



FCC Test Report

Equipment : CEIVA Energy Home Area Network Gateway
Brand Name : CEIVA
Model No. : GWY558
Marketing Name : CEIVAGATEWAY
FCC ID : 2ABKI-GWY558
Standard : 47 CFR FCC Part 15.247
Operating Band : 2400 MHz – 2483.5 MHz
FCC Classification : DTS
Applicant : CEIVA Logic, Inc
214 E Magnolia Blvd, Burbank,
CA 91502, USA
Manufacturer : Quanta Computer Inc.
No. 188, Wenhwa 2nd Rd.
Kueishan Hsiang Tao Yuan Shien
R.O.C. Taiwan

The product sample received on Dec. 27, 2013 and completely tested on Feb. 21, 2014. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

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

Reviewed by:

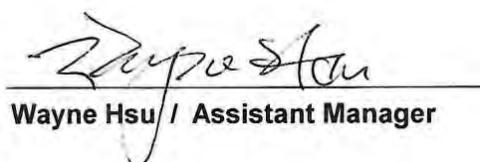

Wayne Hsu / Assistant Manager





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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
1.1.2	15.203	Antenna Requirement	Antenna connector mechanism complied	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	[dBuV]: 0.172154MHz 40.01 (Margin 14.85dB) - AV 46.95 (Margin 17.91dB) - QP	FCC 15.207	Complied
3.2	15.247(a)	6dB Bandwidth	6dB Bandwidth Unit [MHz]: 1.57	$\geq 500\text{kHz}$	Complied
3.3	15.247(b)	RF Output Power (Maximum Peak Conducted Output Power)	Power [dBm]: 11.08	Power [dBm]:30	Complied
3.4	15.247(d)	Power Spectral Density	PSD [dBm/100kHz]: -12.72	PSD [dBm/3kHz]:8	Complied
3.5	15.247(c)	Transmitter Bandedge Emissions	Restricted Bands [dBuV/m at 3m]: 2483.50MHz 69.67 (Margin 4.33dB) - PK 51.05 (Margin 2.95dB) - AV	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied
3.6	15.247(c)	Transmitter Unwanted Emissions	Restricted Bands [dBuV/m at 3m]: 4950MHz 59.85 (Margin 14.15dB) - PK 50.16 (Margin 3.84dB) - AV	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied



Revision History



1 General Description

1.1 Information

The equipment is CEIVA Energy Home Area Network Gateway. There are two types of this product. One is device equipped with ERT (Electronics report tooling) and the other is not. ERT functions only as receivers. Two types are tested in this report. For more detailed features description, please refer to the manufacturer's specifications or user's manual.

1.1.1 RF General Information

RF General Information						
Frequency Range (MHz)	Modulation	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	RF Output Power (dBm)	Co-location
2400-2483.5	O-QPSK	2405-2475	11-25 [15]	1	11.08	Yes

Note 1: RF output power specifies that Maximum Peak Conducted Output Power.
Note 2: 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 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.

Antenna General Information			
No.	Ant. Cat.	Ant. Type	Gain (dBi)
1	Integral	Printed	4.28



Type of EUT

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

1.1.3 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
<input type="checkbox"/> Operated normally 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"/> 100%	0.00

1.1.4 EUT Operational Condition

Supply Voltage	<input checked="" type="checkbox"/> AC mains	<input type="checkbox"/> DC	
Type of DC Source	<input type="checkbox"/> Internal DC supply	<input checked="" type="checkbox"/> External DC adapter	<input type="checkbox"/> Li-on Battery



1.2 Accessories And Support Equipment

Accessories Information				
AC Adapter	Brand Name	Asian Power Devices INC.	Model Name	WA-13B05FU
	Power Rating	I/P: 100-240V ~ 0.5A 50/60Hz ; O/P: 5V---2.5A		
	Power cord	1.5 meter, non-shielded cable, w/o ferrite core		

Reminder: Regarding to more detail and other information, please refer to user manual.

Support Equipment - RF Conducted			
No.	Equipment	Brand Name	Model Name
1	Notebook	DELL	E5500

1.3 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15
- ANSI C63.10-2009
- FCC KDB 558074
- FCC KDB 662911

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	20.8°C / 46%
RF Conducted		TH01-HY	Sky	22.3°C / 61%
Radiated Emission		03CH03-HY	Leo	20.1°C / 50%



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	
AC power-line conducted emissions	± 2.26 dB	
Emission bandwidth, 6dB bandwidth	± 1.42 %	
RF output power, conducted	± 0.63 dB	
Power density, conducted	± 0.81 dB	
Unwanted emissions, conducted	30 – 1000 MHz	± 0.51 dB
	1 – 18 GHz	± 0.67 dB
	18 – 40 GHz	± 0.83 dB
	40 – 200 GHz	N/A
All emissions, radiated	30 – 1000 MHz	± 2.56 dB
	1 – 18 GHz	± 3.59 dB
	18 – 40 GHz	± 3.82 dB
	40 – 200 GHz	N/A
Temperature	± 0.8 °C	
Humidity	± 3 %	
DC and low frequency voltages	± 3 %	
Time	± 1.42 %	
Duty Cycle	± 1.42 %	



2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Worst Modulation Used for Conformance Testing		
Modulation Mode	Transmit Chains (N _{TX})	RF Output Power (dBm)
O-QPSK	1	11.08

Note 1: RF output power specifies that Maximum Peak Conducted Output Power.

2.2 Test Channel Frequencies Configuration

Test Channel Frequencies Configuration	
Modulation Mode	Test Channel Frequencies (MHz)
O-QPSK	2405-(F1), 2440-(F2), 2475-(F3)

2.3 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	Operating Mode Description
1	EUT with ERT via AC Power & Radio link
2	EUT without ERT via AC Power & Radio link

Operating mode 1 was the worst case and it was record in this test report.

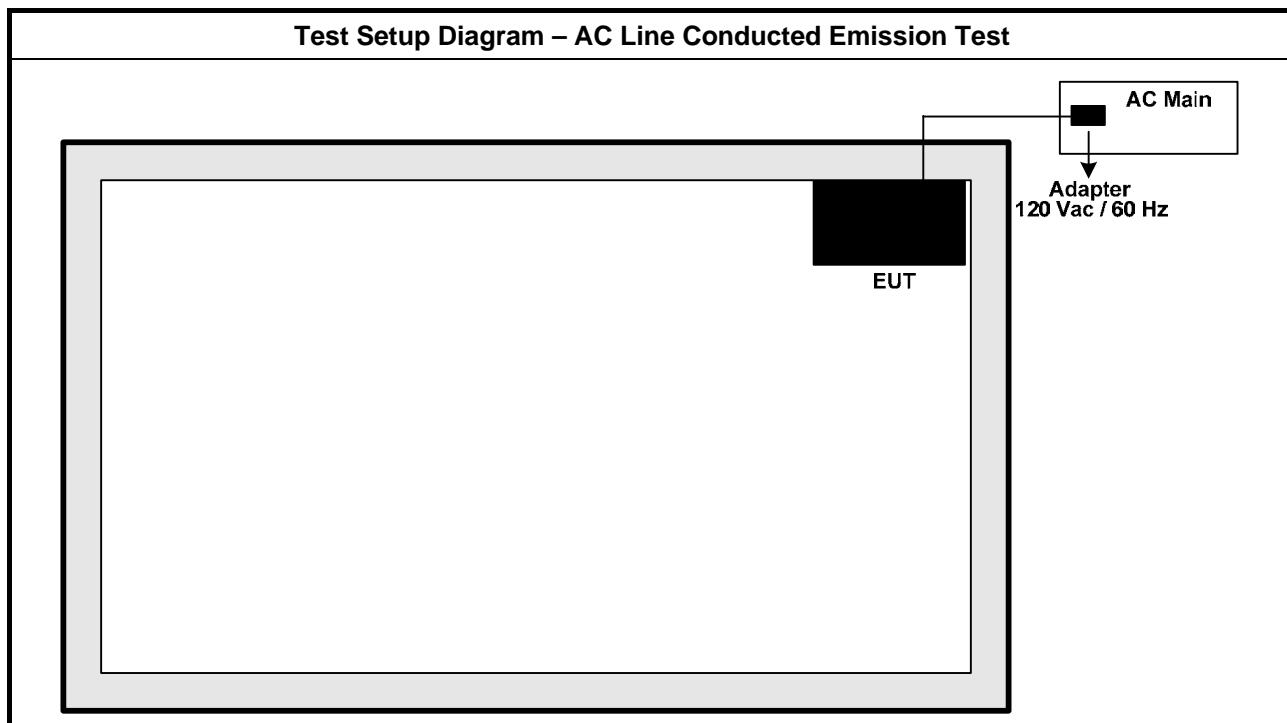
The Worst Case Mode for Following Conformance Tests	
Tests Item	RF Output Power, Power Spectral Density, 6 dB Bandwidth
Test Condition	Conducted measurement at transmit chains
Modulation Mode	O-QPSK

