



FCC Test Report

Equipment : WiFi Dongle
Brand Name : Entone
Model No. : Kamai 500 Dual-band Wi-Fi Adapter
FCC ID : S4A99-970201-00
Standard : 47 CFR FCC Part 15.247
Operating Band : 2400 MHz – 2483.5 MHz
FCC Classification : DTS
Applicant : Entone Technologies (HK) Limited
Level 28, Saxon Tower, 7 Cheung Shun Street,
Lai Chi Kok, HongKong
Manufacturer : XAVi Technologies Corporation
9F, No.129, Hsing Te Rd., Sanchung Dist.,
New Taipei City 241, Taiwan, R.O.C.

The product sample received on Feb. 25, 2013 and completely tested on Jun. 07, 2013. 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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APPENDIX A. TEST PHOTOS

APPENDIX B. PHOTOGRAPHS OF EUT



Summary of Test Result

| Conformance Test Specifications | | | | | |
|---------------------------------|------------------|---|---|--|----------|
| Report Clause | Ref. Std. Clause | Description | Measured | Limit | Result |
| 1.1.2 | 15.203 | Antenna Requirement | Antenna connector mechanism complied | FCC 15.203 | Complied |
| 3.1 | 15.207 | AC Power-line Conducted Emissions | [dBuV]: 0.3934400MHz 27.58 (Margin 20.41dB) - AV 38.47 (Margin 19.52dB) - QP | FCC 15.207 | Complied |
| 3.2 | 15.247(a) | 6dB Bandwidth | 6dB Bandwidth Unit [MHz] 20M:16.61 / 40M:36.36 | ≥500kHz | Complied |
| 3.3 | 15.247(b) | RF Output Power (Maximum Peak Conducted Output Power) | Power [dBm]:23.86 | Power [dBm]:30 | Complied |
| 3.4 | 15.247(d) | Power Spectral Density | PSD [dBm/100KHz]:-9.00 | PSD [dBm/3kHz]:8 | Complied |
| 3.5 | 15.247(c) | Transmitter Radiated Bandedge Emissions | Non-Restricted Bands: 2545.100MHz: 23.61dB Restricted Bands [dBuV/m at 3m]: 2390.000MHz 67.05 (Margin 6.95dB) - PK 52.75(Margin 1.25dB) - AV | Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209 | Complied |
| 3.6 | 15.247(c) | Transmitter Radiated Unwanted Emissions | [dBuV/m at 3m]: 52.310MHz 36.56 (Margin 3.44dB) - PK | Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209 | Complied |



Revision History



1 General Description

1.1 Information

1.1.1 RF General Information

| RF General Information | | | | | | |
|------------------------|------------------|-----------------|----------------|------------------------------------|-----------------------|-------------|
| Frequency Range (MHz) | IEEE Std. 802.11 | Ch. Freq. (MHz) | Channel Number | Transmit Chains (N _{TX}) | RF Output Power (dBm) | Co-location |
| 2400-2483.5 | b | 2412-2462 | 1-11 [11] | 1 | 22.07 | N/A |
| 2400-2483.5 | g | 2412-2462 | 1-11 [11] | 1 | 18.41 | N/A |
| 2400-2483.5 | n (HT20) | 2412-2462 | 1-11 [11] | 2 | 23.18 | N/A |
| 2400-2483.5 | n (HT40) | 2422-2452 | 3-9 [7] | 2 | 21.85 | N/A |
| 2400-2483.5 | n (HT20) | 2412-2462 | 1-11 [11] | 3 | 23.86 | N/A |
| 2400-2483.5 | n (HT40) | 2422-2452 | 3-9 [7] | 3 | 23.70 | 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 | |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | Integral antenna (antenna permanently attached) |
| <input checked="" type="checkbox"/> | Temporary RF connector provided |
| <input type="checkbox"/> | No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path. |

| Antenna General Information | | | |
|-----------------------------|-----------|-----------|------------|
| No. | Ant. Cat. | Ant. Type | Gain (dBi) |
| 1 | Integral | Chip | 2.21 |
| 2 | Integral | PIFA | 2.07 |
| 3 | Integral | Chip | 2.21 |

Reminder:

1. For the 1Tx Mode, the EUT was pre-tested Antenna Port 1, Antenna Port 2 and Antenna Port 3 for single chain, the worst case was Antenna Port 2. Therefore only the test data recorded in this report.
2. For the 2Tx Mode, the EUT will be used the Antenna Port 1 and Antenna Port, only these two ports can be transmitted at the same time.



1.1.3 Type of EUT

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

1.1.4 Test Signal Duty Cycle

| Operated Mode for Worst Duty Cycle | |
|---|--|
| <input type="checkbox"/> Operated normally mode for worst duty cycle | |
| <input checked="" type="checkbox"/> Operated test mode for worst duty cycle | |
| Test Signal Duty Cycle (x) | Power Duty Factor [dB] – (10 log 1/x) |
| <input checked="" type="checkbox"/> 100.00% - IEEE 802.11b | 0 |
| <input checked="" type="checkbox"/> 100.00% - IEEE 802.11g | 0 |
| <input checked="" type="checkbox"/> 100.00% - IEEE 802.11n (HT20) | 0 |
| <input checked="" type="checkbox"/> 100.00% - IEEE 802.11n (HT40) | 0 |

1.1.5 EUT Operational Condition

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



1.2 Support Equipment

| Support Equipment- AC Conduction | | | | |
|----------------------------------|-----------|------------|-------------|------------|
| No. | Equipment | Brand Name | Model Name | Serial No. |
| 1 | Notebook | DELL | VOSTRO 3350 | DoC |

| Support Equipment- Radiated Emission | | | | |
|--------------------------------------|-----------|------------|------------|------------|
| No. | Equipment | Brand Name | Model Name | Serial No. |
| 1 | Notebook | DELL | PP25L | DoC |

1.3 Testing Applied Standards

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

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

1.4 Testing Location Information

| Testing Location | | | | |
|-------------------------------------|--------|---------------|--|--|
| <input checked="" type="checkbox"/> | HWA YA | ADD | : No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. | |
| | | TEL | : 886-3-327-3456 | FAX : 886-3-327-0973 |
| Test Condition | | Test Site No. | Test Engineer | Test Environment |
| RF Conducted | | TH01-HY | Shiming | 21.8°C / 39% |
| AC Conduction | | CO04-HY | Zeus | 24.3°C / 56% |
| Radiated Emission | | 03CH02-HY | Hsiao | 22.8°C / 62% Mar. 23, 2013~ Jun. 07, 2013 |



1.5 Measurement Uncertainty

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

| Measurement Uncertainty | | | |
|-----------------------------------|---------------|----------|-----|
| Test Item | Uncertainty | Limit | |
| AC power-line conducted emissions | ±2.26 dB | N/A | |
| Emission bandwidth, 6dB bandwidth | ±1.42 % | N/A | |
| RF output power, conducted | ±0.63 dB | N/A | |
| Power density, conducted | ±0.81 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 The Worst Case Modulation Configuration

| Worst Modulation Used for Conformance Testing | | | |
|---|------------------------------------|-----------------|-----------------------|
| Modulation Mode | Transmit Chains (N _{TX}) | Data Rate / MCS | Worst Data Rate / MCS |
| 11b,1-11Mbps | 1 | 1-11 Mbps | 1 Mbps |
| 11g,6-54Mbps | 1 | 6-54 Mbps | 6 Mbps |
| HT20,M8-15 | 2 | M8-15 | MCS 8 |
| HT40,M8-15 | 2 | M8-15 | MCS 8 |
| HT20,M16-23 | 3 | M16-23 | MCS 16 |
| HT40, M16-23 | 3 | M16-23 | MCS 16 |

2.2 The Worst Case Power Setting Parameter

| The Worst Case Power Setting Parameter (2400-2483.5MHz band) | | | | | | | |
|--|--------------------|----------------------|----------|----------|------------|----------|----------|
| Test Software Version | RT3573 QA_V1.0.1.9 | | | | | | |
| Modulation Mode | N _{TX} | Test Frequency (MHz) | | | | | |
| | | NCB: 20MHz | | | NCB: 40MHz | | |
| | | 2412 | 2437 | 2462 | 2422 | 2437 | 2452 |
| 11b,1-11Mbps | 1 | 19 | 1A | 1C | - | - | - |
| 11g,6-54Mbps | 1 | 0C | 0C | 11 | - | - | - |
| HT20,M8-15 | 2 | 0F/0F | 10/10 | 11/12 | - | - | - |
| HT40,M8-15 | 2 | - | - | - | -09/09 | 11/11- | 11/12 |
| HT20,M16-23 | 3 | 1B/1B/1C | 1B/1B/1C | 1B/1C/1D | - | - | - |
| HT40, M16-23 | 3 | - | - | - | 1B/1B/1C | 1B/1B/1C | 1C/1C/1D |



2.3 The Worst Case Measurement Configuration

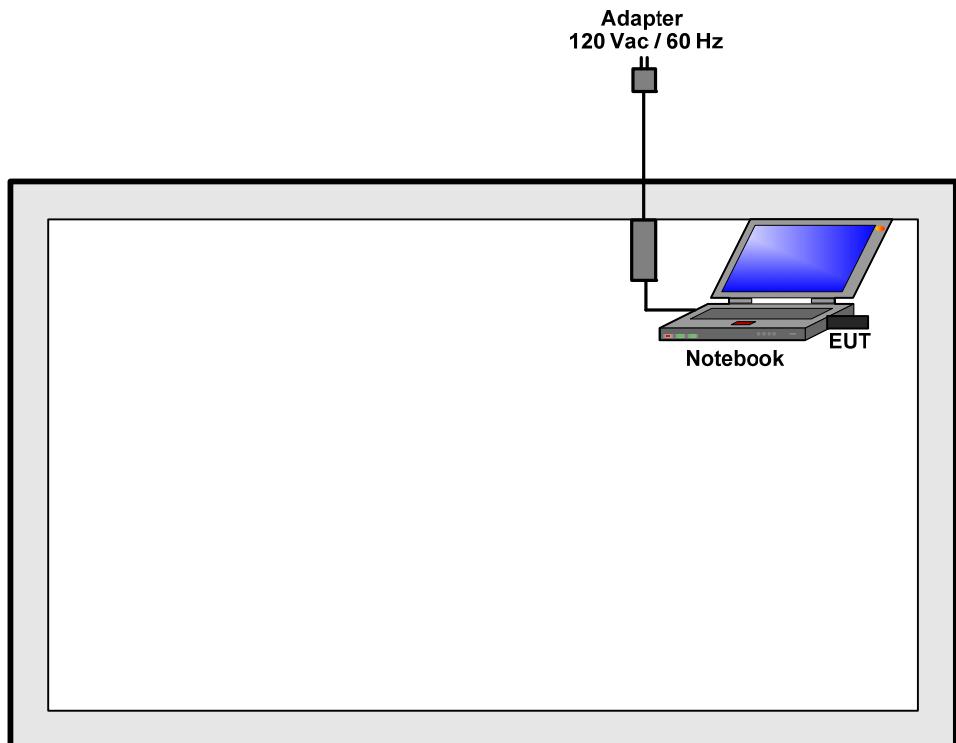
| The Worst Case Mode for Following Conformance Tests | |
|---|---|
| Tests Item | AC power-line conducted emissions |
| Condition | AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz |
| Operating Mode | Operating Mode Description |
| 1 | AC Power & Radio link (WLAN)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

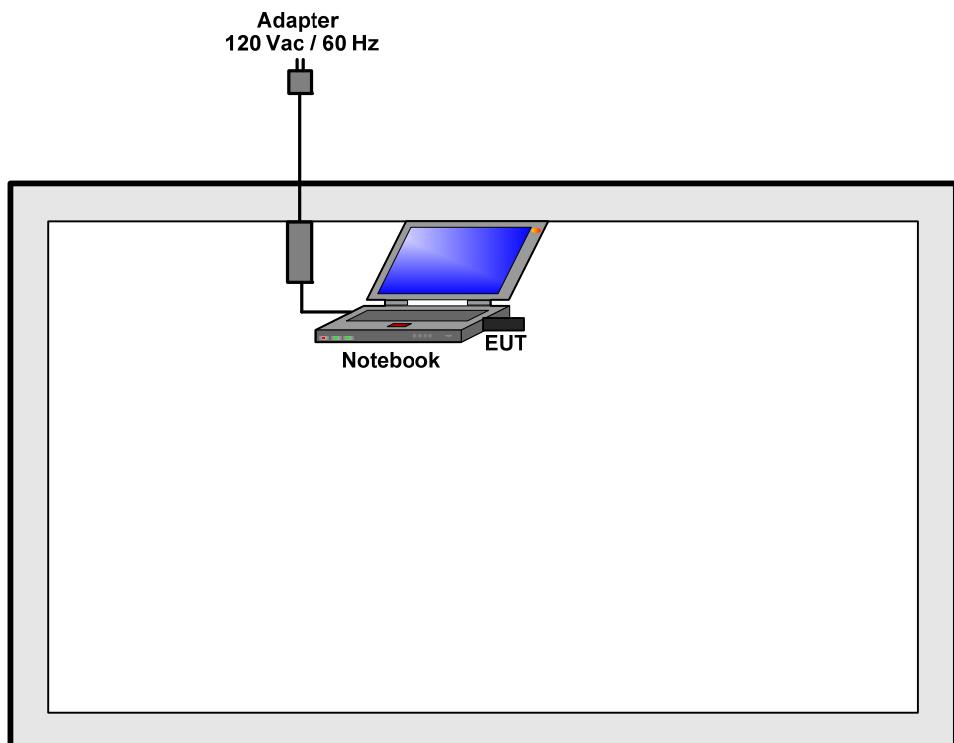
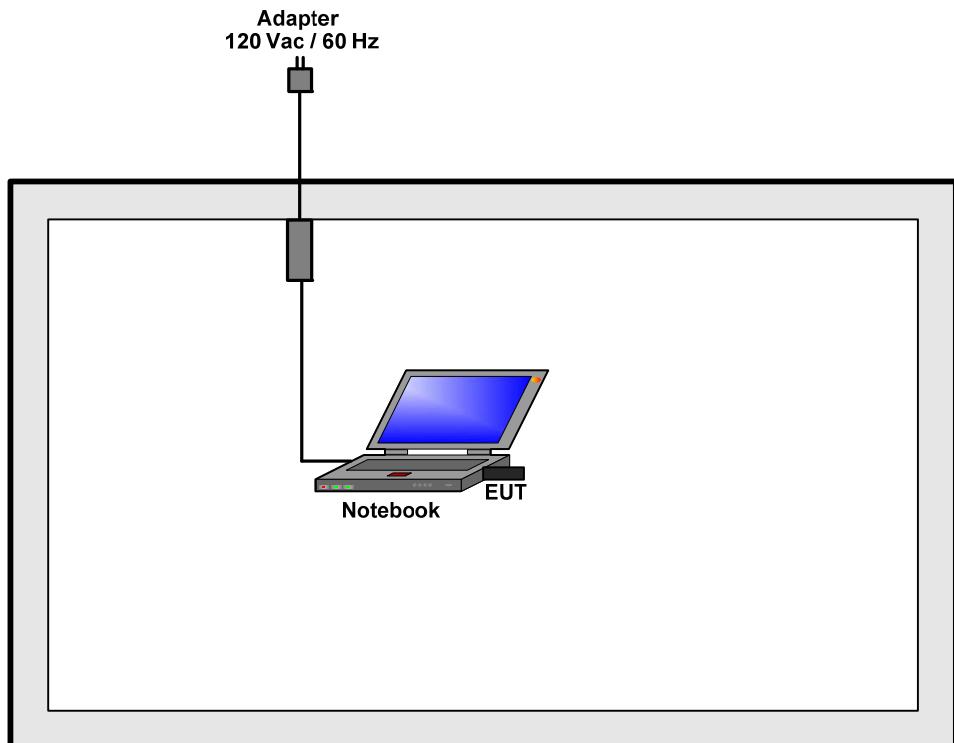
| The Worst Case Mode for Following Conformance Tests | |
|---|---|
| Tests Item | RF Output Power, Power Spectral Density, 6 dB Bandwidth |
| Test Condition | Conducted measurement at transmit chains |
| Modulation Mode | 11b, 11g, HT20, HT40 |

| 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. Transmitter Mode | | | | | | |
| Modulation Mode | 11b, 11g, HT20, HT40 | | | | | | |
| Orthogonal Planes of EUT | <table><thead><tr><th>X Plane</th><th>Y Plane</th><th>Z Plane</th></tr></thead><tbody><tr><td></td><td></td><td></td></tr></tbody></table> | X Plane | Y Plane | Z Plane | | | |
| X Plane | Y Plane | Z Plane | | | | | |
| | | | | | | | |

2.4 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



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

3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

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

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

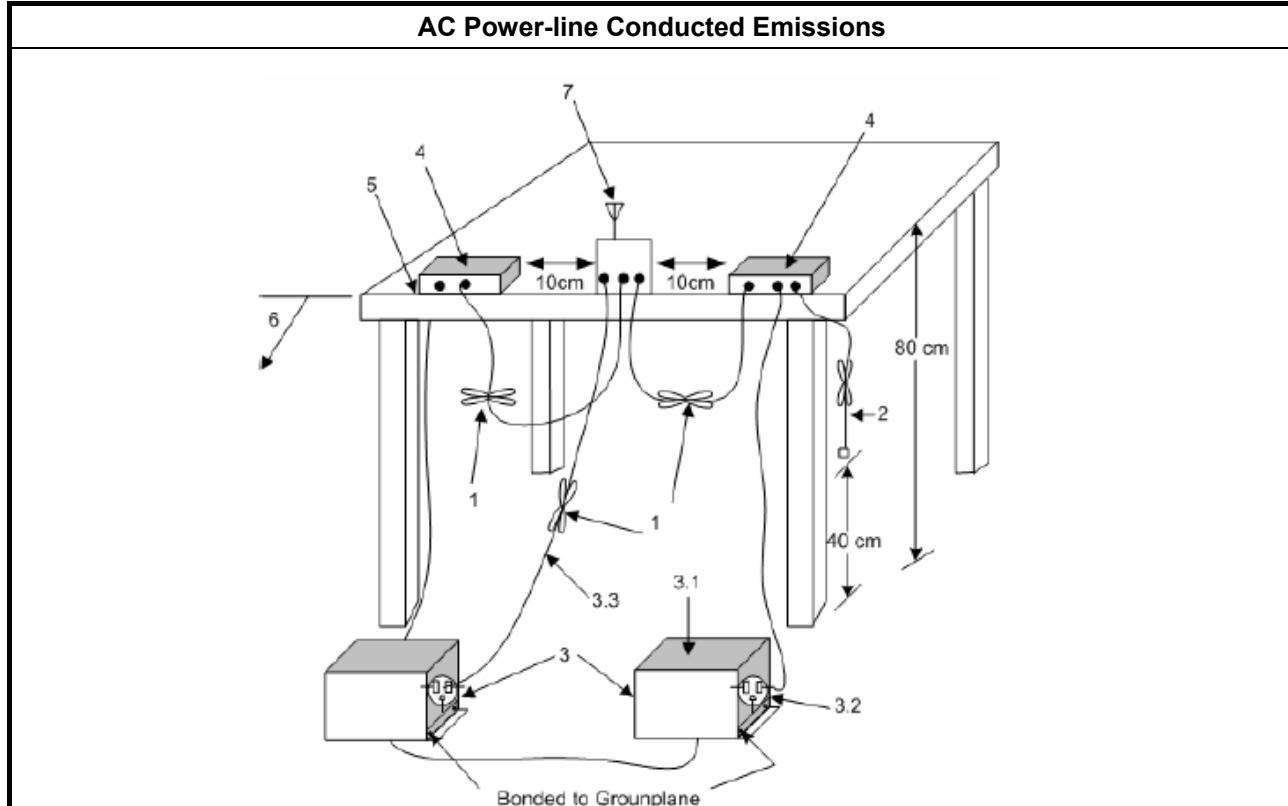
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

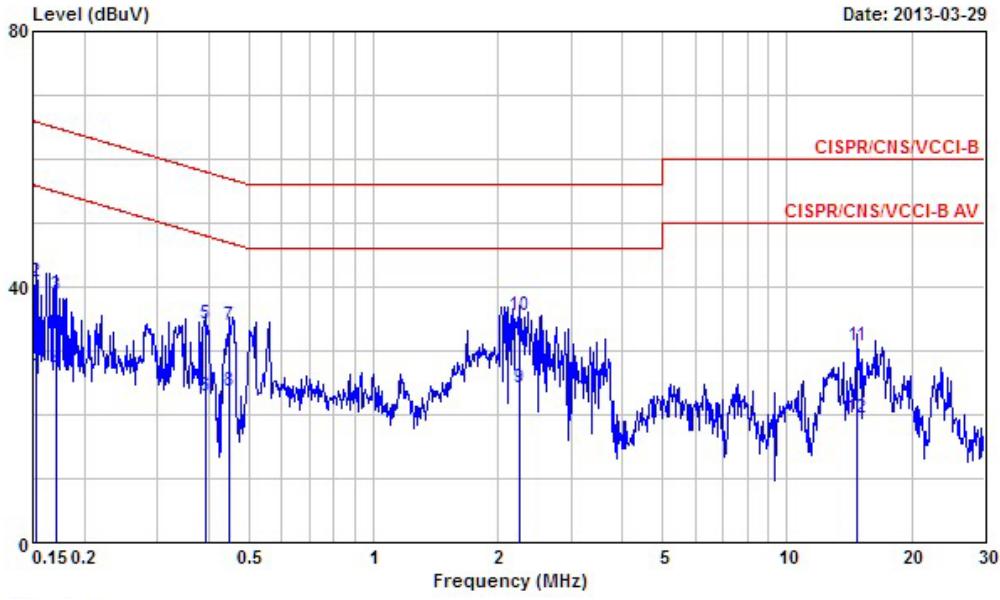
| Test Method |
|--|
| <input checked="" type="checkbox"/> Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions. |

3.1.4 Test Setup



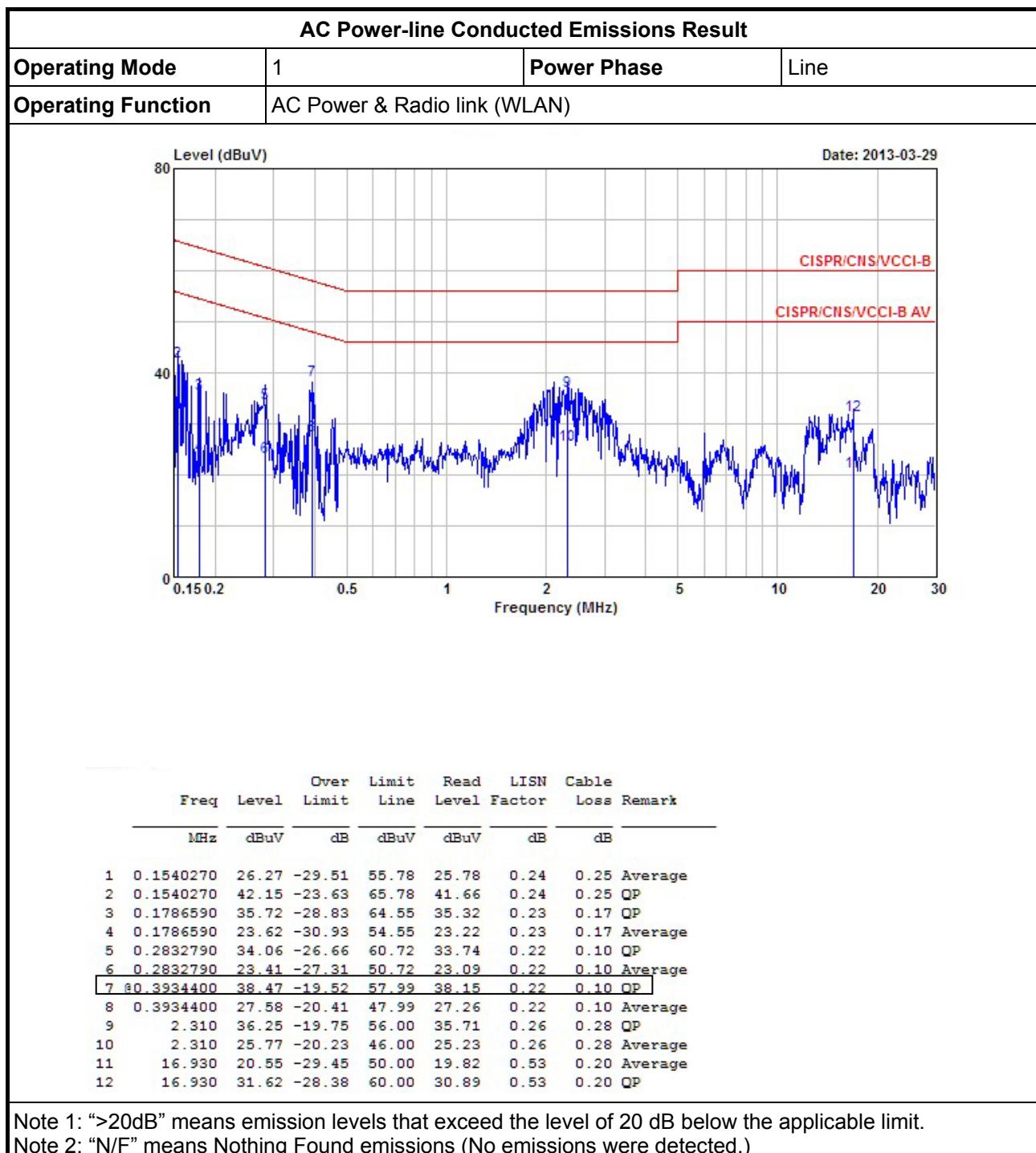


3.1.5 Test Result of AC Power-line Conducted Emissions

| AC Power-line Conducted Emissions Result | | | | | | | | |
|---|------------------------------|-------------|---------|-----------|------------|--------------|--------------|--|
| Operating Mode | 1 | Power Phase | Neutral | | | | | |
| Operating Function | AC Power & Radio link (WLAN) | | | | | | | |
| Date: 2013-03-29 | | | | | | | | |
|  | | | | | | | | |
| Emissions Data (dBuV) | | | | | | | | |
| Freq | Level | Over Limit | Line | Read Line | LISN Level | Cable Factor | Remark | |
| MHz | dBuV | dB | dBuV | dBuV | dB | dB | | |
| 1 | 0.1532130 | 26.12 | -29.70 | 55.82 | 25.75 | 0.11 | 0.26 Average | |
| 2 | 0.1532130 | 40.83 | -24.99 | 65.82 | 40.46 | 0.11 | 0.26 QP | |
| 3 | 0.1712450 | 38.77 | -26.13 | 64.90 | 38.47 | 0.11 | 0.19 QP | |
| 4 | 0.1712450 | 26.81 | -28.09 | 54.90 | 26.51 | 0.11 | 0.19 Average | |
| 5 | 0.3934400 | 34.09 | -23.90 | 57.99 | 33.89 | 0.10 | 0.10 QP | |
| 6 | 0.3934400 | 23.02 | -24.97 | 47.99 | 22.82 | 0.10 | 0.10 Average | |
| 7 | 0.4491640 | 34.05 | -22.84 | 56.89 | 33.84 | 0.10 | 0.11 QP | |
| 8 | 0.4491640 | 23.81 | -23.08 | 46.89 | 23.60 | 0.10 | 0.11 Average | |
| 9 | 2.260 | 24.30 | -21.70 | 46.00 | 23.89 | 0.13 | 0.28 Average | |
| 10 | 2.260 | 35.61 | -20.39 | 56.00 | 35.20 | 0.13 | 0.28 QP | |
| 11 | 14.750 | 30.84 | -29.16 | 60.00 | 30.37 | 0.28 | 0.19 QP | |
| 12 | 14.750 | 19.53 | -30.47 | 50.00 | 19.06 | 0.28 | 0.19 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 6dB Bandwidth

3.2.1 6dB Bandwidth Limit

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

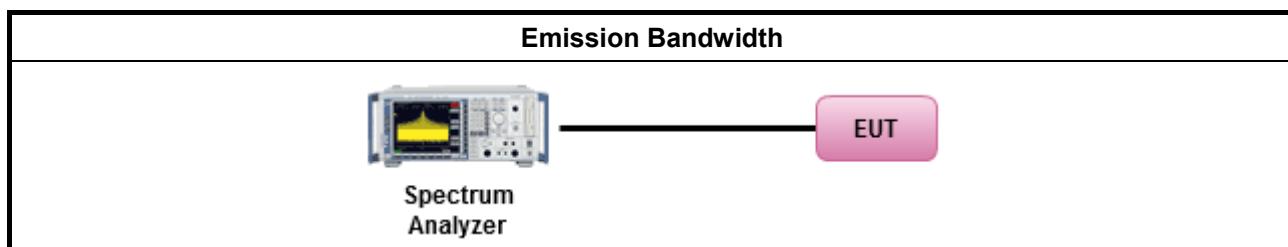
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

| Test Method |
|---|
| <input checked="" type="checkbox"/> For the emission bandwidth shall be measured using one of the options below: |
| <input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.1 Option 1 for 6 dB bandwidth measurement. |
| <input type="checkbox"/> Refer as FCC KDB 558074, clause 8.2 Option 2 for 6 dB bandwidth measurement. |
| <input type="checkbox"/> Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing. |
| <input checked="" type="checkbox"/> For conducted measurement. |
| <input checked="" type="checkbox"/> The EUT supports single transmit chain and measurements performed on this transmit chain. |
| <input checked="" type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 2 is the worst case. |
| <input checked="" type="checkbox"/> The EUT supports multiple transmit chains using options given below: |
| <input type="checkbox"/> Option 1: Multiple transmit chains measurements need to be performed on one of the active transmit chains (antenna outputs). All measurement had be performed on transmit chains 2. |
| <input checked="" type="checkbox"/> Option 2: Multiple transmit chains measurements need to be performed on each transmit chains individually (antenna outputs). All measurement had be performed on all transmit chains. |

