

# HONG KONG IPRO TECHNOLOGY CO., LIMITED

## Smart Mobile Phone

Main Model: WAVE 4.0  
Serial Model: N/A




September 04, 2014

Report No.: 14070433-FCC-R1  
(This report supersedes NONE)



Modifications made to the product : None

This Test Report is Issued Under the Authority of:

		
Hank Li Compliance Engineer	Alex Liu Technical Manager	

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

# RF Test Report

SIEMIC, INC.  
Accessing global markets

To: FCC Part 22(H) & FCC Part 24(E): 2013

## Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



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Country/Region	Scope
USA	EMC , RF/Wireless , Telecom
Canada	EMC, RF/Wireless , Telecom
Taiwan	EMC, RF, Telecom , Safety
Hong Kong	RF/Wireless ,Telecom
Australia	EMC, RF, Telecom , Safety
Korea	EMI, EMS, RF , Telecom, Safety
Japan	EMI, RF/Wireless, Telecom
Singapore	EMC , RF , Telecom
Europe	EMC, RF, Telecom , Safety

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# 1. EXECUTIVE SUMMARY & EUT INFORMATION

The purpose of this test programmed was to demonstrate compliance of the HONG KONG IPRO TECHNOLOGY CO., LIMITED, Smart Mobile Phone and model: WAVE 4.0 against the current Stipulated Standards. The Smart Mobile Phone has demonstrated compliance with the FCC Part 22(H) & FCC Part 24(E): 2013.

<b><u>EUT Information</u></b>
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<b>EUT</b>	
<b>Description</b>	: Smart Mobile Phone
<b>Main Model</b>	: WAVE 4.0
<b>Serial Model</b>	: N/A
<b>Antenna Gain</b>	: GSM850/ UMTS-FDD Band V: 0.69 dBi PCS1900/UMTS-FDD Band II: 1.54 dBi Bluetooth/BLE: 2.2 dBi WIFI: 2.2 dBi
<b>Input Power</b>	: <b>Battery:</b> Model: I9403 Spec: 3.7V 1350mAh Limited charger voltage: 4.2V <b>Adapter:</b> Model: NTR-S01 Input: AC 100-240V; 50/60Hz 150mA Output: DC 5.0V; 700mA
<b>Maximum Conducted AV Power to Antenna</b>	: GSM850: 32.21 dBm PCS1900: 29.13 dBm UMTS-FDD Band V : 22.49 dBm UMTS-FDD Band II : 22.26 dBm
<b>Maximum Radiated ERP/EIRP</b>	: GSM850: 25.74 dBm / ERP PCS1900: 23.65 dBm / EIRP UMTS-FDD Band V : 19.14dBm / ERP UMTS-FDD Band II : 18.82 dBm / EIRP
<b>Classification Per Stipulated Test Standard</b>	: FCC Part 22(H) & FCC Part 24(E): 2013

## 2. TECHNICAL DETAILS

<b>Purpose</b>	<b>Compliance testing of Smart Mobile Phone with stipulated standard</b>
<b>Applicant / Client</b>	<b>HONG KONG IPRO TECHNOLOGY CO., LIMITED FLAT/RM A3, 9/F SILVERCORP INT TOWER 707-713 NATHAN RD MONGKOK, HONGKONG</b>
<b>Manufacturer</b>	<b>SHENZHEN ZHIKE COMMUNICATION CO., LTD 8th Floor, B Bldg. Dianzi Fuhua Jidi, Taojindi, Longsheng community, Longhua District, Shenzhen, China</b>
<b>Laboratory performing the tests</b>	<b>SIEMIC (Shenzhen - China) Laboratories Zone A, Floor 1, Building 2, Wan Ye Long Technology Park, South Side of Zhoushi Road, Bao'an District, Shenzhen, Guangdong, China Tel: +86-0755-2601 4629 / 2601 4953 Fax: +86-0755-2601 4953-810 Email: China@siemic.com.cn</b>
<b>Test report reference number</b>	<b>14070433-FCC-R1</b>
<b>Date EUT received</b>	<b>August 13, 2014</b>
<b>Standard applied</b>	<b>FCC Part 22(H) &amp; FCC Part 24(E): 2013</b>
<b>Dates of test</b>	<b>August 19 to August 28, 2014</b>
<b>No of Units</b>	<b>#1</b>
<b>Equipment Category</b>	<b>PCE</b>
<b>Trade Name</b>	<b>IPRO</b>
<b>RF Operating Frequency (ies)</b>	<b>GSM850 TX : 824.2 ~ 848.8 MHz; RX : 869.2 ~ 893.8 MHz PCS1900 TX : 1850.2 ~ 1909.8 MHz; RX : 1930.2 ~ 1989.8 MHz UMTS-FDD Band V TX : 826.4 ~ 846.6 MHz; RX : 871.4 ~ 891.6 MHz UMTS-FDD Band II TX : 1852.4 ~ 1907.6 MHz; RX : 1932.4 ~ 1987.6 MHz 802.11b/g/n: 2412-2462 MHz Bluetooth&amp; BLE: 2402-2480 MHz</b>
<b>Number of Channels</b>	<b>299CH (PCS1900) and 124CH (GSM850) UMTS-FDD Band V : 102CH UMTS-FDD Band II : 277CH Bluetooth: 79CH 802.11b/g/n: 11CH BLE: 40CH</b>
<b>Modulation</b>	<b>GSM / GPRS: GMSK UMTS-FDD: QPSK 802.11b/g/n: DSSS/OFDM Bluetooth: GFSK&amp; <math>\pi</math>/4DQPSK&amp;8DPSK BLE: GFSK</b>
<b>GPRS Multi-slot class</b>	<b>8/10/12</b>
<b>FCC ID</b>	<b>PQ4IPROWAVE40</b>

