# RADIO TEST REPORT
## FCC 47 CFR PART 15 SUBPART C

| | |
|---|---|
| **Test Standard** | **FCC Part 15.247** |
| **FCC ID** | **2AMKV-AP6212A-ZA** |
| **Product name** | **Portable DVR** |
| **Brand Name** | **N/A** |
| **Model** | **PV-50HD2 Deluxe** |
| **Test Result** | **Pass** |

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.
The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc.(Wugu Laboratory)

The sample selected for test was production product and was provided by manufacturer.

*Approved by:*

Sam Chuang
Manager

*Tested by:*

Ed Chiang
Engineer


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| 00 | April 6, 2017 | Initial Issue | Doris Chu |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# Table of contents

1. GENERAL INFORMATION....4
1.1 EUT INFORMATION....4
1.2 EUT CHANNEL INFORMATION....5
1.3 ANTENNA INFORMATION....5
1.4 MEASUREMENT UNCERTAINTY....6
1.5 FACILITIES AND TEST LOCATION....7
1.6 INSTRUMENT CALIBRATION....7
1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT....8
2. TEST SUMMERY....9
3. DESCRIPTION OF TEST MODES....10
3.1 THE WORST MODE OF OPERATING CONDITION....10
3.2 THE WORST MODE OF MEASUREMENT....11
3.3 EUT DUTY CYCLE....12
4. TEST RESULT....13
4.1 AC POWER LINE CONDUCTED EMISSION....13
4.2 6DB BANDWIDTH AND OCCUPIED BANDWIDTH(99%)....16
4.3 OUTPUT POWER MEASUREMENT....18
4.4 POWER SPECTRAL DENSITY....20
4.5 CONDUCTED BAND EDGE AND SPURIOUS EMISSION....22
4.6 RADIATION BANDEDGE AND SPURIOUS EMISSION....26
APPENDIX 1 - PHOTOGRAPHS OF EUT


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# 1. GENERAL INFORMATION

## 1.1 EUT INFORMATION

| | |
|---|---|
| Applicant | Appro Photoelectron Inc.<br>6F, No.23, Syuan Rd, Shinjuang District, New Taipei City, Taiwan |
| Manufacturer | Appro Photoelectron Inc.<br>6F, No.23, Syuan Rd, Shinjuang District, New Taipei City, Taiwan |
| Equipment | Portable DVR |
| Model No. | PV-50HD2 Deluxe |
| Model Discrepancy | N/A |
| Trade Name | N/A |
| Received Date | November 24, 2016 |
| Date of Test | March 9 ~ 28, 2017 |
| Output Power (W) | BLE : 0.0090 |
| Power Operation | 1. Powered from Battery<br>NEO-Power/ BA-1400<br>Rating: 3.7V<br>2. Powered from host device via USB Cable |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

## 1.2 EUT CHANNEL INFORMATION

| | |
|---|---|
| Frequency Range | 2402MHz-2480MHz |
| Modulation Type | GFSK for BLE-1Mbps |
| Number of channel | 40 Channels |

**Remark:**
Refer as ANSI 63.10:2013 clause 5.6.1 Table 4 and RSS-GEN Table A1 for test channels

Number of frequencies to be tested

| Frequency range in which device operates | Number of frequencies | Location in frequency range of operation |
|---|---|---|
| ☐ 1 MHz or less | 1 | Middle |
| ☐ 1 MHz to 10 MHz | 2 | 1 near top and 1 near bottom |
| ☒ More than 10 MHz | 3 | 1 near top, 1 near middle, and 1 near bottom |

## 1.3 ANTENNA INFORMATION

| | |
|---|---|
| **Antenna Category** | ☒ Integral: antenna permanently attached<br>☐ External dedicated antennas<br>☐ External Unique antenna connector |
| **Antenna Type** | ☐ PIFA<br>☒ PCB<br>☐ Dipole<br>☐ Coils |
| **Antenna Gain** | 4.2 dBi |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# 1.4 MEASUREMENT UNCERTAINTY

| PARAMETER | UNCERTAINTY |
|---|---|
| AC Powerline Conducted Emission | +/- 1.2575 |
| Emission bandwidth, 20dB bandwidth | +/- 1.4003 |
| RF output power, conducted | +/- 1.1372 |
| Power density, conducted | +/- 1.4003 |
| 3M Semi Anechoic Chamber / 30M~200M | +/- 4.0138 |
| 3M Semi Anechoic Chamber / 200M~1000M | +/- 3.9483 |
| 3M Semi Anechoic Chamber / 1G~8G | +/- 2.5975 |
| 3M Semi Anechoic Chamber / 8G~18G | +/- 2.6112 |
| 3M Semi Anechoic Chamber / 18G~26G | +/- 2.7389 |
| 3M Semi Anechoic Chamber / 26G~40G | +/- 2.9683 |
| 3M Semi Anechoic Chamber / 40G~60G | +/- 1.8509 |
| 3M Semi Anechoic Chamber / 60G~75G | +/- 1.9869 |
| 3M Semi Anechoic Chamber / 75G~110G | +/- 2.9651 |
| 3M Semi Anechoic Chamber / 110G~170G | +/- 2.7807 |
| 3M Semi Anechoic Chamber / 170G~220G | +/- 3.6437 |
| 3M Semi Anechoic Chamber / 220G~325G | +/- 4.2982 |

***Remark**:*
*1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2*
*2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.*


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# 1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at *No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)*

| Test site | Test Engineer | Remark |
|---|---|---|
| AC Conduction Room | Eric Lee | - |
| Radiation | Ed Chiang | - |
| RF Conducted | Eric Lee | - |

***Remark:*** *The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.*

# 1.6 INSTRUMENT CALIBRATION

| RF Conducted Test Site | | | | | |
|---|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Date** | **Calibration Due** |
| Power Meter | Anritsu | ML2495A | 1012009 | 07/04/2016 | 07/03/2017 |
| Power Sensor | Anritsu | MA2411B | 917072 | 07/04/2016 | 07/03/2017 |
| Spectrum Analyzer | R&S | FSV 40 | 101073 | 10/05/2016 | 10/04/2017 |

| Wugu 966 Chamber A | | | | | |
|---|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Date** | **Calibration Due** |
| Bilog Antenna | Sunol Sciences | JB3 | A030105 | 07/03/2016 | 07/02/2017 |
| Horn Antenna | EMCO | 3117 | 00055165 | 02/20/2017 | 02/19/2018 |
| Pre-Amplifier | EMCI | EMC 012635 | 980151 | 06/23/2016 | 06/22/2017 |
| Pre-Amplifier | EMEC | EM330 | 060609 | 06/08/2016 | 06/07/2017 |
| Spectrum Analyzer | Agilent | E4446A | US42510252 | 12/05/2016 | 12/04/2017 |
| Antenna Tower | CCS | CC-A-1F | N/A | N.C.R | N.C.R |
| Controller | CCS | CC-C-1F | N/A | N.C.R | N.C.R |
| Turn Table | CCS | CC-T-1F | N/A | N.C.R | N.C.R |
| Software | EZ-EMC (CCS-3A1RE) | | | | |

| Conducted Emission Room # B | | | | | |
|---|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Date** | **Calibration Due** |
| LISN | R&S | ENV216 | 101054 | 05/11/2016 | 05/10/2017 |
| LISN | SCHWARZBECK | NSLK 8128 | 5012 | 04/15/2016 | 04/14/2017 |
| Receiver | R&S | ESCI | 101073 | 08/20/2016 | 08/19/2017 |

***Remark:*** *Each piece of equipment is scheduled for calibration once a year.*


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# 1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

| EUT Accessories Equipment | | | | | |
|---|---|---|---|---|---|
| **No.** | **Equipment** | **Brand** | **Model** | **Series No.** | **FCC ID** |
| | N/A | | | | |

| Support Equipment | | | | | |
|---|---|---|---|---|---|
| **No.** | **Equipment** | **Brand** | **Model** | **Series No.** | **FCC ID** |
| 1 | Notebook | Acer | Aspire 4320 series | N/A | QDS-BRCM1018 |

# 1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247, KDB 558074 D01 v03r05.

# 1.9 TABLE OF ACCREDITATIONS AND LISTINGS

| Country | Agency | Scope of Accreditation | Logo |
|---|---|---|---|
| USA | FCC | 3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements | FCC MRA: TW1039 |

.


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# 2. TEST SUMMERY

| FCC Standard Section | Report Section | Test Item | Result |
|---|---|---|---|
| 15.203 | 1.2 | Antenna Requirement | Pass |
| 15.207(a) | 4.1 | AC Conducted Emission | Pass |
| 15.247(a)(2) | 4.2 | 6 dB Bandwidth | Pass |
| - | 4.2 | Occupied Bandwidth (99%) | - |
| 15.247(b) | 4.3 | Output Power Measurement | Pass |
| 15.247(e) | 4.4 | Power Spectral Density | Pass |
| 15.247(d) | 4.5 | Conducted Band Edge | Pass |
| 15.247(d) | 4.5 | Conducted Emission | Pass |
| 15.247(d) | 4.6 | Radiation Band Edge | Pass |
| 15.247(d) | 4.6 | Radiation Spurious Emission | Pass |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# 3. DESCRIPTION OF TEST MODES

## 3.1 THE WORST MODE OF OPERATING CONDITION

| | |
|---|---|
| Operation mode | BT4.0 Mode (1Mbps) |
| Test Channel Frequencies | 1.Lowest Channel : 2402MHz<br>2.Middle Channel : 2440MHz<br>3.Highest Channel : 2480MHz |

*Remark:*
*1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.*
.


