

**SHENZHEN HUBSAN
INTELLIGENT COMPANY LIMITED**

MINI QUADCOPTER FPV PLUS

**Main Model: H107D+
Serial Model: H107D**


December 17, 2015

**Report No.: 15070788-FCC-R2
(This report supersedes none)**



Modifications made to the product : None

This Test Report is Issued Under the Authority of:

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Winnie Zhang Compliance Engineer	David Huang Technical Manager	

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

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1 EXECUTIVE SUMMARY & EUT INFORMATION

The purpose of this test programme was to demonstrate compliance of the SHENZHEN HUBSAN INTELLIGENT COMPANY LIMITED , MINI QUADCOPTER FPV PLUS and model: H107D+ against the current Stipulated Standards. The MINI QUADCOPTER FPV PLUS has demonstrated compliance with the FCC Part 15.407: 2014, ANSI C63.10: 2013.

EUT Information

EUT
Description : **MINI QUADCOPTER FPV PLUS**

Main Model : **H107D+**

Serial Model : **H107D**

Antenna Gain : **5.8GHz: 1.6 dBi**

Input Power : **Battery**
Spec: 3.7V, 520mAh, 2.0Wh

Classification
Per Stipulated : **FCC Part 15.407: 2014, ANSI C63.10: 2013**
Test Standard

2 TECHNICAL DETAILS

Purpose	Compliance testing of MINI QUADCOPTER FPV PLUS with stipulated standard
Applicant / Client	SHENZHEN HUBSAN INTELLIGENT COMPANY LIMITED 13th Floor, Bldg 1C, Shenzhen Software Industry Base, Xuefu Road, Nanshan District, Shenzhen, China, 518054
Manufacturer	DONGGUAN TENGSHENG INDUSTRIAL CO., LTD A22# Luyi Street, Tianxin Village, Tangxia Town, Dongguan, China
Laboratory performing the tests	SIEMIC (Shenzhen-China) Laboratories Zone A, Floor 1, Building 2, Wan Ye Long Technology Park, South Side of Zhoushi Road, Bao'an District, Shenzhen, Guangdong, China Tel: +86-0755-2601 4629 / 2601 4953 Fax: +86-0755-2601 4953-810 Email: China@siemic.com.cn
Test report reference number	15070788-FCC-R2
Date EUT received	November 10, 2015
Standard applied	FCC Part 15.407: 2014, ANSI C63.10: 2013
Dates of test (from – to)	November 11 to November 27, 2015
No of Units :	#1
Equipment Category :	Spread Spectrum System/Device
Trade Name :	HUBSAN
RF Operating Frequency (ies)	5725-5850MHz
Number of Channels	5.725-5.850G: 24CH
Modulation	GFSK
FCC ID	2AEXY107DPRX

3 MODIFICATION

NONE

4 TEST SUMMARY

The product was tested in accordance with the following specifications.
 All testing has been performed according to below product classification:

Test Results Summary

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.407 (a)(5)	DTS (99%&26 dB) CHANNEL BANDWIDTH	Compliance
§15.407 (a)(6)	DTS (6 dB) CHANNEL BANDWIDTH With the Band 5.725-5.85 GHz	Compliance
15.407(a)(3)	Conducted Maximum Output Power	Compliance
15.407(a)(3)	The maximum Power Spectral Density	Compliance
15.407(b)(4)	Band Edge	Compliance
§15.207 (a),	AC Power Line Conducted Emissions	Compliance
§15.205, §15.209	Radiated Spurious Emissions & Unwanted Emissions into Restricted Frequency Bands	Compliance

Table for frequency list

For 5.725-5.850 G band

Channel	Frequency (MHz)
1	5730
2	5735
3	5740
4	5745
5	5750
6	5755
7	5760
8	5765
9	5770
10	5775
11	5780
12	5785
13	5790
14	5795
15	5800
16	5805
17	5810
18	5815
19	5820
20	5825
21	5830
22	5835
23	5840
24	5845

5 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

5.1 §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 one permanently attached PCB antenna for 5.8GHz, the gain is 1.6 dBi.

Result: PASS

§15.407(a)(5)–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	25°C
Relative Humidity	53%
Atmospheric Pressure	1020mbar
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 $\pm 1.5\text{dB}$.
4. Test date : November 20, 2015
Tested By : Winnie Zhang

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) $\geq 3 \times \text{RBW}$.
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.

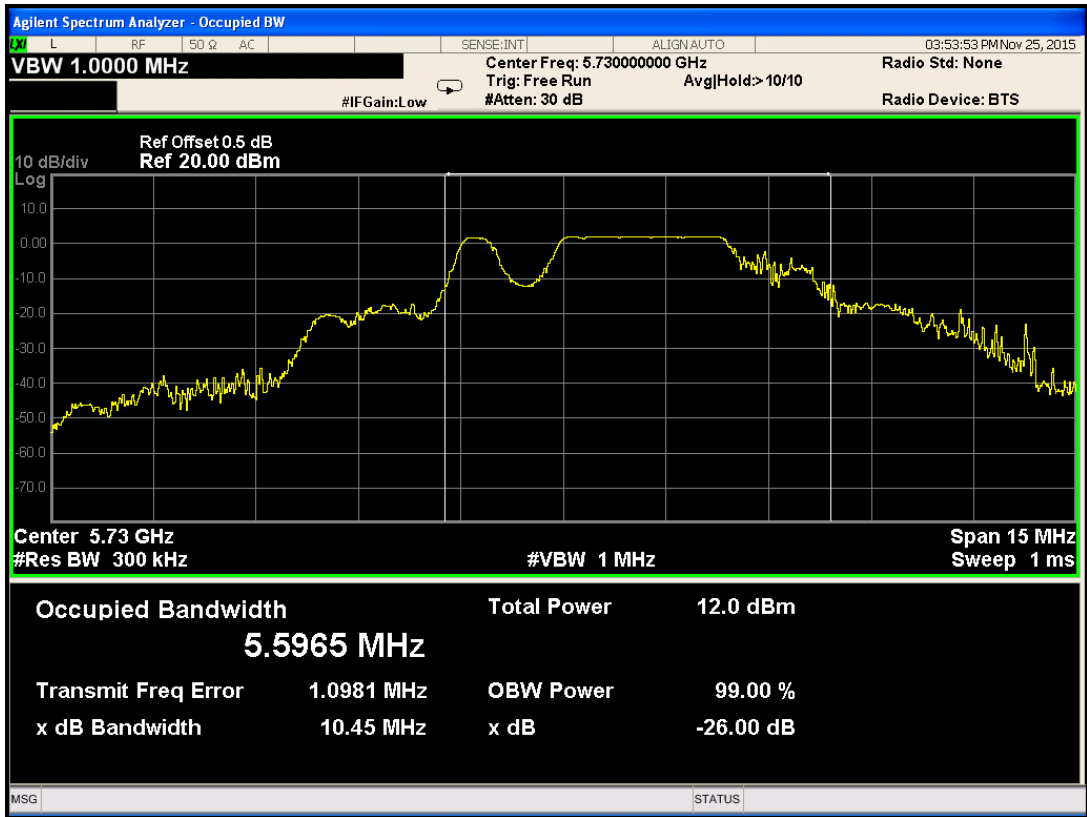
Please refer to the following tables and plots.

For the band 5.725-5.850 GHz

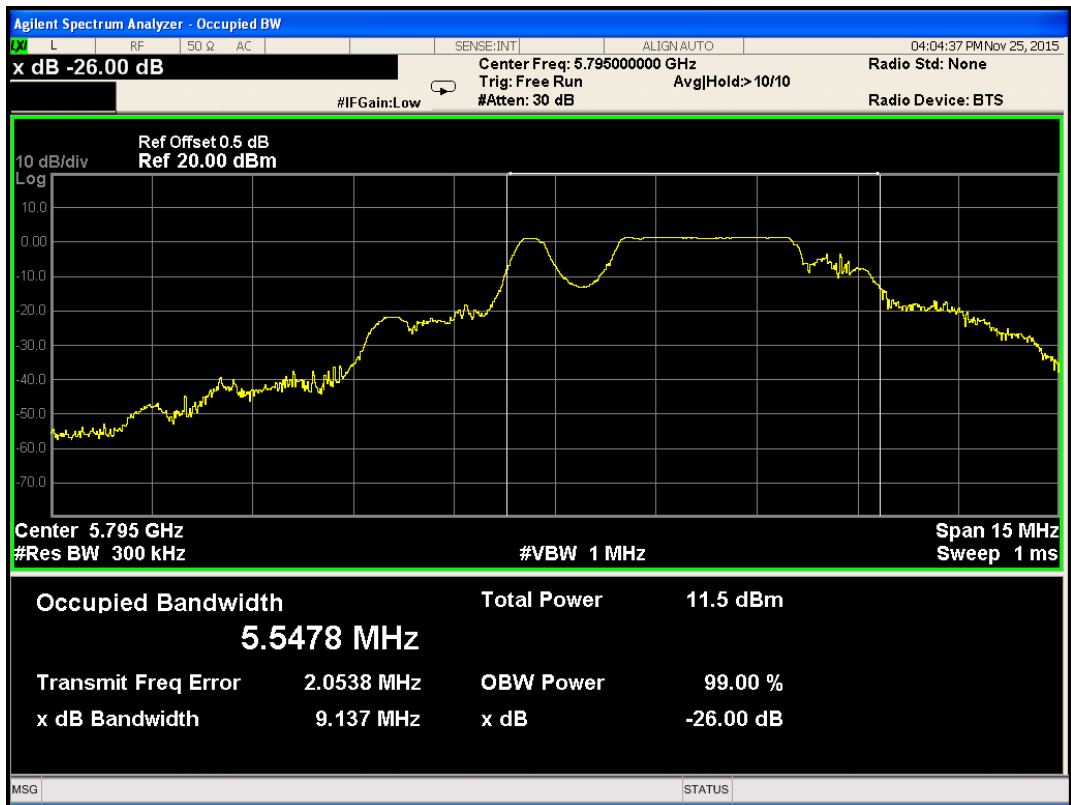
Channel	Channel Frequency (MHz)	Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)
Low	5730	5.5965	10.45
Middle	5795	5.5478	9.137
High	5845	5.9297	9.754