3.2.4 Test Setup

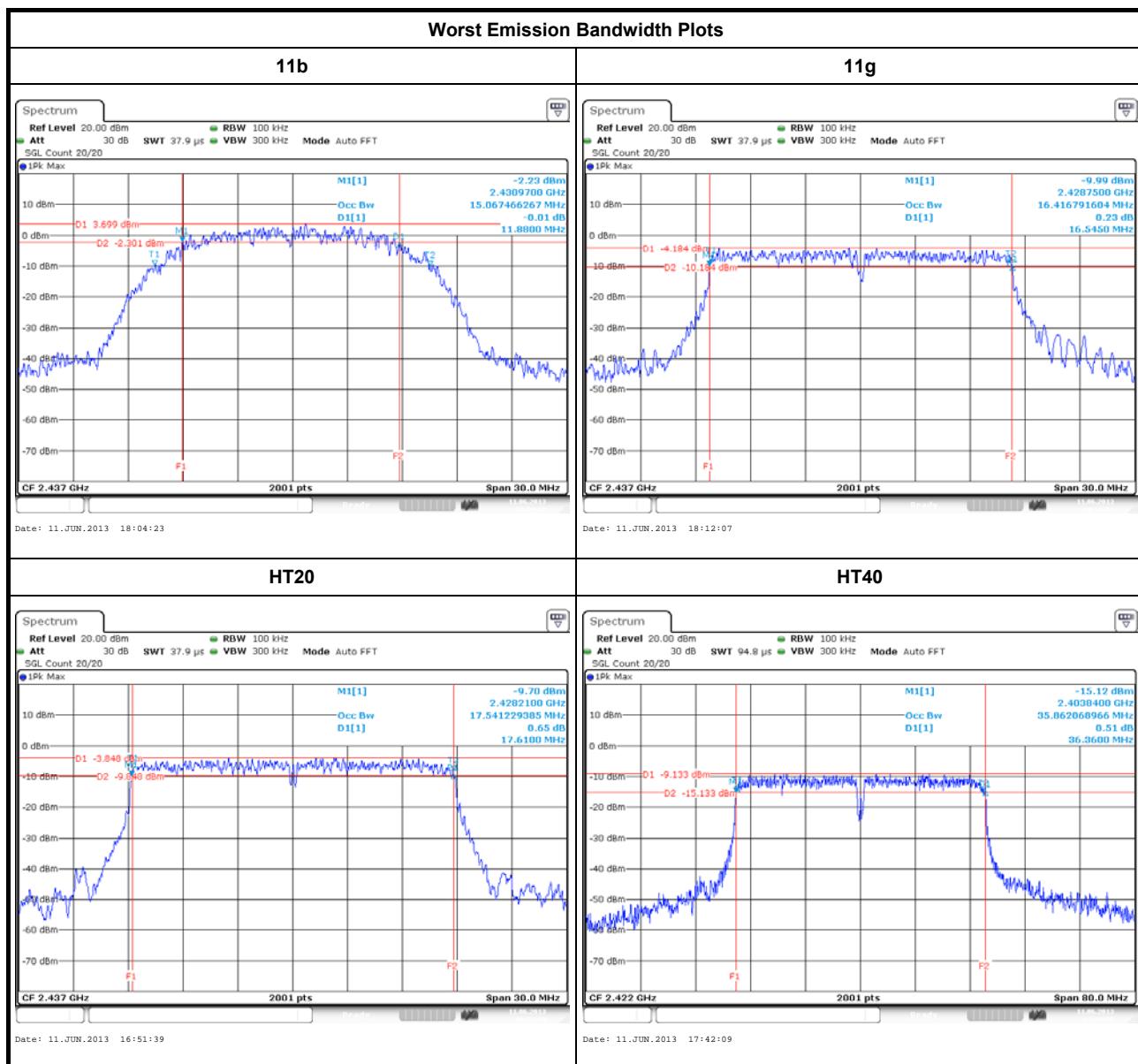




3.2.5 Test Result of Emission Bandwidth

| 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 3 | Chain- Port 1 | Chain- Port 2 | Chain- Port 3 |
| 11b | 1 | 2412 | - | 15.03 | - | - | 11.67 | - |
| 11b | 1 | 2437 | - | 15.06 | - | - | 11.88 | - |
| 11b | 1 | 2462 | - | 15.14 | - | - | 11.58 | - |
| 11g | 1 | 2412 | - | 16.37 | - | - | 16.45 | - |
| 11g | 1 | 2437 | - | 16.41 | - | - | 16.54 | - |
| 11g | 1 | 2462 | - | 16.38 | - | - | 16.41 | - |
| HT20 | 2 | 2412 | 17.49 | 17.49 | - | 17.61 | 17.55 | - |
| HT20 | 2 | 2437 | 17.51 | 17.54 | - | 17.58 | 17.58 | - |
| HT20 | 2 | 2462 | 17.52 | 17.54 | - | 17.59 | 17.59 | - |
| HT40 | 2 | 2422 | 35.86 | 35.90 | - | 36.36 | 36.32 | - |
| HT40 | 2 | 2437 | 35.82 | 35.82 | - | 36.08 | 35.24 | - |
| HT40 | 2 | 2452 | 35.82 | 35.82 | - | 36.04 | 36.04 | - |
| HT20 | 3 | 2412 | 17.52 | 17.52 | 17.52 | 17.61 | 17.59 | 17.59 |
| HT20 | 3 | 2437 | 17.54 | 17.52 | 17.54 | 17.61 | 17.58 | 17.59 |
| HT20 | 3 | 2462 | 17.51 | 17.51 | 17.51 | 17.61 | 17.56 | 17.61 |
| HT40 | 3 | 2422 | 35.82 | 35.82 | 35.82 | 36.32 | 36.04 | 36.36 |
| HT40 | 3 | 2437 | 35.82 | 35.86 | 35.86 | 36.32 | 36.28 | 36.20 |
| HT40 | 3 | 2452 | 35.78 | 35.86 | 35.78 | 36.28 | 36.28 | 36.04 |
| Limit | | | N/A | | | ≥500 kHz | | |
| Result | | | Complied | | | | | |

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





3.3 RF Output Power

3.3.1 RF Output Power Limit

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

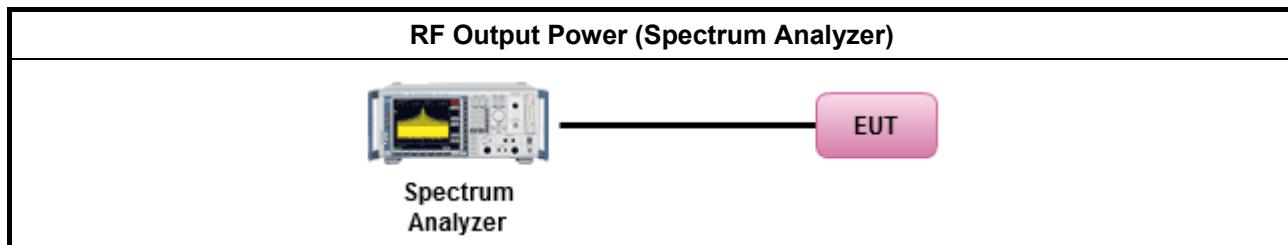
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

| Test Method | |
|---|---|
| <input checked="" type="checkbox"/> Maximum Peak Conducted Output Power | <input type="checkbox"/> Refer as FCC KDB 558074, clause 9.1.1 Option 1 (RBW \geq EBW method). <input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 9.1.2 Option 2 (integrated band power method). <input type="checkbox"/> Refer as FCC KDB 558074, clause 9.1.3 Option 2 (peak power meter for VBW \geq DTS BW) |
| <input checked="" type="checkbox"/> Maximum Conducted Output Power | [duty cycle \geq 98% or external video / power trigger] <input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.2.2 Method AVGSA-1 (spectral trace averaging). <input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.2.3 Method AVGSA-1 Alt. (slow sweep speed) duty cycle < 98% and average over on/off periods with duty factor <input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.2.4 Method AVGSA-2 (spectral trace averaging). <input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.2.5 Method AVGSA-2 Alt. (slow sweep speed) RF power meter and average over on/off periods with duty factor or gated trigger <input type="checkbox"/> Refer as FCC KDB 558074, clause 9.2.3 Method AVGPM (using an RF average power meter). |
| <input checked="" type="checkbox"/> For conducted measurement. | <input checked="" type="checkbox"/> The EUT supports single transmit chain and measurements performed on this transmit chain. <input checked="" type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 2 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 | 3 | - |
| Maximum G_{ANT} (dBi) | | 2.21 | 2.07 | 2.21 | - |
| Modulation Mode | DG (dBi) | N_{TX} | N_{SS} (Min.) | STBC | Array Gain (dB) |
| 11b,1-11Mbps | - | 1 | 1 | - | - |
| 11g,6-54Mbps | - | 1 | 1 | - | - |
| HT20,M8-15 | 2.14 <small>Note 2</small> | 2 | 2 | - | - |
| HT40,M8-15 | 2.14 <small>Note 2</small> | 2 | 2 | - | - |
| HT20,M16-23 | 2.16 <small>Note 2</small> | 3 | 3 | - | - |
| HT20,M16-23 | 2.16 <small>Note 2</small> | 3 | 3 | - | - |

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

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

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

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



3.3.6 Test Result of Maximum 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 | Chain Port 3 | Sum Chain | Power Limit | Ant. Gain (dBi) | EIRP Power | EIRP Limit |
| 11b | 1 | 2412 | - | 22.07 | - | 22.07 | 30 | 2.07 | 24.14 | 36 |
| 11b | 1 | 2437 | - | 21.46 | - | 21.46 | 30 | 2.07 | 23.53 | 36 |
| 11b | 1 | 2462 | - | 21.86 | - | 21.86 | 30 | 2.07 | 23.93 | 36 |
| 11g | 1 | 2412 | - | 18.13 | - | 18.13 | 30 | 2.07 | 20.20 | 36 |
| 11g | 1 | 2437 | - | 17.59 | - | 17.59 | 30 | 2.07 | 19.66 | 36 |
| 11g | 1 | 2462 | - | 18.41 | - | 18.41 | 30 | 2.07 | 20.48 | 36 |
| Result | | | Complied | | | | | | | |

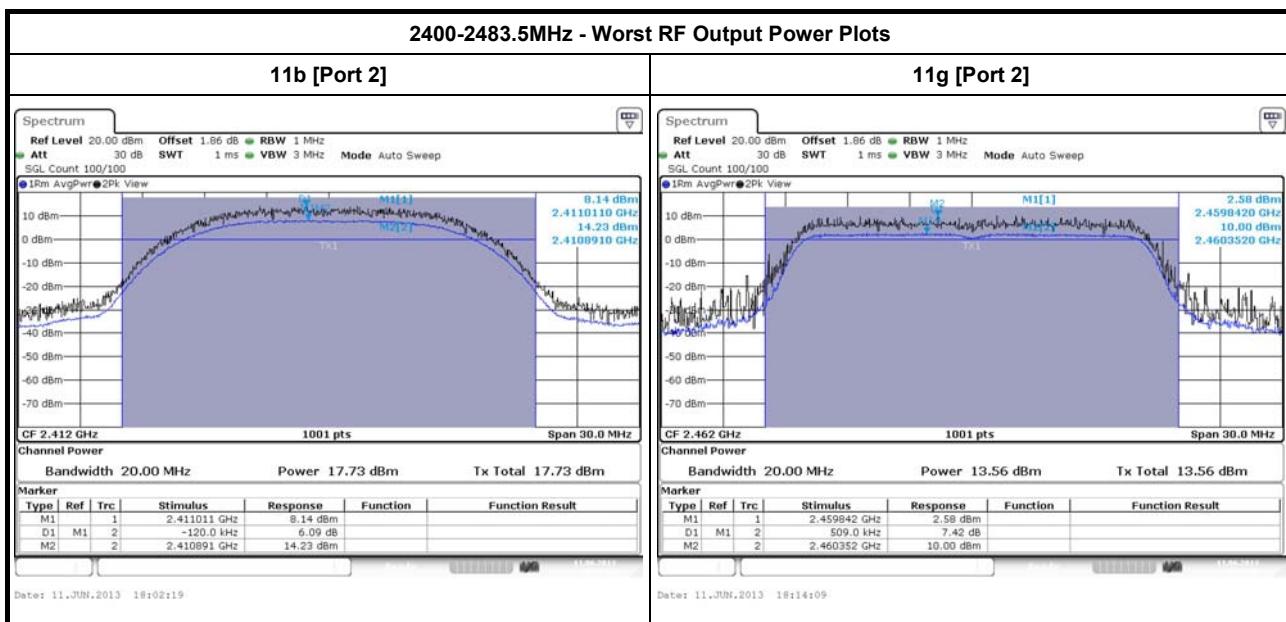
| Maximum Peak Conducted Output Power Result | | | | | | | | | | |
|--|-----------------|-------------|-----------------------|--------------|--------------|-----------|-------------|----------|------------|------------|
| Condition | | | RF Output Power (dBm) | | | | | | | |
| Modulation Mode | N _{TX} | Freq. (MHz) | Chain Port 1 | Chain Port 2 | Chain Port 3 | Sum Chain | Power Limit | DG (dBi) | EIRP Power | EIRP Limit |
| HT20 | 2 | 2412 | 20.13 | 20.21 | - | 23.18 | 30 | 2.14 | 25.32 | 36 |
| HT20 | 2 | 2437 | 18.36 | 18.23 | - | 21.31 | 30 | 2.14 | 23.44 | 36 |
| HT20 | 2 | 2462 | 19.38 | 19.15 | - | 22.28 | 30 | 2.14 | 24.42 | 36 |
| HT40 | 2 | 2422 | 15.75 | 15.76 | - | 18.77 | 30 | 2.14 | 20.90 | 36 |
| HT40 | 2 | 2437 | 18.94 | 18.73 | - | 21.85 | 30 | 2.14 | 23.99 | 36 |
| HT40 | 2 | 2452 | 18.57 | 18.53 | - | 21.56 | 30 | 2.14 | 23.70 | 36 |
| HT20 | 3 | 2412 | 18.68 | 18.90 | 19.62 | 23.86 | 30 | 2.16 | 26.02 | 36 |
| HT20 | 3 | 2437 | 18.35 | 18.13 | 18.60 | 23.14 | 30 | 2.16 | 25.30 | 36 |
| HT20 | 3 | 2462 | 17.69 | 17.89 | 13.37 | 21.52 | 30 | 2.16 | 23.68 | 36 |
| HT40 | 3 | 2422 | 18.77 | 18.83 | 19.17 | 23.70 | 30 | 2.16 | 25.86 | 36 |
| HT40 | 3 | 2437 | 18.09 | 17.96 | 18.26 | 22.88 | 30 | 2.16 | 25.04 | 36 |
| HT40 | 3 | 2452 | 18.86 | 18.25 | 18.62 | 23.36 | 30 | 2.16 | 25.52 | 36 |
| Result | | | Complied | | | | | | | |

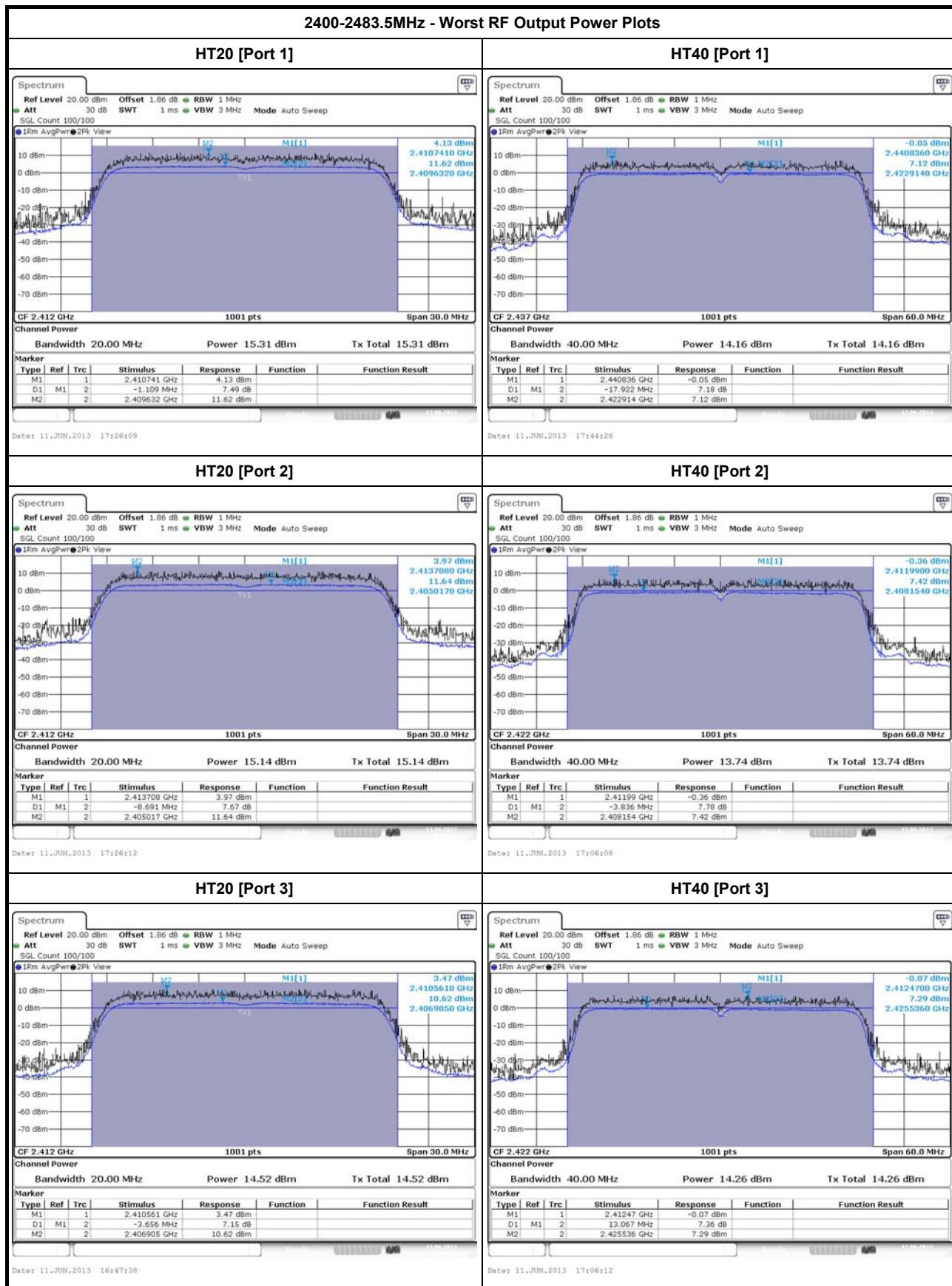


3.3.7 Test Result of Maximum Conducted Output Power

| Maximum Conducted Output Power | | | | | | | | | | |
|--------------------------------|-----------------|-------------|-----------------------|--------------|--------------|-----------|-------------|-----------------|------------|------------|
| Condition | | | RF Output Power (dBm) | | | | | | | |
| Modulation Mode | N _{TX} | Freq. (MHz) | Chain Port 1 | Chain Port 2 | Chain Port 3 | Sum Chain | Power Limit | Ant. Gain (dBi) | EIRP Power | EIRP Limit |
| 11b | 1 | 2412 | - | 17.73 | - | 17.73 | 30 | 2.07 | 19.80 | 36 |
| 11b | 1 | 2437 | - | 17.18 | - | 17.18 | 30 | 2.07 | 19.25 | 36 |
| 11b | 1 | 2462 | - | 17.57 | - | 17.57 | 30 | 2.07 | 19.64 | 36 |
| 11g | 1 | 2412 | - | 13.35 | - | 13.35 | 30 | 2.07 | 15.42 | 36 |
| 11g | 1 | 2437 | - | 12.76 | - | 12.76 | 30 | 2.07 | 14.83 | 36 |
| 11g | 1 | 2462 | - | 13.56 | - | 13.56 | 30 | 2.07 | 15.63 | 36 |
| Result | | | Complied | | | | | | | |

| Maximum Conducted Output Power | | | | | | | | | | |
|--------------------------------|-----------------|-------------|-----------------------|--------------|--------------|-----------|-------------|----------|------------|------------|
| Condition | | | RF Output Power (dBm) | | | | | | | |
| Modulation Mode | N _{TX} | Freq. (MHz) | Chain Port 1 | Chain Port 2 | Chain Port 3 | Sum Chain | Power Limit | DG (dBi) | EIRP Power | EIRP Limit |
| HT20 | 2 | 2412 | 15.31 | 15.14 | - | 18.24 | 30 | 2.14 | 20.38 | 36 |
| HT20 | 2 | 2437 | 13.51 | 13.23 | - | 16.38 | 30 | 2.14 | 18.52 | 36 |
| HT20 | 2 | 2462 | 14.45 | 14.06 | - | 17.27 | 30 | 2.14 | 19.41 | 36 |
| HT40 | 2 | 2422 | 10.97 | 10.71 | - | 13.85 | 30 | 2.14 | 15.99 | 36 |
| HT40 | 2 | 2437 | 14.16 | 13.70 | - | 16.95 | 30 | 2.14 | 19.09 | 36 |
| HT40 | 2 | 2452 | 13.73 | 13.54 | - | 16.65 | 30 | 2.14 | 18.79 | 36 |
| HT20 | 3 | 2412 | 13.89 | 13.94 | 14.52 | 18.90 | 30 | 2.16 | 21.06 | 36 |
| HT20 | 3 | 2437 | 13.49 | 13.06 | 13.60 | 18.16 | 30 | 2.16 | 20.32 | 36 |
| HT20 | 3 | 2462 | 12.89 | 12.83 | 13.37 | 17.81 | 30 | 2.16 | 19.97 | 36 |
| HT40 | 3 | 2422 | 13.88 | 13.74 | 14.26 | 18.74 | 30 | 2.16 | 20.90 | 36 |
| HT40 | 3 | 2437 | 13.19 | 12.81 | 13.46 | 17.93 | 30 | 2.16 | 20.09 | 36 |
| HT40 | 3 | 2452 | 13.95 | 13.17 | 13.61 | 18.36 | 30 | 2.16 | 20.52 | 36 |
| Result | | | Complied | | | | | | | |







3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

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

3.4.2 Measuring Instruments

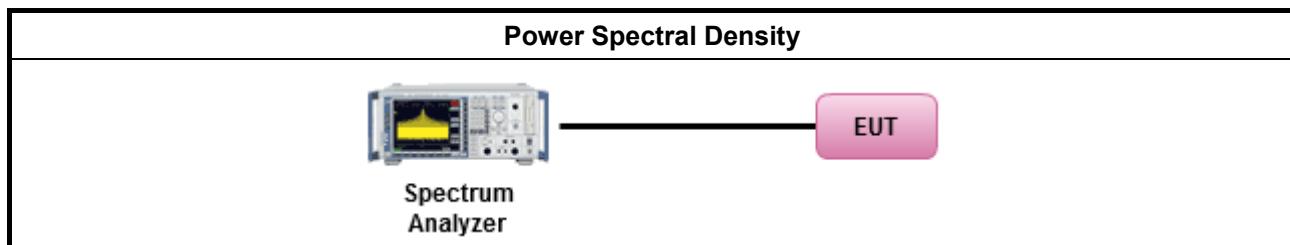
Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

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



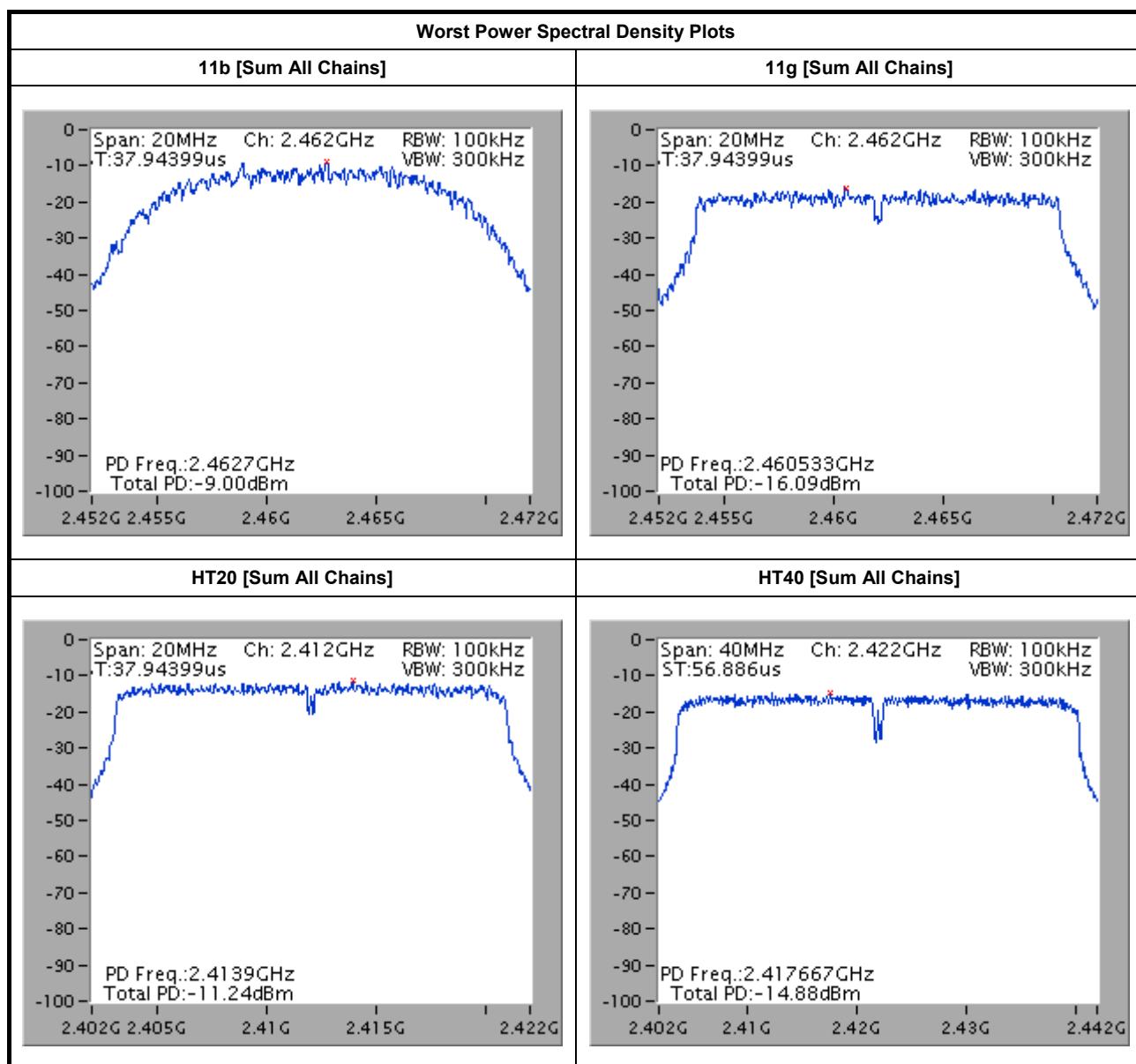
3.4.4 Test Setup



3.4.5 Test Result of Power Spectral Density

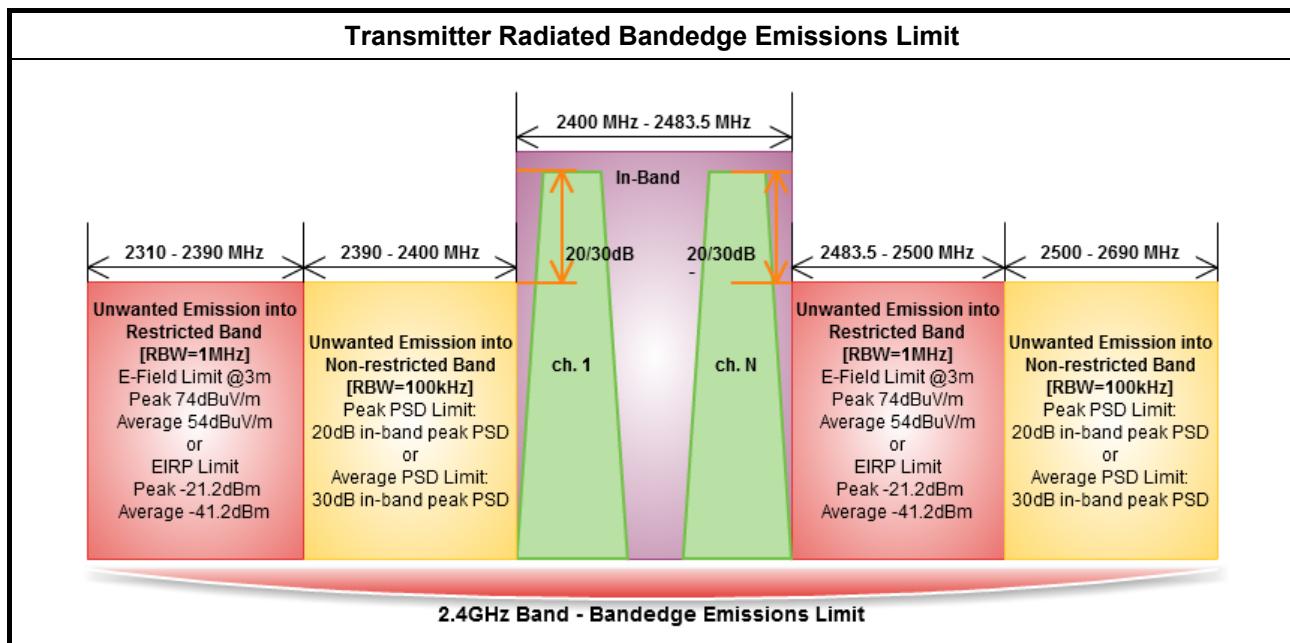
| Power Spectral Density Result | | | | | | | | |
|-------------------------------|-----------------|-------------|-------------------------------------|---|---|---|-----------|-------------|
| Condition | | | Power Spectral Density (dBm/100KHz) | | | | | |
| Modulation Mode | N _{TX} | Freq. (MHz) | - | - | - | - | Sum Chain | Power Limit |
| 11b | 1 | 2412 | - | - | - | - | -9.28 | 8 |
| 11b | 1 | 2437 | - | - | - | - | -10.34 | 8 |
| 11b | 1 | 2462 | - | - | - | - | -9.00 | 8 |
| 11g | 1 | 2412 | - | - | - | - | -16.86 | 8 |
| 11g | 1 | 2437 | - | - | - | - | -17.25 | 8 |
| 11g | 1 | 2462 | - | - | - | - | -16.09 | 8 |
| HT20 | 2 | 2412 | - | - | - | - | -12.14 | 8 |
| HT20 | 2 | 2437 | - | - | - | - | -13.87 | 8 |
| HT20 | 2 | 2462 | - | - | - | - | -13.26 | 8 |
| HT40 | 2 | 2422 | - | - | - | - | -18.61 | 8 |
| HT40 | 2 | 2437 | - | - | - | - | -15.15 | 8 |
| HT40 | 2 | 2452 | - | - | - | - | -16.31 | 8 |
| HT20 | 3 | 2412 | - | - | - | - | -11.24 | 8 |
| HT20 | 3 | 2437 | - | - | - | - | -12.46 | 8 |
| HT20 | 3 | 2462 | - | - | - | - | -12.83 | 8 |
| HT40 | 3 | 2422 | - | - | - | - | -14.88 | 8 |
| HT40 | 3 | 2437 | - | - | - | - | -15.23 | 8 |
| HT40 | 3 | 2452 | - | - | - | - | -15.17 | 8 |
| Result | | | Complied | | | | | |

