



# FCC Test Report

**Equipment** : amor H100 cloud gateway  
**Brand Name** : LEADTEK  
**Model No.** : 8Z61  
**FCC ID** : I2I8Z61  
**Standard** : 47 CFR FCC Part 15.247  
**Operating Band** : 2400 MHz – 2483.5 MHz  
**Equipment Class** : DTS  
**Applicant** : Leadtek Research Inc.  
18F., No. 166, Jian-Yi Rd., Chung-Ho Dist., New Taipei  
City 23511, Taiwan, R.O.C.  
**Manufacturer** : Leadtek Research Inc.  
5F, No. 4, Alley 11, Lane 327, Sec. 2, Chung Shan Rd.,  
Chung-Ho Dist., New Taipei City 23511, Taiwan, R.O.C.

The product sample received on Apr. 28, 2015 and completely tested on Dec. 10, 2015. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

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

Reviewed by:

  
\_\_\_\_\_  
Kevin Liang / 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]: 0.1676540MHz 47.59 (Margin 7.49dB) - AV 59.66 (Margin 5.42dB) - QP	FCC 15.207	Complied
3.2	15.247(a)	6dB Bandwidth	6dB Bandwidth Unit [MHz] 20M:8.59	$\geq$ 500kHz	Complied
3.3	15.247(b)	RF Output Power (Maximum Peak Conducted Output Power)	Power [dBm]: 20.42	Power [dBm]:30	Complied
3.4	15.247(e)	Power Spectral Density	PSD [dBm/100kHz]: -12.19	PSD [dBm/3kHz]:8	Complied
3.5	15.247(d)	Transmitter Radiated Bandedge Emissions	Non-Restricted Bands: 2398.03 MHz: 26.71 dB Restricted Bands [dBuV/m at 3m]: 2483.50 MHz 70.32 (Margin 3.68 dB) - PK 52.98 (Margin 1.02 dB) - AV	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied
3.6	15.247(d)	Radiated Unwanted Emissions	Restricted Bands [dBuV/m at 3m]: 4924.00 MHz 52.83 (Margin 1.17 dB) – AV 55.83 (Margin 18.17 dB) - PK	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 <sub>TX</sub> )	RF Output Power (dBm)
2400-2483.5	b	2412-2462	1-11 [11]	1	14.28
2400-2483.5	g	2412-2462	1-11 [11]	1	20.42
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	1	20.11

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.

#### 1.1.2 Antenna Information

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

Antenna General Information		
Ant. Cat.	Ant. Type	Gain (dBi)
Integral	PIFA	0



### 1.1.3 Type of EUT

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

### 1.1.4 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"/> 100.00% - IEEE 802.11b	0.00
<input checked="" type="checkbox"/> 97.67%- IEEE 802.11g	0.10
<input checked="" type="checkbox"/> 97.74%- IEEE 802.11n (HT20)	0.10

### 1.1.5 EUT Operational Condition

Supply Voltage	<input checked="" type="checkbox"/> AC mains	<input checked="" type="checkbox"/> DC	
Type of DC Source	<input type="checkbox"/> External DC adapter	<input type="checkbox"/> From System	<input checked="" type="checkbox"/> Li-ion Battery



## 1.2 Accessories and Support Equipment

Accessories Information				
AC Adapter	Brand Name	GME Technology Co., Ltd	Model Name	GME6A-050100FGU
	Power Rating	I/P:100 ~ 240Vac; O/P:5Vdc,1A		
Li-ion battery	Brand Name	SPRINGPOWER	Model Name	LF524
	Power Rating	3.7Vdc, 1500mAh		
USB Cable	Brand Name	WAL	Model Name	G100
	Signal Line	1 meter, non-shielded cable, w/o ferrite core		
LCD Panel	Brand Name	Shenzhen Xuri Opto	Model Name	G100

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

Support Equipment - AC Conduction and Radiated Emission		
Equipment	Brand Name	Model Name
Notebook	DELL	E5530

## 1.3 Testing Applied Standards

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

- 47 CFR FCC Part 15
- ANSI C63.10-2013
- FCC KDB 558074 D01 v03r02
- FCC KDB 662911 D01v02r01

## 1.4 Testing Location Information

Testing Location			
<input checked="" type="checkbox"/>	HWA YA	ADD :	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.
		TEL :	886-3-327-3456      FAX : 886-3-327-0973
Test site registered number [636805] with FCC.			
Test Condition	Test Site No.	Test Engineer	Test Environment
Radiated Emission (Verify adapter 2 and Radiated Unwanted Emissions below 1GHz)	03CH03-HY	Joe	21.4°C / 57.4%



## 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	±2.3 dB	
Emission bandwidth, 6dB bandwidth	±0.6 %	
RF output power, conducted	±0.1 dB	
Power density, conducted	±0.6 dB	
Unwanted emissions, conducted	9 – 150 kHz	±0.4 dB
	0.15 – 30 MHz	±0.4 dB
	30 – 1000 MHz	±0.6 dB
	1 – 18 GHz	±0.5 dB
	18 – 40 GHz	±0.5 dB
	40 – 200 GHz	N/A
All emissions, radiated	9 – 150 kHz	±2.5 dB
	0.15 – 30 MHz	±2.3 dB
	30 – 1000 MHz	±2.6 dB
	1 – 18 GHz	±3.6 dB
	18 – 40 GHz	±3.8 dB
	40 – 200 GHz	N/A
Temperature	±0.8 °C	
Humidity	±5 %	
DC and low frequency voltages	±0.9%	
Time	±1.4 %	
Duty Cycle	±0.6 %	



## 2 Test Configuration of EUT

### 2.1 The Worst Case Modulation Configuration

Worst Modulation Used for Conformance Testing			
Modulation Mode	Transmit Chains (N <sub>TX</sub> )	Data Rate / MCS	Worst Data Rate / MCS
11b,1-11Mbps	1	1-11 Mbps	1 Mbps
11g,6-54Mbps	1	6-54 Mbps	6 Mbps
HT20, M0-7	1	MCS 0-7	MCS 0

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

Note 2: Modulation modes consist below configuration:  
11b: IEEE 802.11b, 11g: IEEE 802.11g, HT20: IEEE 802.11n

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

### 2.2 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter (2400-2483.5MHz band)					
Test Software Version	DOS				
Modulation Mode	N <sub>TX</sub>	Test Frequency (MHz)			
		NCB: 20MHz			
		2412	2437	2462	
11b	1	3	3	4	
11g	1	1045	1056	1039	
HT20	1	1055	1070	1047	



## 2.3 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
<b>Tests Item</b>	AC power-line conducted emissions
<b>Condition</b>	AC power-line conducted measurement for line and neutral. Test Voltage: 120Vac / 60Hz
<b>Operating Mode</b>	Operating Mode Description
1	EUT transmitted with Adapter 1 via USB Cable
2	EUT transmitted with Notebook via USB Cable

For operating mode 1 is the worst case and it was record in this test report.

The Worst Case Mode for Following Conformance Tests	
<b>Tests Item</b>	RF Output Power, Power Spectral Density, 6 dB Bandwidth
<b>Test Condition</b>	Conducted measurement at transmit chains
<b>Modulation Mode</b>	11b, 11g, HT20

The Worst Case Mode for Following Conformance Tests	
<b>Tests Item</b>	Transmitter Radiated Unwanted Emissions Transmitter Radiated Bandedge Emissions
<b>Test Condition</b>	Radiated measurement
<b>User Position</b>	<input checked="" type="checkbox"/> EUT will be placed in fixed position. <input type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. <input type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed three orthogonal planes.
<b>Operating Mode</b>	Operating Mode Description
1	EUT transmitted with Adapter 1 via USB Cable
2	EUT transmitted with Notebook via USB Cable

For operating mode 2 is the worst case and it was record in this test report.

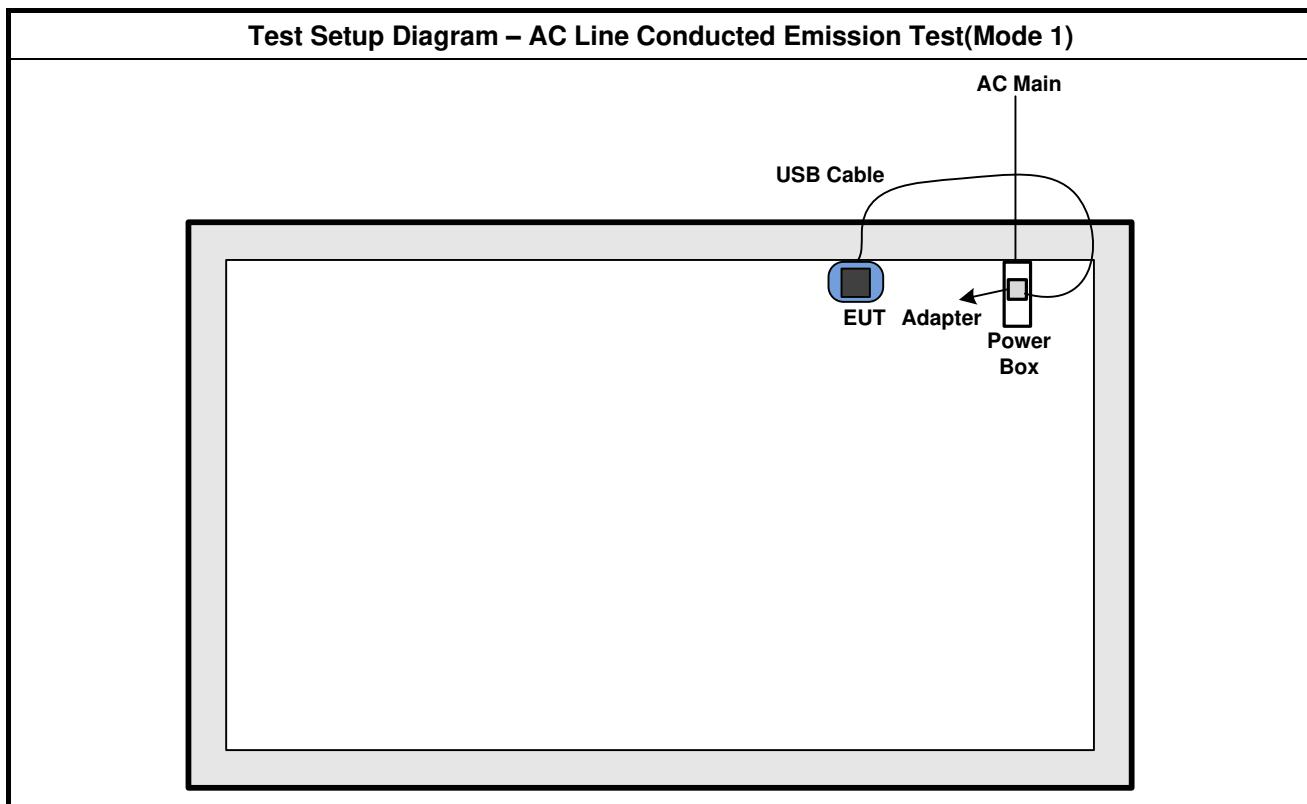
**Modulation Mode** 11b, 11g, HT20

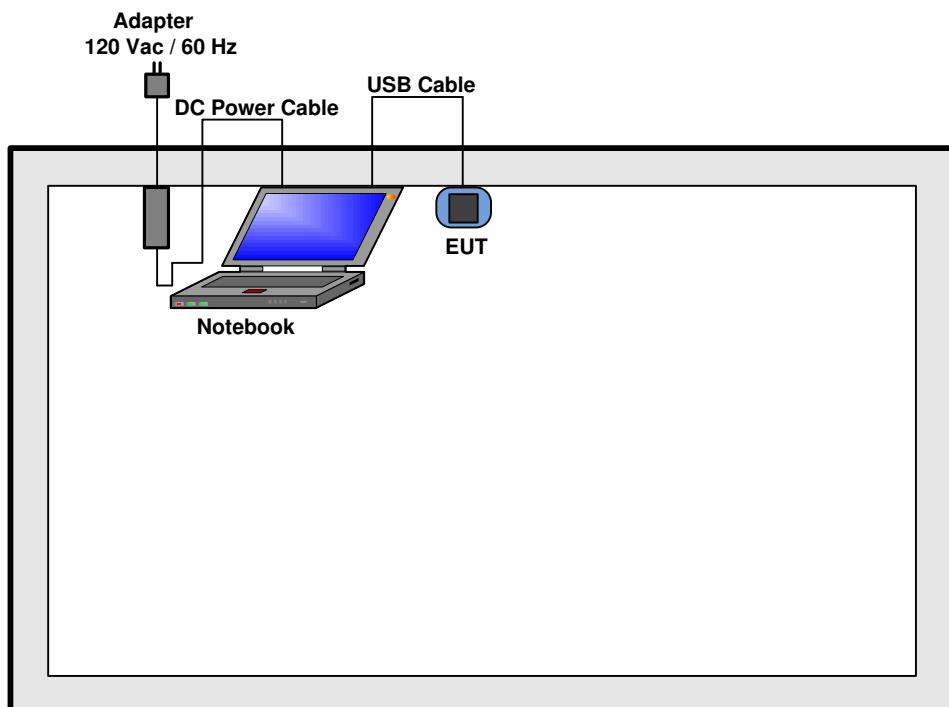
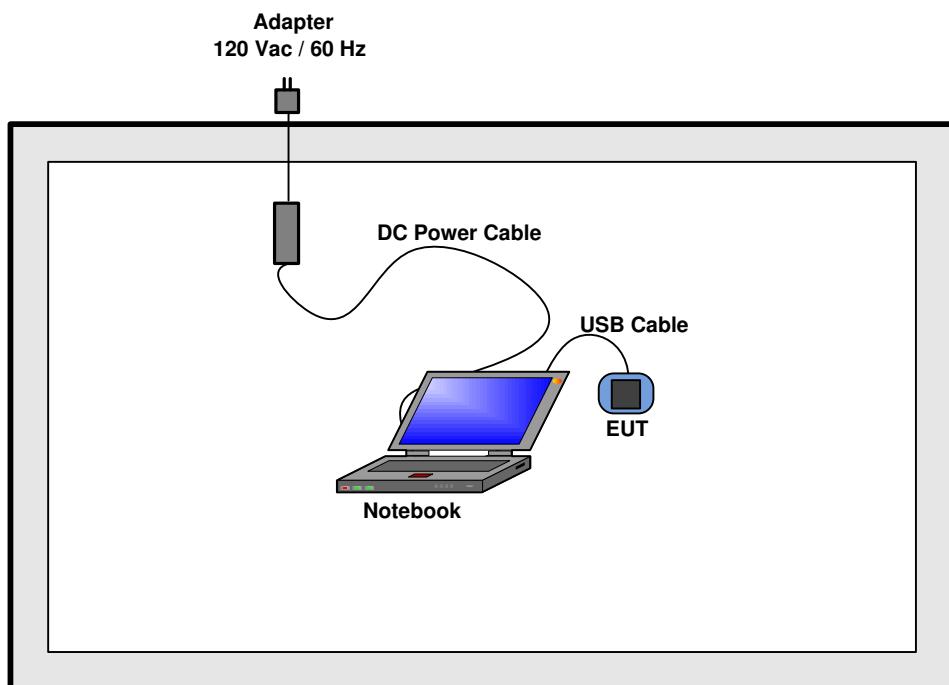
**X Plane**

