



REPORT No.: SZ16080189W13A

FCC RF TEST REPORT

APPLICANT : Pycom Ltd
PRODUCT NAME : LoPy
MODEL NAME : LoPy1.0r
TRADE NAME : LoPy
BRAND NAME : Pycom
FCC ID : 2AJMTLOPY1R
STANDARD(S) : 47 CFR Part 15 Subpart C
ISSUE DATE : 2016-10-09



SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.

NOTE: This document is issued by MORLAB, the test report shall not be reproduced except in full without prior written permission of the company. The test results apply only to the particular sample(s) tested and to the specific tests carried out which is available on request for validation and information confirmed at our website.

MORLAB GROUP

FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road,
Block67, BaoAn District, ShenZhen , Guangdong Province, P. R. China

Tel: 86-755-36698555
Http://www.morlab.com

Fax: 86-755-36698525
E-mail: service@morlab.cn



DIRECTORY

TEST REPORT DECLARATION4

1. TECHNICAL INFORMATION5

1.1 APPLICANT INFORMATION5

1.2 EQUIPMENT UNDER TEST (EUT) DESCRIPTION5

1.2.1 IDENTIFICATION OF ALL USED EUTS5

1.3 TEST STANDARDS AND RESULTS6

1.3.1 TEST ENVIRONMENT CONDITIONS6

2. 47 CFR PART 15C REQUIREMENTS7

2.1 ANTENNA REQUIREMENT7

2.1.1 APPLICABLE STANDARD7

2.1.2 RESULT: COMPLIANT7

2.2 PEAK OUTPUT POWER7

2.2.1 REQUIREMENT7

2.2.2 TEST DESCRIPTION7

2.2.3 TEST RESULT8

2.3 6DB BANDWIDTH11

2.3.1 REQUIREMENT11

2.3.2 TEST DESCRIPTION11

2.3.3 TEST RESULT11

2.4 CONDUCTED SPURIOUS EMISSIONS AND BAND EDGE14

2.4.1 REQUIREMENT14

2.4.2 TEST DESCRIPTION14

2.4.3 TEST RESULT14

2.5 POWER SPECTRAL DENSITY (PSD)18

2.5.1 REQUIREMENT18

2.5.2 TEST DESCRIPTION18

2.5.3 TEST RESULT18

2.6 CONDUCTED EMISSION21

2.6.1 REQUIREMENT21

2.6.2 TEST DESCRIPTION21

2.6.3 TEST RESULT22



2.7 RADIATED EMISSION 24
2.7.1 REQUIREMENT 24
2.7.2 TEST DESCRIPTION 25
2.7.3 TEST RESULT 27

ANNEX A GENERAL INFORMATION 31

| Change History | | |
|----------------|------------|-------------------|
| Issue | Date | Reason for change |
| 1.0 | 2016-10-09 | First edition |
| | | |

**TEST REPORT DECLARATION**

| | |
|----------------------|--|
| Applicant | Pycom Ltd |
| Applicant Address | Registered Office 57 Avenue Road Cranleigh, Surrey GU6 7LJ UK |
| Manufacturer | In-Tech Electronics Ltd |
| Manufacturer Address | 2/F Rhythm Home, 119 Shazui Road, Futian, Shenzhen, Guangdong, P.R.China |
| Product Name | LoPy |
| Model Name | LoPy1.0r |
| Brand Name | Pycom |
| HW Version | 1.0r |
| SW Version | 1.0 |
| Test Standards | 47 CFR Part 15 Subpart C |
| Test Date | 2016-09-29 to 2016-10-11 |
| Test Result | PASS |

Tested by : Zou Jian
Zou Jian

Reviewed by : Qiu Xiaojun
Qiu Xiaojun

Approved by : Peng Huarui
Peng Huarui



1. TECHNICAL INFORMATION

Note: Provide by applicant.

1.1 Applicant Information

| | |
|----------|---|
| Company: | Pycom Ltd |
| Address: | Registered Office 57 Avenue Road Cranleigh, Surrey GU6 7LJ UK |

1.2 Equipment under Test (EUT) Description

| | |
|------------------|--|
| Brand Name: | Pycom |
| Trade Name: | LoPy |
| Model Name: | LoPy1.0r |
| Frequency Range: | The frequency range used is 903.0MHz – 914.2MHz (8 channels, at intervals of 1.6MHz) |
| Antenna Type: | Dedicated Antenna |
| Antenna Gain: | 2.2 dBi |

NOTE:

The EUT is a LoPy, the frequencies is $F(\text{MHz})=903.0+1.6*(n-64)$ ($64 \leq n \leq 71$). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 64 (903.0MHz), 68 (909.4MHz) and 71 (914.2MHz).

1. The EUT connected to the serial port of the computer with a serial communication cable, and then use the dedicated software to control the EUT into the test mode.
2. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.2.1 Identification of all used EUTs

The EUT identity consists of numerical and letter characters, the letter character indicates the test sample, and the following two numerical characters indicate the software version of the test sample.

| EUT Identity | Hardware Version | Software Version |
|--------------|------------------|------------------|
| 01 | 1.0r | 1.0 |



1.3 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

| No. | Identity | Document Title |
|-----|-------------------------------------|-------------------------|
| 1 | 47 CFR Part 15 (10-1-15 Edition) | Radio Frequency Devices |

Test detailed items/section required by FCC rules and results are as below:

| No. | Section | Description | Test Date | Result |
|-----|-------------------|--|--------------|--------------------|
| 1 | 15.203 | Antenna Requirement | N.A | <u>PASS</u> |
| 2 | 15.247(b) | Peak Output Power | Sep 29, 2016 | <u>PASS</u> |
| 3 | 15.247(a) | Bandwidth | Sep 29, 2016 | <u>PASS</u> |
| 4 | 15.247(d) | Conducted Spurious Emission and Band Edge | Sep 29, 2016 | <u>PASS</u> |
| 5 | 15.207 | Conducted Emission | Sep 22, 2016 | <u>PASS</u> |
| 6 | 15.209 ,15.247(d) | Radiated Emission | Oct 09, 2016 | <u>PASS</u> |
| 7 | 15.247(e) | Power spectral density (PSD) | Oct 11, 2016 | <u>PASS</u> |

The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013.

1.3.1 Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

| | |
|-----------------------------|---------|
| Temperature (°C): | 15 - 35 |
| Relative Humidity (%): | 30 -60 |
| Atmospheric Pressure (kPa): | 86-106 |



2. 47 CFR PART 15C REQUIREMENTS

2.1 Antenna requirement

2.1.1 Applicable Standard

According to FCC 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

2.1.2 Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

2.2 Peak Output Power

2.2.1 Requirement

According to FCC section 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: The maximum peak conducted output power of the intentional radiator shall not exceed 1 Watt.

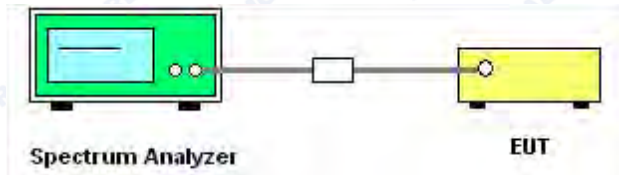
2.2.2 Test Description

A. Test procedure

The measured output power was calculated by the reading of the spectrum analyzer and calibration. Following is the test procedure for Peak Output Power test on the spectrum analyzer:

- a) Set analyzer center frequency to channel center frequency.
- b) Set the RBW to 1MHz
- c) Set VBW to 3MHz
- d) Set span to 3MHz
- e) Sweep time to auto couple.
- f) Detector = peak.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use peak marker function to determine the peak amplitude level.

B. Test Setup:



The EUT (Equipment under the test) which is powered by the Battery is coupled to the Spectrum analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading, all test result in Spectrum analyzer.

C. Equipments List:

Please reference ANNEX A (1.5).

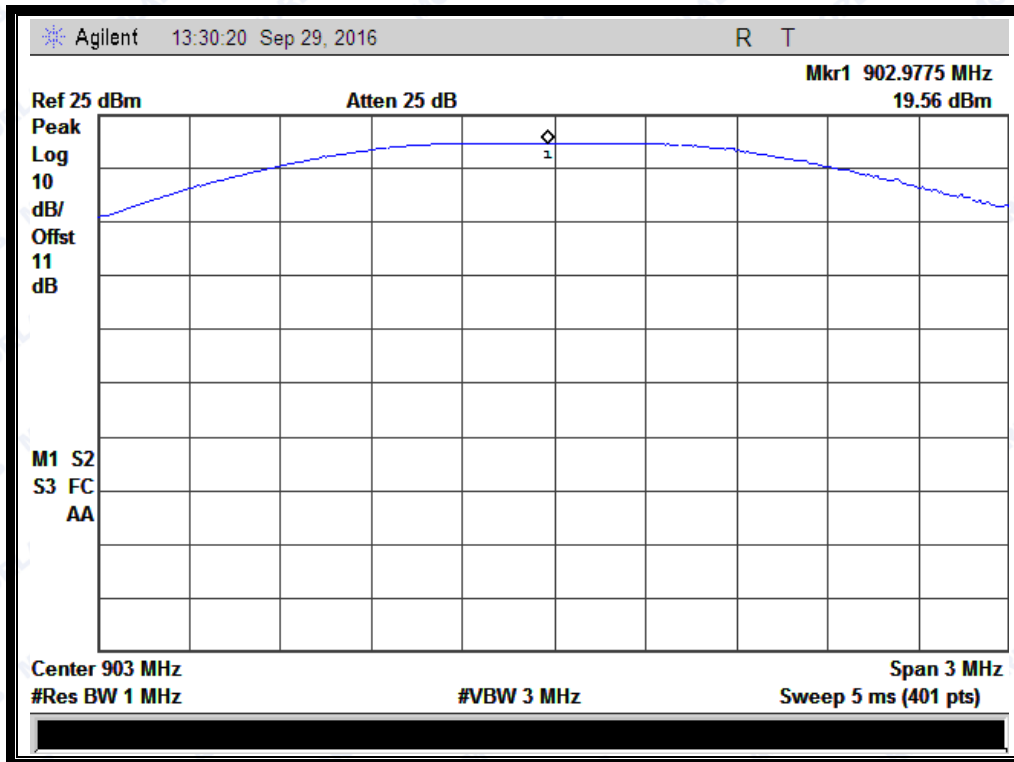
2.2.3 Test Result

The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the EUT.

