

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 Spe. 30, 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

Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information.....	5
1.2	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	Test Setup Diagram	9
3	TRANSMITTER TEST RESULT	10
3.1	6dB Bandwidth	10
3.2	RF Output Power.....	12
3.3	Power Spectral Density	14
3.4	Emission in Non-Restricted Frequency Bands.....	16
3.5	Emission in Restricted Frequency Bands	18
3.6	AC Power-line Conducted Emissions	26
4	TEST EQUIPMENT AND CALIBRATION DATA	29

APPENDIX A. TEST PHOTOS

APPENDIX B. PHOTOGRAPHS OF EUT

Summary of Test Result

Conformance Test Specifications					
Report Clause	Ref. Std. Clause	Description	Typical Data	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	6dB Bandwidth	LE: 658.70 kHz	≥500kHz	Complied
		99% Bandwidth	LE: 1065.80 kHz		
3.2	15.247(b) / RSS-210 A8.4	RF Output Power (Maximum Peak Conducted Output Power)	Power [dBm] LE: 5.53	≤ 30 dBm	Complied
3.3	15.247(e) / RSS-210 A8.2	Power Spectral Density	PSD [dBm/100kHz] LE: -9.23	≤ 8 dBm/3kHz	Complied
3.4	15.247(d) / RSS-210 A8.5	Emission in Non-Restricted Frequency Bands	Non Restricted Bands:	Non-Restricted Bands: > 20 dBc	Complied
3.5	15.247(d) / RSS-210 A8.5	Emission in Restricted Frequency Bands	Restricted Bands -36.31 dBm - PK -42.50 dBm - AV	Restricted Bands: According to FCC 15.209 / RSS-Gen 6.1	Complied
3.6	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

[illegible]

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, 2404, 2406, 2408, 2410, 2412, 2414, 2416, 2418, 2420, 2422, 2424, 2426, 2428, 2430, 2432, 2434, 2436, 2438, 2440, 2442, 2444, 2446, 2448, 2450, 2452, 2454, 2456, 2458, 2460, 2462, 2464, 2466, 2468, 2470, 2472, 2474, 2476, 2478, 2480	0-39 [40]	LE-1Mbps	5.53	No
<p>Note 1: Bluetooth LE (Low Energy) using GFSK modulation for DTS digital modulation.</p> <p>Note 2: RF output power specifies that Maximum Peak Conducted Output Power.</p> <p>Note 3: 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.)</p>					

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.	Frequency Band	Maximum Gain (dBi)
1	2400~2483.5MHz	3.62
2	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"/> 77.42% - test mode single channel - LE	1.11

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 KDB 558074
- ♦ FCC KDB 662911
- ♦ FCC KDB 412172

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
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%

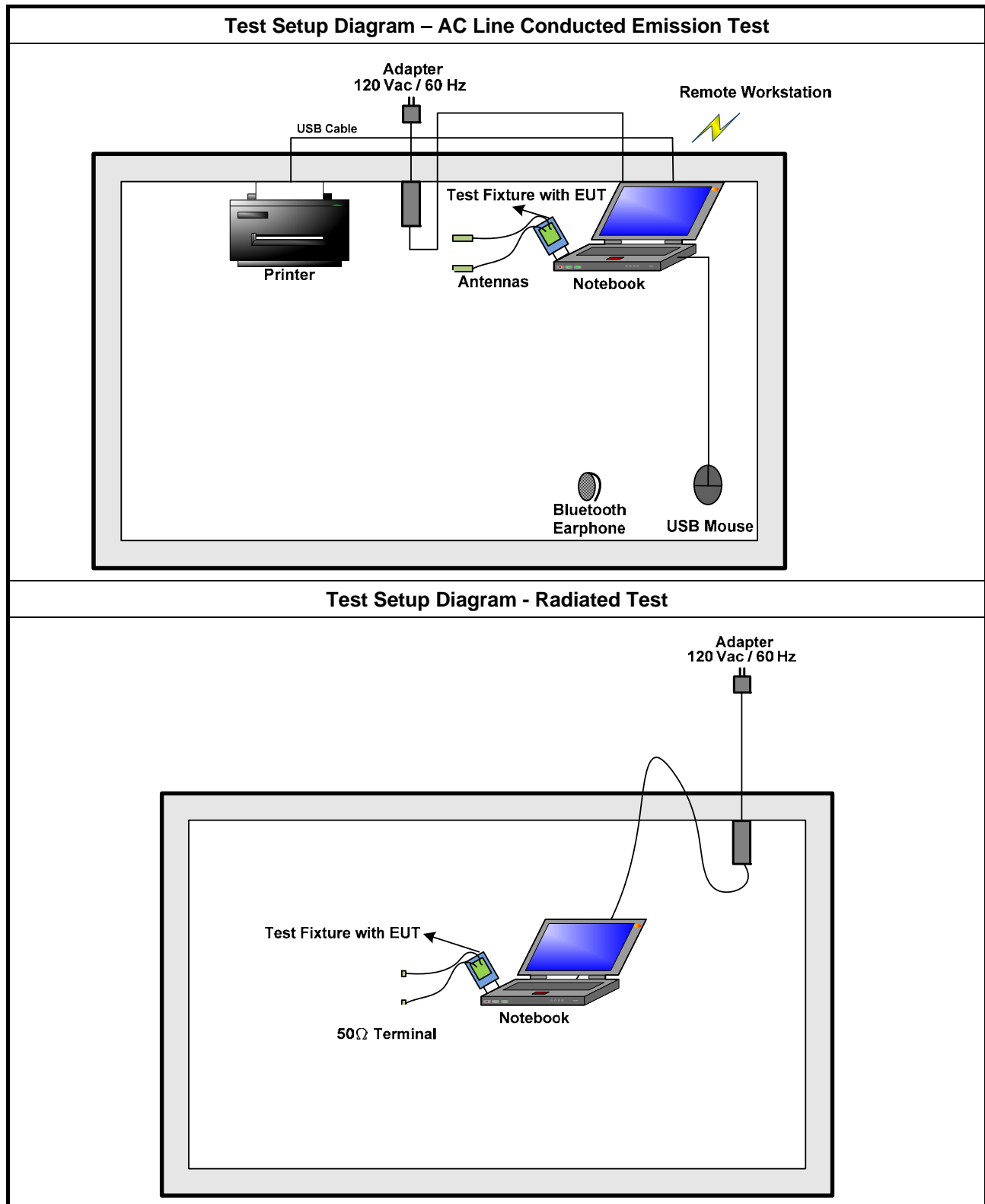
1.5 Measurement Uncertainty

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



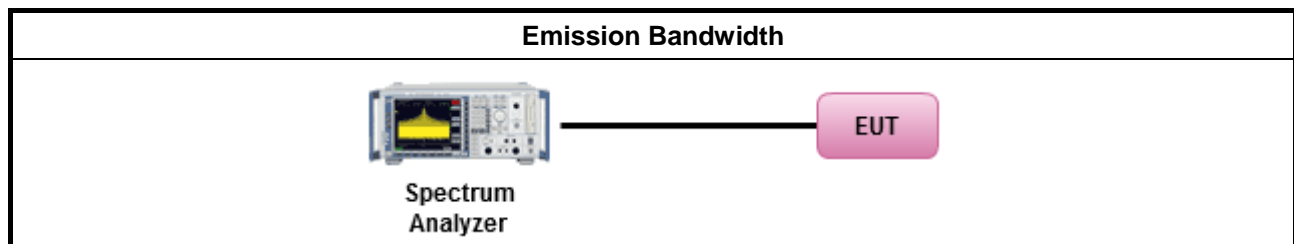
3 Transmitter Test Result

3.1 6dB Bandwidth

3.1.1 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	For the emission bandwidth shall be measured using one of the options below:
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 8.1 Option 1 for 6 dB bandwidth measurement.
<input checked="" type="checkbox"/>	Refer as RSS-Gen 4.6.1.
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 8.2 Option 2 for 6 dB bandwidth measurement.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
<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

