# FCC Test Report

| | |
|---|---|
| Product Name | MOBILE DATA TERMINAL |
| Model No. | MT7010 |
| FCC ID. | 2ABTU-MT7010 |

| | |
|---|---|
| Applicant | RuggON Corporation |
| Address | 4F, No. 298, Yang Guang St. Neihu Dist., Taipei City, Taiwan |

| | |
|---|---|
| Date of Receipt | Aug. 29, 2017 |
| Issued Date | Oct. 23, 2017 |
| Report No. | 1780508R-RFUSP01V00 |
| Report Version | V1.0 |

Testing Laboratory
3023

# Test Report

Issued Date: Oct. 23, 2017
Report No.: 1780508R-RFUSP01V00

| | |
|---|---|
| Product Name | MOBILE DATA TERMINAL |
| Applicant | RuggON Corporation |
| Address | 4F, No. 298, Yang Guang St. Neihu Dist., Taipei City, Taiwan |
| Manufacturer | RuggON Corporation |
| Model No. | MT7010 |
| FCC ID. | 2ABTU-MT7010 |
| EUT Rated Voltage | DC 9-36V |
| EUT Test Voltage | DC 12V |
| Trade Name | RuggON |
| Applicable Standard | FCC CFR Title 47 Part 15 Subpart C: 2016<br>ANSI C63.4: 2014, ANSI C63.10: 2013 |
| Test Result | Complied |

Documented By : Joanne Lin

( Senior Adm. Specialist / Joanne Lin )

Tested By : Anson Lu

( Engineer / Anson Lu )

Approved By :

( Director / Vincent Lin )

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# 1. GENERAL INFORMATION

## 1.1. EUT Description

| | |
|---|---|
| Product Name | MOBILE DATA TERMINAL |
| Trade Name | RuggON |
| Model No. | MT7010 |
| FCC ID. | 2ABTU-MT7010 |
| Frequency Range | 2402-2480MHz |
| Channel Number | 79 |
| Type of Modulation | FHSS: GFSK(1Mbps) / $\pi$ /4DQPSK(2Mbps) / 8DPSK(3Mbps) |
| Antenna Type | PIFA Antenna |
| Channel Control | Auto |
| Antenna Gain | Refer to the table “Antenna List” |

**Antenna List**

| No. | Manufacturer | Part No. | Antenna Type | Peak Gain |
|---|---|---|---|---|
| 1 | Anjie | MT7010 | PIFA Antenna | 2.14dBi for 2.4 GHz |

Note:

1. The antenna of EUT conforms to FCC 15.203.

Center Frequency of Each Channel:

| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|---|---|
| Channel 00: | 2402 MHz | Channel 20: | 2422 MHz | Channel 40: | 2442 MHz | Channel 60: | 2462 MHz |
| Channel 01: | 2403 MHz | Channel 21: | 2423 MHz | Channel 41: | 2443 MHz | Channel 61: | 2463 MHz |
| Channel 02: | 2404 MHz | Channel 22: | 2424 MHz | Channel 42: | 2444 MHz | Channel 62: | 2464 MHz |
| Channel 03: | 2405 MHz | Channel 23: | 2425 MHz | Channel 43: | 2445 MHz | Channel 63: | 2465 MHz |
| Channel 04: | 2406 MHz | Channel 24: | 2426 MHz | Channel 44: | 2446 MHz | Channel 64: | 2466 MHz |
| Channel 05: | 2407 MHz | Channel 25: | 2427 MHz | Channel 45: | 2447 MHz | Channel 65: | 2467 MHz |
| Channel 06: | 2408 MHz | Channel 26: | 2428 MHz | Channel 46: | 2448 MHz | Channel 66: | 2468 MHz |
| Channel 07: | 2409 MHz | Channel 27: | 2429 MHz | Channel 47: | 2449 MHz | Channel 67: | 2469 MHz |
| Channel 08: | 2410 MHz | Channel 28: | 2430 MHz | Channel 48: | 2450 MHz | Channel 68: | 2470 MHz |
| Channel 09: | 2411 MHz | Channel 29: | 2431 MHz | Channel 49: | 2451 MHz | Channel 69: | 2471 MHz |
| Channel 10: | 2412 MHz | Channel 30: | 2432 MHz | Channel 50: | 2452 MHz | Channel 70: | 2472 MHz |
| Channel 11: | 2413 MHz | Channel 31: | 2433 MHz | Channel 51: | 2453 MHz | Channel 71: | 2473 MHz |
| Channel 12: | 2414 MHz | Channel 32: | 2434 MHz | Channel 52: | 2454 MHz | Channel 72: | 2474 MHz |
| Channel 13: | 2415 MHz | Channel 33: | 2435 MHz | Channel 53: | 2455 MHz | Channel 73: | 2475 MHz |
| Channel 14: | 2416 MHz | Channel 34: | 2436 MHz | Channel 54: | 2456 MHz | Channel 74: | 2476 MHz |
| Channel 15: | 2417 MHz | Channel 35: | 2437 MHz | Channel 55: | 2457 MHz | Channel 75: | 2477 MHz |
| Channel 16: | 2418 MHz | Channel 36: | 2438 MHz | Channel 56: | 2458 MHz | Channel 76: | 2478 MHz |
| Channel 17: | 2419 MHz | Channel 37: | 2439 MHz | Channel 57: | 2459 MHz | Channel 77: | 2479 MHz |
| Channel 18: | 2420 MHz | Channel 38: | 2440 MHz | Channel 58: | 2460 MHz | Channel 78: | 2480 MHz |
| Channel 19: | 2421 MHz | Channel 39: | 2441 MHz | Channel 59: | 2461 MHz | | |

Note:

1. The EUT is a MOBILE DATA TERMINAL with a built-in WLAN、Bluetooth V4.1, V2.1+EDR transceiver, this report for Bluetooth V2.1+EDR.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test
4. Bluetooth operation was evaluated at both 1Mb/s and 3Mb/s data rates. 2Mb/s data rate was found, through pre-testing, to produce emissions similar to those for 3Mb/s.
5. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

| | |
|---|---|
| Test Mode | Mode 1: Transmit - 1Mbps (GFSK)<br>Mode 2: Transmit - 3Mbps (8DPSK) |

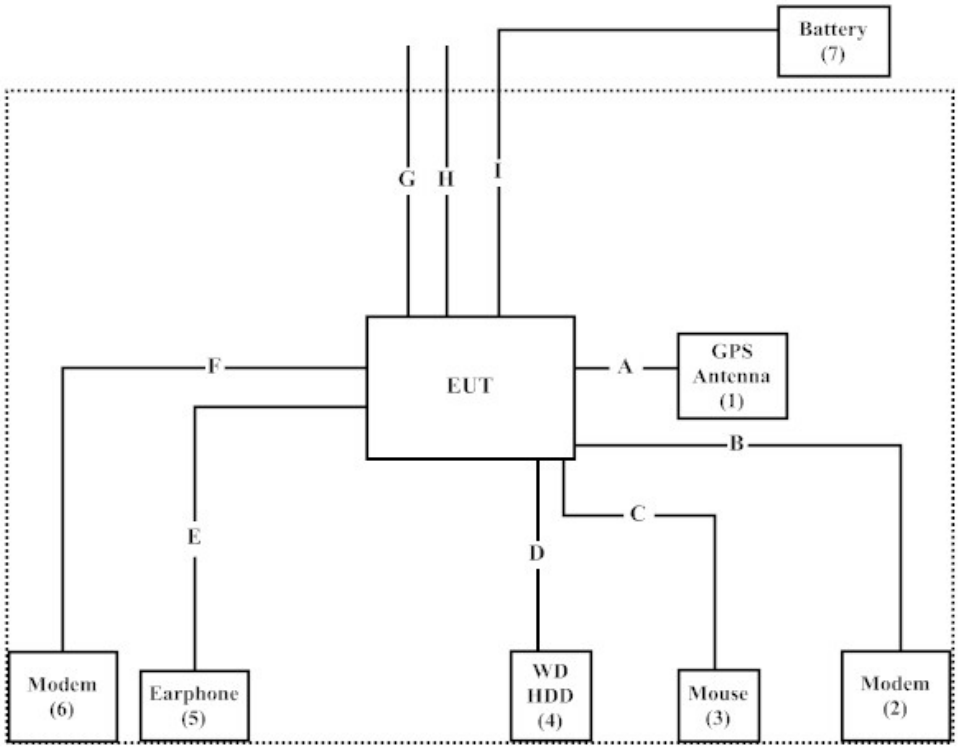
## 1.3. Tested System Details

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 | GPS Antenna | N/A | N/A | N/A | N/A |
| 2 | Modem | ACEEX | DM-1414 | 0102027550 | Non-Shielded, 1.8m |
| 3 | Mouse | Logitech | M-SBM96B | 810-000439 | N/A |
| 4 | WD HDD 2.5 | Western Digital | WD1200BEVS | WXE108L30036 | Non-Shielded, 1.8m With Core*1 |
| 5 | Earphone | Dr.AV | CD-806B | N/A | N/A |
| 6 | Modem | ACEEX | DM-1414 | 0102027533 | Non-Shielded, 1.8m |
| 7 | DC 12V Battery | TRANE | 12B50PE | N/A | N/A |

| Signal Cable Type | | Signal cable Description |
|---|---|---|
| A | Signal Cable | Non-Shielded, 1.3m |
| B | Signal Cable | Non-Shielded, 1.2m |
| C | Signal Cable | Non-Shielded, 1.8m |
| D | USB Cable | Non-Shielded, 0.4m |
| E | Signal Cable | Non-Shielded, 1.8m |
| F | Signal Cable | Non-Shielded, 1.2m |
| G | Signal Cable | Non-Shielded, 0.7m |
| H | Network Cable | Non-Shielded, 1.8m |
| I | Signal Cable | Non-Shielded, 1.5m |

## 1.4. Configuration of Tested System



## 1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software ” RF Test V3.10.49” on the EUT.
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 | 30-65 |
| 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.aspx

Site Description: Accredited by TAF
Accredited Number: 3023

Site Name: DEKRA Testing and Certification Co., Ltd
Site Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan, R.O.C.
TEL : 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : info.tw@dekra.com

FCC Accreditation Number: TW3023

## 1.7. List of Test Equipment

**For Conducted measurements / CB3 / SR8**

| | Equipment | Manufacturer | Model No. | Serial No. | Cali. Data | Due. Data |
|---|---|---|---|---|---|---|
| | Temperature Chamber | WIT GROUP | TH-1S-B | EQ-201-00146 | 2016/11/28 | 2017/11/27 |
| X | Spectrum Analyzer | Agilent | N9010A | MY48030495 | 2017/7/22 | 2018/7/21 |
| X | Power Meter | Anritsu | ML2495A | 6K00003357 | 2017/6/23 | 2018/6/22 |
| X | Pulse power sensor | Anritsu | MA2411B | 0846193 | 2017/6/23 | 2018/6/22 |
| X | EMI Test Receiver | R&S | ESCS 30 | 100369 | 2017/10/13 | 2018/10/12 |
| X | LISN | R&S | ESH3-Z5 | 836679/017 | 2017/1/7 | 2018/1/6 |
| X | LISN | R&S | ENV216 | 100097 | 2017/1/7 | 2018/1/6 |
| X | Coaxial Cable | QTK(Arnist) | RG 400 | LC018-RG | 2017/6/25 | 2018/6/24 |

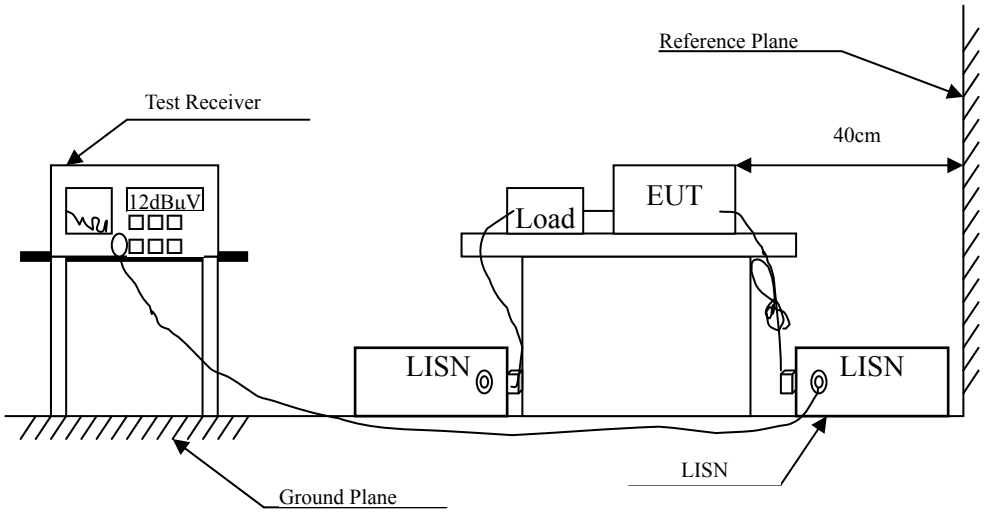
**For Radiated measurements / Site3 / CB8**

| | Equipment | Manufacturer | Model No. | Serial No. | Cali. Data | Due. Data |
|---|---|---|---|---|---|---|
| X | Spectrum Analyzer | R&S | FSP40 | 100170 | 2017/1/5 | 2018/1/4 |
| | Loop Antenna | Teseq | HLA6121 | 37133 | 2017/3/18 | 2018/3/17 |
| X | Bi-Log Antenna | Schaffner Chase | CBL6112B | 2707 | 2017/6/11 | 2018/6/10 |
| X | Horn Antenna | ETS-Lindgren | 3117 | 00135205 | 2017/4/6 | 2018/4/5 |
| X | Horn Antenna | Schwarzbeck | BBHA9170 | 9170430 | 2017/1/11 | 2018/1/10 |
| X | Pre-Amplifier | QTK | AP/0100A | CHM/0901069 | 2017/6/23 | 2018/6/22 |
| X | Pre-Amplifier | EMCI | EMC012630SE | 980210 | 2017/1/26 | 2018/1/24 |
| X | Pre-Amplifier | NARDA WE | DBL-1840N506 | 013 | 2017/9/30 | 2018/9/29 |
| X | Filter | MicroTRON | BRM50701 | 019 | 2016/11/2 | 2017/11/1 |
| X | Filter | Microwave Circuits | N0257881 | 36681 | 2016/12/7 | 2017/12/6 |
| X | EMI Test Receiver | R&S | ESR26 | 101385 | 2017/9/29 | 2018/9/28 |
| X | Coaxial Cable | QTK(Arnist) | SUCOFLEX 106 | L1606-015C | 2017/6/23 | 2018/6/22 |
| X | EMI Test Receiver | R&S | ESCS 30 | 838251/001 | 2017/7/21 | 2018/7/20 |
| X | Coaxial Cable | QTK(Arnist) | RG 214 | LC003-RG | 2017/6/16 | 2018/6/15 |
| X | Coaxial signal switch | Anritsu | MP59B | 6201415889 | 2017/6/16 | 2018/6/15 |

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. Conducted Emission

## 2.1. Test Setup



## 2.2. Limits

| FCC Part 15 Subpart C Paragraph 15.207 (dBμV) Limit | | |
|---|---|---|
| Frequency MHz | Limits | |
| | QP | AV |
| 0.15 - 0.50 | 66-56 | 56-46 |
| 0.50-5.0 | 56 | 46 |
| 5.0 - 30 | 60 | 50 |

Remarks: In the above table, the tighter limit applies at the band edges.

## 2.3. Test Procedure

The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

The EUT was setup to ANSI C63.4: 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

## 2.4. Uncertainty

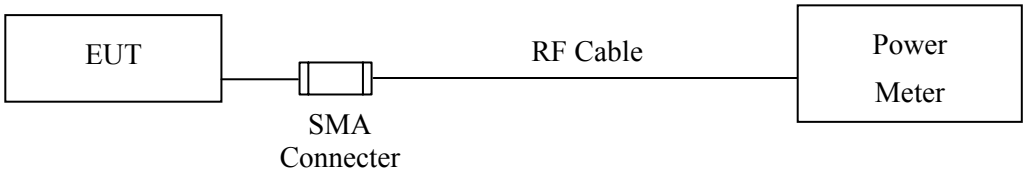
± 2.26 dB

## 2.5. Test Result of Conducted Emission

Owing to the DC operation of EUT, this test item is not performed.

# 3. Peak Power Output

## 3.1. Test Setup




## 3.2. Limit

The maximum peak power shall be less 1Watt.

