# FCC Test Report

**Report No.:** RF160706E06

**FCC ID:** ZMYDSL2401HNAT1CC

**Test Model:** DSL-2401HNA-T1CC

**Received Date:** July 06, 2016

**Test Date:** July 20 to 28, 2016

**Issued Date:** Sep. 20, 2016

**Applicant:** MitraStar Technology Corporation

**Address:** No. 6, Innovation Rd II, Hsinchu Science Park, Hsinchu 30076, Taiwan

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory

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Testing Laboratory
2022

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## Table of Contents


**Release Control Record** ..... **4**

**1 Certificate of Conformity** ..... **5**

**2 Summary of Test Results** ..... **6**

2.1 Measurement Uncertainty ..... 6
2.2 Modification Record ..... 6

**3 General Information** ..... **7**

3.1 General Description of EUT ..... 7
3.2 Description of Test Modes ..... 10
3.2.1 Test Mode Applicability and Tested Channel Detail ..... 11
3.3 Duty Cycle of Test Signal ..... 13
3.4 Description of Support Units ..... 14
3.4.1 Configuration of System under Test ..... 15
3.5 General Description of Applied Standards ..... 16

**4 Test Types and Results** ..... **17**

4.1 Radiated Emission and Bandedge Measurement ..... 17
4.1.1 Limits of Radiated Emission and Bandedge Measurement ..... 17
4.1.2 Test Instruments ..... 18
4.1.3 Test Procedures ..... 19
4.1.4 Deviation from Test Standard ..... 19
4.1.5 Test Setup ..... 20
4.1.6 EUT Operating Conditions ..... 20
4.1.7 Test Results ..... 21
4.2 Conducted Emission Measurement ..... 34
4.2.1 Limits of Conducted Emission Measurement ..... 34
4.2.2 Test Instruments ..... 34
4.2.3 Test Procedures ..... 35
4.2.4 Deviation from Test Standard ..... 35
4.2.5 Test Setup ..... 35
4.2.6 EUT Operating Conditions ..... 35
4.2.7 Test Results ..... 36
4.3 6dB Bandwidth Measurement ..... 38
4.3.1 Limits of 6dB Bandwidth Measurement ..... 38
4.3.2 Test Setup ..... 38
4.3.3 Test Instruments ..... 38
4.3.4 Test Procedure ..... 38
4.3.5 Deviation fromTest Standard ..... 38
4.3.6 EUT Operating Conditions ..... 38
4.3.7 Test Result ..... 39
4.4 Conducted Output Power Measurement ..... 41
4.4.1 Limits of Conducted Output Power Measurement ..... 41
4.4.2 Test Setup ..... 41
4.4.3 Test Instruments ..... 41
4.4.4 Test Procedures ..... 41
4.4.5 Deviation from Test Standard ..... 41
4.4.6 EUT Operating Conditions ..... 41
4.4.7 Test Results ..... 42
4.5 Power Spectral Density Measurement ..... 44
4.5.1 Limits of Power Spectral Density Measurement ..... 44
4.5.2 Test Setup ..... 44
4.5.3 Test Instruments ..... 44
4.5.4 Test Procedure ..... 44
4.5.5 Deviation from Test Standard ..... 44
4.5.6 EUT Operating Condition ..... 44

4.5.7 Test Results ..... 45
4.6 Conducted Out of Band Emission Measurement ..... 48
4.6.1 Limits of Conducted Out of Band Emission Measurement ..... 48
4.6.2 Test Setup ..... 48
4.6.3 Test Instruments ..... 48
4.6.4 Test Procedure ..... 48
4.6.5 Deviation from Test Standard ..... 48
4.6.6 EUT Operating Condition ..... 48
4.6.7 Test Results ..... 48

**5 Pictures of Test Arrangements ..... 57**

**Appendix – Information on the Testing Laboratories ..... 58**

## Release Control Record

| Issue No. | Description | Date Issued |
|---|---|---|
| RF160706E06 | Original release. | Sep. 20, 2016 |

## 1 Certificate of Conformity

**Product:** VDSL IAD

**Brand:** MitraStar

**Test Model:** DSL-2401HNA-T1CC

**Sample Status:** ENGINEERING SAMPLE

**Applicant:** MitraStar Technology Corporation

**Test Date:** July 20 to 28, 2016

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :** _____ , **Date:** Sep. 20, 2016
Wendy Wu / Specialist

**Approved by :** _____ , **Date:** Sep. 20, 2016
May Chen / Manager

## 2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart C (SECTION 15.247) | | | |
|---|---|---|---|
| FCC Clause | Test Item | Result | Remarks |
| 15.207 | AC Power Conducted Emission | PASS | Meet the requirement of limit. Minimum passing margin is -10.56dB at 24.00000MHz. |
| 15.205 / 15.209 / 15.247(d) | Radiated Emissions and Band Edge Measurement | PASS | Meet the requirement of limit. Minimum passing margin is -0.1dB at 4924.00MHz, 2390.00MHz, 2483.50MHz. |
| 15.247(d) | Antenna Port Emission | PASS | Meet the requirement of limit. |
| 15.247(a)(2) | 6dB bandwidth | PASS | Meet the requirement of limit. |
| 15.247(b) | Conducted power | PASS | Meet the requirement of limit. |
| 15.247(e) | Power Spectral Density | PASS | Meet the requirement of limit. |
| 15.203 | Antenna Requirement | PASS | No antenna connector is used. |

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| Measurement | Frequency | Expanded Uncertainty (k=2) (±) |
|---|---|---|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz | 1.83 dB |
| Radiated Emissions up to 1 GHz | 30MHz ~ 1GHz | 5.13 dB |
| | 1GHz ~ 6GHz | 3.40 dB |
| Radiated Emissions above 1 GHz | 6GHz ~ 18GHz | 3.73 dB |
| | 18GHz ~ 40GHz | 4.11 dB |

### 2.2 Modification Record

There were no modifications required for compliance.

# 3 General Information

## 3.1 General Description of EUT

| | |
|---|---|
| Product | VDSL IAD |
| Brand | MitraStar |
| Test Model | DSL-2401HNA-T1CC |
| Status of EUT | ENGINEERING SAMPLE |
| Power Supply Rating | DC12V from power adapter |
| Modulation Type | CCK, DQPSK, DBPSK for DSSS<br>64QAM, 16QAM, QPSK, BPSK for OFDM<br>256QAM for OFDM in 11ac mode only |
| Modulation Technology | DSSS, OFDM |
| Transfer Rate | 802.11b: up to 11Mbps<br>802.11a/g: up to 54Mbps<br>802.11n: up to 600Mbps<br>802.11ac: up to 1733.3Mbps |
| Operating Frequency | **2.4GHz:** 2.412GHz ~ 2.462GHz<br>**5GHz:** 5.18GHz ~ 5.24GHz, 5.745GHz ~ 5.825GHz |
| Number of Channel | **2.4GHz:**<br>802.11b, 802.11g, 802.11n (HT20): 11<br>802.11n (HT40): 7<br>**5GHz:**<br>802.11a, 802.11n (HT20), 802.11ac (VHT20): 9<br>802.11n (HT40), 802.11ac (VHT40): 4<br>802.11ac (VHT80): 2 |
| Output Power | **2.4GHz:**<br>532.235mW<br>**5GHz:**<br>**5.18GHz ~ 5.24GHz:**<br>**CDD Mode:**<br>348.899mW<br>**Beamforming Mode:**<br>348.899mW<br>**5.745GHz ~ 5.825GHz:**<br>**CDD Mode:**<br>413.705mW<br>**Beamforming Mode:**<br>413.705mW |
| Antenna Type | Refer to Note |
| Antenna Connector | Refer to Note |
| Accessory Device | Adapter x 1 |
| Data Cable Supplied | RJ-11 cable (unshielded, 1.5m) x 1<br>RJ-45 cable (unshielded, 1.5m) x 1 |

Note:

1. The EUT must be supplied with a power adapter as following table:

| Brand | Model No. | Spec. |
|---|---|---|
| UMEC | UP0181D-12PA | Input: 100-240Vac, 50-60Hz, 0.4A<br>Output: 12Vdc, 1.5A<br>DC output cable (Unshielded, 1.5m) |

2. Simultaneously transmission condition.

| Condition | Technology | |
|---|---|---|
| 1 | WLAN (2.4GHz) | WLAN (5GHz) |
| **Note:** The emission of the simultaneous operation has been evaluated and no non-compliance was found. | | |

3. The antennas provided to the EUT, please refer to the following table:

| 2.4GHz band | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Antenna Set. | Chain No. | Brand | Model | Antenna Gain(dBi) | Frequency range (GHz ~ GHz) | Antenna Type | Connecter Type | Cable Length (mm) |
| 1 | Chain 0 | Whayu | 65-031-240136B | 2.7 | 2.4~2.4835 | PCB | NA | 202 |
| | Chain 1 | | 65-031-240141B | 3 | 2.4~2.4835 | | NA | 75 |

| 5GHz band | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Antenna Set. | Chain No. | Brand | Model | Antenna Gain(dBi) | Frequency range (GHz ~ GHz) | Antenna Type | Connecter Type | Cable Length (mm) |
| 1 | Chain 0 | Whayu | 65-031-240137B | 3.4 | 5.15~5.85 | PCB | i-pex(MHF) | 90 |
| | Chain 1 | | 65-031-240138B | 3.3 | 5.15~5.85 | | i-pex(MHF) | 115 |
| | Chain 2 | | 65-031-240139B | 3.4 | 5.15~5.85 | | i-pex(MHF) | 181 |
| | Chain 3 | | 65-031-240140B | 3.4 | 5.15~5.85 | | i-pex(MHF) | 200 |

4. The EUT incorporates a MIMO function.

| 2.4GHz Band | | | |
|---|---|---|---|
| **MODULATION MODE** | **DATA RATE (MCS)** | **TX & RX CONFIGURATION** | |
| **802.11b** | 1 ~ 11Mbps | 2TX | 2RX |
| **802.11g** | 6 ~ 54Mbps | 2TX | 2RX |
| **802.11n (HT20)** | MCS 0~7 | 2TX | 2RX |
| | MCS 8~15 | 2TX | 2RX |
| **802.11n (HT40)** | MCS 0~7 | 2TX | 2RX |
| | MCS 8~15 | 2TX | 2RX |
| **5GHz Band** | | | |
| **MODULATION MODE** | **DATA RATE (MCS)** | **TX & RX CONFIGURATION** | |
| **802.11a** | 6 ~ 54Mbps | 4TX | 4RX |
| **802.11n (HT20)** | MCS 0~7 | 4TX | 4RX |
| | MCS 8~15 | 4TX | 4RX |
| | MCS 16~23 | 4TX | 4RX |
| | MCS 24~31 | 4TX | 4RX |
| **802.11n (HT40)** | MCS 0~7 | 4TX | 4RX |
| | MCS 8~15 | 4TX | 4RX |
| | MCS 16~23 | 4TX | 4RX |
| | MCS 24~31 | 4TX | 4RX |
| **802.11ac (VHT20)** | MCS0~8 Nss=1 | 2TX | 2RX |
| | MCS0~8 Nss=2 | 2TX | 2RX |
| | MCS0~9 Nss=3 | 4TX | 4RX |
| | MCS0~8 Nss=4 | 4TX | 4RX |
| **802.11ac (VHT40)** | MCS0~9 Nss=1 | 4TX | 4RX |
| | MCS0~9 Nss=2 | 4TX | 4RX |
| | MCS0~9 Nss=3 | 4TX | 4RX |
| | MCS0~9 Nss=4 | 4TX | 4RX |
| **802.11ac (VHT80)** | MCS0~9 Nss=1 | 4TX | 4RX |
| | MCS0~9 Nss=2 | 4TX | 4RX |
| | MCS0~9 Nss=3 | 4TX | 4RX |
| | MCS0~9 Nss=4 | 4TX | 4RX |

Note:
1. All of modulation mode support beamforming function except 802.11a modulation mode and 2.4GHz band.

5. The power setting are list as below:

| Modulation Mode | Frequency (MHz) | Power Setting |
|---|---|---|
| **802.11b** | 2412 | 1E |
| | 2437 | 1C |
| | 2462 | 1B |
| **802.11g** | 2412 | 20 |
| | 2437 | 2F |
| | 2462 | 1D |
| **802.11n(HT20)** | 2412 | 1B |
| | 2437 | 2F |
| | 2462 | 1E |
| **802.11n(HT40)** | 2422 | 13 |
| | 2437 | 1E |
| | 2452 | 17 |

6. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

### 3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

| Channel | Frequency | Channel | Frequency |
|---|---|---|---|
| 1 | 2412MHz | 7 | 2442MHz |
| 2 | 2417MHz | 8 | 2447MHz |
| 3 | 2422MHz | 9 | 2452MHz |
| 4 | 2427MHz | 10 | 2457MHz |
| 5 | 2432MHz | 11 | 2462MHz |
| 6 | 2437MHz | | |

7 channels are provided for 802.11n (HT40):

| Channel | Frequency | Channel | Frequency |
|---|---|---|---|
| 3 | 2422MHz | 7 | 2442MHz |
| 4 | 2427MHz | 8 | 2447MHz |
| 5 | 2432MHz | 9 | 2452MHz |
| 6 | 2437MHz | | |

### 3.2.1 Test Mode Applicability and Tested Channel Detail

| EUT CONFIGURE MODE | APPLICABLE TO | | | | DESCRIPTION |
|---|---|---|---|---|---|
| | RE≥1G | RE<1G | PLC | APCM | |
| - | √ | √ | √ | √ | - |

Where RE≥1G: Radiated Emission above 1GHz & Bandedge Measurement
**RE<1G:** Radiated Emission below 1GHz
**PLC:** Power Line Conducted Emission
**APCM:** Antenna Port Conducted Measurement

**Radiated Emission Test (Above 1GHz):**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
|---|---|---|---|---|---|
| 802.11b | 1 to 11 | 1, 6, 11 | DSSS | DBPSK | 1 |
| 802.11g | 1 to 11 | 1, 6, 11 | OFDM | BPSK | 6 |
| 802.11n (HT20) | 1 to 11 | 1, 6, 11 | OFDM | BPSK | 6.5 |
| 802.11n (HT40) | 3 to 9 | 3, 6, 9 | OFDM | BPSK | 13.5 |

**Radiated Emission Test (Below 1GHz):**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
|---|---|---|---|---|---|
| 802.11g | 1 to 11 | 6 | OFDM | BPSK | 6 |

**Power Line Conducted Emission Test:**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
|---|---|---|---|---|---|
| 802.11g | 1 to 11 | 6 | OFDM | BPSK | 6 |

## Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
|---|---|---|---|---|---|
| 802.11b | 1 to 11 | 1, 6, 11 | DSSS | DBPSK | 1 |
| 802.11g | 1 to 11 | 1, 6, 11 | OFDM | BPSK | 6 |
| 802.11n (HT20) | 1 to 11 | 1, 6, 11 | OFDM | BPSK | 6.5 |
| 802.11n (HT40) | 3 to 9 | 3, 6, 9 | OFDM | BPSK | 13.5 |

## Test Condition:

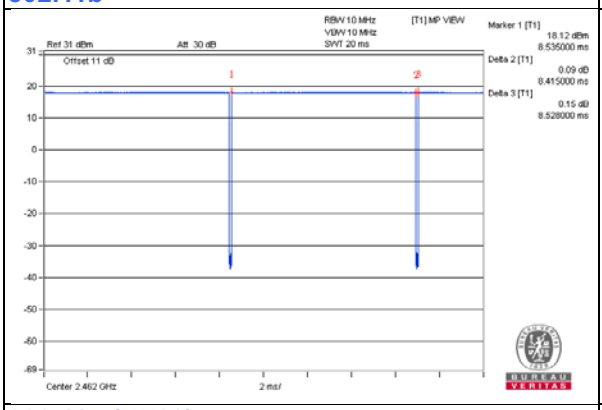
| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER | TESTED BY |
|---|---|---|---|
| RE≥1G | 22deg. C, 69%RH | 120Vac, 60Hz | Russell Yeh |
| RE<1G | 22deg. C, 69%RH | 120Vac, 60Hz | Robert Cheng |
| PLC | 23deg. C, 62%RH | 120Vac, 60Hz | Jyunchun Lin |
| APCM | 25deg. C, 60%RH | 120Vac, 60Hz | Robert Cheng |

### 3.3 Duty Cycle of Test Signal

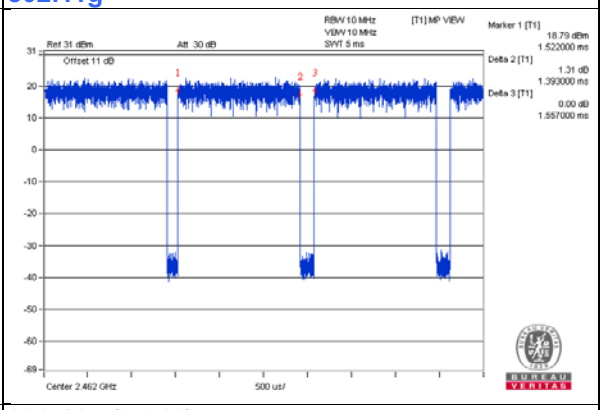
If duty cycle of test signal is ≥ 98 %, duty factor is not required.
If duty cycle of test signal is < 98%, duty factor shall be considered.

