# FCC 47 CFR PART 15 SUBPART C

| | | |
|---|---|---|
| Product Type | : | SUPER GPS,POWER GPS |
| Applicant | : | Lezyne USA, Incorporated |
| Address | : | 645 Tank Farm Road Unit F San Luis Obispo California 93401 United States |
| Trade Name | : | LEZYNE |
| Model Number | : | Super GPS, Power GPS |
| Test Specification | : | FCC 47 CFR PART 15 SUBPART C: Oct., 2014<br>ANSI C63.10:2009 |
| Receive Date | : | Mar. 20, 2015 |
| Test Period | : | Apr. 09 ~ Apr. 13, 2015 |
| Issue Date | : | Jun. 11, 2015 |

**Issue by**

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade City,
Taoyuan County 334, Taiwan R.O.C.
Tel：+886-3-2710188 / Fax：+886-3-2710190

Taiwan Accreditation Foundation accreditation number: 1330

***Note:*** *This report shall not be reproduced except in full, without the written approval of A Test Lab Techno Corp. This document may be altered or revised by A Test Lab Techno Corp. personnel only, and shall be noted in the revision section of the document. The client should not use it to claim product endorsement by TAF, or any government agencies. The test results in the report only apply to the tested sample.*

## Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| 00 | Apr. 21, 2015 | Initial Issue | |
| 01 | Jun. 11, 2015 | Revised report information. | Snow Wang |
| | | | |
| | | | |

# Verification of Compliance

Issued Date: 06/11/2015

| | | |
|---|---|---|
| Product Type | : | SUPER GPS,POWER GPS |
| Applicant | : | Lezyne USA, Incorporated |
| Address | : | 645 Tank Farm Road Unit F San Luis Obispo California 93401 United States |
| Trade Name | : | LEZYNE |
| Model Number | : | Super GPS, Power GPS |
| FCC ID | : | 2AD4S-GPS-V106 |
| EUT Rated Voltage | : | DC 5.0V |
| Test Voltage | : | 120 Vac / 60 Hz , DC 3.7V |
| Applicable Standard | : | FCC 47 CFR PART 15 SUBPART C: Oct., 2014<br>ANSI C63.10:2009 |
| Test Result | : | Complied |
| Performing Lab. | : | A Test Lab Techno Corp.<br>No. 140-1, Changan Street, Bade City,<br>Taoyuan County 334, Taiwan R.O.C.<br>Tel：+886-3-2710188 / Fax：+886-3-2710190<br>Taiwan Accreditation Foundation accreditation number: 1330<br>http://www.atl-lab.com.tw/e-index.htm |

A Test Lab Techno Corp. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

| | | | |
|---|---|---|---|
| Approved By | : Fly Lu | Reviewed By | : Eric Ou Yang |
| (Manager) | (Fly Lu) | (Testing Engineer) | (Eric Ou Yang) |

# TABLE OF CONTENTS

**1 General Information ..... 6**
**2 EUT Description ..... 7**
**3 Test Methodology ..... 8**
3.1. Mode of Operation ..... 8
3.2. EUT Exercise Software ..... 8
3.3. Configuration of Test System Details ..... 9
3.4. Test Site Environment ..... 9
**4 Conducted Emission Measurement ..... 10**
4.1. Limit ..... 10
4.2. Test Instruments ..... 10
4.3. Test Setup ..... 10
4.4. Test Procedure ..... 11
4.5. Test Result ..... 12
**5 Radiated Emission Measurement ..... 14**
5.1. Limit ..... 14
5.2. Test Instruments ..... 14
5.3. Setup ..... 15
5.4. Test Procedure ..... 17
5.5. Test Result ..... 19
**6 Maximum Conducted Output Power Measurement ..... 22**
6.1. Limit ..... 22
6.2. Test Setup ..... 22
6.3. Test Instruments ..... 22
6.4. Test Procedure ..... 22
6.5. Test Result ..... 23
**7 6dB RF Bandwidth and 99 % Occupied Bandwidth Measurement ..... 24**
7.1. Limit ..... 24
7.2. Test Setup ..... 24
7.3. Test Instruments ..... 24
7.4. Test Procedure ..... 25
7.5. Test Result ..... 25
7.6. Test Graphs ..... 26
**8 Maximum Power Density Measurement ..... 27**
8.1. Limit ..... 27
8.2. Test Setup ..... 27
8.3. Test Instruments ..... 27
8.4. Test Procedure ..... 27
8.5. Test Result ..... 28
8.6. Test Graphs ..... 29

**9 Out of Band Conducted Emissions Measurement ..... 30**
9.1. Limit ..... 30
9.2. Test Setup ..... 30
9.3. Test Instruments ..... 30
9.4. Test Procedure ..... 30
9.5. Test Graphs ..... 31
**10 Band Edges Measurement ..... 34**
10.1. Limit ..... 34
10.2. Test Setup ..... 34
10.3. Test Instruments ..... 34
10.4. Test Procedure ..... 35
10.5. Test Result ..... 36
**11 Antenna Measurement ..... 37**
11.1. Limit ..... 37
11.2. Antenna Connector Construction ..... 37

# 1 General Information

## 1.1 Summary of Test Result

| Standard<br>15.247 | Item | Result | Remark |
|---|---|---|---|
| 15.207 | AC Power Conducted Emission | PASS | ----- |
| Standard<br>15.247 | Item | Result | Remark |
| 15.247(d) | Transmitter Radiated Emissions | PASS | ----- |
| 15.247(b)(3) | Max. Output Power | PASS | ----- |
| 15.247(a)(2) | 6dB RF Bandwidth | PASS | ----- |
| 15.247(e) | Power Spectral Density | PASS | ----- |
| 15.247(d) | Out of Band Conducted Spurious Emission | PASS | ----- |
| 15.247(d) | Band Edge Measurement | PASS | ----- |
| 15.203 | Antenna Requirement | PASS | ----- |

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

## 1.2 Measurement Uncertainty

| Test Item | Frequency Range | | Uncertainty (dB) |
|---|---|---|---|
| Conducted Emission | 9kHz ~ 30MHz | | ± 2.02 |
| Radiated Emission | 30MHz ~ 1000MHz | Horizontal | ± 3.98 |
| | | Vertical | ± 3.62 |
| | 1000MHz ~ 18000MHz | Horizontal | ± 3.11 |
| | | Vertical | ± 3.07 |
| | 18000MHz ~ 40000MHz | Horizontal | ± 3.66 |
| | | Vertical | ± 3.54 |

# 2 EUT Description

| | |
|---|---|
| Product Type | SUPER GPS,POWER GPS |
| Trade Name | LEZYNE |
| Model No. | Super GPS, Power GPS |
| Different Description | Power GPS without ANT+ function |
| Applicant | Lezyne USA, Incorporated<br>645 Tank Farm Road Unit F San Luis Obispo California 93401 United States |
| Manufacturer | LEZYNE USA, INC.<br>645 Tank Farm Road Unit F San Luis Obispo CA US 93401 USA |
| FCC ID | 2AD4S-GPS-V106 |
| Frequency Range | Bluetooth v4.0 LE: 2402 ~ 2480 MHz |
| Modulation Type | GFSK |
| Antenna Type | Internal Antenna |
| Antenna Gain | -2.41 dBi |
| RF Output Power | 0.00352 W / 5.46 dBm |

# 3 Test Methodology

## 3.1. Mode of Operation

Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

| Test Mode |
|---|
| Mode 1: Super GPS, Normal Operation Mode |
| Mode 2: Super GPS, Bluetooth v4.0 LE Link Mode |

The product has two models, the Power GPS without ANT+ function.

We only to test the fully function models: Super GPS.