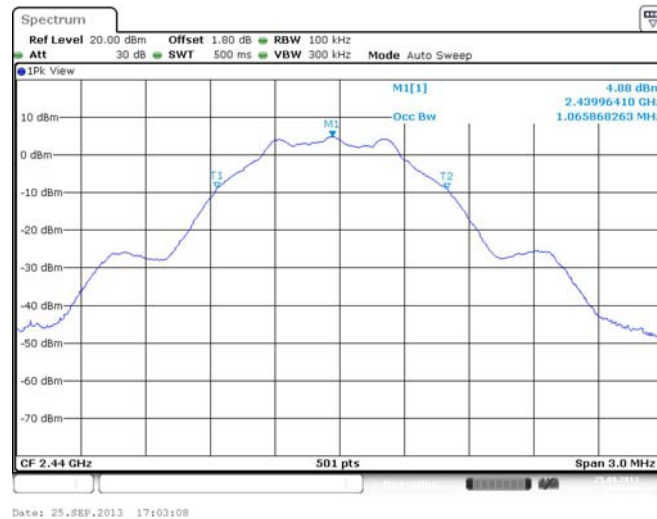


3.1.3 Test Result of Emission Bandwidth

Emission Bandwidth Result			
Modulation Mode	Freq. (MHz)	99% Bandwidth (kHz)	6dB Bandwidth (kHz)
LE-1Mbps	2402	1065.80	658.70
LE-1Mbps	2440	1065.80	658.70
LE-1Mbps	2480	1065.80	658.70
Limit		N/A	≥500 kHz
Result		Complied	

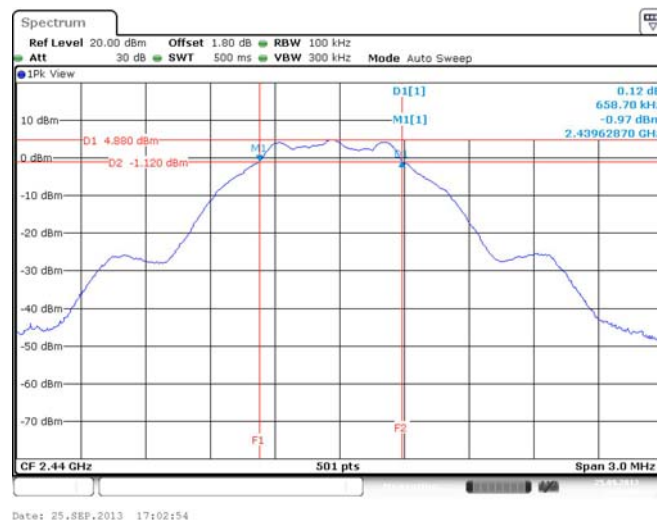
Worst 99% Bandwidth Plots

LE-1Mbps



Worst 6dB Bandwidth Plots

LE-1Mbps

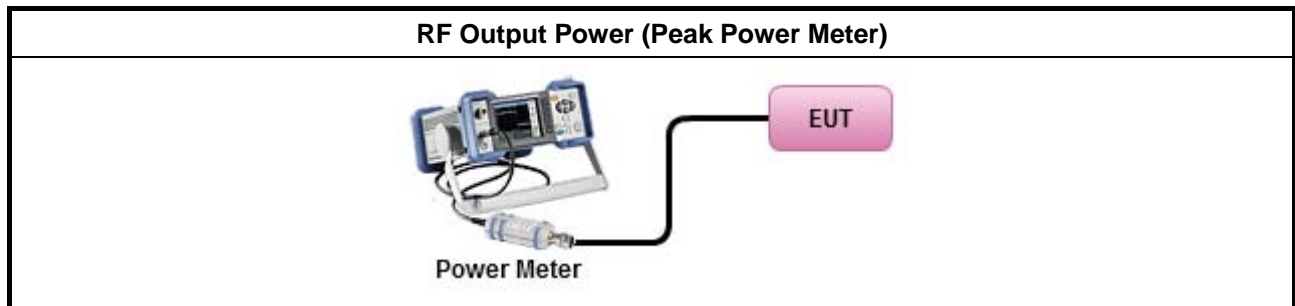


3.2 RF Output Power

3.2.1 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Maximum Peak Conducted Output Power
<input checked="" 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.

3.2.2 Test Setup



3.2.3 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
LE-1Mbps	2402	4.46	30	3.62	8.08	36
LE-1Mbps	2440	4.96	30	3.62	8.58	36
LE-1Mbps	2480	5.53	30	3.62	9.15	36
Result		Complied				

3.2.4 Test Result of Maximum Average Conducted Output Power

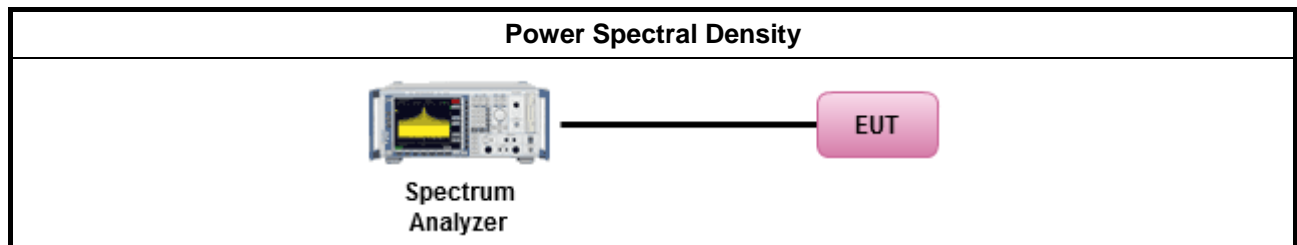
Maximum Average Conducted Output Power Result						
Condition		RF Output Power (dBm)				
Modulation Mode	Freq. (MHz)	RF Output Power	Power Limit	Antenna Gain (dBi)	EIRP Power	EIRP Limit
LE-1Mbps	2402	3.99	30	3.62	7.61	36
LE-1Mbps	2440	4.33	30	3.62	7.95	36
LE-1Mbps	2480	4.90	30	3.62	8.52	36
Result		Complied				