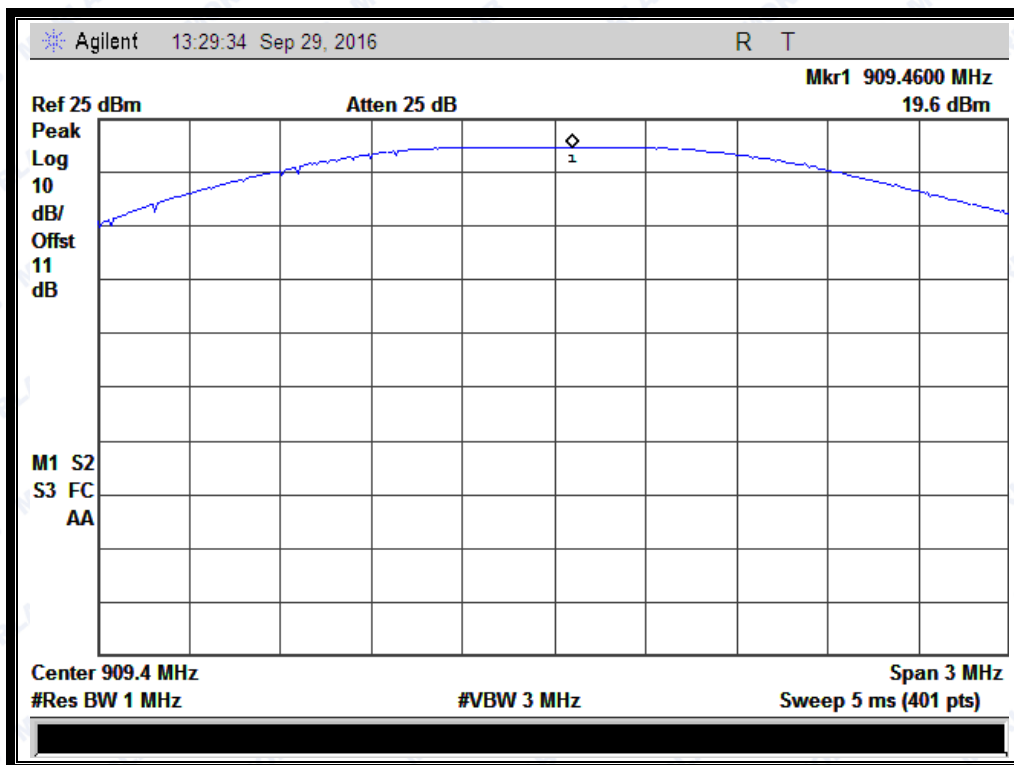
A. Test Verdict:

| Channel | Frequency (MHz) | Measured Output Peak Power | | Refer to Plot | Limit | | Verdict |
|---------|-----------------|----------------------------|--------|---------------|-------|---|---------|
| | | dBm | W | | dBm | W | |
| 64 | 903.0 | 19.56 | 0.0904 | Plot A | 30 | 1 | PASS |
| 68 | 909.4 | 19.60 | 0.0912 | Plot B | | | PASS |
| 71 | 914.2 | 19.61 | 0.0914 | Plot C | | | PASS |

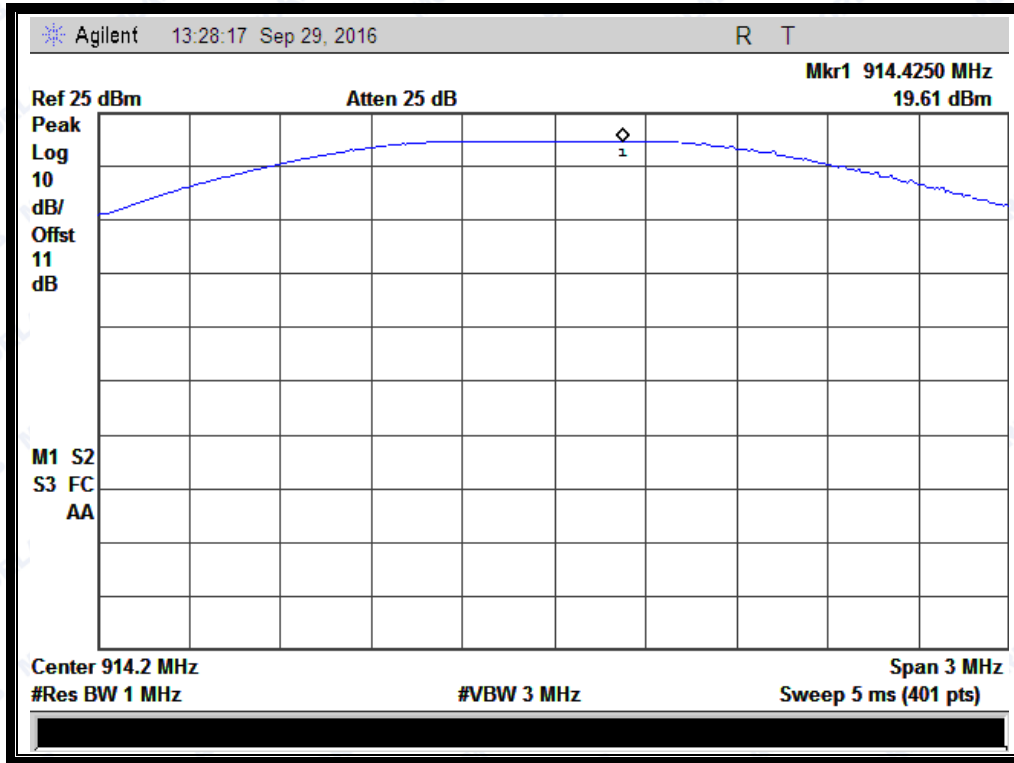
B. Test Plots:



(Plot A: Channel 64: 903.0MHz)



(Plot B: Channel 68: 909.4MHz)



(Plot C: Channel 71: 914.2MHz)

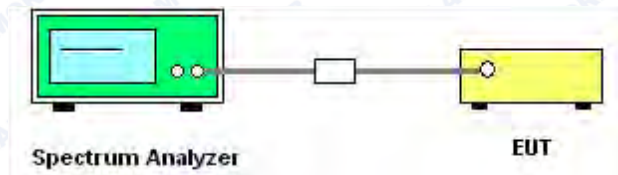
2.3 6dB Bandwidth

2.3.1 Requirement

According to FCC section 15.247(a) (2), Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

2.3.2 Test Description

A. Test Set:



The EUT which is powered by the battery, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

B. Equipments List:

Please reference ANNEX A(1.5).

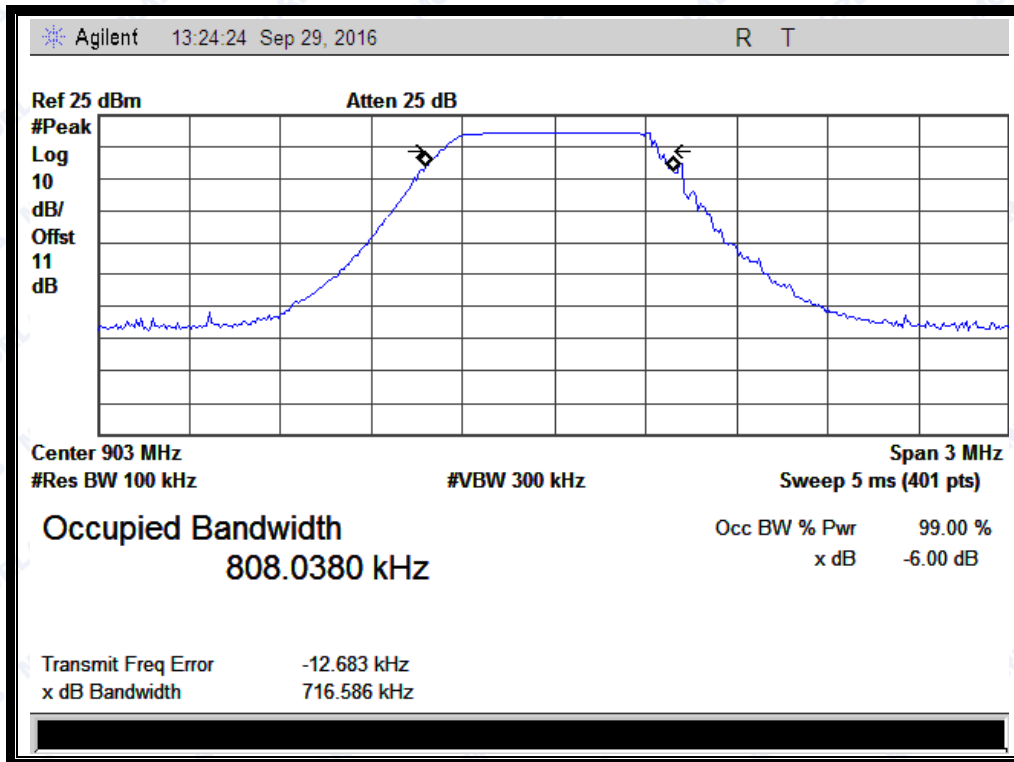
2.3.3 Test Result

The lowest, middle and highest channels are selected to perform testing to record the 6 dB bandwidth of the EUT.

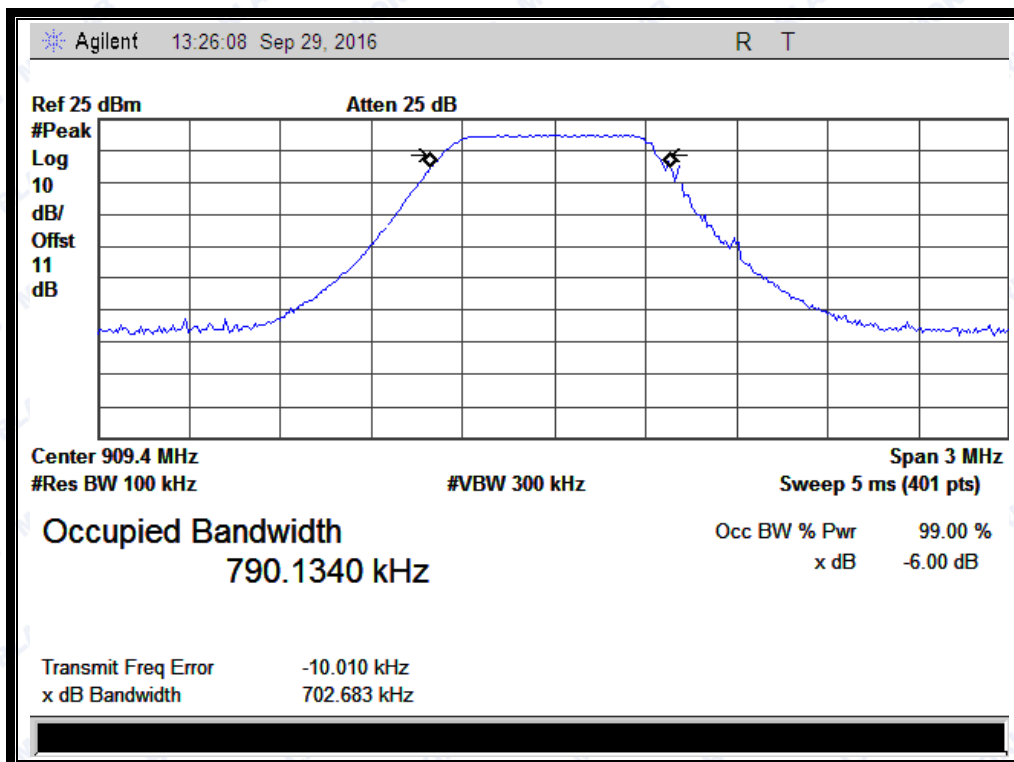
A. Test Verdict:

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Refer to Plot | Limits(kHz) | Result |
|---------|-----------------|----------------------|---------------|-------------|--------|
| 64 | 903.0 | 0.7166 | Plot A | ≥500 | PASS |
| 68 | 909.4 | 0.7027 | Plot B | ≥500 | PASS |
| 71 | 914.2 | 0.7129 | Plot C | ≥500 | PASS |

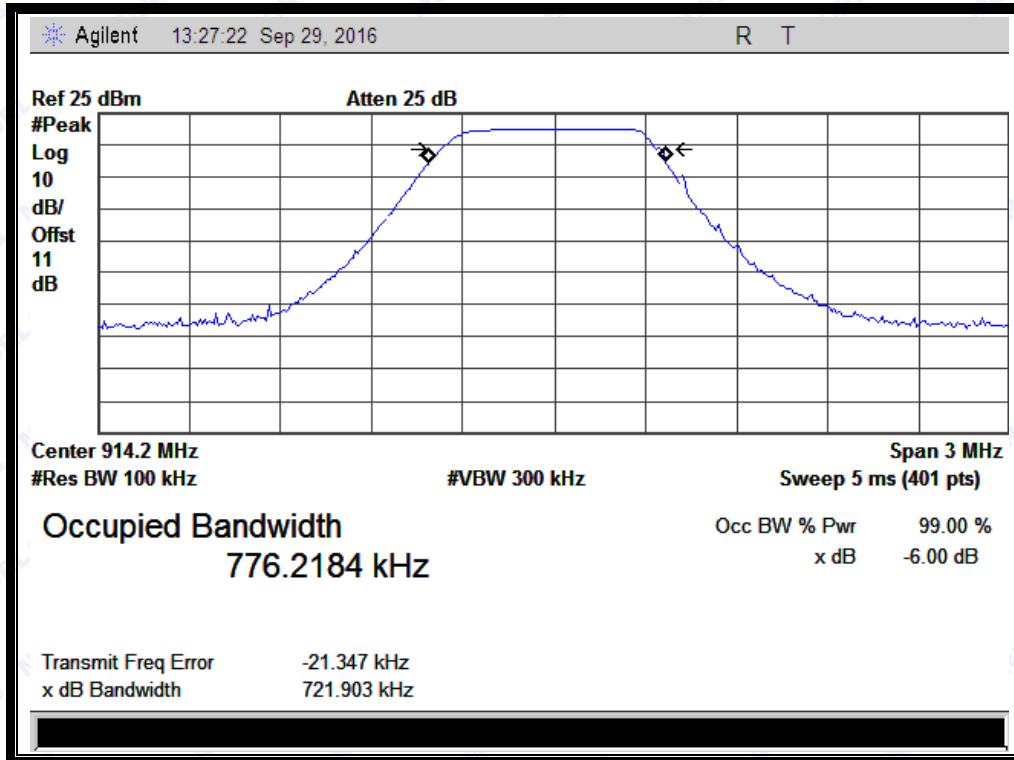
B. Test Plots:



(Plot A: Channel 64: 903.0MHz)



(Plot B: Channel 68: 909.4 MHz)



(Plot C: Channel 71: 914.2MHz)

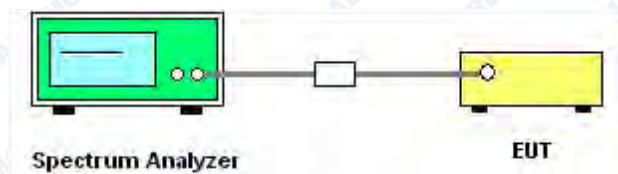
2.4 Conducted Spurious Emissions and Band Edge

2.4.1 Requirement

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

2.4.2 Test Description

A. Test Set:



The EUT which is powered by the Battery, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

B. Equipments List:

Please reference ANNEX A (1.5).

2.4.3 Test Result

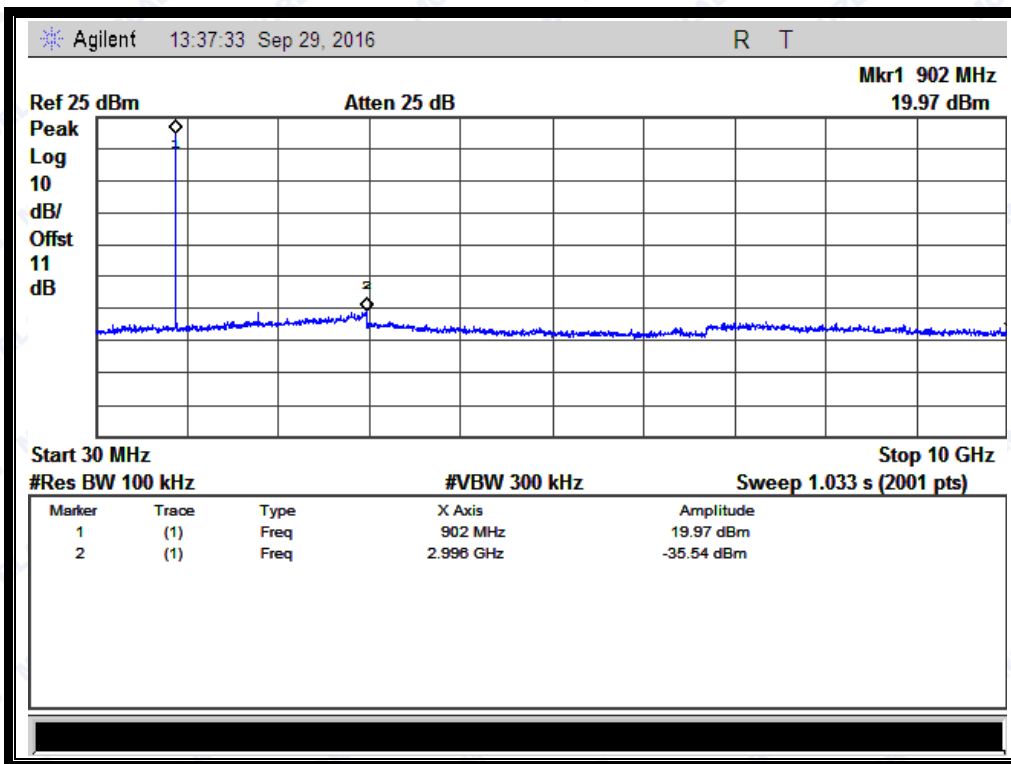
The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

A. Test Verdict:

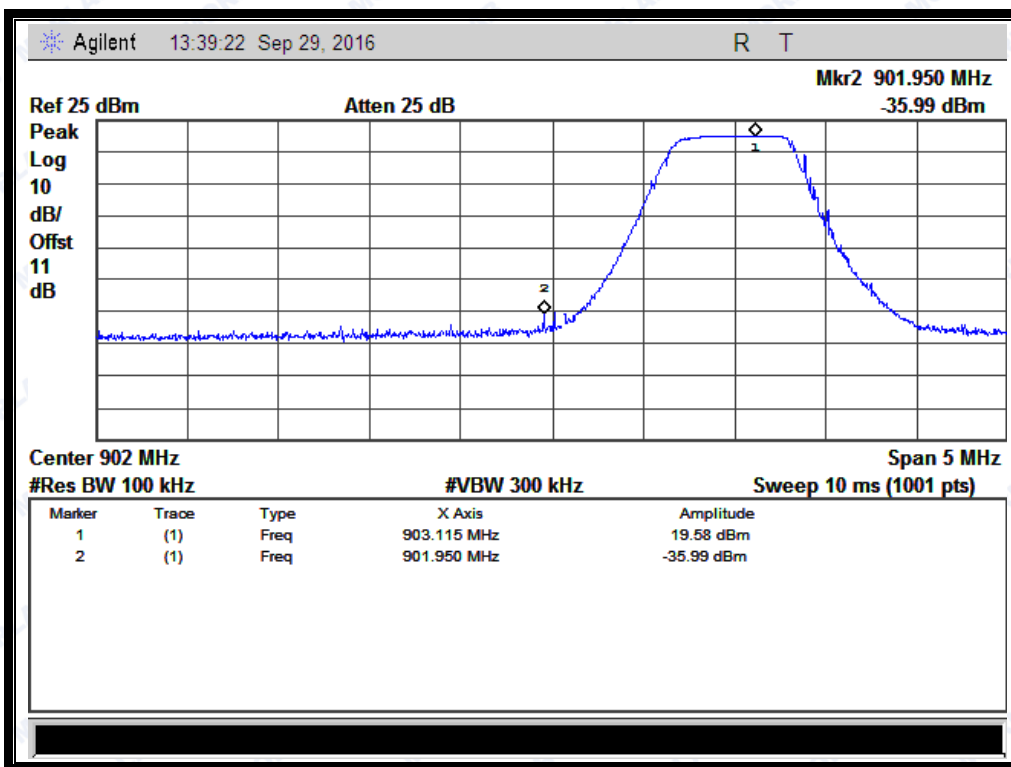
| Channel | Frequency (MHz) | Measured Max. Out of Band Emission (dBm) | Refer to Plot | Limit (dBm) | | Verdict |
|---------|-----------------|--|---------------|---------------|-------------------------|---------|
| | | | | Carrier Level | Calculated -20dBc Limit | |
| 64 | 903.0 | -35.54 | Plot A.1 | 19.97 | -0.03 | PASS |
| 68 | 909.4 | -35.89 | Plot B.1 | 19.74 | -0.26 | PASS |
| 71 | 914.2 | -35.66 | Plot C.1 | 19.77 | -0.23 | PASS |

