RF TEST REPORT

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Report No.: 16040115-FCC-R4

Supersede Report No.: N/A

Applicant	Panasonic corporation of North America
Product Name	Car Audio System with Bluetooth and Wi-Fi
Model No.	AH1801
Serial No.	N/A
Test Standard	FCC Part 15.247: 2015, ANSI C63.10: 2013
Test Date	April 25 to October 1, 2016
Issue Date	October 15, 2016
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Loren Luo	David Huang	
Loren Luo Test Engineer	David Huang Checked By	

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

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

Zone A, Floor 1, Building 2 Wan Ye Long Technology Park

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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
16040115-FCC-R4	NONE	Original	Ocotber 1, 2016
16040115-FCC-R4	V1	Charging antenna gain and setup photos	October 15, 2016

2. Customer information

Applicant Name	Panasonic corporation of North America
Applicant Add	Two Riverfront Plaza, 9th Floor, Newark, New Jersey NJ07102-5490 USA
Manufacturer	Panasonic Automotive Systems de Mexico S.A. de C.V.
Manufacturer Add	88785 Mike Allen1231, Parque Industrial Reynosa, Reynosa Tamaulipas, Mexico.

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:	Car Audio System with Bluetooth and Wi-Fi
Main Model:	AH1801
Serial Model:	N/A
Date EUT received:	April 25, 2016
Test Date(s):	April 25 to October 1, 2016
Equipment Category：	DTS
Antenna Gain:	Bluetooth(2.4G): -0.53 dBi WIFI(2.4G): -0.53 dBi WIFI(5150-5350MHz): -0.98 dBi WIFI(5470-5725MHz): -0.26 dBi WIFI(5725-5850MHz): -0.63 dBi **(Note: The AH1801 will be sold without antenna, this antenna only used for DFS or radiated spurious emission test.)**
Type of Modulation:	Bluetooth: GFSK, π /4DQPSK, 8DPSK 802.11b: DSSS 802.11a/g/n20/n40/ac20/ac40/ac80: OFDM
Input Power:	DC 13.2V, 5A
Number of Channels:	Bluetooth: 79CH WIFI :802.11b/g: 11CH WIFI :802.11a: 24CH WIFI :802.11n20: 11CH(2.4GHz); 24CH(5GHz) WIFI :802.11n40: 9CH(2.4GHz); 12CH(5GHz) WIFI :802.11ac20: 24CH WIFI :802.11ac40: 12CH WIFI :802.11ac80: 6CH

RF Operating Frequency (ies):	Bluetooth: 2402-2480 MHz 802.11b/g: 2412-2462 MHz (TX/RX) 802.11n20: 2412-2462MHz ;5180-5320 MHz; 5500-5700 MHz; 5745-5825 MHz； (TX/RX) 802.11n40: 2422-2452 MHz (TX/RX); 5190-5310 MHz; 5510-5710 MHz;5755-5795 MHz；(TX/RX) 802.11 a: 5180-5320 MHz; 5500-5700 MHz; 5745-5825 MHz (TX/RX) 802.11ac 20: 5180-5320 MHz; 5500-5700 MHz; 5745-5825 MHz；(TX/RX) 802.11ac 40: 5190-5310 MHz; 5510-5710 MHz; 5755-5795 MHz；(TX/RX) 802.11ac 80: 5210-5290 MHz; 5530-5690 MHz; 5775 MHz； (TX/RX)
Max. Output Power:	802.11b: 14.90dBm 802.11g: 18.76dBm 802.11n(20M): 17.55dBm 802.11n(40M): 16.61dBm
Port:	GPS antenna Connector; XM antenna connector; BT/WiFi antenna Connector; Extension 2 Connector; RS485 Connector; S/PDIF Connector (AMP/DVD/RT); USB Connector(TCU/NFC);GA-NET Connector;LVDS Connector(CTR/MTR); USB Connector(1,2); Extension 1 Connector; MAIN Connector
Trade Name :	Panasonic
FCC ID:	ACJAH1801
Antenna Type:	PIFA antenna

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 Restricted Frequency Bands	Compliance
§15.207 (a),	AC Power Line Conducted Emissions	N/A
§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.

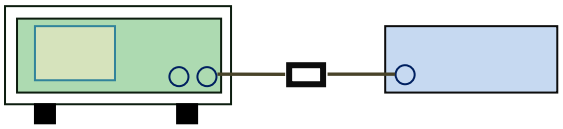
Antenna Connector Construction

The EUT has 1 antennas:
The antenna which is in the LCD display uses a unique type of connector to attach to the EUT. For Bluetooth//WIFI, the gain is -0.53dBi for Bluetooth, the gain is -0.53dBi for 2400-2483.5MHz WIFI, the gain is 0.98dBi for 5150-5350MHz WIFI, the gain is 0.26dBi for 5470-5725MHz WIFI, the gain is -0.63dBi for 5725-2850MHz WIFI.

Result: Pass

6.2 DTS (6 dB&20 dB) Channel Bandwidth

Temperature	24℃
Relative Humidity	51%
Atmospheric Pressure	1027mbar
Test date :	May 27, 2016 &September 30,2016
Tested By :	Loren Luo

Spec	Item	Requirement	Applicable
§ 15.247(a)(2)	a)	6dB BW≥ 500kHz; 20dB BW≥ 500kHz;	☑
RSS Gen(4.6.1)	b)	99% BW: For FCC reference only; required by IC.	☑
Test Setup			
Test Procedure	558074 D01 DTS MEAS Guidance v03r03, 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

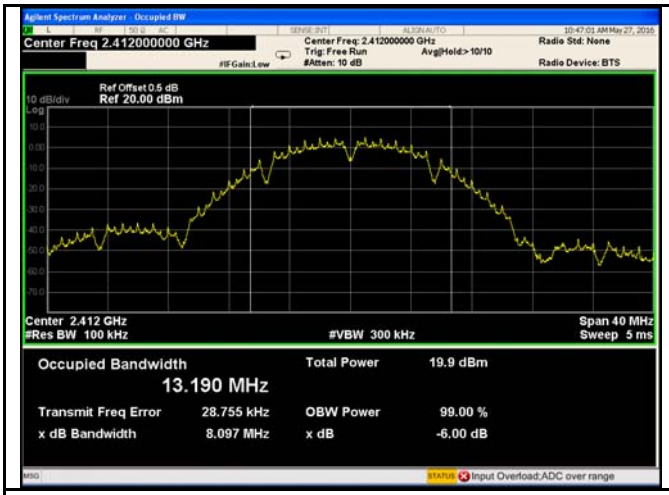
Test Plot ☑ Yes (See below) ☐ N/A

Measurement result

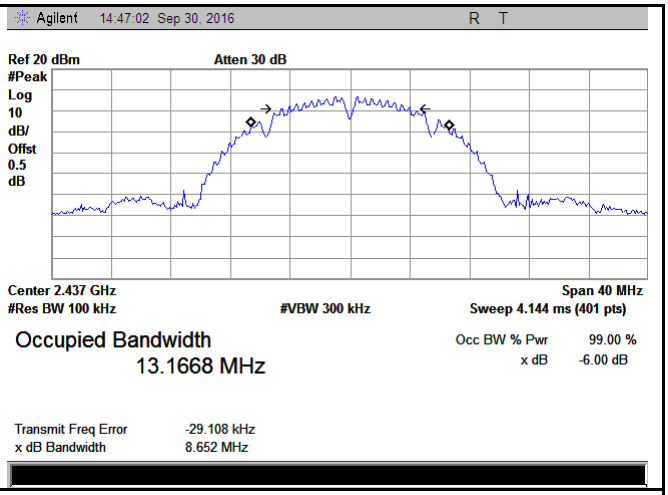
Test mode	CH	Freq (MHz)	6dB Bandwidth (MHz)	20dB Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	8.097	16.140	≥ 0.5
	Mid	2436	8.652	15.311	≥ 0.5
	High	2462	9.115	15.286	≥ 0.5
802.11g	Low	2412	16.300	17.960	≥ 0.5
	Mid	2436	16.438	20.014	≥ 0.5
	High	2462	16.405	19.612	≥ 0.5
802.11n (20M)	Low	2412	17.530	19.170	≥ 0.5
	Mid	2436	17.557	20.412	≥ 0.5
	High	2462	17.584	20.450	≥ 0.5
802.11n (40M)	Low	2422	39.140	41.130	≥ 0.5
	Mid	2436	36.046	39.704	≥ 0.5
	High	2452	35.767	39.539	≥ 0.5

