RF TEST REPORT

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Report No.: 15020044-FCC-R1
Supersede Report No.: N/A

Applicant	Shanghai MXCHIP Information Technology Co., Ltd
Product Name	Embedded WiFi module
Main Model	EMW3165
Test Standard	FCC Part 15.247: 2014, ANSI C63.10: 2009
Test Date	January 26 to February 27, 2015
Issue Date	February 28, 2015
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Herith shi	Alex. Liu	
Herith Shi Test Engineer	Alex Liu Checked By	

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

Issued by:
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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
15020044-FCC-R1	NONE	Original	February 28, 2015

2. Customer information

Applicant Name	Shanghai MXCHIP Information Technology Co., Ltd
Applicant Add	Room 811, Tongpu Building, No.1220, Tongpu Road, Shanghai, China
Manufacturer	Shanghai MXCHIP Information Technology Co., Ltd
Manufacturer Add	Room 811, Tongpu Building, No.1220, Tongpu Road, Shanghai, China

3. Test site information

Lab performing tests	SIEMIC (Nanjing-China) Laboratories
Lab Address	2-1 Longcang Avenue Yuhua Economic and Technology Development Park, Nanjing, China
FCC Test Site No.	986914
IC Test Site No.	4842B-1
Test Software	Labview of SIEMIC version 1.0

4. Equipment under Test (EUT) Information

Description of EUT:	Embedded WiFi module
Main Model:	EMW3165
Serial Model:	EMW3165-P, EMW3165-E
Date EUT received:	January 19, 2015
Test Date(s):	January 26 to February 27, 2015
Conducted AV Power (dBm)	802.11b:14.30dBm 802.11g:13.50 dBm 802.11n20M:13.56 dBm
Antenna Gain:	PCB Antenna EMW3165-P: 2 dBi External Antenna EMW3165-E: 2 dBi
Type of Modulation:	802.11b/g/n: DSSS/OFDM
RF Operating Frequency (ies):	802.11b/g/n(20M): 2412-2462 MHz(TX/RX)
Number of Channels:	802.11b/g/n(20M): 11CH
Port:	N/A
Input Power:	3.0V~3.6V
Trade Name :	MXCHIP
FCC ID:	P53-EMW3165

Note: the difference between the models please refer to Annex E. DECLARATION OF SIMILARITY.

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
§ 15.247 (i), §2.1091	RF Exposure	Compliance
§ 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
Radiated 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)	3.952dB

6. Measurements, Examination And Derived Results

6.1 RF Exposure

The EUT is a mobile device, thus requires please refer to RF Evaluation Report: 15020044-FCC-H.

6.2 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.

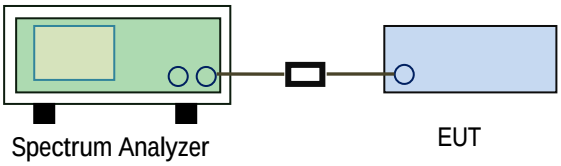
Antenna Connector Construction

The EUT Gain is 2 dBi, which in accordance to section 15.203, please refer to the internal photos.

Result: Compliance.

6.3 DTS (6 dB&20 dB) Channel Bandwidth

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	January 28, 2015
Tested By :	Herith Shi

Spec	Item	Requirement	Applicable
§ 15.247(a)(2) RSSGen (4.6.1)	a)	6dB BW≥500kHz;	☑
	b)	20dB BW: For FCC reference only; required by IC.	☑
Test Setup			
Test Procedure	558074 D01 DTS Meas Guidance v03r02, 8.1 DTS bandwidth 6dB Emission bandwidth measurement procedure - Set RBW = 100 kHz. - Set the video bandwidth (VBW) ≥ 3 x RBW. - Detector = Peak. - Trace mode = max hold. - Sweep = auto couple. - Allow the trace to stabilize. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. - 20dB bandwidth C63.10 Occupied Bandwidth (OBW=20dB bandwidth) - Set RBW = 1%-5% OBW. - Set the video bandwidth (VBW) ≥ 3 x RBW. - Set the span range between 2 times and 5 times of the OBW. - Sweep time=Auto, Detector=PK, Trace=Max hold. - Once reference level is established, the equipment is conditioned with typical modulating signal 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 level with respect to the reference level.		
Remark			
Result	☑ Pass ☐ Fail		
Test Data	☑ Yes ☐ N/A		
Test Plot	☑ Yes (See below) ☐ N/A		

6dB Bandwidth measurement result

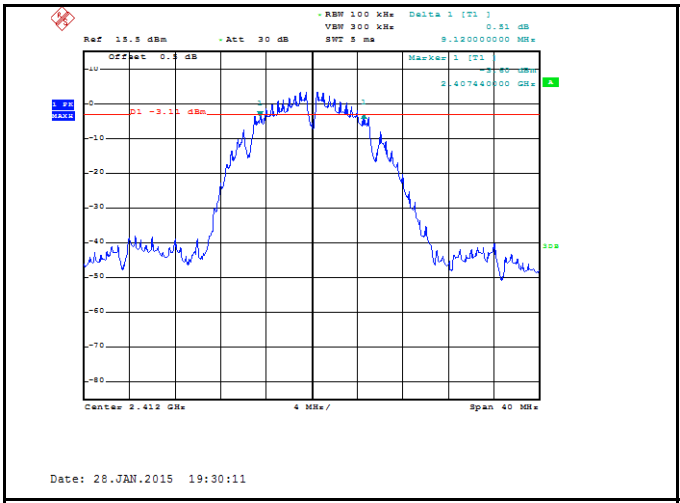
Type	Test mode	CH	Freq (MHz)	Result (MHz)	Limit (MHz)	Result
6dB BW	802.11b	Low	2412	9.12	≥0.5	Pass
		Mid	2437	9.04	≥0.5	Pass
		High	2462	9.04	≥0.5	Pass
	802.11g	Low	2412	15.20	≥0.5	Pass
		Mid	2437	15.20	≥0.5	Pass
		High	2462	15.44	≥0.5	Pass
	802.11n(20M)	Low	2412	16.16	≥0.5	Pass
		Mid	2437	16.16	≥0.5	Pass
		High	2462	16.16	≥0.5	Pass

20 dB Bandwidth measurement result

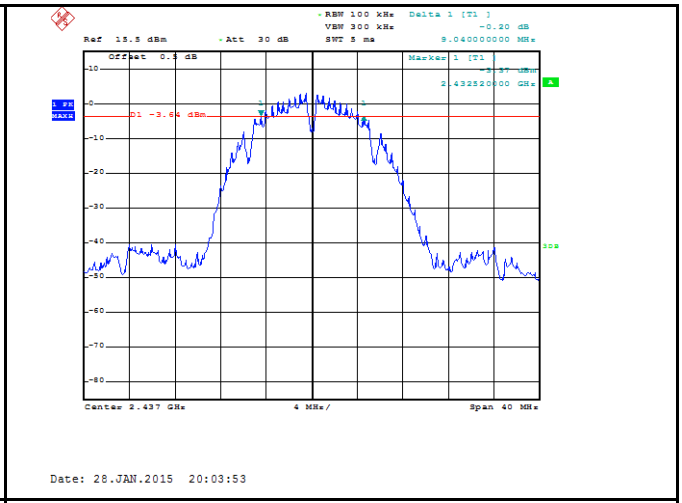
Type	Test mode	CH	Freq (MHz)	Result (MHz)	Limit (MHz)	Result
20dB BW	802.11b	Low	2412	14.32	≥0.5	Pass
		Mid	2437	14.32	≥0.5	Pass
		High	2462	14.32	≥0.5	Pass
	802.11g	Low	2412	18.00	≥0.5	Pass
		Mid	2437	18.16	≥0.5	Pass
		High	2462	18.00	≥0.5	Pass
	802.11n(20M)	Low	2412	18.56	≥0.5	Pass
		Mid	2437	18.64	≥0.5	Pass
		High	2462	18.64	≥0.5	Pass

Test Plots

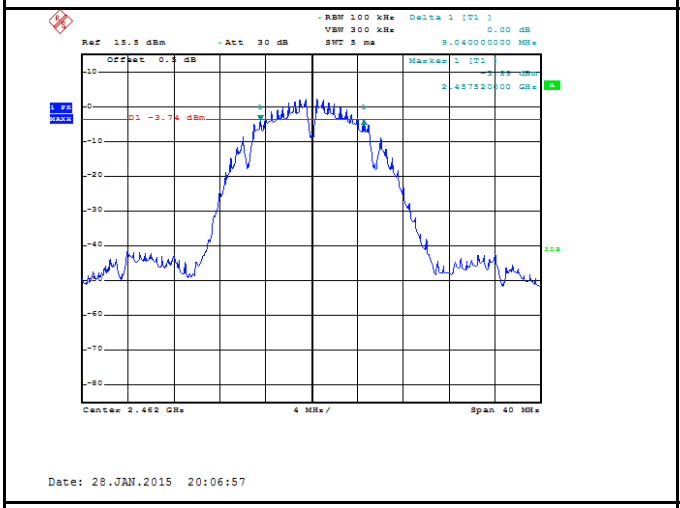
6dB Bandwidth measurement result



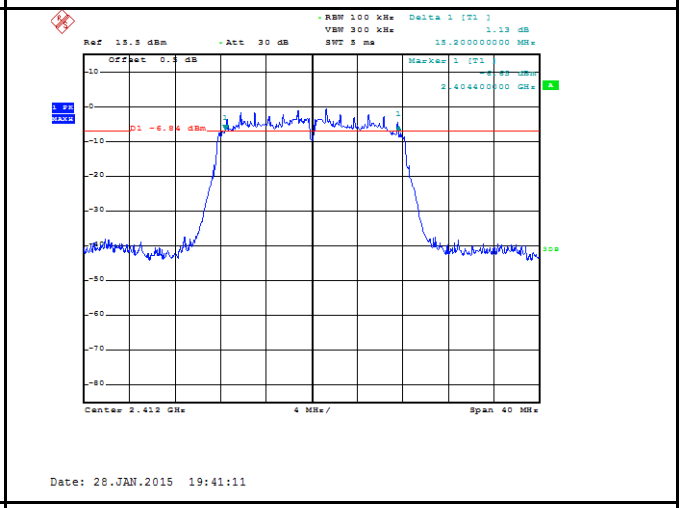
6dB Bandwidth - Low CH 2412 - 802.11b



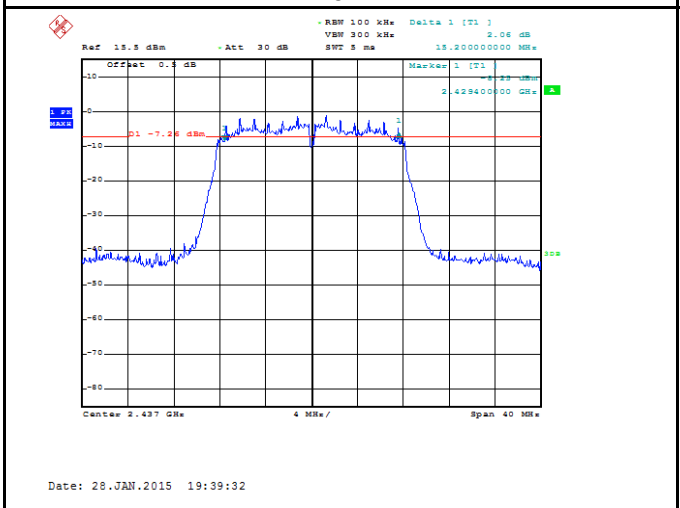
6dB Bandwidth - Mid CH 2437 - 802.11b



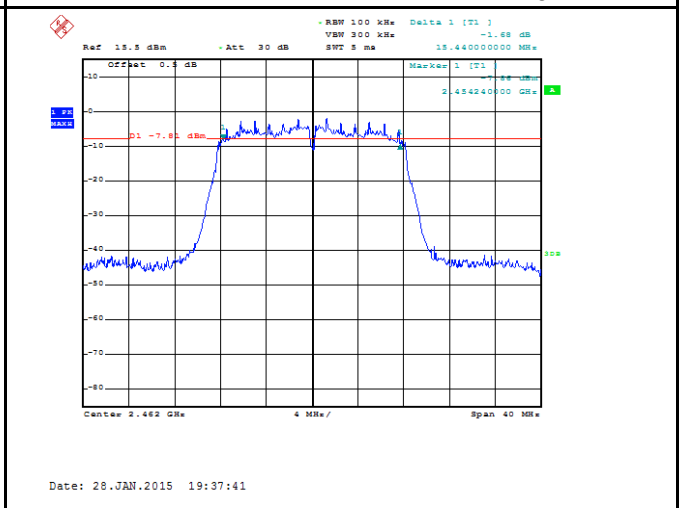
6dB Bandwidth - High CH 2462 - 802.11b



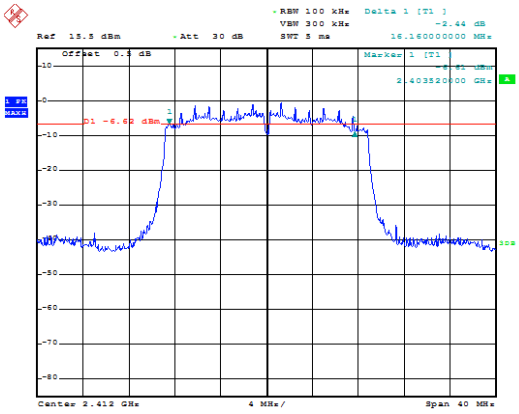
6dB Bandwidth - Low CH 2412 - 802.11g



6dB Bandwidth - Mid CH 2437 - 802.11g

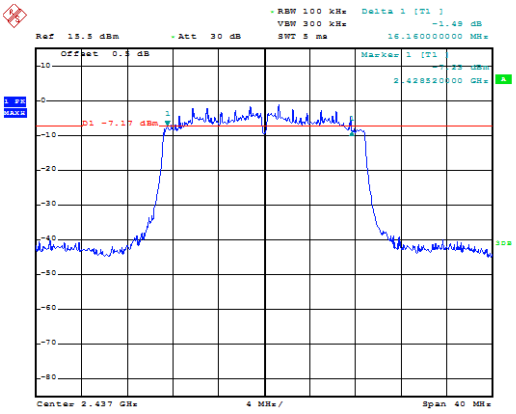


6dB Bandwidth - High CH 2462 - 802.11g



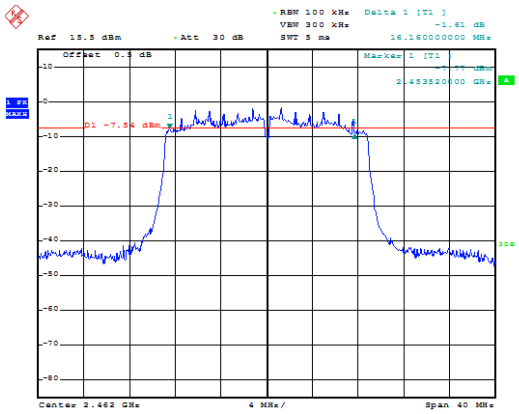
Date: 28.JAN.2015 19:43:55

6dB Bandwidth - Low CH 2412 - 802.11n(20M)



