



BUREAU
VERITAS

Test Report No.: RF161222W002-2



FCC TEST REPORT

(Part 15, Subpart C)

Product: smartphone

Model Name: Ilium X220

FCC ID: ZC4X220

Applicant: Corporativo Lanix S.A. de C.V.

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Report No.: RF161222W002-2

Received Date: Dec. 22, 2016

Test Date: Dec. 23, 2016 ~ Jan. 12, 2017

Issued Date: Jan. 13, 2017

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Test Report No.: RF161222W002-2

RELEASE CONTROL RECORD

| ISSUE NO. | REASON FOR CHANGE | DATE ISSUED |
|----------------|-------------------|---------------|
| RF161222W002-2 | Original release | Jan. 13, 2017 |



Test Report No.: RF161222W002-2

1 CERTIFICATION

PRODUCT: smartphone
BRAND NAME: LANIX
MODEL NAME: Ilium X220
APPLICANT: Corporativo Lanix S.A. de C.V.
TESTED: Dec. 23, 2016 ~ Jan. 12, 2017
TEST SAMPLE: Identical Prototype
STANDARDS: FCC Part 15, Subpart C. Section 15.247
ANSI C63.10-2013

The above equipment has been tested by **Bureau Veritas Shenzhen Co., Ltd. Dongguan 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:** Jan. 13, 2017
(Harry Li/ Engineer)

APPROVED BY : _____, **DATE:** Jan. 13, 2017
(Sam Tung / Manager)



2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247) | | | |
|---|----------------------------------|--------|--|
| STANDARD SECTION | TEST TYPE AND LIMIT | RESULT | REMARK |
| 15.207 | AC Power Conducted Emission | PASS | Meet the requirement of limit. Minimum passing margin is -9.16dB at 4.948000MHz. |
| 15.205 15.209 | Radiated Emissions | PASS | Meet the requirement of limit. Minimum passing margin is -1.58dB at 2483.5MHz. |
| 15.247(d) | Out of band Emission Measurement | PASS | Meet the requirement of limit. |
| 15.247(a)(2) | 6dB bandwidth | PASS | Meet the requirement of limit. |
| 15.247(b) | Conducted Output 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 | UNCERTAINTY |
|---------------------|---------------|-------------|
| Conducted emissions | 9kHz~30MHz | 2.66dB |
| Radiated emissions | 9KHz ~ 30MHz | 2.74dB |
| | 30MHz ~ 1GMHz | 3.55dB |
| | 1GHz ~ 18GHz | 4.84dB |
| | 18GHz ~ 40GHz | 1.94dB |

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

| | |
|------------------------------|--|
| PRODUCT | smartphone |
| MODEL NAME | Ilium X220 |
| NOMINAL VOLTAGE | 5.0Vdc (adapter or host equipment) 3.7Vdc (Li-ion, battery) |
| MODULATION TECHNOLOGY | DSSS, OFDM |
| MODULATION TYPE | CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM |
| TRANSMISSION RATE | 802.11b: 11/ 5.5/ 2.0 / 1.0 Mbps 802.11g: 54/ 48/ 36 / 24 / 18 / 9/ 6 Mbps 802.11n: up to 135 Mbps |
| OPERATING FREQUENCY | 2412-2462MHz for 11b/g/n(HT20) |
| MAX. OUTPUT POWER | WLAN: 36.898mW (Maximum) |
| ANTENNA TYPE | PIFA Antenna with 1.2dBi gain |
| HW VERSION | V1 |
| SW VERSION | Ilium X220_TELCEL_SW_01 |
| I/O PORTS | Refer to user's manual |
| CABLE SUPPLIED | USB cable: non-shielded, detachable, 1.0m Earphone cable: non-shielded, detachable, 1.0m |

NOTE:

- For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
- The EUT was powered by the following adapter:

| ADAPTER | |
|----------------|--------------------|
| BRAND: | LANIX |
| MODEL: | Ilium X220 |
| INPUT: | AC 100-240V, 120mA |
| OUTPUT: | DC 5V, 700mA |

- The EUT matched the following USB cable and Earphone:

| USB CABLE | |
|---------------------|------------|
| BRAND: | LANIX |
| MODEL: | ILIUM X220 |
| SIGNAL LINE: | 1.0 METER |

| EARPHONE | |
|---------------------|------------|
| BRAND: | LANIX |
| MODEL: | ILIUM X220 |
| SIGNAL LINE: | 1.0 METER |

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4. The EUT incorporates a SISO function. Physically, the EUT provides one transmitter and one receiver.

| MODULATION MODE | TX/RX FUNCTION |
|-----------------|----------------|
| 802.11b | 1TX /1RX |
| 802.11g | 1TX /1RX |
| 802.11n (20MHz) | 1TX /1RX |

5. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.



3.2 DESCRIPTION OF TEST MODES

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

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

3.2.1 CONFIGURATION OF SYSTEM UNDER TEST

Please see section 5 photographs of the test configuration for reference.

3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports

The worst case was found when positioned on Y axis for radiated emission. Following test modes were selected for the final test, and the final worst case is marked in boldface and recorded in the report:

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

Where **RE<1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission

RE≥1G: Radiated Emission above 1GHz
APCM: Antenna Port Conducted Measurement

**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, XYZ axis 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) |
|--------------|-------------------|----------------|-----------------------|-----------------|------------------|
| 802.11n HT20 | 1 to 11 | 11 | OFDM | BPSK | 6.5 |

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, XYZ axis 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 | CCK | DBPSK | 1.0 |
| 802.11g | 1 to 11 | 1, 6, 11 | OFDM | BPSK | 6.0 |
| 802.11n HT20 | 1 to 11 | 1, 6, 11 | OFDM | BPSK | 6.5 |

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, XYZ axis 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) |
|--------------|-------------------|----------------|-----------------------|-----------------|------------------|
| 802.11n HT20 | 1 to 11 | 11 | OFDM | BPSK | 6.5 |



BANDEDGE MEASUREMENT:

- ☒ 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, 11 | CCK | DBPSK | 1.0 |
| 802.11g | 1 to 11 | 1, 11 | OFDM | BPSK | 6.0 |
| 802.11n HT20 | 1 to 11 | 1, 11 | OFDM | BPSK | 6.5 |

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 | CCK | DBPSK | 1.0 |
| 802.11g | 1 to 11 | 1, 6, 11 | OFDM | BPSK | 6.0 |
| 802.11n HT20 | 1 to 11 | 1, 6, 11 | OFDM | BPSK | 6.5 |

TEST CONDITION:

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | TEST VOLTAGE | TESTED BY |
|---------------|--------------------------|---------------------|-----------|
| RE<1G | 22deg. C, 54%RH | DC 5V from adaptor | Tony |
| RE≥1G | 22deg. C, 54%RH | DC 5V from adaptor | Tony |
| PLC | 25deg. C, 60%RH | DC 5V from adaptor | Wenliang |
| APCM | 25deg. C, 60%RH | 3.7Vdc from battery | Wenliang |



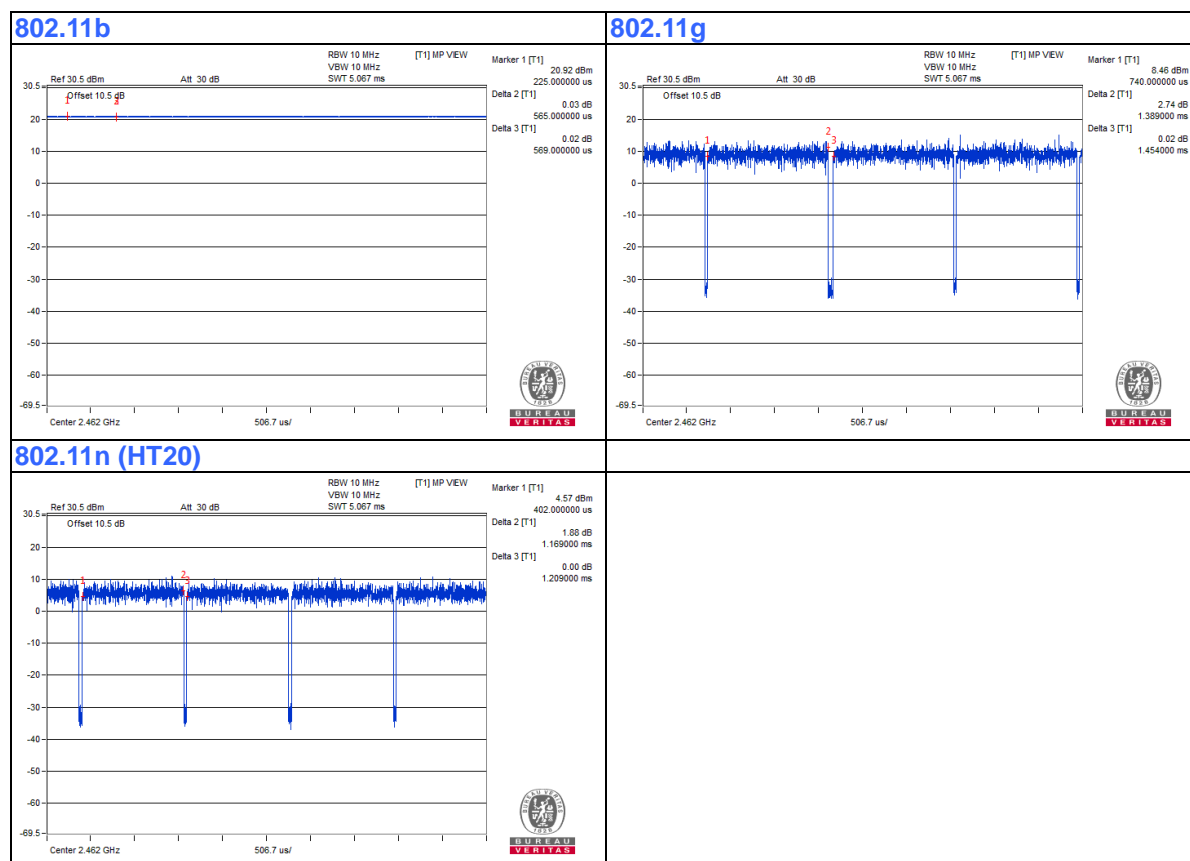
3.3 DUTY CYCLE OF TEST SIGNAL

WIFI 2.4GHz

802.11b: Duty cycle = $0.565/0.569 = 0.993 > 98\%$, Duty factor is not required.

802.11g: Duty cycle = $1.389/1.454 = 0.955 < 98\%$, Duty factor = $10 * \log(1/0.955) = 0.199$

802.11n (HT20): Duty cycle = $1.169/1.209 = 0.967 < 98\%$, Duty factor = $10 * \log(1/0.967) = 0.146$





3.4 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, Section 15.247

KDB 558074 D01 DTS Meas Guidance v03r05

ANSI C63.10-2013

Note:

1. All test items have been performed and recorded as per the above standards.
2. The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (Certification). The test report has been issued separately.

