Dfine Technology Co.,Ltd.

Wireless HDMI AV Transmission System

Main Model: DF-W5001
Serial Model: N/A

June 29,2015

Report No.: 15070332-FCC-R1
(This report supersedes none)

RF Test Report

SIEMIC, INC. Accessing global markets

Modifications made to the product : None

This Test Report is Issued Under the Authority of:		
Winnie Zhang	David Huang	
Winnie Zhang **Compliance Engineer**	**David Huang** **Technical Manager**	

Laboratory 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 through out 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.

SIEMIC (Shenzhen-China) Laboratories Accreditations for Conformity Assessment

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

This page has been left blank intentionally.

CONTENTS

1 EXECUTIVE SUMMARY & EUT INFORMATION 5

2 TECHNICAL DETAILS 6

3 MODIFICATION 7

4 TEST SUMMARY 8

5 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS 10

ANNEX A. TEST INSTRUMENT & METHOD 52

ANNEX B. EUT AND TEST SETUP PHOTOGRAPHS 57

ANNEX C. TEST SETUP AND SUPPORTING EQUIPMENT 62

ANNEX D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PART LIST 66

ANNEX E. DECLARATION OF SIMILARITY 67

1 EXECUTIVE SUMMARY & EUT INFORMATION

The purpose of this test programme was to demonstrate compliance of the Dfine Technology Co.,Ltd., Wireless HDMI AV Transmission System and model: DF-W5001 against the current Stipulated Standards. The Wireless HDMI AV Transmission System has demonstrated compliance with the FCC Part 15.407: 2014, ANSI C63.10: 2013.

EUT Information

EUT Description	:	**Wireless HDMI AV Transmission System**
Main Model	:	**DF-W5001**
Serial Model	:	**N/A**
Antenna Gain	:	**WIFI 5GHz: 5 dBi**
Input Power	:	**Adapter: Model:ST-012AAC-050200U Input: AC 100-240V 50/60Hz 0.3A Output: DC5V 2.0A**
Classification Per Stipulated Test Standard	:	**FCC Part 15.407: 2014, ANSI C63.10: 2013**

2 TECHNICAL DETAILS

Purpose	**Compliance testing of Wireless HDMI AV Transmission System with stipulated standard**
Applicant / Client	**Dfine Technology Co.,Ltd. Building E6, Tianfu Software Park, No.1366, Tianfu Avenue, High-Tech District, Chengdu, Sichuan, China**
Manufacturer	**Dfine Technology Co.,Ltd. Building E6, Tianfu Software Park, No.1366, Tianfu Avenue, High-Tech District, Chengdu, Sichuan, 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	**15070332-FCC-R1**
Date EUT received	**May 21,2015**
Standard applied	**FCC Part 15.407: 2014, ANSI C63.10: 2013**
Dates of test (from – to)	**May 22 to June 29,2015**
No of Units :	**#1**
Equipment Category :	**Spread Spectrum System/Device**
Trade Name :	
RF Operating Frequency (ies)	**WIFI(802.11a): 5190-5230 MHz; 5755-5795MH**
Number of Channels	**WIFI 5.19-5.23G(a):2CH WIFI 5.755-5.795G(a): 2CH**
Modulation	**WIFI(802.11a): OFDM**
FCC ID	**Y48DF-W5001R**

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)(1)(Ⅳ) & 15.407(a)(3)	Conducted Maximum Output Power	Compliance
§15.407(a)(1)(Ⅳ) & 15.407(a)(3)	The maximum Power Spectral Density	Compliance
§15.407(b)(1) & 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 5.18-5.24G band

802.11a-40	
Channel	Frequency (MHz)
38	5190
46	5230

For 5.725-5.850 G band

802.11a-40	
Channel	Frequency (MHz)
151	5755
159	5795

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 two permanently attached PCB antenna for 5GHz, the gain is 5 dBi, so the total gain is 8 dBi.

Result: PASS

§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	24°C
Relative Humidity	54%
Atmospheric Pressure	1025mbar

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 :June 25, 2015
   Tested By : Winnie Zhang

Procedures:

99% Bandwith:

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.

For the band 5.15-5.25 GHz

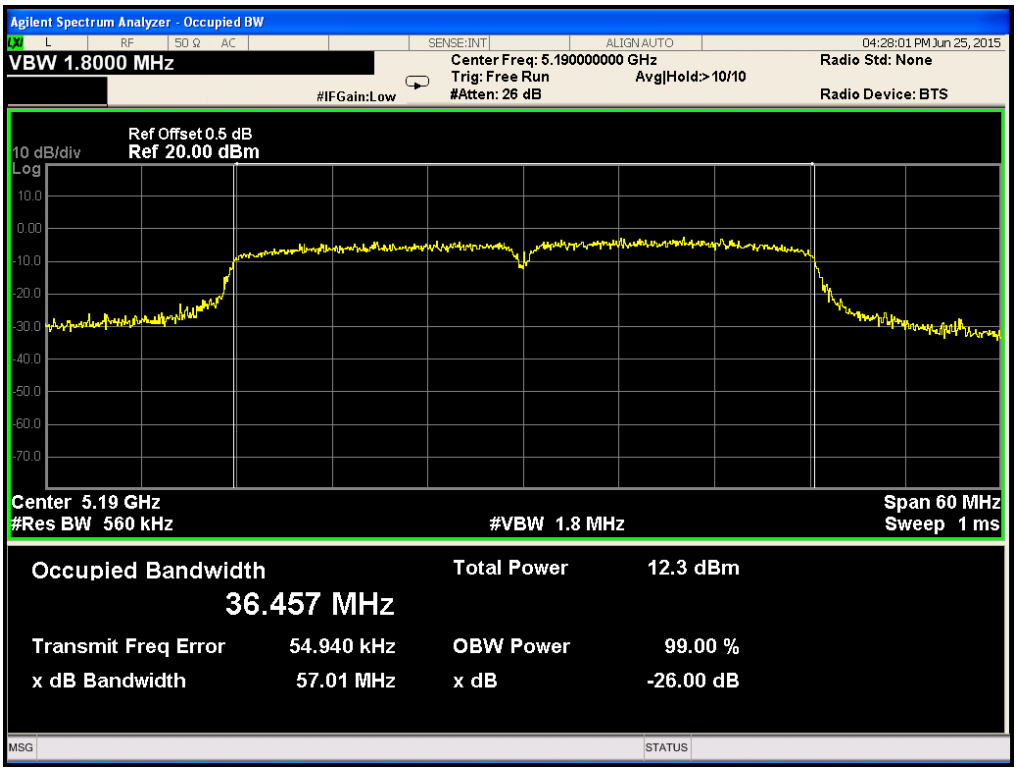
Channel	Channel Frequency (MHz)	Data Rate (Mbps)	Antenna #0		Antenna #1	
			Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)
802.11a(40M) mode						
Low	5190	12	36.457	57.01	36.475	57.29
High	5230	12	37.005	59.17	36.938	59.98

For the band 5.725-5.85 GHz

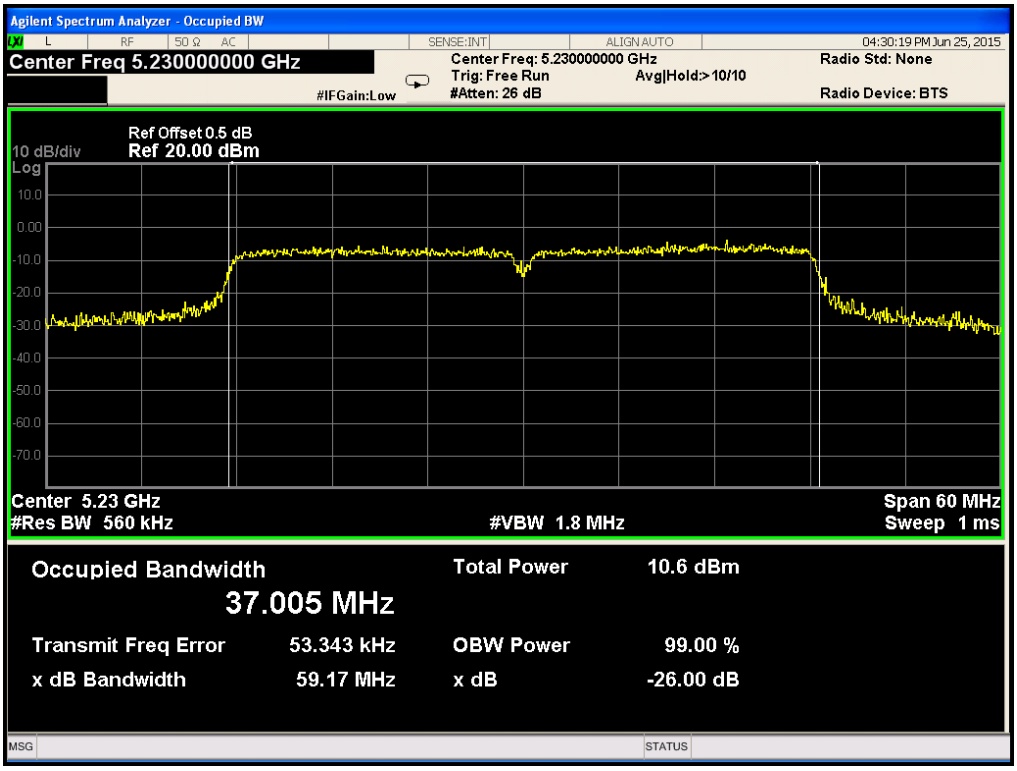
Channel	Channel Frequency (MHz)	Data Rate (Mbps)	Antenna #0		Antenna #1	
			Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)
802.11a(40M) mode						
Low	5755	12	36.371	44.99	36.378	44.77
High	5795	12	36.276	45.51	36.290	44.90