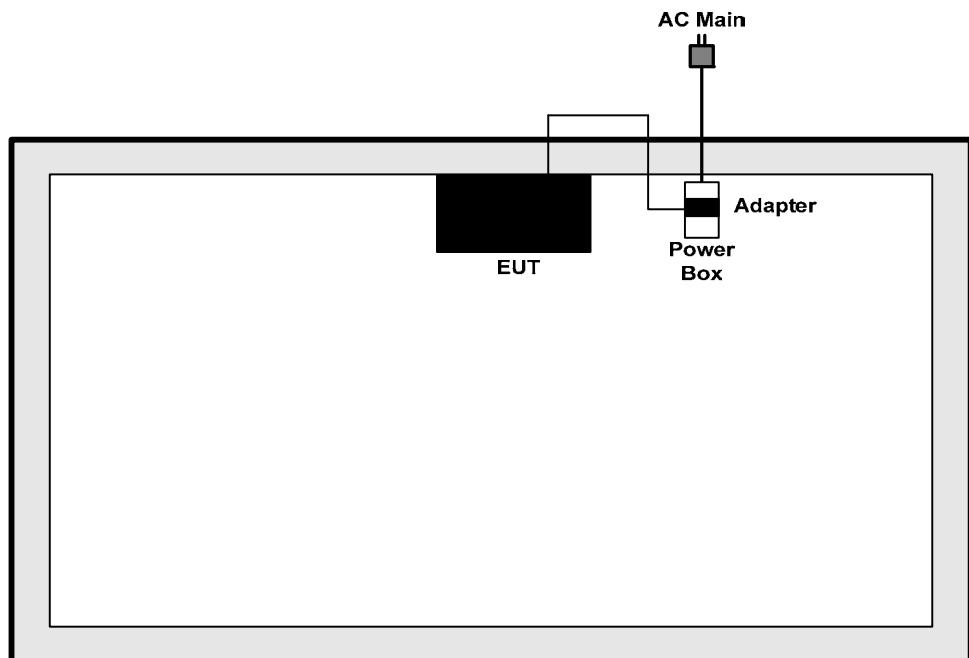
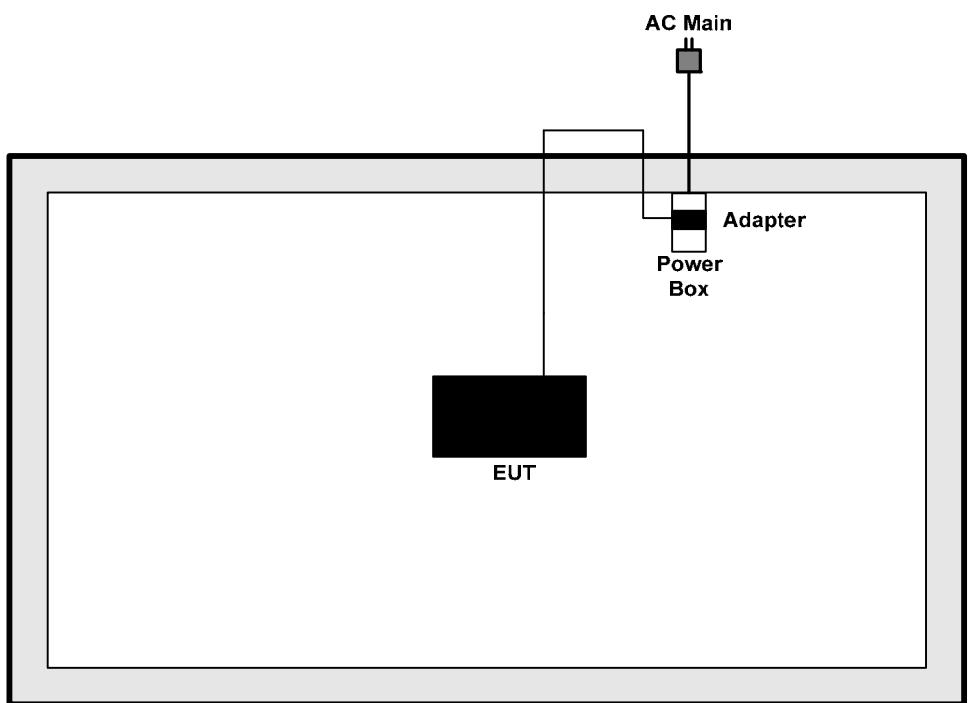


The Worst Case Mode for Following Conformance Tests							
Tests Item	Transmitter Radiated Unwanted Emissions Transmitter Radiated Bandedge Emissions						
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.						
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 plane is Z. <input type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed two or three orthogonal planes.						
Operating Mode	<input checked="" type="checkbox"/> 1. EUT with ERT via AC Power & Radio link <input checked="" type="checkbox"/> 2. EUT without ERT via AC Power & Radio link Operating mode 1 was the worst case and it was recorded in this test report.						
Modulation Mode	O-QPSK						
Orthogonal Planes of EUT	<table><thead><tr><th>X Plane</th><th>Y Plane</th><th>Z Plane</th></tr></thead><tbody><tr><td></td><td></td><td></td></tr></tbody></table>	X Plane	Y Plane	Z Plane			
X Plane	Y Plane	Z Plane					



2.4 Test Setup Diagram



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

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.

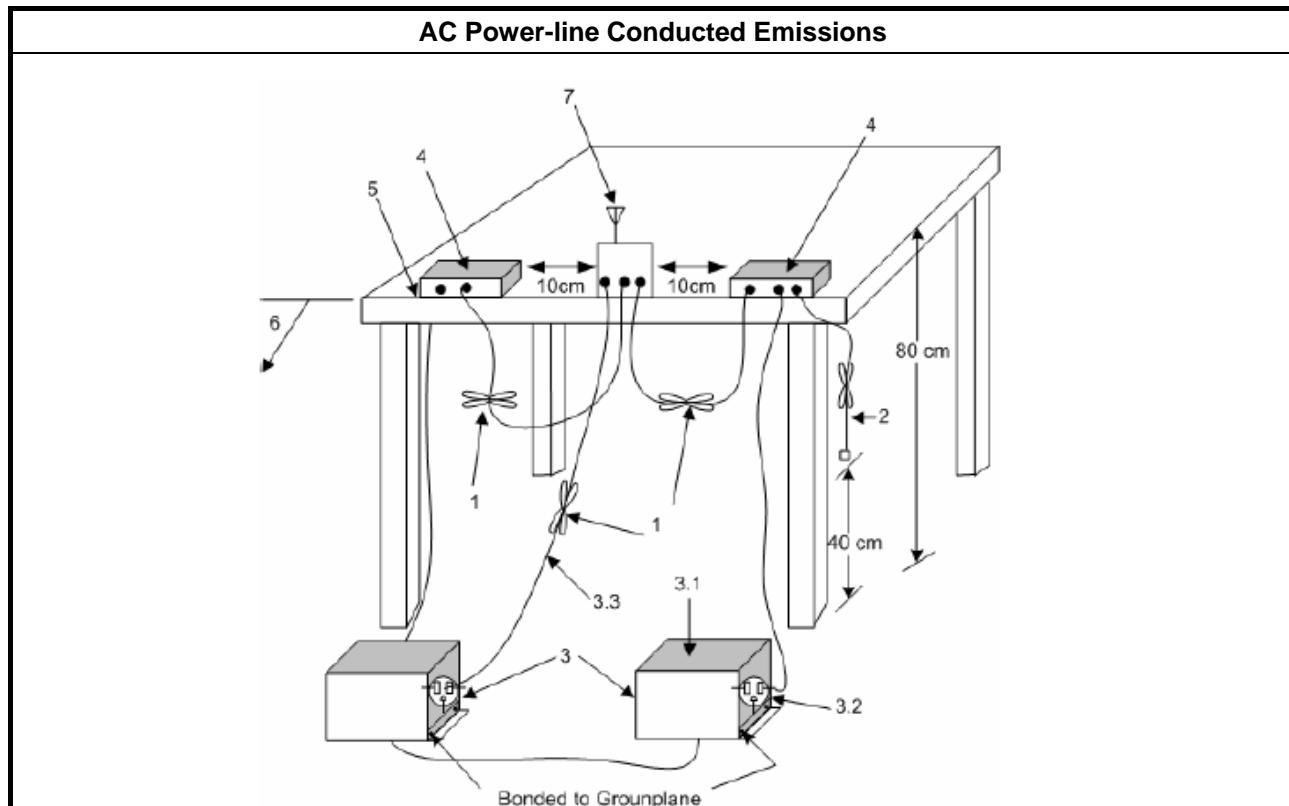
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