3.5 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.

| NO. | PRODUCT | BRAND | MODEL NO. | SERIAL NO. | FCC ID |
|-----|-----------|----------|-----------|------------|--------|
| 1 | DC source | LONG WEI | PS-6403D | 010934269 | N/A |
| 2 | PC | HP | A6608CN | 3CR83825X3 | N/A |

| NO. | SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS |
|-----|---|
| 1 | DC Line: Unshielded, Detachable 1.0m |
| 2 | AC Line: Unshielded, Detachable 1.5m |



4 TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

| FREQUENCY OF EMISSION (MHz) | CONDUCTED LIMIT (dB μ V) | |
|-----------------------------|------------------------------|----------|
| | Quasi-peak | Average |
| 0.15 ~ 0.5 | 66 to 56 | 56 to 46 |
| 0.5 ~ 5 | 56 | 46 |
| 5 ~ 30 | 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.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|--------------------------|---------------|-----------------|----------------|------------|------------|
| EMI Test Receiver | Rohde&Schwarz | ESR7 | 101588 | Jan. 22,16 | Jan. 21,17 |
| Artificial Mains Network | Rohde&Schwarz | ENV216 | 101173 | Mar. 04,16 | Mar. 03,17 |
| Artificial Mains Network | Rohde&Schwarz | ESH3-Z5 | 100317 | Apr. 05,16 | Apr. 04,17 |
| Voltage probe | SCHWARZBECK | TK 9421 | TK 9421-176 | Jan. 08,16 | Jan. 07,17 |
| Test software | ADT | ADT_Cond_V7.3.7 | N/A | N/A | N/A |

NOTE:

1. The test was performed in shielded room 553.
2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.



4.1.3 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.

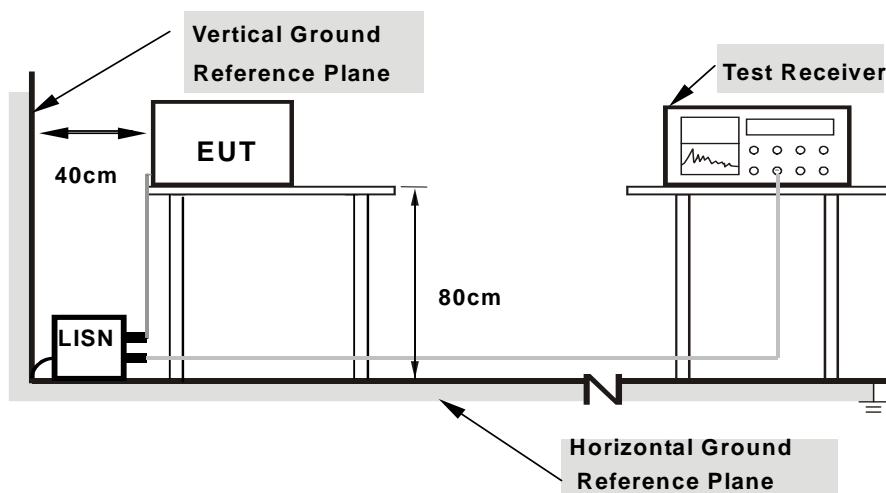
NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation.



4.1.5 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80
from other units and other metal planes

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

4.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power and connected of all equipment.
- b. EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.



4.1.7 TEST RESULTS

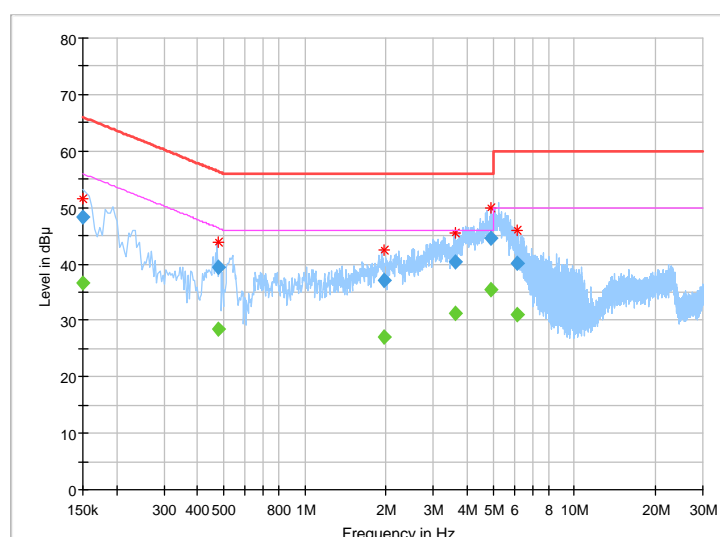
CONDUCTED WORST-CASE DATA:

| | | | |
|-----------------|----------------|--|---------------------------------------|
| Frequency Range | 150KHz ~ 30MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9 kHz |
| Input Power | 120Vac, 60Hz | Environmental Conditions | 24deg. C, 55RH |
| Tested By | Eric | TEST DATE | 2016/12/29 |

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|------|--------|------------|
| 0.150000 | --- | 36.63 | 56.00 | -19.37 | L | ON | 9.6 |
| 0.150000 | 48.38 | --- | 66.00 | -17.62 | L | ON | 9.6 |
| 0.476000 | --- | 28.47 | 46.41 | -17.94 | L | ON | 9.7 |
| 0.476000 | 39.50 | --- | 56.41 | -16.91 | L | ON | 9.7 |
| 1.966000 | --- | 27.13 | 46.00 | -18.87 | L | ON | 9.7 |
| 1.966000 | 37.02 | --- | 56.00 | -18.98 | L | ON | 9.7 |
| 3.606000 | --- | 31.20 | 46.00 | -14.80 | L | ON | 9.7 |
| 3.606000 | 40.37 | --- | 56.00 | -15.63 | L | ON | 9.7 |
| 4.912000 | --- | 35.47 | 46.00 | -10.53 | L | ON | 9.7 |
| 4.912000 | 44.53 | --- | 56.00 | -11.47 | L | ON | 9.7 |
| 6.128000 | --- | 31.09 | 50.00 | -18.91 | L | ON | 9.8 |
| 6.128000 | 40.01 | --- | 60.00 | -19.99 | L | ON | 9.8 |

- REMARKS:** 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.

Full Spectrum



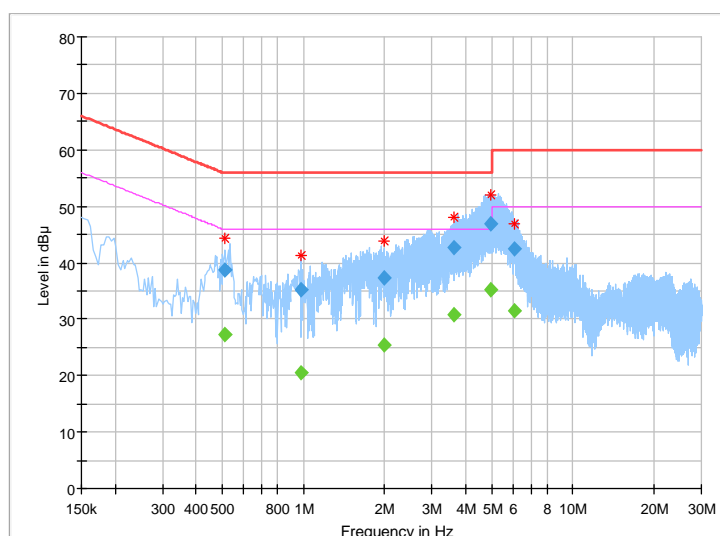


| | | | |
|-----------------|----------------|--|---------------------------------------|
| Frequency Range | 150KHz ~ 30MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9 kHz |
| Input Power | 120Vac, 60Hz | Environmental Conditions | 24deg. C, 55RH |
| Tested By | Eric | TEST DATE | 2016/12/29 |

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|--------------|----------|-----------|------------|
| 0.512000 | --- | 27.40 | 46.00 | -18.60 | N | ON | 10.1 |
| 0.512000 | 38.68 | --- | 56.00 | -17.32 | N | ON | 10.1 |
| 0.980000 | --- | 20.63 | 46.00 | -25.37 | N | ON | 9.9 |
| 0.980000 | 35.32 | --- | 56.00 | -20.68 | N | ON | 9.9 |
| 1.984000 | --- | 25.38 | 46.00 | -20.62 | N | ON | 9.8 |
| 1.984000 | 37.43 | --- | 56.00 | -18.57 | N | ON | 9.8 |
| 3.636000 | --- | 30.87 | 46.00 | -15.13 | N | ON | 9.8 |
| 3.636000 | 42.64 | --- | 56.00 | -13.36 | N | ON | 9.8 |
| 4.948000 | --- | 35.32 | 46.00 | -10.68 | N | ON | 9.8 |
| 4.948000 | 46.84 | --- | 56.00 | -9.16 | N | ON | 9.8 |
| 6.104000 | --- | 31.43 | 50.00 | -18.57 | N | ON | 9.8 |
| 6.104000 | 42.34 | --- | 60.00 | -17.66 | N | ON | 9.8 |

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.

Full Spectrum





4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

| 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. As shown in 15.35(b), 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.



4.2.2 TEST INSTRUMENTS

| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|------------------------------|---------------|------------------|-------------|-------------|-------------|
| EMI Test Receiver | Rohde&Schwarz | ESR7 | 101494 | Apr. 05,16 | Apr. 04,17 |
| Signal and Spectrum Analyzer | Rohde&Schwarz | FSV7 | 102331 | Nov. 04,16 | Nov. 03,17 |
| Bilog Antenna | Teseq | CBL 6111D | 30643 | Jul. 14, 16 | Jul. 13, 17 |
| Loop antenna | Daze | ZN30900A | 0708 | Nov. 28, 16 | Nov. 27, 17 |
| Horn Antenna (1GHz -18GHz) | ETS -Lindgren | 3117 | 00062558 | May 18,16 | May 17,17 |
| 10m Semi-anechoic Chamber | CHANGLING | 21.4m*12.1m*8.8m | NSEMC006 | Mar. 12,16 | Mar. 11,18 |
| Test Software | E3 | V 9.160323 | N/A | N/A | N/A |
| Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA9170242 | Mar. 12,16 | Mar. 11,17 |
| Amplifier (9kHz-1GHz) | SONOMA | 310D | 186955 | Mar. 04,16 | Mar. 03, 17 |
| Pre-Amplifier(1-18G) | HP | 8449B | 3008A00409 | Apr. 25,16 | Apr. 24,17 |
| Pre-Amplifier (18GHz-40GHz) | EMCI | EMC 184045 | 980102 | Nov. 04,16 | Nov. 03,17 |
| BLUETOOTH TESTER | Rohde&Schwarz | CBT32 | 100811 | Aug. 08,16 | Aug. 07,17 |

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GREGT/CHINA and NIM/CHINA.
2. The test was performed in 10m Chamber.
3. The FCC Site Registration No. is 502831.