For the band 5.725-5.850 GHz

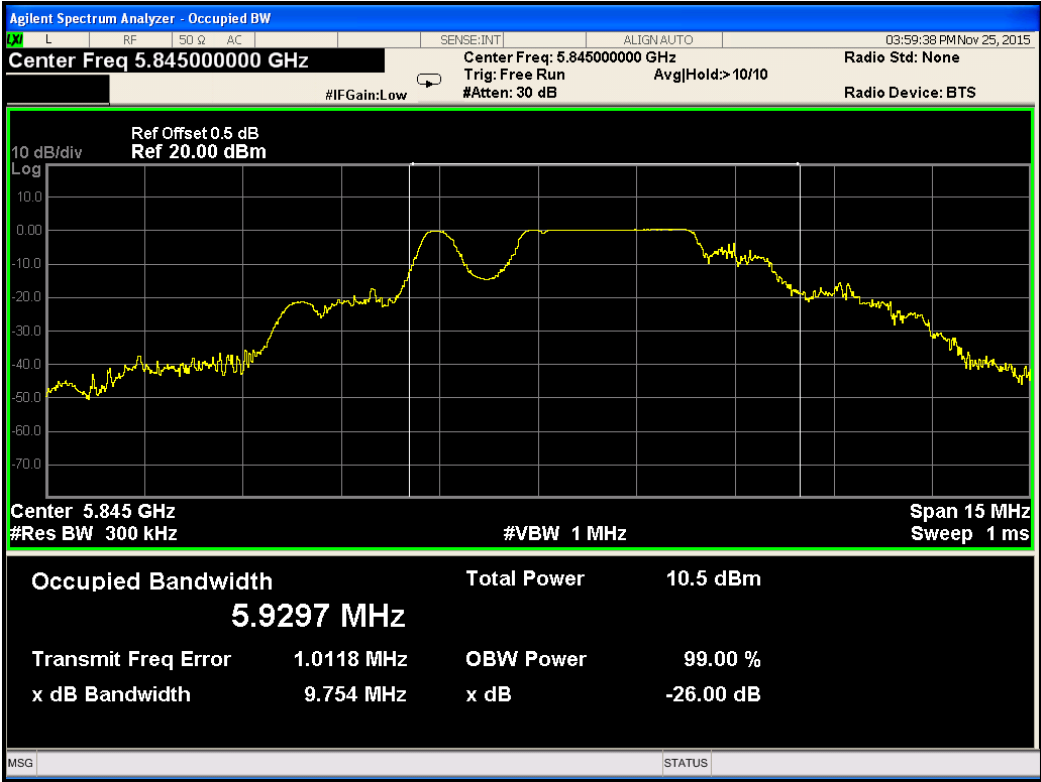
Low Channel



Middle Channel



High Channel



§15.407(a)(6)–DTS (6 dB) CHANNEL BANDWIDTH WITH THE 5.725-5.850 GHz

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	53%
Atmospheric Pressure	1020mbar
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 $\pm 1.5\text{dB}$.
4. Test date : November 27, 2015
Tested By : Winnie Zhang

Standard Requirement:

Within the 5.725-5.850 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz

Procedures:

Minimum Emission Bandwidth for the band 5.725-5.850 GHz

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) $\geq 3 \times \text{RBW}$.
- 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.

Test Result: Pass.

Please refer to the following tables and plots.

For the band 5.725-5.850 GHz

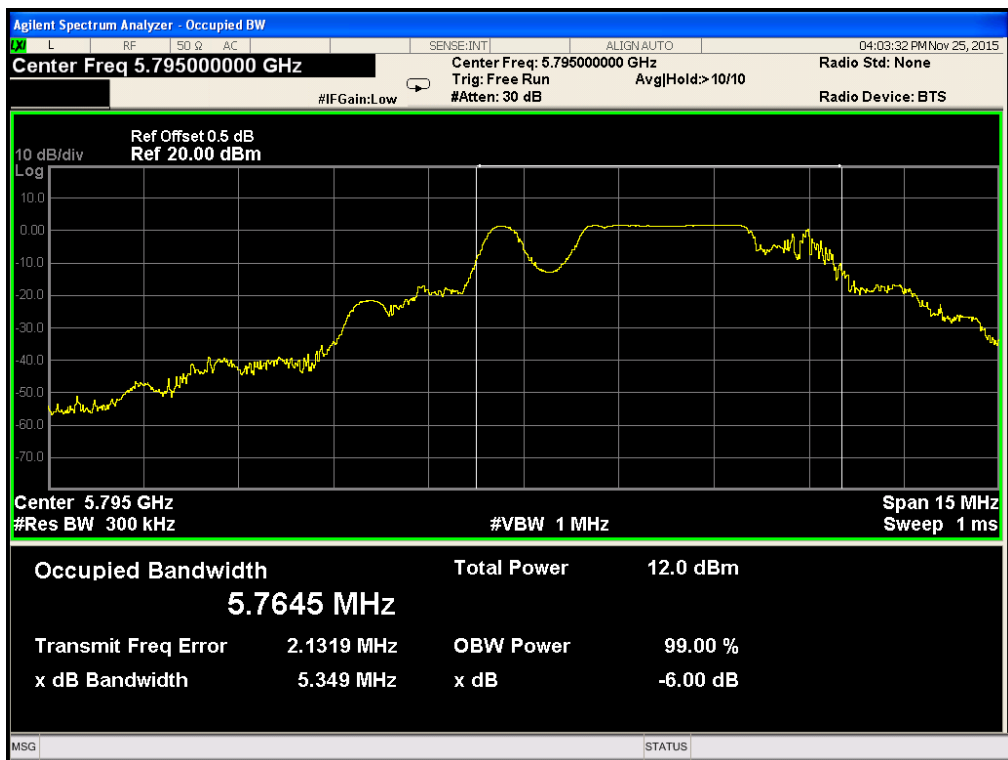
Channel	Channel Frequency (MHz)	Measured 6dB Bandwidth (MHz)	Limit(MHz)
Low	5730	3.787	≥ 0.5
Middle	5795	5.349	≥ 0.5
High	5845	4.316	≥ 0.5

For the band 5.725-5.850 GHz

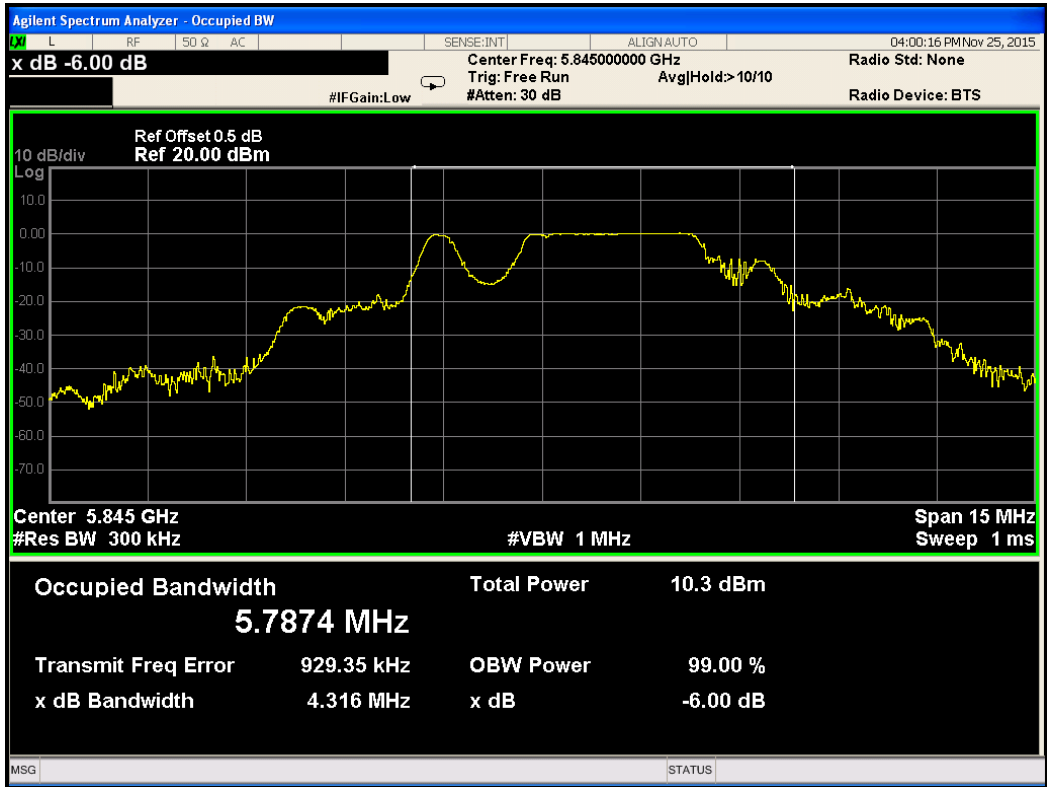
Low Channel



Middle Channel



High Channel



5.2 §15.407(a)(3) - 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 $\pm 1.5\text{dB}$.
3. Environmental Conditions

Temperature	25°C
Relative Humidity	53%
Atmospheric Pressure	1020mbar
4. Test date : November 27, 2015
Tested By : Winnie Zhang

Standard Requirement:

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

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 Spectrum Analyzer or EMI Receiver (SA)

Measurement of maximum conducted output power using a spectrum analyzer requires integrating the spectrum across a frequency span that encompasses, at a minimum, either the EBW or the 99-percent occupied bandwidth of the signal.¹ However, the EBW must be used to

¹ The option of using 99% occupied bandwidth to determine the frequency span for integration provides flexibility to the test lab. 789033 D02 General UNII Test Procedures New Rules v01 Page 5 determine bandwidth dependent limits on maximum conducted output power in accordance with § 15.407(a).

a) The test method shall be selected as follows: (i) Method SA-1 or SA-1 Alternative (averaging with the EUT transmitting at full power throughout each sweep) shall be applied if either of the following conditions can be satisfied:

- The EUT transmits continuously (or with a duty cycle ≥ 98 percent).
- Sweep triggering or gating can be implemented in a way that the device transmits at the maximum power control level throughout the duration of each of the instrument sweeps to be averaged. This condition can generally be achieved by triggering the instrument's sweep if the duration of the sweep (with the analyzer configured as in Method SA-1, below) is equal to or shorter than the duration T of each transmission from the EUT and if those transmissions exhibit full power throughout their durations.