Software used to control the EUT for staying in continuous transmitting mode was programmed.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “X axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

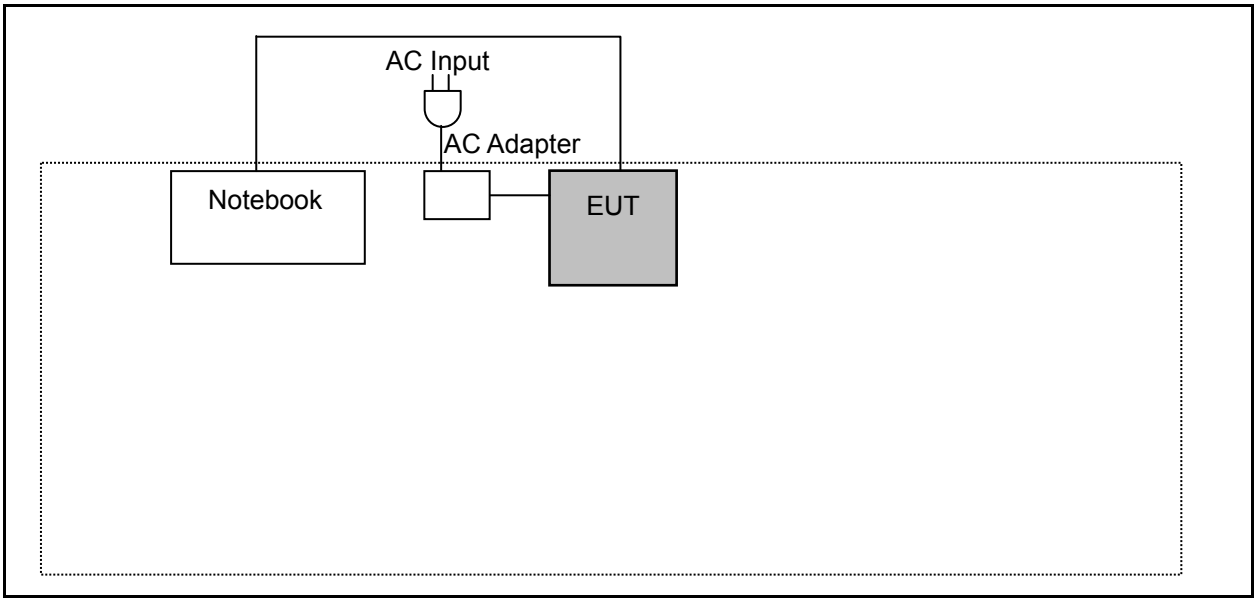
Note: The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

## 3.2. EUT Exercise Software

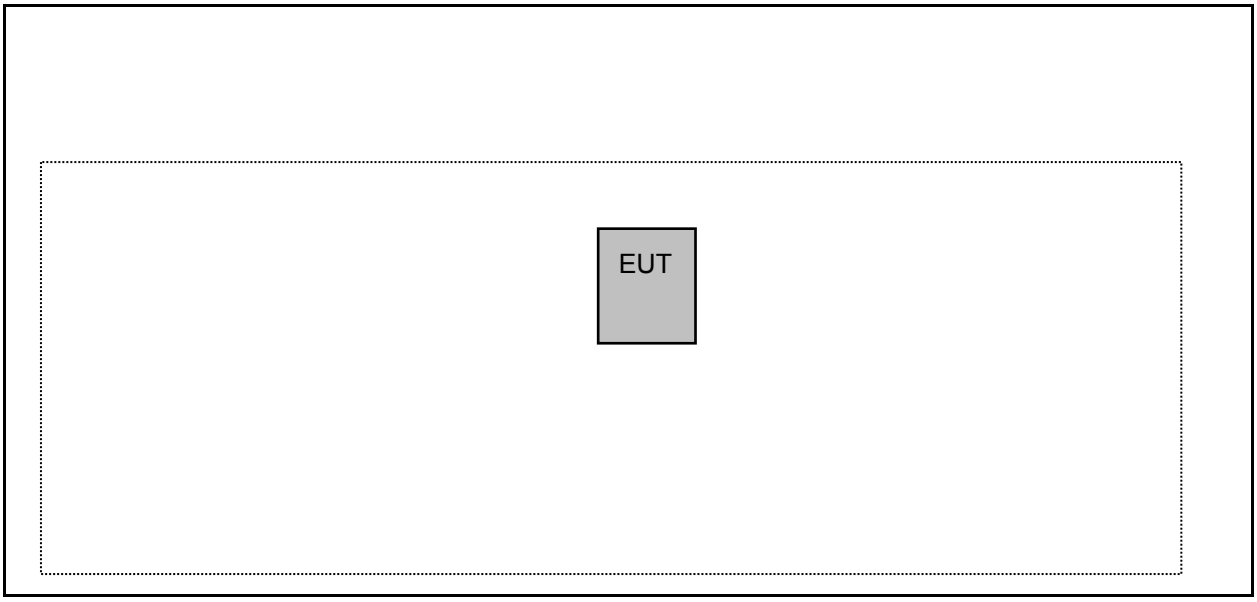
| | |
|---|---|
| 1. | Setup the EUT shown on 3.3. |
| 2. | Turn on the power of all equipment. |
| 3. | Turn Bluetooth function link to CBT. |
| 4. | EUT run test program. |

## 3.3. Configuration of Test System Details

AC Power Conducted Emission




Radiated Emissions




## 3.4. Test Site Environment

| Items | Required (IEC 60068-1) | Actual |
|---|---|---|
| Temperature (°C) | 15-35 | 26 |
| Humidity (%RH) | 25-75 | 60 |
| Barometric pressure (mbar) | 860-1060 | 950 |

# 4 Conducted Emission Measurement

## 4.1. Limit

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

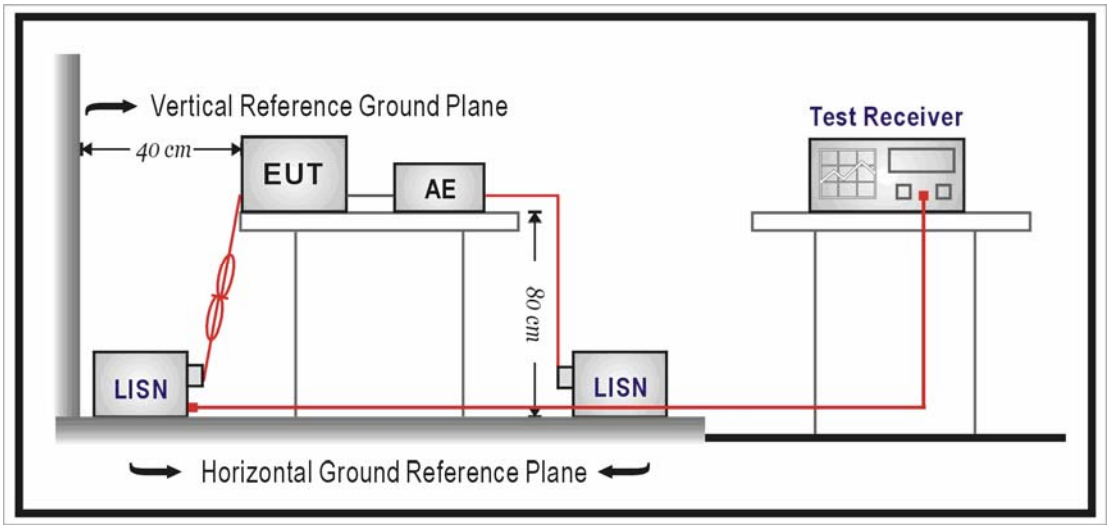
## 4.2. Test Instruments

| Describe | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
|---|---|---|---|---|---|
| Test Receiver | R&S | ESCI | 100367 | 06/12/2014 | (1) |
| LISN | R&S | ENV216 | 101040 | 03/10/2015 | (1) |
| LISN | R&S | ENV216 | 101041 | 03/06/2015 | (1) |
| RF Cable | EMCI | RG 214/U | TE-02 | 06/30/2014 | (1) |
| Test Site | ATL | TE02 | TE02 | N.C.R. | ----- |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

## 4.3. Test Setup



## 4.4. Test Procedure

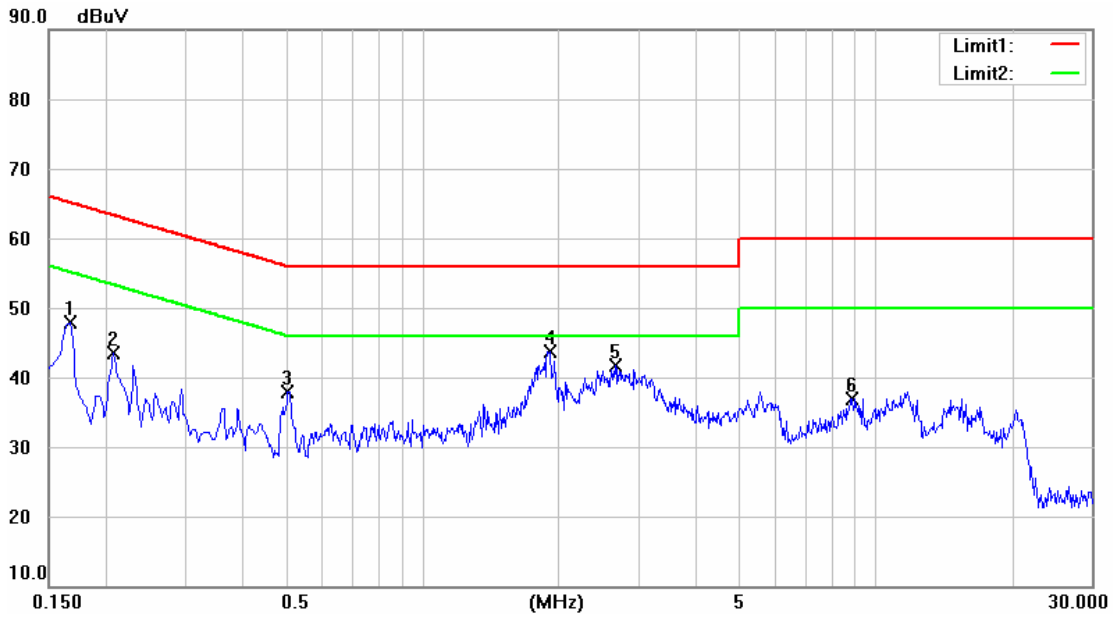
The power line conducted emission measurements were performed in a shielded enclosure. The EUT was assembled on a wooden table which is 80 centimeters high, was placed 40 centimeters from the back wall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and EMCO Model 3162/2 SH Line Impedance Stabilization Networks (LISN). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPR quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 4.1.

