

TEST REPORT

Test Report No.: 20171010651

Applicant: Hangzhou Shining3D Tech Co., Ltd

Manufacturer: Hangzhou Shining3D Tech Co., Ltd

Factory: /

Name of the sample: 3D Printer

Brand Name: Shining3D

Model: Einstart-c

Test Result: PASS

STATEMENT

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2. The test results presented in this report relate only to the sample and the item tested.
3. This test report is ineffective if it is without special inspection seal of the test laboratory.
4. If you have any question or comment, please bring them to our attention within 15 days, after you receive the test report. (Please lodge them to the assignment department if the task is consigned by the government.)
5. Please retake the samples in 60 days after you receive the report, the laboratory will dispose the samples after exceeding the time limit.
6. The test items in the report with accreditation symbols have already been accredited by related accreditation bodys(except for the items with *)

Date of test: 05/05/2017~22/5/2017

Tested by: Lu Jie

Lu Jie

Checked by: He Fei

He Fei

Approved by: Qin Feng

Qin Feng

Date: Jun. 29, 2017

Issued By: Jiangsu Electronic Information Product Quality Supervision & Inspection Institute

LAB Address: No.100 Jinshui Road, WuXi, Jiangsu, P.R.China



Test standard:

FCC 47 CFR, PART 15 SUBPART C Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

ANSCI C63.10(2013) American National Standard for Testing Unlicensed Wireless Devices

KDB 558074 D01 DTS Meas Guidance v03r05 Guidance for Performing Compliance Measurements on Digital Transmission Systems(DTS) Operating Under §15.247

Test item description:

Model/Type reference: Einstart-c

Ratings: AC 100V~240V, 50/60Hz

Possible test case verdicts:

- test case does not apply to the test object: N/A
- test object does meet the requirement: P (Pass)
- test object does not meet the requirement: F (Fail)

General product information:

EUT is a 3D Printer, model number is Einstart-c (FCC ID:2AMG4-EINSTART-C).The Highest Operation Frequency is 2462MHz. The main ports are as follows: USB port.



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1 General Description

1.1 Testing Facility

All measurement facilities used to collect the measurement data are located at
No.100 Jinshui Road, WuXi, Jiangsu, P.R.China

The FCC Site Registration No. is 399439

The IC Site Registration No. is 12843A-1

1.2 Applicant

Name: Hangzhou Shining3D Tech Co., Ltd

Address: No.1398 Xiangbin Rd., Wenyan St., Xiaoshan District, Hangzhou, P.R. China 311258

1.3 Manufacturer

Name: Hangzhou Shining3D Tech Co., Ltd

Address: No.1398 Xiangbin Rd., Wenyan St., Xiaoshan District, Hangzhou, P.R. China 311258

1.4 Product Feature of Equipment Under Test

Product Name: 3D Printer

Brand Name: Shining3D

Model No.: Einstart-c

FCC ID: 2AMG4-EINSTART-C

Note: The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications and user's manual.

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Standards Applicable for Testing

The EUT is a RF Product. According to the specification of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR, PART 15 SUBPART C

ANSCI C63.10(2013)

KDB 558074 D01 DTS Meas Guidance v03r05



2 Test Configuration of Equipment Under Test

Frequency range investigated:

Conducted Emission: 150kHz ~30MHz

Radiated Emission: 9kHz to the 10th harmonic of the highest fundamental frequency or to 40GHz, whichever is lower

Pre-Scan has been conducted to determine the worst-case mode across all the data rates and modulation modes under section 2.2.

Based on the worst configuration found above, different channels and data rates were selected for the final test as listed in section 2.3.

2.1 Carrier Frequency Channel

Frequency Band	Channel	Frequency (MHz)	Channel	Frequency (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437	-	-

2.2 Pre-Scanned RF Power

The manufacturer provides special test software named UTF-8 TeraTerm Pro to make the EUT transmit continuously with a constant duty cycle, control TX duty cycle >98% for TX test. Preliminary tests were performed in different data rate. Results with different data rate associated with the highest power were shown in the following tables.

IEEE 802.11b RF Power(dBm)				
Channel	Data Rate(Mbps)			
	1Mbps	2Mbps	5.5Mbps	11Mbps
1	18.2	18.1	17.3	17.5
6	17.9	--	--	--
11	18.0	--	--	--

IEEE 802.11g RF Power(dBm)								
Channel	Data Rate(Mbps)							
	6	9	12	18	24	36	48	54
1	20.5	20.4	20.1	20.1	20.3	19.7	20.1	20.2
6	20.2	--	--	--	--	--	--	--
11	19.9	--	--	--	--	--	--	--

IEEE 802.11n HT20 RF Power(dBm)								
Channel	MCS Index							
	MCS 0	MCS1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7
1	20.6	20.5	20.5	20.1	20.4	19.9	20.3	20.2
6	20.5	--	--	--	--	--	--	--
11	20.1	--	--	--	--	--	--	--

IEEE 802.11n HT40 RF Power(dBm)								
Channel	MCS Index							
	MCS 0	MCS1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7
3	20.5	19.5	19.6	19.5	19.6	20.2	20.2	19.0
6	20.7	--	--	--	--	--	--	--
9	20.1	--	--	--	--	--	--	--

2.3 Test Mode

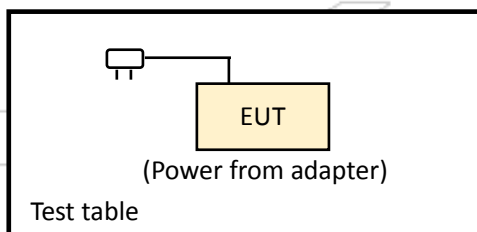
Based on the worst configuration found in the Preliminary tests, Final results of test modes, data rates and test channels are shown in the following table.

Test Cases			
Test Items	Mode	Data Rate	Test Channel
Maximum Peak Conducted Output Power	802.11b	1Mbps	1/6/11
	802.11g	6Mbps	1/6/11
	802.11n HT20	MCS0	1/6/11
	802.11n HT40	MCS0	3/6/9
Peak Power Spectral Density	802.11b	1Mbps	1/11
	802.11g	6Mbps	1/11
	802.11n HT20	MCS0	1/6/11
	802.11n HT40	MCS0	3/6/9
6dB and 99% Bandwidth Measurement	802.11b	1Mbps	1/6/11
	802.11g	6Mbps	1/6/11
	802.11n HT20	MCS0	1/6/11
	802.11n HT40	MCS0	3/6/9
Band-edge Measurement for RF Conducted Emission	802.11b	1Mbps	1/11
	802.11g	6Mbps	1/11
	802.11n HT20	MCS0	1/11
	802.11n HT40	MCS0	3/9
Radiated Band Edge	802.11b	1Mbps	1/11
	802.11g	6Mbps	1/11
	802.11n HT20	MCS0	1/11
	802.11n HT40	MCS0	3/9

Test Case			
Test Items	Mode	Data Rate	Test Channel
Spurious RF Conducted Emission	802.11b	1Mbps	1/6/11
	802.11g	6Mbps	1/6/11
	802.11n HT20	MCS0	1/6/11
	802.11n HT40	MCS0	3/6/9
Radiated Spurious Emission	802.11b	1Mbps	1/6/11
	802.11g	6Mbps	1/6/11
	802.11n HT20	MCS0	1/6/11
	802.11n HT40	MCS0	3/6/9
AC Conducted Emission Measurement	802.11b	1Mbps	1
Maximum Permissible Exposure(MPE)	802.11b	1Mbps	1
	802.11g	6Mbps	1
	802.11n HT20	MCS0	1
	802.11n HT40	MCS0	3

Note: For Radiated Emissions, By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

2.4 Connection Diagram of Test System



2.5 Test Equipment List

The EUT has been tested as an independent unit.

Instrument	Manufacturer	Model No.	S/N	Calibration Due	Calibration Interval
EMI Test Receiver	R&S	ESU	100186	2018.4.29	1 year
Broad-band antenna	ETS	3142C	00098968	2018.01.12	3 year
Horn antenna	Schwarz beck	BBHA9120D	9120D-513	2017.07.01	3 year
Horn antenna	TOYO Corporation	HAP06-18W	9120c-528	2018.12.26	3 year
Horn antenna	TOYO Corporation	HAP18-26W	00000032	2018.12.26	3 year
Loop antenna	R&S	HFH2-Z2	100256	2017.6.16	3 year

Instrument	Manufacturer	Model No.	S/N	Calibration Due	Calibration Interval
Preamplifier	Compliance Direction	PAP-1G18	8487	2018.4.29	1 year
Spectrum Analyzer	R&S	FSU43	100050	2018.3.6	1 year
EMI Test Receiver	R&S	ESCI7	100820	2018.2.24	1 year
EMI Test Receiver	R&S	ESCI	100065	2018.2.24	1 year
Artificial mains	R&S	ENV216	100497	2018.2.24	1 year
Shielded room	P.R.China	PB-4.95m×4m×3.3m	PB-05	2018.2.7	1 year
Shielded room	P.R.China	PB-7.7m×3.5m×3.3m	PB-06	2018.2.7	1 year
Shielded room	P.R.China	PB-4.4m×7.9m×2.8m	PB-04	2018.2.7	1 year
Semi-anechoic chamber	ETS	RFD-F/A-100	4400	2018.4.29	1 year
Semi-anechoic chamber	ETS	FACT-3	601	2018.2.24	1 year
Power Sensor	Keysight	U2021XA	MY54480008	2017.11.4	1 year
TOYO EMI SoftWare	TOYO Corporation	TOYO EMI Software	Ver 5.5.1	/	/

2.5 Support Equipment List

Equipment	Manufacturer	Model No.	S/N	NOTES
PC	HP Inc.	HSTNN-I62C-7	CNU0110JCY	Doc
AC Adapter	DELTA ELECTRONICS (JIANGSU) LTD.	PPP012D-S	WCNXF0AAR5K5QQ	/

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example: The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 6.3 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB). = 6.3 + 10 = 16.3(dB)

3 Summary of Test Result

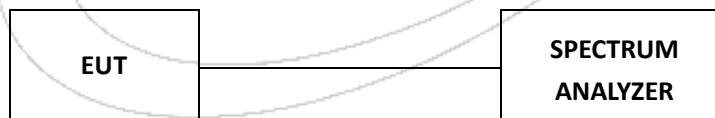
The EUT has been tested according to the following specifications:

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.247(b)(3)	Maximum Peak Conducted Output Power	Compliance
§15.247(e)	Peak Power Spectral Density	Compliance
§15.247(a)(2)	6dB and 99% Bandwidth Measurement	Compliance
§15.247(d)	Band-edge Measurement for RF Conducted Emission	Compliance
§15.247(d)	Radiated Band Edge	Compliance
§15.247(d)	Spurious RF Conducted Emission	Compliance
§15.247(d)	Radiated Spurious Emission	Compliance
§15.207(a)	AC Conducted Emission Measurement	Compliance
§15.247(i), §1.1307(b)(1)& §2.1091	Maximum Permissible Exposure(MPE)	Compliance

4 Test Result

4.1Duty Cycle

TEST CONFIGURATION



TEST PROCEDURE

- A diode detector and an oscilloscope that together have sufficiently short response time to permit accurate measurements of the on and off times of the transmitted signal.
- The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW $\geq$ OBW if possible; otherwise, set RBW to the largest available value. Set VBW $\geq$ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are $> 50/T$ and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if $T \leq 16.7$ microseconds.)

LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

Preferably, all measurements of maximum conducted (average) output power will be performed with the



EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%).

When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternate procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle. Within this guidance document, the duty cycle refers to the fraction of time over which the transmitter is on and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than ± 2 percent, otherwise the duty cycle is considered to be non-constant.