## 3.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

## 3.4. Uncertainty

± 1.19 dB

## 3.5. Test Result of Peak Power Output

Product : MOBILE DATA TERMINAL
Test Item : Peak Power Output
Test Site : No.3 OATS
Test date : 2017/10/19
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

| Channel No. | Frequency (MHz) | Measurement (dBm) | Required Limit | Result |
|---|---|---|---|---|
| Channel 00 | 2402.00 | 5.59 | 1 Watt= 30 dBm | Pass |
| Channel 39 | 2441.00 | 5.61 | 1 Watt= 30 dBm | Pass |
| Channel 78 | 2480.00 | 4.31 | 1 Watt= 30 dBm | Pass |

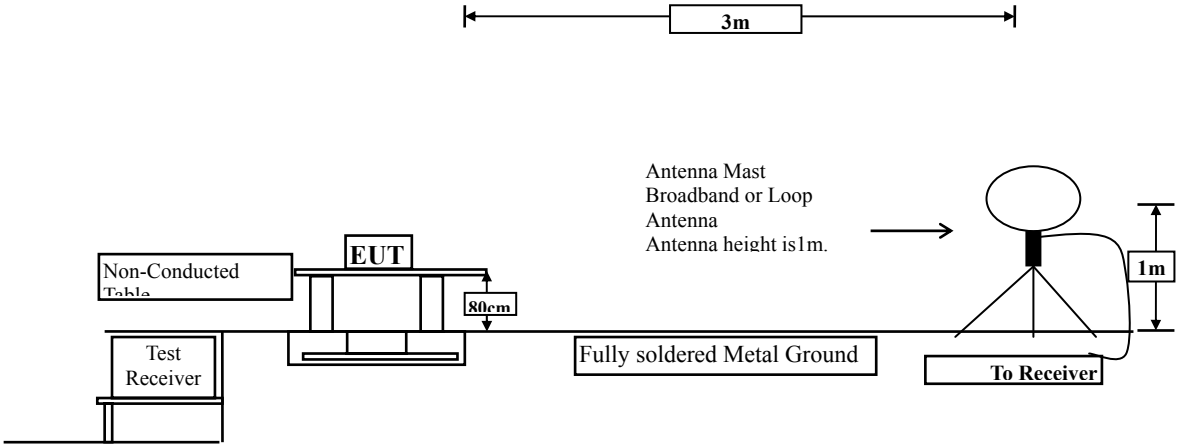
Product : MOBILE DATA TERMINAL
Test Item : Peak Power Output
Test Site : No.3 OATS
Test date : 2017/10/19
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

| Channel No. | Frequency (MHz) | Measurement (dBm) | Required Limit | Result |
|---|---|---|---|---|
| Channel 00 | 2402.00 | 5.48 | 1 Watt= 30 dBm | Pass |
| Channel 39 | 2441.00 | 6.57 | 1 Watt= 30 dBm | Pass |
| Channel 78 | 2480.00 | 4.66 | 1 Watt= 30 dBm | Pass |

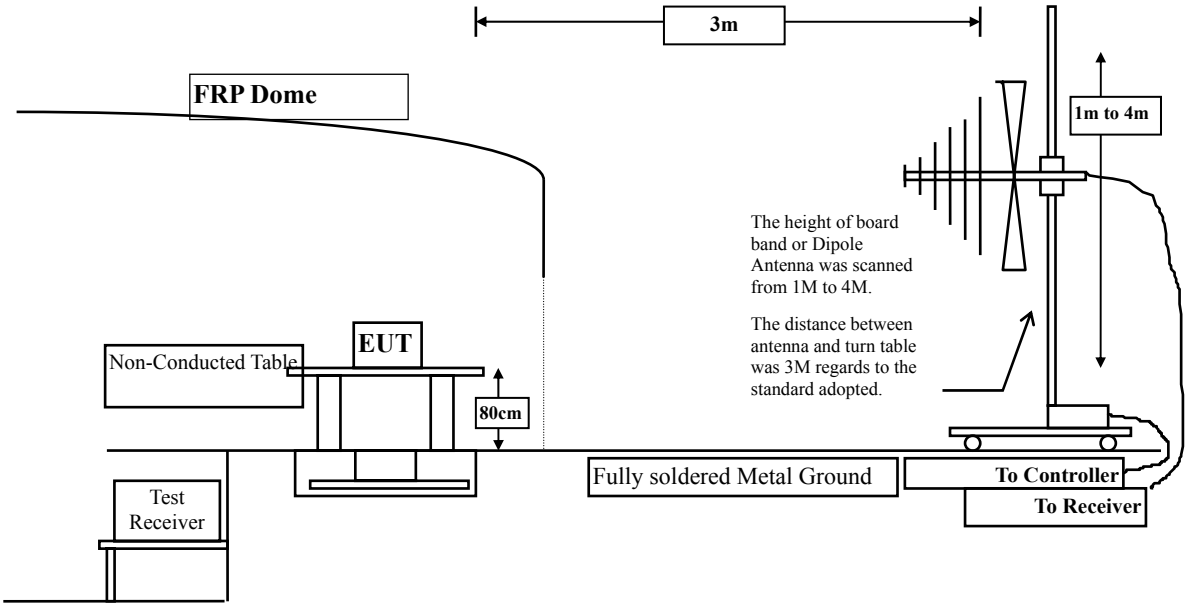
# 4. Radiated Emission

## 4.1. Test Setup

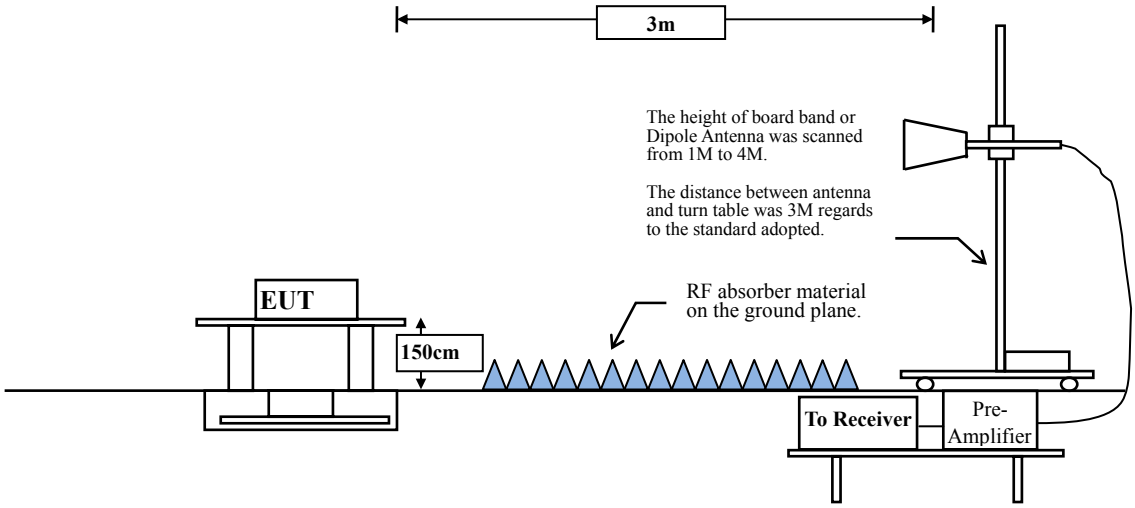
Under 30MHz




Below 1GHz



Above 1GHz




## 4.2. 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 (dBμV) = 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.

## 4.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested 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 worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

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

## 4.4. Uncertainty

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

## 4.5. Test Result of Radiated Emission

Product : MOBILE DATA TERMINAL
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2017/10/12
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2402MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBμV | dBμV/m | dB | dBμV/m |
| **Horizontal** | | | | | |
| **Peak Detector:** | | | | | |
| 4804.000 | 2.511 | 40.374 | 42.884 | -31.116 | 74.000 |
| 7206.000 | 9.511 | 38.123 | 47.634 | -26.366 | 74.000 |
| 9608.000 | 10.394 | 38.949 | 49.343 | -24.657 | 74.000 |
| **Average Detector:** | | | | | |
| -- | | | | | |
| **Vertical** | | | | | |
| **Peak Detector:** | | | | | |
| 4804.000 | 2.754 | 40.153 | 42.907 | -31.093 | 74.000 |
| 7206.000 | 10.177 | 38.452 | 48.629 | -25.371 | 74.000 |
| 9608.000 | 10.847 | 39.014 | 49.861 | -24.139 | 74.000 |
| **Average Detector:** | | | | | |
| -- | | | | | |

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 | : | MOBILE DATA TERMINAL |
| Test Item | : | Harmonic Radiated Emission |
| Test Site | : | No.3 OATS |
| Test date | : | 2017/10/12 |
| Test Mode | : | Mode 1: Transmit - 1Mbps (GFSK) (2441MHz) |

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBμV | dBμV/m | dB | dBμV/m |
| **Horizontal** | | | | | |
| **Peak Detector:** | | | | | |
| 4882.000 | 2.025 | 40.231 | 42.256 | -31.744 | 74.000 |
| 7323.000 | 9.762 | 38.016 | 47.777 | -26.223 | 74.000 |
| 9764.000 | 9.682 | 38.898 | 48.579 | -25.421 | 74.000 |
| **Average** | | | | | |
| **Detector:** | | | | | |
| -- | | | | | |
| **Vertical** | | | | | |
| **Peak Detector:** | | | | | |
| 4882.000 | 2.371 | 40.043 | 42.413 | -31.587 | 74.000 |
| 7323.000 | 10.590 | 38.070 | 48.660 | -25.340 | 74.000 |
| 9764.000 | 10.315 | 39.045 | 49.360 | -24.640 | 74.000 |
| **Average** | | | | | |
| **Detector:** | | | | | |
| -- | | | | | |

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 | : | MOBILE DATA TERMINAL |
| Test Item | : | Harmonic Radiated Emission |
| Test Site | : | No.3 OATS |
| Test date | : | 2017/10/12 |
| Test Mode | : | Mode 1: Transmit - 1Mbps (GFSK) (2480MHz) |

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBμV | dBμV/m | dB | dBμV/m |
| **Horizontal** | | | | | |
| **Peak Detector:** | | | | | |
| 4960.000 | 2.582 | 40.332 | 42.914 | -31.086 | 74.000 |
| 7440.000 | 10.555 | 41.251 | 51.806 | -22.194 | 74.000 |
| 9920.000 | 10.206 | 41.311 | 51.517 | -22.483 | 74.000 |
| **Average** | | | | | |
| **Detector:** | | | | | |
| -- | | | | | |
| **Vertical** | | | | | |
| **Peak Detector:** | | | | | |
| 4960.000 | 3.398 | 40.216 | 43.615 | -30.385 | 74.000 |
| 7440.000 | 11.214 | 41.155 | 52.369 | -21.631 | 74.000 |
| 9920.000 | 11.245 | 41.138 | 52.383 | -21.617 | 74.000 |
| **Average** | | | | | |
| **Detector:** | | | | | |
| -- | | | | | |

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 | : | MOBILE DATA TERMINAL |
| Test Item | : | Harmonic Radiated Emission |
| Test Site | : | No.3 OATS |
| Test date | : | 2017/10/12 |
| Test Mode | : | Mode 2: Transmit - 3Mbps (8DPSK)(2402MHz) |

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBμV | dBμV/m | dB | dBμV/m |
| **Horizontal** | | | | | |
| **Peak Detector:** | | | | | |
| 4804.000 | 2.511 | 39.923 | 42.433 | -31.567 | 74.000 |
| 7206.000 | 9.511 | 40.356 | 49.867 | -24.133 | 74.000 |
| 9608.000 | 10.394 | 40.433 | 50.827 | -23.173 | 74.000 |
| **Average Detector:** | | | | | |
| -- | | | | | |
| **Vertical** | | | | | |
| **Peak Detector:** | | | | | |
| 4804.000 | 2.923 | 39.647 | 42.569 | -31.431 | 74.000 |
| 7206.000 | 9.988 | 40.267 | 50.256 | -23.744 | 74.000 |
| 9608.000 | 10.847 | 40.385 | 51.232 | -22.768 | 74.000 |
| **Average Detector:** | | | | | |
| -- | | | | | |

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 | : | MOBILE DATA TERMINAL |
| Test Item | : | Harmonic Radiated Emission |
| Test Site | : | No.3 OATS |
| Test date | : | 2017/10/12 |
| Test Mode | : | Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz) |

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBμV | dBμV/m | dB | dBμV/m |
| **Horizontal** | | | | | |
| **Peak Detector:** | | | | | |
| 4882.000 | 2.025 | 40.521 | 42.546 | -31.454 | 74.000 |
| 7323.000 | 9.762 | 41.208 | 50.969 | -23.031 | 74.000 |
| 9764.000 | 9.682 | 41.307 | 50.988 | -23.012 | 74.000 |
| **Average Detector:** | | | | | |
| -- | | | | | |
| **Vertical** | | | | | |
| **Peak Detector:** | | | | | |
| 4882.000 | 2.488 | 40.404 | 42.892 | -31.108 | 74.000 |
| 7323.000 | 10.375 | 41.108 | 51.482 | -22.518 | 74.000 |
| 9764.000 | 10.315 | 41.066 | 51.381 | -22.619 | 74.000 |
| **Average Detector:** | | | | | |
| -- | | | | | |

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 | : | MOBILE DATA TERMINAL |
| Test Item | : | Harmonic Radiated Emission |
| Test Site | : | No.3 OATS |
| Test date | : | 2017/10/12 |
| Test Mode | : | Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz) |

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBμV | dBμV/m | dB | dBμV/m |
| **Horizontal** | | | | | |
| **Peak Detector:** | | | | | |
| 4960.000 | 2.582 | 40.912 | 43.494 | -30.506 | 74.000 |
| 7440.000 | 10.555 | 41.601 | 52.156 | -21.844 | 74.000 |
| 9920.000 | 10.206 | 41.922 | 52.128 | -21.872 | 74.000 |
| **Average** | | | | | |
| **Detector:** | | | | | |
| -- | | | | | |
| **Vertical** | | | | | |
| **Peak Detector:** | | | | | |
| 4960.000 | 3.398 | 40.759 | 44.158 | -29.842 | 74.000 |
| 7440.000 | 11.214 | 41.264 | 52.478 | -21.522 | 74.000 |
| 9920.000 | 11.245 | 41.058 | 52.303 | -21.697 | 74.000 |
| **Average** | | | | | |
| **Detector:** | | | | | |
| -- | | | | | |

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 | : | MOBILE DATA TERMINAL |
| Test Item | : | General Radiated Emission |
| Test Site | : | No.3 OATS |
| Test date | : | 2017/10/12 |
| Test Mode | : | Mode 1: Transmit - 1Mbps (GFSK) (2441MHz) |

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBμV | dBμV/m | dB | dBμV/m |
| **Horizontal** | | | | | |
| 120.210 | -7.275 | 38.386 | 31.111 | -12.389 | 43.500 |
| 306.450 | -3.944 | 43.027 | 39.083 | -6.917 | 46.000 |
| 409.270 | 0.046 | 38.081 | 38.127 | -7.873 | 46.000 |
| 716.760 | 3.809 | 34.405 | 38.214 | -7.786 | 46.000 |
| 819.580 | 6.961 | 31.621 | 38.582 | -7.418 | 46.000 |
| 921.430 | 6.730 | 30.052 | 36.782 | -9.218 | 46.000 |
| **Vertical** | | | | | |
| 120.210 | -3.535 | 35.562 | 32.027 | -11.473 | 43.500 |
| 307.420 | -4.030 | 42.132 | 38.102 | -7.898 | 46.000 |
| 512.090 | 0.604 | 33.201 | 33.805 | -12.195 | 46.000 |
| 614.910 | 1.701 | 32.130 | 33.831 | -12.169 | 46.000 |
| 716.760 | -1.321 | 36.577 | 35.256 | -10.744 | 46.000 |
| 819.580 | 3.001 | 30.799 | 33.800 | -12.200 | 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.

| | | |
|---|---|---|
| Product | : | MOBILE DATA TERMINAL |
| Test Item | : | General Radiated Emission |
| Test Site | : | No.3 OATS |
| Test date | : | 2017/10/12 |
| Test Mode | : | Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz) |

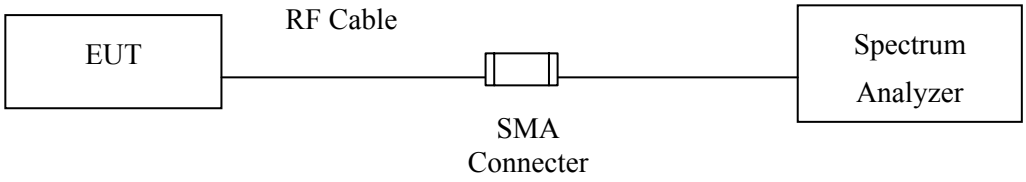
| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBμV | dBμV/m | dB | dBμV/m |
| **Horizontal** | | | | | |
| 120.210 | -7.275 | 39.824 | 32.549 | -10.951 | 43.500 |
| 307.420 | -4.120 | 43.510 | 39.390 | -6.610 | 46.000 |
| 409.270 | 0.046 | 39.003 | 39.049 | -6.951 | 46.000 |
| 512.090 | 3.184 | 35.172 | 38.356 | -7.644 | 46.000 |
| 716.760 | 3.809 | 33.925 | 37.734 | -8.266 | 46.000 |
| 819.580 | 6.961 | 31.368 | 38.329 | -7.671 | 46.000 |
| **Vertical** | | | | | |
| 157.070 | -5.195 | 35.835 | 30.640 | -12.860 | 43.500 |
| 304.510 | -4.007 | 42.589 | 38.582 | -7.418 | 46.000 |
| 512.090 | 0.604 | 33.718 | 34.322 | -11.678 | 46.000 |
| 614.910 | 1.701 | 33.358 | 35.059 | -10.941 | 46.000 |
| 716.760 | -1.321 | 36.383 | 35.062 | -10.938 | 46.000 |
| 819.580 | 3.001 | 30.939 | 33.940 | -12.060 | 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.

# 5. RF Antenna Conducted Test

## 5.1. Test Setup




## 5.2. Limits

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.

