TCT 通测检测 TESTING CENTRE TECHNOLOGY

TEST REPORT

FCC ID: 2ADINN5001TL

Product: LTE mobile phone

Model No.: N5001L

Additional Model No.: N5001TL, A4L, A3L

Trade Mark: NUU

Report No.: TCT171020E013

Issued Date: Oct. 20, 2017

Issued for:

Sun Cupid Technology (HK) Ltd.

16/F, CEO Tower, 77 Wing Hong St, Cheung Sha Wan, Kowloon, Hong Kong.

Issued By:

Shenzhen Tongce Testing Lab.

1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

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TABLE OF CONTENTS

Hotline: 400-6611-140 Tel: 86-755-27673339 Fax: 86-755-27673332 http://www.tct-lab.com

1. Test Certification

Product:	LTE mobile phone
Model No.:	N5001L
Additional Model No.:	N5001TL, A4L, A3L
Trade Mark:	**NUU**
Applicant:	Sun Cupid Technology (HK) Ltd.
Address:	16/F, CEO Tower, 77 Wing Hong St, Cheung Sha Wan, Kowloon, Hong Kong.
Manufacturer:	SUNCUPID (ShenZhen) Electronic Ltd
Address:	Baolong Industrial City, Longgang District, Shenzhen Hi-Tech Road, Building1, A 7, China.
Date of Test:	Apr. 24, 2017 – Jun. 13, 2017
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247 KDB 558074 D01 DTS Meas Guidance v04

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:	Garen	***Date:***	***Jun. 13, 2017***
Reviewed By:		***Date:***	***Oct. 20, 2017***
Approved By:	Tomsin	***Date:***	***Oct. 20, 2017***

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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) §2.1046	PASS
6dB Emission Bandwidth	§15.247 (a)(2) §2.1049	PASS
Power Spectral Density	§15.247 (e)	PASS
Band Edge	1§5.247(d) §2.1051, §2.1057	PASS
Spurious Emission	§15.205/§15.209 §2.1053, §2.1057	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.

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3. EUT Description

Product:	LTE mobile phone
Model No.:	N5001L
Additional Model No.:	N5001TL, A4L, A3L
Trade Mark:	**NUU**
Hardware version:	110SFM788P0A2V0
Software version:	N5001L-AM-01
Operation Frequency:	2412MHz~2462MHz (802.11b/802.11g/802.11n(HT20)) 2422MHz~2452MHz (802.11n(HT40))
Channel Separation:	5MHz
Number of Channel:	11 for 802.11b/802.11g/802.11n(HT20) 7 for 802.11n(HT40)
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:	Integral Antenna
Antenna Gain:	1.02dBi
Power Supply:	Rechargeable Li-ion Battery DC3.8V / 2000mAh
Adapter:	Adapter Information: Model name: HJ-0501000E1-US Input: AC 100-240V 50/60Hz 0.2A Output: DC 5.0V⎓1000mA
Remark:	All models above are identical in interior structure, electrical circuits and components, and just model names and color are different for the marketing requirement.

Note: All the test data for this report follows the 2ADINN5001L report

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Operation Frequency each of channel For 802.11b/g/n(HT20)

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 (HT40)

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 (HT20)

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

802.11n (HT40)

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

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4. Genera Information

4.1. Test environment and mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is 98.46%)
The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) 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. For the full battery state and The output power to the maximum state.	

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	802.11b
Mode 2	802.11g
Mode 3	802.11n20
Mode 4	802.11n40

For Conducted Emission	
Final Test Mode	Description
Mode 1	802.11b

For Radiated Emission	
Final Test Mode	Description
Mode 1	802.11b

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Mode 2	802.11g
Mode 3	802.11n20
Mode 4	802.11n40

Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

(2) The EUT use new battery.

(3)The data rate was set in 1Mbps, 6 Mbps, 6.5 Mbps and 13.5M for radiated emission due to the highest RF output power.

(4) Record the worst case of each test item in this report.

(5) When we test it, the duty cycle ≥ 98%

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.

3. For conducted measurements (Output Power, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

5. Facilities and Accreditations

5.1. Facilities

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

- FCC - Registration No.: 645098

  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

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: +86-755-27673339

5.3. Measurement Uncertainty

The reported uncertainty of measurement y ± 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	±2.56dB
2	RF power, conducted	±0.12dB
3	Spurious emissions, conducted	±0.11dB
4	All emissions, radiated(<1G)	±3.92dB
5	All emissions, radiated(>1G)	±4.28dB
6	Temperature	±0.1°C
7	Humidity	±1.0%

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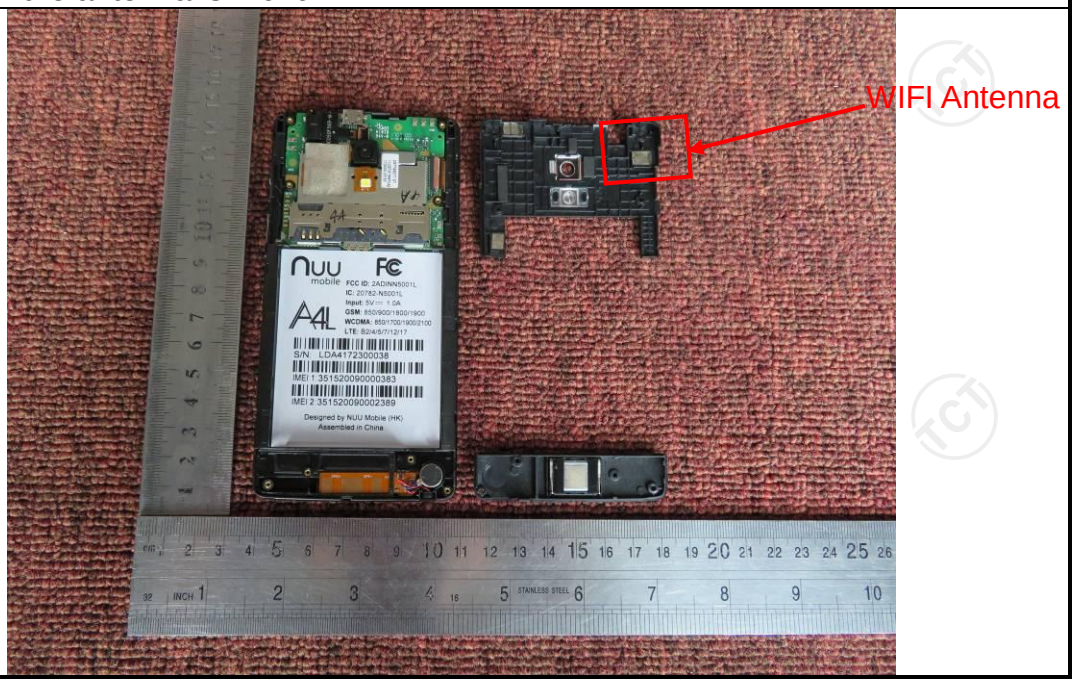
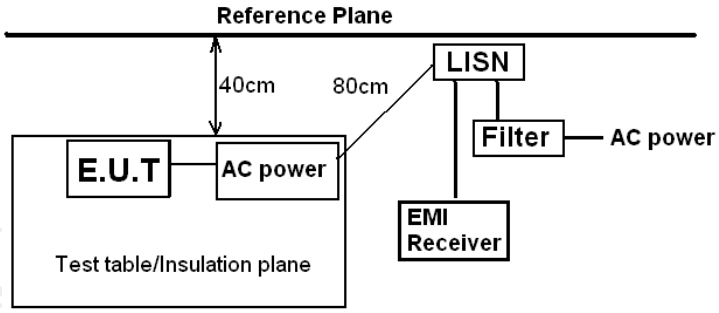
6. Test Results and Measurement Data

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 Integral antenna which permanently attached, and the best case gain of the antenna is 1.02dBi.	
	

6.2. Conducted Emission

6.2.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Frequency Range:</td><td>150 kHz to 30 MHz</td></tr>
<tr><td>Receiver setup:</td><td>RBW=9 kHz, VBW=30 kHz, Sweep time=auto</td></tr>
<tr><td>Limits:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></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>
</td></tr>
<tr><td>Test Setup:</td><td>


Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m
</td></tr>
<tr><td>Test Mode:</td><td>Charging + transmitting with modulation</td></tr>
<tr><td>Test Procedure:</td><td>1. The E.U.T is 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 C63.10: 2013 on conducted measurement.</td></tr>
<tr><td>Test Result:</td><td>PASS</td></tr>
</table>

6.2.2. Test Instruments

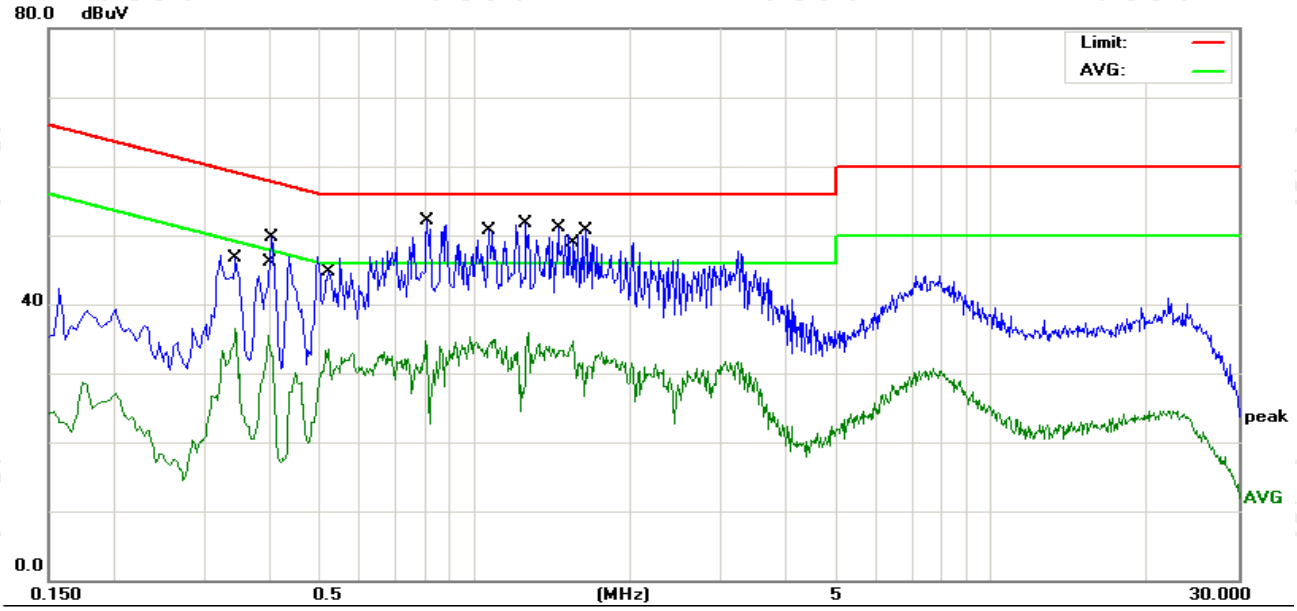
Conducted Emission Shielding Room Test Site (843)				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Test Receiver	R&S	ESPI	101401	Jun. 12, 2018
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 27, 2018
Coax cable (9KHz-30MHz)	TCT	CE-05	N/A	Sep. 27, 2018
EMI Test Software	Shurple Technology	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)



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.8100	41.32	10.71	52.03	56.00	-3.97	QP
2		1.2620	41.13	10.63	51.76	56.00	-4.24	QP
3		1.6420	40.03	10.60	50.63	56.00	-5.37	QP
4		0.4060	38.83	10.92	49.75	57.73	-7.98	QP
5		1.0660	40.09	10.63	50.72	56.00	-5.28	QP
6		1.4539	40.45	10.62	51.07	56.00	-4.93	QP
7		0.8059	23.91	10.71	34.62	46.00	-11.38	AVG
8		0.5220	22.79	10.80	33.59	46.00	-12.41	AVG
9		0.3980	24.47	10.93	35.40	47.89	-12.49	AVG
10		0.3460	25.44	11.01	36.45	49.06	-12.61	AVG
11		1.2700	25.33	10.63	35.96	46.00	-10.04	AVG
12		1.5580	24.08	10.60	34.68	46.00	-11.32	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

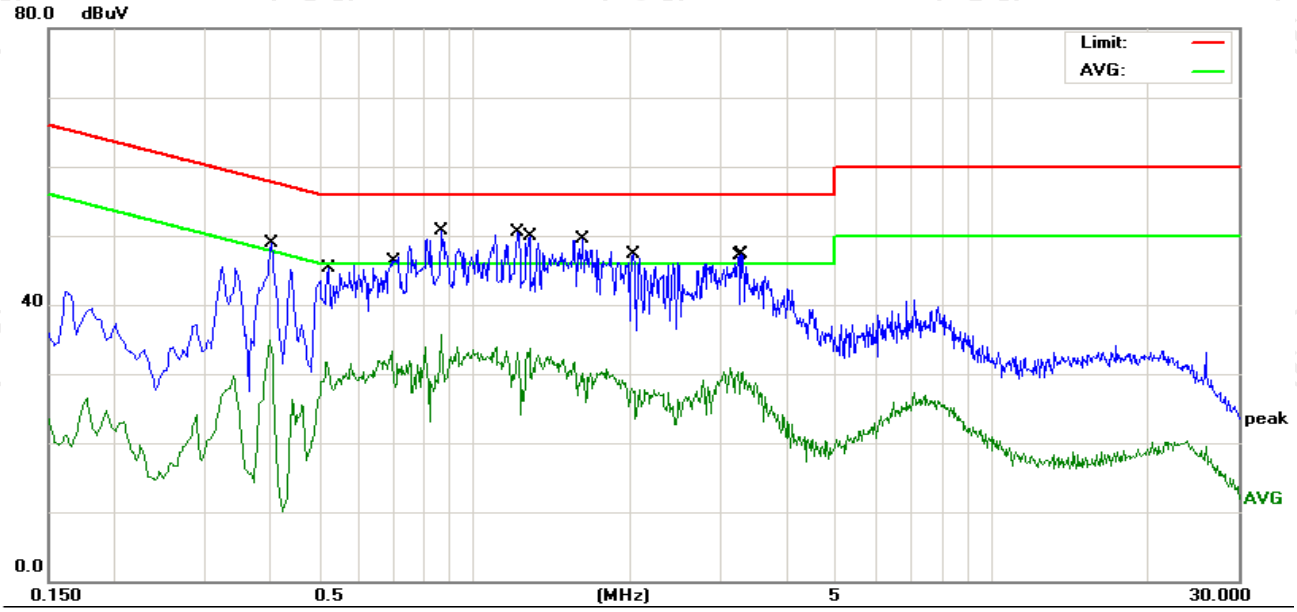
Margin (dB) = Measurement (dBμV) – Limits (dBμV)

