



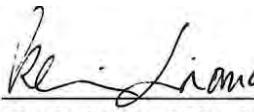
# FCC Test Report

**Equipment** : WiFi abgn module  
**Brand Name** : TSC  
**Model No.** : RF-WRN  
**FCC ID** : VTV-RFWRN  
**Standard** : 47 CFR FCC Part 15.247  
**Operating Band** : 2400 MHz – 2483.5 MHz  
**FCC Classification** : DTS  
**Applicant** : TSC Auto ID Technology Co., Ltd.  
**Manufacturer** : No. 35, Sec. 2, Ligong 1st Rd., Wujie Town,  
I-Lan County 26841, TAIWAN

The product sample received on Aug. 22, 2015 and completely tested on Oct. 14, 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]: 0.1540270MHz 37.44 (Margin 18.34dB) - AV 52.78 (Margin 13.00dB) - QP	FCC 15.207	Complied
3.2	15.247(a)	6dB Bandwidth	6dB Bandwidth Unit [MHz]:9.39	$\geq$ 500kHz	Complied
3.3	15.247(b)	RF Output Power (Maximum Peak Conducted Output Power)	Power [dBm]: 21.75	Power [dBm]:30	Complied
3.4	15.247(e)	Power Spectral Density	PSD [dBm/100kHz]: -10.04	PSD [dBm/3kHz]:8	Complied
3.5	15.247(d)	Transmitter Radiated Bandedge Emissions	Non-Restricted Bands: 2503MHz: 20.54dB Restricted Bands [dBuV/m at 3m]: 2483.500MHz 72.80 (Margin 1.20dB) - PK 52.93 (Margin 1.07dB) - AV	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied
3.6	15.247(d)	Transmitter Radiated Unwanted Emissions	Restricted Bands [dBuV/m at 3m]: 31.940MHz 38.85 (Margin 1.15dB) - QP	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	19.79
2400-2483.5	g	2412-2462	1-11 [11]	1	21.26
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	1	21.75

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 checked="" 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 type="checkbox"/>	<input checked="" 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			
No.	Ant. Cat.	Ant. Type	Gain (dBi)
1	External	Dipole	2
2	Integral	PCB	0.99
3	External	PIFA	-0.5

Note 1: EUT can match with above antennas for using. Higher gain in each type of antenna was used to perform the worst configuration and result of that was recorded as the final test result.  
Note 2: IEEE 802.11b/g/n only includes 1TX and Port1 for emission.



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

### 1.1.5 EUT Operational Condition

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



## 1.2 Support Equipment

Support Equipment - RF Conducted				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	DELL	E5540	DoC
2	Adapter (For notebook)	DELL	HA65NM130	DoC
3	Test Fixture	-	-	-

Note: The Test Fixture provided by Customer.

Support Equipment - AC Conduction				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	DELL	E5540	DoC
2	Adapter (For notebook)	DELL	HA65NM130	DoC
3	Test Fixture	-	-	-

Note: The Test Fixture provided by Customer.

Support Equipment - Radiated Emission				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	DELL	E5530	DoC
2	Adapter (For notebook)	DELL	HA65NM130	DoC
3	Test Fixture	-	-	-

Note: The Test Fixture provided by Customer.

## 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 v03r03



## 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 : 886-3-327-0973 FAX : 886-3-327-0973				
Test site registered number [636805] with FCC.				
Test Condition	Test Site No.	Test Engineer	Test Environment	
AC Conduction	CO04-HY	Zeus	23°C / 56%	
RF Conducted	TH01-HY	Candy	21.1°C / 58.2%	
Radiated Emission for LF	03CH02-HY	Daniel	23.8°C / 56.1%	
Radiated Emission for HF		Joe	26.8°C / 61%	
Test Site Registration Number				
FCC				
636805				



## 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 (HT: High Throughput). Then EUT support 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, HT-20: 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	QCOM_V1.0 10.12.21.15.08				
Modulation Mode	N <sub>TX</sub>	Test Frequency (MHz)			
		NCB: 20MHz			
		2412	2437	2462	
11b	1	15	18	14	
11g	1	12	17	9	
HT-20	1	10	17	7	



## 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 with Dipole Antenna
2	EUT with PCB Antenna
3	EUT with PIFA Antenna
Operating mode 1 is the worst case and it is recorded in this test report.	

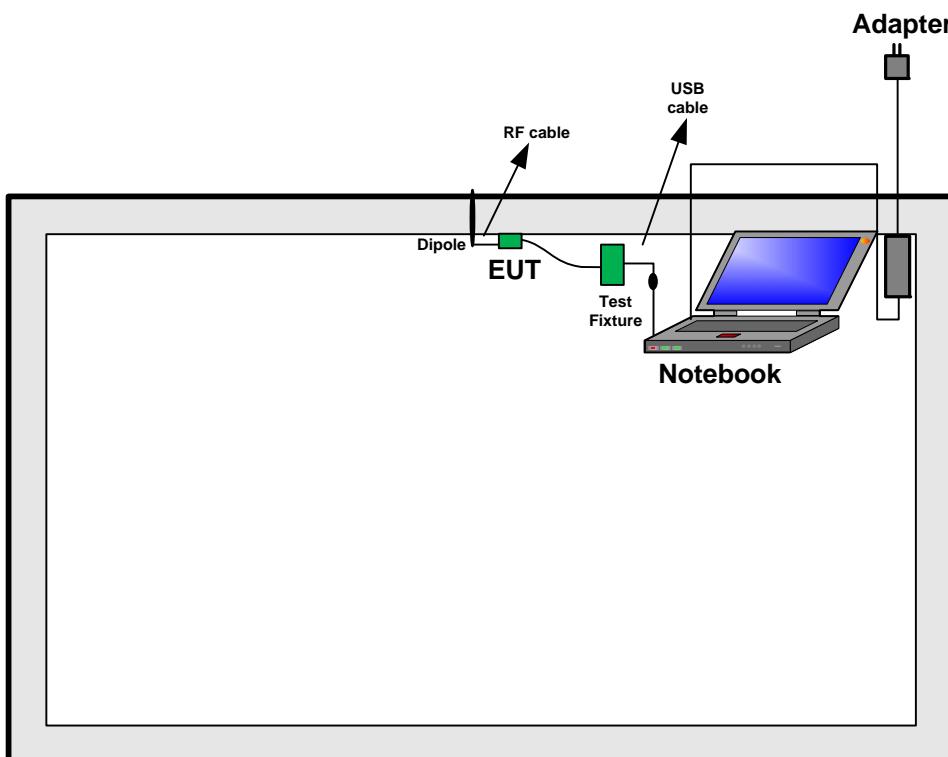
The Worst Case Mode for Following Conformance Tests	
<b>Tests Item</b>	RF Output Power, Power Spectral Density, 6 dB Bandwidth
<b>Test Condition</b>	Conducted measurement at transmit chains
<b>Modulation Mode</b>	11b, 11g, HT20



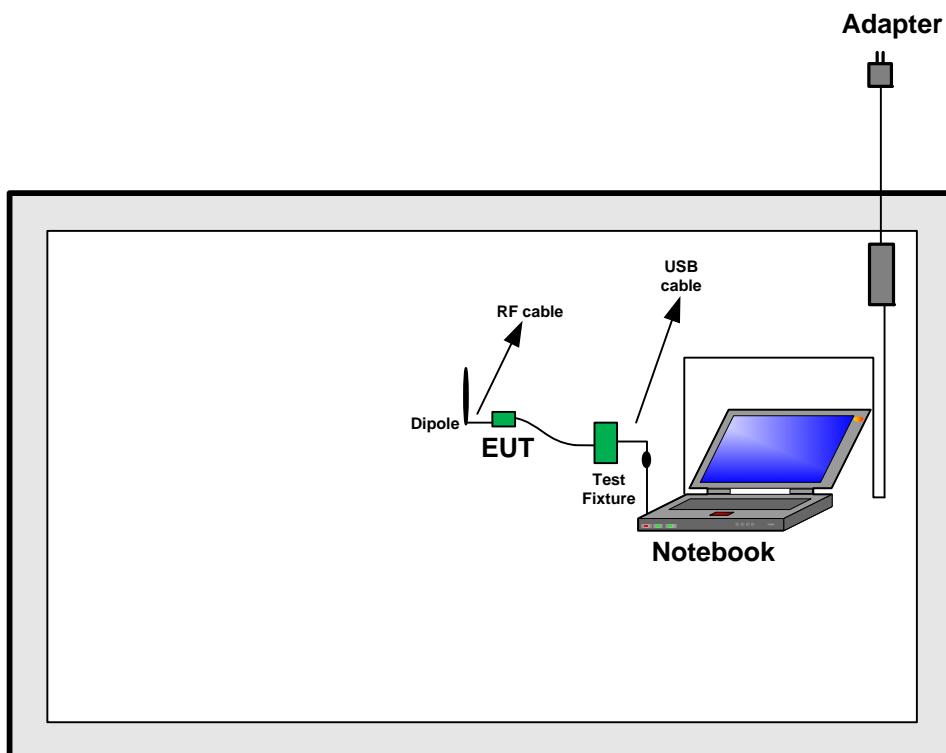
The Worst Case Mode for Following Conformance Tests							
<b>Tests Item</b>	Transmitter Radiated Unwanted Emissions Transmitter Radiated Bandedge Emissions						
<b>Test Condition</b>	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.						
<b>User Position</b>	<input type="checkbox"/> EUT will be placed in fixed position. <input checked="" type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. EUT shall be performed three 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 three orthogonal planes.						
<b>Operating Mode</b>	Operating Mode Description						
<b>Radiated Emissions Below 1GHz</b>	<input checked="" type="checkbox"/> 1. EUT with Dipole Antenna <input checked="" type="checkbox"/> 2. EUT with PCB Antenna <input checked="" type="checkbox"/> 3. EUT with PIFA Antenna <b>Operating mode 1 is the worst case and it is recorded in this test report.</b>						
<b>Radiated Emissions Above 1GHz</b>	<input checked="" type="checkbox"/> 1. EUT with Dipole Antenna <input checked="" type="checkbox"/> 2. EUT with PCB Antenna <input checked="" type="checkbox"/> 3. EUT with PIFA Antenna						
<b>Modulation Mode</b>	11b, 11g, HT20						
<b>Orthogonal Planes of EUT</b>	<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					
<b>Worst Planes of EUT</b>	V						

## 2.4 Test Setup Diagram

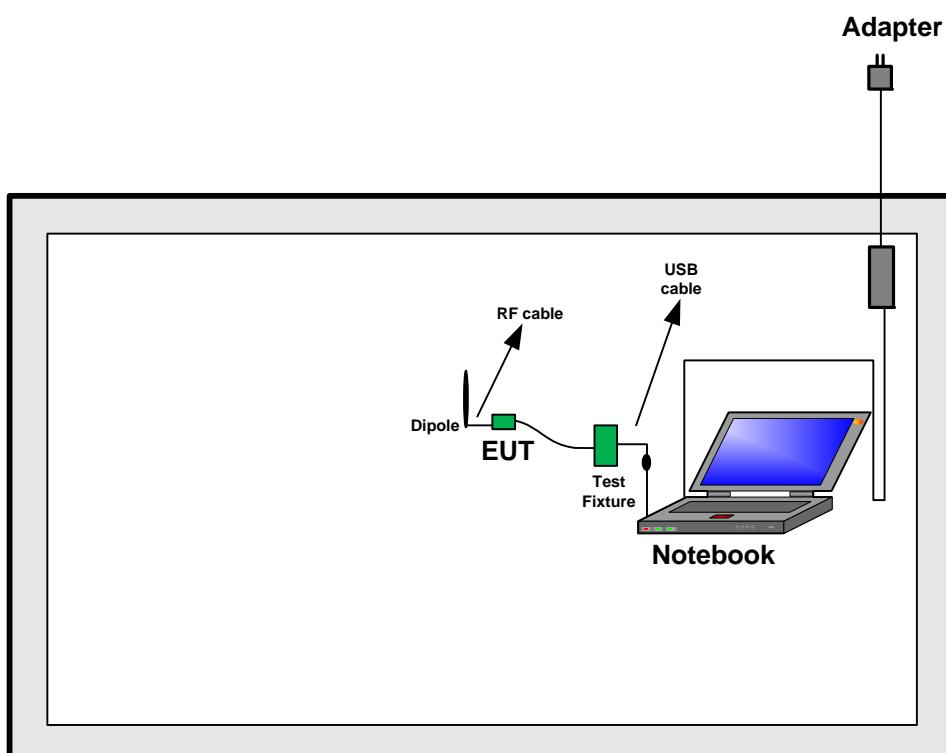
Test Setup Diagram – AC Line Conducted Emission Test (Mode 1)

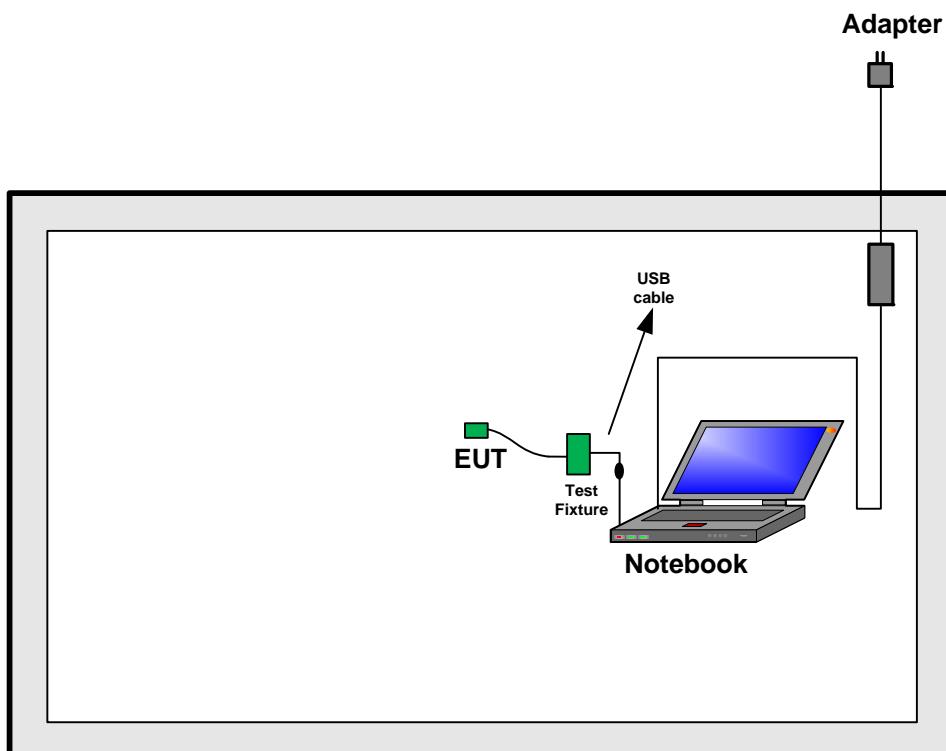
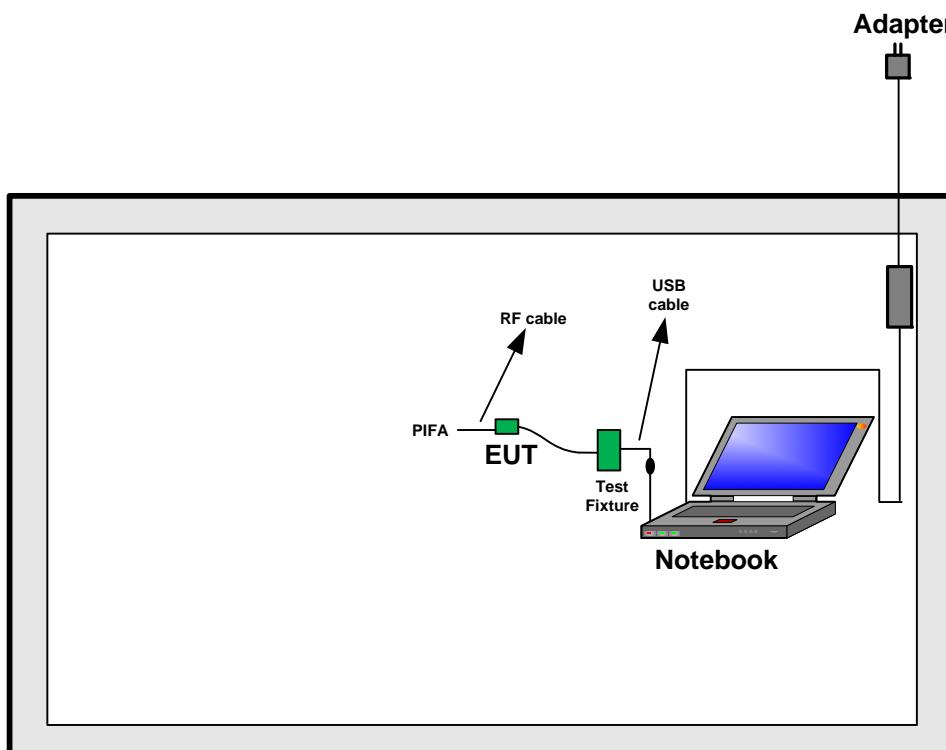


## Test Setup Diagram - Radiated Test Below 1GHz (Mode 1)



## Test Setup Diagram - Radiated Test Above 1GHz (Mode 1)



**Test Setup Diagram - Radiated Test Above 1GHz (Mode 2)****Test Setup Diagram - Radiated Test Above 1GHz (Mode 3)**

### 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.

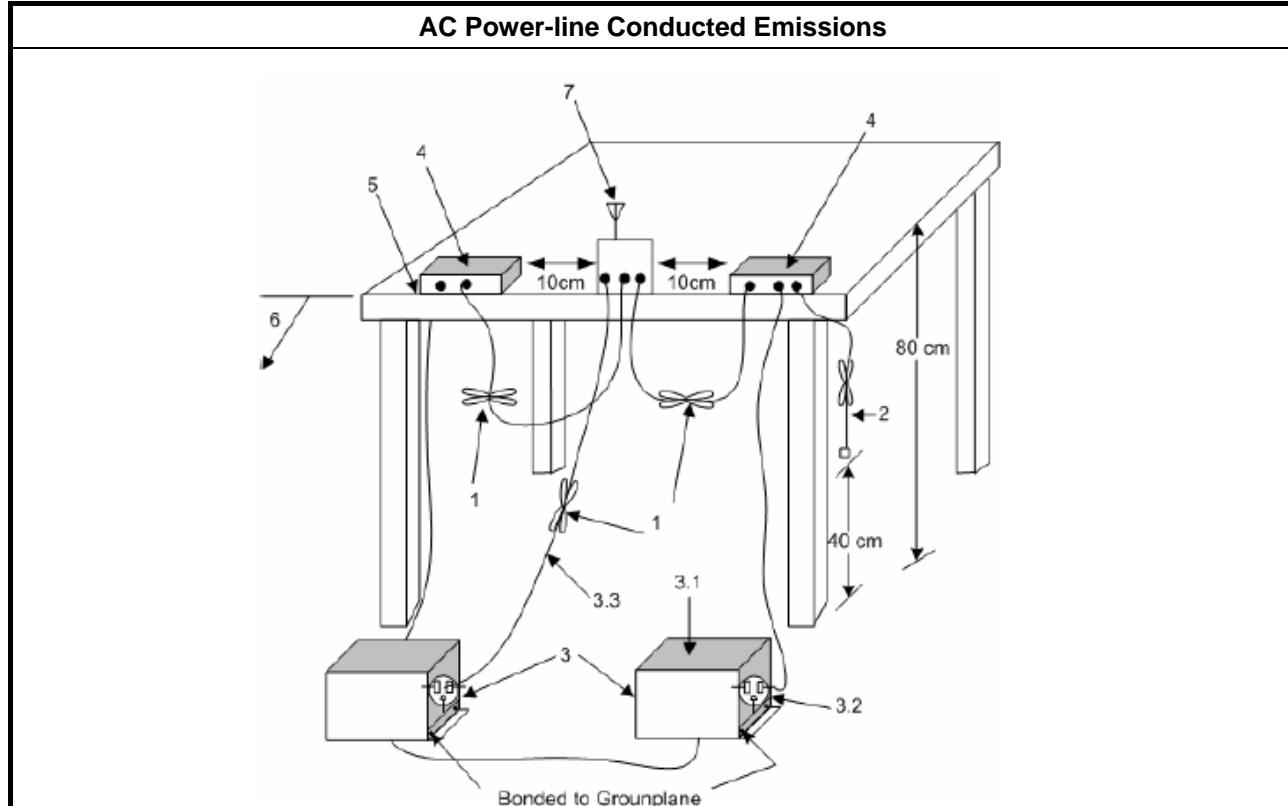
##### 3.1.2 Measuring Instruments

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

##### 3.1.3 Test Procedures

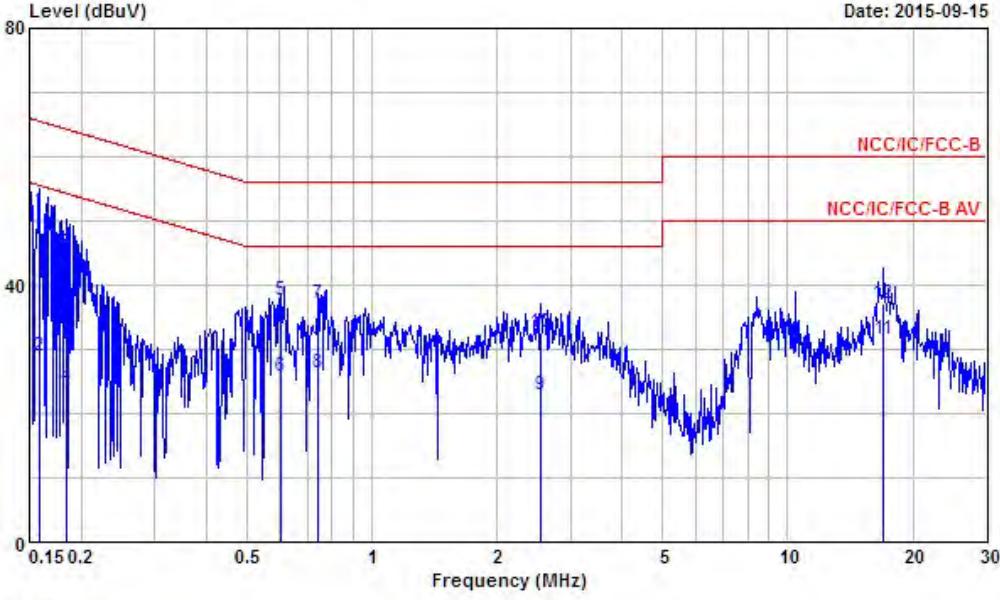
Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.

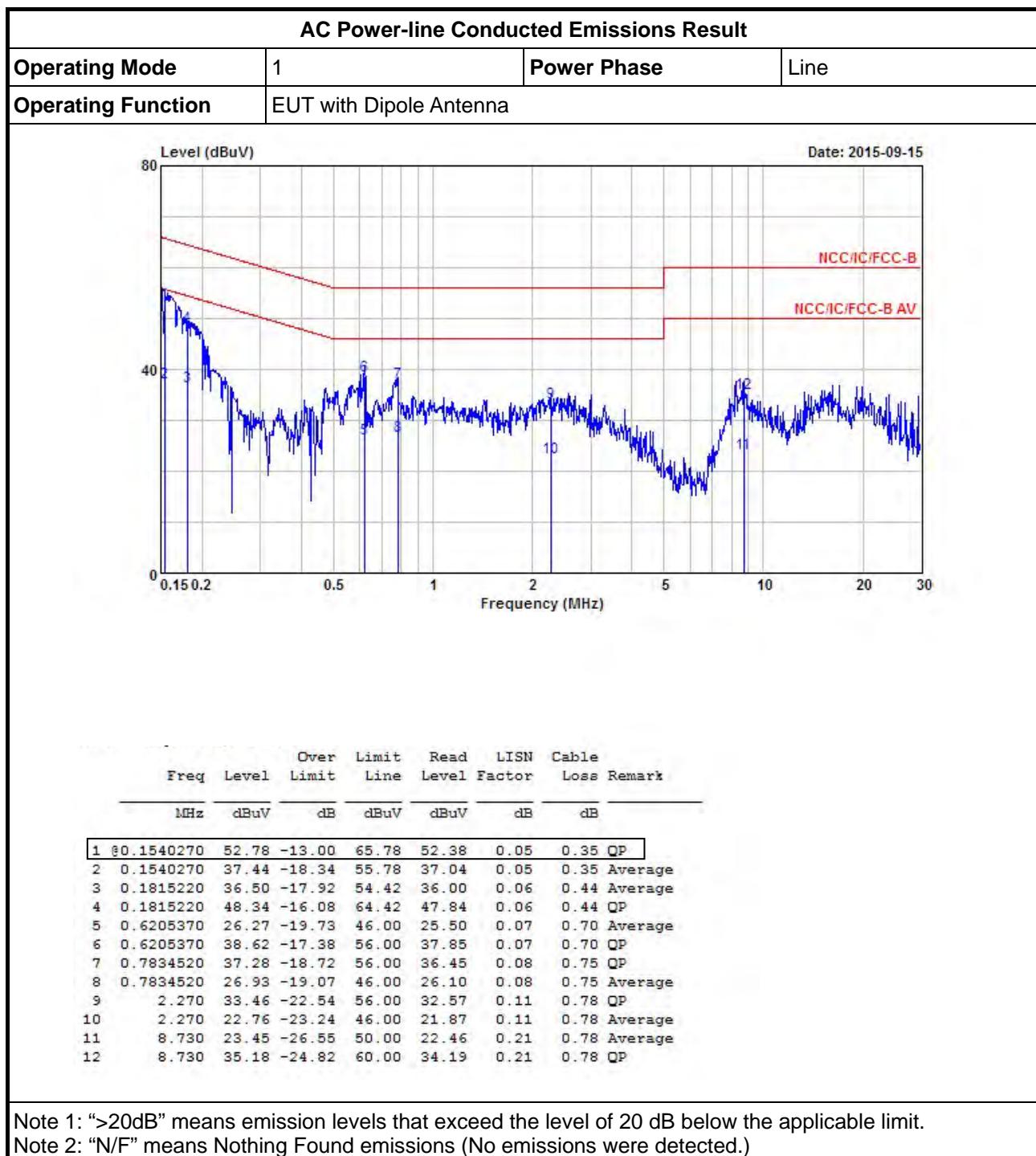
##### 3.1.4 Test Setup





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

AC Power-line Conducted Emissions Result																																																																																																																							
Operating Mode	1	Power Phase	Neutral																																																																																																																				
Operating Function	EUT with Dipole Antenna																																																																																																																						
							Date: 2015-09-15																																																																																																																
<table><thead><tr><th>Freq</th><th>Level</th><th>Over Limit</th><th>Limit Line</th><th>Read Level</th><th>LISN Factor</th><th>Cable Loss</th><th>Remark</th></tr><tr><th>MHz</th><th>dBuV</th><th>dB</th><th>dBuV</th><th>dBuV</th><th>dB</th><th>dB</th><th></th></tr></thead><tbody><tr><td>1 0.1590020</td><td>51.56</td><td>-13.96</td><td>65.52</td><td>51.12</td><td>0.07</td><td>0.37</td><td>QP</td></tr><tr><td>2 0.1590020</td><td>29.01</td><td>-26.51</td><td>55.52</td><td>28.57</td><td>0.07</td><td>0.37</td><td>Average</td></tr><tr><td>3 0.1844300</td><td>44.87</td><td>-19.41</td><td>64.28</td><td>44.35</td><td>0.07</td><td>0.45</td><td>QP</td></tr><tr><td>4 0.1844300</td><td>24.12</td><td>-30.16</td><td>54.28</td><td>23.60</td><td>0.07</td><td>0.45</td><td>Average</td></tr><tr><td>5 0.6011200</td><td>37.70</td><td>-18.30</td><td>56.00</td><td>36.93</td><td>0.08</td><td>0.69</td><td>QP</td></tr><tr><td>6 0.6011200</td><td>25.92</td><td>-20.08</td><td>46.00</td><td>25.15</td><td>0.08</td><td>0.69</td><td>Average</td></tr><tr><td>7 0.7430230</td><td>36.99</td><td>-19.01</td><td>56.00</td><td>36.18</td><td>0.08</td><td>0.73</td><td>QP</td></tr><tr><td>8 0.7430230</td><td>26.23</td><td>-19.77</td><td>46.00</td><td>25.42</td><td>0.08</td><td>0.73</td><td>Average</td></tr><tr><td>9 2.550</td><td>22.89</td><td>-23.11</td><td>46.00</td><td>22.01</td><td>0.11</td><td>0.77</td><td>Average</td></tr><tr><td>10 2.550</td><td>32.60</td><td>-23.40</td><td>56.00</td><td>31.72</td><td>0.11</td><td>0.77</td><td>QP</td></tr><tr><td>11 17.020</td><td>31.60</td><td>-18.40</td><td>50.00</td><td>30.48</td><td>0.36</td><td>0.76</td><td>Average</td></tr><tr><td>12 17.020</td><td>37.17</td><td>-22.83</td><td>60.00</td><td>36.05</td><td>0.36</td><td>0.76</td><td>QP</td></tr></tbody></table>								Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	MHz	dBuV	dB	dBuV	dBuV	dB	dB		1 0.1590020	51.56	-13.96	65.52	51.12	0.07	0.37	QP	2 0.1590020	29.01	-26.51	55.52	28.57	0.07	0.37	Average	3 0.1844300	44.87	-19.41	64.28	44.35	0.07	0.45	QP	4 0.1844300	24.12	-30.16	54.28	23.60	0.07	0.45	Average	5 0.6011200	37.70	-18.30	56.00	36.93	0.08	0.69	QP	6 0.6011200	25.92	-20.08	46.00	25.15	0.08	0.69	Average	7 0.7430230	36.99	-19.01	56.00	36.18	0.08	0.73	QP	8 0.7430230	26.23	-19.77	46.00	25.42	0.08	0.73	Average	9 2.550	22.89	-23.11	46.00	22.01	0.11	0.77	Average	10 2.550	32.60	-23.40	56.00	31.72	0.11	0.77	QP	11 17.020	31.60	-18.40	50.00	30.48	0.36	0.76	Average	12 17.020	37.17	-22.83	60.00	36.05	0.36	0.76	QP
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12 17.020	37.17	-22.83	60.00	36.05	0.36	0.76	QP																																																																																																																
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
<b>Systems using digital modulation techniques:</b>
<input checked="" type="checkbox"/> 6 dB bandwidth $\geq$ 500 kHz.

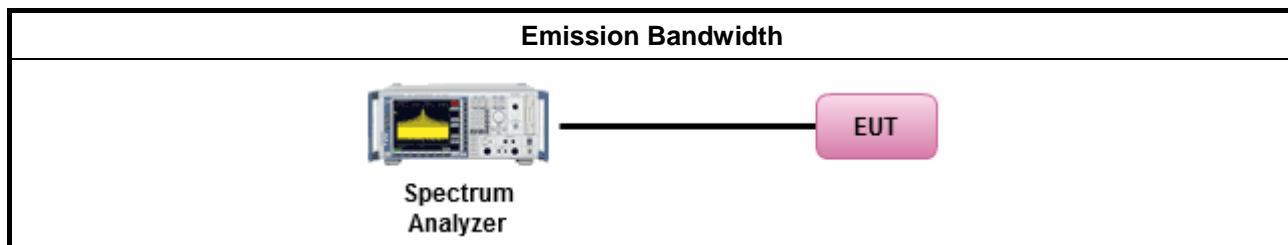
### 3.2.2 Measuring Instruments

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, clause 8.1 Option 1 for 6 dB bandwidth measurement.
<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.2 Option 2 for 6 dB bandwidth measurement.
<input type="checkbox"/> Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
<input checked="" type="checkbox"/> For conducted measurement.
<input checked="" type="checkbox"/> The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
<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.