For the band 5.15-5.25 GHz
Antenna #0

Low Channel

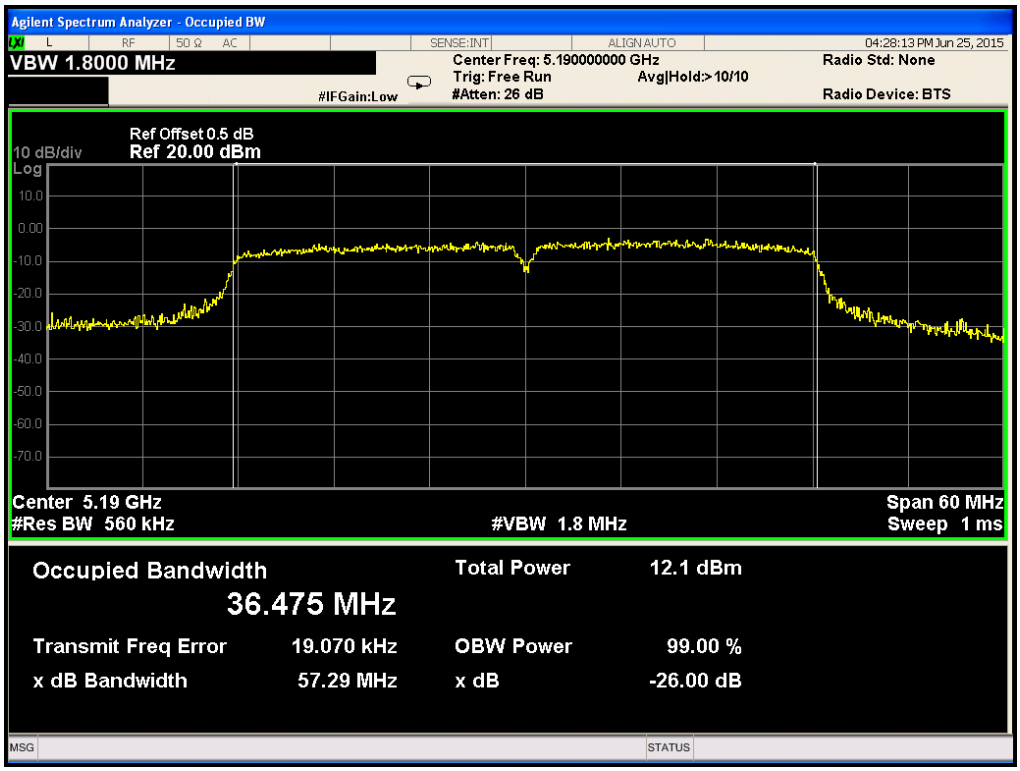


High Channel

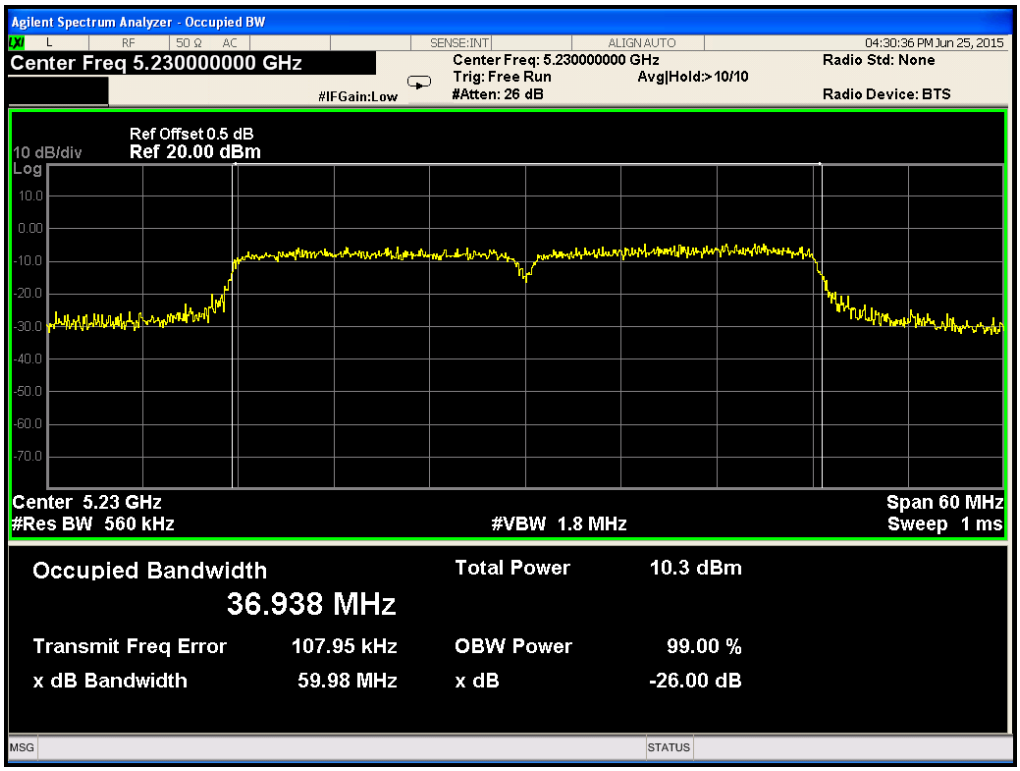


Antenna #1

Low Channel

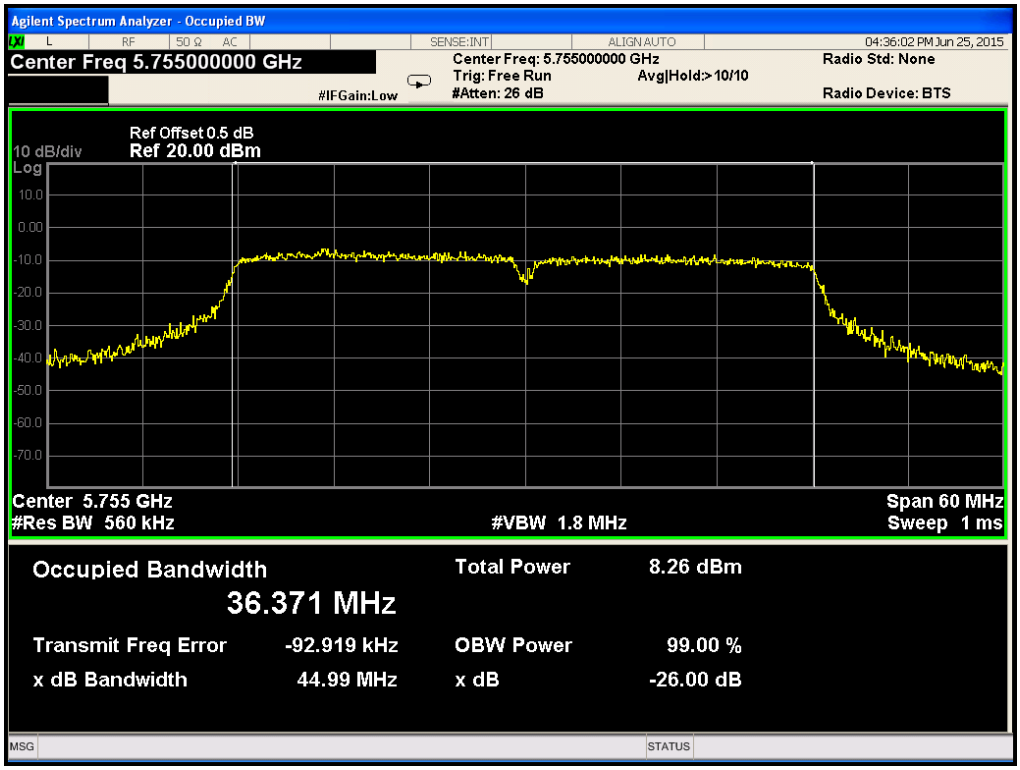


High Channel

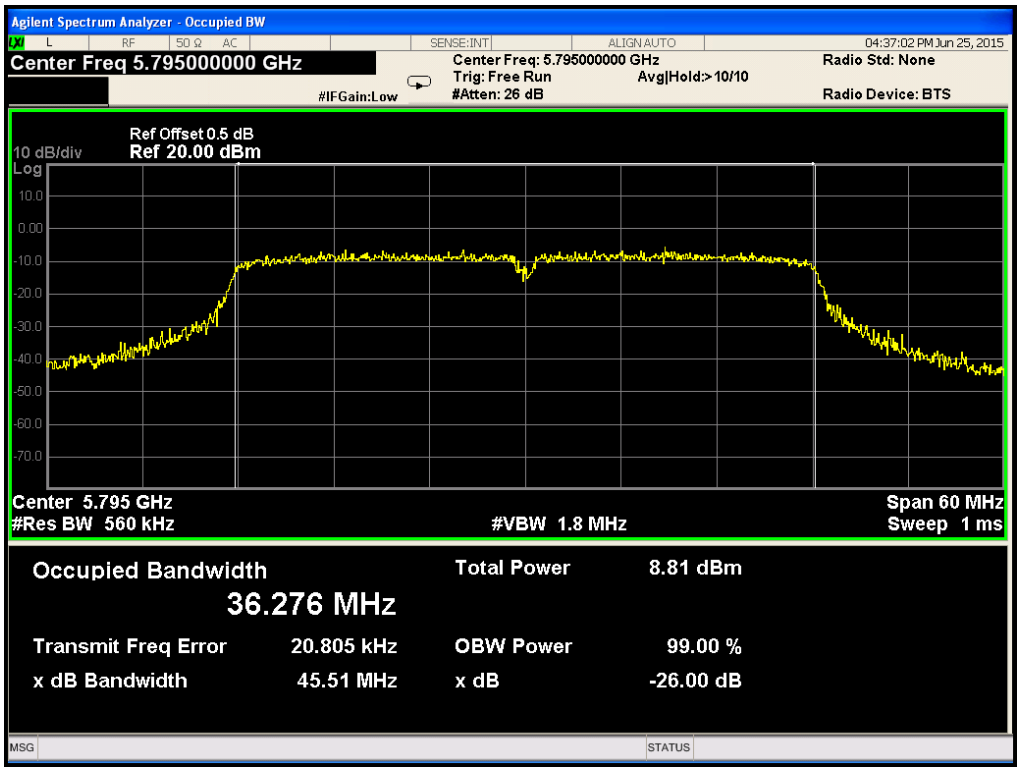


For the band 5.725-5.85 GHz
Antenna #0

Low Channel

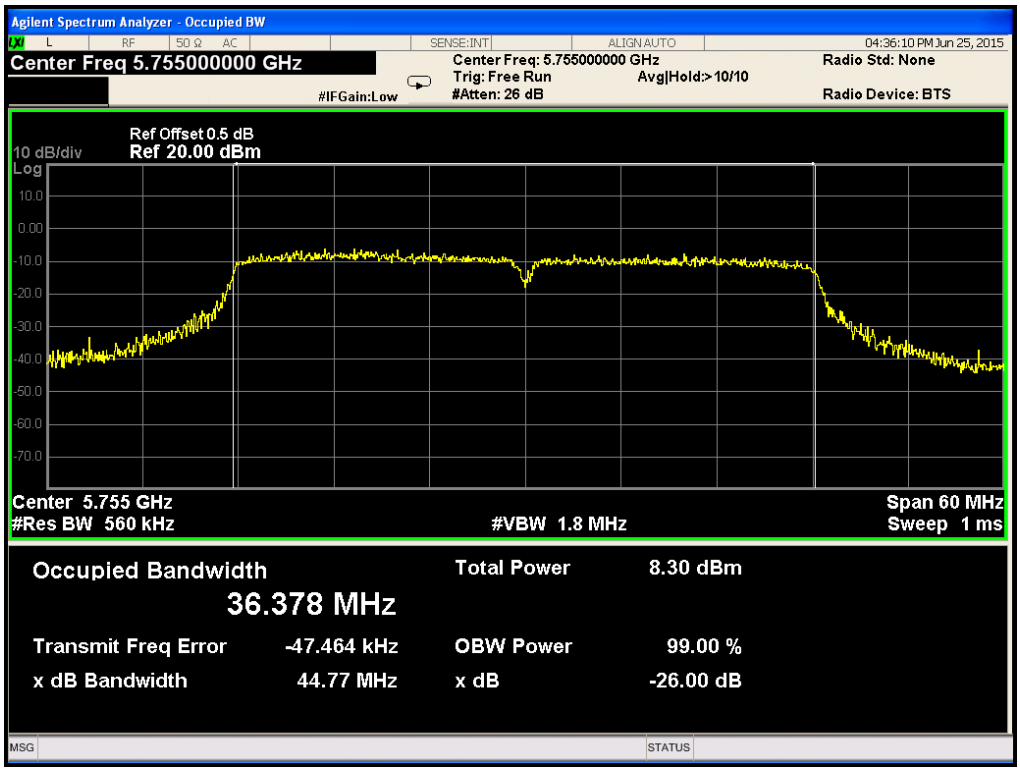


High Channel

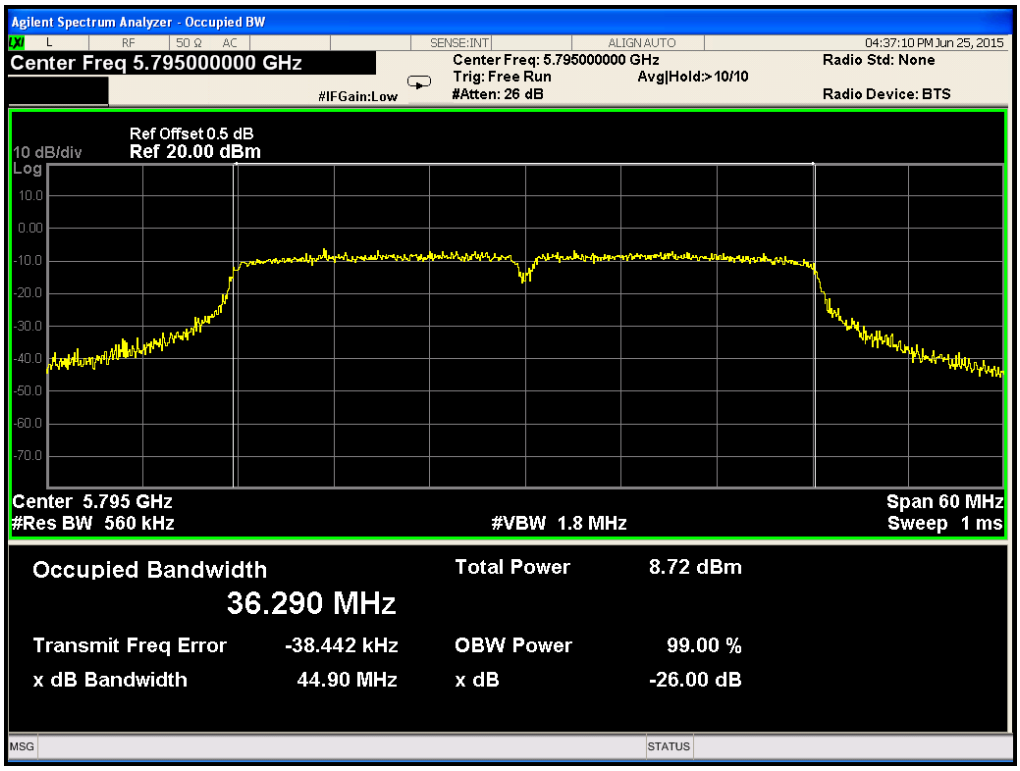


Antenna #1

Low Channel



High Channel



§15.407(a)–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	24°C
Relative Humidity	54%
Atmospheric Pressure	1025mbar

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 : June 25, 2015
   Tested By : Winnie Zhang

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:

Minimum Emission Bandwidth for the band 5.725-5.85 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) ≥ 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.

Test Result: Pass.

Please refer to the following tables and plots.

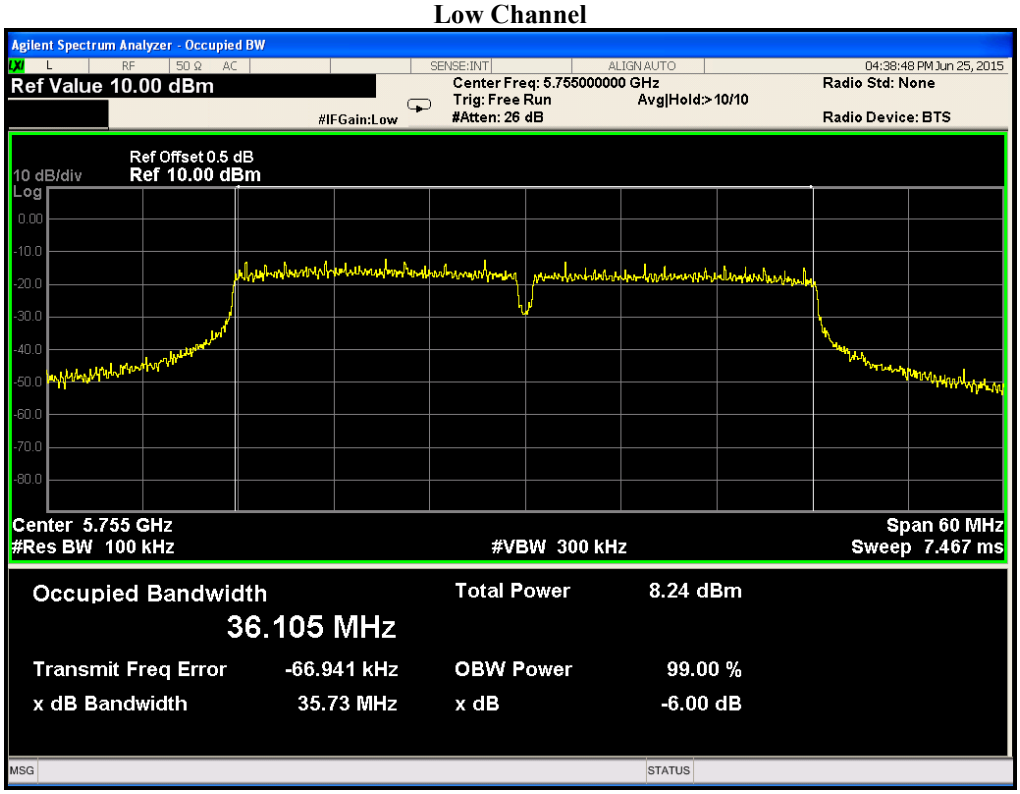
For the band 5.725-5.85 GHz

Channel	Channel Frequency (MHz)	Data Rate (Mbps)	Antenna #0	Antenna #1	Limit(MHz)
			Measured 6dB Bandwidth (MHz)	Measured 6dB Bandwidth (MHz)	
802.11a(40M) mode					
Low	5755	12	35.73	35.70	>=0.5
High	5795	12	35.92	35.90	>=0.5

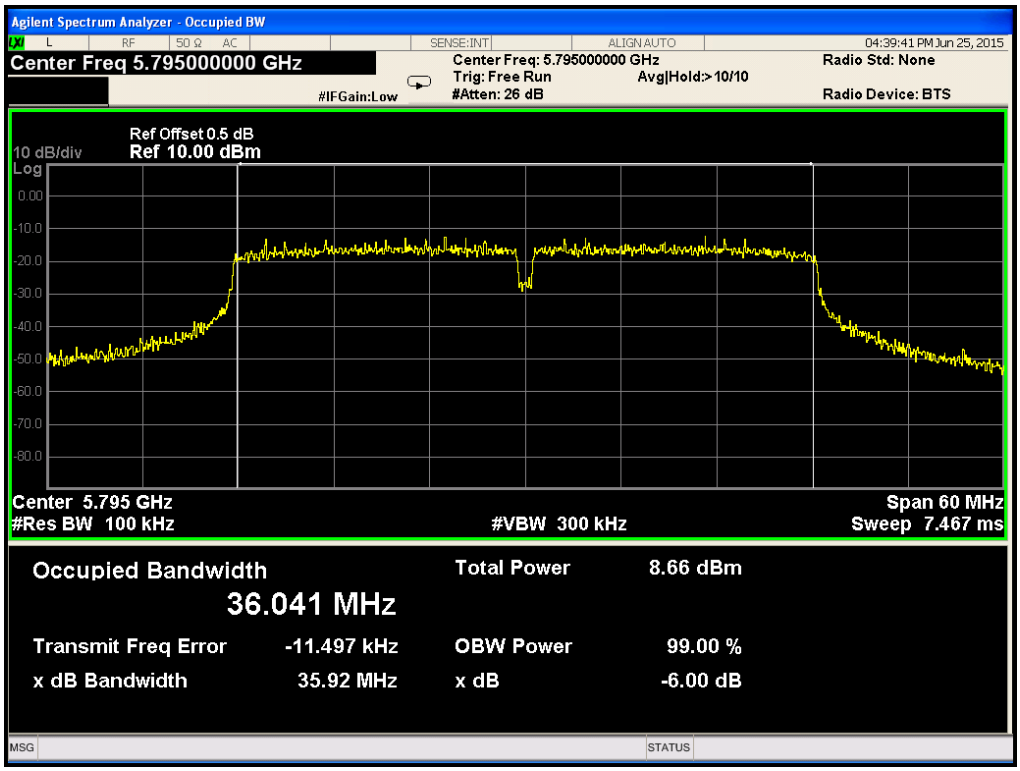
For the band 5.725-5.85 GHz

Antenna #0

Low Channel

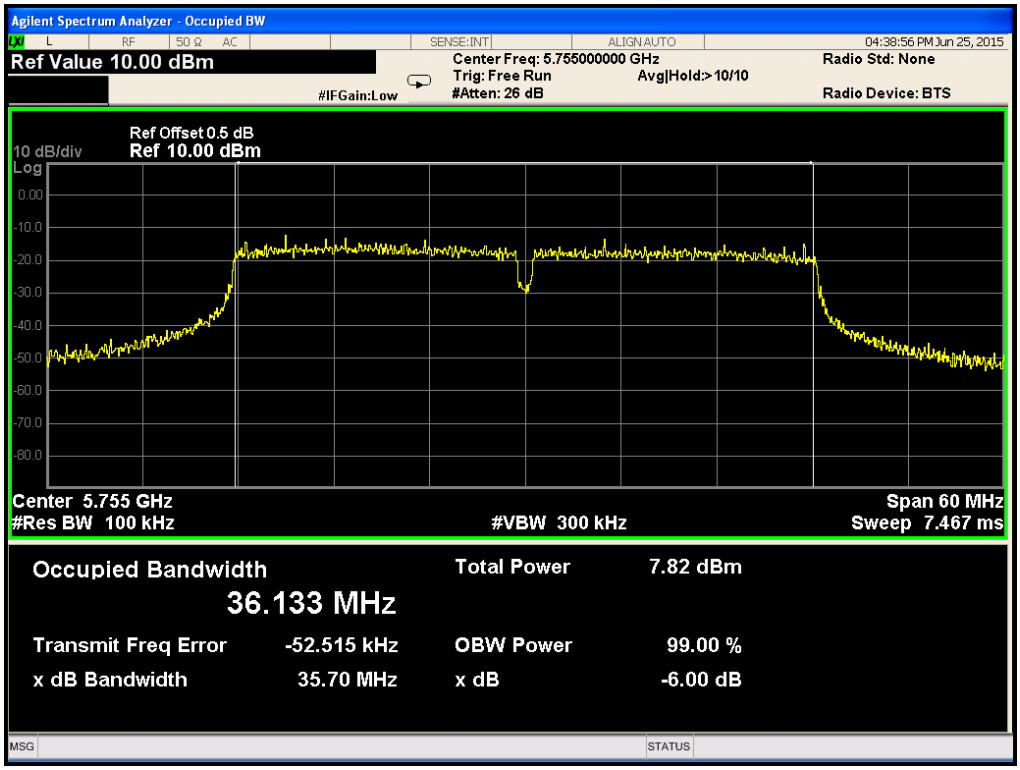


High Channel

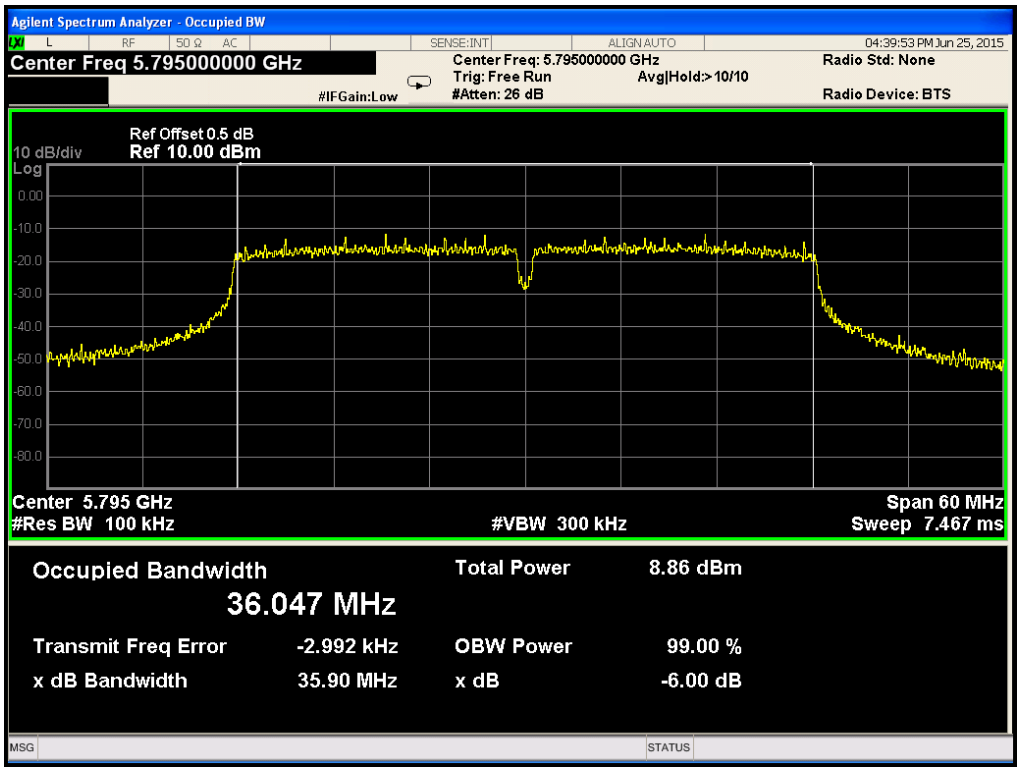


Antenna #1

Low Channel



High Channel



5.2 §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	24°C
Relative Humidity	54%
Atmospheric Pressure	1025mbar

4. Test date : June 25,2015
   Tested By : Winnie Zhang

Standard Requirement:

For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, 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.

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 ≤ 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 5.15-5.25 GHz

802.11a (40M) mode				
Data Rate:12.0Mbps				
Channel	AV Output Power(dBm)		Total AV Power(dBm)	Limit(dBm)
	Antenna #0	Antenna #1		
5190	11.87	12.00	**14.95**	24
5230	10.92	10.92	13.92	24

For the band 5.725-5.850 GHz

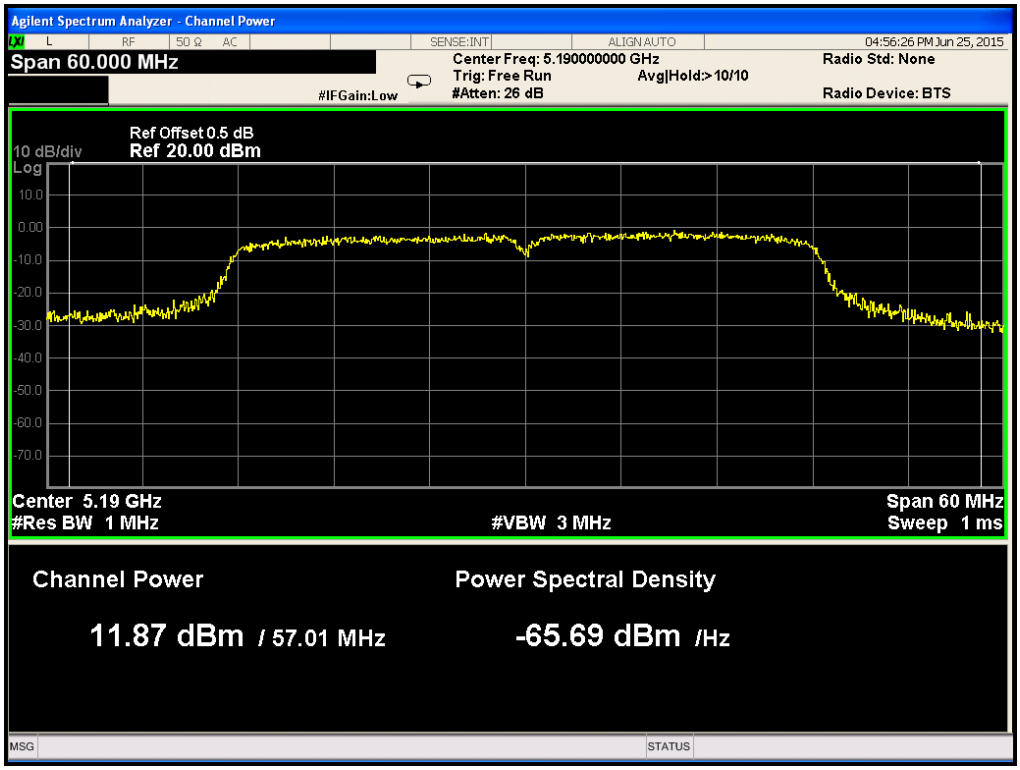
802.11a(40M)mode				
Data Rate:12.0Mbps				
Channel	AV Output Power(dBm)		Total AV Power(dBm)	Limit(dBm)
	Antenna #0	Antenna #1		
5755	8.76	8.84	11.81	30
5795	9.10	9.40	12.26	30

Not: The antenna Gain is 8 dBi, and it exceeds 6 dBi. So the limit of Power is reduced by 2 dBi. It should be 22 dBm for 5190MHz and 5230MHz; 28 dBm for 5755MHz and 5795MHz.