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

## 3.2 THE WORST MODE OF MEASUREMENT

| AC Power Line Conducted Emission | |
|---|---|
| **Test Condition** | **AC Power line conducted emission for line and neutral** |
| **Voltage/Hz** | **120V/60Hz** |
| **Test Mode** | **Mode 1:EUT power by host system via USB cable.** |
| **Worst Mode** | **☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4** |

| Radiated Emission Measurement Above 1G | |
|---|---|
| **Test Condition** | **Band edge, Emission for Unwanted and Fundamental** |
| **Voltage/Hz** | **120V/60Hz** |
| **Test Mode** | **Mode 1:EUT power by host system via USB cable.** |
| **Worst Mode** | **☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4** |
| **Worst Position** | **☐ Placed in fixed position.**<br>**☐ Placed in fixed position at X-Plane (E2-Plane)**<br>**☒ Placed in fixed position at Y-Plane (E1-Plane)**<br>**☐ Placed in fixed position at Z-Plane (H-Plane)** |
| **Worst Polarity** | **☐ Horizontal ☒ Vertical** |

| Radiated Emission Measurement Below 1G | |
|---|---|
| **Test Condition** | **Radiated Emission Below 1G** |
| **Voltage/Hz** | **120V/60Hz** |
| **Test Mode** | **Mode 1:EUT power by host system via USB cable.** |
| **Worst Mode** | **☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4** |

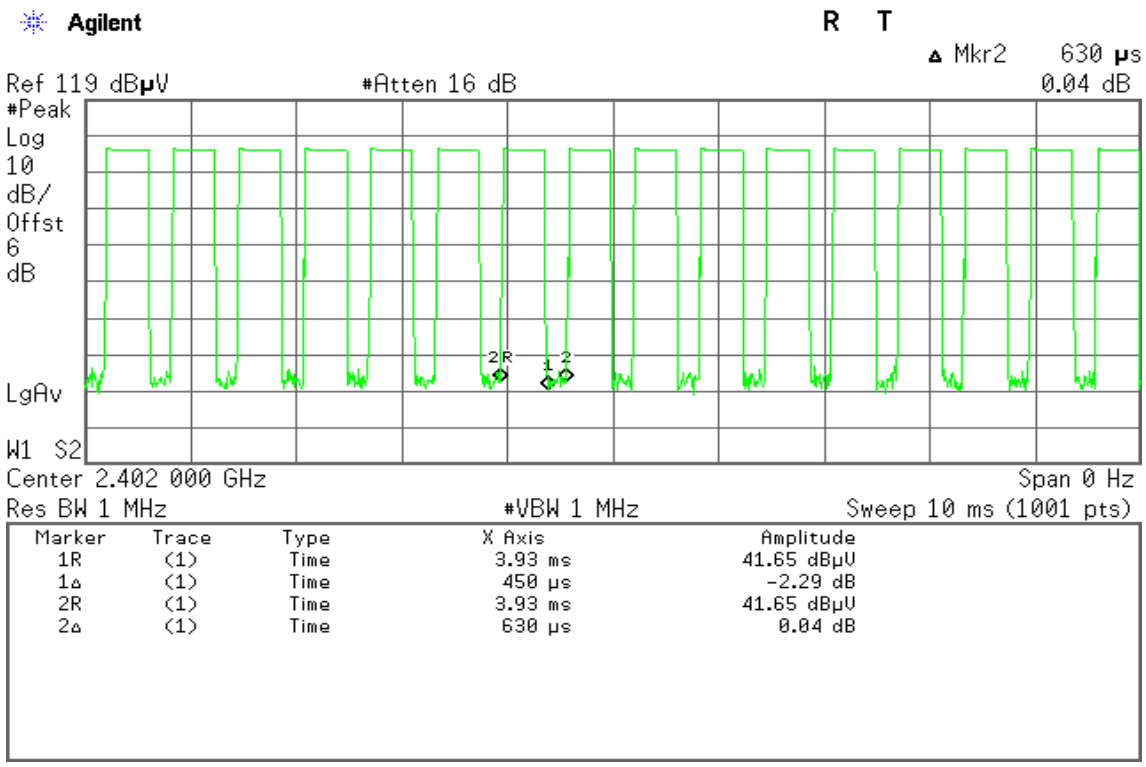
*Remark:*
*1. The worst mode was record in this test report.*
*2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, Horizontal and Vertical for radiated measurement. The worst case(Y-Plane and Vertical) were recorded in this report*
*3. For AC power line conducted emission and below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.*


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# 3.3 EUT DUTY CYCLE

| Duty Cycle | | | | |
|---|---|---|---|---|
| Configuration | TX ON (ms) | TX ALL (ms) | Duty Cycle (%) | Duty Factor(dB) |
| BLE | 0.4500 | 0.6300 | 71.43% | 1.46 |

BLE





*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# 4. TEST RESULT

## 4.1 AC POWER LINE CONDUCTED EMISSION

### 4.1.1 Test Limit

According to §15.207(a)

| Frequency Range (MHz) | Limits(dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56* | 56 to 46* |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

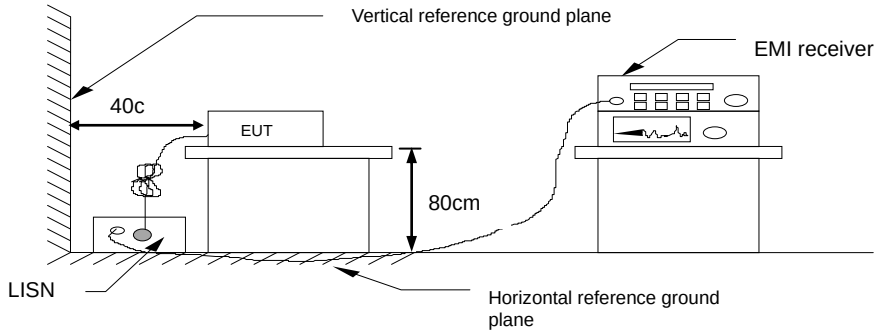
* Decreases with the logarithm of the frequency.

### 4.1.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.2,

1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

### 4.1.3 Test Setup



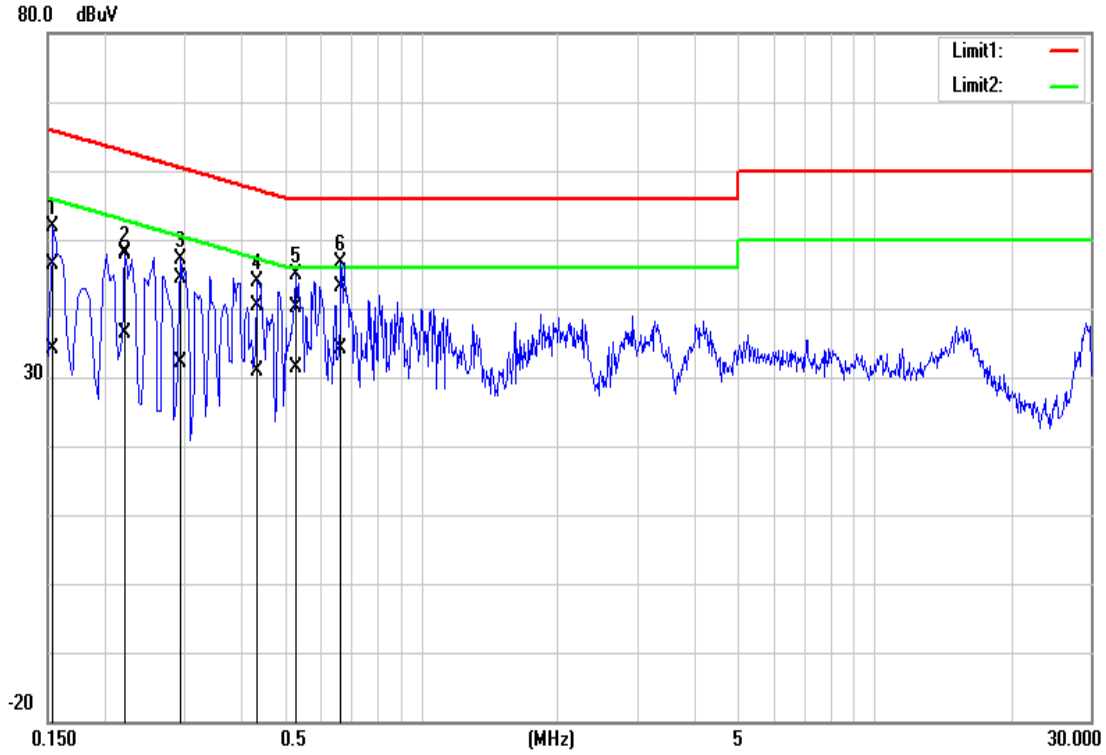

### 4.1.4 Test Result

**Pass**


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

## Test Data

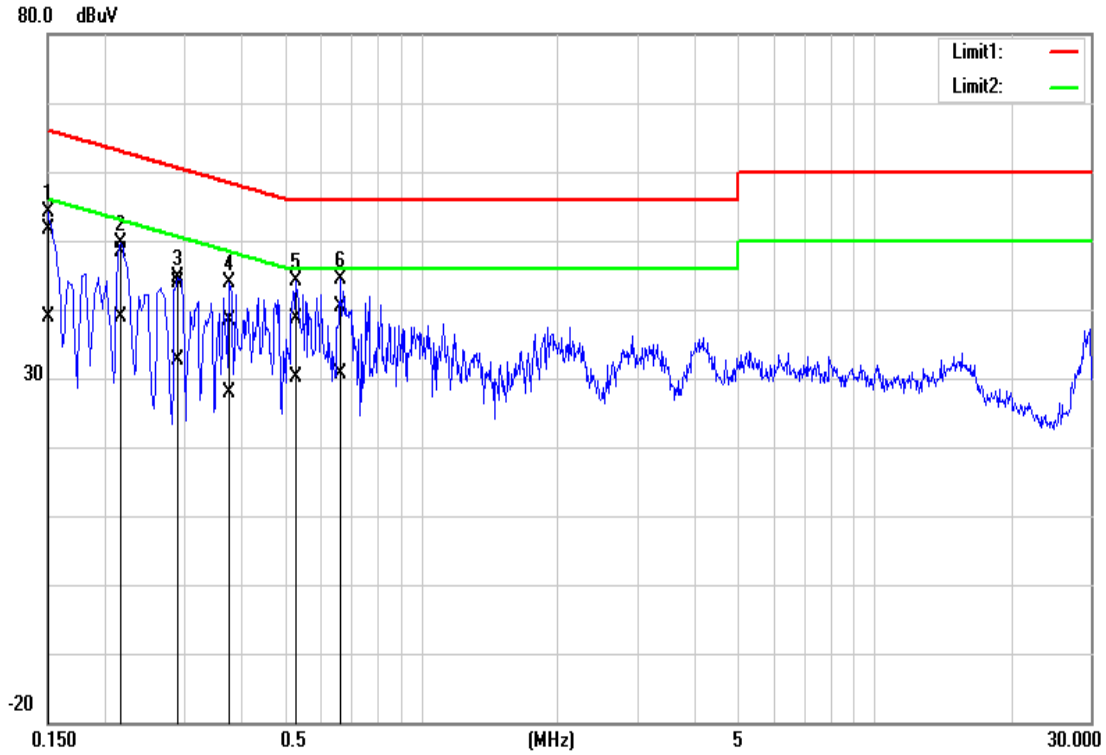
| Test Mode: | Mode 1 | Temp/Hum | 24(℃)/ 50%RH |
|---|---|---|---|
| Test Voltage: | 120Vac / 60Hz | Test Date | March 21, 2017 |
| Phase: | Line | Test Engineer | Eric Lee |




| Frequency | QuasiPeak reading | Average reading | Correction factor | QuasiPeak result | Average result | QuasiPeak limit | Average limit | QuasiPeak margin | Average margin |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dBuV) | (dBuV) | (dB) | (dBuV) | (dBuV) | (dBuV) | (dBuV) | (dB) | (dB) |
| 0.1539 | 36.60 | 24.53 | 9.70 | 46.30 | 34.23 | 65.78 | 55.79 | -19.48 | -21.56 |
| 0.2220 | 38.48 | 26.77 | 9.69 | 48.17 | 36.46 | 62.74 | 52.74 | -14.57 | -16.28 |
| 0.2940 | 34.57 | 22.52 | 9.69 | 44.26 | 32.21 | 60.41 | 50.41 | -16.15 | -18.20 |
| 0.4340 | 30.66 | 21.22 | 9.68 | 40.34 | 30.90 | 57.18 | 47.18 | -16.84 | -16.28 |
| 0.5299 | 30.41 | 21.63 | 9.68 | 40.09 | 31.31 | 56.00 | 46.00 | -15.91 | -14.69 |
| 0.6660 | 33.51 | 24.52 | 9.68 | 43.19 | 34.20 | 56.00 | 46.00 | -12.81 | -11.80 |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