Test Plots

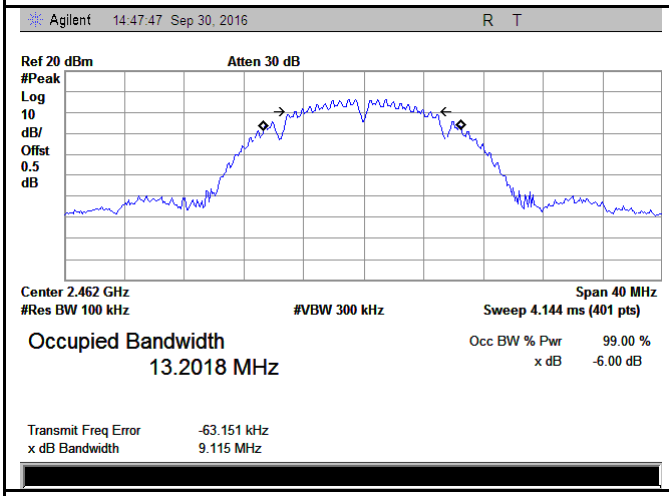
6dB Bandwidth measurement result



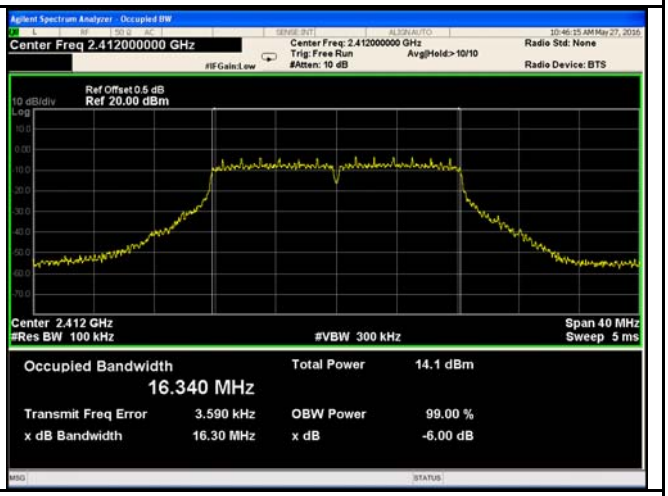
802.11b 6dB Bandwidth - Low CH 2412



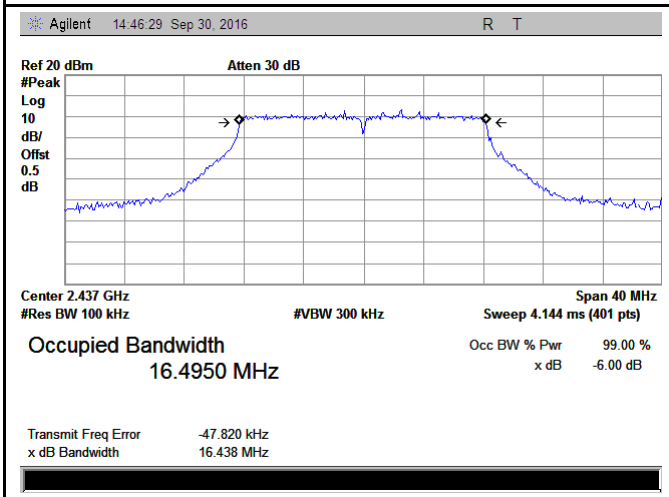
802.11b 6dB Bandwidth - Mid CH 2437



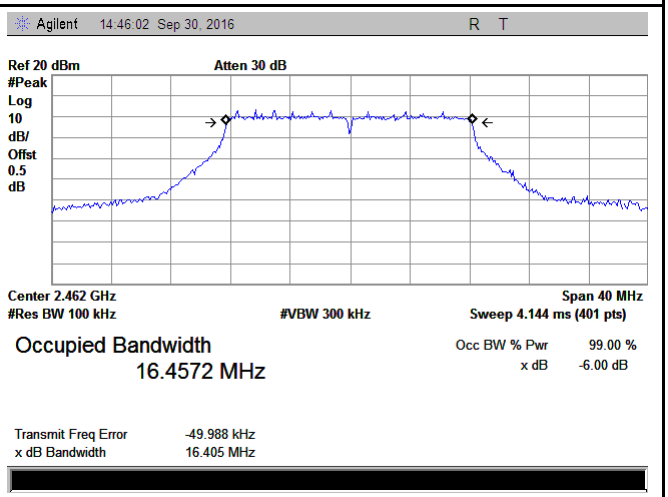
802.11b 6dB Bandwidth - High CH 2462



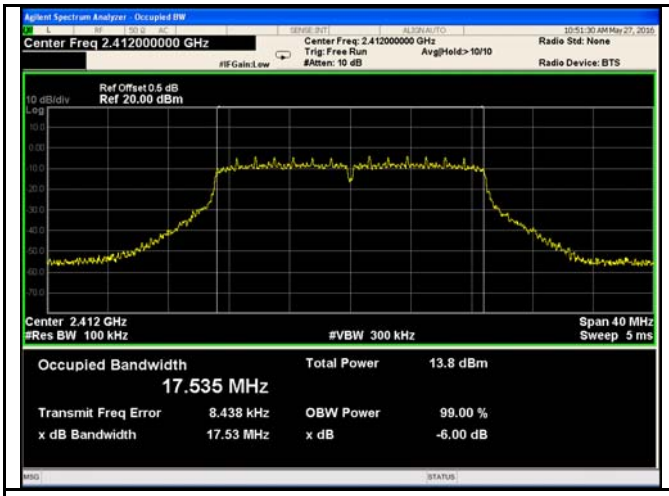
802.11g 6dB Bandwidth - Low CH 2412



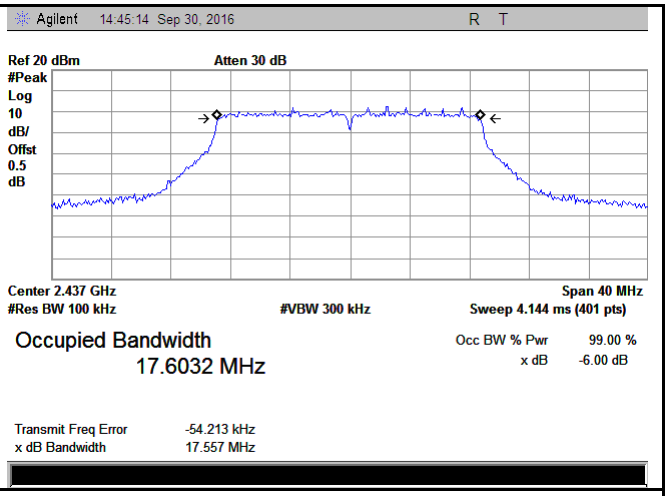
802.11g 6dB Bandwidth - Mid CH 2437



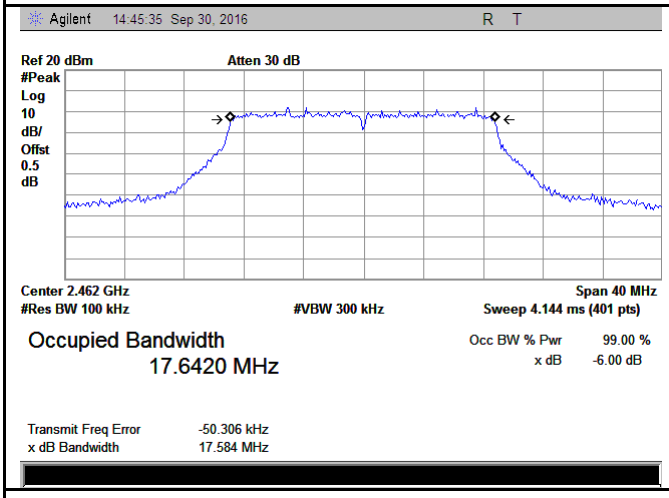
802.11g 6dB Bandwidth - High CH 2462



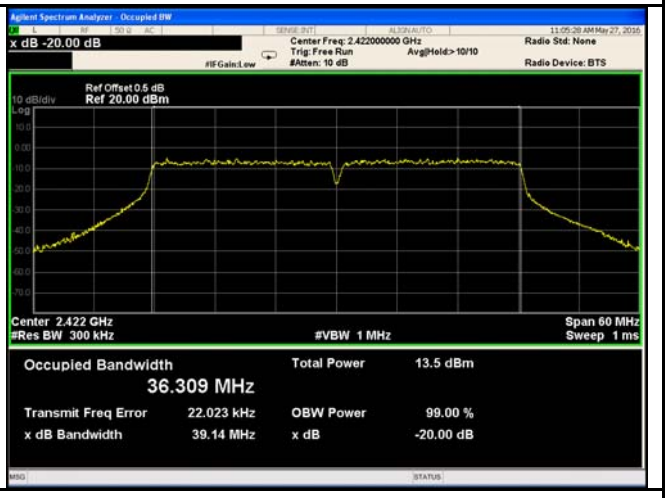
802.11n20 6dB Bandwidth - Low CH 2412



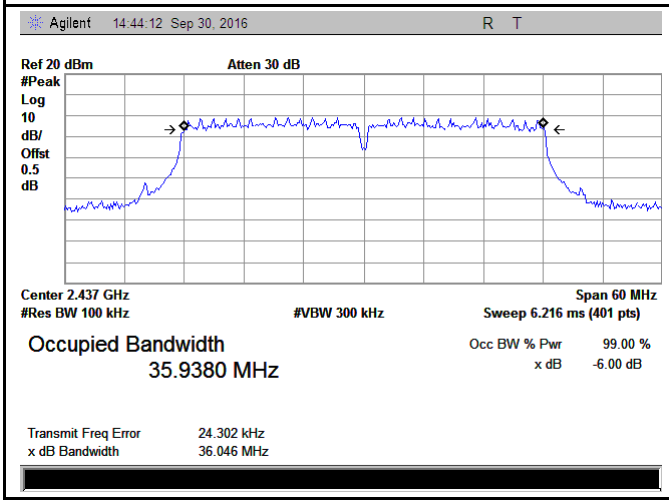
802.11n20 6dB Bandwidth - Mid CH 2437



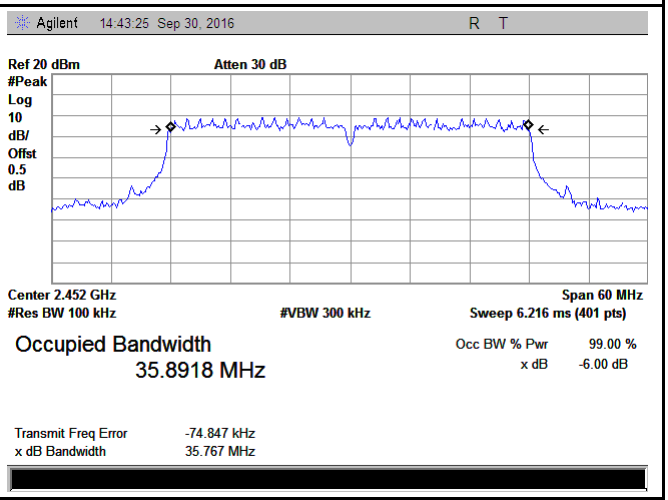
802.11n20 6dB Bandwidth - High CH 2462



802.11n40 6dB Bandwidth - Low CH 2422

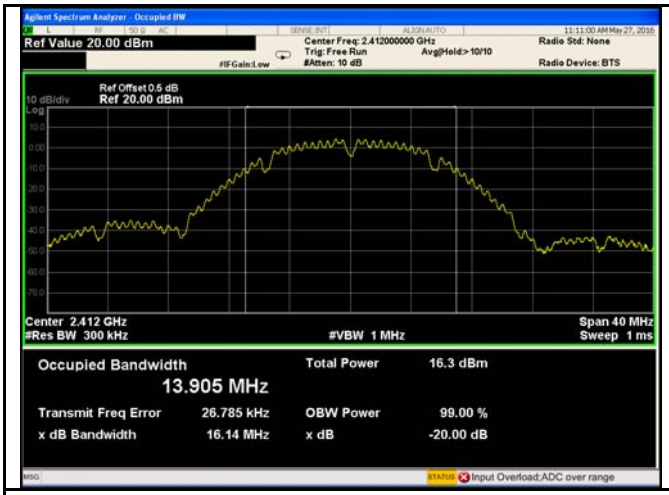


802.11n40 6dB Bandwidth - Mid CH 2437

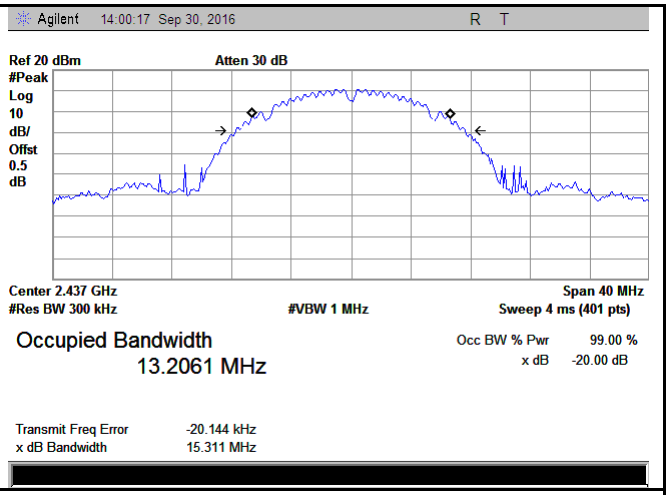


802.11n40 6dB Bandwidth - High CH 2452

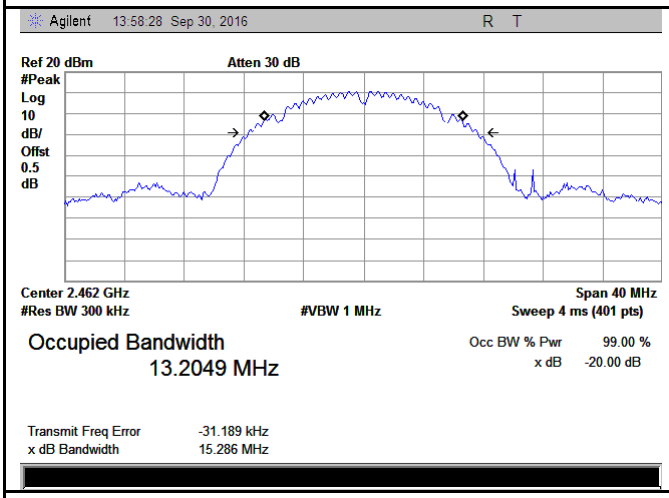
20 dB Bandwidth measurement result



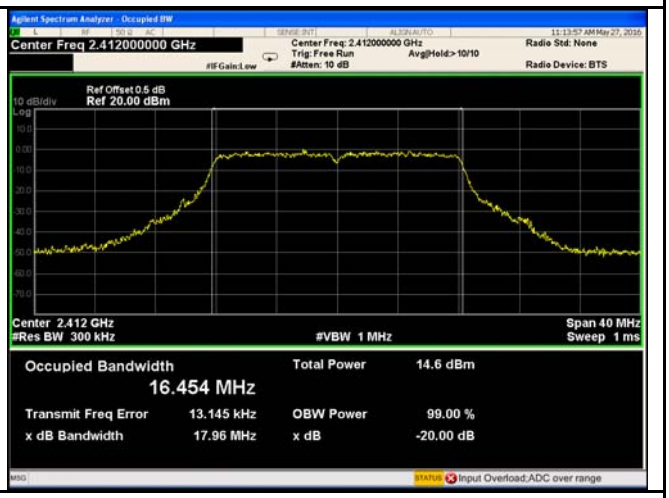
802.11b 20dB Bandwidth - Low CH 2412



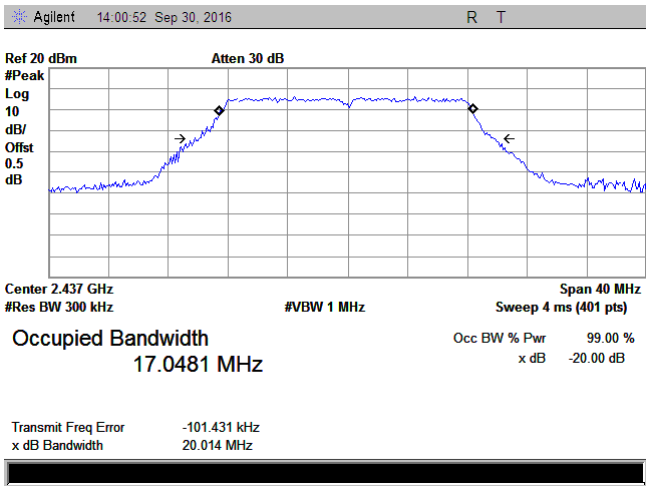
802.11b 20dB Bandwidth - Mid CH 2437



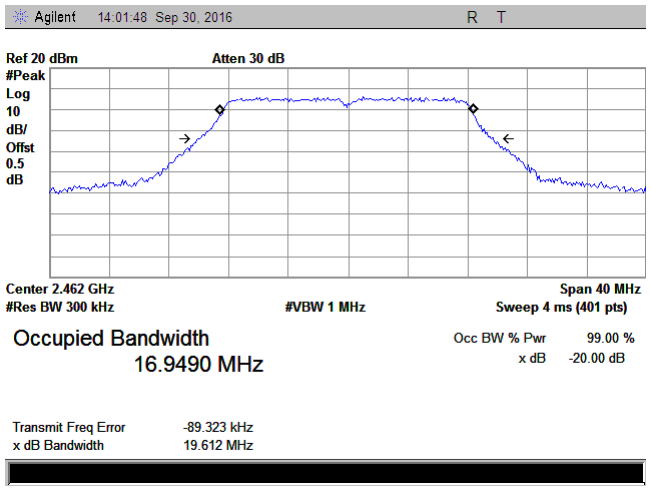
802.11b 20dB Bandwidth - High CH 2462



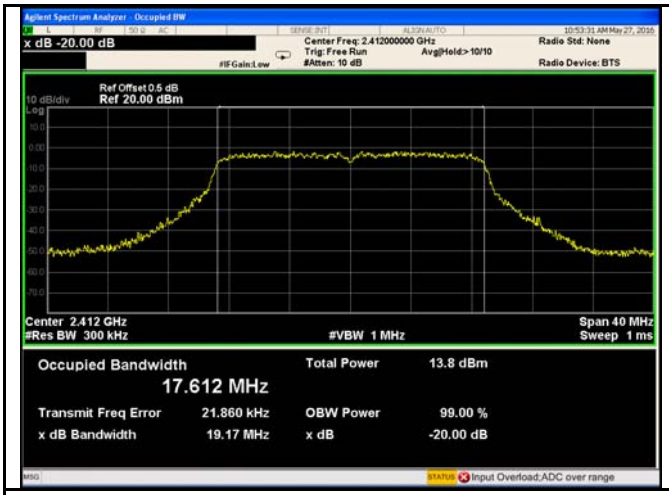
802.11g 20dB Bandwidth - Low CH 2412



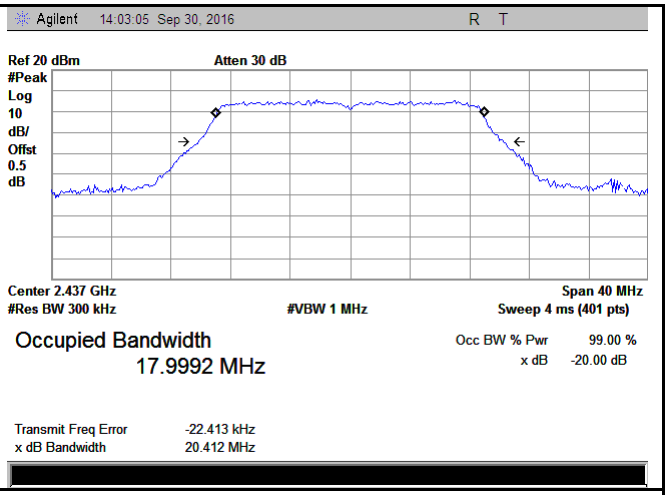
802.11g 20dB Bandwidth - Mid CH 2437