# 3 MODIFICATION

NONE

### 3. TEST SUMMARY

**The product was tested in accordance with the following specifications.  
 All testing has been performed according to below product classification:**

**PCE**

**Test Results Summary**

Test Standard	Description	Product Class	Pass / Fail
§ 1.1307, § 2.1093	RF Exposure (SAR)	See Above	Pass
§2.1046; § 22.913 (a); § 24.232 (c)	RF Output Power	See Above	Pass
§ 2.1047	Modulation Characteristics	See Above	N/A
§ 2.1049; § 22.905 § 22.917; § 24.238	99% & -26 dB Occupied Bandwidth	See Above	Pass
§ 2.1051, § 22.917 (a); § 24.238 (a)	Spurious Emissions at Antenna Terminal	See Above	Pass
§ 2.1053 § 22.917 (a); § 24.238 (a)	Field Strength of Spurious Radiation	See Above	Pass
§ 22.917 (a); § 24.238 (a)	Out of band emission, Band Edge	See Above	Pass
§ 2.1055 § 22.355; § 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	See Above	Pass

*Note: Testing was performed by configuring EUT to maximum output power status, the declared output power class for different.*



## **4. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS**

### **5.1 §1.1307, §2.1093- RF Exposure (SAR)**

**Test Result: Pass**

The EUT is a portable device, thus requires SAR evaluation;  
Please refer to SIEMIC SAR Report: 14070433-FCC-H

## **5.2 §2.1046; §22.913 (a); §24.232 (c) - RF Output Power**

1. Conducted Measurement  
EUT was set for low, mid, high channel with modulated mode and highest RF output power. The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is  $\pm 1.5$ dB.
3. Environmental Conditions
 

Temperature	24°C
Relative Humidity	55%
Atmospheric Pressure	1011mbar
4. Test date : August 20, 2014  
Tested By : Hank Li

### **Procedures: (According with KDB 971168)**

#### **For Conducted Power:**

1. The transmitter output port was connected to base station.
2. Set EUT at maximum power through base station.
3. Select lowest, middle, and highest channels for each band and different test mode.
4. The instrument must have an available measurement/resolution bandwidth that is equal to or exceeds the OBW. If this capability is available, then the following procedure can be used to determine the total peak output power.
  - a) Set the  $RBW \geq OBW$ .
  - b) Set  $VBW \geq 3 \times RBW$ .
  - c) Set span  $\geq 2 \times RBW$
  - d) Sweep time = auto couple.
  - e) Detector = peak.
  - f) Ensure that the number of measurement points  $\geq span/RBW$ .
  - g) Trace mode = max hold.
  - h) Allow trace to fully stabilize.
  - 1) Use the peak marker function to determine the peak amplitude level.

#### **For ERP/EIRP: (According with TIA 603D)**

1. The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

#### Sample Calculation:

EUT Field Strength (dBm) = Reading (Signal generator) + Antenna Gain (substitution antenna) - Cable loss (From Signal Generator to substitution antenna)