## 4.5. Test Result

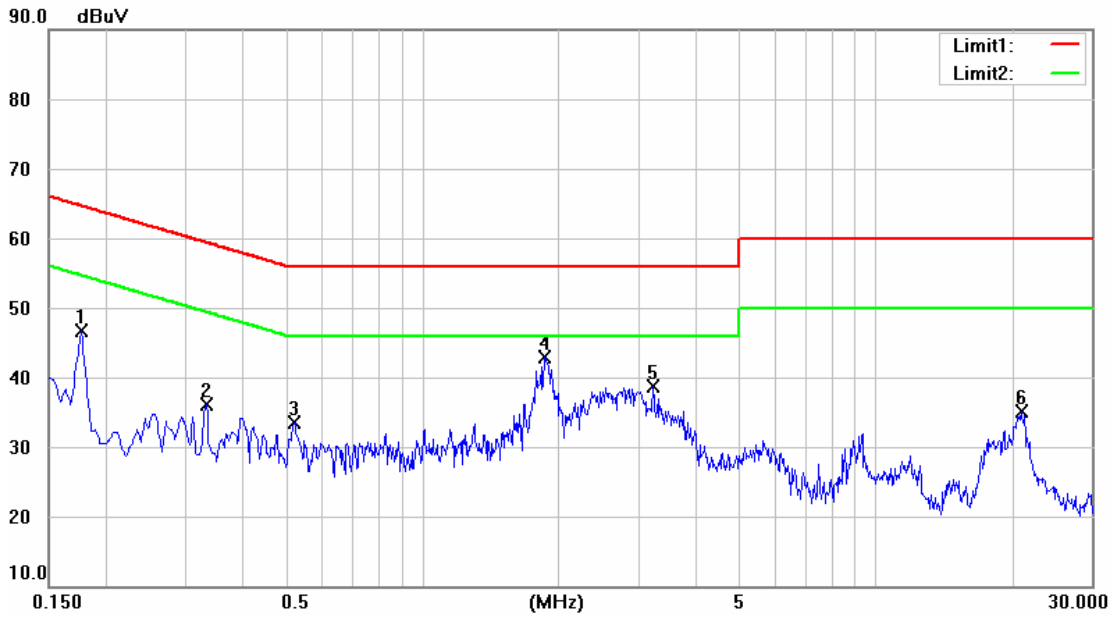
| | | | |
|---|---|---|---|
| Standard: | FCC Part 15C | Line: | L1 |
| Test item: | Conducted Emission | Power: | AC 120V/60Hz |
| Model Number: | Super GPS | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | 1 | Date: | 04/09/2015 |
| | | Test By: | Eric Ou Yang |
| Description: | | | |




| No. | Frequency (MHz) | QP reading (dBuV) | AVG reading (dBuV) | Correction factor (dB) | QP result (dBuV) | AVG result (dBuV) | QP limit (dBuV) | AVG limit (dBuV) | QP margin (dB) | AVG margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.1680 | 34.23 | 19.57 | 9.60 | 43.83 | 29.17 | 65.06 | 55.06 | -21.23 | -25.89 | Pass |
| 2 | 0.2085 | 29.43 | 16.67 | 9.60 | 39.03 | 26.27 | 63.26 | 53.26 | -24.23 | -26.99 | Pass |
| 3 | 0.5056 | 24.56 | 18.58 | 9.62 | 34.18 | 28.20 | 56.00 | 46.00 | -21.82 | -17.80 | Pass |
| 4 | 1.9100 | 30.12 | 22.74 | 9.69 | 39.81 | 32.43 | 56.00 | 46.00 | -16.19 | -13.57 | Pass |
| 5 | 2.6705 | 29.05 | 23.11 | 9.72 | 38.77 | 32.83 | 56.00 | 46.00 | -17.23 | -13.17 | Pass |
| 6 | 8.8954 | 24.22 | 17.67 | 9.92 | 34.14 | 27.59 | 60.00 | 50.00 | -25.86 | -22.41 | Pass |

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15C | Line: | N |
| Test item: | Conducted Emission | Power: | AC 120V/60Hz |
| Model Number: | Super GPS | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | 1 | Date: | 04/09/2015 |
| | | Test By: | Eric Ou Yang |
| Description: | | | |




| No. | Frequency (MHz) | QP reading (dBuV) | AVG reading (dBuV) | Correction factor (dB) | QP result (dBuV) | AVG result (dBuV) | QP limit (dBuV) | AVG limit (dBuV) | QP margin (dB) | AVG margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.1770 | 32.85 | 17.46 | 9.60 | 42.45 | 27.06 | 64.63 | 54.63 | -22.18 | -27.57 | Pass |
| 2 | 0.3345 | 21.40 | 14.36 | 9.61 | 31.01 | 23.97 | 59.34 | 49.34 | -28.33 | -25.37 | Pass |
| 3 | 0.5236 | 21.91 | 15.02 | 9.62 | 31.53 | 24.64 | 56.00 | 46.00 | -24.47 | -21.36 | Pass |
| 4 | 1.8650 | 31.99 | 20.32 | 9.69 | 41.68 | 30.01 | 56.00 | 46.00 | -14.32 | -15.99 | Pass |
| 5 | 3.2287 | 25.90 | 19.37 | 9.77 | 35.67 | 29.14 | 56.00 | 46.00 | -20.33 | -16.86 | Pass |
| 6 | 21.0346 | 21.91 | 14.96 | 10.25 | 32.16 | 25.21 | 60.00 | 50.00 | -27.84 | -24.79 | Pass |

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

# 5 Radiated Emission Measurement

## 5.1. Limit

According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (μV/m at meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009 – 0.490 | 2400 / F (kHz) | 300 |
| 0.490 – 1.705 | 24000 / F (kHz) | 30 |
| 1.705 – 30.0 | 30 | 30 |
| 30 - 88 | 100** | 3 |
| 88-216 | 150** | 3 |
| 216-960 | 200** | 3 |
| Above 960 | 500 | 3 |

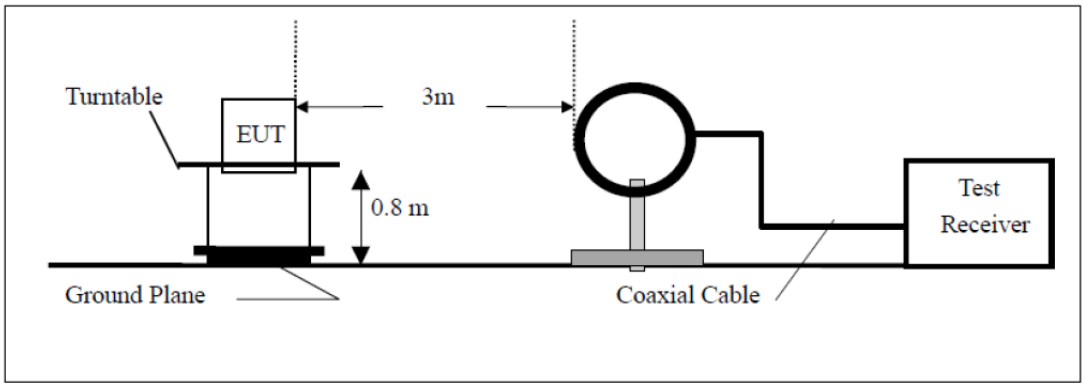
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

