TEST REPORT

Product	:	3G smart phone
Trade mark	:	N/A
Model/Type reference	:	SP4541
Serial Number	:	N/A
Report Number	:	EED32H000601-2
FCC ID	:	2AETNSP4541
Date of Issue:	:	Jun. 03, 2015
Test Standards	:	47 CFR Part 15 Subpart C (2014)
Test result	:	PASS

Prepared for:

WOO GLOBAL MARKETS, S.L.

Camino de Vinateros, 10. Bajo (Oficinas) 28030 MADRID - SPAIN

Prepared by:

Centre Testing International (Shenzhen) Corporation

Building C, Scientific Innovation Park, Tiegang Reservior, Xixiang, Baoan District, Shenzhen, China

TEL: +86-755-3368 3919

FAX: +86-755-3368 3385

Tested by: Wave Xin Reviewed by: Kevin Lan

Approved by: Sheek Luo Date: Jun. 03, 2015

Sheek Luo

Lab supervisor

Check No.: 1727844581

2 Version

Version No.	Date	Description
00	2015-04-01	Original

3 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10-2013	PASS
Conducted Peak Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(1)	ANSI C63.10-2013	PASS
20dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10-2013	PASS
Carrier Frequencies Separation	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10-2013	PASS
Hopping Channel Number	47 CFR Part 15, Subpart C Section 15.247 (b)	ANSI C63.10-2013	PASS
Dwell Time	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10-2013	PASS
Pseudorandom Frequency Hopping Sequence	47 CFR Part 15, Subpart C Section 15.247(b)(4)&TCB Exclusion List (7 July 2002)	ANSI C63.10-2013	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10-2013	PASS
Radiated Spurious emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS

Test according to ANSI C63.4-2014 & ANSI C63.10-2013.

4 Content

.....1

2 VERSION 2

3 TEST SUMMARY 3

4 CONTENT 4

5 TEST REQUIREMENT 5

5.1 TEST SETUP 5

5.1.1 For Conducted test setup 5

5.1.2 For Radiated Emissions test setup 5

5.1.3 For Conducted Emissions test setup 6

5.2 TEST ENVIRONMENT 6

5.3 TEST CONDITION 6

6 GENERAL INFORMATION 8

6.1 CLIENT INFORMATION 8

6.2 GENERAL DESCRIPTION OF EUT 8

6.3 *PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD* 8

6.4 DESCRIPTION OF SUPPORT UNITS 9

6.5 TEST LOCATION 9

6.6 TEST FACILITY 9

6.7 DEVIATION FROM STANDARDS 10

6.8 ABNORMALITIES FROM STANDARD CONDITIONS 10

6.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER 10

7 EQUIPMENT LIST 11

8 RADIO TECHNICAL REQUIREMENTS SPECIFICATION 12

Appendix A): Conducted Peak Output Power 13

Appendix B): 6dB Occupied Bandwidth 17

Appendix C): Band-edge for RF Conducted Emissions 21

Appendix D): RF Conducted Spurious Emissions 23

Appendix E): Power Spectral Density 35

Appendix F) Antenna Requirement 39

Appendix G) AC Power Line Conducted Emission 40

Appendix H) Restricted bands around fundamental frequency (Radiated) 43

Appendix I) Radiated Spurious Emissions 51

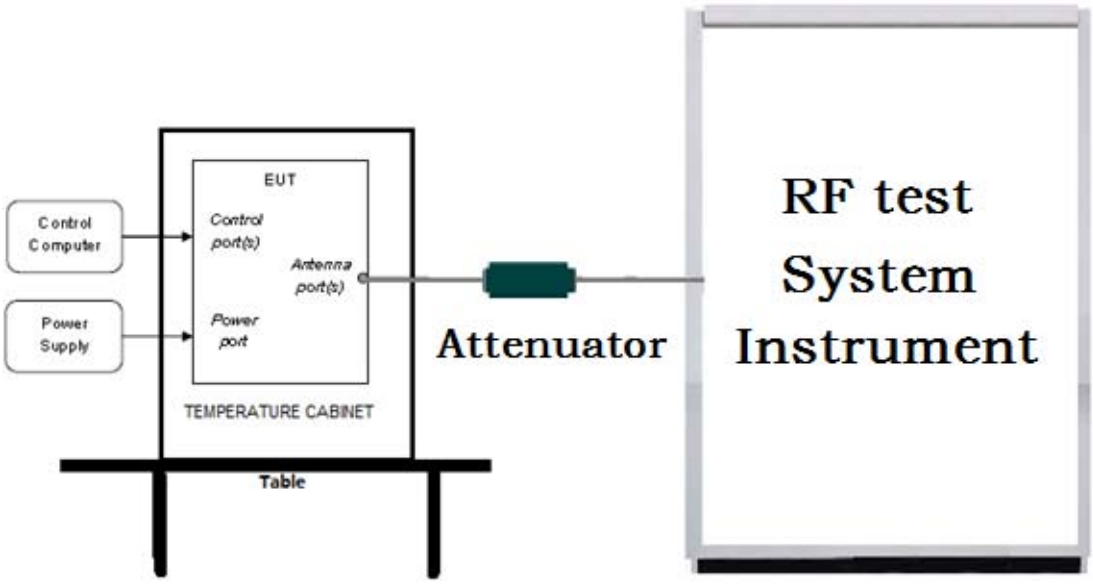
PHOTOGRAPHS OF TEST SETUP 58

PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS 60

5 Test Requirement

5.1 Test setup

5.1.1 For Conducted test setup



5.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

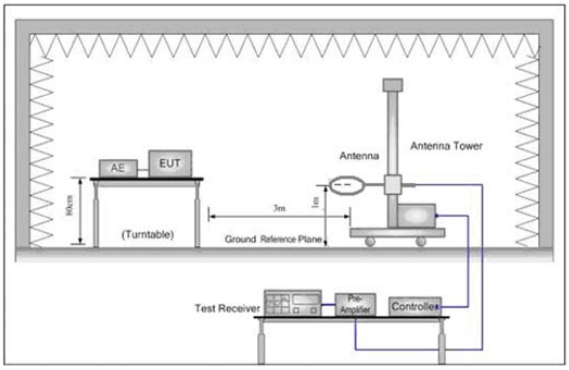


Figure 1. Below 30MHz

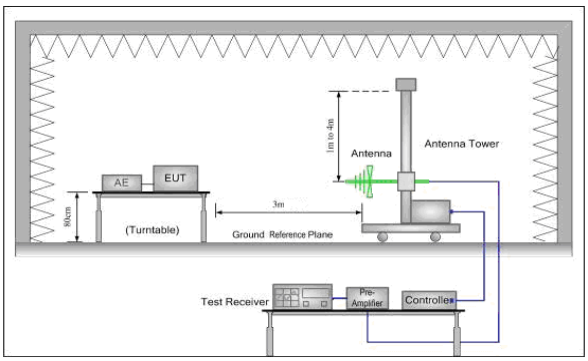


Figure 2. 30MHz to 1GHz

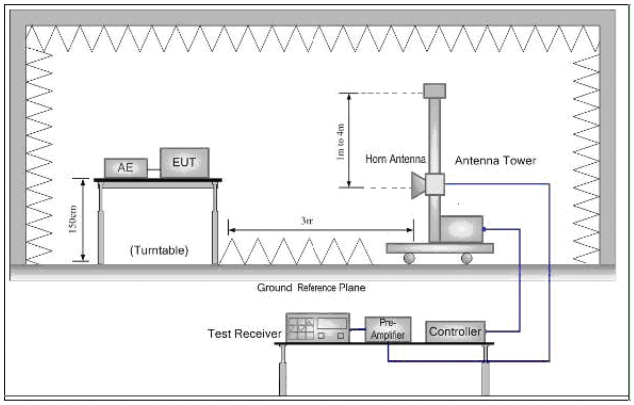
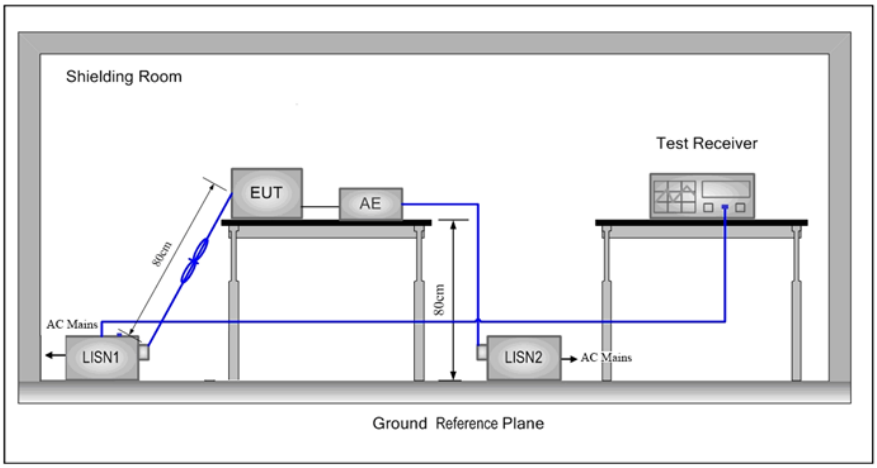


Figure 3. Above 1GHz

5.1.3 For Conducted Emissions test setup

Conducted Emissions setup



5.2 Test Environment

Operating Environment:	
Temperature:	25.0 °C
Humidity:	53 % RH
Atmospheric Pressure:	995mbar

5.3 Test Condition

Test channel:

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(M)	High(H)
802.11b/g/n(HT20)	2412MHz ~2462 MHz	Channel 1	Channel 6	Channel11
		2412MHz	2437MHz	2462MHz
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.			

Test mode:

Pre-scan under all rate at lowest channel 1

Mode	**802.11b**							
Data Rate	**1Mbps**	**2Mbps**	**5.5Mbps**	**11Mbps**				
EIRP(dBm)	15.09	15.54	15.65	15.76				
Mode	**802.11g**							
Data Rate	**6Mbps**	**9Mbps**	**12Mbps**	**18Mbps**	**24Mbps**	**36Mbps**	**48Mbps**	**54Mbps**
EIRP(dBm)	12.97	12.78	12.67	12.56	12.43	12.42	12.32	12.33
Mode	**802.11n (HT20)**							
Data Rate	**6.5Mbps**	**13Mbps**	**19.5Mbps**	**26Mbps**	**39Mbps**	**52Mbps**	**58.5Mbps**	**65Mbps**
EIRP(dBm)	12.40	12.14	11.98	11.87	11.77	11.67	11.66	11.62

Through Pre-scan, 11Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n (HT20).

6 General Information

6.1 Client Information

Applicant:	WOO GLOBAL MARKETS, S.L.
Address of Applicant:	Camino de Vinateros, 10. Bajo (Oficinas) 28030 MADRID - SPAIN
Manufacturer:	WOO GLOBAL MARKETS, S.L.
Address of Manufacturer:	Camino de Vinateros, 10. Bajo (Oficinas) 28030 MADRID - SPAIN

6.2 General Description of EUT

Product Name:	3G smart phone	
Model No.(EUT):	SP4541	
Tark mark:	N/A	
EUT Supports Radios application	GSM/GPRS 850: Tx:824.20 - 848.80MHz;Rx: 869.20 – 893.80MHz GSM/GPRS 1900: Tx:1850.20 – 1909.80MHz; Rx:1930.20 – 1989.80MHz WCDMA/HSDPA Band V: Tx:826.40 -846.60MHz;Rx: 871.40 – 891.60MHz WCDMA/HSDPA Band II: Tx:1852.40 – 1907.60MHz;Rx:1932.40 – 1987.60MHz BT3.0+EDR: 2402 – 2480MHz IEEE 802.11b/g/n(HT20): 2412 – 2462MHz	
Power Supply:	Adapter:	Input: AC 100V-240V 50-60Hz 0.4A Output: DC 5.0V 1000mA
	Battery:	DC3.7V (Li-on Rechargeable Battery)
Sample Received Date:	May 12, 2015	
Sample tested Date:	May 12,2015 to Jun. 03, 2015	

6.3 *Product Specification subjective to this standard*

Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels
Channel Separation:	5MHz
Type of Modulation:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g : OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20) : OFDM (64QAM, 16QAM, QPSK,BPSK)
Sample Type:	Portable production
Antenna Type:	Integral
Antenna Gain:	0dBi

Operation Frequency each of channel(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		

6.4 Description of Support Units

The EUT has been tested independently.

6.5 Test Location

All tests were performed at:

Centre Testing International (Shenzhen) Corporation
Building C, Scientific Innovation Park, Tiegang Reservior, Xixiang, Baoan District, Shenzhen, China
TEL: +86-755-3368 3919
FAX: +86-755-3368 3385
No tests were sub-contracted.

6.6 Test Facility

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

CNAS-Lab Code: L1910

Centre Testing International (Shenzhen) Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories. .

A2LA-Lab Cert. No. 3061.01

Centre Testing International (Shenzhen) Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 756231

Centre Testing International (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 756231.

IC-Registration No.: 7408A

The 3m Alternate Test Site of Centre Testing International (Shenzhen) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 7408A .

IC-Registration No.: 7408B

The 10m Alternate Test Site of Centre Testing International (Shenzhen) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 7408B.

NEMKO-Aut. No.: ELA503

Centre Testing International (Shenzhen) Co., Ltd. has been assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA-10.

VCCI

The Radiation 3 &10 meters site of Centre Testing International (Shenzhen) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-4096.

Main Ports Conducted Interference Measurement of Centre Testing International (Shenzhen) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-4563.

Telecommunication Ports Conducted Disturbance Measurement of Centre Testing International (Shenzhen) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: T-2146.

The Radiation 3 meters site of Centre Testing International (Shenzhen) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-758

6.7 Deviation from Standards

None.

6.8 Abnormalities from Standard Conditions

None.

6.9 Other Information Requested by the Customer

None.