Note 1: PSD = sum each transmit chains by bin-to-bin PSD



3.5 Transmitter Bandedge Emissions

3.5.1 Transmitter Radiated Bandedge Emissions Limit



3.5.2 Measuring Instruments

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



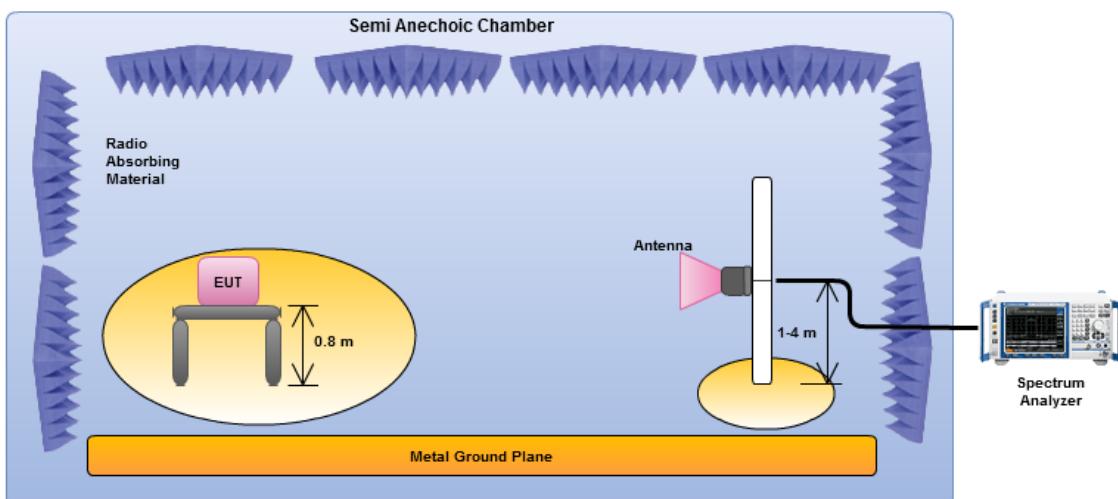
3.5.3 Test Procedures

| Test Method |
|---|
| <input checked="" type="checkbox"/> The average emission levels shall be measured in [duty cycle \geq 98 or duty factor]. |
| <input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 6.9.2.2 bandedge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band. |
| <input checked="" type="checkbox"/> For the transmitter unwanted emissions shall be measured using following options below: |
| <input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 11 for unwanted emissions into non-restricted bands. |
| <input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands. |
| <input type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.1 Option 1 (trace averaging for duty cycle $\geq 98\%$) |
| <input type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.2 Option 2 (trace averaging + duty factor). |
| <input type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.3 Option 3 (Reduced VBW $\geq 1/T$). |
| <input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW $\geq 1/T$, where T is pulse time. |
| <input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions. |
| <input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 11.3 and 12.2.4 measurement procedure peak limit. |
| <input checked="" type="checkbox"/> For the transmitter bandedge emissions shall be measured using following options below: |
| <input type="checkbox"/> Refer as FCC KDB 558074, clause 13.3 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz). |
| <input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 6.9.2 for band-edge testing. |
| <input type="checkbox"/> Refer as ANSI C63.10, clause 6.9.3 for marker-delta method for band-edge measurements. |
| <input checked="" type="checkbox"/> For radiated measurement, refer as FCC KDB 558074, clause 12.2.7. |

| Test Method |
|--|
| <input type="checkbox"/> For conducted and cabinet radiation measurement, refer as FCC KDB 558074, clause 12.2.2. |
| <input type="checkbox"/> For conducted unwanted emissions into non-restricted bands (relative emission limits). Devices with multiple transmit chains: Refer as FCC KDB 662911, when testing out-of-band and spurious emissions against relative emission limits, tests may be performed on each output individually without summing or adding 10 log(N) if the measurements are made relative to the in-band emissions on the individual outputs. |
| <input type="checkbox"/> For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB |
| <input type="checkbox"/> For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred. |

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

| 2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Non-restricted Band) | | | | | | | | |
|--|-----------------|------------------|-------------------------------|-------------|--------------------------------|----------------|------------|------|
| Modulation | N _{TX} | Test Freq. (MHz) | In-band PSD [i] (dBuV/100kHz) | Freq. (MHz) | Out-band PSD [o] (dBuV/100kHz) | [i] – [o] (dB) | Limit (dB) | Pol. |
| 11b | 1 | 2412 | 104.39 | 2399.040 | 64.96 | 39.43 | 20 | V |
| 11b | 1 | 2462 | 102.95 | 2515.900 | 64.53 | 38.42 | 20 | V |
| 11g | 1 | 2412 | 89.22 | 2399.820 | 63.31 | 25.91 | 20 | V |
| 11g | 1 | 2462 | 88.15 | 2545.100 | 64.54 | 23.61 | 20 | V |
| HT20,M0-15 | 2 | 2412 | 98.72 | 2400.000 | 65.76 | 32.96 | 20 | V |
| HT20,M0-15 | 2 | 2462 | 97.57 | 2505.400 | 63.93 | 33.64 | 20 | V |
| HT40,M0-15 | 2 | 2422 | 93.39 | 2398.570 | 67.63 | 25.76 | 20 | V |
| HT40,M0-15 | 2 | 2452 | 93.89 | 2536.400 | 64.69 | 29.20 | 20 | V |
| HT20,M0-15 | 3 | 2412 | 98.74 | 2392.660 | 63.76 | 33.98 | 20 | V |
| HT20,M0-15 | 3 | 2462 | 98.66 | 2517.900 | 64.55 | 34.11 | 20 | V |
| HT40,M0-15 | 3 | 2422 | 98.37 | 2399.100 | 65.37 | 33.00 | 20 | V |
| HT40,M0-15 | 3 | 2452 | 98.54 | 2525.360 | 63.52 | 35.02 | 20 | V |

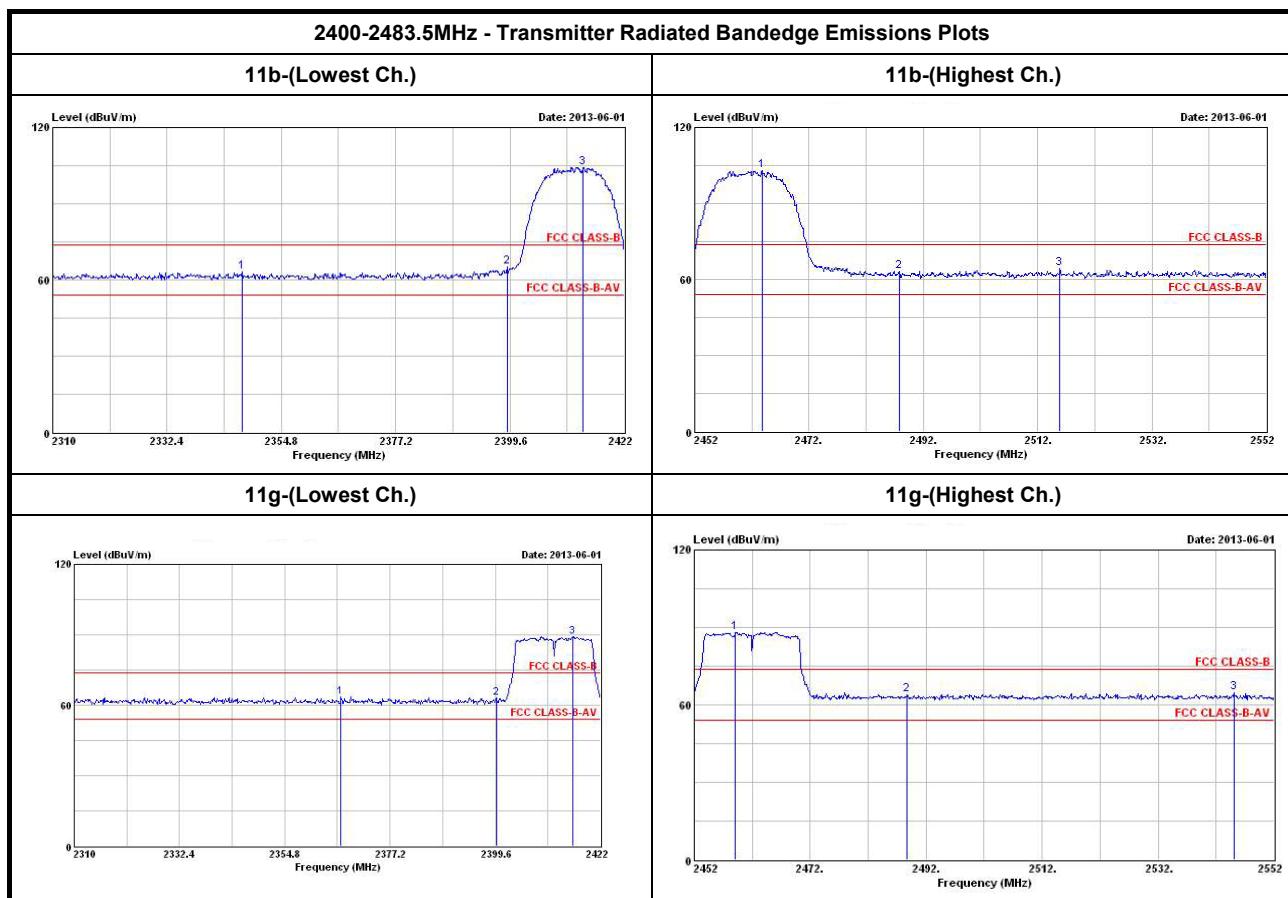
Note 1: Measurement worst emissions of receive antenna polarization

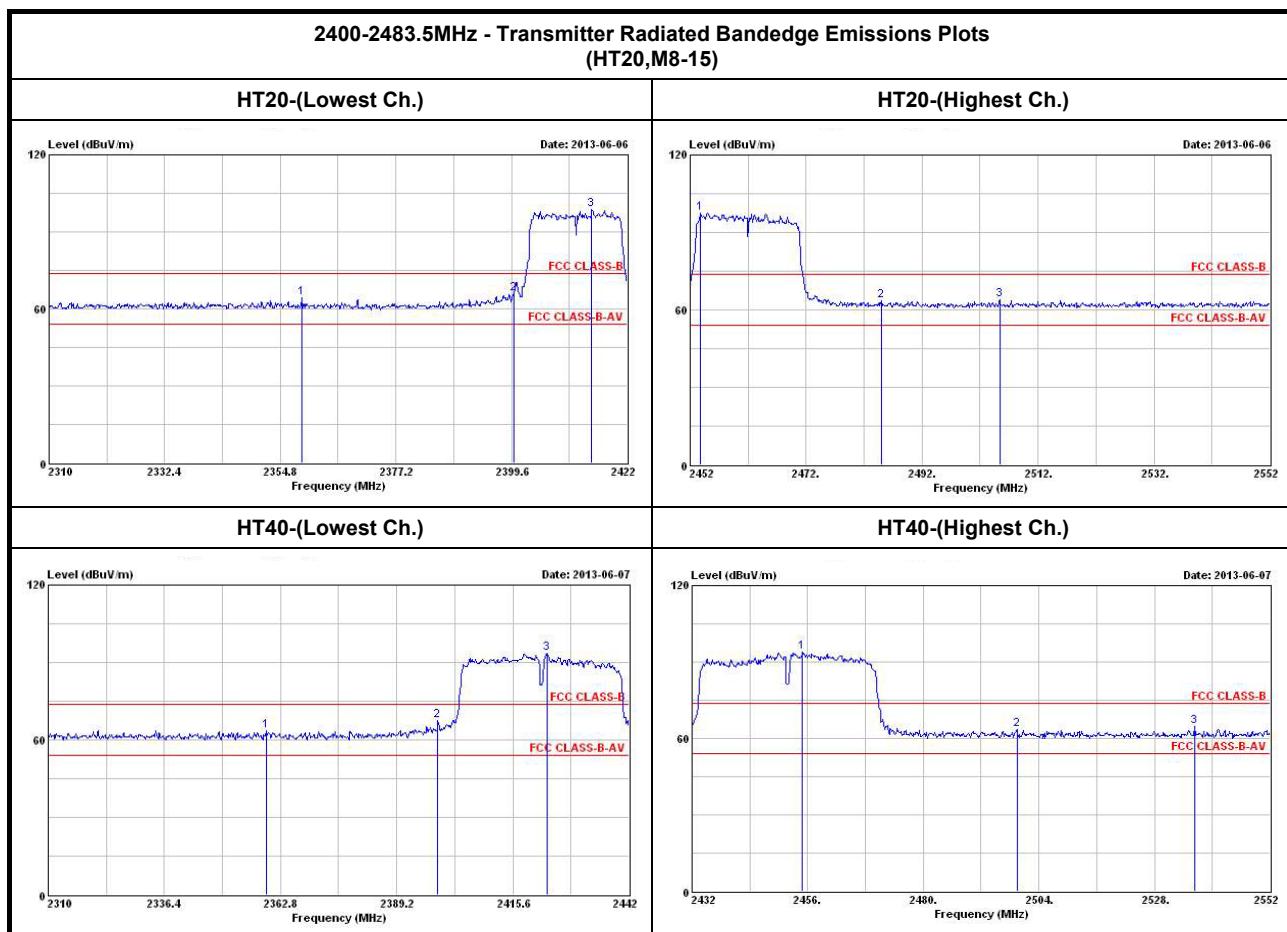


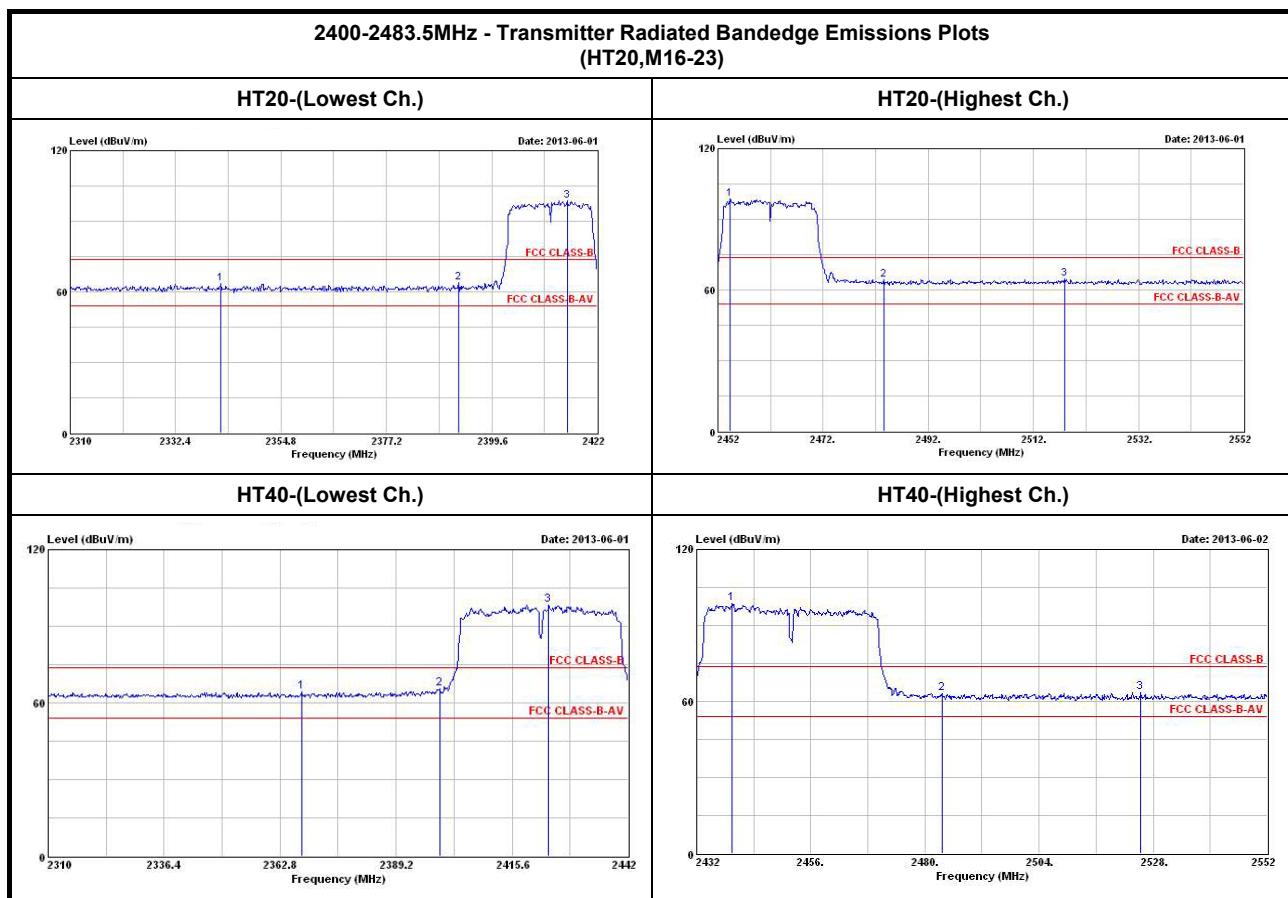
| 2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Restricted Band) | | | | | | | | | | |
|--|-----------------|-------------|----------------------|----------------|-------------------|-------------------|----------------|-------------------|-------------------|------|
| Modulation Mode | N _{TX} | Freq. (MHz) | Measure Distance (m) | Freq. (MHz) PK | Level (dBuV/m) PK | Limit (dBuV/m) PK | Freq. (MHz) AV | Level (dBuV/m) AV | Limit (dBuV/m) AV | Pol. |
| 11b | 1 | 2412 | 3 | 2359.060 | 61.16 | 74 | 2390.000 | 49.39 | 54 | V |
| 11b | 1 | 2462 | 3 | 2483.800 | 62.21 | 74 | 2483.500 | 50.46 | 54 | V |
| 11g | 1 | 2412 | 3 | 2320.080 | 59.06 | 74 | 2310.670 | 47.34 | 54 | V |
| 11g | 1 | 2462 | 3 | 2485.900 | 59.54 | 74 | 2488.700 | 47.66 | 54 | V |
| HT20,M0-15 | 2 | 2412 | 3 | 2390.000 | 63.86 | 74 | 2390.000 | 50.15 | 54 | V |
| HT20,M0-15 | 2 | 2462 | 3 | 2483.900 | 62.02 | 74 | 2483.500 | 48.40 | 54 | V |
| HT40,M0-15 | 2 | 2422 | 3 | 2390.000 | 67.05 | 74 | 2390.000 | 52.75 | 54 | V |
| HT40,M0-15 | 2 | 2452 | 3 | 2487.560 | 61.97 | 74 | 2483.500 | 49.73 | 54 | V |
| HT20,M0-15 | 3 | 2412 | 3 | 2359.620 | 61.32 | 74 | 2360.400 | 49.70 | 54 | V |
| HT20,M0-15 | 3 | 2462 | 3 | 2483.500 | 61.33 | 74 | 2483.500 | 48.89 | 54 | V |
| HT40,M0-15 | 3 | 2422 | 3 | 2389.460 | 63.86 | 74 | 2390.000 | 51.45 | 54 | V |
| HT40,M0-15 | 3 | 2452 | 3 | 2483.600 | 65.65 | 74 | 2483.720 | 50.84 | 54 | V |

Note 1: Measurement worst emissions of receive antenna polarization.

3m->1m=9.54dB; 3m->1.5m=6.02dB









3.6 Transmitter Unwanted Emissions

3.6.1 Transmitter Radiated Unwanted Emissions Limit

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

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

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

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

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

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

3.6.2 Measuring Instruments

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

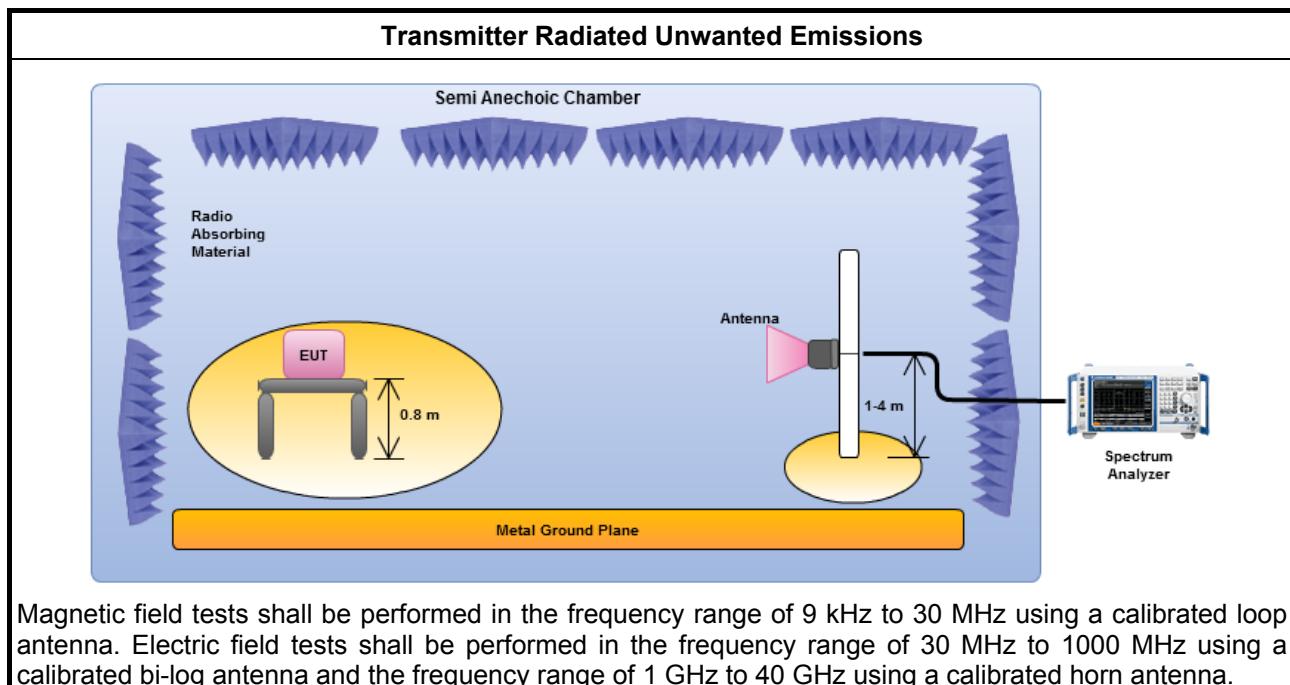


3.6.3 Test Procedures

| Test Method | |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements). |
| <input checked="" type="checkbox"/> | 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. |
| <input checked="" type="checkbox"/> | 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. |
| <input checked="" type="checkbox"/> | The average emission levels shall be measured in [duty cycle \geq 98 or duty factor]. |
| <input checked="" type="checkbox"/> | For the transmitter unwanted emissions shall be measured using following options below: |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074, clause 11 for unwanted emissions into non-restricted bands. |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands. |
| | <input type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.1 Option 1 (trace averaging for duty cycle \geq 98%) |
| | <input type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.2 Option 2 (trace averaging + duty factor). |
| | <input type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.3 Option 3 (Reduced VBW \geq 1/T). |
| | <input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW \geq 1/T, where T is pulse time. |
| | <input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions. |
| | <input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 11.3 and 12.2.4 measurement procedure peak limit. |
| | <input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.3 measurement procedure Quasi-Peak limit. |
| <input checked="" type="checkbox"/> | For radiated measurement, refer as FCC KDB 558074, clause 12.2.7. |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz. |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz. |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 6.6 for radiated emissions from above 1 GHz. |

| Test Method | |
|--------------------------|--|
| <input type="checkbox"/> | For conducted and cabinet radiation measurement, refer as FCC KDB 558074, clause 12.2.2. |
| <input type="checkbox"/> | For conducted unwanted emissions into non-restricted bands (relative emission limits). Devices with multiple transmit chains: Refer as FCC KDB 662911, when testing out-of-band and spurious emissions against relative emission limits, tests may be performed on each output individually without summing or adding $10 \log(N)$ if the measurements are made relative to the in-band emissions on the individual outputs. |
| <input type="checkbox"/> | For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add $10 \log(N)$ dB |
| <input type="checkbox"/> | For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred. |

3.6.4 Test Setup



3.6.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

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



3.6.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Transmitter Radiated Unwanted Emissions (Below 1GHz)

| | | | |
|-----------------|-----|------------------|------|
| Modulation Mode | 11g | Test Freq. (MHz) | 2437 |
| N _{TX} | 1 | Polarization | V |

Date: 2013-03-23

FCC CLASS-B -3dB

Level (dBuV/m)

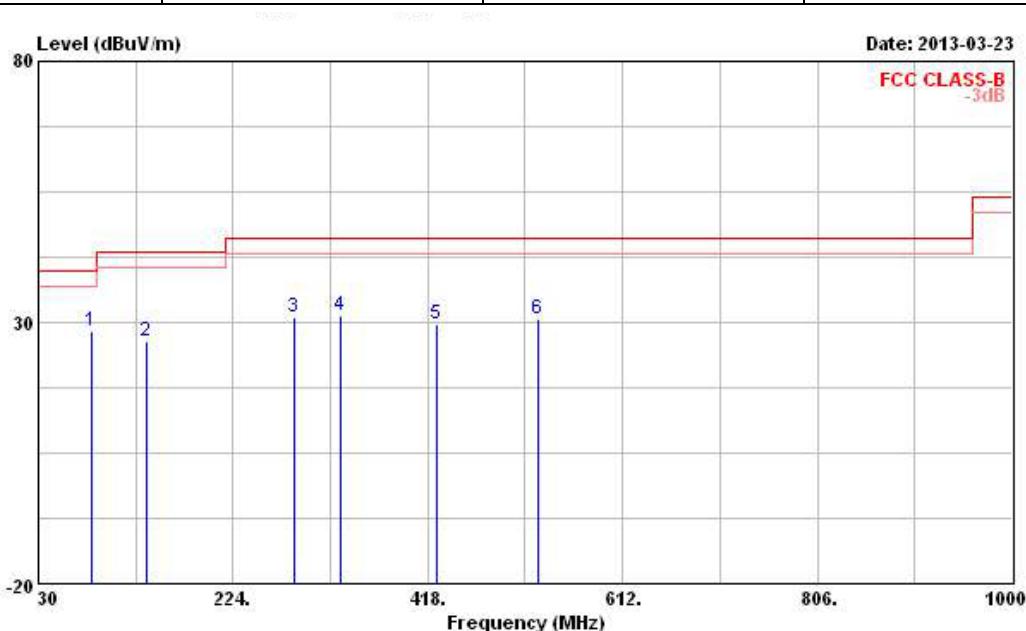
Frequency (MHz)

| Freq | Level | Over | Limit | Read | Antenna | Cable | Preamp | Ant Pos | Table Pos | |
|------|---------|-------|--------|-------|---------|-------|--------|------------|--------------|--------|
| | | Limit | Line | Level | Factor | Loss | Factor | | | Remark |
| 1 30 | 52.310 | 36.56 | -3.44 | 40.00 | 54.43 | 8.94 | 1.04 | 27.85 Peak | --- | --- |
| 2 | 90.140 | 28.55 | -14.95 | 43.50 | 45.60 | 9.50 | 1.34 | 27.89 Peak | --- | --- |
| 3 | 285.110 | 27.81 | -18.19 | 46.00 | 39.08 | 13.49 | 2.50 | 27.26 Peak | --- | --- |
| 4 | 357.860 | 27.63 | -18.37 | 46.00 | 37.81 | 14.60 | 2.85 | 27.63 Peak | --- | --- |
| 5 | 664.380 | 30.65 | -15.35 | 46.00 | 35.87 | 19.32 | 3.94 | 28.48 Peak | --- | --- |
| 6 | 897.180 | 33.30 | -12.70 | 46.00 | 36.45 | 20.03 | 4.60 | 27.78 Peak | --- | --- |



Transmitter Radiated Unwanted Emissions (Below 1GHz)

| | | | |
|-----------------|-----|------------------|------|
| Modulation Mode | 11g | Test Freq. (MHz) | 2437 |
| N _{TX} | 1 | Polarization | H |