**Orthogonal Planes of EUT**



## 2.4 Test Setup Diagram



**Test Setup Diagram - Radiated Test Below 1GHz (Mode 2)****Test Setup Diagram - Radiated Test Above 1GHz (Mode 2)**

### 3 Transmitter Test Result

#### 3.1 AC Power-line Conducted Emissions

##### 3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: \* Decreases with the logarithm of the frequency.

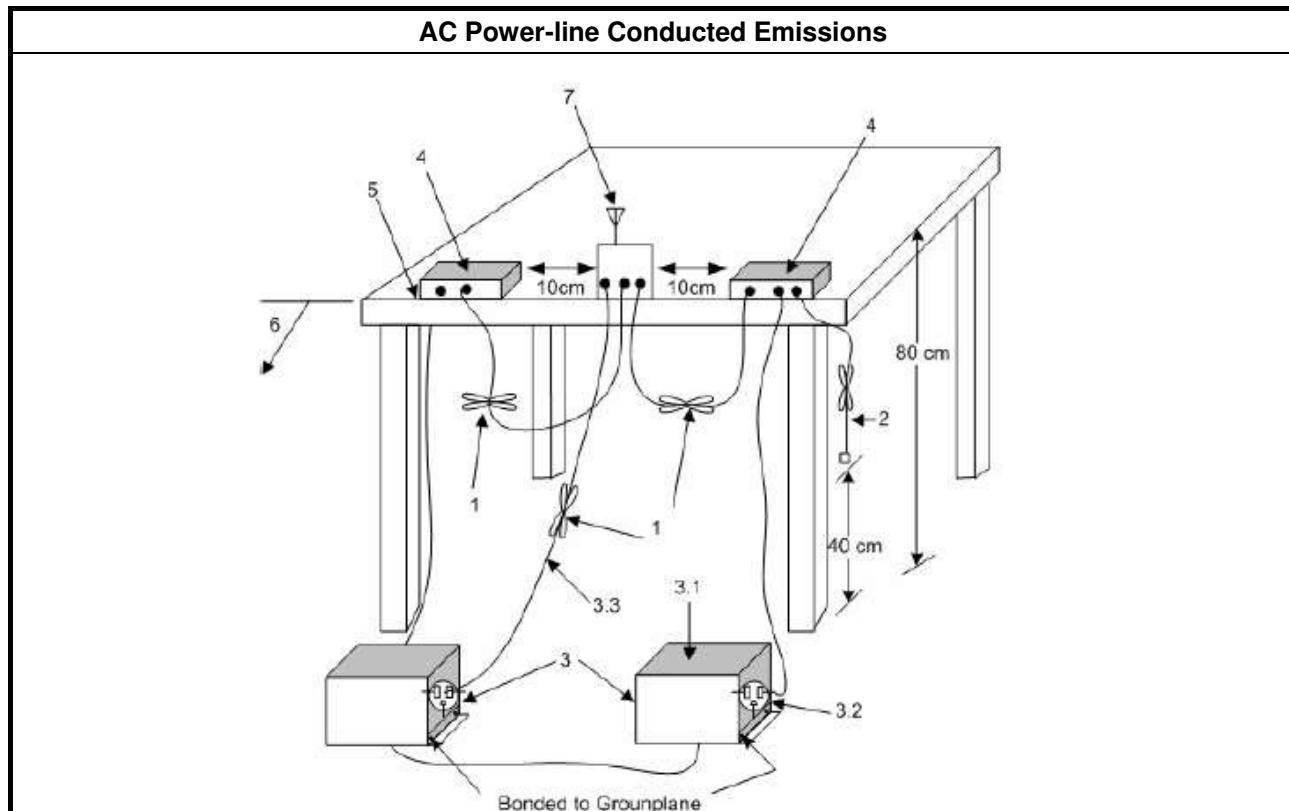
##### 3.1.2 Measuring Instruments

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

##### 3.1.3 Test Procedures

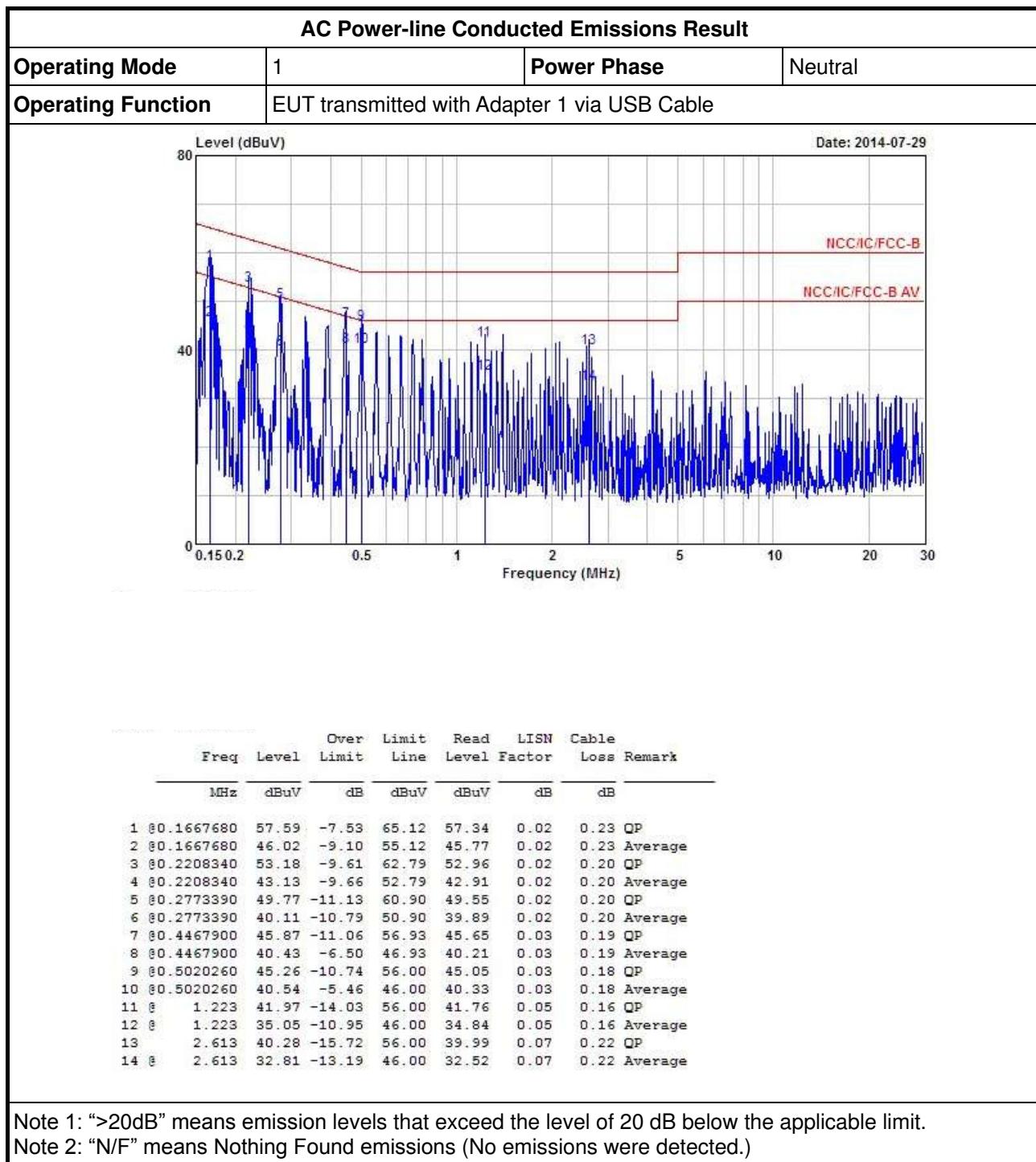
Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.

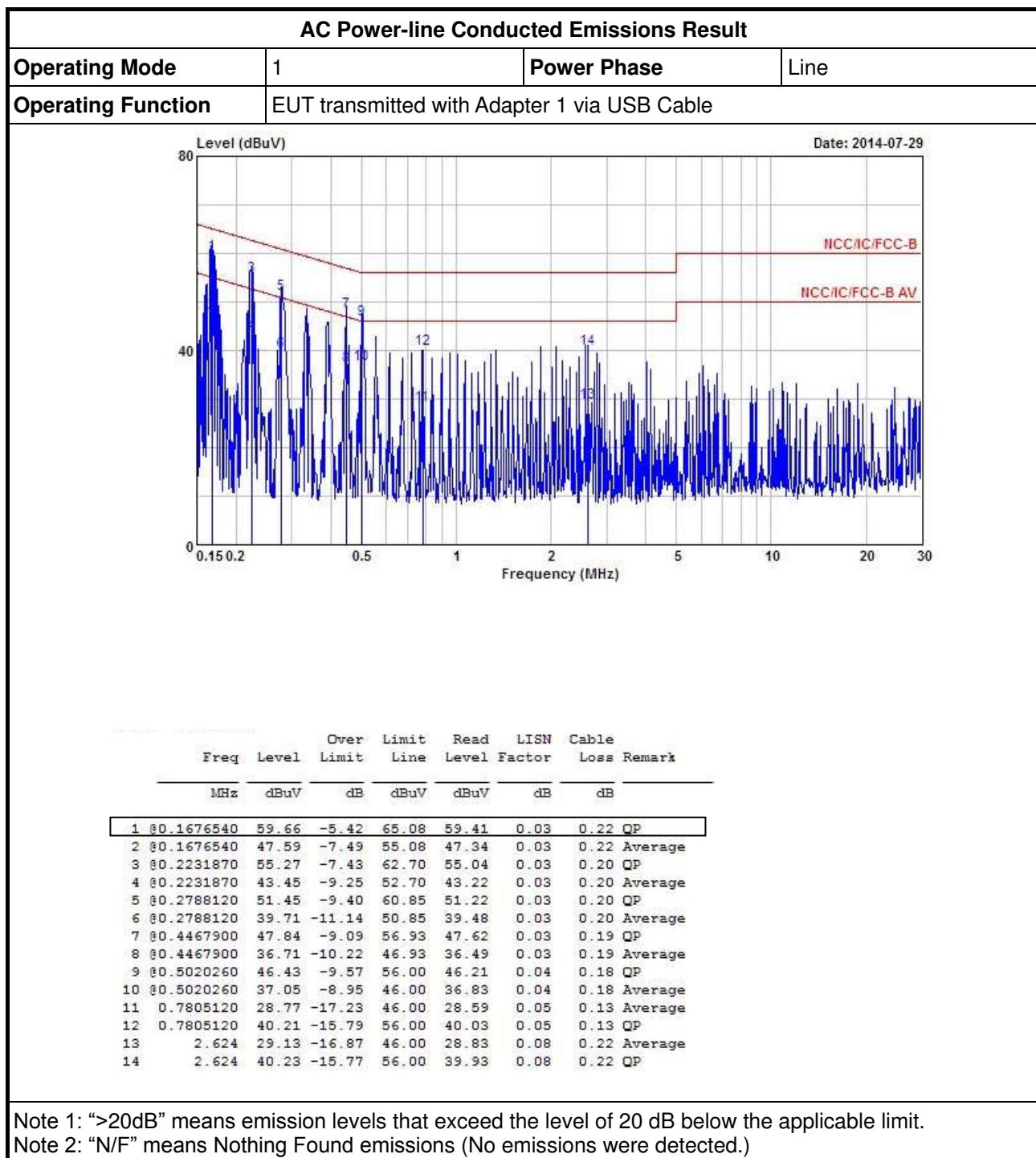
##### 3.1.4 Test Setup





## 3.1.5 Test Result of AC Power-line Conducted Emissions







## 3.2 6dB Bandwidth

### 3.2.1 6dB Bandwidth Limit

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

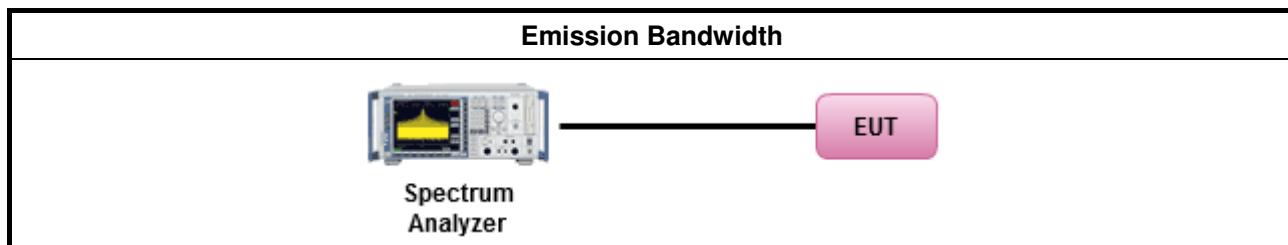
### 3.2.2 Measuring Instruments

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 D01 v03r02, clause 8.1 Option 1 for 6 dB bandwidth measurement.
<input type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, 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 1.
<input type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 2 is the worst case.
<input 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 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

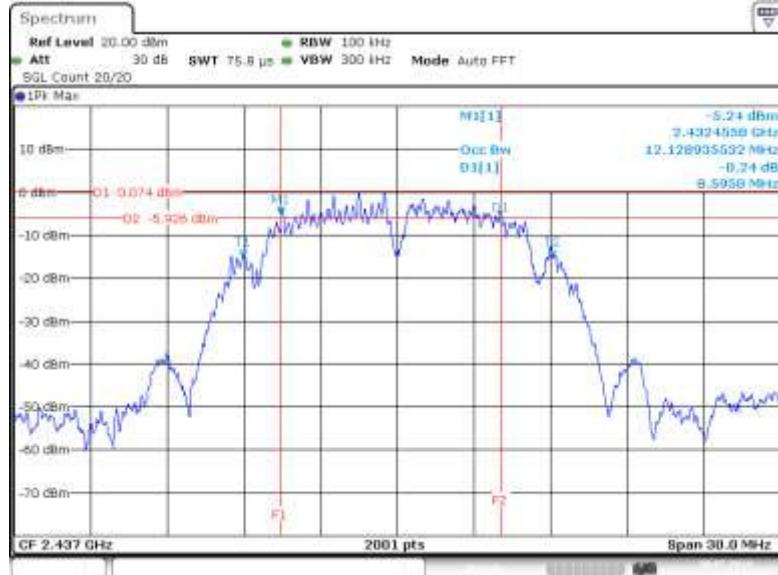




### 3.2.5 Test Result of Emission Bandwidth

Emission Bandwidth Result				
Condition		Emission Bandwidth (MHz)		
Modulation Mode	N <sub>TX</sub>	Freq. (MHz)	99% Bandwidth	6dB Bandwidth
11b	1	2412	12.20	8.92
11b	1	2437	12.12	8.59
11b	1	2462	12.14	9.69
11g	1	2412	16.32	16.36
11g	1	2437	16.44	16.38
11g	1	2462	16.31	16.35
HT20	1	2412	17.54	17.61
HT20	1	2437	17.55	17.58
HT20	1	2462	17.52	17.58
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	
<b>Maximum Peak Conducted Output Power or Maximum Conducted Output Power Limit</b>	
<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 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
<b>e.i.r.p. Power Limit:</b>	
<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

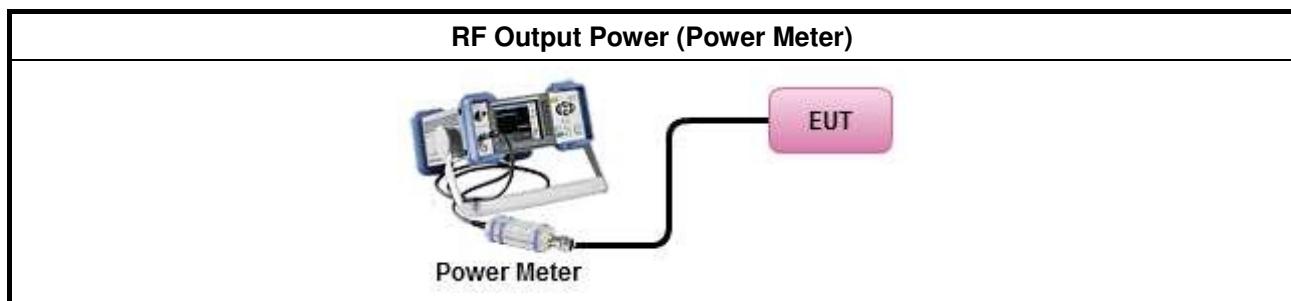
Refer a test equipment and calibration data table in this test report.