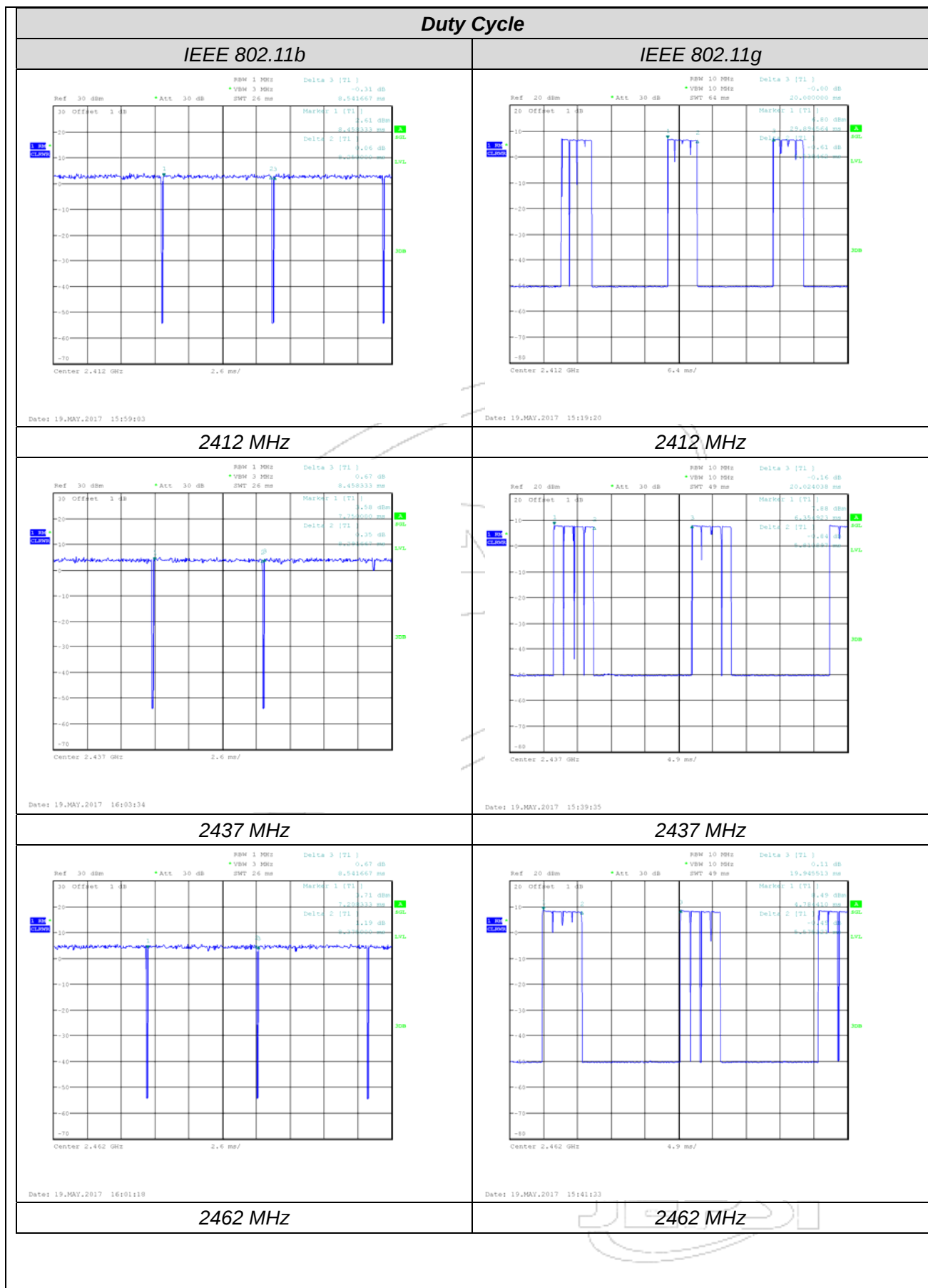
TEST RESULTS

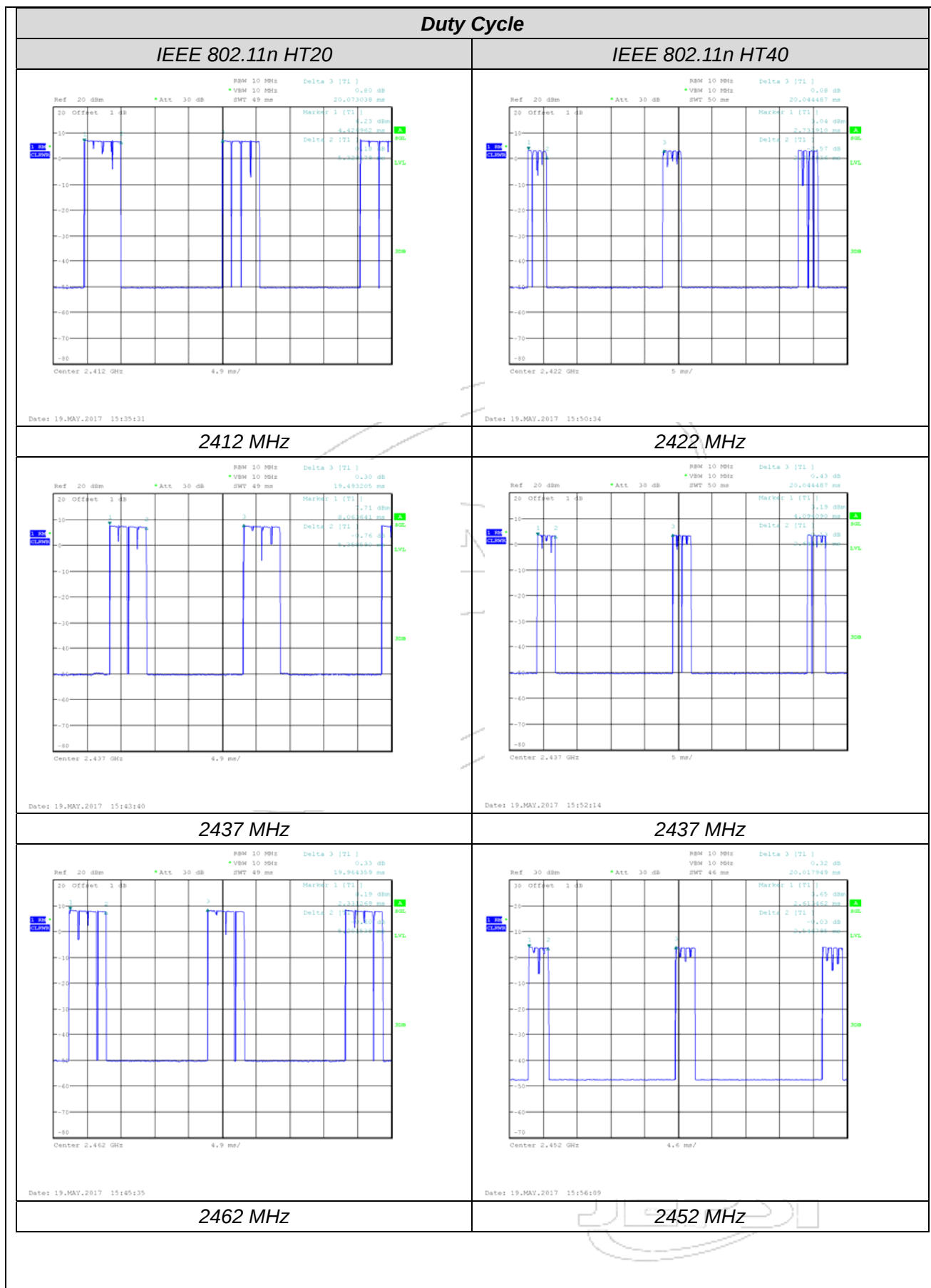
The Manufacturer provides test software to enter engineer test mode;

Test Mode	Channel	Frequency (MHz)	Duty Cycle	Duty Cycle Factor (dB)
IEEE 802.11 b	1	2412	96.59%	0.2
	6	2437	98.03%	0.1
	11	2462	98.05%	0.1
IEEE 802.11 g	1	2412	27.69%	5.6
	6	2437	29.02%	5.4
	11	2462	27.95%	5.5
IEEE 802.11 n HT20	1	2412	26.54%	5.8
	6	2437	27.49%	5.6
	11	2462	26.05%	5.8
IEEE 802.11 n HT40	3	2422	13.58%	8.7
	6	2437	13.18%	8.8
	9	2452	12.72%	9.0

Note:

1. Duty Cycle Factor = $10 \cdot \log (1/\text{Duty Cycle})$





4.2 Antenna Requirement

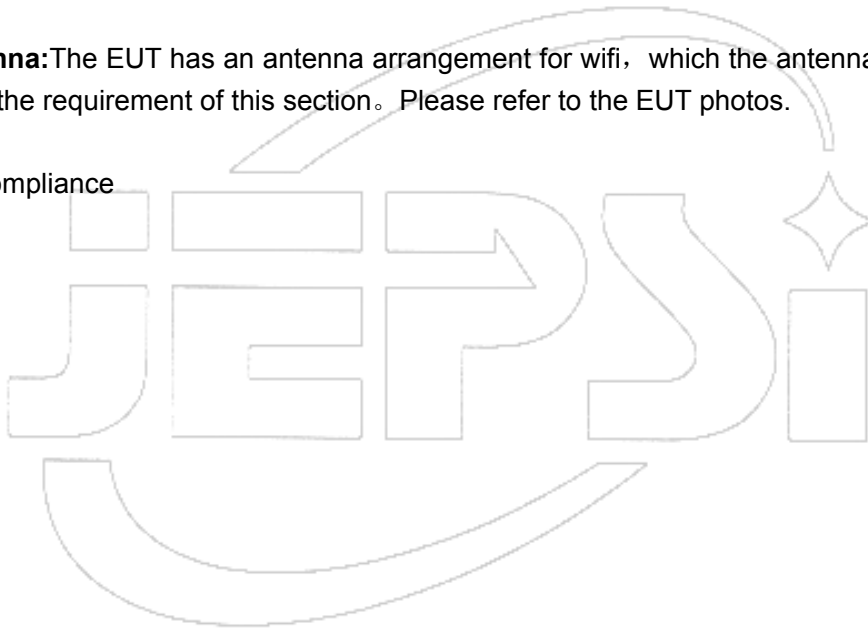
LIMIT

For intentional device, according to FCC 47 CFR Section 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 the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

And according to FCC 47 CFR Section 15.247 (c), if 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 6dBi.

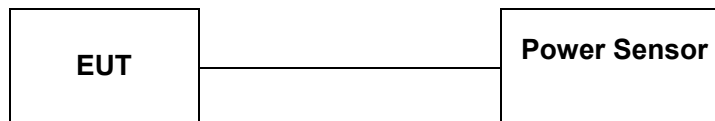
EUT Antenna: The EUT has an antenna arrangement for wifi, which the antenna maximum gain is 3.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance



4.3 Maximum Peak Conducted Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to KDB558074 D01 DTS Meas Guidance v03r05:

PKPM1 Peak power meter method: The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Result
IEEE 802.11b	1	2412	18.2	30	Compliance
	6	2437	17.9		
	11	2462	18.0		
IEEE 802.11g	1	2412	20.5	30	Compliance
	6	2437	20.2		
	11	2462	19.9		
IEEE 802.11n HT20	1	2412	20.6	30	Compliance
	6	2437	20.5		
	11	2462	20.1		
IEEE 802.11n HT40	3	2422	20.5	30	Compliance
	6	2437	20.7		
	9	2452	20.1		

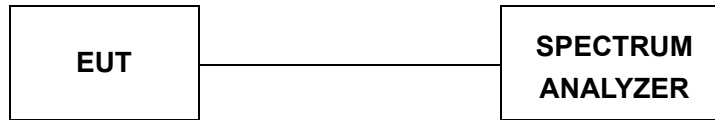
Note:

1. Measured output power at difference data rate for each mode and recorded worst case for each mode.
2. Test results including cable loss;



4.4 Peak Power Spectral Density

TEST CONFIGURATION



TEST PROCEDURE

According to KDB558074 D01 DTS Meas Guidance v03r05:

Method PKPSD (peak PSD): This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \text{ RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

LIMIT

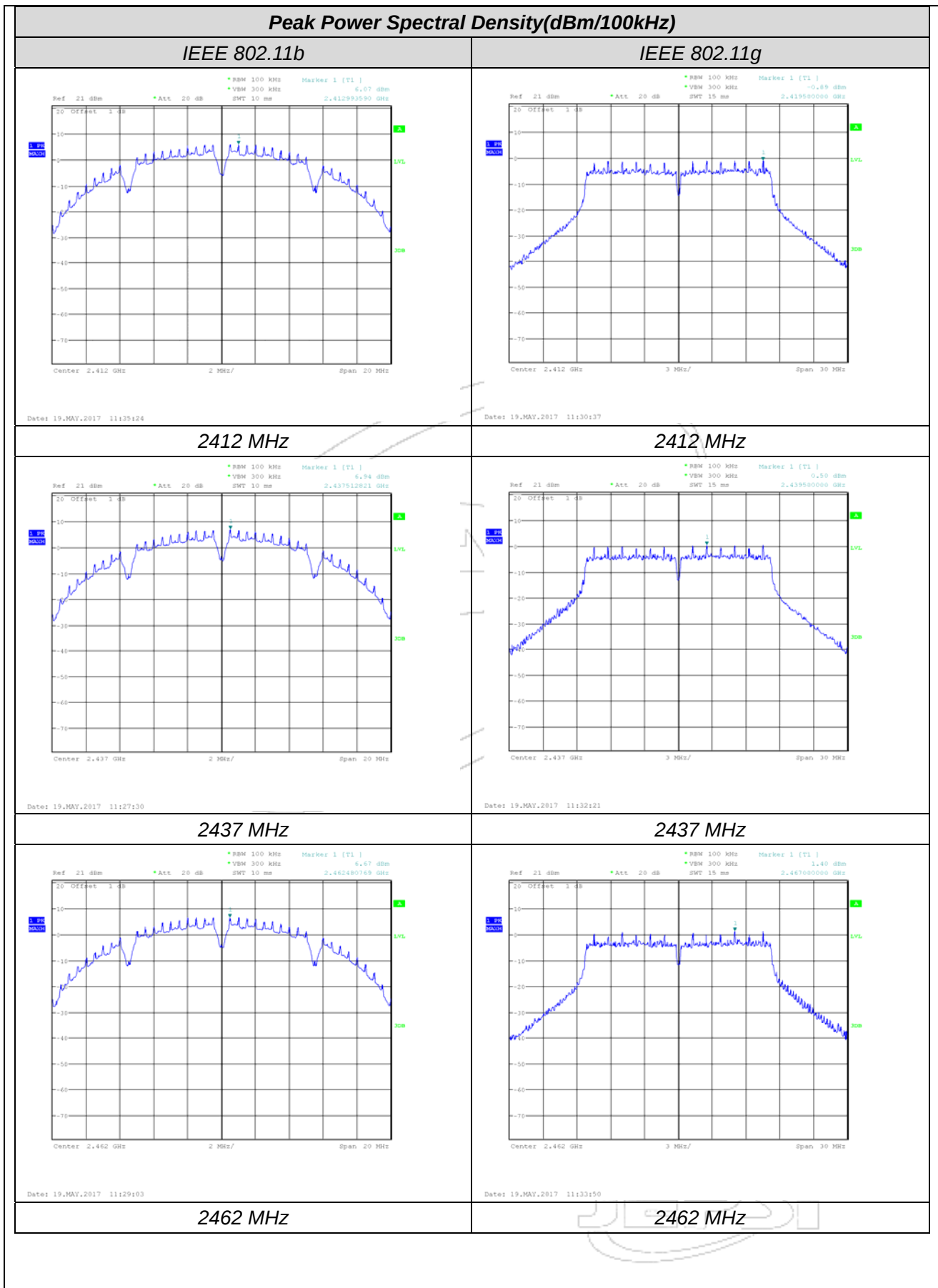
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Measured Peak Power Spectral Density (dBm/100kHz)	Limits (dBm/3kHz)	Result
IEEE 802.11b	1	2412	6.07	8	Compliance
	6	2437	6.94		
	11	2462	6.67		
IEEE 802.11g	1	2412	-0.89	8	Compliance
	6	2437	-0.50		
	11	2462	1.40		

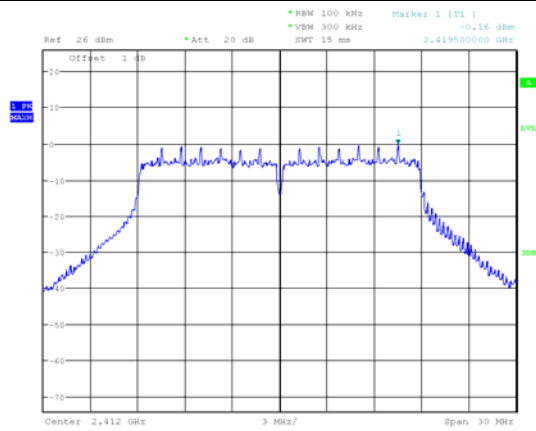
Test Mode	Channel	Frequency (MHz)	Measured Peak Power Spectral Density (dBm/100kHz)	Limits (dBm/3kHz)	Result
IEEE 802.11n HT20	1	2412	-0.16	8	Compliance
	6	2437	0.42		
	11	2462	1.27		
IEEE 802.11n HT40	3	2422	-3.44	8	Compliance
	6	2437	-3.04		
	9	2452	-2.66		