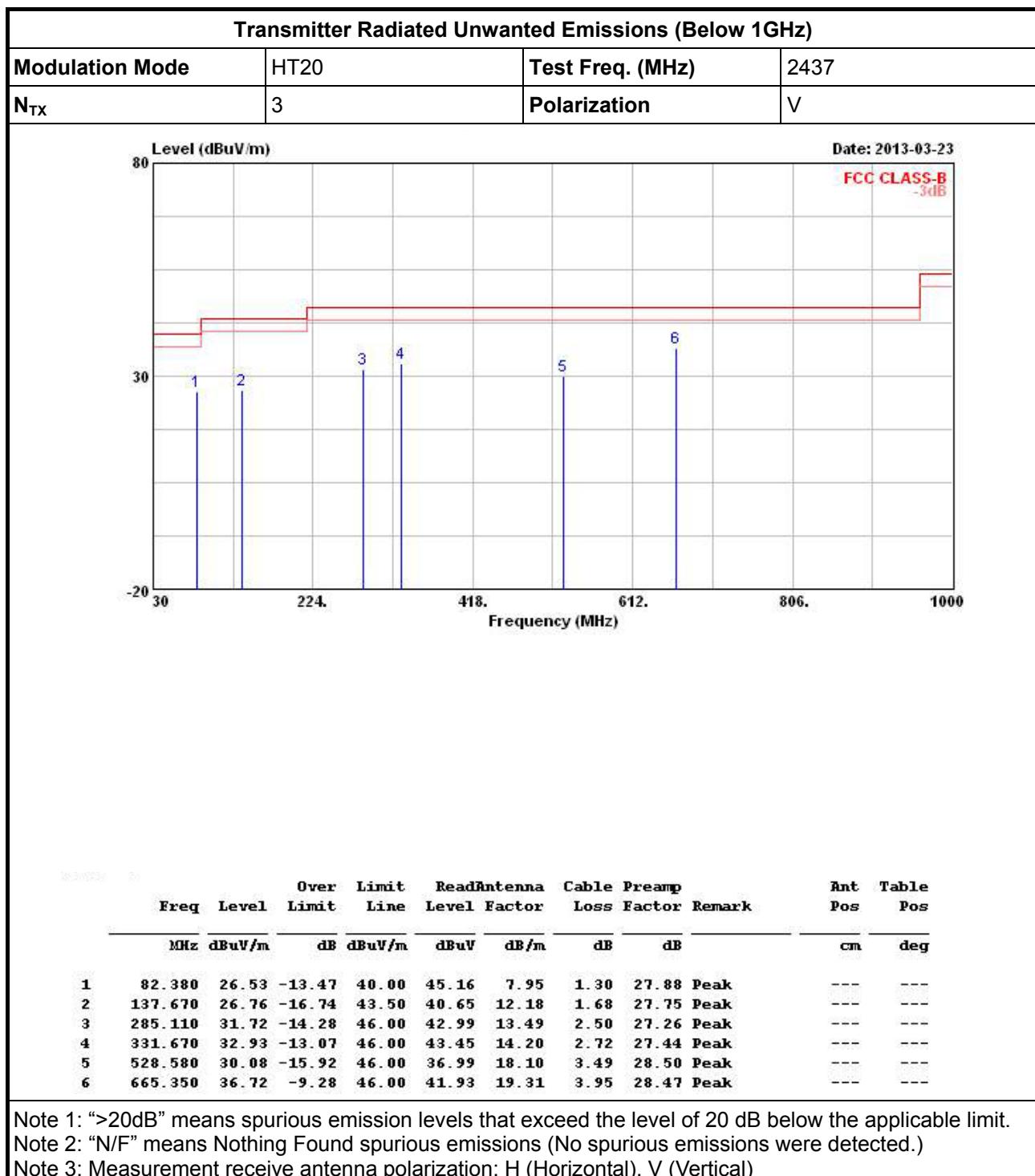


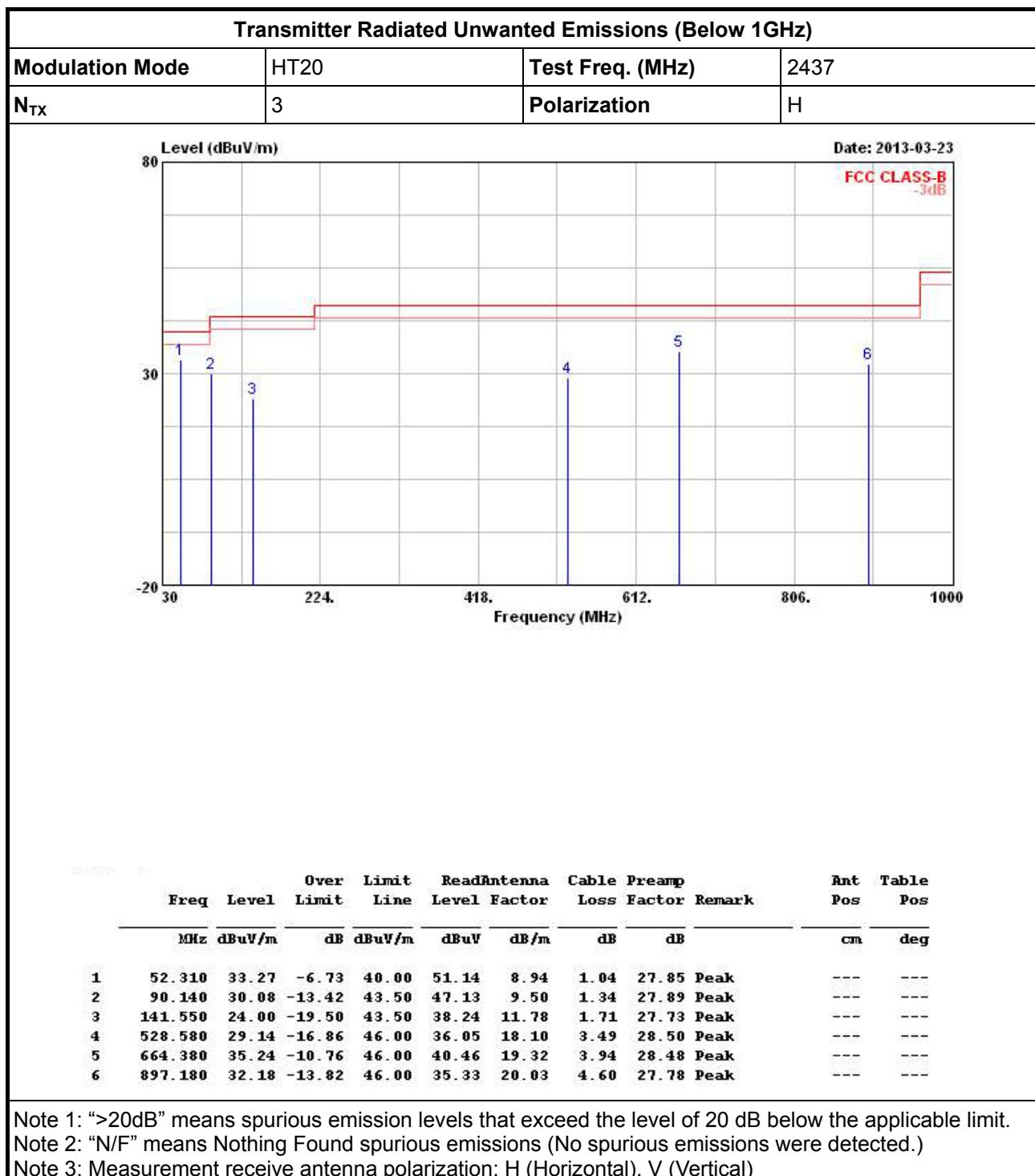
| Freq | Level | Over Limit | Line | Read | Antenna | Cable | Preamp | Ant | Table | |
|-----------|--------|------------|-------|-------|---------|-------|--------|------|-------|-----|
| | | | | | | | | | Pos | Pos |
| MHz | dBuV/m | | | | dBuV | dB/m | | | cm | deg |
| 1 82.380 | 28.28 | -11.72 | 40.00 | 46.91 | 7.95 | 1.30 | 27.88 | Peak | --- | --- |
| 2 137.670 | 26.33 | -17.17 | 43.50 | 40.22 | 12.18 | 1.68 | 27.75 | Peak | --- | --- |
| 3 285.110 | 31.05 | -14.95 | 46.00 | 42.32 | 13.49 | 2.50 | 27.26 | Peak | --- | --- |
| 4 330.700 | 31.44 | -14.56 | 46.00 | 41.96 | 14.19 | 2.72 | 27.43 | Peak | --- | --- |
| 5 427.700 | 29.75 | -16.25 | 46.00 | 38.94 | 15.82 | 3.08 | 28.09 | Peak | --- | --- |
| 6 528.580 | 30.81 | -15.19 | 46.00 | 37.72 | 18.10 | 3.49 | 28.50 | Peak | --- | --- |

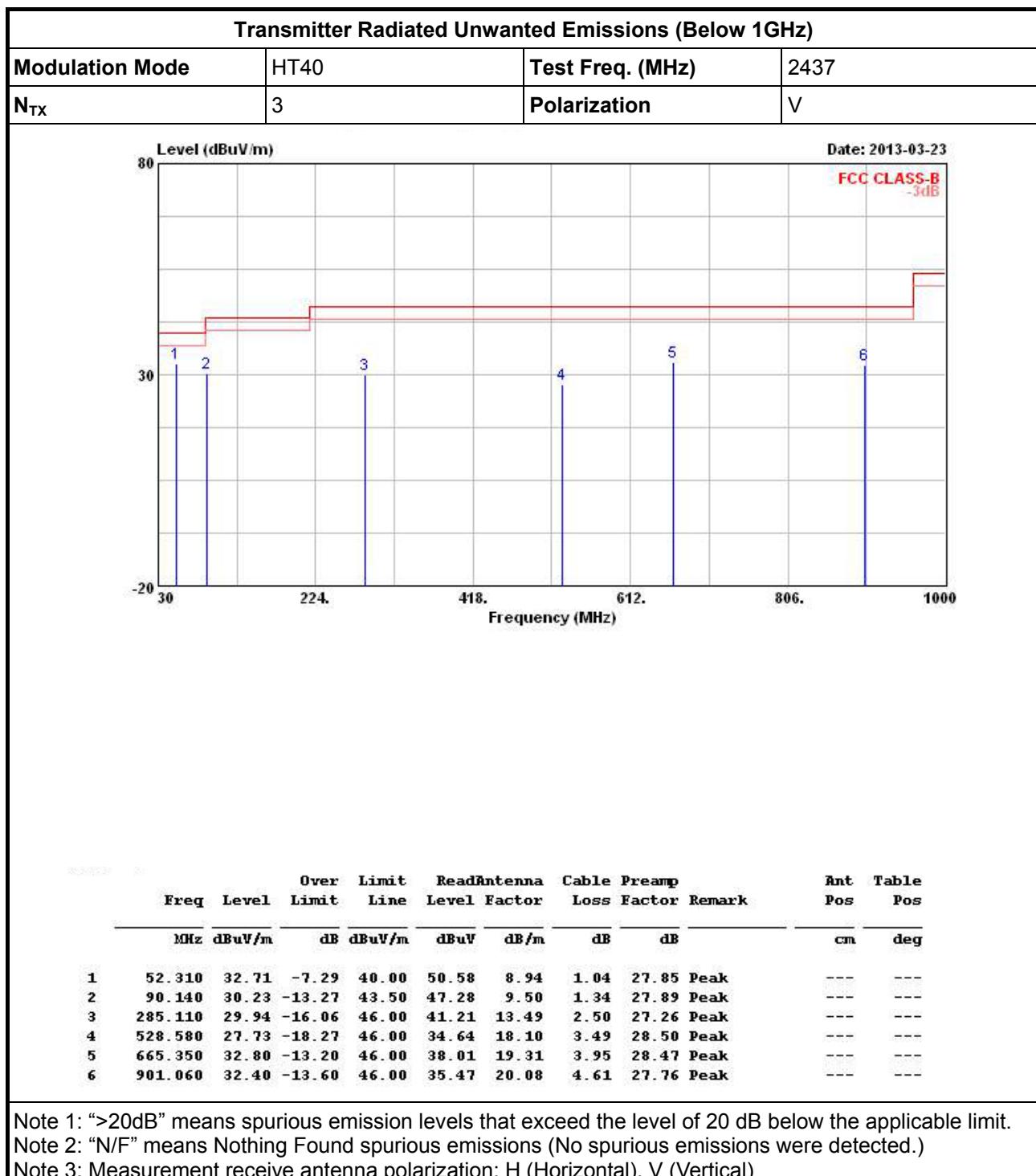
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

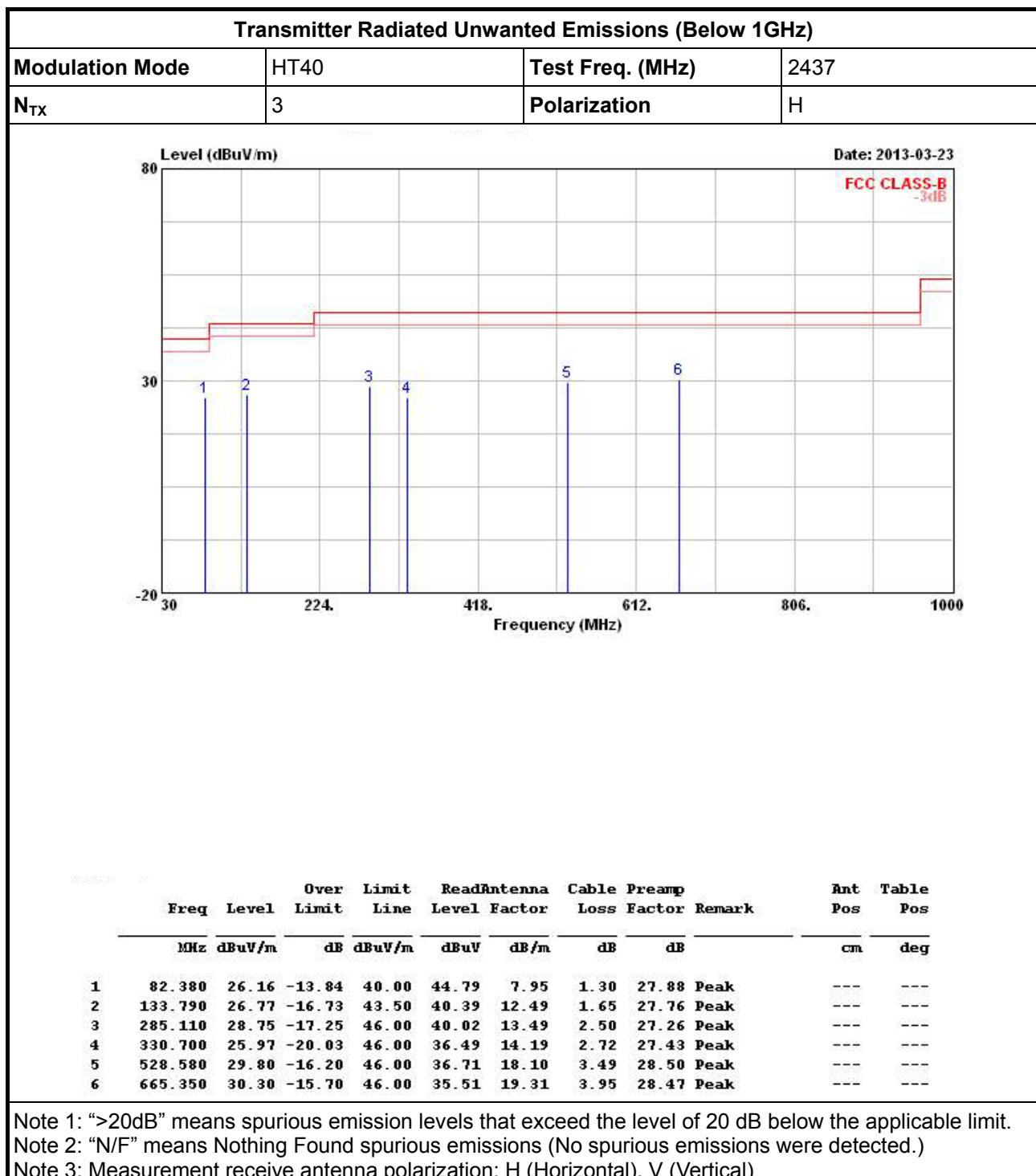
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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



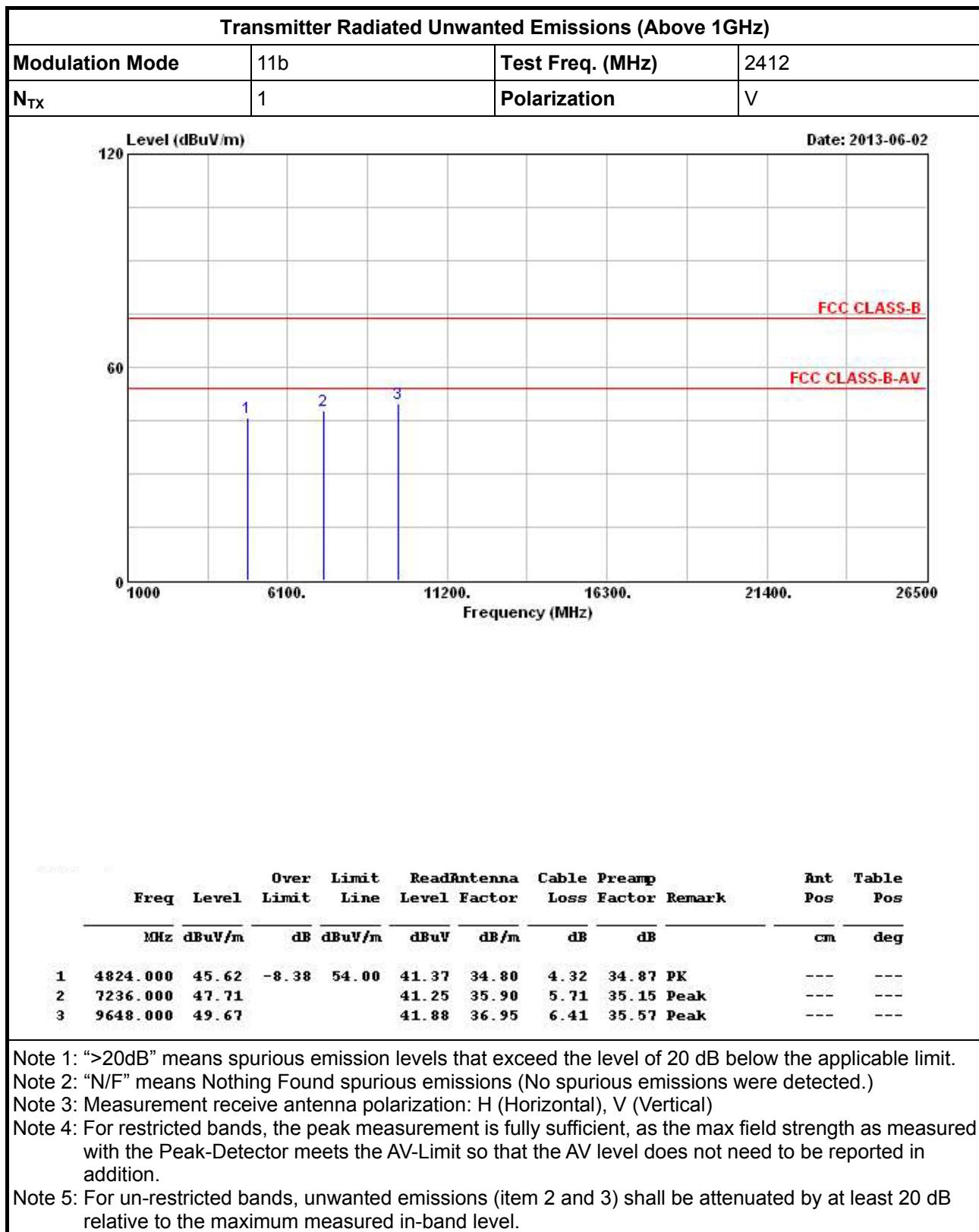


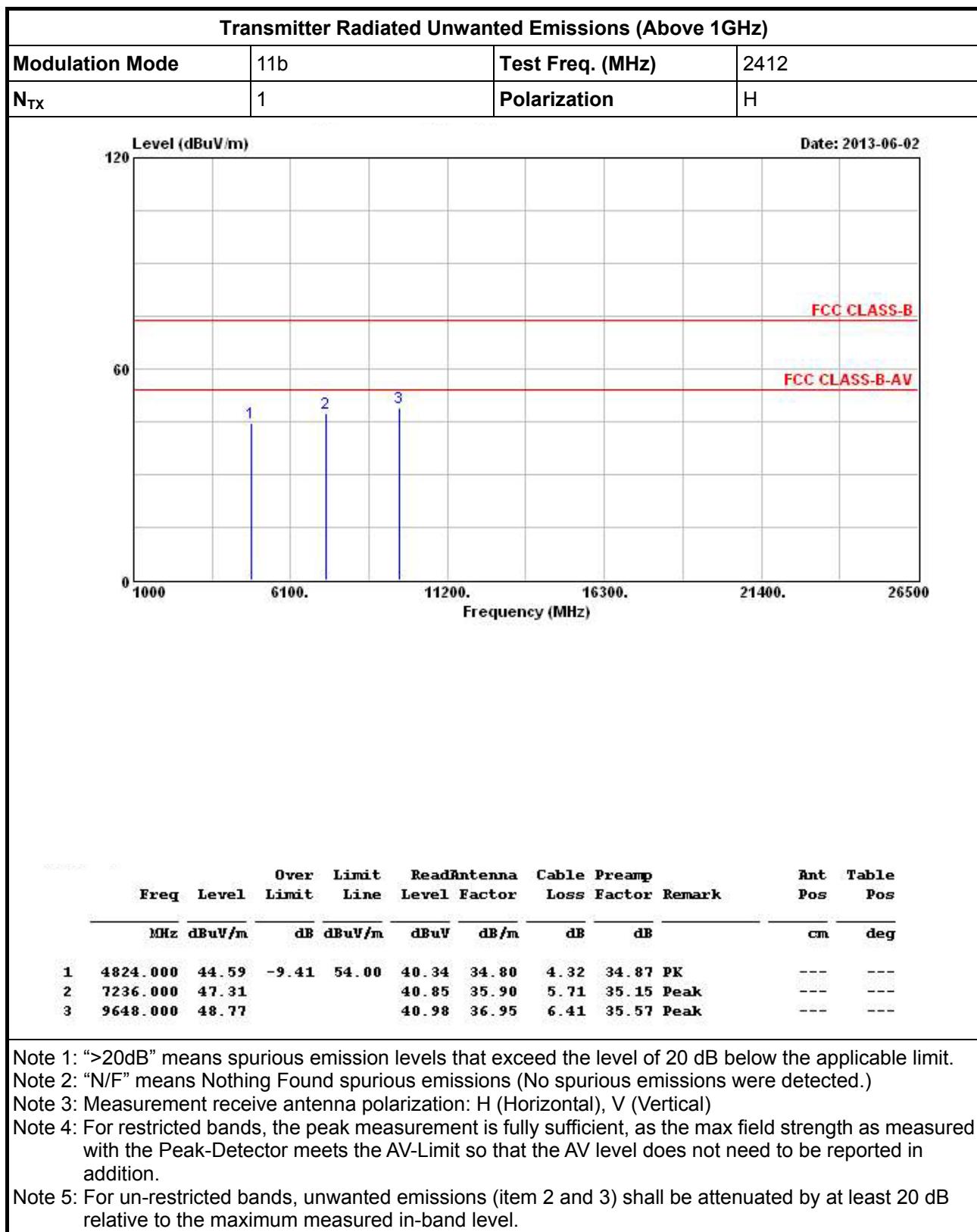


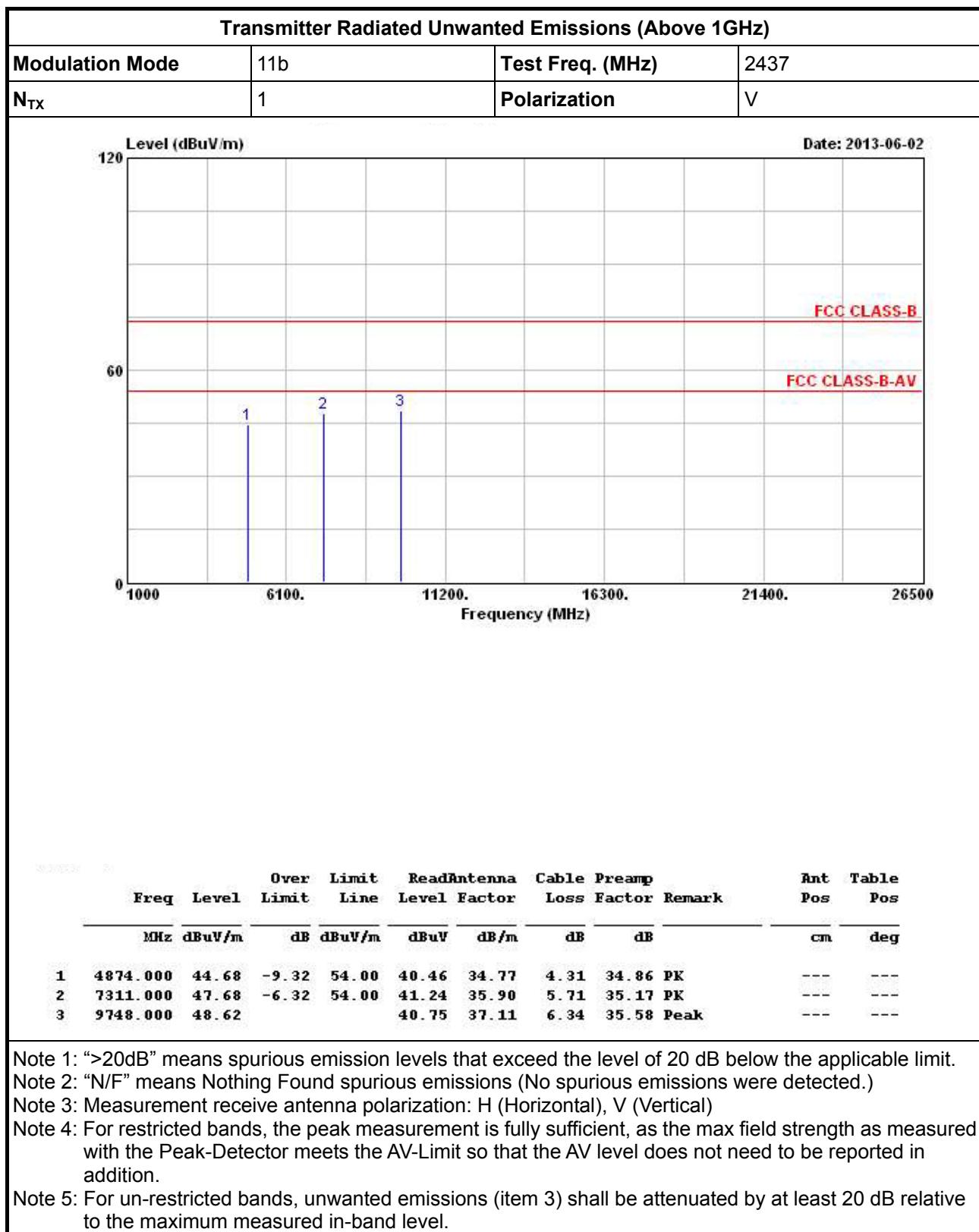


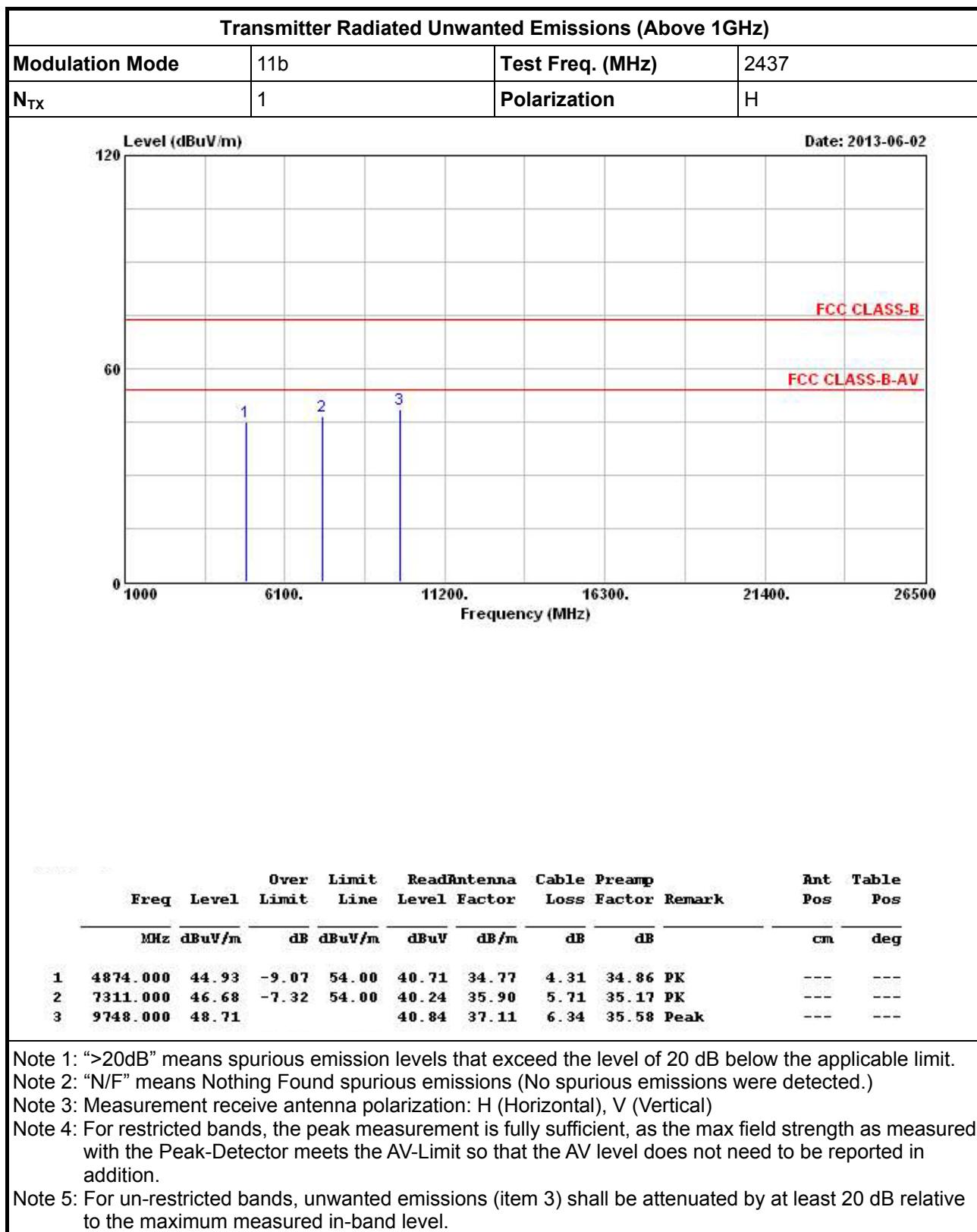


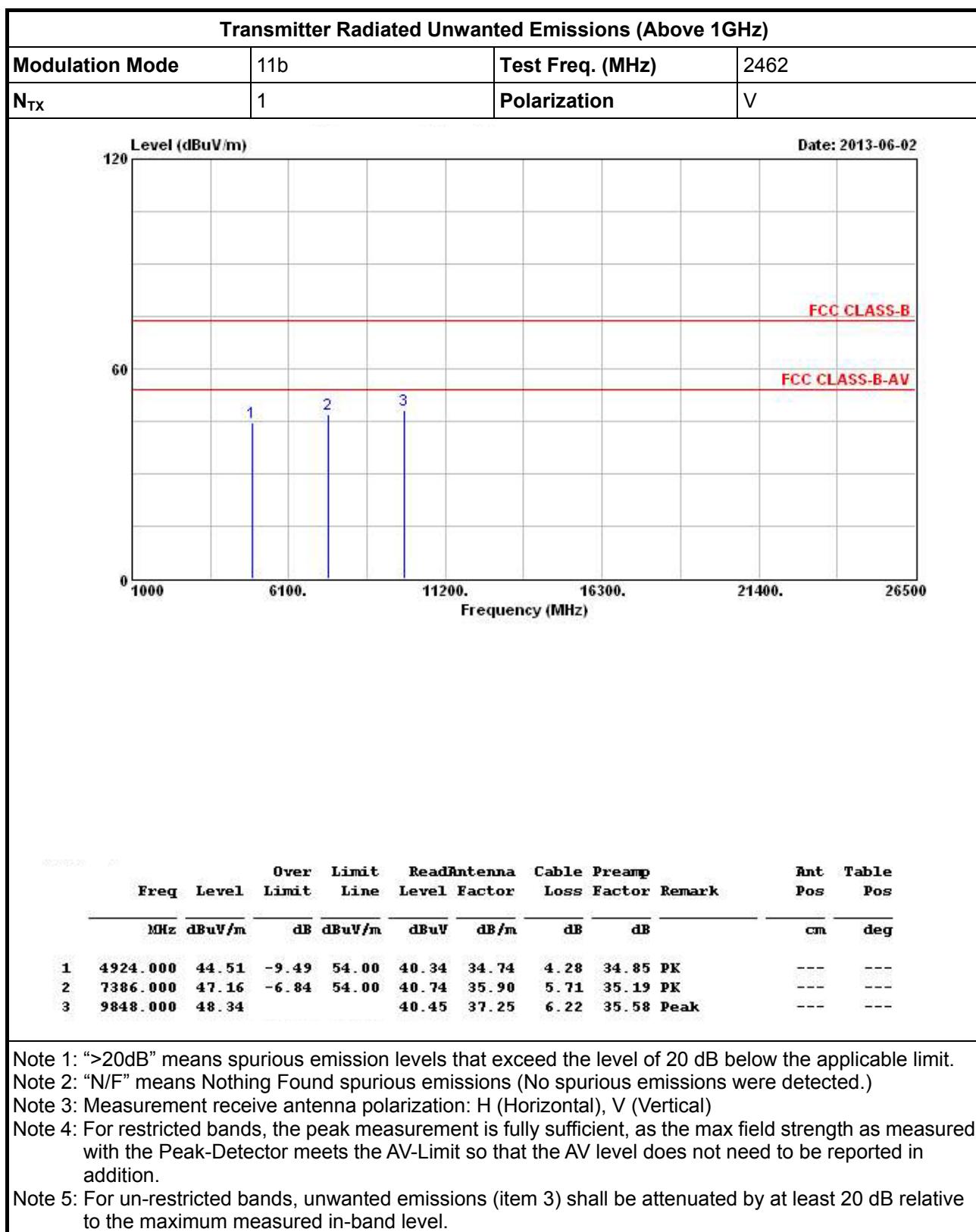
3.6.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 2400-2483.5MHz

