



FCC Test Report

Equipment : Sophos Wireless Access Point AP55
Brand Name : Sophos
Model No. : AP 55
FCC ID : 2ACTO-AP55
Standard : 47 CFR FCC Part 15.407
Operating Band : 5150 MHz – 5250 MHz
5725 MHz – 5850 MHz
FCC Classification : NII
Applicant : Sophos Ltd
The Pentagon, Abingdon, OX14 3YP, United Kingdom
Manufacturer : Edimax Technology Co., Ltd.
No.3, Wu-Chuan 3rd Road, Wu-Ku Industrial Park,
New Taipei City 24891, Taiwan R.O.C.
Function : Outdoor AP; Indoor AP; Fixed P2P AP
 Portable Client

The product sample received on Dec. 05, 2014 and completely tested on Feb. 13, 2015. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

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

Reviewed by:


Vic Hsiao / Supervisor





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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	Result
1.1.2	15.203	Antenna Requirement	Complied
3.1	15.207	AC Power-line Conducted Emissions	Complied
3.2	15.407(a)	Emission Bandwidth	Complied
3.3	15.407(a)	RF Output Power (Maximum Conducted Output Power)	Complied
3.4	15.407(a)	Peak Power Spectral Density	Complied
3.5	15.407(b)	Transmitter Bandedge Emissions	Complied
3.6	15.407(b)	Transmitter Unwanted Emissions	Complied
3.7	15.407(g)	Frequency Stability	Complied



Revision History



1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information						
Frequency Range (MHz)	IEEE Std. 802.11	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	RF Output Power (dBm)	Co-location
5150-5250	a	5180-5240	36-48 [4]	1	21.69	Yes
5725-5850		5745-5825	149-165 [5]	1	22.47	Yes
5150-5250	n (HT20)	5180-5240	36-48 [4]	2 / 2	24.78 / 24.78	Yes
5725-5850		5745-5825	149-165 [5]	2 / 2	22.83 / 22.94	Yes
5150-5250	n (HT40)	5190-5230	38-46 [2]	2 / 2	25.03 / 25.09	Yes
5725-5850		5755-5795	151-159 [2]	2 / 2	23.14 / 23.18	Yes
5150-5250	ac (VHT80)	5210	48 [1]	2	17.24	Yes
5725-5850		5775	155 [1]	2	13.89	Yes

Note 1: RF output power specifies that Maximum Conducted Output Power.
Note 2: 802.11a/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
Note 3: 802.11ac uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM modulation.
Note 4: Co-location, Co-location is generally defined as simultaneously transmitting (co-transmitting) antennas within 20 cm of each other. (i.e., EUT has simultaneously co-transmitting that operating 2.4GHz and 5GHz.)



1.1.2 Antenna Information

Antenna Category	
<input checked="" type="checkbox"/>	External antenna (antenna permanently attached)
<input checked="" 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.

Antenna General Information			
No.	Ant. Cat.	Ant. Type	Gain (dBi)
1			2.58
2	External	Dipole	2.58
Remark:			
1. 11a only include 1TX and Port1 for emission. 2. HT20 and HT40 only include 2TX and Data Rate are MCS0 ~ MCS15. 3. VHT20 only include 2TX and Data Rate are MCS0 ~ MCS8. 4. VHT40 and VHT80 only include 2TX and Data Rate are MCS0 ~ MCS9.			

1.1.3 Type of EUT

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



1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
<input type="checkbox"/> Operated normally mode for worst duty cycle	
<input checked="" type="checkbox"/> Operated test mode for worst duty cycle	
Test Signal Duty Cycle (x)	Power Duty Factor [dB] – (10 log 1/x)
<input checked="" type="checkbox"/> 100% - IEEE 802.11a	0
<input checked="" type="checkbox"/> 100% - IEEE 802.11n (HT20)	0
<input checked="" type="checkbox"/> 100% - IEEE 802.11n (HT40)	0
<input checked="" type="checkbox"/> 100% - IEEE 802.11ac (VHT20)	0
<input checked="" type="checkbox"/> 100% - IEEE 802.11ac (VHT40)	0
<input checked="" type="checkbox"/> 100% - IEEE 802.11ac (VHT80)	0

1.1.5 EUT Operational Condition

Supply Voltage	<input checked="" type="checkbox"/> AC mains	<input checked="" type="checkbox"/> DC	<input type="checkbox"/> System
Type of DC Source	<input type="checkbox"/> Internal DC supply	<input checked="" type="checkbox"/> From PoE	<input checked="" type="checkbox"/> External adapter
Test Voltage	<input checked="" type="checkbox"/> Vnom (110 V)	<input checked="" type="checkbox"/> Vmax (126.5 V)	<input checked="" type="checkbox"/> Vmin (93.5 V)
Test Climatic	<input checked="" type="checkbox"/> Thom (20°C)	<input checked="" type="checkbox"/> Tmax (50°C)	<input checked="" type="checkbox"/> Tmin (-20°C)



1.2 Support Equipment

Support Equipment - AC Conducted				
No.	Equipment	Brand Name	Model Name	FCC ID
1	PoE	Bothhand	SA06L48-V	-
2	Adapter	APD	DA-48T12	-
3	Notebook (Remote)	DELL	E5530	DoC
4	HUB (Remote)	DELL	Power Connect 2816	DoC
5	UTM (Remote)	SOPHOS	UTM110/120	DoC

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

Support Equipment - Radiated Emission				
No.	Equipment	Brand Name	Model Name	FCC ID
1	PoE	Bothhand	SA06L48-V	-
2	Adapter	APD	DA-48T12	-
3	Notebook (Remote)	DELL	E5530	DoC
4	HUB (Remote)	DELL	Power Connect 2816	DoC
5	UTM (Remote)	SOPHOS	UTM110/120	DoC



1.3 Testing Applied Standards

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

- 47 CFR FCC Part 15
- ANSI C63.10-2009
- FCC KDB 789033 D02 v01
- FCC KDB 644545 D03 v01
- FCC KDB 662911 v02r01
- FCC-14-30A1-UNII

1.4 Testing Location Information

Testing Location					
<input checked="" type="checkbox"/>	HWA YA	ADD :	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.		
			TEL :	FAX :	
Test Condition	Test Site No.		Test Engineer	Test Environment	
AC Conduction	CO04-HY		Zeus	26°C / 39%	
RF Conducted	TH06-HY		Morgan	22°C / 61%	
Radiated Emission	03CH02-HY		Daniel	24.5°C / 58%	



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, 26dB bandwidth	±1.4 %	
RF output power, conducted	±0.6 dB	
Power density, conducted	±0.8 dB	
Unwanted emissions, conducted	9 – 150 kHz	±0.4 dB
	0.15 – 30 MHz	±0.4 dB
	30 – 1000 MHz	±0.5 dB
	1 – 18 GHz	±0.7 dB
	18 – 40 GHz	±0.8 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	±3 %	
DC and low frequency voltages	±3 %	
Time	±1.4 %	
Duty Cycle	±1.4 %	



2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Worst Modulation Used for Conformance Testing			
Modulation Mode	Transmit Chains (N_{TX})	Data Rate / MCS	Worst Data Rate / MCS
11a	1	6-54Mbps	6 Mbps
HT20	2	MCS 0-15	MCS 0
HT40	2	MCS 0-15	MCS 0
VHT20	2	MCS 0-8	MCS 0
VHT40	2	MCS 0-9	MCS 0
VHT80	2	MCS 0-9	MCS 0

2.2 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter (5150-5250MHz band)							
Test Software Version	DOS Command						
Modulation Mode	N_{TX}	Test Frequency (MHz)					
		NCB: 20MHz	5180	5200	5240	5190	5230
		NCB: 40MHz	5210	5210	5210	5210	5210
11a	1	20.5	20.5	20.5	21	-	-
HT20	2	20	21	21	21	-	-
HT40	2	-	-	-	-	18	22
VHT20	2	20	21	21	21	-	-
VHT40	2	-	-	-	-	18	22
VHT80	2	-	-	-	-	-	14.5

The Worst Case Power Setting Parameter (5725-5850MHz band)							
Test Software Version	DOS Command						
Modulation Mode	N_{TX}	Test Frequency (MHz)					
		NCB: 20MHz	5745	5785	5825	5755	5795
		NCB: 40MHz	5775	5775	5775	5775	5775
11a	1	21	20.5	20.5	18	-	-
HT20	2	15	19	19	16.5	-	-
HT40	2	-	-	-	-	13	20
VHT20	2	15	19	19	16.5	-	-
VHT40	2	-	-	-	-	13	20
VHT80	2	-	-	-	-	-	11



2.3 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	Operating Mode Description
1	EUT with AC power (Transmitter)
2	EUT with PoE (Transmitter)

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

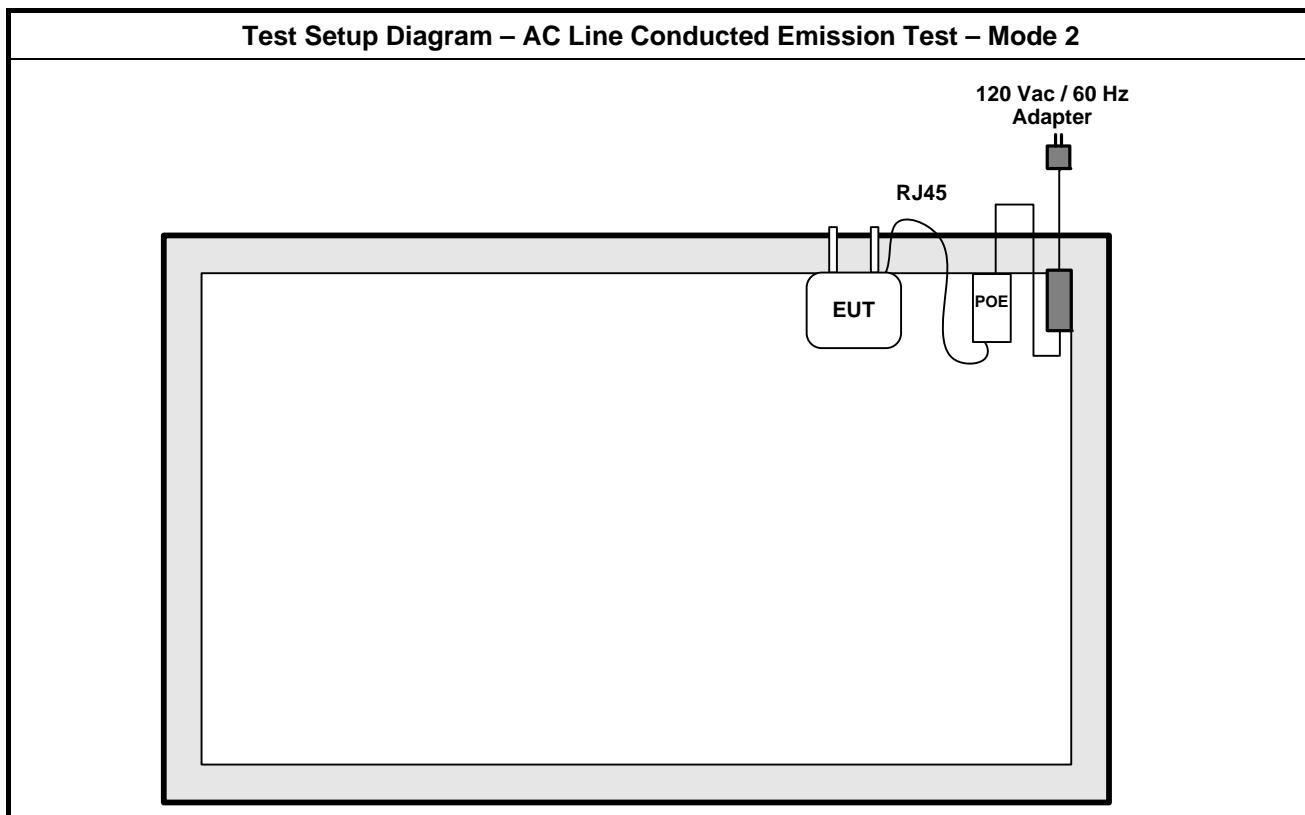
The Worst Case Mode for Following Conformance Tests	
Tests Item	RF Output Power, Peak Power Spectral Density, Emission Bandwidth, Peak Excursion, Transmitter Conducted Unwanted Emissions Transmitter Conducted Bandedge Emissions
Test Condition	Conducted measurement at transmit chains
Modulation Mode	11a, HT20, HT40, VHT20, VHT40, VHT80

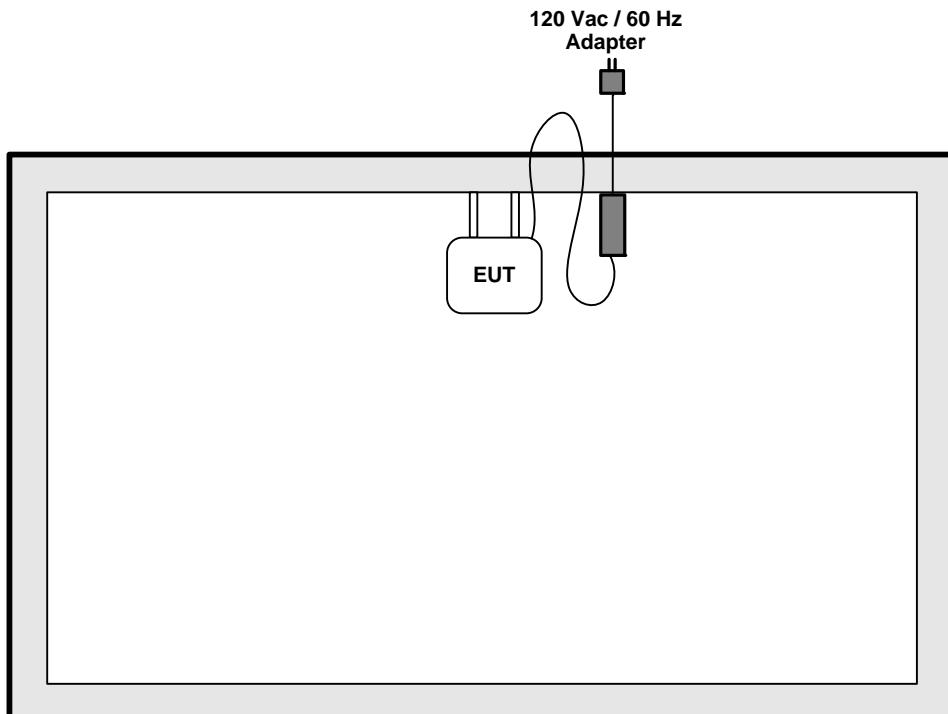
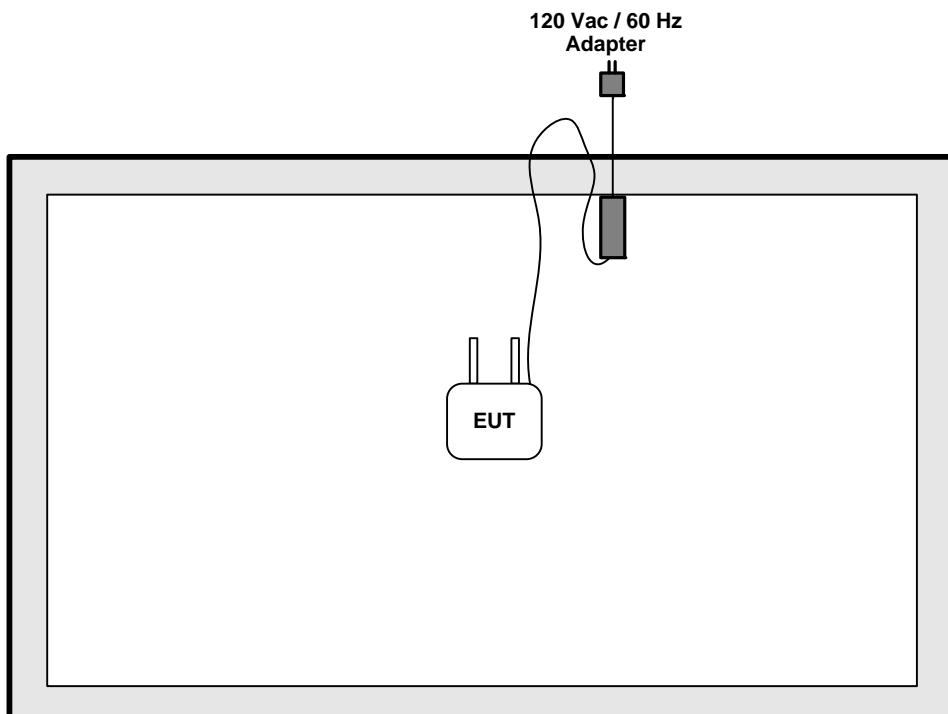
The Worst Case Mode for Following Conformance Tests	
Tests Item	Transmitter Radiated Unwanted Emissions Transmitter Radiated Bandedge Emissions
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.
User Position	<input type="checkbox"/> EUT will be placed in fixed position. <input checked="" type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. <input type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions.
Operating Mode < 1GHz	Operating Mode Description
1	EUT with AC power (Transmitter)
2	EUT with PoE (Transmitter)

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

Operating Mode > 1GHz	Operating Mode Description		
1	EUT with AC power (Transmitter)		
Modulation Mode	11a, HT20, HT40, VHT20, VHT40, VHT80		
Orthogonal Planes of EUT	X Plane	Y Plane	Z Plane
Worst Planes of EUT			V

2.4 Test Setup Diagram



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

3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

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

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

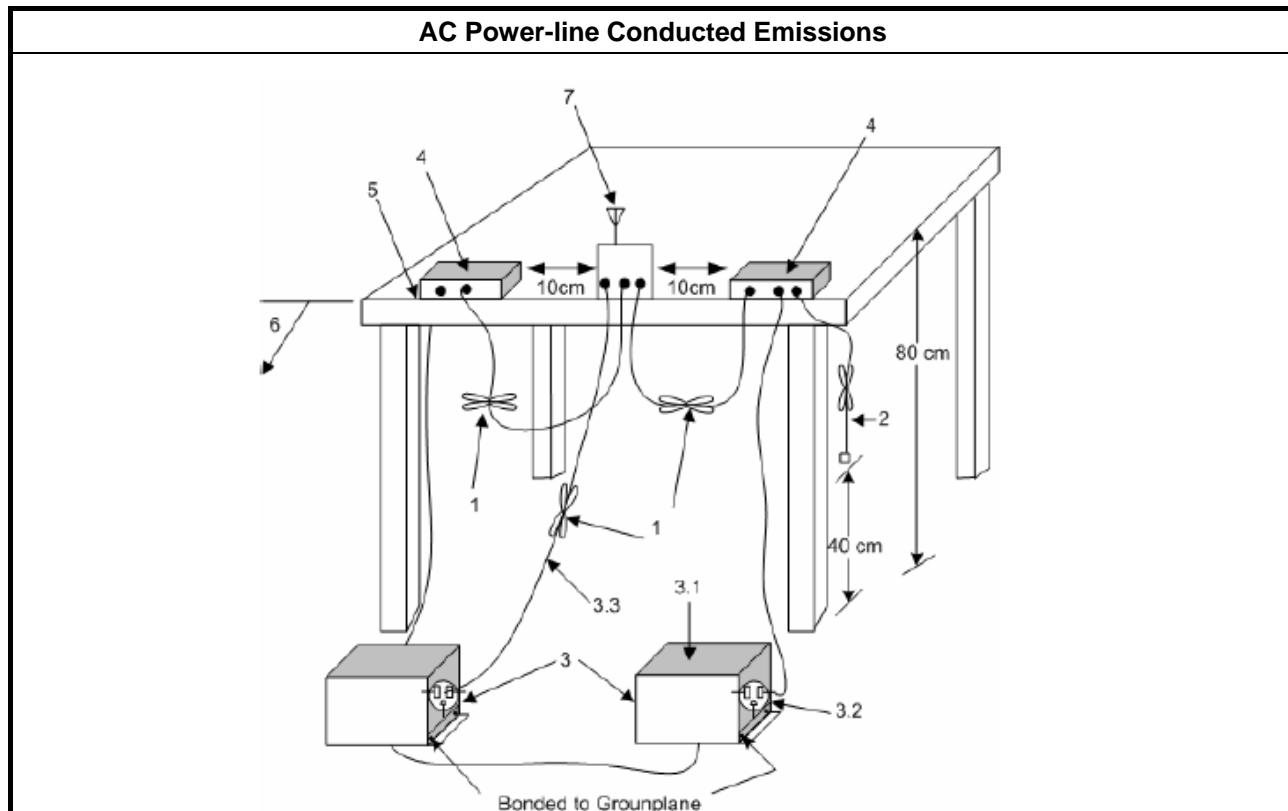
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

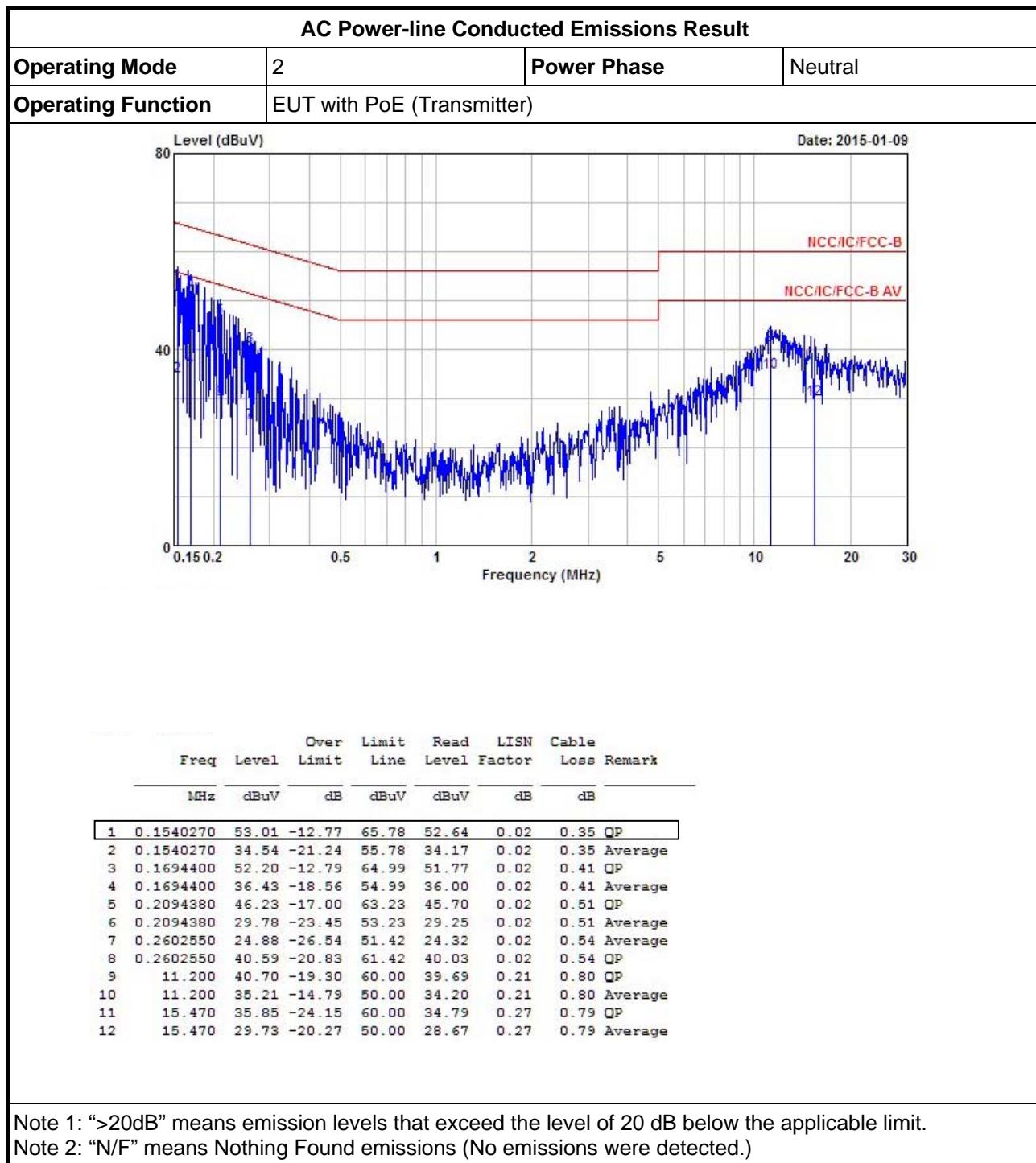
Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions.

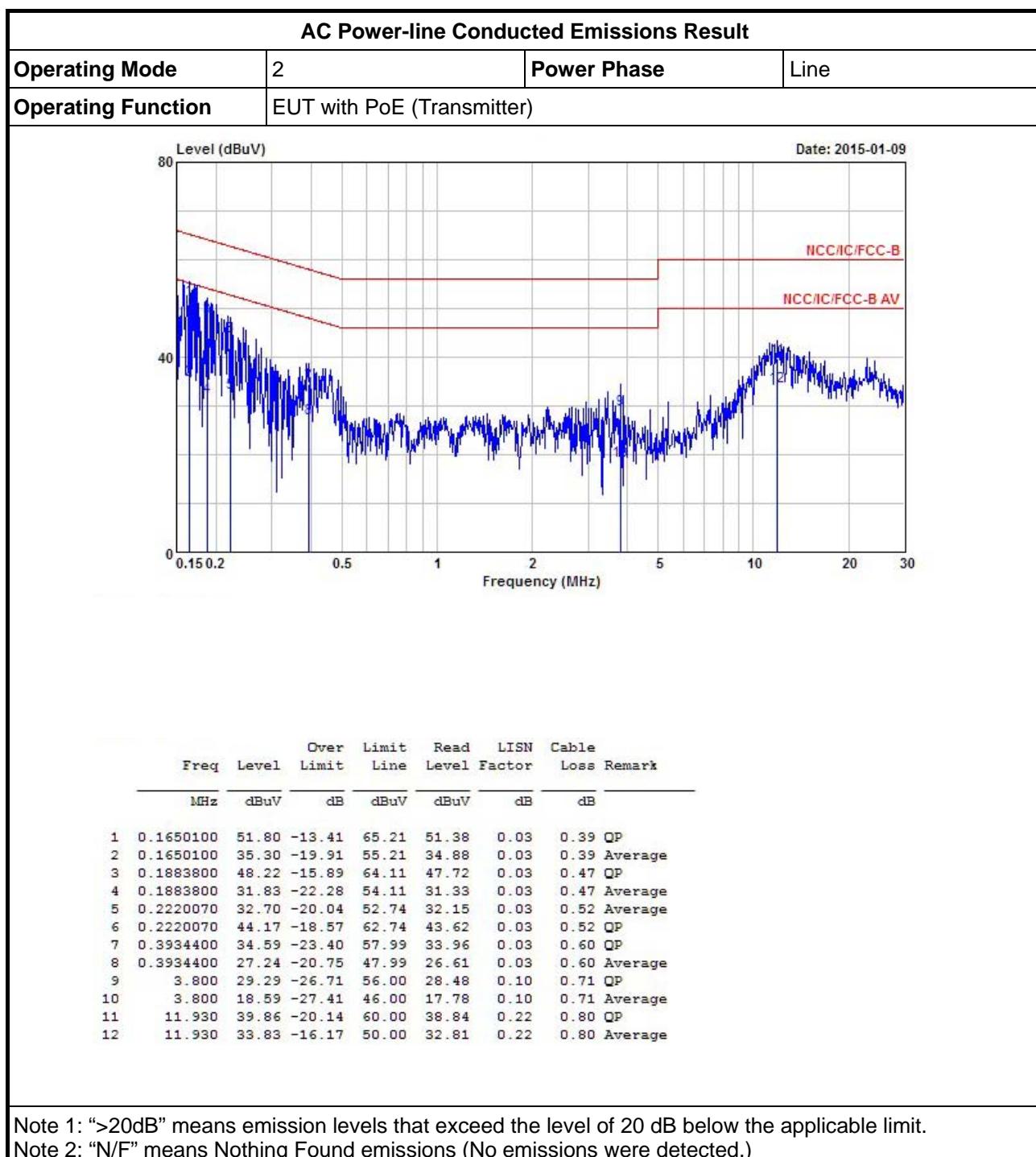
3.1.4 Test Setup





3.1.5 Test Result of AC Power-line Conducted Emissions







3.2 Emission Bandwidth

3.2.1 Emission Bandwidth Limit

Emission Bandwidth Limit	
UNII Devices	
<input checked="" type="checkbox"/>	For the 5.15-5.25 GHz band, N/A
<input type="checkbox"/>	For the 5.25-5.35 GHz band, the maximum conducted output power shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.
<input type="checkbox"/>	For the 5.47-5.725 GHz band, the maximum conducted output power shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.
<input checked="" type="checkbox"/>	For the 5.725-5.85 GHz band, 6 dB emission bandwidth \geq 500kHz.

3.2.2 Measuring Instruments

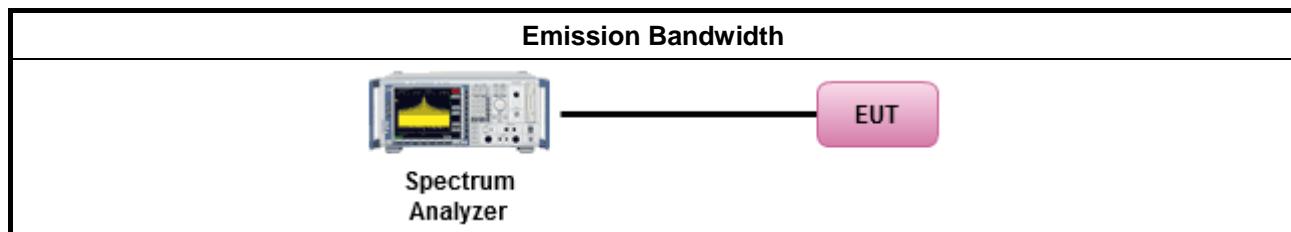
Refer a test equipment and calibration data table in this test report.

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 789033 D02 v01, clause C for EBW and clause D for OBW measurement.
	<input type="checkbox"/> Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
	<input type="checkbox"/> Refer as IC RSS-Gen, clause 4.6 for 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 port 1.
	<input type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
	<input checked="" type="checkbox"/> The EUT supports multiple transmit chains using options given below:
	<input type="checkbox"/> Option 1: Multiple transmit chains measurements need to be performed on one of the active transmit chains (antenna outputs). All measurement had be performed on transmit chains 1.
	<input checked="" type="checkbox"/> Option 2: Multiple transmit chains measurements need to be performed on each transmit chains individually (antenna outputs). All measurement had be performed on all transmit chains.



3.2.4 Test Setup



3.2.5 Test Result of Emission Bandwidth

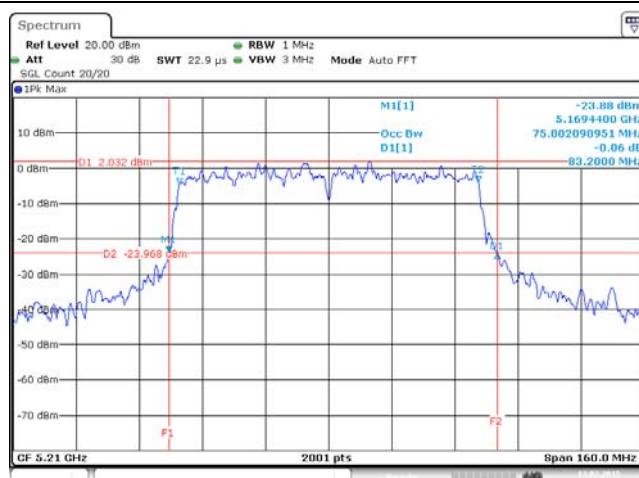
UNII Emission Bandwidth Result (5150-5250MHz band)						
Condition			Emission Bandwidth (MHz)			
Modulation Mode	N _{TX}	Freq. (MHz)	99% Bandwidth		26dB Bandwidth	
			Chain- Port 1	Chain- Port 2	Chain- Port 1	Chain- Port 2
11a	1	5180	16.51	-	21.85	-
11a	1	5200	16.69	-	24.95	-
11a	1	5240	16.54	-	21.70	-
HT20	2	5180	17.79	17.89	21.47	22.62
HT20	2	5200	17.96	17.89	24.67	21.27
HT20	2	5240	18.04	17.81	23.62	21.35
HT40	2	5190	36.46	36.34	40.64	39.20
HT40	2	5230	36.86	36.62	49.68	42.36
VHT20	2	5180	17.71	17.84	22.45	21.55
VHT20	2	5200	17.86	18.04	28.45	21.80
VHT20	2	5240	17.99	17.66	25.15	21.65
VHT40	2	5190	36.18	36.18	39.32	42.16
VHT40	2	5230	36.74	36.42	50.84	42.28
VHT80	2	5210	75.72	75.80	83.20	83.20
Result			Complied			



UNII Emission Bandwidth Result (5725-5850MHz band)						
Condition			Emission Bandwidth (MHz)			
Modulation Mode	N _{TX}	Freq. (MHz)	99% Bandwidth		6dB Bandwidth	
			Chain- Port 1	Chain- Port 2	Chain- Port 1	Chain- Port 2
11a	1	5745	16.47	-	16.47	-
11a	1	5785	16.41	-	16.50	-
11a	1	5825	16.38	-	16.47	-
HT20	2	5745	17.67	17.64	17.70	17.73
HT20	2	5785	17.67	17.64	17.59	17.73
HT20	2	5825	17.64	17.63	17.70	17.67
HT40	2	5755	36.18	36.18	36.44	36.40
HT40	2	5795	36.18	36.26	36.44	36.40
VHT20	2	5745	17.64	17.63	17.68	17.77
VHT20	2	5785	17.64	17.63	17.71	17.70
VHT20	2	5825	17.66	17.67	17.67	17.79
VHT40	2	5755	36.22	36.18	36.52	36.36
VHT40	2	5795	36.18	36.26	36.36	36.44
VHT80	2	5775	75.64	75.80	76.40	76.40
Limit			-		≥ 500 kHz	
Result			Complied			

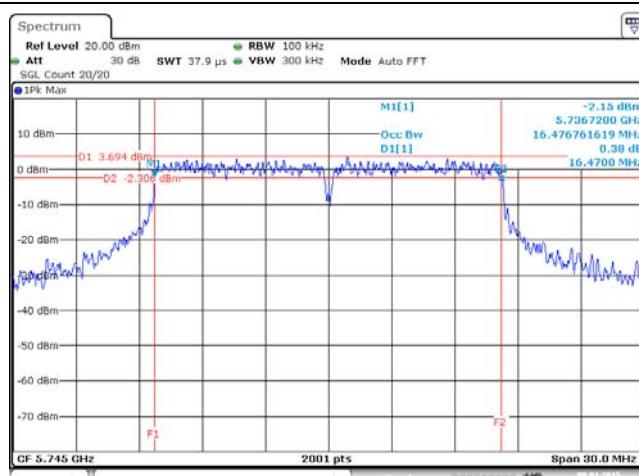


5150-5250MHz - Worst Emission 26Bandwidth Plots



Date: 13.FEB.2015 16:29:16

5725-5850MHz - Worst Emission 6Bandwidth Plots



Date: 8.JAN.2015 03:12:57



3.3 RF Output Power

3.3.1 RF Output Power Limit

Maximum Conducted Output Power Limit	
UNII Devices	
<input checked="" type="checkbox"/> For the 5.15-5.25 GHz band:	
<input type="checkbox"/> Outdoor AP: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$. e.i.r.p. at any elevation angle above 30 degrees ≤ 125 mW [21dBm]	
<input checked="" type="checkbox"/> Indoor AP: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$	
<input type="checkbox"/> Point-to-point AP: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W If $G_{TX} > 23$ dBi, then $P_{Out} = 30 - (G_{TX} - 23)$.	
<input type="checkbox"/> Mobile or Portable Client: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW. If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$.	
<input type="checkbox"/> For the 5.25-5.35 GHz band, the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW or 11 dBm + $10 \log B$, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$.	
<input type="checkbox"/> For the 5.47-5.725 GHz band, the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW or 11 dBm + $10 \log B$, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$.	
<input checked="" type="checkbox"/> For the 5.725-5.85 GHz band:	
<input checked="" type="checkbox"/> Point-to-multipoint systems (P2M): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$.	
<input type="checkbox"/> Point-to-point systems (P2P): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W.	
P_{Out} = maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi.	

