

TEST REPORT

FCC ID: 2AEF5M10G1BA01

Product: Minno10

Model No.: M10G1BA01

Additional Model No.: A10G1BA01

Trade Mark: Minno, Armtab

Report No.: TCT150225E027

Issued Date: Apr. 20, 2015

Issued for:

Minno LLC

421 North Milpas Street, Santa Barbara, CA 93103 U.S.A.

Issued By:

Shenzhen Tongce Testing Lab.

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1. Test Certification

Product:	Minno10
Model No.:	M10G1BA01
Additional Model No.	A10G1BA01
Applicant:	Minno LLC
Address:	421 North Milpas Street, Santa Barbara, CA 93103 U.S.A.
Manufacturer:	Shenzhen Longhorn Technology Co.,Ltd.
Address:	Longhorn Hi-Tech Estate, Gongyeyuan Rd., Dalang Street, Baoan, Shenzhen, China.
Date of Test:	Mar. 02 – Mar. 31, 2015
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247 KDB 558074 D01 DTS Meas Guidance v03r02

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:



SKY

Date:

Mar. 31, 2015

Reviewed By:



Joe Zhou

Date:

Apr. 17, 2015

Approved By:



Tomsin

Date:

Apr. 20, 2015

2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Peak Output Power	§15.247 (b)(3)	PASS
6dB Emission Bandwidth	§15.247 (a)(2)	PASS
Power Spectral Density	§15.247 (e)	PASS
Band Edge	§15.247(d)	PASS
Spurious Emission	§15.205/§15.209	PASS

Note:

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

3. EUT Description

Product Name:	Minno10
Model :	M10G1BA01
Additional Model:	A10G1BA01
Trade Mark:	Minno, Armtab
Operation Frequency:	2412MHz~2462MHz (802.11b/802.11g/802.11n(H20)) 2422MHz~2452MHz (802.11n(H40))
Channel Separation:	5MHz
Number of Channel:	11 for 802.11b/802.11g/802.11n(H20) 7 for 802.11n(H40)
Modulation Technology: (IEEE 802.11b)	Direct Sequence Spread Spectrum (DSSS)
Modulation Technology: (IEEE 802.11g/802.11n)	Orthogonal Frequency Division Multiplexing(OFDM)
Data speed (IEEE 802.11b):	1Mbps, 2Mbps, 5.5Mbps, 11Mbps
Data speed (IEEE 802.11g):	6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps,54Mbps
Data speed (IEEE 802.11n):	Up to 150Mbps
Antenna Type:	Internal Antenna
Antenna Gain:	1.6dBi
Power Supply:	Rechargeable Li-ion Battery DC3.7V, 4000mAh
Remark:	All models above are identical in interior structure, electrical circuits and components, and just differ in look and model for the marketing requirement.

Operation Frequency each of channel For 802.11b/g/n(H20)

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

Operation Frequency each of channel For 802.11n (H40)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
--	--	4	2427MHz	7	2442MHz	--	--
--	--	5	2432MHz	8	2447MHz	--	--
3	2422MHz	6	2437MHz	9	2452MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

802.11b/802.11g/802.11n (H20)

Channel	Frequency
The lowest channel	2412MHz
The middle channel	2437MHz
The Highest channel	2462MHz

802.11n (H40)

Channel	Frequency
The lowest channel	2422MHz
The middle channel	2437MHz
The Highest channel	2452MHz

4. Genera Information

4.1. Test environment and mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Operation mode:	Keep the EUT in continuous transmitting with modulation
The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.	

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:	
Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.	
Mode	Data rate
802.11b	1Mbps
802.11g	6Mbps
802.11n(H20)	6.5Mbps
802.11n(H40)	13.5Mbps
Final Test Mode:	
Operation mode:	Keep the EUT in continuous transmitting with modulation
According to ANSI C63.4 standards, the test results are both the “worst case” and “worst setup” 1Mbps for 802.11b, 6Mbps for 802.11g, 6.5Mbps for 802.11n(H20) and 13.5 Mbps for 802.11n(H40). Duty cycle setting during the transmission is 98.5% with maximum power setting for all modulations.	

4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

- 1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
- 2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

5. Facilities and Accreditations

5.1. Facilities

The test facility is recognized, certified, or accredited by the following organizations:

- FCC - Registration No.: 572331

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

- CNAS - Registration No.: CNAS L6165

Shenzhen TCT Testing Technology Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6165.

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1F, Leinuo Watch Building, Fuyong Town, Baoan Dist, Shenzhen, China

Tel: 86-755-36638142

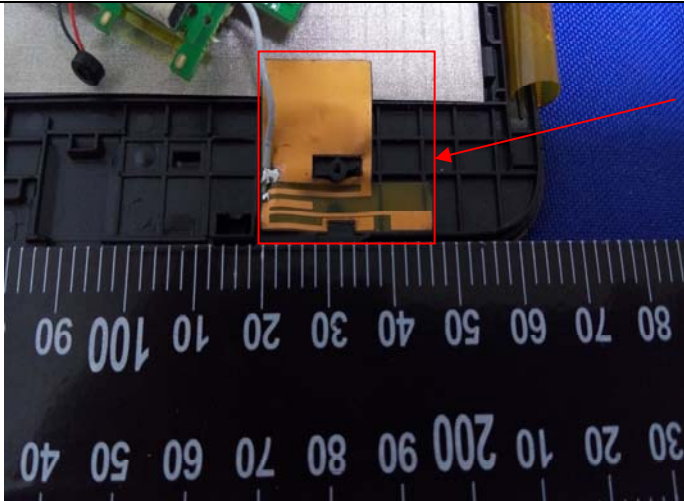
5.3. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^{\circ}\text{C}$
7	Humidity	$\pm 1.0\%$

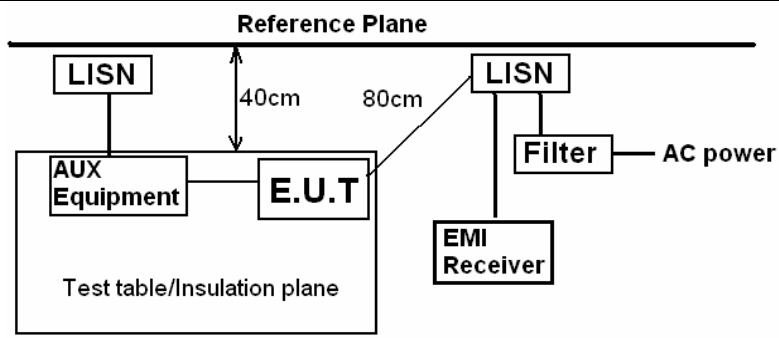
6. Test Results and Measurement Data

6.1. Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
E.U.T Antenna:	
The WIFI antenna is an internal PCB antenna which permanently attached, and the best case gain of the antenna is 1.6 dBi.	
	

6.2. Conducted Emission

6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.4:2009														
Frequency Range:	150 kHz to 30 MHz														
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
Limits:	<table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table>	Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)														
	Quasi-peak	Average													
0.15-0.5	66 to 56*	56 to 46*													
0.5-5	56	46													
5-30	60	50													
Test Setup:	Reference Plane  Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m														
Test Mode:	Refer to section 4.1 for details														
Test Procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2009 on conducted measurement.														
Test Result:	PASS														

6.2.2. Test Instruments

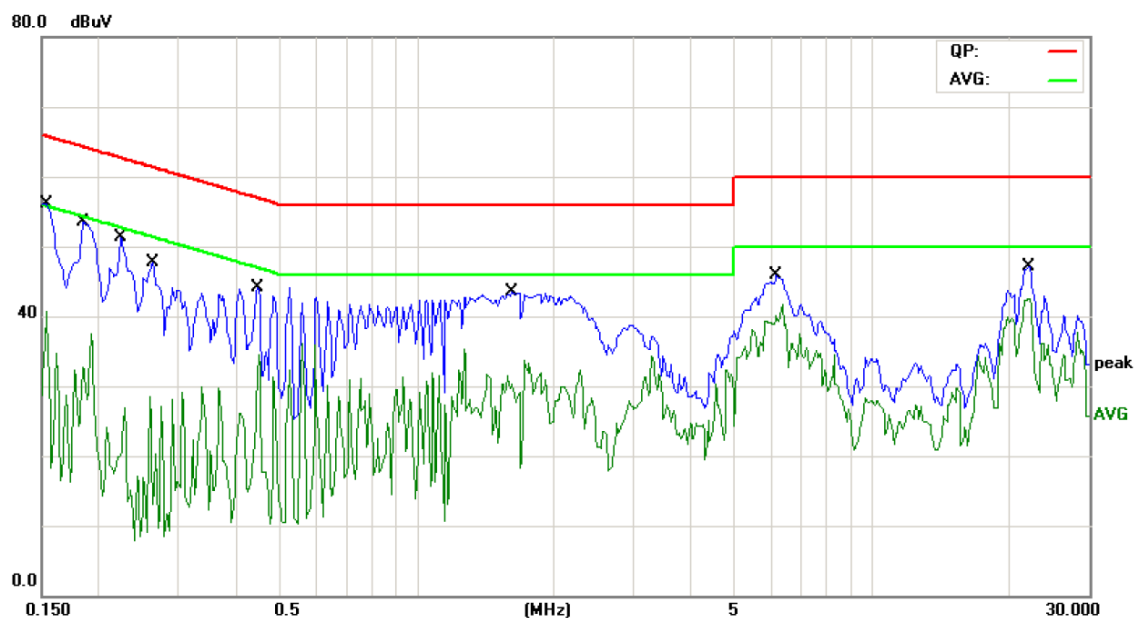
Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	100139	Sep. 16, 2015
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 29, 2015
Coax cable	TCT	N/A	N/A	Sep. 15 , 2015
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.2.3. Test data

Please refer to following diagram for individual

Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Site Chamber #1

Phase: **L1**

Temperature: 22 (C)

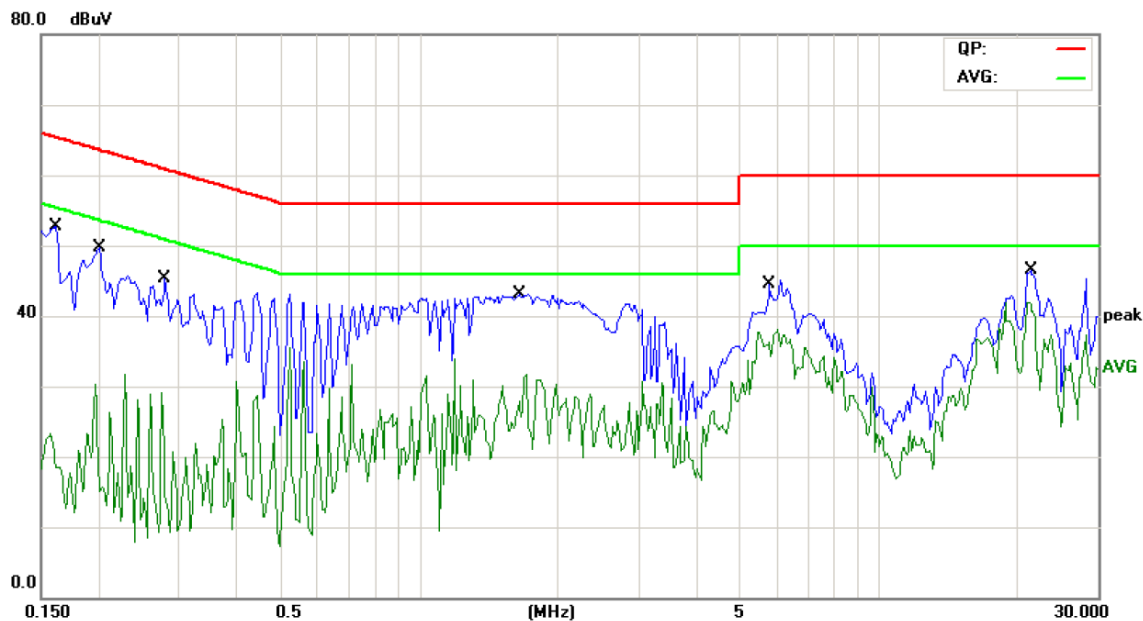
Limit: FCC PART15 Conduction(QP)

Power: AC 120V/60Hz

Humidity: 55 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.1539	39.49	11.49	50.98	65.78	-14.80	QP	
2		0.1539	22.05	11.49	33.54	55.78	-22.24	AVG	
3		0.1852	34.31	11.48	45.79	64.24	-18.45	QP	
4		0.1852	16.55	11.48	28.03	54.24	-26.21	AVG	
5		0.2242	32.79	11.45	44.24	62.66	-18.42	QP	
6		0.2242	12.74	11.45	24.19	52.66	-28.47	AVG	
7		0.2633	30.15	11.43	41.58	61.32	-19.74	QP	
8		0.2633	8.70	11.43	20.13	51.32	-31.19	AVG	
9		0.4469	29.41	11.33	40.74	56.93	-16.19	QP	
10		0.4469	20.60	11.33	31.93	46.93	-15.00	AVG	
11		1.6187	21.01	11.49	32.50	56.00	-23.50	QP	
12		1.6187	2.78	11.49	14.27	46.00	-31.73	AVG	
13		6.1563	29.92	10.78	40.70	60.00	-19.30	QP	

Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



Site Chamber #1

Phase: **N**

Temperature: 22 (C)

Limit: FCC PART15 Conduction(QP)

Power: AC 120V/60Hz

Humidity: 55 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1617	33.33	11.51	44.84	65.37	-20.53	QP	
2		0.1617	11.82	11.51	23.33	55.37	-32.04	AVG	
3		0.2008	31.51	11.48	42.99	63.57	-20.58	QP	
4		0.2008	10.37	11.48	21.85	53.57	-31.72	AVG	
5		0.2789	28.56	11.44	40.00	60.85	-20.85	QP	
6		0.2789	5.58	11.44	17.02	50.85	-33.83	AVG	
7		1.6461	24.04	11.51	35.55	56.00	-20.45	QP	
8		1.6461	5.05	11.51	16.56	46.00	-29.44	AVG	
9		5.7135	26.97	10.74	37.71	60.00	-22.29	QP	
10		5.7135	11.47	10.74	22.21	50.00	-27.79	AVG	
11	*	21.4570	30.91	10.62	41.53	60.00	-18.47	QP	
12		21.4570	13.96	10.62	24.58	50.00	-25.42	AVG	

Note:

Freq. = Emission frequency in MHz

Reading level (dBμV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)

Limit (dBμV) = Limit stated in standard

Margin (dB) = Measurement (dBμV) – Limits (dBμV)

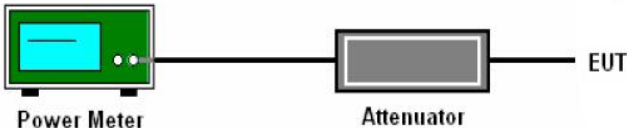
Q.P. =Quasi-Peak

AVG =average

* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

6.3. Conducted Output Power

6.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.4:2009 and KDB558074
Limit:	30dBm
Test Setup:	 The diagram illustrates the test setup. A green Power Meter is connected via a cable to a grey Attenuator. The Attenuator is then connected to the EUT (Equipment Under Test).
Test Mode:	Refer to section 4.1 for details
Test Procedure:	1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v03r02. 2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Measure the conducted output power and record the results in the test report.
Test Result:	PASS

6.3.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Power Meter	Anritsu	ML2495A	1005002	Dec. 11, 2015
Pulse Power Sensor	Anritsu	MA2411B	0917070	Dec. 11, 2015

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.3.3. Test Data

802.11b mode			
Test channel	Maximum Conducted Output Power (dBm)	Limit (dBm)	Result
Lowest	9.50	30.00	PASS
Middle	9.64	30.00	PASS
Highest	9.65	30.00	PASS

802.11g mode			
Test channel	Maximum Conducted Output Power (dBm)	Limit (dBm)	Result
Lowest	8.94	30.00	PASS
Middle	9.01	30.00	PASS
Highest	9.25	30.00	PASS

802.11n(H20) mode			
Test channel	Maximum Conducted Output Power (dBm)	Limit (dBm)	Result
Lowest	8.37	30.00	PASS
Middle	8.56	30.00	PASS
Highest	8.66	30.00	PASS

802.11n(H40) mode			
Test channel	Maximum Conducted Output Power (dBm)	Limit (dBm)	Result
Lowest	8.23	30.00	PASS
Middle	8.42	30.00	PASS
Highest	8.53	30.00	PASS

6.4. Emission Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.4:2003 and KDB558074
Limit:	>500kHz
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Refer to section 4.1 for details
Test Procedure:	1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r02. 2. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r02. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz. 5. Measure and record the results in the test report.
Test Result:	PASS

6.4.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	ROHDE&SCH WARZ	FSU3	1166.1660.03	Sep.16, 2015

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

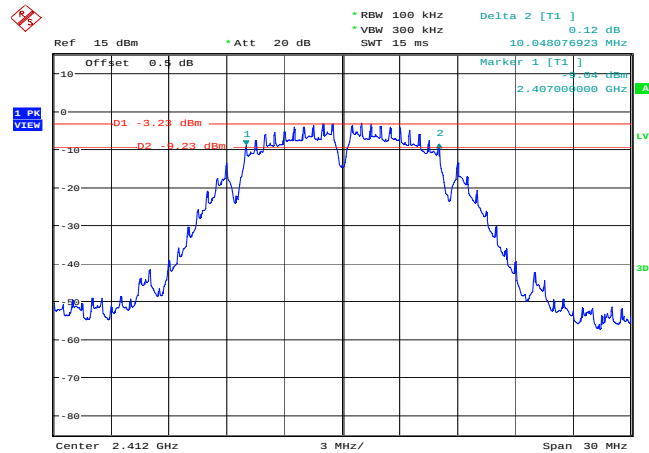
6.4.3. Test data

Test channel	6dB Emission Bandwidth (MHz)			
	802.11b	802.11g	802.11n(H20)	802.11n(H40)
Lowest	10.05	16.38	17.64	35.96
Middle	10.00	16.39	17.63	35.15
Highest	10.00	16.39	17.64	36.25
Limit:	>500k			
Test Result:	PASS			

Test plots as follows:

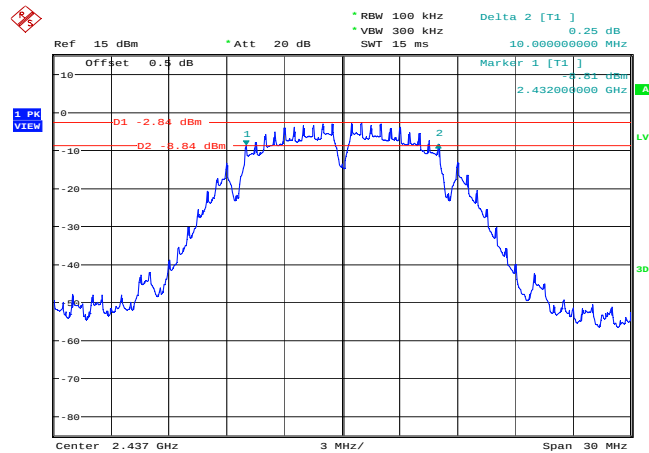
802.11b Modulation

Lowest channel



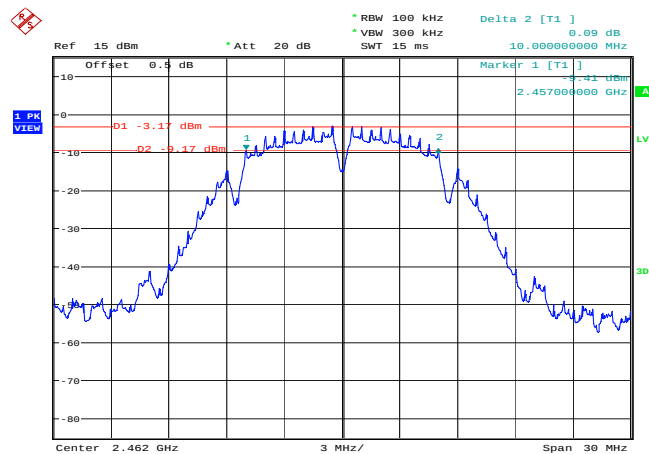
Date: 16.MAR.2015 09:44:45

Middle channel



Date: 16.MAR.2015 09:49:34

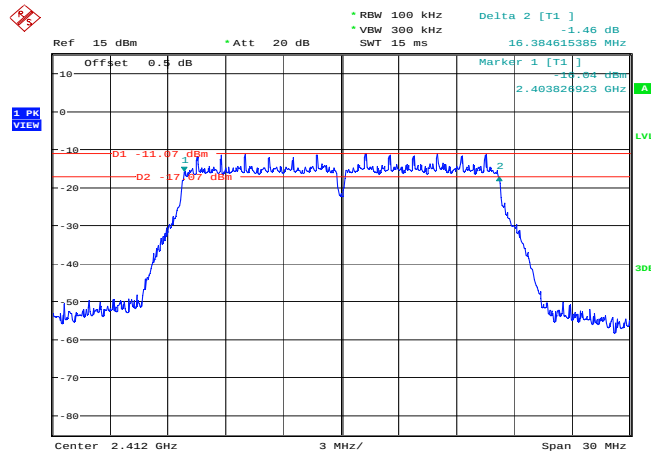
Highest channel



Date: 16.MAR.2015 09:57:19

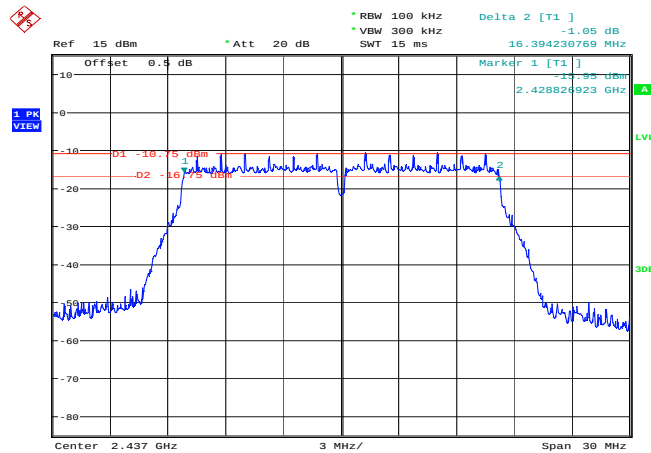
802.11g Modulation

Lowest channel



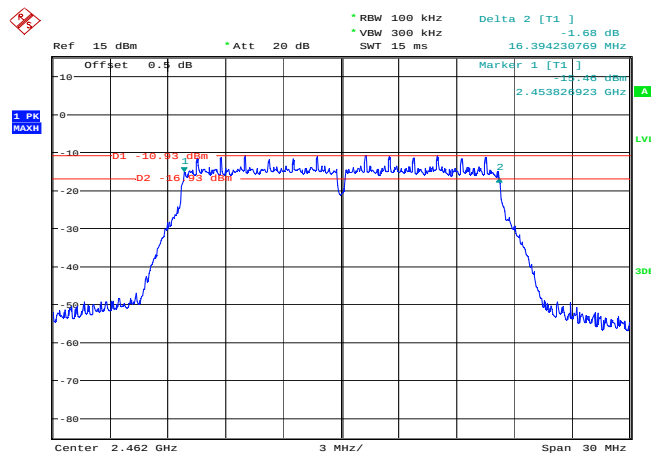
Date: 16.MAR.2015 09:46:06

Middle channel



Date: 16.MAR.2015 09:53:57

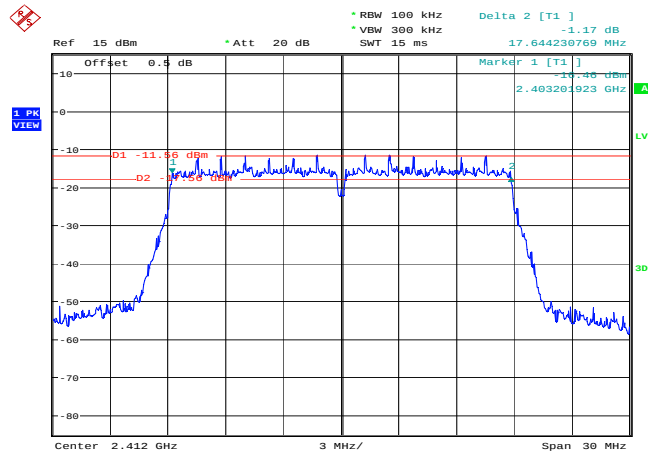
Highest channel



Date: 16.MAR.2015 09:58:33

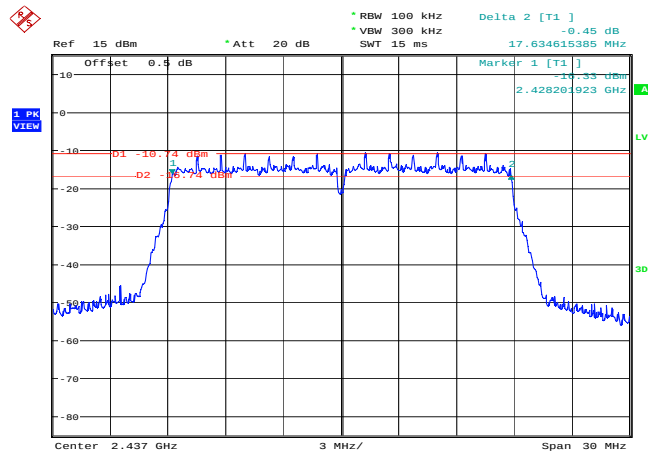
802.11n (HT20) Modulation

Lowest channel



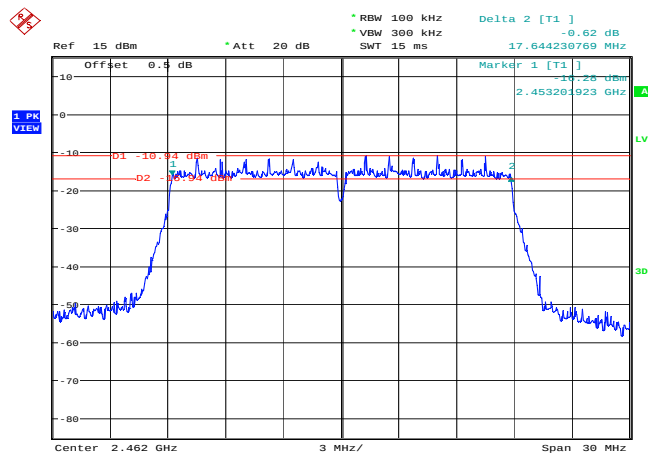
Date: 16.MAR.2015 09:47:04

Middle channel



Date: 16.MAR.2015 09:55:36

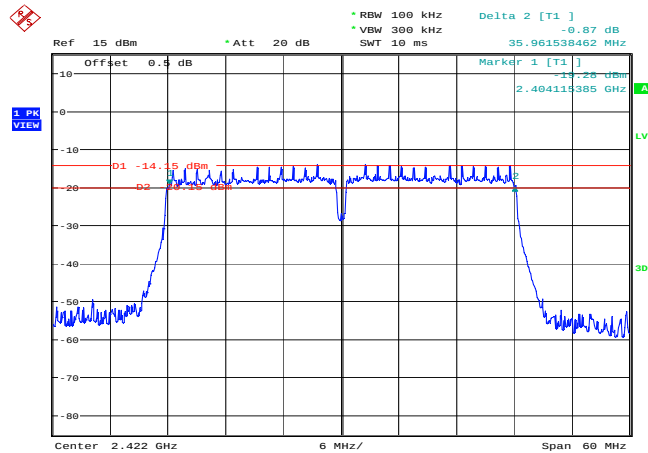
Highest channel



Date: 16.MAR.2015 09:59:36

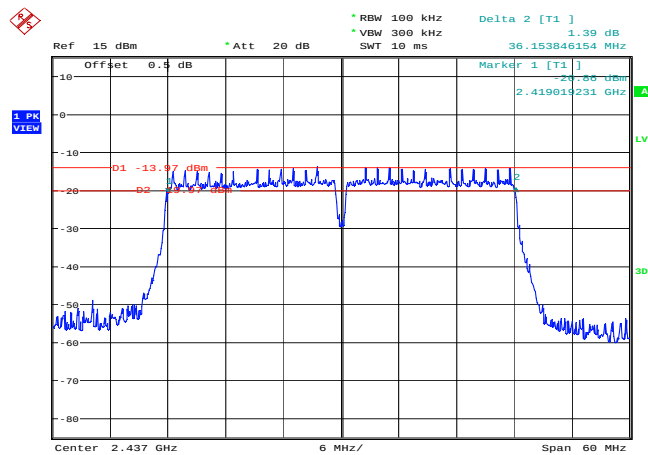
802.11n (HT40) Modulation

Lowest channel



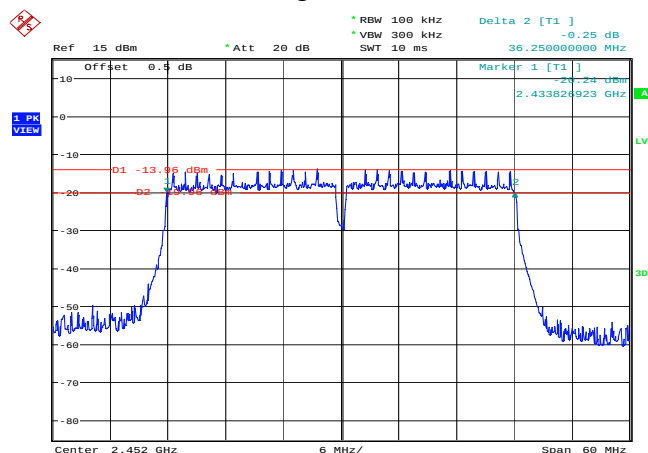
Date: 16.MAR.2015 10:03:50

Middle channel



Date: 16.MAR.2015 10:06:06

Highest channel



Date: 16.MAR.2015 10:07:52

6.5. Power Spectral Density

6.6. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	ANSI C63.4:2003 and KDB558074
Limit:	The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Refer to section 4.1 for details
Test Procedure:	1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No.558074 D01 DTS Meas. Guidance v03r02 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW) 5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level. 6. Measure and record the results in the test report.
Test Result:	PASS

6.6.1. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSU3	1166.1660.03	Sep.16, 2015

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

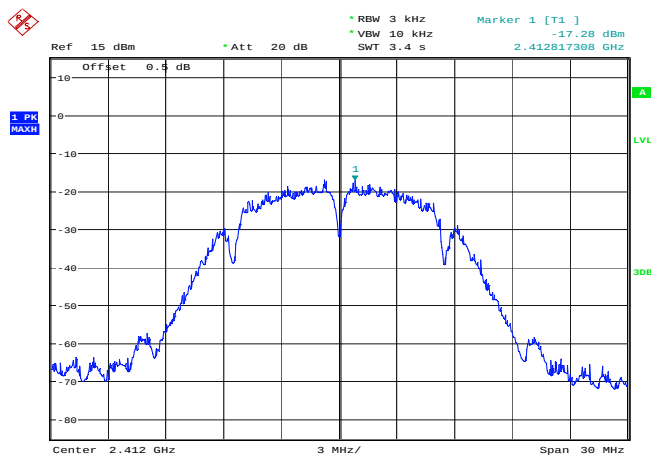
6.6.2. Test data

Test channel	Power Spectral Density			
	802.11b	802.11g	802.11n(H20)	802.11n(H40)
Lowest	-17.28	-24.25	-26.00	-28.81
Middle	-18.03	-25.17	-25.67	-28.47
Highest	-17.72	-24.62	-25.00	-28.67
Limit:	8dBm			
Test Result:	PASS			

Test plots as follows:

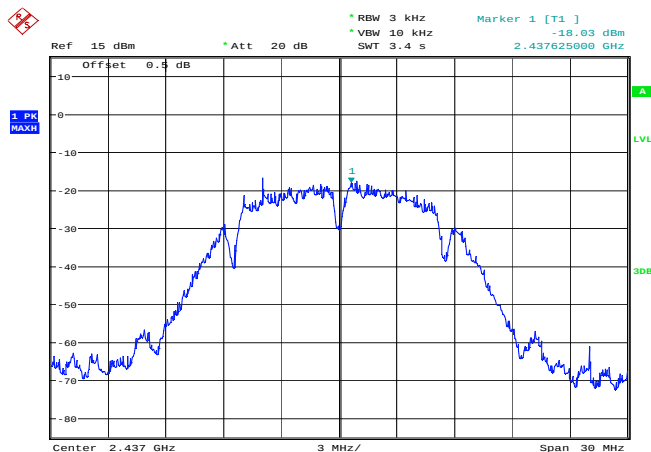
802.11b Modulation

Lowest channel



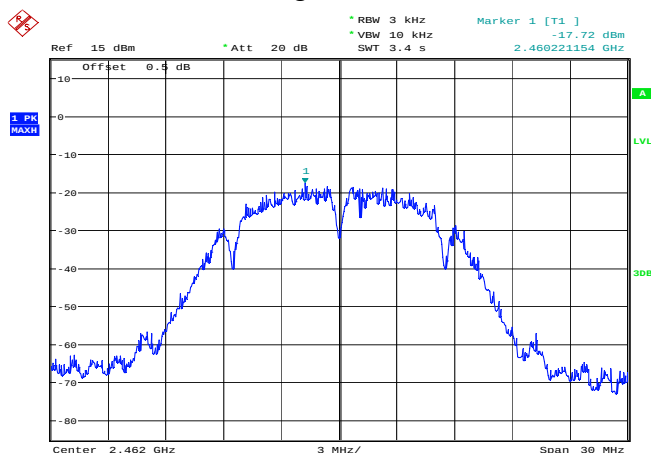
Date: 16.MAR.2015 10:09:24

Middle channel



Date: 16.MAR.2015 10:11:45

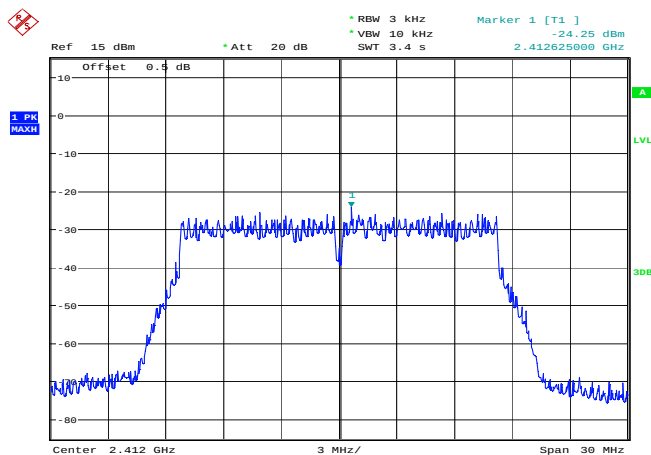
Highest channel



Date: 16.MAR.2015 10:21:19

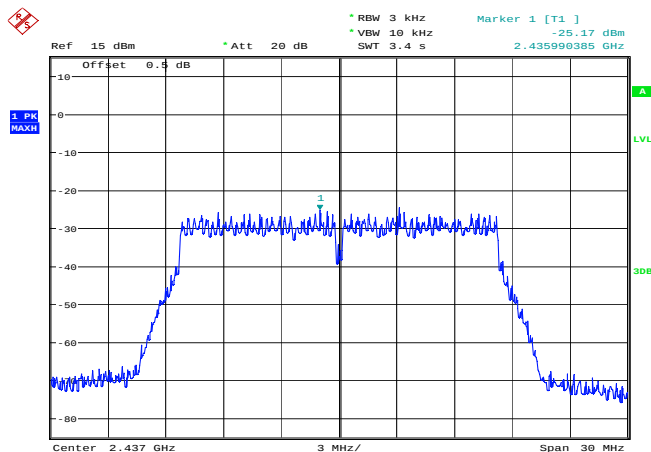
802.11g Modulation

Lowest channel



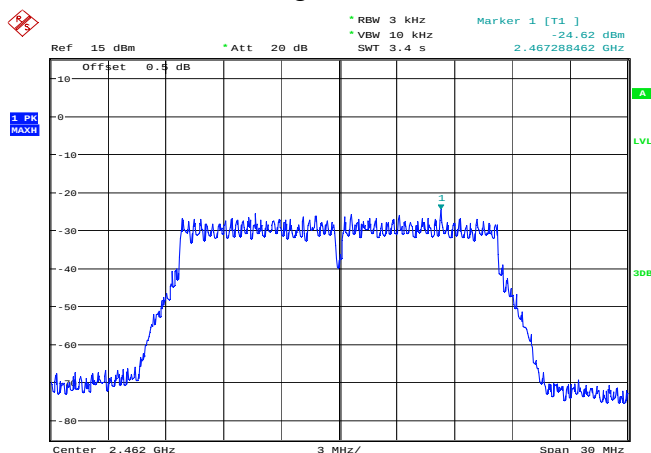
Date: 16.MAR.2015 10:10:02

Middle channel



Date: 16.MAR.2015 10:13:50

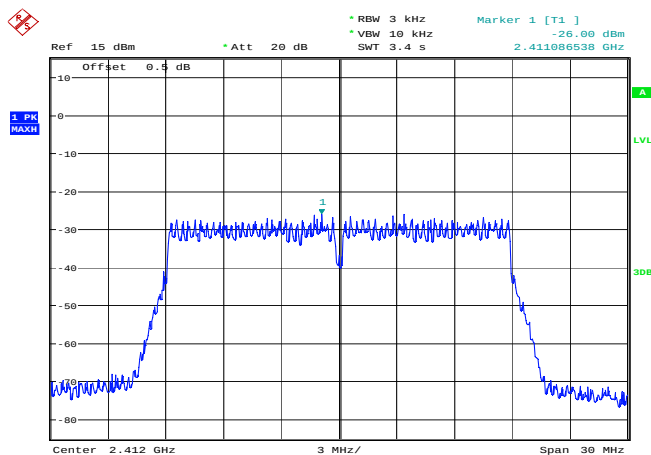
Highest channel



Date: 16.MAR.2015 10:22:13

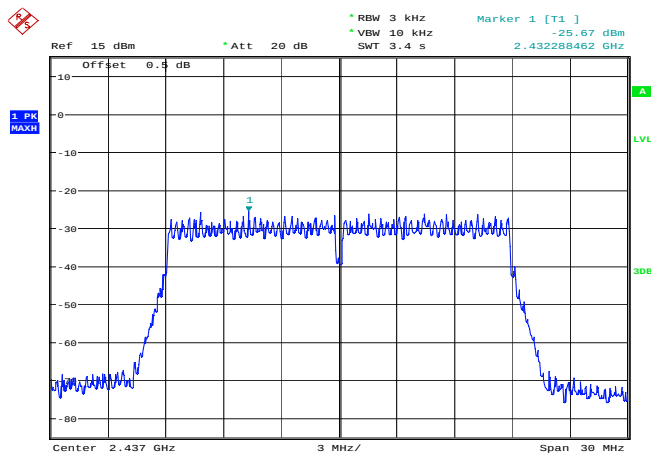
802.11n (HT20) Modulation

Lowest channel



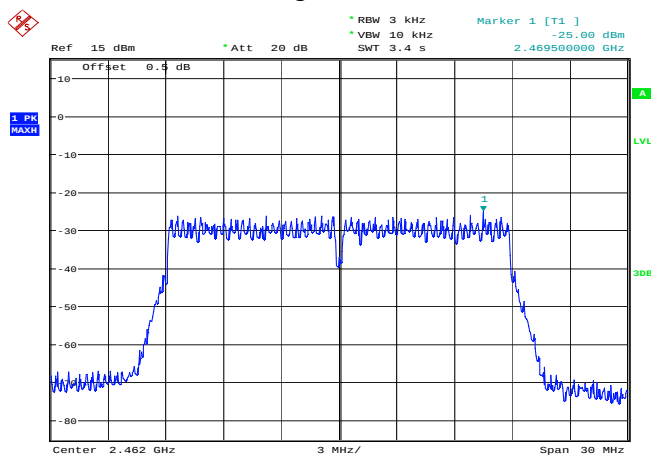
Date: 16.MAR.2015 10:10:33

Middle channel



Date: 16.MAR.2015 10:13:13

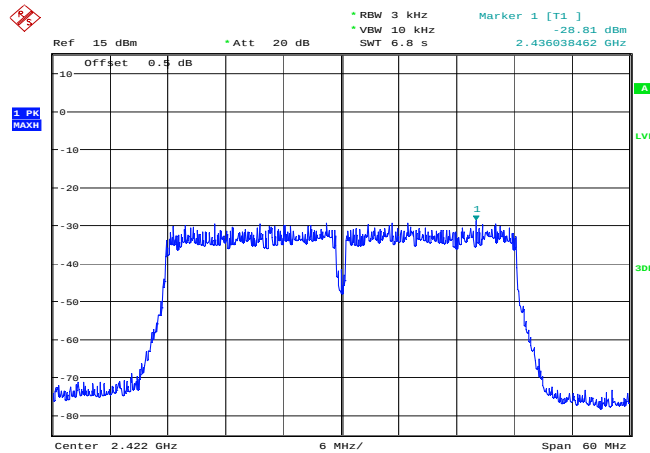
Highest channel



Date: 16.MAR.2015 10:22:44

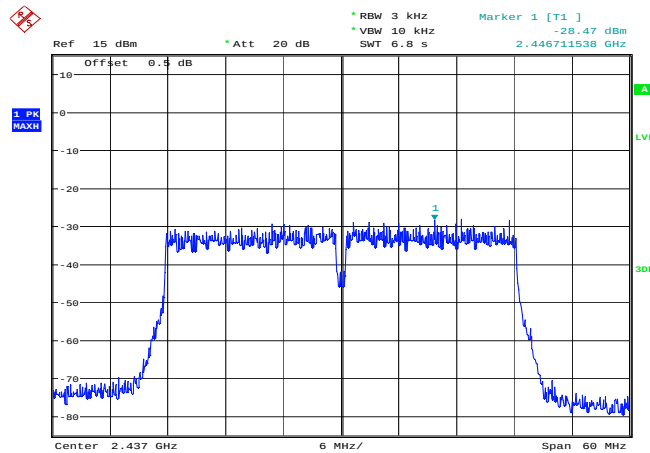
802.11n (HT40) Modulation

Lowest channel



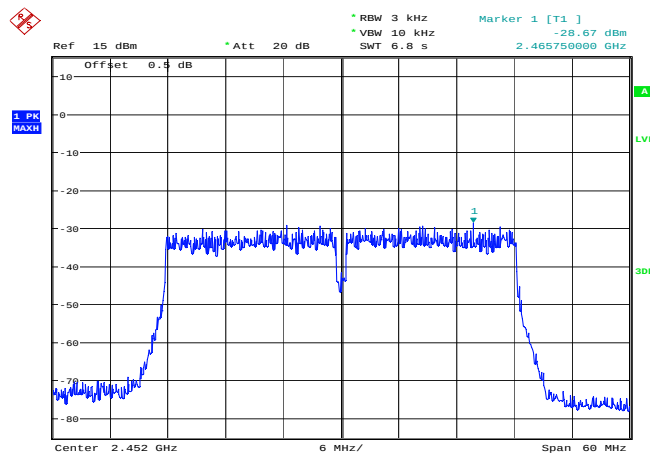
Date: 16.MAR.2015 10:23:25

Middle channel



Date: 16.MAR.2015 10:23:56

Highest channel



Date: 16.MAR.2015 10:24:34

6.7. Conducted Band Edge and Spurious Emission Measurement

6.7.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.4:2003 and KDB558074
Limit:	In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Refer to section 4.1 for details
Test Procedure:	1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02. 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d). 5. Measure and record the results in the test report. 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
Test Result:	PASS

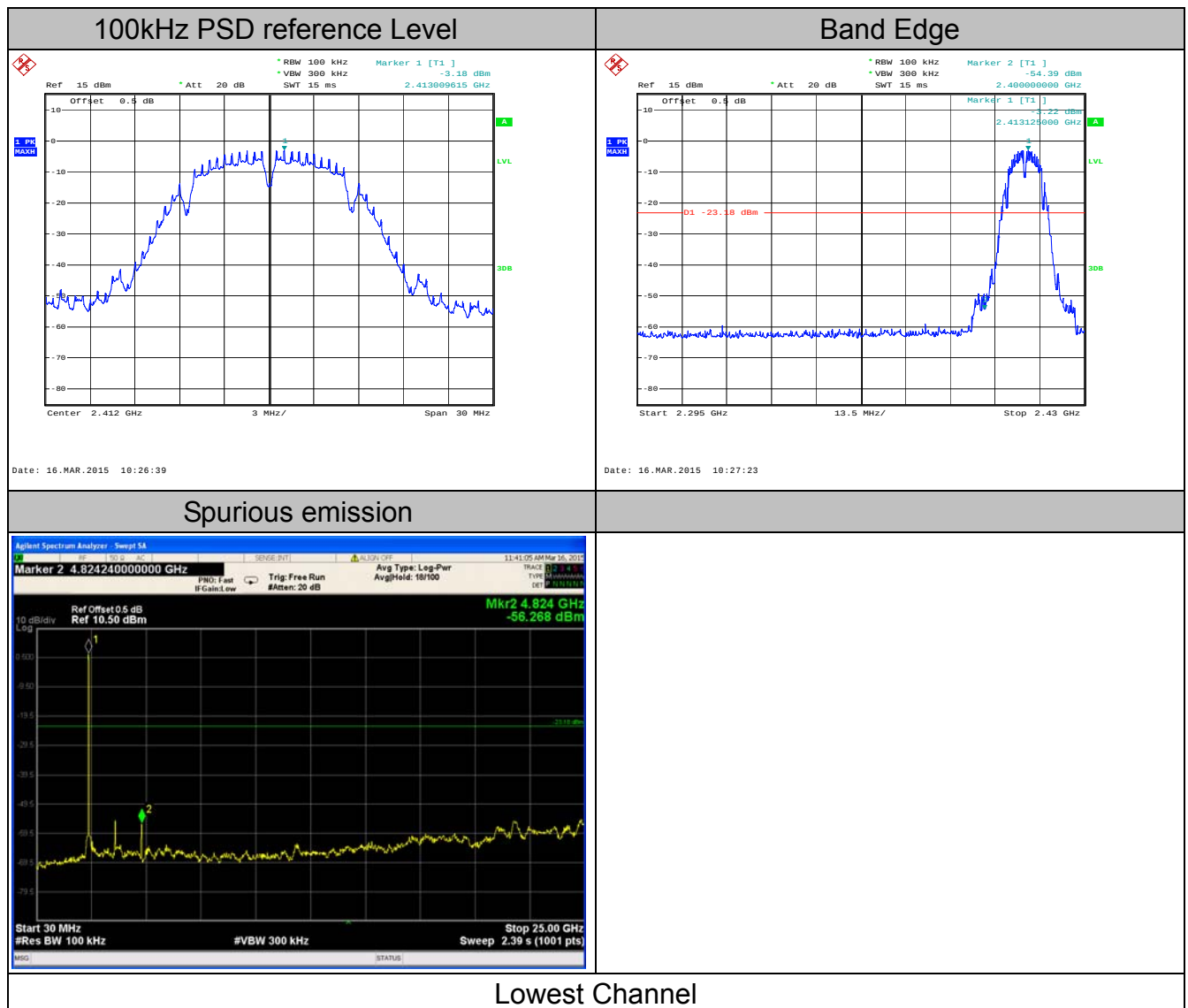
6.7.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Oct. 21, 2015
Spectrum Analyzer	ROHDE&SCHWARZ	FSU3	1166.1660.03	Sep.16, 2015

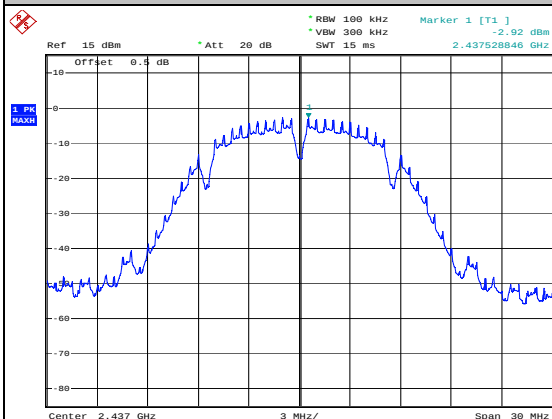
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.7.3. Test Data

