



FCC Test Report

Equipment : 2T2R 11ac Wireless LAN Concurrent Dual Band Gigabit Router
Brand Name : EDIMAX
Model No. : BR-6478AC / GR-478AC
FCC ID : NDD9564781213
Standard : 47 CFR FCC Part 15.407
Operating Band : 5725 MHz – 5850 MHz
FCC Classification : NII
Applicant / Manufacturer : EDIMAX TECHNOLOGY CO., LTD.
No.3,Wu-Chuan 3rd Road,Wu-Ku Industrial Park, New
Taipei City, Taiwan
Multiple Listing : Please refer to section 1.3

The product sample received on Aug. 04, 2016 and completely tested on Aug. 12, 2016. 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





Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information.....	5
1.2	Product Details	7
1.3	Table for Multiple Listing	7
1.4	Accessories	7
1.5	Support Equipment.....	7
1.6	Testing Applied Standards	8
1.7	Testing Location Information	9
1.8	Measurement Uncertainty	10
2	TEST CONFIGURATION OF EUT.....	11
2.1	The Worst Case Modulation Configuration	11
2.2	Test Channel Frequencies Configuration.....	11
2.3	The Worst Case Power Setting Parameter	11
2.4	The Worst Case Measurement Configuration.....	12
2.5	Test Setup Diagram	13
3	TRANSMITTER TEST RESULT	15
3.1	AC Power-line Conducted Emissions	15
3.2	Emission Bandwidth	18
3.3	RF Output Power.....	21
3.4	Peak Power Spectral Density.....	26
3.5	Transmitter Radiated Bandedge Emissions	30
3.6	Transmitter Radiated Unwanted Emissions	48
3.7	Frequency Stability	72
	TEST EQUIPMENT AND CALIBRATION DATA	74
	APPENDIX A. TEST PHOTOS	A1
	APPENDIX B. PHOTOGRAPHS OF EUT	B1



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 (Average) 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
5725-5850	a	5745-5825	149-165 [5]	1	15.40	Yes
5725-5850	n(HT20)	5745-5825	149-165 [5]	2	18.41	Yes
5725-5850	n(HT40)	5755-5795	151-159 [2]	2	18.10	Yes
5725-5850	ac(VHT80)	5775	155 [1]	2	18.22	Yes

Note 1: RF output power specifies that Maximum Conducted (Average) 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 type="checkbox"/>	Integral antenna (antenna permanently attached)
<input type="checkbox"/>	<input type="checkbox"/> Temporary RF connector provided
<input type="checkbox"/>	<input type="checkbox"/> No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.
<input checked="" type="checkbox"/>	External antenna (dedicated antennas)
<input checked="" type="checkbox"/>	<input type="checkbox"/> Single power level with corresponding antenna(s). <input checked="" type="checkbox"/> Multiple power level and corresponding antenna(s).

Antenna General Information			
No.	Ant. Cat.	Ant. Type	Gain (dBi)
1	External	Dipole	3.00

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



1.1.3 Type of EUT

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

1.1.4 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 802.11a	0
<input checked="" type="checkbox"/> 100.00% - IEEE 802.11n (HT20)	0
<input checked="" type="checkbox"/> 100.00% - IEEE 802.11n (HT40)	0
<input checked="" type="checkbox"/> 100.00% - IEEE 802.11ac (VHT80)	0

1.1.5 EUT Operational Condition

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



1.2 Product Details

The equipment is 2T2R 11ac Wireless LAN Concurrent Dual Band Gigabit Router. There are two types of EUT. The only difference is the appearance. For more detailed features description, please refer to the manufacturer's specifications or user's manual.

1.3 Table for Multiple Listing

The models are exactly same in both physical and electrical. The different in model number for marketing purpose.

No.	Brand Name	Model Name
1	Edimax	BR-6478AC,GR-478AC
2	ZyXEL	X650

1.4 Accessories

Accessories				
AC Adapter 1	Brand Name	DVE	Model Name	DSA-12PFA-05 FUS
	Power Rating	I/P: 100-240V ~ 50/60Hz 0.5A; O/P: +5V --- 2A		
	Remark	Level V		
AC Adapter 2	Brand Name	DVE	Model Name	DSA-12PFT-05 FUS
	Power Rating	I/P: 100-240V ~ 50/60Hz 0.5A; O/P: +5V --- 2A		
	Remark	Level VI		

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

1.5 Support Equipment

Support Equipment - Conducted Emissions				
No.	Equipment	Brand Name	Model Name	Serial No.
1	Notebook	DELL	VOSTRO 3350	DoC
2	(USB)Mouse	Microsoft	1113	DoC
3	(USB) Printer	EPSON	STYLUS C61	DoC
4	Dummy Load	-	-	-
5	Notebook	DELL	PP32LB	DoC
6	PC (Remote workstation)	HP	d330uT	DoC
7	LCD Monitor (Remote workstation)	DELL	2408WFPb	DoC
8	(PS2)Keyboard (Remote workstation)	HP	KB-0133	DoC
9	(PS2)Mouse (Remote workstation)	HP	M-S69	DoC



Support Equipment - Radiated Emissions				
No.	Equipment	Brand Name	Model Name	Serial No.
1	Notebook	DELL	E5520	DoC
2	(USB)Mouse	Microsoft	1004	DoC
3	(USB) Printer	EPSON	STYLUS C61	DoC
4	Notebook (Remote workstation)	DELL	E5520	DoC

<Add Adapter tested>

Support Equipment - Radiated Emissions Below 1GHz				
No.	Equipment	Brand Name	Model Name	Serial No.
1	Notebook	DELL	E5530	DoC
2	Printer	EPSON	C61	-
3	Mouse	Microsoft	1004	DoC
4	NB Adapter	DELL	LA65NS2-01	DoC

1.6 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 789033 D02 v01r02
- FCC-16-24-UNII
- FCC KDB 662911 D01 v02r01
- FCC KDB 644545 D03 v01



1.7 Testing Location Information

Testing Location				
<input checked="" type="checkbox"/>	HWA YA	ADD	: No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.	
		TEL	: 886-3-327-3456	FAX : 886-3-327-0973
Test Condition		Test Site No.	Test Engineer	Test Environment
RF Conducted		TH01-HY	Ryan	24°C / 61%
AC Conduction		CO04-HY	Zevs	23°C / 49.1%
Radiated Emission		03CH02-HY	Daniel	22.6°C / 52%
Test site registered number [553509] with FCC.				



1.8 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty		
Test Item	Uncertainty	
AC power-line conducted emissions	±2.26 dB	
Emission bandwidth, 26dB bandwidth	±1.42 %	
RF output power, conducted	±0.63 dB	
Power density, conducted	±0.81 dB	
Unwanted emissions, conducted	9 – 150 kHz	±0.38 dB
	0.15 – 30 MHz	±0.42 dB
	30 – 1000 MHz	±0.51 dB
	1 – 18 GHz	±0.67 dB
	18 – 40 GHz	±0.83 dB
	40 – 200 GHz	N/A
All emissions, radiated	9 – 150 kHz	±2.49 dB
	0.15 – 30 MHz	±2.28 dB
	30 – 1000 MHz	±2.56 dB
	1 – 18 GHz	±3.59 dB
	18 – 40 GHz	±3.82 dB
	40 – 200 GHz	N/A
Temperature	±0.8 °C	
Humidity	±3 %	
DC and low frequency voltages	±3 %	
Time	±1.42 %	
Duty Cycle	±1.42 %	



2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Worst Modulation Used for Conformance Testing				
Modulation Mode	Transmit Chains (N _{TX})	Data Rate / MCS	Worst Data Rate / MCS	RF Output Power (dBm)
11a	1	6-54Mbps	6 Mbps	15.40
HT20	2	M0-7	M0	18.41
HT40	2	M0-7	M0	18.10
VHT80	2	M0-9	M0	18.22

Note 1: Modulation modes consist of below configuration:
11a: IEEE 802.11a, HT20/HT40: IEEE 802.11n, VHT20/VHT40/VHT80: IEEE 802.11ac
Note 2: IEEE Std. 802.11n/ac modulation consists of HT20, HT40, VHT20, VHT40, VHT80 and VHT160.
Then EUT support HT20, HT40, VHT20, VHT40 and VHT80.
Worst modulation mode: HT20, HT40, VHT80. Worst modulation of Guard Interval (GI) is 800ns.
Note 3: RF output power specifies that Maximum Conducted (Average) Output Power.

2.2 Test Channel Frequencies Configuration

Test Channel Frequencies Configuration	
IEEE Std. 802.11	Test Channel Frequencies (MHz) – FX (Frequencies Abbreviations)
a, n (HT20)	5745-(F1), 5785-(F2), 5825-(F3)
n (HT40)	5755-(F1'), 5795-(F2')
ac (VHT80)	5210-(F1'')

2.3 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter (5725-5850 MHz band)							
Test Software Version	RTL819x_2.2.5						
Modulation Mode	N _{TX}	Test Frequency (MHz)					
		NCB: 20MHz		NCB: 40MHz		NCB: 80MHz	
		5745	5785	5825	5755	5795	5775
11a,6-54Mbps	1	49	47	47	-	-	-
HT20,M0-15	2	52,55	49,52	48,50	-	-	-
HT40,M0-15	2	-	-	-	52,55	51,54	-
VHT80,M0-9	2	-	-	-	-	-	50,53

2.4 The Worst Case Measurement Configuration

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

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

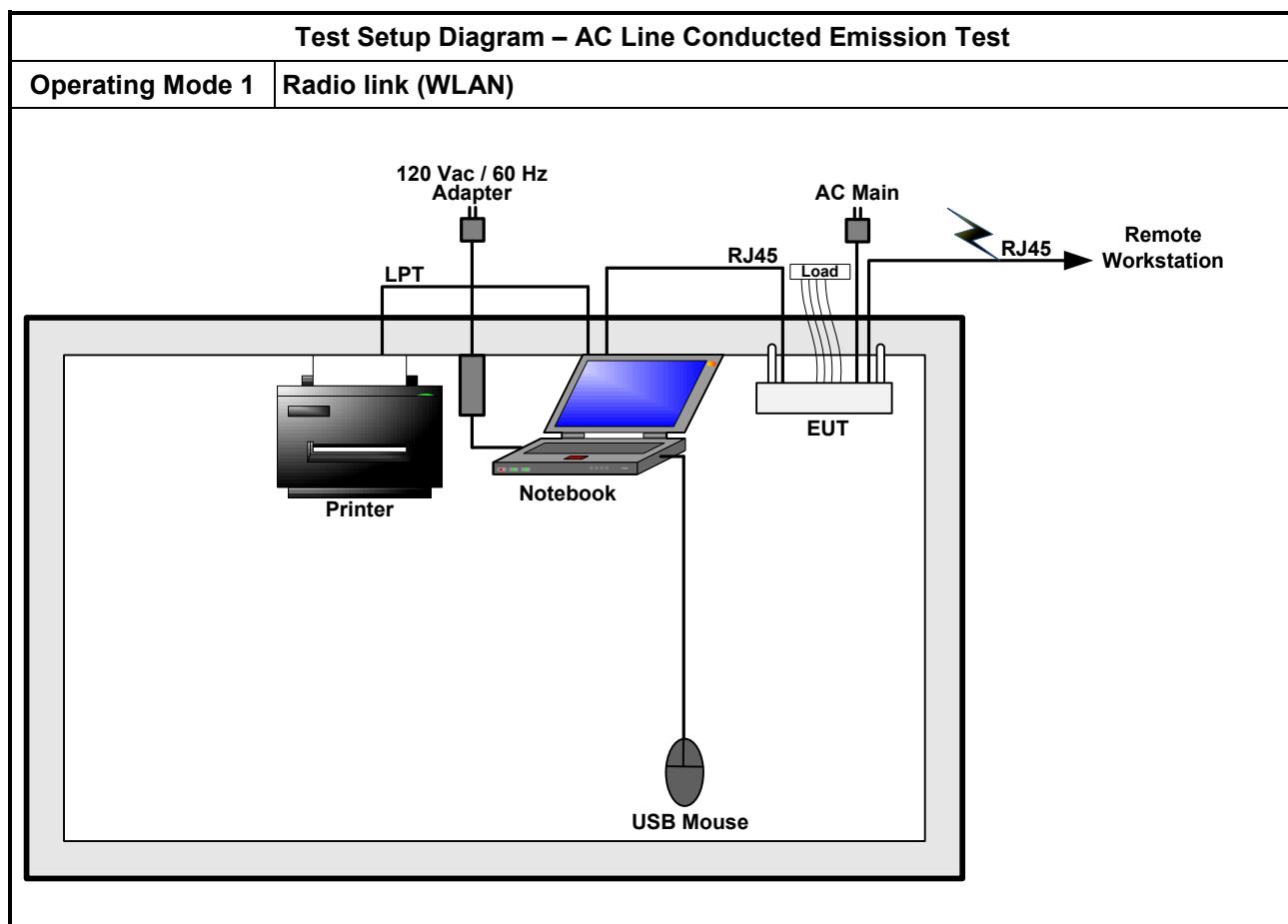
The Worst Case Mode for Following Conformance Tests	
Tests Item	RF Output Power, Power Spectral Density, 6 dB Bandwidth
Test Condition	Conducted measurement at transmit chains
Modulation Mode	11a, HT20, HT40, VHT80

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 checked="" type="checkbox"/> EUT will be placed in fixed position. The worst planes is X. <input type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two orthogonal planes. <input type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed two or three orthogonal planes.
Operating Mode < 1GHz	<input checked="" type="checkbox"/> 1. Radio link (WLAN) <input checked="" type="checkbox"/> 2. Radio link (WLAN) Adapter 2

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

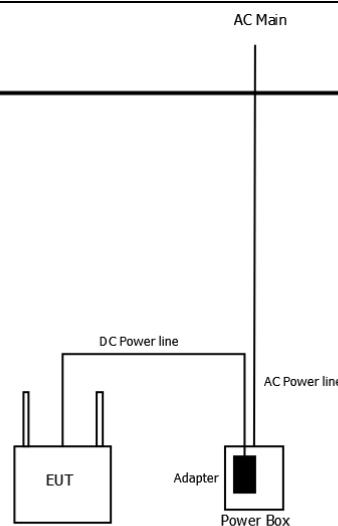
Modulation Mode	11a, HT20, HT40, VHT80		
Orthogonal Planes of EUT	X Plane	Y Plane	Z Plane
			
Worst Planes of EUT	V		
Worst Planes of ANT			V

2.5 Test Setup Diagram



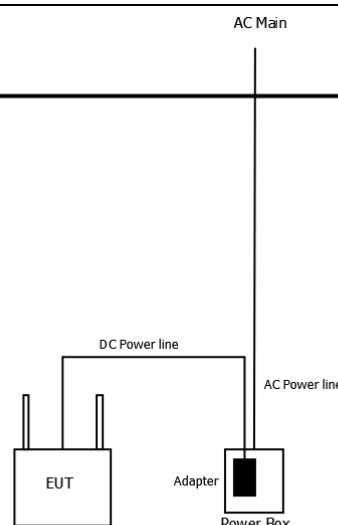
Test Setup Diagram - Radiated Test (Below 1GHz)

Operating Mode	Radio link (WLAN) Adapter 2
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Test Setup Diagram - Radiated Test (Above 1GHz)

Operating Mode	Transmission Mode
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3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

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

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

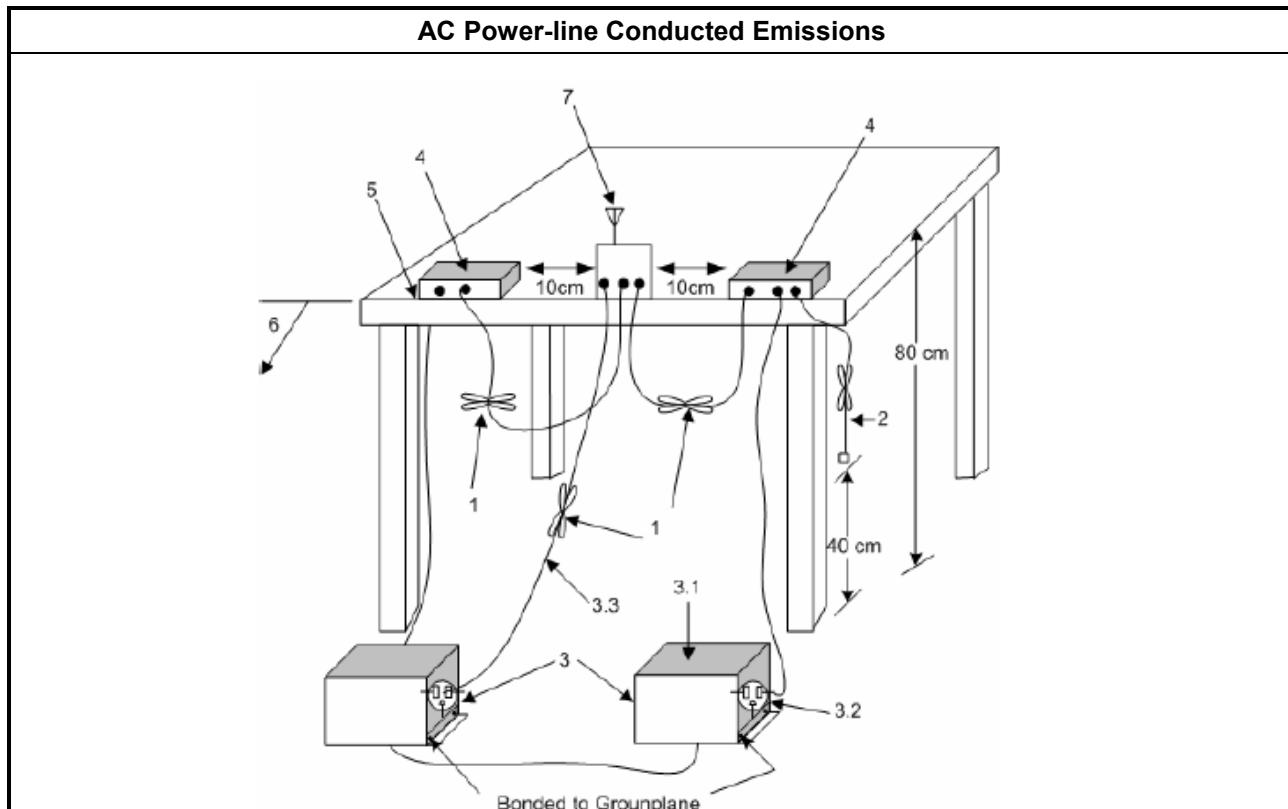
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

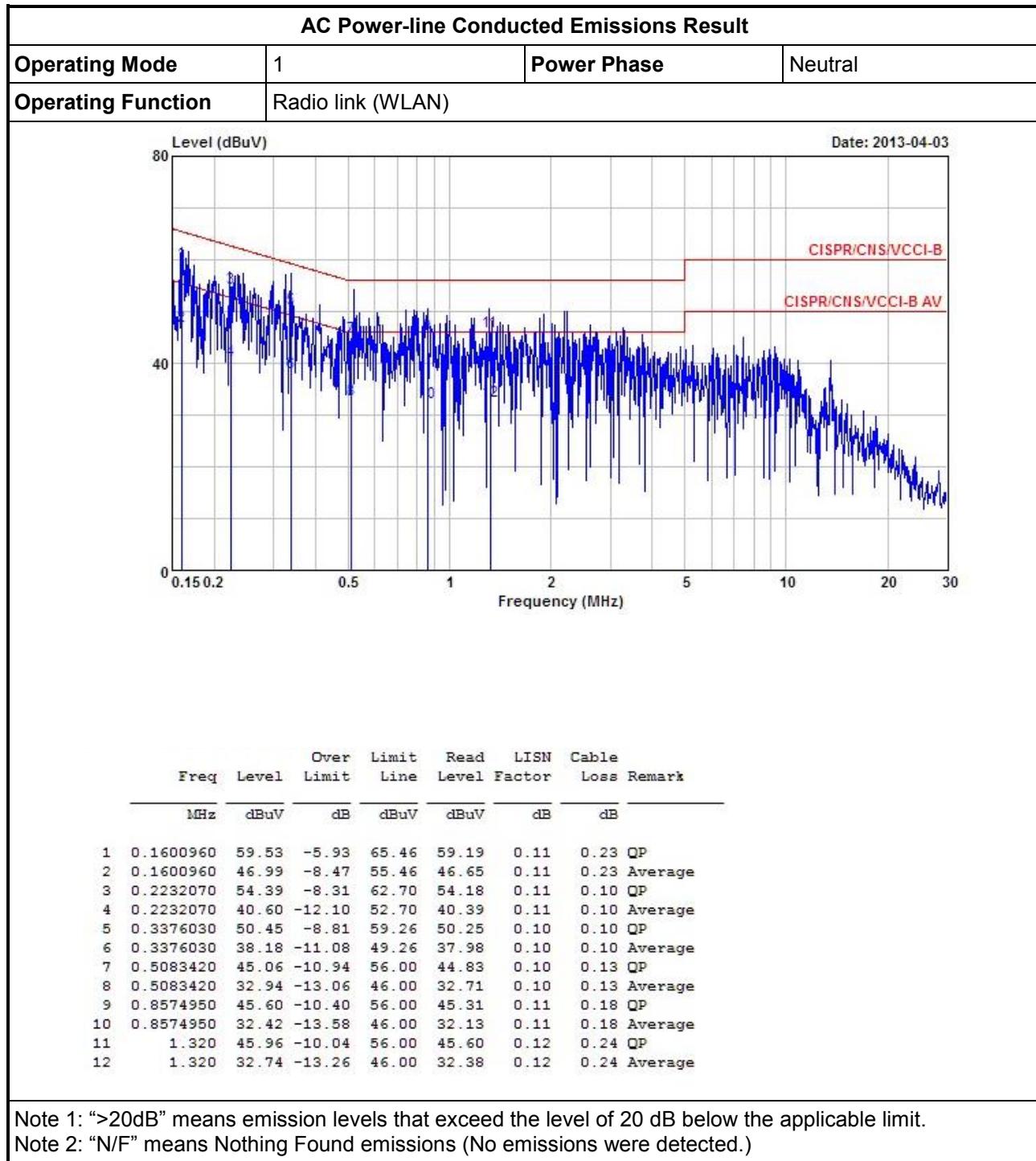
Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.