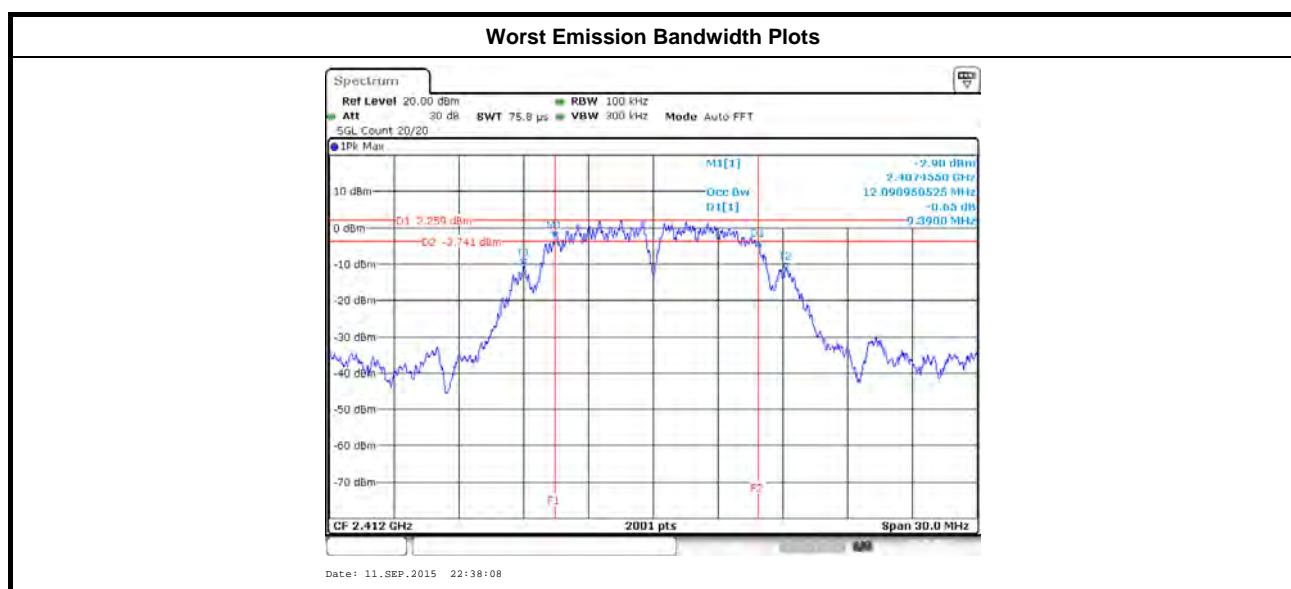
### 3.2.4 Test Setup





## 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	12.09	9.39	
11b	1	2437	12.48	9.93	
11b	1	2462	12.15	9.64	
11g	1	2412	16.47	16.45	
11g	1	2437	17.15	16.57	
11g	1	2462	16.49	16.53	
HT20	1	2412	17.72	17.77	
HT20	1	2437	18.48	17.68	
HT20	1	2462	17.64	17.71	
Limit			N/A	≥500 kHz	
Result			Complied		

Note 1: N<sub>TX</sub> = 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 checked="" 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 type="checkbox"/> Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W)
	<input checked="" type="checkbox"/> Point-to-point systems (P2P): $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX}])$ dBm
	<input type="checkbox"/> Smart antenna system (SAS)
	<input type="checkbox"/> Single beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm
	<input type="checkbox"/> Overlap beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm
	<input type="checkbox"/> Aggregate power on all beams: $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX} + 8])$ dBm
$P_{Out}$ = maximum peak conducted output power or maximum conducted output power in dBm, $G_{TX}$ = the maximum transmitting antenna directional gain in dBi. $P_{eirp}$ = e.i.r.p. Power in dBm.	

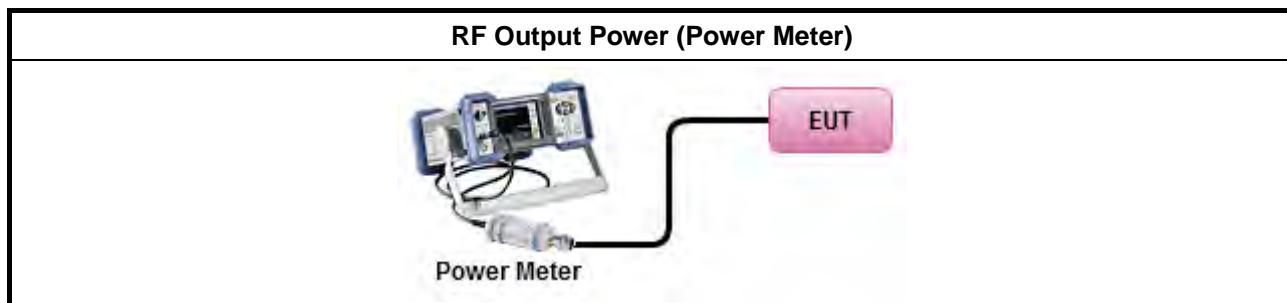
#### 3.3.2 Measuring Instruments

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

### 3.3.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/> Maximum Peak Conducted Output Power	<input type="checkbox"/> Refer as FCC KDB 558074, clause 9.1.1 Option 1 (RBW $\geq$ EBW method). <input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 9.1.2 Option 2 (peak power meter for VBW $\geq$ DTS BW)
<input checked="" type="checkbox"/> Maximum Conducted Output Power	<p>[duty cycle <math>\geq</math> 98% or external video / power trigger]</p> <p><input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.2.2 Method AVGSA-1 (spectral trace averaging).</p> <p><input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.2.3 Method AVGSA-1 Alt. (slow sweep speed)</p> <p>duty cycle &lt; 98% and average over on/off periods with duty factor</p> <p><input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.2.4 Method AVGSA-2 (spectral trace averaging).</p> <p><input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.2.5 Method AVGSA-2 Alt. (slow sweep speed)</p> <p>RF power meter and average over on/off periods with duty factor or gated trigger</p> <p><input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.3 Method AVGPM (using an RF average power meter).</p>
<input checked="" type="checkbox"/> For conducted measurement.	<p><input checked="" type="checkbox"/> The EUT supports single transmit chain and measurements performed on this transmit chain.</p> <p><input type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.</p> <p><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.</p> <p><input type="checkbox"/> If multiple transmit chains, EIRP calculation could be following as methods: <math>P_{total} = P_1 + P_2 + \dots + P_n</math> (calculated in linear unit [mW] and transfer to log unit [dBm]) <math>EIRP_{total} = P_{total} + DG</math></p>

### 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)	RF Output Power	Power Limit	Antenna Gain (dBi)	EIRP Power	EIRP Limit
11b	1	2412	16.69	30.00	2.00	18.69	36.00
11b	1	2437	19.79	30.00	2.00	21.79	36.00
11b	1	2462	16.41	30.00	2.00	18.41	36.00
11g	1	2412	15.65	30.00	2.00	17.65	36.00
11g	1	2437	21.26	30.00	2.00	23.26	36.00
11g	1	2462	11.96	30.00	2.00	13.96	36.00
HT20	1	2412	13.84	30.00	2.00	15.84	36.00
HT20	1	2437	21.75	30.00	2.00	23.75	36.00
HT20	1	2462	10.47	30.00	2.00	12.47	36.00
Result			Complied				

### 3.3.6 Test Result of Maximum Conducted Output Power

Maximum Conducted Output Power							
Condition			RF Output Power (dBm)				
Modulation Mode	N <sub>TX</sub>	Freq. (MHz)	RF Output Power	Power Limit	Antenna Gain (dBi)	EIRP Power	EIRP Limit
11b	1	2412	13.82	30.00	2.00	15.82	36.00
11b	1	2437	16.89	30.00	2.00	18.89	36.00
11b	1	2462	13.53	30.00	2.00	15.53	36.00
11g	1	2412	10.69	30.00	2.00	12.69	36.00
11g	1	2437	16.38	30.00	2.00	18.38	36.00
11g	1	2462	7.08	30.00	2.00	9.08	36.00
HT20	1	2412	8.93	30.00	2.00	10.93	36.00
HT20	1	2437	16.86	30.00	2.00	18.86	36.00
HT20	1	2462	5.65	30.00	2.00	7.65	36.00
Result			Complied				



## 3.4 Power Spectral Density

### 3.4.1 Power Spectral Density Limit

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

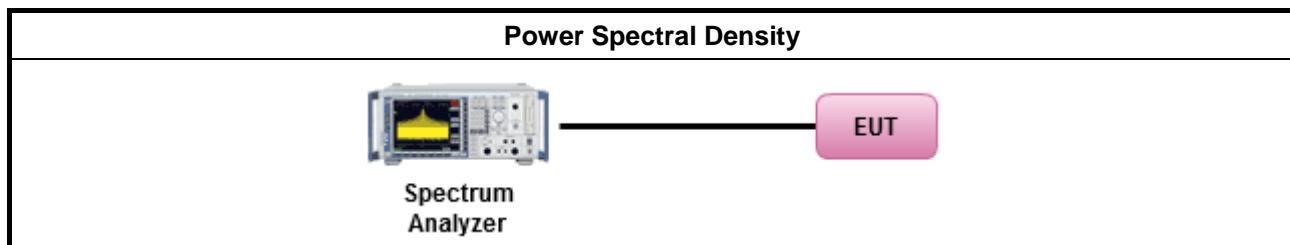
### 3.4.2 Measuring Instruments

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

### 3.4.3 Test Procedures

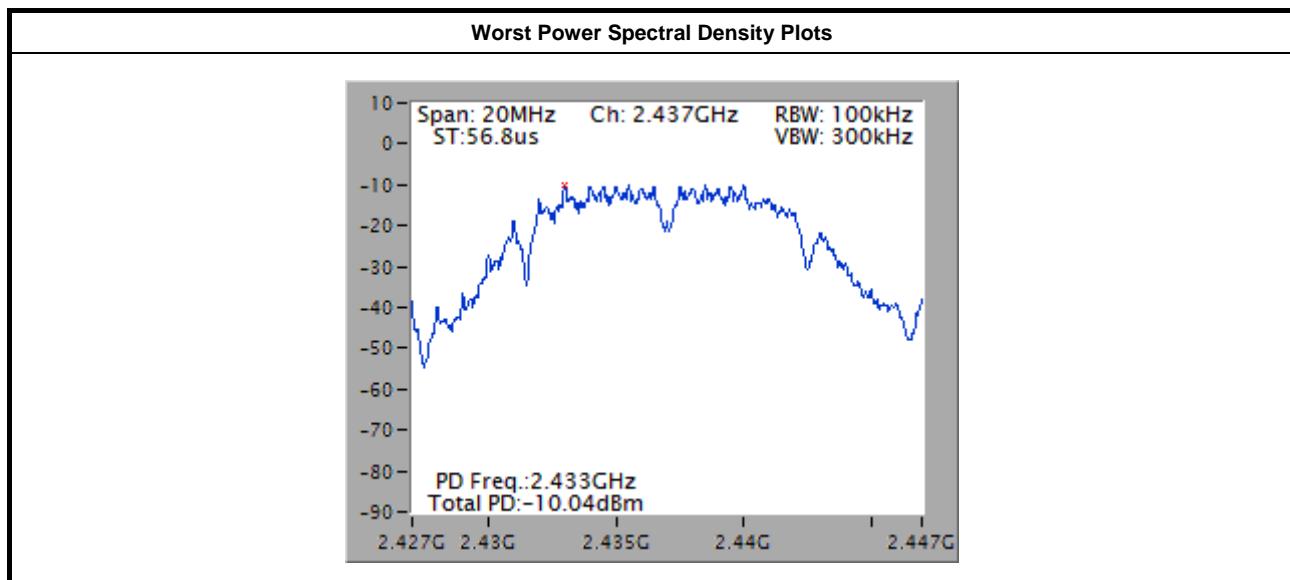
Test Method
<input checked="" type="checkbox"/> Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option).
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.2 Method PKPSD (RBW=3-100kHz;detector=peak).. [duty cycle $\geq 98\%$ or external video / power trigger]
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.3 Method AVGPSD-1 (spectral trace averaging).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.4 Method AVGPSD-1 Alt. (slow sweep speed)
duty cycle $< 98\%$ and average over on/off periods with duty factor
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.5 Method AVGPSD-2 (spectral trace averaging).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.6 Method AVGPSD-2 Alt. (slow sweep speed)
<input checked="" type="checkbox"/> For conducted measurement.
<input checked="" type="checkbox"/> The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
<input type="checkbox"/> The EUT supports multiple transmit chains using options given below:
<input type="checkbox"/> Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the $N_{TX}$ output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.
<input type="checkbox"/> Option 2: Measure and add $10 \log(N) \text{ dB}$ , 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



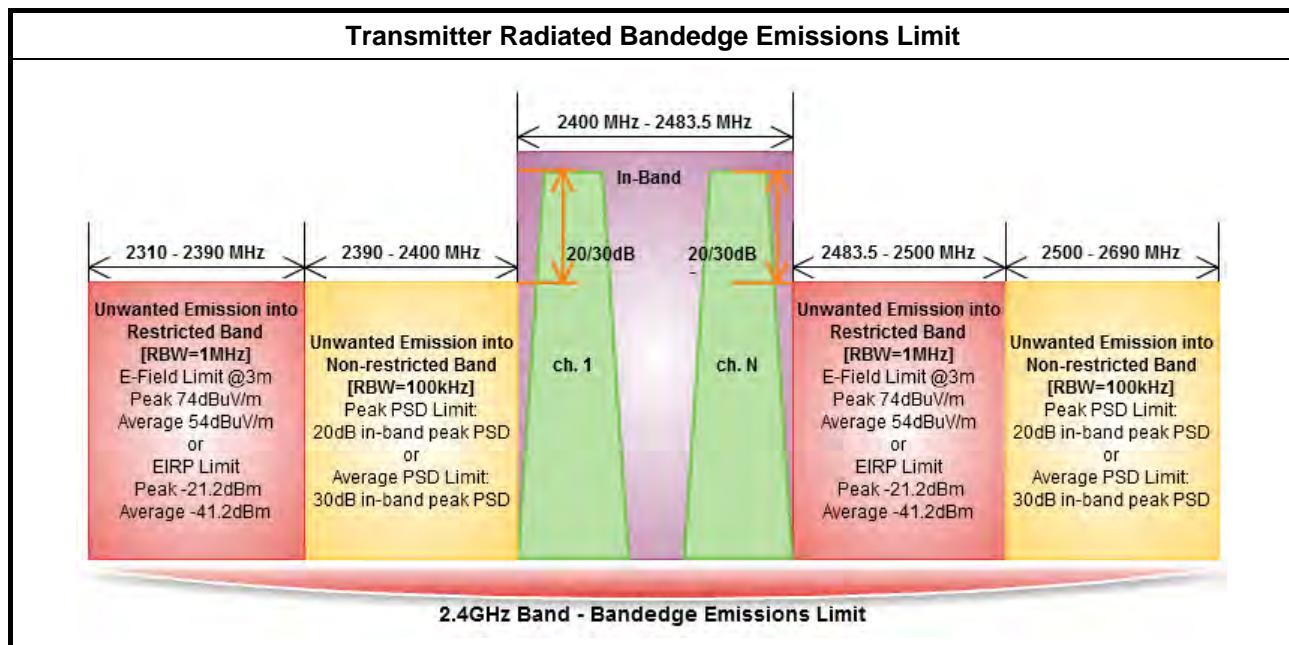
### 3.4.5 Test Result of Power Spectral Density

Condition			Power Spectral Density	
Modulation Mode	N <sub>TX</sub>	Freq. (MHz)	Sum Chain (dBm/100kHz)	PSD Limit (dBm/3kHz)
11b	1	2412	-13.04	8.00
11b	1	2437	-10.04	8.00
11b	1	2462	-14.03	8.00
11g	1	2412	-19.73	8.00
11g	1	2437	-14.47	8.00
11g	1	2462	-22.33	8.00
HT20	1	2412	-22.36	8.00
HT20	1	2437	-14.16	8.00
HT20	1	2462	-25.73	8.00
Result		Complied		



### 3.5 Transmitter Radiated Bandedge Emissions

#### 3.5.1 Transmitter Radiated Bandedge Emissions Limit



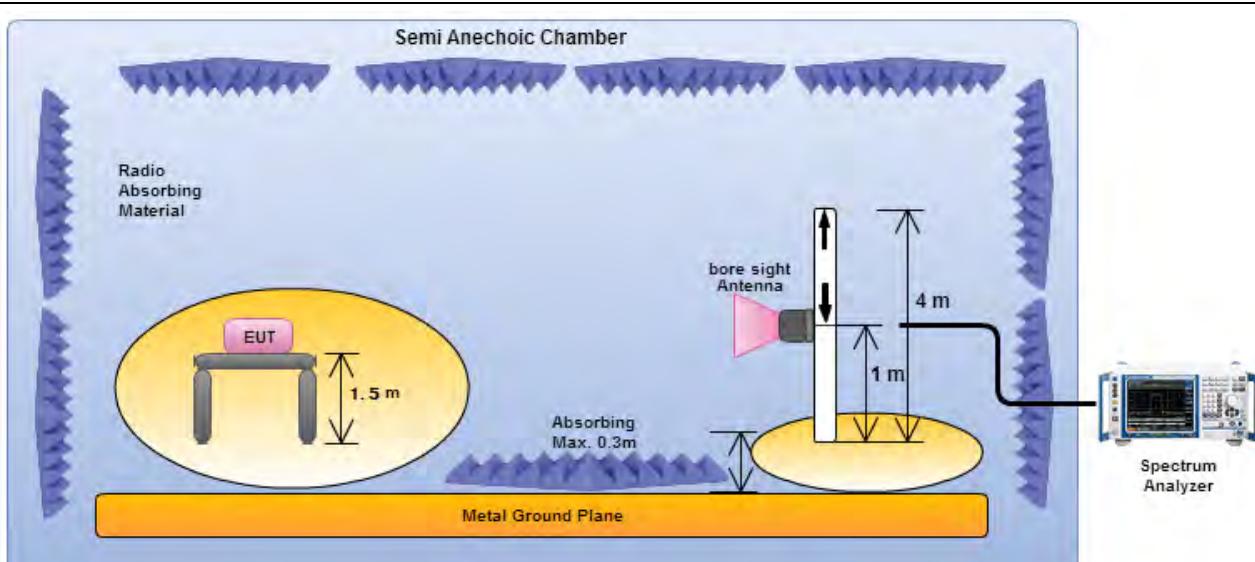
#### 3.5.2 Measuring Instruments

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, clause 11 for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands.
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.1 Option 1 (trace averaging for duty cycle $\geq 98\%$ )
<input type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.2 Option 2 (trace averaging + duty factor).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.3 Option 3 (Reduced VBW $\geq 1/T$ ).
<input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW $\geq 1/T$ , where T is pulse time.
<input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 11.3 and 12.2.4 measurement procedure peak limit.
<input checked="" type="checkbox"/> For the transmitter bandedge emissions shall be measured using following options below:
<input type="checkbox"/> Refer as FCC KDB 558074, clause 13.3 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).
<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 6.10 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, clause 12.2.7 and ANSI C63.10, clause 6.6. Test distance is 3m.

### 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

2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Non-restricted Band) – Dipole Antenna								
Modulation	N <sub>TX</sub>	Test Freq. (MHz)	In-band PSD [i] (dB <sub>uV</sub> /100kHz)	Freq. (MHz)	Out-band PSD [o] (dB <sub>uV</sub> /100kHz)	[i] – [o] (dB)	Limit (dB)	Pol.
11b	1	2412	103.06	2397.136	70.80	32.26	20	V
11b	1	2462	100.37	2503.800	64.29	36.08	20	V
11g	1	2412	90.00	2397.360	65.53	24.47	20	V
11g	1	2462	91.74	2528.400	64.35	27.39	20	V
HT20	1	2412	92.73	2399.600	68.04	24.69	20	V
HT20	1	2462	89.66	2536.600	64.40	25.26	20	V

Note 1: Measurement worst emissions of receive antenna polarization

2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Non-restricted Band) – PCB Antenna								
Modulation	N <sub>TX</sub>	Test Freq. (MHz)	In-band PSD [i] (dB <sub>uV</sub> /100kHz)	Freq. (MHz)	Out-band PSD [o] (dB <sub>uV</sub> /100kHz)	[i] – [o] (dB)	Limit (dB)	Pol.
11b	1	2412	98.04	2397.136	69.22	28.82	20	H
11b	1	2462	93.42	2530.600	64.10	29.32	20	H
11g	1	2412	89.12	2392.432	64.48	24.64	20	H
11g	1	2462	88.13	2501.200	63.93	24.20	20	H
HT20	1	2412	85.59	2399.824	64.59	21.00	20	H
HT20	1	2462	86.05	2502.200	64.65	21.40	20	H

Note 1: Measurement worst emissions of receive antenna polarization

2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Non-restricted Band) – PIFA Antenna								
Modulation	N <sub>TX</sub>	Test Freq. (MHz)	In-band PSD [i] (dB <sub>uV</sub> /100kHz)	Freq. (MHz)	Out-band PSD [o] (dB <sub>uV</sub> /100kHz)	[i] – [o] (dB)	Limit (dB)	Pol.
11b	1	2412	93.49	2397.136	65.64	27.85	20	H
11b	1	2462	93.07	2545.400	64.39	28.68	20	H
11g	1	2412	91.04	2399.600	65.31	25.73	20	H
11g	1	2462	88.12	2532.000	64.37	23.75	20	H
HT20	1	2412	88.82	2399.824	65.50	23.32	20	H
HT20	1	2462	84.60	2503.000	64.06	20.54	20	H

Note 1: Measurement worst emissions of receive antenna polarization



2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Restricted Band) – Dipole Antenna										
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	2389.968	62.05	74	2389.296	52.63	54	V
11b	1	2462	3	2483.600	62.49	74	2483.500	52.71	54	V
11g	1	2412	3	2389.968	71.33	74	2389.968	52.37	54	V
11g	1	2462	3	2483.500	72.80	74	2483.500	52.93	54	V
HT20	1	2412	3	2389.296	71.31	74	2389.968	52.92	54	V
HT20	1	2462	3	2483.500	71.33	74	2483.500	52.06	54	V

Note 1: Measurement worst emissions of receive antenna polarization.

2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Restricted Band) – PCB Antenna										
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	2389.968	63.92	74	2389.968	52.31	54	H
11b	1	2462	3	2484.200	61.68	74	2483.500	52.43	54	H
11g	1	2412	3	2389.968	71.06	74	2389.968	52.00	54	H
11g	1	2462	3	2483.600	67.40	74	2483.500	50.88	54	H
HT20	1	2412	3	2389.968	68.90	74	2389.968	51.05	54	H
HT20	1	2462	3	2484.600	68.26	74	2483.500	50.11	54	H

Note 1: Measurement worst emissions of receive antenna polarization.

2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Restricted Band) – PIFA Antenna										
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	2389.520	61.57	74	2389.296	52.16	54	H
11b	1	2462	3	2483.500	61.70	74	2483.500	52.46	54	H
11g	1	2412	3	2389.744	67.19	74	2389.968	51.25	54	H
11g	1	2462	3	2483.500	68.98	74	2483.500	52.37	54	H
HT20	1	2412	3	2389.296	65.47	74	2389.968	49.64	54	H
HT20	1	2462	3	2484.000	68.15	74	2483.600	49.90	54	H

Note 1: Measurement worst emissions of receive antenna polarization.



## 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.

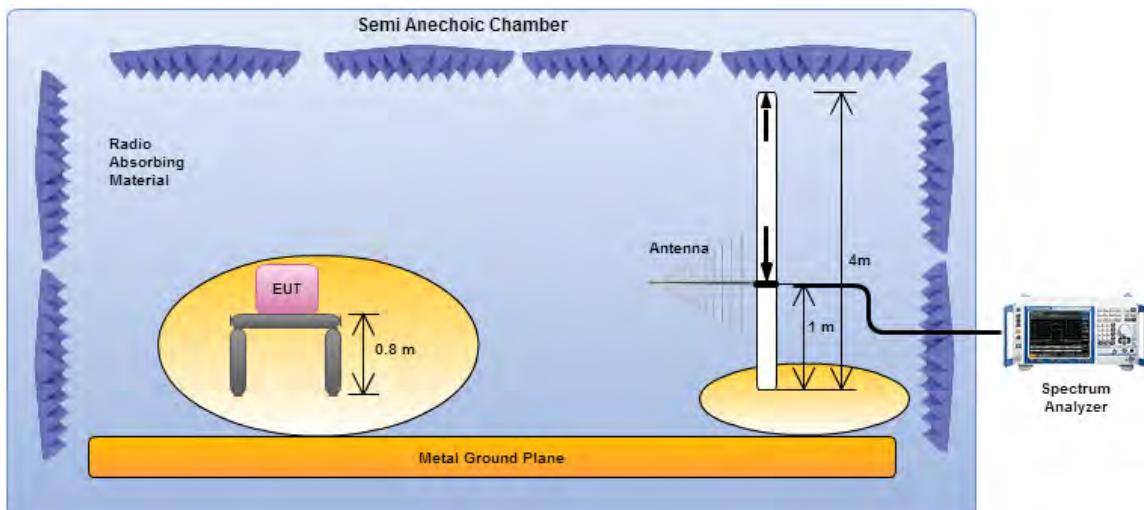


### 3.6.3 Test Procedures

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"/> The average emission levels shall be measured in [duty cycle $\geq$ 98 or duty factor].
<input checked="" type="checkbox"/> For the transmitter unwanted emissions shall be measured using following options below:
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 11 for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands.
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.1 Option 1 (trace averaging for duty cycle $\geq 98\%$ )
<input type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.2 Option 2 (trace averaging + duty factor).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.3 Option 3 (Reduced $VBW \geq 1/T$ ).
<input 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, clause 11.3 and 12.2.4 measurement procedure peak limit.
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.3 measurement procedure Quasi-Peak limit.
<input checked="" type="checkbox"/> For radiated measurement, refer as FCC KDB 558074, clause 12.2.7.
<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 6.4 for radiated emissions below 30 MHz and test distance is 3m.
<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 6.5 for radiated emissions 30 MHz to 1 GHz and test distance is 3m.
<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1 GHz and test distance is 3m.
<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.

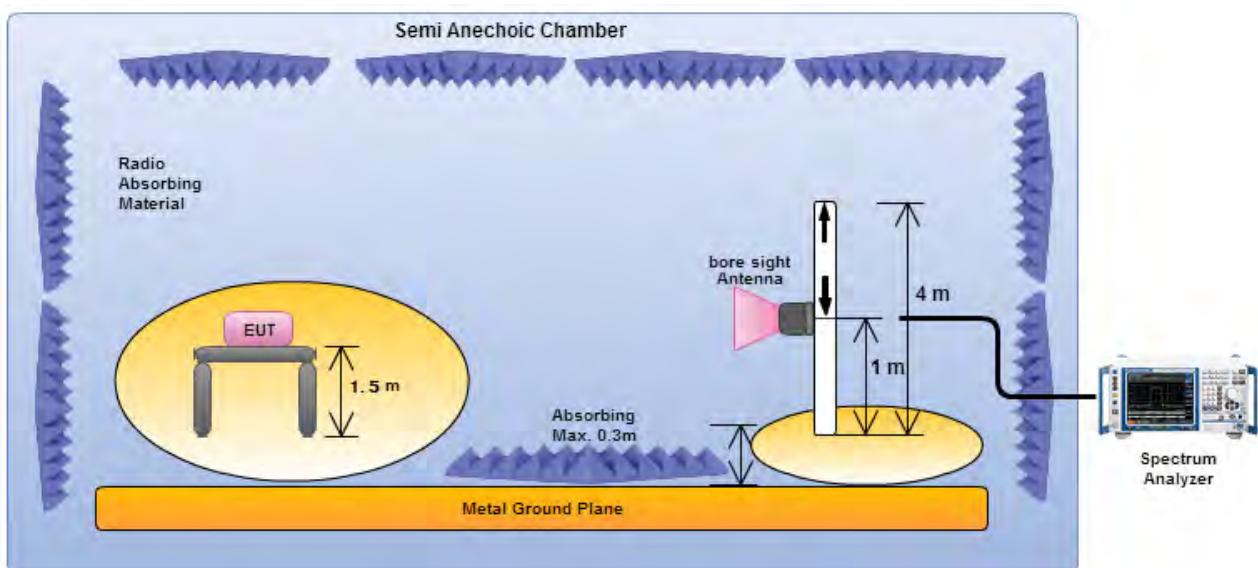
### 3.6.4 Test Setup

#### 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.

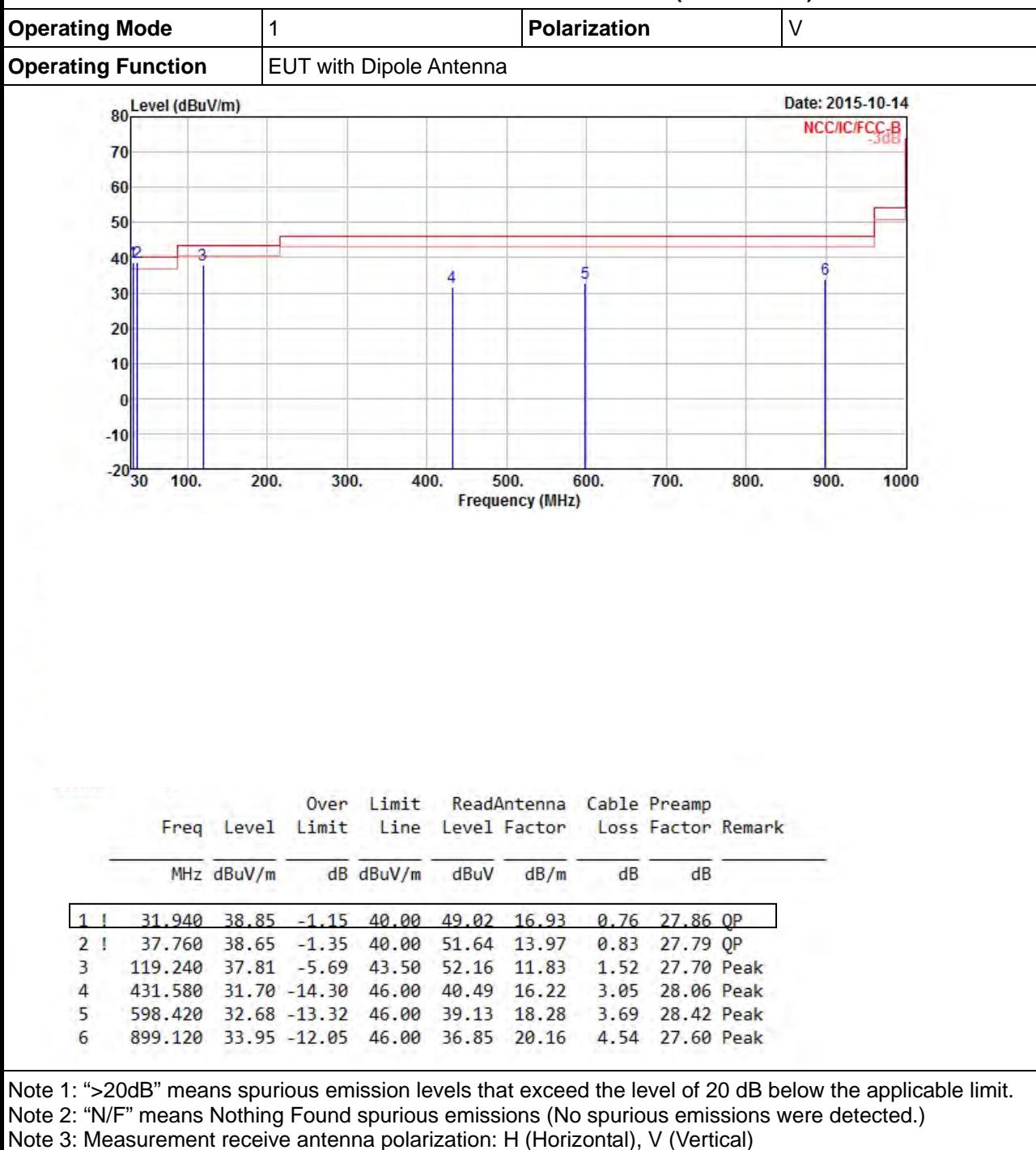
### 3.6.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

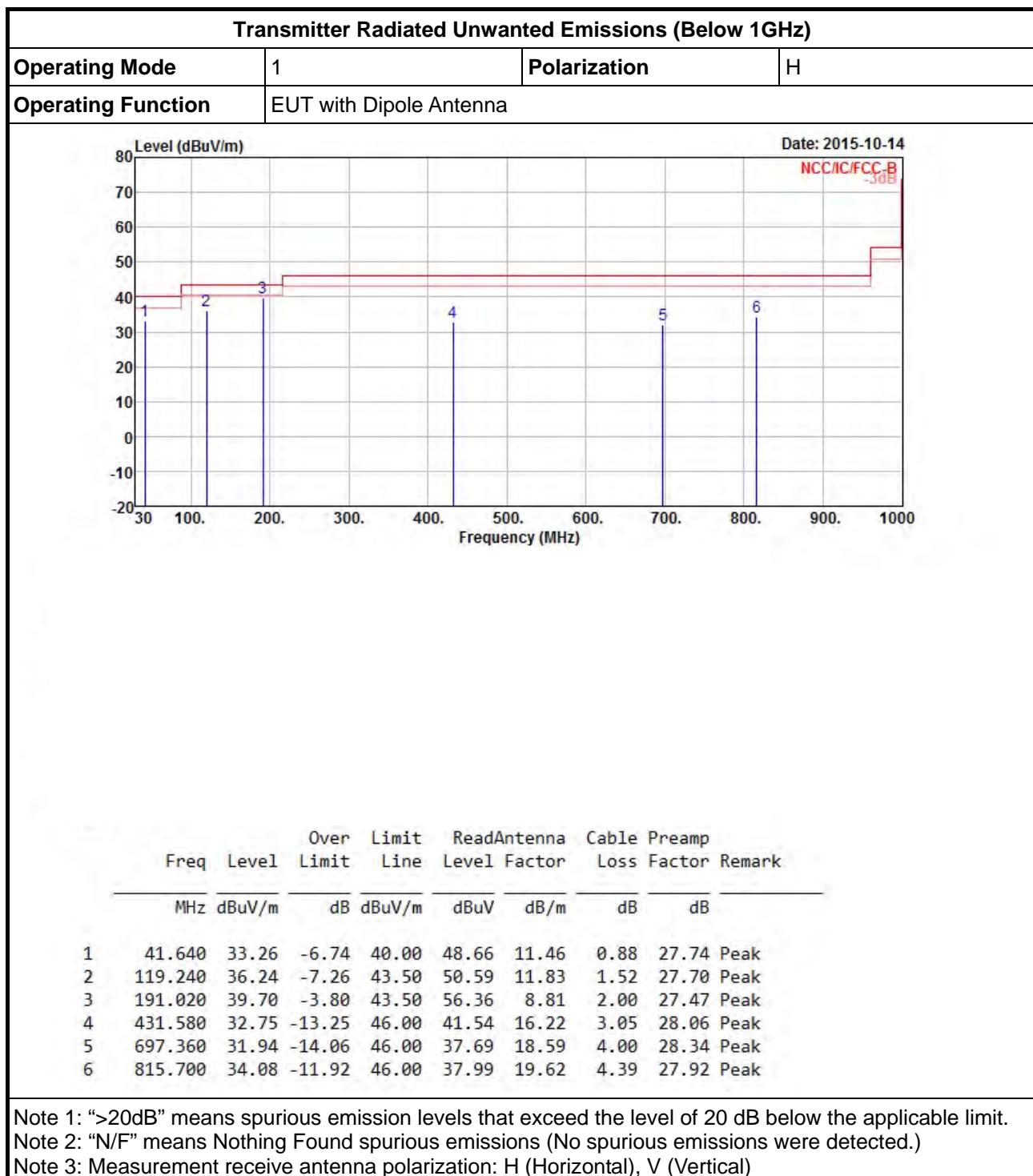
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.