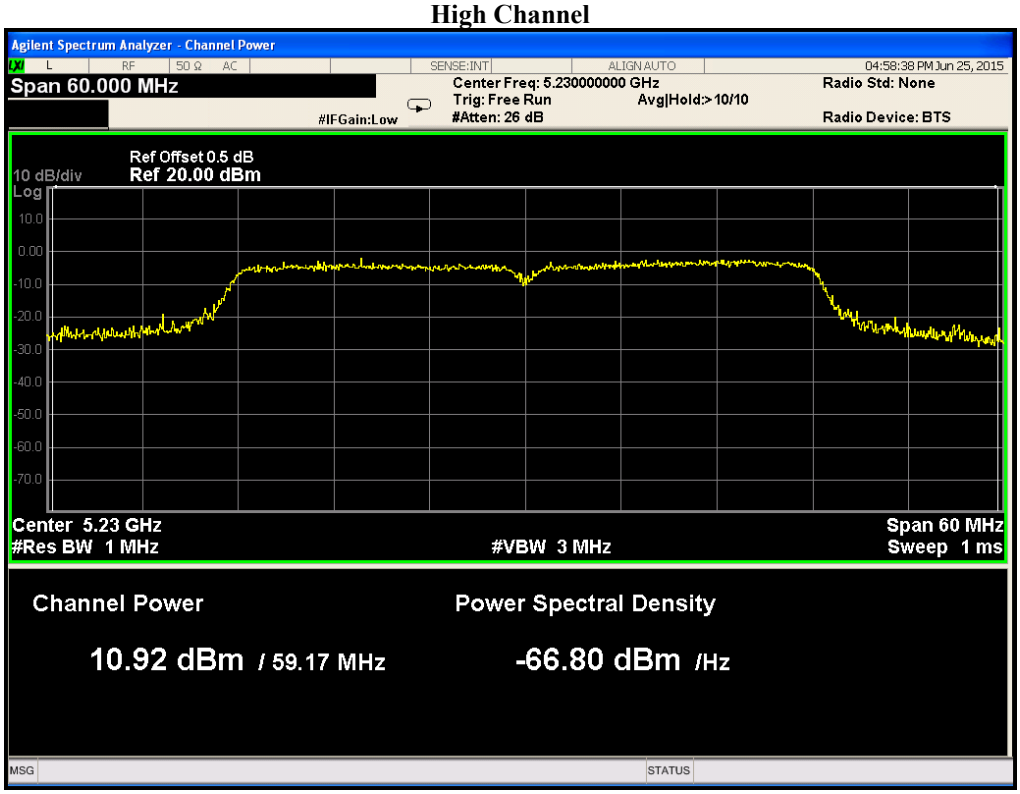
For the band 5.15-5.25 GHz

Antenna #0

Low Channel

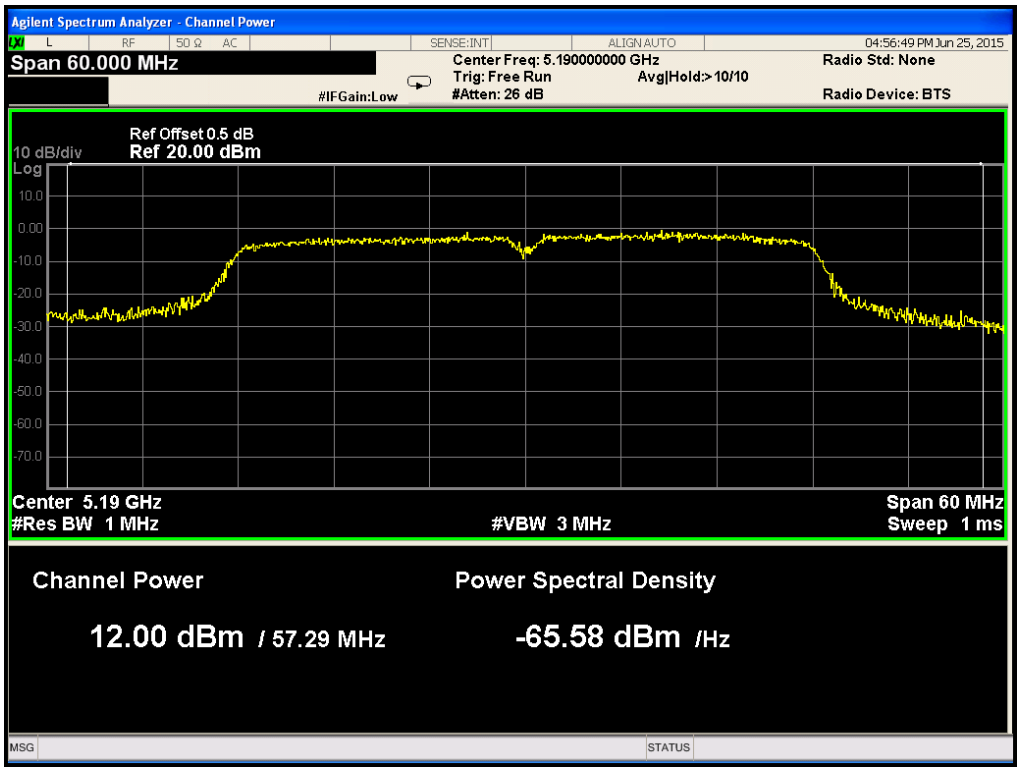


High Channel

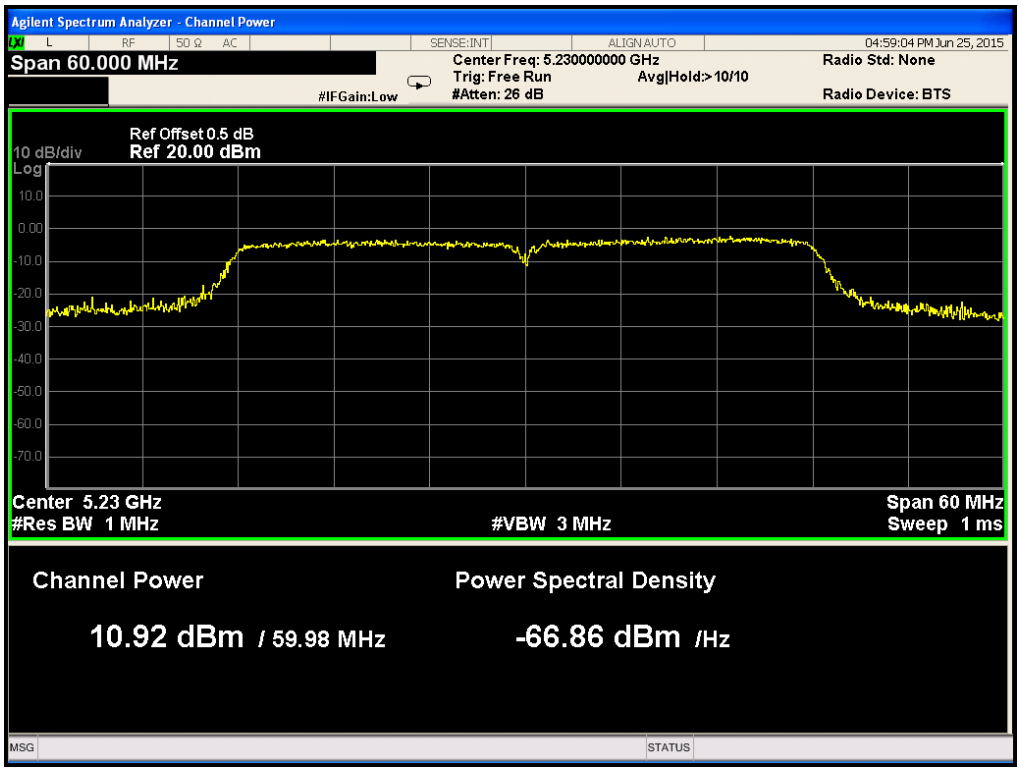


Antenna #1

Low Channel

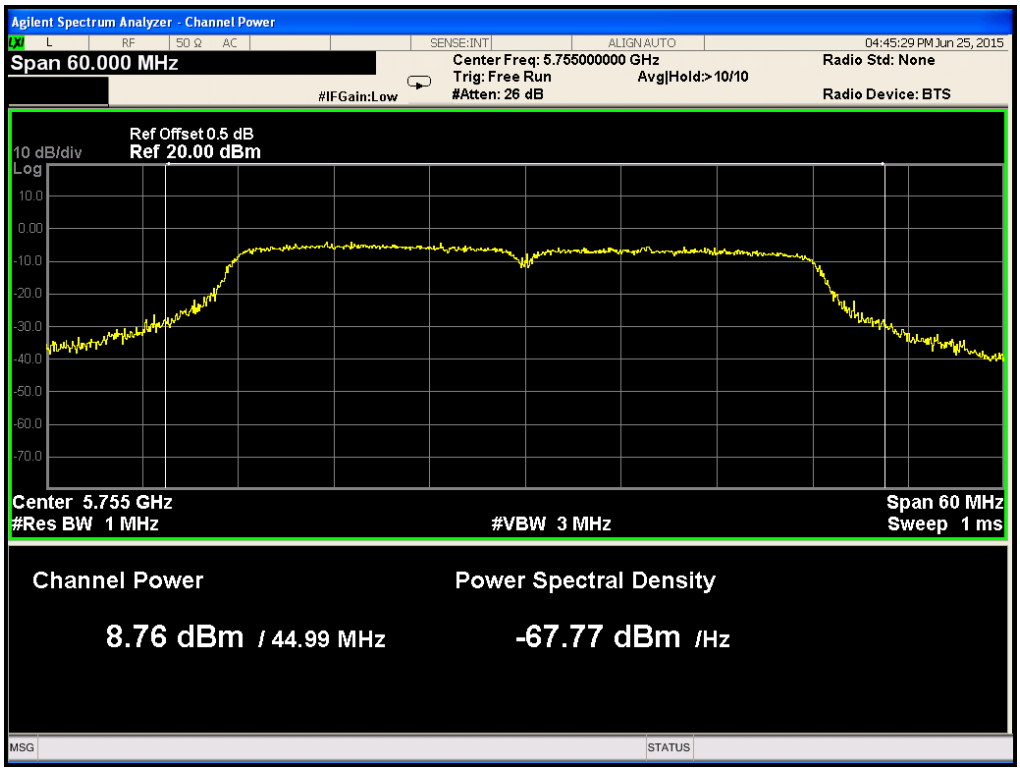


High Channel

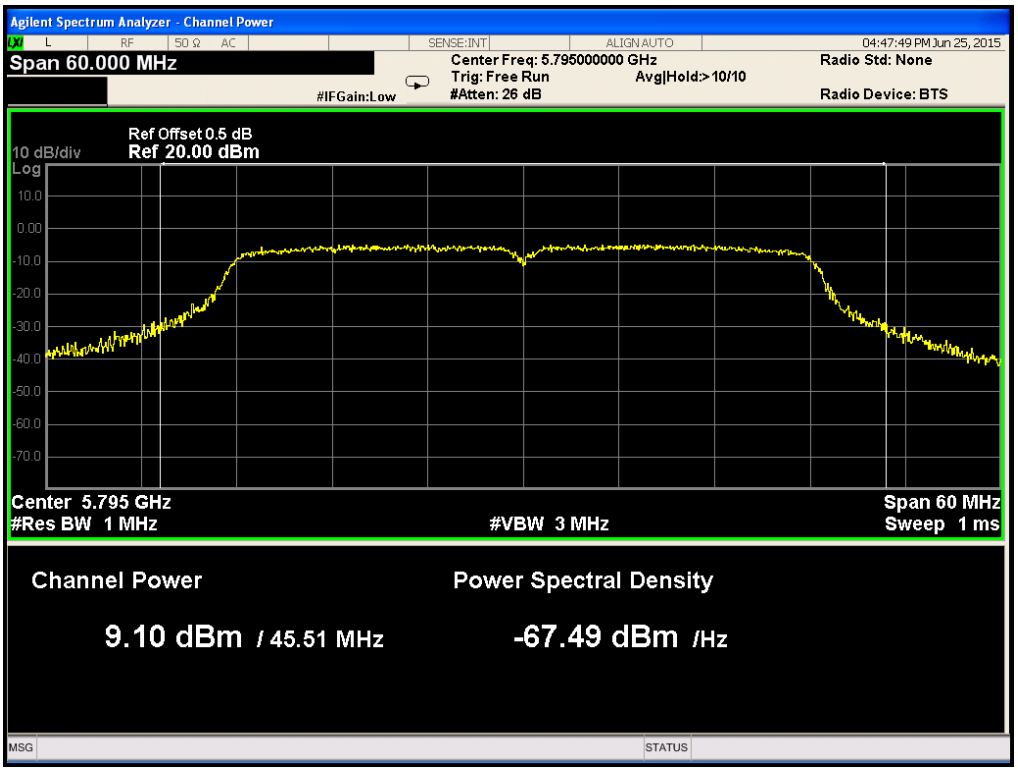


For the band 5.725-5.850 GHz
Antenna #0

Low Channel

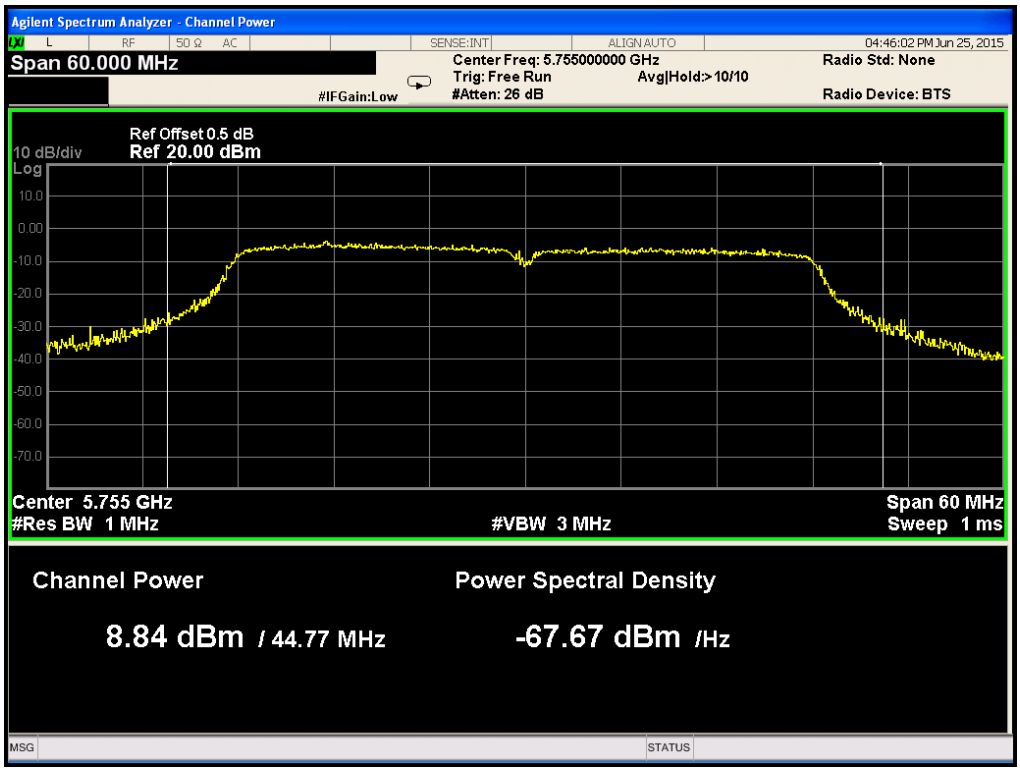


High Channel

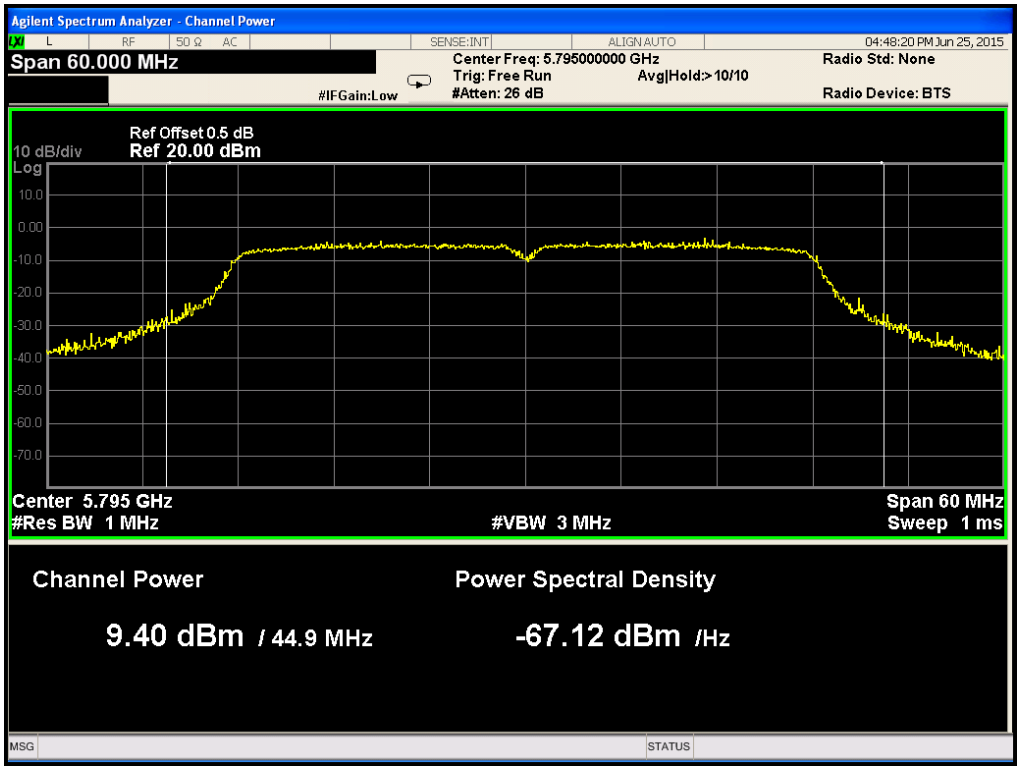


Antenna #1

Low Channel



High Channel



5.3 §15.407(a)(1)(Ⅳ) &(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	24°C
Relative Humidity	54%
Atmospheric Pressure	1025mbar

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 : June 25,2015
   Tested By : Winnie Zhang

Standard Requirement:

For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, 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.