802.11b Modulation

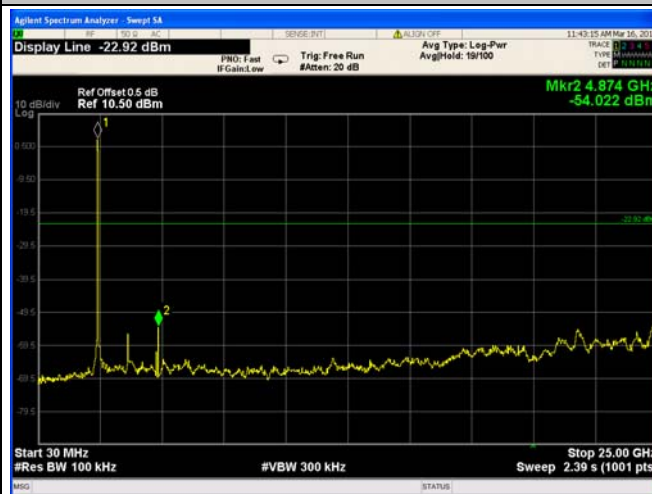


100kHz PSD reference Level



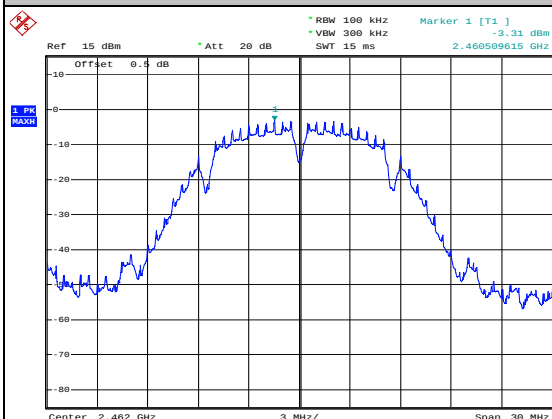
Date: 16.MAR.2015 10:28:17

Spurious emission



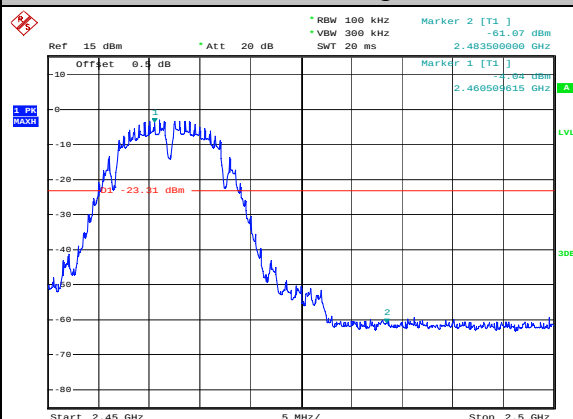
Middle Channel

100kHz PSD reference Level



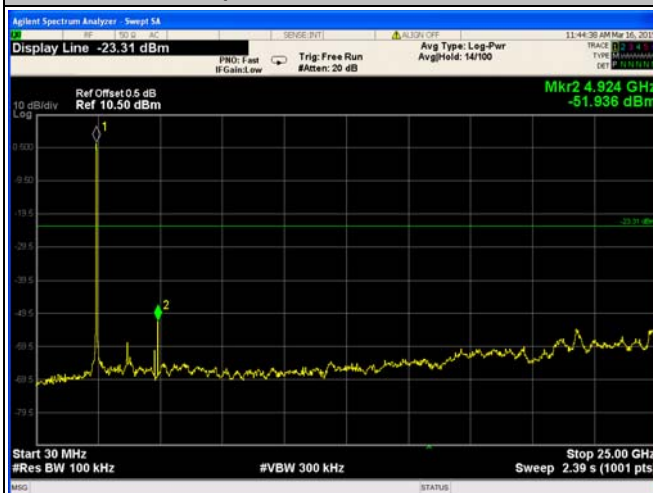
Date: 16.MAR.2015 10:28:54

Band Edge



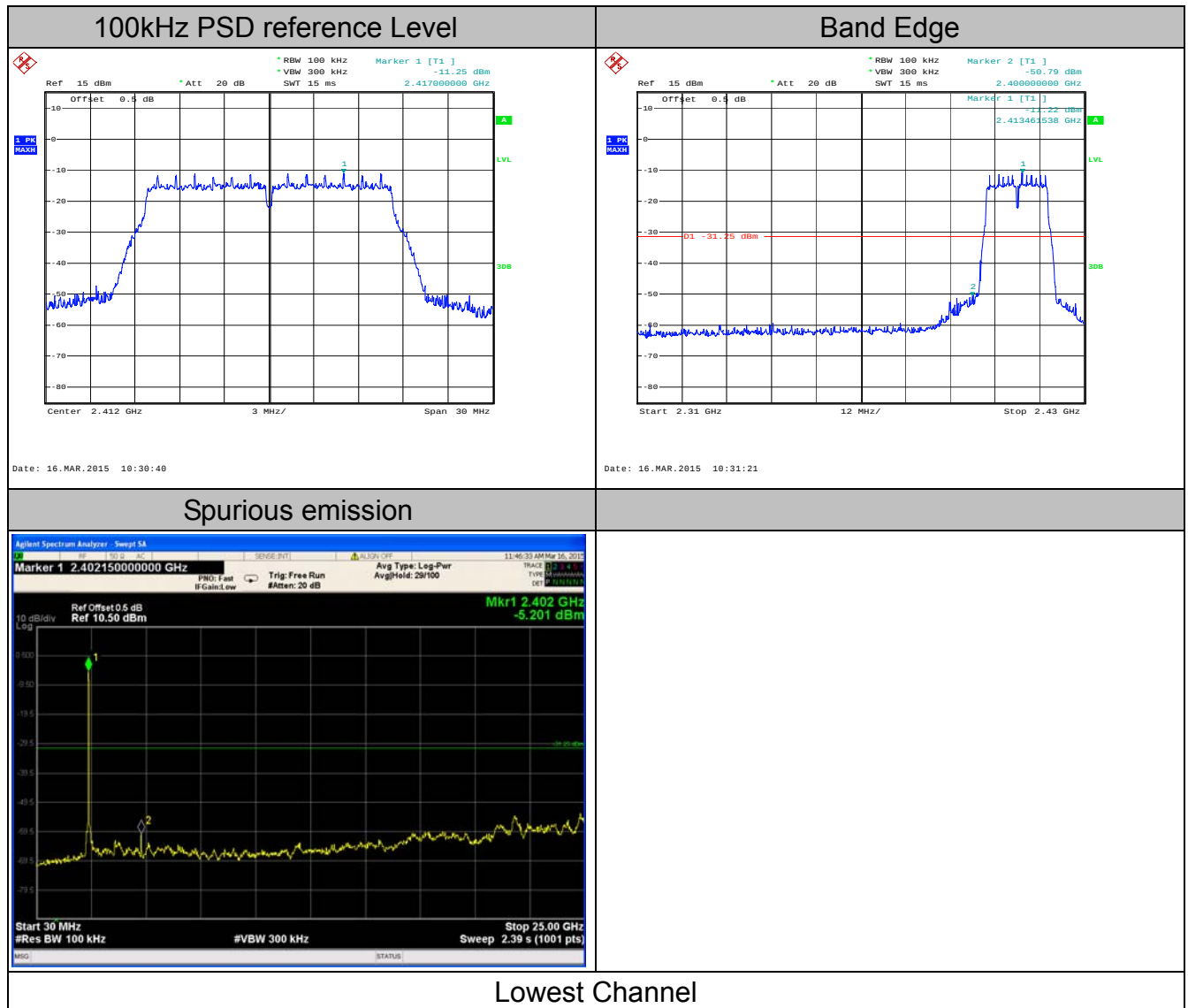
Date: 16.MAR.2015 10:29:45

Spurious emission

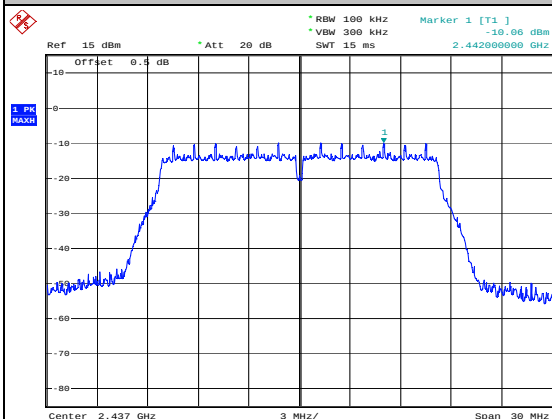


Highest Channel

802.11g Modulation

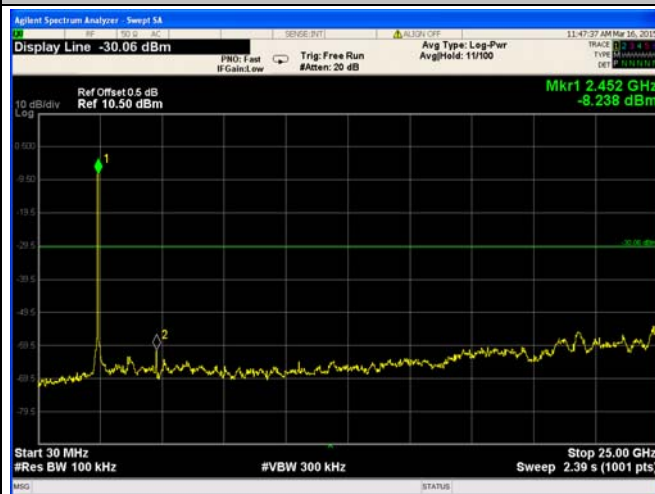


100kHz PSD reference Level



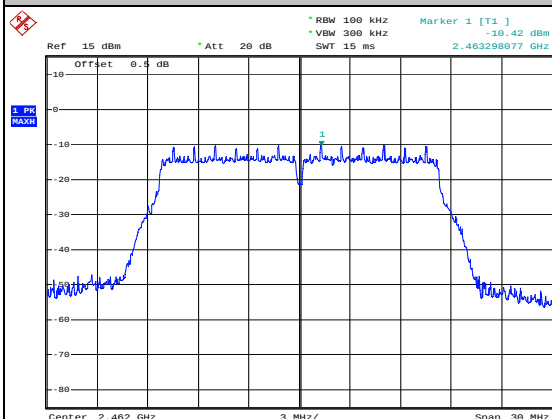
Date: 16.MAR.2015 10:32:26

Spurious emission



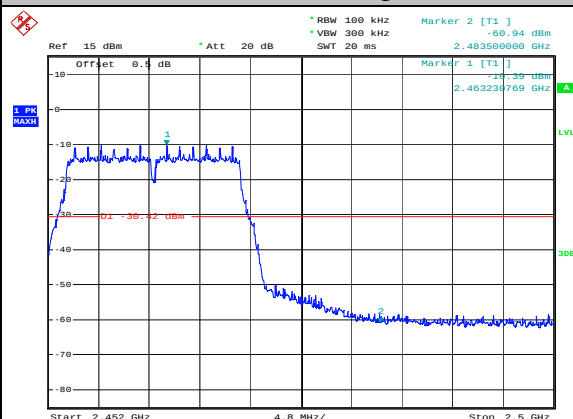
Middle Channel

100kHz PSD reference Level



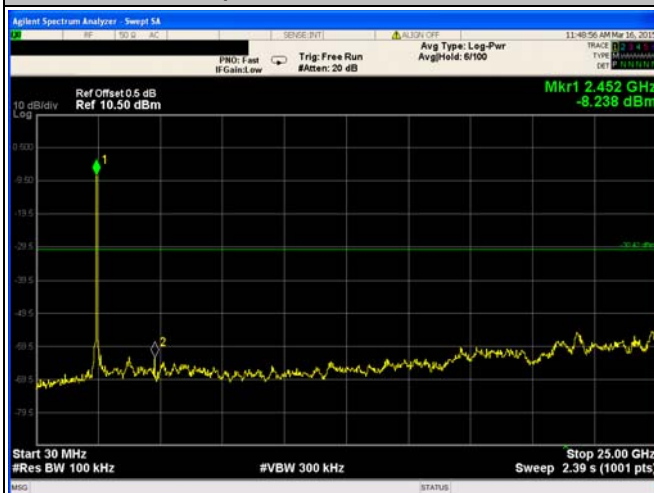
Date: 16.MAR.2015 10:33:25

Band Edge



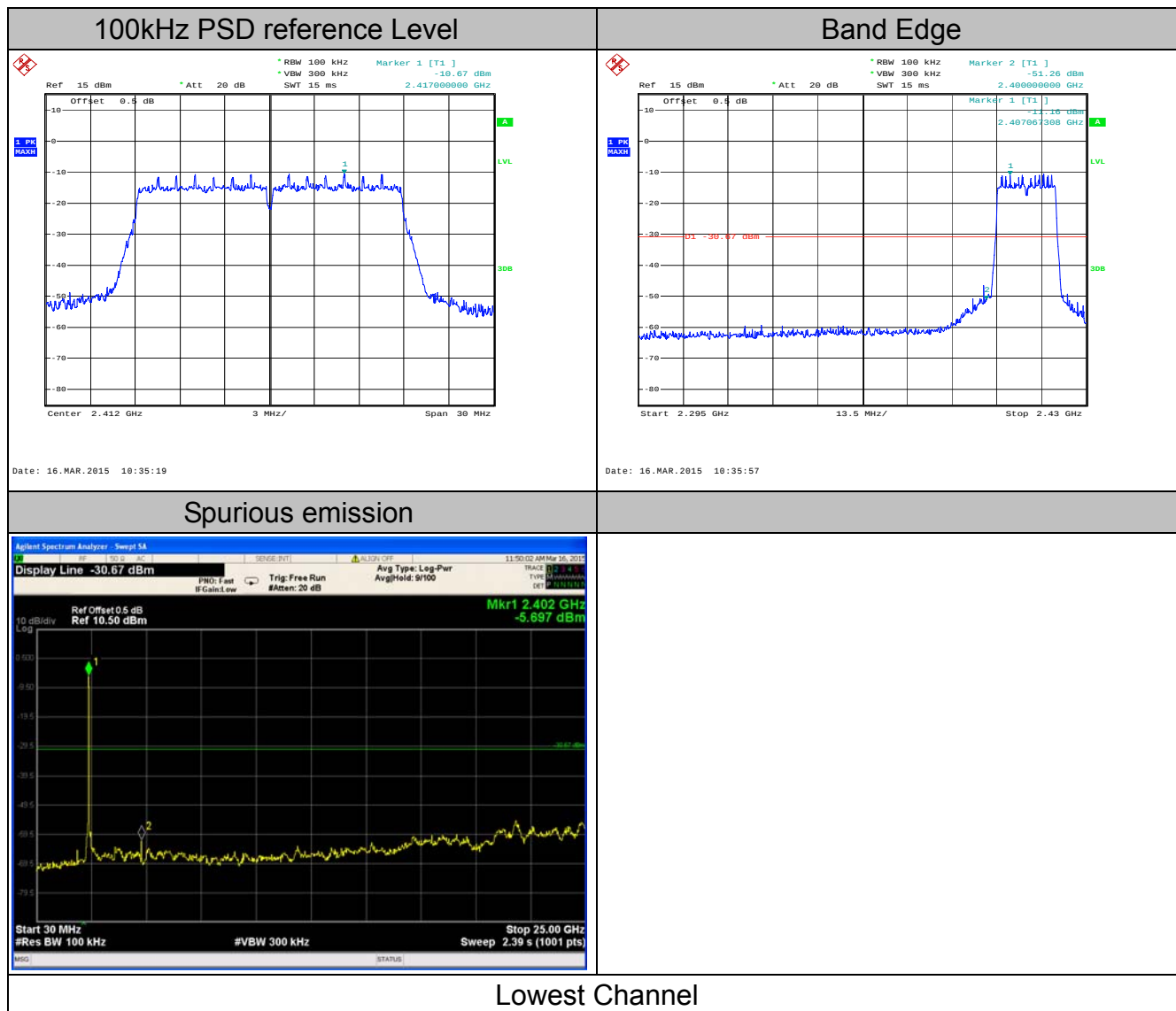
Date: 16.MAR.2015 10:34:29

Spurious emission

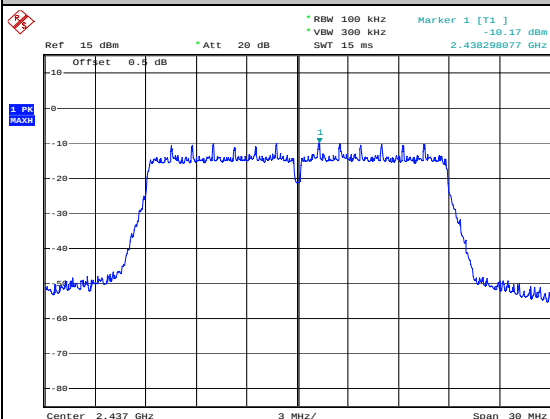


Highest Channel

802.11n (HT20) Modulation

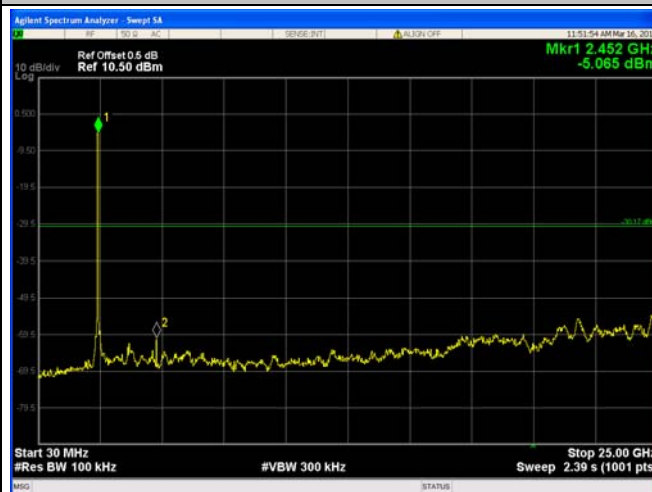


100kHz PSD reference Level



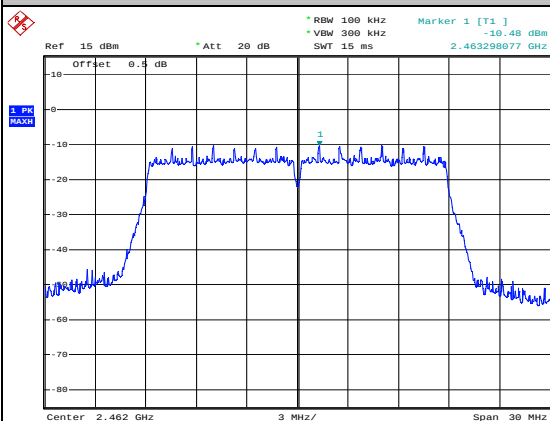
Date: 16.MAR.2015 10:36:37

Spurious emission



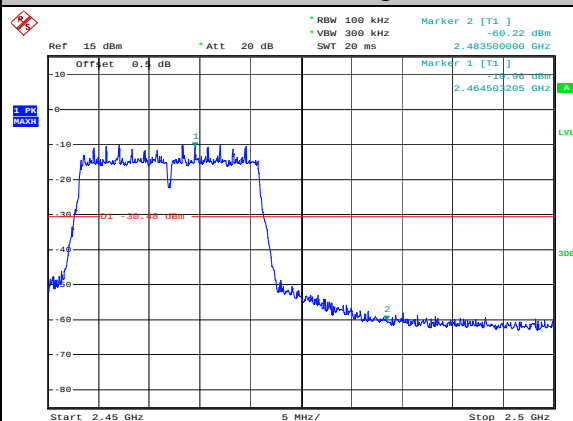
Middle Channel

100kHz PSD reference Level



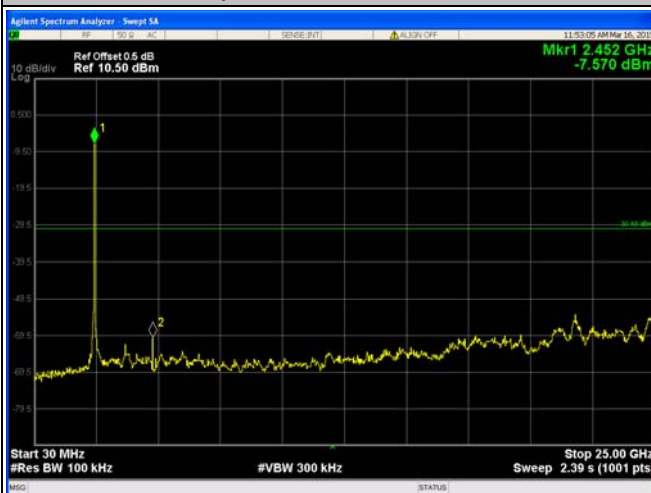
Date: 16.MAR.2015 10:37:26

Band Edge



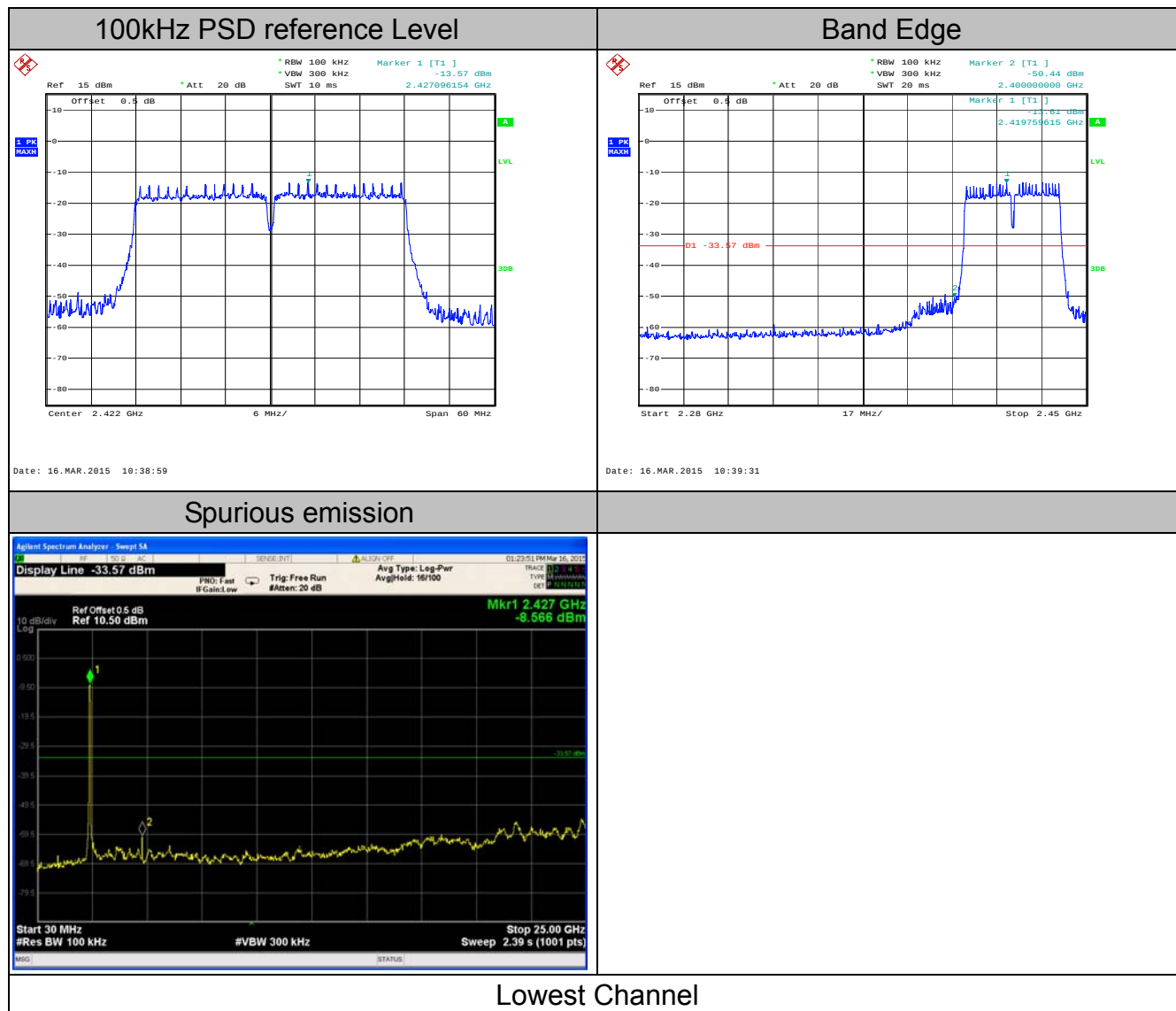
Date: 16.MAR.2015 10:37:50

Spurious emission

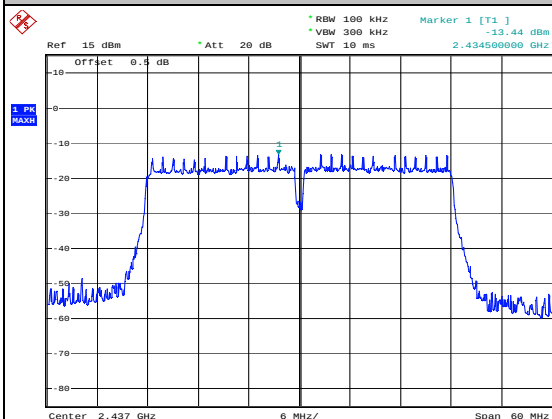


Highest Channel

802.11n (HT40) Modulation

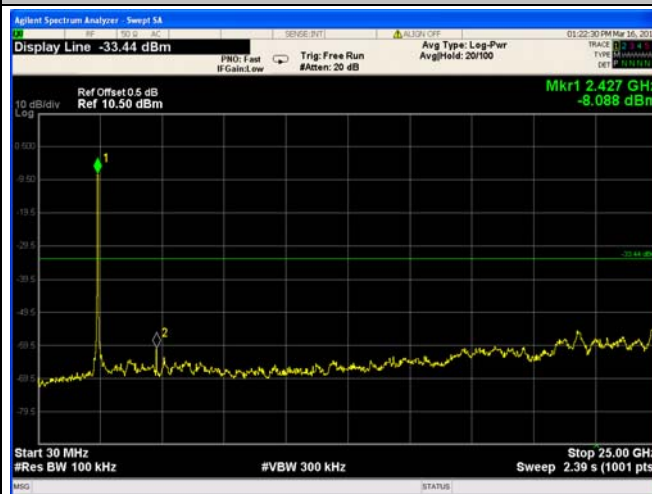


100kHz PSD reference Level



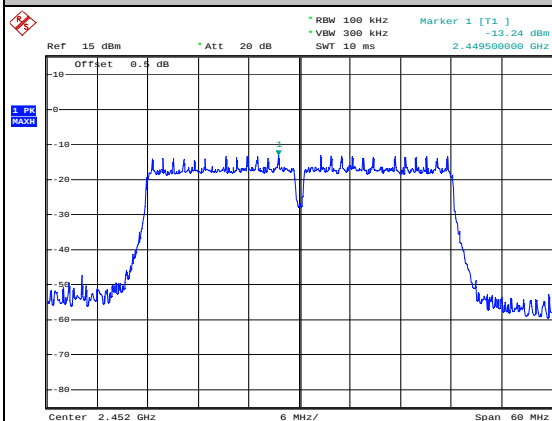
Date: 16.MAR.2015 10:40:23

Spurious emission



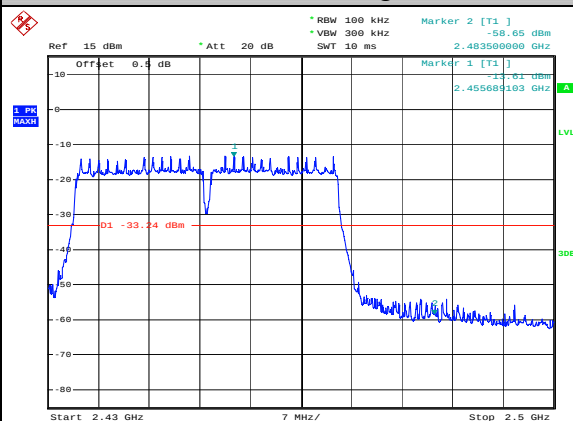
Middle Channel

100kHz PSD reference Level



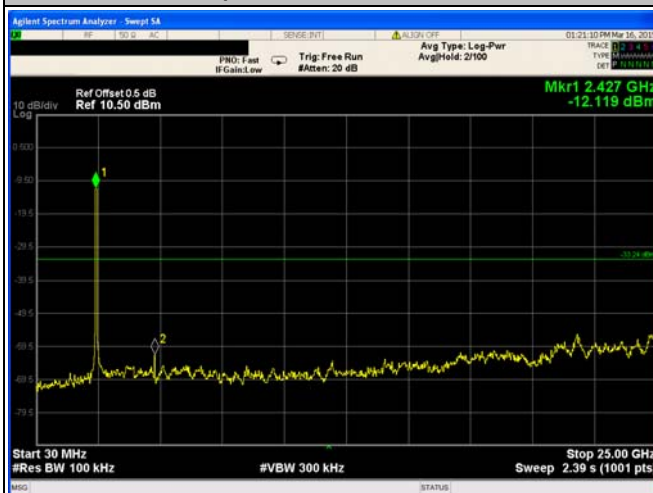
Date: 16.MAR.2015 10:41:05

Band Edge



Date: 16.MAR.2015 10:41:35

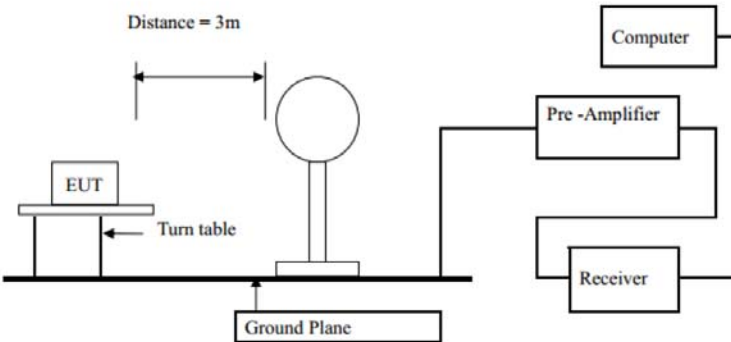
Spurious emission

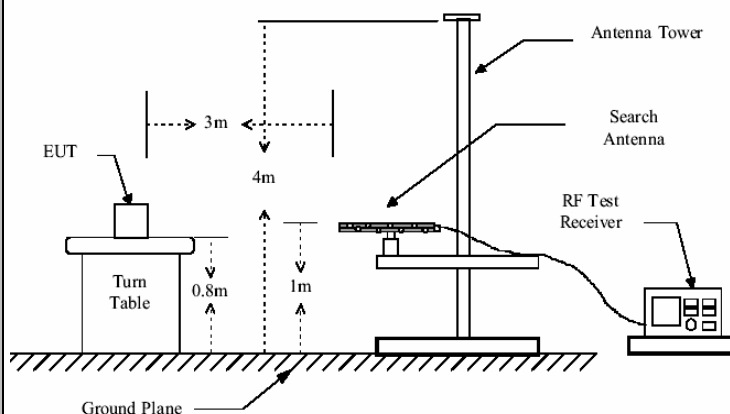


Highest Channel

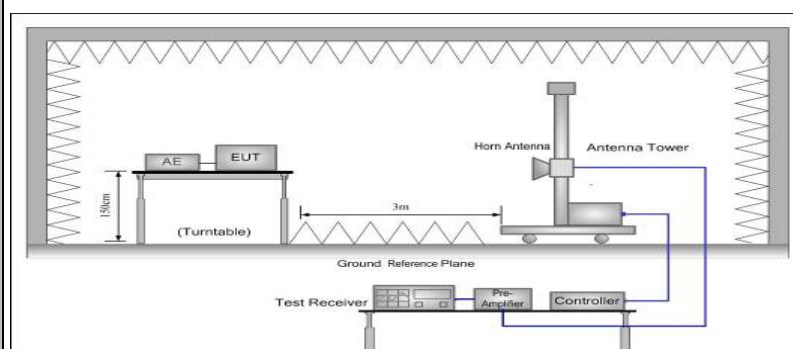
6.8. Radiated Spurious Emission Measurement

6.8.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.4: 2009 and ANSI C63.10-2013				
Frequency Range:	9 kHz to 25 GHz				
Measurement Distance:	3 m				
Antenna Polarization:	Horizontal & Vertical				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Peak	1MHz	10Hz	Average Value