(ii) Method SA-2 or SA-2 Alternative (averaging across on and off times of the EUT transmissions, followed by duty cycle correction) shall be applied if the conditions of (i) cannot be achieved and the transmissions exhibit a constant duty cycle during the measurement duration. Duty cycle will be considered to be constant if variations are less than ± 2 percent.

(iii) Method SA-3 (RMS detection with max hold) or SA-3 Alternative (reduced VBW with max hold) shall be applied if the conditions of (i) and (ii) cannot be achieved.

b) Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep): (i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(ii) Set RBW = 1 MHz.

(iii) Set VBW ≥ 3 MHz.

(iv) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is \leq RBW/2, so that narrowband signals are not lost between frequency bins.)

(v) Sweep time = auto.

(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".

(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum

Test Result: Pass.

Please refer to the following tables and plots.

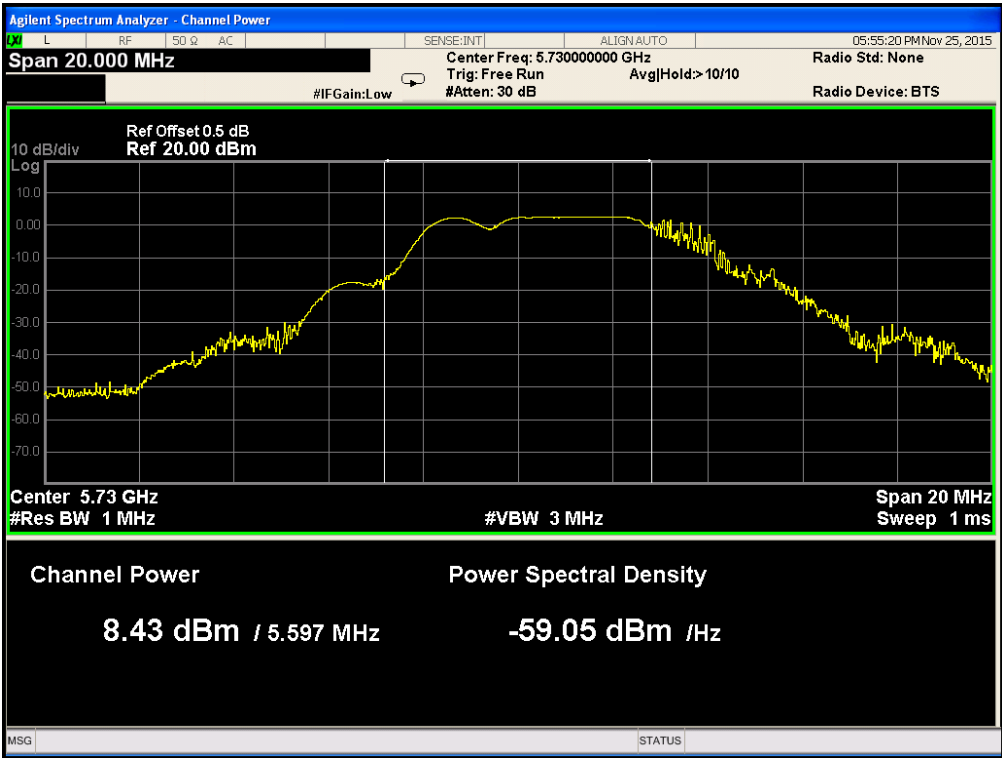
The Average Power

For the band 5.725-5.850 GHz

Channel	Channel Frequency (MHz)	AV Output Power(dBm)	Limit(dBm)
Low	5730	8.43	30
Middle	5795	7.08	30
High	5845	7.00	30

For the band 5.725-5.850 GHz

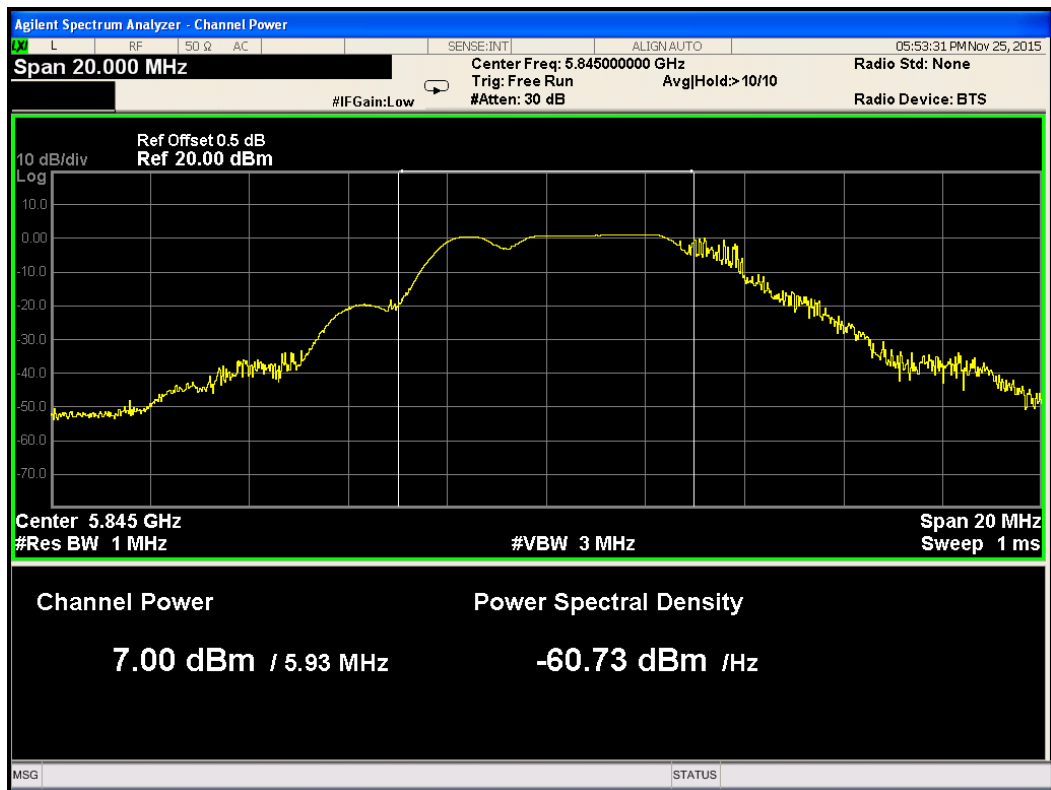
Low Channel



Middle Channel



High Channel



5.3 §15.407 (a)(3) – Power Spectrum 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	53%
Atmospheric Pressure	1020mbar
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 : November 27, 2015
Tested By : Winnie Zhang

Standard Requirement:

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, 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 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 $RBW \geq 1/T$, where T is defined in section II.B.1.a).
- b) Set $VBW \geq 3 RBW$.
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10\log(500\text{kHz}/RBW)$ to the measured result, whereas $RBW (< 500 \text{ KHz})$ 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 $10\log(1\text{MHz}/RBW)$ to the measured result, whereas $RBW (< 1 \text{ MHz})$ 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 $RBW=100 \text{ KHz}$ is available on nearly all spectrum analyzers.

Test Result: Pass.

Please refer to the following tables and plots.

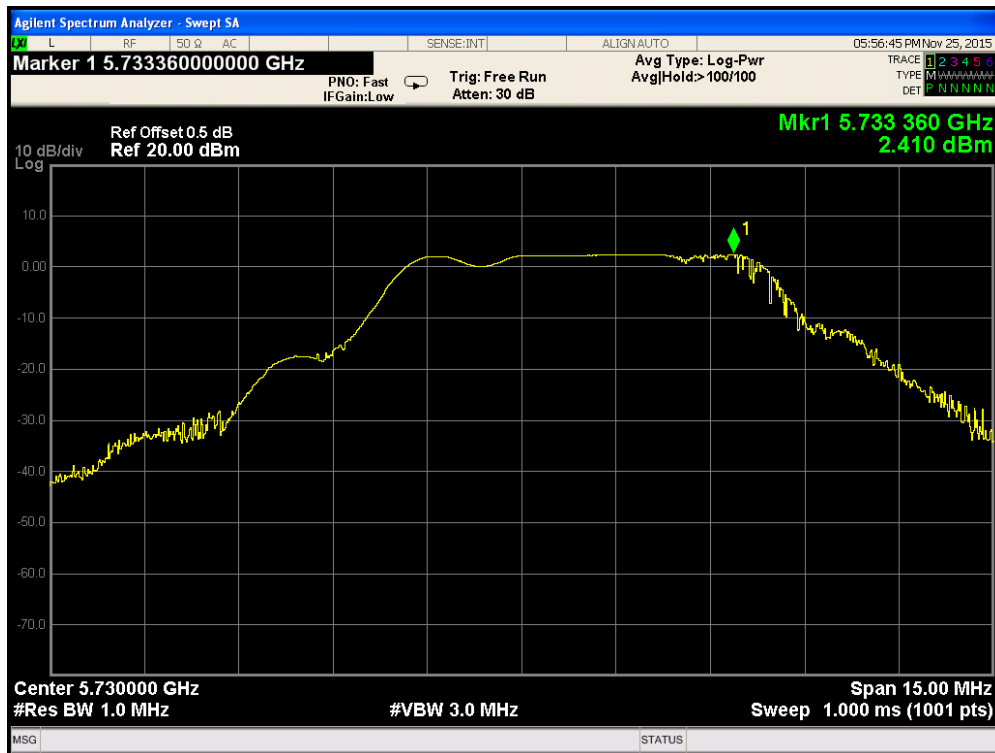
Please refer to the following tables and plots.

