RF TEST REPORT

Report No.: 18070022-FCC-R2-V1

Supersede Report No.: N/A

Applicant	Horizon Hobby, LLC
Product Name	Glimpse
Model No.	BLH2202
Serial No.	N/A
Test Standard	FCC Part 15.407: 2016, ANSI C63.10: 2013 IC RSS-247; Issue 2 , February 2017 ; IC RSS-Gen : Issue 4 , November 2014 ; ANSIC 63.10:2013
Test Date	January 05 to 26, 2018
Issue Date	February 09, 2018
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Aaron Liang	David Huang	
Aaron Liang Test Engineer	David Huang Checked By	

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Test result presented in this test report is applicable to the tested sample only

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

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Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
18070022-FCC-R2	NONE	Original	January 27, 2018
18070022-FCC-R2-V1	V1	Updated the Operating Frequency	February 09, 2018

2. Customer information

Applicant Name	Horizon Hobby, LLC
Applicant Add	4105 Fieldstone Road, Champaign, IL 61822, USA
Manufacturer	Yuneec International(China) Co., Ltd
Manufacturer Add	No.388 East Zhengwei Road, Jinxi Town, Kunshan, Jiangsu, 215324, China

3. Test site information

Test Lab A:

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	535293
IC Test Site No.	4842E-1
Test Software	Radiated Emission Program-To Shenzhen v2.0

Test Lab B:

Lab performing tests	BV 7LAYERS COMMUNICATION TRCHNOLOGY(SHENZHEN)CO.,LTD
Lab Address	No. B102, Dazu Cuangxin Mansion, North of Beihuan Avenue, North Area, Hi-Tech Industry Park, Nanshan District Shenzhen, Guangdong China
FCC Test Site No.	525120

Note: We just perform Radiated Spurious Emission above 18GHz in the test Lab. B.

4. Equipment under Test (EUT) Information

Description of EUT:	Glimpse
Main Model:	BLH2202
Serial Model:	N/A
Date EUT received:	January 05, 2018
Test Date(s):	January 05 to 26, 2018
Equipment Category：	NII
Antenna Gain:	2.4G: 1dBi WIFI(5745-5825MHz): 1dBi
Antenna Type:	Internal antenna
Type of Modulation:	2.4G: GFSK 802.11: OFDM(BPSK/QPSK/16QAM/64QAM/256QAM)
Number of Channels:	2.4G: 40CH WIFI : 24CH
RF Operating Frequency (ies):	2.4G: 2404-2476 MHz 802.11a: 5745-5825 MHz； (TX/RX)
Max. Output Power:	802.11a: 10.96dBm
Max. Output Power:	802.11a: 11.96dBm
Port:	Please refer to the user’ s manual
Trade Name：	N/A
FCC ID:	BRWBLH2202MD

IC	6157A-BLH2202MD
Product HW/SW version:	A. Software: 1.0
Radio HW/SW version:	B. Software: 2.0
Test SW version:	1

5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

FCC/IC Rules	Description of Test	Result
§15.407 (i), §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.407 (a)(1) RSS-Gen [4.6]	DTS (99%&26 dB) CHANNEL BANDWIDTH	Compliance
§15.407 (e) RSS-Gen [4.6]	DTS (99%&6 dB) CHANNEL BANDWIDTH	Compliance
§15.407(a/1/2) RSS247 (6.2.2.(1); 6.2.3.(1); 6.2.4.(1)	Conducted Maximum Output Power	Compliance
§15.407(a/1/2) RSS247 (6.2.2.(1); 6.2.3.(1); 6.2.4.(1)	Maximum Power Spectral Density	Compliance
§15.407(a)(6) RSS247 (6.2.2.(2); 6.2.3.(2); 6.2.4.(2)	Bandedge	Compliance
§15.207 (a) RSS-Gen [7.2.4]	AC Power Line Conducted Emissions	N/A
§15.205, §15.209, §15.247(b/1/2/3/6) RSS-Gen [7.2.5]	Radiated Spurious Emissions & Unwanted Emissions into Restricted Frequency Bands	Compliance

6. Measurements, Examination And Derived Results

6.1 §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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. 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.
The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.

b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has 2 antennas:
A permanently attached internal antenna for 2.4G the gain for 2.4G is 1dBi
A permanently attached internal antenna for 5.8G, the gain for 5.8G is 1dBi.

Result: Pass

6.2 §15.407(a)-DTS (99% &26 dB) Channel Bandwidth

1. Conducted Measurement

   EUT was set for low, mid, high channel with modulated mode and highest RF output power.

   The spectrum analyzer was connected to the antenna terminal.

2. Environmental Conditions

Temperature	27°C
Relative Humidity	55%
Atmospheric Pressure	1023mbar

3. Conducted Emissions Measurement Uncertainty

   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.

4. Test date : January 22, 2018

   Tested By : Aaron Liang

Standard Requirement:

None; for reporting purposes only.

Procedures:

99% Bandwidth:

1. Set center frequency to the nominal EUT channel center frequency
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. he video bandwidth (VBW) ≥ 3 x RBW.
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used
6. Use the 99 % power bandwidth function of the instrument (if available)
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning

at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the

difference between these two frequencies.

Emission Bandwidth (EBW)

1) Set RBW = approximately 1% of the emission bandwidth.
2) Set the VBW > RBW.
3) Detector = Peak.
4) Trace mode = max hold.
5) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust

Test Result: Pass.

Please refer to the following tables and plots.

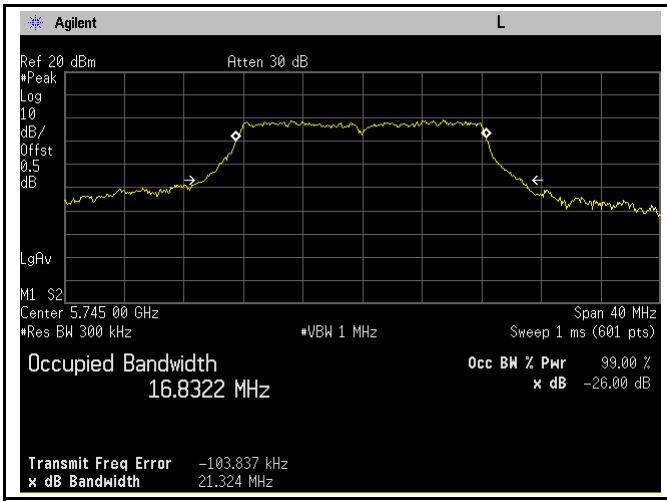
Measurement result

Test mode	Freq Band (MHz)	CH	Freq (MHz)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
802.11a	5745-5825	Low	5745	16.8322	21.324
		Mid	5785	16.8641	22.866
		High	5825	16.8173	22.638

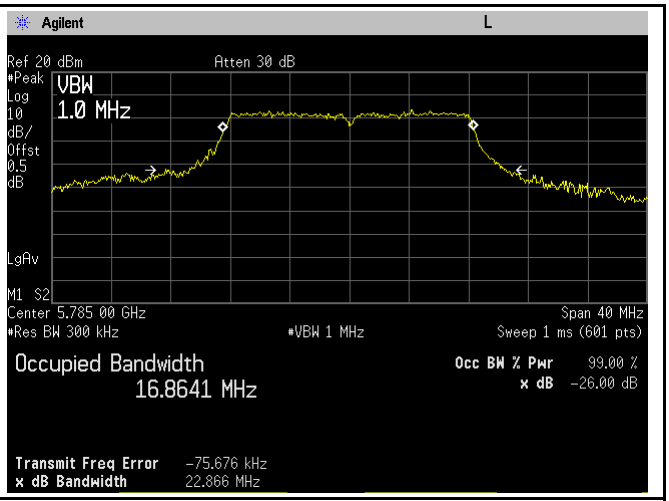
Test Plots

Bandwidth measurement result

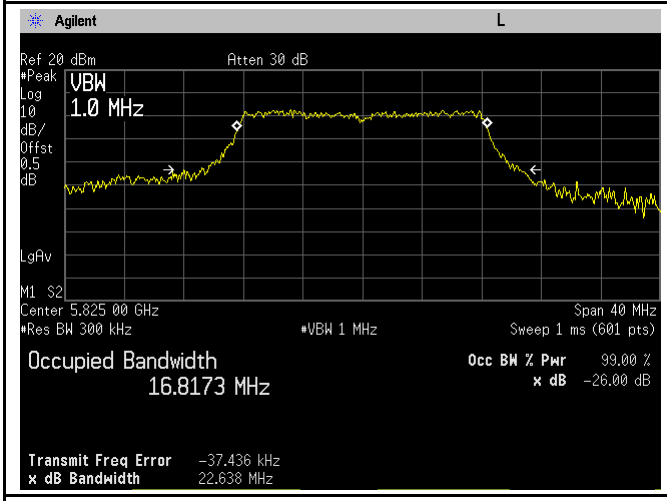
802.11a



5745-5825MHz Bandwidth - Low CH 5745



5745-5825MHz Bandwidth - Mid CH 5785



5745-5825MHz Bandwidth - High CH 5825

6.3 §15.407(a)-DTS (99% &6 dB) Channel Bandwidth

1. Conducted Measurement

   EUT was set for low, mid, high channel with modulated mode and highest RF output power.

   The spectrum analyzer was connected to the antenna terminal.