### 3.3.3 Test Procedures

Test Method
<input checked="" type="checkbox"/> Maximum Peak Conducted Output Power
<input type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, clause 9.1.1 (RBW $\geq$ EBW method).
<input checked="" type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, clause 9.1.2 (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 D01 v03r02, clause 9.2.2.2 Method AVGSA-1 (spectral trace averaging).
<input type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, 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 checked="" type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, clause 9.2.2.4 Method AVGSA-2 (spectral trace averaging).
<input type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, 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 D01 v03r02, 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 1.
<input type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 2 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 <sub>TX</sub>	Freq. (MHz)	Output Power	Power Limit	Antenna Gain (dBi)	EIRP Power	EIRP Limit
11b	1	2412	14.28	30.00	0	14.28	36.00
11b	1	2437	13.84	30.00	0	13.84	36.00
11b	1	2462	14.19	30.00	0	14.19	36.00
11g	1	2412	18.15	30.00	0	18.15	36.00
11g	1	2437	20.42	30.00	0	20.42	36.00
11g	1	2462	16.21	30.00	0	16.21	36.00
HT20	1	2412	17.30	30.00	0	17.30	36.00
HT20	1	2437	20.11	30.00	0	20.11	36.00
HT20	1	2462	15.54	30.00	0	15.54	36.00
Result			Complied				

### 3.3.6 Test Result of Maximum Conducted Output Power

Maximum Conducted Output Power Result							
Condition			RF Output Power (dBm)				
Modulation Mode	N <sub>TX</sub>	Freq. (MHz)	Output Power	Power Limit	Antenna Gain (dBi)	EIRP Power	EIRP Limit
11b	1	2412	11.28	30.00	0	11.28	36.00
11b	1	2437	10.77	30.00	0	10.77	36.00
11b	1	2462	11.17	30.00	0	11.17	36.00
11g	1	2412	12.93	30.00	0	12.93	36.00
11g	1	2437	15.43	30.00	0	15.43	36.00
11g	1	2462	11.26	30.00	0	11.26	36.00
HT20	1	2412	12.34	30.00	0	12.34	36.00
HT20	1	2437	15.24	30.00	0	15.24	36.00
HT20	1	2462	10.59	30.00	0	10.59	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) $\leq 8 \text{ dBm/3kHz}$

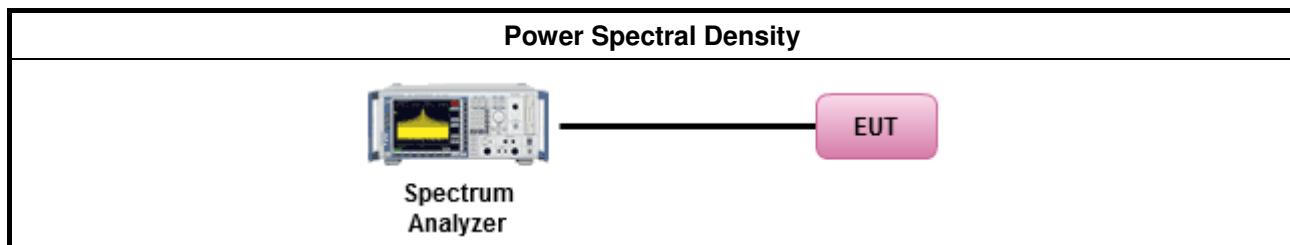
### 3.4.2 Measuring Instruments

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

### 3.4.3 Test Procedures

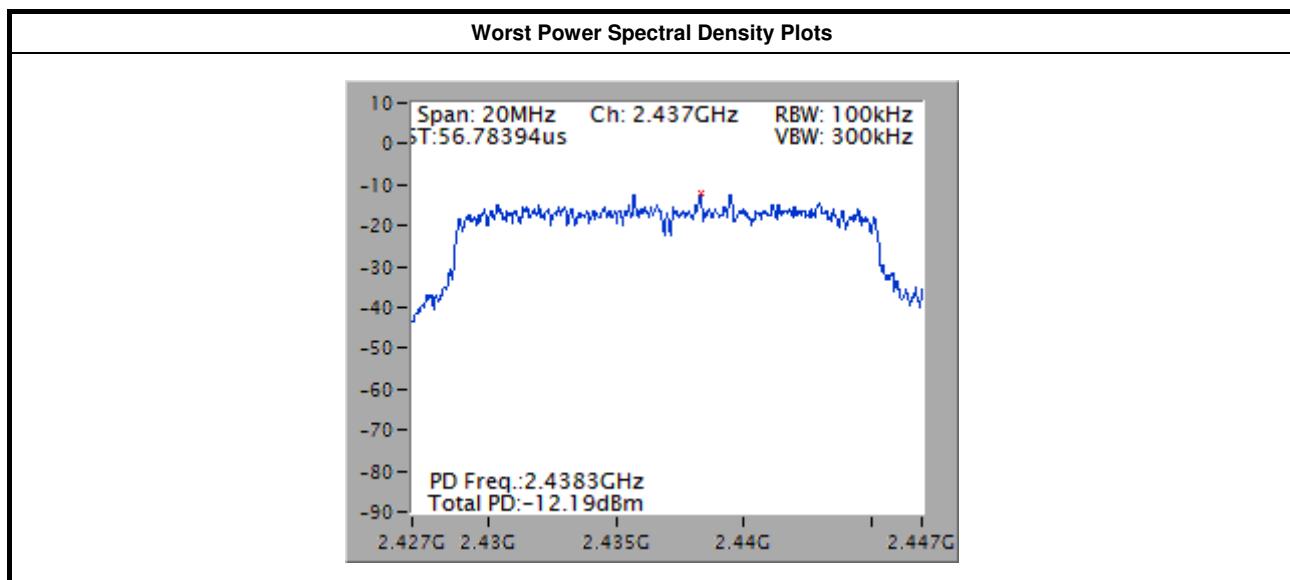
Test Method		
<input checked="" type="checkbox"/> Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method 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 D01 v03r02, 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 D01 v03r02, clause 10.3 Method AVGPSD-1 (spectral trace averaging). <input type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, 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 D01 v03r02, clause 10.5 Method AVGPSD-2 (spectral trace averaging). <input type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, 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 1. <input type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 2 is the worst case. <input type="checkbox"/> The EUT supports multiple transmit chains using options given below: <table border="1"><tr><td><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 <math>N_{TX}</math> 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.</td></tr><tr><td><input type="checkbox"/> Option 2: Measure and add <math>10 \log(N)</math> dB, where <math>N</math> 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 <math>10 \log(N)</math>. Or each transmit chains shall be add <math>10 \log(N)</math> to compared with the limit.</td></tr></table>	<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.
<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



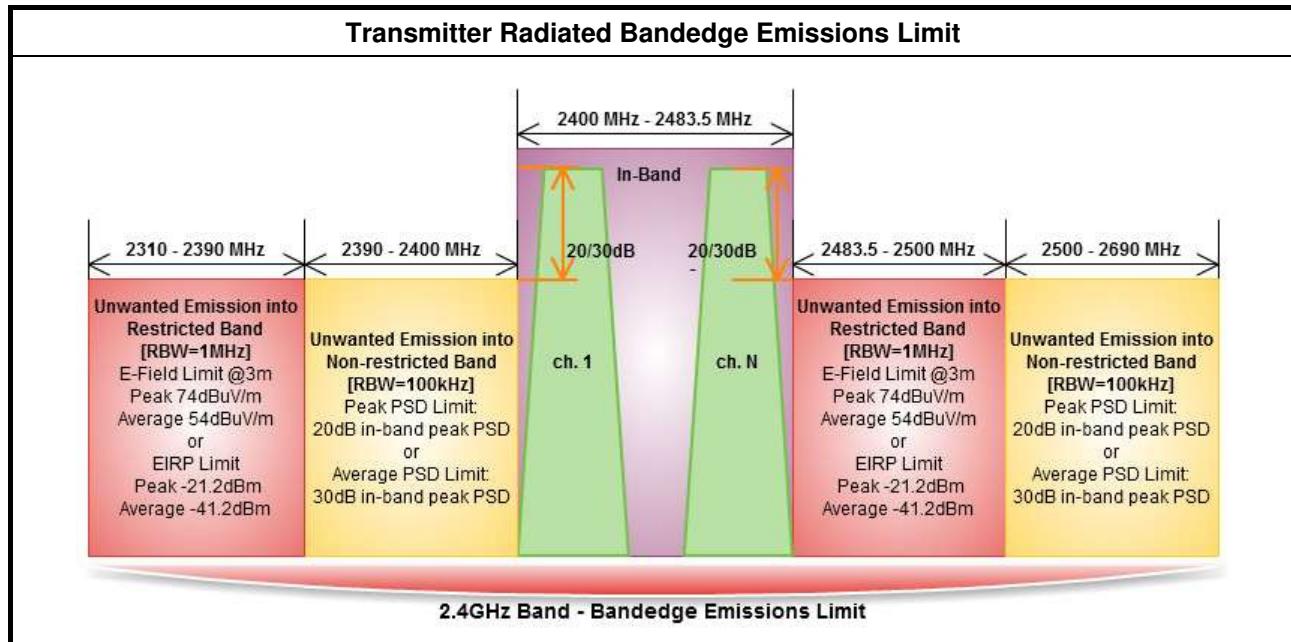
### 3.4.5 Test Result of Power Spectral Density

Condition			Power Spectral Density	
Modulation Mode	N <sub>TX</sub>	Freq. (MHz)	Sum Chain (dBm/100kHz)	PSD Limit (dBm/3kHz)
11b	1	2412	-15.36	8.00
11b	1	2437	-15.60	8.00
11b	1	2462	-15.93	8.00
11g	1	2412	-16.43	8.00
11g	1	2437	-12.19	8.00
11g	1	2462	-18.18	8.00
HT20	1	2412	-17.47	8.00
HT20	1	2437	-14.89	8.00
HT20	1	2462	-19.13	8.00
Result		Complied		



## 3.5 Transmitter Radiated Bandedge Emissions

### 3.5.1 Transmitter Radiated Bandedge Emissions Limit



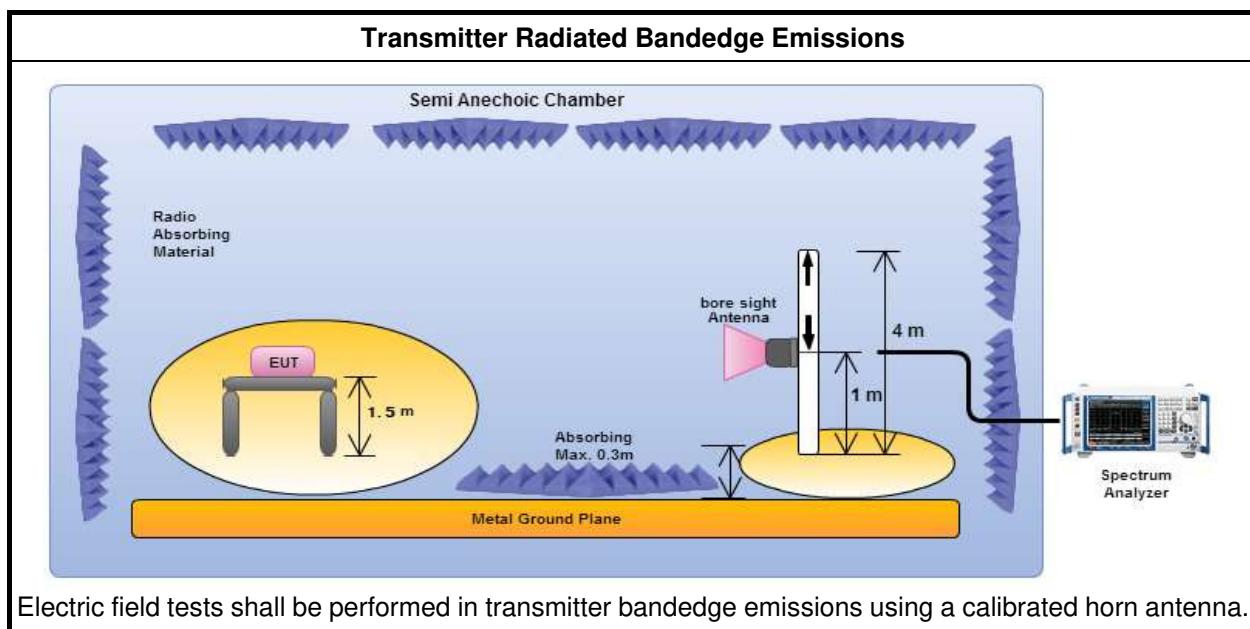
### 3.5.2 Measuring Instruments

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 6.10 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 D01 v03r02, clause 11 for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074 D01 v03r02, clause 12 for unwanted emissions into restricted bands.
	<input type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, clause 12.2.5.1 Option 1 (trace averaging for duty cycle $\geq 98\%$ )
	<input type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, clause 12.2.5.2 Option 2 (trace averaging + duty factor).
	<input type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, clause 12.2.5.3 Option 3 (Reduced $VBW \geq 1/T$ ).
	<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 4.1.4.2.3 (Reduced $VBW$ ). $VBW \geq 1/T$ , where $T$ is pulse time.
	<input type="checkbox"/> Refer as ANSI C63.10, clause 4.1.4.2.4 average value of pulsed emissions.
	<input checked="" type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, 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 D01 v03r02, 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 6.10 for band-edge testing.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.10.6.2 for marker-delta method for band-edge measurements.
<input checked="" type="checkbox"/>	For radiated measurement, refer as FCC KDB 558074 D01 v03r02, clause 12.2.7 and ANSI C63.10, clause 6.6. Test distance is 3m.

### 3.5.4 Test Setup





## 3.5.5 Test Result of Transmitter Radiated Bandedge Emissions

2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Non-restricted Band)								
Modulation	N <sub>TX</sub>	Test Freq. (MHz)	In-band PSD [i] (dBuV/100kHz)	Freq. (MHz)	Out-band PSD [o] (dBuV/100kHz)	[i] – [o] (dB)	Limit (dB)	Pol.
11b	1	2412	95.62	2392.32	63.60	32.02	20	V
11b	1	2462	99.09	2507.80	64.23	34.86	20	V
11g	1	2412	92.88	2398.03	66.17	26.71	20	V
11g	1	2462	93.78	2500.70	63.90	29.88	20	V
HT20	1	2412	94.68	2399.94	67.76	26.92	20	V
HT20	1	2462	93.00	2542.20	63.82	29.18	20	V

Note 1: Measurement worst emissions of receive antenna polarization

2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Restricted Band)										
Modulation Mode	N <sub>TX</sub>	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.
11b	1	2412	3	2333.63	60.63	74	2333.52	47.88	54	V
11b	1	2462	3	2497.10	60.23	74	2487.90	48.04	54	V
11g	1	2412	3	2389.97	68.45	74	2390.00	52.70	54	V
11g	1	2462	3	2483.50	69.22	74	2483.50	52.50	54	V
HT20	1	2412	3	2389.97	72.83	74	2390.00	52.65	54	V
HT20	1	2462	3	2483.50	70.32	74	2483.50	52.98	54	V

Note 1: Measurement worst emissions of receive antenna polarization.