3.3.2 Measuring Instruments

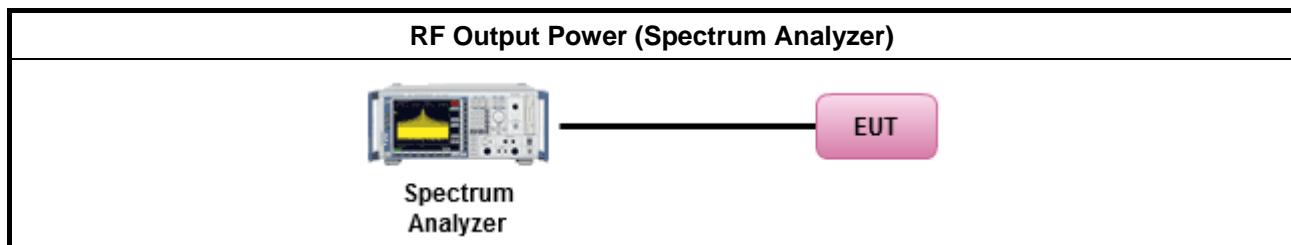
Refer a test equipment and calibration data table in this test report.



3.3.3 Test Procedures

Test Method
<input checked="" type="checkbox"/> Maximum Conducted Output Power
[duty cycle \geq 98% or external video / power trigger]
<input checked="" type="checkbox"/> Refer as FCC KDB 789033 D02 v01, clause E Method SA-1 (spectral trace averaging).
<input type="checkbox"/> Refer as FCC KDB 789033 D02 v01, clause E Method SA-1 Alt. (RMS detection with slow sweep speed)
duty cycle $<$ 98% and average over on/off periods with duty factor
<input type="checkbox"/> Refer as FCC KDB 789033 D02 v01, clause E Method SA-2 (spectral trace averaging).
<input type="checkbox"/> Refer as FCC KDB 789033 D02 v01, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)
Wideband RF power meter and average over on/off periods with duty factor
<input type="checkbox"/> Refer as FCC KDB 789033 D02 v01, clause E Method PM (using an RF average power meter).
<input checked="" type="checkbox"/> For conducted measurement.
<input checked="" type="checkbox"/> The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
<input checked="" type="checkbox"/> The EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
<input checked="" type="checkbox"/> If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + \dots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$

3.3.4 Test Setup





3.3.5 Directional Gain for Power Measurement

Directional Gain (DG) Result					
Transmit Chains No.		1	2	-	-
Maximum G_{ANT} (dBi)		2.58	2.58	-	-
Modulation Mode	DG (dBi) (See the Note 3)	N_{TX}	N_{SS} (Min.)	STBC	Array Gain (dB)
11a	2.58	1	1	-	-
HT20	5.59	2	1 / 2	-	3.01
HT40	5.59	2	1 / 2	-	3.01
VHT20	5.59	2	1 / 2	-	3.01
VHT40	5.59	2	1 / 2	-	3.01
VHT80	5.59	2	1 / 2	-	3.01

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

Note 2: For all transmitter outputs with unequal antenna gains, directional gain is to be computed as follows:
Any transmit signals are correlated, Directional Gain = $10 \log[(10^{G_{1/20}} + \dots + 10^{G_{N/20}})^2 / N_{TX}]$
All transmit signals are completely uncorrelated, Directional Gain = $10 \log[(10^{G_{1/10}} + \dots + 10^{G_{N/10}}) / N_{TX}]$

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

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



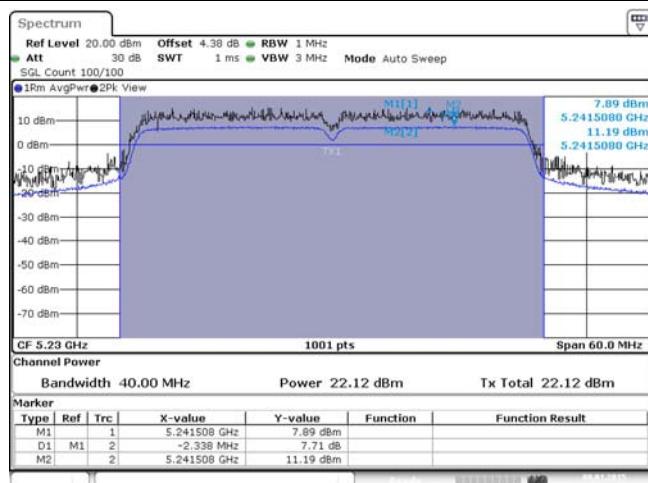
3.3.6 Test Result of Maximum Conducted Output Power

Maximum Conducted Output Power (5150-5250MHz band)							
Modulation Mode	N _{TX}	Freq. (MHz)	Output Power (dBm)			Antenna Gain (dBi)	Power Limit
			Chain Port 1	Chain Port 2	Sum Chain		
11a	1	5180	21.29	-	21.29	2.58	30.00
11a	1	5200	21.52	-	21.52	2.58	30.00
11a	1	5240	21.69	-	21.69	2.58	30.00
HT20	2	5180	20.93	20.31	23.64	5.59	30.00
HT20	2	5200	21.93	21.61	24.78	5.59	30.00
HT20	2	5240	21.66	21.49	24.59	5.59	30.00
HT40	2	5190	18.18	17.87	21.04	5.59	30.00
HT40	2	5230	22.03	22.00	25.03	5.59	30.00
VHT20	2	5180	20.96	20.35	23.68	5.59	30.00
VHT20	2	5200	21.96	21.57	24.78	5.59	30.00
VHT20	2	5240	21.74	21.47	24.62	5.59	30.00
VHT40	2	5190	18.19	17.94	21.08	5.59	30.00
VHT40	2	5230	22.12	22.04	25.09	5.59	30.00
VHT80	2	5210	14.41	14.04	17.24	5.59	30.00
Result			Complied				

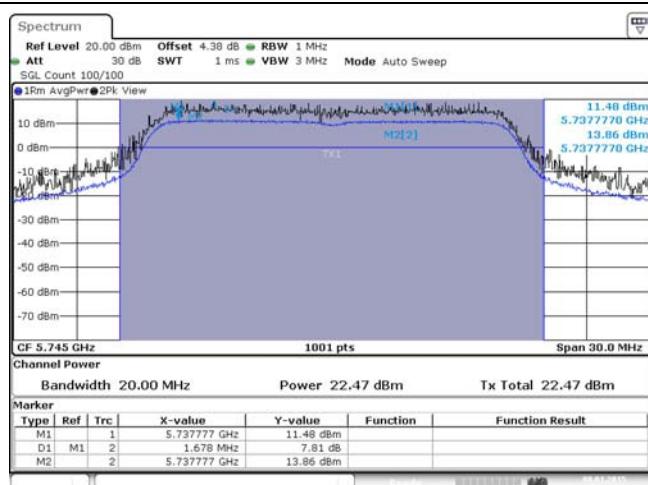
Maximum Conducted Output Power (5725-5850MHz band)							
Modulation Mode	N _{TX}	Freq. (MHz)	Output Power (dBm)			Antenna Gain (dBi)	Power Limit
			Chain Port 1	Chain Port 2	Sum Chain		
11a	1	5745	22.47	-	22.47	2.58	30.00
11a	1	5785	21.81	-	21.81	2.58	30.00
11a	1	5825	19.11	-	19.11	2.58	30.00
HT20	2	5745	16.43	14.95	18.76	5.59	30.00
HT20	2	5785	20.52	18.98	22.83	5.59	30.00
HT20	2	5825	17.82	16.64	20.28	5.59	30.00
HT40	2	5755	13.68	12.72	16.24	5.59	30.00
HT40	2	5795	20.69	19.48	23.14	5.59	30.00
VHT20	2	5745	16.57	15.13	18.92	5.59	30.00
VHT20	2	5785	20.57	19.17	22.94	5.59	30.00
VHT20	2	5825	17.87	16.70	20.33	5.59	30.00
VHT40	2	5755	13.76	12.76	16.30	5.59	30.00
VHT40	2	5795	20.75	19.50	23.18	5.59	30.00
VHT80	2	5775	11.39	10.30	13.89	5.59	30.00
Result			Complied				



5150-5250MHz - Worst RF Output Power Plots



5725-5850MHz - Worst RF Output Power Plots





3.4 Peak Power Spectral Density

3.4.1 Peak Power Spectral Density Limit

Peak Power Spectral Density Limit	
UNII Devices	
<input checked="" type="checkbox"/> For the 5.15-5.25 GHz band:	
<input type="checkbox"/> Outdoor AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 17 - (G_{TX} - 6)$.	
<input checked="" type="checkbox"/> Indoor AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 17 - (G_{TX} - 6)$.	
<input type="checkbox"/> Point-to-point AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If $G_{TX} > 23$ dBi, then $P_{Out} = 17 - (G_{TX} - 23)$.	
<input type="checkbox"/> Mobile or Portable Client: the peak power spectral density (PPSD) ≤ 11 dBm/MHz. If $G_{TX} > 6$ dBi, then PPSD= $11 - (G_{TX} - 6)$..	
<input type="checkbox"/> For the 5.25-5.35 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz. If $G_{TX} > 6$ dBi, then PPSD= $11 - (G_{TX} - 6)$.	
<input type="checkbox"/> For the 5.47-5.725 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz. If $G_{TX} > 6$ dBi, then PPSD= $11 - (G_{TX} - 6)$.	
<input checked="" type="checkbox"/> For the 5.725-5.85 GHz band:	
<input checked="" type="checkbox"/> Point-to-multipoint systems (P2M): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz. If $G_{TX} > 6$ dBi, then PPSD= $30 - (G_{TX} - 6)$.	
<input type="checkbox"/> Point-to-point systems (P2P): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz.	
PPSD = peak power spectral density that he same method as used to determine the conducted output power shall be used to determine the power spectral density. And power spectral density in dBm/MHz G_{TX} = the maximum transmitting antenna directional gain in dBi.	

3.4.2 Measuring Instruments

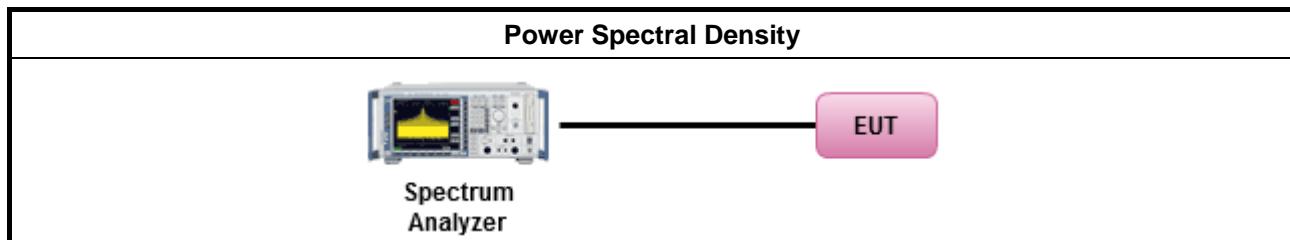
Refer a test equipment and calibration data table in this test report.



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 shall be used to determine the peak power spectral density and use the peak search function on the spectrum analyzer to find the peak of the spectrum. For the peak power spectral density shall be measured using below options:	
<input checked="" type="checkbox"/> Refer as FCC KDB 789033 D02 v01, F5) power spectral density can be measured using resolution bandwidths < 1 MHz provided that the results are integrated over 1 MHz bandwidth [duty cycle \geq 98% or external video / power trigger]	
<input checked="" type="checkbox"/> Refer as FCC KDB 789033 D02 v01, clause E Method SA-1 (spectral trace averaging).	
<input type="checkbox"/> Refer as FCC KDB 789033 D02 v01, clause E Method SA-1 Alt. (RMS detection with slow sweep speed)	duty cycle $<$ 98% and average over on/off periods with duty factor
<input type="checkbox"/> Refer as FCC KDB 789033 D02 v01, clause E Method SA-2 (spectral trace averaging).	
<input type="checkbox"/> Refer as FCC KDB 789033 D02 v01, clause E Method SA-2 Alt. (RMS detection with 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 port 1.	
<input type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.	
<input checked="" type="checkbox"/> The EUT supports multiple transmit chains using options given below:	
	<input type="checkbox"/> Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
	<input checked="" type="checkbox"/> 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"/> If multiple transmit chains, EIRP PPSD calculation could be following as methods: $PPSD_{total} = PPSD_1 + PPSD_2 + \dots + PPSD_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = PPSD_{total} + DG$
	<input type="checkbox"/> Each individually PPSD plots refer as test report clause 3.3.5 with each individually PPSD plots.

3.4.4 Test Setup





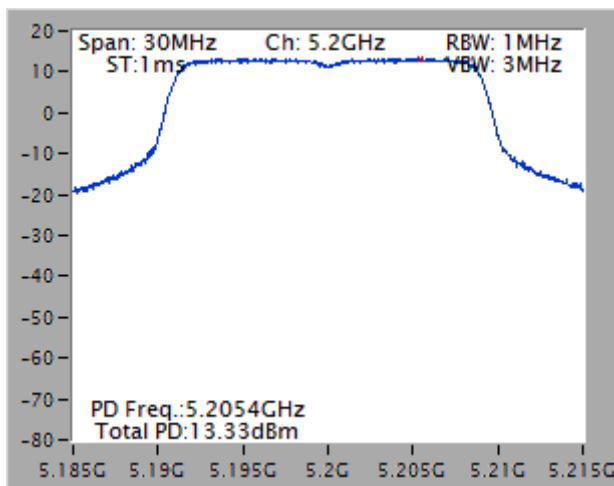
3.4.5 Test Result of Peak Power Spectral Density

Peak Power Spectral Density Result (5150-5250MHz band)					
Modulation Mode	N _{TX}	Freq. (MHz)	Peak Power Spectral Density (dBm/1MHz)	PSD Limit	Antenna Gain (dBi)
11a	1	5180	10.18	17.00	2.58
11a	1	5200	10.34	17.00	2.58
11a	1	5240	10.59	17.00	2.58
HT20	2	5180	12.00	17.00	5.59
HT20	2	5200	13.28	17.00	5.59
HT20	2	5240	12.94	17.00	5.59
HT40	2	5190	6.44	17.00	5.59
HT40	2	5230	10.39	17.00	5.59
VHT20	2	5180	12.21	17.00	5.59
VHT20	2	5200	13.33	17.00	5.59
VHT20	2	5240	13.18	17.00	5.59
VHT40	2	5190	6.70	17.00	5.59
VHT40	2	5230	10.45	17.00	5.59
VHT80	2	5210	-0.38	17.00	5.59
Result		Complied			

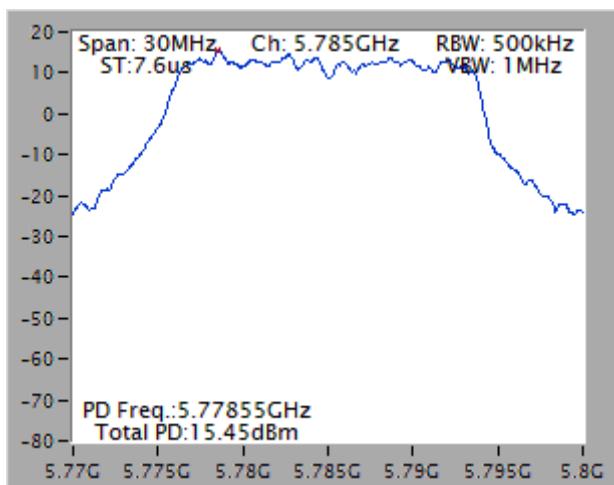
Peak Power Spectral Density Result (5725-5850MHz band)					
Modulation Mode	N _{TX}	Freq. (MHz)	Peak Power Spectral Density (dBm/500KHz)	PSD Limit (500kHz)	Antenna Gain (dBi)
11a	1	5745	14.86	30.00	2.58
11a	1	5785	13.54	30.00	2.58
11a	1	5825	11.20	30.00	2.58
HT20	2	5745	9.82	30.00	5.59
HT20	2	5785	14.13	30.00	5.59
HT20	2	5825	11.69	30.00	5.59
HT40	2	5755	4.98	30.00	5.59
HT40	2	5795	12.07	30.00	5.59
VHT20	2	5745	7.51	30.00	5.59
VHT20	2	5785	15.45	30.00	5.59
VHT20	2	5825	11.38	30.00	5.59
VHT40	2	5755	4.76	30.00	5.59
VHT40	2	5795	11.45	30.00	5.59
VHT80	2	5775	-0.80	30.00	5.59
Result		Complied			



5150-5250MHz - Worst Power Spectral Density Plots

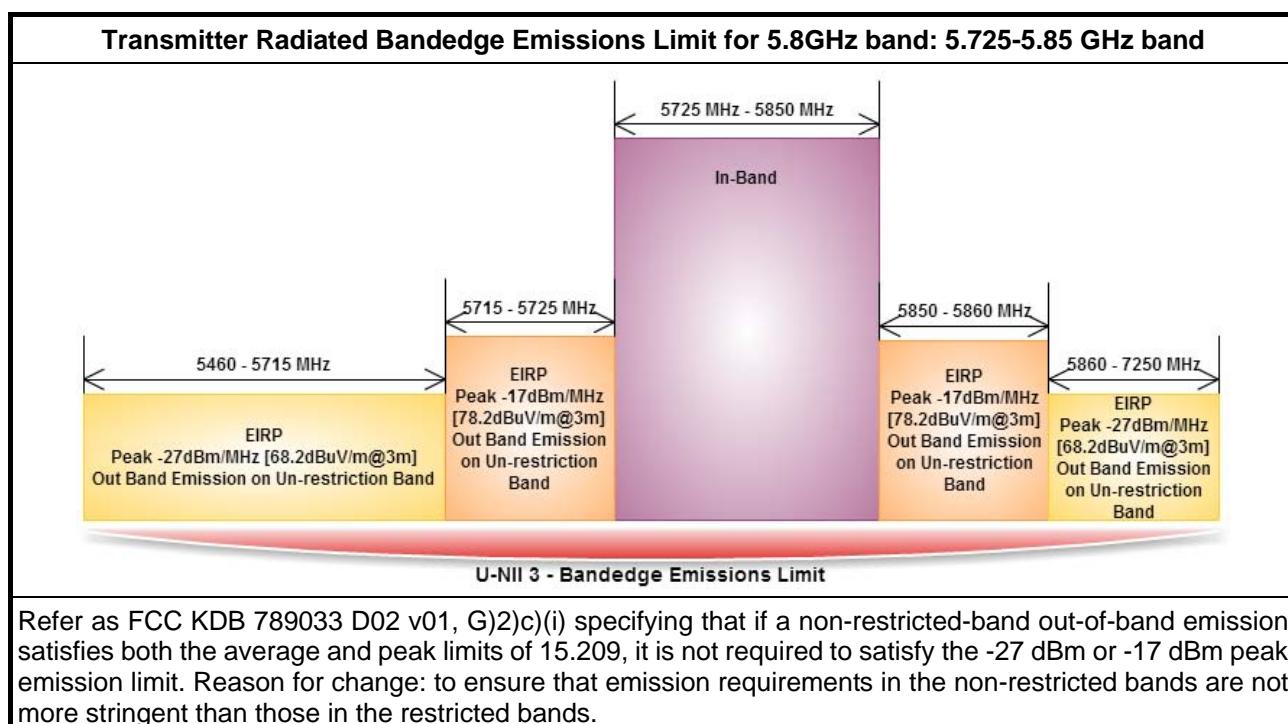
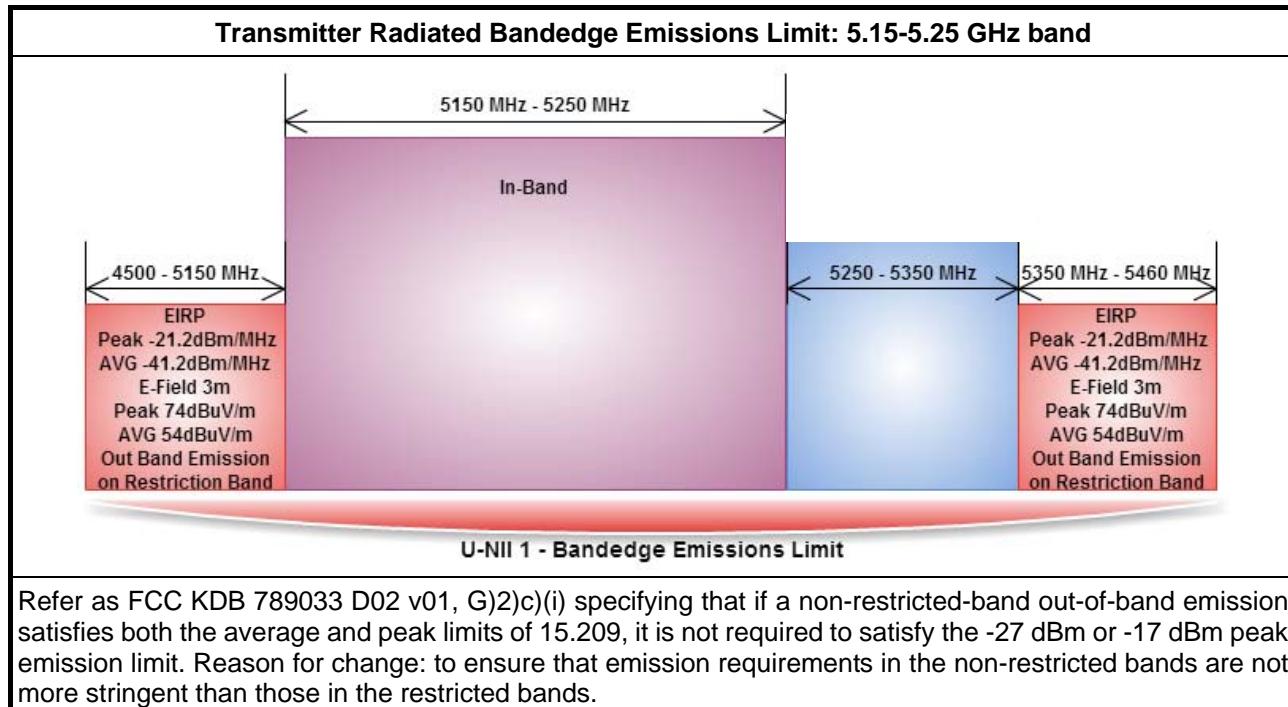


5725-5850MHz - Worst Power Spectral Density Plots



3.5 Transmitter Bandedge Emissions

3.5.1 Transmitter Radiated Bandedge Emissions Limit



3.5.2 Measuring Instruments

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

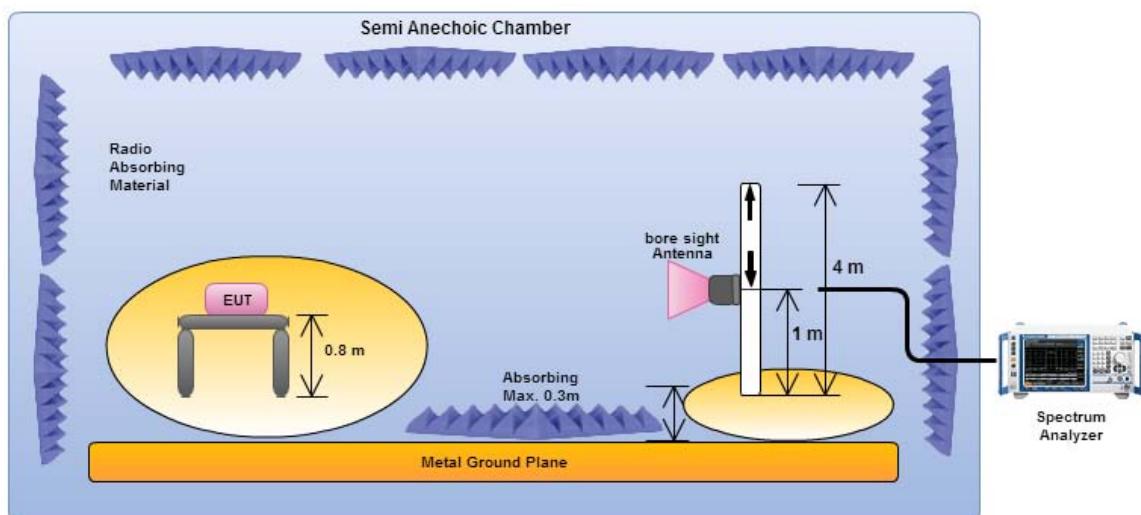


3.5.3 Test Procedures

Test Method
<input checked="" type="checkbox"/> The average emission levels shall be measured in [duty cycle \geq 98 or duty factor].
<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 6.9.2.2 bandedge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.
<input type="checkbox"/> If EUT operate in adjacent contiguous bands, bandedge testing performed at the lowest frequency channel at lower-band and highest frequency channel at higher-band. Transmitter in-band emissions will consist of adjacent contiguous bands (e.g., IEEE 802.11ac VHT160 The lowest frequency channel at lower-band and highest frequency channel at higher-band in-band emissions will consist of two adjacent contiguous bands.) <input type="checkbox"/> Operating in 5.15-5.25 GHz band (lower-band) and 5.25-5.35 GHz band (higher-band). <input type="checkbox"/> Operating in 5.47-5.725 GHz band (lower-band) and 5.725-5.85 GHz band (higher-band).
<input type="checkbox"/> If EUT operate in individual non-contiguous bands, bandedge testing performed at the lowest frequency channel and highest frequency channel within lower-band and higher-band. (e.g., (e.g., IEEE 802.11ac VHT160) <input type="checkbox"/> Operating in 5.25-5.35 GHz band (lower-band) and 5.47-5.725 GHz band (higher-band). <input type="checkbox"/> Operating in 5.15-5.25 GHz band (lower-band) and 5.725-5.85 GHz band (higher-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 789033 D02 v01, clause G)2) for unwanted emissions into non-restricted bands. <input checked="" type="checkbox"/> Refer as FCC KDB 789033 D02 v01, clause G)1) for unwanted emissions into restricted bands. <input type="checkbox"/> Refer as FCC KDB 789033 D02 v01, G)6) Method AD (Trace Averaging). <input type="checkbox"/> Refer as FCC KDB 789033 D02 v01, G)6) Method VB (Reduced VBW). <input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). $VBW \geq 1/T$, where T is pulse time. <input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions. <input checked="" type="checkbox"/> Refer as FCC KDB 789033 D02 v01, clause G)5) measurement procedure peak limit. <input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.2 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 789033 D02 v01, clause G)3)d) for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz). <input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 6.9.2 for band-edge testing. <input type="checkbox"/> Refer as ANSI C63.10, clause 6.9.3 for marker-delta method for band-edge measurements.
<input checked="" type="checkbox"/> For radiated measurement, refer as ANSI C63.10, clause 6.6. Test distance is 3m.
<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). Measurements in the bandedge are typically made at a closer distance 3m, because the instrumentation noise floor is typically close to the radiated emission limit.

3.5.4 Test Setup

Transmitter Radiated Bandedge Emissions



Electric field tests shall be performed in transmitter bandedge emissions using a calibrated horn antenna.



3.5.5 Transmitter Radiated Bandedge Emissions (with Antenna)

U-NII 5150-5250MHz Transmitter Radiated Bandedge (with Antenna)										
Modulation Mode	N _{TX}	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.
11a	1	5180	3	5149.60	70.58	74	5149.80	52.98	54	V
11a	1	5240	3	5392.20	59.90	74	5393.40	46.74	54	V
HT20	2	5180	3	5148.80	67.75	74	5149.60	52.35	54	V
HT20	2	5240	3	5370.60	60.53	74	5397.60	47.14	54	V
HT40	2	5190	3	5149.94	67.96	74	5149.94	52.48	54	V
HT40	2	5230	3	5391.00	60.79	74	5398.20	47.27	54	V
VHT20	2	5180	3	5148.20	67.88	74	5149.80	52.46	54	V
VHT20	2	5240	3	5393.40	60.37	74	5392.80	47.08	54	V
VHT40	2	5190	3	5149.72	67.41	74	5149.72	52.53	54	V
VHT40	2	5230	3	5391.60	60.32	74	5388.00	47.15	54	V
VHT80	2	5210	3	5146.20	69.05	74	5148.00	52.64	54	V
VHT80	2	5210	3	5389.80	59.82	74	5388.60	46.09	54	V

Note 1: Measurement worst emissions of receive antenna polarization.

U-NII 5725-5850MHz Transmitter Radiated Bandedge (with Antenna)							
Modulation Mode	N _{TX}	Freq. (MHz)	Measure Distance (m)	Freq. (MHz) PK	Level (dBuV/m) PK	Limit (dBuV/m) PK	Pol.
11a	1	5745	3	5713.84	65.96	68.20	V
11a	1	5825	3	5860.36	63.99	68.20	V
HT20	2	5745	3	5714.26	66.31	68.20	V
HT20	2	5825	3	5861.20	66.40	68.20	V
HT40	2	5755	3	5713.44	65.90	68.20	V
HT40	2	5795	3	5868.70	66.18	68.20	V
VHT20	2	5745	3	5714.68	66.54	68.20	V
VHT20	2	5825	3	5860.57	66.93	68.20	V
VHT40	2	5755	3	5715.00	66.81	68.20	V
VHT40	2	5795	3	5869.60	66.52	68.20	V
VHT80	2	5775	3	5714.80	66.66	68.20	V
VHT80	2	5775	3	5876.80	59.45	68.20	V

Note 1: Measurement worst emissions of receive antenna polarization.



3.6 Transmitter Unwanted Emissions

3.6.1 Transmitter Radiated Unwanted Emissions Limit

Unwanted emissions below 1 GHz and restricted band emissions above 1GHz 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 above 1GHz Limit	
Operating Band	Limit
5.15 - 5.25 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.725 - 5.85 GHz	5.715 5.725 GHz: e.i.r.p. -17 dBm [78.2 dBuV/m@3m] 5.85 5.86 GHz: e.i.r.p. -17 dBm [78.2 dBuV/m@3m] Other un-restricted band: e.i.r.p. -27 dBm [68.2 dBuV/m@3m]

Note 1: 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).

3.6.2 Measuring Instruments

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

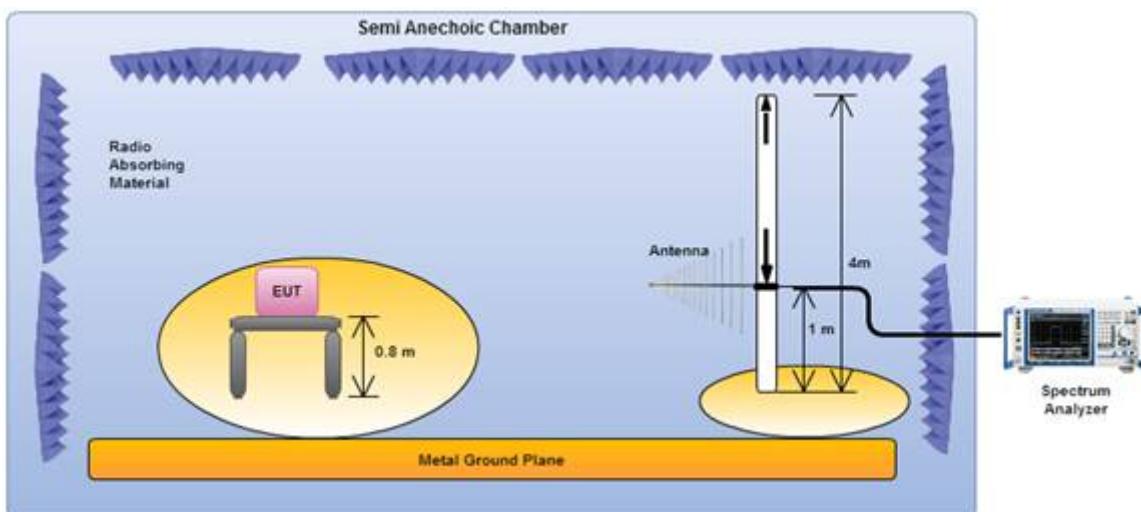


3.6.3 Test Procedures

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. Measurements shall not be performed at a distance greater than 30 m for frequencies above 30 MHz, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. 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 789033 D02 v01, clause G)2) for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/> Refer as FCC KDB 789033 D02 v01, clause G)1) for unwanted emissions into restricted bands.
<input type="checkbox"/> Refer as FCC KDB 789033 D02 v01, G)6) Method AD (Trace Averaging).
<input type="checkbox"/> Refer as FCC KDB 789033 D02 v01, G)6) Method VB (Reduced VBW).
<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW \geq 1/T, where T is pulse time.
<input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
<input checked="" type="checkbox"/> Refer as FCC KDB 789033 D02 v01, clause G)5) measurement procedure peak limit.
<input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.
<input checked="" type="checkbox"/> For radiated measurement.
<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 1GHz. For 1 GHz to 40 GHz, 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.