**802.11b:** Duty cycle = 8.415/8.528 = 0.987
**802.11g:** Duty cycle = 1.393/1.557 = 0.895, Duty factor = 10 * log( 1/0.895) = 0.5
**802.11n (HT20):** Duty cycle = 1.306/1.424 = 0.917, Duty factor = 10 * log( 1/0.917) = 0.4
**802.11n (HT40):** Duty cycle = 0.647/0.748 = 0.865, Duty factor = 10 * log( 1/0.865) = 0.6

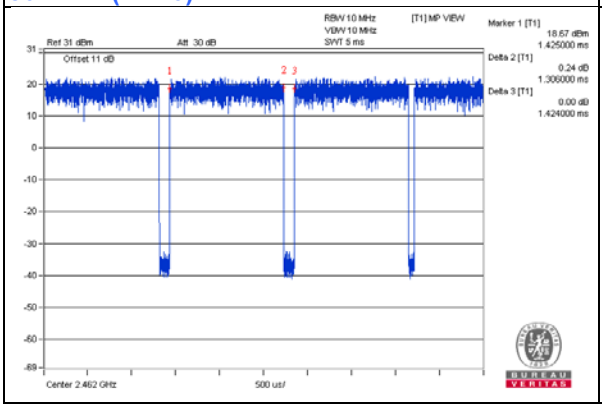
**802.11b**



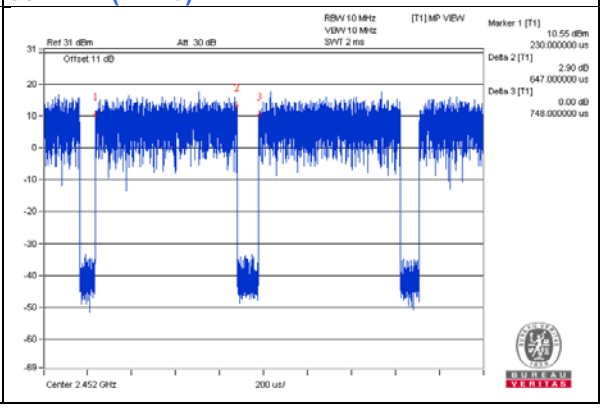

**802.11g**




**802.11n (HT20)**




**802.11n (HT40)**



## 3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

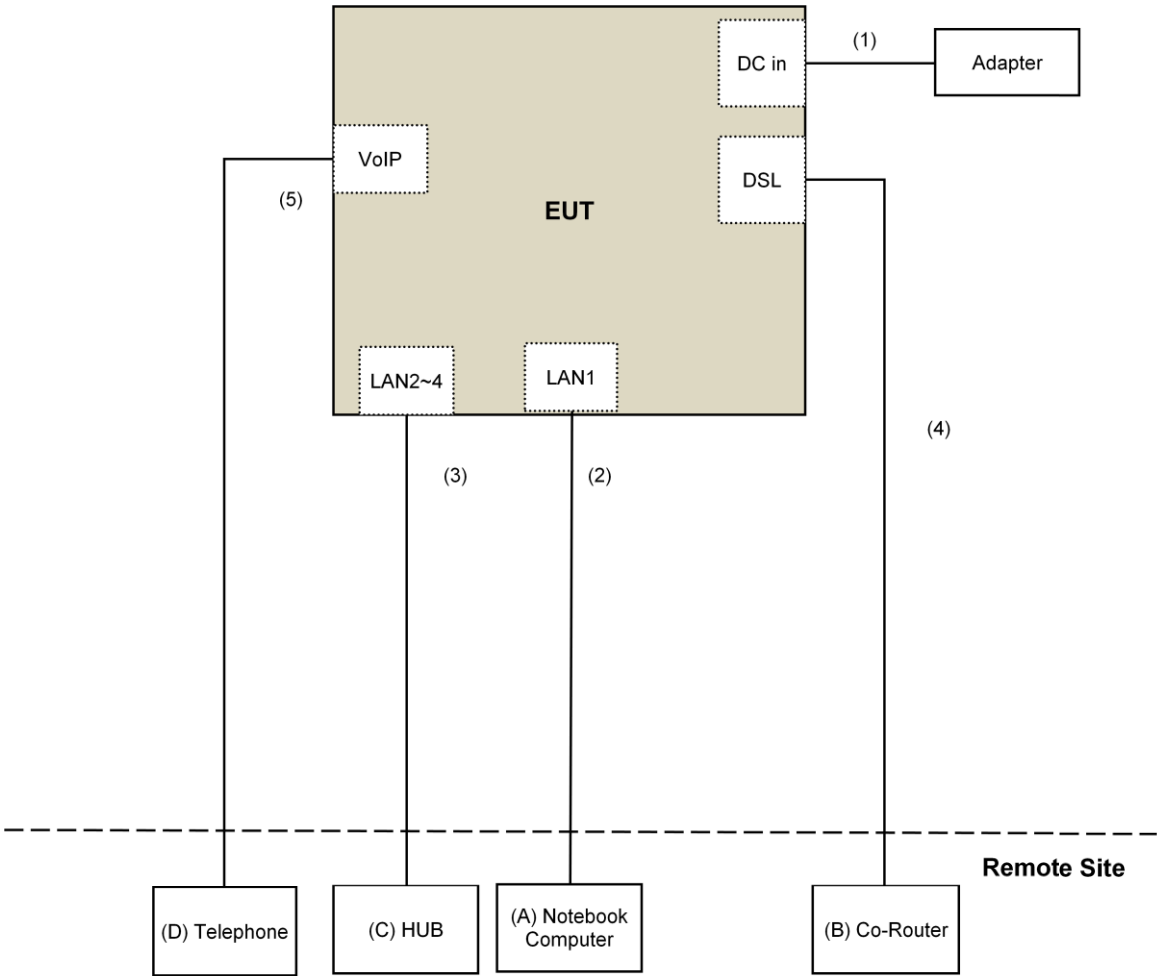
| ID | Product | Brand | Model No. | Serial No. | FCC ID | Remarks |
|---|---|---|---|---|---|---|
| A. | Notebook Computer | DELL | E6440 | H7LYQ32 | FCC DoC | Provided by Lab |
| B. | Co-Router | ZyXEL | IES-1000 | S08024701597 | FCC DoC | Provided by Lab |
| C. | HUB | ZyXEL | ES-116P | S060H02000215 | FCC DoC | Provided by Lab |
| D. | Telephone | DAISHO | DS-03 | N/A | N/A | Provided by Lab |

Note:

1. All power cords of the above support units are non-shielded (1.8m).

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks |
|---|---|---|---|---|---|---|
| 1. | DC Cable | 1 | 1.5 | No | 0 | Supplied by client |
| 2. | RJ-45 Cable | 1 | 10 | No | 0 | Provided by Lab |
| 3. | RJ-45 Cable | 3 | 10 | No | 0 | Provided by Lab |
| 4. | RJ-11 Cable | 1 | 10 | No | 0 | Provided by Lab |
| 5. | RJ-11 Cable | 1 | 10 | No | 0 | Provided by Lab |

### 3.4.1 Configuration of System under Test



### 3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC Part 15, Subpart C (15.247)**
**KDB 558074 D01 DTS Meas Guidance v03r05**
**KDB 662911 D01 Multiple Transmitter Output v02r01**
**ANSI C63.10-2013**

All test items have been performed and recorded as per the above standards.

**NOTE:** The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

# 4 Test Types and Results

## 4.1 Radiated Emission and Bandedge Measurement

### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

| Frequencies (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009 ~ 0.490 | 2400/F(kHz) | 300 |
| 0.490 ~ 1.705 | 24000/F(kHz) | 30 |
| 1.705 ~ 30.0 | 30 | 30 |
| 30 ~ 88 | 100 | 3 |
| 88 ~ 216 | 150 | 3 |
| 216 ~ 960 | 200 | 3 |
| Above 960 | 500 | 3 |

**NOTE**:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|---|---|---|---|---|
| Test Receiver<br>Agilent | N9038A | MY50010156 | Aug. 12, 2015 | Aug. 11, 2016 |
| Pre-Amplifier(*)<br>EMCI | EMC001340 | 980142 | Jan. 20, 2016 | Jan. 19, 2018 |
| Loop Antenna(*)<br>Electro-Metrics | EM-6879 | 264 | Dec. 16, 2014 | Dec. 15, 2016 |
| RF Cable | NA | LOOPCAB-001<br>LOOPCAB-002 | Jan. 18, 2016 | Jan. 17, 2017 |
| Pre-Amplifier<br>Mini-Circuits | ZFL-1000VH2B | AMP-ZFL-05 | May 07, 2016 | May 06, 2017 |
| Trilog Broadband Antenna<br>SCHWARZBECK | VULB 9168 | 9168-156 | Jan. 04, 2016 | Jan. 03, 2017 |
| RF Cable | 8D | 966-3-1<br>966-3-2<br>966-3-3 | Apr. 02, 2016 | Apr. 01, 2017 |
| Horn_Antenna<br>SCHWARZBECK | BBHA9120-D | 9120D-406 | Jan. 20, 2016 | Jan. 19, 2017 |
| Pre-Amplifier<br>Agilent | 8449B | 3008A02465 | Apr. 05, 2016 | Apr. 04, 2017 |
| RF Cable | EMC104-SM-SM-2000<br>EMC104-SM-SM-5000<br>EMC104-SM-SM-5000 | 150317<br>150321<br>150322 | Mar. 30, 2016 | Mar. 29, 2017 |
| Test Receiver<br>Keysight | N9038A | MY54450088 | July 20, 2016 | July 19, 2017 |
| Pre-Amplifier<br>EMCI | EMC184045 | 980143 | Jan. 15, 2016 | Jan. 14, 2017 |
| Horn_Antenna<br>SCHWARZBECK | BBHA 9170 | BBHA9170608 | Jan. 08, 2016 | Jan. 07, 2017 |
| RF Cable | SUCOFLEX 102 | 36432/2<br>36441/2 | Jan. 16, 2016 | Jan. 15, 2017 |
| Software | ADT_Radiated_V8.7.07 | NA | NA | NA |
| Antenna Tower & Turn Table<br>Max-Full | MF-7802 | MF780208406 | NA | NA |
| Boresight Antenna Fixture | FBA-01 | FBA-SIP01 | NA | NA |
| Spectrum Analyzer<br>R&S | FSP40 | 100060 | May 11, 2016 | May 10, 2017 |
| Power meter<br>Anritsu | ML2495A | 1014008 | May 5, 2016 | May 4, 2017 |
| Power sensor<br>Anritsu | MA2411B | 0917122 | May 5, 2016 | May 4, 2017 |

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. *The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 3.
4. The FCC Site Registration No. is 147459
5. Loop antenna was used for all emissions below 30 MHz.
6. The CANADA Site Registration No. is 20331-1
8. Tested Date: July 27 to 28, 2016

### 4.1.3 Test Procedures

a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

**Note:**

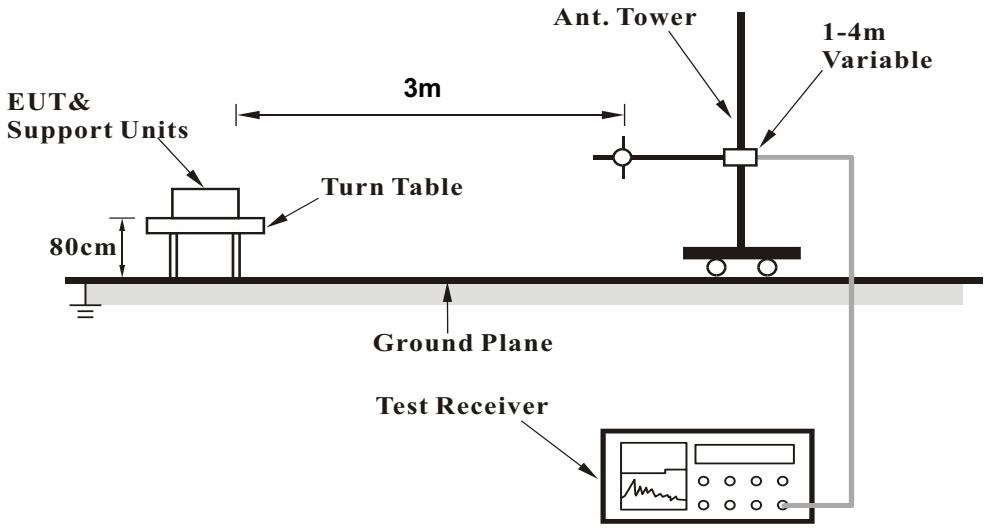
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (10 log(1/duty cycle)).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

### 4.1.4 Deviation from Test Standard

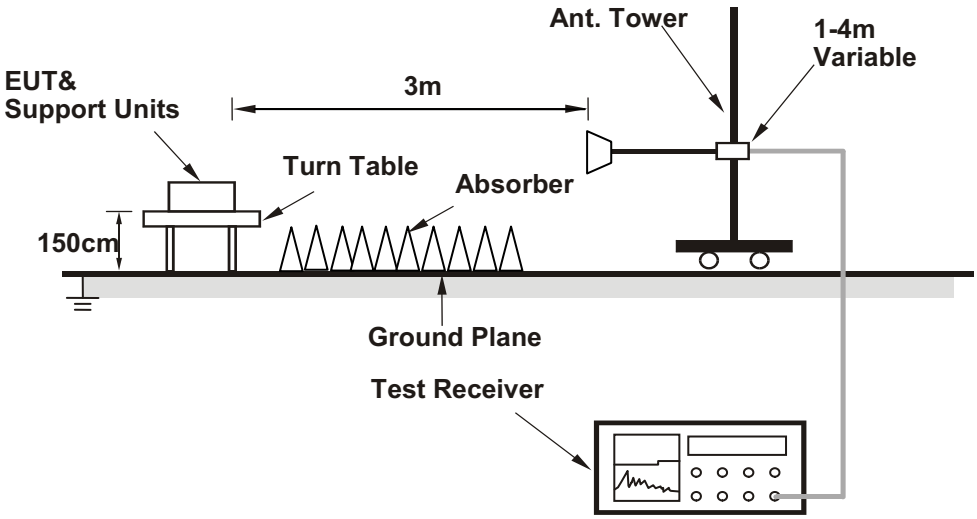
No deviation.

4.1.5 Test Setup

**<Frequency Range below 1GHz>**




**<Frequency Range above 1GHz>**




For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Connected the EUT with the Notebook Computer which is placed on remote site.
b. Contorlling software (QATool Dbg.exe [Ver 0.0.0.71]) has been activated to set the EUT on specific status.

4.1.7 Test Results

**Above 1GHz Data:**

**802.11b**

| | | | |
|---|---|---|---|
| **CHANNEL** | TX Channel 1 | **DETECTOR FUNCTION** | Peak (PK)<br>Average (AV) |
| **FREQUENCY RANGE** | 1GHz ~ 25GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **NO.** | **FREQ. (MHz)** | **EMISSION LEVEL (dBuV/m)** | **LIMIT (dBuV/m)** | **MARGIN (dB)** | **ANTENNA HEIGHT (m)** | **TABLE ANGLE (Degree)** | **RAW VALUE (dBuV)** | **CORRECTION FACTOR (dB/m)** |
| 1 | 2387.00 | 49.3 PK | 74.0 | -24.7 | 2.75 H | 316 | 53.6 | -4.3 |
| 2 | 2387.00 | 37.7 AV | 54.0 | -16.3 | 2.75 H | 316 | 42.0 | -4.3 |
| 3 | *2412.00 | 103.1 PK | | | 2.75 H | 316 | 107.2 | -4.1 |
| 4 | *2412.00 | 101.1 AV | | | 2.75 H | 316 | 105.2 | -4.1 |
| 5 | 4824.00 | 55.1 PK | 74.0 | -18.9 | 1.99 H | 294 | 52.8 | 2.3 |
| 6 | 4824.00 | 53.5 AV | 54.0 | -0.5 | 1.99 H | 294 | 51.2 | 2.3 |
| **ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M** | | | | | | | | |
| **NO.** | **FREQ. (MHz)** | **EMISSION LEVEL (dBuV/m)** | **LIMIT (dBuV/m)** | **MARGIN (dB)** | **ANTENNA HEIGHT (m)** | **TABLE ANGLE (Degree)** | **RAW VALUE (dBuV)** | **CORRECTION FACTOR (dB/m)** |
| 1 | 2387.00 | 56.7 PK | 74.0 | -17.3 | 1.07 V | 221 | 61.0 | -4.3 |
| 2 | 2387.00 | 47.6 AV | 54.0 | -6.4 | 1.07 V | 221 | 51.9 | -4.3 |
| 3 | *2412.00 | 113.3 PK | | | 1.07 V | 221 | 117.4 | -4.1 |
| 4 | *2412.00 | 110.9 AV | | | 1.07 V | 221 | 115.0 | -4.1 |
| 5 | 4824.00 | 49.5 PK | 74.0 | -24.5 | 1.68 V | 360 | 47.2 | 2.3 |
| 6 | 4824.00 | 45.9 AV | 54.0 | -8.1 | 1.68 V | 360 | 43.6 | 2.3 |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

| CHANNEL | TX Channel 6 | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
|---|---|---|---|
| FREQUENCY RANGE | 1GHz ~ 25GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2437.00 | 102.7 PK | | | 2.81 H | 308 | 106.7 | -4.0 |
| 2 | *2437.00 | 100.6 AV | | | 2.81 H | 308 | 104.6 | -4.0 |
| 3 | 4874.00 | 55.1 PK | 74.0 | -18.9 | 2.12 H | 293 | 52.6 | 2.5 |
| 4 | 4874.00 | 53.7 AV | 54.0 | -0.3 | 2.12 H | 293 | 51.2 | 2.5 |
| 5 | 7311.00 | 48.3 PK | 74.0 | -25.7 | 1.94 H | 326 | 39.4 | 8.9 |
| 6 | 7311.00 | 35.3 AV | 54.0 | -18.7 | 1.94 H | 326 | 26.4 | 8.9 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2437.00 | 112.7 PK | | | 1.09 V | 218 | 116.7 | -4.0 |
| 2 | *2437.00 | 110.1 AV | | | 1.09 V | 218 | 114.1 | -4.0 |
| 3 | 4874.00 | 49.8 PK | 74.0 | -24.2 | 1.66 V | 360 | 47.3 | 2.5 |
| 4 | 4874.00 | 46.1 AV | 54.0 | -7.9 | 1.66 V | 360 | 43.6 | 2.5 |
| 5 | 7311.00 | 46.3 PK | 74.0 | -27.7 | 1.99 V | 360 | 37.4 | 8.9 |
| 6 | 7311.00 | 33.3 AV | 54.0 | -20.7 | 1.99 V | 360 | 24.4 | 8.9 |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

| CHANNEL | TX Channel 11 | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
|---|---|---|---|
| FREQUENCY RANGE | 1GHz ~ 25GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2462.00 | 102.2 PK | | | 2.76 H | 330 | 106.3 | -4.1 |
| 2 | *2462.00 | 99.9 AV | | | 2.76 H | 330 | 104.0 | -4.1 |
| 3 | 2487.70 | 49.1 PK | 74.0 | -24.9 | 2.76 H | 330 | 53.1 | -4.0 |
| 4 | 2487.70 | 37.3 AV | 54.0 | -16.7 | 2.76 H | 330 | 41.3 | -4.0 |
| 5 | 4924.00 | 55.7 PK | 74.0 | -18.3 | 1.99 H | 290 | 53.2 | 2.5 |
| **6** | **4924.00** | **53.9 AV** | **54.0** | **-0.1** | **1.99 H** | **290** | **51.4** | **2.5** |
| 7 | 7386.00 | 48.2 PK | 74.0 | -25.8 | 1.91 H | 338 | 38.9 | 9.3 |
| 8 | 7386.00 | 35.1 AV | 54.0 | -18.9 | 1.91 H | 338 | 25.8 | 9.3 |
| **ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M** | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2462.00 | 111.9 PK | | | 1.07 V | 221 | 116.0 | -4.1 |
| 2 | *2462.00 | 109.1 AV | | | 1.07 V | 221 | 113.2 | -4.1 |
| 3 | 2487.70 | 57.8 PK | 74.0 | -16.2 | 1.07 V | 221 | 61.8 | -4.0 |
| 4 | 2487.70 | 46.6 AV | 54.0 | -7.4 | 1.07 V | 221 | 50.6 | -4.0 |
| 5 | 4924.00 | 49.4 PK | 74.0 | -24.6 | 1.70 V | 360 | 46.9 | 2.5 |
| 6 | 4924.00 | 45.9 AV | 54.0 | -8.1 | 1.70 V | 360 | 43.4 | 2.5 |
| 7 | 7386.00 | 46.2 PK | 74.0 | -27.8 | 1.94 V | 360 | 36.9 | 9.3 |
| 8 | 7386.00 | 33.2 AV | 54.0 | -20.8 | 1.94 V | 360 | 23.9 | 9.3 |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