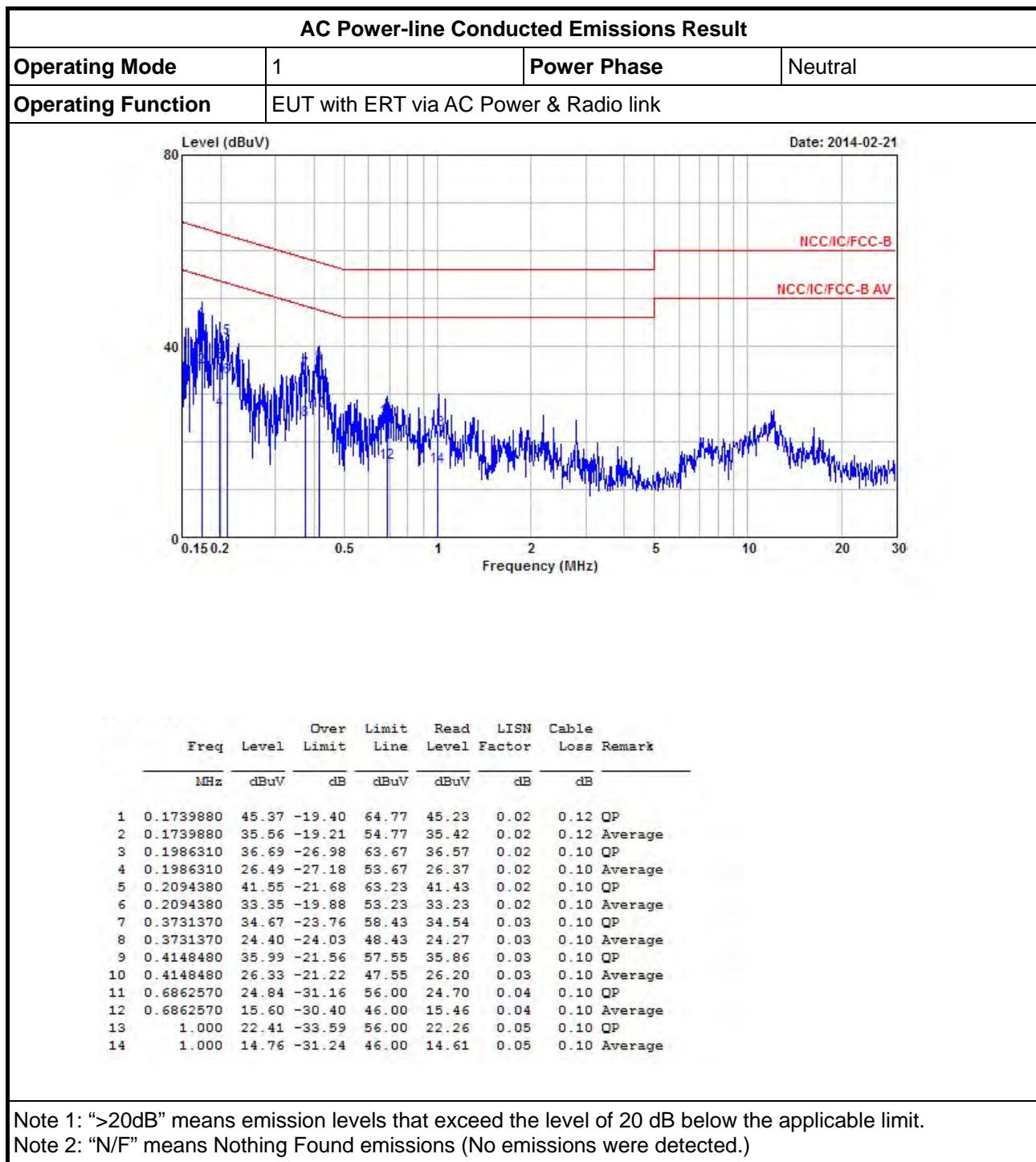
Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions.

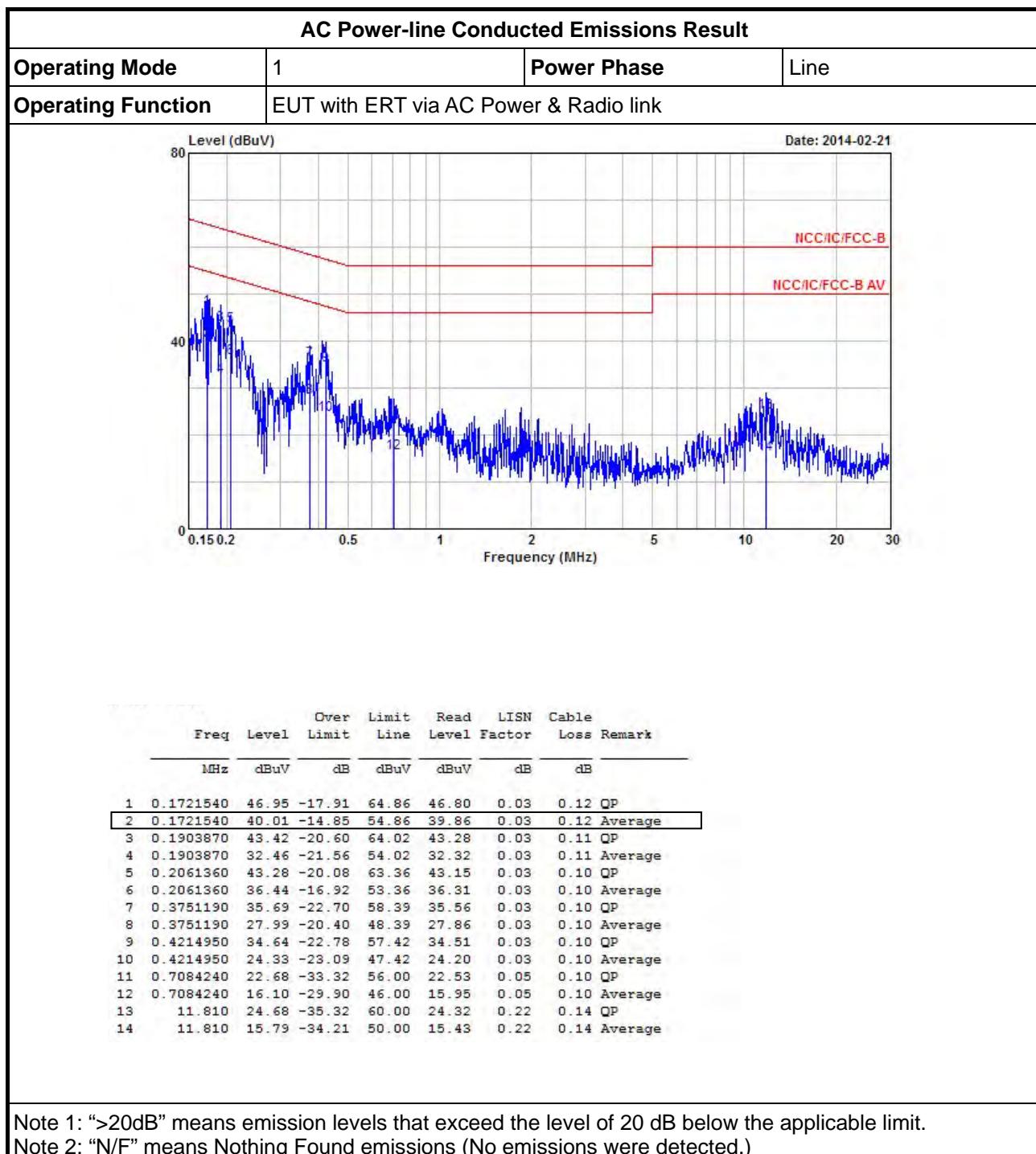
3.1.4 Test Setup





3.1.5 Test Result of AC Power-line Conducted Emissions





3.2 6dB Bandwidth

3.2.1 6dB Bandwidth Limit

6dB Bandwidth Limit
Systems using digital modulation techniques:
<input checked="" type="checkbox"/> 6 dB bandwidth \geq 500 kHz.

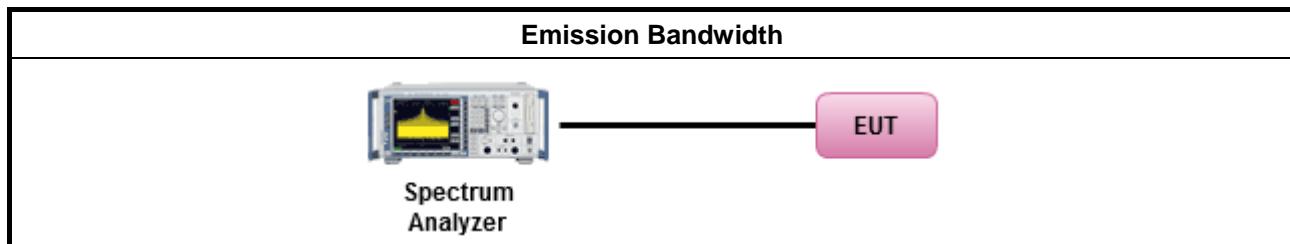
3.2.2 Measuring Instruments

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

3.2.3 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 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.

