

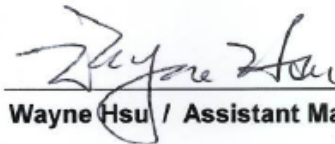
FCC Test Report

Equipment : ProSafe Wireless - 802.11 b/g/n VPN Firewall
Brand Name : NETGEAR
Model No. : FVS318N
FCC ID : PY311100158
Standard : 47 CFR FCC Part 15.247
Frequency Range : 2400 MHz – 2483.5 MHz
Equipment Class : DTS
Applicant : Netgear Inc
Manufacturer : 350 East Plumeria Drive San Jose, CA 95134 U.S.A

The product sample received on Sep. 12, 2012 and completely tested on Oct. 15, 2012. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

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

Reviewed by:



Wayne Hsu / Assistant Manager



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Summary of Test Result

Conformance Test Specifications					
Report Clause	Ref. Std. Clause	Description	Measured	Limit	Result
1.1.2	15.203	Antenna Requirement	Antenna connector mechanism complied	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	[dBuV]: 0.371MHz 35.81 (Margin 12.67dB) - AV 38.72 (Margin 19.76dB) - QP	FCC 15.207	Complied
3.2	15.247(b)	RF Output Power (Maximum Peak Conducted Output Power)	Power [dBm] 11B-20M: 17.64 11G-20M: 22.59 11N2.4G-20M: 25.14 11N2.4G-40M:25.05	Power [dBm]:30	Complied
3.3	15.247(c)	Transmitter Radiated Bandedge Emissions	Non-Restricted Bands: 2400.00MHz: 25.76dB Restricted Bands [dBuV/m at 3m]: 2390.00MHz 72.53 (Margin 1.47dB) - PK 52.93 (Margin 1.07dB) - AV	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied
3.4	15.247(c)	Transmitter Radiated Unwanted Emissions	Restricted Bands [dBuV/m at 3m]: 4874MHz 50.90(Margin 3.10dB) - PK	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied

Revision History

[illegible]

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information						
Frequency Range (MHz)	IEEE Std. 802.11	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	RF Output Power (dBm)	Co-location
2400-2483.5	b	2412-2462	1-11 [11]	1	17.64	N/A
2400-2483.5	g	2412-2462	1-11 [11]	1	22.59	N/A
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	1	22.05	N/A
2400-2483.5	n (HT40)	2422-2452	3-9 [7]	1	22.32	N/A
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	2	25.14	N/A
2400-2483.5	n (HT40)	2422-2452	3-9 [7]	2	25.05	N/A
Note 1: RF output power specifies that Maximum Peak Conducted Output Power. Note 2: 802.11b uses a combination of DSSS-DBPSK, DQPSK, CCK modulation. Note 3: 802.11g/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation. Note 4: Co-location, Co-location is generally defined as simultaneously transmitting (co-transmitting) antennas within 20 cm of each other. (i.e., EUT has simultaneously co-transmitting that operating 2.4GHz and 5GHz.)						

1.1.2 Antenna Information

Antenna Category	
☒	External antenna (dedicated antennas)
☒	Single power level with corresponding antenna(s).
☐	Multiple power level and corresponding antenna(s).
☒	RF connector provided
☒	Unique antenna connector. (e.g., MMCX, U.FL, IPX, and RP-SMA, RP-N type...)
☐	Standard antenna connector. (e.g., SMA, N, BNC, and TNC type...)

Antenna General Information				
No.	Ant. Port	Ant. Cat.	Ant. Type	G _{ANT} (dBi)
1	1, 2	Integral	Dipole	2.0

1.1.3 Type of EUT

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

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle		
☐ Operated normally mode for worst duty cycle		
☒ Operated test mode for worst duty cycle		
Test Signal Duty Cycle (x)	Power Duty Factor [dB] – (10 log 1/x)	Voltage Duty Factor [dB] – (20 log 1/x)
☒ 100% - IEEE 802.11b	0	0
☒ 100% - IEEE 802.11g	0	0
☒ 100% - IEEE 802.11n (HT20) - N _{TX} 1	0	0
☒ 100% - IEEE 802.11n (HT40) - N _{TX} 1	0	0
☒ 100% - IEEE 802.11n (HT20) - N _{TX} 2	0	0
☒ 100% - IEEE 802.11n (HT40) - N _{TX} 2	0	0

1.1.5 EUT Operational Condition

Supply Voltage	☒ AC mains	☐ DC	
Type of DC Source	☐ Internal DC supply	☒ External DC adapter	☐ Battery

1.2 Accessories

Accessories Information				
AC Adapter 1	Brand Name	NETGEAR	Model Name	T012LF1209
	Power Rating	I/P: 100-240V 50~ 60Hz 0.5A ; O/P: 12V 1.0A		
AC Adapter 2	Brand Name	NETGEAR	Model Name	MT12-120100-A1
	Power Rating	I/P: 100-240V~ 60Hz 0.3A ; O/P: 12V 1.0A		

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

1.3 Support Equipment

Support Equipment - Conducted Emissions				
No.	Equipment	Brand Name	Model Name	Serial No.
1	Notebook (Remote Workstation)	DELL	E5520	DoC

Note: In radiated emissions tested EUT was tested alone.

1.4 Testing Applied Standards

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

- ♦ 47 CFR FCC Part 15
- ♦ ANSI C63.10-2009
- ♦ FCC KDB 558074
- ♦ FCC KDB 662911
- ♦ FCC KDB 412172

1.5 Testing Location Information

Testing Location				
☒	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C		
		TEL : 886-3-327-3456 FAX : 886-3-327-0973		
Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
AC Conduction	CO01-HY	David	24.7°C / 53.6%	15-Oct-12
Radiated Emission	03CH03-HY	Daniel	25.6°C / 58%	24-Sep-12 ~ 25-Sep-12

1.6 Measurement Uncertainty

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

Measurement Uncertainty			
Test Item		Uncertainty	Limit
AC power-line conducted emissions		± 2.26 dB	N/A
Unwanted emissions, conducted	30 – 1000 MHz	± 0.51 dB	N/A
	1 – 18 GHz	± 0.67 dB	N/A
	18 – 40 GHz	± 0.83 dB	N/A
	40 – 200 GHz	N/A	N/A
All emissions, radiated	30 – 1000 MHz	± 2.56 dB	N/A
	1 – 18 GHz	± 3.59 dB	N/A
	18 – 40 GHz	± 3.82 dB	N/A
	40 – 200 GHz	N/A	N/A
Temperature		± 0.8 °C	N/A
Humidity		± 3 %	N/A
DC and low frequency voltages		± 3 %	N/A
Time		± 1.42 %	N/A
Duty Cycle		± 1.42 %	N/A

2 Test Configuration of EUT

2.1 Test Channel Frequencies Configuration

Worst Modulation Used for Conformance Testing					
IEEE Std. 802.11	Transmit Chains (N _{TX})	Data Rate / MCS	Worst Data Rate / MCS	Modulation Mode	RF Output Power (dBm)
b	1	1-11 Mbps	1 Mbps	11B-20M	17.64
g	1	6-54 Mbps	6 Mbps	11G-20M	22.59
n (HT20)	1	MCS 0-7	MCS 0	11N2.4G-20M	22.05
n (HT40)	1	MCS 0-7	MCS 0	11N2.4G-40M	22.32
n (HT20)	2	MCS 7-15	MCS 8	11N2.4G-20M	25.14
n (HT40)	2	MCS 7-15	MCS 8	11N2.4G-40M	25.05
Note 1: IEEE Std. 802.11n-2009 modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40. Worst modulation mode of Guard Interval (GI) is 800ns. Note 2: Modulation modes consist below configuration:: 11B: IEEE 802.11b, 11G: IEEE 802.11g, 11N: IEEE 802.11n 2.4G: 2.4-2.4835GHz band 20M/40M: Channel Bandwidth 20MHz/40MHz Note 3: RF output power specifies that Maximum Peak Conducted Output Power.					

2.2 Test Channel Frequencies Configuration

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

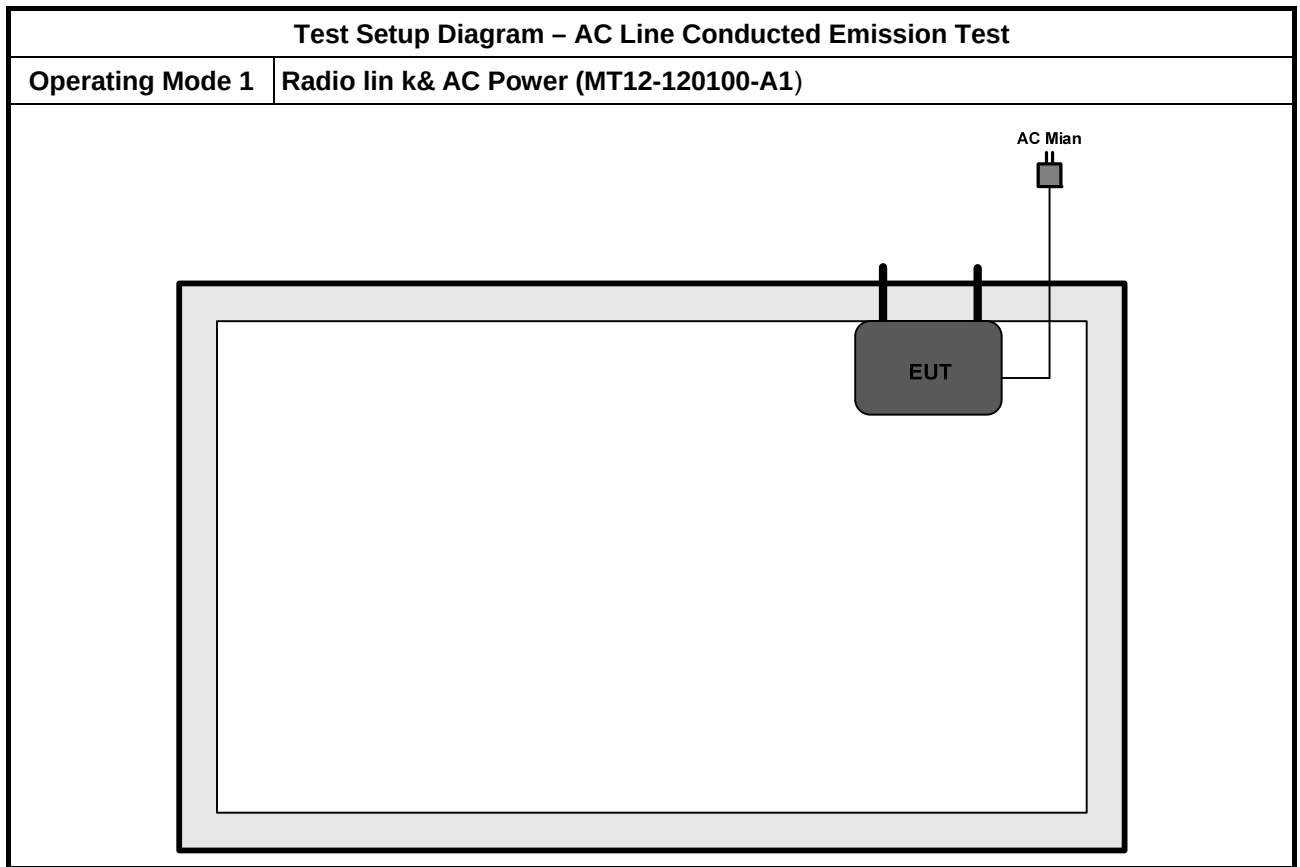
2.3 The Worst Case Measurement Configuration

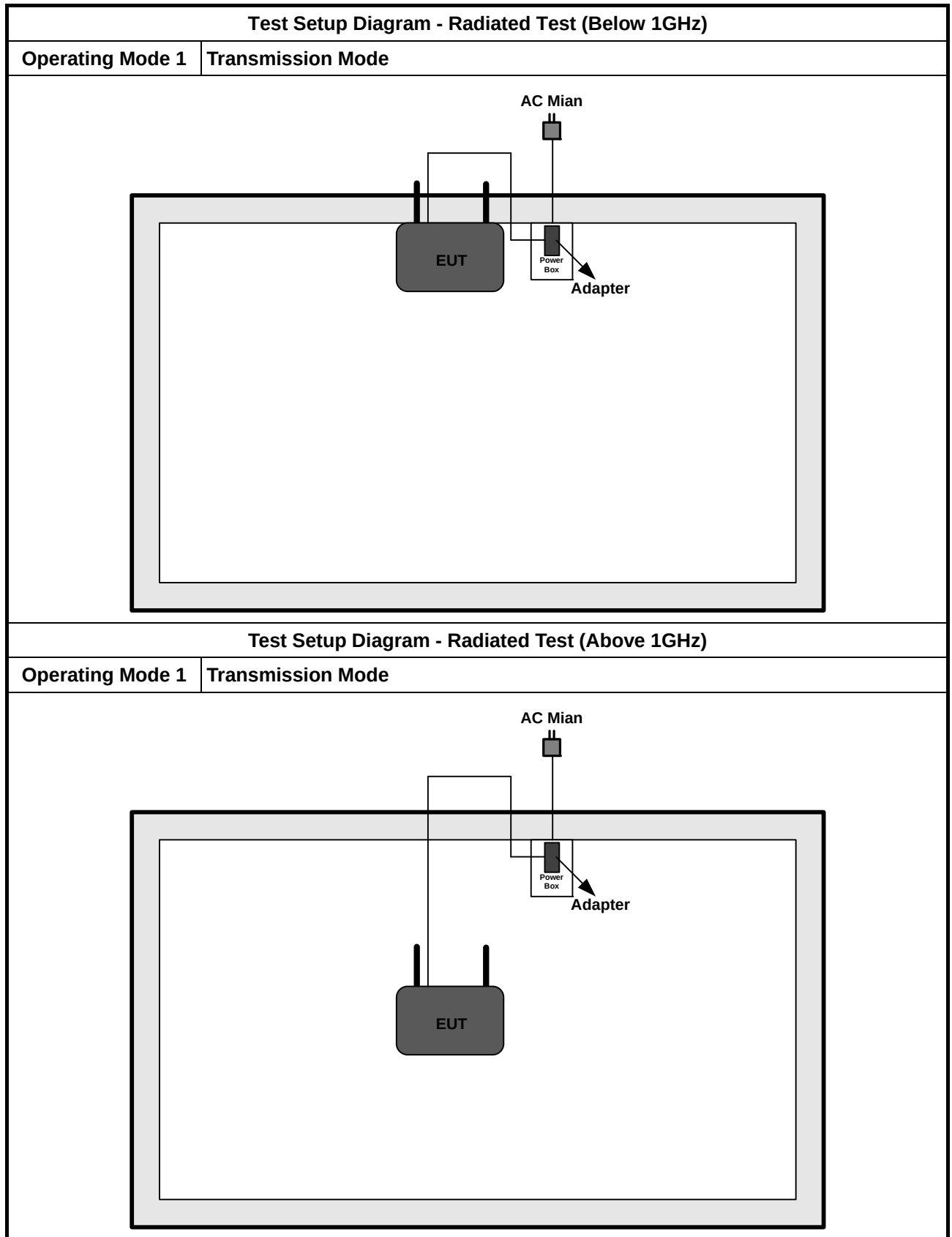
The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	Operating Mode Description
1	Radio lin k& AC Power (T012LF1209)
2	Radio lin k& AC Power (MT12-120100-A1)
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, Power Spectral Density, 6 dB Bandwidth		
Test Condition	Conducted measurement at transmit chains		
Modulation Mode	Transmit Chains (N_{TX})	Data Rate / MCS	Test Frequency
11B-20M	1	1 Mbps	F1, F2, F3
11G-20M	1	6 Mbps	F1, F2, F3
11N2.4G-20M	1	MCS 0	F1, F2, F3
11N2.4G-40M	1	MCS 0	F4, F5, F6
11N2.4G-20M	2	MCS 8	F1, F2, F3
11N2.4G-40M	2	MCS 8	F4, F5, F6

The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Bandedge Emissions		
Test Condition	Radiated measurement		
Modulation Mode	Transmit Chains (N_{TX})	Data Rate / MCS	Test Frequency
11B-20M	1	1 Mbps	F1, F3
11G-20M	1	6 Mbps	F1, F3
11N2.4G-20M	1	MCS 0	F1, F3
11N2.4G-40M	1	MCS 0	F4, F6
11N2.4G-20M	2	MCS 8	F1, F3
11N2.4G-40M	2	MCS 8	F4, F6

2.4 Test Setup Diagram





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.

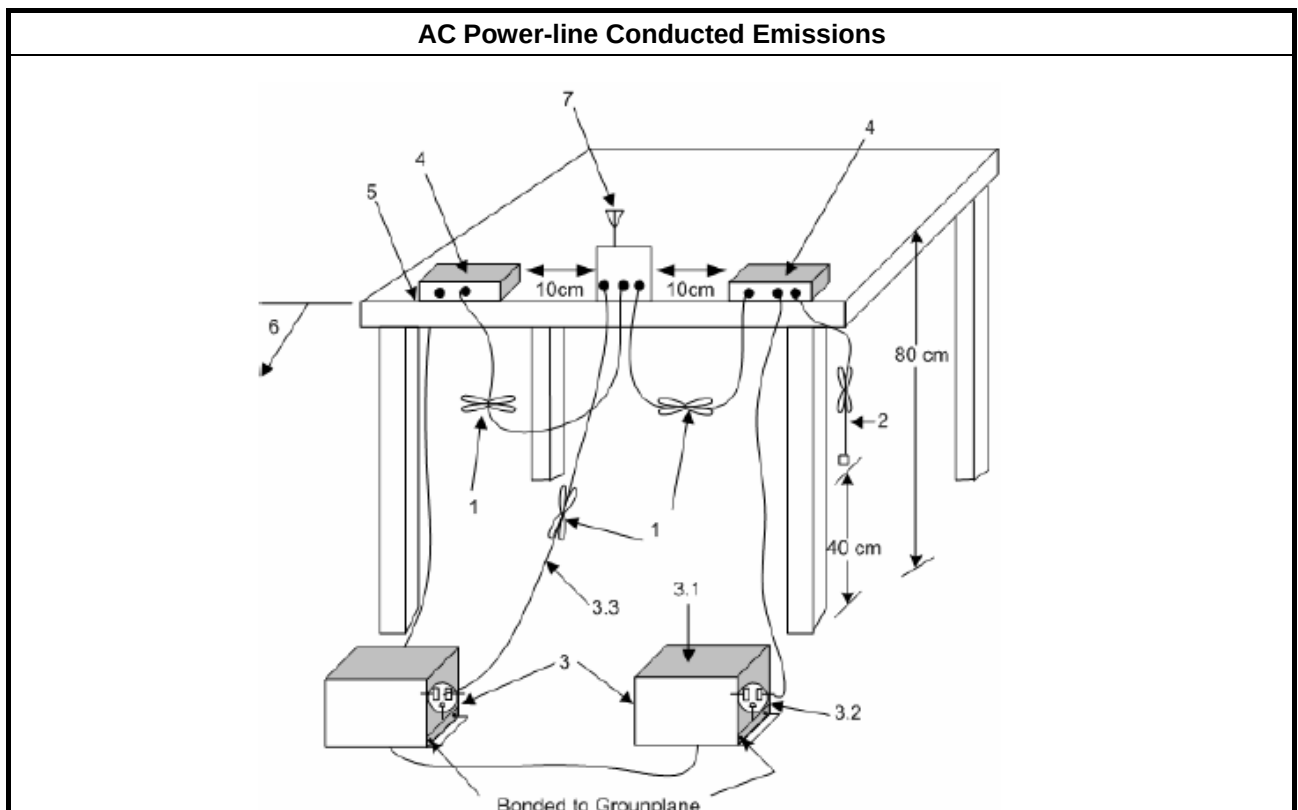
3.1.2 Measuring Instruments

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

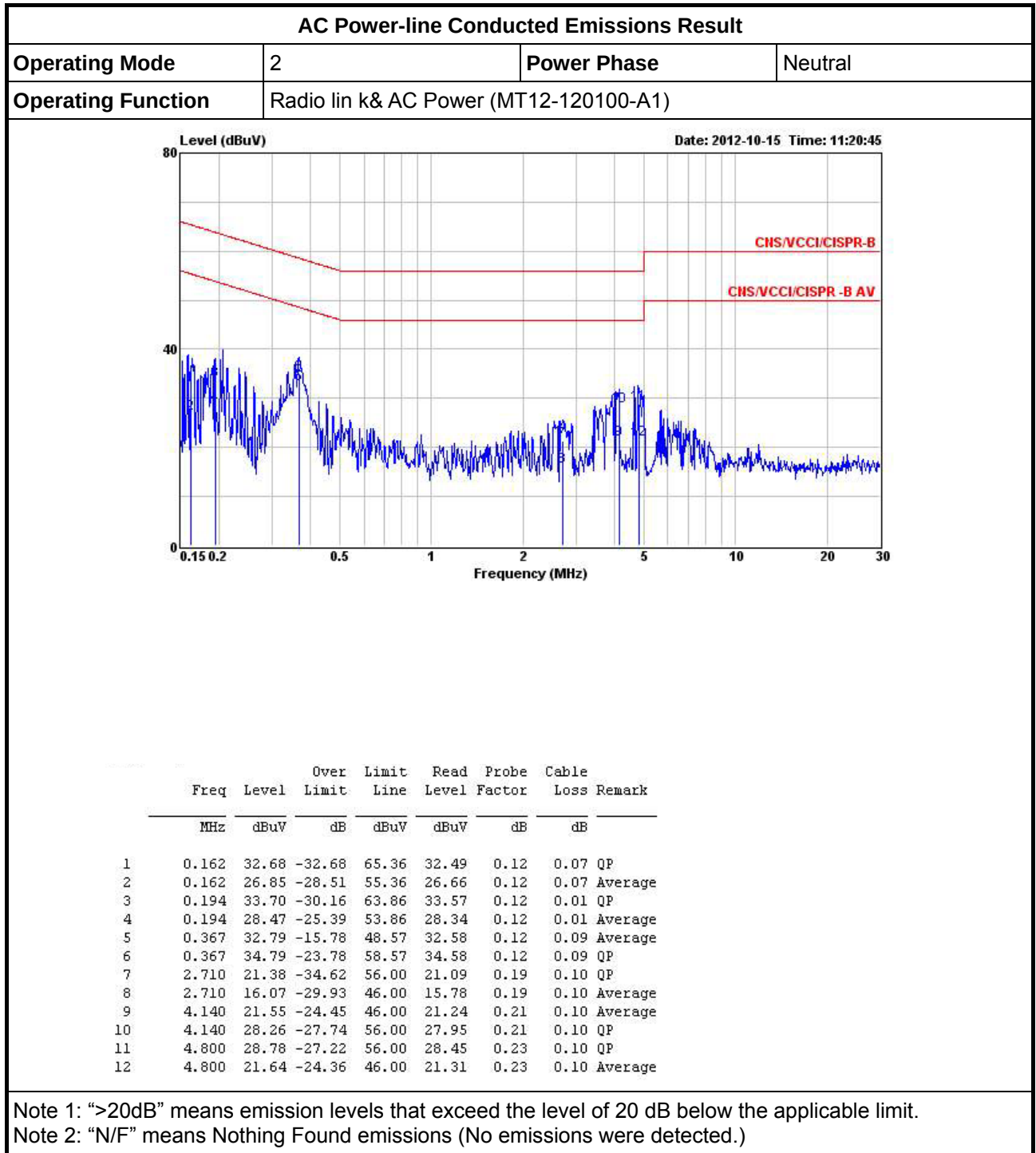
3.1.3 Test Procedures

Test Method
☒ Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions.