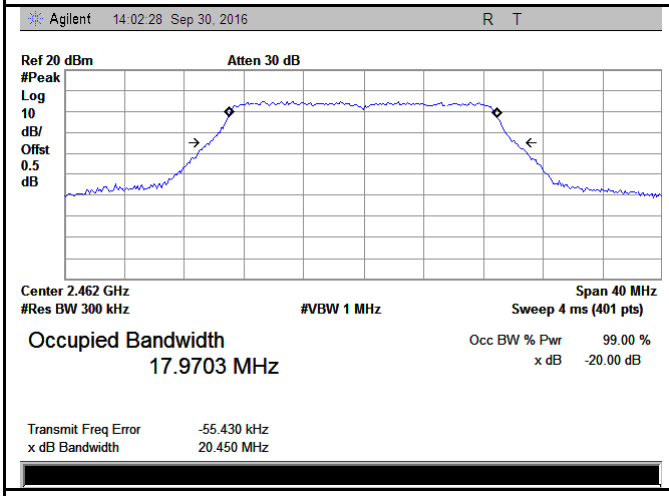
802.11g 20dB Bandwidth - High CH 2462



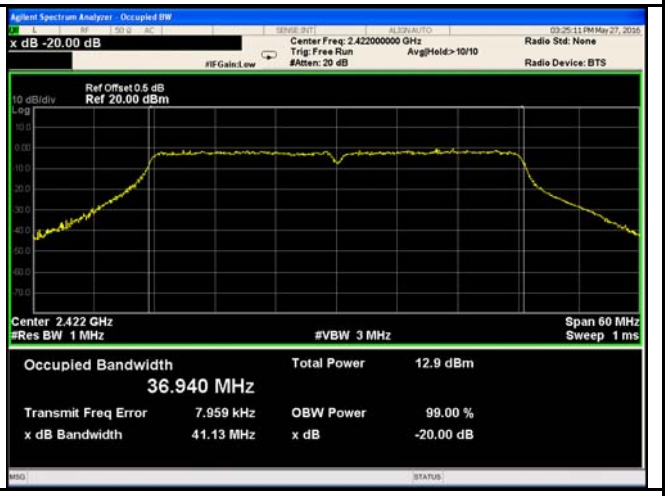
802.11n20 20dB Bandwidth - Low CH 2412



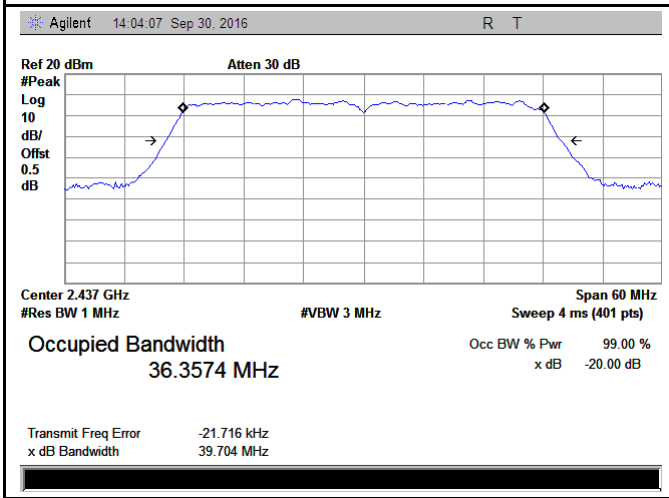
802.11n20 20dB Bandwidth - Mid CH 2437



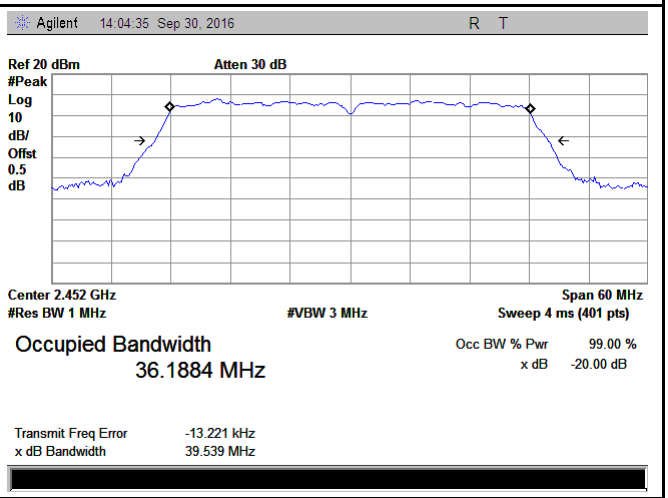
802.11n20 20dB Bandwidth - High CH 2462



802.11n40 20dB Bandwidth - Low CH 2422



802.11n40 20dB Bandwidth - Mid CH 2437

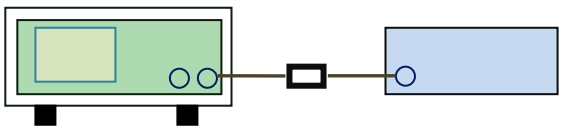


802.11n40 20dB Bandwidth - High CH 2452

6.3 Maximum Output Power

Temperature	24℃
Relative Humidity	51%
Atmospheric Pressure	1027mbar
Test date :	May 27, 2016 &September 30,2016
Tested By :	Loren Luo

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b)(3),RSS210(A8.4)	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)	DTS in 902-928MHz, 2400-2483.5MHz: ≤ 1 Watt	☑
Test Setup			
Test Procedure	558074 D01 DTS MEAS Guidance v03r03, 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

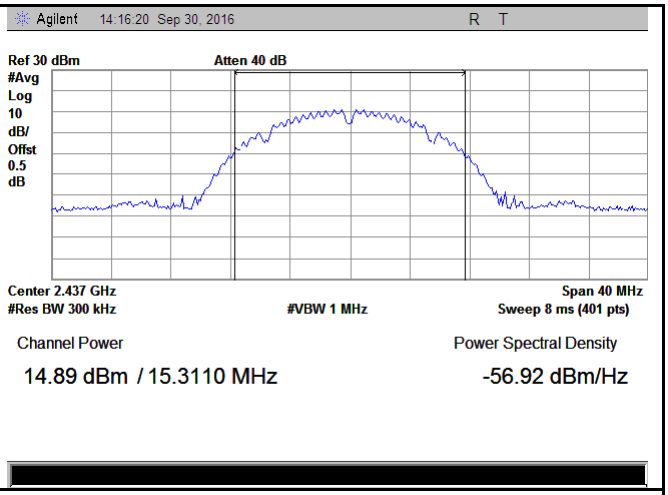
Output Power measurement result

Type	Test mode	CH	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Result
Output power	802.11b	Low	2412	14.75	30	Pass
		Mid	2436	14.89	30	Pass
		High	2462	**14.90**	30	Pass
	802.11g	Low	2412	14.72	30	Pass
		Mid	2436	**18.76**	30	Pass
		High	2462	18.70	30	Pass
	802.11n (20M)	Low	2412	13.71	30	Pass
		Mid	2436	**17.55**	30	Pass
		High	2462	16.88	30	Pass
	802.11n (40M)	Low	2422	12.97	30	Pass
		Mid	2436	16.22	30	Pass
		High	2452	**16.61**	30	Pass

