# FCC Test Report
# (Class II Permissive Change)

| | |
|---|---|
| Product Name | Logistic Monitoring Gateway |
| Model No. | GWS-CSCG |
| FCC ID. | WL6GWS-CSCG |

| | |
|---|---|
| Applicant | ELITEGROUP COMPUTER SYSTEMS CO., LTD |
| Address | No.239, Sec. 2, Ti Ding Blvd., Taipei, Taiwan |

| | |
|---|---|
| Date of Receipt | Sep. 29, 2017 |
| Issued Date | Nov. 20, 2017 |
| Report No. | 1790405R-RFUSP24V00 |
| Report Version | V1.0 |

Testing Laboratory
3023

# Test Report

Issued Date: Nov. 20, 2017
Report No.: 1790405R-RFUSP24V00

| | |
|---|---|
| Product Name | Logistic Monitoring Gateway |
| Applicant | ELITEGROUP COMPUTER SYSTEMS CO., LTD |
| Address | No.239, Sec. 2, Ti Ding Blvd., Taipei, Taiwan |
| Manufacturer | Golden Elite Technology ( SHENZHEN ) CO., LTD. |
| Model No. | GWS-CSCG |
| FCC ID. | WL6GWS-CSCG |
| EUT Rated Voltage | DC 5V by USB |
| EUT Test Voltage | DC 5V by USB |
| Trade Name | ECS |
| Applicable Standard | FCC CFR Title 47 Part 15 Subpart C: 2016<br>ANSI C63.4: 2014, ANSI C63.10: 2013<br>KDB 558074 D01 DTS Meas Guidance v04 |
| Test Result | Complied |

Documented By : Joanne Lin

( Senior Adm. Specialist / Joanne Lin )

Tested By : Bill Lin

( Engineer / Bill Lin )

Approved By :

( Director / Vincent Lin )

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# 1. GENERAL INFORMATION

## 1.1. EUT Description

| | |
|---|---|
| Product Name | Logistic Monitoring Gateway |
| Trade Name | ECS |
| Model No. | GWS-CSCG |
| FCC ID. | WL6GWS-CSCG |
| Frequency Range | 2405-2480MHz |
| Channel Number | 16 |
| Type of Modulation | GFSK |
| Antenna Type | Chip Antenna |
| Channel Control | Auto |
| Antenna Gain | Refer to the table “Antenna List” |

**Antenna List**

| No. | Manufacturer | Part No. | Antenna Type | Peak Gain |
|---|---|---|---|---|
| 1 | ECS | IOT | Chip Antenna | 0.92dBi for 2.4 GHz |

Note: The antenna of EUT is conforming to FCC 15.203.

Center Frequency of Each Channel

| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|---|---|
| Channel 01 | 2405 | Channel 05 | 2425 | Channel 09 | 2445 | Channel 13 | 2465 |
| Channel 02 | 2410 | Channel 06 | 2430 | Channel 10 | 2450 | Channel 14 | 2470 |
| Channel 03 | 2415 | Channel 07 | 2435 | Channel 11 | 2455 | Channel 15 | 2475 |
| Channel 04 | 2420 | Channel 08 | 2440 | Channel 12 | 2460 | Channel 16 | 2480 |

Note:

1. The EUT is a Logistic Monitoring Gateway with a built-in WLAN, Zigbee and NFC transceiver, this report for Zigbee.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Zigbee transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
4. This is to request a Class II permissive change for FCC ID: WL6GWS-CSCG, originally granted on 06/13/2017.

   The major change filed under this application is:

   Change #1:

   Add load switch to turn on/off power of UBLOX M8C GNSS module. A GPIO is to control the load switch.

Change #2:

GPS: To unpopulated the unused GPS level shifter (U2B2).

Change #3:

Add boost after charger to stabilize system power while battery going low.

Change #4:

Remove redundant 0R resistors (keep those for RF tuning, stuff option, and VR output)

Change #5:

Remove C2C16 and C2C15 100uF large capacitor since boost is added.

Change #6:

Remove USB switch (SoFIA - MCU) and rout MCU USB to charger connector.

Change #7:

Change OTG 5V boost from TPS61170 to TPS61236 to fix voltage ripple issue.

Change #8:

Use Telink MCU A1 sample. (DVT is using A0)

Change #9:

At pull-up 3.3V add a resistor R2E1 (165K), C1E4 (47picker) on I2C1 to tune the frequency and slew rate.

Change #10:

Add 2 MOSFETs between OLED and 12V boost to fix OLED residual issue.

Change #11:

Change Zigbee and Wifi antenna from PCB antenna to Chip Antenna

(1) Original antenna: JEM IAHA20170411 (Zigbee), IAH20170410 (Wifi & GPS) PIFA antenna.

(2) New antenna: Walsin RGFRA1903041A1T chip antenna

(3) Schematic & Layout change: remove IPEX connector and change antenna to chip/SMT type.

Change #12:

Change GNSS antenna to active patch antenna

(1) Original antenna: IAH20170410 (Wifi &GPS) PIFA antenna.

(2) New antenna: INPAQ customized active antenna (patch antenna + LNA + co-axial cable), P/N: TBD

(3) Schematic & Layout change: remove LNA on PCB and add 3V LDO for active antenna. Antenna will be installed on top of device.