3.1.4 Test Setup

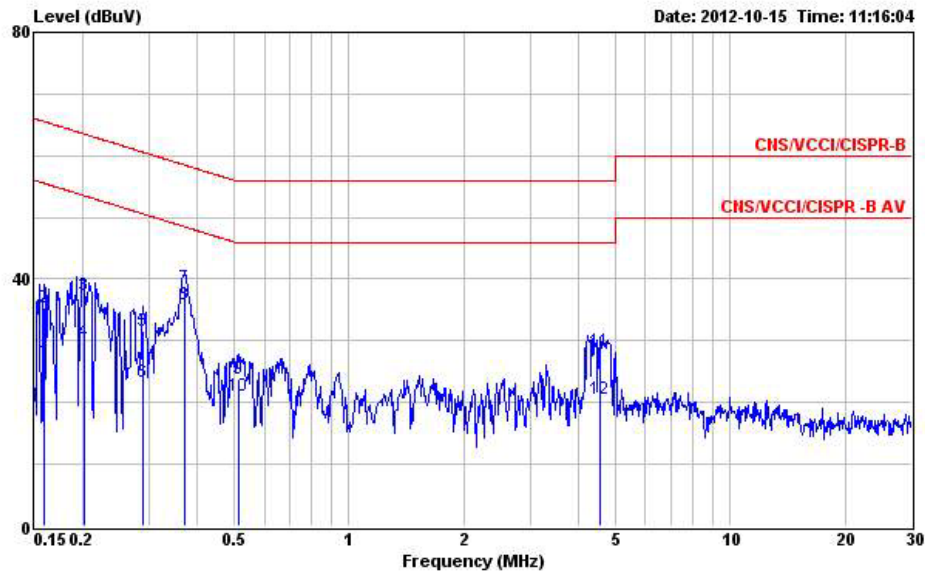


3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Operating Mode	2	Power Phase	Line
Operating Function	Radio lin k & AC Power (MT12-120100-A1)		



	Freq	Level	Over	Limit	Read	Probe	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.159	26.52	-29.00	55.52	26.35	0.09	0.08	Average
2	0.159	35.48	-30.04	65.52	35.31	0.09	0.08	QP
3	0.202	37.48	-26.05	63.53	37.40	0.08	0.00	QP
4	0.202	29.73	-23.80	53.53	29.65	0.08	0.00	Average
5	0.289	31.54	-29.01	60.55	31.40	0.09	0.05	QP
6	0.289	23.37	-27.18	50.55	23.23	0.09	0.05	Average
7	0.371	38.72	-19.76	58.48	38.54	0.09	0.09	QP
8	0.371	35.81	-12.67	48.48	35.63	0.09	0.09	Average
9	0.513	23.82	-32.18	56.00	23.62	0.10	0.10	QP
10	0.513	21.02	-24.98	46.00	20.82	0.10	0.10	Average
11	4.570	28.40	-27.60	56.00	28.10	0.20	0.10	QP
12	4.570	20.55	-25.45	46.00	20.25	0.20	0.10	Average

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

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

3.2 RF Output Power

3.2.1 RF Output Power Limit

RF Output Power Limit	
Maximum Peak Conducted Output Power or Maximum Conducted Output Power Limit	
☒ 2400-2483.5 MHz Band:	
☒	If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)
☒	Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ dBm
☐	Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm
☐	Smart antenna system (SAS):
☐	Single beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm
☐	Overlap beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm
☐	Aggregate power on all beams: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3 + 8$ dBm
e.i.r.p. Power Limit:	
☒ 2400-2483.5 MHz Band	
☒	Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W)
☐	Point-to-point systems (P2P): $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX}])$ dBm
☐	Smart antenna system (SAS)
☐	Single beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm
☐	Overlap beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm
☐	Aggregate power on all beams: $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX} + 8])$ dBm
P_{Out} = maximum peak conducted output power or maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi. P_{eirp} = e.i.r.p. Power in dBm.	

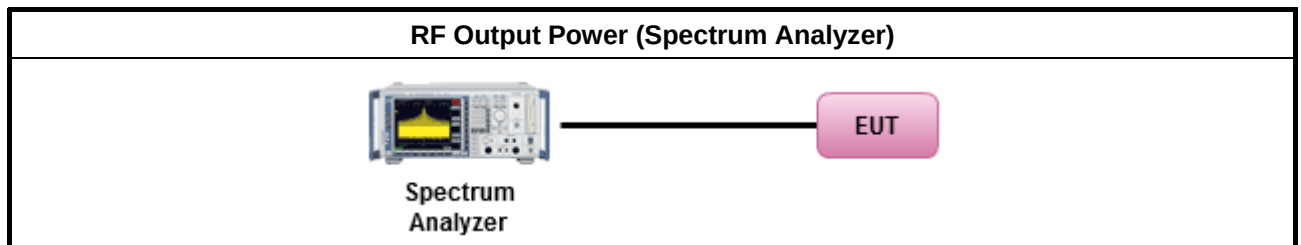
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

Test Method	
☒	Maximum Peak Conducted Output Power
☐	Refer as FCC KDB 558074, clause 5.2.1.1 Option 1 (RBW ≥ EBW method).
☒	Refer as FCC KDB 558074, clause 5.2.1.2 Option 2 (integrated band power method).
☐	Refer as ANSI C63.10, clause 6.10.2.1 a) for peak power meter.
☒	Maximum Conducted (Average) Output Power
☐	Refer as FCC KDB 558074, clause 5.2.2.1 Option 1 (RMS detection with slow sweep speed).
☒	Refer as FCC KDB 558074, clause 5.2.2.2 Option 2 (spectral trace averaging).
☒	For conducted measurement.
☒	The EUT supports single transmit chain and measurements performed on this transmit chain.
☒	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
☒	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.
☒	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]) $EIRP_{total} = P_{total} + DG$

3.2.4 Test Setup



3.2.5 Directional Gain for Power Measurement

Directional Gain (DG) Result					
Transmit Chains No.		1	2	-	-
Maximum G_{ANT} (dBi)		2.0	2.0	-	-
Modulation Mode	DG (dBi)	N_{TX}	N_{SS}	STBC	Array Gain (dB)
Legacy CCK, 1-11Mbps (11b)	2.0	1	1	-	-
Non HT20, 6-54Mbps (11g)	2.0	1	1	-	-
HT20, M0-M7	2.0	1	1	-	-
HT20, M8-15	2.0	2	2	-	-
HT40, M0-M7	2.0	1	1	-	-
HT40, M8-M15	2.0	2	2	-	-
Note 1: For all transmitter outputs with equal antenna gains, directional gain is to be computed as follows: Any transmit signals are correlated, Directional Gain = $G_{ANT} + 10 \log(N_{TX})$ All transmit signals are completely uncorrelated, Directional Gain = G_{ANT} Note 2: For all transmitter outputs with unequal antenna gains, directional gain is to be computed as follows: Any transmit signals are correlated, Directional Gain = $10 \log[(10^{G1/20} + \dots + 10^{GN/20})^2 / N_{TX}]$ All transmit signals are completely uncorrelated, Directional Gain = $10 \log[(10^{G1/10} + \dots + 10^{GN/10}) / N_{TX}]$ Note 3: For Spatial Multiplexing, Directional Gain (DG) = $G_{ANT} + 10 \log(N_{TX}/N_{SS})$, where N_{SS} = the number of independent spatial streams data. Note 4: For CDD transmissions, directional gain is calculated as power measurements: Directional Gain (DG) = $G_{ANT} + \text{Array Gain}$, where Array Gain is as follows: Array Gain = 0 dB (i.e., no array gain) for $N_{TX} \leq 4$; Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{TX};					

3.2.6 Test Result of Maximum Peak Conducted Output Power

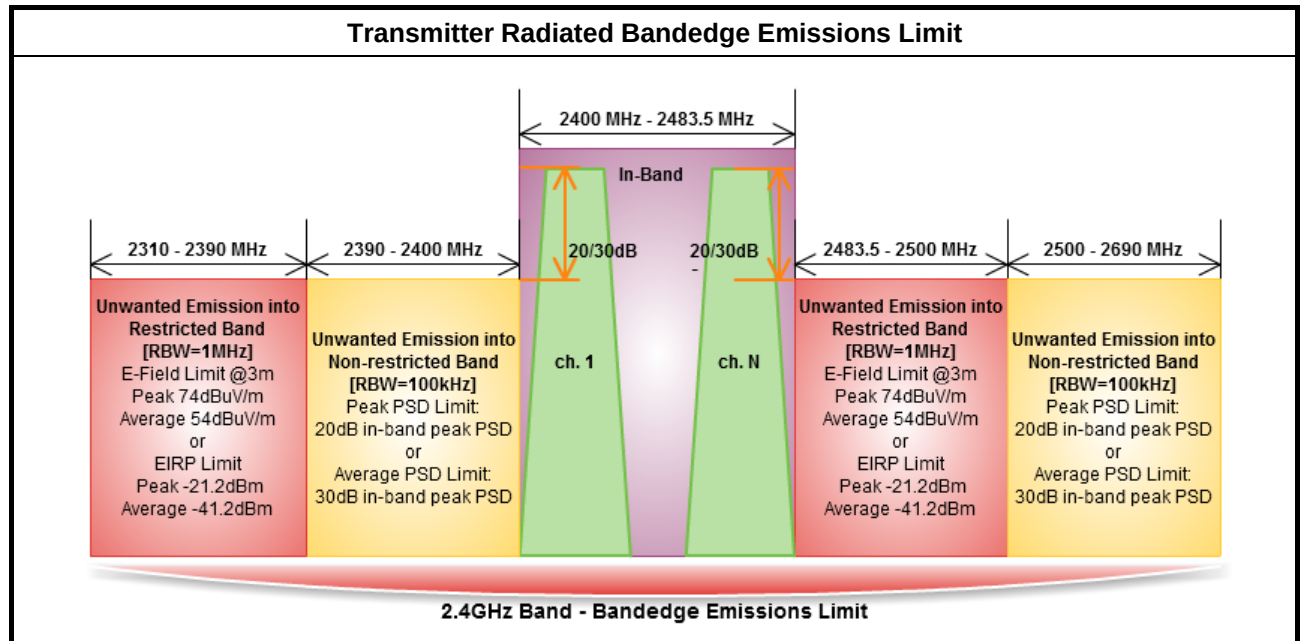
Maximum Peak Conducted Output Power Result											
Condition			RF Output Power (dBm)								
Modulation Mode	N _{TX}	Freq. (MHz)	Chain Port 1	Chain Port 2	-	-	Sum Chain	Power Limit	DG (dBi)	EIRP Power	EIRP Limit
11B-20M	1	2412	17.64	-	-	-	17.64	30	2.0	19.64	36.0
11B-20M	1	2437	16.97	-	-	-	16.97	30	2.0	18.97	36.0
11B-20M	1	2462	17.26	-	-	-	17.26	30	2.0	19.26	36.0
11G-20M	1	2412	19.23	-	-	-	19.23	30	2.0	21.23	36.0
11G-20M	1	2437	22.59	-	-	-	22.59	30	2.0	24.59	36.0
11G-20M	1	2462	19.96	-	-	-	19.96	30	2.0	21.96	36.0
11N2.4G-20M	1	2412	17.70	-	-	-	17.70	30	2.0	19.70	36.0
11N2.4G-20M	1	2437	22.05	-	-	-	22.05	30	2.0	24.05	36.0
11N2.4G-20M	1	2462	18.65	-	-	-	18.65	30	2.0	20.65	36.0
11N2.4G-40M	1	2422	16.21	-	-	-	16.21	30	2.0	18.21	36.0
11N2.4G-40M	1	2437	22.32	-	-	-	22.32	30	2.0	24.32	36.0
11N2.4G-40M	1	2452	16.27	-	-	-	16.27	30	2.0	18.27	36.0
11N2.4G-20M	2	2412	16.20	17.27	-	-	19.78	30	2.0	21.78	36.0
11N2.4G-20M	2	2437	21.80	22.43	-	-	25.14	30	2.0	27.14	36.0
11N2.4G-20M	2	2462	17.46	17.80	-	-	20.64	30	2.0	22.64	36.0
11N2.4G-40M	2	2422	14.14	14.44	-	-	17.30	30	2.0	19.30	36.0
11N2.4G-40M	2	2437	21.73	22.32	-	-	25.05	30	2.0	27.05	36.0
11N2.4G-40M	2	2452	14.98	14.81	-	-	17.91	30	2.0	19.91	36.0
Result			Complied								

3.2.7 Test Result of Maximum Conducted (Average) Output Power

Maximum Conducted (Average) 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)	EIRP Power	EIRP Limit
11B-20M	1	2412	11.71	-	-	-	11.71	30	2.0	13.71	36.0
11B-20M	1	2437	10.61	-	-	-	10.61	30	2.0	12.61	36.0
11B-20M	1	2462	10.92	-	-	-	10.92	30	2.0	12.92	36.0
11G-20M	1	2412	11.90	-	-	-	11.90	30	2.0	13.90	36.0
11G-20M	1	2437	14.75	-	-	-	14.75	30	2.0	16.75	36.0
11G-20M	1	2462	12.68	-	-	-	12.68	30	2.0	14.68	36.0
11N2.4G-20M	1	2412	10.32	-	-	-	10.32	30	2.0	12.32	36.0
11N2.4G-20M	1	2437	14.21	-	-	-	14.21	30	2.0	16.21	36.0
11N2.4G-20M	1	2462	11.36	-	-	-	11.36	30	2.0	13.36	36.0
11N2.4G-40M	1	2422	8.83	-	-	-	8.83	30	2.0	10.83	36.0
11N2.4G-40M	1	2437	14.93	-	-	-	14.93	30	2.0	16.93	36.0
11N2.4G-40M	1	2452	8.84	-	-	-	8.84	30	2.0	10.84	36.0
11N2.4G-20M	2	2412	8.41	9.42	-	-	11.95	30	2.0	13.95	36.0
11N2.4G-20M	2	2437	13.40	14.04	-	-	16.74	30	2.0	18.74	36.0
11N2.4G-20M	2	2462	9.64	10.03	-	-	12.85	30	2.0	14.85	36.0
11N2.4G-40M	2	2422	6.25	6.55	-	-	9.41	30	2.0	11.41	36.0
11N2.4G-40M	2	2437	13.18	13.79	-	-	16.51	30	2.0	18.51	36.0
11N2.4G-40M	2	2452	7.06	6.95	-	-	10.02	30	2.0	12.02	36.0
Result			Complied								

3.3 Transmitter Radiated Bandedge Emissions

3.3.1 Transmitter Radiated Bandedge Emissions Limit



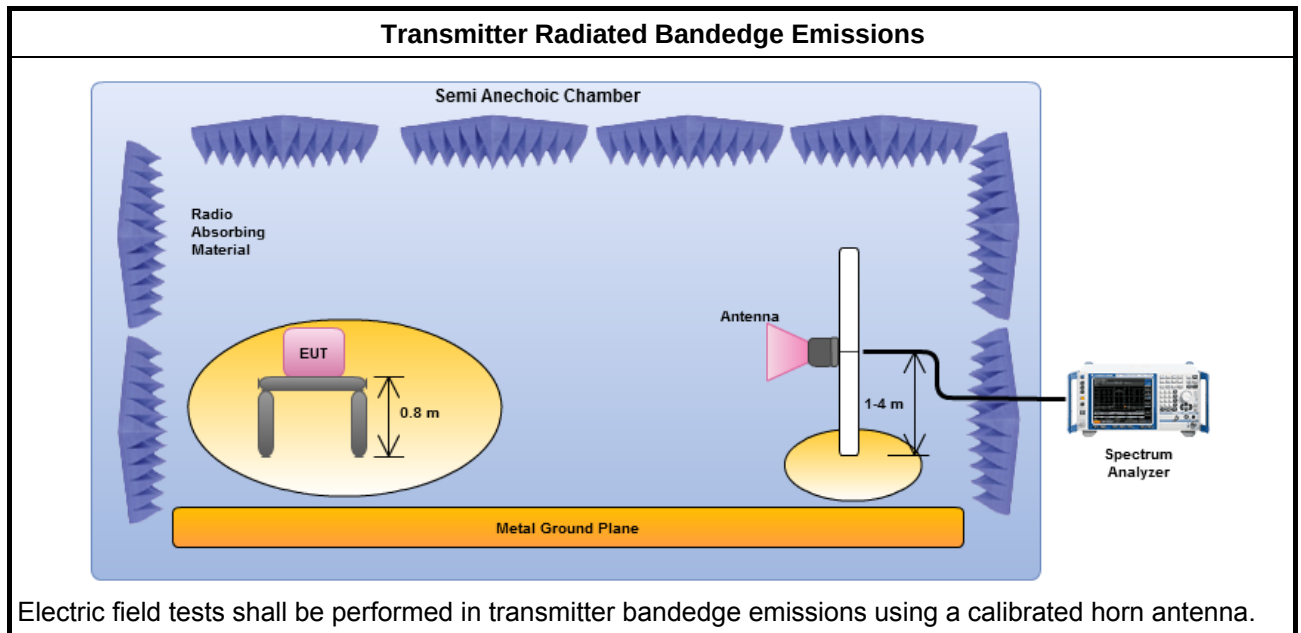
3.3.2 Measuring Instruments

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

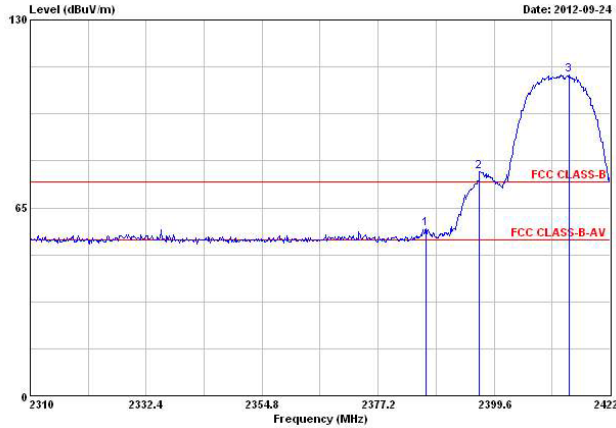
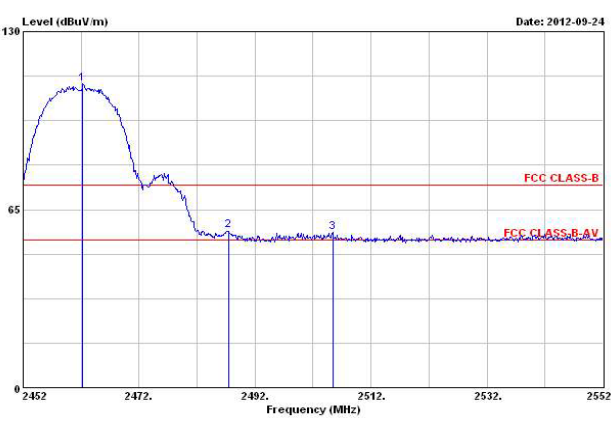
3.3.3 Test Procedures

Test Method	
☒	The average emission levels shall be measured in [duty cycle $\geq$ 98 or duty factor].
☒	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.
☒	For the transmitter unwanted emissions shall be measured using following options below:
☒	Refer as FCC KDB 558074, clause 5.4.1 for unwanted emissions into non-restricted bands.
☒	Refer as FCC KDB 558074, clause 5.4.2 for unwanted emissions into restricted bands.
☒	Refer as FCC KDB 558074, clause 5.4.2.2.1 Option 1 (Power Averaging).
☐	Refer as FCC KDB 558074, clause 5.4.2.2.2 Option 2 (Trace Averaging).
☐	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). – Duty cycle $\geq$ 98%.
☐	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
☒	Refer as FCC KDB 558074, clause 5.4.2.2.1.1 measurement procedure peak limit.
☐	Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.
☒	For the transmitter bandedge emissions shall be measured using following options below:
☐	Refer as FCC KDB 558074, clause 5.4.2.2.4 for narrower resolution bandwidth using the band power and summing the spectral levels (i.e., 100 kHz or 1 MHz).
☒	Refer as ANSI C63.10, clause 6.9.2 for band-edge testing.
☐	Refer as ANSI C63.10, clause 6.9.3 for marker-delta method for band-edge measurements.
☒	For radiated measurement, refer as ANSI C63.10, clause 6.5 for radiated emissions from above 1 GHz.

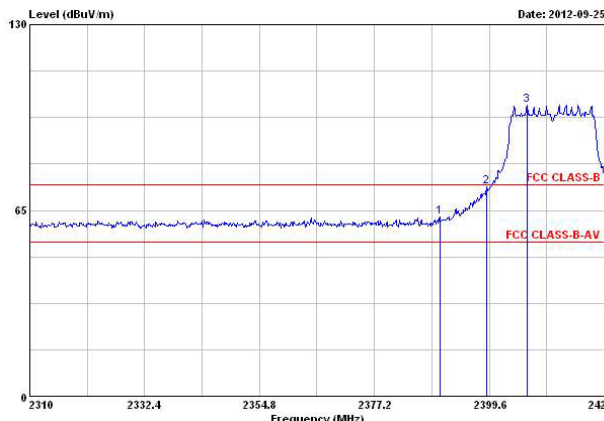
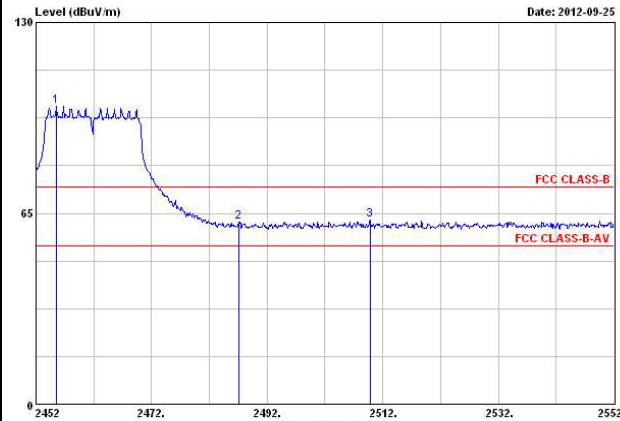
3.3.4 Test Setup



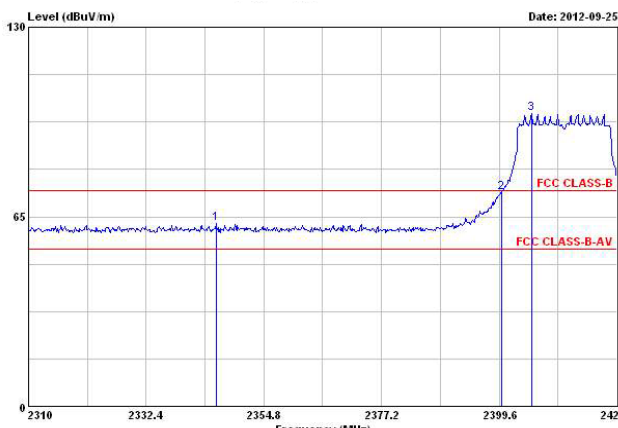
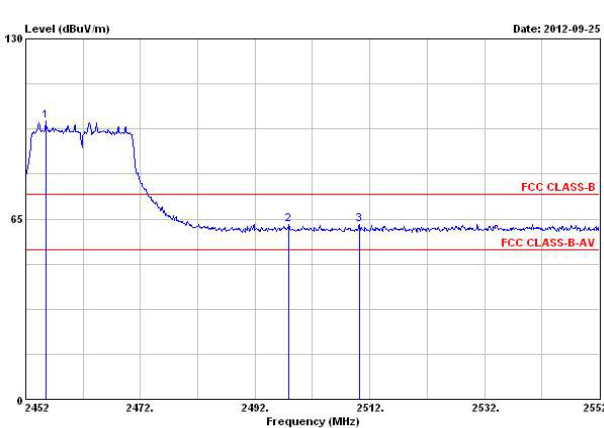
3.3.5 Test Result of Transmitter Radiated Bandedge Emissions-N_{TX} 1

Transmitter Radiated Bandedge Emissions Result								
Modulation	11B-20M		Non-restricted Band Emissions					
Non-restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/100kHz)	NBE Freq. (MHz)	Out-band PSD [o] (dBuV/100kHz)	[i] – [o] (dB)	Limit (dB)	Level Type	Pol. note 1
2390-2400	2412	110.86	2396.80	77.47	33.39	20	PK	V
2500-2690	2462	110.83	2505.40	56.74	54.09	20	PK	V
Low Bandedge				Up Bandedge				
								
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)								

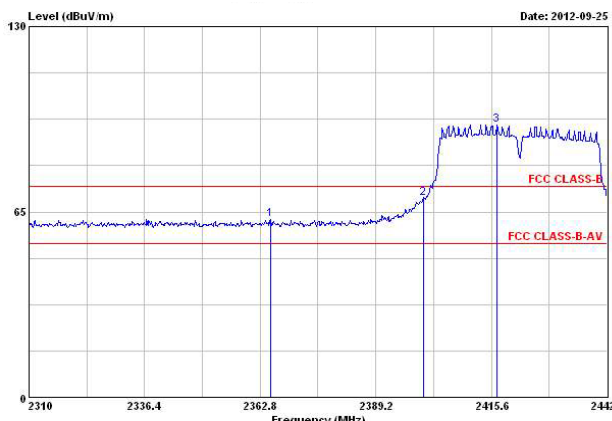
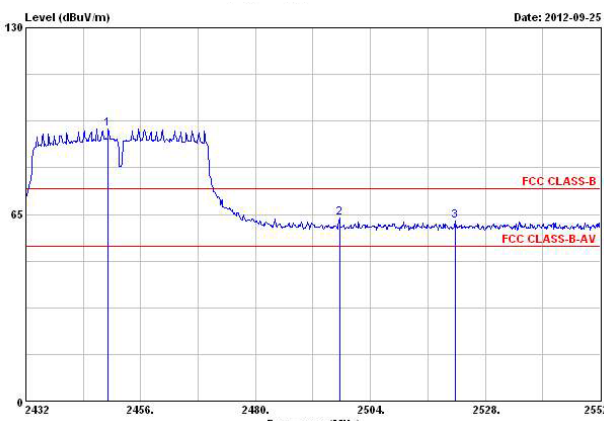
Transmitter Radiated Bandedge Emissions Result								
Modulation	11B-20M		Restricted Band Emissions					
Restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/1MHz)	RBE Freq. (MHz)	Measure Distance (m)	Out-Band Level (dBuV/m)	Limit (dBuV/m)	Level Type	Pol. note 1
2310-2390	2412	118.47	2389.52	3	64.08	74	PK	V
2310-2390	2412	110.55	2386.83	3	52.35	54	AV	V
2483.5-2500	2462	117.73	2483.80	3	64.06	74	PK	V
2483.5-2500	2462	109.17	2486.70	3	52.12	54	AV	V
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).								

Transmitter Radiated Bandedge Emissions Result								
Modulation	11G-20M		Non-restricted Band Emissions					
Non-restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/100kHz)	NBE Freq. (MHz)	Out-band PSD [o] (dBuV/100kHz)	[i] – [o] (dB)	Limit (dB)	Level Type	Pol. note 1
2390-2400	2412	101.95	2399.04	73.38	28.57	20	PK	V
2500-2690	2462	101.47	2509.80	62.55	38.92	20	PK	V
Low Bandedge				Up Bandedge				
								
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)								

Transmitter Radiated Bandedge Emissions Result								
Modulation	11G-20M		Restricted Band Emissions					
Restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/1MHz)	RBE Freq. (MHz)	Measure Distance (m)	Out-Band Level (dBuV/m)	Limit (dBuV/m)	Level Type	Pol. note 1
2310-2390	2412	111.37	2315.95	3	71.18	74	PK	V
2310-2390	2412	99.95	2390.00	3	52.65	54	AV	V
2483.5-2500	2462	110.27	2483.50	3	72.60	74	PK	V
2483.5-2500	2462	99.10	2483.50	3	51.83	54	AV	V
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).								