## 3.6 Radiated Unwanted Emissions

### 3.6.1 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.

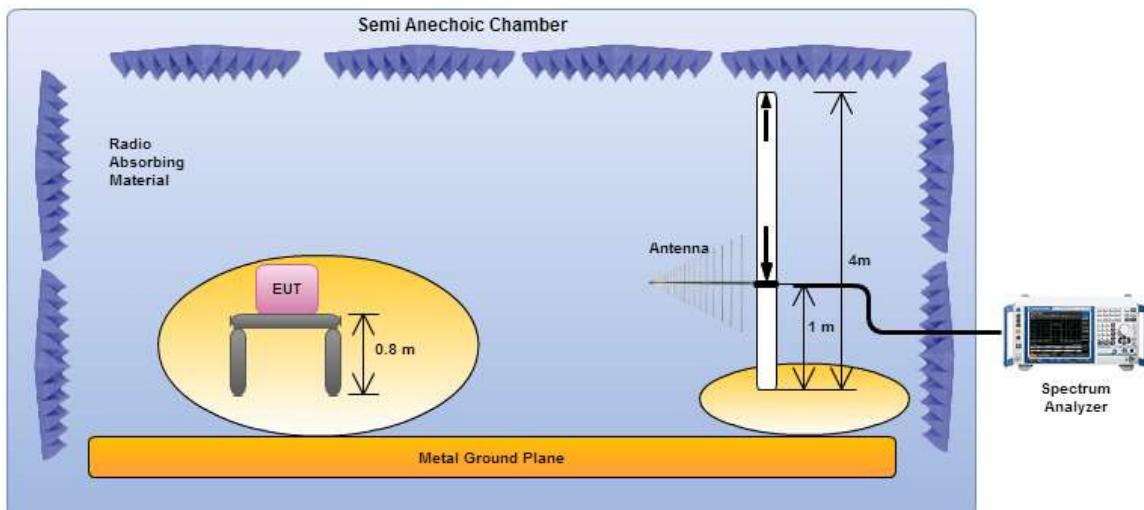


### 3.6.3 Test Procedures

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"/> 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 D01 v03r02, clause 11 for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, clause 12 for unwanted emissions into restricted bands.
<input type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, clause 12.2.5.1 Option 1 (trace averaging for duty cycle $\geq 98\%$ )
<input type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, clause 12.2.5.2 Option 2 (trace averaging + duty factor).
<input type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, clause 12.2.5.3 Option 3 (Reduced $VBW \geq 1/T$ ).
<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 4.1.4.2.3 (Reduced $VBW$ ). $VBW \geq 1/T$ , where $T$ is pulse time.
<input type="checkbox"/> Refer as ANSI C63.10, clause 4.1.4.2.4 average value of pulsed emissions.
<input checked="" type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, clause 11.3 and 12.2.4 measurement procedure peak limit.
<input checked="" type="checkbox"/> Refer as FCC KDB 558074 D01 v03r02, clause 12.2.3 measurement procedure Quasi-Peak limit.
<input checked="" type="checkbox"/> For radiated measurement, refer as FCC KDB 558074 D01 v03r02, 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.
<input checked="" type="checkbox"/> The any unwanted emissions level shall not exceed the fundamental emission level.
<input checked="" type="checkbox"/> All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

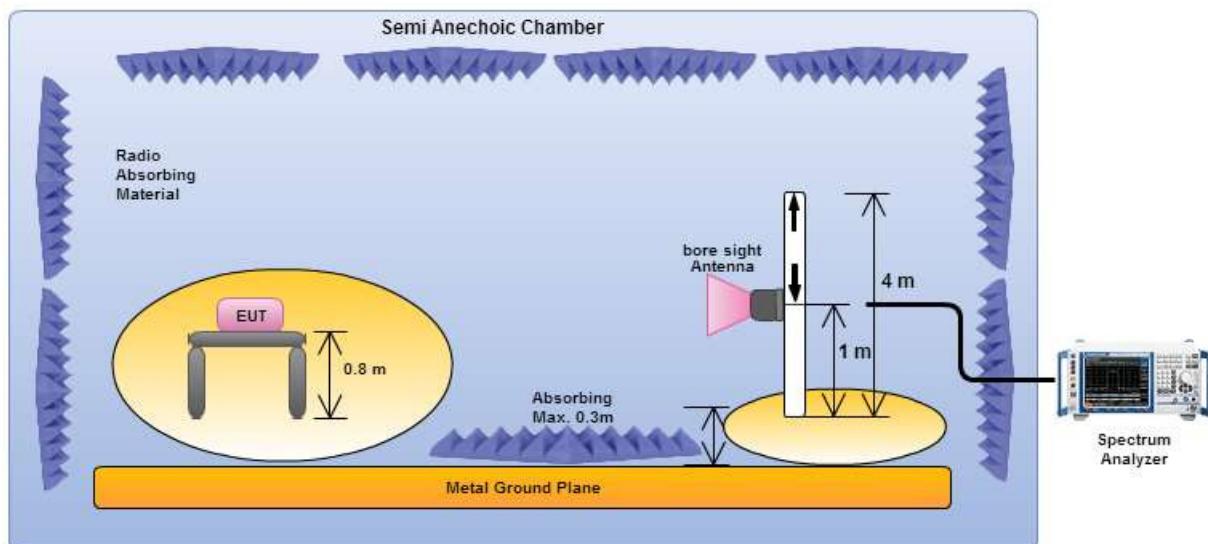
### 3.6.4 Test Setup

#### Transmitter Radiated Unwanted Emissions (below 1GHz)



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.

#### Transmitter Radiated Unwanted Emissions (Above 1GHz)



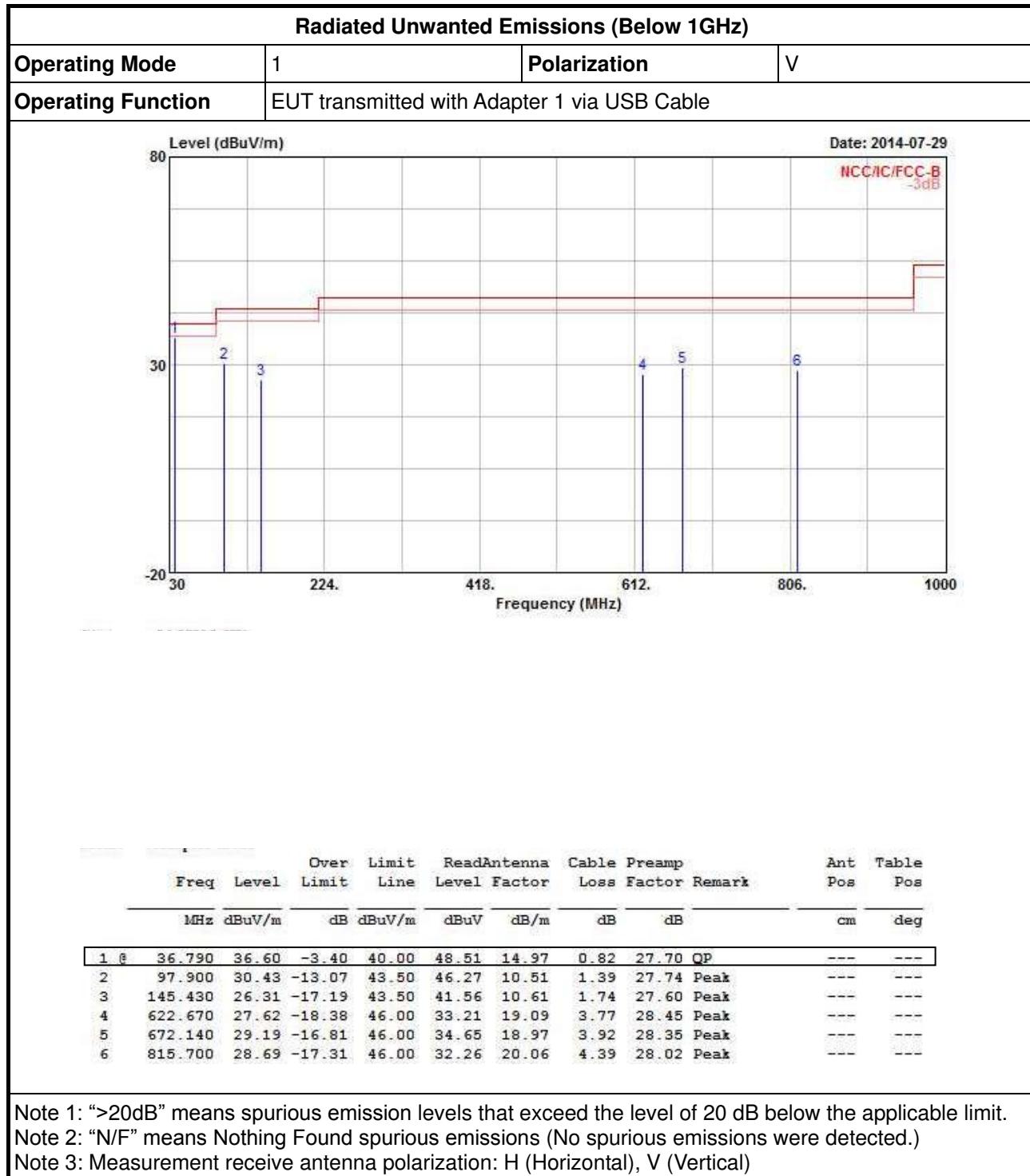
- Electric field tests shall be performed in the frequency range of 1 GHz to 10th harmonic of highest fundamental frequency or 40 GHz using a calibrated horn antenna.

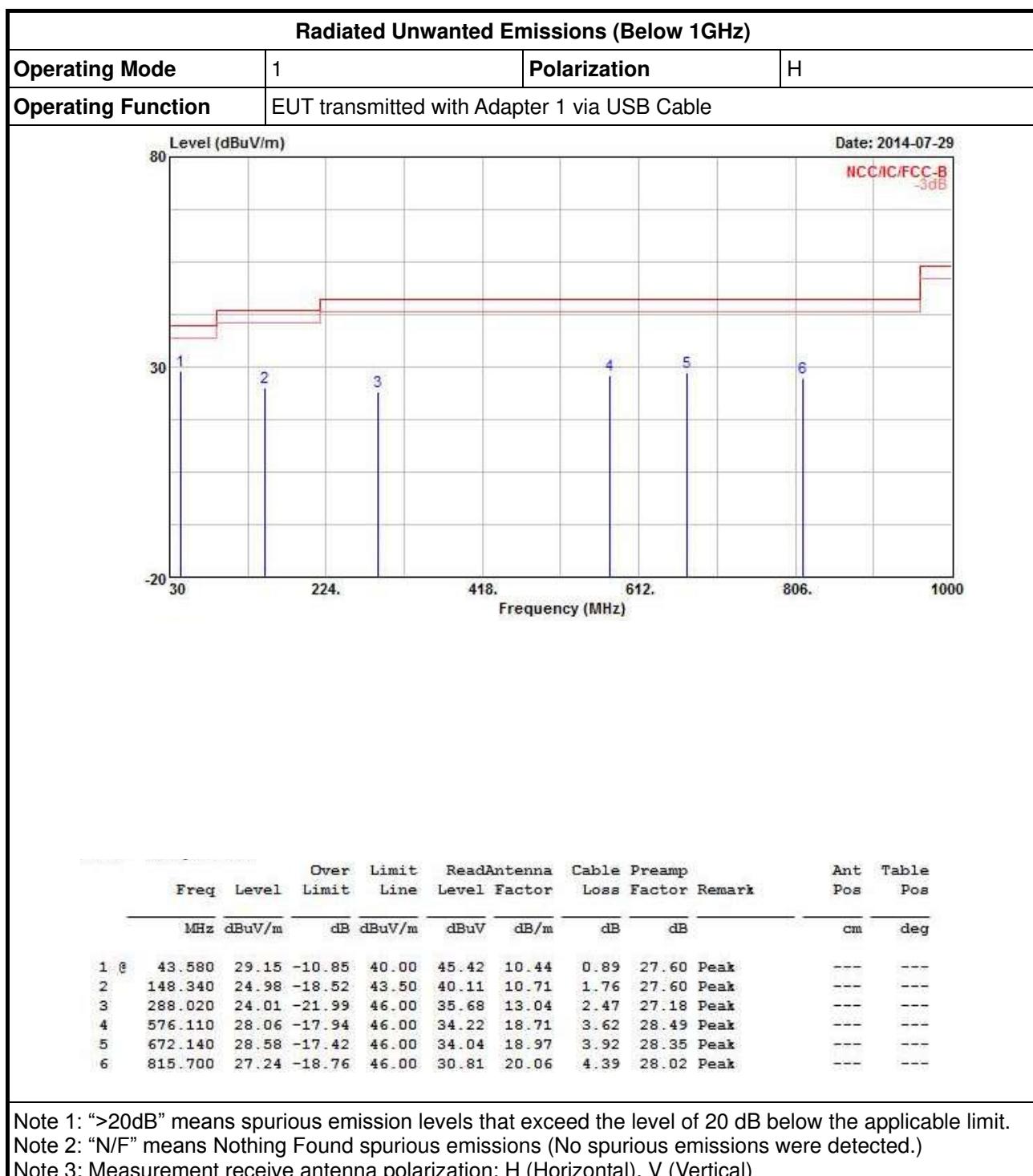
### 3.6.5 Radiated Unwanted Emissions (Below 30MHz)

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



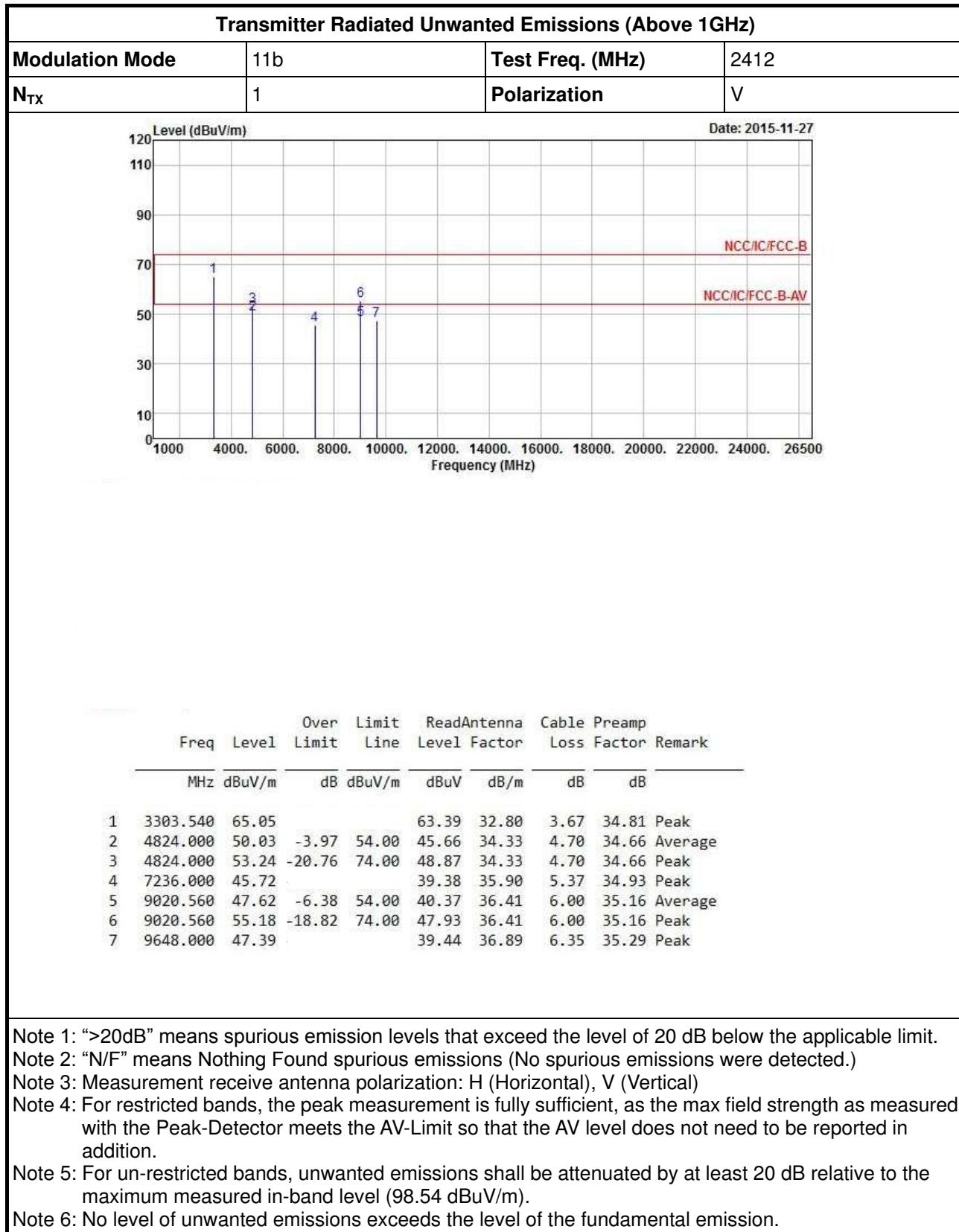
## 3.6.6 Radiated Unwanted Emissions (Below 1GHz)