## 5.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

## 5.4. Uncertainty

± 1.20dB

## 5.5. Test Result of RF Antenna Conducted Test

Product : MOBILE DATA TERMINAL
Test Item : RF Antenna Conducted Test
Test Site : No.3 OATS
Test date : 2017/10/16
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

**Figure Channel 00:**

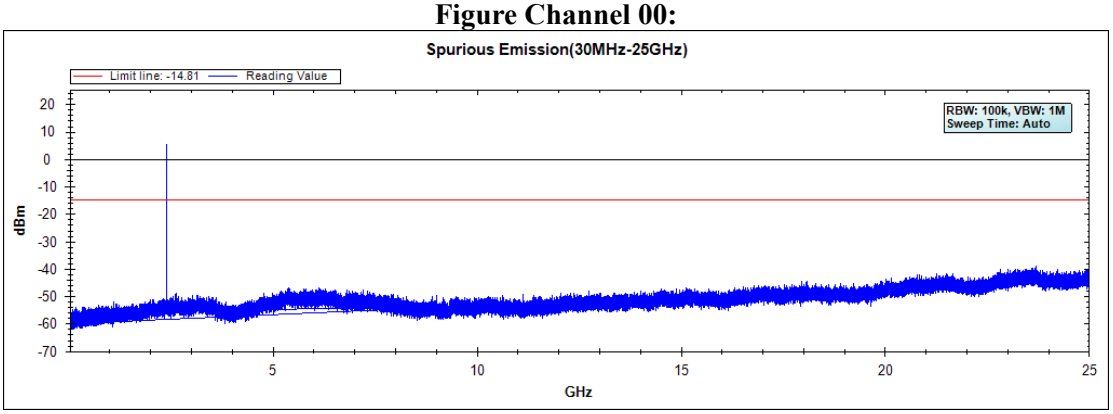



**Figure Channel 39:**

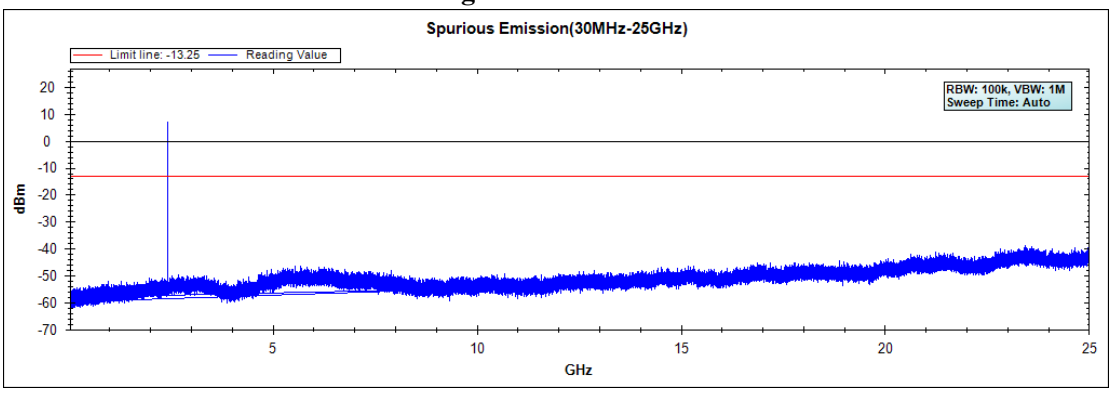
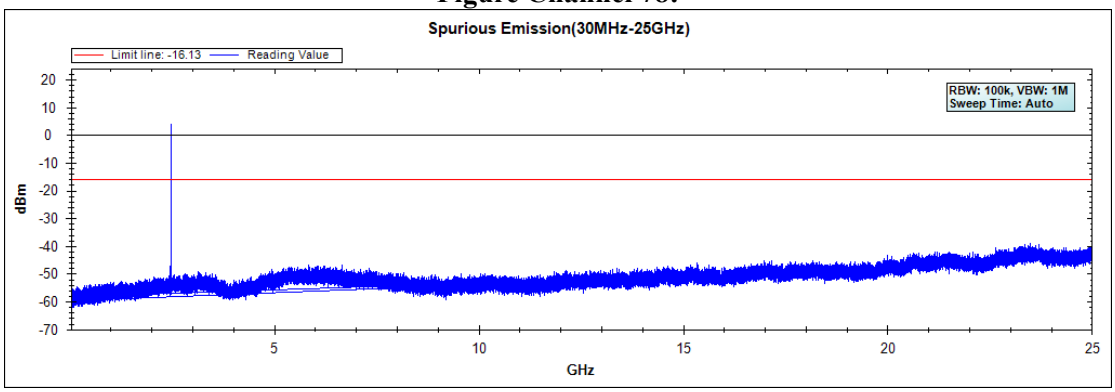



**Figure Channel 78:**




Note: The above test pattern is synthesized by multiple of the frequency range.

| | | |
|---|---|---|
| Product | : | MOBILE DATA TERMINAL |
| Test Item | : | RF Antenna Conducted Test |
| Test Site | : | No.3 OATS |
| Test date | : | 2017/10/19 |
| Test Mode | : | Mode 2: Transmit - 3Mbps (8DPSK) |

**Figure Channel 00:**

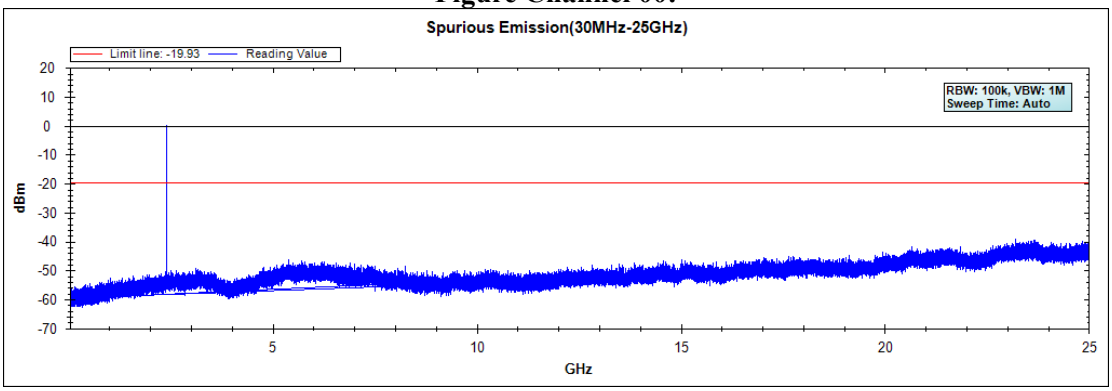



**Figure Channel 39:**

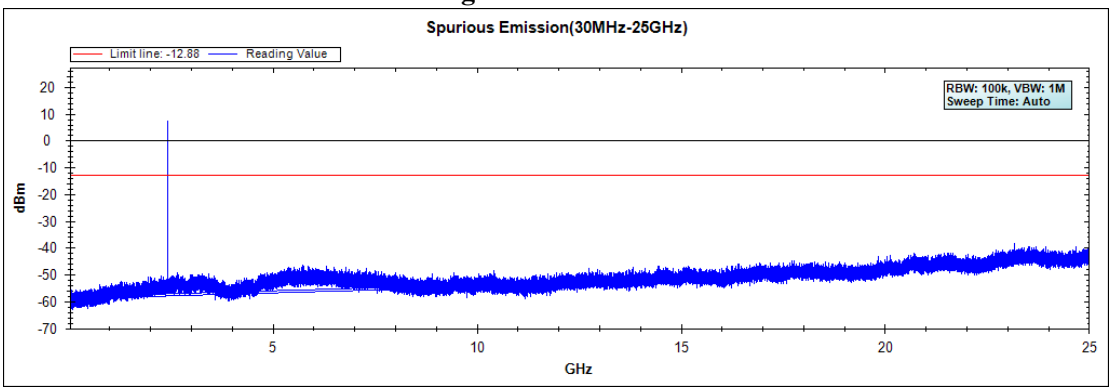
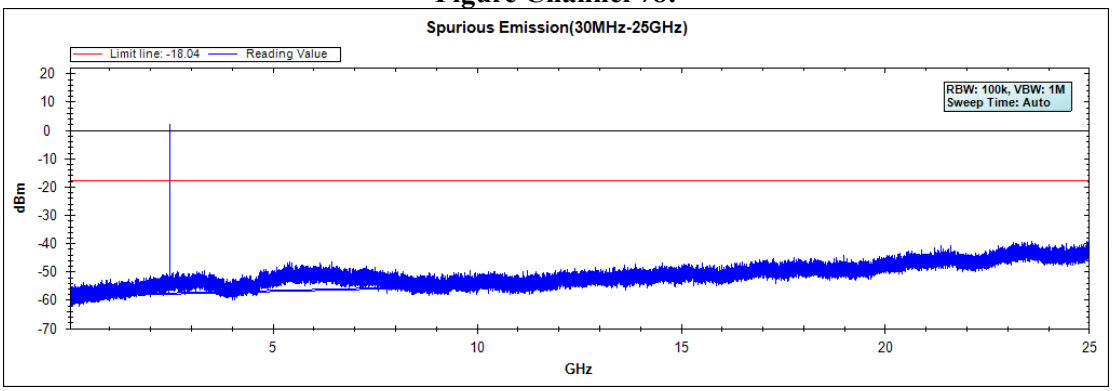



**Figure Channel 78:**



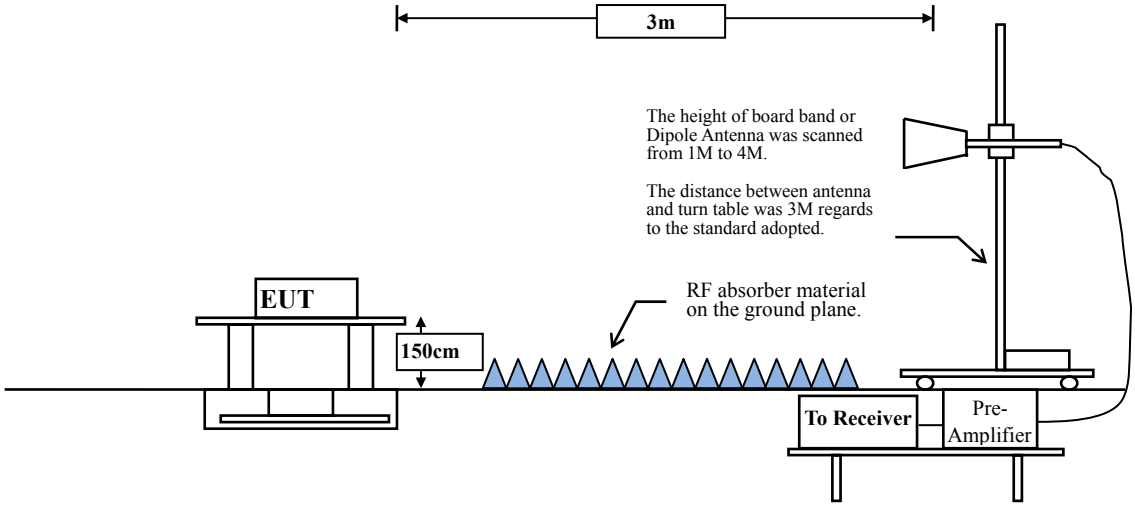

Note: The above test pattern is synthesized by multiple of the frequency range.

# 6. Band Edge

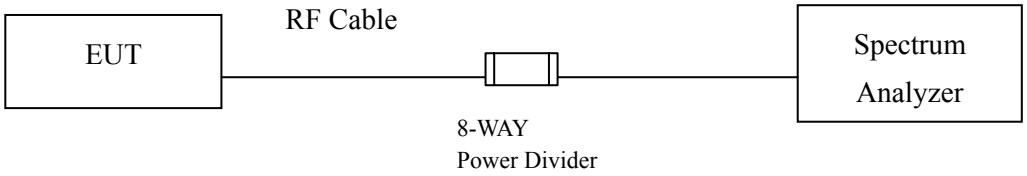
## 6.1. Test Setup

**RF Radiated Measurement:**

Above 1GHz




**RF Conducted Measurement**



## 6.2. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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 a radiated measurement. 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)).

## 6.3. Test Procedure

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 can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz, respectively.

## 6.4. Uncertainty

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

## 6.5. Test Result of Band Edge

Product : MOBILE DATA TERMINAL
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/10/19
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2402MHz)

**RF Radiated Measurement (Horizontal):**

| Channel No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Peak Limit (dBμV/m) | Arerage Limit (dBμV/m) | Result |
|---|---|---|---|---|---|---|---|
| 00 (Peak) | 2377.246 | 6.419 | 42.699 | 49.117 | 74.00 | 54.00 | Pass |
| 00 (Peak) | 2390.000 | 6.474 | 41.506 | 47.981 | 74.00 | 54.00 | Pass |
| 00 (Peak) | 2400.000 | 6.528 | 60.681 | 67.209 | -- | -- | -- |
| 00 (Peak) | 2401.884 | 6.540 | 93.310 | 99.850 | -- | -- | -- |
| 00 (Average) | 2390.000 | 6.474 | 22.644 | 29.119 | 74.00 | 54.00 | Pass |
| 00 (Average) | 2400.000 | 6.528 | 37.766 | 44.294 | -- | -- | -- |
| 00 (Average) | 2402.029 | 6.540 | 79.053 | 85.593 | -- | -- | -- |

**Figure Channel 00: Horizontal (Peak)**

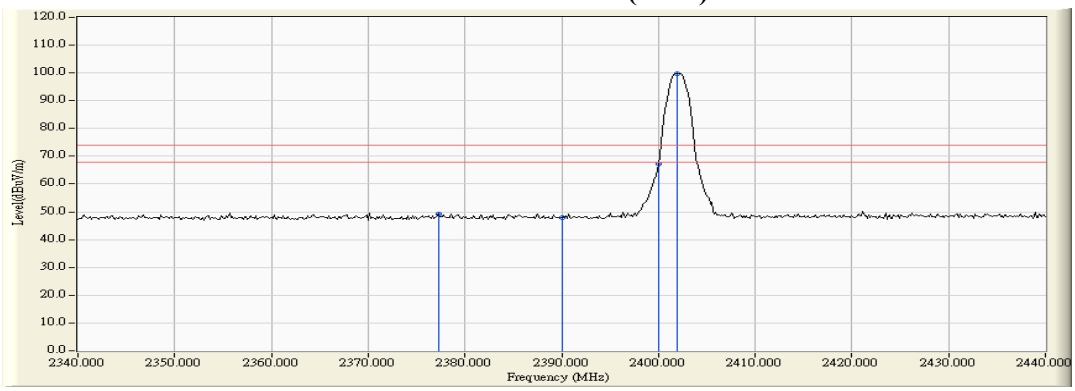
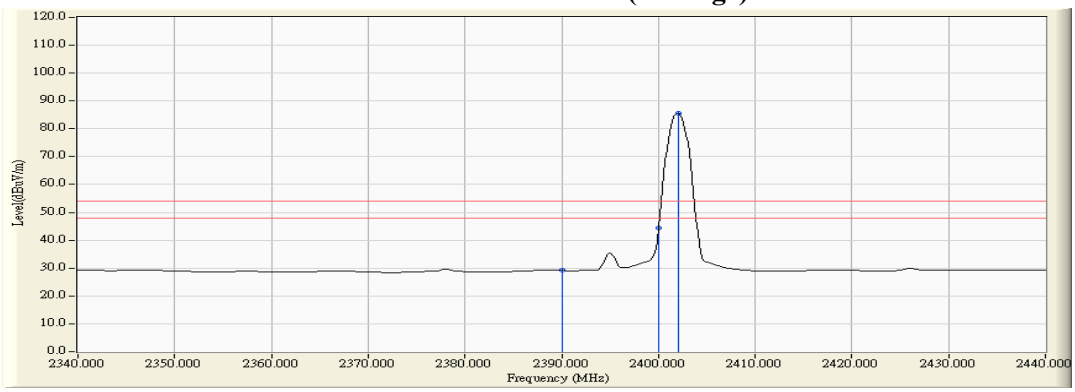



**Figure Channel 00: Horizontal (Average)**




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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : MOBILE DATA TERMINAL
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/10/19
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2402MHz)

**RF Radiated Measurement (VERTICAL):**

| Channel No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Peak Limit (dBμV/m) | Arerage Limit (dBμV/m) | Result |
|---|---|---|---|---|---|---|---|
| 00 (Peak) | 2376.232 | 5.937 | 42.133 | 48.070 | 74.00 | 54.00 | Pass |
| 00 (Peak) | 2390.000 | 5.880 | 41.622 | 47.503 | 74.00 | 54.00 | Pass |
| 00 (Peak) | 2400.000 | 5.879 | 52.329 | 58.208 | -- | -- | -- |
| 00 (Peak) | 2401.884 | 5.884 | 85.940 | 91.824 | -- | -- | -- |
| 00 (Average) | 2390.000 | 5.880 | 22.880 | 28.761 | 74.00 | 54.00 | Pass |
| 00 (Average) | 2400.000 | 5.879 | 32.576 | 38.455 | -- | -- | -- |
| 00 (Average) | 2402.029 | 5.884 | 72.585 | 78.469 | -- | -- | -- |

**Figure Channel 00: VERTICAL (Peak)**

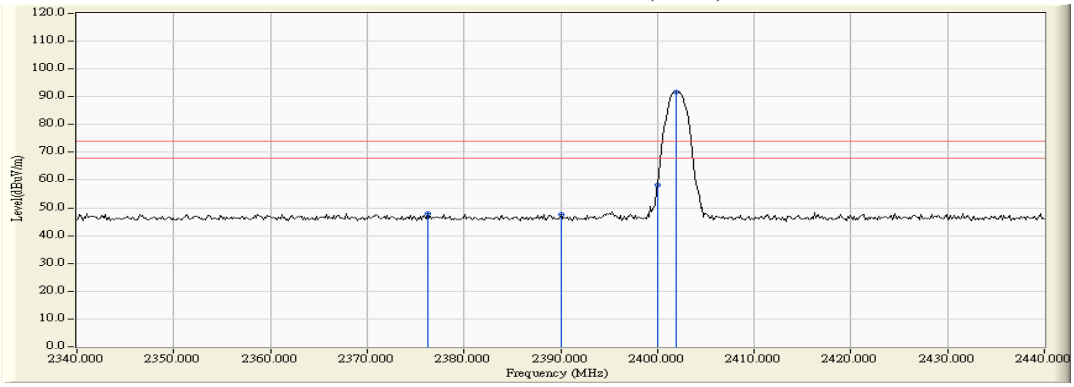
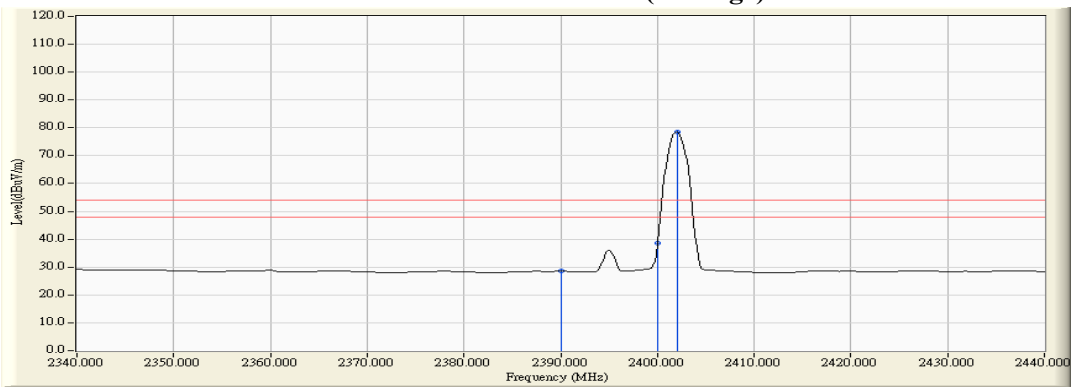



**Figure Channel 00: VERTICAL (Average)**




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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : MOBILE DATA TERMINAL
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/10/19
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2480MHz)

**RF Radiated Measurement (Horizontal):**

| Channel No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Peak Limit (dBμV/m) | Arerage Limit (dBμV/m) | Result |
|---|---|---|---|---|---|---|---|
| 78 (Peak) | 2479.877 | 7.085 | 95.353 | 102.437 | -- | -- | Pass |
| 78 (Peak) | 2483.500 | 7.110 | 44.126 | 51.236 | 74.00 | 54.00 | Pass |
| 78 (Average) | 2480.022 | 7.086 | 80.525 | 87.610 | -- | -- | Pass |
| 78 (Average) | 2483.500 | 7.110 | 25.832 | 32.942 | 74.00 | 54.00 | Pass |

