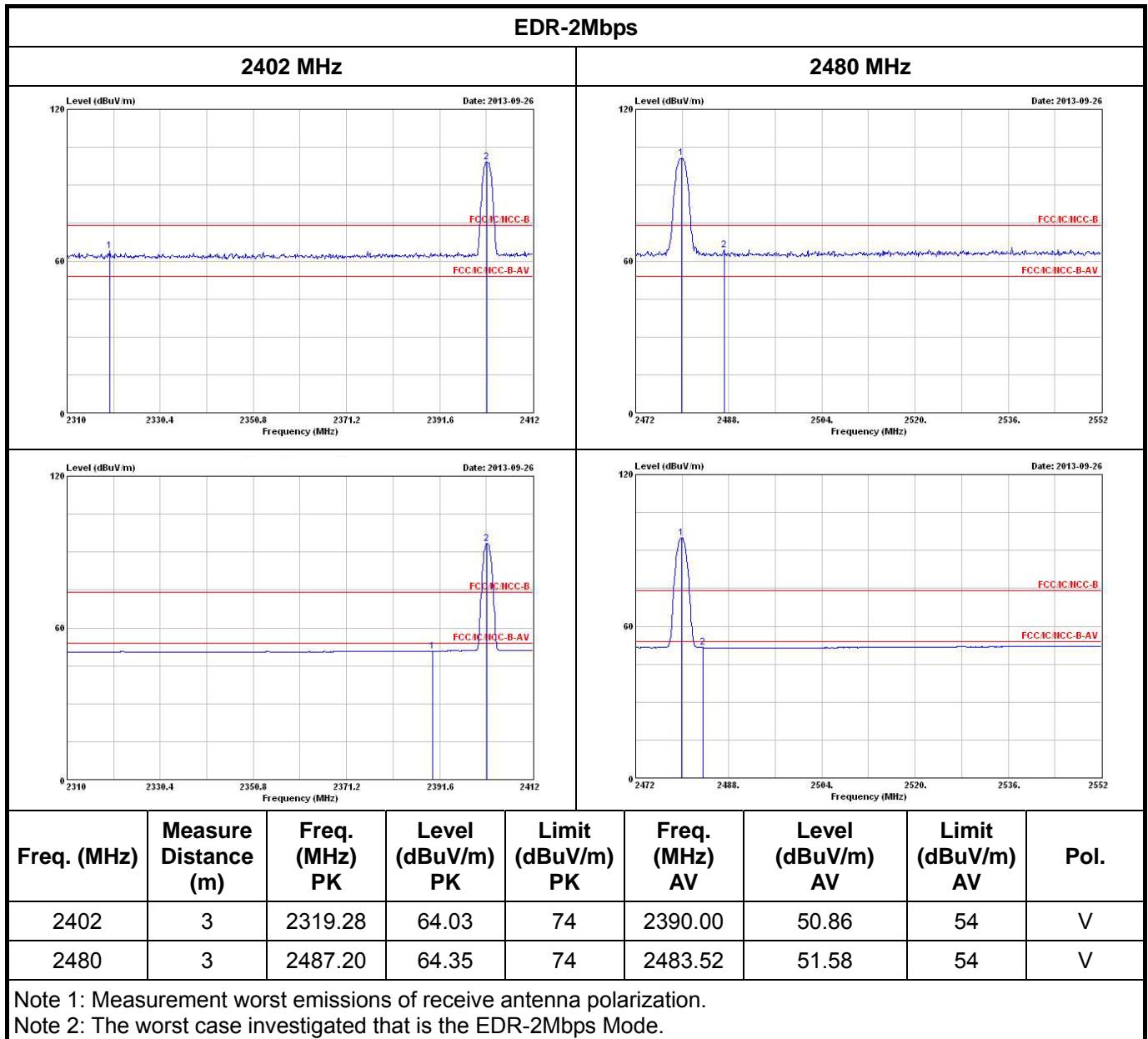
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

3.6.4 Emission in Restricted Frequency Bands (Below 1GHz)



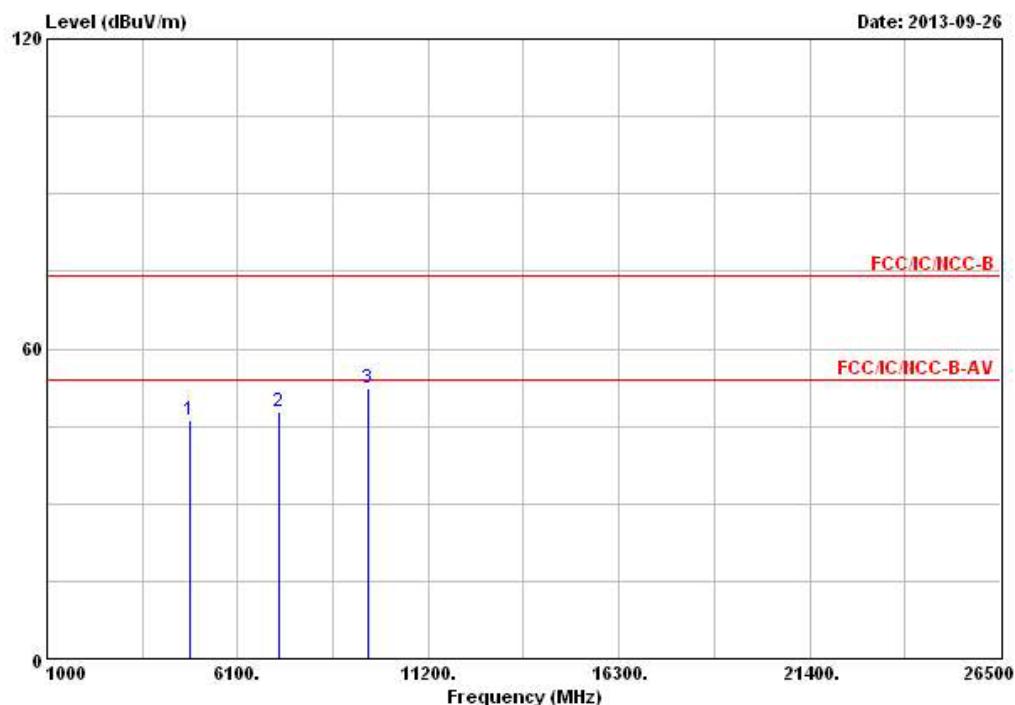


3.6.5 Emission in Restricted Frequency Bands (Above 1GHz) – for PIFA Ant.





Modulation Mode	EDR-3Mbps	Test Freq. (MHz)	2402
Operating Function	Transmit	Polarization	H



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table
		Line	Line	Level	Factor	Loss	Factor		
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1 4804.390	46.32	-27.68	74.00	41.79	33.06	3.91	32.44	Peak	---
2 7205.620	47.93			40.48	35.80	4.29	32.64	Peak	---
3 9608.000	52.31			41.65	38.23	5.53	33.10	Peak	---