(4) Chassis is increase for patch antenna.

| | |
|---|---|
| Test Mode | Mode 1: Transmit |

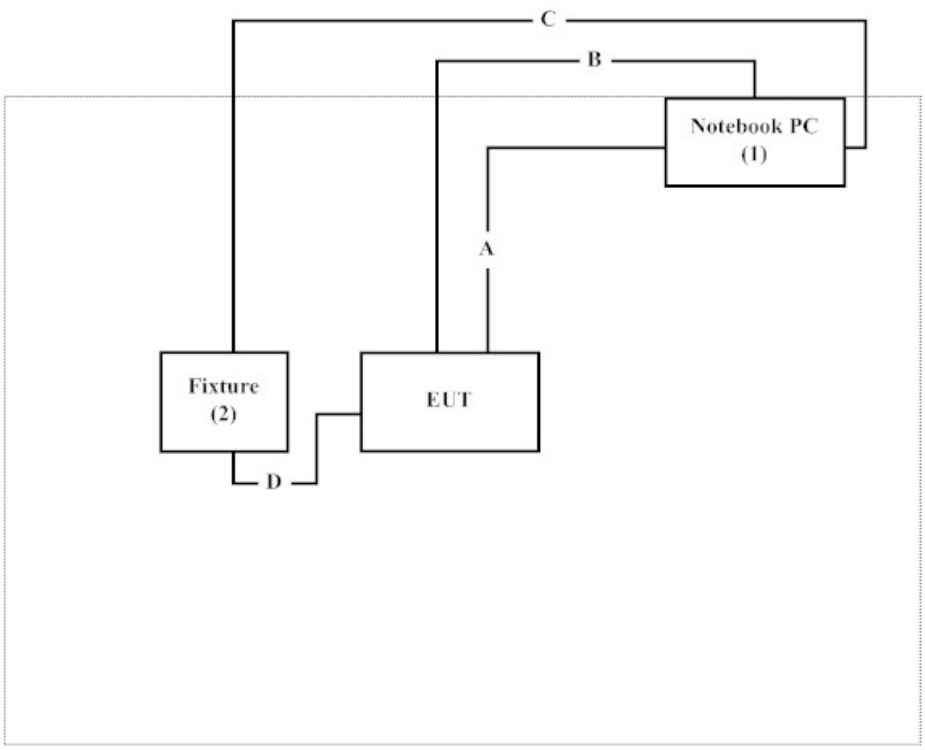
## 1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

| Product | | Manufacturer | Model No. | Serial No. | Power Cord |
|---|---|---|---|---|---|
| 1 | Notebook PC | DELL | P62G | 229FJC2 | N/A |
| 2 | Fixture | N/A | CI53A20_V2.0 | N/A | N/A |

| Signal Cable Type | | Signal cable Description |
|---|---|---|
| A | USB 2.0 Cable | Shielded, 0.75m |
| B | USB 2.0 Cable | Shielded, 1.0m |
| C | USB 2.0 Cable | Shielded, 1.8m |
| D | Signal Cable | Non-Shielded, 0.25m |

## 1.4. Configuration of Tested System




## 1.5. EUT Exercise Software

(1) Setup the EUT as shown in Section 1.4.

(2) Execute software “Tera Term (ver 4.90)” on the Notebook.

(3) Configure the test mode, the test channel, and the data rate.

(4) Press “OK” to start the continuous Transmit.

(5) Verify that the EUT works properly.

## 1.6. Test Facility

Ambient conditions in the laboratory:

| Items | Required (IEC 68-1) | Actual |
|---|---|---|
| Temperature (°C) | 15-35 | 20-35 |
| Humidity (%RH) | 25-75 | 50-65 |
| Barometric pressure (mbar) | 860-1060 | 950-1000 |

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:
http://www.dekra.com.tw/english/about/certificates.aspx?bval=5
The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en

Site Description: Accredited by TAF
Accredited Number: 3023

Site Name: DEKRA Testing and Certification Co., Ltd.
Site Address: No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,
New Taipei City 24457, Taiwan.
TEL: 886-2-2602-7968 / FAX : 866-2-2602-3286
E-Mail : info.tw@dekra.com

FCC Accreditation Number: TW1014

## 1.7. List of Test Equipment

**For Conduction measurements /ASR1**

| | Equipment | Manufacturer | Model No. | Serial No. | Cali. Data | Due. Data |
|---|---|---|---|---|---|---|
| X | EMI Test Receiver | R&S | ESR7 | 161601 | 2017.01.04 | 2018.01.05 |
| X | LISN | R&S | ESH3-Z5 | 836679/017 | 2017.01.18 | 2018.01.17 |
| X | LISN | R&S | ENV216 | 100097 | 2017.01.18 | 2018.01.17 |
| X | Coaxial Cable | Quietek | RG400_BNC | RF001 | 2017.05.25 | 2018.05.24 |

Note:
1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

**For Conducted measurements /ASR4**

| | Equipment | Manufacturer | Model No. | Serial No. | Cali. Data | Due. Data |
|---|---|---|---|---|---|---|
| X | Spectrum Analyzer | R&S | FSV30 | 103464 | 2017.01.07 | 2018.01.08 |
| X | Power Meter | Anritsu | ML2496A | 1548003 | 2016.12.15 | 2017.12.14 |
| X | Power Sensor | Anritsu | MA2411B | 1531024 | 2016.12.15 | 2017.12.14 |
| X | Power Sensor | Anritsu | MA2411B | 1531025 | 2016.12.15 | 2017.12.14 |
| | Bluetooth Tester | R&S | CBT | 101238 | 2017.01.01 | 2018.01.02 |

Note:
1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek Conduction Test System V8.0.110