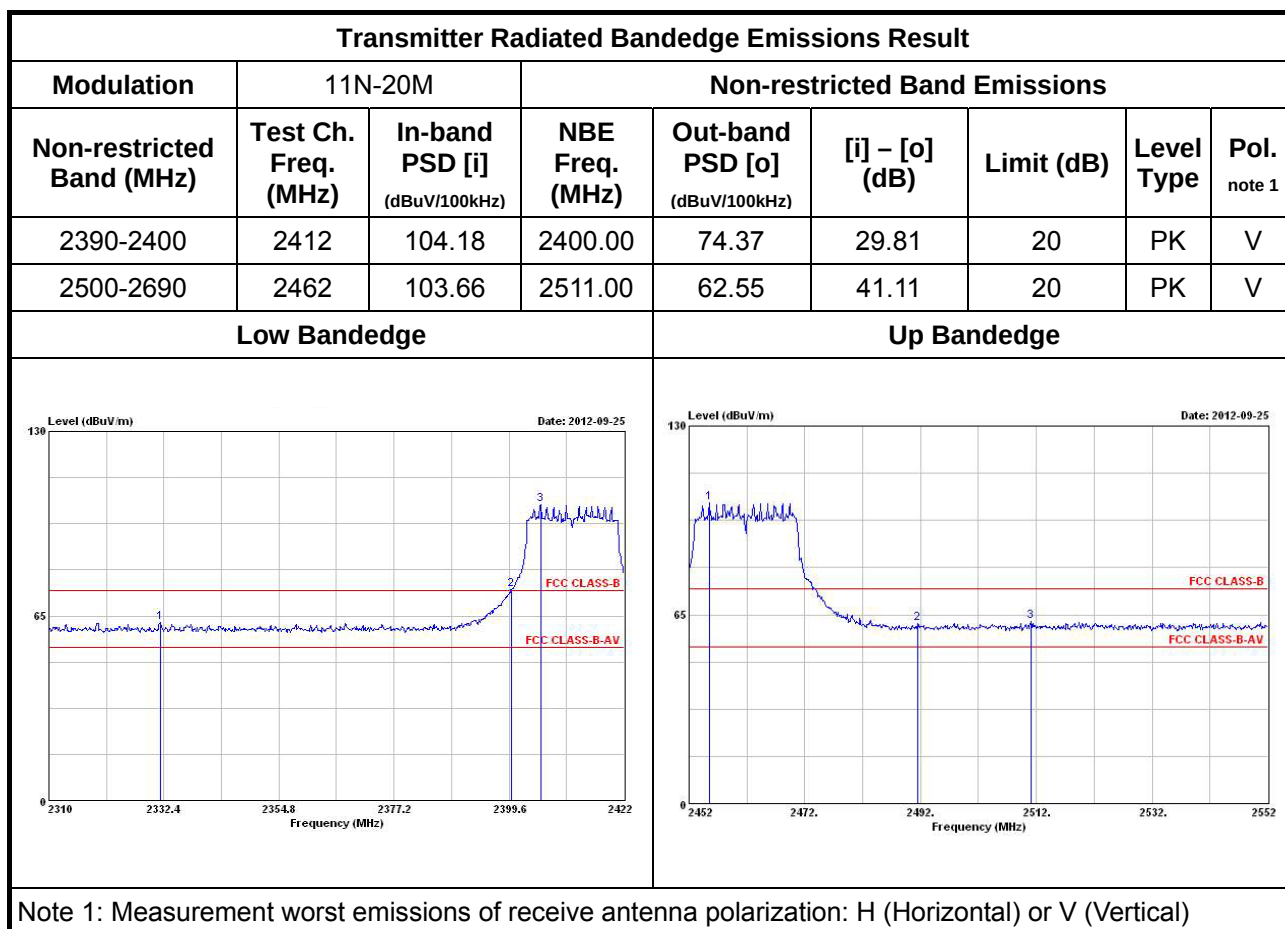
Transmitter Radiated Bandedge Emissions Result								
Modulation	11N-20M		Non-restricted Band Emissions					
Non-restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/100kHz)	NBE Freq. (MHz)	Out-band PSD [o] (dBuV/100kHz)	[i] - [o] (dB)	Limit (dB)	Level Type	Pol. note 1
2390-2400	2412	100.31	2400.00	73.36	26.95	20	PK	V
2500-2690	2462	100.30	2510.20	63.16	37.14	20	PK	V
Low Bandedge				Up Bandedge				
								
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)								

Transmitter Radiated Bandedge Emissions Result								
Modulation	11N-20M		Restricted Band Emissions					
Restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/1MHz)	RBE Freq. (MHz)	Measure Distance (m)	Out-Band Level (dBuV/m)	Limit (dBuV/m)	Level Type	Pol. note 1
2310-2390	2412	109.75	2390.00	3	72.17	74	PK	V
2310-2390	2412	97.73	2390.00	3	51.39	54	AV	V
2483.5-2500	2462	109.08	2484.60	3	72.91	74	PK	V
2483.5-2500	2462	97.56	2483.50	3	51.70	54	AV	V
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).								

Transmitter Radiated Bandedge Emissions Result								
Modulation	11N-40M		Non-restricted Band Emissions					
Non-restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/100kHz)	NBE Freq. (MHz)	Out-band PSD [o] (dBuV/100kHz)	[i] – [o] (dB)	Limit (dB)	Level Type	Pol. note 1
2390-2400	2422	95.48	2400.00	69.72	25.76	20	PK	V
2500-2690	2452	94.87	2521.64	62.78	32.09	20	PK	V
Low Bandedge				Up Bandedge				
								
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)								

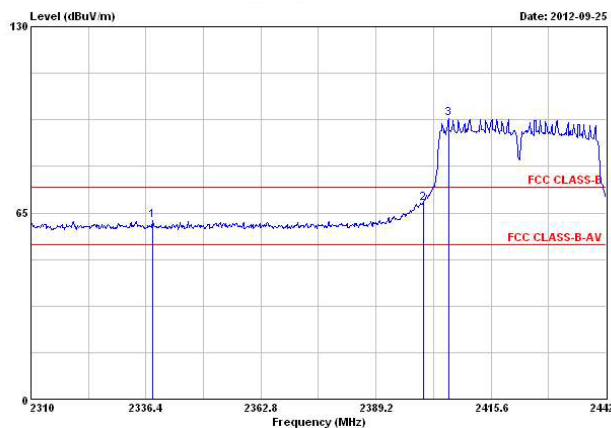
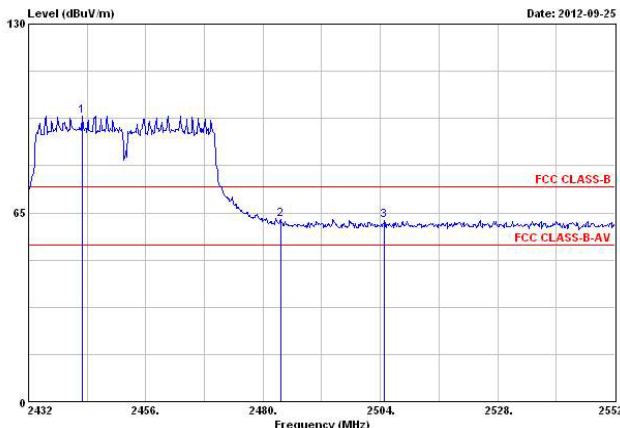
Transmitter Radiated Bandedge Emissions Result								
Modulation	11N-40M		Restricted Band Emissions					
Restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/1MHz)	RBE Freq. (MHz)	Measure Distance (m)	Out-Band Level (dBuV/m)	Limit (dBuV/m)	Level Type	Pol. note 1
2310-2390	2422	105.19	2388.01	3	72.53	74	PK	V
2310-2390	2422	92.97	2390.00	3	52.93	54	AV	V
2483.5-2500	2452	103.83	2483.60	3	71.87	74	PK	V
2483.5-2500	2452	92.11	2483.50	3	52.26	54	AV	V
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).								

3.3.6 Test Result of Transmitter Radiated Bandedge Emissions-N_{TX} 2



Transmitter Radiated Bandedge Emissions Result								
Modulation	11N-20M		Restricted Band Emissions					
Restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/1MHz)	RBE Freq. (MHz)	Measure Distance (m)	Out-Band Level (dBuV/m)	Limit (dBuV/m)	Level Type	Pol. note 1
2310-2390	2412	112.09	2390.00	3	72.17	74	PK	V
2310-2390	2412	99.12	2390.00	3	52.92	54	AV	V
2483.5-2500	2462	111.11	2483.80	3	69.88	74	PK	V
2483.5-2500	2462	98.70	2483.58	3	52.88	54	AV	V

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

Transmitter Radiated Bandedge Emissions Result								
Modulation	11N-40M		Non-restricted Band Emissions					
Non-restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/100kHz)	NBE Freq. (MHz)	Out-band PSD [o] (dBuV/100kHz)	[i] – [o] (dB)	Limit (dB)	Level Type	Pol. note 1
2390-2400	2422	98.00	2400.00	68.35	39.65	20	PK	V
2500-2690	2452	98.40	2504.84	62.47	35.94	20	PK	V
Low Bandedge				Up Bandedge				
								
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)								

Transmitter Radiated Bandedge Emissions Result								
Modulation	11N-40M		Restricted Band Emissions					
Restricted Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/1MHz)	RBE Freq. (MHz)	Measure Distance (m)	Out-Band Level (dBuV/m)	Limit (dBuV/m)	Level Type	Pol. note 1
2310-2390	2422	106.13	2390.00	3	71.49	74	PK	V
2310-2390	2422	92.77	2390.00	3	52.42	54	AV	V
2483.5-2500	2452	106.61	2483.72	3	71.45	74	PK	V
2483.5-2500	2452	92.89	2483.50	3	52.29	54	AV	V
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).								

3.4 Transmitter Radiated Unwanted Emissions

3.4.1 Transmitter Radiated Unwanted Emissions Limit

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Un-restricted Band Emissions Limit	
RF output power procedure	Limit (dB)
Peak output power procedure	20
Average output power procedure	30

Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

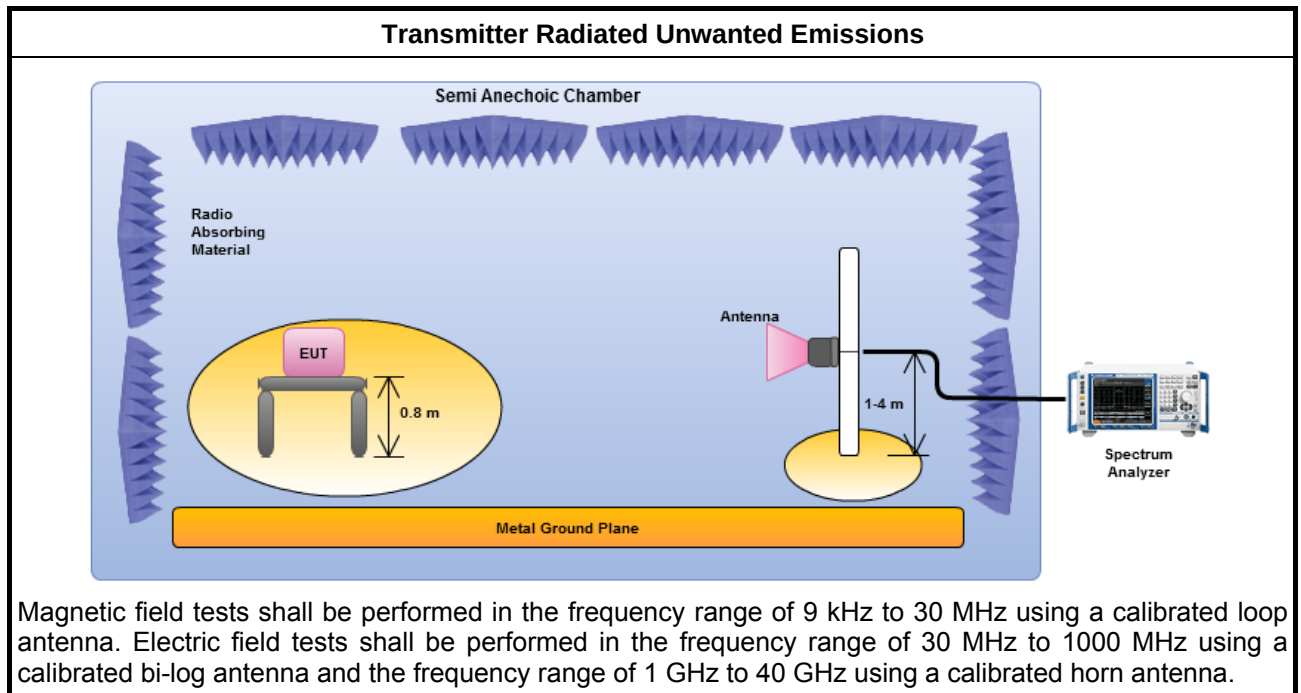
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

Test Method	
☒	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 frequency range 10 GHz - 18GHz are typically made at a closer distance 1m, because the instrumentation noise floor is typically close to the radiated emission limit.
☒	Measurements in the frequency range above 18 GHz - 25GHz are typically made at a closer distance 0.5m, because the instrumentation noise floor is typically close to the radiated emission limit.
☒	The average emission levels shall be measured in [duty cycle $\geq$ 98 or duty factor].
☒	For the transmitter unwanted emissions shall be measured using following options below:
☒	Refer as FCC KDB 558074, clause 5.4.1 for unwanted emissions into non-restricted bands.
☒	Refer as FCC KDB 558074, clause 5.4.2 for unwanted emissions into restricted bands.
☒	Refer as FCC KDB 558074, clause 5.4.2.2.1 Option 1 (Power Averaging).
☐	Refer as FCC KDB 558074, clause 5.4.2.2.2 Option 2 (Trace Averaging).
☐	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW) – Duty cycle $\geq$ 98%.
☐	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
☒	Refer as FCC KDB 558074, clause 5.4.2.2.1.1 measurement procedure peak limit.
☐	Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.
☒	For radiated measurement.
☐	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz.
☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz.
☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions from above 1 GHz.

3.4.4 Test Setup

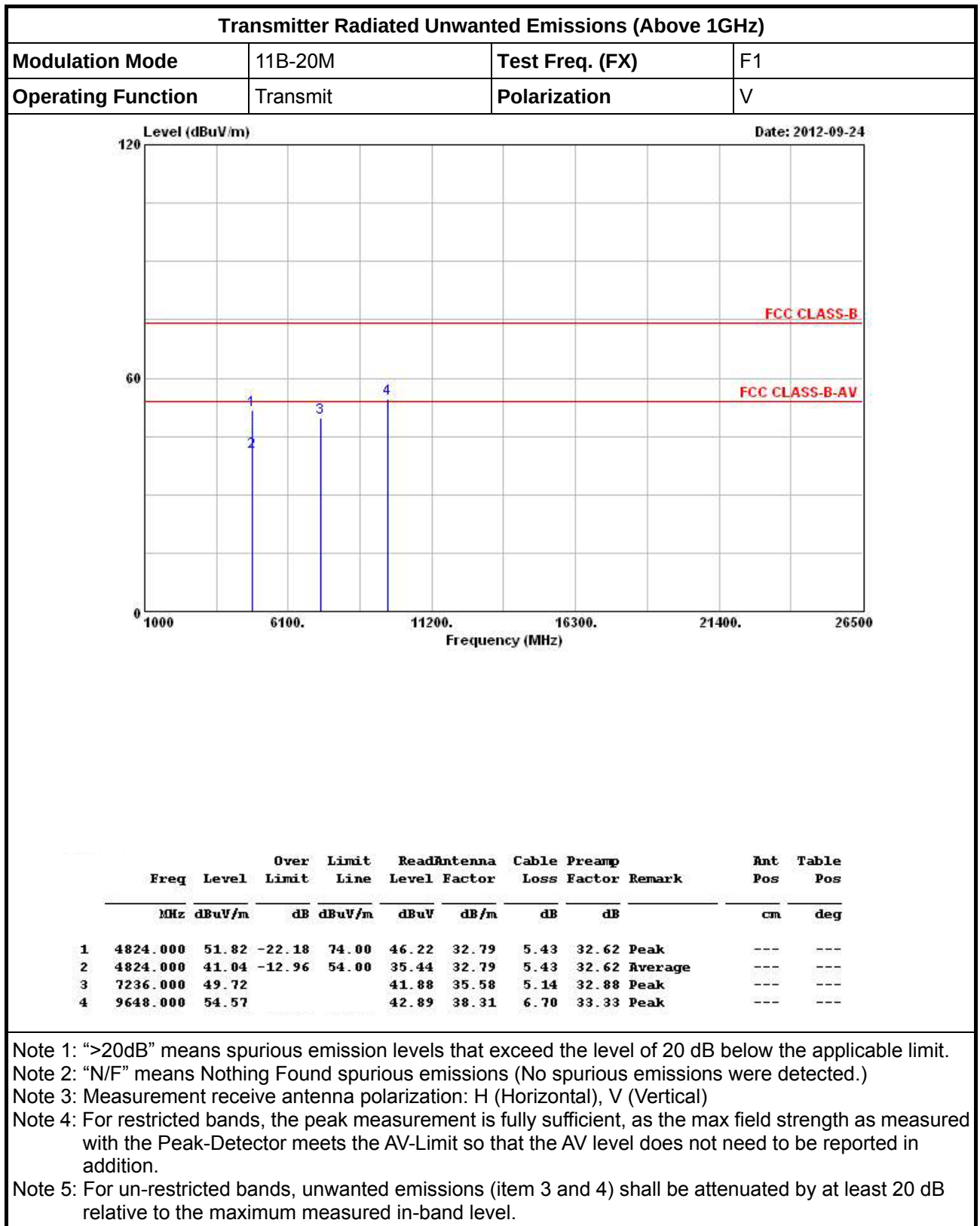


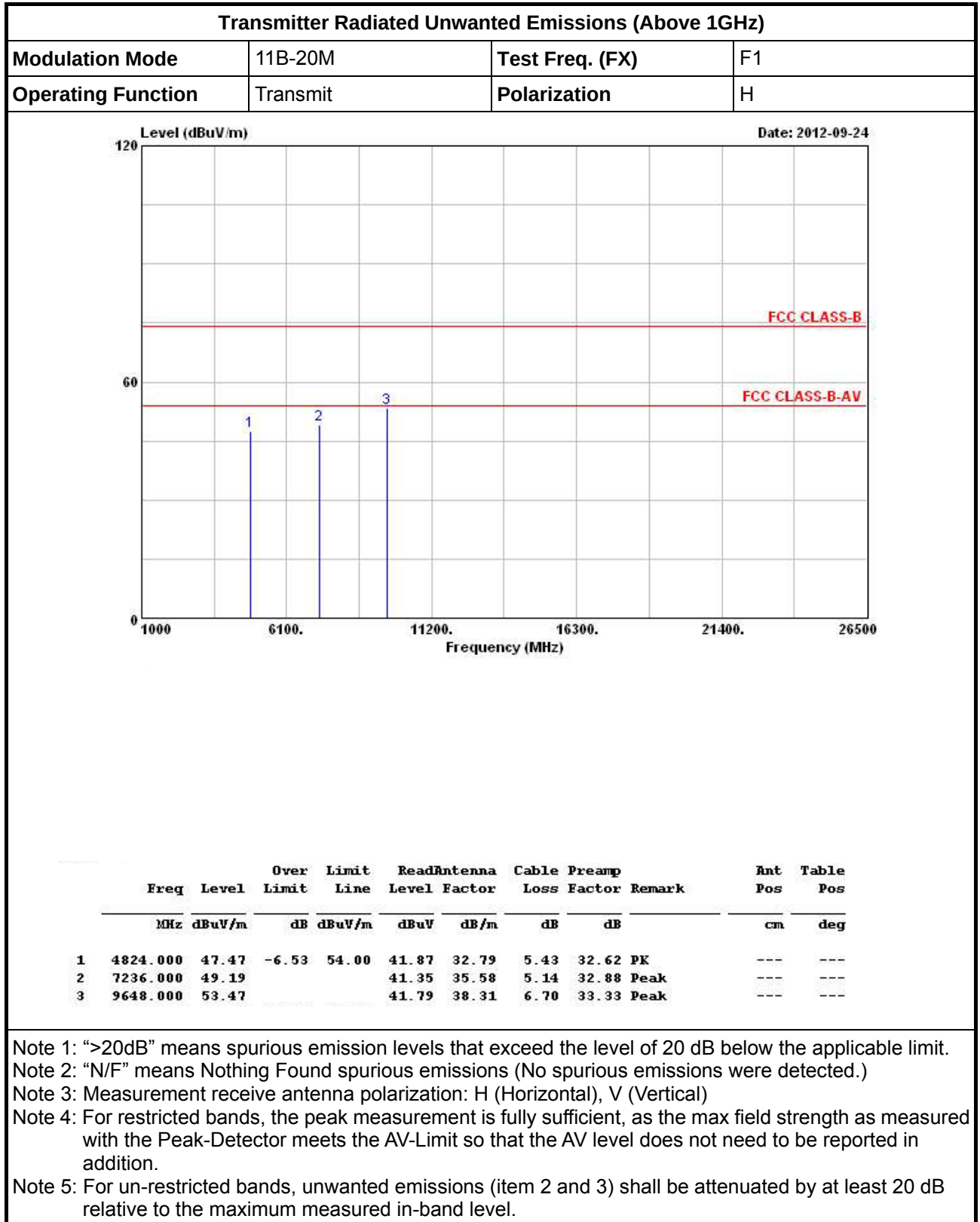
3.4.5 Transmitter Radiated Unwanted Emissions (Below 1GHz)