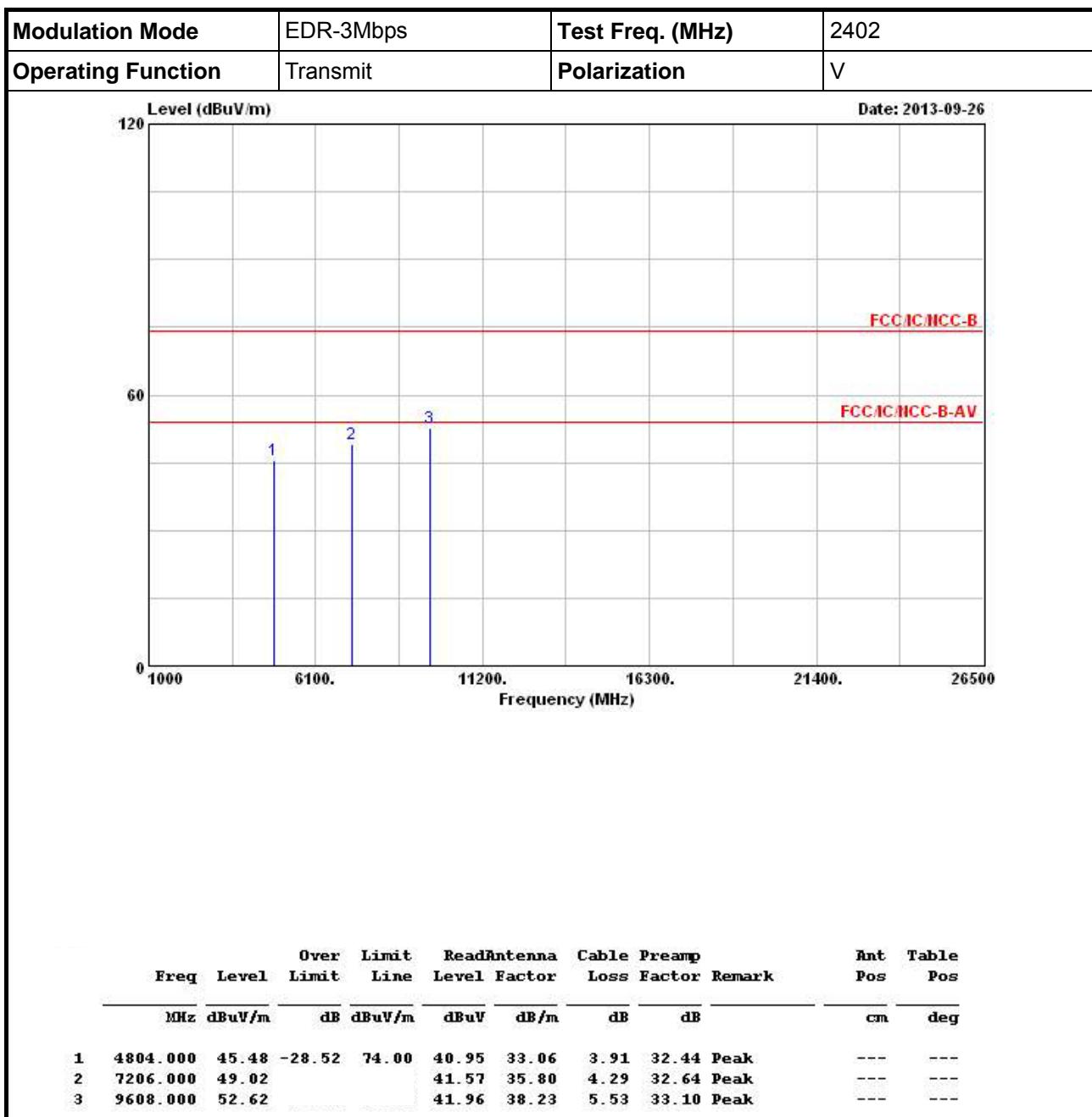
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

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: The worst case investigated that is the EDR-3Mbps Mode.



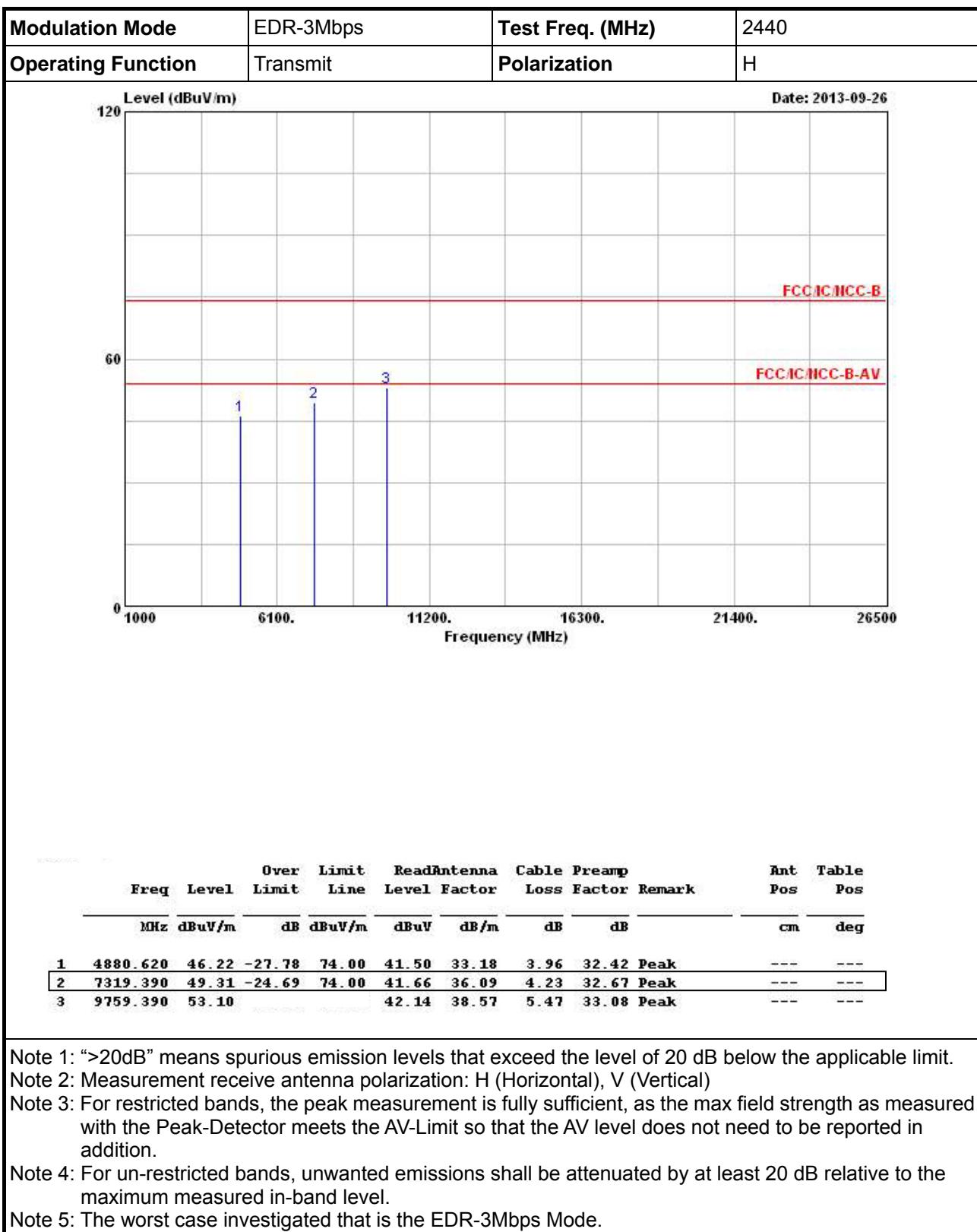
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

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.