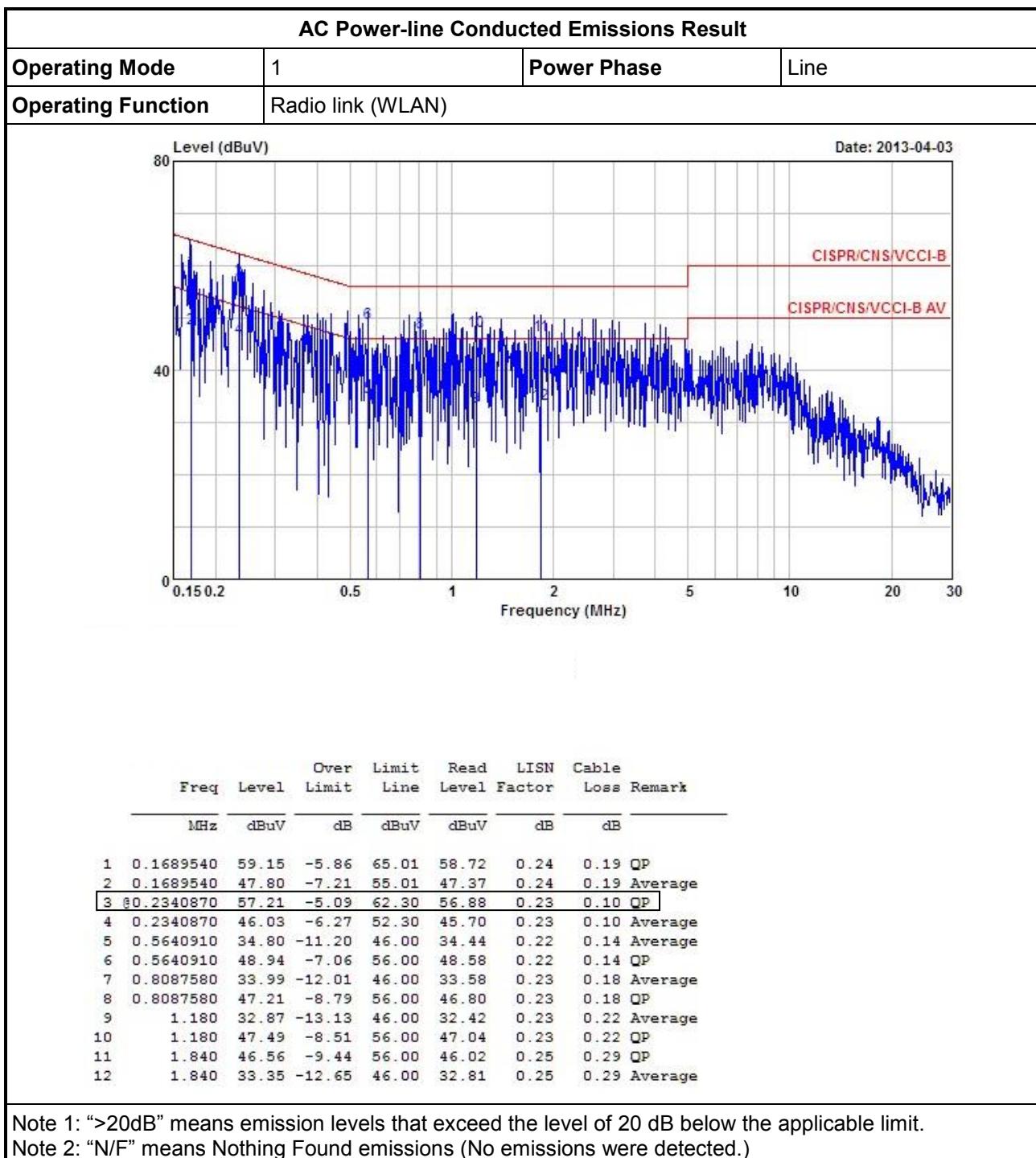
3.1.4 Test Setup





3.1.5 Test Result of AC Power-line Conducted Emissions





3.2 Emission Bandwidth

3.2.1 Emission Bandwidth Limit

Emission Bandwidth Limit	
UNII Devices	
<input 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.

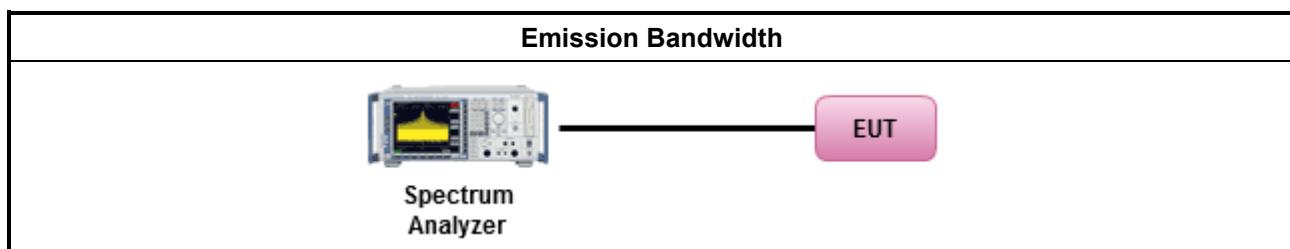
3.2.2 Measuring Instruments

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, 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 6.6 for bandwidth testing.
<input checked="" type="checkbox"/>	For conducted measurement.
<input type="checkbox"/>	The EUT supports single transmit chain and measurements performed on this transmit chain.
<input checked="" type="checkbox"/>	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
<input checked="" type="checkbox"/>	The EUT supports multiple transmit chains using options given below:
	<input checked="" type="checkbox"/> Option 1: 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

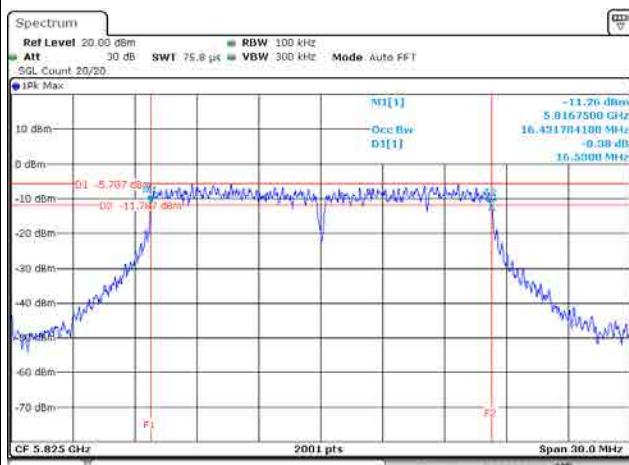
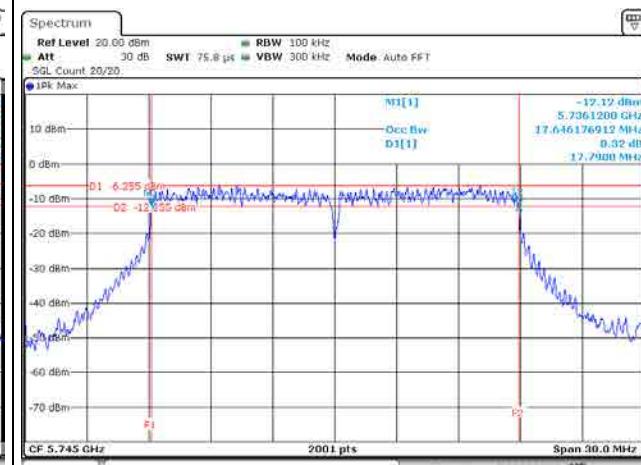
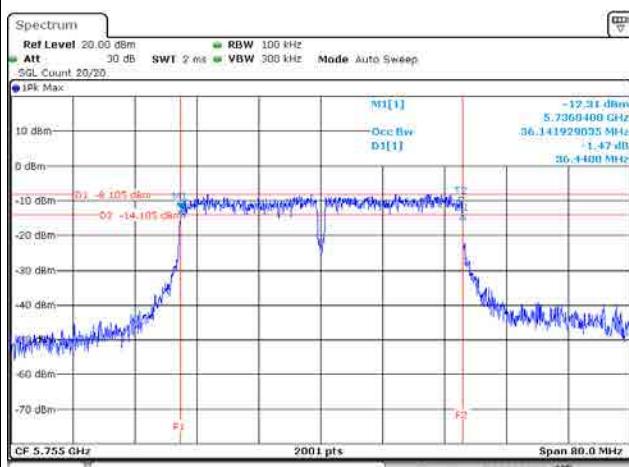
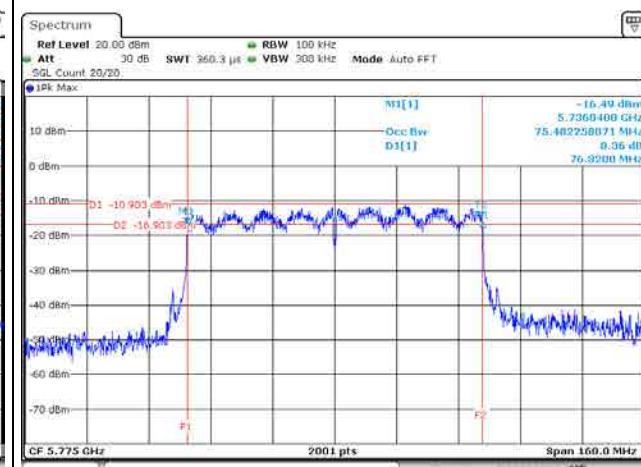




3.2.5 Test Result of Emission Bandwidth

Emission Bandwidth Result						
Condition			Emission Bandwidth (MHz)			
Modulation Mode	N _{TX}	Freq. (MHz)	99% Bandwidth		6dB Bandwidth	
			Chain- Port 1	Chain- Port 2	Chain- Port 1	Chain- Port 2
11a	1	5745	16.43	-	16.48	-
11a	1	5785	16.47	-	16.48	-
11a	1	5825	16.43	-	16.53	-
HT20	2	5745	17.64	17.60	17.79	17.65
HT20	2	5785	17.60	17.66	17.67	17.70
HT20	2	5825	17.66	17.69	17.67	17.58
HT40	2	5755	36.14	36.14	36.44	36.40
HT40	2	5795	36.14	36.18	36.40	36.36
VHT80	2	5775	75.48	75.48	76.32	76.00
Limit			N/A		≥500 kHz	
Result			Complied			

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

Worst Emission Bandwidth Plots
11a

HT20

HT40

HT80




3.3 RF Output Power

3.3.1 RF Output Power Limit

Maximum Conducted Output Power Limit	
UNII Devices	
<input 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 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.	

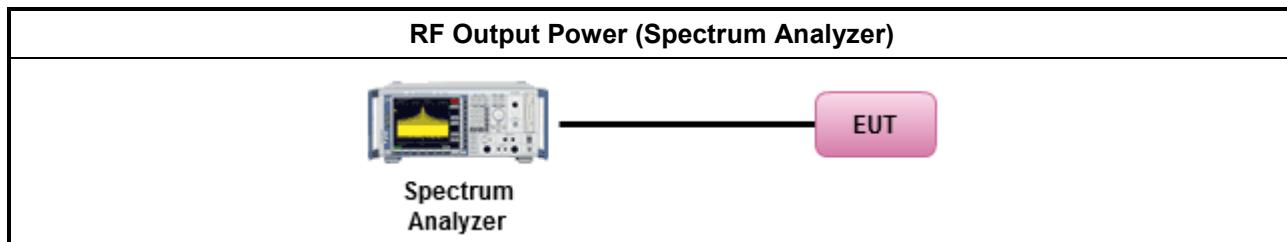
3.3.2 Measuring Instruments

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

3.3.4 Test Setup





3.3.5 Directional Gain for Power Measurement

Directional Gain (DG) Result					
Transmit Chains No.		1	2	-	-
Maximum G _{ANT} (dBi)		3.00	3.00	-	-
Modulation Mode	DG (dBi)	N _{TX}	N _{SS}	STBC	Array Gain (dB)
11a,6-54Mbps	3.00	1	1	-	-
HT40,M0-M07	6.01	2	1	-	-
HT40,M0-M07	6.01	2	1	-	-
VHT80,M0-9	6.01	2	1	-	-

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

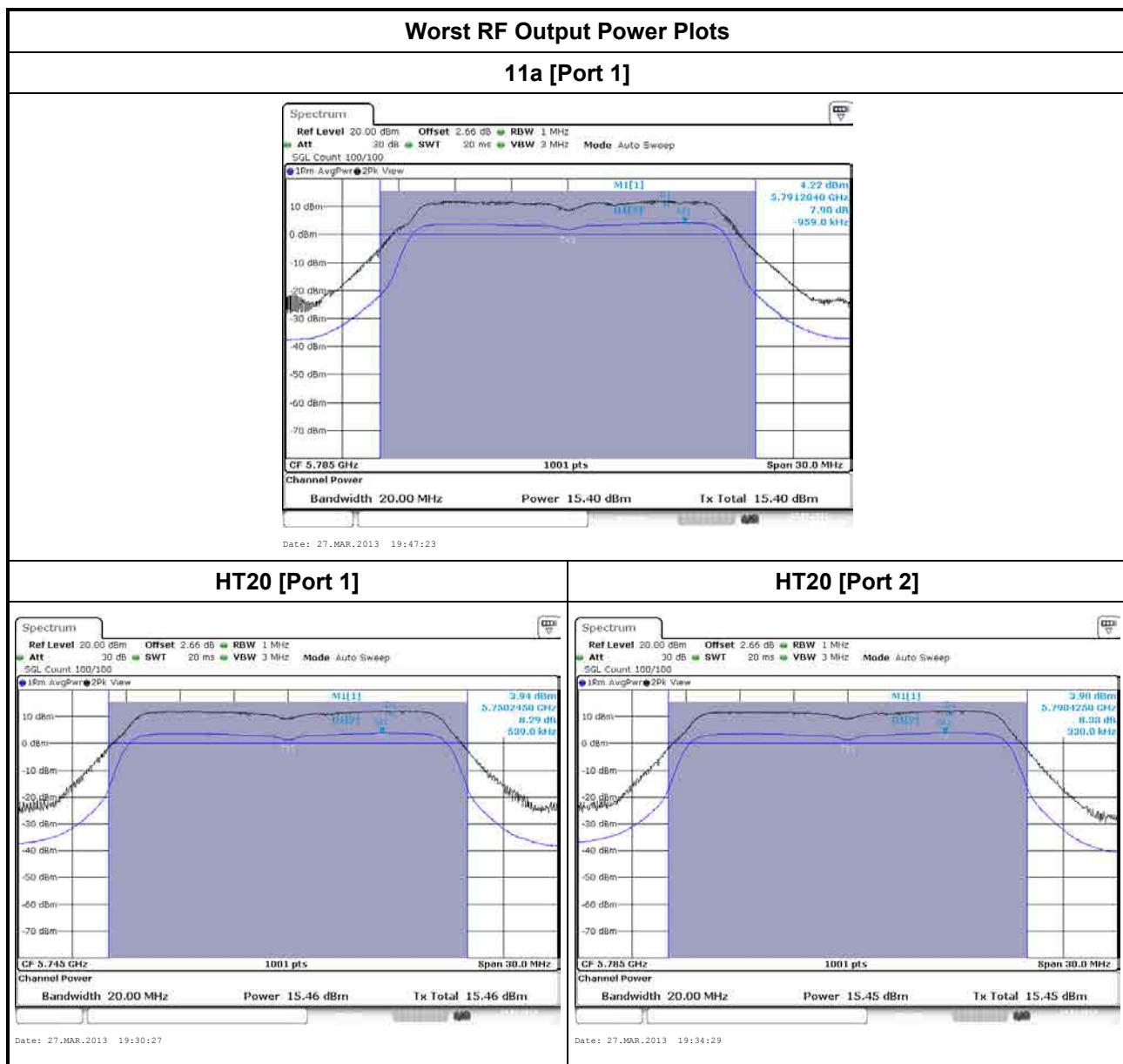
Note 2: For all transmitter outputs with unequal antenna gains, directional gain is to be computed as follows:
 Any transmit signals are correlated, Directional Gain = 10 log[(10^{G1/20} + ... + 10^{GN/20})² / N_{TX}]
 All transmit signals are completely uncorrelated, Directional Gain = 10 log[(10^{G1/10}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

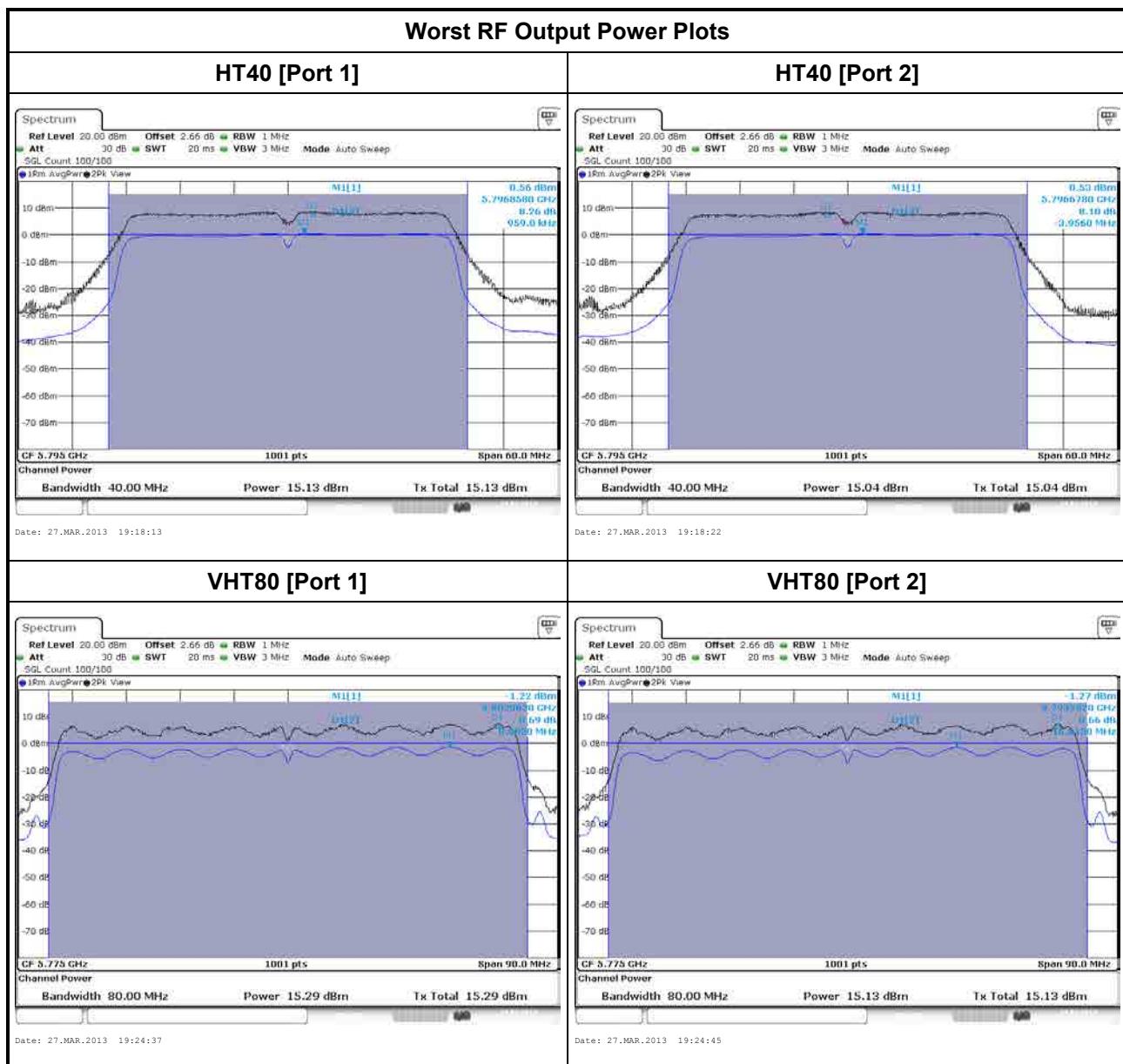
Note 3: For Spatial Multiplexing, Directional Gain (DG) = G_{ANT} + 10 log(N_{TX}/N_{SS}),
 where N_{SS} = the number of independent spatial streams data.

Note 4: For CDD transmissions, directional gain is calculated as power measurements:
 Directional Gain (DG) = G_{ANT} + Array Gain, where Array Gain is as follows:
 Array Gain = 0 dB (i.e., no array gain) for N_{TX} ≤ 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 Average Conducted Output Power

Maximum Average Conducted Output Power							
Condition			RF Output Power (dBm)				
Modulation Mode	N _{TX}	Freq. (MHz)	Chain Port 1	Chain Port 2	Sum Chain	Power Limit	DG (dBi)
11a	1	5745	15.39	-	15.39	30.00	3.00
11a	1	5785	15.40	-	15.40	30.00	3.00
11a	1	5825	15.36	-	15.36	30.00	3.00
HT20	2	5745	15.46	15.34	18.41	29.99	6.01
HT20	2	5785	15.17	15.45	18.32	29.99	6.01
HT20	2	5825	15.39	15.21	18.31	29.99	6.01
HT40	2	5755	15.10	15.03	18.08	29.99	6.01
HT40	2	5795	15.13	15.04	18.10	29.99	6.01
VHT80	2	5775	15.29	15.13	18.22	29.99	6.01
Result			Complied				







3.4 Peak Power Spectral Density

3.4.1 Peak Power Spectral Density Limit

Peak Power Spectral Density Limit	
UNII Devices	
<input 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 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 the 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

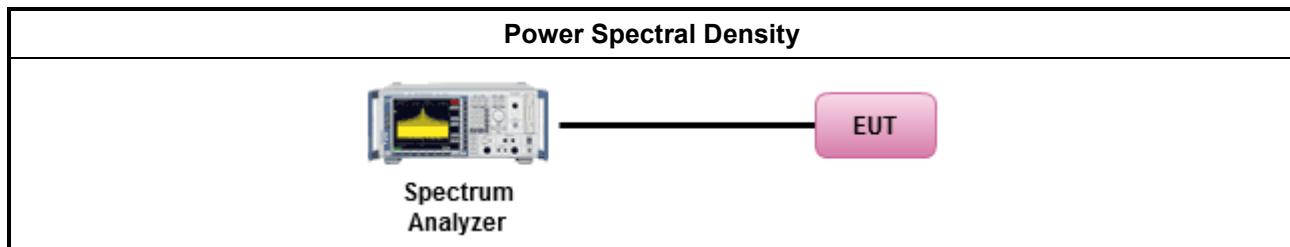
Refer a test equipment and calibration data table in this test report.



