



FCC Test Report

Equipment : Hi-Gain Outdoor Dual-Band Wireless-N Access Point/Bridge
Brand Name : HAWKING TECHNOLOGY
Model No. : HOD45B
FCC ID : SOY-HOD45B
Standard : 47 CFR FCC Part 15.247
Operating Band : 2400 MHz – 2483.5 MHz
Equipment Class : DTS
Applicant : Hawking Technologies, Inc
Manufacturer : 8 Faraday, Suite B, Irvine, CA 92618, USA

The product sample received on Nov. 21, 2012 and completely tested on Jan. 08, 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:

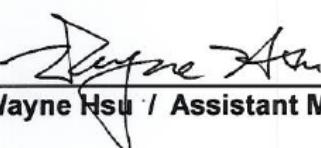

Wayne Hsu / Assistant Manager





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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]: 1.134MHz 41.42 (Margin 4.58dB) - AV 42.05 (Margin 13.95dB) - QP	FCC 15.207	Complied
3.2	15.247(a)	6dB Bandwidth	6dB Bandwidth Unit [MHz] 11B-20M: 11.26 11G-20M: 16.23 11N2.4G-20M: 17.40 11N2.4G-40M: 35.68	≥500kHz	Complied
3.3	15.247(b)	RF Output Power (Maximum Peak Conducted Output Power)	Power [dBm] 11B-20M: 24.74 11G-20M: 24.83 11N2.4G-20M: 29.96 11N2.4G-40M: 29.87	Power [dBm]:30	Complied
3.4	15.247(d)	Power Spectral Density	PSD [dBm/3kHz] 11B-20M: -7.28 11G-20M: -12.39 11N2.4G-20M: -7.16 11N2.4G-40M: -9.68	PSD [dBm/3kHz]:8	Complied
3.5	15.247(c)	Transmitter Radiated Bandedge Emissions	Non-Restricted Bands: 2399.89MHz: 35.19dB Restricted Bands [dBuV/m at 3m]: 2483.50MHz: 65.73 (Margin 8.27dB) - PK 52.99 (Margin 1.01dB) - AV	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied
3.6	15.247(c)	Transmitter Radiated Unwanted Emissions	Non-Restricted Bands: [dBuV/m at 3m]: 7311.00MHz 65.81 (Margin 8.19dB) - PK 52.97 (Margin 1.03dB) - AV	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied



Revision History



1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information						
Frequency Range (MHz)	IEEE Std. 802.11	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	RF Output Power (dBm)	Co-location
2400-2483.5	b	2412-2462	1-11 [11]	1	24.74	Yes
2400-2483.5	g	2412-2462	1-11 [11]	1	24.83	Yes
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	2	29.96	Yes
2400-2483.5	n (HT40)	2422-2452	3-9 [7]	2	29.87	Yes

Note 1: RF output power specifies that Maximum Peak Conducted Output Power.
 Note 2: 802.11b uses a combination of DSSS-DBPSK, DQPSK, CCK modulation.
 Note 3: 802.11g/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
 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 Antenna Information

Antenna Category	
<input type="checkbox"/>	Integral antenna (antenna permanently attached)
<input type="checkbox"/>	<input type="checkbox"/> Temporary RF connector provided
<input type="checkbox"/>	<input type="checkbox"/> No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.
<input checked="" type="checkbox"/>	External antenna (dedicated antennas)
	<input checked="" type="checkbox"/> Single power level with corresponding antenna(s).
	<input type="checkbox"/> Multiple power level and corresponding antenna(s).
	<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. Cat.	Ant. Type	Gain (dBi)
1	External	Dipole	4.50

Reminder: The EUT was pre-tested Antenna Port 1 and Antenna Port 2 for single chain, the worst case was Antenna Port 2. Therefore only the test data recorded in this report.



1.1.3 Type of EUT

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

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
<input type="checkbox"/> Operated normally 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% - IEEE 802.11b	0
<input checked="" type="checkbox"/> 100% - IEEE 802.11g	0
<input checked="" type="checkbox"/> 100% - IEEE 802.11n (HT20)	0
<input checked="" type="checkbox"/> 100% - IEEE 802.11n (HT40)	0

1.1.5 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"/> External DC PoE	<input type="checkbox"/> Battery



1.2 Accessories

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

1.3 Support Equipment

Support Equipment- AC Conduction				
No.	Equipment	Brand Name	Model Name	Serial No.
1	PoE	D-Link	DWL-P200	DOC
2	Adapter	D-Link	DSA-0421S-50	DOC
3	Notebook (Remote Workstation)	DELL	VOSTRO 3350	DOC

Support Equipment- Radiated Emission				
No.	Equipment	Brand Name	Model Name	Serial No.
1	PoE (Remote Workstation)	D-Link	DWL-P200	DOC
2	Adapter (Remote Workstation)	D-Link	DSA-0421S-50	DOC
3	Notebook (x2) (Remote Workstation)	DELL	E5500	DOC

1.4 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
- ◆ FCC KDB 412172

1.5 Testing Location Information

Testing Location				
	HWA YA	ADD	: No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.	
		TEL	: 886-3-327-3456 FAX : 886-3-327-0973	
Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-HY	Ian	25.8°C / 44%	25-Dec.-12
AC Conduction	CO04-HY	Bill	22.5°C / 51.7%	08-Jan.-13
Radiated Emission	03CH02-HY	Daniel	26°C / 55%	25-Dec.-12 ~ 27-Dec.-12



1.6 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 The Worst Case Modulation Configuration

Worst Modulation Used for Conformance Testing				
Modulation Mode	Transmit Chains (N _{TX})	Data Rate / MCS	Worst Data Rate / MCS	RF Output Power (dBm)
11b,1-11Mbps	1	1-11 Mbps	11 Mbps	24.74
11g,6-54Mbps	1	6-54 Mbps	6 Mbps	24.83
HT20,M0-15	2	MCS 0-15	MCS 0	29.96
HT40,M0-15	2	MCS 0-15	MCS 0	29.87

Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40. Worst modulation mode of Guard Interval (GI) is 800ns.

Note 2: Modulation modes consist below configuration:
11b: IEEE 802.11b, 11g: IEEE 802.11g, HT-20/HT40: IEEE 802.11n

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

2.2 Test Channel Frequencies Configuration

Test Channel Frequencies Configuration	
IEEE Std. 802.11	Test Channel Frequencies (MHz)
b, g, n (HT20)	2412-(F1), 2437-(F2), 2462-(F3)
n (HT40)	2422-(F4), 2437-(F5), 2452-(F6)

2.3 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter (2400-2483.5MHz band)							
Test Software Version	RT 3x9x QA: 1.5.6.8						
Modulation Mode	N _{TX}	Test Frequency (MHz)					
		NCB: 20MHz			NCB: 40MHz		
		2412	2437	2462	2422	2437	2452
11b	1	11	15	14	-	-	-
11g	1	12	16	12	-	-	-
HT-20	2	10,11	17,1B	11,11	-	-	-
HT-40	2	-	-	-	0B,0B	18,1B	0D,0D



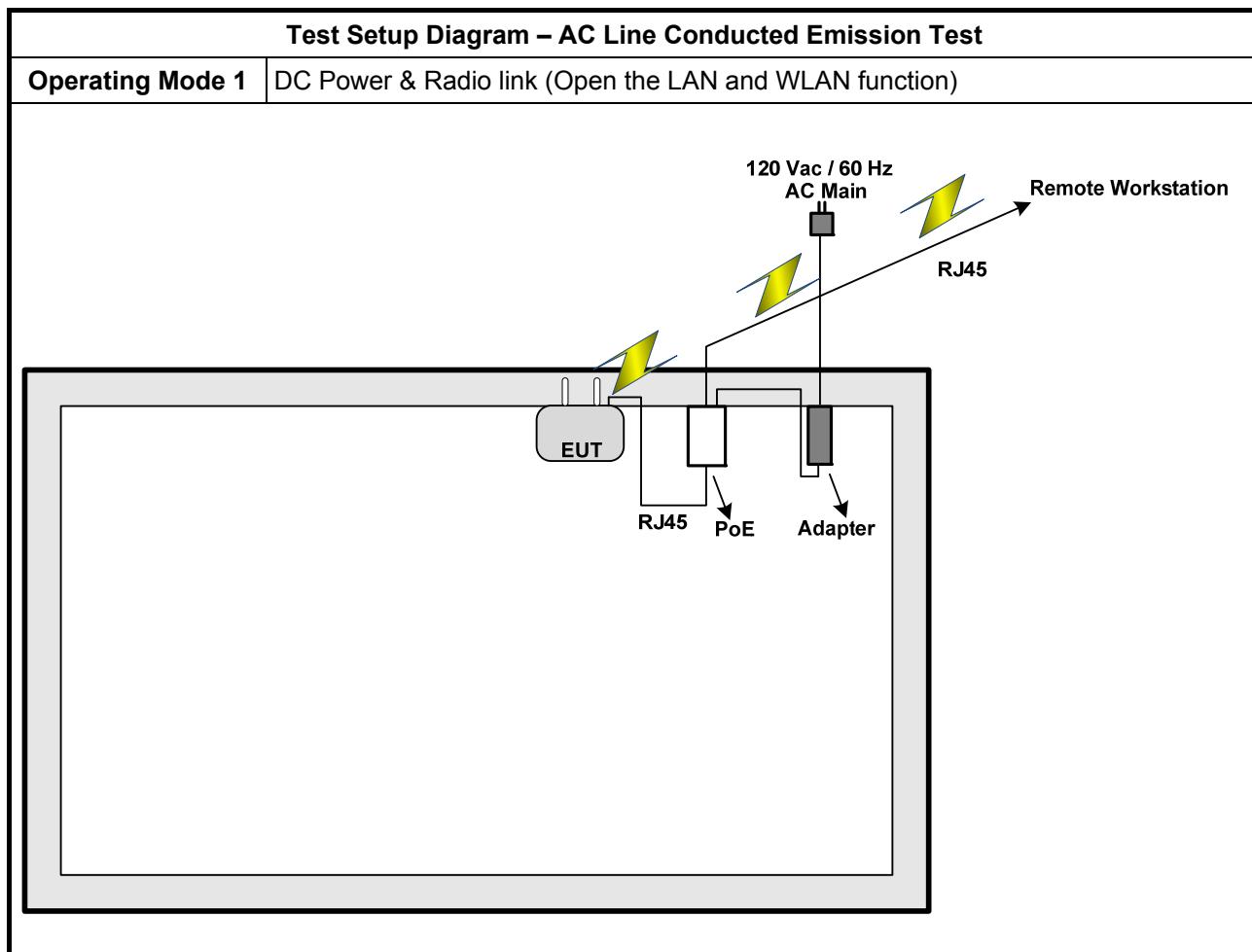
2.4 The Worst Case Measurement Configuration

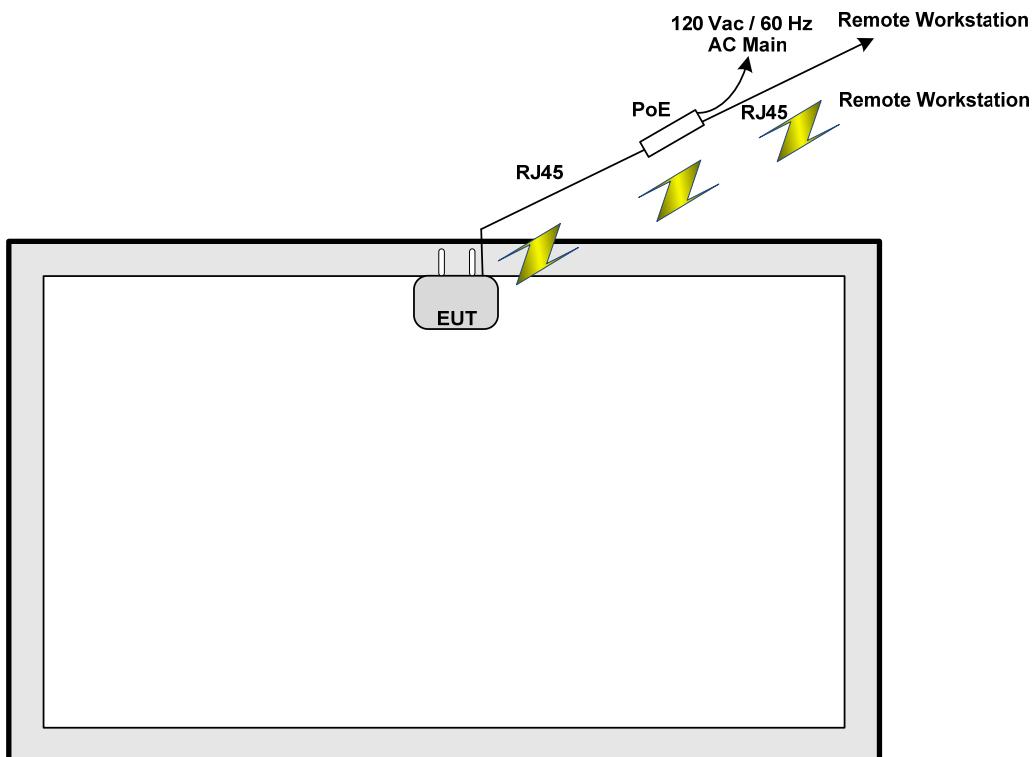
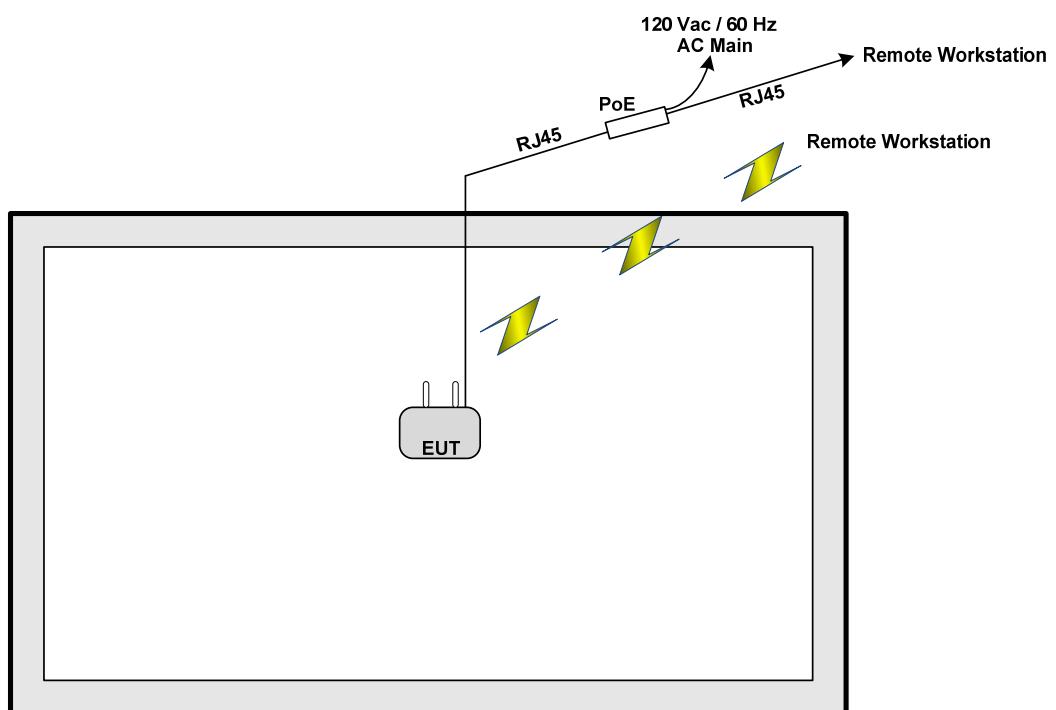
The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	Operating Mode Description
1	DC Power & Radio link (Open the LAN and WLAN function)

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	11b, 11g, HT20, HT40

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 checked="" type="checkbox"/> EUT will be placed in fixed position. The worst planes is X. <input type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two orthogonal planes. <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 < 1GHz	<input checked="" type="checkbox"/> 1. DC Power & Radio link (Open the LAN and WLAN function)						
Modulation Mode	11b, 11g, HT20, HT40						
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					

2.5 Test Setup Diagram



Test Setup Diagram - Radiated Test (Below 1GHz)**Operating Mode 1** DC Power & Radio link (Open the LAN and WLAN function)**Test Setup Diagram - Radiated Test (Above 1GHz)****Operating Mode 1** DC Power & Radio link Transmission Mode

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.

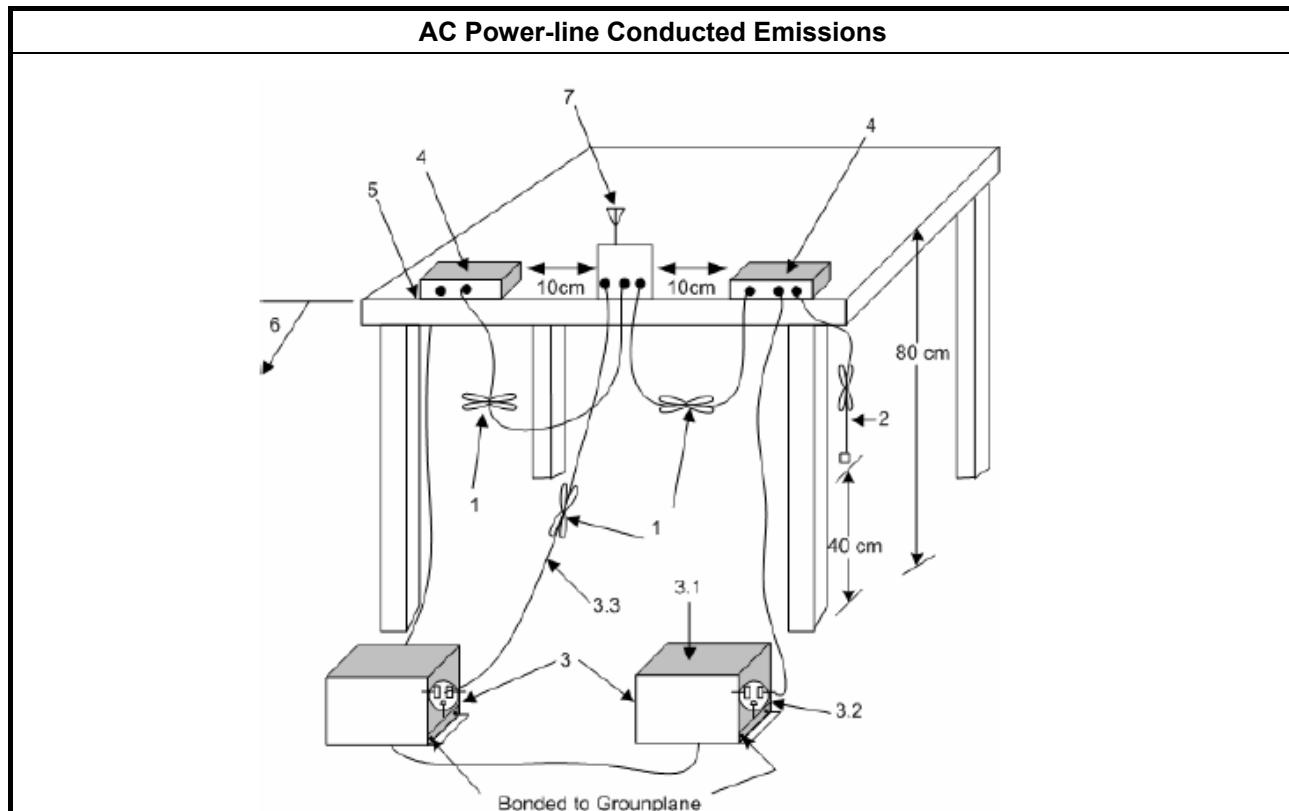
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

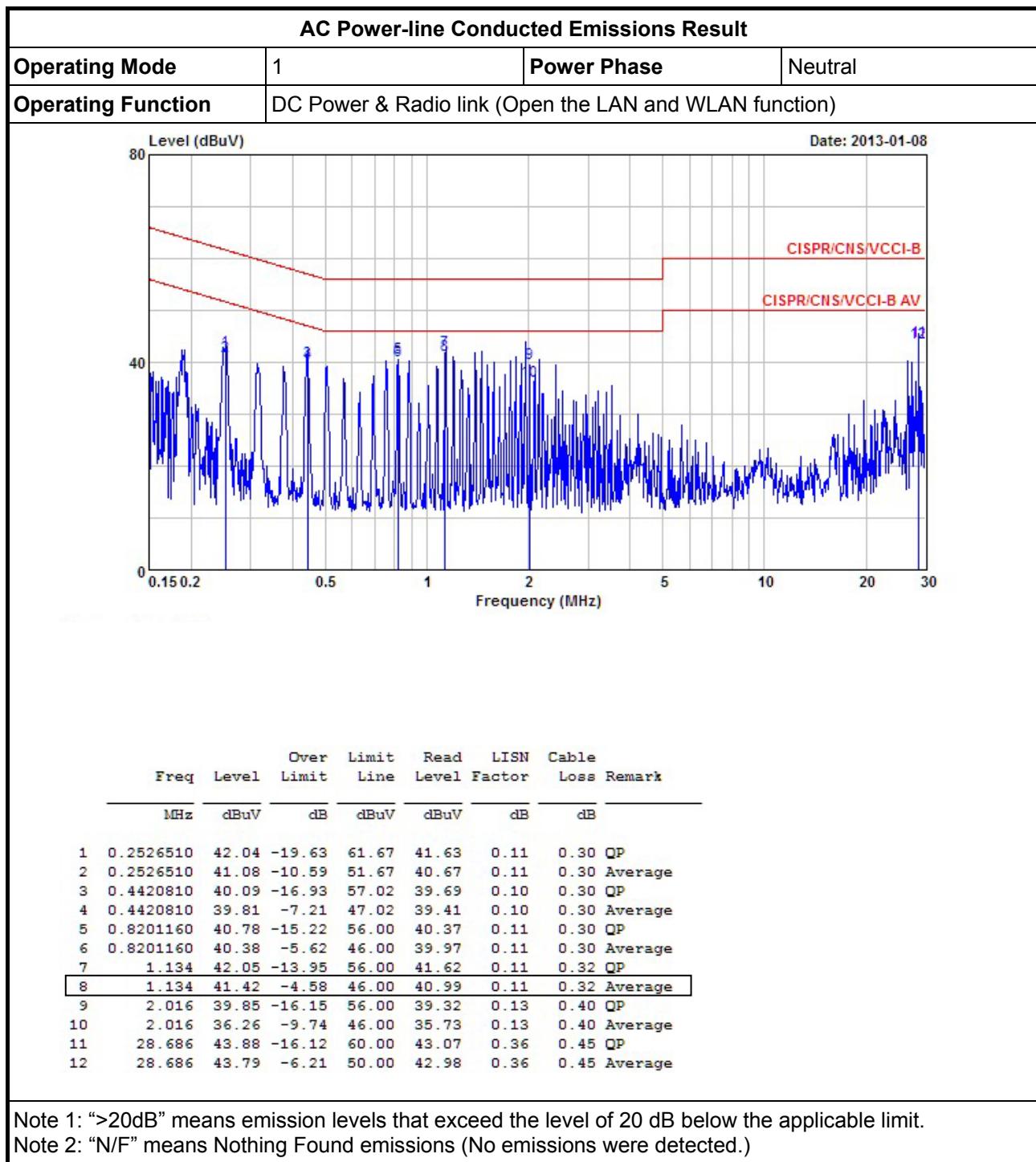
Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions.