2. Environmental Conditions

Temperature	27℃
Relative Humidity	55%
Atmospheric Pressure	1023mbar

3. Conducted Emissions Measurement Uncertainty

   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.

4. Test date : January 22, 2018

   Tested By : Aaron Liang

Standard Requirement:

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Procedures:

99% &6 dB Bandwidth:

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

a) Set RBW = 100 kHz.

b) Set the video bandwidth (VBW) ≥ 3 × RBW.

c) Detector = Peak.

d) Trace mode = max hold.

e) Sweep = auto couple.

f) Allow the trace to stabilize.

g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

Emission Bandwidth (EBW)

1) Set RBW = approximately 1% of the emission bandwidth.

2) Set the VBW > RBW.

3) Detector = Peak.

4) Trace mode = max hold.

5) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust

Test Result: Pass.

Please refer to the following tables and plots.

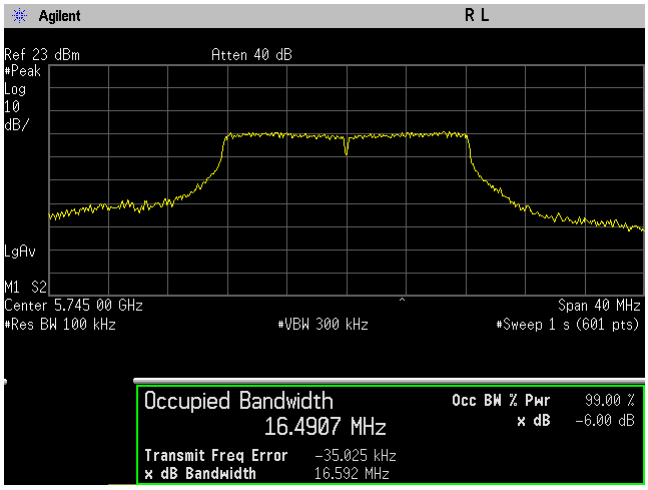
Measurement result

Test mode	Freq Band (MHz)	CH	Freq (MHz)	99% Occupied Bandwidth (MHz)	6dB Bandwidth (MHz)
802.11a	5745-5825	Low	5745	16.4907	16.592
		Mid	5785	16.4859	16.584
		High	5825	16.4718	16.569

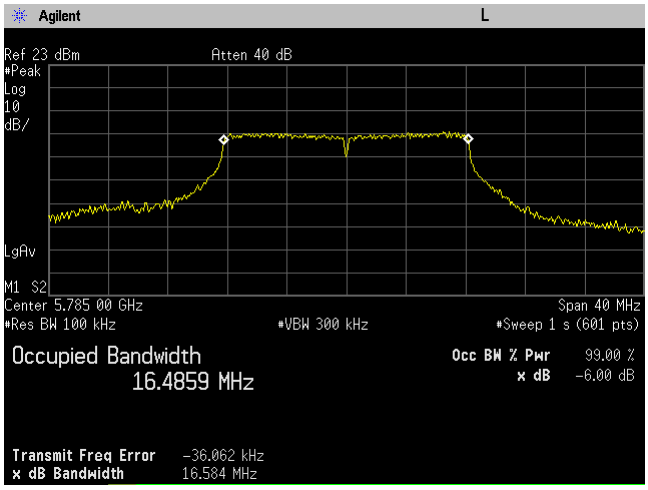
Test Plots (Bandwidth measurement result)

5745-5825MHz

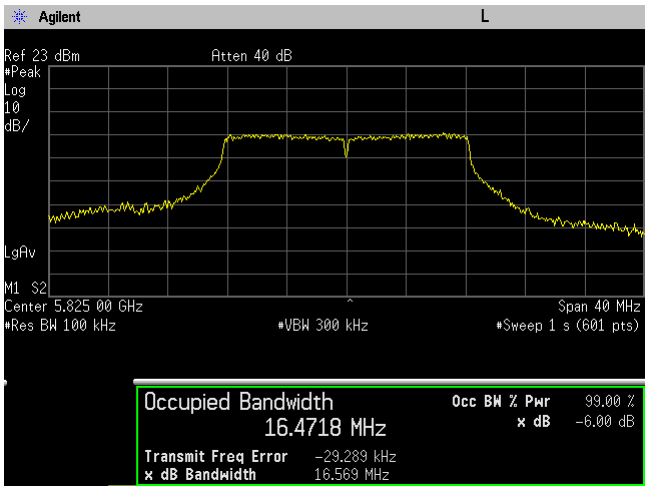
802.11 a



5745-5825MHz Bandwidth - Low CH 5745



5745-5825MHz Bandwidth - Mid CH 5785



5745-5825MHz Bandwidth - High CH 5825

6.4 §15.407(a)-Conducted Maximum Output Power

1. Conducted Measurement
   EUT was set for low, mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.
3. Environmental Conditions

Temperature	25°C
Relative Humidity	55%
Atmospheric Pressure	1017mbar

4. Test date: January 23, 2018

   Tested By : Aaron Liang

Standard Requirement:

For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. f transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Procedures:

Measurement Procedure Maximum conducted output power:

Maximum conducted output power may be measured using a spectrum analyzer/EMI receiver or an RF power meter.

1. Device Configuration

If possible, configure or modify the operation of the EUT so that it transmits continuously at its maximum power control level (see section II.B.).

a) The intent is to test at 100 percent duty cycle; however a small reduction in duty cycle (to no lower than 98 percent) is permitted if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

b) If continuous transmission (or at least 98 percent duty cycle) cannot be achieved due to hardware limitations (e.g., overheating), the EUT shall be operated at its maximum power control level with the transmit duration as long as possible and the duty cycle as high as possible.

2. Measurement using a Power Meter (PM)

a) Method PM (Measurement using an RF average power meter):

(i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.

- The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
- At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.

• The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

(ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section II.B.
(iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
(iv) Adjust the measurement in dBm by adding 10 log(1/x) where x is the duty cycle (e.g., 10

log(1/0.25) if the duty cycle is 25 percent).

Test Result: Pass.

Please refer to the following tables and plots:

Output Power measurement result

Test mode	Freq Band (MHz)	CH	Frequency (MHz)	Conducted Power (dBm)	E.I.R.P (dBm)	Limit (dBm)	Result
802.11a	5745-5825	Low	5745	10.95	11.95	30	Pass
		Mid	5785	10.74	11.74	30	Pass
		High	5825	10.96	11.96	30	Pass

6.5 §15.407(a) - Power Spectral Density

1. Conducted Measurement

   EUT was set for low, mid, high channel with modulated mode and highest RF output power.

   The spectrum analyzer was connected to the antenna terminal.

2. Environmental Conditions

Temperature	25°C
Relative Humidity	55%
Atmospheric Pressure	1017mbar

3. Conducted Emissions Measurement Uncertainty

   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.

4. Test date : January 23, 2018

   Tested By : Aaron Liang

Standard Requirement:

The maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

The maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional

gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII
device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Procedures:

The rules requires " maximum power spectral density" measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission.

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, " Compute power…" . (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)

2. Use the peak search function on the instrument to find the peak of the spectrum and record its value.

3. Make the following adjustments to the peak value of the spectrum, if applicable:

a) If Method SA-2 or SA-2 Alternative was used, add 10 log(1/x), where x is the duty cycle, to the peak of the spectrum.

b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.

4. The result is the Maximum PSD over 1 MHz reference bandwidth.

5. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, " provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and

integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ≥ 1/T, where T is defined in section II.B.I.a).

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10log(1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 KHz for the sections 5.c) and 5.d) above, since RBW=100 KHZ is available on nearly all spectrum analyzers.

Test Result: Pass.

Please refer to the following tables and plots.

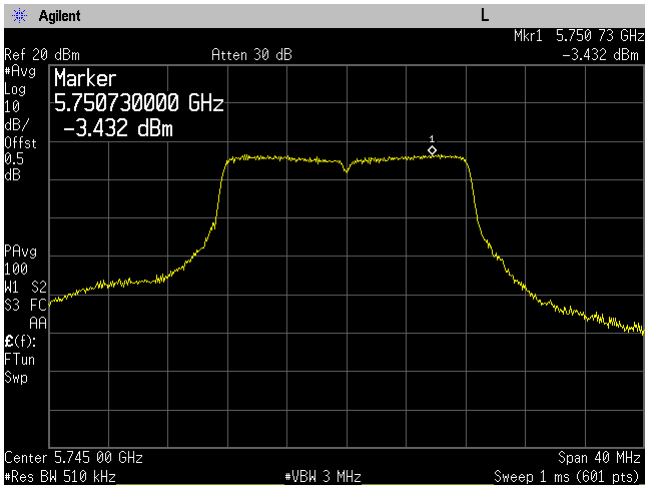
Power Spectral Density measurement result

Test mode	Freq Band (MHz)	CH	Frequency (MHz)	Measured PSD (dBm)	Limit (dBm)	Result
802.11a	5745-5825	Low	5745	-3.432	30	Pass
		Mid	5785	-3.565	30	Pass
		High	5825	0.109	30	Pass

