RF TEST REPORT

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Report No.: 15050006-FCC-R2

Supersede Report No.: N/A

Applicant	Fenghua Tiancheng Plastic Electronics Co.,Ltd
Product Name	INTELLIGENT CONTROLLER
Model No.	CRZ-8X8
Serial No.	N/A
Test Standard	FCC Part 15.247: 2014, ANSI C63.10: 2013
Test Date	May 07 to June 03
Issue Date	June 04, 2015
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Wiky.Jam	Chris You	
Wiky.Jam Test Engineer	Chris You Checked By	

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

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

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Laboratories Introduction

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

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

Accreditations for Conformity Assessment

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

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
15050006-FCC-R2	NONE	Original	June 04, 2015

2. Customer information

Applicant Name	Fenghua Tiancheng Plastic Electronics Co.,Ltd
Applicant Add	No.66 Dongfeng Road Fenghua Zhejiang China
Manufacturer	Fenghua Tiancheng Plastic Electronics Co.,Ltd
Manufacturer Add	No.66 Dongfeng Road Fenghua Zhejiang China

3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	718246
IC Test Site No.	4842E-1
Test Software	Radiated Emission Program-To Shenzhen v2.0

4. Equipment under Test (EUT) Information

Description of EUT:	INTELLIGENT CONTROLLER
Main Model:	CRZ-8X8
Serial Model:	N/A
Date EUT received:	May 07 to June 03
Equipment Category :	DTS
Antenna Gain:	WIFI: -0.5 dBi 15.249: 4.5 dBi
Input Power:	AC 120V 60Hz
Trade Name :	CRZ
FCC ID:	2AENLCRZ

Max. Output Power:	802.11b: 16.72dBm 802.11g: 11.67dBm 802.11n(20M): 11.87dBm 802.11n(40M): 10.18dBm
Type of Modulation:	802.11b/g/n: DSSS, OFDM 15.249: DSSS
RF Operating Frequency (ies):	WIFI:802.11b/g/n(20M): 2412-2462 MHz WIFI:802.11n(40M): 2422-2452 MHz 15.249: 2470 MHz
Number of Channels:	WIFI :802.11b/g/n(20M): 11CH WIFI :802.11n(40M): 7CH 15.249: 1 Channel
Port:	Power Port,

5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.247 (a)(2)	DTS (6 dB&20 dB) CHANNEL BANDWIDTH	Compliance
§15.247(b)(3)	Conducted Maximum Output Power	Compliance
§15.247(e)	Power Spectral Density	Compliance
§15.247(d)	Band-Edge & Unwanted Emissions into Non-Restricted Frequency Bands	Compliance
§15.207 (a),	AC Power Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Spurious Emissions & Unwanted Emissions into Restricted Frequency Bands	Compliance

Measurement Uncertainty

Emissions		
Test Item	**Description**	**Uncertainty**
Band Edge and Radiated Spurious Emissions	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
-	-	-

6. Measurements, Examination And Derived Results

6.1 Antenna Requirement

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.
The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

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

Antenna Connector Construction

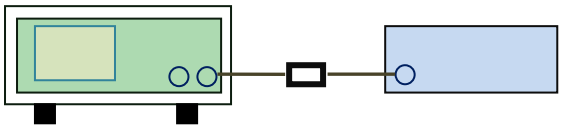
The EUT has 2 antennas:
A Whip antenna, the gain is 4.5 dBi for ZIGBEE.
A Whip antenna, the gain is -0.5 dBi for WIFI.

The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 DTS (6 dB&20 dB) Channel Bandwidth

Temperature	21°C
Relative Humidity	53%
Atmospheric Pressure	10077mbar
Test date :	May 07, 2015
Tested By :	Wiky.Jam

Spec	Item	Requirement	Applicable
§ 15.247(a)(2)	a)	6dB BW≥ 500kHz; 20dB BW≥ 500kHz;	☑
	b)	99% BW: For FCC reference only; required by IC.	☑
Test Setup	 Spectrum Analyzer EUT		
Test Procedure	558074 D01 DTS MEAS Guidance v03r02, 8.1 DTS bandwidth 6dB 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 freq uencies associated with the two outermost amplitude points (upper and lower fr equencies) that are attenuated by 6 dB relative to the maximum level measure d in the fundamental emission. 20dB bandwidth C63.10 Occupied Bandwidth (OBW=20dB bandwidth) 1. Set RBW = 1%-5% OBW. 2. Set the video bandwidth (VBW) ≥ 3 x RBW. 3. Set the span range between 2 times and 5 times of the OBW. 4. Sweep time=Auto, Detector=PK, Trace=Max hold. 5. Once the reference level is established, the equipment is conditioned with t ypical modulating signals to produce the worst-		

	case (i.e., the widest) bandwidth. Unless otherwise specified for an unlicensed wireless device, measure the bandwidth at the 20 dB levels with respect to the reference level.
Remark	
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

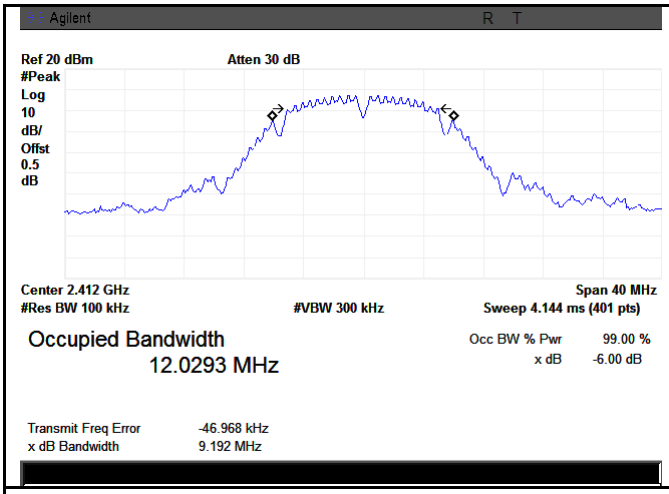
Test Plot ☑ Yes (See below) ☐ N/A

Measurement result

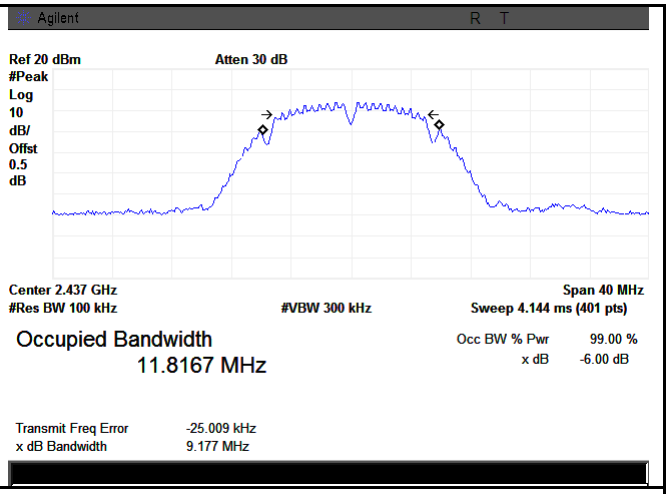
Test mode	CH	Freq (MHz)	6dB Bandwidth (MHz)	20dB Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	9.192	13.816	≥ 0.5
	Mid	2437	9.177	13.840	≥ 0.5
	High	2462	9.157	13.841	≥ 0.5
802.11g	Low	2412	16.468	19.126	≥ 0.5
	Mid	2437	16.483	19.137	≥ 0.5
	High	2462	16.438	19.151	≥ 0.5
802.11n (20M)	Low	2412	16.167	19.411	≥ 0.5
	Mid	2437	17.20	19.442	≥ 0.5
	High	2462	17.004	19.424	≥ 0.5
802.11n (40M)	Low	2422	36.277	38.766	≥ 0.5
	Mid	2437	36.277	38.482	≥ 0.5
	High	2452	36.152	38.449	≥ 0.5