## 802.11g

| CHANNEL | TX Channel 1 | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
|---|---|---|---|
| FREQUENCY RANGE | 1GHz ~ 25GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 2390.00 | 68.1 PK | 74.0 | -5.9 | 2.33 H | 360 | 72.3 | -4.2 |
| 2 | 2390.00 | 51.0 AV | 54.0 | -3.0 | 2.33 H | 360 | 55.2 | -4.2 |
| 3 | *2412.00 | 109.2 PK | | | 2.33 H | 360 | 113.3 | -4.1 |
| 4 | *2412.00 | 97.2 AV | | | 2.33 H | 360 | 101.3 | -4.1 |
| 5 | 4824.00 | 53.2 PK | 74.0 | -20.8 | 2.15 H | 291 | 50.9 | 2.3 |
| 6 | 4824.00 | 39.6 AV | 54.0 | -14.4 | 2.15 H | 291 | 37.3 | 2.3 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| **1** | **2390.00** | **73.9 PK** | **74.0** | **-0.1** | **1.11 V** | **213** | **78.1** | **-4.2** |
| 2 | 2390.00 | 53.5 AV | 54.0 | -0.5 | 1.11 V | 213 | 57.7 | -4.2 |
| 3 | *2412.00 | 116.3 PK | | | 1.11 V | 212 | 120.4 | -4.1 |
| 4 | *2412.00 | 104.5 AV | | | 1.11 V | 212 | 108.6 | -4.1 |
| 5 | 4824.00 | 44.3 PK | 74.0 | -29.7 | 1.64 V | 360 | 42.0 | 2.3 |
| 6 | 4824.00 | 32.1 AV | 54.0 | -21.9 | 1.64 V | 360 | 29.8 | 2.3 |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The resolution bandwidth of test receiver is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) for Average detection (AV). Emission AV measured by RBW/VBW= 1MHz/1kHz

| CHANNEL | TX Channel 6 | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
|---|---|---|---|
| FREQUENCY RANGE | 1GHz ~ 25GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 2390.00 | 56.1 PK | 74.0 | -17.9 | 2.73 H | 322 | 60.3 | -4.2 |
| 2 | 2390.00 | 42.4 AV | 54.0 | -11.6 | 2.73 H | 322 | 46.6 | -4.2 |
| 3 | *2437.00 | 110.2 PK | | | 2.73 H | 322 | 114.2 | -4.0 |
| 4 | *2437.00 | 99.8 AV | | | 2.73 H | 322 | 103.8 | -4.0 |
| 5 | 2483.50 | 56.9 PK | 74.0 | -17.1 | 2.73 H | 322 | 60.9 | -4.0 |
| 6 | 2483.50 | 42.9 AV | 54.0 | -11.1 | 2.73 H | 322 | 46.9 | -4.0 |
| 7 | 4874.00 | 59.1 PK | 74.0 | -14.9 | 1.99 H | 294 | 56.6 | 2.5 |
| 8 | 4874.00 | 45.7 AV | 54.0 | -8.3 | 1.99 H | 294 | 43.2 | 2.5 |
| 9 | 7311.00 | 52.4 PK | 74.0 | -21.6 | 1.90 H | 337 | 43.5 | 8.9 |
| 10 | 7311.00 | 38.4 AV | 54.0 | -15.6 | 1.90 H | 337 | 29.5 | 8.9 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 2390.00 | 61.1 PK | 74.0 | -12.9 | 1.09 V | 213 | 65.3 | -4.2 |
| 2 | 2390.00 | 47.1 AV | 54.0 | -6.9 | 1.09 V | 213 | 51.3 | -4.2 |
| 3 | *2437.00 | 118.1 PK | | | 1.09 V | 213 | 122.1 | -4.0 |
| 4 | *2437.00 | 107.2 AV | | | 1.09 V | 213 | 111.2 | -4.0 |
| 5 | 2483.50 | 62.3 PK | 74.0 | -11.7 | 1.09 V | 213 | 66.3 | -4.0 |
| 6 | 2483.50 | 47.9 AV | 54.0 | -6.1 | 1.09 V | 213 | 51.9 | -4.0 |
| 7 | 4874.00 | 49.2 PK | 74.0 | -24.8 | 1.72 V | 360 | 46.7 | 2.5 |
| 8 | 4874.00 | 36.9 AV | 54.0 | -17.1 | 1.72 V | 360 | 34.4 | 2.5 |
| 9 | 7311.00 | 49.2 PK | 74.0 | -24.8 | 1.79 V | 351 | 40.3 | 8.9 |
| 10 | 7311.00 | 36.7 AV | 54.0 | -17.3 | 1.79 V | 351 | 27.8 | 8.9 |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The resolution bandwidth of test receiver is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) for Average detection (AV). Emission AV measured by RBW/VBW= 1MHz/1kHz

| CHANNEL | TX Channel 11 | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
|---|---|---|---|
| FREQUENCY RANGE | 1GHz ~ 25GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2462.00 | 107.2 PK | | | 2.77 H | 303 | 111.3 | -4.1 |
| 2 | *2462.00 | 95.1 AV | | | 2.77 H | 303 | 99.2 | -4.1 |
| 3 | 2483.50 | 67.7 PK | 74.0 | -6.3 | 2.77 H | 303 | 71.7 | -4.0 |
| 4 | 2483.50 | 50.8 AV | 54.0 | -3.2 | 2.77 H | 303 | 54.8 | -4.0 |
| 5 | 4924.00 | 52.8 PK | 74.0 | -21.2 | 2.11 H | 283 | 50.3 | 2.5 |
| 6 | 4924.00 | 38.7 AV | 54.0 | -15.3 | 2.11 H | 283 | 36.2 | 2.5 |
| 7 | 7386.00 | 49.5 PK | 74.0 | -24.5 | 1.95 H | 334 | 40.2 | 9.3 |
| 8 | 7386.00 | 33.4 AV | 54.0 | -20.6 | 1.95 H | 334 | 24.1 | 9.3 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2462.00 | 114.7 PK | | | 1.08 V | 214 | 118.8 | -4.1 |
| 2 | *2462.00 | 102.6 AV | | | 1.08 V | 214 | 106.7 | -4.1 |
| 3 | 2483.50 | 70.7 PK | 74.0 | -3.3 | 1.08 V | 214 | 74.7 | -4.0 |
| 4 | 2483.50 | 53.6 AV | 54.0 | -0.4 | 1.08 V | 214 | 57.6 | -4.0 |
| 5 | 4924.00 | 43.5 PK | 74.0 | -30.5 | 1.64 V | 360 | 41.0 | 2.5 |
| 6 | 4924.00 | 31.4 AV | 54.0 | -22.6 | 1.64 V | 360 | 28.9 | 2.5 |
| 7 | 7386.00 | 43.1 PK | 74.0 | -30.9 | 1.94 V | 360 | 33.8 | 9.3 |
| 8 | 7386.00 | 31.1 AV | 54.0 | -22.9 | 1.94 V | 360 | 21.8 | 9.3 |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The resolution bandwidth of test receiver is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) for Average detection (AV). Emission AV measured by RBW/VBW= 1MHz/1kHz

## 802.11n (HT20)

| CHANNEL | TX Channel 1 | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
|---|---|---|---|
| FREQUENCY RANGE | 1GHz ~ 25GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 2390.00 | 68.6 PK | 74.0 | -5.4 | 2.72 H | 331 | 72.8 | -4.2 |
| 2 | 2390.00 | 51.3 AV | 54.0 | -2.7 | 2.72 H | 331 | 55.5 | -4.2 |
| 3 | *2412.00 | 105.8 PK | | | 2.72 H | 331 | 109.9 | -4.1 |
| 4 | *2412.00 | 93.4 AV | | | 2.72 H | 331 | 97.5 | -4.1 |
| 5 | 4824.00 | 52.3 PK | 74.0 | -21.7 | 2.16 H | 281 | 50.0 | 2.3 |
| 6 | 4824.00 | 38.3 AV | 54.0 | -15.7 | 2.16 H | 281 | 36.0 | 2.3 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 2390.00 | 70.5 PK | 74.0 | -3.5 | 1.08 V | 214 | 74.7 | -4.2 |
| **2** | **2390.00** | **53.9 AV** | **54.0** | **-0.1** | **1.08 V** | **214** | **58.1** | **-4.2** |
| 3 | *2412.00 | 113.0 PK | | | 1.08 V | 214 | 117.1 | -4.1 |
| 4 | *2412.00 | 100.6 AV | | | 1.08 V | 214 | 104.7 | -4.1 |
| 5 | 4824.00 | 42.9 PK | 74.0 | -31.1 | 1.73 V | 360 | 40.6 | 2.3 |
| 6 | 4824.00 | 30.9 AV | 54.0 | -23.1 | 1.73 V | 360 | 28.6 | 2.3 |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The resolution bandwidth of test receiver is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) for Average detection (AV). Emission AV measured by RBW/VBW= 1MHz/1kHz

| CHANNEL | TX Channel 6 | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
|---|---|---|---|
| FREQUENCY RANGE | 1GHz ~ 25GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 2390.00 | 56.4 PK | 74.0 | -17.6 | 2.76 H | 314 | 60.6 | -4.2 |
| 2 | 2390.00 | 42.8 AV | 54.0 | -11.2 | 2.76 H | 314 | 47.0 | -4.2 |
| 3 | *2437.00 | 100.4 PK | | | 2.76 H | 314 | 104.4 | -4.0 |
| 4 | *2437.00 | 99.7 AV | | | 2.76 H | 314 | 103.7 | -4.0 |
| 5 | 2483.50 | 57.0 PK | 74.0 | -17.0 | 2.76 H | 314 | 61.0 | -4.0 |
| 6 | 2483.50 | 43.1 AV | 54.0 | -10.9 | 2.76 H | 314 | 47.1 | -4.0 |
| 7 | 4874.00 | 59.0 PK | 74.0 | -15.0 | 2.08 H | 308 | 56.5 | 2.5 |
| 8 | 4874.00 | 45.8 AV | 54.0 | -8.2 | 2.08 H | 308 | 43.3 | 2.5 |
| 9 | 7311.00 | 52.2 PK | 74.0 | -21.8 | 1.99 H | 324 | 43.3 | 8.9 |
| 10 | 7311.00 | 38.4 AV | 54.0 | -15.6 | 1.99 H | 324 | 29.5 | 8.9 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 2390.00 | 61.7 PK | 74.0 | -12.3 | 1.04 V | 219 | 65.9 | -4.2 |
| 2 | 2390.00 | 47.4 AV | 54.0 | -6.6 | 1.04 V | 219 | 51.6 | -4.2 |
| 3 | *2437.00 | 117.9 PK | | | 1.10 V | 217 | 121.9 | -4.0 |
| 4 | *2437.00 | 107.0 AV | | | 1.10 V | 217 | 111.0 | -4.0 |
| 5 | 2483.50 | 64.2 PK | 74.0 | -9.8 | 1.08 V | 225 | 68.2 | -4.0 |
| 6 | 2483.50 | 48.2 AV | 54.0 | -5.8 | 1.08 V | 225 | 52.2 | -4.0 |
| 7 | 4874.00 | 49.3 PK | 74.0 | -24.7 | 1.74 V | 360 | 46.8 | 2.5 |
| 8 | 4874.00 | 36.8 AV | 54.0 | -17.2 | 1.74 V | 360 | 34.3 | 2.5 |
| 9 | 7311.00 | 49.2 PK | 74.0 | -24.8 | 1.96 V | 360 | 40.3 | 8.9 |
| 10 | 7311.00 | 36.5 AV | 54.0 | -17.5 | 1.96 V | 360 | 27.6 | 8.9 |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The resolution bandwidth of test receiver is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) for Average detection (AV). Emission AV measured by RBW/VBW= 1MHz/1kHz

| CHANNEL | TX Channel 11 | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
|---|---|---|---|
| FREQUENCY RANGE | 1GHz ~ 25GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2462.00 | 107.3 PK | | | 2.78 H | 318 | 111.4 | -4.1 |
| 2 | *2462.00 | 95.1 AV | | | 2.78 H | 318 | 99.2 | -4.1 |
| 3 | 2483.50 | 68.6 PK | 74.0 | -5.4 | 2.78 H | 318 | 72.6 | -4.0 |
| 4 | 2483.50 | 51.2 AV | 54.0 | -2.8 | 2.78 H | 318 | 55.2 | -4.0 |
| 5 | 4924.00 | 52.8 PK | 74.0 | -21.2 | 2.13 H | 283 | 50.3 | 2.5 |
| 6 | 4924.00 | 38.8 AV | 54.0 | -15.2 | 2.13 H | 283 | 36.3 | 2.5 |
| 7 | 7386.00 | 49.6 PK | 74.0 | -24.4 | 1.95 H | 322 | 40.3 | 9.3 |
| 8 | 7386.00 | 33.4 AV | 54.0 | -20.6 | 1.95 H | 322 | 24.1 | 9.3 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2462.00 | 114.6 PK | | | 1.07 V | 213 | 118.7 | -4.1 |
| 2 | *2462.00 | 102.2 AV | | | 1.07 V | 213 | 106.3 | -4.1 |
| 3 | 2483.50 | 72.3 PK | 74.0 | -1.7 | 1.07 V | 213 | 76.3 | -4.0 |
| **4** | **2483.50** | **53.9 AV** | **54.0** | **-0.1** | **1.07 V** | **213** | **57.9** | **-4.0** |
| 5 | 4924.00 | 43.1 PK | 74.0 | -30.9 | 1.74 V | 360 | 40.6 | 2.5 |
| 6 | 4924.00 | 31.2 AV | 54.0 | -22.8 | 1.74 V | 360 | 28.7 | 2.5 |
| 7 | 7386.00 | 43.5 PK | 74.0 | -30.5 | 1.95 V | 350 | 34.2 | 9.3 |
| 8 | 7386.00 | 31.4 AV | 54.0 | -22.6 | 1.95 V | 350 | 22.1 | 9.3 |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The resolution bandwidth of test receiver is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) for Average detection (AV). Emission AV measured by RBW/VBW= 1MHz/1kHz

## 802.11n (HT40)

| CHANNEL | TX Channel 3 | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
|---|---|---|---|
| FREQUENCY RANGE | 1GHz ~ 25GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 2390.00 | 67.9 PK | 74.0 | -6.1 | 2.80 H | 310 | 72.1 | -4.2 |
| 2 | 2390.00 | 50.9 AV | 54.0 | -3.1 | 2.80 H | 310 | 55.1 | -4.2 |
| 3 | *2422.00 | 98.9 PK | | | 2.80 H | 310 | 103.0 | -4.1 |
| 4 | *2422.00 | 89.9 AV | | | 2.80 H | 310 | 94.0 | -4.1 |
| 5 | 4844.00 | 42.8 PK | 74.0 | -31.2 | 2.10 H | 287 | 40.5 | 2.3 |
| 6 | 4844.00 | 30.1 AV | 54.0 | -23.9 | 2.10 H | 287 | 27.8 | 2.3 |
| 7 | 7266.00 | 42.5 PK | 74.0 | -31.5 | 1.99 H | 321 | 33.7 | 8.8 |
| 8 | 7266.00 | 29.4 AV | 54.0 | -24.6 | 1.99 H | 321 | 20.6 | 8.8 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 2390.00 | 70.8 PK | 74.0 | -3.2 | 1.08 V | 209 | 75.0 | -4.2 |
| 2 | 2390.00 | 53.8 AV | 54.0 | -0.2 | 1.08 V | 209 | 58.0 | -4.2 |
| 3 | *2422.00 | 106.1 PK | | | 1.08 V | 209 | 110.2 | -4.1 |
| 4 | *2422.00 | 97.1 AV | | | 1.08 V | 209 | 101.2 | -4.1 |
| 5 | 4844.00 | 42.2 PK | 74.0 | -31.8 | 1.69 V | 360 | 39.9 | 2.3 |
| 6 | 4844.00 | 29.7 AV | 54.0 | -24.3 | 1.69 V | 360 | 27.4 | 2.3 |
| 7 | 7266.00 | 42.5 PK | 74.0 | -31.5 | 1.99 V | 360 | 33.7 | 8.8 |
| 8 | 7266.00 | 29.2 AV | 54.0 | -24.8 | 1.99 V | 360 | 20.4 | 8.8 |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The resolution bandwidth of test receiver is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) for Average detection (AV). Emission AV measured by RBW/VBW= 1MHz/3kHz

| CHANNEL | TX Channel 6 | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
|---|---|---|---|
| FREQUENCY RANGE | 1GHz ~ 25GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 2390.00 | 68.4 PK | 74.0 | -5.6 | 2.71 H | 314 | 72.6 | -4.2 |
| 2 | 2390.00 | 51.0 AV | 54.0 | -3.0 | 2.71 H | 314 | 55.2 | -4.2 |
| 3 | *2437.00 | 102.6 PK | | | 2.71 H | 314 | 106.6 | -4.0 |
| 4 | *2437.00 | 95.1 AV | | | 2.71 H | 314 | 99.1 | -4.0 |
| 5 | 2483.50 | 67.9 PK | 74.0 | -6.1 | 2.71 H | 314 | 71.9 | -4.0 |
| 6 | 2483.50 | 50.8 AV | 54.0 | -3.2 | 2.71 H | 314 | 54.8 | -4.0 |
| 7 | 4874.00 | 42.2 PK | 74.0 | -31.8 | 2.15 H | 282 | 39.7 | 2.5 |
| 8 | 4874.00 | 29.7 AV | 54.0 | -24.3 | 2.15 H | 282 | 27.2 | 2.5 |
| 9 | 7311.00 | 42.0 PK | 74.0 | -32.0 | 1.98 H | 332 | 33.1 | 8.9 |
| 10 | 7311.00 | 29.0 AV | 54.0 | -25.0 | 1.98 H | 332 | 20.1 | 8.9 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 2390.00 | 68.6 PK | 74.0 | -5.4 | 1.05 V | 208 | 72.8 | -4.2 |
| **2** | **2390.00** | **53.9 AV** | **54.0** | **-0.1** | **1.05 V** | **208** | **58.1** | **-4.2** |
| 3 | *2437.00 | 110.2 PK | | | 1.05 V | 208 | 114.2 | -4.0 |
| 4 | *2437.00 | 102.4 AV | | | 1.05 V | 208 | 106.4 | -4.0 |
| 5 | 2483.50 | 68.1 PK | 74.0 | -5.9 | 1.05 V | 208 | 72.1 | -4.0 |
| 6 | 2483.50 | 53.7 AV | 54.0 | -0.3 | 1.05 V | 208 | 57.7 | -4.0 |
| 7 | 4874.00 | 43.9 PK | 74.0 | -30.1 | 1.64 V | 360 | 41.4 | 2.5 |
| 8 | 4874.00 | 30.8 AV | 54.0 | -23.2 | 1.64 V | 360 | 28.3 | 2.5 |
| 9 | 7311.00 | 43.2 PK | 74.0 | -30.8 | 1.94 V | 360 | 34.3 | 8.9 |
| 10 | 7311.00 | 30.1 AV | 54.0 | -23.9 | 1.94 V | 360 | 21.2 | 8.9 |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The resolution bandwidth of test receiver is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) for Average detection (AV). Emission AV measured by RBW/VBW= 1MHz/3kHz