3.1.4 Test Setup





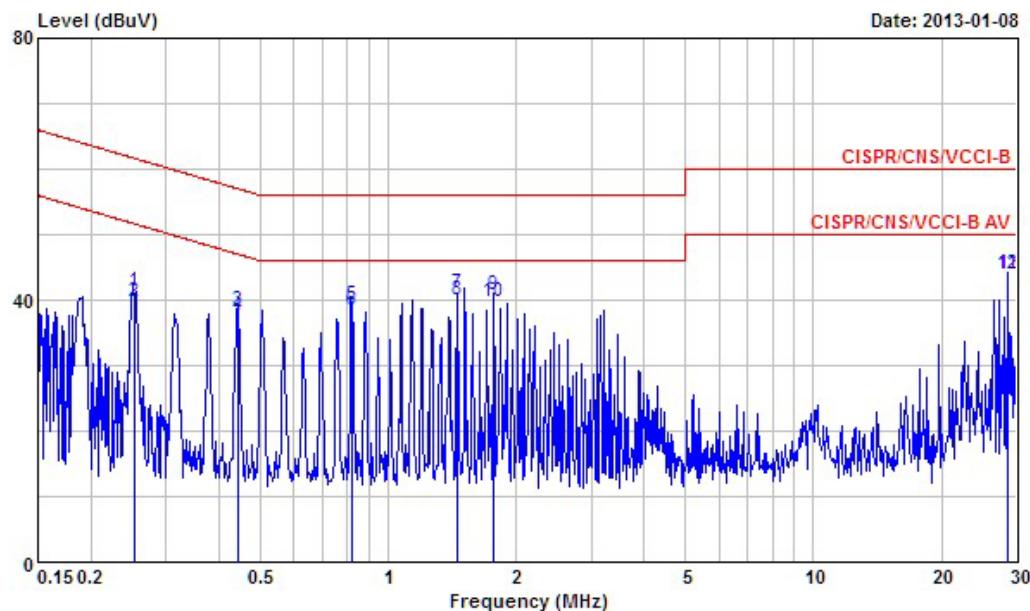
3.1.5 Test Result of AC Power-line Conducted Emissions





AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	DC Power & Radio link (Open the LAN and WLAN function)		



Freq	Level	Over	Limit	Read	LISN	Cable
		Limit	Line	Level	Factor	Loss Remark
MHz	dBuV	dB	dBuV	dBuV	dB	dB
.2519790	41.23	-20.46	61.69	40.70	0.23	0.30 QP
.2519790	39.78	-11.91	51.69	39.25	0.23	0.30 Average
.4420810	38.31	-18.71	57.02	37.79	0.22	0.30 QP
.4420810	37.65	-9.37	47.02	37.13	0.22	0.30 Average
.8193740	39.13	-16.87	56.00	38.60	0.23	0.30 QP
.8193740	38.50	-7.50	46.00	37.97	0.23	0.30 Average
1.451	41.00	-15.00	56.00	40.41	0.24	0.35 QP
1.451	39.87	-6.13	46.00	39.28	0.24	0.35 Average
1.766	40.88	-15.12	56.00	40.25	0.25	0.38 QP
1.766	39.61	-6.39	46.00	38.98	0.25	0.38 Average
28.685	43.98	-16.02	60.00	42.83	0.70	0.45 QP
28.685	43.87	-6.13	50.00	42.72	0.70	0.45 Average

Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)

3.2 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.

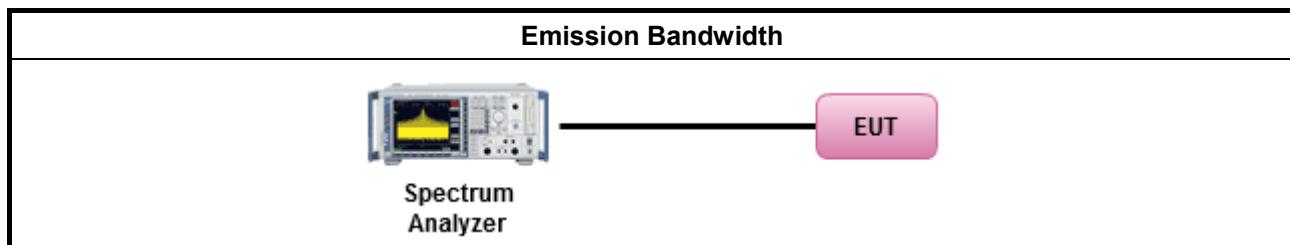
3.2.2 Measuring Instruments

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 7.1 Option 1 for 6 dB bandwidth measurement.
<input type="checkbox"/> Refer as FCC KDB 558074, clause 7.2 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 checked="" type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
<input checked="" type="checkbox"/> The EUT supports multiple transmit chains using options given below:
<input type="checkbox"/> Option 1: Multiple transmit chains measurements need to be performed on one of the active transmit chains (antenna outputs). All measurement had be performed on transmit chains 1.
<input checked="" type="checkbox"/> Option 2: Multiple transmit chains measurements need to be performed on each transmit chains individually (antenna outputs). All measurement had be performed on all transmit chains.

3.2.4 Test Setup

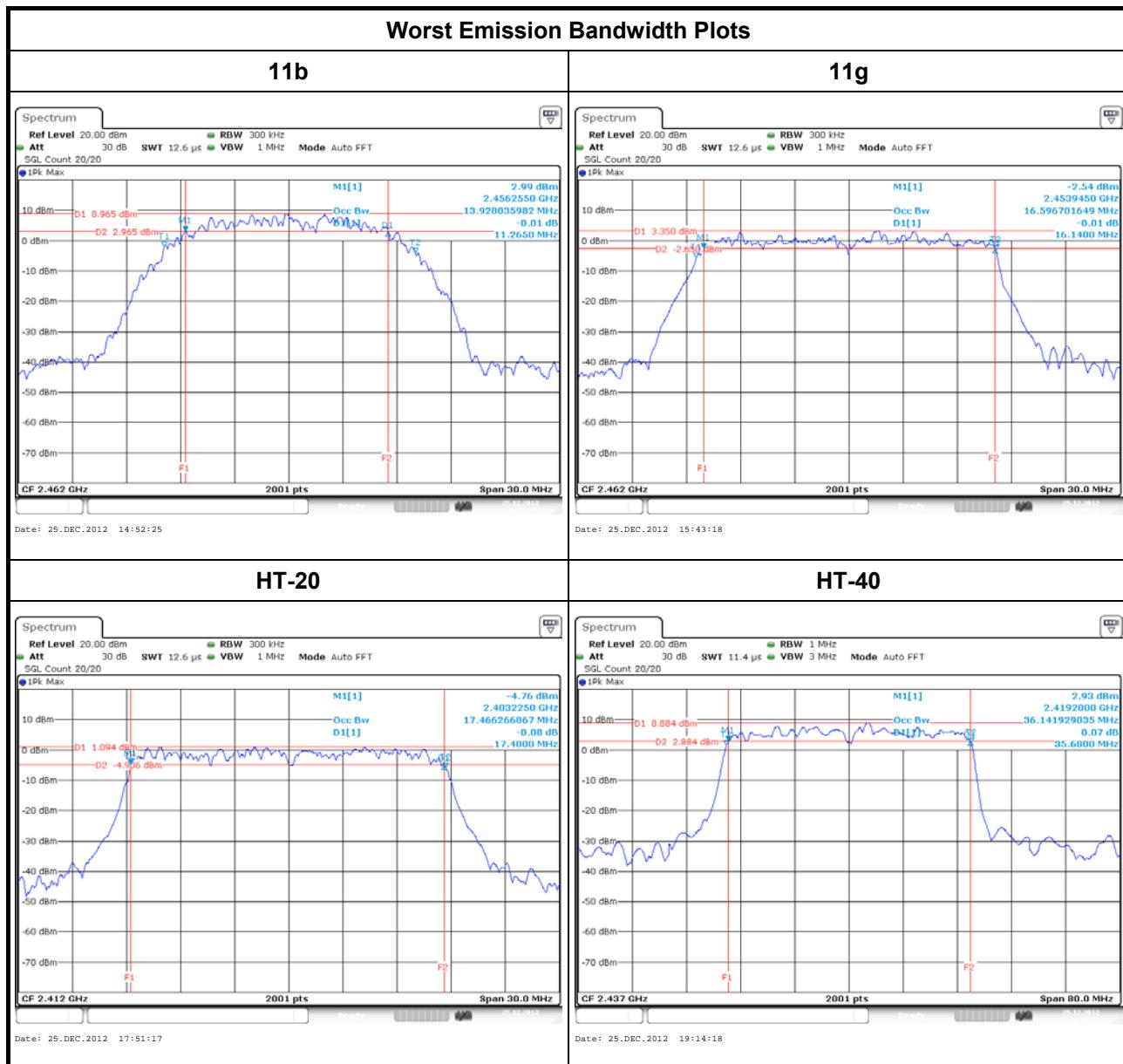




3.2.5 Test Result of Emission Bandwidth

Emission Bandwidth Result										
Condition			Emission Bandwidth (MHz)							
Modulation Mode	N _{TX}	Freq. (MHz)	99% Bandwidth				6dB Bandwidth			
			Chain-Port 1	Chain-Port 2	Chain-Port 3	Chain-Port 4	Chain-Port 1	Chain-Port 2	Chain-Port 3	Chain-Port 4
11b	1	2412	-	13.65	-	-	-	11.05	-	-
11b	1	2437	-	13.55	-	-	-	10.35	-	-
11b	1	2462	-	13.92	-	-	-	11.26	-	-
11g	1	2412	-	16.28	-	-	-	15.97	-	-
11g	1	2437	-	16.31	-	-	-	16.23	-	-
11g	1	2462	-	16.59	-	-	-	16.14	-	-
HT-20	2	2412	17.42	17.46	-	-	17.32	17.40	-	-
HT-20	2	2437	17.42	17.45	-	-	17.28	17.26	-	-
HT-20	2	2462	17.45	17.45	-	-	17.31	16.90	-	-
HT-40	2	2412	35.82	35.78	-	-	34.88	34.96	-	-
HT-40	2	2437	35.90	36.14	-	-	35.64	35.68	-	-
HT-40	2	2462	35.82	35.86	-	-	35.28	34.96	-	-
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.	

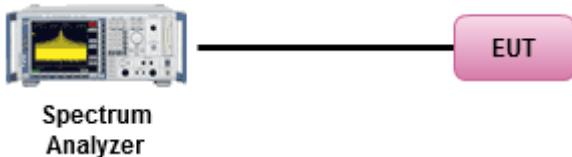
3.3.2 Measuring Instruments

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 8.1.1 Option 1 (RBW \geq EBW method).
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.1.2 Option 2 (integrated band power method).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.1.3 Option 2 (peak power meter for VBW \geq DTS BW)
<input checked="" type="checkbox"/> Maximum Conducted (Average) Output Power
<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.2.1 Option 1 (spectral trace averaging).
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.2.2 Option 2 (slow sweep speed).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.2.3 Option 3 (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 checked="" type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
<input checked="" 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 checked="" 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

RF Output Power (Spectrum Analyzer)

RF Output Power (Power Meter)




3.3.5 Directional Gain for Power Measurement

Directional Gain (DG) Result (See Note 4)				
Transmit Chains No.	1	2	-	-
Maximum G_{ANT} (dBi)	4.50	4.50	-	-
Modulation Mode	N_{TX}	N_{SS}	Array Gain (dB)	DG (dBi)
11b,1-11Mbps	1	1	0	4.50
11g,6-54Mbps	1	1	0	4.50
HT20,M0-M7	2	1	0	4.50
HT20,M8-M15	2	2	0	4.50
HT40,M0-M7	2	1	0	4.50
HT40,M8-M15	2	2	0	4.50

Note 1: For all transmitter outputs with equal antenna gains, directional gain is to be computed as follows:
Any transmit signals are correlated, Directional Gain = $G_{ANT} + 10 \log(N_{TX})$
All transmit signals are completely uncorrelated, Directional Gain = G_{ANT}

Note 2: For all transmitter outputs with unequal antenna gains, directional gain is to be computed as follows:
Any transmit signals are correlated, Directional Gain = $10 \log[(10^{G1/20} + \dots + 10^{GN/20})^2 / N_{TX}]$
All transmit signals are completely uncorrelated, Directional Gain = $10 \log[(10^{G1/10} + \dots + 10^{GN/10}) / N_{TX}]$

Note 3: For Spatial Multiplexing, Directional Gain (DG) = $G_{ANT} + 10 \log(N_{TX}/N_{SS})$,
where N_{SS} = the number of independent spatial streams data.

Note 4: For CDD transmissions, directional gain is calculated as power measurements:
Directional Gain (DG) = $G_{ANT} + \text{Array Gain}$, where Array Gain is as follows:
Array Gain = 0 dB (i.e., no array gain) for $N_{TX} \leq 4$
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{TX}

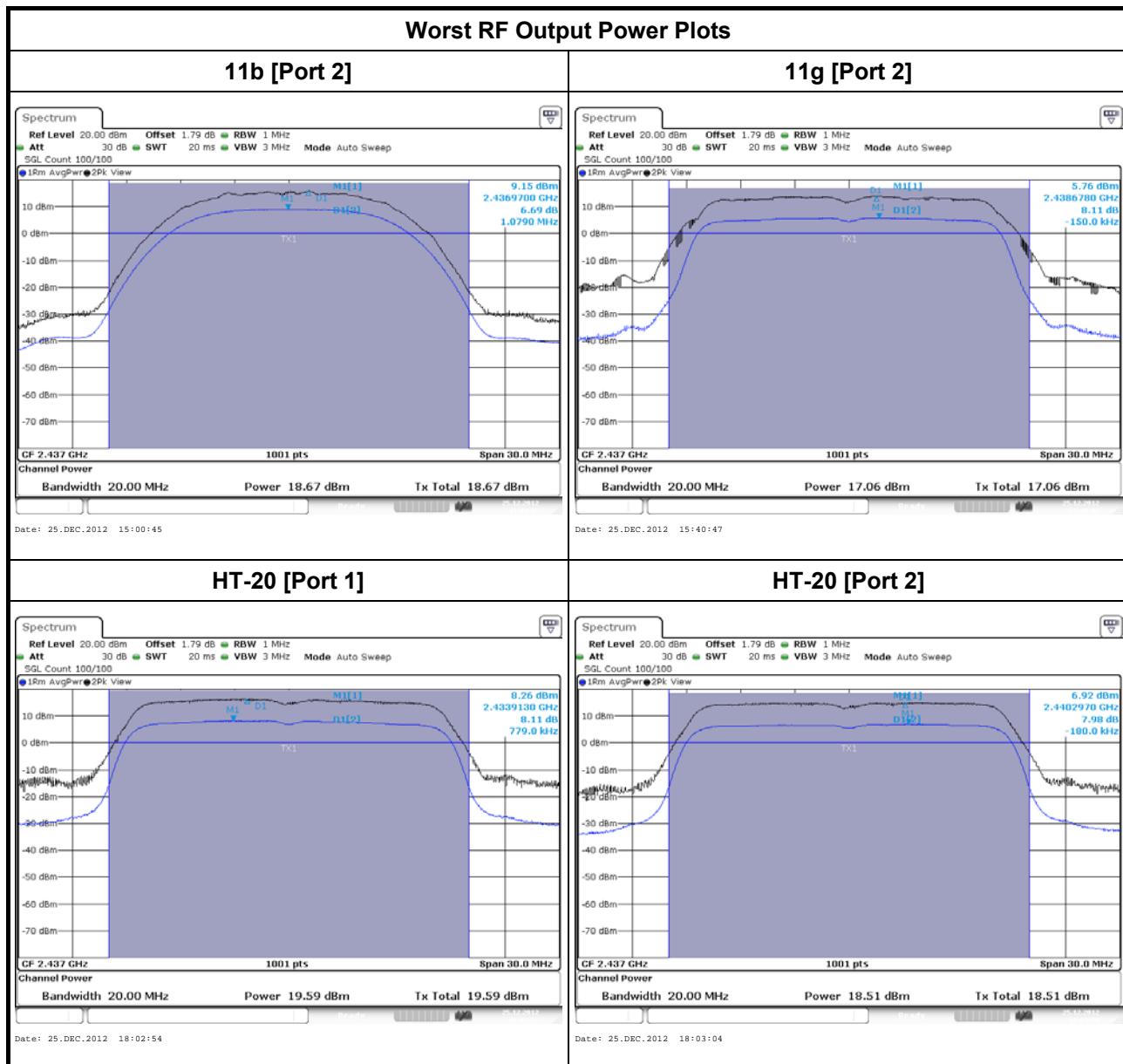


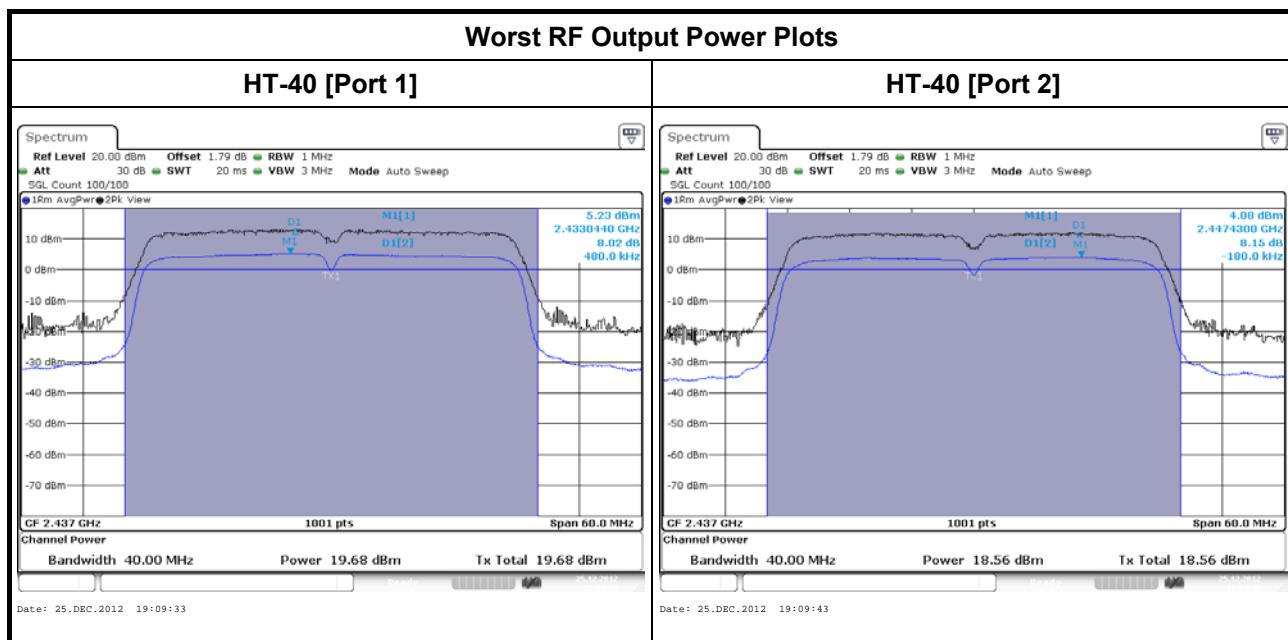
3.3.6 Test Result of Maximum Peak Conducted Output Power