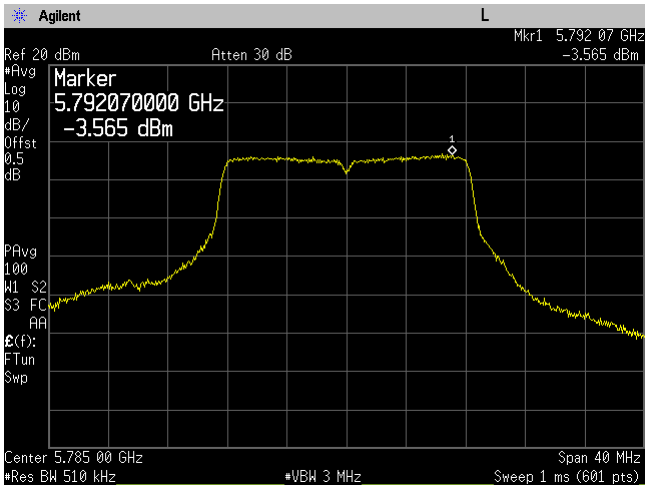
Test Plots

Power Spectral Density measurement result Test Plots

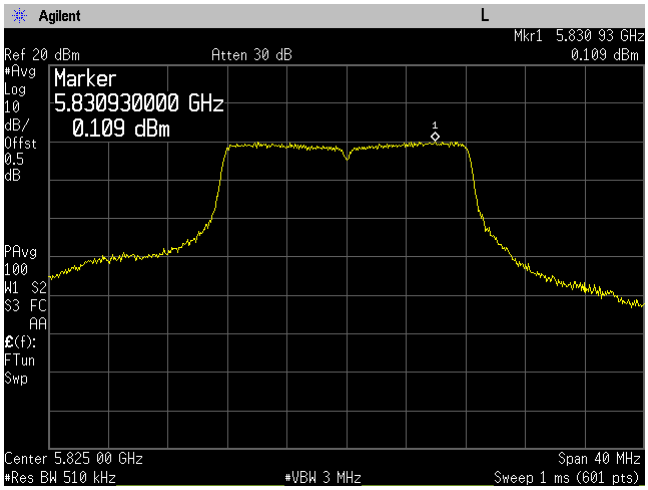
802.11a



Low CH 5745



Mid CH 5785



High CH 5825

6.6 §15.407(1) and b(4) Band-Edge

1. Conducted Measurement

   EUT was set for low, mid, high channel with modulated mode and highest RF output power.

   The spectrum analyzer was connected to the antenna terminal.

2. Environmental Conditions

Temperature	25°C
Relative Humidity	55%
Atmospheric Pressure	1017mbar

3. Conducted Emissions Measurement Uncertainty

   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.

4. Test date : January 23, 2018

   Tested By : Aaron Liang

Standard Requirement:

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of − 27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of − 27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of − 27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:

Procedures:

Measurement Procedure Band edge:

Bandedge are measured by setting the analyzer as follows:

(i) RBW = 1 MHz.

(ii) VBW ≥ 3 MHz.

(iii) Detector = Peak.

(iv) Sweep time = auto.

(v) Trace mode = max hold.

(vi) Allow sweeps to continue until the trace stabilizes. Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately 1/x, where x is the duty cycle. For example, at 50 percent duty cycle, the measurement time will increase by a factor of two relative to measurement time for continuous transmission.

Unwanted band-edge emissions may be measured using either of the special band-edge measurement techniques (the marker-delta or integration methods) described below. Note that the marker-delta method is primarily a radiated measurement technique that requires the 99% occupied bandwidth edge to be within 2 MHz of the authorized band edge, whereas the integration method can be used in either a radiated or conducted measurement without any special requirement with regards to the displacement of the unwanted emission(s) relative to the authorized bandwidth.

(i) Marker-Delta Method.

The marker-delta method, as described in ANSI C63.10, can be used to perform measurements of the radiated unwanted emissions level of emissions provided that the 99% occupied bandwidth of the fundamental is within 2 MHz of the authorized band-edge..

(ii) Integration Method •

For maximum emissions measurements, follow the procedures described in section II.G.5., " Procedures for Unwanted Maximum Emissions Measurements above 1000 MHz" , except for the following changes:

◦ Set RBW = 100 kHz

◦ Set VBW ≥ 3 • RBW

◦ Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured. CAUTION: You must ensure that the spectrum analyzer or EMI

receiver is set for peak-detection and max-hold for this measurement.

• For average emissions measurements, follow the procedures described in section II.G.6., " Procedures for Average Unwanted Emissions Measurements above 1000 MHz" , except for the following changes:

◦ Set RBW = 100 kHz

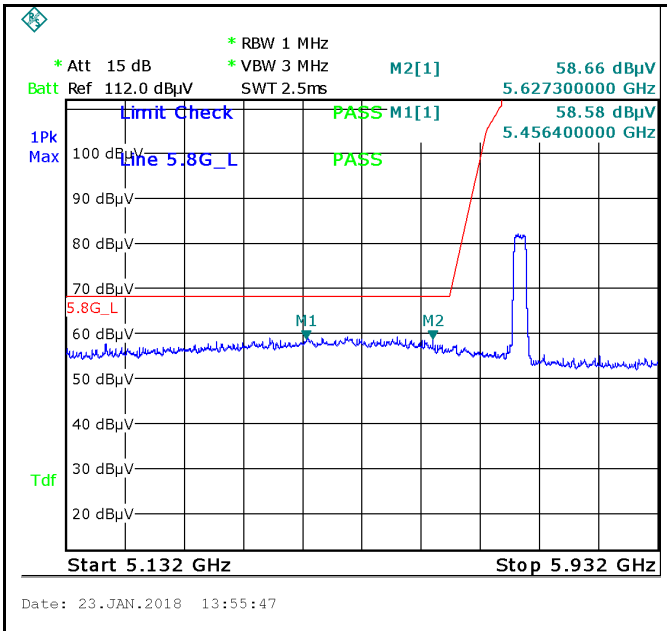
◦ Set VBW ≥ 3 • RBW

◦ Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured.

Test Result: Pass.

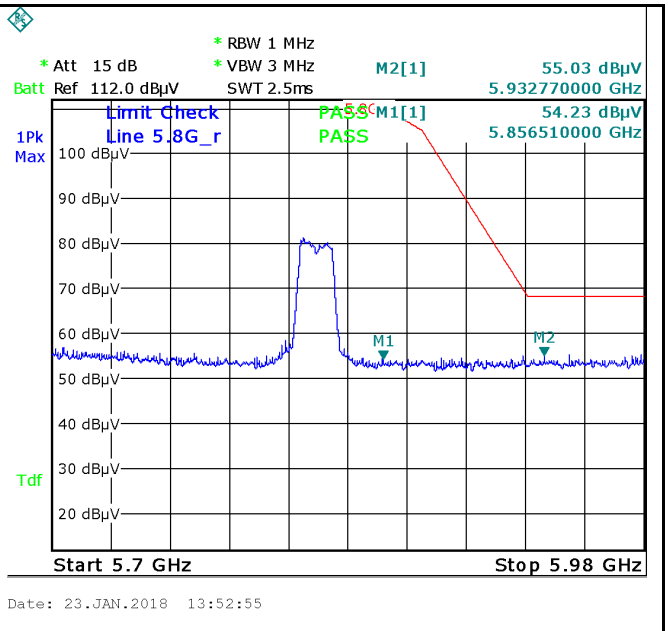
Please refer to the following plots.

5745-5825MHz



Band Edge, Left Side (Peak) - a

Note: F1 is frequency 4500MHz;



Band Edge, Right Side (Peak) - a

Note: F1 is frequency 5200MHz

6.7 §15.207 (a) - AC Power Line Conducted Emissions

Requirement:

Frequency of emission (MHz)	Conducted limit (dBμ V)	
	Quasi-peak	Average
0.15– 0.5	66 to 56*	56 to 46*
0.5– 5	56	46
5– 30	60	50

*Decreases with the logarithm of the frequency.

Procedures:

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is ±3.5dB.
4. Environmental Conditions

Temperature	22°C
Relative Humidity	57%
Atmospheric Pressure	1005mbar

5. Test date: --------
   Tested By :---------

Result: N/A

Note: The BLH2202 is powered by battery, so it is no need to test against this item.

6.8 §15.209, §15.205 & §15.407(b) - Radiated Spurious Emissions & Unwanted Emissions into Restricted Frequency Bands

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 1GHz & 1GHz above (3m & 10m) is +/-6dB.
4. Environmental Conditions

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1023mbar

5. Test date : January 27, 2018
   Tested By : Aaron Liang

Requirement: §15.407(b) specifies that emissions which fall in the restricted bands, as defined in **§15.205(a)**, must comply with the radiated emission limits specified in **§15.209(a)**.

Procedures:

Radiated Spurious Emissions Measurement

An additional consideration when performing conducted measurements of restricted band emissions is that unwanted emissions radiating from the EUT cabinet, control circuits, power leads, or intermediate circuit elements will likely go undetected in a conducted measurement configuration. To address this concern, a radiated test shall be performed to ensure that emissions emanating from the EUT cabinet (rather than the antenna port) also comply with the applicable limits.

For these radiated spurious emission measurements the EUT transmit antenna may be replaced with a termination matching the nominal impedance of the antenna. Established procedures for performing radiated measurements shall be used (see C63.10). All detected emissions must comply with the applicable limits.

Measurement Detectors

§15.35(a) specifies that on frequencies less than and below 1000 MHz, the radiated emissions limits assume the use of a CISPR quasi-peak detector function and related measurement bandwidths. §15.35(b) specifies that on frequencies above 1000 MHz, the radiated emissions limits assume the use of an average detector and a minimum resolution bandwidth of 1 MHz. In addition, §15.35(b) that when average radiated emissions measurements are specified there is also a limit on the peak emissions level which is 20 dB above the applicable maximum permitted average emission limit. These specifications also apply to conducted emissions measurements.