| CHANNEL | TX Channel 9 | DETECTOR FUNCTION | Peak (PK)<br>Average (AV) |
|---|---|---|---|
| FREQUENCY RANGE | 1GHz ~ 25GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2452.00 | 100.3 PK | | | 2.76 H | 316 | 104.4 | -4.1 |
| 2 | *2452.00 | 92.1 AV | | | 2.76 H | 316 | 96.2 | -4.1 |
| 3 | 2483.50 | 68.4 PK | 74.0 | -5.6 | 2.76 H | 316 | 72.4 | -4.0 |
| 4 | 2483.50 | 51.2 AV | 54.0 | -2.8 | 2.76 H | 316 | 55.2 | -4.0 |
| 5 | 4904.00 | 42.1 PK | 74.0 | -31.9 | 2.09 H | 289 | 39.6 | 2.5 |
| 6 | 4904.00 | 29.7 AV | 54.0 | -24.3 | 2.09 H | 289 | 27.2 | 2.5 |
| 7 | 7356.00 | 42.4 PK | 74.0 | -31.6 | 1.93 H | 340 | 33.2 | 9.2 |
| 8 | 7356.00 | 29.1 AV | 54.0 | -24.9 | 1.93 H | 340 | 19.9 | 9.2 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2452.00 | 107.8 PK | | | 1.07 V | 202 | 111.9 | -4.1 |
| 2 | *2452.00 | 99.6 AV | | | 1.07 V | 202 | 103.7 | -4.1 |
| 3 | 2483.50 | 72.2 PK | 74.0 | -1.8 | 1.07 V | 202 | 76.2 | -4.0 |
| 4 | 2483.50 | 53.6 AV | 54.0 | -0.4 | 1.07 V | 202 | 57.6 | -4.0 |
| 5 | 4904.00 | 41.7 PK | 74.0 | -32.3 | 1.69 V | 360 | 39.2 | 2.5 |
| 6 | 4904.00 | 29.3 AV | 54.0 | -24.7 | 1.69 V | 360 | 26.8 | 2.5 |
| 7 | 7356.00 | 42.4 PK | 74.0 | -31.6 | 2.03 V | 360 | 33.2 | 9.2 |
| 8 | 7356.00 | 28.9 AV | 54.0 | -25.1 | 2.03 V | 360 | 19.7 | 9.2 |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The resolution bandwidth of test receiver is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) for Average detection (AV). Emission AV measured by RBW/VBW= 1MHz/3kHz

## Below 1GHz Data:

### 802.11g

| CHANNEL | TX Channel 6 | DETECTOR FUNCTION | Quasi-Peak (QP) |
|---|---|---|---|
| FREQUENCY RANGE | below 1GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 250.00 | 31.3 QP | 46.0 | -14.7 | 1.00 H | 91 | 40.8 | -9.5 |
| 2 | 320.01 | 34.9 QP | 46.0 | -11.1 | 1.00 H | 8 | 41.7 | -6.8 |
| 3 | 375.00 | 37.4 QP | 46.0 | -8.6 | 1.00 H | 340 | 42.9 | -5.5 |
| 4 | 480.01 | 34.7 QP | 46.0 | -11.3 | 2.00 H | 0 | 37.6 | -2.9 |
| 5 | 625.00 | 36.4 QP | 46.0 | -9.6 | 1.50 H | 333 | 36.0 | 0.4 |
| 6 | 874.99 | 37.5 QP | 46.0 | -8.5 | 1.50 H | 45 | 33.8 | 3.7 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 43.80 | 33.5 QP | 40.0 | -6.5 | 1.00 V | 348 | 41.9 | -8.4 |
| 2 | 104.74 | 30.8 QP | 43.5 | -12.7 | 1.00 V | 259 | 43.0 | -12.2 |
| 3 | 143.32 | 28.9 QP | 43.5 | -14.6 | 1.00 V | 43 | 37.6 | -8.7 |
| 4 | 375.00 | 36.7 QP | 46.0 | -9.3 | 1.00 V | 31 | 42.2 | -5.5 |
| 5 | 625.00 | 37.1 QP | 46.0 | -8.9 | 1.50 V | 6 | 36.7 | 0.4 |
| 6 | 875.02 | 38.1 QP | 46.0 | -7.9 | 1.00 V | 358 | 34.4 | 3.7 |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

## 4.2 Conducted Emission Measurement

### 4.2.1 Limits of Conducted Emission Measurement

| Frequency (MHz) | Conducted Limit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 - 0.5 | 66 - 56 | 56 - 46 |
| 0.50 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 4.2.2 Test Instruments

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|---|---|---|---|---|
| Test Receiver R&S | ESCS 30 | 847124/029 | Oct. 23, 2015 | Oct. 22, 2016 |
| Line-Impedance Stabilization Network (for EUT) R&S | ESH3-Z5 | 848773/004 | Oct. 28, 2015 | Oct. 27, 2016 |
| RF Cable | 5D-FB | COACAB-002 | Mar. 04, 2016 | Mar. 03, 2017 |
| 10 dB PAD Mini-Circuits | HAT-10+ | CONATT-004 | June 20, 2016 | June 19, 2017 |
| Software BVADT | BVADT_Cond_ V7.3.7.3 | NA | NA | NA |

**Note:**

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. 1.
3 Tested Date: July 20, 2016

4.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

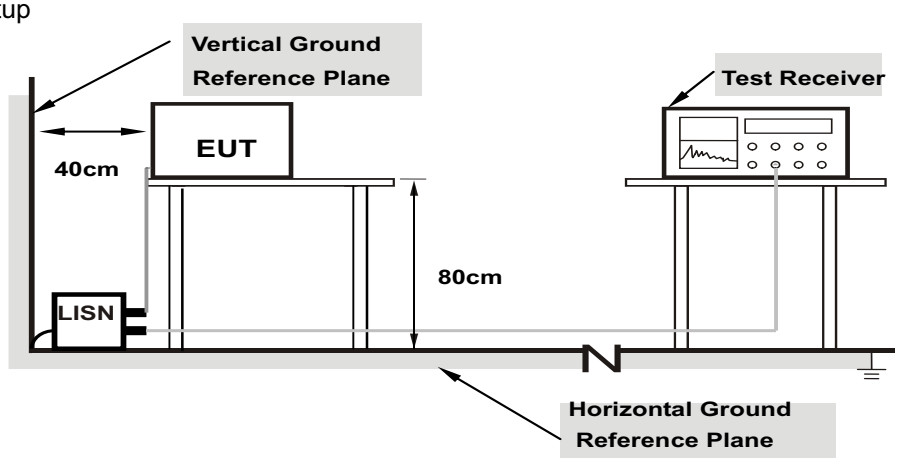
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

**NOTE:** The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup




**Note: 1.Support units were connected to second LISN.**

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

Same as 4.1.6.

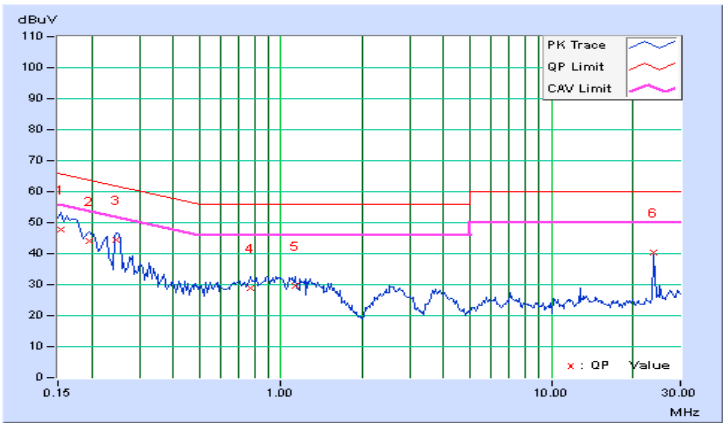
4.2.7 Test Results

| Phase | Line (L) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|---|---|---|---|

| No | Freq. | Corr. Factor | Reading Value [dB (uV)] | | Emission Level [dB (uV)] | | Limit [dB (uV)] | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | (dB) | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.15391 | 10.21 | 37.70 | 26.15 | 47.91 | 36.36 | 65.79 | 55.79 | -17.88 | -19.43 |
| 2 | 0.19687 | 10.22 | 33.85 | 24.39 | 44.07 | 34.61 | 63.74 | 53.74 | -19.67 | -19.13 |
| 3 | 0.24766 | 10.22 | 34.21 | 29.01 | 44.43 | 39.23 | 61.84 | 51.84 | -17.41 | -12.61 |
| 4 | 0.77109 | 10.24 | 18.74 | 11.80 | 28.98 | 22.04 | 56.00 | 46.00 | -27.02 | -23.96 |
| 5 | 1.12891 | 10.27 | 19.46 | 14.41 | 29.73 | 24.68 | 56.00 | 46.00 | -26.27 | -21.32 |
| **6** | **24.00000** | **11.43** | **29.01** | **28.01** | **40.44** | **39.44** | **60.00** | **50.00** | **-19.56** | **-10.56** |

**REMARKS:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

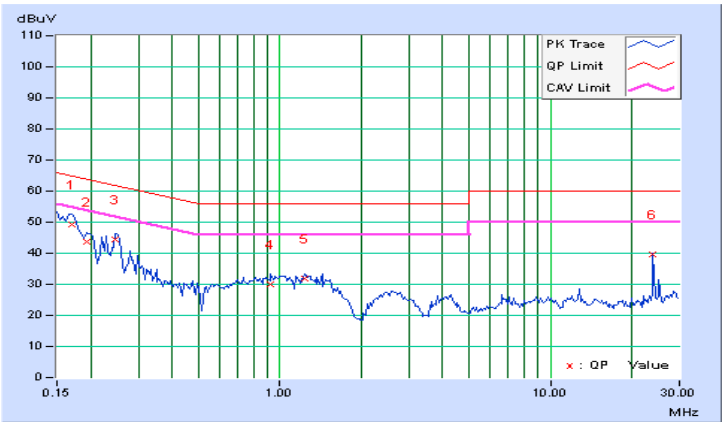


| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|---|---|---|---|

| No | Freq. | Corr. | Reading Value | | Emission Level | | Limit | | Margin | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Factor | [dB (uV)] | | [dB (uV)] | | [dB (uV)] | | (dB) | |
| | [MHz] | (dB) | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.16953 | 10.20 | 38.98 | 29.26 | 49.18 | 39.46 | 64.98 | 54.98 | -15.81 | -15.53 |
| 2 | 0.19297 | 10.21 | 33.56 | 22.55 | 43.77 | 32.76 | 63.91 | 53.91 | -20.14 | -21.15 |
| 3 | 0.24766 | 10.21 | 34.23 | 29.29 | 44.44 | 39.50 | 61.84 | 51.84 | -17.40 | -12.34 |
| 4 | 0.92734 | 10.24 | 19.78 | 14.86 | 30.02 | 25.10 | 56.00 | 46.00 | -25.98 | -20.90 |
| 5 | 1.23047 | 10.25 | 21.48 | 14.98 | 31.73 | 25.23 | 56.00 | 46.00 | -24.27 | -20.77 |
| 6 | 24.00000 | 11.13 | 28.55 | 28.25 | 39.68 | 39.38 | 60.00 | 50.00 | -20.32 | -10.62 |

**REMARKS:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

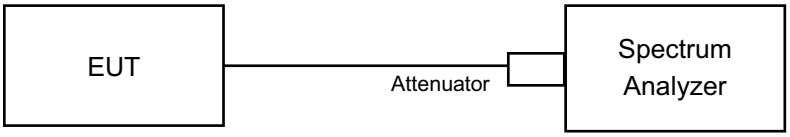


## 4.3 6dB Bandwidth Measurement

### 4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

### 4.3.2 Test Setup




### 4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.3.4 Test Procedure

a. Set resolution bandwidth (RBW) = 100kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

### 4.3.5 Deviation fromTest Standard

No deviation.

### 4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

### 4.3.7 Test Result

**802.11b**

| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | | Minimum Limit (MHz) | Pass / Fail |
|---|---|---|---|---|---|
| | | CHAIN 0 | CHAIN 1 | | |
| 1 | 2412 | 10.09 | 10.08 | 0.5 | PASS |
| 6 | 2437 | 10.08 | 10.08 | 0.5 | PASS |
| 11 | 2462 | 10.08 | 9.14 | 0.5 | PASS |

**802.11g**

| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | | Minimum Limit (MHz) | Pass / Fail |
|---|---|---|---|---|---|
| | | CHAIN 0 | CHAIN 1 | | |
| 1 | 2412 | 15.17 | 15.17 | 0.5 | PASS |
| 6 | 2437 | 15.18 | 15.17 | 0.5 | PASS |
| 11 | 2462 | 15.17 | 15.17 | 0.5 | PASS |

**802.11n (HT20)**

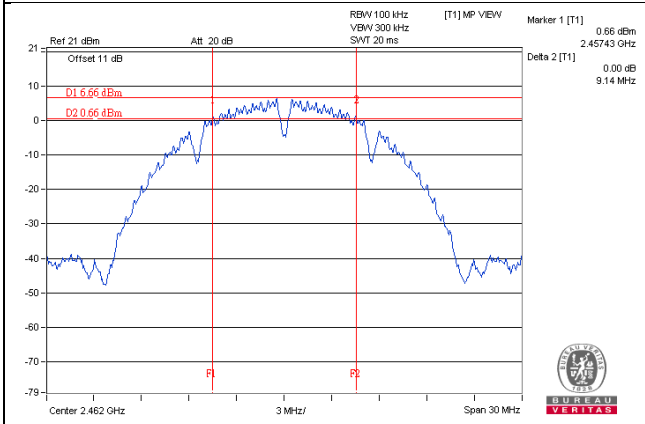
| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | | Minimum Limit (MHz) | Pass / Fail |
|---|---|---|---|---|---|
| | | CHAIN 0 | CHAIN 1 | | |
| 1 | 2412 | 15.16 | 15.16 | 0.5 | Pass |
| 6 | 2437 | 15.17 | 15.17 | 0.5 | Pass |
| 11 | 2462 | 15.17 | 15.15 | 0.5 | Pass |

**802.11n (HT40)**

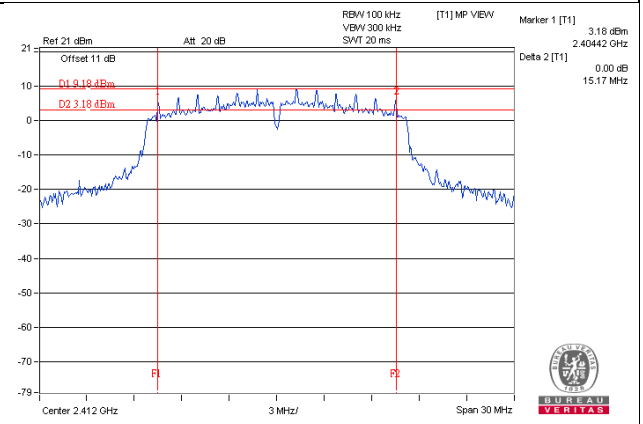
| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | | Minimum Limit (MHz) | Pass / Fail |
|---|---|---|---|---|---|
| | | CHAIN 0 | CHAIN 1 | | |
| 3 | 2422 | 35.12 | 35.14 | 0.5 | Pass |
| 6 | 2437 | 35.09 | 35.12 | 0.5 | Pass |
| 9 | 2452 | 35.17 | 35.17 | 0.5 | Pass |

## Spectrum Plot of Worst Value

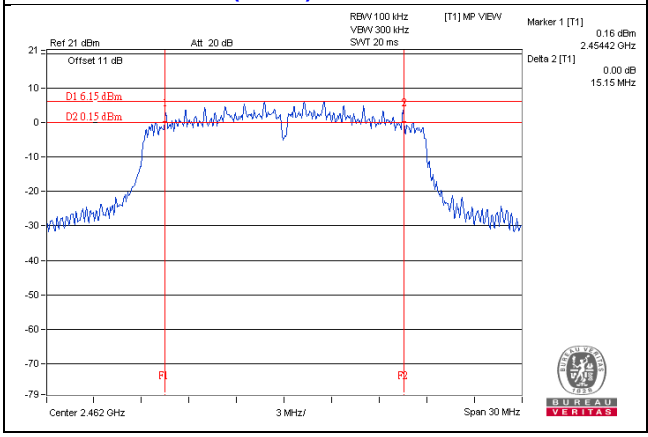
### 802.11b / Chain 1 : CH11



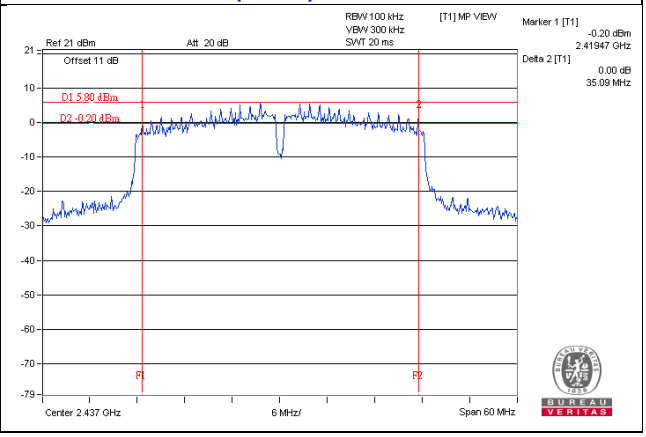

### 802.11g / Chain 0 : CH1




### 802.11n (HT20) / Chain 1 : CH11




### 802.11n (HT40) / Chain 0 : CH6



## 4.4 Conducted Output Power Measurement

### 4.4.1 Limits of Conducted Output Power Measurement

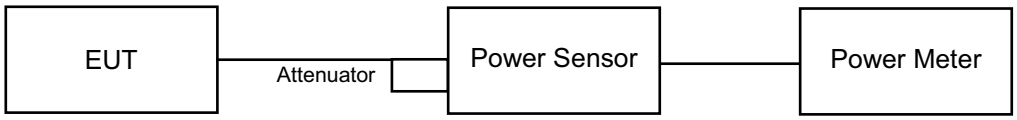
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any $N_{ANT}$;
Array Gain = 5 log($N_{ANT}/N_{SS}$) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = 10 log($N_{ANT}/N_{SS}$) dB.