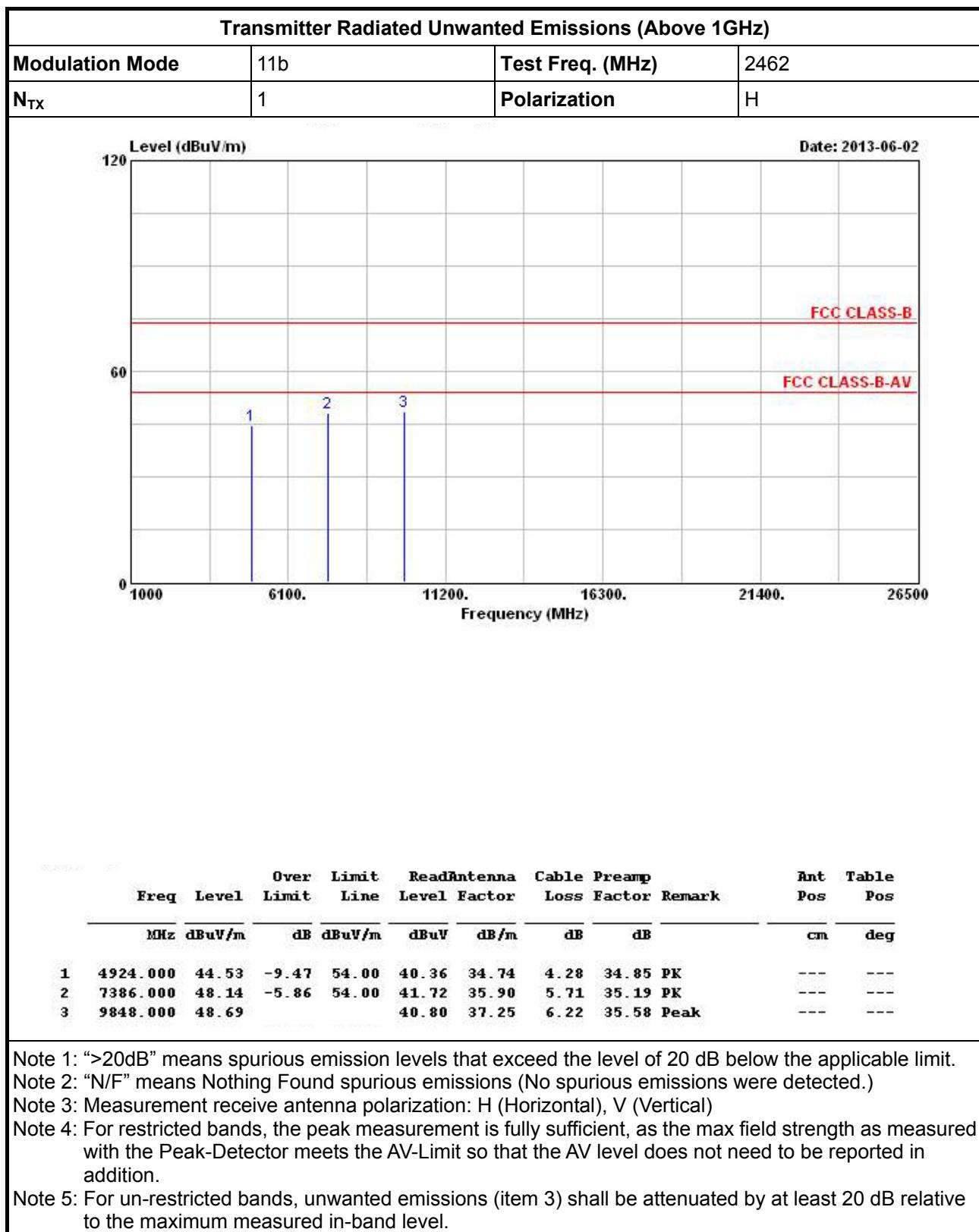


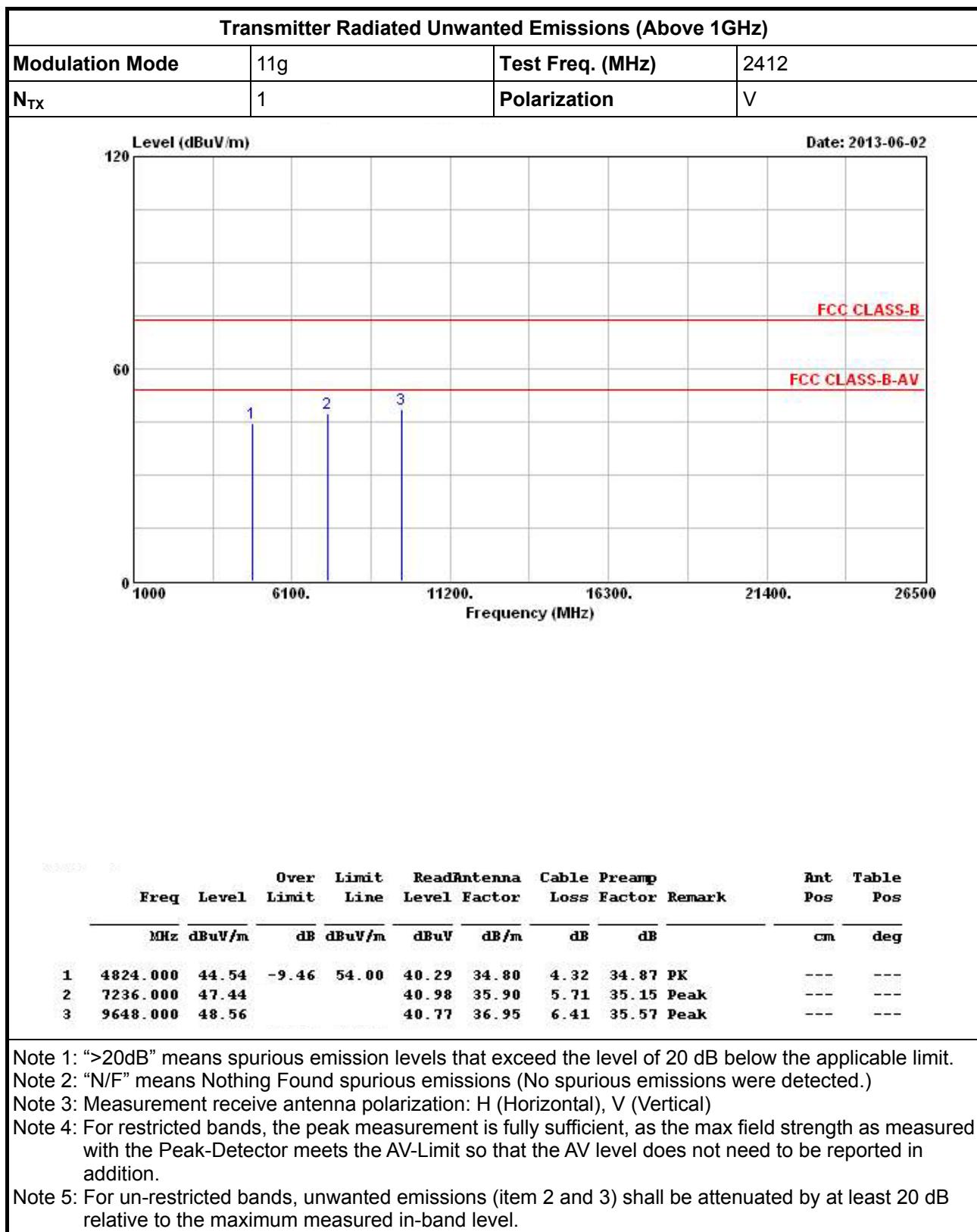


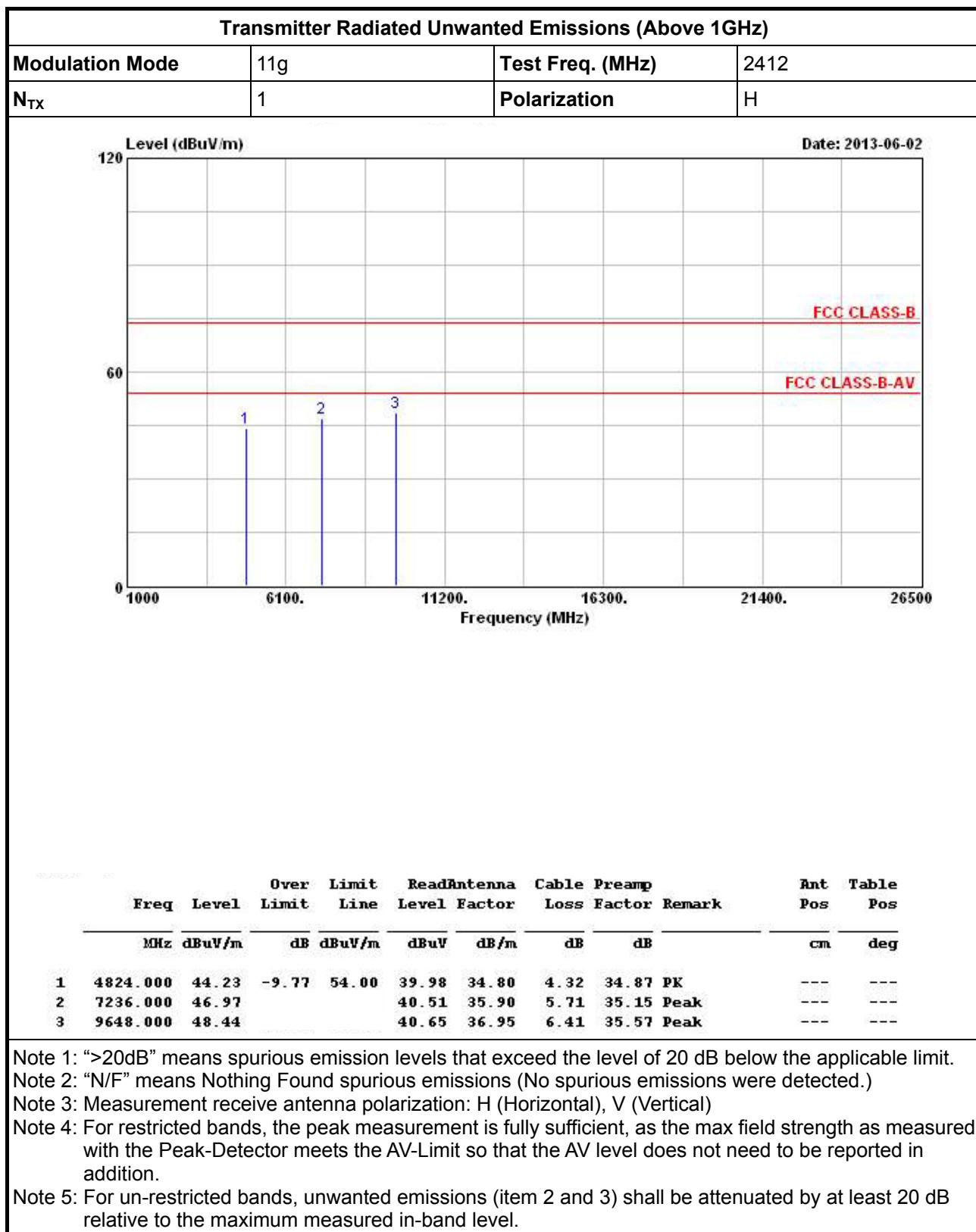


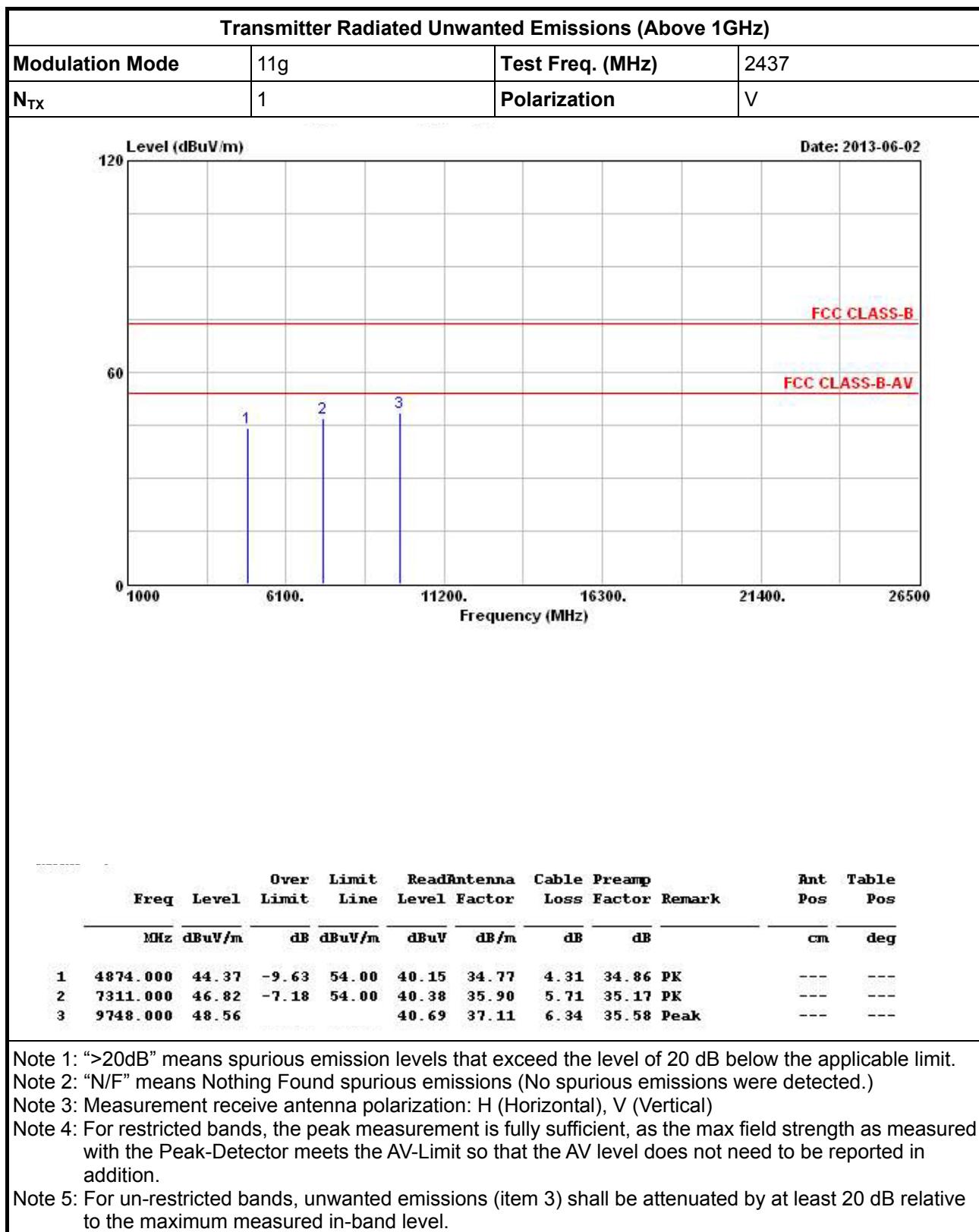


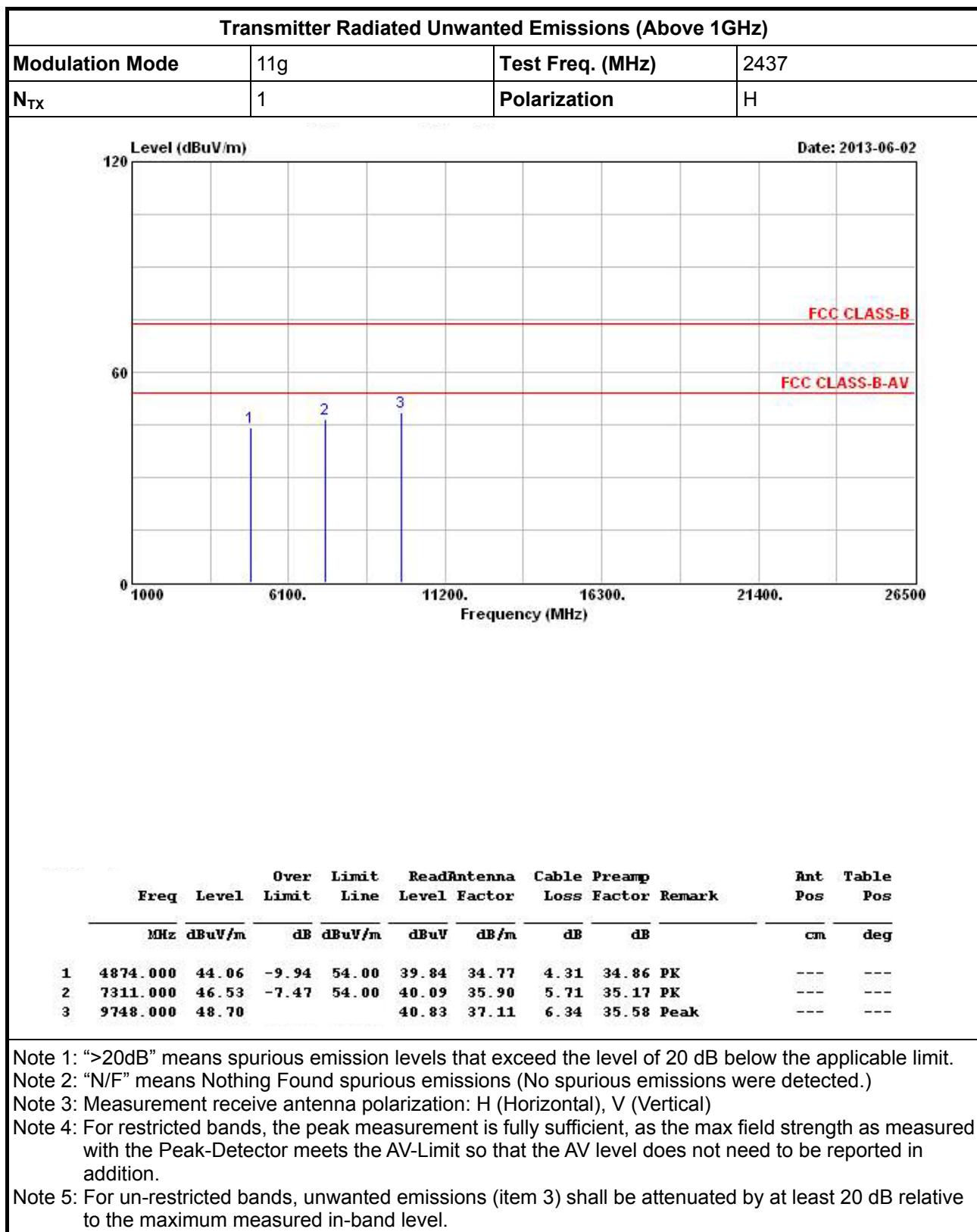


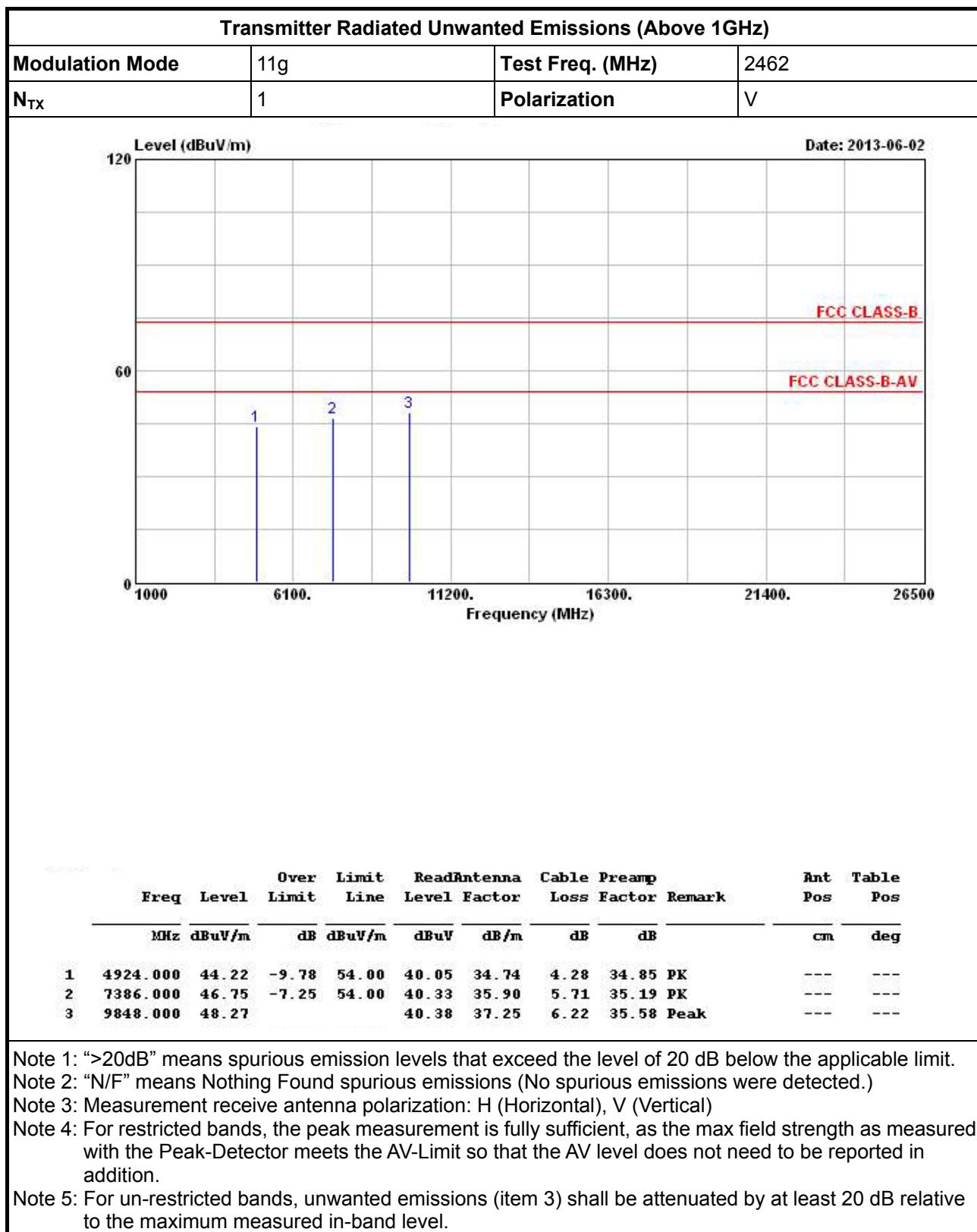


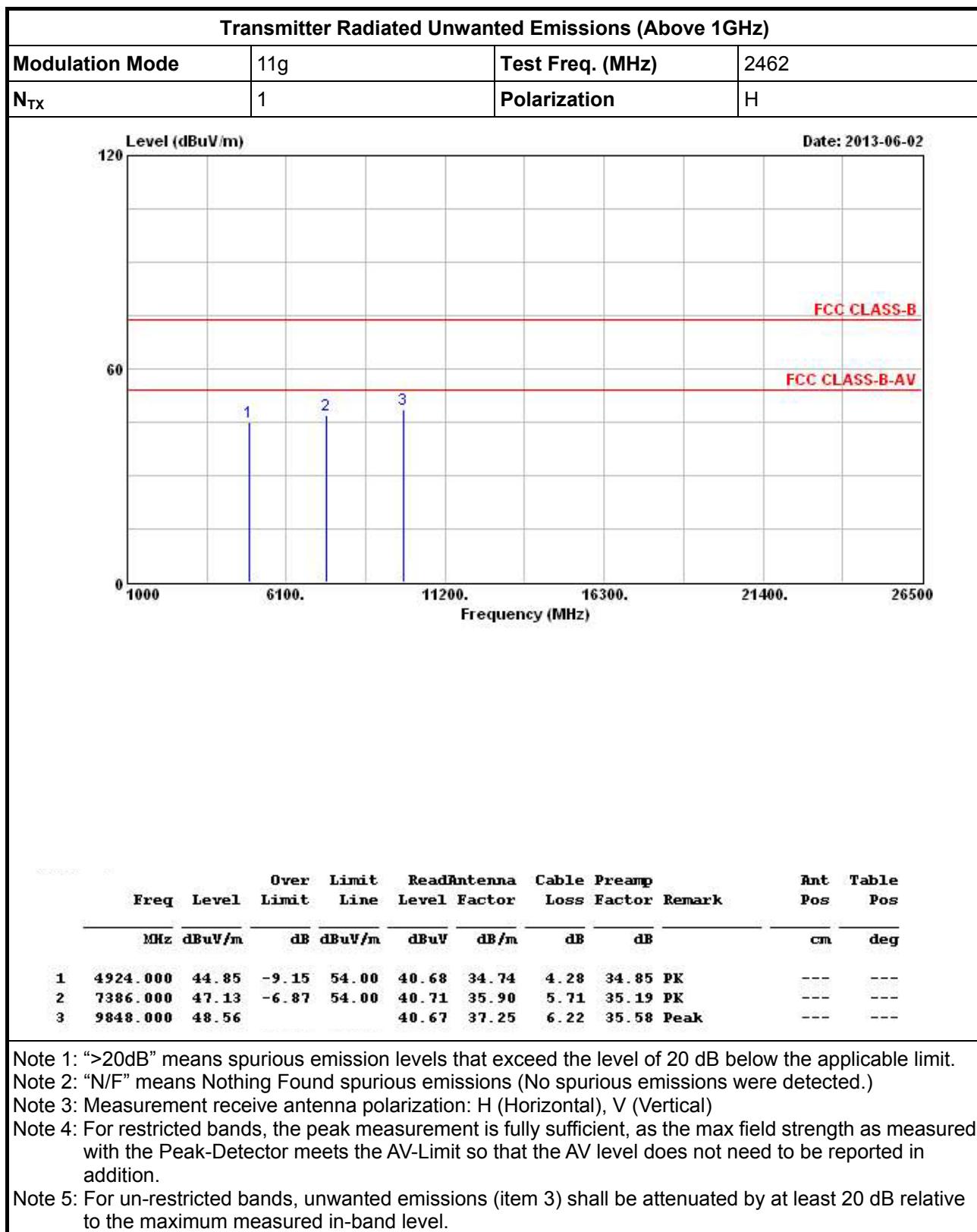


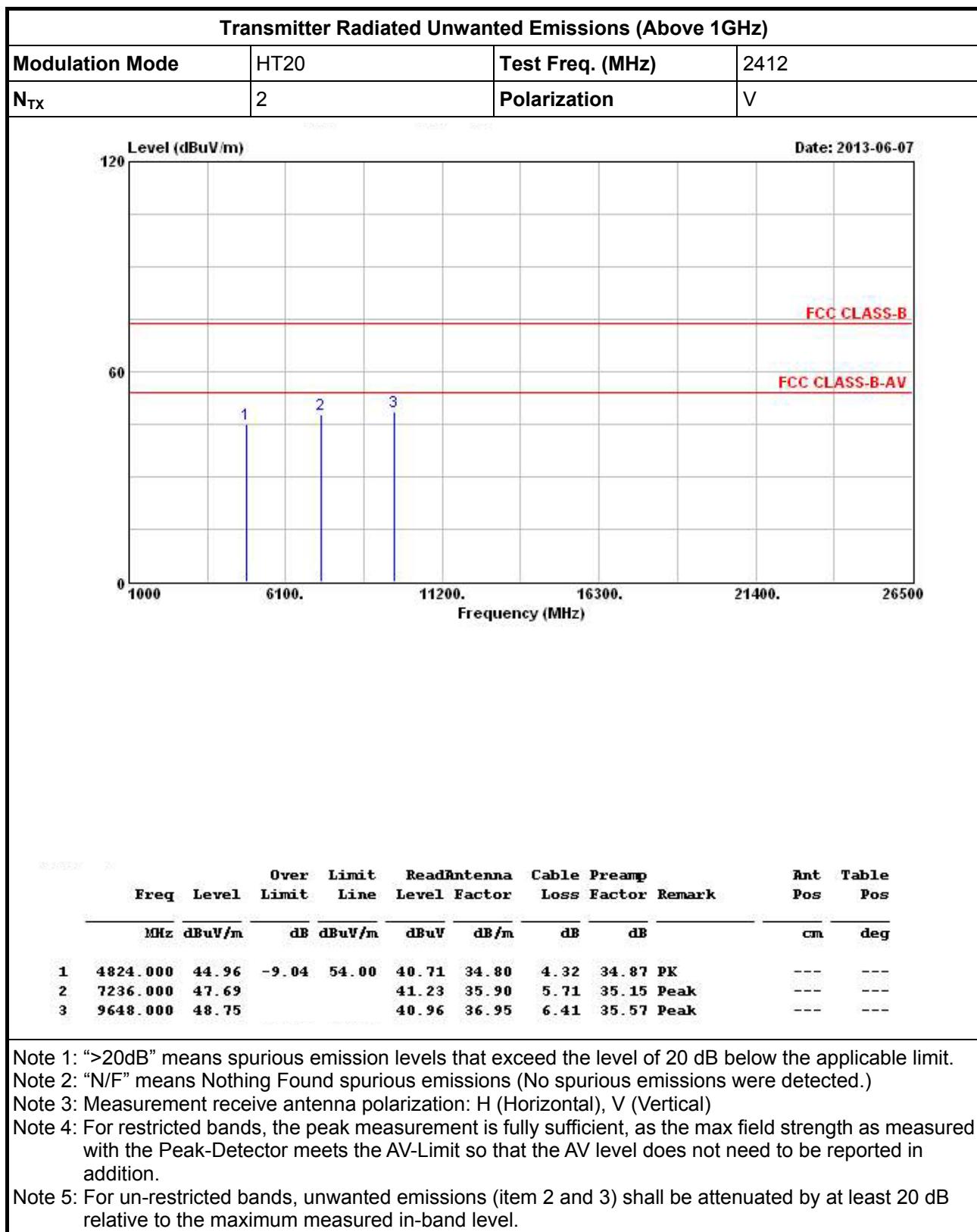


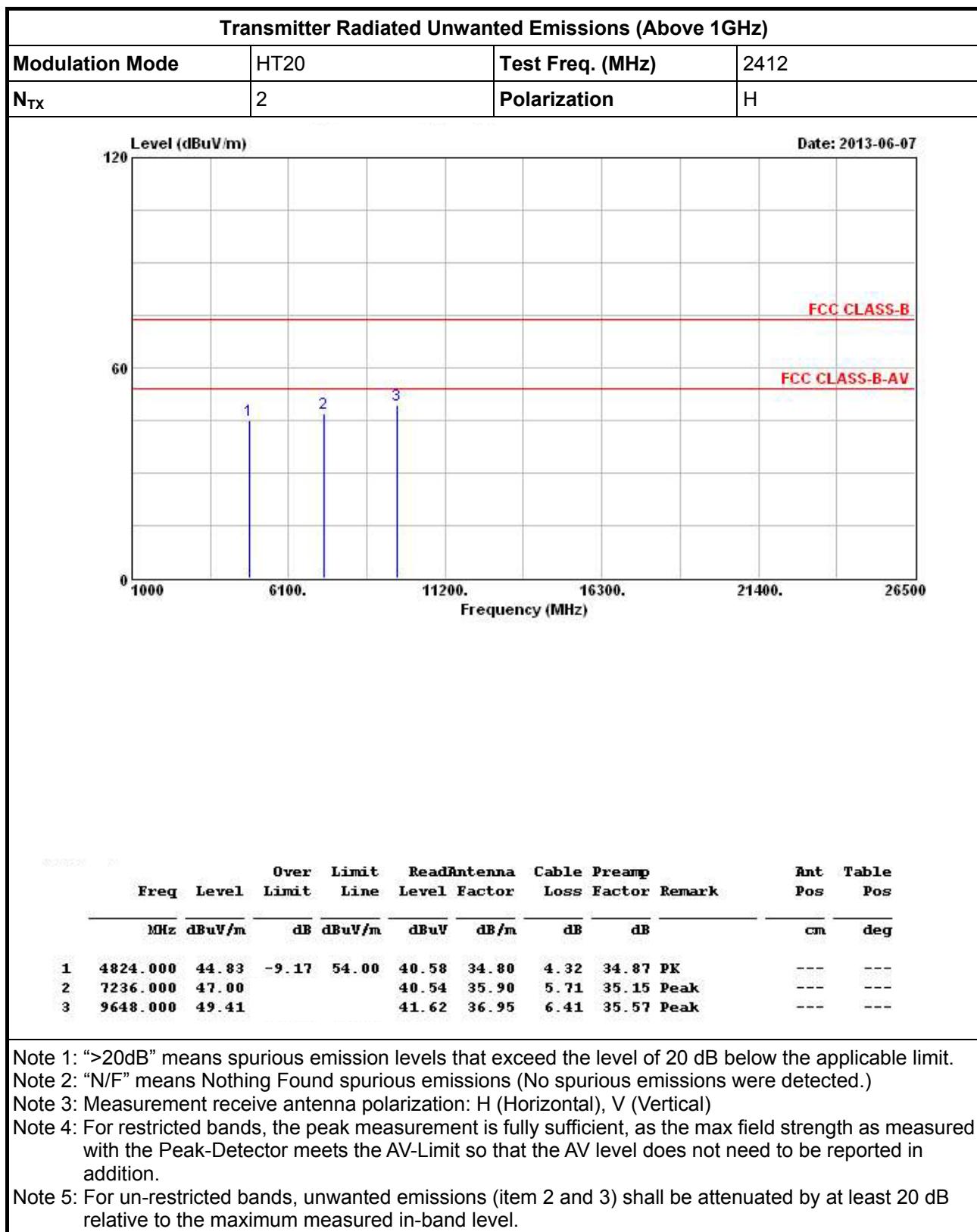


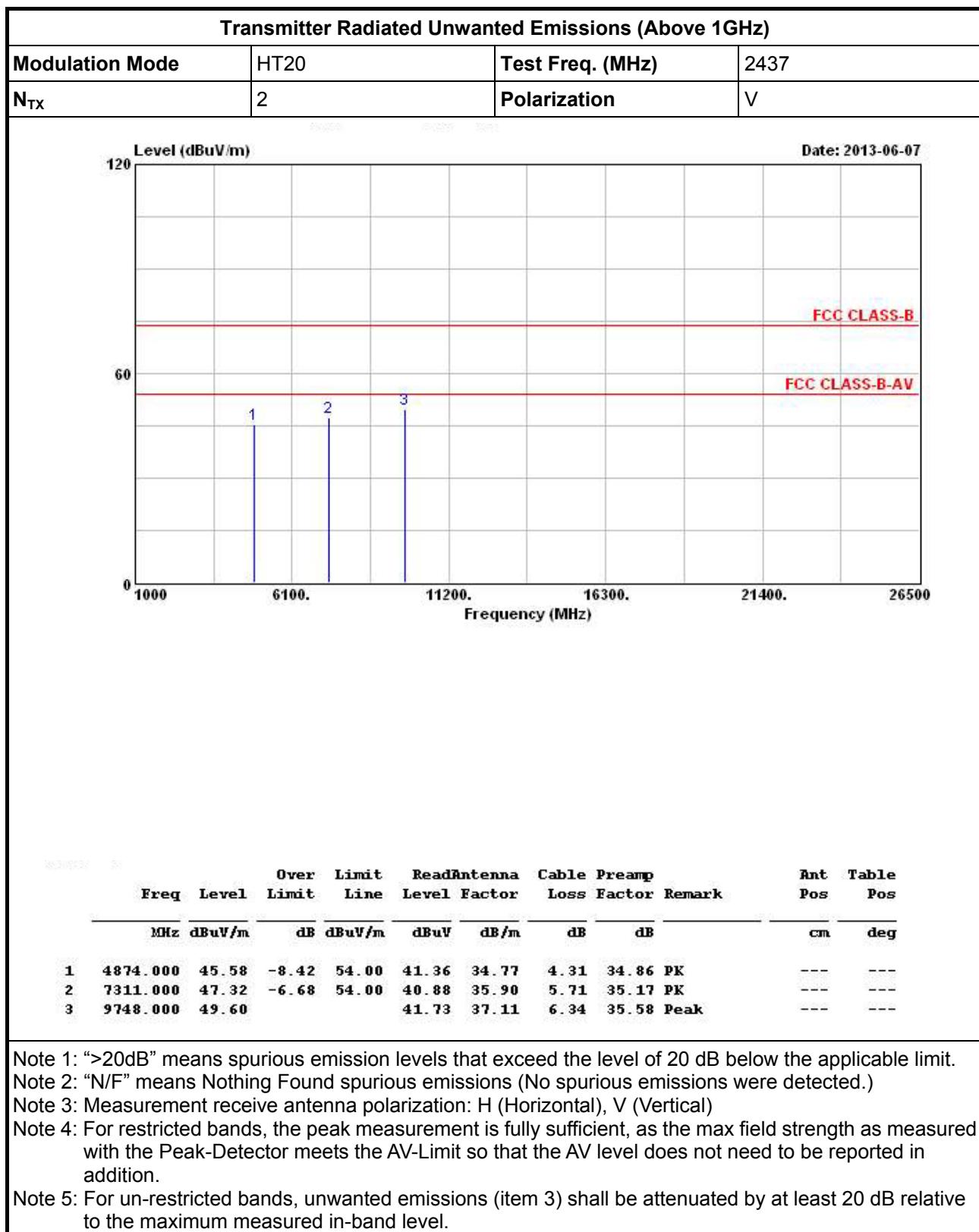


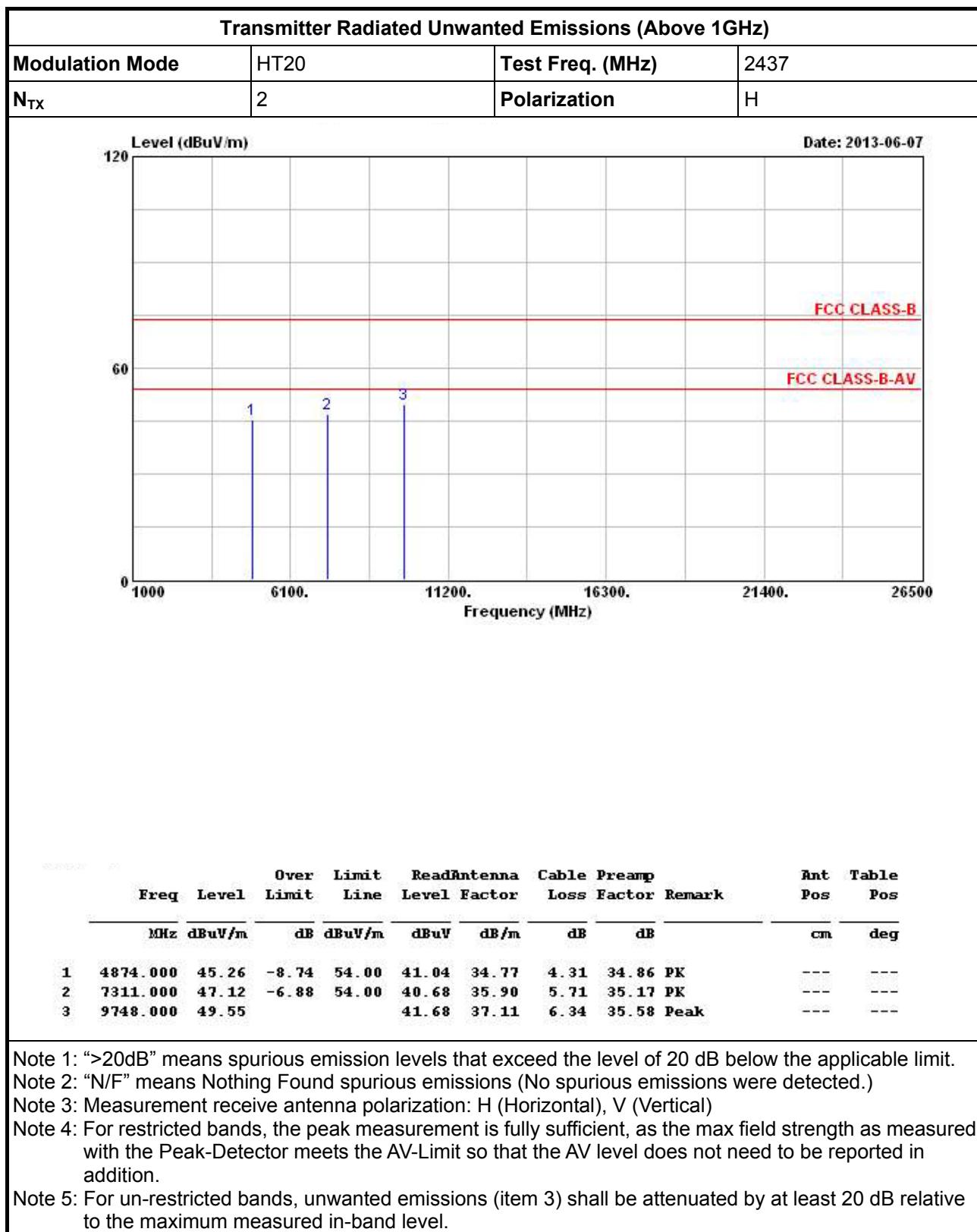








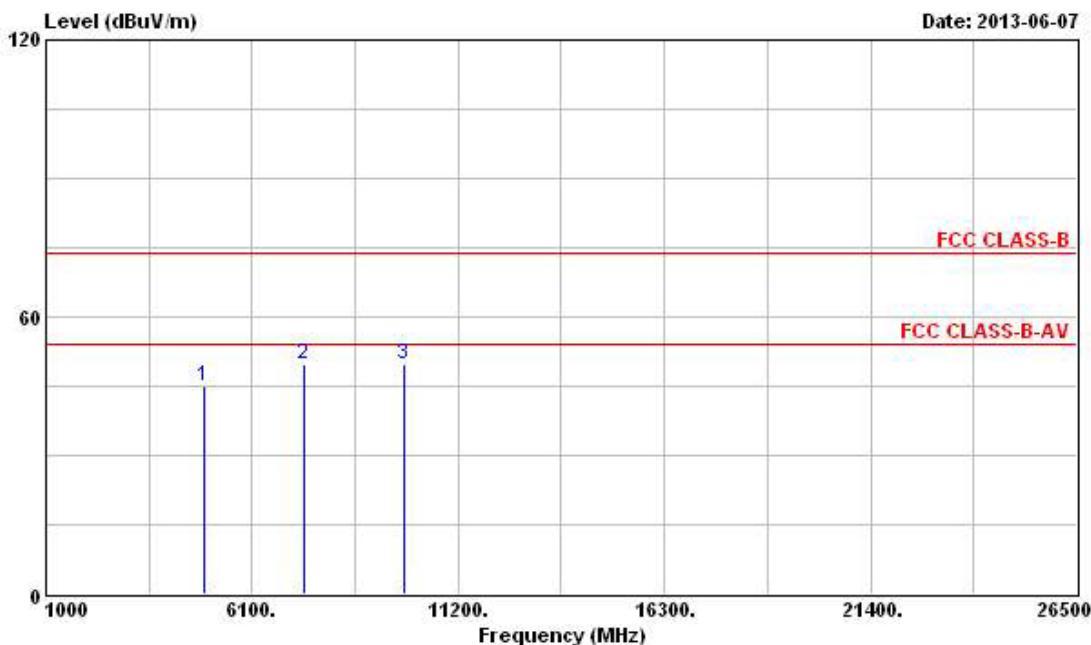






Transmitter Radiated Unwanted Emissions (Above 1GHz)

| | | | |
|-----------------|------|------------------|------|
| Modulation Mode | HT20 | Test Freq. (MHz) | 2462 |
| N _{TX} | 2 | Polarization | V |



| Freq | Level | Over Limit | Read Line | Antenna | | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos | |
|------|----------|------------|-----------|---------|--------|------------|---------------|--------|---------|-----------|-----|
| | | | | Limit | Line | | | | | | |
| MHz | dBuV/m | | | dB | dBuV/m | dBuV | dB/m | dB | dB | cm deg | |
| 1 | 4924.000 | 45.18 | -8.82 | 54.00 | 41.01 | 34.74 | 4.28 | 34.85 | PK | --- | --- |
| 2 | 7386.000 | 49.71 | -4.29 | 54.00 | 43.29 | 35.90 | 5.71 | 35.19 | PK | --- | --- |
| 3 | 9848.000 | 49.89 | | | 42.00 | 37.25 | 6.22 | 35.58 | Peak | --- | --- |

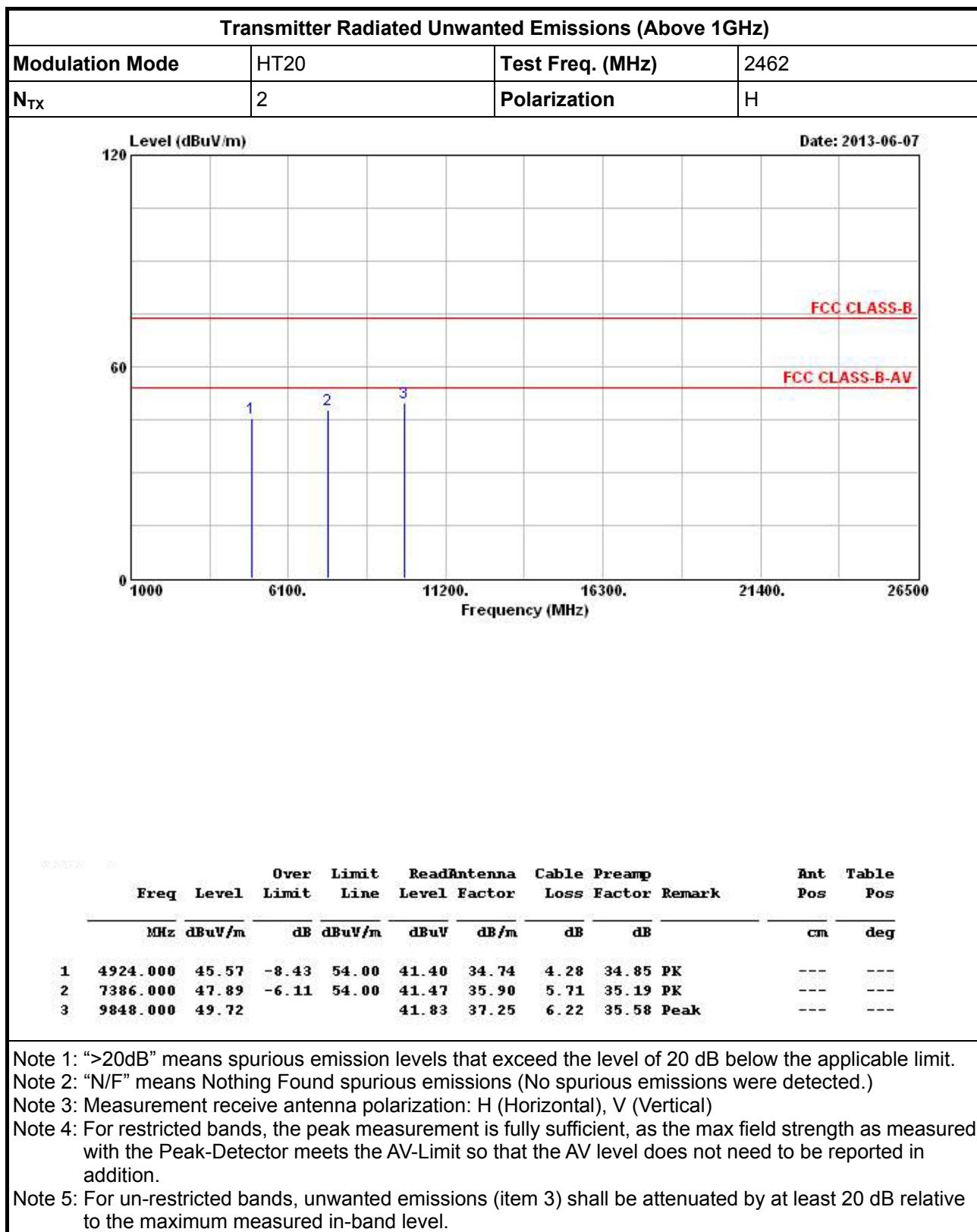
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

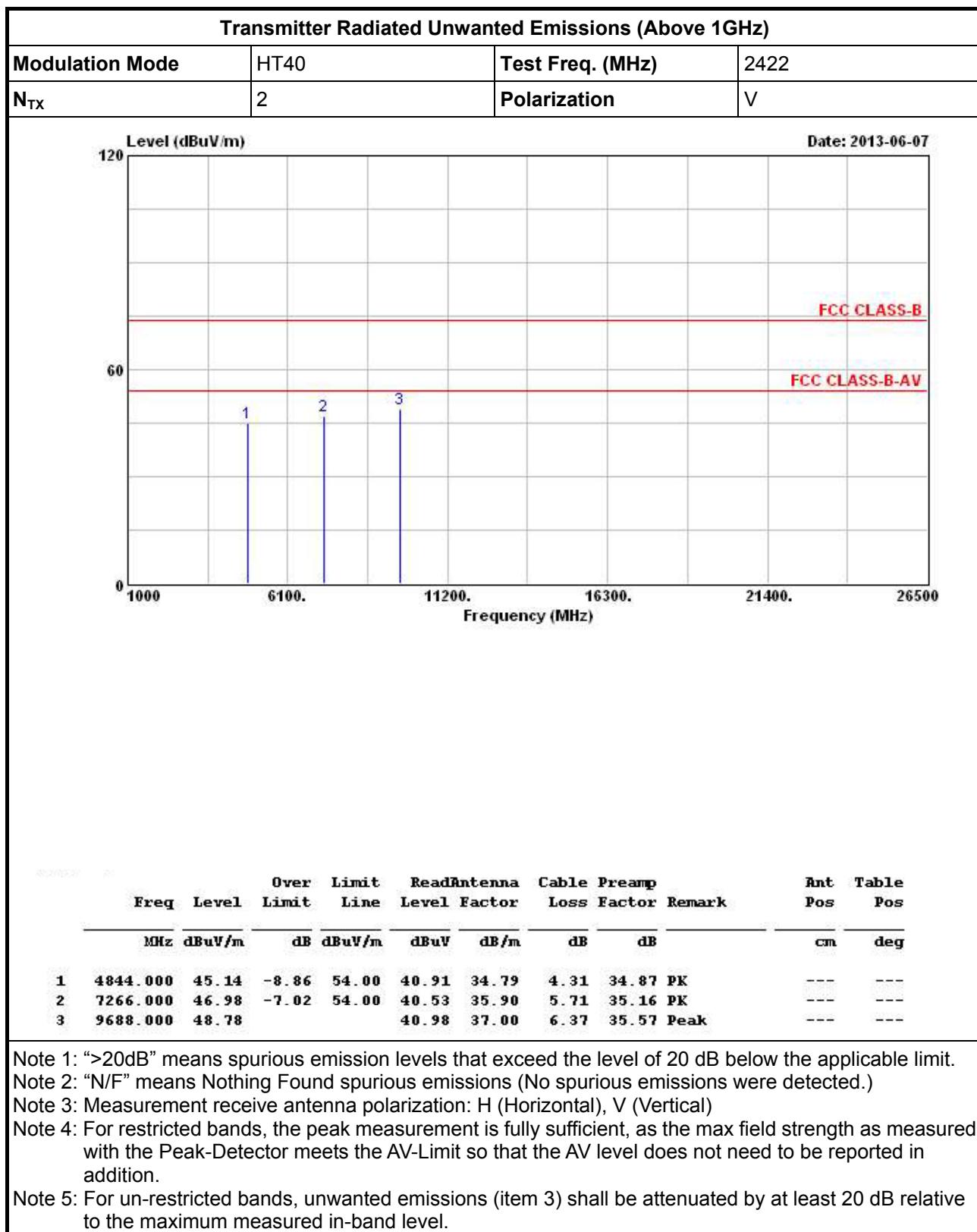
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

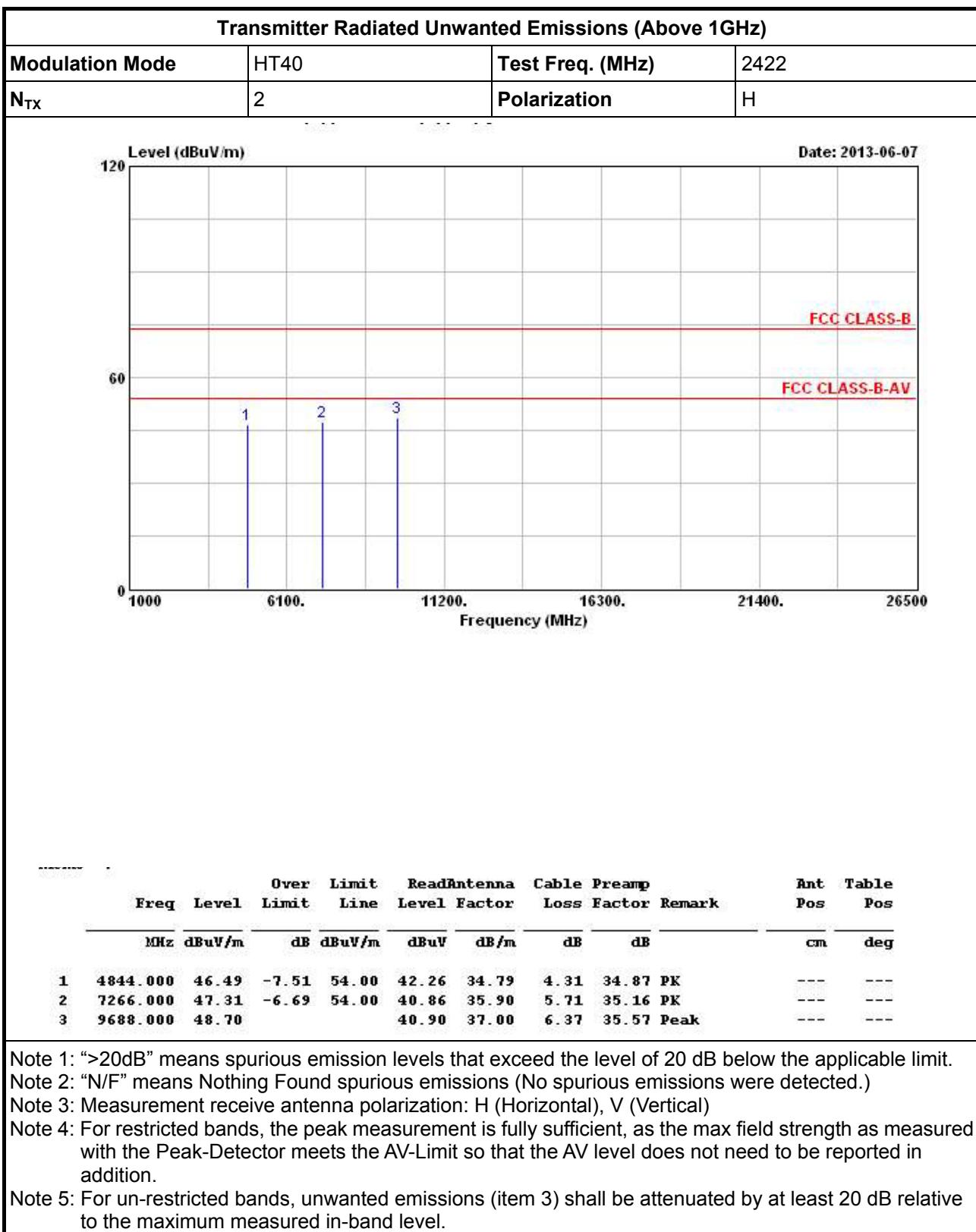
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

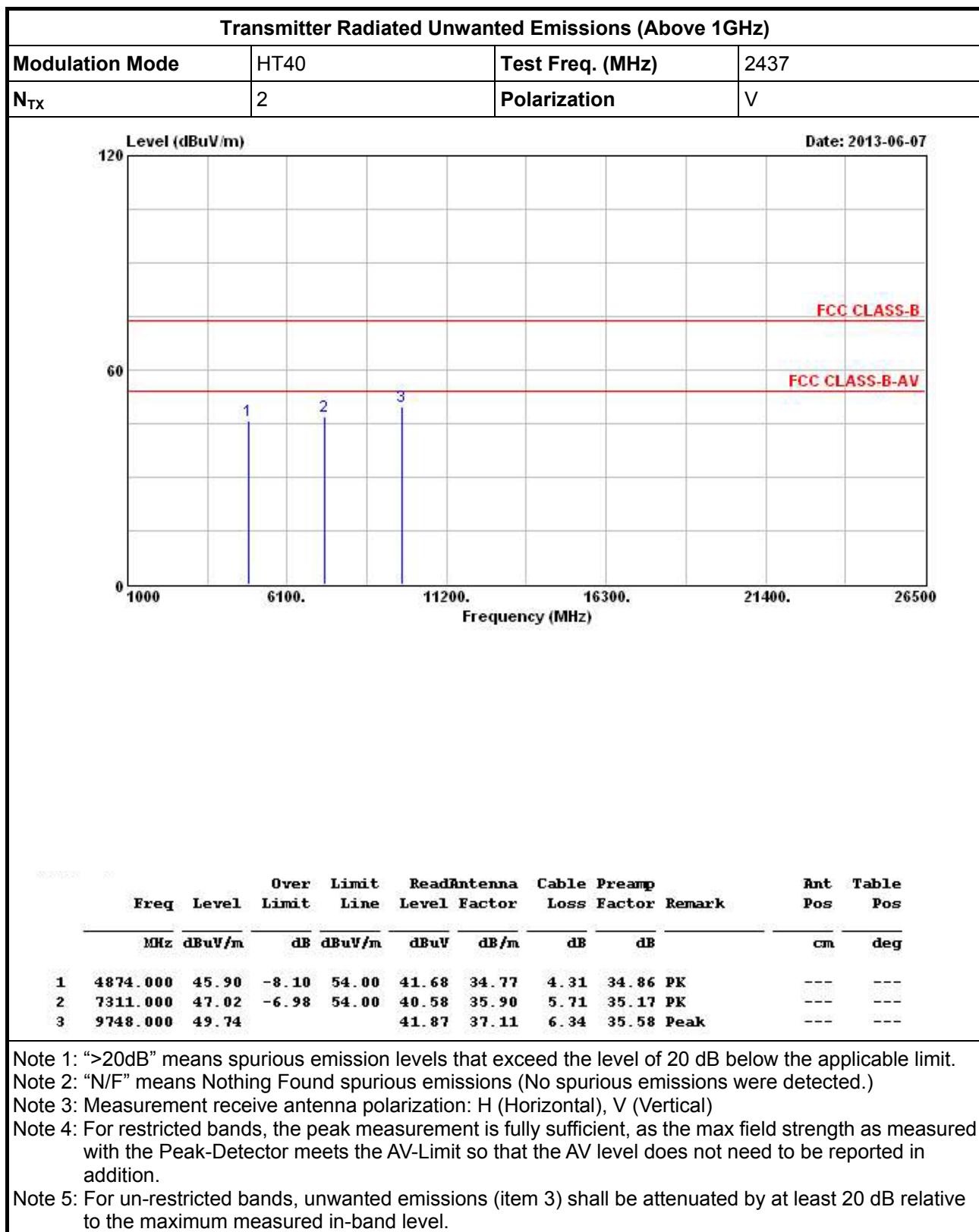
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