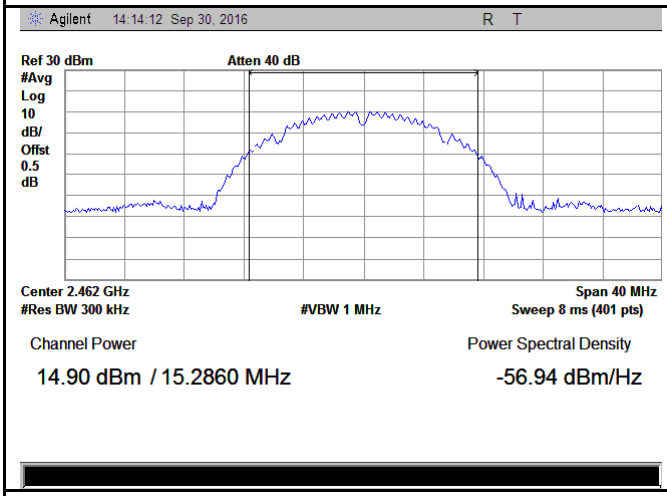
Test Plots

The Average Power

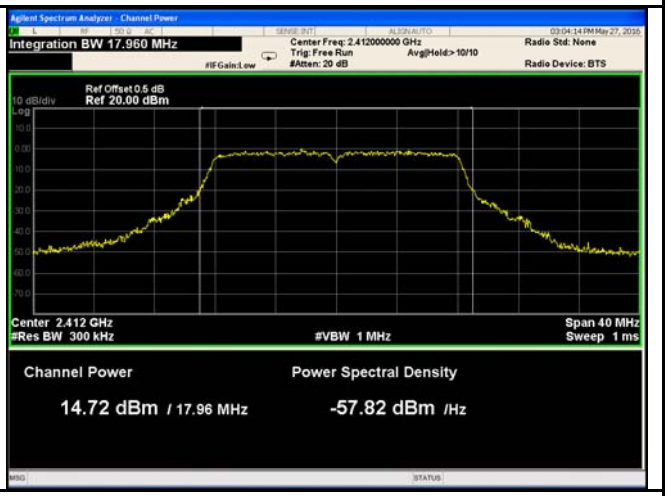
802.11b - AV Output power - Low CH 2412



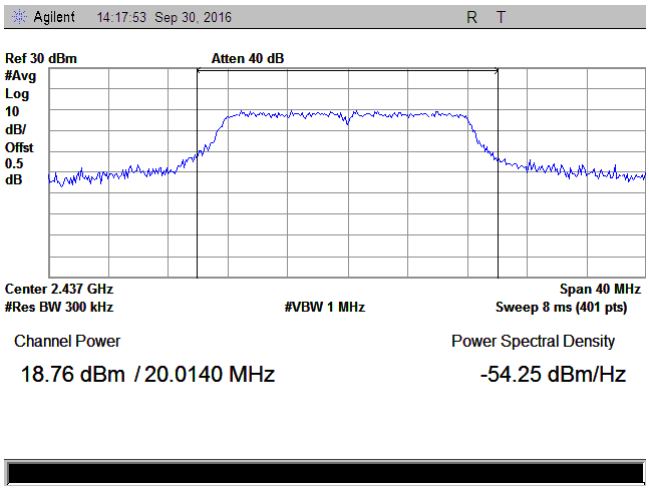
802.11b - AV Output power - Mid CH 2437



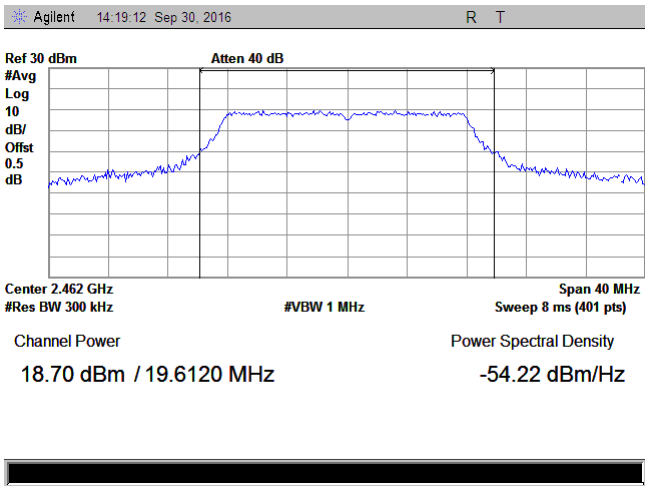
802.11b - AV Output power - High CH 2462



802.11g - AV Output power - Low CH 2412

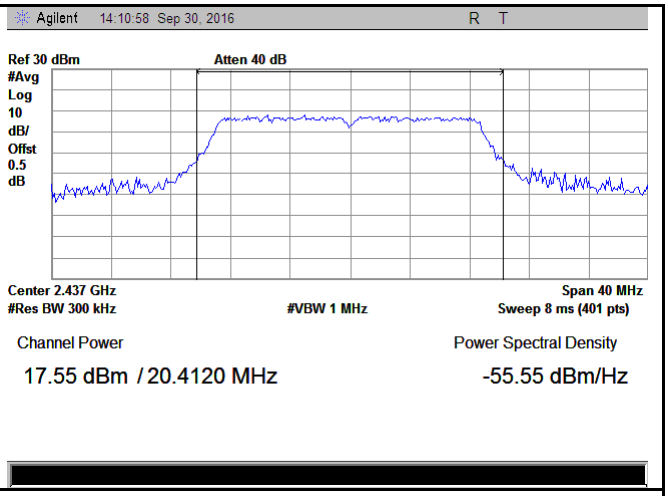


802.11g - AV Output power - Mid CH 2437

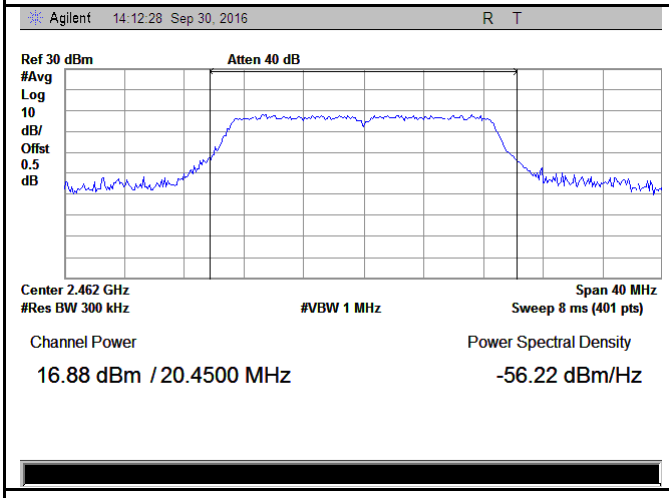


802.11g - AV Output power - High CH 2462

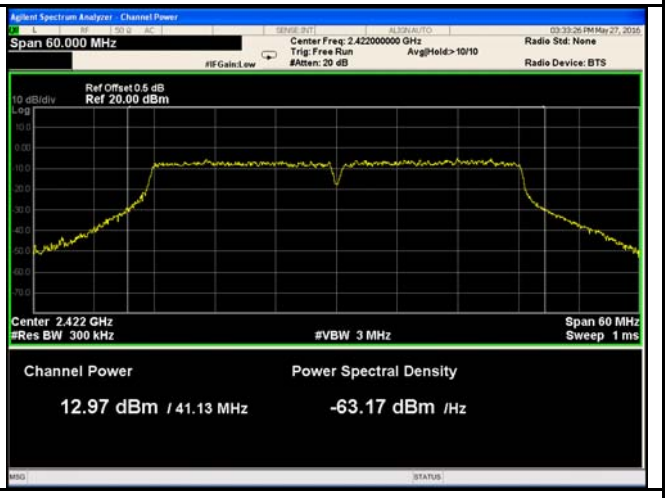
802.11n20 - AV Output power - Low CH 2412



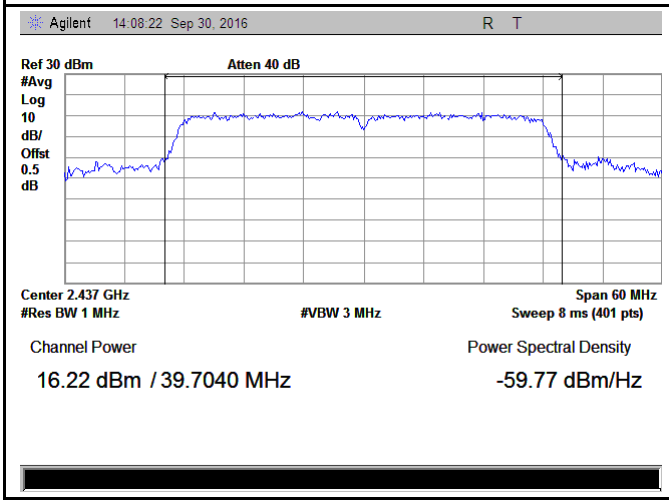
802.11n20 - AV Output power - Mid CH 2437



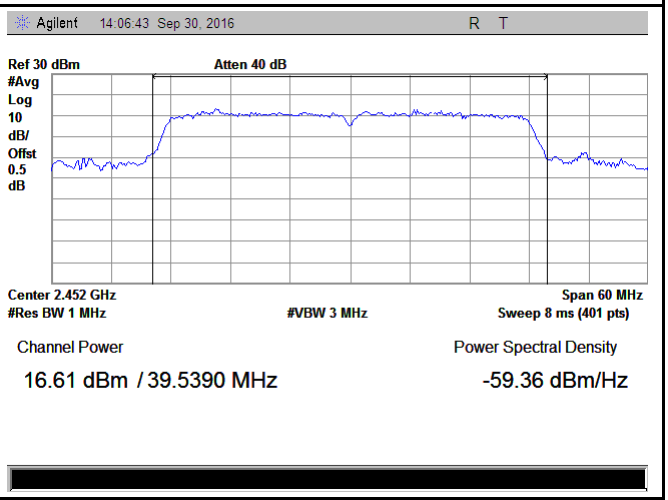
802.11n20 - AV Output power - High CH 2462



802.11n40 - AV Output power - Low CH 2422



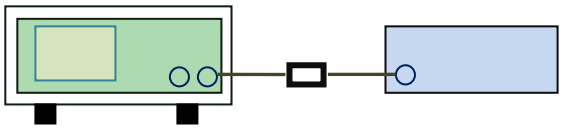
802.11n40 - AV Output power - Mid CH 2437



802.11n40 - AV Output power - High CH 2452

6.4 Power Spectral Density

Temperature	24℃
Relative Humidity	51%
Atmospheric Pressure	1027mbar
Test date :	September 30,2016
Tested By :	Loren Luo

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 v03r03, 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

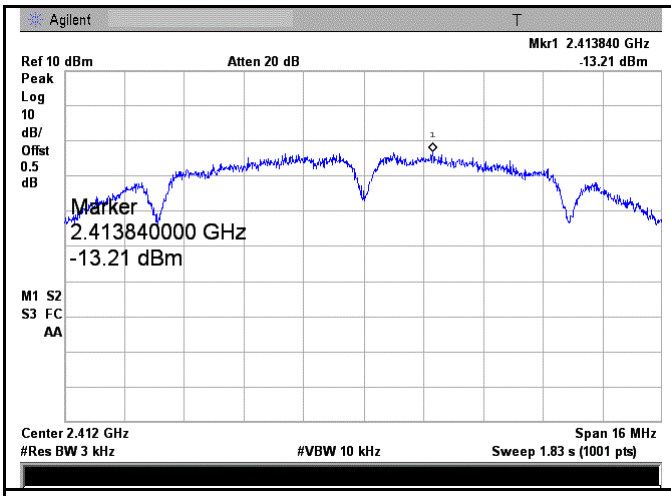
Test Plot ☑ Yes (See below) ☐ N/A

Power Spectral Density measurement result

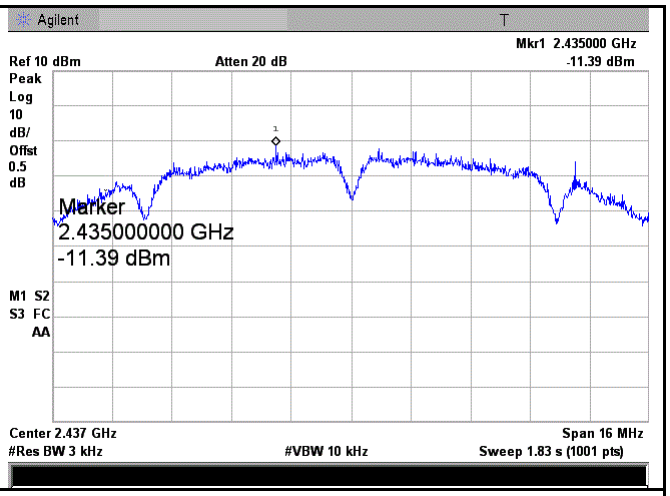
Type	Test mode	CH	Freq (MHz)	PSD (dBm)	Limit (dBm)	Result
PSD	802.11b	Low	2412	-13.21	8	Pass
		Mid	2436	-11.39	8	Pass
		High	2462	-13.48	8	Pass
	802.11g	Low	2412	-14.75	8	Pass
		Mid	2436	-14.84	8	Pass
		High	2462	-15.25	8	Pass
	802.11n (20M)	Low	2412	-15.51	8	Pass
		Mid	2436	-16.12	8	Pass
		High	2462	-13.95	8	Pass
	802.11n (40M)	Low	2422	-17.73	8	Pass
		Mid	2436	-18.13	8	Pass
		High	2452	-17.63	8	Pass