Maximum Peak Conducted Output Power Result												
Condition			RF Output Power (dBm)									
Modulation Mode	N _{TX}	Freq. (MHz)	Chain Port 1	Chain Port 2	Chain Port 3	Chain Port 4	Sum Chain	Power Limit	DG (dBi)	EIRP Power	EIRP Limit	
11b	1	2412	-	23.16	-	-	23.16	30	4.50	27.66	36	
11b	1	2437	-	24.74	-	-	24.74	30	4.50	29.24	36	
11b	1	2462	-	24.53	-	-	24.53	30	4.50	29.03	36	
11g	1	2412	-	21.80	-	-	21.80	30	4.50	26.30	36	
11g	1	2437	-	24.83	-	-	24.83	30	4.50	29.33	36	
11g	1	2462	-	22.49	-	-	22.49	30	4.50	26.99	36	
HT-20	2	2412	24.40	21.44	-	-	26.18	30	4.50	30.68	36	
HT-20	2	2437	27.44	26.40	-	-	29.96	30	4.50	34.46	36	
HT-20	2	2462	23.73	21.51	-	-	25.77	30	4.50	30.27	36	
HT-40	2	2422	21.47	18.50	-	-	23.24	30	4.50	27.74	36	
HT-40	2	2437	27.36	26.30	-	-	29.87	30	4.50	34.37	36	
HT-40	2	2452	22.76	20.56	-	-	24.81	30	4.50	29.31	36	
Result			Complied									

3.3.7 Test Result of Maximum Conducted Output Power

Maximum Conducted Output Power												
Condition			RF Output Power (dBm)									
Modulation Mode	N _{TX}	Freq. (MHz)	Chain Port 1	Chain Port 2	Chain Port 3	Chain Port 4	Sum Chain	Power Limit	DG (dBi)	EIRP Power	EIRP Limit	
11b	1	2412	-	17.06	-	-	17.06	30	4.50	21.56	36	
11b	1	2437	-	18.67	-	-	18.67	30	4.50	23.17	36	
11b	1	2462	-	18.45	-	-	18.45	30	4.50	22.95	36	
11g	1	2412	-	14.10	-	-	14.10	30	4.50	18.60	36	
11g	1	2437	-	17.06	-	-	17.06	30	4.50	21.56	36	
11g	1	2462	-	14.79	-	-	14.79	30	4.50	19.29	36	
HT-20	2	2412	16.45	13.45	-	-	18.21	30	4.50	22.71	36	
HT-20	2	2437	19.59	18.51	-	-	22.09	30	4.50	26.59	36	
HT-20	2	2462	15.75	13.54	-	-	17.79	30	4.50	22.29	36	
HT-40	2	2422	13.65	10.70	-	-	15.43	30	4.50	19.93	36	
HT-40	2	2437	19.68	18.56	-	-	22.17	30	4.50	26.67	36	
HT-40	2	2452	14.95	12.75	-	-	17.00	30	4.50	21.50	36	
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) $\leq 8 \text{ dBm/3kHz}$

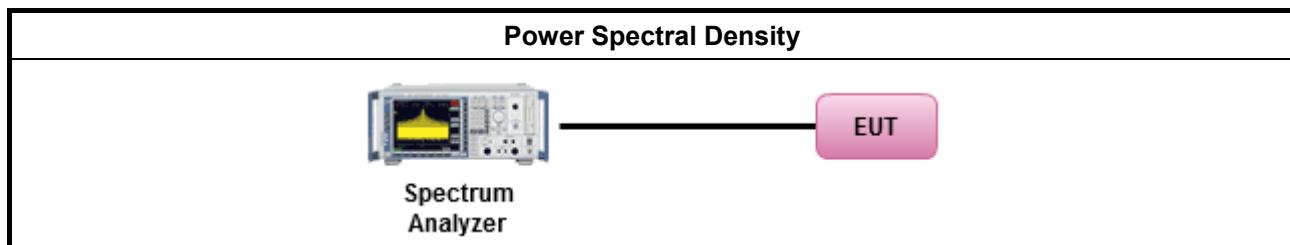
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

Test Method
<input checked="" type="checkbox"/> Power spectral density procedures that the same method as used to determine the conducted output power shall be used to determine the power spectral density. In addition, the use of a peak PSD procedure will always result in a "worst-case" measured level for comparison to the limit. Therefore, whenever the DTS bandwidth exceeds 500 kHz, it is acceptable to utilize the peak PSD procedure to demonstrate compliance to the PSD limit, regardless of how the fundamental output power was measured. For the power spectral density shall be measured using below options:
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 9.1 Option 1 - (RBW $\geq 3\text{kHz}$; sweep=auto, detector=peak).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2 Option 2 - (RBW $\geq 3\text{kHz}$; sweep=auto, average=100).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.3 Option 3 - (RBW $\geq 3\text{kHz}$; slow sweep speed).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.4 Alternative 1 (average PSD; Add 10log (1/duty cycle)).
<input checked="" type="checkbox"/> RBW $>3\text{kHz}$, add the bandwidth correction factor (BWCF) adjusting in PSD per 3kHz.
<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 checked="" type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
<input checked="" type="checkbox"/> The EUT supports multiple transmit chains using options given below:
<input checked="" 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.

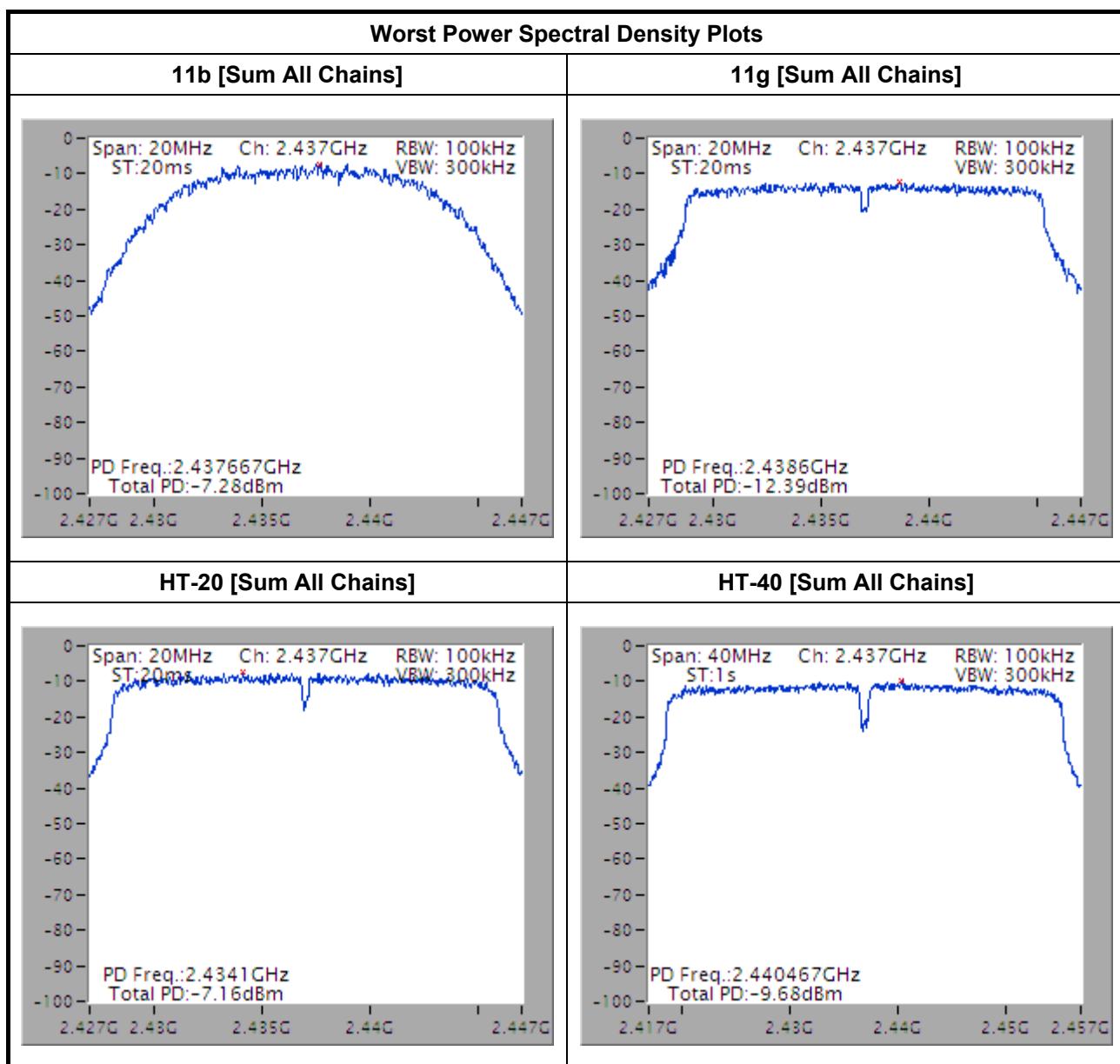
3.4.4 Test Setup



3.4.5 Test Result of Power Spectral Density

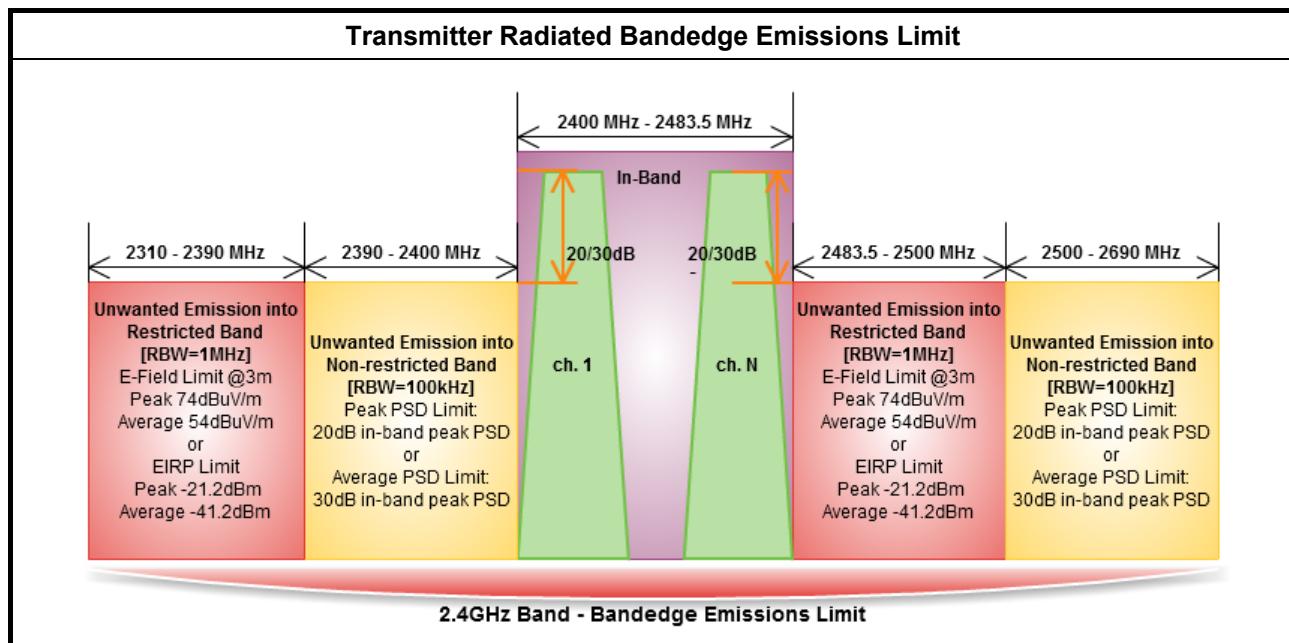
Condition			Power Spectral Density (dBm/3kHz)						Sum Chain	Power Limit
Modulation Mode	N _{TX}	Freq. (MHz)	-	-	-	-	-	-		
11b	1	2412	-	-	-	-	-	-	-9.16	8
11b	1	2437	-	-	-	-	-	-	-7.28	8
11b	1	2462	-	-	-	-	-	-	-7.51	8
11g	1	2412	-	-	-	-	-	-	-15.38	8
11g	1	2437	-	-	-	-	-	-	-12.39	8
11g	1	2462	-	-	-	-	-	-	-14.78	8
HT-20	2	2412	-	-	-	-	-	-	-11.37	8
HT-20	2	2437	-	-	-	-	-	-	-7.16	8
HT-20	2	2462	-	-	-	-	-	-	-11.77	8
HT-40	2	2422	-	-	-	-	-	-	-16.94	8
HT-40	2	2437	-	-	-	-	-	-	-9.68	8
HT-40	2	2452	-	-	-	-	-	-	-15.43	8
Result			Complied							

Note 1: PSD [dBm/3kHz] = sum each transmit chains by bin-to-bin PSD [dBm/100kHz] + BWFC [-15.2 dB]



3.5 Transmitter Radiated Bandedge Emissions

3.5.1 Transmitter Radiated Bandedge Emissions Limit



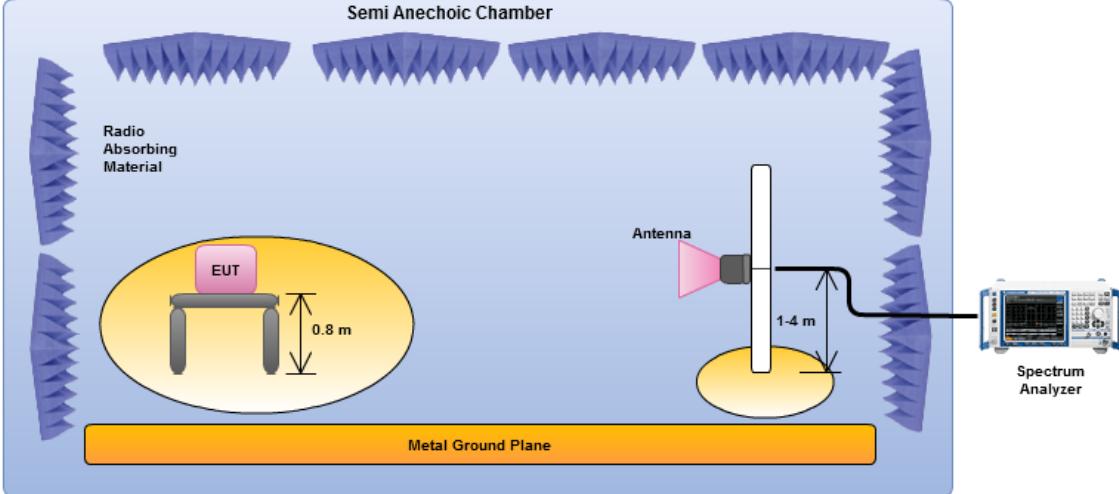
3.5.2 Measuring Instruments

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: <table border="1" style="width: 100%;"><tr><td><input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.1 for unwanted emissions into non-restricted bands.</td></tr><tr><td><input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.2 for unwanted emissions into restricted bands.</td></tr><tr><td><input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.2.3.3 and 8.2.1 Option 1 (spectral trace averaging)</td></tr><tr><td><input type="checkbox"/> Refer as FCC KDB 558074, clause 10.2.3.3 and 8.2.1 Option 2 (slow sweep speed).</td></tr><tr><td><input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW).</td></tr><tr><td><input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.</td></tr><tr><td><input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.2.3.2 and 8.1.1 measurement procedure peak limit.</td></tr></table>	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.1 for unwanted emissions into non-restricted bands.	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.2 for unwanted emissions into restricted bands.	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.2.3.3 and 8.2.1 Option 1 (spectral trace averaging)	<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.2.3.3 and 8.2.1 Option 2 (slow sweep speed).	<input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW).	<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 10.2.3.2 and 8.1.1 measurement procedure peak limit.
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.1 for unwanted emissions into non-restricted bands.							
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.2 for unwanted emissions into restricted bands.							
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.2.3.3 and 8.2.1 Option 1 (spectral trace averaging)							
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.2.3.3 and 8.2.1 Option 2 (slow sweep speed).							
<input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW).							
<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 10.2.3.2 and 8.1.1 measurement procedure peak limit.							
<input checked="" type="checkbox"/> For the transmitter bandedge emissions shall be measured using following options below: <table border="1" style="width: 100%;"><tr><td><input type="checkbox"/> Refer as FCC KDB 558074, clause 10.2.5.2 for narrower resolution bandwidth using the band power and summing the spectral levels (i.e., 100 kHz or 1 MHz).</td></tr><tr><td><input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 6.9.2 for band-edge testing.</td></tr><tr><td><input type="checkbox"/> Refer as ANSI C63.10, clause 6.9.3 for marker-delta method for band-edge measurements.</td></tr></table>	<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.2.5.2 for narrower resolution bandwidth using the band power and summing the spectral levels (i.e., 100 kHz or 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 type="checkbox"/> Refer as FCC KDB 558074, clause 10.2.5.2 for narrower resolution bandwidth using the band power and summing the spectral levels (i.e., 100 kHz or 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 10.2.1.							
<input checked="" type="checkbox"/> For conducted measurement, refer as FCC KDB 558074, clause 10.2.2.							

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 Test Result of Transmitter Radiated Bandedge Emissions

Transmitter Radiated Bandedge Emissions Result								
Modulation	11b			N _{TX}	1			
Non-restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/100kHz)	NBE Freq. (MHz)	Out-band PSD [o] (dBuV/100kHz)	[i] – [o] (dB)	Limit (dB)	Level Type	Pol. note 1
2390-2400	2412	112.16	2399.04	66.85	45.31	20	PK	H
2500-2690	2462	110.88	2534.60	57.87	53.01	20	PK	H
Low Bandedge				Up Bandedge				

Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)

Transmitter Radiated Bandedge Emissions Result								
Modulation	11b			N _{TX}	1			
Restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/1MHz)	RBE Freq. (MHz)	Measure Distance (m)	Out-Band Level (dBuV/m)	Limit (dBuV/m)	Level Type	Pol. note 1
2310-2390	2412	119.60	2387.84	3	64.49	74	PK	H
2310-2390	2412	110.60	2390.00	3	52.51	54	AV	H
2483.5-2500	2462	118.36	2487.80	3	65.73	74	PK	H
2483.5-2500	2462	109.40	2483.50	3	52.99	54	AV	H

Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).



Transmitter Radiated Bandedge Emissions Result								
Modulation	11g			N _{TX}	1			
Non-restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/100kHz)	NBE Freq. (MHz)	Out-band PSD [o] (dBuV/100kHz)	[i] – [o] (dB)	Limit (dB)	Level Type	Pol. note 1
2390-2400	2412	105.43	2399.40	68.85	36.58	20	PK	H
2500-2690	2462	103.70	2513.80	58.75	44.95	20	PK	H
Low Bandedge				Up Bandedge				

Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)

Transmitter Radiated Bandedge Emissions Result								
Modulation	11g			N _{TX}	1			
Restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/1MHz)	RBE Freq. (MHz)	Measure Distance (m)	Out-Band Level (dBuV/m)	Limit (dBuV/m)	Level Type	Pol. note 1
2310-2390	2412	114.00	2389.18	3	68.71	74	PK	H
2310-2390	2412	104.75	2390.00	3	52.72	54	AV	H
2483.5-2500	2462	112.55	2483.50	3	69.09	74	PK	H
2483.5-2500	2462	102.52	2483.50	3	52.90	54	AV	H

Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).