B. Test Plots:

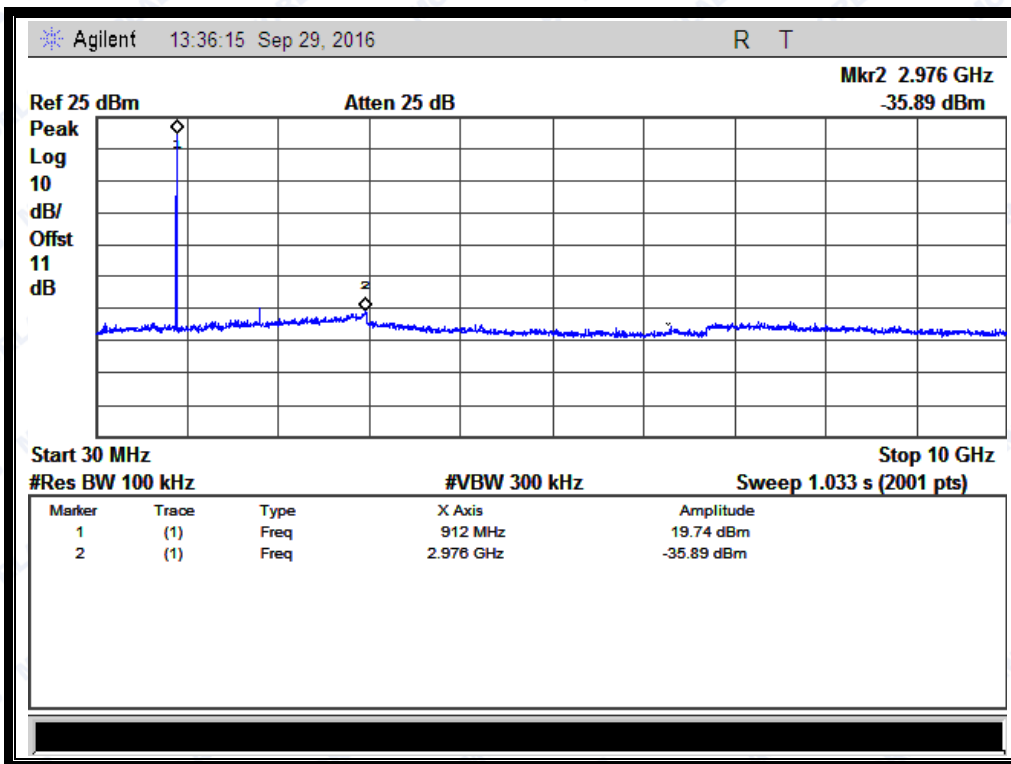
Note: the power of the EUT transmitting frequency should be ignored.



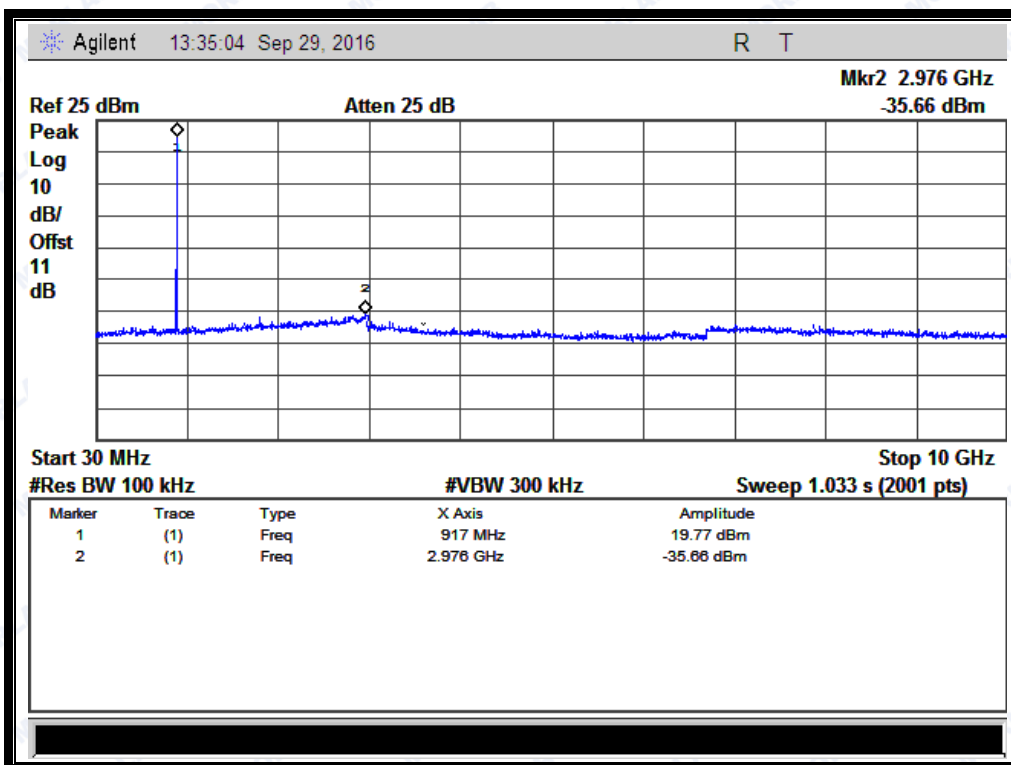
(Plot A.1: Channel = 64, 30MHz to 10GHz)



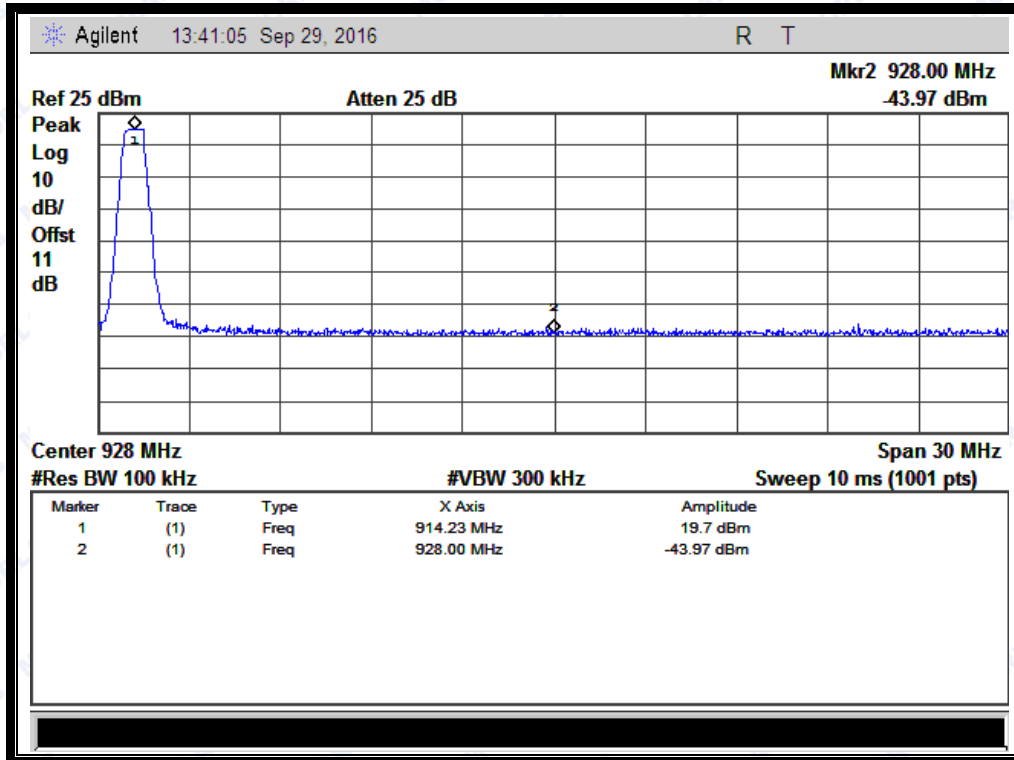
(Band Edge@ Channel = 64)



(Plot B.1: Channel = 68, 30MHz to 10GHz)



(Plot C.1: Channel = 71, 30MHz to 10GHz)



(Band Edge@ Channel = 71)

2.5 Power spectral density (PSD)

2.5.1 Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

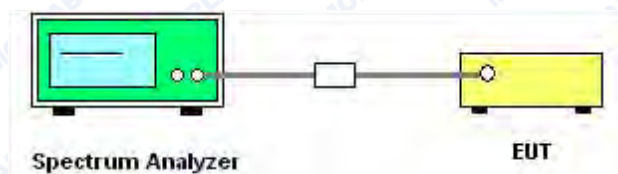
2.5.2 Test Description

A. Test procedure

The measured power spectral density was calculated by the reading of the spectrum analyzer and calibration. Following is the test procedure for PSD test:

- a) Set analyzer center frequency to channel center frequency.
- b) Set the span to 3MHz
- c) Set the RBW to 3 kHz
- d) Set the VBW to 10KHz
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.

B. Test Set:



The EUT which is powered by the battery, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

C. Equipments List:

Please reference ANNEX A (1.5).

2.5.3 Test Result

The lowest, middle and highest channels are tested.