3.3 Power Spectral Density

3.3.1 Test Procedures

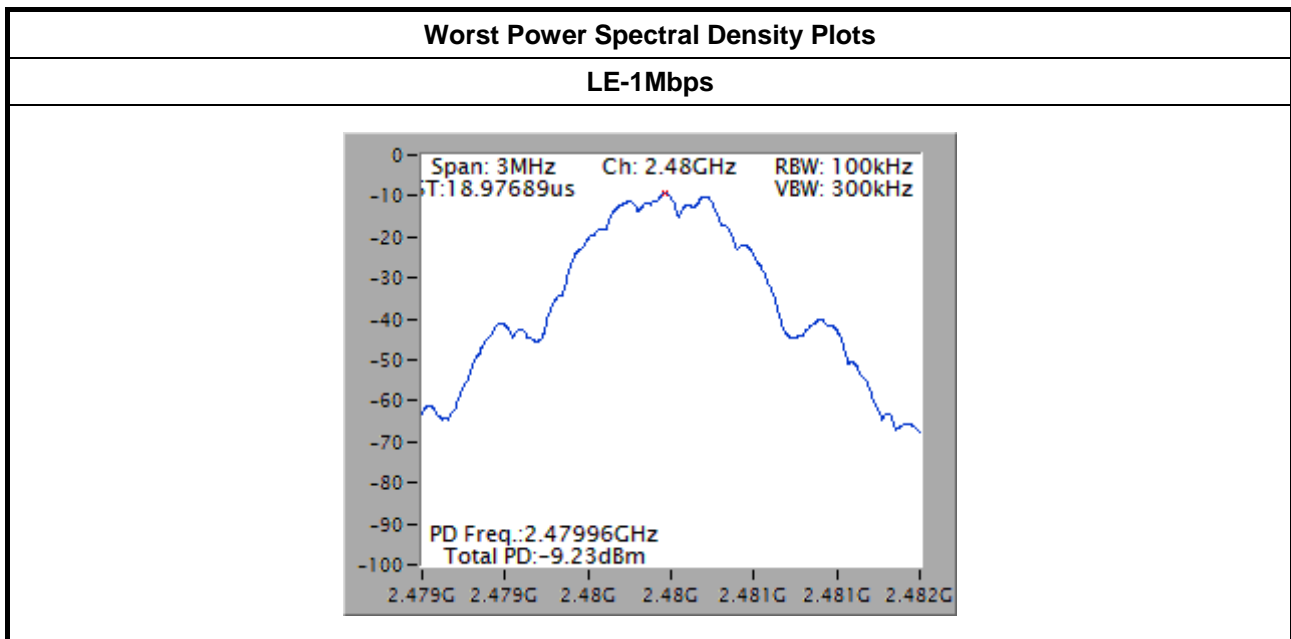
Test Method	
<input checked="" type="checkbox"/>	Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option).
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 10.2 Method PKPSD (RBW=3-100kHz;detector=peak).. [duty cycle \geq 98% or external video / power trigger]
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 10.3 Method AVGPS-1 (spectral trace averaging).
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 10.4 Method AVGPS-1 Alt. (slow sweep speed) duty cycle < 98% and average over on/off periods with duty factor
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 10.5 Method AVGPS-2 (spectral trace averaging).
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 10.6 Method AVGPS-2 Alt. (slow sweep speed)
<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 Power Spectral Density

Power Spectral Density Result			
Modulation Mode	Freq. (MHz)	PSD dBm/100kHz	PSD Limit dBm/3kHz
LE-1Mbps	2402	-10.17	8
LE-1Mbps	2440	-9.61	8
LE-1Mbps	2480	-9.23	8
Result		Complied	