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 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.l.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.

Please refer to the following tables and plots.

For the band 5.15-5.25 GHz

802.11a (40M) mode				
Data Rate: 12Mbps				
Channel	**PSD (dBm)**		**Total PSD (dBm)**	**Limit (dBm**
	Antenna #0	**Antenna #1**		
5190	-1.129	-0.239	2.35	9
5230	-2.233	-2.163	0.81	9

For the band 5.725-5.85 GHz

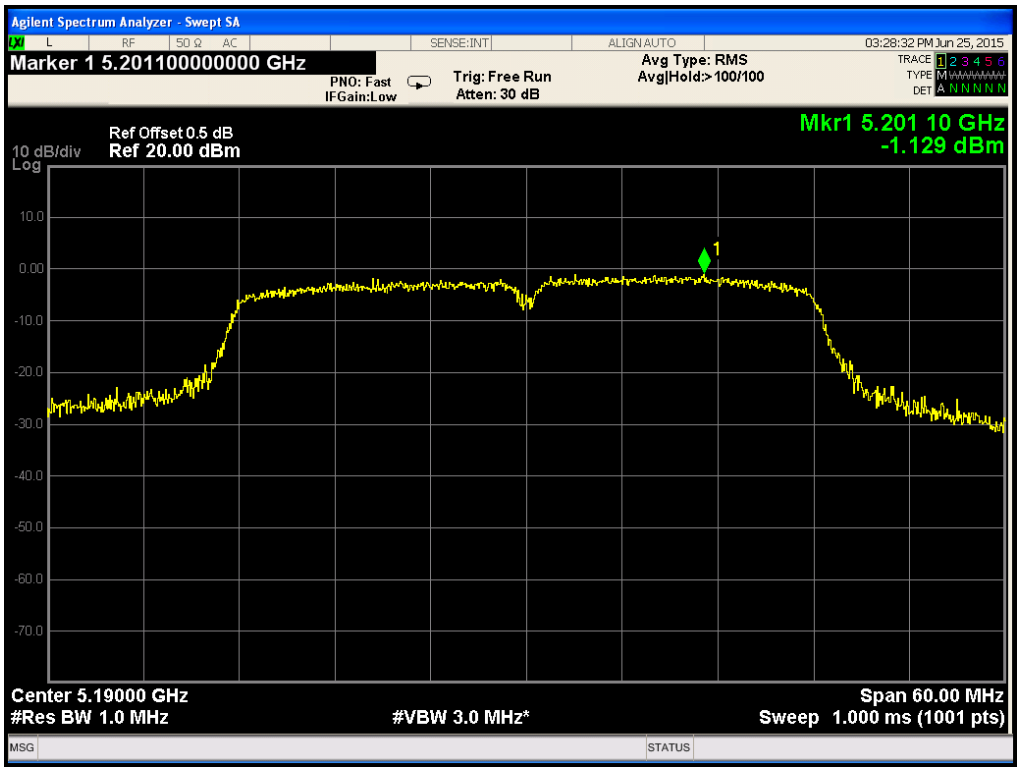
802.11a (40M)mode				
Data Rate: 12Mbps				
Channel	**PSD (dBm)**		**Total PSD (dBm)**	**Limit (dBm**
	Antenna #0	**Antenna #1**		
5755	-4.659	-4.337	-1.48	28
5795	-3.934	-4.498	-0.81	28

Not: The antenna Gain is 8 dBi, and it exceeds 6 dBi. So the limit of power spectrum density is reduced by 2 dBi. It should be 9 dBm for 5190MHz and 5230MHz; 28 dBm for 5755MHz and 5795MHz.

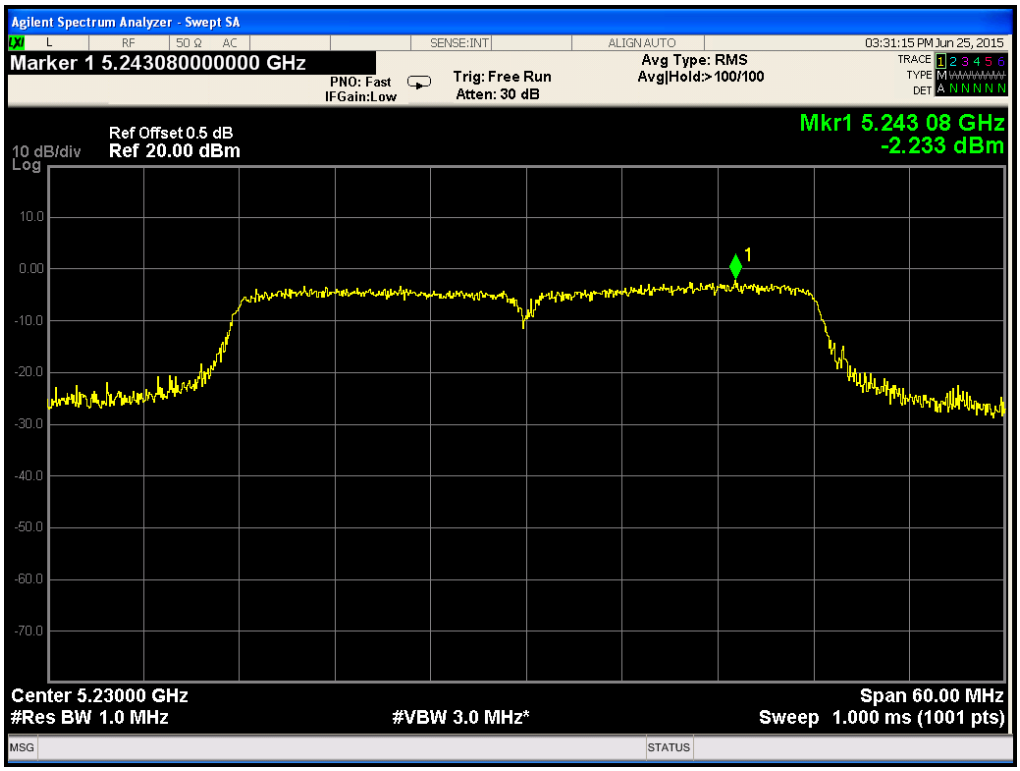
For the band 5.15-5.25 GHz

Antenna #0

Power Spectral Density

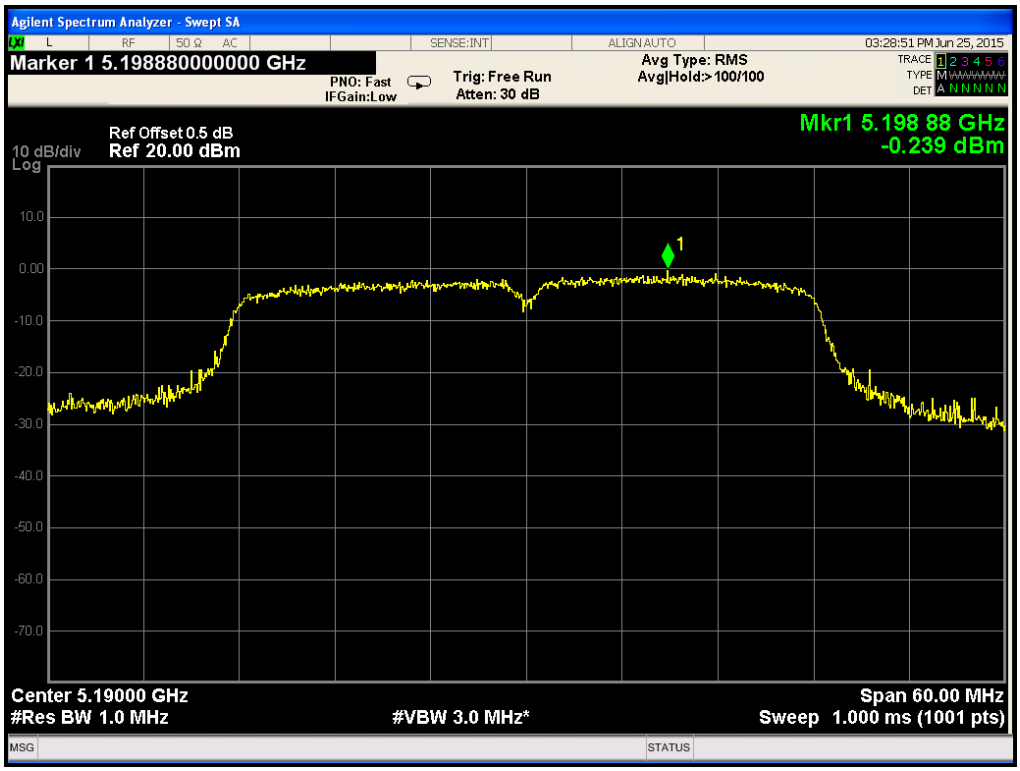


High Channel

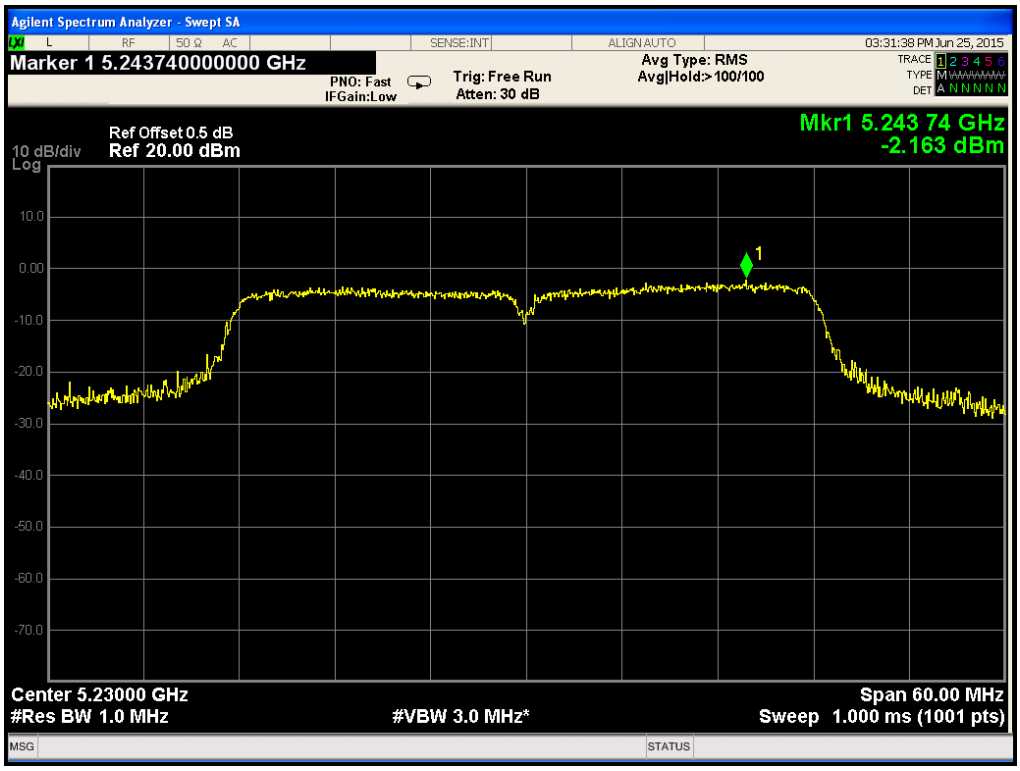


Antenna #1

Low Channel



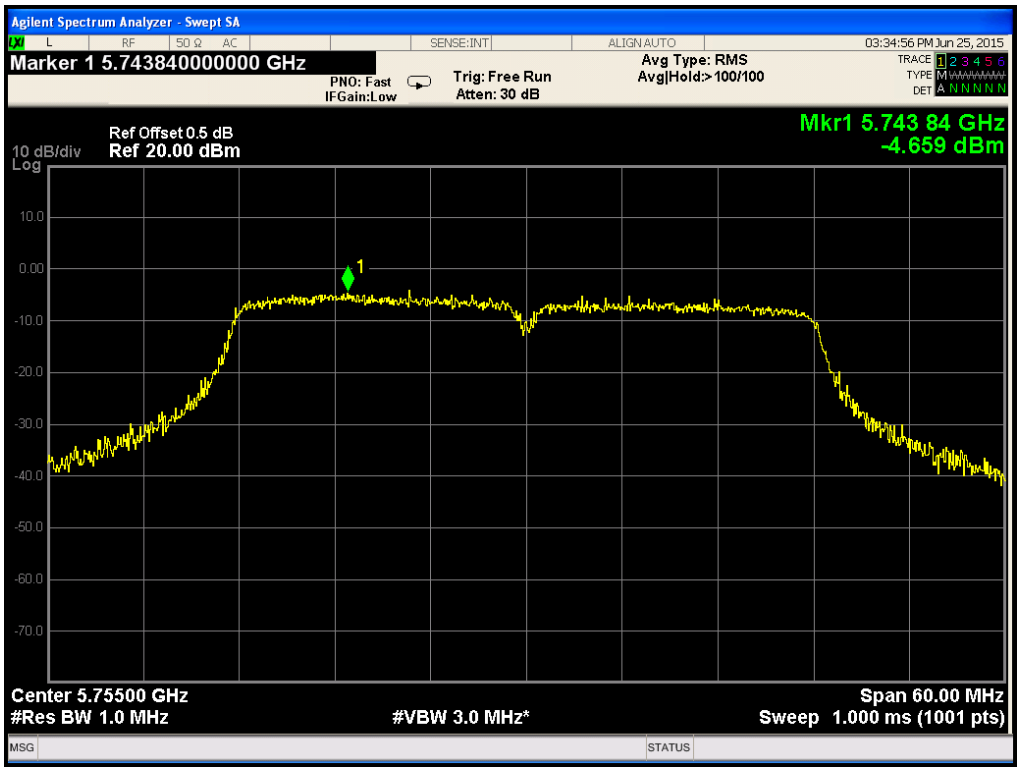
High Channel



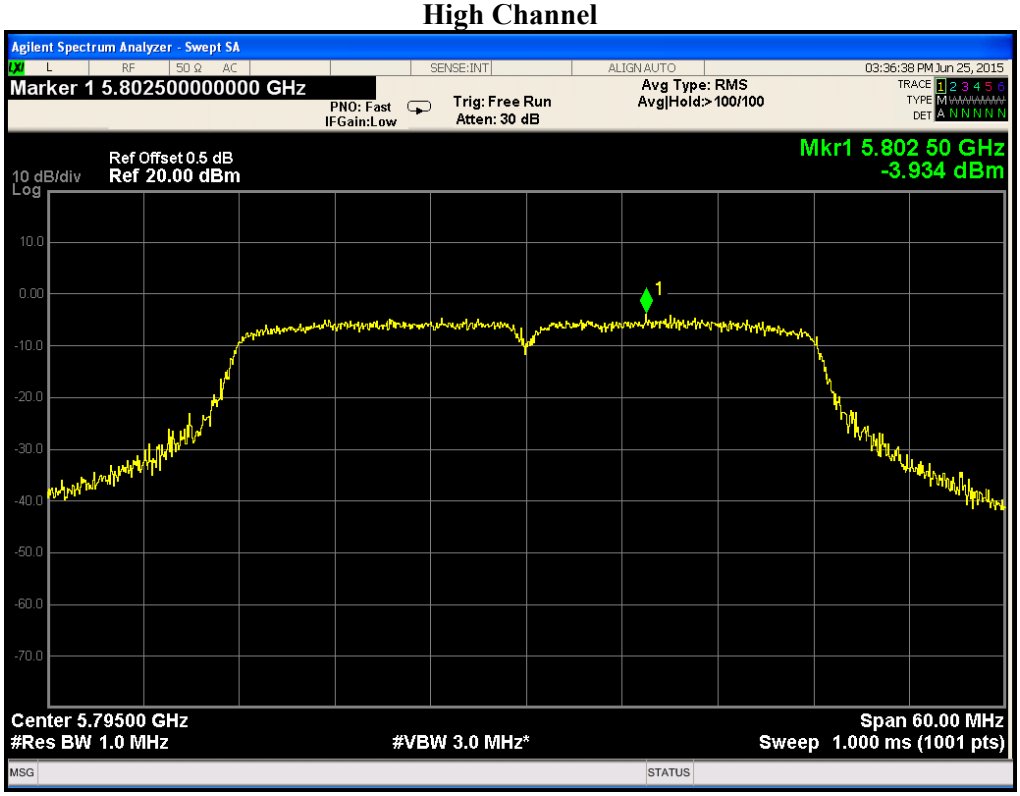
For the band 5.725-5.850 GHz

Antenna #0

Low Channel

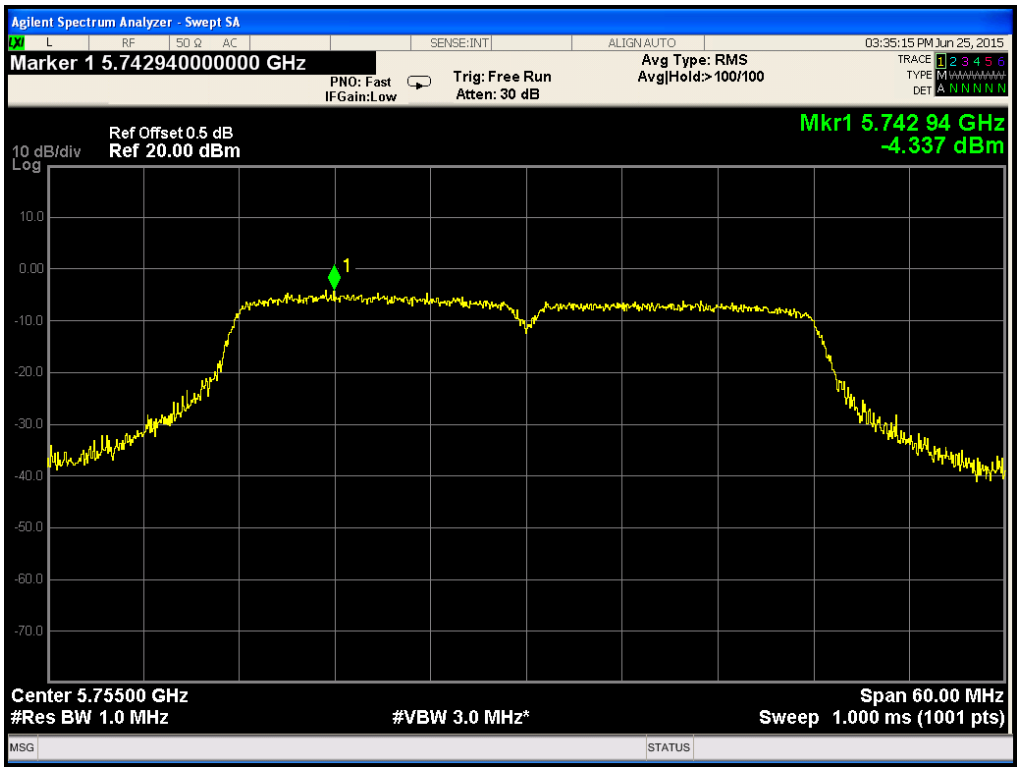


High Channel

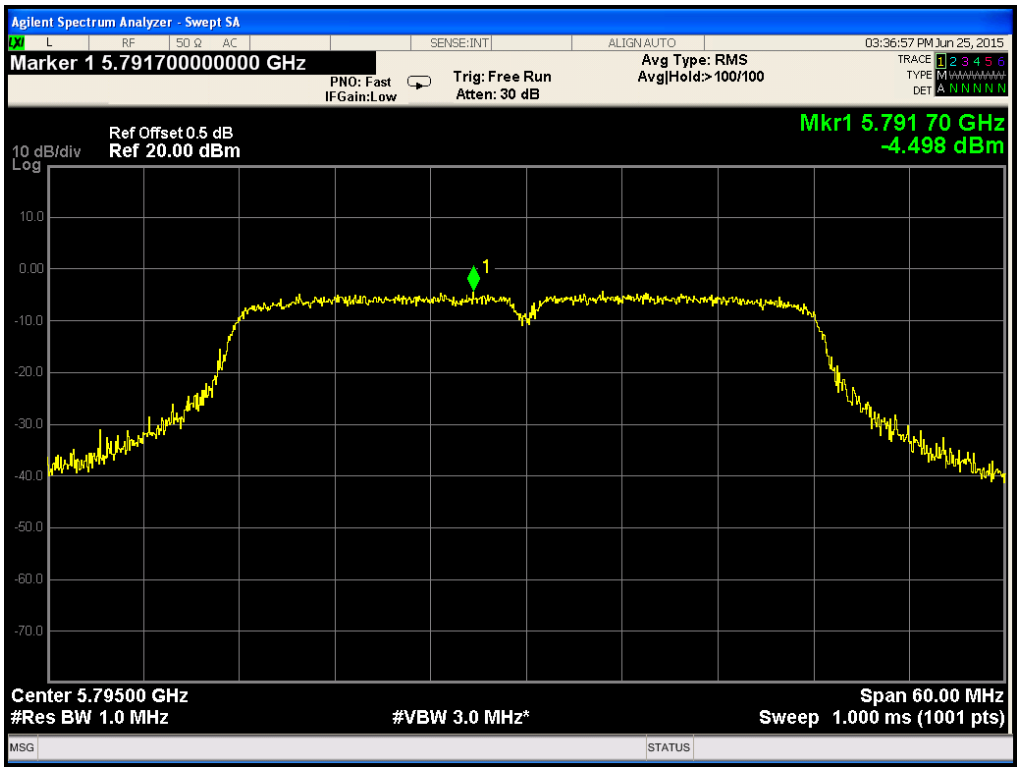


Antenna #1

Low Channel



High Channel



5.4 §15.407b(1) and 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	24°C
Relative Humidity	54%
Atmospheric Pressure	1025mbar