For the band 5.725-5.85 GHz

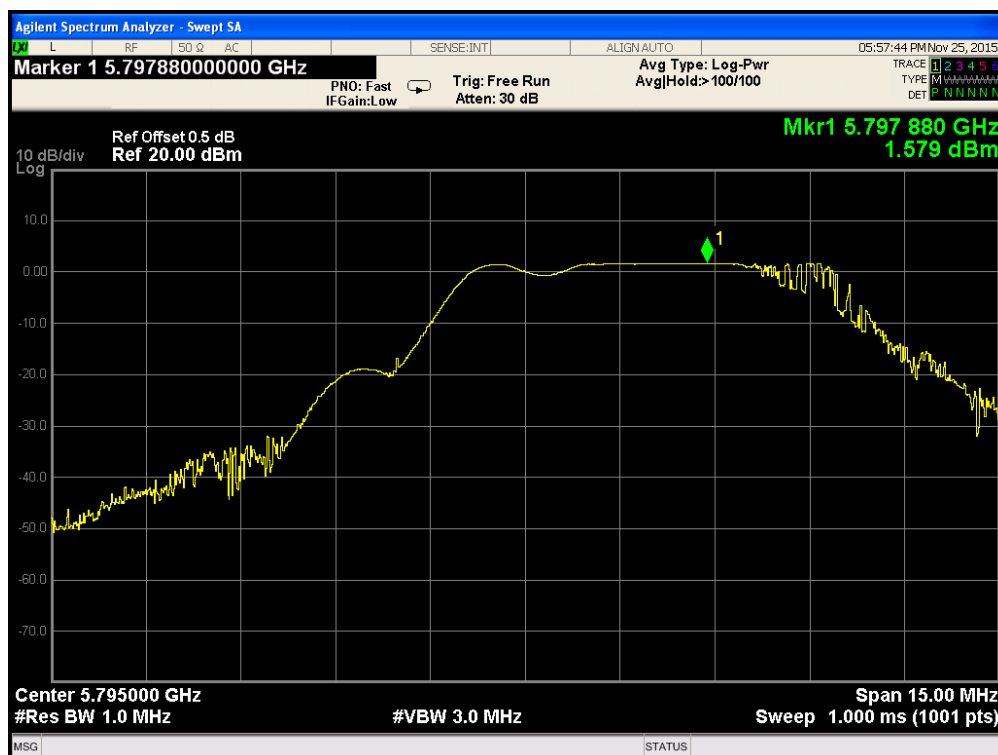
Channel	Channel Frequency (MHz)	PSD (dBm)	Limit(dBm)
Low	5730	2.410	30
Middle	5795	1.579	30
High	5845	1.933	30

For the band 5.725-5.850 GHz

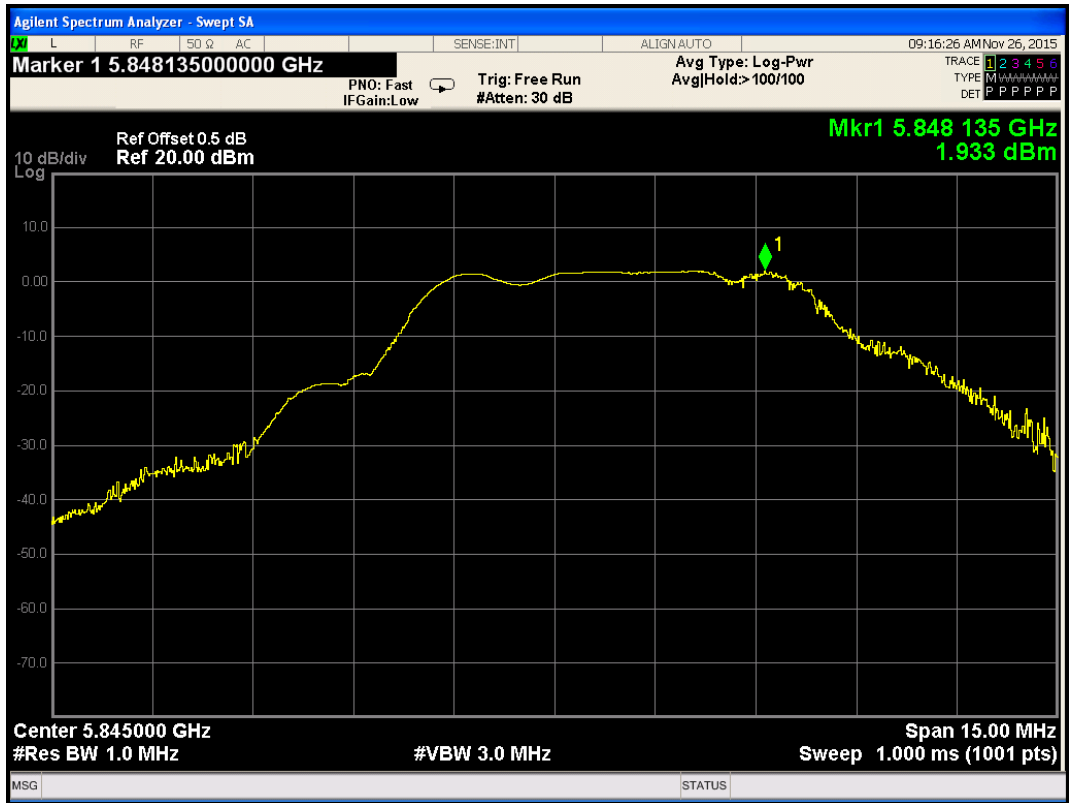
Low Channel



Middle Channel



High Channel



5.4 §15.407 (b)(4) Bandedge

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	53%
Atmospheric Pressure	1020mbar
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 :November 27, 2015
Tested By : Winnie Zhang

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:

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

Procedures:

Measurement Procedure Peak power spectral density (PPSD) :

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.

Test Result: Pass.

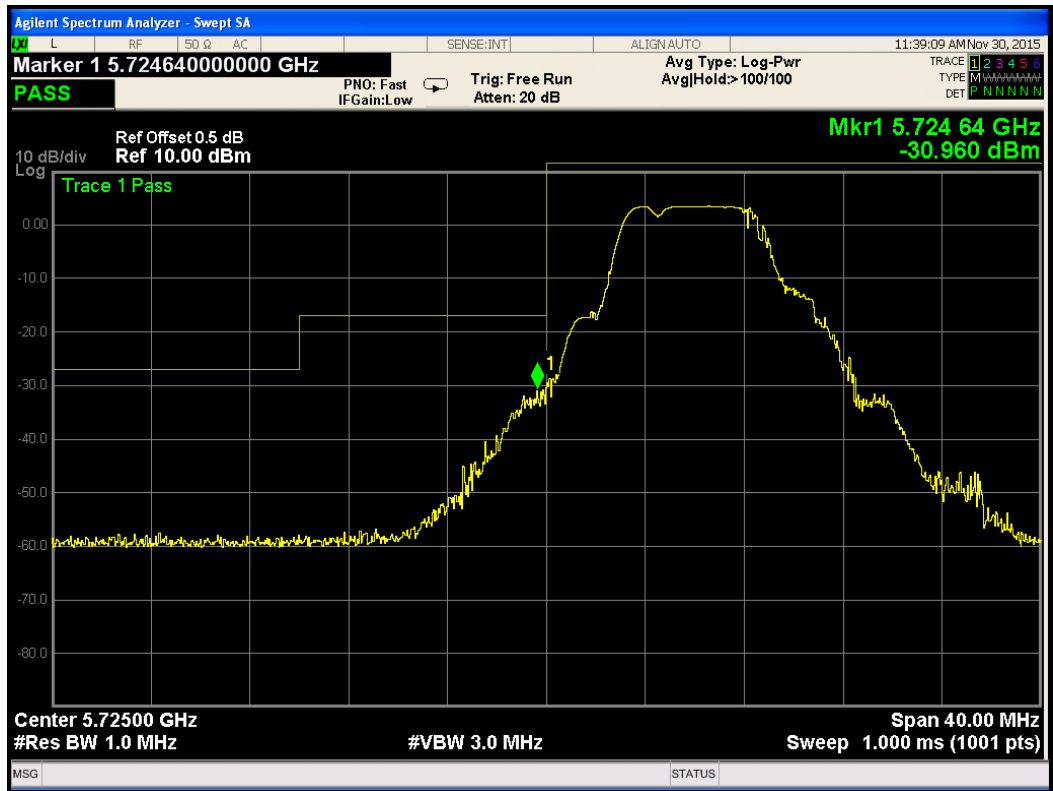
Please refer to the following tables and plots.

For the band 5.725-5.85 GHz

Channel	Channel Frequency (MHz)	Bandedge (dBm)	Limit(dBm)
Low	5730	-30.960	-17
High	5845	-17.990	-17

For the band 5.725-5.850 GHz

Low Channel



High Channel



5.5 §15.207 (a) - AC Power Line Conducted Emissions

Requirement:

Frequency of emission (MHz)	Conducted limit (dB μ 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 ± 3.5 dB.
4. Environmental Conditions

Temperature	---
Relative Humidity	---
Atmospheric Pressure	---
5. Test date: ---
Tested By : ---

Result : N/A

5.6 §15.205, §15.209 & §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	53%
Atmospheric Pressure	1020mbar
5. Test date : November 27, 2015
Tested By : Winnie Zhang

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 ($\geq 98\%$ 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:

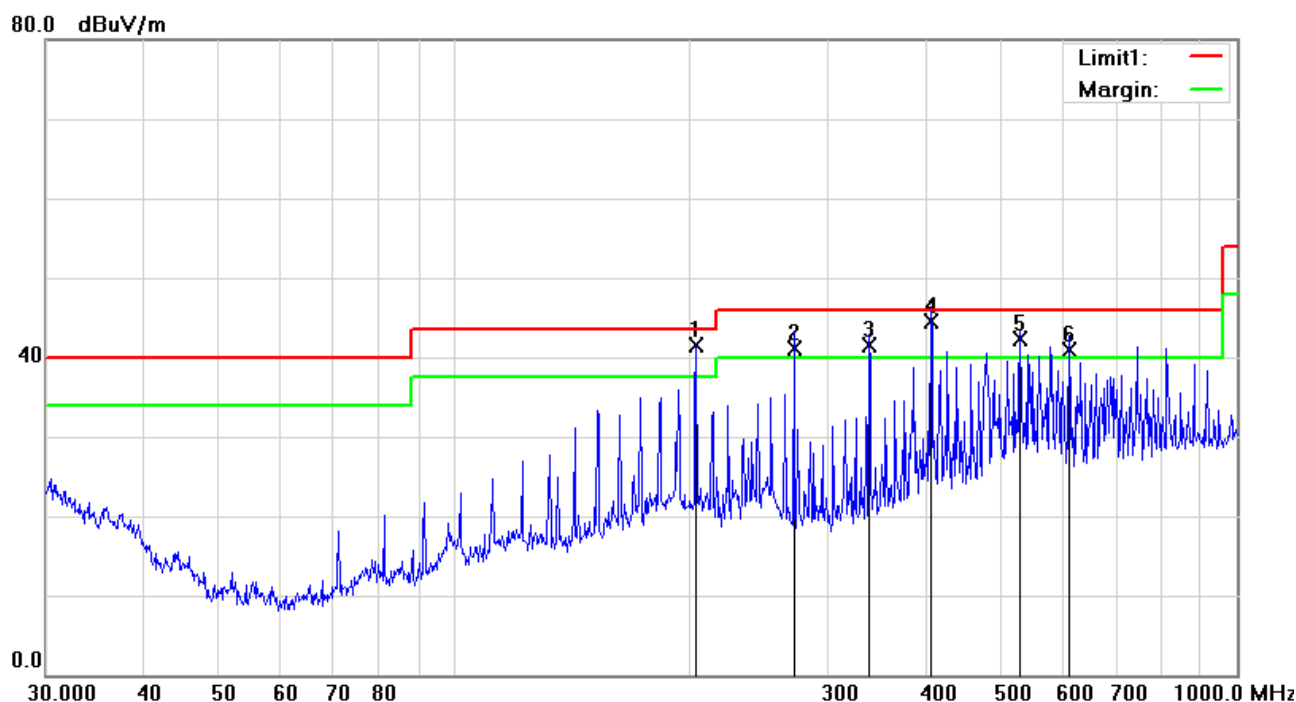
Set analyzer center frequency to the frequency associated with the restricted band emission.