Q.P. =Quasi-Peak

AVG =average

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

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



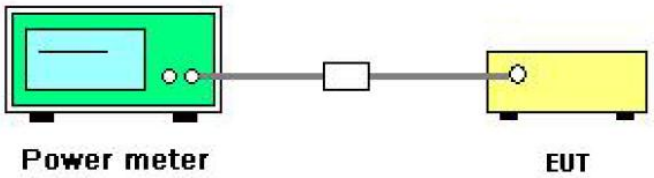
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		1.2138	39.93	10.62	50.55	56.00	-5.45	QP
2	*	0.8659	40.04	10.69	50.73	56.00	-5.27	QP
3		0.4060	37.90	10.92	48.82	57.73	-8.91	QP
4		1.6140	38.84	10.60	49.44	56.00	-6.56	QP
5		3.2860	36.76	10.56	47.32	56.00	-8.68	QP
6		2.0259	36.63	10.59	47.22	56.00	-8.78	QP
7		0.4020	23.93	10.93	34.86	47.81	-12.95	AVG
8		0.5180	20.83	10.80	31.63	46.00	-14.37	AVG
9		0.8659	24.98	10.69	35.67	46.00	-10.33	AVG
10		0.6899	22.55	10.77	33.32	46.00	-12.68	AVG
11		1.2780	22.99	10.63	33.62	46.00	-12.38	AVG
12		3.2259	19.75	10.57	30.32	46.00	-15.68	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.*

6.2.4. Maximum Conducted Output Power

6.2.5. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	KDB 558074
Limit:	30dBm
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04. 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 Peak output power and record the results in the test report.
Test Result:	PASS

6.2.6. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Power Meter	Anritsu	ML2495A	1005002	Sep. 27, 2018
Pulse Power Senor	Anritsu	MA2411B	0917070	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

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

6.2.7. Test Data

802.11b mode			
Test channel	Maximum Conducted Output Power (dBm)	Limit (dBm)	Result
Lowest	14.22	30.00	PASS
Middle	14.33	30.00	PASS
Highest	14.31	30.00	PASS

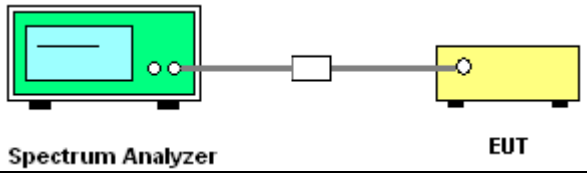
802.11g mode			
Test channel	Maximum Conducted Output Power (dBm)	Limit (dBm)	Result
Lowest	13.34	30.00	PASS
Middle	13.64	30.00	PASS
Highest	13.92	30.00	PASS

802.11n(H20) mode			
Test channel	Maximum Conducted Output Power (dBm)	Limit (dBm)	Result
Lowest	13.43	30.00	PASS
Middle	13.52	30.00	PASS
Highest	13.64	30.00	PASS

802.11n(H40) mode			
Test channel	Maximum Conducted Output Power (dBm)	Limit (dBm)	Result
Lowest	12.08	30.00	PASS
Middle	12.05	30.00	PASS
Highest	12.34	30.00	PASS

6.3. Emission Bandwidth

6.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	KDB 558074
Limit:	>500kHz
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v04. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. 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. 4. Measure and record the results in the test report.
Test Result:	PASS

6.3.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	R&S	FSU	200054	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

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

Test channel	6dB Emission Bandwidth (MHz)			
	802.11b	802.11g	802.11n(H20)	802.11n(H40)
Lowest	9.36	16.54	17.69	36.54
Middle	9.36	16.47	17.69	36.54
Highest	9.36	16.47	17.69	36.54
Limit:	>500k			
Test Result:	PASS			

Test plots as follows:

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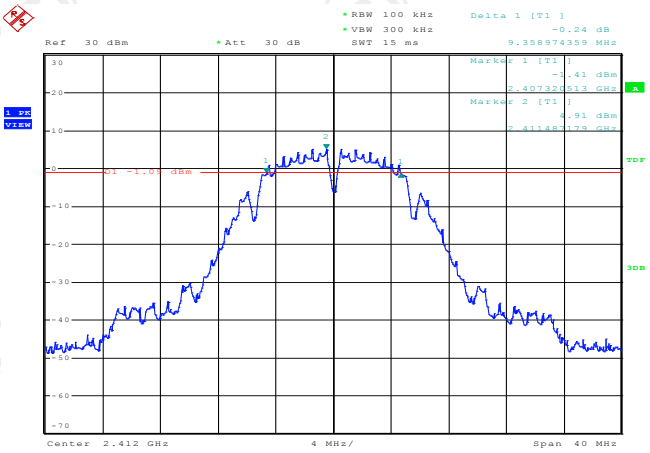
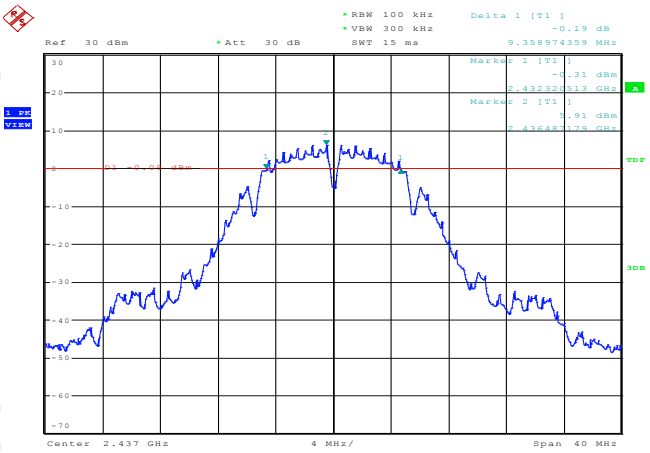
802.11b Modulation