3.2.4 Test Setup

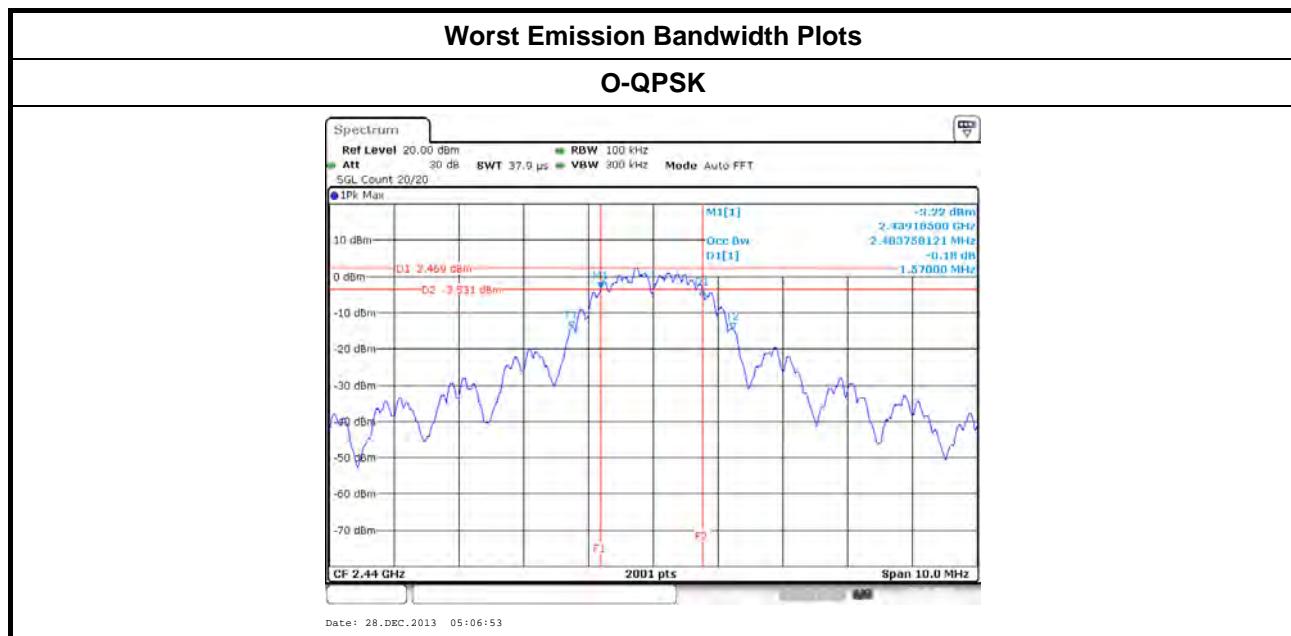




3.2.5 Test Result of Emission Bandwidth

Emission Bandwidth Result				
Condition		Emission Bandwidth (MHz)		
Modulation Mode	N _{TX}	Freq. (MHz)	99% Bandwidth	6dB Bandwidth
O-QPSK	1	2405	2.42	1.70
O-QPSK	1	2440	2.48	1.57
O-QPSK	1	2475	2.51	1.60
Limit		N/A		≥500 kHz
Result		Complied		

Note 1: N_{TX} = Number of Transmit Chains





3.3 RF Output Power

3.3.1 RF Output Power Limit

RF Output Power Limit	
Maximum Peak Conducted Output Power or Maximum Conducted Output Power Limit	
<input checked="" type="checkbox"/> 2400-2483.5 MHz Band:	
<input checked="" type="checkbox"/> If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)	
<input checked="" type="checkbox"/> Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ dBm	
<input type="checkbox"/> Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm	
<input type="checkbox"/> Smart antenna system (SAS):	
	<input type="checkbox"/> Single beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm
	<input type="checkbox"/> Overlap beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm
	<input type="checkbox"/> Aggregate power on all beams: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3 + 8$ dB dBm
e.i.r.p. Power Limit:	
<input checked="" type="checkbox"/> 2400-2483.5 MHz Band	
<input checked="" type="checkbox"/> Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W)	
<input type="checkbox"/> Point-to-point systems (P2P): $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX}])$ dBm	
<input type="checkbox"/> Smart antenna system (SAS)	
	<input type="checkbox"/> Single beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm
	<input type="checkbox"/> Overlap beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm
	<input type="checkbox"/> Aggregate power on all beams: $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX} + 8])$ dBm
P_{Out} = maximum peak conducted output power or maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi. P_{eirp} = e.i.r.p. Power in dBm.	

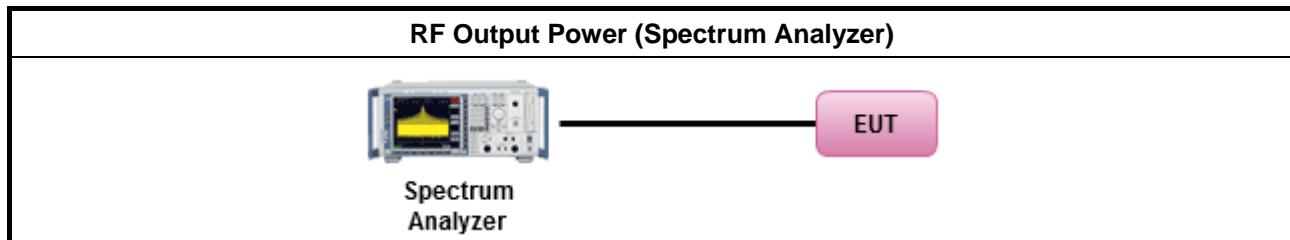
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

Test Method
<input checked="" type="checkbox"/> Maximum Peak Conducted Output Power
<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.1.1 Option 1 (RBW \geq EBW method).
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 9.1.2 Option 2 (integrated band power method).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.1.3 Option 2 (peak power meter for VBW \geq DTS BW)
<input checked="" type="checkbox"/> Maximum Conducted Output Power
[duty cycle \geq 98% or external video / power trigger]
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.2.2 Method AVGSA-1 (spectral trace averaging).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.2.3 Method AVGSA-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 9.2.2.4 Method AVGSA-2 (spectral trace averaging).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.2.5 Method AVGSA-2 Alt. (slow sweep speed)
RF power meter and average over on/off periods with duty factor or gated trigger
<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.3 Method AVGPM (using an RF average power meter).
<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.
<input type="checkbox"/> The EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
<input type="checkbox"/> If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + \dots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$

3.3.4 Test Setup



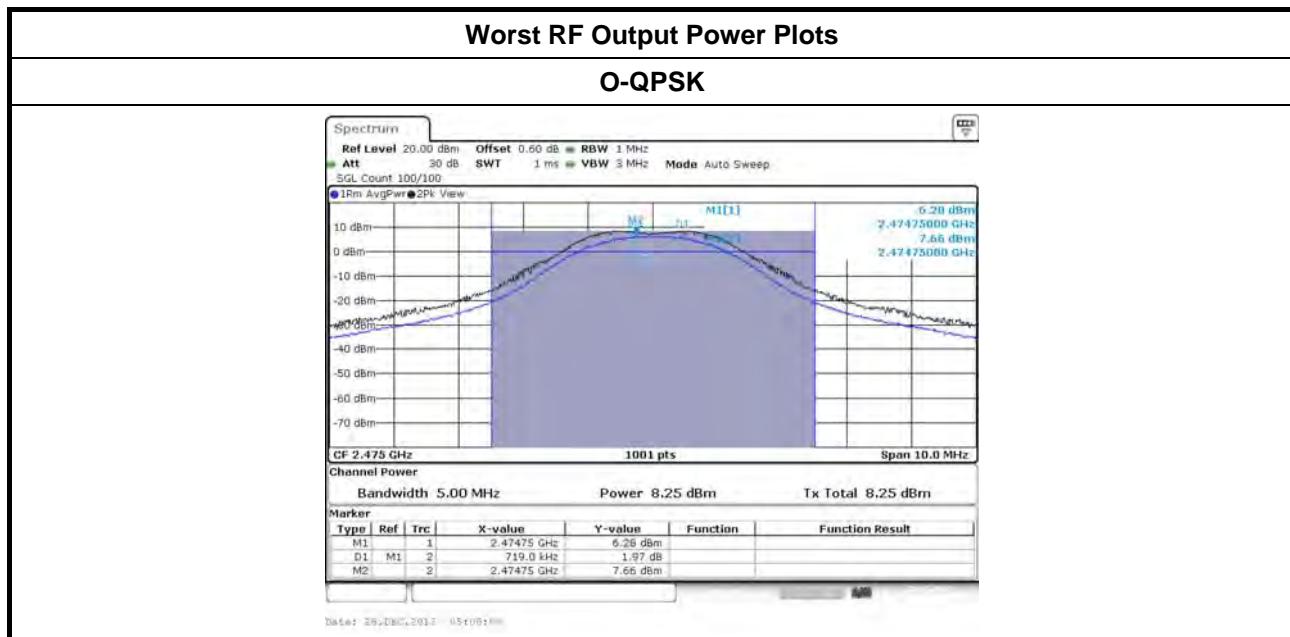


3.3.5 Test Result of Maximum Peak Conducted Output Power

Maximum Peak Conducted Output Power Result							
Condition			RF Output Power (dBm)				
Modulation Mode	N _{TX}	Freq. (MHz)	RF Output Power	Power Limit	Ant. Gain (dBi)	EIRP Power	EIRP Limit
O-QPSK	1	2405	9.51	30.00	4.28	13.79	36.00
O-QPSK	1	2440	10.35	30.00	4.28	14.63	36.00
O-QPSK	1	2475	11.08	30.00	4.28	15.36	36.00
Result		Complied					

3.3.6 Test Result of Maximum Conducted Output Power

Maximum Conducted Output Power							
Condition			RF Output Power (dBm)				
Modulation Mode	N _{TX}	Freq. (MHz)	RF Output Power	Power Limit	Ant. Gain (dBi)	EIRP Power	EIRP Limit
O-QPSK	1	2405	6.73	30.00	4.28	11.01	36.00
O-QPSK	1	2440	7.52	30.00	4.28	11.80	36.00
O-QPSK	1	2475	8.25	30.00	4.28	12.53	36.00
Result		Complied					





3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

Power Spectral Density Limit
<input checked="" type="checkbox"/> Power Spectral Density (PSD) $\leq 8 \text{ dBm/3kHz}$

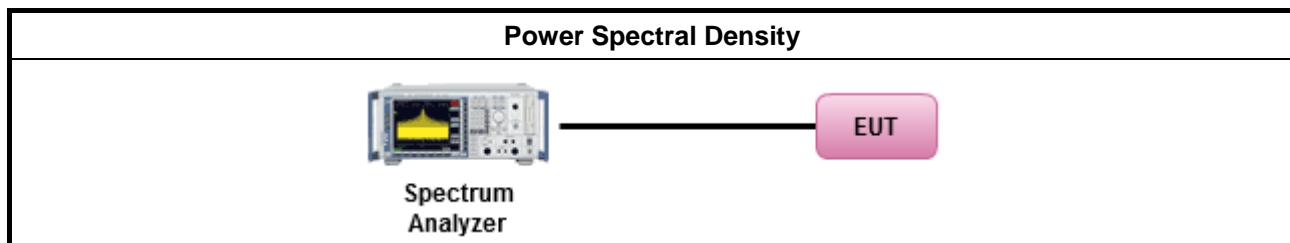
3.4.2 Measuring Instruments

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

3.4.3 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 checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.3 Method AVGPSD-1 (spectral trace averaging).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.4 Method AVGPSD-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 AVGPSD-2 (spectral trace averaging).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.6 Method AVGPSD-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.
<input type="checkbox"/> The EUT supports multiple transmit chains using options given below:
<input type="checkbox"/> Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the N_{TX} output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.
<input type="checkbox"/> Option 2: Measure and add $10 \log(N)$ dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with $10 \log(N)$. Or each transmit chains shall be add $10 \log(N)$ to compared with the limit.