## 3.6.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

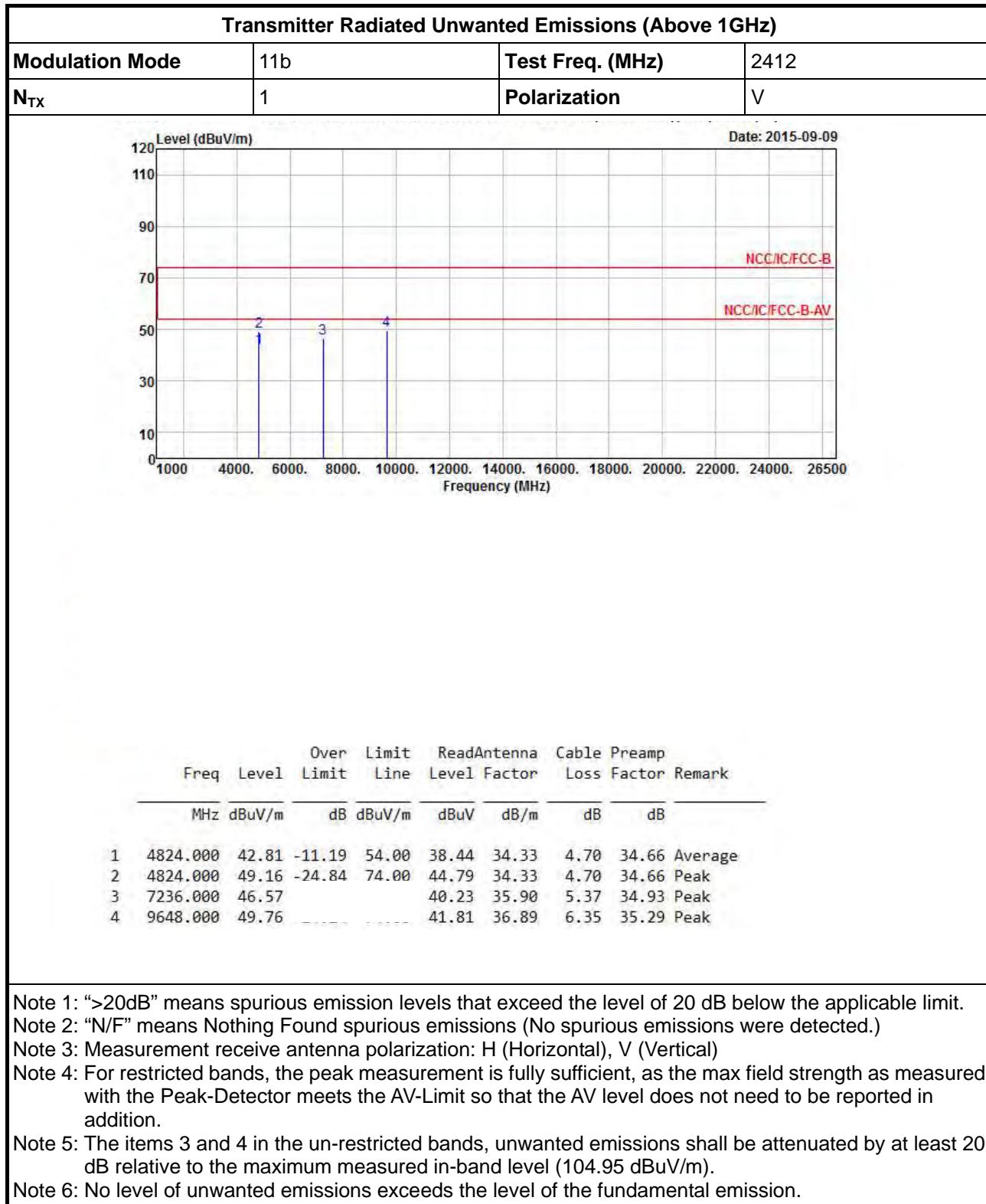
## Transmitter Radiated Unwanted Emissions (Below 1GHz)







## 3.6.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) – Dipole Antenna



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

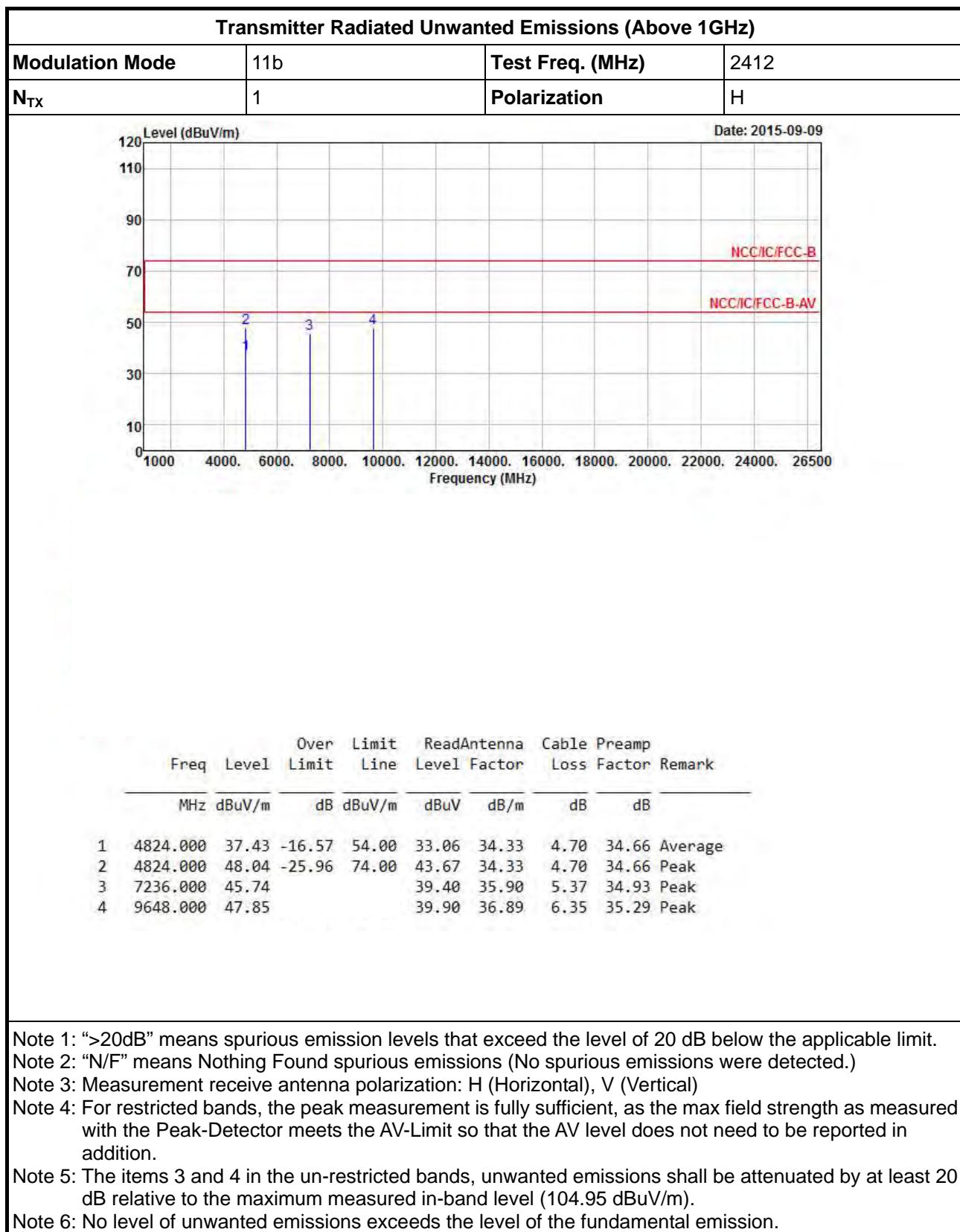
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

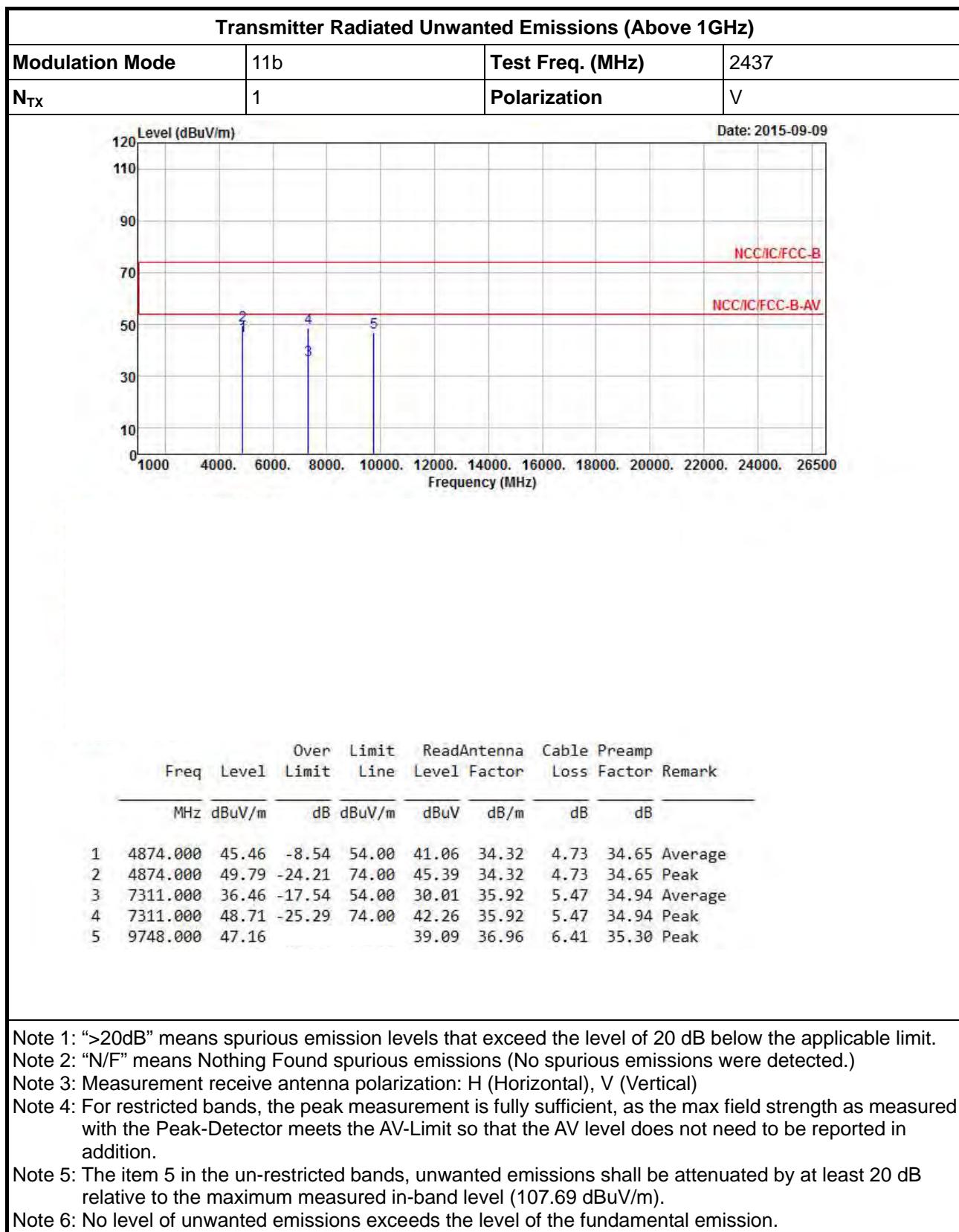
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

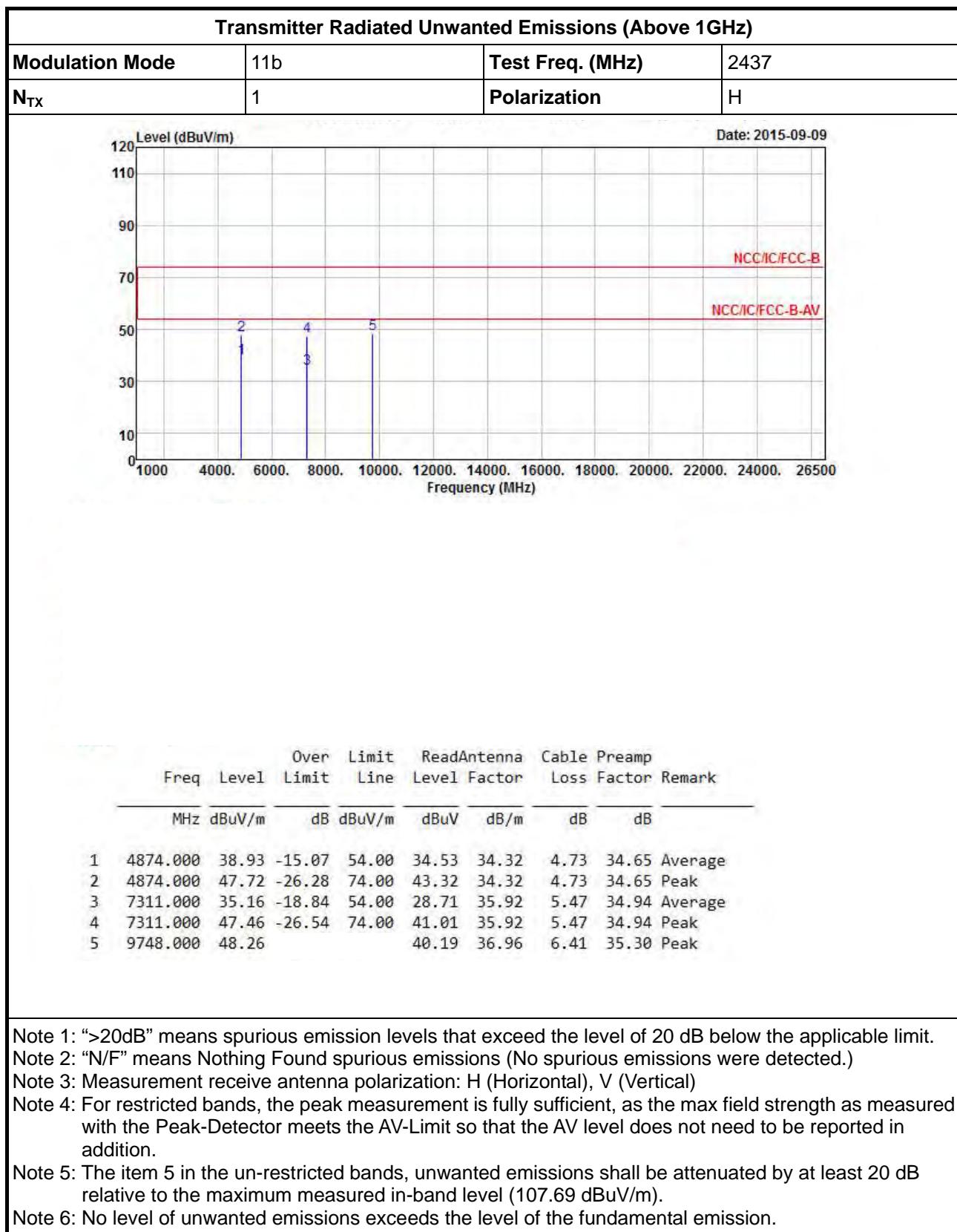
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

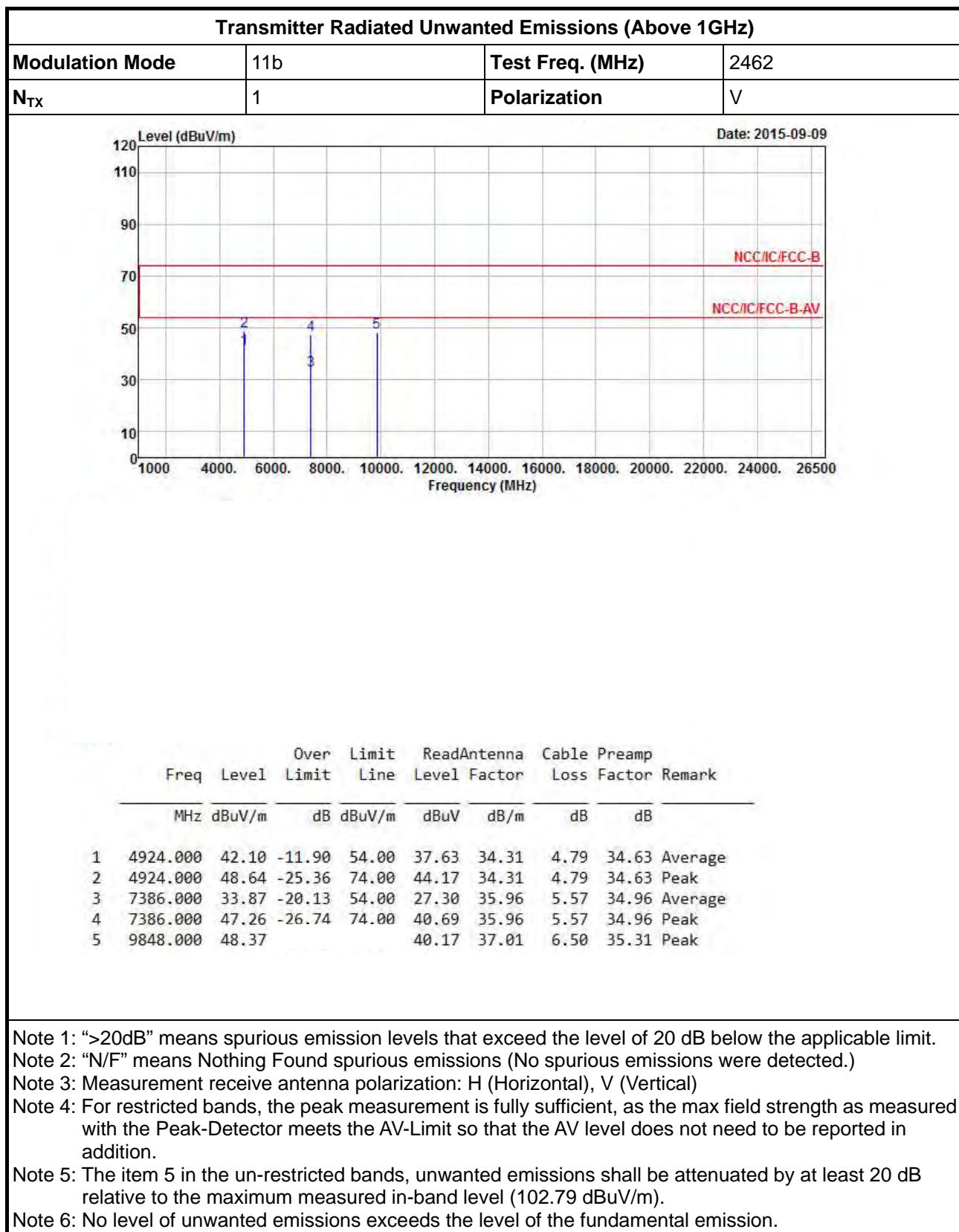
Note 5: The items 3 and 4 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (104.95 dBuV/m).

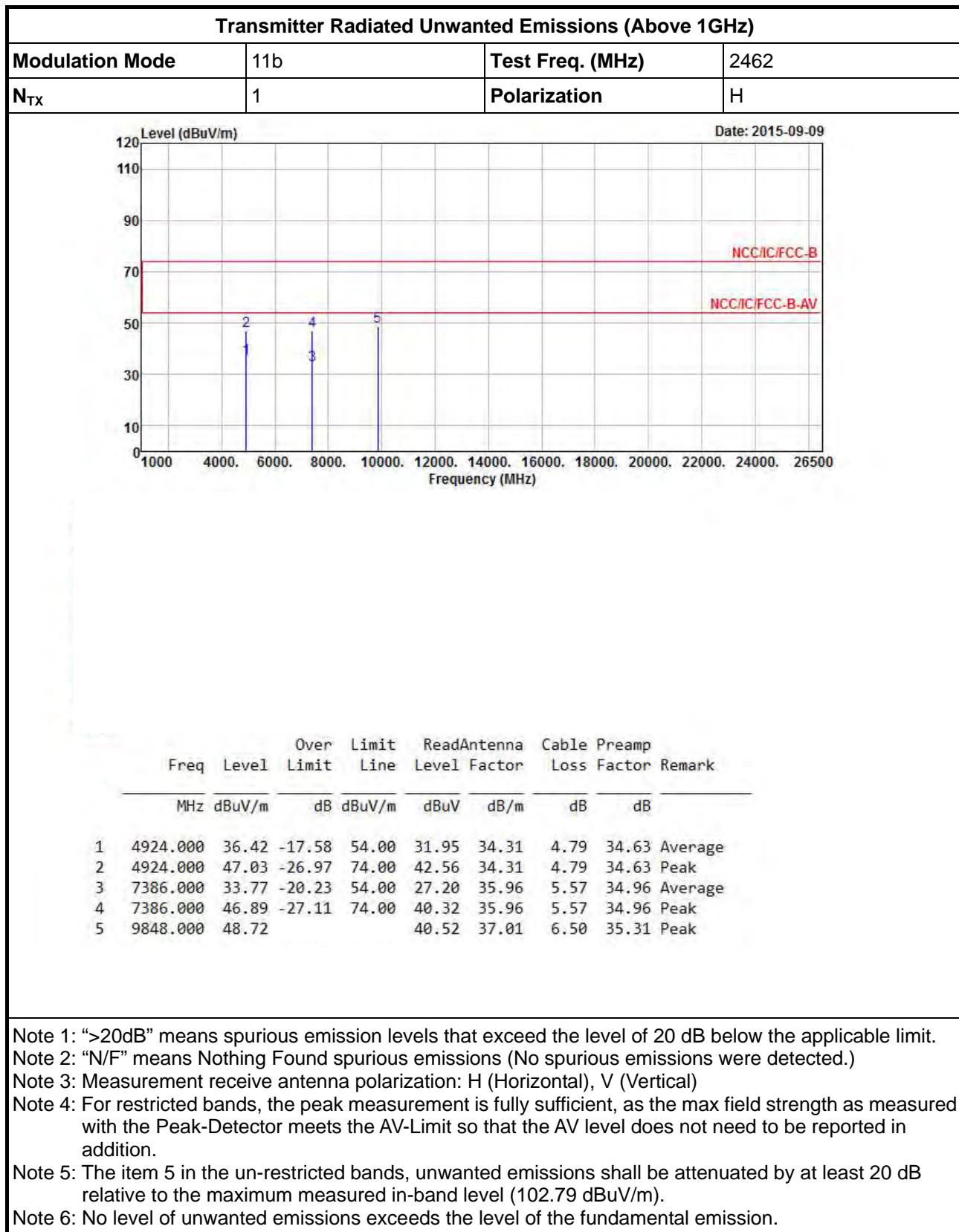
Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

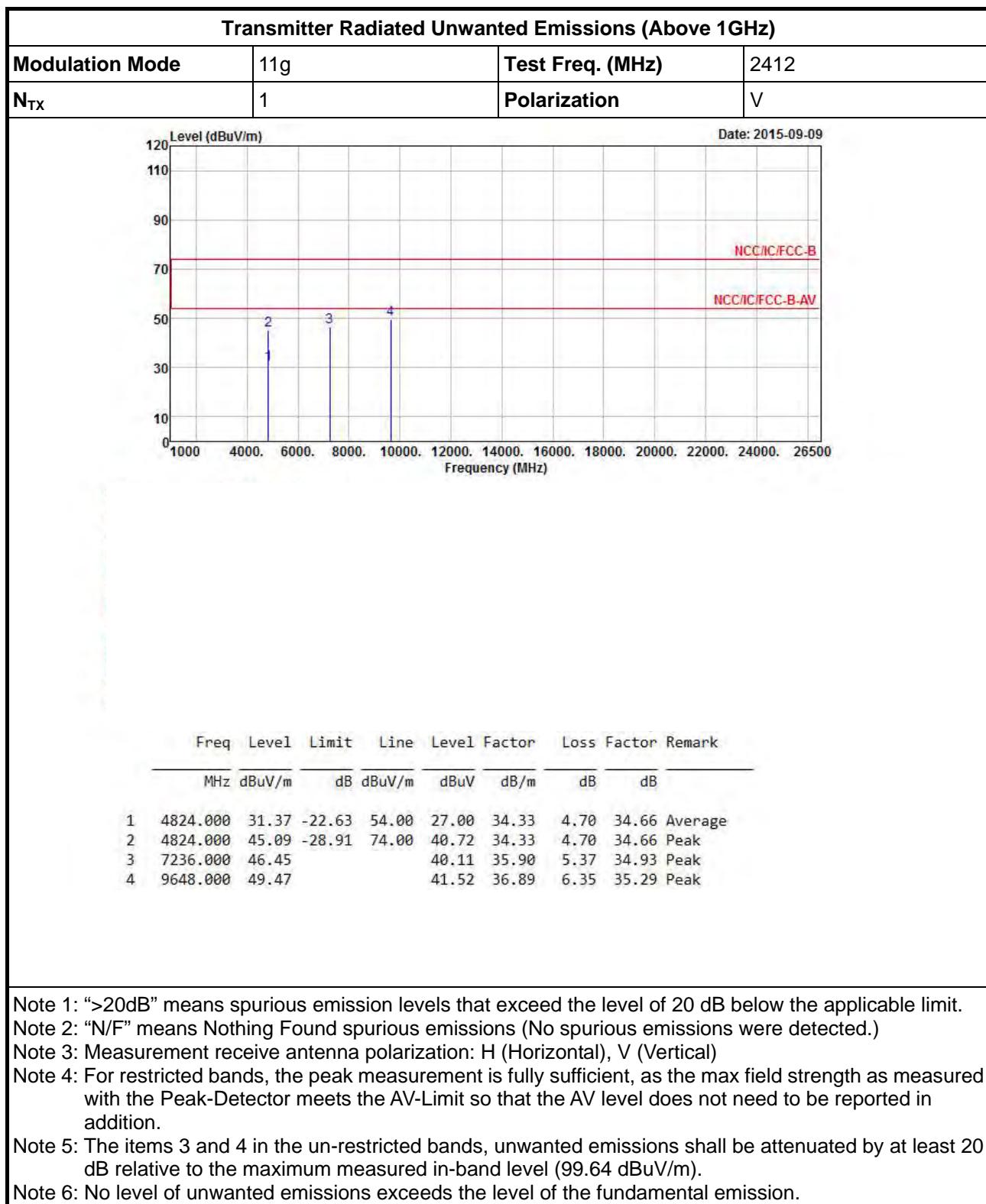








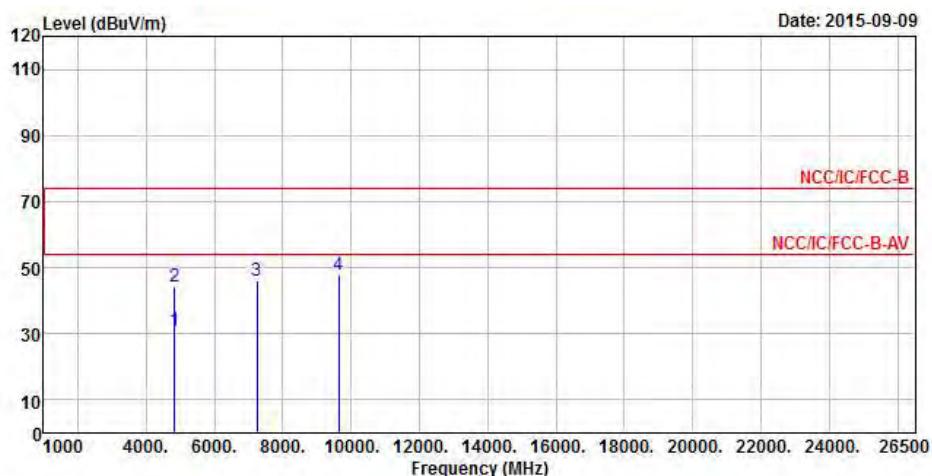






## Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11g	Test Freq. (MHz)	2412
N <sub>TX</sub>	1	Polarization	H



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		MHz	dBuV/m	dB	Line	Level	Factor	
1	4824.000	31.18	-22.82	54.00	26.81	34.33	4.70	34.66 Average
2	4824.000	44.17	-29.83	74.00	39.80	34.33	4.70	34.66 Peak
3	7236.000	45.88			39.54	35.90	5.37	34.93 Peak
4	9648.000	47.67			39.72	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.