Test Plots

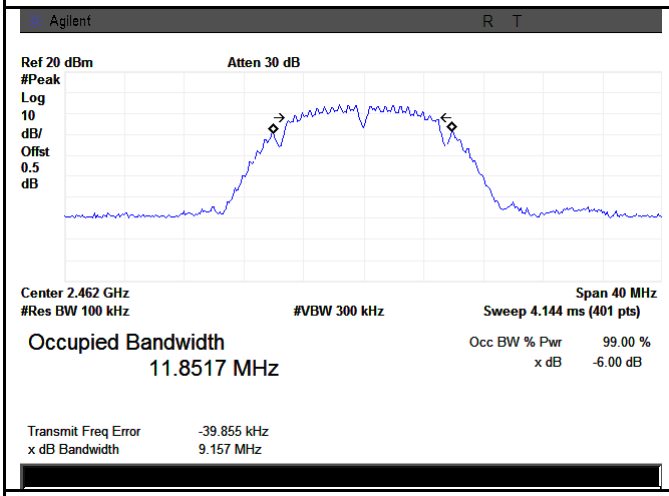
6dB Bandwidth measurement result



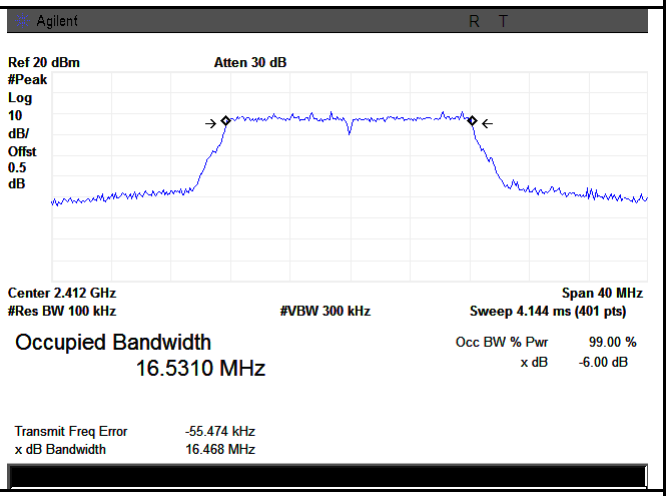
802.11b 6dB Bandwidth - Low CH 2412



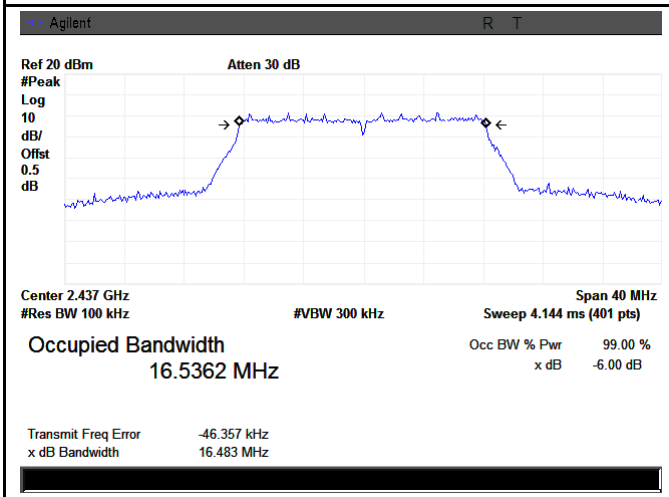
802.11b 6dB Bandwidth - Mid CH 2437



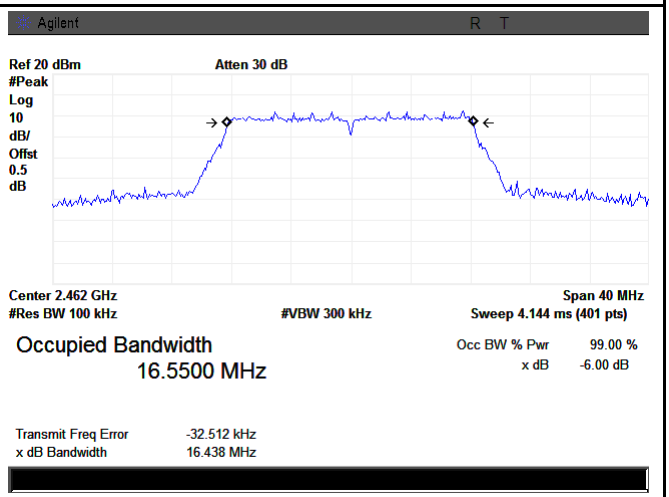
802.11b 6dB Bandwidth - High CH 2462



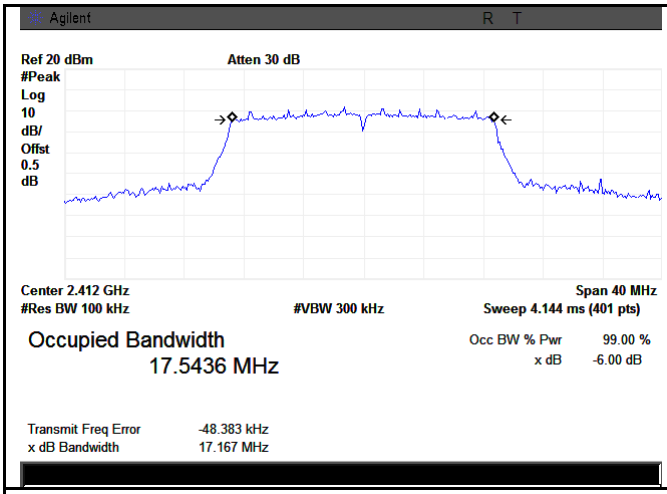
802.11g 6dB Bandwidth - Low CH 2412



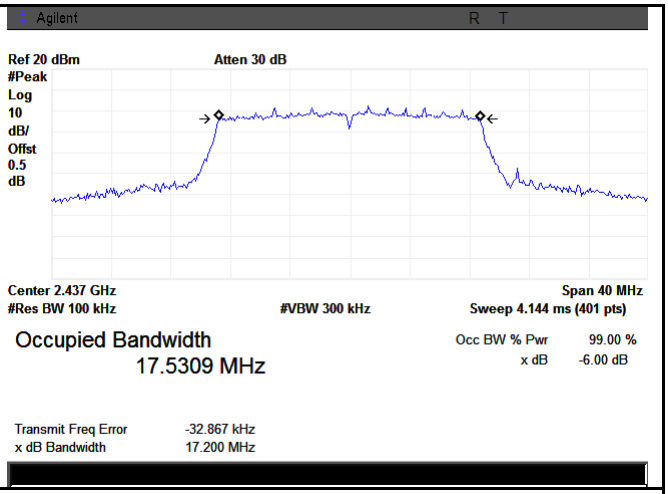
802.11g 6dB Bandwidth - Mid CH 2437



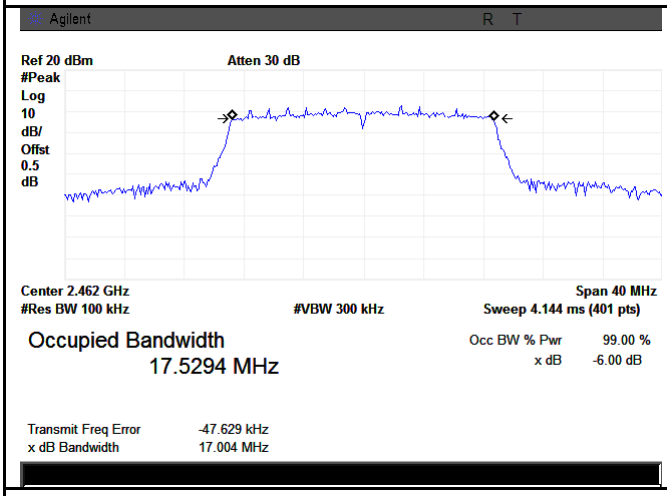
802.11g 6dB Bandwidth - High CH 2462



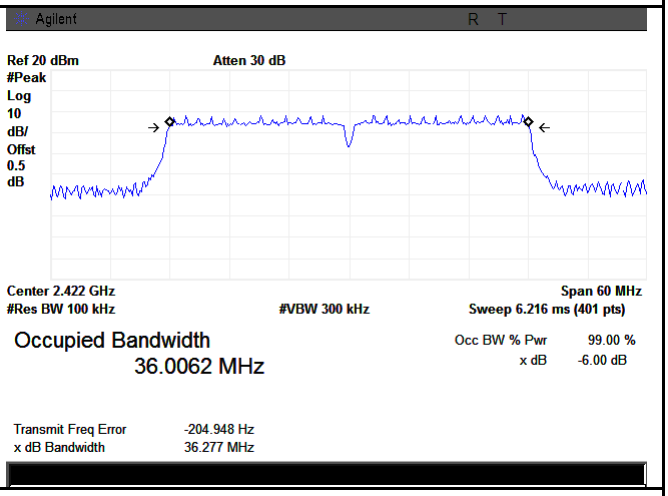
802.11n20 6dB Bandwidth - Low CH 2412



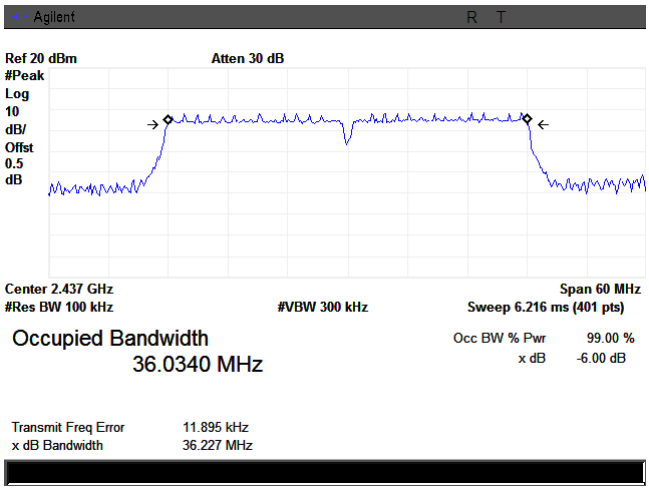
802.11n20 6dB Bandwidth - Mid CH 2437



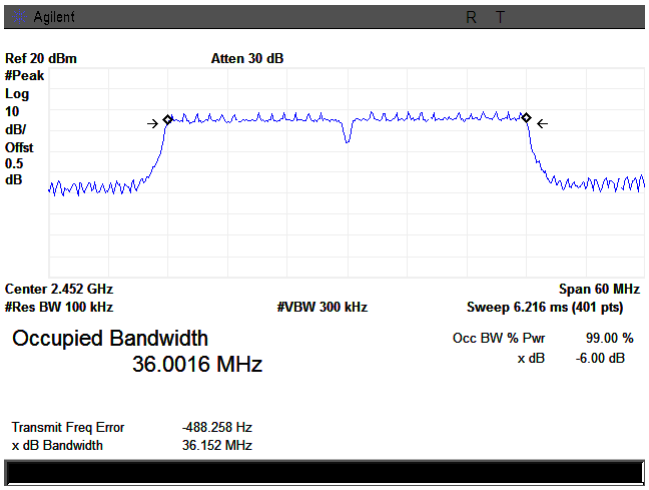
802.11n20 6dB Bandwidth - High CH 2462



802.11n40 6dB Bandwidth - Low CH 2422

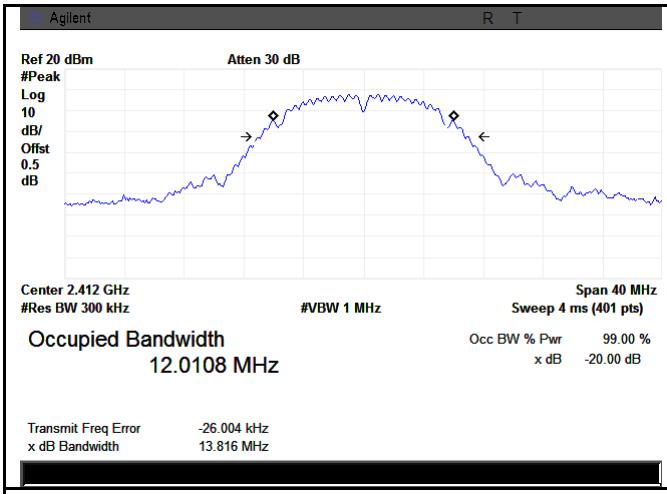


802.11n40 6dB Bandwidth - Mid CH 2437

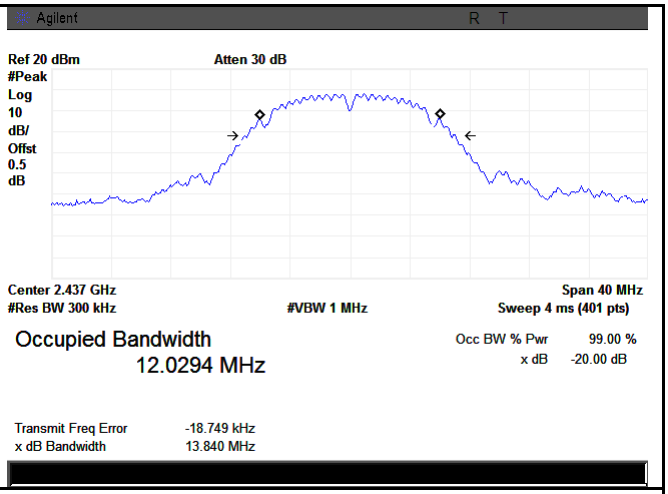


802.11n40 6dB Bandwidth - High CH 2452

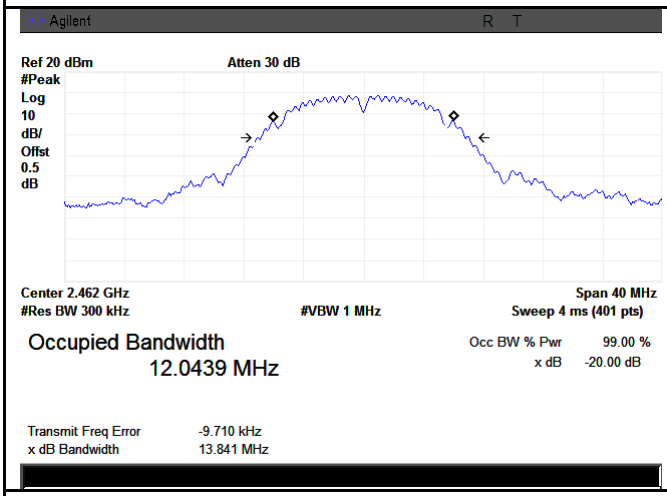
20 dB Bandwidth measurement result



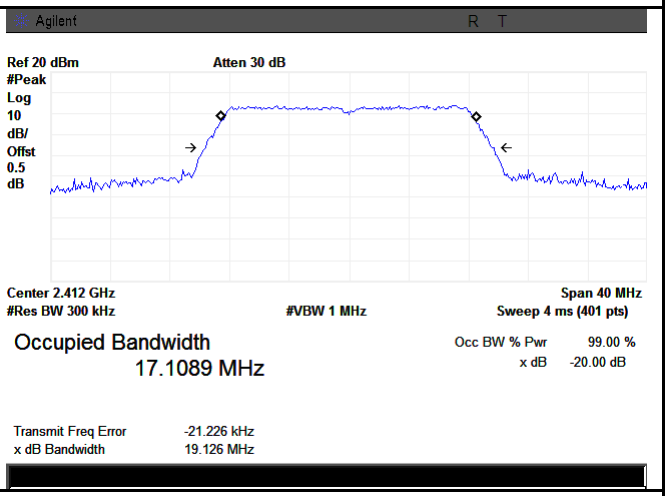
802.11b 20dB Bandwidth - Low CH 2412



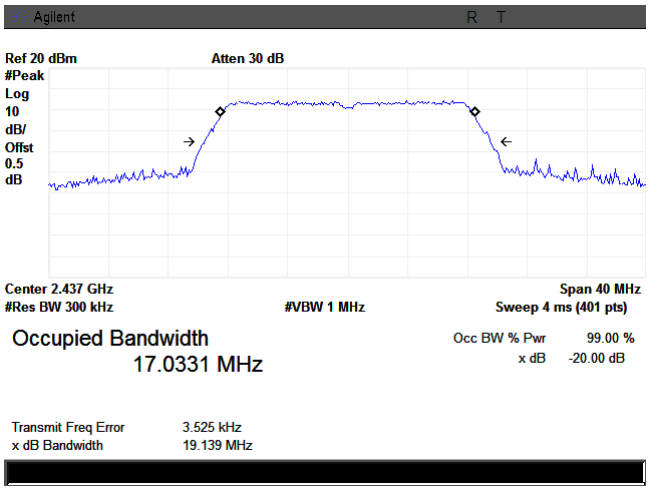
802.11b 20dB Bandwidth - Mid CH 2437



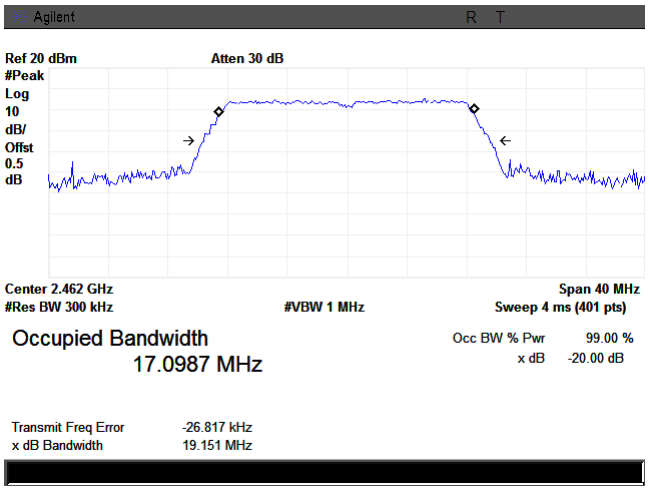
802.11b 20dB Bandwidth - High CH 2462



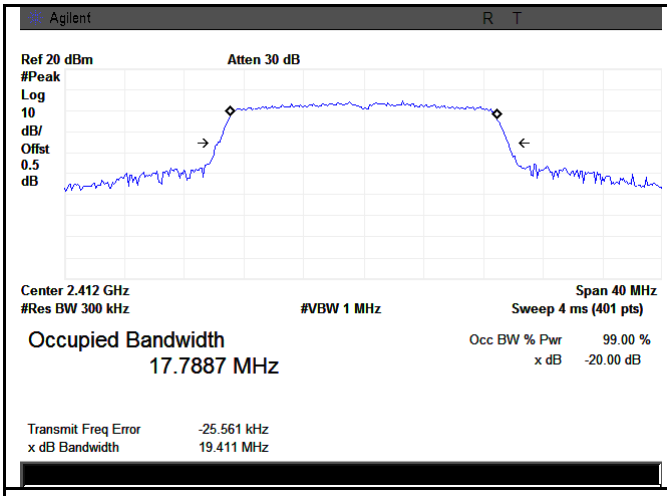
802.11g 20dB Bandwidth - Low CH 2412



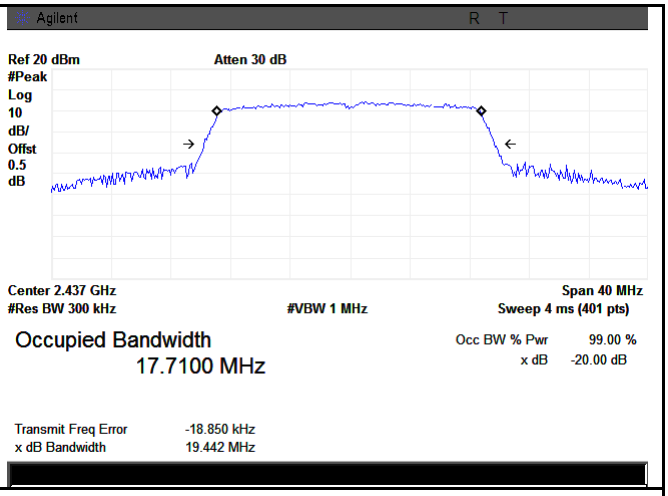
802.11g 20dB Bandwidth - Mid CH 2437



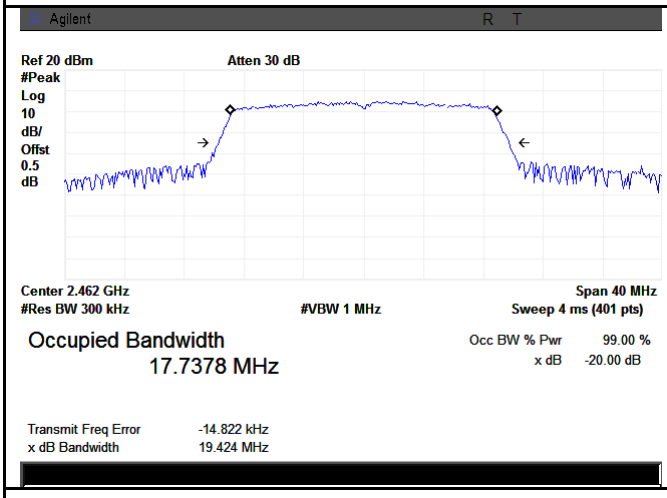
802.11g 20dB Bandwidth - High CH 2462



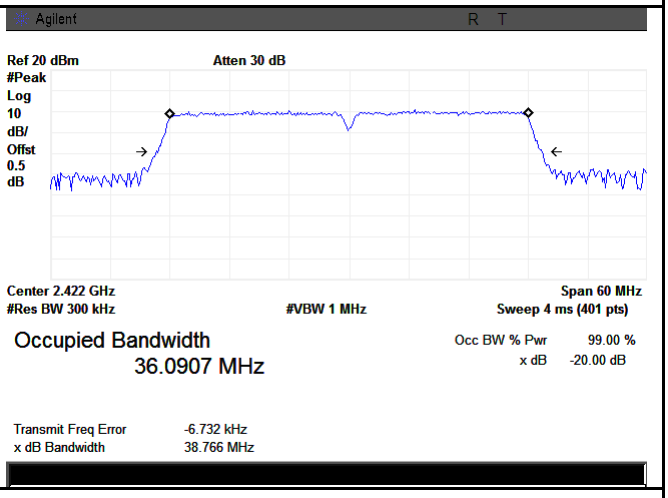
802.11n20 20dB Bandwidth - Low CH 2412



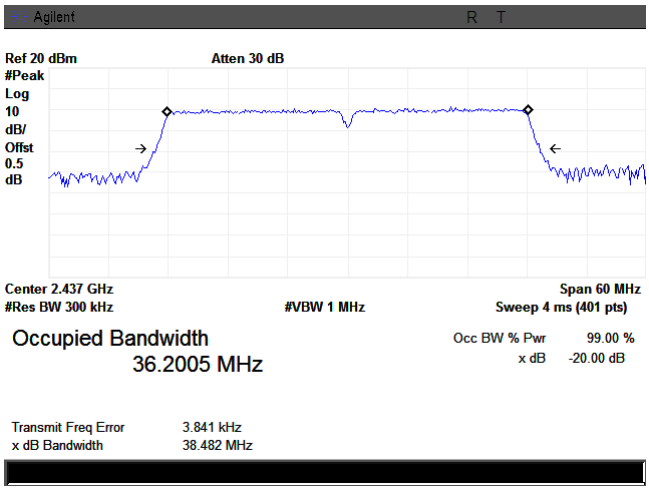
802.11n20 20dB Bandwidth - Mid CH 2437



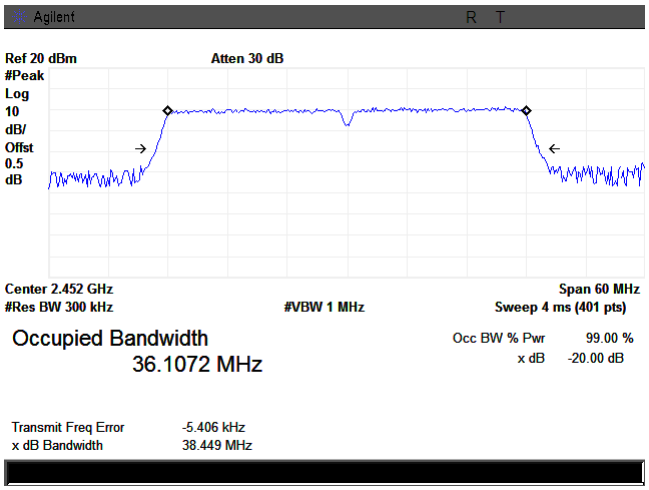
802.11n20 20dB Bandwidth - High CH 2462



802.11n40 20dB Bandwidth - Low CH 2422



802.11n40 20dB Bandwidth - Mid CH 2437

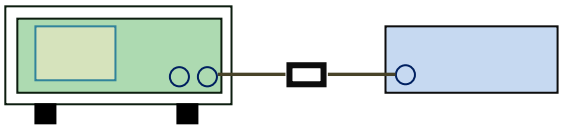


802.11n40 20dB Bandwidth - High CH 2452

6.3 Maximum Output Power

Temperature	21°C
Relative Humidity	53%
Atmospheric Pressure	1007mbar
Test date :	May 07, 2015
Tested By :	Wiky.Jam