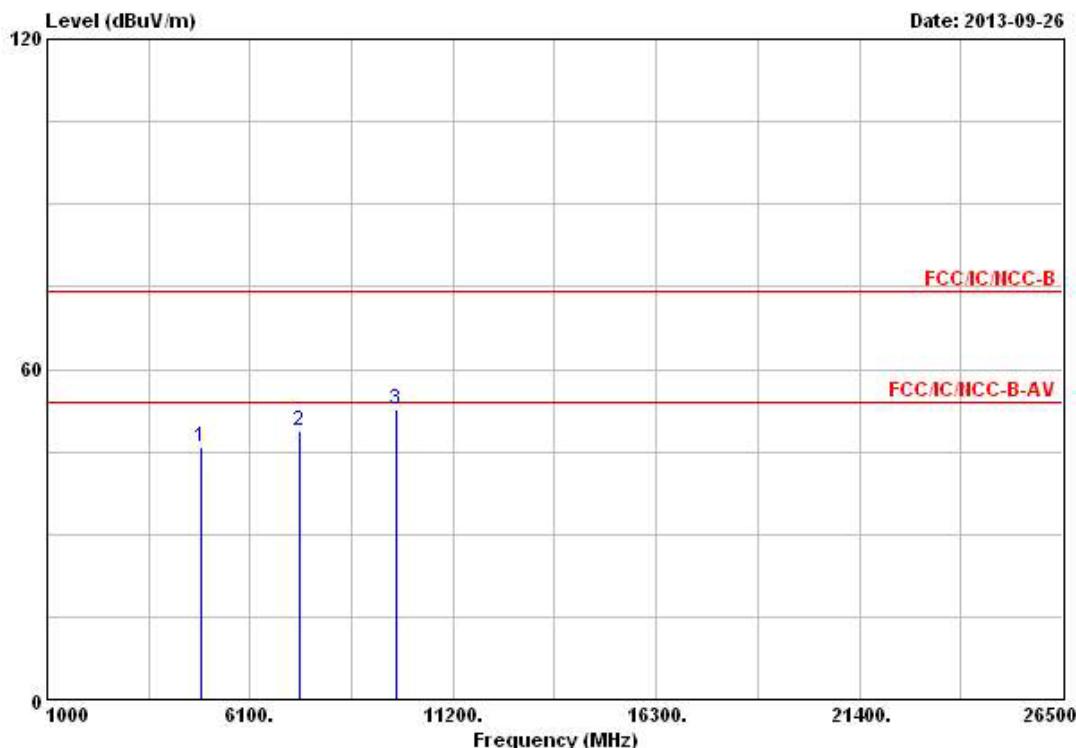
Note 4: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

Note 5: The worst case investigated that is the EDR-3Mbps Mode.





Modulation Mode	EDR-3Mbps	Test Freq. (MHz)	2440
Operating Function	Transmit	Polarization	V



Freq	Level	Over Limit		ReadAntenna		Cable Preamp			Ant Pos	Table Pos
		Limit	Line	Level	Factor	Loss	Factor	Remark		
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 4879.620	45.84	-28.16	74.00	41.14	33.18	3.94	32.42	Peak	---	---
2 7320.390	48.90	-25.10	74.00	41.25	36.09	4.23	32.67	Peak	---	---
3 9760.000	52.72			41.76	38.57	5.47	33.08	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)

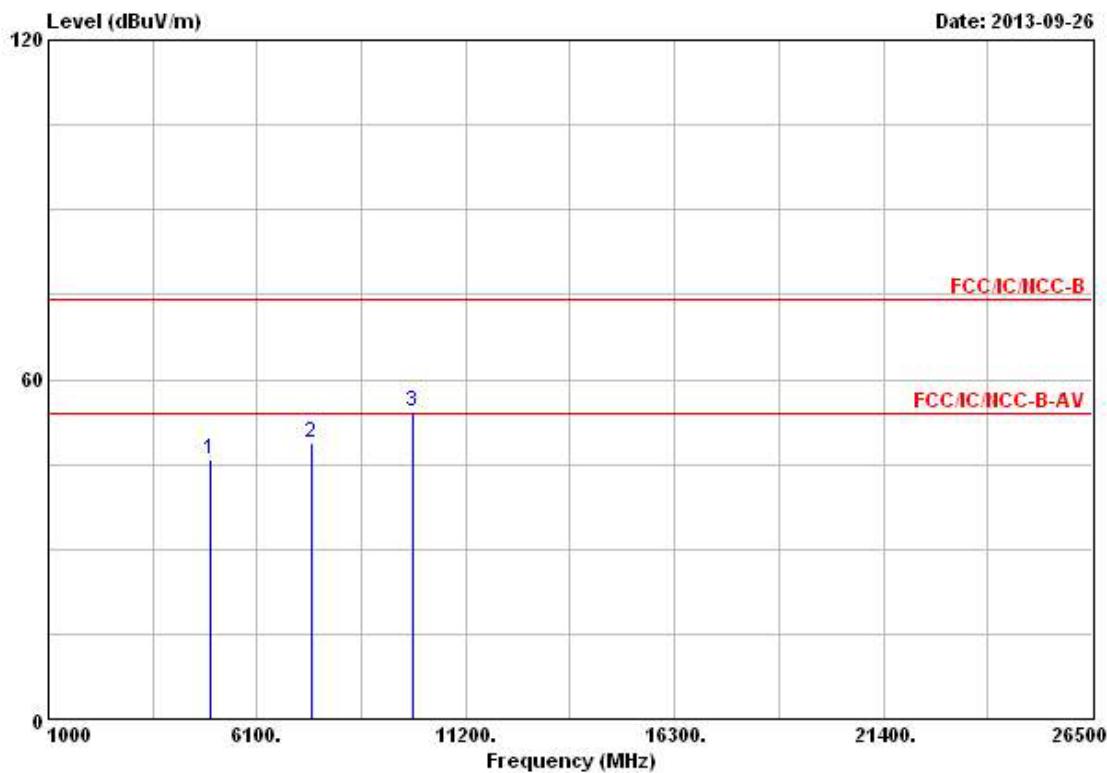
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: The worst case investigated that is the EDR-3Mbps Mode.



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



Freq	Level	Over Limit		Read		Antenna Factor	Cable Preamp		Ant Pos	Table Pos
		Line	Limit	Level	Factor		Loss	Factor		
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	4960.620	45.95	-28.05	74.00	41.01	33.34	4.01	32.41	Peak	---
2	7439.390	48.87	-25.13	74.00	41.03	36.38	4.17	32.71	Peak	---
3	9920.000	54.17			42.88	38.95	5.41	33.07	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)