Limit:	Frequency		Field Strength (microvolts/meter)		Measurement Distance (meters)
	0.009-0.490		2400/F(KHz)		300
	0.490-1.705		24000/F(KHz)		30
	1.705-30		30		30
	30-88		100		3
	88-216		150		3
	216-960		200		3
	Above 960		500		3
	Frequency		Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector
	Above 1GHz		500	3	Average
		5000	3	Peak	
Test setup:	For radiated emissions below 30MHz				
					
	30MHz to 1GHz				



Above 1GHz



Test Procedure:

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter above ground in below 1GHz, 1.5 meter for above 1GHz
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1 \text{ GHz}$; $\text{VBW} \geq \text{RBW}$;

	Sweep = auto; Detector function = peak; Trace = max hold; (3) Set RBW = 1 MHz, VBW= 3MHz for f 1 GHz for peak measurement. For average measurement: VBW = 10 Hz, when duty cycle is no less than 98 percent. $VBW \geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
Test results:	PASS

6.8.2. Test Instruments

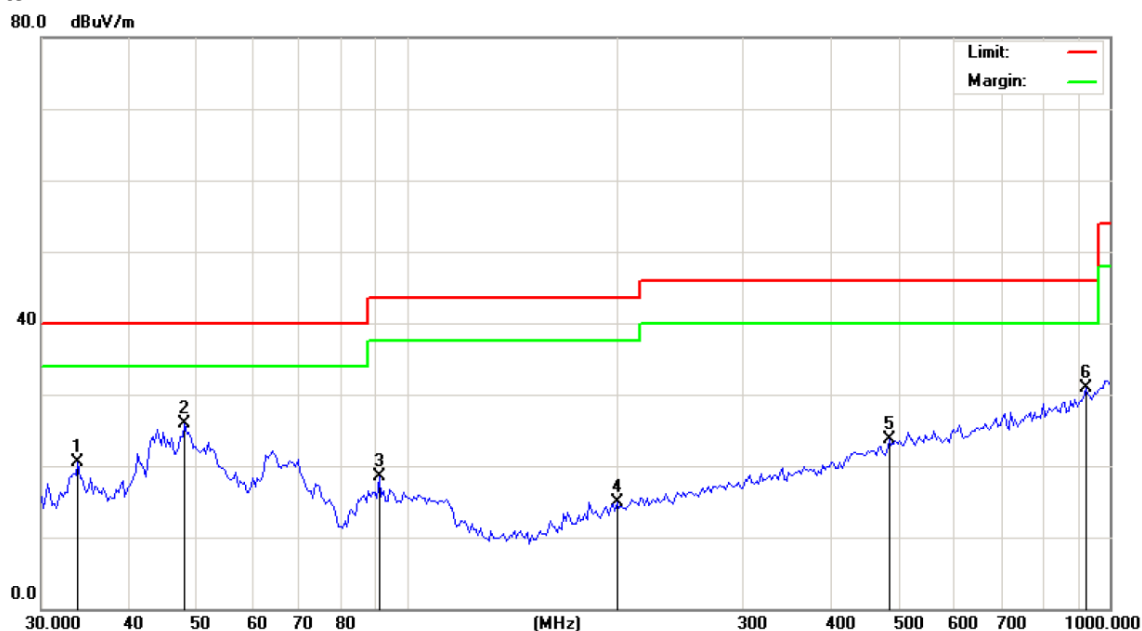
Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESPI Test Receiver	ROHDE&SCHW ARZ	ESVD	100008	Sep.16 , 2015
Spectrum Analyzer	ROHDE&SCHW ARZ	FSEM	848597/001	Sep.16 , 2015
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep.16 , 2015
Pre-amplifier	HP	8447D	2727A05017	Sep.16 , 2015
Loop antenna	ZHINAN	ZN30900A	12024	Dec.14 , 2015
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep.16 , 2015
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep.16 , 2015
Coax cable	TCT	N/A	N/A	Sep.15 , 2015
Coax cable	TCT	N/A	N/A	Sep.15 , 2015
Coax cable	TCT	N/A	N/A	Sep.15 , 2015
Coax cable	TCT	N/A	N/A	Sep.15 , 2015
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.8.3. Test Data

Below 1GHz

Horizontal:



Site

Polarization: **Horizontal**

Temperature: 23

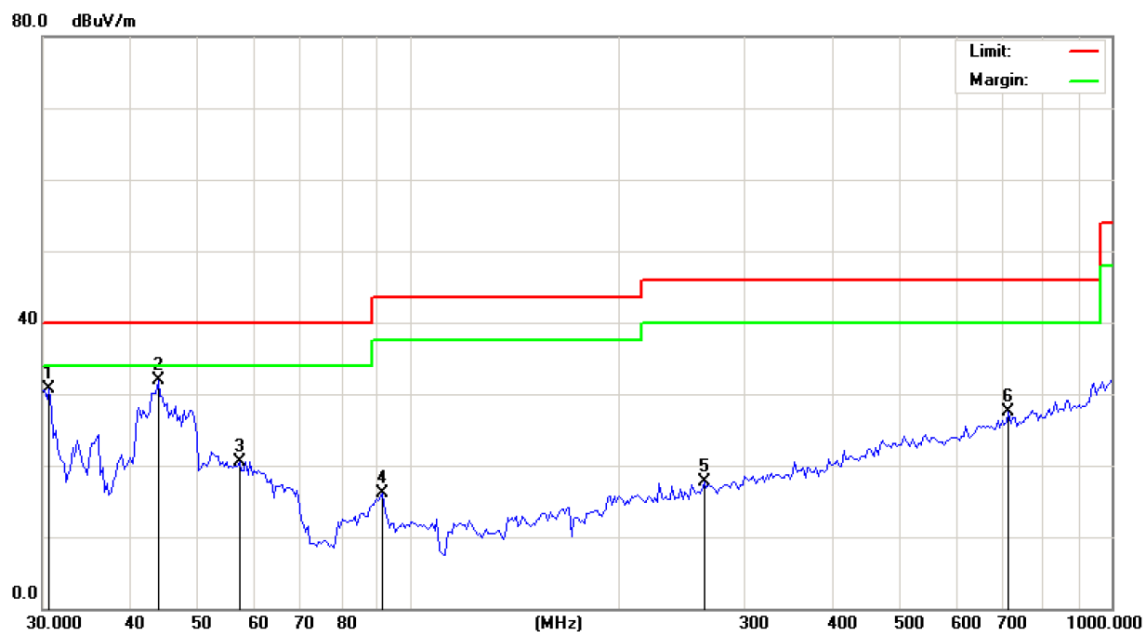
Limit: FCC Part 15B Class B RE_3 m

Power: AC 120V/60Hz

Humidity: 50 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		33.8066	33.75	-13.25	20.50	40.00	-19.50	peak	0	
2	*	48.0392	37.99	-12.12	25.87	40.00	-14.13	peak	0	
3		91.0574	31.24	-12.82	18.42	43.50	-25.08	peak	0	
4		198.6424	26.75	-11.77	14.98	43.50	-28.52	peak	0	
5		484.9067	27.22	-3.46	23.76	46.00	-22.24	peak	0	
6		925.6132	27.30	3.54	30.84	46.00	-15.16	peak	0	

Vertical:



Site

Polarization: **Vertical**

Temperature: 23

Limit: FCC Part 15B Class B RE_3 m

Power: AC 120V/60Hz

Humidity: 50 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Comment