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b)(2),	a)	FHSS in 2400-2483.5MHz with ≥ 75 channels: ≤ 1 Watt	☐
	b)	FHSS in 5725-5850MHz: ≤ 1 Watt	☐
	c)	For all other FHSS in the 2400-2483.5MHz band: ≤ 0.125 Watt.	☐
	d)	FHSS in 902-928MHz with ≥ 50 channels: ≤ 1 Watt	☐
	e)	FHSS in 902-928MHz with ≥ 25 & <50 channels: ≤ 0.25 Watt	☐
	f)	DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: ≤ 1 Watt	☑
Test Setup	 Spectrum Analyzer EUT		
Test Procedure	558074 D01 DTS MEAS Guidance v03r02, 9.1.2 Integrated band power method Maximum output power measurement procedure - a) Set span to at least 1.5 times the OBW. - b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz. - c) Set VBW ≥ 3 x RBW. - d) Number of points in sweep ≥ 2 × span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.) - e) Sweep time = auto. - f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode. - g) If transmit duty cycle < 98 %, use a sweep trigger with the level set to enable		

	triggering only on full power pulses. The transmitter shall 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 %, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to " free run" . - h) Trace average at least 100 traces in power averaging (i.e., RMS) mode. - i) Compute power by integrating the spectrum across the OBW of the signal using the instrument' s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
Remark	
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

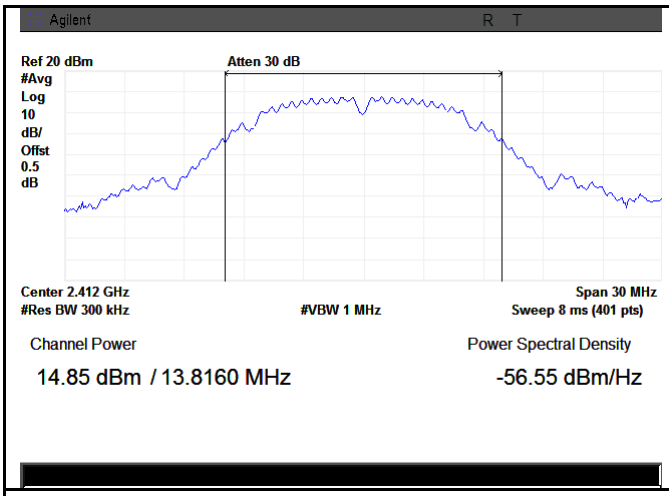
Test Plot ☑ Yes (See below) ☐ N/A

Output Power measurement result

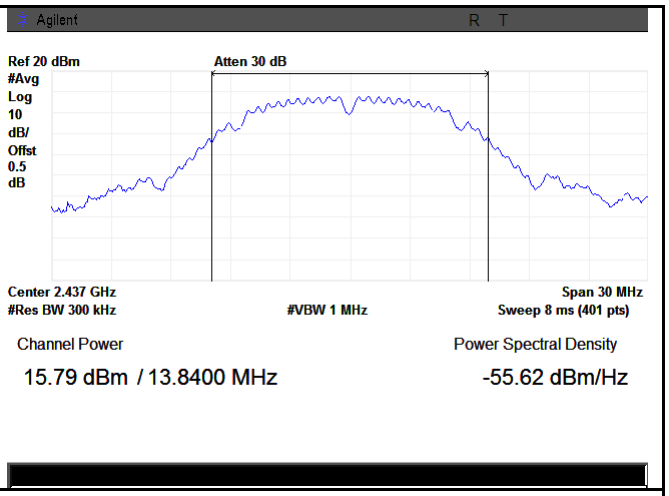
Type	Test mode	CH	Freq (MHz)	Conducted Power (dBm)	Limit (dBm)	Result
Output power	802.11b	Low	2412	14.85	30	Pass
		Mid	2437	15.79	30	Pass
		High	2462	**16.72**	30	Pass
	802.11g	Low	2412	11.03	30	Pass
		Mid	2437	11.04	30	Pass
		High	2462	**11.67**	30	Pass
	802.11n (20M)	Low	2412	10.54	30	Pass
		Mid	2437	10.98	30	Pass
		High	2462	**11.87**	30	Pass
	802.11n (40M)	Low	2422	9.45	30	Pass
		Mid	2437	8.96	30	Pass
		High	2452	**10.18**	30	Pass

Test Plots

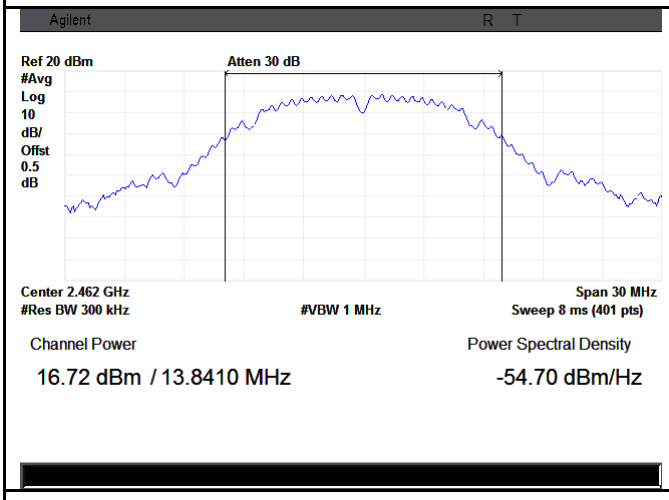
The Average Power



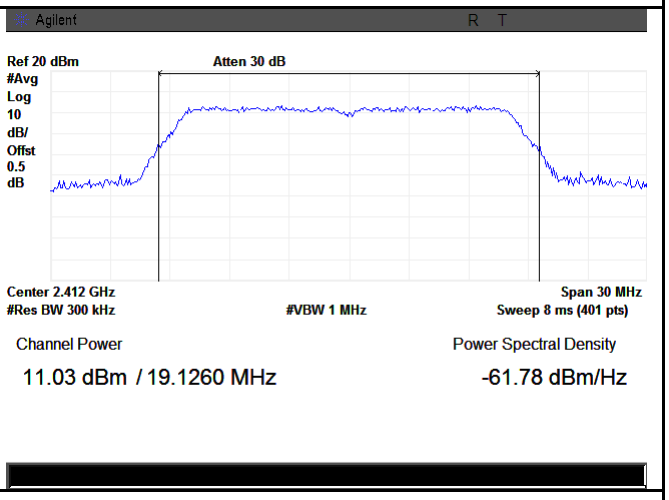
802.11b - AV Output power - Low CH 2412



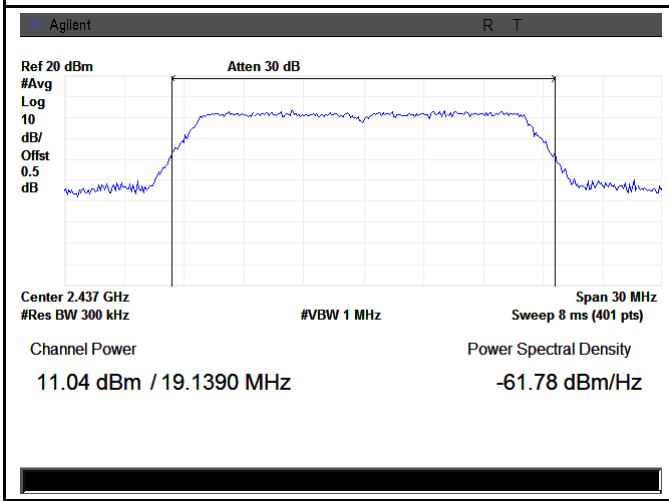
802.11b - AV Output power - Mid CH 2437



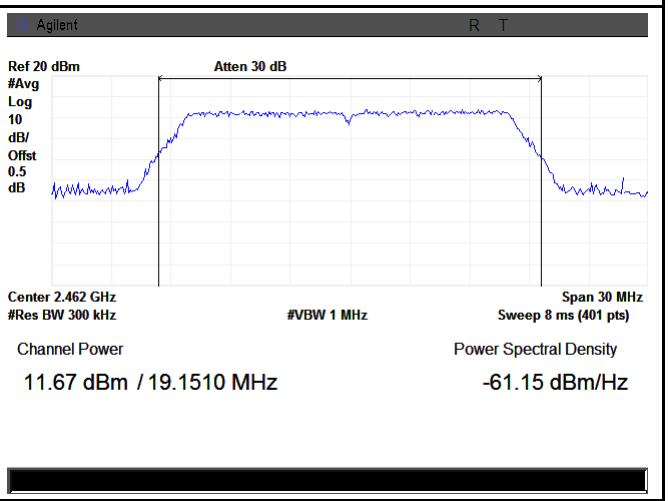
802.11b - AV Output power - High CH 2462



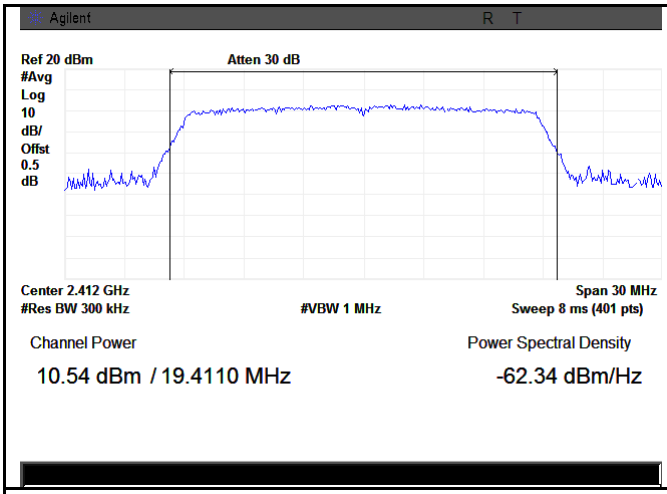
802.11g - AV Output power - Low CH 2412



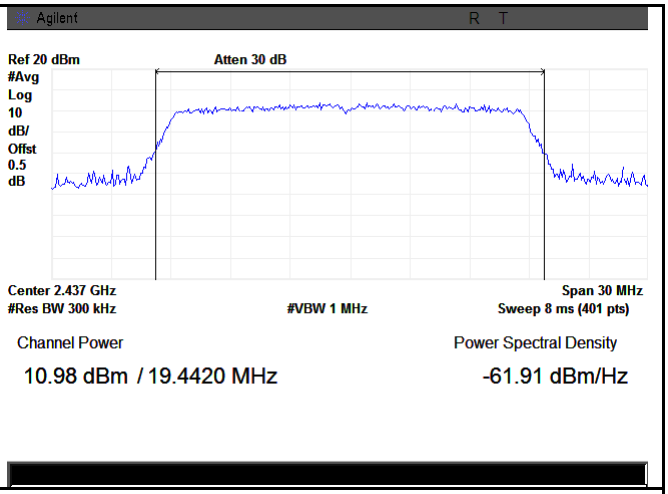
802.11g - AV Output power - Mid CH 2437



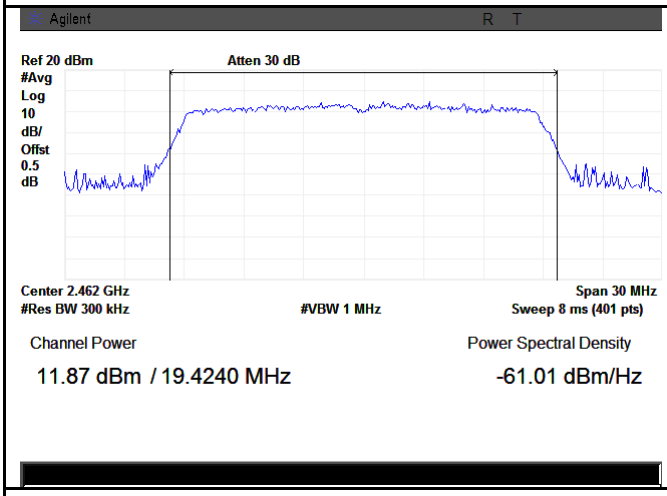
802.11g - AV Output power - High CH 2462



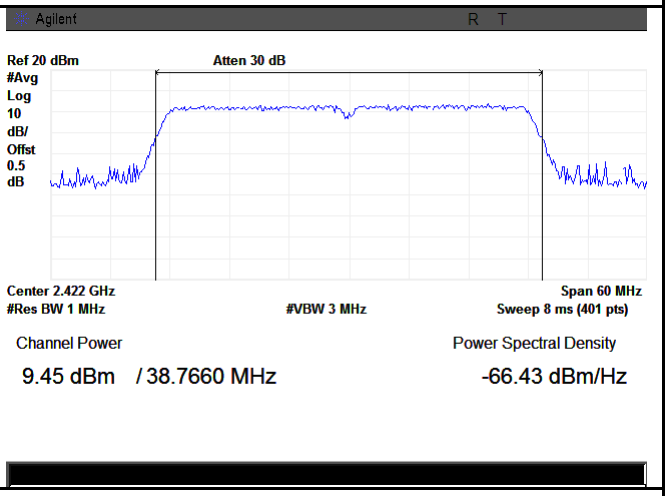
802.11n20 - AV Output power - Low CH 2412