3.4.3 Test Procedures

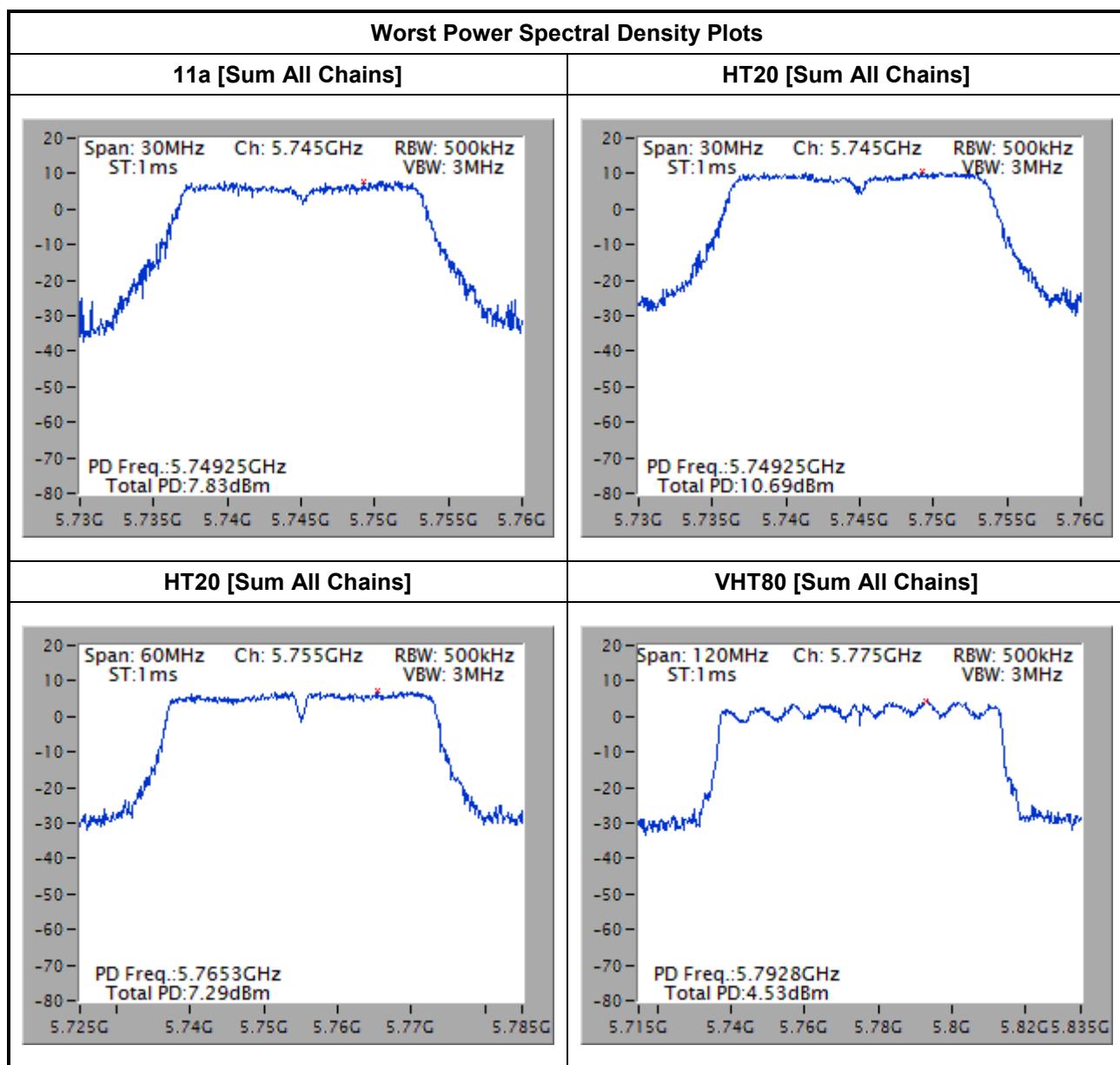
Test Method	
<input checked="" type="checkbox"/> Peak power spectral density procedures that the same method as used to determine the conducted output power shall be used to determine the peak power spectral density and use the peak search function on the spectrum analyzer to find the peak of the spectrum. For the peak power spectral density shall be measured using below options:	
<input type="checkbox"/> Refer as FCC KDB 789033, F)5) 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, clause E Method SA-1 (spectral trace averaging).	
<input type="checkbox"/> Refer as FCC KDB 789033, 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, clause E Method SA-2 (spectral trace averaging).	
<input type="checkbox"/> Refer as FCC KDB 789033, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)	
<input checked="" type="checkbox"/> For conducted measurement.	
<input type="checkbox"/> The EUT supports single transmit chain and measurements performed on this transmit chain.	
<input checked="" type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.	
<input checked="" type="checkbox"/> The EUT supports multiple transmit chains using options given below:	
	<input checked="" type="checkbox"/> Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NTX 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 sum spectral maxima across the outputs. With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The maximum value (peak) of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs. These operations shall be performed separately over frequency spans that have different out-of-band or spurious emission limits.
	<input type="checkbox"/> Option 3: 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 checked="" 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]) $EIRP_{total} = PPSD_{total} + DG$

3.4.4 Test Setup



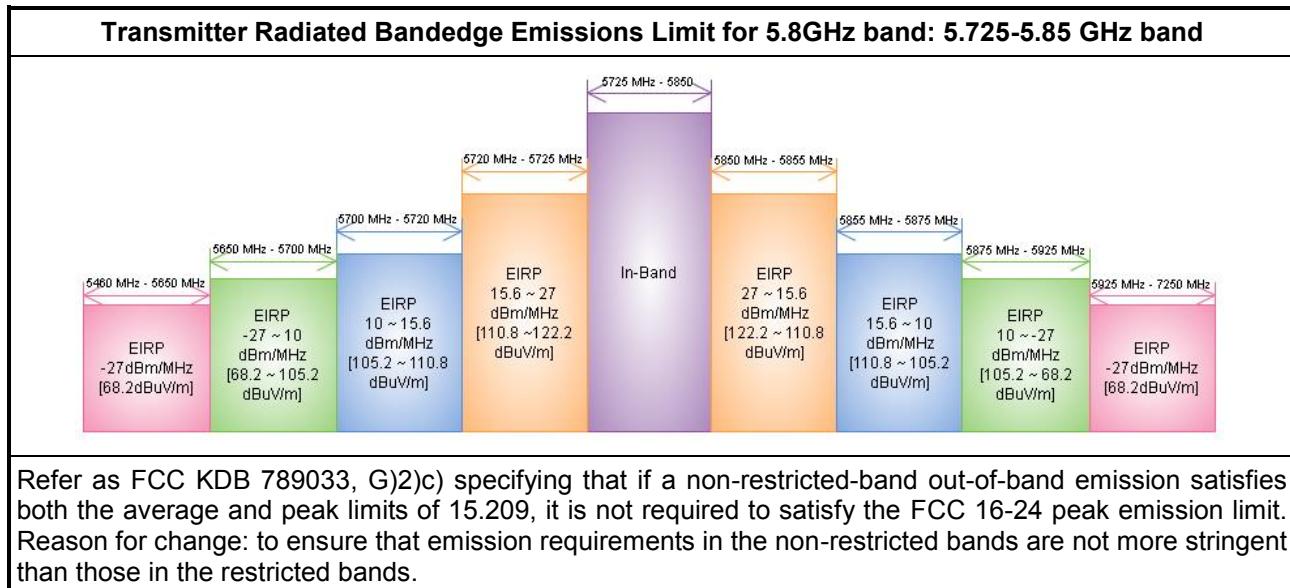
3.4.5 Test Result of Power Spectral Density

Peak Power Spectral Density Result (5725-5850MHz band)					
Modulation Mode	N _{TX}	Freq. (MHz)	Peak Power Spectral Density (dBm/500kHz)	PSD Limit (dBm/500kHz)	Antenna Gain (dBi)
11a	1	5745	7.83	30.00	3.00
11a	1	5785	7.82	30.00	3.00
11a	1	5825	7.60	30.00	3.00
HT20	2	5745	10.69	29.99	6.01
HT20	2	5785	10.49	29.99	6.01
HT20	2	5825	10.54	29.99	6.01
HT40	2	5755	7.29	29.99	6.01
HT40	2	5795	7.28	29.99	6.01
VHT80	2	5775	4.53	29.99	6.01
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.

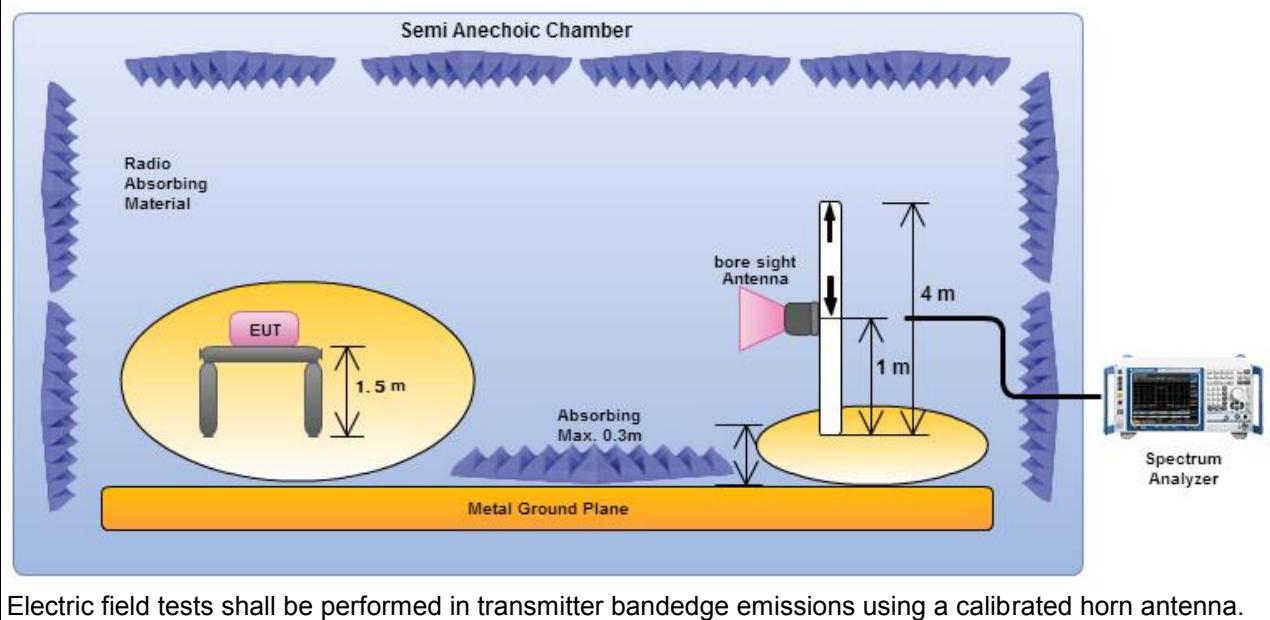


3.5.3 Test Procedures

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 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.) <ul style="list-style-type: none"><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) <ul style="list-style-type: none"><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: <ul style="list-style-type: none"><input checked="" type="checkbox"/> Refer as FCC KDB 789033, clause G2) for unwanted emissions into non-restricted bands.<input checked="" type="checkbox"/> Refer as FCC KDB 789033, clause G1) for unwanted emissions into restricted bands.<ul style="list-style-type: none"><input type="checkbox"/> Refer as FCC KDB 789033, G6) Method AD (Trace Averaging).<input type="checkbox"/> Refer as FCC KDB 789033, G6) Method VB (Reduced VBW).<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 4.1.4.2.3 (Reduced VBW). $VBW \geq 1/T$, where T is pulse time.<input type="checkbox"/> Refer as ANSI C63.10, clause 4.1.4.2.4 average value of pulsed emissions.<input checked="" type="checkbox"/> Refer as FCC KDB 789033, clause G5) measurement procedure peak limit.<input type="checkbox"/> Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak limit.
<input checked="" type="checkbox"/> For the transmitter bandedge emissions shall be measured using following options below: <ul style="list-style-type: none"><input type="checkbox"/> Refer as FCC KDB 789033, clause G3)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 6.10 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 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)

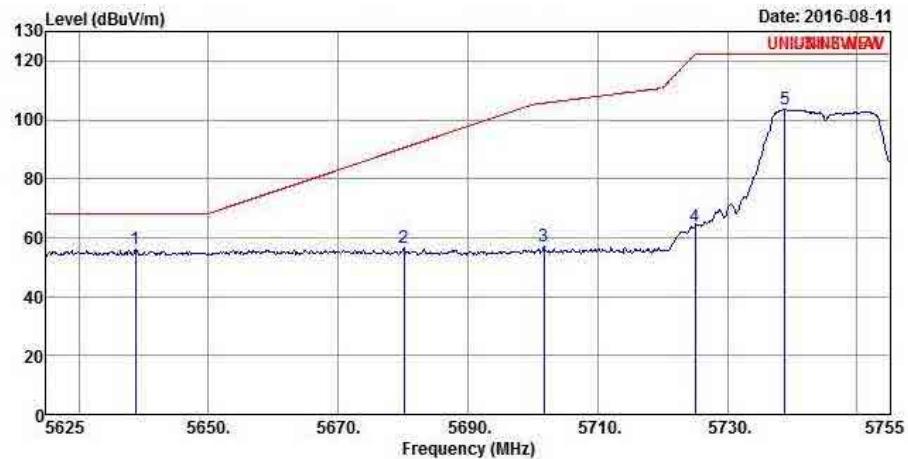
U-NII 5725-5850MHz Transmitter Radiated Bandedge (with Antenna)							
Modulation Mode	N _{TX}	Freq. (MHz)	Measure Distance (m)	Freq. (MHz) PK	Level (dBuV/m) PK	Limit (dBuV/m) PK	Pol.
11a	1	5745	3	5638.780	56.19	68.2	V
11a	1	5825	3	5940.280	55.97	68.2	V
HT20	2	5745	3	5629.160	56.14	68.2	V
HT20	2	5825	3	5941.360	56.04	68.2	V
HT40	2	5755	3	5647.010	55.46	68.2	V
HT40	2	5795	3	5948.920	54.61	68.2	V
VHT80	2	5775	3	5645.800	55.71	68.2	V

Note 1: Measurement worst emissions of receive antenna polarization.



Transmitter Radiated Bandedge Emissions

Modulation Mode	11a	Test Freq. (FX)	F1
N_{TX}	1	Polarization	V

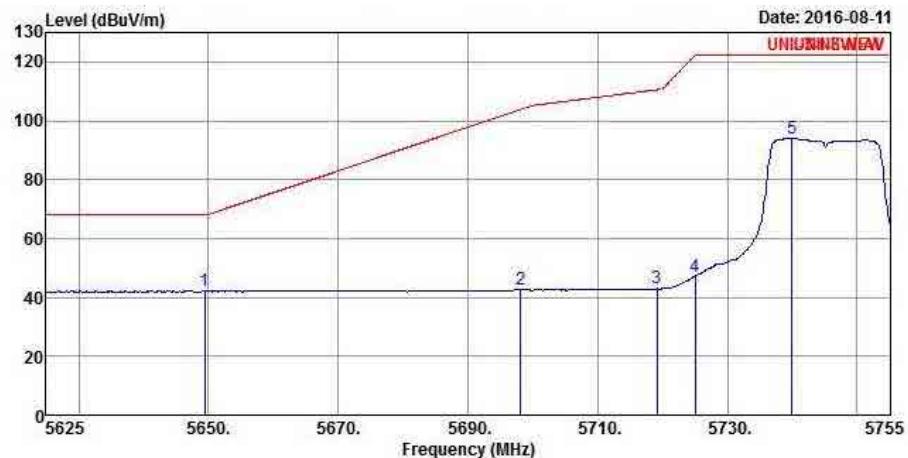


Freq	Level	Over Limit	Limit Line	Read	Antenna Level	Cable Factor	Preamp Loss	Remark
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
5638.7800	56.19	-12.01	68.20	55.10	32.09	4.19	35.19	Peak
5680.1200	56.52	-34.01	90.53	55.37	32.15	4.20	35.20	Peak
5701.7000	57.11	-48.57	105.68	55.92	32.18	4.21	35.20	Peak
5724.9700	63.97	-58.16	122.13	62.76	32.21	4.21	35.21	Peak
5738.8800	103.78	-18.42	122.20	102.55	32.23	4.21	35.21	Peak



Transmitter Radiated Bandedge Emissions

Modulation Mode	11a	Test Freq. (FX)	F1
N_{TX}	1	Polarization	V

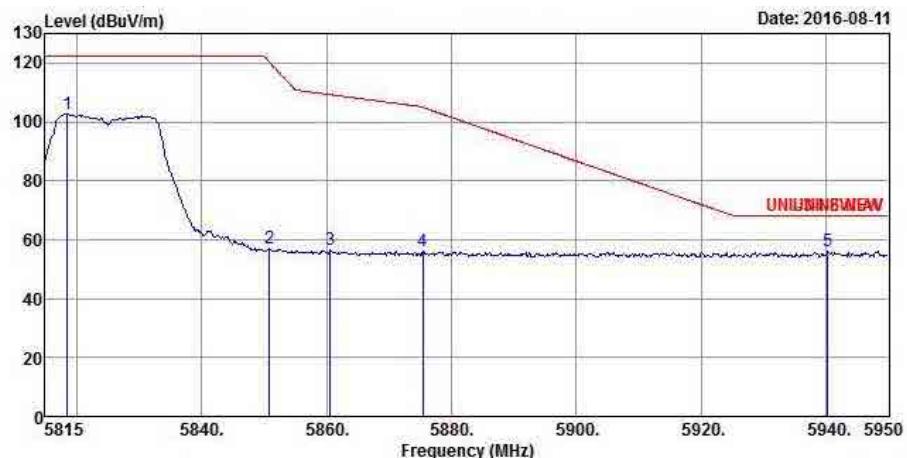


Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Level	Factor	Loss	Factor	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
9.4400	42.13	-26.07	68.20	41.02	32.11	4.19	35.19	Average
8.0600	42.58	-61.19	103.77	41.40	32.18	4.20	35.20	Average
9.1200	43.01	-67.54	110.55	41.80	32.21	4.21	35.21	Average
4.9700	47.22	-74.91	122.13	46.01	32.21	4.21	35.21	Average
9.9200	94.00	-28.20	122.20	92.76	32.24	4.21	35.21	Average

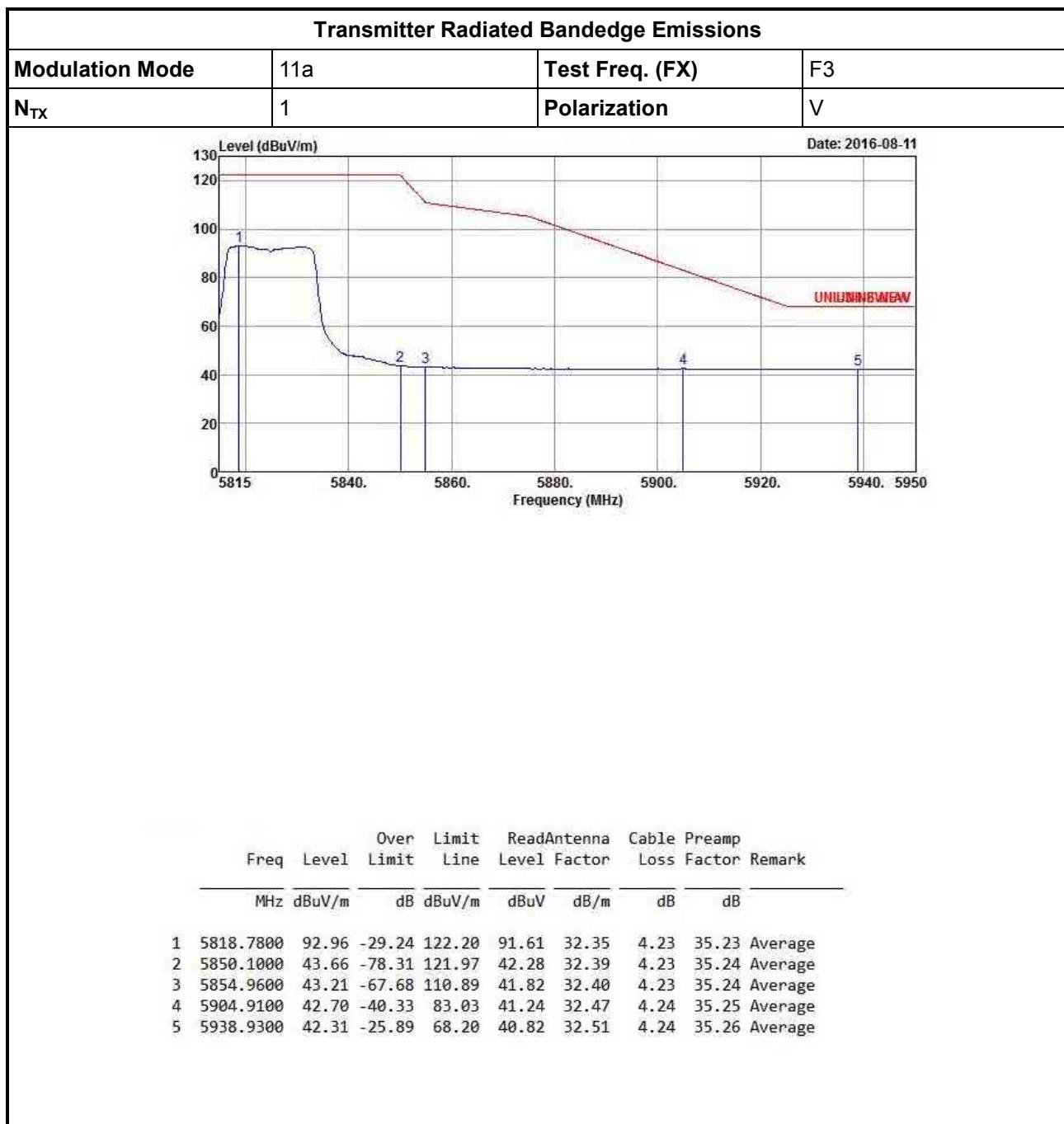


Transmitter Radiated Bandedge Emissions

Modulation Mode	11a	Test Freq. (FX)	F3
N _{TX}	1	Polarization	V

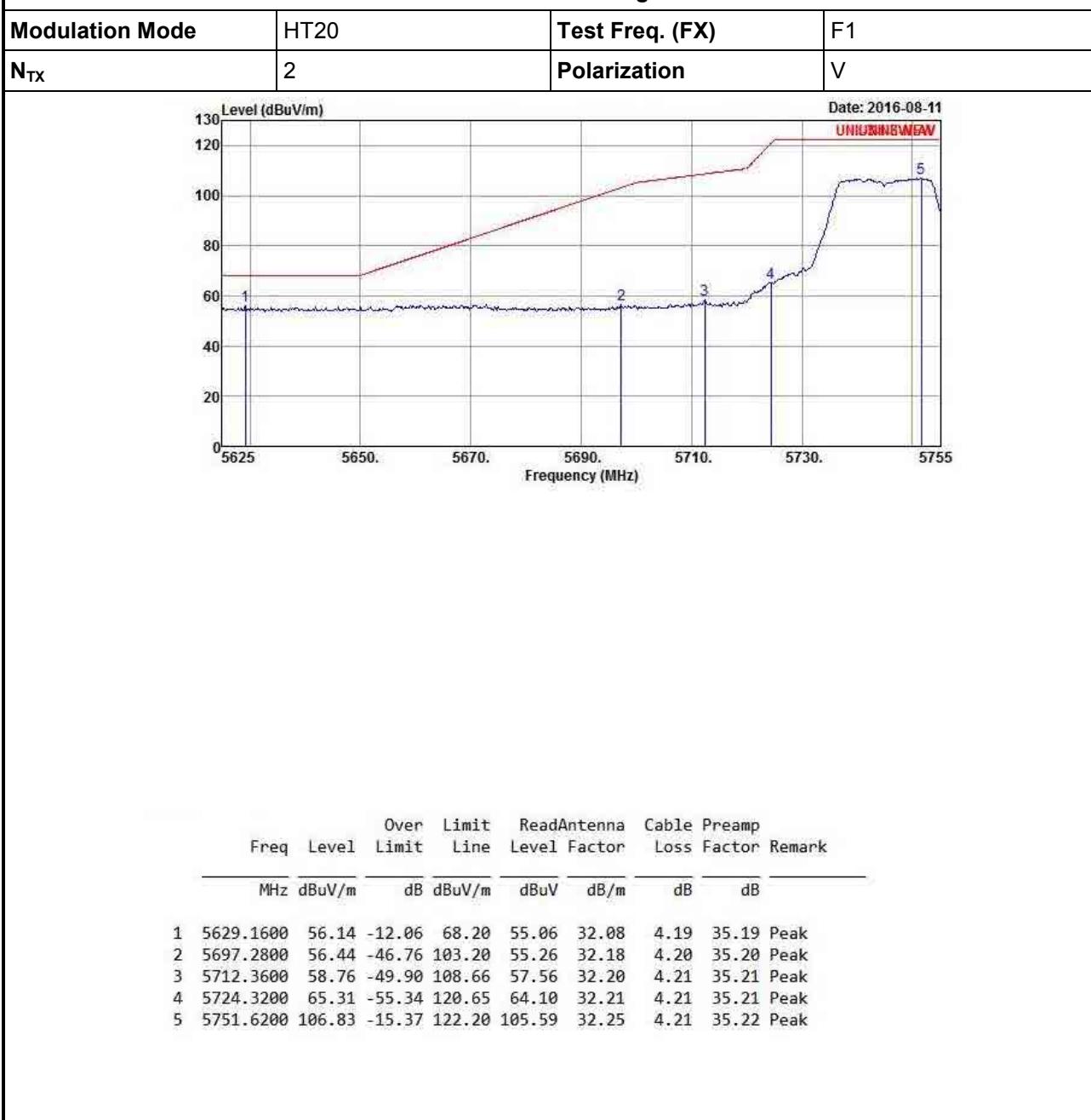


Freq	Level	Over Limit		Read	Antenna	Cable	Preamplifier	Remark
		Limit	Line					
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	5818.5100	102.88	-19.32	122.20	101.53	32.35	4.23	35.23 Peak
2	5850.9100	57.06	-63.06	120.12	55.68	32.39	4.23	35.24 Peak
3	5860.6300	56.62	-52.60	109.22	55.23	32.40	4.23	35.24 Peak
4	5875.4800	56.33	-48.51	104.84	54.91	32.43	4.23	35.24 Peak
5	5940.2800	55.97	-12.23	68.20	54.47	32.52	4.24	35.26 Peak