Lowest channel



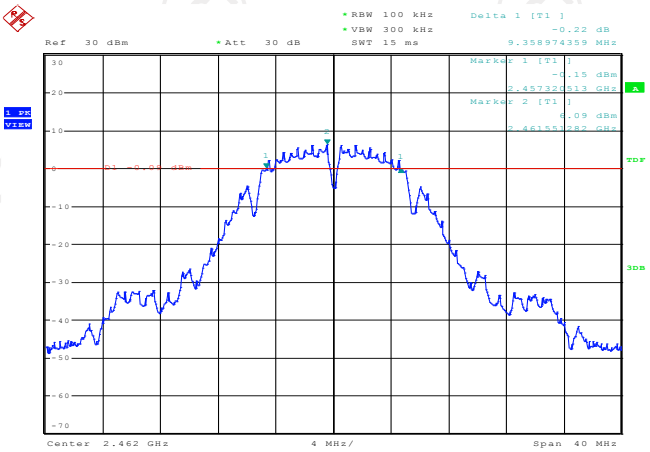
Date: 17.MAY.2017 16:53:39

Middle channel



Date: 17.MAY.2017 16:55:07

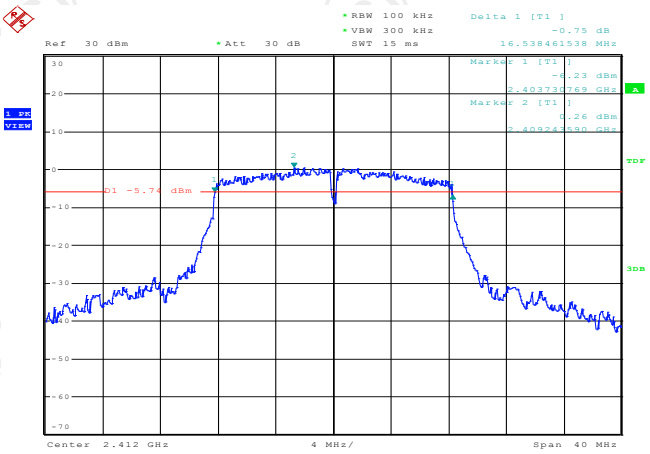
Highest channel



Date: 17.MAY.2017 16:56:42

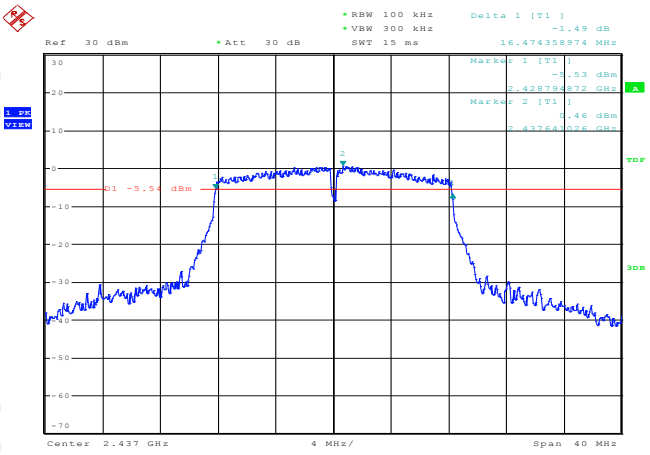
802.11g Modulation

Lowest channel



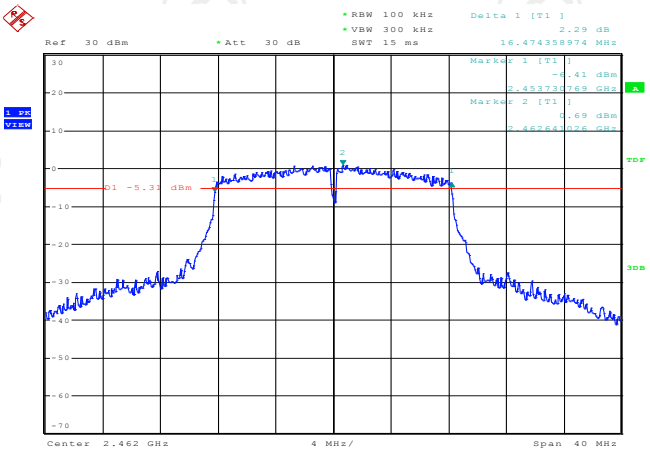
Date: 17.MAY.2017 16:59:01

Middle channel



Date: 17.MAY.2017 17:01:04

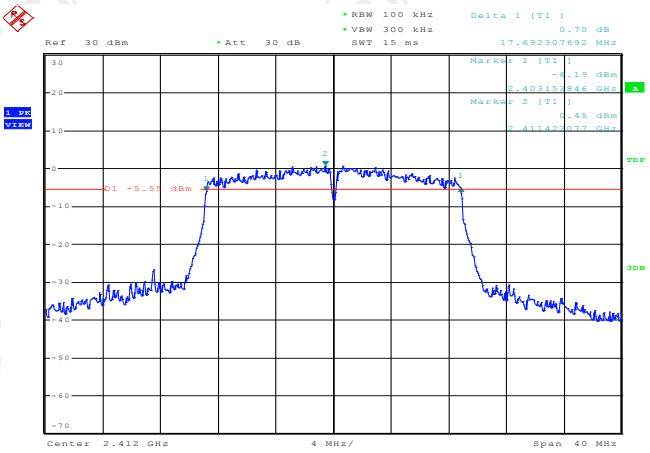
Highest channel



Date: 17.MAY.2017 17:04:13

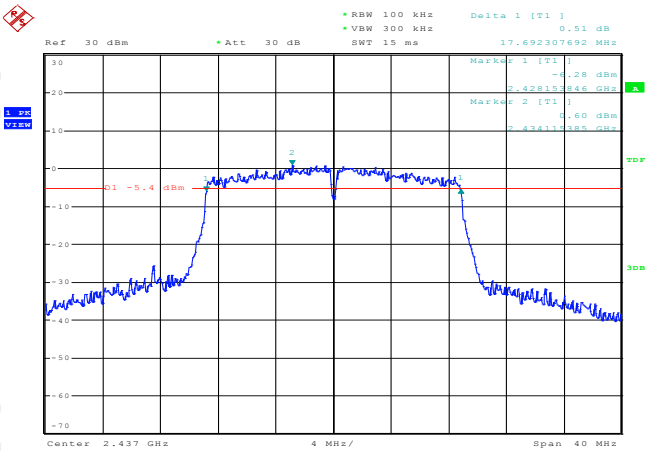
802.11n (HT20) Modulation

Lowest channel



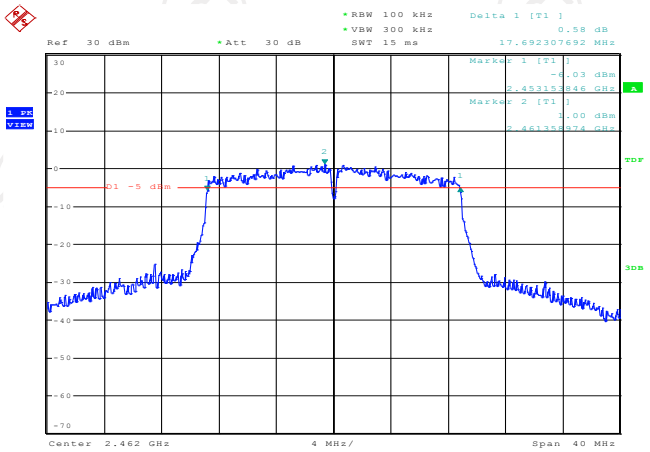
Date: 17.MAY.2017 17:06:09

Middle channel



Date: 17.MAY.2017 17:08:13

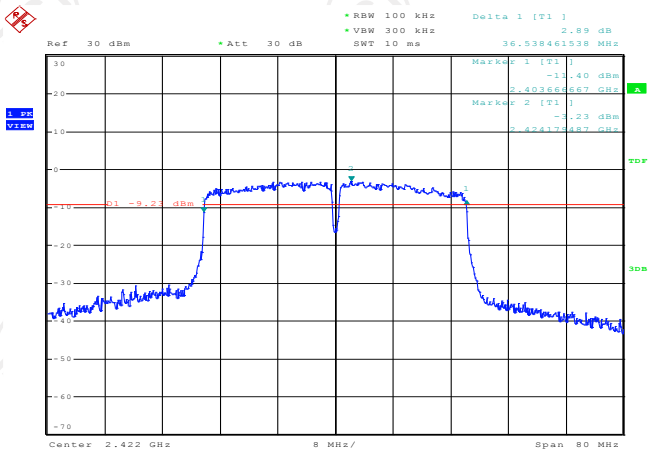
Highest channel



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

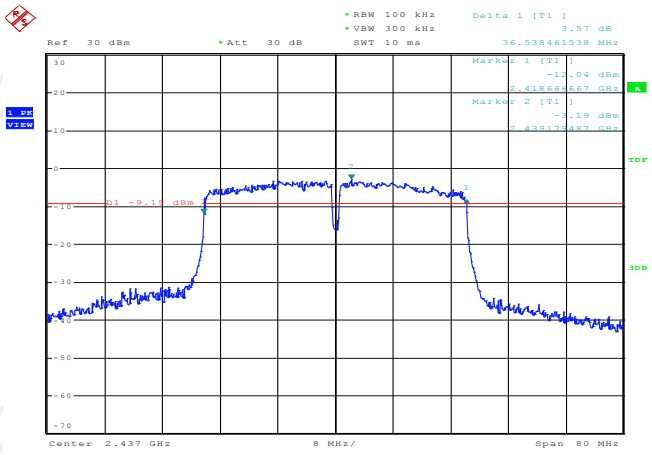
802.11n (HT40) Modulation

Lowest channel



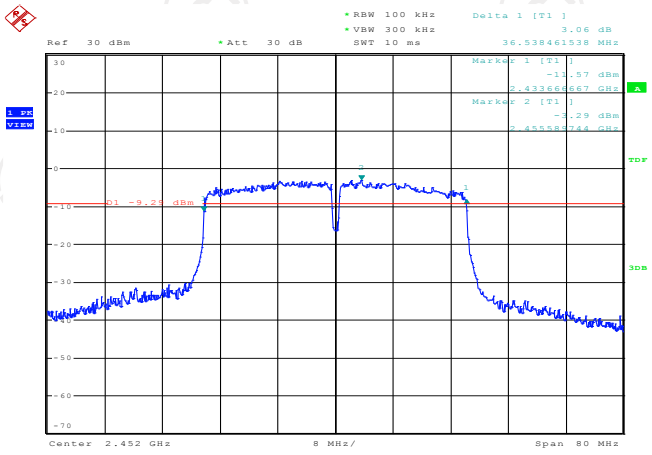
Date: 17.MAY.2017 17:11:45

Middle channel



Date: 17.MAY.2017 17:13:43

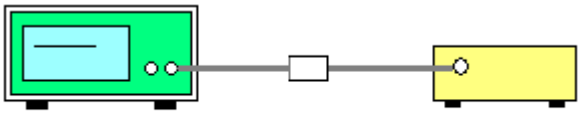
Highest channel



Date: 17.MAY.2017 17:16:21

6.4. Power Spectral Density

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	KDB 558074
Limit:	The average power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows Measurement Procedure 10.3 Method AVGPSD of FCC KDB Publication No.558074 D01 DTS Meas. Guidance v04 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 ≤ RBW ≤ 100 kHz. Video bandwidth VBW ≥ 3 x RBW. Set the span to at least 1.5 times the OBW. 5. Detector = RMS, Sweep time = auto couple. 6. Employ trace averaging (RMS) mode over a minimum of 100 traces. Use the peak marker function to determine the maximum power level. 6. Measure and record the results in the test report.
Test Result:	PASS

6.4.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	R&S	FSU	200054	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

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

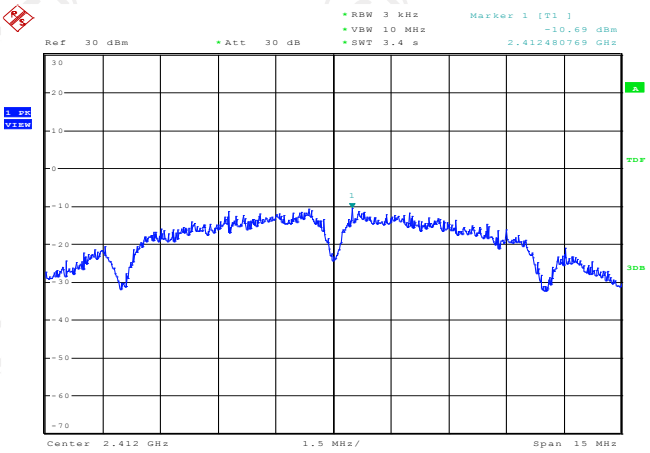
Test channel	AVG Power Spectral Density (dBm/3kHz)			
	802.11b	802.11g	802.11n(H20)	802.11n(H40)
Lowest	-10.69	-12.65	-13.12	-14.13
Middle	-10.57	-12.77	-12.71	-14.87
Highest	-10.96	-11.90	-12.94	-15.80
Limit:	8dBm/3kHz			
Test Result:	PASS			

Test plots as follows:

Hotline: 400-6611-140 Tel: 86-755-27673339 Fax: 86-755-27673332 http://www.tct-lab.com