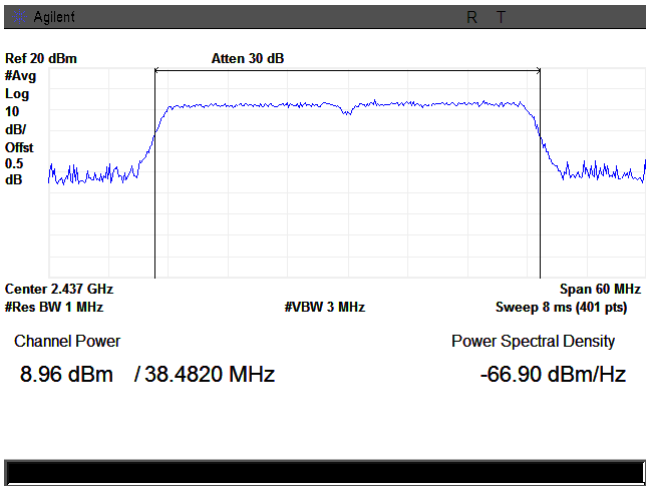
802.11n20 - AV Output power - Mid CH 2437



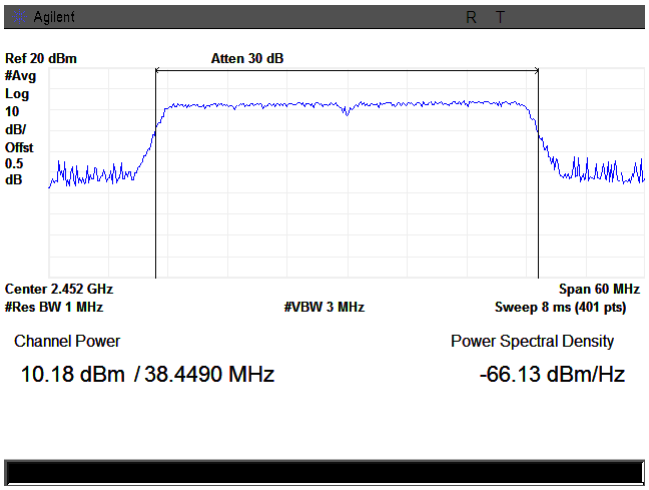
802.11n20 - AV Output power - High CH 2462



802.11n40 - AV Output power - Low CH 2422



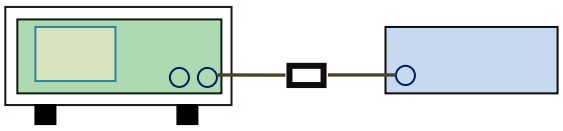
802.11n40 - AV Output power - Mid CH 2437



802.11n40 - AV Output power - High CH 2452

6.4 Power Spectral Density

Temperature	21°C
Relative Humidity	53%
Atmospheric Pressure	1007mbar
Test date :	May 07, 2015
Tested By :	Wiky.Jam

Spec	Item	Requirement	Applicable
§15.247(e)	a)	The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.	☑
Test Setup			
Test Procedure	558074 D01 DTS MEAS Guidance v03r02, 10.2 power spectral density method power spectral density measurement procedure - a) Set analyzer center frequency to DTS channel center frequency. - b) Set the span to 1.5 times the DTS bandwidth. - c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz. - d) Set the VBW ≥ 3 × RBW. - e) Detector = peak. - f) Sweep time = auto couple. - g) Trace mode = max hold. - h) Allow trace to fully stabilize. - i) Use the peak marker function to determine the maximum amplitude level within the RBW. - j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.		
Remark			
Result	☑ Pass ☐ Fail		

Test Data ☑ Yes ☐ N/A

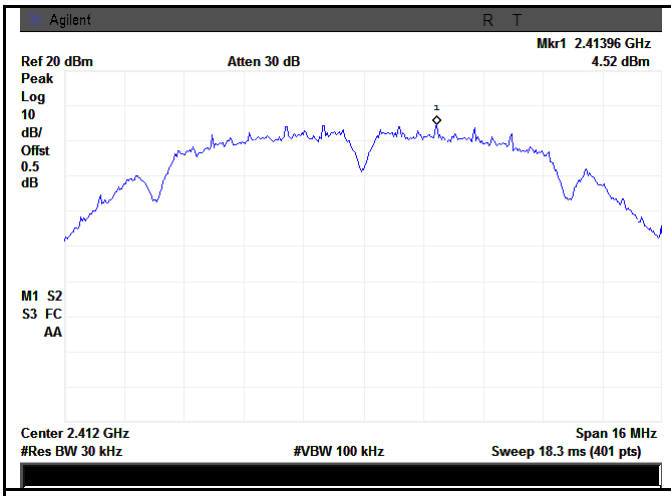
Test Plot ☑ Yes (See below) ☐ N/A

Power Spectral Density measurement result

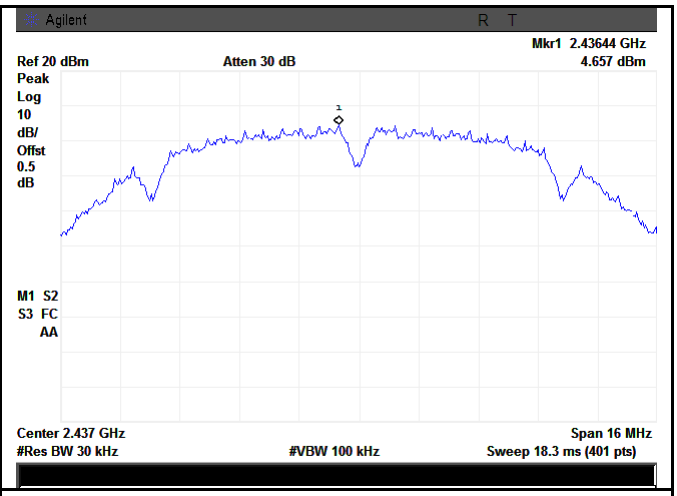
Type	Test mode	CH	Freq (MHz)	PSD (dBm)	Limit (dBm)	Result
PSD	802.11b	Low	2412	4.520	8	Pass
		Mid	2437	4.657	8	Pass
		High	2462	5.537	8	Pass
	802.11g	Low	2412	-3.416	8	Pass
		Mid	2437	-2.459	8	Pass
		High	2462	-1.805	8	Pass
	802.11n (20M)	Low	2412	-2.502	8	Pass
		Mid	2437	-2.040	8	Pass
		High	2462	-1.542	8	Pass
	802.11n (40M)	Low	2422	-1.672	8	Pass
		Mid	2437	-1.516	8	Pass
		High	2452	-0.767	8	Pass

Test Plots

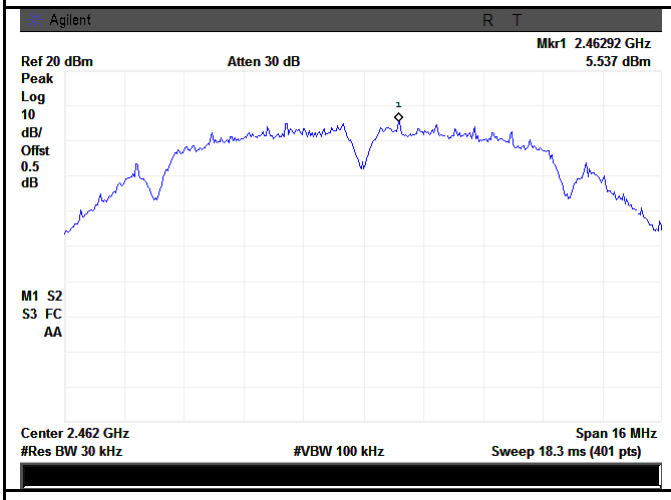
Power Spectral Density measurement result