1. CISPR Quasi-Peak Measurement

The specifications for the measuring instrument using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Frequency Interference (CISPR) of the International Electrotechnical Commission.

As an alternative to CISPR quasi-peak measurement, compliance can be demonstrated to the applicable emission limits using a peak detector.

2. Peak Power Measurement Procedure

Utilize the peak power measurement procedure specified in Section 8.1.1 with the following modifications:

Set analyzer center frequency to the frequency associated with the restricted band emission under examination.

Set RBW = 1 MHz.

Note that if the peak measured value complies with the average limit, it is not necessary to perform a separate average measurement. If this option is exercised, it should be so noted in the test report.

3. Average Power Measurement Procedures

The average restricted band emission levels must be measured with the EUT transmitting continuously (≥ 98% duty cycle) at its maximum power control level. Optionally, video triggering/signal gating can be used to ensure that measurements are performed only when the EUT is transmitting at its maximum power control level.

The average power measurement procedures described in Section 8.2 shall be used with the following modifications:

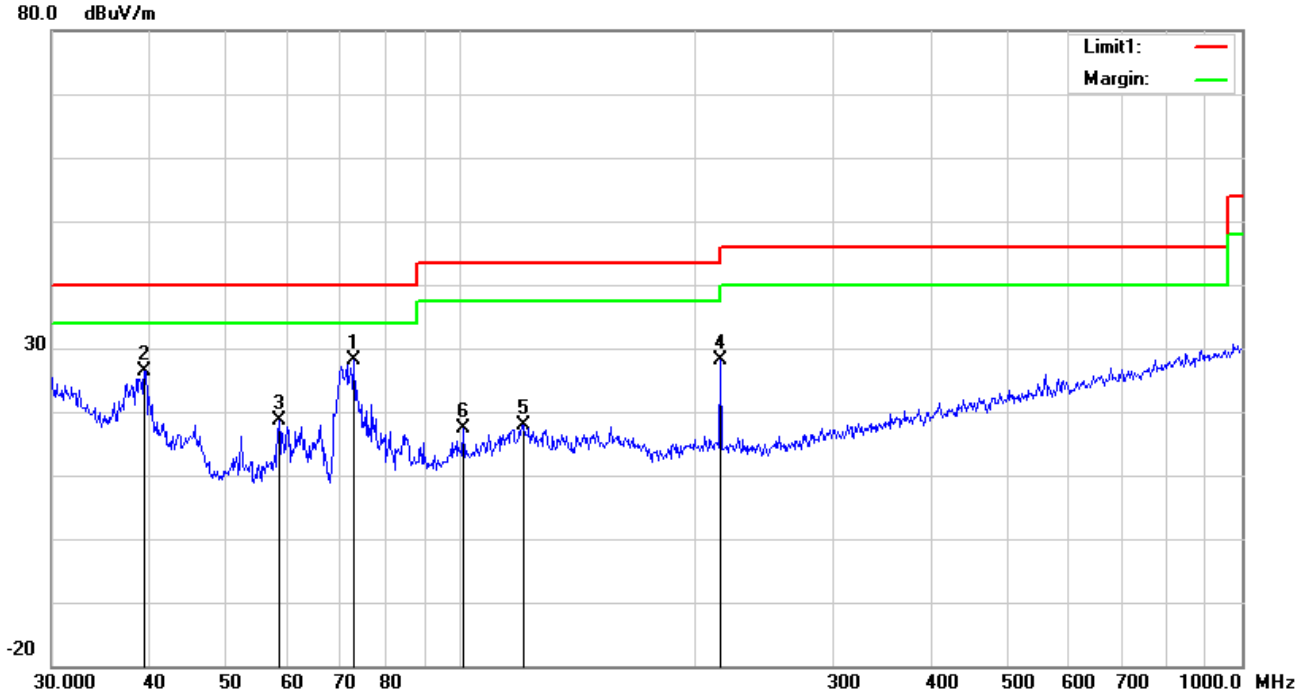
Set analyzer center frequency to the frequency associated with the restricted band emission.

Set span to at least 1 MHz.

Use peak marker function to determine the highest amplitude within the RBW (1 MHz).

Test Mode:	Transmitting Mode

(Below 1GHz)

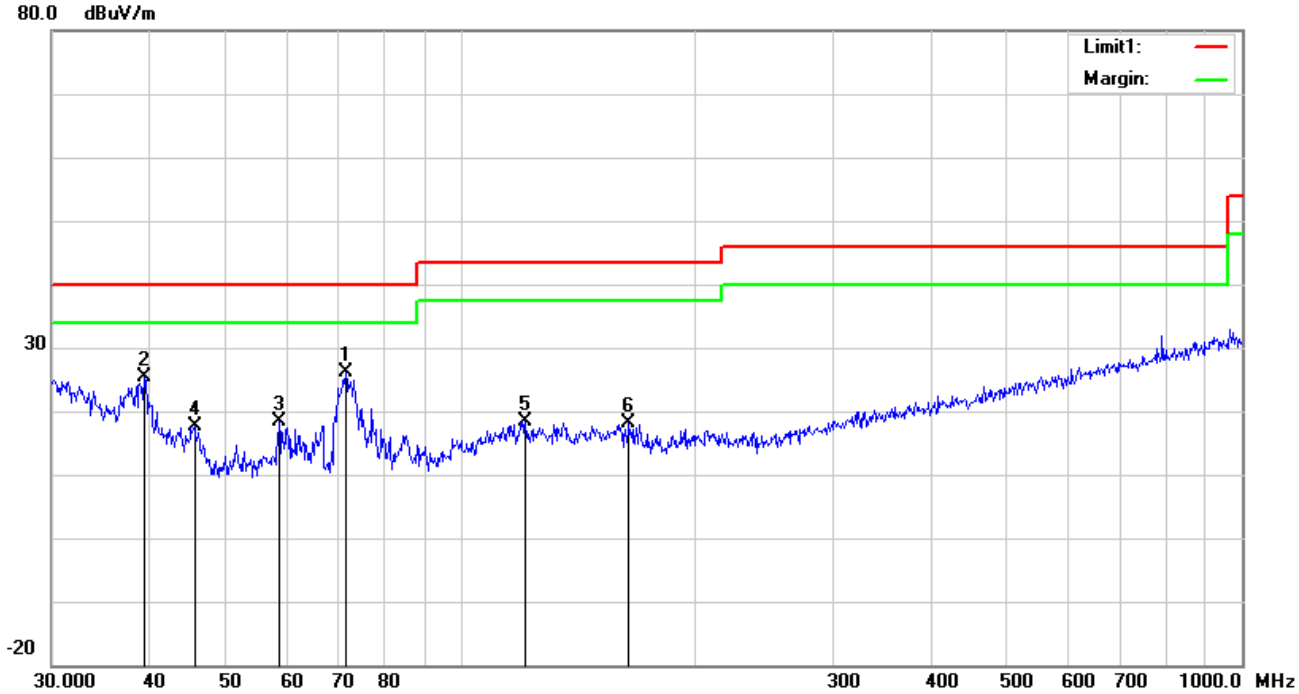


Test Data

Vertical Polarity Plot @3m

No.	P/L	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	H	73.1025	41.91	peak	7.74	22.39	0.97	28.23	40.00	-11.77	100	334
2	H	39.4372	33.57	peak	14.31	22.28	0.79	26.39	40.00	-13.61	100	19
3	H	58.6126	32.90	peak	7.45	22.41	0.76	18.70	40.00	-21.30	100	296
4	H	215.2678	37.10	peak	11.89	22.35	1.59	28.23	43.50	-15.27	100	224
5	H	120.6991	25.14	peak	13.85	22.36	1.16	17.79	43.50	-25.71	100	50
6	H	100.9340	27.94	peak	10.56	22.32	1.12	17.30	43.50	-26.20	100	351

(Below 1GHz)



Test Data

Horizontal Polarity Plot @3m

No.	P/L	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	V	71.3300	39.71	peak	7.77	22.39	0.97	26.06	40.00	-13.94	100	18
2	V	39.4372	32.54	peak	14.31	22.28	0.79	25.36	40.00	-14.64	100	291
3	V	58.6126	32.63	peak	7.45	22.41	0.76	18.43	40.00	-21.57	100	307
4	V	45.6948	28.78	peak	10.29	22.30	0.76	17.53	40.00	-22.47	100	99
5	V	121.1231	25.84	peak	13.83	22.36	1.16	18.47	43.50	-25.03	100	158
6	V	164.3302	26.89	peak	12.25	22.27	1.38	18.25	43.50	-25.25	100	251

Above 1GHz

Test Mode:	Transmitting Mode

Low Channel (5745 MHz)

Frequency (MHz)	S.A. Reading (dBµV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11490	30.65	AV	V	40.15	12.46	39.93	43.33	54	-10.67
11490	30.73	AV	H	40.15	12.46	39.93	43.41	54	-10.59
11490	49.19	PK	V	40.15	12.46	39.93	61.87	74	-12.13
11490	50.37	PK	H	40.15	12.46	39.93	63.05	74	-10.95
10534	39.13	AV	V	39.9	10.56	46.94	42.65	54	-11.35
10534	36.79	AV	H	39.9	10.56	46.94	40.31	54	-13.69
10534	55.65	PK	V	39.9	10.56	46.94	59.17	74	-14.83
10534	57.21	PK	H	39.9	10.56	46.94	60.73	74	-13.27