| Test Mode: | Mode 1 | Temp/Hum | 27(℃)/ 53%RH |
|---|---|---|---|
| Test Voltage: | 120Vac / 60Hz | Test Date | March 21, 2017 |
| Phase: | Neutral | Test Engineer | Eric Lee |




| Frequency | QuasiPeak reading | Average reading | Correction factor | QuasiPeak result | Average result | QuasiPeak limit | Average limit | QuasiPeak margin | Average margin |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dBuV) | (dBuV) | (dB) | (dBuV) | (dBuV) | (dBuV) | (dBuV) | (dB) | (dB) |
| 0.1500 | 41.86 | 29.06 | 9.71 | 51.57 | 38.77 | 65.99 | 56.00 | -14.42 | -17.23 |
| 0.2180 | 38.80 | 29.09 | 9.70 | 48.50 | 38.79 | 62.89 | 52.89 | -14.39 | -14.10 |
| 0.2900 | 34.24 | 22.97 | 9.70 | 43.94 | 32.67 | 60.52 | 50.52 | -16.58 | -17.85 |
| 0.3780 | 28.64 | 18.21 | 9.69 | 38.33 | 27.90 | 58.32 | 48.32 | -19.99 | -20.42 |
| 0.5299 | 28.89 | 20.45 | 9.69 | 38.58 | 30.14 | 56.00 | 46.00 | -17.42 | -15.86 |
| 0.6620 | 30.62 | 20.96 | 9.69 | 40.31 | 30.65 | 56.00 | 46.00 | -15.69 | -15.35 |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# 4.2 6DB BANDWIDTH AND OCCUPIED BANDWIDTH(99%)

## 4.2.1 Test Limit

According to §15.247(a)(2)

**6 dB Bandwidth** ：

| | |
|---|---|
| Limit | Shall be at least 500kHz |

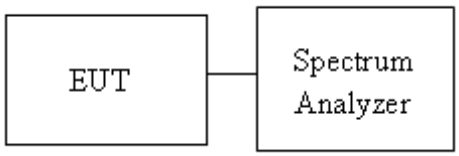
**Occupied Bandwidth(99%)** ： For reporting purposes only.

## 4.2.2 Test Procedure

Test method Refer as KDB 558074 D01 v03r05, section 8.1 and ANSI 63.10:2013 clause 11.8.1.

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 100kHz, VBW = 300kHz and Detector = Peak, to measurement 6 dB Bandwidth and 99% Bandwidth.
4. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth in the test report.

## 4.2.3 Test Setup

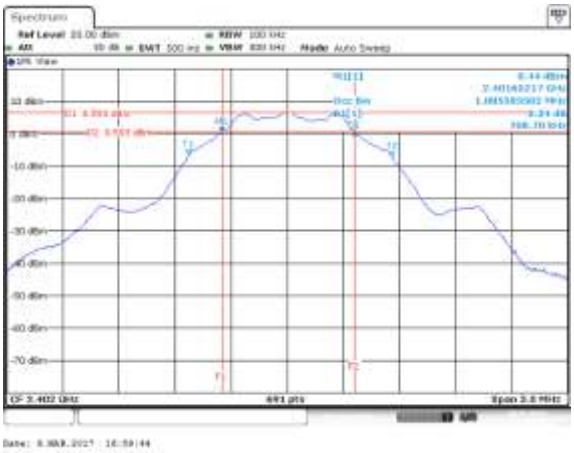
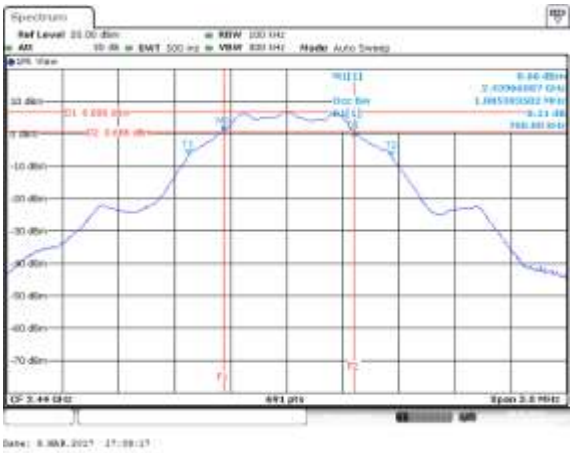



## 4.2.4 Test Result

| Test mode: BLE mode / 2402-2480 MHz | | | | |
|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **OBW(99%) (MHz)** | **6dB BW (MHz)** | **6dB limit (kHz)** |
| Low | 2402 | 1.0853 | 0.7087 | >500 |
| Mid | 2440 | 1.0853 | 0.7000 | |
| High | 2480 | 1.0853 | 0.6956 | |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

## Test Data

| BLE mode | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | |
| | |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# 4.3 OUTPUT POWER MEASUREMENT

## 4.3.1 Test Limit

According to §15.247(b)

**Peak output power**：

For systems using digital modulation in the 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt(30 dBm), base on the use of antennas with directional gain not exceed 6 dBi If transmitting antennas of directional gain greater than 6dBi are used the peak output power the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

| | |
|---|---|
| Limit | ☒ Antenna not exceed 6 dBi：30dBm<br>☐ Antenna with DG greater than 6 dBi<br>[ Limit = 30 – (DG – 6) ]<br>☐ Point-to-point operation |

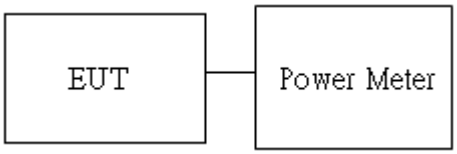
**Average output power**：For reporting purposes only.

## 4.3.2 Test Procedure

Test method Refer as KDB 558074 D01 v03r05, section 9.1.2.

1. The EUT RF output connected to the power meter by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Peak output power and Average output power in the test report.

## 4.3.3 Test Setup





*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

## 4.3.4 Test Result

**Peak output power**：

| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) | Limit (W) | Test Result |
|---|---|---|---|---|---|
| Low | 2402 | ***9.52** | 0.0090 | 1 | PASS |
| Mid | 2440 | 9.01 | 0.0080 | | PASS |
| High | 2480 | 8.42 | 0.0070 | | PASS |

**Average output power**：

| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) |
|---|---|---|---|
| Low | 2402 | 8.70 | 0.0074 |
| Mid | 2440 | 8.24 | 0.0067 |
| High | 2480 | 7.53 | 0.0057 |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# 4.4 POWER SPECTRAL DENSITY

## 4.4.1 Test Limit

According to §15.247(e)

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.

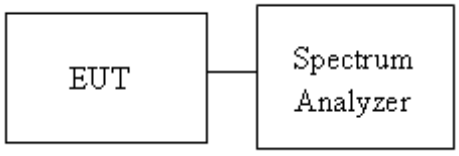
| | |
|---|---|
| Limit | ☒ Antenna not exceed 6 dBi：8dBm<br>☐ Antenna with DG greater than 6 dBi<br>[ Limit = 8 – (DG – 6) ]<br>☐ Point-to-point operation： |

## 4.4.2 Test Procedure

Test method Refer as KDB 558074 D01 v03r05, Section 10.2

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 3kHz, VBW = 30kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = Peak, Sweep Time = Auto and Trace = Max hold.
4. The path loss and Duty Factor were compensated to the results for each measurement by SA.
5. Mark the maximum level.
6. Measure and record the result of power spectral density. in the test report.

## 4.4.3 Test Setup

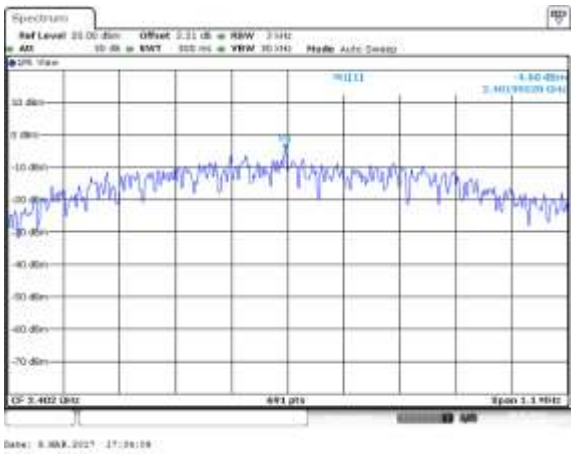
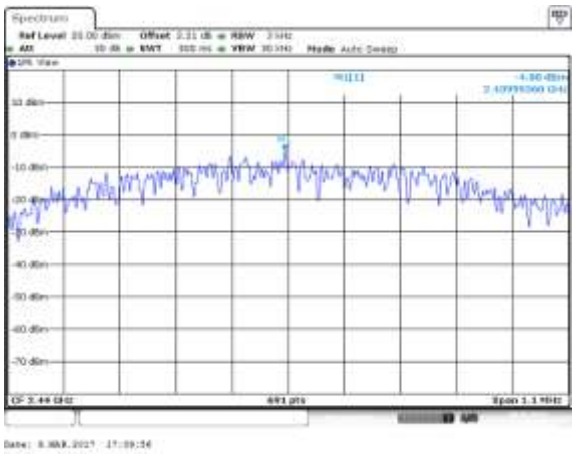
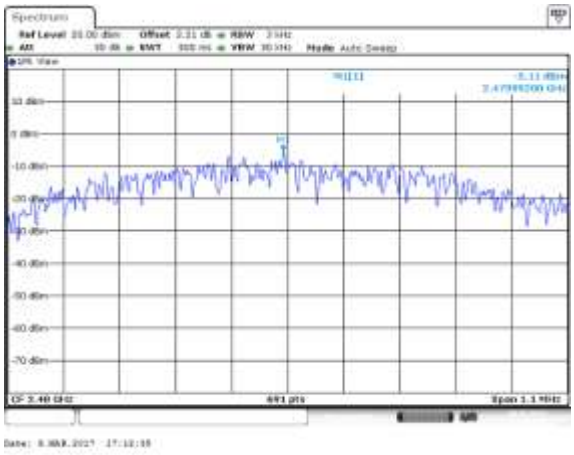



## 4.4.4 Test Result

| Test mode: BLE mode / 2402-2480 MHz | | | |
|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **PSD (dBm)** | **FCC limit (dBm)** |
| Low | 2402 | -4.60 | 8 |
| Mid | 2440 | -4.80 | |
| High | 2480 | -5.11 | |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# Test Data

| BLE mode | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | |
|  | |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# 4.5 CONDUCTED BAND EDGE AND SPURIOUS EMISSION

## 4.5.1 Test Limit

According to §15.247(d)

In any 100 kHz bandwidth outside the authorized frequency band,

Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

## 4.5.2 Test Procedure

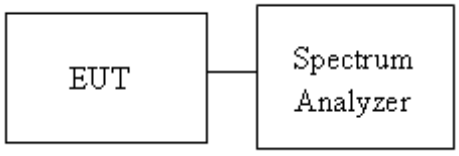
Test method Refer as KDB 558074 D01 v03r05, Section 11.