Test Plots

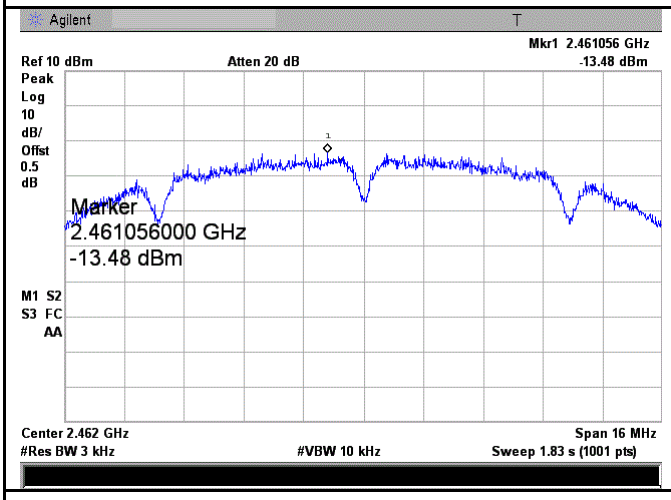
Power Spectral Density measurement result



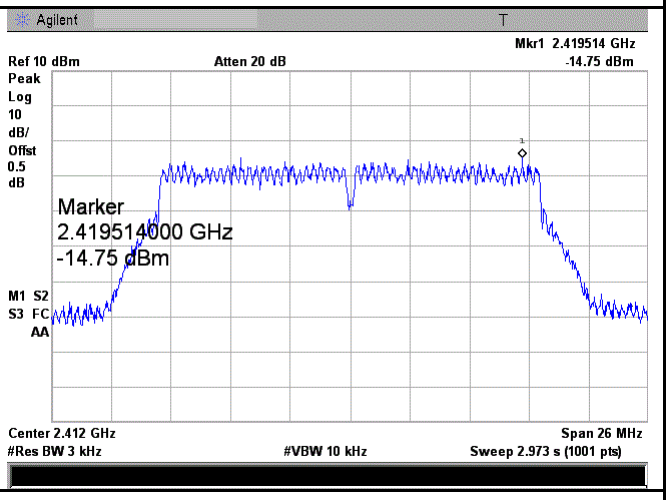
PSD - Low CH 2412 - 802.11b



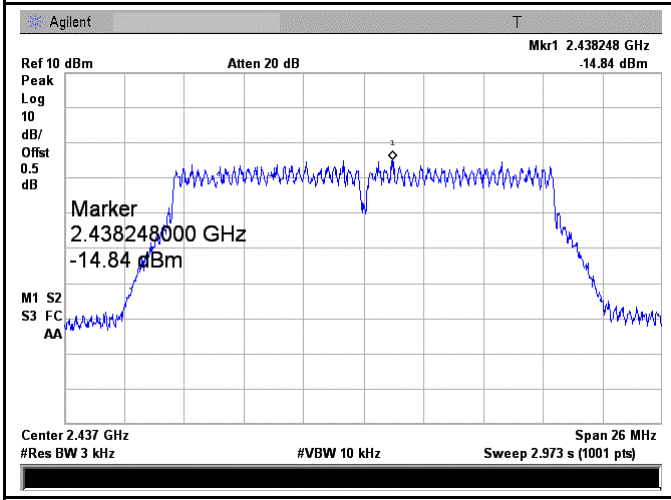
PSD - Mid CH 2437 – 802.11b



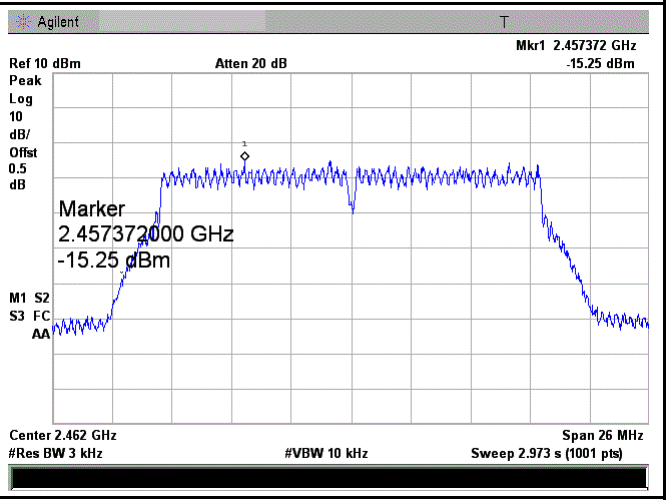
PSD - High CH 2462 - 802.11b



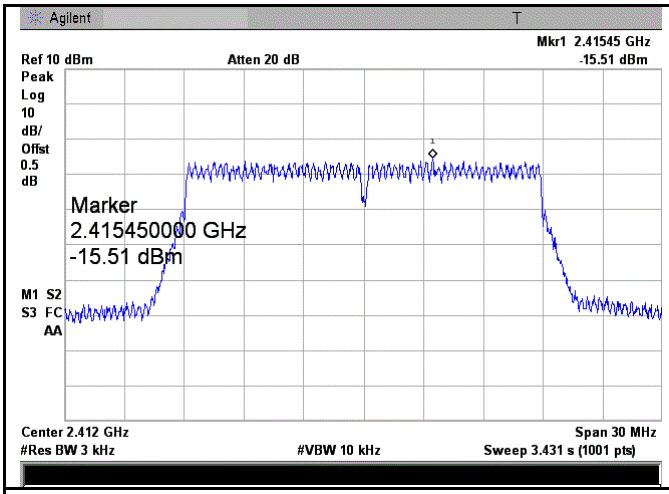
PSD - Low CH 2412 -802.11g



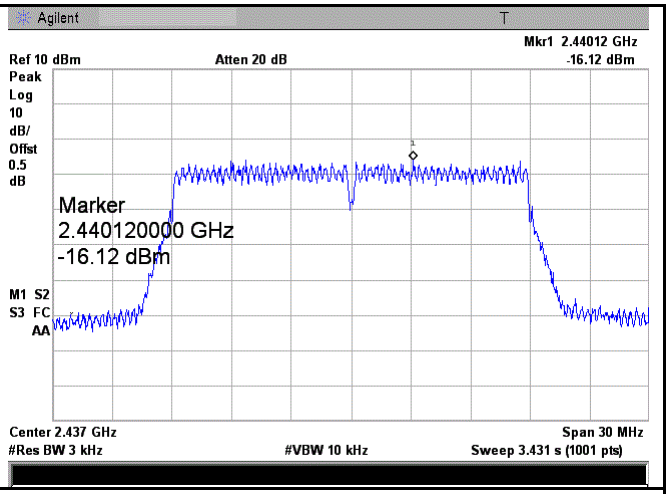
PSD - Mid CH 2437 – 802.11g



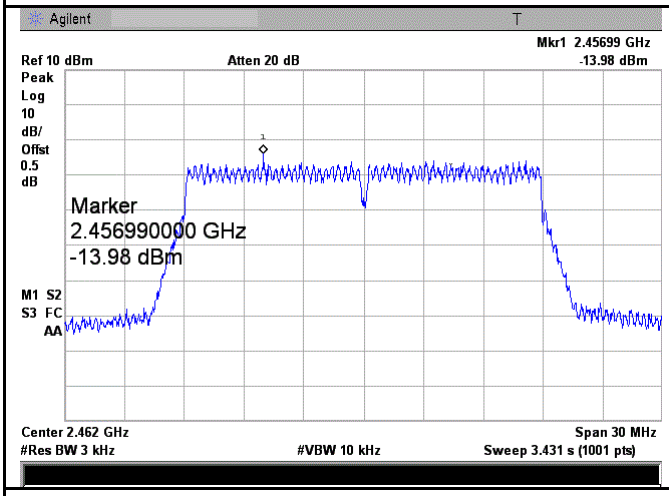
PSD - High CH 2462 - 802.11g



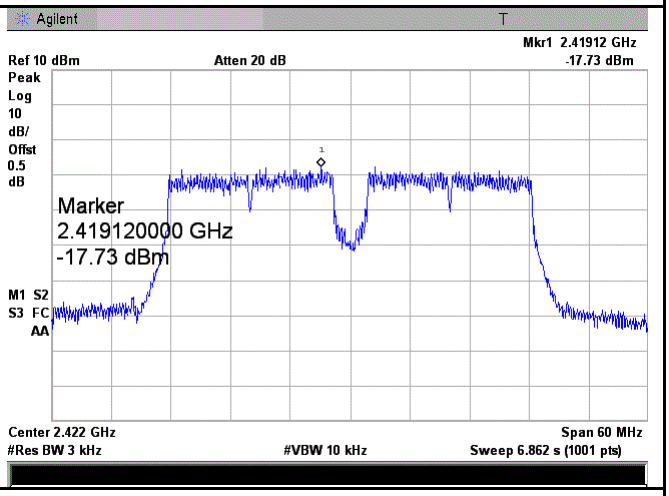
PSD - Low CH 2412 - 802.11n20



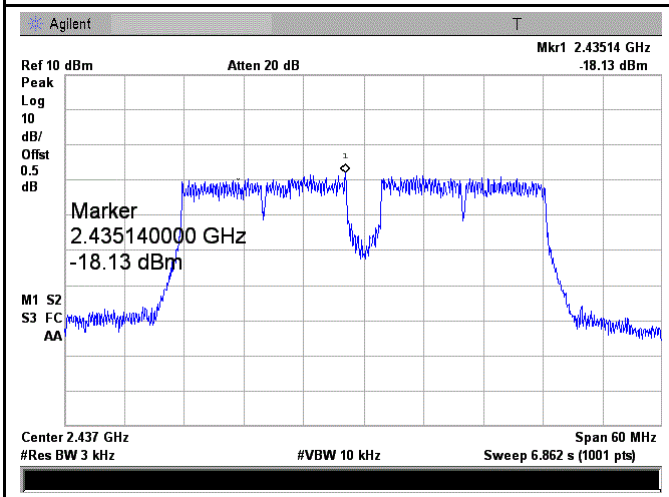
PSD - Mid CH 2437 – 802.11n20



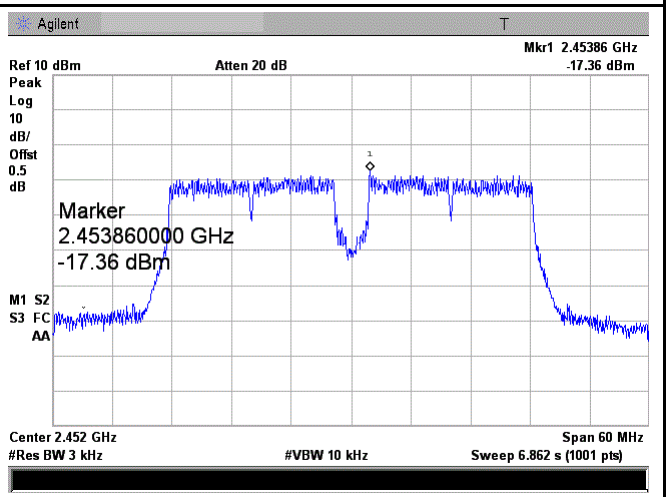
PSD - High CH 2462 - 802.11n20



PSD - Low CH 2422 - 802.11n40



PSD - Mid CH 2437 – 802.11n40

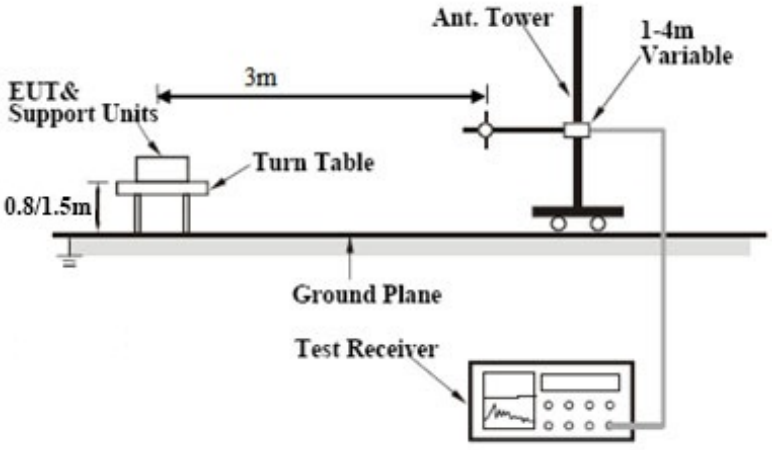


PSD - High CH 2452 - 802.11n40

6.5 Band-Edge & Unwanted Emissions into Restricted Frequency Bands

Temperature	23℃
Relative Humidity	54%
Atmospheric Pressure	1030mbar
Test date :	May 30, 2016
Tested By :	Loren Luo

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.		