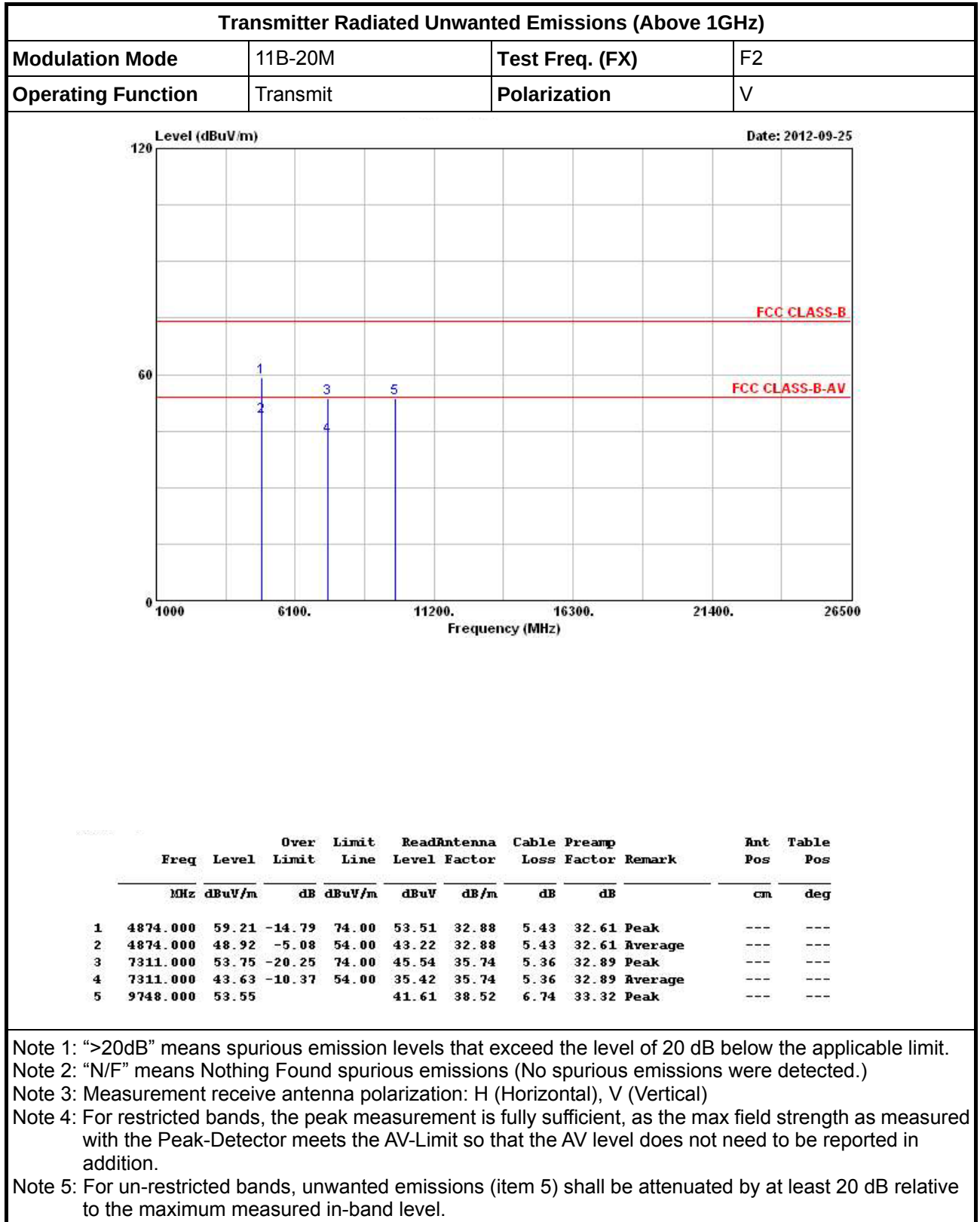


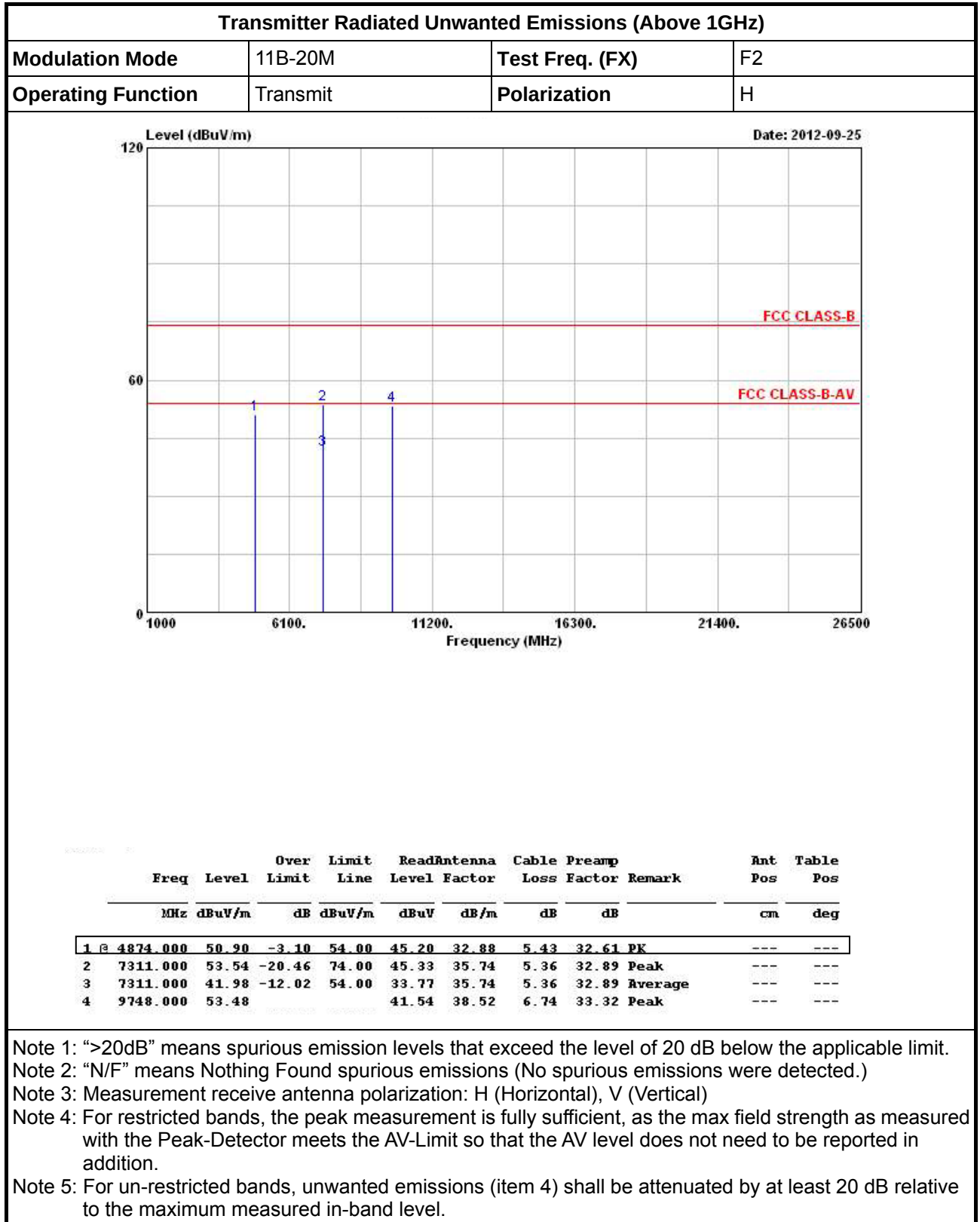


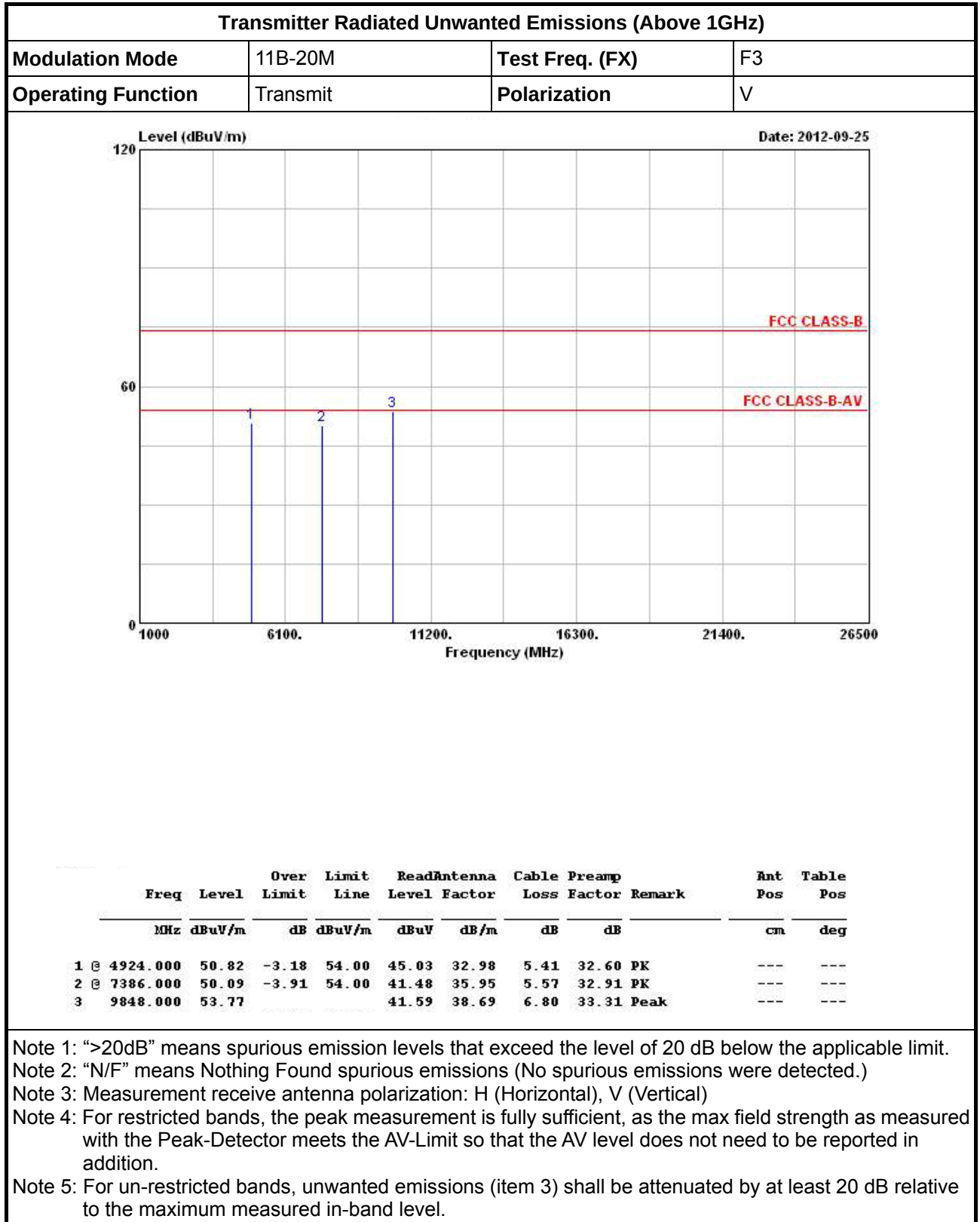
3.4.6 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11B-20M-N_{Tx}1