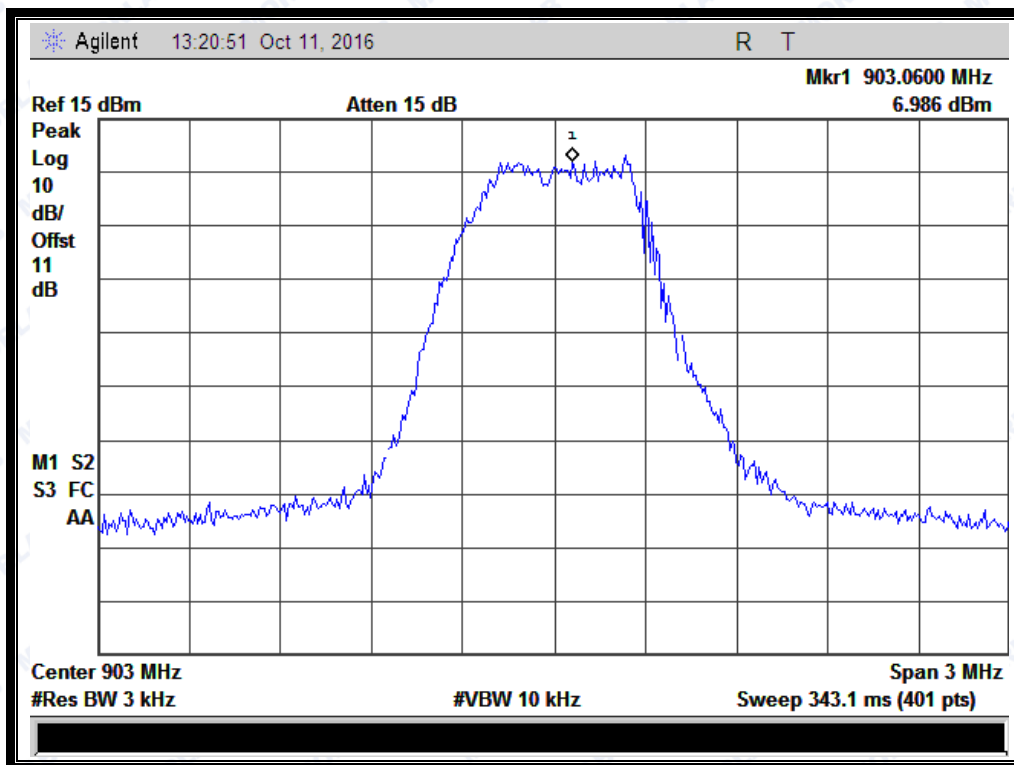


A. Test Verdict:

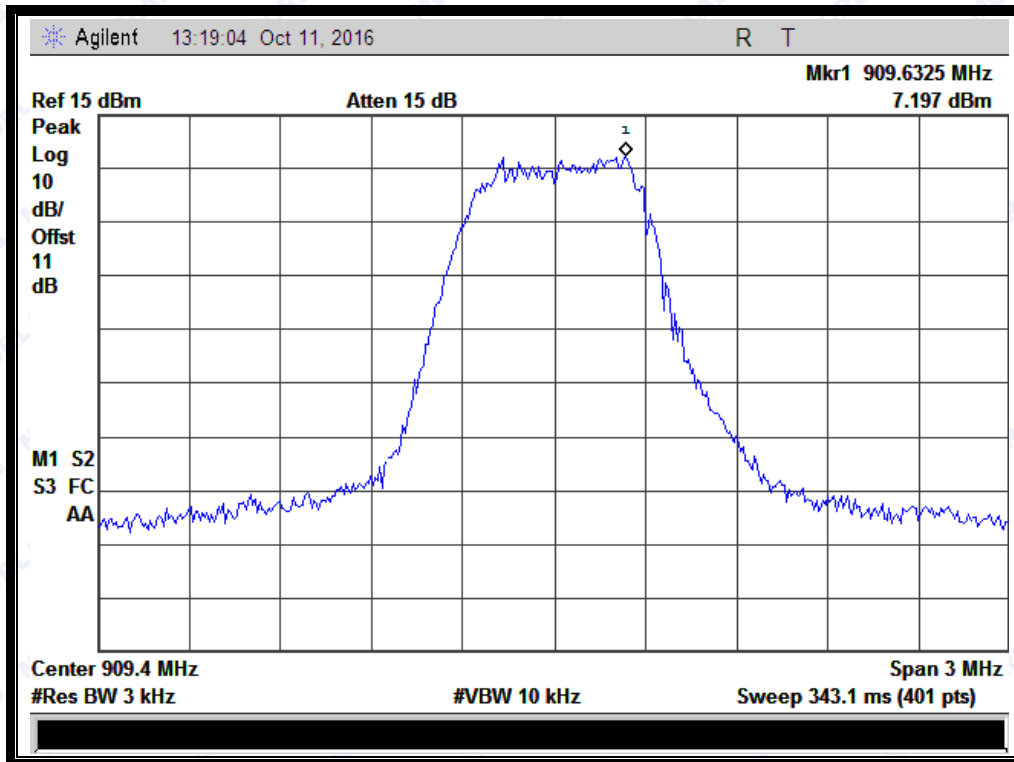
| Spectral power density (dBm/3kHz) | | | | | |
|-----------------------------------|-----------------|-------------------------|---------------|------------------|---------|
| Channel | Frequency (MHz) | Measured PSD (dBm/3kHz) | Refer to Plot | Limit (dBm/3kHz) | Verdict |
| 64 | 903.0 | 6.99 | Plot A | 8 | PASS |
| 68 | 909.4 | 7.20 | Plot B | 8 | PASS |
| 71 | 914.2 | 7.00 | Plot C | 8 | PASS |

Measurement uncertainty: ± 1.3 dB

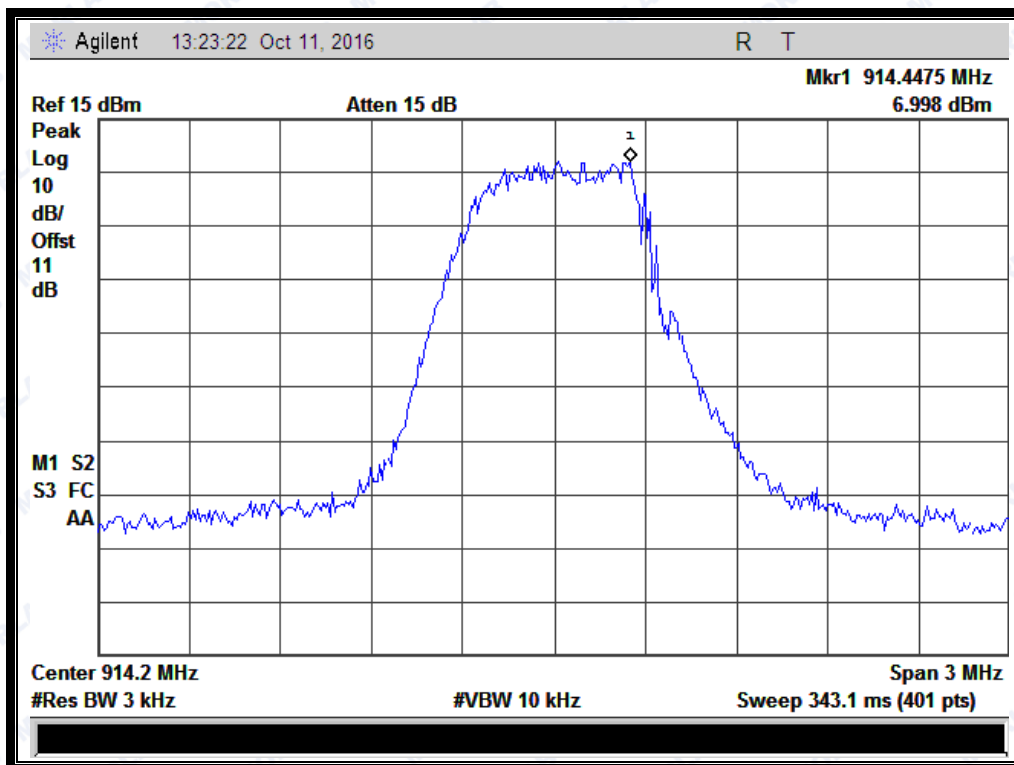
B. Test Plots:



(Plot A: Channel = 64)



(Plot B: Channel = 68)



(Plot C: Channel = 71)

2.6 Conducted Emission

2.6.1 Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

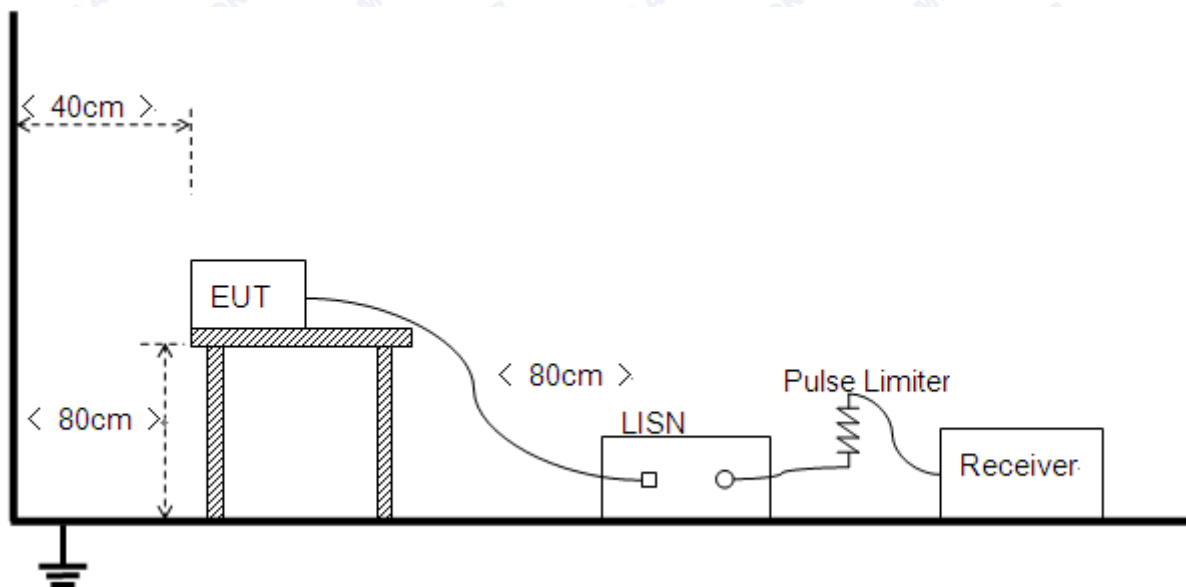
| Frequency range (MHz) | Conducted Limit (dB μ V) | |
|-----------------------|------------------------------|----------|
| | Quai-peak | Average |
| 0.15 - 0.50 | 66 to 56 | 56 to 46 |
| 0.50 - 5 | 56 | 46 |
| 5 - 30 | 60 | 50 |

NOTE:

- The lower limit shall apply at the band edges.
- The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.6.2 Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10 2013.

B. Equipments List:

Please reference ANNEX A(1.5).

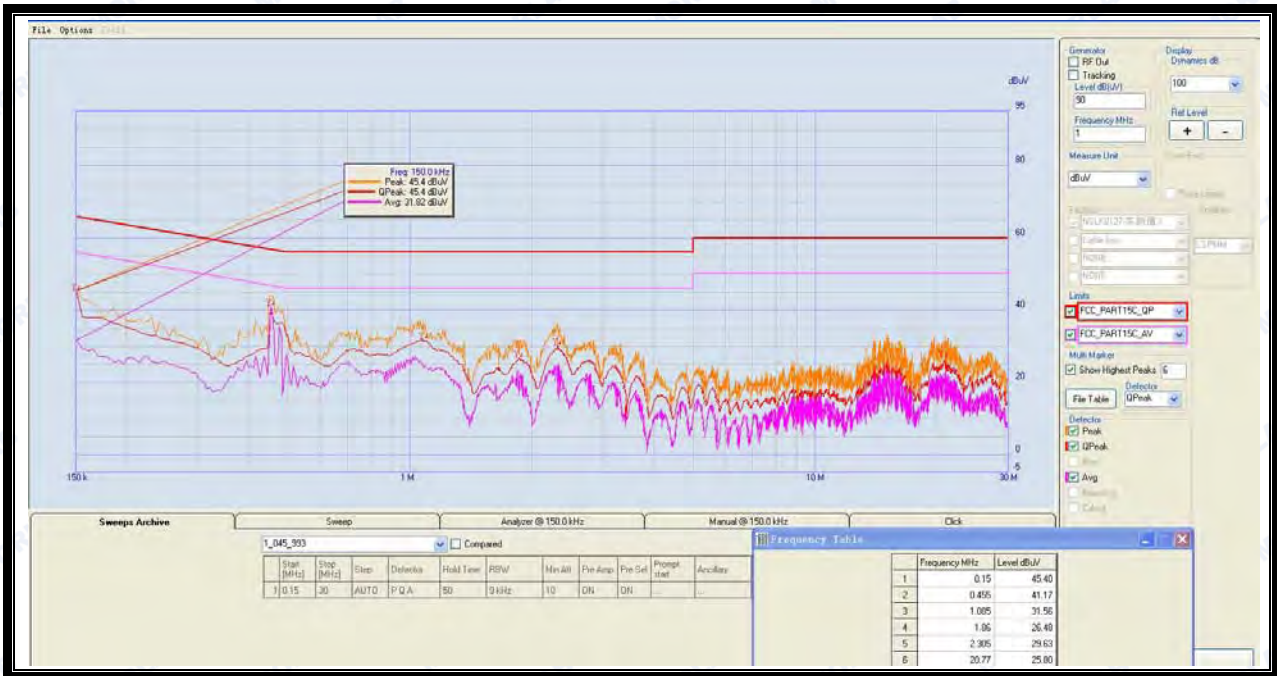
2.6.3 Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