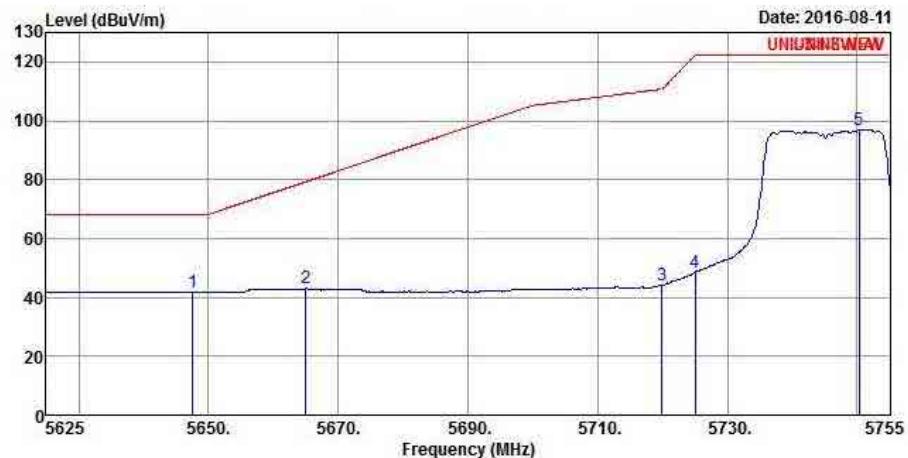
Transmitter Radiated Bandedge Emissions





Transmitter Radiated Bandedge Emissions

Modulation Mode	HT20	Test Freq. (FX)	F1
N_{TX}	2	Polarization	V



Freq	Level	Over	Limit	ReadAntenna		Cable	Preamp	Remark
		Limit	Line	Level	Factor	Loss	Factor	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
47.6200	41.94	-26.26	68.20	40.83	32.11	4.19	35.19	Average
55.0400	43.07	-36.29	79.36	41.94	32.13	4.20	35.20	Average
59.9000	44.09	-66.68	110.77	42.88	32.21	4.21	35.21	Average
24.9700	48.50	-73.63	122.13	47.29	32.21	4.21	35.21	Average
60.3200	97.09	-25.11	122.20	95.85	32.25	4.21	35.22	Average



Transmitter Radiated Bandedge Emissions

Modulation Mode	HT20	Test Freq. (FX)	F3
N_{TX}	2	Polarization	V

Date: 2016-08-11

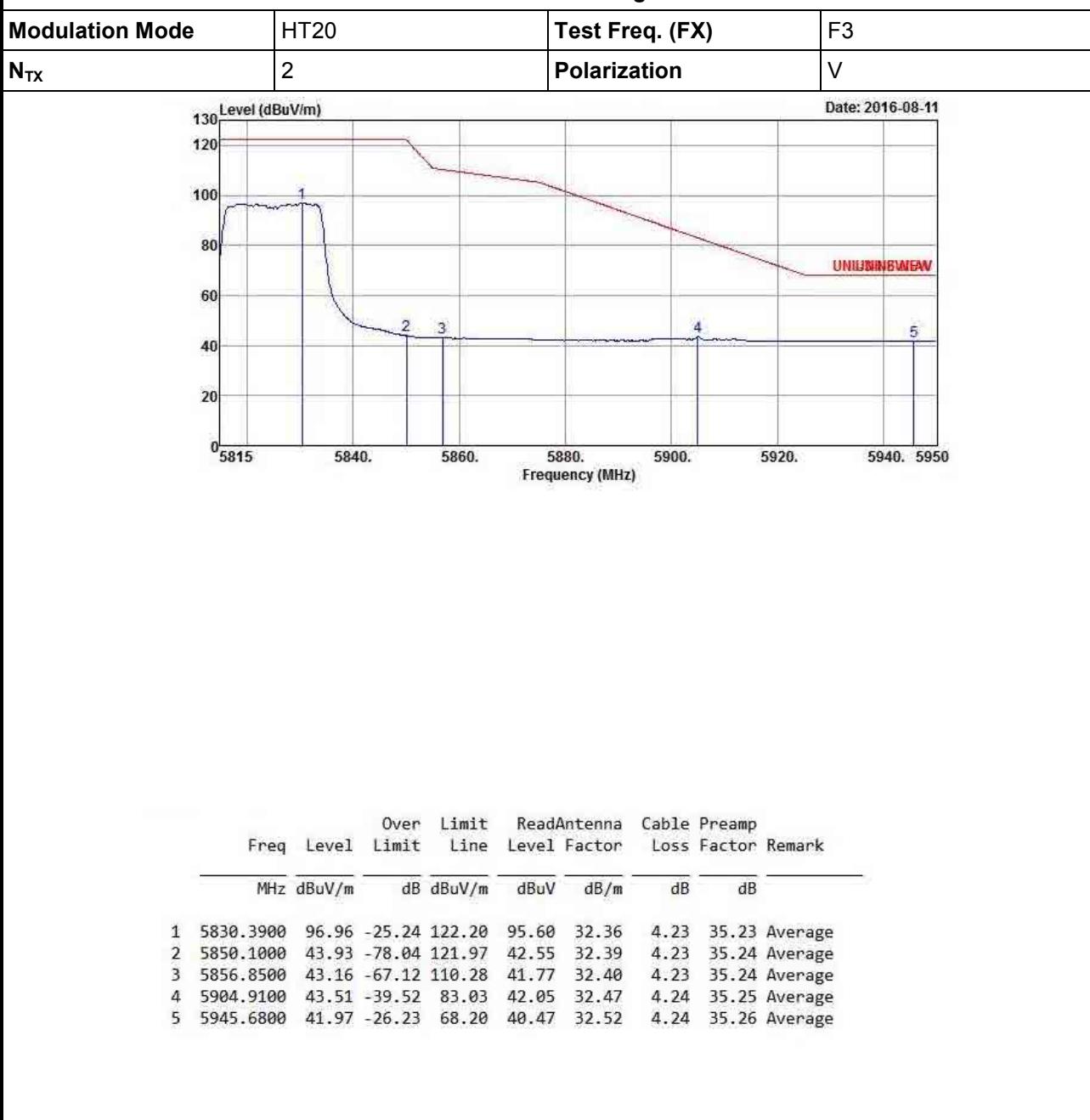
Level (dBuV/m)

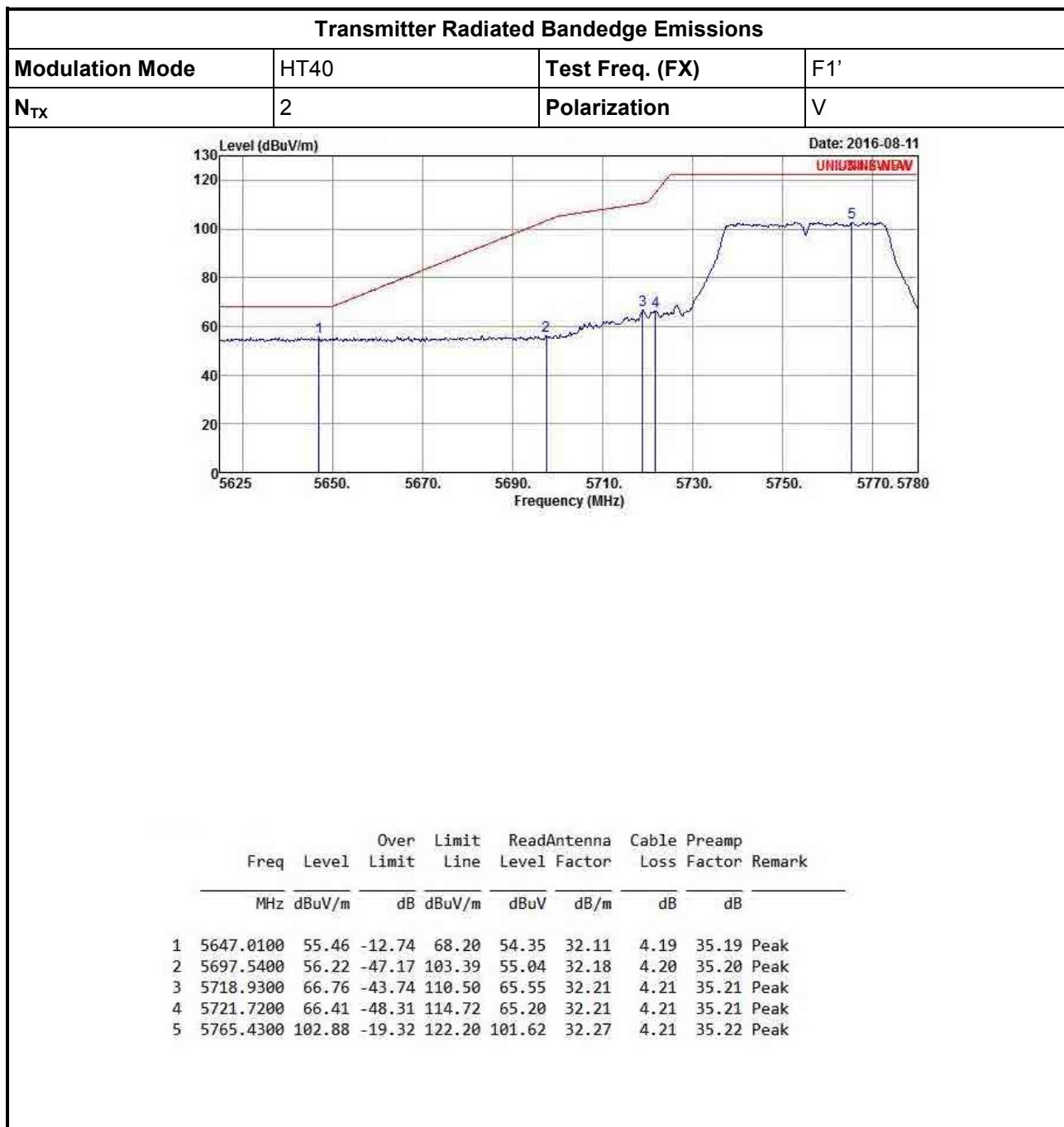
Frequency (MHz)

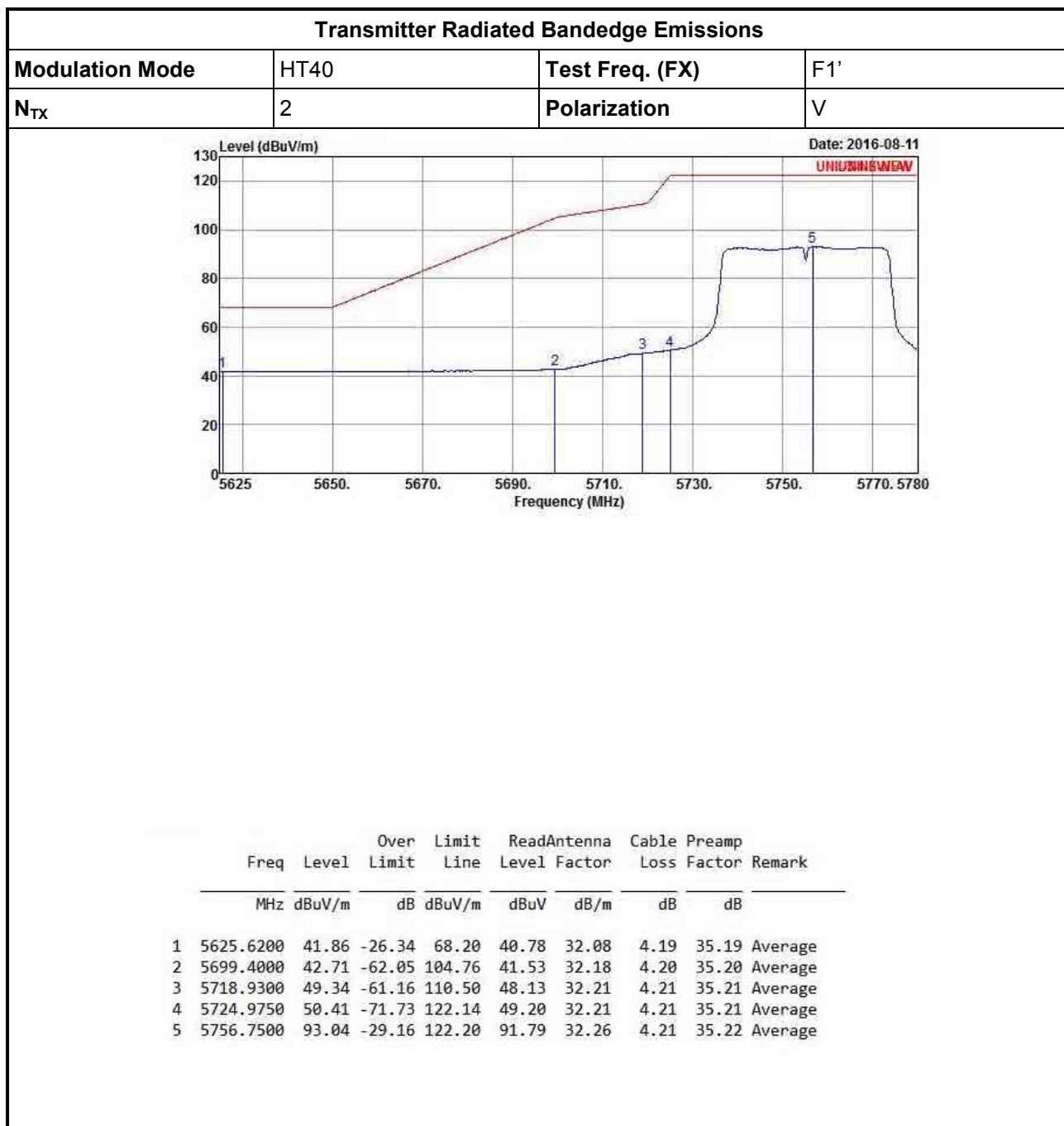
Freq	Level	Over Limit		Read	Antenna	Cable Preamp		Remark
		MHz	dBuV/m			dB	dBuV/m	
1	5822.0200	106.69	-15.51	122.20	105.34	32.35	4.23	35.23 Peak
2	5851.7200	57.29	-60.99	118.28	55.91	32.39	4.23	35.24 Peak
3	5857.9300	56.92	-53.06	109.98	55.53	32.40	4.23	35.24 Peak
4	5900.3200	56.50	-29.92	86.42	55.05	32.46	4.24	35.25 Peak
5	5941.3600	56.04	-12.16	68.20	54.54	32.52	4.24	35.26 Peak



Transmitter Radiated Bandedge Emissions



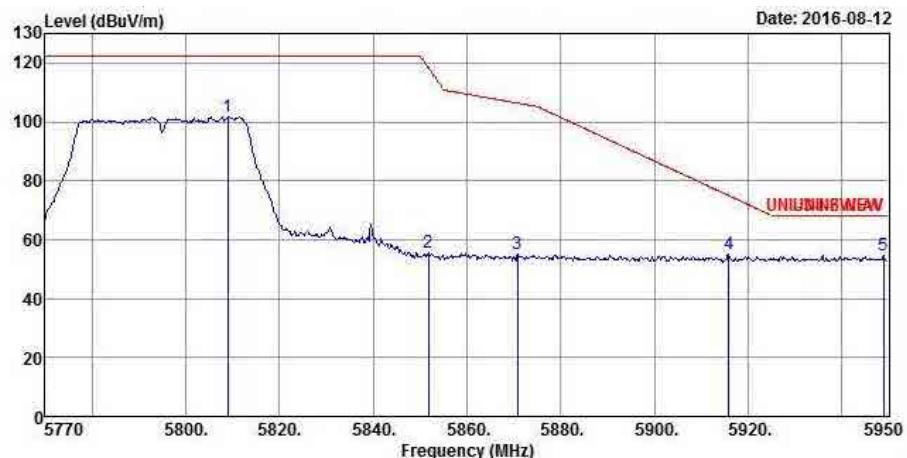






Transmitter Radiated Bandedge Emissions

Modulation Mode	HT40	Test Freq. (FX)	F2'
N _{TX}	2	Polarization	V

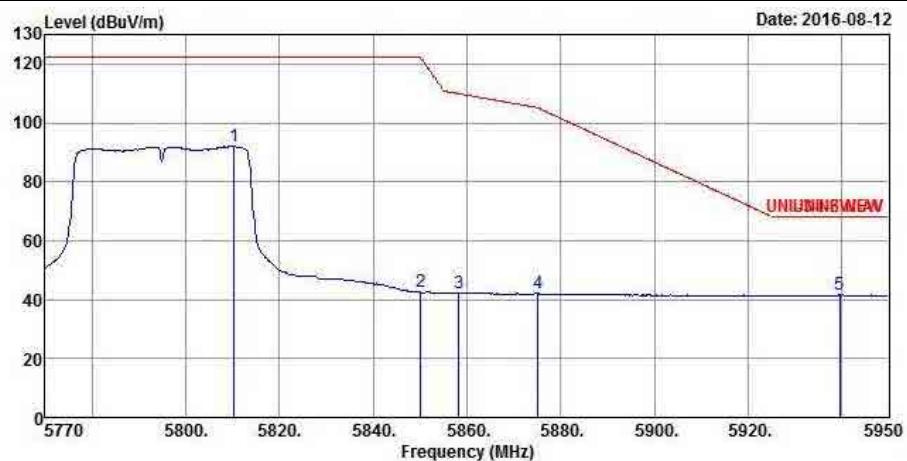


Freq	Level	Over Limit		Read	Antenna	Cable	Preamplifier	Remark
		Limit	Line					
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	5808.8800	101.75	-20.45	122.20	100.43	32.33	4.22	35.23 Peak
2	5851.7200	55.44	-62.84	118.28	54.06	32.39	4.23	35.24 Peak
3	5870.8000	55.12	-51.25	106.37	53.71	32.42	4.23	35.24 Peak
4	5915.8000	55.12	-19.86	74.98	53.65	32.48	4.24	35.25 Peak
5	5948.9200	54.61	-13.59	68.20	53.10	32.53	4.24	35.26 Peak