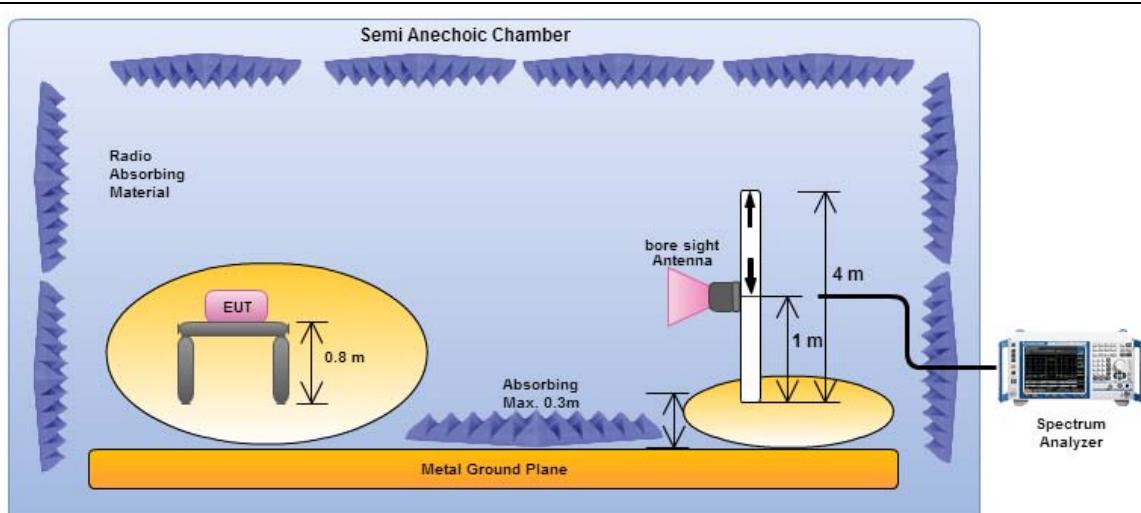
3.6.4 Test Setup

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-with Antenna (Below 30MHz)

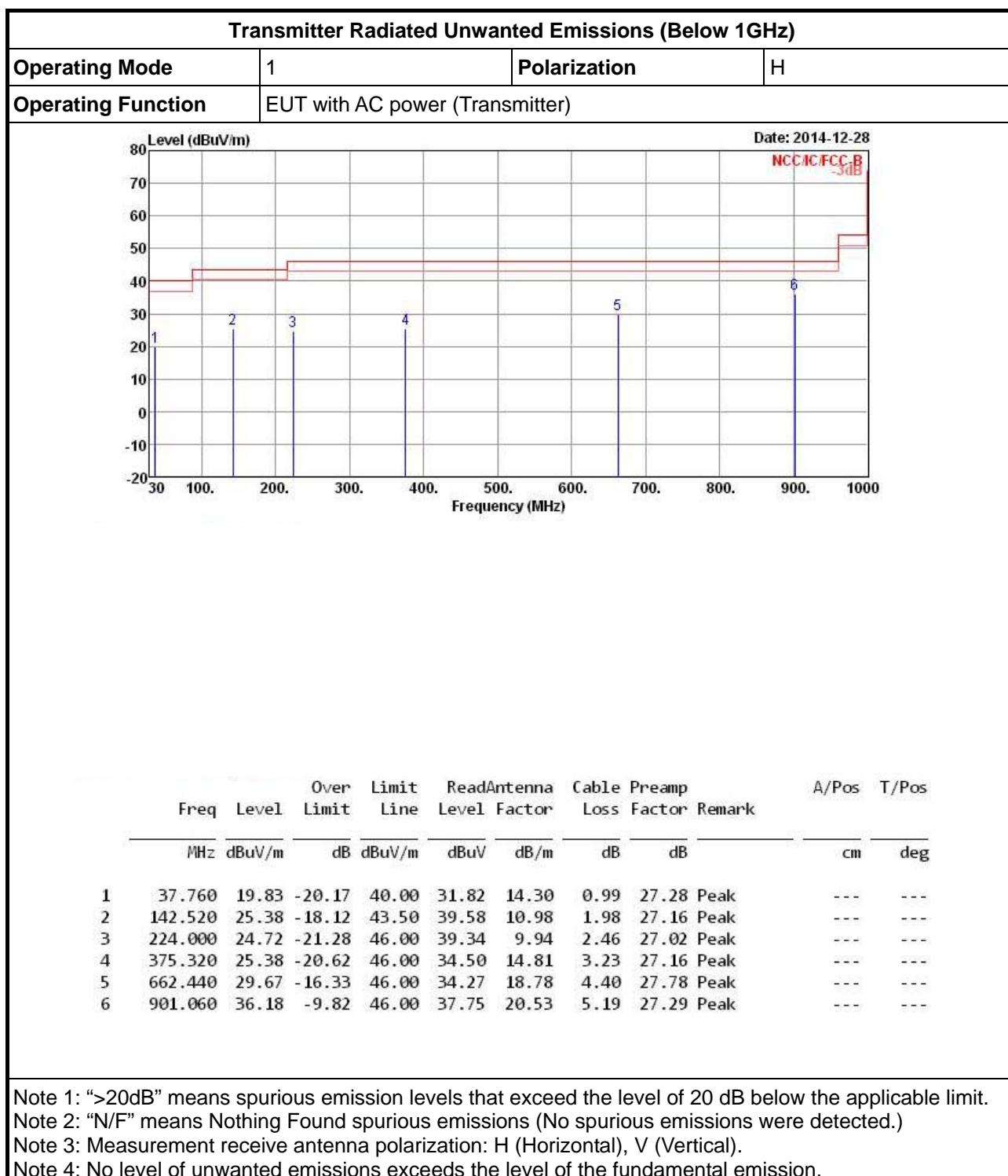
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.



3.6.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

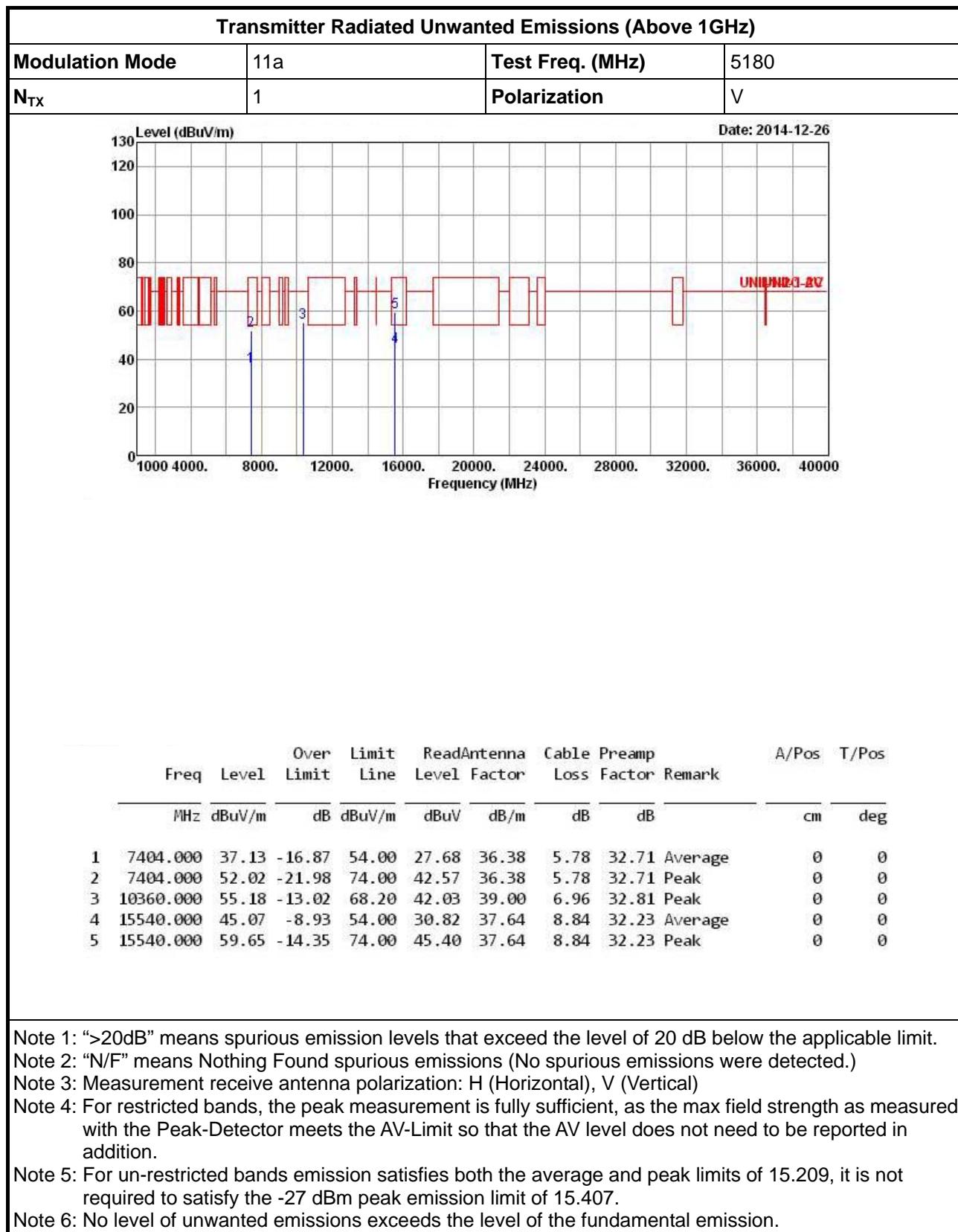
Transmitter Radiated Unwanted Emissions (Below 1GHz)																
Operating Mode		1		Polarization		V										
Operating Function		EUT with AC power (Transmitter)														
Date: 2014-12-28												NCC IC FCC-B -30dB				
Level (dB _{uV/m})																
-20	30	100.	200.	300.	400.	500.	600.	700.	800.	900.	1000					
Frequency (MHz)																
1	35.820	36.16	-3.84	40.00	46.92	15.52	0.96	27.24	Peak	---	---					
2	92.080	35.67	-7.83	43.50	51.82	9.55	1.54	27.24	Peak	---	---					
3	146.400	29.38	-14.12	43.50	43.87	10.67	2.00	27.16	Peak	---	---					
4	600.360	30.65	-15.35	46.00	35.80	18.46	4.15	27.76	Peak	---	---					
5	773.020	28.73	-17.27	46.00	31.87	19.75	4.78	27.67	Peak	---	---					
6	901.060	39.11	-6.89	46.00	40.68	20.53	5.19	27.29	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: No level of unwanted emissions exceeds the level of the fundamental emission.





3.6.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 5150-5250MHz



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

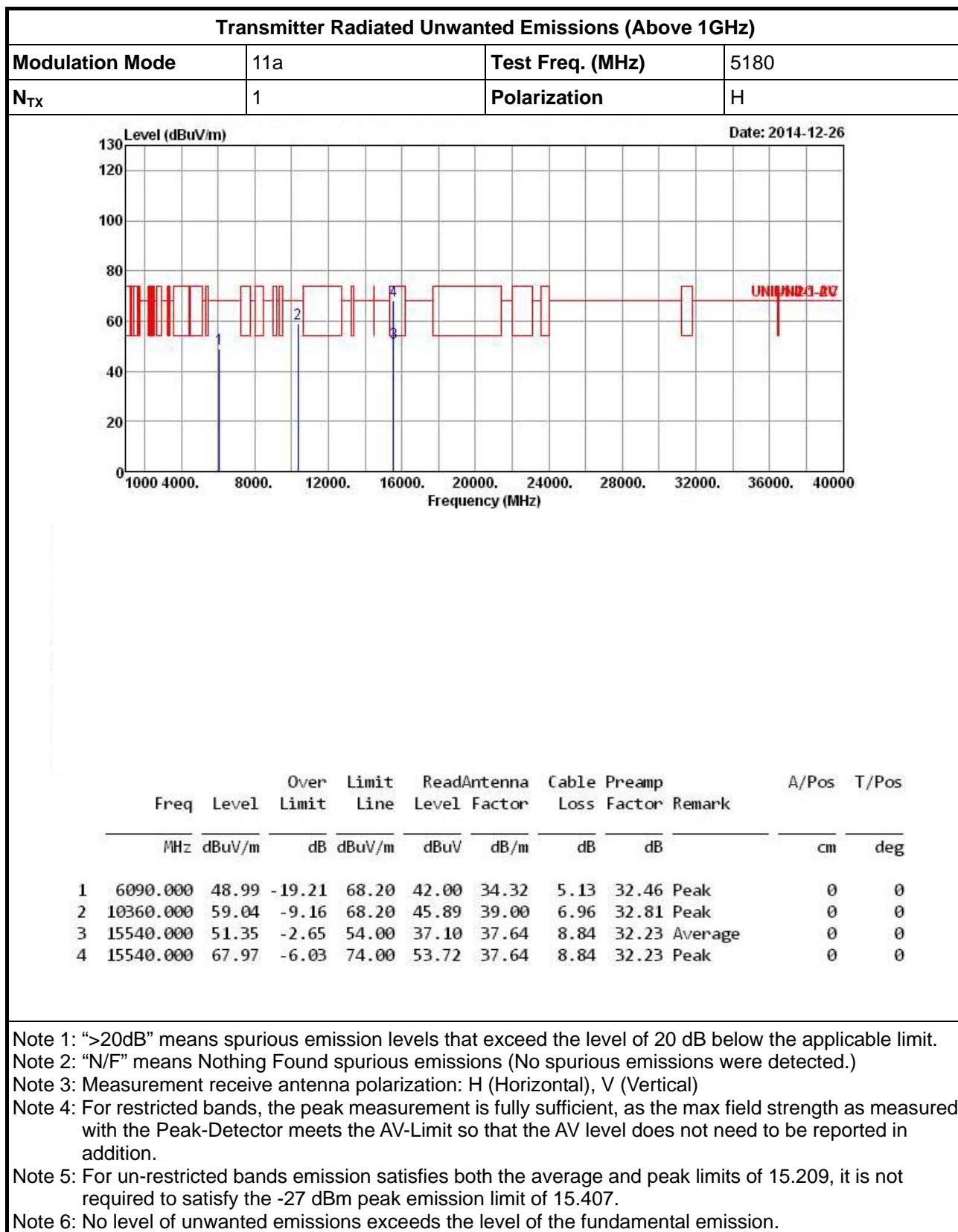
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

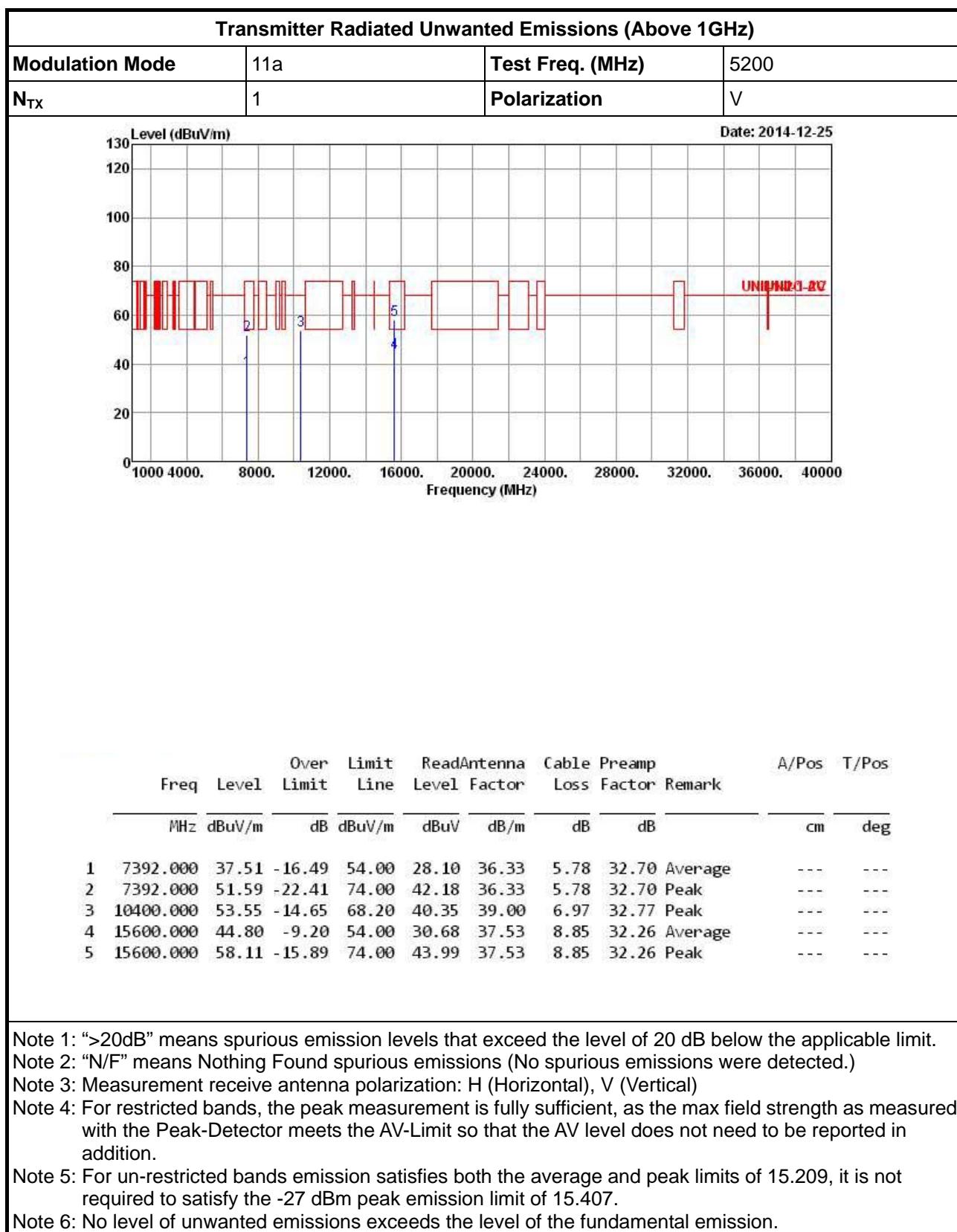
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

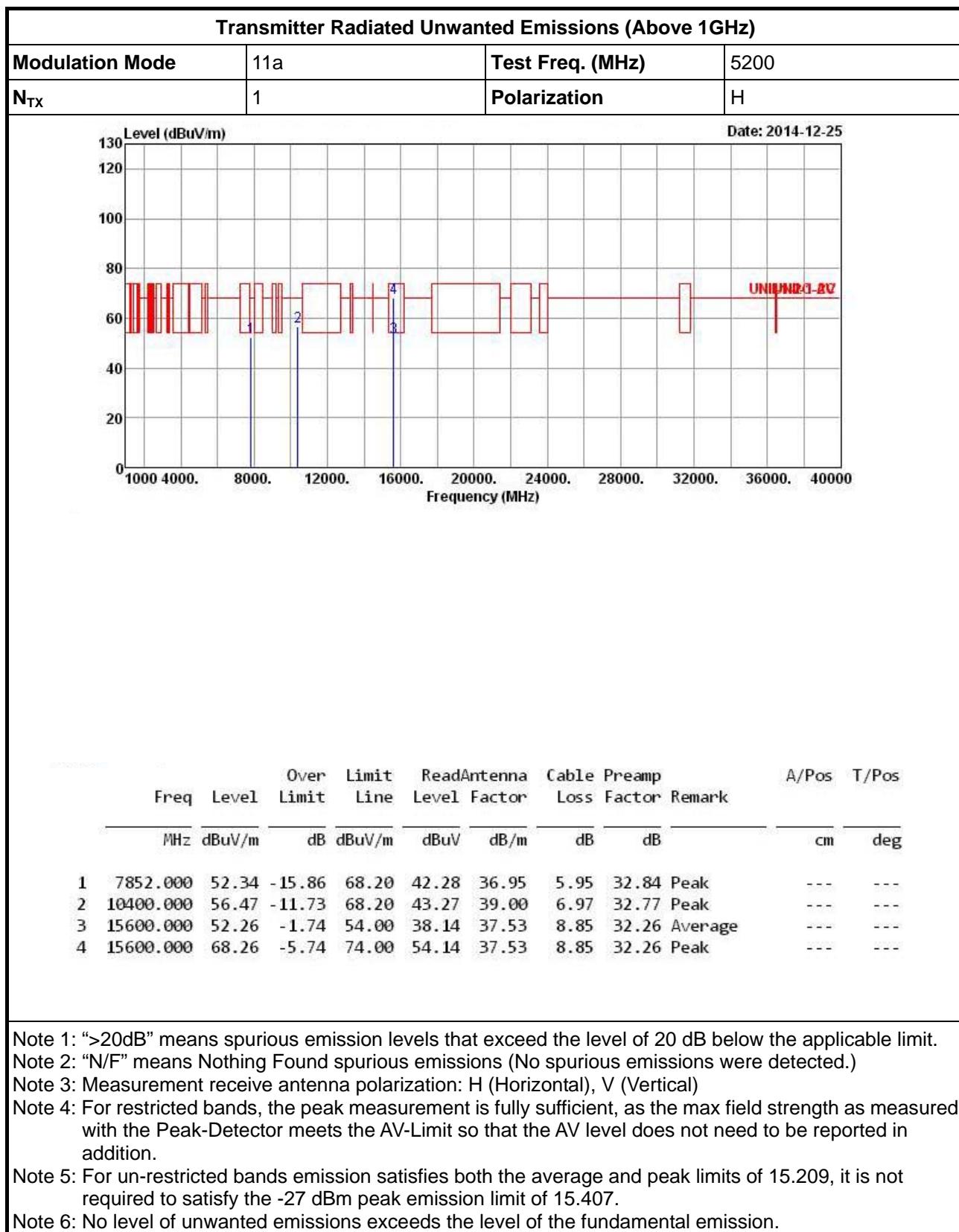
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

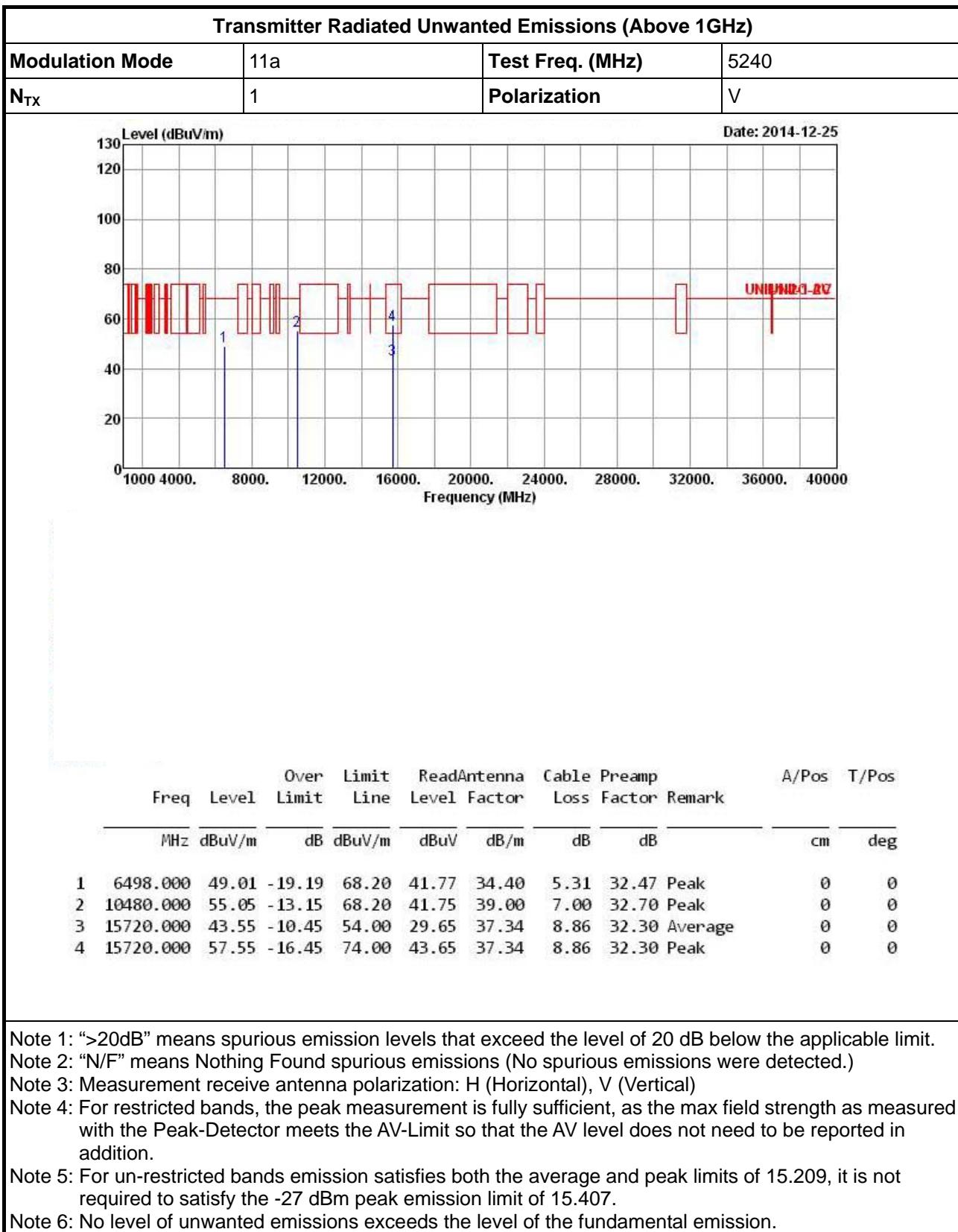
Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

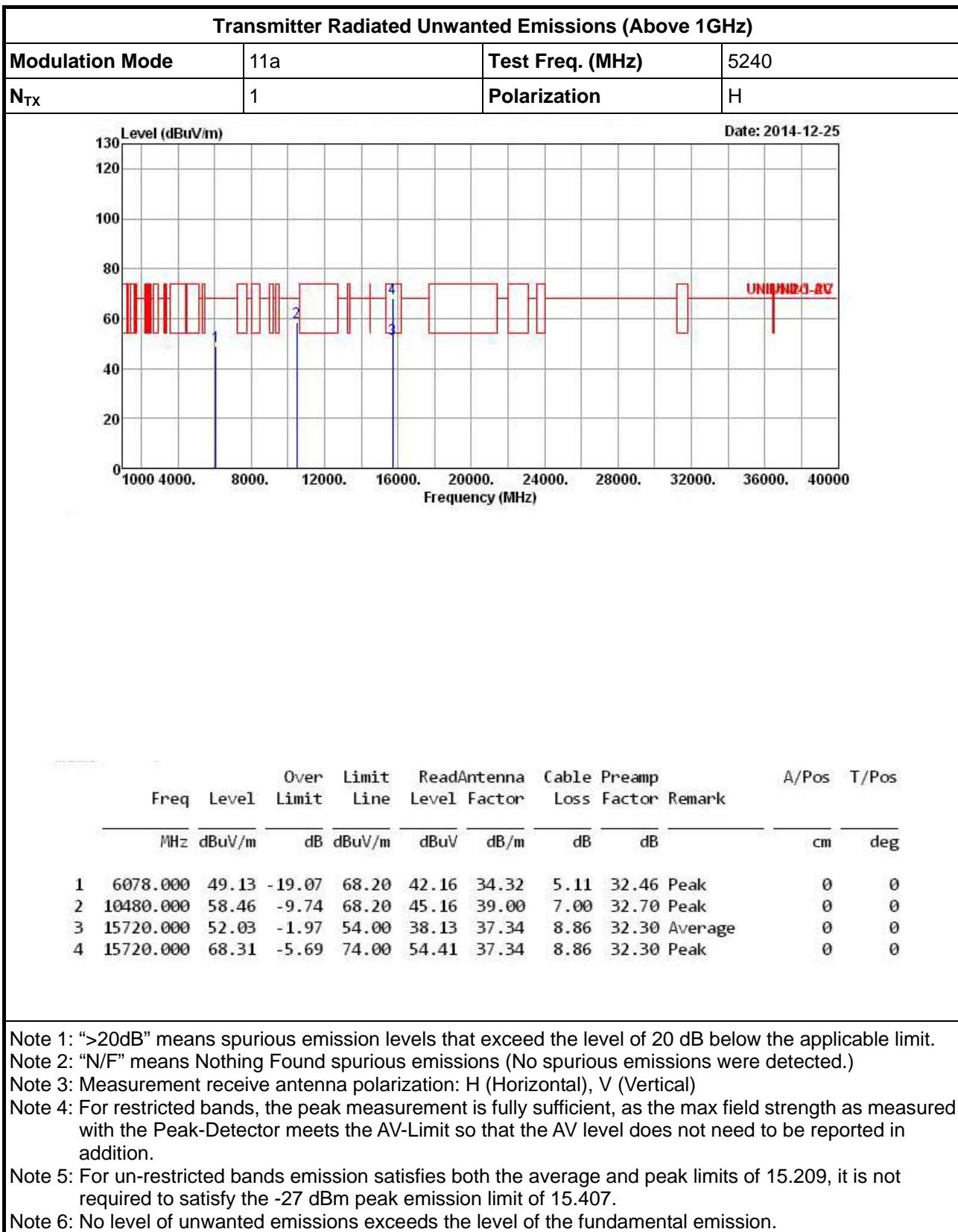
Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