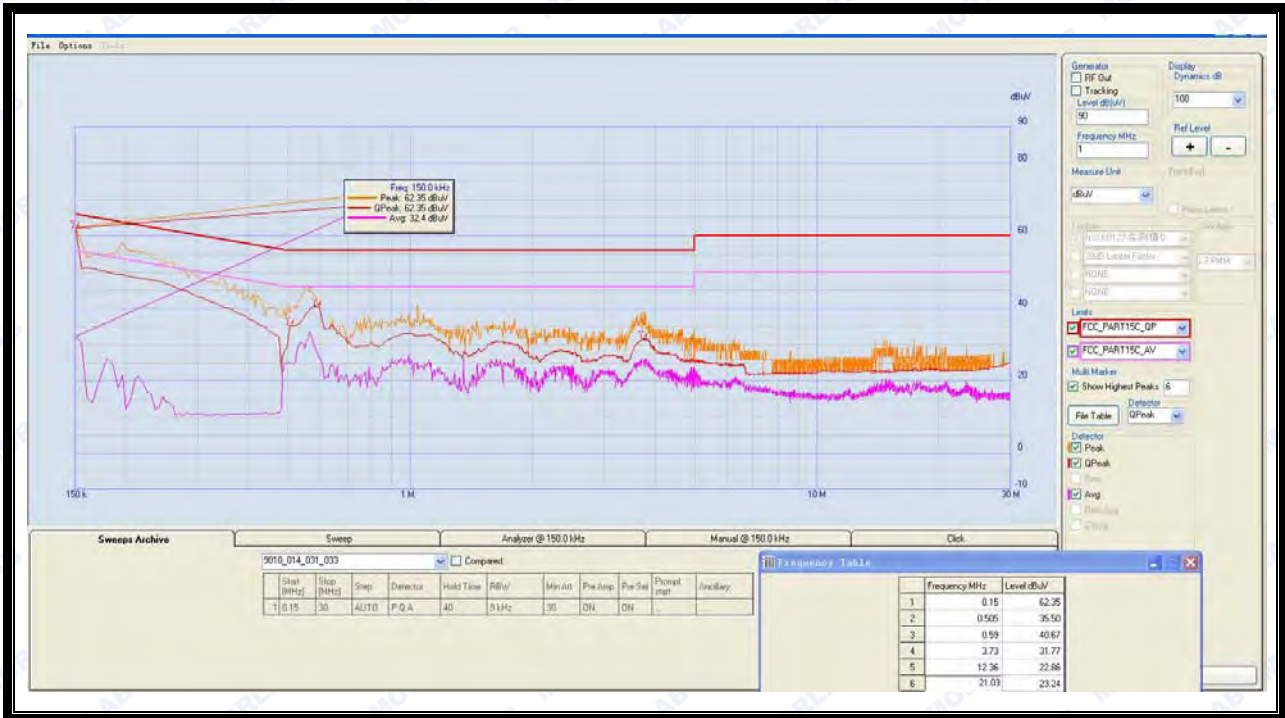
A. Test setup:

The EUT configuration of the emission tests is EUT + Link.

B. Test Plots:



(Plot A: L Phase)



(Plot B: N Phase)



2.7 Radiated Emission

2.7.1 Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 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 ($\mu\text{V}/\text{m}$) | Measurement Distance (m) |
|-----------------|---|--------------------------|
| 0.009 - 0.490 | 2400/F(kHz) | 300 |
| 0.490 - 1.705 | 24000/F(kHz) | 30 |
| 1.705 - 30.0 | 30 | 30 |
| 30 - 88 | 100 | 3 |
| 88 - 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

Note:

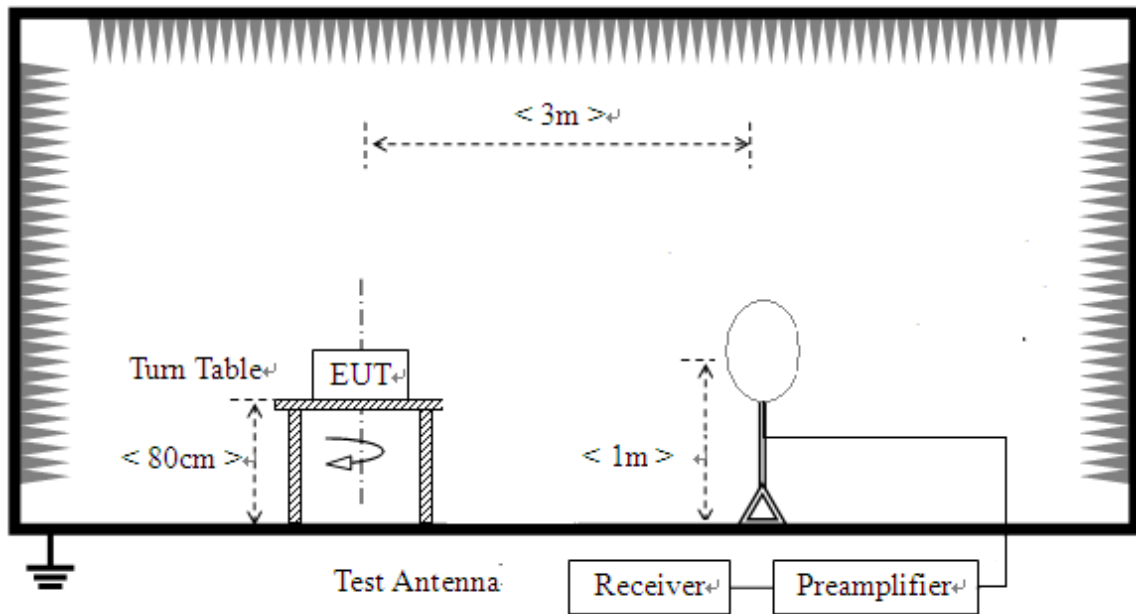
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

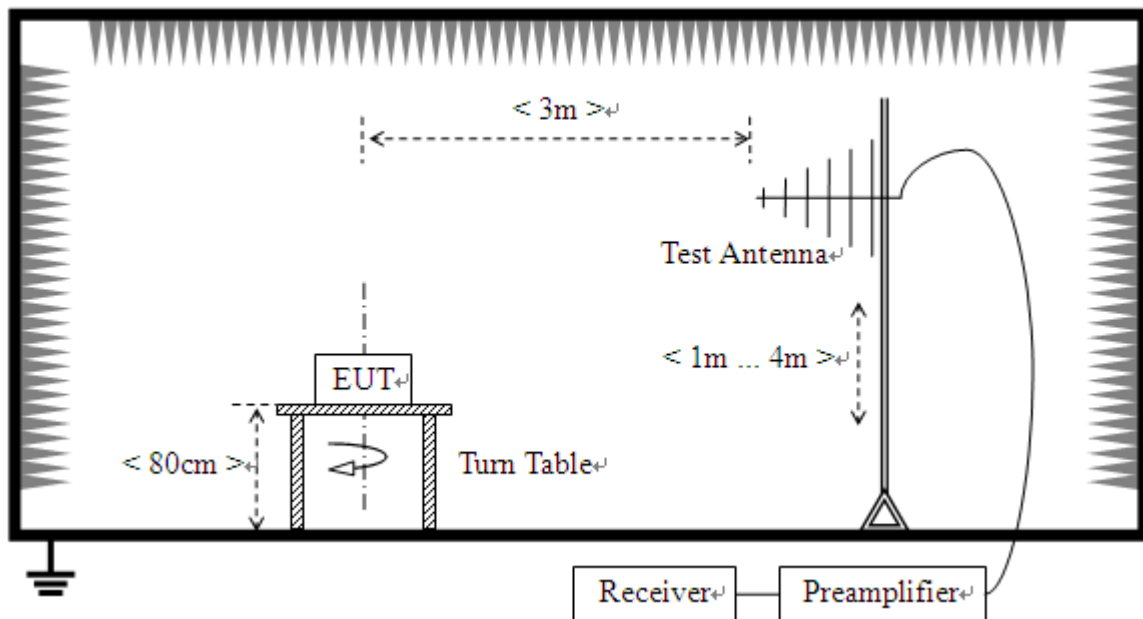
2.7.2 Test Description

A. Test Setup:

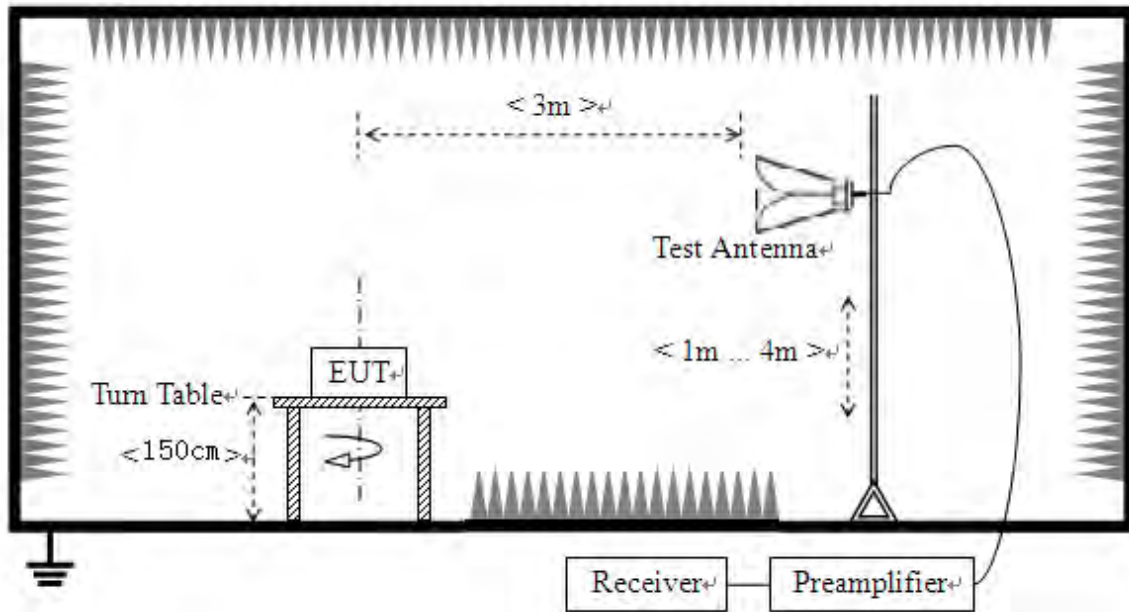
- 1) For radiated emissions from 9kHz to 30MHz



- 2) For radiated emissions from 30MHz to 1GHz



3) For radiated emissions above 1GHz



The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10 (2013). For radiated emissions below or equal to 1GHz, The EUT was set-up on insulator 80cm above the Ground Plane, For radiated emissions above 1GHz, The EUT was set-up on insulator 150cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

- (a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna.