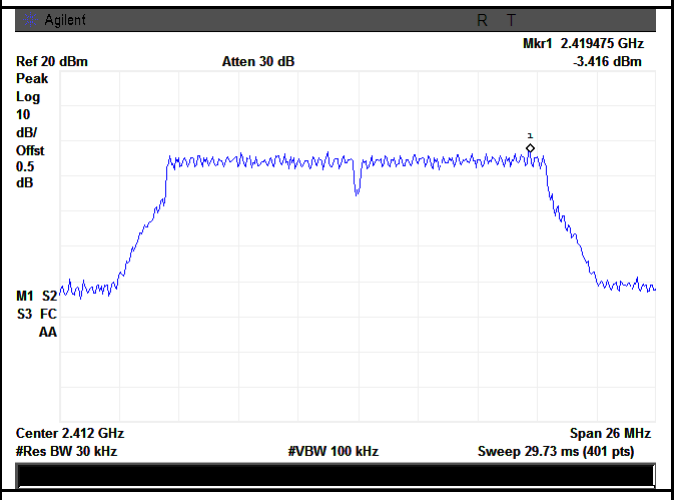
PSD - Low CH 2412 - 802.11b



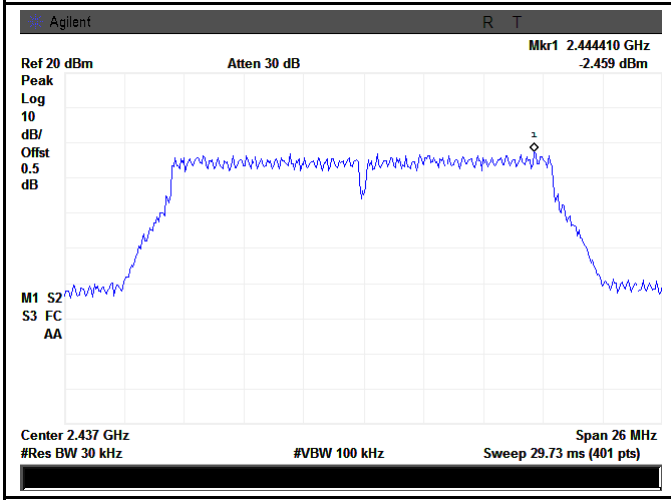
PSD - Mid CH 2437 – 802.11b



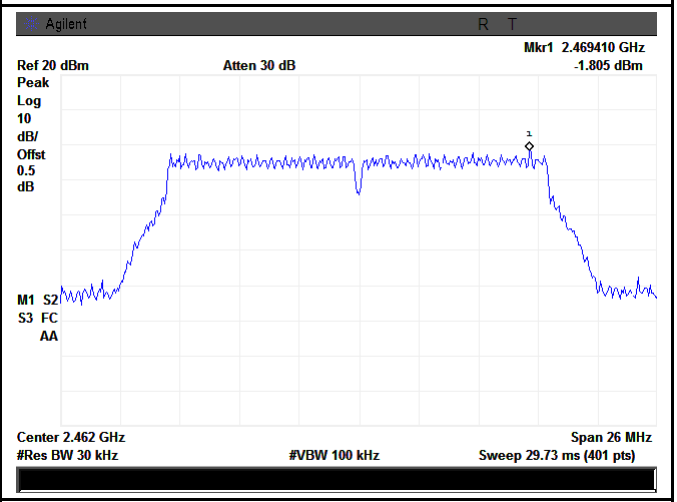
PSD - High CH 2462 - 802.11b



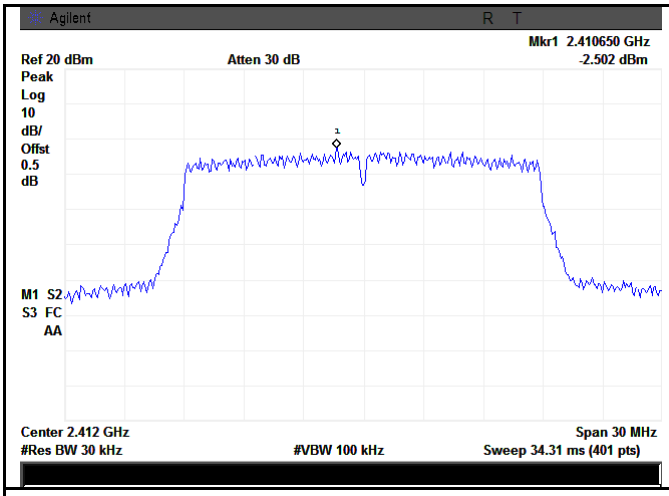
PSD - Low CH 2412 -802.11g



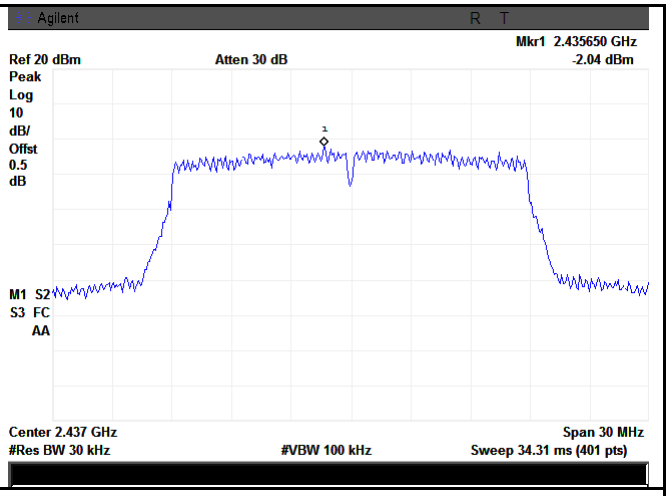
PSD - Mid CH 2437 – 802.11g



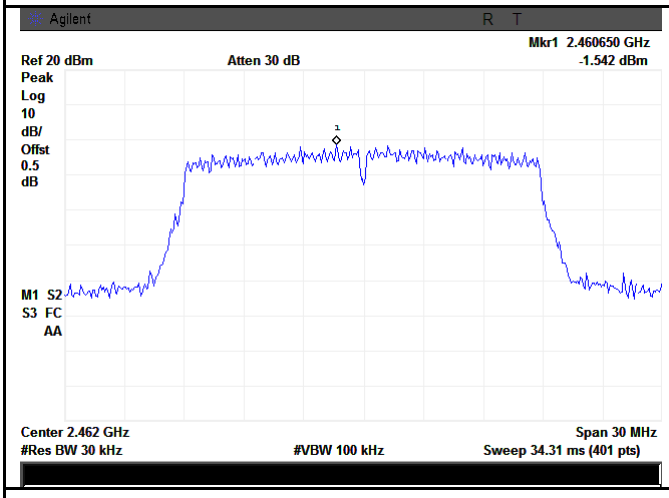
PSD - High CH 2462 - 802.11g



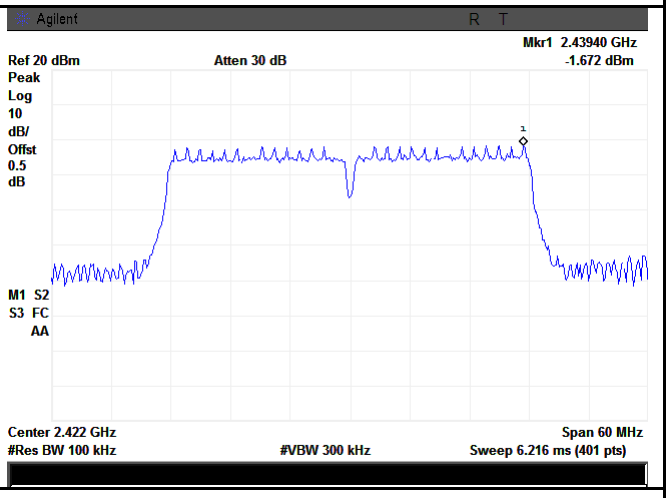
PSD - Low CH 2412 - 802.11n20



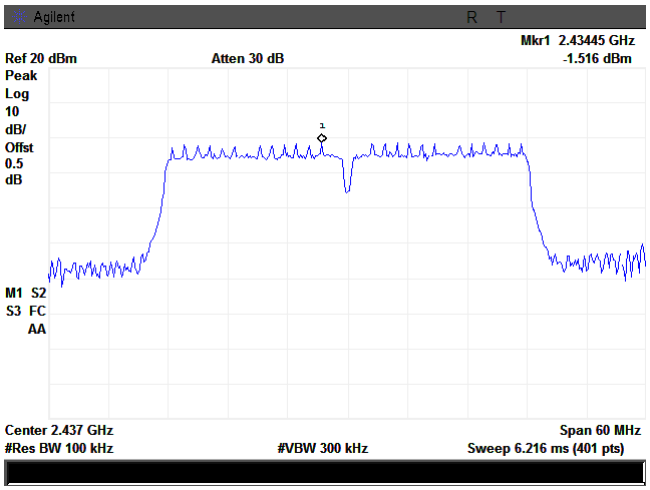
PSD - Mid CH 2437 – 802.11n20



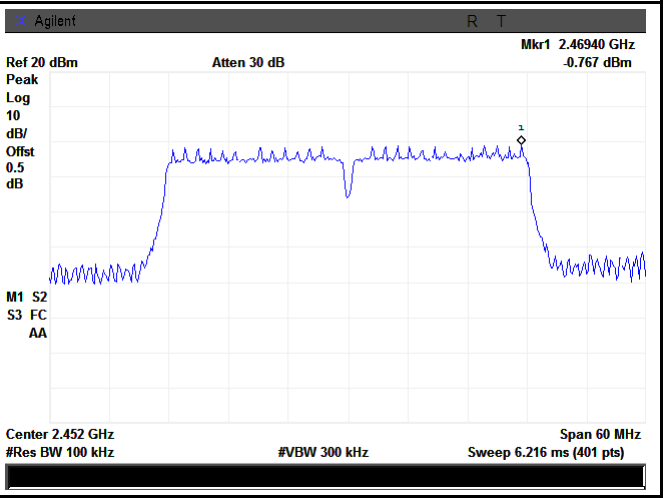
PSD - High CH 2462 - 802.11n20



PSD - Low CH 2422 - 802.11n40



PSD - Mid CH 2437 – 802.11n40

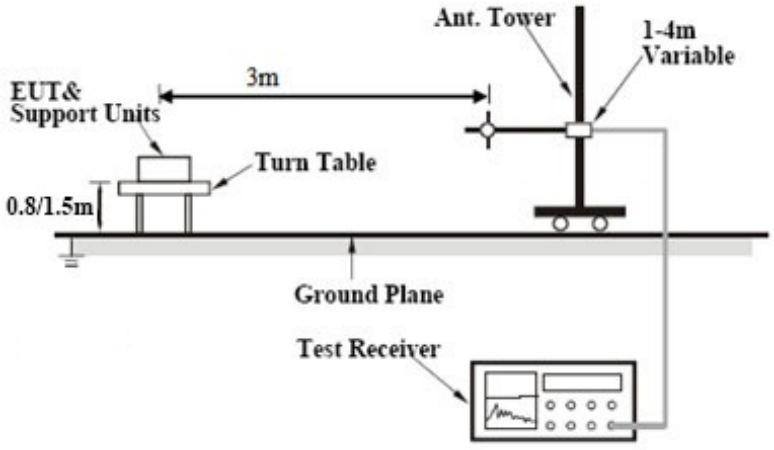


PSD - High CH 2462 - 802.11n40

6.5 Band-Edge & Unwanted Emissions into Non-Restricted Frequency Bands

Temperature	22°C
Relative Humidity	52%
Atmospheric Pressure	1013mbar
Test date :	May 13, 2015
Tested By :	Wiky.Jam

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(d)	a)	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.	☑
Test Setup			
Test Procedure	Radiated Method Only - 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. - 2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.		

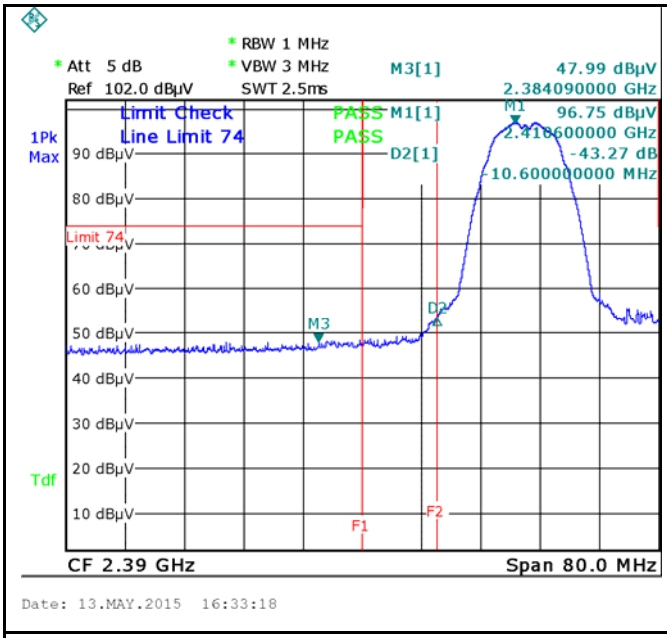
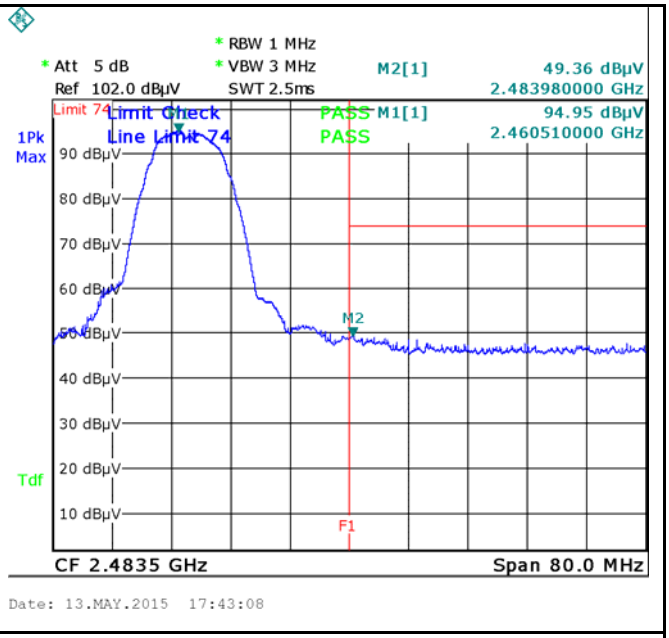
	- 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below: a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz. b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz. c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz. - 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency. - 5. Repeat above procedures until all measured frequencies were complete.
Remark	
Result	☑ Pass ☐ Fail

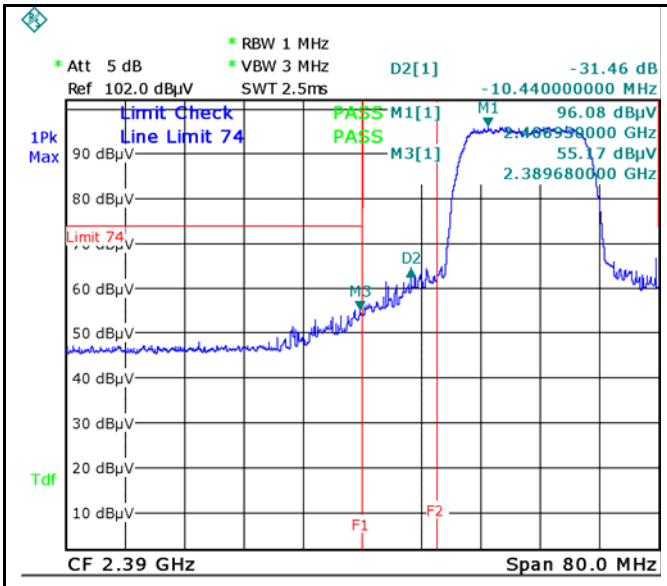
Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Plots

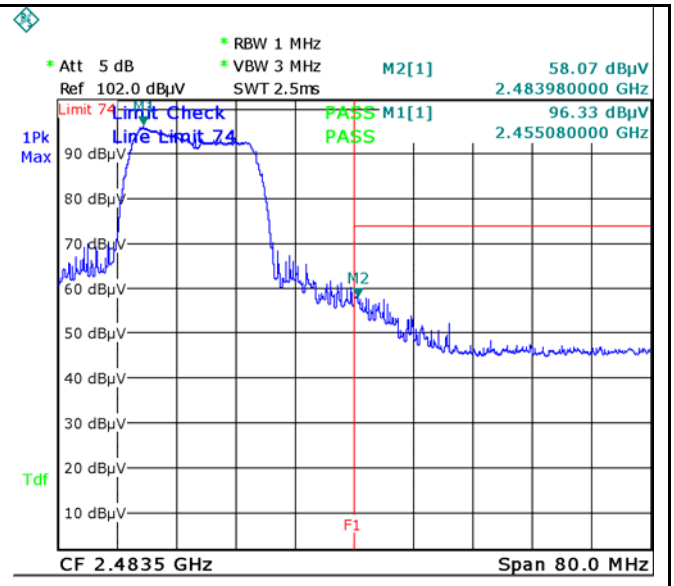
Band Edge measurement result

	
Band Edge, Left Side (Peak) - 802.11b **Note: F1 is frequency 2390MHz;F2 is frequency 2400MHz**	Band Edge, Right Side (Peak) - 802.11b **Note: F1 is frequency 2483.5MHz**
Note: (no need if PK value less than the AV limit)	Note: (no need if PK value less than the AV limit)
Band Edge, Left Side (Average) - 802.11b	Band Edge, Right Side (Average) - 802.11b



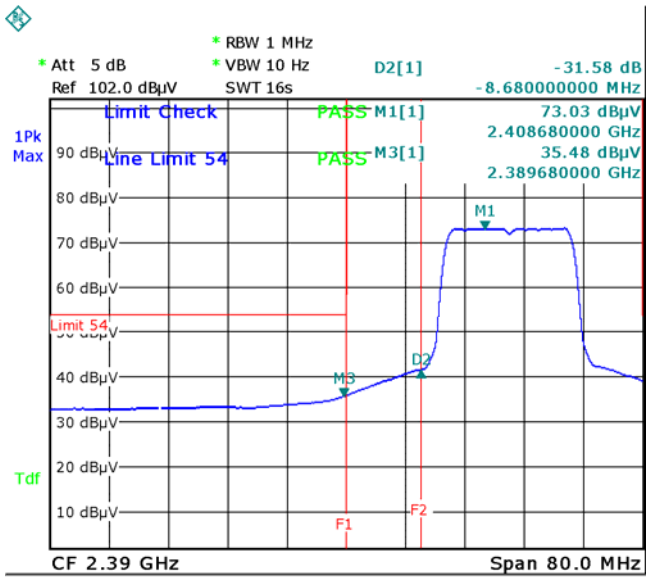
Band Edge, Left Side (Peak) - 802.11g

Note: F1 is frequency 2390MHz;F2 is frequency 2400MHz



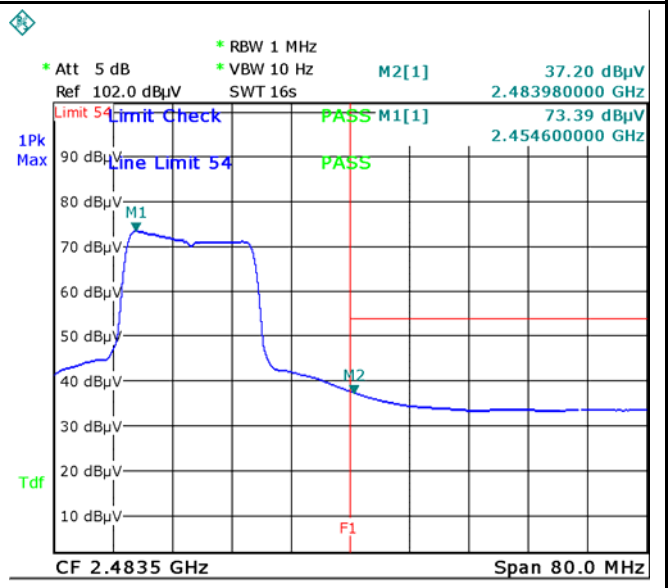
Band Edge, Right Side (Peak) - 802.11g

Note: F1 is frequency 2483.5MHz



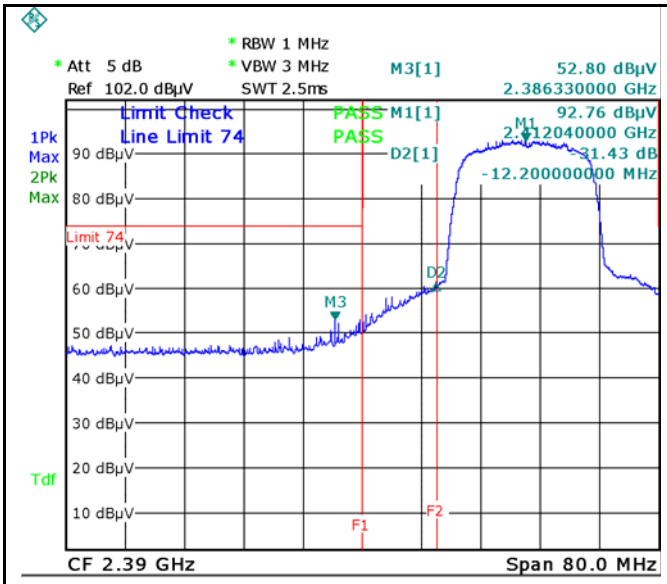
Band Edge, Left Side (Average) - 802.11g

Note: F1 is frequency 2390MHz;F2 is frequency 2400MHz



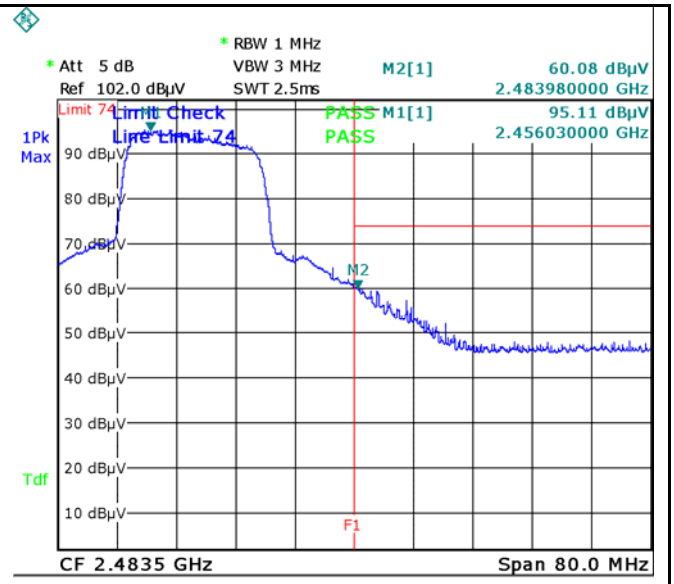
Band Edge, Right Side (Average) - 802.11g