4.2.3 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 10 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 antenna is a broadband antenna, and its height 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

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 ($10 \log(1/\text{duty cycle})$).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

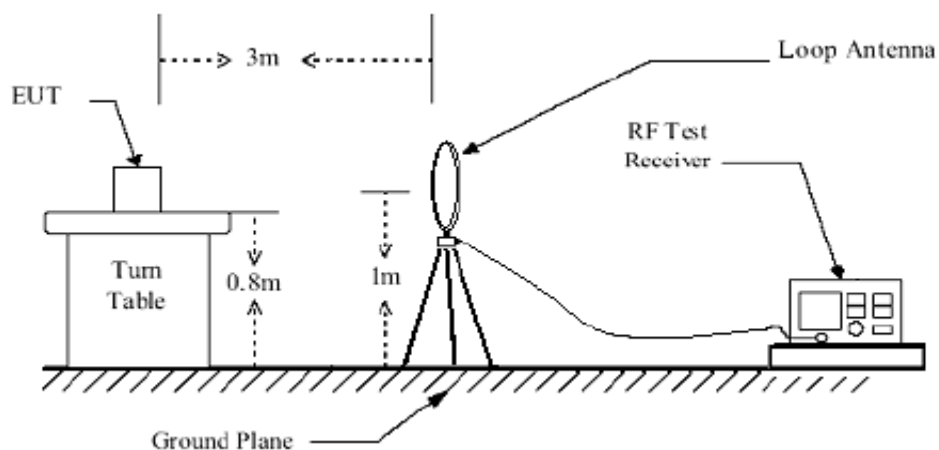
4.2.4 DEVIATION FROM TEST STANDARD

No deviation

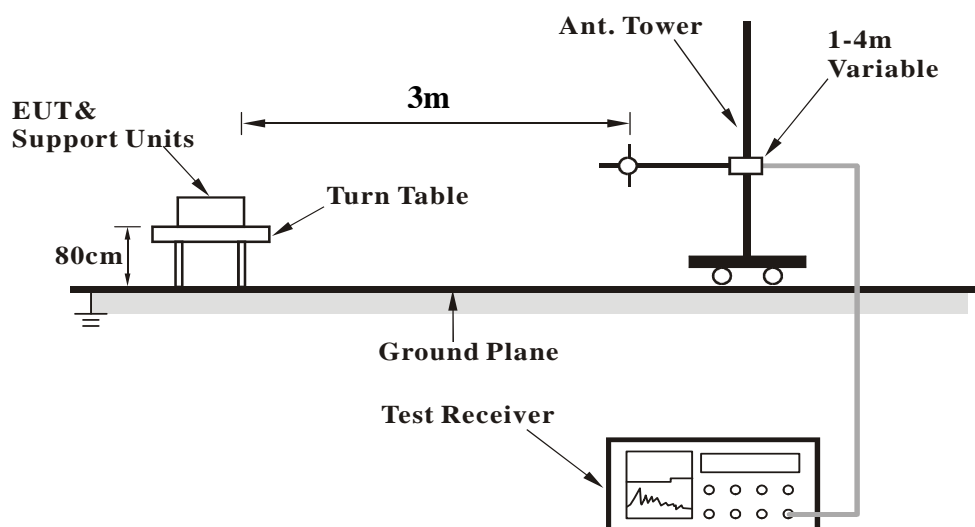


4.2.5 TEST SETUP

< Frequency Range below 30MHz >

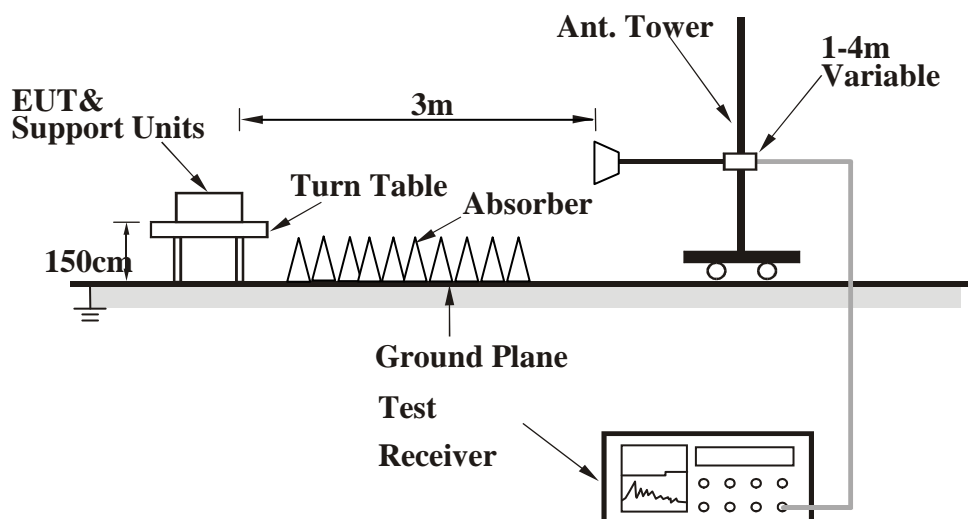


< Frequency Range 30MHz~1GHz >





<Frequency Range above 1GHz>



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

4.2.6 EUT OPERATING CONDITIONS

- Set the EUT under full load condition and placed them on a testing table.
- Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the EUT in full functions.



4.2.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA:

9 KHz – 30 KHz data: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

30 MHz – 1GHz data:

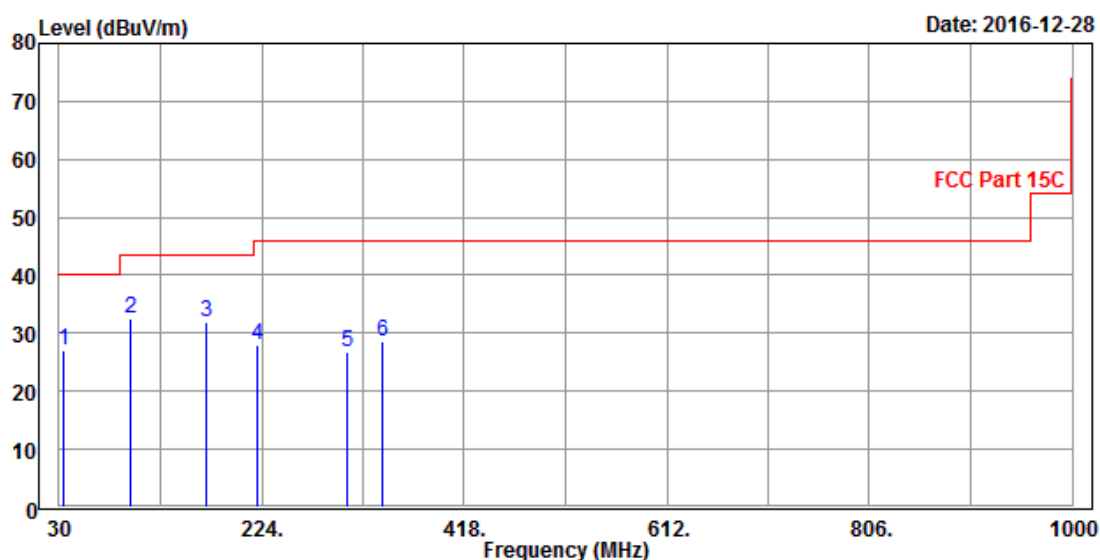
802.11n (20MHz)

| | | | |
|-----------------|---------------|-------------------|-----------------|
| CHANNEL | TX Channel 11 | DETECTOR FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | 30MHz ~ 1GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|--------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 34.85 | 27.12 | 50.00 | 40.00 | -12.88 | 13.75 | 0.89 | 37.52 | 100 | 40 | QP |
| 98.87 | 32.41 | 60.00 | 43.50 | -11.09 | 7.88 | 1.53 | 37.00 | 100 | 84 | QP |
| 171.62 | 31.89 | 56.56 | 43.50 | -11.61 | 10.03 | 2.01 | 36.71 | 100 | 96 | QP |
| 219.15 | 28.08 | 51.35 | 46.00 | -17.92 | 10.98 | 2.28 | 36.53 | 100 | 120 | QP |
| 305.48 | 26.91 | 47.45 | 46.00 | -19.09 | 13.23 | 2.74 | 36.51 | 100 | 256 | QP |
| 340.40 | 28.54 | 47.54 | 46.00 | -17.46 | 14.70 | 2.89 | 36.59 | 100 | 248 | QP |

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.





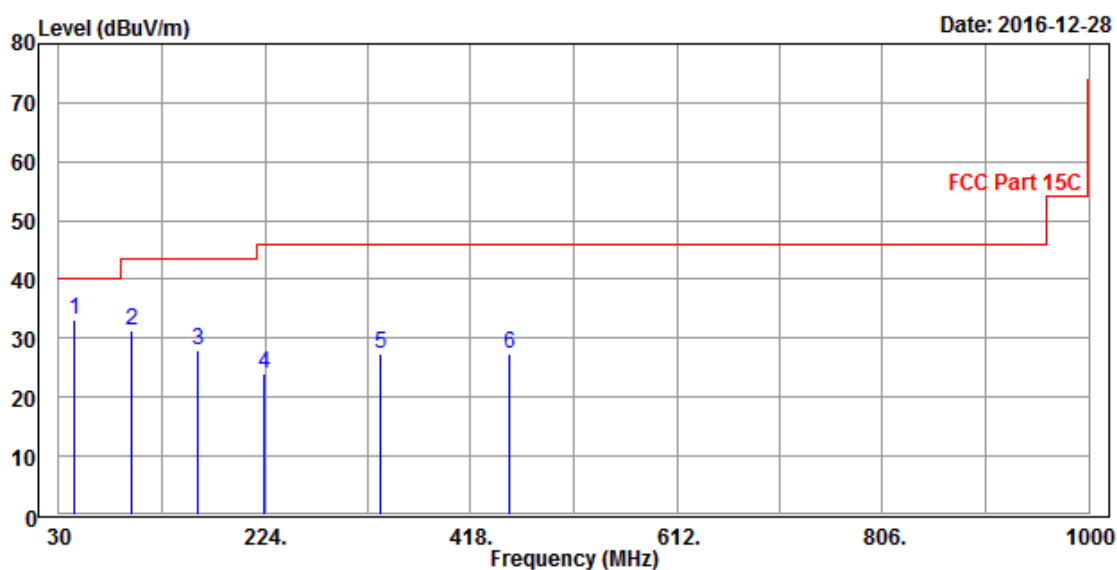
| | | | |
|-----------------|---------------|-------------------|-----------------|
| CHANNEL | TX Channel 11 | DETECTOR FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | 30MHz ~ 1GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|--------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 43.58 | 33.27 | 60.85 | 40.00 | -6.73 | 8.88 | 0.99 | 37.45 | 200 | 36 | QP |
| 97.90 | 31.46 | 59.17 | 43.50 | -12.04 | 7.77 | 1.52 | 37.00 | 200 | 60 | QP |
| 159.98 | 28.09 | 52.70 | 43.50 | -15.41 | 10.20 | 1.93 | 36.74 | 200 | 78 | QP |
| 223.03 | 24.01 | 47.08 | 46.00 | -21.99 | 11.16 | 2.30 | 36.53 | 200 | 156 | QP |
| 333.61 | 27.28 | 46.58 | 46.00 | -18.72 | 14.41 | 2.86 | 36.57 | 200 | 240 | QP |
| 453.89 | 27.32 | 43.00 | 46.00 | -18.68 | 17.85 | 3.32 | 36.85 | 200 | 132 | QP |

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor

Margin value = Emission level – Limit value.





ABOVE 1GHz WORST-CASE DATA:

Note: For higher frequency, the emission is too low to be detected.