1		30.6390	44.29	-13.64	30.65	40.00	-9.35	peak	0	
2	*	43.8451	44.13	-12.30	31.83	40.00	-8.17	peak	0	
3		57.2653	33.19	-12.59	20.60	40.00	-19.40	peak	0	
4		91.6994	28.90	-12.72	16.18	43.50	-27.32	peak	0	
5		263.1154	27.28	-9.51	17.77	46.00	-28.23	peak	0	
6		713.6915	27.14	0.31	27.45	46.00	-18.55	peak	0	

Note: 1. The low frequency, which started from 9KHz~30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported
2. Measurements were conducted in all three channels (high, middle, low), and the worst case 11B Mode (Highest channel) was submitted only.

Above 1GHz

Modulation Type: 802.11b

Low channel: 2412 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
2387.50	H	65.82	---	-4.20	61.62	---	74.00	54.00	-12.38
2387.50	H	---	50.31	-4.20	---	46.11	74.00	54.00	-7.89
4824.00	H	46.20	---	-3.94	42.26	---	74.00	54.00	-11.74
7236.00	H	45.00	---	0.52	45.52	---	74.00	54.00	-8.48
---	---	---	---	---	---	---	---	---	---
2387.50	V	68.23	---	-4.20	64.03	---	74.00	54.00	-9.97
2387.50	V	---	51.74	-4.20	---	47.54	74.00	54.00	-6.46
4824.00	V	48.42	---	-3.94	44.48	---	74.00	54.00	-9.52
7236.00	V	45.47	---	0.52	45.99	---	74.00	54.00	-8.01
---	V	---	---	---	---	---	---	---	---

Middle channel: 2437MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4874.00	H	48.78	---	-3.98	44.8	---	74.00	54.00	-9.2
7311.00	H	46.20	---	0.57	46.77	---	74.00	54.00	-7.23
---	---	---	---	---	---	---	---	---	---
---	H	---	---	---	---	---	---	---	---
---	H	---	---	---	---	---	---	---	---
4874.00	V	49.64	---	-3.98	45.66	---	74.00	54.00	-8.34
7311.00	V	48.21	---	0.57	48.78	---	74.00	54.00	-5.22
---	---	---	---	---	---	---	---	---	---
---	V	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---

High channel: 2462 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
2486.58	H	65.43	---	-2.38	63.05	---	74.00	54.00	-10.95
2486.58	H	---	51.56	-2.38	---	49.18	74.00	54.00	-4.82
4924.00	H	50.76	---	-3.98	46.78	---	74.00	54.00	-7.22
7386.00	H	47.42	---	0.57	47.99	---	74.00	54.00	-6.01
---	---	---	---	---	---	---	---	---	---
2483.51	V	69.63	---	-2.38	67.25	---	74.00	54.00	-6.75
2483.51	V	---	50.22	-2.38	---	47.84	74.00	54.00	-6.16
4924.00	V	50.97	---	-3.98	46.99	---	74.00	54.00	-7.01
7386.00	V	46.29	---	0.57	46.86	---	74.00	54.00	-7.14
---	---	---	---	---	---	---	---	---	---

Note:

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. Data of measurement shown "—" in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