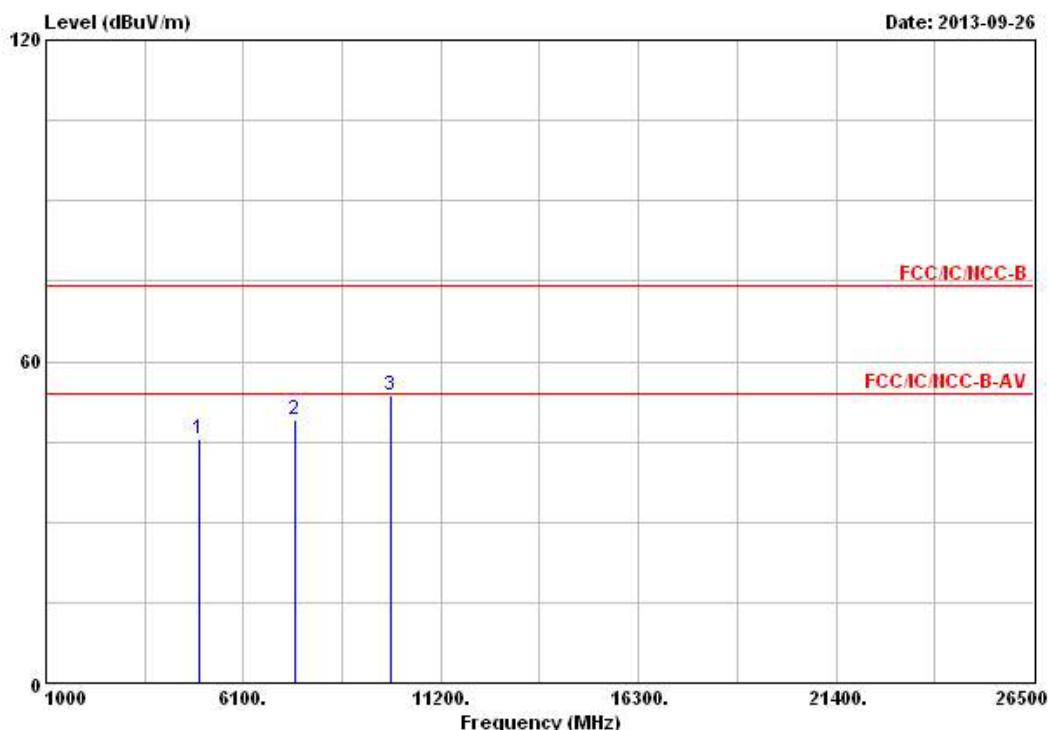
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: The worst case investigated that is the EDR-3Mbps Mode.



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



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark	Ant	Table
		Limit	Line	Level	Factor	Cable	Preamp			
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 4960.000	45.62	-28.38	74.00	40.68	33.34	4.01	32.41	Peak	---	---
2 7440.000	49.03	-24.97	74.00	41.19	36.38	4.17	32.71	Peak	---	---
3 9920.000	53.78			42.49	38.95	5.41	33.07	Peak	---	---

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

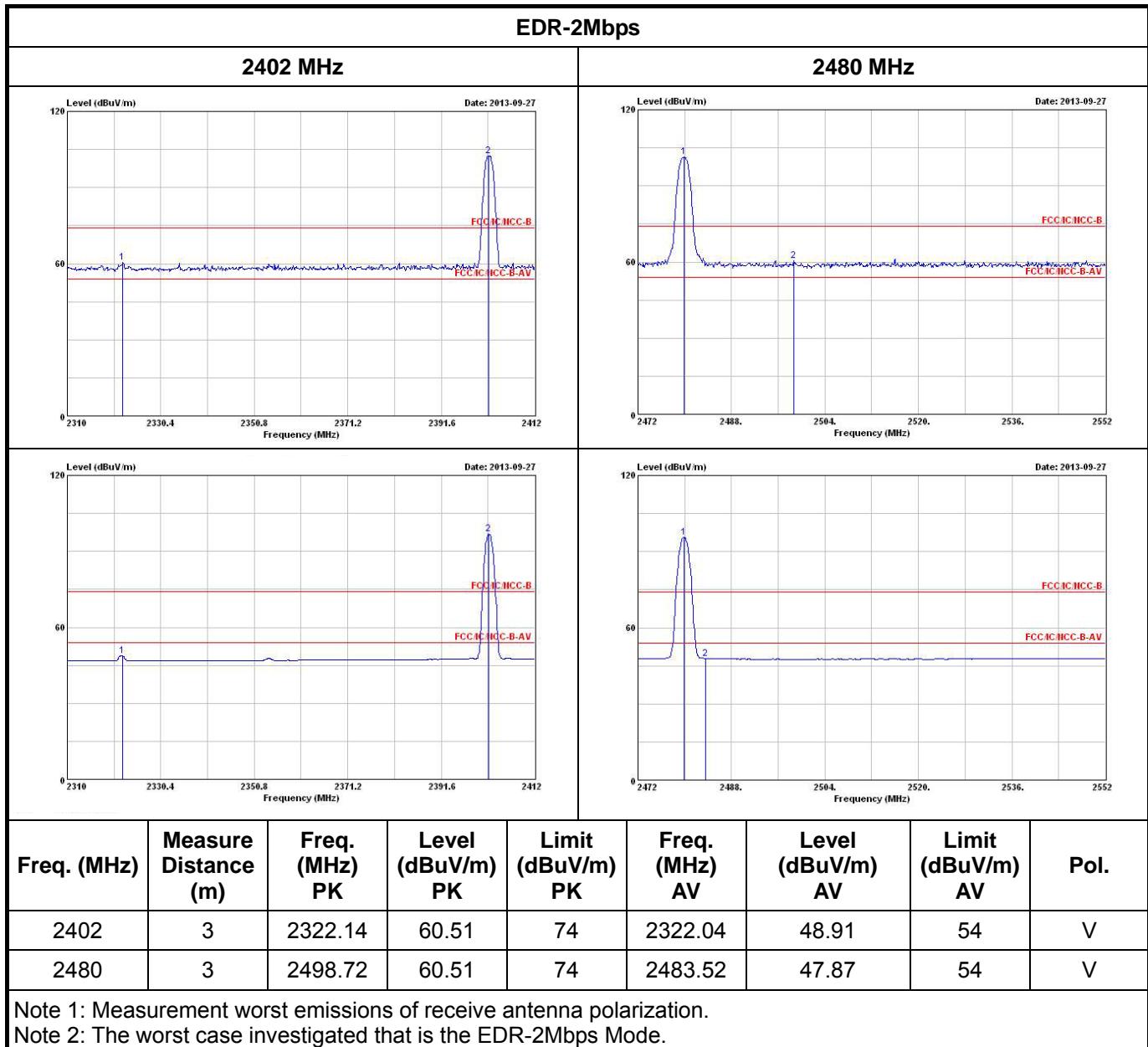
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

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.

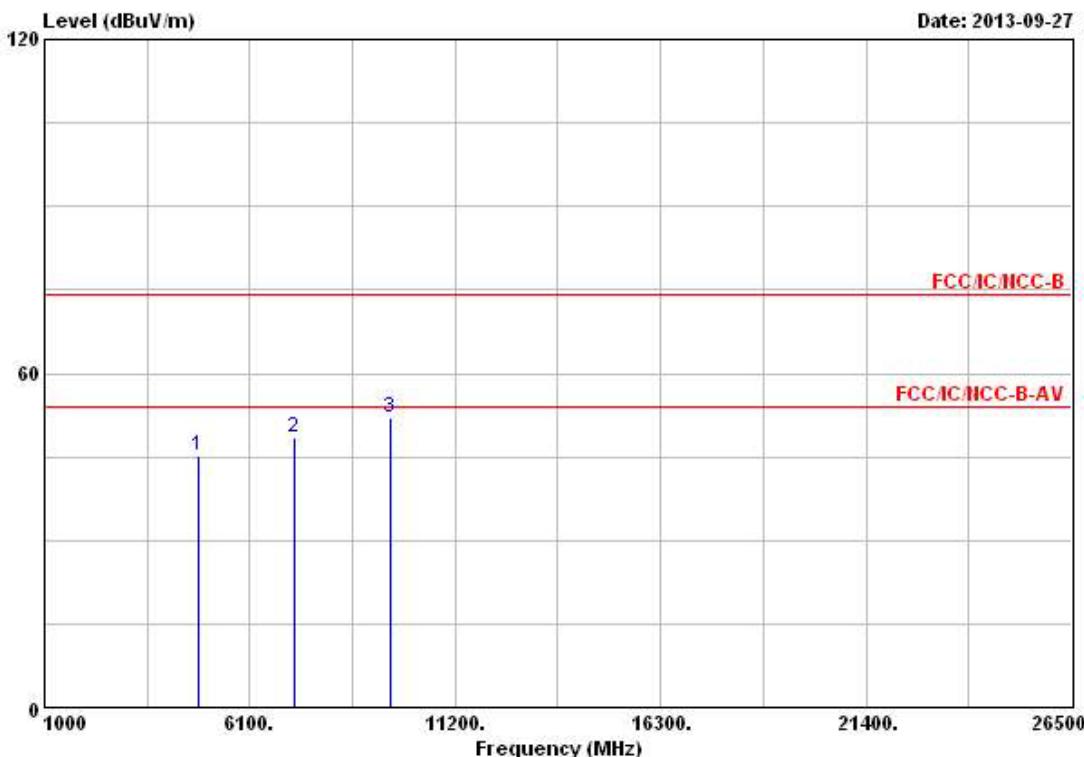
Note 5: The worst case investigated that is the EDR-3Mbps Mode.