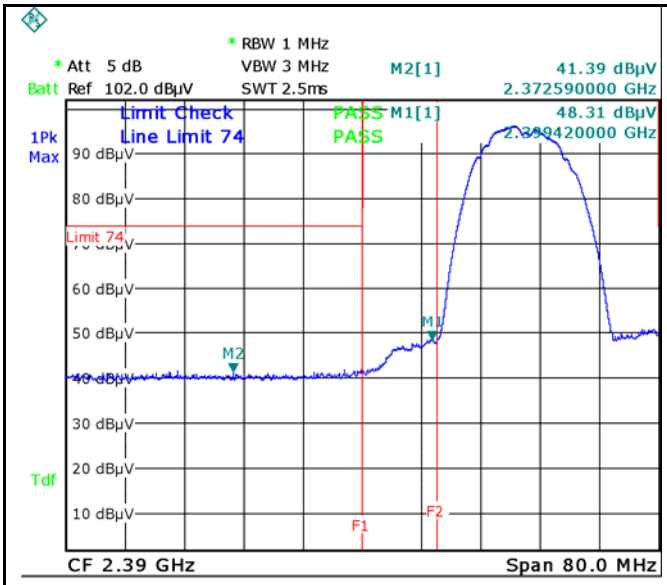
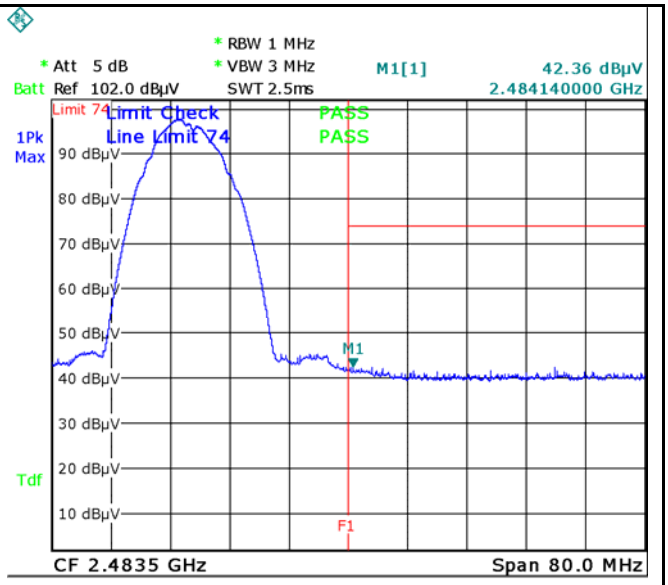
	- 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below: a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 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

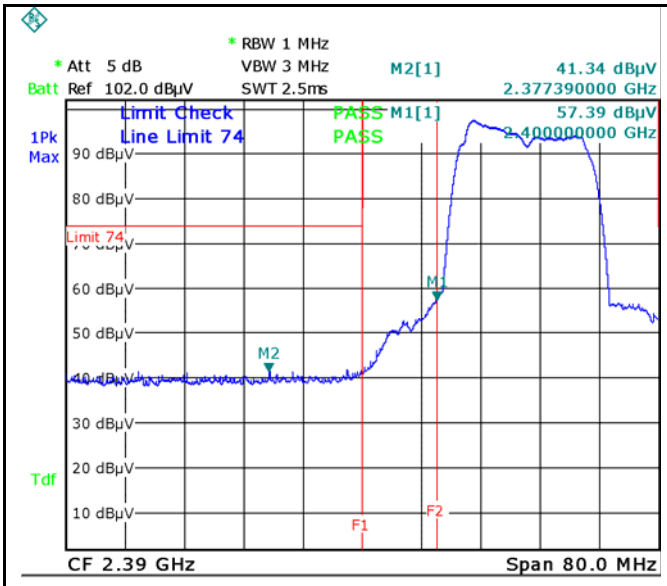
Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Plots

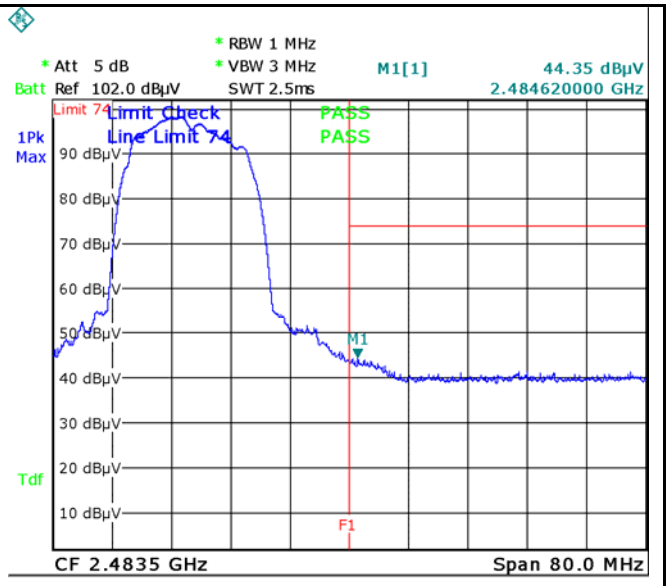
Band Edge measurement result

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



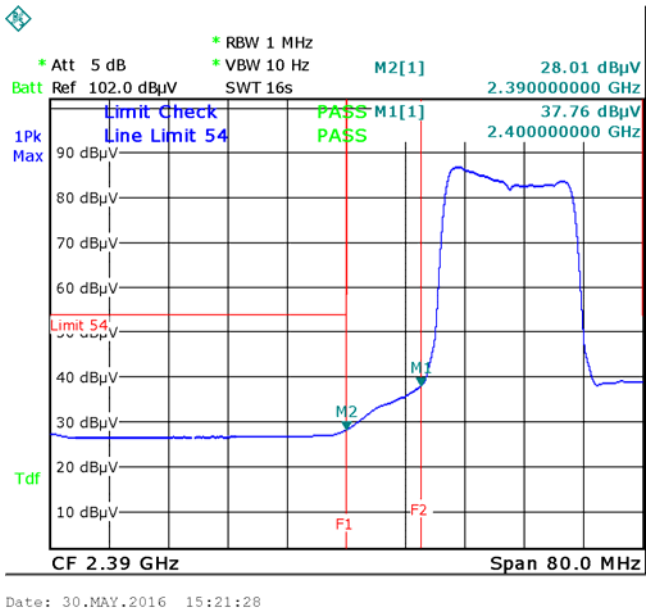
Band Edge, Left Side (Peak) - 802.11g

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



Band Edge, Right Side (Peak) - 802.11g

Note: F1 is frequency 2483.5MHz



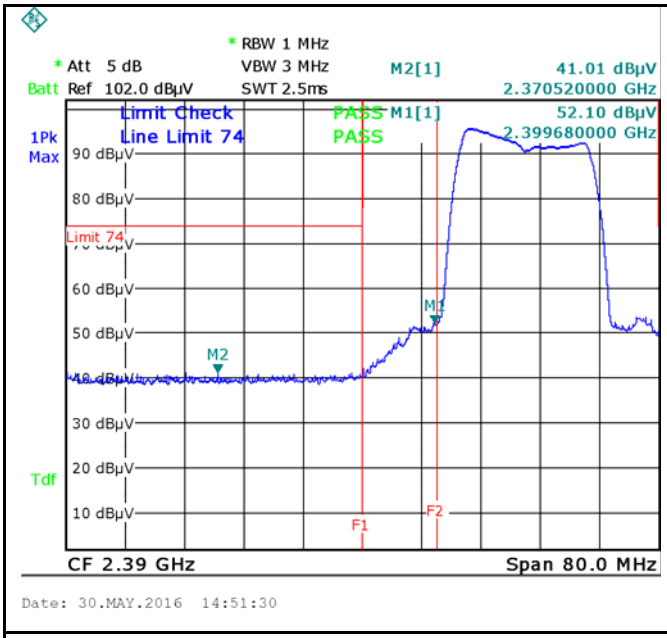
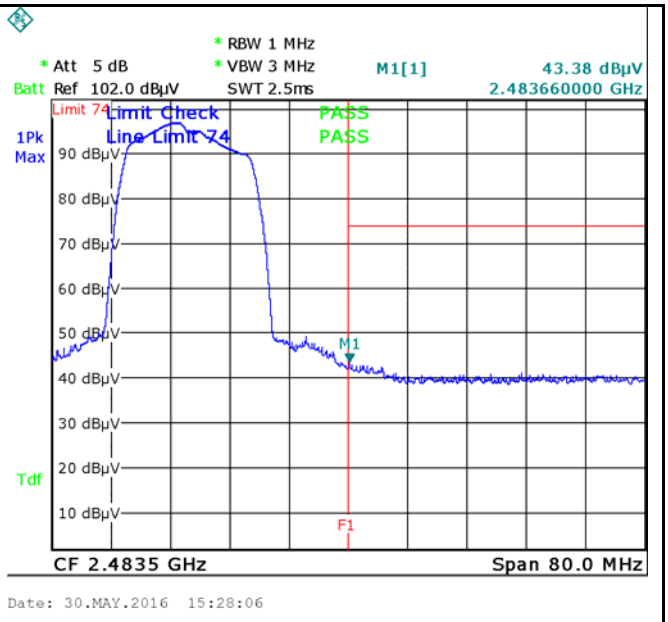
Band Edge, Left Side (Average) - 802.11g

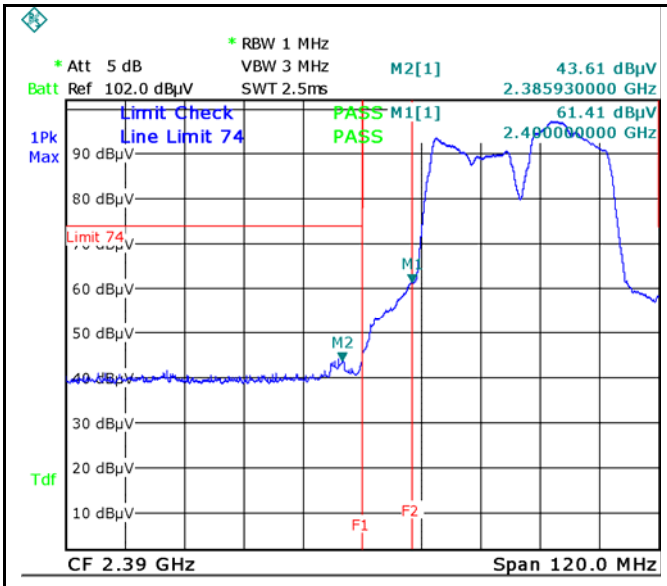
Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz

Note: (no need if PK value less than the AV limit)