Date: 28.JAN.2015 19:47:23

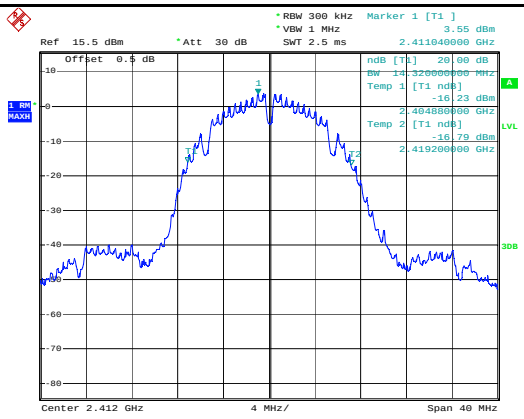
6dB Bandwidth - Mid CH 2437- 802.11n(20M)



Date: 28.JAN.2015 19:49:33

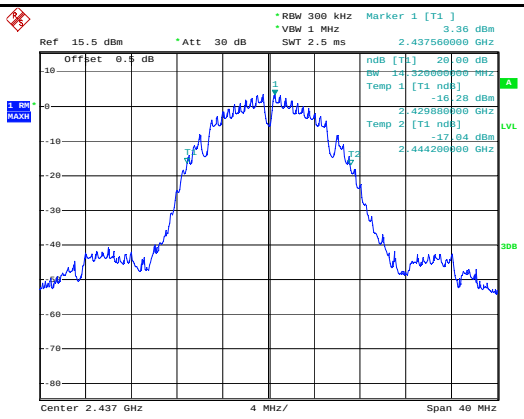
6dB Bandwidth - High CH 2462 - 802.11n(20M)

20dB Bandwidth measurement result



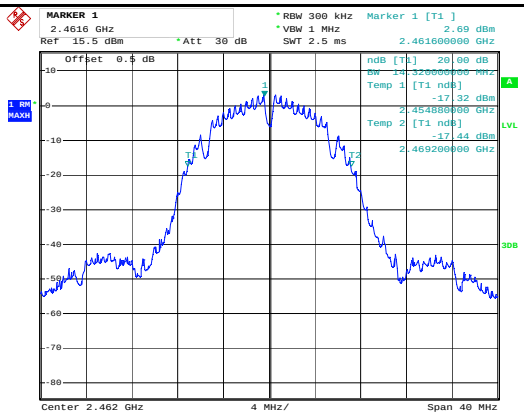
Date: 28.JAN.2015 20:41:16

20dB Bandwidth - Low CH 2412 - 802.11b



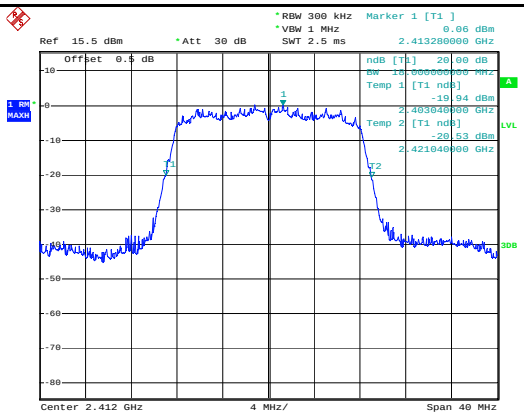
Date: 28.JAN.2015 20:40:01

20dB Bandwidth - Mid CH 2437 - 802.11b



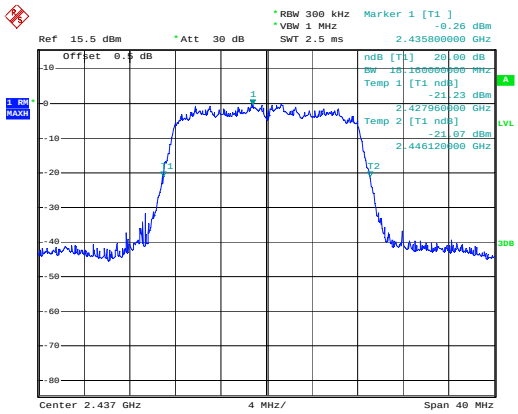
Date: 28.JAN.2015 20:38:52

20dB Bandwidth - High CH 2462 - 802.11b



Date: 28.JAN.2015 20:28:15

20dB Bandwidth - Low CH 2412 - 802.11g



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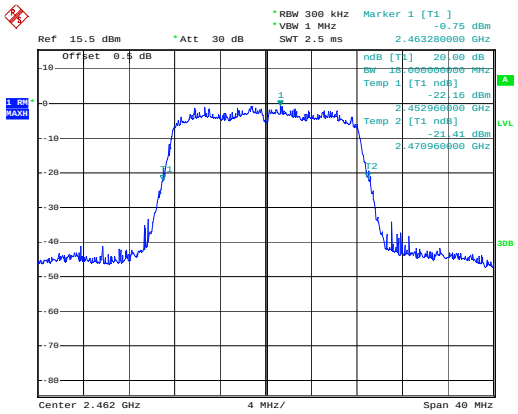
20dB Bandwidth - Mid CH 2437 - 802.11g



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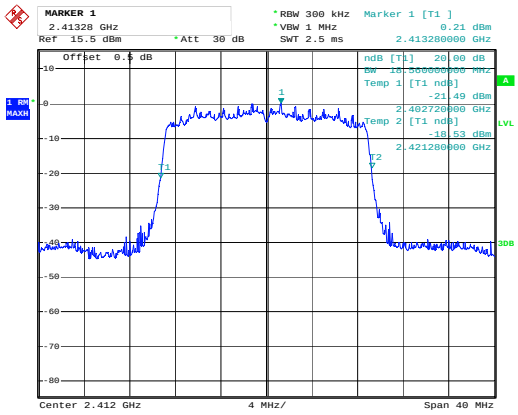
20dB Bandwidth - High CH 2462 - 802.11g



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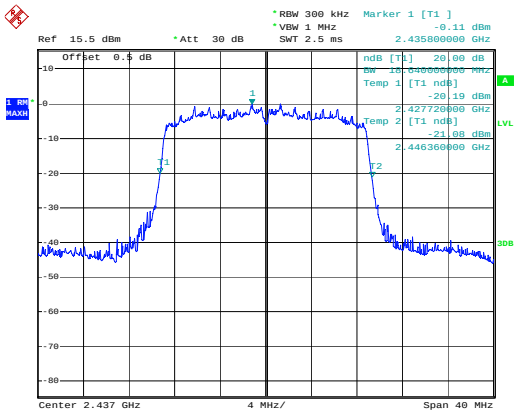
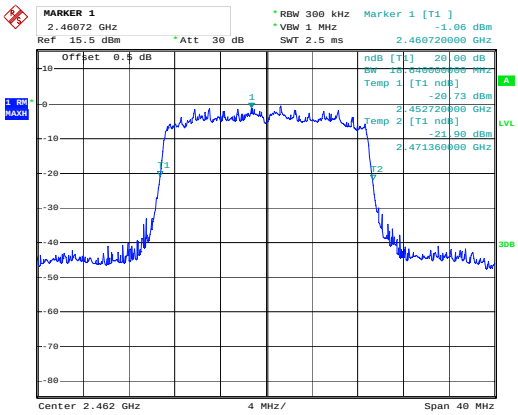
20dB Bandwidth - Low CH 2412 - 802.11n(20M)



Date: 28.JAN.2015 20:35:11

20dB Bandwidth - Mid CH 2437- 802.11n(20M)



Date: 28.JAN.2015 20:35:58

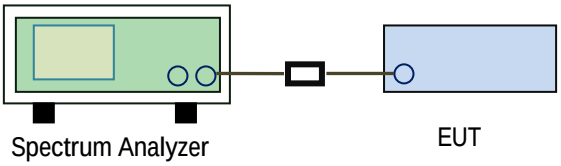
20dB Bandwidth - High CH 2462 - 802.11 n(20M)

6.4 Maximum Output Power

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	January 28, 2015
Tested By :	Herith Shi

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b)(2),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)	DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: ≤1 Watt	☑

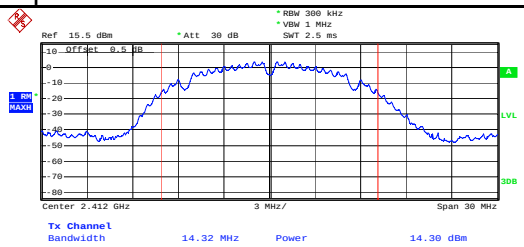
Test Setup	
Test Procedure	558074 D01 DTS MEAS Guidance v03r02, 9.1.2 Integrated band power method Maximum output power measurement procedure - a) Set span to at least 1.5 times the OBW. - b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz. - c) Set VBW ≥ 3 x RBW. - d) Number of points in sweep ≥ 2 × 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 AV Power (dBm)	Limit (dBm)	Result
Output power	802.11b	Low	2412	14.30	30	Pass
		Mid	2437	13.99	30	Pass
		High	2462	13.76	30	Pass
	802.11g	Low	2412	13.50	30	Pass
		Mid	2437	13.02	30	Pass
		High	2462	13.40	30	Pass
	802.11n(20M)	Low	2412	13.56	30	Pass
		Mid	2437	13.16	30	Pass
		High	2462	13.21	30	Pass

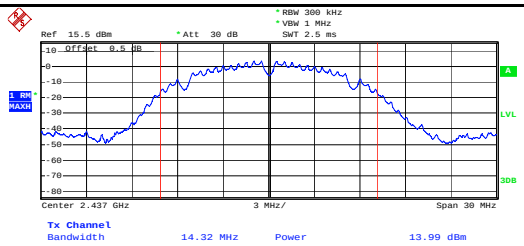
Test Plots

Output Power measurement result



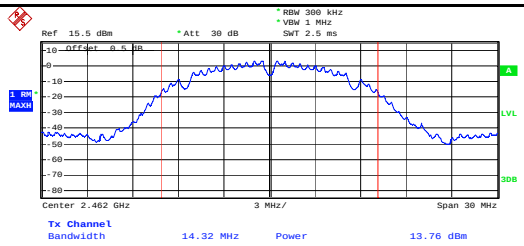
Date: 28.JAN.2015 20:58:03

Output power - Low CH 2412 -802.11b



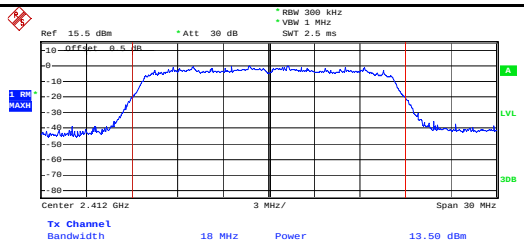
Date: 28.JAN.2015 20:58:47

Output power - Mid CH 2437 – 802.11b



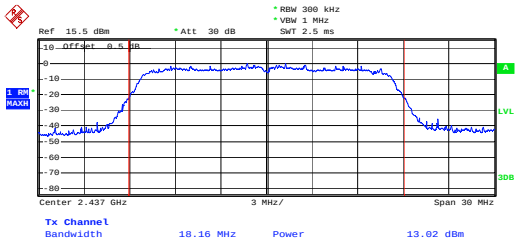
Date: 28.JAN.2015 20:59:39

Output power - High CH 2462 - 802.11b



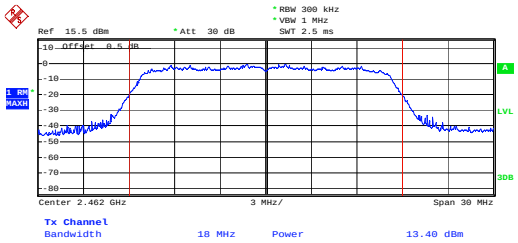
Date: 28.JAN.2015 21:00:45

Output power - Low CH 2412 -802.11g



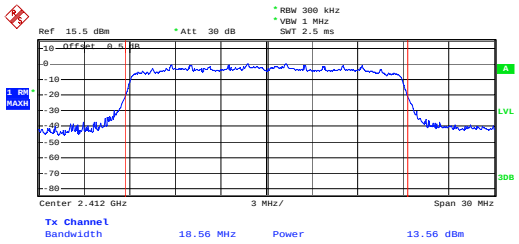
Date: 28.JAN.2015 21:01:51

Output power - Mid CH 2437 – 802.11g



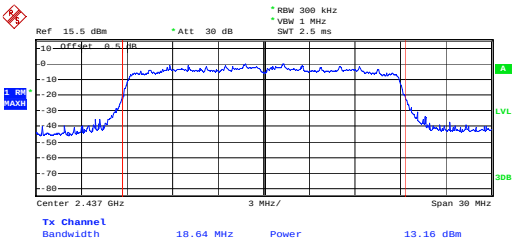
Date: 28.JAN.2015 21:03:21

Output power - High CH 2462 - 802.11g



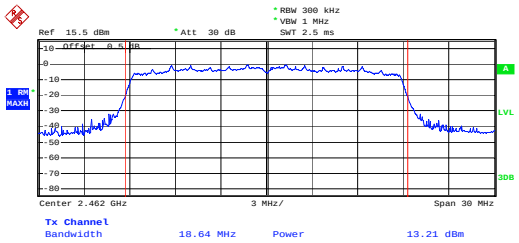
Date: 28.JAN.2015 21:04:19

Output power - Low CH 2412 -802.11n(20M)