**Figure Channel 78: Horizontal (Peak)**

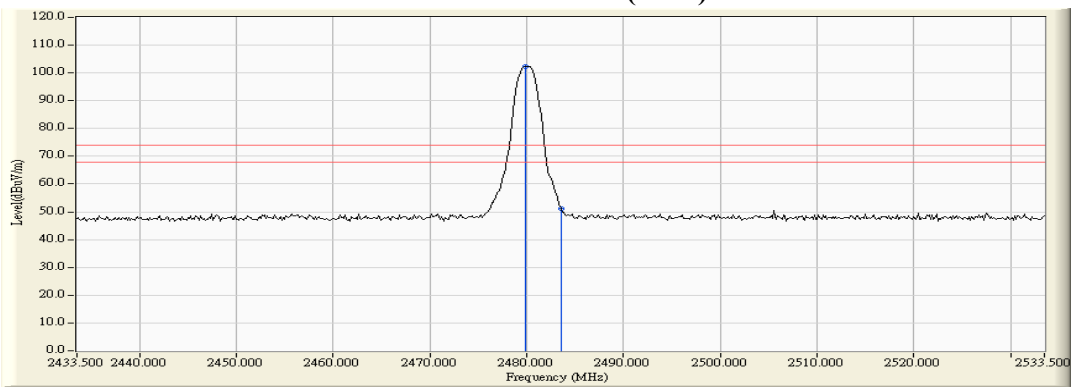
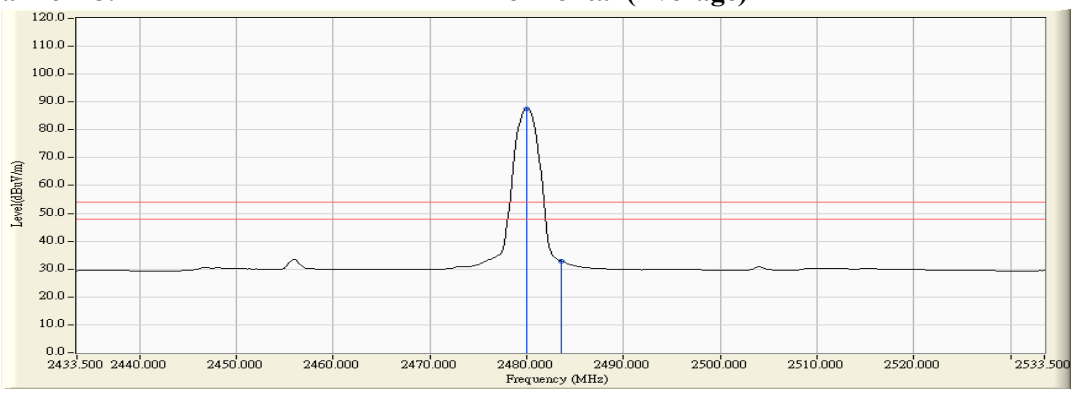



**Figure Channel 78: Horizontal (Average)**




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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : MOBILE DATA TERMINAL
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/10/19
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2480MHz)

**RF Radiated Measurement (VERTICAL):**

| Channel No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Peak Limit (dBμV/m) | Arerage Limit (dBμV/m) | Result |
|---|---|---|---|---|---|---|---|
| 78 (Peak) | 2479.877 | 6.341 | 85.139 | 91.480 | -- | -- | Pass |
| 78 (Peak) | 2483.500 | 6.363 | 41.157 | 47.520 | 74.00 | 54.00 | Pass |
| 78 (Peak) | 2503.065 | 6.452 | 42.874 | 49.326 | 74.00 | 54.00 | Pass |
| 78 (Average) | 2480.022 | 6.342 | 72.135 | 78.477 | -- | -- | Pass |
| 78 (Average) | 2483.500 | 6.363 | 22.884 | 29.247 | 74.00 | 54.00 | Pass |

**Figure Channel 78: VERTICAL (Peak)**

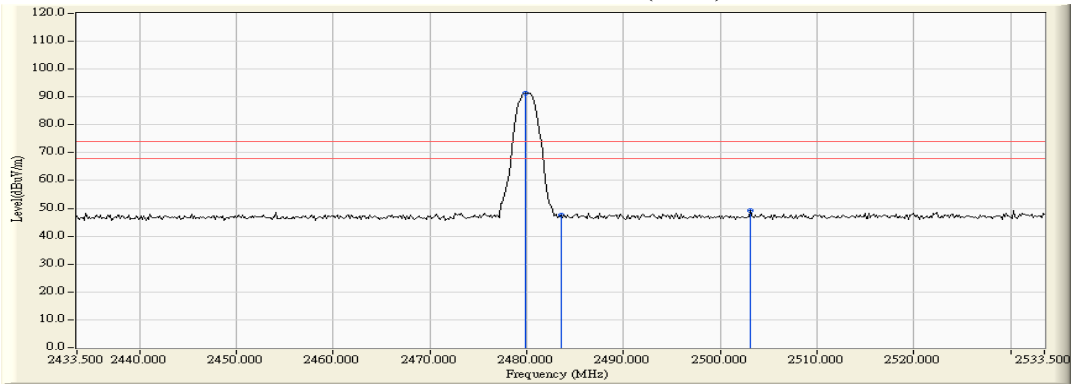
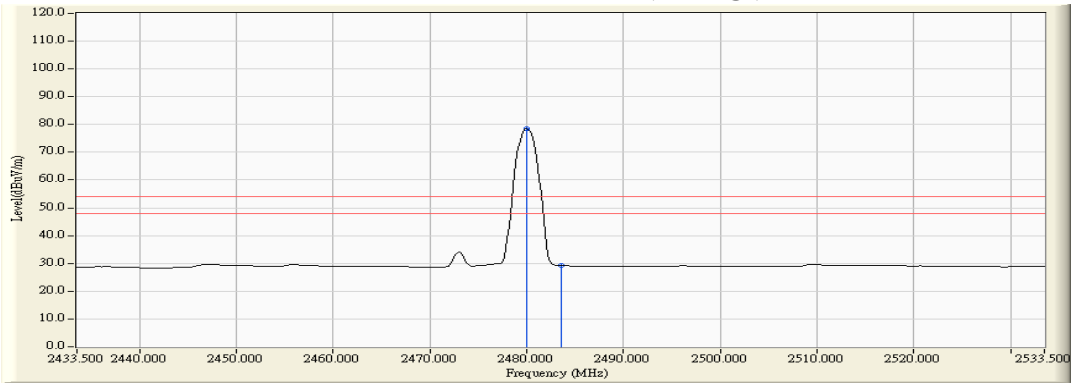



**Figure Channel 78: VERTICAL (Average)**




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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : MOBILE DATA TERMINAL
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/10/19
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

**RF Radiated Measurement (Horizontal):**

| Channel No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Peak Limit (dBμV/m) | Arerage Limit (dBμV/m) | Result |
|---|---|---|---|---|---|---|---|
| 00 (Peak) | 2363.623 | 6.357 | 42.385 | 48.742 | 74.00 | 54.00 | Pass |
| 00 (Peak) | 2390.000 | 6.474 | 39.652 | 46.127 | 74.00 | 54.00 | Pass |
| 00 (Peak) | 2400.000 | 6.528 | 66.272 | 72.800 | -- | -- | -- |
| 00 (Peak) | 2402.029 | 6.540 | 92.968 | 99.508 | -- | -- | -- |
| 00 (Average) | 2390.000 | 6.474 | 22.745 | 29.220 | 74.00 | 54.00 | Pass |
| 00 (Average) | 2400.000 | 6.528 | 43.398 | 49.926 | -- | -- | -- |
| 00 (Average) | 2402.029 | 6.540 | 75.083 | 81.623 | -- | -- | -- |

**Figure Channel 00: Horizontal (Peak)**

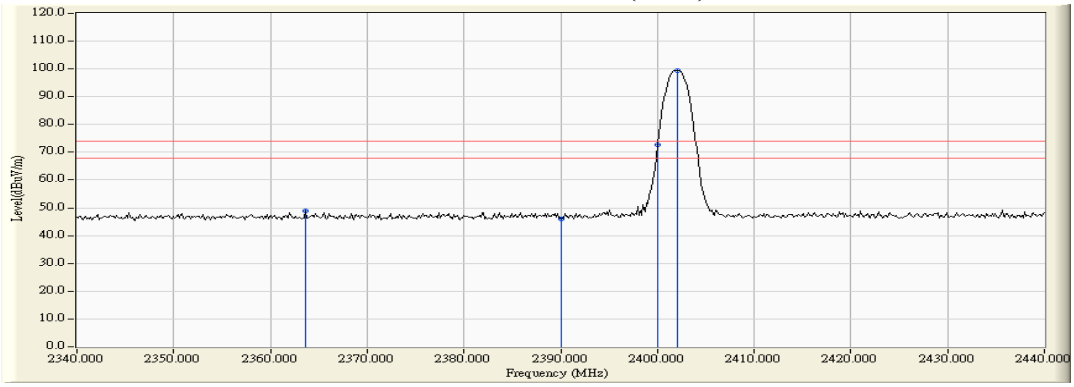
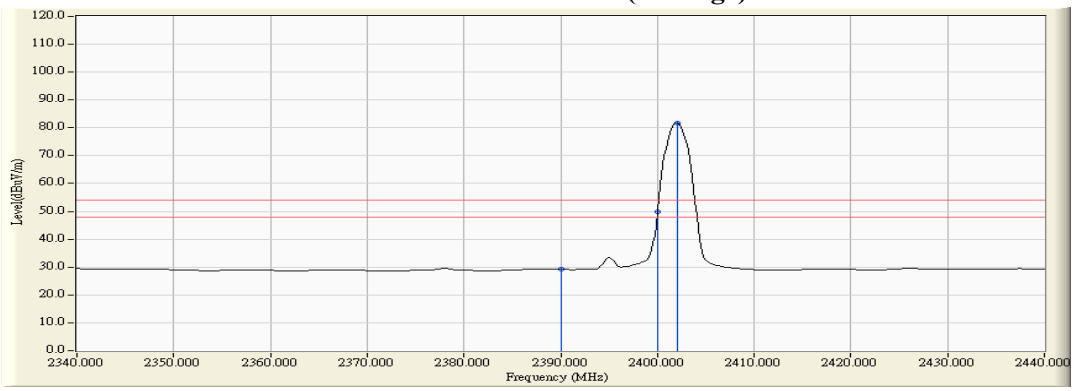



**Figure Channel 00: Horizontal (Average)**




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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : MOBILE DATA TERMINAL
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/10/19
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

**RF Radiated Measurement (VERTICAL):**

| Channel No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Peak Limit (dBμV/m) | Arerage Limit (dBμV/m) | Result |
|---|---|---|---|---|---|---|---|
| 00 (Peak) | 2342.464 | 6.076 | 43.005 | 49.082 | 74.00 | 54.00 | Pass |
| 00 (Peak) | 2390.000 | 5.880 | 39.772 | 45.653 | 74.00 | 54.00 | Pass |
| 00 (Peak) | 2400.000 | 5.879 | 59.758 | 65.637 | -- | -- | -- |
| 00 (Peak) | 2402.029 | 5.884 | 86.347 | 92.231 | -- | -- | -- |
| 00 (Average) | 2390.000 | 5.880 | 23.157 | 29.038 | 74.00 | 54.00 | Pass |
| 00 (Average) | 2400.000 | 5.879 | 38.471 | 44.350 | -- | -- | -- |
| 00 (Average) | 2402.029 | 5.884 | 69.869 | 75.753 | -- | -- | -- |

**Figure Channel 00: VERTICAL (Peak)**

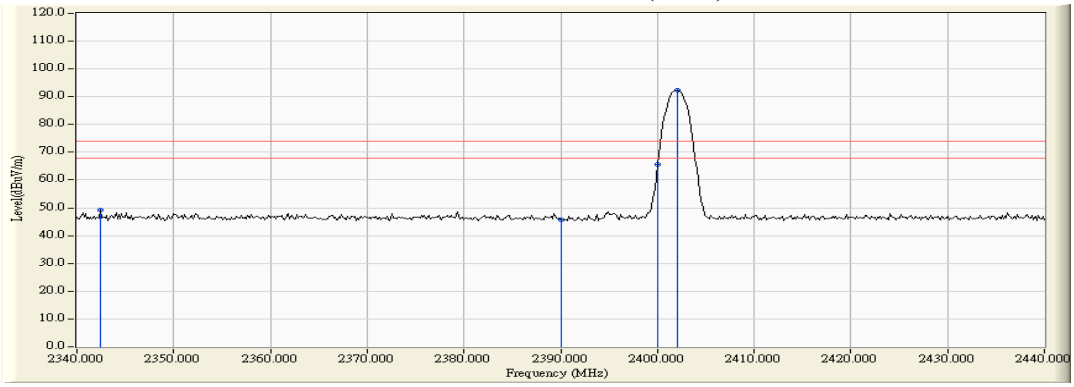
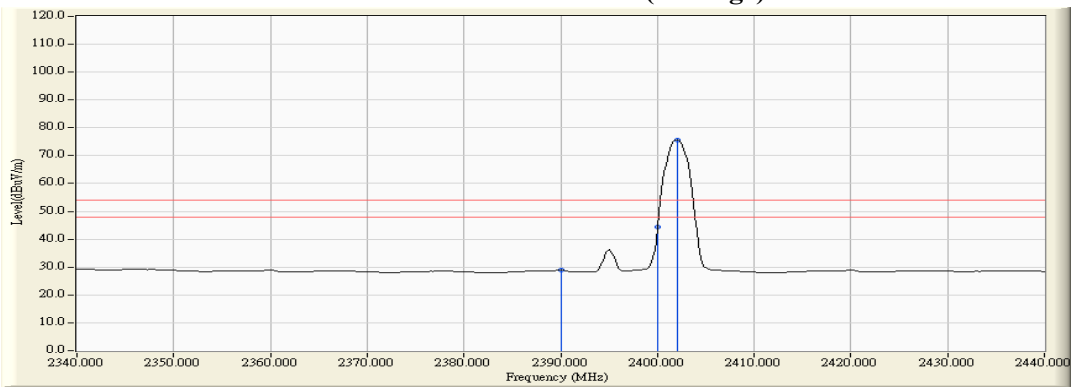



**Figure Channel 00: VERTICAL (Average)**




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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : MOBILE DATA TERMINAL
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/10/19
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)

**RF Radiated Measurement (Horizontal):**

| Channel No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Peak Limit (dBμV/m) | Arerage Limit (dBμV/m) | Result |
|---|---|---|---|---|---|---|---|
| 78 (Peak) | 2479.877 | 7.085 | 95.048 | 102.132 | -- | -- | Pass |
| 78 (Peak) | 2483.500 | 7.110 | 41.768 | 48.878 | 74.00 | 54.00 | Pass |
| 78 (Peak) | 2484.370 | 7.116 | 43.265 | 50.381 | 74.00 | 54.00 | Pass |
| 78 (Average) | 2480.022 | 7.086 | 77.780 | 84.865 | -- | -- | Pass |
| 78 (Average) | 2483.500 | 7.110 | 25.826 | 32.936 | 74.00 | 54.00 | Pass |

**Figure Channel 00: Horizontal (Peak)**

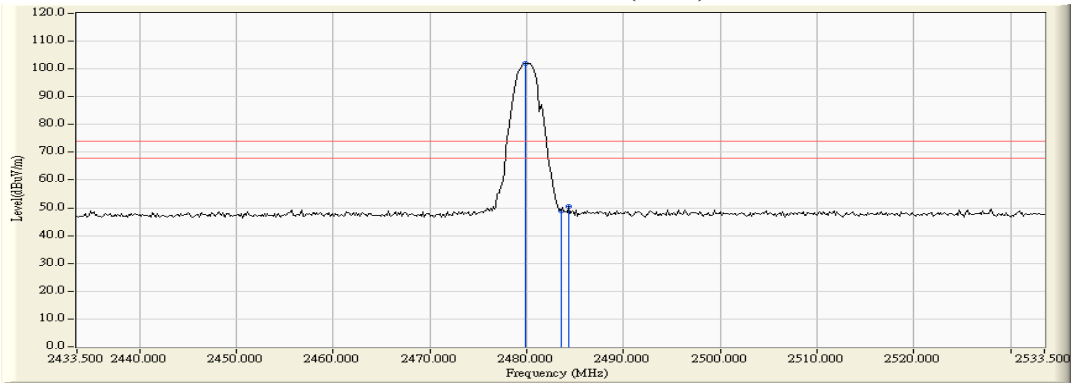
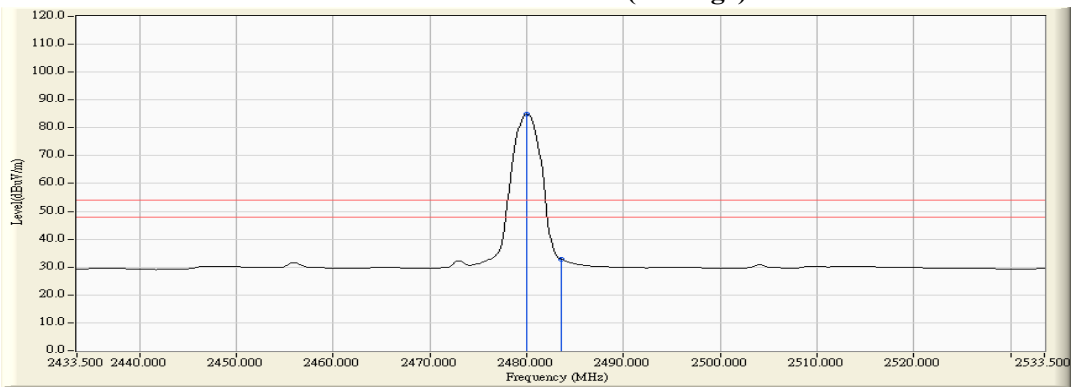



**Figure Channel 00: Horizontal (Average)**




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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : MOBILE DATA TERMINAL
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2017/10/19
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)

**RF Radiated Measurement (VERTICAL):**

| Channel No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Peak Limit (dBμV/m) | Arerage Limit (dBμV/m) | Result |
|---|---|---|---|---|---|---|---|
| 78 (Peak) | 2479.877 | 6.341 | 86.449 | 92.790 | -- | -- | Pass |
| 78 (Peak) | 2483.500 | 6.363 | 40.300 | 46.663 | 74.00 | 54.00 | Pass |
| 78 (Peak) | 2530.457 | 6.463 | 42.153 | 48.616 | 74.00 | 54.00 | Pass |
| 78 (Average) | 2480.022 | 6.342 | 69.976 | 76.318 | -- | -- | Pass |
| 78 (Average) | 2483.500 | 6.363 | 23.077 | 29.440 | 74.00 | 54.00 | Pass |