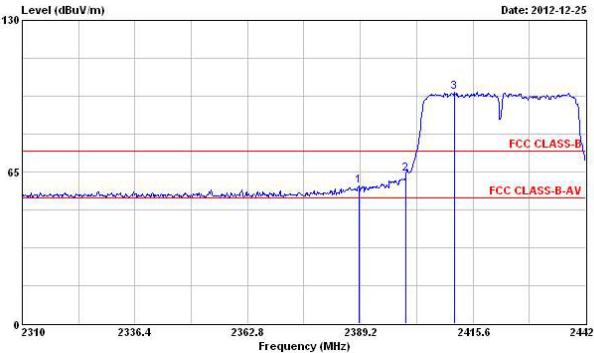
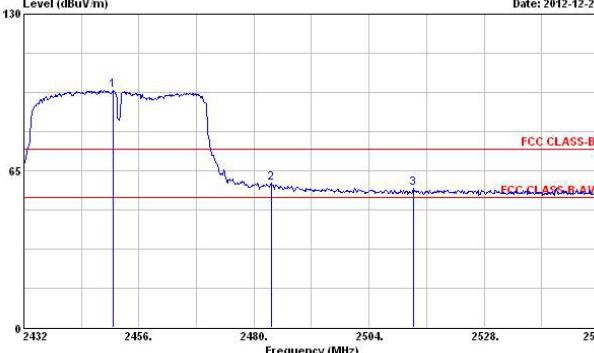
Transmitter Radiated Bandedge Emissions Result								
Modulation	HT20			N _{TX}	2			
Non-restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/100kHz)	NBE Freq. (MHz)	Out-band PSD [o] (dBuV/100kHz)	[i] – [o] (dB)	Limit (dB)	Level Type	Pol. note 1
2390-2400	2412	104.88	2397.25	66.24	38.64	20	PK	H
2500-2690	2462	102.67	2526.60	59.42	43.25	20	PK	H
Low Bandedge				Up Bandedge				

Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)

Transmitter Radiated Bandedge Emissions Result								
Modulation	HT20			N _{TX}	2			
Restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/1MHz)	RBE Freq. (MHz)	Measure Distance (m)	Out-Band Level (dBuV/m)	Limit (dBuV/m)	Level Type	Pol. note 1
2310-2390	2412	113.52	2389.97	3	66.52	74	PK	H
2310-2390	2412	103.80	2390.00	3	52.75	54	AV	H
2483.5-2500	2462	111.64	2483.80	3	67.02	74	PK	H
2483.5-2500	2462	101.47	2483.50	3	52.67	54	AV	H

Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).



Transmitter Radiated Bandedge Emissions Result								
Modulation	HT-40			N _{TX}	2			
Non-restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/100kHz)	NBE Freq. (MHz)	Out-band PSD [o] (dBuV/100kHz)	[i] – [o] (dB)	Limit (dB)	Level Type	Pol. note 1
2390-2400	2422	99.19	2399.89	64.00	35.19	20	PK	H
2500-2690	2452	98.55	2513.36	57.66	40.89	20	PK	H
Low Bandedge				Up Bandedge				
								

Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)

Transmitter Radiated Bandedge Emissions Result								
Modulation	HT-40			N _{TX}	2			
Restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/1MHz)	RBE Freq. (MHz)	Measure Distance (m)	Out-Band Level (dBuV/m)	Limit (dBuV/m)	Level Type	Pol. note 1
2310-2390	2422	109.24	2389.60	3	66.09	74	PK	H
2310-2390	2422	97.95	2390.00	3	52.50	54	AV	H
2483.5-2500	2452	108.06	2483.72	3	67.40	74	PK	H
2483.5-2500	2452	97.40	2483.60	3	52.79	54	AV	H

Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).



3.6 Transmitter Radiated 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.

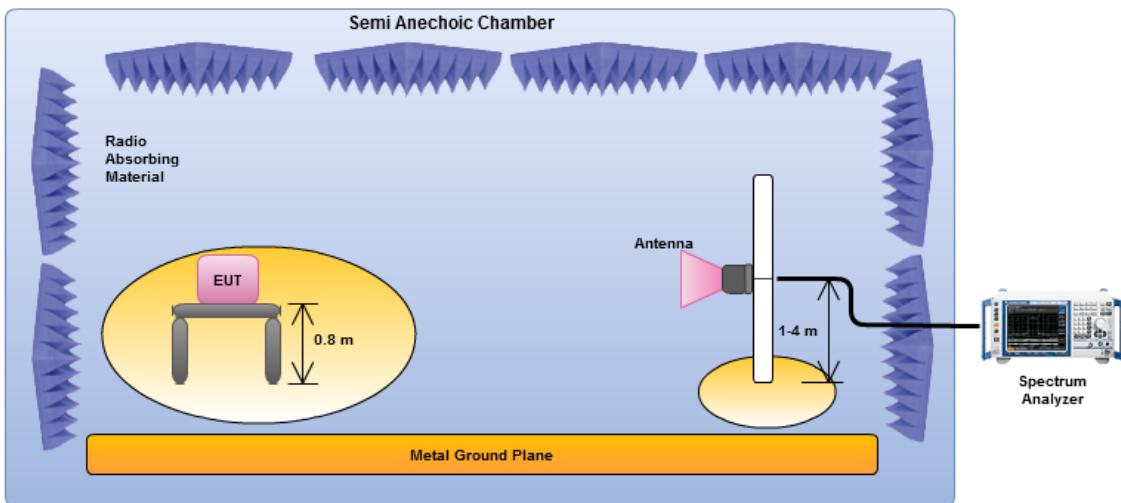


3.6.3 Test Procedures

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 10.1 for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.2 for unwanted emissions into restricted bands.
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.2.3.3 and 8.2.1 Option 1 (spectral trace averaging)
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.2.3.3 and 8.2.1 Option 2 (slow sweep speed).
<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 10.2.3.2 and 8.1.1 measurement procedure peak limit.
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.2.3.1 measurement procedure Quasi-Peak limit.
<input checked="" type="checkbox"/> For radiated measurement, refer as FCC KDB 558074, clause 10.2.1.
<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 10.2.2.
<input checked="" 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 checked="" 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

3.6.4 Test Setup

Transmitter Radiated Unwanted Emissions



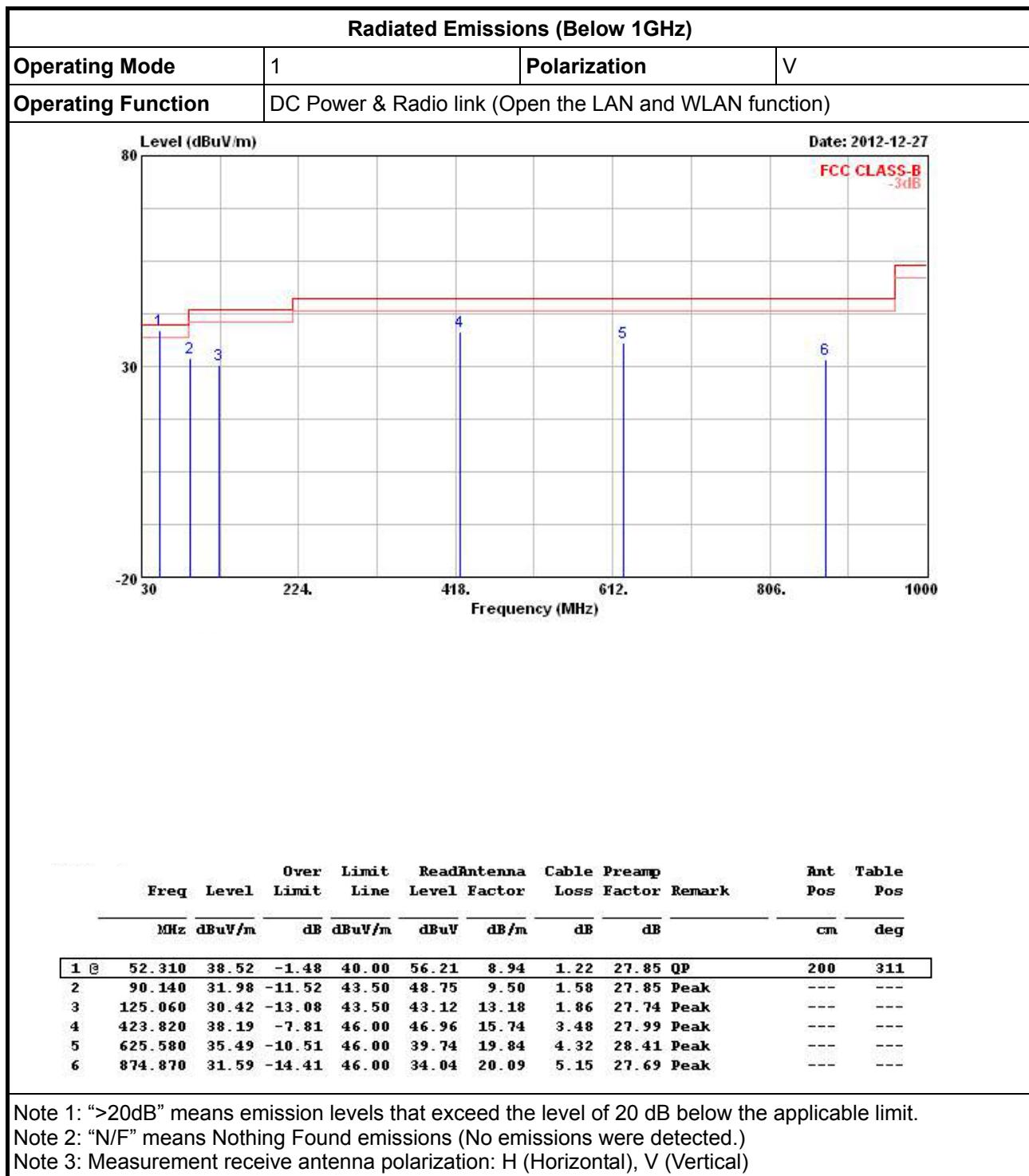
Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna. Electric field tests shall be performed in the frequency range of 30 MHz to 1000 MHz using a calibrated bi-log antenna and the frequency range of 1 GHz to 40 GHz using a calibrated horn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

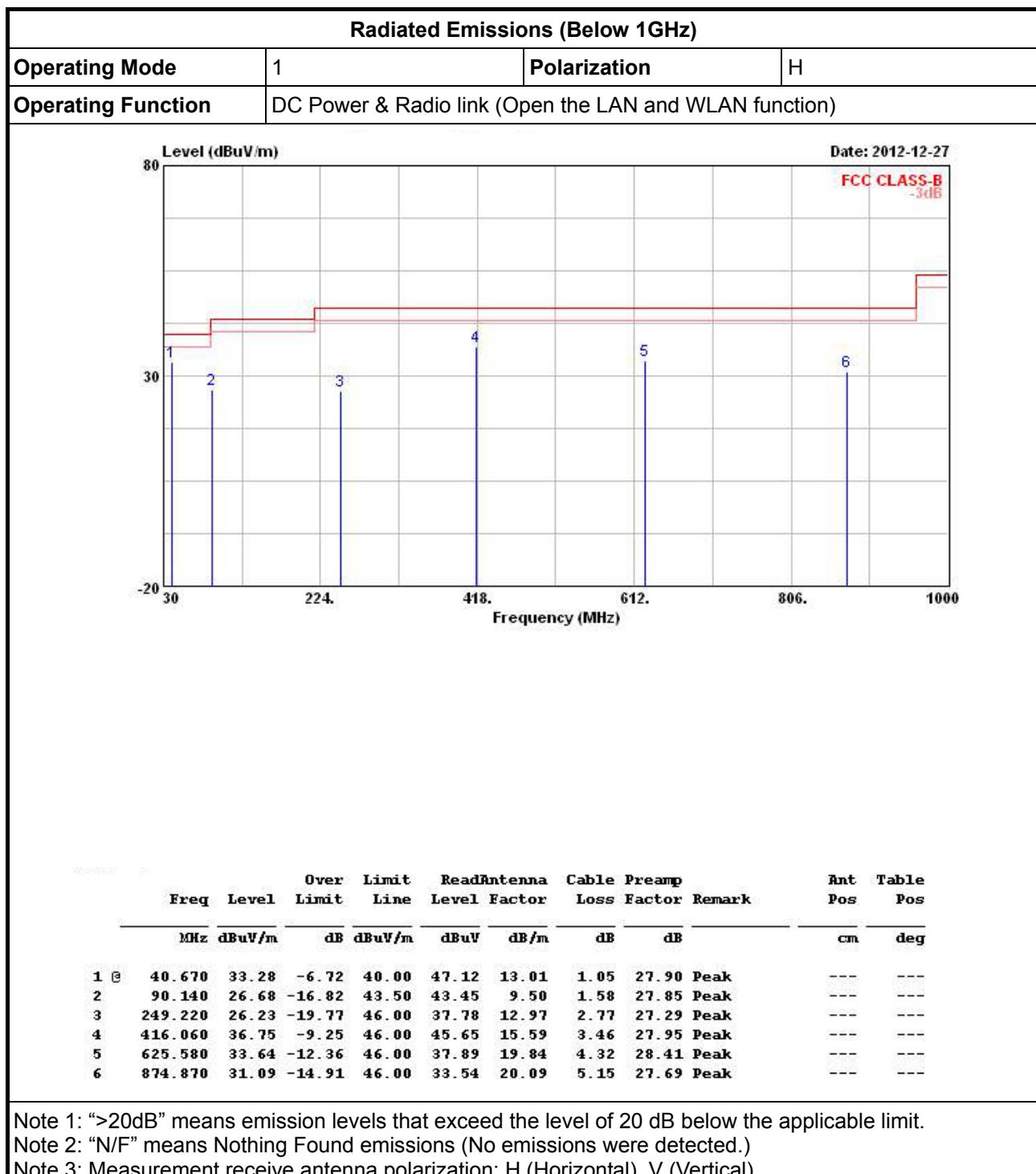
3.6.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

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



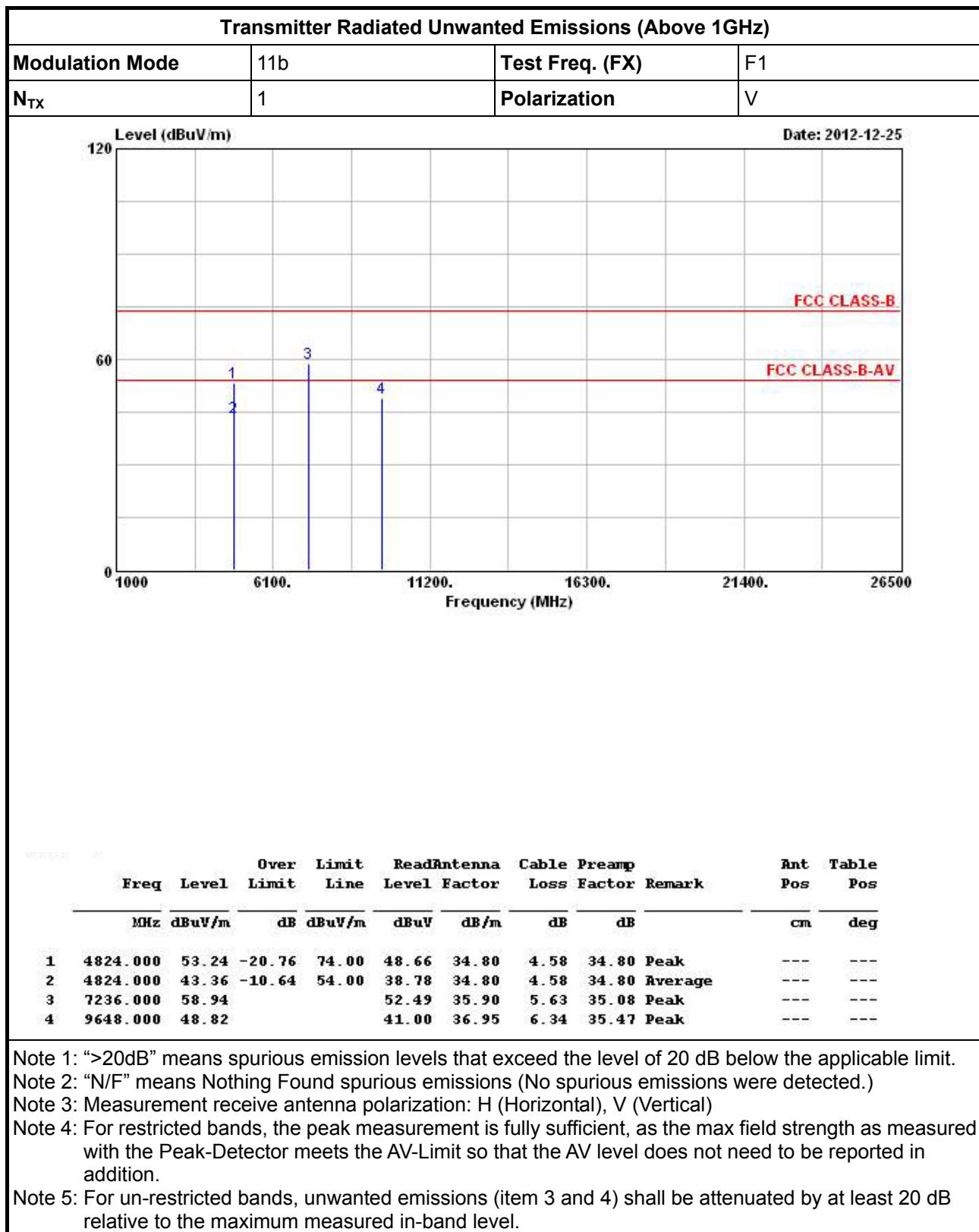
3.6.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)







3.6.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11b



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: 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.