802.11b

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

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 43.14 | 51.01 | 54.00 | -10.86 | 32.29 | 8.15 | 48.31 | 105 | 168 | Average |
| 2390 | 49.30 | 57.17 | 74.00 | -24.70 | 32.29 | 8.15 | 48.31 | 105 | 168 | Peak |
| 2412 | 97.20 | 105.01 | | | 32.31 | 8.19 | 48.31 | 105 | 168 | Average |
| 2412 | 99.83 | 107.64 | | | 32.31 | 8.19 | 48.31 | 105 | 168 | Peak |
| 2483.5 | 32.23 | 39.83 | 54.00 | -21.77 | 32.38 | 8.32 | 48.30 | 105 | 168 | Average |
| 2483.5 | 44.18 | 51.78 | 74.00 | -29.82 | 32.38 | 8.32 | 48.30 | 105 | 168 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 51.93 | 59.80 | 54.00 | -2.07 | 32.29 | 8.15 | 48.31 | 100 | 290 | Average |
| 2390 | 55.57 | 63.44 | 74.00 | -18.43 | 32.29 | 8.15 | 48.31 | 100 | 290 | Peak |
| 2412 | 98.97 | 106.78 | | | 32.31 | 8.19 | 48.31 | 100 | 290 | Average |
| 2412 | 101.93 | 109.74 | | | 32.31 | 8.19 | 48.31 | 100 | 290 | Peak |
| 2483.5 | 31.96 | 39.56 | 54.00 | -22.04 | 32.38 | 8.32 | 48.30 | 100 | 290 | Average |
| 2483.5 | 43.89 | 51.49 | 74.00 | -30.11 | 32.38 | 8.32 | 48.30 | 100 | 290 | Peak |

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2412MHz: Fundamental frequency.



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

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 32.46 | 40.33 | 54.00 | -21.54 | 32.29 | 8.15 | 48.31 | 135 | 220 | Average |
| 2390 | 43.30 | 51.17 | 74.00 | -30.70 | 32.29 | 8.15 | 48.31 | 135 | 220 | Peak |
| 2437 | 98.52 | 106.25 | | | 32.34 | 8.24 | 48.31 | 135 | 220 | Average |
| 2437 | 101.50 | 109.23 | | | 32.34 | 8.24 | 48.31 | 135 | 220 | Peak |
| 2483.5 | 33.52 | 41.12 | 54.00 | -20.48 | 32.38 | 8.32 | 48.30 | 135 | 220 | Average |
| 2483.5 | 45.21 | 52.81 | 74.00 | -28.79 | 32.38 | 8.32 | 48.30 | 135 | 220 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 34.60 | 42.47 | 54.00 | -19.40 | 32.29 | 8.15 | 48.31 | 100 | 300 | Average |
| 2390 | 45.58 | 53.45 | 74.00 | -28.42 | 32.29 | 8.15 | 48.31 | 100 | 300 | Peak |
| 2437 | 99.28 | 107.01 | | | 32.34 | 8.24 | 48.31 | 100 | 300 | Average |
| 2437 | 102.19 | 109.92 | | | 32.34 | 8.24 | 48.31 | 100 | 300 | Peak |
| 2483.5 | 33.34 | 40.94 | 54.00 | -20.66 | 32.38 | 8.32 | 48.30 | 100 | 300 | Average |
| 2483.5 | 46.14 | 53.74 | 74.00 | -27.86 | 32.38 | 8.32 | 48.30 | 100 | 300 | Peak |

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2437MHz: Fundamental frequency.



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

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 32.29 | 40.16 | 54.00 | -21.71 | 32.29 | 8.15 | 48.31 | 100 | 166 | Average |
| 2390 | 45.93 | 53.80 | 74.00 | -28.07 | 32.29 | 8.15 | 48.31 | 100 | 166 | Peak |
| 2462 | 97.03 | 104.69 | | | 32.36 | 8.28 | 48.30 | 100 | 166 | Average |
| 2462 | 99.62 | 107.28 | | | 32.36 | 8.28 | 48.30 | 100 | 166 | Peak |
| 2483.5 | 48.95 | 56.55 | 54.00 | -5.05 | 32.38 | 8.32 | 48.30 | 100 | 166 | Average |
| 2483.5 | 53.27 | 60.87 | 74.00 | -20.73 | 32.38 | 8.32 | 48.30 | 100 | 166 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 31.55 | 39.42 | 54.00 | -22.45 | 32.29 | 8.15 | 48.31 | 100 | 300 | Average |
| 2390 | 45.35 | 53.22 | 74.00 | -28.65 | 32.29 | 8.15 | 48.31 | 100 | 300 | Peak |
| 2462 | 98.52 | 106.18 | | | 32.36 | 8.28 | 48.30 | 100 | 300 | Average |
| 2462 | 101.35 | 109.01 | | | 32.36 | 8.28 | 48.30 | 100 | 300 | Peak |
| 2483.5 | 50.66 | 58.26 | 54.00 | -3.34 | 32.38 | 8.32 | 48.30 | 100 | 300 | Average |
| 2483.5 | 54.84 | 62.44 | 74.00 | -19.16 | 32.38 | 8.32 | 48.30 | 100 | 300 | Peak |

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2462MHz: Fundamental frequency.



802.11g

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

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 43.34 | 51.21 | 54.00 | -10.66 | 32.29 | 8.15 | 48.31 | 100 | 135 | Average |
| 2390 | 59.61 | 67.48 | 74.00 | -14.39 | 32.29 | 8.15 | 48.31 | 100 | 135 | Peak |
| 2412 | 89.94 | 97.75 | | | 32.31 | 8.19 | 48.31 | 100 | 135 | Average |
| 2412 | 99.35 | 107.16 | | | 32.31 | 8.19 | 48.31 | 100 | 135 | Peak |
| 2483.5 | 32.87 | 40.47 | 54.00 | -21.13 | 32.38 | 8.32 | 48.30 | 100 | 135 | Average |
| 2483.5 | 44.60 | 52.20 | 74.00 | -29.40 | 32.38 | 8.32 | 48.30 | 100 | 135 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 50.77 | 58.64 | 54.00 | -3.23 | 32.29 | 8.15 | 48.31 | 100 | 300 | Average |
| 2390 | 69.95 | 77.82 | 74.00 | -4.05 | 32.29 | 8.15 | 48.31 | 100 | 300 | Peak |
| 2412 | 93.72 | 101.53 | | | 32.31 | 8.19 | 48.31 | 100 | 300 | Average |
| 2412 | 102.20 | 110.01 | | | 32.31 | 8.19 | 48.31 | 100 | 300 | Peak |
| 2483.5 | 32.80 | 40.40 | 54.00 | -21.20 | 32.38 | 8.32 | 48.30 | 100 | 300 | Average |
| 2483.5 | 44.73 | 52.33 | 74.00 | -29.27 | 32.38 | 8.32 | 48.30 | 100 | 300 | Peak |

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2412MHz: Fundamental frequency.



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

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 32.74 | 40.61 | 54.00 | -21.26 | 32.29 | 8.15 | 48.31 | 105 | 165 | Average |
| 2390 | 45.10 | 52.97 | 74.00 | -28.90 | 32.29 | 8.15 | 48.31 | 105 | 165 | Peak |
| 2437 | 91.20 | 98.93 | | | 32.34 | 8.24 | 48.31 | 105 | 165 | Average |
| 2437 | 100.82 | 108.55 | | | 32.34 | 8.24 | 48.31 | 105 | 165 | Peak |
| 2483.5 | 33.08 | 40.68 | 54.00 | -20.92 | 32.38 | 8.32 | 48.30 | 105 | 165 | Average |
| 2483.5 | 45.05 | 52.65 | 74.00 | -28.95 | 32.38 | 8.32 | 48.30 | 105 | 165 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 32.81 | 40.68 | 54.00 | -21.19 | 32.29 | 8.15 | 48.31 | 100 | 310 | Average |
| 2390 | 43.85 | 51.72 | 74.00 | -30.15 | 32.29 | 8.15 | 48.31 | 100 | 310 | Peak |
| 2437 | 94.29 | 102.02 | | | 32.34 | 8.24 | 48.31 | 100 | 310 | Average |
| 2437 | 103.08 | 110.81 | | | 32.34 | 8.24 | 48.31 | 100 | 310 | Peak |
| 2483.5 | 33.01 | 40.61 | 54.00 | -20.99 | 32.38 | 8.32 | 48.30 | 100 | 310 | Average |
| 2483.5 | 48.97 | 56.57 | 74.00 | -25.03 | 32.38 | 8.32 | 48.30 | 100 | 310 | Peak |

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2437MHz: Fundamental frequency.



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

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 32.38 | 40.25 | 54.00 | -21.62 | 32.29 | 8.15 | 48.31 | 100 | 165 | Average |
| 2390 | 44.37 | 52.24 | 74.00 | -29.63 | 32.29 | 8.15 | 48.31 | 100 | 165 | Peak |
| 2462 | 91.76 | 99.42 | | | 32.36 | 8.28 | 48.30 | 100 | 165 | Average |
| 2462 | 101.16 | 108.82 | | | 32.36 | 8.28 | 48.30 | 100 | 165 | Peak |
| 2483.5 | 51.65 | 59.25 | 54.00 | -2.35 | 32.38 | 8.32 | 48.30 | 100 | 165 | Average |
| 2483.5 | 70.02 | 77.62 | 74.00 | -3.98 | 32.38 | 8.32 | 48.30 | 100 | 165 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 32.31 | 40.18 | 54.00 | -21.69 | 32.29 | 8.15 | 48.31 | 100 | 310 | Average |
| 2390 | 44.63 | 52.50 | 74.00 | -29.37 | 32.29 | 8.15 | 48.31 | 100 | 310 | Peak |
| 2462 | 94.67 | 102.33 | | | 32.36 | 8.28 | 48.30 | 100 | 310 | Average |
| 2462 | 103.90 | 111.56 | | | 32.36 | 8.28 | 48.30 | 100 | 310 | Peak |
| 2483.5 | 52.36 | 59.96 | 54.00 | -1.64 | 32.38 | 8.32 | 48.30 | 100 | 310 | Average |
| 2483.5 | 70.42 | 78.02 | 74.00 | -3.58 | 32.38 | 8.32 | 48.30 | 100 | 310 | Peak |

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2462MHz: Fundamental frequency.



802.11n (20MHz)

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

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------------|-------------------------|-------------------|----------------|------------------------------|-----------------------|--------------------------|---------------------------|----------------------------|---------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 42.36 | 50.23 | 54.00 | -11.64 | 32.29 | 8.15 | 48.31 | 105 | 168 | Average |
| 2390 | 61.88 | 69.75 | 74.00 | -12.12 | 32.29 | 8.15 | 48.31 | 105 | 168 | Peak |
| 2412 | 87.79 | 95.60 | | | 32.31 | 8.19 | 48.31 | 105 | 168 | Average |
| 2412 | 98.36 | 106.17 | | | 32.31 | 8.19 | 48.31 | 105 | 168 | Peak |
| 2483.5 | 32.87 | 40.47 | 54.00 | -21.13 | 32.38 | 8.32 | 48.30 | 105 | 168 | Average |
| 2483.5 | 51.94 | 59.54 | 74.00 | -22.06 | 32.38 | 8.32 | 48.30 | 105 | 168 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 51.52 | 59.39 | 54.00 | -2.48 | 32.29 | 8.15 | 48.31 | 100 | 290 | Average |
| 2390 | 70.20 | 78.07 | 74.00 | -3.80 | 32.29 | 8.15 | 48.31 | 100 | 290 | Peak |
| 2412 | 92.50 | 100.31 | | | 32.31 | 8.19 | 48.31 | 100 | 290 | Average |
| 2412 | 102.53 | 110.34 | | | 32.31 | 8.19 | 48.31 | 100 | 290 | Peak |
| 2483.5 | 32.85 | 40.45 | 54.00 | -21.15 | 32.38 | 8.32 | 48.30 | 100 | 290 | Average |
| 2483.5 | 54.58 | 62.18 | 74.00 | -19.42 | 32.38 | 8.32 | 48.30 | 100 | 290 | Peak |

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2412MHz: Fundamental frequency.