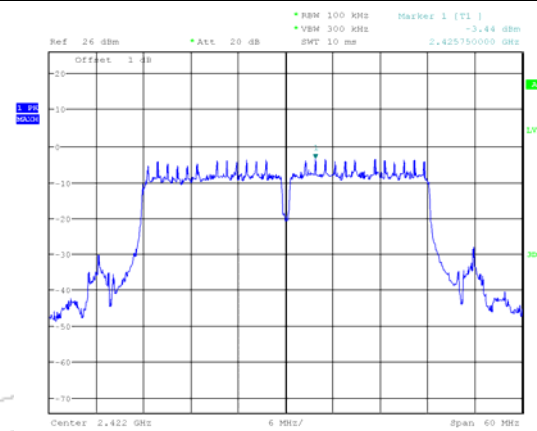


Peak Power Spectral Density

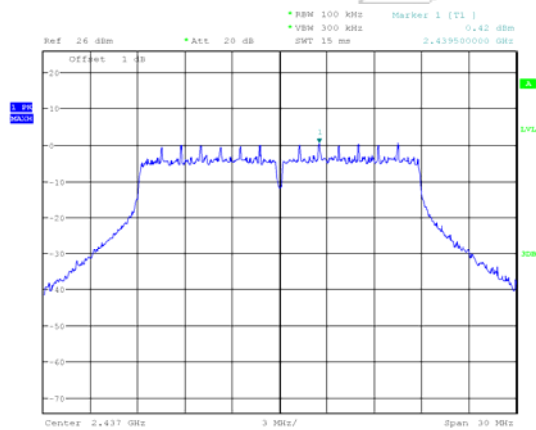
IEEE 802.11 n HT20



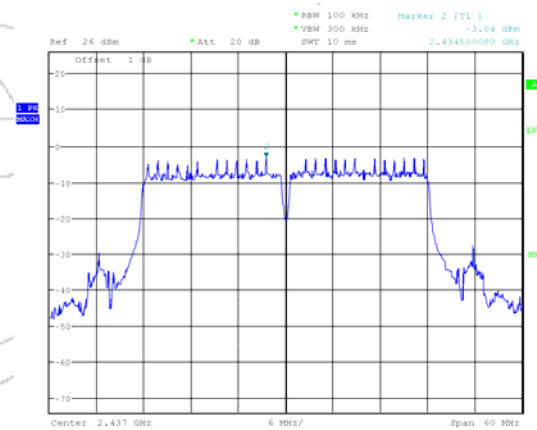
IEEE 802.11 n HT40



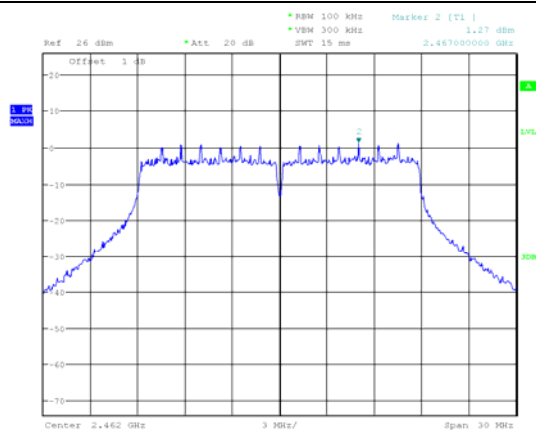
2412 MHz



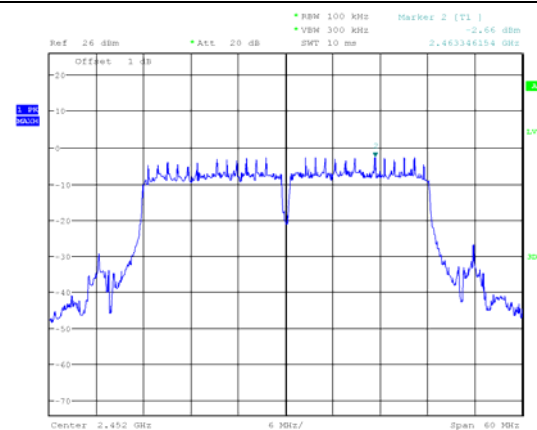
2422 MHz



2437 MHz



2437 MHz

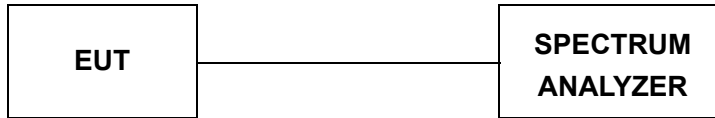


2462 MHz

2452 MHz

4.5 6dB Bandwidth Measurement

TEST CONFIGURATION



TEST PROCEDURE

According to KDB558074 D01 DTS Meas Guidance v03r05:

DTS Bandwidth Option1:

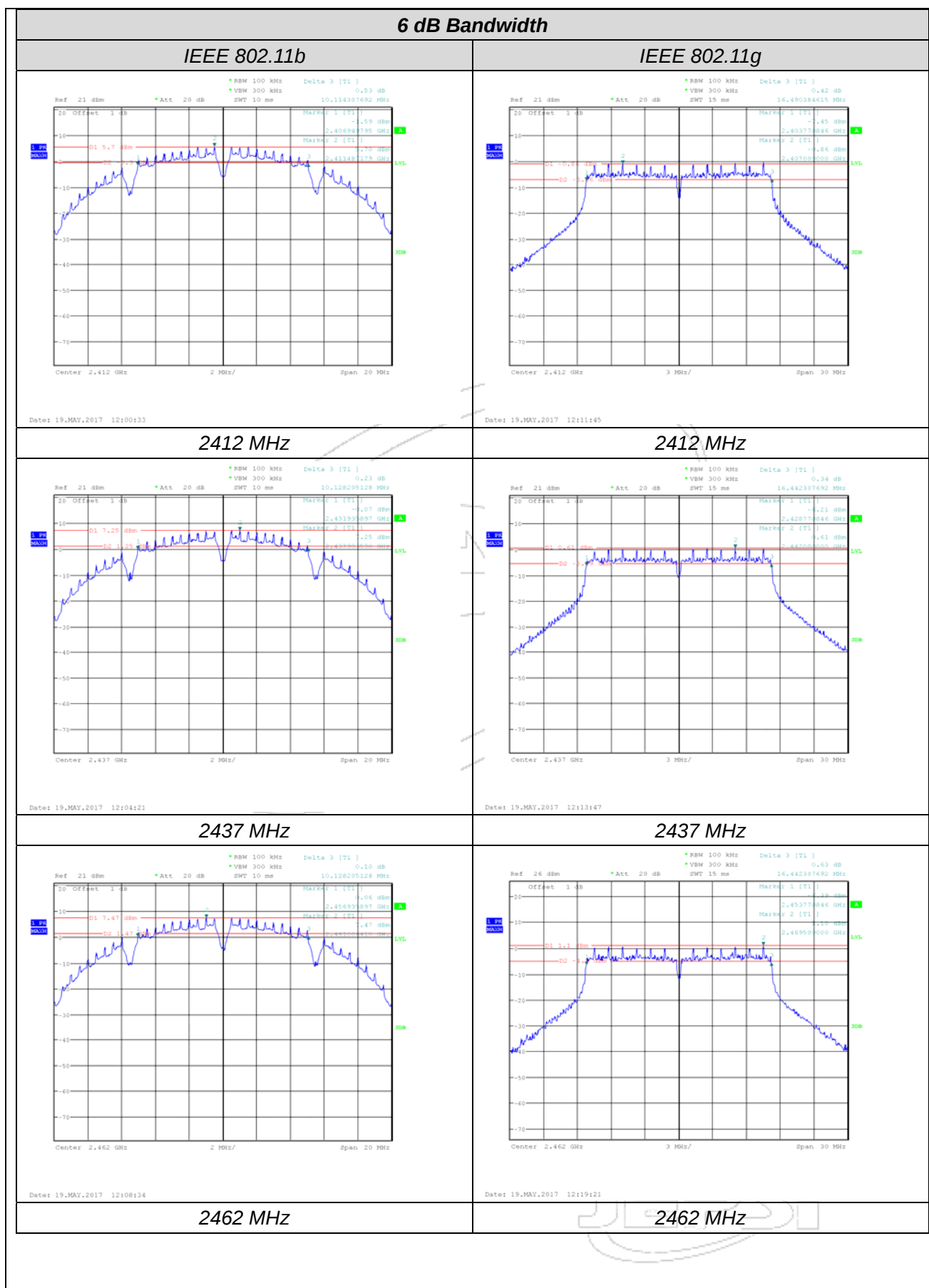
- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) ≥ 3 RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

LIMIT

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

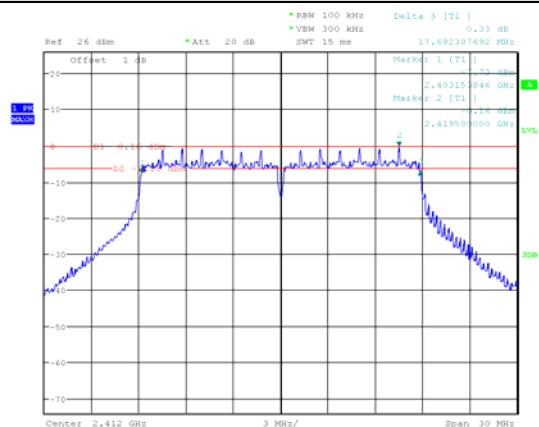
TEST RESULTS

Test Mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (MHz)	Result
IEEE 802.11b	1	2412	10.11	≥ 0.5	Compliance
	6	2437	10.13		
	11	2462	10.13		
IEEE 802.11g	1	2412	16.49	≥ 0.5	Compliance
	6	2437	16.44		
	11	2462	16.44		
IEEE 802.11n HT20	1	2412	17.69	≥ 0.5	Compliance
	6	2437	17.69		
	11	2462	17.69		
IEEE 802.11n HT40	3	2422	36.15	≥ 0.5	Compliance
	6	2437	35.87		
	9	2452	35.77		



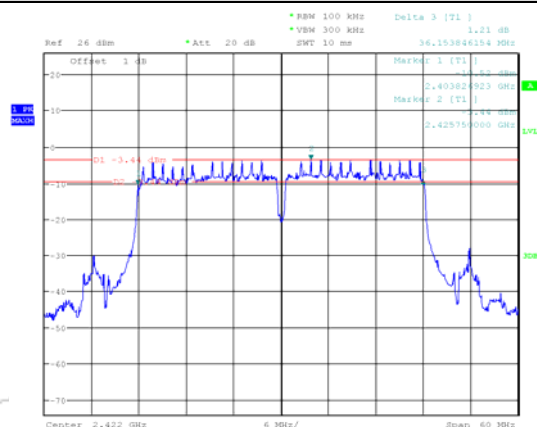
6 dB Bandwidth

IEEE 802.11n HT20



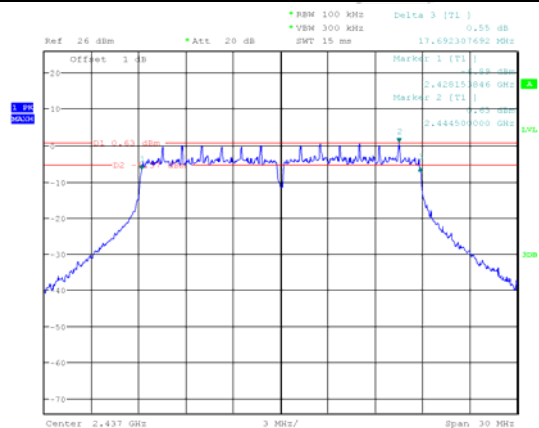
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IEEE 802.11n HT40



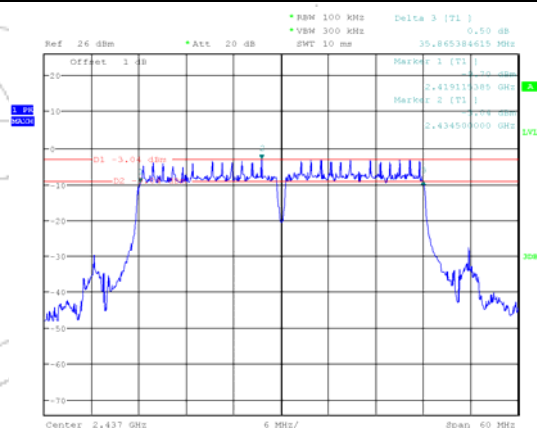
Date: 19.MAY.2017 12:36:32

2412 MHz



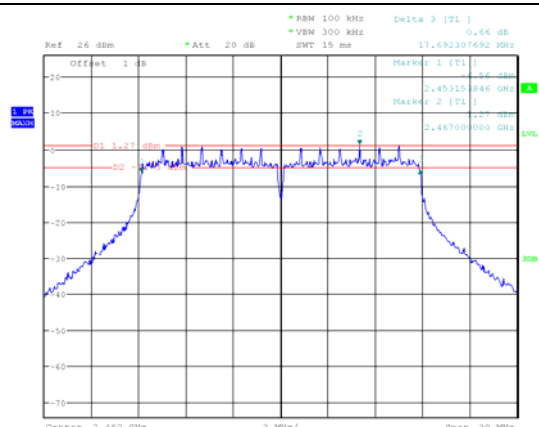
Date: 19.MAY.2017 12:28:08

2422 MHz



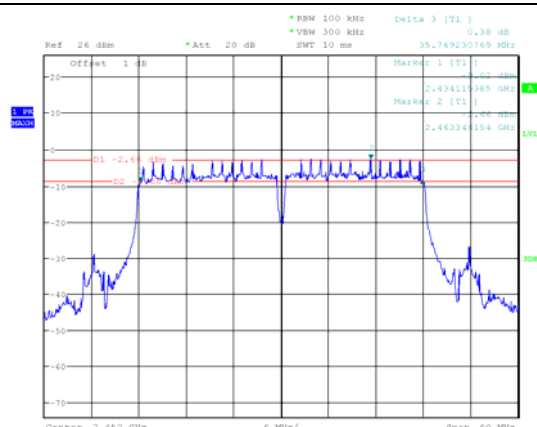
Date: 19.MAY.2017 12:38:37

2437 MHz



Date: 19.MAY.2017 12:30:19

2437 MHz



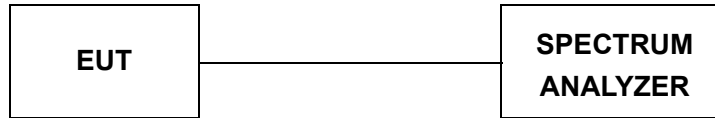
Date: 19.MAY.2017 12:45:29

2462 MHz

2452 MHz

4.6 Band-edge Measurements for RF Conducted Emissions

TEST CONFIGURATION



TEST PROCEDURE

According to KDB558074 D01 DTS Meas Guidance v03r05:

1. Set RBW to 100kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
2. Detector = Peak; Sweep time = auto couple; Trace mode = max hold;
3. Allow trace to fully stabilize, then 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.
4. Repeat above procedures until all measured frequencies were complete.

LIMIT

Below -20dB of the highest emission level in operating band.