3.6.6 Emission in Restricted Frequency Bands (Above 1GHz) – for Dipole Ant.





Modulation Mode	EDR-3Mbps	Test Freq. (MHz)	2402
Operating Function	Transmit	Polarization	H



Freq	Level	Over Limit	Limit	Read	Antenna	Cable	Preamp	Ant Table		
								Pos	Pos	
MHz	dB _{uV/m}		dB	dB _{uV/m}	dB _{uV}	dB/m	dB	dB	cm deg	
1 4804.000	45.20	-28.80	74.00	40.67	33.06	3.91	32.44	Peak	---	---
2 7206.000	48.38			40.93	35.80	4.29	32.64	Peak	---	---
3 9608.000	51.92			41.26	38.23	5.53	33.10	Peak	---	---

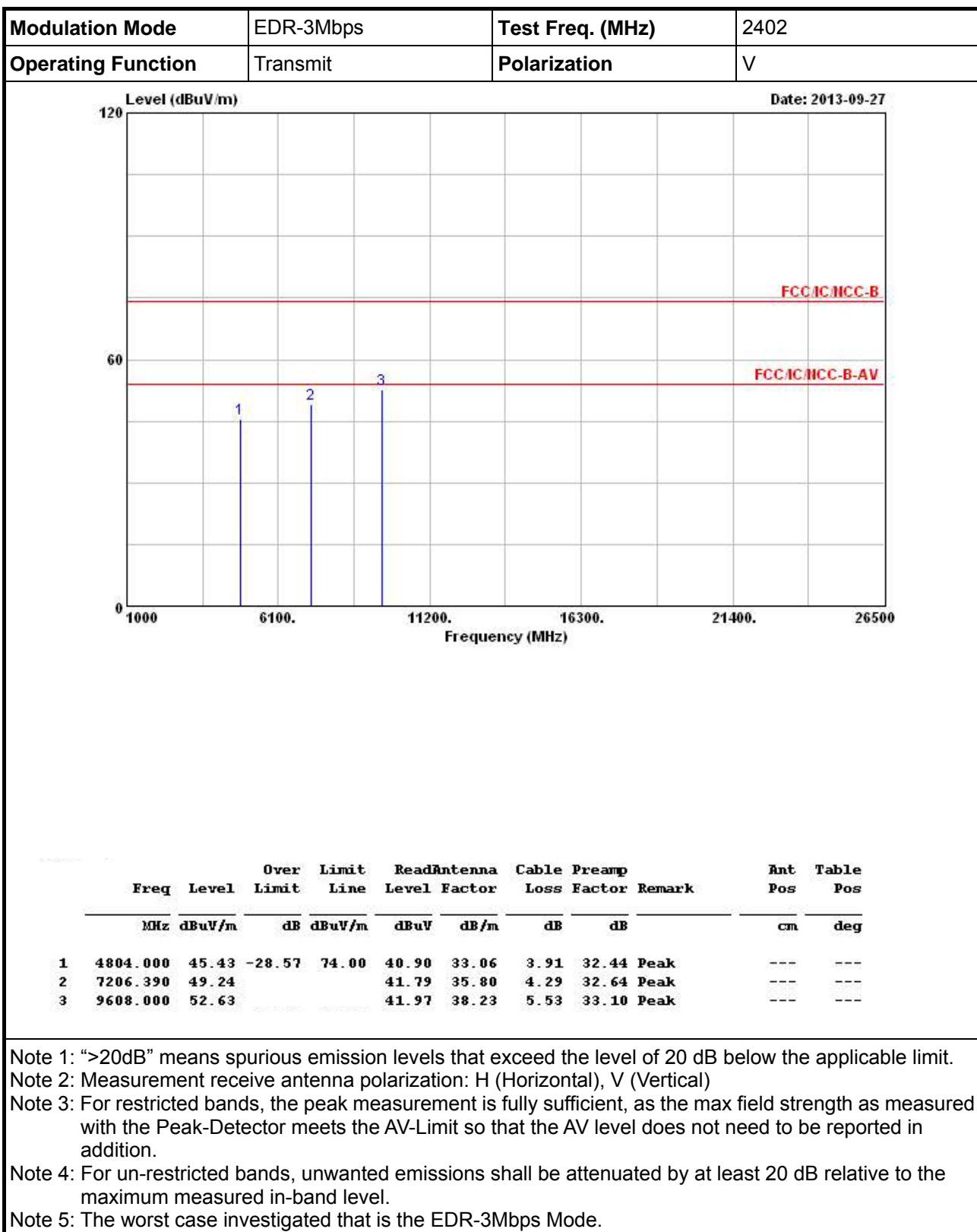
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