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 :June 25, 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:
(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.
(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 5.15-5.25 GHz

802.11a(40M) mode				
Data Rate: 12Mbps				
Channel	Bandedge (dBm)		Bandedge (dBm)	Limit (dBm)
	Antenna #0	Antenna #1		
5180	-32.729	-32.743	-29.73	-29
5240	-48.812	-49.674	-46.21	-29

For the band 5.725-5.85 GHz

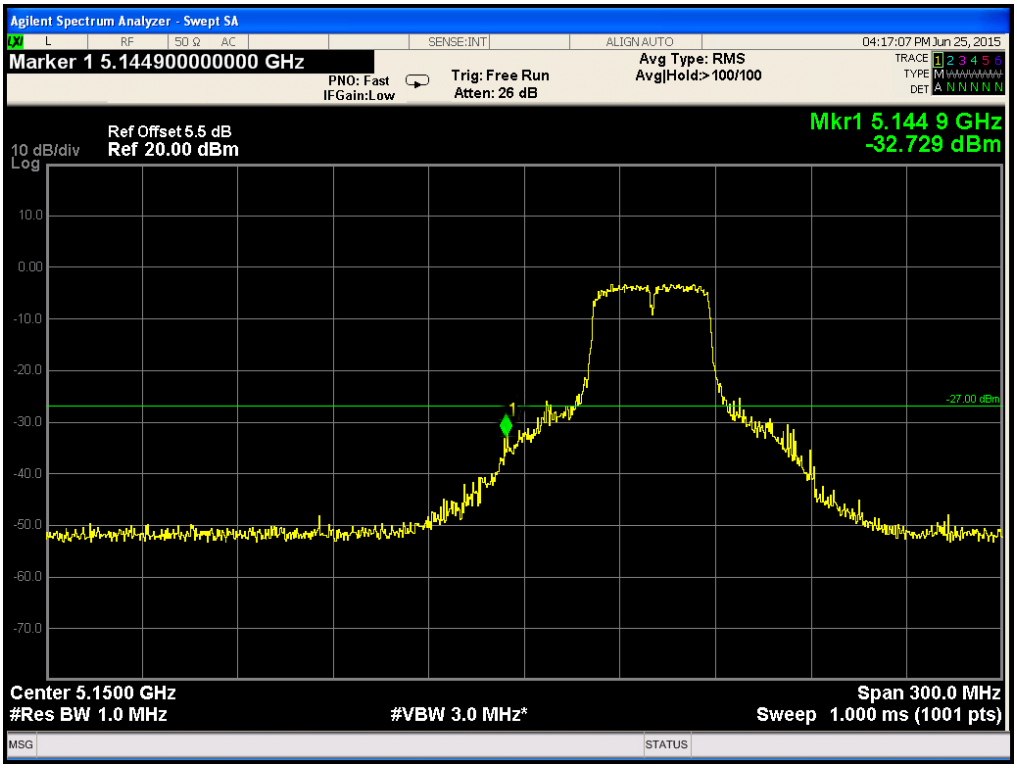
802.11a (40M)mode				
Data Rate: 12Mbps				
Channel	Bandedge (dBm)		Bandedge (dBm)	Limit (dBm)
	Antenna #0	Antenna #1		
5745	-29.143	-28.080	-25.57	-19
5825	-48.933	-48.493	-45.70	-19

Not: The antenna Gain is 8 dBi, and it exceeds 6 dBi. So the limit of bandedge is reduced by 2 dBi. It should be -29 dBm for 5190MHz and 5230MHz; -19 dBm for 5755MHz and 5795MHz.

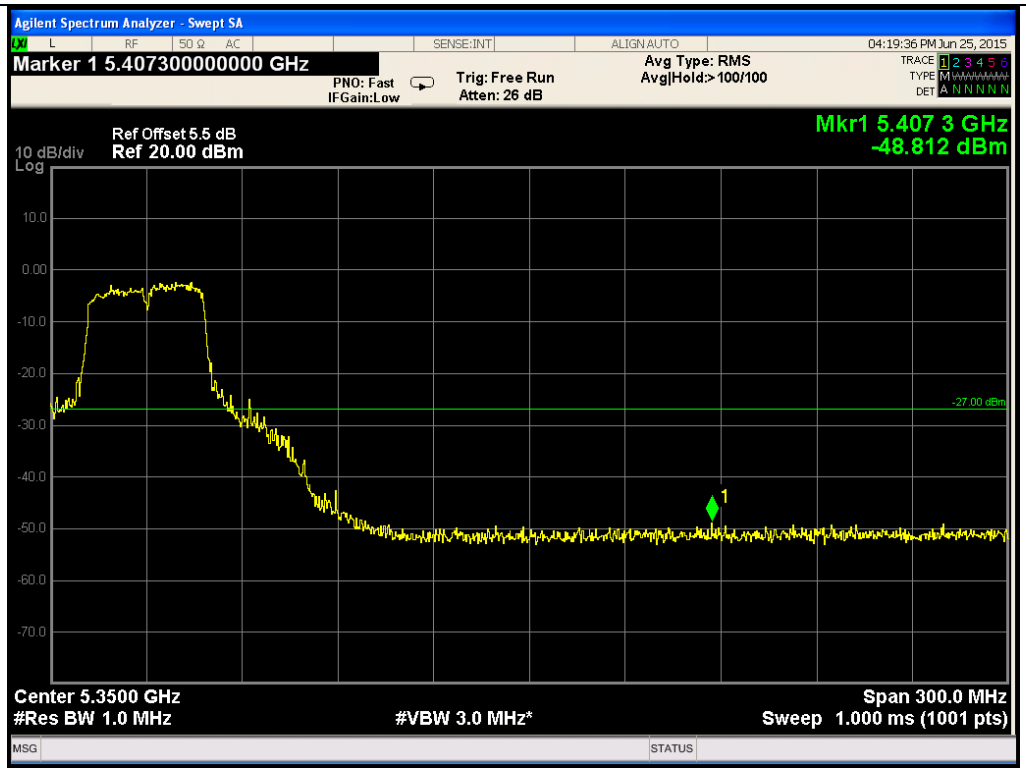
For the band 5.15-5.25 GHz

Antenna #0

Low Channel

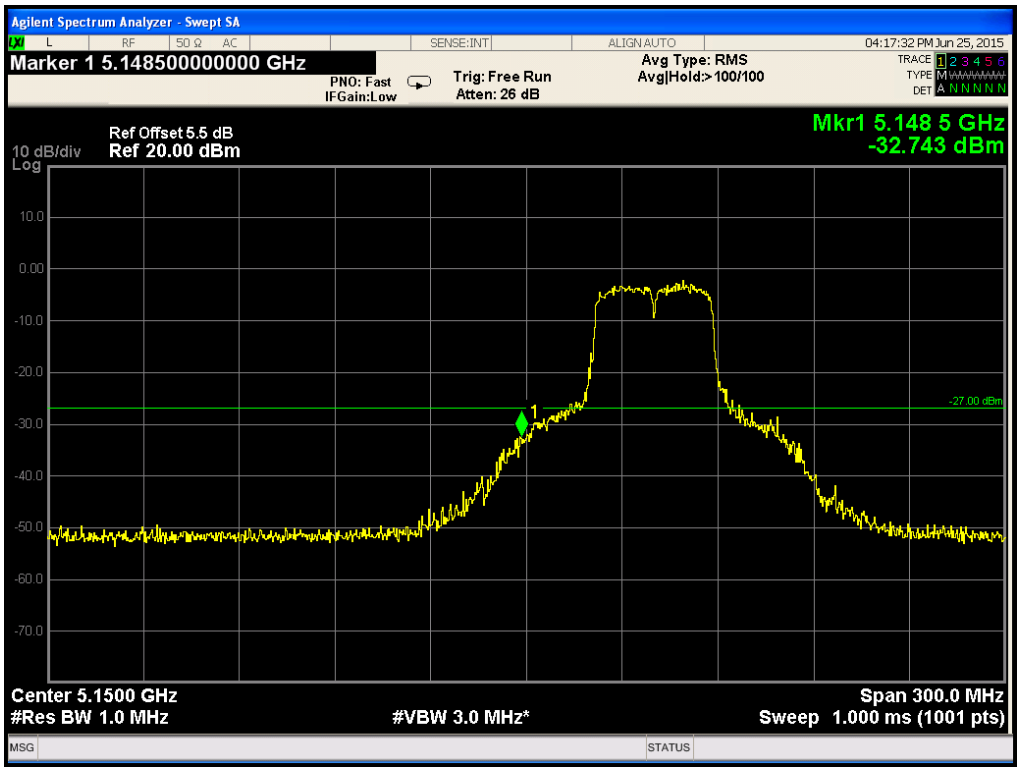


High Channel

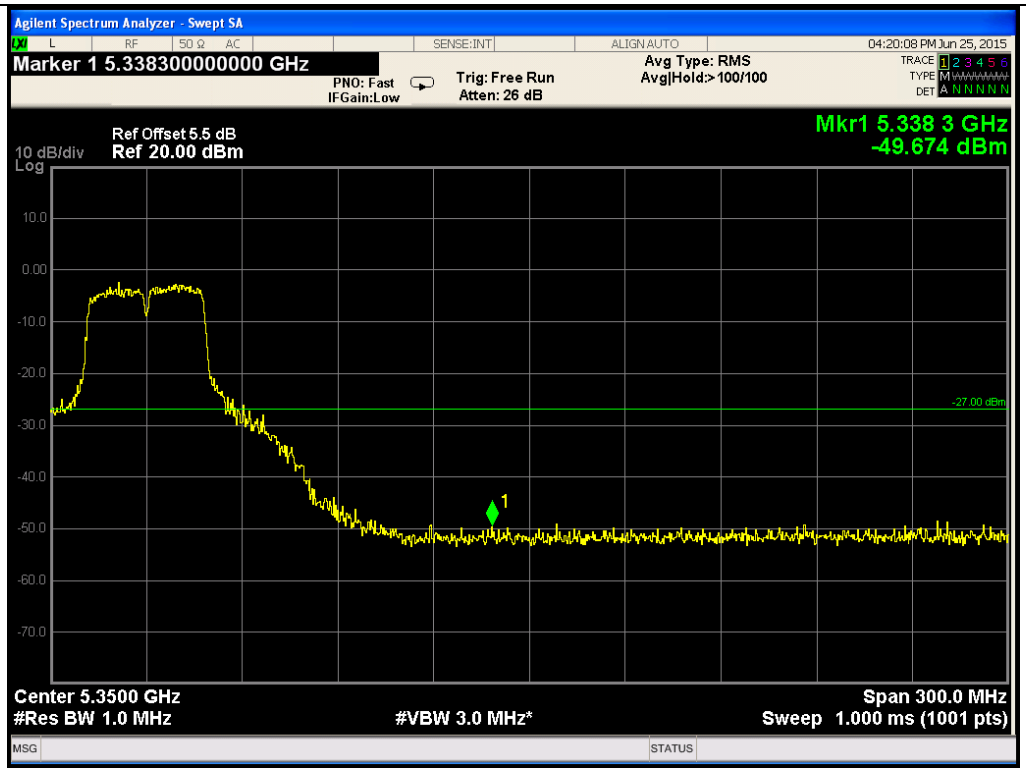


Antenna #1

Low Channel



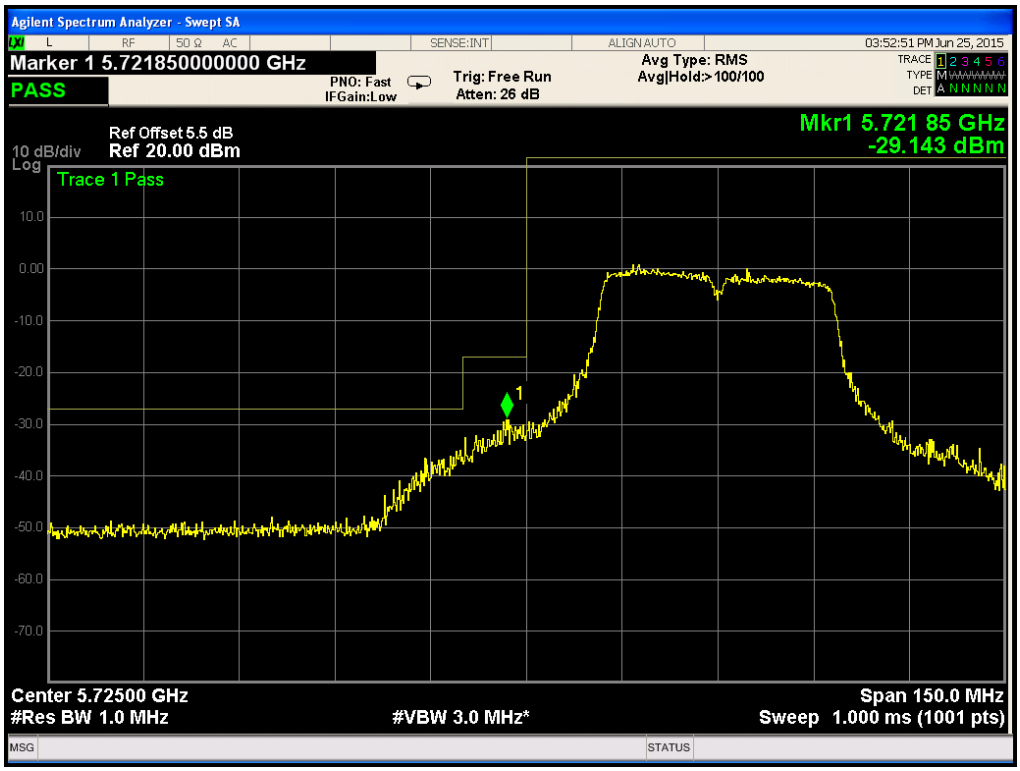
High Channel



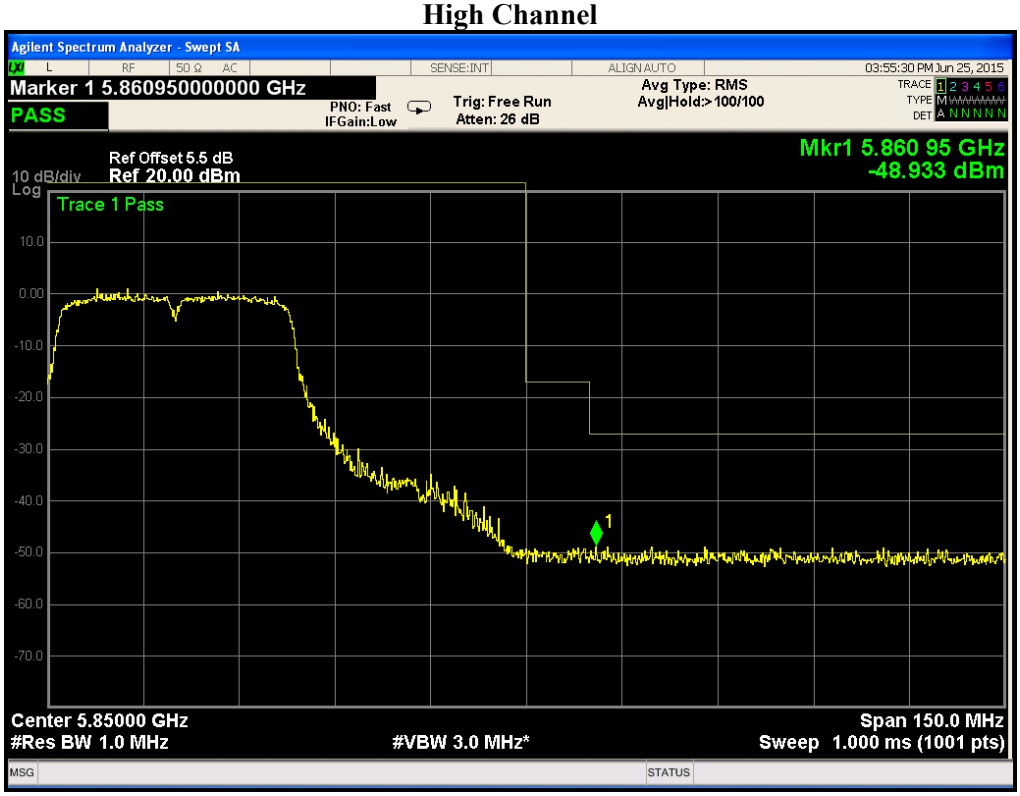
For the band 5.725-5.850 GHz

Antenna #0

Low Channel

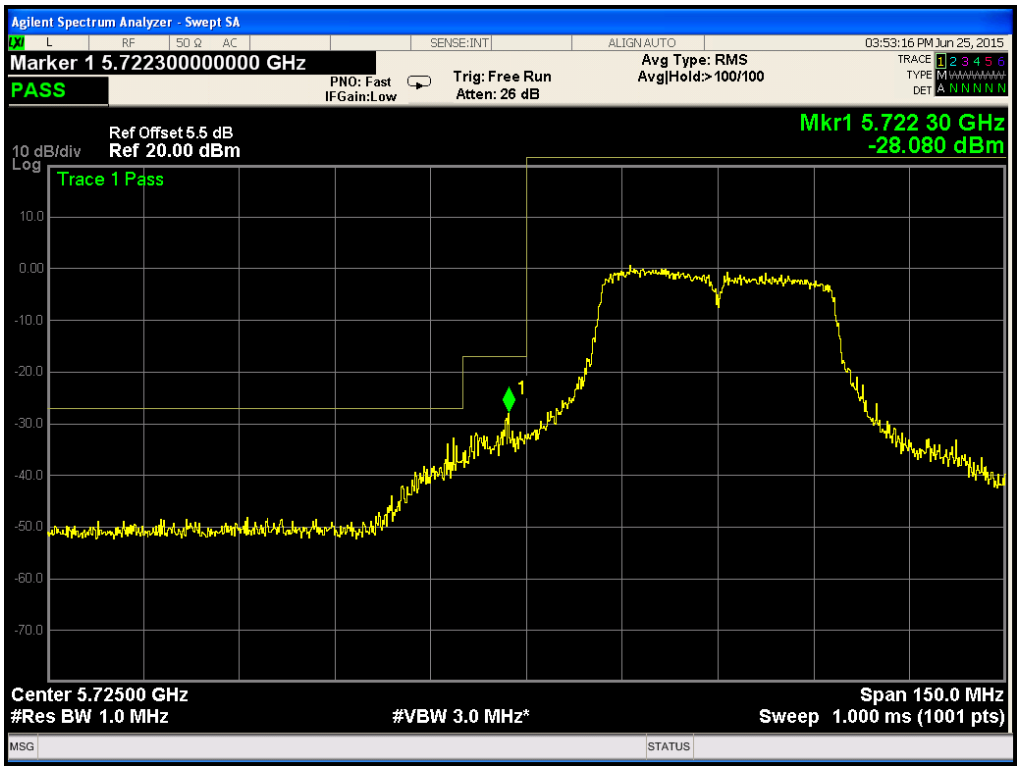


High Channel



Antenna #1

Low Channel



High Channel


Agilent Spectrum Analyzer - Swept SA
Marker 1 5.874300000000 GHz
PASS
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 26 dB
Avg Type: RMS
Avg|Hold:>100/100
03:56:05 PM Jun 25, 2015
Ref Offset 5.5 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 5.874 30 GHz
-48.493 dBm
Trace 1 Pass
Center 5.85000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Span 150.0 MHz
Sweep 1.000 ms (1001 pts)
MSG
STATUS

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

Requirement:

Frequency of emission (MHz)	Conducted limit (dBμV)	
	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.