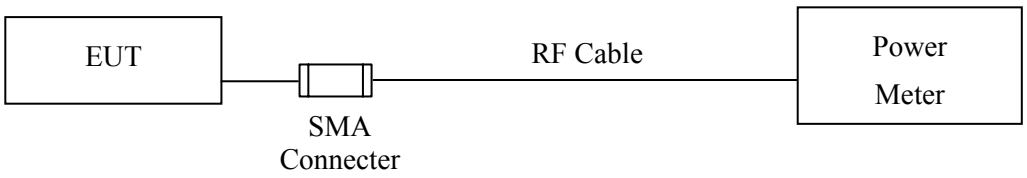
**For Radiated measurements /ACB1**

| | Equipment | Manufacturer | Model No. | Serial No. | Cali. Data | Due. Data |
|---|---|---|---|---|---|---|
| X | Loop Antenna | A.H. | SAS-562B | 272 | 2017.07.21 | 2018.07.20 |
| X | Bi-Log Antenna | SCHWARZBECK | VULB9168 | 9168-675 | 2017.02.09 | 2018.02.08 |
| X | Horn Antenna | ETS-Lindgren | 3117 | 00203800 | 2017.10.13 | 2018.10.12 |
| X | Horn Antenna | Com-Power | AH-840 | 101087 | 2017.05.03 | 2018.05.02 |
| X | Pre-Amplifier | EMCI | EMC001330 | 980316 | 2017.05.14 | 2018.05.15 |
| X | Pre-Amplifier | EMCI | EMC051835SE | 980311 | 2017.05.15 | 2018.05.16 |
| X | Pre-Amplifier | EMCI | EMC05820SE | 980310 | 2017.05.15 | 2018.05.16 |
| X | Pre-Amplifier | EMCI | EMC184045SE | 980314 | 2017.05.17 | 2018.05.18 |
| X | Filter | MICRO TRONICS | BRM50702 | G251 | 2017.08.11 | 2018.08.10 |
| | Filter | MICRO TRONICS | BRM50716 | G188 | 2017.08.11 | 2018.08.10 |
| X | EMI Test Receiver | R&S | ESR7 | 101602 | 2016.12.15 | 2017.12.14 |
| X | Spectrum Analyzer | R&S | FSV40 | 101149 | 2017.01.24 | 2018.01.23 |
| X | Coaxial Cable | SUHNER | SUCOFLEX 106 | RF002 | 2017.05.25 | 2018.05.24 |
| X | Mircoflex Cable | HUBER SUHNER | SUCOFLEX 102 | MY3381/2 | 2017.08.11 | 2018.08.10 |

Note:
1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

## 2. Peak Power Output

### 2.1. Test Setup




### 2.2. Limit

The maximum peak power shall be less 1Watt.

### 2.3. Test Procedure

Tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using KDB 558074 section 9.1.3 PKPM1 Peak power meter method.

### 2.4. Uncertainty

±0.86 dB

## 2.5. Test Result of Peak Power Output

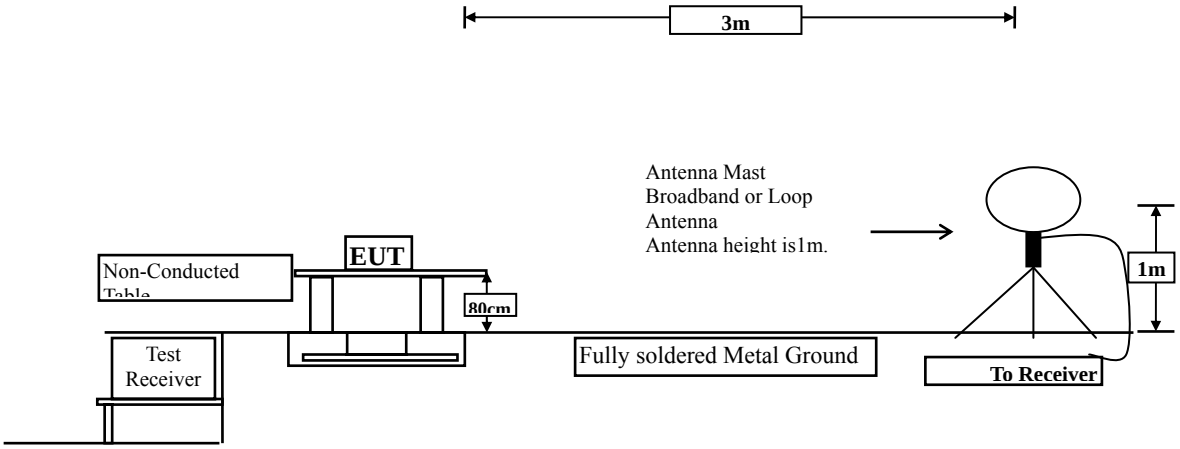
Product : Logistic Monitoring Gateway
Test Item : Peak Power Output
Test Mode : Mode 1: Transmit
Test Date : 2017/11/10

| Channel No. | Frequency (MHz) | Measurement (dBm) | Required Limit | Result |
|---|---|---|---|---|
| Channel 01 | 2405.00 | 2.79 | 1 Watt= 30 dBm | Pass |
| Channel 08 | 2440.00 | 3.03 | 1 Watt= 30 dBm | Pass |
| Channel 16 | 2480.00 | 2.34 | 1 Watt= 30 dBm | Pass |