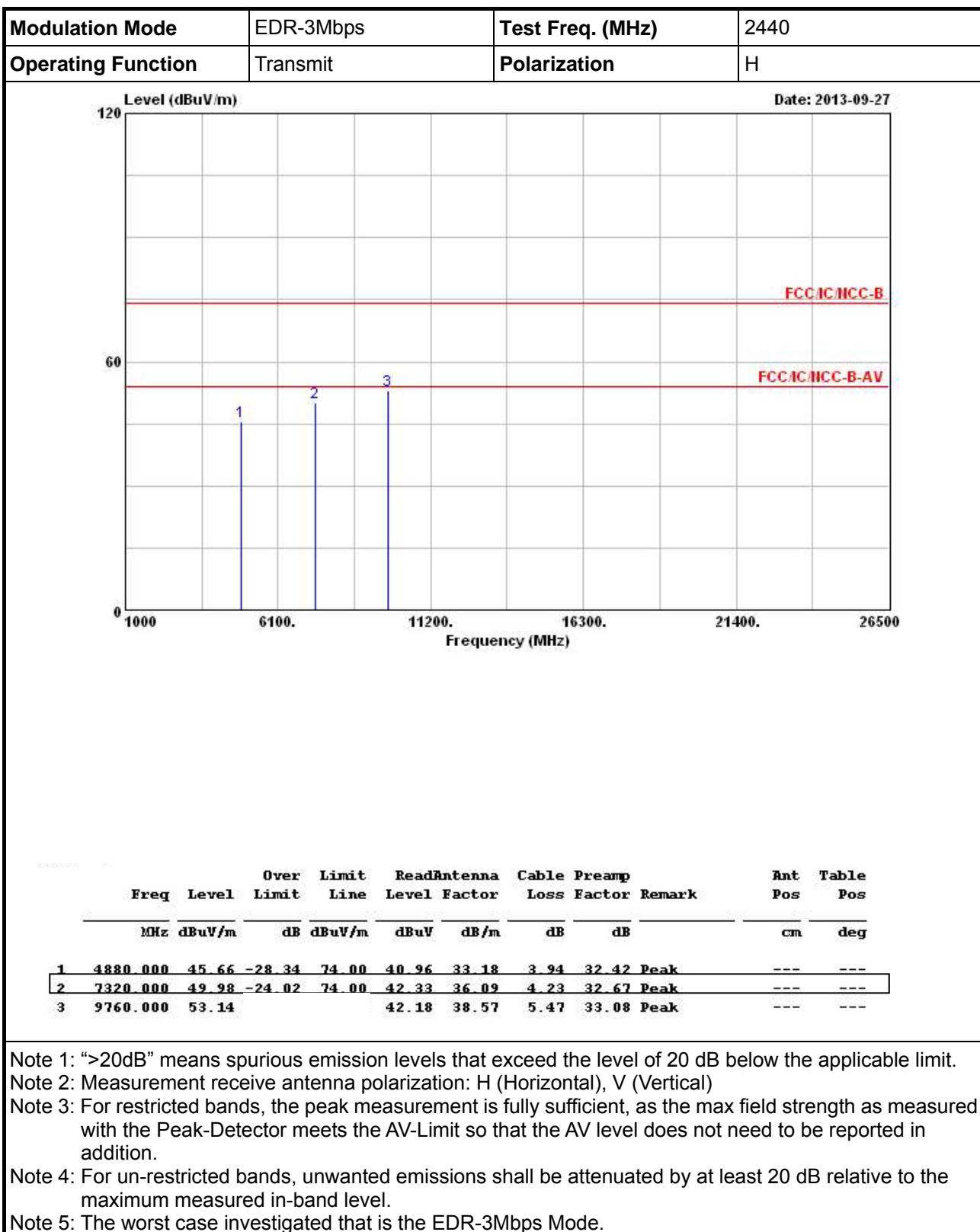
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

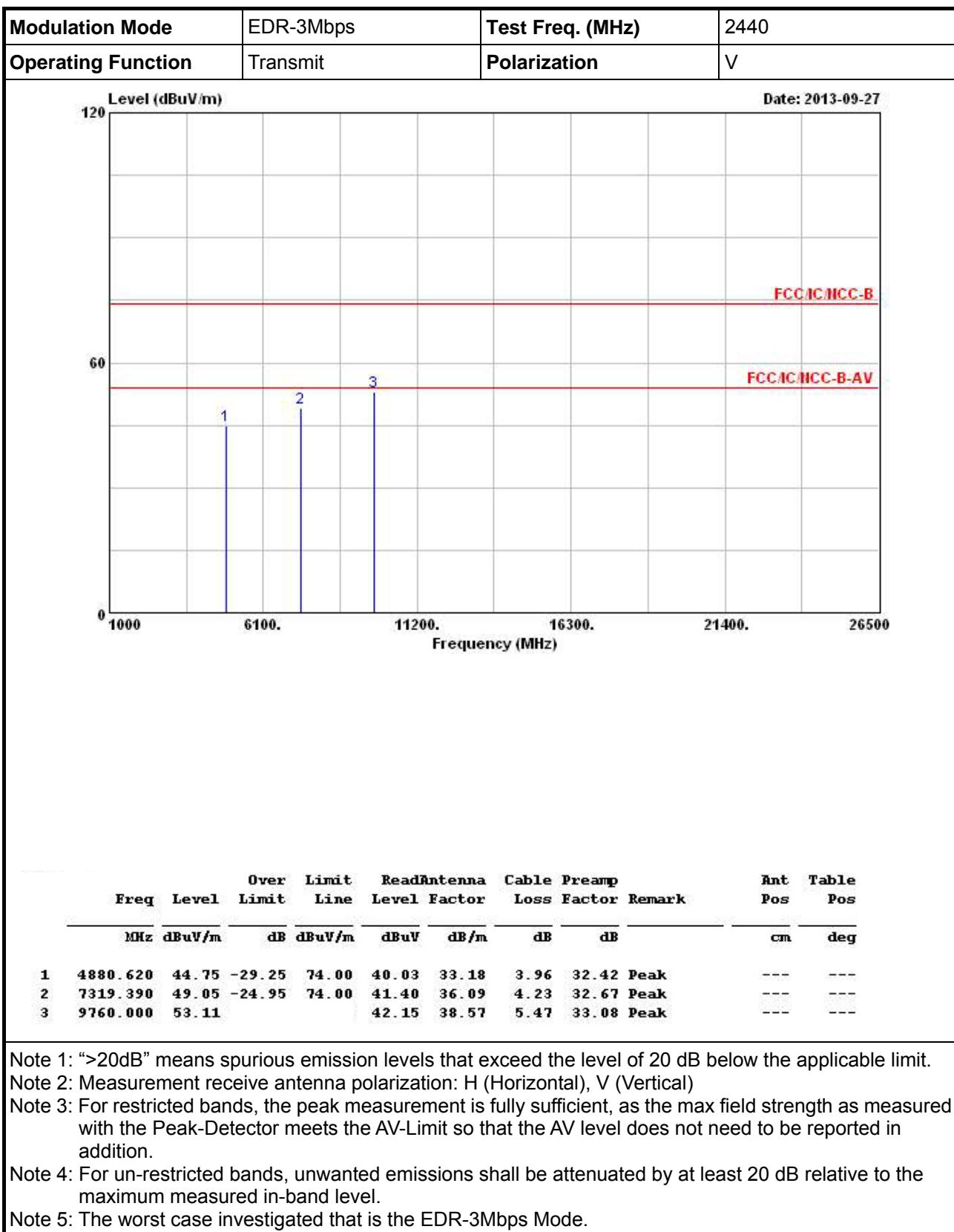
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

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: The worst case investigated that is the EDR-3Mbps Mode.