Transmitter Radiated Bandedge Emissions

Modulation Mode	HT40	Test Freq. (FX)	F2'
N _{TX}	2	Polarization	V

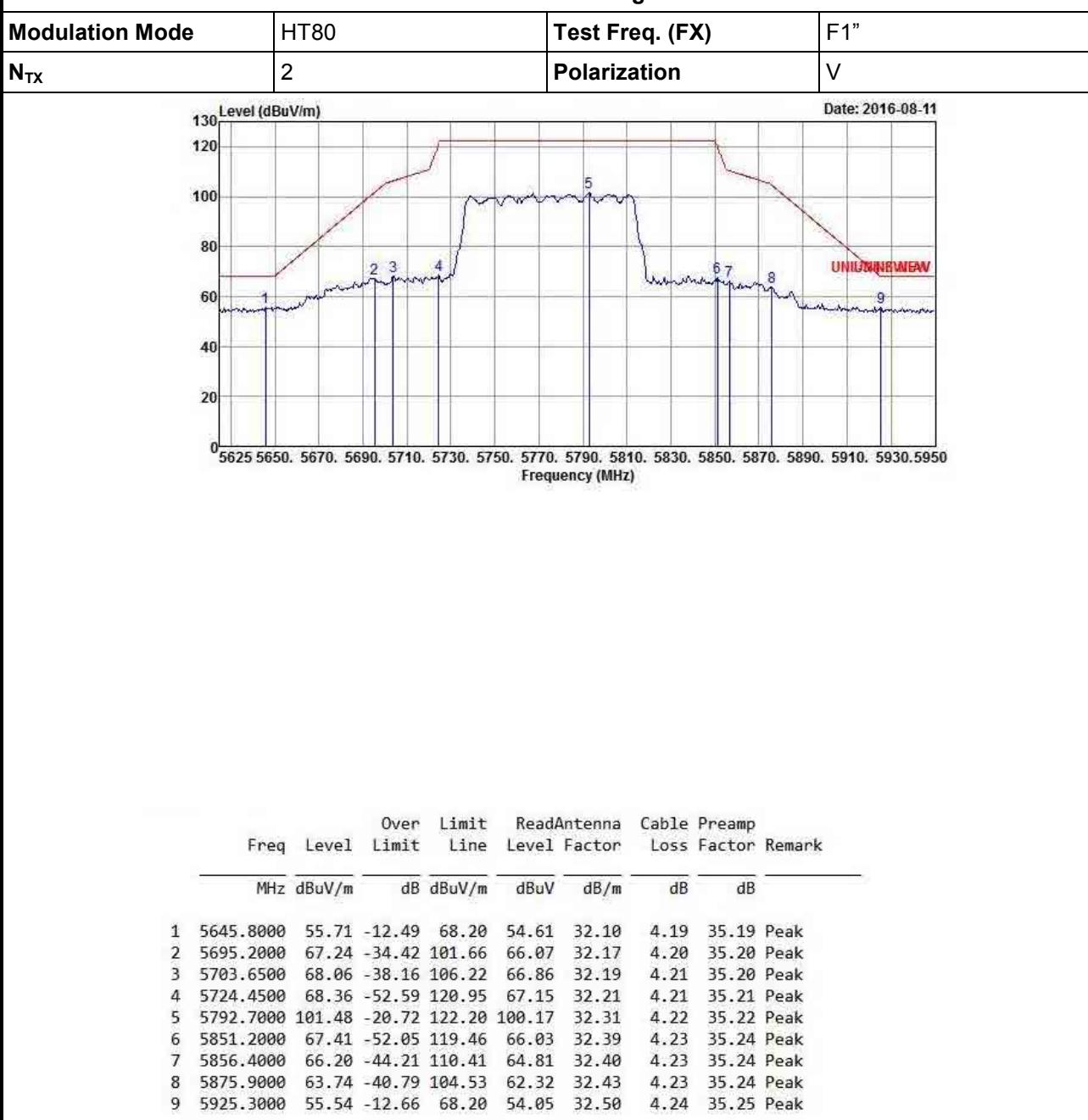


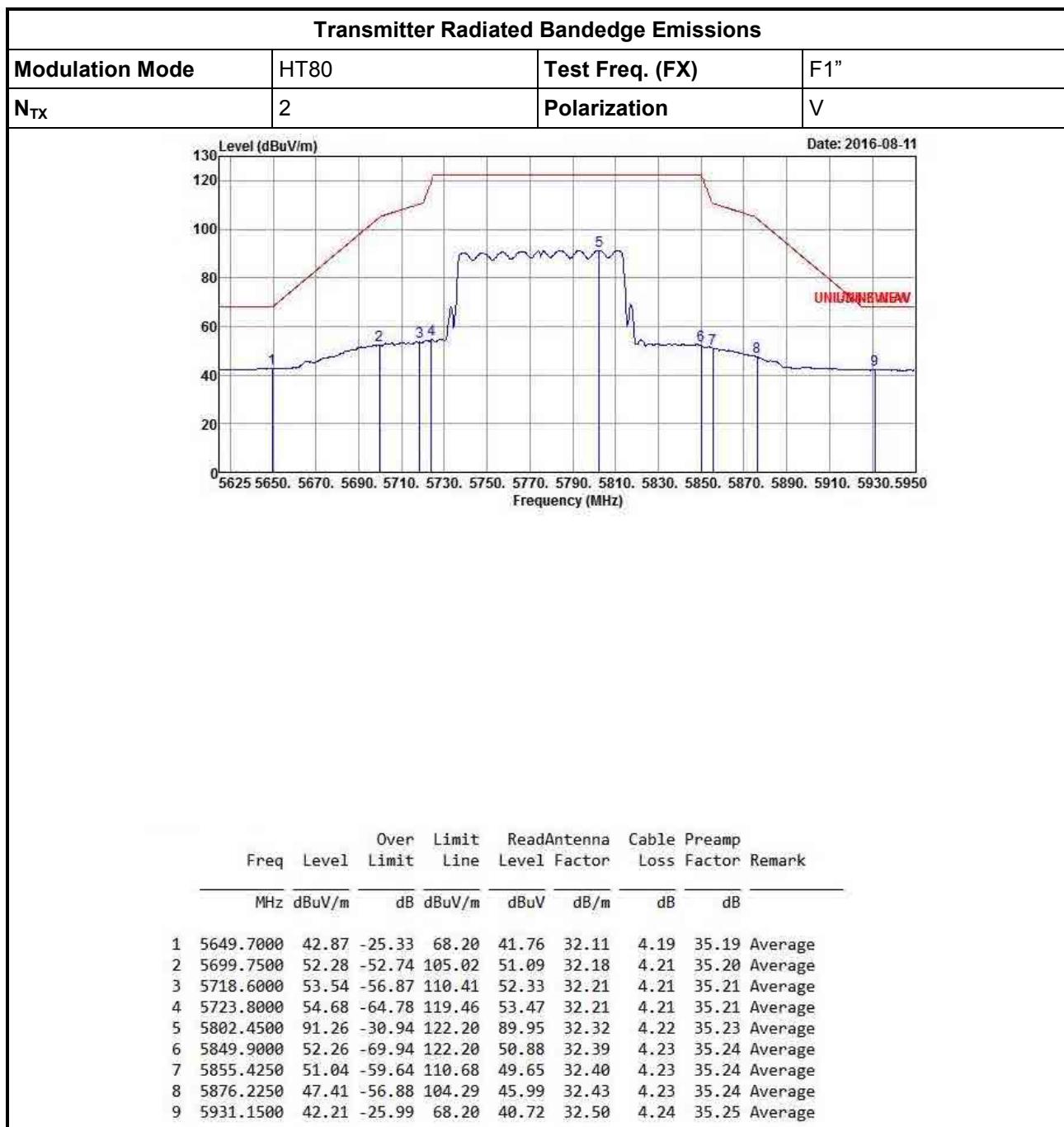
	Freq	Over Limit	Limit	Read	Antenna	Cable	Preamp
	MHz	dB	dBuV/m	Level	Factor	Loss	Factor

	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	5810.3200	91.97	-30.23	122.20	90.65	32.33	4.22	35.23	Average
2	5850.1000	42.55	-79.42	121.97	41.17	32.39	4.23	35.24	Average
3	5858.2000	42.31	-67.59	109.90	40.92	32.40	4.23	35.24	Average
4	5875.1200	42.09	-63.02	105.11	40.67	32.43	4.23	35.24	Average
5	5939.5600	41.54	-26.66	68.20	40.04	32.52	4.24	35.26	Average



Transmitter Radiated Bandedge Emissions







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 above 1GHz Limit	
Operating Band	Limit
5.15 - 5.25 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.25 - 5.35 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.47 - 5.725 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.725 - 5.85 GHz	5.650-5700 GHz: e.i.r.p. -27 ~ 10 dBm [68.2 ~ 105.2 dBuV/m@3m] 5.700-5720 GHz: e.i.r.p. 10 ~ 15.6 dBm [105.2 ~ 110.8 dBuV/m@3m] 5.720-5725 GHz: e.i.r.p. 15.6 ~ 27 dBm [110.8 ~ 122.2 dBuV/m@3m] 5.850-5.855 GHz: e.i.r.p. 27 ~ 15.6 dBm [122.2 ~ 110.8 dBuV/m@3m] 5.855-5.875 GHz: e.i.r.p. 15.6 ~ 10 dBm [110.8 ~ 105.2 dBuV/m@3m] 5.875-5.925 GHz: e.i.r.p. 10 ~ -27 dBm [105.2 ~ 68.2 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.

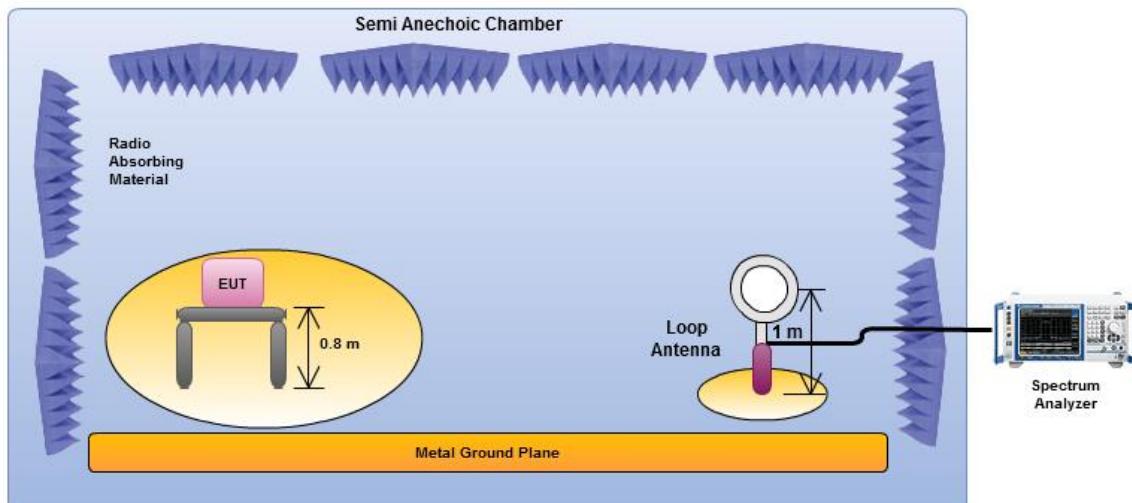
3.6.3 Test Procedures

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"/>	<input checked="" type="checkbox"/> Refer as FCC KDB 789033, clause G2) for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Refer as FCC KDB 789033, clause G1) for unwanted emissions into restricted bands.
	<input type="checkbox"/> Refer as FCC KDB 789033, G)6) Method AD (Trace Averaging).
	<input type="checkbox"/> Refer as FCC KDB 789033, G)6) Method VB (Reduced VBW).
	<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 4.1.4.2.3 (Reduced VBW). $VBW \geq 1/T$, where T is pulse time.
	<input type="checkbox"/> Refer as ANSI C63.10, clause 4.1.4.2.4 average value of pulsed emissions.
	<input checked="" type="checkbox"/> Refer as FCC KDB 789033, clause G)5) measurement procedure peak limit.
	<input type="checkbox"/> Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak limit.
<input checked="" type="checkbox"/>	For radiated measurement.
<input checked="" type="checkbox"/>	<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"/>	<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"/>	<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1GHz. For 1 GHz to 5 GHz, test distance is 3m; For 5 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

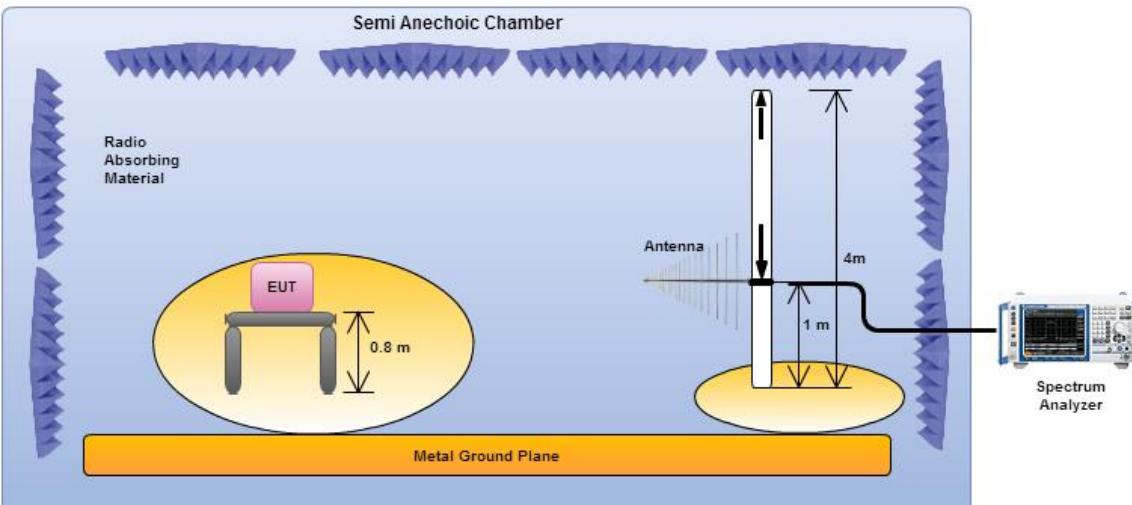
3.6.5

Transmitter Spurious and Out of Band Emissions (9 kHz - 30 MHz)

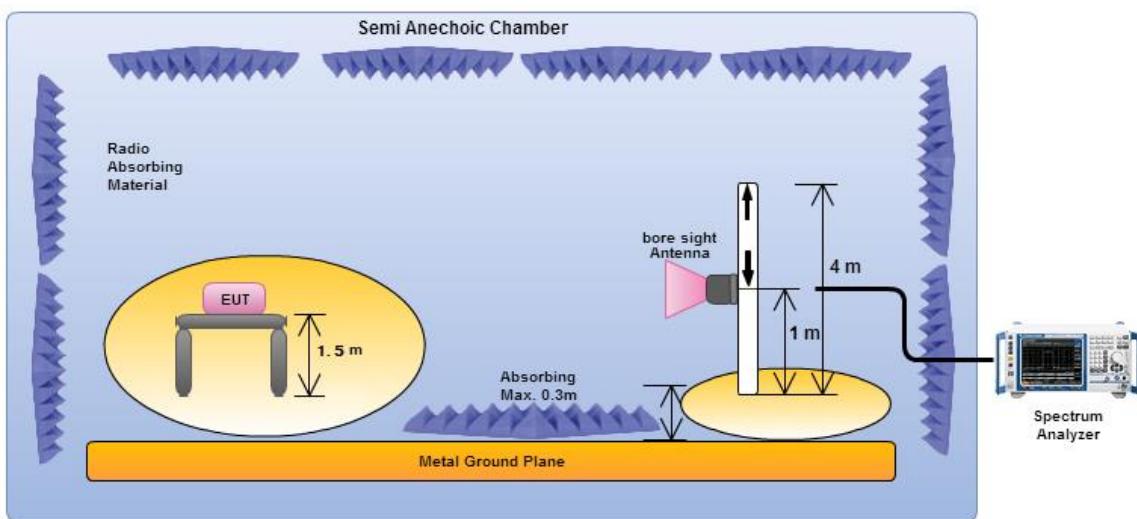


Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna.

Transmitter Radiated Unwanted Emissions (below 1GHz)



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)

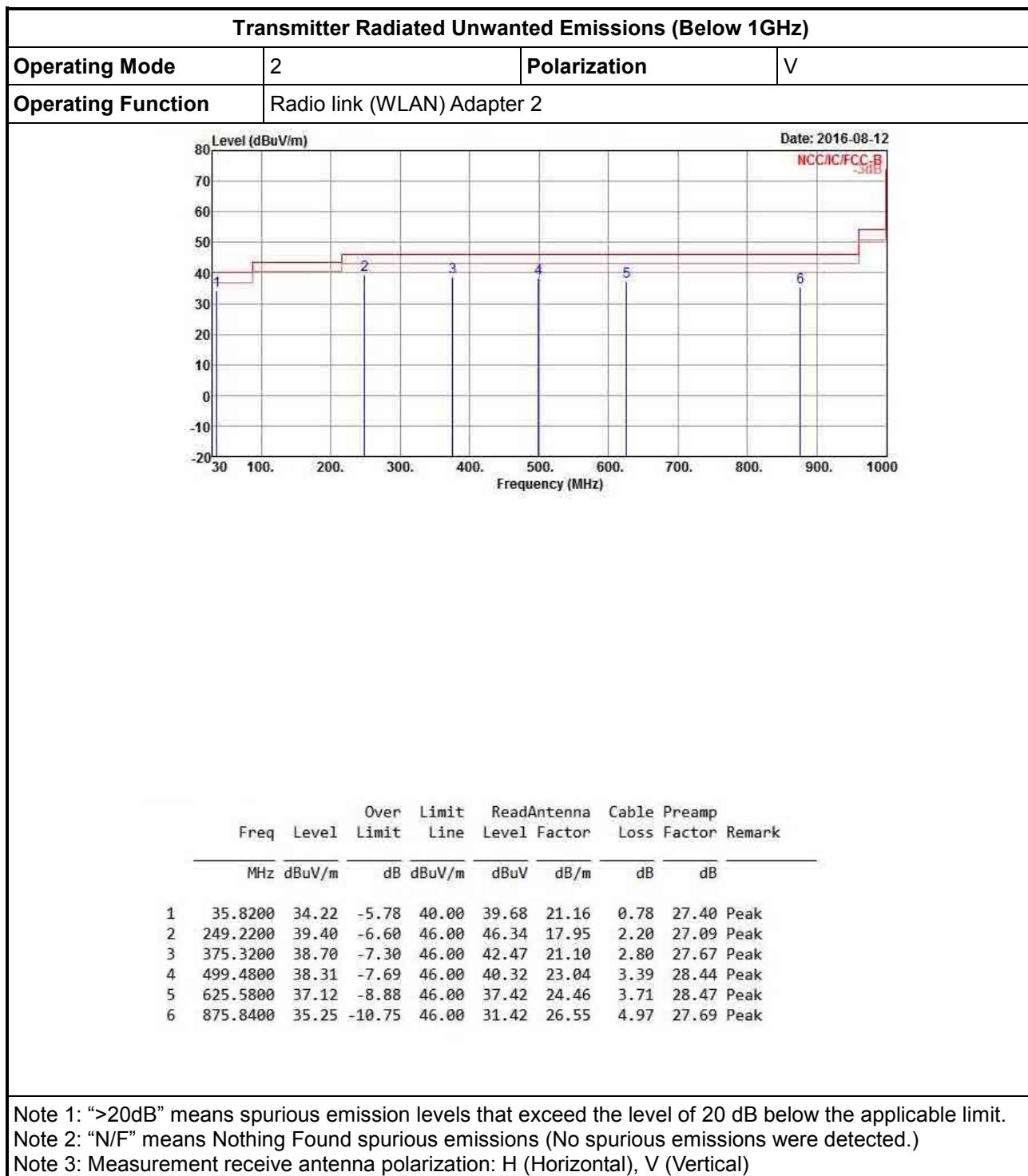
Electric field tests shall be performed in the frequency range of 1 GHz to 10th harmonic of highest fundamental frequency or 40 GHz using a calibrated horn antenna.

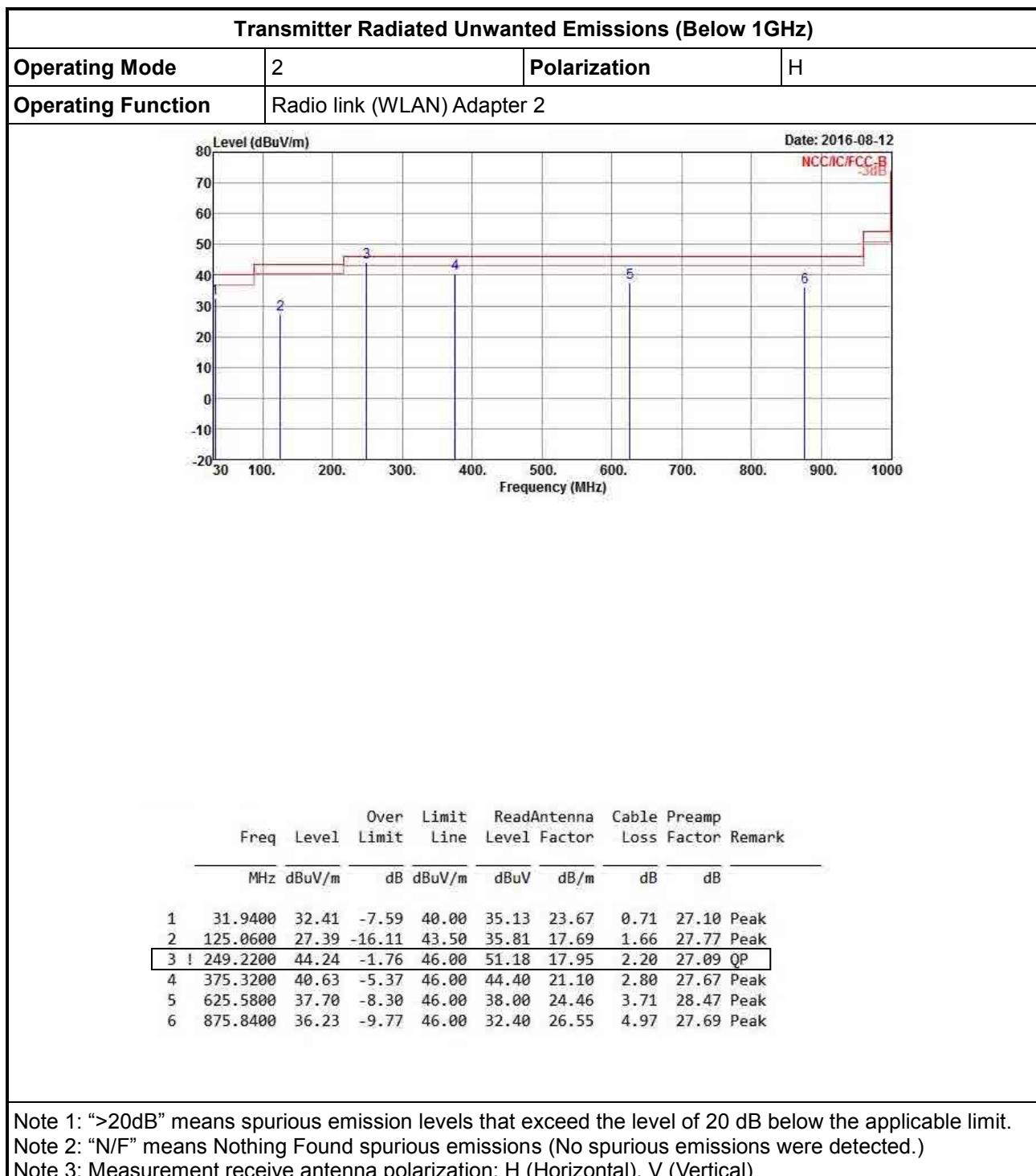
3.6.6 Transmitter Radiated Unwanted Emissions (Below 30MHz)

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported. any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.