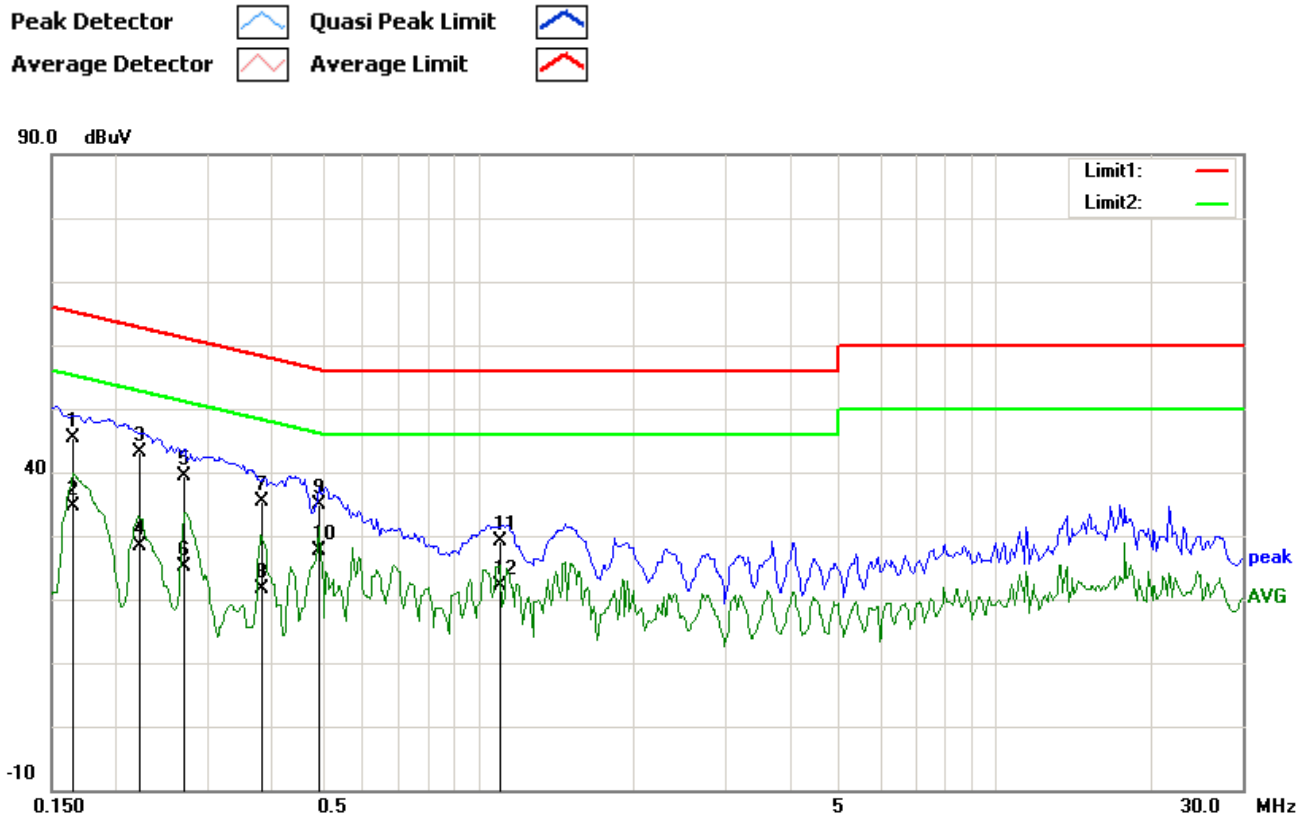
Procedures:

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	25°C
Relative Humidity	52%
Atmospheric Pressure	1026mbar

5. Test date: June 26,2015
   Tested By : Winnie Zhang

Test Mode:	802.11a Transmitting Mode(Worse Case)

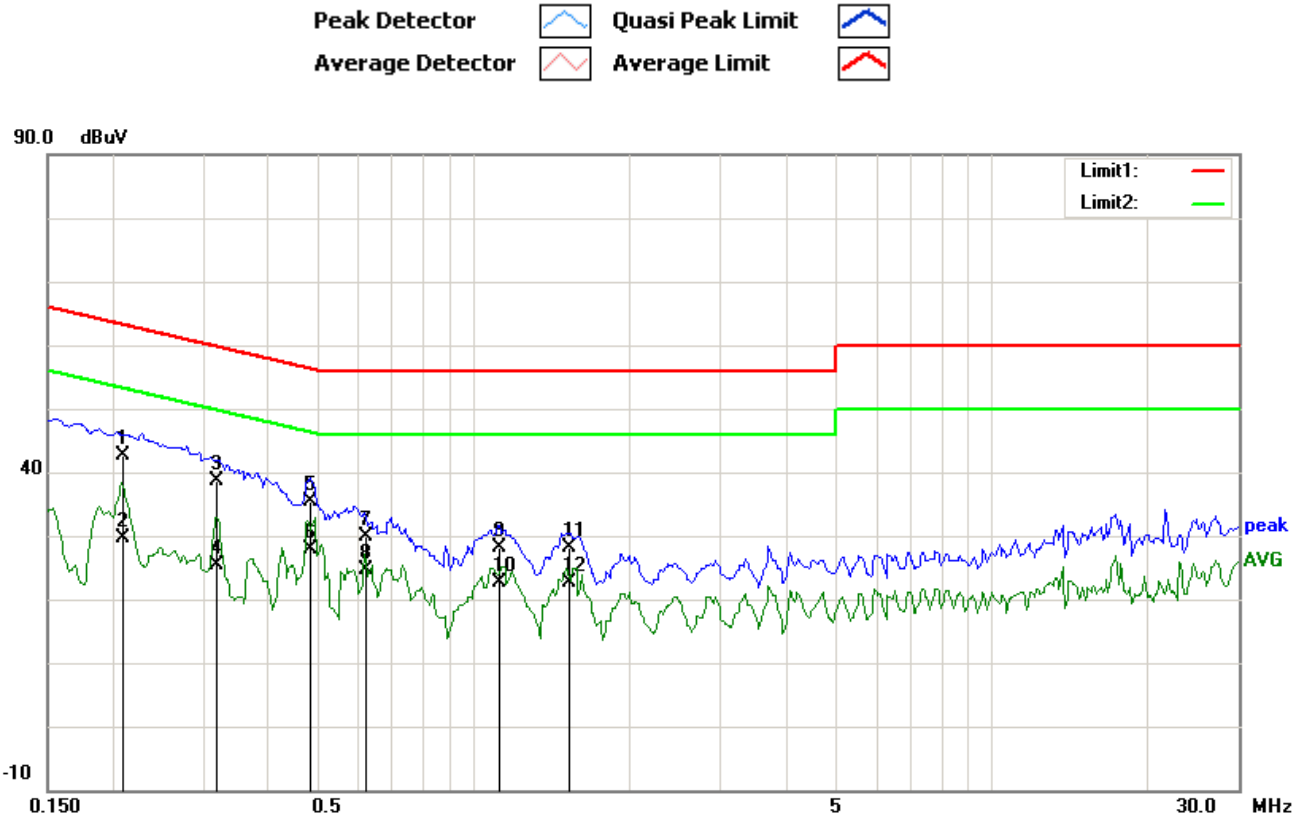


Test Data

Phase Line Plot at 120V AC, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Comment
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)	
1	L1	0.1656	32.34	QP	13.14	45.48	65.18	-19.70	
2	L1	0.1656	21.47	AVG	13.14	34.61	55.18	-20.57	
3	L1	0.2220	30.08	QP	12.93	43.01	62.74	-19.73	
4	L1	0.2220	15.57	AVG	12.93	28.50	52.74	-24.24	
5	L1	0.2711	26.51	QP	12.75	39.26	61.08	-21.82	
6	L1	0.2711	12.28	AVG	12.75	25.03	51.08	-26.05	
7	L1	0.3832	22.95	QP	12.33	35.28	58.21	-22.93	
8	L1	0.3832	9.41	AVG	12.33	21.74	48.21	-26.47	
9	L1	0.4941	22.99	QP	11.92	34.91	56.10	-21.19	
10	L1	0.4941	15.80	AVG	11.92	27.72	46.10	-18.38	
11	L1	1.1056	17.81	QP	11.40	29.21	56.00	-26.79	
12	L1	1.1056	10.63	AVG	11.40	22.03	46.00	-23.97	

Test Mode:	802.11a Transmitting Mode(Worse Case)

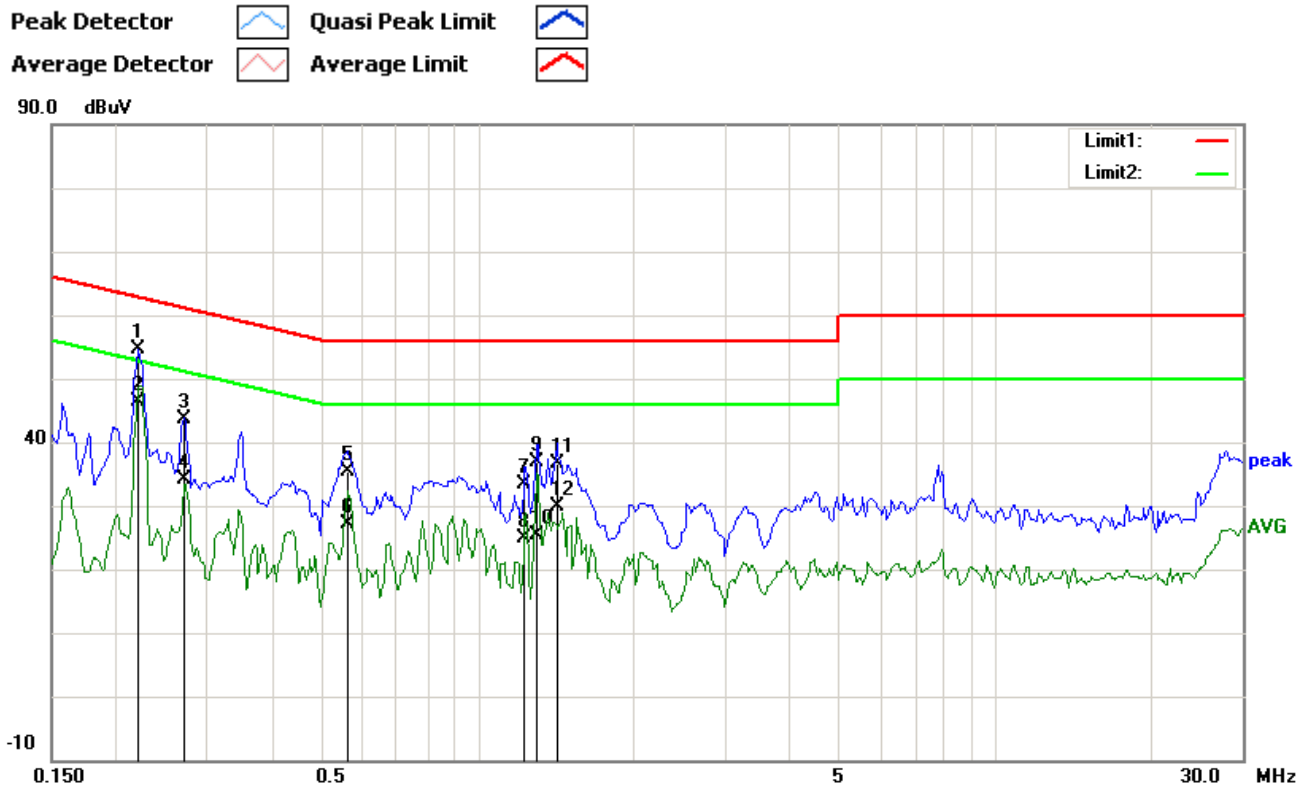


Test Data

Phase Natural Plot at 120V AC, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Comment
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)	
1	N	0.2086	29.75	QP	12.98	42.73	63.26	-20.53	
2	N	0.2086	16.61	AVG	12.98	29.59	53.26	-23.67	
3	N	0.3183	26.03	QP	12.57	38.60	59.75	-21.15	
4	N	0.3183	12.74	AVG	12.57	25.31	49.75	-24.44	
5	N	0.4837	23.42	QP	11.96	35.38	56.28	-20.90	
6	N	0.4837	16.01	AVG	11.96	27.97	46.28	-18.31	
7	N	0.6173	18.10	QP	11.78	29.88	56.00	-26.12	
8	N	0.6173	12.88	AVG	11.78	24.66	46.00	-21.34	
9	N	1.1173	16.61	QP	11.41	28.02	56.00	-27.98	
10	N	1.1173	11.28	AVG	11.41	22.69	46.00	-23.31	
11	N	1.5367	16.65	QP	11.47	28.12	56.00	-27.88	
12	N	1.5367	11.06	AVG	11.47	22.53	46.00	-23.47	

Test Mode:	5GHz 802.11a Transmitting Mode(Worse Case)

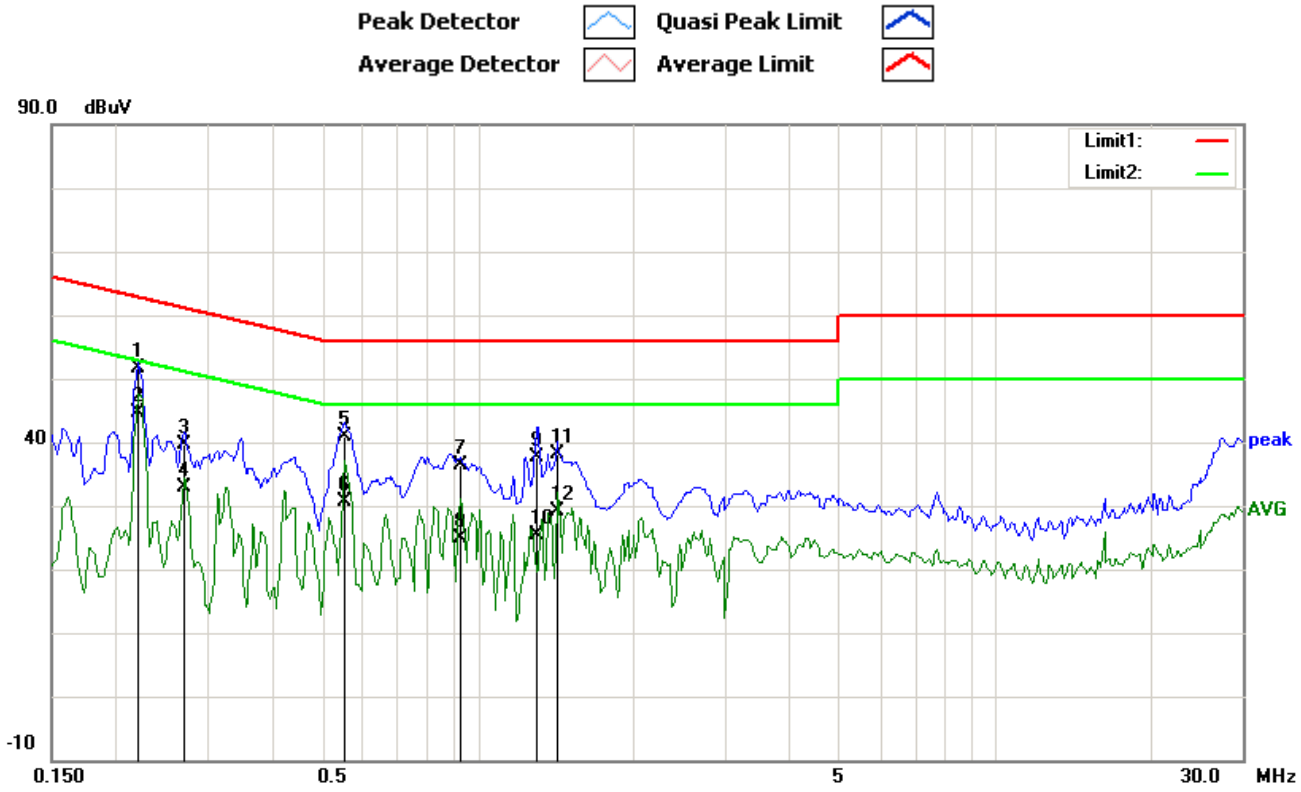


Test Data

Phase Line Plot at 240V AC, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Comment
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)	
1	L1	0.2203	41.61	QP	12.94	54.55	62.81	-8.26	
2	L1	0.2203	33.33	AVG	12.94	46.27	52.81	-6.54	
3	L1	0.2711	30.77	QP	12.75	43.52	61.08	-17.56	
4	L1	0.2711	21.47	AVG	12.75	34.22	51.08	-16.86	
5	L1	0.5602	23.62	QP	11.84	35.46	56.00	-20.54	
6	L1	0.5602	15.26	AVG	11.84	27.10	46.00	-18.90	
7	L1	1.2320	21.91	QP	11.40	33.31	56.00	-22.69	
8	L1	1.2320	13.51	AVG	11.40	24.91	46.00	-21.09	
9	L1	1.3023	25.54	QP	11.40	36.94	56.00	-19.06	
10	L1	1.3023	13.94	AVG	11.40	25.34	46.00	-20.66	
11	L1	1.4234	25.31	QP	11.40	36.71	56.00	-19.29	
12	L1	1.4234	18.43	AVG	11.40	29.83	46.00	-16.17	

Test Mode:	802.11a Transmitting Mode(Worse Case)



Test Data

Phase Natural Plot at 240V AC, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Comment
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)	
1	N	0.2203	38.62	QP	12.94	51.56	62.81	-11.25	
2	N	0.2203	31.59	AVG	12.94	44.53	52.81	-8.28	
3	N	0.2711	26.91	QP	12.75	39.66	61.08	-21.42	
4	N	0.2711	20.06	AVG	12.75	32.81	51.08	-18.27	
5	N	0.5523	29.05	QP	11.85	40.90	56.00	-15.10	
6	N	0.5523	18.69	AVG	11.85	30.54	46.00	-15.46	
7	N	0.9234	24.79	QP	11.48	36.27	56.00	-19.73	
8	N	0.9234	13.51	AVG	11.48	24.99	46.00	-21.01	
9	N	1.3023	26.27	QP	11.44	37.71	56.00	-18.29	
10	N	1.3023	13.88	AVG	11.44	25.32	46.00	-20.68	
11	N	1.4234	26.75	QP	11.45	38.20	56.00	-17.80	
12	N	1.4234	17.65	AVG	11.45	29.10	46.00	-16.90	

5.6 §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	52%
Atmospheric Pressure	1026mbar

5. Test date : June 26 ,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 (≥ 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.