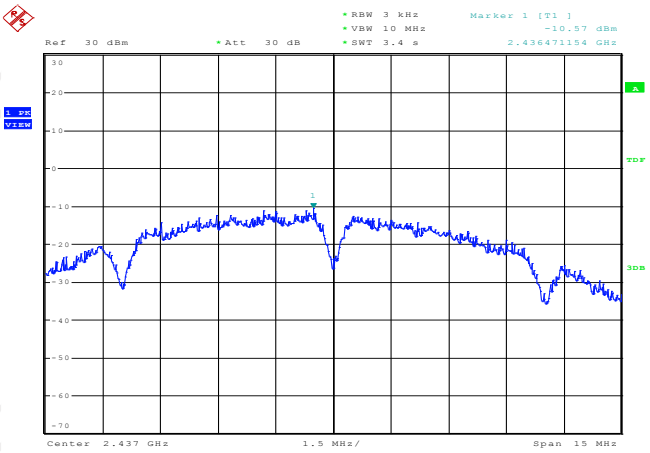
802.11b Modulation

Lowest channel



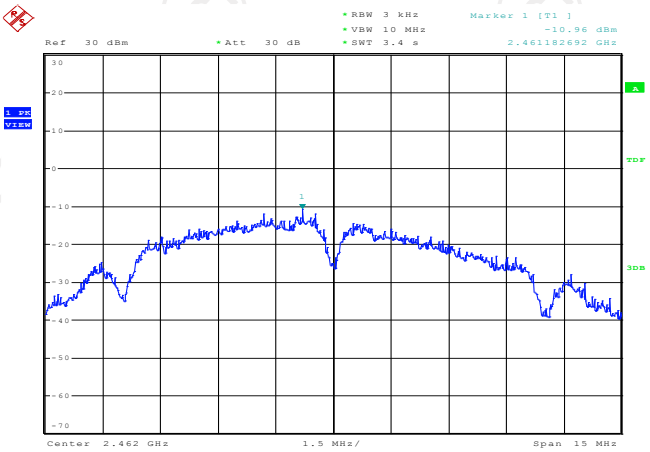
Date: 31.JUL.2017 19:53:23

Middle channel



Date: 31.JUL.2017 19:54:46

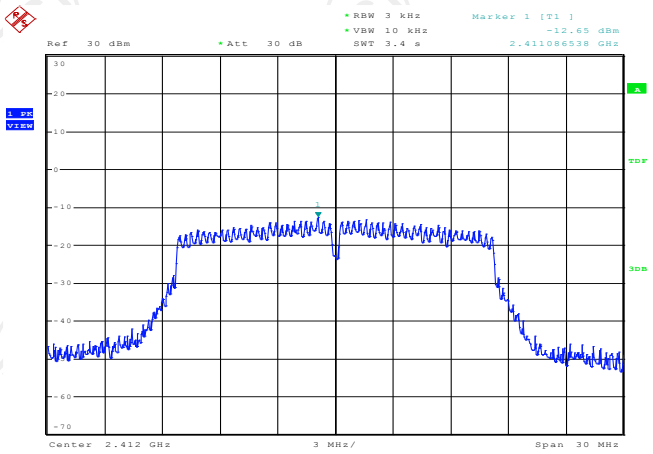
Highest channel



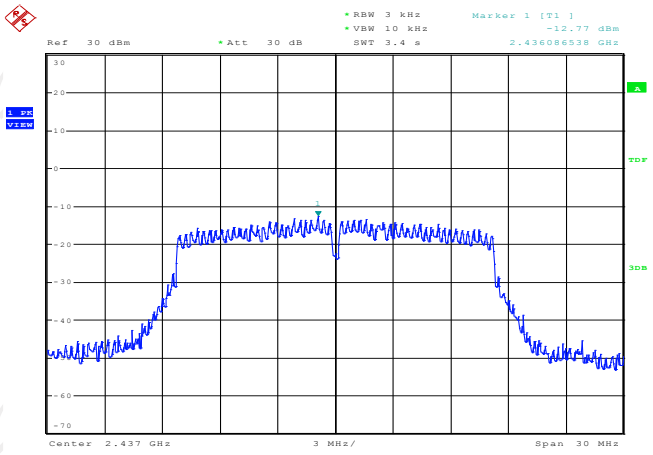
Date: 31.JUL.2017 19:56:15

802.11g Modulation

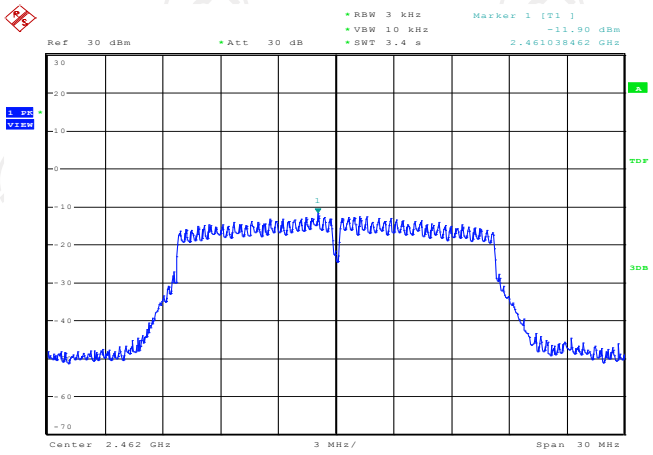
Lowest channel



Middle channel

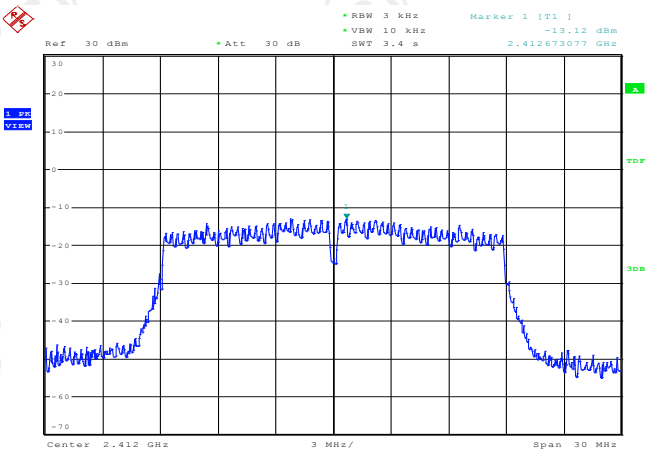


Highest channel



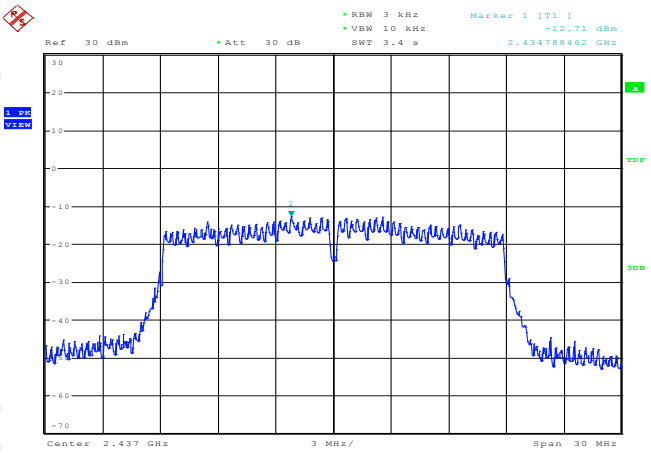
802.11n (HT20) Modulation

Lowest channel



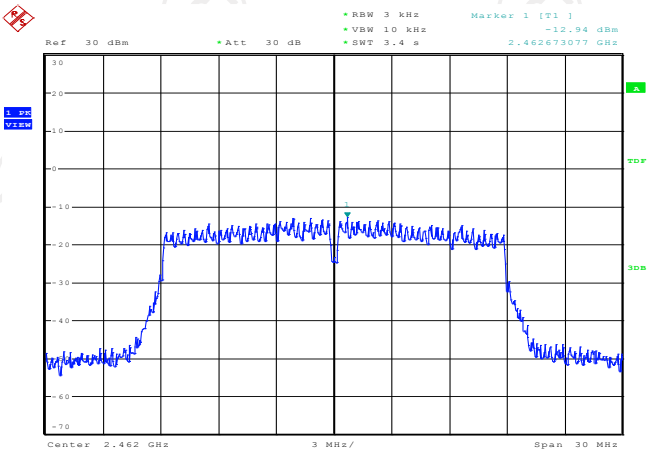
Date: 17.MAY.2017 22:01:37

Middle channel



Date: 17.MAY.2017 22:02:58

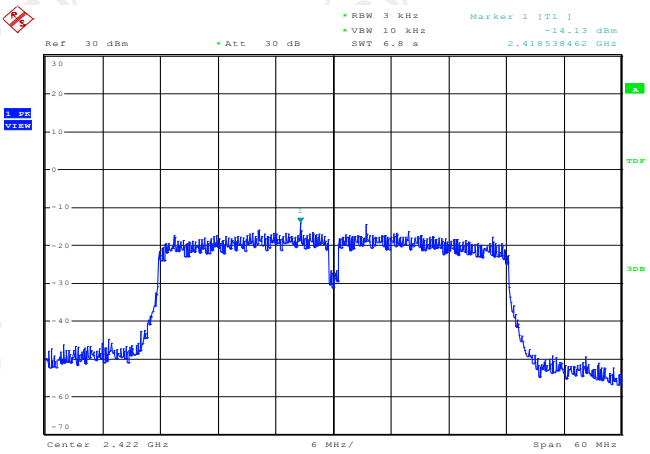
Highest channel



Date: 10.AUG.2017 14:48:13

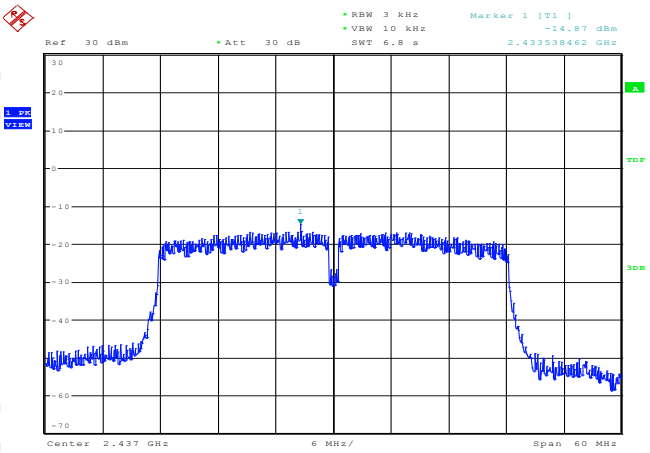
802.11n (HT40) Modulation

Lowest channel



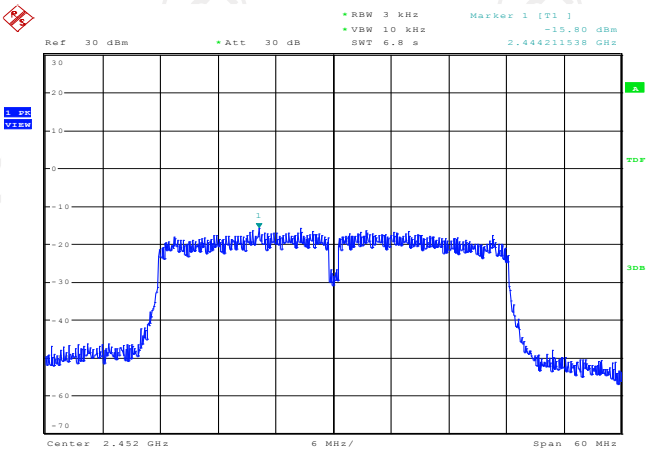
Date: 17.MAY.2017 22:07:12

Middle channel



Date: 17.MAY.2017 22:08:05

Highest channel



Date: 17.MAY.2017 22:09:04

6.5. Conducted Band Edge and Spurious Emission Measurement

6.5.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	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:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04. 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

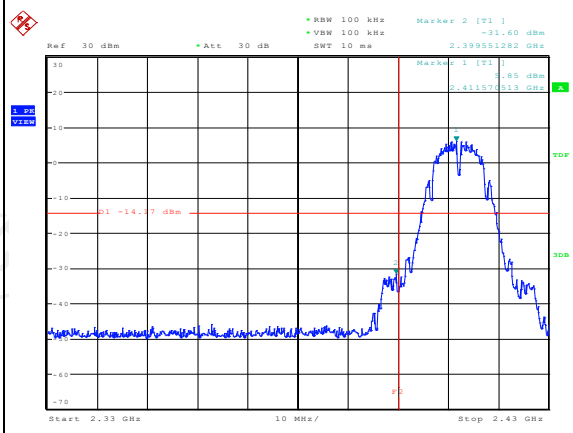
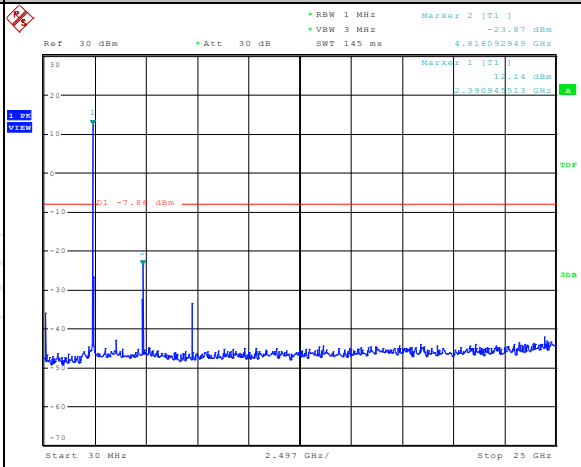
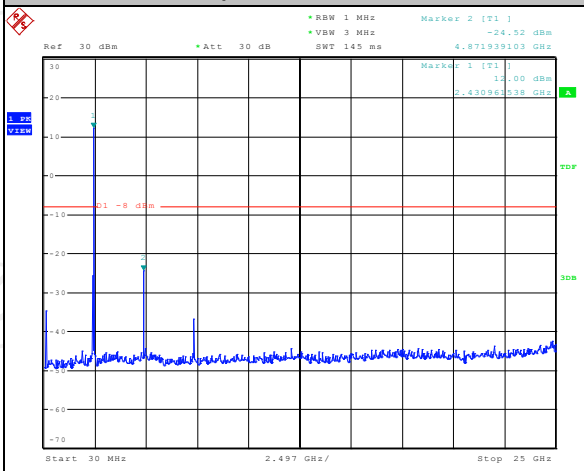
6.5.2. Test Instruments

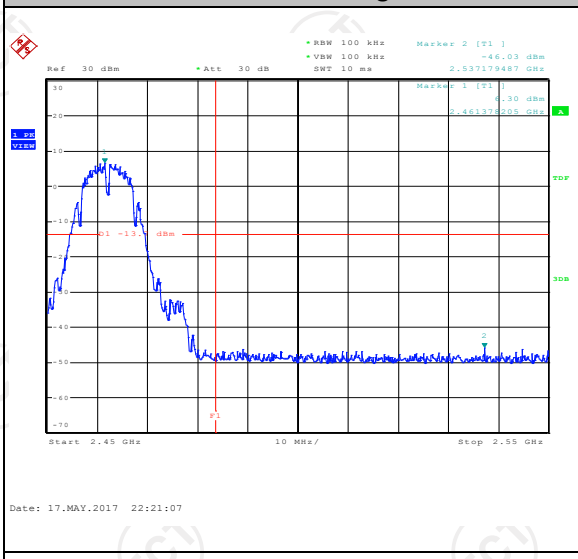
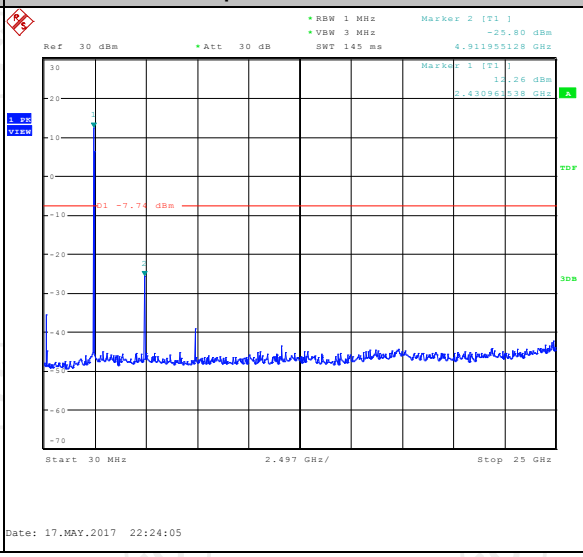
RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	R&S	FSU	200054	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHWARZ	FSQ	200061	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

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

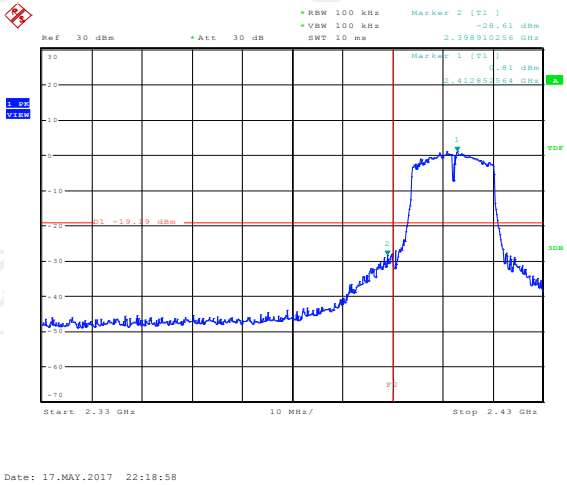
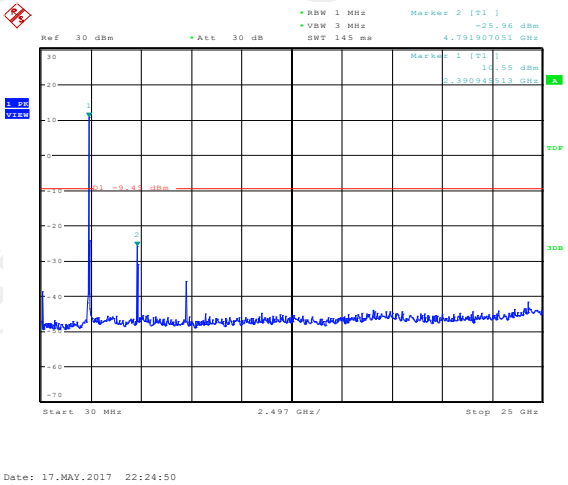
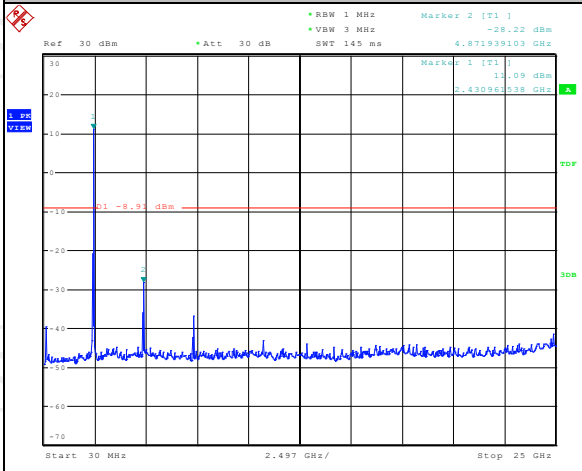
6.5.3. Test Data

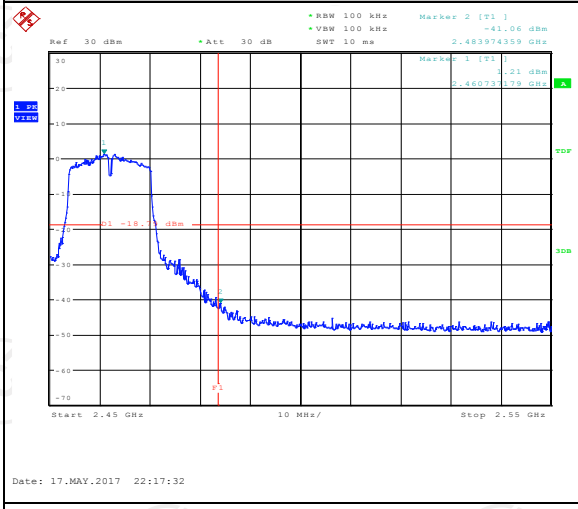
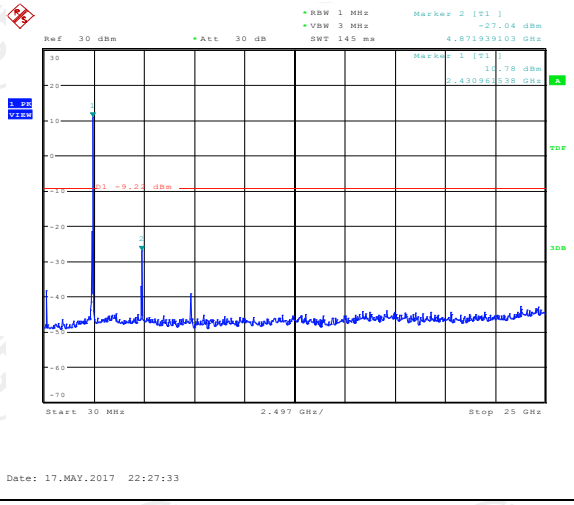
802.11b Modulation