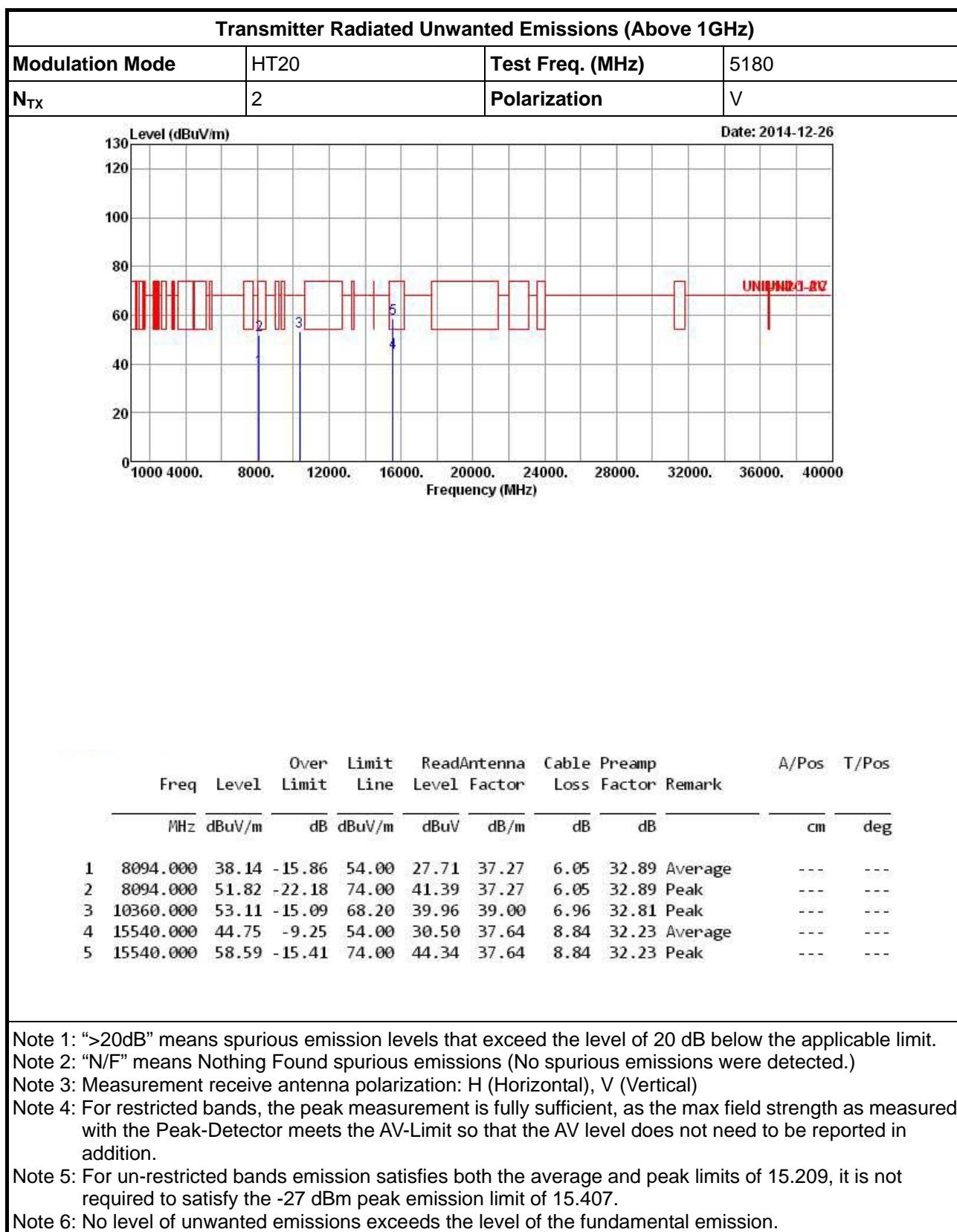


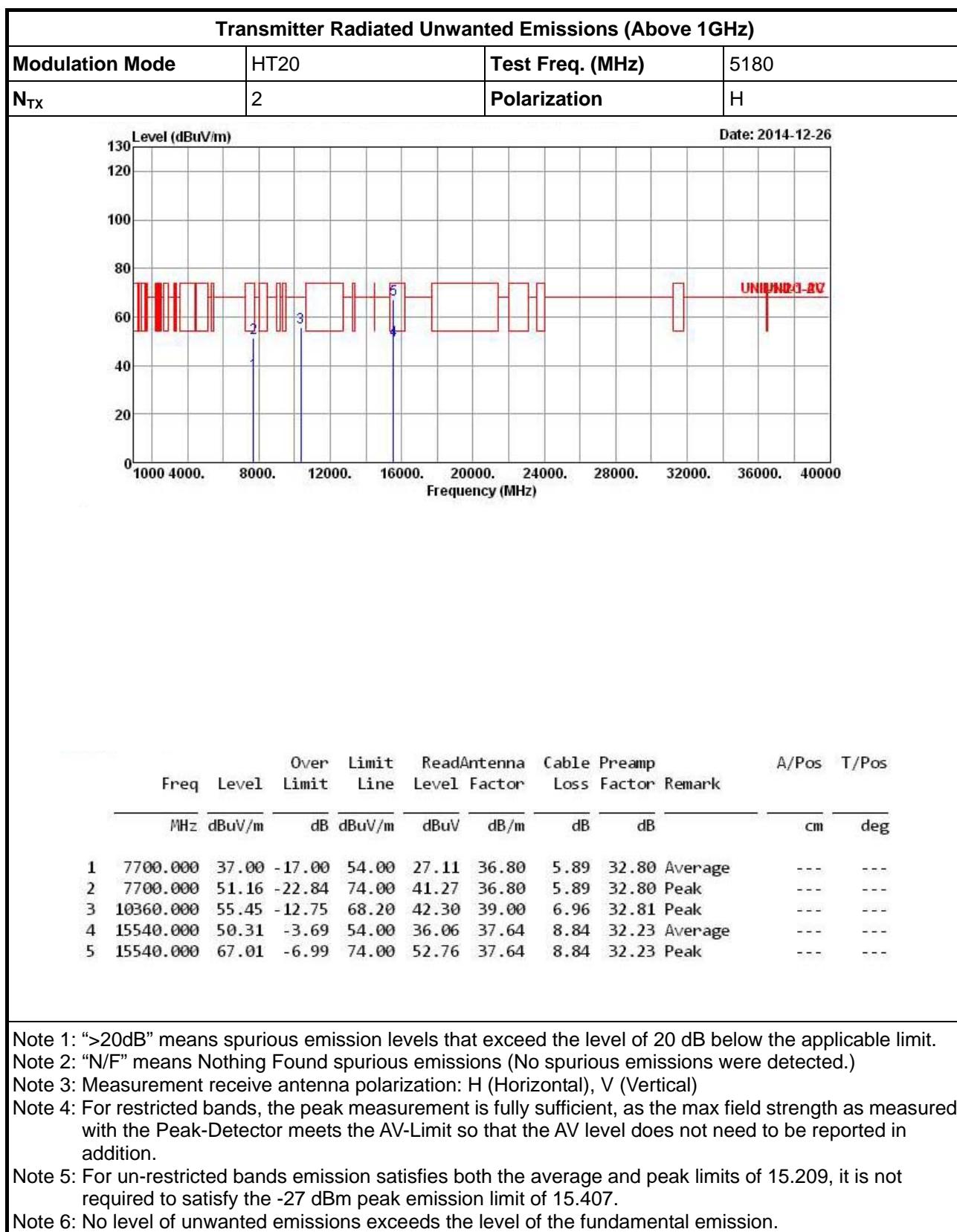


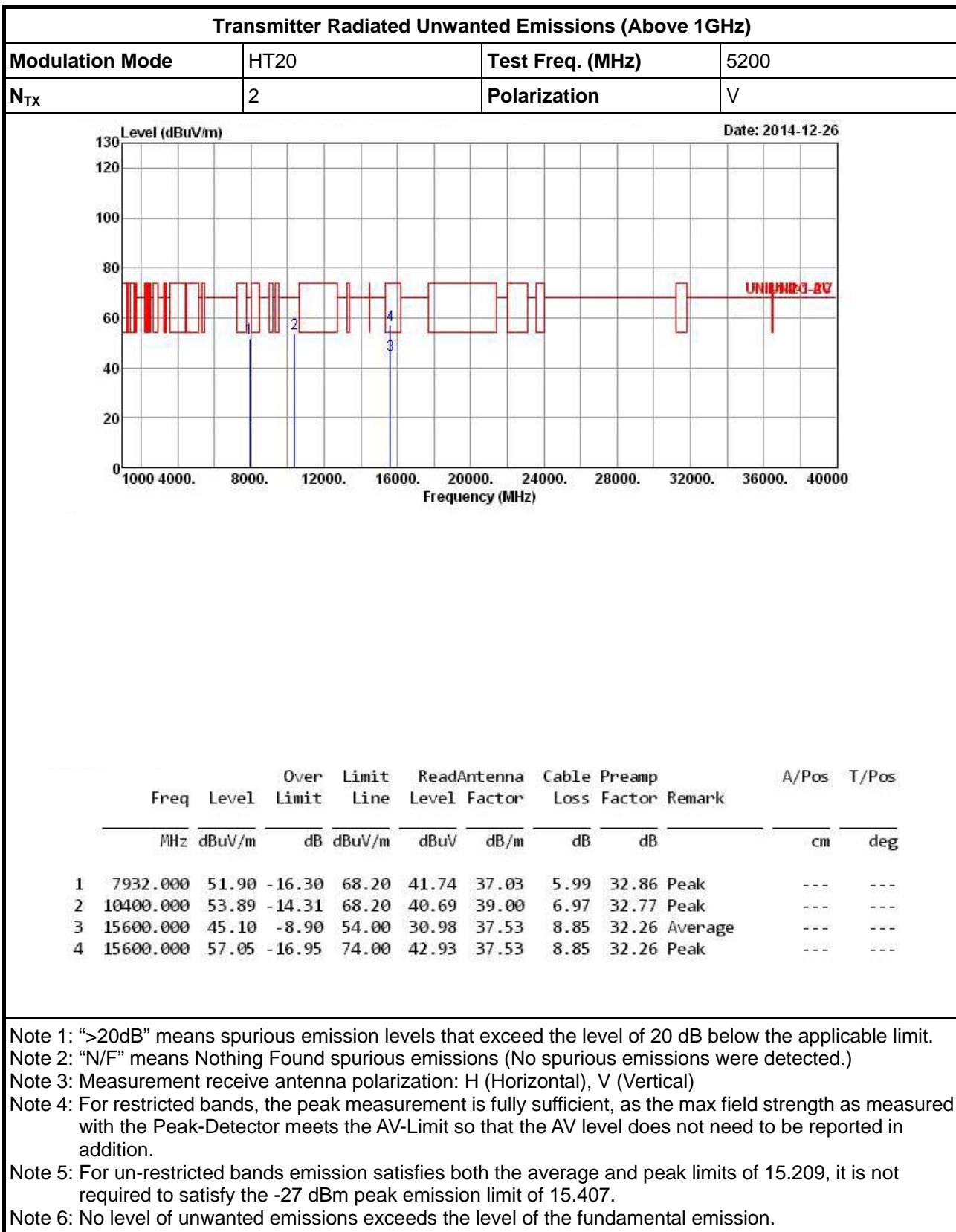


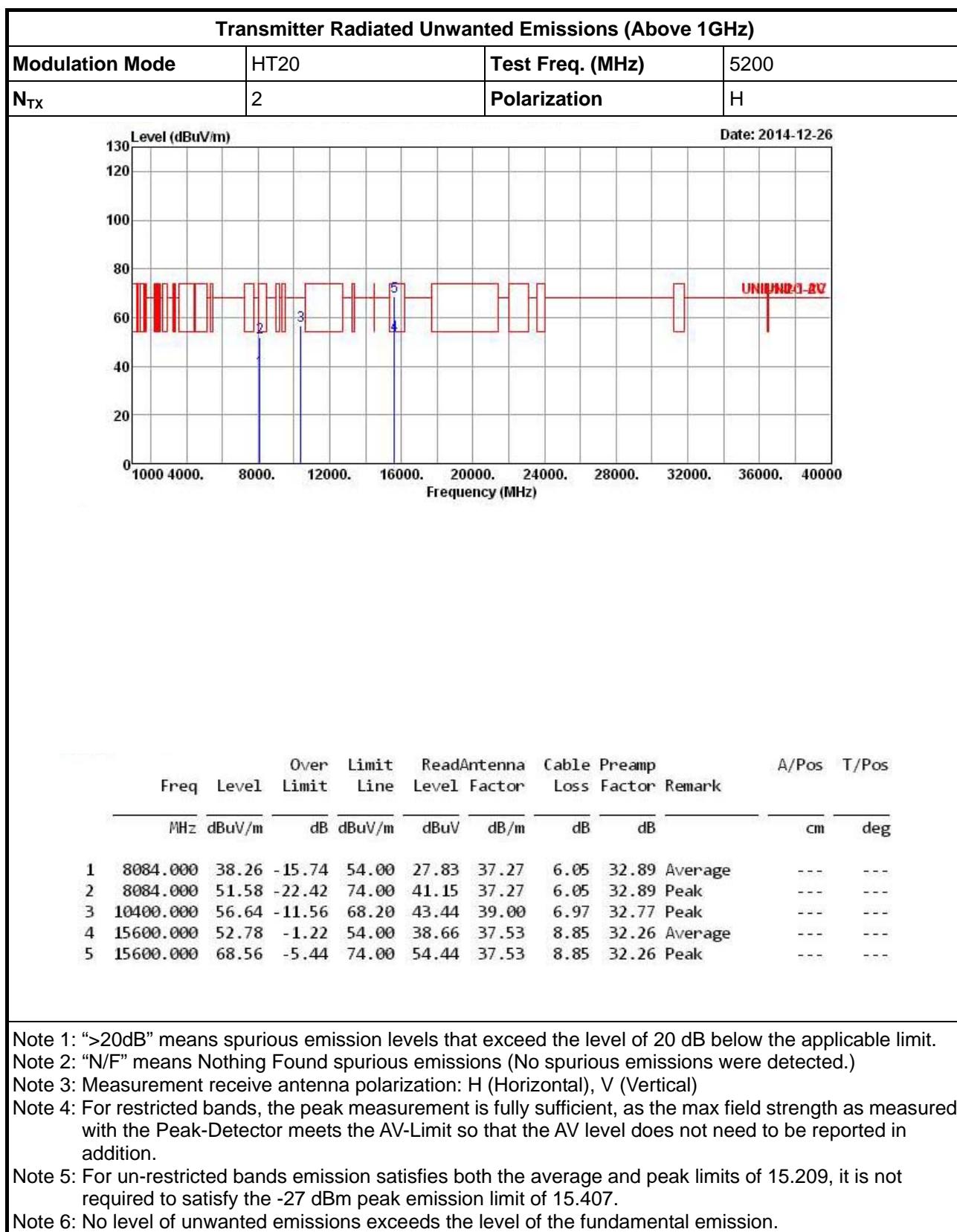


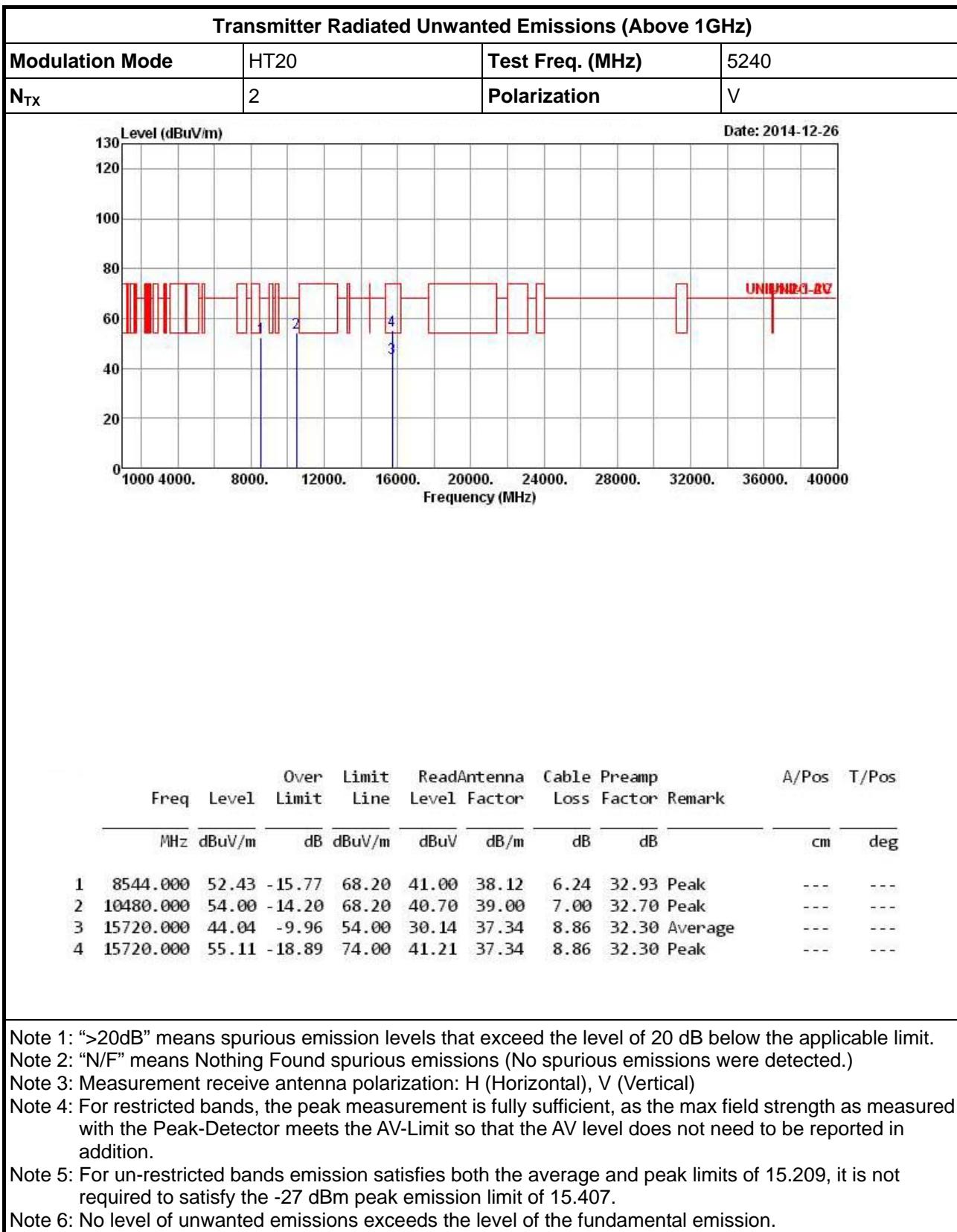


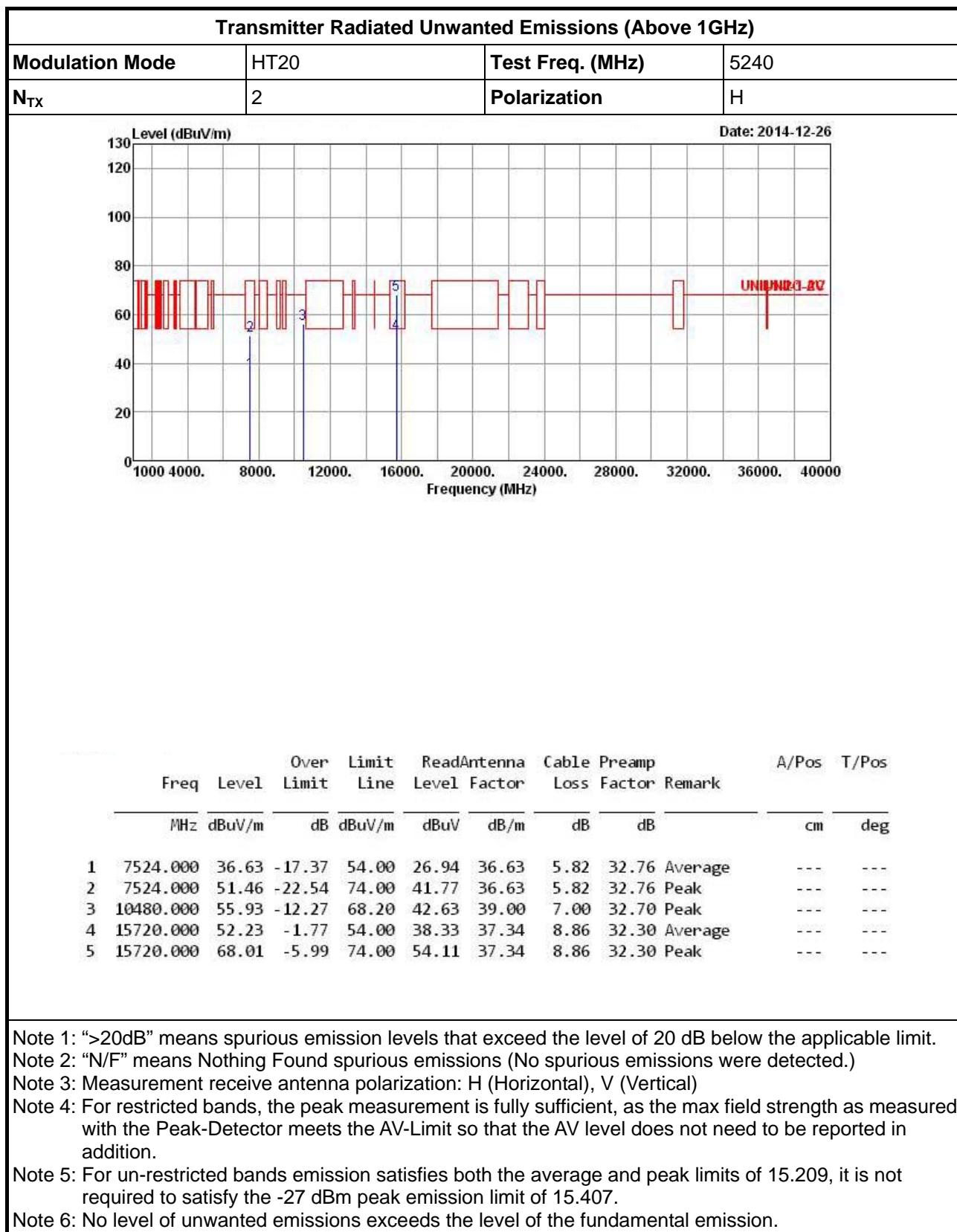


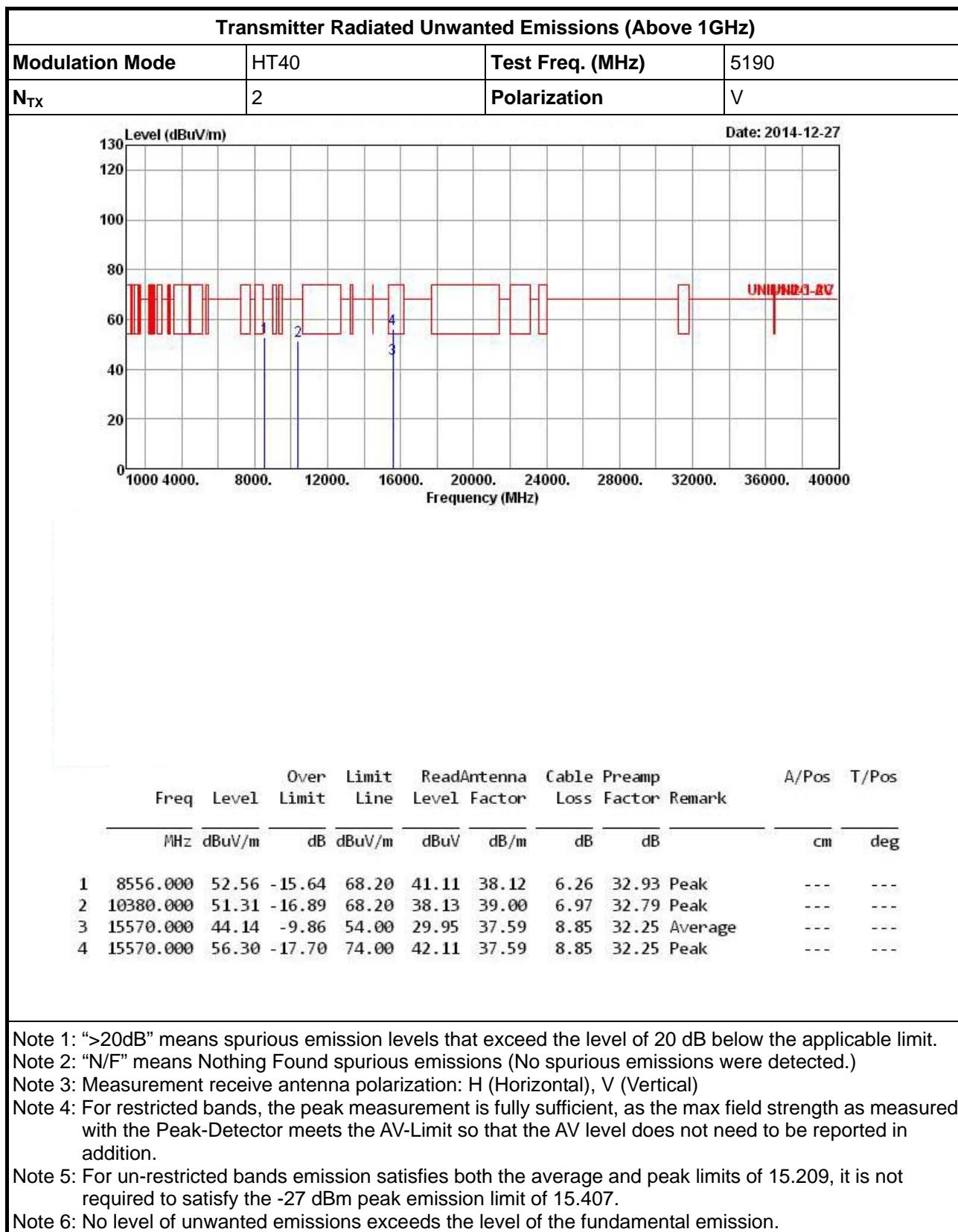


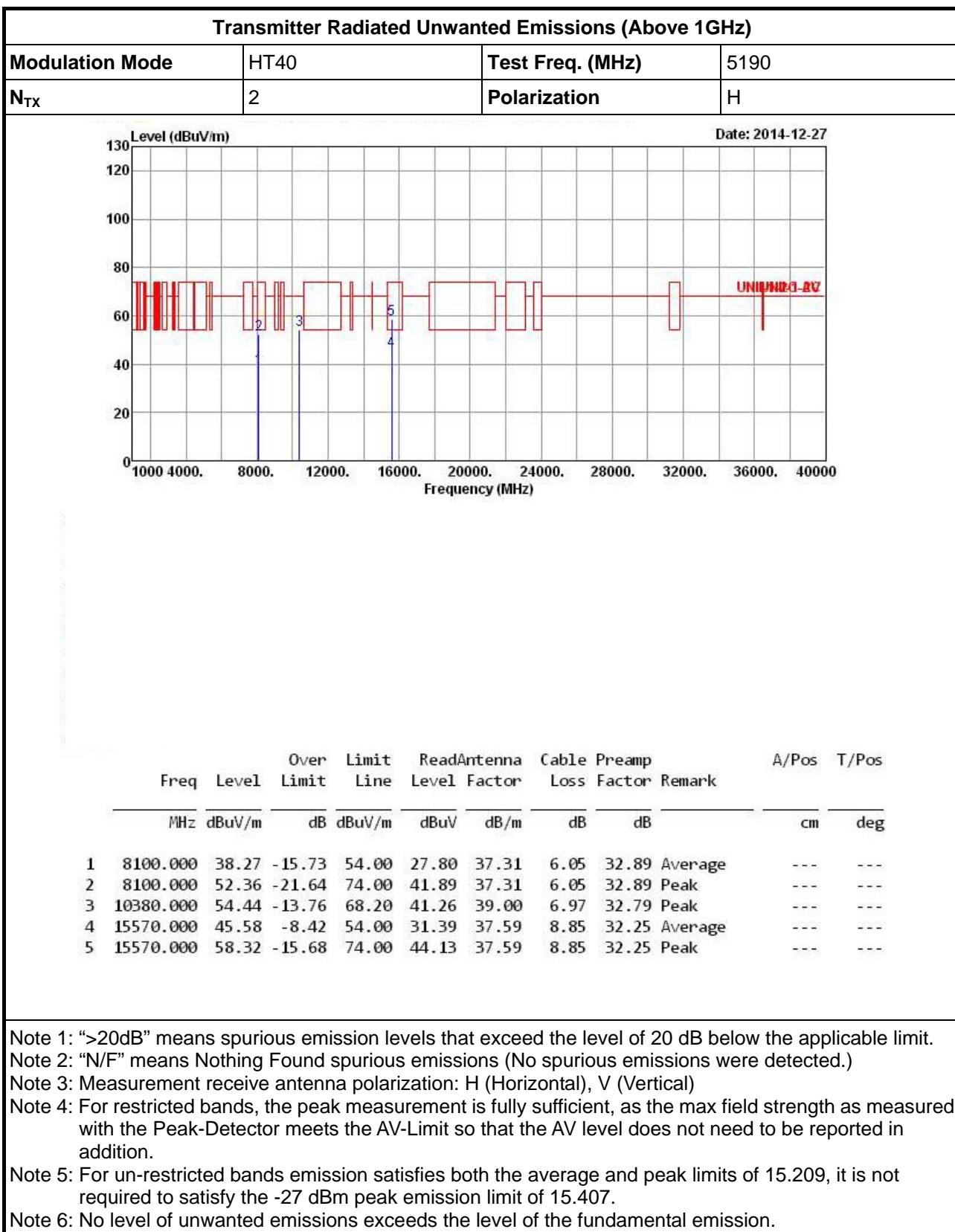


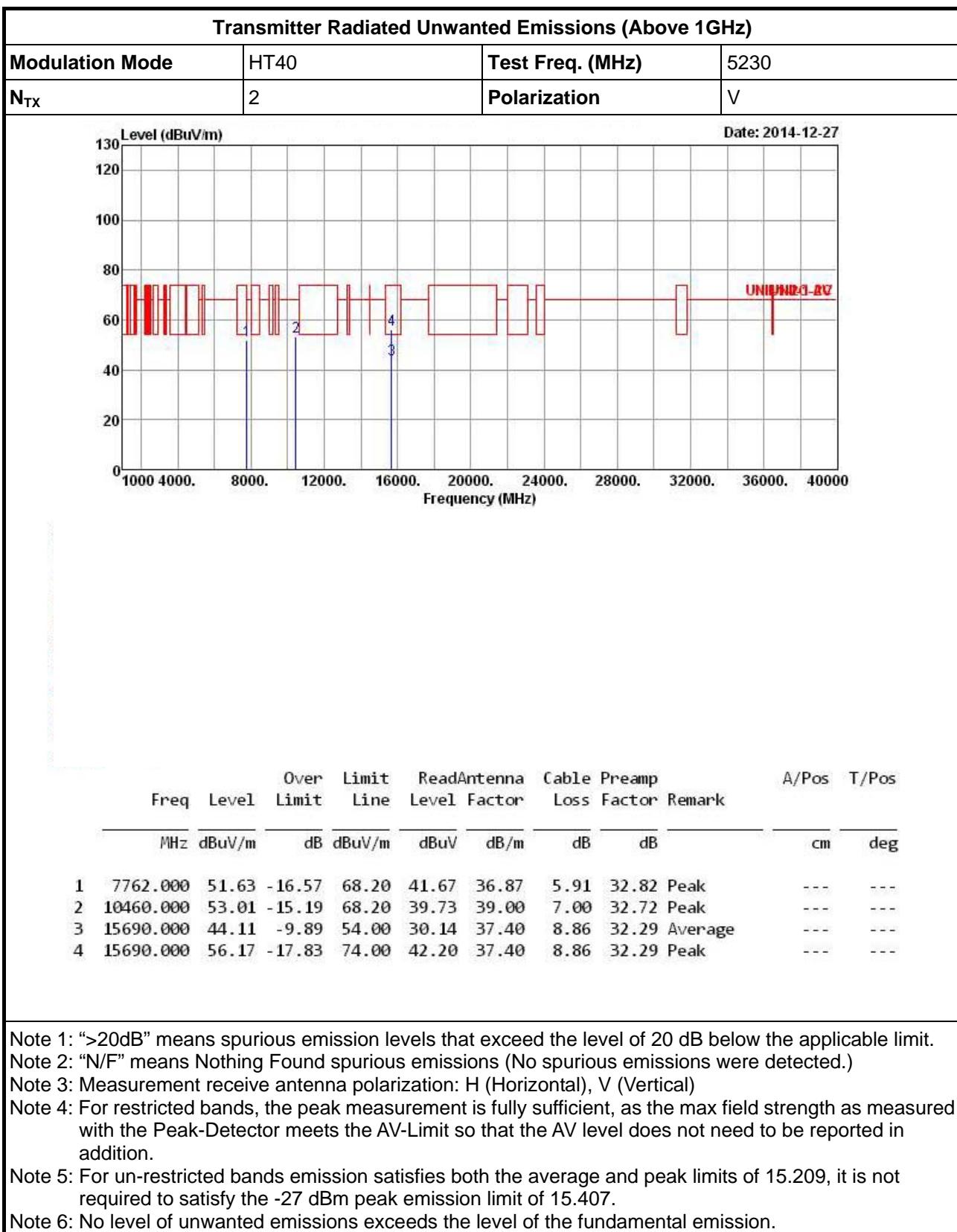


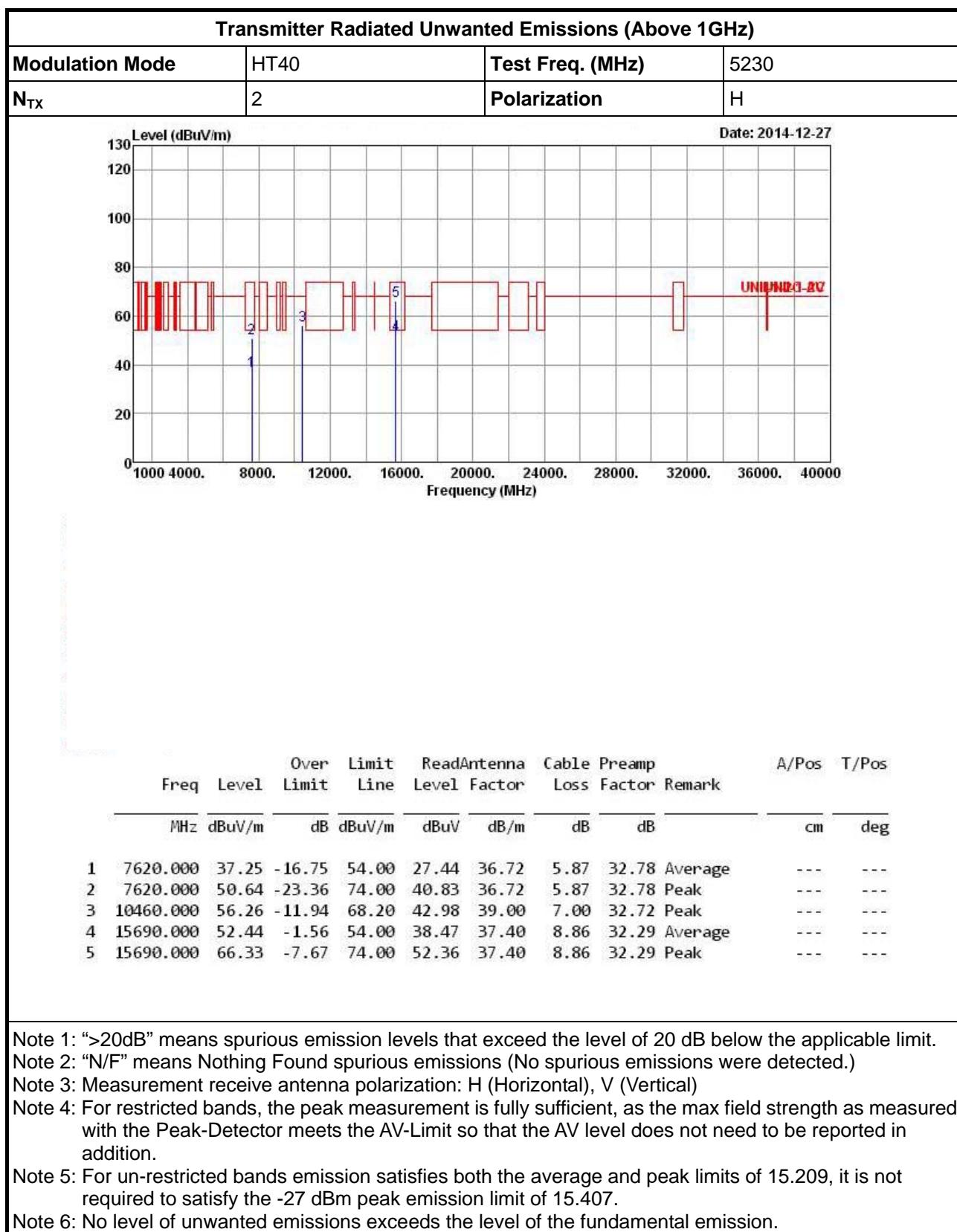


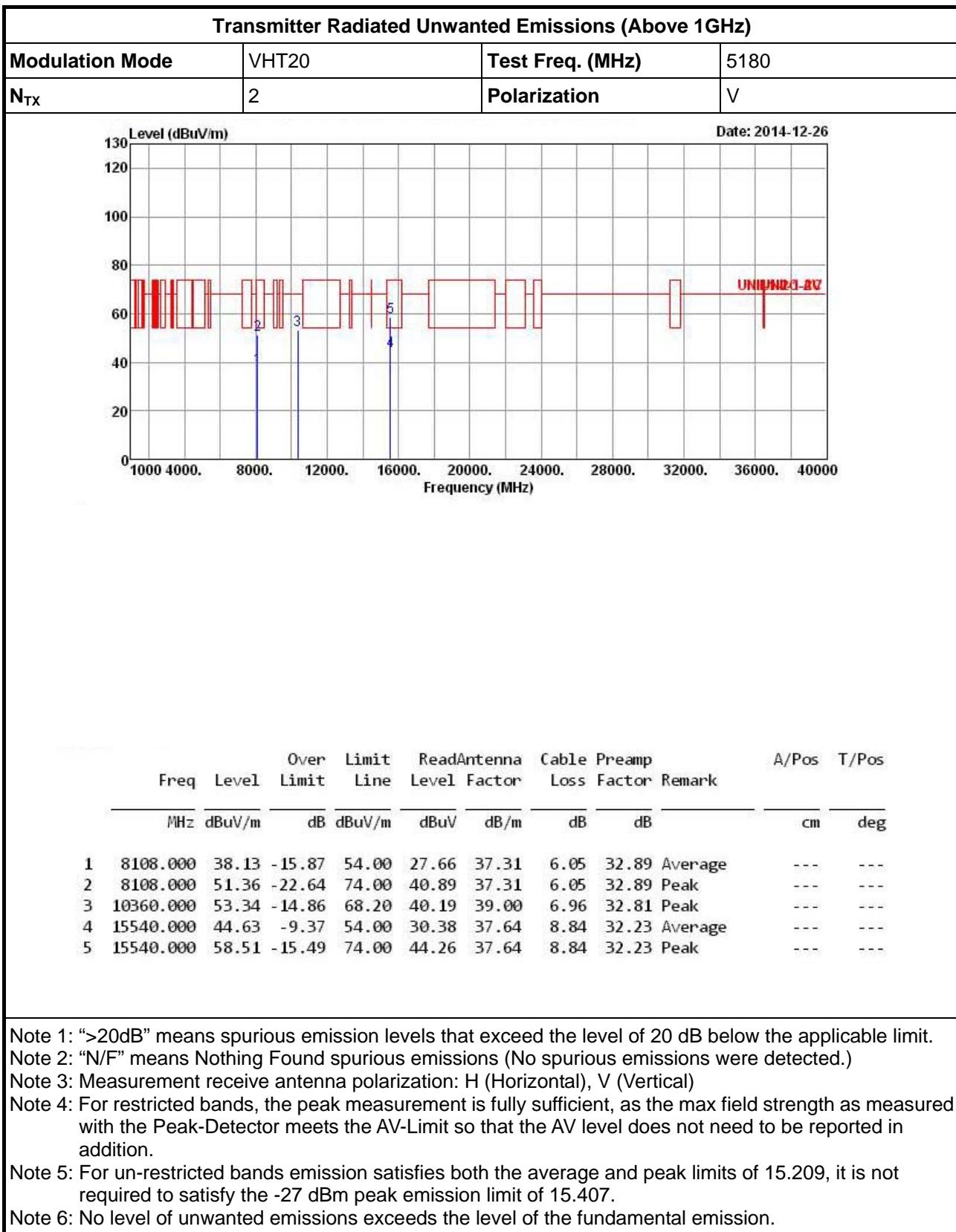


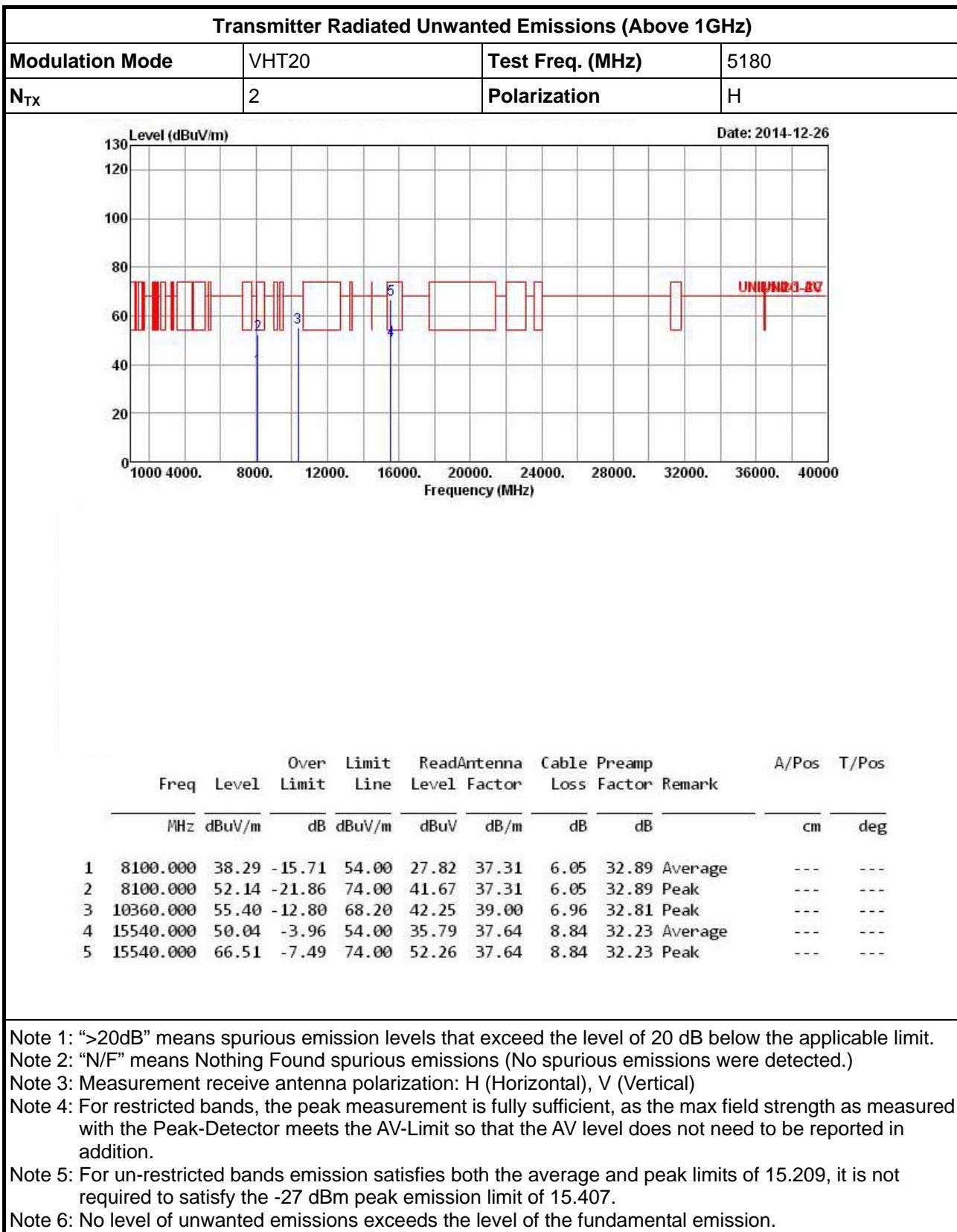


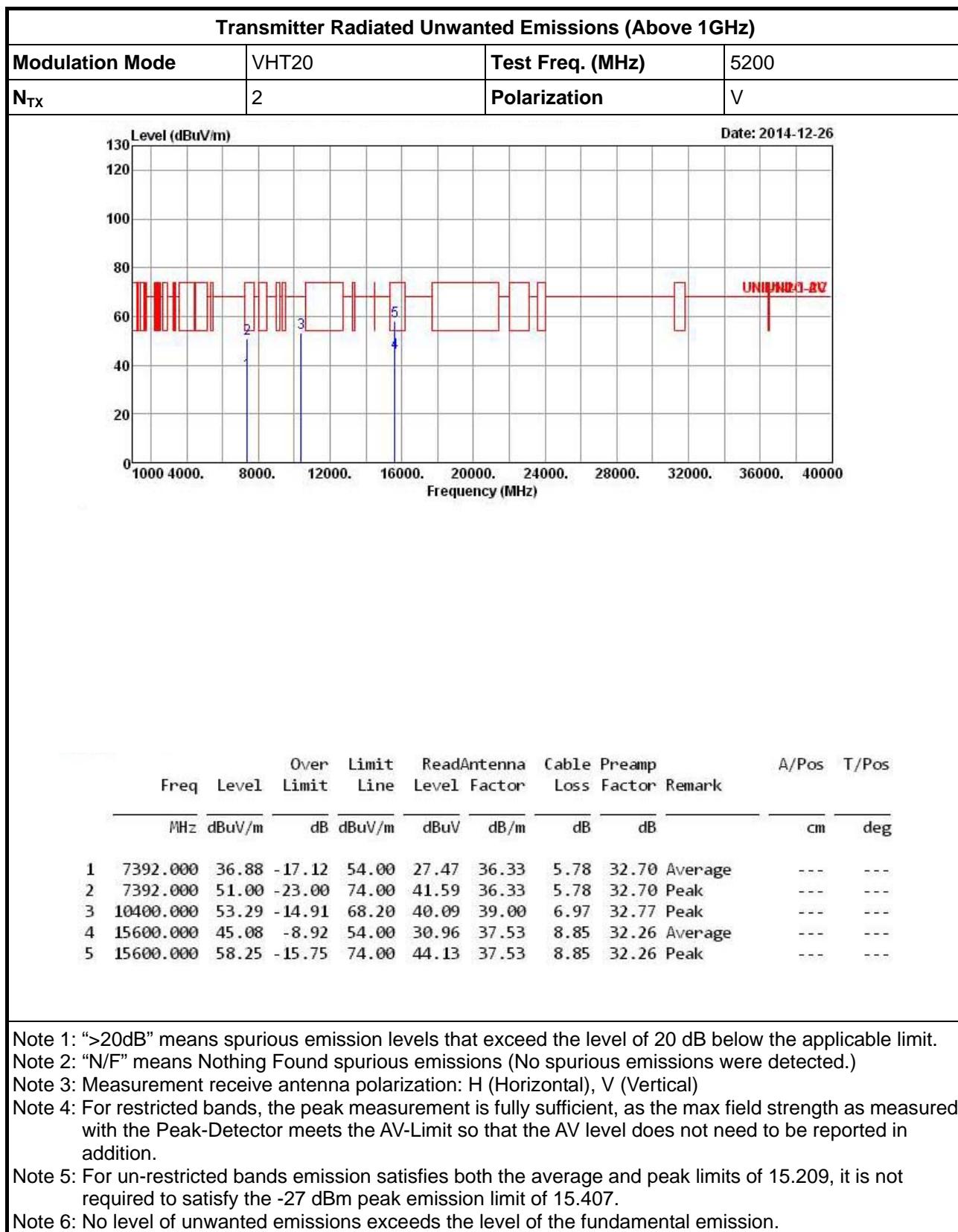


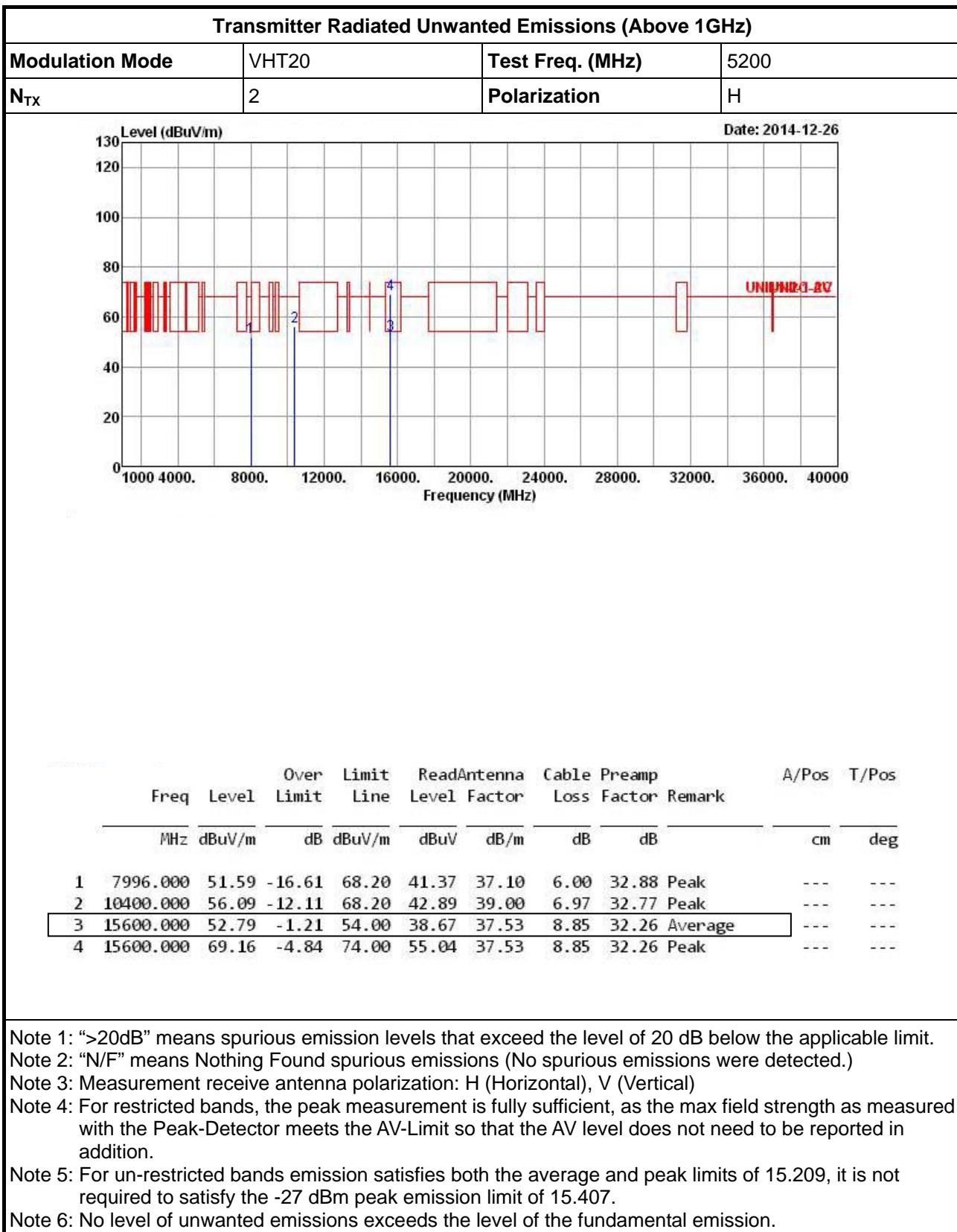


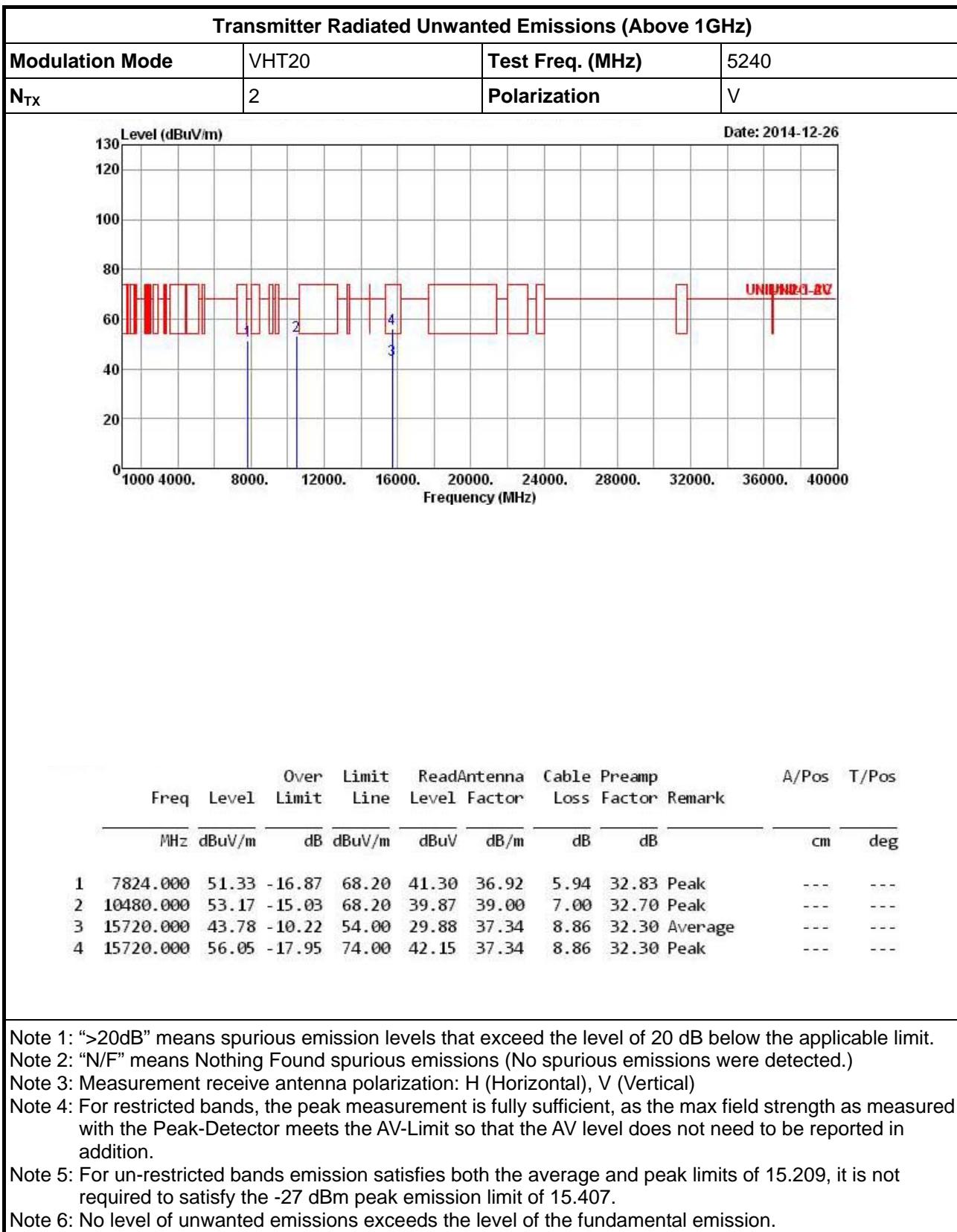


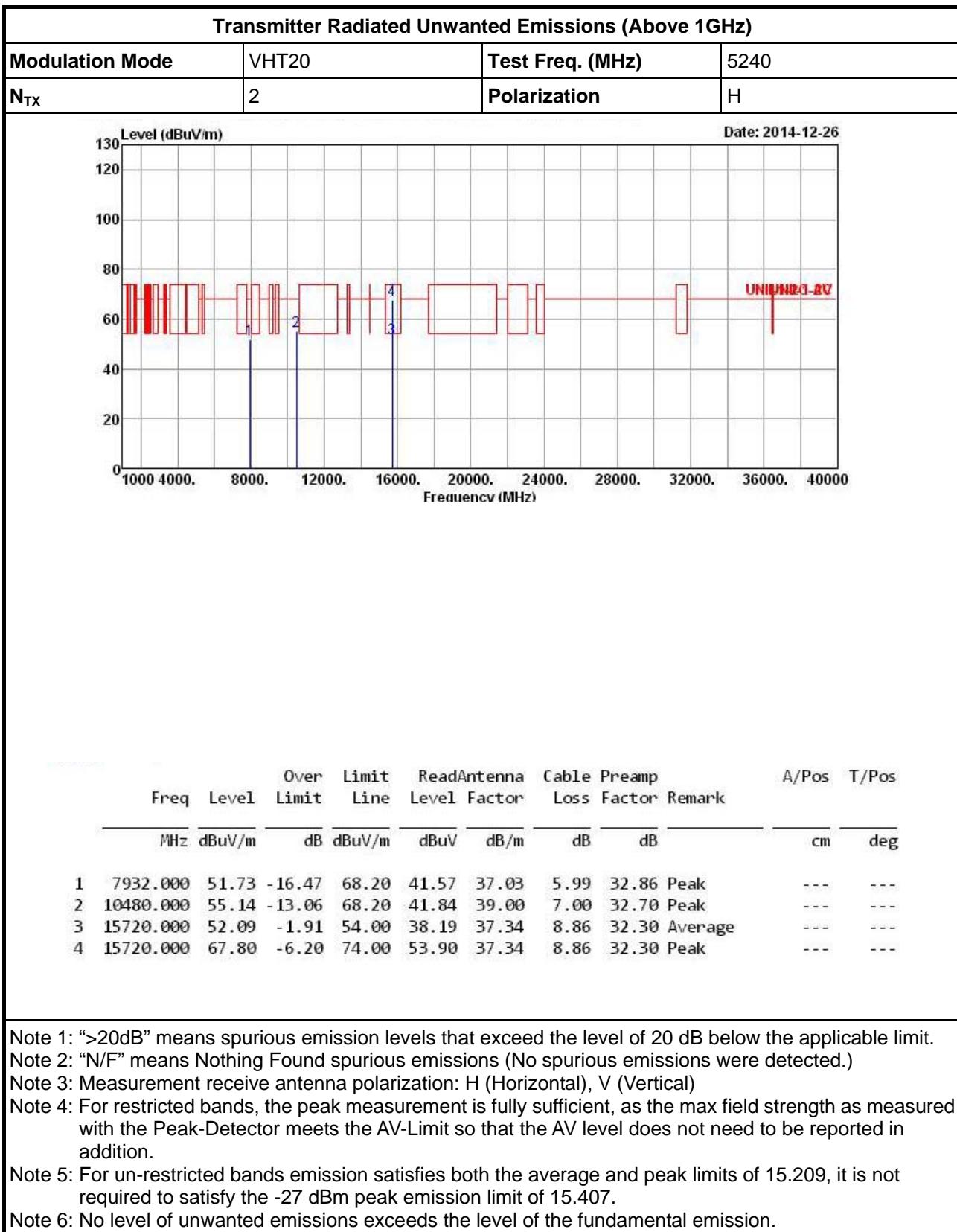


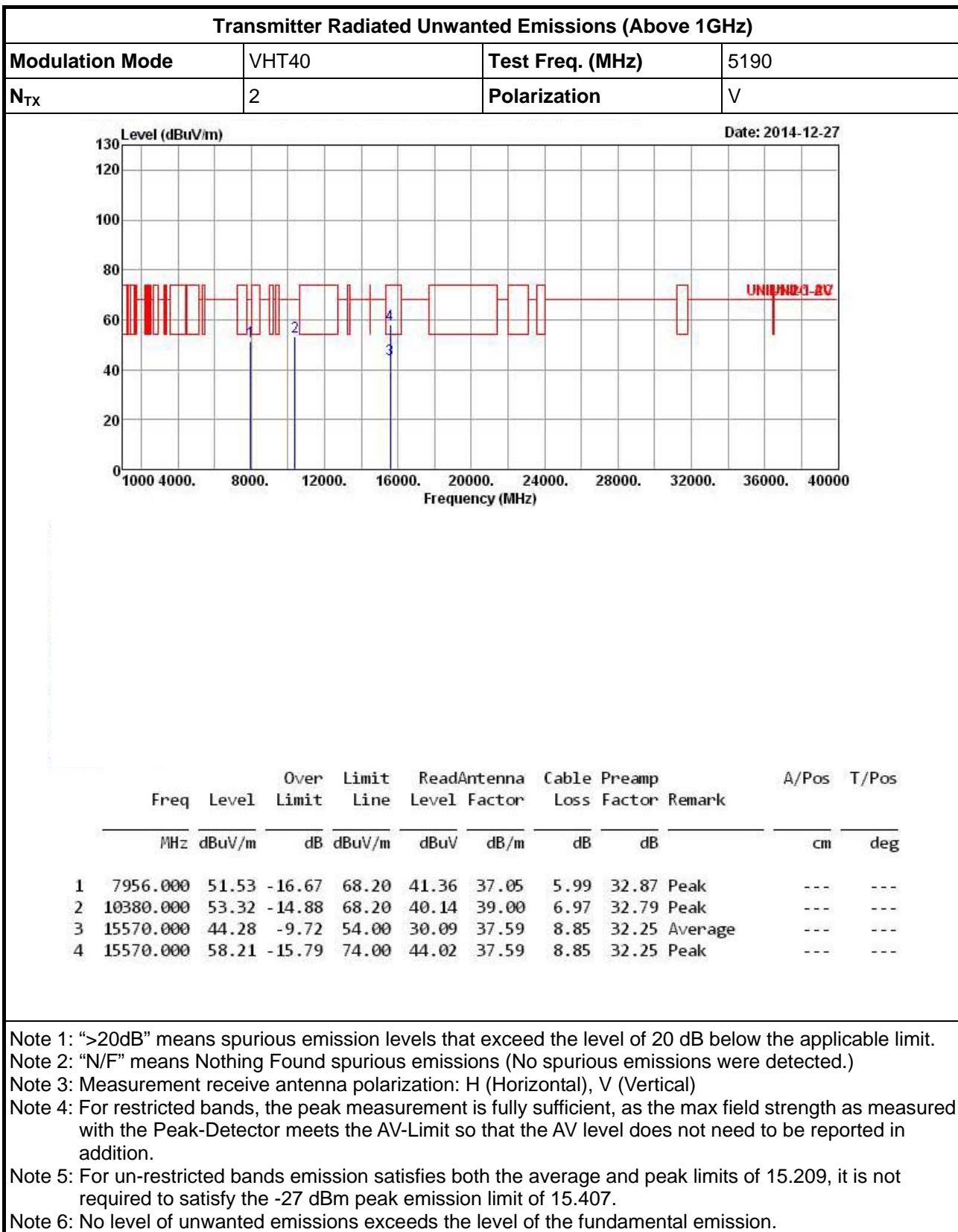


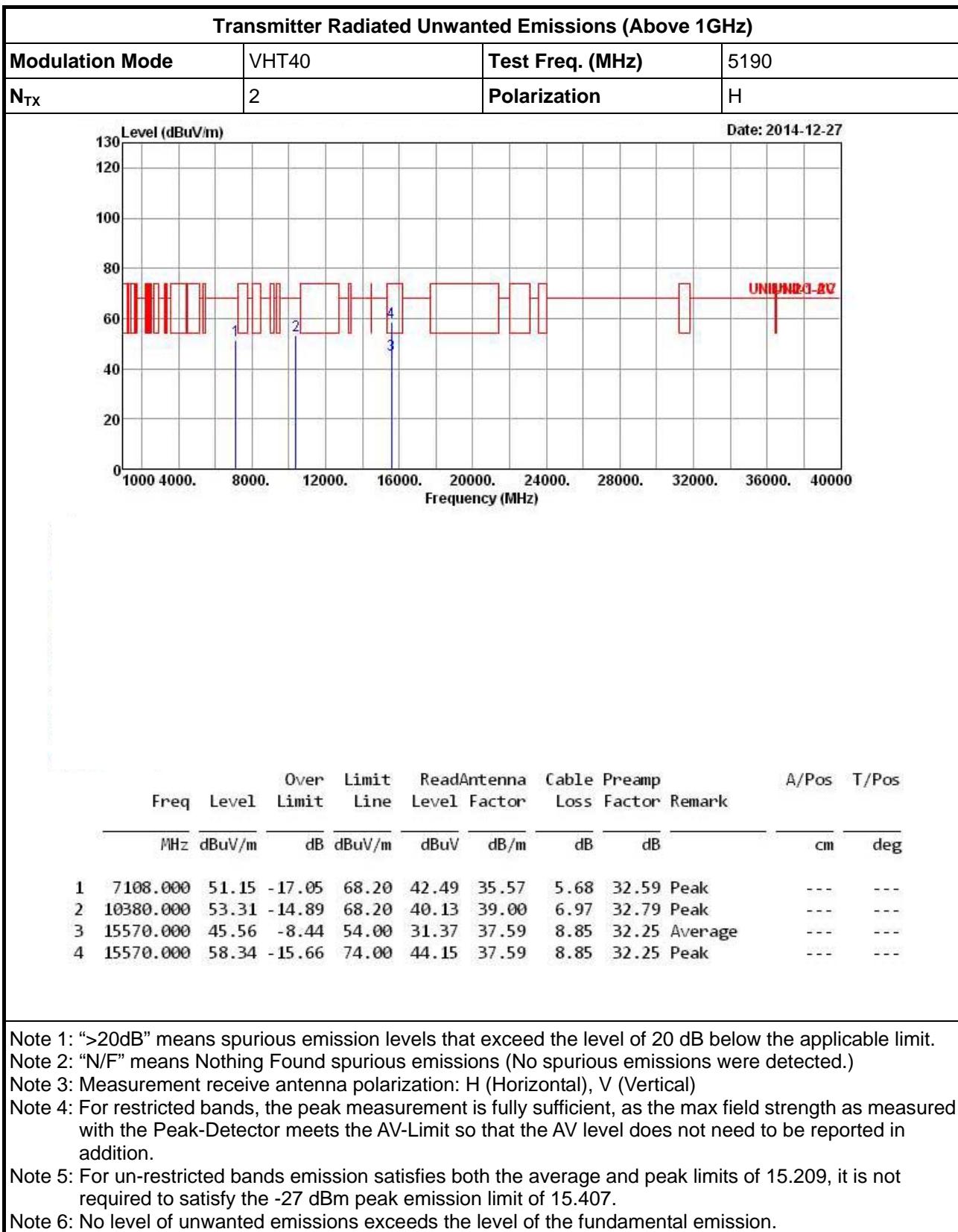


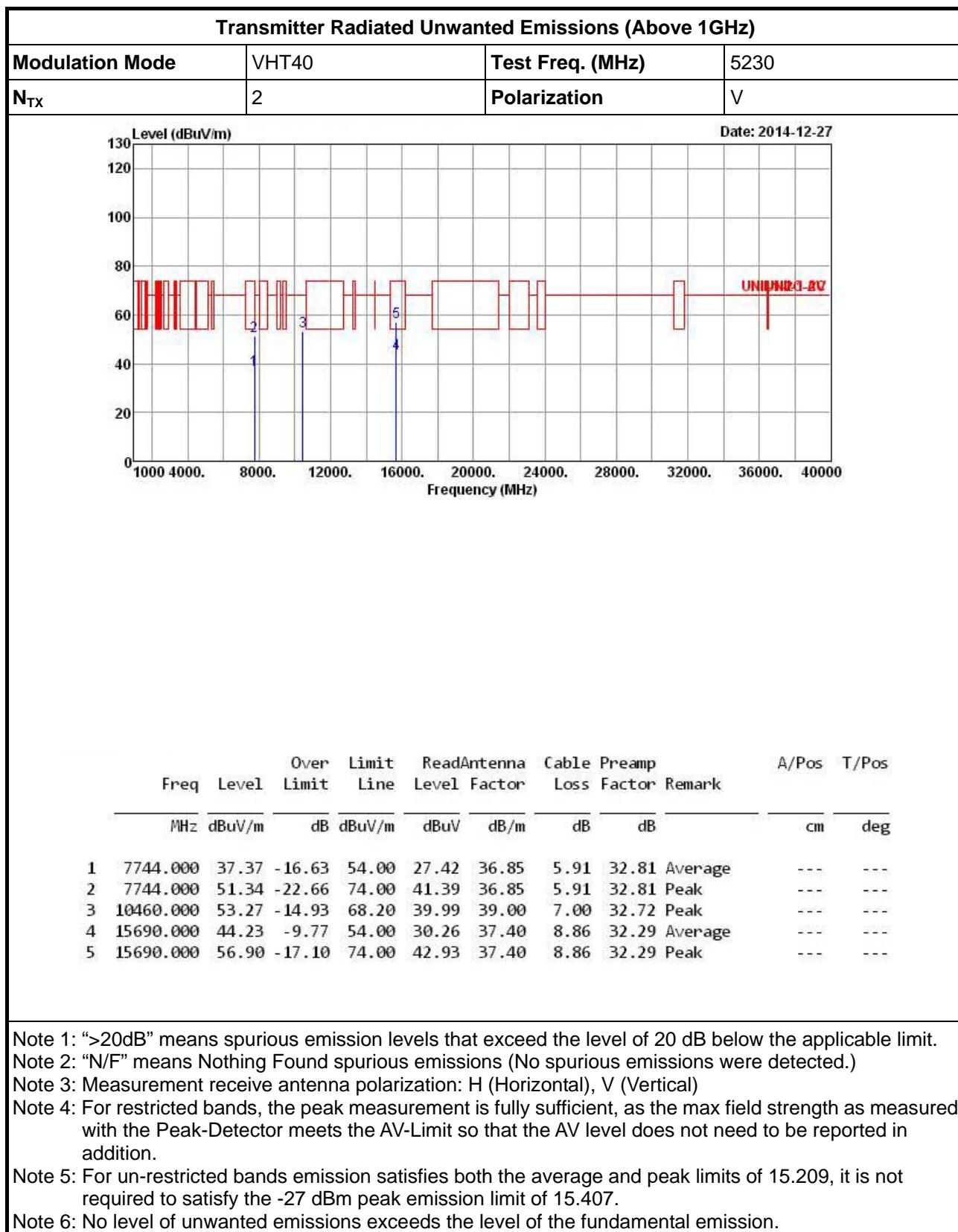


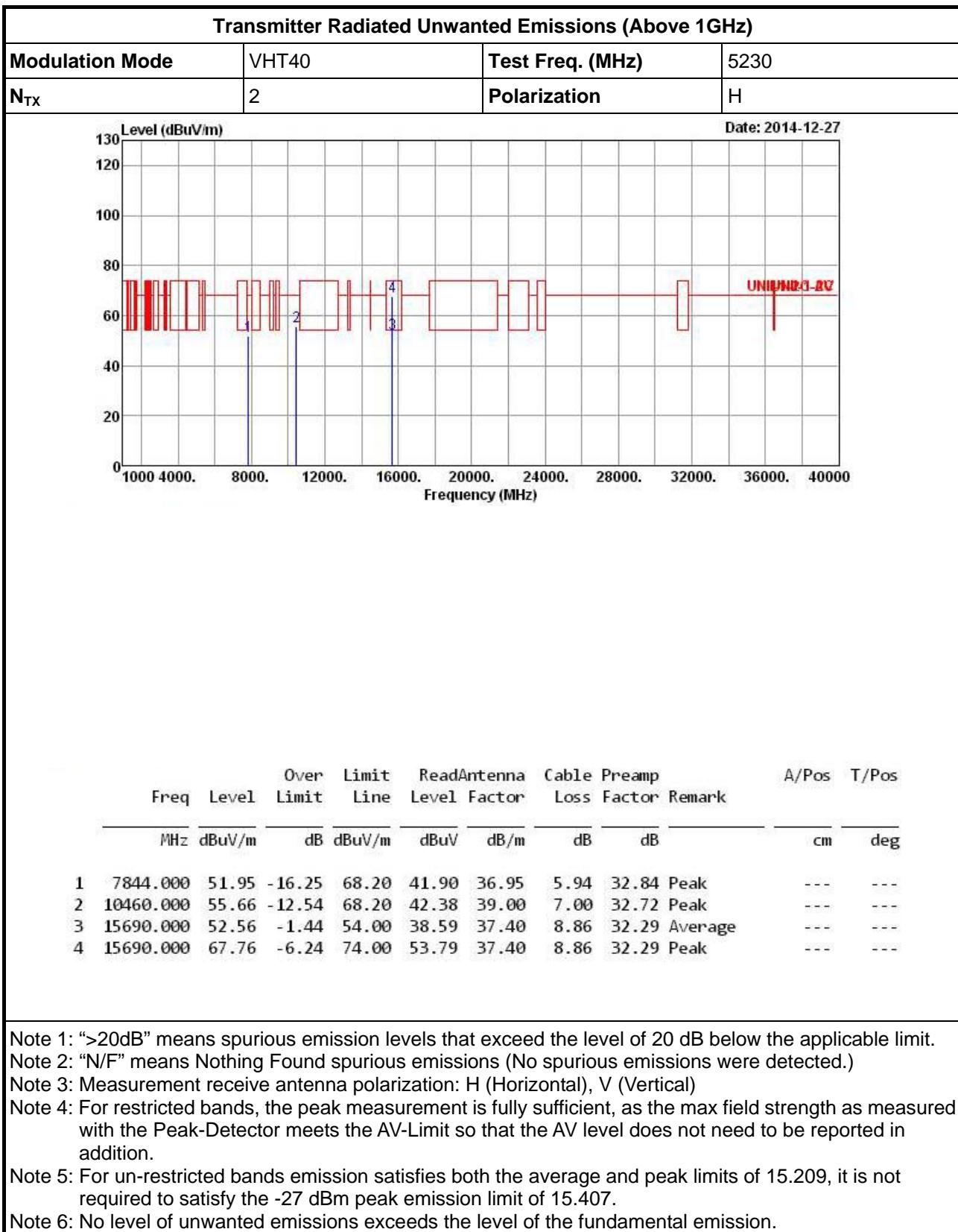


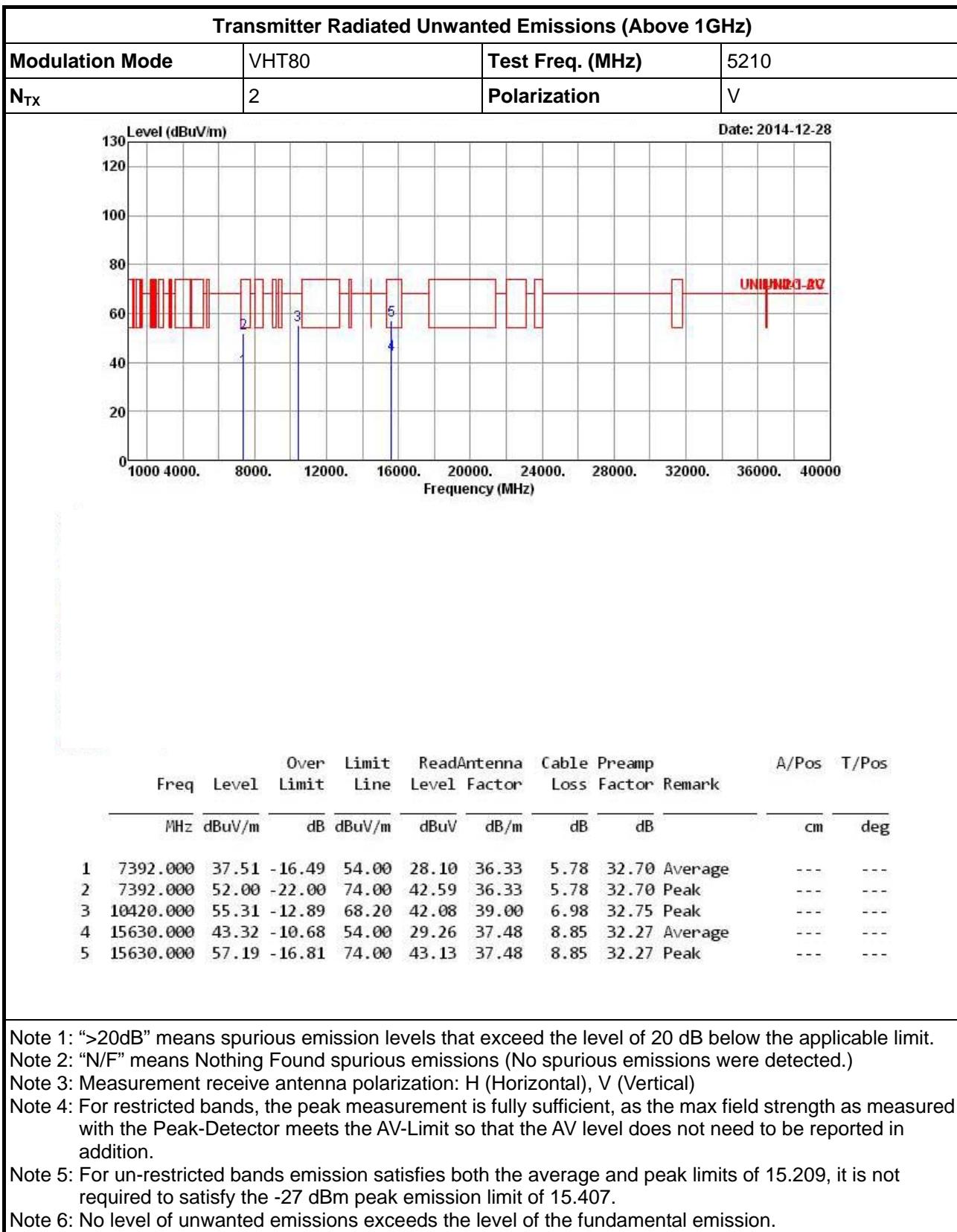


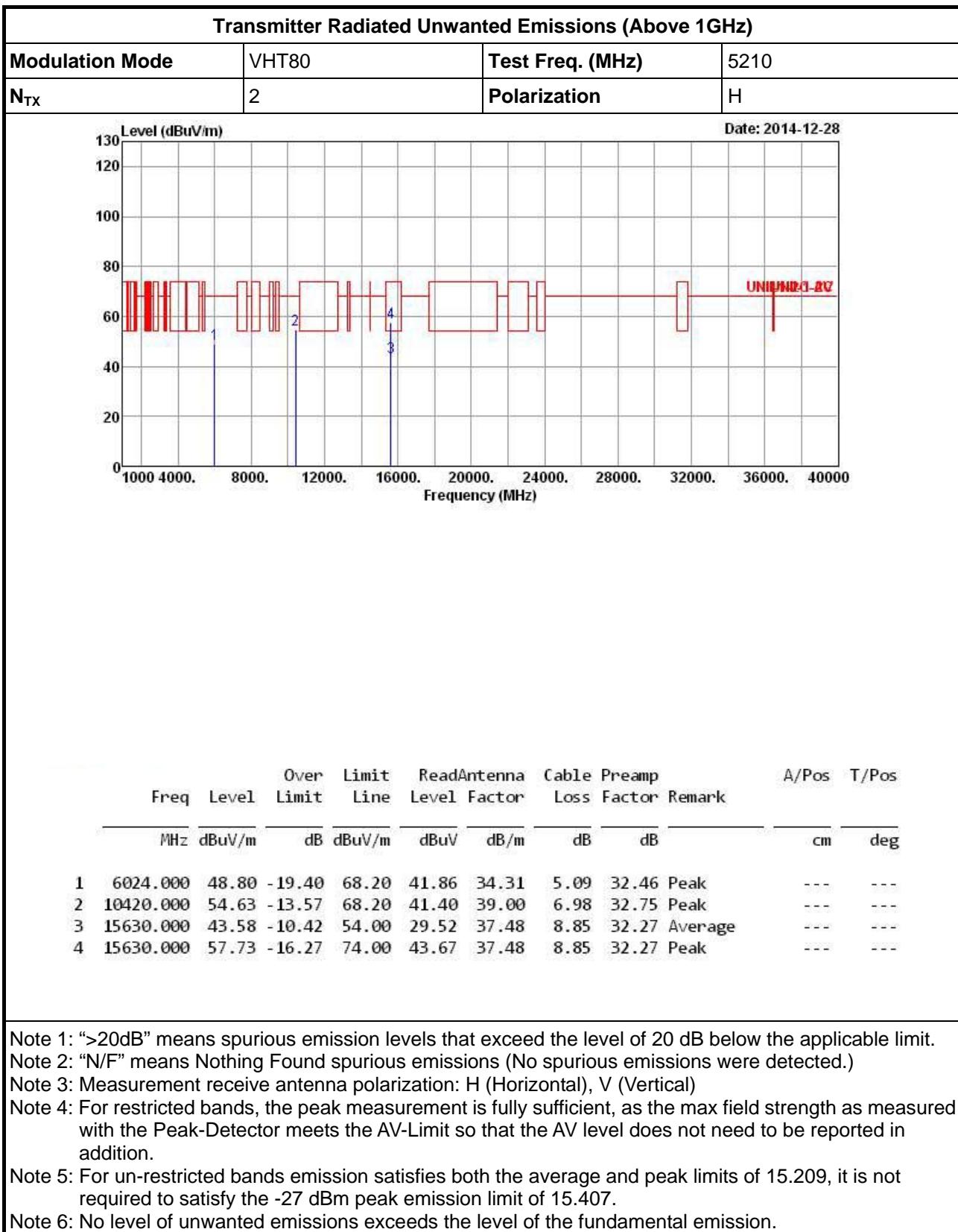














3.6.8 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 5725-5850MHz

Transmitter Radiated Unwanted Emissions (Above 1GHz)												
Modulation Mode		11a			Test Freq. (MHz)			5745				
N _{TX}		1			Polarization			V				
Level (dB _{UV} /m)												Date: 2014-12-26
1	1000	4000.	7000.	8000.	12000.	16000.	17235.	20000.	24000.	32000.	36000.	40000
2	60	70	75	78	65	65	65	65	65	65	75	75
3	60	70	75	78	65	65	65	65	65	65	75	75
4	60	70	75	78	65	65	65	65	65	65	75	75
UNIDIRECTIONAL												
Freq	Level	Over Limit	Line	ReadAntenna	Cable	Preamplifier	A/Pos	T/Pos				
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg		
1	7154.000	50.48	-17.72	68.20	41.68	35.70	5.70	32.60	Peak	0	0	
2	11490.000	41.28	-12.72	54.00	26.90	39.28	7.52	32.42	Average	0	0	
3	11490.000	55.16	-18.84	74.00	40.78	39.28	7.52	32.42	Peak	0	0	
4	17235.000	63.21	-4.99	68.20	43.05	42.12	9.49	31.45	Peak	0	0	
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 emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.												
Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.												