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.

2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.

3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. 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.

## 4.5.3 Test Setup

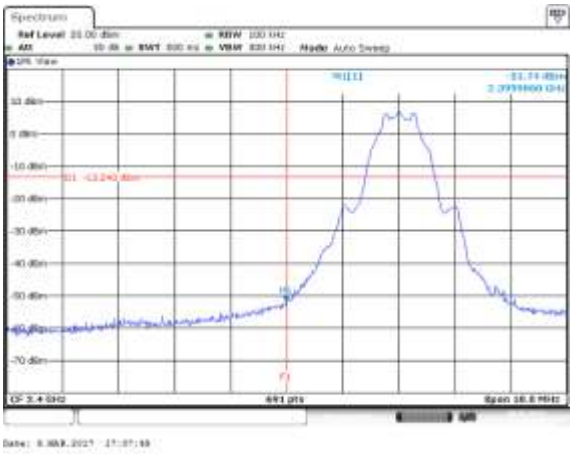
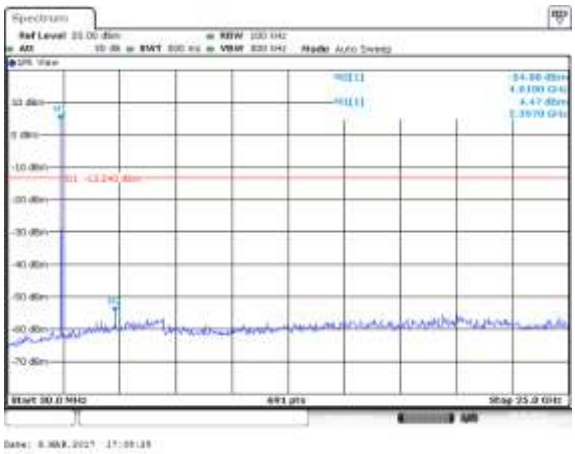




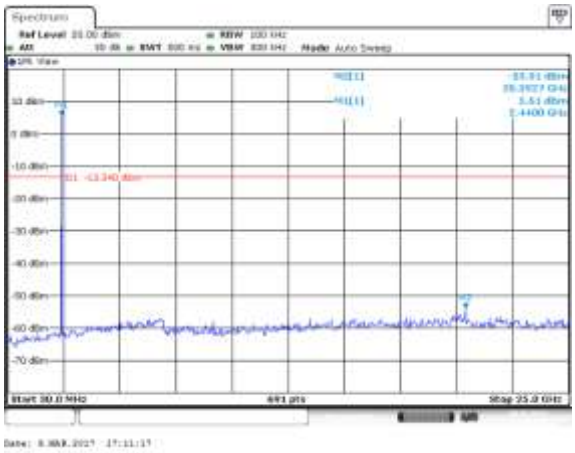
*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

## 4.5.4 Test Result

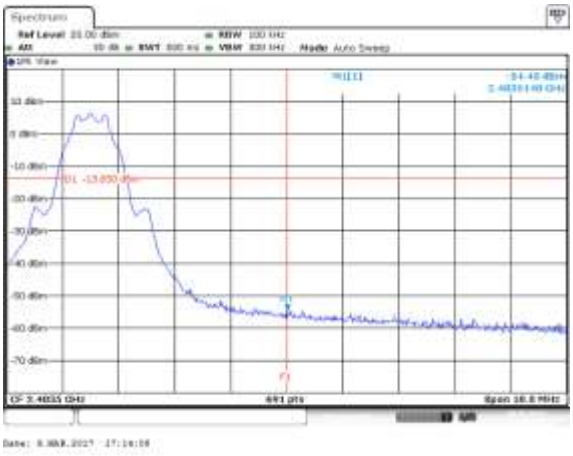
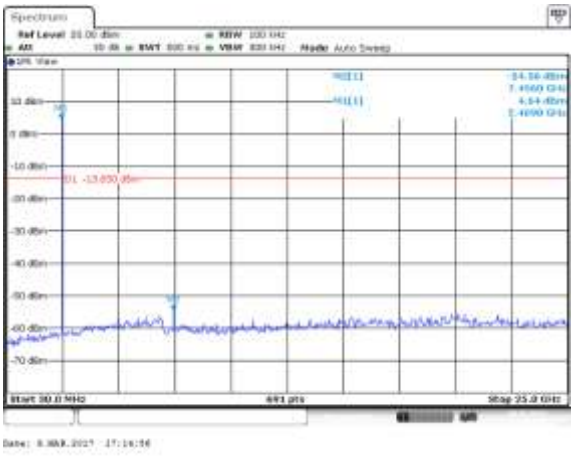
## Test Data

| BLE mode Low CH | |
|---|---|
| **Reference Level of PSD in 100kHz** | **Band Edge** |
| |  |
| **Spurious Emission 30MHz-25GHz** | |
|  | |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

| BLE mode Mid CH | |
|---|---|
| **Reference Level of PSD in 100kHz** | **Spurious Emission 30MHz-25GHz** |
| |  |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

| BLE mode High CH | |
|---|---|
| **Reference Level of PSD in 100kHz** | **Band Edge** |
| |  |
| **Spurious Emission 30MHz-25GHz** | |
|  | |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

# 4.6 RADIATION BANDEDGE AND SPURIOUS EMISSION

## 4.6.1 Test Limit

FCC according to §15.247(d), §15.209 and §15.205,

In any 100 kHz bandwidth outside the authorized frequency band, all harmonic and spurious must be least 20 dB below the highest emission level with the authorized frequency band. Radiation emission which fall in the restricted bands must also follow the FCC section 15.209 as below limit in table.

**Below 30 MHz**

| Frequency | Field Strength (microvolts/m) | Magnetic H-Field (microamperes/m) | Measurement Distance (metres) |
|---|---|---|---|
| 9-490 kHz | 2,400/F (F in kHz) | 2,400/F (F in kHz) | 300 |
| 490-1,705 kHz | 24,000/F (F in kHz) | 24,000/F (F in kHz) | 30 |
| 1.705-30 MHz | 30 | N/A | 30 |

**Above 30 MHz**

| Frequency (MHz) | Field Strength microvolts/m at 3 metres (watts, e.i.r.p.) | |
|---|---|---|
| | Transmitters | Receivers |
| 30-88 | 100 (3 nW) | 100 (3 nW) |
| 88-216 | 150 (6.8 nW) | 150 (6.8 nW) |
| 216-960 | 200 (12 nW) | 200 (12 nW) |
| Above 960 | 500 (75 nW) | 500 (75 nW) |

Remark:
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

### 4.6.2 Test Procedure

Test method Refer as KDB 558074 D01 v03r05, Section 12.1.

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10, and the EUT set in a continuous mode.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.

3. Span shall wide enough to full capture the emission measured. The SA from 30MHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.

4. The SA setting following：

(1) Below 1G：RBW = 100kHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2) Above 1G：

(2.1) For Peak measurement：RBW = 1MHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2.2) For Average measurement：RBW = 1MHz, VBW

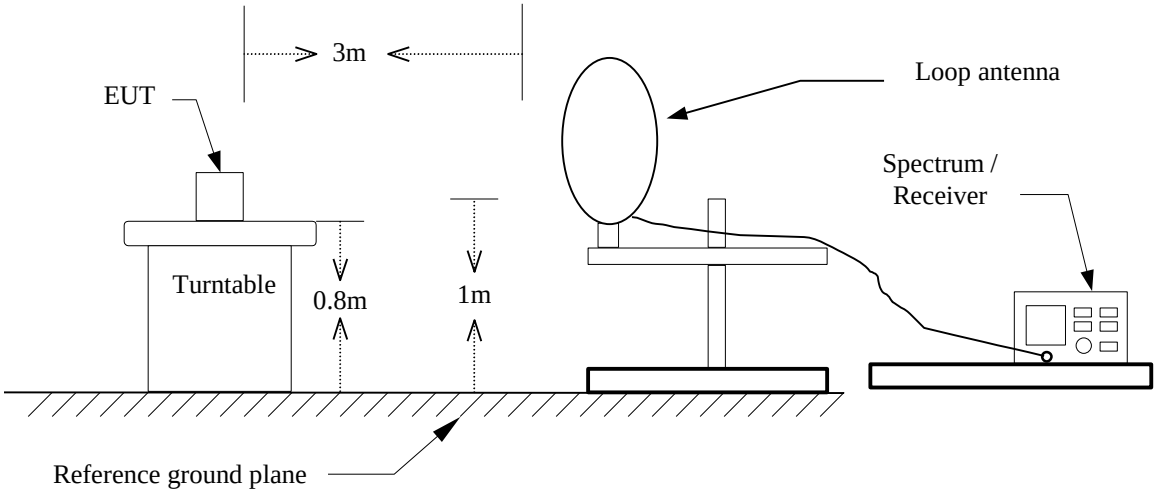
- If Duty Cycle ≥ 98%, VBW=10Hz.
- If Duty Cycle < 98%, VBW≥1/T.

| Configuration | Duty Cycle (%) | T(ms) | 1/T (kHz) | VBW Setting |
|---|---|---|---|---|
| BLE | 71.43% | 0.4500 | 2.222 | 2.4KHz |