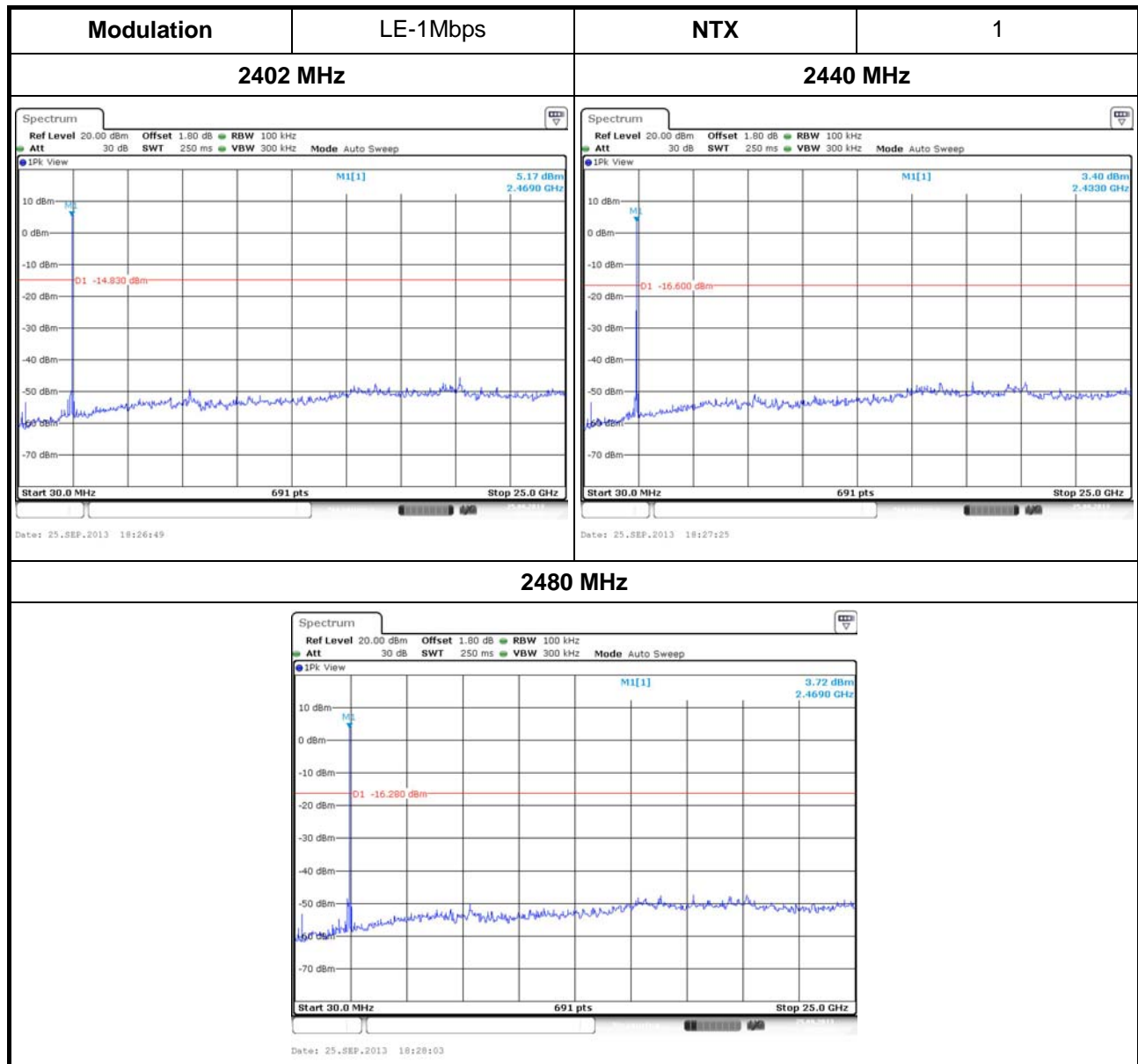


3.4 Emission in Non-Restricted Frequency Bands

3.4.1 Test Procedures

Test Method	
<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"/>	Refer as FCC KDB 558074, clause 11 for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands.
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 12.2.5.1 Option 1 (trace averaging for duty cycle \geq 98%)
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 12.2.5.2 Option 2 (trace averaging + duty factor).
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 12.2.5.3 Option 3 (Reduced VBW \geq 1/T).
<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 type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 11.3 and 12.2.4 measurement procedure peak limit.
<input checked="" type="checkbox"/>	For the transmitter bandedge emissions shall be measured using following options below:
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 13.3 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).
<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"/>	For radiated measurement, refer as FCC KDB 558074, clause 12.2.7.

3.4.2 Test Result of Emission in Non-Restricted Frequency Bands



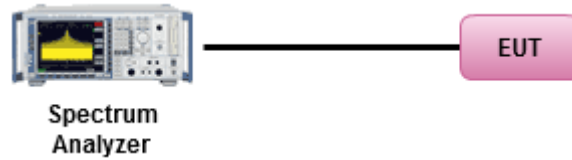
3.5 Emission in Restricted Frequency Bands

3.5.1 Test Procedures

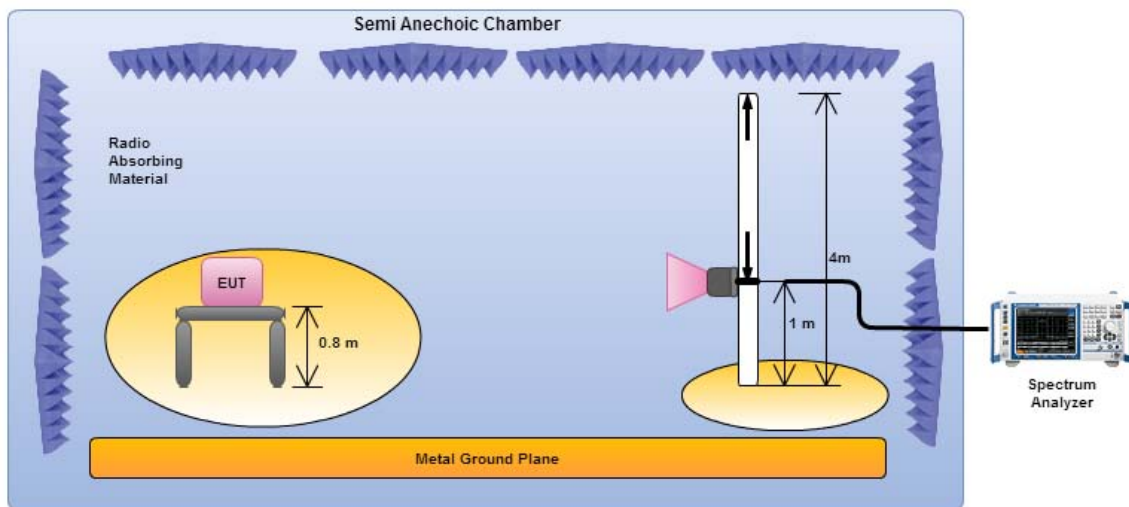
Test Method	
<input checked="" type="checkbox"/>	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other 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 ≥ 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 KDB 558074, clause 11 for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands.
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 12.2.5.1 Option 1 (trace averaging for duty cycle $\geq 98\%$)
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 12.2.5.2 Option 2 (trace averaging + duty factor).
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 12.2.5.3 Option 3 (Reduced VBW $\geq 1/T$).
<input 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 type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 11.3 and 12.2.4 measurement procedure peak limit.
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 12.2.3 measurement procedure Quasi-Peak limit.
<input checked="" type="checkbox"/>	For radiated measurement, refer as FCC KDB 558074, clause 12.2.7.
<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.
<input checked="" type="checkbox"/>	For conducted and cabinet radiation measurement, refer as FCC KDB 558074, clause 12.2.2.
<input type="checkbox"/>	For conducted unwanted emissions into non-restricted bands (relative emission limits). Devices with multiple transmit chains: Refer as FCC KDB 662911, when testing out-of-band and spurious emissions against relative emission limits, tests may be performed on each output individually without summing or adding 10 log(N) if the measurements are made relative to the in-band emissions on the individual outputs.
<input type="checkbox"/>	For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB
<input type="checkbox"/>	For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.

3.5.2 Test Setup

Transmitter Conducted Emissions in restricted frequency bands (with Antenna Gain)



Transmitter Radiated Emissions in restricted frequency bands (with 50 Ω Terminated)



Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna. Electric field tests shall be performed in the frequency range of 30 MHz to 1000 MHz using a calibrated bi-log antenna and the frequency range of 1 GHz to 40 GHz using a calibrated horn antenna.

3.5.3 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.

3.5.4 Emission in Restricted Frequency Bands (Below 1GHz)

Modulation Mode	LE-1Mbps	Test Freq. (MHz)	2440
Configuration	with 50Ω Terminated	Polarization	H

Level (dBuV/m)

80

30

-20

30

224.

418.

612.

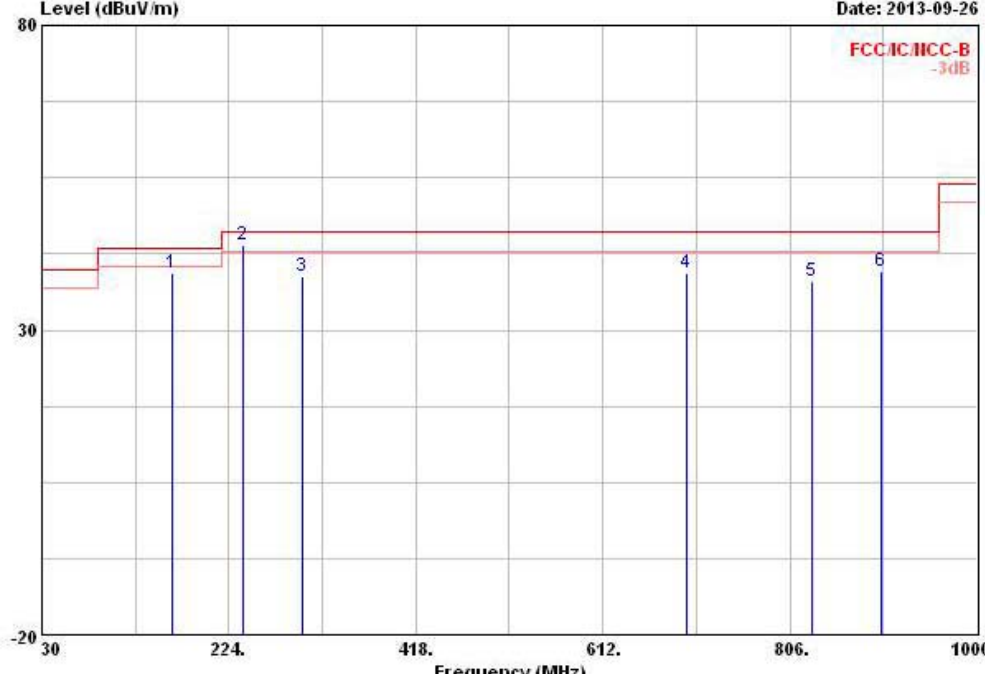
806.