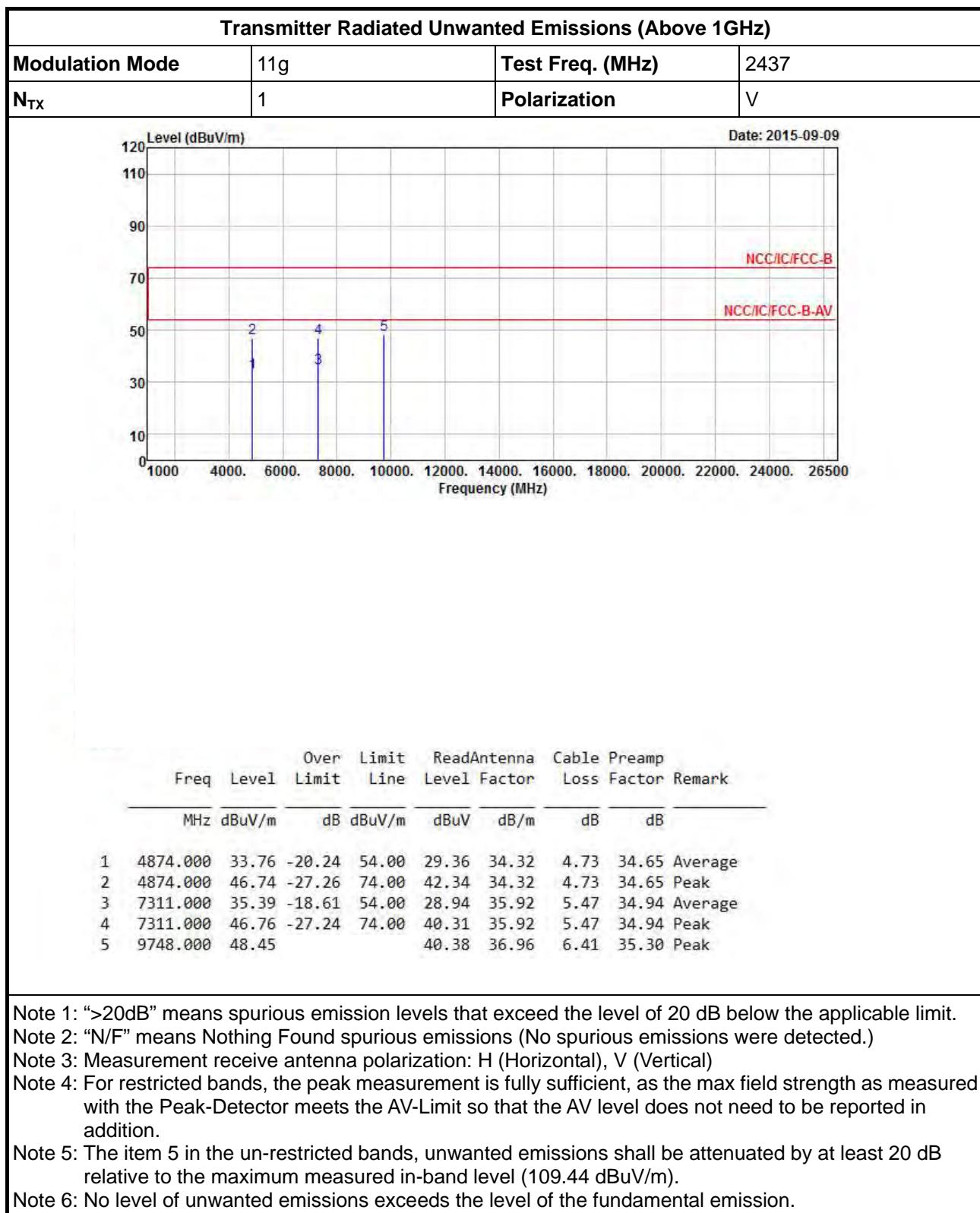
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

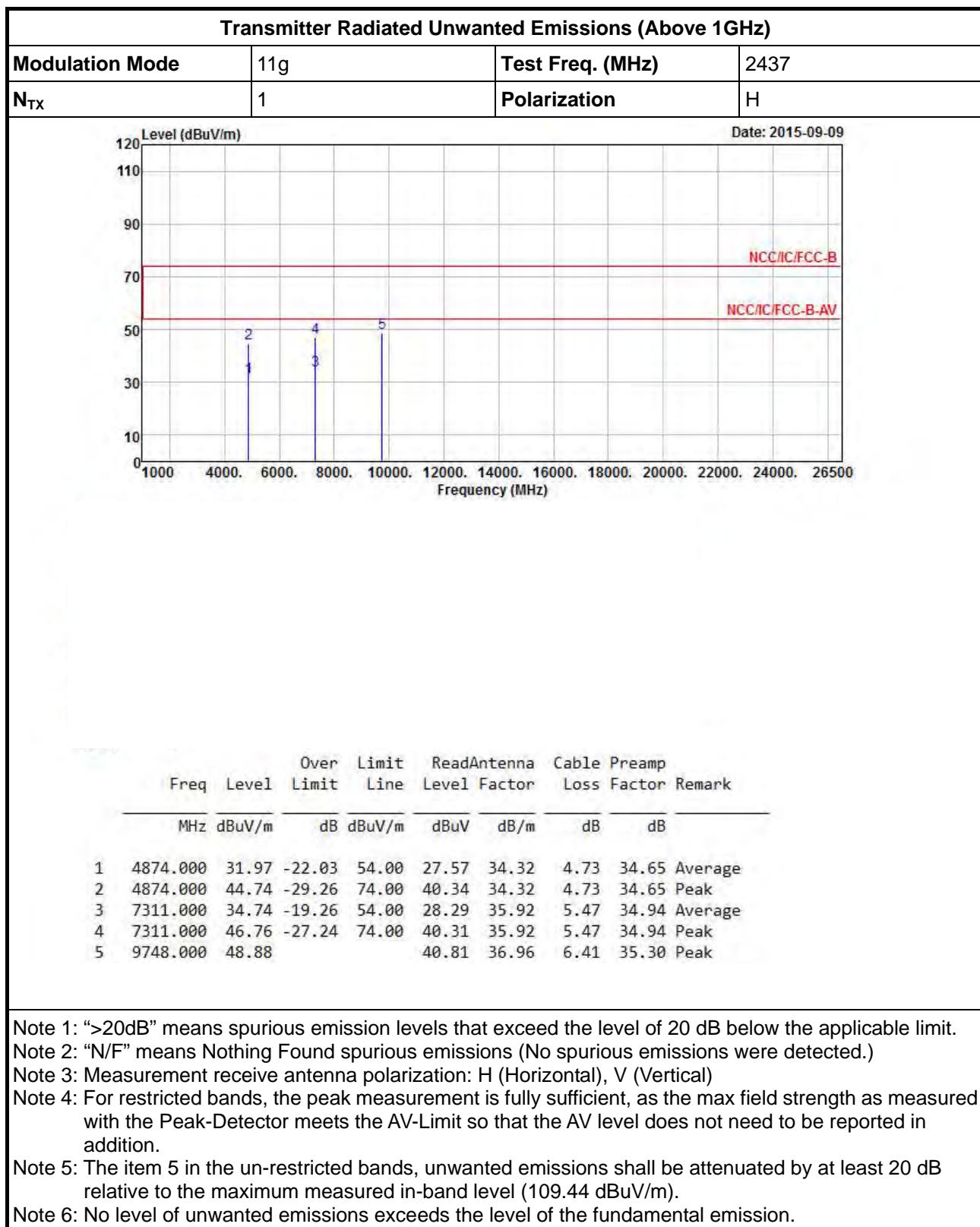
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

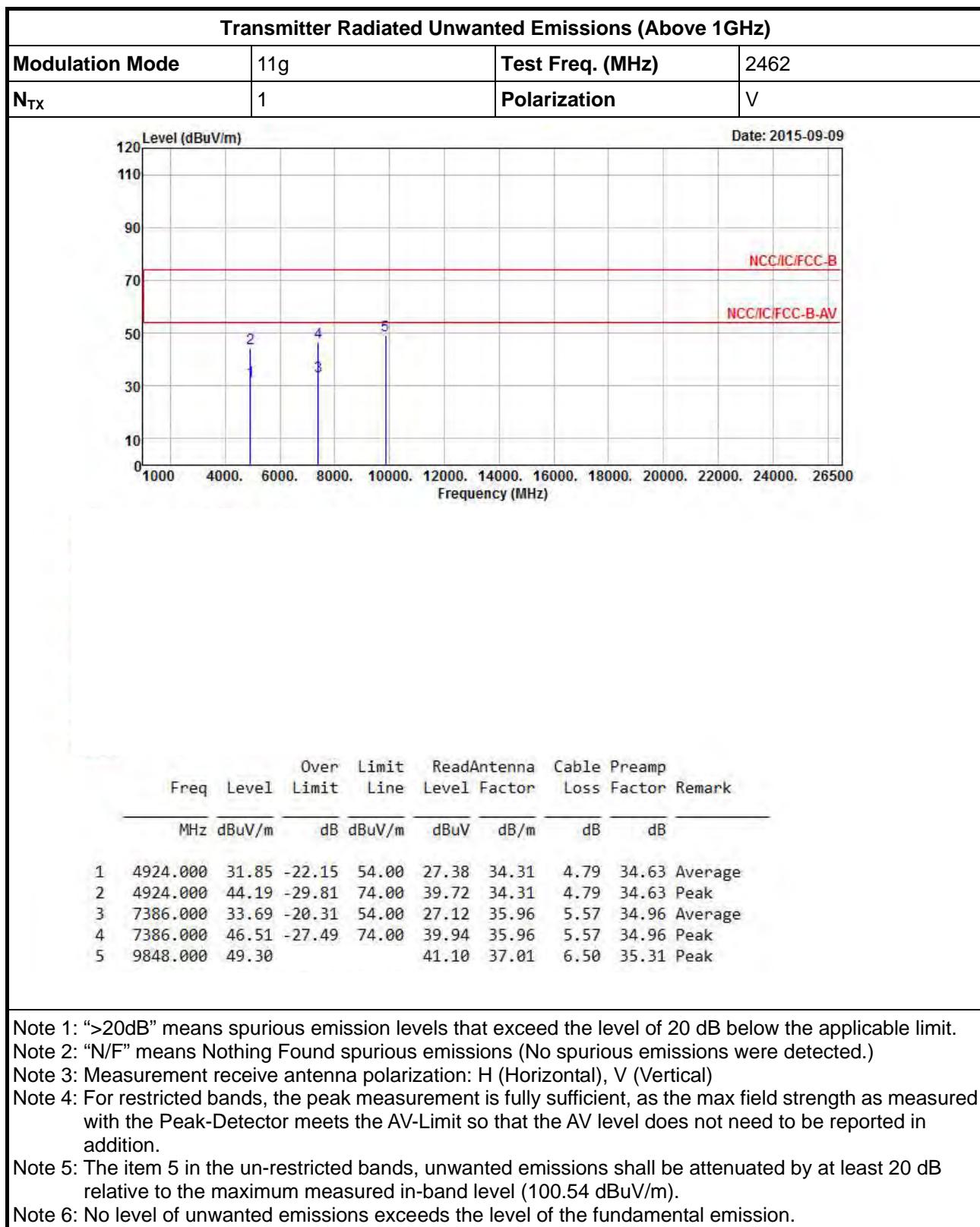
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

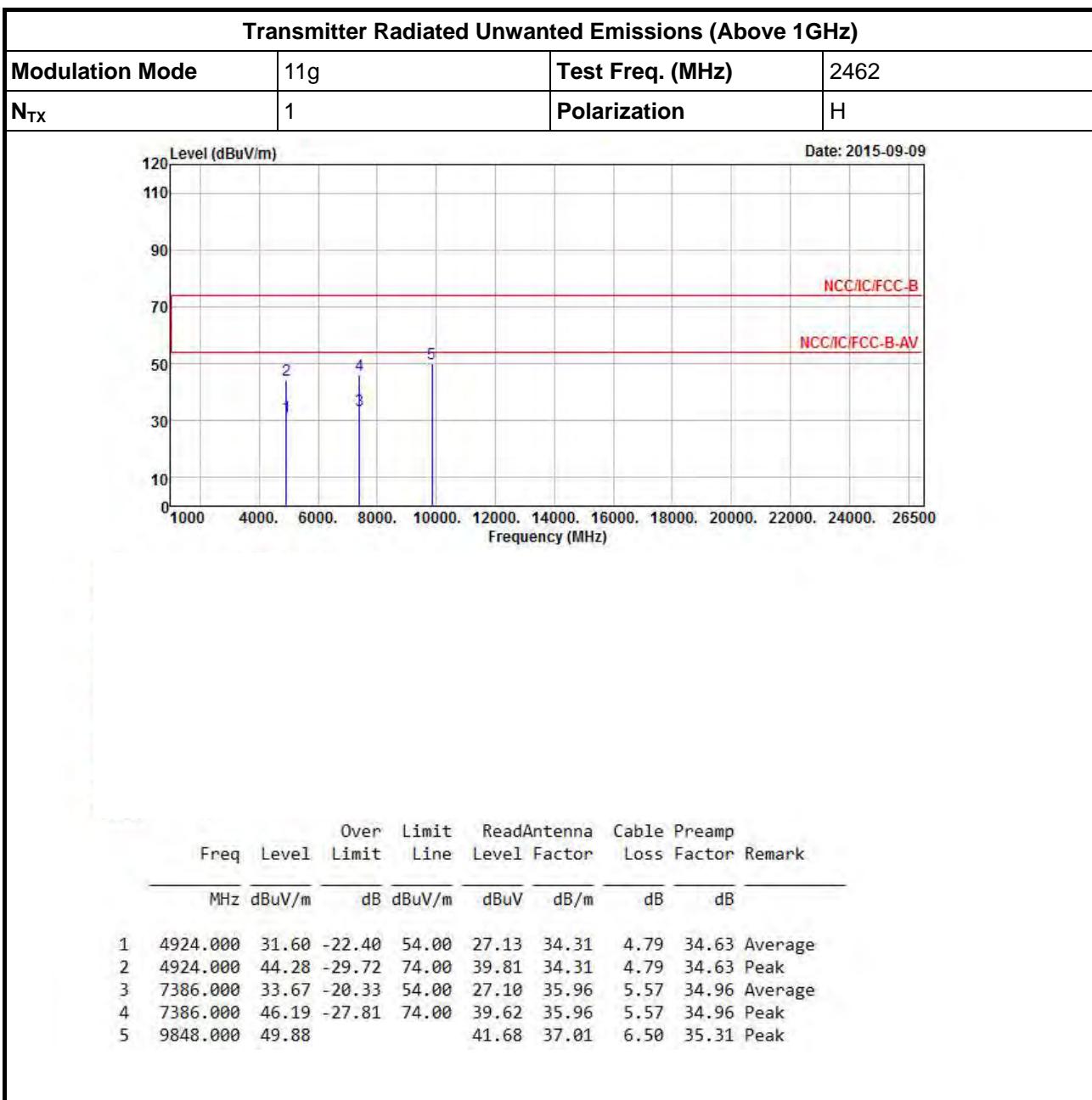
Note 5: The items 3 and 4 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (99.64 dBuV/m).

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.

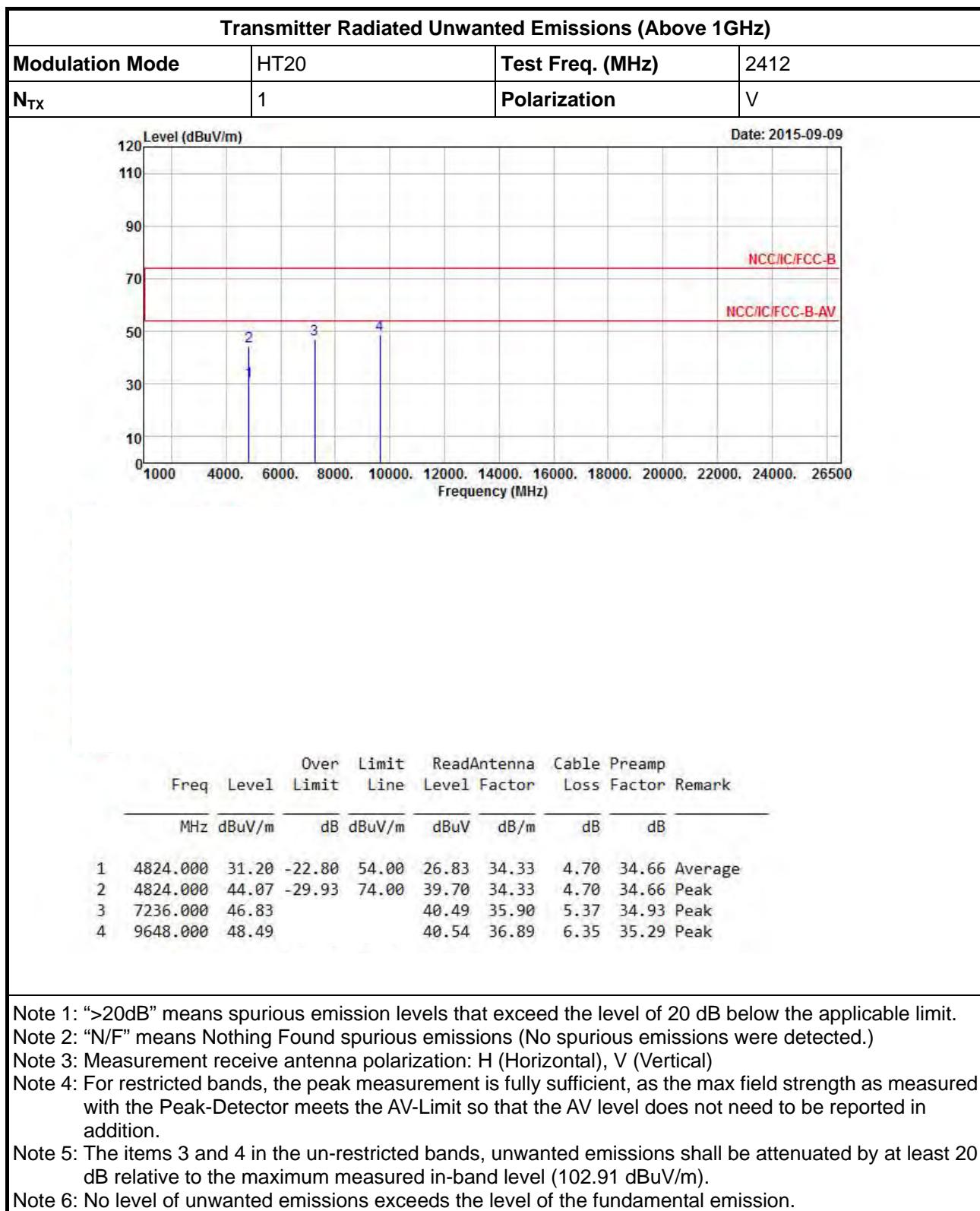
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

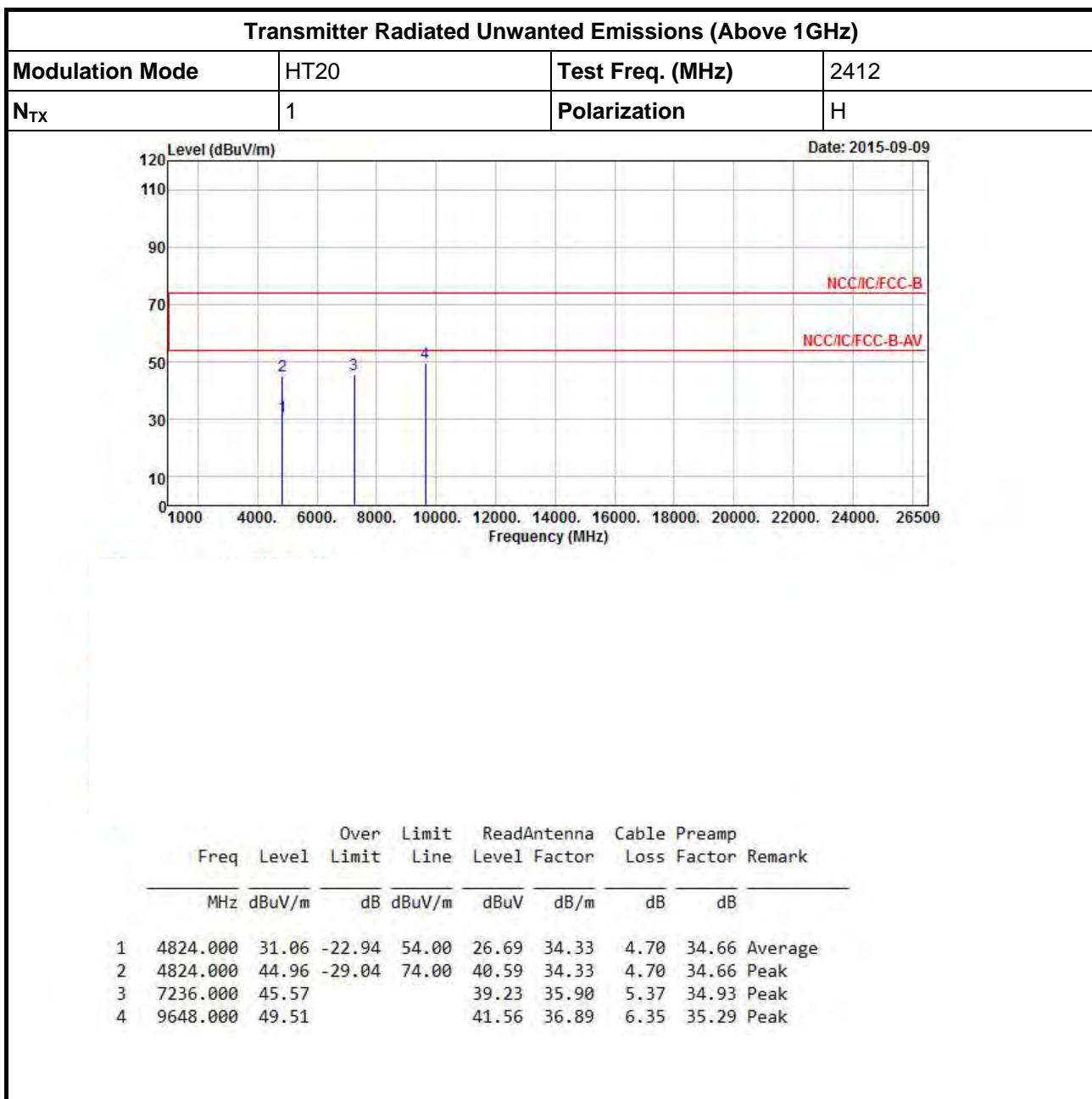
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

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: The item 5 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (100.54 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.

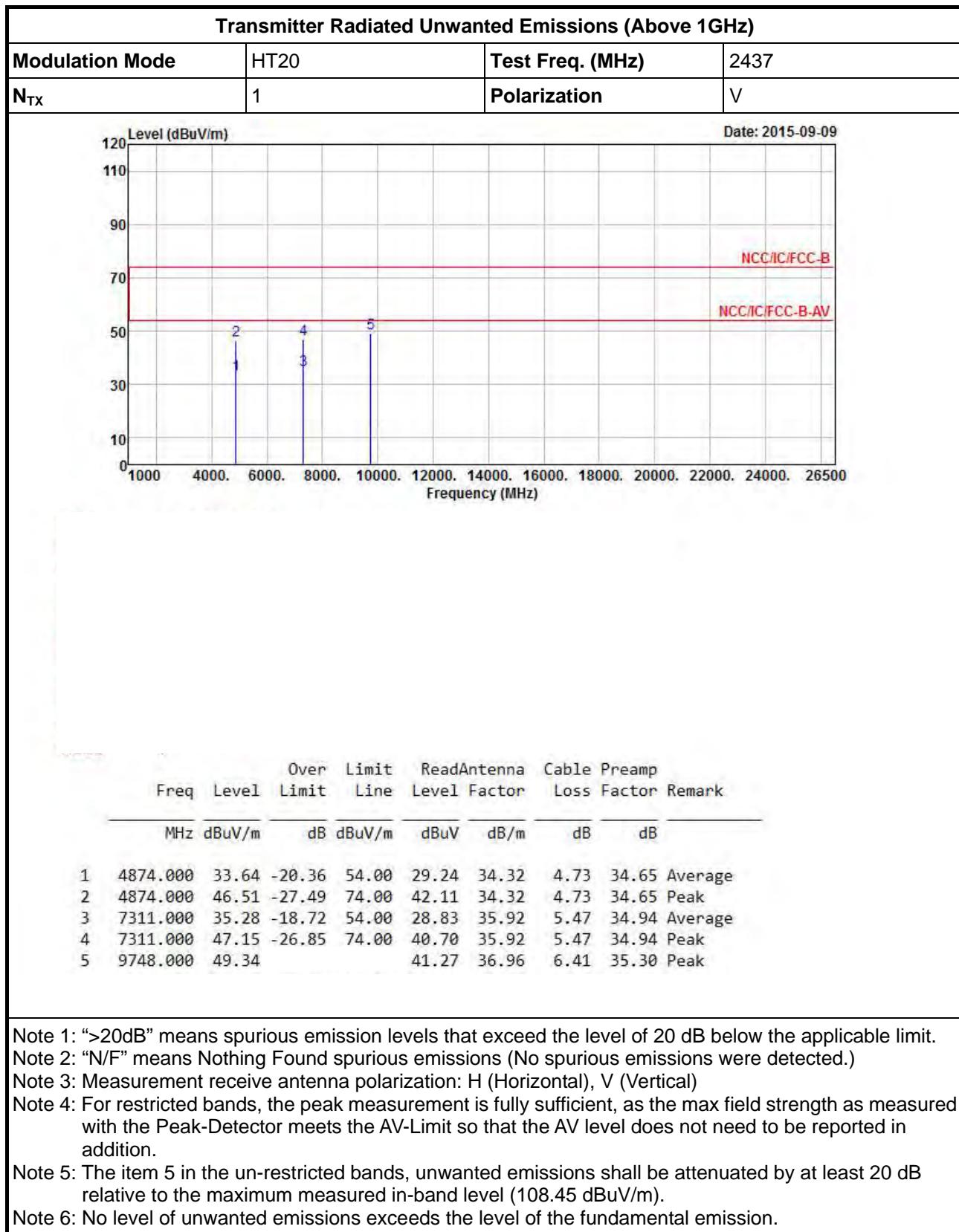
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

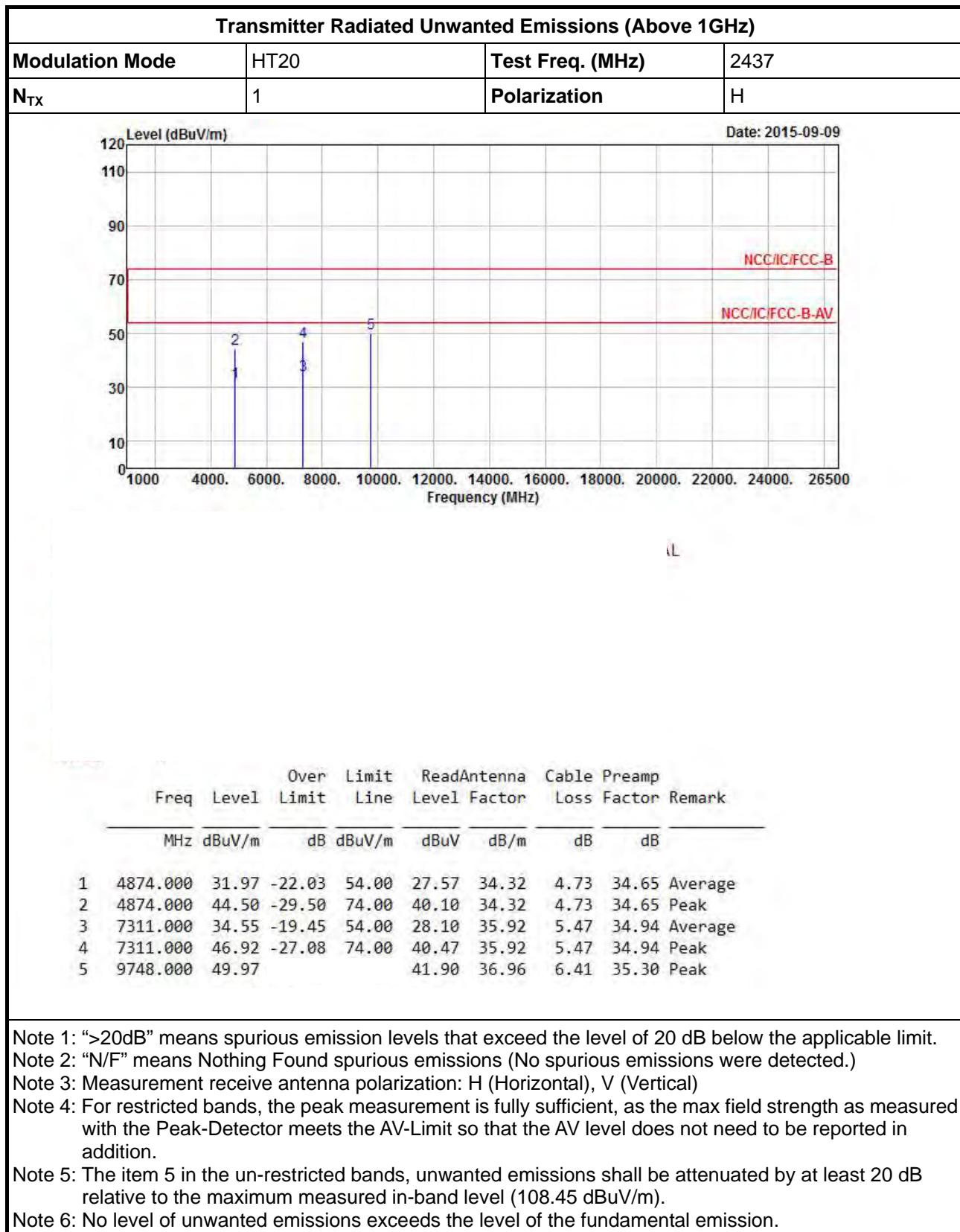
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

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: The items 3 and 4 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (102.91 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.

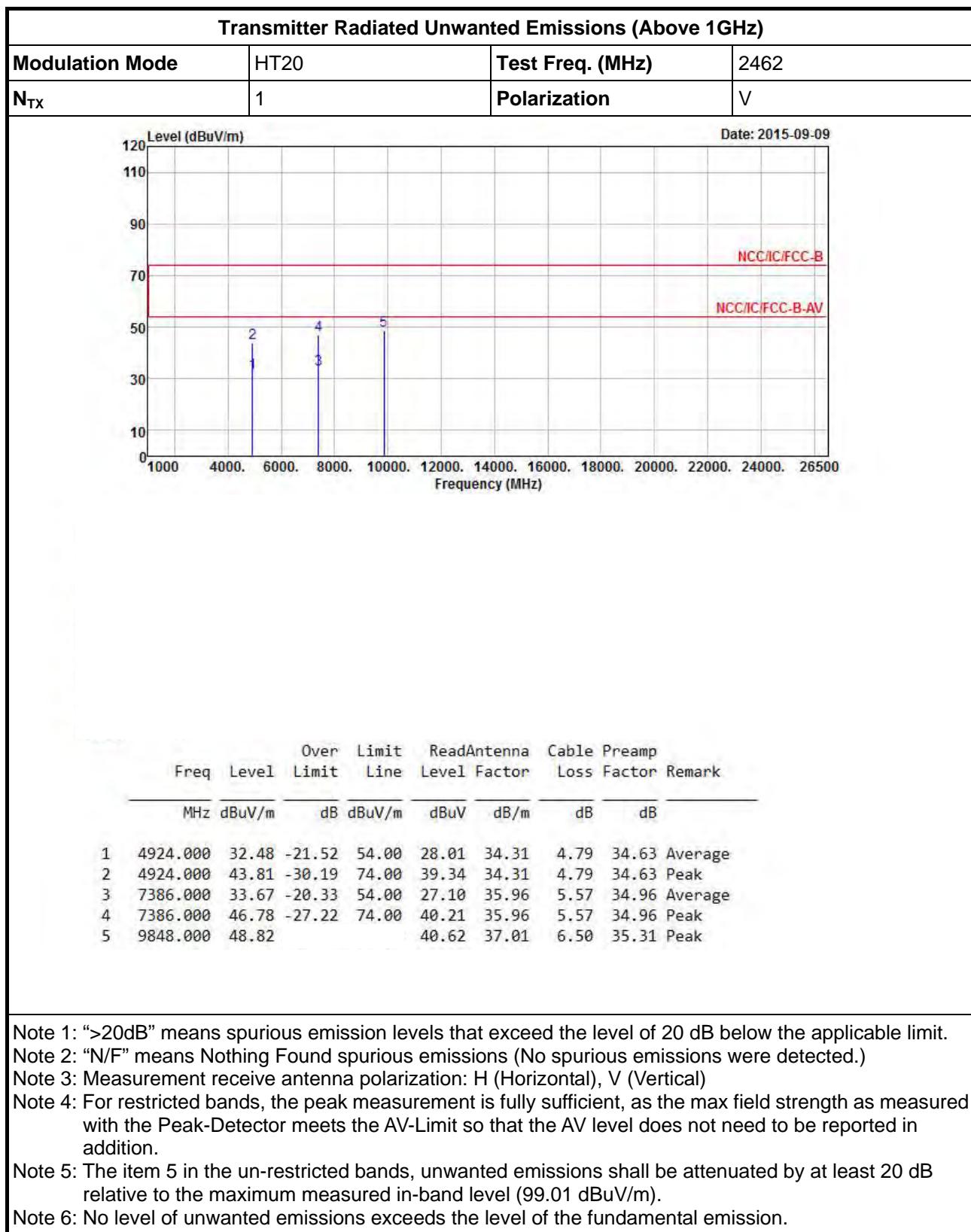
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

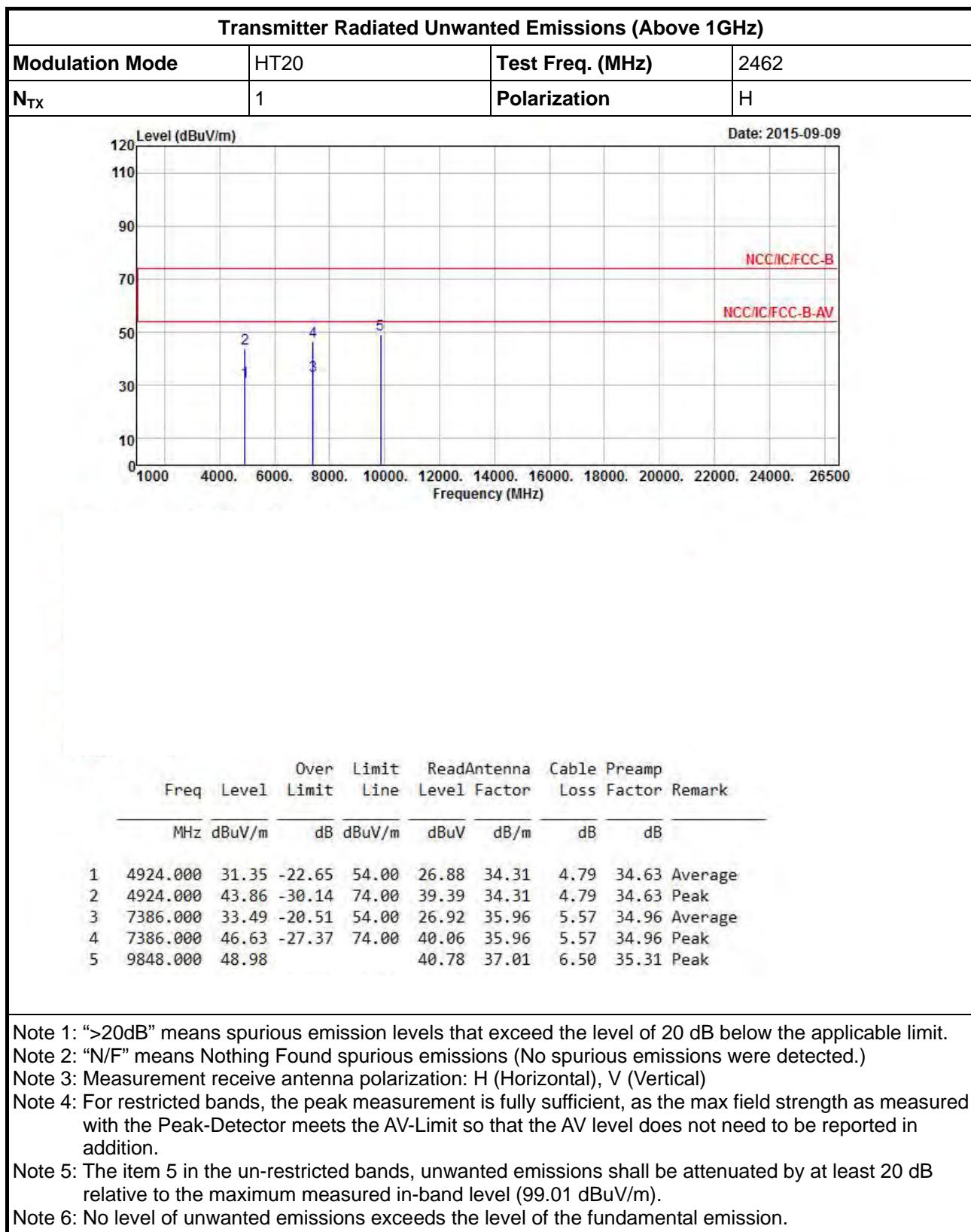
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

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: The item 5 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (108.45 dBuV/m).