### 4.4.2 Test Setup




### 4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.4.4 Test Procedures

A peak / average power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak / average power sensor. Record the power level.

### 4.4.5 Deviation from Test Standard

No deviation.

### 4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

**FOR PEAK POWER**

**802.11b**

| Chan. | Freq. (MHz) | Peak Power (dBm) | | Total Power (mW) | Total Power (dBm) | Limit (dBm) | Pass / Fail |
|---|---|---|---|---|---|---|---|
| | | Chain 0 | Chain 1 | | | | |
| 1 | 2412 | 20.45 | 19.34 | 196.818 | 22.94 | 30 | Pass |
| 6 | 2437 | 19.52 | 18.32 | 157.456 | 21.97 | 30 | Pass |
| 11 | 2462 | 19.06 | 17.84 | 141.352 | 21.50 | 30 | Pass |

**802.11g**

| Chan. | Freq. (MHz) | Peak Power (dBm) | | Total Power (mW) | Total Power (dBm) | Limit (dBm) | Pass / Fail |
|---|---|---|---|---|---|---|---|
| | | Chain 0 | Chain 1 | | | | |
| 1 | 2412 | 23.56 | 23.42 | 446.772 | 26.50 | 30 | Pass |
| 6 | 2437 | 24.33 | 24.17 | 532.235 | 27.26 | 30 | Pass |
| 11 | 2462 | 22.69 | 22.26 | 354.047 | 25.49 | 30 | Pass |

**802.11n (HT20)**

| Chan. | Freq. (MHz) | Peak Power (dBm) | | Total Power (mW) | Total Power (dBm) | Limit (dBm) | Pass / Fail |
|---|---|---|---|---|---|---|---|
| | | Chain 0 | Chain 1 | | | | |
| 1 | 2412 | 23.14 | 22.21 | 372.404 | 25.71 | 30 | Pass |
| 6 | 2437 | 24.33 | 24.13 | 529.84 | 27.24 | 30 | Pass |
| 11 | 2462 | 22.95 | 22.46 | 373.44 | 25.72 | 30 | Pass |

**802.11n (HT40)**

| Chan. | Freq. (MHz) | Peak Power (dBm) | | Total Power (mW) | Total Power (dBm) | Limit (dBm) | Pass / Fail |
|---|---|---|---|---|---|---|---|
| | | Chain 0 | Chain 1 | | | | |
| 3 | 2422 | 20.47 | 19.28 | 196.152 | 22.93 | 30 | Pass |
| 6 | 2437 | 23.14 | 22.56 | 386.365 | 25.87 | 30 | Pass |
| 9 | 2452 | 21.25 | 20.31 | 240.751 | 23.82 | 30 | Pass |

## FOR AVERAGE POWER

### 802.11b

| Chan. | Frequency (MHz) | Avg. Power (dBm) | | Total Power (mW) | Total Power (dBm) |
|---|---|---|---|---|---|
| | | Chain 0 | Chain 1 | | |
| 1 | 2412 | 18.75 | 17.54 | 131.743 | 21.20 |
| 6 | 2437 | 17.81 | 16.63 | 106.421 | 20.27 |
| 11 | 2462 | 17.34 | 15.92 | 93.284 | 19.70 |

### 802.11g

| Chan. | Frequency (MHz) | Avg. Power (dBm) | | Total Power (mW) | Total Power (dBm) |
|---|---|---|---|---|---|
| | | Chain 0 | Chain 1 | | |
| 1 | 2412 | 18.76 | 17.61 | 132.839 | 21.23 |
| 6 | 2437 | 21.44 | 20.94 | 263.481 | 24.21 |
| 11 | 2462 | 17.19 | 16.13 | 93.38 | 19.70 |

### 802.11n (HT20)

| Chan. | Frequency (MHz) | Avg. Power (dBm) | | Total Power (mW) | Total Power (dBm) |
|---|---|---|---|---|---|
| | | Chain 0 | Chain 1 | | |
| 1 | 2412 | 16.54 | 15.54 | 80.892 | 19.08 |
| 6 | 2437 | 21.33 | 20.93 | 259.711 | 24.14 |
| 11 | 2462 | 17.34 | 16.64 | 100.332 | 20.01 |

### 802.11n (HT40)

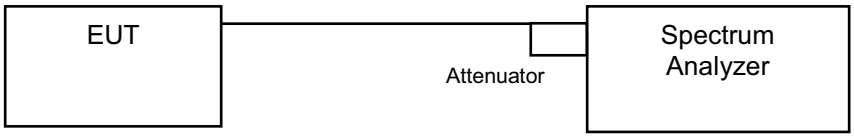
| Chan. | Frequency (MHz) | Avg. Power (dBm) | | Total Power (mW) | Total Power (dBm) |
|---|---|---|---|---|---|
| | | Chain 0 | Chain 1 | | |
| 3 | 2422 | 13.15 | 11.93 | 36.25 | 15.59 |
| 6 | 2437 | 17.83 | 16.97 | 110.448 | 20.43 |
| 9 | 2452 | 14.68 | 13.74 | 53.035 | 17.25 |

## 4.5 Power Spectral Density Measurement

### 4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm.

### 4.5.2 Test Setup




### 4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.5.4 Test Procedure

a. Set analyzer center frequency to DTS channel center frequency.
b. Set the span to 1.5 times the DTS bandwidth.
c. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d. Set the VBW ≥ 3 × RBW.
e. Detector = peak.
f. Sweep time = auto couple.
g. Trace mode = max hold.
h. Allow trace to fully stabilize.
i. Use the peak marker function to determine the maximum amplitude level within the RBW.

### 4.5.5 Deviation from Test Standard

No deviation.

### 4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

**802.11b**

| TX chain | Channel | Freq. (MHz) | PSD (dBm/3kHz) | 10 log (N=2) dB | Total PSD (dBm/3kHz) | Limit (dBm/3kHz) | Pass /Fail |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 2412 | -6.74 | 3.01 | -3.73 | 8 | Pass |
| | 6 | 2437 | -7.94 | 3.01 | -4.93 | 8 | Pass |
| | 11 | 2462 | -9.88 | 3.01 | -6.87 | 8 | Pass |
| 1 | 1 | 2412 | -7.92 | 3.01 | -4.91 | 8 | Pass |
| | 6 | 2437 | -9.84 | 3.01 | -6.83 | 8 | Pass |
| | 11 | 2462 | -9.46 | 3.01 | -6.45 | 8 | Pass |

**NOTE:** Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20})^2$ / 2] = 5.86dBi < 6dBi , so the power density limit shall not be reduced.

**802.11g**

| TX chain | Channel | Freq. (MHz) | PSD (dBm/3kHz) | 10 log (N=2) dB | Total PSD (dBm/3kHz) | Limit (dBm/3kHz) | Pass /Fail |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 2412 | -7.47 | 3.01 | -4.46 | 8 | Pass |
| | 6 | 2437 | -4.59 | 3.01 | -1.58 | 8 | Pass |
| | 11 | 2462 | -9.76 | 3.01 | -6.75 | 8 | Pass |
| 1 | 1 | 2412 | -9.47 | 3.01 | -6.46 | 8 | Pass |
| | 6 | 2437 | -6.47 | 3.01 | -3.46 | 8 | Pass |
| | 11 | 2462 | -10.64 | 3.01 | -7.63 | 8 | Pass |

**NOTE:** Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20})^2$ / 2] = 5.86dBi < 6dBi , so the power density limit shall not be reduced.

**802.11n (HT20)**

| TX chain | Channel | Freq. (MHz) | PSD (dBm/3kHz) | 10 log (N=2) dB | Total PSD (dBm/3kHz) | Limit (dBm/3kHz) | Pass /Fail |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 2412 | -9.67 | 3.01 | -6.66 | 8 | Pass |
| | 6 | 2437 | -5.27 | 3.01 | -2.26 | 8 | Pass |
| | 11 | 2462 | -8.52 | 3.01 | -5.51 | 8 | Pass |
| 1 | 1 | 2412 | -10.66 | 3.01 | -7.65 | 8 | Pass |
| | 6 | 2437 | -5.57 | 3.01 | -2.56 | 8 | Pass |
| | 11 | 2462 | -9.59 | 3.01 | -6.58 | 8 | Pass |

**NOTE:** Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20})^2$ / 2] = 5.86dBi < 6dBi , so the power density limit shall not be reduced.

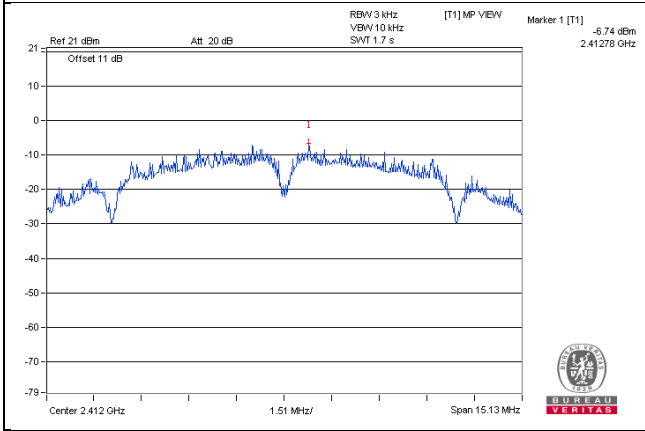
### 802.11n (HT40)

| TX chain | Channel | Freq. (MHz) | PSD (dBm/3kHz) | 10 log (N=2) dB | Total PSD (dBm/3kHz) | Limit (dBm/3kHz) | Pass /Fail |
|---|---|---|---|---|---|---|---|
| 0 | 3 | 2412 | -16.30 | 3.01 | -13.29 | 8 | Pass |
| | 6 | 2437 | -9.07 | 3.01 | -6.06 | 8 | Pass |
| | 9 | 2462 | -13.12 | 3.01 | -10.11 | 8 | Pass |
| 1 | 3 | 2412 | -15.92 | 3.01 | -12.91 | 8 | Pass |
| | 6 | 2437 | -11.64 | 3.01 | -8.63 | 8 | Pass |
| | 9 | 2462 | -13.95 | 3.01 | -10.94 | 8 | Pass |

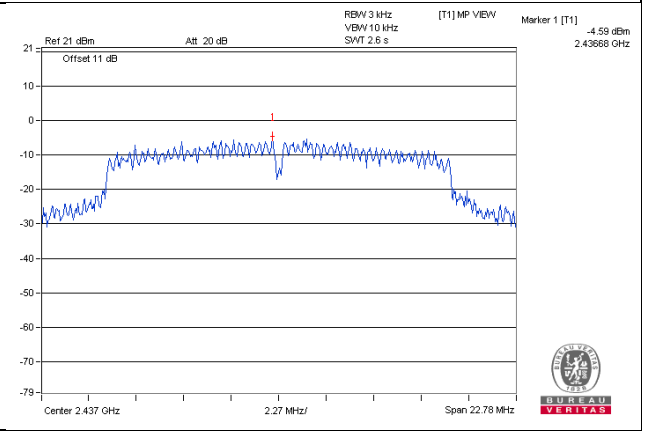
**NOTE:** Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20})^2$ / 2] = 5.86dBi < 6dBi , so the power density limit shall not be reduced.

## Spectrum Plot of Worst Value

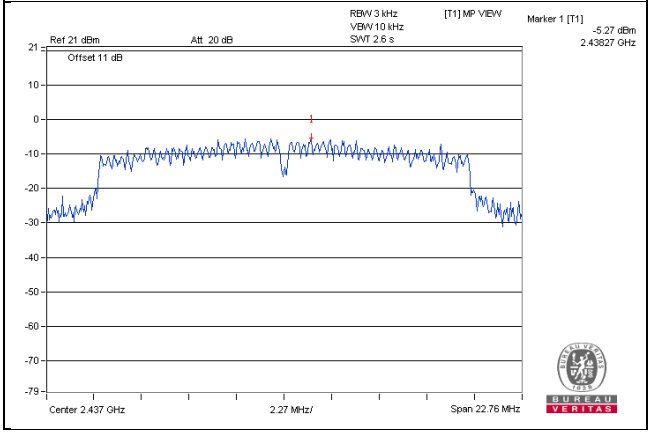
### 802.11b / Chain 0 : CH1



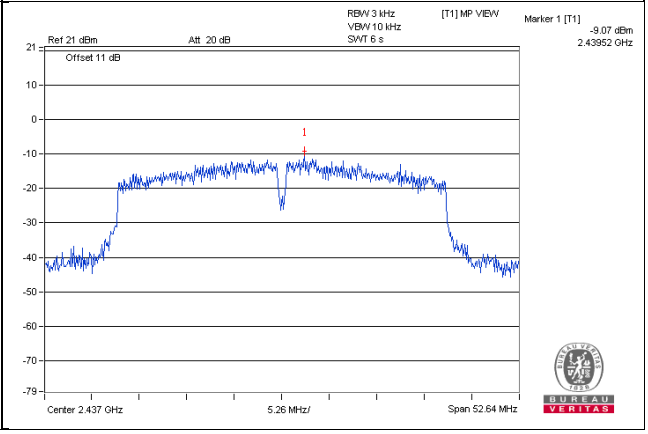

### 802.11g / Chain 0 : CH6




### 802.11n (HT20) / Chain 0 : CH6




### 802.11n (HT40) / Chain 0 : CH6

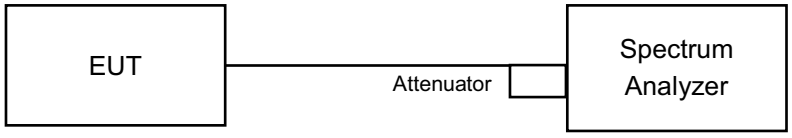


## 4.6 Conducted Out of Band Emission Measurement

### 4.6.1 Limits of Conducted Out of Band Emission Measurement

Below 20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

### 4.6.2 Test Setup




### 4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.6.4 Test Procedure

**MEASUREMENT PROCEDURE REF**

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

**MEASUREMENT PROCEDURE OOBE**

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

### 4.6.5 Deviation from Test Standard

No deviation.