Modulation Type: 802.11g

Low channel: 2412 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
2389.98	H	59.68	---	-4.20	55.48	---	74.00	54.00	-18.52
2389.98	H	---	51.31	-4.20	---	47.11	74.00	54.00	-6.89
4824.00	H	51.32	---	-3.94	47.38	---	74.00	54.00	-6.62
7236.00	H	49.64	---	0.52	50.16	---	74.00	54.00	-3.84
---	---	---	---	---	---	---	---	---	---
2389.98	V	58.79	---	-4.20	54.59	---	74.00	54.00	-19.41
2389.98	V	---	48.57	-4.20	---	44.37	74.00	54.00	-9.63
4824.00	V	50.78	---	-3.94	46.84	---	74.00	54.00	-7.16
7236.00	V	44.32	---	0.52	44.84	---	74.00	54.00	-9.16
---	---	---	---	---	---	---	---	---	---

Middle channel: 2437MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4874.00	H	51.45	---	-3.98	47.47	---	74.00	54.00	-6.53
7311.00	H	44.78	---	0.57	45.35	---	74.00	54.00	-8.65
---	---	---	---	---	---	---	---	---	---
---	H	---	---	---	---	---	---	---	---
---	H	---	---	---	---	---	---	---	---
4874.00	V	51.63	---	-3.98	47.65	---	74.00	54.00	-6.35
7311.00	V	48.21	---	0.57	48.78	---	74.00	54.00	-5.22
---	---	---	---	---	---	---	---	---	---
---	V	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---

High channel: 2462 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
2488.34	H	58.35	---	-2.38	55.97	---	74.00	54.00	-18.03
2488.34	H	---	51.31	-2.38	---	48.93	74.00	54.00	-5.07
4924.00	H	51.56	---	-3.98	47.58	---	74.00	54.00	-6.42
7386.00	H	45.72	---	0.57	46.29	---	74.00	54.00	-7.71
---	---	---	---	---	---	---	---	---	---
2488.34	V	57.39	---	-2.38	55.01	---	74	54.00	-18.99
2488.34	V	---	48.57	-2.38	---	46.19	74	54.00	-7.81
4924.00	V	50.72	---	-3.98	46.74	---	74.00	54.00	-7.26
7386.00	V	45.32	---	0.57	45.89	---	74.00	54.00	-8.11
---	---	---	---	---	---	---	---	---	---

Note:

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. Data of measurement shown "---" in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

Modulation Type: 802.11n (HT20)

Low channel: 2412 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
2388.01	H	67.98	---	-4.20	63.78	---	74.00	54.00	-10.22
2388.01	H	---	49.25	-4.20	---	45.05	74.00	54.00	-8.95
4824.00	H	48.52	---	-3.94	44.58	---	74.00	54.00	-9.42
7236.00	H	46.46	---	0.52	46.98	---	74.00	54.00	-7.02
---	---	---	---	---	---	---	---	---	---
2388.01	V	67.24	---	-4.20	63.04	---	74.00	54.00	-10.96
2388.01	V	---	48.57	-4.20	---	44.37	74.00	54.00	-9.63
4824.00	V	49.59	---	-3.94	45.65	---	74.00	54.00	-8.35
7236.00	V	45.50	---	0.52	46.02	---	74.00	54.00	-7.98
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Middle channel: 2437MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4874.00	H	49.70	---	-3.98	45.72	---	74.00	54.00	-8.28
7311.00	H	45.88	---	0.57	46.45	---	74.00	54.00	-7.55
---	---	---	---	---	---	---	---	---	---
---	H	---	---	---	---	---	---	---	---
---	H	---	---	---	---	---	---	---	---
4874.00	V	50.82	---	-3.98	46.84	---	74.00	54.00	-7.16
7311.00	V	46.06	---	0.57	46.63	---	74.00	54.00	-7.37
---	---	---	---	---	---	---	---	---	---
---	V	---	---	---	---	---	---	---	---
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High channel: 2462 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
2493.51	H	68.54	---	-2.38	66.16	---	74.00	54.00	-7.84
2493.51	H	---	51.97	-2.38	---	49.59	74.00	54.00	-4.41
4924.00	H	51.34	---	-3.98	47.36	---	74.00	54.00	-6.64
7386.00	H	46.53	---	0.57	47.1	---	74.00	54.00	-6.90
---	---	---	---	---	---	---	---	---	---
2493.51	V	69.54	---	-2.38	67.16	---	74.00	54.00	-6.84
2493.51	V	---	52.2	-2.38	---	49.82	74.00	54.00	-4.18
4924.00	V	50.97	---	-3.98	46.99	---	74.00	54.00	-7.01
7386.00	V	46.29	---	0.57	46.86	---	74.00	54.00	-7.14
---	---	---	---	---	---	---	---	---	---

Note:

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. Data of measurement shown "—" in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

Modulation Type: 802.11n (HT40)

Low channel: 2422 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
2389.98	H	70.28	---	-4.20	66.08	---	74.00	54.00	-7.92
2389.98	H	---	52.34	-4.20	---	48.14	74.00	54.00	-5.86
4844.00	H	52.75	---	-3.94	48.81	---	74.00	54.00	-5.19
7266.00	H	47.63	---	0.52	48.15	---	74.00	54.00	-5.85
---	---	---	---	---	---	---	---	---	---
2389.98	V	71.68	---	-4.20	67.48	---	74.00	54.00	-6.52
2389.98	V	---	52.14	-4.20	---	47.94	74.00	54.00	-6.06
4844.00	V	52.62	---	-3.94	47.07	---	74.00	54.00	-6.93
7266.00	V	47.53	---	0.52	46.72	---	74.00	54.00	-7.28
---	---	---	---	---	---	---	---	---	---

Middle channel: 2437MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4874.00	H	53.55	---	-3.98	49.57	---	74.00	54.00	-4.43
7311.00	H	49.32	---	0.57	49.89	---	74.00	54.00	-4.11
---	---	---	---	---	---	---	---	---	---
---	H	---	---	---	---	---	---	---	---
---	H	---	---	---	---	---	---	---	---
4874.00	V	52.35	---	-3.98	48.37	---	74.00	54.00	-5.63
7311.00	V	47.32	---	0.57	47.89	---	74.00	54.00	-6.11
---	---	---	---	---	---	---	---	---	---
---	V	---	---	---	---	---	---	---	---
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High channel: 2452 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
2493.51	H	67.45	---	-2.38	65.07	---	74.00	54.00	-8.93
2493.51	H	---	51.08	-2.38	---	48.7	74.00	54.00	-5.30
4904.00	H	53.24	---	-3.98	49.26	---	74.00	54.00	-4.74
7356.00	H	48.52	---	0.57	49.09	---	74.00	54.00	-4.91
---	---	---	---	---	---	---	---	---	---
2493.51	V	68.54	---	-2.38	66.16	---	74.00	54.00	-7.84
2493.51	V	---	52.73	-2.38	---	50.35	74.00	54.00	-3.65
4904.00	V	53.56	---	-3.98	49.58	---	74.00	54.00	-4.42
7356.00	V	46.92	---	0.57	47.49	---	74.00	54.00	-6.51
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Note:

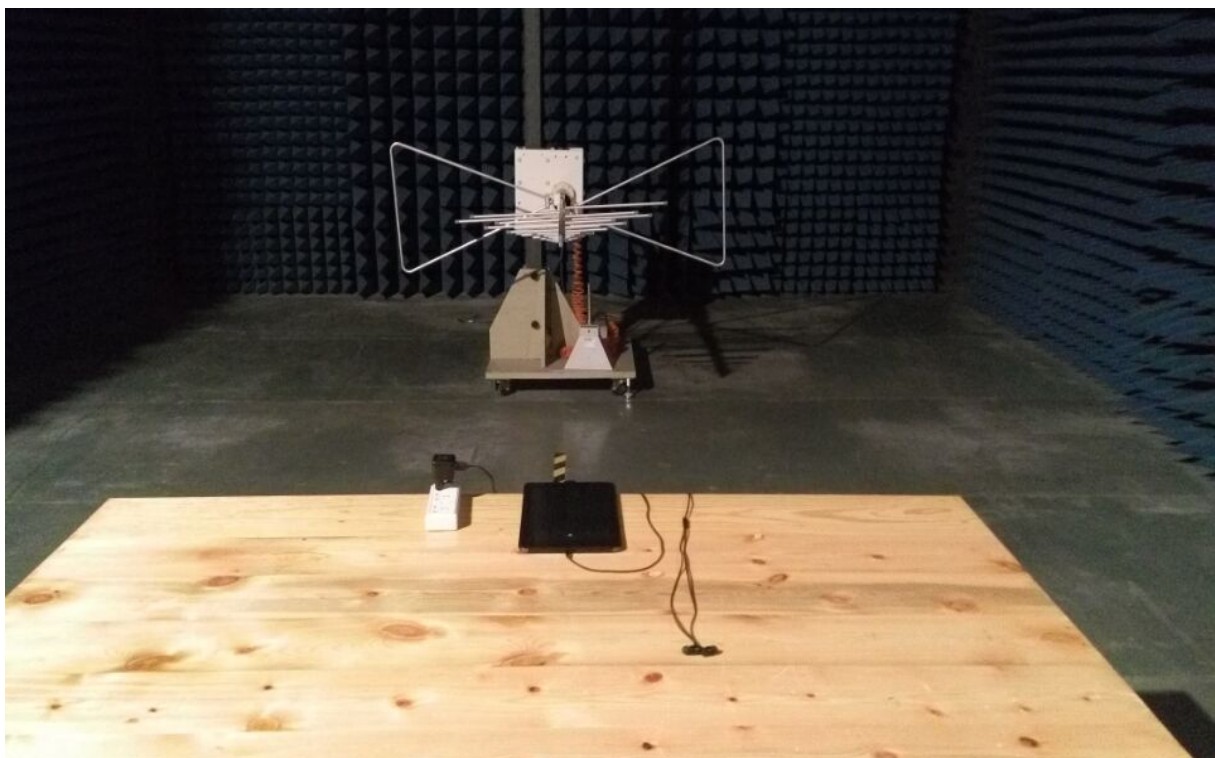
- Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
- Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)
- The emission levels of other frequencies are very lower than the limit and not show in test report.
- Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
- Data of measurement shown "---" in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

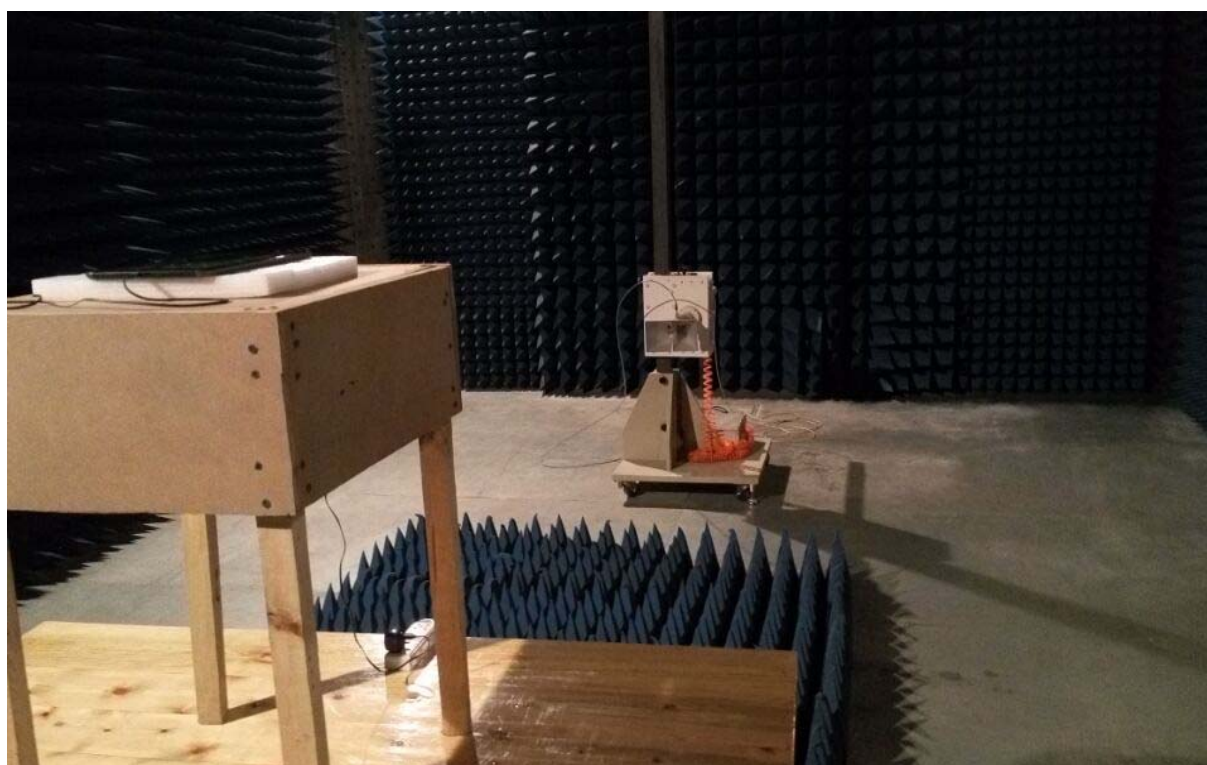
7. Photographs of Test Configuration

Conducted Emission



Radiated Emission





8. Photographs of EUT

Please refer to report TCT150225E026

*******END OF REPORT*******