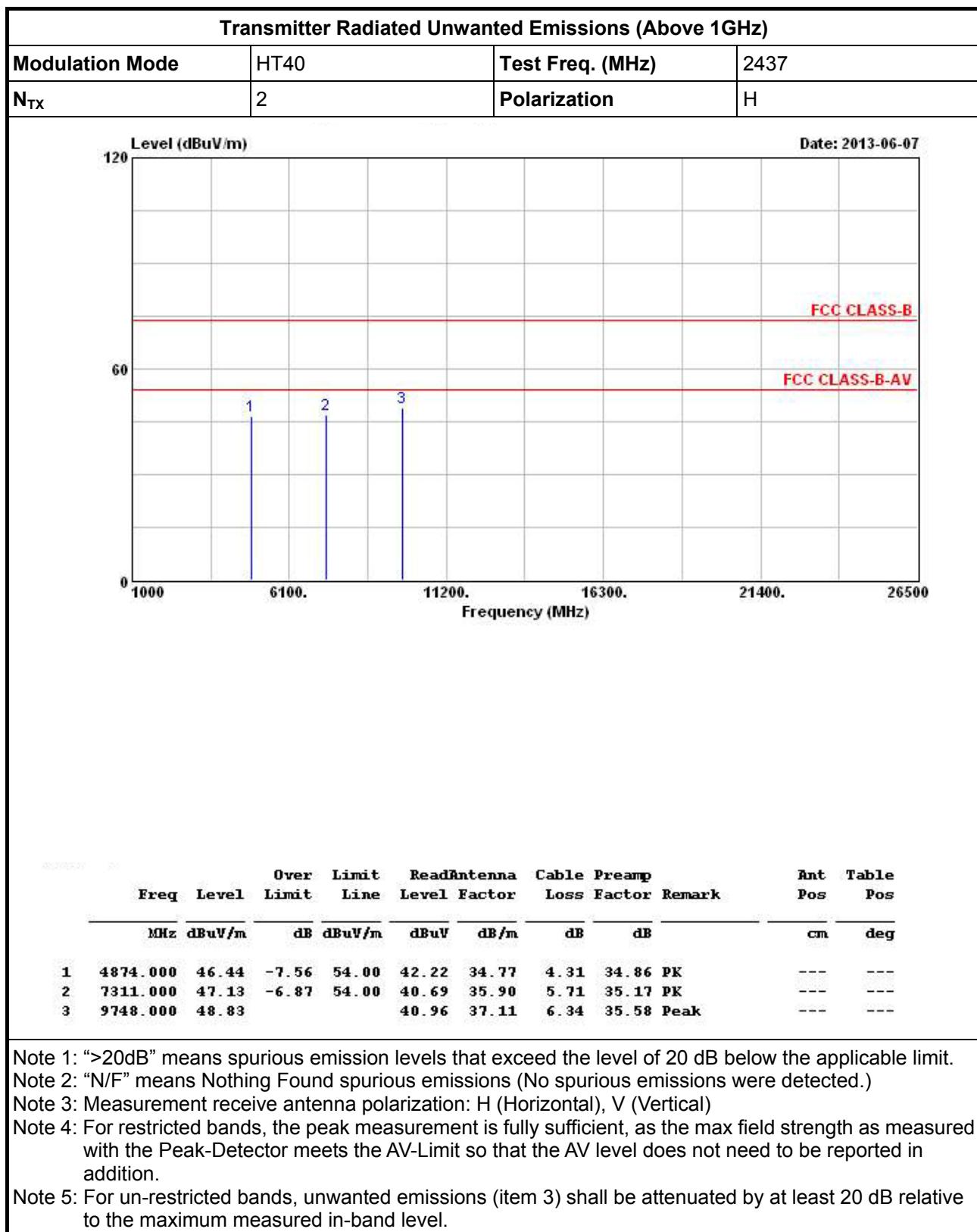
Note 5: For un-restricted bands, unwanted emissions (item 3) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