**Figure Channel 78: VERTICAL (Peak)**

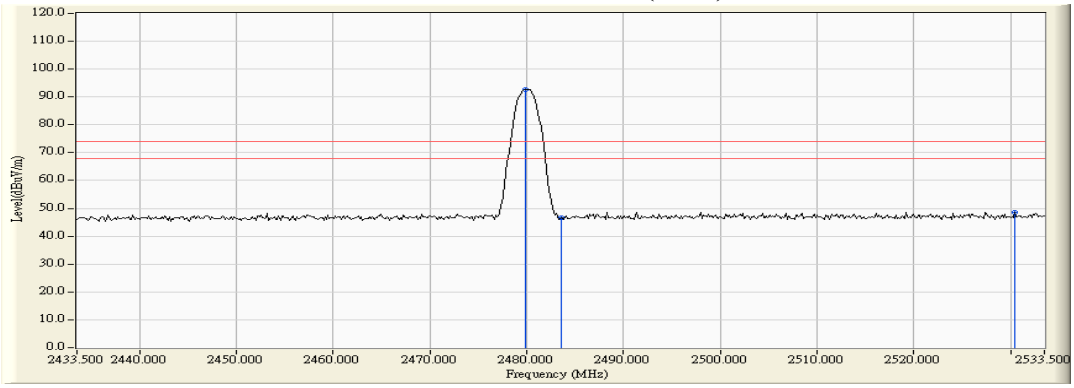
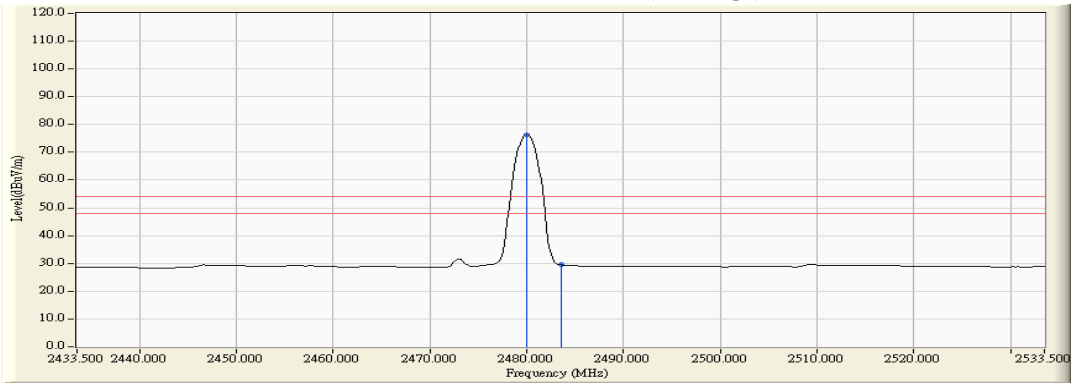



**Figure Channel 78: VERTICAL (Average)**




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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : MOBILE DATA TERMINAL
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)(Hopping off)

| Measurement Level<br>Δ (dB) | Result |
|---|---|
| > 20 | PASS |

**Figure Channel 00:**

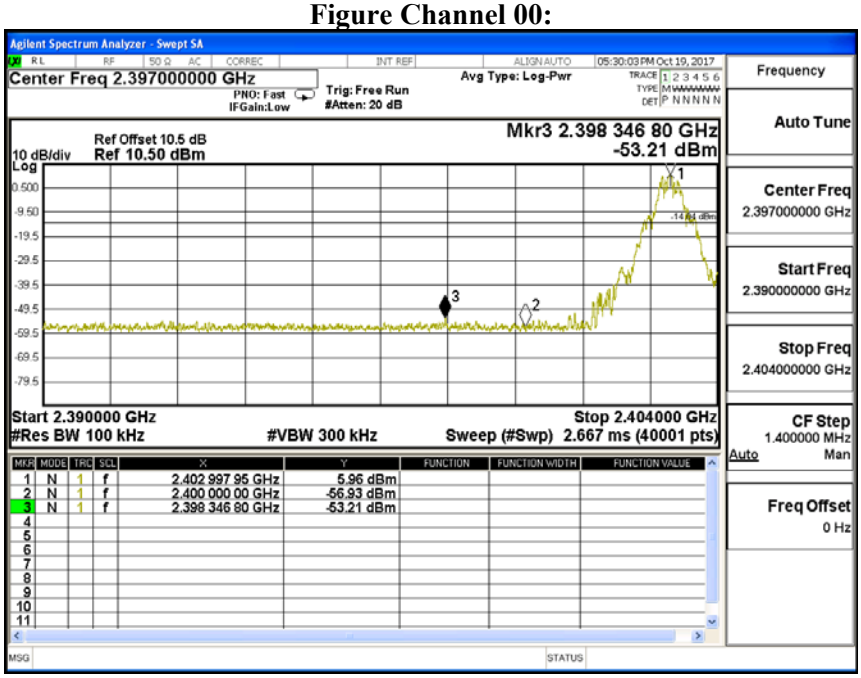
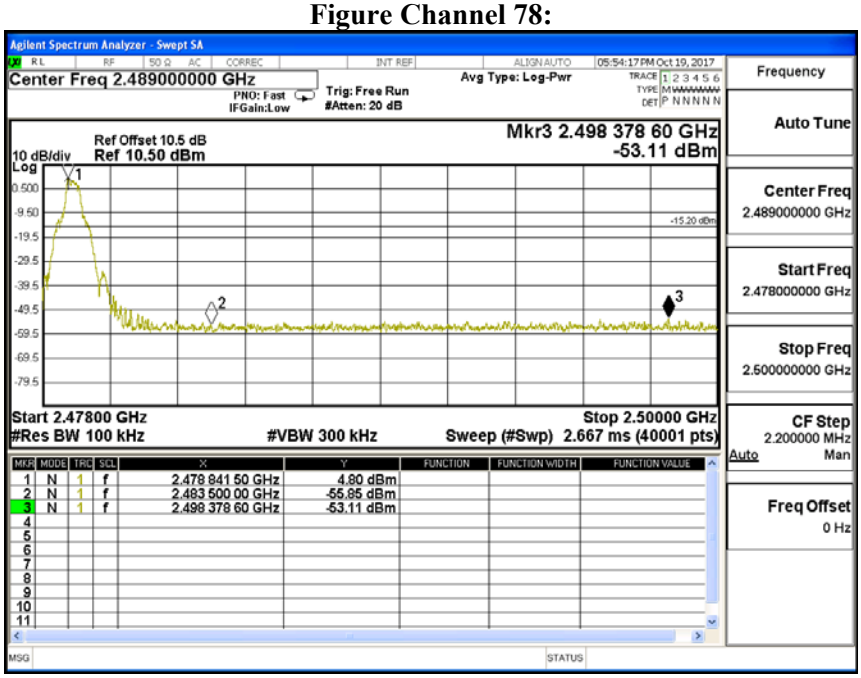



**Figure Channel 78:**



Product : MOBILE DATA TERMINAL
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (Hopping off)

| Measurement Level<br>Δ (dB) | Result |
|---|---|
| > 20 | PASS |

**Figure Channel 00:**

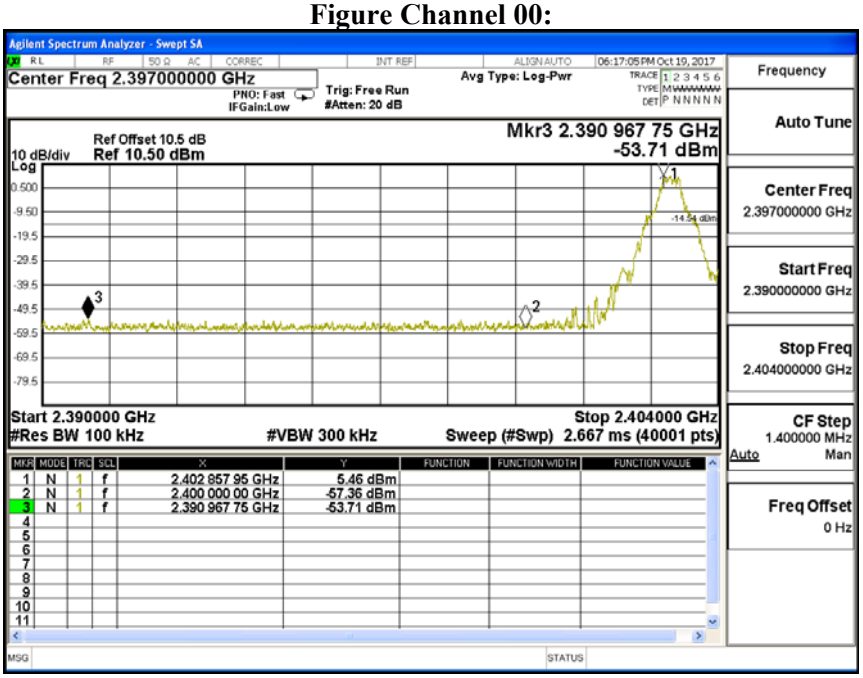
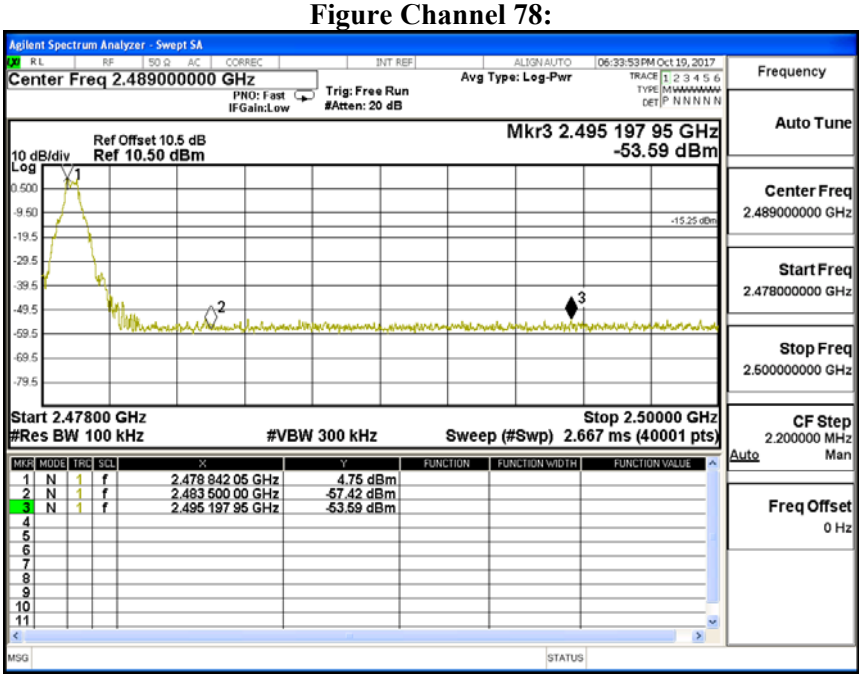



**Figure Channel 78:**



Product : MOBILE DATA TERMINAL
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)(Hopping on)

| Measurement Level<br>Δ (dB) | Result |
|---|---|
| > 20 | PASS |

**Figure Channel 00 Hopping:**

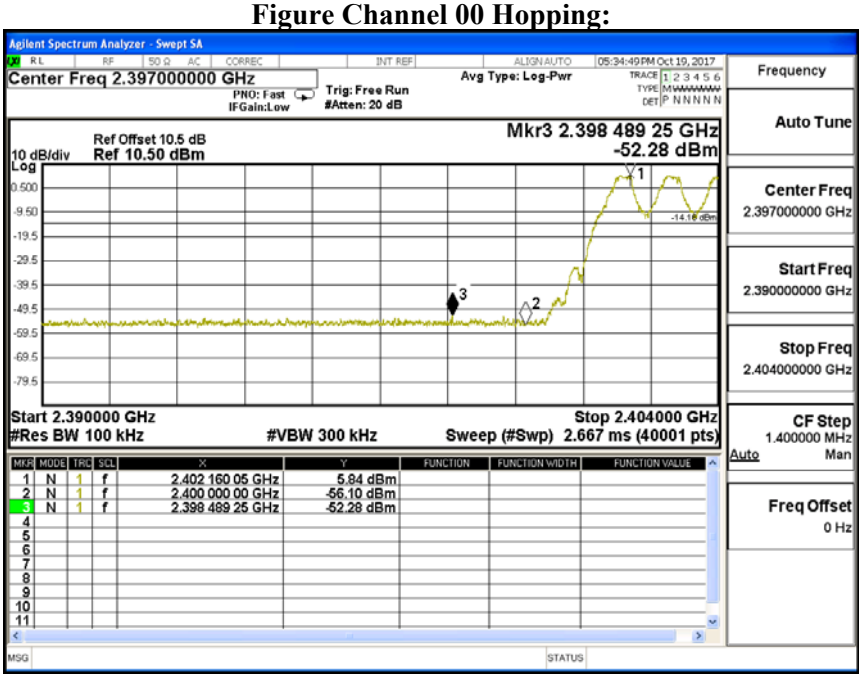
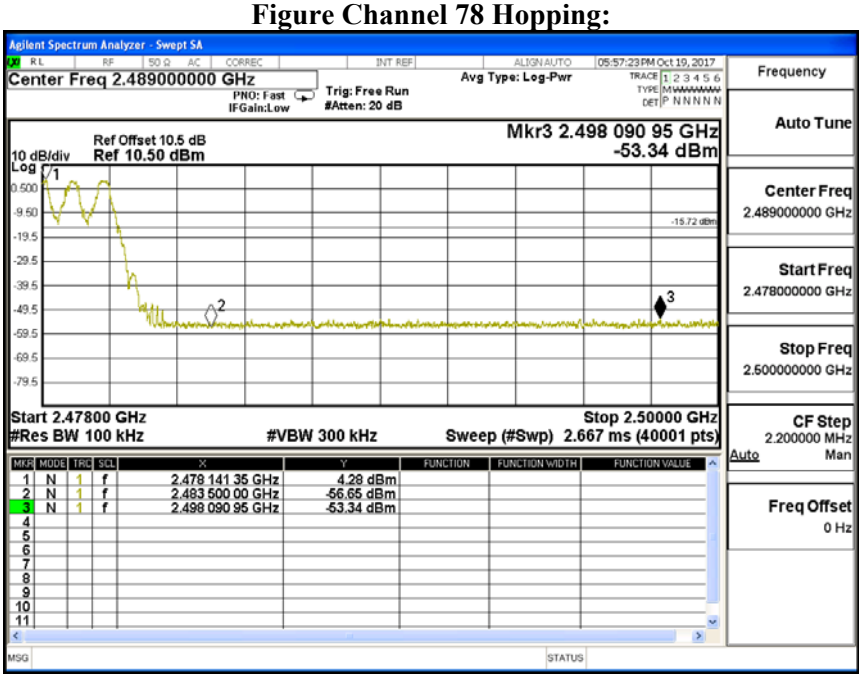



**Figure Channel 78 Hopping:**



Product : MOBILE DATA TERMINAL
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (Hopping on)

| Measurement Level<br>Δ (dB) | Result |
|---|---|
| > 20 | PASS |

**Figure Channel 00 Hopping:**

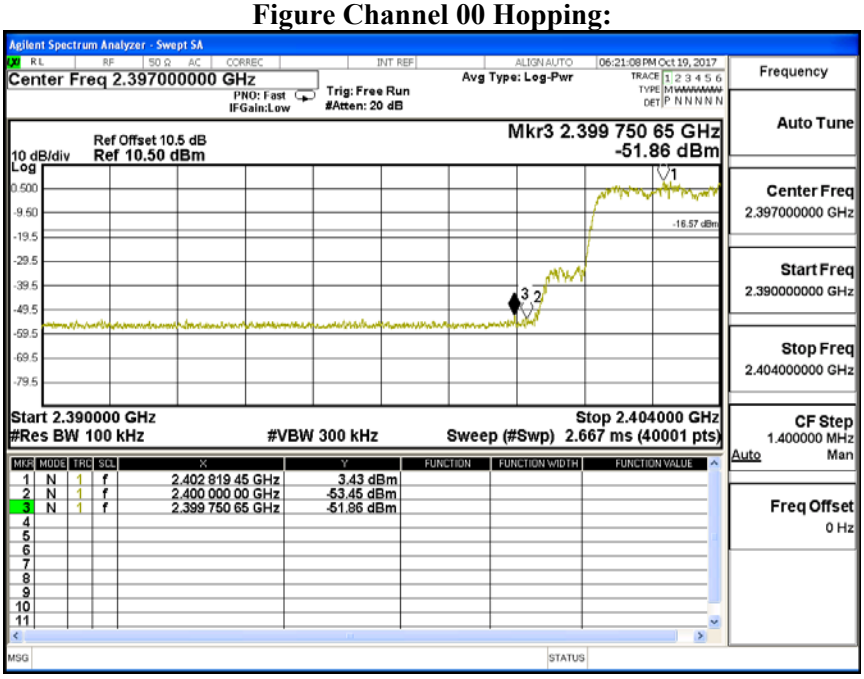
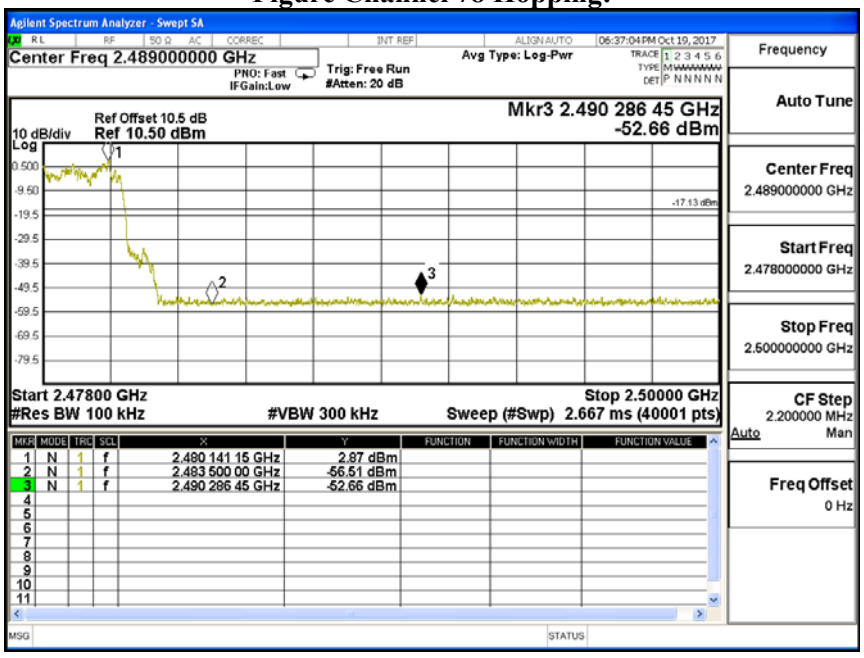
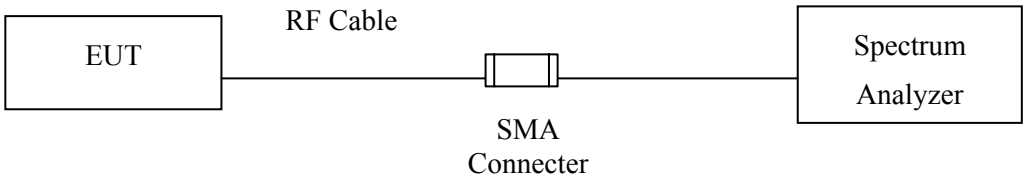



**Figure Channel 78 Hopping:**



# 7. Channel Number

## 7.1. Test Setup




## 7.2. Limit

Frequency hopping systems operating in the 2400-2483.5 MHz bands shall use at least 75 hopping frequencies.