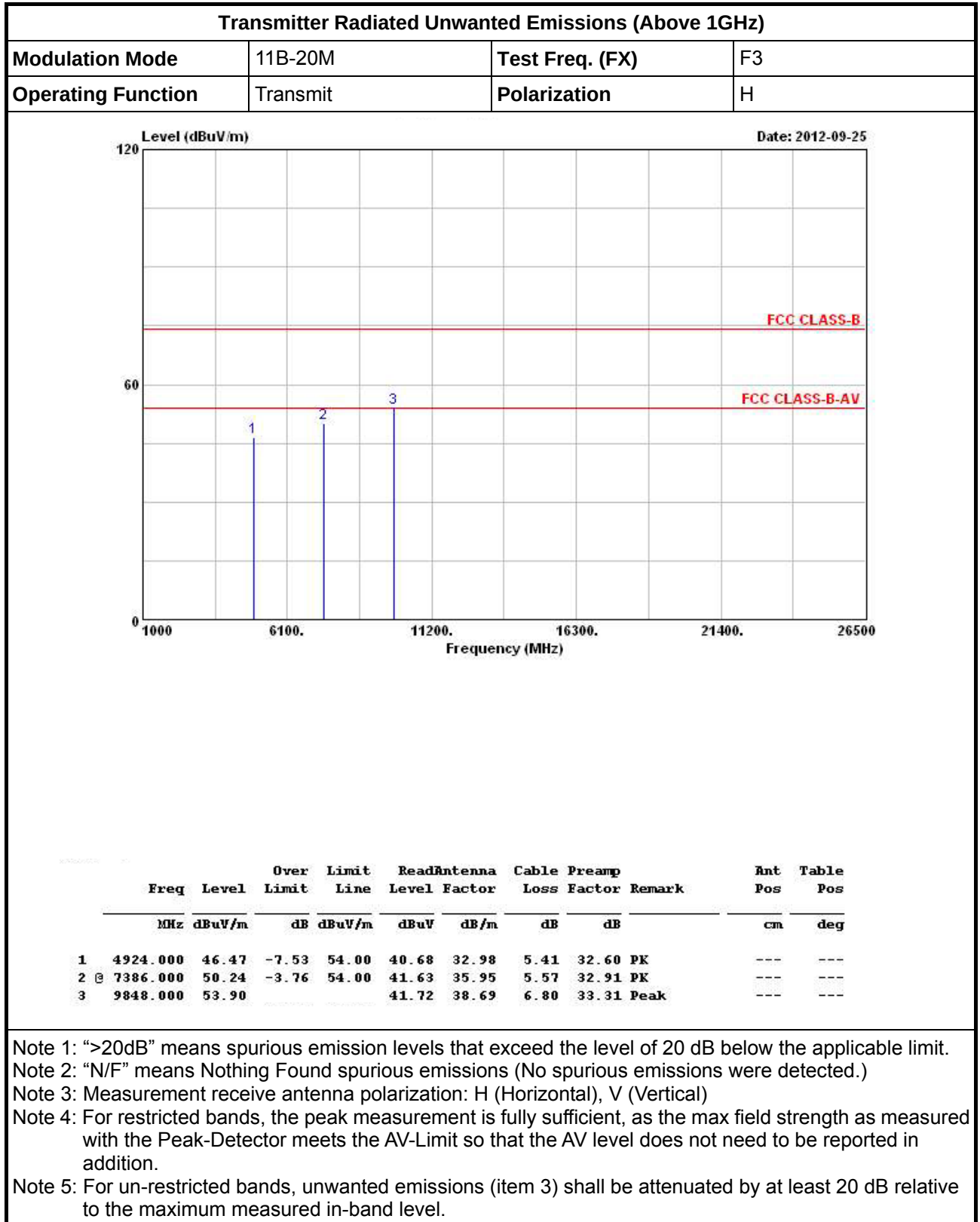




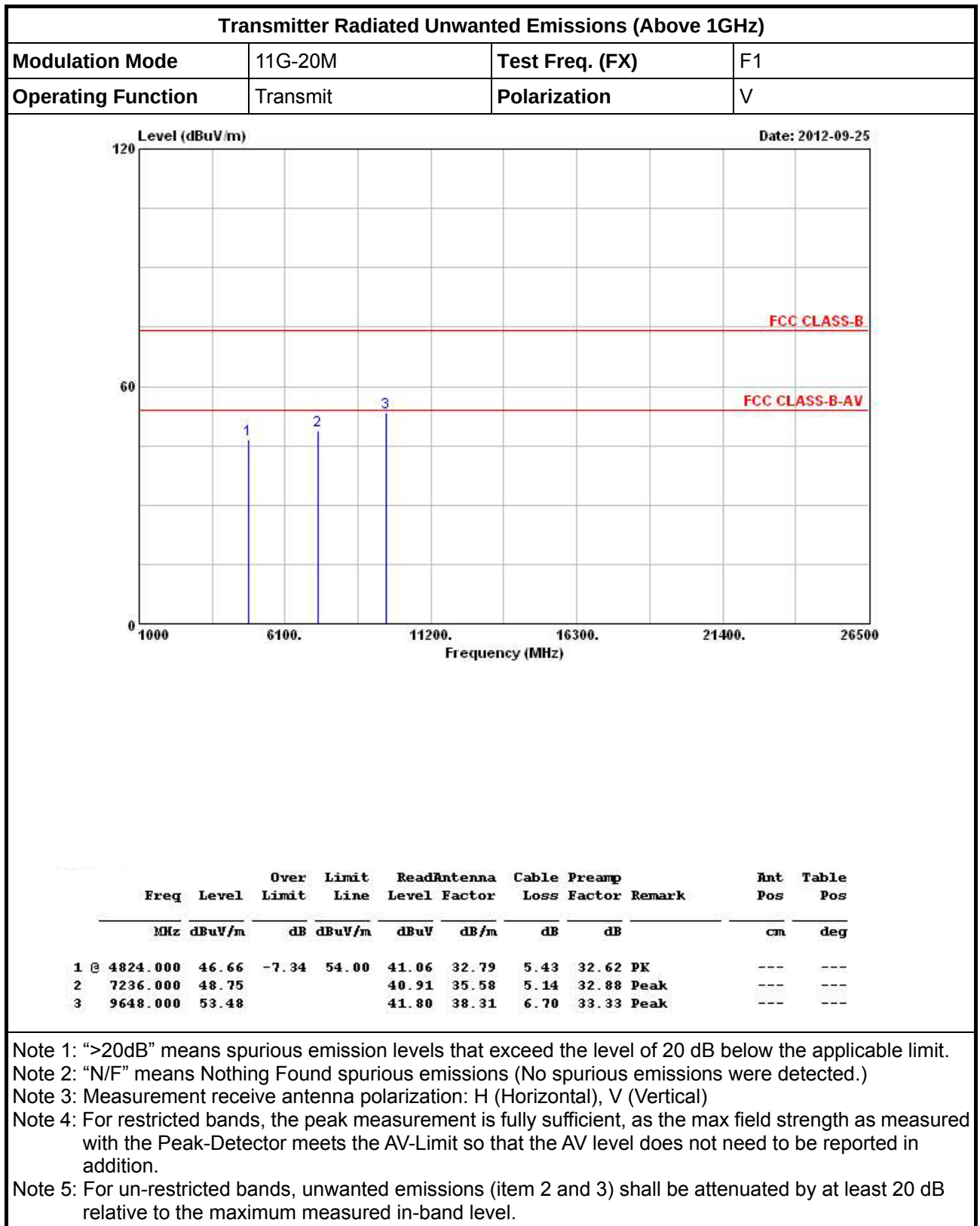


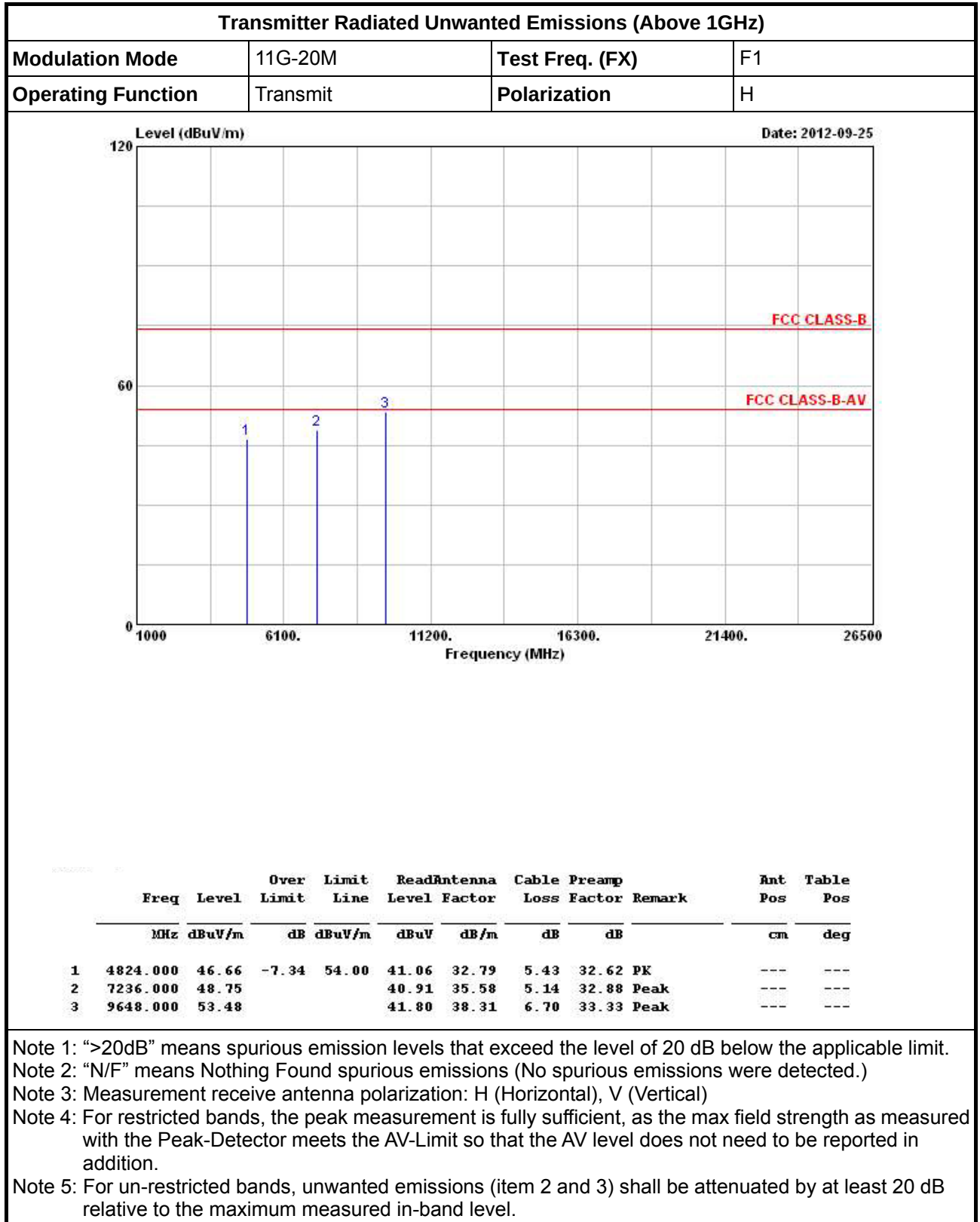


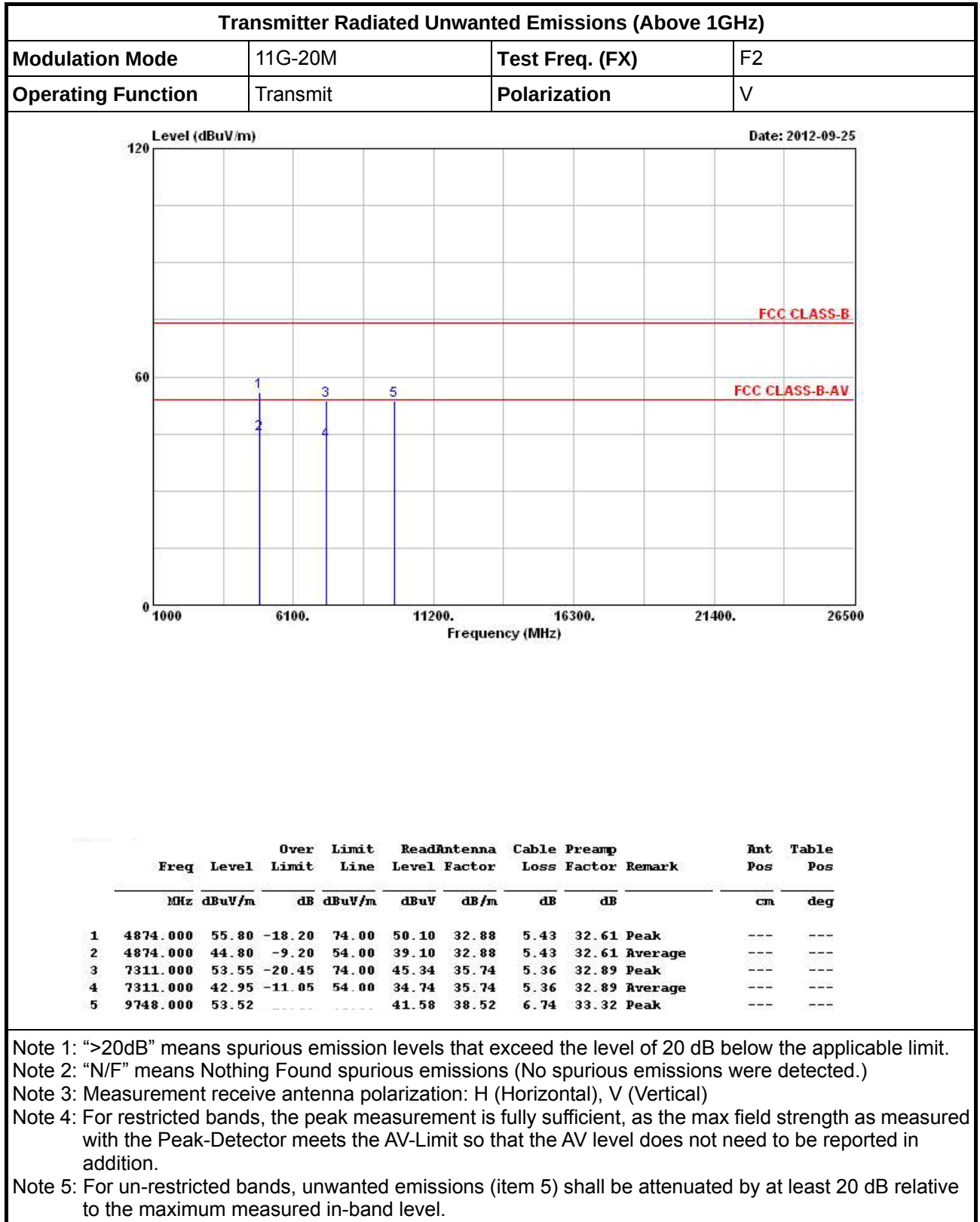


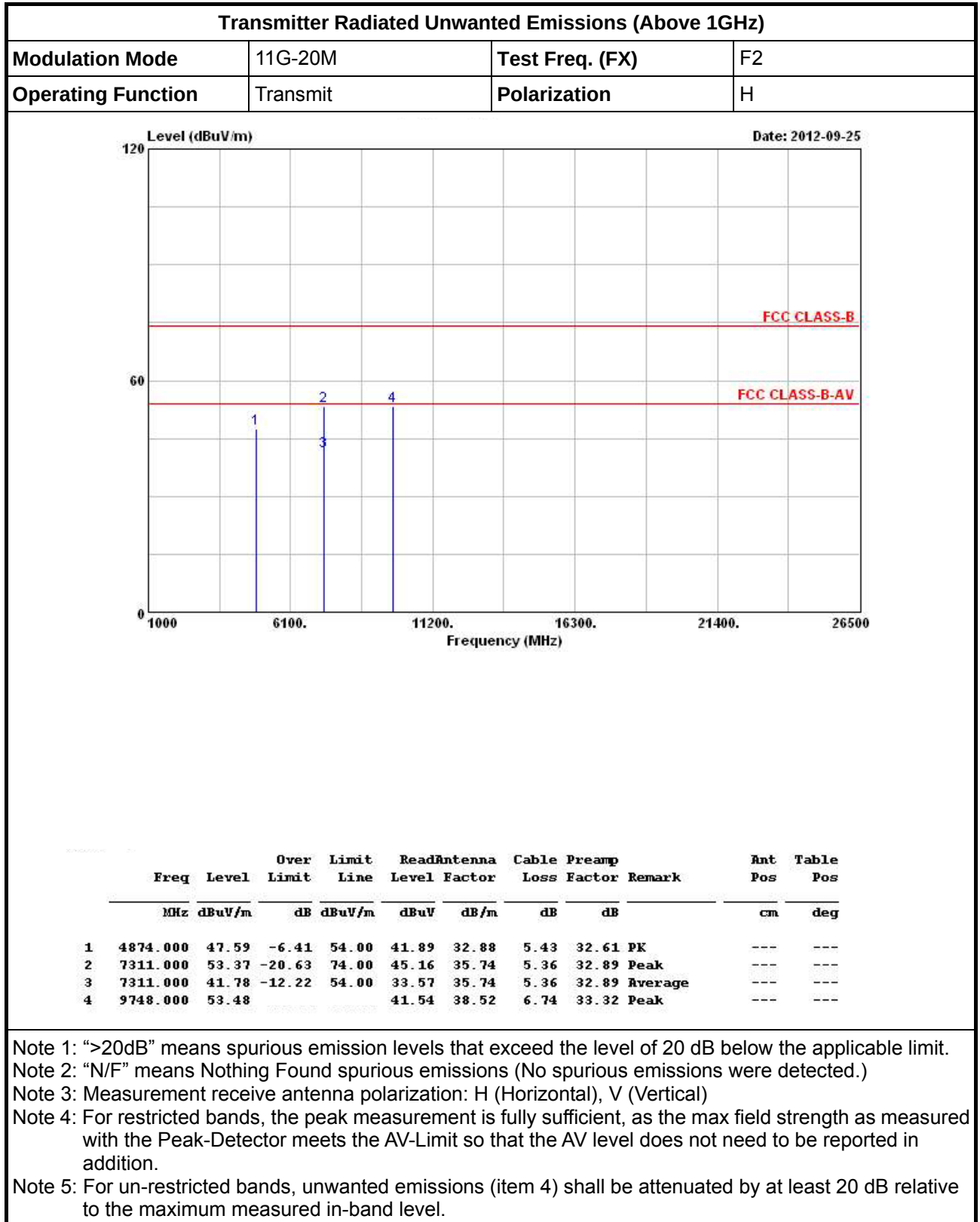


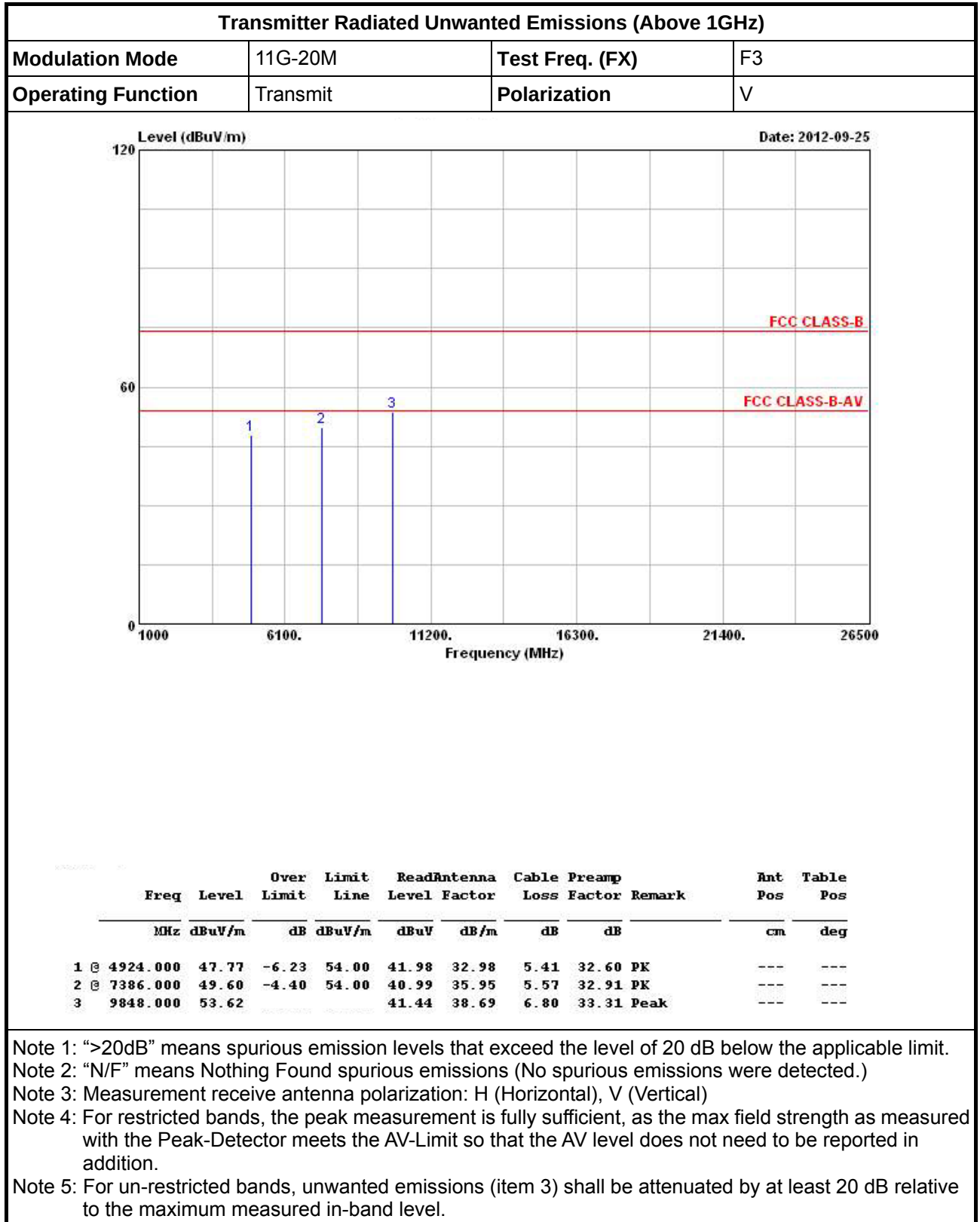
3.4.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11G-20M-N_{Tx} 1