Band Edge	Spurious emission
	
Lowest Channel	
Spurious emission	
	
Middle Channel	

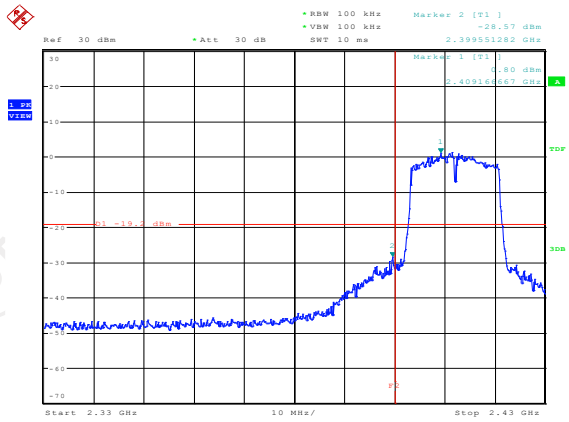
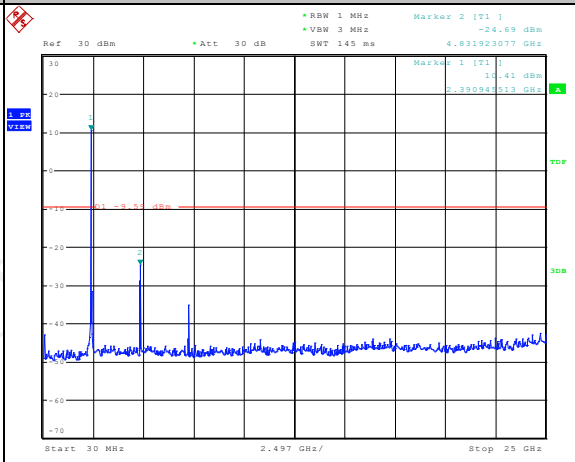
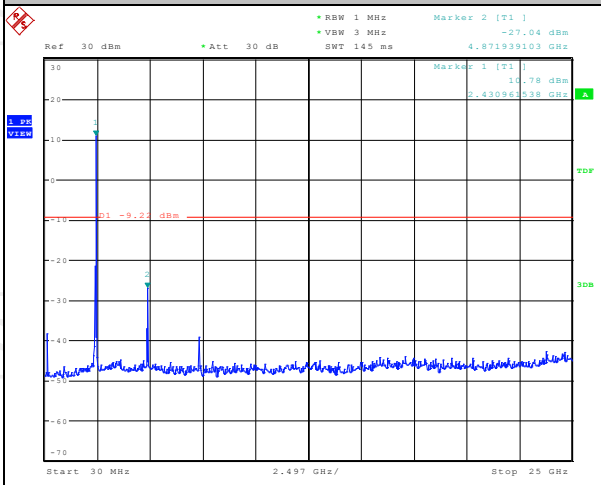
Band Edge	Spurious emission
	
Highest Channel	

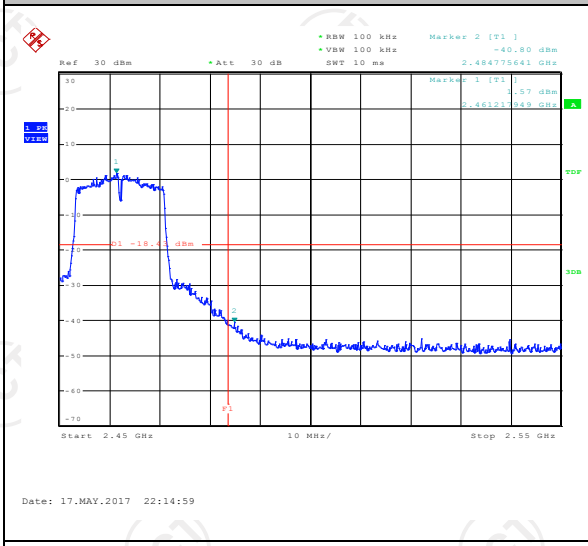
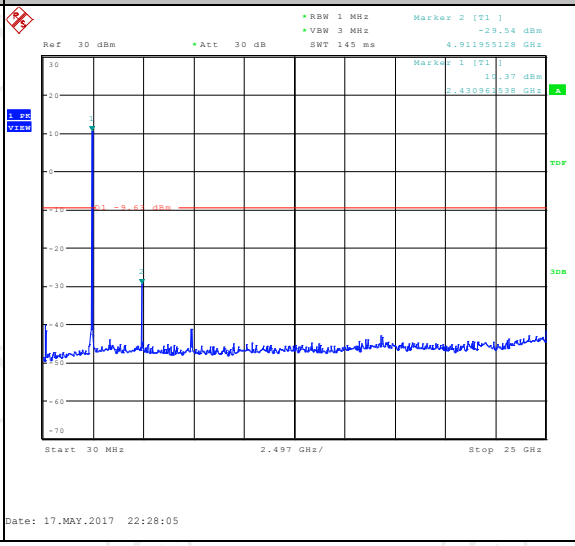
802.11g Modulation

Band Edge	Spurious emission
	
Lowest Channel	
Spurious emission	
	
Middle Channel	

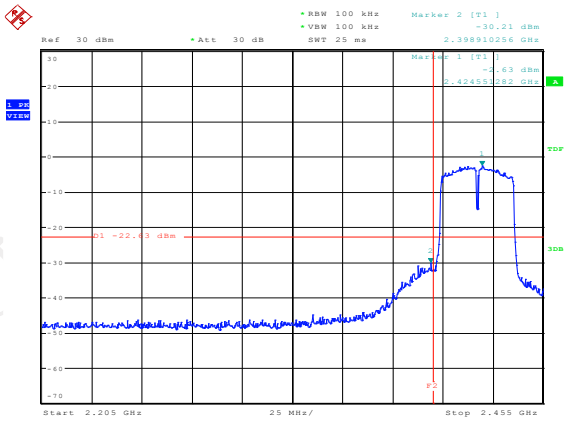
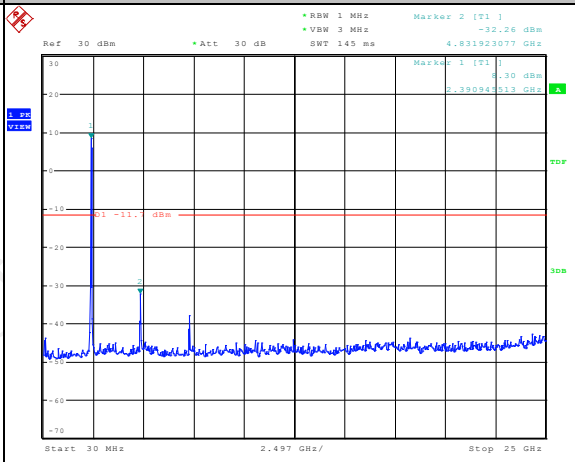
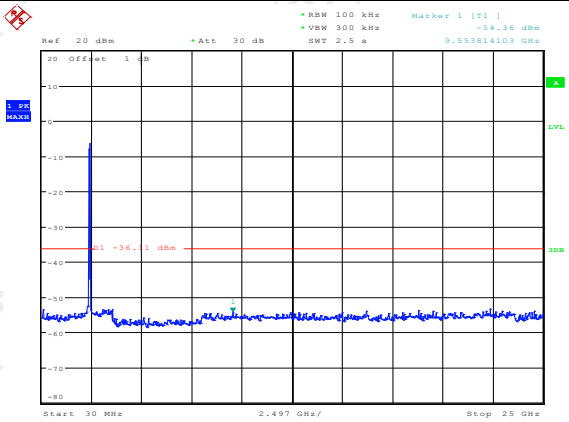
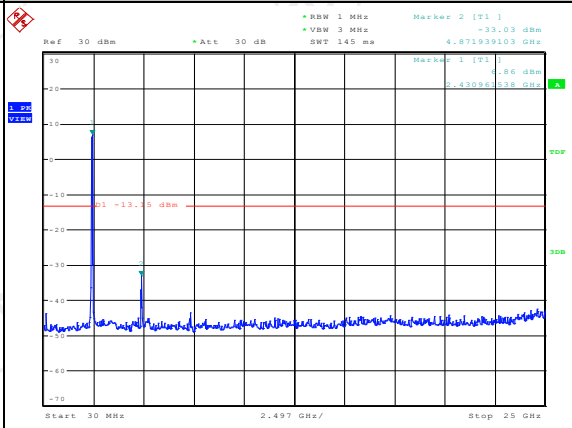
Band Edge	Spurious emission
	
Highest Channel	

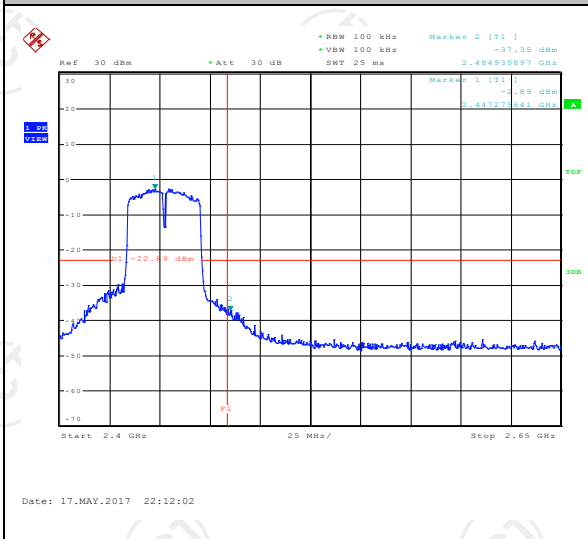
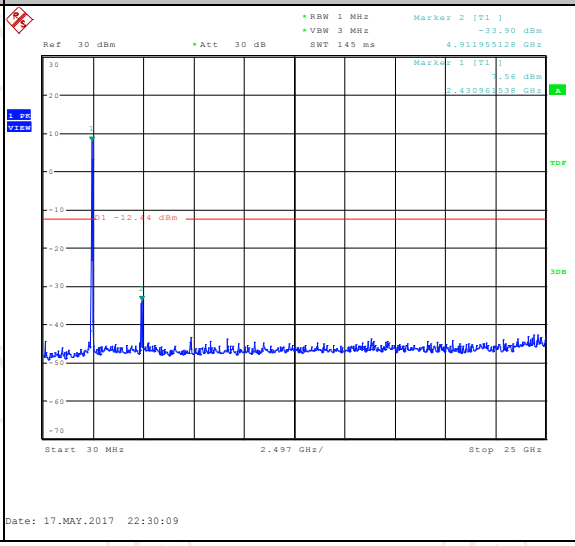
802.11n (HT20) Modulation

Band Edge	Spurious emission
	
Lowest Channel	
Spurious emission	
	
Middle Channel	

Band Edge	Spurious emission
	
Highest Channel	

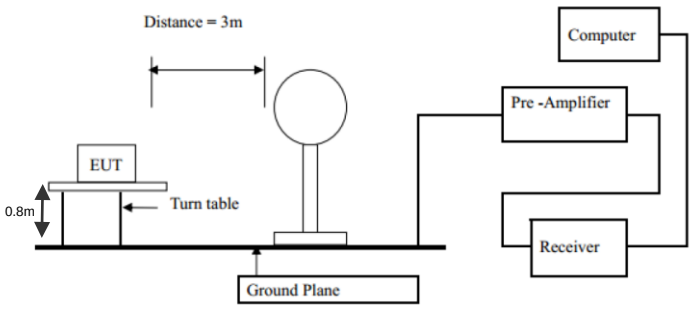
802.11n (HT40) Modulation

Band Edge	Spurious emission
	
Lowest Channel	
Spurious emission	
	
Middle Channel	

Band Edge	Spurious emission
	
Highest Channel	

6.6. Radiated Spurious Emission Measurement

6.6.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10: 2013</td></tr>
<tr><td>Frequency Range:</td><td>9 kHz to 25 GHz</td></tr>
<tr><td>Measurement Distance:</td><td>3 m</td></tr>
<tr><td>Antenna Polarization:</td><td>Horizontal & Vertical</td></tr>
<tr><td>Operation mode:</td><td>Transmitting mode with modulation</td></tr>
<tr><td>Receiver Setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>9kHz- 150kHz</td><td>Quasi-peak</td><td>200Hz</td><td>1kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>30kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>100KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency</td><td>Field Strength (microvolts/meter)</td><td>Measurement Distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(KHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(KHz)</td><td>30</td></tr>
<tr><td>1.705-30</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100</td><td>3</td></tr>
<tr><td>88-216</td><td>150</td><td>3</td></tr>
<tr><td>216-960</td><td>200</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
<table>
<tr><td>Frequency</td><td>Field Strength (microvolts/meter)</td><td>Measurement Distance (meters)</td><td>Detector</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>500</td><td>3</td><td>Average</td></tr>
<tr><td>5000</td><td>3</td><td>Peak</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>For radiated emissions below 30MHz
 