Middle Channel (5785MHz)

Frequency (MHz)	S.A. Reading (dBµV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11570	32.59	AV	V	40.15	12.46	39.93	45.27	54	-8.73
11570	29.23	AV	H	40.15	12.46	39.93	41.91	54	-12.09
11570	49.9	PK	V	40.15	12.46	39.93	62.58	74	-11.42
11570	47.53	PK	H	40.15	12.46	39.93	60.21	74	-13.79
13096	27.57	AV	V	40.64	13.81	46.55	35.47	54	-18.53
13096	24.11	AV	H	40.64	13.81	46.55	32.01	54	-21.99
13096	44.33	PK	V	40.64	13.81	46.55	52.23	74	-21.77
13096	47.28	PK	H	40.64	13.81	46.55	55.18	74	-18.82

High Channel (5825 MHz)

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11650	28.88	AV	V	40.15	12.46	39.93	41.56	54	-12.44
11650	28.32	AV	H	40.15	12.46	39.93	41	54	-13
11650	53.01	PK	V	40.15	12.46	39.93	65.69	74	-8.31
11650	49.05	PK	H	40.15	12.46	39.93	61.73	74	-12.27
17894	26.59	AV	V	42.43	19.36	43.66	44.72	54	-9.28
17894	23.86	AV	H	42.43	19.36	43.66	41.99	54	-12.01
17894	45.32	PK	V	42.43	19.36	43.66	63.45	74	-10.55
17894	46.74	PK	H	42.43	19.36	43.66	64.87	74	-9.13

Note:

1, The testing has been conformed to 40GHz;
2, All other emissions more than 30 dB below the limit
3, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.
4, The radiated spurious test above 18GHz is subcontracted to "BV 7LAYERS COMMUNICATION TRCHNOLOGY(SHENZHEN)CO.,LTD" Laboratories. and found 30dB below the limit at least.

6.9 ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

Test Result:

The Duty Cycle is 100%.

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/15/2017	09/14/2018	☑
Power Splitter	1#	1#	08/30/2017	08/29/2018	☑
DC Power Supply	E3640A	MY40004013	09/15/2017	09/14/2018	☑
Radiated Emissions					
EMI test receiver	ESL6	100262	09/15/2017	09/14/2018	☑
Positioning Controller	UC3000	MF780208282	11/17/2017	11/16/2018	☑
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	08/30/2017	08/29/2018	☑
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/23/2017	03/22/2018	☑
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/19/2017	09/18/2018	☑
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/22/2017	09/21/2018	☑
Universal Radio Communication Tester	CMU200	121393	09/23/2017	09/22/2018	☑

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	Euroshieldpn-CT0001143-1216	May 06,17	May 05,18
Horn Antenna (18GHz-40GHz)	N/A	QWH-SL-18-40-K-SG/QMS-00361	15433	Dec. 15,17	Dec. 14,18
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A
10dB Attenuator	JFW/USA	50HF-010-SMA	1505	Jul. 24,17	Jul. 23,18
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Mar. 10,17	Mar. 09,18
Signal Pre-Amplifier	EMSI	EMC 184045B	980259	Jul. 24,17	Jul. 23,18

Annex A.ii. CONDUCTED EMISSIONS TEST DESCRIPTION

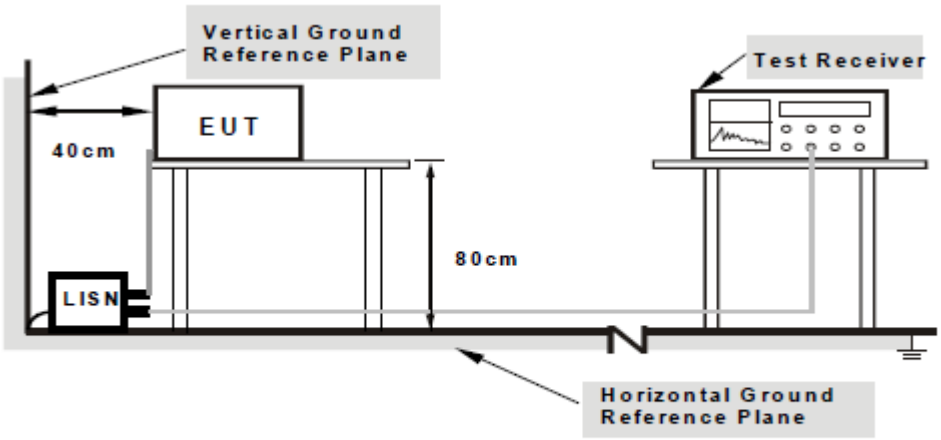
Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B.

2. The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains.

3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.

4. All other supporting equipments were powered separately from another main supply.



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration1.

Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.

2. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.

3. High peaks, relative to the limit line, were then selected.

4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. For FCC tests, only Quasi-peak measurements were made; while for CISPR/EN tests, both Quasi-peak and Average measurements were made.

5. Steps 2 to 4 were then repeated for the LIVE line (for AC mains) or DC line (for DC power).

Description of Conducted Emission Program

This EMC Measurement software run LabView automation software and offers a common user interface for electromagnetic interference (EMI) measurements. This software is a modern and powerful tool for controlling and monitoring EMI test receivers and EMC test systems. It guarantees reliable collection, evaluation, and documentation of measurement results. Basically, this program will run a pre-scan measurement before it proceeds with the final measurement. The pre-scan routine will run the common scan range from 150 kHz to 30 MHz; the program will first start a peak and average scan on selectable measurement time and step size. After the program complete the pre-scan, this program will perform the Quasi Peak and Average measurement, based on the pre-scan peak data reduction result.

Sample Calculation Example

At 20 MHz limit = 250 μV = 47.96 dBμV

Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.20 dB

Q-P reading obtained directly from EMI Receiver = 40.00 dBμV
(Calibrated for system losses)

Therefore, Q-P margin = 47.96 – 40.00 = 7.96 i.e. **7.96 dB below limit**

Annex A. iii RADIATED EMISSIONS TEST DESCRIPTION

EUT Characterisation

EUT characterisation, over the frequency range from 30MHz to 10th Harmonic , was done in order to minimise radiated emissions testing time while still maintaining high confidence in the test results.

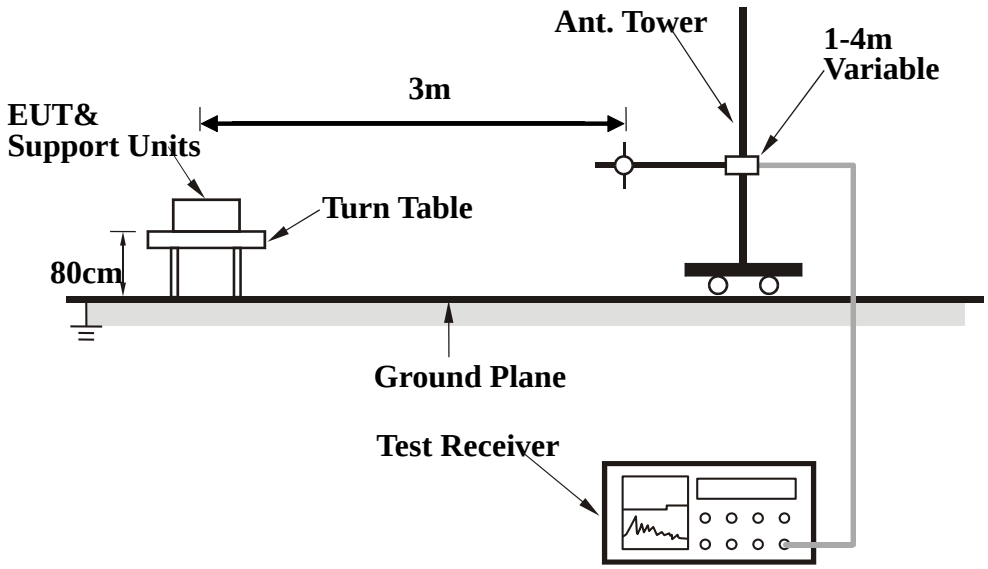
The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable manually, changing the antenna polarisation and manipulating the EUT cables while observing the frequency profile on the spectrum analyzer / receiver. Frequency points at which maximum emissions occurred, clock frequencies and operating frequencies were then noted for the formal radiated emissions test at the Open Area Test Site (OATS).

Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.

2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.

3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.



Test Method

The following procedure was performed to determine the maximum emission axis of EUT:
1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

Final Radiated Emission Measurement
1. Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function.

2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.

3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.

4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0。 to 360。with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.

5. Repeat step 4 until all frequencies need to be measured was complete.

6. Repeat step 5 with search antenna in vertical polarized orientations.

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	Peak	100 kHz	100 kHz

Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

Sample Calculation Example

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

Peak = Reading + Corrected Factor

where

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

And the average value is

Average = Peak Value + Duty Factor or

Set RBW = 1MHz, VBW = 10Hz.

Note :

If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.