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11a	Test Freq. (MHz)	5745							
N_{TX}	1	Polarization	H							
Level (dBuV/m)			Date: 2014-12-26							
Freq	Level	Over Limit	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos		
MHz	dBuV/m	dB	dBuV/m	Level	Factor	Loss	Factor	Remark		
1	7818.000	51.17	-17.03	68.20	41.14	36.92	5.94	32.83 Peak	0	0
2	11490.000	45.62	-8.38	54.00	31.24	39.28	7.52	32.42 Average	0	0
3	11490.000	60.42	-13.58	74.00	46.04	39.28	7.52	32.42 Peak	0	0
4	17235.000	66.34	-1.86	68.20	46.18	42.12	9.49	31.45 Peak	0	0

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

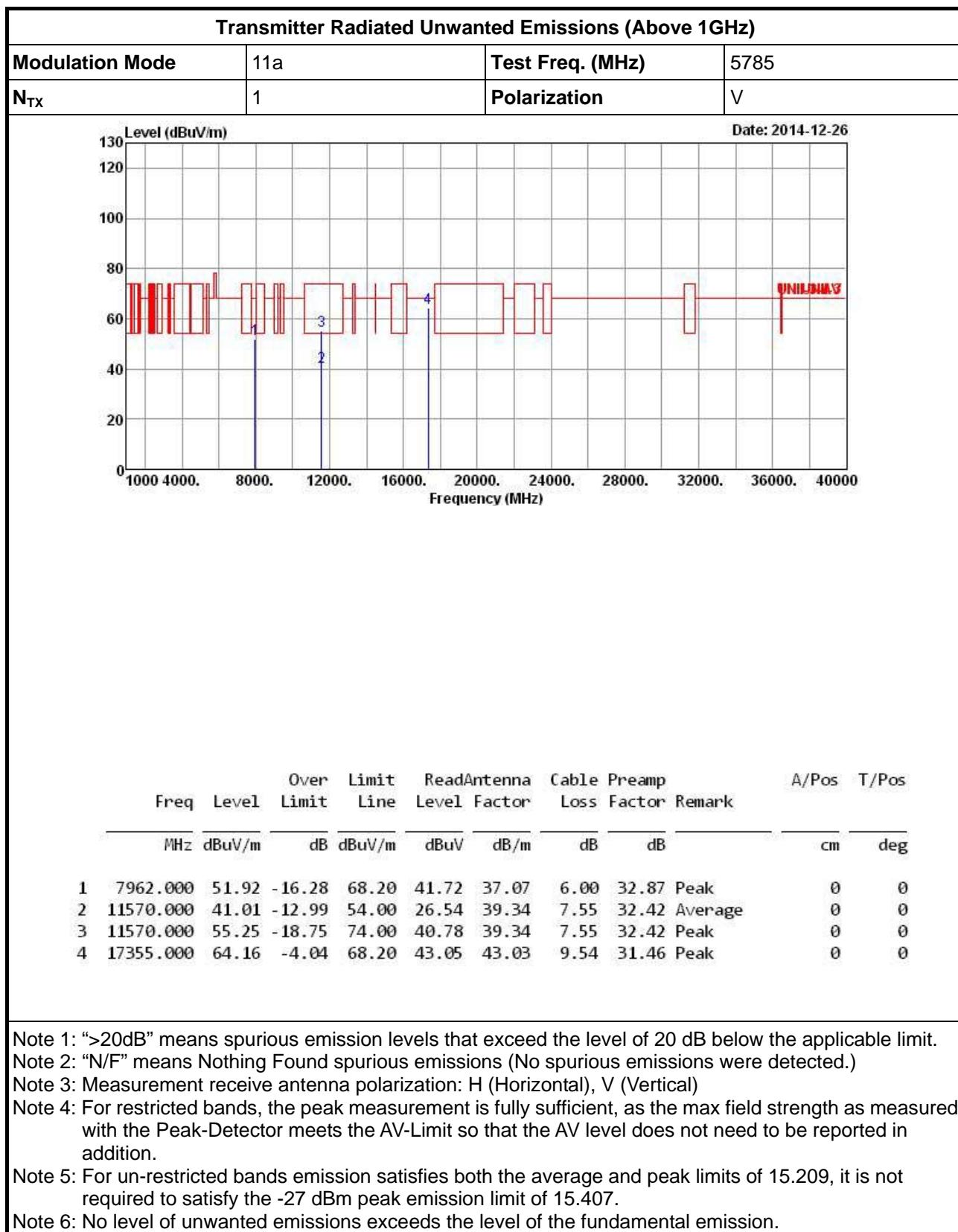
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

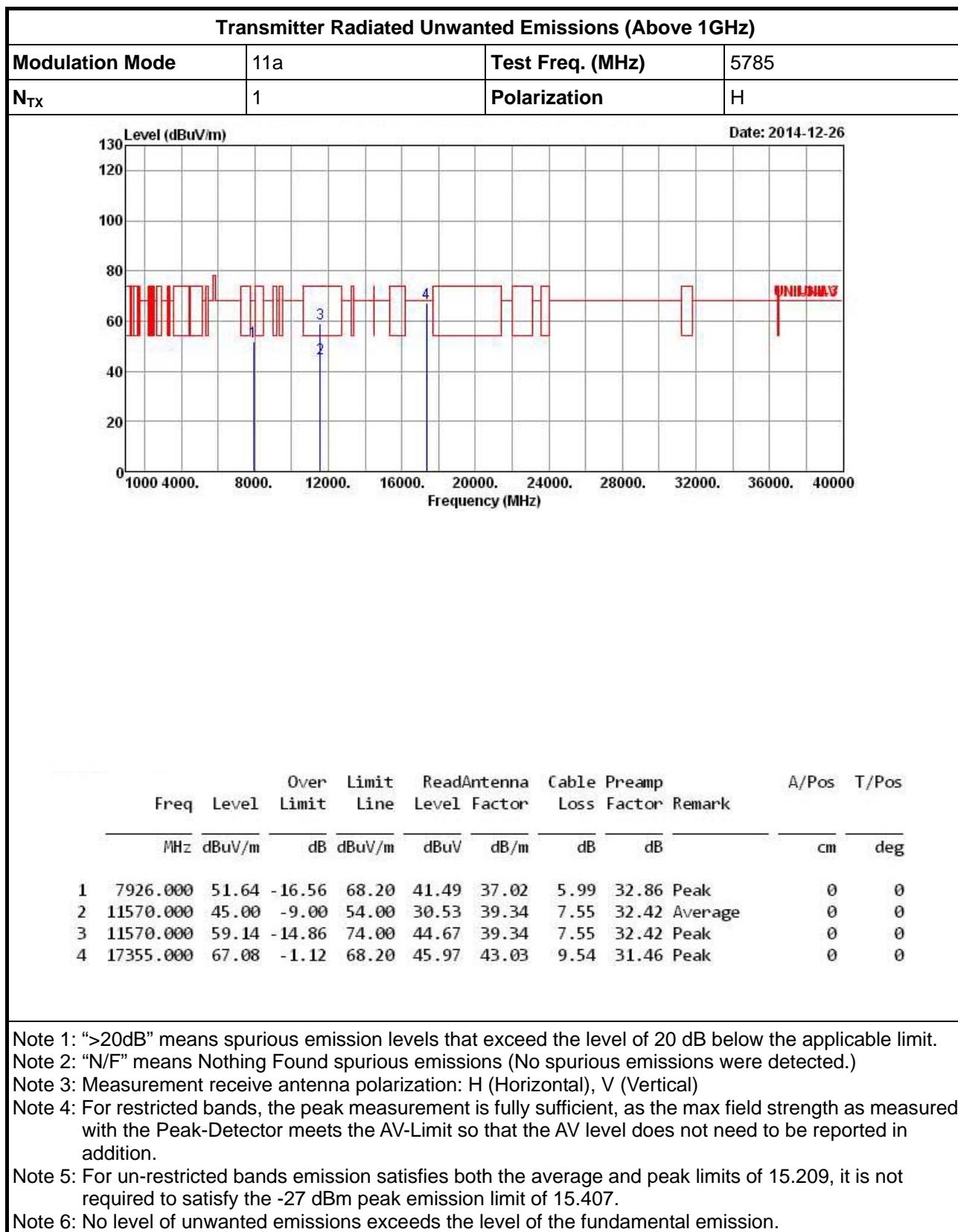
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

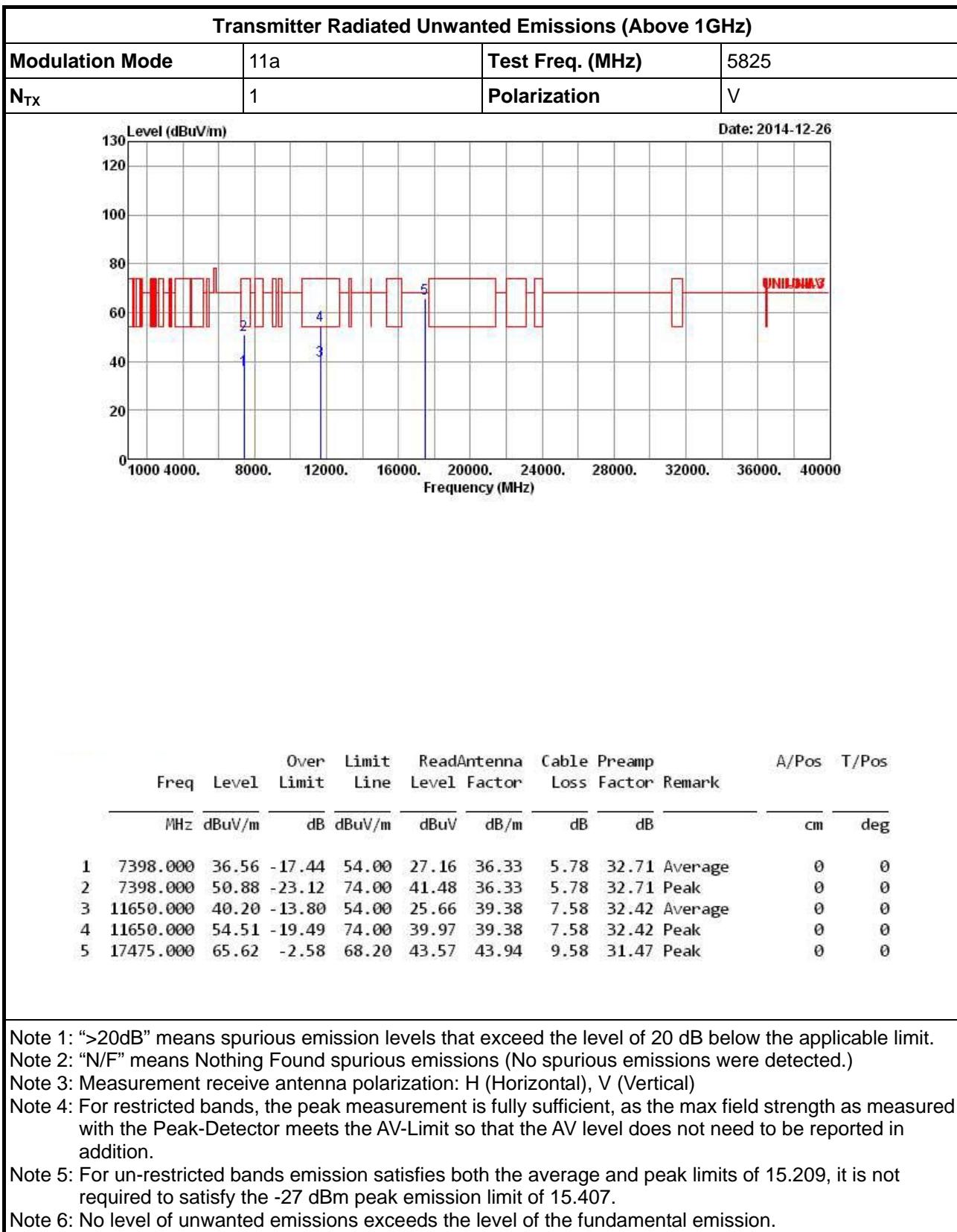
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

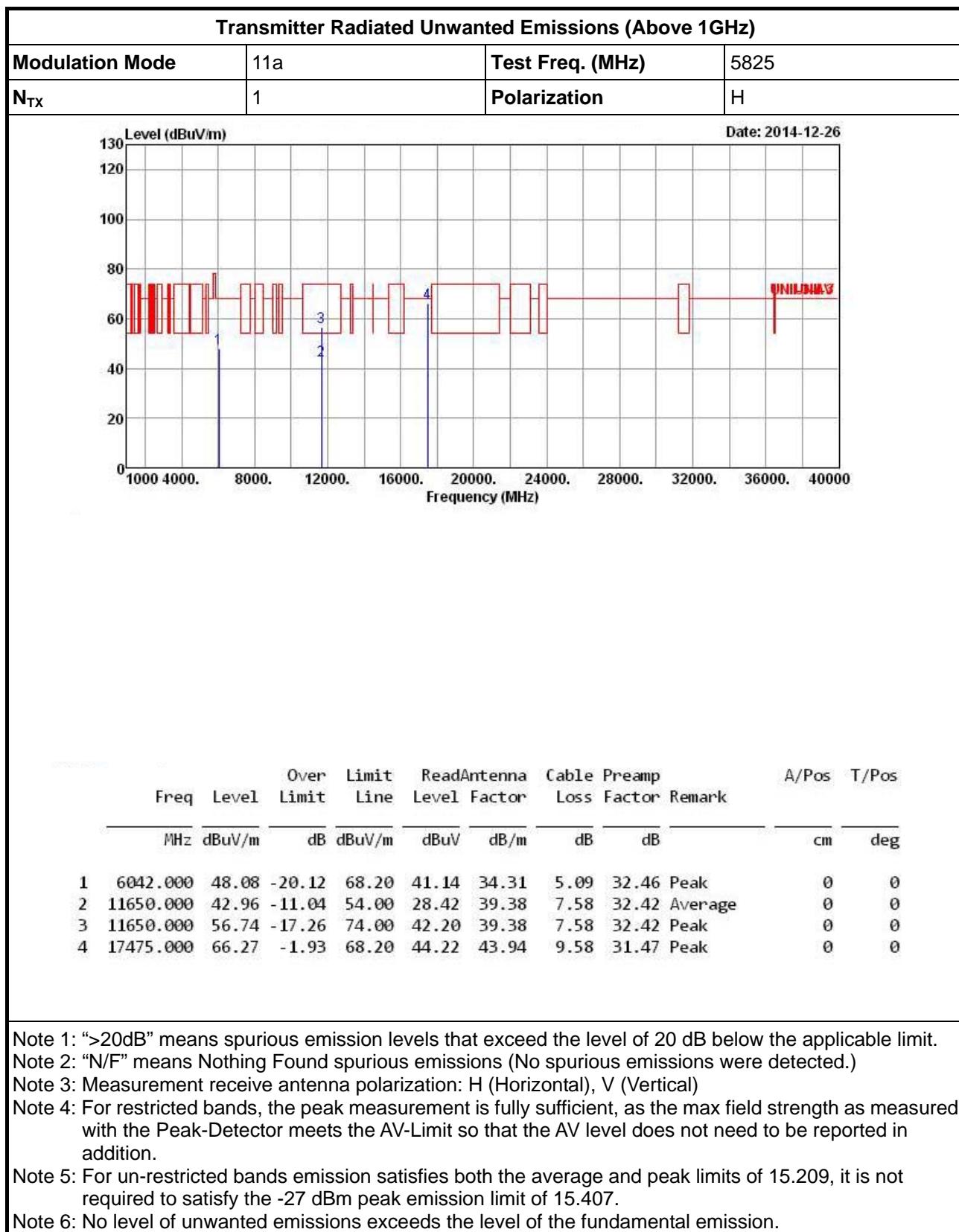
Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

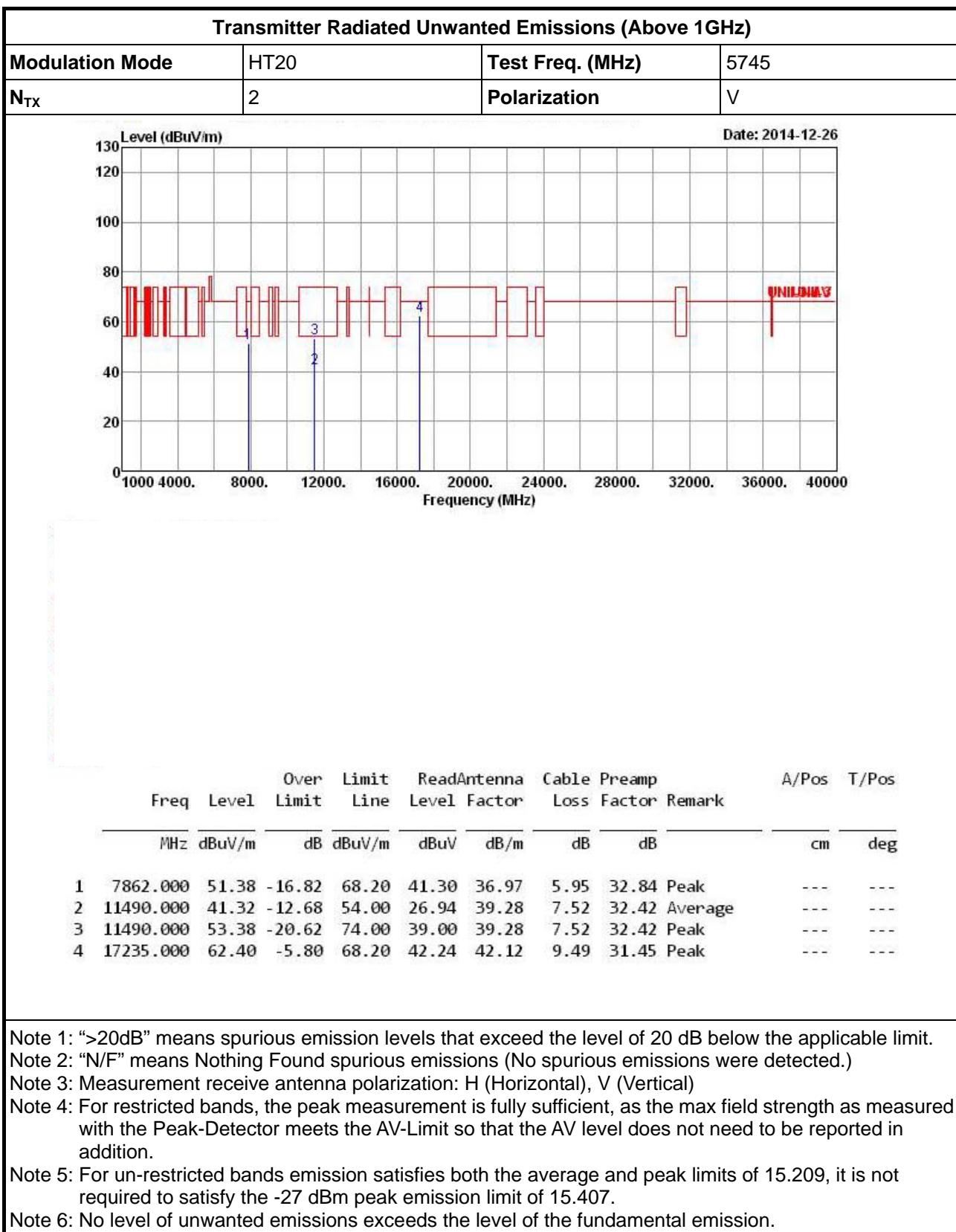
Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