30MHz to 1GHz</td></tr>
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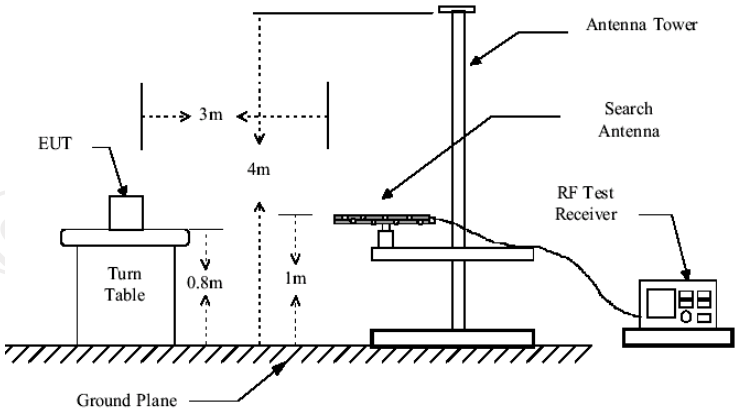
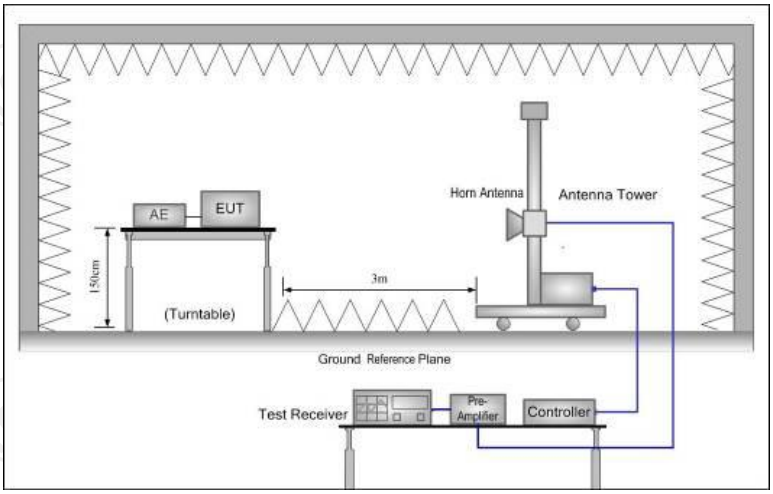


Above 1GHz



Test Procedure:

1. For the radiated emission test below 1GHz:
The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. 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.
For the radiated emission test above 1GHz:
Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for

	receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. 3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level 4. 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. 5. 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 GHz; VBW ≥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 ≥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

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6.6.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Test Receiver	ROHDE&SCHWARZ	ESVD	100008	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHWARZ	FSQ	200061	Sep. 27, 2018
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 27, 2018
Pre-amplifier	HP	8447D	2727A05017	Sep. 27, 2018
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 27, 2018
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBH 9170	582	Jun. 07, 2018
Antenna Mast	Keleto	CC-A-4M	N/A	N/A
Coax cable (9KHz-1GHz)	TCT	RE-low-01	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-02	N/A	Sep. 27, 2018
Coax cable (9KHz-1GHz)	TCT	RE-low-03	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-04	N/A	Sep. 27, 2018
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).*

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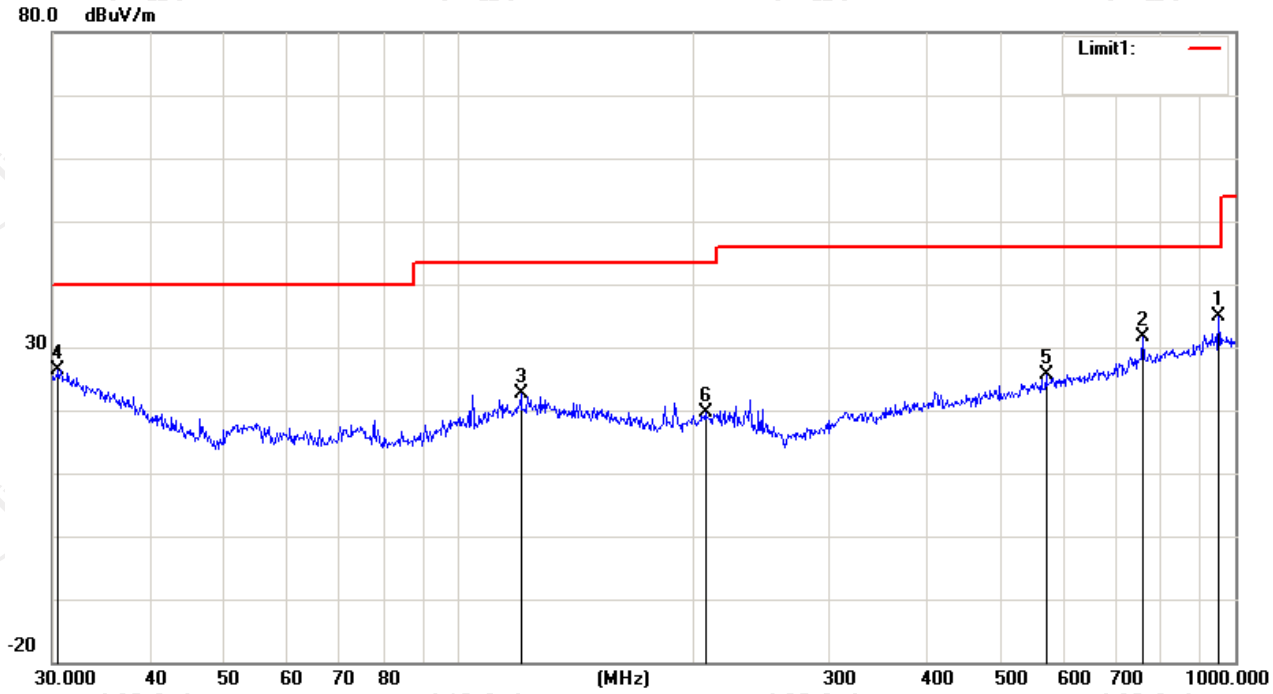
6.6.3. Test Data

Please refer to following diagram for individual

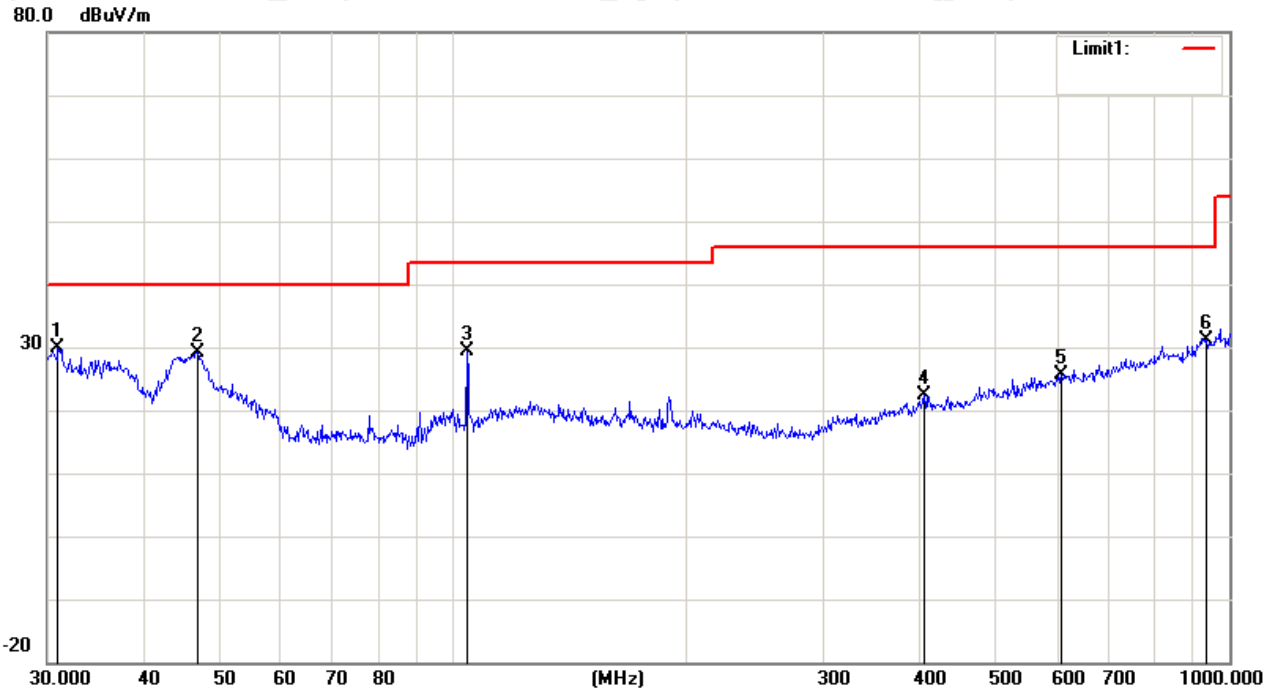
Below 1GHz

Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	952.0937	12.72	22.19	34.91	46.00	-11.09	QP
2		760.7036	28.07	3.56	31.63	46.00	-14.37	QP
3		120.2766	24.86	-2.31	22.55	43.50	-20.95	QP
4		30.5304	23.16	3.13	26.29	40.00	-13.71	QP
5		570.6100	25.12	0.49	25.61	46.00	-20.39	QP
6		207.8499	24.70	-5.10	19.60	43.50	-23.90	QP

Vertical:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	30.9618	27.12	2.85	29.97	40.00	-10.03	QP
2		46.8303	36.58	-7.56	29.02	40.00	-10.98	QP
3		104.1701	34.58	-5.18	29.40	43.50	-14.10	QP
4		404.6664	24.51	-2.17	22.34	46.00	-23.66	QP
5		607.7866	24.44	1.15	25.59	46.00	-20.41	QP
6		935.5461	24.57	6.53	31.10	46.00	-14.90	QP

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*

Test Mode	Mode 1 TX	Frequency	2412MHz

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV) PK	Emission Level(dBuV) AV	Limit 3m(dBuV/m) PK	Limit 3m(dBuV/m) AV	Over(dB) PK	Over(dB) AV
4824	V	60.68	41.71	74	54	-13.32	-12.29
7236	V	59.74	40.94	74	54	-14.26	-13.06
4824	H	59.27	40.51	74	54	-14.73	-13.49
7236	H	58.22	39.22	74	54	-15.78	-14.78

Test Mode	Mode 1 TX	Frequency	2437MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV) PK	Emission Level(dBuV) AV	Limit 3m(dBuV/m) PK	Limit 3m(dBuV/m) AV	Over(dB) PK	Over(dB) AV
4874	V	59.40	40.79	74	54	-14.60	-13.21
7311	V	58.56	39.50	74	54	-15.44	-14.50
4874	H	59.18	40.70	74	54	-14.82	-13.30
7311	H	59.56	40.56	74	54	-14.44	-13.44

Test Mode	Mode 1 TX	Frequency	2462MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV) PK	Emission Level(dBuV) AV	Limit 3m(dBuV/m) PK	Limit 3m(dBuV/m) AV	Over(dB) PK	Over(dB) AV
4924	V	58.96	41.16	74	54	-15.04	-12.84
7386	V	58.08	40.85	74	54	-15.92	-13.15
4924	H	59.55	39.29	74	54	-14.45	-14.71
7386	H	58.14	39.14	74	54	-15.86	-14.86

Remark:

All emissions not reported were more than 20dB below the specified limit or in the noise floor.
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
All the x/y/z orientation has been investigated, and only worst case is presented in this report.

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Test Mode	Mode2 TX	Frequency	2412MHz

Freq. (MHz)	Ant. Pol.	Emission Level(dBuV)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
4824	V	60.32	40.39	74	54	-13.68	-13.61
7236	V	59.51	40.24	74	54	-14.49	-13.76
4824	H	58.82	40.70	74	54	-15.18	-13.30
7236	H	58.15	39.15	74	54	-15.85	-14.85

Test Mode	Mode 2 TX	Frequency	2437MHz

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
4874	V	59.73	41.83	74	54	-14.27	-12.17
7311	V	58.90	40.41	74	54	-15.10	-13.59
4874	H	58.52	39.33	74	54	-15.48	-14.67
7311	H	58.59	39.59	74	54	-15.41	-14.41

Test Mode	Mode 2 TX	Frequency	2462MHz

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
4924	V	59.75	39.15	74	54	-14.25	-14.85
7386	V	58.53	39.21	74	54	-15.47	-14.79
4924	H	58.12	40.20	74	54	-15.88	-13.80
7386	H	59.19	40.19	74	54	-14.81	-13.81

Remark:

All emissions not reported were more than 20dB below the specified limit or in the noise floor.
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test Mode	Mode3 TX	Frequency	2412MHz

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV) PK	Emission Level(dBuV) AV	Limit 3m(dBuV/m) PK	Limit 3m(dBuV/m) AV	Over(dB) PK	Over(dB) AV
4824	V	58.71	41.44	74	54	-15.29	-12.56
7236	V	59.58	40.16	74	54	-14.42	-13.84
4824	H	59.11	39.78	74	54	-14.89	-14.22
7236	H	59.04	40.04	74	54	-14.96	-13.96

Test Mode	Mode 3 TX	Frequency	2437MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV) PK	Emission Level(dBuV) AV	Limit 3m(dBuV/m) PK	Limit 3m(dBuV/m) AV	Over(dB) PK	Over(dB) AV
4874	V	59.32	40.80	74	54	-14.68	-13.20
7311	V	58.52	39.38	74	54	-15.48	-14.62
4874	H	58.52	40.28	74	54	-15.48	-13.72
7311	H	59.00	40.00	74	54	-15.00	-14.00

Test Mode	Mode 3 TX	Frequency	2462MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV) PK	Emission Level(dBuV) AV	Limit 3m(dBuV/m) PK	Limit 3m(dBuV/m) AV	Over(dB) PK	Over(dB) AV
4924	V	60.77	39.02	74	54	-13.23	-14.98
7386	V	59.49	39.37	74	54	-14.51	-14.63
4924	H	58.68	39.28	74	54	-15.32	-14.72
7386	H	58.86	39.86	74	54	-15.14	-14.14

Remark:

All emissions not reported were more than 20dB below the specified limit or in the noise floor.
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
All the x/y/z orientation has been investigated, and only worst case is presented in this report.