7 Equipment List

Equipment	Manufacturer	Model	Serial No.	Due Date
3M Chamber & Accessory Equipment	TDK	SAC-3	---	06/01/2016
Receiver	R&S	ESCI	100435	07/08/2015
Spectrum Analyzer	R&S	FSP40	100416	07/06/2015
Signal Generator	R&S	SMB 100A	3008A02145	01/15/2016
Vector Signal Generator	R&S	SMBV 100A	3636A01004	01/15/2016
Signal Analyzer	R&S	FSV	100263	01/15/2016
Communication test set test set	Agilent	N4010A	MY47230124	01/15/2016
Spectrum Analyzer	Keysight	N9010A	5522H-HY5KC-VL	01/15/2016
Signal Generator	Keysight	N5182B	MMAPJ-I6AC3	01/15/2016
TRILOG Broadband Antenna	schwarzbeck	VULB 9163	618	06/17/2015
TRILOG Broadband Antenna	schwarzbeck	VULB 9163	617	07/13/2015
Multi device Controller	maturo	NCD/070/107 11112	---	N/A
Horn Antenna	ETS-LINGREN	3117	00057407	07/07/2015
Horn Antenna	ETS-LINGREN	3117	00057362	07/07/2015
Microwave Preamplifier	Agilent	8449B	3008A02425	03/19/2016
ESG Vector signal generators	Agilent	E4438C	MY45095744	01/15/2016
Temperature & Humidity Chamber	ESPEC	EL-04KA	N/A	08/03/2015
Receiver	R&S	ESCI	100009	07/19/2015
LISN	R&S	ENV216	100098	07/19/2015

8 Radio Technical Requirements Specification

Reference documents for testing:

No.	Identity	Document Title
1	FCC Part15C (2014)	Subpart C-Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicesed Wireless Devices

Test Results List:

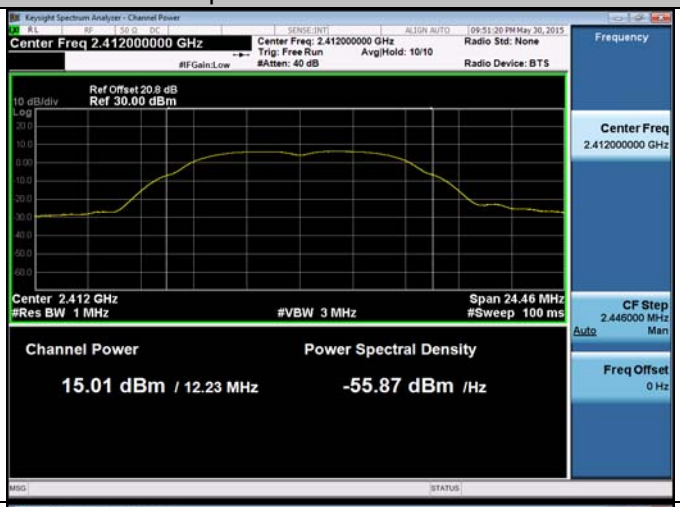
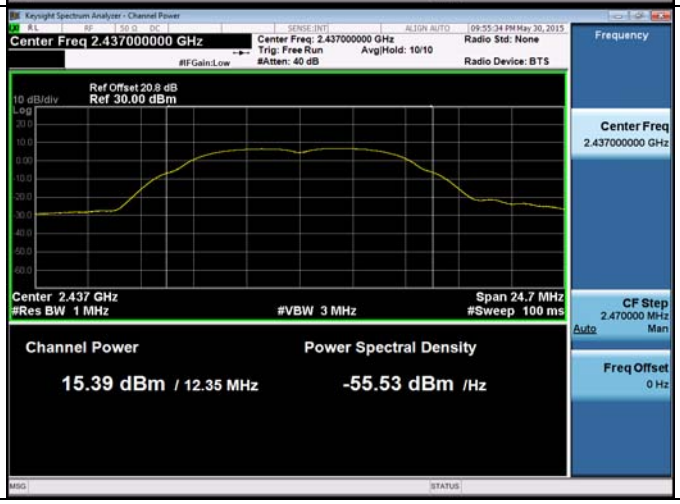
Test Requirement	Test method	Test item	Verdict	Note
Part15C Section 15.247 (b)(3)	ANSI C63.10	Conducted Peak Output Power	PASS	Appendix A)
Part15C Section 15.247 (a)(2)	ANSI C63.10	6dB Occupied Bandwidth	PASS	Appendix B)
Part15C Section 15.247(d)	ANSI C63.10	Band-edge for RF Conducted Emissions	PASS	Appendix C)
Part15C Section 15.247(d)	ANSI C63.10	RF Conducted Spurious Emissions	PASS	Appendix D)
Part15C Section 15.247 (e)	ANSI C63.10	Power Spectral Density	PASS	Appendix E)
Part15C Section 15.203/15.247 (c)	ANSI C63.10	Antenna Requirement	PASS	Appendix F)
Part15C Section 15.207	ANSI C63.10	AC Power Line Conducted Emission	PASS	AppendixG)
Part15C Section 15.205/15.209	ANSI C63.10	Restricted bands around fundamental frequency (Radiated Emission)	PASS	Appendix H)
Part15C Section 15.205/15.209	ANSI C63.10	Radiated Spurious Emissions	PASS	Appendix I)

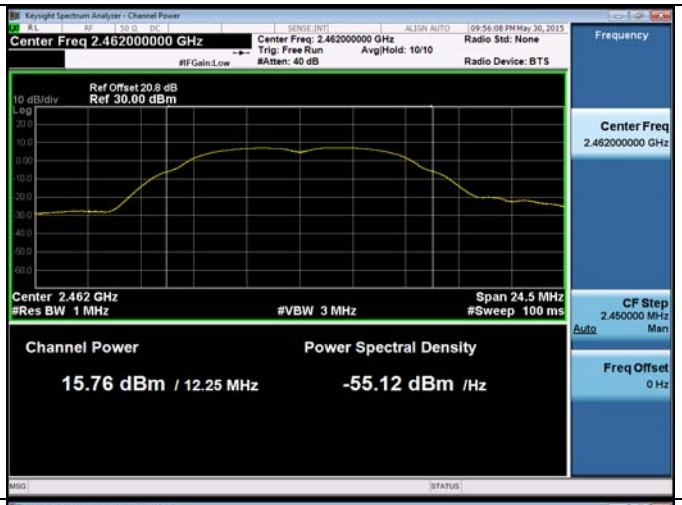
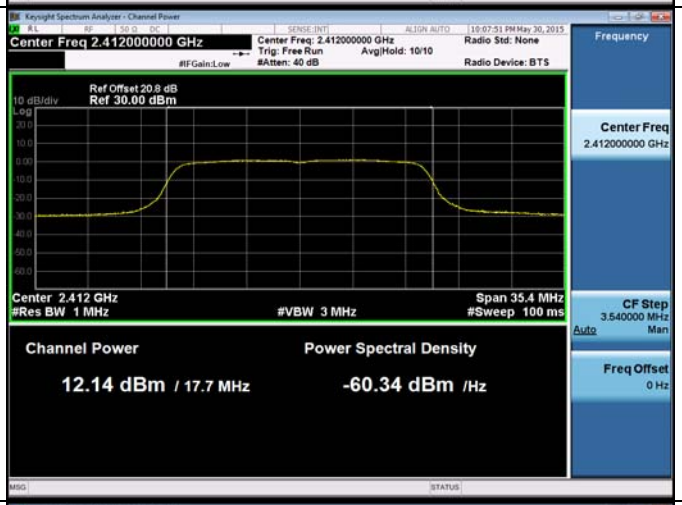
Appendix A): Conducted Peak Output Power

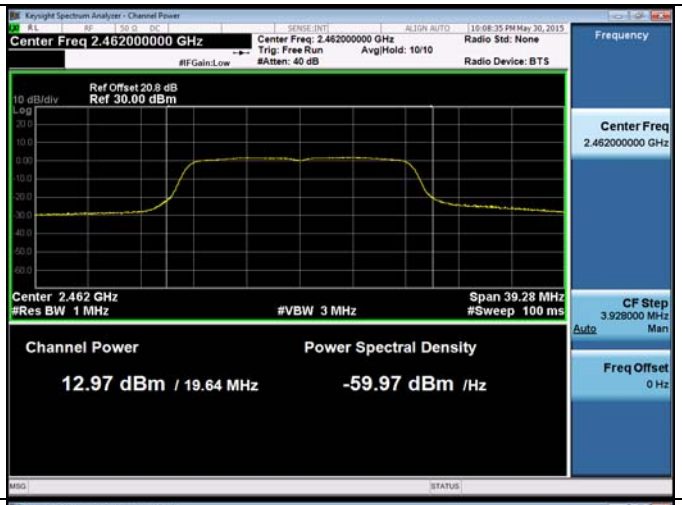
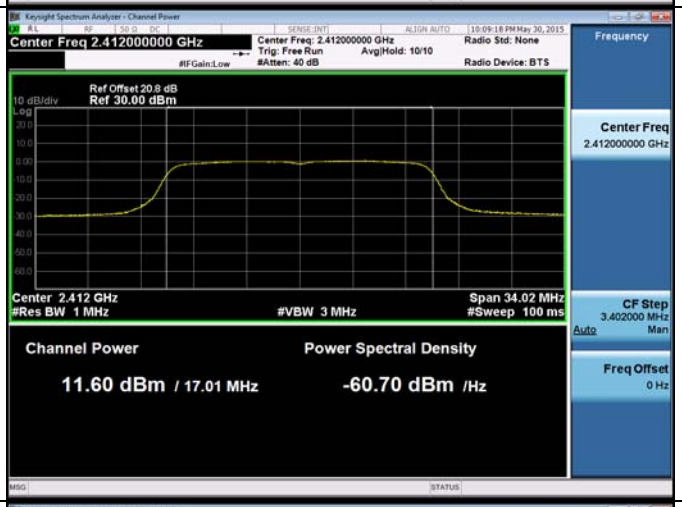
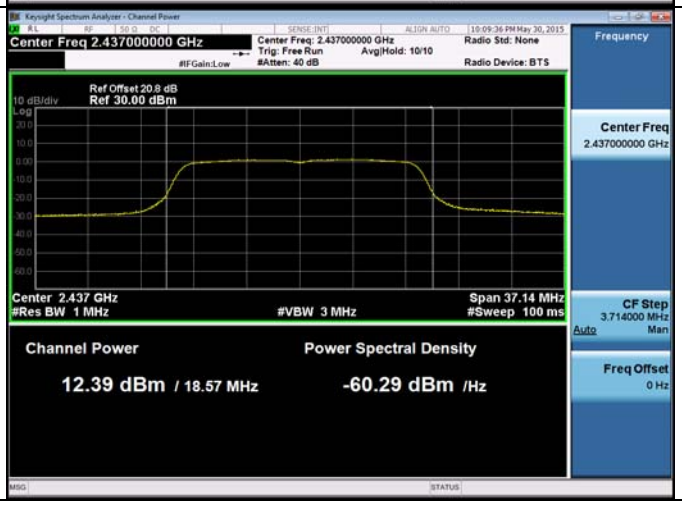
Result Table

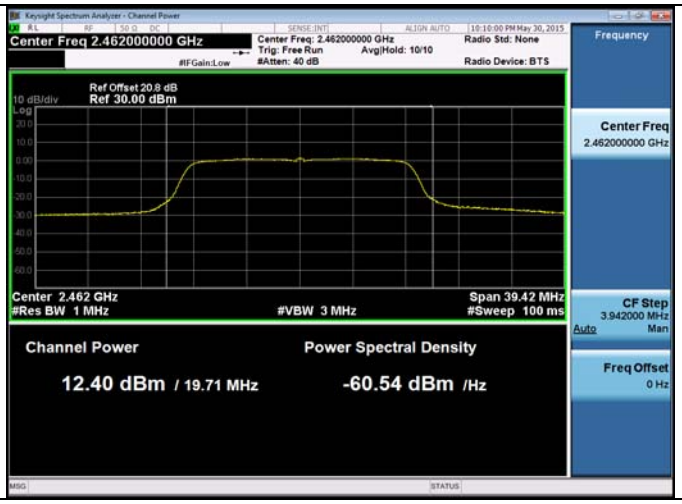
Mode	Channel	Meas.Level [dBm]	Verdict
11B	LCH	15.01	PASS
11B	MCH	15.39	PASS
11B	HCH	15.76	PASS
11G	LCH	12.14	PASS
11G	MCH	12.84	PASS
11G	HCH	12.97	PASS
11N20SISO	LCH	11.60	PASS
11N20SISO	MCH	12.39	PASS
11N20SISO	HCH	12.40	PASS

Test Graph

Graphs			
11B/LCH			
11B/MCH			

11B/HCH			
11G/LCH			
11G/MCH			

11G/HCH			
11N20SISO/LCH			
11N20SISO/MCH			

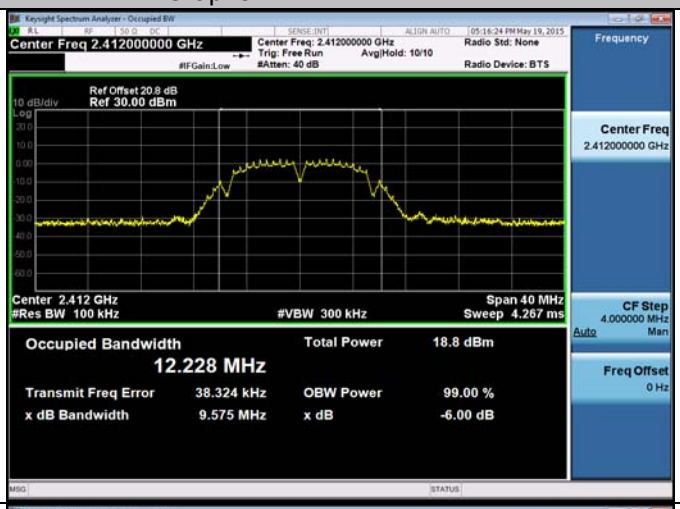
11N20SISO/HCH			

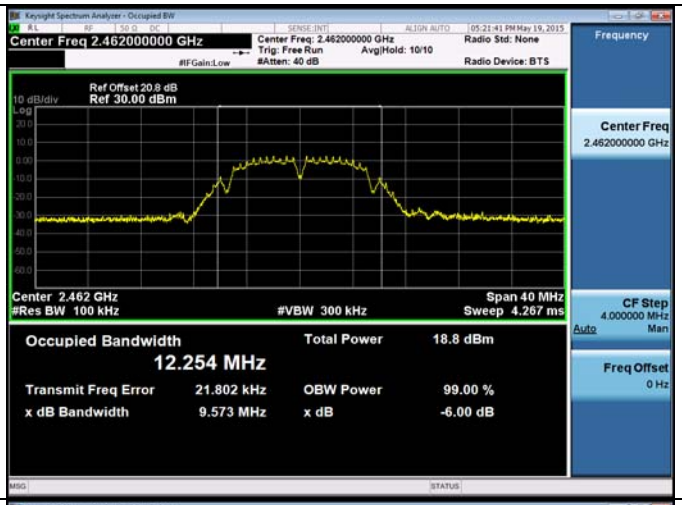
Appendix B): 6dB Occupied Bandwidth

Result Table

Mode	Channel	6dB Bandwidth [MHz]	99% OBW [MHz]	Verdict
11B	LCH	9.58	12.23	PASS
11B	MCH	10.05	12.35	PASS
11B	HCH	9.57	12.25	PASS
11G	LCH	15.10	17.71	PASS
11G	MCH	13.82	18.85	PASS
11G	HCH	15.06	19.64	PASS
11N20SISO	LCH	12.56	17.01	PASS
11N20SISO	MCH	15.31	18.57	PASS
11N20SISO	HCH	15.04	19.71	PASS