Annex B. EUT

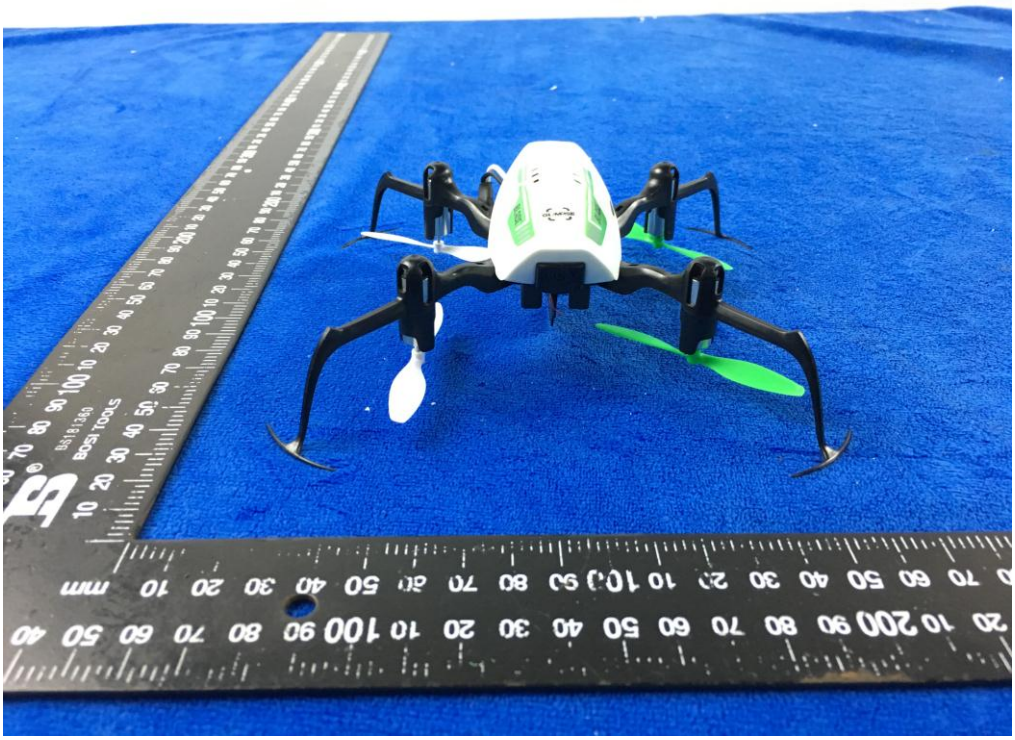
Annex B.i. Photograph: EUT External Photo

Whole package View

EUT - Front View

EUT - Rear View

EUT - Top View



EUT - Bottom View

EUT - Left View

EUT - Right View

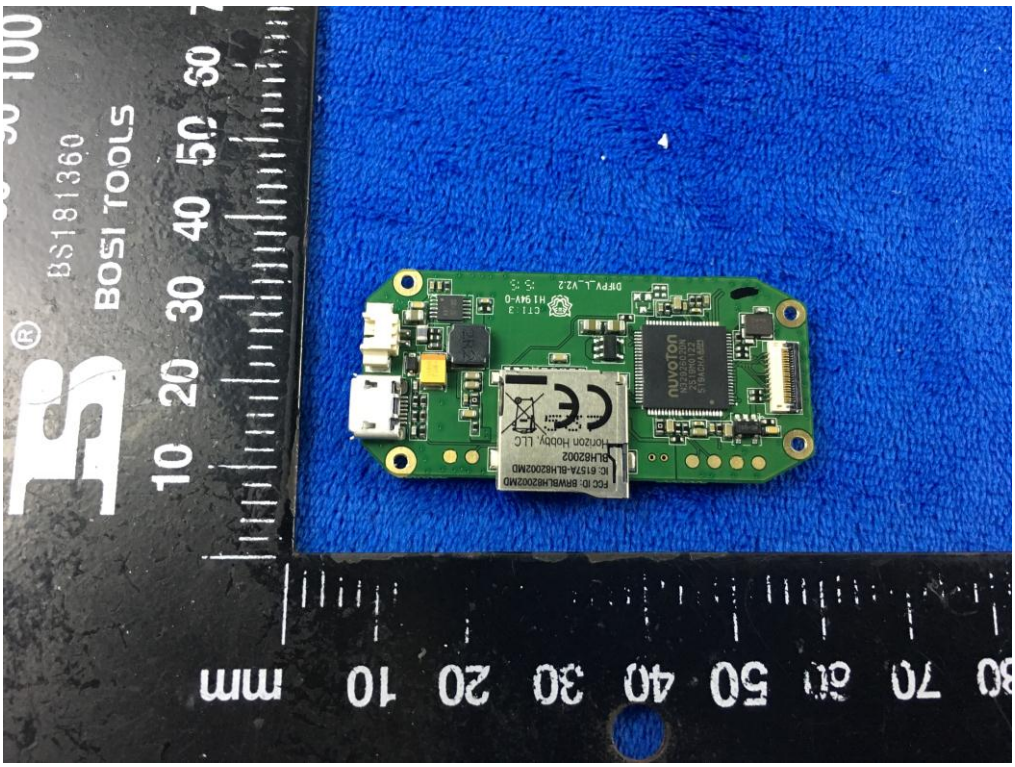
Annex B.ii. Photograph: EUT Internal Photo