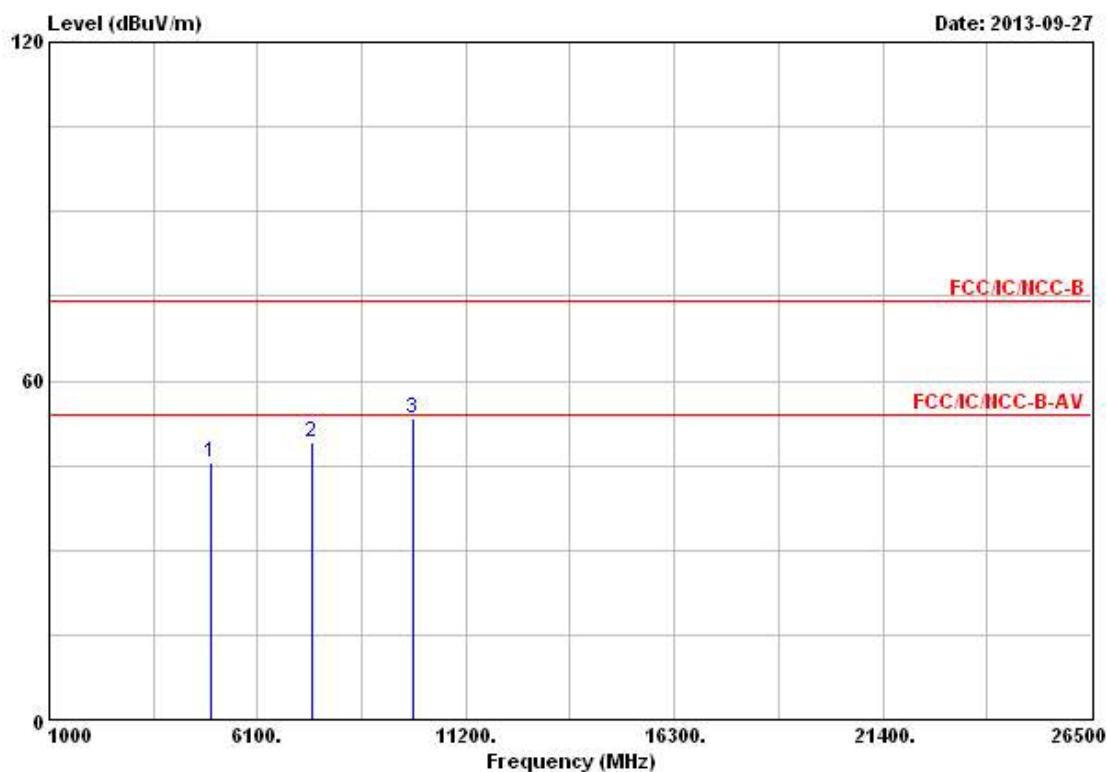








Modulation Mode	EDR-3Mbps	Test Freq. (MHz)	2480
Operating Function	Transmit	Polarization	H



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark	Ant	Table
		Limit	Line	Level	Factor	Cable	Preamp			
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 4959.390	45.50	-28.50	74.00	40.56	33.34	4.01	32.41	Peak	---	---
2 7440.000	49.02	-24.98	74.00	41.18	36.38	4.17	32.71	Peak	---	---
3 9920.000	53.22			41.93	38.95	5.41	33.07	Peak	---	---

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

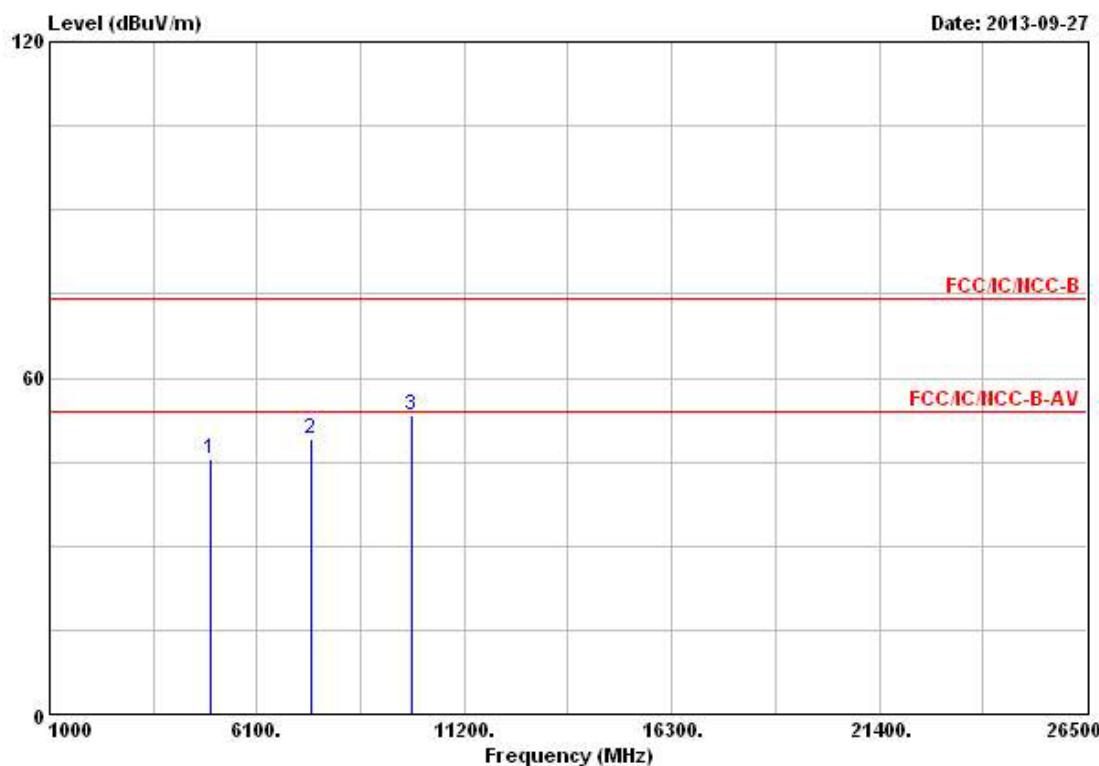
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

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: The worst case investigated that is the EDR-3Mbps Mode.

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



Freq	Level	Over Limit	Line	Read	Antenna	Cable	Preamp	Ant	Table	
									Pos	Pos
MHz	dBuV/m		dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1 4962.620	45.65	-28.35	74.00	40.71	33.34	4.01	32.41	Peak	---	---
2 7439.390	49.23	-24.77	74.00	41.39	36.38	4.17	32.71	Peak	---	---
3 9922.620	53.48			42.19	38.95	5.41	33.07	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: The worst case investigated that is the EDR-3Mbps Mode.