The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.

(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

B. Equipments List:

Please reference ANNEX A(1.5).

2.7.3 Test Result

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

$$E \text{ [dB}\mu\text{V/m]} = U_R + A_T + A_{\text{Factor}} \text{ [dB]}; A_T = L_{\text{Cable loss}} \text{ [dB]} - G_{\text{preamp}} \text{ [dB]}$$

A_T : Total correction Factor except Antenna

U_R : Receiver Reading

G_{preamp} : Preamplifier Gain

A_{Factor} : Antenna Factor at 3m

During the test, the total correction Factor A_T and A_{Factor} were built in test software.

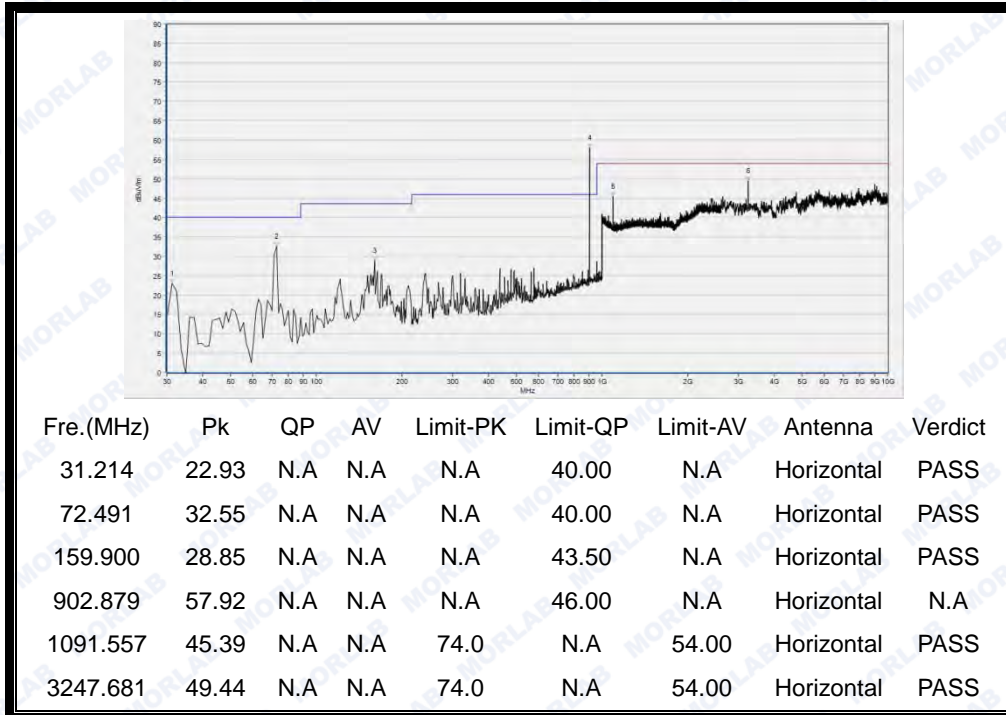
Note: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

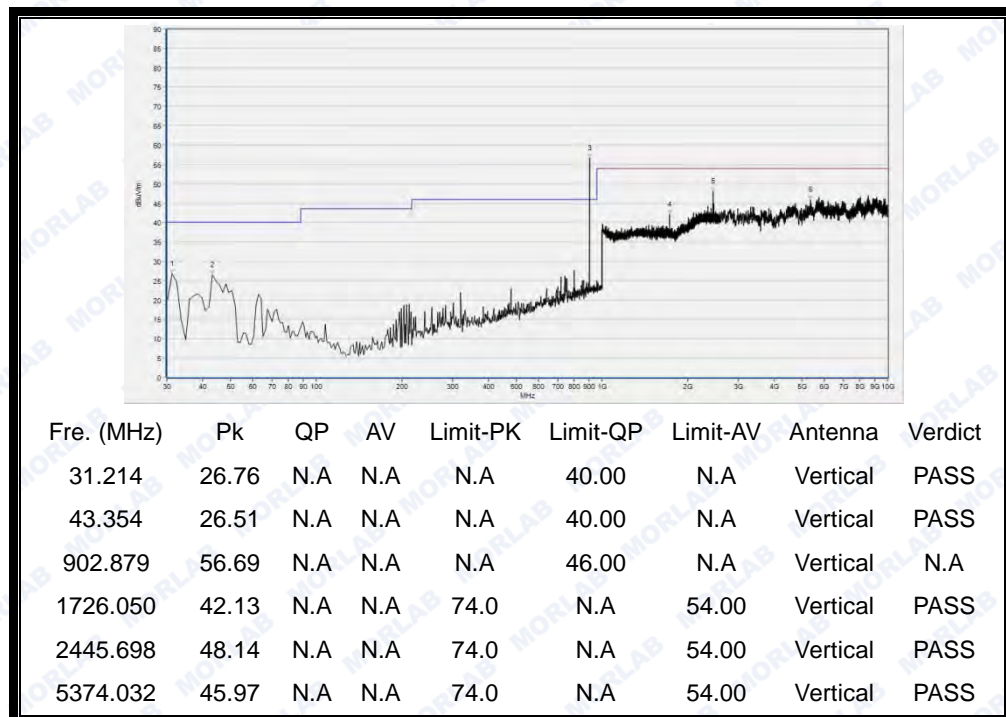


A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 64



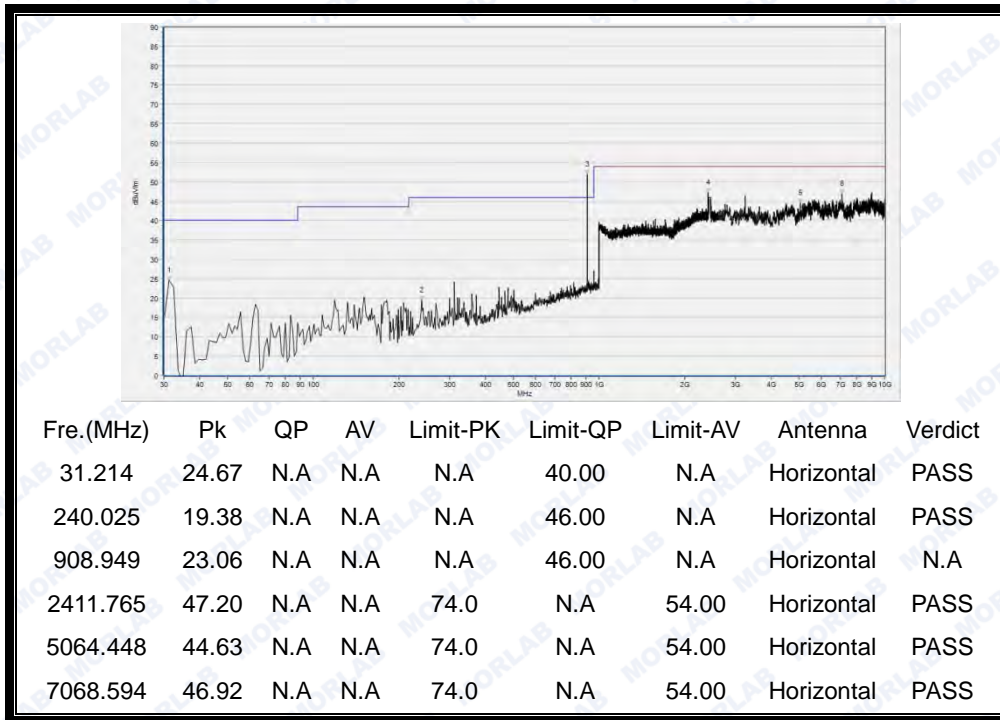
(Antenna Horizontal, 30MHz to 10GHz)



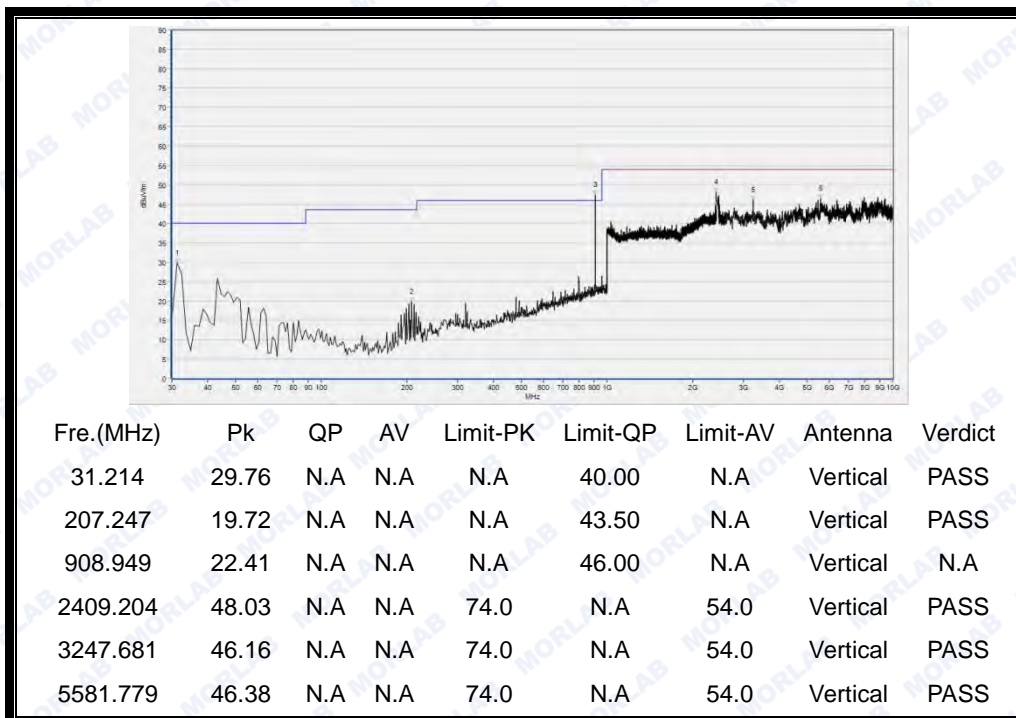
(Antenna Vertical, 30MHz to 10GHz)