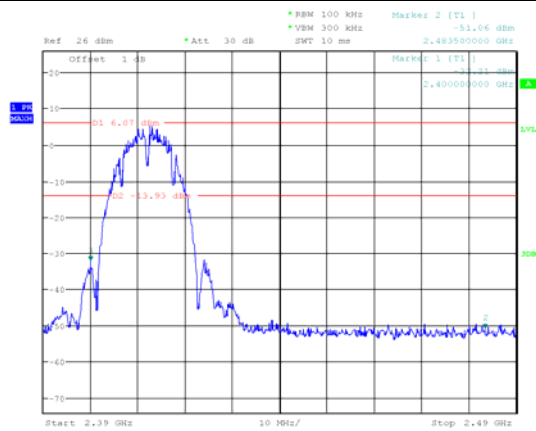
TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Conducted Band-edge Emission (dBc)	Limits (dBc)	Result
IEEE 802.11b	1	2412	<-20dBc	-20	Compliance
	11	2462	<-20dBc	-20	
IEEE 802.11g	1	2412	<-20dBc	-20	Compliance
	11	2462	<-20dBc	-20	
IEEE 802.11n HT20	1	2412	<-20dBc	-20	Compliance
	11	2462	<-20dBc	-20	
IEEE 802.11n HT40	3	2422	<-20dBc	-20	Compliance
	9	2452	<-20dBc	-20	

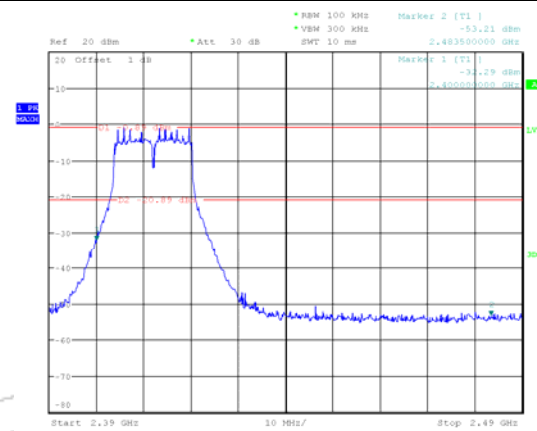


Band-edge Measurements for RF Conducted Emissions

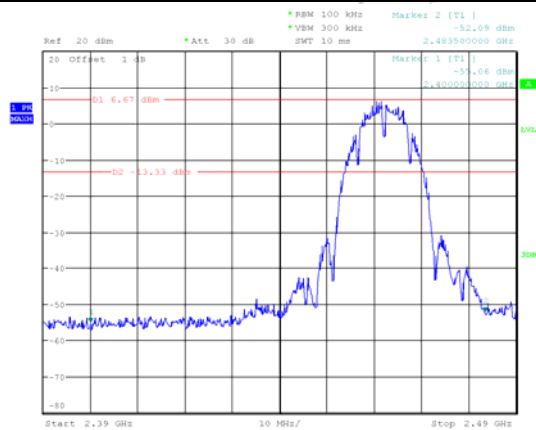
IEEE 802.11b



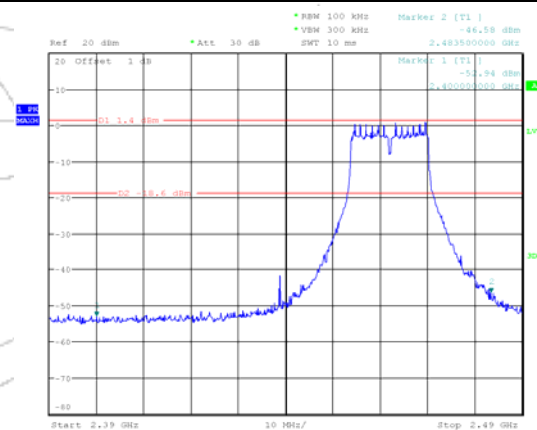
IEEE 802.11g



2412 MHz



2412 MHz

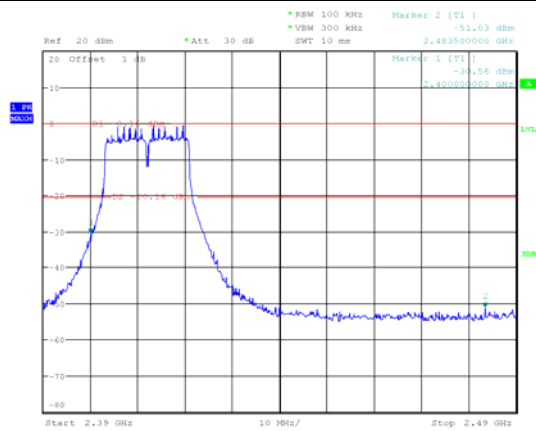


2462 MHz

2462 MHz

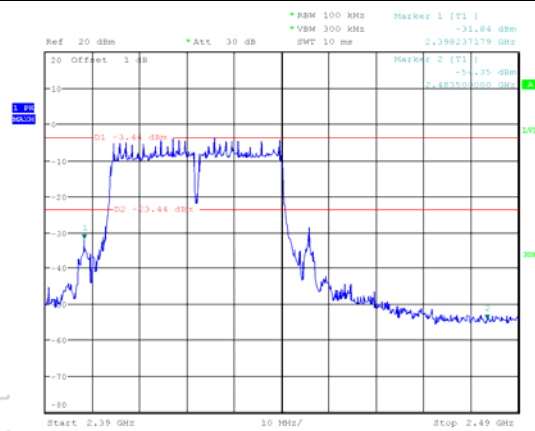
Band-edge Measurements for RF Conducted Emissions

IEEE 802.11n HT20



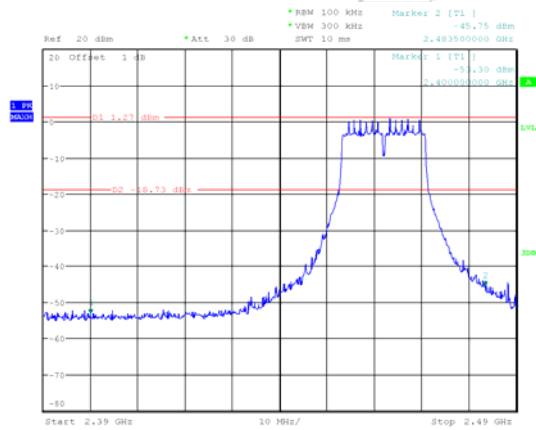
Date: 19.MAY.2017 14:19:09

IEEE 802.11n HT40



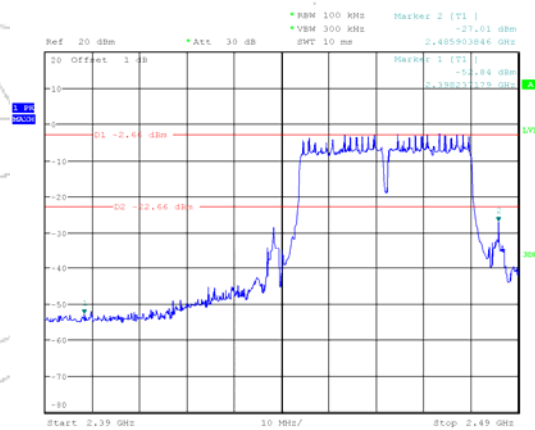
Date: 19.MAY.2017 14:26:09

2412 MHz



Date: 19.MAY.2017 14:22:13

2422 MHz



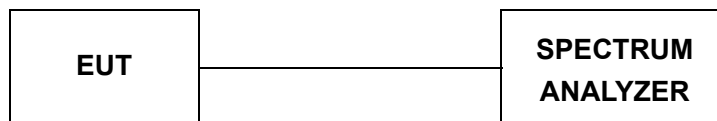
Date: 19.MAY.2017 14:29:13

2462 MHz

2452 MHz

4.7 Radiated Band Edge

TEST CONFIGURATION



TEST PROCEDURE

According to KDB558074 D01 DTS Meas Guidance v03r05:

Antenna-port conducted measurements: Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.

1. Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 12.2.2, 12.2.3, and 12.2.4 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
2. Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)

Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).

3. For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
4. Convert the resultant EIRP level to an equivalent electric field strength using the following relationship: $E = \text{EIRP} - 20\log D + 104.8$

Where:

E = electric field strength in dB μ V/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

5. Compare the resultant electric field strength level to the applicable regulatory limit.

LIMIT

Radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply With the radiated emission limits specified in § 15.209(a)



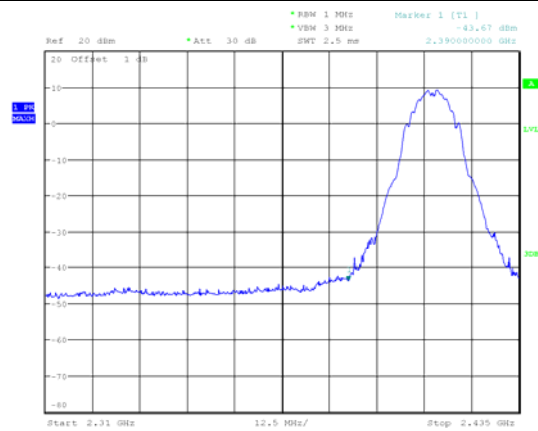
TEST RESULTS

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	Duty Cycle Factor (dB)	Covert Radiated E Level At 3m (dBuV/m)	Detector	Limit (dBuV/m)
Test Mode: IEEE 802.11b							
1	2390.0	-43.7	3.0	0.0	54.6	Peak	74.0
1	2390.0	-54.3	3.0	0.0	44.0	AV	54.0
11	2483.5	-43.0	3.0	0.0	55.3	Peak	74.0
11	2483.5	-52.5	3.0	0.0	45.8	AV	54.0
Result: Compliance							
Test Mode: IEEE 802.11g							
1	2390.0	-43.0	3.0	5.6	55.3	Peak	74.0
1	2390.0	-52.9	3.0	5.6	51.0	AV	54.0
11	2483.5	-31.6	3.0	5.5	66.7	Peak	74.0
11	2483.5	-52.2	3.0	5.5	51.6	AV	54.0
Result: Compliance							
Test Mode: IEEE 802.11n HT20							
1	2390.0	-40.4	3.0	5.8	57.9	Peak	74.0
1	2390.0	-54.5	3.0	5.8	49.6	AV	54.0
11	2483.5	-29.9	3.0	5.8	68.4	Peak	74.0
11	2483.5	-53.7	3.0	5.8	50.4	AV	54.0
Result: Compliance							
Test Mode: IEEE 802.11n HT40							
3	2390.0	-39.7	3.0	8.7	58.6	Peak	74.0
3	2390.0	-55.4	3.0	8.7	51.6	AV	54.0
9	2483.5	-31.3	3.0	9.0	67.0	Peak	74.0
9	2483.5	-53.9	3.0	9.0	53.4	AV	54.0
Result: Compliance							