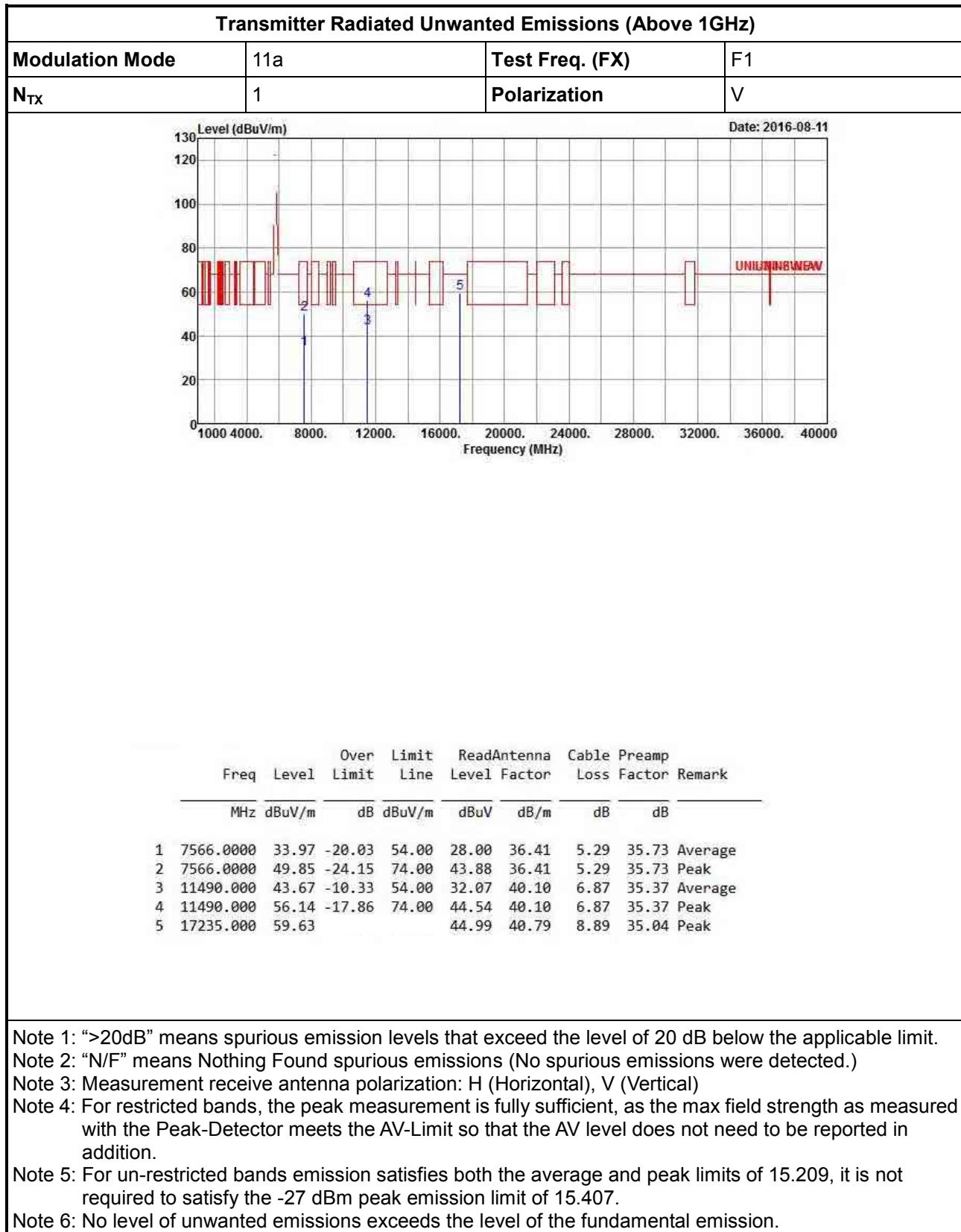


3.6.7 Transmitter Radiated Unwanted Emissions (Below 1GHz)





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



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

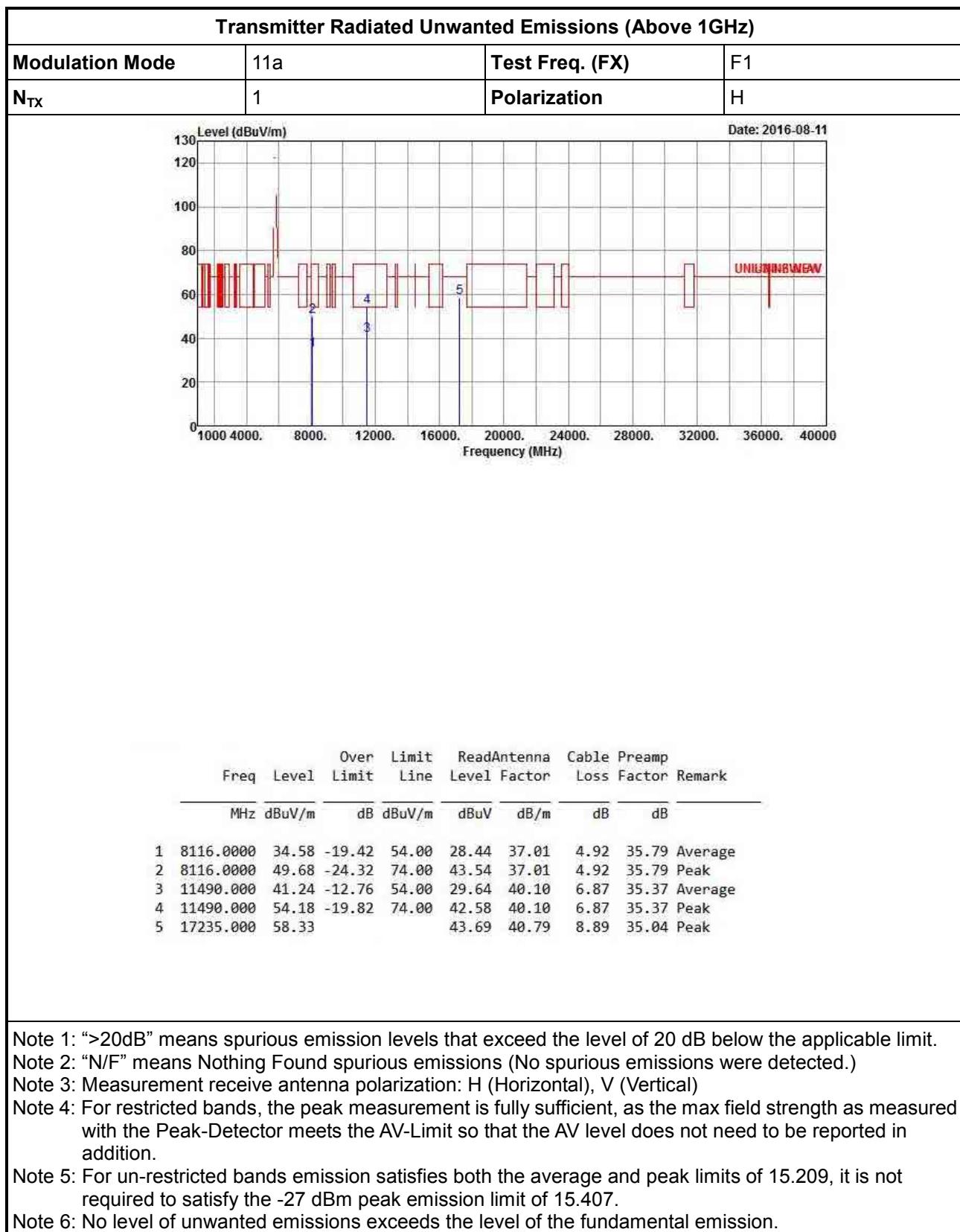
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

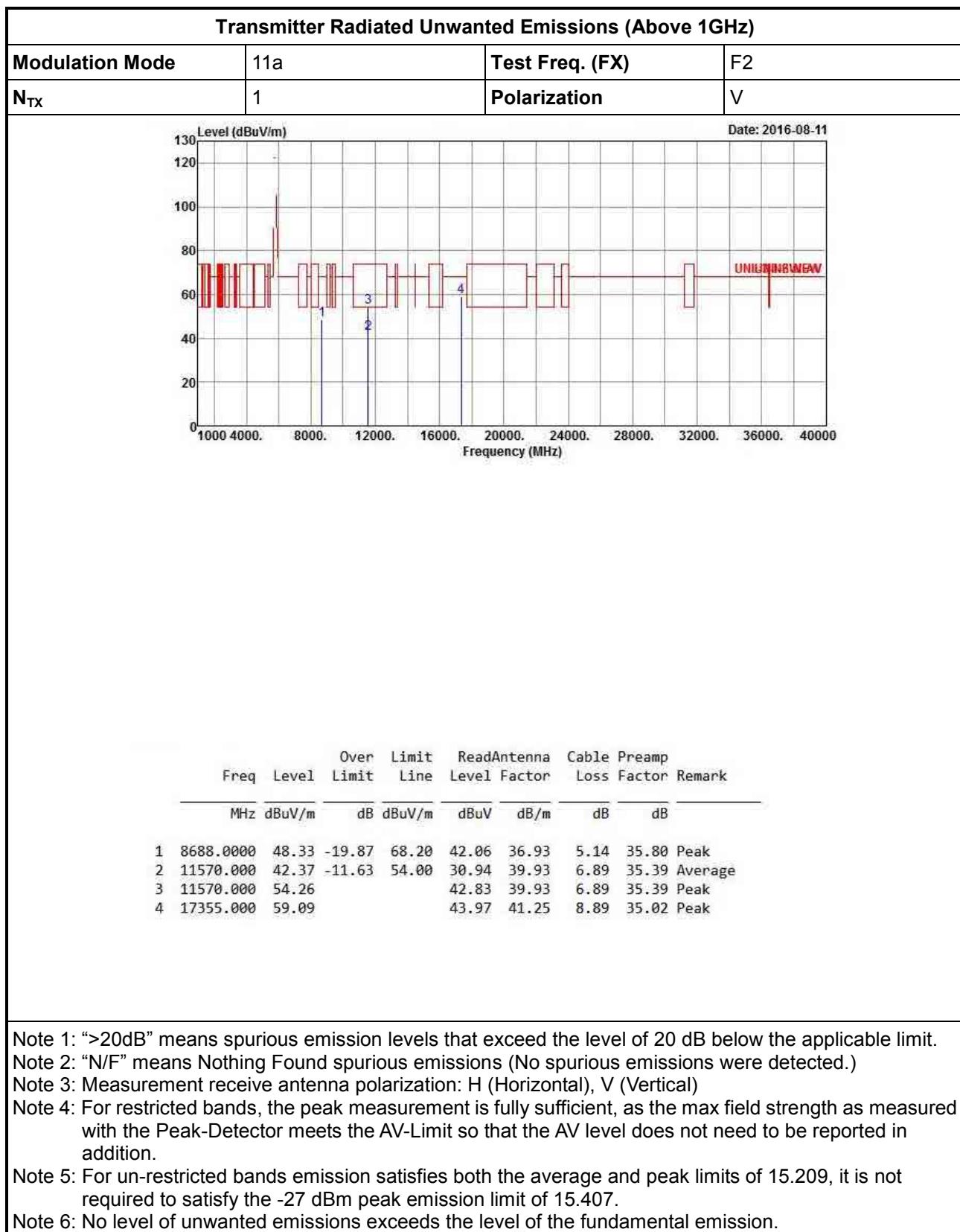
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

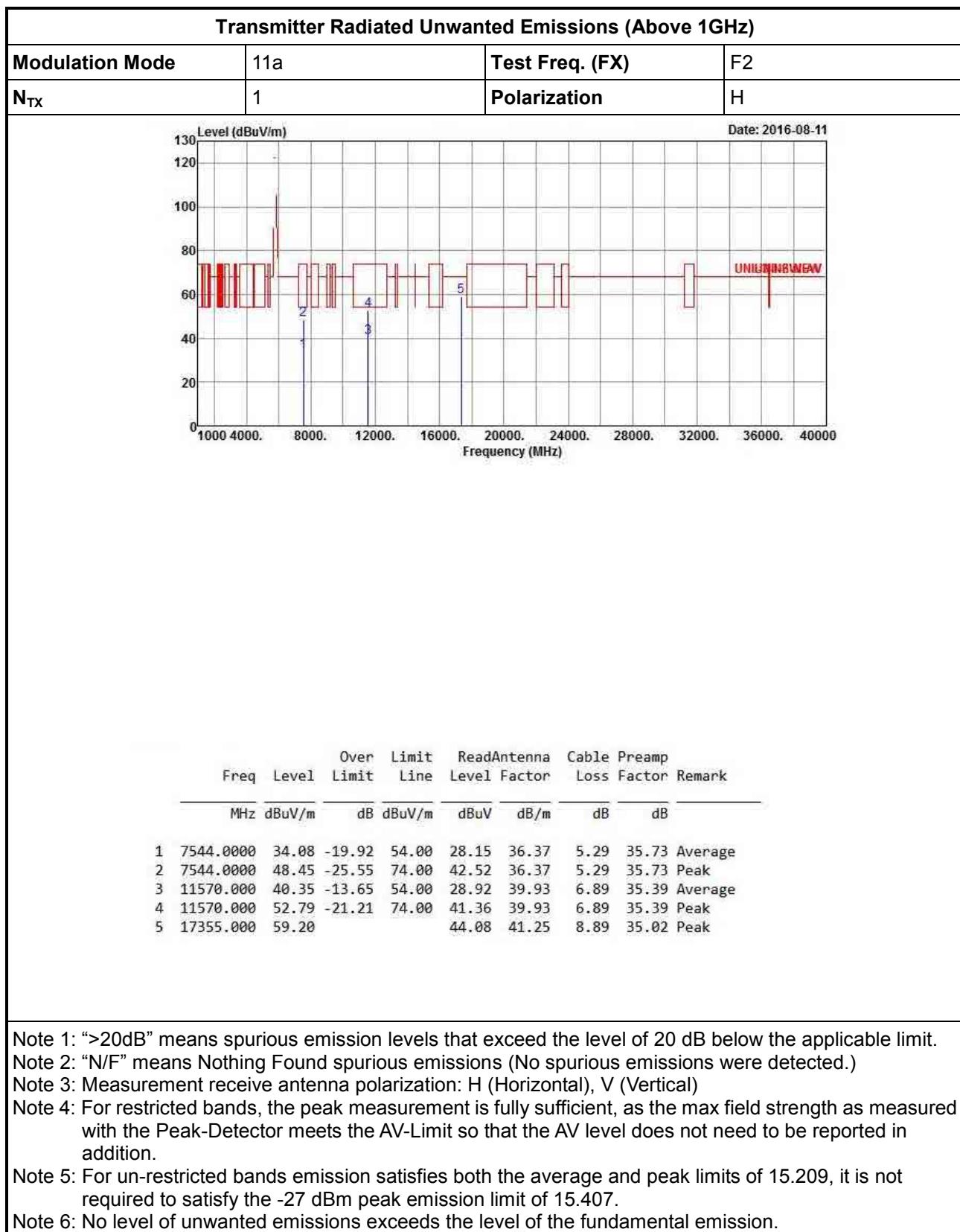
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

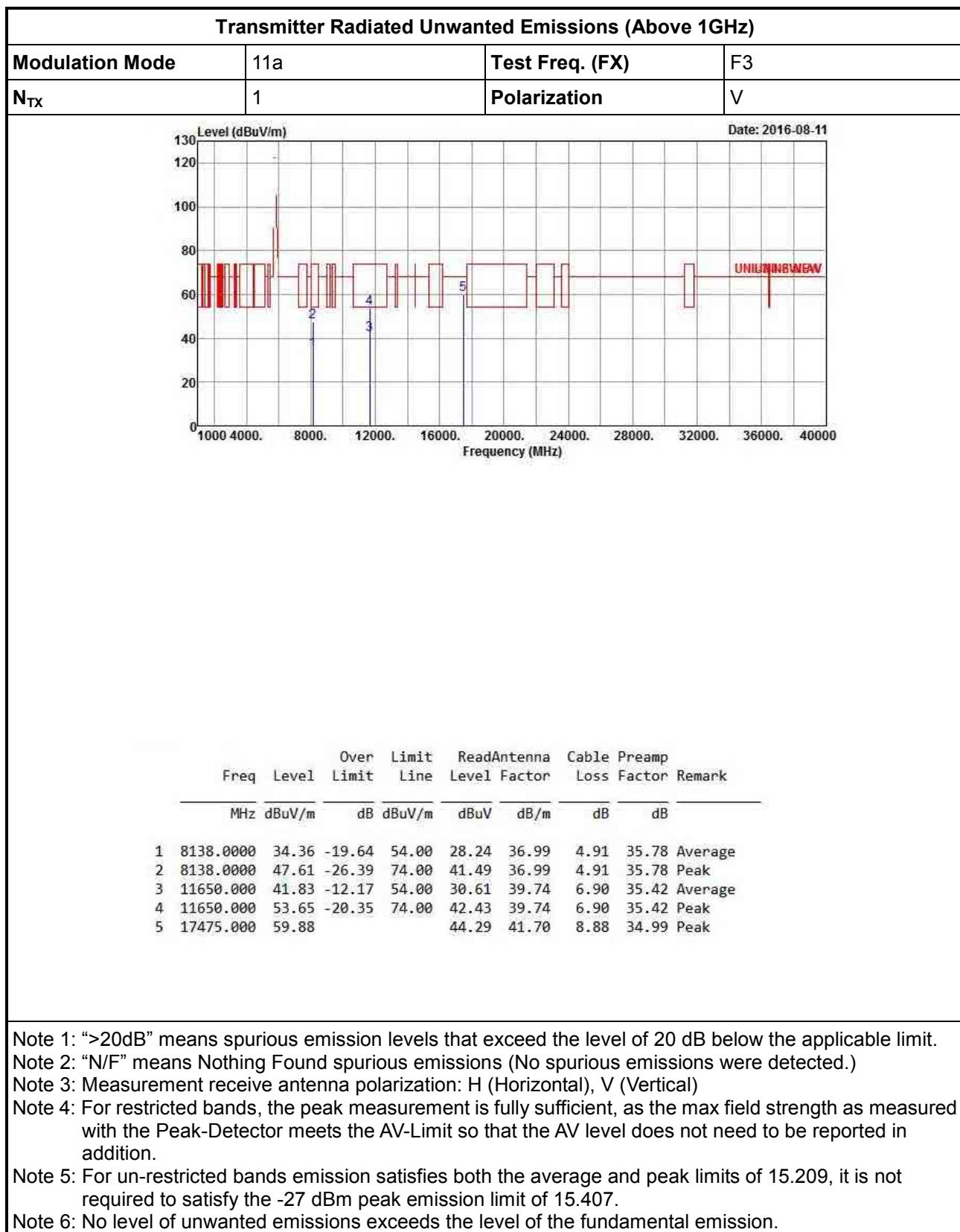
Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

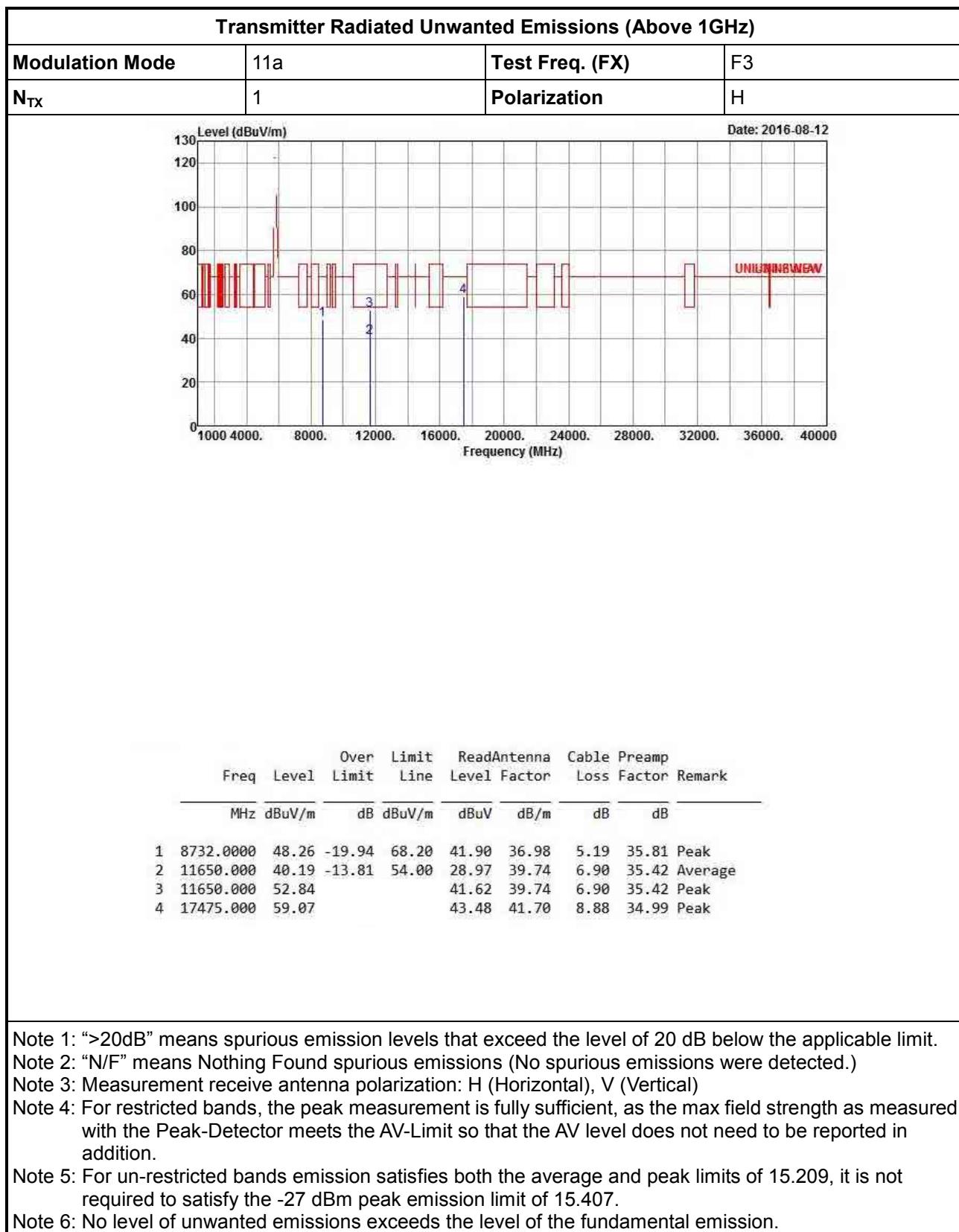
Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.