1000

Frequency (MHz)

Date: 2013-09-26

FCC/IC/MCC-B
-3dB



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	164.830	39.37	-4.13	43.50	54.72	9.92	1.86	27.13	Peak	---	---
2	238.550	43.87	-2.13	46.00	56.88	11.60	2.26	26.87	QP	---	---
3	299.660	38.70	-7.30	46.00	49.55	13.23	2.57	26.65	QP	---	---
4	699.300	39.39	-6.61	46.00	44.54	18.81	3.98	27.94	Peak	---	---
5	828.310	37.92	-8.08	46.00	41.14	20.12	4.39	27.73	Peak	---	---
6	901.060	39.66	-6.34	46.00	42.13	20.53	4.55	27.55	Peak	---	---

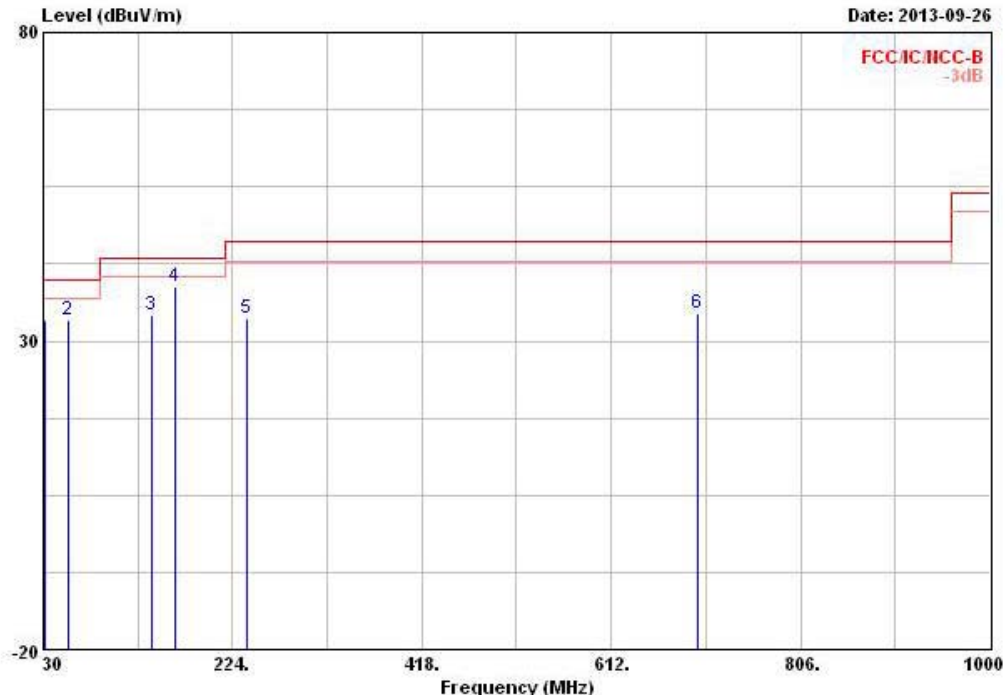
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

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

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Note 4: With 50Ω terminated was measured the spurious emissions from the digital circuits and other than the antenna port. So, the different channel transmitted didn't be impacted the results.

Modulation Mode	LE-1Mbps	Test Freq. (MHz)	2440
Configuration	with 50Ω Terminated	Polarization	V



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level Factor	Loss	Factor	Remark	Pos	Pos
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	31.940	33.45	-6.55	40.00	42.50	17.76	0.80	27.61 Peak	---	---
2	55.220	33.32	-6.68	40.00	52.91	6.93	1.04	27.56 Peak	---	---
3	141.550	34.21	-9.29	43.50	48.59	11.08	1.76	27.22 Peak	---	---
4	164.830	38.91	-4.59	43.50	54.26	9.92	1.86	27.13 Peak	---	---
5	238.550	33.69	-12.31	46.00	46.70	11.60	2.26	26.87 Peak	---	---
6	700.270	34.36	-11.64	46.00	39.50	18.82	3.98	27.94 Peak	---	---

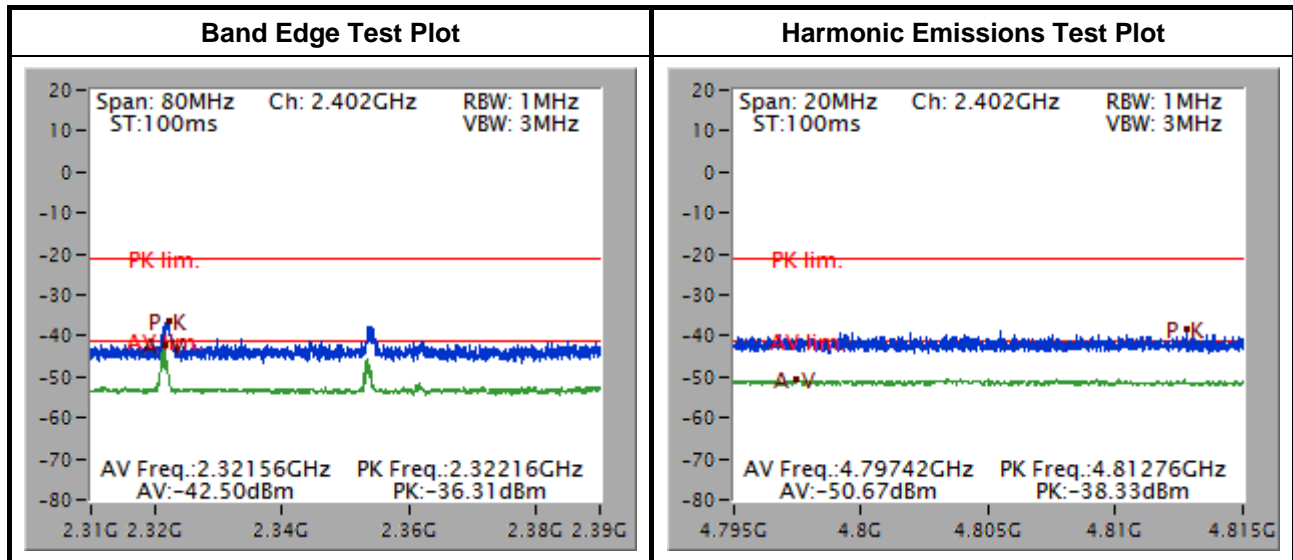
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
 Note 4: With 50Ω terminated was measured the spurious emissions from the digital circuits and other than the antenna port. So, the different channel transmitted didn't be impacted the results.