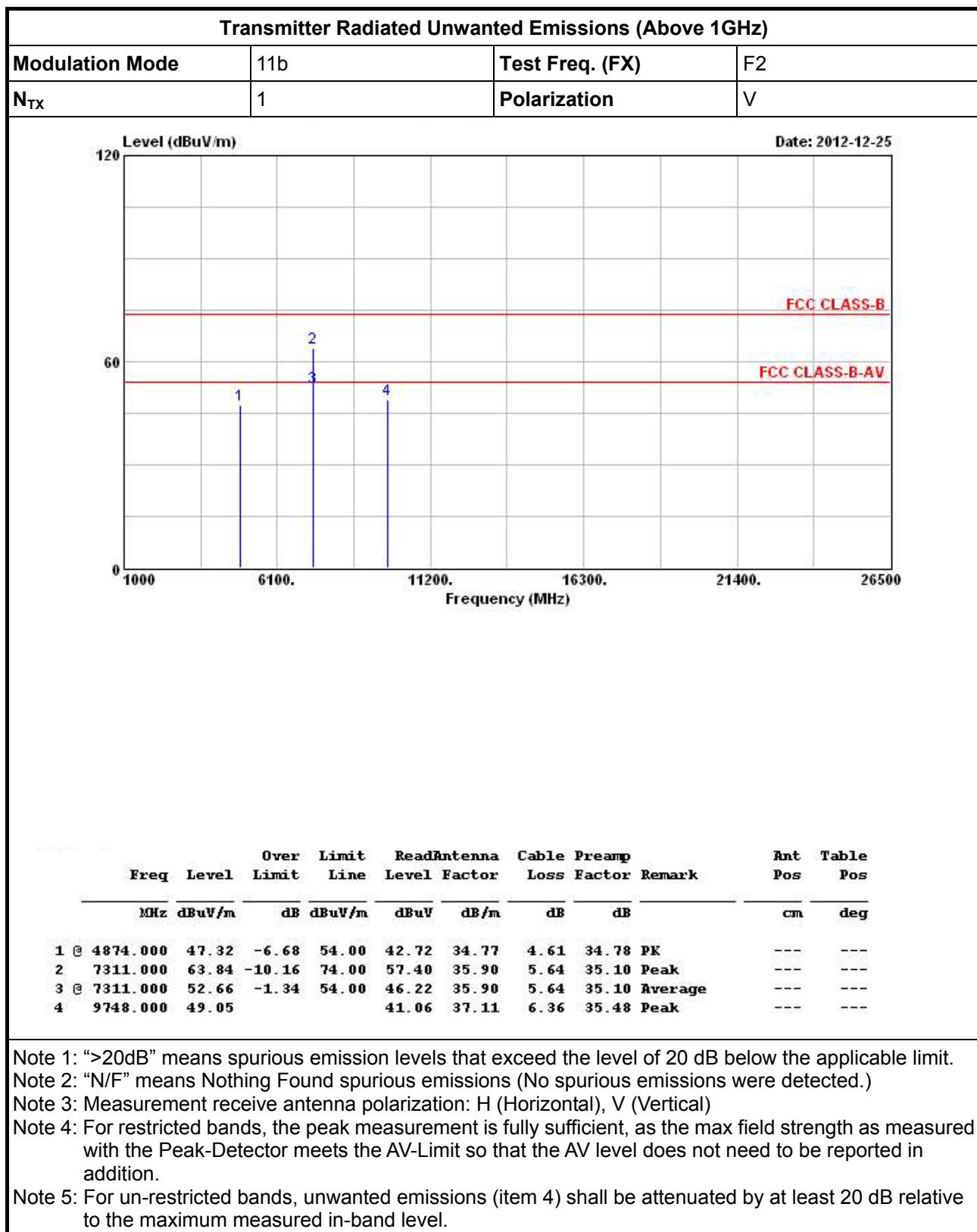
Note 5: For un-restricted bands, unwanted emissions (item 3 and 4) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

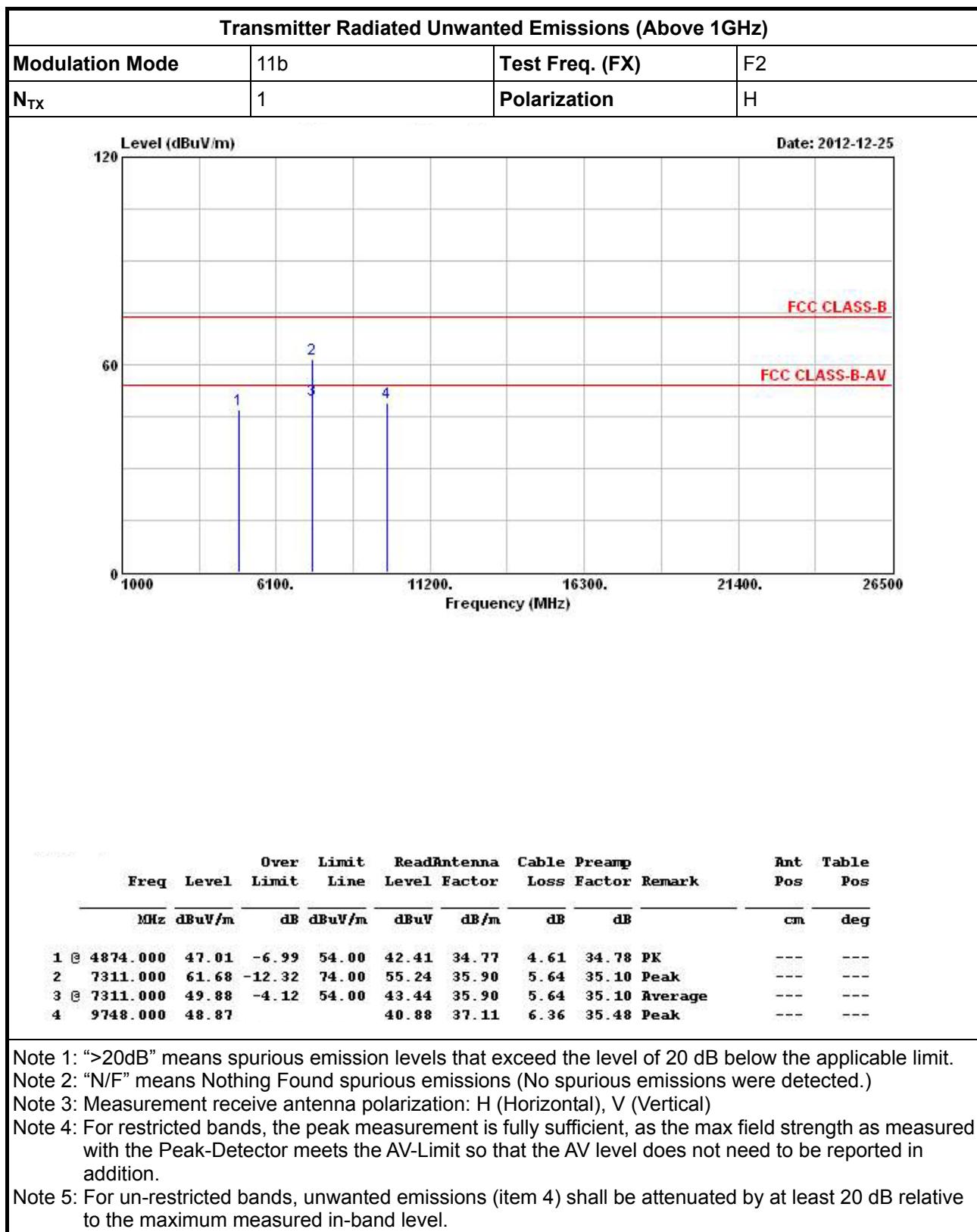


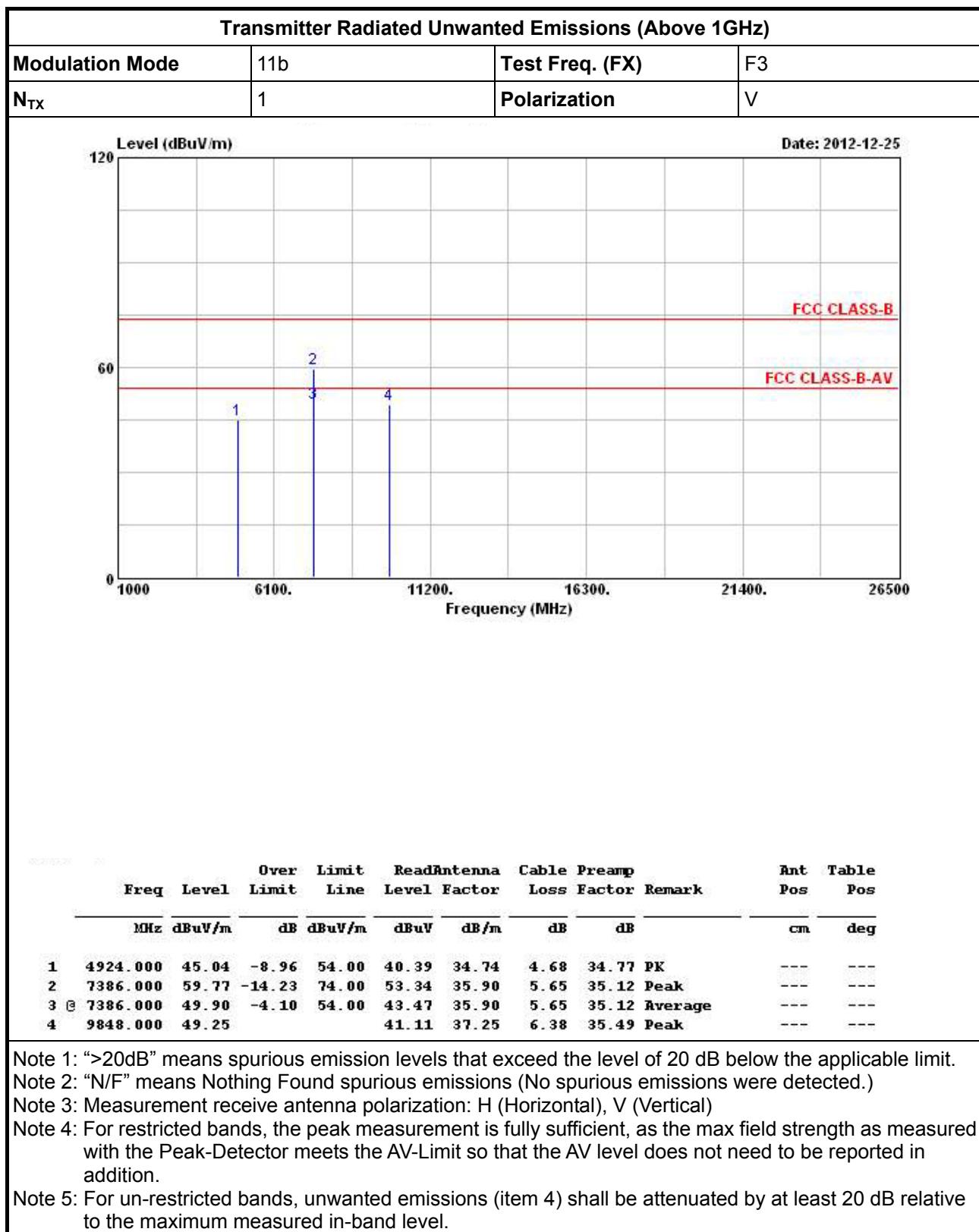
Transmitter Radiated Unwanted Emissions (Above 1GHz)

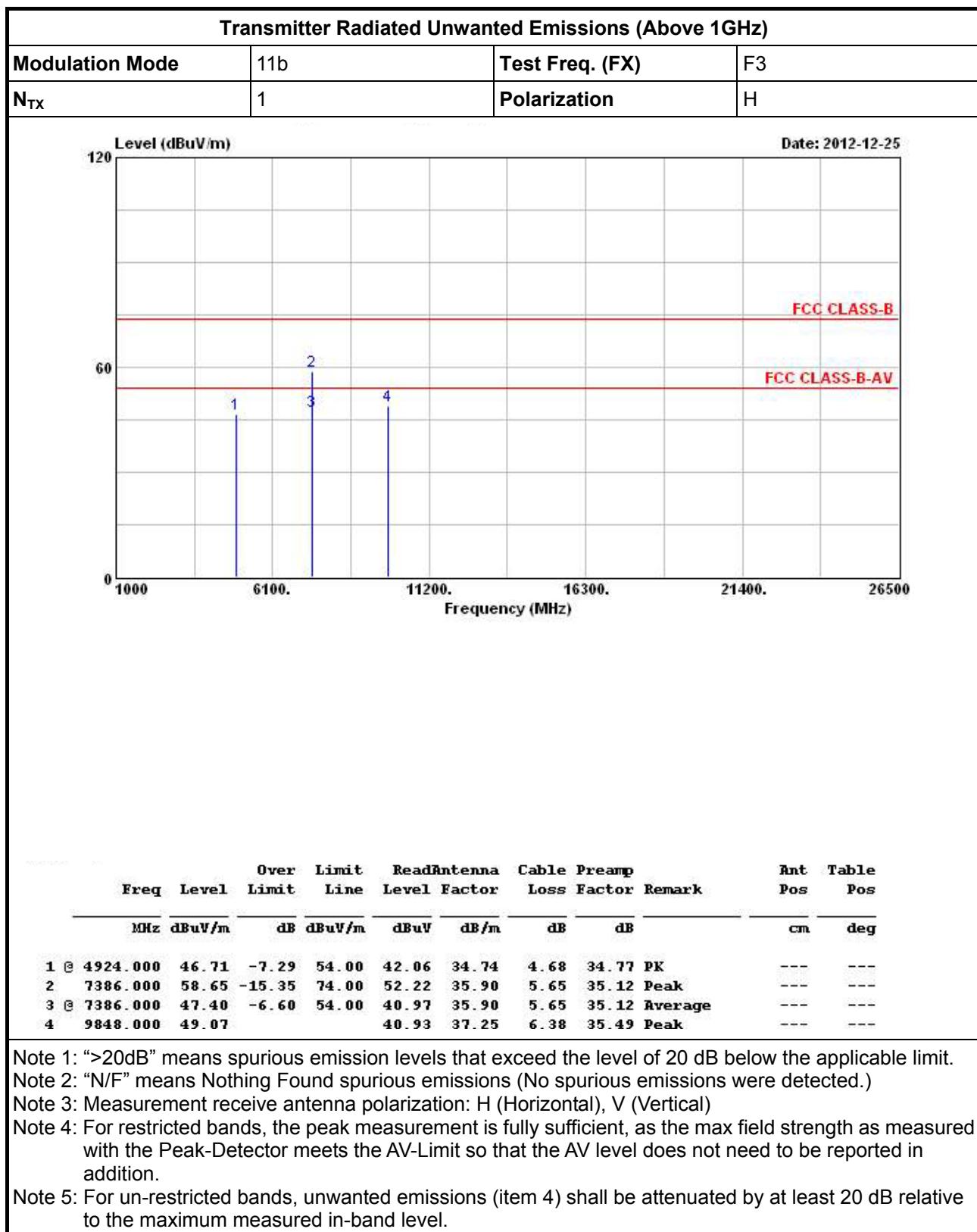
Modulation Mode	11b	Test Freq. (FX)	F1																																																							
N _{TX}	1	Polarization	H																																																							
Level (dBuV/m)			Date: 2012-12-25																																																							
<table border="1"> <thead> <tr> <th rowspan="2">Freq</th> <th rowspan="2">Level</th> <th>Over</th> <th>Limit</th> <th>Read</th> <th>Antenna</th> <th>Cable</th> <th>Preamp</th> <th rowspan="2">Ant Pos</th> <th rowspan="2">Table Pos</th> </tr> <tr> <th>Line</th> <th>Line</th> <th>Antenna</th> <th>Cable</th> <th>Preamp</th> </tr> </thead> <tbody> <tr> <td>MHz</td> <td>dBuV/m</td> <td>dB</td> <td>dBuV/m</td> <td>dBuV</td> <td>dB/m</td> <td>dB</td> <td>dB</td> <td>cm</td> <td>deg</td> </tr> <tr> <td>1 4824.000</td> <td>47.28</td> <td>-6.72</td> <td>54.00</td> <td>42.70</td> <td>34.80</td> <td>4.58</td> <td>34.80 PK</td> <td>---</td> <td>---</td> </tr> <tr> <td>2 7236.000</td> <td>57.57</td> <td></td> <td></td> <td>51.12</td> <td>35.90</td> <td>5.63</td> <td>35.08 Peak</td> <td>---</td> <td>---</td> </tr> <tr> <td>3 9648.000</td> <td>48.92</td> <td></td> <td></td> <td>41.10</td> <td>36.95</td> <td>6.34</td> <td>35.47 Peak</td> <td>---</td> <td>---</td> </tr> </tbody> </table>			Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant Pos	Table Pos	Line	Line	Antenna	Cable	Preamp	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	1 4824.000	47.28	-6.72	54.00	42.70	34.80	4.58	34.80 PK	---	---	2 7236.000	57.57			51.12	35.90	5.63	35.08 Peak	---	---	3 9648.000	48.92			41.10	36.95	6.34	35.47 Peak	---	---	
Freq	Level	Over			Limit	Read	Antenna	Cable	Preamp	Ant Pos			Table Pos																																													
		Line	Line	Antenna	Cable	Preamp																																																				
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg																																																	
1 4824.000	47.28	-6.72	54.00	42.70	34.80	4.58	34.80 PK	---	---																																																	
2 7236.000	57.57			51.12	35.90	5.63	35.08 Peak	---	---																																																	
3 9648.000	48.92			41.10	36.95	6.34	35.47 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: 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 5: For un-restricted bands, unwanted emissions (item 2 and 3) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.



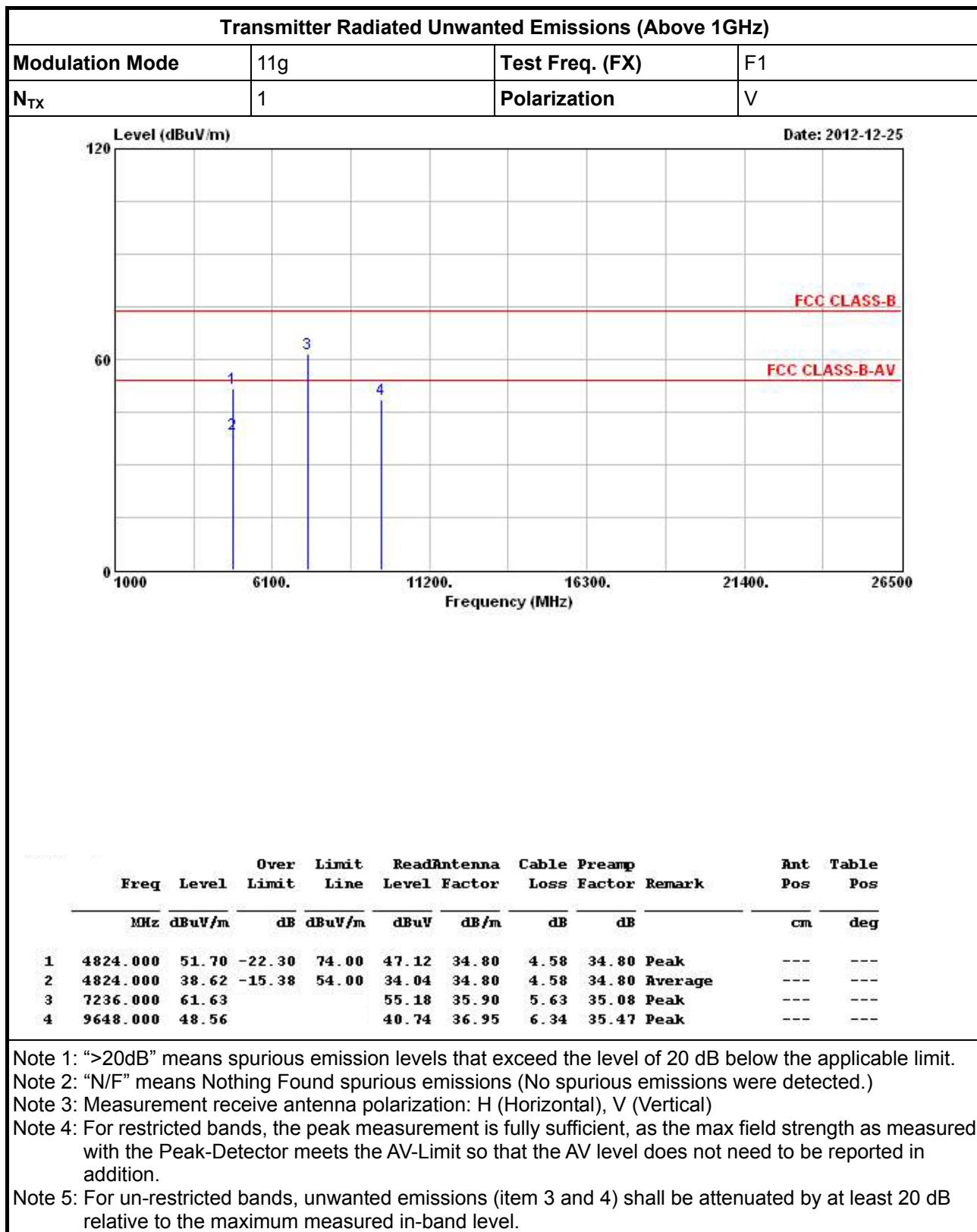








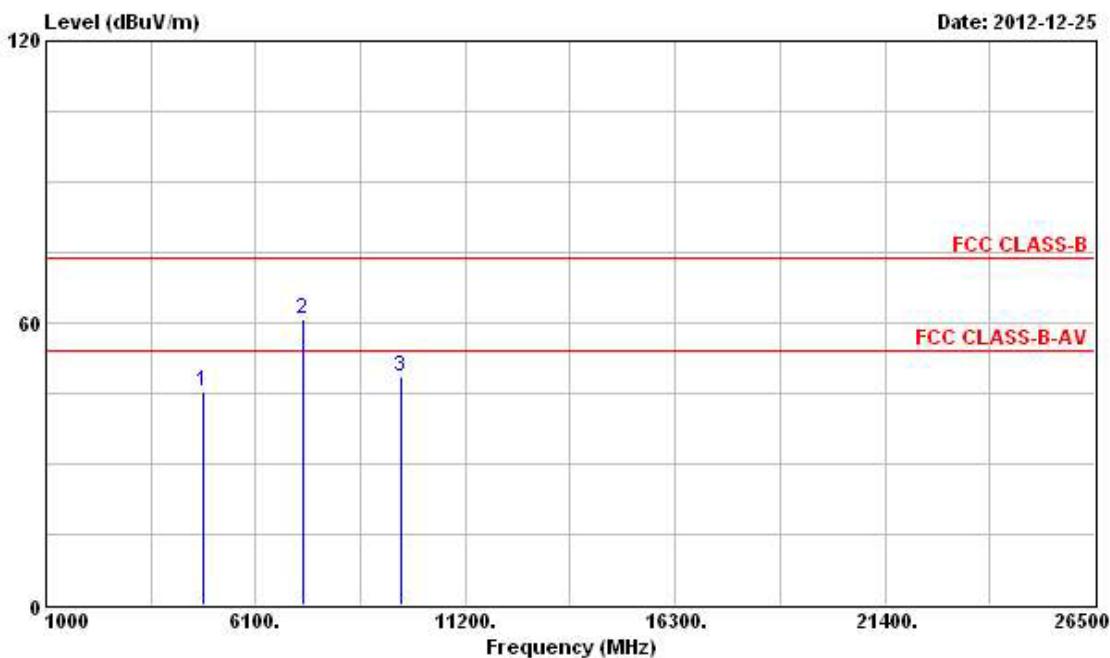
3.6.8 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11g





Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11g	Test Freq. (FX)	F1
N _{TX}	1	Polarization	H



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant Pos	Table Pos
		MHz	dBuV/m	dB	Line	Level	Factor		
1	4824.000	45.21	-8.79	54.00	40.63	34.80	4.58	34.80 PK	---
2	7236.000	60.76			54.31	35.90	5.63	35.08 Peak	---
3	9648.000	48.41			40.59	36.95	6.34	35.47 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)

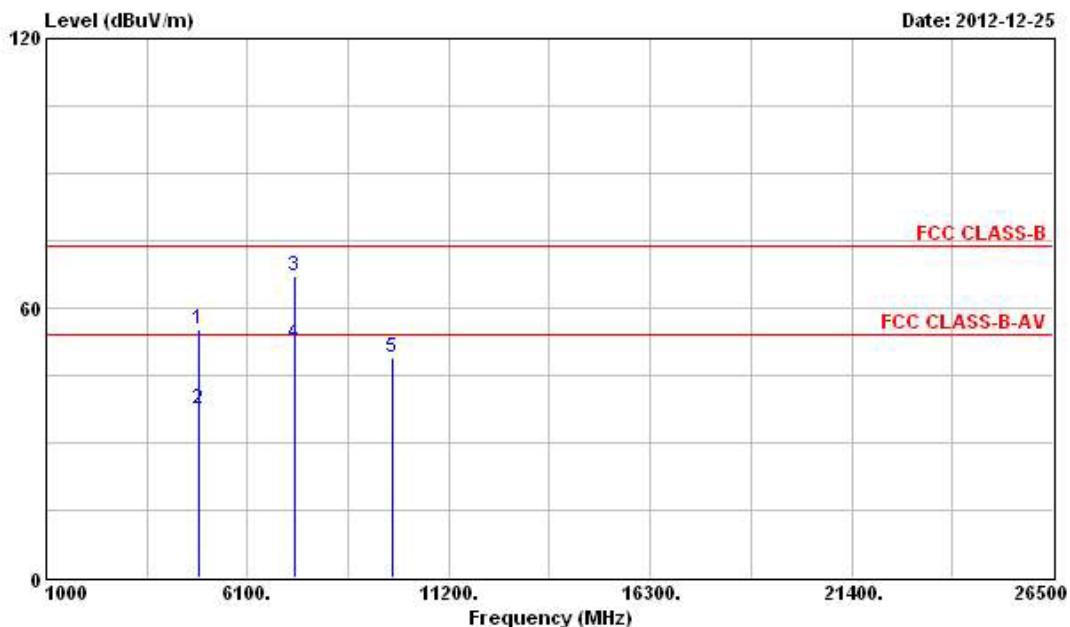
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands, unwanted emissions (item 3 and 4) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11g	Test Freq. (FX)	F2
N_{TX}	1	Polarization	V



Freq	Level	Over Limit		ReadAntenna		Cable Preamp		Ant Pos	Table Pos
		Limit	Line	Level	Factor	Loss	Factor		
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1 4874.000	55.20	-18.80	74.00	50.60	34.77	4.61	34.78	Peak	---
2 4874.000	37.48	-16.52	54.00	32.88	34.77	4.61	34.78	Average	---
3 @ 7311.000	67.21	-6.79	74.00	60.77	35.90	5.64	35.10	Peak	---
4 @ 7311.000	52.28	-1.72	54.00	45.84	35.90	5.64	35.10	Average	---
5 9748.000	48.95			40.96	37.11	6.36	35.48	Peak	---

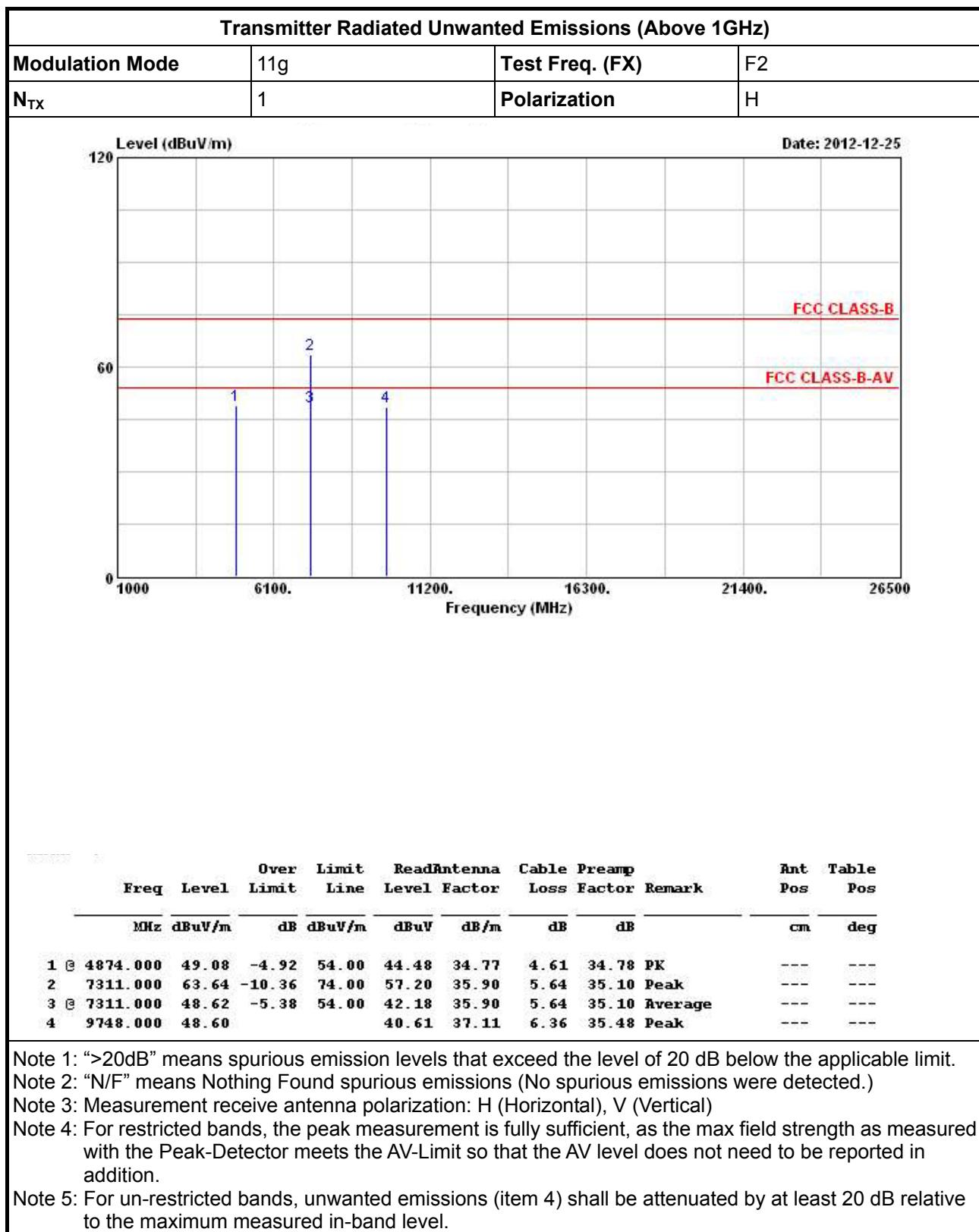
Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.

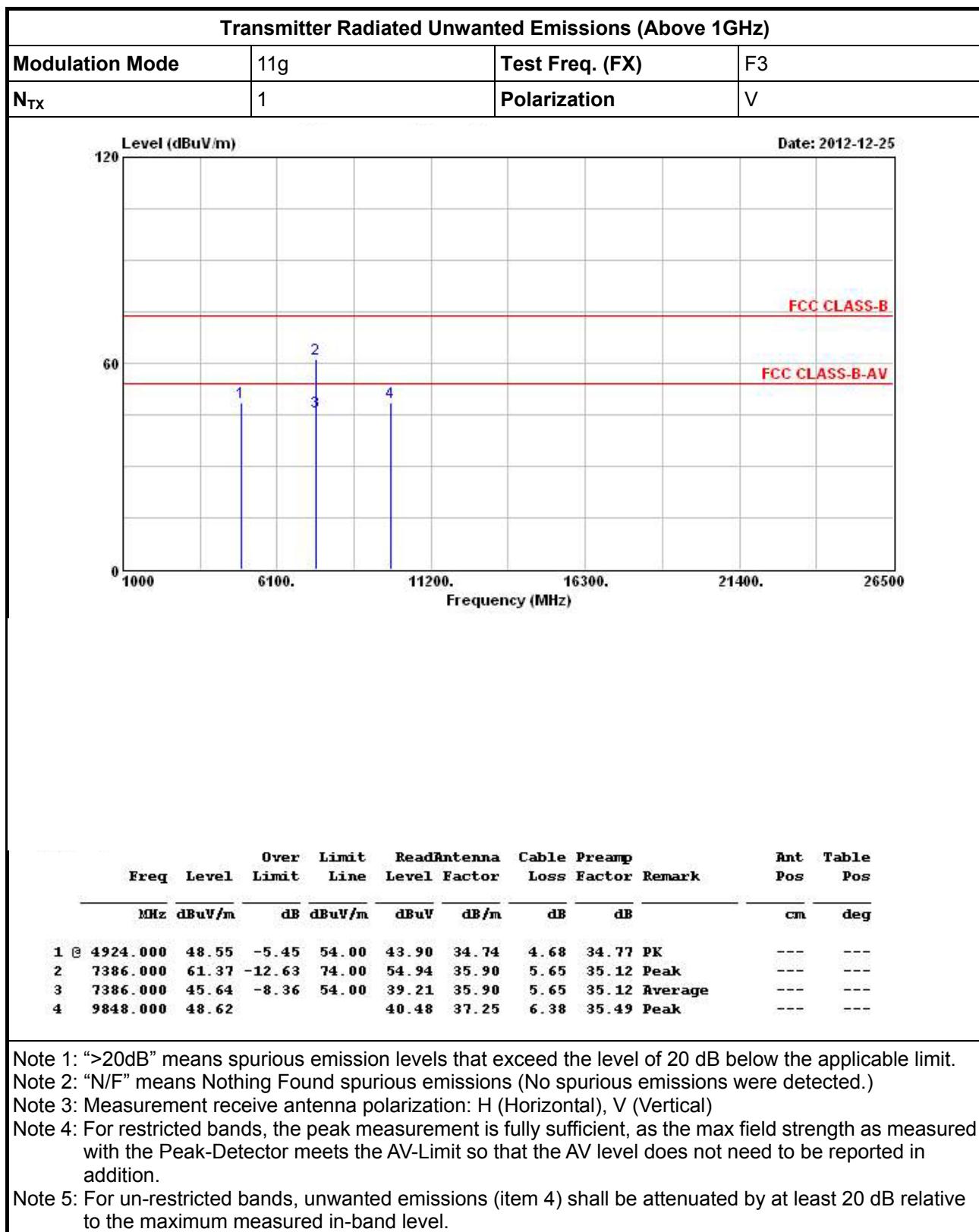
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

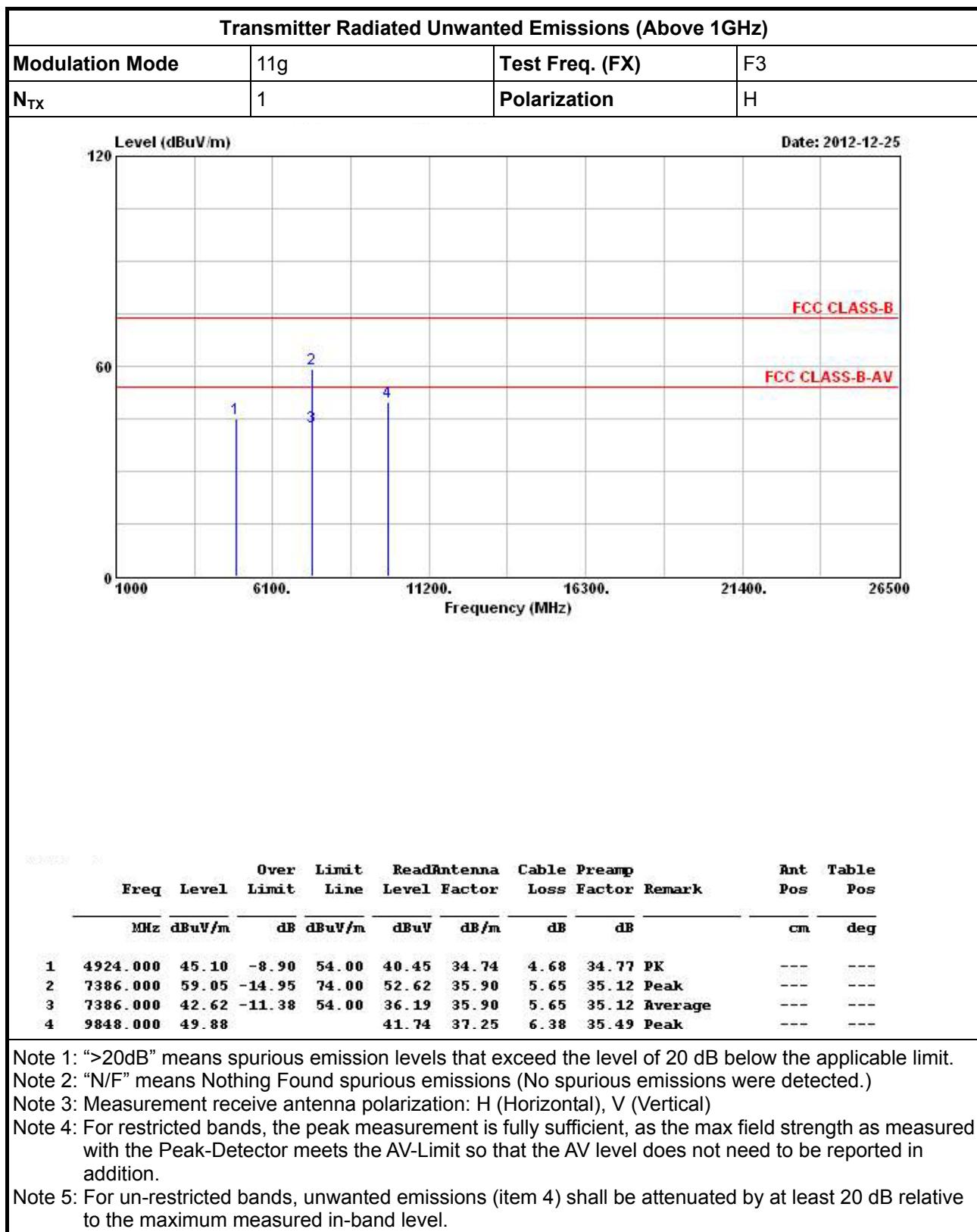
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Note 4: 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 5: For un-restricted bands, unwanted emissions (item 5) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