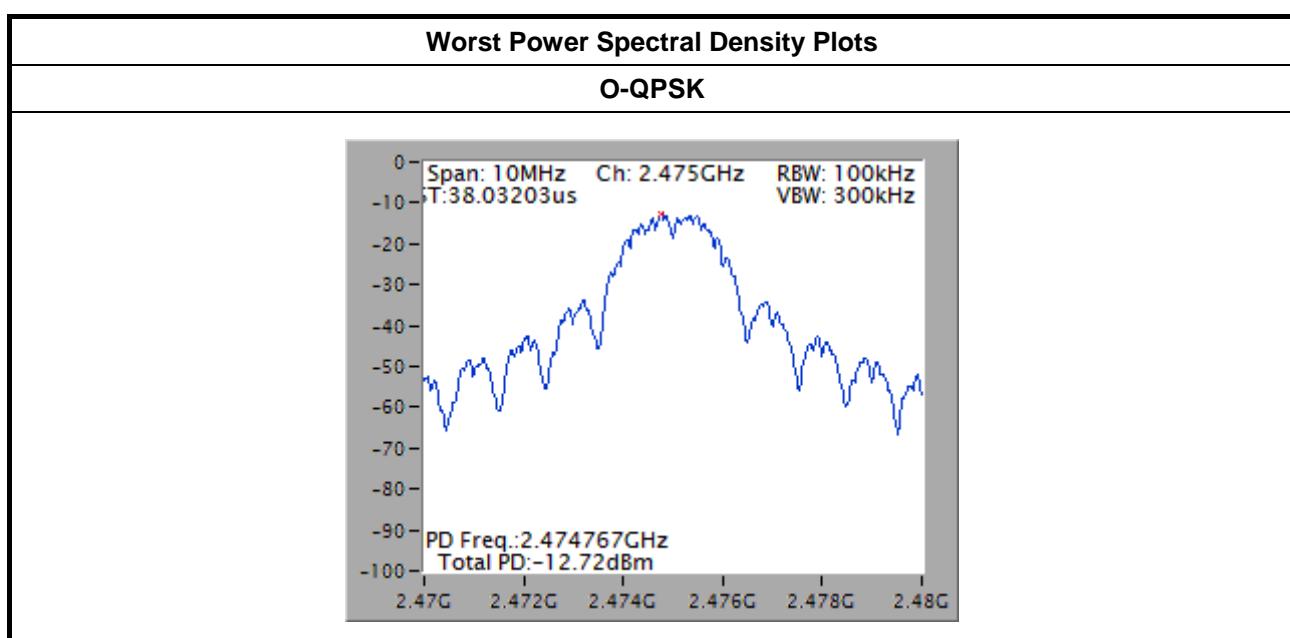
3.4.4 Test Setup



3.4.5 Test Result of Power Spectral Density

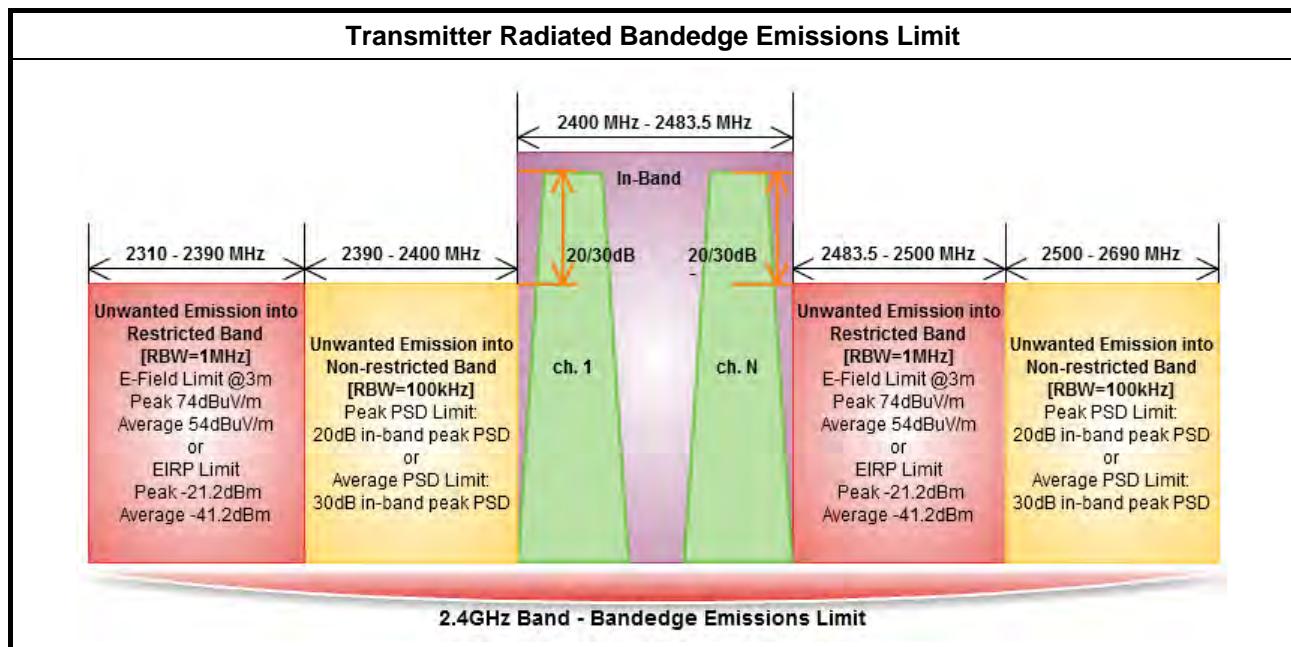
Power Spectral Density Result				
Modulation Mode	N _{TX}	Freq. (MHz)	Power Spectral Density (dBm/100kHz)	Power Limit (dBm/3kHz)
O-QPSK	1	2405	-14.98	8
O-QPSK	1	2440	-14.26	8
O-QPSK	1	2475	-12.72	8
Result		Complied		

Note 1: PSD = sum each transmit chains by bin-to-bin PSD



3.5 Transmitter Bandedge Emissions

3.5.1 Transmitter Radiated Bandedge Emissions Limit



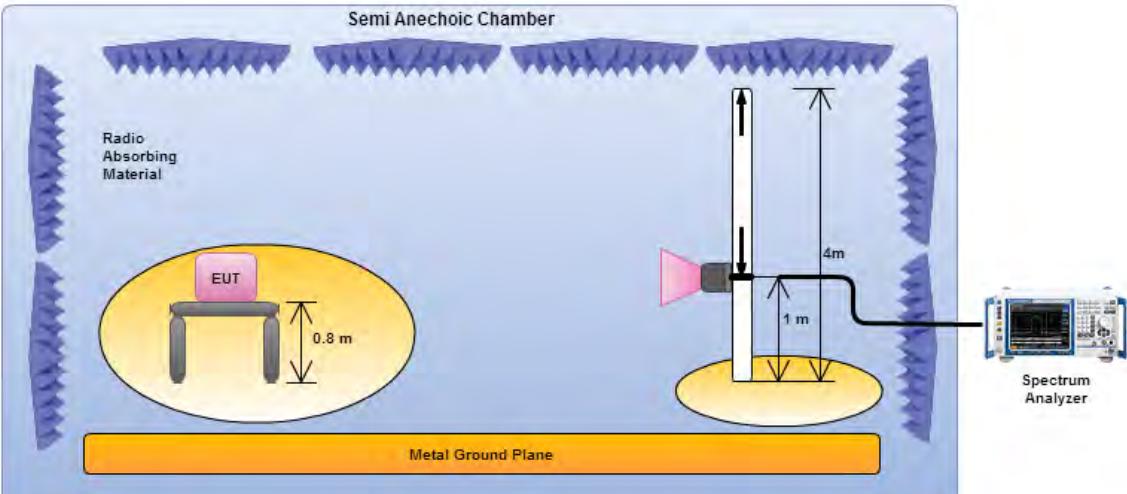
3.5.2 Measuring Instruments

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

3.5.3 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.