3.5.5 Emission in Restricted Frequency Bands (Above 1GHz)

Antenna-ports conducted measurements are used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands; in the meanwhile, an additional radiated test with 50ohm terminator for cabinet spurious emission is also performed.

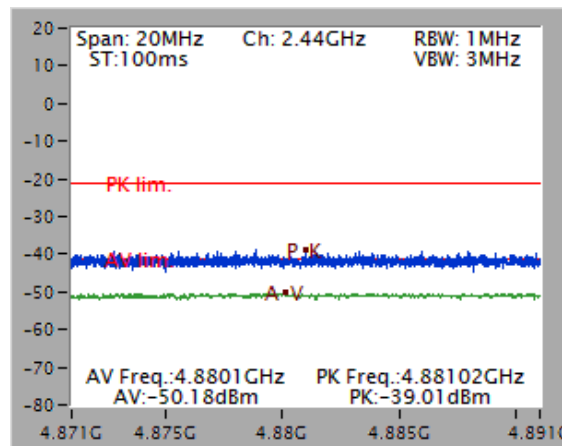
Modulation: LE-1Mbps; Test Frequency: 2402 MHz; number of TX Chain: 1

Transmitter Conducted Unwanted Emissions Result in Restricted Bands						
Frequency (MHz)	Test Level (dBm)	Antenna Gain (dBi)	EIRP Level (dBm)	Margin (dB)	Limit (dBm)	Level Type
2322.16	-39.93	3.62	-36.31	-15.11	-21.2	Peak
2321.56	-46.12	3.62	-42.50	-1.30	-41.2	Average
4812.76	-41.95	3.62	-38.33	-17.13	-21.2	Peak
4797.42	-54.29	3.62	-50.67	-9.47	-41.2	Average

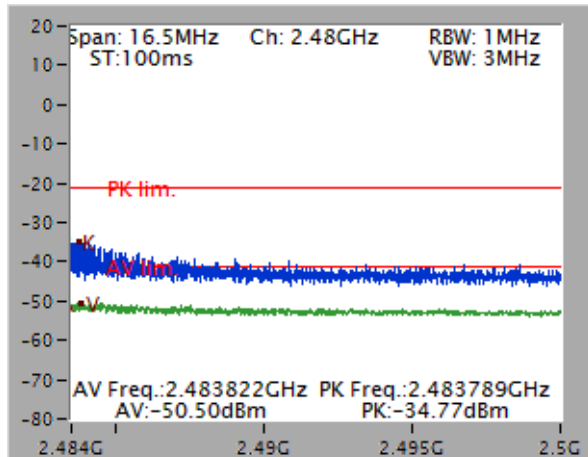
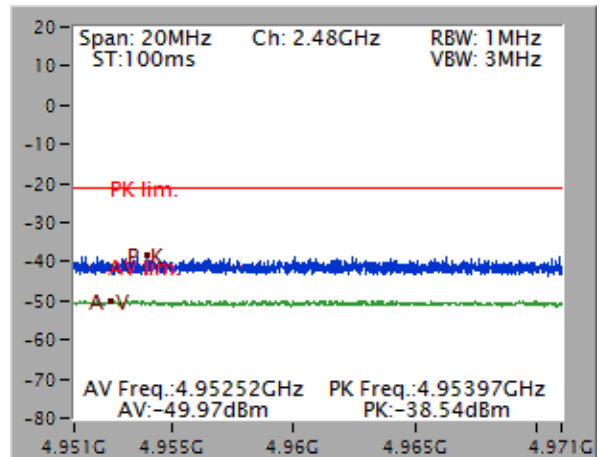


Modulation: LE-1Mbps; Test Frequency: 2440 MHz; number of TX Chain: 1
Transmitter Conducted Unwanted Emissions Result in Restricted Bands

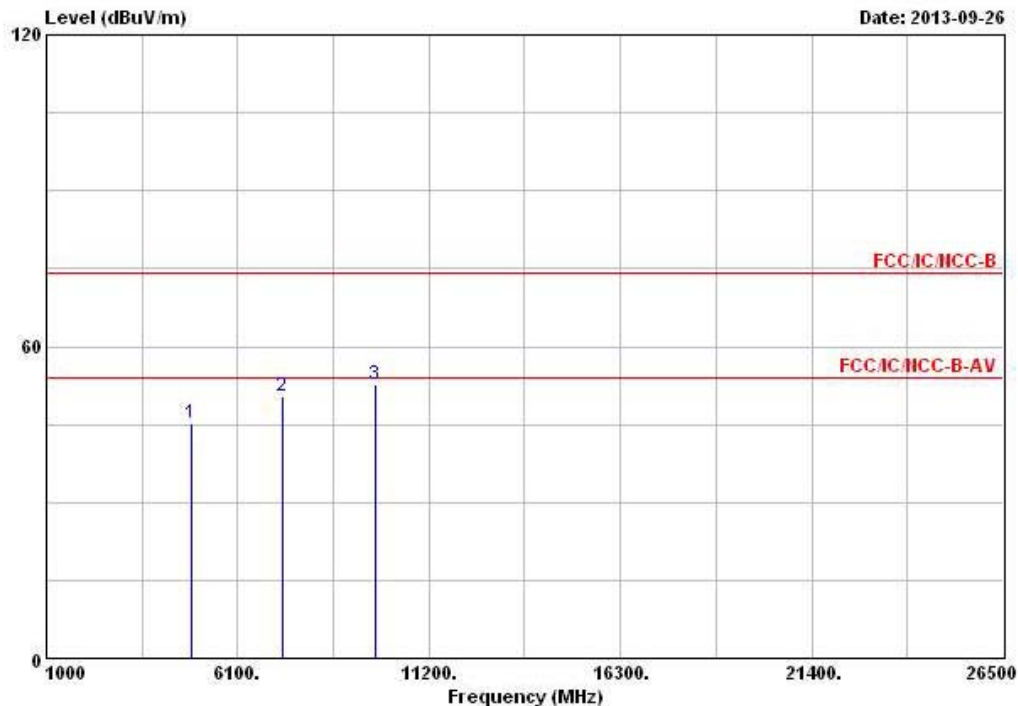
Frequency (MHz)	Test Level (dBm)	Antenna Gain (dBi)	EIRP Level (dBm)	Margin (dB)	Limit (dBm)	Level Type
4881.02	-42.63	3.62	-39.01	-17.81	-21.2	Peak
4880.10	-53.80	3.62	-50.18	-8.98	-41.2	Average