Date: 28.JAN.2015 21:05:49

Output power - Mid CH 2437 – 802.11 n(20M)

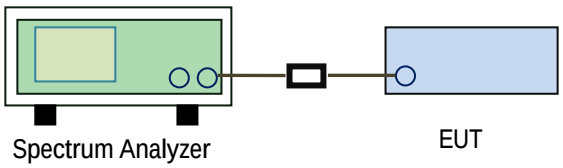


Date: 28.JAN.2015 21:06:47

Output power - High CH 2462 - 802.11 n(20M)

6.5 Power Spectral Density

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	January 28, 2015
Tested By :	Herith Shi

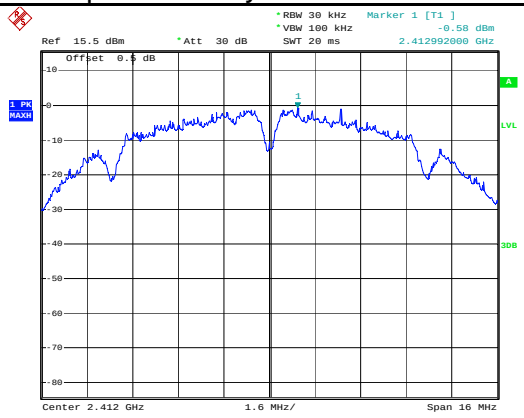
Spec	Item	Requirement	Applicable
§15.247(e)	a)	The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.	☑
Test Setup			
Test Procedure	558074 D01 DTS MEAS Guidance v03r02, 10.2 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

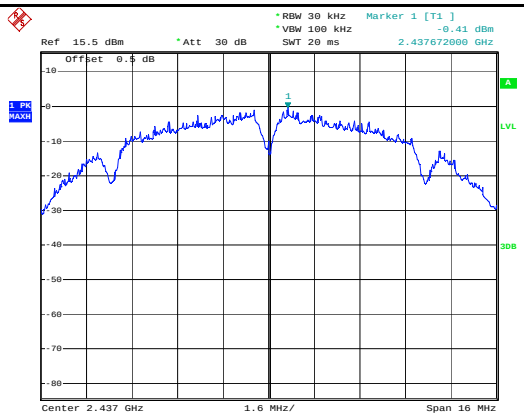
Type	Test mode	CH	Freq (MHz)	PSD (dBm)	Limit (dBm)	Result
PSD	802.11b	Low	2412	-0.58	8	Pass
		Mid	2437	-0.41	8	Pass
		High	2462	-0.47	8	Pass
	802.11g	Low	2412	-4.81	8	Pass
		Mid	2437	-4.46	8	Pass
		High	2462	-4.99	8	Pass
	802.11n(20M)	Low	2412	-5.49	8	Pass
		Mid	2437	-5.80	8	Pass
		High	2462	-5.91	8	Pass

Test Plots

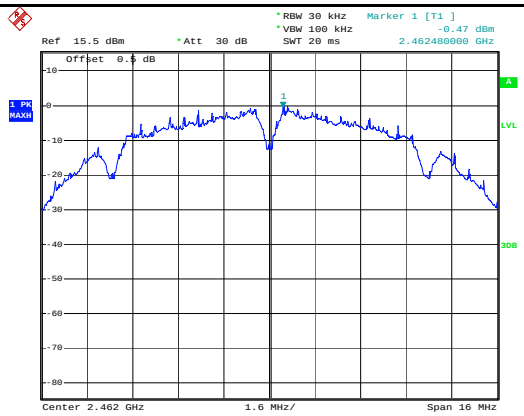
Power Spectral Density measurement result



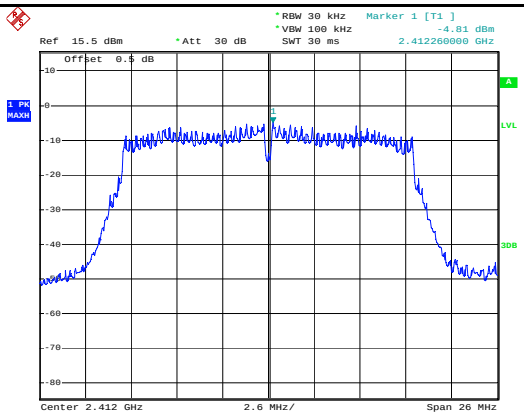
PSD - Low CH 2412 -802.11b



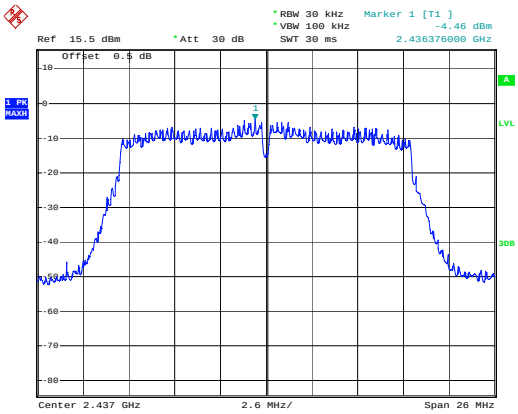
PSD - Mid CH 2437 – 802.11b



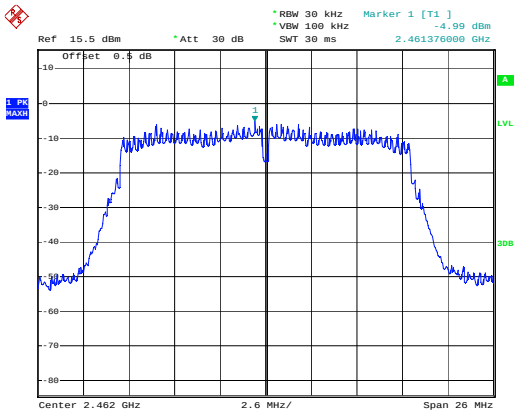
PSD - High CH 2462 - 802.11b



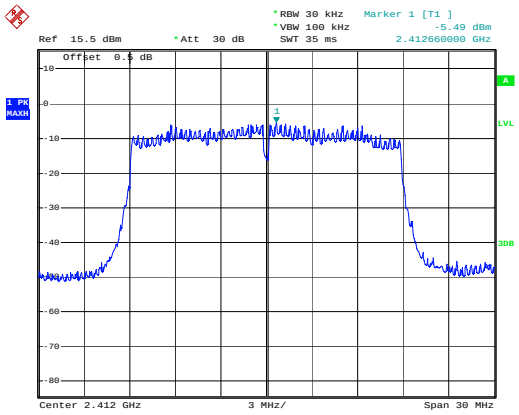
PSD - Low CH 2412 -802.11g



PSD - Mid CH 2437 – 802.11g

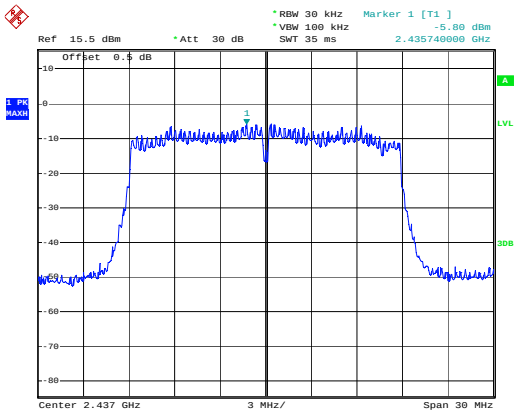


PSD - High CH 2462 - 802.11g



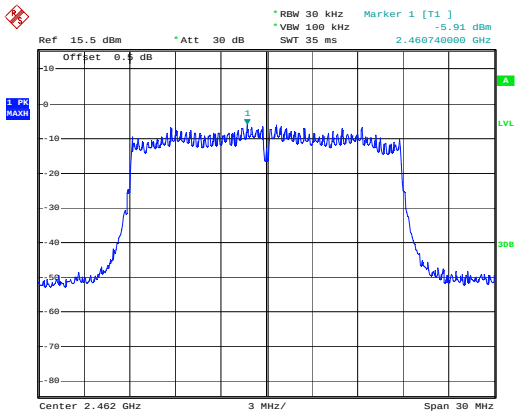
Date: 28.JAN.2015 21:21:29

PSD - Low CH 2412 -802.11n(20M)



Date: 28.JAN.2015 21:22:19

PSD - Mid CH 2437 – 802.11 n(20M)



Date: 28.JAN.2015 21:20:15

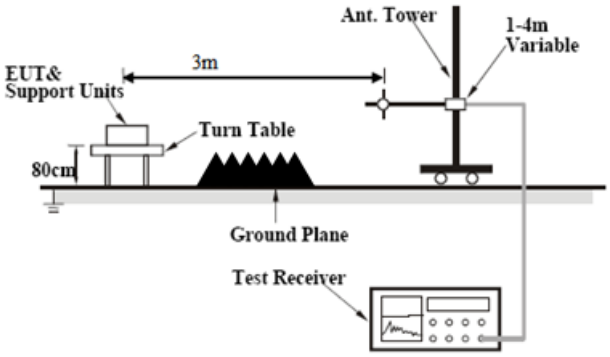
PSD - High CH 2462 - 802.11 n(20M)

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

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	January 26 to February 27, 2015
Tested By :	Herith Shi

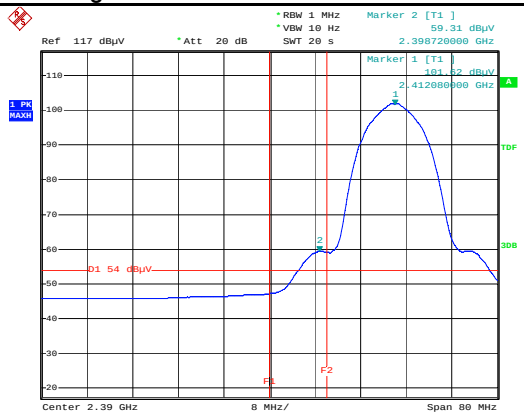
Requirement(s):

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 Quasi Peak detection at frequency below 1GHz. b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz. c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth for Average detection (AV) as below at frequency above 1GHz. ■ 1/T kHz (Duty cycle < 98%) □ 10 Hz (Duty cycle > 98%) - 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

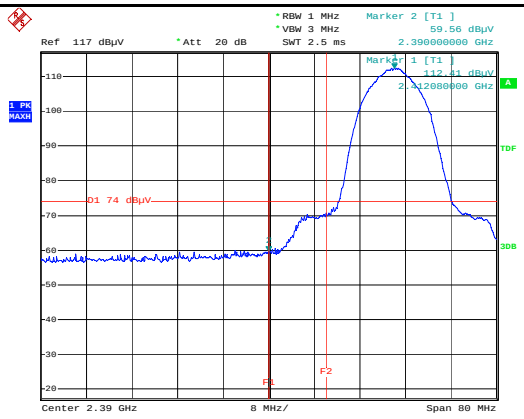
Test Plots

Band Edge measurement result



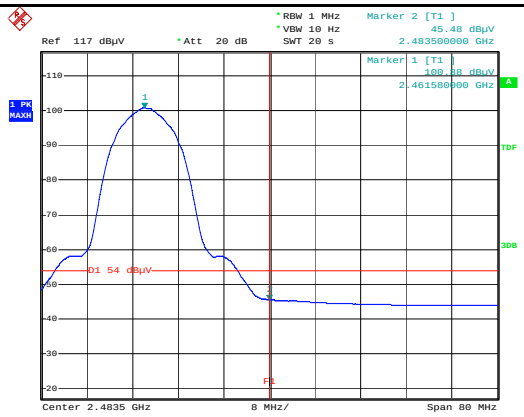
Date: 26.JAN.2015 22:16:17

Band Edge, Left Side (Average) - 802.11b (EMW3165-P)



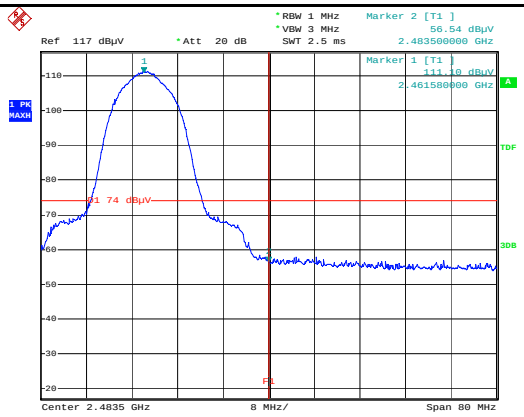
Date: 26.JAN.2015 22:35:34

Band Edge, Left Side (Peak) - 802.11b (EMW3165-P)



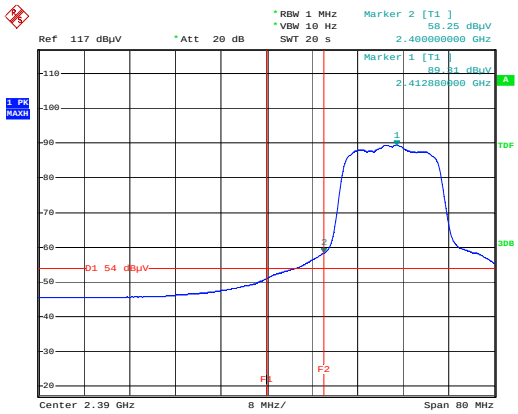
Date: 26.JAN.2015 22:26:49

Band Edge, Right Side (Average) - 802.11b (EMW3165-P)



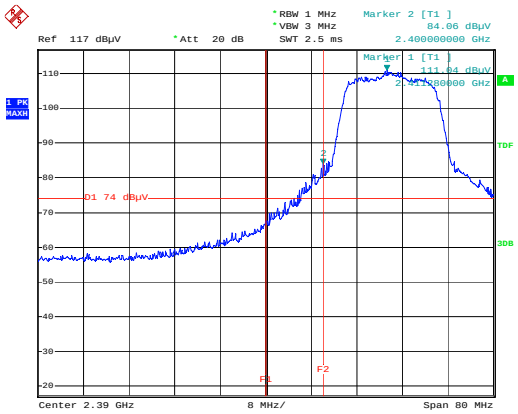
Date: 26.JAN.2015 22:27:26

Band Edge, Right Side (Peak) - 802.11b (EMW3165-P)