Set span to at least 1 MHz.

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

Test Mode:	Running Mode
-------------------	---------------------

Below 1GHz

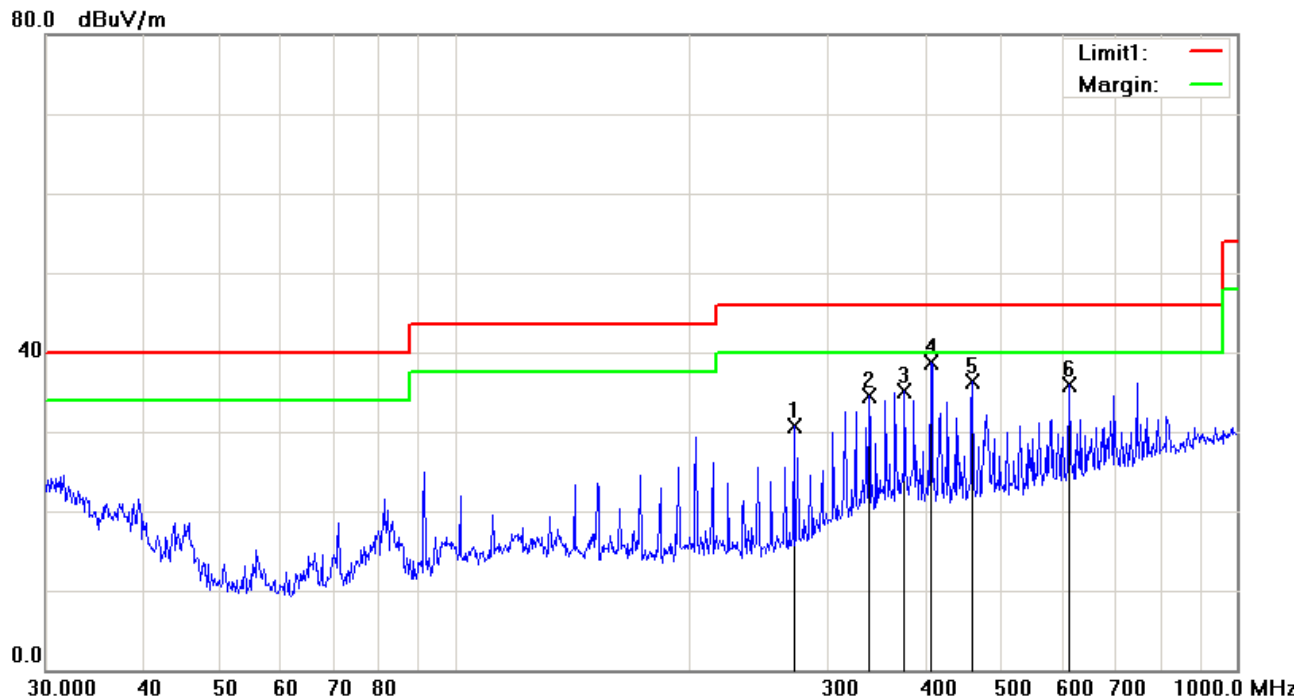


Test Data

Horizontal Polarity Plot @3m

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Height	Degree
		(MHz)	(dBuV/m)		(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	()
1	H	203.2211	50.31	QP	-8.77	41.54	43.50	-1.96	100	288
2	H	270.9590	49.36	QP	-8.23	41.13	46.00	-4.87	100	85
3	H	338.6978	47.29	QP	-5.79	41.50	46.00	-4.50	100	0
4	H	406.4389	48.59	QP	-4.14	44.45	46.00	-1.55	100	0
5	H	528.3697	43.50	QP	-1.19	42.31	46.00	-3.69	100	258
6	H	609.6580	40.69	QP	0.17	40.86	46.00	-5.14	100	130

Below 1GHz



Test Data

Vertical Polarity Plot @3m

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Height	Degree
		(MHz)	(dBuV/m)		(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	()
1	V	271.3246	38.86	peak	-8.21	30.65	46.00	-15.35	100	53
2	V	338.4001	40.32	peak	-5.79	34.53	46.00	-11.47	100	72
3	V	375.9385	40.04	peak	-4.87	35.17	46.00	-10.83	100	68
4	V	406.0880	42.89	peak	-4.16	38.73	46.00	-7.27	100	113
5	V	459.1144	39.05	peak	-2.83	36.22	46.00	-9.78	100	42
6	V	609.9217	35.64	peak	0.17	35.81	46.00	-10.19	100	334

Above 1 GHz:

Test Mode: Transmitting

Note: Other modes were verified, only the result of worst case basic rate mode was presented.

Frequency band **5725-5850MHz**

Mode: 802.11

Low Channel (5730MHz)

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)
11510	36.48	AV	V	39.74	1.34	31.72	48.31	54	-5.69
11510	36.05	AV	H	39.74	1.34	31.72	48.05	54	-5.95
11510	46.27	PK	V	39.74	1.34	31.72	57.87	74	-16.13
11510	45.33	PK	H	39.74	1.34	31.72	57.42	74	-16.58
4755	41.75	AV	V	33.95	0.98	30.06	42.49	54	-11.51
4755	40.19	AV	H	33.95	0.98	30.06	42.16	54	-11.84
4755	50.11	PK	V	34.02	0.98	30.06	56.67	74	-17.33
4755	49.68	PK	H	34.02	0.98	30.06	56.32	74	-17.68
5388	39.52	AV	V	34.14	1.25	30.73	42.35	54	-11.65
5388	39.76	AV	H	34.14	1.25	30.73	42.31	54	-11.69
5388	49.35	PK	V	34.14	1.25	30.73	56.14	74	-17.86
5388	49.27	PK	H	34.14	1.25	30.73	56	74	-18

High Channel (5845 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)
11590	37.91	AV	V	39.78	1.55	31.92	48.14	54	-5.86
11590	37.56	AV	H	39.78	1.55	31.92	47.69	54	-6.31
11590	44.25	PK	V	39.78	1.55	31.92	57.73	74	-16.27
11590	45.37	PK	H	39.78	1.55	31.92	57.7	74	-16.3
4750	40.22	AV	V	33.95	1.01	30.12	42.28	54	-11.72
4750	40.38	AV	H	33.95	1.01	30.12	42.01	54	-11.99
4750	49.29	PK	V	34.02	1.1	30.16	55.27	74	-18.73
4750	48.96	PK	H	34.02	1.1	30.16	55.22	74	-18.78
5390	39.81	AV	V	34.14	1.21	30.73	43.41	54	-10.59
5390	39.75	AV	H	34.14	1.21	30.73	43.27	54	-10.73
5390	48.55	PK	V	34.14	1.21	30.73	54.9	74	-19.1
5390	48.19	PK	H	34.14	1.21	30.73	54.84	74	-19.16

Annex A. TEST INSTRUMENT & METHOD

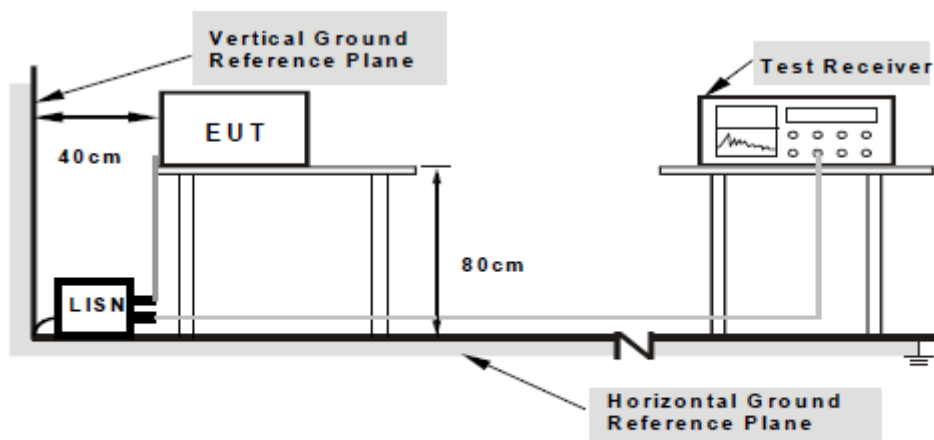
Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
EMI test receiver	ESCS30	8471241027	09/17/2015	09/16/2016	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191106	09/25/2015	09/24/2016	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191107	09/25/2015	09/24/2016	<input checked="" type="checkbox"/>
LISN	ISN T800	34373	09/25/2015	09/24/2016	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/24/2015	09/23/2016	<input checked="" type="checkbox"/>
Transient Limiter	LIT-153	531118	09/01/2015	08/31/2016	<input checked="" type="checkbox"/>
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/17/2015	09/16/2016	<input checked="" type="checkbox"/>
Power Splitter	1#	1#	09/01/2015	08/31/2016	<input checked="" type="checkbox"/>
DC Power Supply	E3640A	MY40004013	09/17/2015	09/16/2016	<input checked="" type="checkbox"/>
Radiated Emissions					
EMI test receiver	ESL6	100262	09/17/2015	09/16/2016	<input checked="" type="checkbox"/>
Positioning Controller	UC3000	MF780208282	11/19/2015	11/18/2016	<input checked="" type="checkbox"/>
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/01/2015	08/31/2016	<input checked="" type="checkbox"/>
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/25/2015	03/24/2016	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/21/2015	09/20/2016	<input checked="" type="checkbox"/>
Horn Antenna(18-40G)	AH840	10SL0073	09/22/2015	09/21/2016	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/24/2015	09/23/2016	<input checked="" type="checkbox"/>
Universal Radio Communication Tester	CMU200	121393	09/25/2015	09/24/2016	<input checked="" type="checkbox"/>