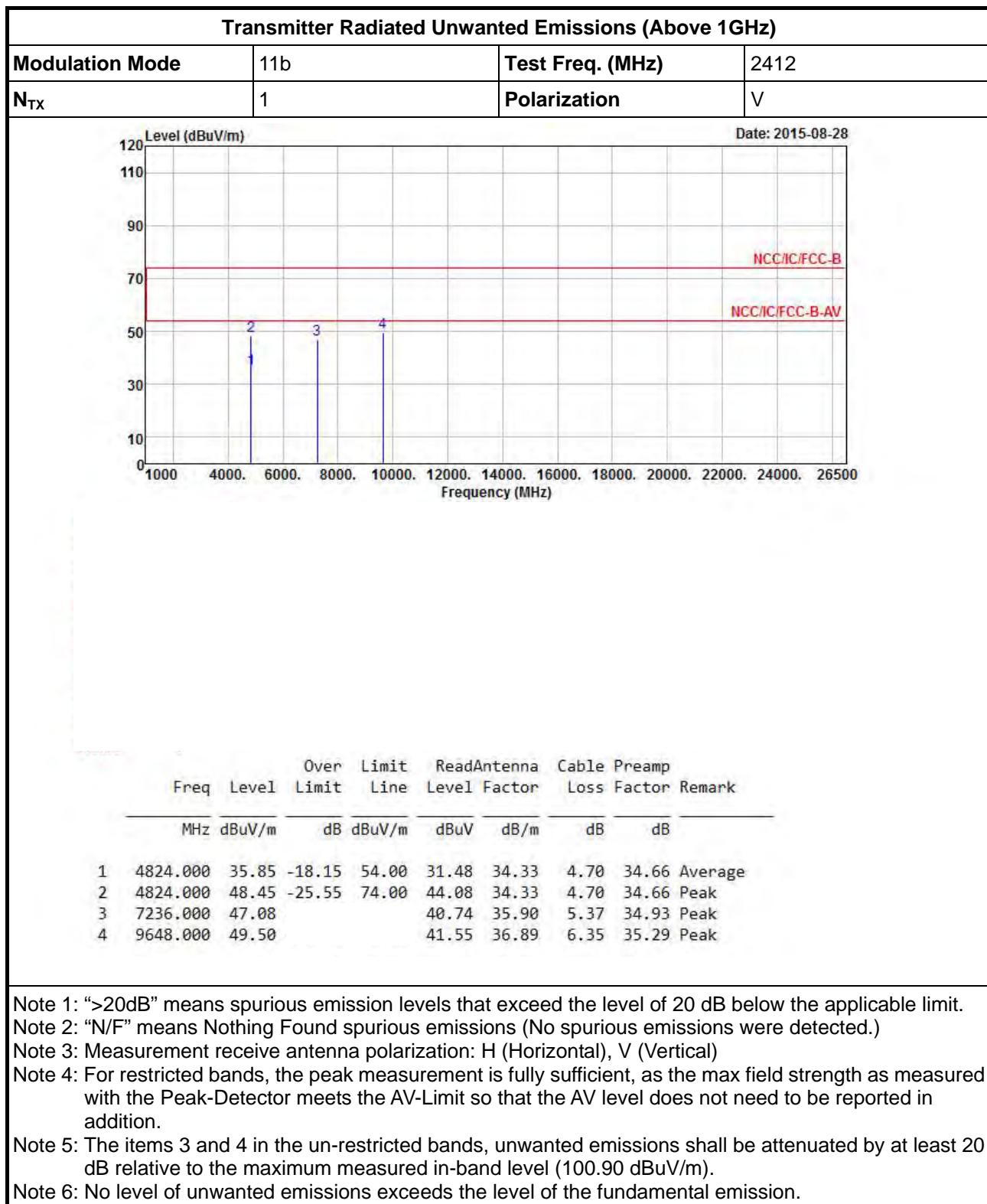
Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

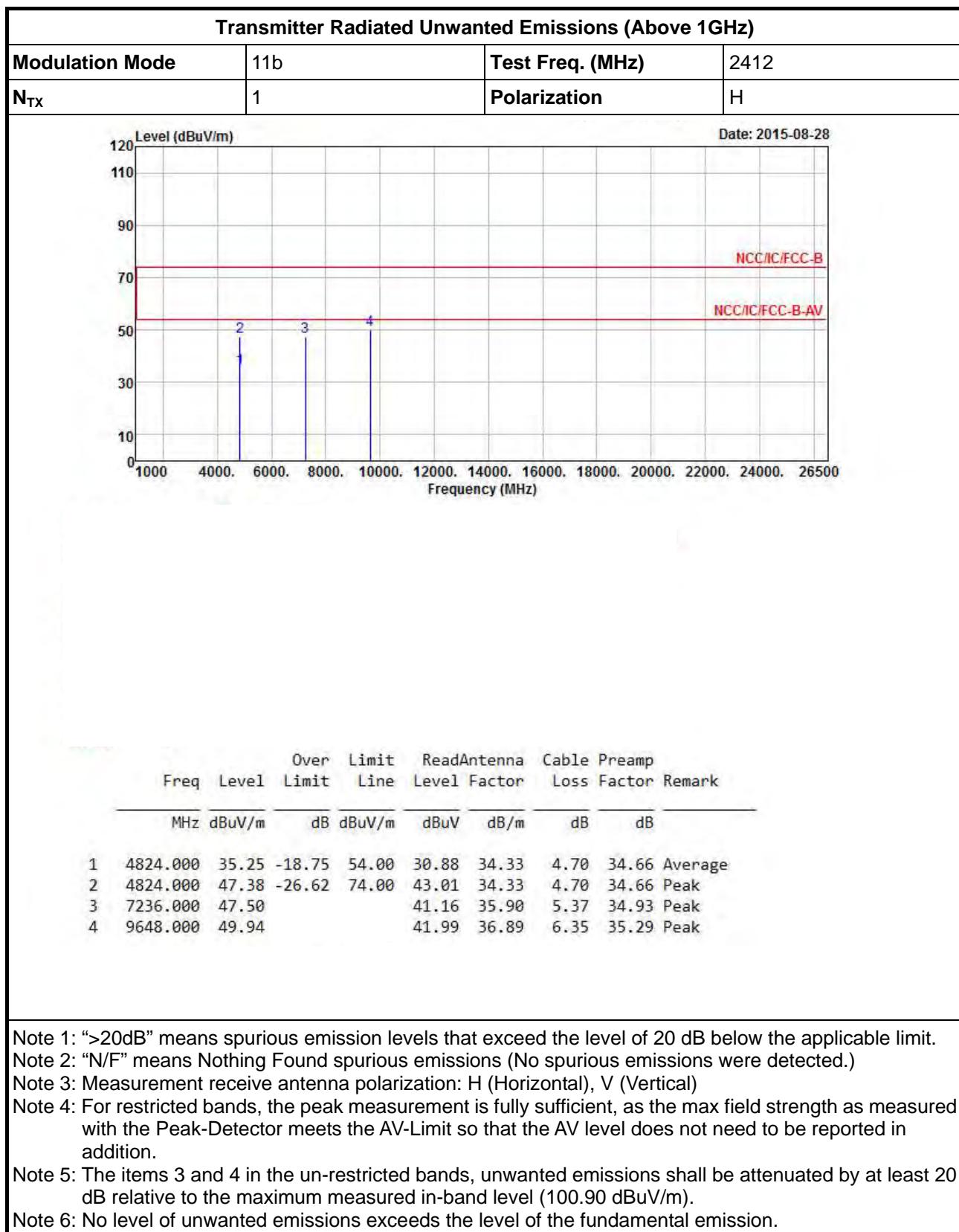






## 3.6.8 Transmitter Radiated Unwanted Emissions (Above 1GHz) – PCB Antenna





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

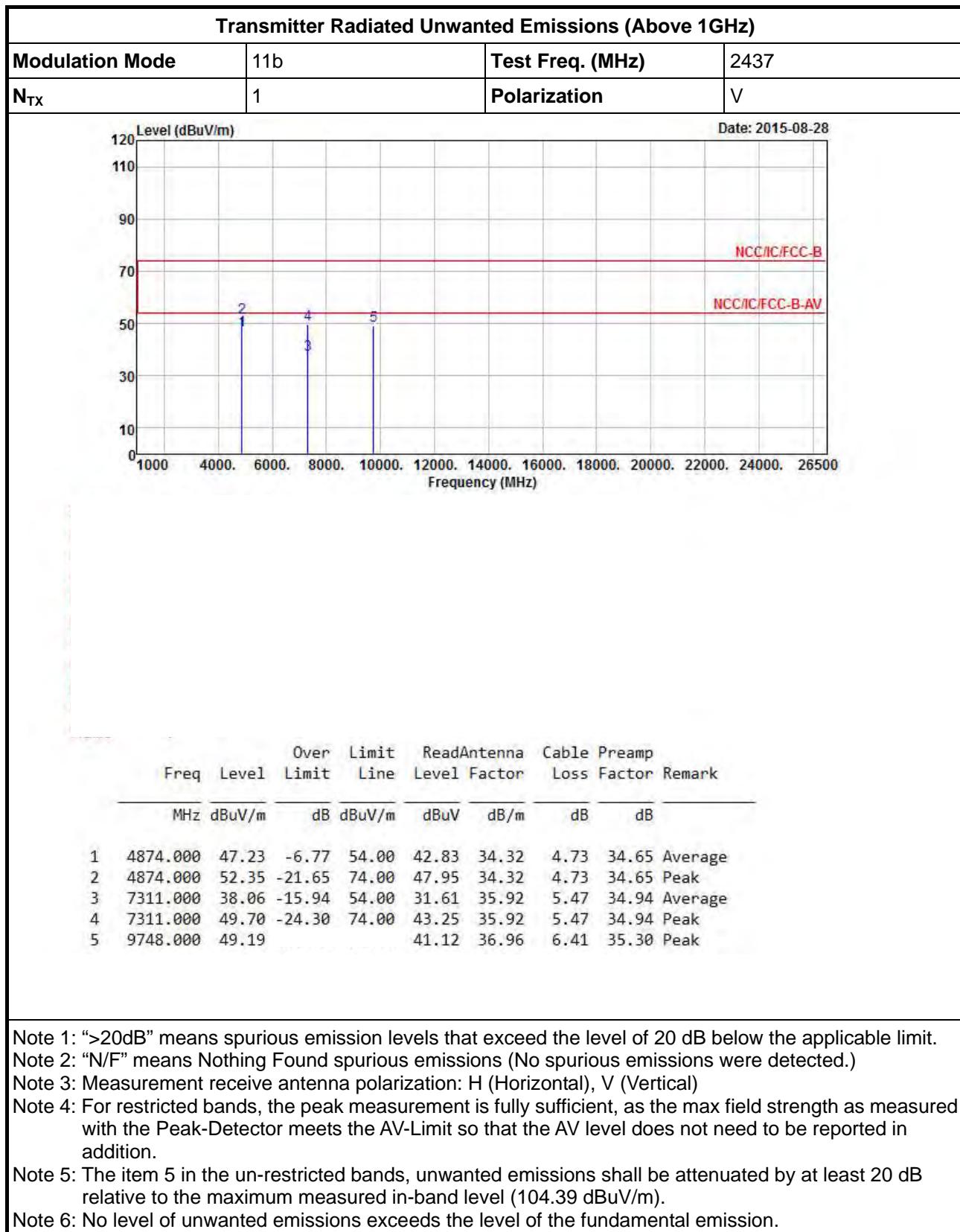
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

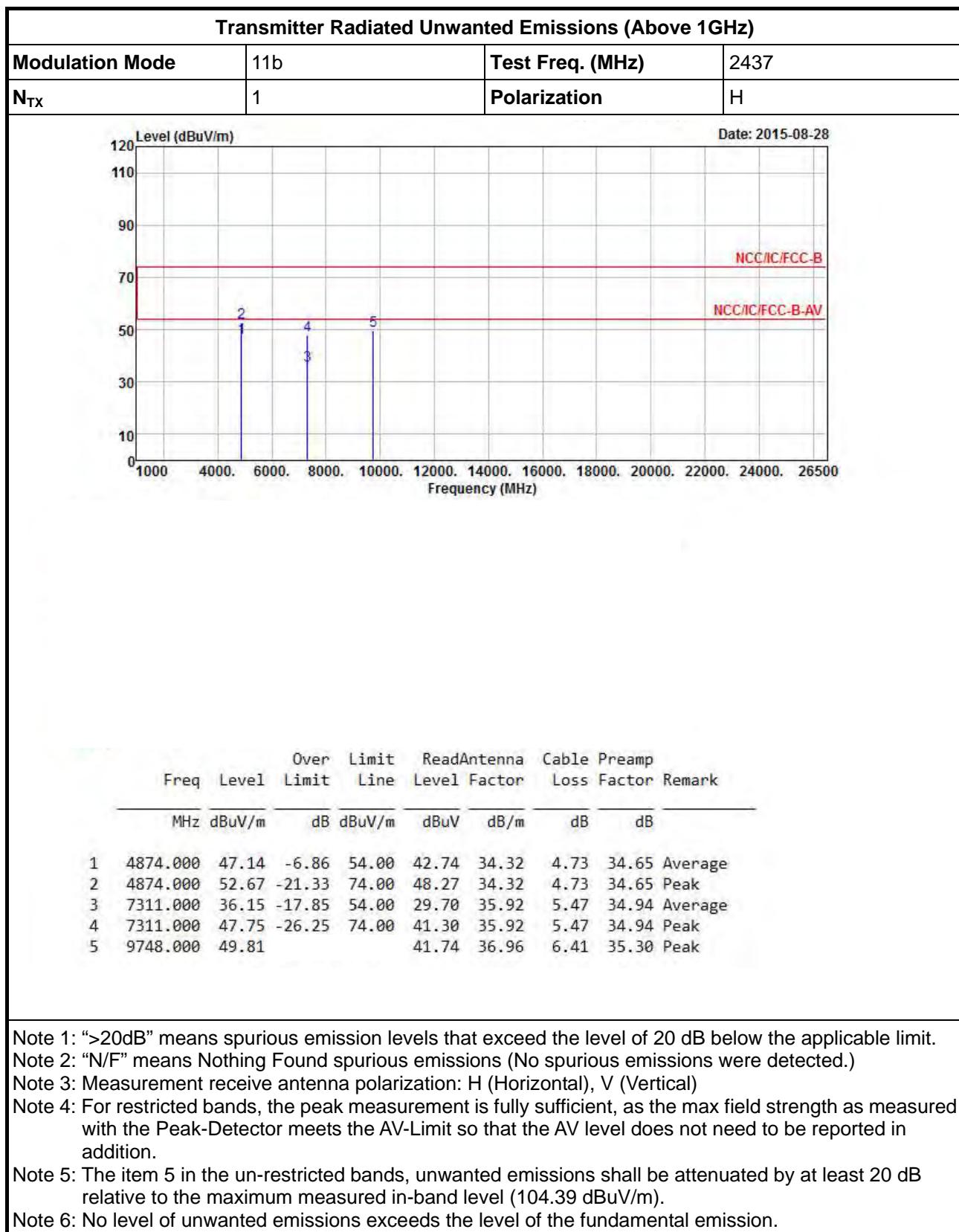
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

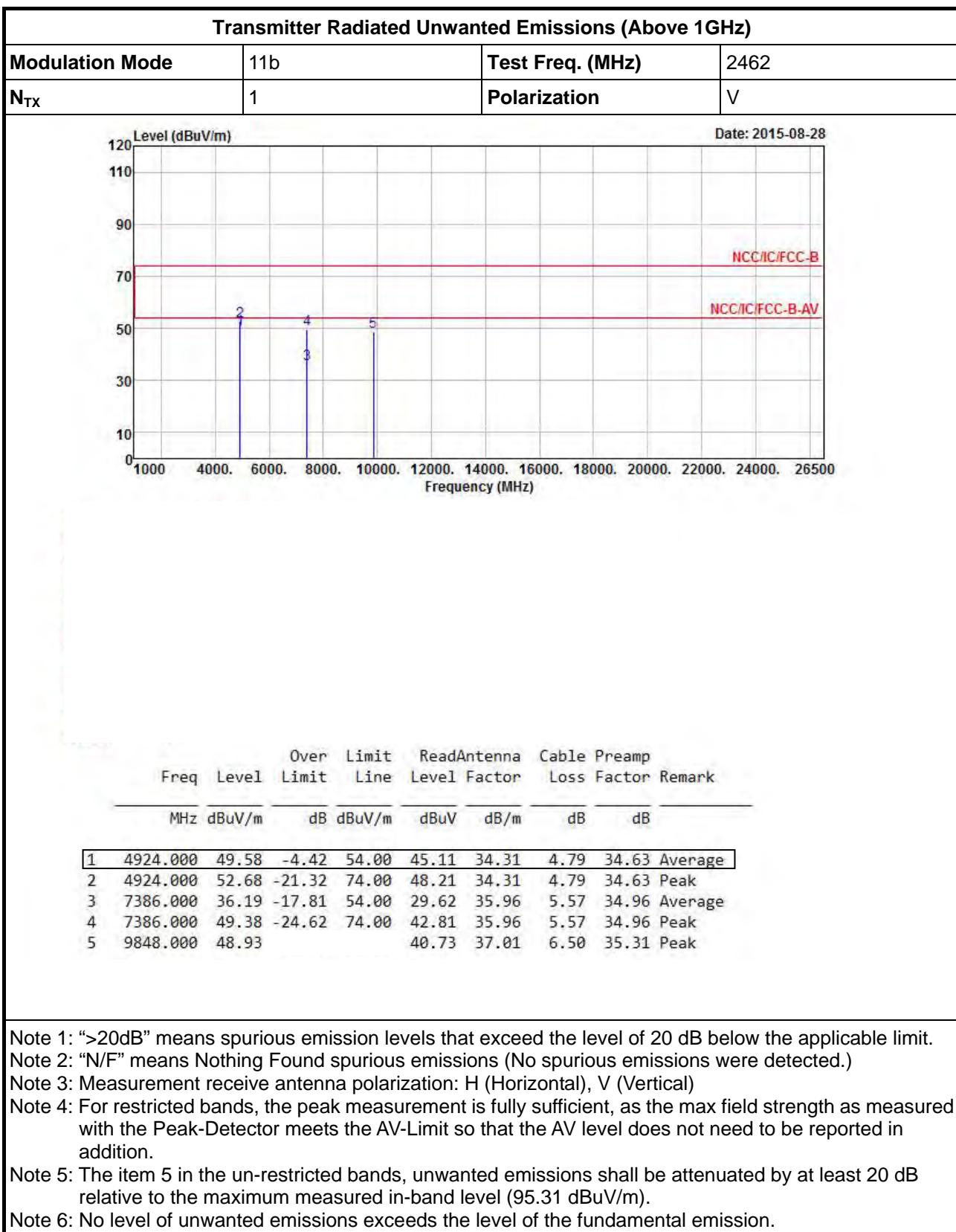
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

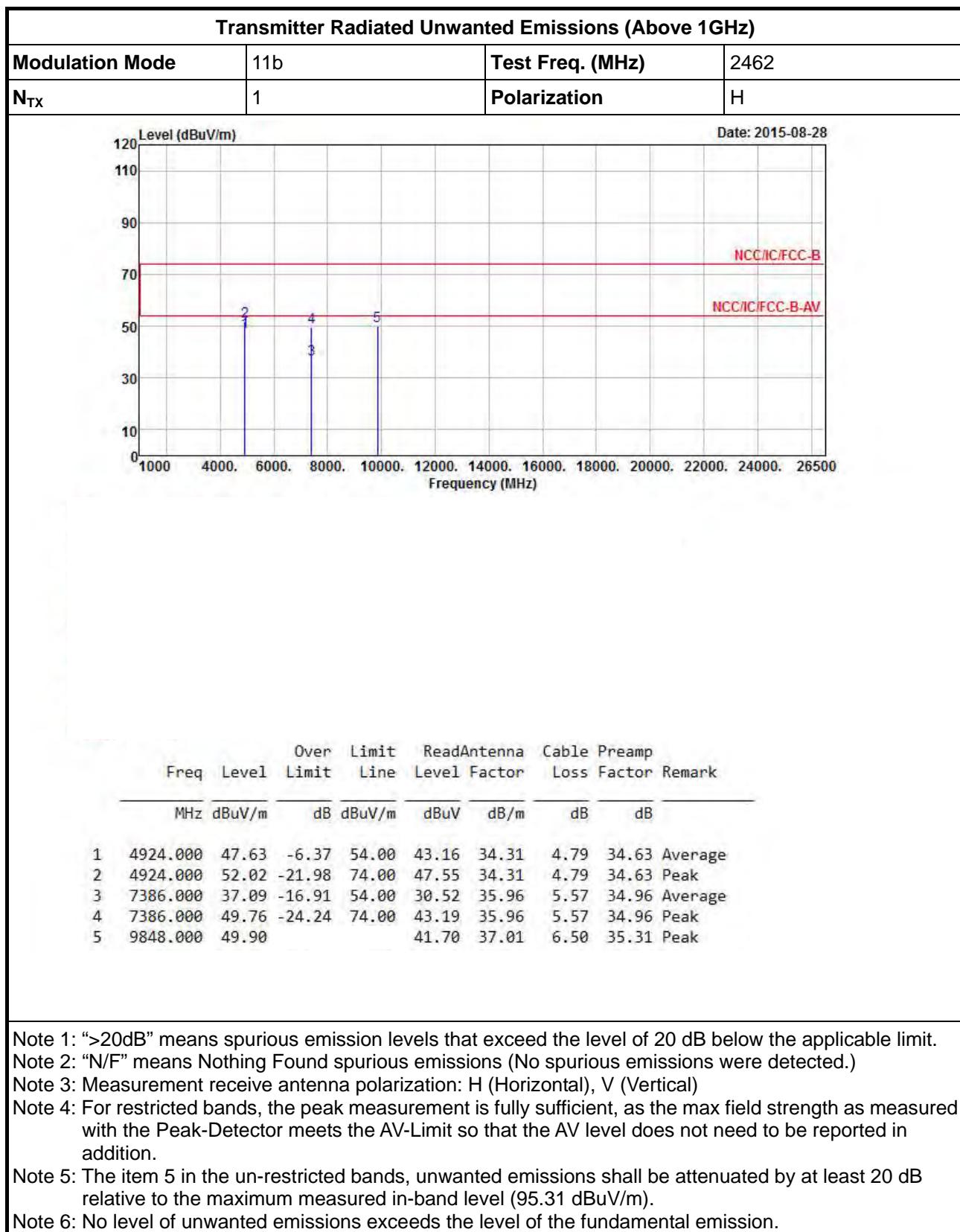
Note 5: The items 3 and 4 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (100.90 dBuV/m).

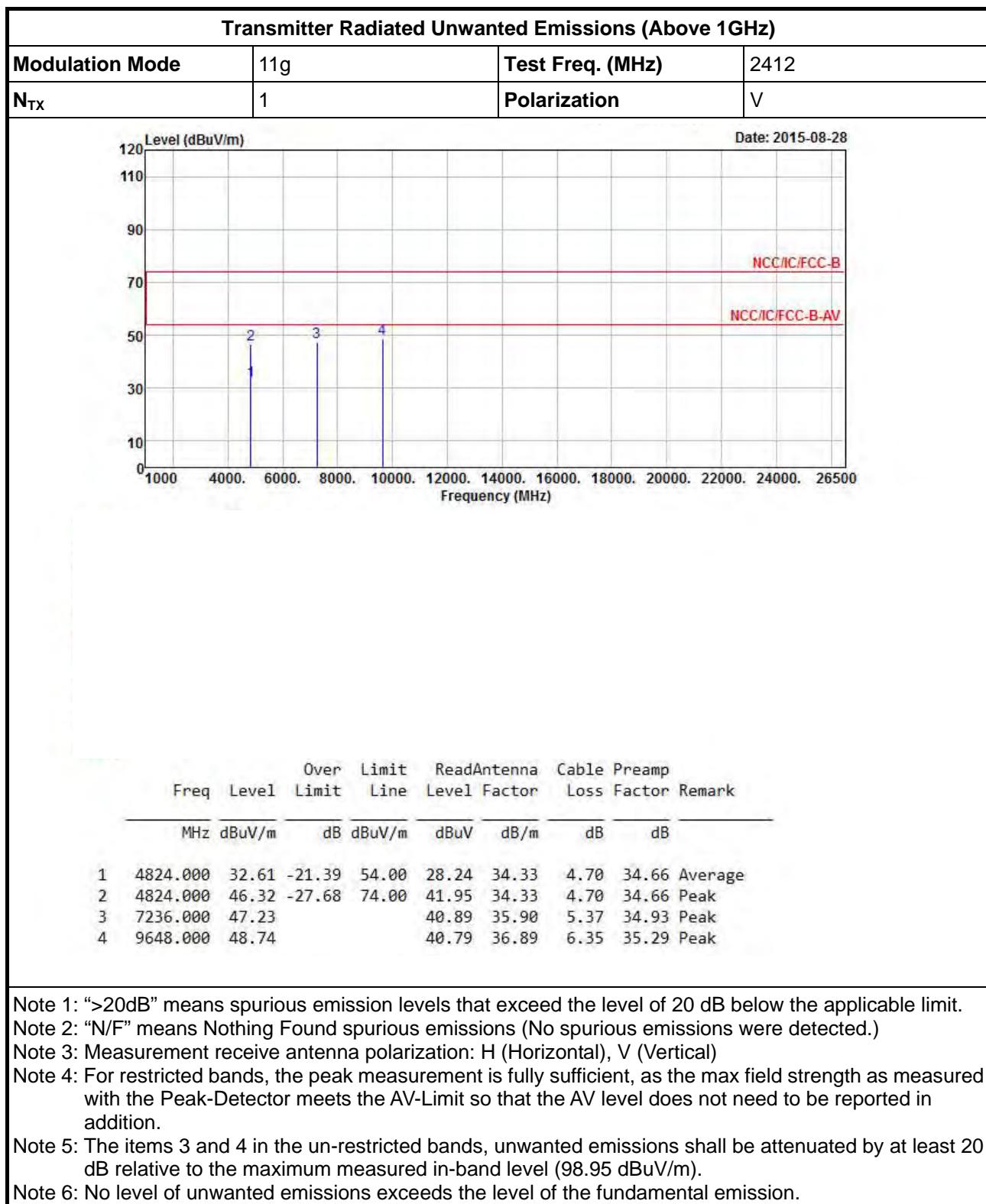
Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.













## Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11g	Test Freq. (MHz)	2412																																																
N <sub>TX</sub>	1	Polarization	H																																																
Level (dBuV/m)			Date: 2015-08-28																																																
<table border="1"> <thead> <tr> <th>Freq</th> <th>Level</th> <th>Over Limit</th> <th>Line</th> <th>ReadAntenna</th> <th>Cable</th> <th>Preamp</th> <th>Remark</th> </tr> <tr> <th>MHz</th> <th>dBuV/m</th> <th>dB</th> <th>dBuV/m</th> <th>dBuV</th> <th>dB/m</th> <th>dB</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>4824.000</td> <td>32.27</td> <td>-21.73</td> <td>54.00</td> <td>27.90</td> <td>34.33</td> <td>4.70 34.66 Average</td> </tr> <tr> <td>2</td> <td>4824.000</td> <td>45.04</td> <td>-28.96</td> <td>74.00</td> <td>40.67</td> <td>34.33</td> <td>4.70 34.66 Peak</td> </tr> <tr> <td>3</td> <td>7236.000</td> <td>46.71</td> <td></td> <td></td> <td>40.37</td> <td>35.90</td> <td>5.37 34.93 Peak</td> </tr> <tr> <td>4</td> <td>9648.000</td> <td>48.98</td> <td></td> <td></td> <td>41.03</td> <td>36.89</td> <td>6.35 35.29 Peak</td> </tr> </tbody> </table>				Freq	Level	Over Limit	Line	ReadAntenna	Cable	Preamp	Remark	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB		1	4824.000	32.27	-21.73	54.00	27.90	34.33	4.70 34.66 Average	2	4824.000	45.04	-28.96	74.00	40.67	34.33	4.70 34.66 Peak	3	7236.000	46.71			40.37	35.90	5.37 34.93 Peak	4	9648.000	48.98			41.03	36.89	6.35 35.29 Peak
Freq	Level	Over Limit	Line	ReadAntenna	Cable	Preamp	Remark																																												
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB																																													
1	4824.000	32.27	-21.73	54.00	27.90	34.33	4.70 34.66 Average																																												
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3	7236.000	46.71			40.37	35.90	5.37 34.93 Peak																																												
4	9648.000	48.98			41.03	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.