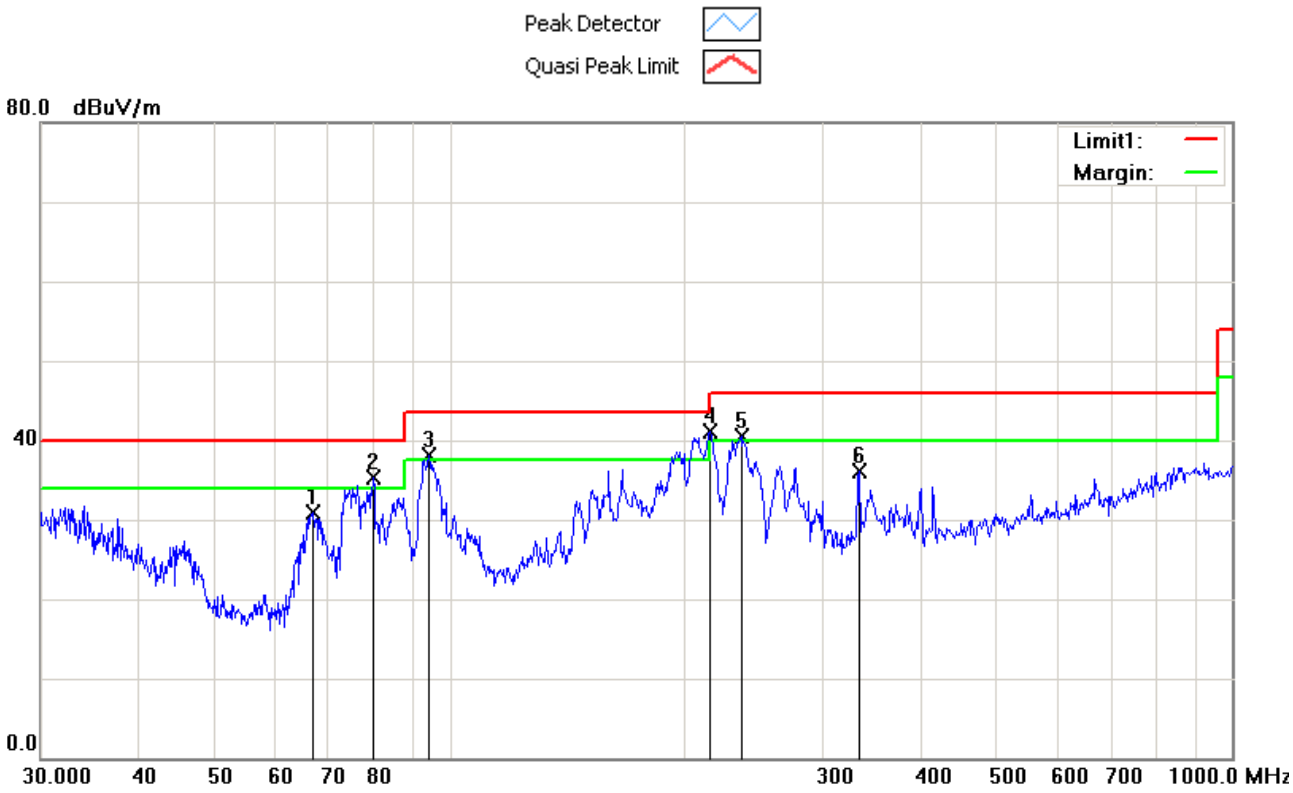
Set span to at least 1 MHz.

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

(Below 1GHz)

z

Test Mode:	**Transmitting Mode(Worse Case)**

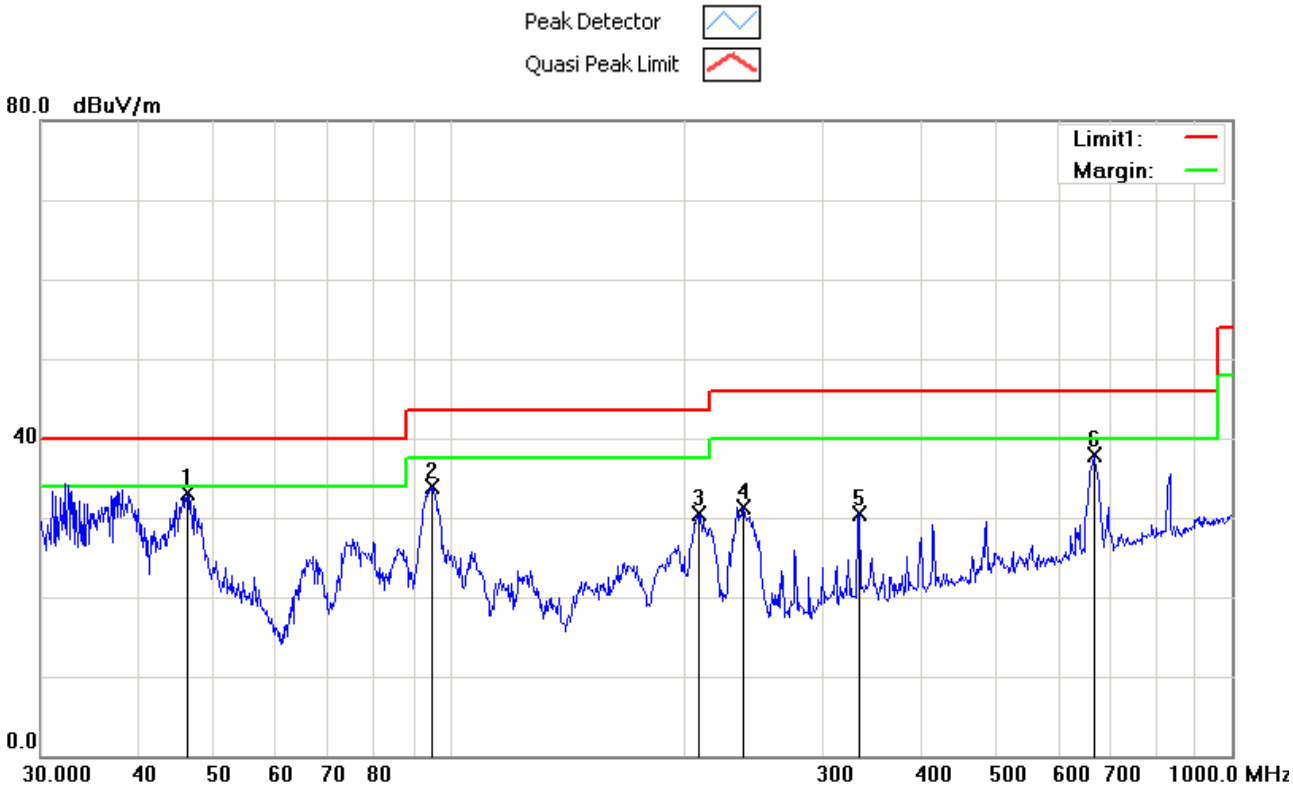


Test Data

Vertical & Horizontal Polarity Plot @3m

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Height	Degree	Comment
		(MHz)	(dBuV/m)		(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( )	
1	H	66.9669	44.63	peak	-13.82	30.81	40.00	-9.19			
2	H	79.8003	49.15	peak	-13.77	35.38	40.00	-4.62			
3	H	94.0979	50.47	peak	-12.36	38.11	43.50	-5.39			
4	H	215.2678	49.93	peak	-8.87	41.06	43.50	-2.44			
5	H	235.8164	49.55	peak	-9.07	40.48	46.00	-5.52			
6	H	333.6867	41.96	peak	-5.93	36.03	46.00	-9.97			

Test Mode:	Transmitting Mode(Worse Case)



Test Data

Vertical & Horizontal Polarity Plot @3m

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Height	Degree	Comment
		(MHz)	(dBuV/m)		(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( )	
1	V	46.1780	44.58	peak	-11.47	33.11	40.00	-6.89			
2	V	94.7601	46.17	peak	-12.19	33.98	43.50	-9.52			
3	V	207.8501	39.25	peak	-8.81	30.44	43.50	13.06			
4	V	237.4760	40.42	peak	-9.07	31.35	46.00	14.65			
5	V	333.6867	36.53	peak	-5.93	30.60	46.00	15.40			
6	V	665.8035	36.86	peak	0.98	37.84	46.00	-8.16			

Above 1 GHz:

Test Mode: Transmitting

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

Frequency band 5150-5250MHz

Mode: 802.11a

Low Channel (5190 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)
10380	37.21	AV	V	39.74	1.345	31.72	46.575	54	-7.425
10380	36.85	AV	H	39.74	1.345	31.72	46.215	54	-7.785
10380	45.66	PK	V	39.74	1.345	31.72	55.025	74	-18.975
10380	44.52	PK	H	39.74	1.345	31.72	53.885	74	-20.115
5020	38.19	AV	V	33.95	1.01	30.12	43.03	54	-10.97
5020	37.24	AV	H	33.95	1.01	30.12	42.08	54	-11.92
5020	48.06	PK	V	34.02	1.1	30.16	53.02	74	-20.98
5020	47.87	PK	H	34.02	1.1	30.16	52.83	74	-21.17
5395	39.61	AV	V	34.14	1.23	30.54	44.44	54	-9.56
5395	40.15	AV	H	34.14	1.23	30.54	44.98	54	-9.02
5395	48.79	PK	V	34.14	1.23	30.54	53.62	74	-20.38
5395	49.24	PK	H	34.14	1.23	30.54	54.07	74	-19.93

High Channel (5230 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)
10460	36.49	AV	V	39.78	1.553	31.92	45.903	54	-8.097
10460	35.64	AV	H	39.78	1.553	31.92	45.053	54	-8.947
10460	45.25	PK	V	39.78	1.553	31.92	54.663	74	-19.337
10460	45.02	PK	H	39.78	1.553	31.92	54.433	74	-19.567
5035	38.66	AV	V	33.95	1.01	30.12	43.5	54	-10.5
5035	37.19	AV	H	33.95	1.01	30.12	42.03	54	-11.97
5035	48.35	PK	V	34.02	1.1	30.16	53.31	74	-20.69
5035	47.06	PK	H	34.02	1.1	30.16	52.02	74	-21.98
5406	39.58	AV	V	34.14	1.23	30.54	44.41	54	-9.59
5406	40.31	AV	H	34.14	1.23	30.54	45.14	54	-8.86
5406	48.52	PK	V	34.14	1.23	30.54	53.35	74	-20.65
5406	49.07	PK	H	34.14	1.23	30.54	53.9	74	-20.1

Frequency band **5725-5850**MHz

Mode: 802.11a

Low Channel (5755MHz)

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	40.12	1.81	31.72	46.69	54	-7.31
11510	36.05	AV	H	40.12	1.81	31.72	46.26	54	-7.74
11510	46.27	PK	V	40.12	1.81	31.72	56.48	74	-17.52
11510	45.12	PK	H	40.12	1.81	31.72	55.33	74	-18.67
4750	41.08	AV	V	34.51	1.19	30.26	46.52	54	-7.48
4750	40.19	AV	H	34.51	1.19	30.26	45.63	54	-8.37
4750	49.38	PK	V	34.51	1.19	30.26	54.82	74	-19.18
4750	49.01	PK	H	34.51	1.19	30.26	54.45	74	-19.55
5385	40.24	AV	V	34.89	1.24	30.31	46.06	54	-7.94
5385	40.52	AV	H	34.89	1.24	30.31	46.34	54	-7.66
5385	48.37	PK	V	34.89	1.24	30.31	54.19	74	-19.81
5385	49.02	PK	H	34.89	1.24	30.31	54.84	74	-19.16

High Channel (5795 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)
36.7	AV	V	40.13	1.826	31.92	46.736	54	-7.264	36.7
36.59	AV	H	40.13	1.826	31.92	46.626	54	-7.374	36.59
45.08	PK	V	40.13	1.826	31.92	55.116	74	-18.884	45.08
44.25	PK	H	40.13	1.826	31.92	54.286	74	-19.714	44.25
40.95	AV	V	34.51	1.19	30.26	46.39	54	-7.61	40.95
41.22	AV	H	34.51	1.19	30.26	46.66	54	-7.34	41.22
49.06	PK	V	34.51	1.19	30.26	54.5	74	-19.5	49.06
48.77	PK	H	34.51	1.19	30.26	54.21	74	-19.79	48.77
40.59	AV	V	34.89	1.24	30.31	46.41	54	-7.59	40.59
41.08	AV	H	34.89	1.24	30.31	46.9	54	-7.1	41.08
48.22	PK	V	34.89	1.24	30.31	54.04	74	-19.96	48.22
48.94	PK	H	34.89	1.24	30.31	54.76	74	-19.24	48.94

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	09/18/2014	09/17/2015	☑
Line Impedance	LI-125A	191106	09/26/2014	09/25/2015	☑
Line Impedance	LI-125A	191107	09/26/2014	09/25/2015	☑
LISN	ISN T800	34373	09/26/2014	09/25/2015	☑
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	☑
Transient Limiter	LIT-153	531118	09/02/2014	09/01/2015	☑
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/18/2014	09/17/2015	☑
Power Splitter	1#	1#	09/02/2014	09/01/2015	☑
DC Power Supply	E3640A	MY40004013	09/18/2014	09/17/2015	☑
Radiated Emissions					
EMI test receiver	ESL6	100262	09/18/2014	09/17/2015	☑
Positioning Controller	UC3000	MF780208282	11/20/2014	11/19/2015	☑
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/02/2014	09/01/2015	☑
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/25/2015	03/24/2016	☑
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/22/2014	09/21/2015	☑
Horn Antenna(18-40G)	AH840	10SL0073	09/23/2014	09/22/2015	☑
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	☑
Universal Radio Communication Tester	CMU200	121393	09/26/2014	09/25/2015	☑

Annex A.ii. CONDUCTED EMISSIONS TEST DESCRIPTION

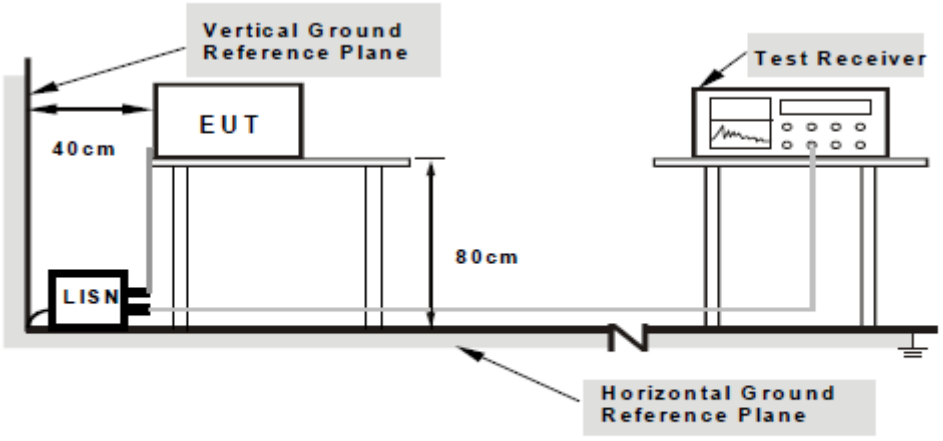
Test Set-up

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.

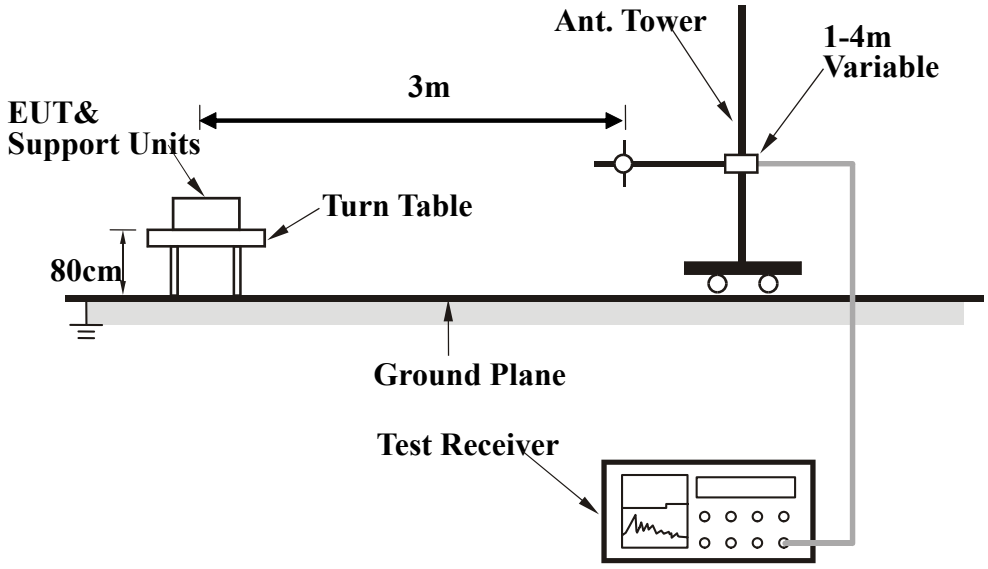
The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable 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

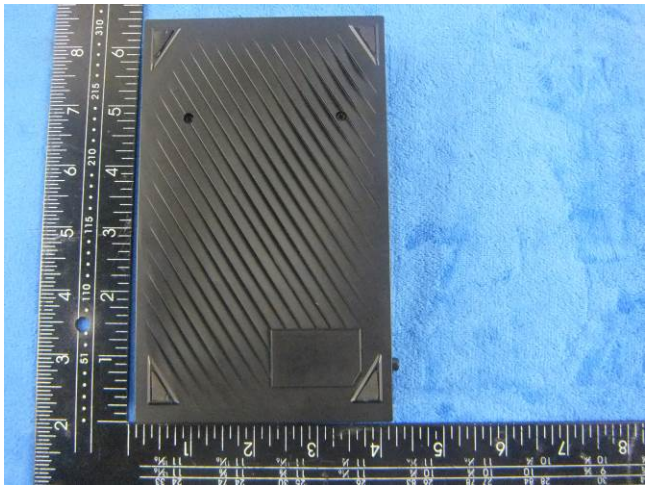
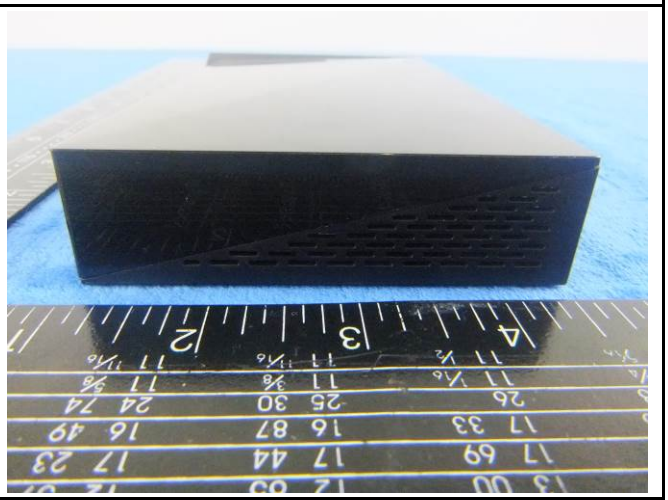
where
Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)
And the average value is

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.