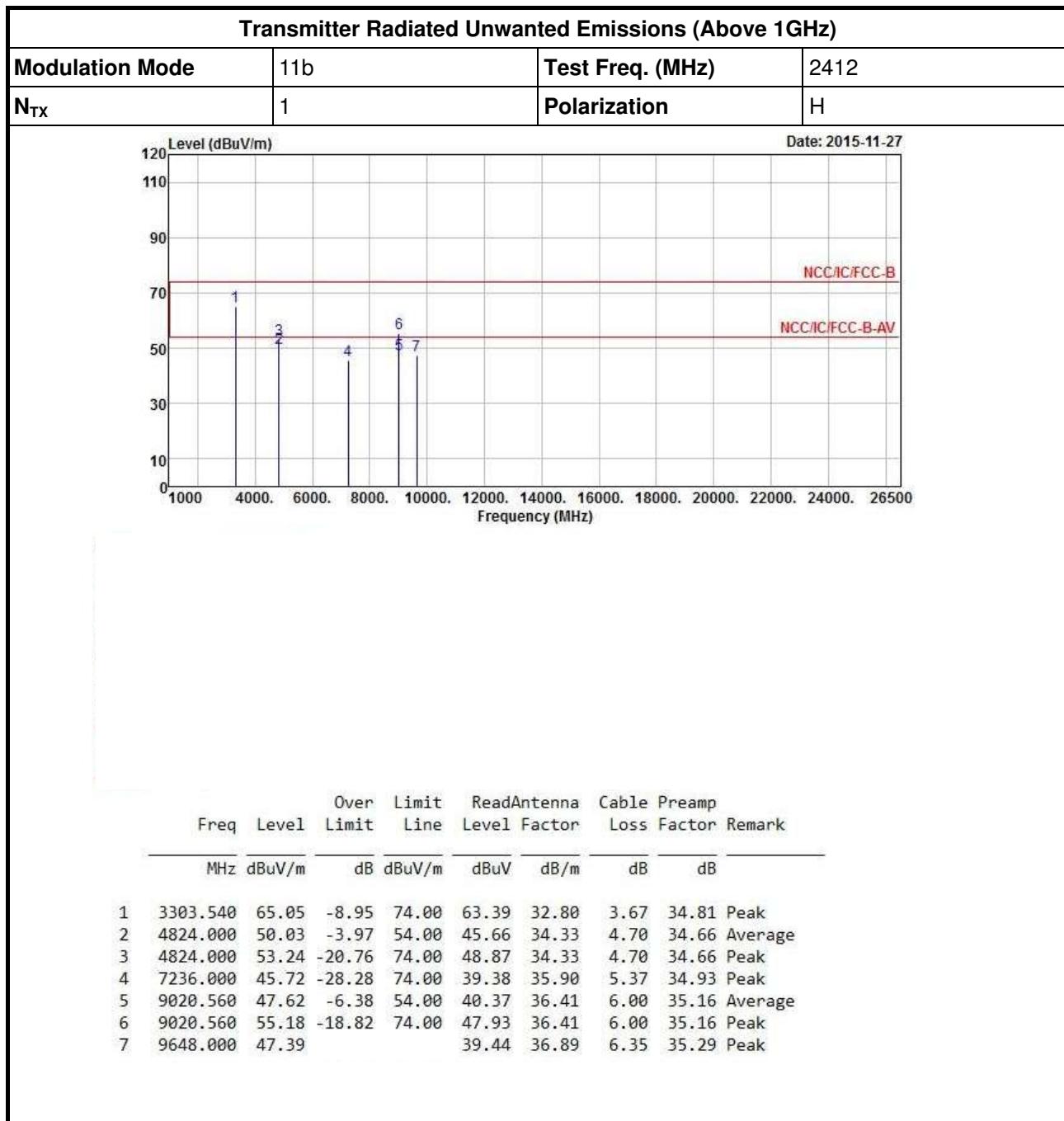






## 3.6.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)





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

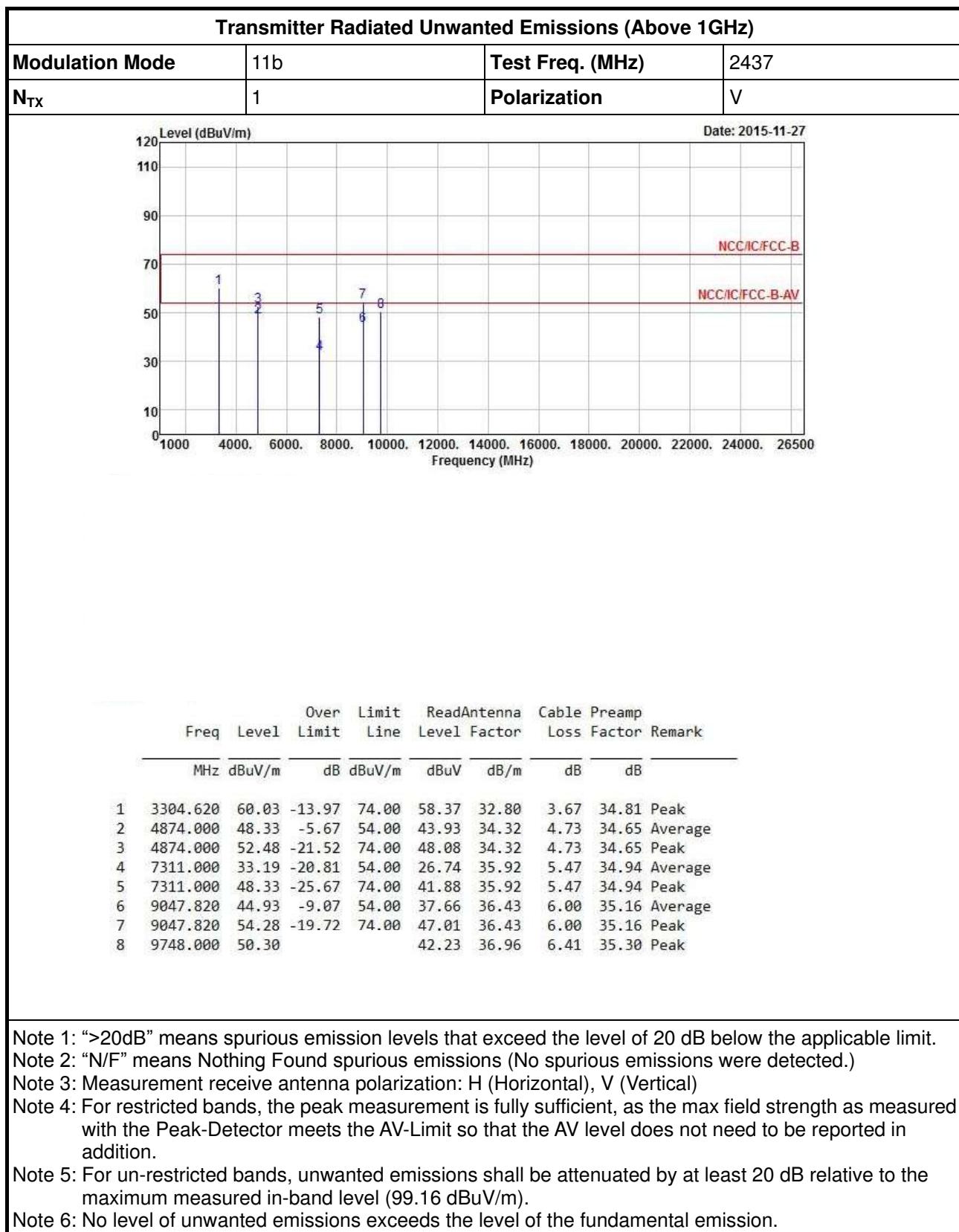
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

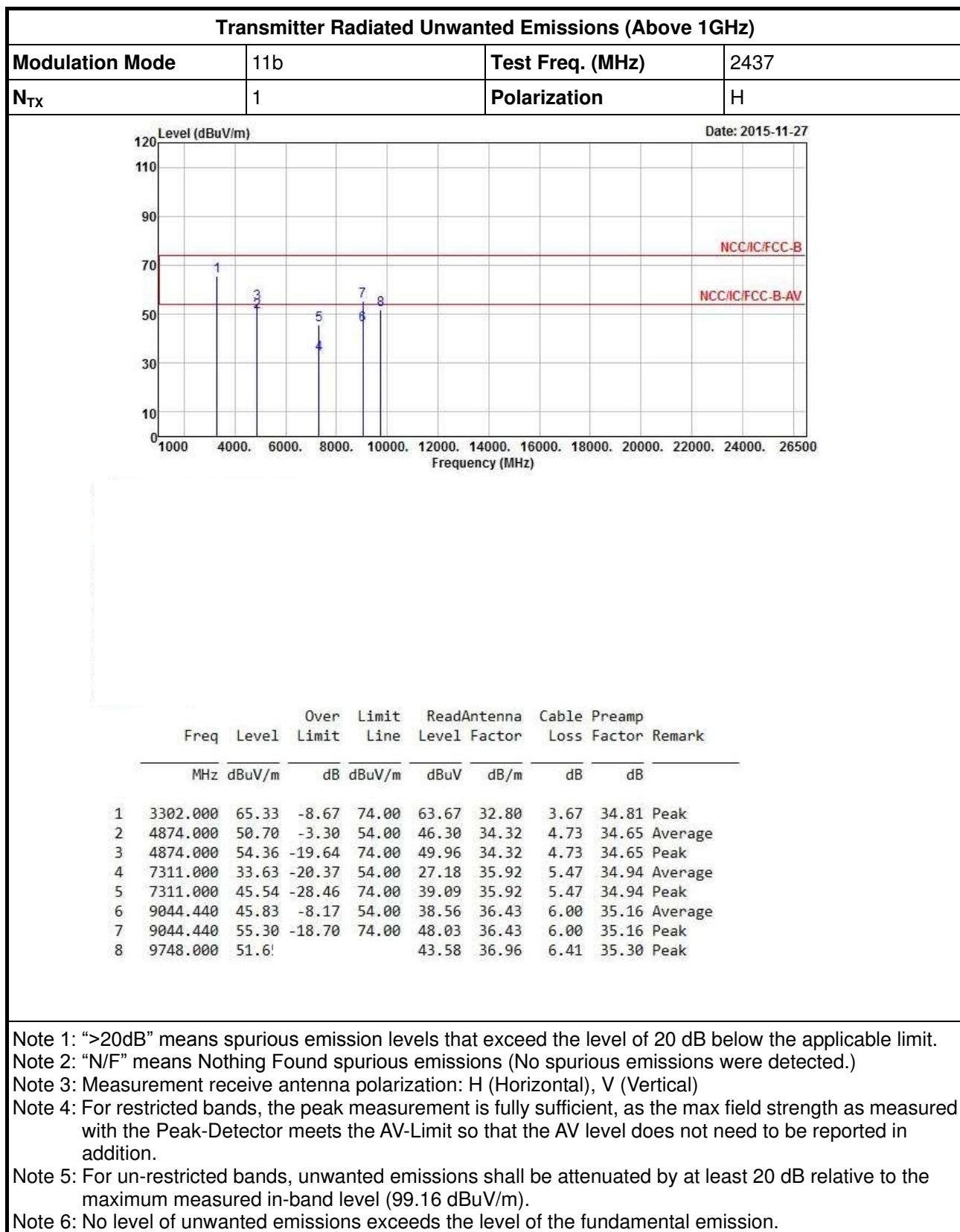
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

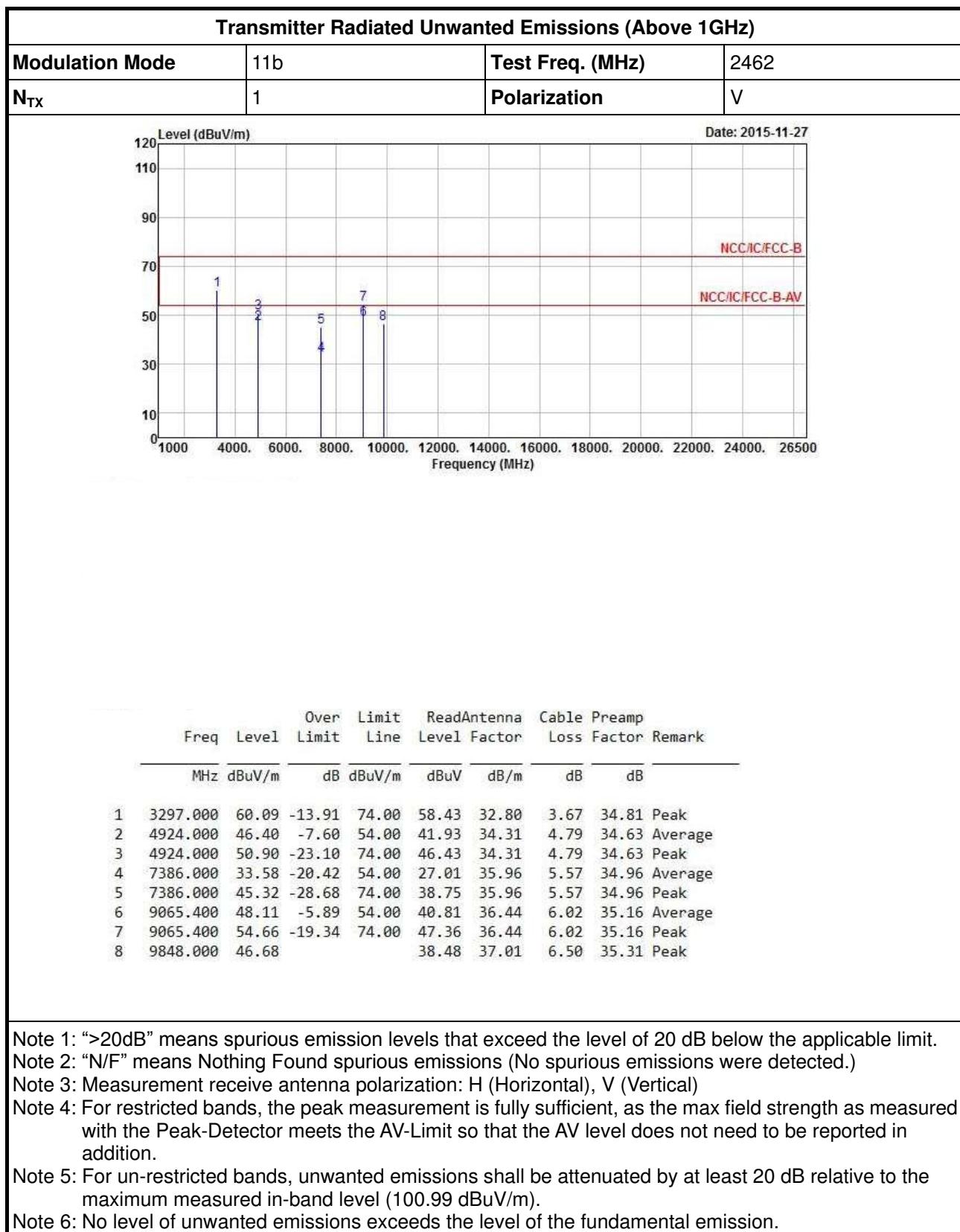
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