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Test Mode	Mode4 TX	Frequency	2422MHz

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV) PK	Emission Level(dBuV) AV	Limit 3m(dBuV/m) PK	Limit 3m(dBuV/m) AV	Over(dB) PK	Over(dB) AV
4844	V	59.48	41.13	74	54	-14.52	-12.87
7266	V	58.23	40.97	74	54	-15.77	-13.03
4844	H	59.78	39.06	74	54	-14.22	-14.94
7266	H	58.37	39.37	74	54	-15.63	-14.63

Test Mode	Mode 4 TX	Frequency	2437MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV) PK	Emission Level(dBuV) AV	Limit 3m(dBuV/m) PK	Limit 3m(dBuV/m) AV	Over(dB) PK	Over(dB) AV
4874	V	60.76	40.95	74	54	-13.24	-13.05
7311	V	58.44	39.79	74	54	-15.56	-14.21
4874	H	58.92	40.20	74	54	-15.08	-13.80
7311	H	58.82	39.82	74	54	-15.18	-14.18

Test Mode	Mode 4 TX	Frequency	2452MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV) PK	Emission Level(dBuV) AV	Limit 3m(dBuV/m) PK	Limit 3m(dBuV/m) AV	Over(dB) PK	Over(dB) AV
4904	V	59.94	40.58	74	54	-14.06	-13.42
7356	V	59.23	40.93	74	54	-14.77	-13.07
4904	H	59.41	40.43	74	54	-14.59	-13.57
7356	H	59.36	40.36	74	54	-14.64	-13.64

Remark:

All emissions not reported were more than 20dB below the specified limit or in the noise floor.
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
All the x/y/z orientation has been investigated, and only worst case is presented in this report.

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Radiated Band Edge measurement:

802.11b

Indicated		result (PK/AV)	Antenna Polar (H/V)	Correction Factor			FCC Part 15.247		
Frequency (MHz)	Receiver Reading (dBμV/m)			Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Low Channel (2412MHz)									
2390	31.16	AV	V	30.3	4.1	33.1	32.46	54	21.54
2390	31.07	AV	H	30.3	4.1	33.1	32.37	54	21.63
2390	42.10	PK	V	30.3	4.1	33.1	43.40	74	30.60
2390	41.85	PK	H	30.3	4.1	33.1	43.15	74	30.85
High Channel (2462MHz)									
2483.5	30.10	AV	V	31	4.4	32.7	32.80	54	21.20
2483.5	30.50	AV	H	31	4.4	32.7	33.20	54	20.80
2483.5	41.62	PK	V	31	4.4	32.7	44.32	74	29.68
2483.5	41.03	PK	H	31	4.4	32.7	43.73	74	30.27

802.11g

Indicated		result (PK/AV)	Antenna Polar (H/V)	Correction Factor			FCC Part 15.247		
Frequency (MHz)	Receiver Reading (dBμV/m)			Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Low Channel (2412MHz)									
2390	33.37	AV	V	30.3	4.1	33.1	34.67	54	19.33
2390	34.54	AV	H	30.3	4.1	33.1	35.84	54	18.16
2390	51.59	PK	V	30.3	4.1	33.1	52.89	74	21.11
2390	49.84	PK	H	30.3	4.1	33.1	51.14	74	22.86
High Channel (2462MHz)									
2483.5	31.78	AV	V	31	4.4	32.7	34.48	54	19.52
2483.5	32.15	AV	H	31	4.4	32.7	34.85	54	19.15
2483.5	41.85	PK	V	31	4.4	32.7	44.55	74	29.45
2483.5	41.22	PK	H	31	4.4	32.7	43.92	74	30.08

Note: *The BAND EDGE RESTRICTED BANDS emission is too low at least 20dB to the Fundamental.*

802.11n HT20

Indicated		result (PK/AV)	Antenna Polar (H/V)	Correction Factor			FCC Part 15.247		
Frequency (MHz)	Receiver Reading (dBμV/m)			Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Low Channel (2412MHz)									
2390	35.06	AV	V	30.3	4.1	33.1	36.36	54	17.64
2390	35.15	AV	H	30.3	4.1	33.1	36.45	54	17.55
2390	49.43	PK	V	30.3	4.1	33.1	50.73	74	23.27
2390	50.42	PK	H	30.3	4.1	33.1	51.72	74	22.28
High Channel (2462MHz)									
2483.5	31.07	AV	V	31	4.4	32.7	33.77	54	20.23
2483.5	31.97	AV	H	31	4.4	32.7	34.67	54	19.33
2483.5	40.49	PK	V	31	4.4	32.7	43.19	74	30.81
2483.5	41.94	PK	H	31	4.4	32.7	44.64	74	29.36

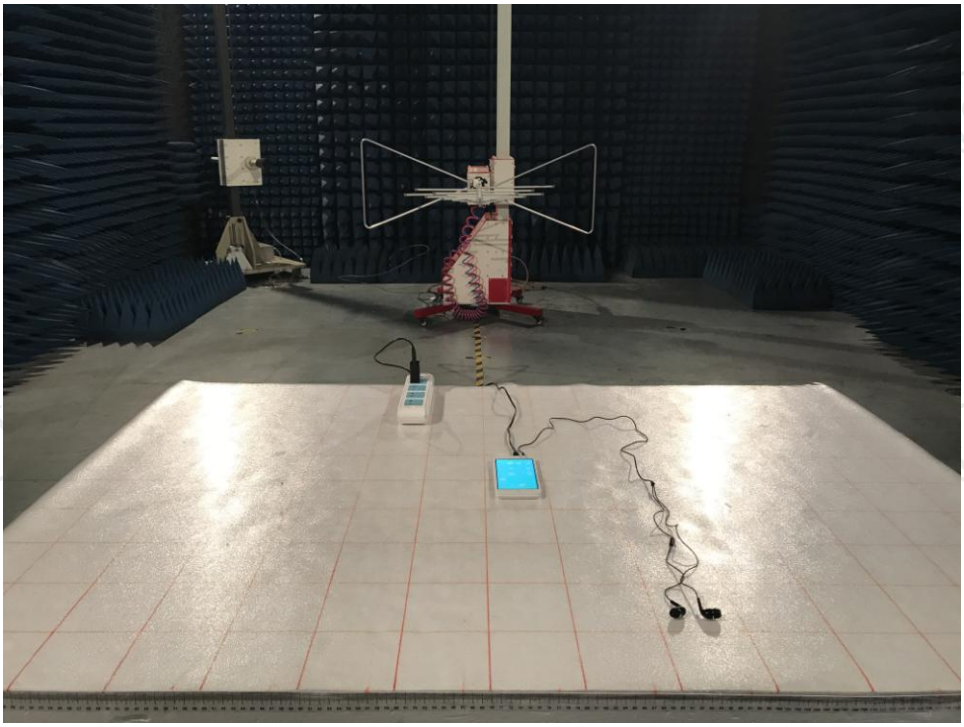
802.11n HT40

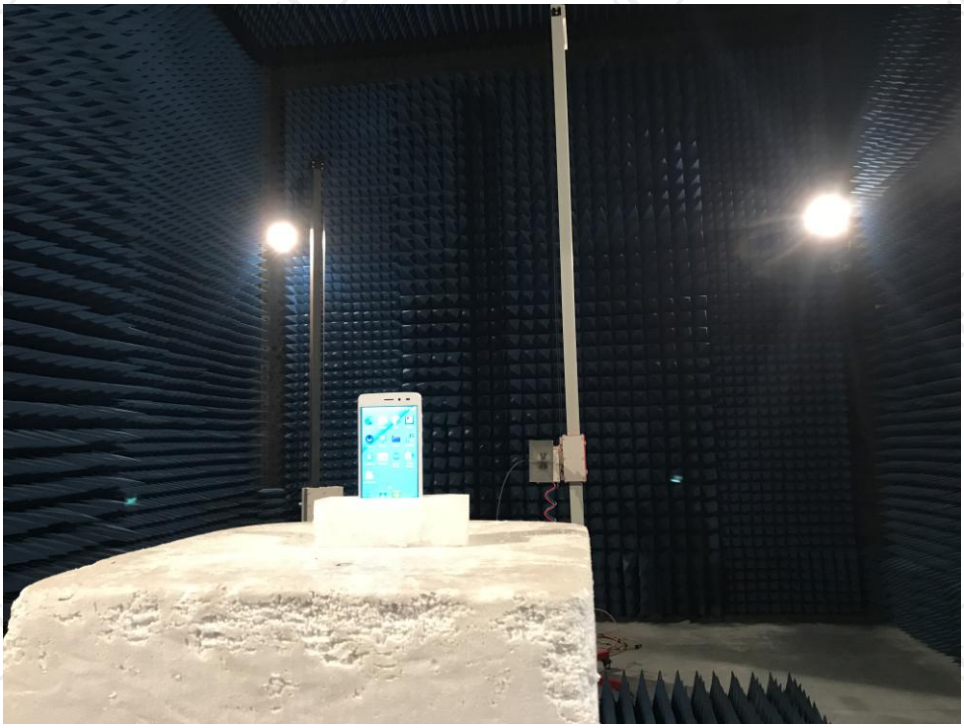
Indicated		result (PK/AV)	Antenna Polar (H/V)	Correction Factor			FCC Part 15.247		
Frequency (MHz)	Receiver Reading (dBμV/m)			Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Low Channel (2422MHz)									
2390	36.80	AV	V	30.3	4.1	33.1	38.10	54	15.90
2390	37.72	AV	H	30.3	4.1	33.1	39.02	54	14.98
2390	54.10	PK	V	30.3	4.1	33.1	55.40	74	18.60
2390	54.85	PK	H	30.3	4.1	33.1	56.15	74	17.85
High Channel (2452MHz)									
2483.5	32.87	AV	V	31	4.4	32.7	35.57	54	18.43
2483.5	31.59	AV	H	31	4.4	32.7	34.29	54	19.71
2483.5	45.53	PK	V	31	4.4	32.7	48.23	74	25.77
2483.5	45.48	PK	H	31	4.4	32.7	48.18	74	25.82

Note: *The BAND EDGE RESTRICTED BANDS emission is too low at least 20dB to the Fundamental.*

Appendix A: Photographs of Test Setup

Product: LTE mobile phone
Model: N5001L
Radiated Emission





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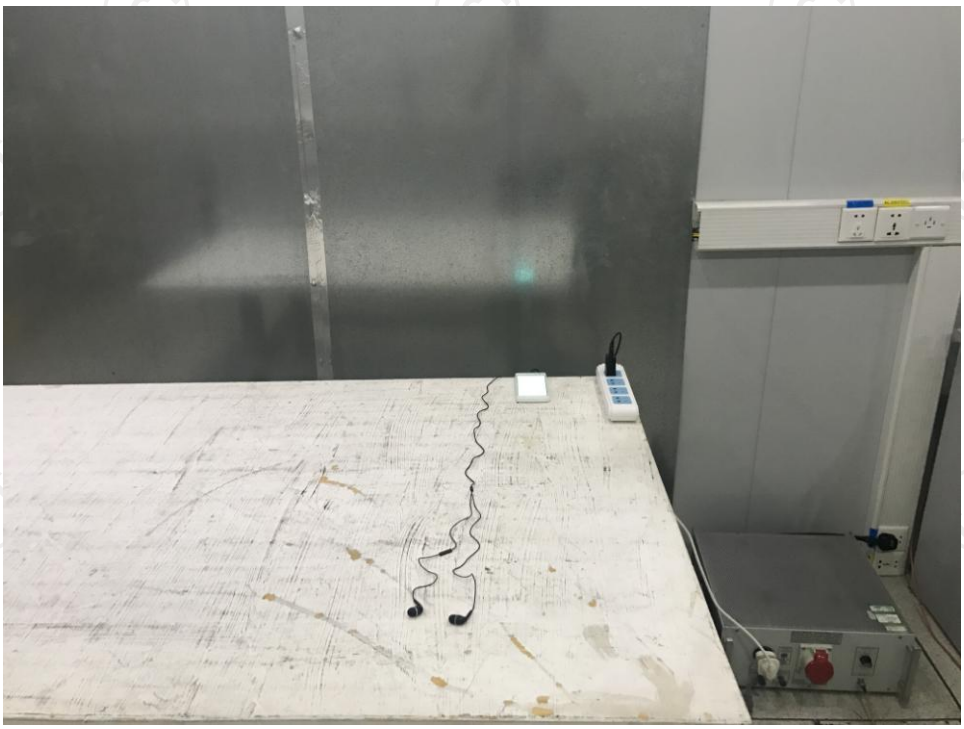
Conducted Emission



Appendix B: Photographs of EUT
Product: LTE mobile phone
Model: N5001L
External Photos