3.7 AC Power-line Conducted Emissions

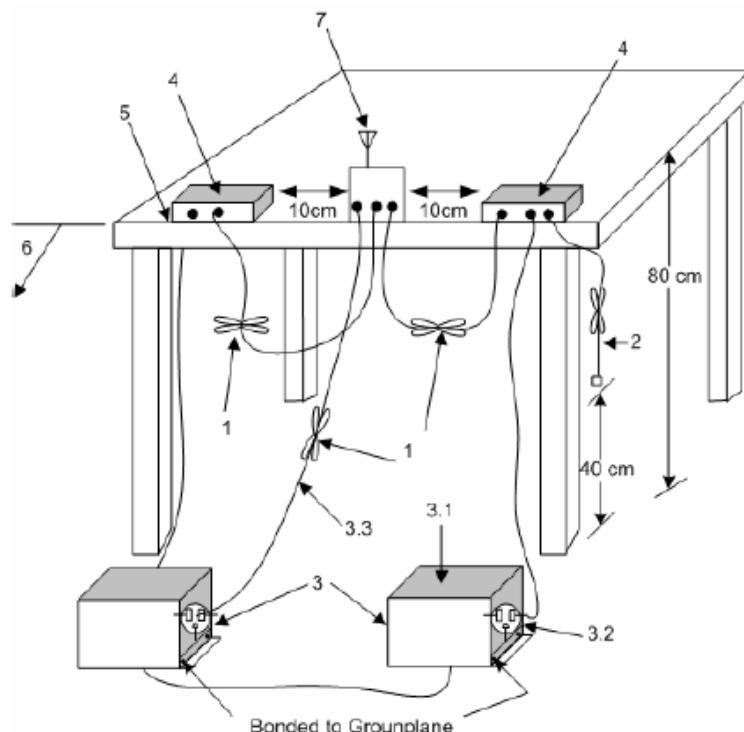
3.7.1 Test Procedures

Test Method

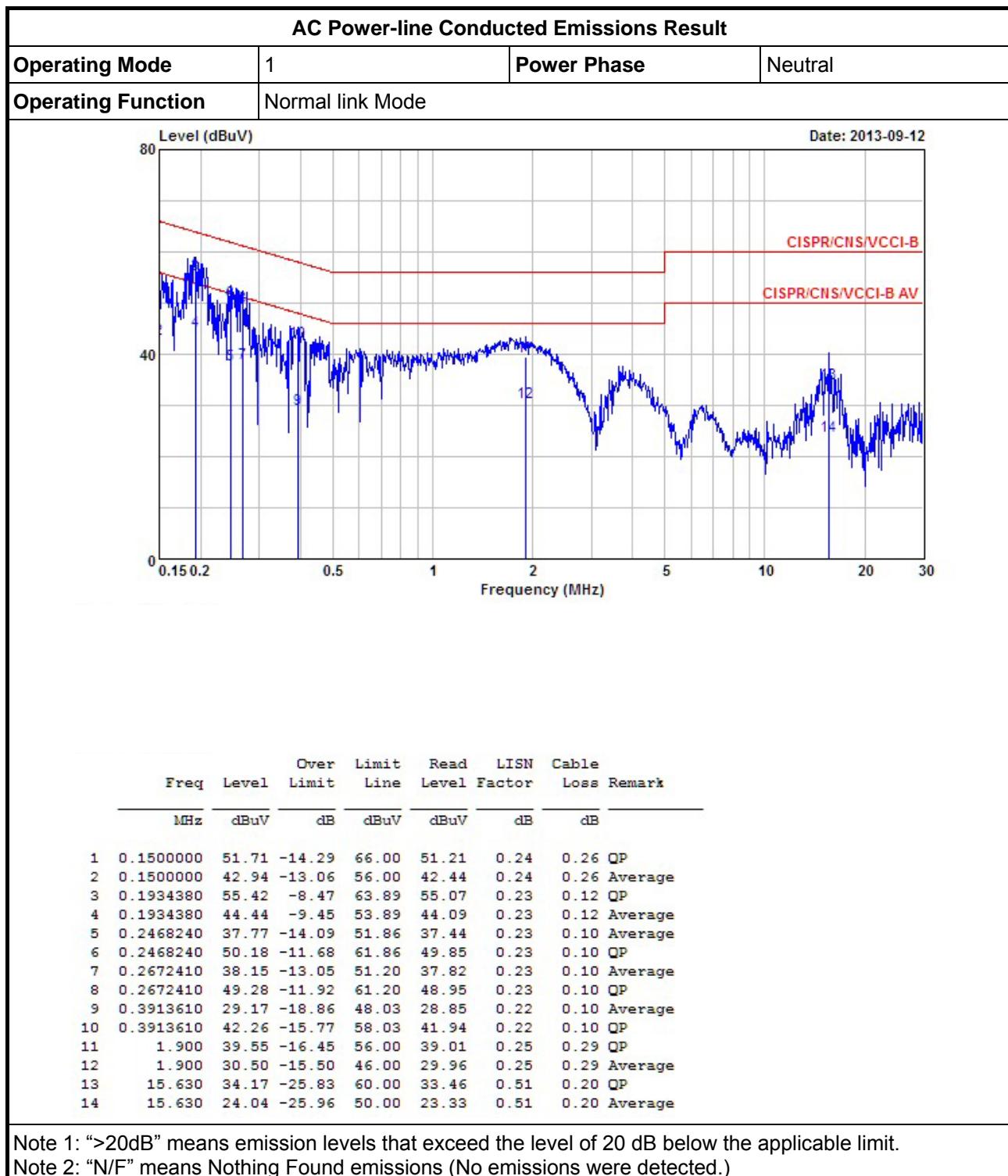
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions.
--

3.7.2 Test Setup

AC Power-line Conducted Emissions
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3.7.3 Test Result of AC Power-line Conducted Emissions





AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	Normal link Mode		

Date: 2013-09-12

Level (dBuV)

Frequency (MHz)

CISPR/CNS/VCCI-B

CISPR/CNS/VCCI-B AV

Freq	Level	Over	Limit	Read	LISN	Cable	
		Limit	Line	Level	Factor	Loss	Remark
MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1515980	44.97	-10.94	55.91	44.60	0.11	0.26 Average
2	0.1515980	51.56	-14.35	65.91	51.19	0.11	0.26 QP
3	0.1954980	43.77	-10.03	53.80	43.55	0.11	0.11 Average
4	0.1954980	56.14	-7.66	63.80	55.92	0.11	0.11 QP
5	0.2534510	48.28	-13.36	61.64	48.07	0.11	0.10 QP
6	0.2534510	41.60	-10.04	51.64	41.39	0.11	0.10 Average
7	0.2744160	47.03	-13.95	60.98	46.82	0.11	0.10 QP
8	0.2744160	34.38	-16.60	50.98	34.17	0.11	0.10 Average
9	0.3851900	31.96	-16.21	48.17	31.76	0.10	0.10 Average
10	0.3851900	40.45	-17.72	58.17	40.25	0.10	0.10 QP
11	1.800	26.41	-19.59	46.00	26.00	0.13	0.28 Average
12	1.800	35.40	-20.60	56.00	34.99	0.13	0.28 QP
13	15.720	37.75	-22.25	60.00	37.26	0.29	0.20 QP
14	15.720	32.25	-17.75	50.00	31.76	0.29	0.20 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.)



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, 2013	Conduction (CO04-HY)
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Jan. 21, 2013	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz ~ 30MHz	Apr. 18, 2013	Conduction (CO04-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	7.61183201e+012	9kHz ~ 30MHz	Nov. 09, 2012	Conduction (CO04-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSV 40	101013	9KHz~40GHz	Jan. 29, 2013	Conducted (TH06-HY)
AC Power Source	G.W	APS-9102	EL920581	AC 0V ~ 300V	Jul. 16, 2013	Conducted (TH06-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100°C	Nov. 21, 2012	Conducted (TH06-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jun. 27, 2013	Conducted (TH06-HY)
Power Sensor	Anritsu	MA2411B	1027452	300MHz ~ 40GHz	Sep. 11, 2013	Conducted (TH06-HY)
Power Meter	Anritsu	ML2495A	1124009	300MHz ~ 40GHz	Sep. 11, 2013	Conducted (TH06-HY)
RF Cable-2m	HUBER+SUHNER	SUCOFLEX_104	SN 345673/4	30MHz ~ 26.5GHz	Dec. 04, 2012	Conducted (TH06-HY)
RF Cable-3m	HUBER+SUHNER	SUCOFLEX_104	SN 345668/4	30MHz ~ 26.5GHz	Dec. 04, 2012	Conducted (TH06-HY)

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



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	Dec. 01, 2012	Radiation (03CH03-HY)
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	May. 03, 2013	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	Aug. 20, 2013	Radiation (03CH03-HY)
Receiver	R&S	ESU26	1302.6005.26	20Hz ~ 26.5GHz	Apr. 02, 2013	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30MHz ~ 1GHz	Sep. 22, 2012	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6741	1GHz ~ 18GHz	May 31, 2013	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz ~ 40GHz	Jan. 08, 2013	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	9MHz ~ 1GHz	Jan. 17, 2013	Radiation (03CH03-HY)
RF Cable-high	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz ~ 40GHz	Jan. 17, 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
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz - 30 MHz	Dec. 02, 2012	Radiation (03CH03-HY)

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