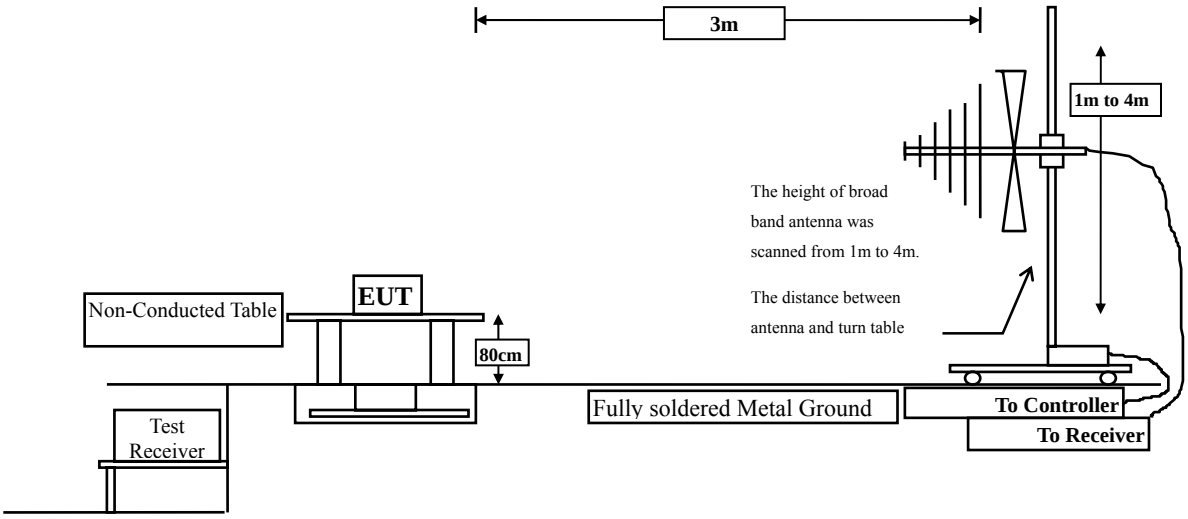
# 3. Radiated Emission

## 3.1. Test Setup

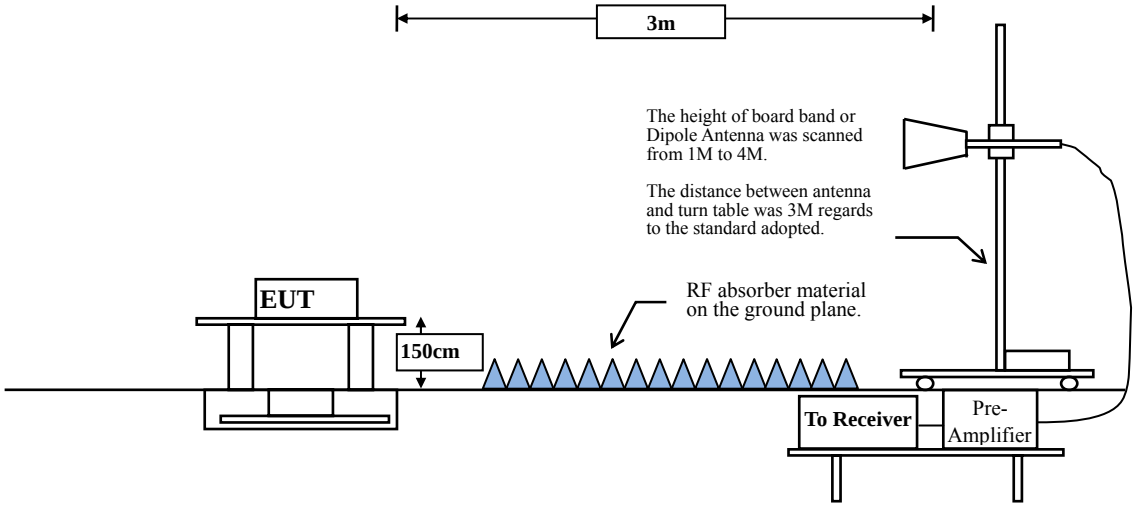
Radiated Emission Under 30MHz




Radiated Emission Below 1GHz




Radiated Emission Above 1GHz



## 3.2. Limits

### ➢ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

| FCC Part 15 Subpart C Paragraph 15.209 Limits | | |
|---|---|---|
| Frequency MHz | Field strength (microvolts/meter) | Measurement distance (meter) |
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30 | 30 | 30 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |

Remarks: 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

## 3.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground,when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The measurement frequency range form 9kHz - 10th Harmonic of fundamental was investigated.

## 3.4. Uncertainty

Horizontal polarization：

30-300MHz: ±4.08dB；300M-1GHz: ±3.86dB；1-18GHz: ±3.77dB；18-40GHz: ±3.98dB

Vertical polarization：

30-300MHz: ±4.81dB；300M-1GHz: ±3.87dB；1-18GHz : ±3.83dB；18-40GHz: ±3.98dB

## 3.5. Test Result of Radiated Emission

Product : Logistic Monitoring Gateway
Test Item : Harmonic Radiated Emission Data
Test Date : 2017/11/14
Test Mode : Mode 1: Transmit (2405MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBμV | dBμV /m | dB | dBμV /m |
| **Horizontal** | | | | | |
| **Peak Detector:** | | | | | |
| 4810.000 | -2.870 | 46.990 | 44.120 | -29.880 | 74.000 |
| 7215.000 | 0.383 | 45.230 | 45.613 | -28.387 | 74.000 |
| 9620.000 | 2.361 | 43.400 | 45.761 | -28.239 | 74.000 |
| **Average Detector:** | | | | | |
| -- | | | | | 54.000 |
| **Vertical** | | | | | |
| **Peak Detector:** | | | | | |
| 4810.000 | -2.870 | 47.580 | 44.710 | -29.290 | 74.000 |
| 7215.000 | 0.383 | 44.640 | 45.023 | -28.977 | 74.000 |
| 9620.000 | 2.361 | 43.570 | 45.931 | -28.069 | 74.000 |
| **Average Detector:** | | | | | |
| -- | | | | | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Logistic Monitoring Gateway
Test Item : Harmonic Radiated Emission Data
Test Date : 2017/11/14
Test Mode : Mode 1: Transmit (2440MHz)

| Frequency MHz | Correct Factor dB | Reading Level dBμV | Measurement Level dBμV /m | Margin dB | Peak Limit dBμV /m |
|---|---|---|---|---|---|
| **Horizontal Peak Detector:** | | | | | |
| 4880.000 | -2.817 | 46.560 | 43.742 | -30.258 | 74.000 |
| 7320.000 | 0.464 | 45.150 | 45.614 | -28.386 | 74.000 |
| 9760.000 | 2.608 | 43.860 | 46.467 | -27.533 | 74.000 |
| **Average Detector** | | | | | |
| -- | | | | | 54.000 |
| **Vertical Peak Detector:** | | | | | |
| 4880.000 | -2.817 | 47.780 | 44.962 | -29.038 | 74.000 |
| 7320.000 | 0.464 | 45.320 | 45.784 | -28.216 | 74.000 |
| 9760.000 | 2.608 | 44.030 | 46.637 | -27.363 | 74.000 |
| **Average Detector** | | | | | |
| -- | | | | | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Logistic Monitoring Gateway
Test Item : Harmonic Radiated Emission Data
Test Date : 2017/11/14
Test Mode : Mode 1: Transmit (2480MHz)