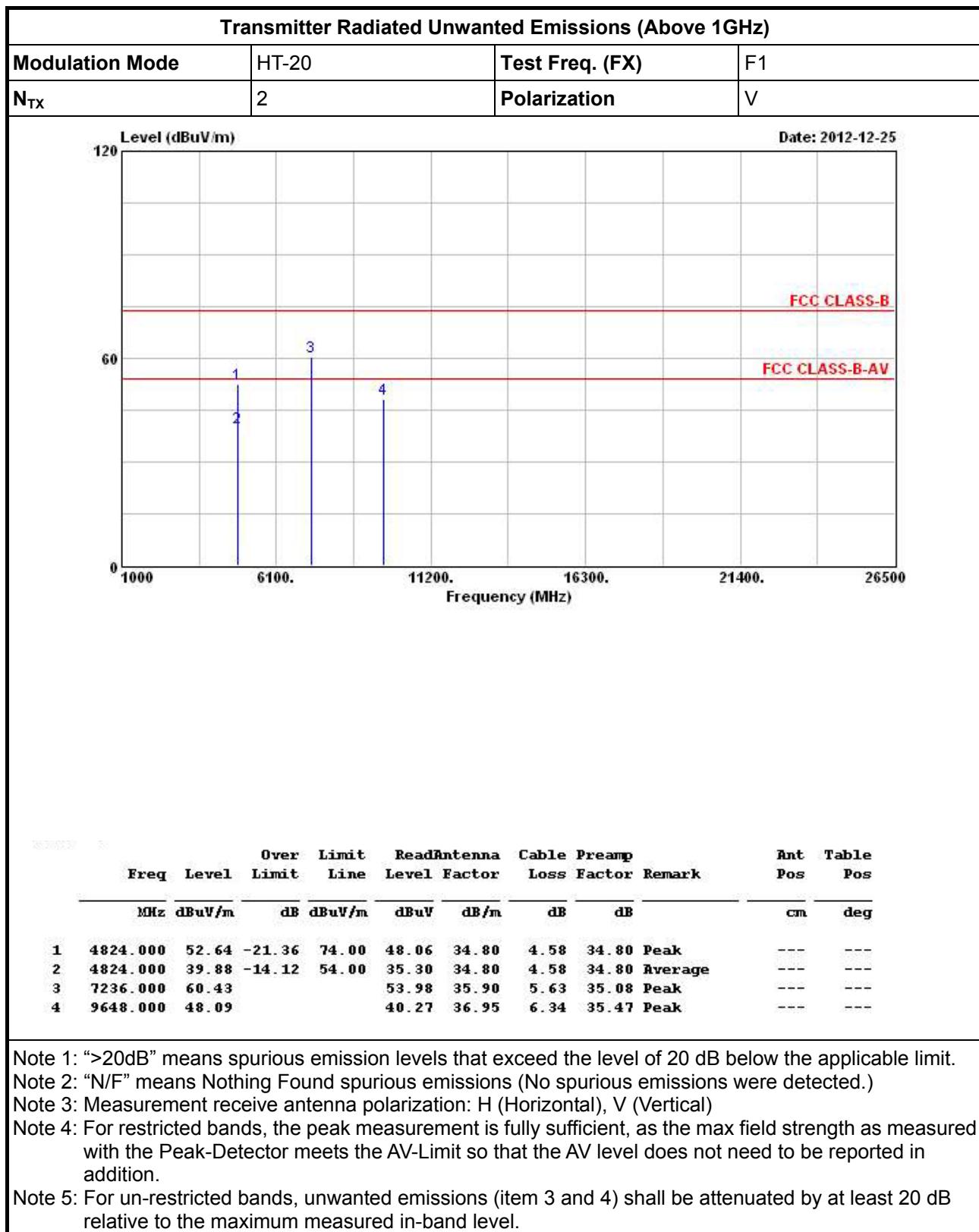


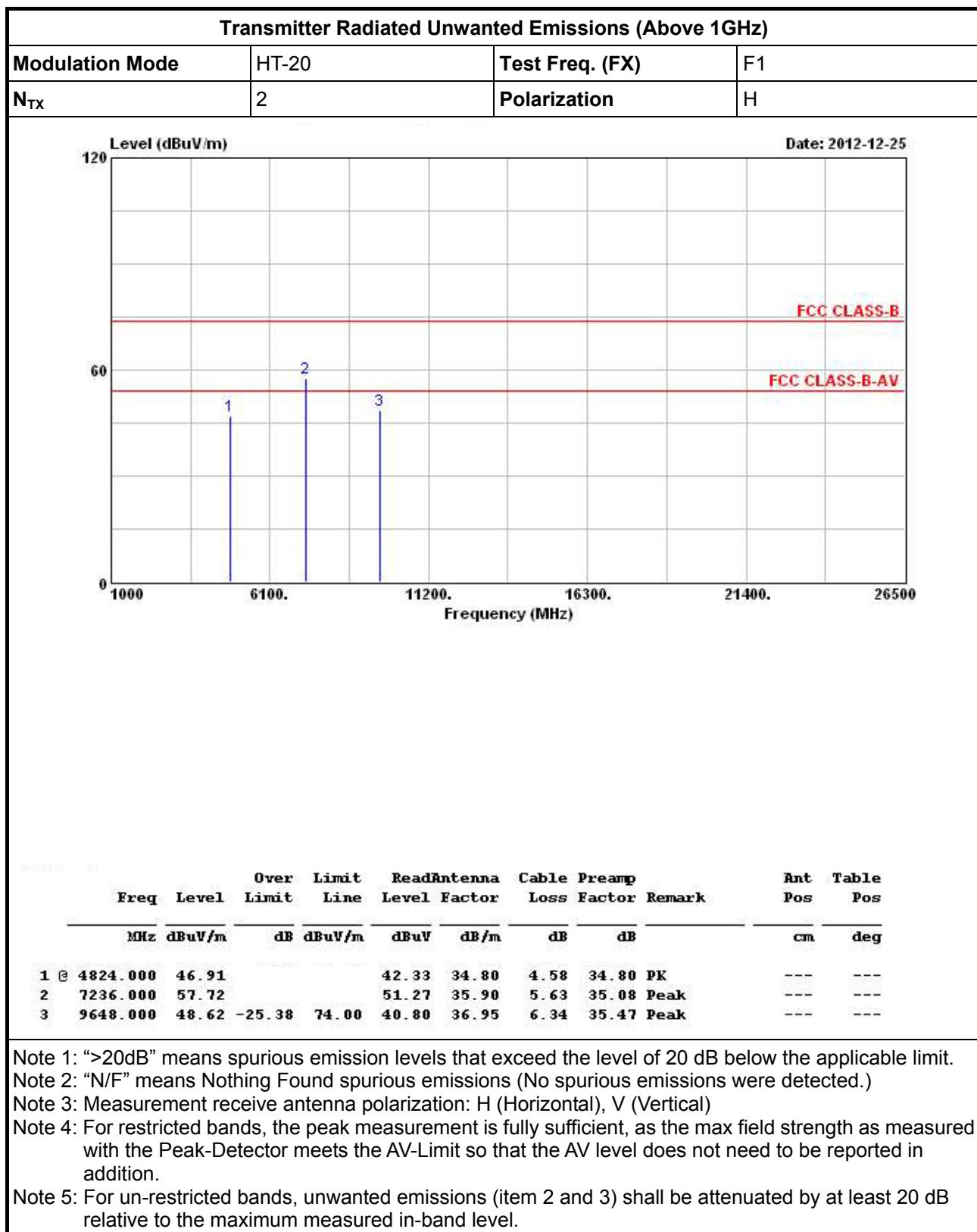


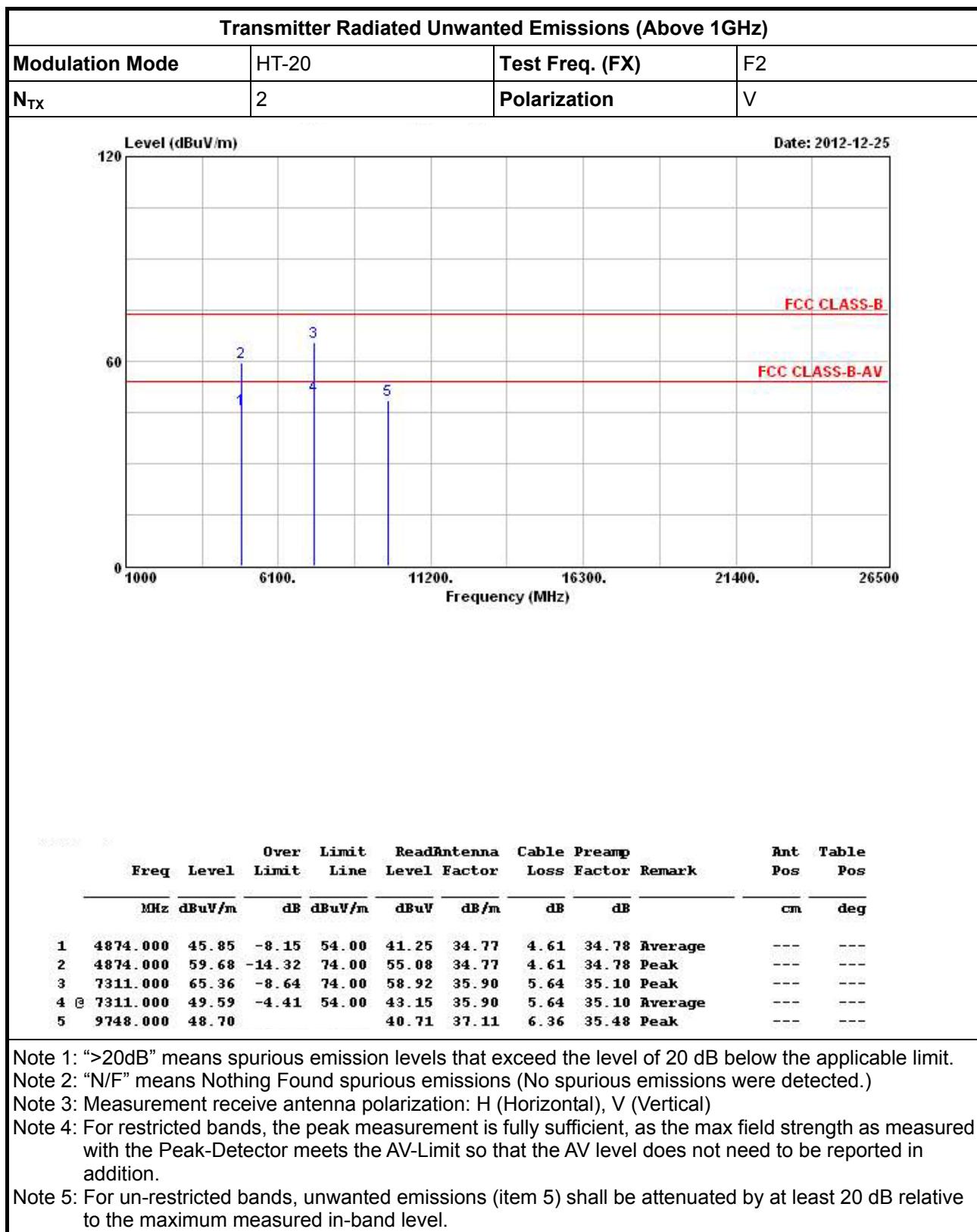


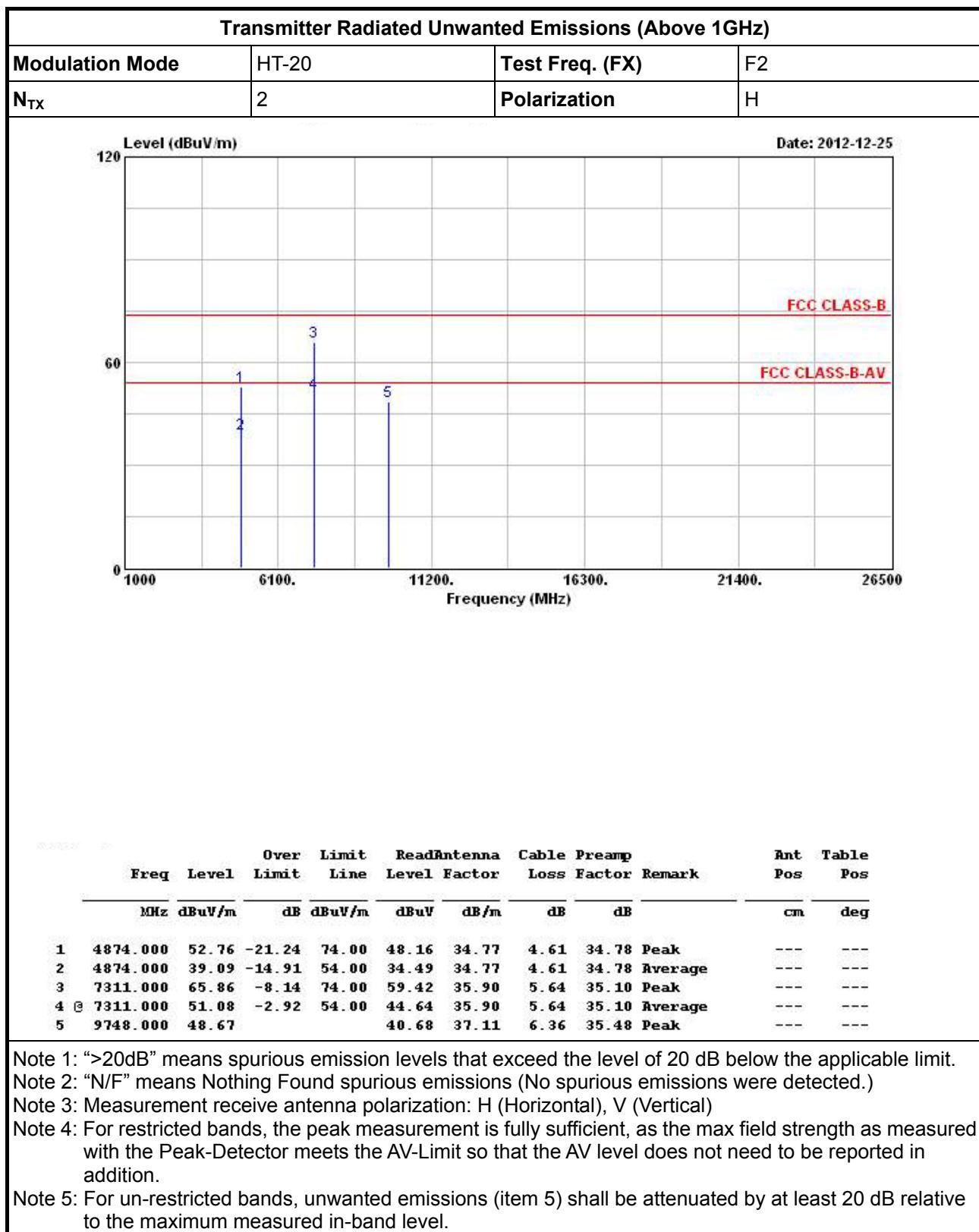


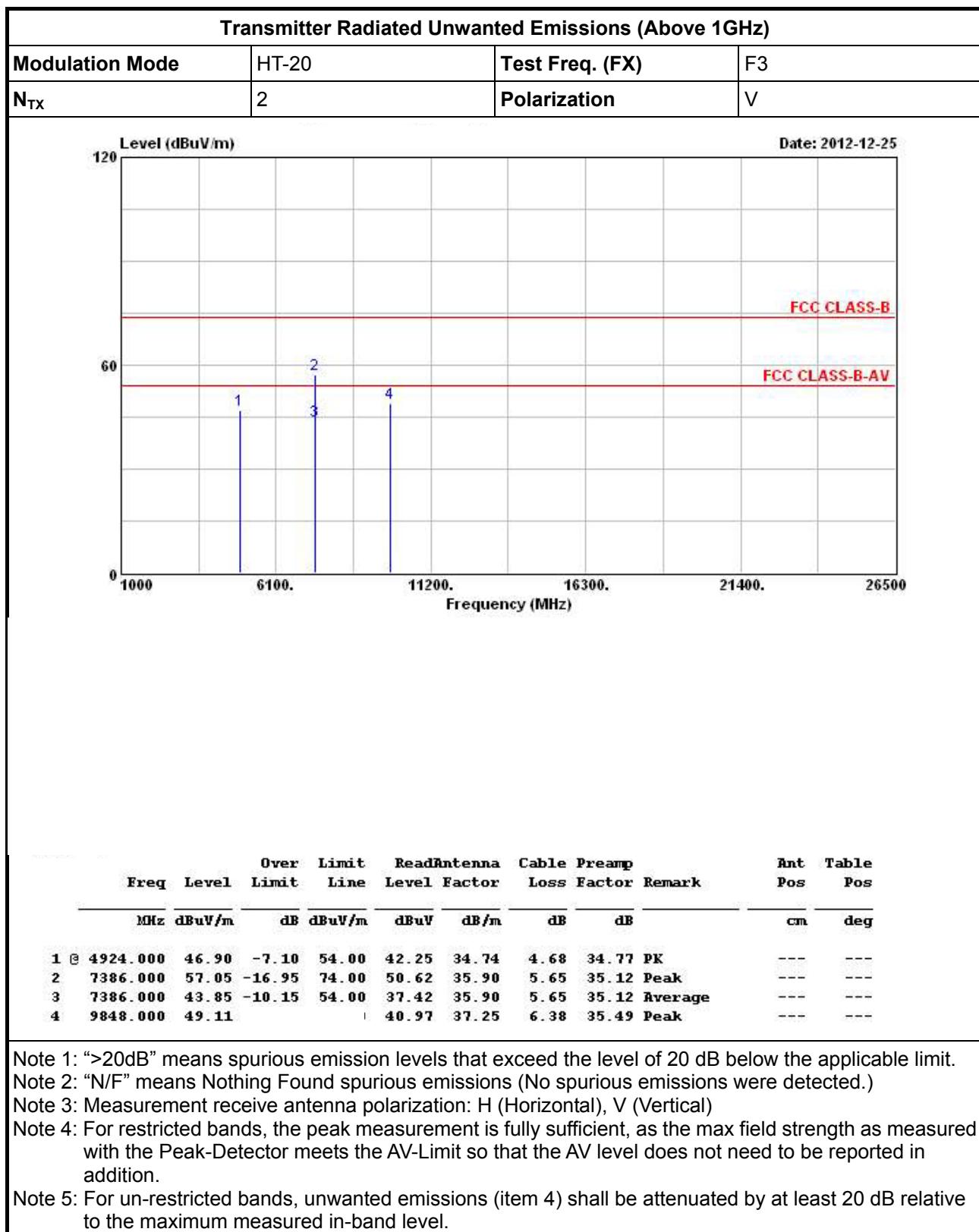
3.6.9 Transmitter Radiated Unwanted Emissions (Above 1GHz) for HT-20







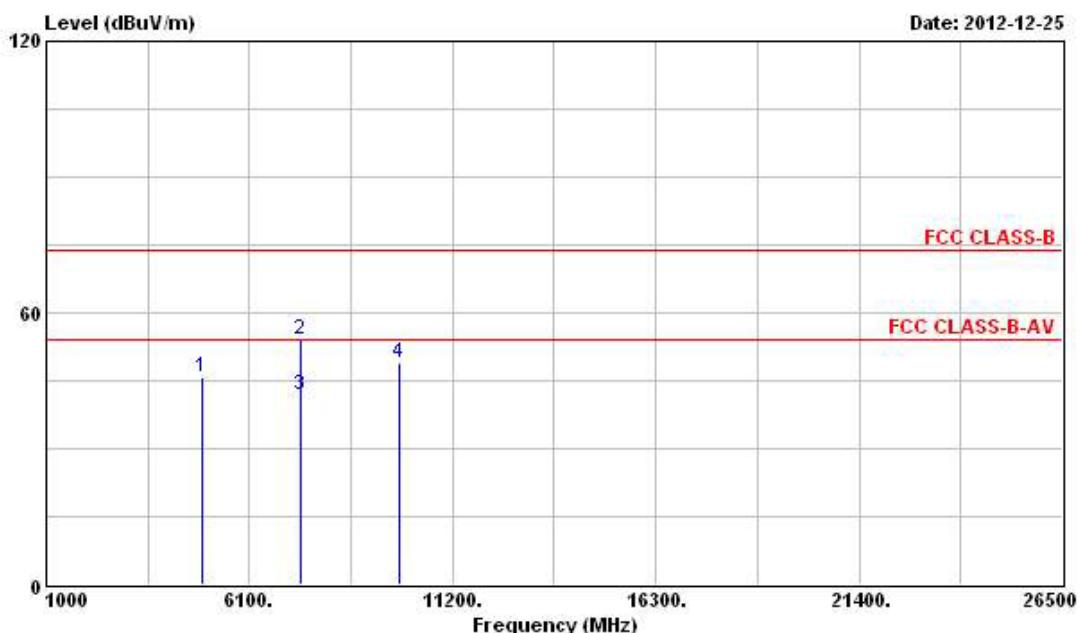






Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	HT-20	Test Freq. (FX)	F3
N _{TX}	2	Polarization	H



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant Pos	Table Pos
		MHz	dB	Line	Level	Factor	Loss		
1	4924.000	45.83	-8.17	54.00	41.18	34.74	4.68	34.77 PK	---
2	7386.000	53.92	-20.08	74.00	47.49	35.90	5.65	35.12 Peak	---
3	7386.000	41.68	-12.32	54.00	35.25	35.90	5.65	35.12 Average	---
4	9848.000	49.03			40.89	37.25	6.38	35.49 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.)

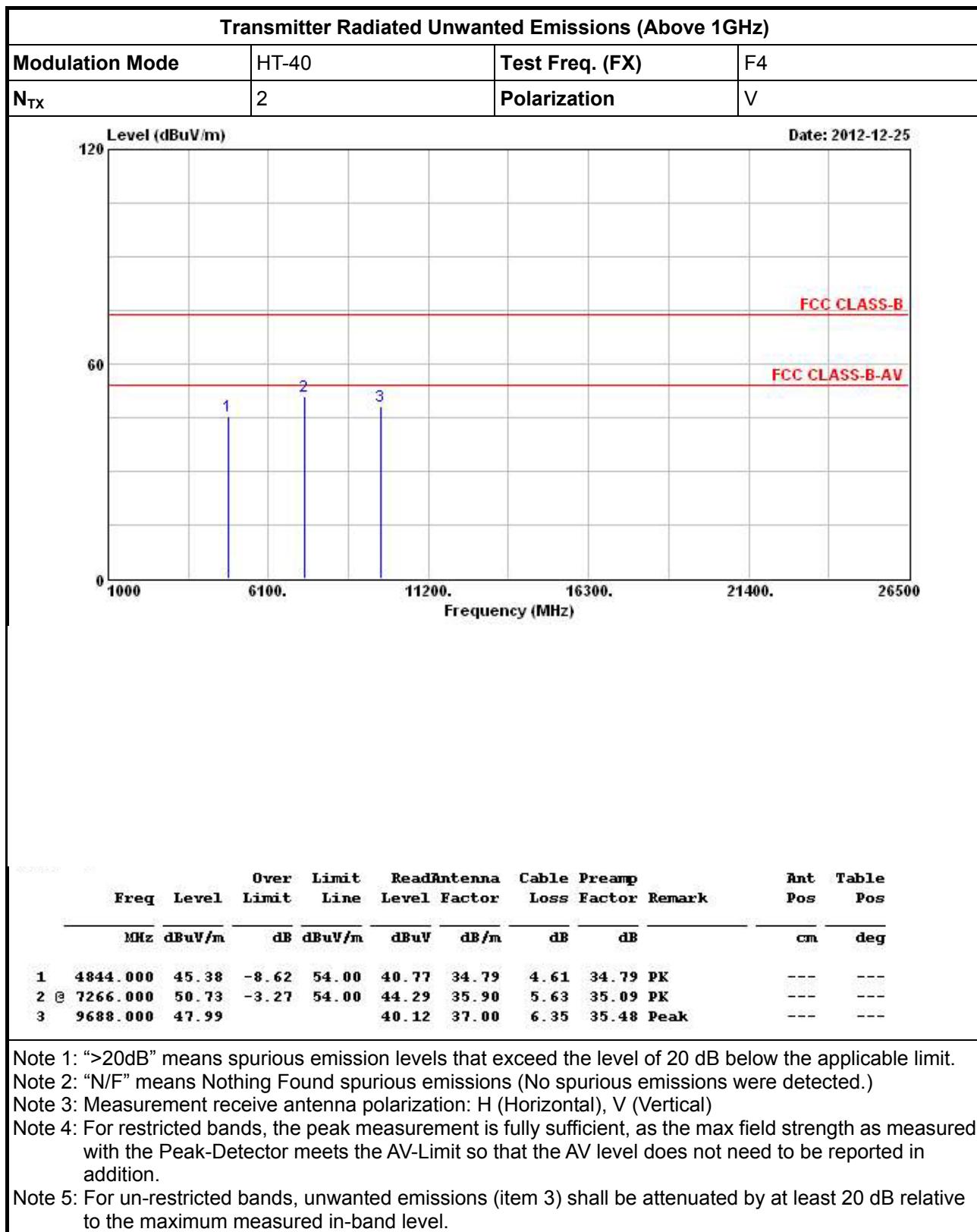
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