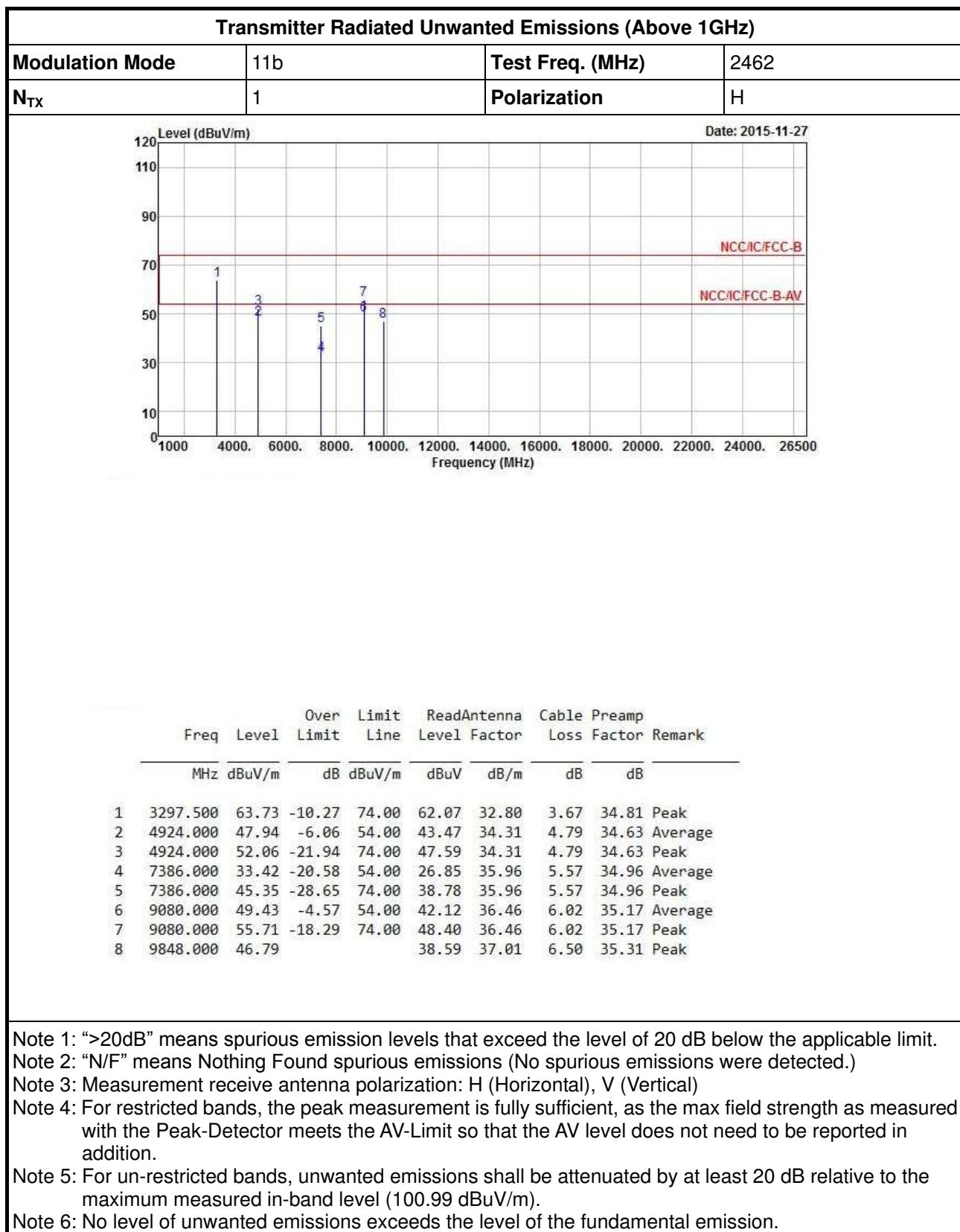
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (98.54 dBuV/m).

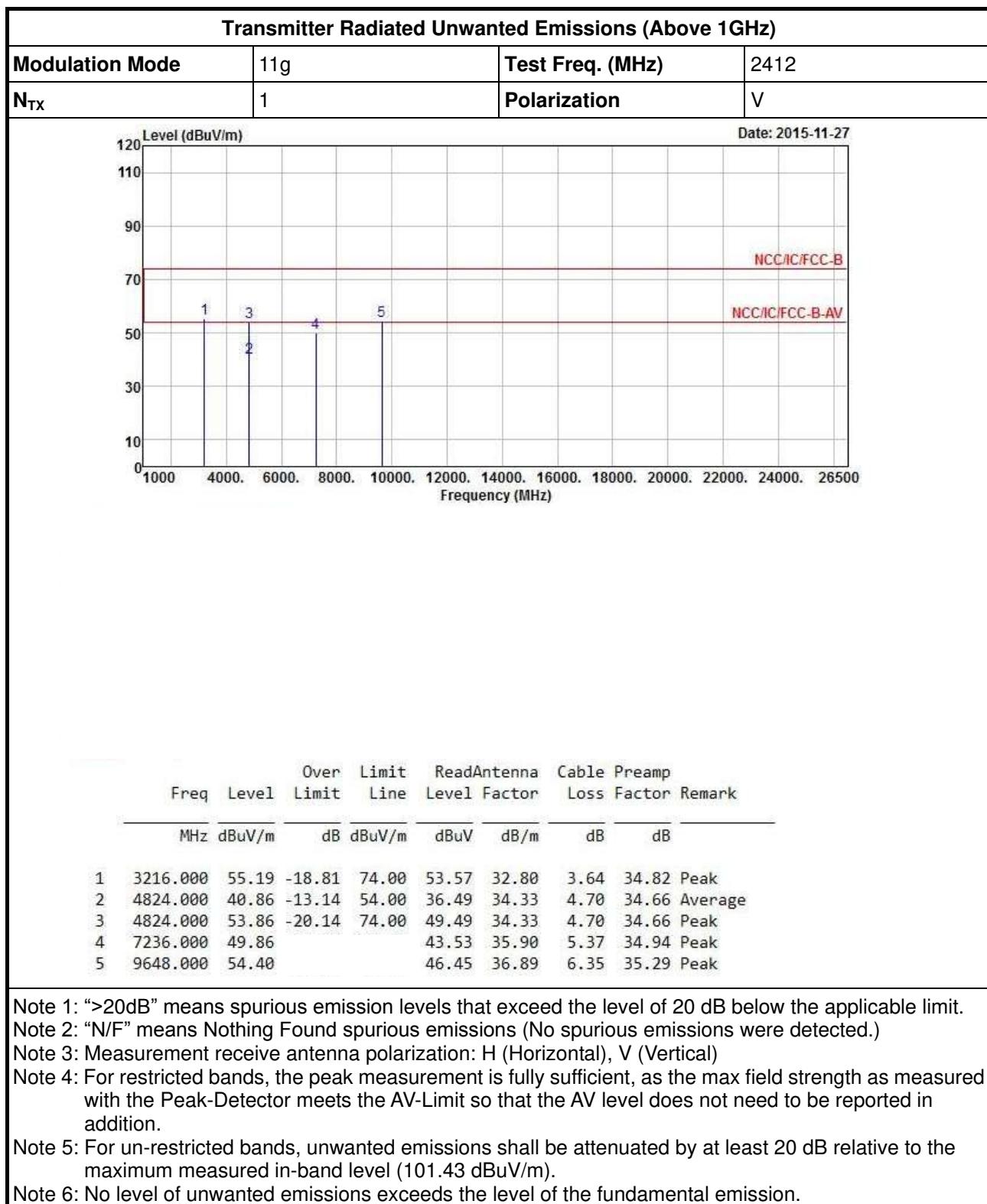
Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