## 7.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

## 7.4. Uncertainty

N/A

## 7.5. Test Result of Channel Number

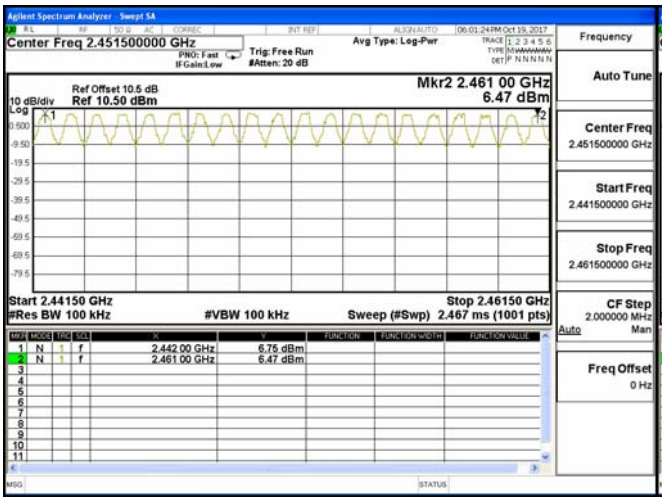
Product : MOBILE DATA TERMINAL
Test Item : Channel Number
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

| Frequency Range (MHz) | Measurement (Hopping Channel) | Required Limit (Hopping Channel) | Result |
|---|---|---|---|
| 2402 ~ 2480 | 79 | >75 | Pass |

**2402-2421MHz**


**2422-2441MHz**


**2442-2461MHz**



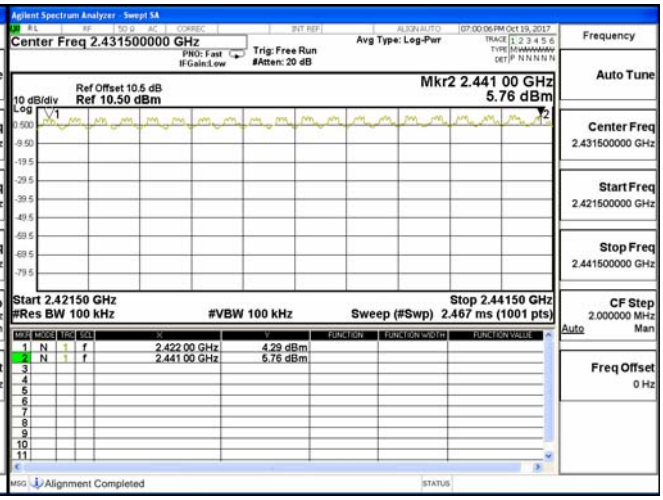

**2462-2480MHz**

Product : MOBILE DATA TERMINAL
Test Item : Channel Number
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

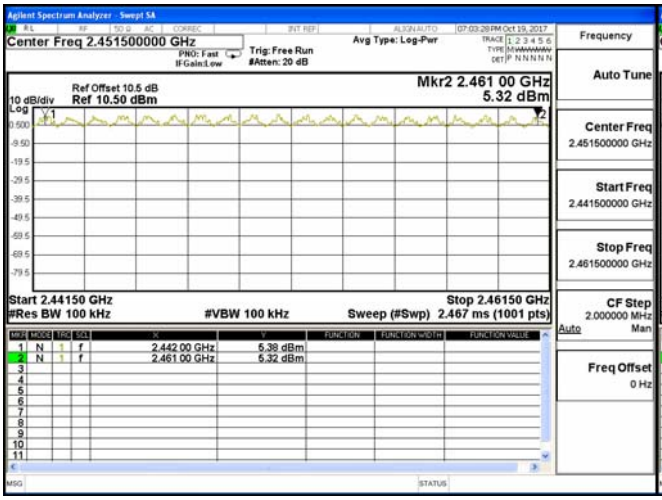
| Frequency Range (MHz) | Measurement (Hopping Channel) | Required Limit (Hopping Channel) | Result |
|---|---|---|---|
| 2402 ~ 2480 | 79 | >75 | Pass |

**2402-2421MHz**

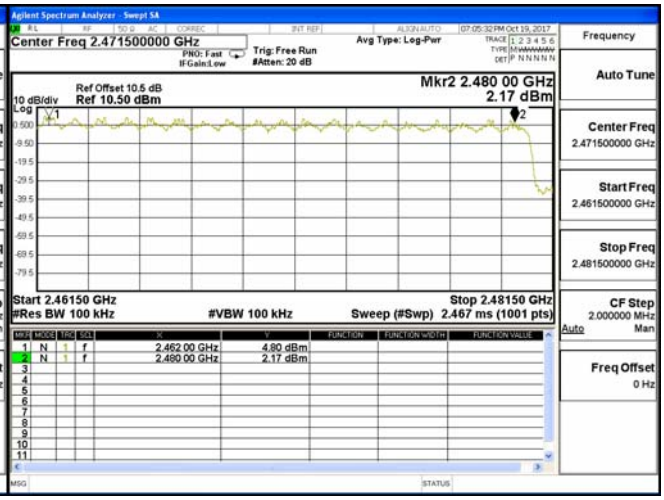

**2422-2441MHz**




**2442-2461MHz**

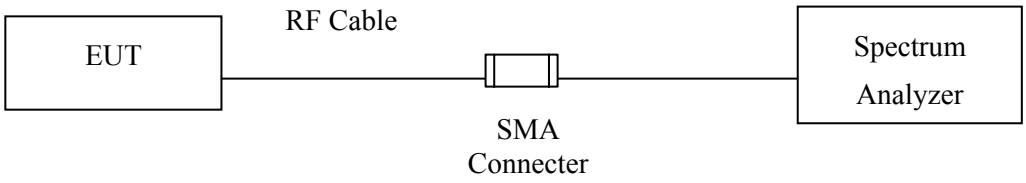



**2462-2480MHz**



# 8. Channel Separation

## 8.1. Test Setup




## 8.2. Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

## 8.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

## 8.4. Uncertainty

± 283Hz

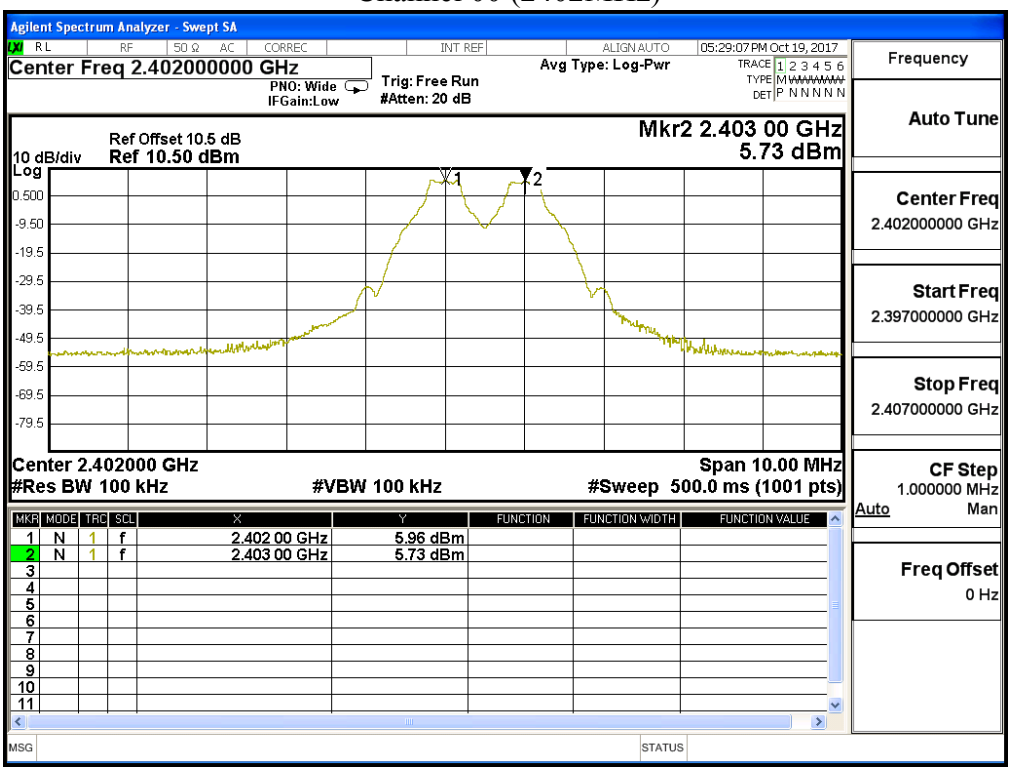
## 8.5. Test Result of Channel Separation

Product : MOBILE DATA TERMINAL
Test Item : Channel Separation
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

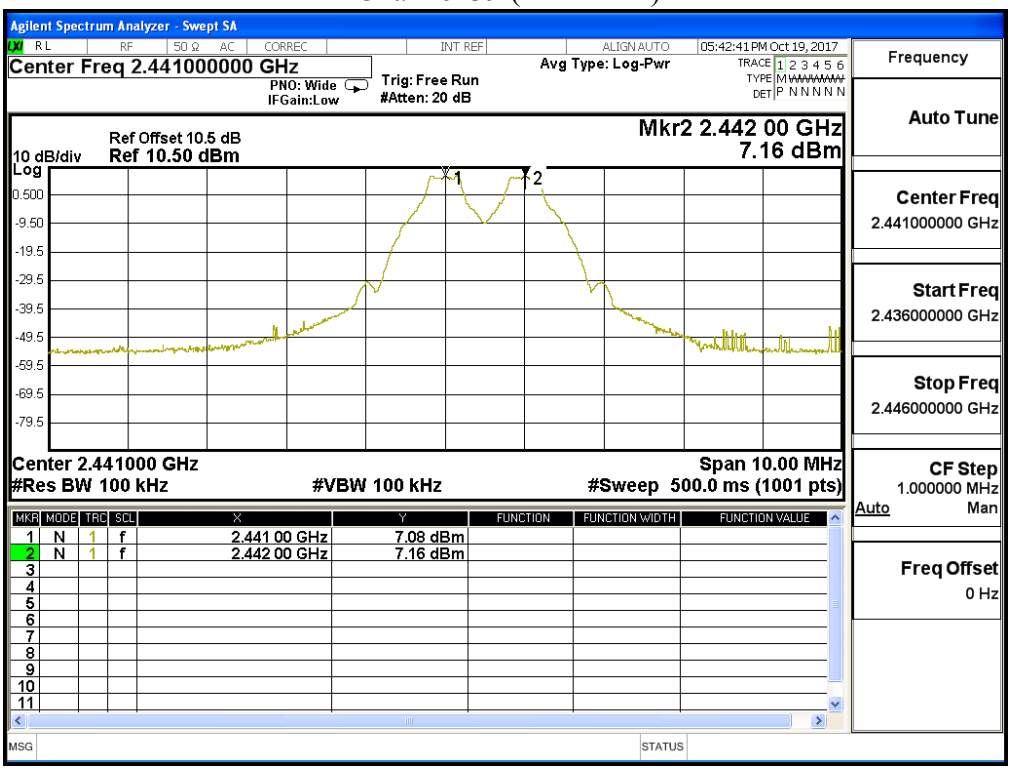
| Channel No. | Frequency (MHz) | Measurement Level (kHz) | Limit (kHz) | Limit of (2/3)*20dB Bandwidth (kHz) | Result |
|---|---|---|---|---|---|
| 00 | 2402 | 1000 | >25 kHz | 680.0 | Pass |
| 39 | 2441 | 1000 | >25 kHz | 678.0 | Pass |
| 78 | 2480 | 1000 | >25 kHz | 682.0 | Pass |

NOTE: The 20dB Bandwidth is refer to section 10.

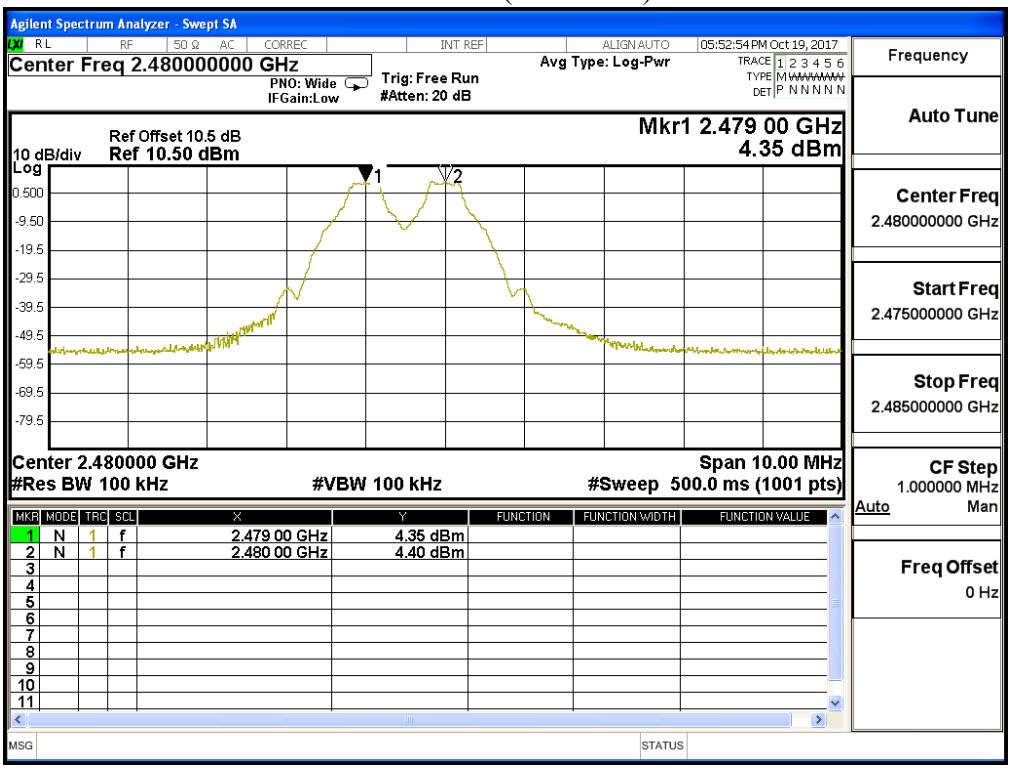
Channel 00 (2402MHz)



Channel 39 (2441MHz)




Channel 78 (2480MHz)

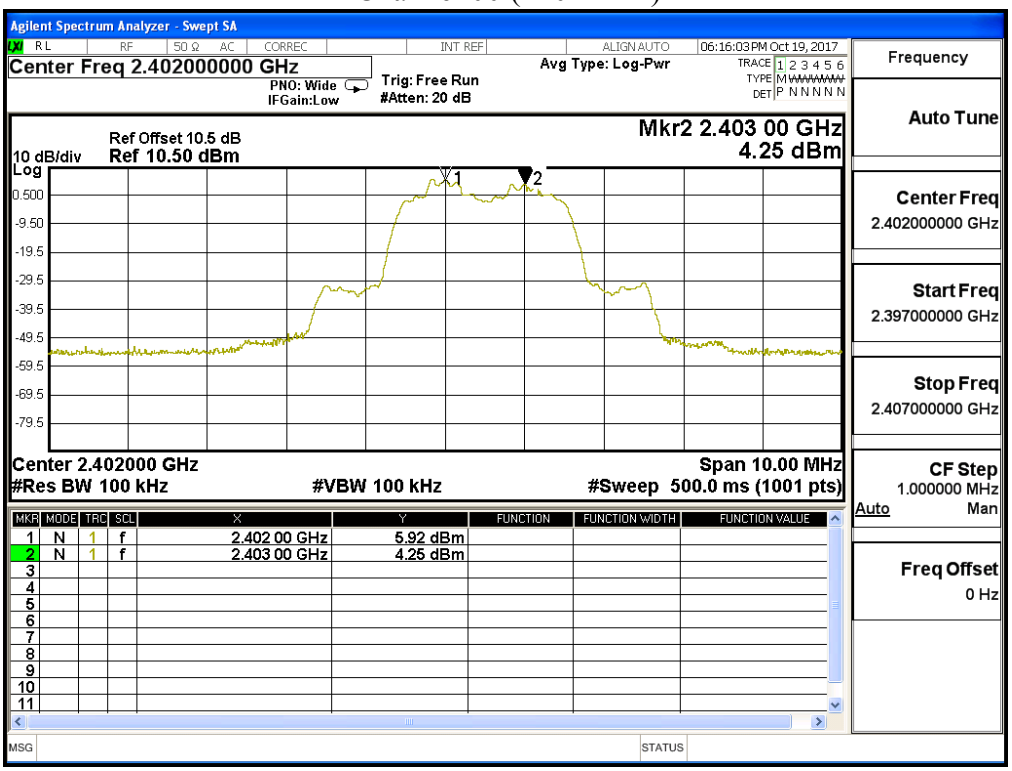


Product : MOBILE DATA TERMINAL
Test Item : Channel Separation
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

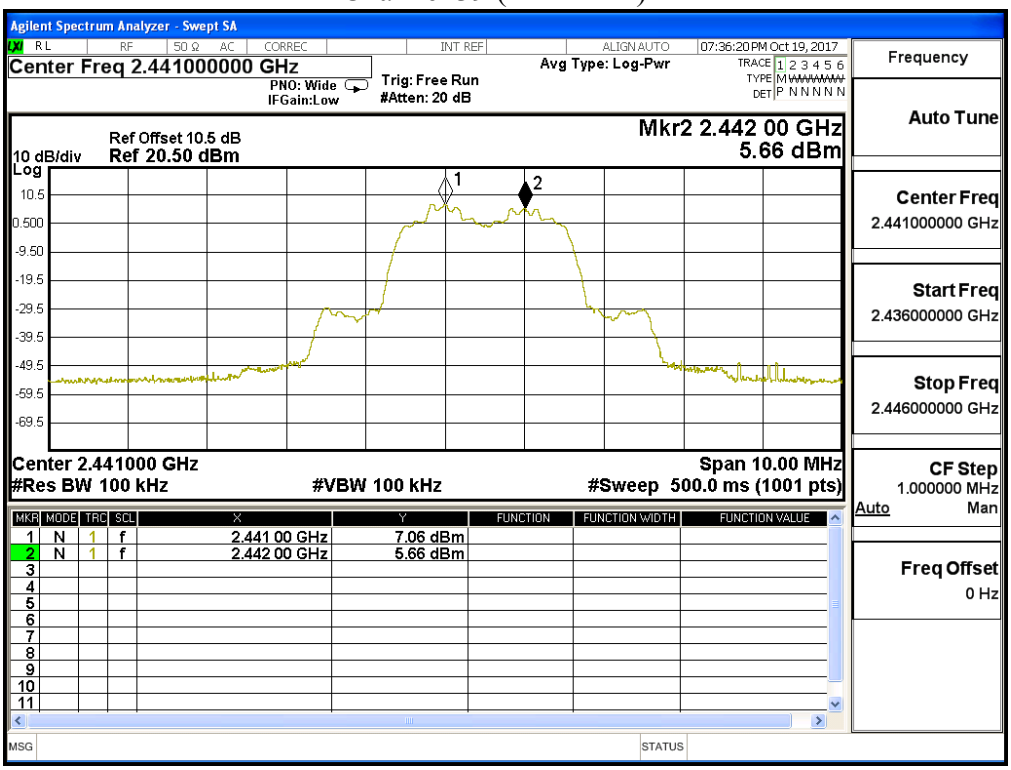
| Channel No. | Frequency (MHz) | Measurement Level (kHz) | Limit (kHz) | Limit of (2/3)*20dB Bandwidth (kHz) | Result |
|---|---|---|---|---|---|
| 00 | 2402 | 1000 | >25 kHz | 862.0 | Pass |
| 39 | 2441 | 1000 | >25 kHz | 862.0 | Pass |
| 78 | 2480 | 1000 | >25 kHz | 876.0 | Pass |

NOTE: The 20dB Bandwidth is refer to section 10.