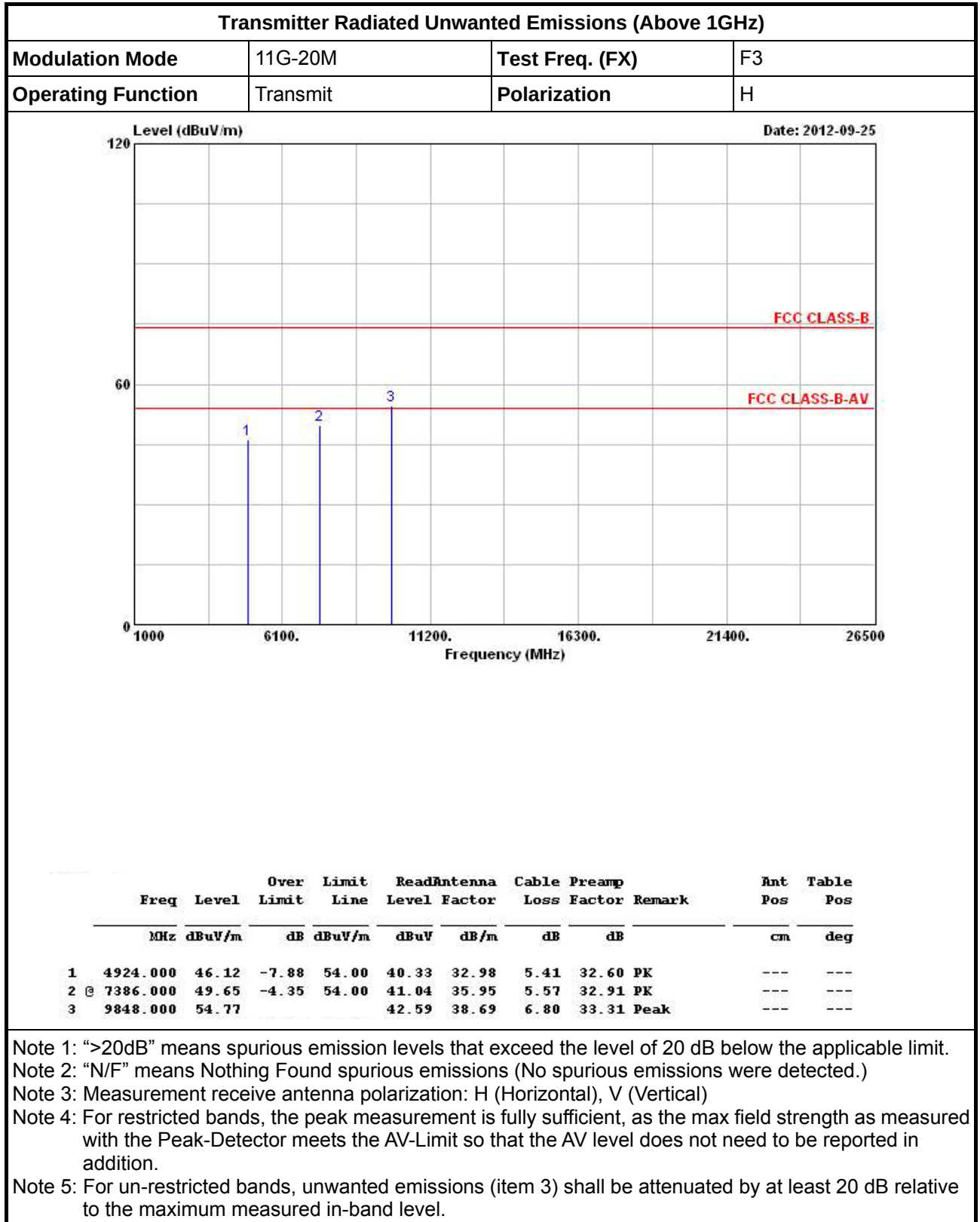


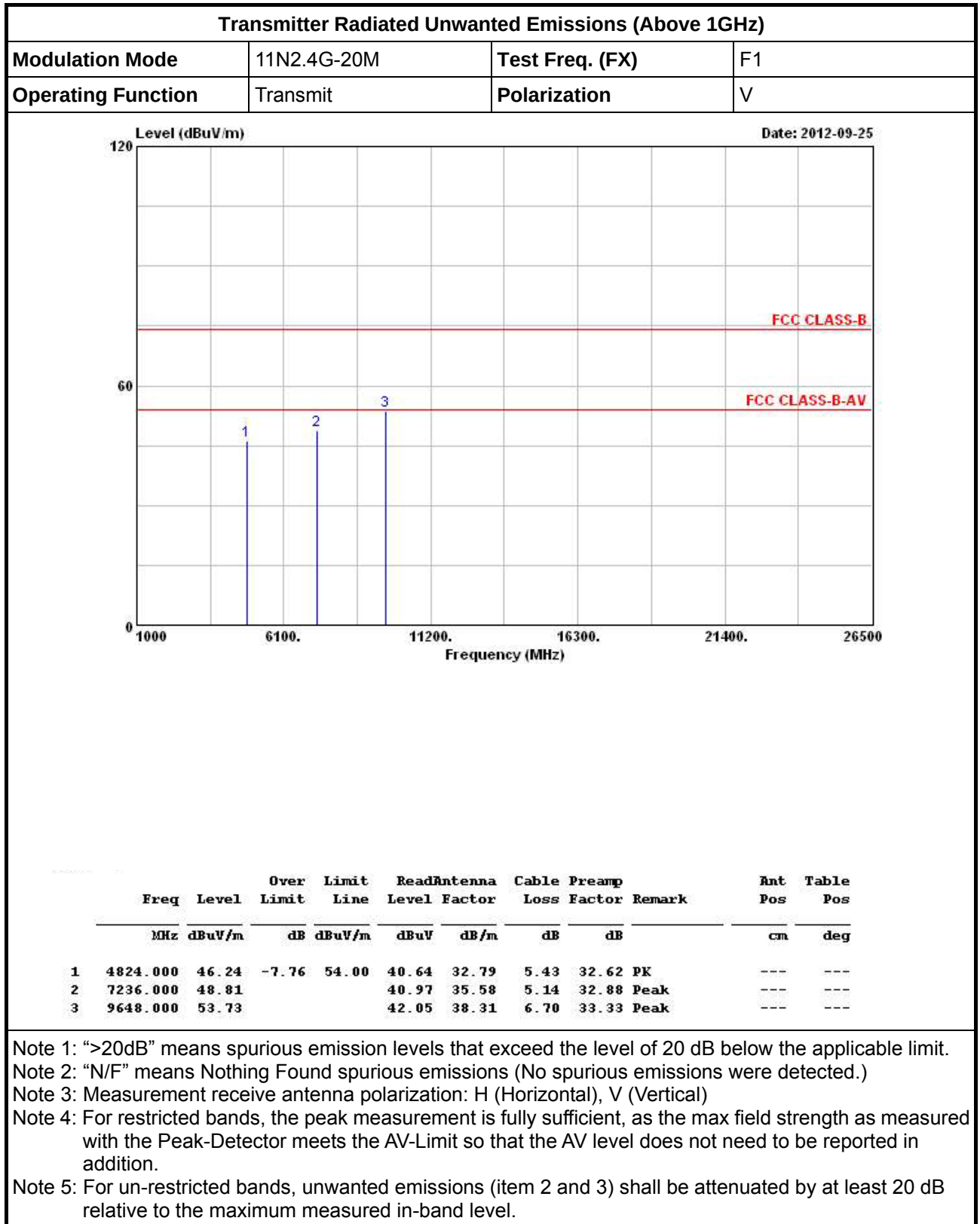


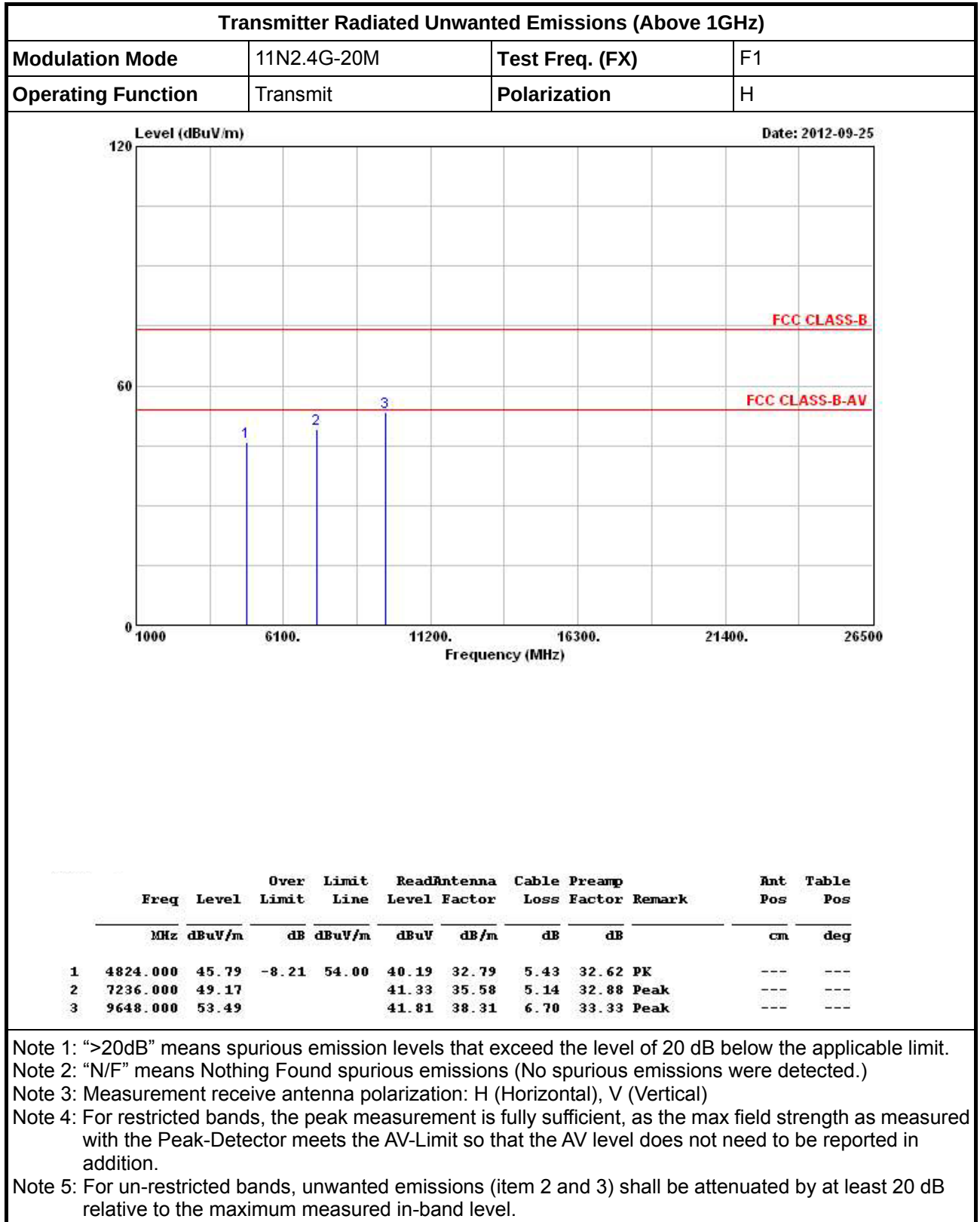


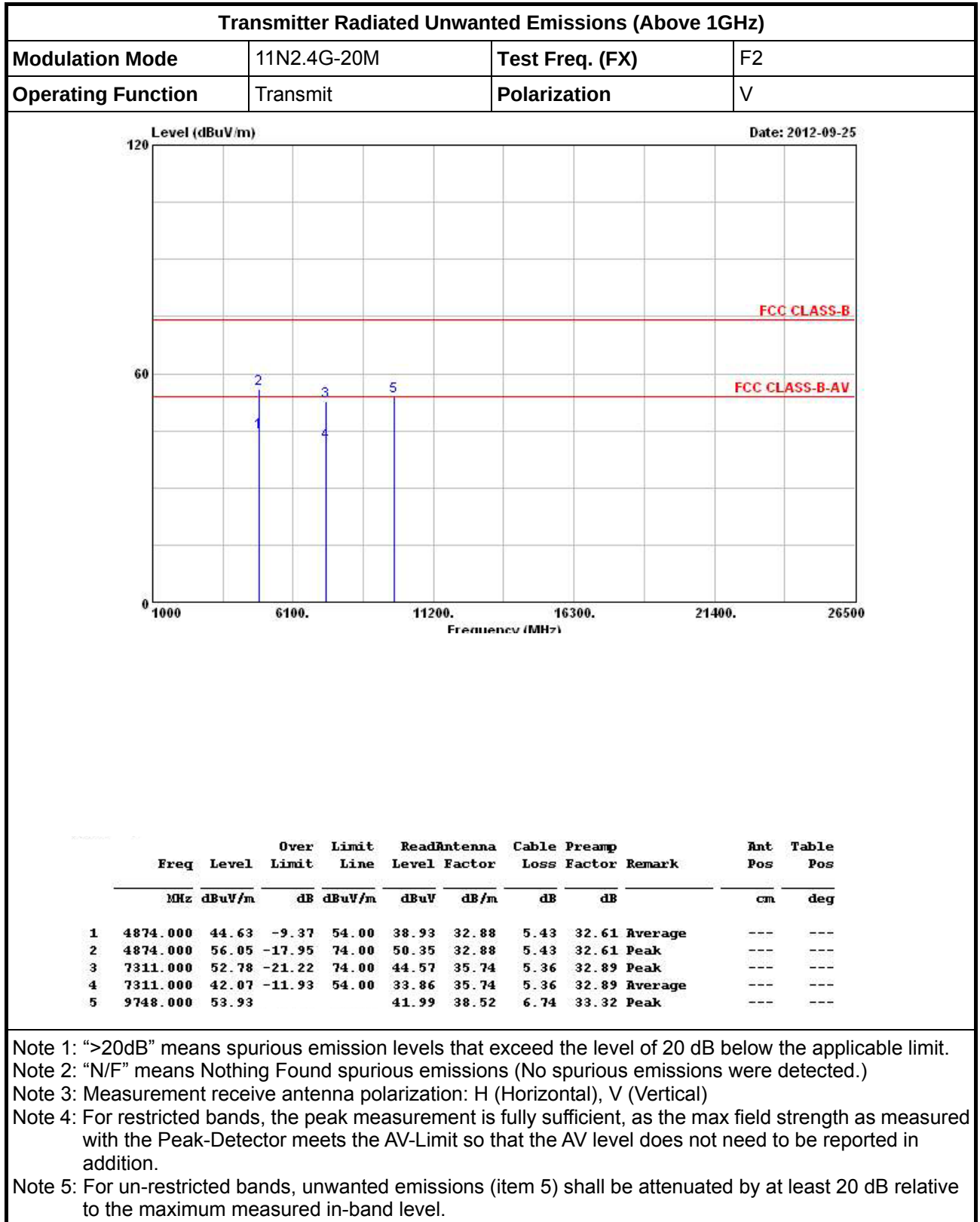


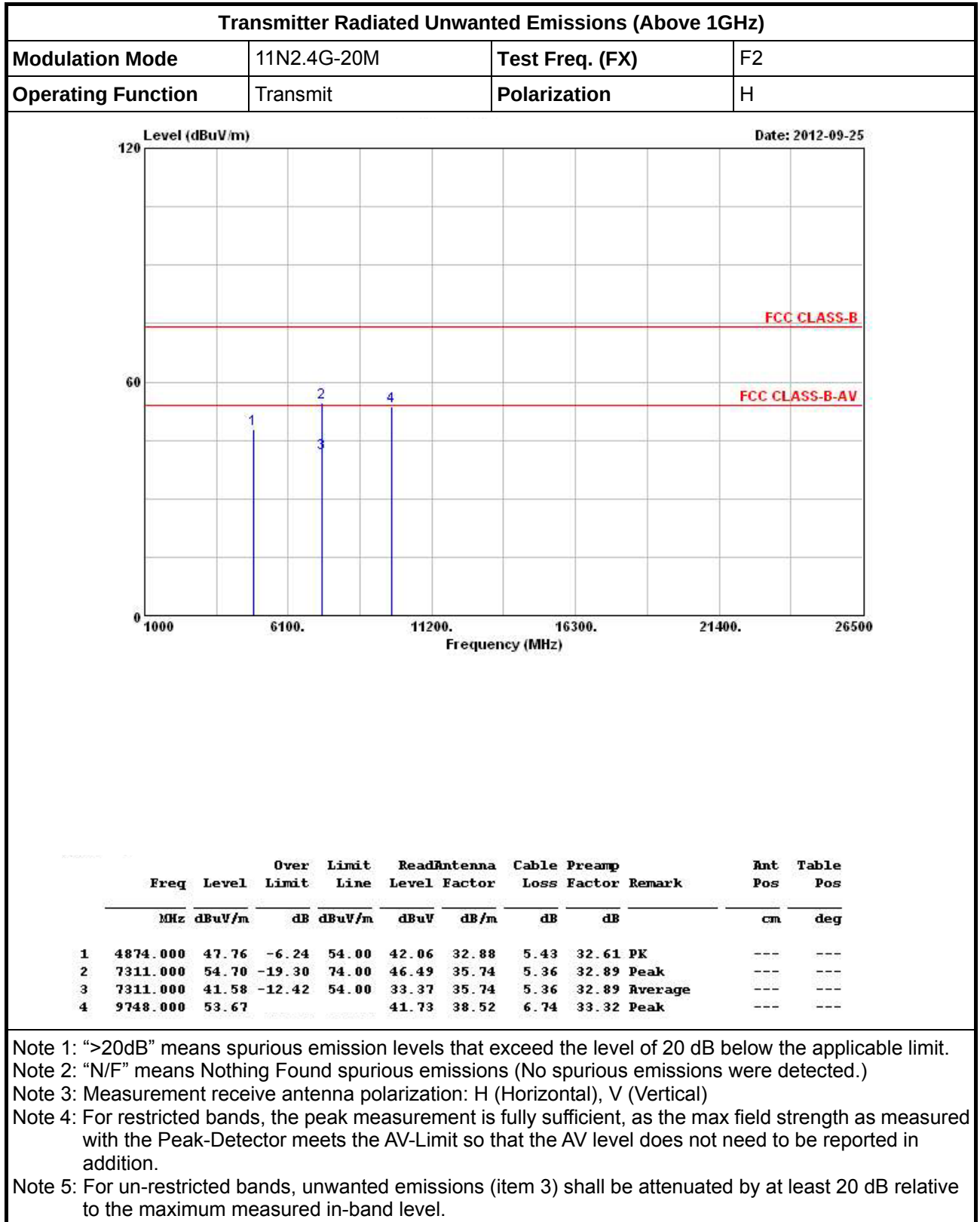


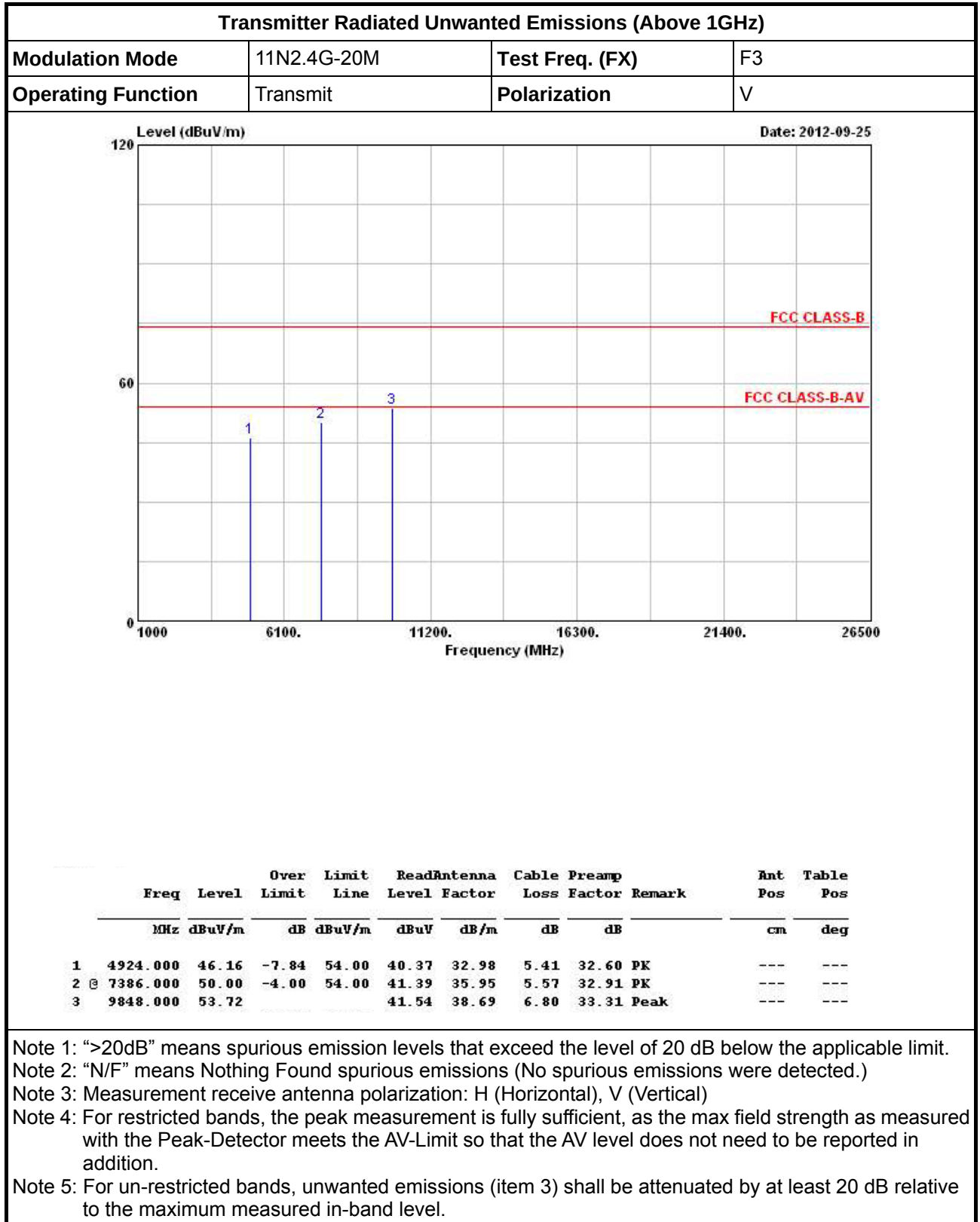


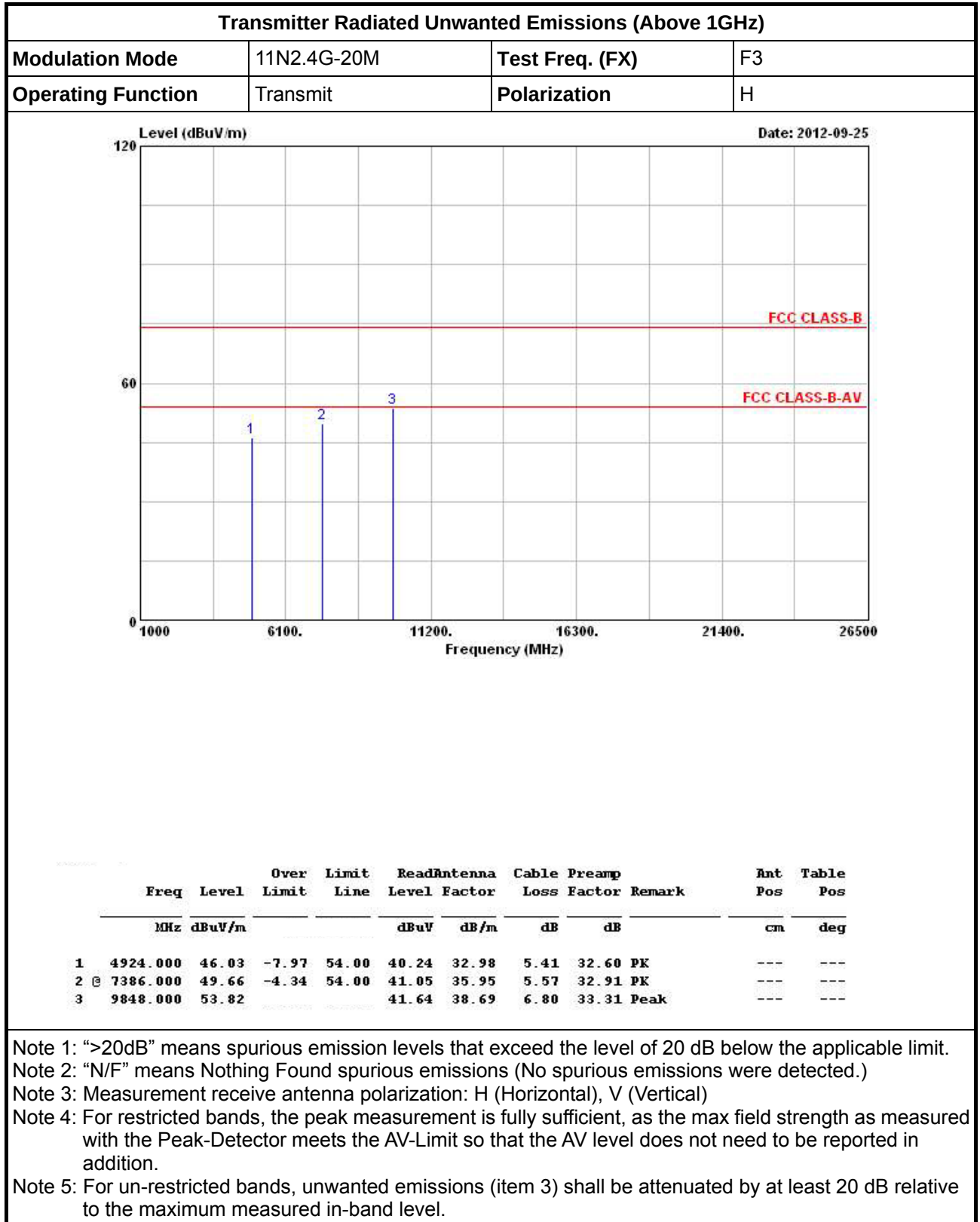
3.4.8 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11N2.4G-20M-N_{TX} 1


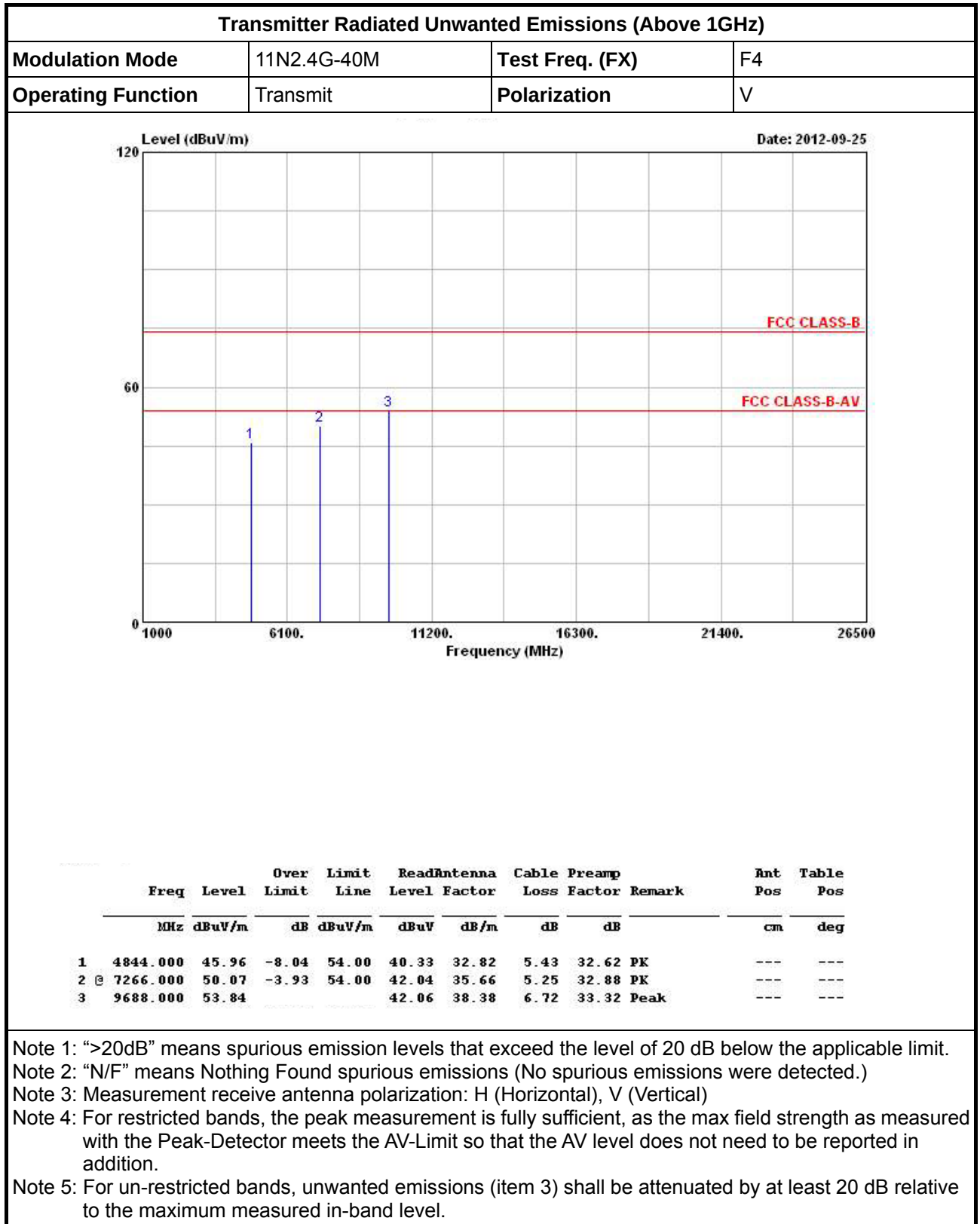


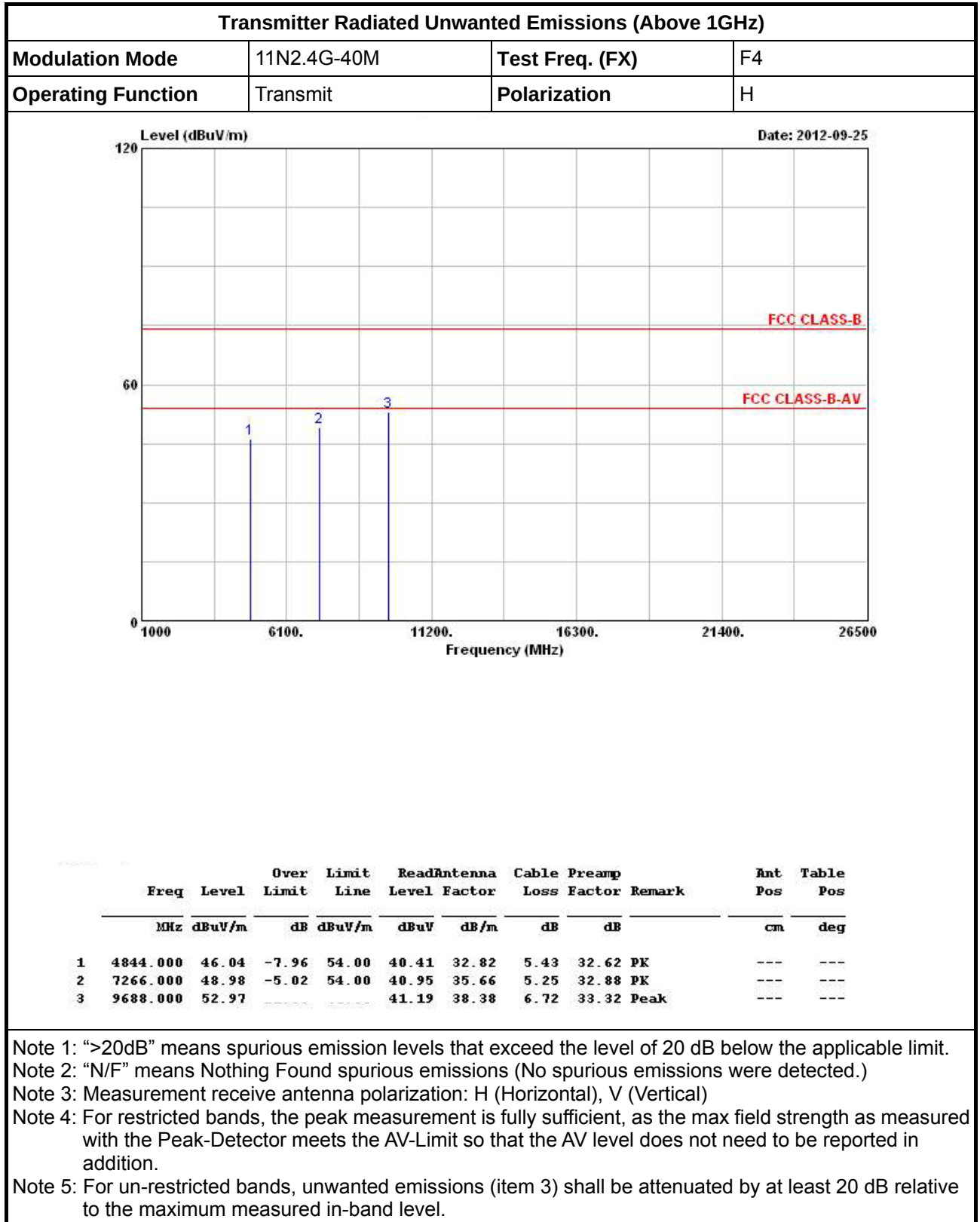


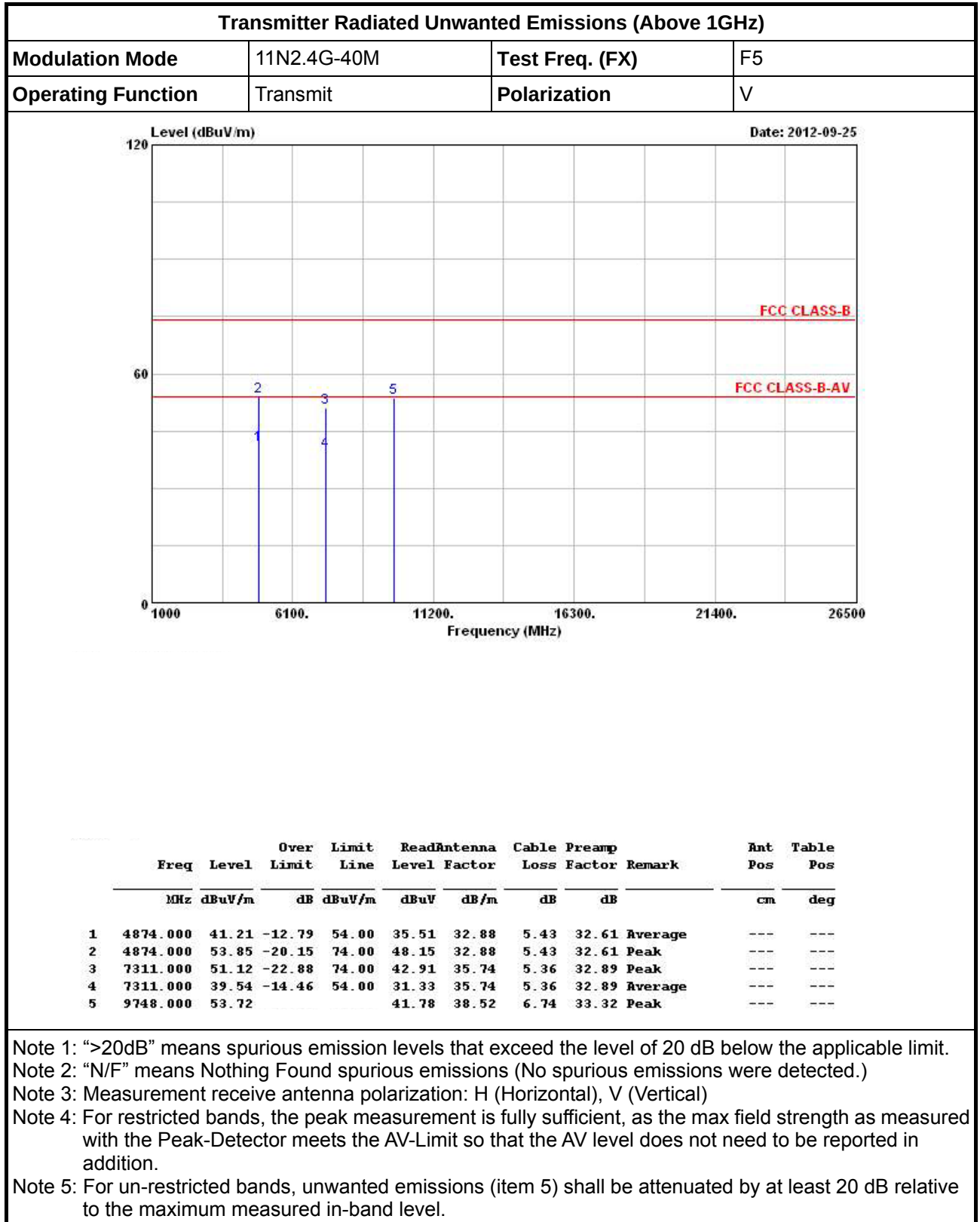


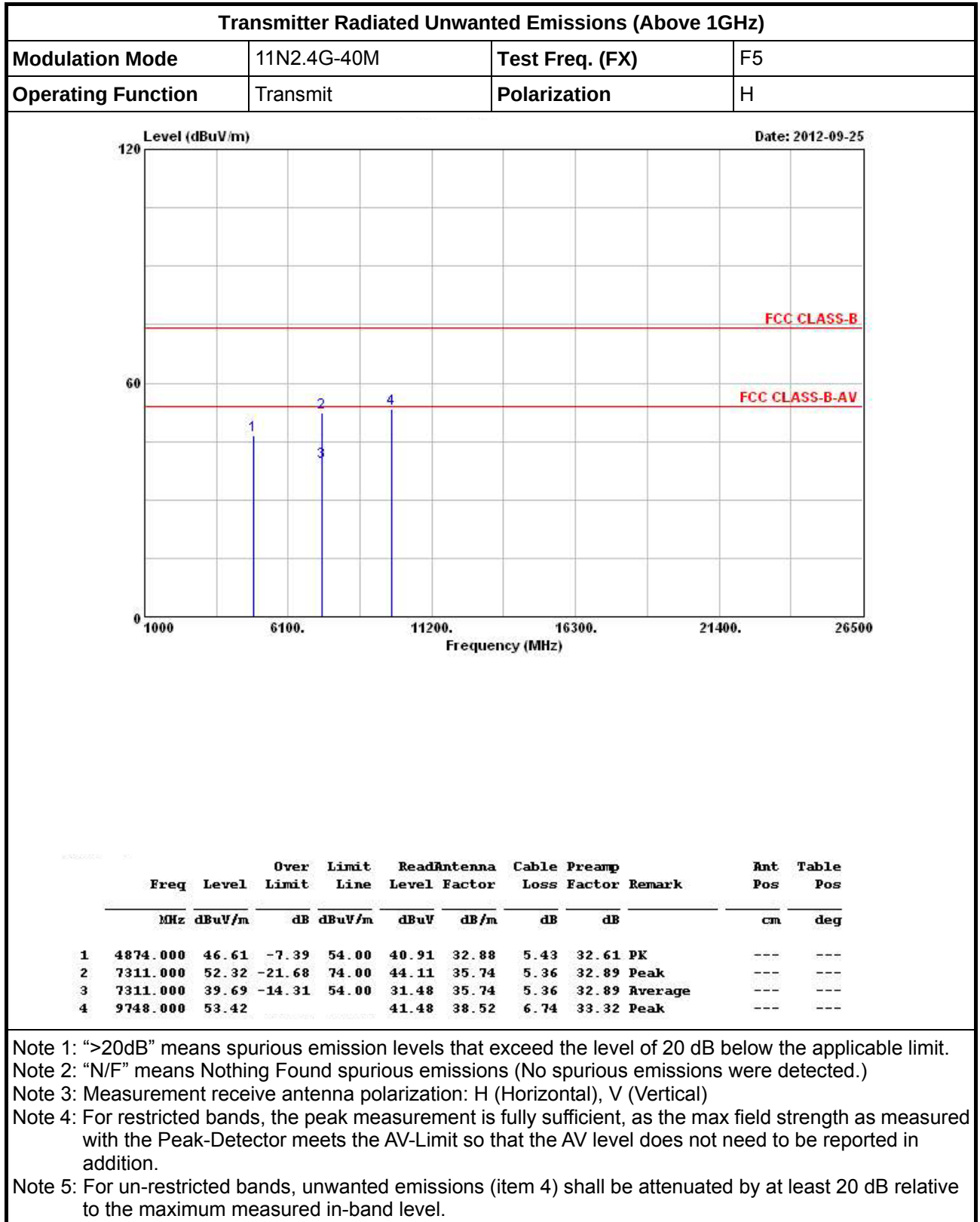


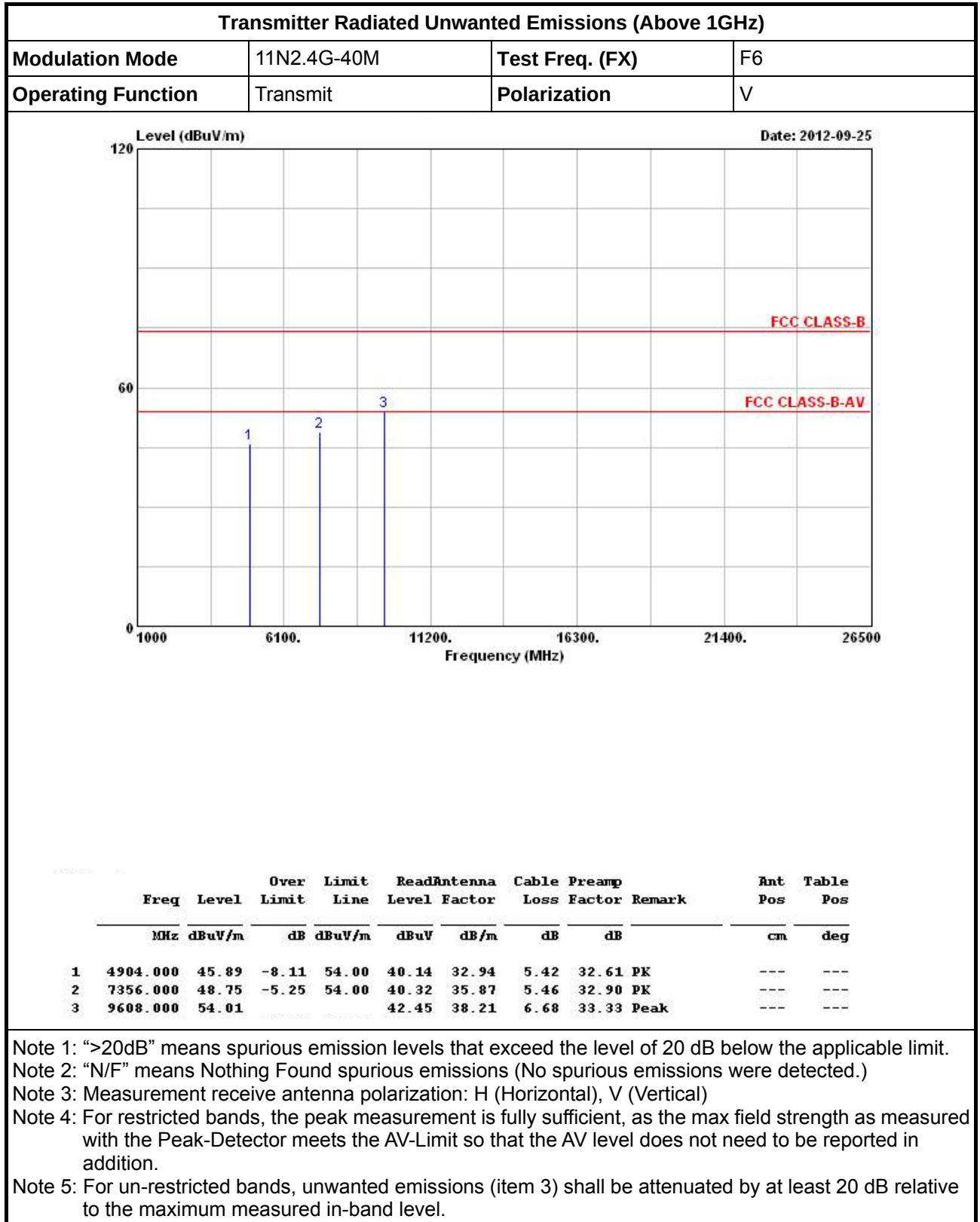


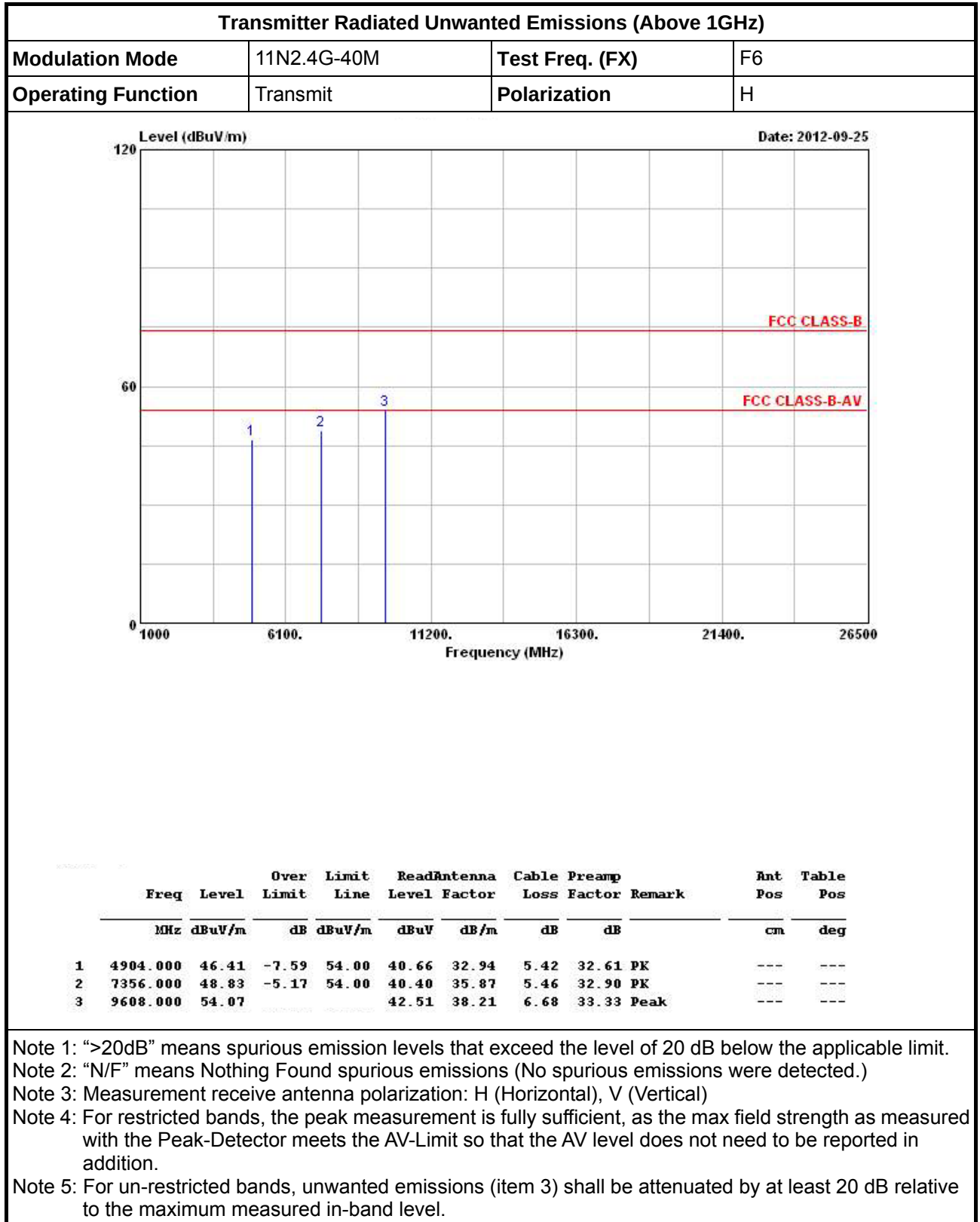
3.4.9 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11N2.4G-40M-N_{TX} 1