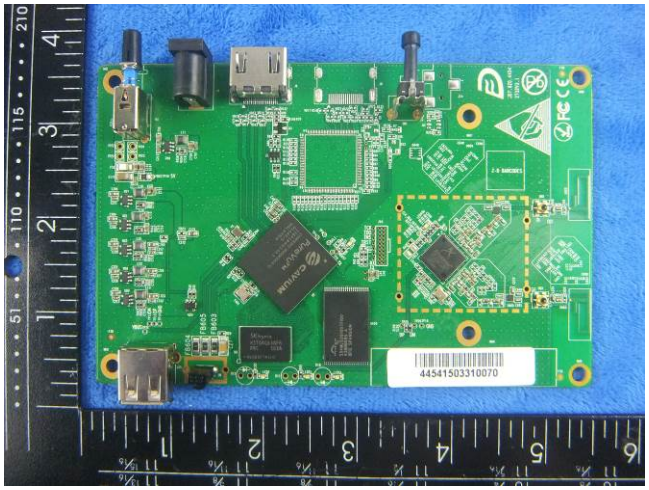
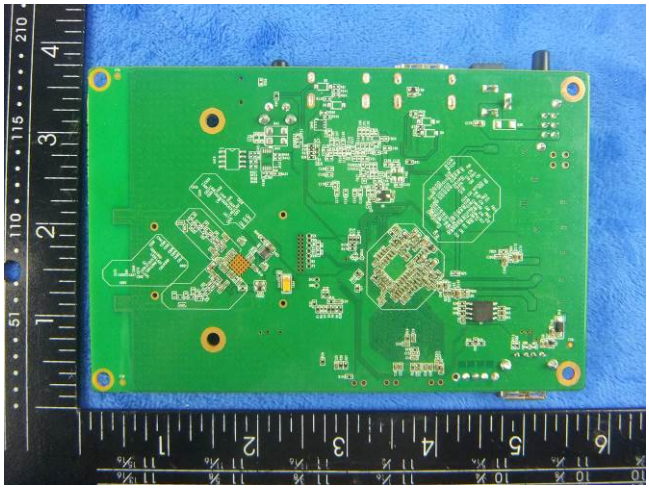
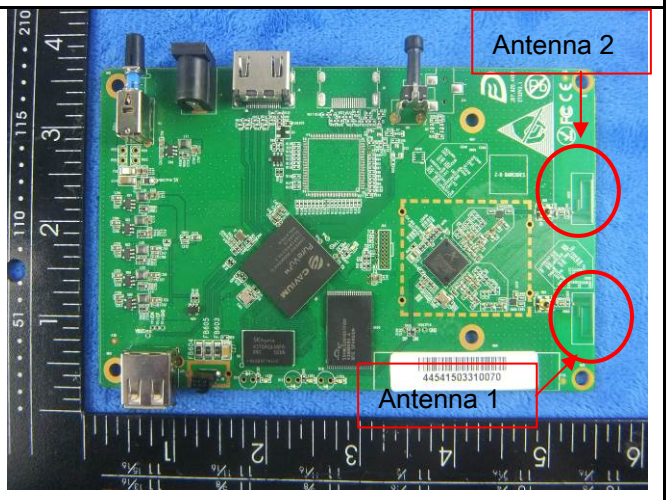
Annex B. EUT AND TEST SETUP PHOTOGRAPHS

Annex B.i. Photograph: EUT External Photo

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Whole package -- DF-W5001RX Front View</td><td>Adapter -- DF-W5001RX Front View</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>EUT - DF-W5001RX Front View</td><td>EUT - DF-W5001RX Rear View</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>EUT - DF-W5001RX Top View</td><td>EUT - DF-W5001RX Bottom View</td></tr>
</table>

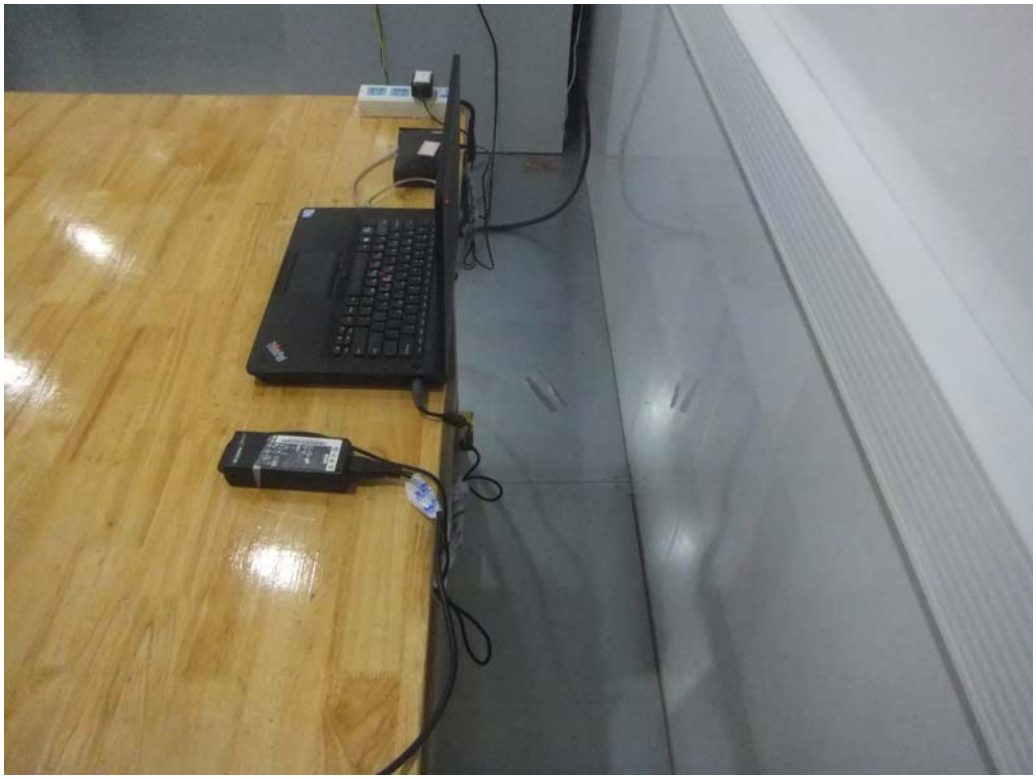
	
EUT - DF-W5001RX Left View	EUT – DF-W5001RX Right View

Annex B.ii. Photograph: EUT Internal Photo

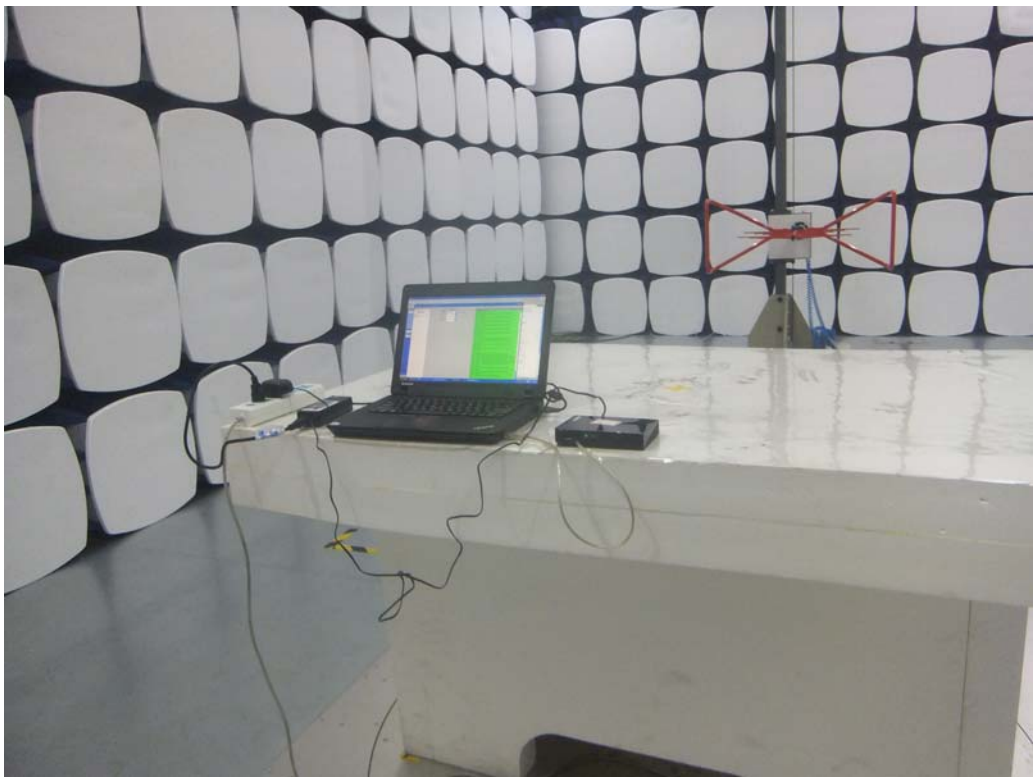
<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Mainbard - DF-W5001RX Rear View</td><td>Mainboard – DF-W5001RX Front View</td></tr>
<tr><td>  </td><td> 
</td></tr>
<tr><td>Mainboard – DF-W5001RX Front View</td><td>WIFI - DF-W5001RX Antenna View</td></tr>
</table>

Annex B.iii. Photograph 3: Test Setup Photo

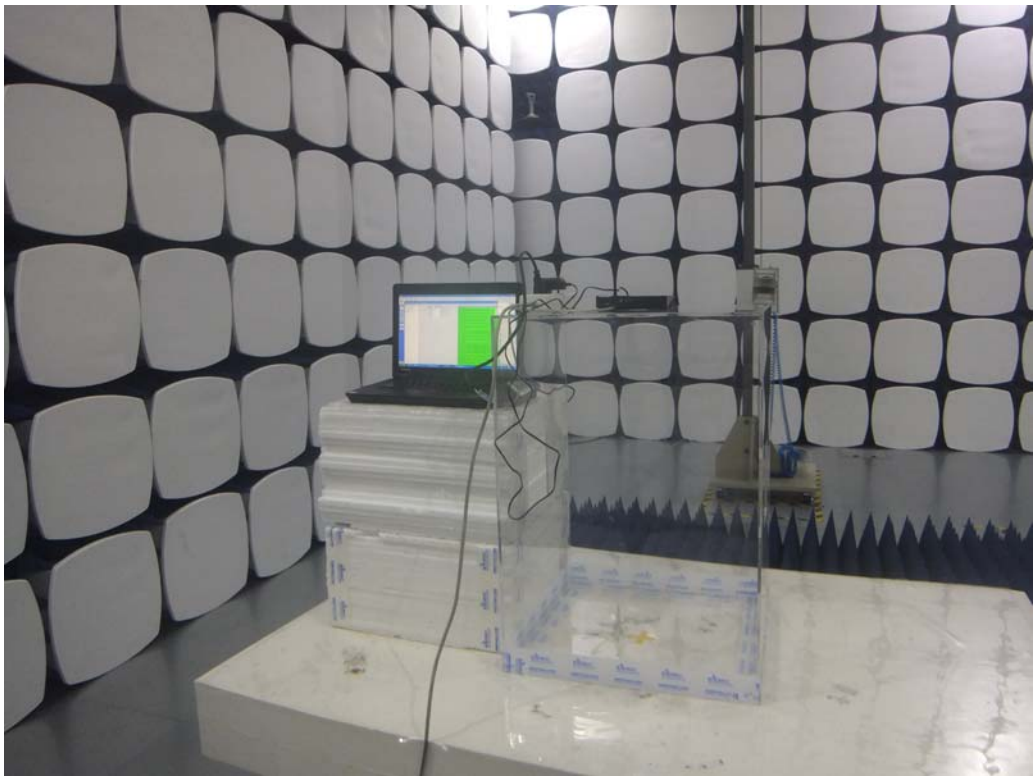
Conducted Emissions Test Setup Front View



Conducted Emissions Test Setup Side View



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

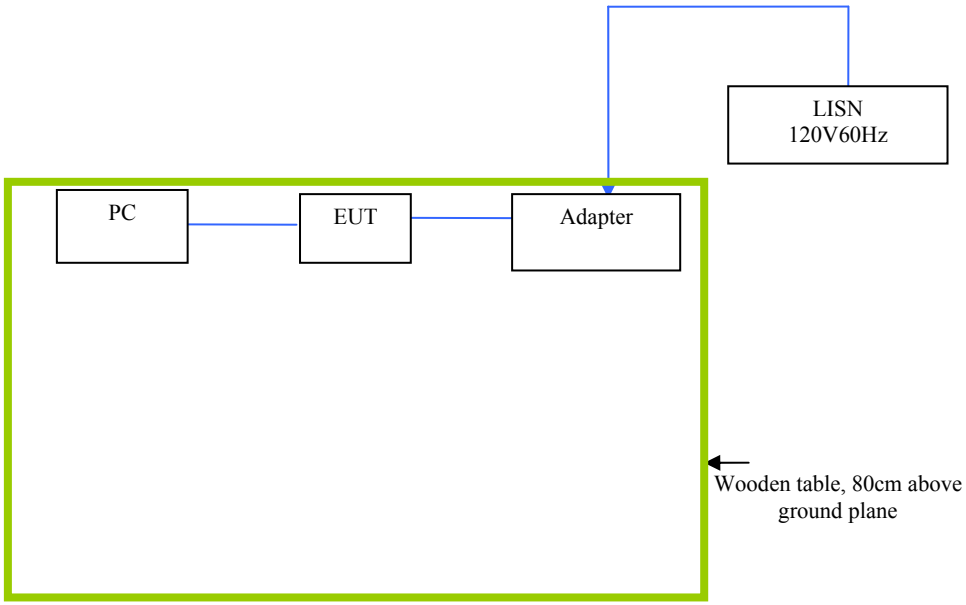
EUT TEST CONDITIONS

Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

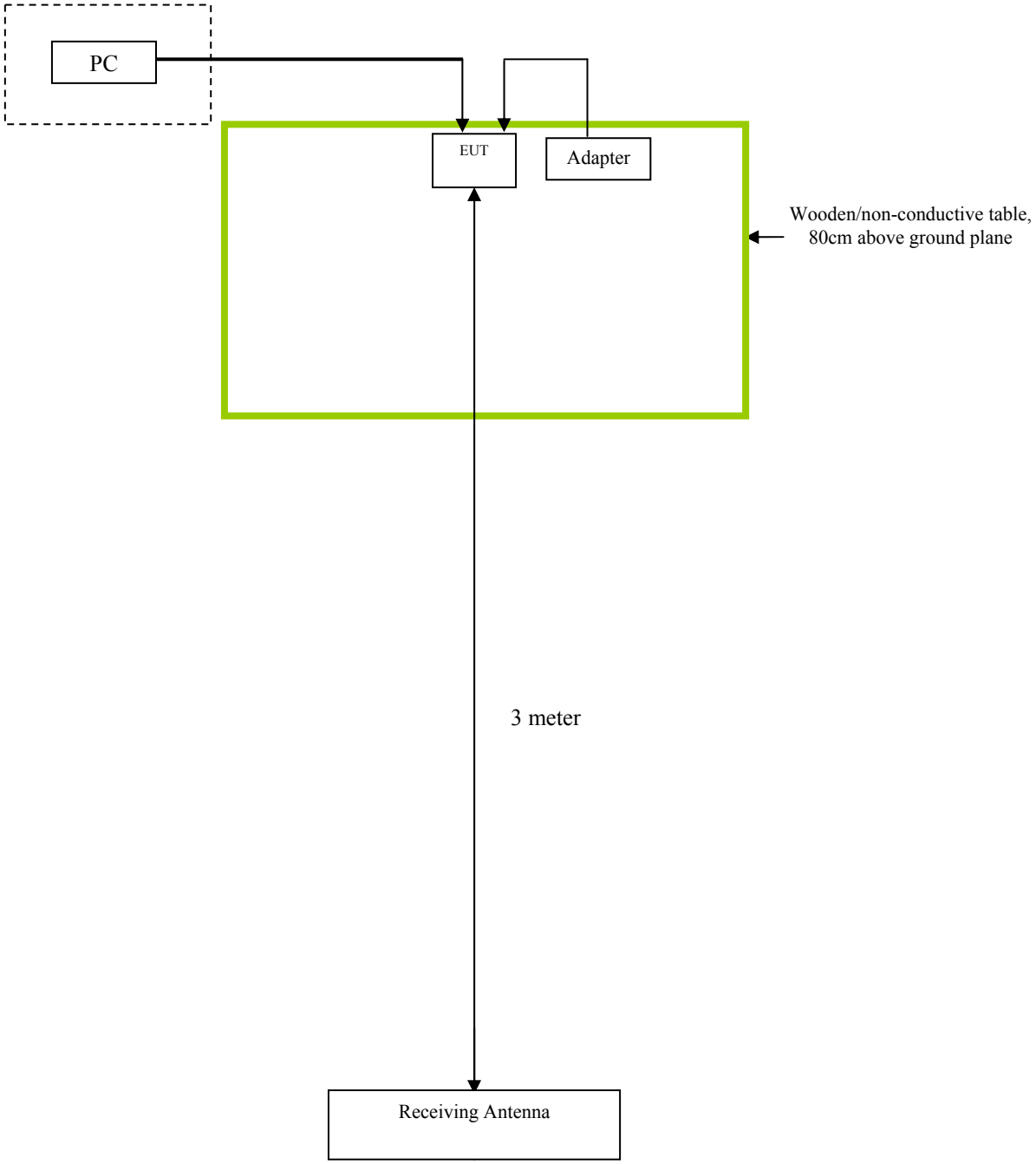
The following is a description of supporting equipment and details of cables used with the EUT.

Manufacturer	Equipment Description (Including Brand Name)	Model	Calibration Date	Calibration Due Date
lenovo Laptop	E40& 0579A52	N/A	lenovo Laptop	E40& 0579A52

Block Configuration Diagram for AC Line Conducted Emissions


LISN
120V60Hz
PC
EUT
Adapter
Wooden table, 80cm above
ground plane

Block Configuration Diagram for Radiated Emissions



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

N/A