Note: F1 is frequency 2483.5MHz



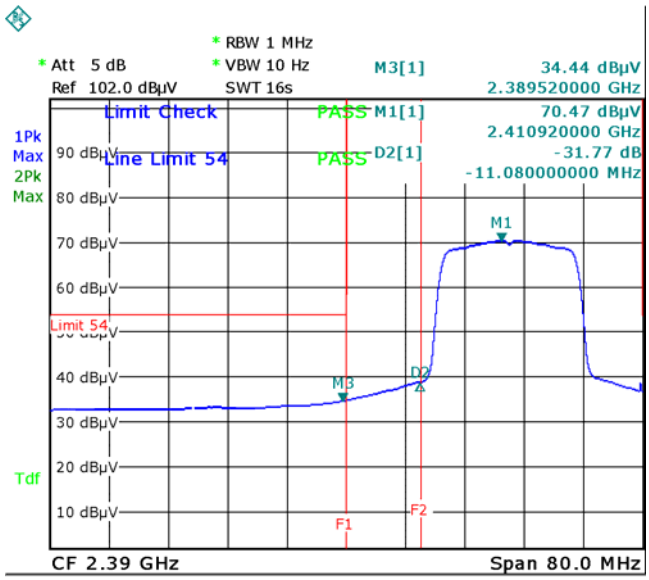
Band Edge, Left Side (Peak) - 802.11n20

Note: F1 is frequency 2390MHz;F2 is frequency 2400MHz



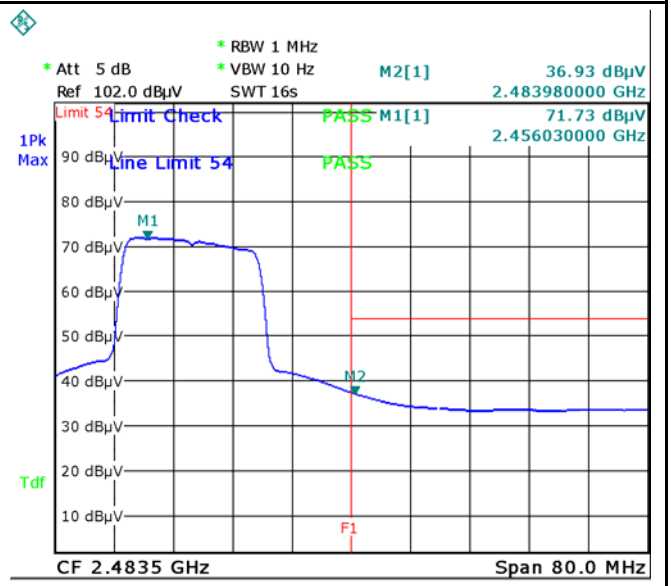
Band Edge, Right Side (Peak) - 802.11n20

Note: F1 is frequency 2483.5MHz



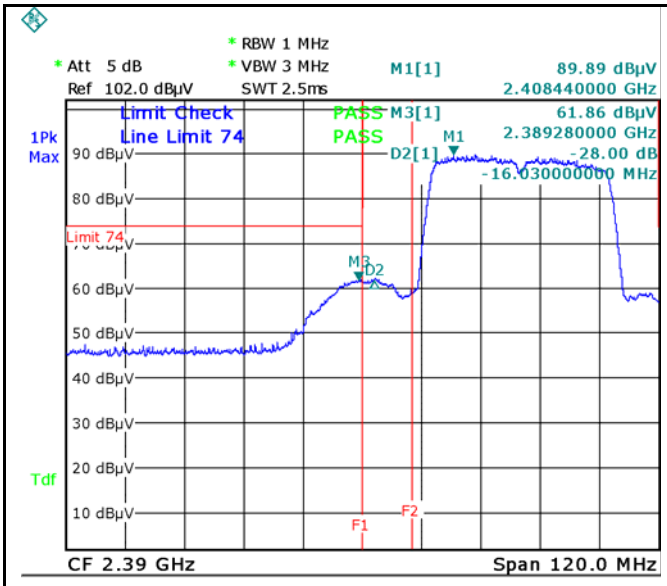
Band Edge, Left Side (Average) - 802.11n20

Note: F1 is frequency 2390MHz;F2 is frequency 2400MHz



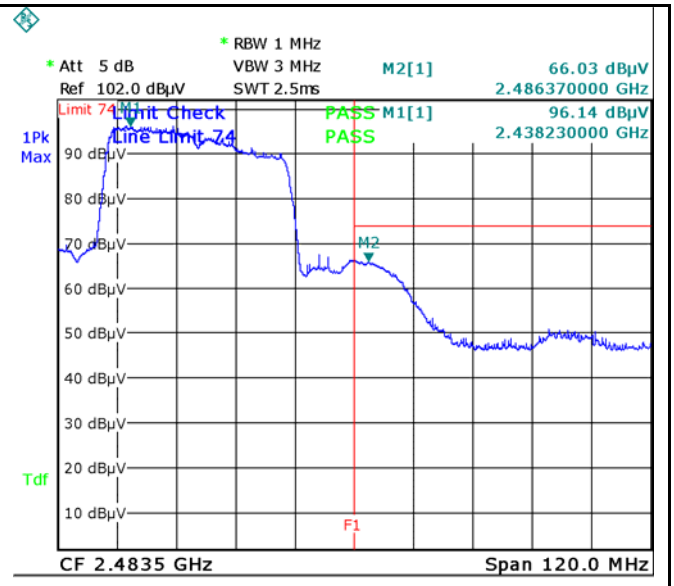
Band Edge, Right Side (Average) - 802.11n20

Note: F1 is frequency 2483.5MHz



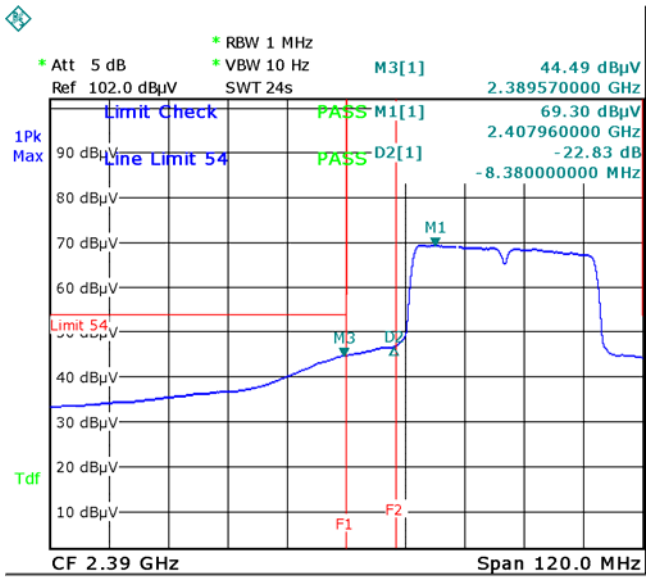
Band Edge, Left Side (Peak) - 802.11n40

Note: F1 is frequency 2390MHz;F2 is frequency 2400MHz



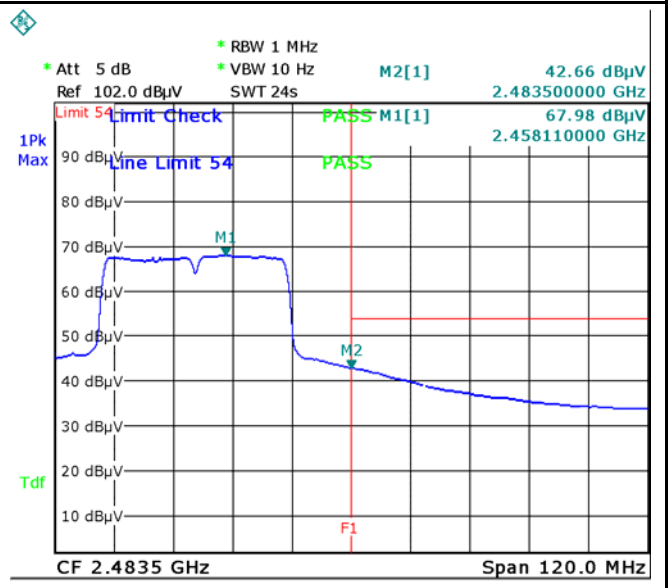
Band Edge, Right Side (Peak) - 802.11n40

Note: F1 is frequency 2483.5MHz



Band Edge, Left Side (Average) - 802.11n40

Note: F1 is frequency 2390MHz;F2 is frequency 2400MHz



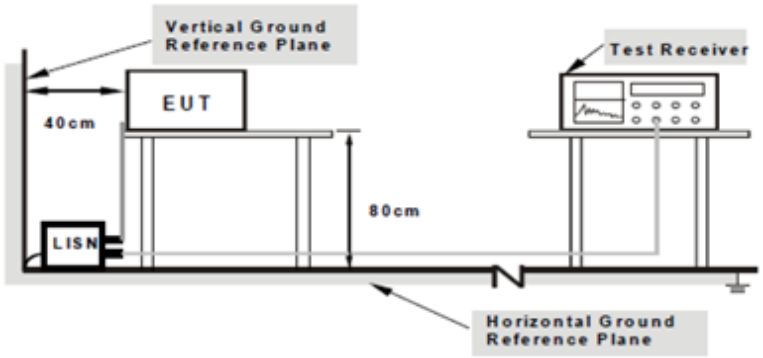
Band Edge, Right Side (Average) - 802.11n40

Note: F1 is frequency 2483.5MHz

6.6 AC Power Line Conducted Emissions

Temperature	20°C
Relative Humidity	51%
Atmospheric Pressure	1027mbar
Test date :	May 27, 2015
Tested By :	Wiky.Jam

Requirement(s):

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>47CFR§15.207,</td><td>a)</td><td>For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu] H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.
<table>
<tr><th rowspan="2">Frequency ranges (MHz)</th><th colspan="2">Limit (dBμV)</th></tr>
<tr><th>QP</th><th>Average</th></tr>
<tr><td>0.15 ~ 0.5</td><td>66 – 56</td><td>56 – 46</td></tr>
<tr><td>0.5 ~ 5</td><td>56</td><td>46</td></tr>
<tr><td>5 ~ 30</td><td>60</td><td>50</td></tr>
</table>
</td><td>☑</td></tr>
<tr><td>Test Setup</td><td colspan="3"> 

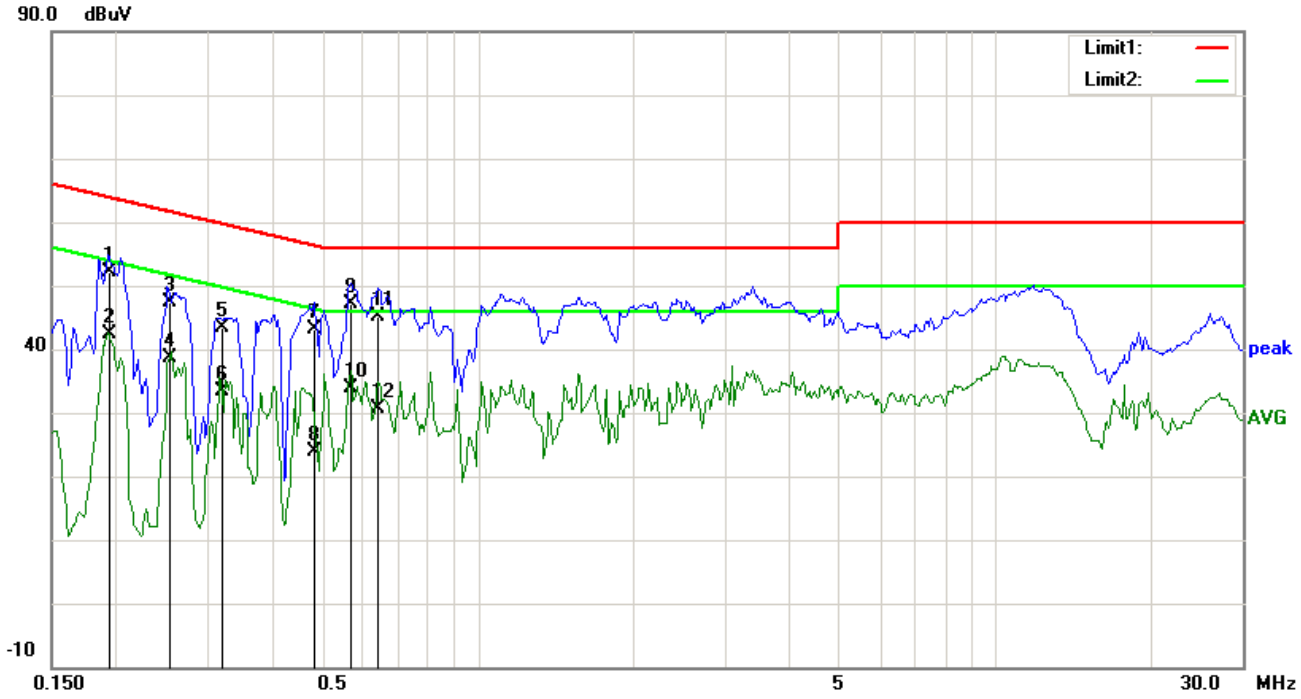
Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.</td></tr>
<tr><td>Procedure</td><td colspan="3">1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50W/50mH 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</td></tr>
</table>

	coaxial cable. 4. All other supporting equipment were powered separately from another main supply. 5. The EUT was switched on and allowed to warm up to its normal operating condition. 6. 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. 7. High peaks, relative to the limit line, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. 8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).
Remark	
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Mode:	Transmitting Mode

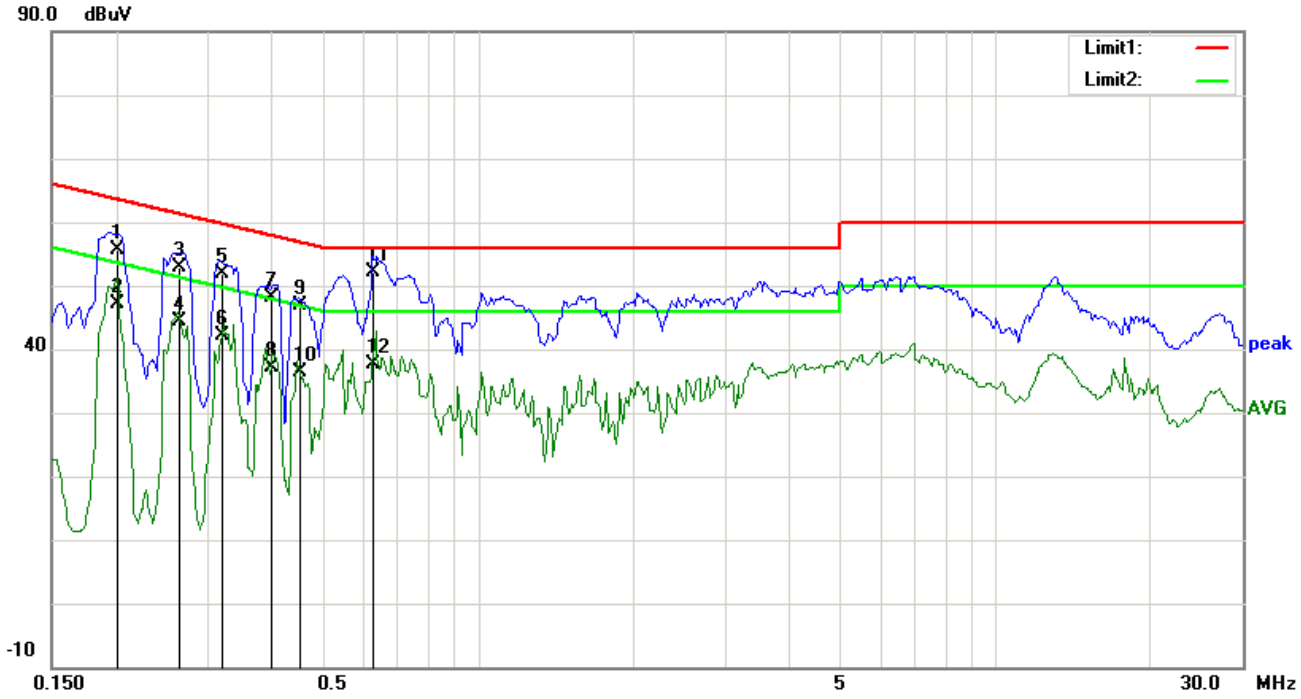


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dBµV)	Detector	Corrected (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)	Comment)
1	L1	0.1945	39.18	QP	13.03	52.21	63.84	-11.63	
2	L1	0.1945	29.47	AVG	13.03	42.50	53.84	-11.34	
3	L1	0.2535	34.50	QP	12.82	47.32	61.64	-14.32	
4	L1	0.2535	25.93	AVG	12.82	38.75	51.64	-12.89	
5	L1	0.3200	30.71	QP	12.57	43.28	59.71	-16.43	
6	L1	0.3200	20.78	AVG	12.57	33.35	49.71	-16.36	
7	L1	0.4837	31.19	QP	11.96	43.15	56.28	-13.13	
8	L1	0.4837	12.00	AVG	11.96	23.96	46.28	-22.32	
9	L1	0.5680	35.33	QP	11.83	47.16	56.00	-8.84	
10	L1	0.5680	22.12	AVG	11.83	33.95	46.00	-12.05	
11	L1	0.6422	33.42	QP	11.76	45.18	56.00	-10.82	
12	L1	0.6422	18.81	AVG	11.76	30.57	46.00	-15.43	