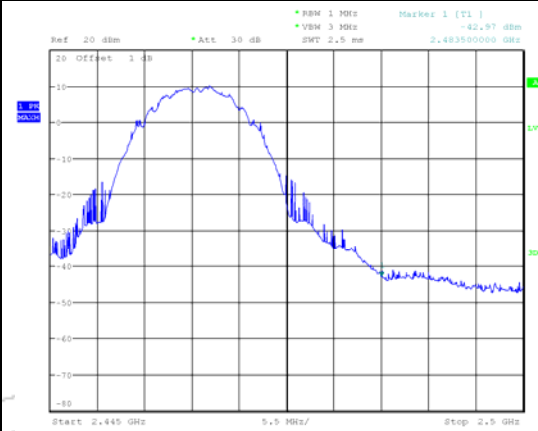


Radiated Band-edge

IEEE 802.11b

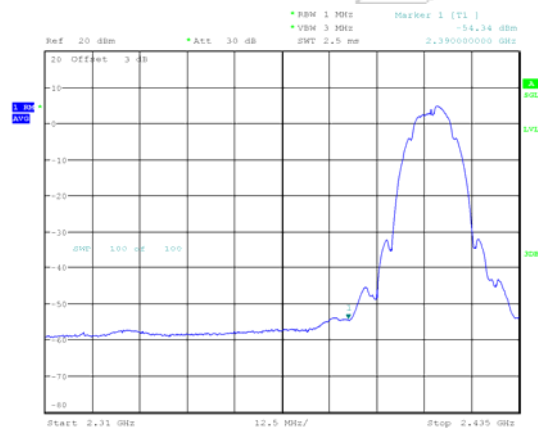


Date: 19.MAY.2017 14:41:53



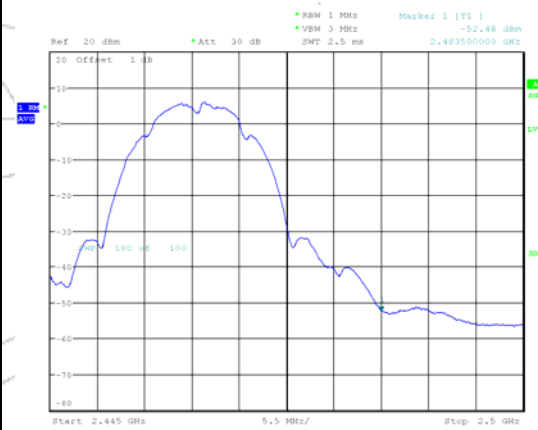
Date: 19.MAY.2017 15:07:12

2412 MHz – Peak



Date: 19.MAY.2017 14:48:22

2462 MHz – Peak



Date: 19.MAY.2017 15:06:38

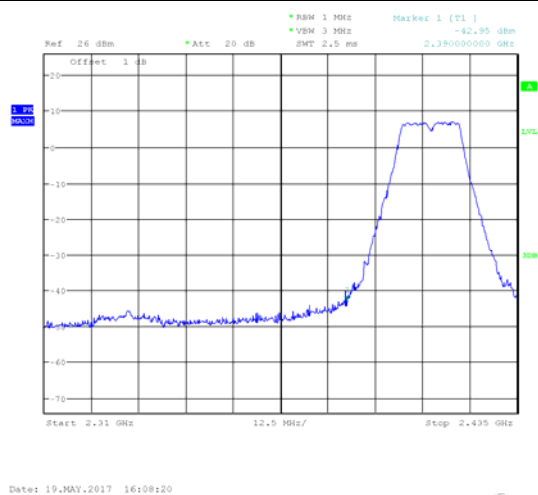
2412 MHz – Average

2462 MHz – Average

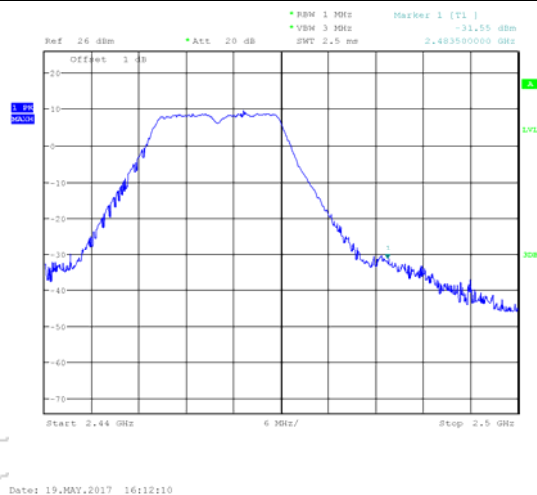


Radiated Band-edge

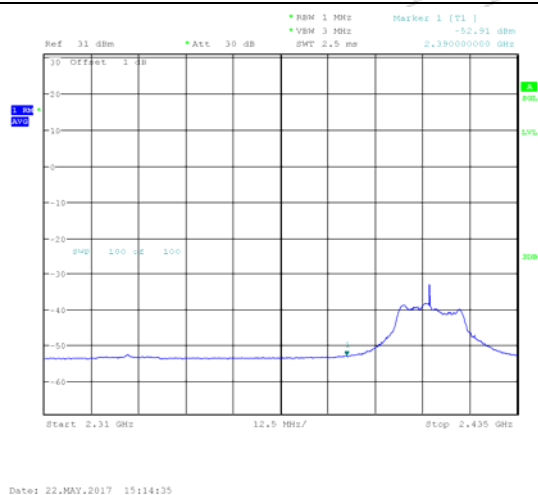
IEEE 802.11g



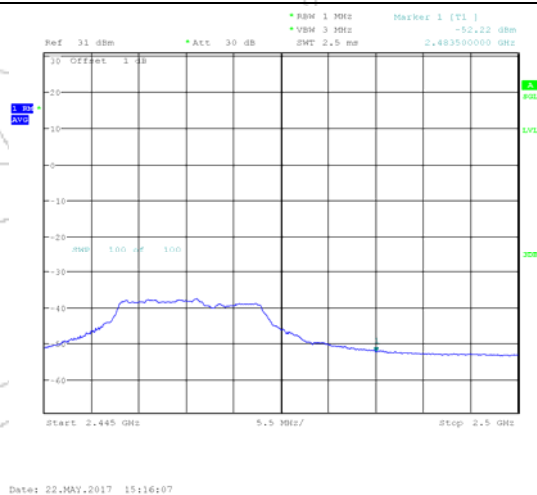
2412 MHz – Peak



2462 MHz – Peak



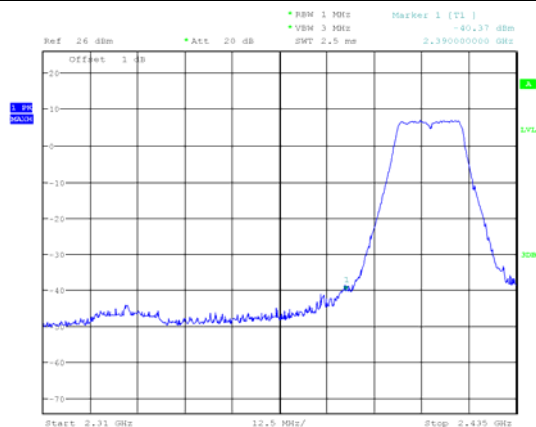
2412 MHz – Average



2462 MHz – Average

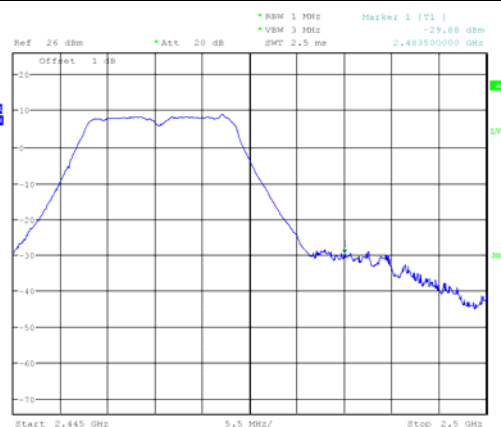
Radiated Band-edge

IEEE 802.11n HT20



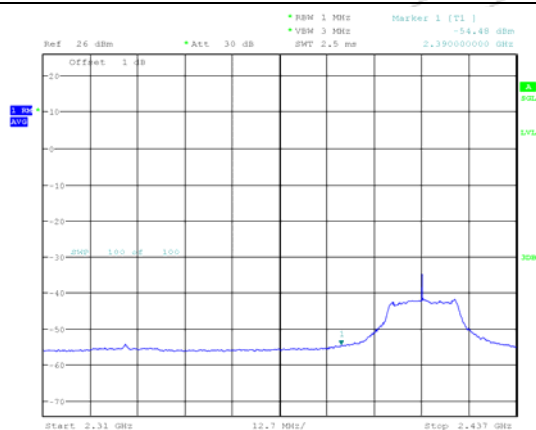
Date: 19.MAY.2017 16:15:47

2412 MHz – Peak



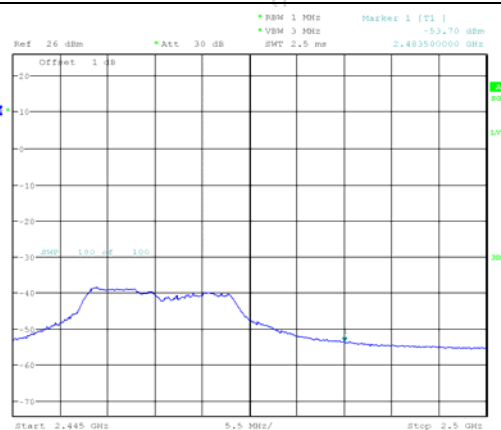
Date: 19.MAY.2017 16:19:49

2462 MHz – Peak



Date: 22.MAY.2017 15:19:29

2412 MHz – Average

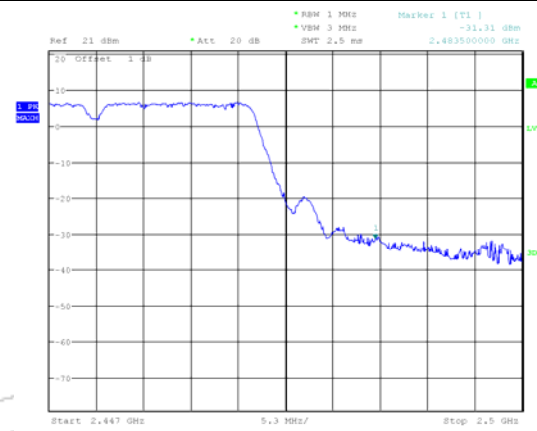
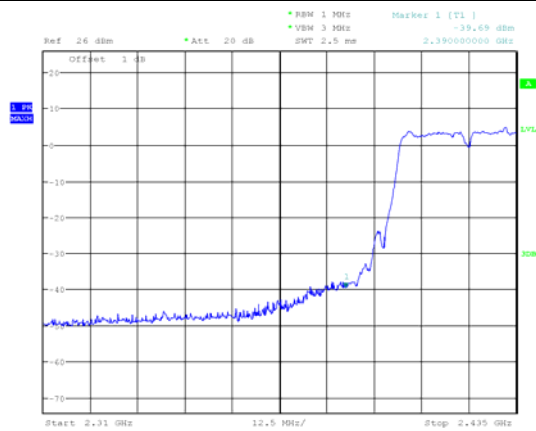


Date: 22.MAY.2017 15:19:10

2462 MHz – Average

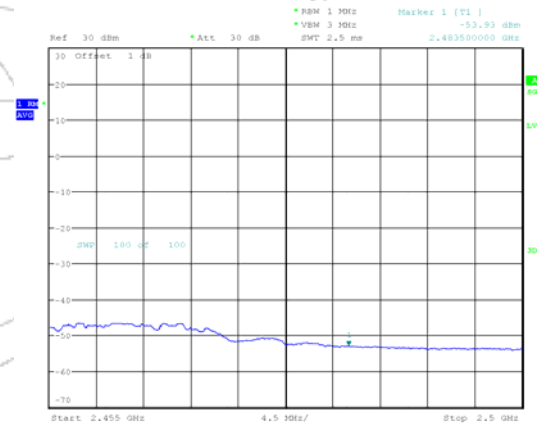
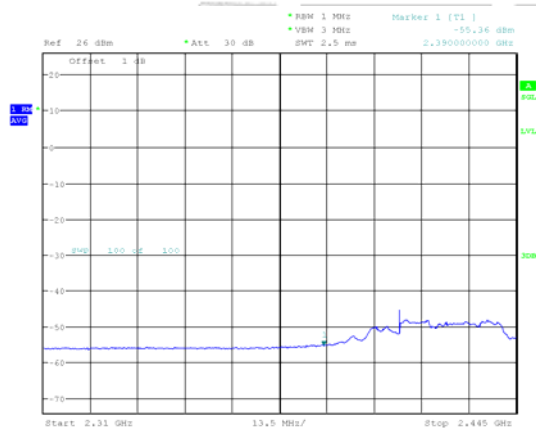
Radiated Band-edge

IEEE 802.11n HT40



2422 MHz – Peak

2452 MHz – Peak



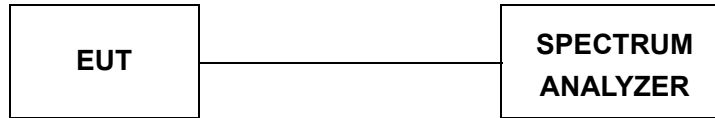
2422 MHz – Average

2452 MHz – Average



4.8 Spurious RF Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

According to KDB558074 D01 DTS Meas Guidance v03r05:

1. Set RBW to 100kHz and VBW of spectrum analyzer to 300 kHz with a measurement frequency range from 30MHz to 25GHz.
2. Detector = Peak; Sweep time = auto couple; Trace mode = max hold;
3. Allow trace to fully stabilize, then 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.
4. Repeat above procedures until all measured frequencies were complete.

LIMIT

Below -20dB of the highest emission level in operating band.

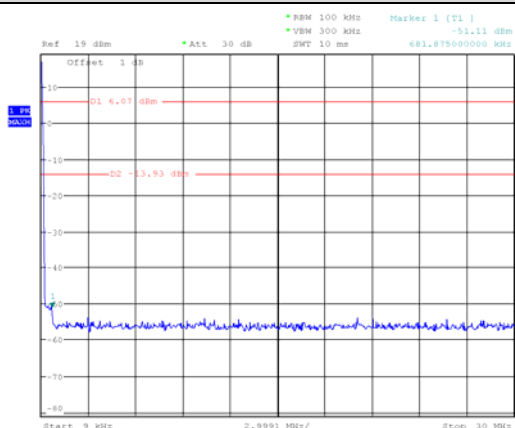
TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Spurious RF Conducted Emission (dBc)	Limits (dBc)	Result
IEEE 802.11b	1	2412	<-20dBc	-20	Compliance
	6	2437	<-20dBc	-20	
	11	2462	<-20dBc	-20	
IEEE 802.11g	1	2412	<-20dBc	-20	Compliance
	6	2437	<-20dBc	-20	
	11	2462	<-20dBc	-20	
IEEE 802.11n HT20	1	2412	<-20dBc	-20	Compliance
	6	2437	<-20dBc	-20	
	11	2462	<-20dBc	-20	
IEEE 802.11n HT40	3	2422	<-20dBc	-20	Compliance
	6	2437	<-20dBc	-20	
	9	2452	<-20dBc	-20	