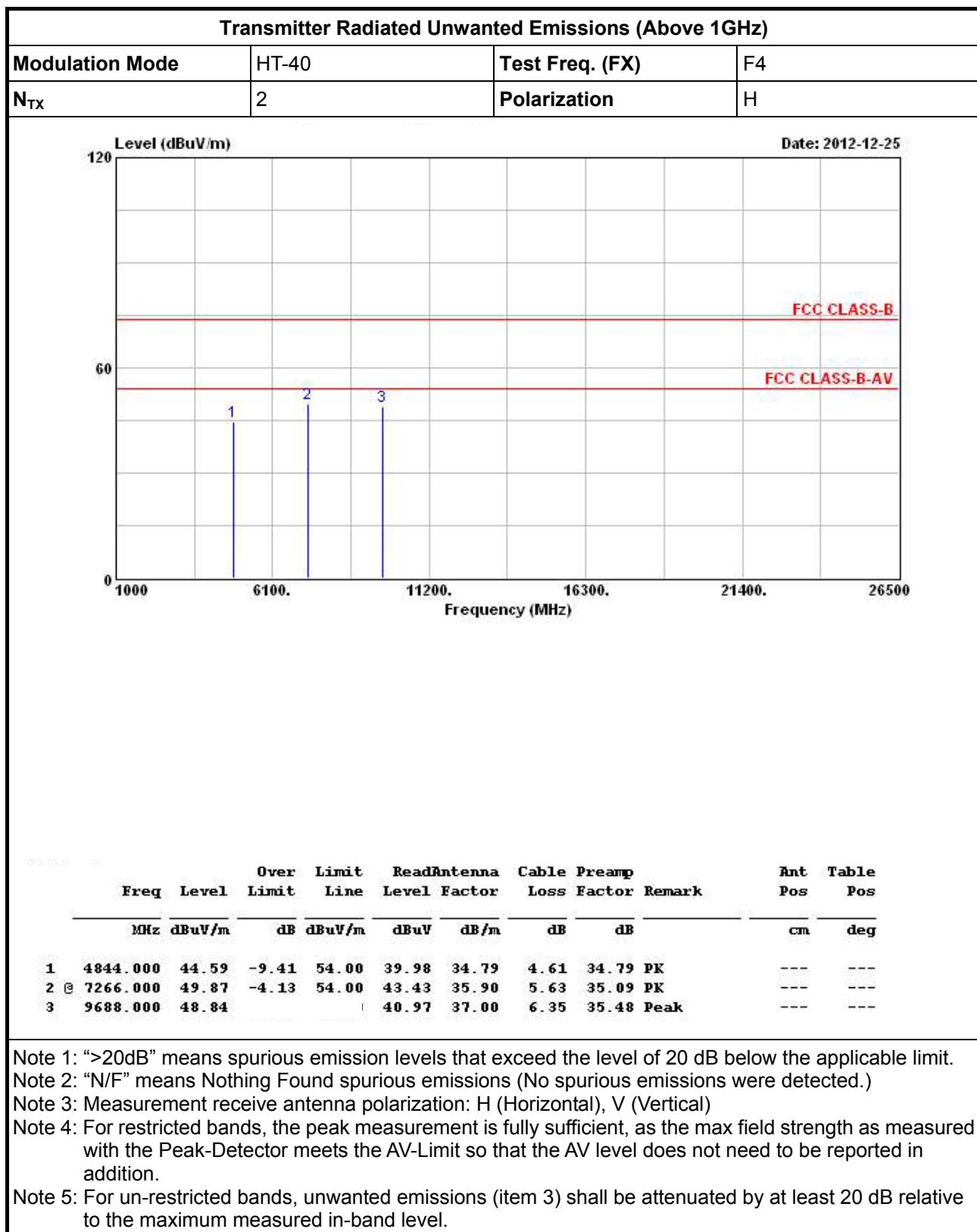
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

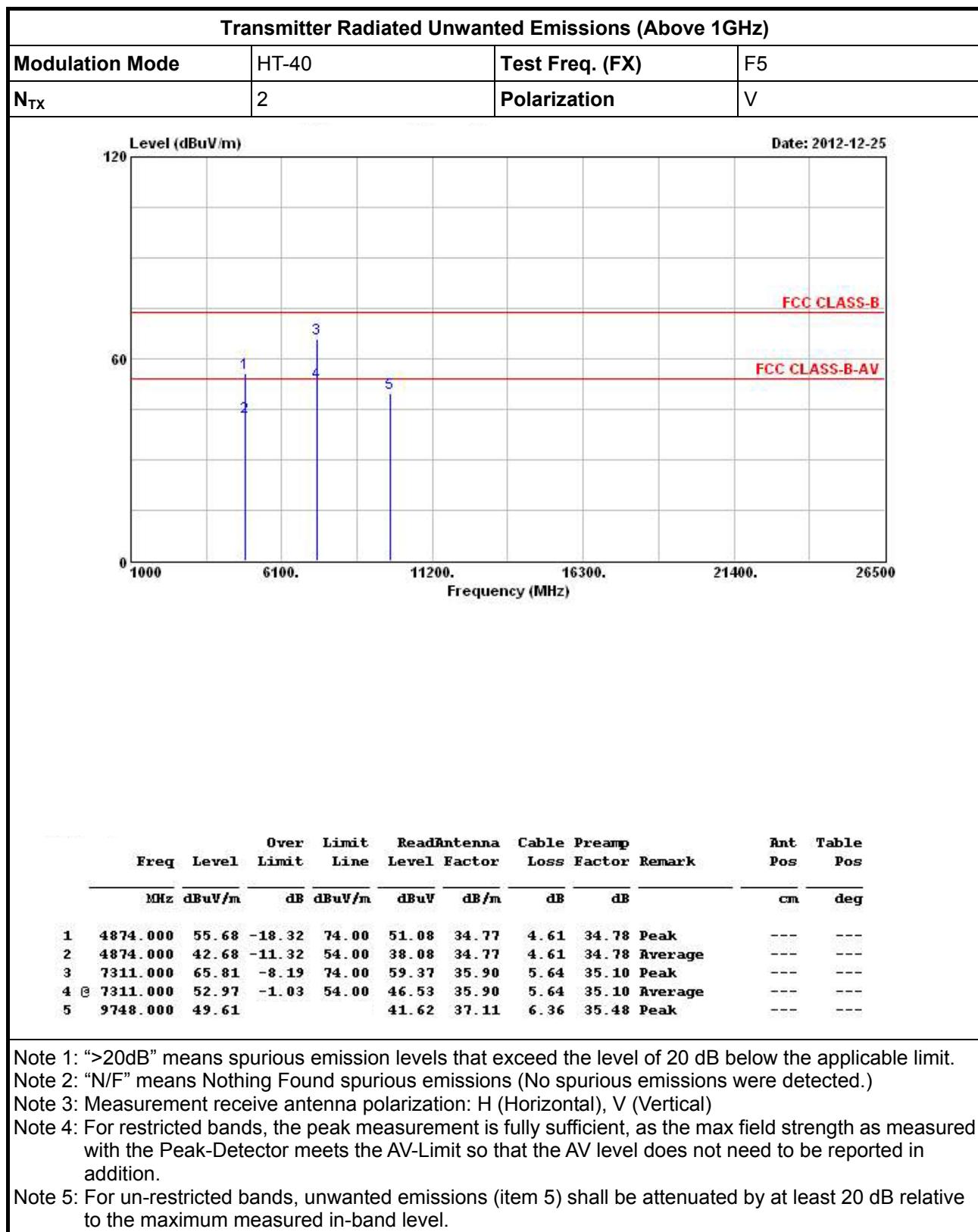
Note 5: For un-restricted bands, unwanted emissions (item 4) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

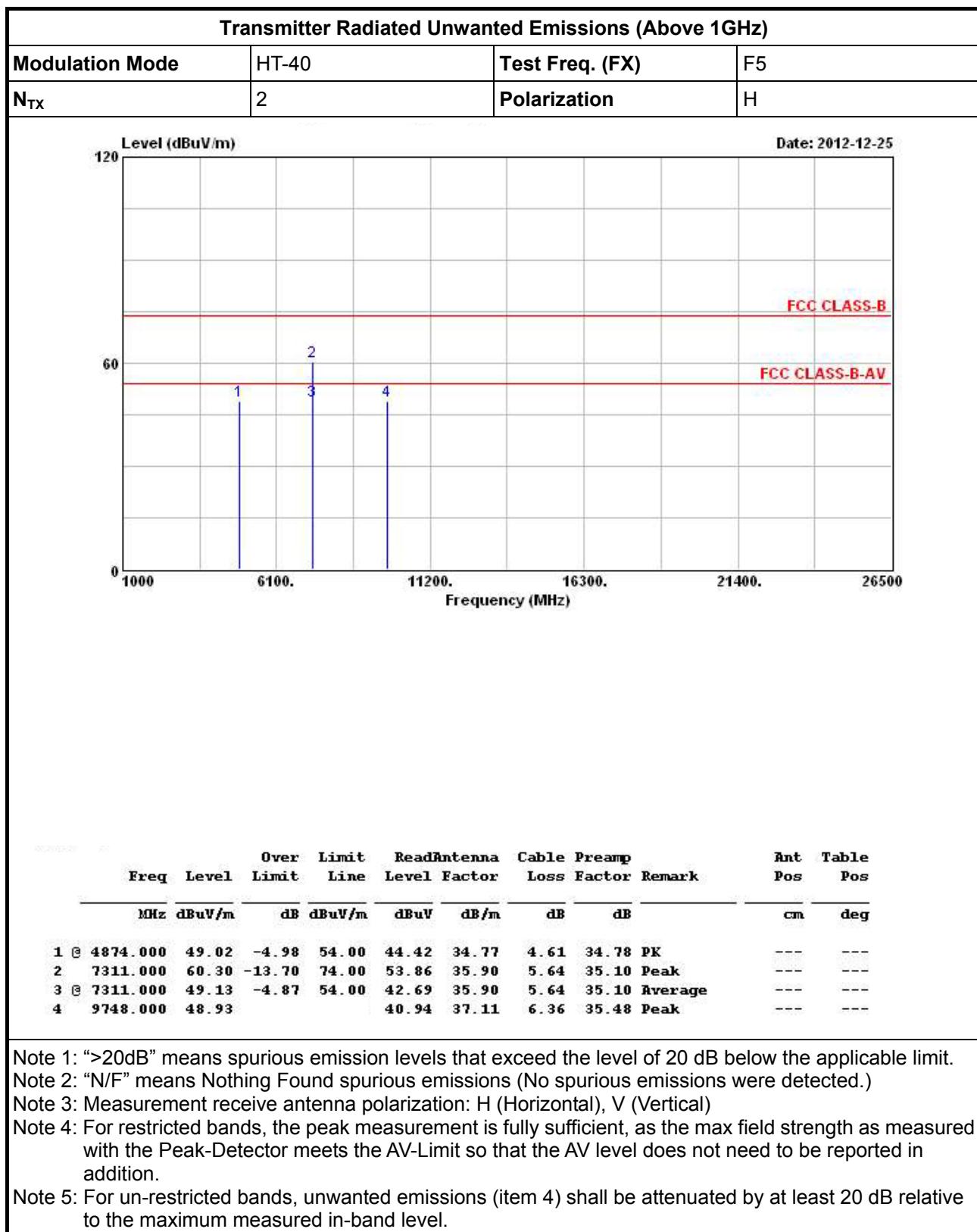


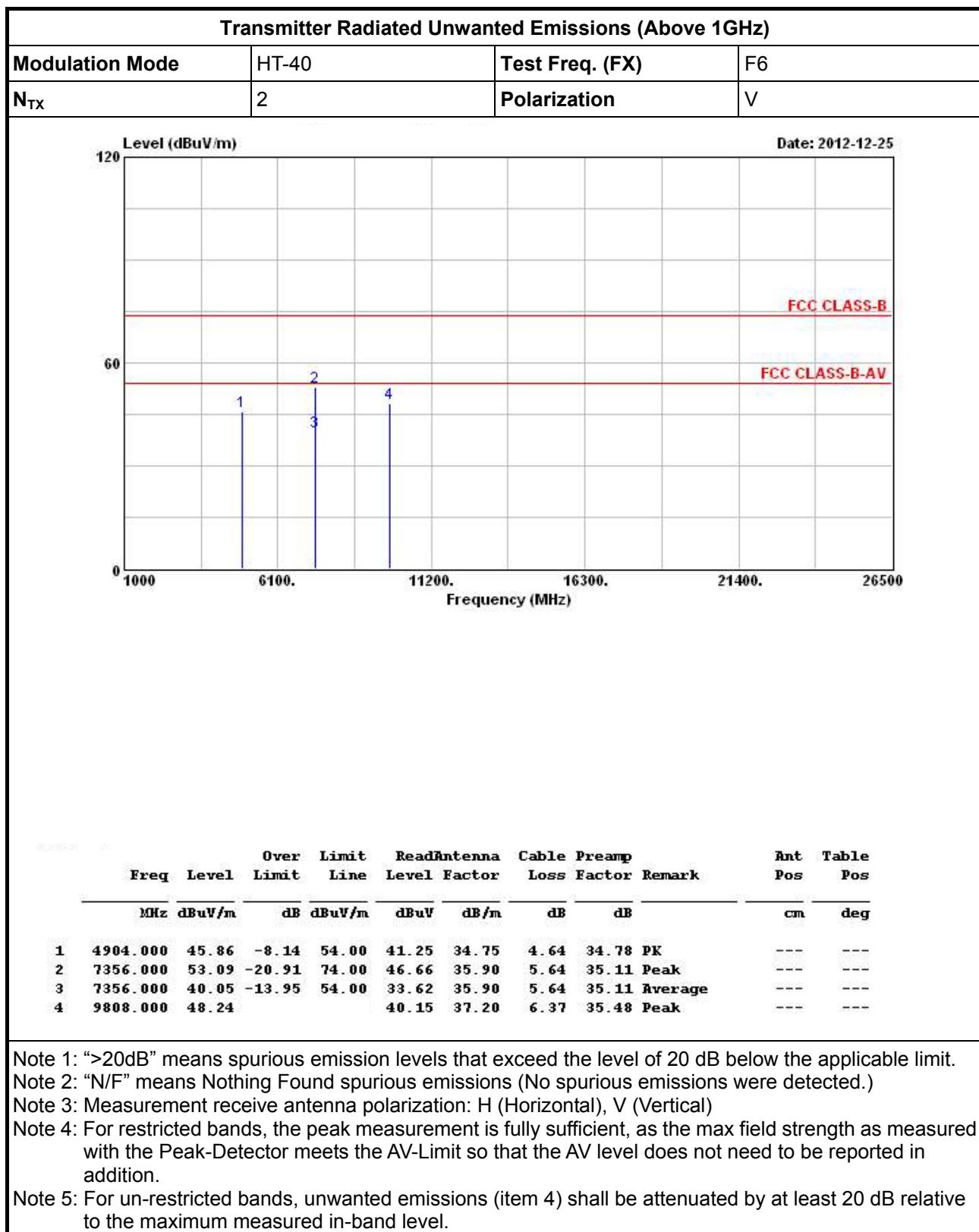
3.6.10 Transmitter Radiated Unwanted Emissions (Above 1GHz) for HT-40







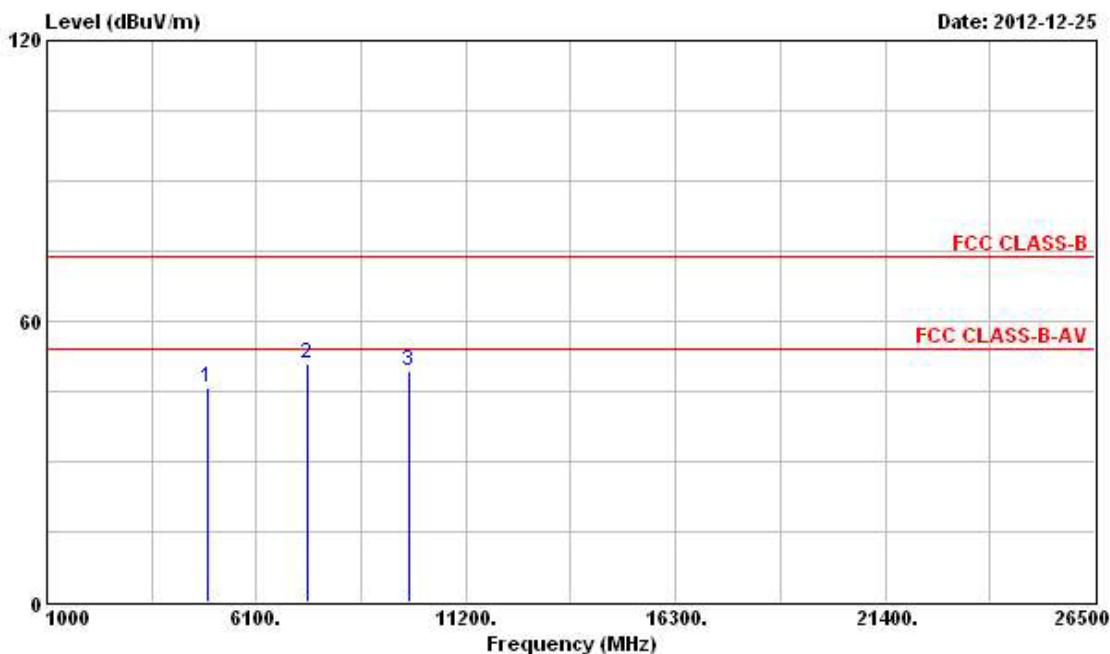






Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	HT-40	Test Freq. (FX)	F6
N _{TX}	2	Polarization	H



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant Pos	Table Pos
		MHz	dBuV/m	dB	Line	Level	Factor		
1	4904.000	45.76	-8.24	54.00	41.15	34.75	4.64	34.78 PK	---
2	7356.000	50.92	-3.08	54.00	44.49	35.90	5.64	35.11 PK	---
3	9808.000	49.41			41.32	37.20	6.37	35.48 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: 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 5: For un-restricted bands, unwanted emissions (item 3) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.



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. 23, 2012	Conduction (CO04-HY)
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Feb. 08, 2012	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz ~ 30MHz	Apr. 20, 2012	Conduction (CO04-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	CB049	9kHz ~ 30MHz	Apr. 25, 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	FSP 40	100305	9KHz~40GHz	Feb. 21, 2012	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Jun. 19, 2012	Conducted (TH01-HY)
AC Power Source	GW	APS-9102	EL920581	AC 0V ~ 300V	Jul. 02, 2012	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100°C	Nov. 21, 2012	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jun. 26, 2012	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	0917017	300MHz ~ 40GHz	Jan. 12, 2012	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	0949003	300MHz ~ 40GHz	Jan. 12, 2012	Conducted (TH01-HY)
RF Cable-2m	HUBER+SUHNER	SUCOFLEX_104	SN 345675/4	1GHz ~ 26.5GHz	NA	Conducted (TH01-HY)
RF Cable-3m	HUBER+SUHNER	SUCOFLEX_104	SN 345669/4	1GHz ~ 26.5GHz	NA	Conducted (TH01-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	FSP40	100593	9kHz ~ 40GHz	Sep. 14, 2012	Radiation (03CH02-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	May 10, 2012	Radiation (03CH02-HY)
Amplifier	Agilent	8447D	2944A11146	100kHz ~ 1.3GHz	Jul. 23, 2012	Radiation (03CH02-HY)
Amplifier	Agilent	8449B	3008A02373	1GHz ~ 26.5GHz	Aug. 10, 2012	Radiation (03CH02-HY)
Horn Antenna	ETS-LINDGREN	3117	00091920	1GHz ~ 18GHz	Nov. 16, 2012	Radiation (03CH02-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz ~ 40GHz	Jan.13, 2012	Radiation (03CH02-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Nov. 10, 2012	Radiation (03CH02-HY)
RF Cable-high	SUHNER	SUCOFLEX106	03CH02-HY	1GHz ~ 40GHz	Mar. 06, 2012	Radiation (03CH02-HY)
Bilog Antenna	SCHAFFNER	CBL61128	2723	30MHz ~ 2GHz	Oct. 22, 2012	Radiation (03CH02-HY)
Turn Table	HD	DS 420	420/649/00	0~ 360 degree	N/A	Radiation (03CH02-HY)
Antenna Mast	HD	MA 240	240/559/00	1 ~ 4 m	N/A	Radiation (03CH02-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	R&S	HFH2-Z2	860004/0001	9 kHz - 30 MHz	Jul. 03, 2012	Radiation (03CH02-HY)

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