## 5.2. Test Instruments

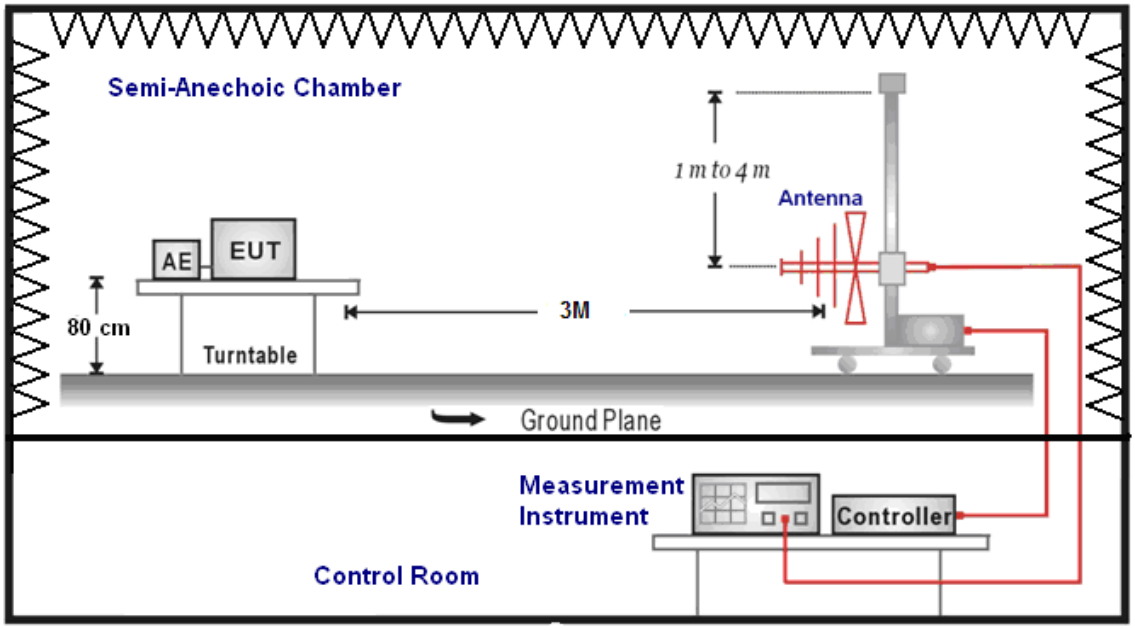
| 3 Meter Chamber | | | | | |
|---|---|---|---|---|---|
| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
| RF Pre-selector | Agilent | N9039A | MY46520256 | 01/06/2015 | (1) |
| Spectrum Analyzer | Agilent | E4446A | MY46180578 | 01/06/2015 | (1) |
| Pre Amplifier | Agilent | 8449B | 3008A02237 | 02/24/2015 | (1) |
| Pre Amplifier | Agilent | 8447D | 2944A10961 | 02/24/2015 | (1) |
| Broadband Antenna (30MHz~1GHz) | SCHWARZBECK MESS-ELEKTRONIK | VULB9163 | 9163-270 | 07/22/2014 | (1) |
| Horn Antenna (1~18GHz) | SCHWARZBECK MESS-ELEKTRONIK | BBHA9120D | 9120D-550 | 06/11/2014 | (1) |
| Horn Antenna (18~40GHz) | SCHWARZBECK MESS-ELEKTRONIK | BBHA9170 | 9170-320 | 07/02/2014 | (1) |
| Loop Antenna | COM-POWER CORPORATION | AL-130 | 121014 | 02/02/2015 | (1) |
| Microwave Cable | EMCI | EMC-104-SM-SM-14000 | 140202 | 02/24/2015 | (1) |
| Microwave Cable | EMCI | EMC104-SM-SM-600 | 140301 | 02/24/2015 | (1) |
| Test Site | ATL | TE01 | 888001 | 08/28/2014 | (1) |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.
Note: N.C.R. = No Calibration Request.

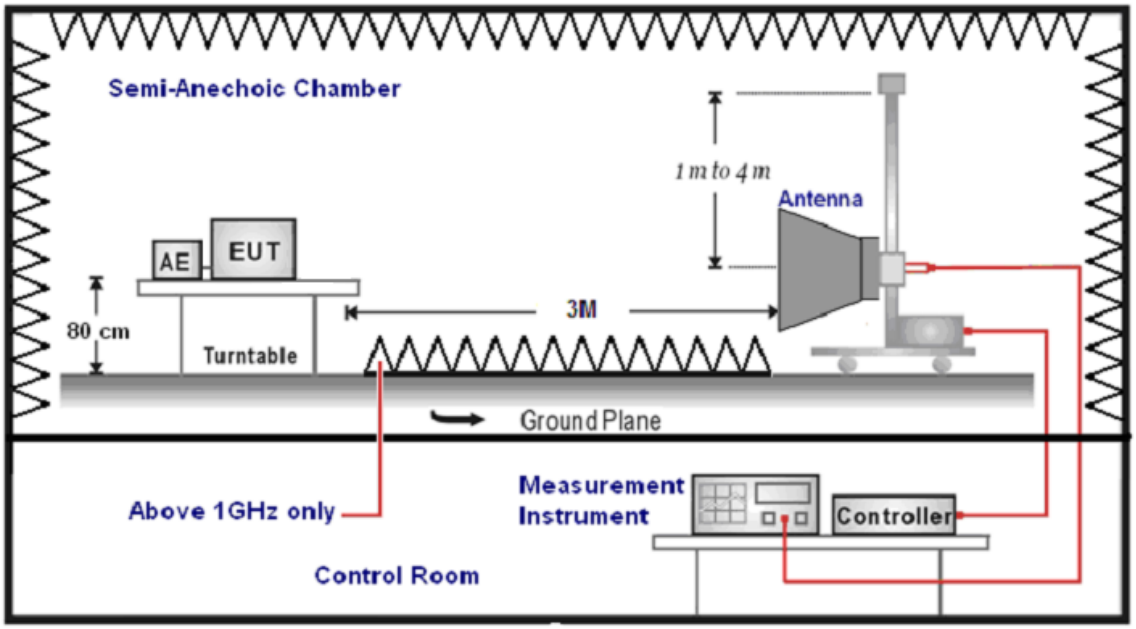
## 5.3. Setup




Below 1GHz



Above 1GHz


Semi-Anechoic Chamber
1 m to 4 m
Antenna
AE
EUT
80 cm
Turntable
3M
Ground Plane
Above 1GHz only
Measurement
Instrument
Controller
Control Room

## 5.4. Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 9 kHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on tree orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna (mode VULB9163) at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna (model BBHA9120D&9170) was used in frequencies 1 – 26.5 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro colts per meter (dBuV/m).

The actual field is intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1) Amplitude (dBuV/m) = FI (dBuV) +AF (dBuV) +CL (dBuV)-Gain (dB)
FI= Reading of the field intensity.
AF= Antenna factor.
CL= Cable loss.
P.S Amplitude is auto calculate in spectrum analyzer.

(2) Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)
The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:
(a) For fundamental frequency : Transmitter Output < +30dBm
(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

## 5.5. Test Result

**Below 1GHz**

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15C | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | DC 3.7V |
| Model Number: | Super GPS | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | 1 | Date: | 04/09/2015 |
| | | Test By: | Eric Ou Yang |

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 140.5000 | 28.02 | -11.66 | 16.36 | 43.50 | -27.14 | QP | H |
| 297.0000 | 28.32 | -9.50 | 18.82 | 46.00 | -27.18 | QP | H |
| 432.5000 | 27.67 | -6.67 | 21.00 | 46.00 | -25.00 | QP | H |
| 592.5000 | 27.42 | -3.35 | 24.07 | 46.00 | -21.93 | QP | H |
| 702.0000 | 28.25 | -1.40 | 26.85 | 46.00 | -19.15 | QP | H |
| 882.5000 | 27.53 | 2.21 | 29.74 | 46.00 | -16.26 | QP | H |
| 135.0000 | 37.67 | -12.36 | 25.31 | 43.50 | -18.19 | QP | V |
| 243.0000 | 37.65 | -11.55 | 26.10 | 46.00 | -19.90 | QP | V |
| 405.0000 | 34.34 | -7.24 | 27.10 | 46.00 | -18.90 | QP | V |
| 568.0000 | 27.30 | -4.01 | 23.29 | 46.00 | -22.71 | QP | V |
| 712.0000 | 27.20 | -1.17 | 26.03 | 46.00 | -19.97 | QP | V |
| 871.5000 | 27.78 | 1.90 | 29.68 | 46.00 | -16.32 | QP | V |

Note: No emission found between lowest internal used/generated frequency to 30MHz (9kH~30MHz).