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 μ V = 47.96 dB μ V

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

Q-P reading obtained directly from EMI Receiver = 40.00 dB μ V
(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

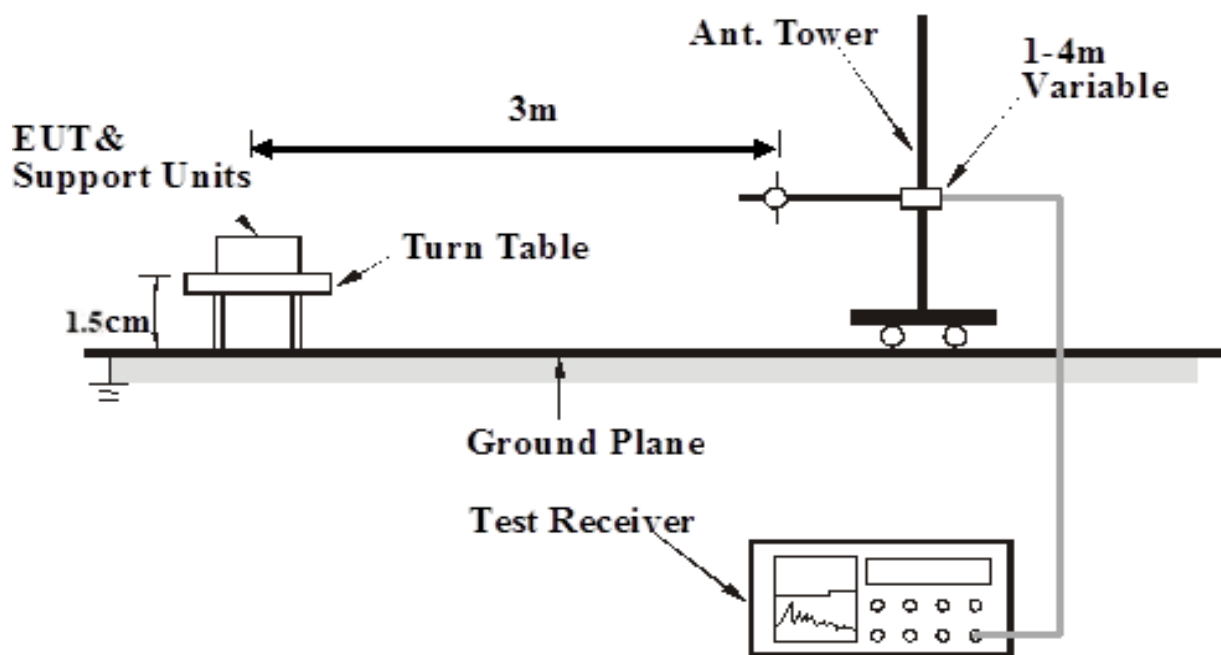
EUT Characterisation

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:

$$\text{Peak} = \text{Reading} + \text{Corrected Factor}$$

where

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

And the average value is

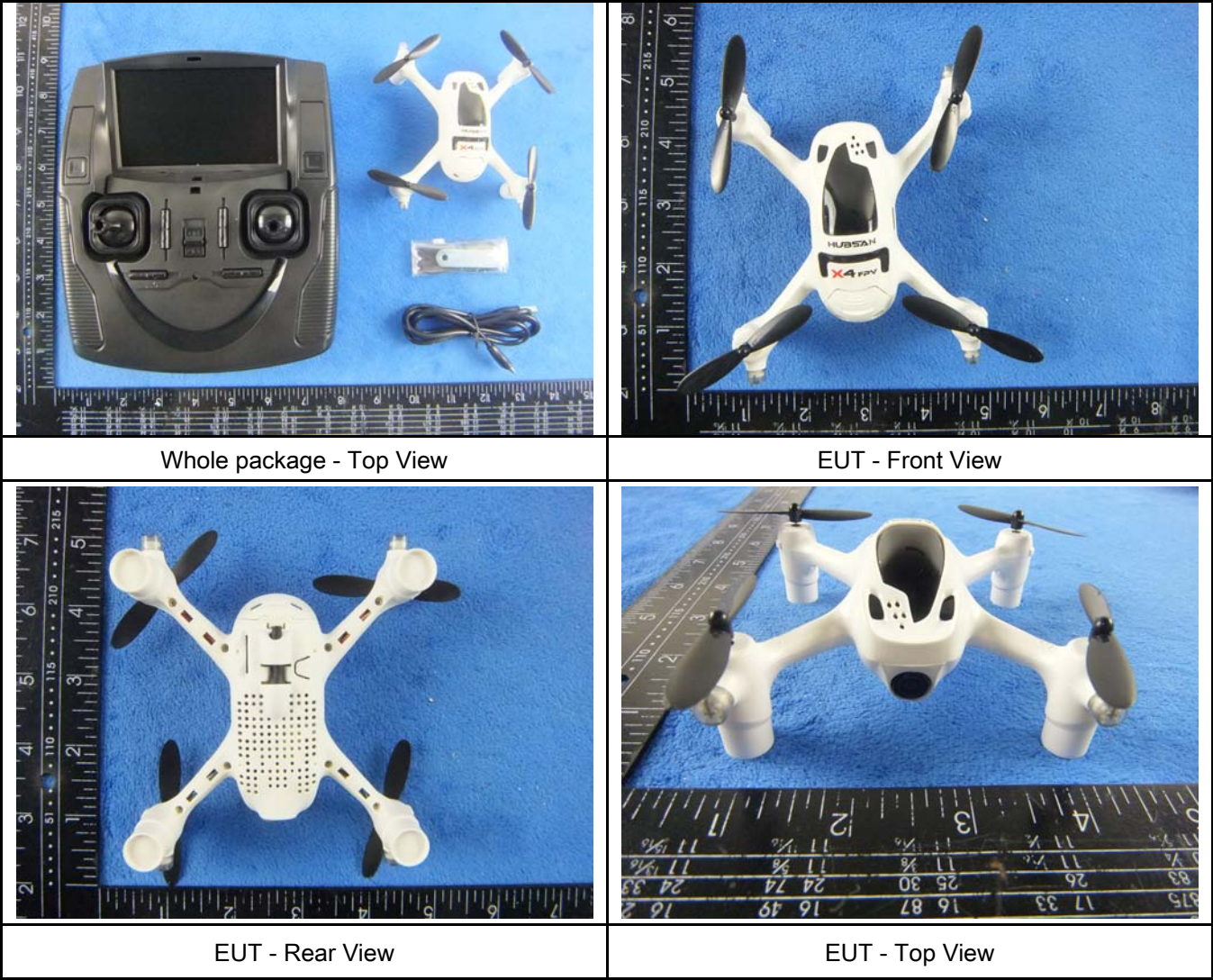
$$\begin{aligned} \text{Average} &= \text{Peak Value} + \text{Duty Factor or} \\ \text{Set RBW} &= 1\text{MHz, VBW} = 10\text{Hz.} \end{aligned}$$

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 AND TEST SETUP PHOTOGRAPHS

Annex B.i. Photograph: EUT External Photo





EUT - Bottom View

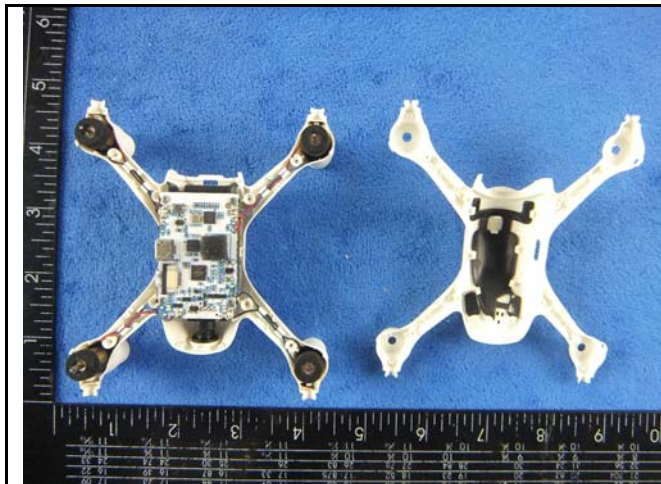


EUT - Left View

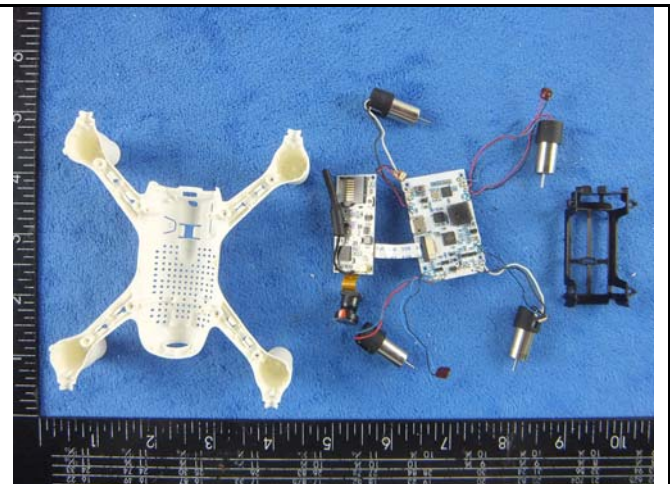


EUT - Right View

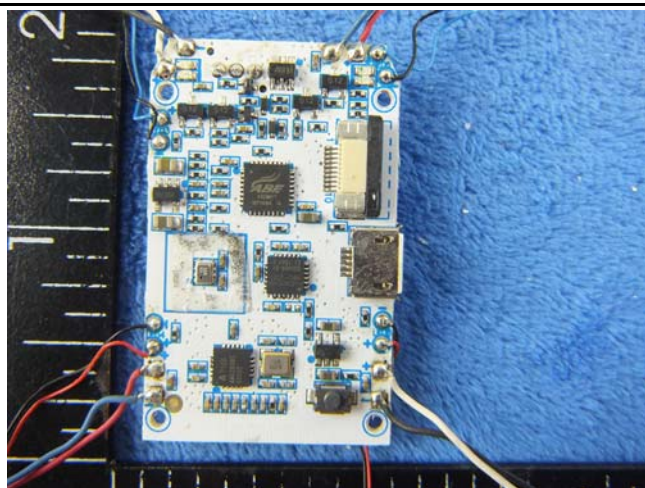
Annex B.ii. Photograph: EUT Internal Photo