### 4.6.6 EUT Operating Condition

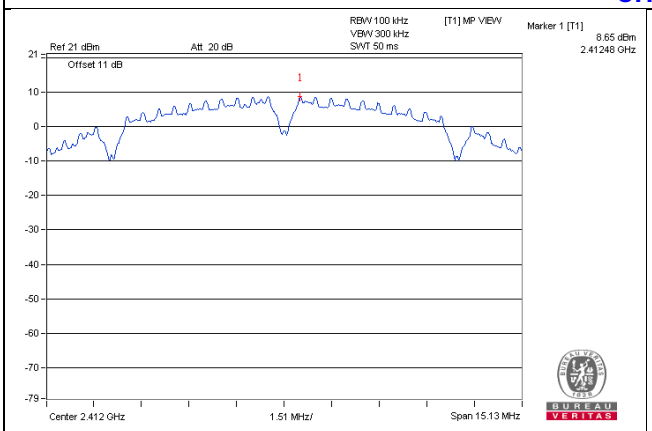
Same as Item 4.3.6

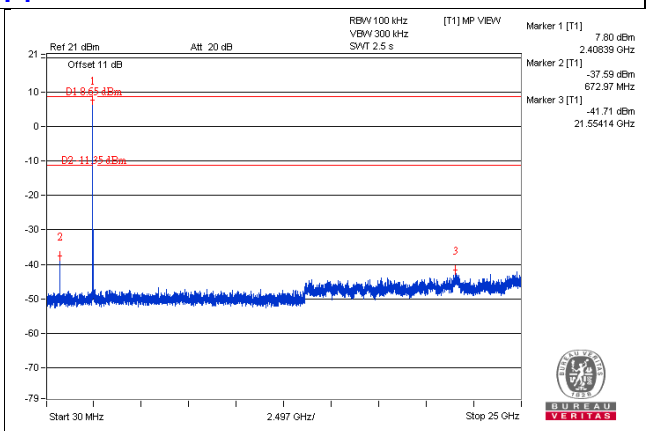
### 4.6.7 Test Results

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

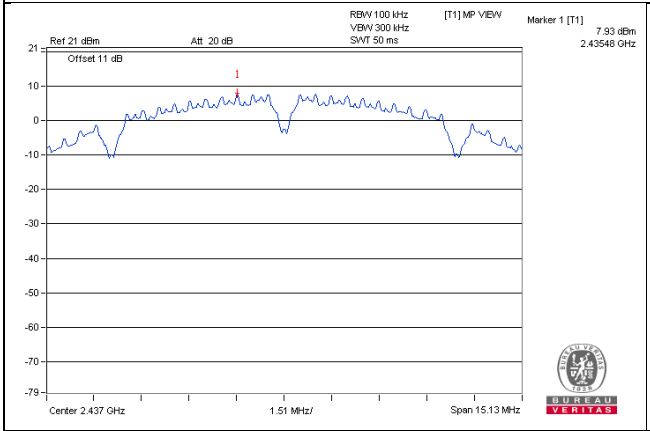
## 802.11b - CHAIN 0

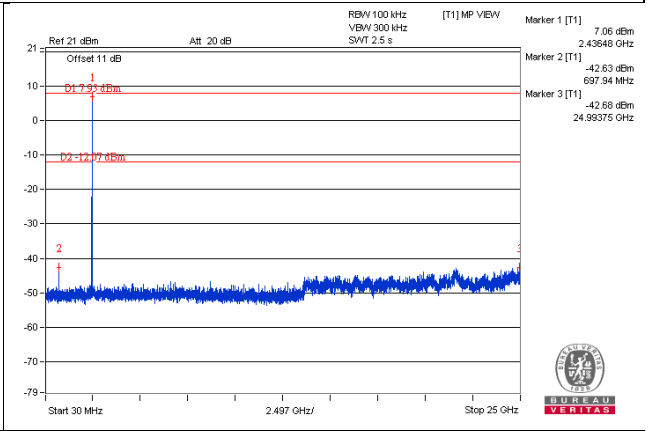
### CH 1



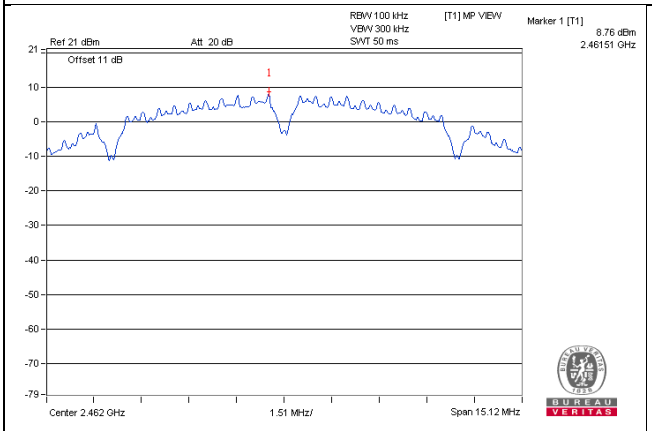



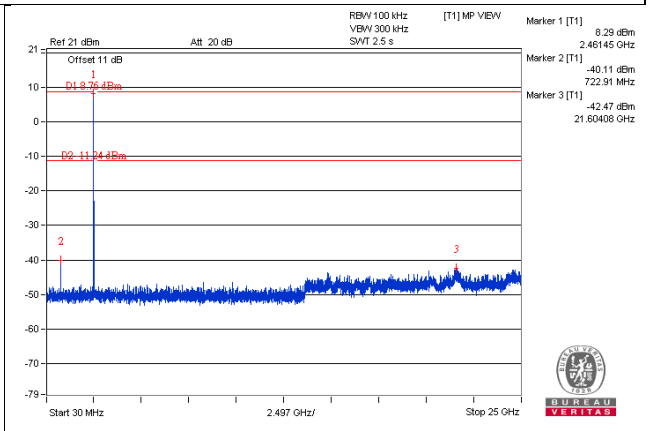

### CH 6



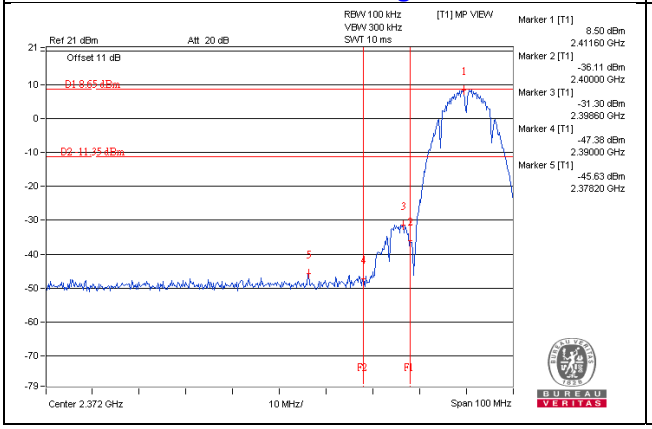




### CH 11

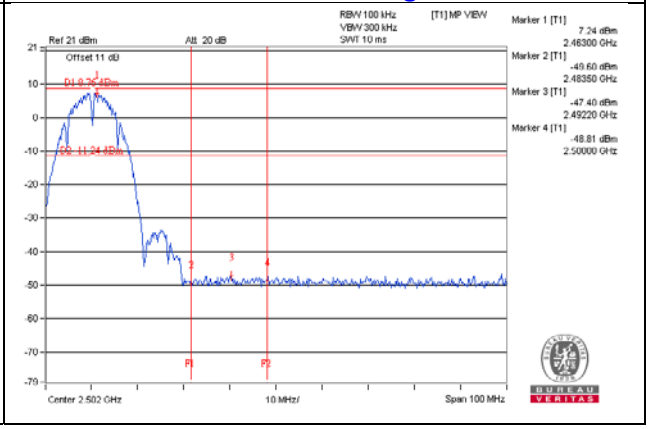



### CH 1 Band edge

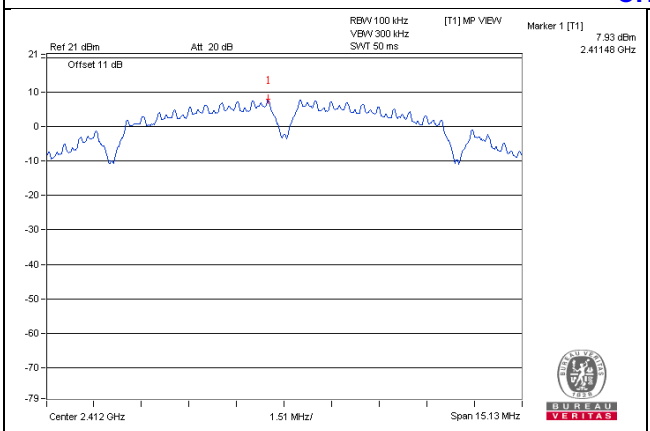


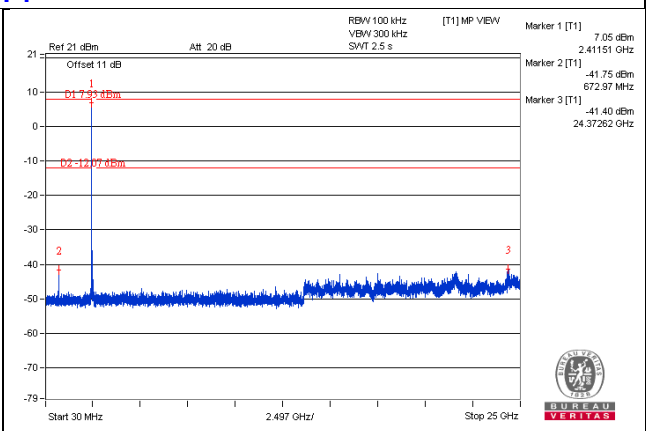

### CH 11 Band edge



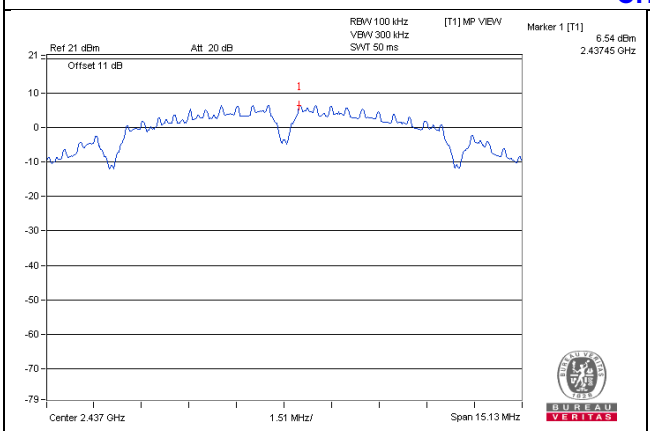
## CHAIN 1

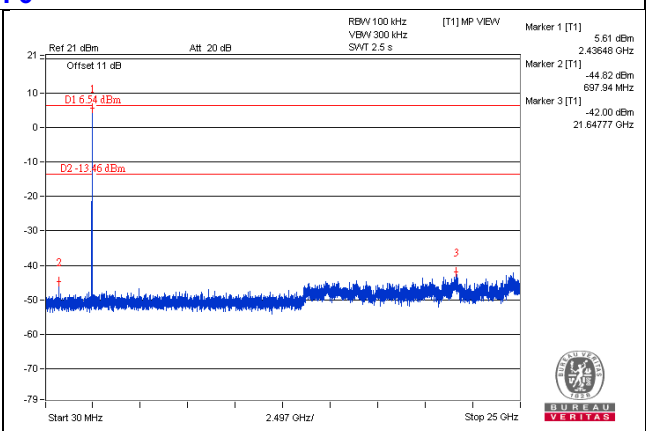
### CH 1




### CH 6

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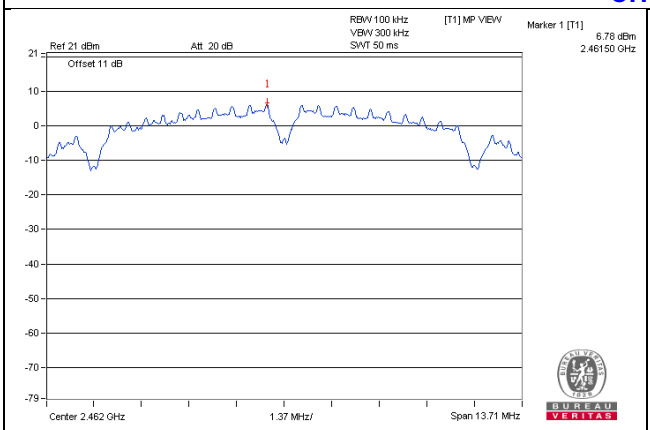
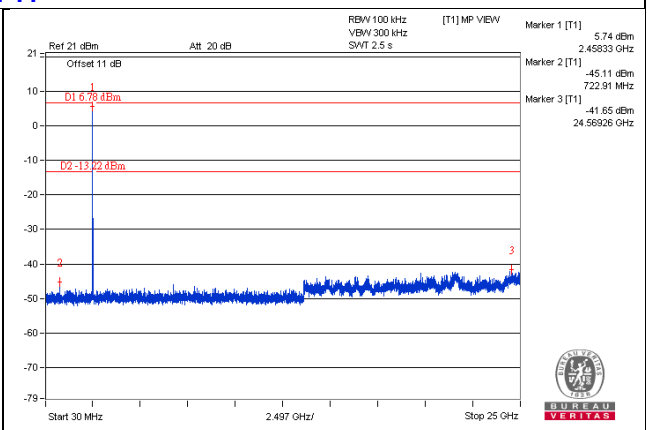
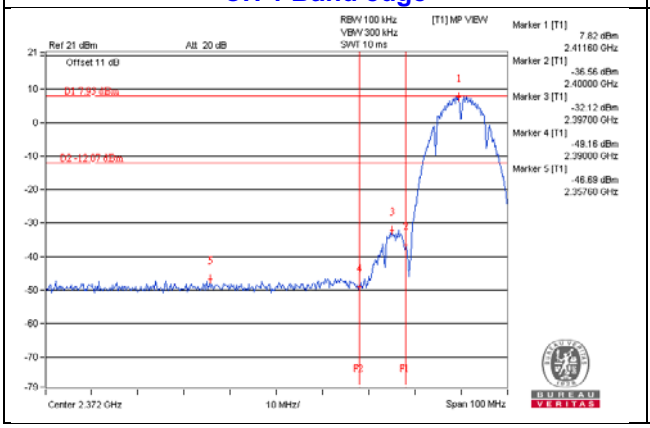
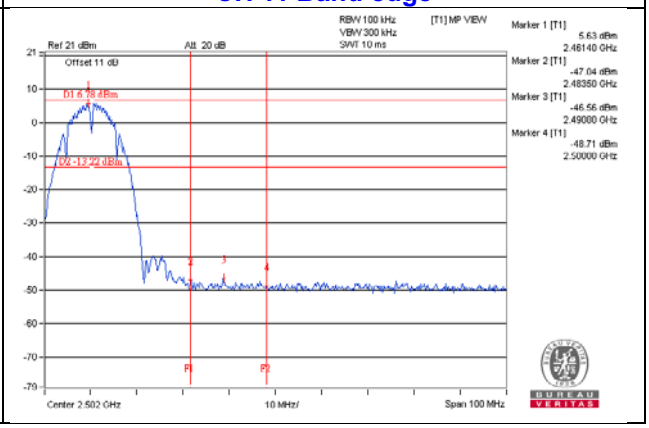



### CH 1 Band edge

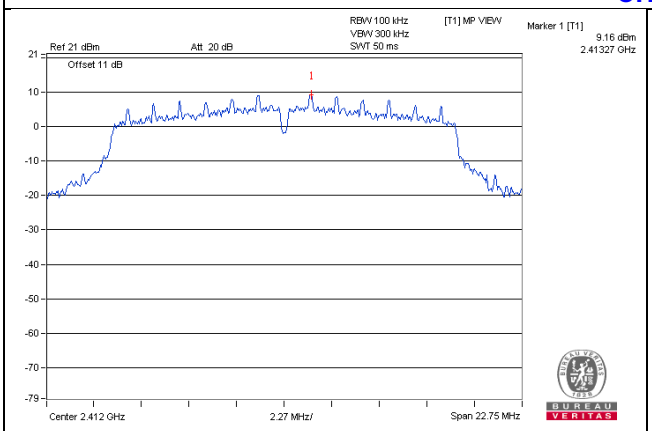


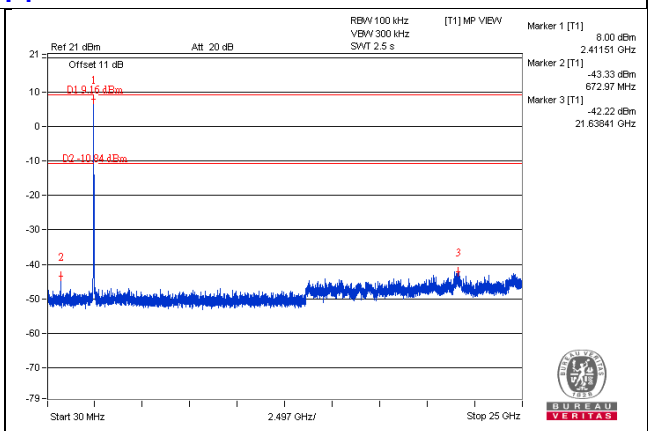

### CH 11 Band edge



## 802.11g - CHAIN 0

### CH 1

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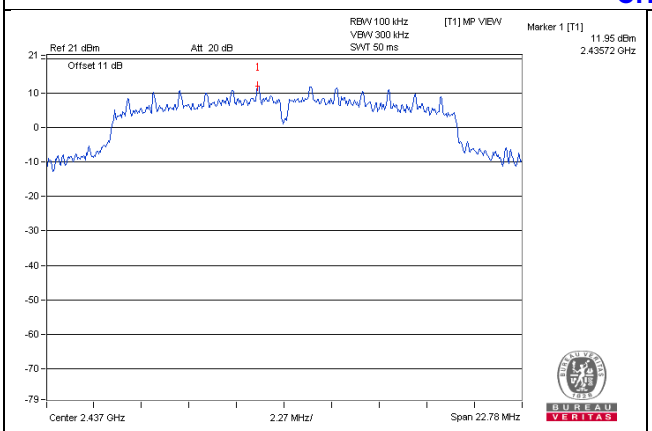
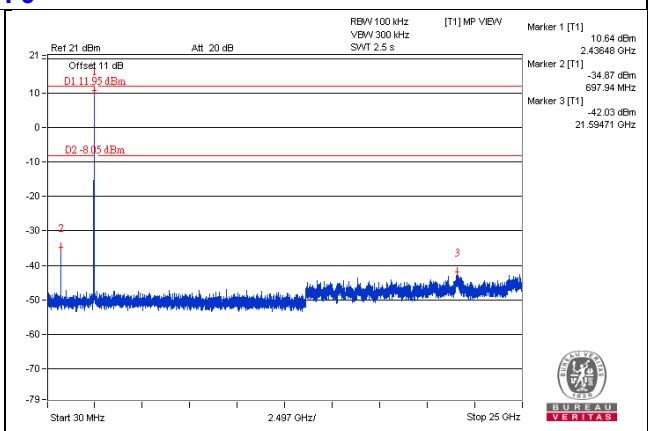
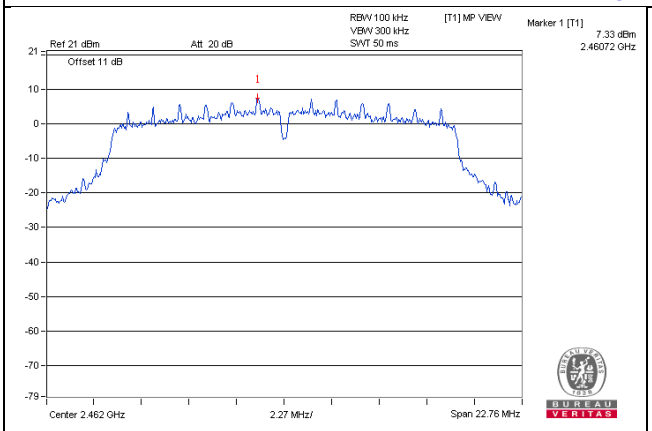
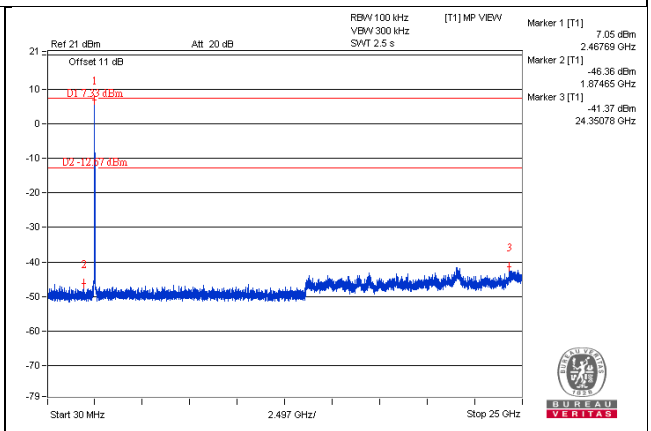