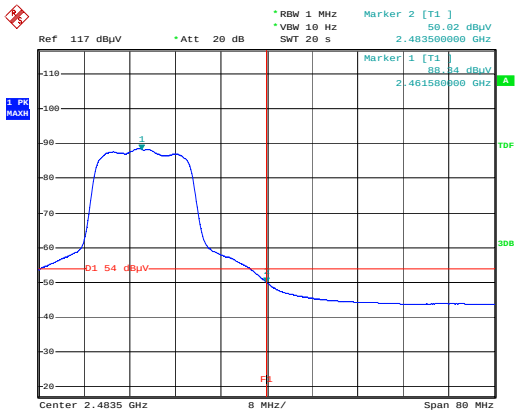
Date: 26.JAN.2015 22:19:54

Band Edge, Left Side (Average) - 802.11g (EMW3165-P)



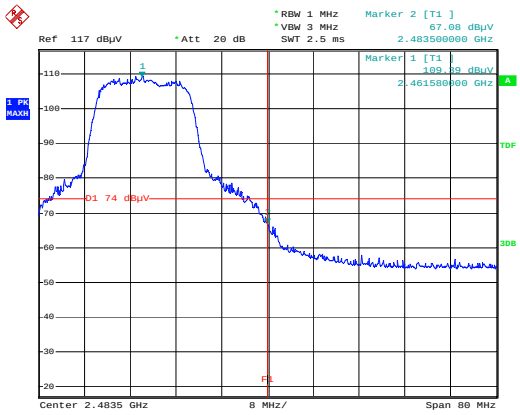
Date: 26.JAN.2015 22:20:45

Band Edge, Left Side (Peak) - 802.11g (EMW3165-P)



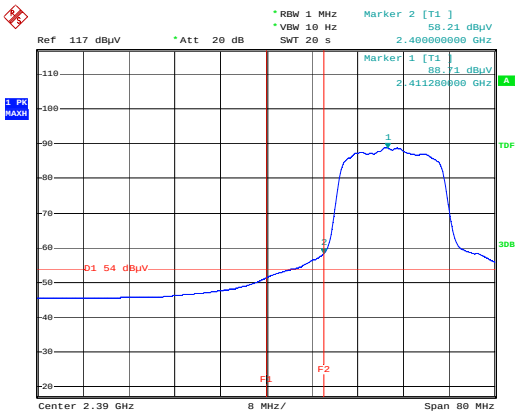
Date: 26.JAN.2015 22:29:37

Band Edge, Right Side (Average) - 802.11g (EMW3165-P)



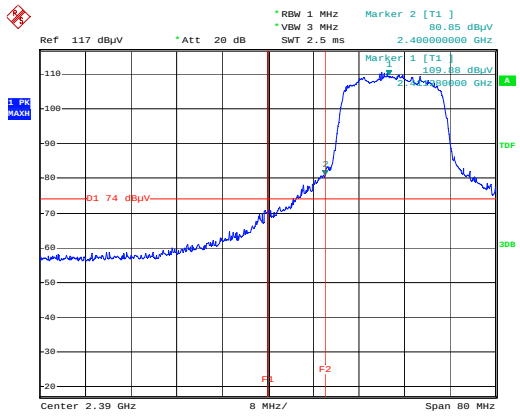
Date: 26.JAN.2015 22:28:47

Band Edge, Right Side (Peak) - 802.11g (EMW3165-P)



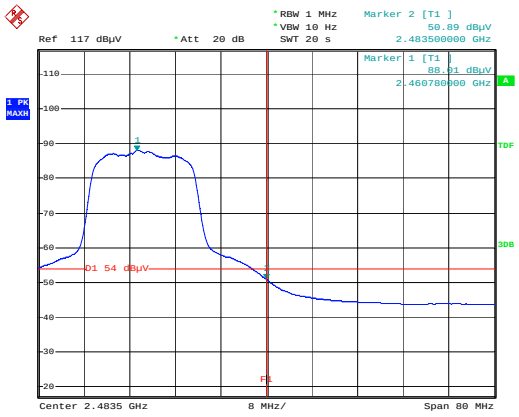
Date: 26.JAN.2015 22:23:43

Band Edge, Left Side (Average) - 802.11n(20M) (EMW3165-P)



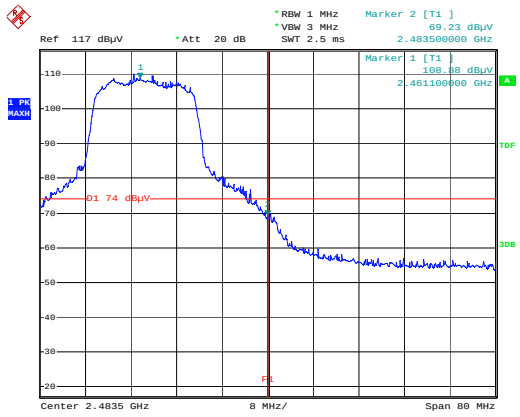
Date: 26.JAN.2015 22:22:52

Band Edge, Left Side (Peak) - 802.11 n(20M) (EMW3165-P)



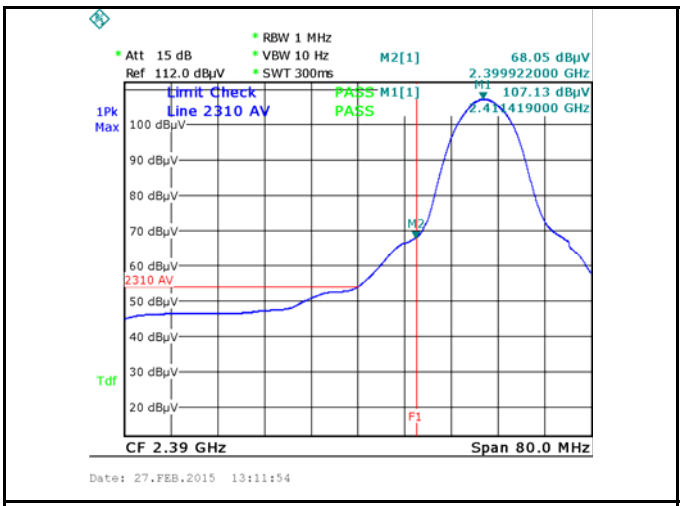
Date: 26.JAN.2015 22:31:19

Band Edge, Right Side (Average) - 802.11 n(20M) (EMW3165-P)

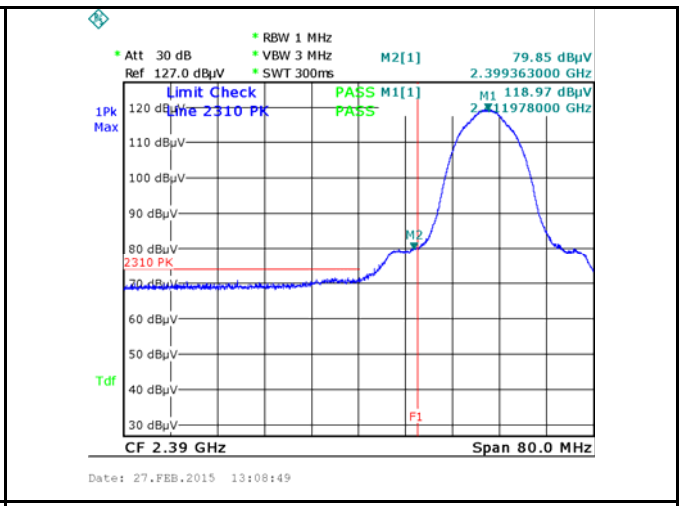


Date: 26.JAN.2015 22:32:01

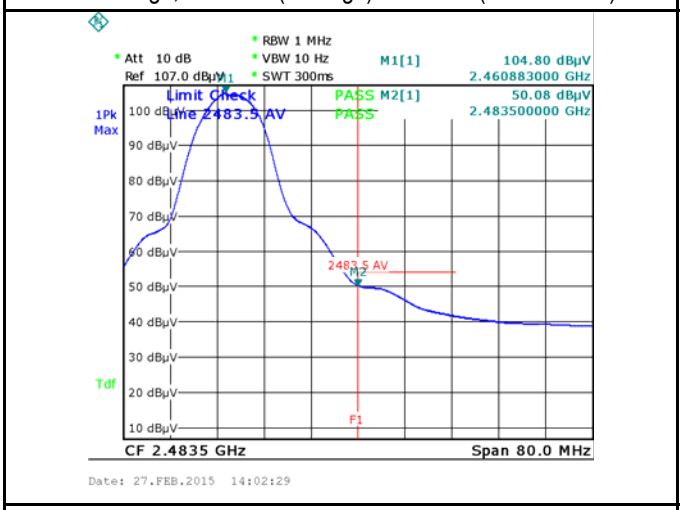
Band Edge, Right Side (Peak) - 802.11 n(20M) (EMW3165-P)



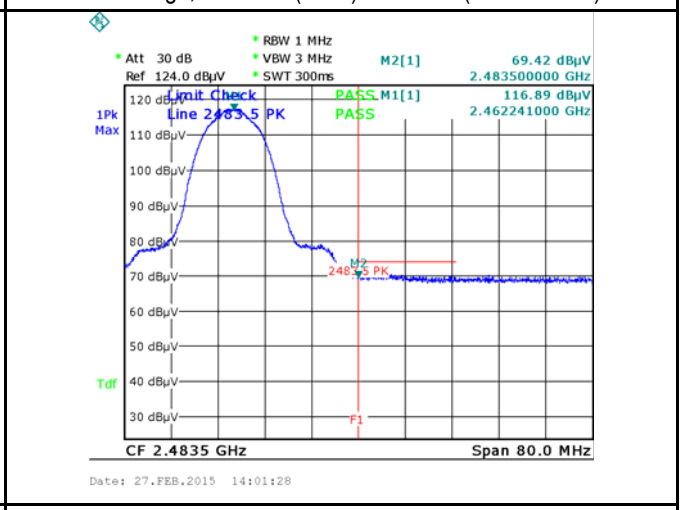
Band Edge, Left Side (Average) - 802.11b (EMW3165-E)



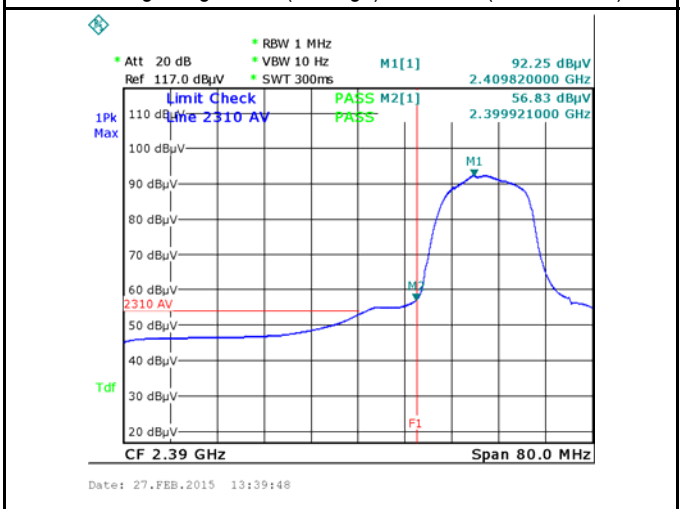
Band Edge, Left Side (Peak) - 802.11b (EMW3165-E)



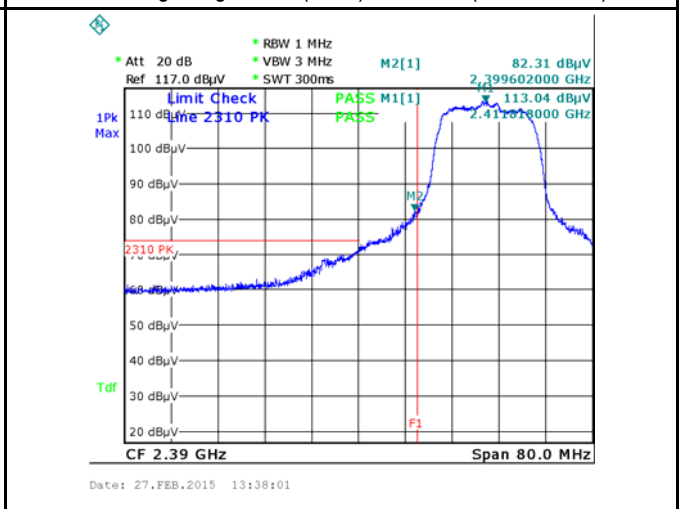
Band Edge, Right Side (Average) - 802.11b (EMW3165-E)



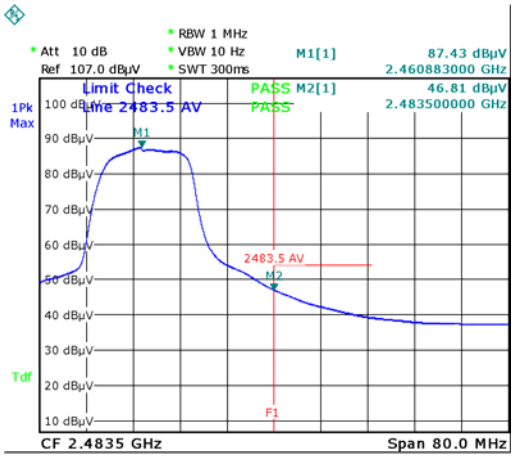
Band Edge, Right Side (Peak) - 802.11b (EMW3165-E)



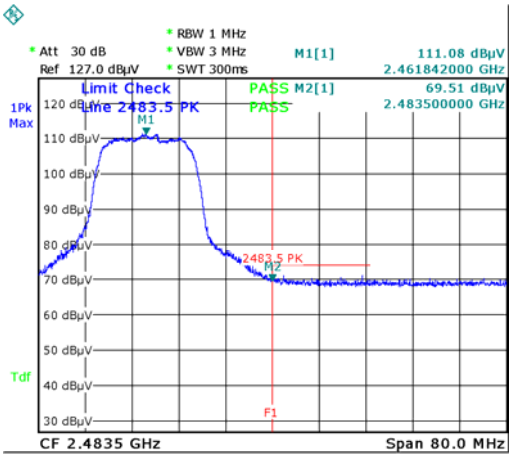
Band Edge, Left Side (Average) - 802.11g (EMW3165-E)