Band Edge, Right Side (Average) - 802.11g

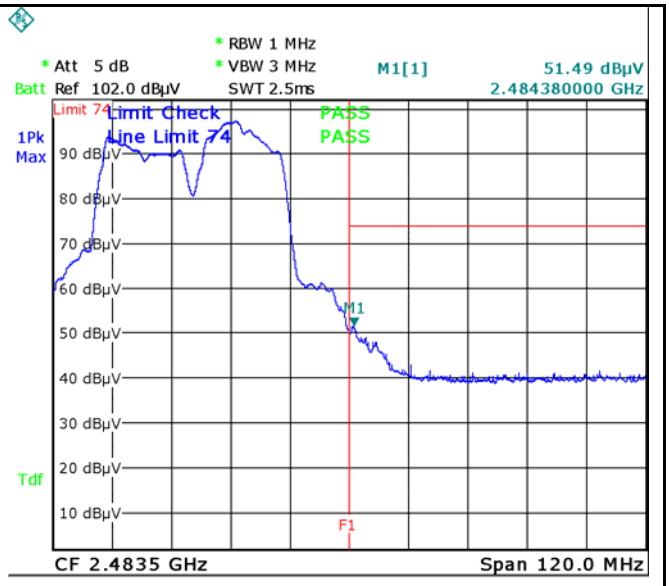
Note: F1 is frequency 2483.5MHz

	
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**
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) - 802.11n20 **Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz**	Band Edge, Right Side (Average) - 802.11n20 **Note: F1 is frequency 2483.5MHz**



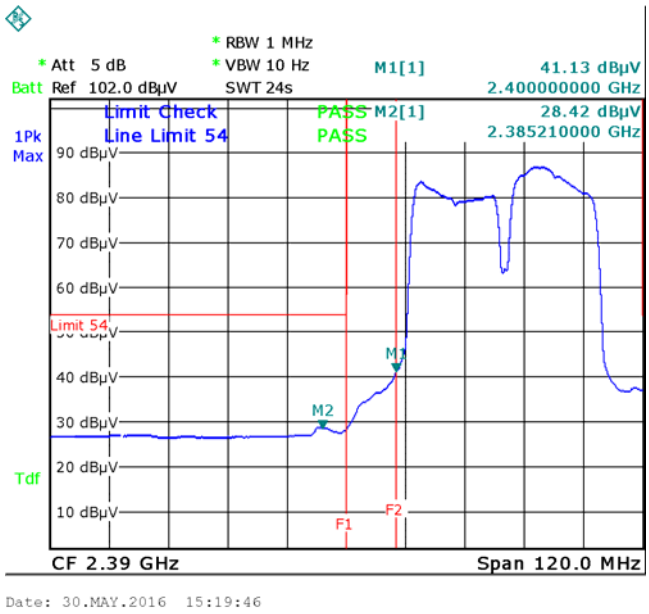
Band Edge, Left Side (Peak) - 802.11n40

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



Band Edge, Right Side (Peak) - 802.11n40

Note: F1 is frequency 2483.5MHz



Note: (no need if PK value less than the AV limit)

Band Edge, Left Side (Average) - 802.11n40

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

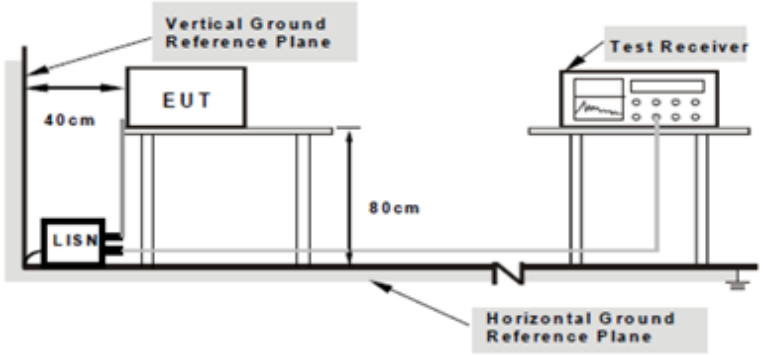
Band Edge, Right Side (Average) - 802.11n40

Note: F1 is frequency 2483.5MHz

6.6 AC Power Line Conducted Emissions

Temperature	23℃
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	----------
Tested By :	Loren Luo

Requirement(s):

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>47CFR§15.207, RSS210 (A8.1)</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 ☑ N/A

Test Data ☐ Yes ☑ N/A

Test Plot ☐ Yes (See below) ☑ N/A

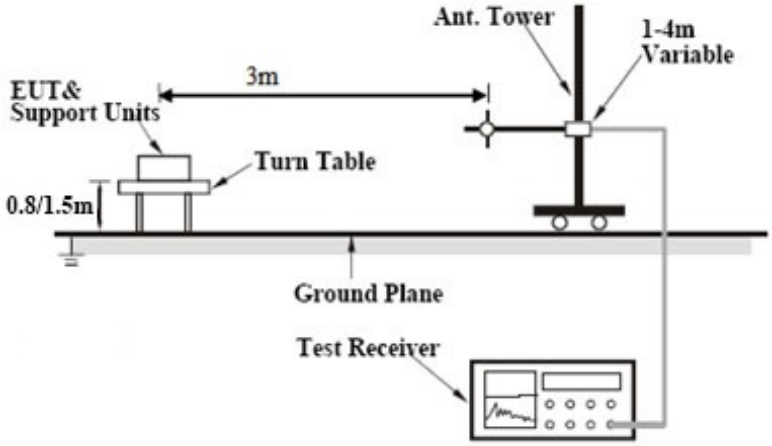
Note: The AH1801 is powered by battery, so it is no need to test against this item.

6.7 Radiated Spurious Emissions & Restricted Band

Temperature	22℃
Relative Humidity	57%
Atmospheric Pressure	1005mbar
Test date :	May 05, 2016
Tested By :	Loren Luo

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), RSS210 (A8.5)</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>

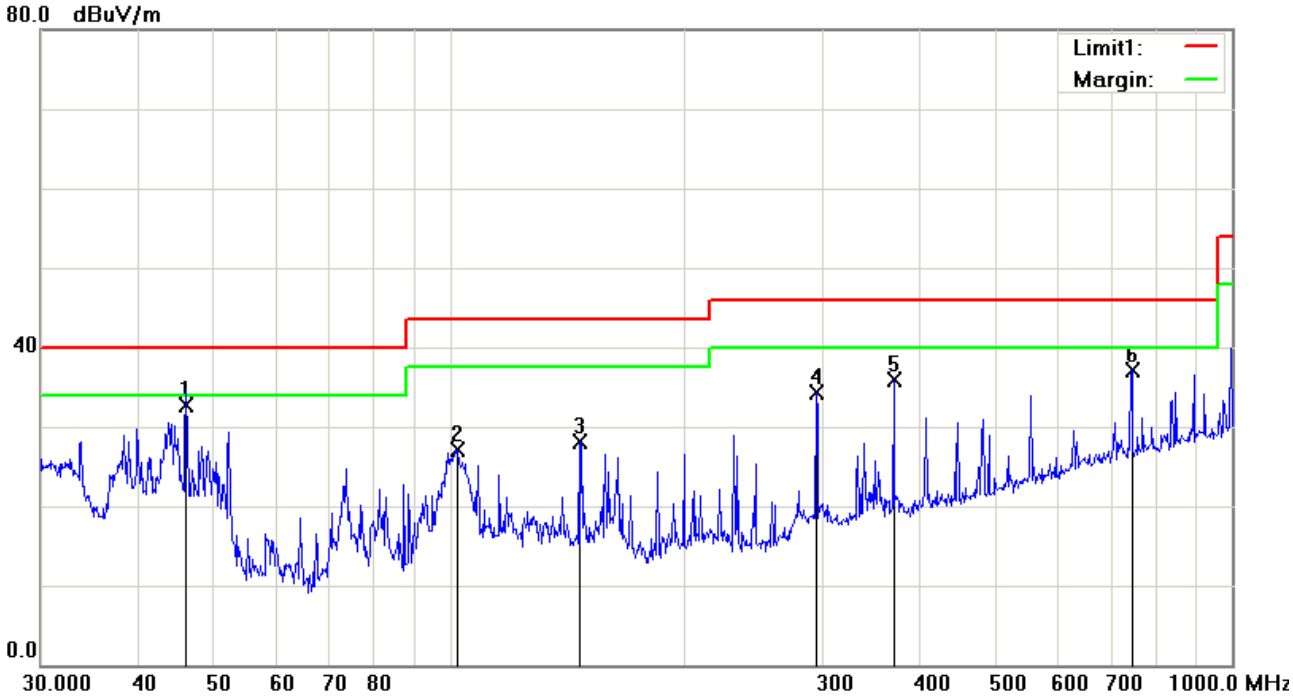
Test Setup	
Procedure	1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, 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)

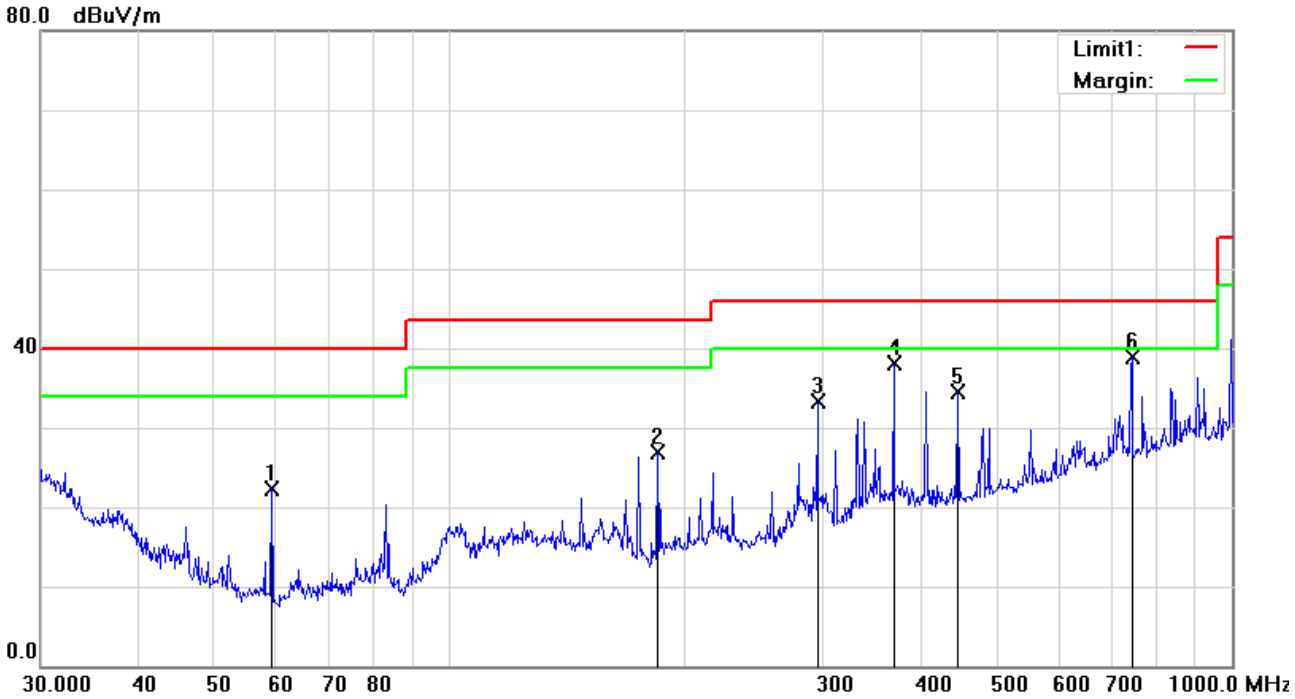


Test Data

Vertical Polarity Plot @3m

No	P/L	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Height	Degree
1	V	46.0164	44.18	QP	-11.40	32.78	40.00	-7.22	100	53
2	V	102.3597	37.41	peak	-10.38	27.03	43.50	-16.47	100	189
3	V	146.3735	36.54	peak	-8.46	28.08	43.50	-15.42	100	124
4	V	294.1137	41.53	peak	-7.17	34.36	46.00	-11.64	100	271
5	V	369.4047	40.96	peak	-5.01	35.95	46.00	-10.05	100	130
6	V	744.8661	34.87	peak	2.31	37.18	46.00	-8.82	100	295