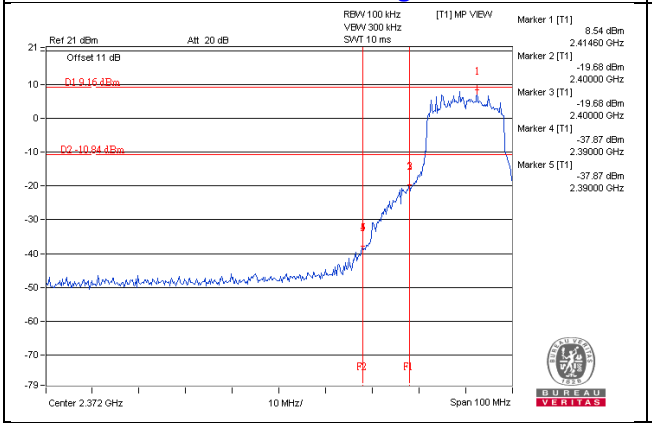




### CH 11

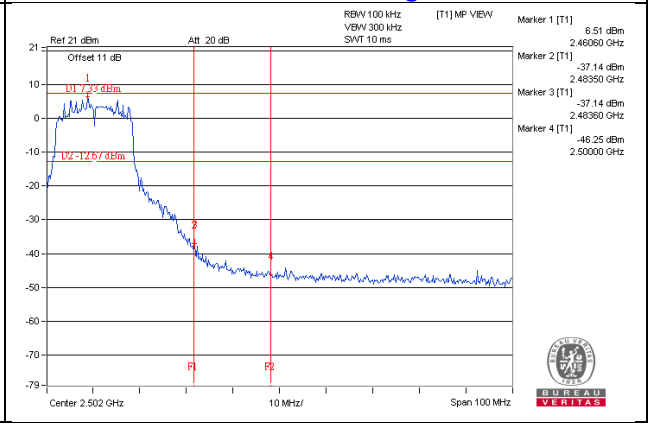



### CH 1 Band edge

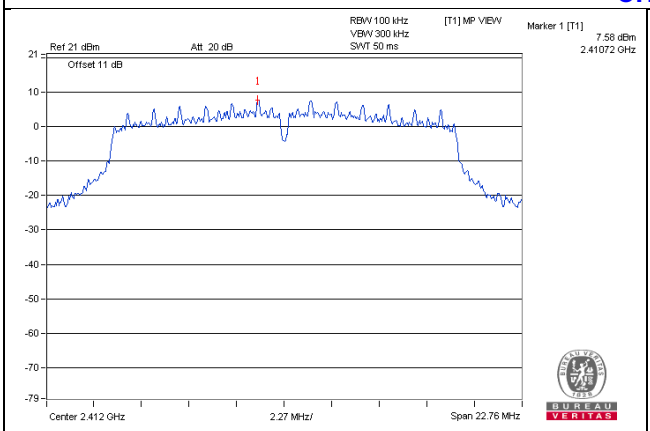


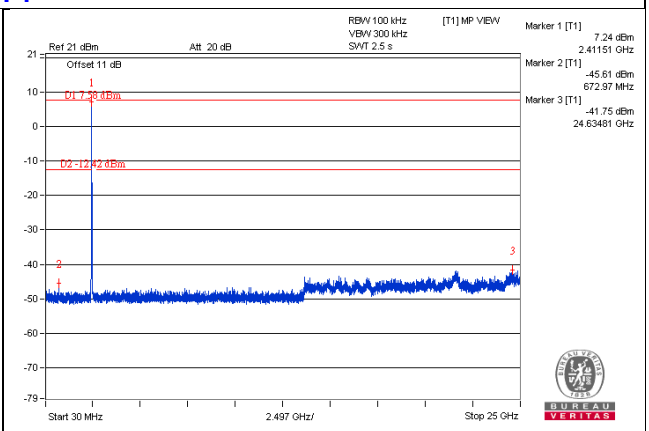

### CH 11 Band edge



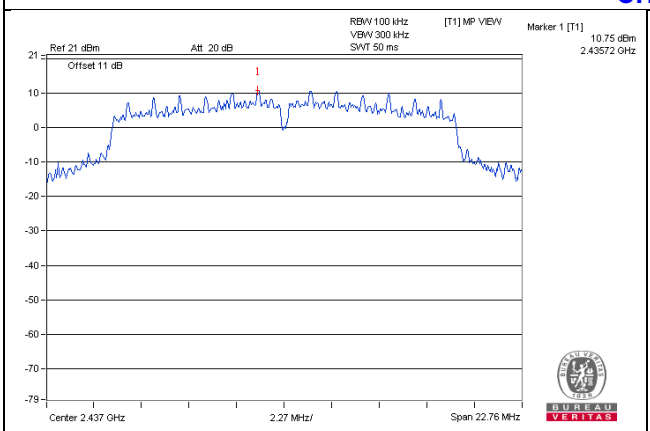
## CHAIN 1

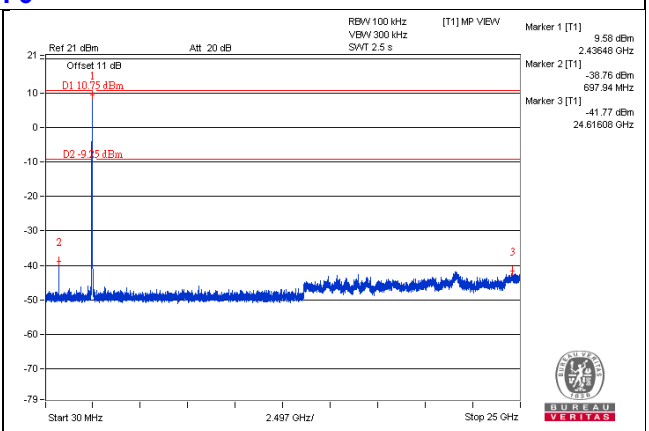
### CH 1



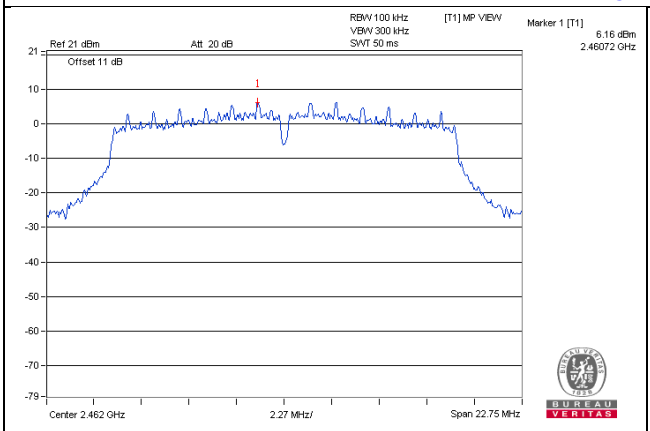



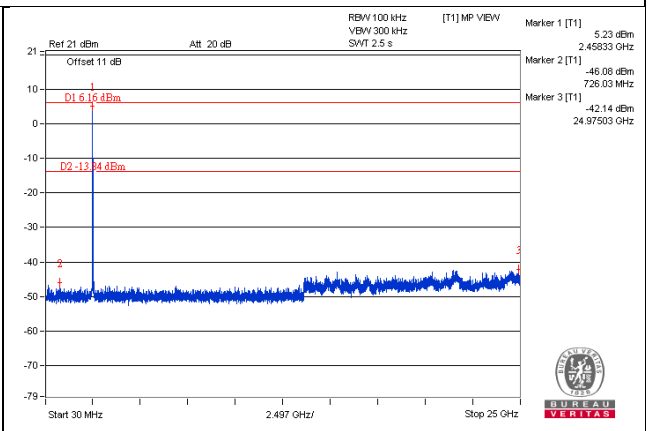

### CH 6



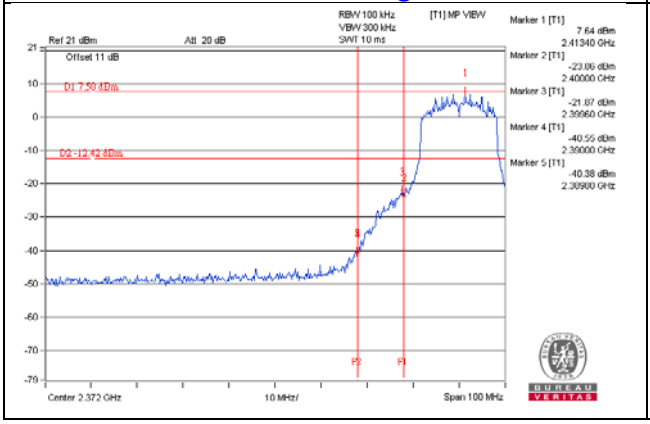




### CH 11

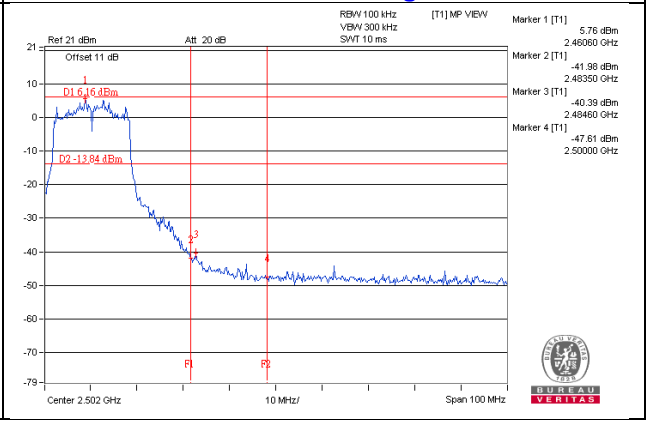



### CH 1 Band edge

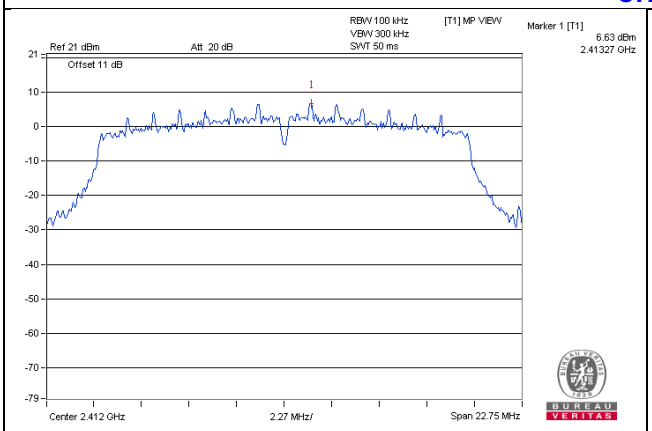


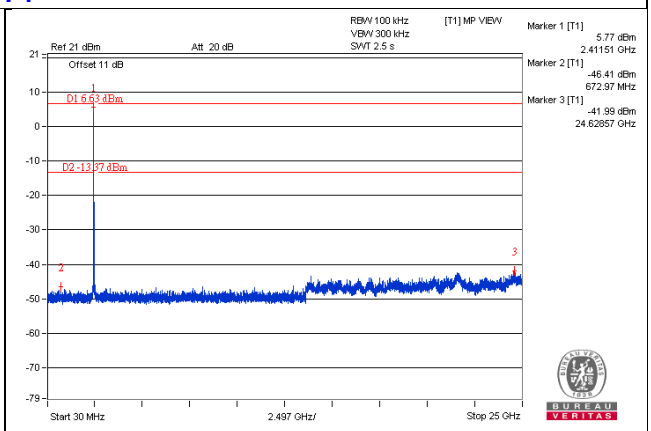

### CH 11 Band edge



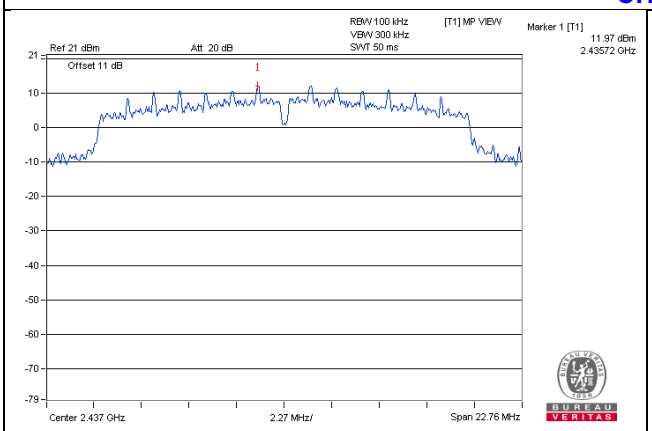
## 802.11n (HT20) - CHAIN 0

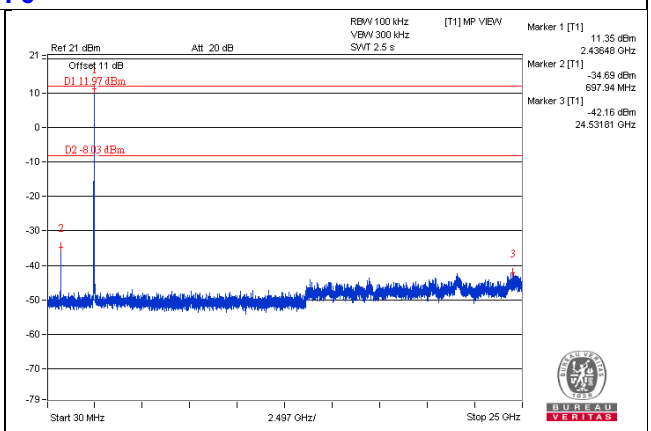
### CH 1



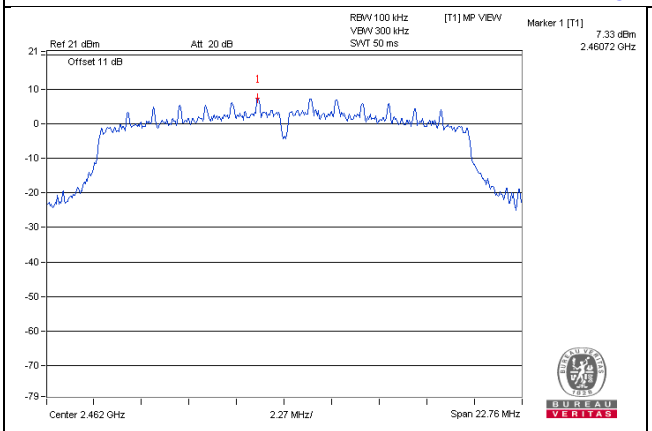



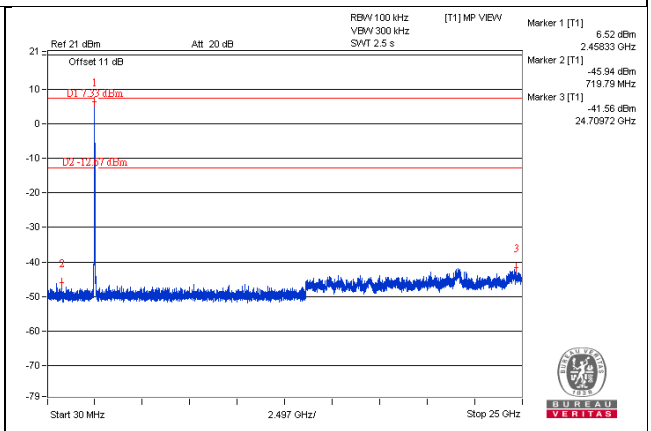

### CH 6



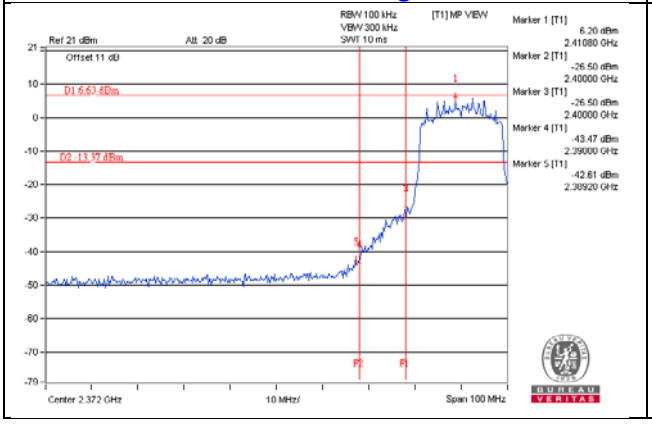




### CH 11

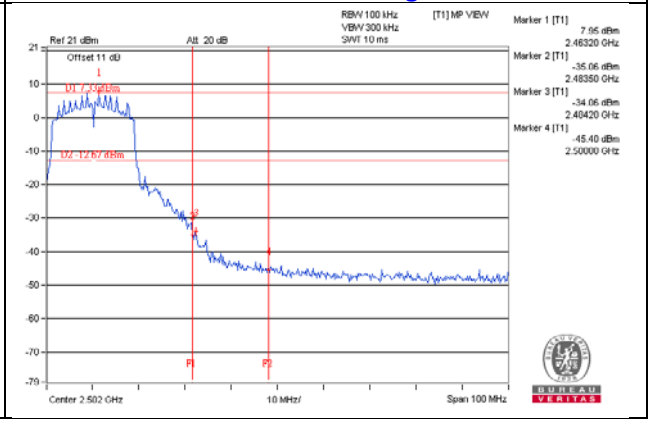



### CH 1 Band edge

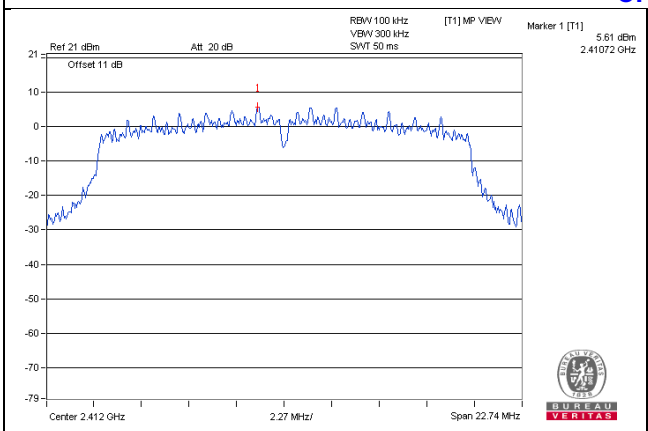


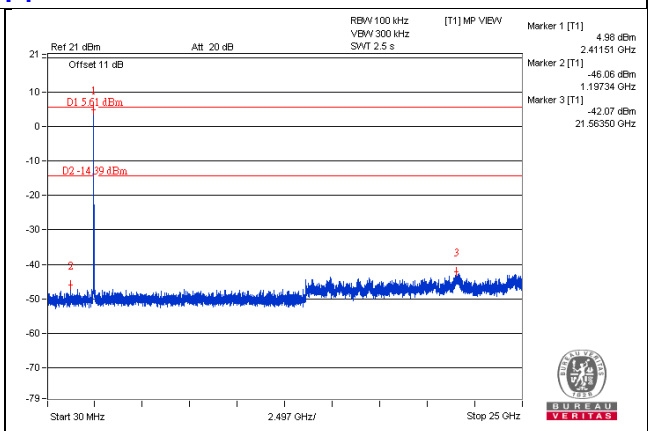

### CH 11 Band edge



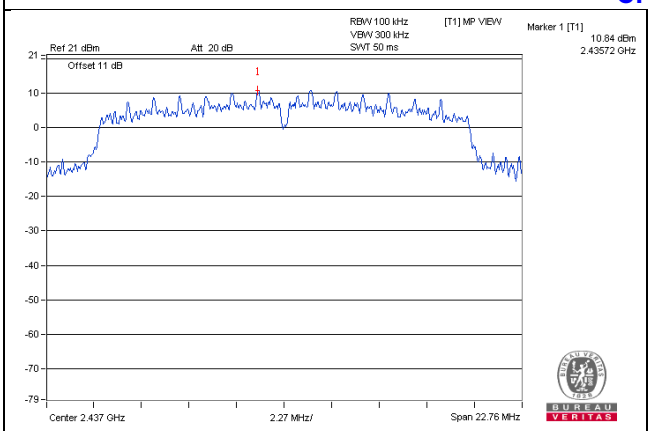
## CHAIN 1

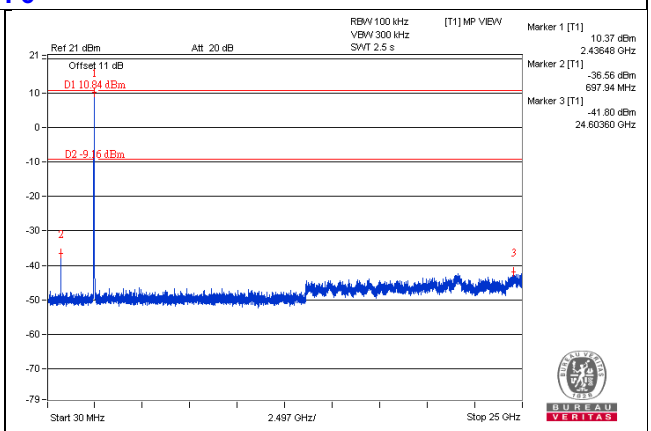
### CH 1



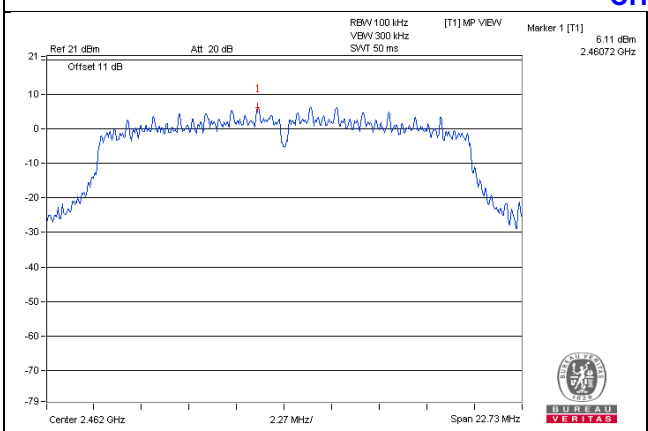



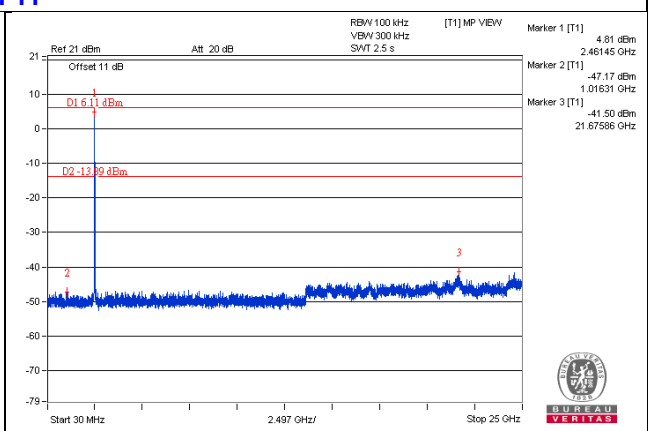

### CH 6



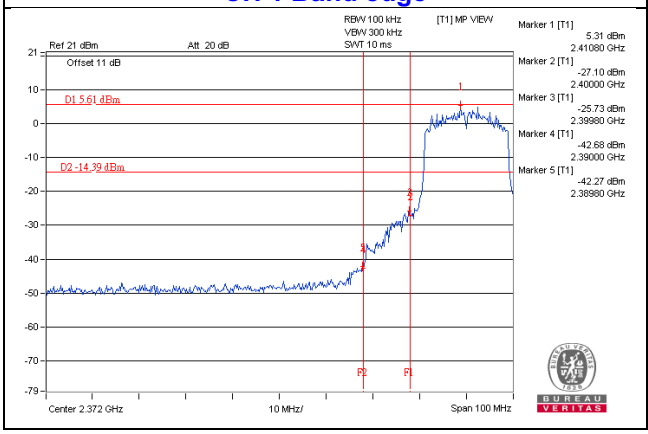