| Frequency MHz | Correct Factor dB | Reading Level dBμV | Measurement Level dBμV /m | Margin dB | Peak Limit dBμV /m |
|---|---|---|---|---|---|
| **Horizontal** | | | | | |
| **Peak Detector:** | | | | | |
| 4960.000 | -2.791 | 46.140 | 43.349 | -30.651 | 74.000 |
| 7440.000 | 0.499 | 44.970 | 45.469 | -28.531 | 74.000 |
| 9920.000 | 2.917 | 43.330 | 46.247 | -27.753 | 74.000 |
| **Average Detector** | | | | | |
| -- | | | | | 54.000 |
| **Vertical** | | | | | |
| **Peak Detector:** | | | | | |
| 4960.000 | -2.791 | 47.330 | 44.539 | -29.461 | 74.000 |
| 7440.000 | 0.499 | 44.590 | 45.089 | -28.911 | 74.000 |
| 9920.000 | 2.917 | 43.410 | 46.327 | -27.673 | 74.000 |
| **Average Detector** | | | | | |
| -- | | | | | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Logistic Monitoring Gateway
Test Item : General Radiated Emission Data
Test Date : 2017/11/14
Test Mode : Mode 1: Transmit (2440MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBμV | dBμV /m | dB | dBμV /m |
| **Horizontal** | | | | | |
| 200.101 | -13.473 | 41.226 | 27.752 | -15.748 | 43.500 |
| 232.435 | -12.337 | 44.292 | 31.955 | -14.045 | 46.000 |
| 333.652 | -9.133 | 40.733 | 31.600 | -14.400 | 46.000 |
| 467.203 | -5.871 | 34.480 | 28.609 | -17.391 | 46.000 |
| 600.754 | -3.062 | 33.288 | 30.226 | -15.774 | 46.000 |
| 800.377 | -0.321 | 40.534 | 40.214 | -5.786 | 46.000 |
| **Vertical** | | | | | |
| 200.101 | -13.473 | 47.661 | 34.187 | -9.313 | 43.500 |
| 232.435 | -12.337 | 51.167 | 38.830 | -7.170 | 46.000 |
| 266.174 | -11.074 | 47.406 | 36.332 | -9.668 | 46.000 |
| 399.725 | -7.349 | 38.546 | 31.197 | -14.803 | 46.000 |
| 600.754 | -3.062 | 32.986 | 29.924 | -16.076 | 46.000 |
| 894.565 | 0.866 | 36.185 | 37.050 | -8.950 | 46.000 |

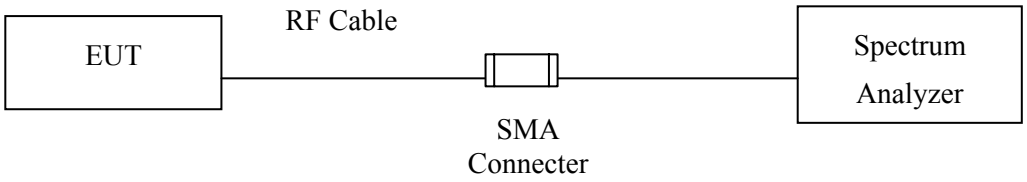
Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.
8. No emission found between lowest internal used/generated frequency to 30MHz.

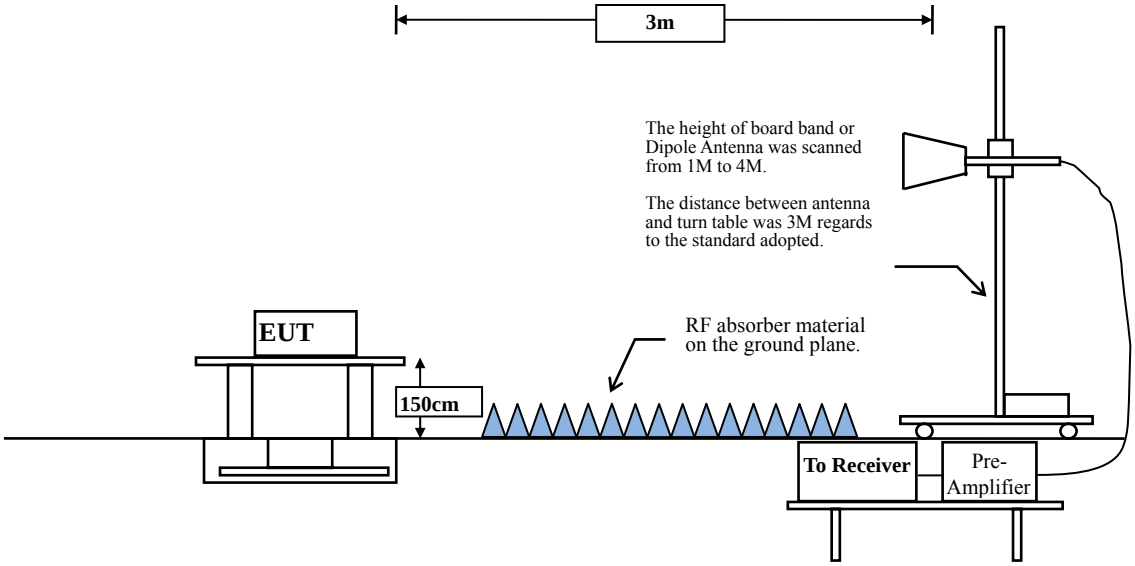
# 4. Band Edge

## 4.1. Test Setup

**RF Conducted Measurement**




**RF Radiated Measurement:**



## 4.2. Limit

According to FCC Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, 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) (see Section 15.205(c)).