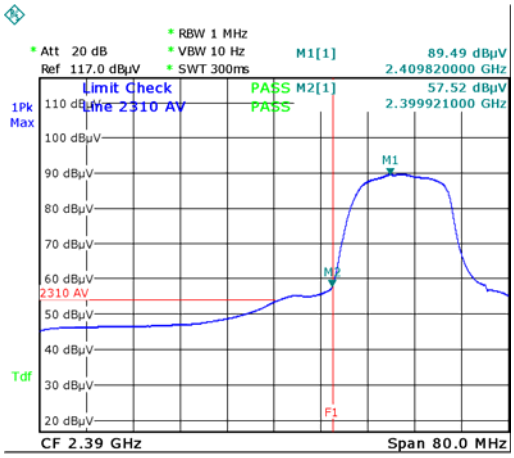
Band Edge, Left Side (Peak) - 802.11g (EMW3165-E)



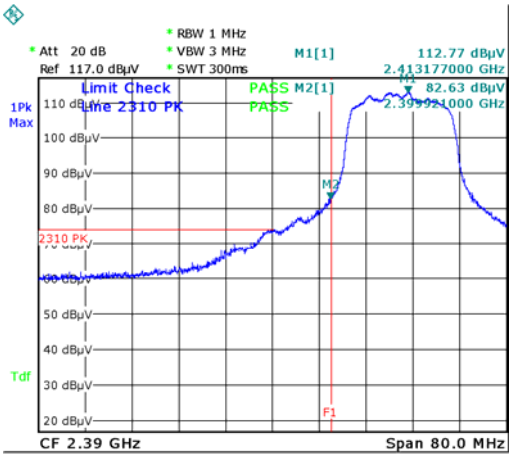
Band Edge, Right Side (Average) - 802.11g (EMW3165-E)



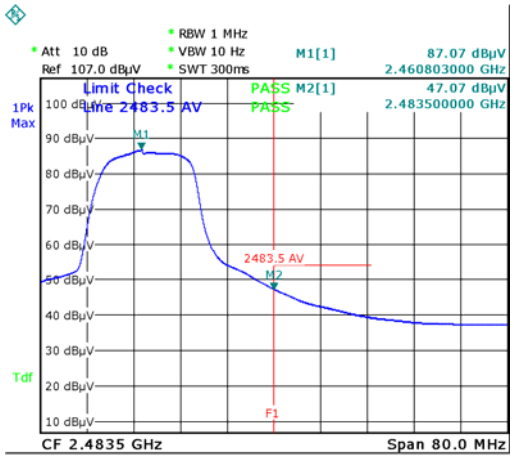
Band Edge, Right Side (Peak) - 802.11g (EMW3165-E)



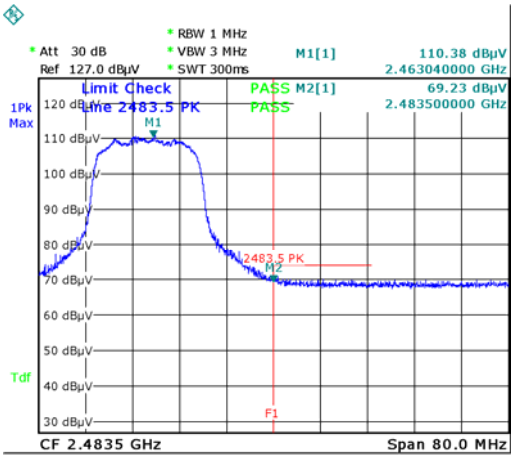
Band Edge, Left Side (Average) - 802.11n(20M) (EMW3165-E)



Band Edge, Left Side (Peak) - 802.11 n(20M) (EMW3165-E)



Band Edge, Right Side (Average) - 802.11 n(20M) (EMW3165-E)



Band Edge, Right Side (Peak) - 802.11 n(20M) (EMW3165-E)

6.7 AC Power Line Conducted Emissions

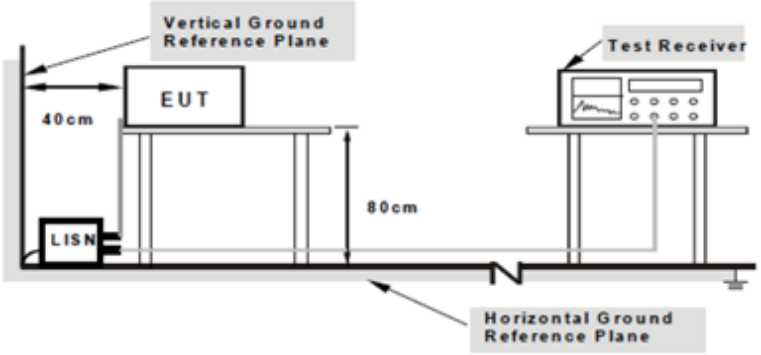
Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	January 30, 2015
Tested By :	Herith Shi

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.207, RSS210 (A8.1)	a)	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.	☑

Frequency ranges (MHz)	Limit (dBμV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

Test Setup



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.

Procedure

- 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.
- The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.
- The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
- All other supporting equipment were powered separately from another main supply.
- The EUT was switched on and allowed to warm up to its normal operating condition.
- 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.
- 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.
- Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).

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(20M)-2437MHz mode.

Result	☑ Pass ☐ Fail
Test Data	☑ Yes ☐ N/A
Test Plot	☑ Yes (See below) ☐ N/A

Data sample

Frequency (MHz)	Quasi-Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Factors (dB)
xxx	56.21	66.00	-9.79	39.20	56.00	-16.80	12.22

Frequency (MHz) = Emission frequency in MHz

Quais-Peak/Average (dBμV/m)=Receiver Reading(dBμV/m)+ Factor(dB)

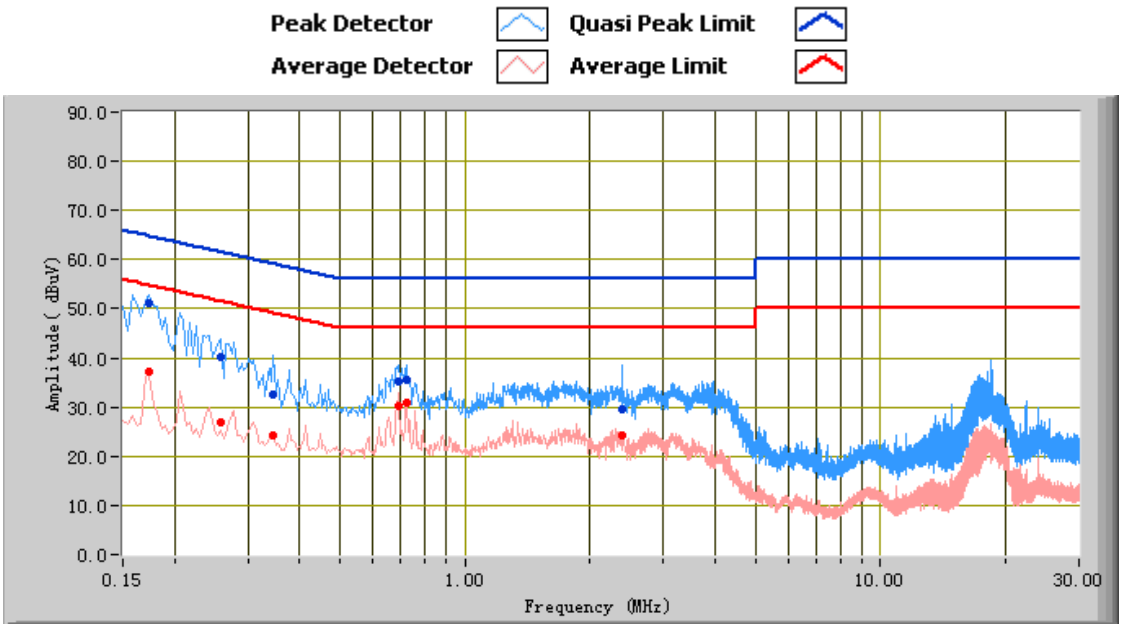
Limit(dBμV/m)=Limit stated in standard

Factor (dB)= cable loss+ Insertion loss of LISN+ Insertion loss of transient limiter (The transient limiter included 10dB attenuation)

Calculation Formula:

Margin (dB)=Quasi Peak / Average (dBμV/m) – limit (dBμV/m)

Test Mode:	Transmitting Mode

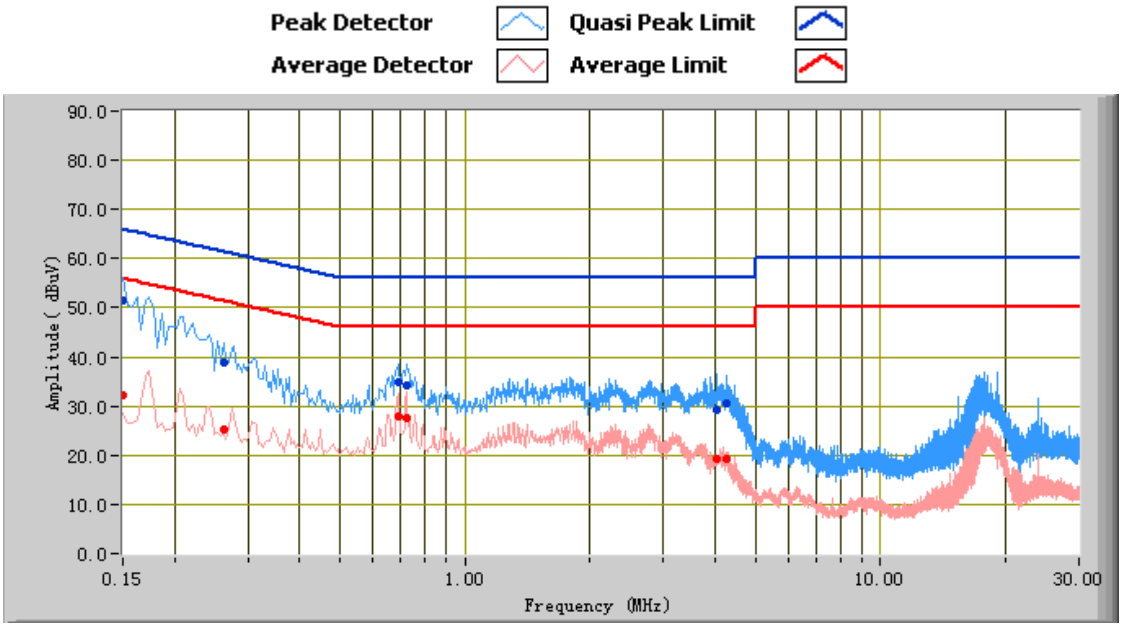


Test Data

Phase Line Plot at 120Vac, 60Hz

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
0.17	51.15	64.77	-13.61	37.11	54.77	-17.66	11.87
0.69	35.31	56.00	-20.69	30.10	46.00	-15.90	10.93
0.26	40.20	61.50	-21.29	27.05	51.50	-24.45	11.44
2.39	29.56	56.00	-26.44	24.16	46.00	-21.84	10.88
0.73	35.70	56.00	-20.30	30.79	46.00	-15.21	10.90
0.35	32.54	59.06	-26.52	24.11	49.06	-24.95	11.31

Test Mode:	Transmitting Mode



Test Data

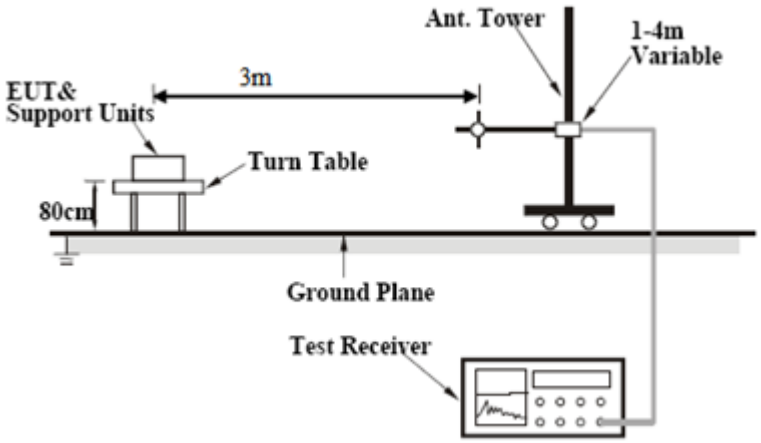
Phase Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
0.15	51.60	66.00	-14.40	32.28	56.00	-23.72	12.21
0.69	34.71	56.00	-21.29	27.81	46.00	-18.19	10.92
0.73	34.30	56.00	-21.70	27.63	46.00	-18.37	10.90
0.26	38.75	61.37	-22.62	25.26	51.37	-26.11	11.44
4.03	29.30	56.00	-26.70	19.28	46.00	-26.72	10.94
4.27	30.41	56.00	-25.59	19.32	46.00	-26.68	10.94

6.8 Radiated Spurious Emissions

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	January 30 to February 27, 2015
Tested By :	Herith Shi

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>
<tr><td>Test Setup</td><td colspan="3"> 
</td></tr>
<tr><td>Procedure</td><td colspan="3">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</td></tr>
</table>

	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(20M)-2437MHz mode.
Result	☑ Pass ☐ Fail
Test Data	☑ Yes ☐ N/A
Test Plot	☑ Yes (See below) ☐ N/A

Data sample

Frequency (MHz)	Quasi Peak (dBμV/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBμV/m)	Margin (dB)
xxx	32.23	181.00	H	350.00	-38.23	40.00	-7.77

Frequency (MHz) = Emission frequency in MHz

Quais-Peak (dBμV/m)= Receiver Reading(dBμV/m)+ Factor(dB)