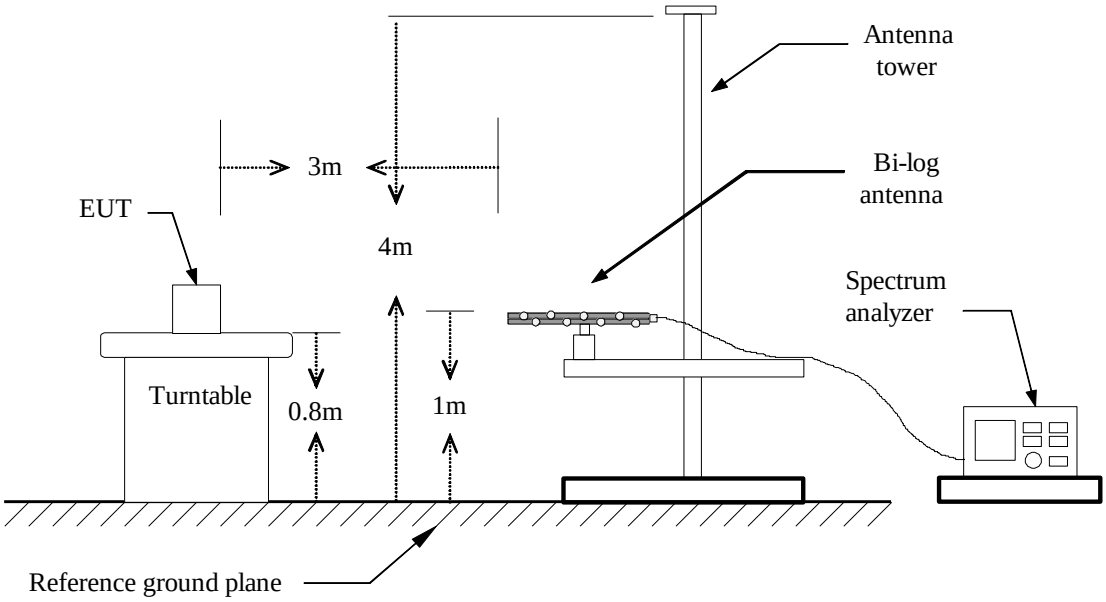

*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

## 4.6.3 Test Setup

**9kHz ~ 30MHz**



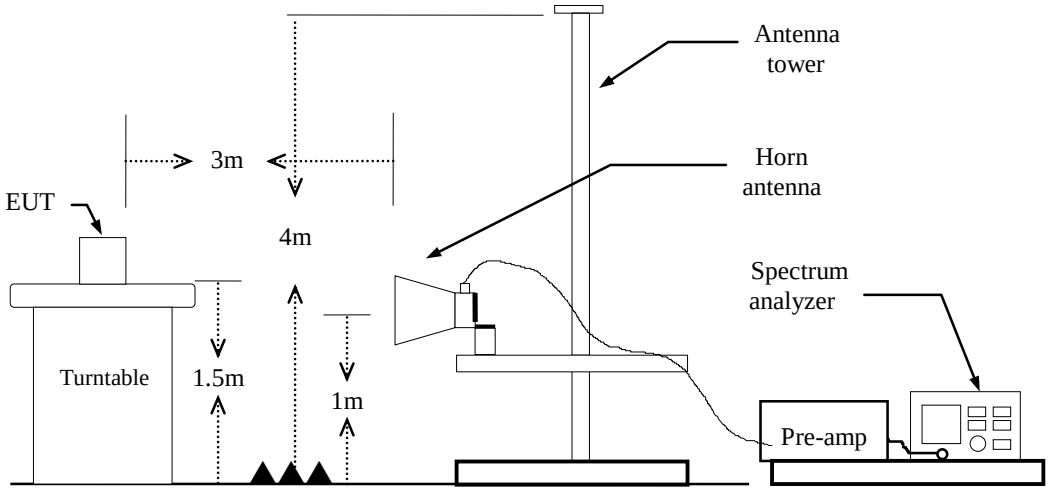

**30MHz ~ 1GHz**





*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

## Above 1 GHz



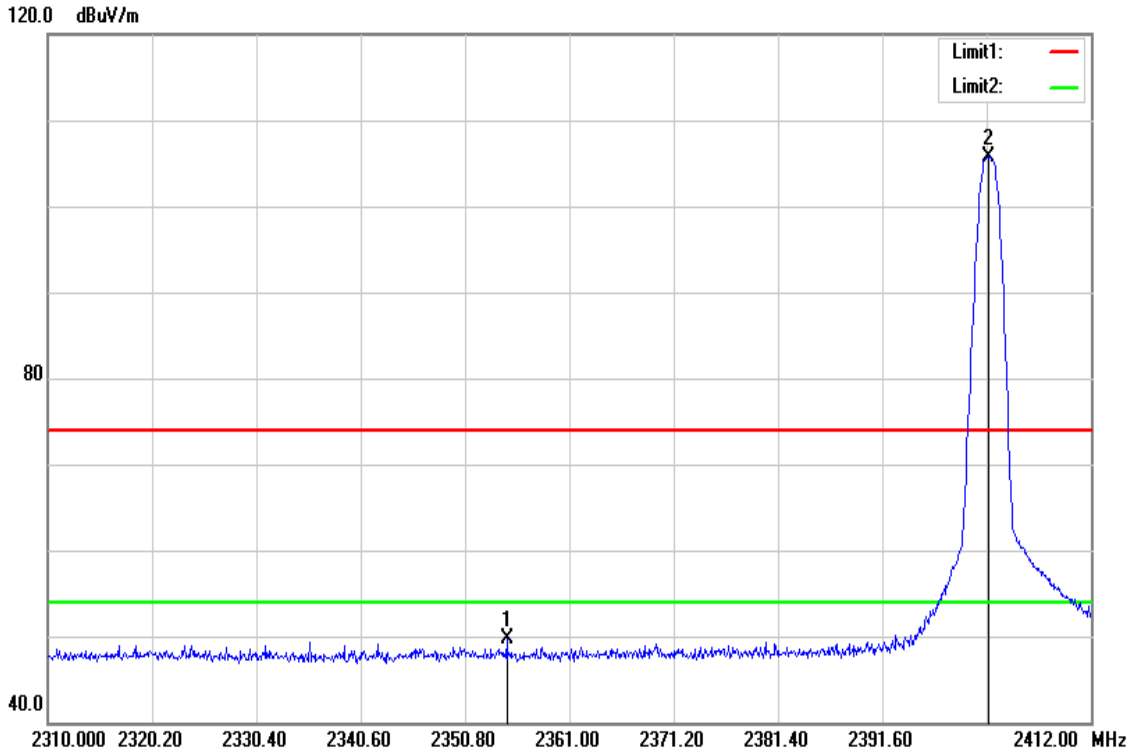


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

## 4.6.4 Test Result

**Band Edge Test Data**

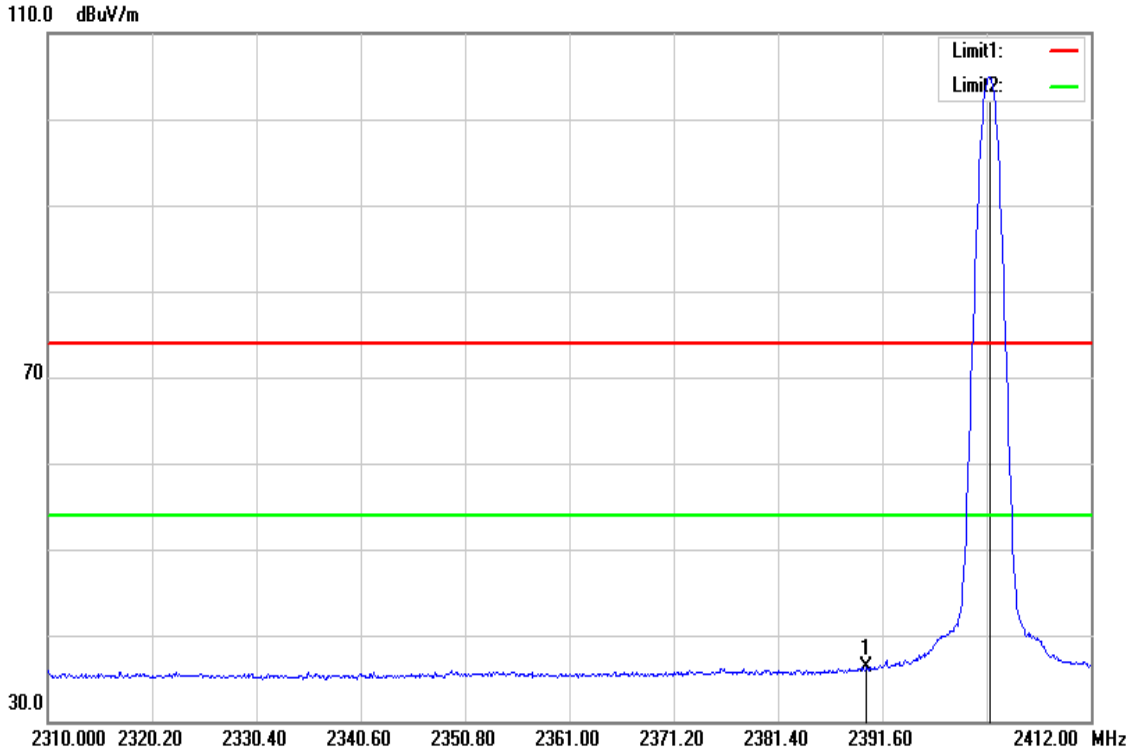
| Test Mode: | BLE Low CH | Temp/Hum | 27(℃)/ 53%RH |
|---|---|---|---|
| Test Item | Band Edge | Test Date | March 17, 2017 |
| Polarize | Horizontal | Test Engineer | Ed Chiang |
| Detector | Peak | | |




| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| 2354.880 | 52.59 | -2.80 | 49.79 | 74.00 | -24.21 | peak |
| 2402.004 | 108.11 | -2.41 | 105.70 | - | - | peak |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

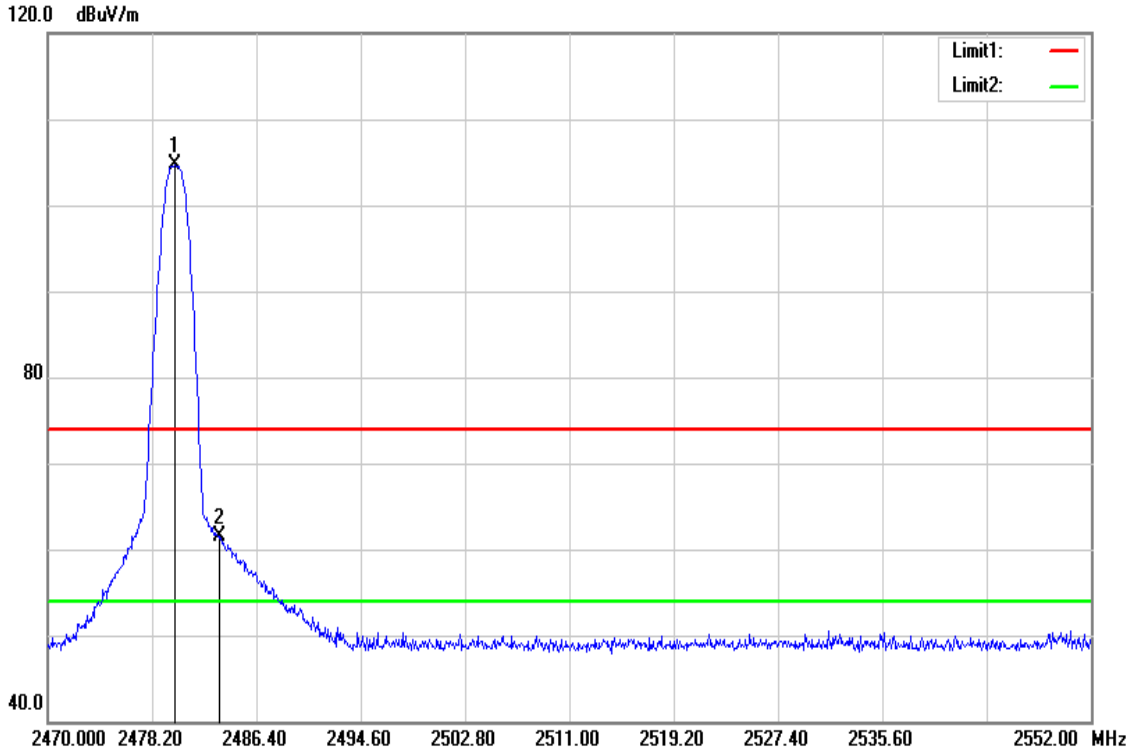
| Test Mode: | BLE Low CH | Temp/Hum | 27(℃)/ 53%RH |
|---|---|---|---|
| Test Item | Band Edge | Test Date | March 17, 2017 |
| Polarize | Horizontal | Test Engineer | Ed Chiang |
| Detector | Average | | |




| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| 2390.000 | 38.74 | -2.49 | 36.25 | 54.00 | -17.75 | AVG |
| 2402.106 | 107.27 | -2.41 | 104.86 | - | - | AVG |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