**Above 1GHz**

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15C | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | DC 3.7V |
| Model Number: | Super GPS | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | 2 | Date: | 04/09/2015 |
| Frequency: | 2402MHz | Test By: | Eric Ou Yang |

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 3030.000 | 36.21 | 1.85 | 38.06 | 74.00 | -35.94 | peak | H |
| 4626.000 | 33.06 | 6.85 | 39.91 | 74.00 | -34.09 | peak | H |
| 6698.000 | 33.45 | 12.03 | 45.48 | 74.00 | -28.52 | peak | H |
| 3051.000 | 38.55 | 1.94 | 40.49 | 74.00 | -33.51 | peak | V |
| 4570.000 | 34.14 | 6.68 | 40.82 | 74.00 | -33.18 | peak | V |
| 6733.000 | 34.06 | 12.11 | 46.17 | 74.00 | -27.83 | peak | V |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15C | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | DC 3.7V |
| Model Number: | Super GPS | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | 2 | Date: | 04/09/2015 |
| Frequency: | 2440MHz | Test By: | Eric Ou Yang |

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 3037.000 | 36.29 | 1.87 | 38.16 | 74.00 | -35.84 | peak | H |
| 4549.000 | 34.10 | 6.61 | 40.71 | 74.00 | -33.29 | peak | H |
| 6677.000 | 33.34 | 11.97 | 45.31 | 74.00 | -28.69 | peak | H |
| 3023.000 | 36.71 | 1.81 | 38.52 | 74.00 | -35.48 | peak | V |
| 4598.000 | 33.51 | 6.77 | 40.28 | 74.00 | -33.72 | peak | V |
| 6691.000 | 33.73 | 12.02 | 45.75 | 74.00 | -28.25 | peak | V |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15C | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | DC 3.7V |
| Model Number: | Super GPS | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | 2 | Date: | 04/09/2015 |
| Frequency: | 2480MHz | Test By: | Eric Ou Yang |

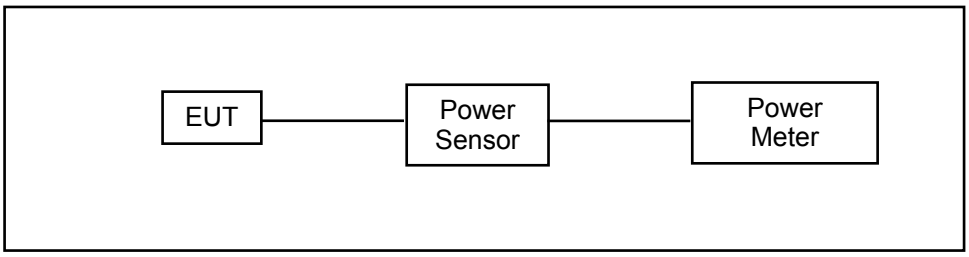
| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 3009.000 | 37.48 | 1.75 | 39.23 | 74.00 | -34.77 | peak | H |
| 4598.000 | 34.09 | 6.77 | 40.86 | 74.00 | -33.14 | peak | H |
| 6670.000 | 34.02 | 11.96 | 45.98 | 74.00 | -28.02 | peak | H |
| 3051.000 | 37.78 | 1.94 | 39.72 | 74.00 | -34.28 | peak | V |
| 4605.000 | 33.19 | 6.79 | 39.98 | 74.00 | -34.02 | peak | V |
| 6670.000 | 34.53 | 11.96 | 46.49 | 74.00 | -27.51 | peak | V |

# 6 Maximum Conducted Output Power Measurement

## 6.1. Limit

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm.

## 6.2. Test Setup




## 6.3. Test Instruments

| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
|---|---|---|---|---|---|
| Single Channel PK Power Sensor | Agilent | N1911A | MY45101619 | 12/15/2014 | (1) |
| Wideband Power Meter | Agilent | N1921A | MY45241957 | 12/15/2014 | (1) |
| Microwave Cable | EMCI | EMC104-SM-SM-1500 | 140303 | 02/24/2015 | (1) |
| Test Site | ATL | TE05 | TE05 | N.C.R. | ----- |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.
Note: N.C.R. = No Calibration Request.

## 6.4. Test Procedure

The tests below are run with the EUT's transmitter set at high power in TX mode. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. Remove the Subjective device's antenna and connect the RF output port to power sensor. The maximum peak output power shall not exceed 1 watt.

Use a direct connection between the antenna port of transmitter and the power sensor, for prevent the power sensor input attenuation 40-50 dB. Set the RBW Bandwidth of the emission or use a channel power meter mode.

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm). For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6)/3 dBm.

The antenna port of the EUT was connected to the input of a power sensor. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

## 6.5. Test Result

| Model Number | Super GPS | | | | |
|---|---|---|---|---|---|
| Test Item | Maximum Conducted Output Power | | | | |
| Test Mode | Mode 2: Bluetooth v4.0 LE Link Mode | | | | |
| Date of Test | 04/09/2015 | | Test Site | TE05 | |
| Frequency (MHz) | Data Rate | Peak Power | | | Limit (dBm) |
| | | (dBm) | (W) | | |
| 2402 | --- | 4.51 | 0.00282 | | < 30 |
| 2440 | --- | 5.02 | 0.00318 | | < 30 |
| 2480 | --- | **5.46** | **0.00352** | | < 30 |

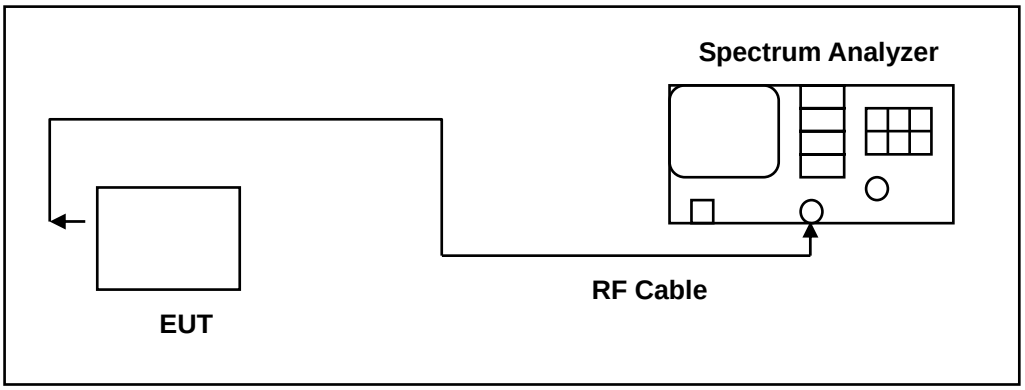
Note: The relevant measured result has the offset with cable loss already.

# 7 6dB RF Bandwidth Measurement

## 7.1. Limit

6dB RF Bandwidth: Systems using digital modulation techniques may operate in the 2400–2483.5 MHz bands. The minimum 6 dB band-width shall be at least 500 kHz.

## 7.2. Test Setup




## 7.3. Test Instruments

| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4445A | MY45300744 | 12/16/2014 | (1) |
| Microwave Cable | EMCI | EMC104-SM-SM-1500 | 140303 | 02/24/2015 | (1) |
| Test Site | ATL | TE05 | TE05 | N.C.R. | ----- |

dRemark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

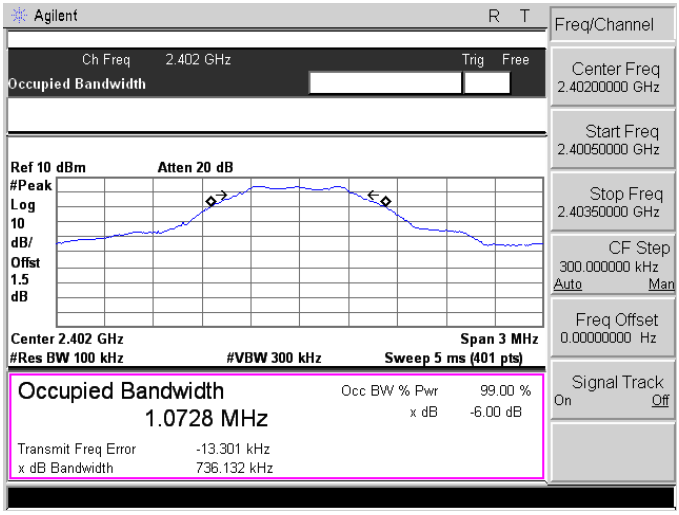
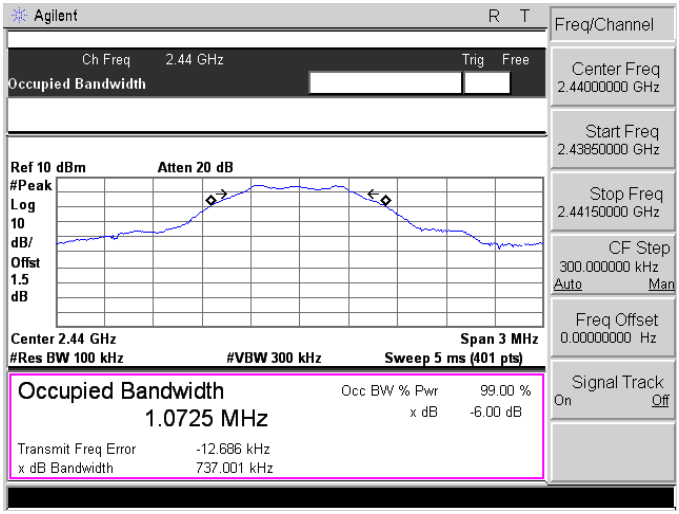
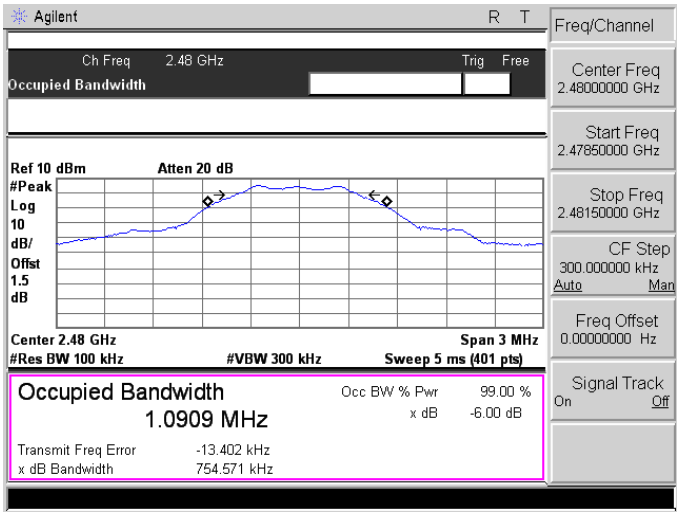
## 7.4. Test Procedure