3.5.4 Test Setup

Transmitter Radiated Bandedge Emissions
 <p>Electric field tests shall be performed in transmitter bandedge emissions using a calibrated horn antenna.</p>



3.5.5 Transmitter Radiated Bandedge Emissions

2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Non-restricted Band)

Modulation	Test Freq. (MHz)	In-band PSD [i] (dBuV/100kHz)	Freq. (MHz)	Out-band PSD [o] (dBuV/100kHz)	[i] – [o] (dB)	Limit (dB)	Pol.
O-QPSK	2405	100.09	2400.00	62.95	37.14	20	V
O-QPSK	2475	110.04	2542.00	62.97	47.07	20	V

Note 1: Measurement worst emissions of receive antenna polarization

2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Restricted Band)

Modulation Mode	Freq. (MHz)	Measure Distance (m)	Freq. (MHz) PK	Level (dBuV/m) PK	Limit (dBuV/m) PK	Freq. (MHz) AV	Level (dBuV/m) AV	Limit (dBuV/m) AV	Pol.
O-QPSK	2405	3	2379.56	59.09	74	2390.00	46.02	54	V
O-QPSK	2475	3	2483.52	69.67	74	2483.50	51.05	54	V

Note 1: Measurement worst emissions of receive antenna polarization.

Note 2: If duty cycle < 100%, average emission = peak emission + 20 log (duty cycle).



3.6 Transmitter Unwanted Emissions

3.6.1 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.

3.6.2 Measuring Instruments

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

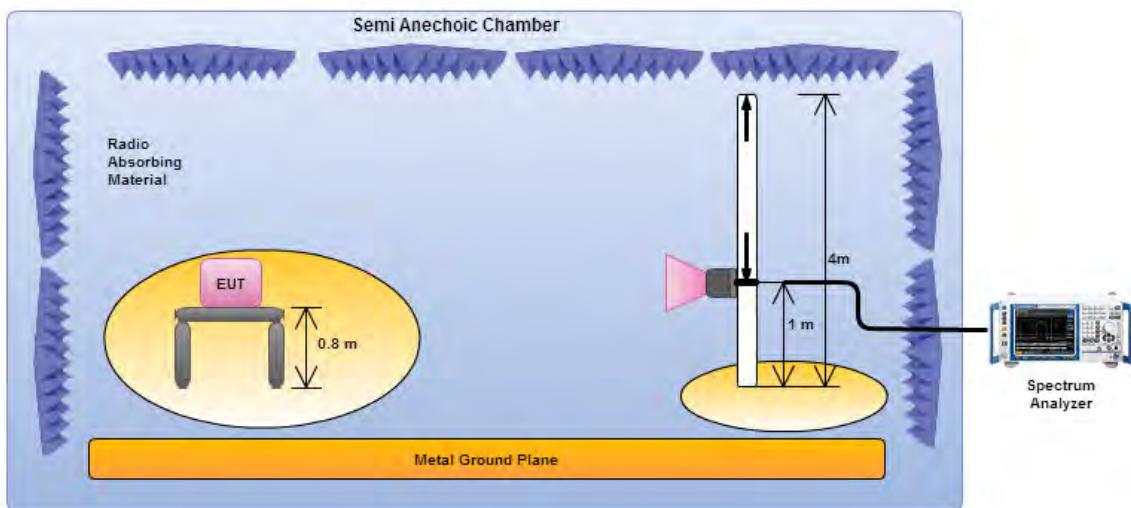


3.6.3 Test Procedures

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 \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 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"/> 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 below 30 MHz and test distance is 3m.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.5 for radiated emissions 30 MHz to 1 GHz and test distance is 3m.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1 GHz and test distance is 3m.

3.6.4 Test Setup

Transmitter Radiated Unwanted Emissions



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.

3.6.5 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.



3.6.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Transmitter Radiated Unwanted Emissions (Below 1GHz)





Transmitter Radiated Unwanted Emissions (Below 1GHz)

Operating Mode	1	Polarization	H
Operating Function	EUT with ERT via AC Power & Radio link		

Level (dBuV/m)

Date: 2013-12-27

FCC IC FCC-B

Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark	Ant	Table
		Limit	Line	Antenna	Level	Loss	Factor			
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	52.310	22.15	-17.85	40.00	40.72	7.84	1.16	27.57 Peak	---	---
2	322.940	30.82	-15.18	46.00	40.92	13.70	3.00	26.80 Peak	---	---
3	358.830	30.13	-15.87	46.00	39.35	14.67	3.16	27.05 Peak	---	---
4	419.940	24.41	-21.59	46.00	31.98	16.48	3.40	27.45 Peak	---	---
5	719.670	23.66	-22.34	46.00	27.77	19.20	4.60	27.91 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)

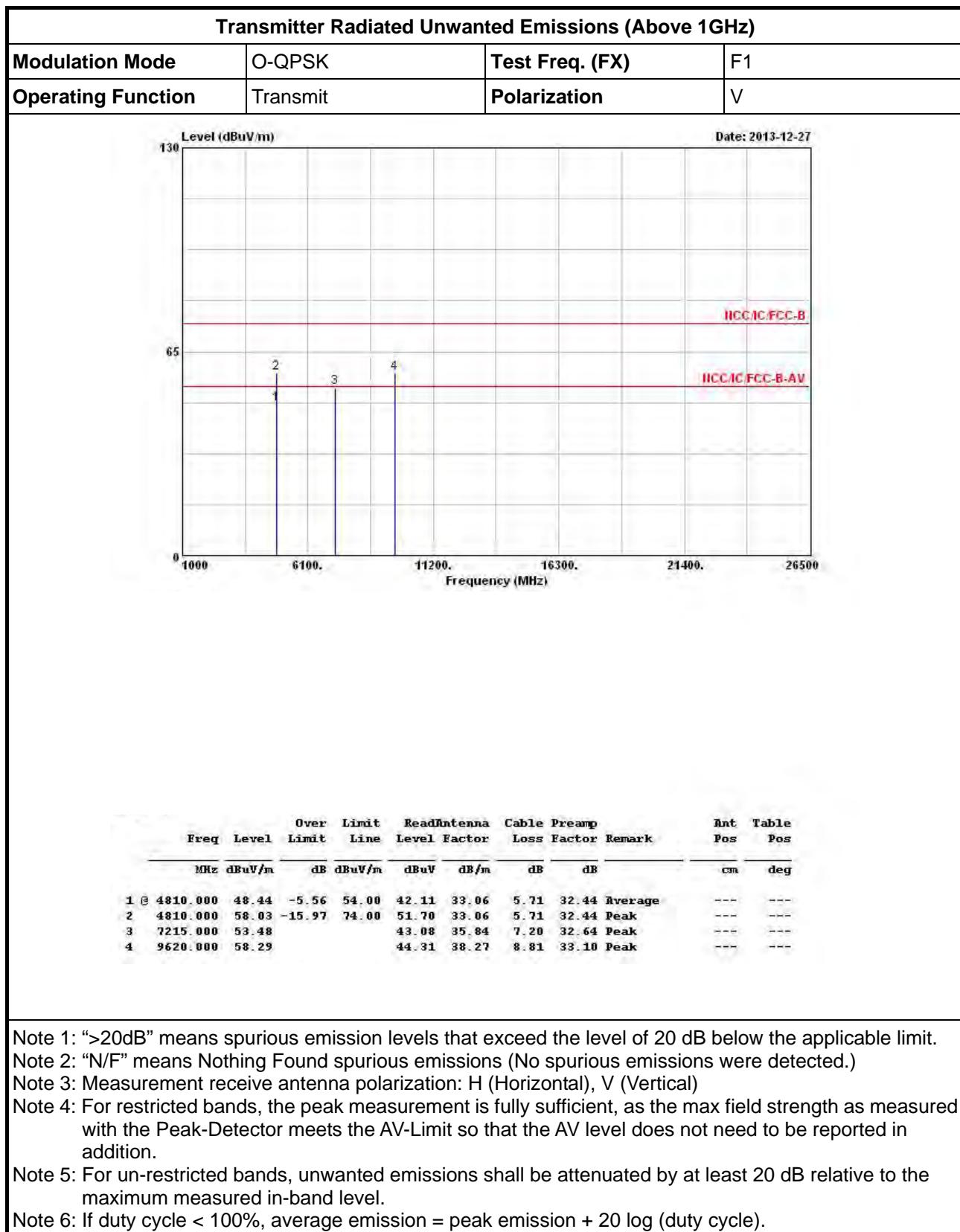
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