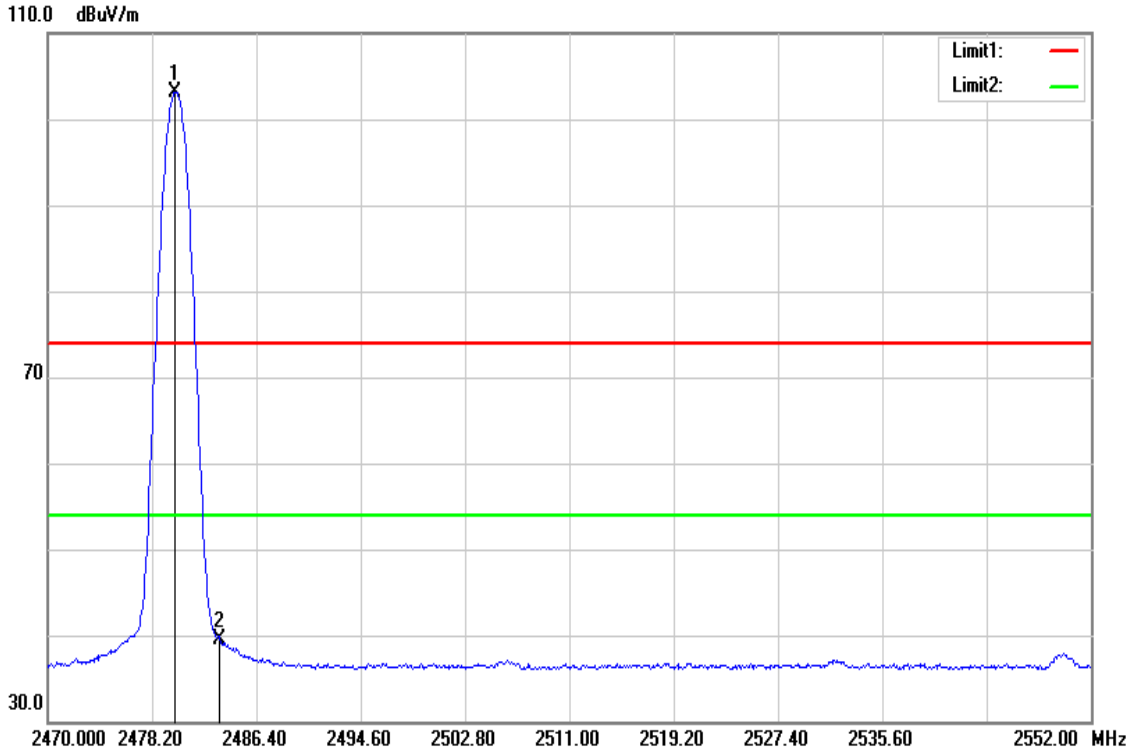
| Test Mode: | BLE High CH | Temp/Hum | 27(℃)/ 53%RH |
|---|---|---|---|
| Test Item | Band Edge | Test Date | March 17, 2017 |
| Polarize | Horizontal | Test Engineer | Ed Chiang |
| Detector | Peak | | |




| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| 2480.004 | 106.68 | -2.03 | 104.65 | - | - | peak |
| 2483.500 | 63.44 | -1.99 | 61.45 | 74.00 | -12.55 | peak |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

| Test Mode: | BLE High CH | Temp/Hum | 27(℃)/ 53%RH |
|---|---|---|---|
| Test Item | Band Edge | Test Date | March 17, 2017 |
| Polarize | Horizontal | Test Engineer | Ed Chiang |
| Detector | Average | | |

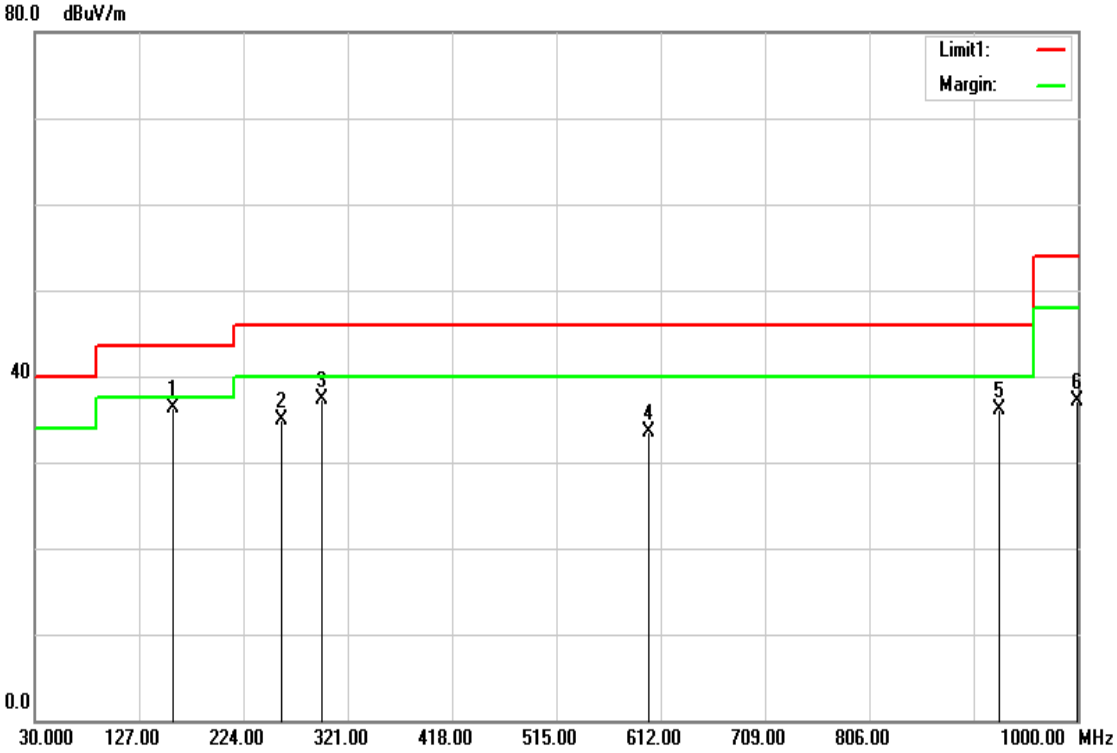



| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| 2480.004 | 105.22 | -2.03 | 103.19 | - | - | AVG |
| 2483.500 | 41.54 | -1.99 | 39.55 | 54.00 | -14.45 | AVG |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

## Below 1G Test Data

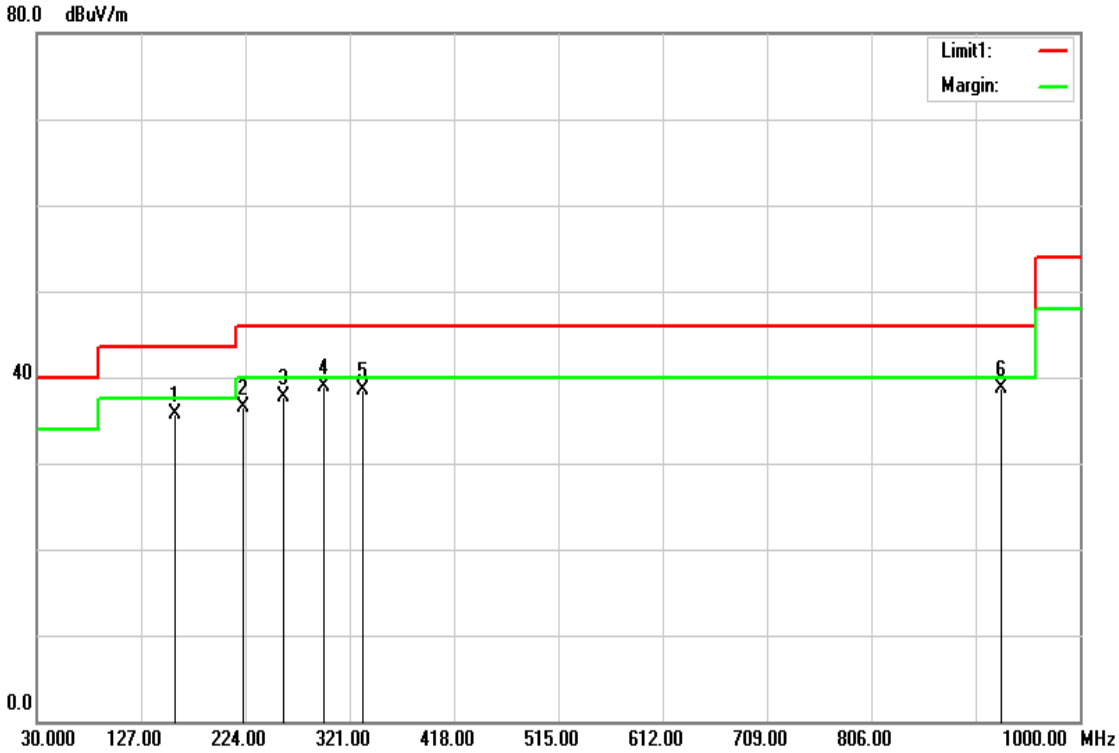
| Test Mode: | BLE Mode | Temp/Hum | 27(℃)/ 53%RH |
|---|---|---|---|
| Test Item | 30MHz-1GHz | Test Date | March 28, 2017 |
| Polarize | Vertical | Test Engineer | Ed Chiang |
| Detector | Peak and Qusi-peak | | |




| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| 159.0100 | 52.63 | -16.33 | 36.30 | 43.50 | -7.20 | peak |
| 259.8900 | 50.44 | -15.55 | 34.89 | 46.00 | -11.11 | peak |
| 296.7500 | 51.52 | -14.30 | 37.22 | 46.00 | -8.78 | peak |
| 600.3600 | 41.35 | -7.75 | 33.60 | 46.00 | -12.40 | peak |
| 927.2500 | 38.78 | -2.76 | 36.02 | 46.00 | -9.98 | peak |
| 999.0300 | 38.68 | -1.60 | 37.08 | 54.00 | -16.92 | peak |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

| Test Mode: | BLE Mode | Temp/Hum | 27(℃)/ 53%RH |
|---|---|---|---|
| Test Item | 30MHz-1GHz | Test Date | March 28, 2017 |
| Polarize | Horizontal | Test Engineer | Ed Chiang |
| Detector | Peak and Qusi-peak | | |