(Below 1GHz)



Test Data

Horizontal Polarity Plot @3m

No	P/L	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Height	Degree
1	H	59.2325	36.54	peak	-14.28	22.26	40.00	-17.74	100	86
2	H	184.4898	36.54	peak	-9.59	26.95	43.50	-16.55	100	80
3	H	295.1469	40.44	peak	-7.12	33.32	46.00	-12.68	100	257
4	H	369.4047	43.13	peak	-5.01	38.12	46.00	-7.88	100	159
5	H	446.4141	37.61	peak	-3.17	34.44	46.00	-11.56	100	341
6	H	744.8661	36.64	peak	2.31	38.95	46.00	-7.05	100	123

Above 1GHz

Test Mode:	Transmitting Mode

Low Channel (2412 MHz)(b mode worst case)

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	39.43	AV	V	33.8	6.86	32.69	47.4	54	-6.6
4824	39.17	AV	H	33.8	6.86	32.69	47.14	54	-6.86
4824	47.51	PK	V	33.8	6.86	32.69	55.48	74	-18.52
4824	47.18	PK	H	33.8	6.86	32.69	55.15	74	-18.85
17907	23.95	AV	V	45.12	11.57	32.11	48.53	54	-5.47
17907	23.57	AV	H	45.12	11.57	32.11	48.15	54	-5.85
17907	39.81	PK	V	45.12	11.57	32.11	64.39	74	-9.61
17907	40.15	PK	H	45.12	11.57	32.11	64.73	74	-9.27

Middle Channel (2437 MHz) (g mode worst case)

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	39.55	AV	V	33.6	6.82	32.71	47.26	54	-6.74
4874	39.21	AV	H	33.6	6.82	32.71	46.92	54	-7.08
4874	47.46	PK	V	33.6	6.82	32.71	55.17	74	-18.83
4874	47.35	PK	H	33.6	6.82	32.71	55.06	74	-18.94
17915	24.18	AV	V	45.17	11.63	32.18	48.8	54	-5.2
17915	23.94	AV	H	45.17	11.63	32.18	48.56	54	-5.44
17915	40.23	PK	V	45.17	11.63	32.18	64.85	74	-9.15
17915	40.51	PK	H	45.17	11.63	32.18	65.13	74	-8.87

High Channel (2462 MHz) (g mode worst case)

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	39.52	AV	V	33.83	6.95	32.79	47.51	54	-6.49
4924	39.38	AV	H	33.83	6.95	32.79	47.37	54	-6.63
4924	47.23	PK	V	33.83	6.95	32.79	55.22	74	-18.78
4924	47.51	PK	H	33.83	6.95	32.79	55.5	74	-18.5
17905	24.15	AV	V	45.19	11.61	32.24	48.71	54	-5.29
17905	23.88	AV	H	45.19	11.61	32.24	48.44	54	-5.56
17905	40.23	PK	V	45.19	11.61	32.24	64.79	74	-9.21
17905	40.17	PK	H	45.19	11.61	32.24	64.73	74	-9.27

Note:

*1, The testing has been conformed to 10*2462MHz=24,620MHz*
2, All other emissions more than 30 dB below the limit
3, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.

Annex A. TEST INSTRUMENT

#1

Instrument	Model	Serial #	Cal Date	Cal Due	In use
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/17/2015	09/16/2016	☑
Power Splitter	1#	1#	09/01/2015	08/31/2016	☑
DC Power Supply	E3640A	MY40004013	09/17/2015	09/16/2016	☑
Radiated Emissions					
EMI test receiver	ESL6	100262	09/17/2015	09/16/2016	☑
Positioning Controller	UC3000	MF780208282	11/19/2015	11/18/2016	☑
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/01/2015	08/31/2016	☑
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/24/2016	03/23/2017	☑
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/21/2015	09/20/2016	☑
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/24/2015	09/23/2016	☑
Universal Radio Communication Tester	CMU200	121393	09/25/2015	09/24/2016	☑

#2

Instrument	Model	Serial #	Cal Date	Cal Due	In use
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/16/2016	09/15/2017	☑
Power Splitter	1#	1#	08/31/2015	08/30/2017	☑
DC Power Supply	E3640A	MY40004013	09/16/2015	09/15/2017	☑

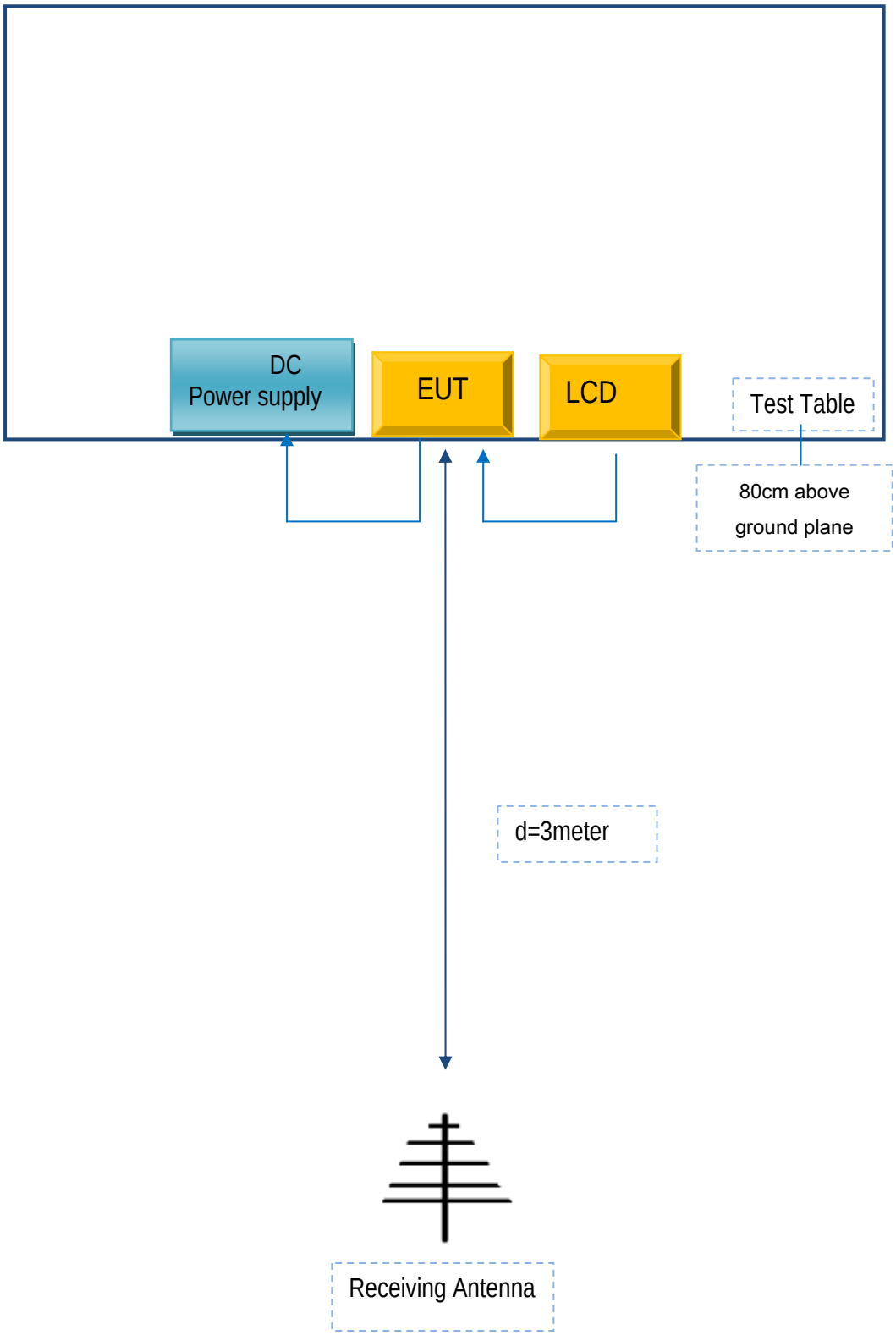
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

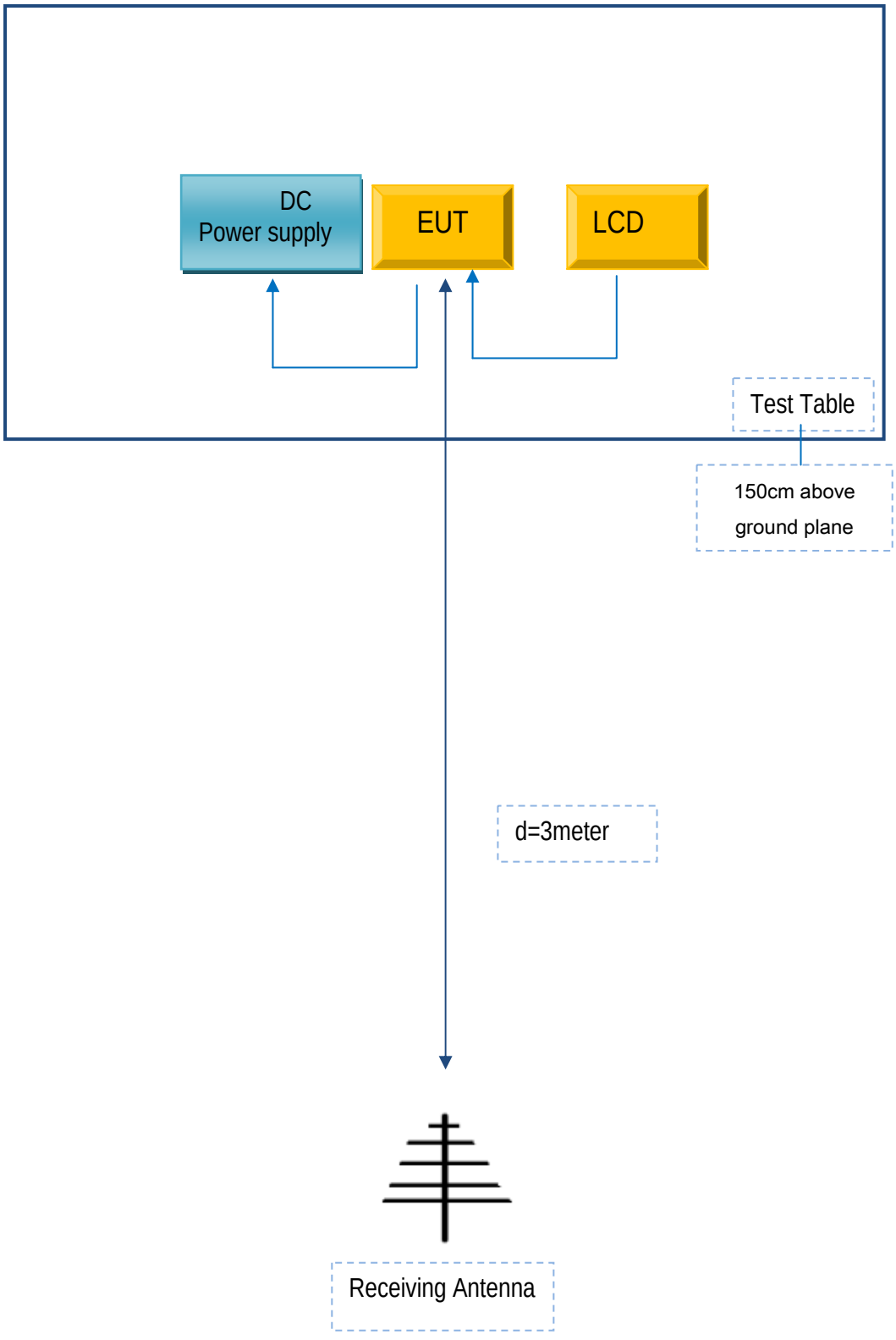
Block Configuration Diagram for AC Line Conducted Emissions

N/A

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



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



Annex C. il. SUPPORTING EQUIPMENT DESCRIPTION

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

Supporting Equipment:

Manufacturer	Equipment Description	Model	Serial No
ALPINE Electronics INC	LCD	39710-TVAF-A21	S-IW-2015222
Agilent	System Power Supply	6032A	MY41000896

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

See attachment

Annex E. DECLARATION OF SIMILARITY

N/A