Test Graph

Graphs			
11B/LCH			
11B/MCH			

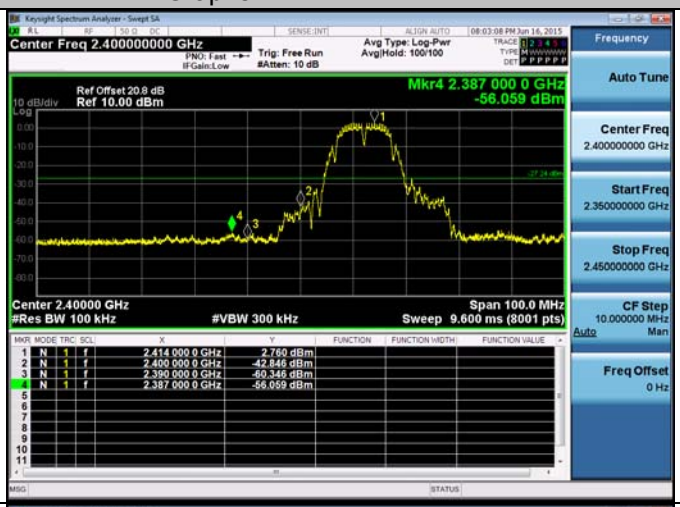
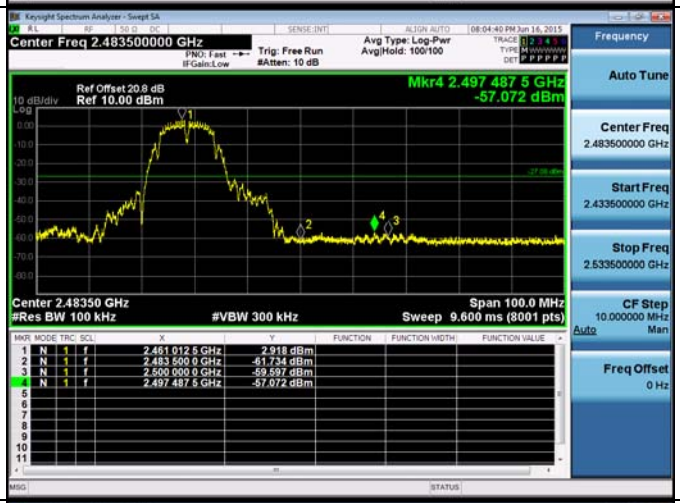
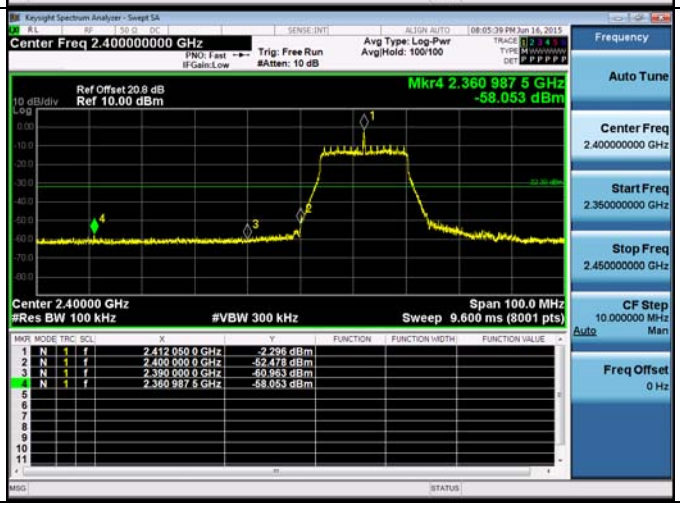
11B/HCH			
11G/LCH			
11G/MCH			

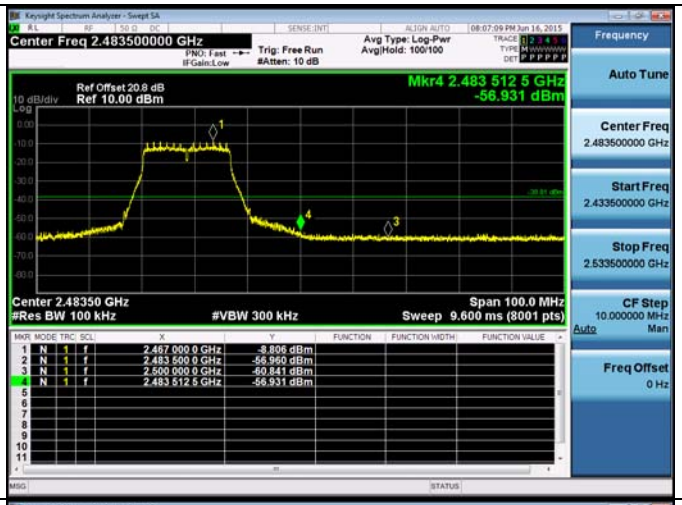
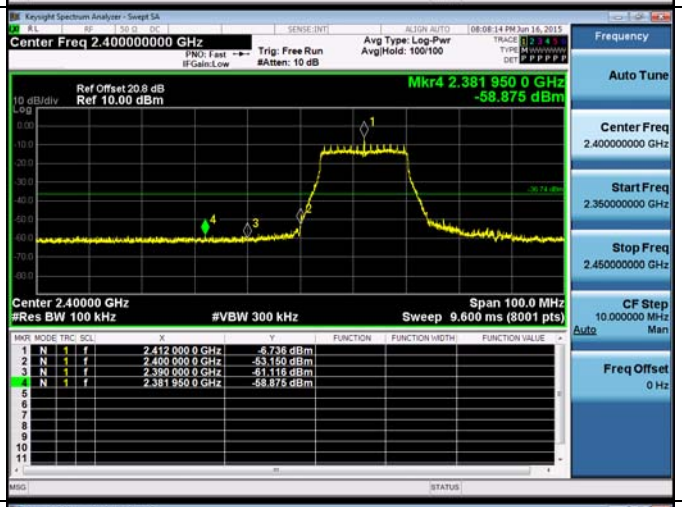
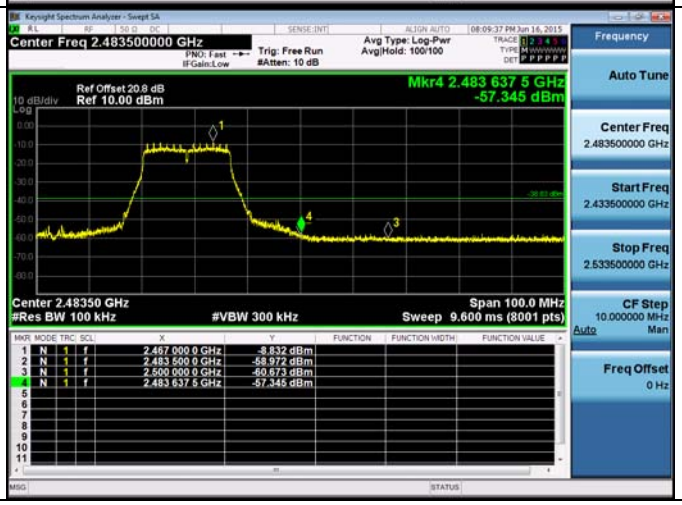
11G/HCH			
11N20SISO/LCH			
11N20SISO/MCH			

11N20SISO/HCH			

Appendix C): Band-edge for RF Conducted Emissions

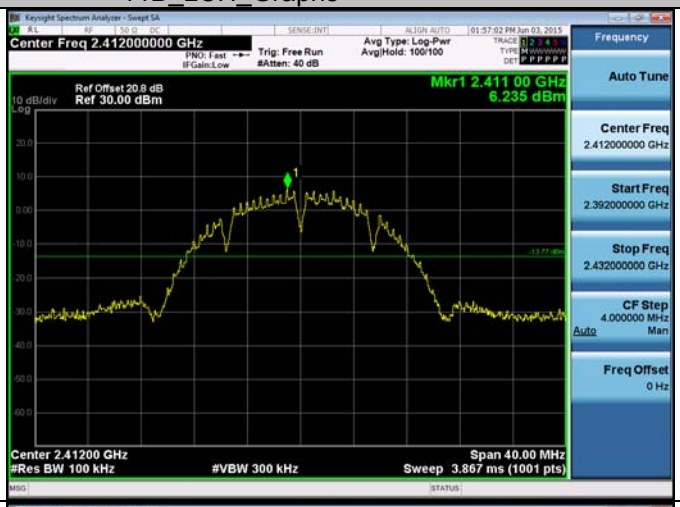
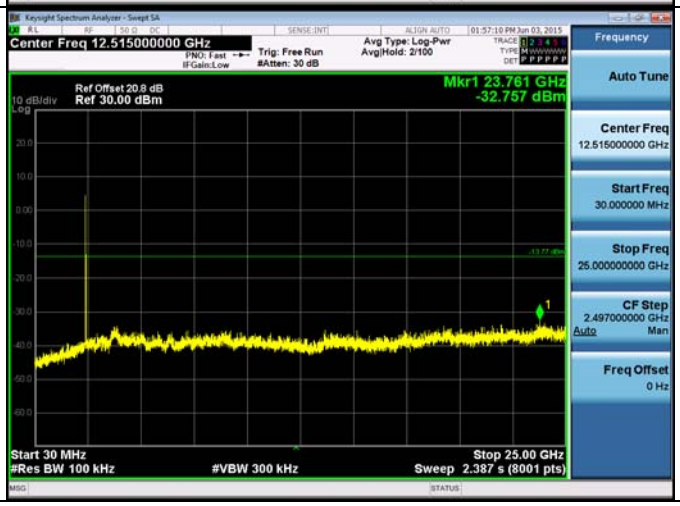
Test Graph

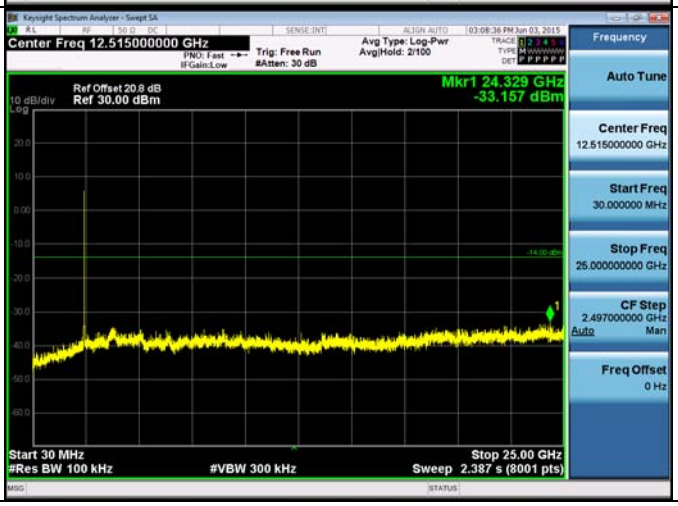
Graphs			
11B/LCH			
11B/HCH			
11G/LCH			

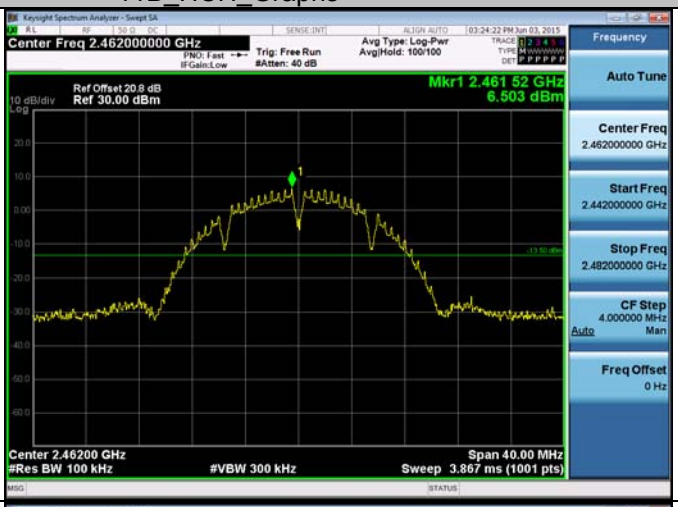
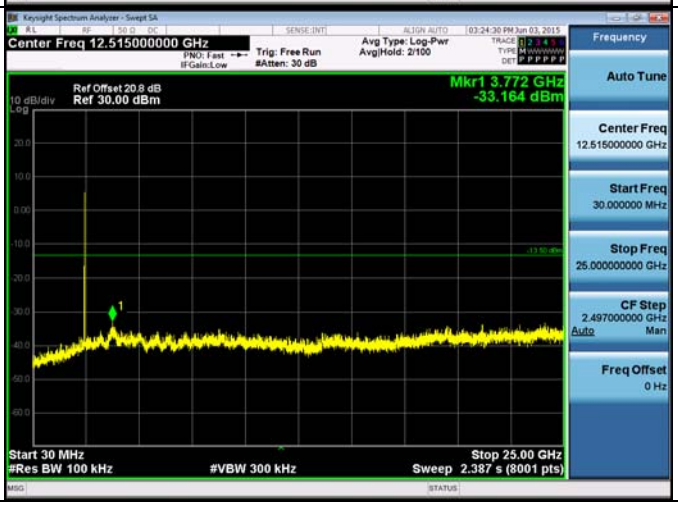
11G/HCH			
11N20SISO/LCH			
11N20SISO/HCH			

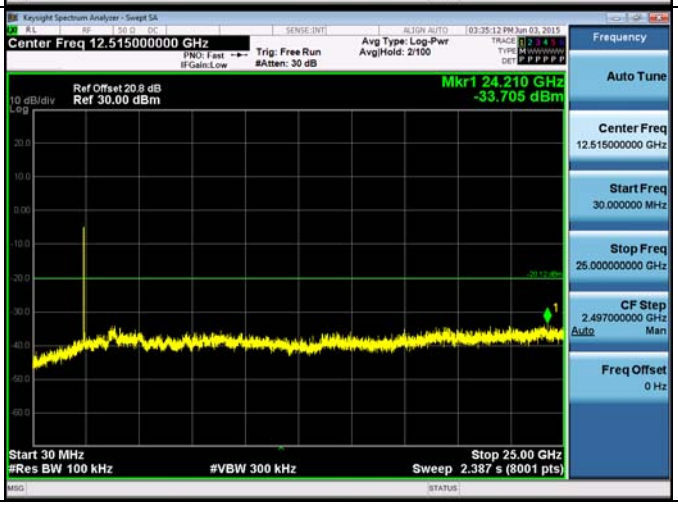
Appendix D): RF Conducted Spurious Emissions

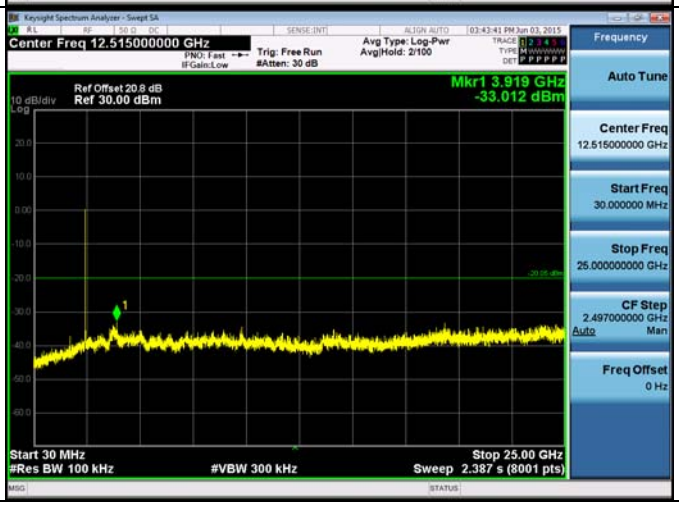
Test Graph

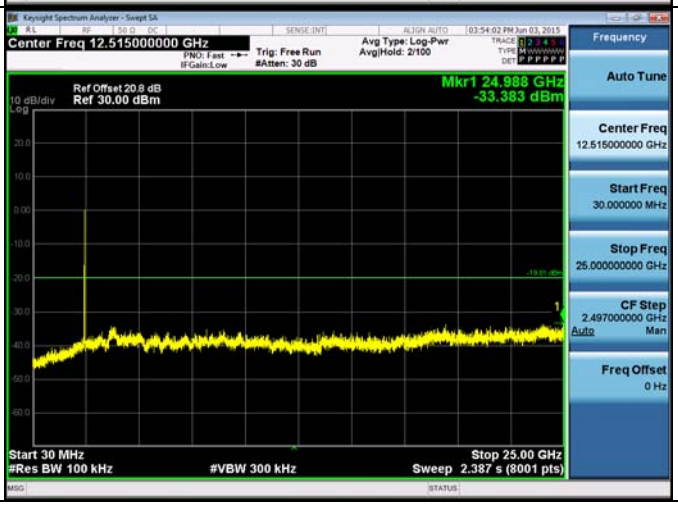
11B_LCH_Graphs			
Pref/11B/LCH			
Puw/11B/LCH			