Cover Off - Top View

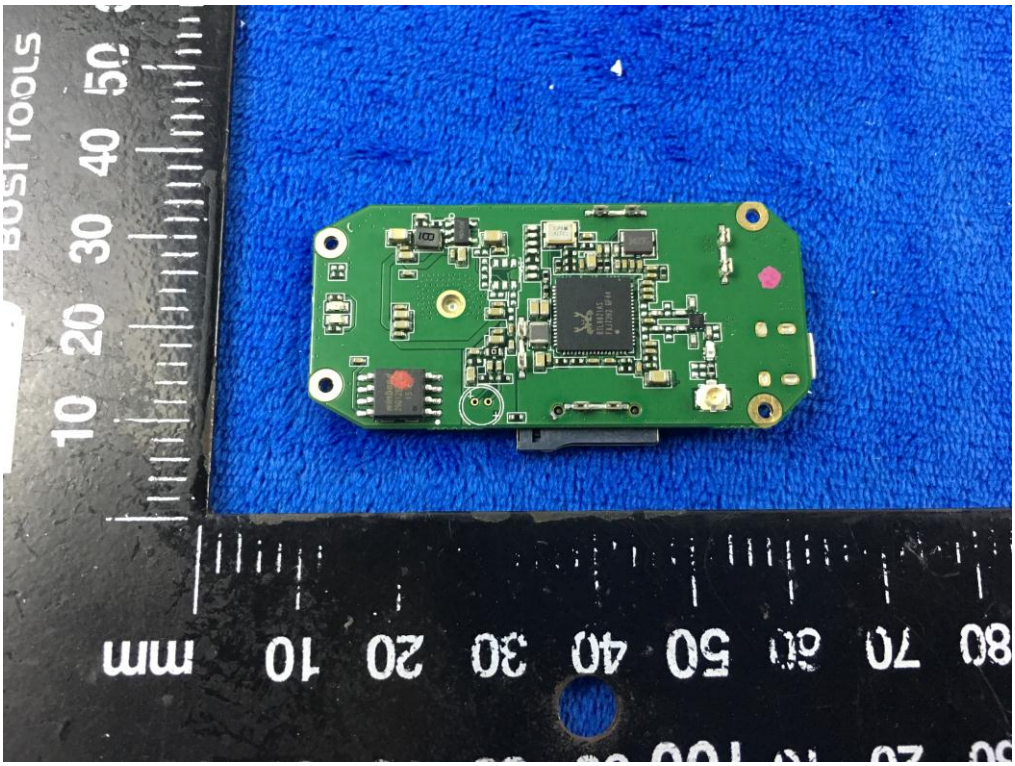
Battery - Front View

Battery - Rear View

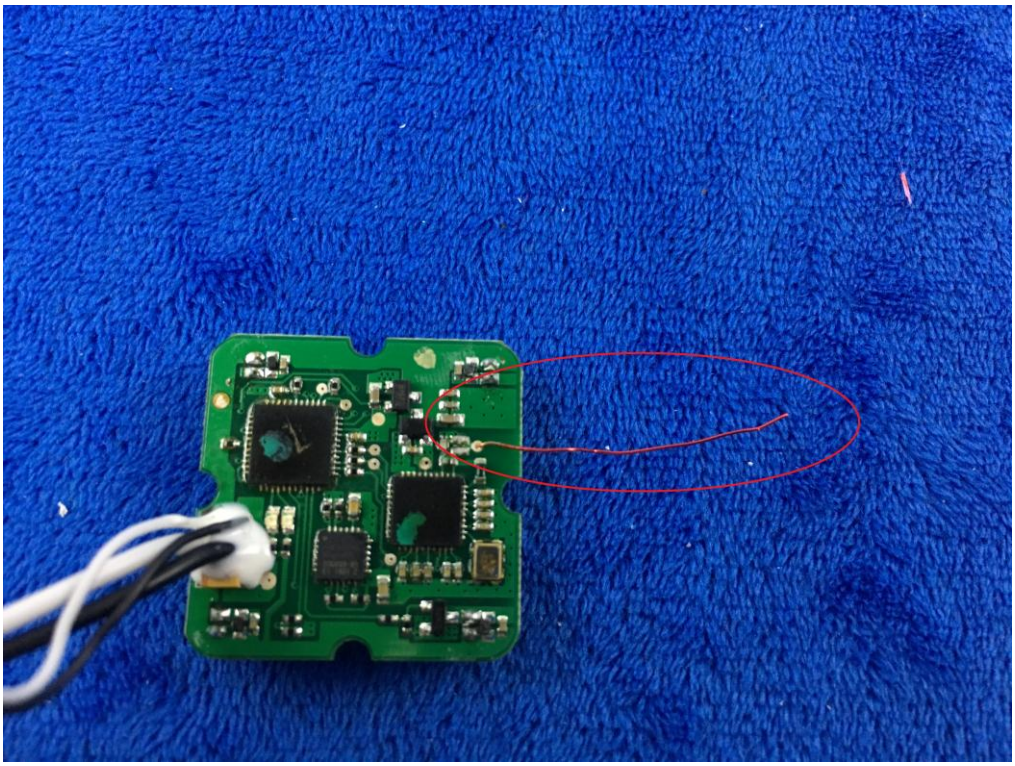
Mainboard - Front View



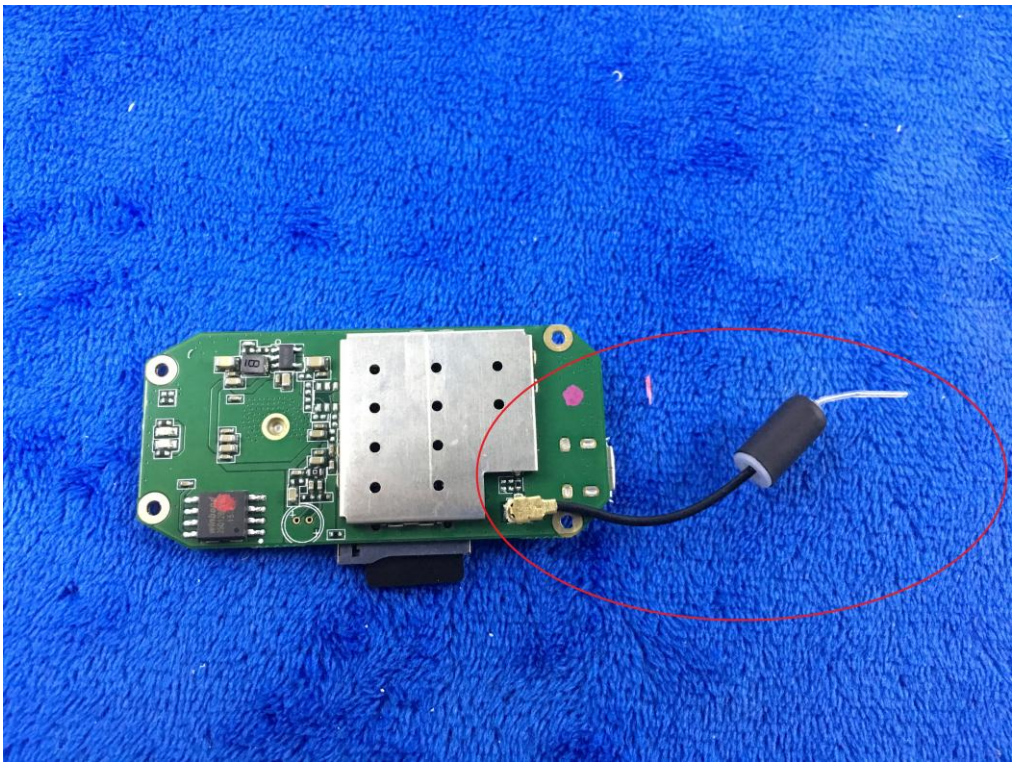
Mainboard - Rear View



2.4G - Antenna View

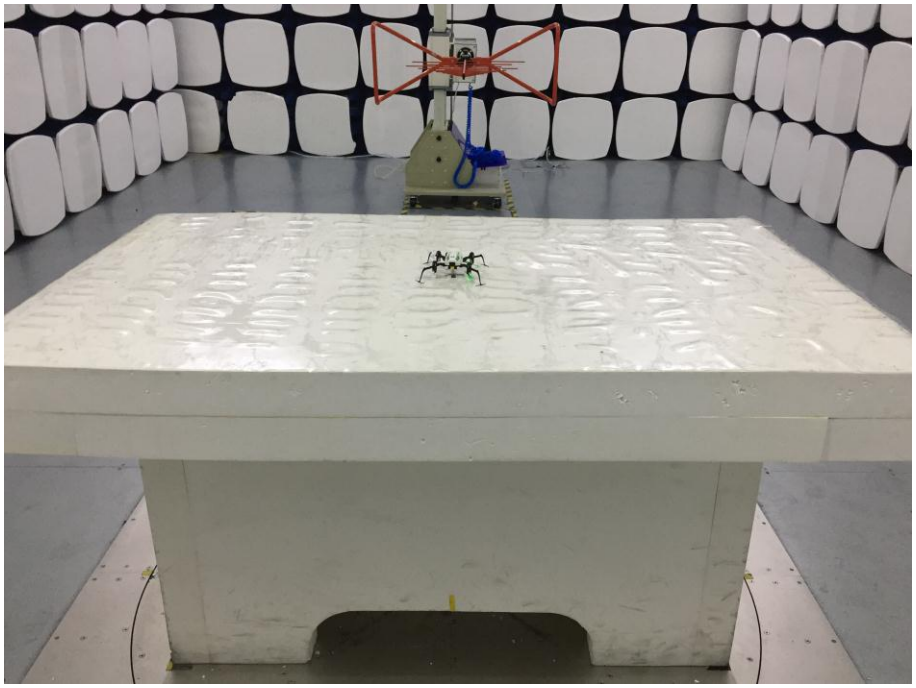


5.8G - Antenna View

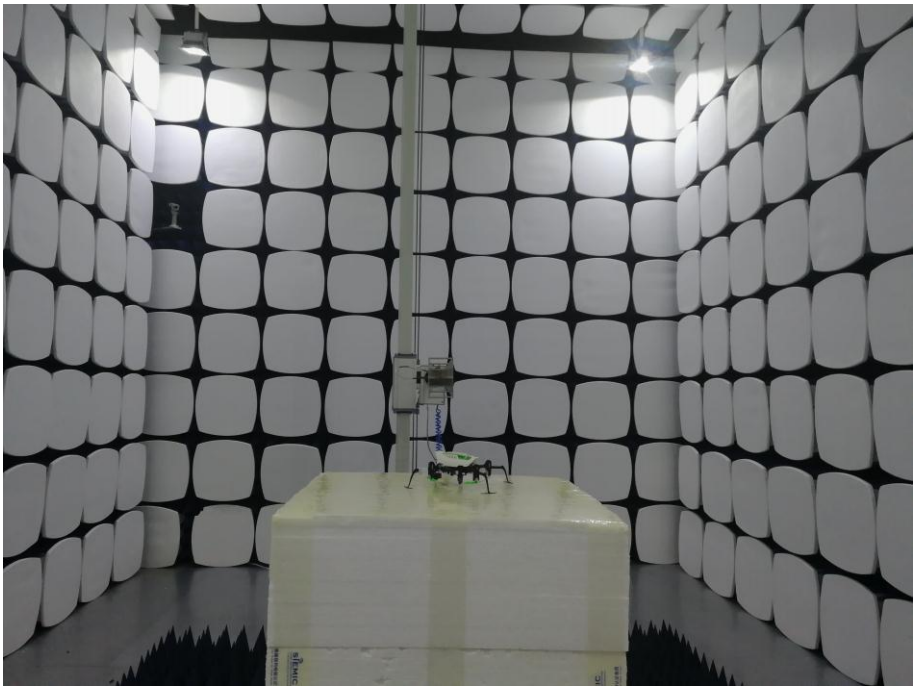


Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

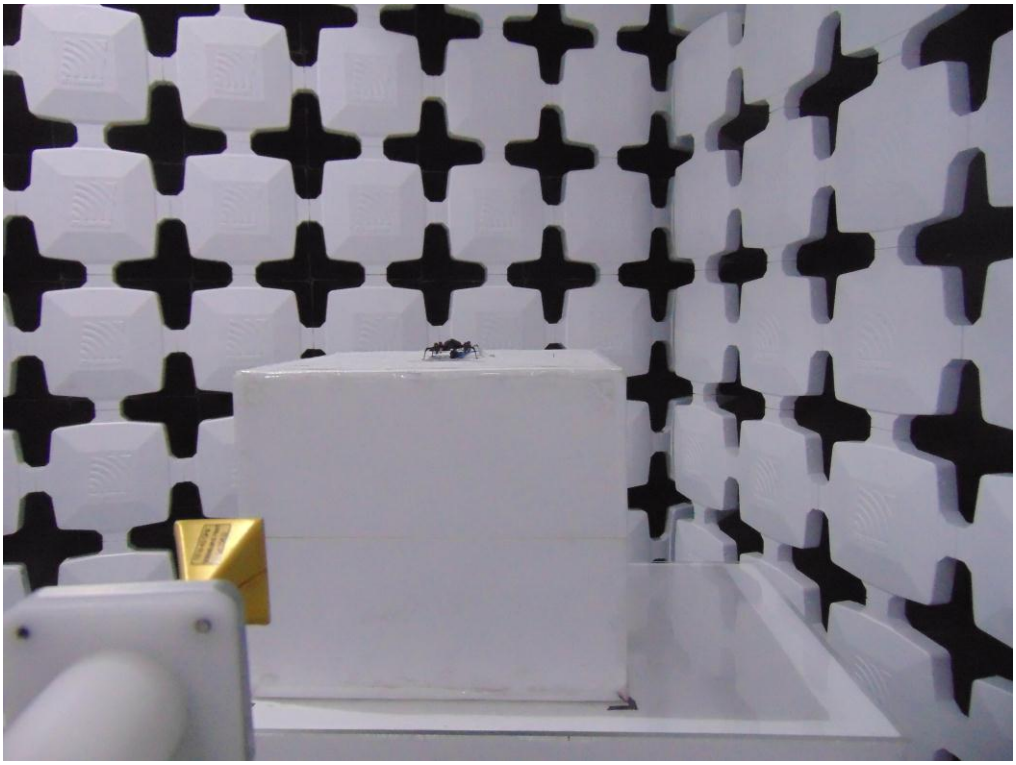
Test Setup Photo



Radiated Spurious Emissions Test Setup Below 1GHz



Radiated Spurious Emissions Test Setup Above 1GHz (1-18GHz)