Test Mode:	Transmitting Mode



Test Data

Phase Neutral Plot at 120Vac, 60Hz

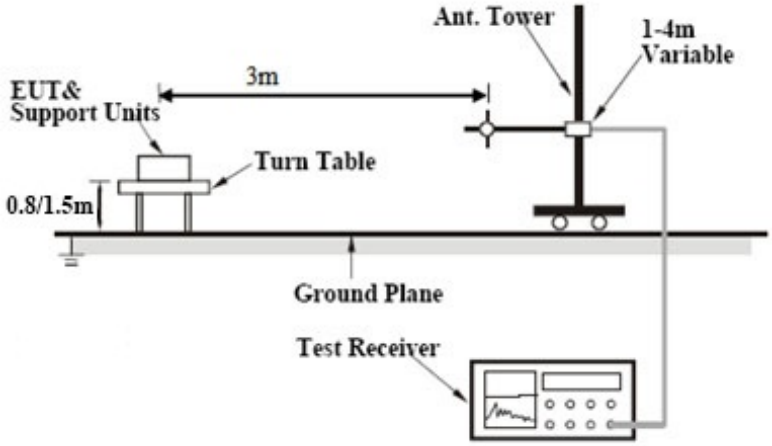
No.	P/L	Frequency (MHz)	Reading (dBµV)	Detector	Corrected (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)	Comment)
1	N	0.2008	42.51	QP	13.01	55.52	63.58	-8.06	
2	N	0.2008	34.07	AVG	13.01	47.08	53.58	-6.50	
3	N	0.2633	40.08	QP	12.78	52.86	61.33	-8.47	
4	N	0.2633	31.71	AVG	12.78	44.49	51.33	-6.84	
5	N	0.3200	39.20	QP	12.57	51.77	59.71	-7.94	
6	N	0.3200	29.52	AVG	12.57	42.09	49.71	-7.62	
7	N	0.4000	35.86	QP	12.27	48.13	57.85	-9.72	
8	N	0.4000	24.84	AVG	12.27	37.11	47.85	-10.74	
9	N	0.4539	34.93	QP	12.07	47.00	56.80	-9.80	
10	N	0.4539	24.37	AVG	12.07	36.44	46.80	-10.36	
11	N	0.6271	40.41	QP	11.77	52.18	56.00	-3.82	
12	N	0.6271	25.84	AVG	11.77	37.61	46.00	-8.39	

6.7 Radiated Spurious Emissions

Temperature	20°C
Relative Humidity	51%
Atmospheric Pressure	1027mbar
Test date :	May 27, 2015
Tested By :	Wiky.Jam

Requirement(s):

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td rowspan="3">47CFR§15.
247(d),</td><td>a)</td><td>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges
<table>
<tr><th>Frequency range (MHz)</th><th>Field Strength (μV/m)</th></tr>
<tr><td>30 – 88</td><td>100</td></tr>
<tr><td>88 – 216</td><td>150</td></tr>
<tr><td>216 960</td><td>200</td></tr>
<tr><td>Above 960</td><td>500</td></tr>
</table></td><td>☑</td></tr>
<tr><td>b)</td><td>For non-restricted band, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required
☒ 20 dB down ☐ 30 dB down</td><td>☑</td></tr>
<tr><td>c)</td><td>or restricted band, emission must also comply with the radiated emission limits specified in 15.209</td><td>☑</td></tr>
</table>

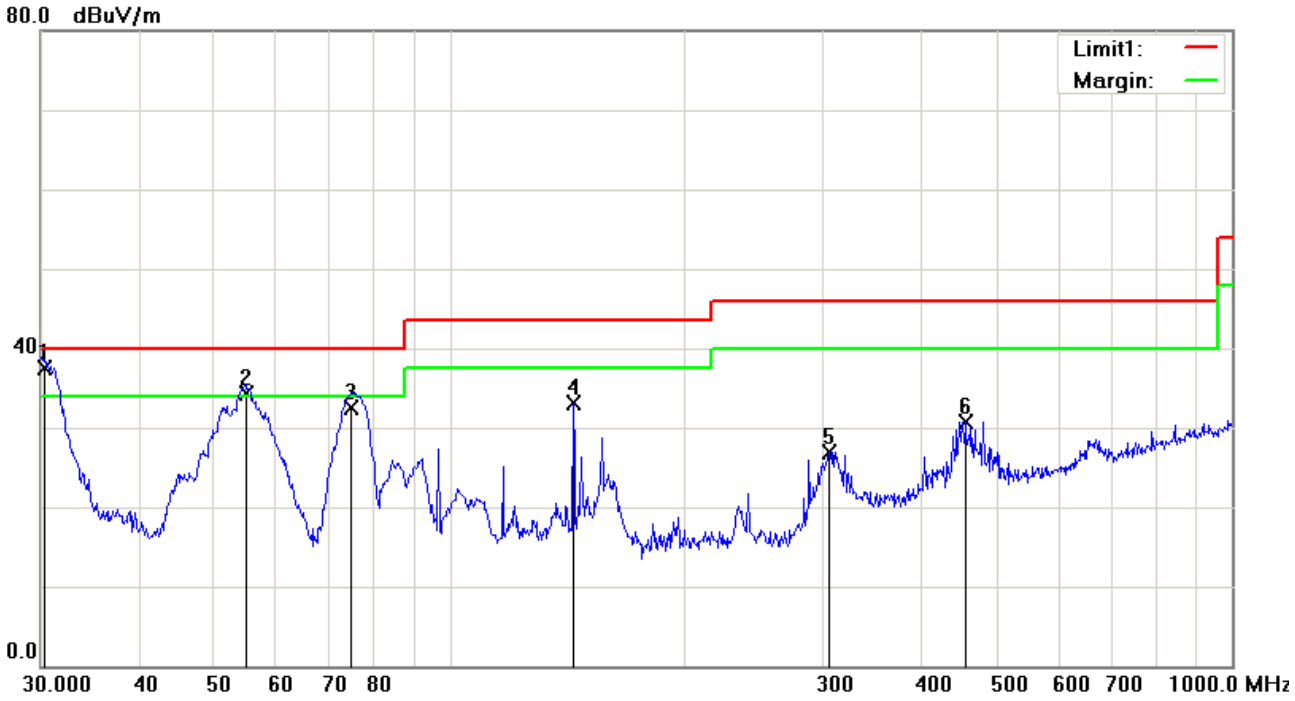
Test Setup	
Procedure	1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz. 4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz. 5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.
Remark	Different RF configuration has been evaluated but not much difference was found. The data presented here is the worst case data with EUT under 802.11n – HT20-2437MHz mode.
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Mode:	Transmitting Mode

(Below 1GHz)

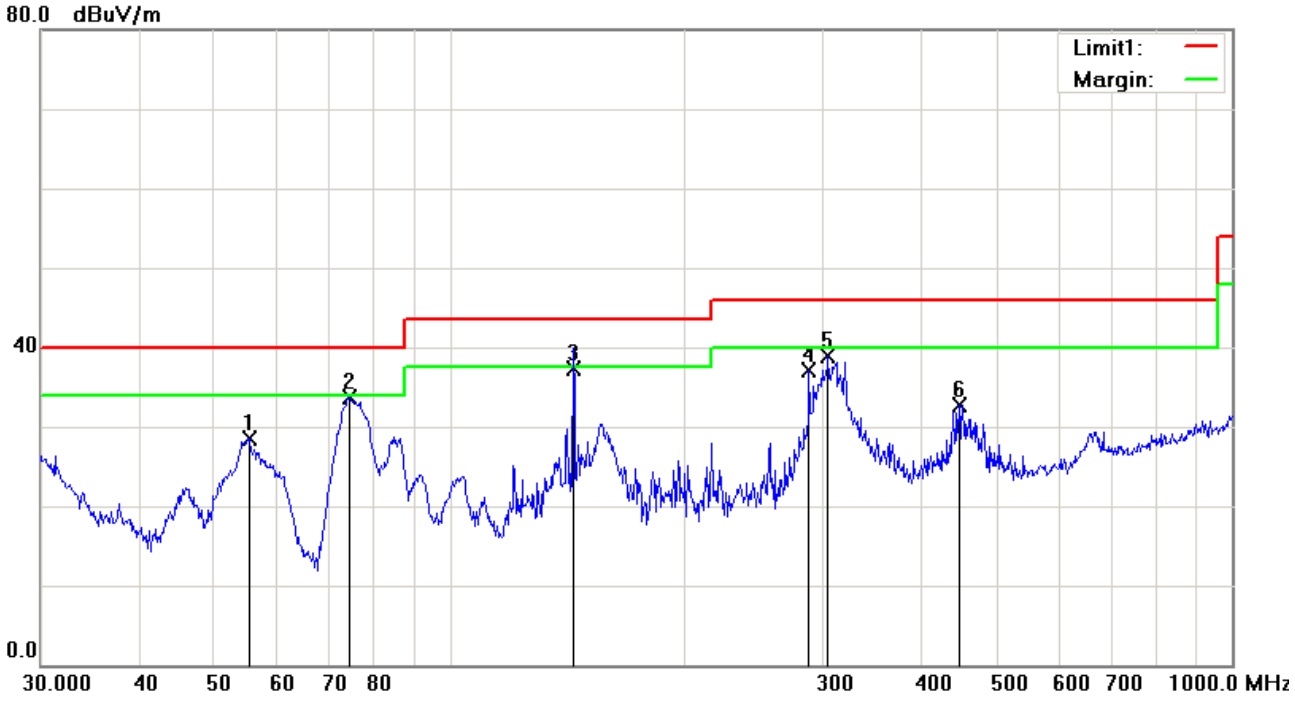


Test Data

Vertical Polarity Plot @3m

No	P/L	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Height	Degree	Comment
1	V	30.3173	38.01	QP	-0.49	37.52	40.00	-2.48	100	257	
2	V	54.8348	48.02	QP	-13.74	34.28	40.00	-5.72	100	261	
3	V	74.9191	46.15	QP	-13.74	32.41	40.00	-7.59	100	316	
4	V	143.8295	41.63	peak	-8.48	33.15	43.50	-10.35	100	69	
5	V	305.6800	33.68	peak	-6.73	26.95	46.00	-19.05	100	125	
6	V	455.9058	33.64	peak	-2.92	30.72	46.00	-15.28	100	147	

(Below 1GHz)



Test Data

Vertical Polarity Plot @3m

No	P/L	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Height	Degree	Comment
1	H	55.4147	42.25	peak	-13.82	28.43	40.00	-11.57	100	209	
2	H	74.3955	47.50	peak	-13.73	33.77	40.00	-6.23	100	198	
3	H	143.8295	45.73	QP	-8.48	37.25	43.50	-6.25	100	105	
4	H	287.9904	44.58	peak	-7.45	37.13	46.00	-8.87	100	260	
5	H	304.6100	45.67	peak	-6.77	38.90	46.00	-7.10	100	157	
6	H	447.9822	35.85	peak	-3.12	32.73	46.00	-13.27	100	238	

Test Mode:	Transmitting Mode

Low Channel (2412 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)
4824	37.16	AV	V	34	6.86	31.72	46.3	54	-7.7
4824	36.82	AV	H	33.8	6.86	31.72	45.76	54	-8.24
4824	47.33	PK	V	34	6.86	31.72	56.47	74	-17.53
4824	46.71	PK	H	33.8	6.86	31.72	55.65	74	-18.35

Middle Channel (2437 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)
4874	37.37	AV	V	33.6	6.82	31.82	45.97	54	-8.03
4874	36.54	AV	H	33.8	6.82	31.82	45.34	54	-8.66
4874	47.18	PK	V	33.6	6.82	31.82	55.78	74	-18.22
4874	46.52	PK	H	33.8	6.82	31.82	55.32	74	-18.68

High Channel (2462 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)
4924	36.98	AV	V	34.6	6.76	31.92	46.42	54	-7.58
4924	36.74	AV	H	34.7	6.76	31.92	46.28	54	-7.72
4924	47.35	PK	V	34.6	6.76	31.92	56.79	74	-17.21
4924	46.78	PK	H	34.7	6.76	31.92	56.32	74	-17.68

Annex A. TEST INSTRUMENT

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	☑
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 B. EUT and Test Setup Photographs

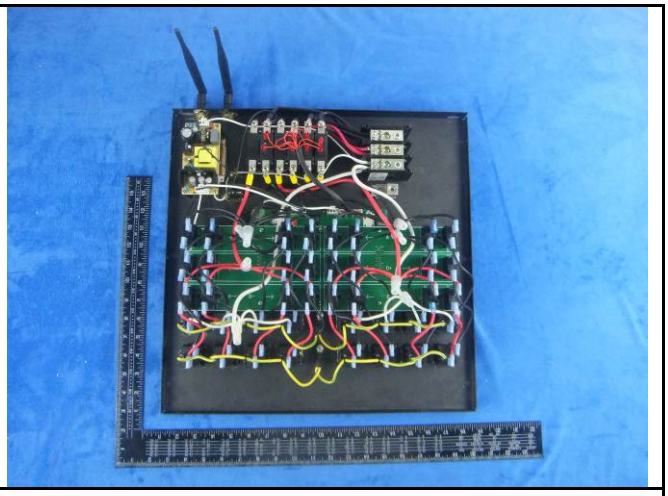
Annex B.i. Photograph: EUT External Photo