The EUT tested to DTS test procedure of KDB558074D01 for compliance to FCC 47CFR 15.247 requirements.
6dB RF Bandwidth: The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A peak output reading was taken, a DISPLAY line was drawn 6 dB lower than peak level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.
The test was performed at 3 channels (Channel low, middle, high)

## 7.5. Test Result

| Model Number | Super GPS | | |
|---|---|---|---|
| Test Item | 6dB RF Bandwidth & 99 % Occupied Bandwidth | | |
| Test Mode | Mode 2: Bluetooth v4.0 LE Link Mode | | |
| Date of Test | 04/09/2015 | Test Site | TE05 |
| Frequency (MHz) | 6dB Bandwidth (MHz) | 6dB RF Bandwidth Limit (MHz) | |
| 2402 | 0.736 | > 0.500 | |
| 2440 | 0.737 | > 0.500 | |
| 2480 | 0.755 | > 0.500 | |

## 7.6. Test Graphs

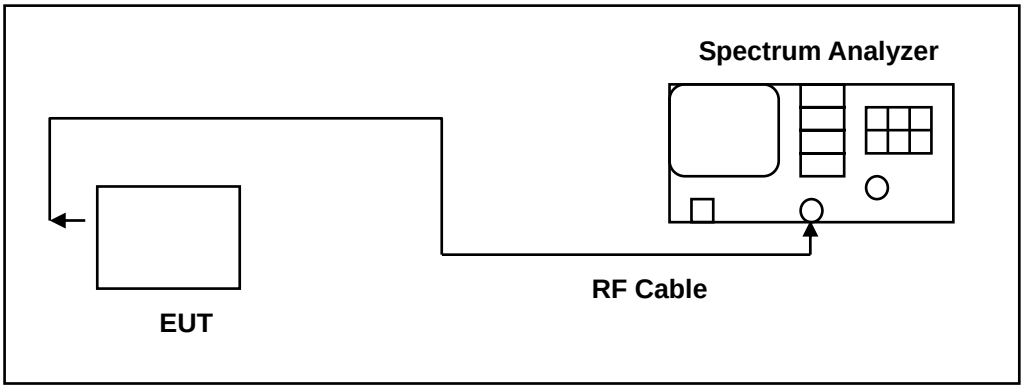
| Mode 2: Bluetooth v4.0 LE Link Mode | |
|---|---|
| 2402 |  |
| 2440 |  |
| 2480 |  |

# 8 Maximum Power Density Measurement

## 8.1. Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

## 8.2. Test Setup




## 8.3. Test Instruments

| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4445A | MY45300744 | 12/16/2014 | (1) |
| Microwave Cable | EMCI | EMC104-SM-SM-1500 | 140303 | 02/24/2015 | (1) |
| Test Site | ATL | TE05 | TE05 | N.C.R. | ----- |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.
Note: N.C.R. = No Calibration Request.

## 8.4. Test Procedure

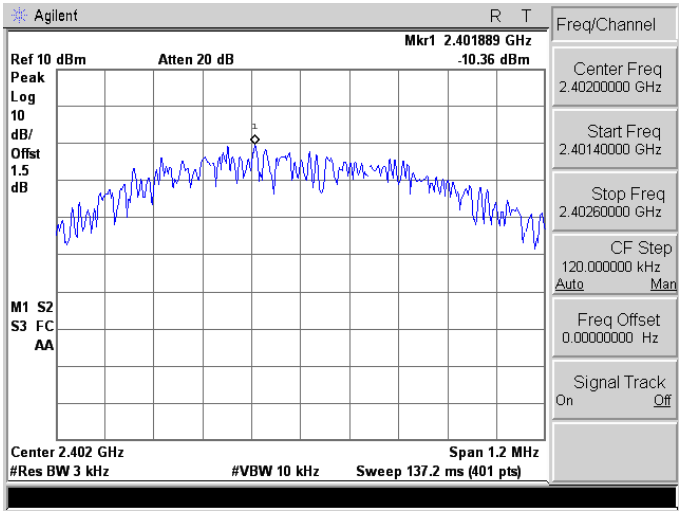
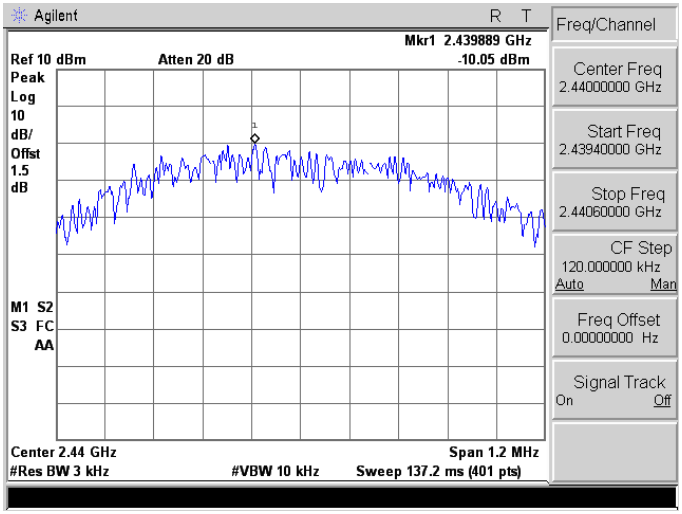
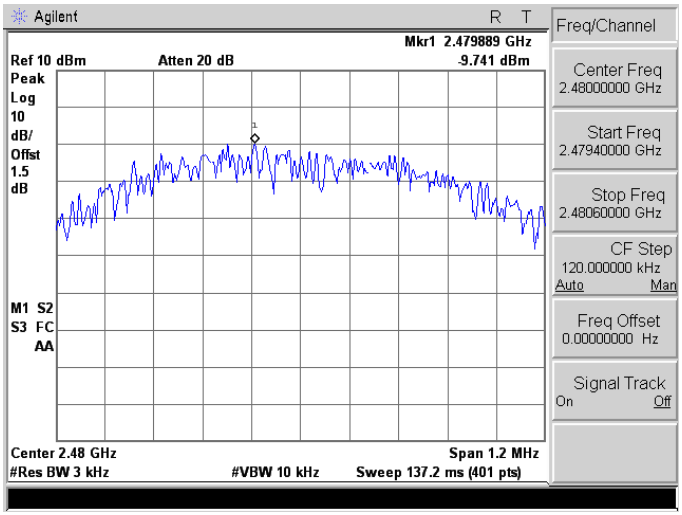
The EUT tested to DTS test procedure of KDB558074D01 for compliance to FCC 47CFR 15.247 requirements.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 × RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

## 8.5. Test Result

| | | | |
|---|---|---|---|
| Model Number | Super GPS | | |
| Test Item | Maximum Power Density | | |
| Test Mode | Mode 2: Bluetooth v4.0 LE Link Mode | | |
| Date of Test | 04/09/2015 | Test Site | TE05 |
| Frequency (MHz) | Reading (dBm/3KHz) | | Limit (dBm) |
| 2402 | -10.360 | | < 8 |
| 2440 | -10.050 | | < 8 |
| 2480 | -9.741 | | < 8 |

## 8.6. Test Graphs

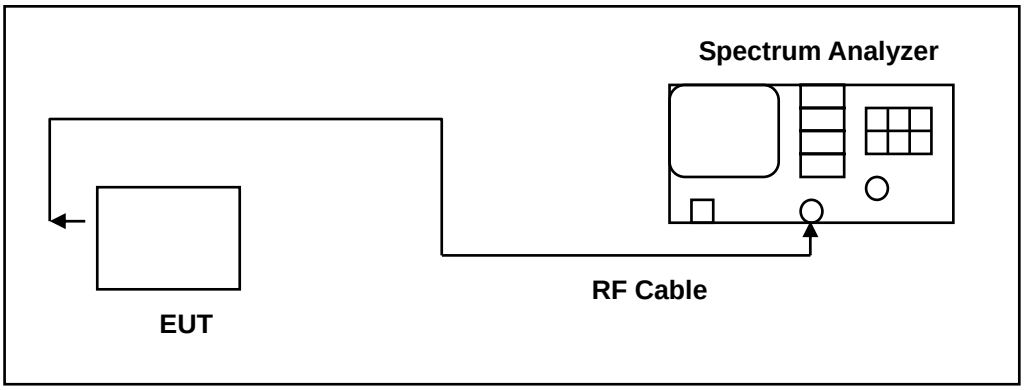
| Mode 2: Bluetooth v4.0 LE Link Mode | |
|---|---|
| 2402 |  |
| 2440 |  |
| 2480 |  |