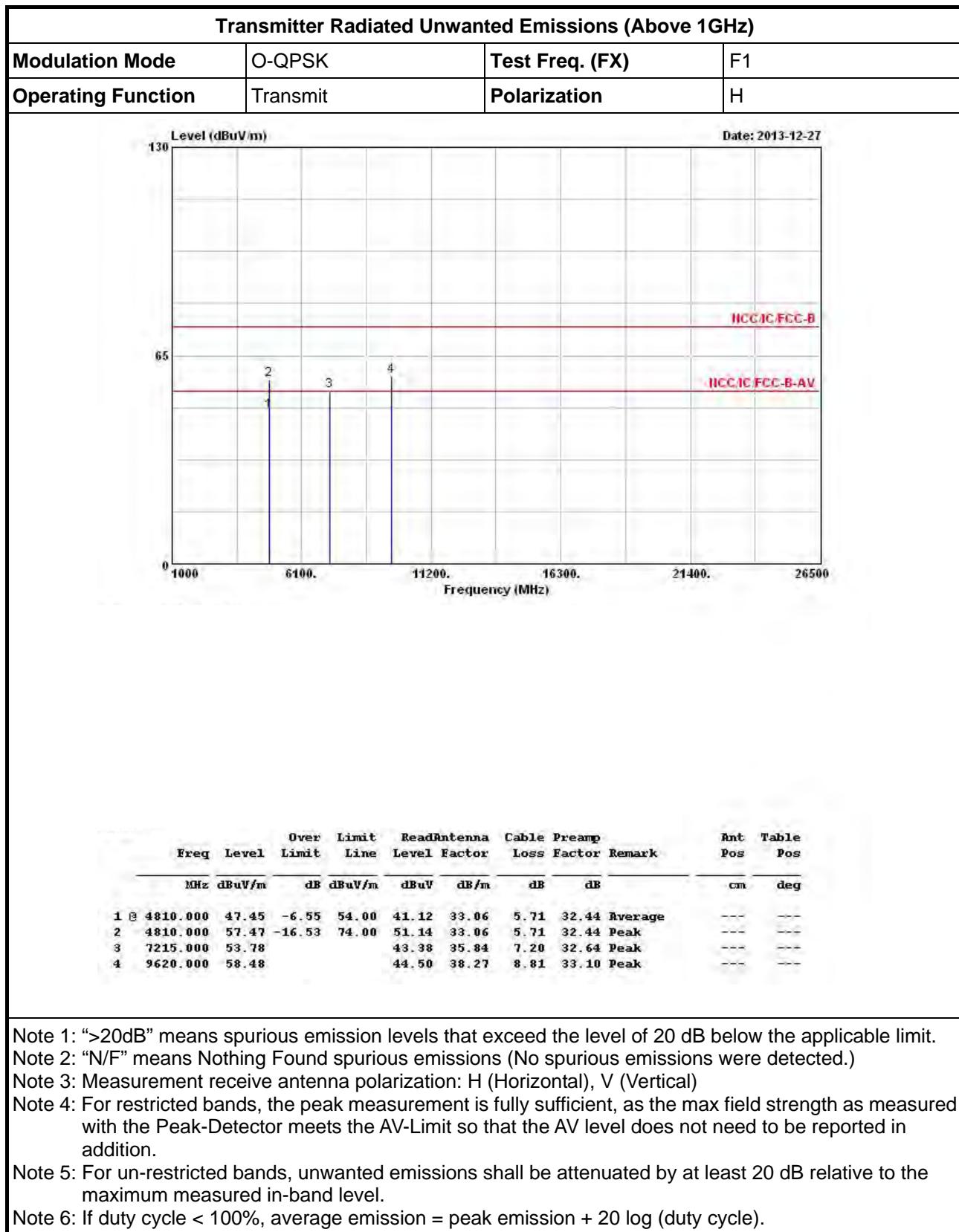
Note 1: >2dB means spurious emission levels that exceed the level of 20 dB below the applicable limit.

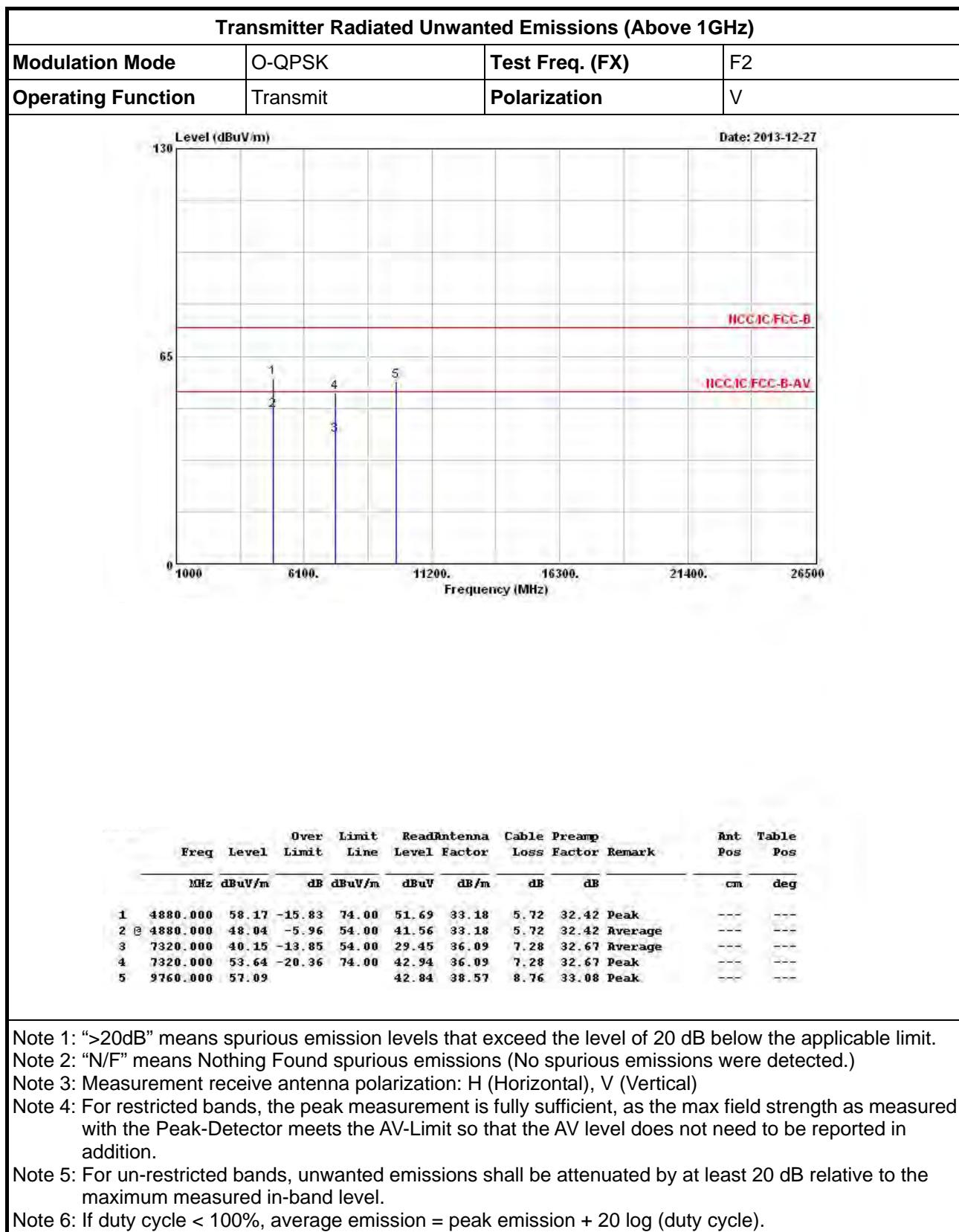
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