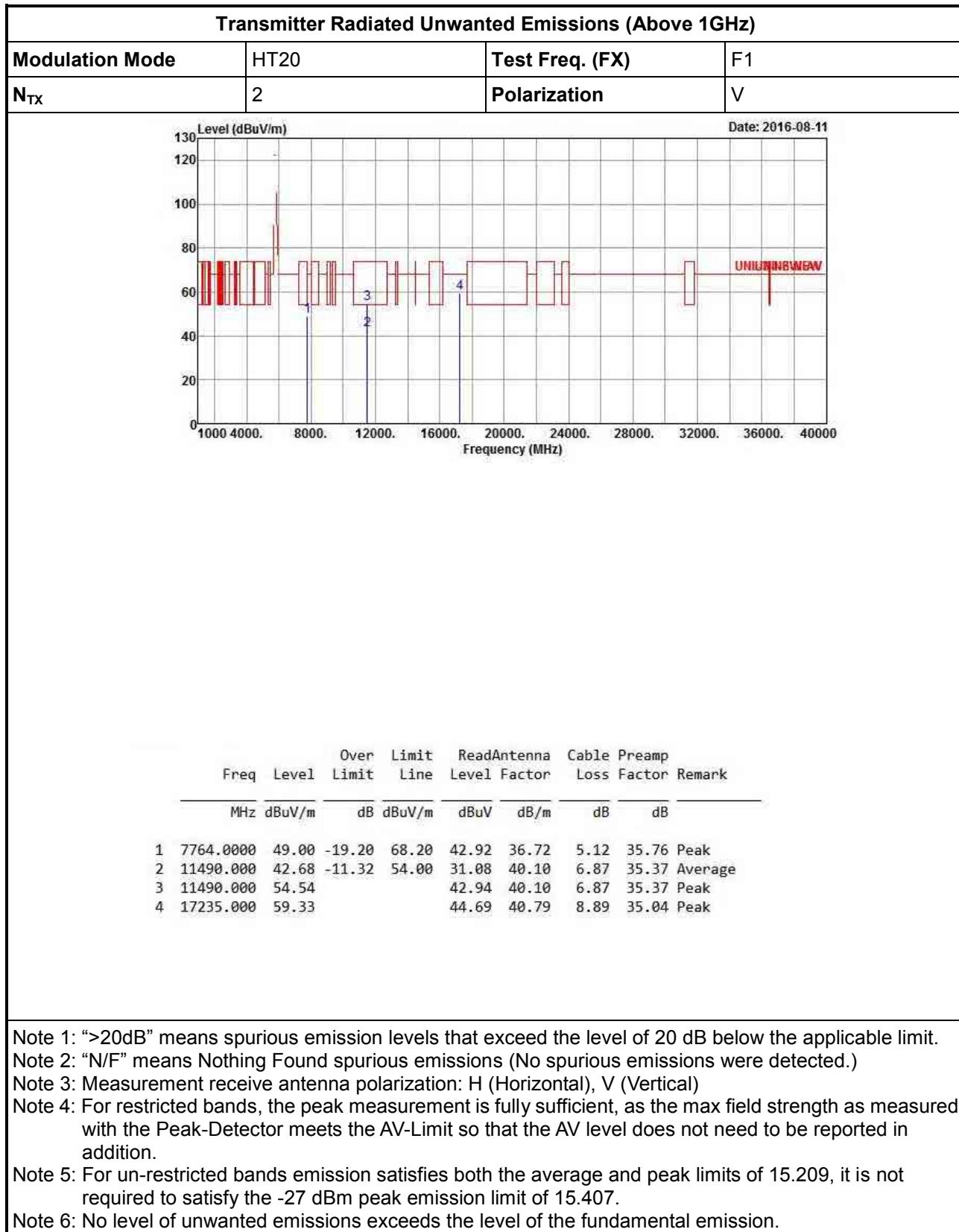


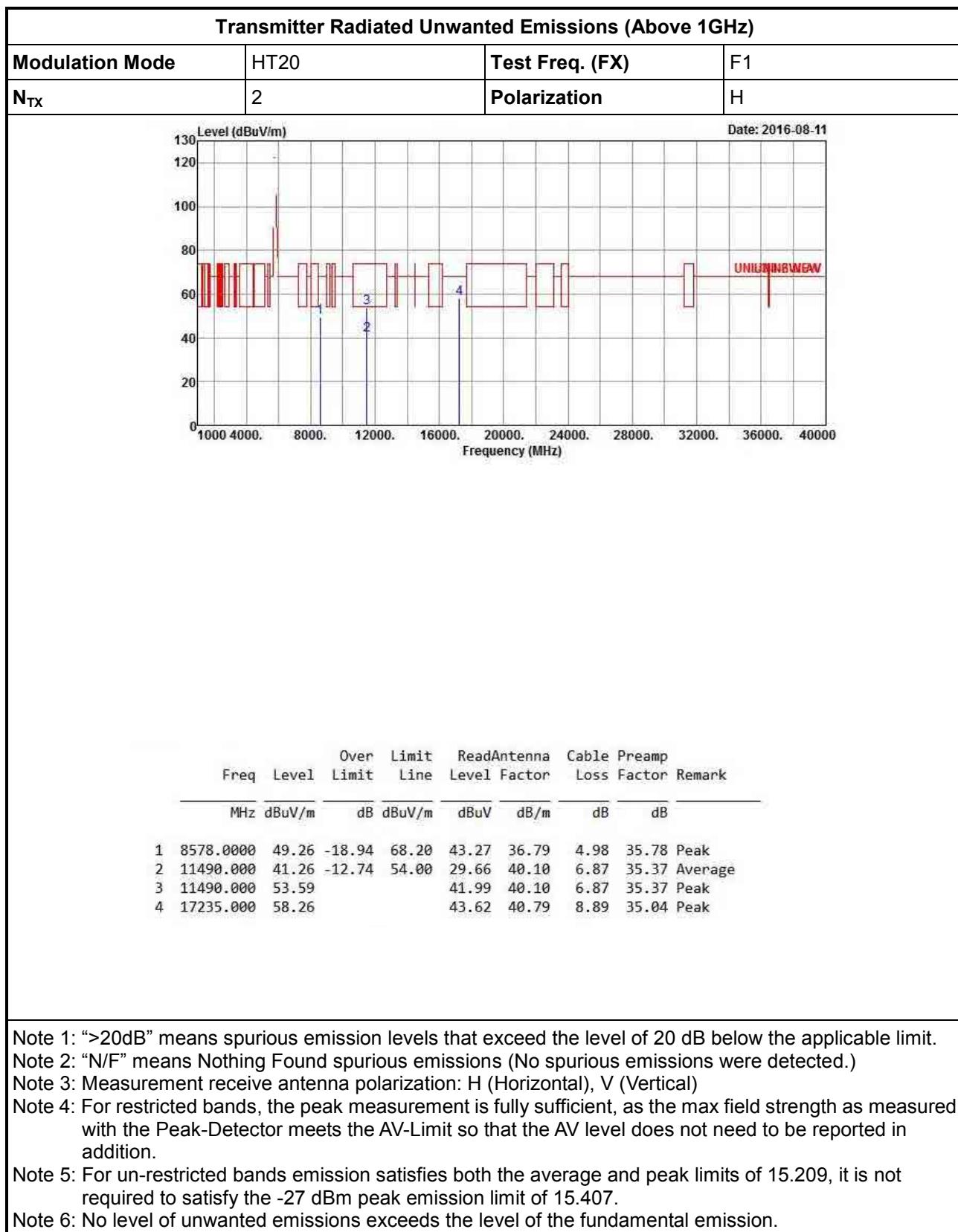


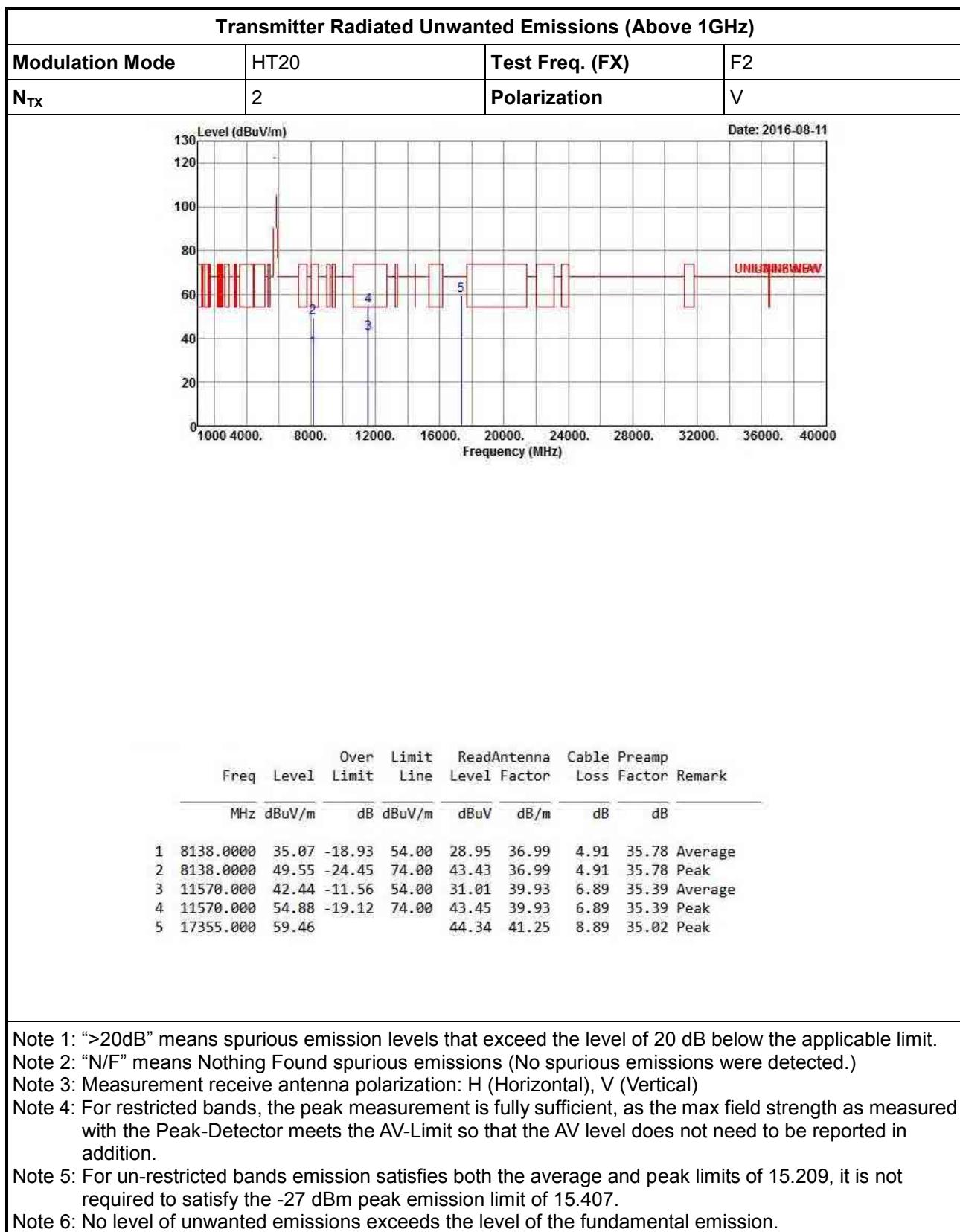


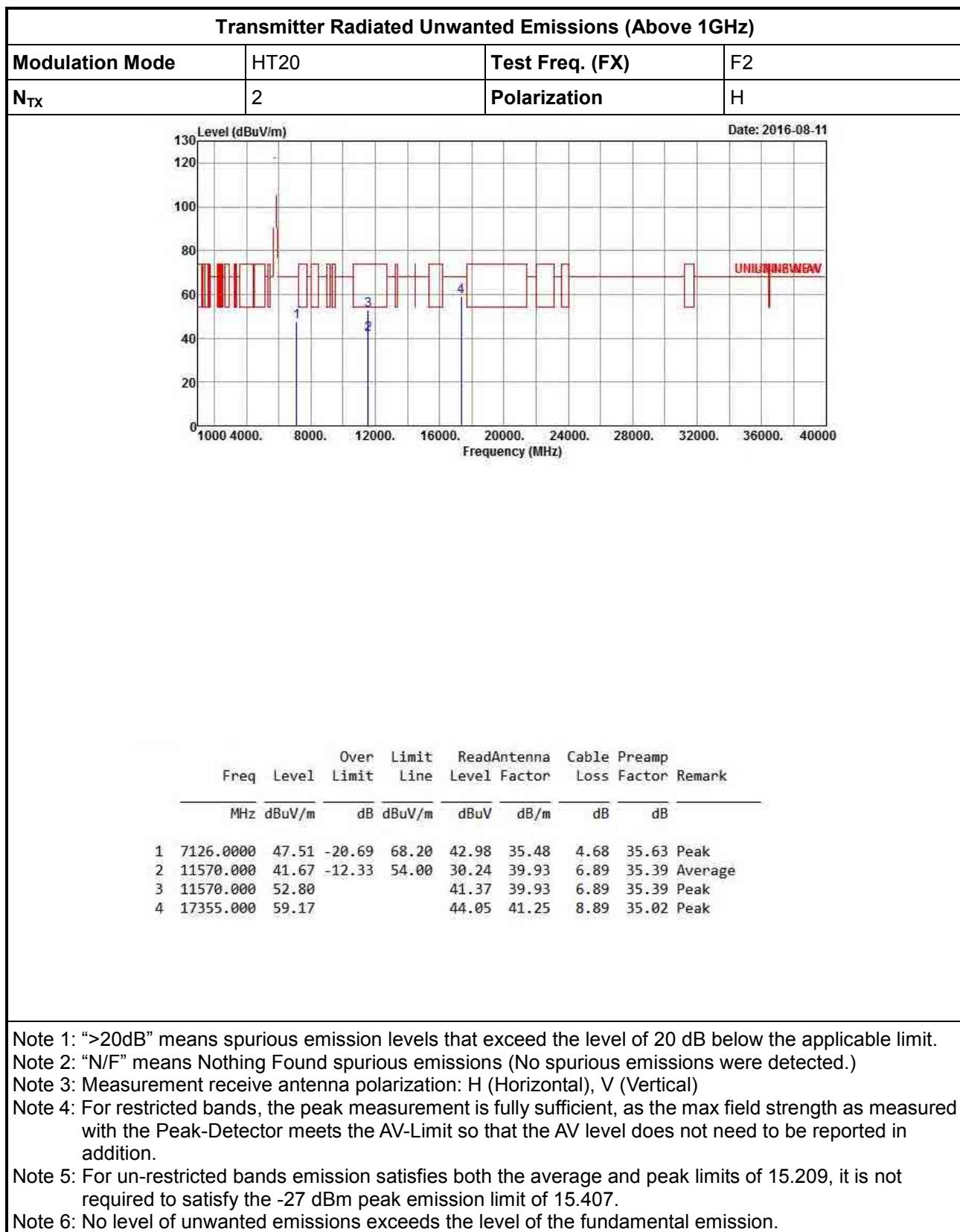


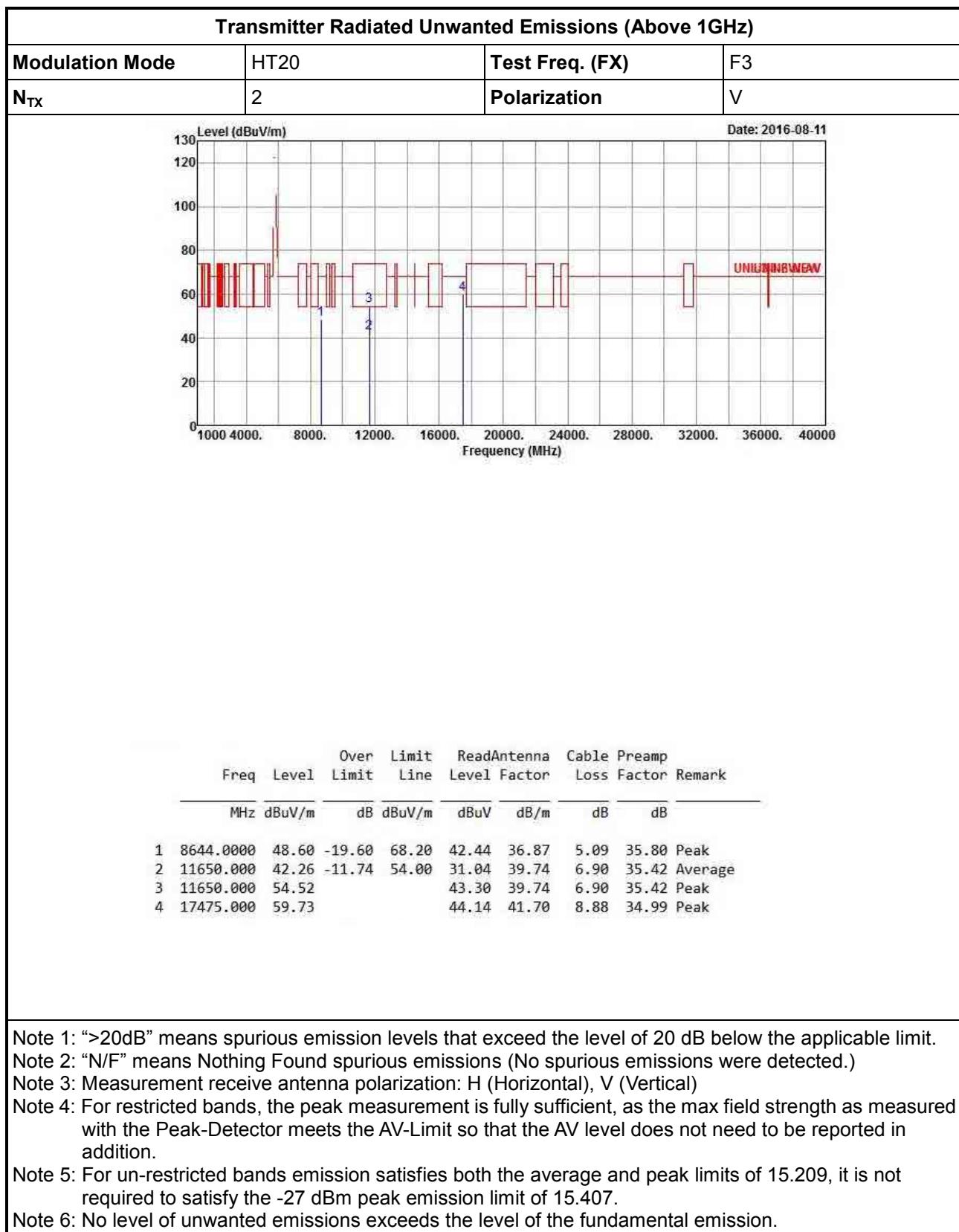
3.6.9 Transmitter Radiated Unwanted Emissions (Above 1GHz) for HT20

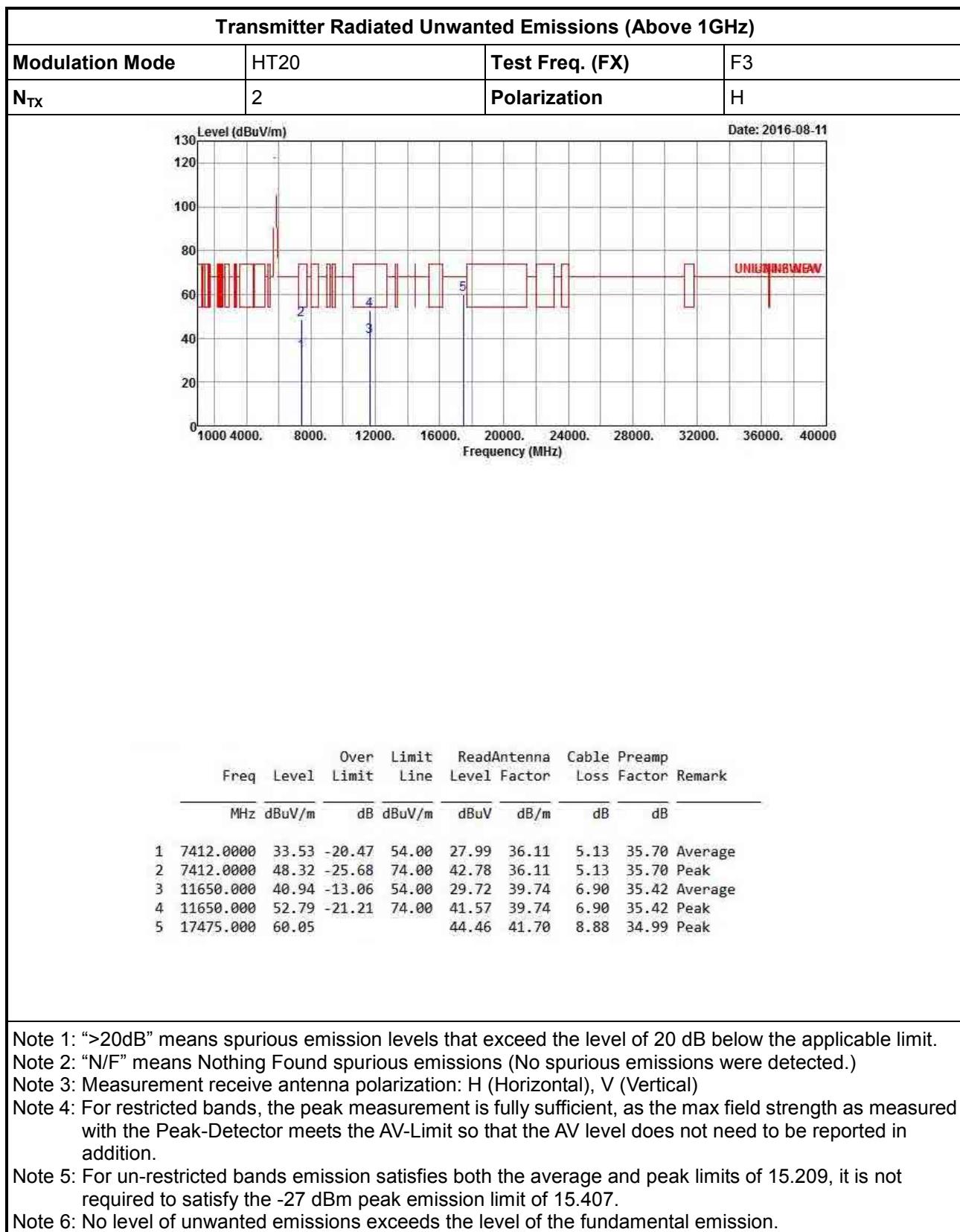




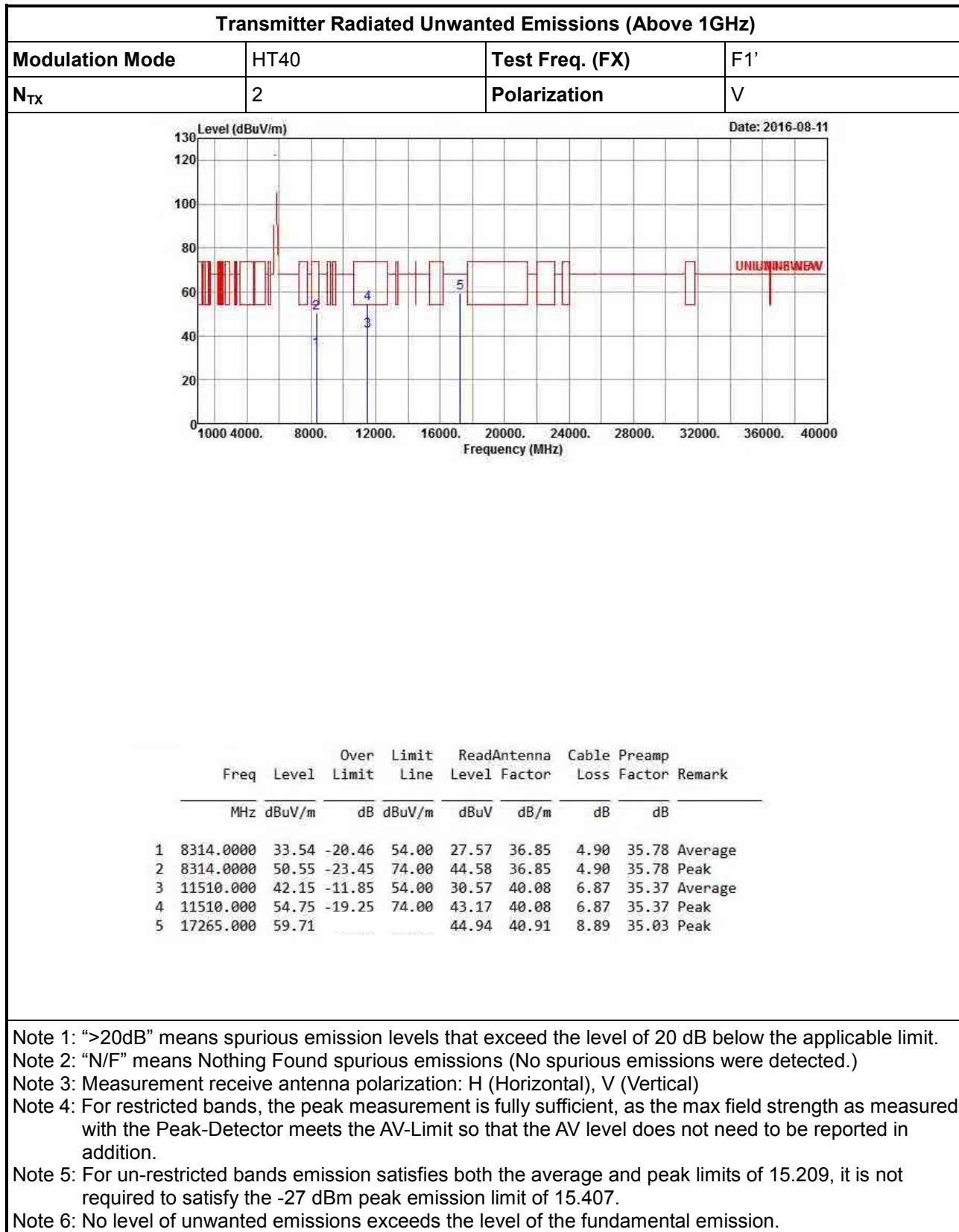








3.6.10 Transmitter Radiated Unwanted Emissions (Above 1GHz) for HT40



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

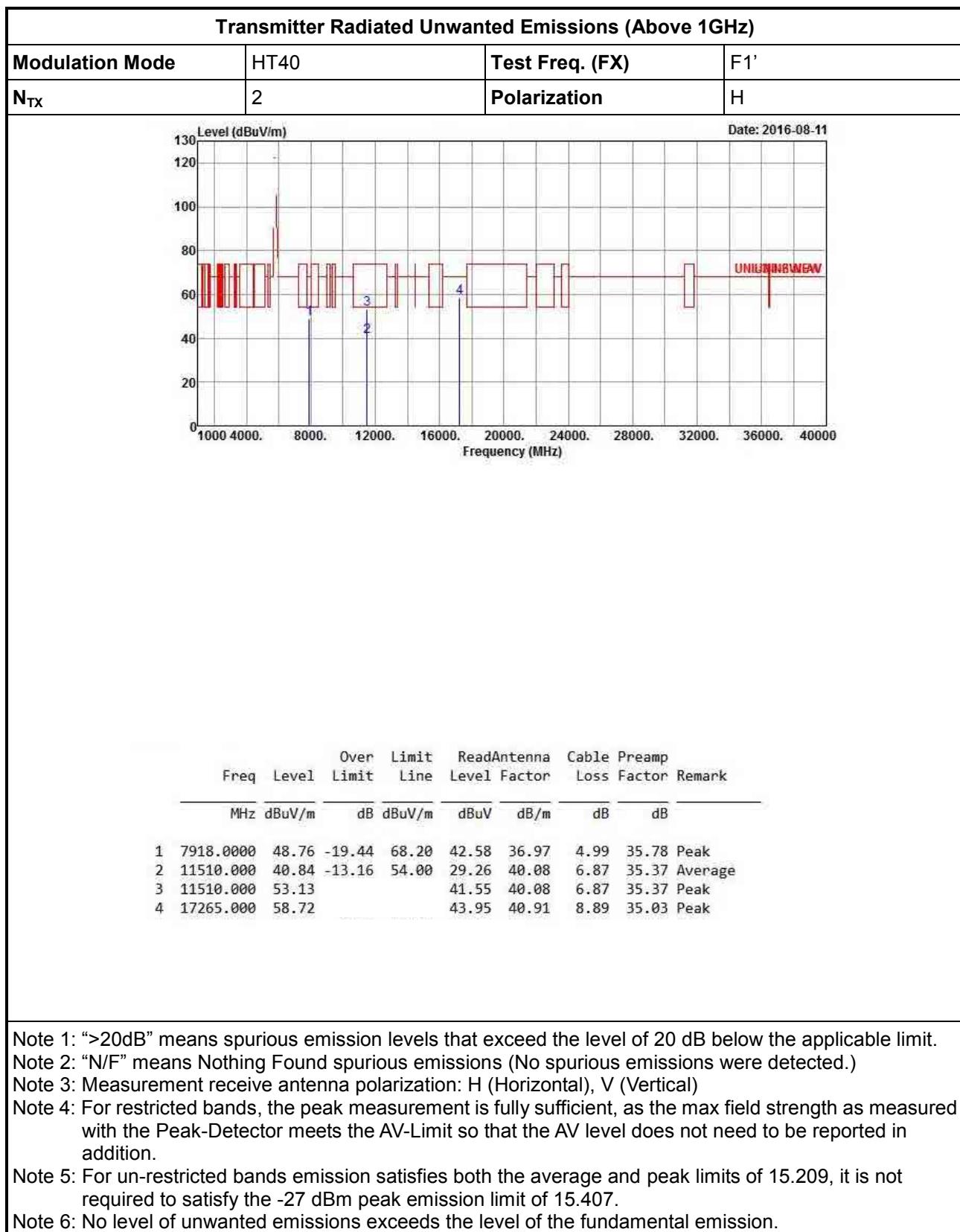
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