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

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 35.53 | 43.40 | 54.00 | -18.47 | 32.29 | 8.15 | 48.31 | 100 | 168 | Average |
| 2390 | 51.66 | 59.53 | 74.00 | -22.34 | 32.29 | 8.15 | 48.31 | 100 | 168 | Peak |
| 2437 | 88.39 | 96.12 | | | 32.34 | 8.24 | 48.31 | 100 | 168 | Average |
| 2437 | 99.05 | 106.78 | | | 32.34 | 8.24 | 48.31 | 100 | 168 | Peak |
| 2483.5 | 32.89 | 40.49 | 54.00 | -21.11 | 32.38 | 8.32 | 48.30 | 100 | 168 | Average |
| 2483.5 | 45.15 | 52.75 | 74.00 | -28.85 | 32.38 | 8.32 | 48.30 | 100 | 168 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 32.67 | 40.54 | 54.00 | -21.33 | 32.29 | 8.15 | 48.31 | 100 | 300 | Average |
| 2390 | 51.00 | 58.87 | 74.00 | -23.00 | 32.29 | 8.15 | 48.31 | 100 | 300 | Peak |
| 2437 | 91.21 | 98.94 | | | 32.34 | 8.24 | 48.31 | 100 | 300 | Average |
| 2437 | 101.57 | 109.30 | | | 32.34 | 8.24 | 48.31 | 100 | 300 | Peak |
| 2483.5 | 33.15 | 40.75 | 54.00 | -20.85 | 32.38 | 8.32 | 48.30 | 100 | 300 | Average |
| 2483.5 | 58.18 | 65.78 | 74.00 | -15.82 | 32.38 | 8.32 | 48.30 | 100 | 300 | Peak |

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2437MHz: Fundamental frequency.



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

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|--------------|------------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 32.48 | 40.35 | 54.00 | -21.52 | 32.29 | 8.15 | 48.31 | 100 | 168 | Average |
| 2390 | 44.58 | 52.45 | 74.00 | -29.42 | 32.29 | 8.15 | 48.31 | 100 | 168 | Peak |
| 2462 | 88.93 | 96.59 | | | 32.36 | 8.28 | 48.30 | 100 | 168 | Average |
| 2462 | 99.55 | 107.21 | | | 32.36 | 8.28 | 48.30 | 100 | 168 | Peak |
| 2483.5 | 50.38 | 57.98 | 54.00 | -3.62 | 32.38 | 8.32 | 48.30 | 100 | 168 | Average |
| 2483.5 | 68.31 | 75.91 | 74.00 | -5.69 | 32.38 | 8.32 | 48.30 | 100 | 168 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 32.53 | 40.40 | 54.00 | -21.47 | 32.29 | 8.15 | 48.31 | 100 | 289 | Average |
| 2390 | 57.10 | 64.97 | 74.00 | -16.90 | 32.29 | 8.15 | 48.31 | 100 | 289 | Peak |
| 2462 | 91.31 | 98.97 | | | 32.36 | 8.28 | 48.30 | 100 | 289 | Average |
| 2462 | 101.50 | 109.16 | | | 32.36 | 8.28 | 48.30 | 100 | 289 | Peak |
| 2483.5 | 52.42 | 60.02 | 54.00 | -1.58 | 32.38 | 8.32 | 48.30 | 100 | 289 | Average |
| 2483.5 | 70.13 | 77.73 | 74.00 | -3.87 | 32.38 | 8.32 | 48.30 | 100 | 289 | Peak |

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2462MHz: Fundamental frequency.



4.3 6 dB BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 TEST INSTRUMENTS

| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|----------------------------------|-----------------|--------------|------------|-------------|-------------|
| Power Sensor | Keysight | U2021XA | MY55060016 | May 04,16 | May 03,17 |
| Power Sensor | Keysight | U2021XA | MY55060018 | May 04,16 | May 03,17 |
| 10dB Attenuator | JFW/USA | 50HF-010-SMA | 1505 | Jul. 27, 16 | Jul. 26, 17 |
| Digital Multimeter | FLUKE | 15B | A1220010DG | Oct. 13, 16 | Oct.12, 17 |
| Humid & Temp Programmable Tester | Haida | HD-2257 | 110807201 | Sep.05,16 | Sep. 04,17 |
| Oscilloscope | Agilent | DSO9254A | MY51260160 | Nov. 04,16 | Nov. 03,17 |
| Signal Analyzer | Rohde & Schwarz | FSV7 | 102331 | Nov. 04,16 | Nov. 03,17 |
| Signal Generator | Agilent | N5183A | MY50140980 | Nov. 04,16 | Nov. 03,17 |
| Agile Signal Generator | Agilent | 8645A | Agilent | Aug.08, 16 | Aug.07, 17 |
| ESG Vector Signal Generator | Agilent | E4438C | MY49072505 | Apr. 22, 16 | Apr. 21, 17 |
| BLUETOOTH TESTER | Rohde&Schwarz | CBT32 | 100811 | Aug.08, 16 | Aug. 07, 17 |

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GREGT/CHINA and NIM/CHINA.
2. The test was performed in RF Oven room.

4.3.3 TEST PROCEDURE

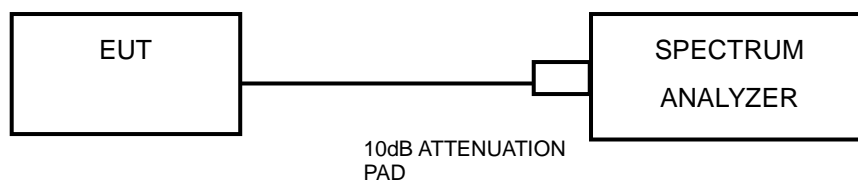
1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

4.3.5 TEST SETUP



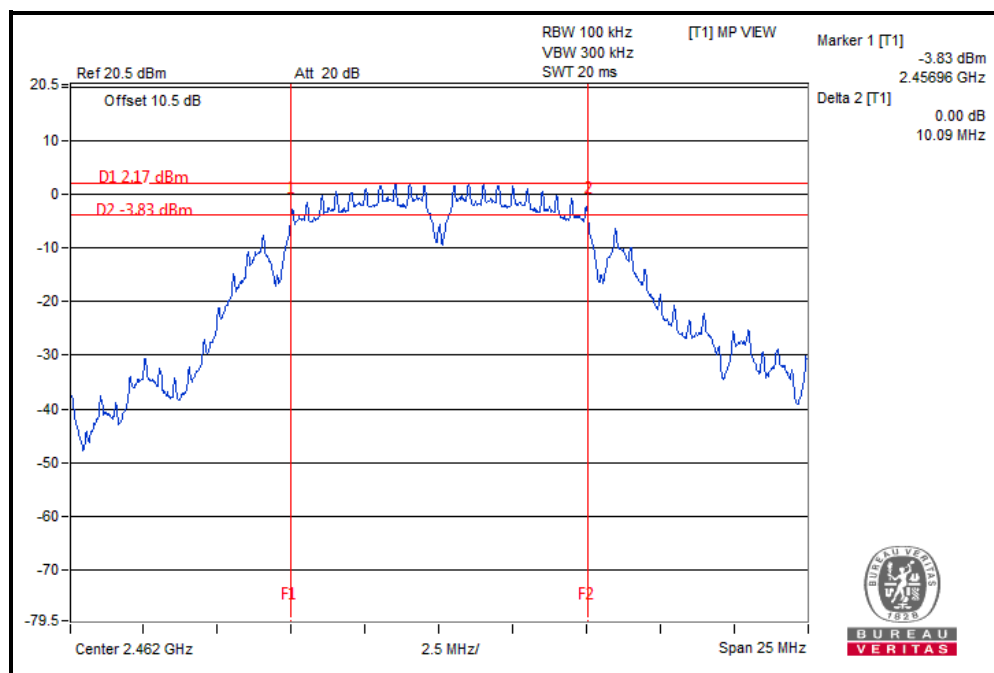
4.3.6 EUT OPERATING CONDITIONS

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 RESULTS

802.11b

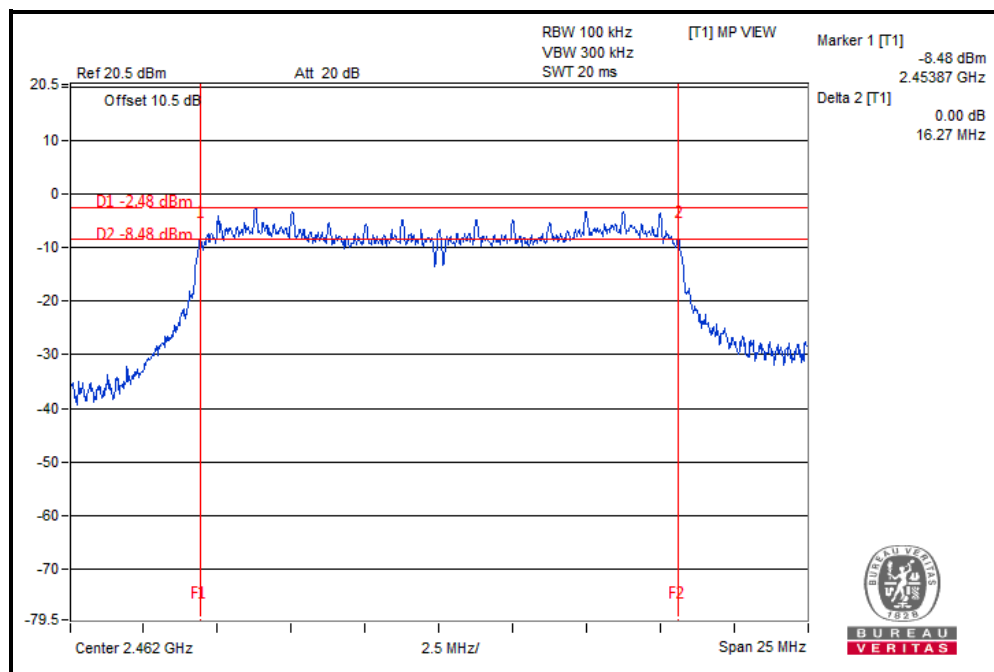
| CHANNEL | CHANNEL FREQUENCY (MHz) | 6dB BANDWIDTH (MHz) | MINIMUM LIMIT (MHz) | PASS / FAIL |
|---------|-------------------------------|---------------------------|------------------------|-------------|
| 1 | 2412 | 10.08 | 0.5 | PASS |
| 6 | 2437 | 10.08 | 0.5 | PASS |
| 11 | 2462 | 10.09 | 0.5 | PASS |