Azimuth=Position of turn table

Polarity=Polarity of Receiver antenna

Height(cm)= Height of Receiver antenna

Factor (dB)=Antenna factor + cable loss- antenna gain

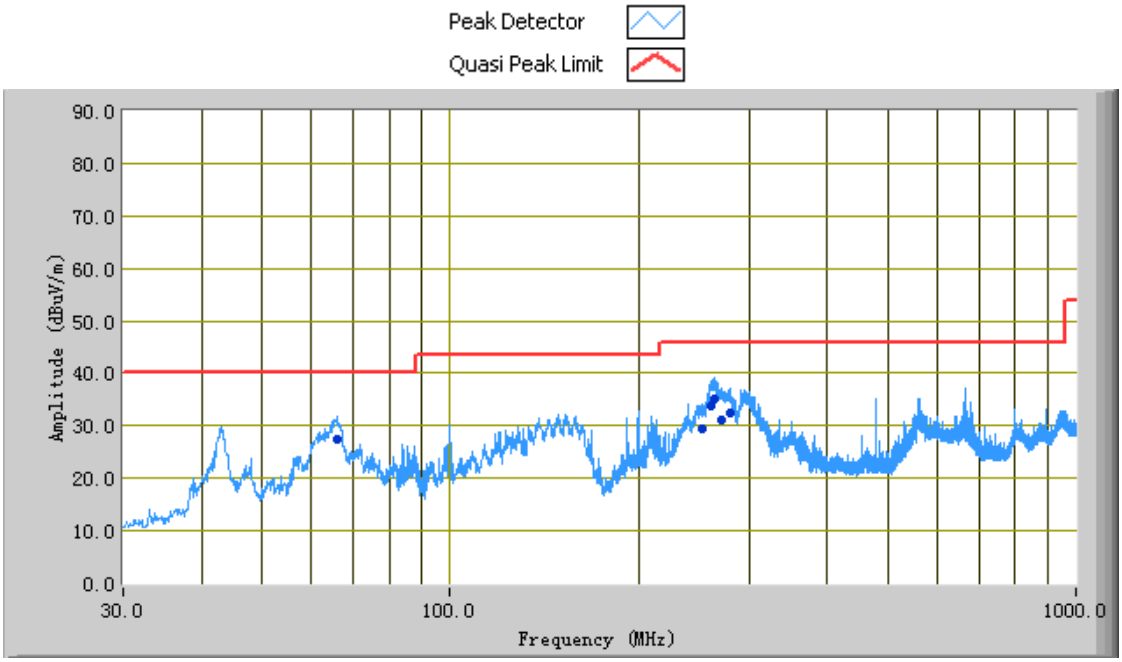
Limit (dBμV/m)=Limit stated in standard

Calculation Formula:

Margin (dB)=Quasi Peak (dBμV/m) – limit (dBμV/m)

Test Mode:	Transmitting Mode (EMW3165-P)

(Below 1GHz)



Test Data

Vertical & Horizontal Polarity Plot @3m

Frequency (MHz)	Quasi Peak (dBµV/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBµV/m)	Margin (dB)
253.85	29.38	334.00	H	163.00	-28.36	46.00	-16.62
264.63	35.29	312.00	H	167.00	-28.76	46.00	-10.71
269.21	31.37	328.00	H	317.00	-28.12	46.00	-14.63
261.29	33.78	351.00	H	231.00	-28.72	46.00	-12.22
65.98	27.30	356.00	V	139.00	-37.88	40.00	-12.70
279.60	32.59	334.00	H	209.00	-28.92	46.00	-13.41

Test Mode:	Transmitting Mode(EMW3165-P)

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

Mode: 802.11b

Low Channel (2412 MHz)

Frequency (MHz)	Substituted level (dBμV/m)	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	37.2	AV	V	33.83	4.87	24	51.9	54	-2.1
4824	45.31	PK	V	33.83	4.87	24	60.01	74	-13.99
4824	37.42	AV	H	33.83	4.87	24	52.12	54	-1.88
4824	44.97	PK	H	33.83	4.87	24	59.67	74	-14.33

Middle Channel (2437 MHz)

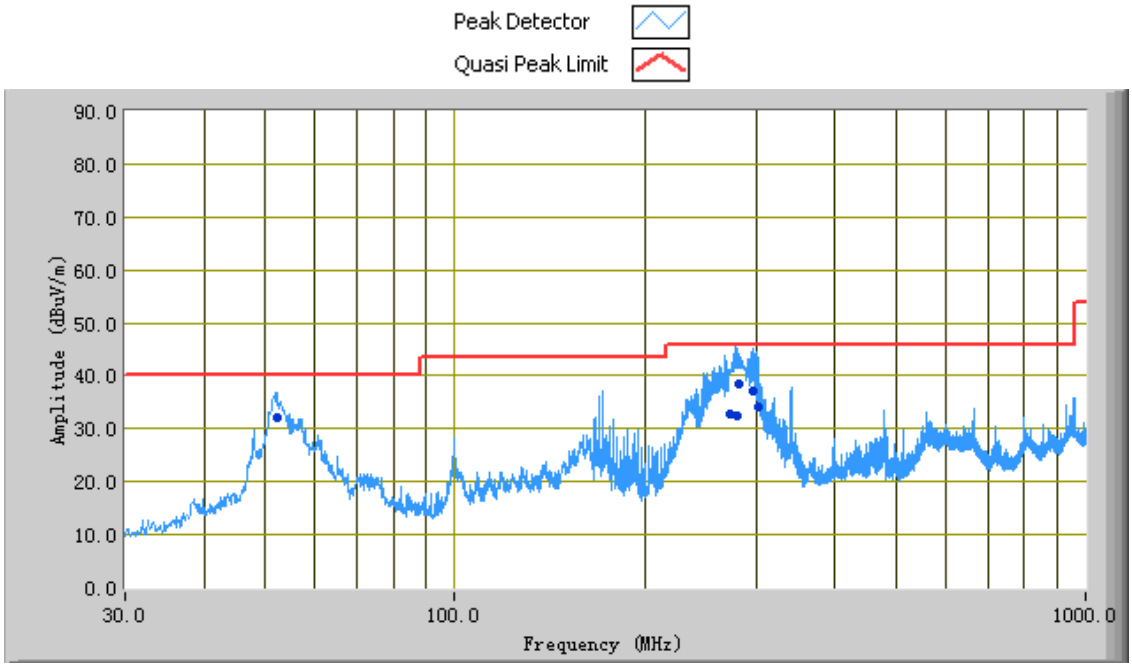
Frequency (MHz)	Substituted level (dBμV/m)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4874	37.13	AV	V	33.83	4.87	24	51.83	54	-2.17
4874	45.61	PK	V	33.83	4.87	24	60.31	74	-13.69
4874	31.25	AV	H	33.83	4.87	24	45.95	54	-8.05
4874	46.22	PK	H	33.83	4.87	24	60.92	74	-13.08

High Channel (2462 MHz)

Frequency (MHz)	Substituted level (dBμV/m)	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	36.23	AV	V	33.9	4.87	24	51	54	-3.00
4924	46.27	PK	V	33.9	4.87	24	61.04	74	-12.96
4924	35.92	AV	H	33.9	4.87	24	50.69	54	-3.31
4924	45.83	PK	H	33.9	4.87	24	60.6	74	-13.4

Test Mode:	Transmitting Mode (EMW3165-E)

(Below 1GHz)



Test Data

Vertical & Horizontal Polarity Plot @3m

Frequency (MHz)	Quasi Peak (dBµV/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBµV/m)	Margin (dB)
279.77	32.38	350.00	H	111.00	-28.92	46.00	-13.62
282.47	38.49	360.00	H	117.00	-28.95	46.00	-7.51
296.83	37.29	311.00	H	136.00	-29.10	46.00	-8.71
272.34	32.92	142.00	H	114.00	-28.84	46.00	-13.08
302.82	34.00	307.00	H	101.00	-29.19	46.00	-12.00
52.34	32.13	335.00	V	132.00	-38.46	40.00	-7.87

Test Mode:	Transmitting Mode(EMW3165-E)

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

Mode: 802.11b

Low Channel (2412 MHz)

Frequency (MHz)	Substituted level (dBμV/m)	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	37.28	AV	V	33.83	4.87	24	51.98	54	-2.02
4824	47.14	PK	V	33.83	4.87	24	61.84	74	-12.16
4824	37.07	AV	H	33.83	4.87	24	51.77	54	-2.23
4824	46.92	PK	H	33.83	4.87	24	61.62	74	-12.38

Middle Channel (2437 MHz)

Frequency (MHz)	Substituted level (dBμV/m)	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	36.31	AV	V	33.83	4.87	24	51.01	54	-2.99
4874	46.72	PK	V	33.83	4.87	24	61.42	74	-12.58
4874	35.33	AV	H	33.83	4.87	24	50.03	54	-3.97
4874	45.89	PK	H	33.83	4.87	24	60.59	74	-13.41

High Channel (2462 MHz)

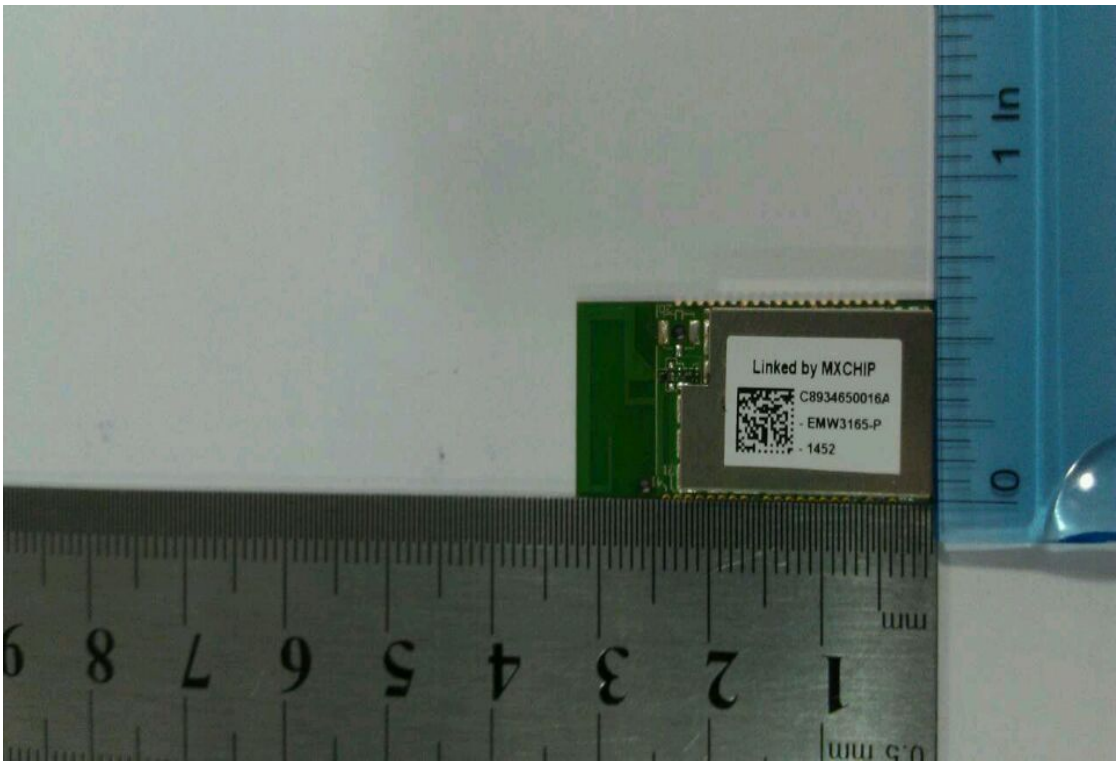
Frequency (MHz)	Substituted level (dBμV/m)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4924	36.02	AV	V	33.9	4.87	24	50.79	54	-3.21
4924	46.18	PK	V	33.9	4.87	24	60.95	74	-13.05
4924	37.14	AV	H	33.9	4.87	24	51.91	54	-2.09
4924	47.21	PK	H	33.9	4.87	24	61.98	74	-12.02