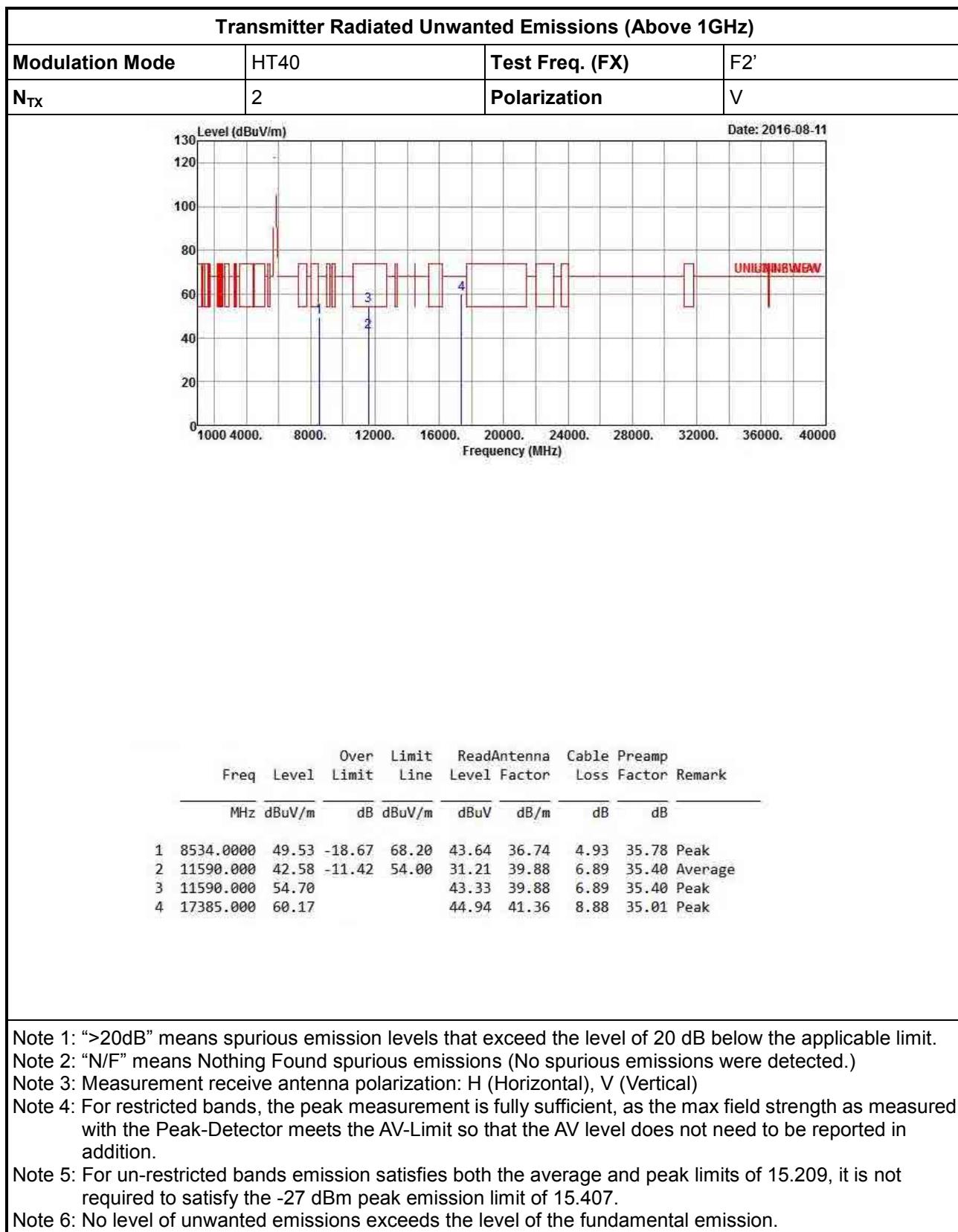
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

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.





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

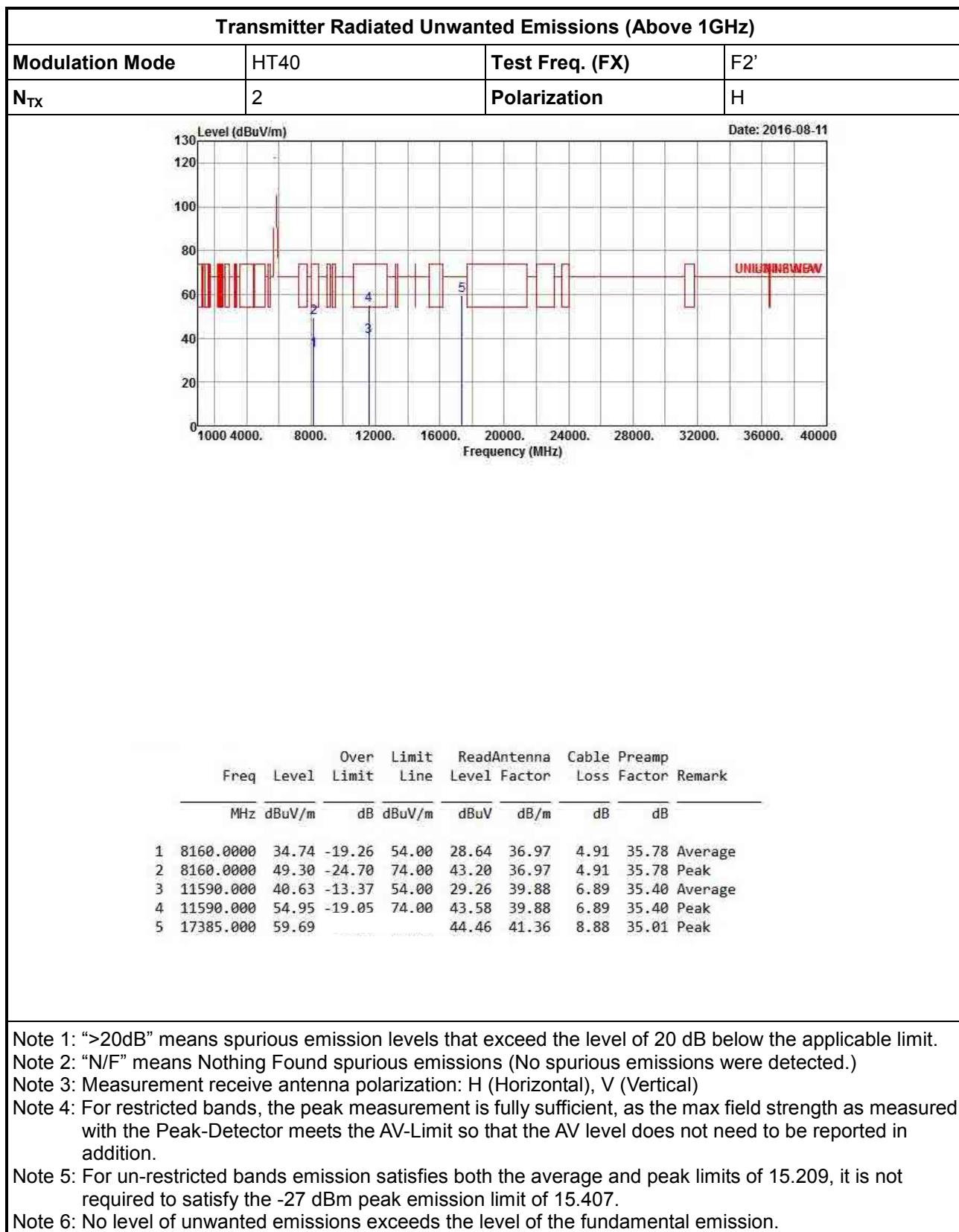
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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

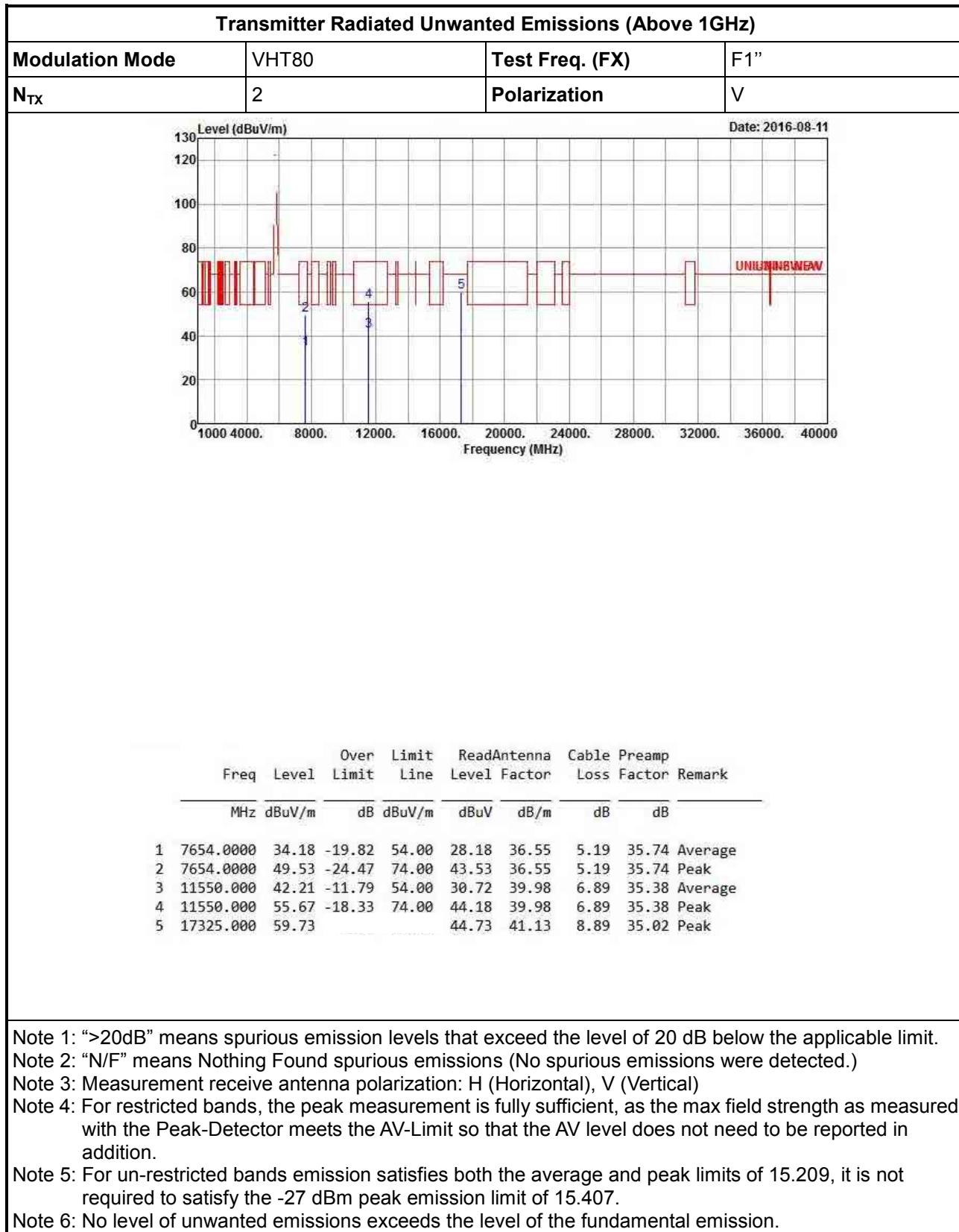
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

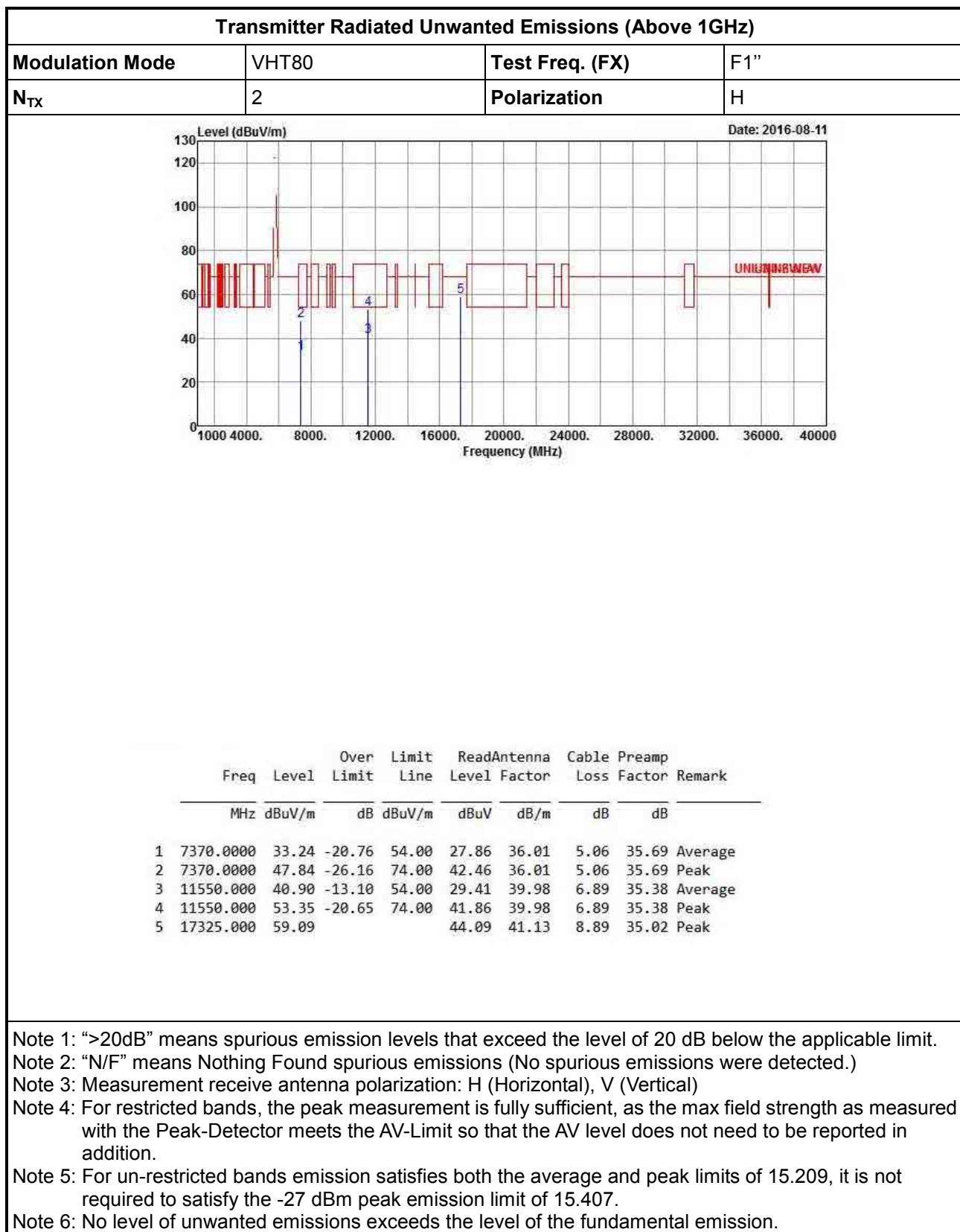
Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

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



3.6.11 Transmitter Radiated Unwanted Emissions (Above 1GHz) for VHT80





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.	

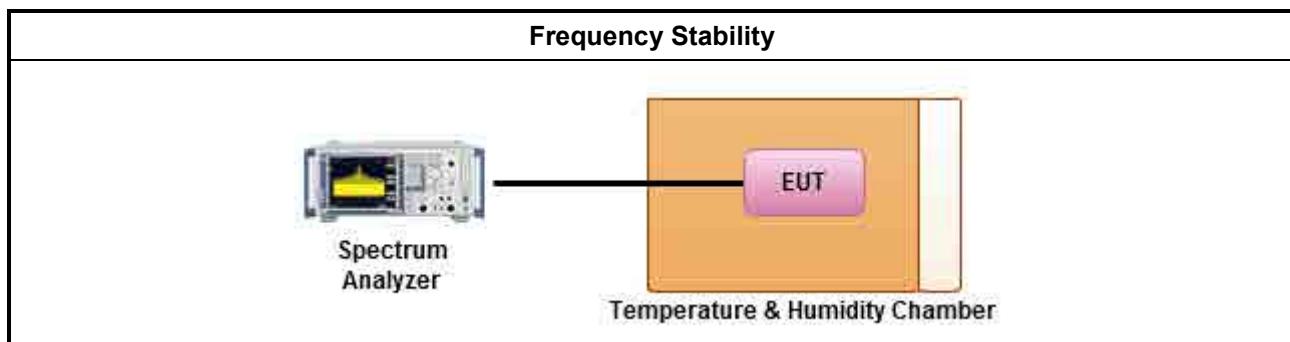
3.7.2 Measuring Instruments

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)			
		0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min
T20°C Vmax	5745	5745.00999	5745.01042	5745.01042	5745.01172	1.74	1.81	1.81	2.04
T20°C Vmin	5745	5745.01042	5745.01085	5745.01129	5745.01129	1.81	1.89	1.97	1.97
T50°C Vnom	5745	5745.03082	5745.03126	5745.03169	5745.03213	5.36	5.44	5.52	5.59
T40°C Vnom	5745	5745.01172	5745.01216	5745.01259	5745.01302	2.04	2.12	2.19	2.27
T30°C Vnom	5745	5745.00781	5745.00825	5745.00868	5745.00912	1.36	1.44	1.51	1.59
T20°C Vnom	5745	5745.01042	5745.01085	5745.01129	5745.01172	1.81	1.89	1.97	2.04
T10°C Vnom	5745	5745.01867	5745.01910	5745.01954	5745.01997	3.25	3.32	3.40	3.48
T0°C Vnom	5745	5745.02822	5745.02865	5745.02909	5745.02952	4.91	4.99	5.06	5.14
T-10°C Vnom	5745	5745.04038	5745.04038	5745.04081	5745.04124	7.03	7.03	7.10	7.18
T-20°C Vnom	5745	5745.05080	5745.05123	5745.05123	5745.05166	8.84	8.92	8.92	8.99
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 1.1.5 for EUT operational condition.



Test Equipment and Calibration Data

Instrument for AC Conduction

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Until
EMC Receiver	R&S	ESCS 30	100174	9kHz ~ 2.75GHz	26/03/2013	25/03/2014
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	21/01/2013	20/01/2014
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz ~ 30MHz	20/04/2012	19/04/2013
RF Cable-CON	HUBER+SUHNER	RG213/U	CB049	9kHz ~ 30MHz	09/11/2012	08/11/2013

Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV 40	101013	9KHz~40GHz	16/02/2016	15/02/2017
AC Power Source	G.W	APS-9102	EL920581	AC 0V ~ 300V	04/06/2016	03/06/2017
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100°C	25/04/2016	24/04/2017
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	21/07/2016	20/07/2017
Power Sensor	Anritsu	MA2411B	0917017	300MHz ~ 40GHz	04/02/2016	03/02/2017
Power Meter	Anritsu	ML2495A	0949003	300MHz ~ 40GHz	04/02/2016	03/02/2017

Instrument for Radiated Test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSP 40	100593	9KHz~40GHz	19/10/2015	18/10/2016
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	03/06/2016	02/06/2017
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	1GHz ~ 18GHz 3m	03/06/2016	02/06/2017
Amplifier	Agilent	8447D	2944A11149	100kHz ~ 1.3GHz	01/07/2016	30/06/2017
Amplifier	Agilent	8449B	3008A02326	1GHz ~ 26.5GHz	12/07/2016	11/07/2017
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 01543	1GHz ~ 18GHz	22/04/2016	21/04/2017
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	18GHz ~ 40GHz	29/01/2016	28/01/2017
Bilog Antenna	SCHAFFNER	CBL 6112B	2723	30MHz ~ 1GHz	05/10/2015	04/10/2016
Amplifier	MITEQ	JS44-18004000-33-8P	1840917	18GHz ~ 40GHz	01/06/2015	31/05/2017
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	02/02/2015	01/02/2017