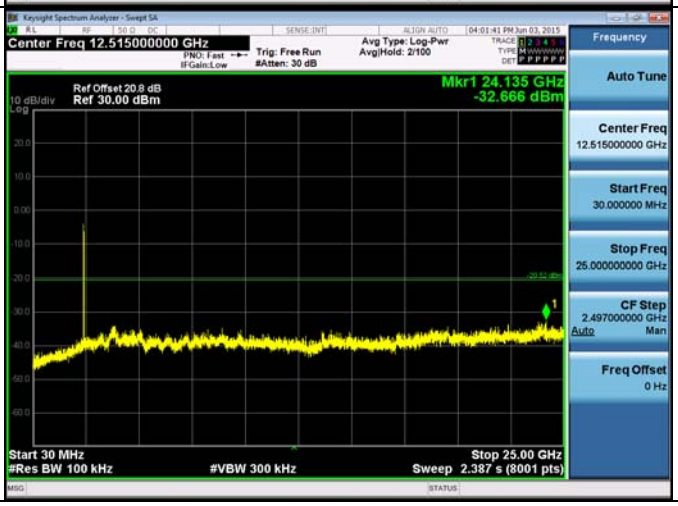
11B_MCH_Graphs			
Pref/11B/MCH			
Puw/11B/MCH			

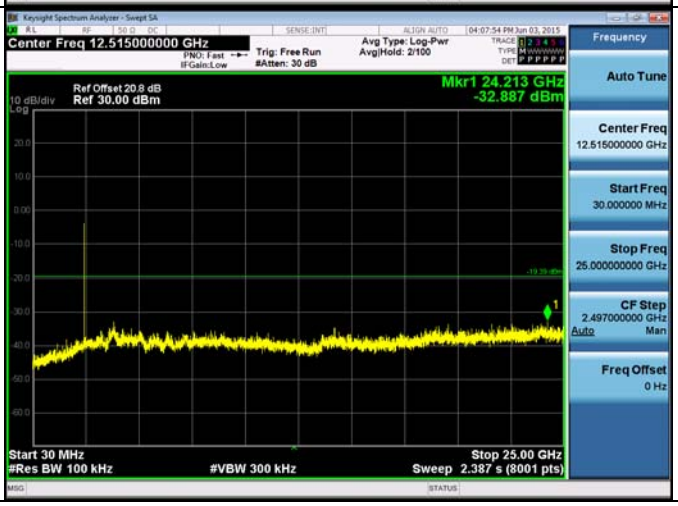
11B_HCH_Graphs			
Pref/11B/HCH			
Puw/11B/HCH			

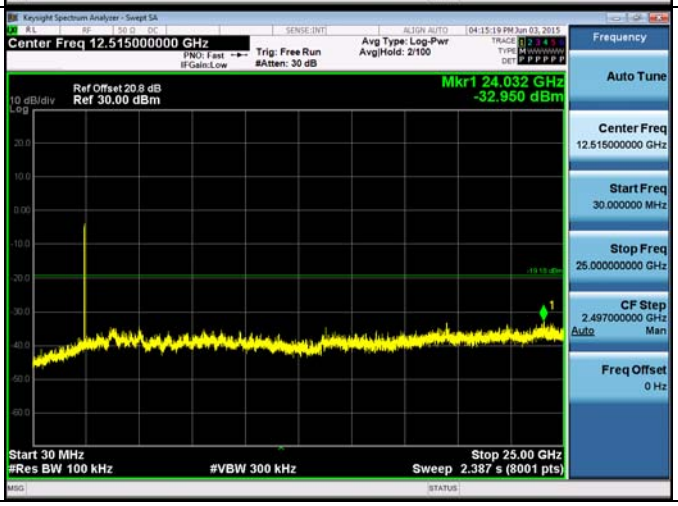
11G_LCH_Graphs			
Pref/11G/LCH			
Puw/11G/LCH			

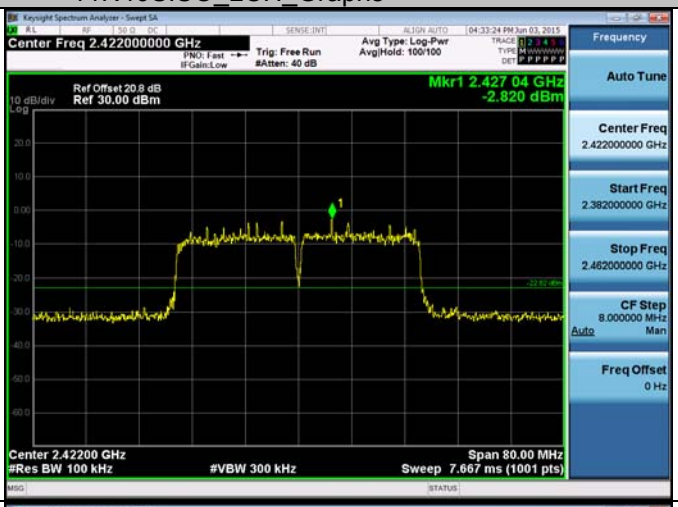
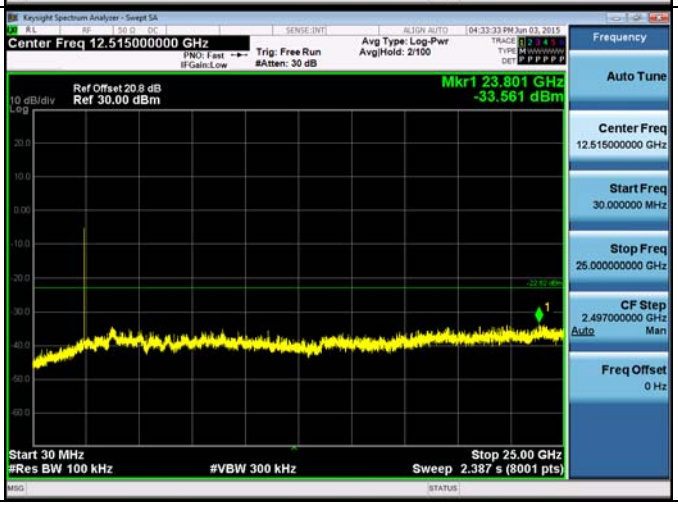
11G_MCH_Graphs			
Pref/11G/MCH			
Puw/11G/MCH			

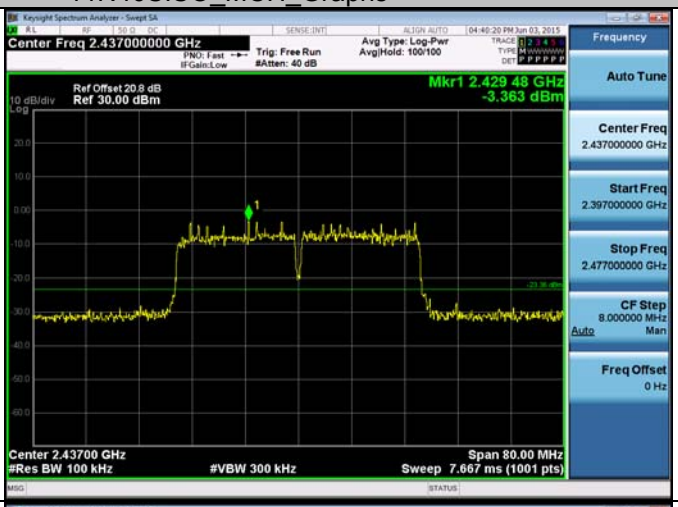
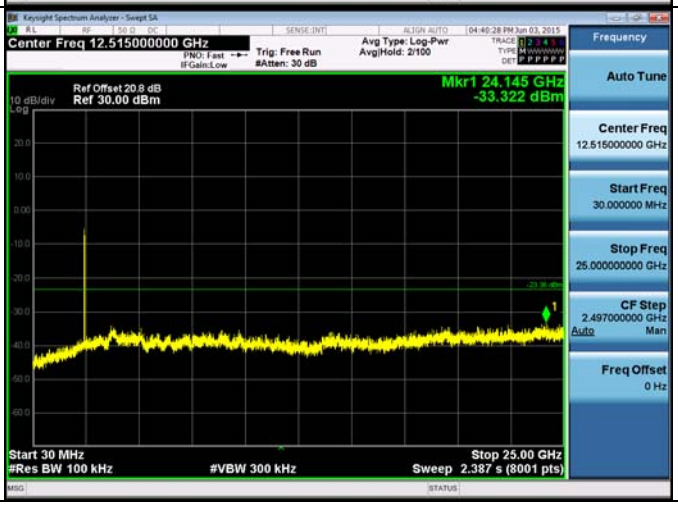
11G_HCH_Graphs			
Pref/11G/HCH			
Puw/11G/HCH			

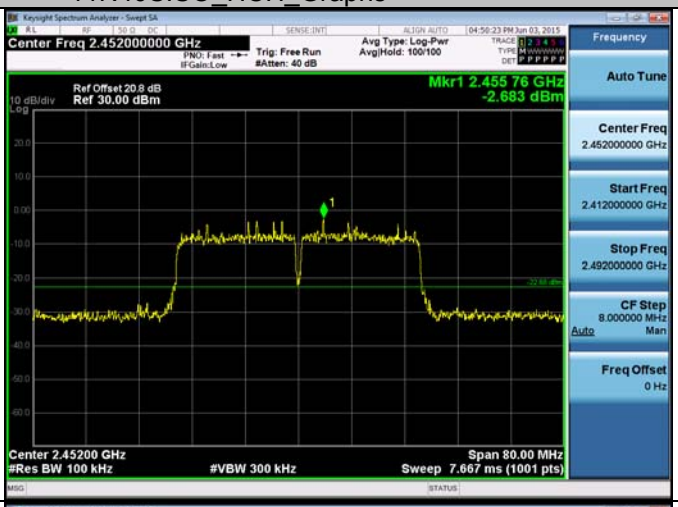
11N20SISO_LCH_Graphs			
Pref/11N20SISO/LCH			
/11N20SISO/LCH			

11N20SISO_MCH_Graphs			
Pref/11N20SISO/MCH			
Puw/11N20SISO/MCH			

11N20SISO_HCH_Graphs			
Pref/11N20SISO/HCH			
Puw/11N20SISO/HCH			

11N40SISO_LCH_Graphs			
Pref/11N40SISO/LCH			
Puw/11N40SISO/LCH			

11N40SISO_MCH_Graphs			
Pref/11N40SISO/MCH			
Puw/11N40SISO/MCH			

11N40SISO_HCH_Graphs			
Pref/11N40SISO/HCH			
Puw/11N40SISO/HCH			

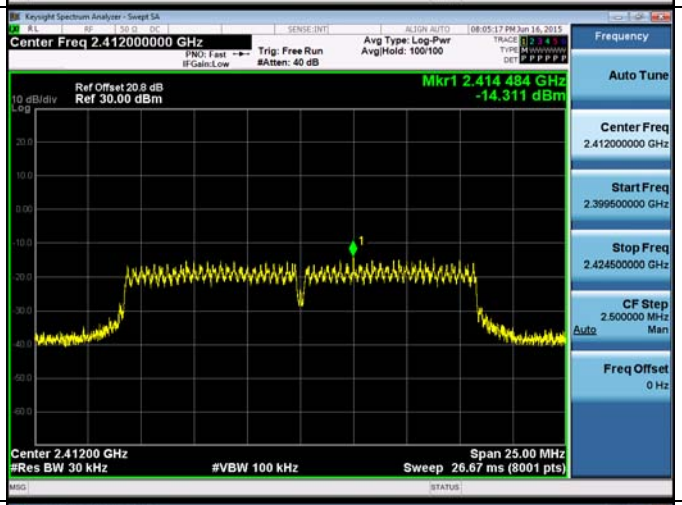
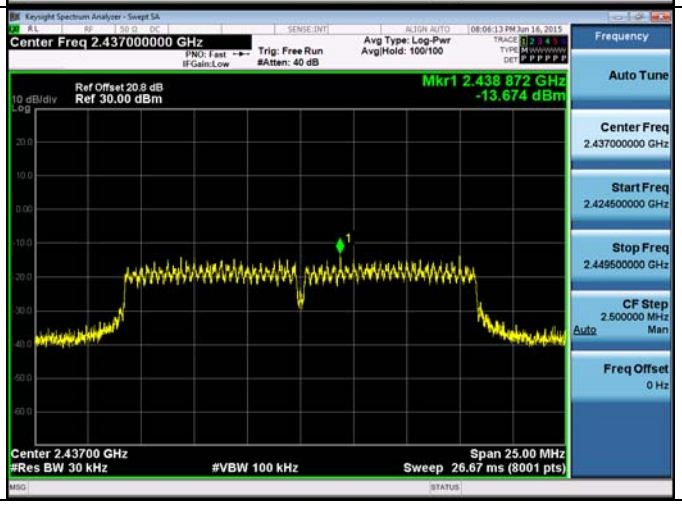
Appendix E): Power Spectral Density