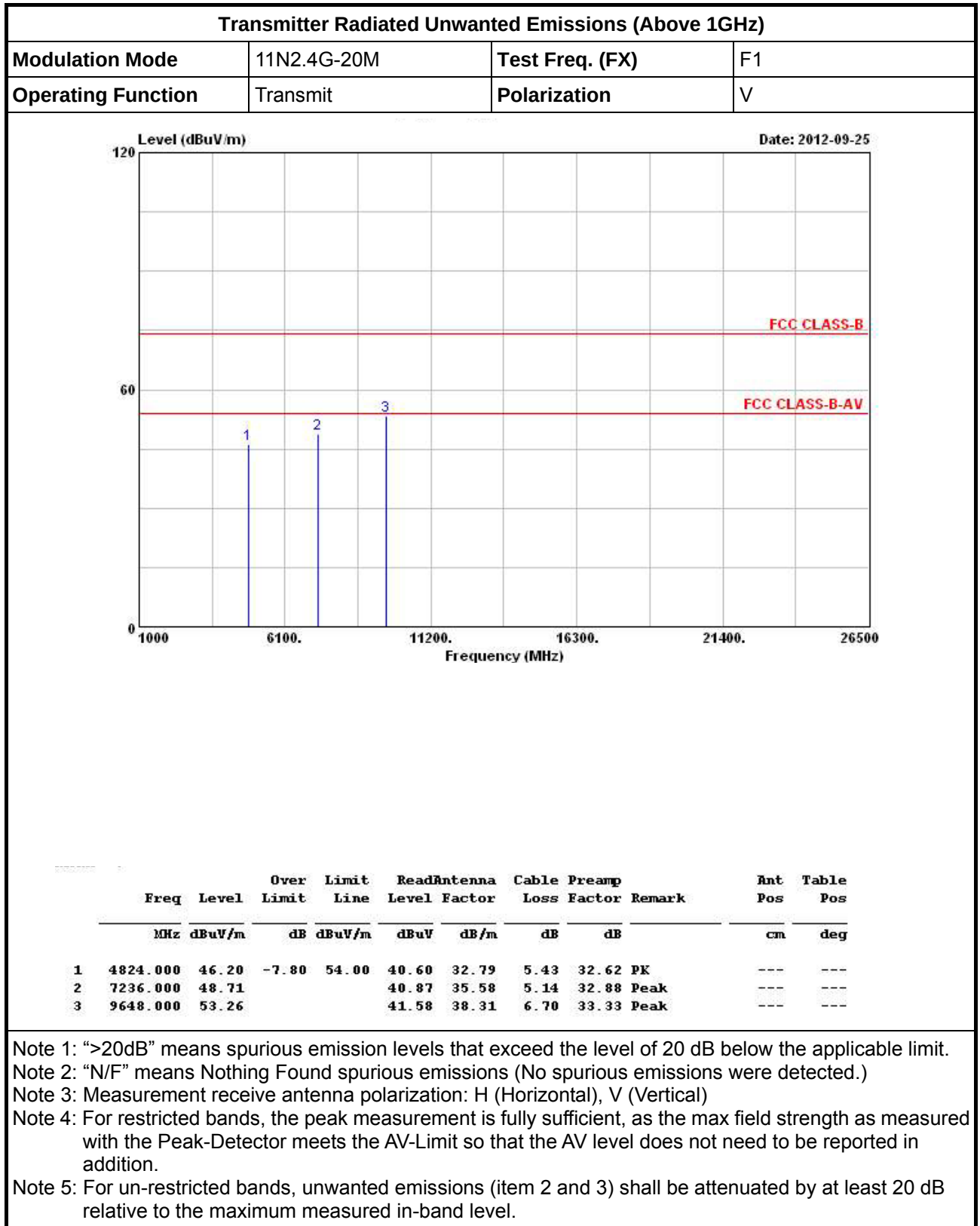


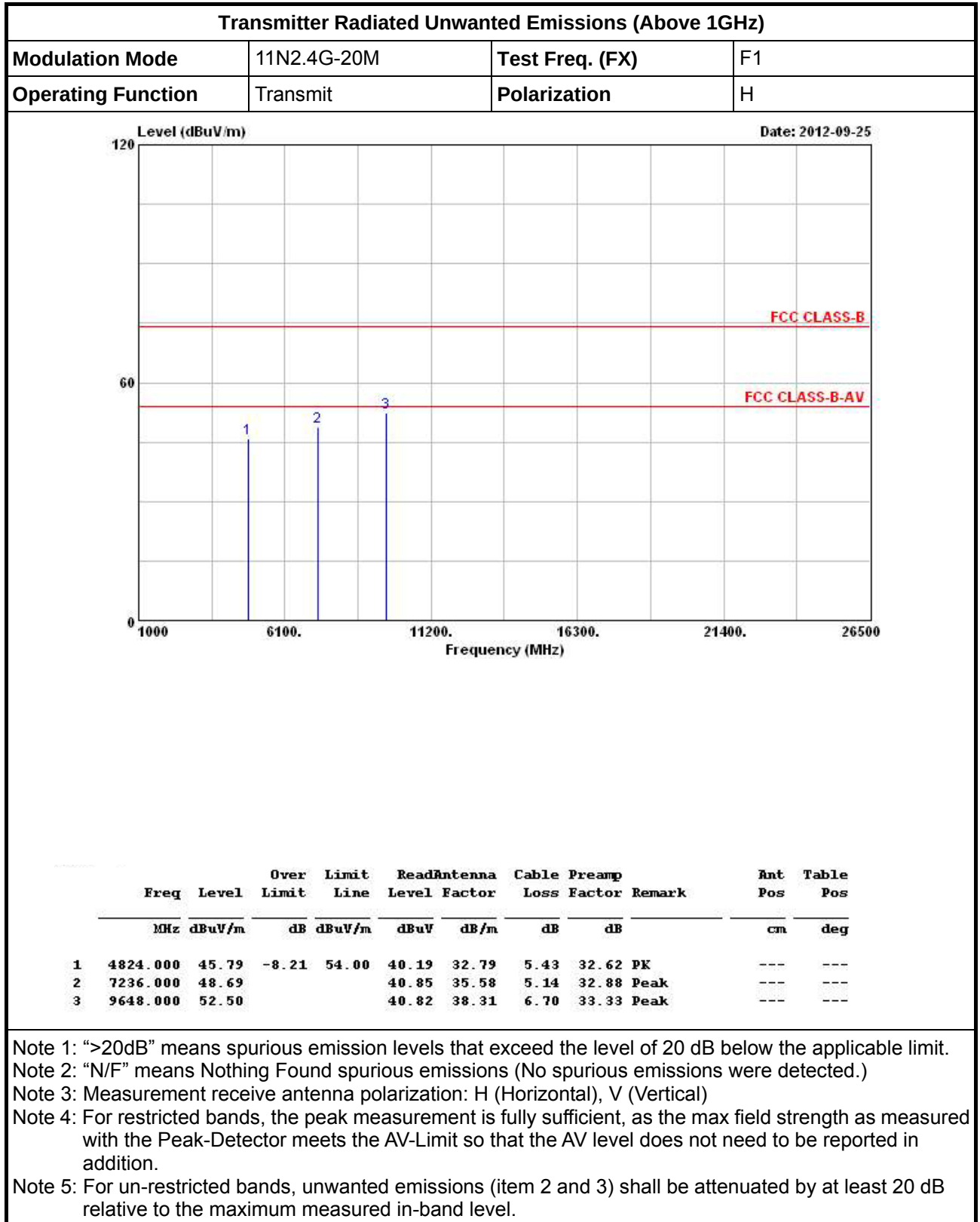


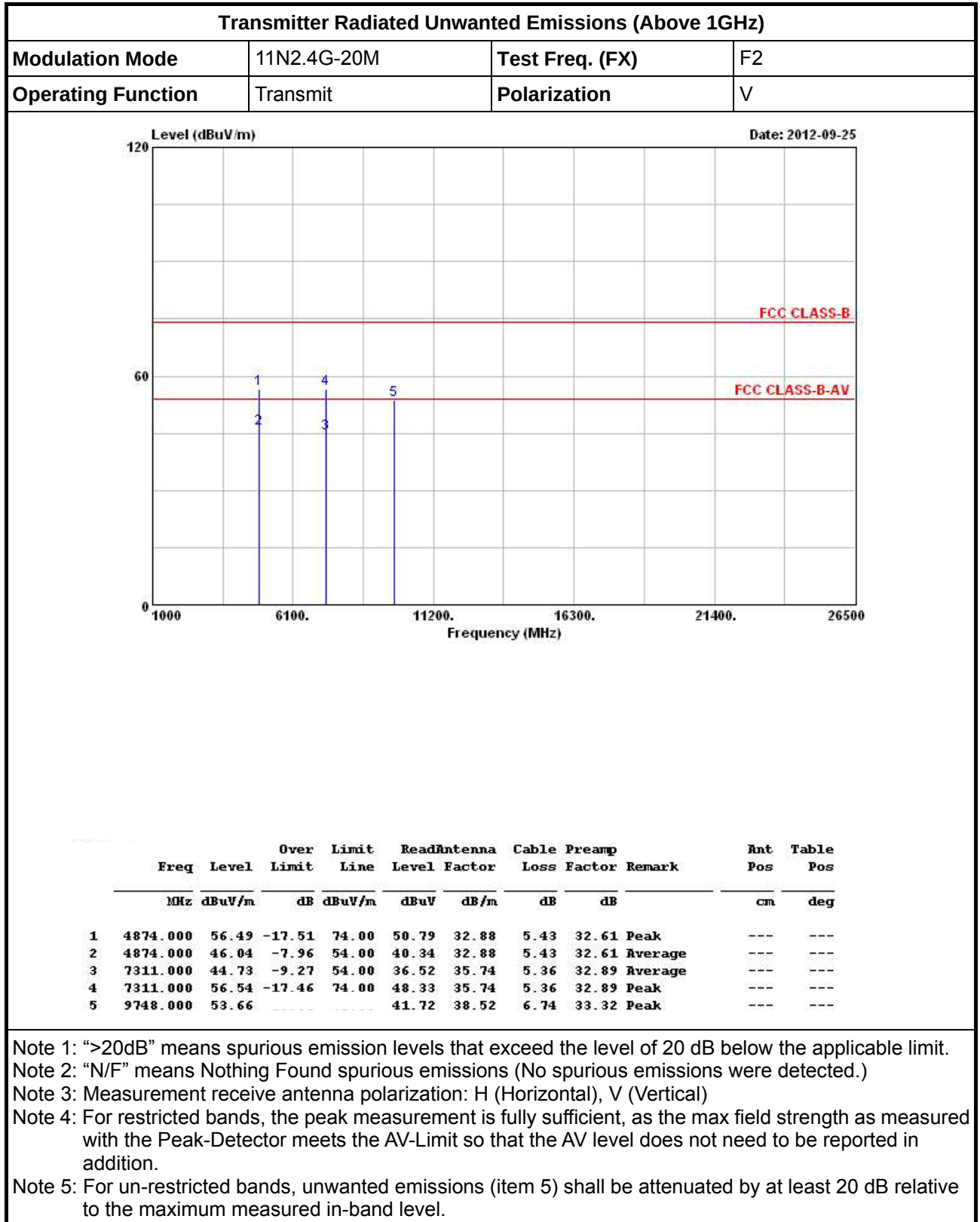


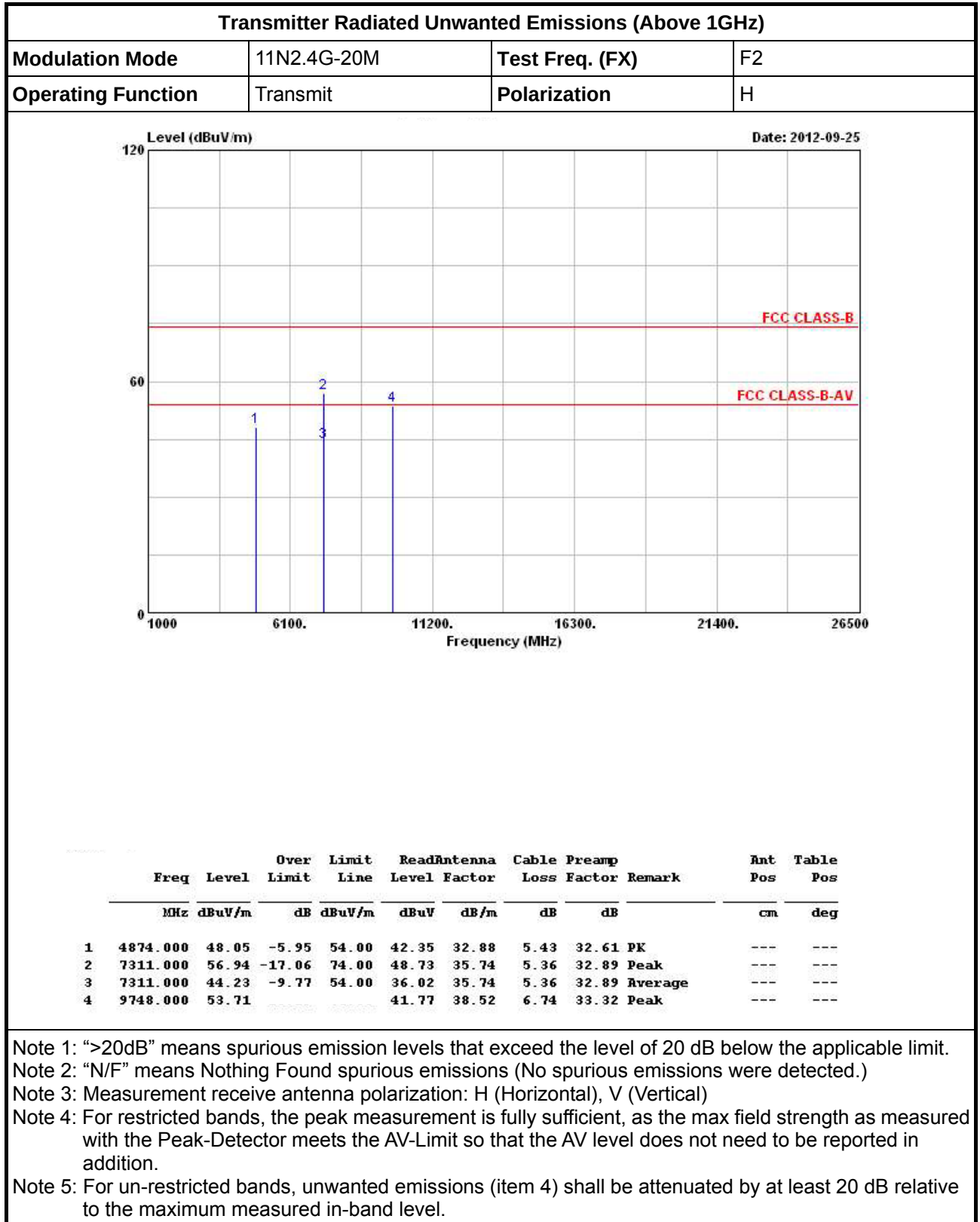


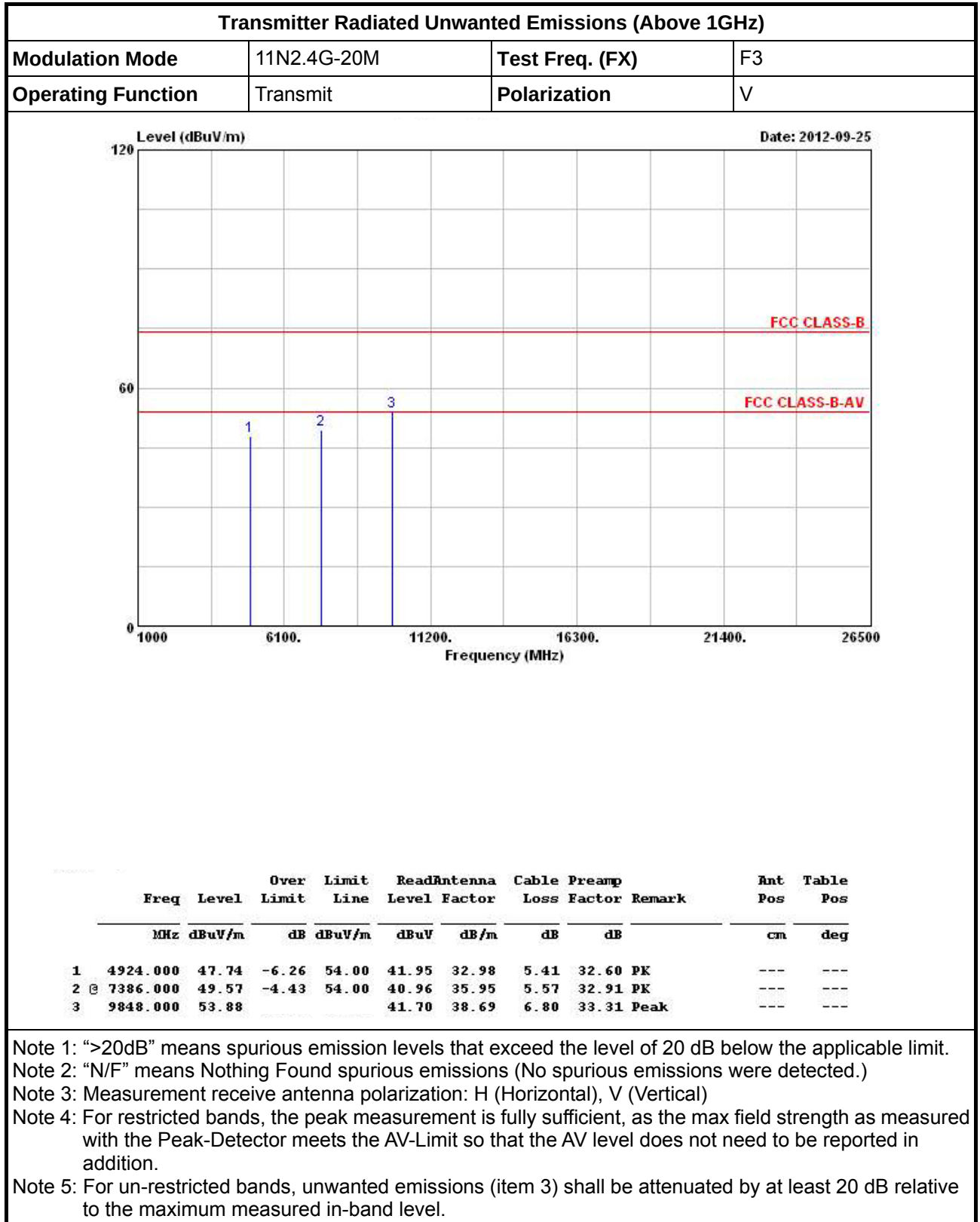


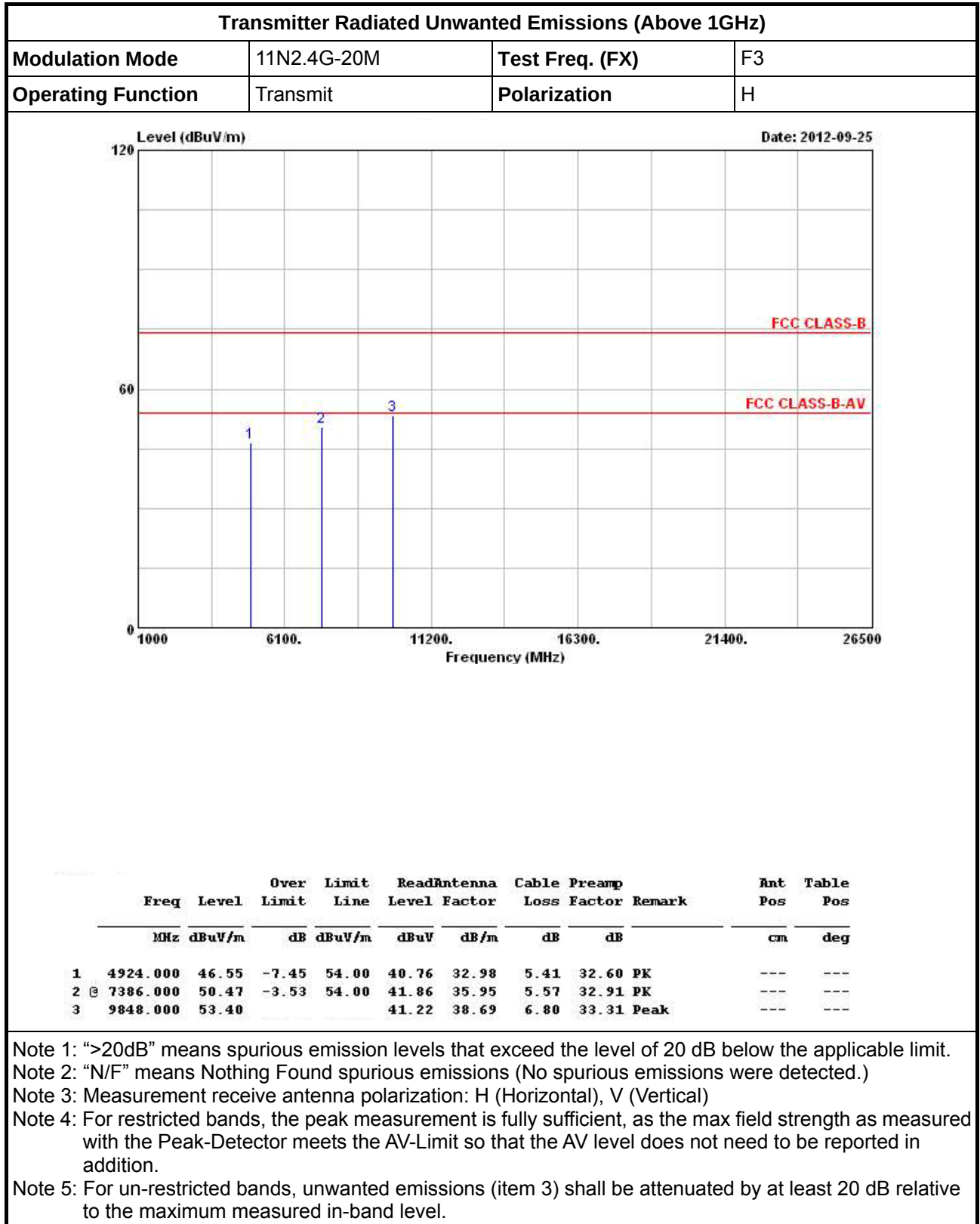
3.4.10 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11N2.4G-20M-N_{TX} 2