	
Whole Package - Top View	EUT - Rear View
	
EUT - Left View	EUT - Right View

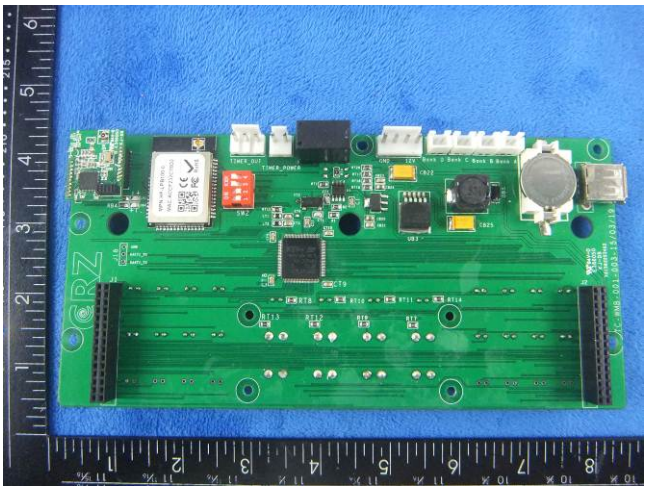
	
EUT - Top View	EUT - Bottom View

Annex B.ii. Photograph: EUT Internal Photo

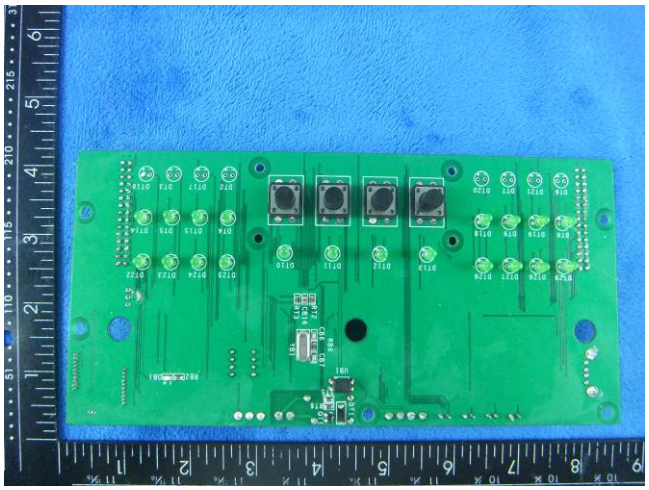
Cover Off - Top View 1



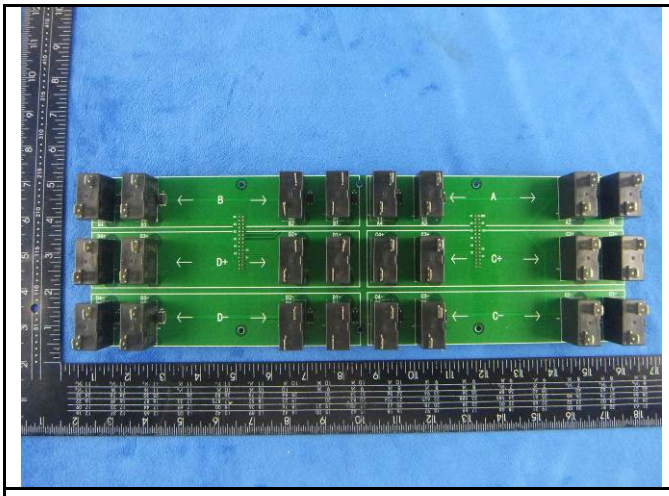
Cover Off - Top View 2



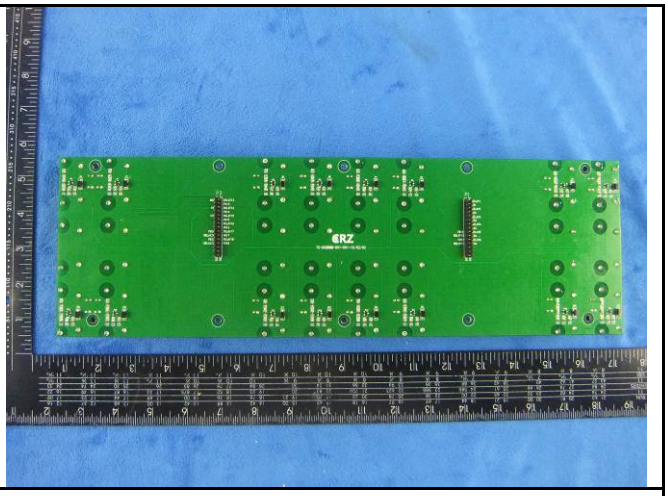
Main board - Top View



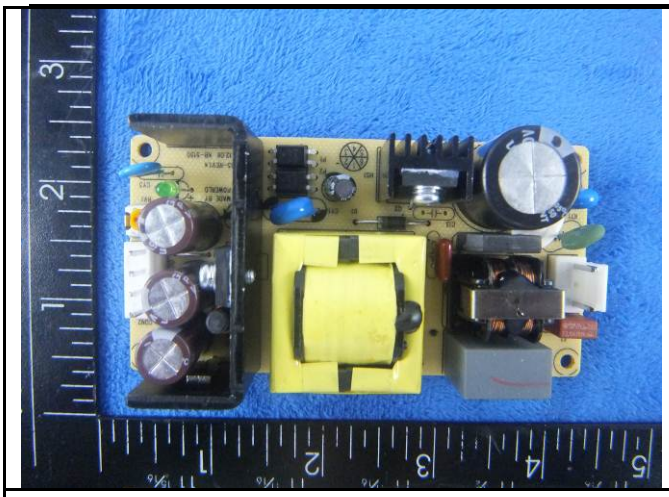
Main board - Rear View



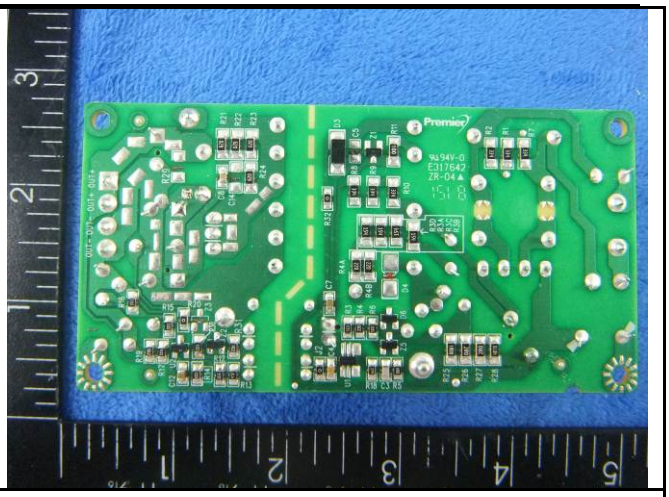
Switch board - Front View



Switch board - Rear View



Power board - Front View

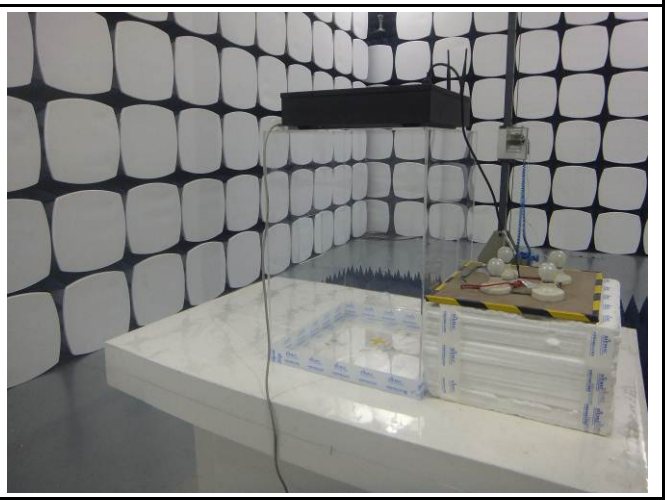


Power board - Rear View

WIFI - Antenna View

ZIGBEE - Antenna View

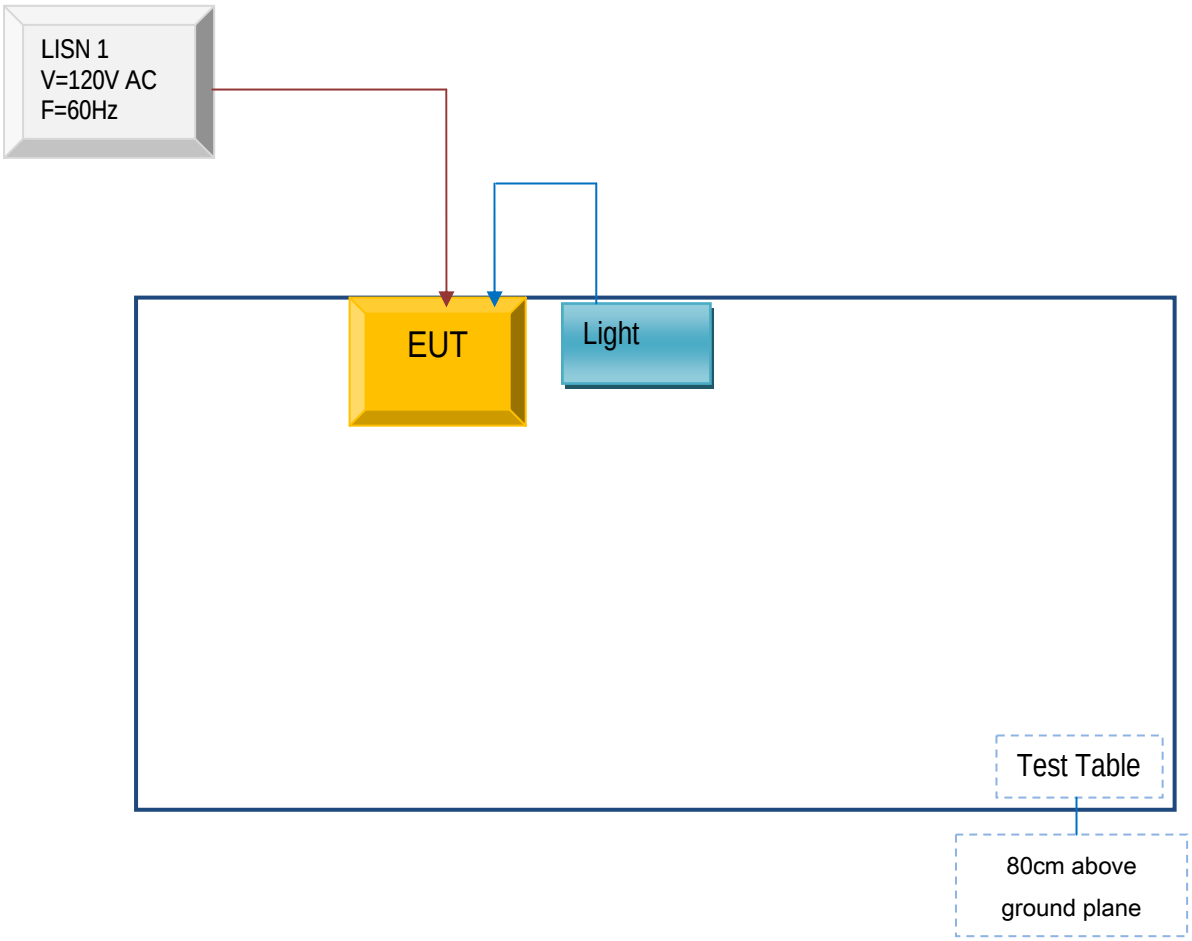
Annex B.iii. Photograph: Test Setup Photo

	
Conducted Emissions Test Setup Front View	Conducted Emissions Test Setup Side View
	
Radiated Spurious Emissions Test Setup Below 1GHz	Radiated Spurious Emissions Test Setup Above 1GHz

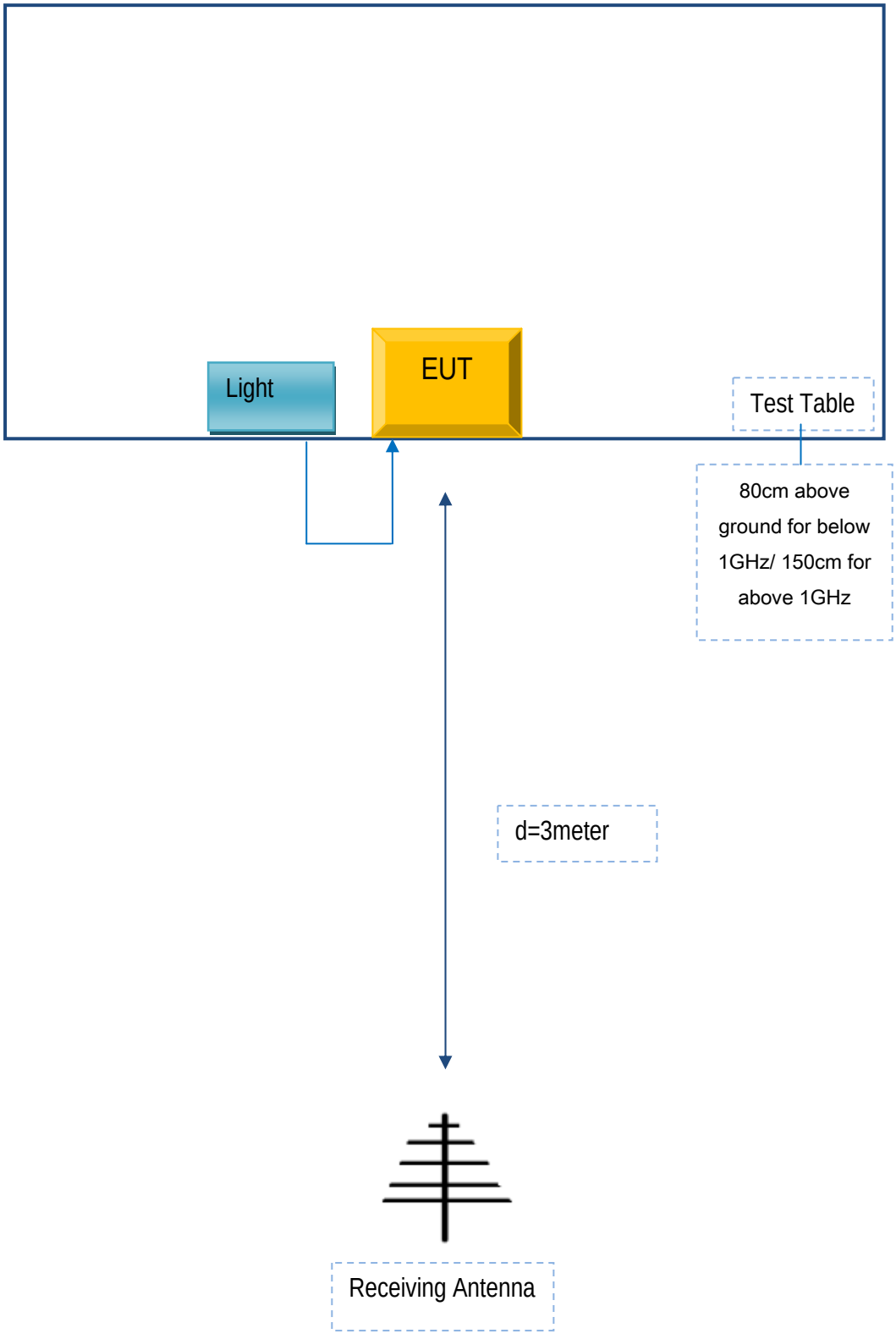
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

Block Configuration Diagram for AC Line Conducted Emissions



Block Configuration Diagram for Radiated Emissions



Annex C. il. SUPPORTING EQUIPMENT DESCRIPTION

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

Manufacturer	Equipment Description	Model	Calibration Date	Calibration Due Date
N/A	N/A	N/A	N/A	N/A

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

Please see attachment

Annex E. DECLARATION OF SIMILARITY