## 4.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.
The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

## 4.4. Uncertainty

Conducted: ±1.23dB
Radiated:
Horizontal polarization：1-18GHz: ±3.77dB
Vertical polarization：1-18GHz : ±3.83dB

## 4.5. Test Result of Band Edge

Product : Logistic Monitoring Gateway
Test Item : Band Edge Data
Test Date : 2017/11/13
Test Mode : Mode 1: Transmit (2405MHz)

**RF Radiated Measurement (Horizontal):**

| Channel No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBμV ) | Emission Level (dBμV /m) | Peak Limit (dBμV /m) | Average Limit (dBμV /m) | Result |
|---|---|---|---|---|---|---|---|
| 01 (Peak) | 2356.522 | 12.052 | 37.434 | 49.487 | 74.00 | 54.00 | Pass |
| 01 (Peak) | 2390.000 | 12.148 | 36.757 | 48.905 | 74.00 | 54.00 | Pass |
| 01 (Peak) | 2400.000 | 12.176 | 42.143 | 54.319 | -- | -- | -- |
| 01 (Peak) | 2405.507 | 12.190 | 78.363 | 90.552 | -- | -- | -- |
| 01 (Average) | 2390.000 | 12.148 | 23.784 | 35.932 | 74.00 | 54.00 | Pass |
| 01 (Average) | 2400.000 | 12.176 | 30.961 | 43.137 | -- | -- | -- |
| 01 (Average) | 2405.072 | 12.188 | 76.039 | 88.227 | -- | -- | -- |

**Figure Channel 01: Horizontal (Peak)**

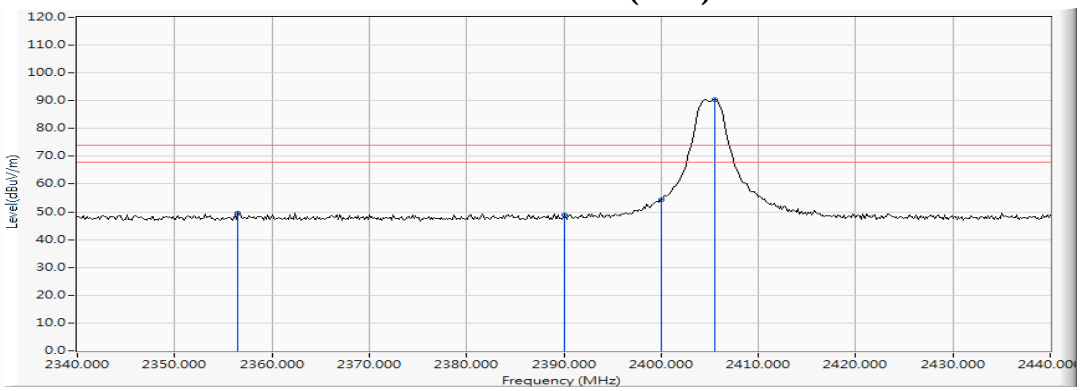
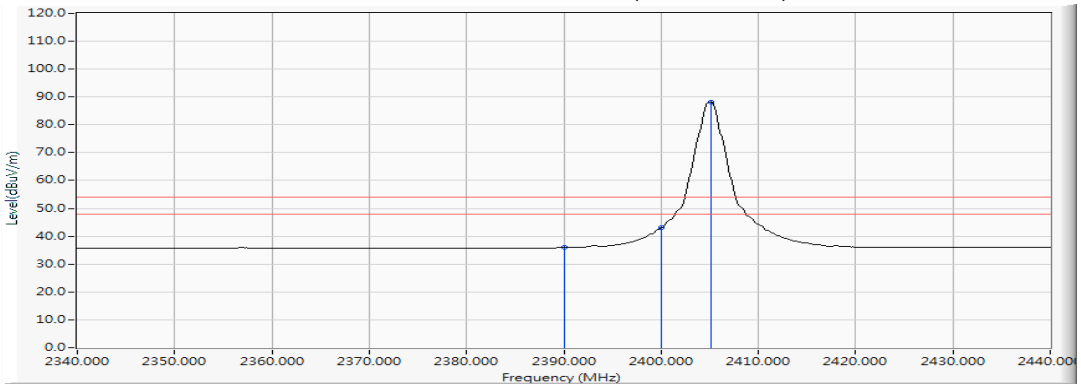



**Figure Channel 01: Horizontal (AVERAGE)**




Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.

Product : Logistic Monitoring Gateway
Test Item : Band Edge Data
Test Date : 2017/11/13
Test Mode : Mode 1: Transmit (2405MHz)

**RF Radiated Measurement (Vertical):**

| Channel No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBµV ) | Emission Level (dBµV /m) | Peak Limit (dBµV /m) | Average Limit (dBµV /m) | Result |
|---|---|---|---|---|---|---|---|
| 01 (Peak) | 2380.000 | 12.118 | 37.133 | 49.252 | 74.00 | 54.00 | Pass |
| 01 (Peak) | 2390.000 | 12.148 | 35.829 | 47.977 | 74.00 | 54.00 | Pass |
| 01 (Peak) | 2400.000 | 12.176 | 38.710 | 50.886 | -- | -- | -- |
| 01 (Peak) | 2405.507 | 12.190 | 72.319 | 84.508 | -- | -- | -- |
| 01 (Average) | 2390.000 | 12.148 | 23.636 | 35.784 | 74.00 | 54.00 | Pass |
| 01 (Average) | 2400.000 | 12.176 | 27.650 | 39.826 | -- | -- | -- |
| 01 (Average) | 2405.072 | 12.188 | 70.011 | 82.199 | -- | -- | -- |