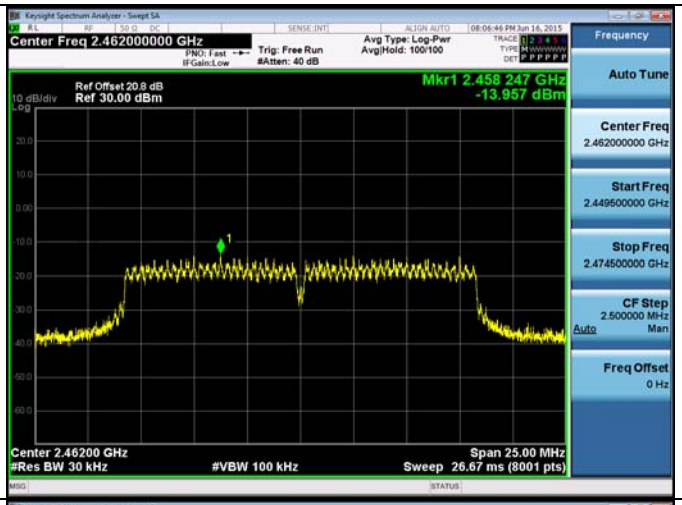
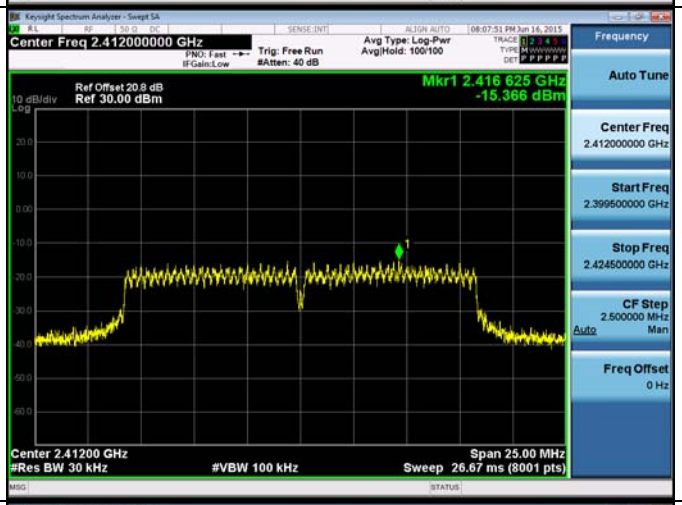
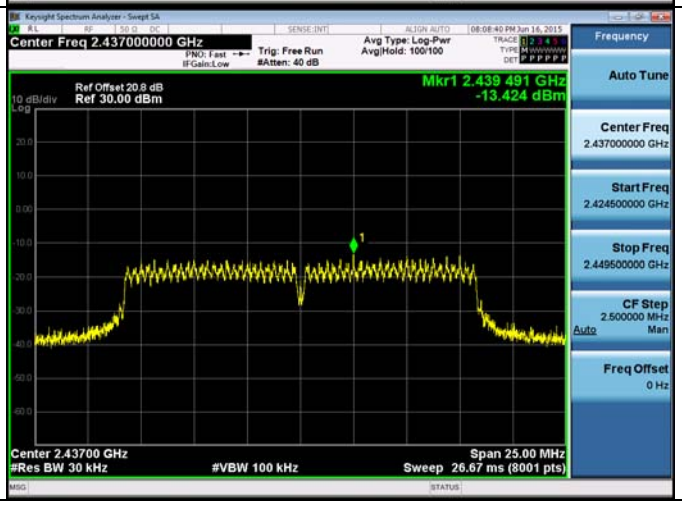
Result Table

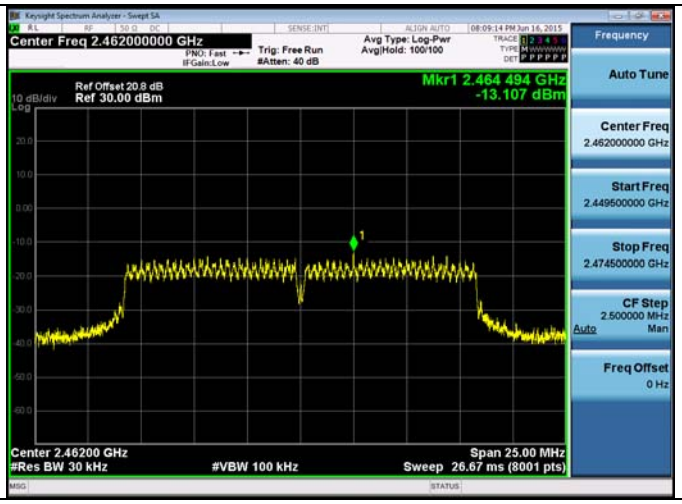
Mode	Channel	Meas.Level [dBm]	Verdict
11B	LCH	-0.317	PASS
11B	MCH	-0.953	PASS
11B	HCH	-0.701	PASS
11G	LCH	-14.311	PASS
11G	MCH	-13.674	PASS
11G	HCH	-13.957	PASS
11N20SISO	LCH	-15.366	PASS
11N20SISO	MCH	-13.424	PASS
11N20SISO	HCH	-13.107	PASS

Test Graph

Graphs			
11B/LCH			
11B/MCH			

11B/HCH			
11G/LCH			
11G/MCH			

11G/HCH			
11N20SISO/LCH			
11N20SISO/MCH			

11N20SISO/HCH			

Appendix F) Antenna Requirement

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(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:	

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.

Appendix G) AC Power Line Conducted Emission

<table>
<tr><td>Test Procedure:</td><td>Test frequency range :150KHz-30MHz
1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) 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 on conducted measurement.</td></tr>
<tr><td>Limit:</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>
* The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.
NOTE : The lower limit is applicable at the transition frequency</td></tr>
</table>

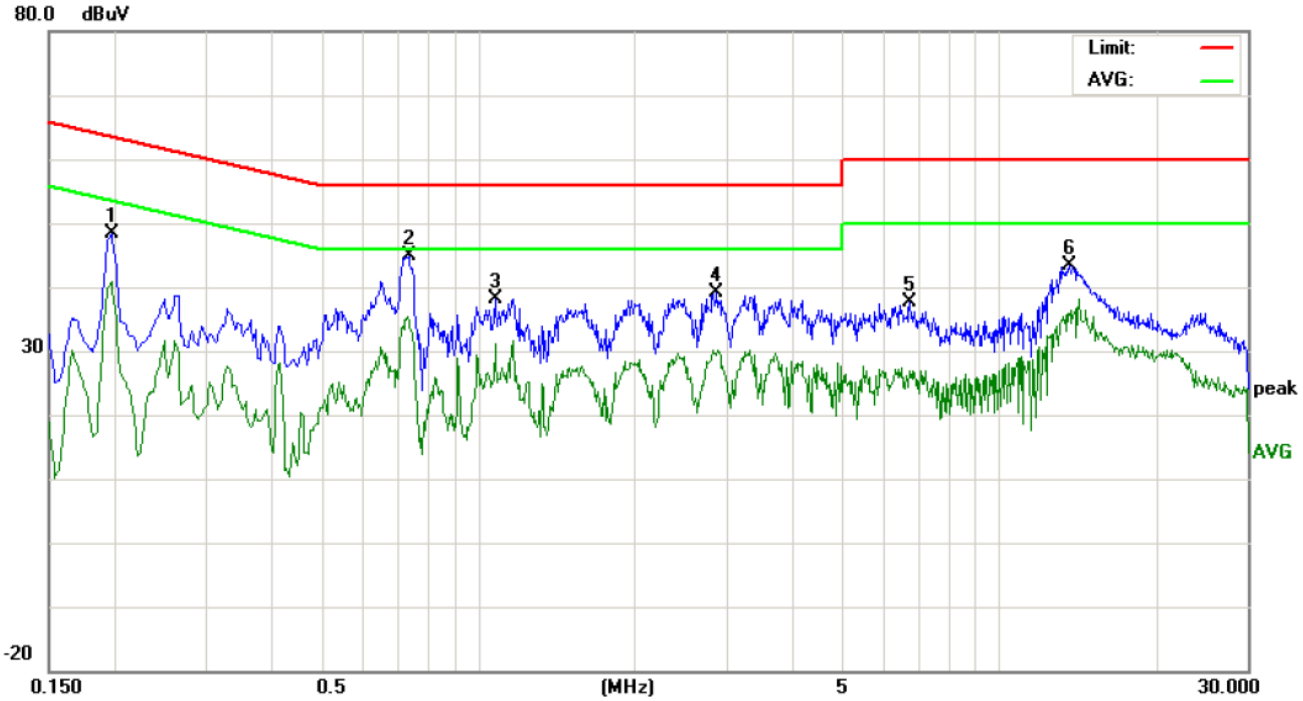
Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

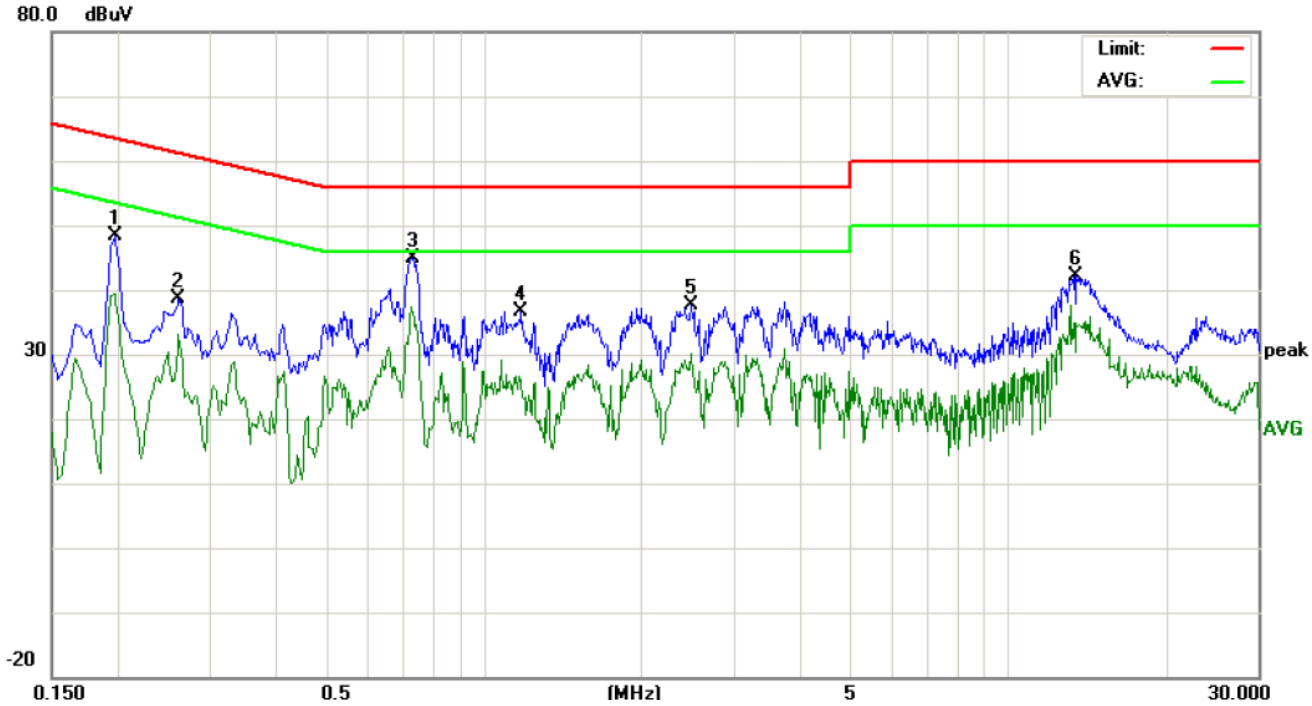
Product	:	3G smart phone	**Model/Type reference**	:	SP4541
Power	:	AC 120V/60Hz	**Temperature**	:	22℃
Mode	:	Keeping TX	**Humidity**	:	52%

Live line:



No.	Freq.	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)			
	MHz	Peak	QP	AVG	dB	peak	QP	AVG	QP	AVG	QP	AVG	P/F	Comment
1	0.1980	38.42		30.97	9.90	48.32		40.87	63.69	53.69	-15.37	-12.82	P	
2	0.7380	35.03		25.00	9.90	44.93		34.90	56.00	46.00	-11.07	-11.10	P	
3	1.0820	28.30		21.24	9.90	38.20		31.14	56.00	46.00	-17.80	-14.86	P	
4	2.8820	29.12		19.57	9.90	39.02		29.47	56.00	46.00	-16.98	-16.53	P	
5	6.7460	27.62		17.05	9.90	37.52		26.95	60.00	50.00	-22.48	-23.05	P	
6	13.6460	33.55		25.76	9.93	43.48		35.69	60.00	50.00	-16.52	-14.31	P	

Neutral line:



No.	Freq.	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)			
	MHz	Peak	QP	AVG	dB	peak	QP	AVG	QP	AVG	QP	AVG	P/F	Comment
1	0.1980	38.49		29.55	9.90	48.39		39.45	63.69	53.69	-15.30	-14.24	P	
2	0.2620	28.68		23.16	9.90	38.58		33.06	61.36	51.36	-22.78	-18.30	P	
3	0.7340	34.95		26.51	9.90	44.85		36.41	56.00	46.00	-11.15	-9.59	P	
4	1.1820	26.78		15.61	9.90	36.68		25.51	56.00	46.00	-19.32	-20.49	P	
5	2.4980	27.77		20.10	9.90	37.67		30.00	56.00	46.00	-18.33	-16.00	P	
6	13.4820	32.25		25.03	9.93	42.18		34.96	60.00	50.00	-17.82	-15.04	P	

Appendix H) Restricted bands around fundamental frequency (Radiated)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Procedure:

Above 1GHz test procedure as below:

a. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
b. Test the EUT in the lowest channel , the Highest channel
c. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
d. Repeat above procedures until all frequencies measured was complete.

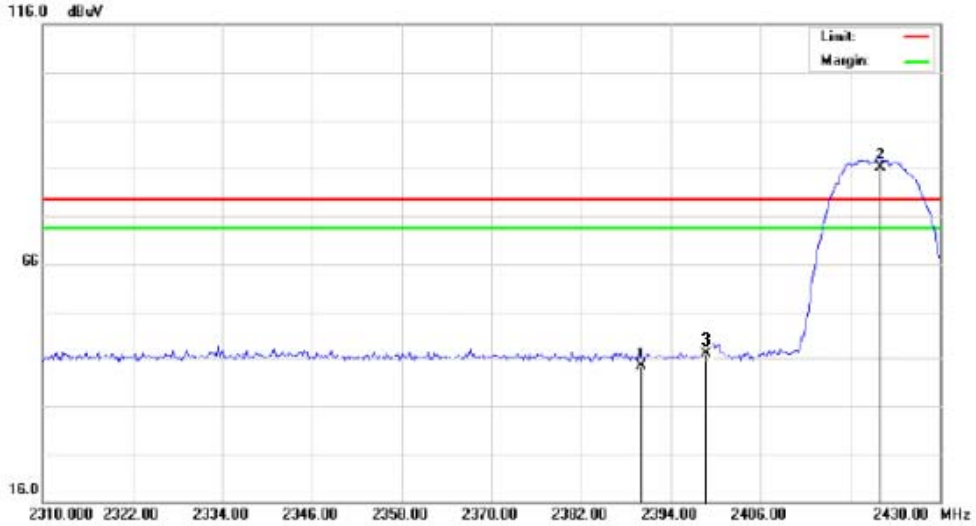
Limit:

Frequency	Limit (dBμV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test plot as follows:

Worse case mode:	802.11b (11Mbps)	Test channel:	Lowest	Remark:	PK/AV	Vertical

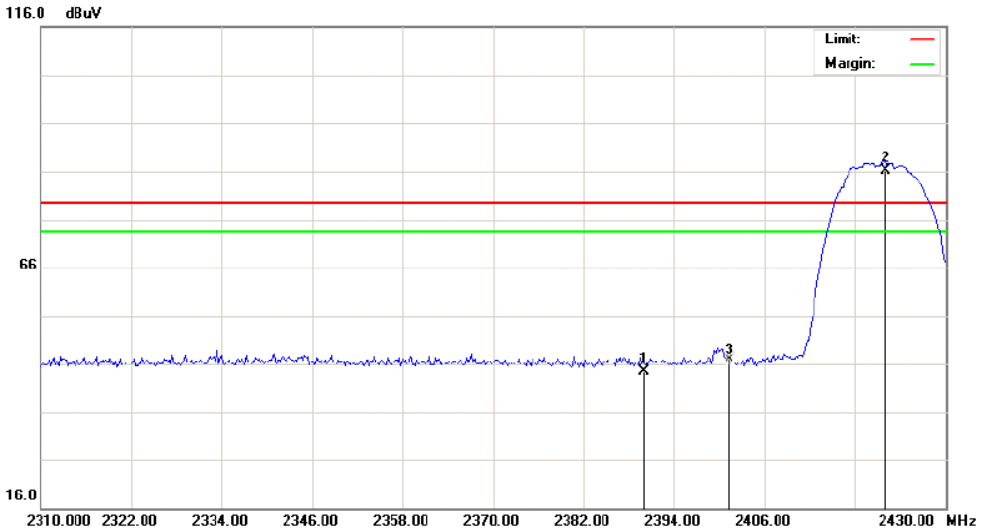
2412MHz:



Frequency (MHz)	Measurement value		Limit		Antenna	Result
	PK (dBμV/m)	AV (dBμV/m)	PK (dBμV/m)	AV (dBμV/m)	(H/V)	(P/F)
2390.000	47.01	---	74	54	V	P
2400.000	47.05	---	74	54	V	P

Worse case mode:	802.11b (11Mbps)	Test channel:	Lowest	Remark:	PK/AV	Horizontal

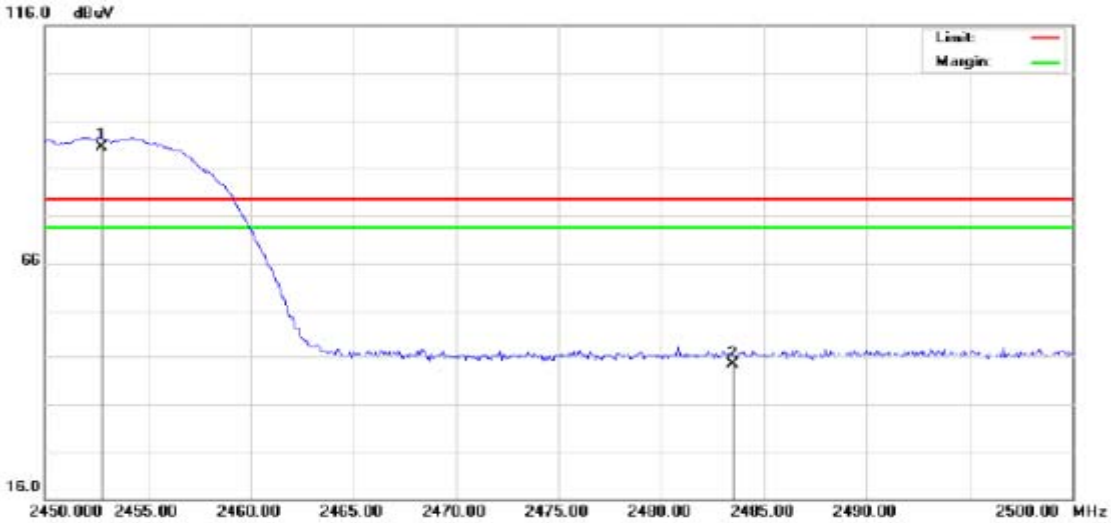
2412MHz:



Frequency (MHz)	Measurement value		Limit		Antenna	Result
	PK (dBμV/m)	AV (dBμV/m)	PK (dBμV/m)	AV (dBμV/m)	(H/V)	(P/F)
2390.000	46.43	---	74	54	H	P
2400.000	46.41	---	74	54	H	P

Worse case mode:	802.11b (11Mbps)	Test channel:	Highest	Remark:	PK/AV	Vertical

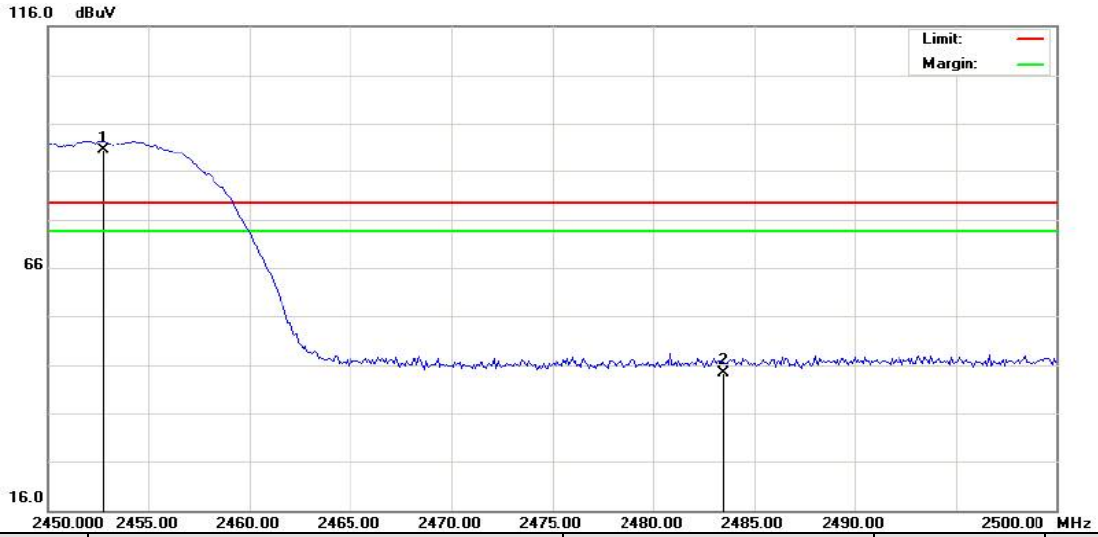
2462MHz:



Frequency (MHz)	Measurement value		Limit		Antenna	Result
	PK (dBμV/m)	AV (dBμV/m)	PK (dBμV/m)	AV (dBμV/m)	(H/V)	(P/F)
2483.500	44.24	---	74	54	V	P

Worse case mode:	802.11b (11Mbps)	Test channel:	Highest	Remark:	PK/AV	Horizontal

2462MHz:



Frequency (MHz)	Measurement value		Limit		Antenna	Result
	PK (dBμV/m)	AV (dBμV/m)	PK (dBμV/m)	AV (dBμV/m)	(H/V)	(P/F)
2483.500	46.43	---	74	54	H	P

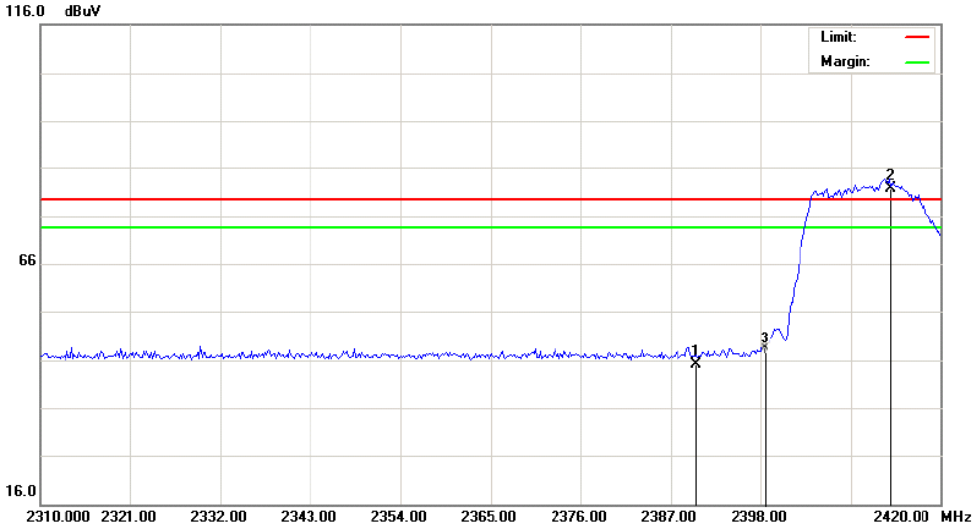
Worse case mode:	802.11g (6Mbps)	Test channel:	Lowest	Remark:	PK/AV	Vertical

2412MHz:

Frequency (MHz)	Measurement value		Limit		Antenna	Result
	PK (dBμV/m)	AV (dBμV/m)	PK (dBμV/m)	AV (dBμV/m)	(H/V)	(P/F)
2390.000	44.81	---	74	54	V	P
2400.000	44.83	---	74	54	V	P

Worse case mode:	802.11g (6Mbps)	Test channel:	Lowest	Remark:	PK/AV	Horizontal

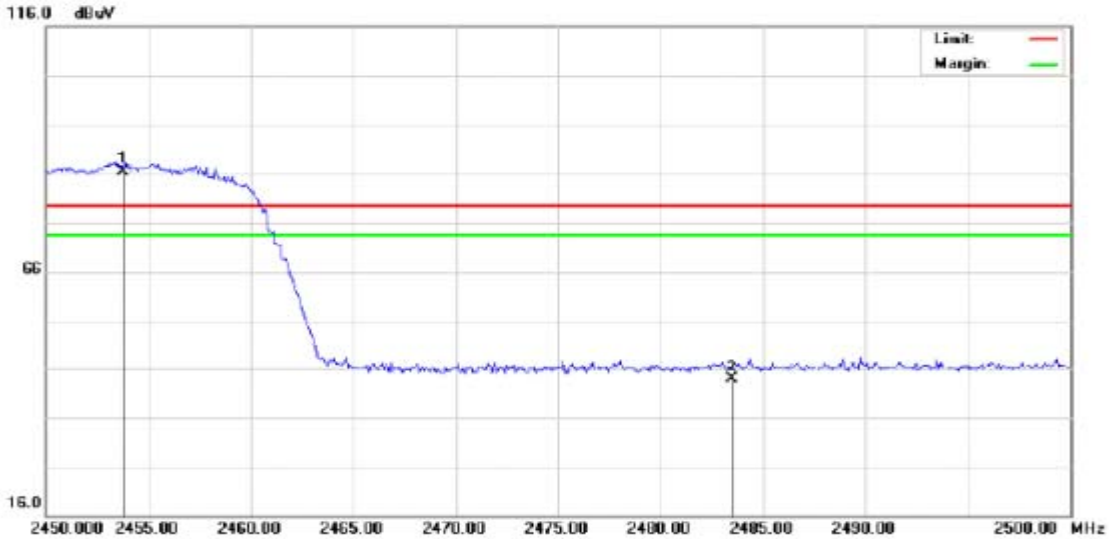
2412MHz:



Frequency (MHz)	Measurement value		Limit		Antenna	Result
	PK (dBμV/m)	AV (dBμV/m)	PK (dBμV/m)	AV (dBμV/m)	(H/V)	(P/F)
2390.000	45.14	---	74	54	H	P
24000.000	45.11	---	74	54	H	P

Worse case mode:	802.11g (6Mbps)	Test channel:	Highest	Remark:	PK/AV	Vertical

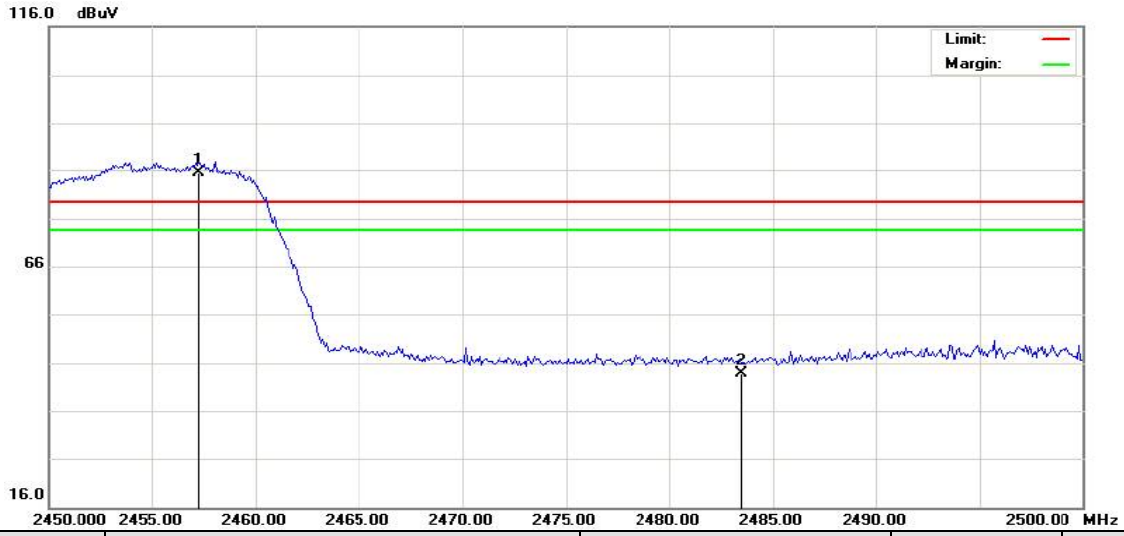
2462MHz:



Frequency (MHz)	Measurement value		Limit		Antenna	Result
	PK (dBμV/m)	AV (dBμV/m)	PK (dBμV/m)	AV (dBμV/m)	(H/V)	(P/F)
2483.500	43.69	---	74	54	V	P

Worse case mode:	802.11g (6Mbps)	Test channel:	Highest	Remark:	PK/AV	Horizontal

2462MHz:



Frequency (MHz)	Measurement value		Limit		Antenna	Result
	PK (dBμV/m)	AV (dBμV/m)	PK (dBμV/m)	AV (dBμV/m)	(H/V)	(P/F)
2483.500	43.58	---	74	54	H	P

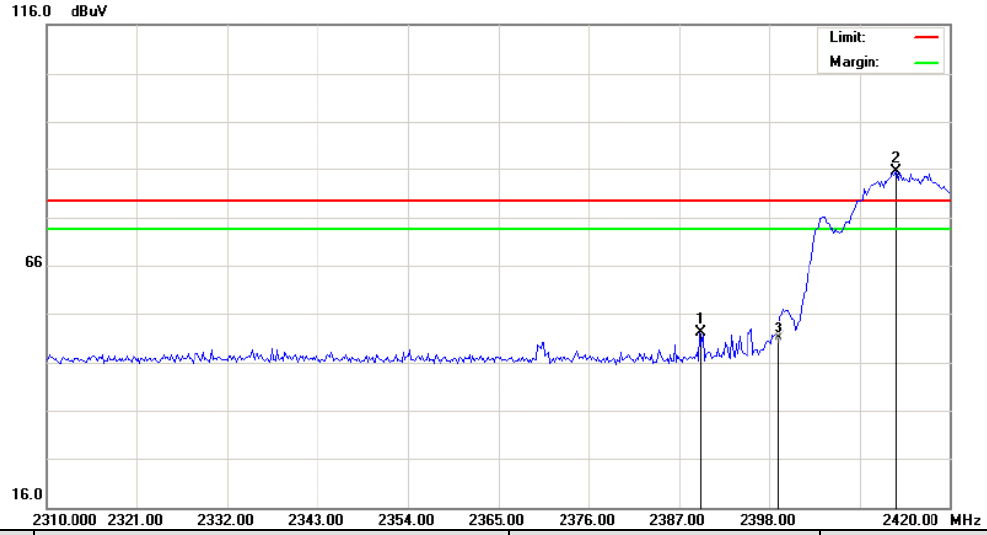
Worse case mode:	802.11n(HT20) (6.5Mbps)	Test channel:	Lowest	Remark:	PK/AV	Vertical

2412MHz:

Frequency (MHz)	Measurement value		Limit		Antenna	Result
	PK (dBμV/m)	AV (dBμV/m)	PK (dBμV/m)	AV (dBμV/m)	(H/V)	(P/F)
2390.000	44.22	---	74	54	V	P
2400.000	44.21	---	74	54	V	P

Worse case mode:	802.11n(HT20) (6.5Mbps)	Test channel:	Lowest	Remark:	PK/AV	Horizontal

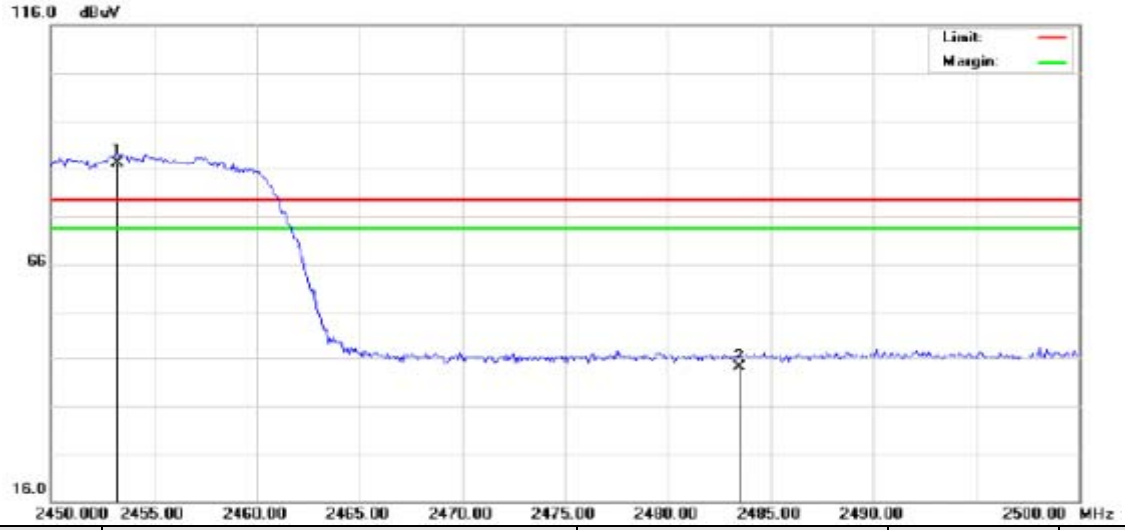
2412MHz:



Frequency (MHz)	Measurement value		Limit		Antenna	Result
	PK (dBμV/m)	AV (dBμV/m)	PK (dBμV/m)	AV (dBμV/m)	(H/V)	(P/F)
2390.000	52.07	---	74	54	H	P
2400.000	52.08	---	74	54	H	P

Worse case mode:	802.11n(HT20) (6.5Mbps)	Test channel:	Highest	Remark:	PK/AV	Vertical

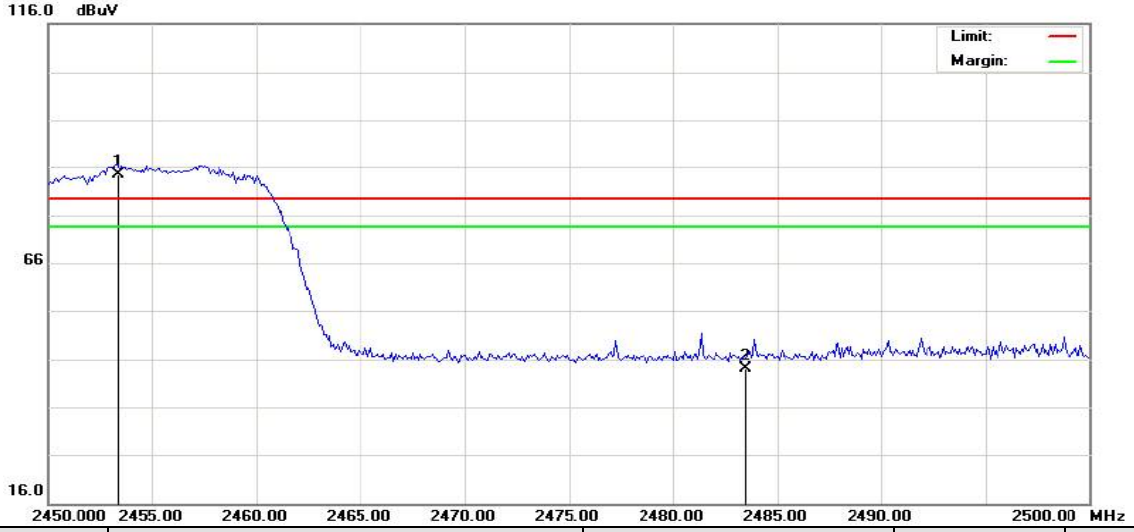
2462MHz:



Frequency (MHz)	Measurement value		Limit		Antenna	Result
	PK (dBμV/m)	AV (dBμV/m)	PK (dBμV/m)	AV (dBμV/m)	(H/V)	(P/F)
2483.500	44.20	---	74	54	V	P

Worse case mode:	802.11n(HT20) (6.5Mbps)	Test channel:	Highest	Remark:	PK/AV	Horizontal

2462MHz:



Frequency (MHz)	Measurement value		Limit		Antenna	Result
	PK (dBμV/m)	AV (dBμV/m)	PK (dBμV/m)	AV (dBμV/m)	(H/V)	(P/F)
2483.500	44.20	---	74	54	H	P

Note:

1) Through Pre-scan transmitting mode and charge+transmitter mode with all kind of modulation and data rate, find the 11Mbps of rate is the worst case of 802.11b; 6Mbpsof rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20).

2) The PK value is less than AV limit, so the AV value is OK.

2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading - Correct Factor

Correct Factor = *Preamplifier Factor– Antenna Factor–Cable Factor*

Appendix I) Radiated Spurious Emissions

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120 kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Procedure:

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber.
h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
j. Repeat above procedures until all frequencies measured was complete.

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Radiated Spurious Emissions test Data:

All the modes of operation (X, Y, Z) were investigated and the worst-case emissions are reported.

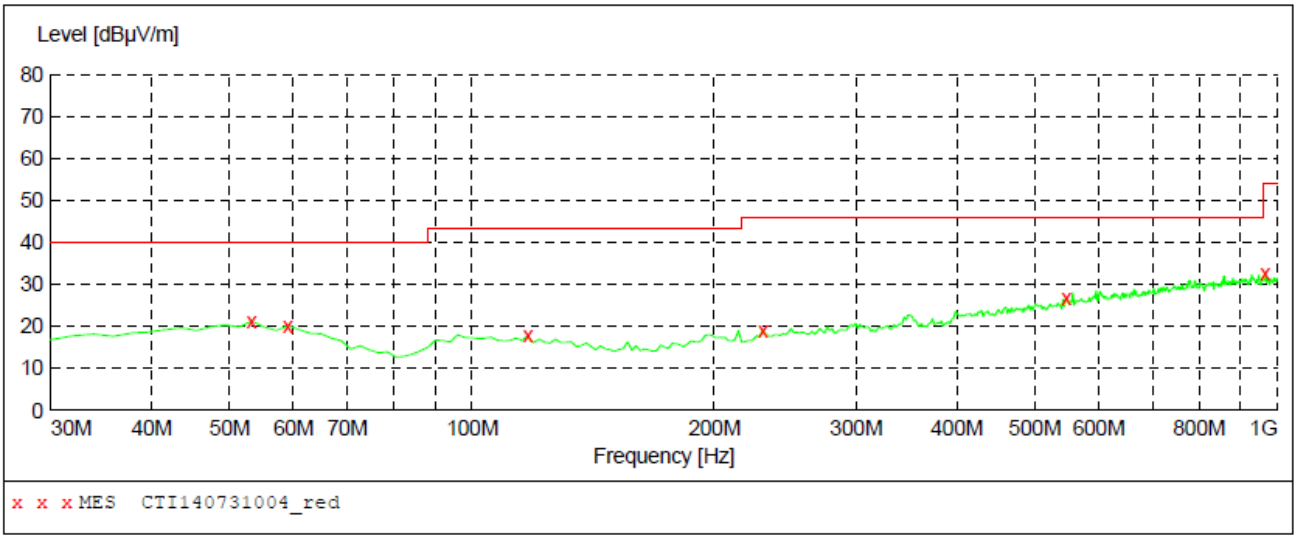
A. Below 30MHz:

No emissions were found higher than the background below 30MHz and background is lower than the limit, so it deems to compliance with the limit without recorded.

B. 30MHz ～ 1GHz:

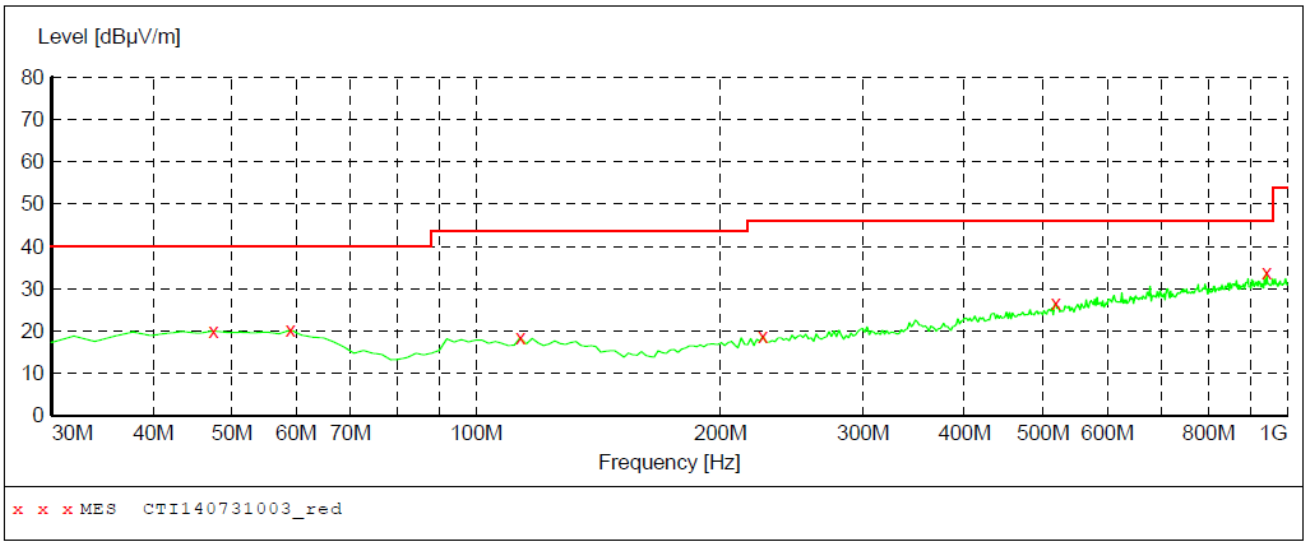
The test data of low channel, middle channel and high channel in IEEE 802.11b/g/n are almost same in frequency bands 30MHz to 1GHz and the data of low channel in IEEE 802.11b of 11Mbps are chosen as representative in below:

H:



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
53.280000	21.30	14.5	40.0	18.7	---	200.0	311.00	HORIZONTAL
59.100000	20.20	13.9	40.0	19.8	---	100.0	360.00	HORIZONTAL
117.300000	17.80	12.0	43.5	25.7	---	100.0	28.00	HORIZONTAL
229.820000	19.20	13.3	46.0	26.8	---	200.0	0.00	HORIZONTAL
547.980000	26.80	21.0	46.0	19.2	---	200.0	351.00	HORIZONTAL
967.020000	32.70	26.6	46.0	13.3	---	100.0	178.00	HORIZONTAL

V:



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
47.460000	20.00	14.7	40.0	20.0	---	100.0	313.00	VERTICAL
59.100000	20.30	13.9	40.0	19.7	---	200.0	87.00	VERTICAL
113.420000	18.40	12.2	43.5	25.1	---	200.0	13.00	VERTICAL
225.940000	18.80	13.1	46.0	27.2	---	200.0	311.00	VERTICAL
518.880000	26.50	20.5	46.0	19.5	---	100.0	43.00	VERTICAL
943.740000	33.90	26.5	46.0	12.1	---	200.0	161.00	VERTICAL

C. Above 1GHz:

The test data of worst case are below:

IEEE 802.11b:

Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)
Low channel (2412MHz)					
4824.0	46.03	74	PK	H	P
4824.0	47.89	74	PK	V	P
Middle channel (2437MHz)					
4874.0	45.90	74	PK	H	P
4874.0	46.62	74	PK	V	P
High channel (2462MHz)					
4924.0	45.91	74	PK	H	P
4924.0	46.52	74	PK	V	P

IEEE 802.11g:

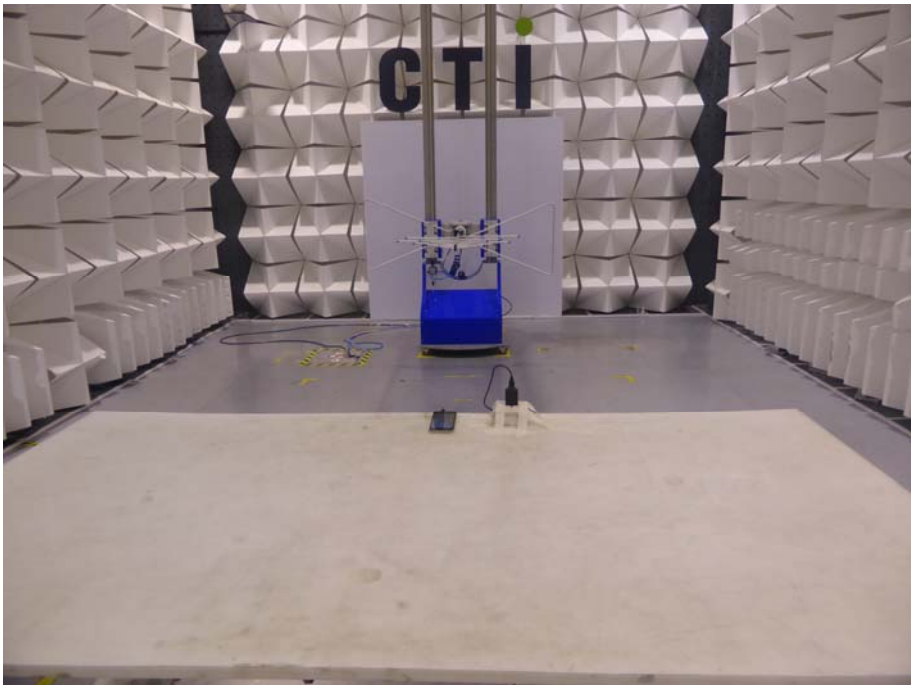
Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)
Low channel (2412MHz)					
4824.0	45.51	74	PK	H	P
4824.0	46.55	74	PK	V	P
Middle channel (2437MHz)					
4874.0	46.56	74	PK	H	P
4874.0	45.61	74	PK	V	P
High channel (2462MHz)					
4924.0	46.31	74	PK	H	P
4924.0	46.29	74	PK	V	P

IEEE 802.11n HT20:

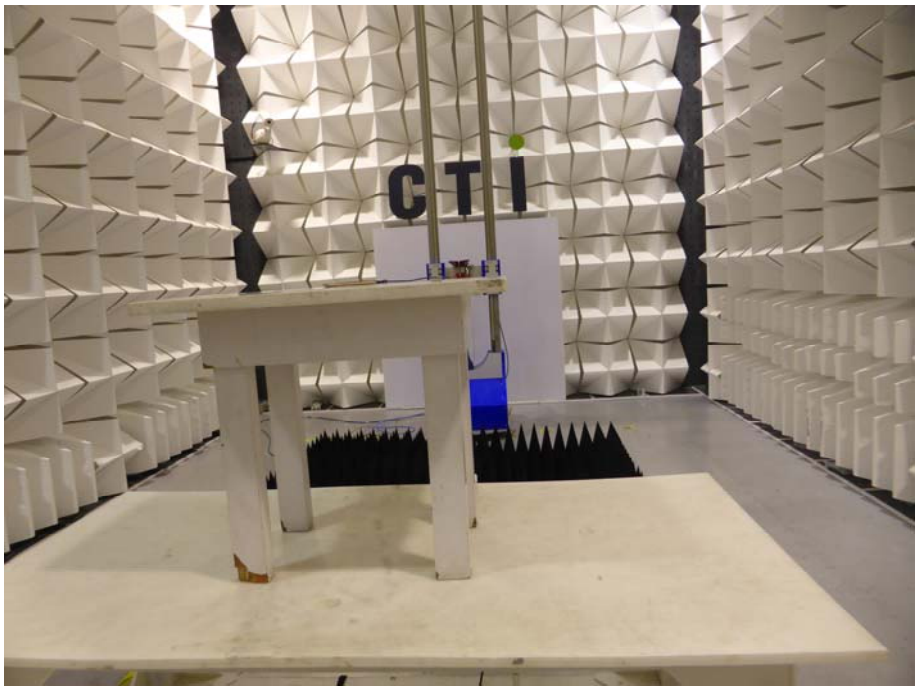
Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)
Low channel (2412MHz)					
4824.0	45.51	74	PK	H	P
4824.0	47.62	74	PK	V	P
Middle channel (2437MHz)					
4874.0	46.55	74	PK	H	P
4874.0	46.80	74	PK	V	P
High channel (2462MHz)					
4924.0	47.55	74	PK	H	P
4924.0	47.27	74	PK	V	P

Remark:
1. The above tables show that the frequencies peak data are all below the average limit, so the average data of these frequencies are deems to fulfill the average limits and not reported.
2. No emission found from 18GHz to 25GHz.
3. All outside of operating frequency band and restricted band specified are below 15.209.

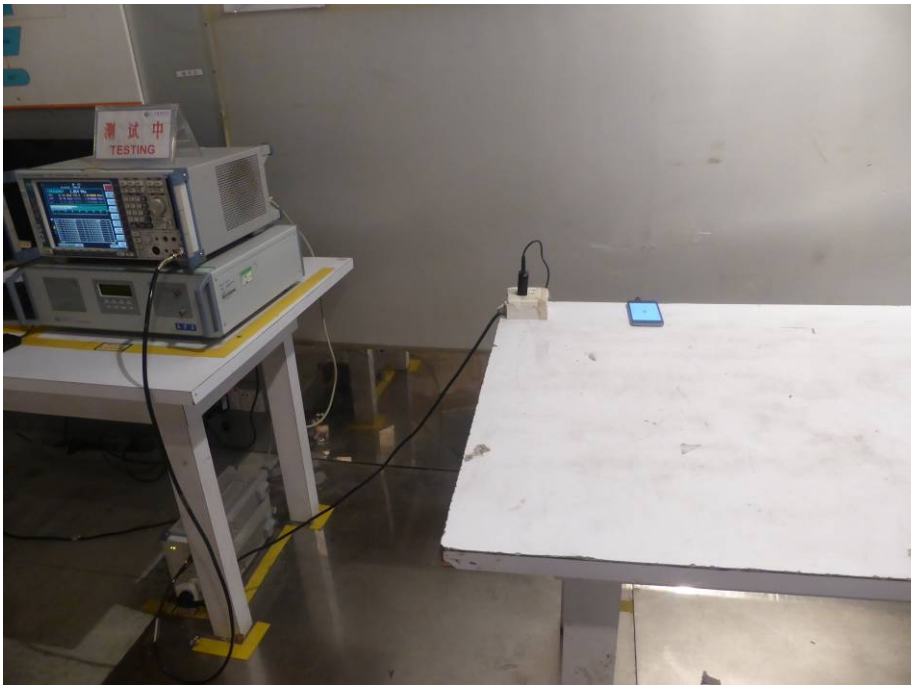
PHOTOGRAPHS OF TEST SETUP



Radiated spurious emission Test Setup-1 (Below 1GHz)



Radiated spurious emission Test Setup-2(Above 1GHz)



Conducted emission Test Setup

PHOTOGRAPHS OF EUT Constructional Details

View of external EUT-1

View of external EUT-2

View of external EUT-3

View of external EUT-4

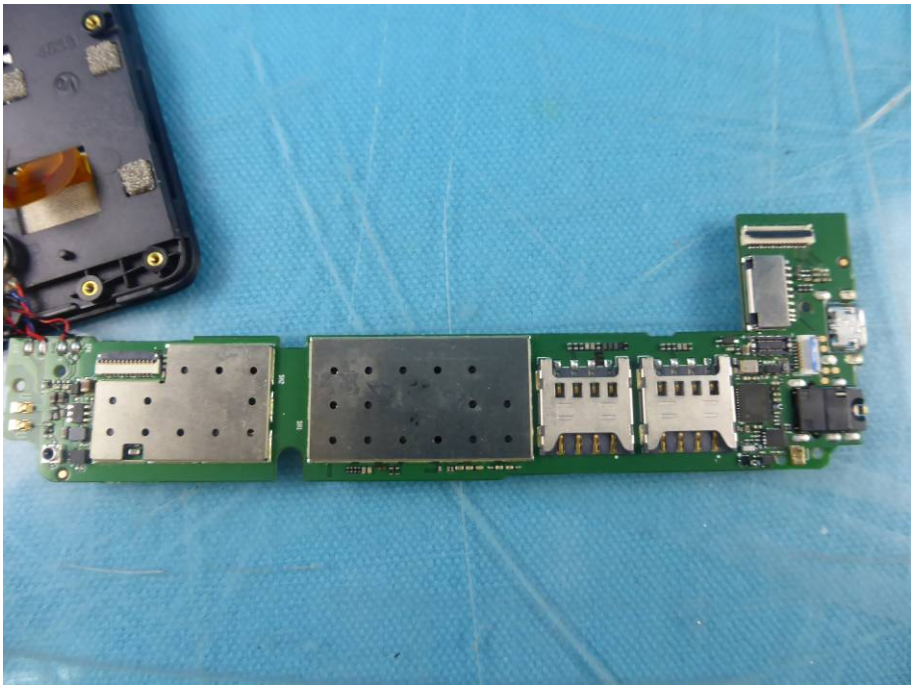
View of external EUT-5

View of external EUT-6

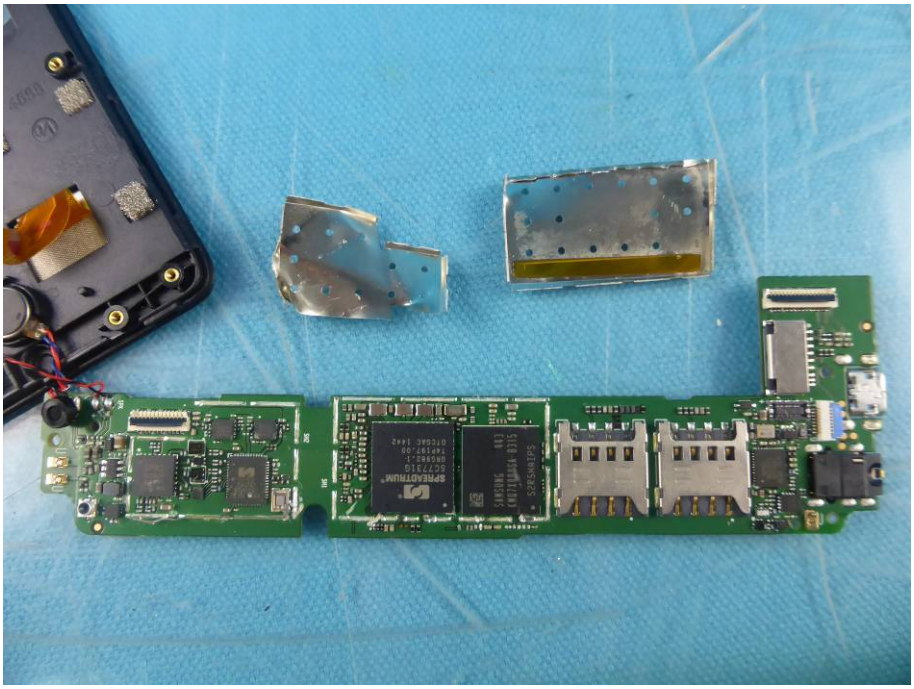
View of internal EUT-1

View of internal EUT-2

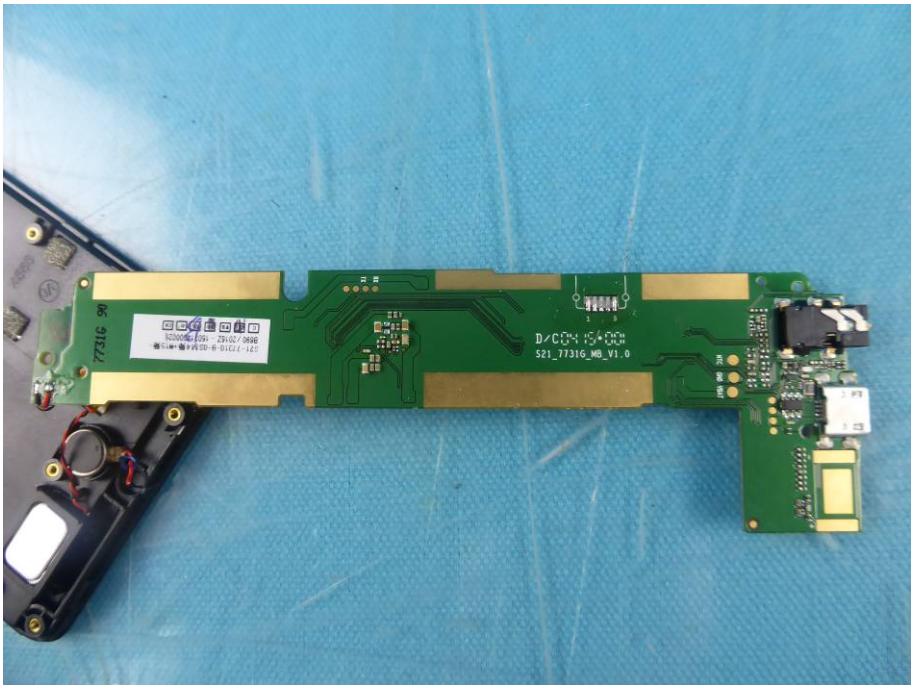
View of internal EUT-3



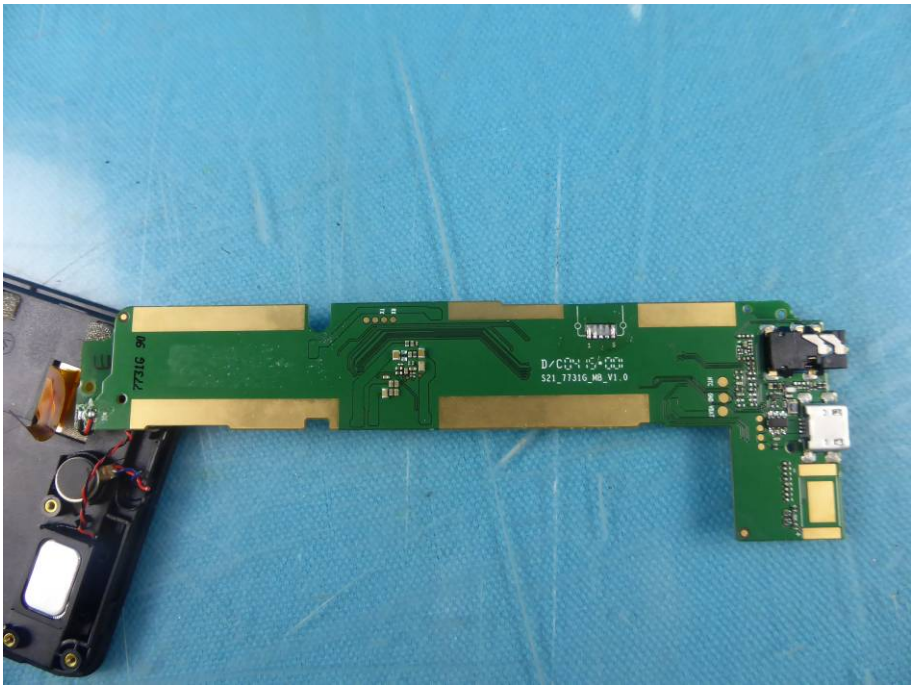
View of internal EUT-4



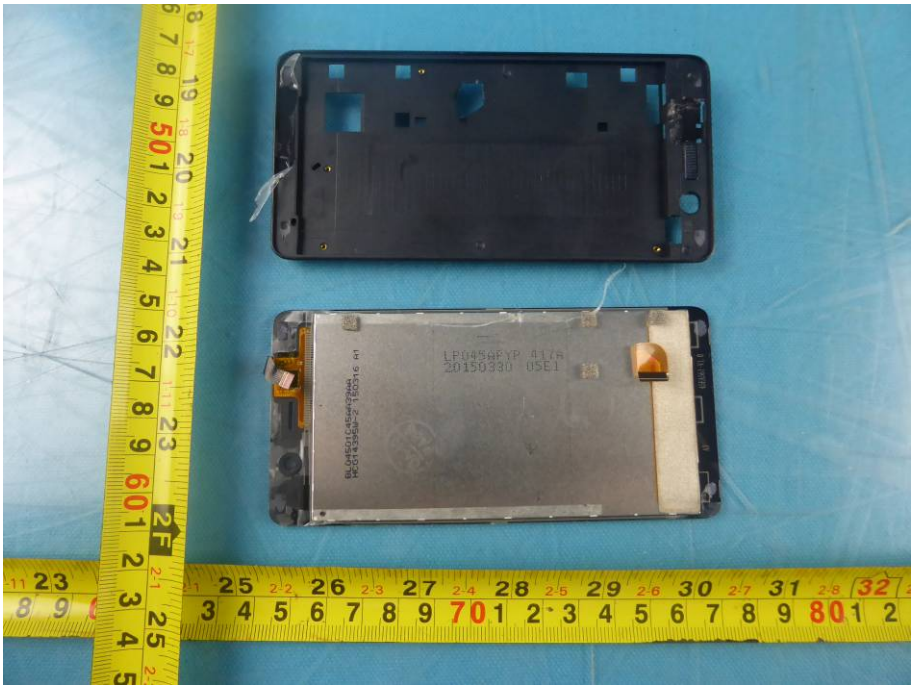
View of internal EUT-5



View of internal EUT-6



View of internal EUT-7



View of internal EUT-8

View of internal EUT-9

View of internal EUT-10

*** End of Report ***

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CTI, this report can't be reproduced except in full.