802.11g

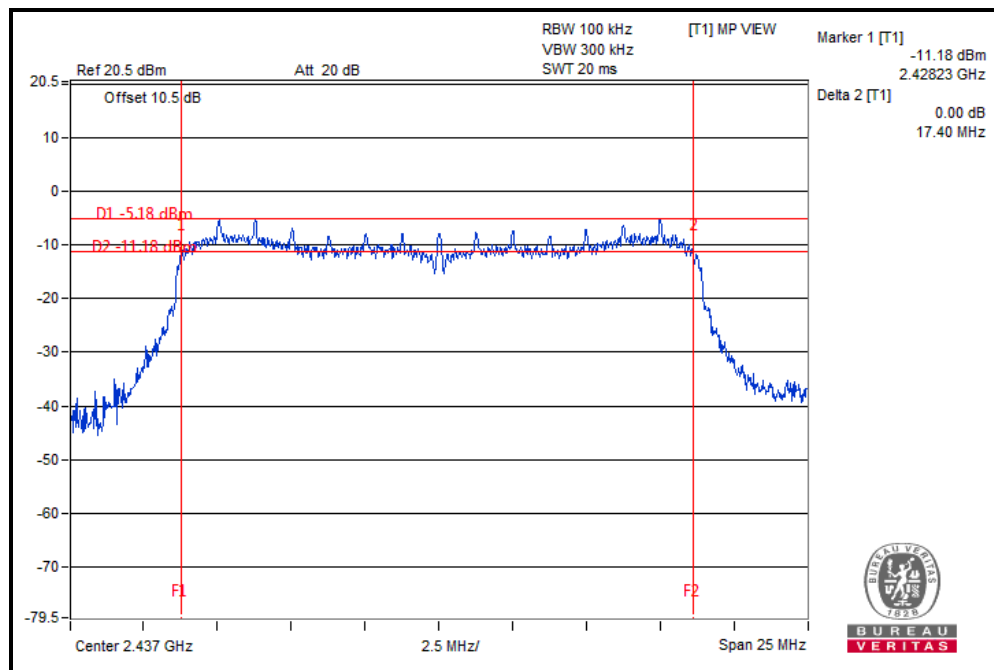
| CHANNEL | CHANNEL FREQUENCY (MHz) | 6dB BANDWIDTH (MHz) | MINIMUM LIMIT (MHz) | PASS / FAIL |
|---------|-------------------------------|---------------------------|------------------------|-------------|
| 1 | 2412 | 15.79 | 0.5 | PASS |
| 6 | 2437 | 15.84 | 0.5 | PASS |
| 11 | 2462 | 16.27 | 0.5 | PASS |





802.11n (20MHz)

| CHANNEL | CHANNEL FREQUENCY (MHz) | 6dB BANDWIDTH (MHz) | MINIMUM LIMIT (MHz) | PASS / FAIL |
|---------|-------------------------------|---------------------------|------------------------|-------------|
| 1 | 2412 | 17.29 | 0.5 | PASS |
| 6 | 2437 | 17.40 | 0.5 | PASS |
| 11 | 2462 | 17.16 | 0.5 | PASS |



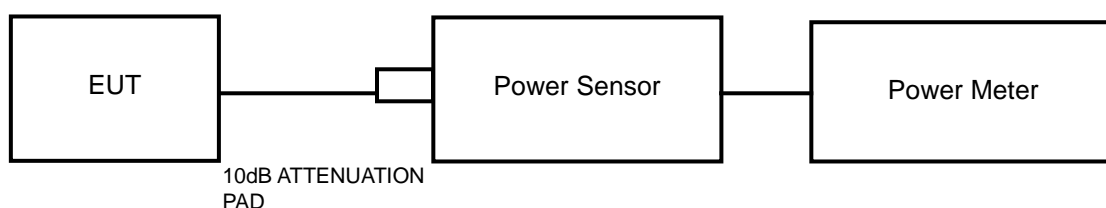


4.4 CONDUCTED OUTPUT POWER

4.4.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

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

4.4.2 TEST SETUP



4.4.3 TEST INSTRUMENTS

Refer to section 4.3.3 to get information of above instrument.

4.4.4 TEST PROCEDURES

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

4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

4.4.6 EUT OPERATING CONDITIONS

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



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4.4.7 TEST RESULTS

4.4.7.1 MAXIMUM PEAK OUTPUT POWER

802.11b

| CHANNEL | CHANNEL FREQUENCY (MHz) | PEAK POWER (dBm) | PEAK POWER (mW) | PEAK POWER LIMIT(W) | PASS/FAIL |
|---------|-------------------------|------------------|-----------------|---------------------|-----------|
| 1 | 2412 | 15.15 | 32.734 | 1 | PASS |
| 6 | 2437 | 15.67 | 36.898 | 1 | PASS |
| 11 | 2462 | 15.56 | 35.975 | 1 | PASS |

802.11g

| CHANNEL | CHANNEL FREQUENCY (MHz) | PEAK POWER (dBm) | PEAK POWER (mW) | PEAK POWER LIMIT(W) | PASS/FAIL |
|---------|-------------------------|------------------|-----------------|---------------------|-----------|
| 1 | 2412 | 15.61 | 36.392 | 1 | PASS |
| 6 | 2437 | 15.54 | 35.810 | 1 | PASS |
| 11 | 2462 | 15.48 | 35.318 | 1 | PASS |

802.11n (20MHz)

| CHANNEL | CHANNEL FREQUENCY (MHz) | PEAK POWER (dBm) | PEAK POWER (mW) | PEAK POWER LIMIT(W) | PASS/FAIL |
|---------|-------------------------|------------------|-----------------|---------------------|-----------|
| 1 | 2412 | 13.01 | 19.999 | 1 | PASS |
| 6 | 2437 | 12.31 | 17.022 | 1 | PASS |
| 11 | 2462 | 11.84 | 15.276 | 1 | PASS |

**4.4.7.2 AVERAGE OUTPUT POWER (FOR REFERENCE)**

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

802.11b

| CHANNEL | CHANNEL FREQUENCY (MHz) | AVERAGE POWER (dBm) | PASS/FAIL |
|---------|-------------------------------|---------------------------|-----------|
| 1 | 2412 | 11.79 | N/A |
| 6 | 2437 | 12.29 | N/A |
| 11 | 2462 | 12.19 | N/A |

802.11g

| CHANNEL | CHANNEL FREQUENCY (MHz) | AVERAGE POWER (dBm) | PASS/FAIL |
|---------|-------------------------------|---------------------------|-----------|
| 1 | 2412 | 9.06 | N/A |
| 6 | 2437 | 9.02 | N/A |
| 11 | 2462 | 8.89 | N/A |

802.11n (20MHz)

| CHANNEL | CHANNEL FREQUENCY (MHz) | AVERAGE POWER (dBm) | PASS/FAIL |
|---------|-------------------------------|---------------------------|-----------|
| 1 | 2412 | 6.02 | N/A |
| 6 | 2437 | 5.55 | N/A |
| 11 | 2462 | 5.23 | N/A |

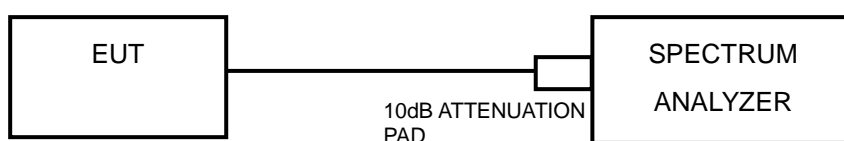


4.5 POWER SPECTRAL DENSITY MEASUREMENT

4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm/3KHz.

4.5.2 TEST SETUP



4.5.3 TEST INSTRUMENTS

Refer to section 4.3.2 to get information of above instrument.

4.5.4 TEST PROCEDURE

1. Set the span to 1.5 times the DTS bandwidth
2. Set the RBW = 3 kHz, VBW $\geq 3 \times$ RBW, Detector = peak.
3. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

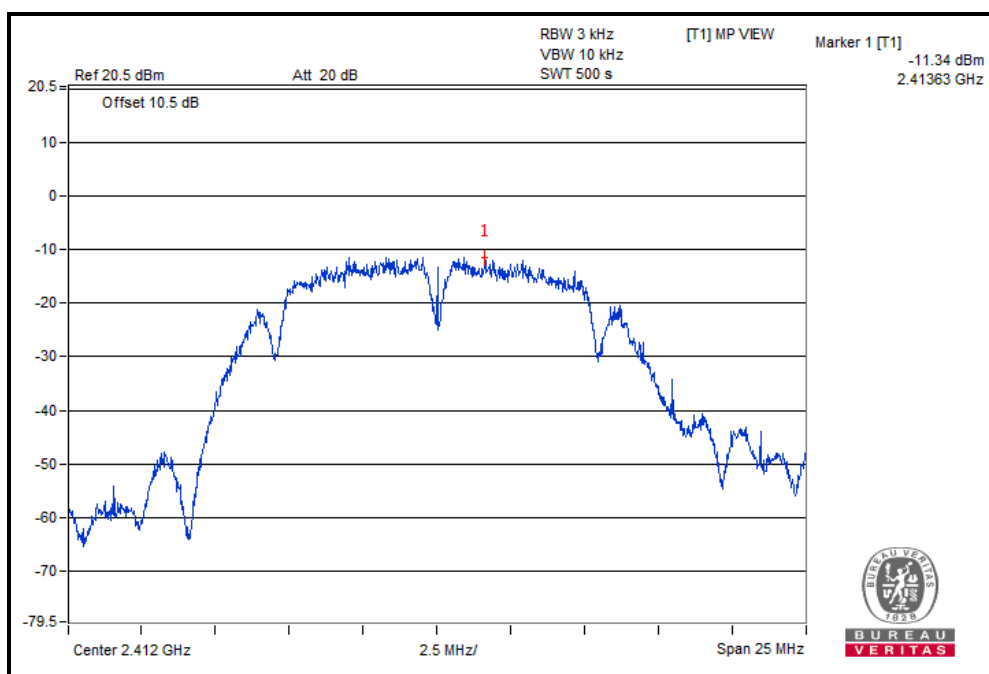
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



4.5.7 TEST RESULTS

802.11b

| Channel | FREQ. (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | PASS /FAIL |
|---------|----------------|-------------------|---------------------|---------------|
| 1 | 2412 | -11.34 | 8 | PASS |
| 6 | 2437 | -11.94 | 8 | PASS |
| 11 | 2462 | -11.81 | 8 | PASS |