Harmonic Emissions Test Plot

Modulation: LE-1Mbps; Test Frequency: 2480 MHz; number of TX Chain: 1
Transmitter Conducted Unwanted Emissions Result in Restricted Bands

Frequency (MHz)	Test Level (dBm)	Antenna Gain (dBi)	EIRP Level (dBm)	Margin (dB)	Limit (dBm)	Level Type
2483.789	-38.39	3.62	-34.77	-13.57	-21.2	Peak
2483.822	-54.12	3.62	-50.50	-9.30	-41.2	Average
4953.97	-42.16	3.62	-38.54	-17.34	-21.2	Peak
4952.52	-53.59	3.62	-49.97	-8.77	-41.2	Average

Band Edge Test Plot

Harmonic Emissions Test Plot


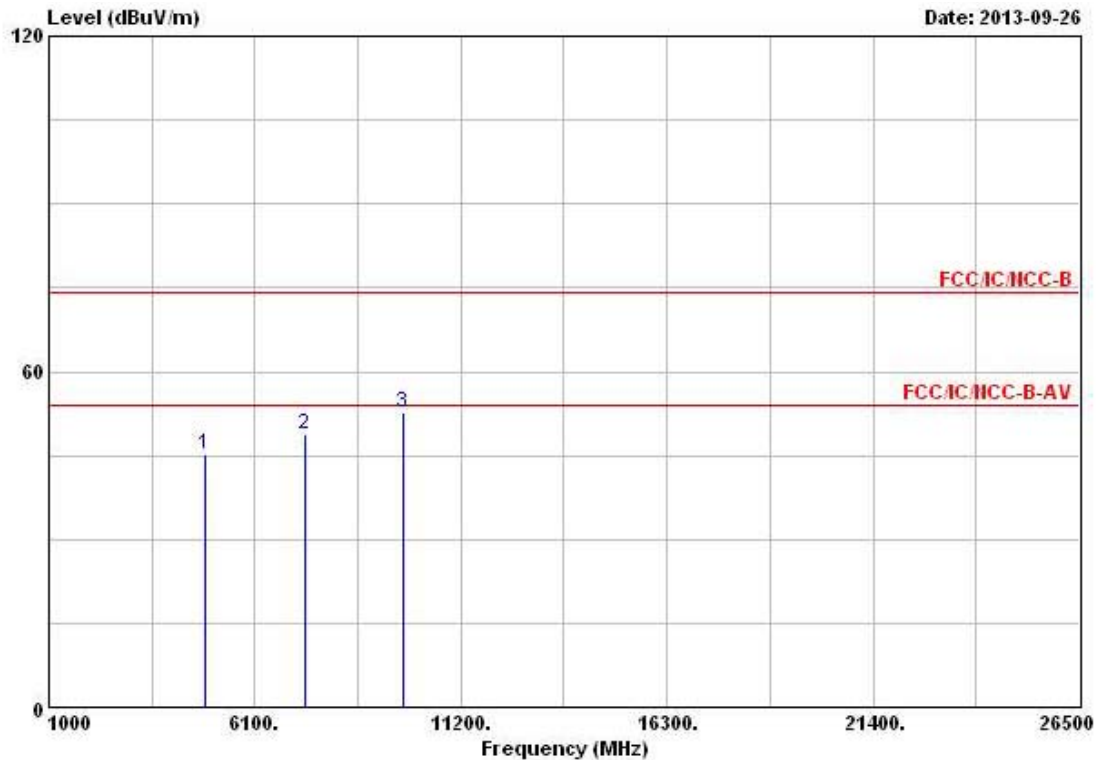
Modulation Mode	LE-1Mbps	Test Freq. (MHz)	2440
Configuration	with 50Ω Terminated	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	4882.620	45.36	-28.64	74.00	40.64	33.18	3.96	32.42	Peak	---	---
2	7318.390	50.38	-23.62	74.00	42.73	36.09	4.23	32.67	Peak	---	---
3	9759.390	52.78			41.82	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: With 50Ω terminated was measured the spurious emissions from the digital circuits and other than the antenna port. So, the different channel transmitted didn't be impacted the results.

Modulation Mode	LE-1Mbps	Test Freq. (MHz)	2440
Configuration	with 50Ω Terminated	Polarization	V



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	4880.020	45.32	-28.68	74.00	40.62	33.18	3.94	32.42	Peak	---	---
2	7320.000	48.73	-25.27	74.00	41.08	36.09	4.23	32.67	Peak	---	---
3	9760.000	52.59			41.63	38.57	5.47	33.08	Peak	---	---

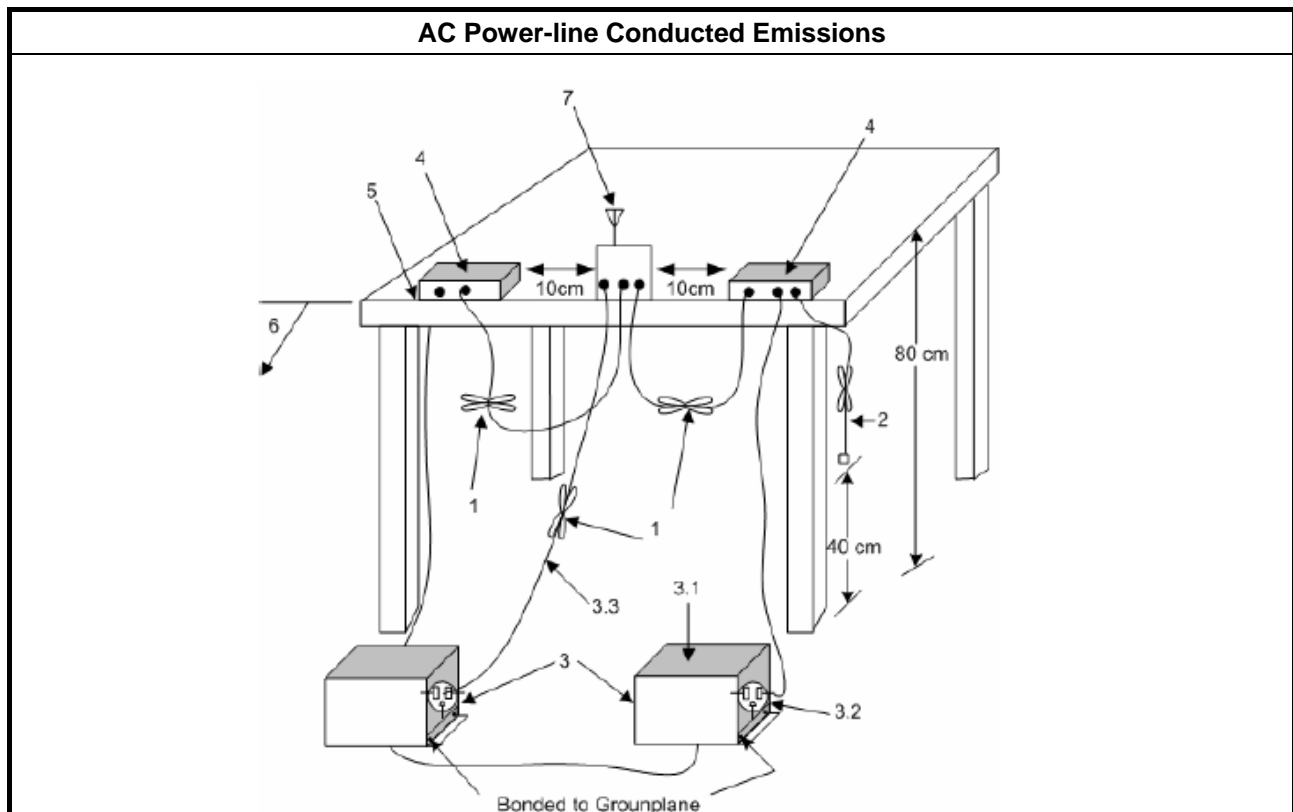
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
 Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with 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: With 50Ω terminated was measured the spurious emissions from the digital circuits and other than the antenna port. So, the different channel transmitted didn't be impacted the results.