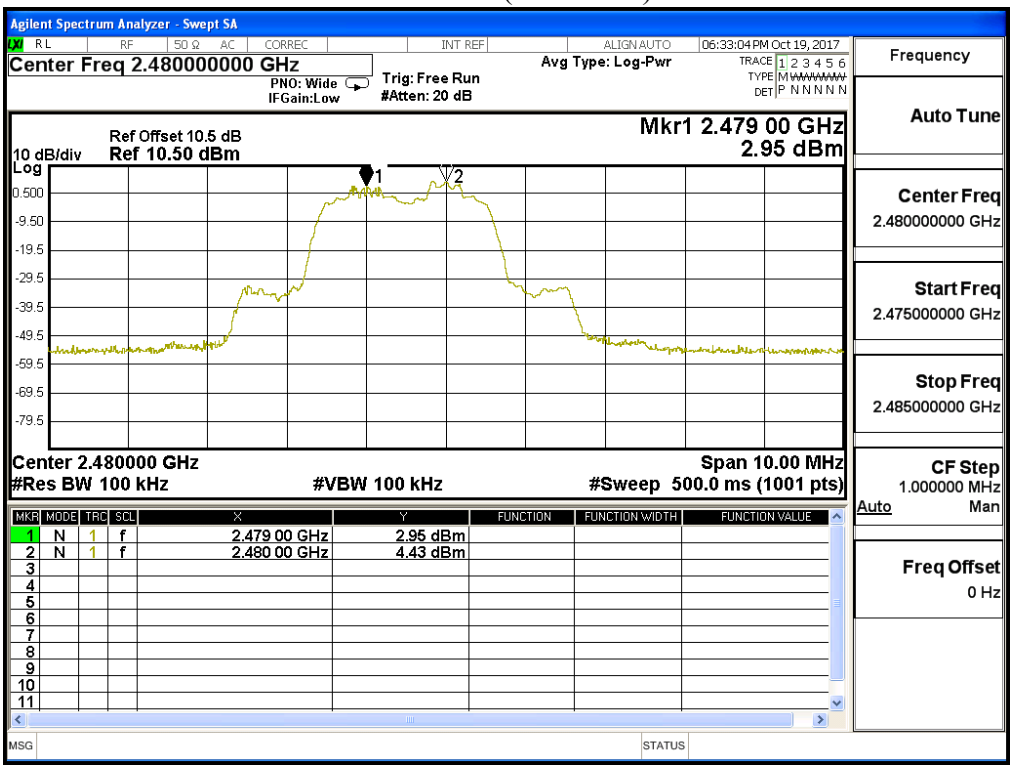
Channel 00 (2402MHz)



Channel 39 (2441MHz)

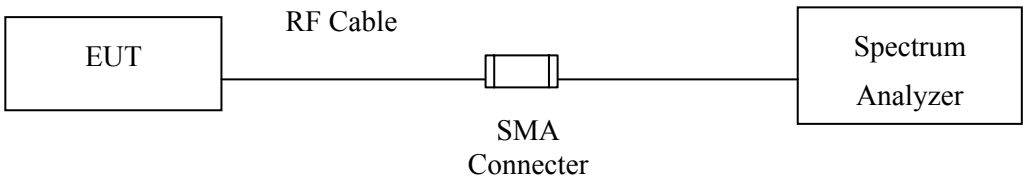



Channel 78 (2480MHz)



# 9. Dwell Time

## 9.1. Test Setup




## 9.2. Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

## 9.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

## 9.4. Uncertainty

± 25msec

## 9.5. Test Result of Dwell Time

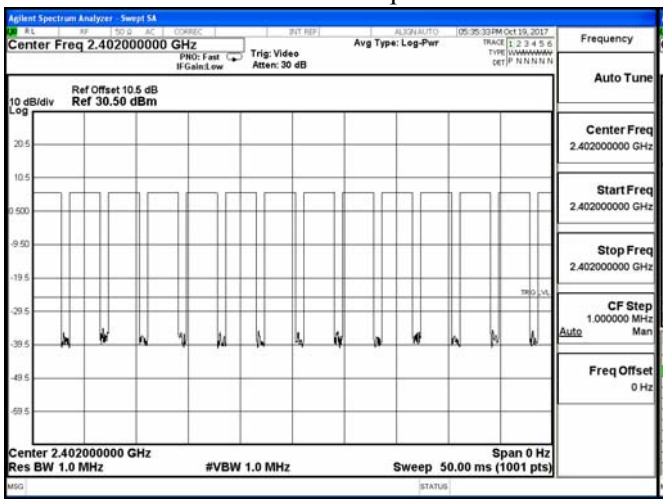
Product : MOBILE DATA TERMINAL
Test Item : Dwell Time
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (Channel 00,39,78 –DH5)

| Frequency (MHz) | Time slot length (ms) | Hopping of Number | Sweep time (ms) | Duty cycle | Dwell Time (Sec) | Limit (Sec) | Result |
|---|---|---|---|---|---|---|---|
| 2402 | 2.887 | 13 | 50 | 0.75 | 0.300 | 0.4 | Pass |
| 2441 | 2.887 | 13 | 50 | 0.75 | 0.300 | 0.4 | Pass |
| 2480 | 2.887 | 13 | 50 | 0.75 | 0.300 | 0.4 | Pass |

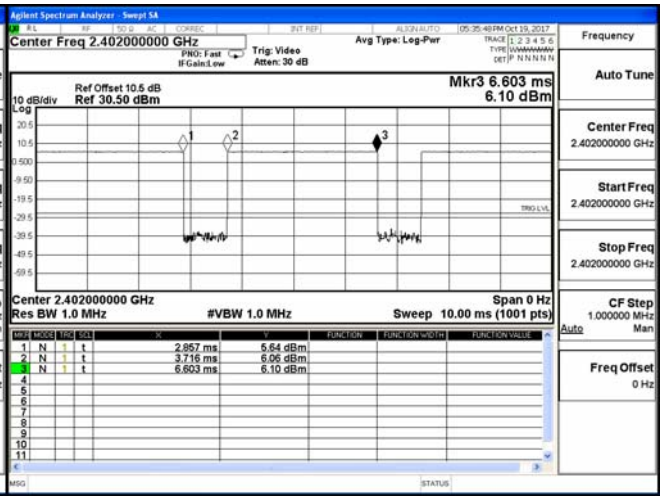
Duty cycle = ((Time slot length(ms)*Hopping of Number) / Sweep time (ms)

Dwell time = (Duty cycle /79) * (79*0.4)

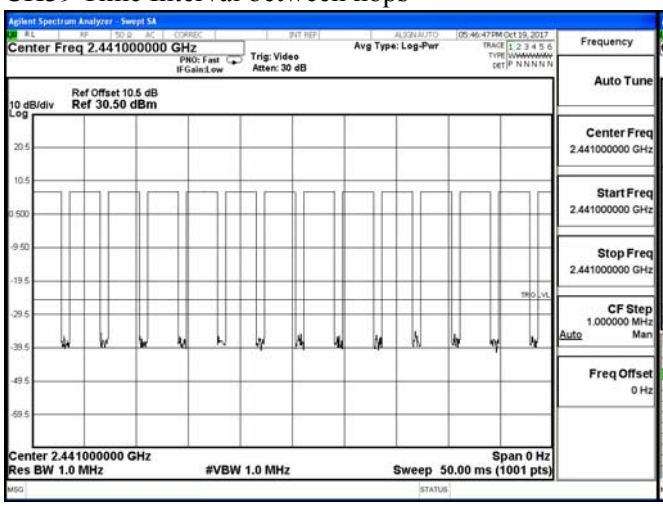
CH 00 Time Interval between hops



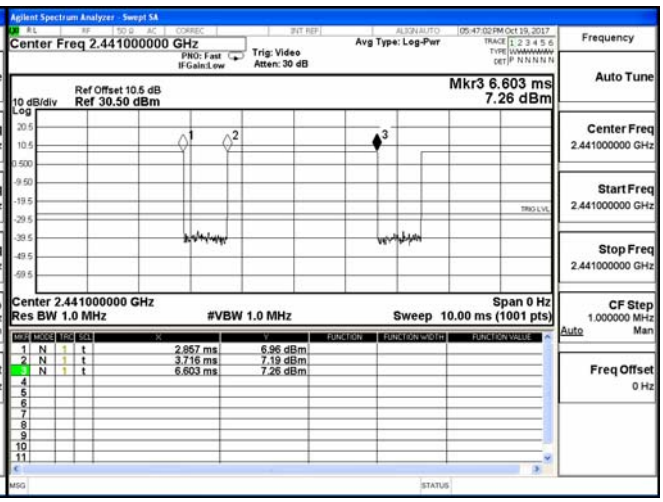

CH 00 Transmission Time



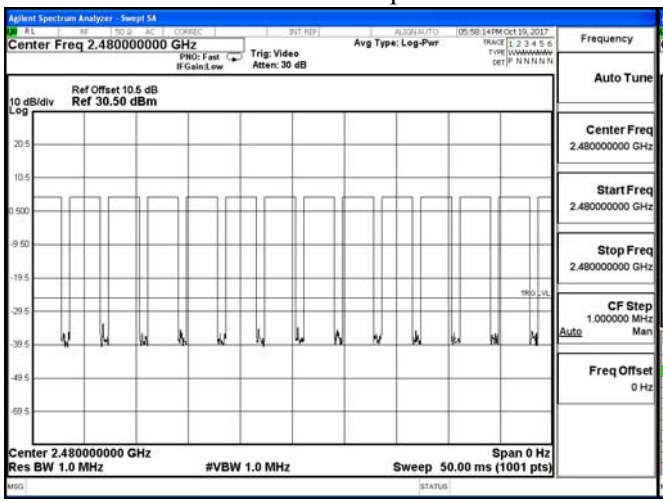

CH39 Time Interval between hops



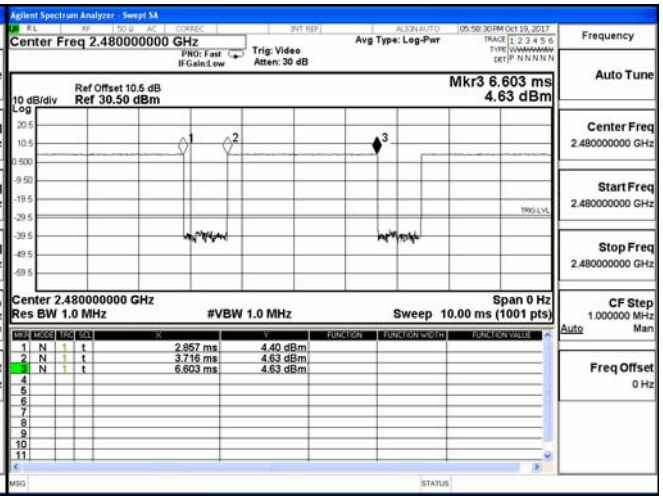

CH 39Transmission Time



CH 78 Time Interval between hops




CH 78 Transmission Time




Note:

The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.

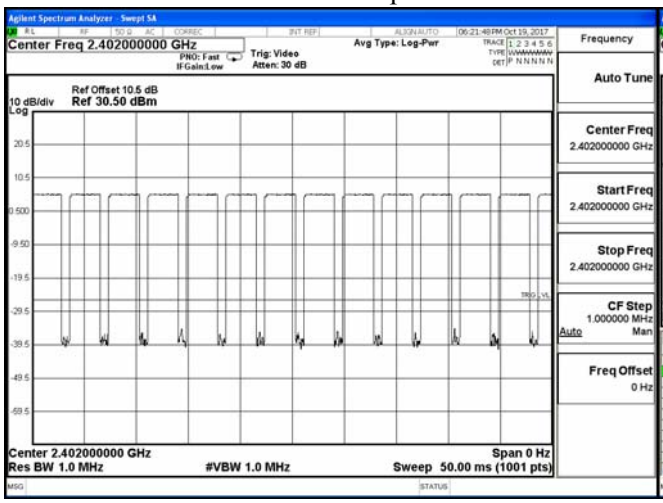
Product : MOBILE DATA TERMINAL
Test Item : Dwell Time
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (Channel 00,39,78 –DH5)

| Frequency (MHz) | Time slot length (ms) | Hopping of Number | Sweep time (ms) | Duty cycle | Dwell Time (Sec) | Limit (Sec) | Result |
|---|---|---|---|---|---|---|---|
| 2402 | 2.887 | 13 | 50 | 0.75 | 0.300 | 0.4 | Pass |
| 2441 | 2.887 | 13 | 50 | 0.75 | 0.300 | 0.4 | Pass |
| 2480 | 2.887 | 13 | 50 | 0.75 | 0.300 | 0.4 | Pass |

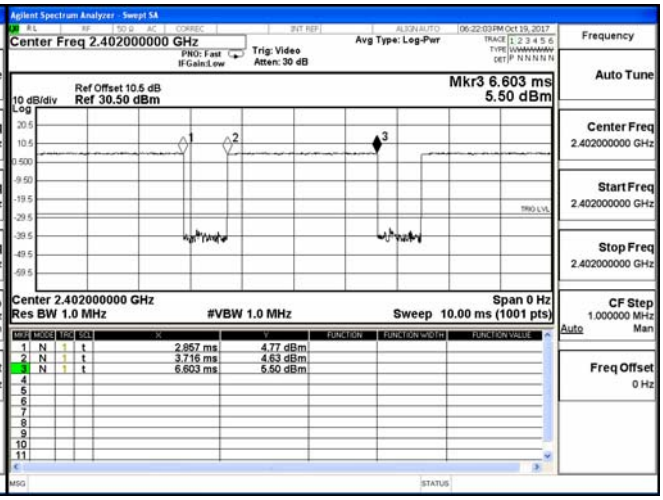
Duty cycle =((Time slot length(ms)*Hopping of Number) / Sweep time (ms)

Dwell time = (Duty cycle /79) * (79*0.4)

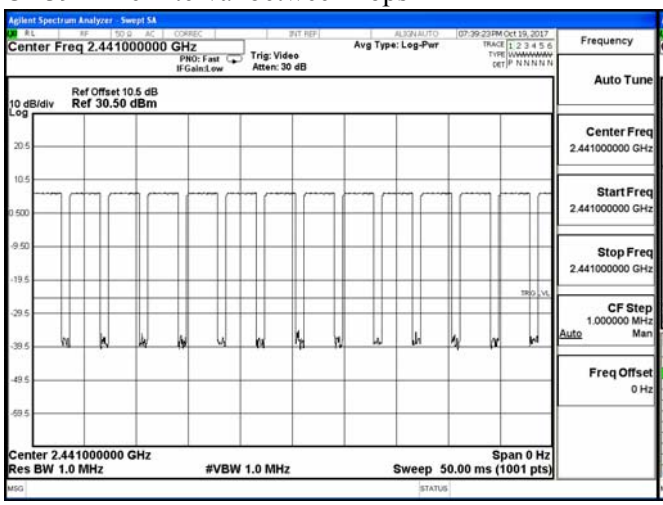
CH 00 Time Interval between hops



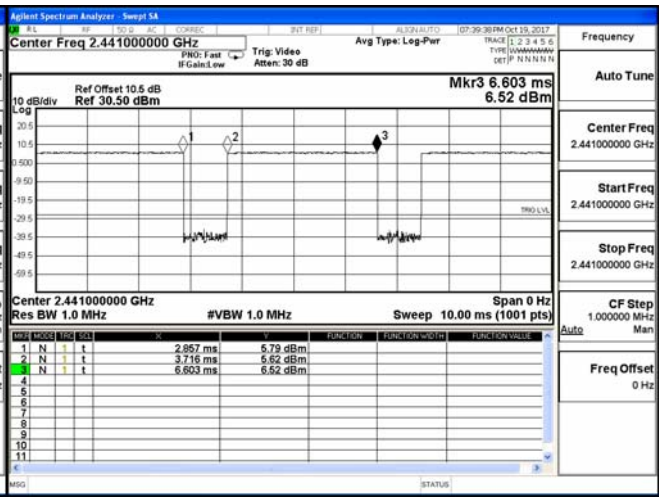

CH 00 Transmission Time



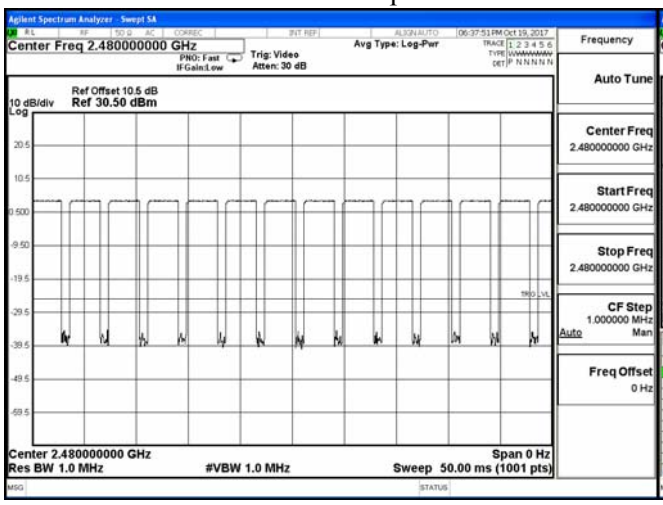

CH39 Time Interval between hops



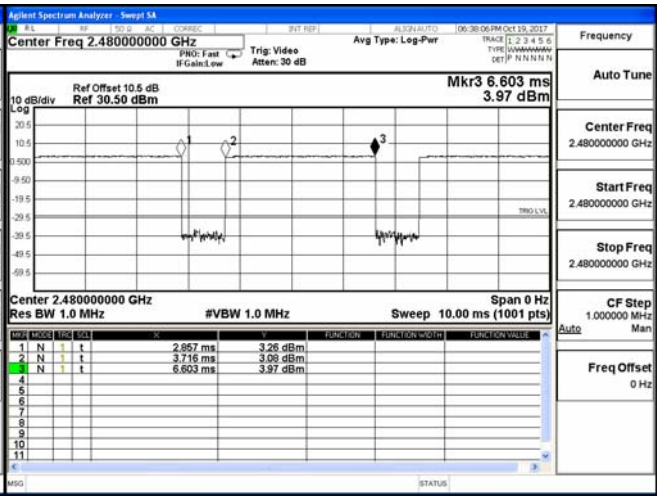

CH 39Transmission Time



CH 78 Time Interval between hops




CH 78 Transmission Time

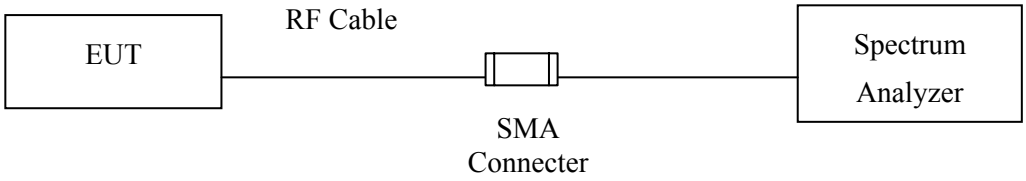



Note:

The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.