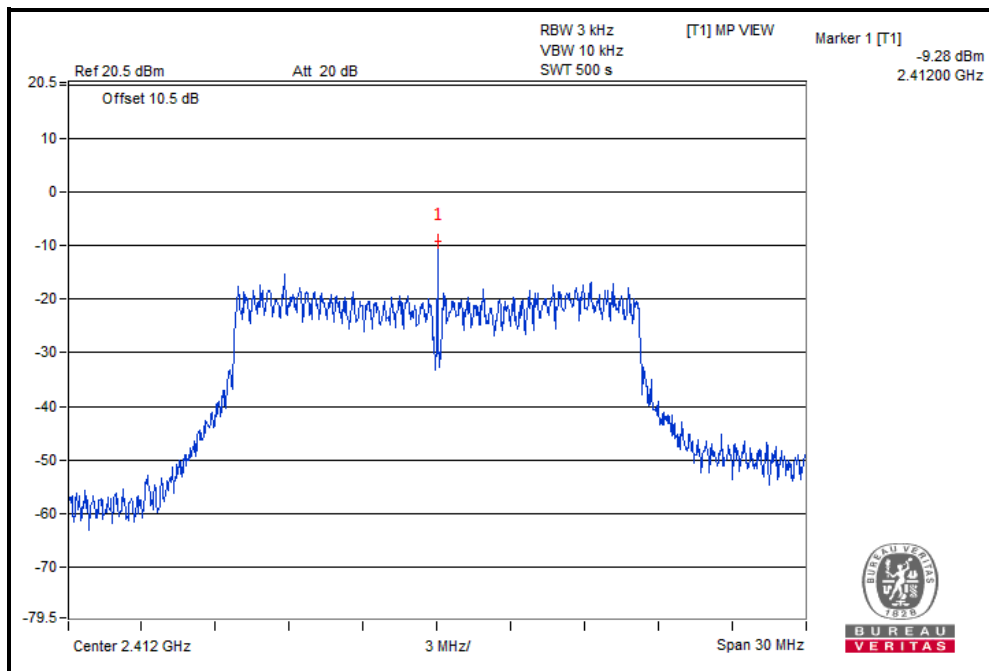


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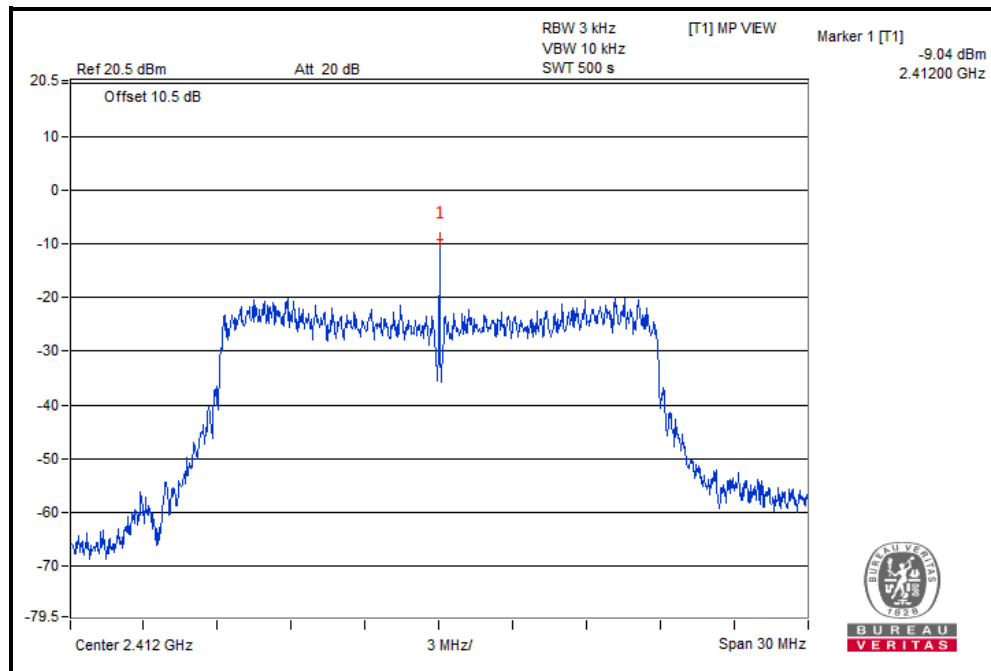
| Channel | FREQ. (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | PASS /FAIL |
|---------|----------------|-------------------|---------------------|---------------|
| 1 | 2412 | -9.28 | 8 | PASS |
| 6 | 2437 | -10.34 | 8 | PASS |
| 11 | 2462 | -10.04 | 8 | PASS |





802.11n (20MHz)

| Channel | FREQ. (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | PASS /FAIL |
|---------|----------------|-------------------|---------------------|---------------|
| 1 | 2412 | -9.04 | 8 | PASS |
| 6 | 2437 | -9.75 | 8 | PASS |
| 11 | 2462 | -10.26 | 8 | PASS |



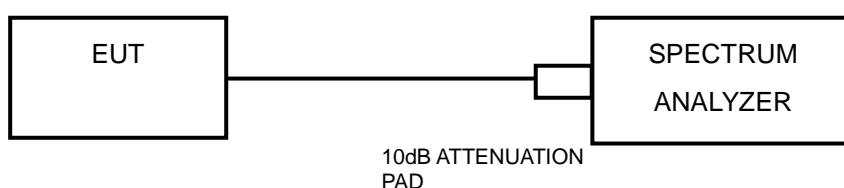


4.6 OUT OF BAND EMISSION MEASUREMENT

4.6.1 LIMITS OF 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 4.3.2 to get information of above instrument.

4.6.4 TEST PROCEDURE

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW \geq 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 OOB

1. Set RBW = 100 kHz.
2. Set VBW \geq 300 kHz.
3. Set span to encompass the spectrum to be examined
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.

4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

4.6.6 EUT OPERATING CONDITION

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

4.6.7 TEST RESULTS

The spectrum plots are attached on the following images. D1 line indicates the highest level. D2 line indicates the 20dB offset below D1. It shows compliance to the requirement.

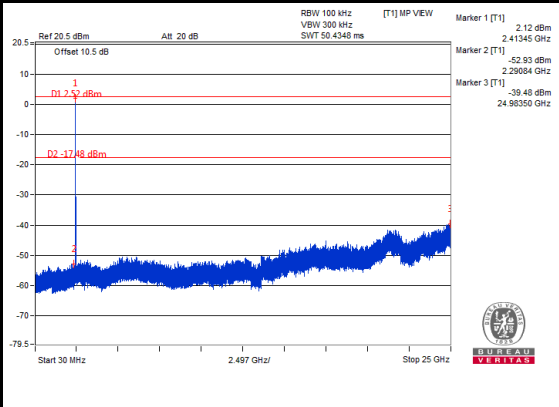
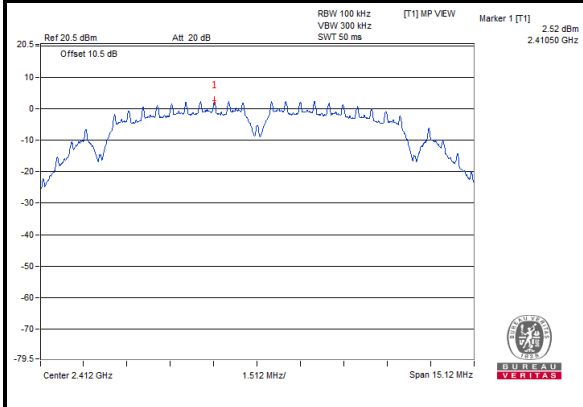


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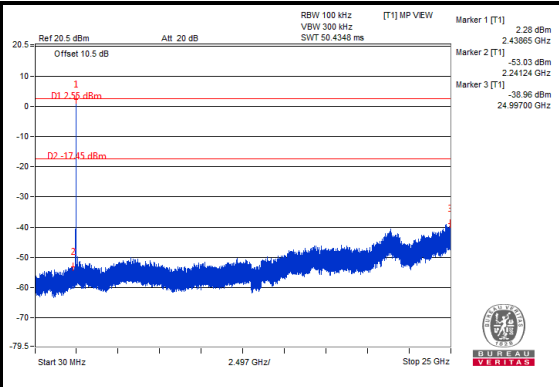
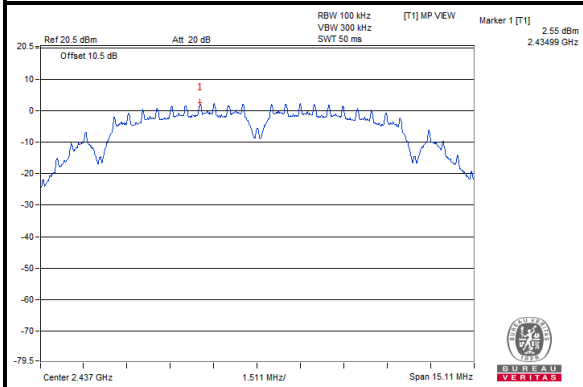
Test Report No.: RF161222W002-2

802.11b

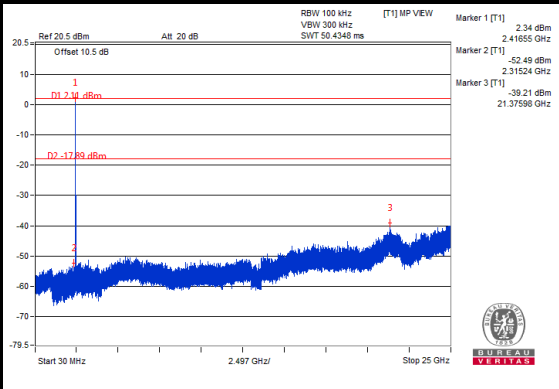
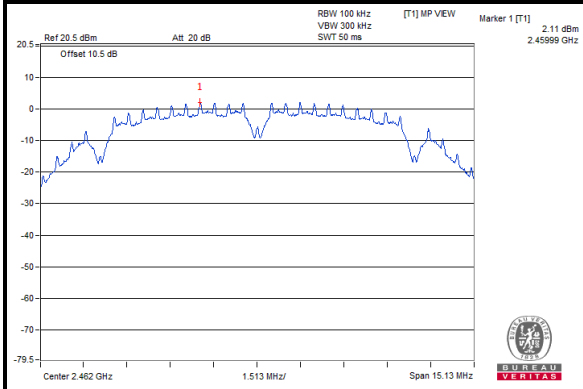
CH 1



CH 6



CH 11

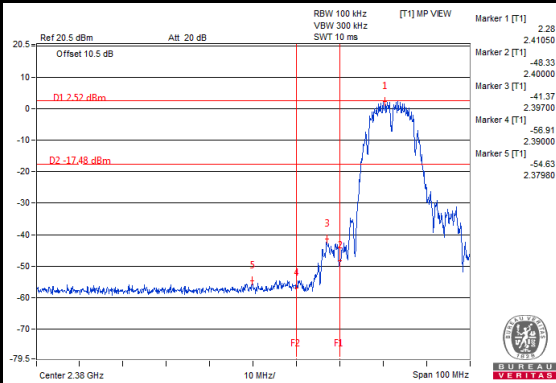




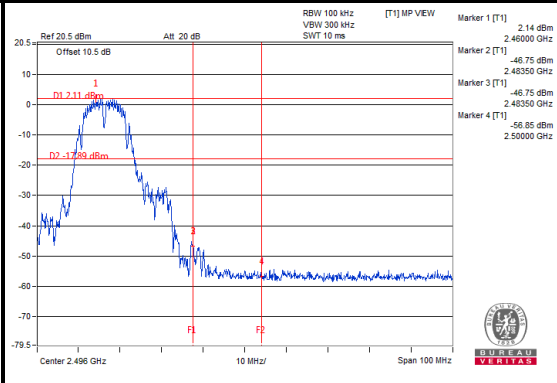
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CH 1 Band Edge