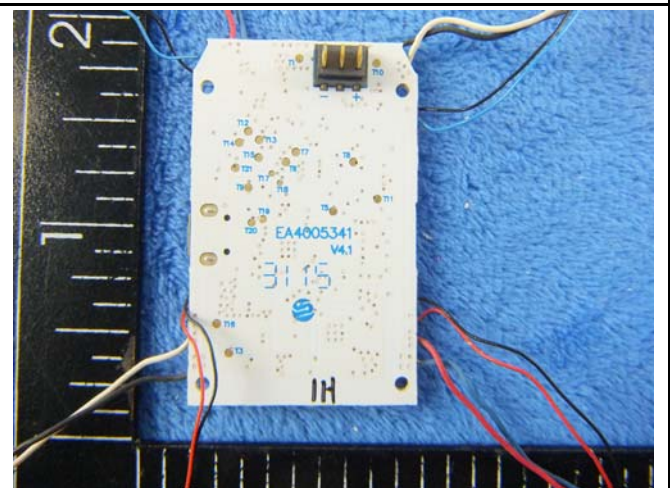
EUT – Uncover View 1



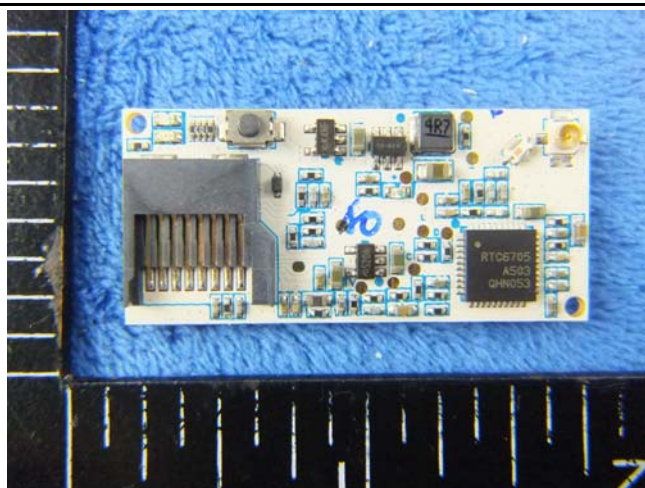
EUT – Uncover View 2



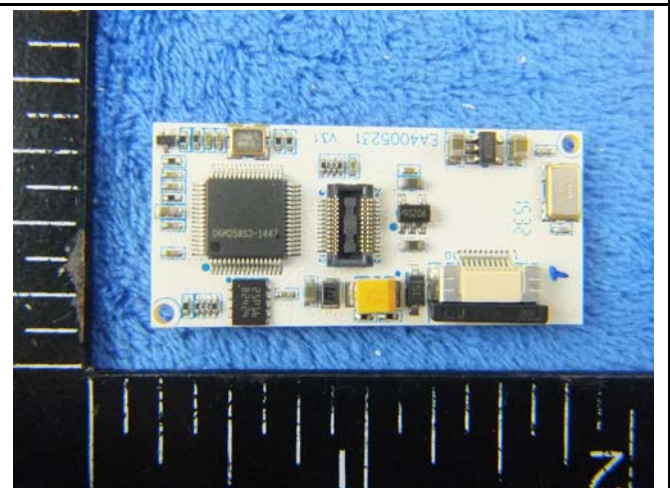
Mainboard- Front View



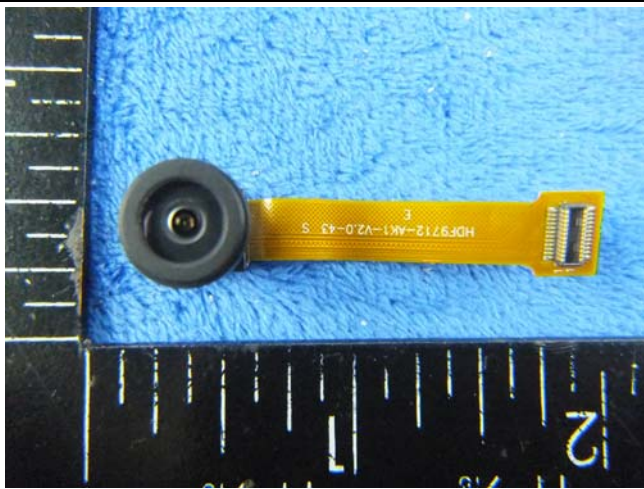
Mainboard- Rear View



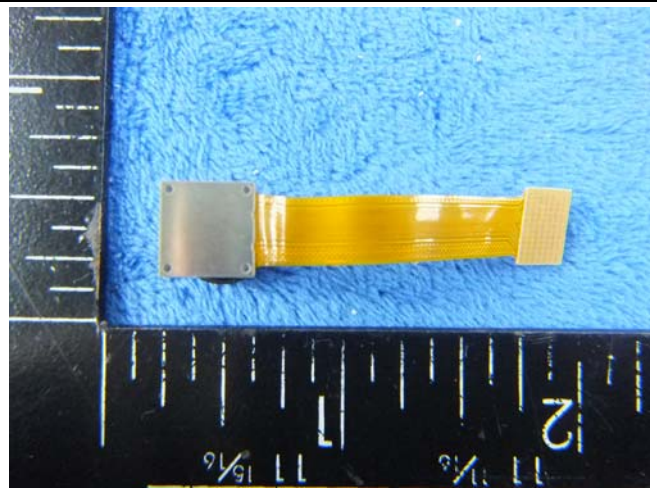
Mini Mainboard- Front View



Mini Mainboard - Rear View



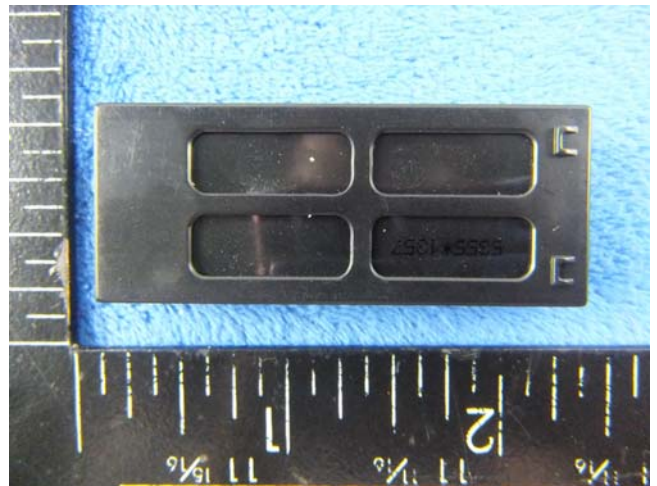
Camera – Front View



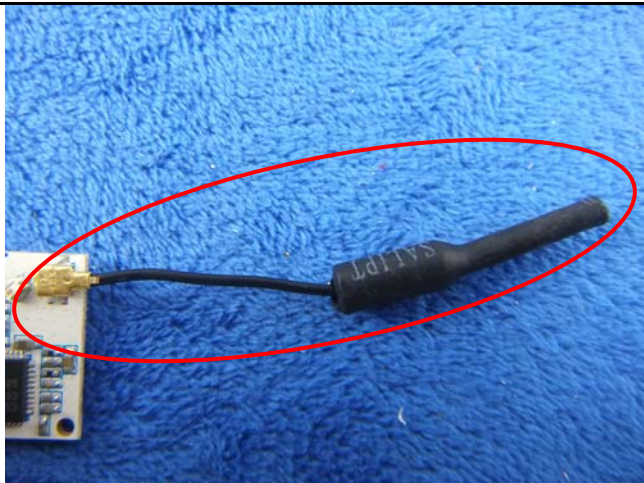
Camera – Rear View



Battery – Front View

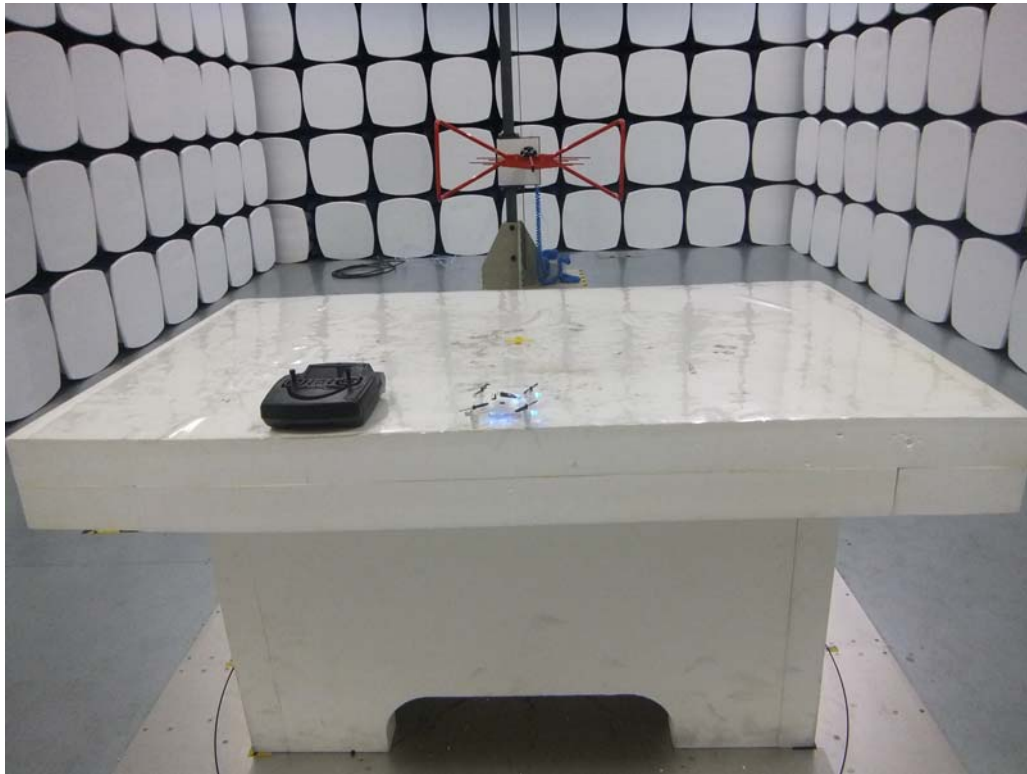


Battery – Rear View



Antenna View

Annex B.iii. Photograph 3: Test Setup Photo



Radiated Spurious Emissions Test Setup Below 1GHz - Front View



Radiated Spurious Emissions Test Setup Above 1GHz –Front View

Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

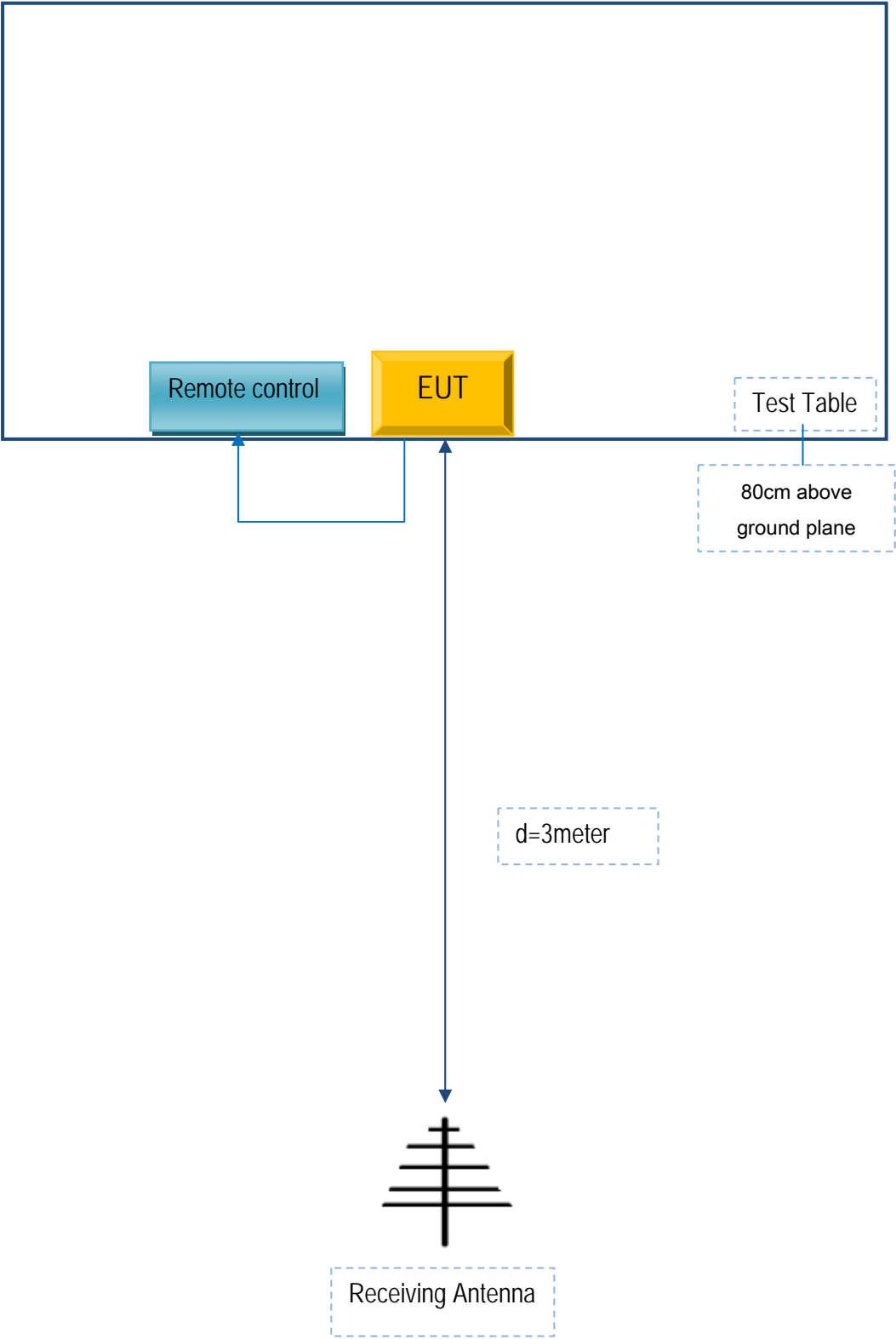
EUT TEST CONDITIONS

Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

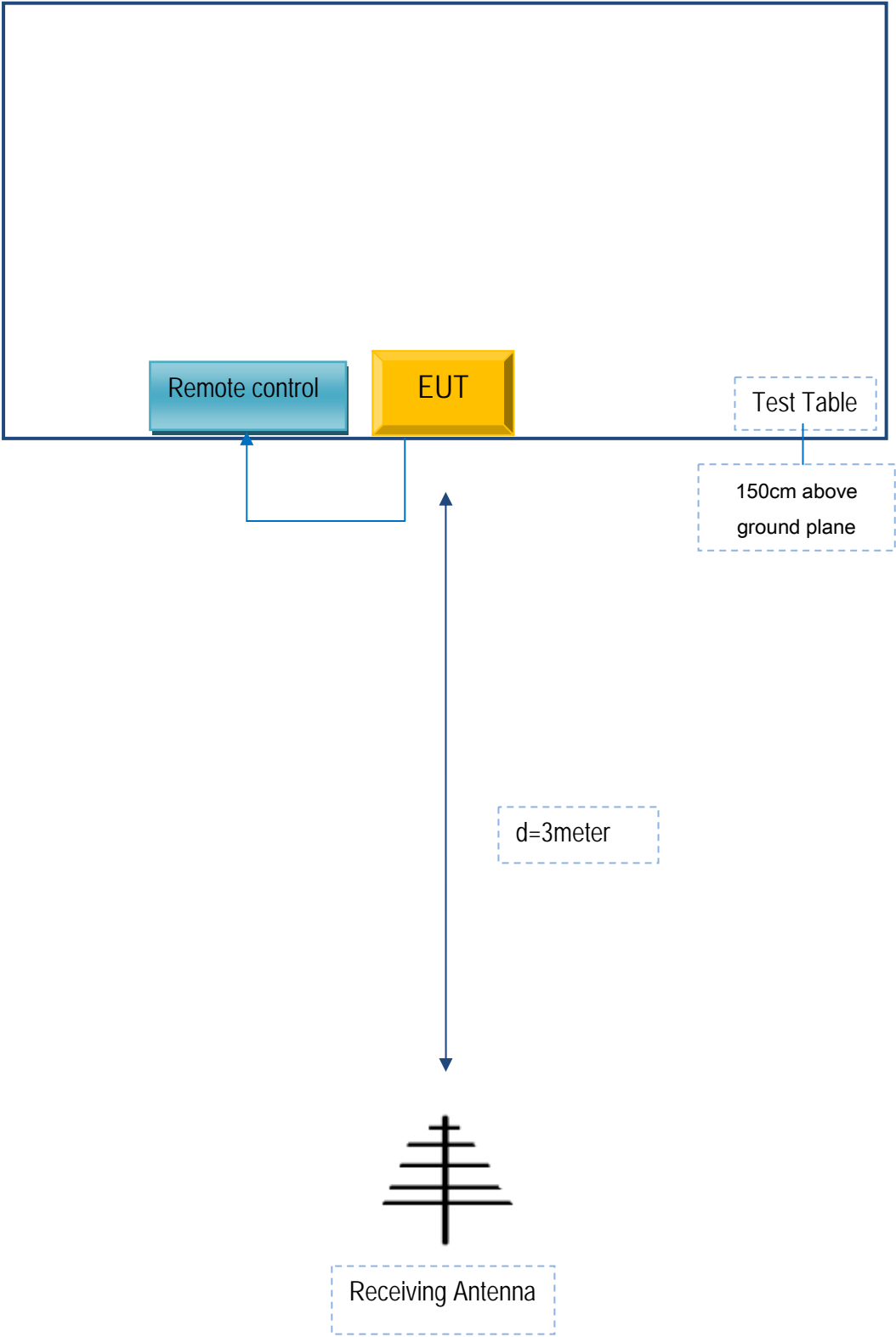
The following is a description of supporting equipment and details of cables used with the EUT.

Manufacturer	Equipment Description (Including Brand Name)	Model	Calibration Date	Calibration Due Date