# 9 Out of Band Conducted Emissions Measurement

## 9.1. Limit

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

## 9.2. Test Setup




## 9.3. Test Instruments

| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4445A | MY45300744 | 12/16/2014 | (1) |
| Spectrum Analyzer | Agilent | E4408B | MY45107753 | 07/24/2014 | (1) |
| Microwave Cable | EMCI | EMC104-SM-SM-1500 | 140303 | 02/24/2015 | (1) |
| Test Site | ATL | TE05 | TE05 | N.C.R. | ----- |

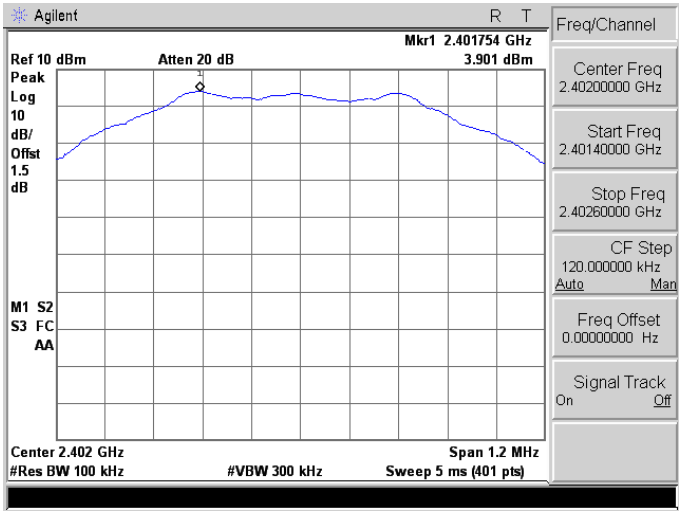
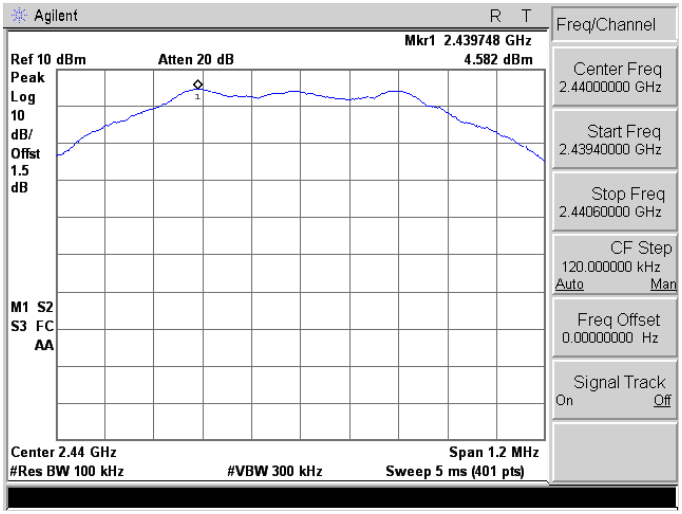
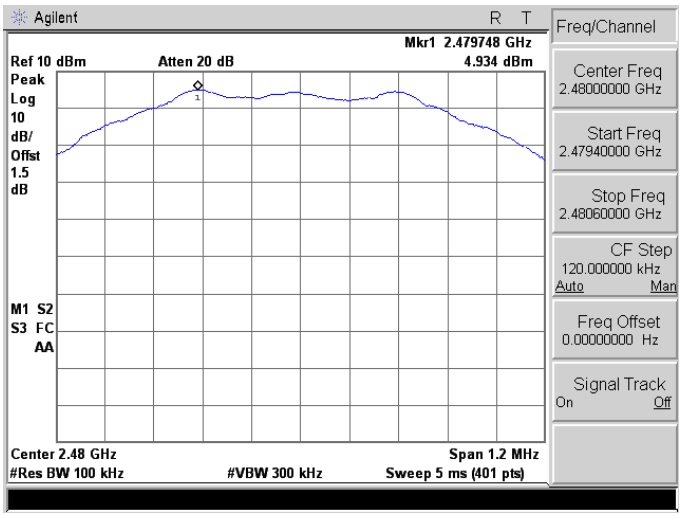
Remark: (1) Calibration period 1 year.
Note: N.C.R. = No Calibration Request.

## 9.4. Test Procedure

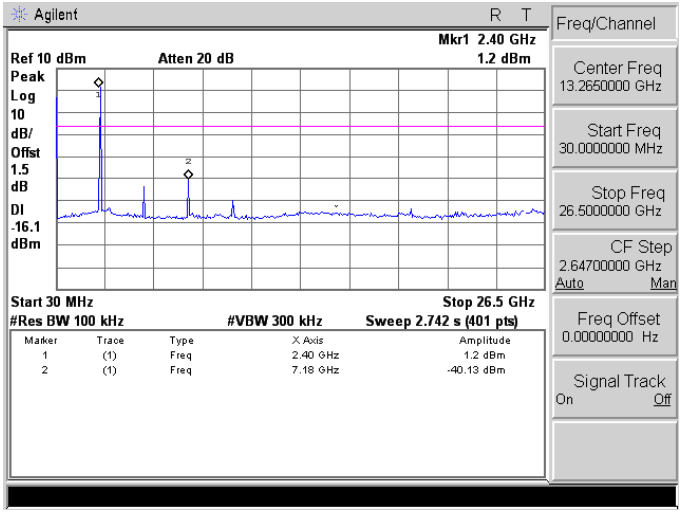
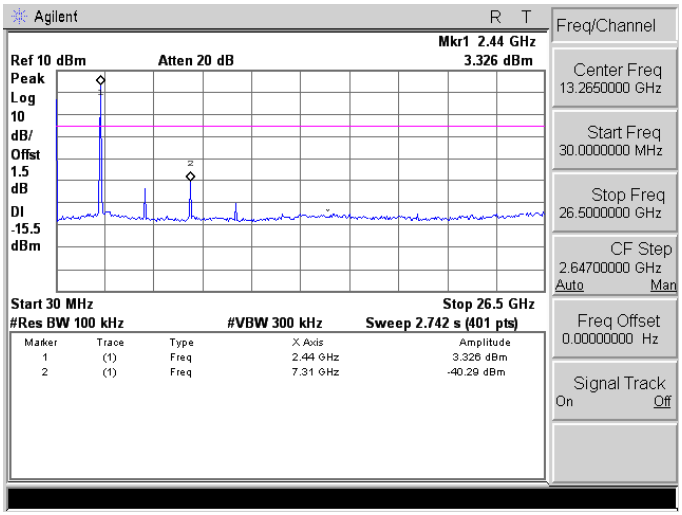
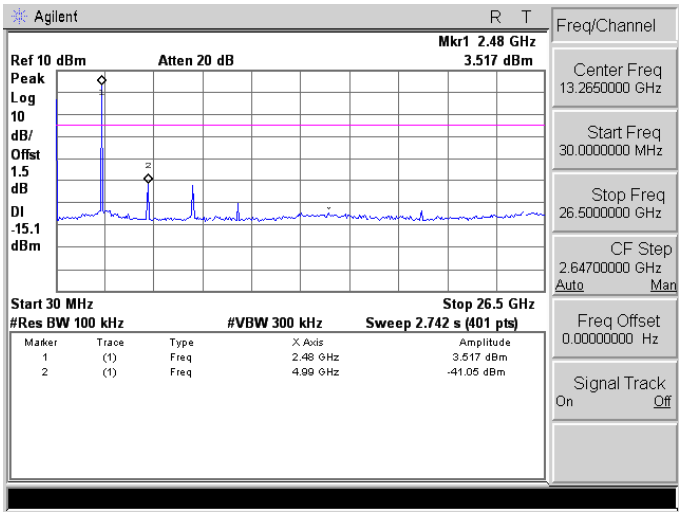
In any 100 kHz bandwidth outside the EUT pass band, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.
All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the pass band.
The test was performed at 3 channels.