**Figure Channel 01: Vertical (Peak)**

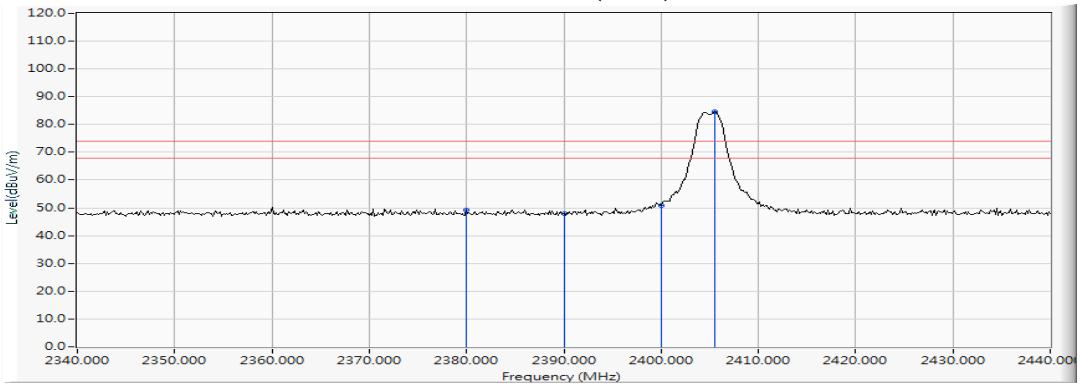
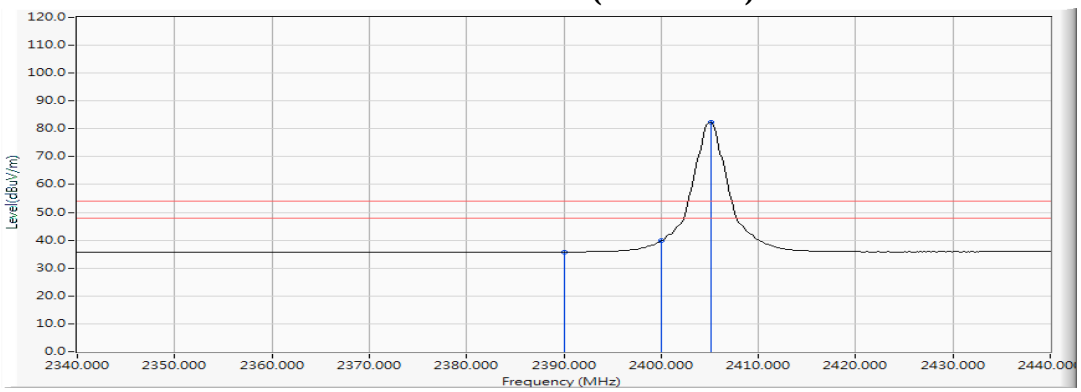



**Figure Channel 01: Vertical (AVERAGE)**




Note:
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.

Product : Logistic Monitoring Gateway
Test Item : Band Edge Data
Test Date : 2017/11/13
Test Mode : Mode 1: Transmit (2480MHz)

**RF Radiated Measurement (Horizontal):**

| Channel No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBμV ) | Emission Level (dBμV /m) | Peak Limit (dBμV /m) | Average Limit (dBμV /m) | Result |
|---|---|---|---|---|---|---|---|
| 16 (Peak) | 2480.457 | 12.394 | 80.888 | 93.282 | 74.00 | 54.00 | Pass |
| 16 (Peak) | 2483.500 | 12.403 | 50.460 | 62.863 | -- | -- | -- |
| 16 (Average) | 2480.022 | 12.393 | 78.512 | 90.905 | 74.00 | 54.00 | Pass |
| 16 (Average) | 2483.500 | 12.403 | 38.906 | 51.309 | -- | -- | -- |

**Figure Channel 16: Horizontal (Peak)**

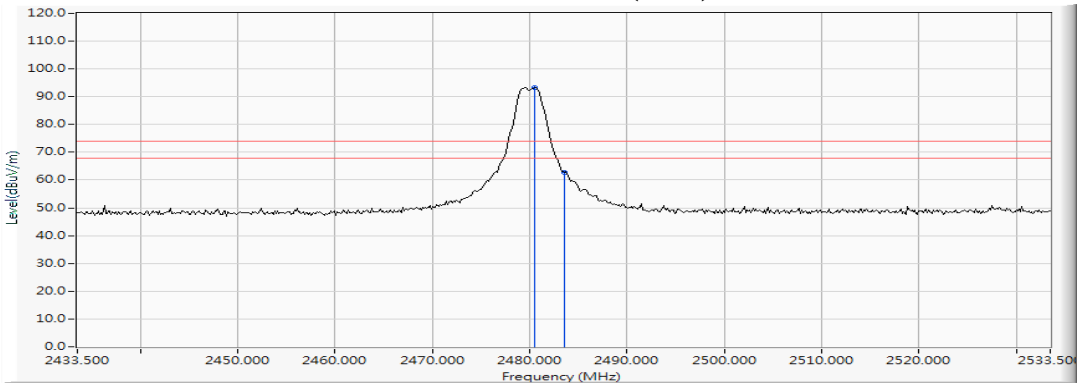
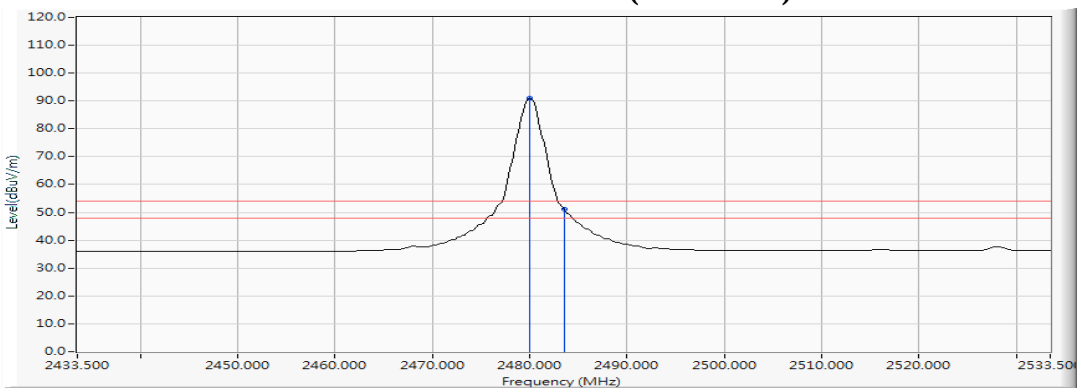



**Figure Channel 16: Horizontal (AVERAGE)**




Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.