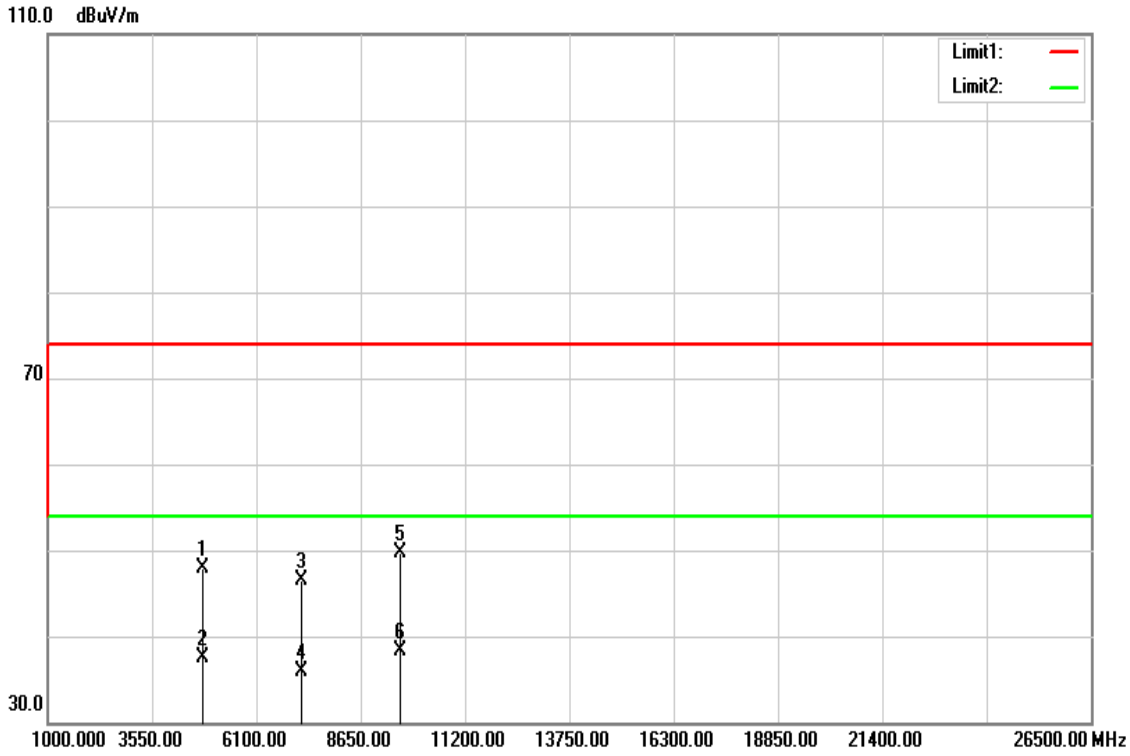



| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| 159.0100 | 51.98 | -16.33 | 35.65 | 43.50 | -7.85 | peak |
| 222.0600 | 53.41 | -16.91 | 36.50 | 46.00 | -9.50 | peak |
| 259.8900 | 53.23 | -15.55 | 37.68 | 46.00 | -8.32 | peak |
| 296.7500 | 53.27 | -14.30 | 38.97 | 46.00 | -7.03 | peak |
| 333.6100 | 51.83 | -13.33 | 38.50 | 46.00 | -7.50 | peak |
| 927.2500 | 41.43 | -2.76 | 38.67 | 46.00 | -7.33 | peak |


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

## Above 1G Test Data

| Test Mode: | BLE Low CH | Temp/Hum | 27(℃)/ 53%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | March 17, 2017 |
| Polarize | Vertical | Test Engineer | Ed Chiang |
| Detector | Peak and Average | | |



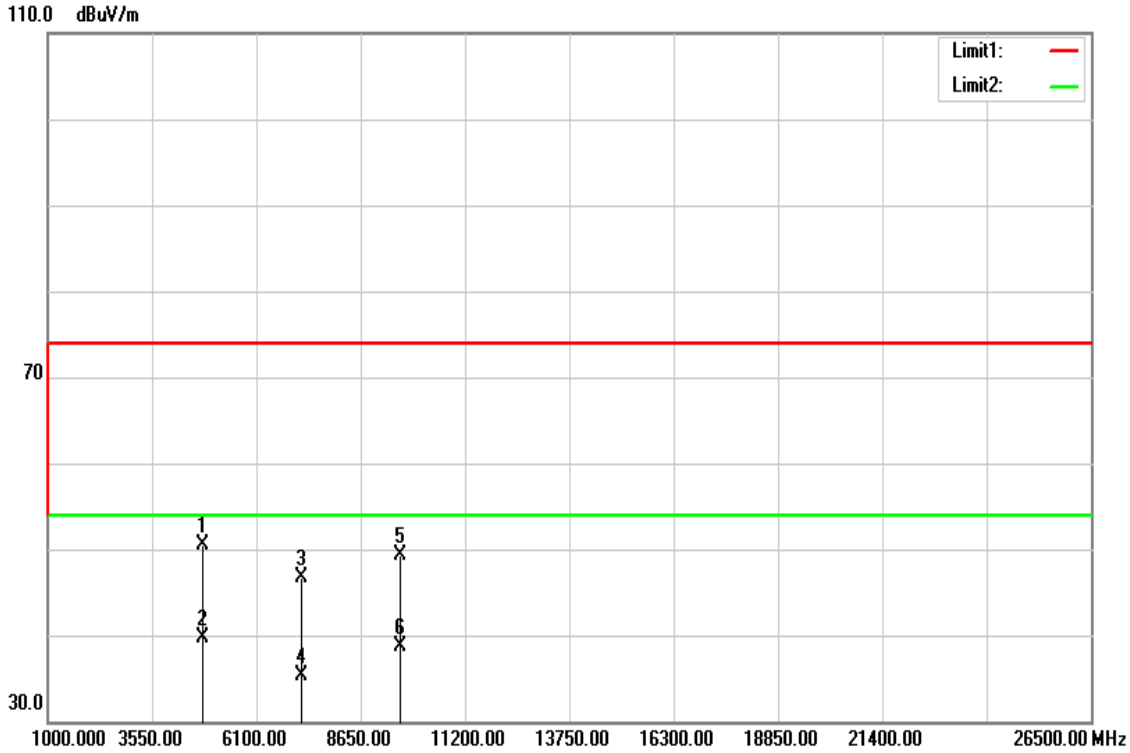

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| 4806.000 | 42.90 | 5.05 | 47.95 | 74.00 | -26.05 | peak |
| 4806.000 | 32.36 | 5.05 | 37.41 | 54.00 | -16.59 | AVG |
| 7206.000 | 33.97 | 12.62 | 46.59 | 74.00 | -27.41 | peak |
| 7206.000 | 23.30 | 12.62 | 35.92 | 54.00 | -18.08 | AVG |
| 9608.000 | 32.06 | 17.60 | 49.66 | 74.00 | -24.34 | peak |
| 9608.000 | 20.61 | 17.60 | 38.21 | 54.00 | -15.79 | AVG |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

| Test Mode: | BLE Low CH | Temp/Hum | 27(℃)/ 53%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | March 17, 2017 |
| Polarize | Horizontal | Test Engineer | Ed Chiang |
| Detector | Peak and Average | | |



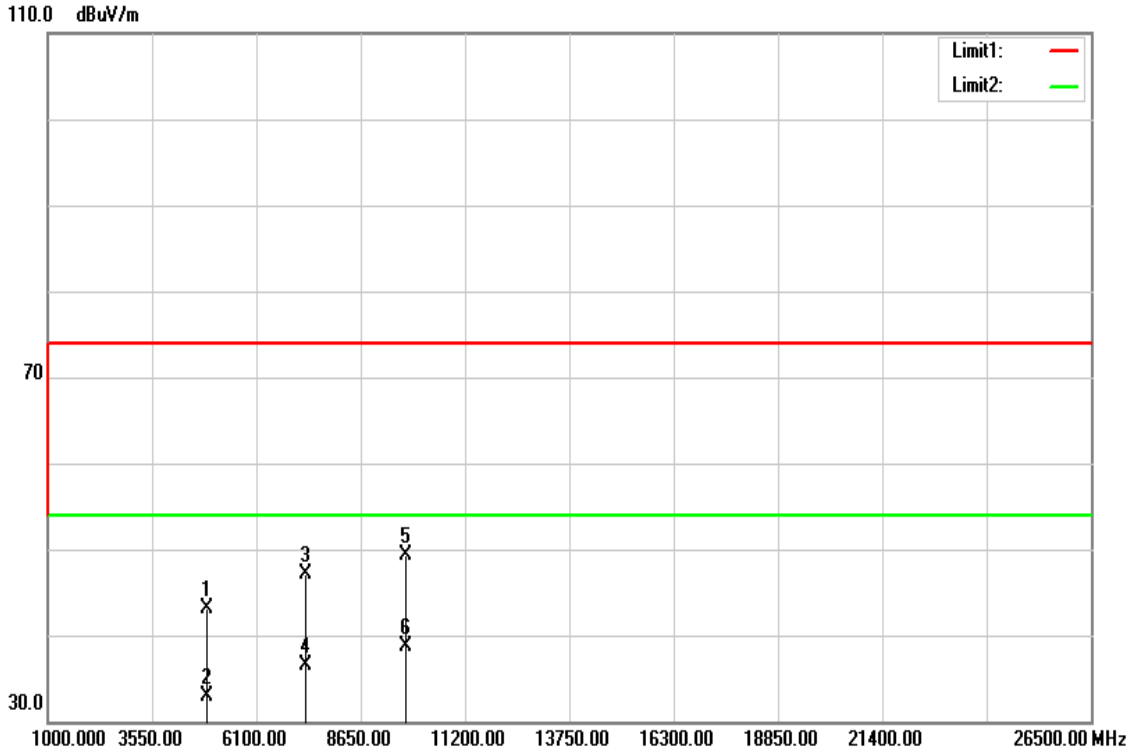

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| 4806.000 | 45.47 | 5.05 | 50.52 | 74.00 | -23.48 | peak |
| 4806.000 | 34.75 | 5.05 | 39.80 | 54.00 | -14.20 | AVG |
| 7206.000 | 34.18 | 12.62 | 46.80 | 74.00 | -27.20 | peak |
| 7206.000 | 22.62 | 12.62 | 35.24 | 54.00 | -18.76 | AVG |
| 9608.000 | 31.75 | 17.60 | 49.35 | 74.00 | -24.65 | peak |
| 9608.000 | 21.07 | 17.60 | 38.67 | 54.00 | -15.33 | AVG |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

| Test Mode: | BLE Mid CH | Temp/Hum | 27(℃)/ 53%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | March 17, 2017 |
| Polarize | Vertical | Test Engineer | Ed Chiang |
| Detector | Peak and Average | | |