### CH 11

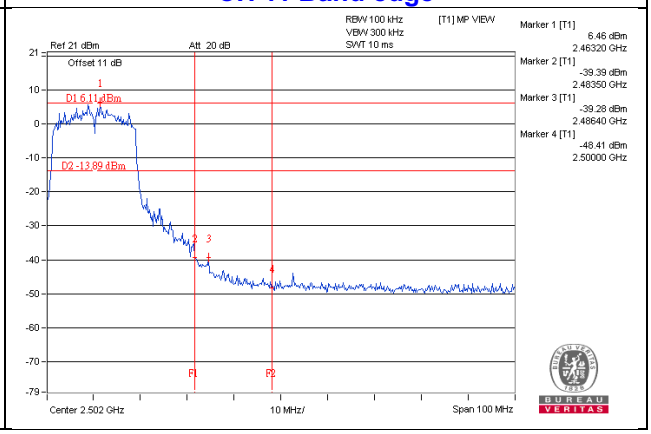



### CH 1 Band edge

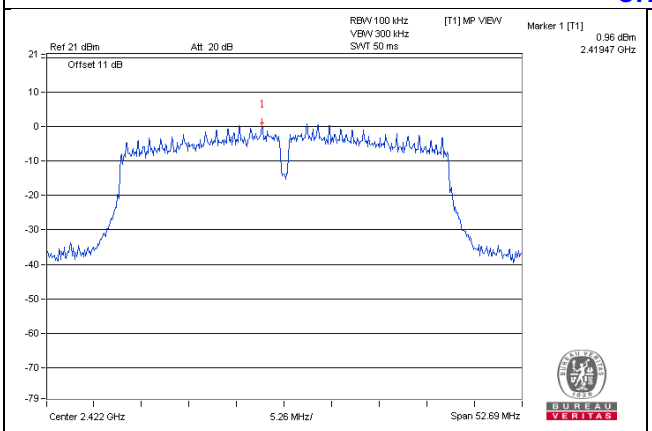


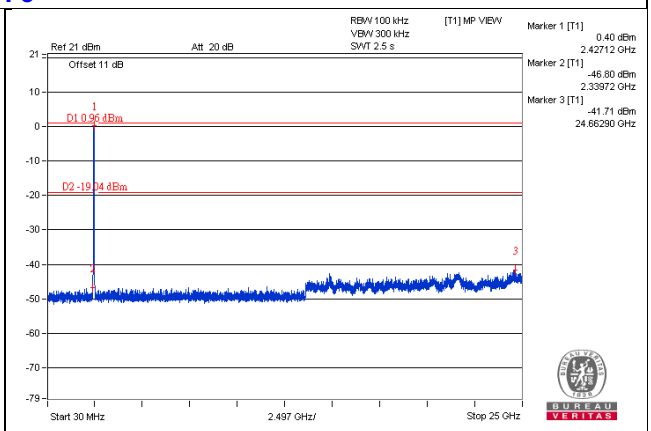

### CH 11 Band edge



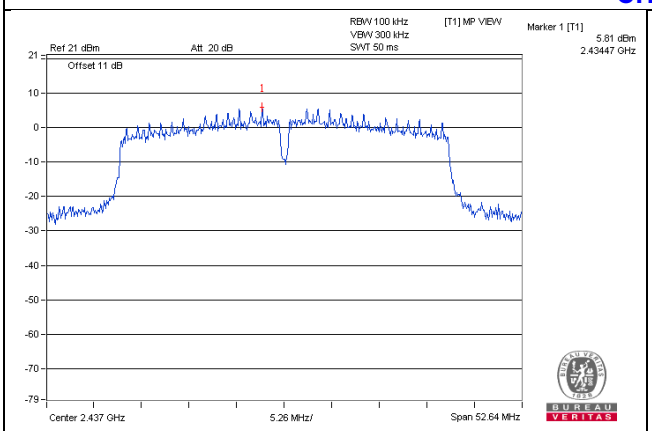
## 802.11n (HT40) - CHAIN 0

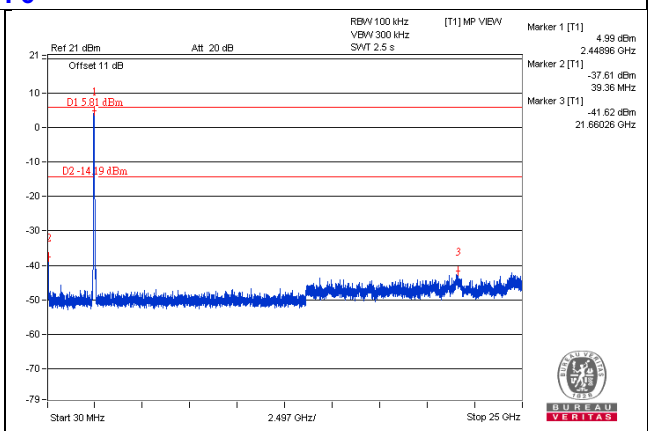
### CH 3



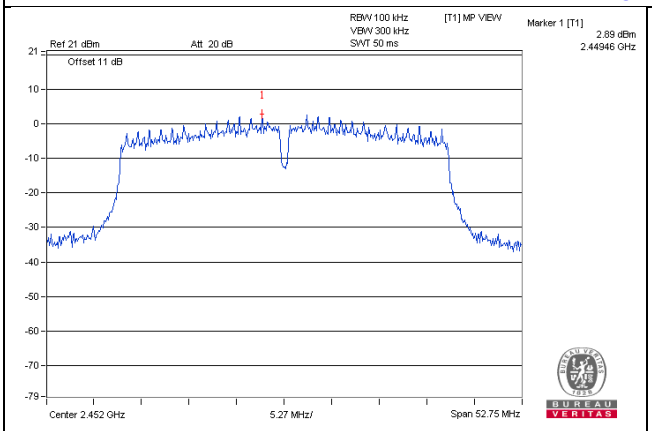



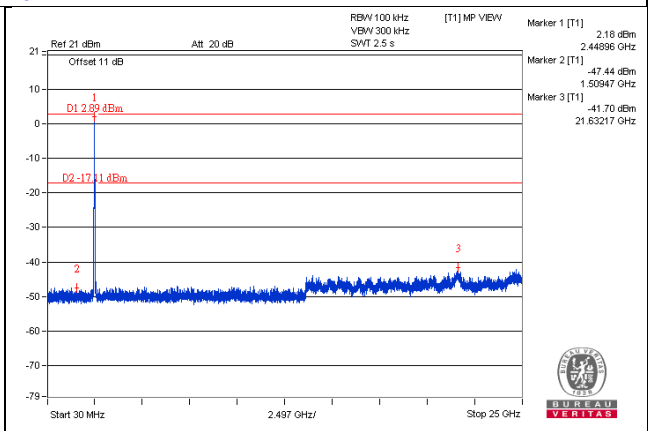

### CH 6



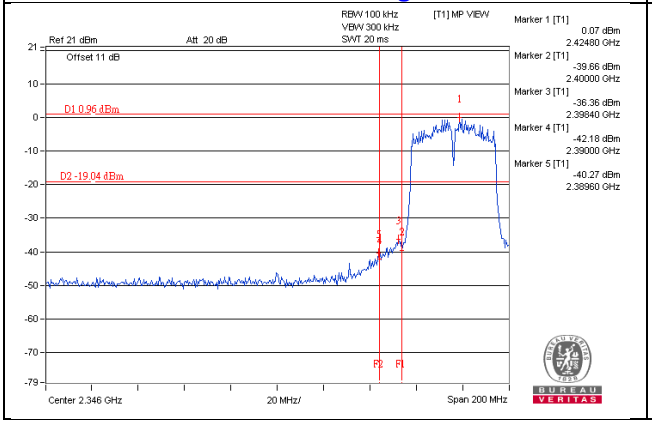




### CH 9

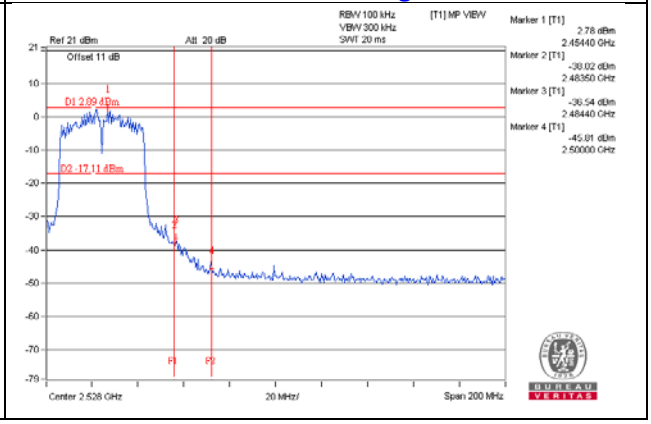



### CH 3 Band edge

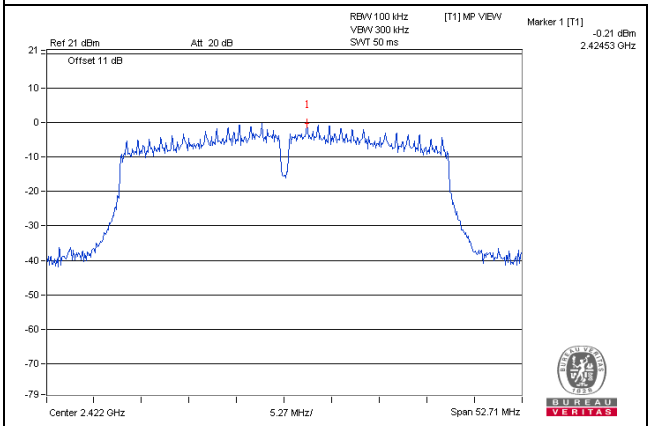


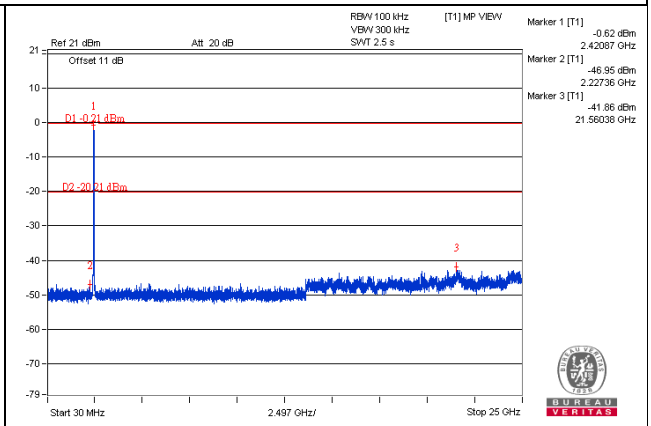

### CH 9 Band edge



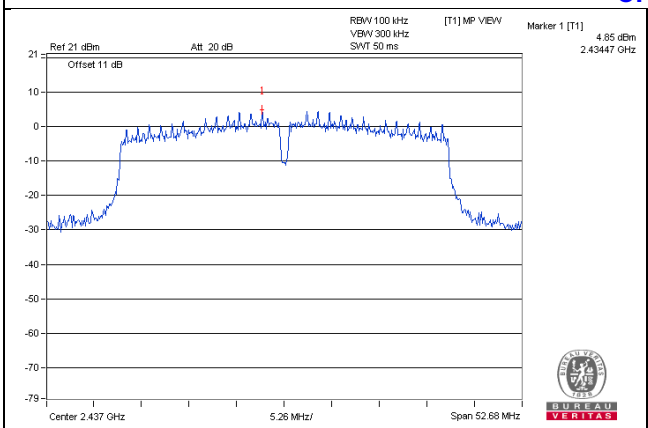
## CHAIN 1

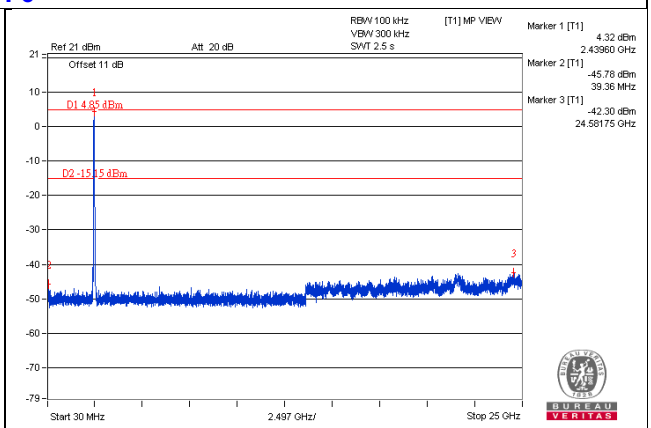
### CH 3



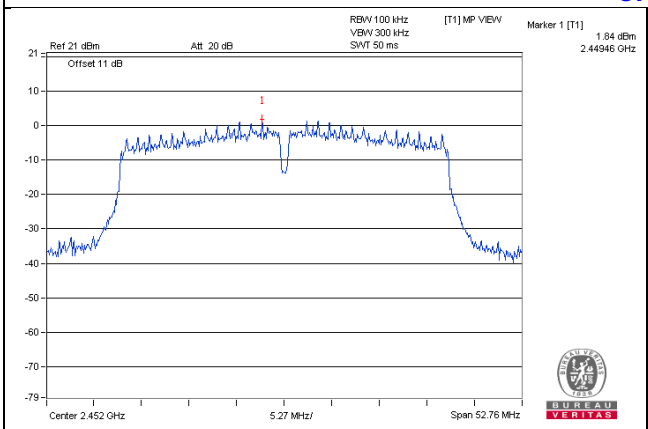



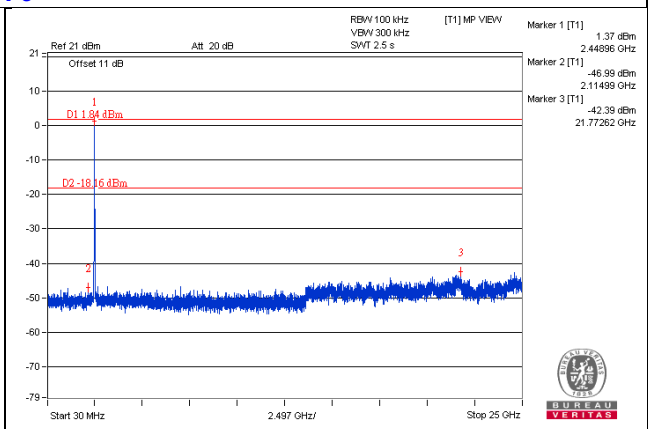

### CH 6



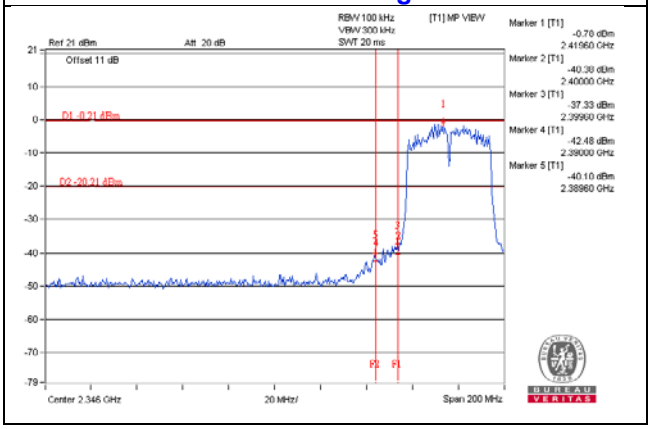




### CH 9

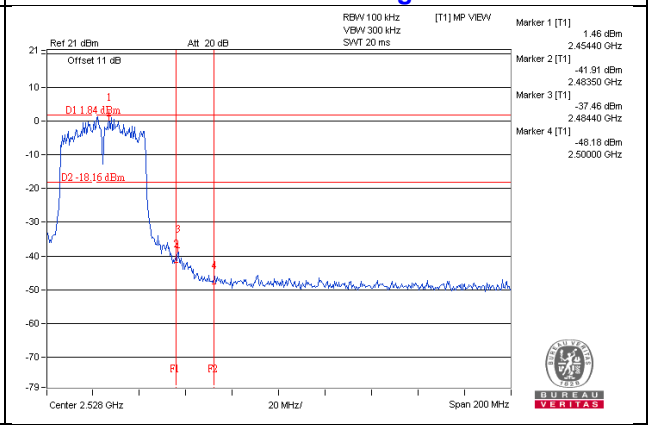



### CH 3 Band edge




### CH 9 Band edge



## 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

## Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:


**Linko EMC/RF Lab**
Tel: 886-2-26052180
Fax: 886-2-26051924

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The address and road map of all our labs can be found in our web site also.

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