# 10. Occupied Bandwidth

## 10.1. Test Setup




## 10.2. Limits

N/A

## 10.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

## 10.4. Uncertainty

± 283Hz

## 10.5. Test Result of Occupied Bandwidth

Product : MOBILE DATA TERMINAL
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

| Channel No. | Frequency (MHz) | Measurement Level (kHz) | Required Limit (kHz) | Result |
|---|---|---|---|---|
| 00 | 2402 | 1020 | -- | NA |
| 39 | 2441 | 1017 | -- | NA |
| 78 | 2480 | 1023 | -- | NA |

**Figure Channel 00:**

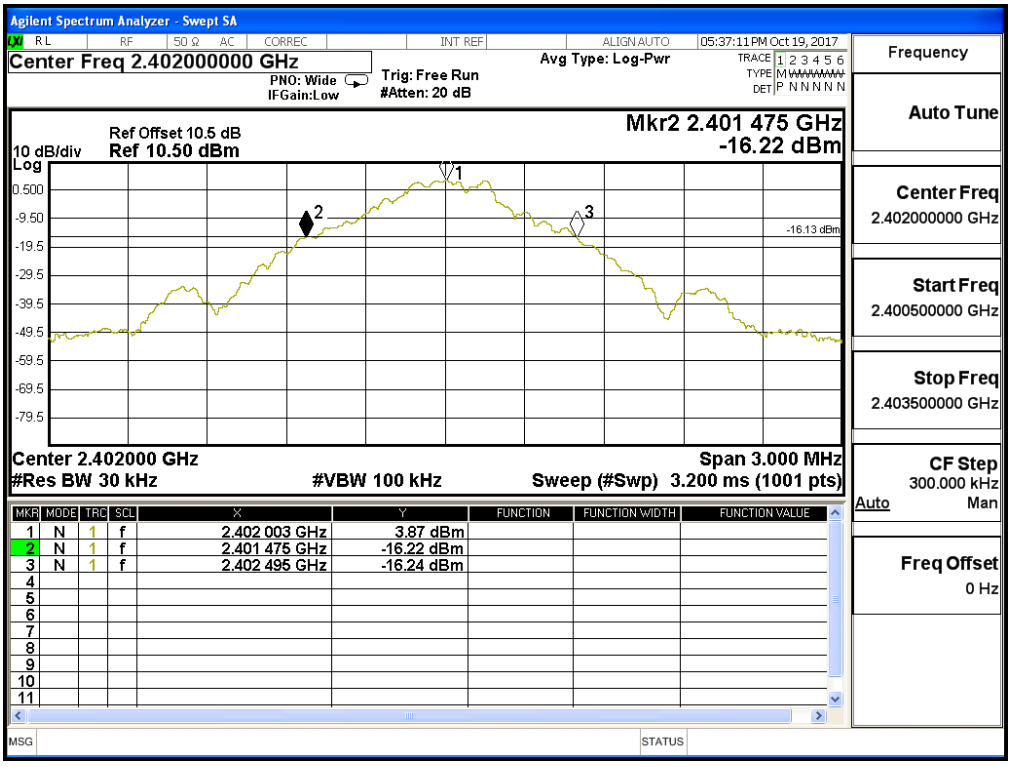


**Figure Channel 39:**

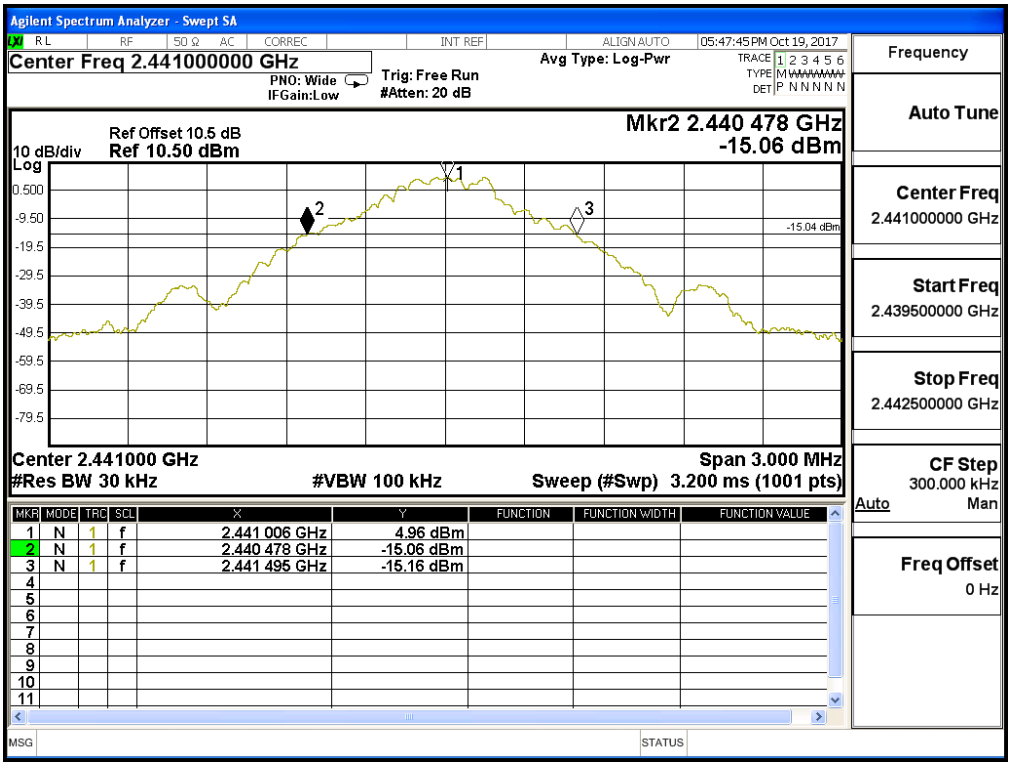
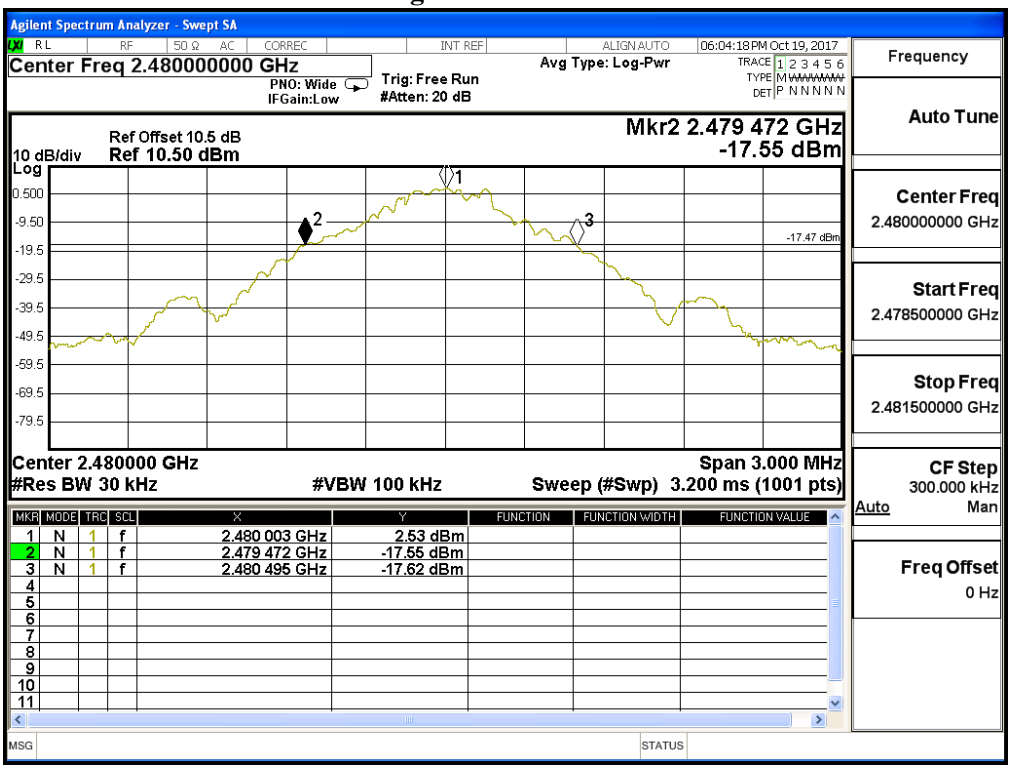



**Figure Channel 78:**



Product : MOBILE DATA TERMINAL
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

| Channel No. | Frequency (MHz) | Measurement Level (kHz) | Required Limit (kHz) | Result |
|---|---|---|---|---|
| 00 | 2402 | 1293 | -- | NA |
| 39 | 2441 | 1293 | -- | NA |
| 78 | 2480 | 1314 | -- | NA |

**Figure Channel 00:**

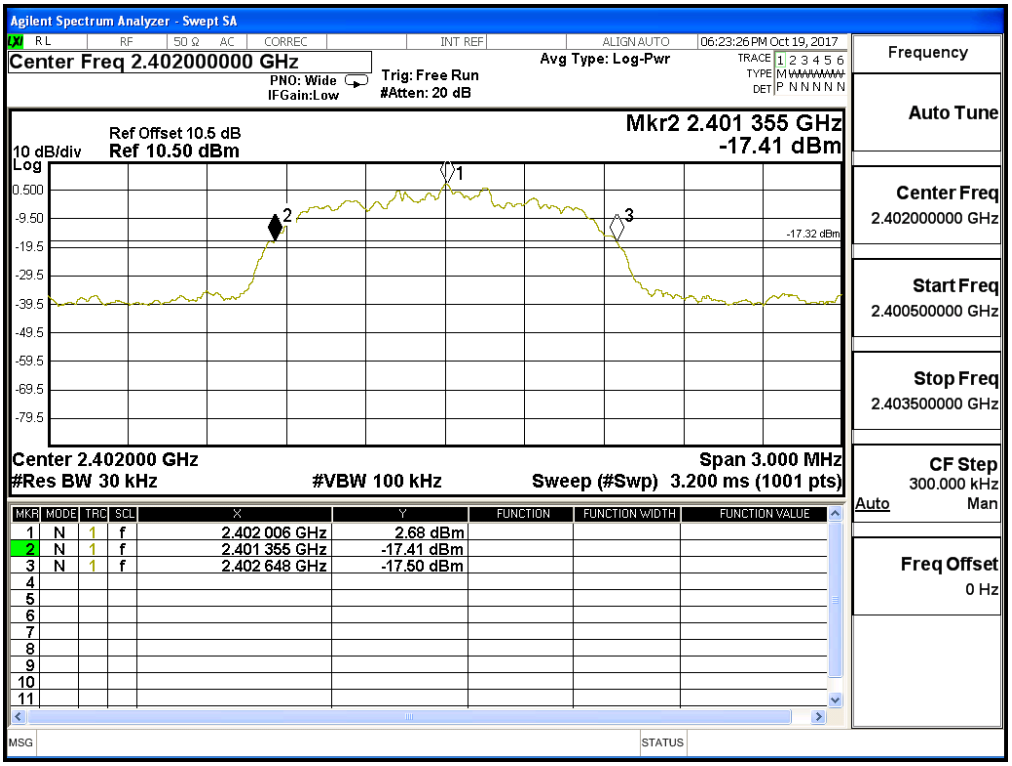


**Figure Channel 39:**

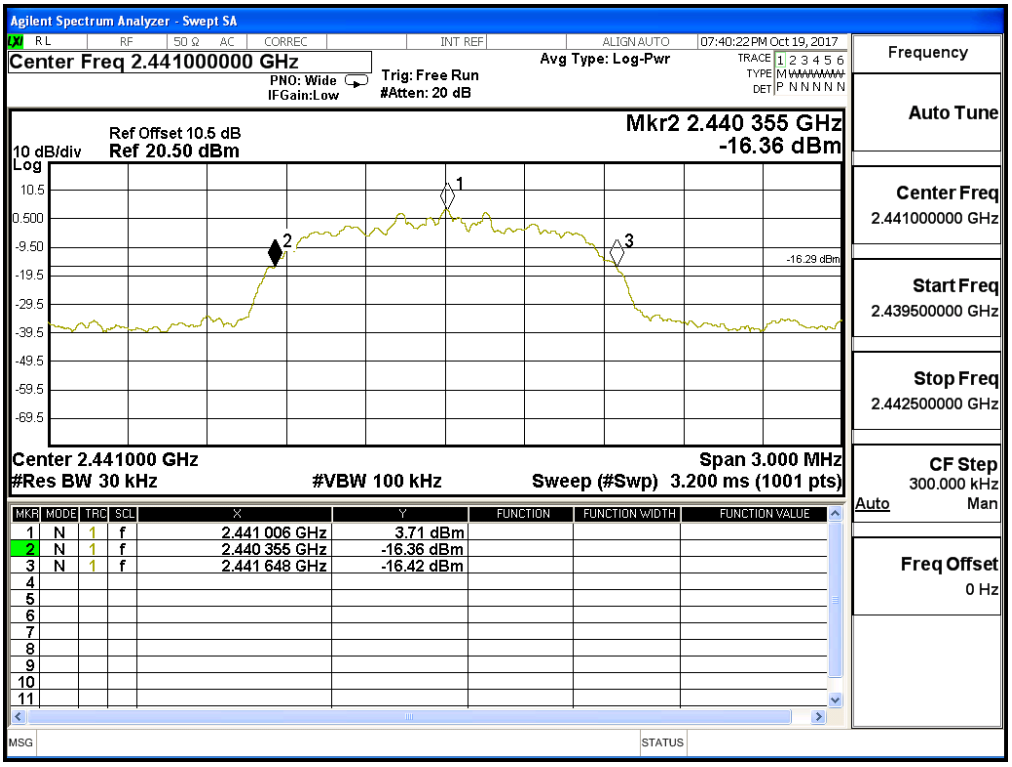
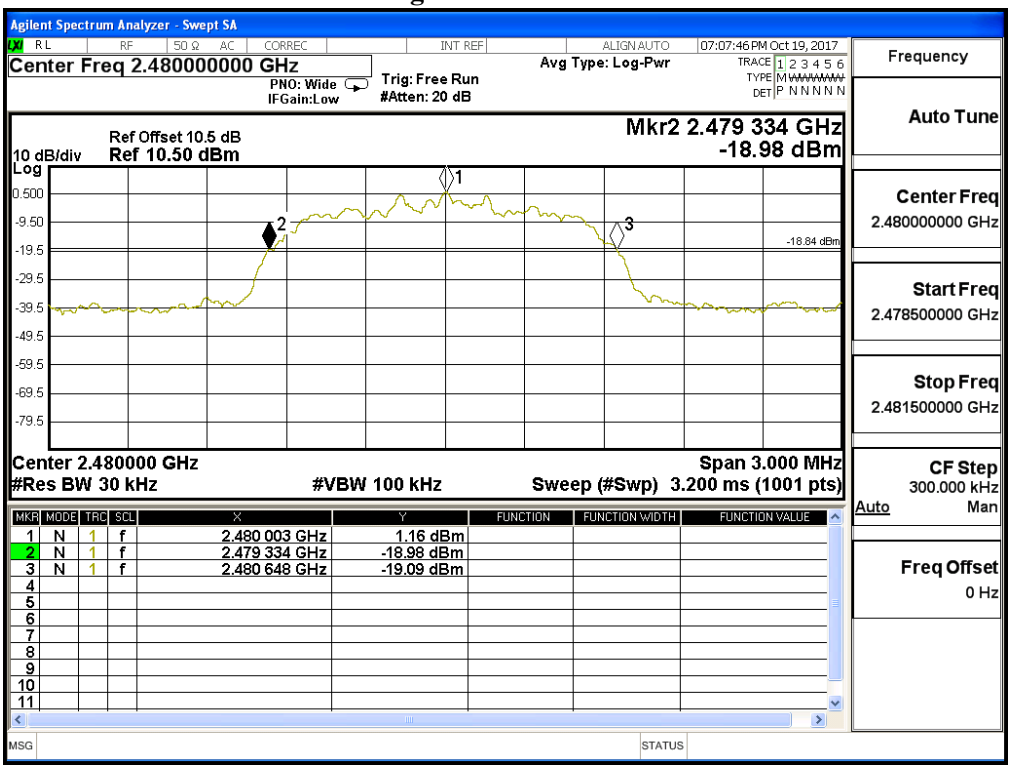



**Figure Channel 78:**



## 11. EMI Reduction Method During Compliance Testing

No modification was made during testing.