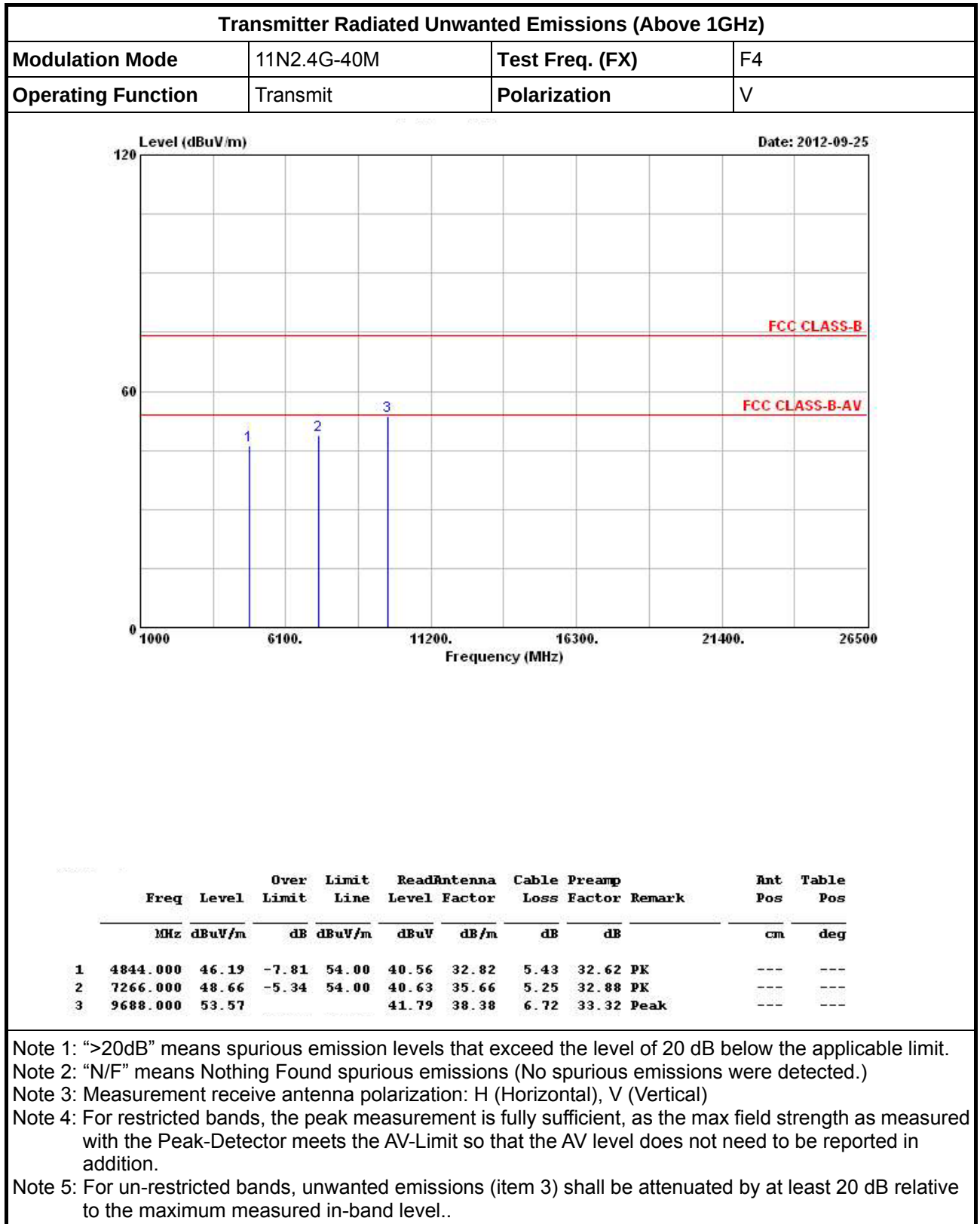


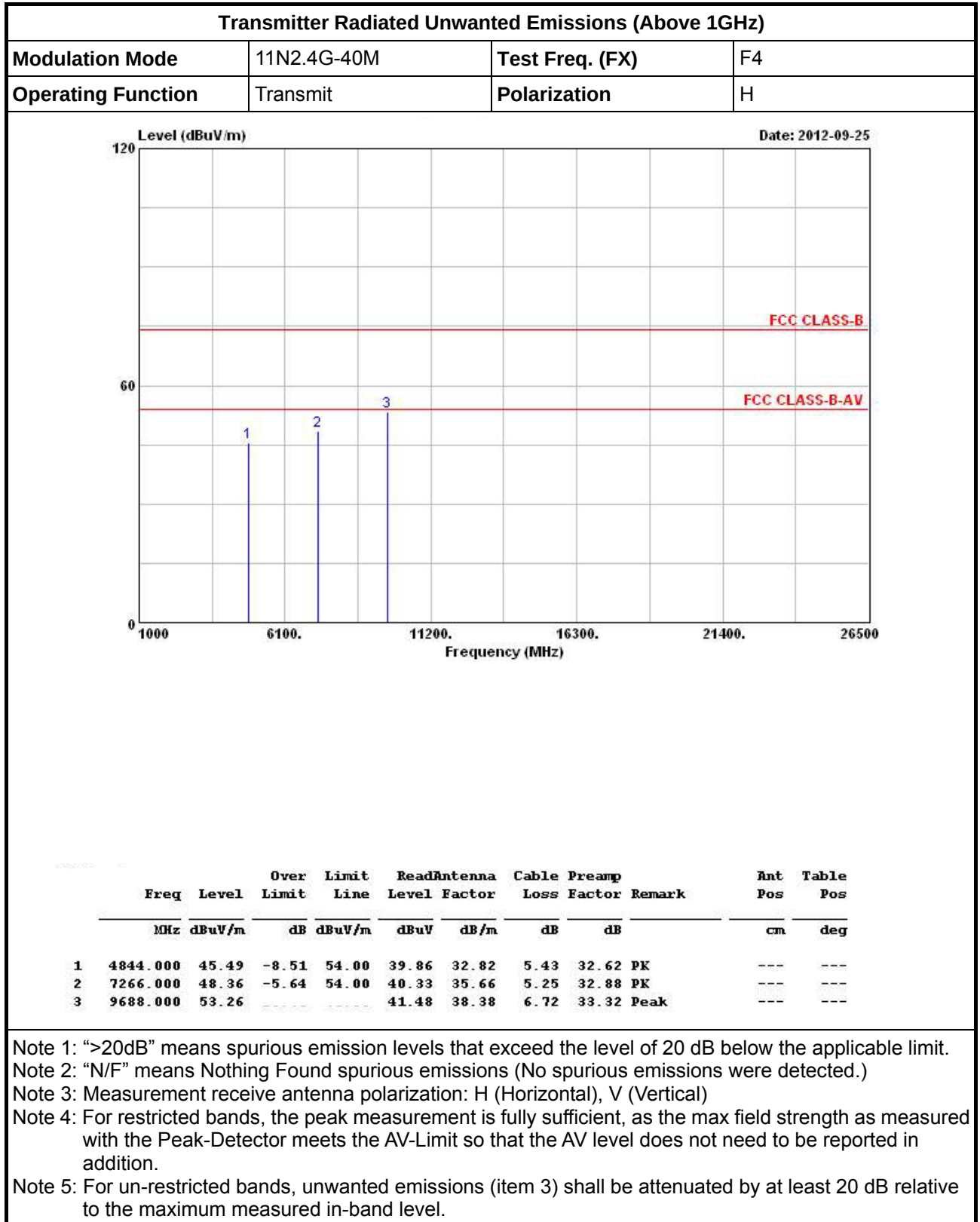


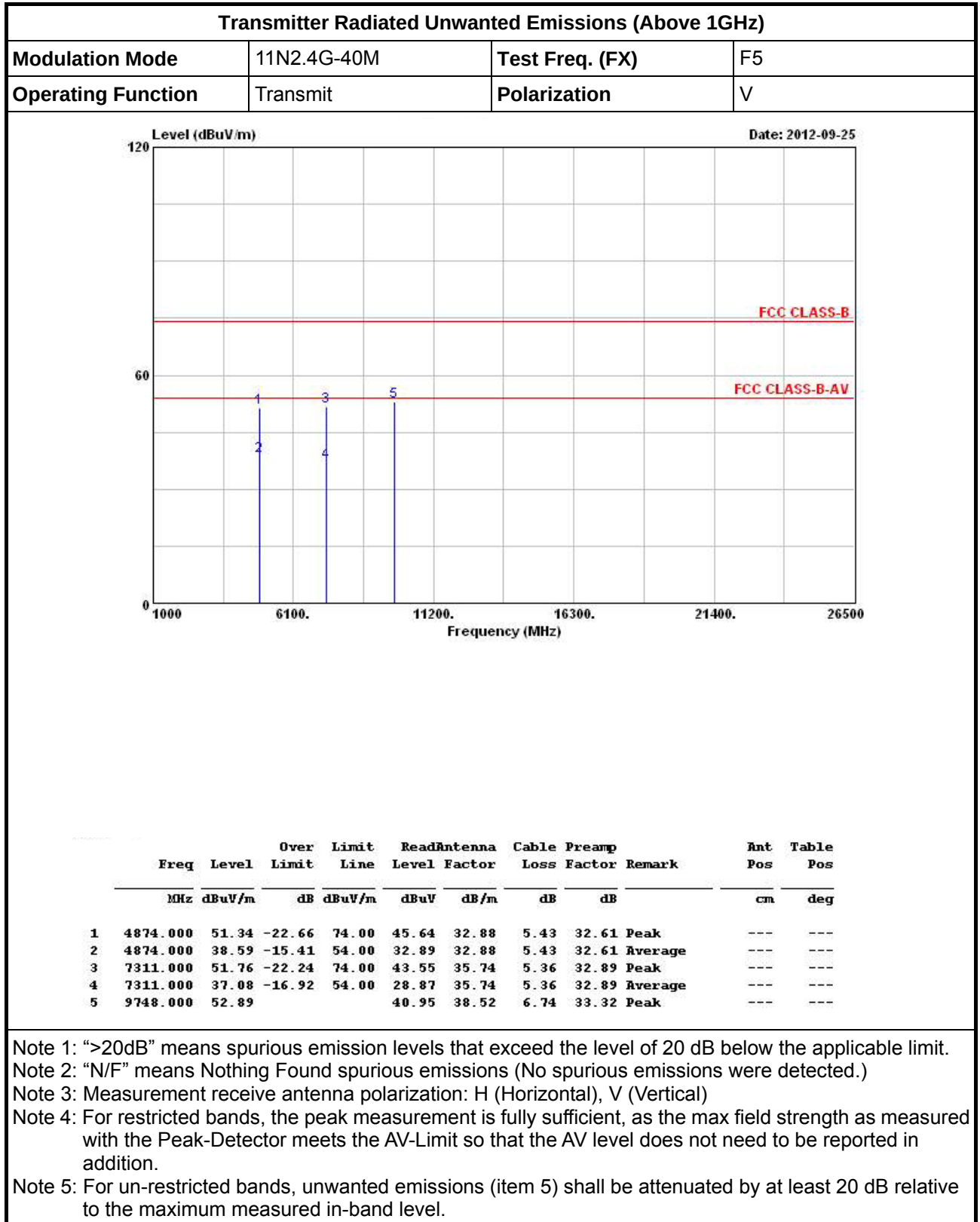


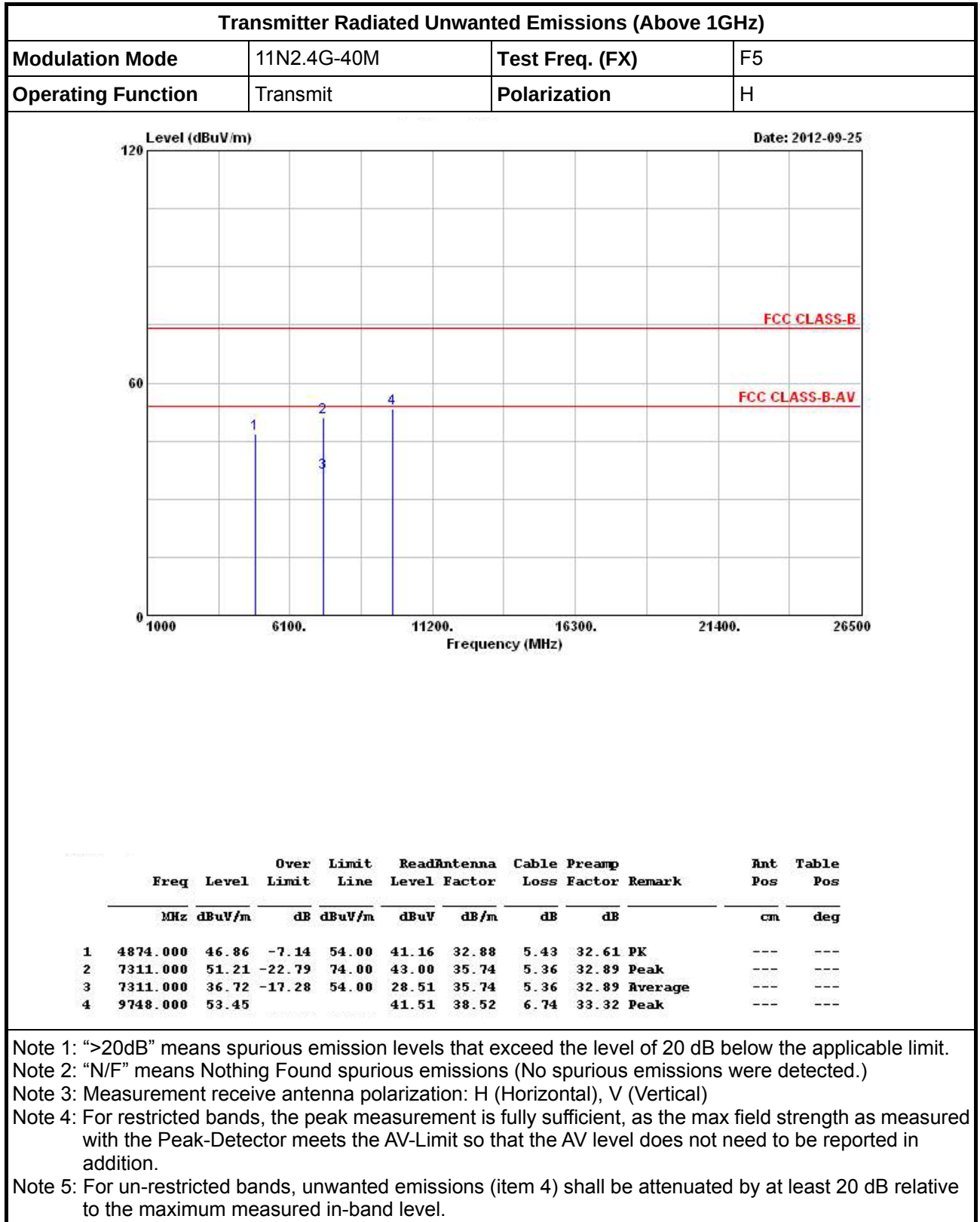


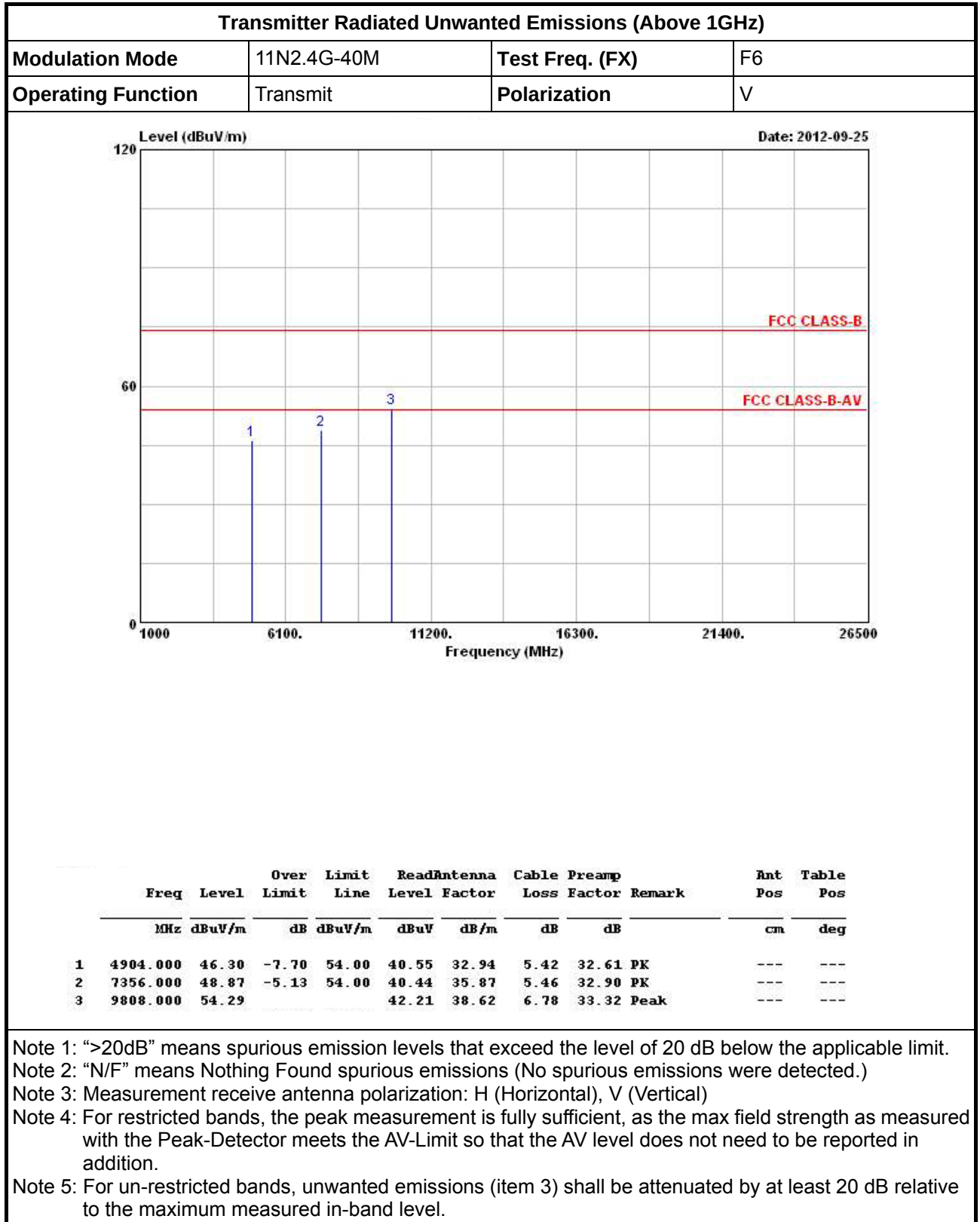


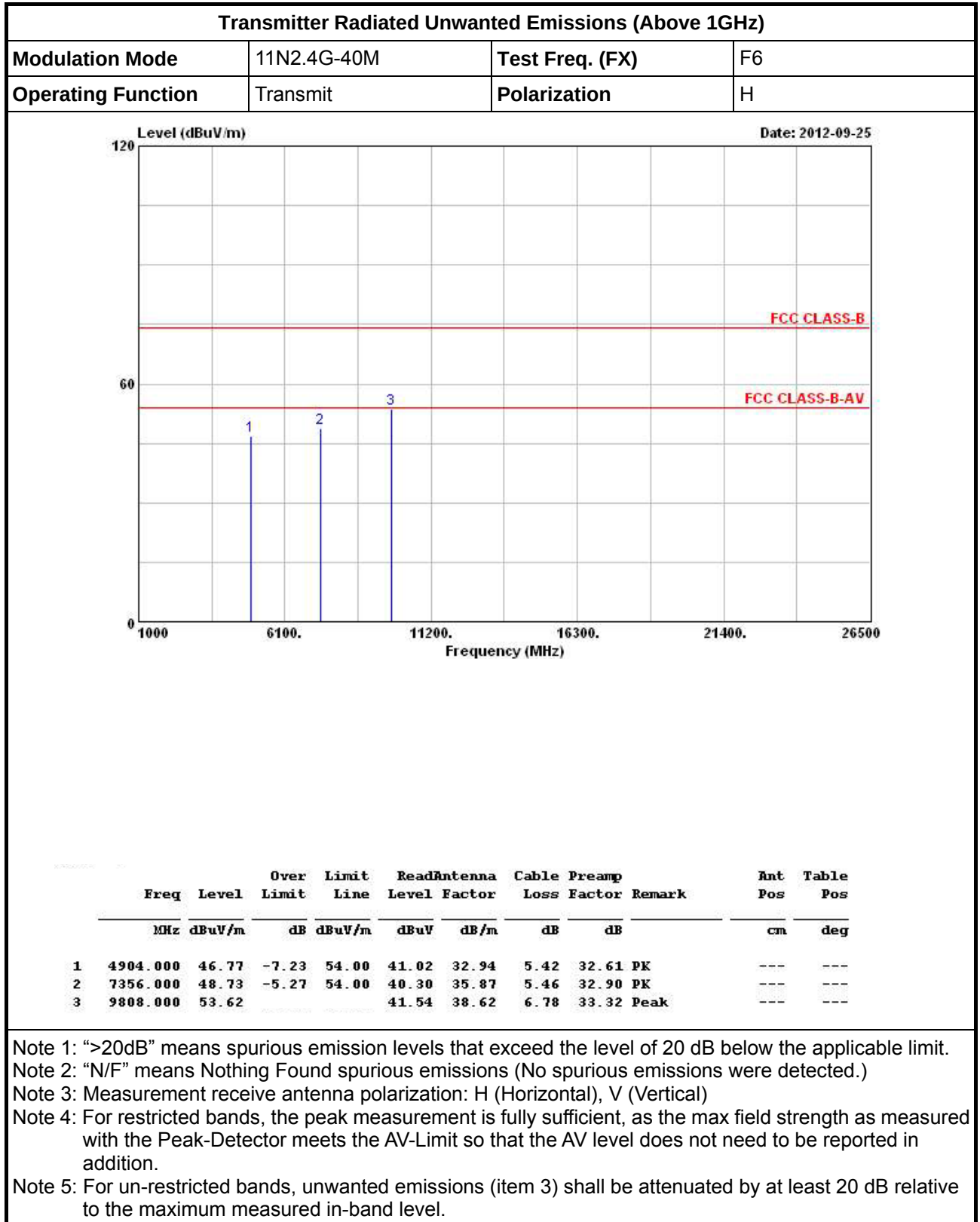
3.4.11 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11N2.4G-40M-N_{TX} 2












4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100132	9kHz ~ 2.75GHz	Feb. 08, 2012	Conduction (CO04-HY)
LISN	TESEQ	NNB-52	27380	9kHz ~ 30MHz	Apr. 09, 2012	Conduction (CO04-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	2001/009	9kHz ~ 30MHz	Feb. 20, 2012	Conduction (CO04-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832010001	9kHz ~ 30MHz	Mar. 02, 2012	Conduction (CO04-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP 40	100305	9KHz~40GHz	Feb. 21, 2012	Conducted (TH01-HY)
Spectrum Analyzer	R&S	FSV 40	15195-01-00	9KHz~40GHz	Jan. 06, 2012	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Jun. 19, 2012	Conducted (TH01-HY)
AC Power Source	G.W	APS-9102	EL920581	AC 0V ~ 300V	Jul. 02, 2012	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100℃	Dec. 07, 2011	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100302	10MHz ~ 40GHz	Nov. 22, 2011	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	1027452	300MHz ~ 40GHz	Jan. 12, 2012	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	1124009	300MHz ~ 40GHz	Jan. 12, 2012	Conducted (TH01-HY)
RF Cable-2m	HUBER+SUHNER	SUCOFLEX_104	SN 345672/4	1GHz ~ 26.5GHz	Dec. 03, 2011	Conducted (TH01-HY)
RF Cable-3m	HUBER+SUHNER	SUCOFLEX_104	SN 345668/4	1GHz ~ 26.5GHz	Dec. 03, 2011	Conducted (TH01-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	Dec. 12, 2011	Radiation (03CH03-HY)
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	May. 10, 2012	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	Aug. 16 2012	Radiation (03CH03-HY)
Spectrum Analyzer	R&S	FSP30	1164.4391.130	9kHz ~ 30GHz	Sep. 27, 2012	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30MHz ~ 1GHz	Oct. 22, 2011	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6741	1GHz ~ 18GHz	May 30, 2012	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz ~ 40GHz	Jan.13, 2012	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz ~ 1GHz	Jan. 18, 2012	Radiation (03CH03-HY)
RF Cable-high	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz ~ 40GHz	Jan. 18, 2012	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	MF	MF-7802	MF780208179	1 ~ 4 m	N/A	Radiation (03CH03-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9kHz ~ 30MHz	Jul. 29, 2010	Radiation (03CH03-HY)

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

5 Certification of TAF Accreditation



Certificate No. : L1190-120405

財團法人全國認證基金會
Taiwan Accreditation Foundation

Certificate of Accreditation

This is to certify that

Sporton International Inc.
EMC & Wireless Communications Laboratory
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien,
Taiwan, R.O.C.

is accredited in respect of laboratory

Accreditation Criteria : ISO/IEC 17025:2005
Accreditation Number : 1190
Originally Accredited : December 15, 2003
Effective Period : January 10, 2010 to January 09, 2013
Accredited Scope : Testing Field, see described in the Appendix
Specific Accreditation Program : Accreditation Program for Designated Testing Laboratory for Commodities Inspection
Accreditation Program for Telecommunication Equipment Testing Laboratory
Accreditation Program for BSMI Mutual Recognition Arrangement with Foreign Authorities



Jay-San Chen
President, Taiwan Accreditation Foundation
Date: April 05, 2012

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