Annex A. TEST INSTRUMENT

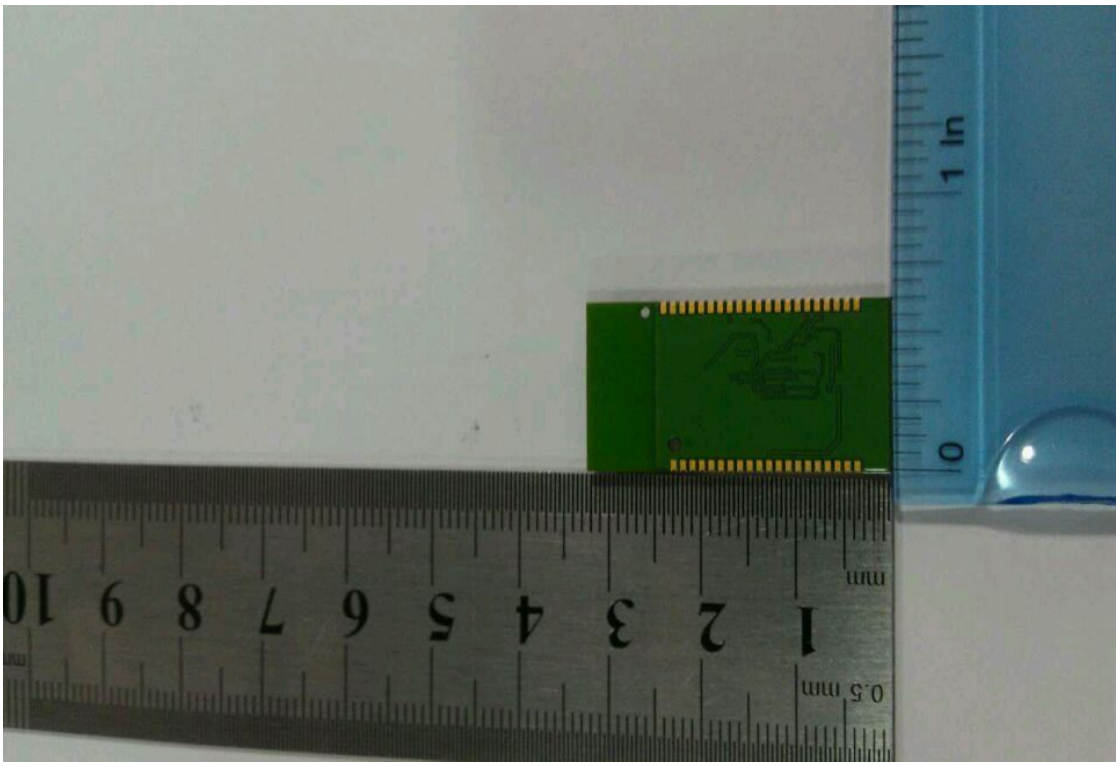
Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted Emissions					
R&S EMI Test Receiver	ESPI3	101216	11/04/2014	11/03/2015	☑
V-LISN	ESH3-Z5	838979/005	09/27/2014	09/26/2015	☑
INFOMW Antenna (1 ~18GHz)	JXTXLB-10180	J2031081120092	10/09/2014	10/08/2015	☑
SIEMIC Labview Conducted Emissions software	V1.0	N/A	N/A	N/A	☑
RF conducted test					
R&S EMI Receiver	ESPI3	101216	11/04/2014	11/03/2015	☑
Power Splitter	1#	1#	02/02/2015	02/01/2016	☑
Hp Spectrum Analyzer	8563E	3821A09023	10/09/2014	10/08/2015	☑
Temperature/Humidity Chamber	1007H	N/A	01/07/2015	01/06/2016	☑
Radiated Emissions					
Hp Spectrum Analyzer	8563E	3821A09023	10/09/2014	10/08/2015	☑
R&S EMI Receiver	ESPI3	101216	11/04/2014	11/03/2015	☑
Antenna (30MHz~6GHz)	JB6	A121411	04/15/2014	04/14/2015	☑
EMCO Horn Antenna (1 ~18GHz)	3115	N/A	11/15/2014	11/14/2015	☑
INFOMW Antenna (1 ~18GHz)	JXTXLB-10180	J2031081120092	10/09/2014	10/08/2015	☑
Horn Antenna (18~40GHz)	AH-840	101013	04/22/2014	04/22/2015	☑
Microwave Pre-Amp (18~40GHz)	PA-840	181250	05/29/2014	05/28/2015	☑
Hp Agilent Pre-Amplifier	8447F	1937A01160	10/27/2014	10/26/2015	☑
MITEQ Pre-Amplifier (0.1 ~ 18GHz)	AMF-7D-00101800-30-10P	1451709	10/27/2014	10/26/2015	☑
SIEMIC Labview Radiated Emissions software	V1.0	N/A	N/A	N/A	☑

Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph EUT Internal Photo

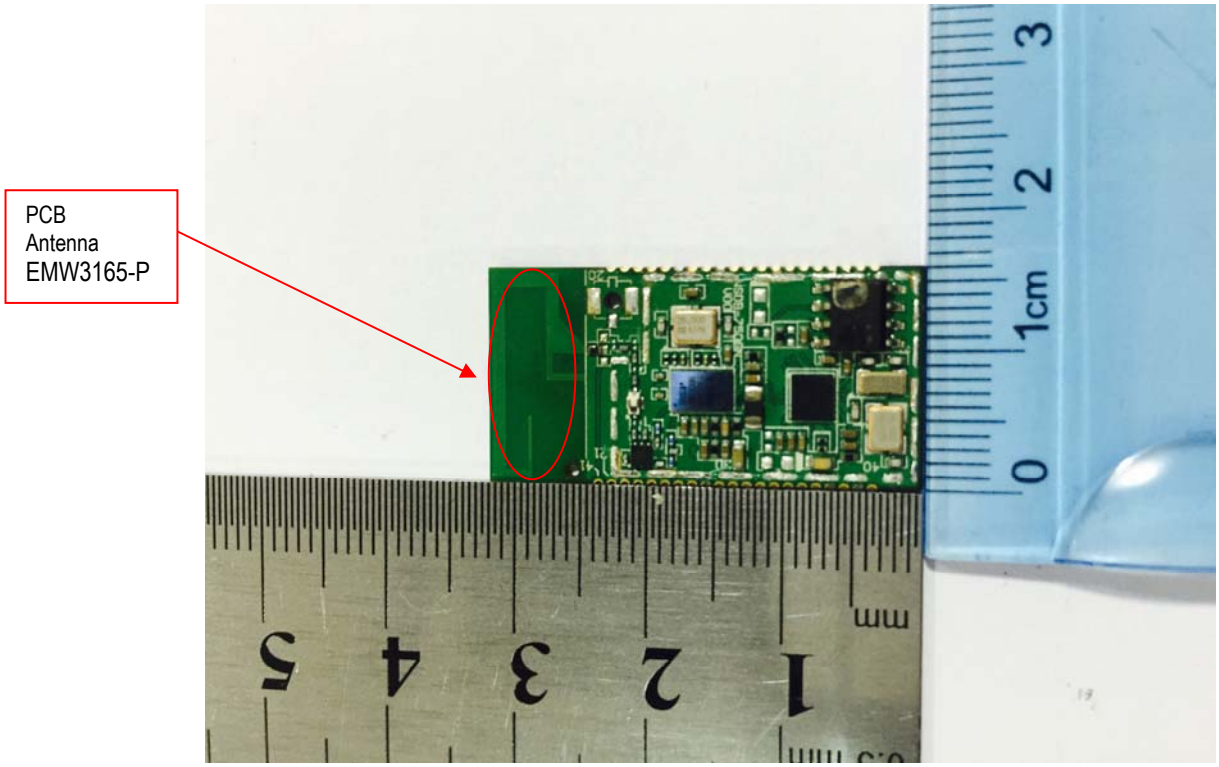


Front View of EUT

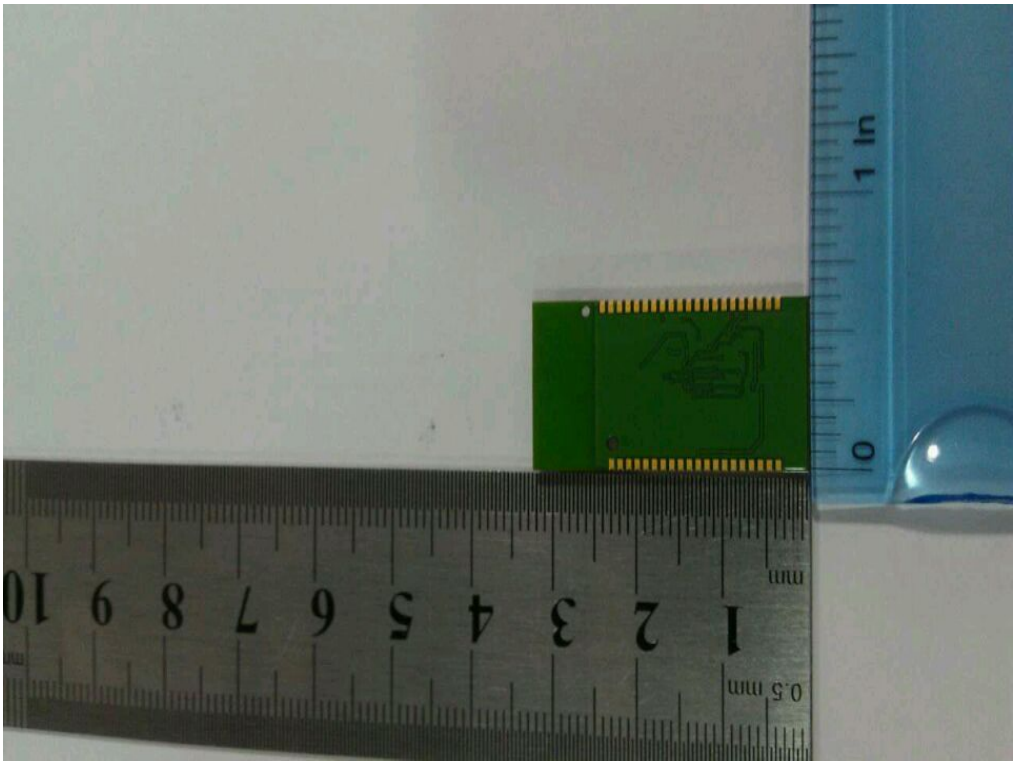


Rear View of EUT

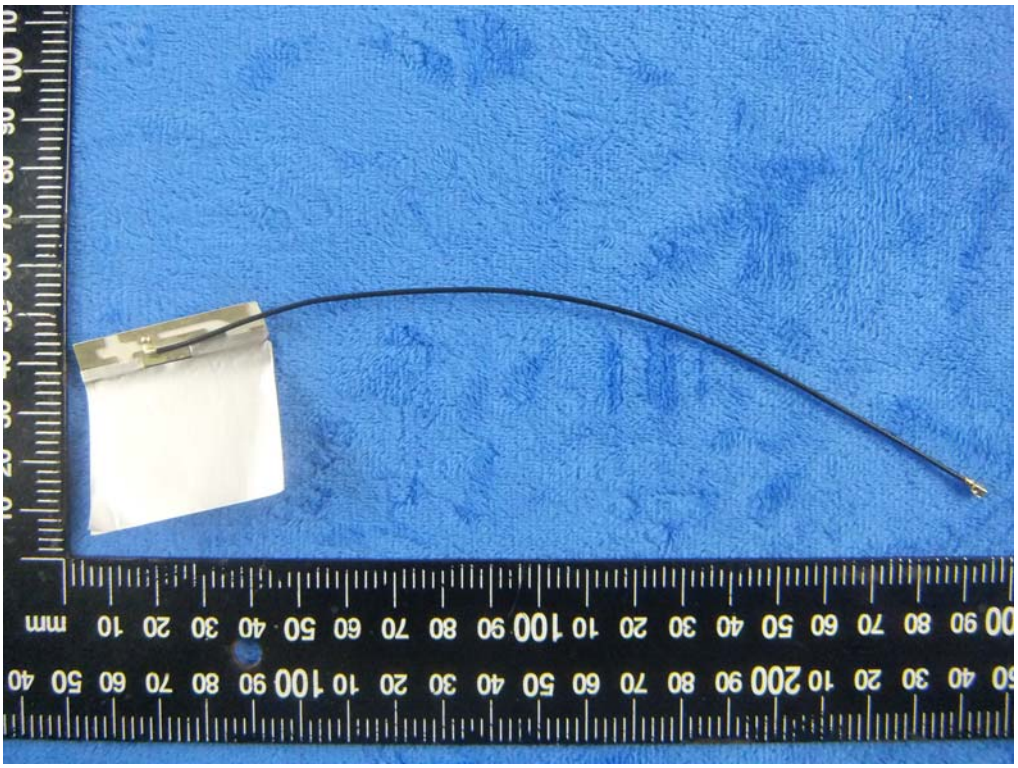
Annex B.ii. Photograph EUT Internal Photo



EUT Shielding Off - Front View



EUT Shielding Off - Rear View

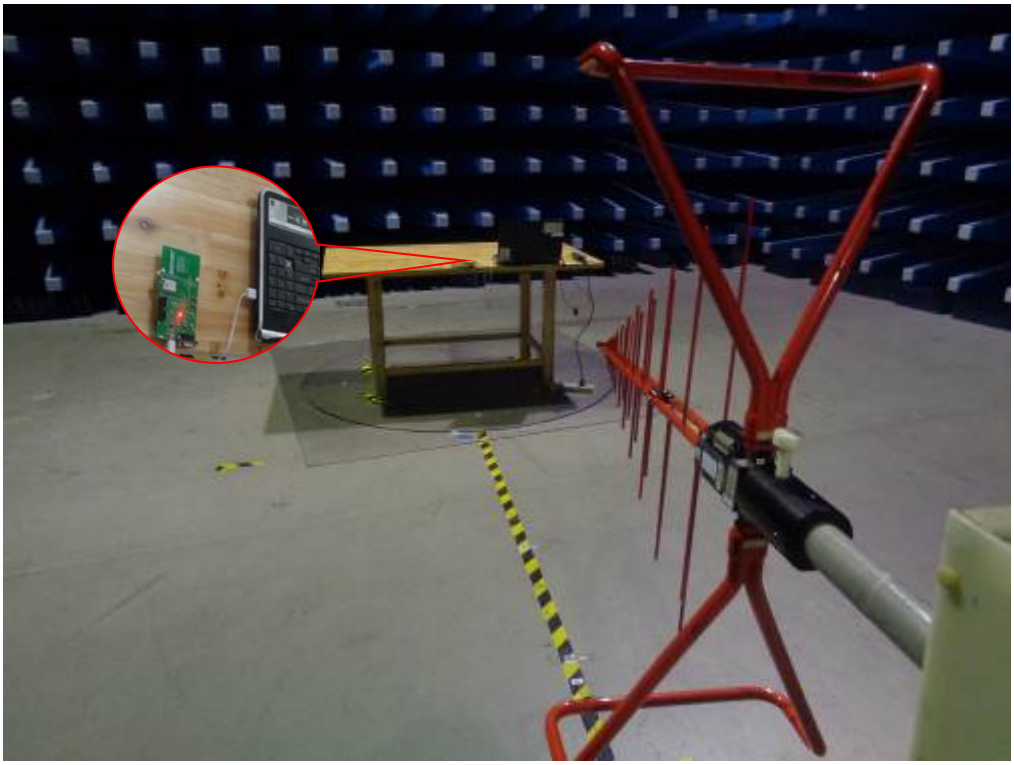


The External Antenna EMW3165-E – Front View

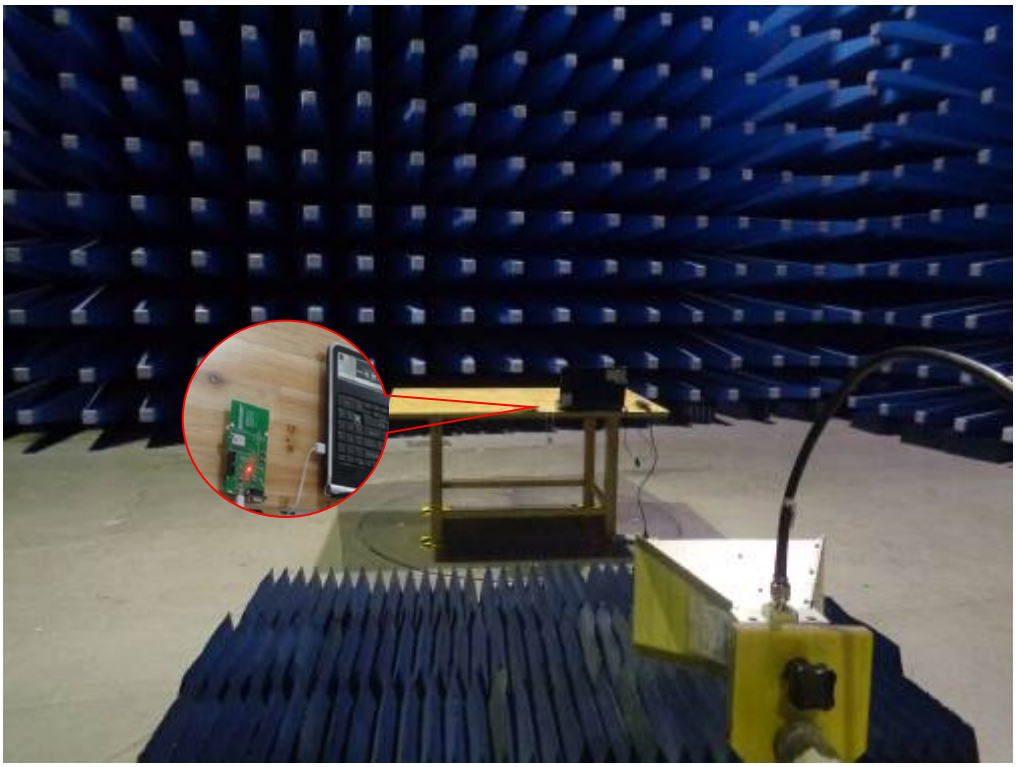
Annex B.iii. Photograph: Test Setup Photo