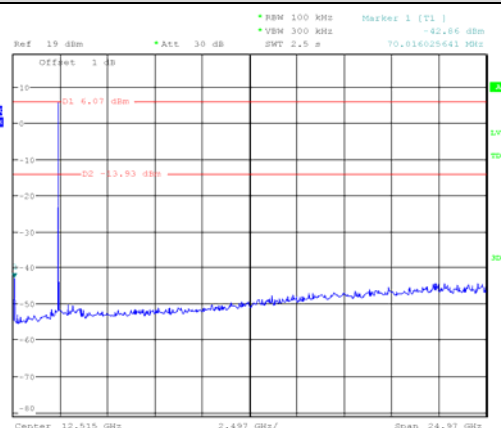
Spurious RF Conducted Emission

IEEE 802.11b 2412MHz



Date: 19.MAY.2017 16:33:58

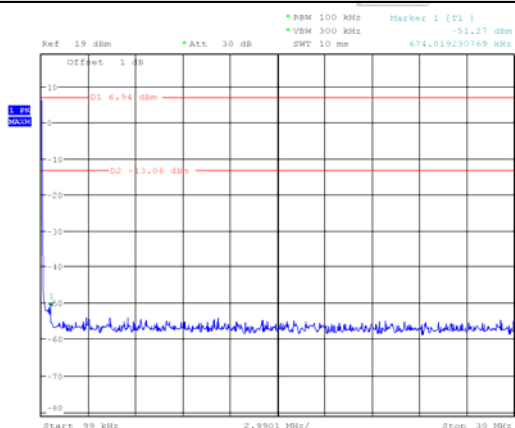
9kHz – 30MHz



Date: 19.MAY.2017 16:40:07

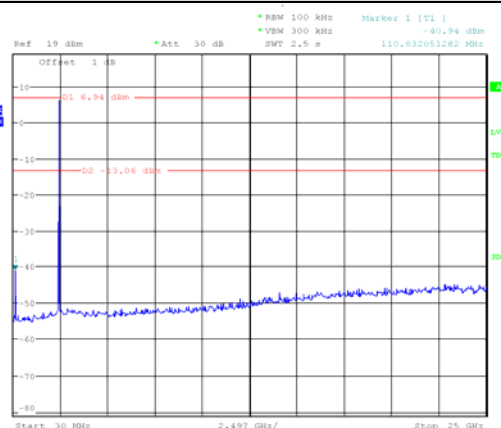
30MHz – 25GHz

IEEE 802.11b 2437 MHz



Date: 19.MAY.2017 16:44:16

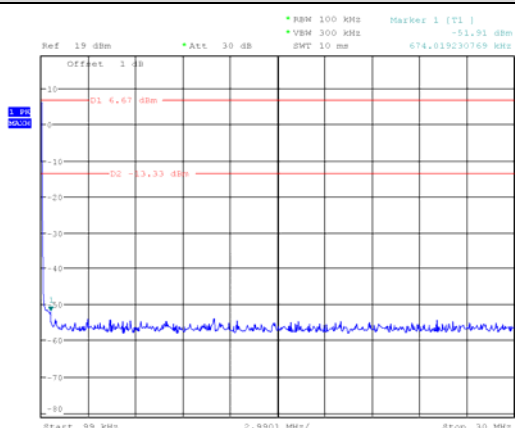
9kHz – 30MHz



Date: 19.MAY.2017 16:43:39

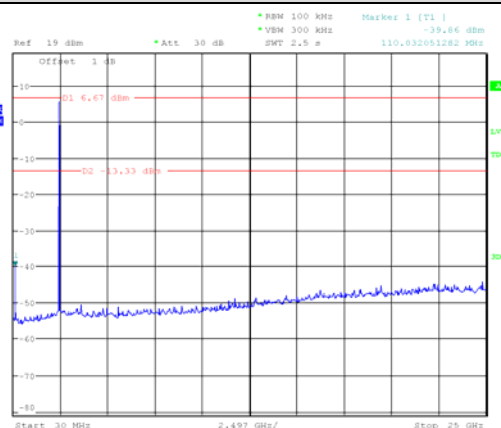
30MHz – 25GHz

IEEE 802.11b 2462 MHz



Date: 19.MAY.2017 16:49:53

9kHz – 30MHz

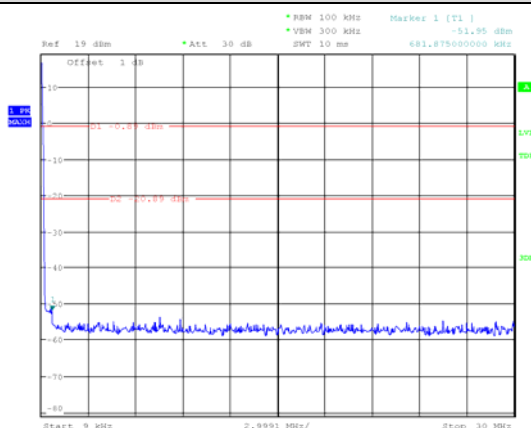


Date: 19.MAY.2017 16:49:31

30MHz – 25GHz

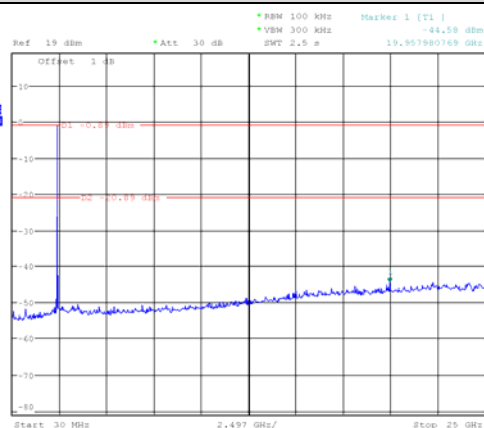
Spurious RF Conducted Emission

IEEE 802.11g 2412 MHz



Date: 19.MAY.2017 16:52:10

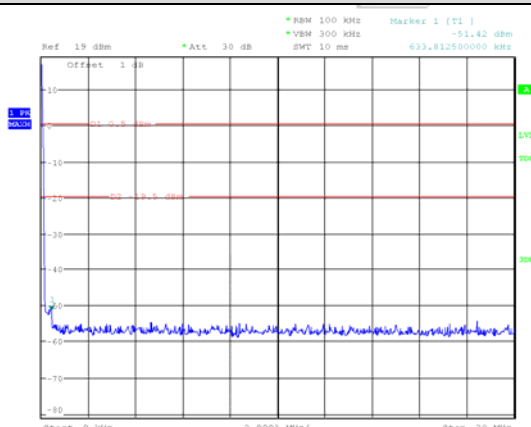
9kHz – 30MHz



Date: 19.MAY.2017 16:51:44

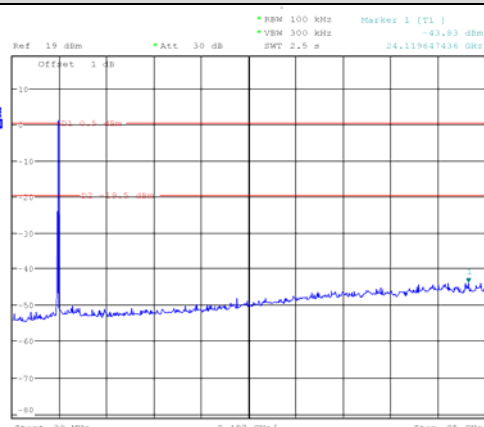
30MHz – 25GHz

IEEE 802.11g 2437 MHz



Date: 19.MAY.2017 16:53:22

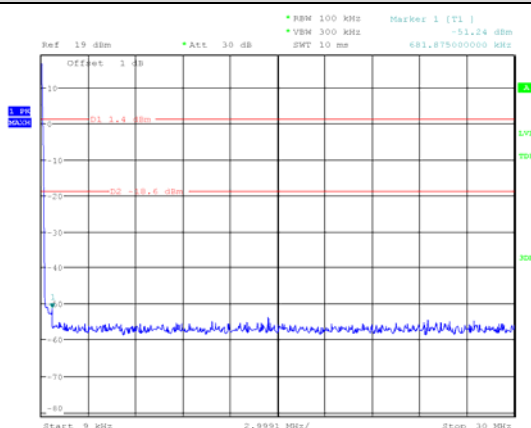
9kHz – 30MHz



Date: 19.MAY.2017 16:56:04

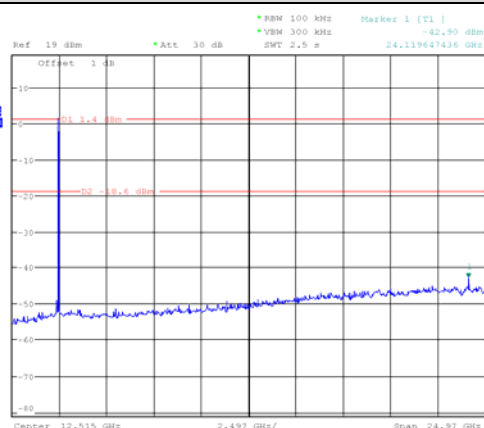
30MHz – 25GHz

IEEE 802.11g 2462 MHz



Date: 19.MAY.2017 16:58:05

9kHz – 30MHz

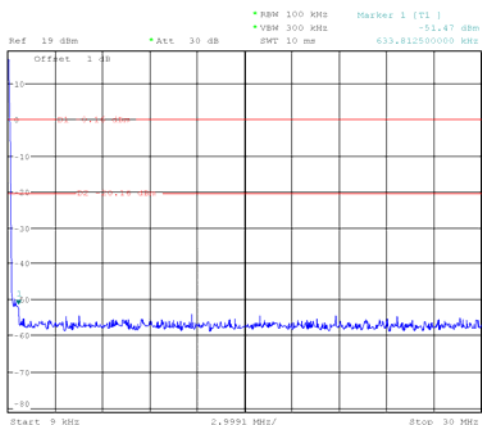


Date: 19.MAY.2017 16:57:32

30MHz – 25GHz

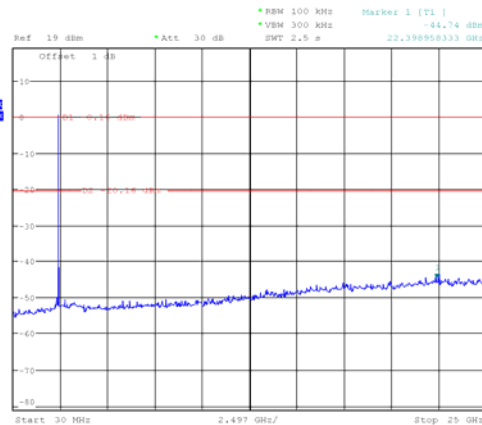
Spurious RF Conducted Emissions

IEEE 802.11n HT20 2412 MHz



Date: 19.MAY.2017 17:02:02

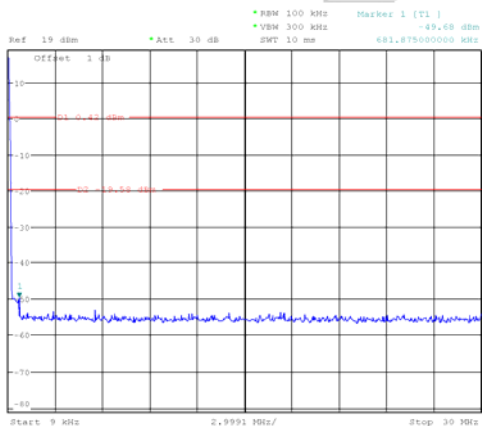
9kHz – 30MHz



Date: 19.MAY.2017 17:01:32

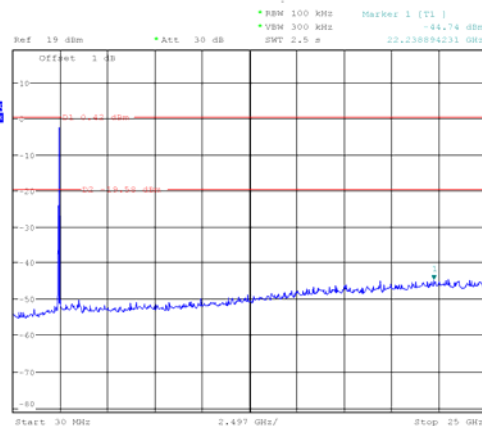
30MHz – 25GHz

IEEE 802.11n HT20 2437 MHz



Date: 19.MAY.2017 17:08:11

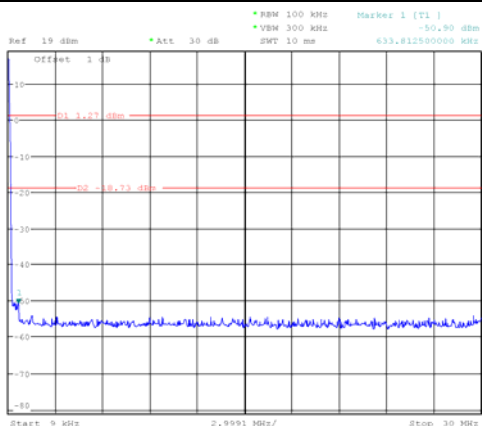
9kHz – 30MHz



Date: 19.MAY.2017 17:09:19

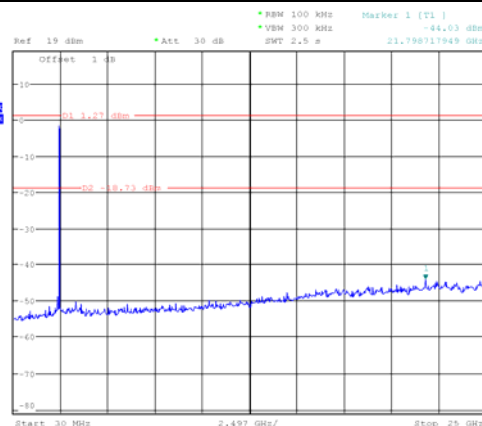
30MHz – 25GHz

IEEE 802.11n HT20 2462 MHz



Date: 19.MAY.2017 18:23:26

9kHz – 30MHz

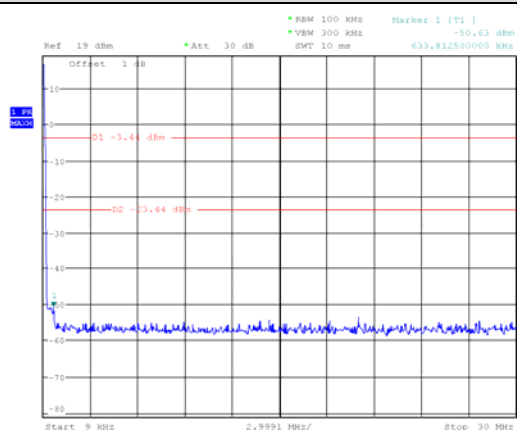


Date: 19.MAY.2017 17:10:43

30MHz – 25GHz

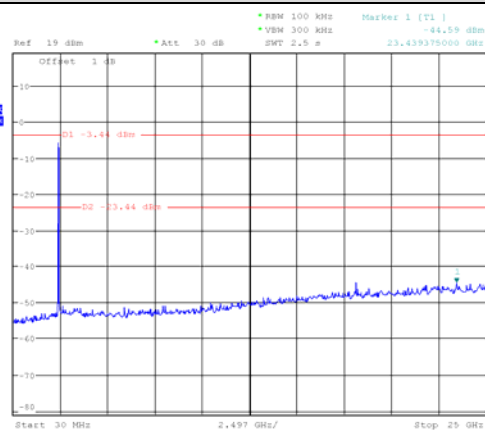
Spurious RF Conducted Emissions

IEEE 802.11n HT40 2422 MHz



Date: 19.MAY.2017 17:12:26

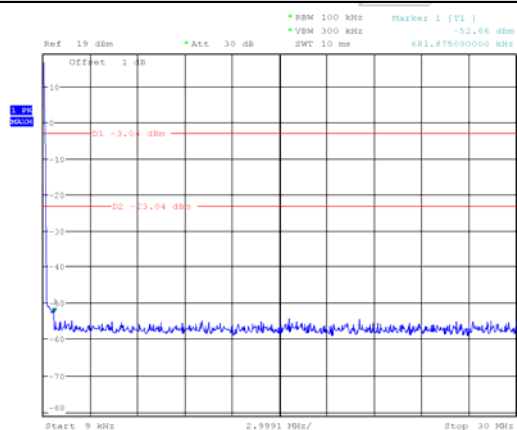
9kHz – 30MHz



Date: 19.MAY.2017 17:12:55

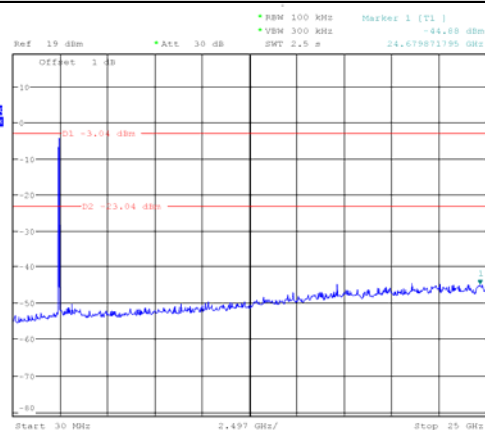
30MHz – 25GHz

IEEE 802.11n HT40 2437 MHz



Date: 19.MAY.2017 17:19:27

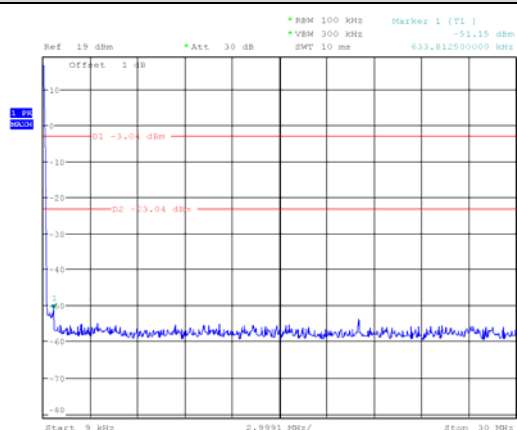
9kHz – 30MHz



Date: 19.MAY.2017 17:19:03

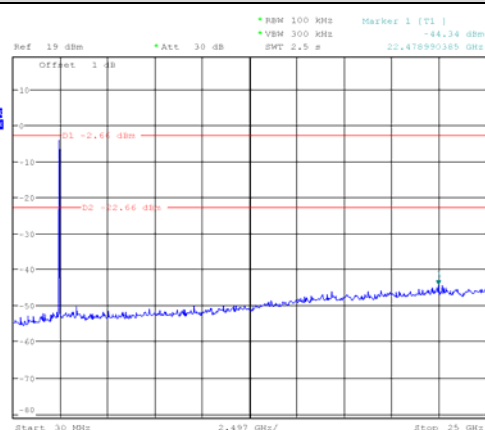
30MHz – 25GHz

IEEE 802.11n HT40 2462 MHz



Date: 19.MAY.2017 17:20:25

9kHz – 30MHz



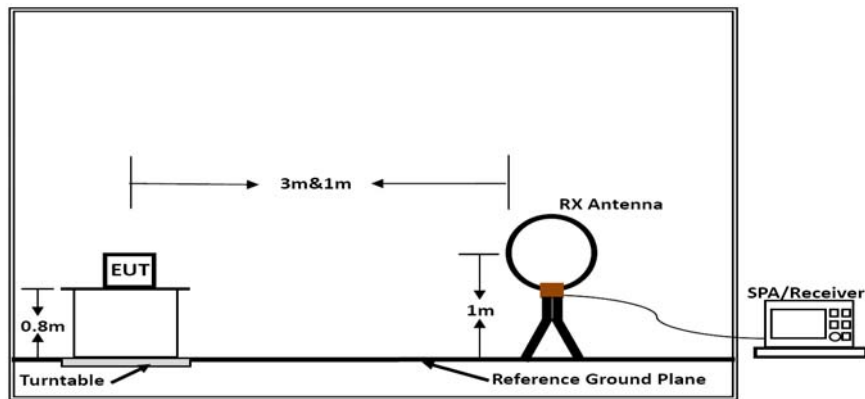
Date: 19.MAY.2017 18:25:16

30MHz – 25GHz

4.9 Radiated Spurious Emission

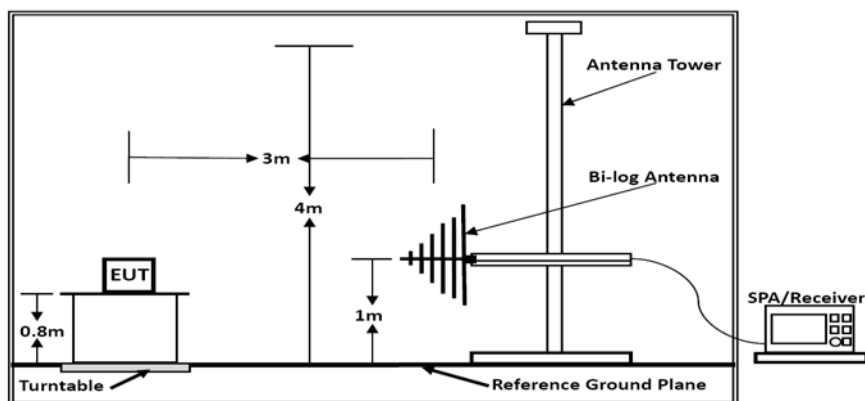
TEST CONFIGURATION

Frequency range: 9KHz – 30MHz



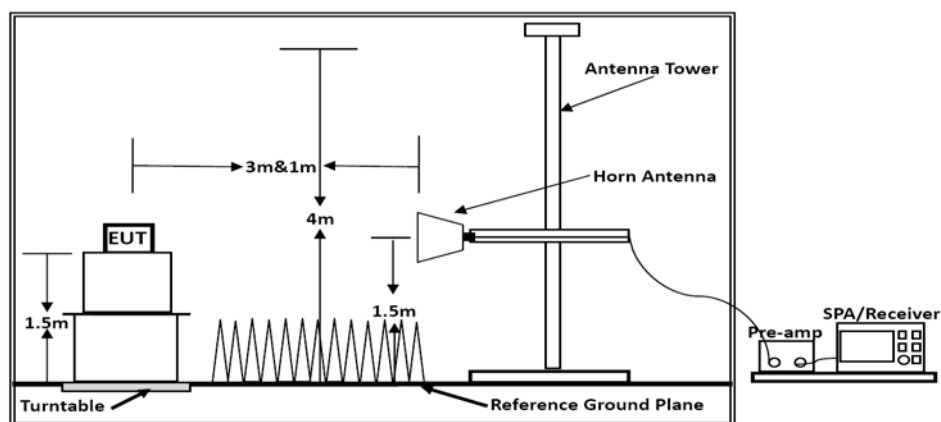
Below 30MHz

Frequency range: 30MHz – 1000MHz



Below 1GHz

Frequency range: 1GHz-25GHz



Above 1GHz

TEST PROCEDURE

According to the guidance in ANSI C63.10-2010:

To measure the maximum emission while the EUT is situated in three orthogonal planes (if appropriate), adjust the measurement antenna height and polarization etc. Measure frequency range from 9kHz to 25GHz.

1. The EUT was placed on a turn table which is 0.8m above ground plane for below 1GHz and 1.50m above ground plane for above 1GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT maximum operation frequency was 2462MHz.so radiated emission test frequency range from 9 KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Loop Antenna	3
30MHz-1GHz	Broadband Antenna	3
1GHz-18GHz	Horn Antenna	3
18GHz-25GHz	Horn Antenna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Peak
	Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

More procure as follows:

1) Sequence of testing 9 kHz to 30 MHz

Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 0.8 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, turntable position, Ant position, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^{\circ}$) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, turntable position, Ant position, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^{\circ}$) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, turntable position, Ant position, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Premeasurement:

--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, turntable position, Ant position, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

Frequency (MHz)	Distance (Meters)	Radiated (dB μ V/m)	Radiated (μ V/m)
0.009-0.49	300	$20\log(2400/F(\text{KHz}))+80$	$2400/F(\text{KHz})$
0.49-1.705	30	$20\log(24000/F(\text{KHz}))+40$	$24000/F(\text{KHz})$
1.705-30	30	$20\log(30)+40$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

Note:

Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$ (dB);

Limit line = specific limits (dB μ V) + distance extrapolation factor [9.5 dB].



Test Result

This DUT has two configurations for the MCU board. Preliminary tests were performed under different configurations. The worst test data are as follows:

Below 1GHz

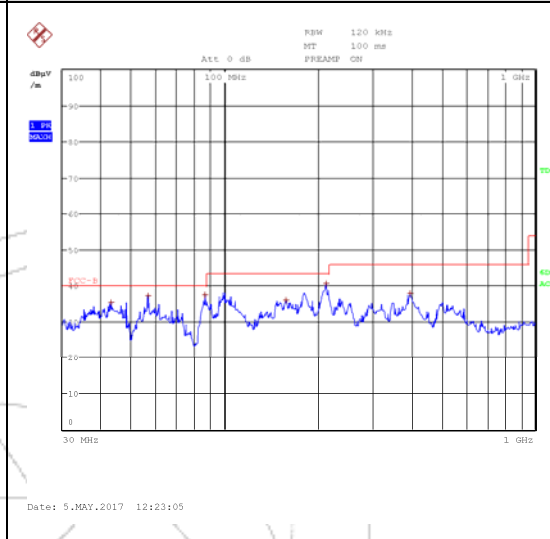
Radiated Spurious Emission

IEEE 802.11b 2412 MHz

Horizontal



Vertical



Frequency (MHz)	Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Ant pos (cm)	Table Pos (deg)	Antenna Polarity [H/V]	remark
209.605	37.8	5.7	43.5	120.1	0.0	H	QP
348.94	39.5	6.5	46.0	100.2	60.4	H	QP
335.982	41.8	4.2	46.0	106.4	83.2	H	QP
56.520	31.1	8.9	40.0	100.0	92.3	V	QP
86.397	36.5	3.5	40.0	100.0	16.1	V	QP
211.184	38.2	5.3	43.5	100.0	183.1	V	QP
Result: Compliance							

Note:

- 1) Pre-scan all mode and recorded the worst case results in this report (IEEE 802.11b (2412MHz)).
- 2) The amplitude of spurious emissions between 9kHz~30MHz which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Above 1GHz

Frequency (MHz)	Read Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Ant pos (cm)	Table Pos (deg)	Antenna Polarity [H/V]	remark
Test Mode: IEEE 802.11b				Test Channel: 1(2412MHz)			
3102.0	44.6	29.4	74.0	128.3	264.8	H	Peak
3102.0	31.4	22.6	54.0	128.3	264.8	H	Average
3925.0	46.5	27.5	74.0	114.7	323.6	V	Peak
3925.0	34.7	19.3	54.0	114.7	323.6	V	Average
4825.0	49.7	24.3	74.0	125.7	327.6	V	Peak
4825.0	35.2	18.8	54.0	125.7	327.6	H	Average
4895.0	49.3	24.7	74.0	122.9	297.7	V	Peak
4895.0	32.2	21.8	54.0	122.9	297.7	V	Average
5673.2	48.8	25.2	74.0	126.4	215.9	V	Peak
5673.2	35.0	19.0	54.0	126.4	215.9	V	Average
5824.7	48.0	26.0	74.0	119.4	274.0	H	Peak
5824.7	34.7	19.3	54.0	119.4	274.0	H	Average
Result: Compliance							
Test Mode: IEEE 802.11b				Test Channel: 6(2437MHz)			
3901.5	44.9	29.1	74.0	108.2	144.5	H	Peak
3901.5	31.7	22.3	54.0	108.2	144.5	H	Average
4003.2	44.3	29.7	74.0	136.4	315.9	V	Peak
4003.2	31.7	22.3	54.0	136.4	315.9	V	Average
4874.1	46.1	27.9	74.0	165.9	328.9	V	Peak
4874.1	40.1	13.9	54.0	165.9	328.9	V	Average
4905.5	39.4	34.6	74.0	180.9	324.2	H	Peak
4905.5	26.3	27.7	54.0	180.9	324.2	H	Average
6542.0	47.2	26.8	74.0	250.0	92.2	V	Peak
6542.0	31.2	22.8	54.0	250.0	92.2	V	Average
6631.2	47.0	27.0	74.0	150.0	12.2	H	Peak
6631.2	30.5	23.5	54.0	150.0	12.2	H	Average
Result: Compliance							



Frequency (MHz)	Read Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Ant pos (cm)	Table Pos (deg)	Antenna Polarity [H/V]	remark
Test Mode: IEEE 802.11b				Test Channel: 11(2462MHz)			
2163.0	44.2	29.8	74.0	100.1	145.2	V	Peak
2163.0	30.7	23.3	54.0	100.1	145.2	V	Average
2205.0	42.2	31.8	74.0	124.2	247.8	H	Peak
2205.0	30.6	23.4	54.0	124.2	247.8	H	Average
4922.7	50.0	24.0	74.0	106.3	145.2	V	Peak
4922.7	35.2	18.8	54.0	106.3	145.2	H	Average
4923.6	49.6	24.4	74.0	122.9	297.7	V	Peak
4923.6	32.1	21.9	54.0	122.9	297.7	V	Average
5012.2	48.8	25.2	74.0	123.2	209.7	H	Peak
5012.2	35.2	18.8	54.0	123.2	209.7	H	Average
5013.0	51.2	22.8	74.0	126.4	340.5	V	Peak
5013.0	36.8	37.2	54.0	126.4	340.5	V	Average
Result: Compliance							
Test Mode: IEEE 802.11g				Test Channel: 1(2412MHz)			
3902.5	47.9	26.1	74.0	109.7	236.4	H	Peak
3902.5	33.8	20.2	54.0	109.7	236.4	H	Average
4542.8	46.5	27.5	74.0	119.6	349.8	V	Peak
4542.8	32.4	21.6	54.0	119.6	349.8	V	Average
4824.0	49.8	24.2	74.0	192.4	316.1	H	Peak
4824.0	38.0	18.8	54.0	192.4	316.1	H	Average
4825.3	48.7	25.3	74.0	168.3	309.4	V	Peak
4825.3	36.4	17.6	54.0	168.3	309.4	V	Average
6518.2	47.3	26.7	74.0	270.1	13.7	V	Peak
6518.2	33.1	20.9	54.0	270.1	13.7	V	Average
6555.6	47.2	26.8	74.0	250.0	164.1	H	Peak
6555.6	33.3	20.7	54.0	250.0	164.1	H	Average
Result: Compliance							



Frequency (MHz)	Read Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Ant pos (cm)	Table Pos (deg)	Antenna Polarity [H/V]	remark
Test Mode: IEEE 802.11g				Test Channel: 6(2437MHz)			
3989.8	45.9	28.1	74.0	120.4	353.9	V	Peak
3989.8	32.9	21.1	54.0	120.4	353.9	V	Average
3998.8	48.3	25.7	74.0	119.3	341.7	H	Peak
3998.8	28.3	25.7	54.0	119.3	341.7	H	Average
4874.0	45.3	28.7	74.0	270.6	345.8	V	Peak
4874.0	37.9	16.1	54.0	270.6	345.8	V	Average
4874.0	42.9	31.1	74.0	189.6	327.2	H	Peak
4874.0	36.5	17.5	54.0	189.6	327.2	H	Average
6460.4	46.7	27.3	74.0	270.0	176.1	V	Peak
6460.4	32.8	21.2	54.0	270.0	176.1	V	Average
6491.0	46.7	27.3	74.0	270.0	224.0	H	Peak
6491.0	33.2	20.8	54.0	270.0	224.0	H	Average
Result: Compliance							
Test Mode: IEEE 802.11g				Test Channel: 11(2462MHz)			
4020.7	52.8	21.2	74.0	118.0	356.4	H	Peak
4020.7	30.2	23.8	54.0	118.0	356.4	H	Average
4036.7	55.0	19.0	74.0	116.8	354.0	V	Peak
4036.7	29.0	25.0	54.0	116.8	354.0	V	Average
4924.0	41.9	32.1	74.0	242.6	344.6	V	Peak
4924.0	33.7	20.3	54.0	242.6	344.6	V	Average
4924.1	45.8	28.2	74.0	214.9	330.6	H	Peak
4924.1	35.2	18.8	54.0	214.9	330.6	H	Average
6470.6	47.0	27.0	74.0	150.0	350.3	V	Peak
6470.6	34.9	19.1	54.0	150.0	350.3	V	Average
6484.2	46.9	27.1	74.0	270.0	257.0	H	Peak
6484.2	33.4	20.6	54.0	270.0	257.0	H	Average
Result: Compliance							

Frequency (MHz)	Read Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Ant pos (cm)	Table Pos (deg)	Antenna Polarity [H/V]	remark
Test Mode: IEEE 802.11n HT20				Test Channel: 1(2412MHz)			
4022.6	54.9	19.1	74.0	106.4	358.1	V	Peak
4022.6	32.4	21.6	54.0	106.4	358.1	V	Average
4036.2	51.2	22.8	74.0	106.1	338.4	H	Peak
4036.2	30.3	23.7	54.0	106.1	338.4	H	Average
4824.0	43.4	30.6	74.0	217.6	312.4	H	Peak
4824.0	33.5	20.5	54.0	217.6	312.4	H	Average
4824.0	42.0	32.0	74.0	268.7	340.6	V	Peak
4824.0	36.0	18.0	54.0	268.7	340.6	V	Average
6501.2	46.6	27.4	74.0	200.0	186.5	V	Peak
6501.2	32.6	21.4	54.0	200.0	186.5	V	Average
6518.2	48.9	25.1	74.0	250.0	152.3	H	Peak
6518.2	31.8	22.2	54.0	250.0	152.3	H	Average
Result: Compliance							
Test Mode: IEEE 802.11n HT20				Test Channel: 6(2437MHz)			
3990.2	55.8	18.2	74.0	120.4	358.4	V	Peak
3990.2	31.8	22.2	54.0	120.4	358.4	V	Average
4038.4	51.2	22.8	74.0	103.2	359.8	H	Peak
4038.4	28.0	26.0	54.0	103.2	359.8	H	Average
4874.0	49.1	24.9	74.0	262.1	332.0	V	Peak
4874.0	37.9	16.1	54.0	262.1	332.0	V	Average
4958.1	43.6	30.4	74.0	191.1	310.3	H	Peak
4958.1	33.4	20.6	54.0	191.1	310.3	H	Average
6429.8	47.1	26.9	74.0	200.0	190.3	V	Peak
6429.8	31.6	22.4	54.0	200.0	190.3	V	Average
6450.2	47.0	27.0	74.0	169.4	6.3	H	Peak
6450.2	32.7	21.3	54.0	169.4	6.3	H	Average
Result: Compliance							