## 9.5. Test Graphs

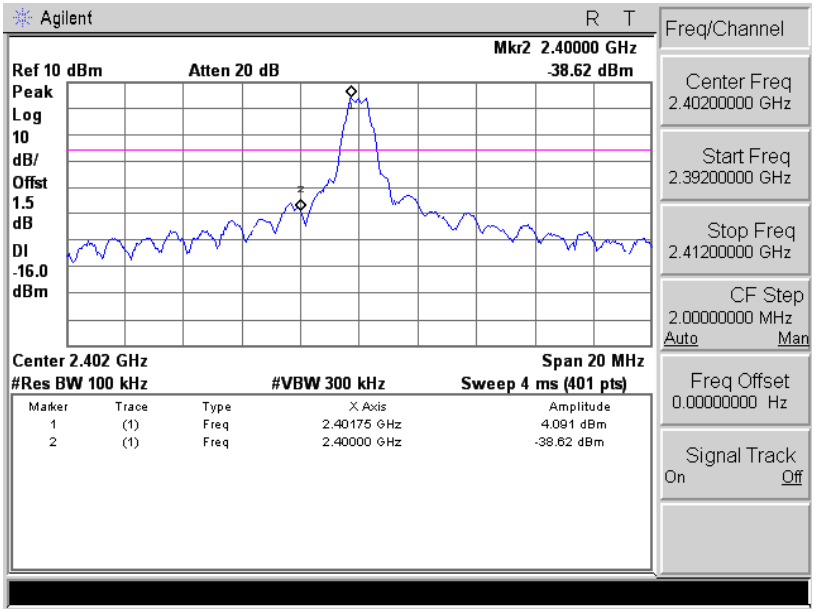
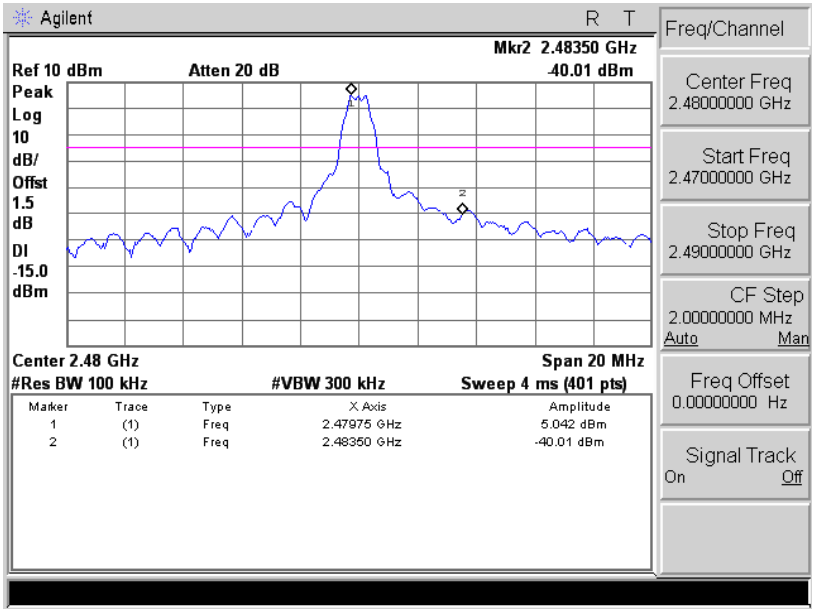
### Reference level

| Mode 2: Bluetooth v4.0 LE Link Mode | |
|---|---|
| 2402 |  |
| 2440 |  |
| 2480 |  |

### Out of Band Conducted Emissions

| Mode 2: Bluetooth v4.0 LE Link Mode | |
|---|---|
| 2402 |  |
| 2440 |  |
| 2480 |  |

**Conducted Band Edge**

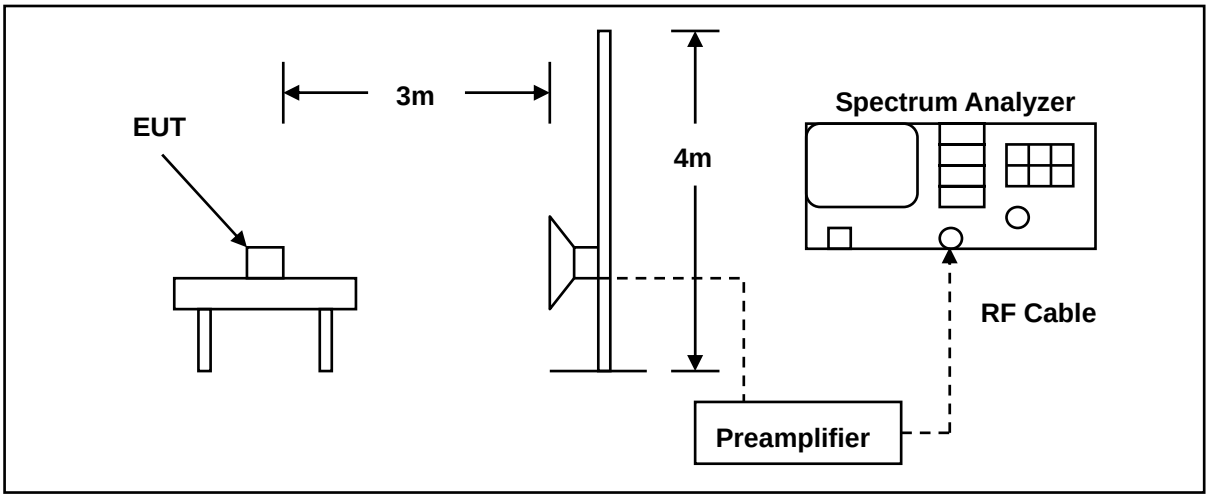
| Mode 2: Bluetooth v4.0 LE Link Mode | |
|---|---|
| 2402 |  |
| 2480 |  |

# 10 Band Edges Measurement

## 10.1.Limit

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

## 10.2.Test Setup




## 10.3.Test Instruments

| 3 Meter Chamber | | | | | |
|---|---|---|---|---|---|
| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
| RF Pre-selector | Agilent | N9039A | MY46520256 | 01/06/2015 | (1) |
| Spectrum Analyzer | Agilent | E4446A | MY46180578 | 01/06/2015 | (1) |
| Pre Amplifier | Agilent | 8449B | 3008A02237 | 02/24/2015 | (1) |
| Pre Amplifier | Agilent | 8447D | 2944A10961 | 02/24/2015 | (1) |
| Horn Antenna (1~18GHz) | SCHWARZBECK MESS-ELEKTRONIK | BBHA9120D | 9120D-550 | 06/11/2014 | (1) |
| Microwave Cable | EMCI | EMC-104-SM-SM-14000 | 140202 | 02/24/2015 | (1) |
| Microwave Cable | EMCI | EMC104-SM-SM-600 | 140301 | 02/24/2015 | (1) |
| Test Site | ATL | TE01 | 888001 | 08/28/2014 | (1) |

Remark: (1) Calibration period 1 year.

Note: N.C.R. = No Calibration Request.

## 10.4. Test Procedure

The EUT tested to DTS test procedure of KDB558074D01 for compliance to FCC 47CFR 15.247 requirements.

The emissions on the harmonics frequencies, the limits, and the margin of compliance are presented. These tests were made when the transmitter was in full radiated power. The additional test was performed to show compliance with the requirement at the band-edge frequency 2483.5 MHz and up to 2500 MHz and at 2390.0 MHz.

The transmitter was configured with the worst case antenna and setup to transmit at the highest channel. Then the field strength was measured at 2483.5 MHz.

The transmitter was then configured with the worst case antenna and setup to transmit at the lowest channel. Then the field strength was measured at 2390.0 MHz. These tests were performed at 4 different bit rates.

For measurements the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

## 10.5.Test Result

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15C | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | DC 3.7V |
| Model Number: | Super GPS | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | 2 | Date: | 04/09/2015 |
| Frequency: | 2402 MHz | Test By: | Eric Ou Yang |

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 2355.100 | 39.94 | -0.62 | 39.32 | 74.00 | -34.68 | peak | H |
| 2390.000 | 37.21 | -0.46 | 36.75 | 74.00 | -37.25 | peak | H |
| 2376.440 | 39.38 | -0.53 | 38.85 | 74.00 | -35.15 | peak | V |
| 2390.000 | 37.61 | -0.46 | 37.15 | 74.00 | -36.85 | peak | V |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15C | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | DC 3.7V |
| Model Number: | Super GPS | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | 2 | Date: | 04/09/2015 |
| Frequency: | 2480 MHz | Test By: | Eric Ou Yang |

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 2483.500 | 39.36 | -0.06 | 39.30 | 74.00 | -34.70 | peak | H |
| 2483.660 | 43.68 | -0.06 | 43.62 | 74.00 | -30.38 | peak | H |
| 2483.500 | 38.99 | -0.06 | 38.93 | 74.00 | -35.07 | peak | V |
| 2484.160 | 41.55 | -0.06 | 41.49 | 74.00 | -32.51 | peak | V |

# 11 Antenna Measurement

## 11.1. Limit

For intentional device, according to 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And According to 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

## 11.2. Antenna Connector Construction

The antenna used in this product is Internal Antenna. And the maximum Gain of this antenna is -2.41 dBi.