Product : Logistic Monitoring Gateway
Test Item : Band Edge Data
Test Date : 2017/11/13
Test Mode : Mode 1: Transmit (2480MHz)

**RF Radiated Measurement (Vertical):**

| Channel No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBμV ) | Emission Level (dBμV /m) | Peak Limit (dBμV /m) | Average Limit (dBμV /m) | Result |
|---|---|---|---|---|---|---|---|
| 16 (Peak) | 2480.457 | 12.394 | 77.342 | 89.736 | -- | -- | -- |
| 16 (Peak) | 2483.500 | 12.403 | 47.837 | 60.240 | 74.00 | 54.00 | Pass |
| 16 (Average) | 2480.022 | 12.393 | 74.944 | 87.337 | -- | -- | -- |
| 16 (Average) | 2483.500 | 12.403 | 36.291 | 48.694 | 74.00 | 54.00 | Pass |

**Figure Channel 16: Vertical (Peak)**

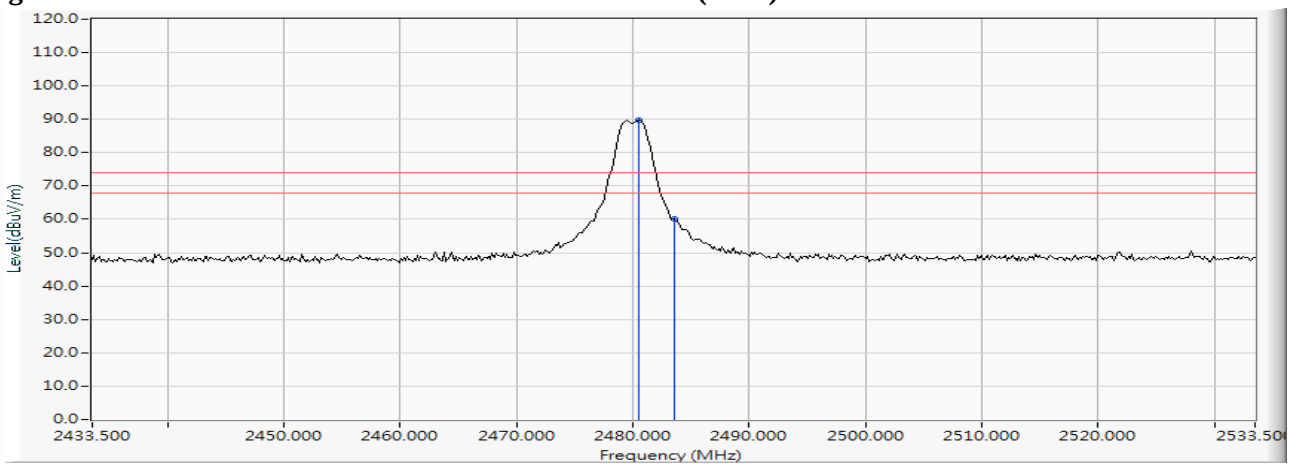
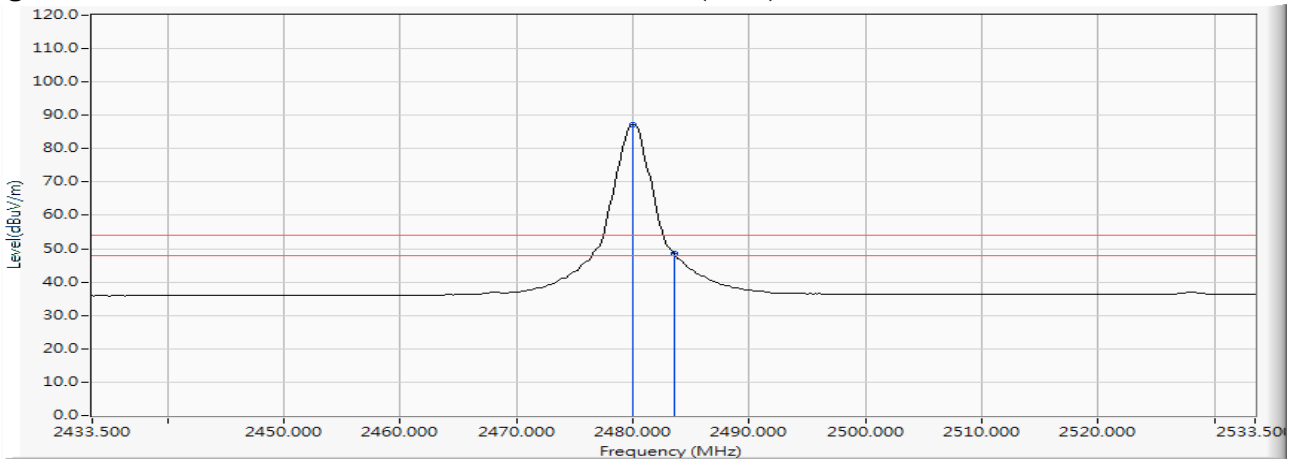



**Figure Channel 16: Vertical (Peak)**




Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.