Frequency (MHz)	Read Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Ant pos (cm)	Table Pos (deg)	Antenna Polarity [H/V]	remark
Test Mode: IEEE 802.11n HT20				Test Channel: 11(2462MHz)			
3976.1	55.3	18.7	74.0	122.2	355.2	V	Peak
3976.1	31.4	22.6	54.0	122.2	355.2	V	Average
3995.2	52.1	21.9	74.0	100.1	359.3	H	Peak
3995.2	30.4	23.6	54.0	100.1	359.3	H	Average
4909.8	40.2	33.8	74.0	176.3	343.1	V	Peak
4909.8	30.6	23.4	54.0	176.3	343.1	V	Average
4933.2	39.6	34.4	74.0	199.9	342.9	H	Peak
4933.2	34.5	19.5	54.0	199.9	342.9	H	Average
6542.0	48.5	25.5	74.0	150.6	289.3	H	Peak
6542.0	33.6	20.4	54.0	150.6	289.3	H	Average
6555.6	48.2	25.8	74.0	159.3	179.9	V	Peak
6555.6	32.2	21.8	54.0	159.3	179.9	V	Average
Result: Compliance							
Test Mode: IEEE 802.11n HT40				Test Channel: 3(2422MHz)			
3991.8	55.0	19.0	74.0	113.1	356.8	V	Peak
3991.8	33.2	20.8	54.0	113.1	356.8	V	Average
4015.8	50.4	23.6	74.0	109.2	338.2	H	Peak
4015.8	30.7	23.3	54.0	109.2	338.2	H	Average
4843.2	49.7	24.3	74.0	207.2	347.3	H	Peak
4843.2	33.9	20.1	54.0	207.2	347.3	H	Average
4850.8	48.6	25.4	74.0	161.3	74.5	V	Peak
4850.8	32.6	21.4	54.0	161.3	74.5	V	Average
6416.2	47.5	26.5	74.0	200.0	157.8	H	Peak
6416.2	32.9	21.1	54.0	200.0	157.8	H	Average
6542.0	47.8	26.2	74.0	200.0	283.4	V	Peak
6542.0	31.6	22.4	54.0	200.0	283.4	V	Average
Result: Compliance							

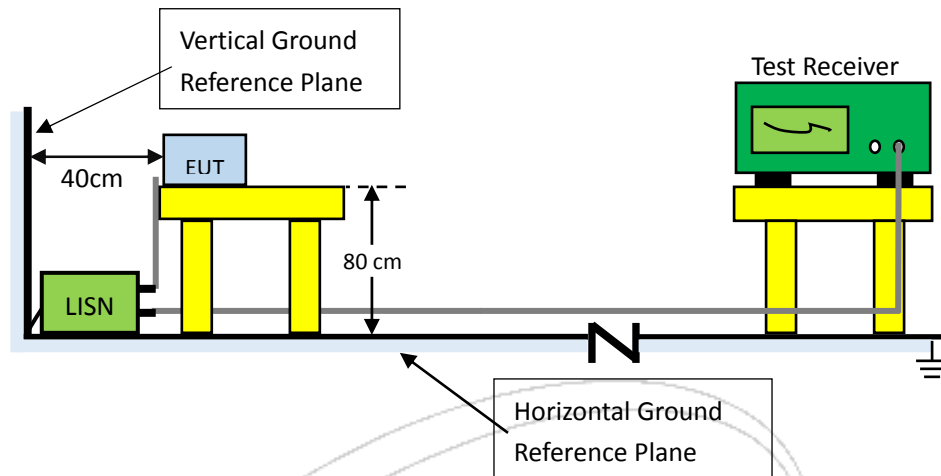


Frequency (MHz)	Read Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Ant pos (cm)	Table Pos (deg)	Antenna Polarity [H/V]	remark
Test Mode: IEEE 802.11n HT40				Test Channel: 6(2437MHz)			
3985.2	49.7	24.3	74.0	120.4	358.4	V	Peak
3985.2	30.9	23.1	54.0	120.4	358.4	V	Average
4039.6	55.4	18.6	74.0	112.3	356.1	H	Peak
4039.6	35.2	18.8	54.0	112.3	356.1	H	Average
4872.8	39.9	34.1	74.0	112.5	98.0	V	Peak
4872.8	32.4	21.6	54.0	112.5	98.0	V	Average
4874.9	43.2	30.8	74.0	200.3	334.2	H	Peak
4874.9	32.5	21.5	54.0	200.3	334.2	H	Average
6514.8	47.7	26.3	74.0	150.3	226.4	V	Peak
6514.8	33.6	20.4	54.0	150.3	226.4	V	Average
6528.4	48.1	25.9	74.0	165.1	288.8	H	Peak
6528.4	31.6	22.4	54.0	165.1	288.8	H	Average
Result: Compliance							
Test Mode: IEEE 802.11n HT40				Test Channel: 9(2452MHz)			
3988.6	51.3	22.7	74.0	110.3	337.8	H	Peak
3988.6	29.2	24.8	54.0	110.3	337.8	H	Average
4012.4	54.8	19.2	74.0	106.2	356.5	V	Peak
4012.4	34.1	19.9	54.0	106.2	356.5	V	Average
4927.2	48.6	25.4	74.0	184.0	341.2	H	Peak
4927.2	32.6	21.4	54.0	184.0	341.2	H	Average
4931.4	46.8	27.2	74.0	198.8	271.5	V	Peak
4931.4	31.9	22.1	54.0	198.8	271.5	V	Average
6491.0	47.9	26.1	74.0	250.0	61.0	V	Peak
6491.0	32.6	21.4	54.0	250.0	61.0	V	Average
6504.6	47.5	26.5	74.0	155.3	280.6	H	Peak
6504.6	31.9	22.1	54.0	155.3	280.6	H	Average
Result: Compliance							



4.10 AC Conducted Emission Measurement

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20dB) was not recorded.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following:

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

Note: * means decreasing linearly with the logarithm of the frequency



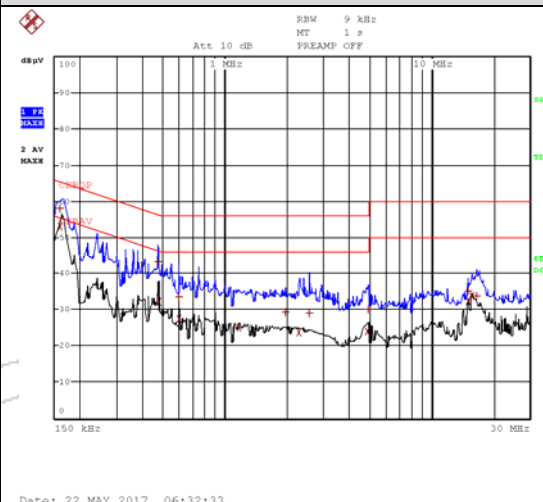
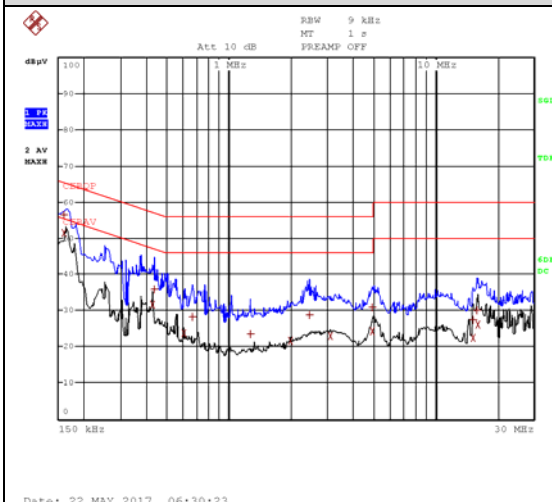
TEST RESULT

AC Conducted Emission Measurement

AC 120V/60Hz

Line

Neutral



Phase	Quasi-Peak			Average		
	Frequency (MHz)	Limits (dBμV)	Result (dBμV)	Frequency (MHz)	Limits (dBμV)	Result (dBμV)
Line	0.162	65.4	56.6	0.162	55.4	51.6
	0.434	57.2	35.7	0.426	57.3	31.6
	4.994	56.0	30.8	4.986	46.0	24.2
	Result: Compliance					
Neutral	0.162	65.4	58.2	0.162	55.4	53.2
	0.474	56.4	43.1	0.478	46.4	32.1
	0.598	56.0	33.5	15.644	50.0	33.7
	Result: Compliance					

Note: The adapter was connected to both AC 120V/60Hz and AC 240V/60Hz power source and the worst case result (AC 120V/60Hz) was recorded in this report.

4.11 Maximum Permissible Exposure(MPE)

LIMIT

According to subpart 15.247(i)and subpart§1.1310,system operating under the provisions if this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure(MPE)(§1.1310, §2.1093)

(B)Limits for General Population/uncontrolled Exposure				
Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm ²)	Averaging Time(minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

F=frequency in MHz;*=Plane-wave equivalent power density

According to §1.1310, §2.1093 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S=PG/4\pi R^2$ =power density (in appropriate units, e.g. mW/cm²) ;

P=power input to the antenna(in appropriate units, e.g., mW);

G=power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna(appropriate units, e.g., cm)

TEST RESULT

Mode	Frequency band (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		dBi	numeric	dBm	mW			
802.11 b	2412-2462	3.0	2.0	17.0	50.12	20	0.0199	1
802.11 g	2412-2462	3.0	2.0	15.0	31.62	20	0.0189	1
802.11n HT20	2412-2462	3.0	2.0	14.0	25.12	20	0.0150	1
802.11n HT40	2422-2452	3.0	2.0	14.0	25.12	20	0.0150	1
Result: Compliance								

Note:

The target power(Average): 802.11b:16dB±1dBm

802.11g:14dB±1dBm

802.11n:13dB±1dBm

which declared by the Manufacturer.



5 Photographs-Test Setup



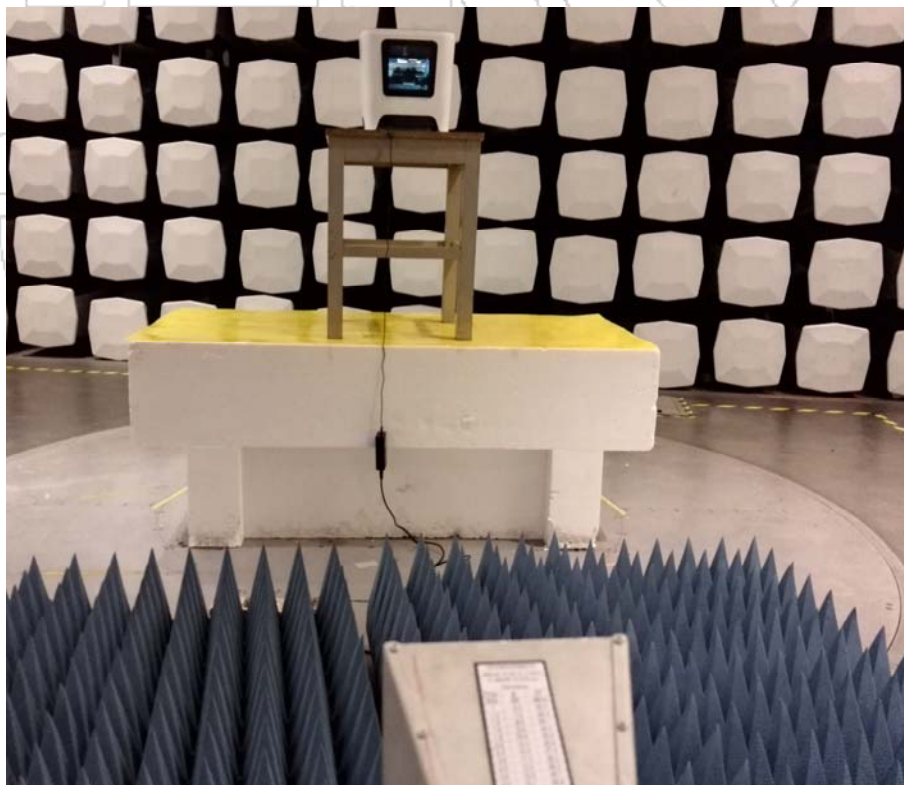
AC Conducted Emission Measurement



Radiated Spurious Emission(9kHz~30MHz)

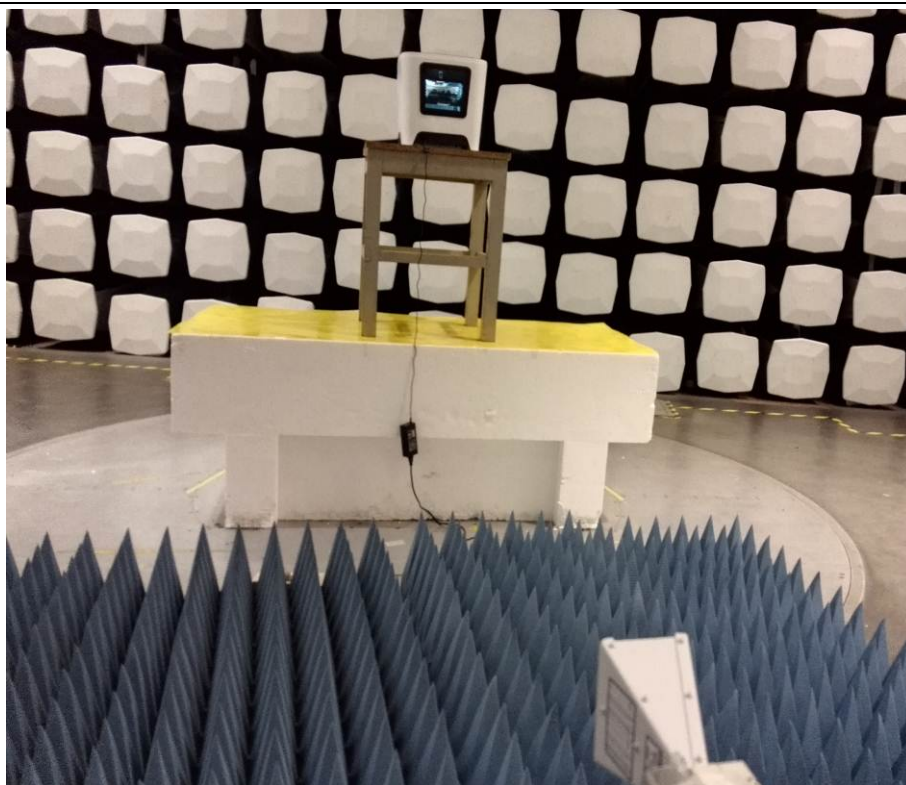


Radiated Spurious Emission(30MHz~1GHz)



Radiated Spurious Emission(1GHz~18GHz)





Radiated Spurious Emission(18GHz~25GHz)