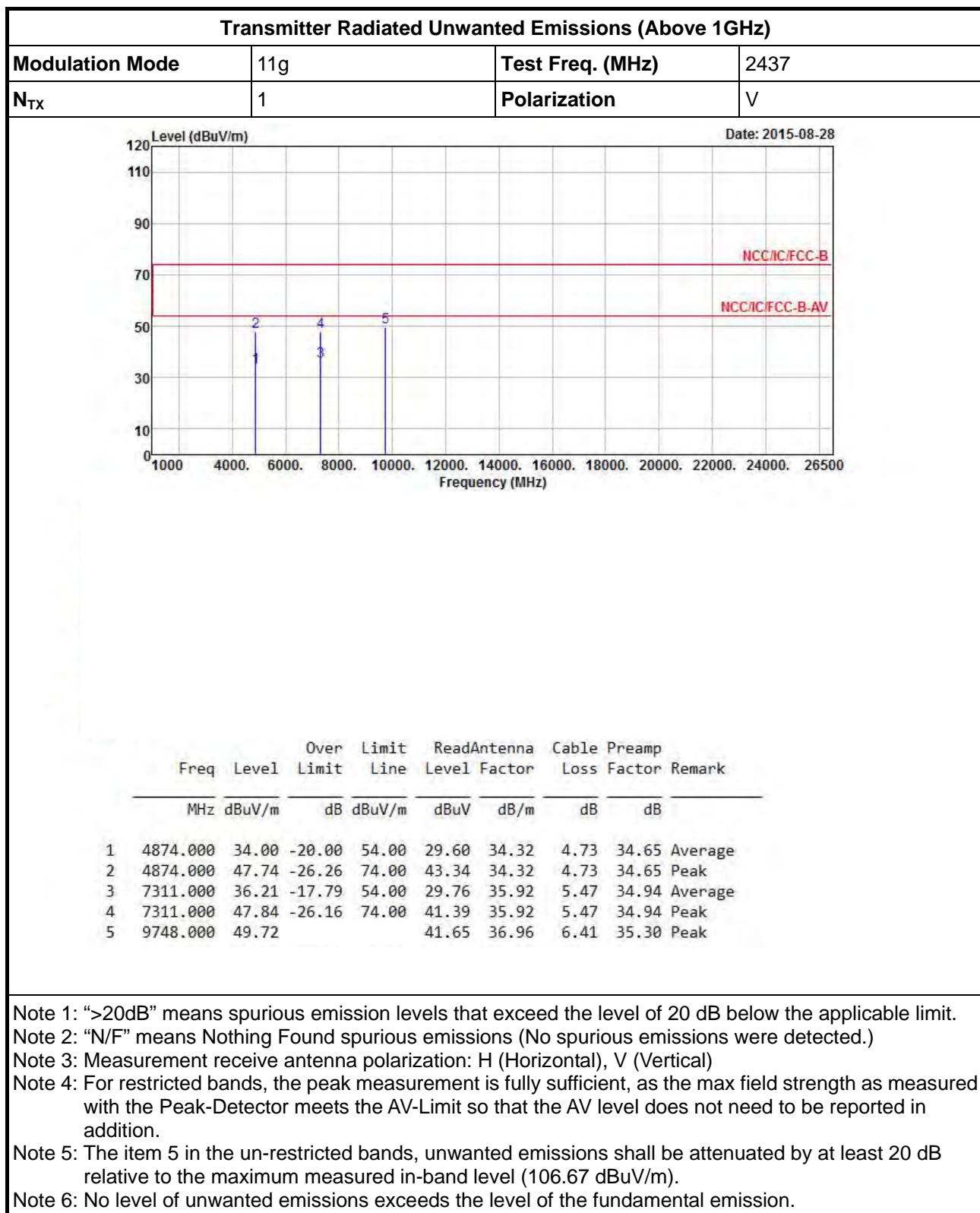
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

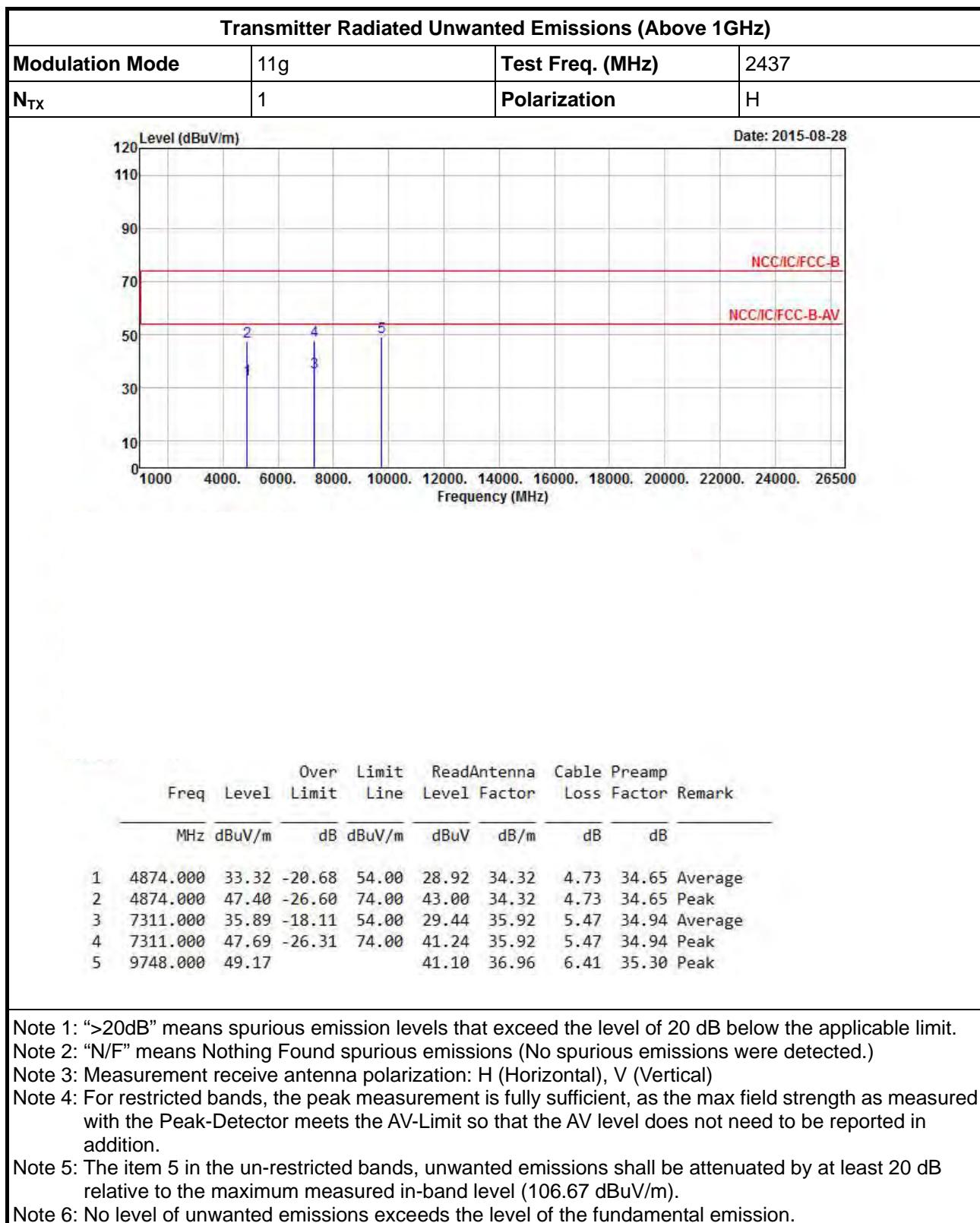
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

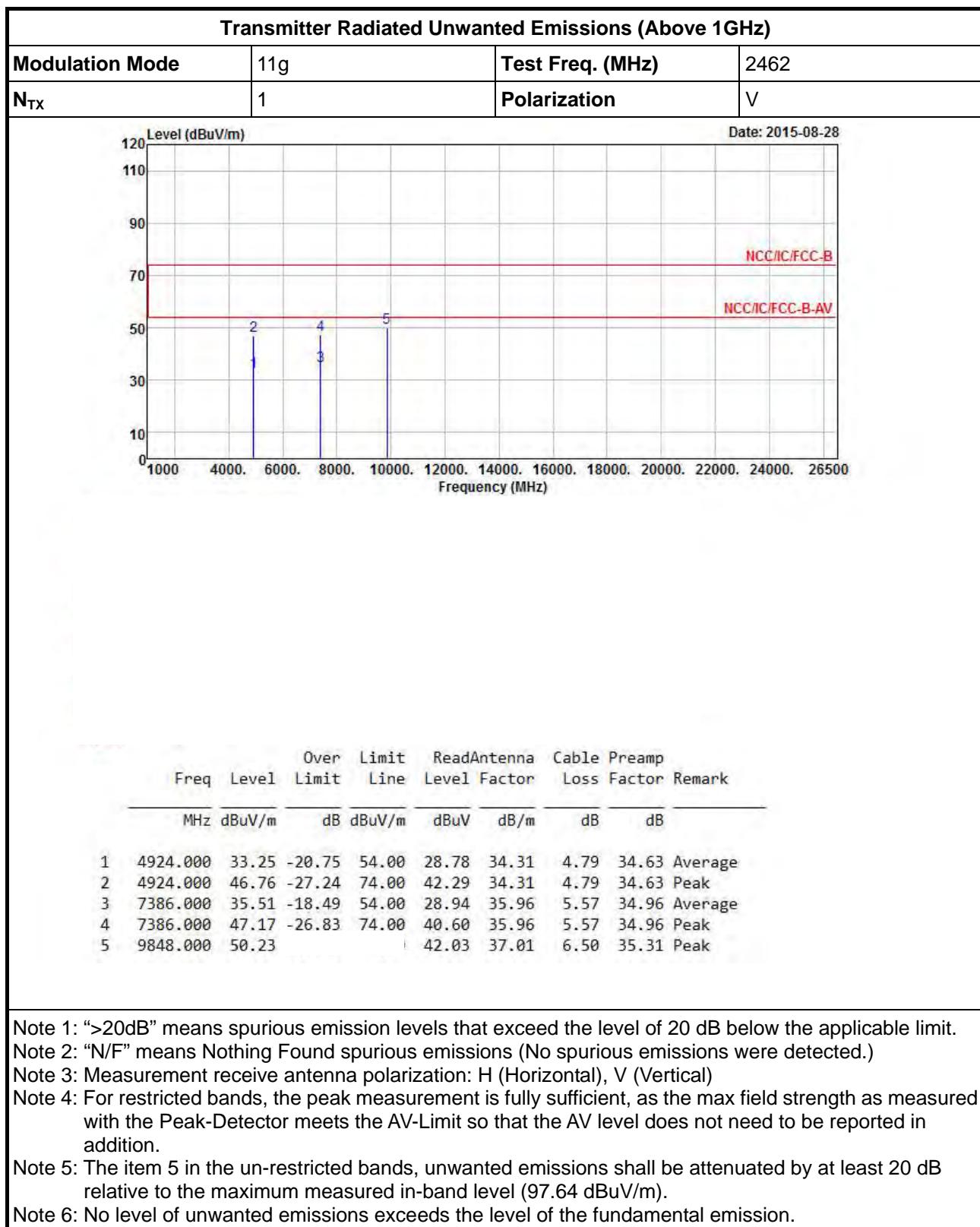
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

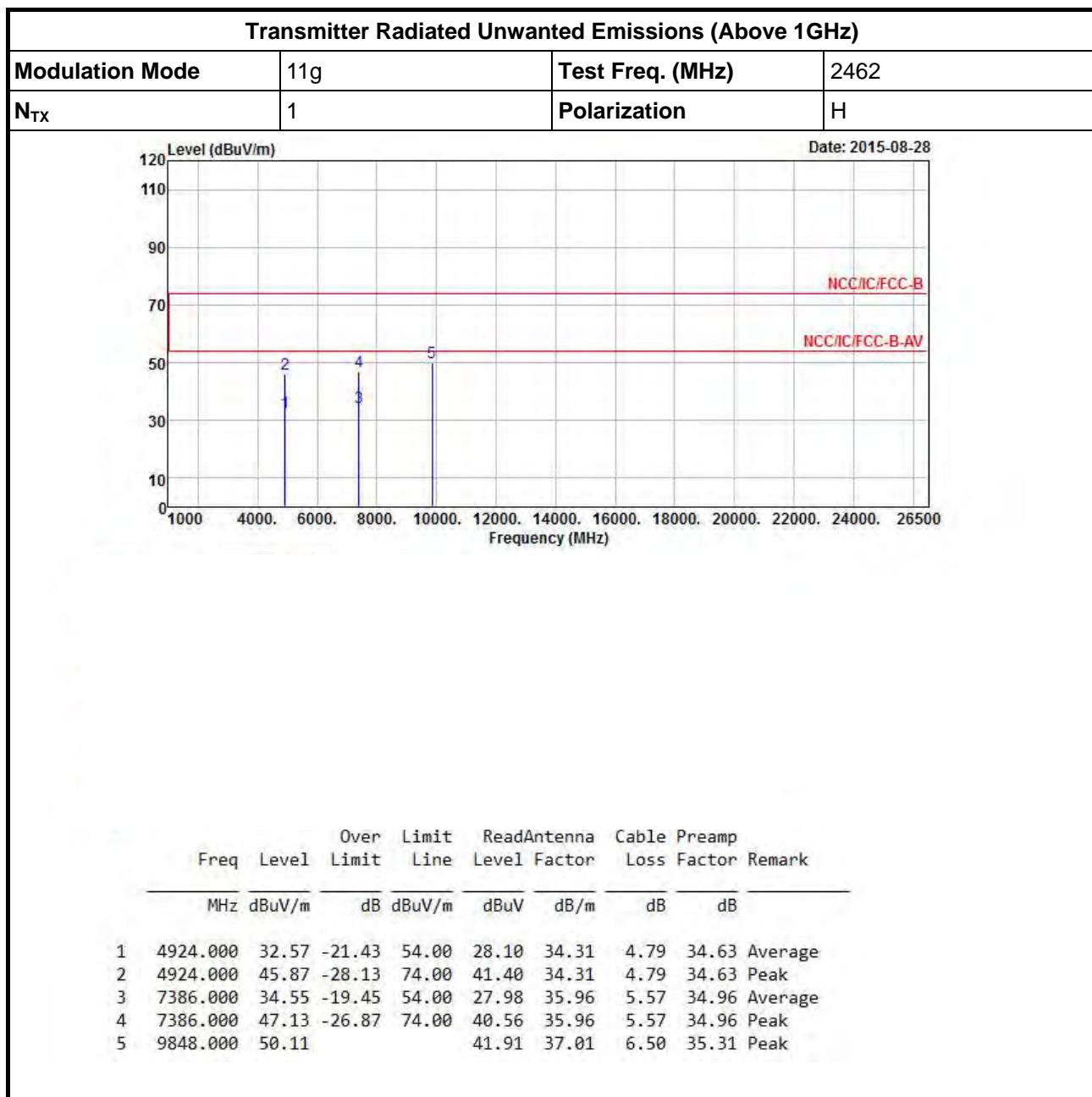
Note 5: The items 3 and 4 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (98.95 dBuV/m).

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.

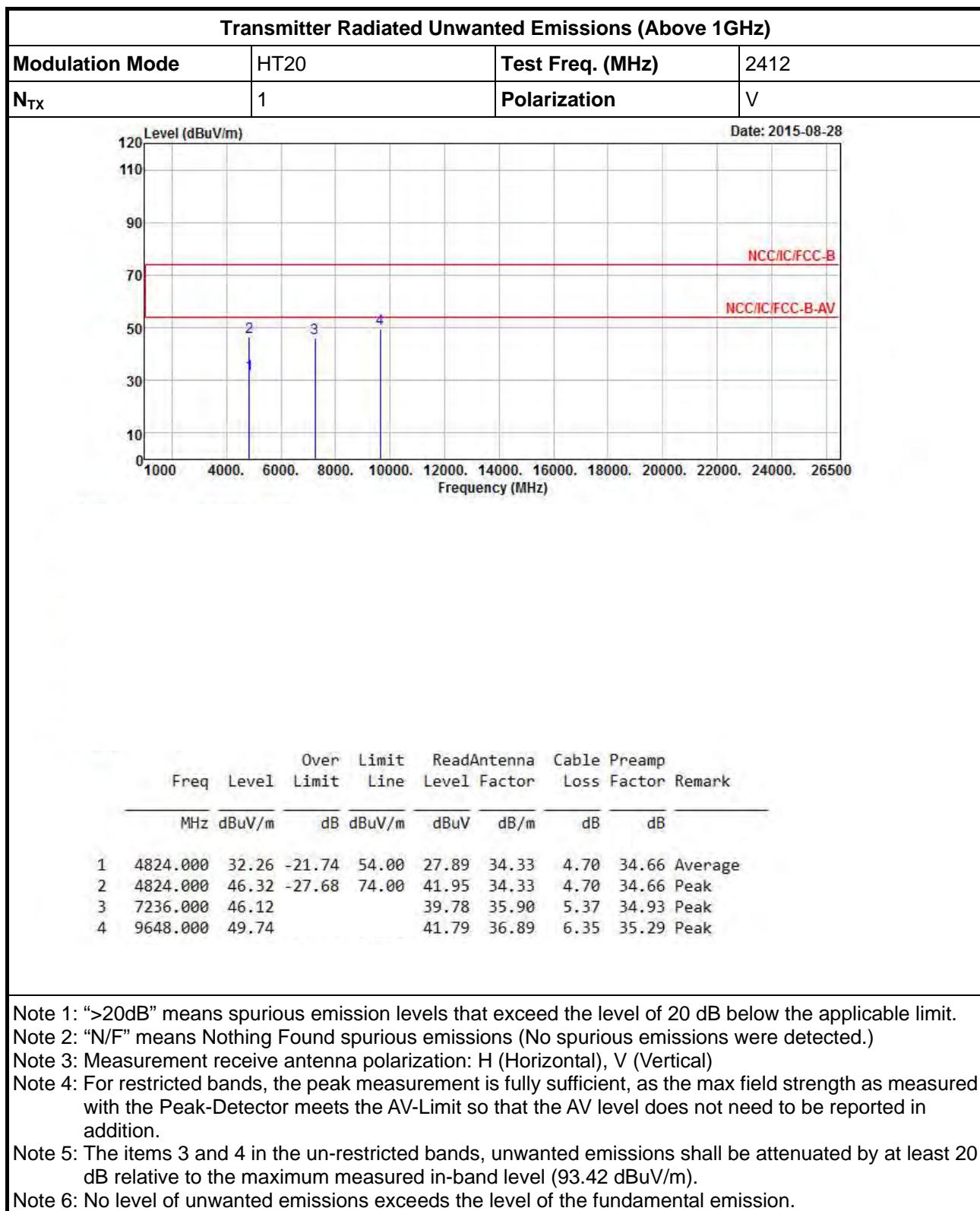
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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: The item 5 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (97.64 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.

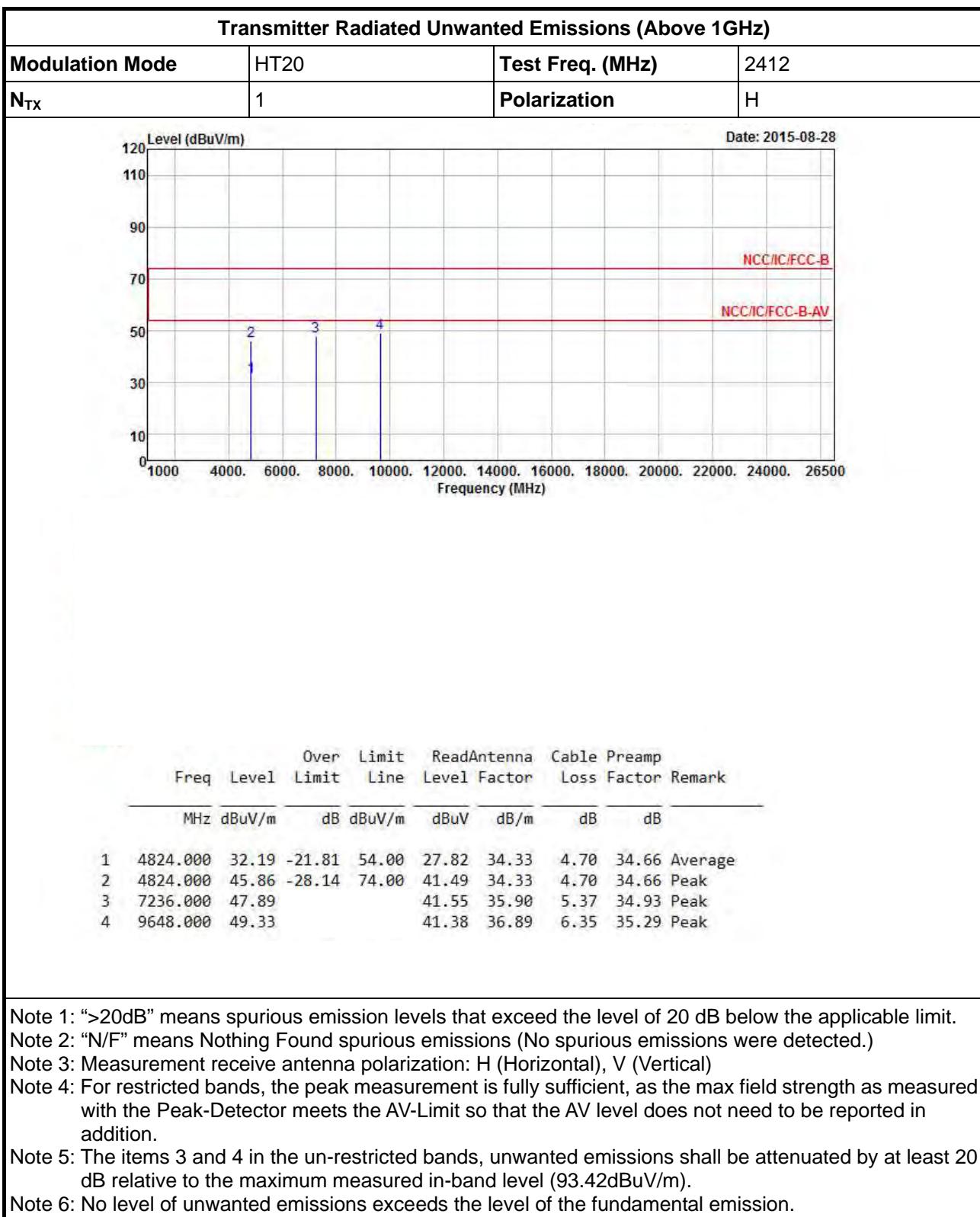
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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: The items 3 and 4 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (93.42 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.

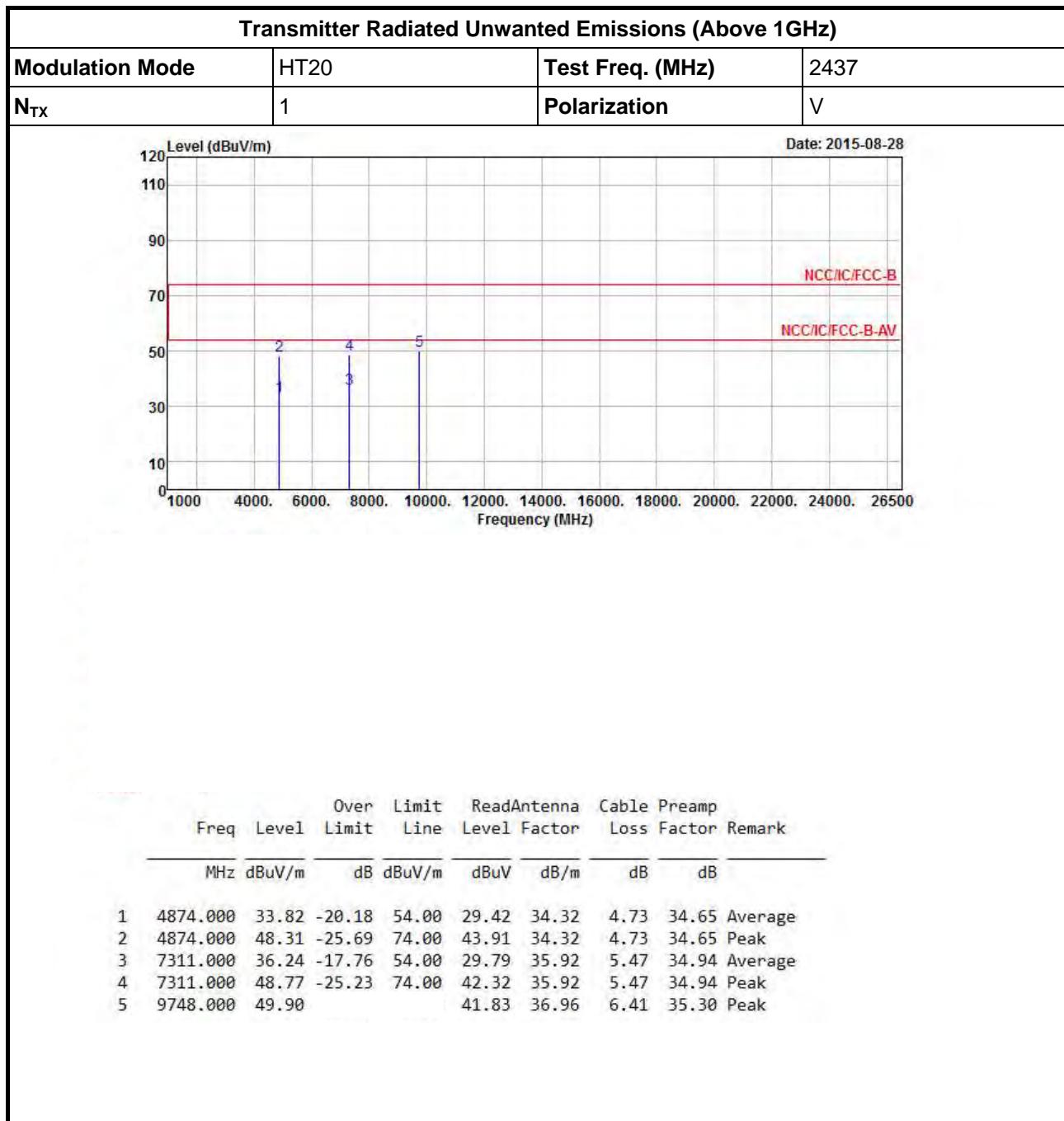
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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: The items 3 and 4 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (93.42dBuV/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.

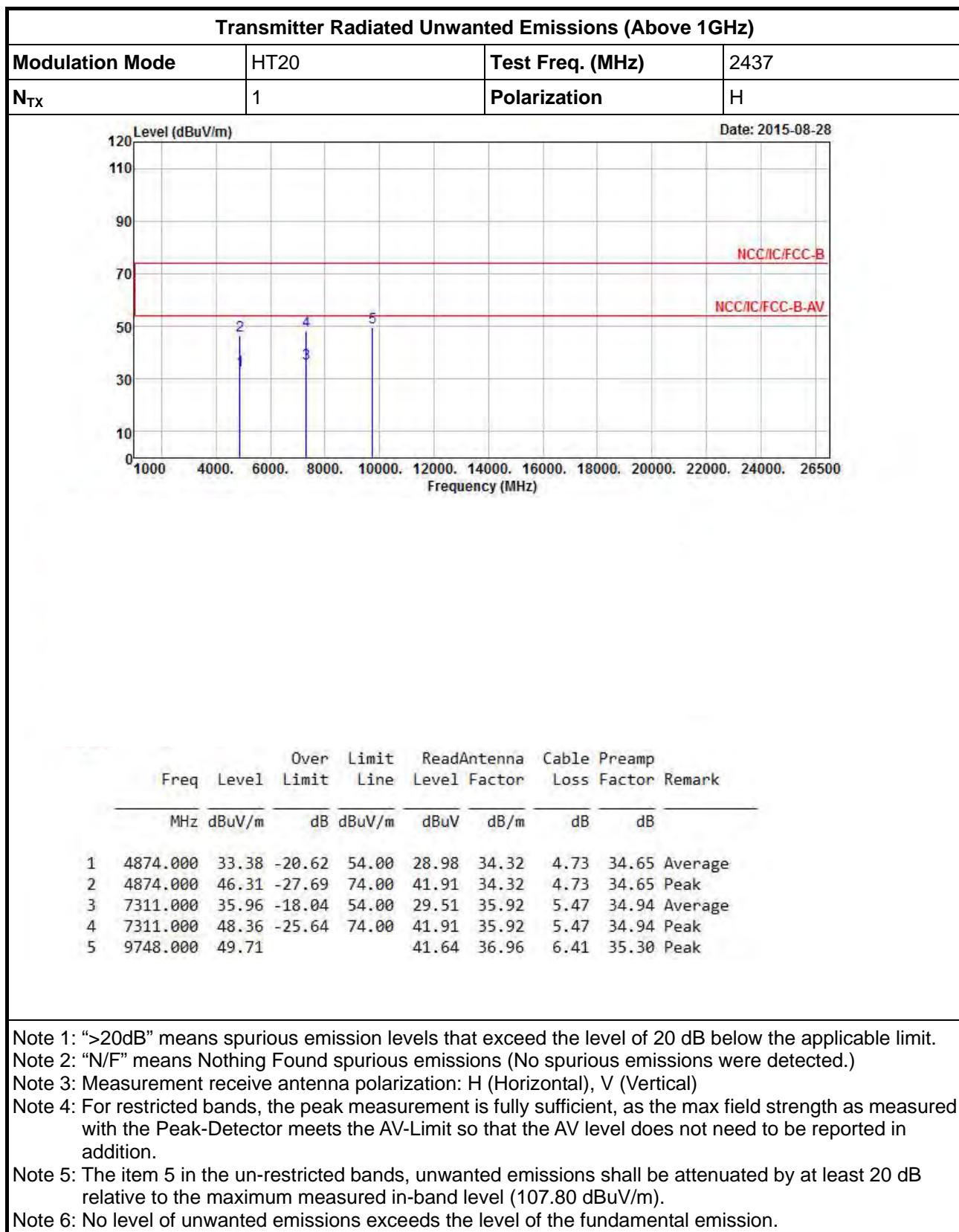
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

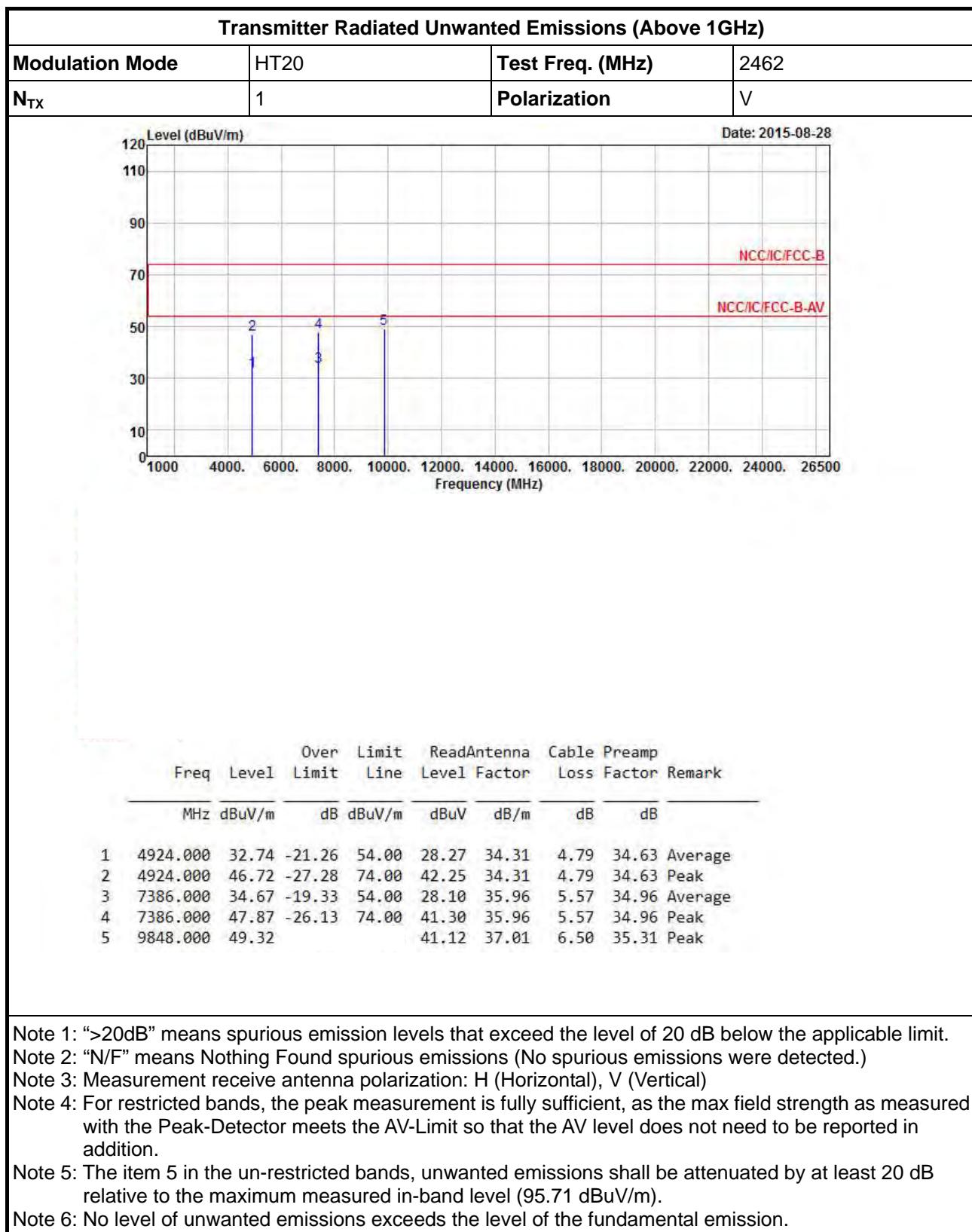
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

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: The item 5 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (107.80 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.