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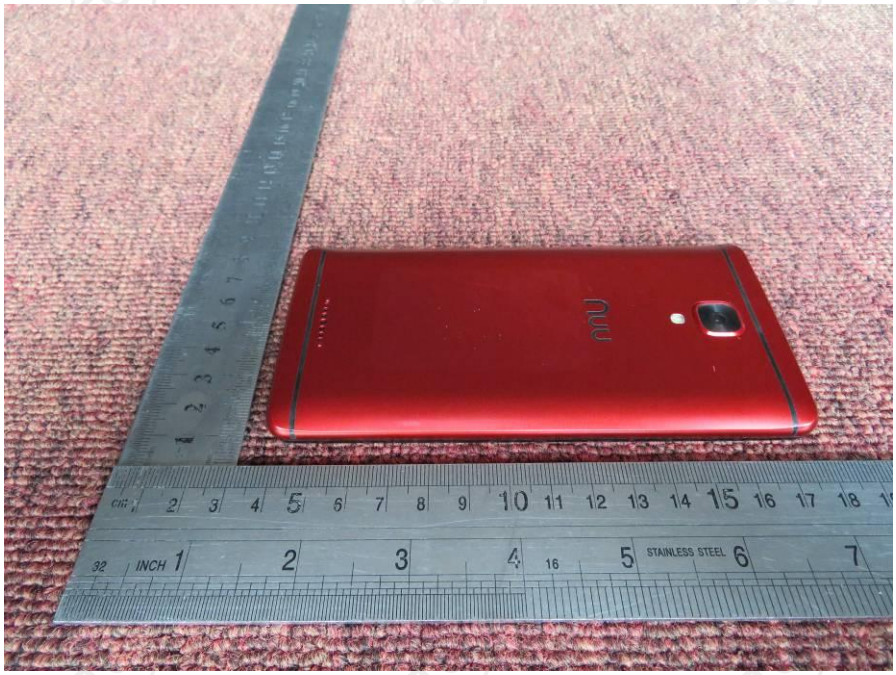
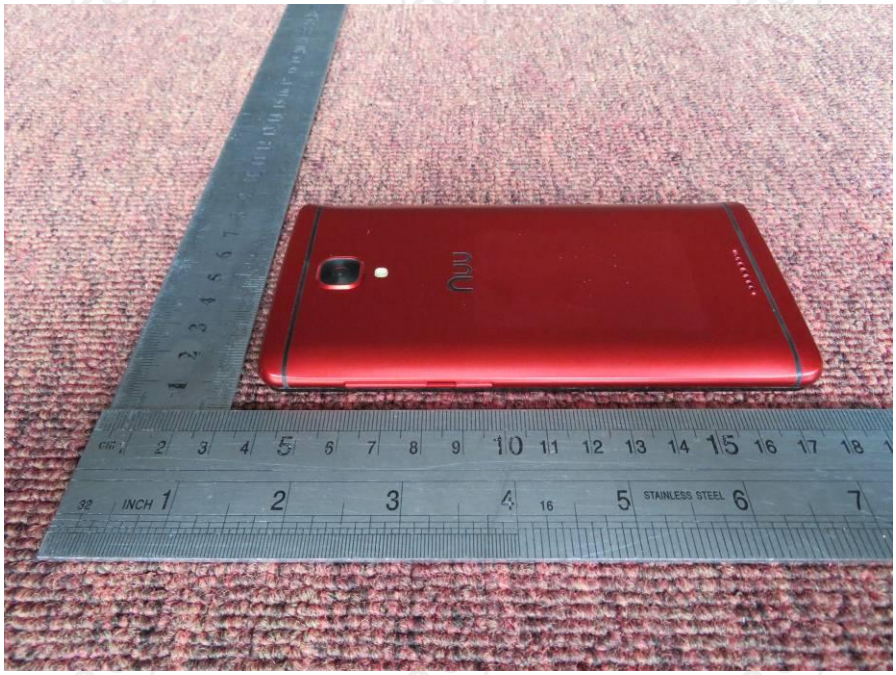
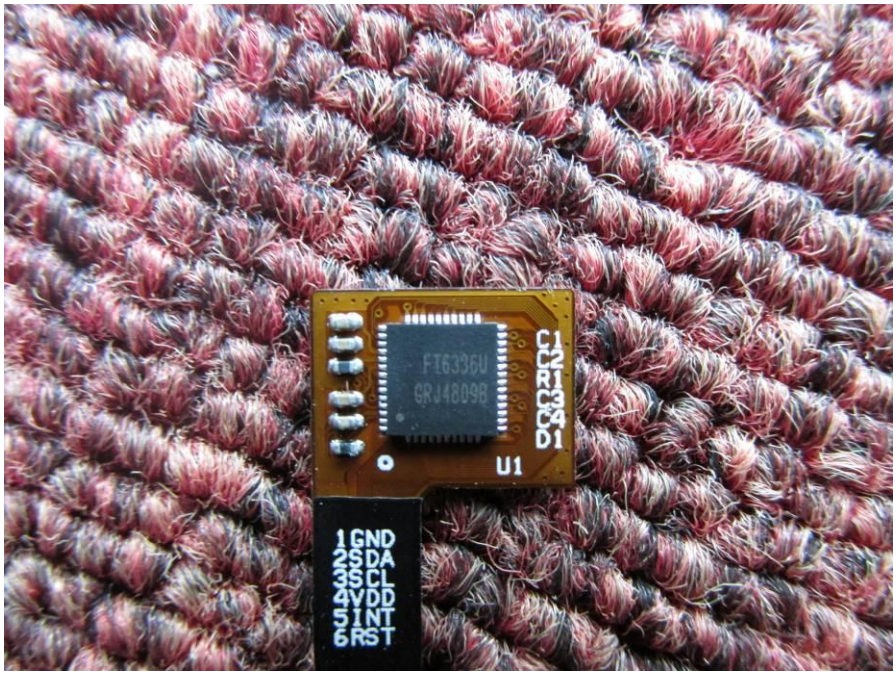




Product: LTE mobile phone
Model: N5001L
Internal Photos


CAUTION


A4L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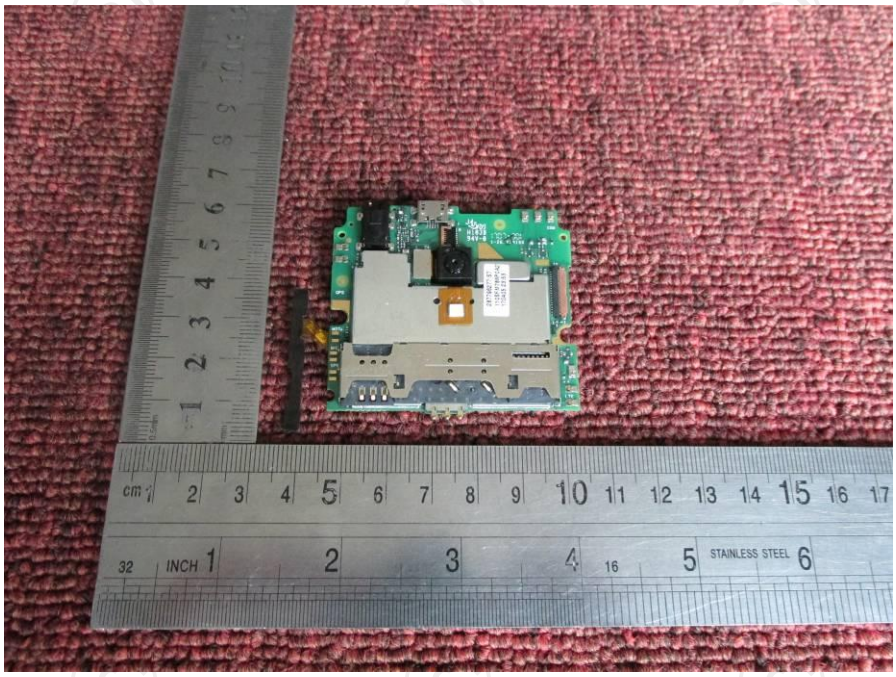
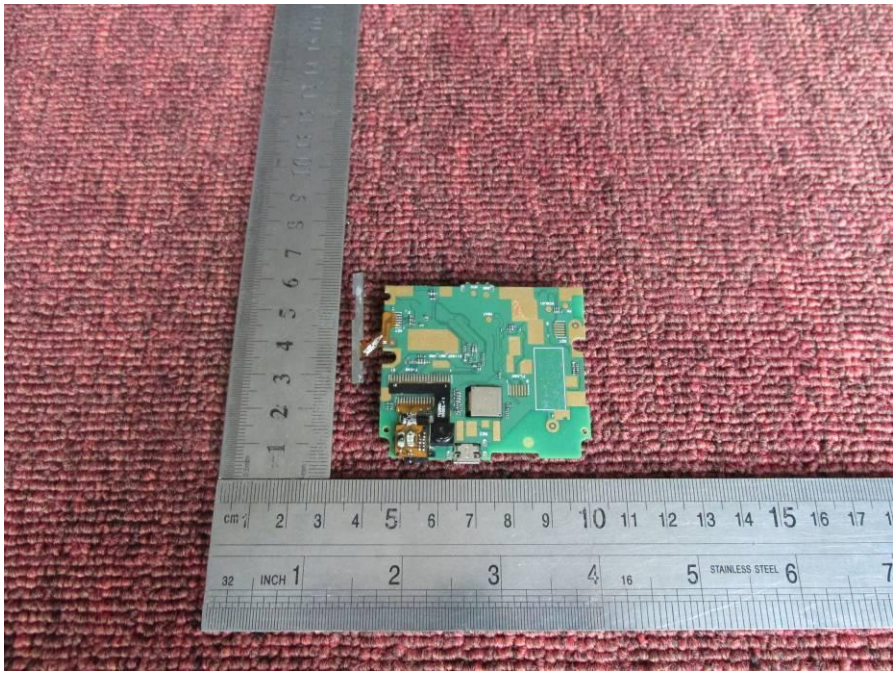
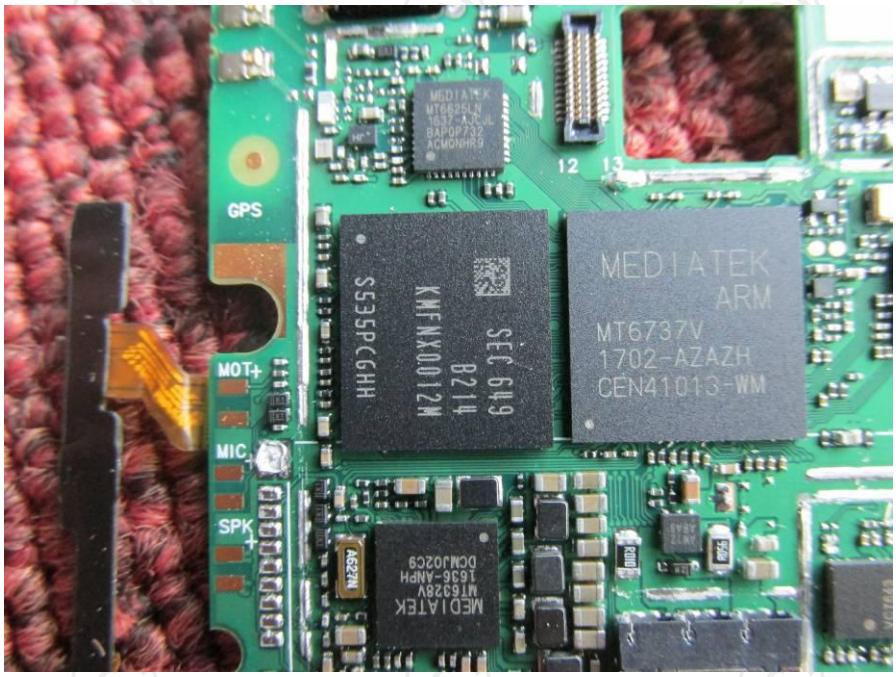
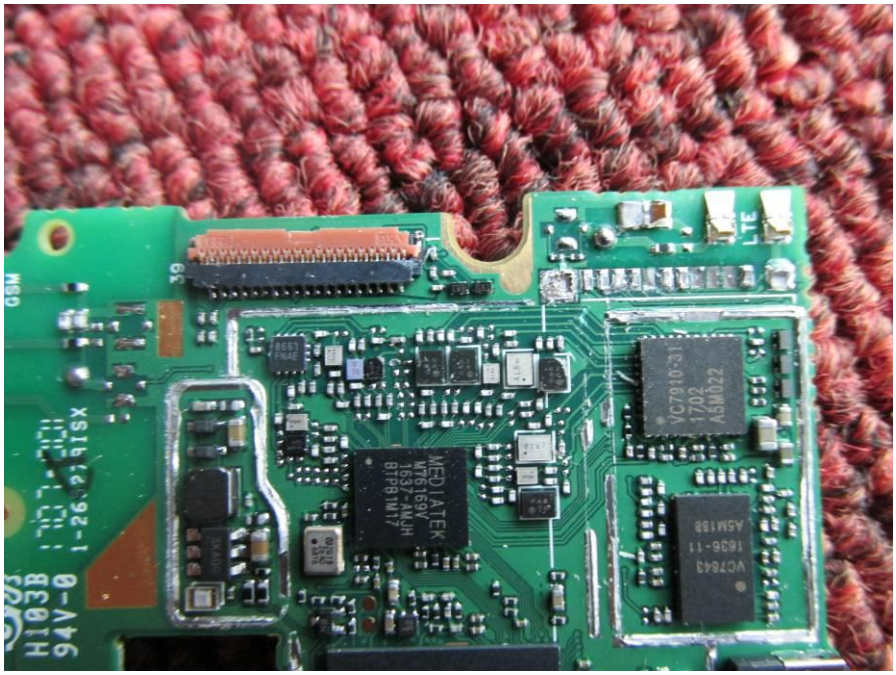
2SDA
3SCL
4VDD
5INT
6RST









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