CH 11 Band Edge



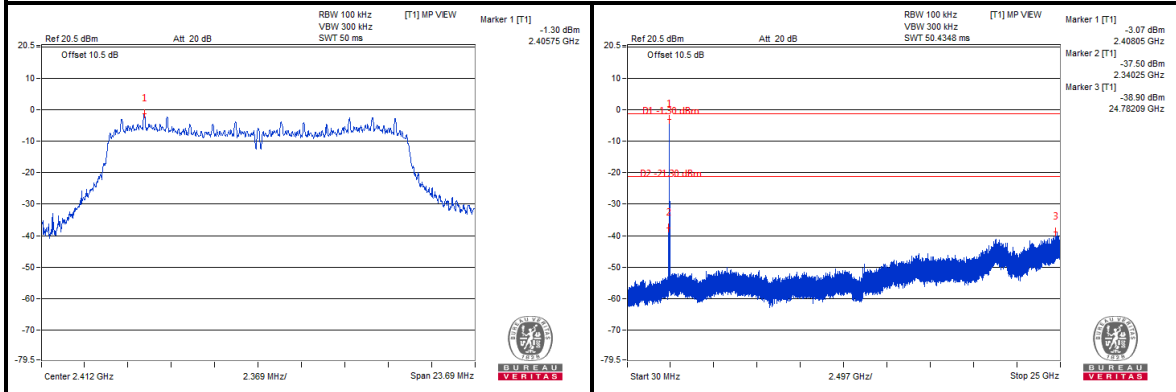


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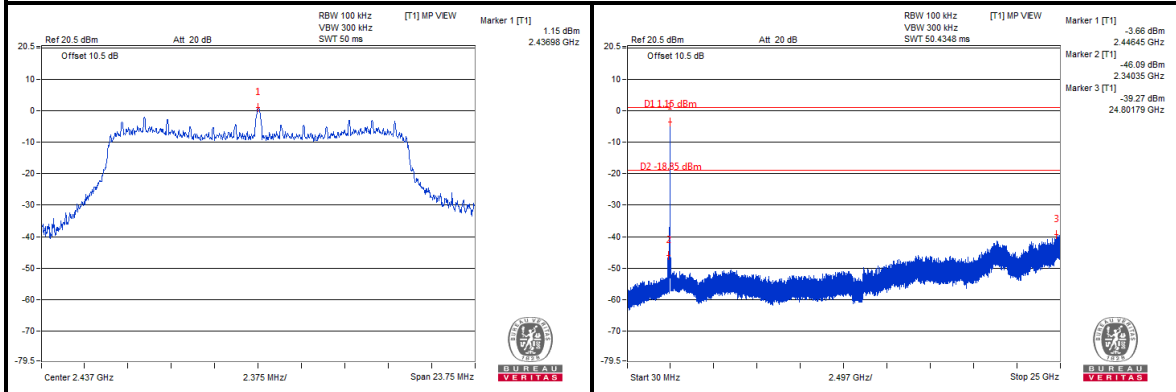
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802.11g

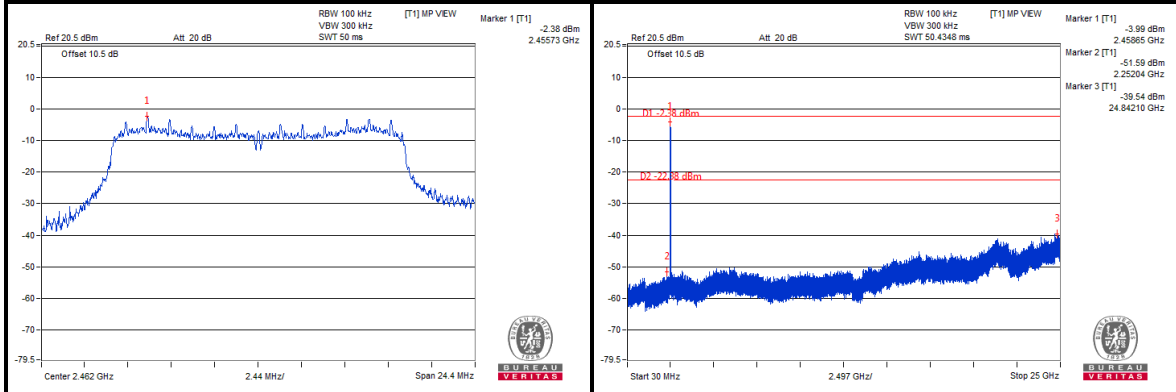
CH 1



CH 6



CH 11

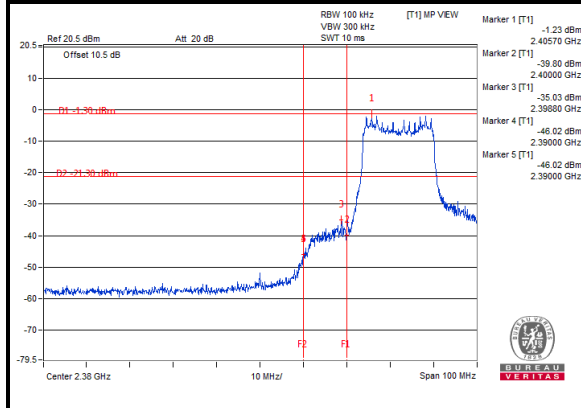




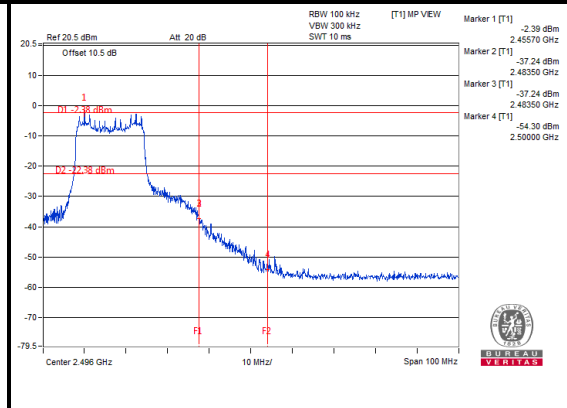
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Test Report No.: RF161222W002-2

CH 1 Band Edge



CH 11 Band Edge



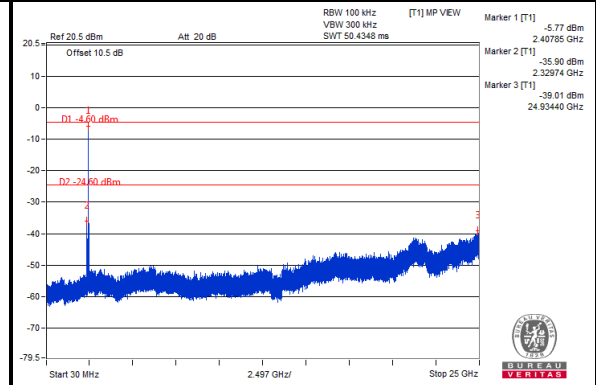
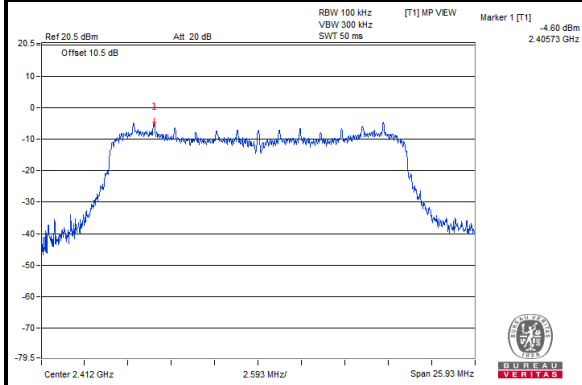


BUREAU
VERITAS

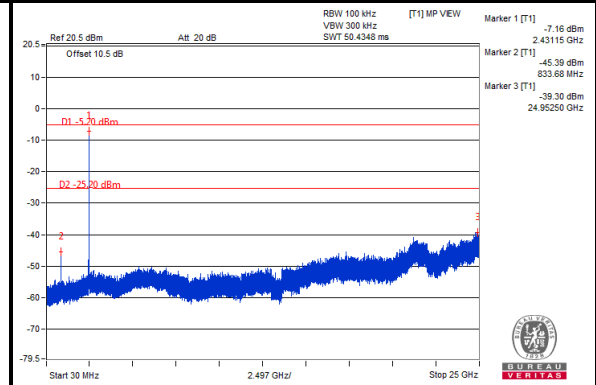
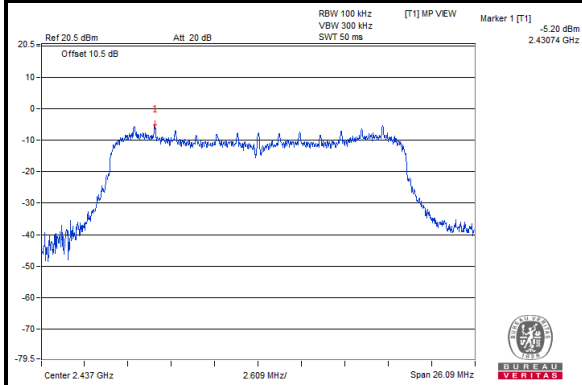
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802.11n (20MHz)

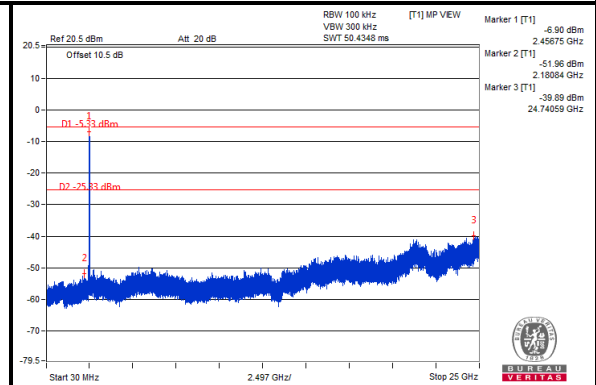
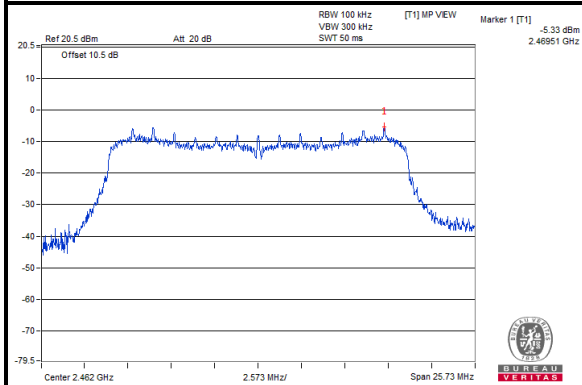
CH 1



CH 6



CH 11

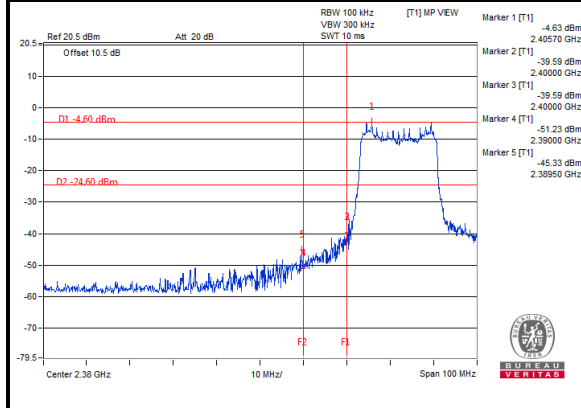




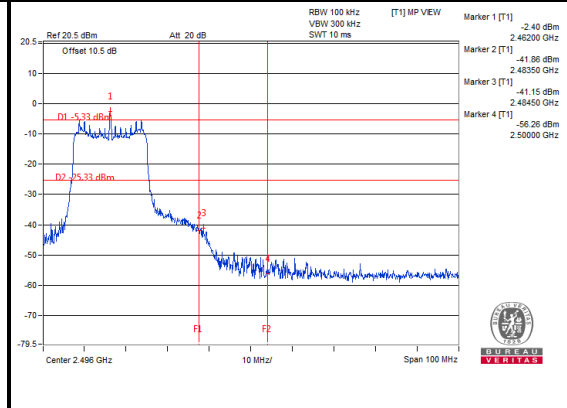
BUREAU
VERITAS

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CH 1 Band Edge



CH 11 Band Edge





5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



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6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---