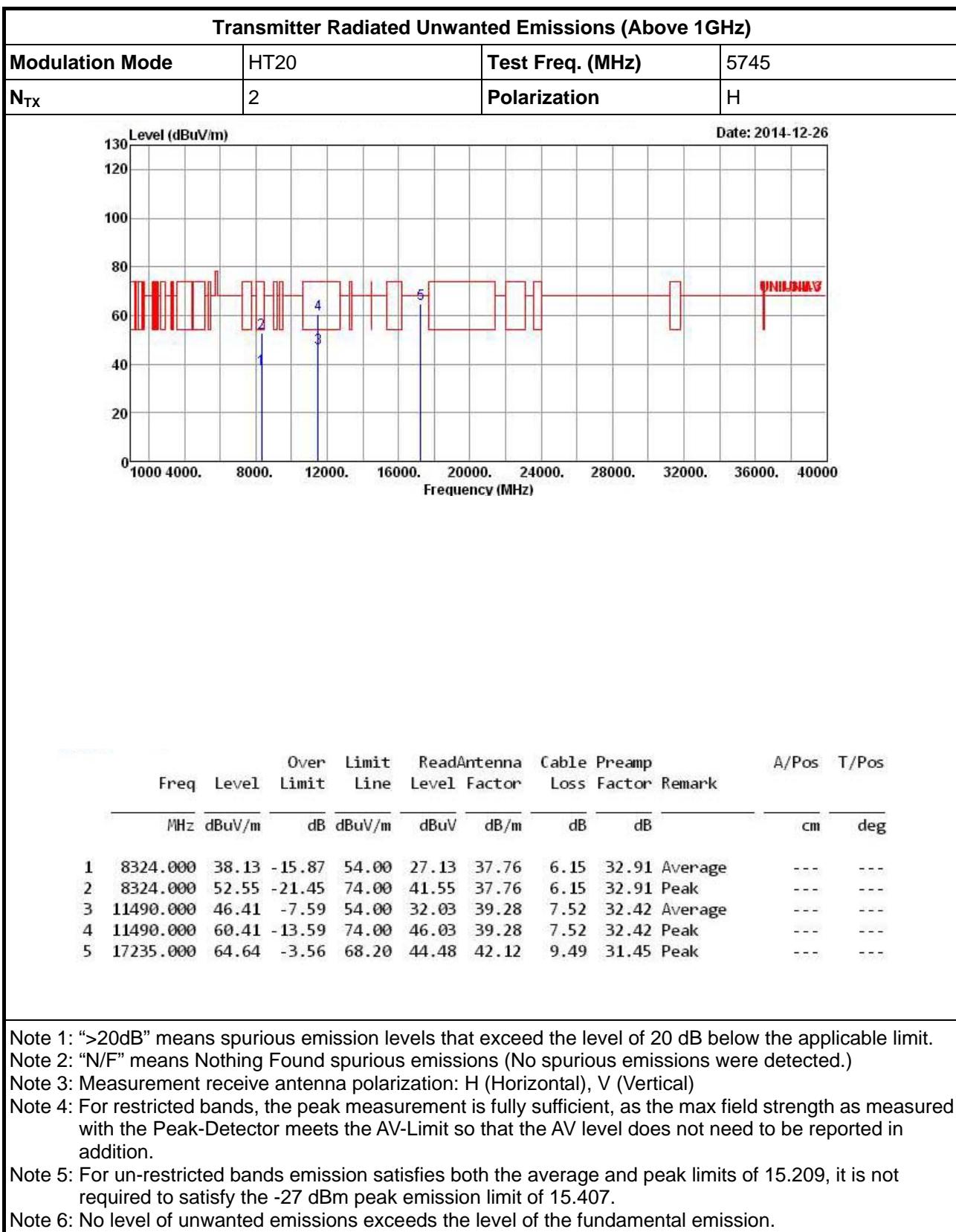


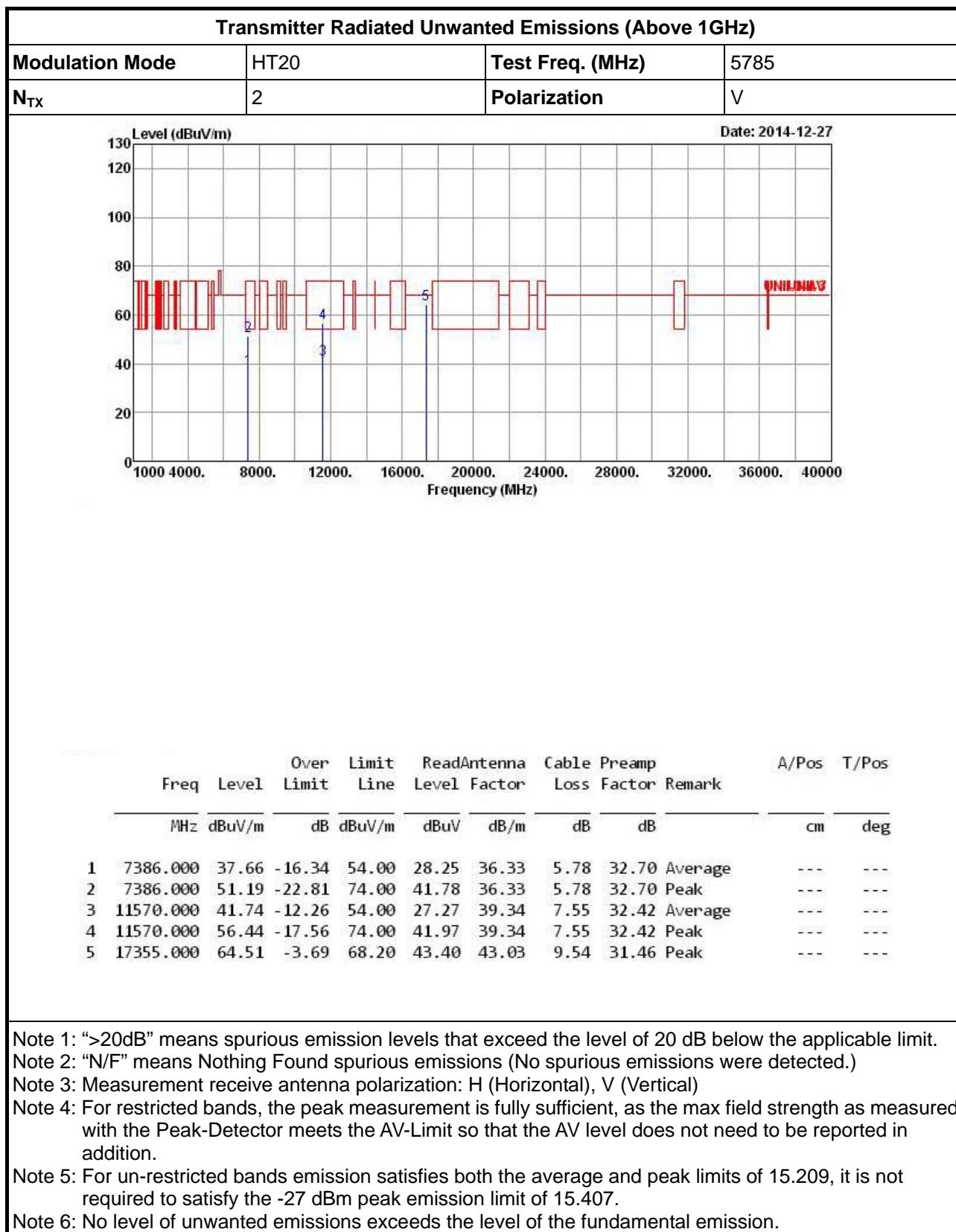


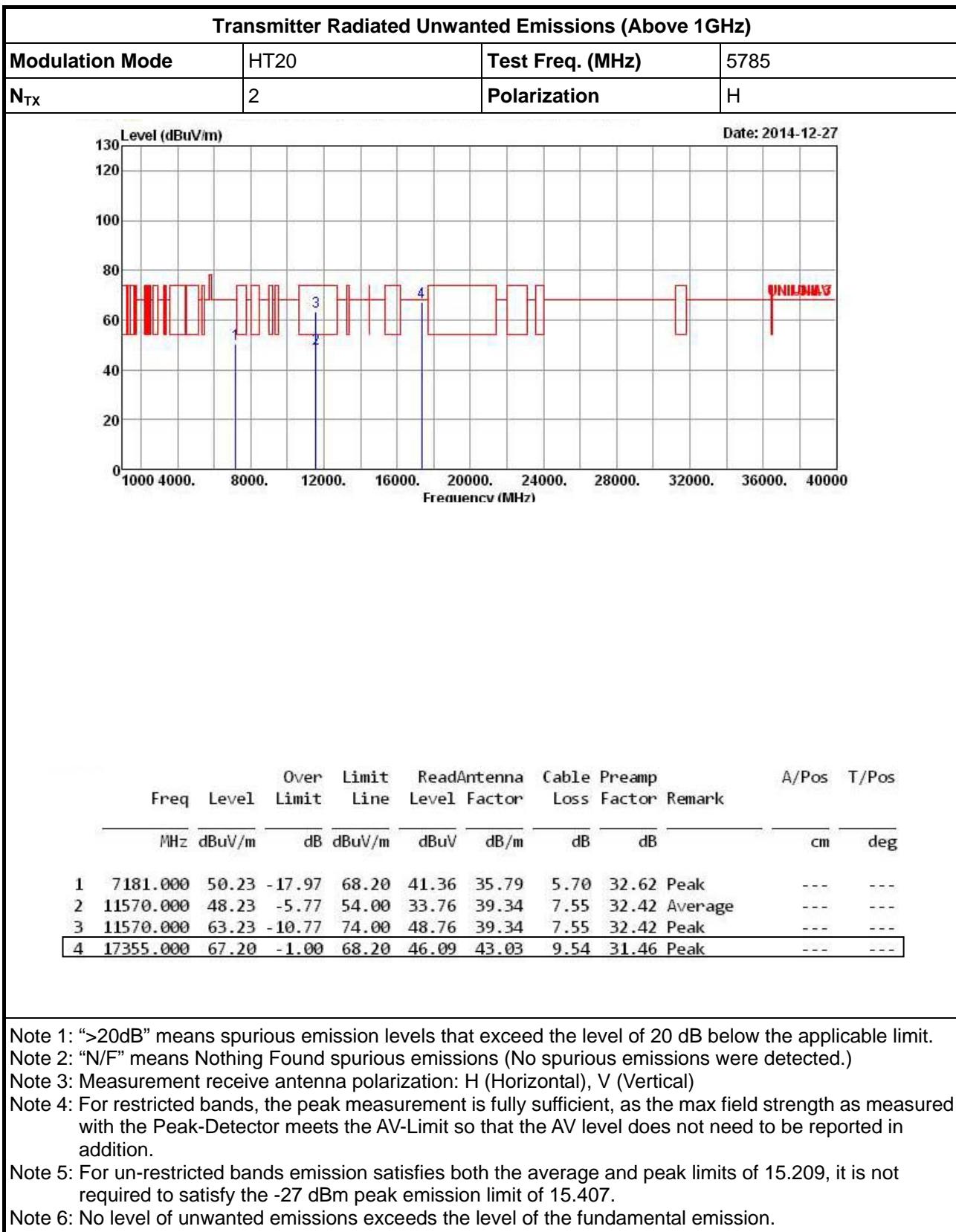


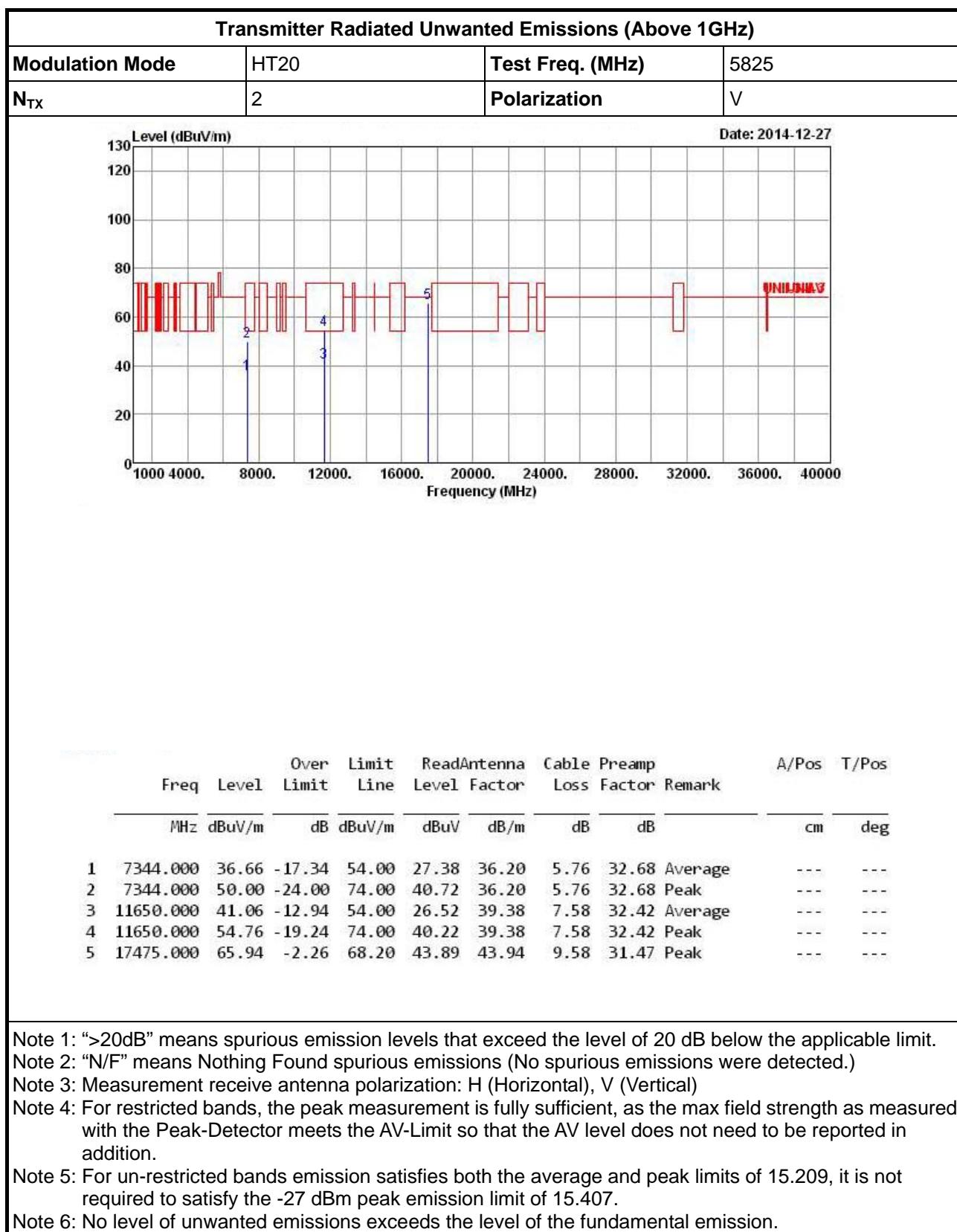


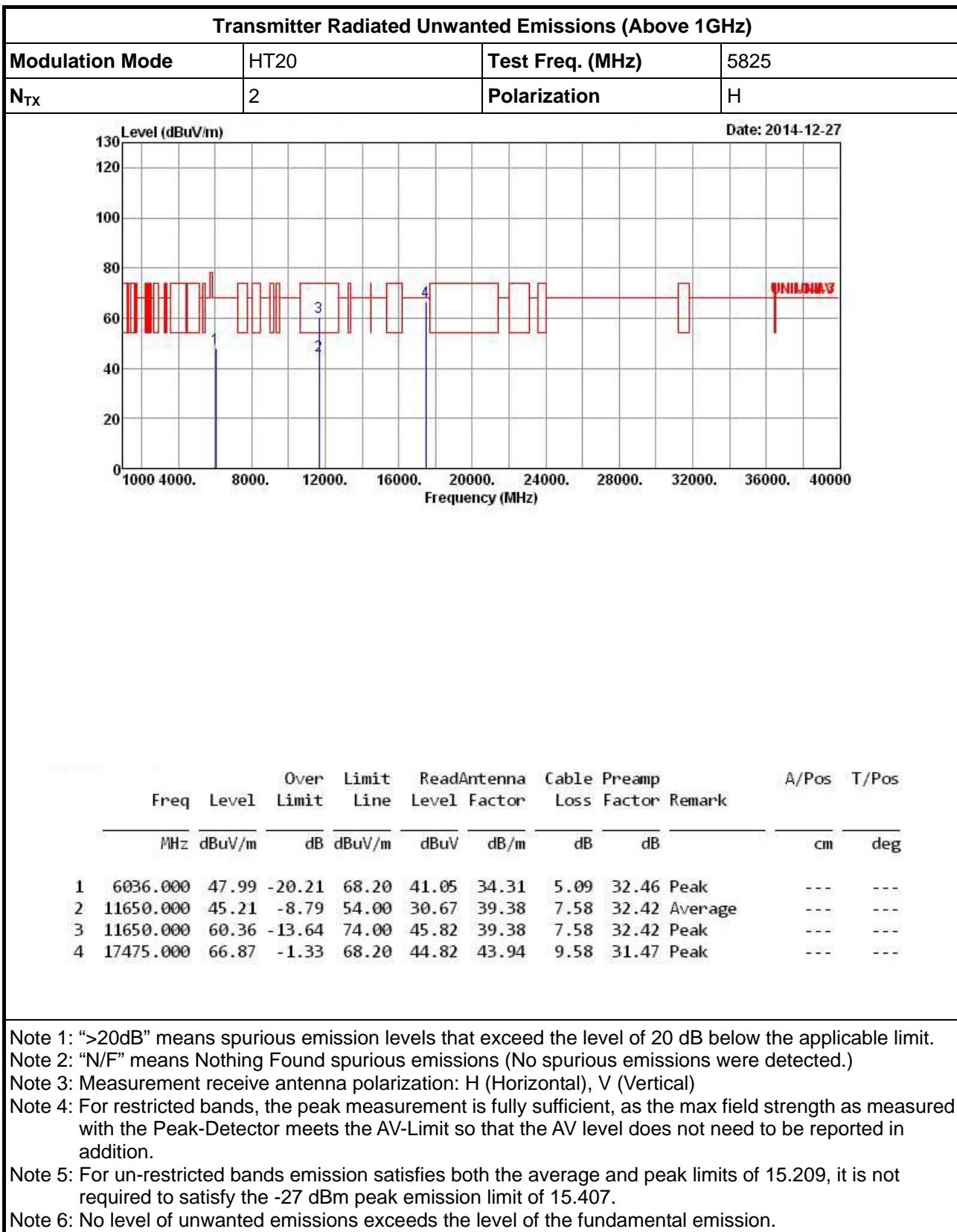


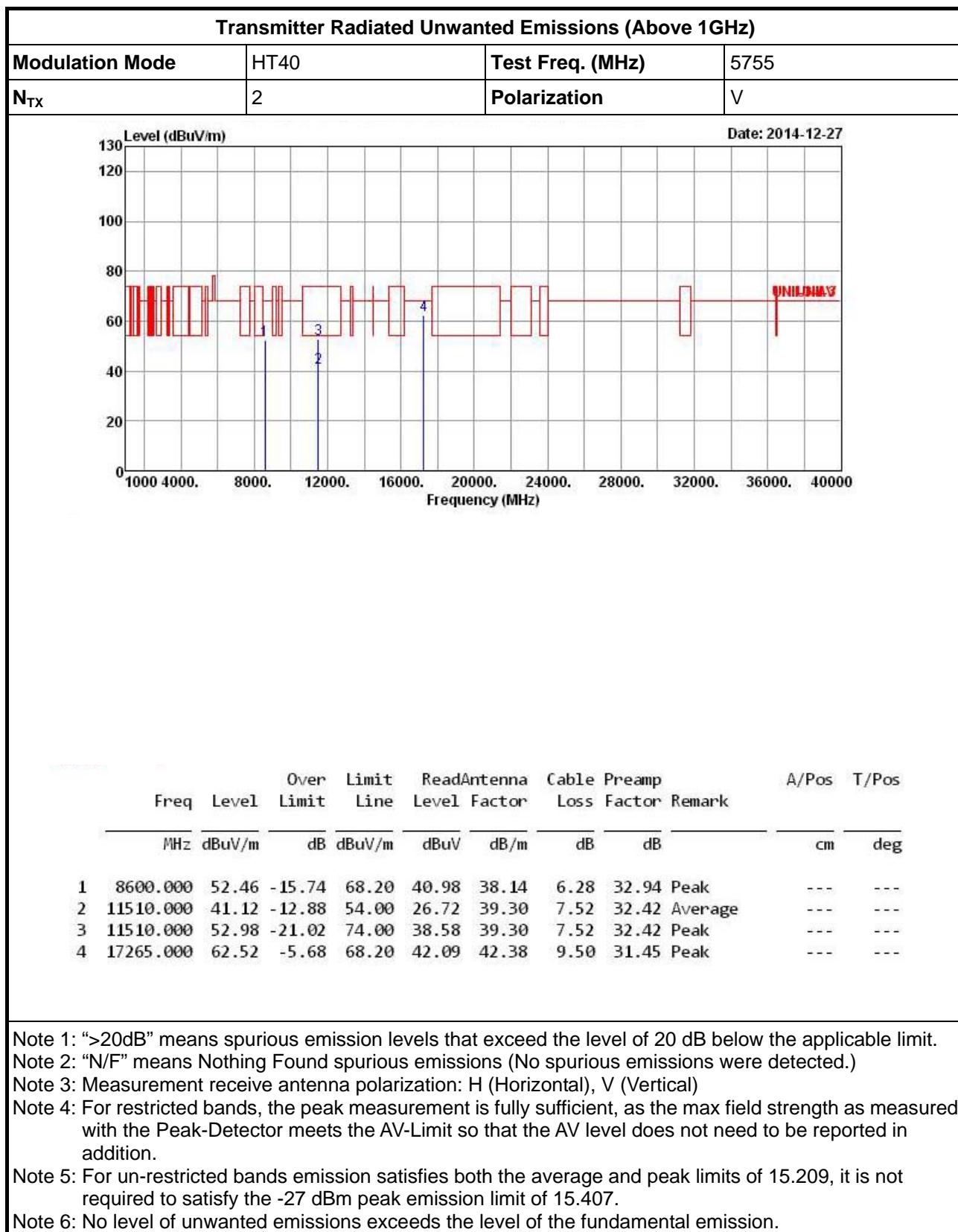


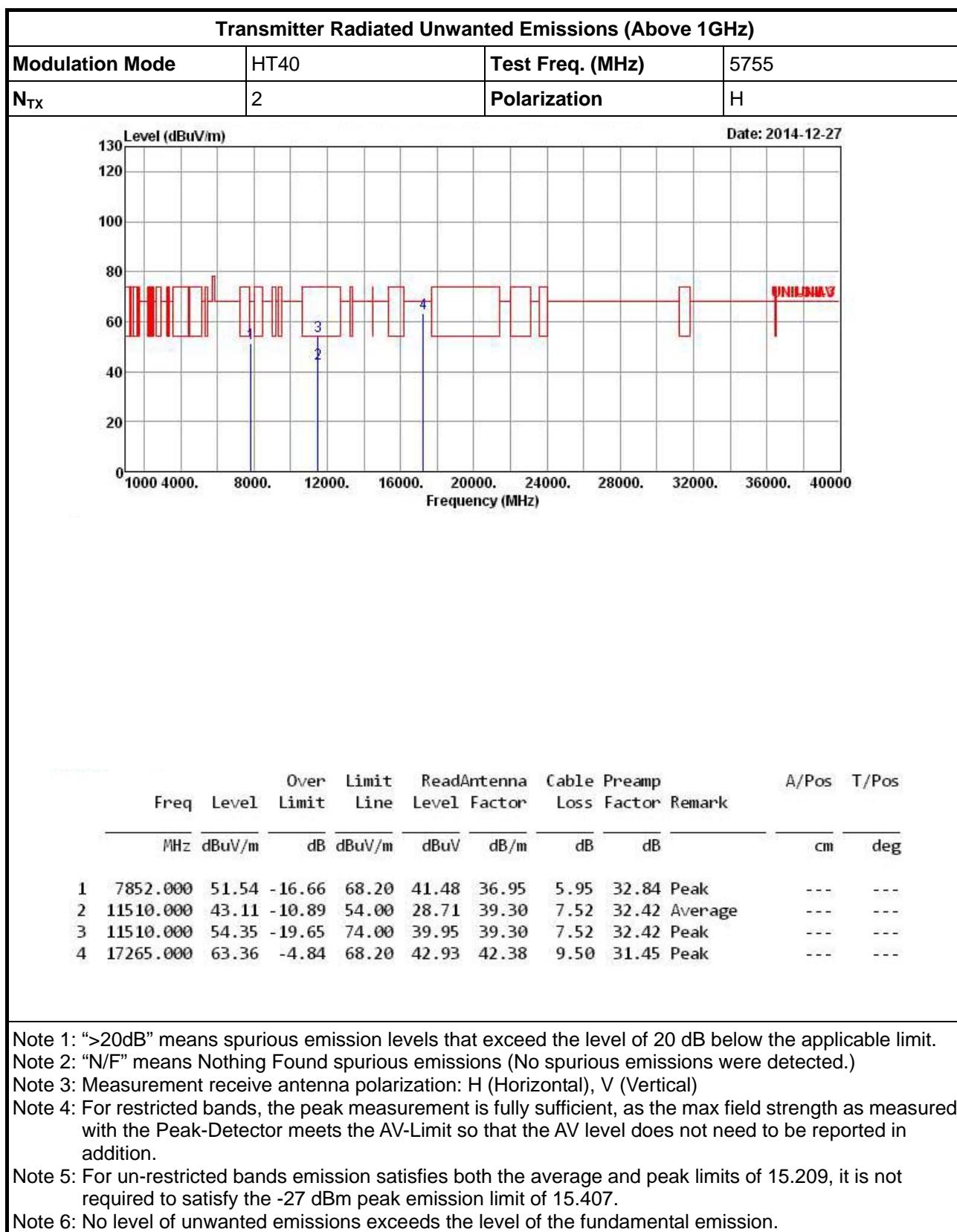


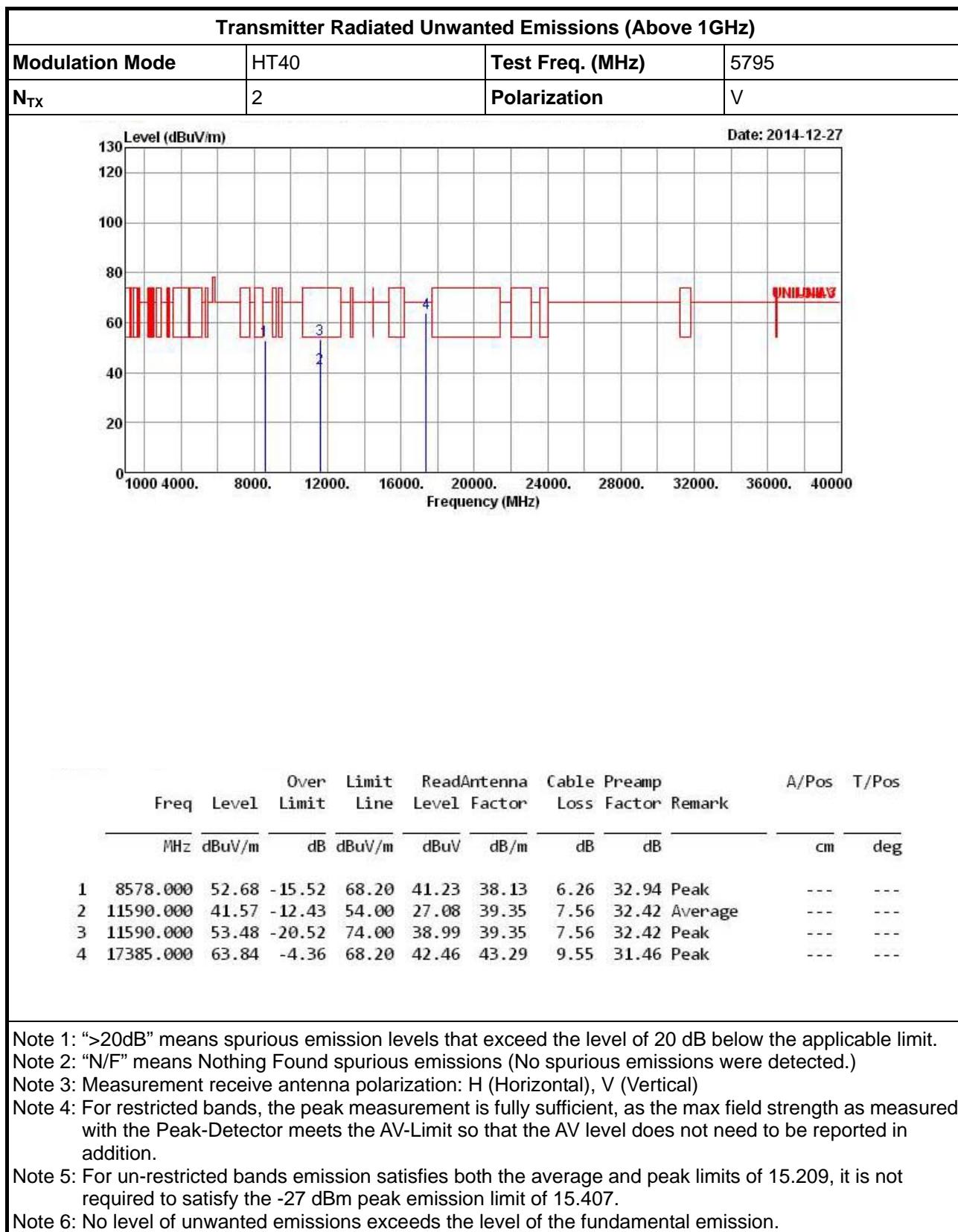


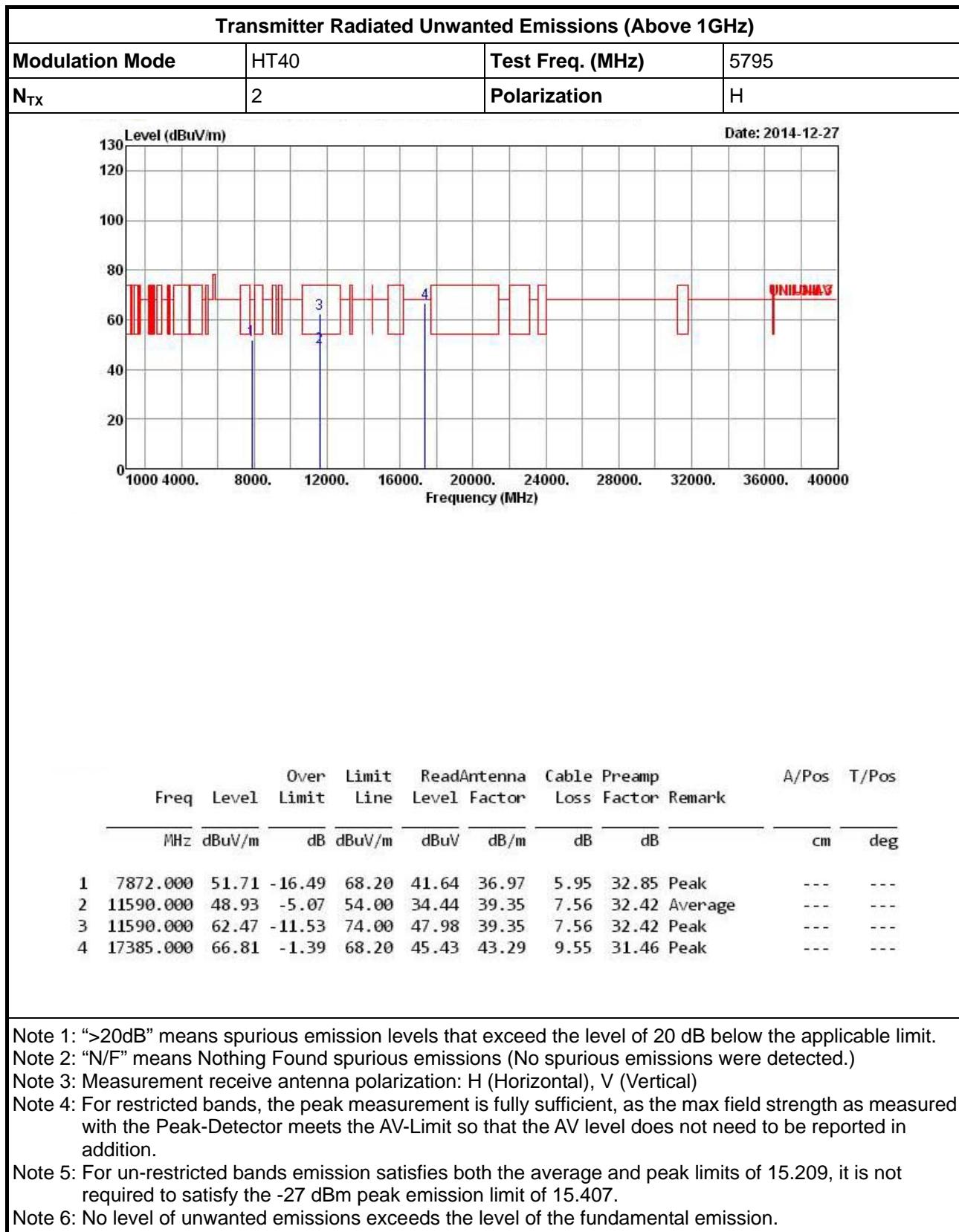


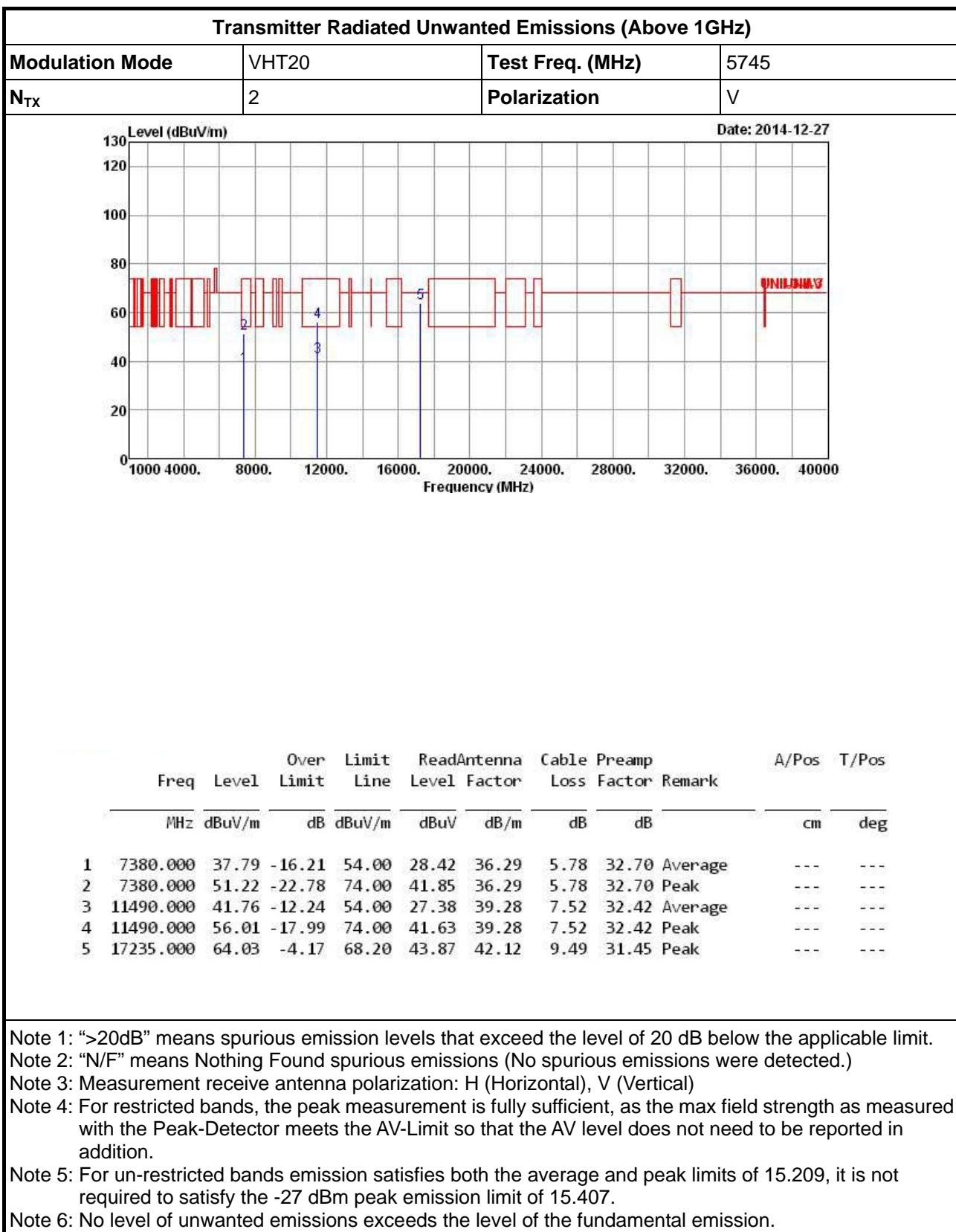


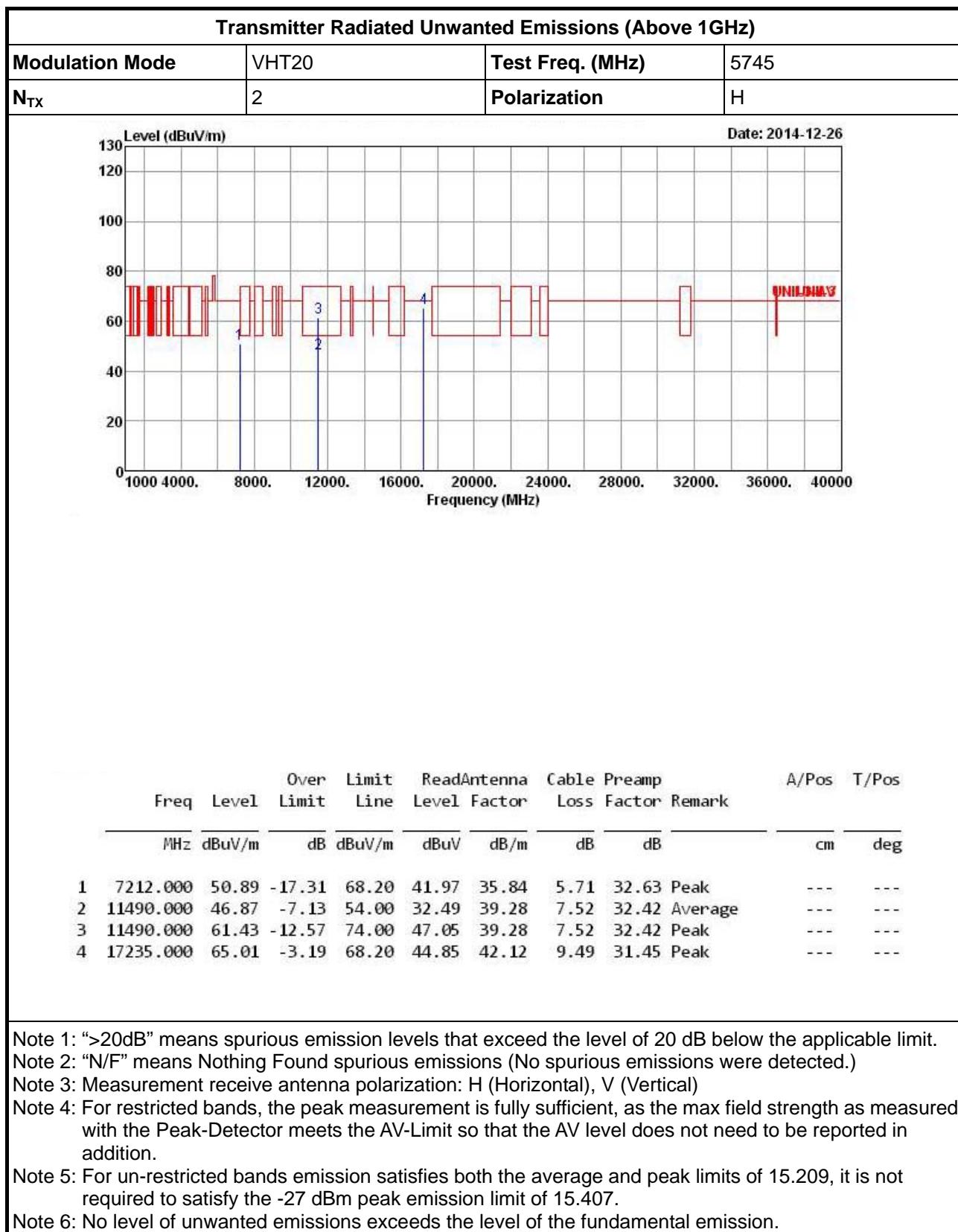


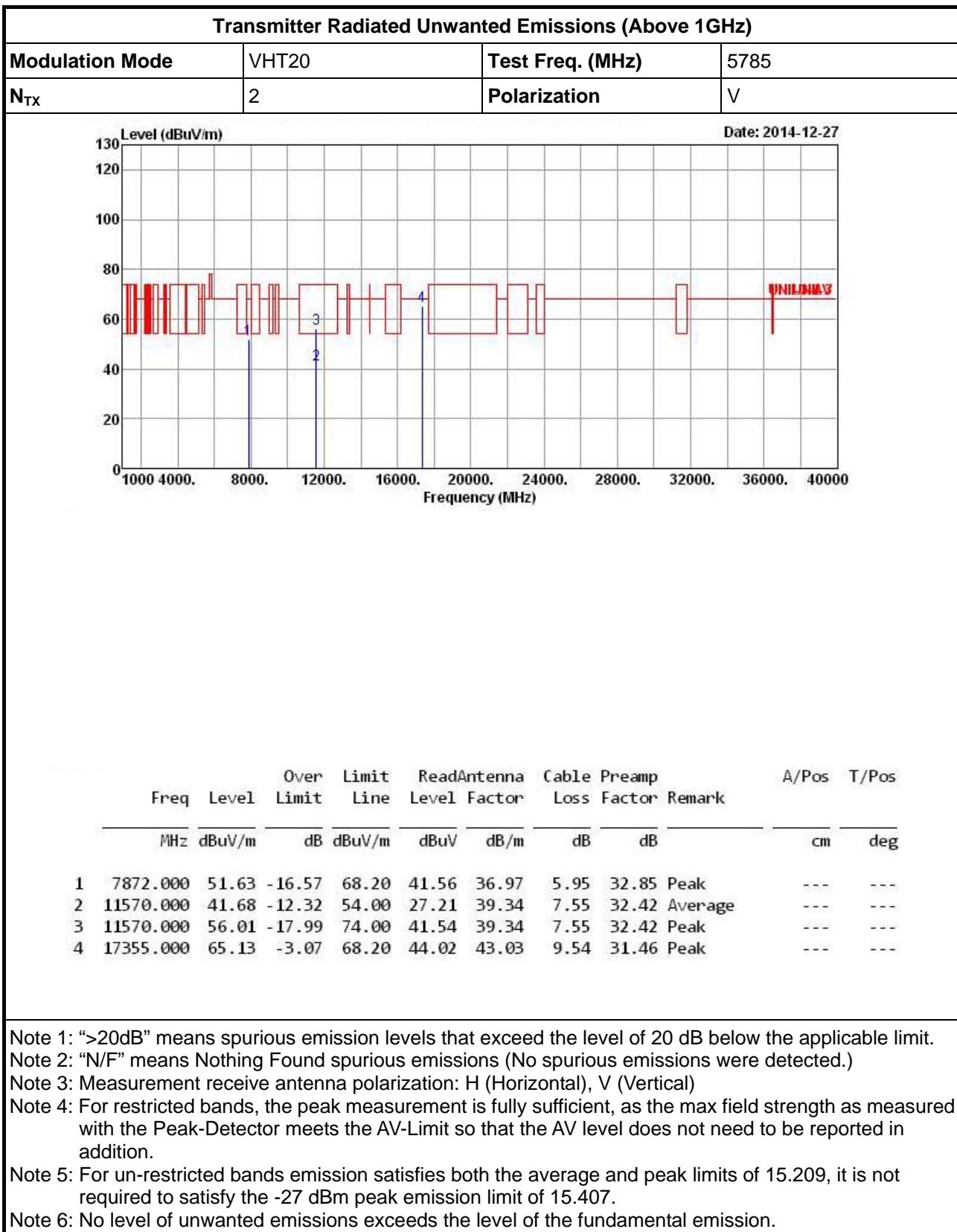


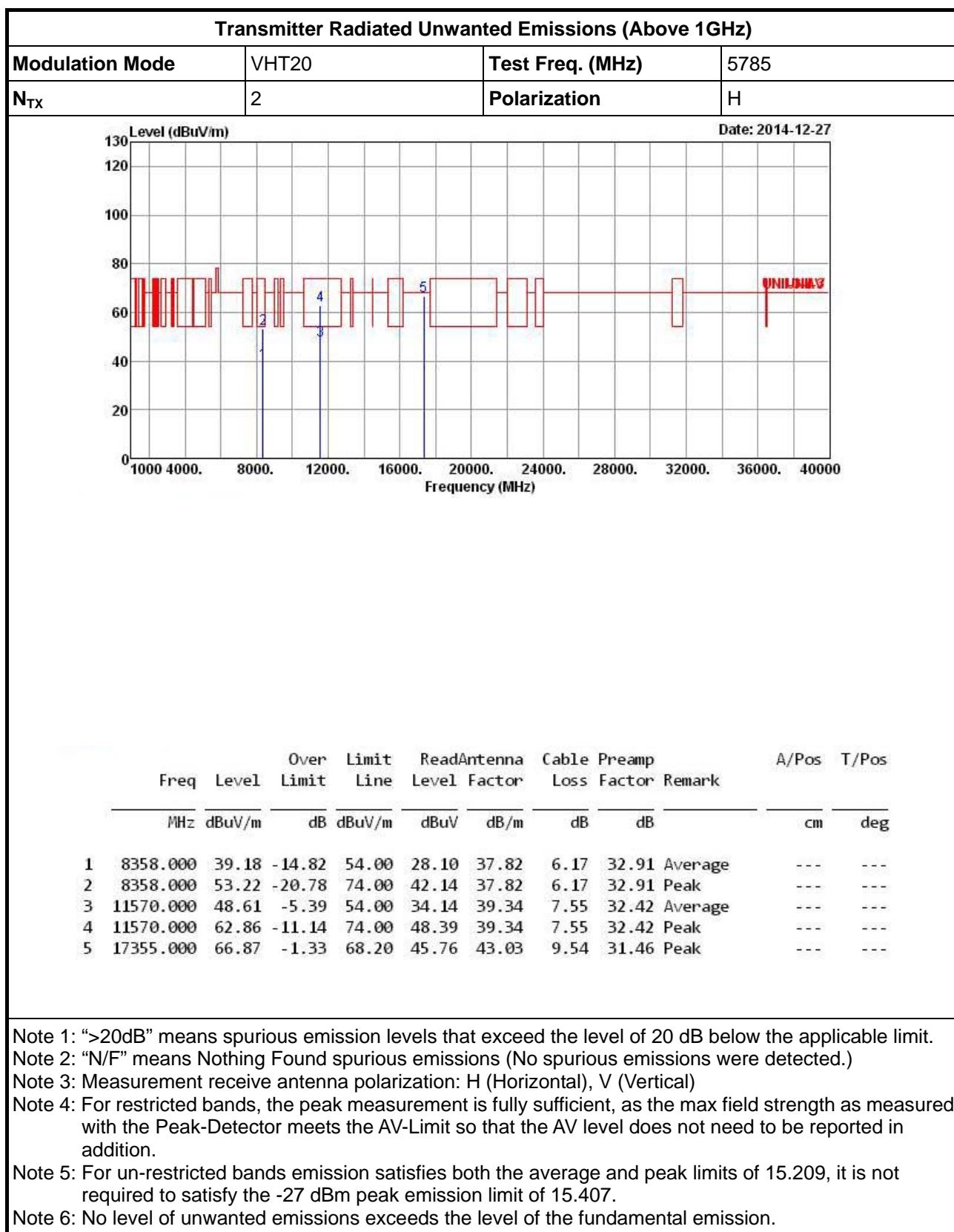


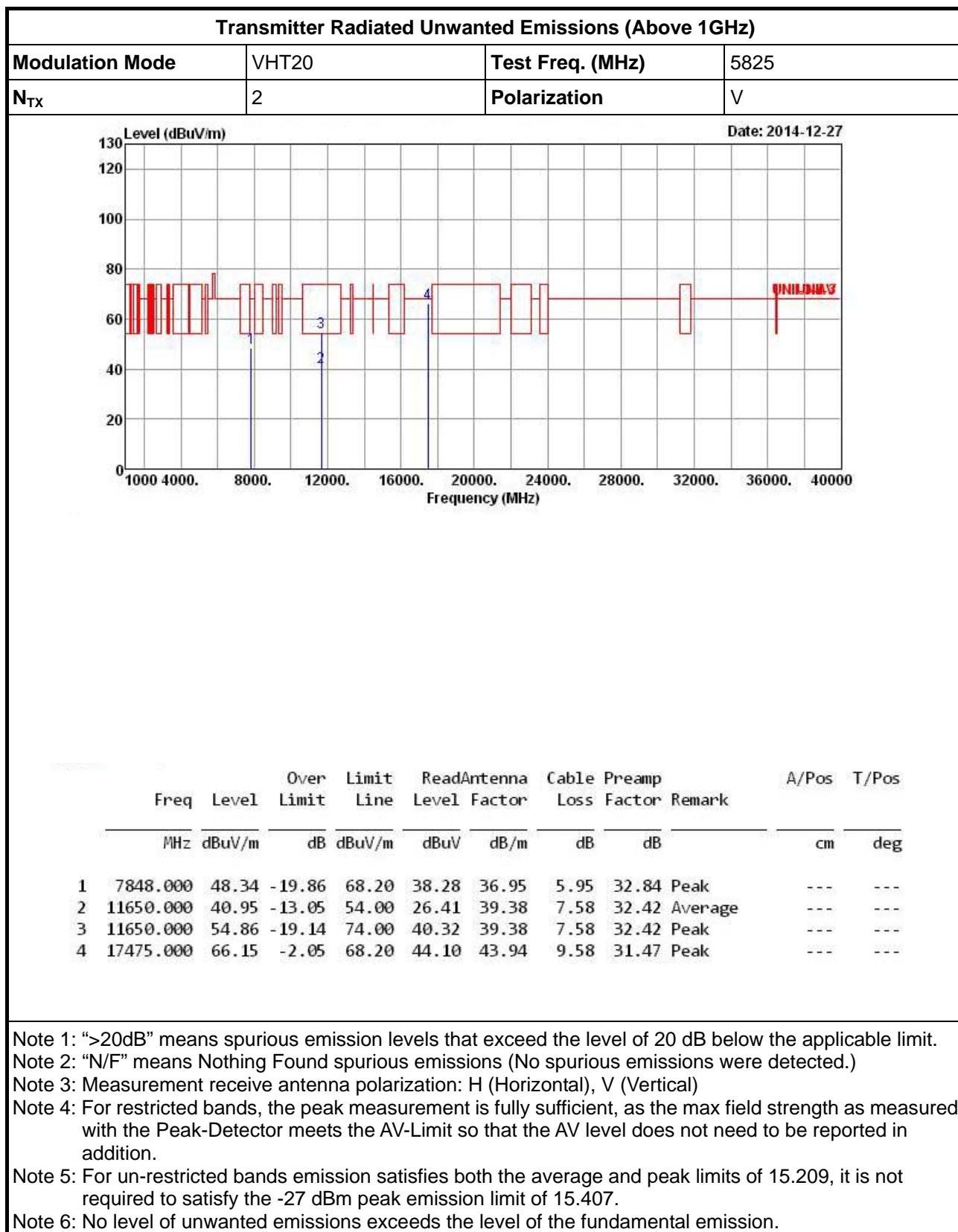


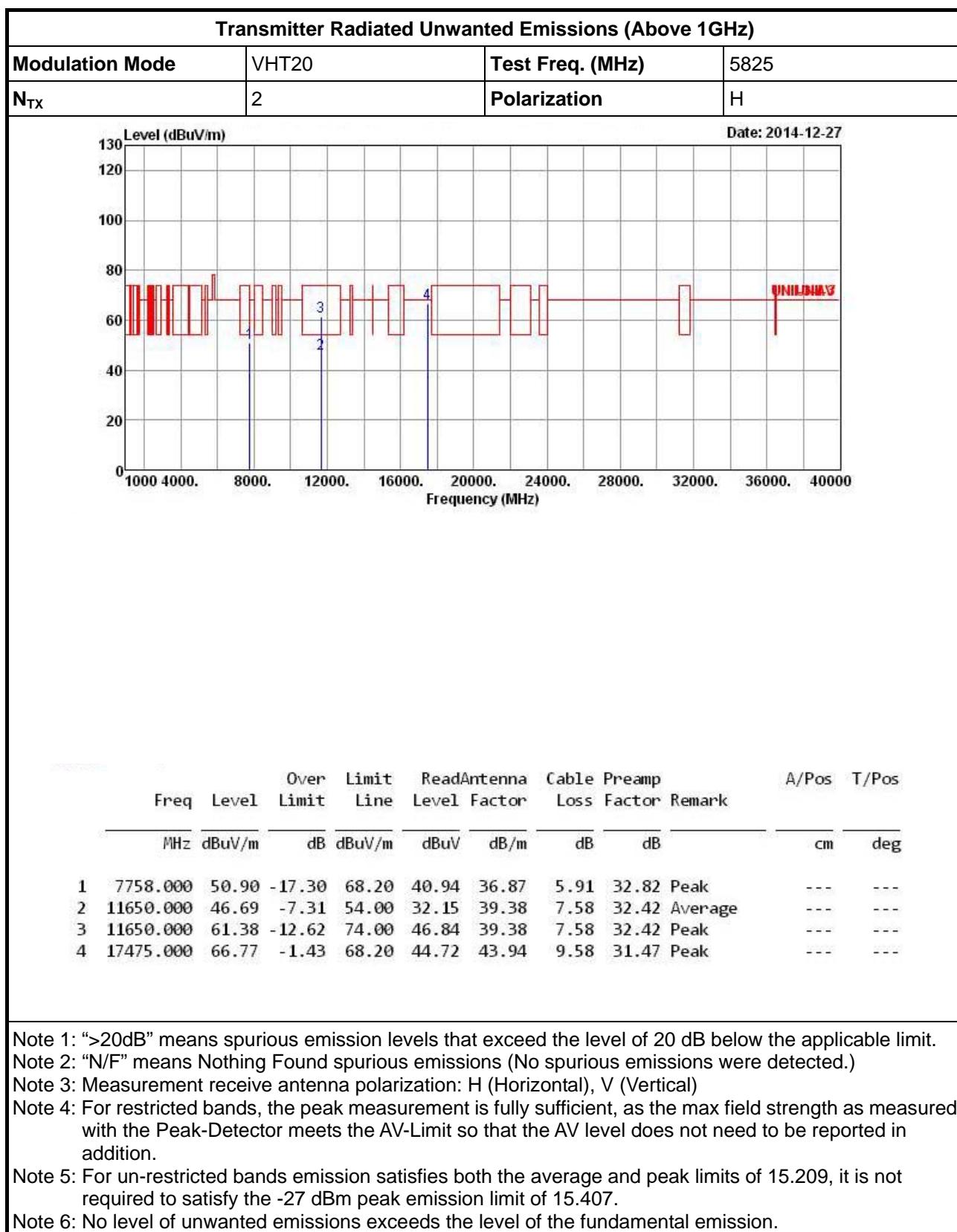


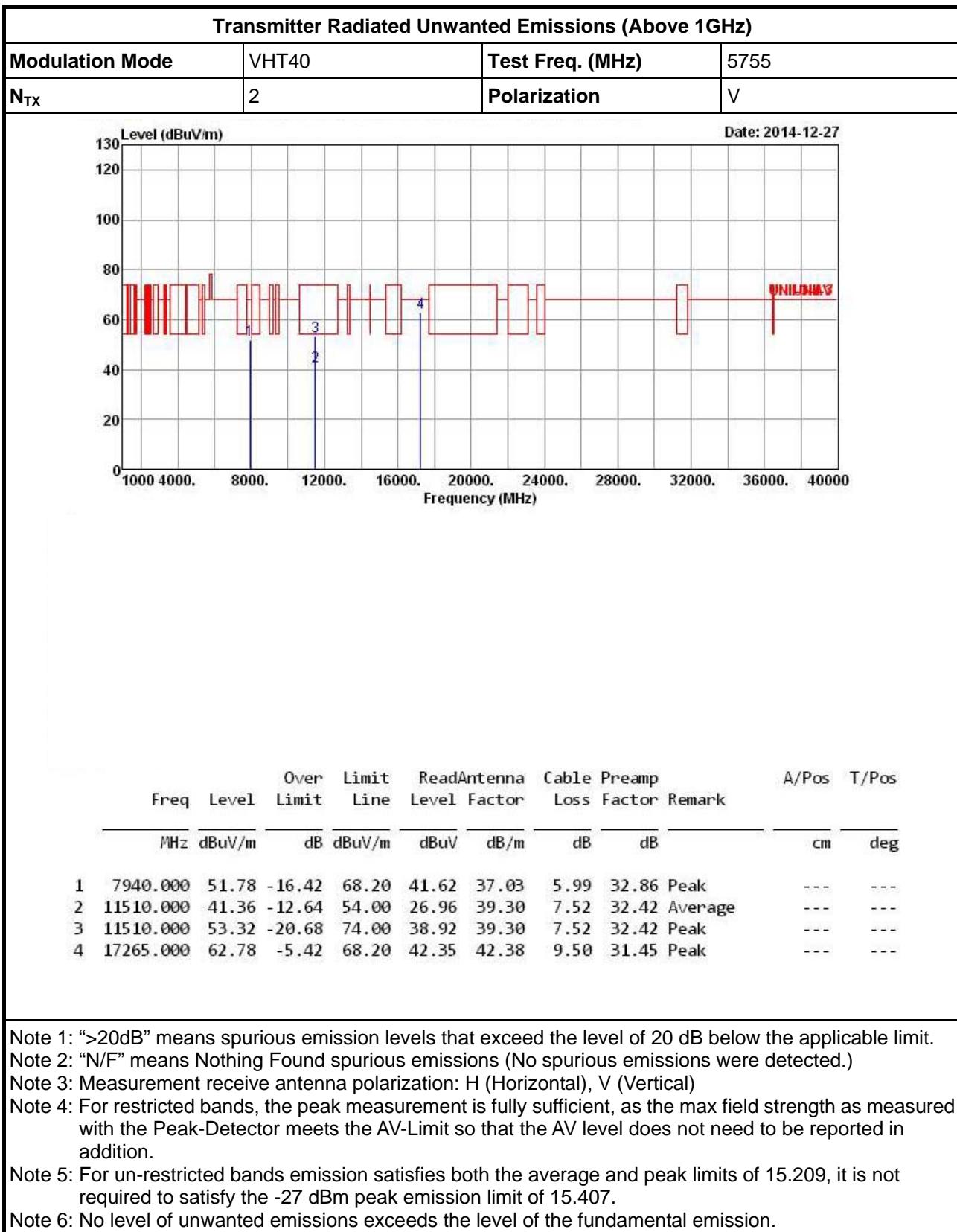


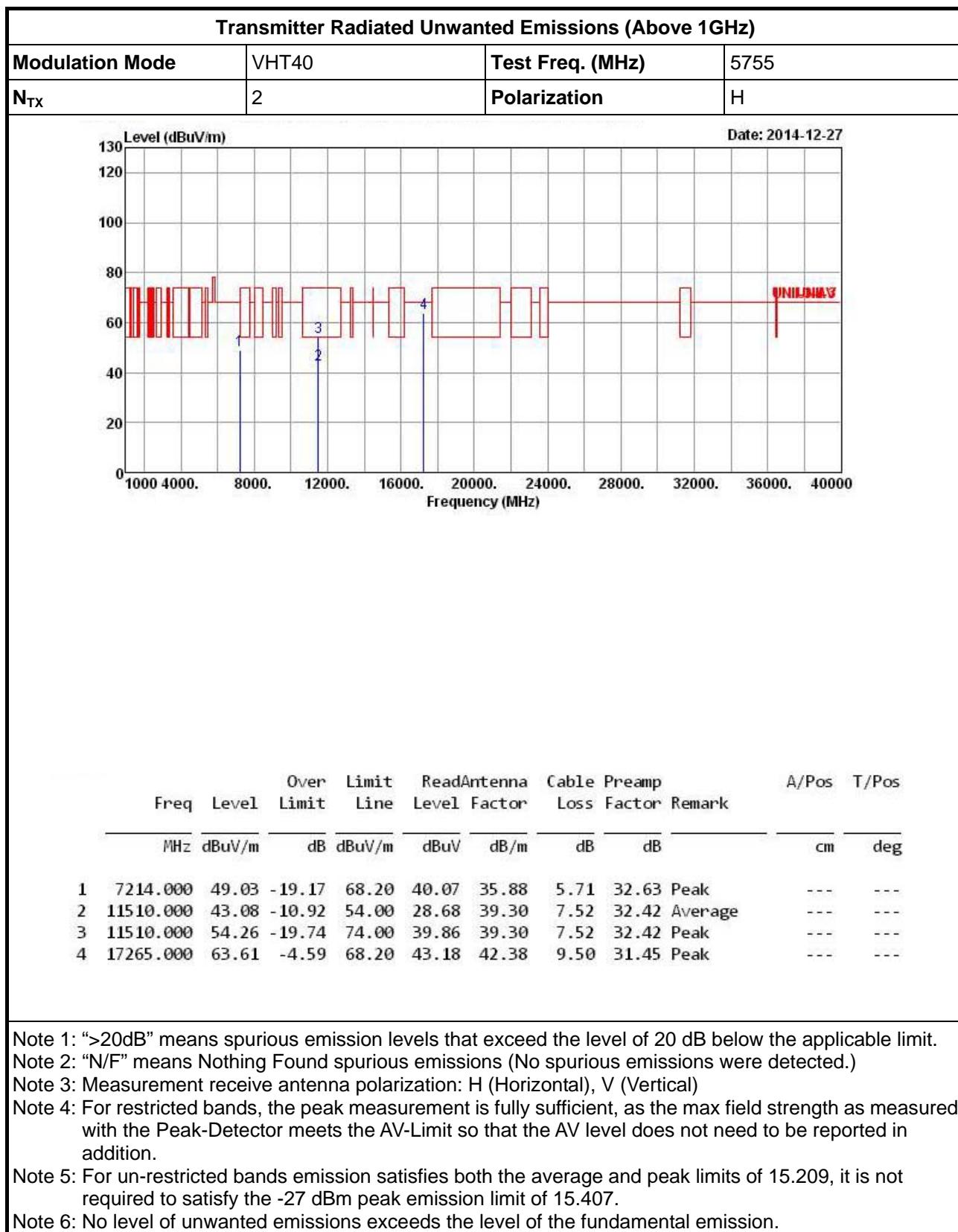


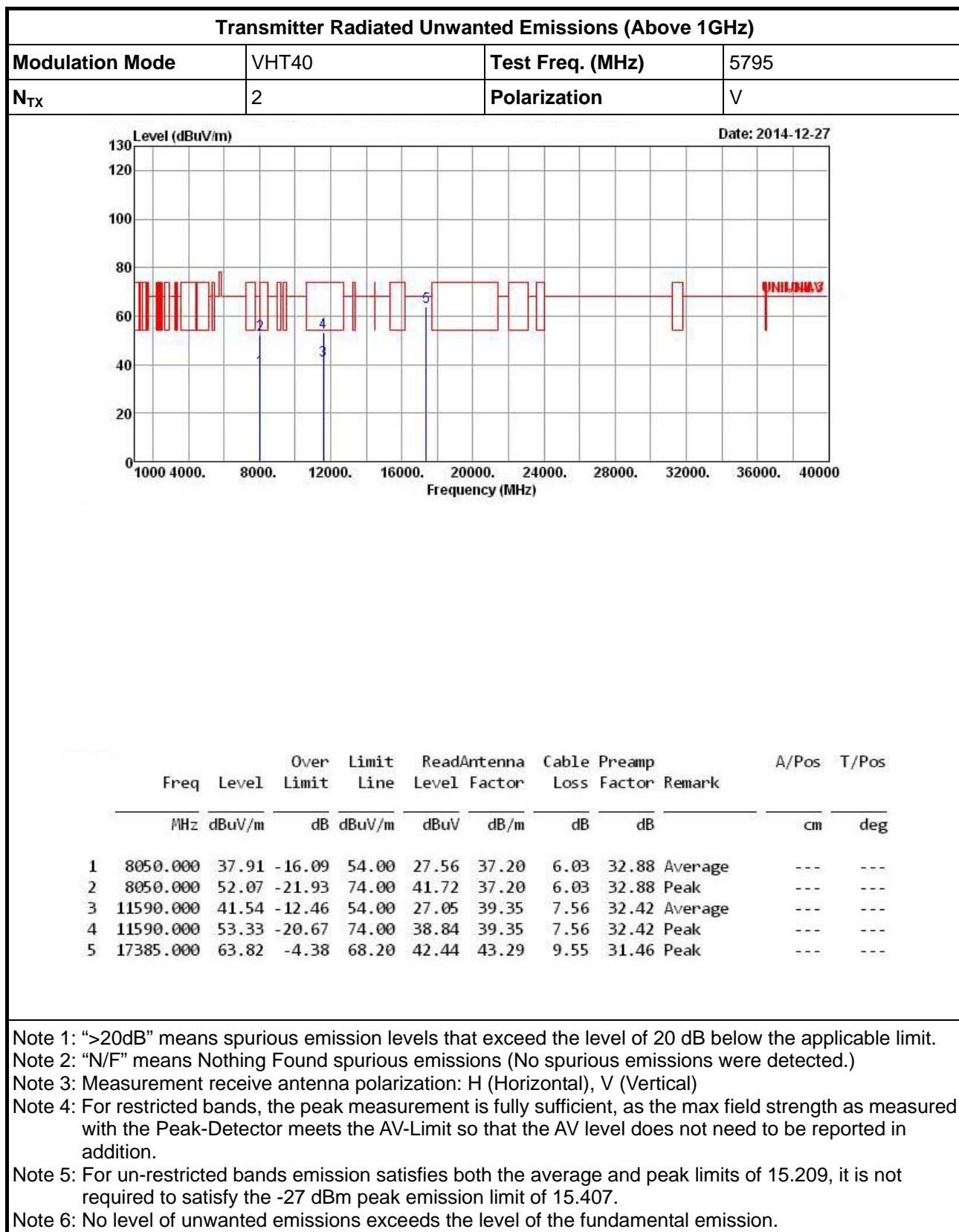


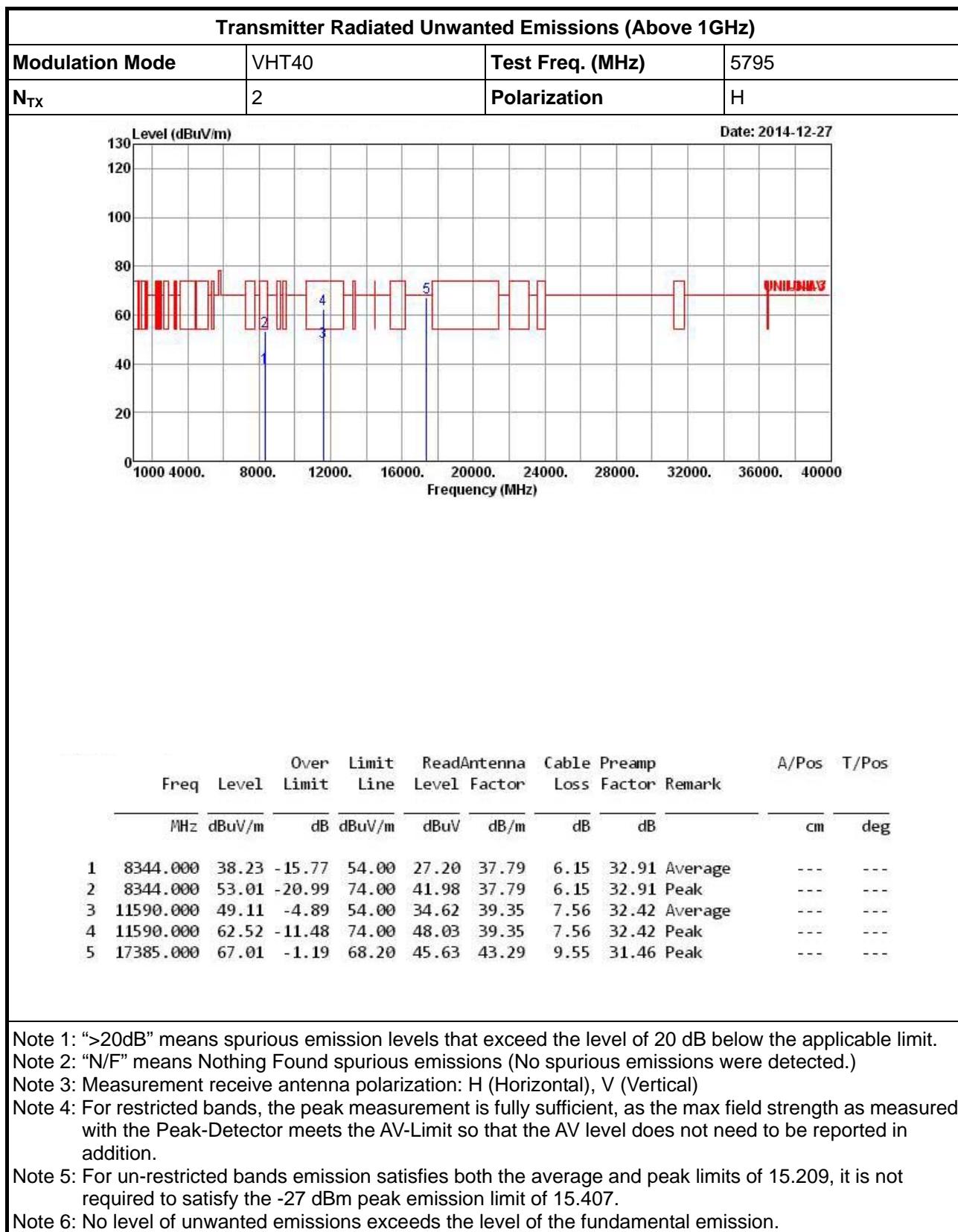


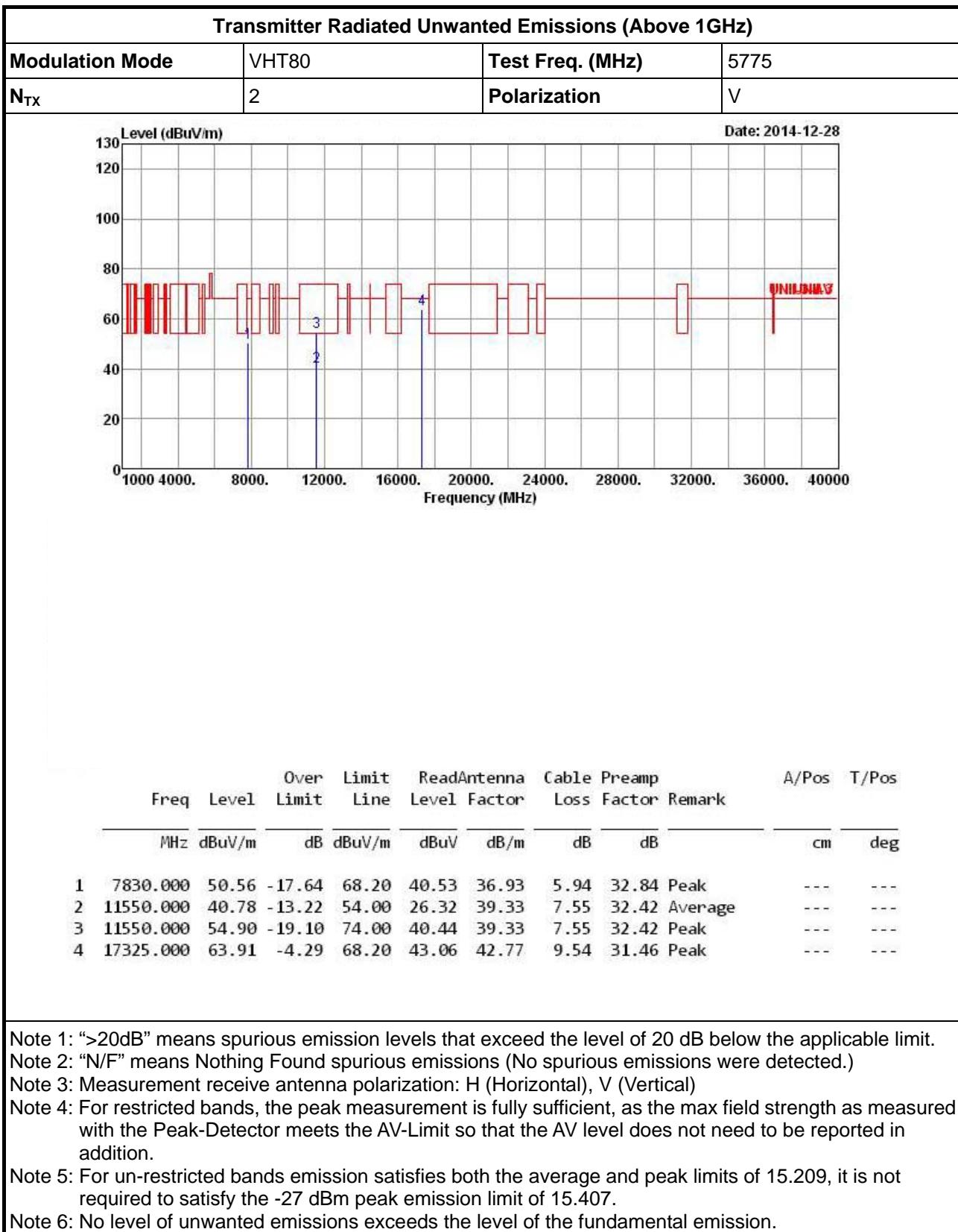


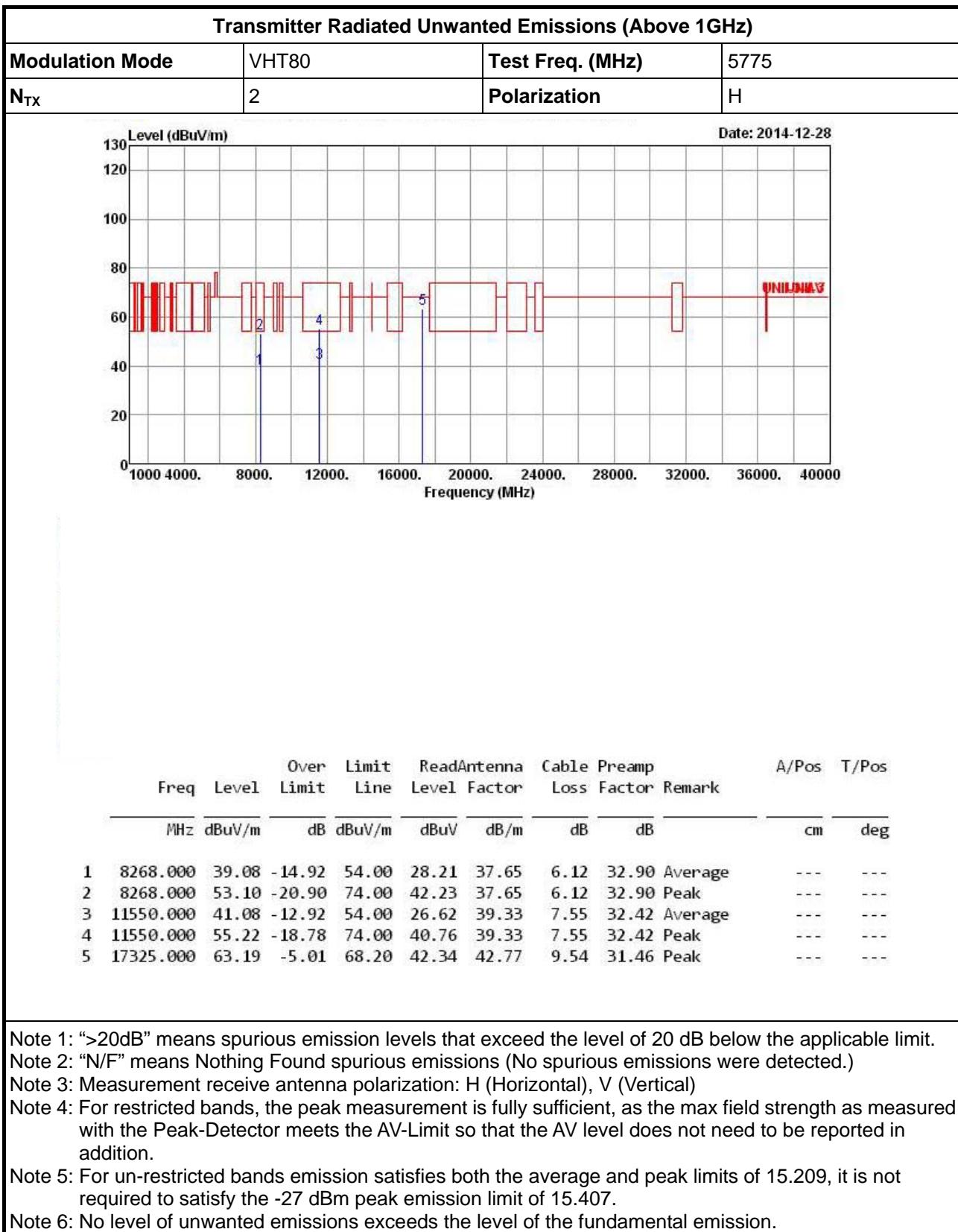














3.7 Frequency Stability

3.7.1 Frequency Stability Limit

Frequency Stability Limit	
UNII Devices	
<input checked="" type="checkbox"/> In-band emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.	
IEEE Std. 802.11n-2009	
<input checked="" type="checkbox"/> The transmitter center frequency tolerance shall be ± 20 ppm maximum for the 5 GHz band and ± 25 ppm maximum for the 2.4 GHz band.	

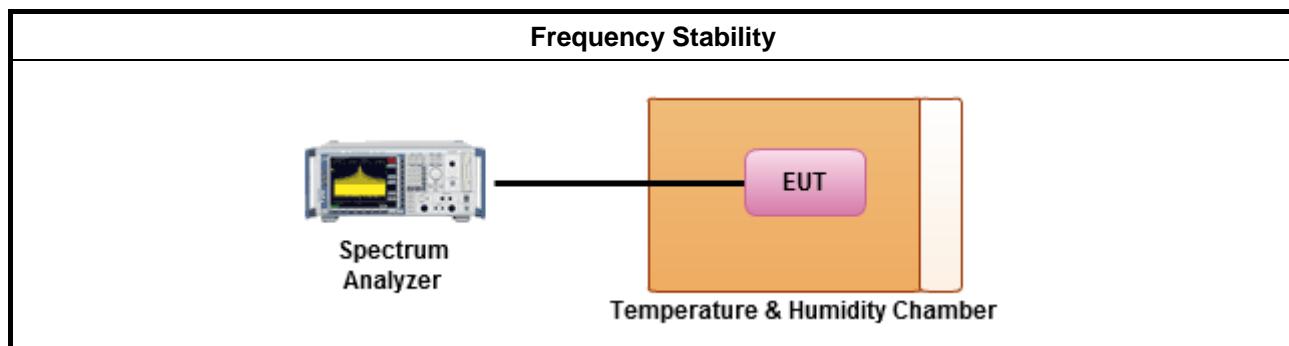
3.7.2 Measuring Instruments

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

3.7.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.8 for frequency stability tests
<input checked="" type="checkbox"/>	Frequency stability with respect to ambient temperature
<input checked="" type="checkbox"/>	Frequency stability when varying supply voltage
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	For conducted measurements on devices with multiple transmit chains: Measurements need only to be performed on one of the active transmit chains (antenna outputs)
<input type="checkbox"/>	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level.

3.7.4 Test Setup





3.7.5 Test Result of Frequency Stability

Frequency Stability Result			