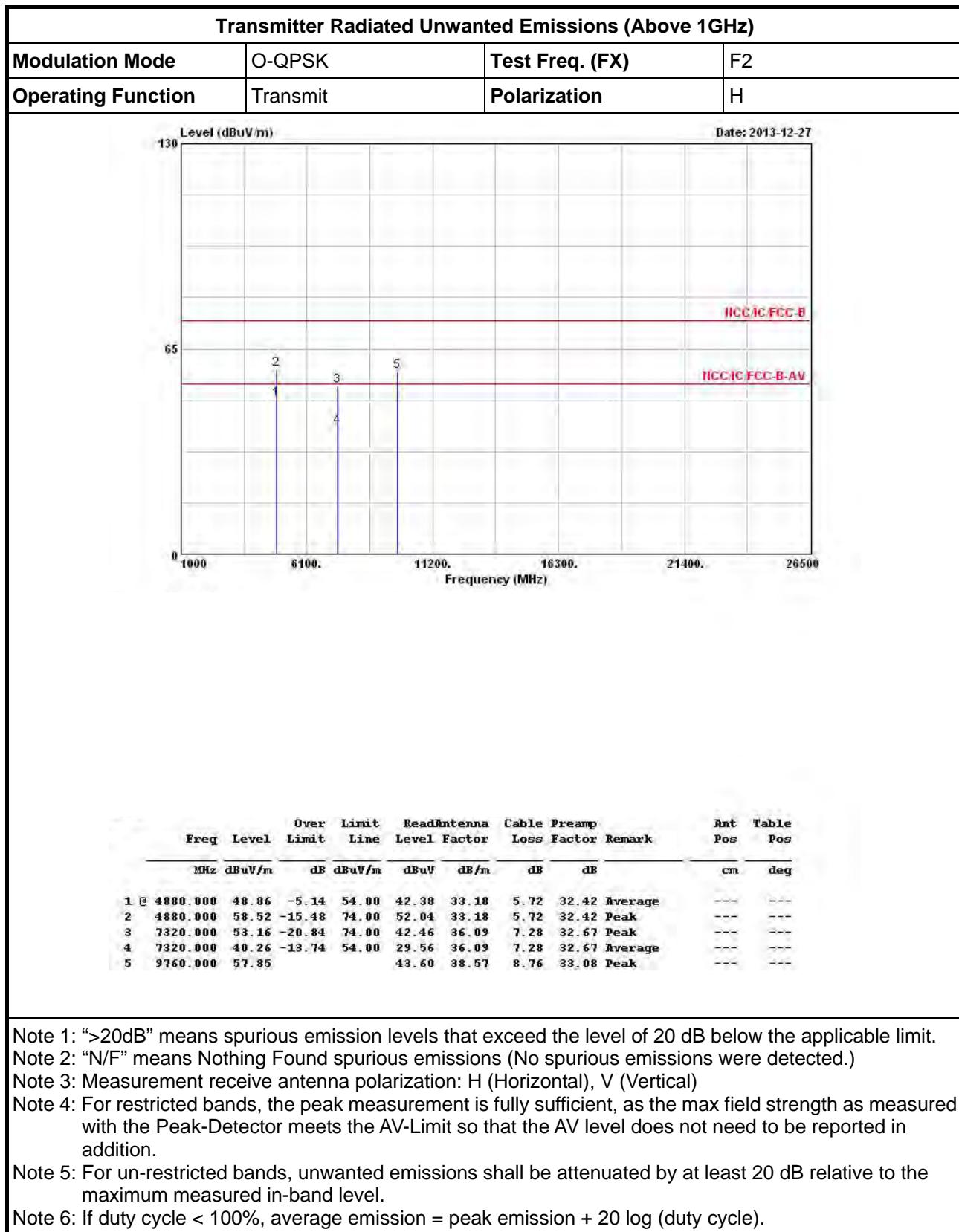


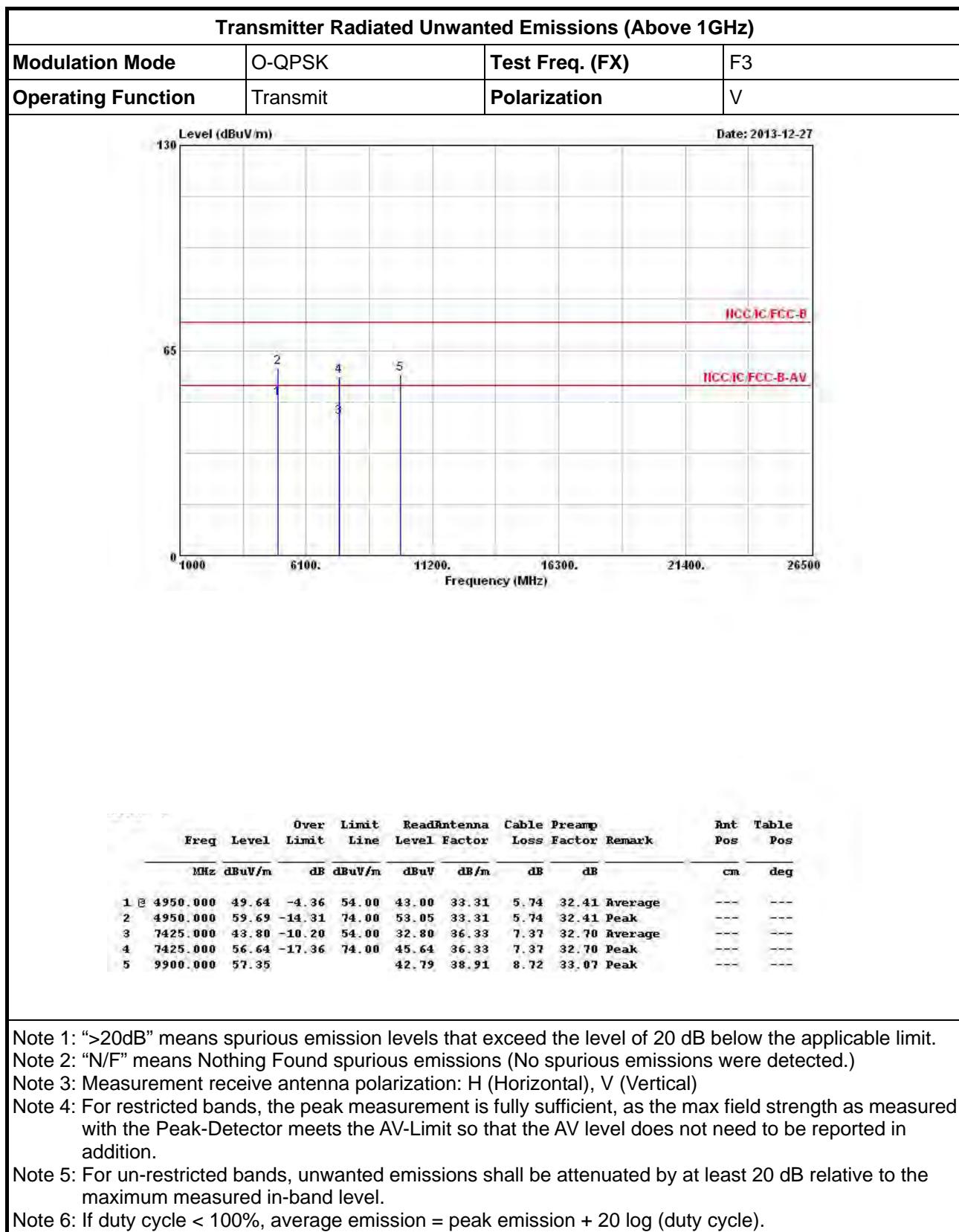
3.6.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)

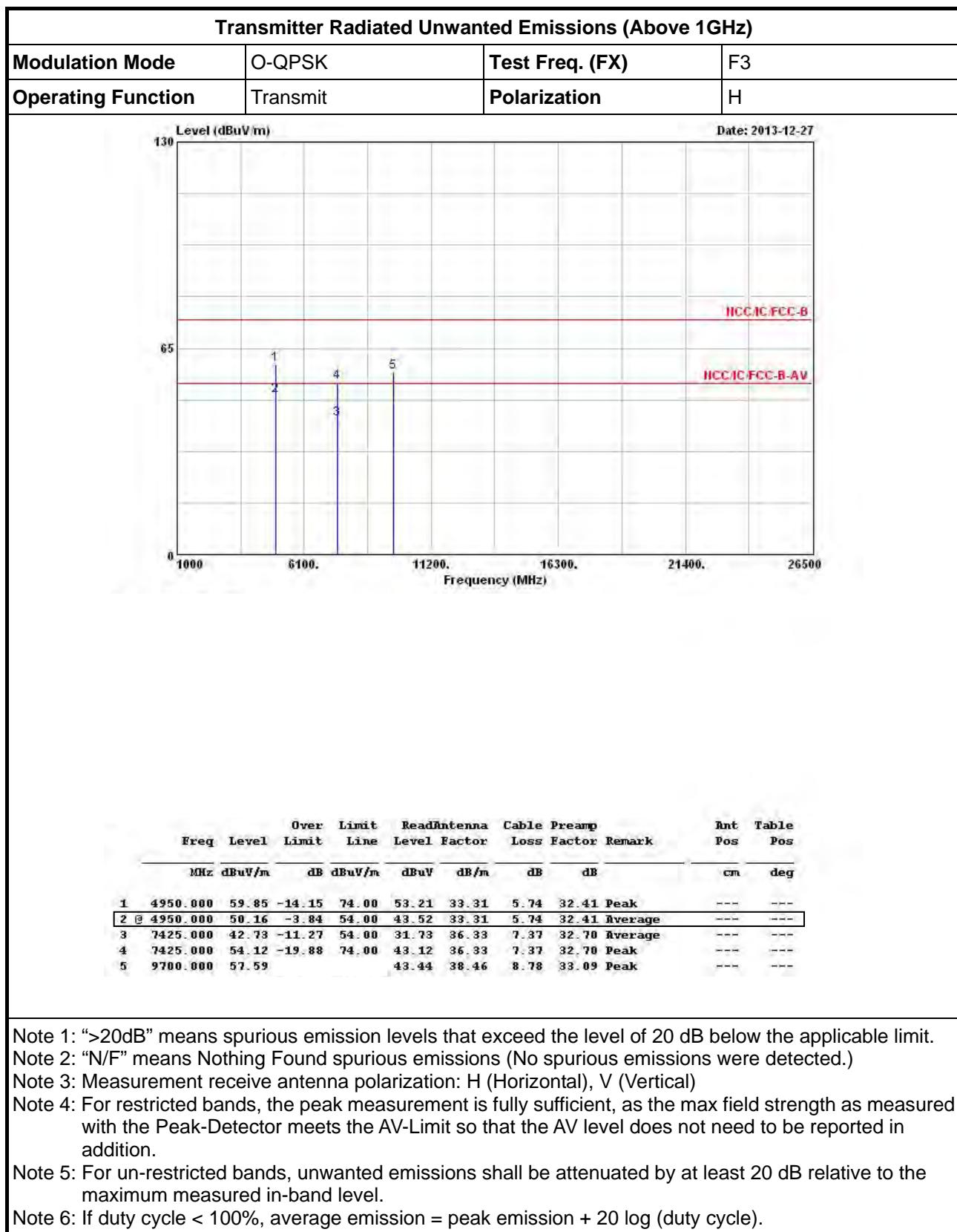














4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz ~ 2.75GHz	Mar. 25, 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	Oct. 30, 2013	Conduction (CO04-HY)
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	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	101500	9KHz~40GHz	Feb. 11, 2013	Conducted (TH01-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	Nov. 30, 2013	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)
Spectrum	R&S	FSP40	100004	9kHz ~ 40GHz	Mar. 11, 2013	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30MHz ~ 1GHz	Sep. 21, 2013	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6741	1GHz ~ 18GHz	May 31, 2013	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz ~ 40GHz	Jan. 11, 2013	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Nov. 16, 2013	Radiation (03CH03-HY)
RF Cable-high	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz ~ 40GHz	Dec. 11, 2013	Radiation (03CH03-HY)
Turn Table	EM Electronics	EM Electronics	060615	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	MF	MF-7802	MF780208179	1 ~ 4 m	N/A	Radiation (03CH03-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	TESEQ	HLA 6120	31244	9kHz ~ 30MHz	Dec. 02, 2012	Radiation (03CH03-HY)

Note: Calibration Interval of instruments listed above is two year