N/A	N/A	N/A	N/A	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 / PART LIST

Please see attachment

Annex E. DECLARATION OF SIMILARITY

SHENZHEN HUBSAN INTELLIGENT COMPANY LIMITED

To: SIEMIC ,775 Montague Expressway, Milpitas, CA 95035,USA

Declaration Letter

Dear Sir,

For our business issue and marketing requirement, we would like to list 2 model numbers on the FCC certificates and reports, as following:

Model No.: H107D+ ,H107D
We declare that, all the model PCB ,Antenna and Appearance shape , accessories are the same . The difference of these is listed as below:

Main Model No	Serial Model No	Difference
H107D+	H107D	Different model name

Thank you!

Hubsan Intelligent Co., Ltd.
a Shenzhen Limited Company
By: 
Print Name: Sam LEE
Title: CEO

(Signature Page to)

Printed name/title: Sam LEE/CEO
Address:13th Floor,Bldg 1C,Shenzhen Software Industry Base,Xuefu Road,Nanshan District,Shenzhen,China.518054



SIEMIC, INC.

Accessing global markets

Title: RF Test Report for MINI QUADCOPTER FPV PLUS
Main Model: H107D+
Serial Model: H107D
To: FCC Part 15.407: 2014, ANSI C63.10: 2013

Report No.: 15070788-FCC-R2
Issue Date: November 27, 2015
Page: 54 of 54
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