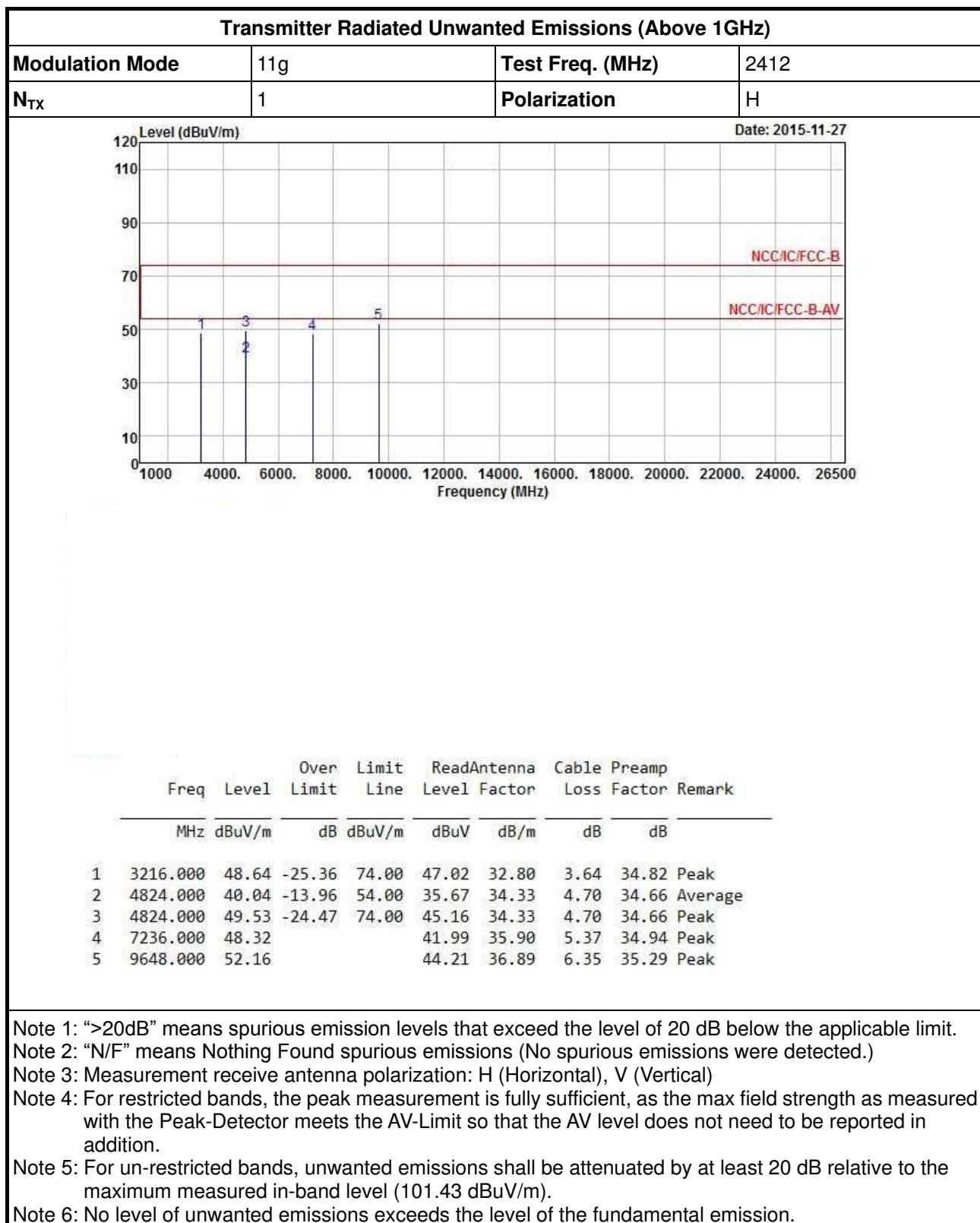


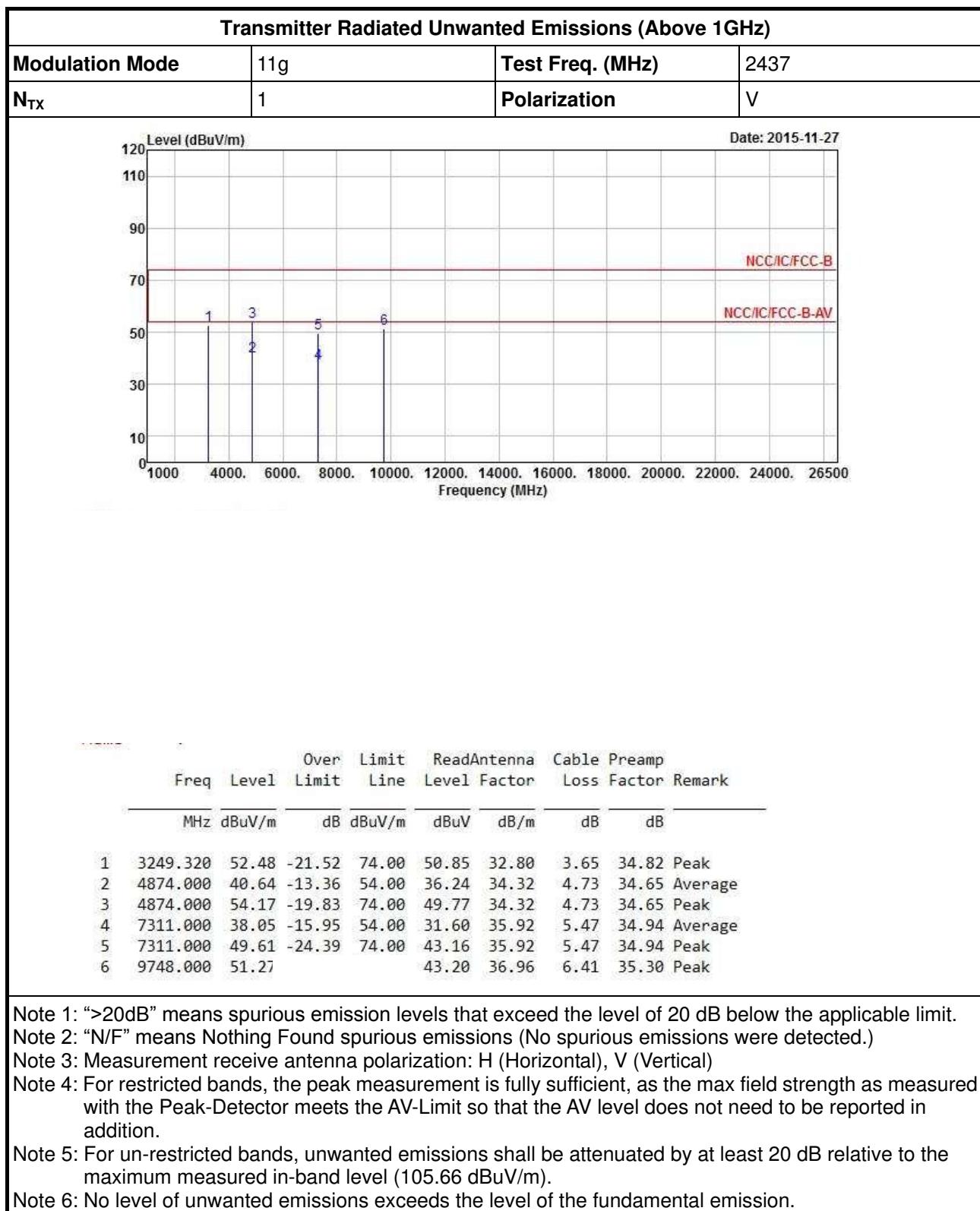


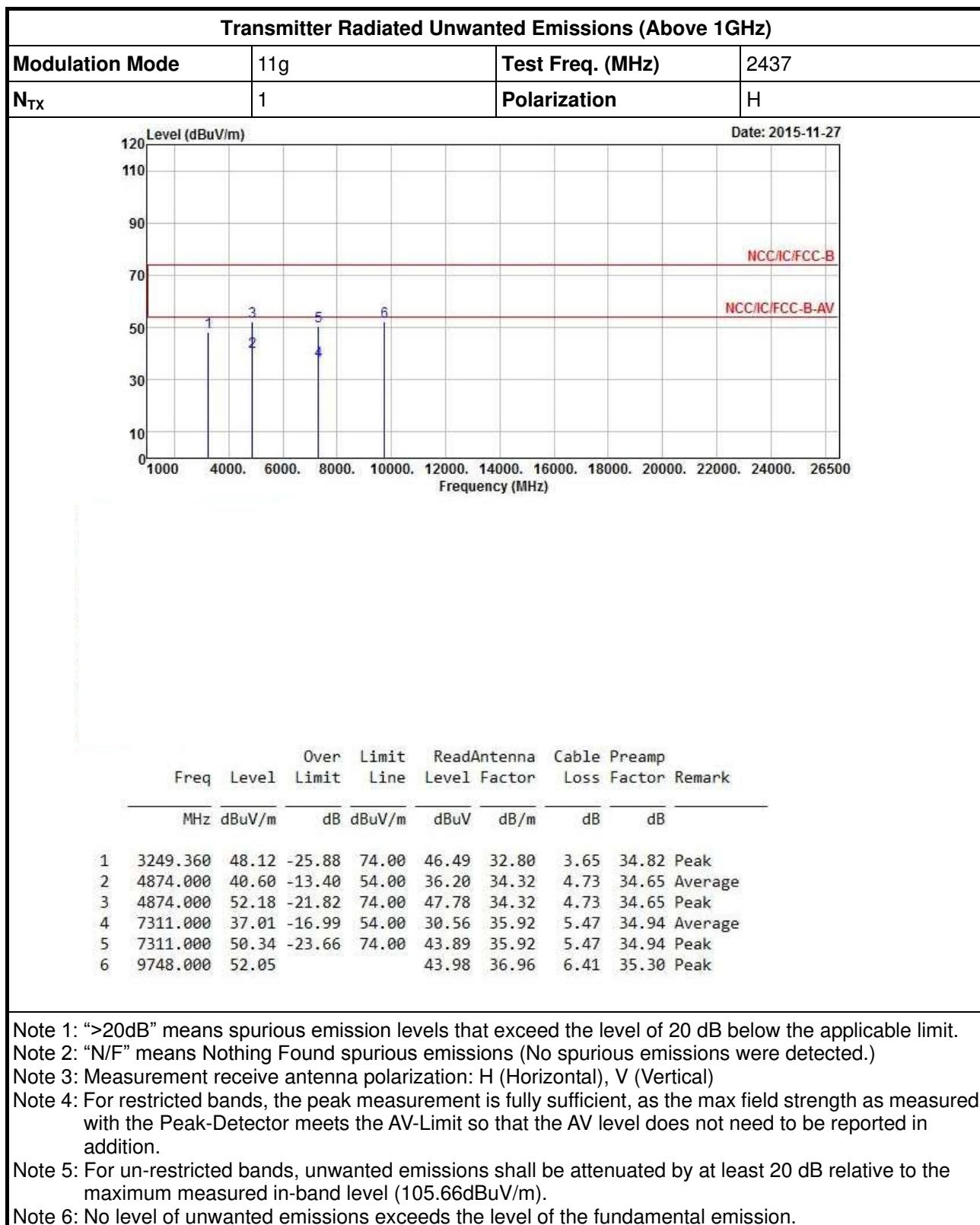


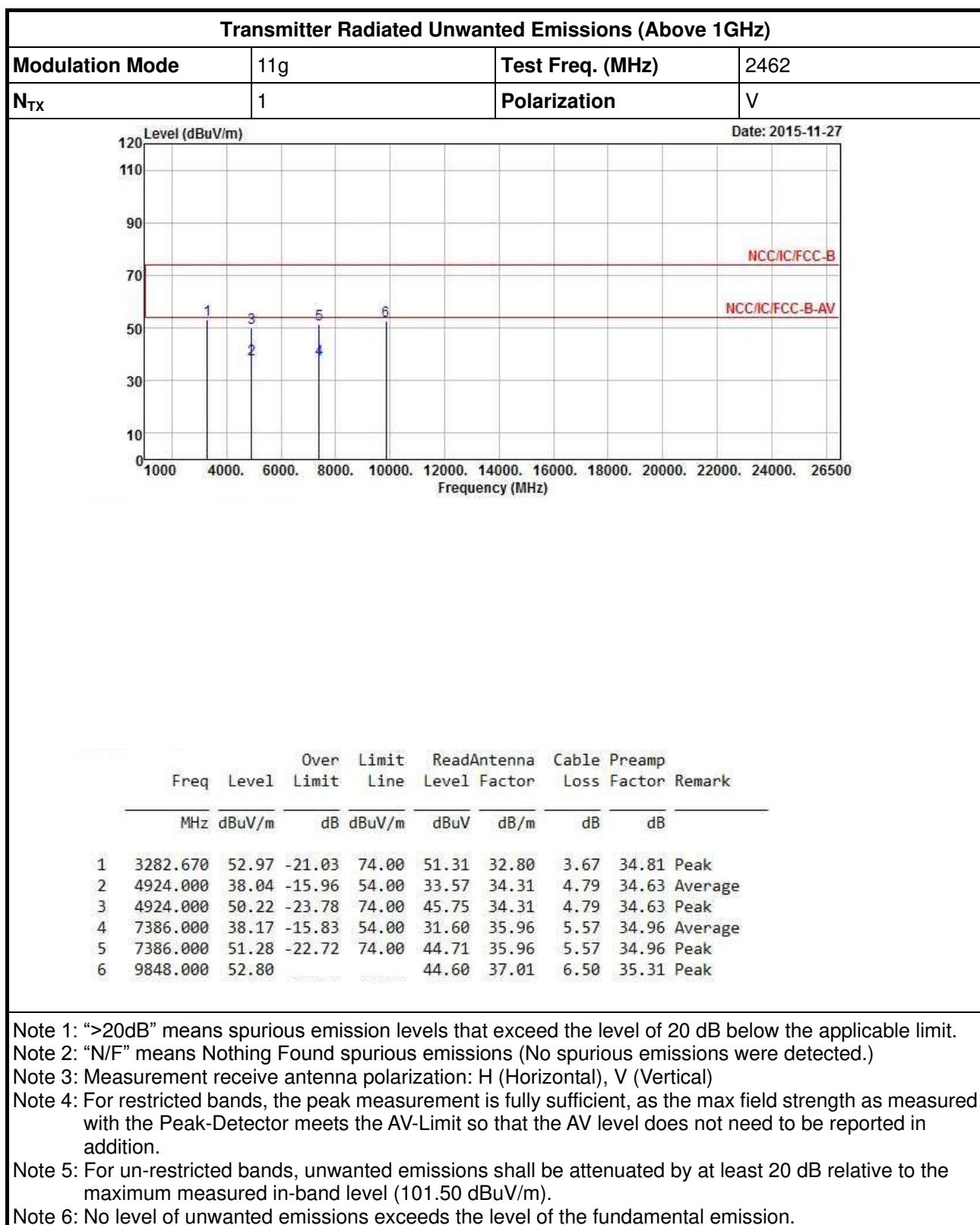


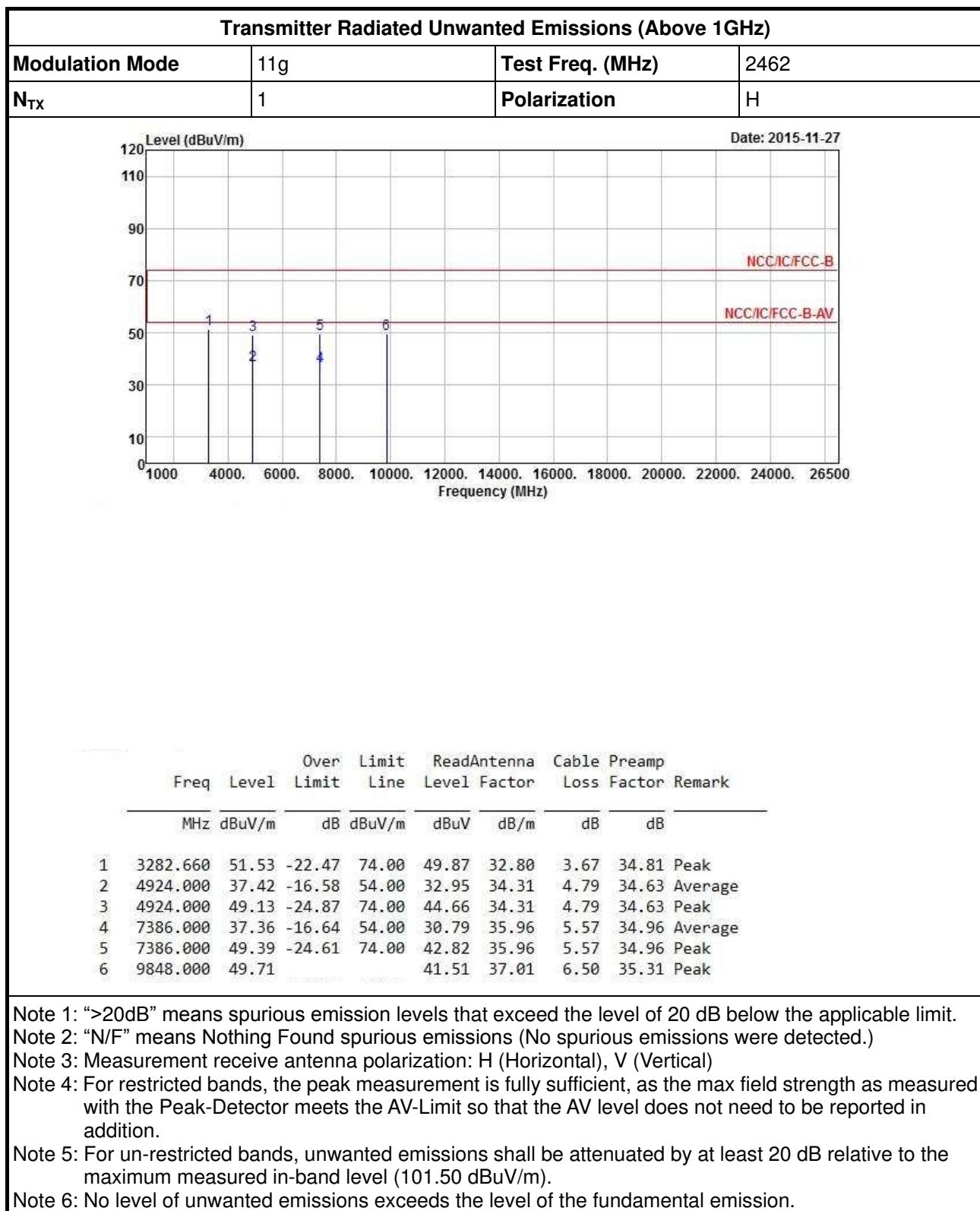


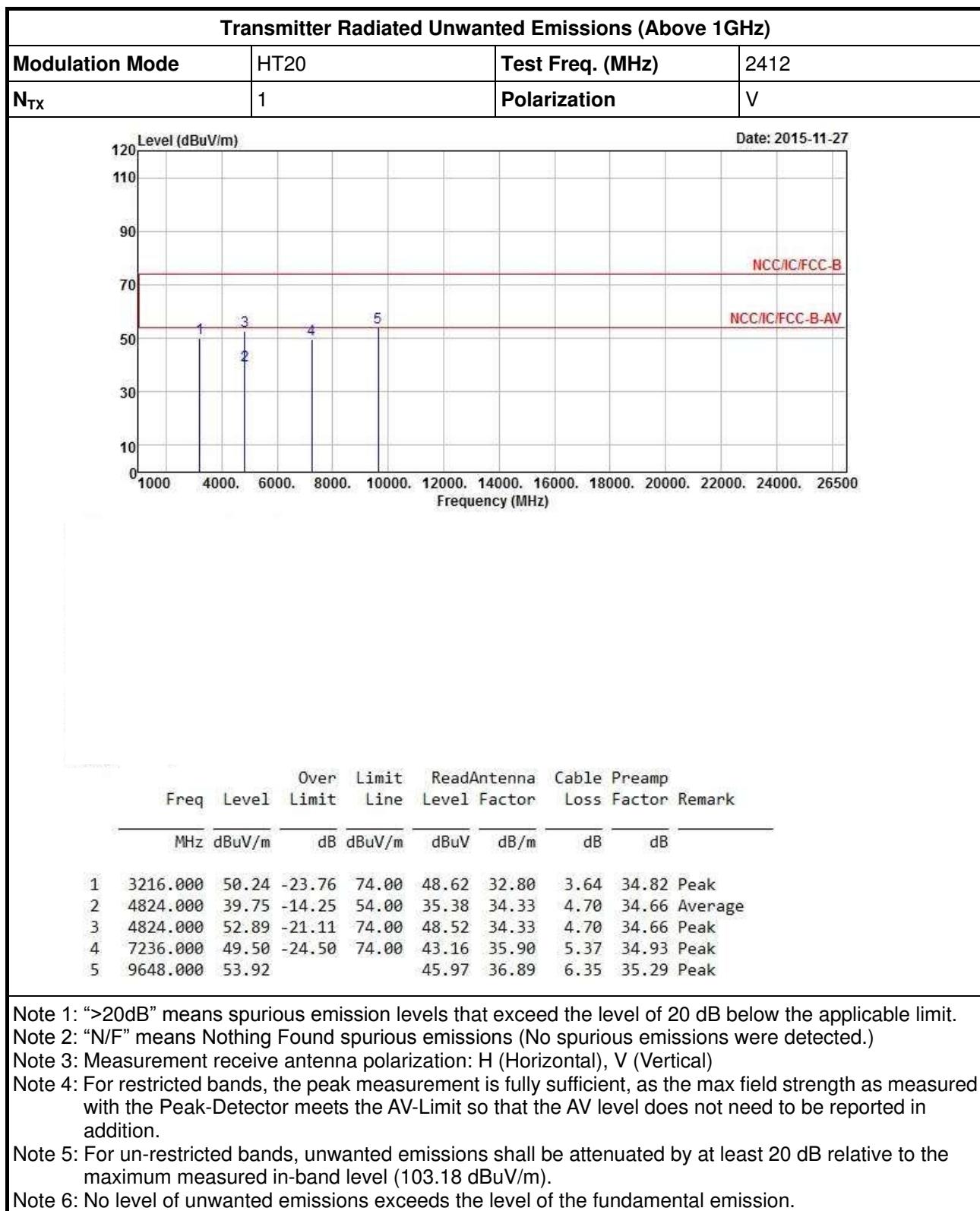












Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

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.

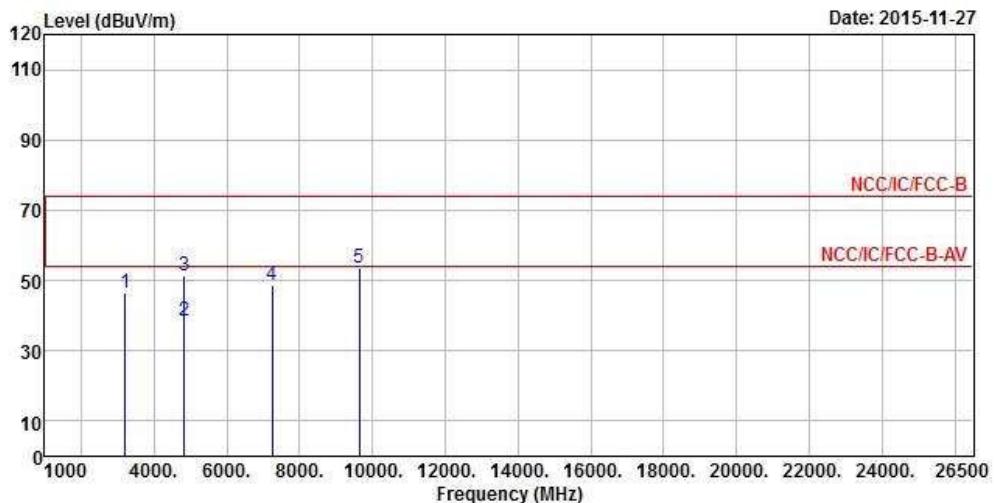
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (103.18 dBuV/m).

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.



## Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	HT20	Test Freq. (MHz)	2412
N <sub>TX</sub>	1	Polarization	H



Freq	Level	Over	Limit	Read	Antenna	Cable Preamp		
		Limit	Line	Level	Factor	Loss	Factor	Remark
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 3216.000	46.52	-27.48	74.00	44.90	32.80	3.64	34.82	Peak
2 4824.000	38.74	-15.26	54.00	34.37	34.33	4.70	34.66	Average
3 4824.000	51.42	-22.58	74.00	47.05	34.33	4.70	34.66	Peak
4 7236.000	48.92	-25.08	74.00	42.58	35.90	5.37	34.93	Peak
5 9648.000	53.40			45.45	36.89	6.35	35.29	Peak

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

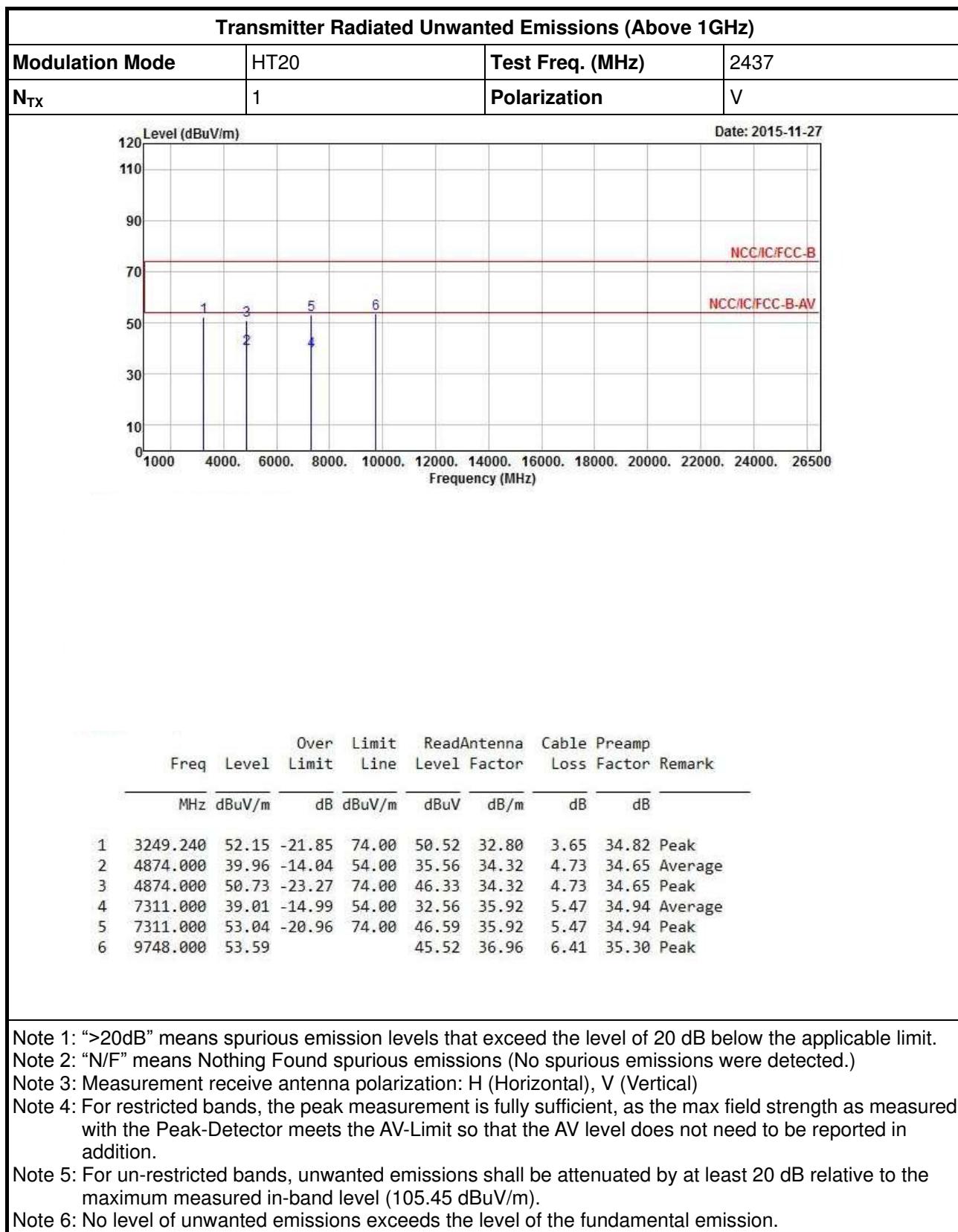
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

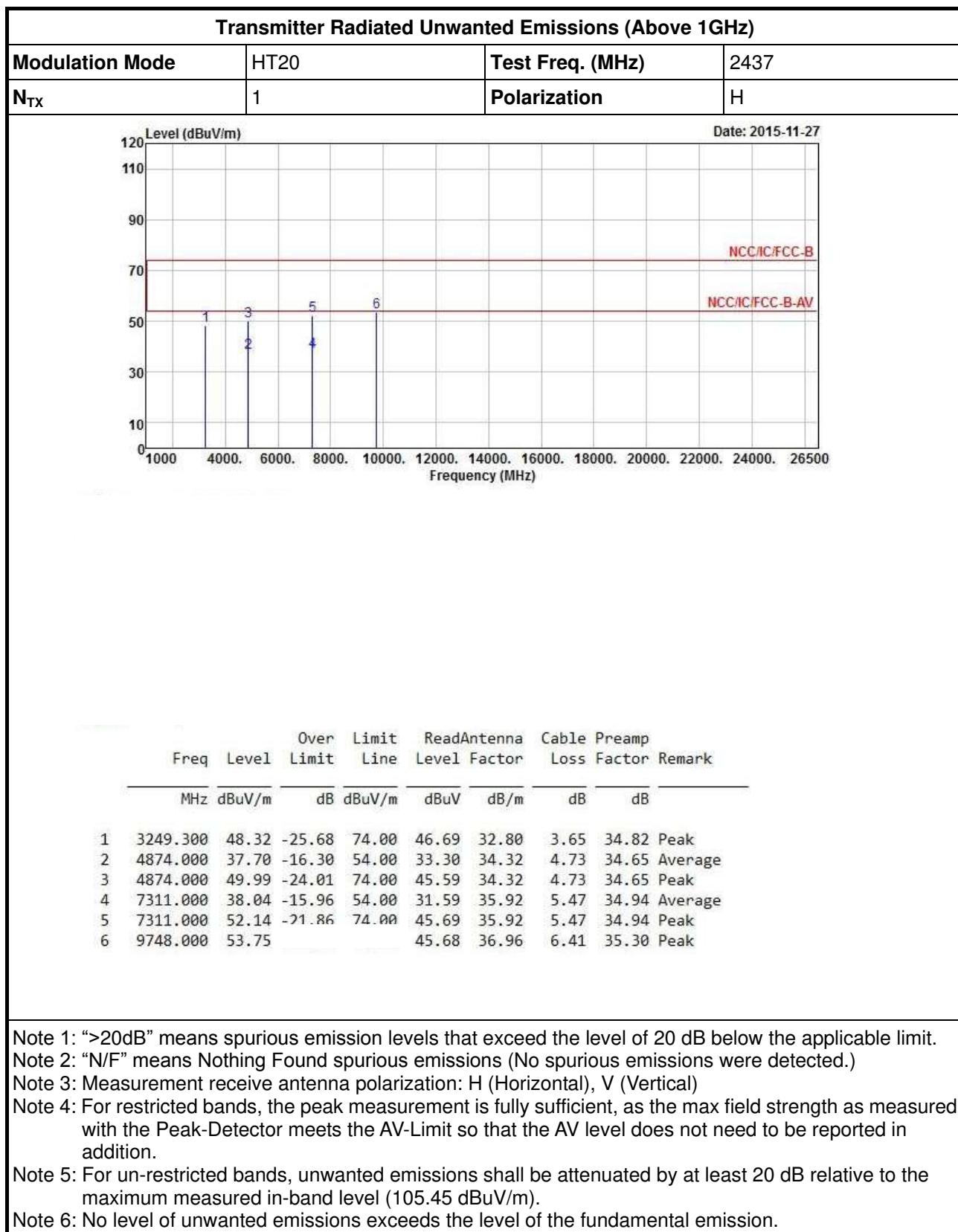
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

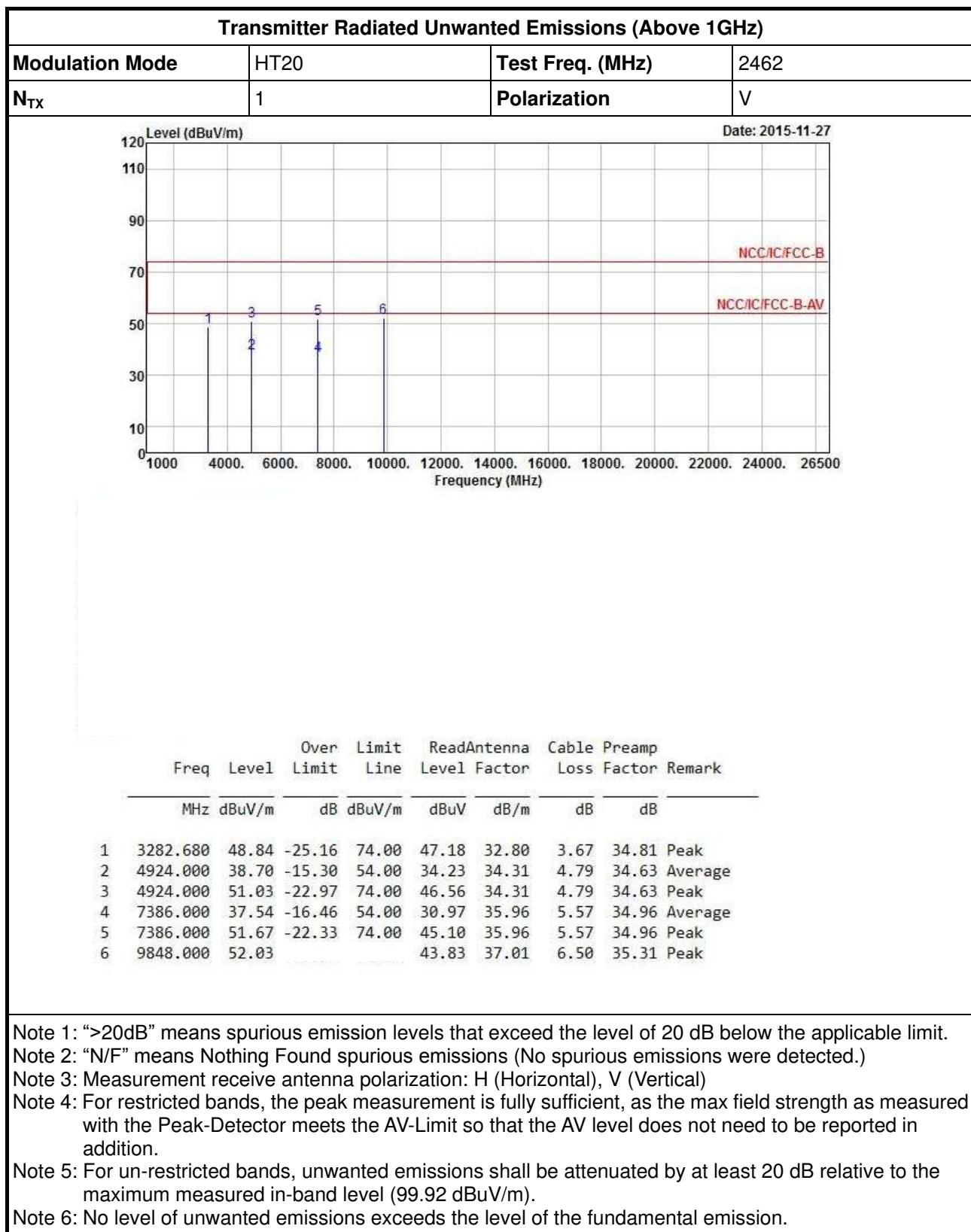
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

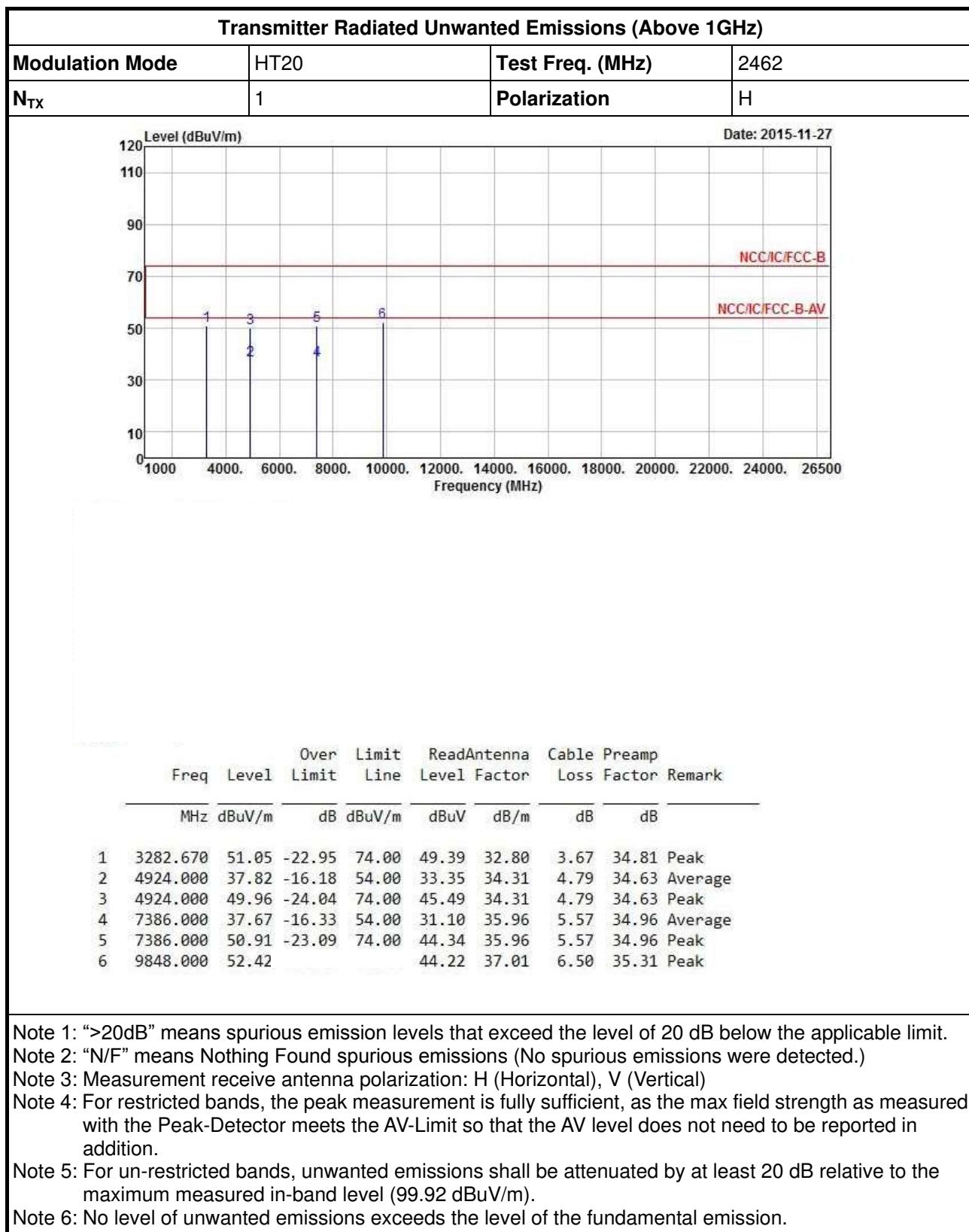
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (103.18 dBuV/m).

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.











## 4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	Nov. 29, 2014	Radiation
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	1GHz ~ 18GHz 3m	Dec. 17, 2014	Radiation
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	May 11, 2015	Radiation
Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	Sep. 02, 2015	Radiation
Spectrum	R&S	FSP40	100004	9kHz ~ 40GHz	Apr. 02, 2015	Radiation
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30MHz ~ 1GHz	Sep. 18, 2015	Radiation
Horn Antenna	ETS • LINDGREN	3115	6741	1GHz ~ 18GHz	Jul. 15, 2015	Radiation
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	18GHz ~ 40GHz	Jan. 27, 2015	Radiation
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Oct. 28, 2015	Radiation
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Nov. 15, 2014	Radiation
RF Cable-high	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz ~ 40GHz	Dec. 12, 2014	Radiation
Turn Table	EM Electronics	EM Electronics	060615	0 ~ 360 degree	N/A	Radiation
Antenna Mast	MF	MF-7802	MF780208179	1 ~ 4 m	N/A	Radiation

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	100330	9 kHz~30 MHz	Nov.16.2015	Radiation

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