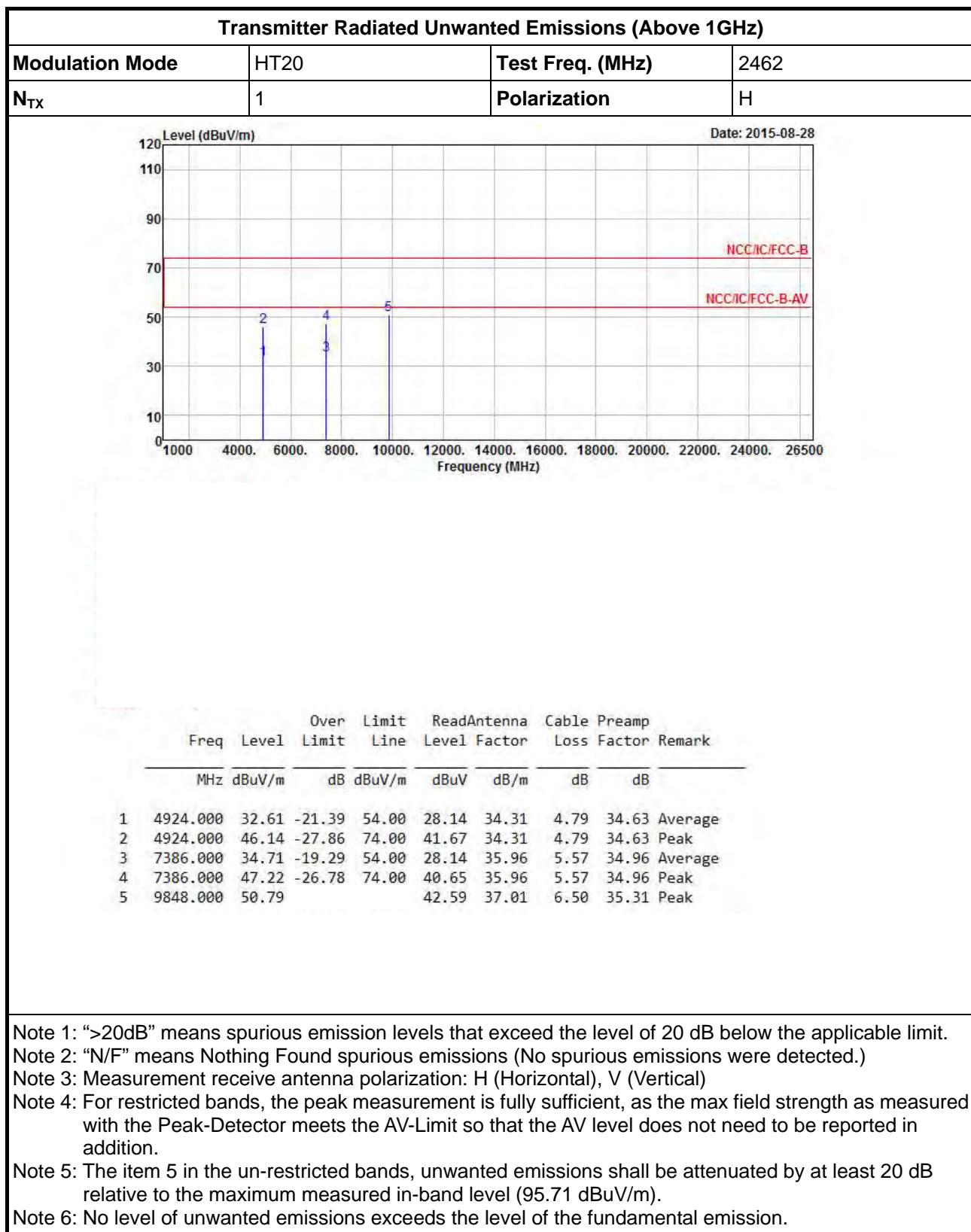
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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: The item 5 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (95.71 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)

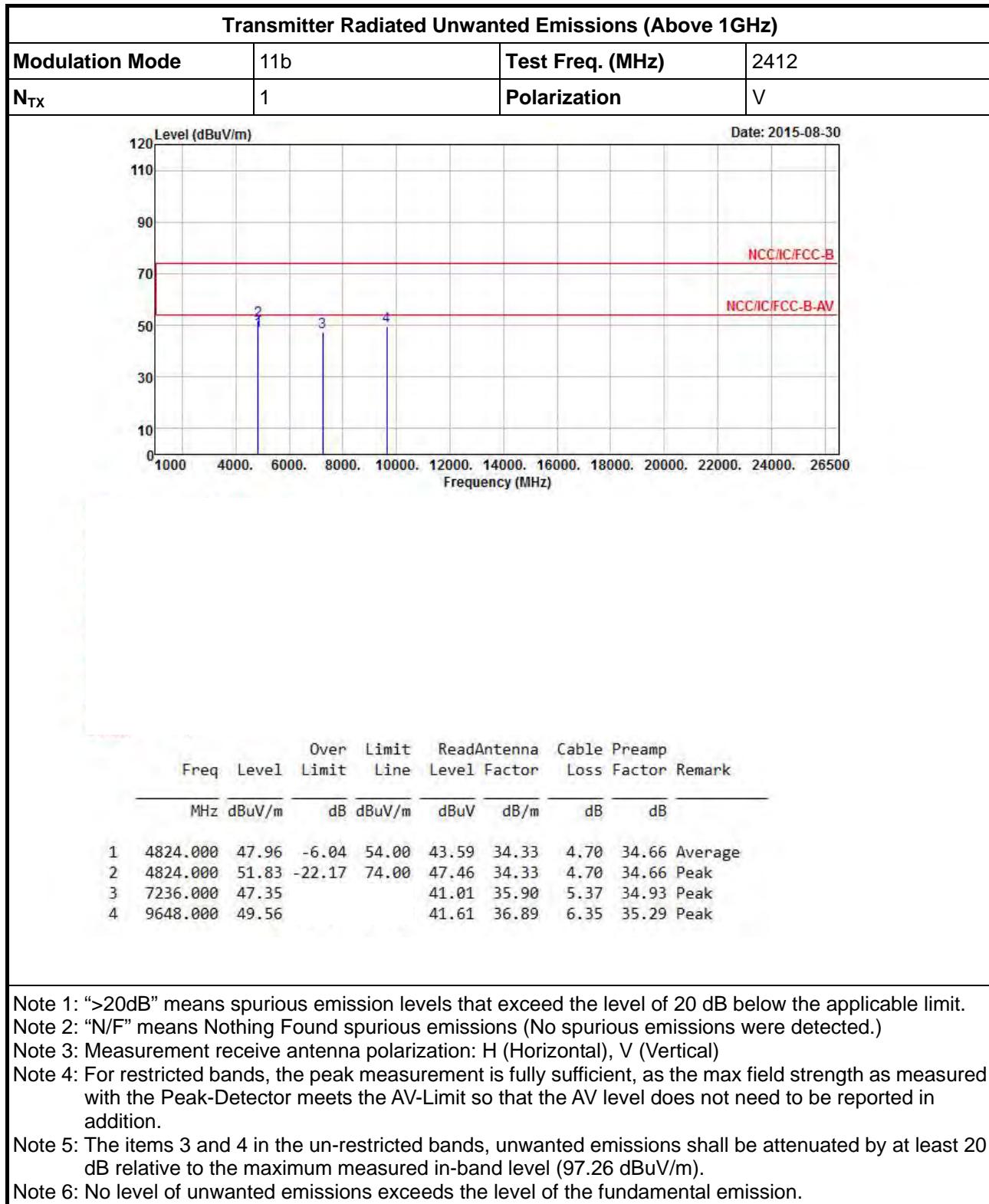
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

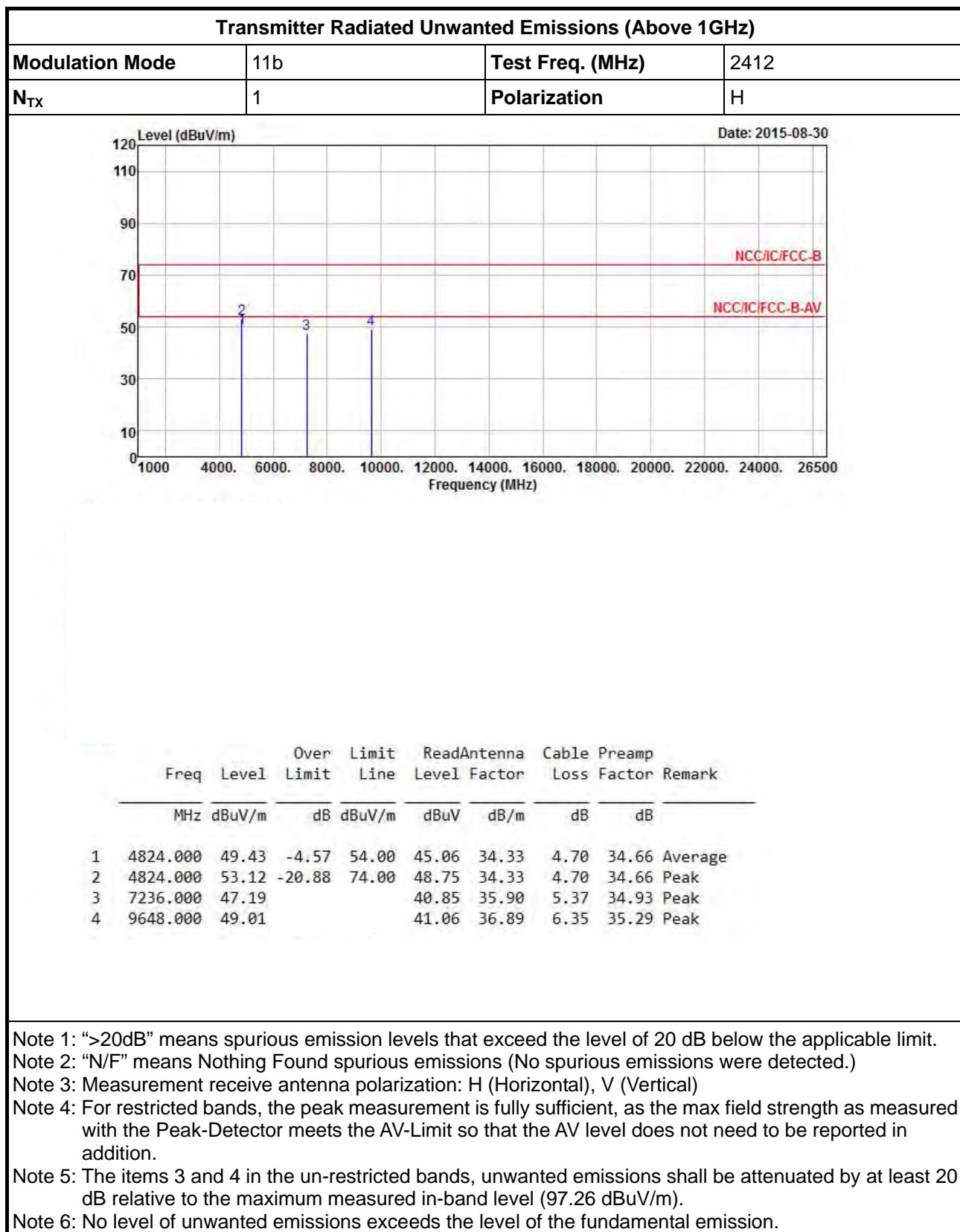
Note 5: The item 5 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (95.71 dBuV/m).

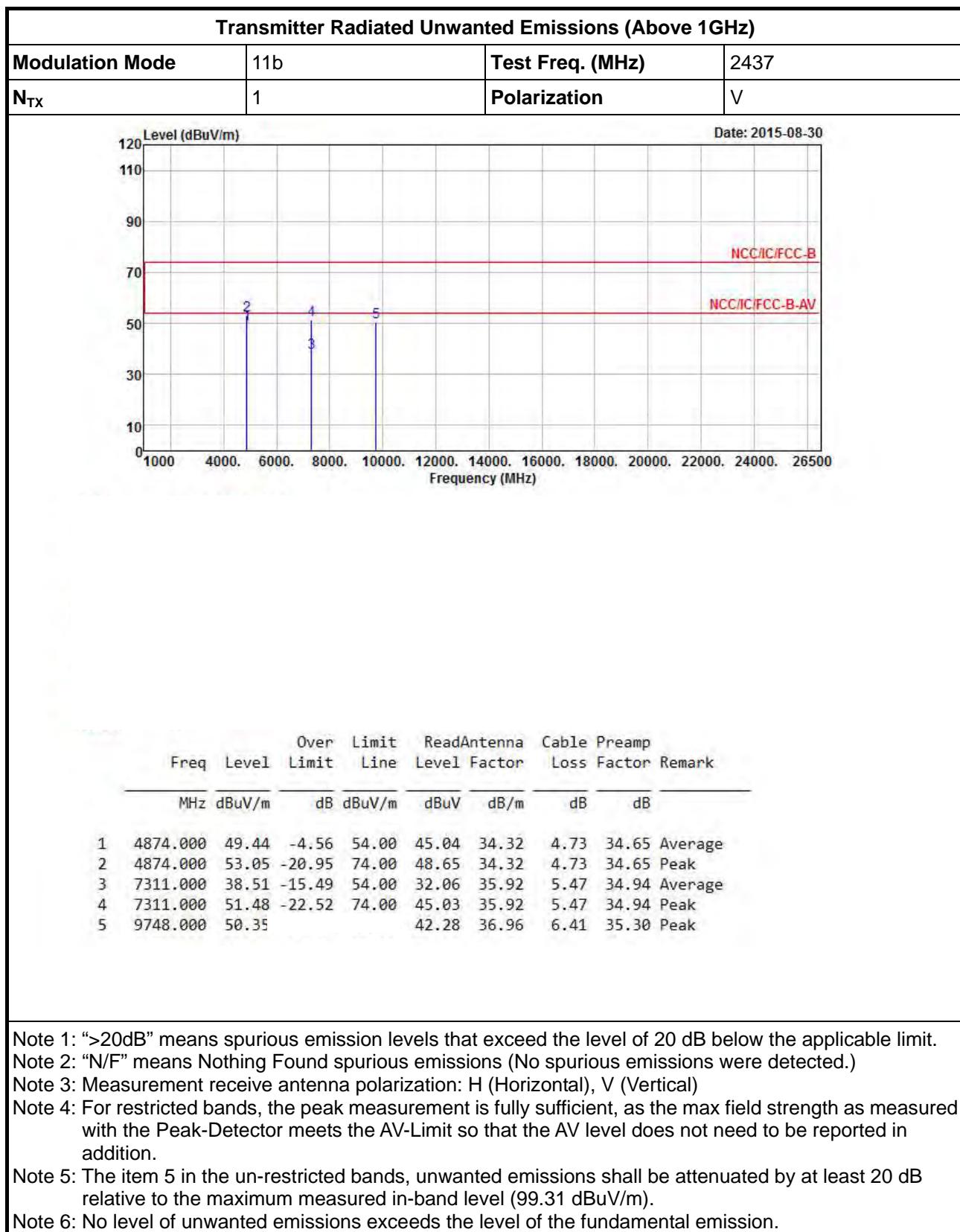
Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

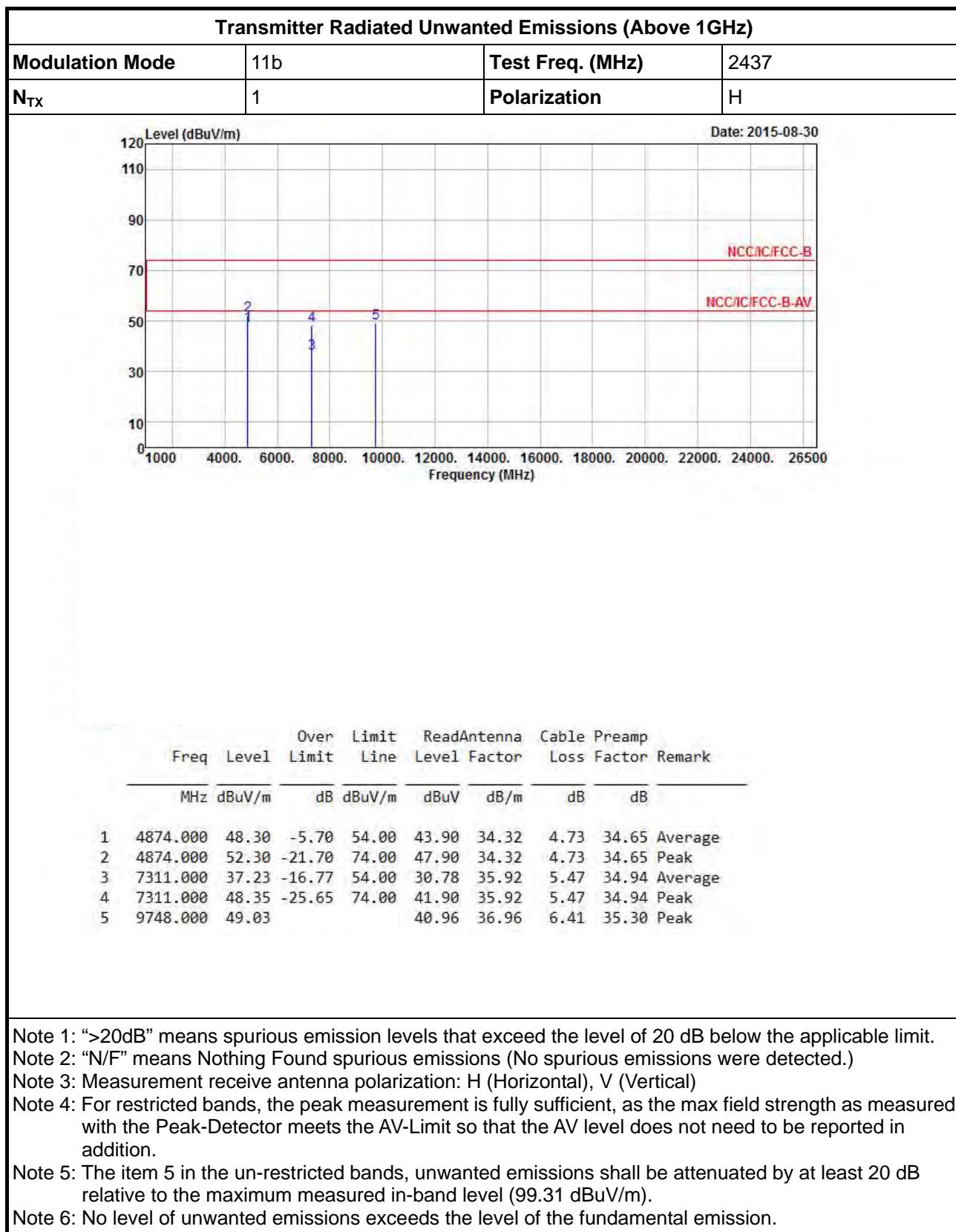


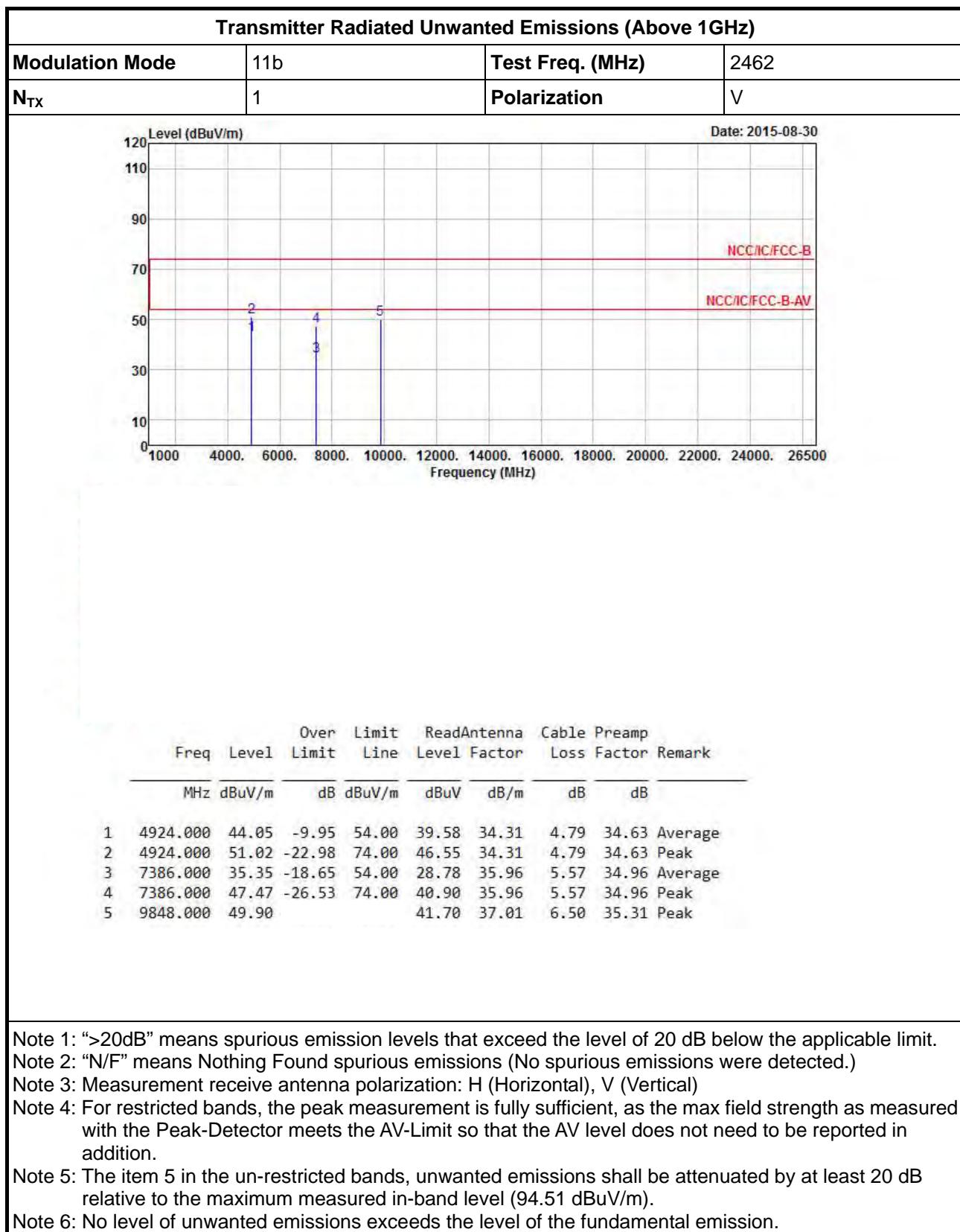
## 3.6.9 Transmitter Radiated Unwanted Emissions (Above 1GHz) – PIFA Antenna

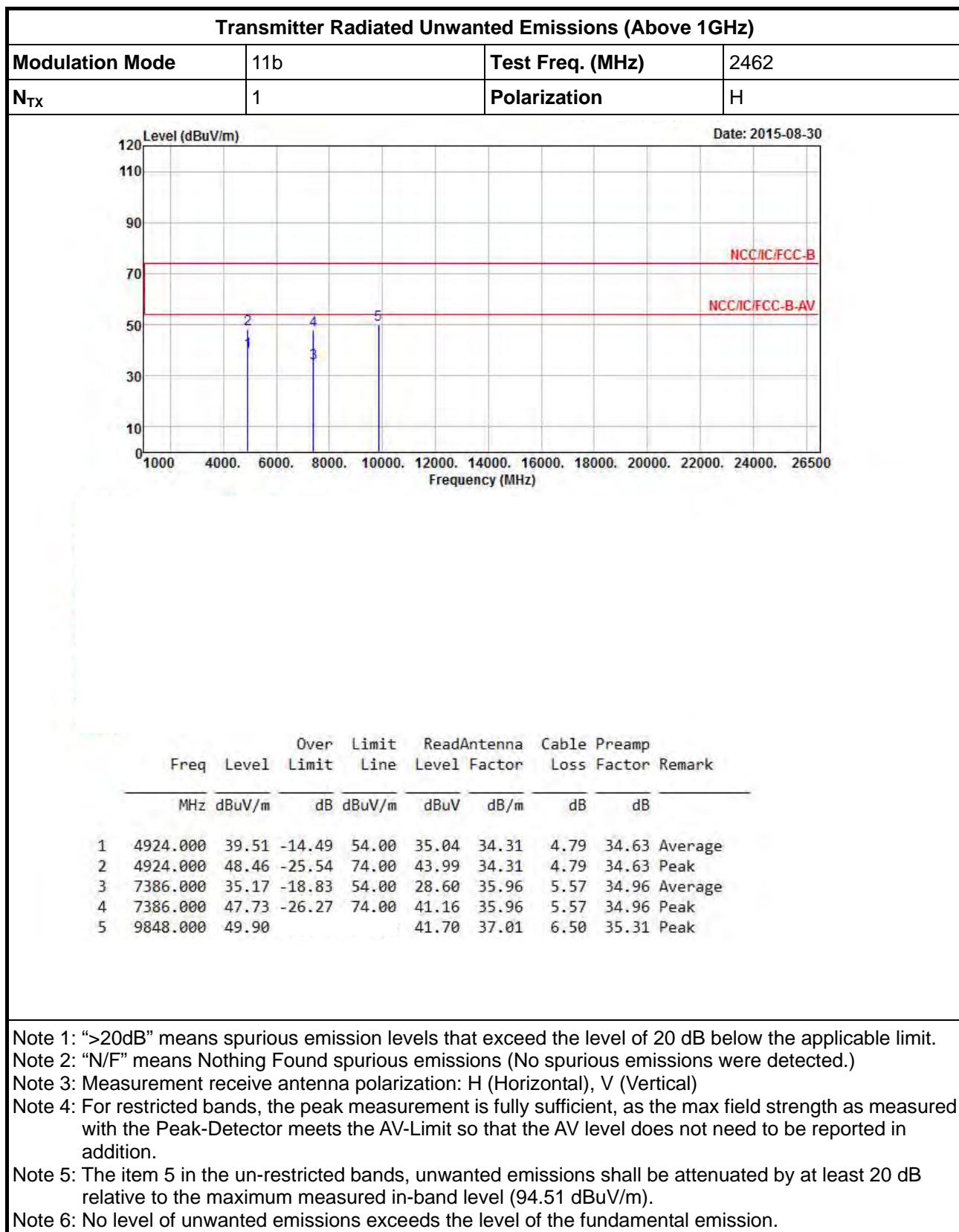


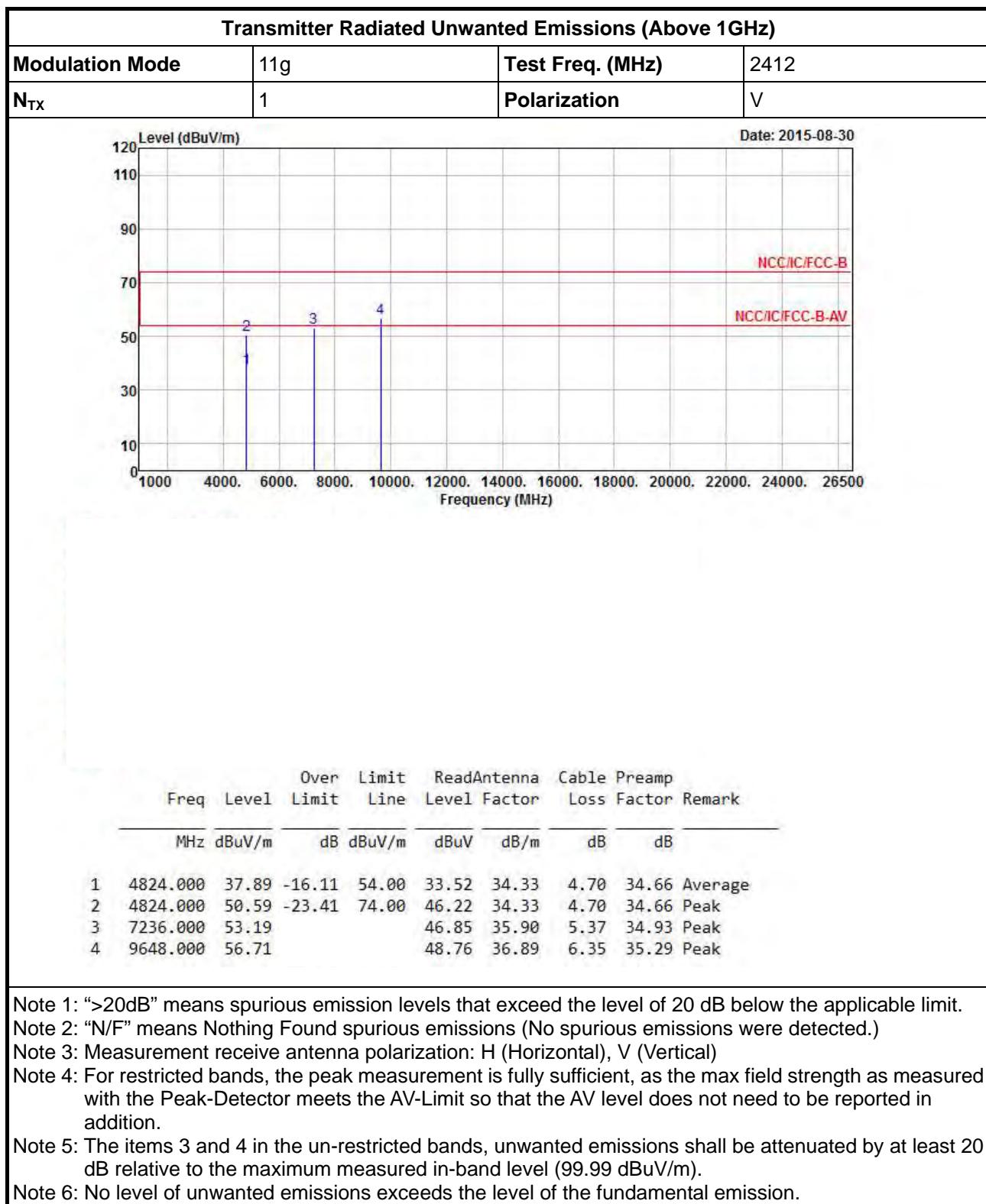








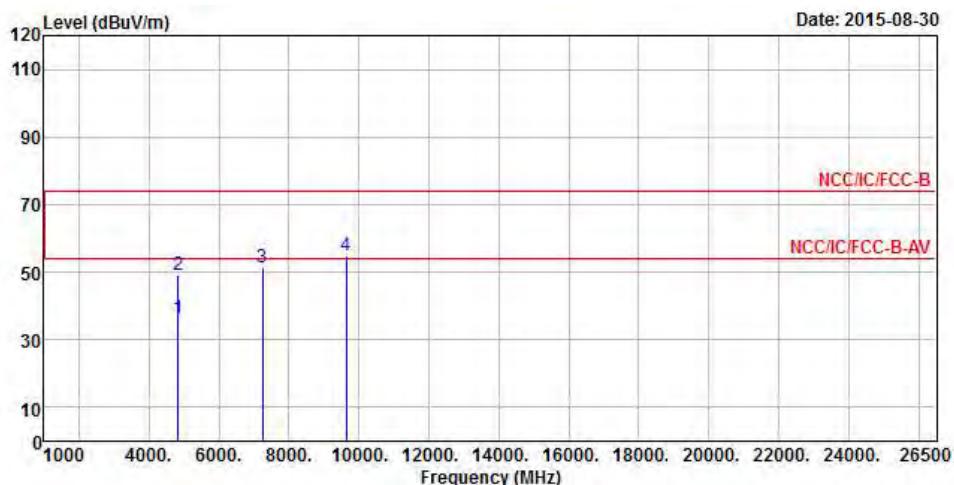






## Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11g	Test Freq. (MHz)	2412
N <sub>TX</sub>	1	Polarization	H



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Level	Factor	Loss	Factor	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4824.000	36.13	-17.87	54.00	31.76	34.33	4.70	34.66 Average
2	4824.000	49.37	-24.63	74.00	45.00	34.33	4.70	34.66 Peak
3	7236.000	51.25			44.91	35.90	5.37	34.93 Peak
4	9648.000	54.69			46.74	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: The items 3 and 4 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (99.99 dBuV/m).