Plot for Channel = 68



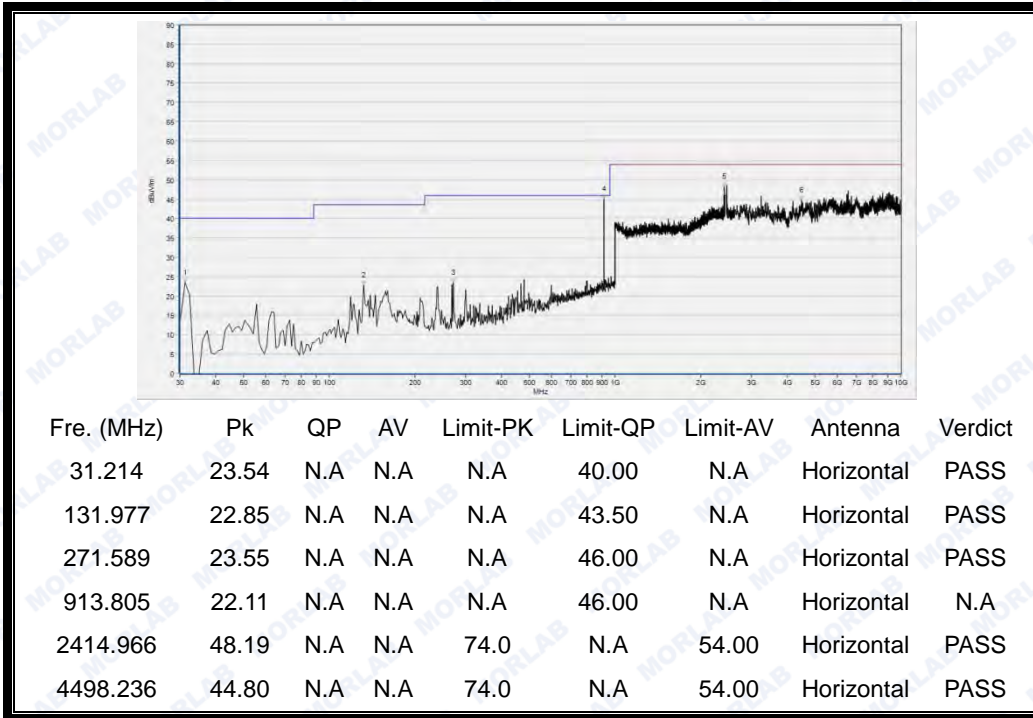
(Antenna Horizontal, 30MHz to 10GHz)



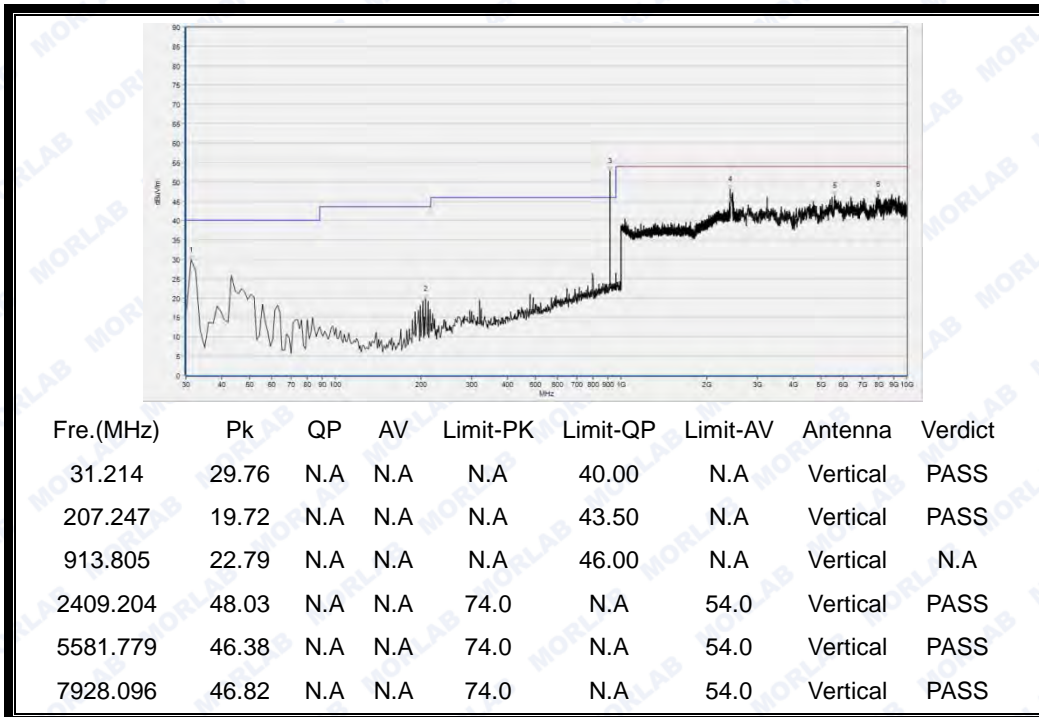
(Antenna Vertical, 30MHz to 10GHz)



Plot for Channel = 71



(Antenna Horizontal, 30MHz to 10GHz)



(Antenna Vertical, 30MHz to 10GHz)



ANNEX A GENERAL INFORMATION

1.1 Identification of the Responsible Testing Laboratory

| | |
|-------------------------------|--|
| Company Name: | Shenzhen Morlab Communications Technology Co., Ltd. |
| Department: | Morlab Laboratory |
| Address: | FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China |
| Responsible Test Lab Manager: | Mr. Su Feng |
| Telephone: | +86 755 36698555 |
| Facsimile: | +86 755 36698525 |

1.2 Identification of the Responsible Testing Location

| | |
|----------|--|
| Name: | Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory |
| Address: | FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China |

1.3 Facilities and Accreditations

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

All measurement facilities used to collect the measurement data are located at FL.1, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10 2013 and CISPR Publication 22; the FCC registration number is 695796.

1.4 Maximum measurement uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

| Measurements | Frequency | Uncertainty |
|---------------------|----------------|-------------|
| Conducted emissions | 9KHz~30MHz | 2.44dB |
| Radiated emissions | 9KHz~30MHz | 2.44dB |
| | 30MHz~200MHz | 2.93dB |
| | 200MHz~1000MHz | 2.95dB |
| | 1GHz~18GHz | 2.26dB |
| | 18GHz~40GHz | 1.94dB |



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

1.5 Test Equipments Utilized

1.5.1 Conducted Test Equipments

| Conducted Test Equipment | | | | | | |
|--------------------------|-----------------------------------|------------|---------|--------------|------------|------------|
| No. | Equipment Name | Serial No. | Type | Manufacturer | Cal. Date | Cal. Due |
| 1 | Spectrum Analyzer | MY45101810 | E4407B | Agilent | 2016.03.02 | 2017.03.01 |
| 2 | USB Wideband Power Sensor | MY54210011 | U2021XA | Agilent | 2016.03.02 | 2017.03.01 |
| 3 | EXA Signal Analyzer | MY53470838 | N9010A | Agilent | 2016.03.02 | 2017.03.01 |
| 4 | RF cable | CB01 | RF01 | Morlab | N/A | N/A |
| 5 | Attenuator | (n.a.) | 10dB | Resnet | N/A | N/A |
| 6 | SMA connector <small>Note</small> | CN01 | RF03 | HUBER-SUHNER | N/A | N/A |

Note: The SMA antenna connector is soldered on the PCB board in order to perform conducted tests and this SMA antenna connector is listed in the equipment list.

1.5.2 Radiated Test Equipments

| Radiated Test Equipments | | | | | | |
|--------------------------|--------------------------|------------|-------------|---------------|------------|--------------|
| No | Equipment Name | Serial No. | Type | Manufacturer | Cal. Date | Cal.Due Date |
| 1 | System Simulator | GB45360846 | 8960-E5515C | Agilent | 2016.03.02 | 2017.03.01 |
| 2 | Receiver | MY54130016 | N9038A | Agilent | 2016.03.02 | 2017.03.01 |
| 3 | Test Antenna - Bi-Log | N/A | VULB9163 | Schwarzbeck | 2016.03.02 | 2017.03.01 |
| 4 | Test Antenna - Horn | 9170C-531 | BBHA9170 | Schwarzbeck | 2016.03.02 | 2017.03.01 |
| 5 | Test Antenna - Loop | 1519-022 | FMZB1519 | Schwarzbeck | 2016.03.02 | 2017.03.01 |
| 6 | Test Antenna - Horn | 71688 | BBHA 9120D | Schwarzbeck | 2016.03.02 | 2017.03.01 |
| 7 | Coaxial cable(N male) | CB02 | EMC02 | Morlab | N/A | N/A |
| 8 | Coaxial cable(N male) | CB03 | EMC03 | Morlab | N/A | N/A |
| 9 | 1-18GHz pre-Amplifier | MA02 | TS-PR18 | Rohde&Schwarz | 2016.03.02 | 2017.03.01 |
| 10 | 18-26.5GHz pre-Amplifier | MA03 | TS-PR18 | Rohde&Schwarz | 2016.03.02 | 2017.03.01 |



1.5.3 Climate Chamber

| Climate Chamber | | | | | | |
|-----------------|-----------------|------------|---------|--------------|------------|--------------|
| No. | Equipment Name | Serial No. | Type | Manufacturer | Cal.Date | Cal.Due Date |
| 1 | Climate Chamber | 2004012 | HL4003T | Yinhe | 2016.03.02 | 2017.03.01 |

1.5.4 Vibration Table

| Vibration Table | | | | | | |
|-----------------|-----------------|------------|---------------|--------------|------------|--------------|
| No. | Equipment Name | Serial No. | Type | Manufacturer | Cal.Date | Cal.Due Date |
| 1 | Vibration Table | N/A | ACT2000-S015L | CMI-COM | 2016.03.02 | 2017.03.01 |

1.5.5 Anechoic Chamber

| Anechoic Chamber | | | | | | |
|------------------|------------------|------------|----------|--------------|------------|--------------|
| No. | Equipment Name | Serial No. | Type | Manufacturer | Cal.Date | Cal.Due Date |
| 1 | Anechoic Chamber | N/A | 9m*6m*6m | Changning | 2016.03.02 | 2017.03.01 |

1.5.6 Auxiliary Test Equipment

| Auxiliary Test Equipment | | | | | | |
|--------------------------|----------------|------------|--------|--------------|----------|--------------|
| No. | Equipment Name | Serial No. | Type | Manufacturer | Cal.Date | Cal.Due Date |
| 1 | Computer | N.A | PU500C | Asus | N.A | N.A |

***** END OF REPORT *****