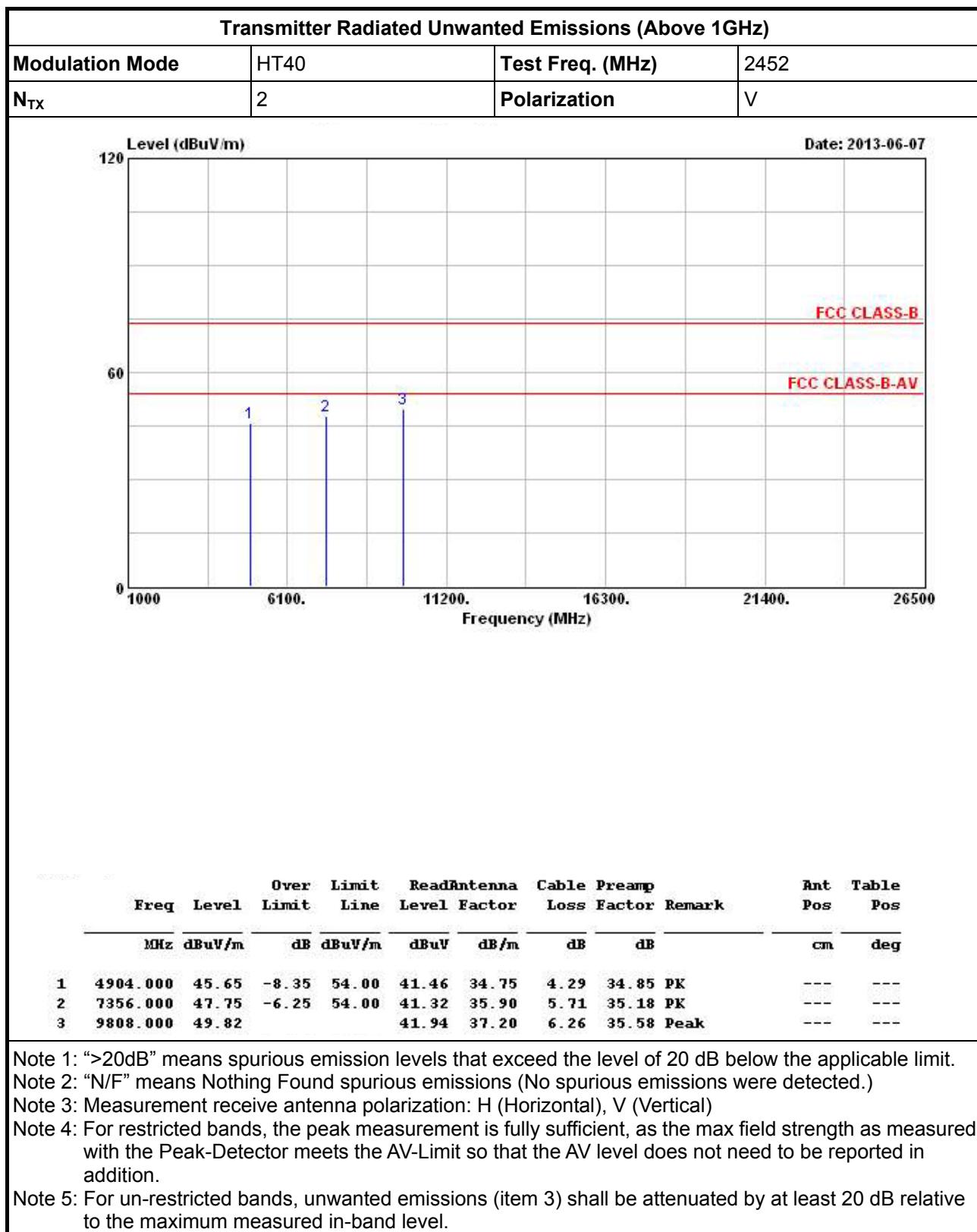


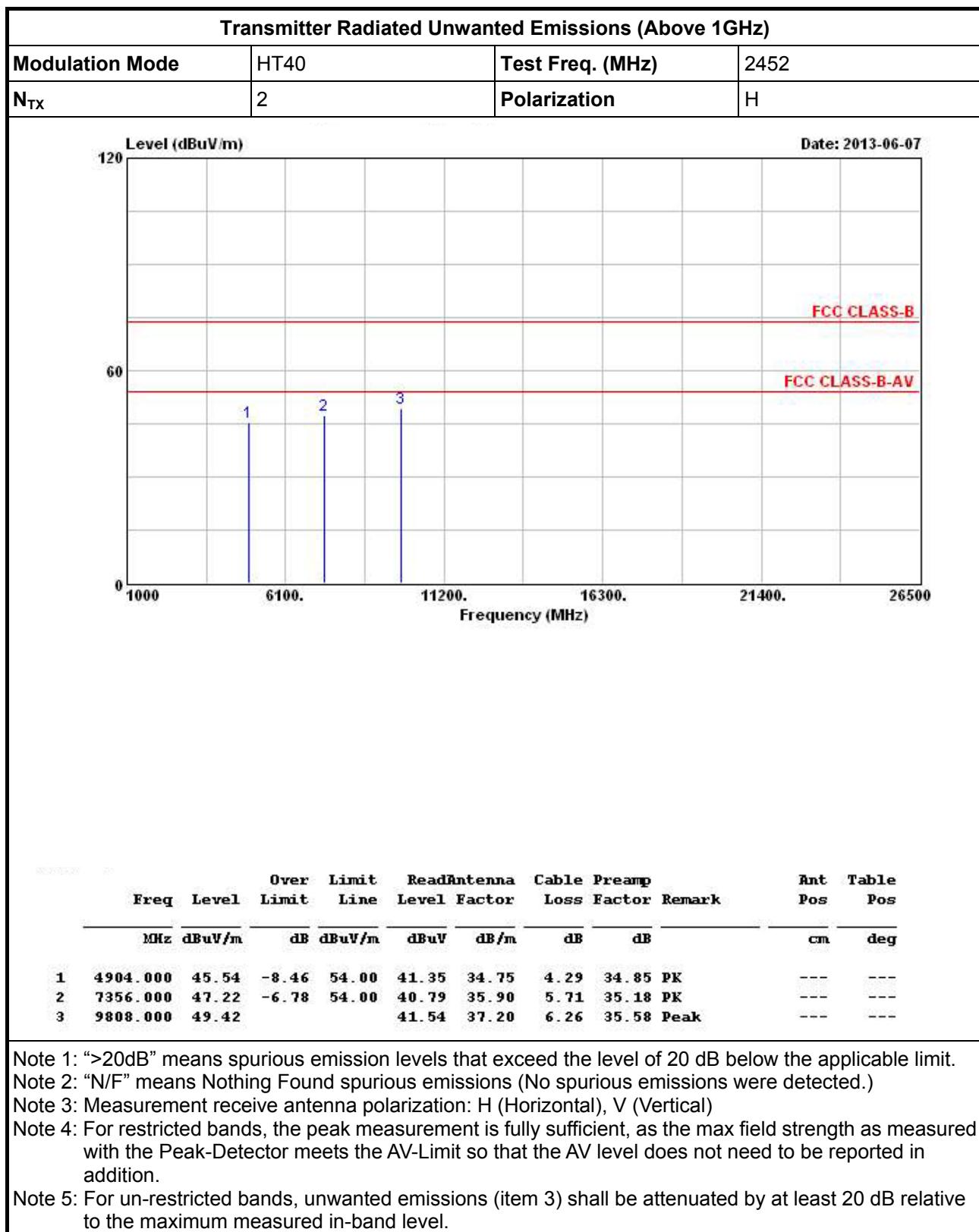


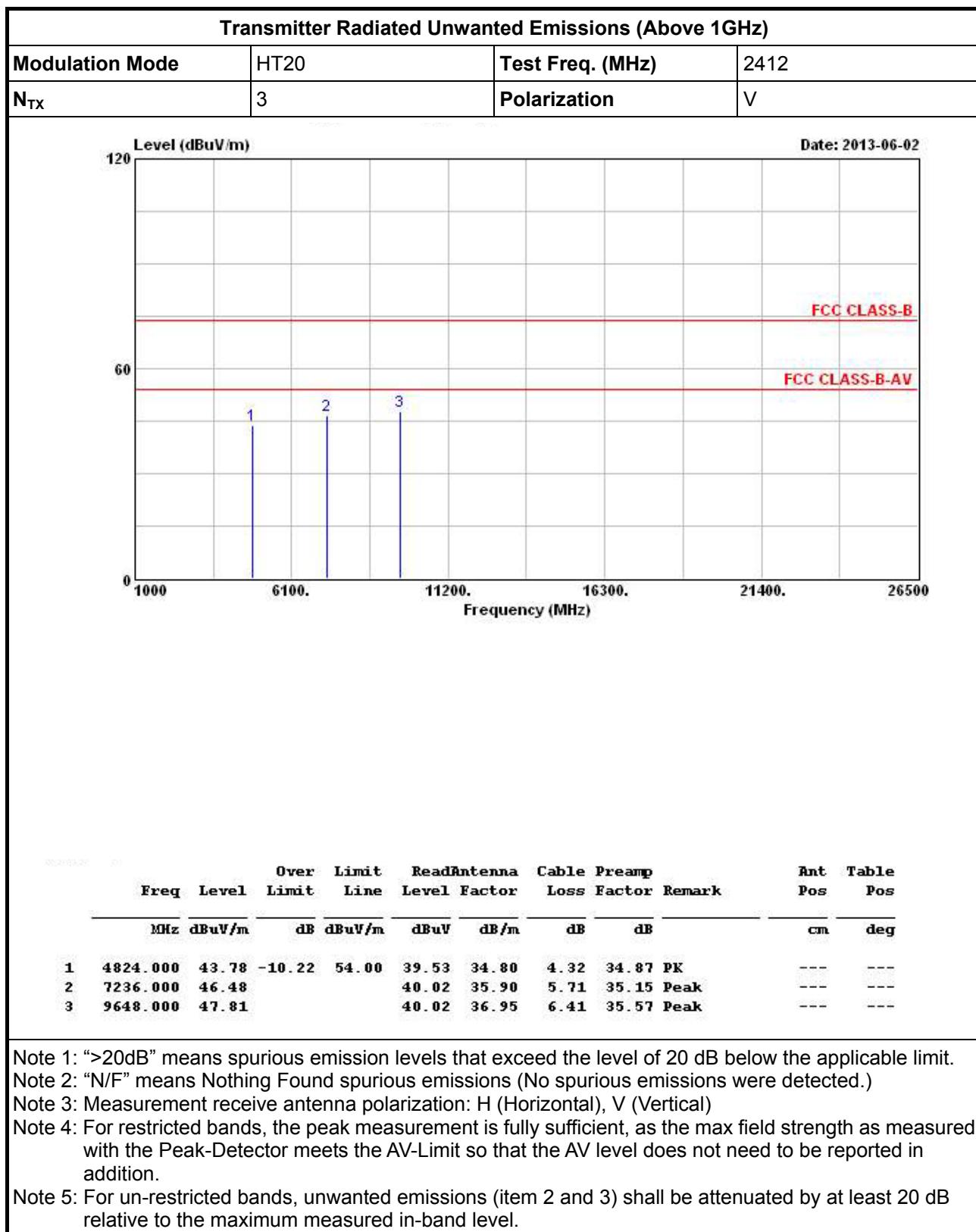


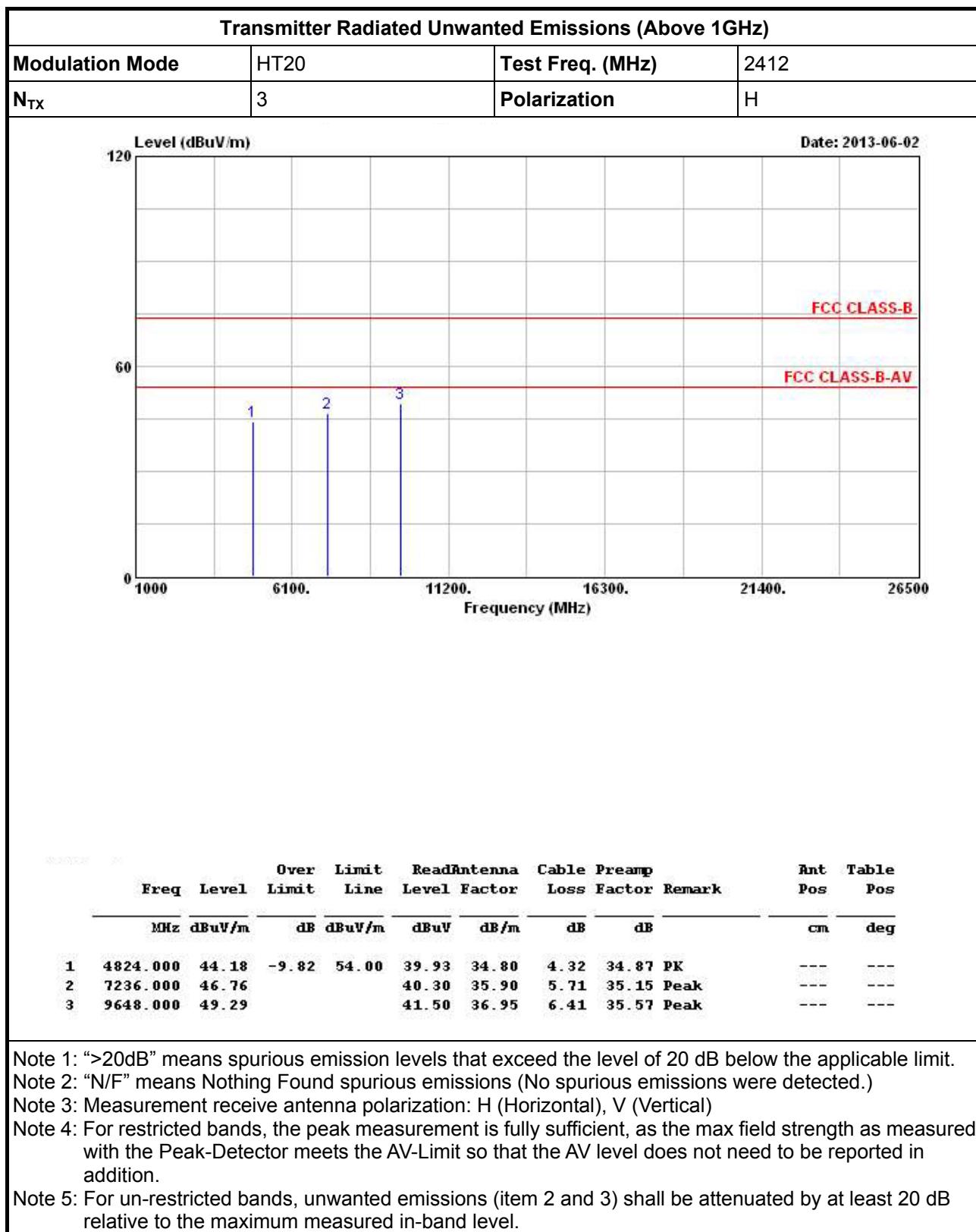


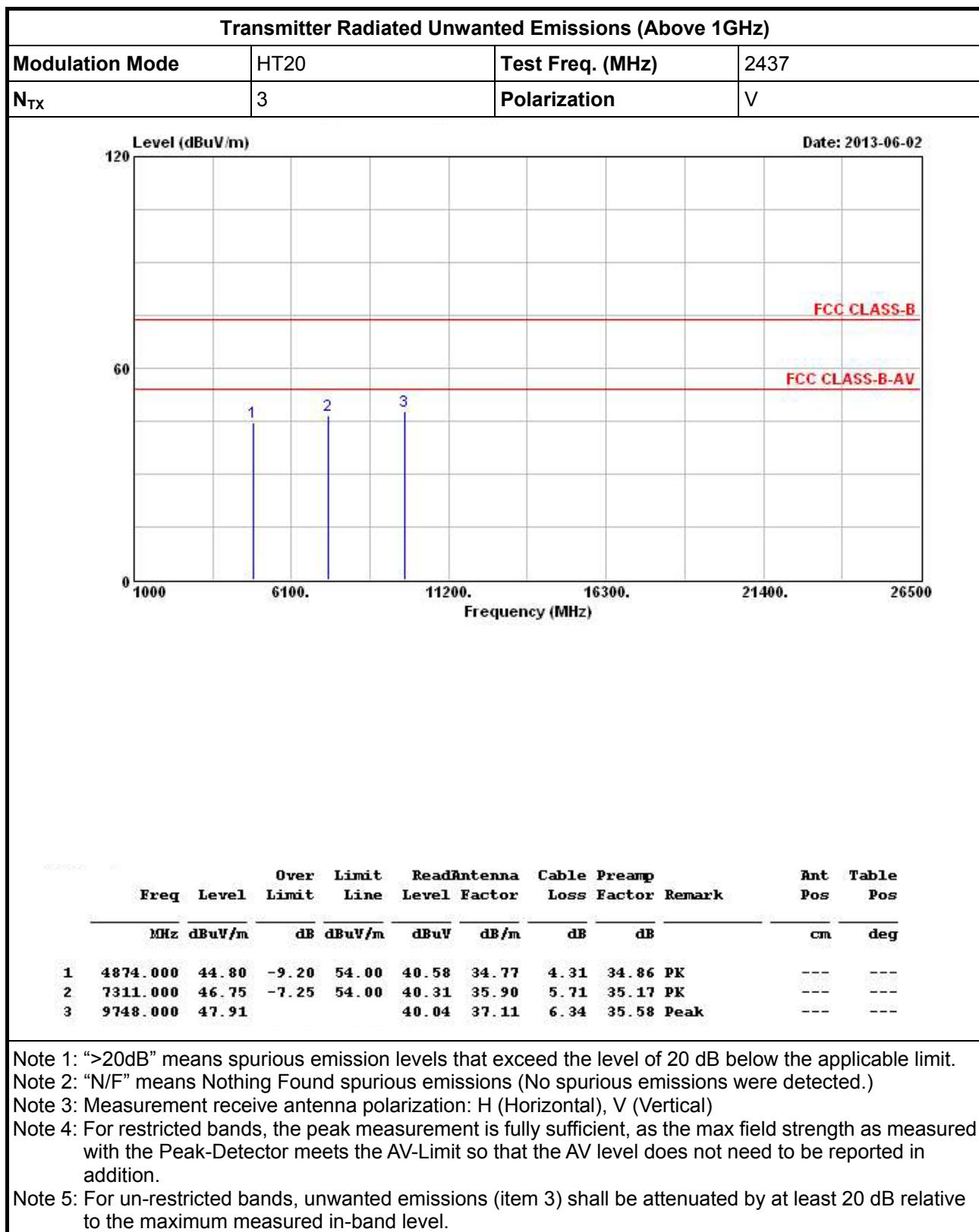


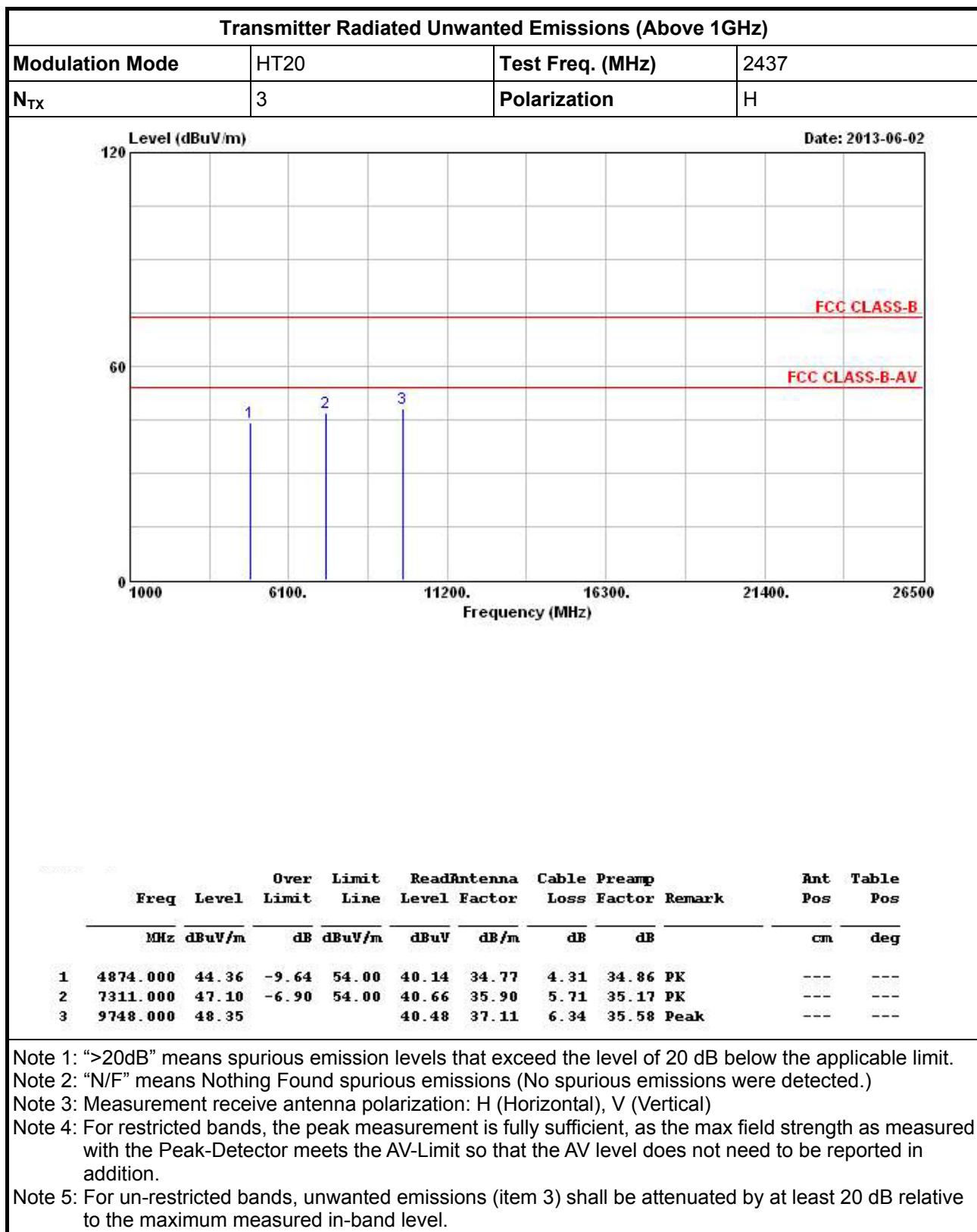


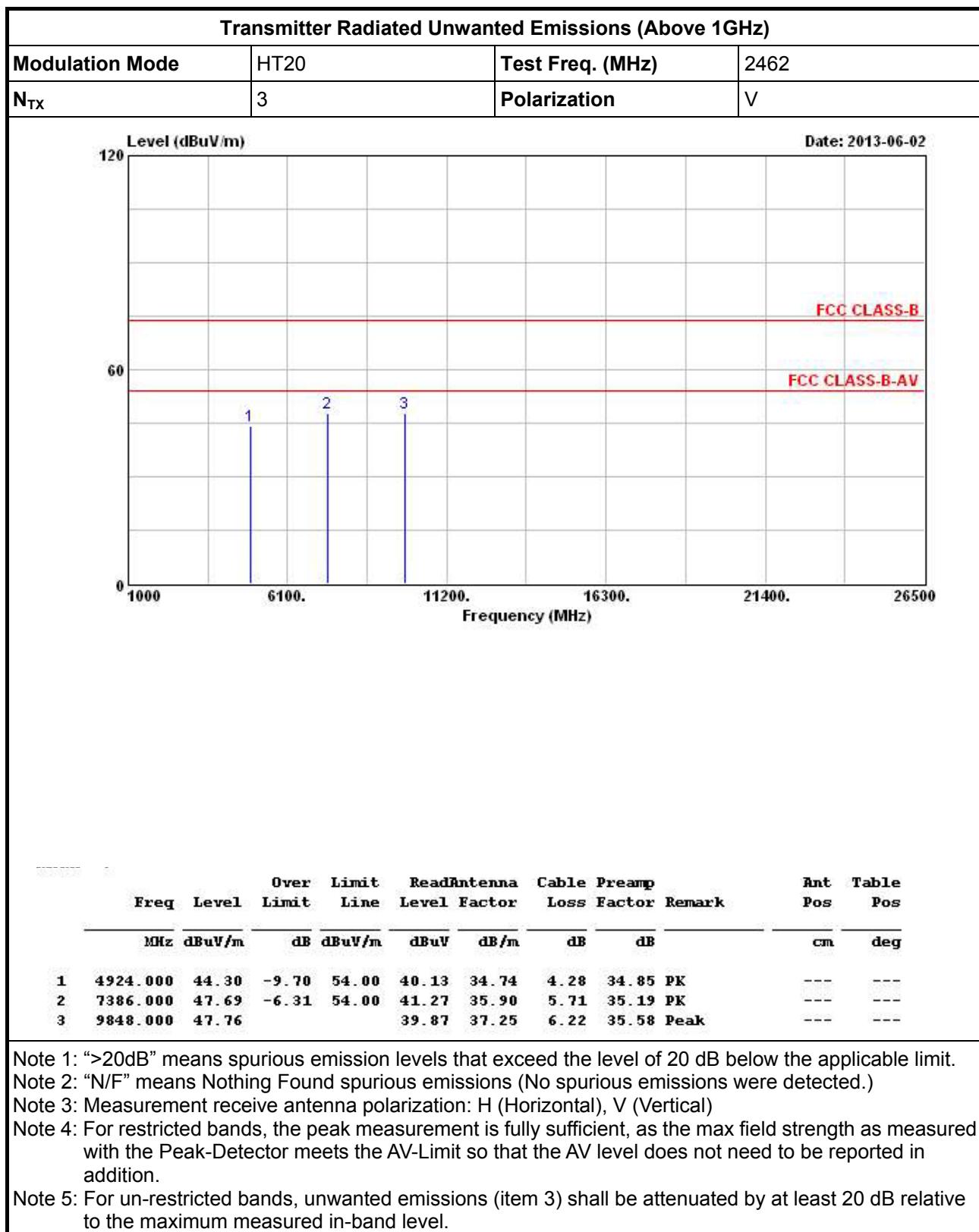


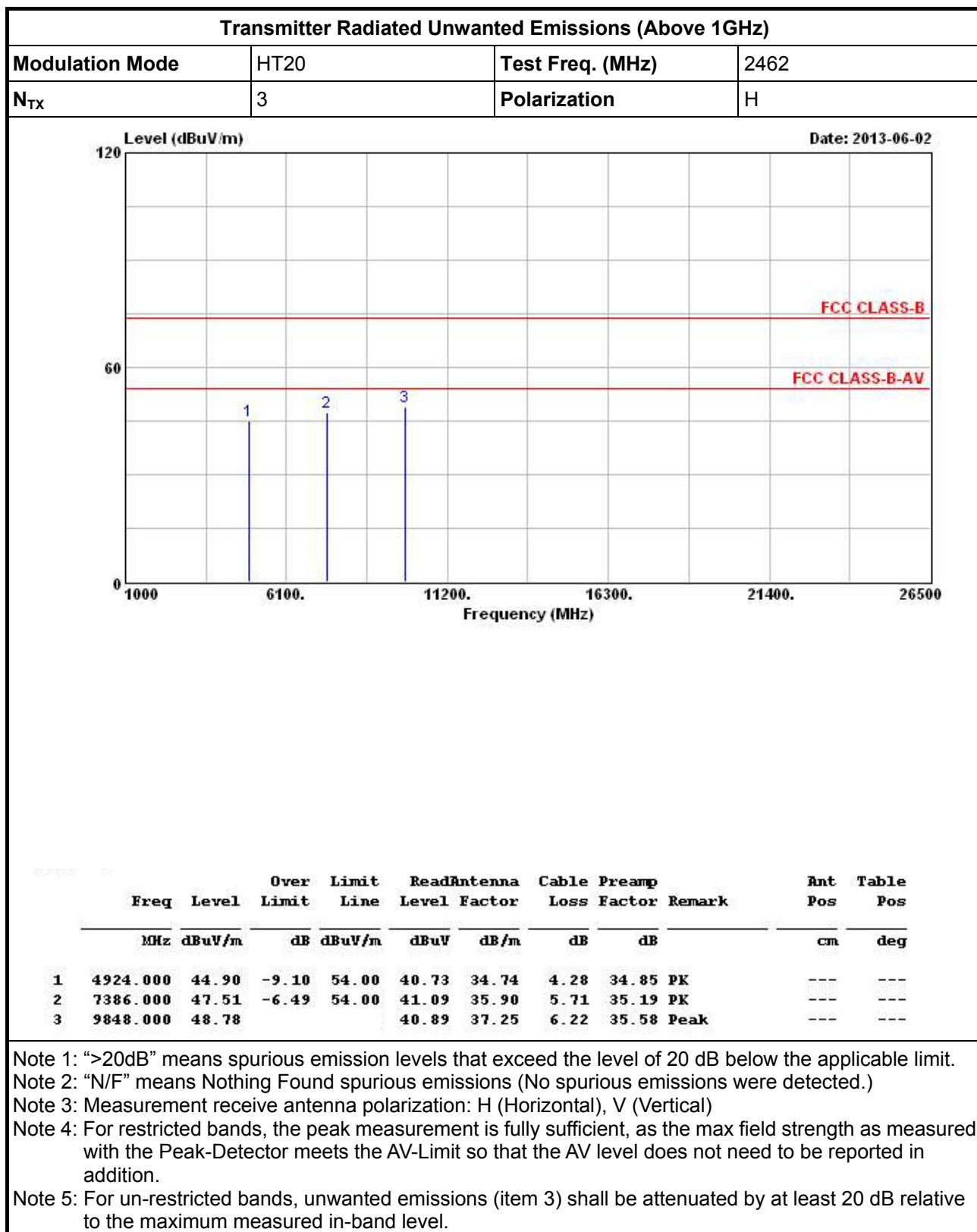








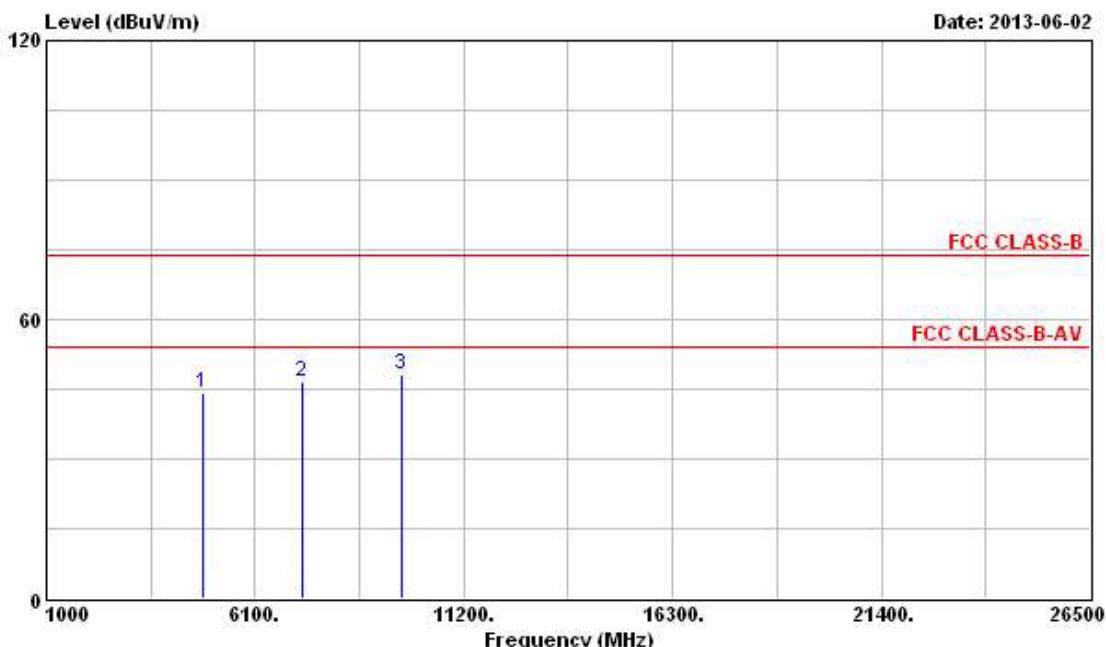






Transmitter Radiated Unwanted Emissions (Above 1GHz)

| | | | |
|-----------------|------|------------------|------|
| Modulation Mode | HT40 | Test Freq. (MHz) | 2422 |
| N _{TX} | 3 | Polarization | V |



| Freq | Level | Over Limit | Line | Read Antenna | | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos | |
|------|----------|------------|-------|--------------|--------|------------|---------------|--------|---------|-----------|-----|
| | | | | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB |
| 1 | 4844.000 | 44.07 | -9.93 | 54.00 | 39.84 | 34.79 | 4.31 | 34.87 | PK | --- | --- |
| 2 | 7266.000 | 46.55 | -7.45 | 54.00 | 40.10 | 35.90 | 5.71 | 35.16 | PK | --- | --- |
| 3 | 9688.000 | 47.98 | | | 40.18 | 37.00 | 6.37 | 35.57 | Peak | --- | --- |

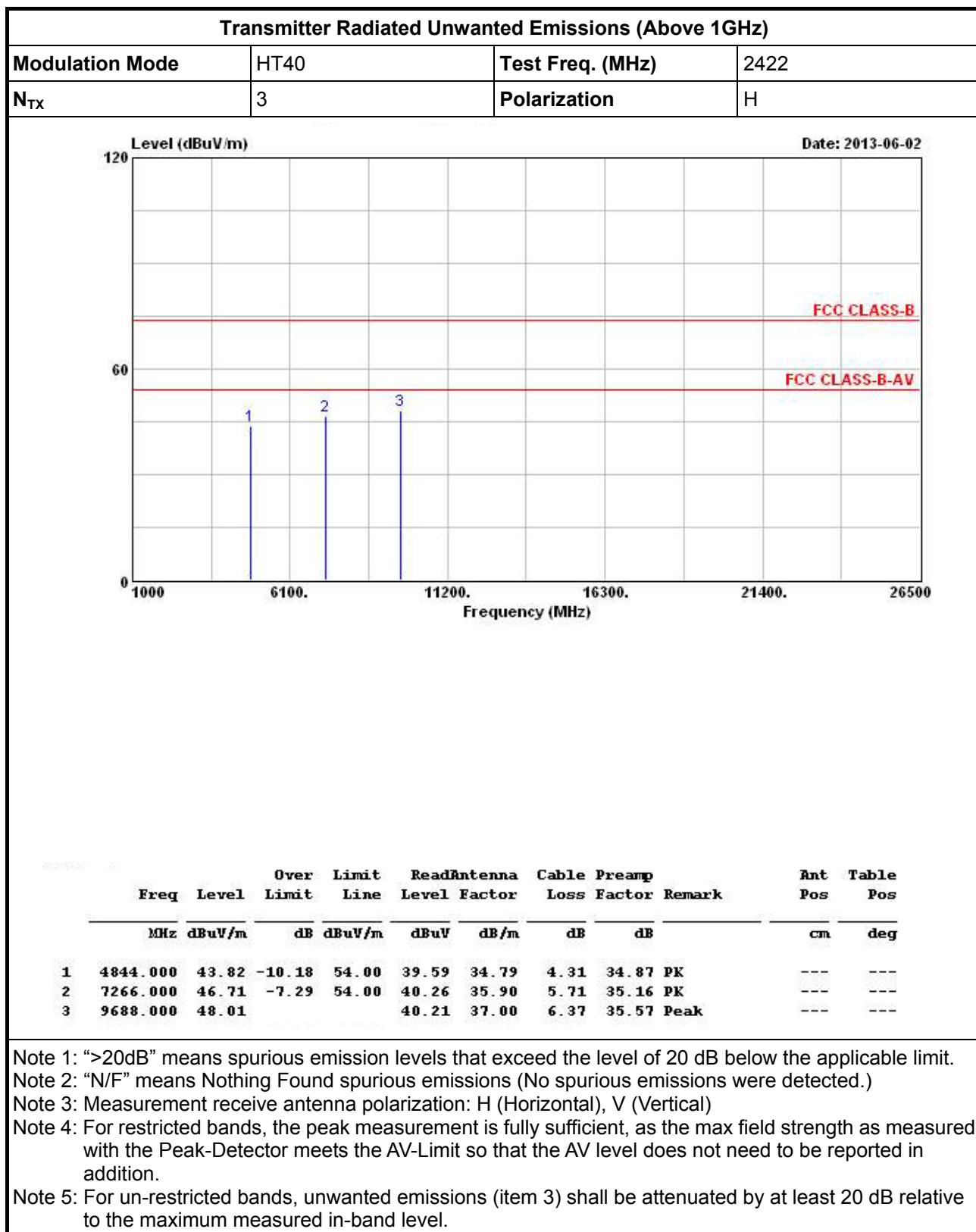
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

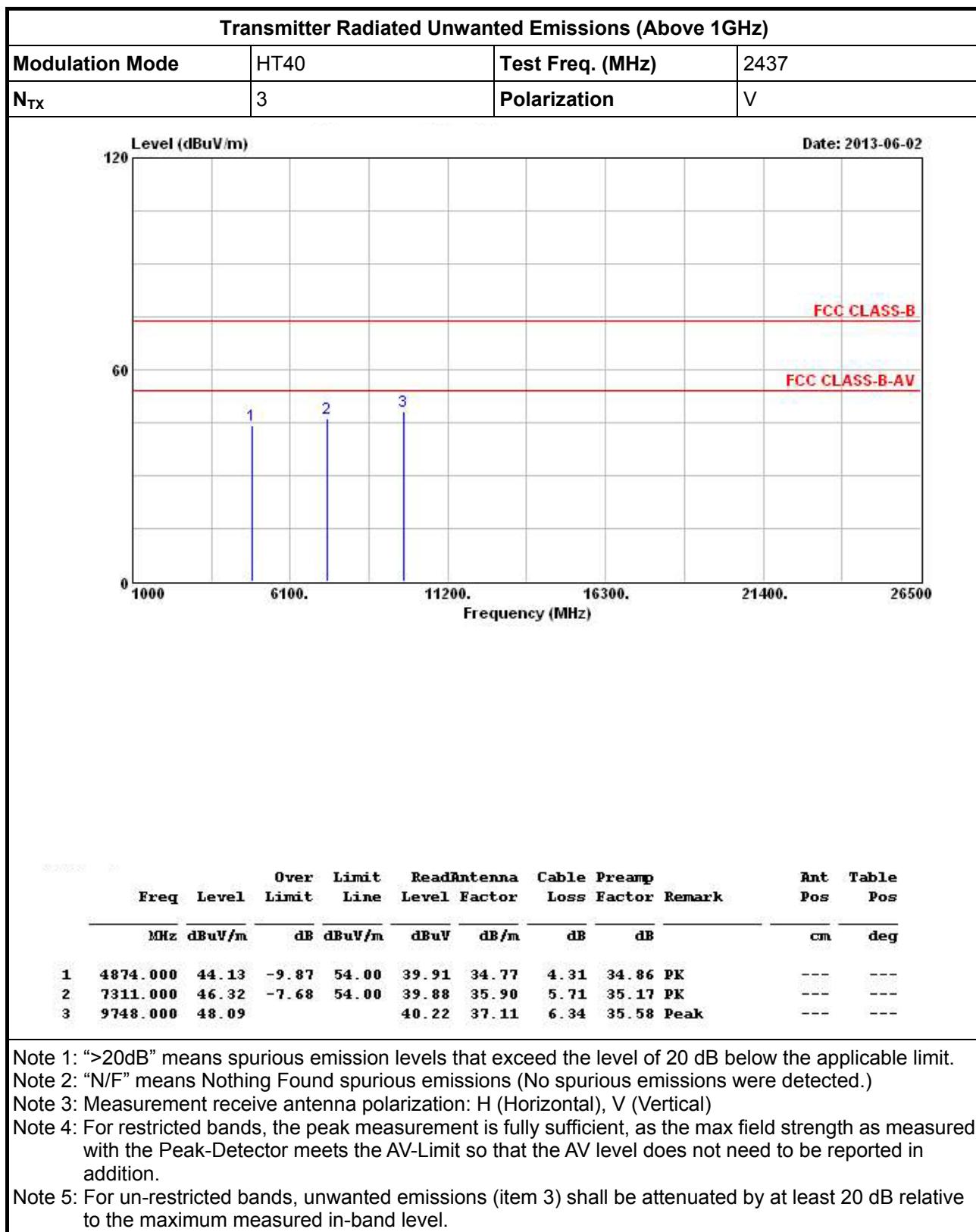
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

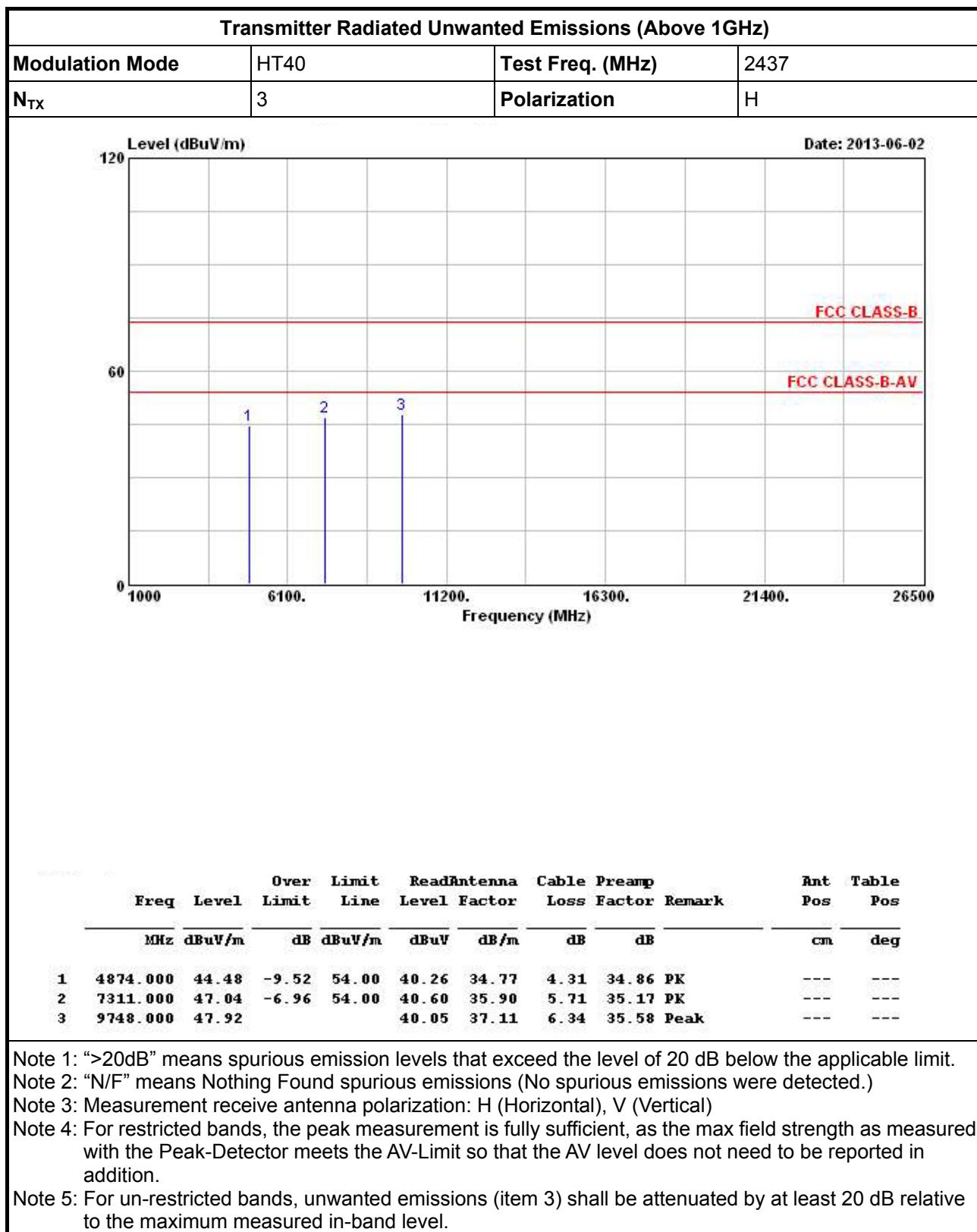
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

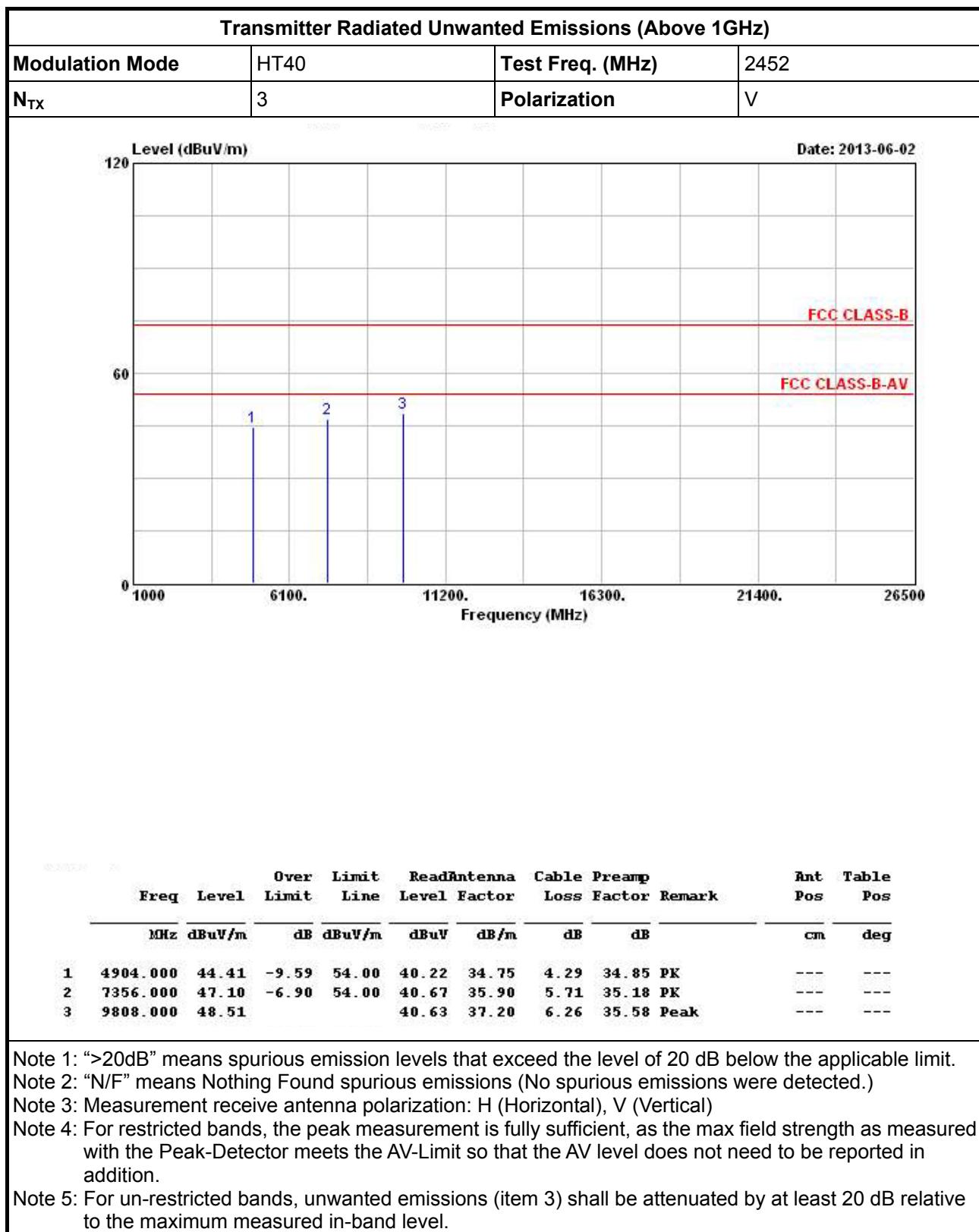
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

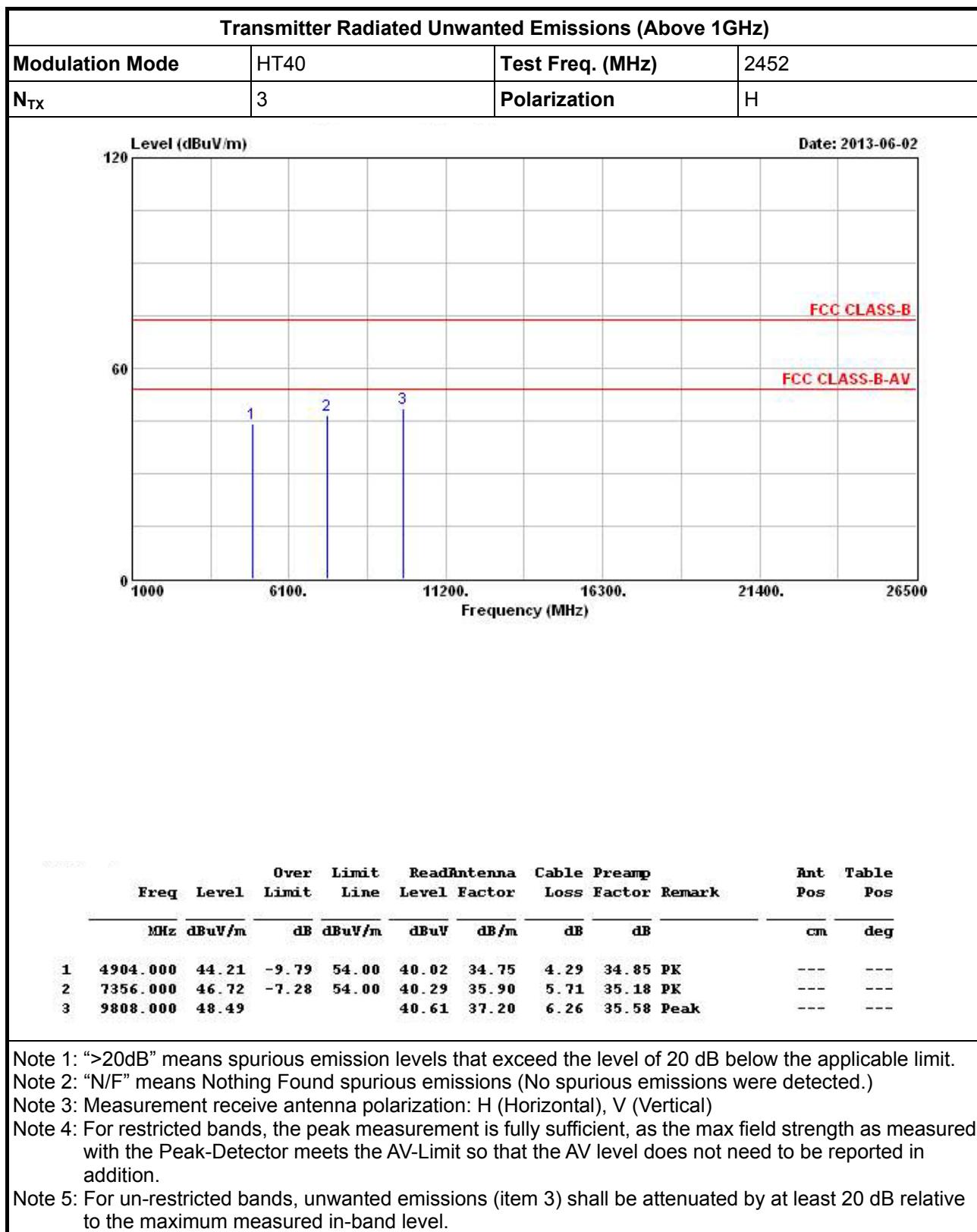
Note 5: For un-restricted bands, unwanted emissions (item 3) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.













4 Test Equipment and Calibration Data

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---------------------|-----------------------------|-----------|-----------------|-----------------|------------------|----------------------|
| EMC Receiver | R&S | ESCS 30 | 100174 | 9kHz ~ 2.75GHz | Mar. 26, 2013 | Conduction (CO04-HY) |
| LISN | SCHWARZBECK MESS-ELEKTRONIK | NSLK 8127 | 8127-477 | 9kHz ~ 30MHz | Jan. 21, 2013 | Conduction (CO04-HY) |
| LISN (Support Unit) | EMCO | 3810/2NM | 9703-1839 | 9kHz ~ 30MHz | Apr. 20, 2012 | Conduction (CO04-HY) |
| RF Cable-CON | HUBER+SUHNER | RG213/U | 7.61183201e+012 | 9kHz ~ 30MHz | Nov. 09, 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 | Mar. 20, 2013 | 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°C | Nov. 21, 2012 | Conducted (TH01-HY) |
| Signal Generator | R&S | SMR40 | 100116 | 10MHz ~ 40GHz | Jun. 26, 2012 | Conducted (TH01-HY) |
| Power Sensor | Anritsu | MA2411B | 0917017 | 300MHz ~ 40GHz | Feb. 02, 2013 | Conducted (TH01-HY) |
| Power Meter | Anritsu | ML2495A | 0949003 | 300MHz ~ 40GHz | Feb. 02, 2013 | Conducted (TH01-HY) |
| RF Cable-2m | HUBER+SUHNER | SUCOFLEX_104 | SN 345675/4 | 1GHz ~ 26.5GHz | NA | Conducted (TH01-HY) |
| RF Cable-3m | HUBER+SUHNER | SUCOFLEX_104 | SN 345669/4 | 1GHz ~ 26.5GHz | NA | Conducted (TH01-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 | FSP40 | 100593 | 9kHz ~ 40GHz | Sep. 14, 2012 | Radiation (03CH02-HY) |
| 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH02-HY | 30MHz ~ 1GHz 3m | May 10, 2012 | Radiation (03CH02-HY) |
| Amplifier | Agilent | 8447D | 2944A11146 | 100kHz ~ 1.3GHz | Jul. 23, 2012 | Radiation (03CH02-HY) |
| Amplifier | Agilent | 8449B | 3008A02373 | 1GHz ~ 26.5GHz | Aug. 10, 2012 | Radiation (03CH02-HY) |
| Horn Antenna | ETS-LINDGREN | 3117 | 00091920 | 1GHz ~ 18GHz | Nov. 16, 2012 | Radiation (03CH02-HY) |
| Horn Antenna | SCHWARZBECK | BBHA9170 | BBHA9170154 | 15GHz ~ 40GHz | Jan. 08, 2013 | Radiation (03CH02-HY) |
| RF Cable-R03m | Jye Bao | RG142 | CB021 | 9kHz ~ 1GHz | Nov. 10, 2012 | Radiation (03CH02-HY) |
| RF Cable-high | SUHNER | SUCOFLEX106 | 03CH02-HY | 1GHz ~ 40GHz | Mar. 05, 2013 | Radiation (03CH02-HY) |
| Bilog Antenna | SCHAFFNER | CBL61128 | 2723 | 30MHz ~ 2GHz | Oct. 22, 2012 | Radiation (03CH02-HY) |
| Turn Table | HD | DS 420 | 420/649/00 | 0~ 360 degree | N/A | Radiation (03CH02-HY) |
| Antenna Mast | HD | MA 240 | 240/559/00 | 1 ~ 4 m | N/A | Radiation (03CH02-HY) |

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

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|--------------|--------------|-----------|------------|-----------------|------------------|-----------------------|
| Loop Antenna | TESEQ | HLA 6120 | 31244 | 9 kHz - 30 MHz | Dec. 02, 2012 | Radiation (03CH02-HY) |

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