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



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

Modulation Mode	11g	Test Freq. (MHz)	2437
N <sub>TX</sub>	1	Polarization	V

Date: 2015-08-30

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	4874.000	38.31	-15.69	54.00	33.91	34.32	4.73	34.65	Average
2	4874.000	52.42	-21.58	74.00	48.02	34.32	4.73	34.65	Peak
3	7311.000	36.79	-17.21	54.00	30.34	35.92	5.47	34.94	Average
4	7311.000	50.51	-23.49	74.00	44.06	35.92	5.47	34.94	Peak
5	9748.000	52.16			44.09	36.96	6.41	35.30	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: The item 5 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (104.12 dB<sub>UV</sub>/m).

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



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

<b>Modulation Mode</b>	11g	<b>Test Freq. (MHz)</b>	2437
<b>N<sub>TX</sub></b>	1	<b>Polarization</b>	H

Date: 2015-08-30

Frequency (MHz)

	Over Limit	Limit	Read	Antenna	Cable	Preamp			
Freq	Level	Limit	Line	Level	Factor	Loss	Factor		
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB		
1	4874.000	37.71	-16.29	54.00	33.31	34.32	4.73	34.65	Average
2	4874.000	49.50	-24.50	74.00	45.10	34.32	4.73	34.65	Peak
3	7311.000	35.68	-18.32	54.00	29.23	35.92	5.47	34.94	Average
4	7311.000	50.46	-23.54	74.00	44.01	35.92	5.47	34.94	Peak
5	9748.000	51.38			43.31	36.96	6.41	35.30	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.

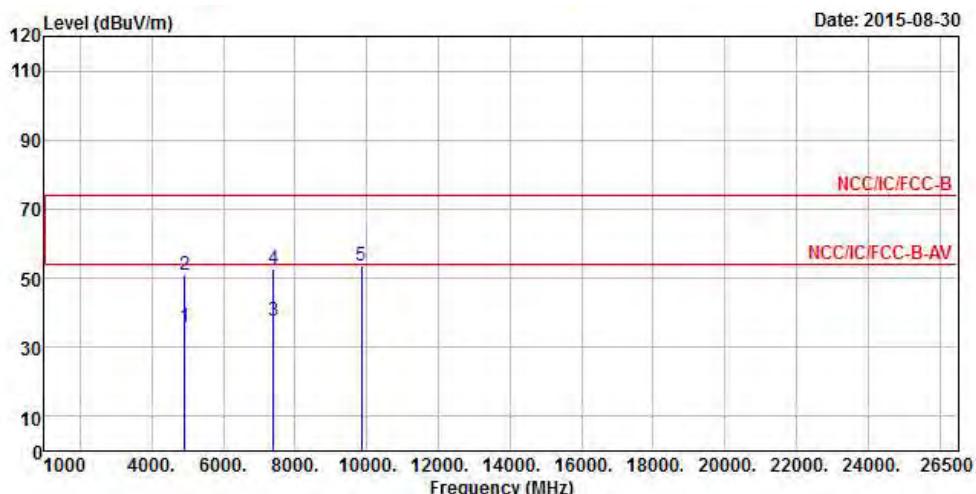
Note 5: The item 5 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (104.12 dB<sub>UV</sub>/m).

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



## Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11g	Test Freq. (MHz)	2462
N <sub>TX</sub>	1	Polarization	V



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Antenna	Level	Factor	Loss	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4924.000	35.70	-18.30	54.00	31.23	34.31	4.79	34.63 Average
2	4924.000	50.88	-23.12	74.00	46.41	34.31	4.79	34.63 Peak
3	7386.000	37.59	-16.41	54.00	31.02	35.96	5.57	34.96 Average
4	7386.000	52.55	-21.45	74.00	45.98	35.96	5.57	34.96 Peak
5	9848.000	53.43			45.23	37.01	6.50	35.31 Peak

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

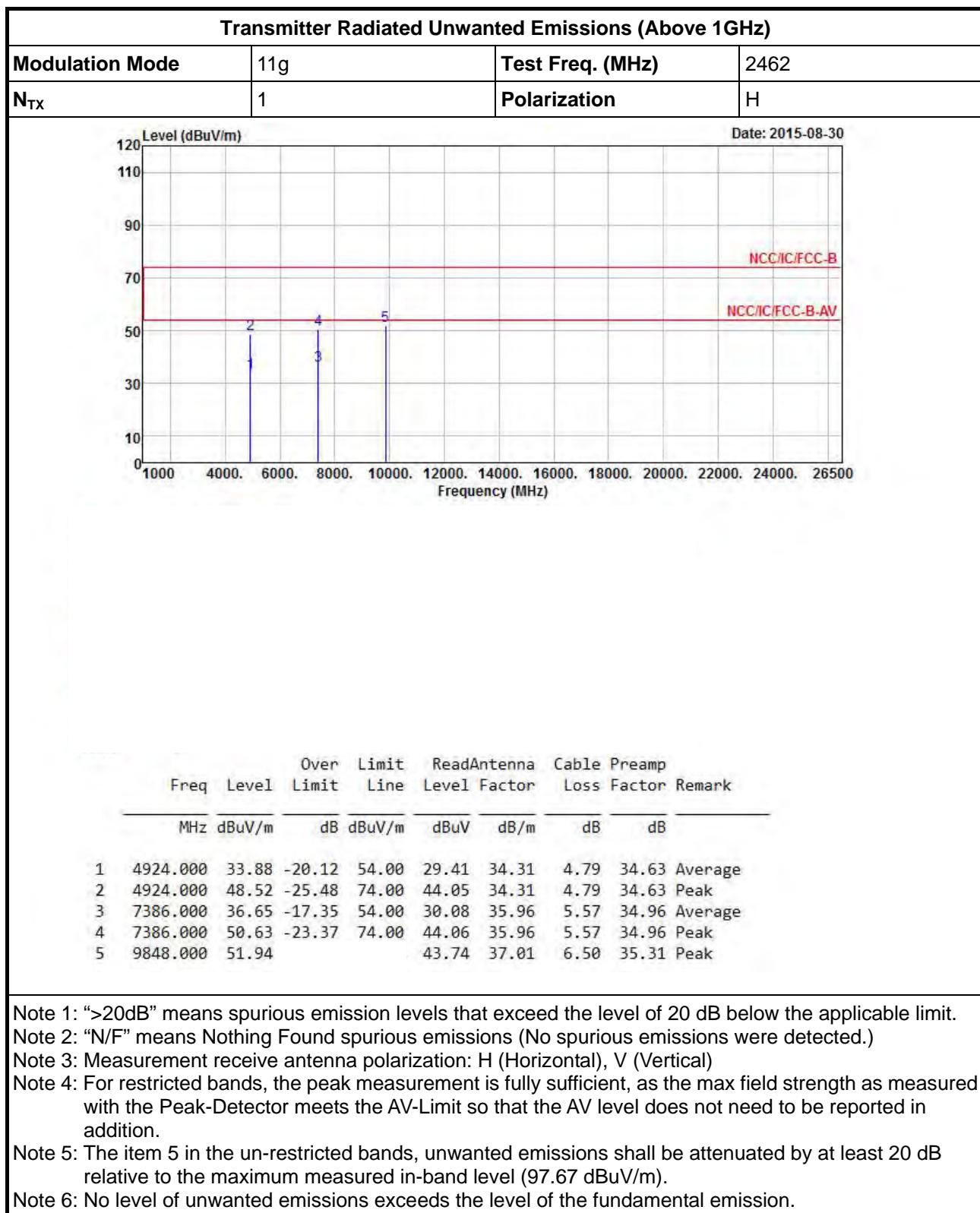
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

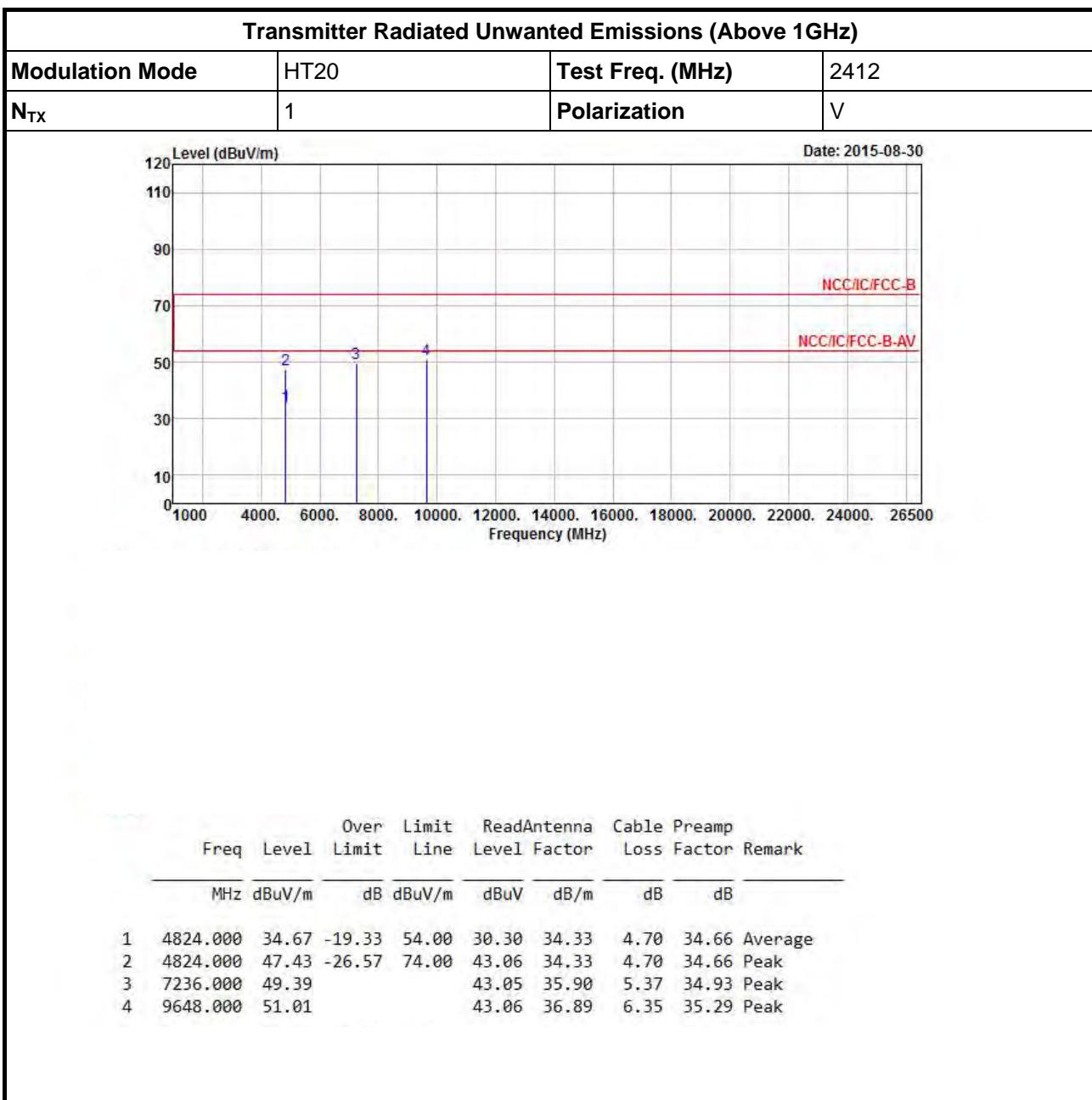
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

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: The item 5 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (97.67 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.

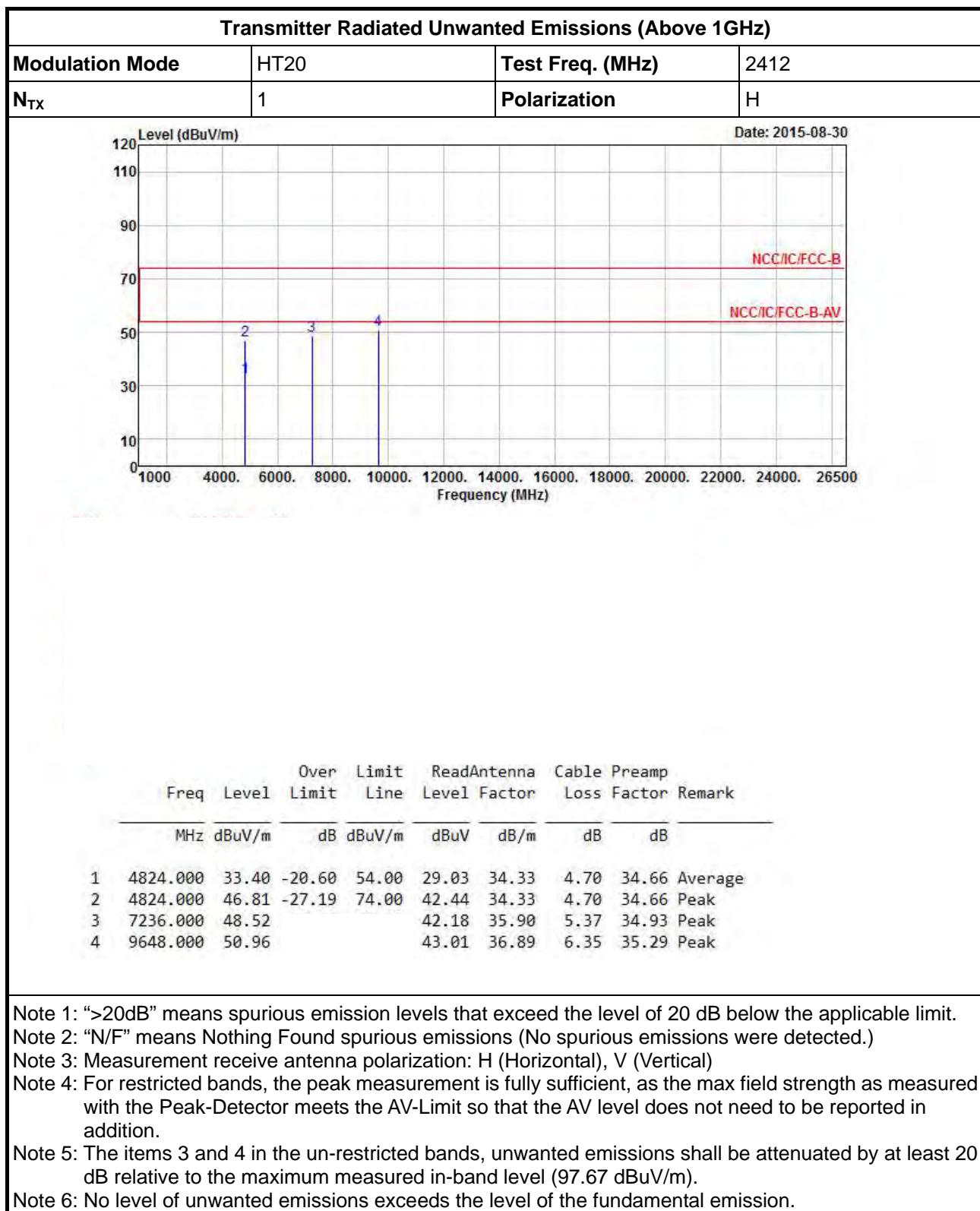
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

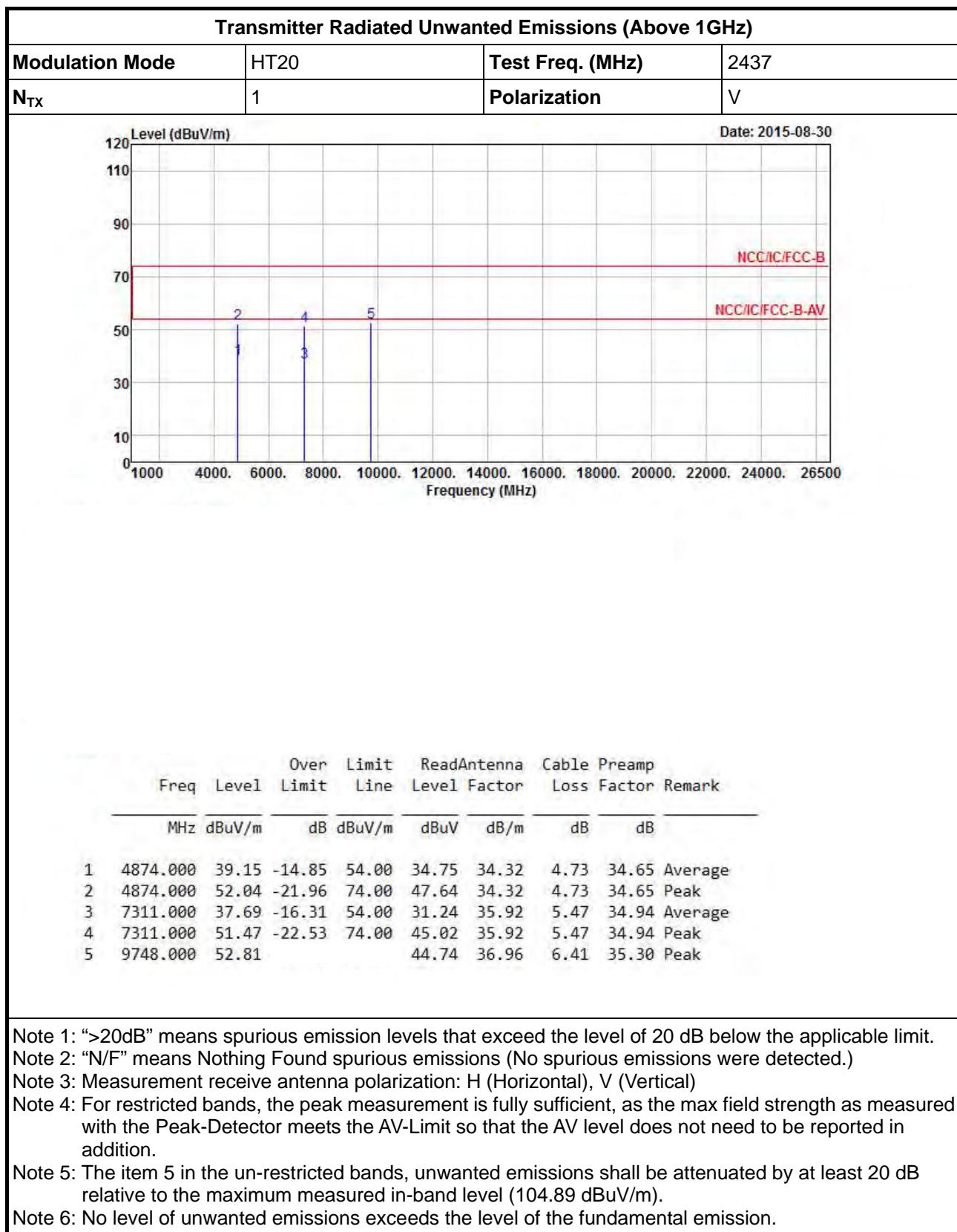
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

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: The items 3 and 4 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (97.67 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.

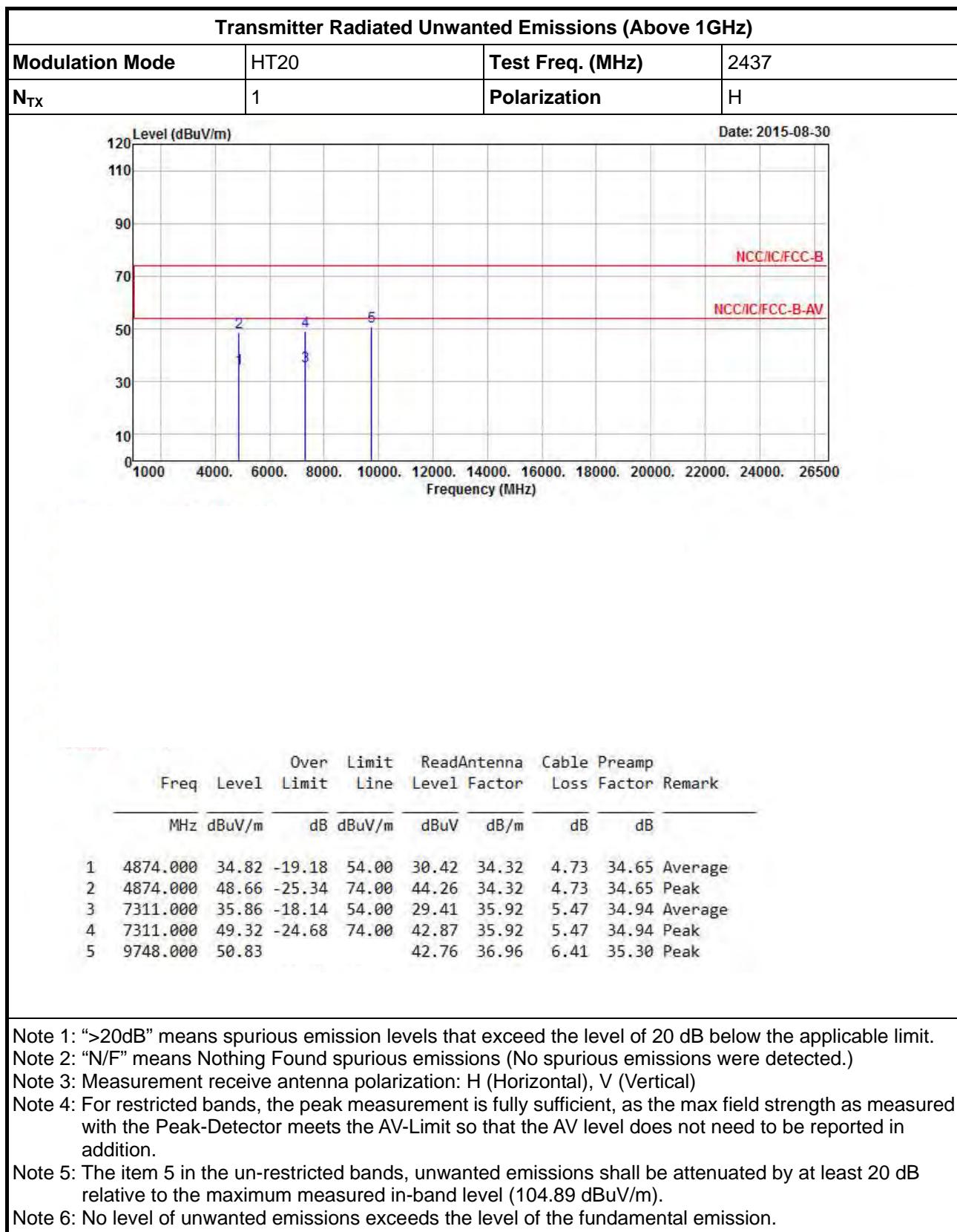
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

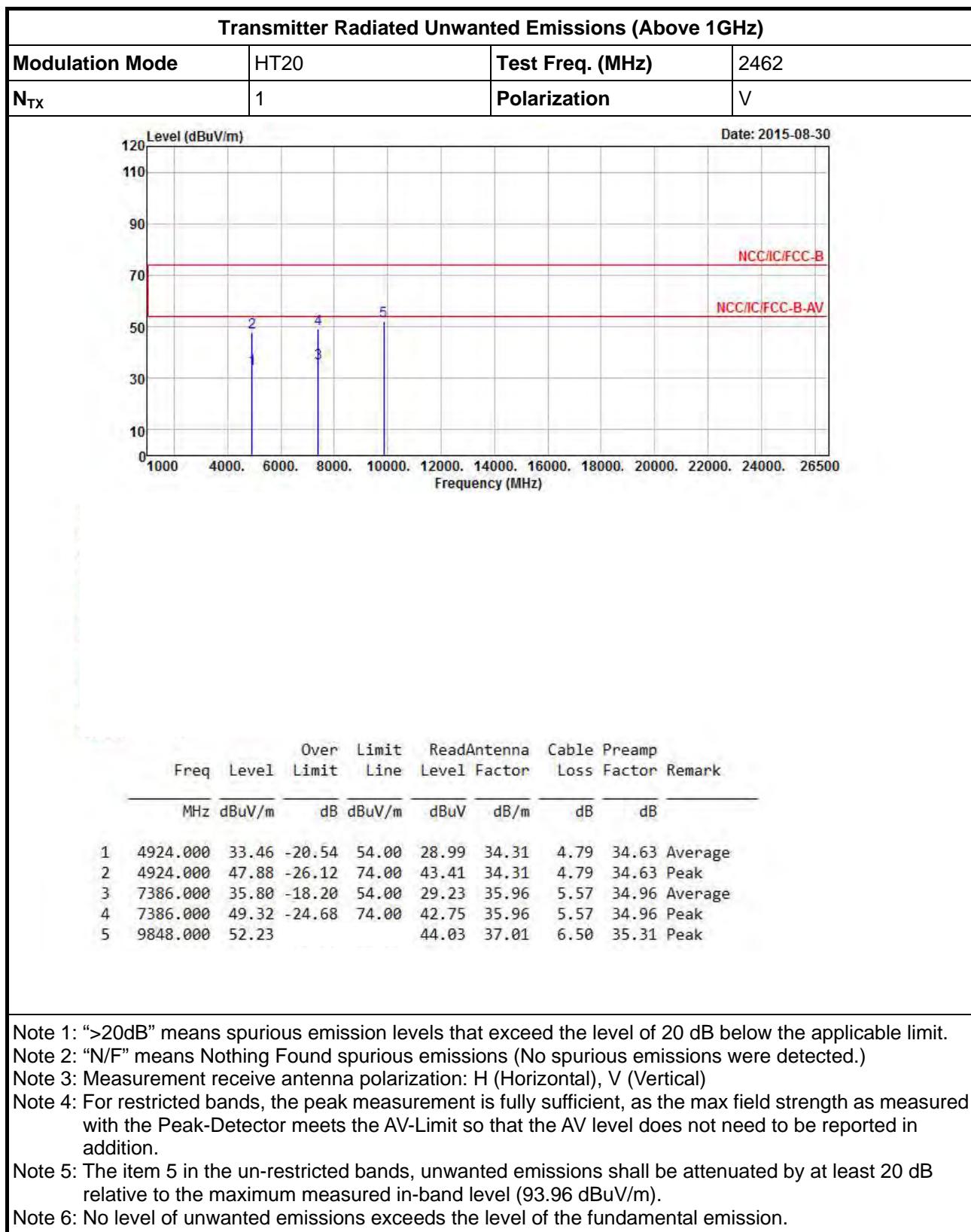
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

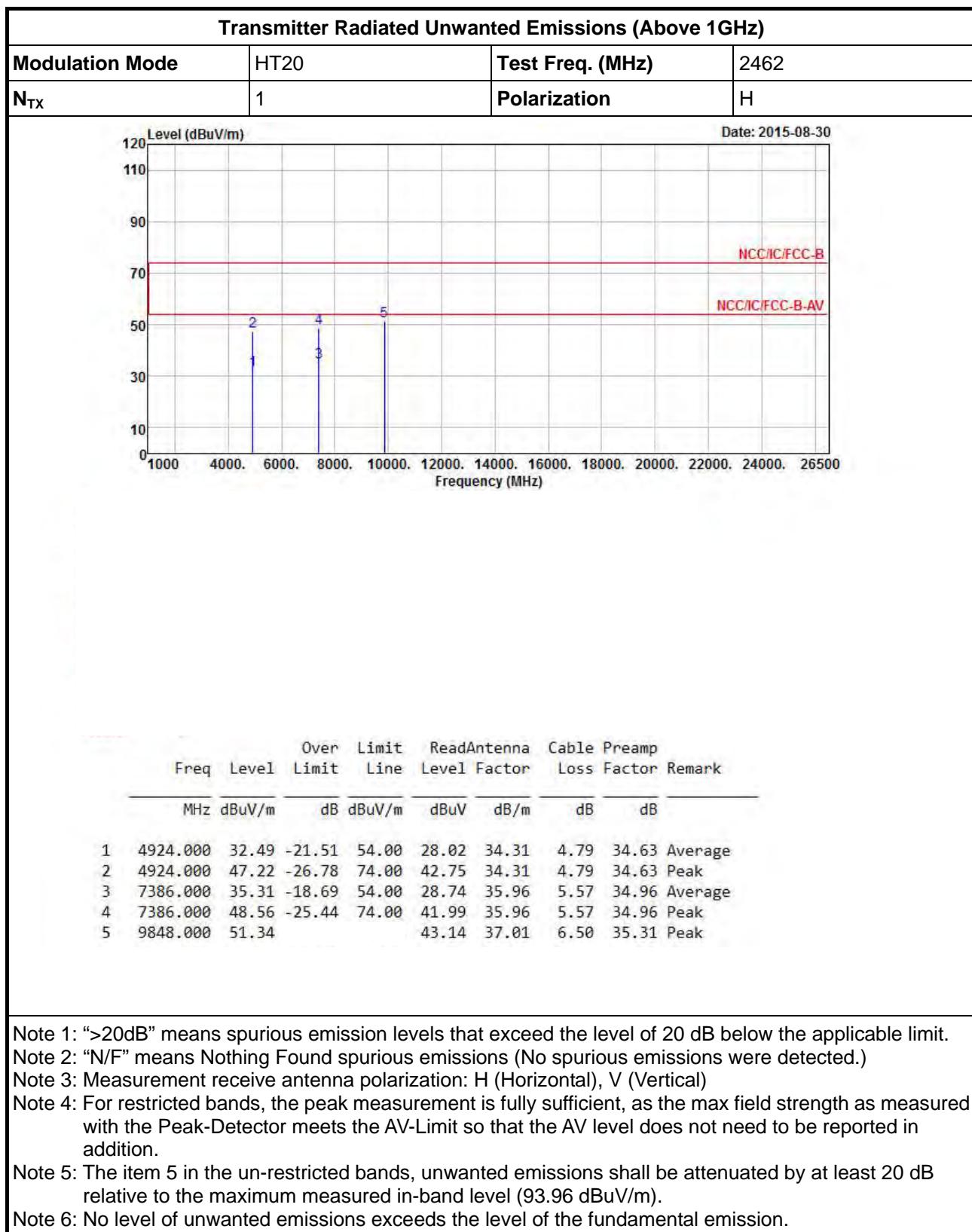
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: The item 5 in the un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (104.89 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
EMC Receiver	R&S	ESCS 30	100174	9kHz ~ 2.75GHz	Apr. 15. 2015	AC Conduction
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Jan. 22, 2015	AC Conduction
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832020001	9kHz ~ 30MHz	Oct. 31, 2014	AC Conduction
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	NCR	AC Conduction

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSV 40	101500	9KHz~40GHz	May 06, 2015	RF Conducted
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jul. 28, 2015	RF Conducted
Power Sensor	Anritsu	MA2411B	1027452	300MHz ~ 40GHz	Jan. 29, 2015	RF Conducted
Power Meter	Anritsu	ML2495A	1124009	300MHz ~ 40GHz	Jan. 29, 2015	RF Conducted
DC Power Source	G.W.	GPS-3030DD	GEN865896	DC 0V ~ 30V	Jan. 16, 2015	RF Conducted

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	Oct. 20, 2014	Radiation
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	May 03, 2015	Radiation
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	1GHz ~ 6GHz 3m	Mar 17, 2015	Radiation
Amplifier	Agilent	8447D	2944A11149	100kHz ~ 1.3GHz	Jul. 24, 2015	Radiation
Amplifier	Agilent	8449B	3008A02602	1GHz ~ 26.5GHz	Oct. 20, 2014	Radiation
Horn Antenna	ETS-LINDGREN	3117	00091920	1GHz ~ 18GHz	Nov. 28, 2014	Radiation
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	18GHz ~ 40GHz	Jan. 27, 2015	Radiation
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Nov. 08, 2014	Radiation
RF Cable-high	SUHNER	SUCOFLEX106	MY17173/4	1GHz ~ 40GHz	Mar. 04, 2015	Radiation
Bilog Antenna	SCHAFFNER	CBL 6112B	2723	30MHz ~ 1GHz	Oct. 05, 2015	Radiation
Turn Table	Chaintek Instruments	3000	MF7802058	0~ 360 degree	N/A	Radiation
Antenna Mast	MF	MF7802	MF780208205	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
Amplifier	EMC INSTRUMENTS	EMC184045B	980192	18GHz ~ 40GHz	Aug. 25, 2014	Radiation
Loop Antenna	R&S	HFH2-Z2	100330	9 kHz~30 MHz	Nov. 10, 2014	Radiation

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