3.6 AC Power-line Conducted Emissions

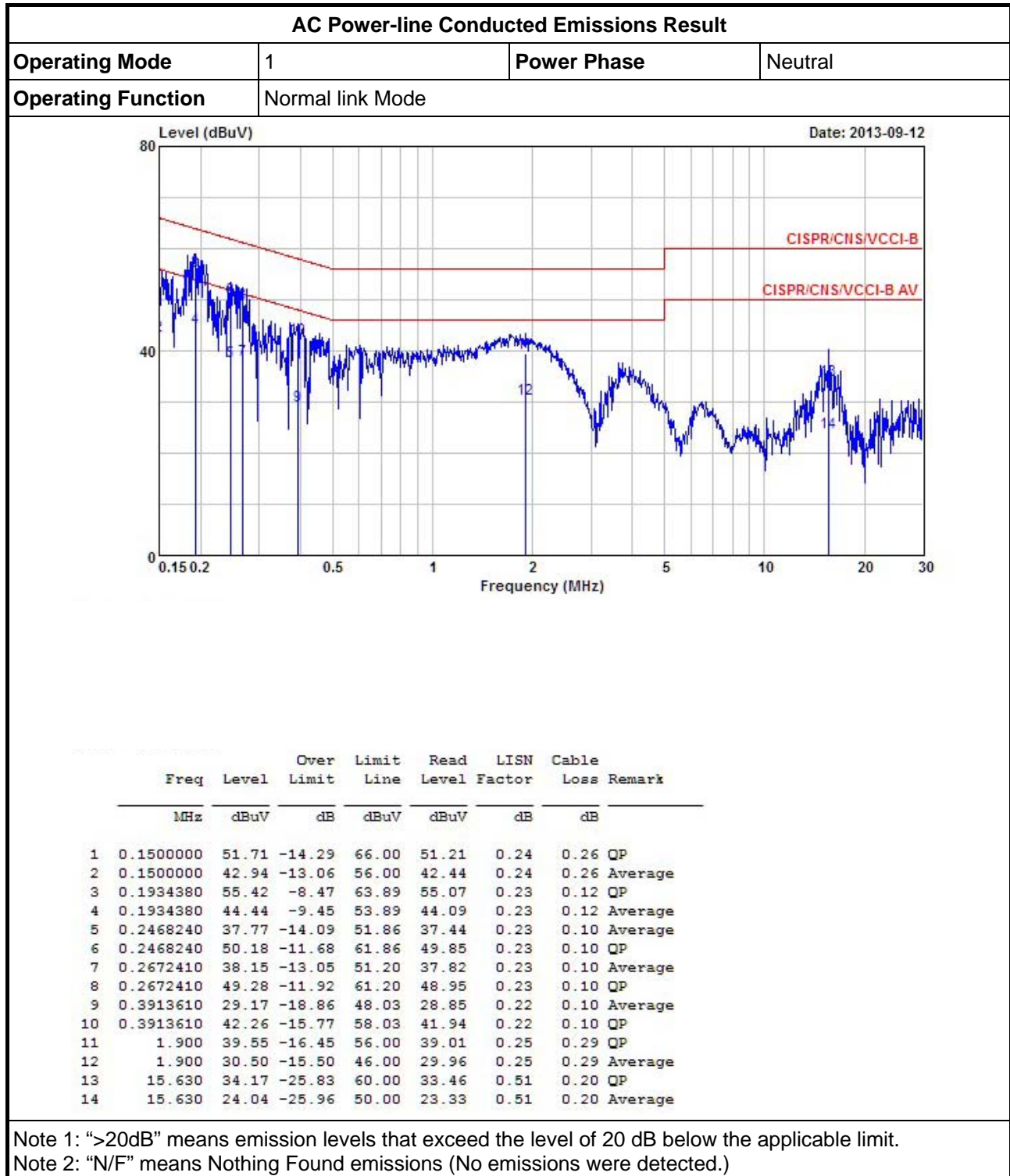
3.6.1 Test Procedures

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

3.6.2 Test Setup

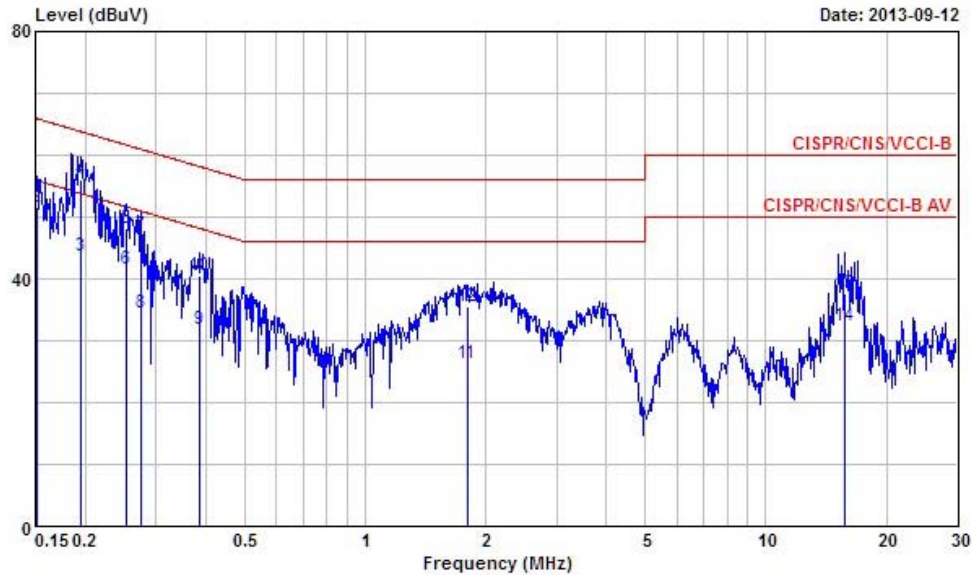


3.6.3 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	Normal link Mode		



	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			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℃	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.