Radiated Spurious Emissions Test Setup Above 1GHz (18-40GHz)

Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

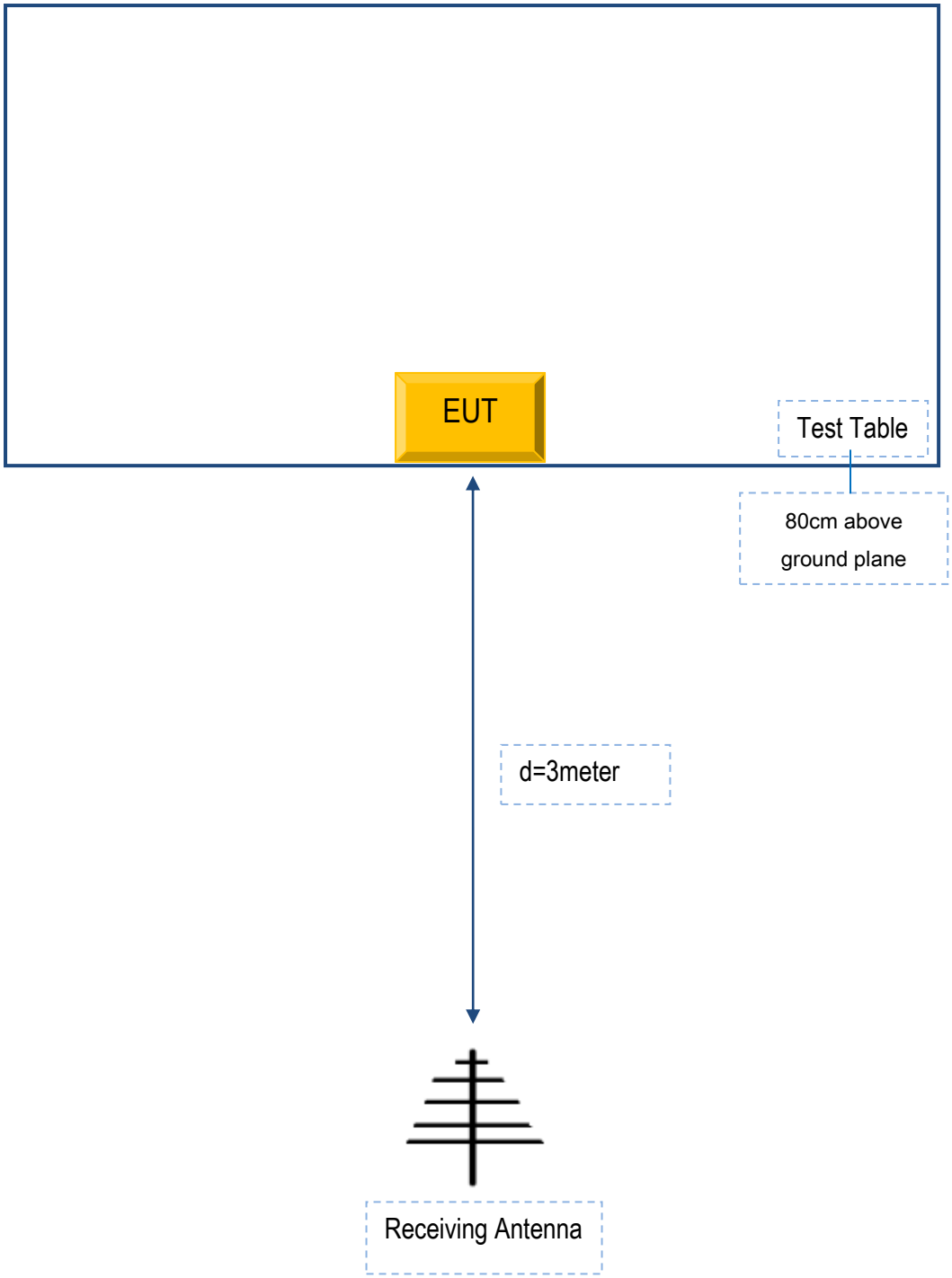
Supporting Equipment:

Manufacturer	Equipment Description	Model	Serial No
N/A	N/A	N/A	N/A

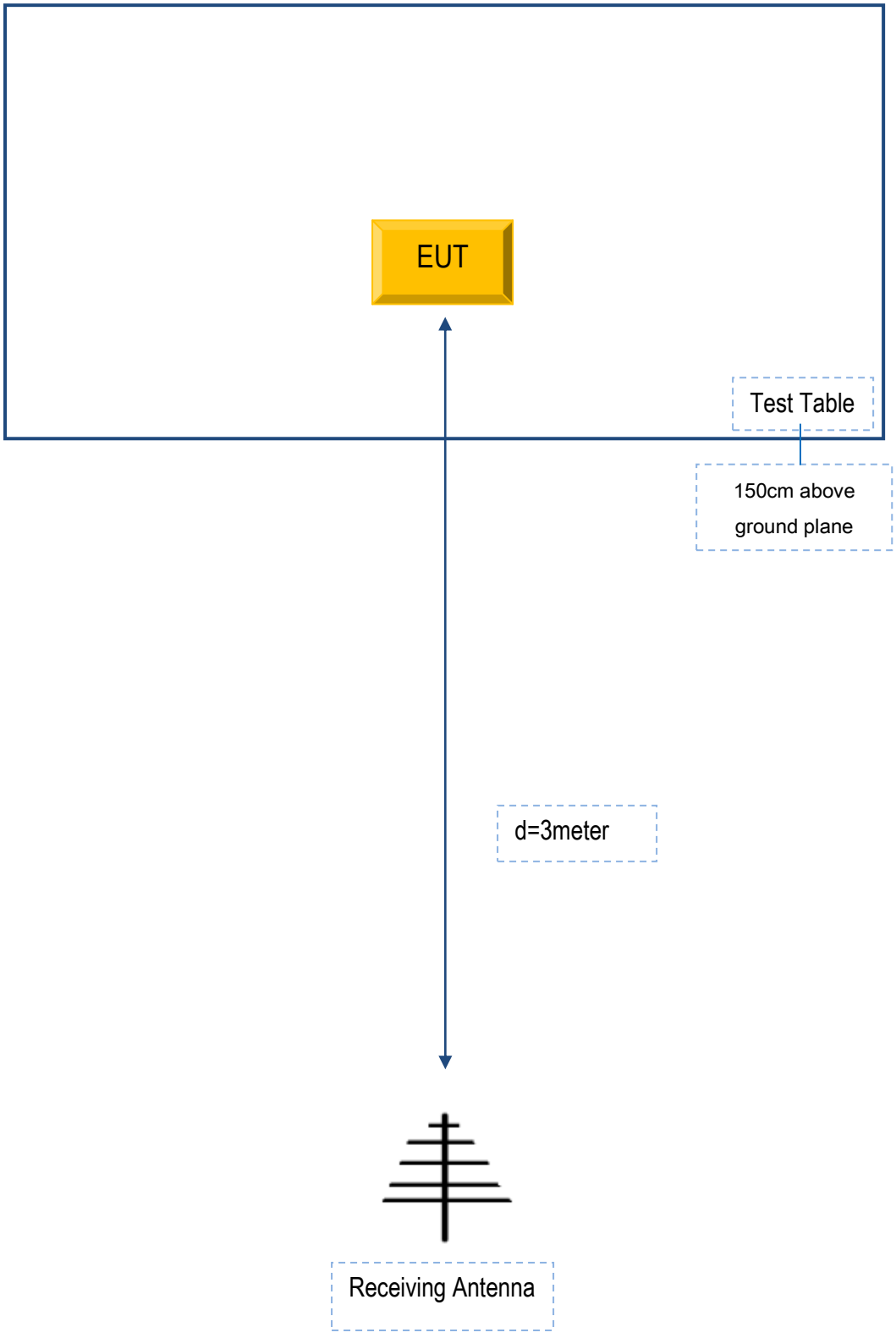
Block Configuration Diagram for AC Line Conducted Emissions

N/A

Block Configuration Diagram for Radiated Emissions （Below 1GHz）.



Block Configuration Diagram for Radiated Emissions （Above 1GHz）.



Annex C.ii. EUT OPERATING CONDITIONS

The following is the description of how the EUT is exercised during testing.

Test	Description Of Operation
Emissions Testing	The EUT was continuously transmitting to stimulate the worst case.

Annex D. User Manual / Block Diagram / Schematics / Partlist

See attachment

Annex E. DECLARATION OF SIMILARITY

N/A