Conducted Emissions Test Setup – Front View(EMW3165-P)

Conducted Emissions Test Setup – Side View (EMW3165-P)



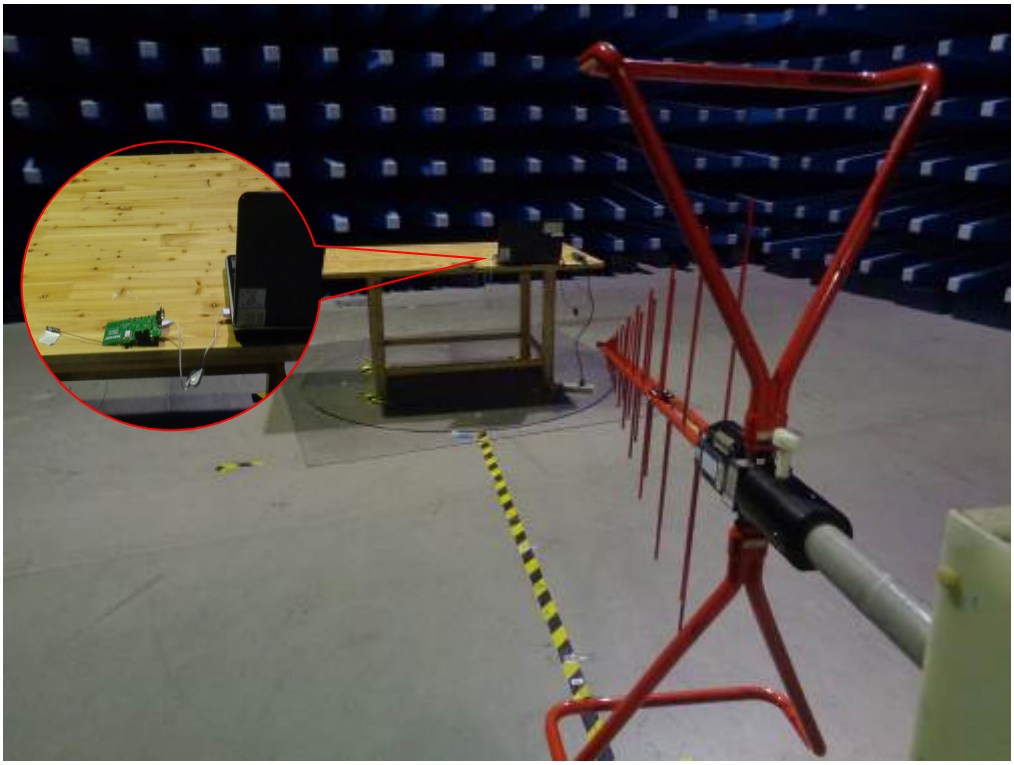
Radiated Spurious Emissions Test Setup Below 1GHz (EMW3165-P)



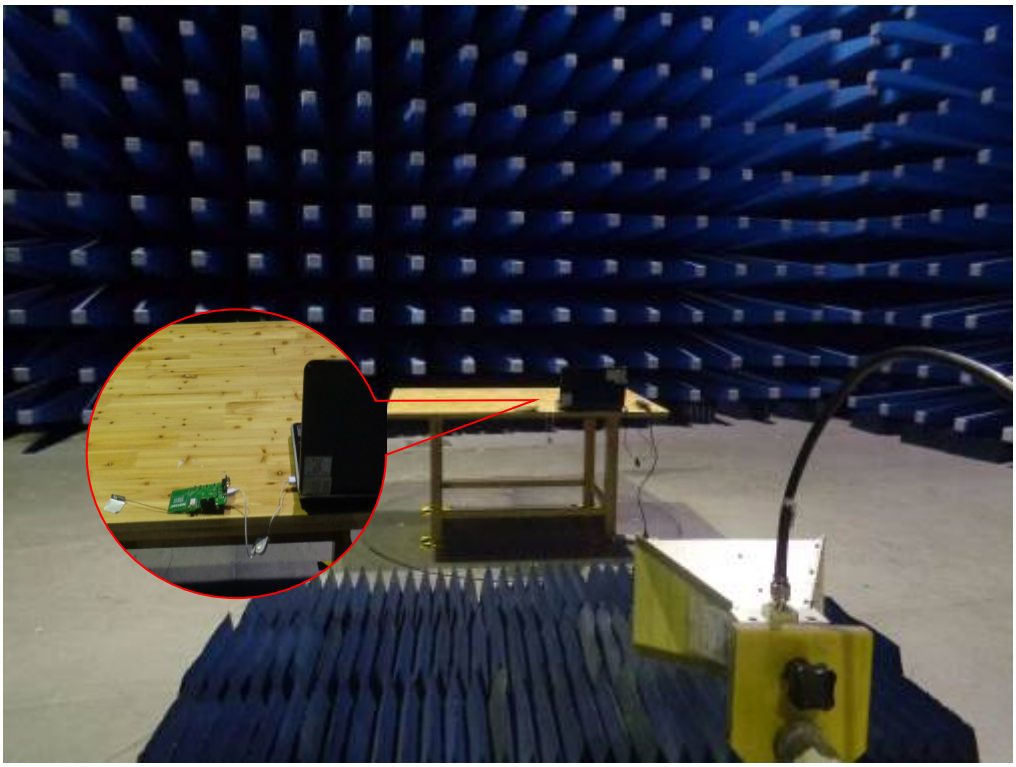
Radiated Spurious Emissions Test Setup Below 1GHz (EMW3165-P)

Conducted Emissions Test Setup – Front View(EMW3165-E)

Conducted Emissions Test Setup – Side View (EMW3165-E)



Radiated Spurious Emissions Test Setup Below 1GHz (EMW3165-E)

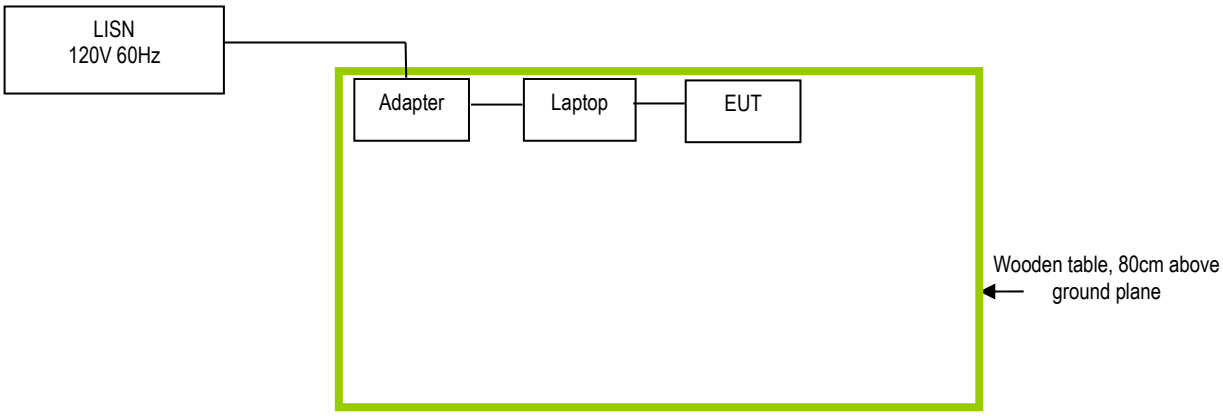


Radiated Spurious Emissions Test Setup Below 1GHz (EMW3165-E)

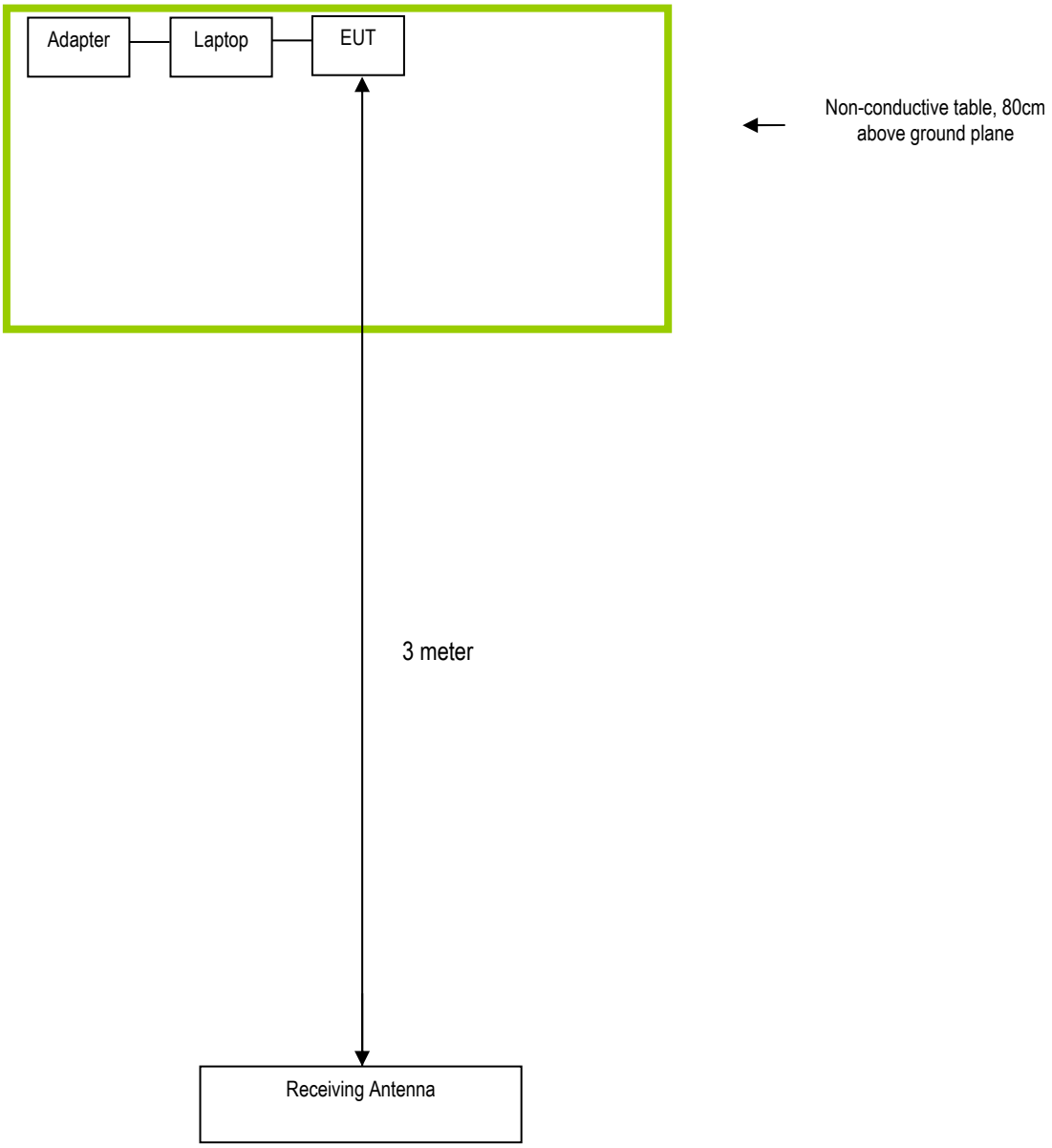
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.i. TEST SET UP BLOCK

Block Configuration Diagram for AC Line Conducted Emissions



Block Configuration Diagram for Radiated Emissions



Annex C. ii. 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
Gateway	Laptop	MS2288 & LXWHF02013951C3CA92200	N/A	N/A

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

Please see attachment

Annex E. DECLARATION OF SIMILARITY

MXCHIP

Statement

We

MXCHIP

Of

Room 811,Tongpu Building, No.1220 Tongpu Road,Shanghai,200333

hereby state that

Product : WiFi module

Model Number : EMW3165

The EMW3165 Serial included two Models（EMW3165-E and EMW3165-P）.

All models have the same constructions, circuit diagram and PCB layout.

EMW3165-E used external antenna, EMW3165-P used PCB antenna.

Sincerely,

Signature:

杨小玲

E-mail: yangxl@mxchip.com

Phone: +86 15026681781

Fax: +86 21 52655025-880

Address: Room 811,Tongpu Building, No.1220 Tongpu Road,Shanghai,China,200333