Mode		Frequency Stability (ppm)	
Condition	Freq. (MHz)	Test Frequency (MHz)	Frequency Stability (ppm)
T _{20°C} Vmax	5200	5200.00868	1.6692
T _{20°C} Vmin	5200	5200.00732	1.4077
T _{50°C} Vnom	5200	5199.98137	-3.5827
T _{40°C} Vnom	5200	5199.98354	-3.1654
T _{30°C} Vnom	5200	5199.98915	-2.0865
T _{20°C} Vnom	5200	5200.00955	1.8365
T _{10°C} Vnom	5200	5200.01259	2.4212
T _{0°C} Vnom	5200	5200.03039	5.8442
T _{-10°C} Vnom	5200	5200.03256	6.2615
T _{-20°C} Vnom	5200	5200.04081	7.8481
Limit (ppm)		20	
Result		Complied	

Note 1: Measure at 85 % [Vmin] and 115 % [Vmax] of the nominal voltage [Vnom].
Note 2: The nominal voltage refer test report clause 0 for EUT operational condition.



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. 14. 2014	AC Conduction
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Jan. 22, 2014	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	N/A	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	Apr. 28, 2014	RF Conducted
Power Sensor	Anritsu	MA2411B	0917017	300MHz ~ 40GHz	Jan. 28, 2014	RF Conducted
Power Meter	Anritsu	ML2495A	0949003	300MHz ~ 40GHz	Jan. 28, 2014	RF Conducted
RF Cable-2m	HUBER+SUHNER	SUCOFLEX_104	SN 345675/4	30MHz ~ 26.5GHz	Dec. 01, 2014	RF Conducted

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

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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
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	May 05, 2014	Radiation
Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	Sep. 01, 2014	Radiation
Spectrum	R&S	FSP40	100004	9kHz ~ 40GHz	Mar. 27, 2014	Radiation
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30MHz ~ 1GHz	Sep. 20, 2014	Radiation
Horn Antenna	ETS • LINDGREN	3115	6741	1GHz ~ 18GHz	Jul. 11, 2014	Radiation
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	18GHz ~ 40GHz	Jan. 10, 2014	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
Amplifier	EM	EM18G40G	060604	18GHz ~ 40GHz	Oct. 17.2013	Radiation
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9kHz ~ 30MHz	Jul. 28, 2014	Radiation

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