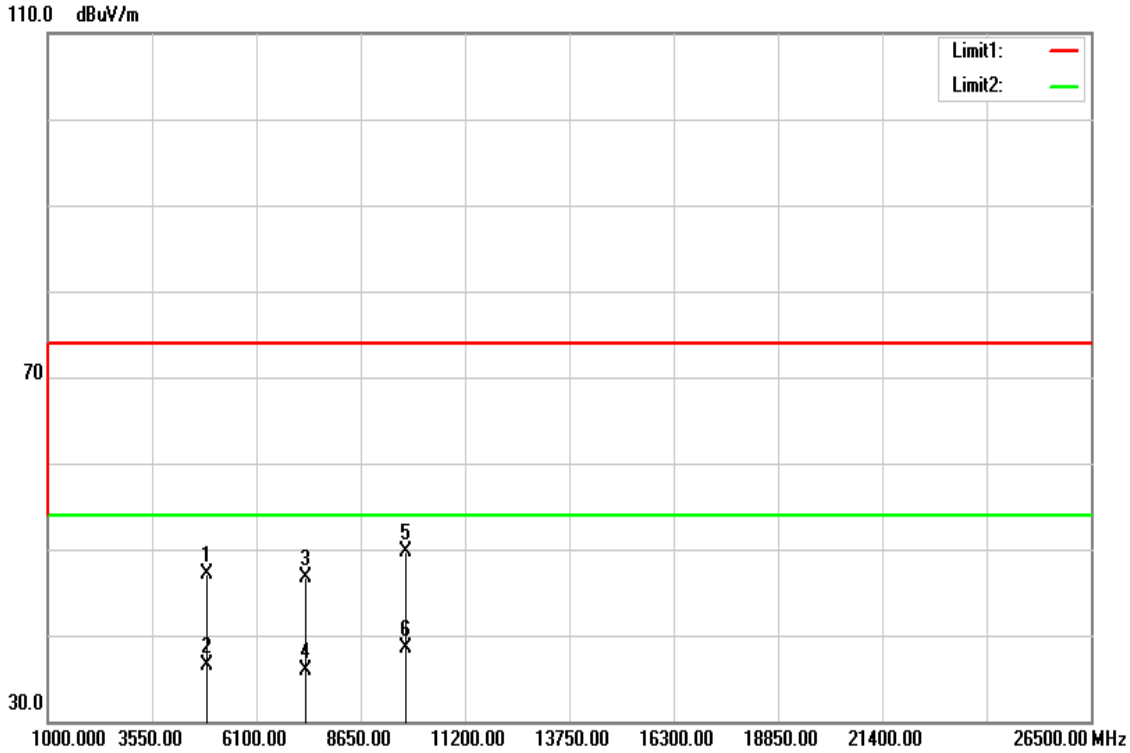

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| 4880.000 | 37.82 | 5.25 | 43.07 | 74.00 | -30.93 | peak |
| 4880.000 | 27.61 | 5.25 | 32.86 | 54.00 | -21.14 | AVG |
| 7320.000 | 34.11 | 12.97 | 47.08 | 74.00 | -26.92 | peak |
| 7320.000 | 23.47 | 12.97 | 36.44 | 54.00 | -17.56 | AVG |
| 9760.000 | 31.71 | 17.60 | 49.31 | 74.00 | -24.69 | peak |
| 9760.000 | 21.13 | 17.60 | 38.73 | 54.00 | -15.27 | AVG |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

| Test Mode: | BLE Mid CH | Temp/Hum | 27(℃)/ 53%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | March 17, 2017 |
| Polarize | Horizontal | Test Engineer | Ed Chiang |
| Detector | Peak and Average | | |



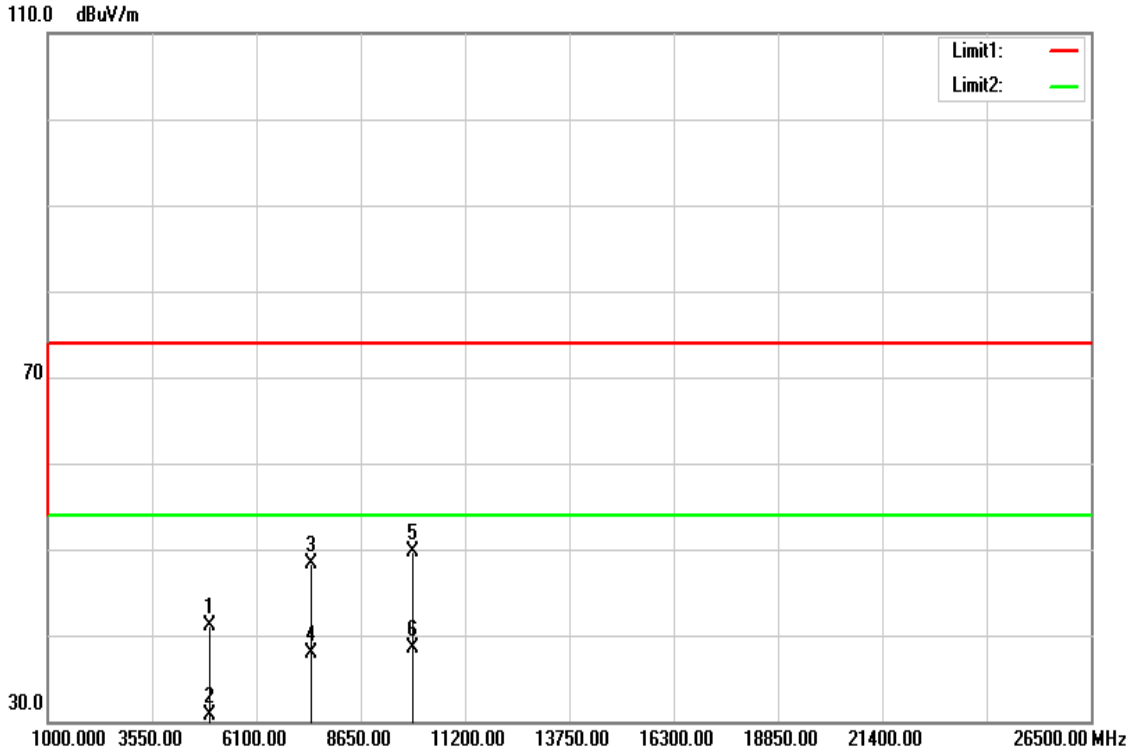

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| 4880.000 | 41.94 | 5.25 | 47.19 | 74.00 | -26.81 | peak |
| 4880.000 | 31.27 | 5.25 | 36.52 | 54.00 | -17.48 | AVG |
| 7320.000 | 33.69 | 12.97 | 46.66 | 74.00 | -27.34 | peak |
| 7320.000 | 22.87 | 12.97 | 35.84 | 54.00 | -18.16 | AVG |
| 9760.000 | 32.04 | 17.60 | 49.64 | 74.00 | -24.36 | peak |
| 9760.000 | 20.81 | 17.60 | 38.41 | 54.00 | -15.59 | AVG |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

| Test Mode: | BLE High CH | Temp/Hum | 27(℃)/ 53%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | March 17, 2017 |
| Polarize | Vertical | Test Engineer | Ed Chiang |
| Detector | Peak and Average | | |



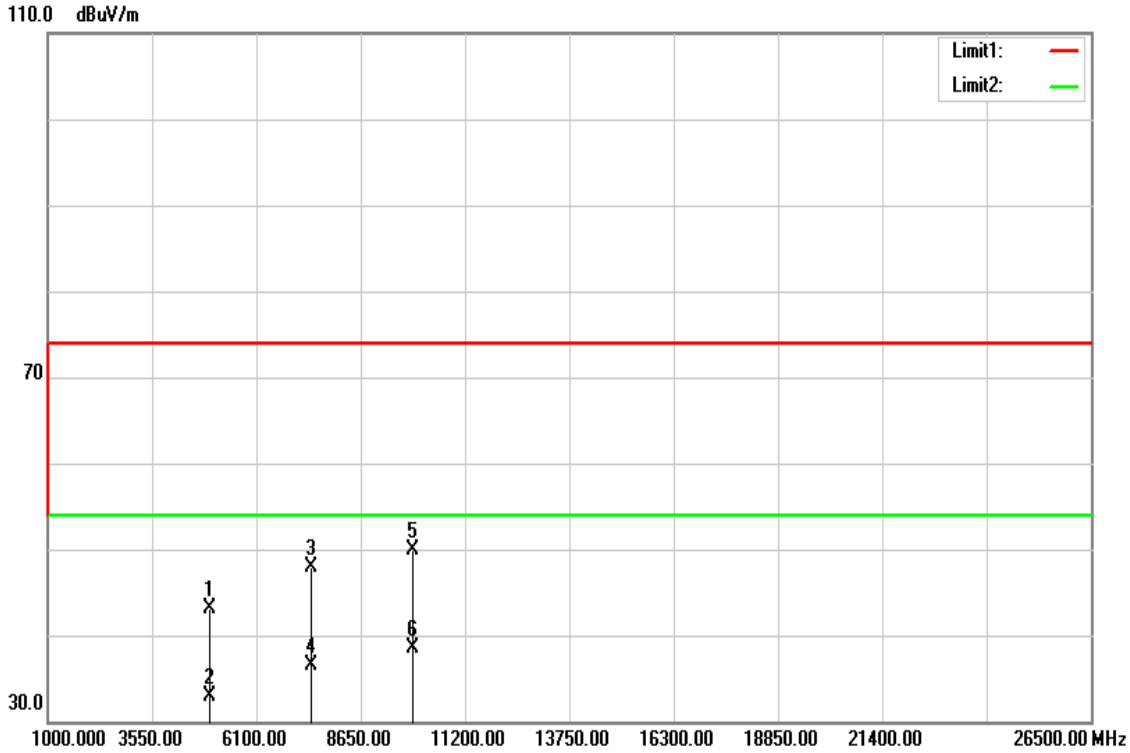

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| 4960.000 | 35.60 | 5.46 | 41.06 | 74.00 | -32.94 | peak |
| 4960.000 | 25.23 | 5.46 | 30.69 | 54.00 | -23.31 | AVG |
| 7440.000 | 35.00 | 13.33 | 48.33 | 74.00 | -25.67 | peak |
| 7440.000 | 24.51 | 13.33 | 37.84 | 54.00 | -16.16 | AVG |
| 9920.000 | 32.05 | 17.60 | 49.65 | 74.00 | -24.35 | peak |
| 9920.000 | 20.81 | 17.60 | 38.41 | 54.00 | -15.59 | AVG |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*

| Test Mode: | BLE High CH | Temp/Hum | 27(℃)/ 53%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | March 17, 2017 |
| Polarize | Horizontal | Test Engineer | Ed Chiang |
| Detector | Peak and Average | | |




| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| 4960.000 | 37.58 | 5.46 | 43.04 | 74.00 | -30.96 | peak |
| 4960.000 | 27.38 | 5.46 | 32.84 | 54.00 | -21.16 | AVG |
| 7440.000 | 34.57 | 13.33 | 47.90 | 74.00 | -26.10 | peak |
| 7440.000 | 23.15 | 13.33 | 36.48 | 54.00 | -17.52 | AVG |
| 9920.000 | 32.31 | 17.60 | 49.91 | 74.00 | -24.09 | peak |
| 9920.000 | 20.89 | 17.60 | 38.49 | 54.00 | -15.51 | AVG |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*


*This report shall not be reproduced except in full, without the written approval of Compliance Certification Services.*