### **Test Result: Pass**

**Remark:** Conducted Burst Average power for reporting purposes only

## Conducted Power

### GSM Mode:

Burst Average Power (dBm);								
Band	GSM850				GSM1900			
Channel	128	190	251	Tune up Power tolerant	512	661	810	Tune up Power tolerant
Frequency (MHz)	824.2	836.6	848.8	/	1850.2	1880	1909.8	/
GSM Voice (1 uplink),GMSK	32.06	32.13	<b>32.21</b>	32±1	29.00	29.08	<b>29.13</b>	29±1
GPRS Multi-Slot Class 8 (1 uplink),GMSK	32.11	32.16	32.20	32±1	29.01	29.17	29.10	29±1
GPRS Multi-Slot Class 10 (2 uplink),GMSK	31.14	31.27	31.31	31±1	28.07	28.14	28.11	28±1
GPRS Multi-Slot Class 12 (4 uplink),GMSK	27.98	27.93	28.12	28±1	24.74	24.89	24.78	24±1
EGPRS Multi-Slot Class 8 (1 uplink),8PSK	32.12	32.17	32.20	32±1	29.07	29.11	29.10	29±1
EGPRS Multi-Slot Class 10 (2 uplink),8PSK	31.14	31.19	31.30	31±1	28.02	28.01	27.80	28±1
EGPRS Multi-Slot Class 12 (4 uplink),8PSK	27.86	27.91	28.02	28±1	24.78	24.83	24.82	24±1

Remark :  
 GPRS, CS1 coding scheme.  
 EGPRS, MCS1 coding scheme.  
 Multi-Slot Class 8 , Support Max 4 downlink, 1 uplink , 5 working link  
 Multi-Slot Class 10 , Support Max 4 downlink, 2 uplink , 5 working link  
 Multi-Slot Class 12 , Support Max 4 downlink, 4 uplink , 5 working link

**Note: Since GSM mode has higher power, so the test items below were not performed to GPRS mode.**

## UMTS Mode:

### UMTS-FDD Band V

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)
RMC 12.2kbps	4132	826.4	21.87
	4175	835.0	<b>22.49</b>
	4233	846.6	21.51
HSDPA Subtest1	4132	826.4	21.85
	4175	835.0	22.45
	4233	846.6	21.50
HSDPA Subtest2	4132	826.4	21.84
	4175	835.0	22.45
	4233	846.6	21.50
HSDPA Subtest3	4132	826.4	21.84
	4175	835.0	22.45
	4233	846.6	21.49
HSDPA Subtest4	4132	826.4	21.86
	4175	835.0	22.46
	4233	846.6	21.47
HSUPA Subtest1	4132	826.4	21.86
	4175	835.0	22.44
	4233	846.6	21.48
HSUPA Subtest2	4132	826.4	21.83
	4175	835.0	22.47
	4233	846.6	21.50
HSUPA Subtest3	4132	826.4	21.84
	4175	835.0	22.44
	4233	846.6	21.47
HSUPA Subtest4	4132	826.4	21.84
	4175	835.0	22.45
	4233	846.6	21.49
HSUPA Subtest5	4132	826.4	21.85
	4175	835.0	22.46
	4233	846.6	21.47

## UMTS-FDD Band II

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)
RMC 12.2kbps	9262	1852.4	<b>22.26</b>
	9400	1880.0	21.56
	9538	1907.6	21.39
HSDPA Subtest1	9262	1852.4	22.25
	9400	1880.0	21.53
	9538	1907.6	21.38
HSDPA Subtest2	9262	1852.4	22.24
	9400	1880.0	21.52
	9538	1907.6	21.36
HSDPA Subtest3	9262	1852.4	22.23
	9400	1880.0	21.51
	9538	1907.6	21.37
HSDPA Subtest4	9262	1852.4	22.23
	9400	1880.0	21.54
	9538	1907.6	21.35
HSUPA Subtest1	9262	1852.4	22.25
	9400	1880.0	21.51
	9538	1907.6	21.33
HSUPA Subtest2	9262	1852.4	22.22
	9400	1880.0	21.54
	9538	1907.6	21.35
HSUPA Subtest3	9262	1852.4	22.23
	9400	1880.0	21.51
	9538	1907.6	21.35
HSUPA Subtest4	9262	1852.4	22.23
	9400	1880.0	21.52
	9538	1907.6	21.36
HSUPA Subtest5	9262	1852.4	22.24
	9400	1880.0	21.51
	9538	1907.6	21.35

**ERP & EIRP (worst case)**  
**ERP for Cellular Band (Part 22H)**

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
824.2	18.83	V	6.8	0.53	25.10	38.45
824.2	17.26	H	6.8	0.53	23.53	38.45
836.6	19.21	V	6.8	0.53	25.48	38.45
836.6	17.54	H	6.8	0.53	23.81	38.45
848.8	19.37	V	6.9	0.53	<b>25.74</b>	38.45
848.8	17.33	H	6.9	0.53	23.70	38.45

**EIRP for PCS Band (Part 24E)**

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
1850.2	15.01	V	7.88	0.85	22.04	33
1850.2	16.62	H	7.88	0.85	<b>23.65</b>	33
1880	15.47	V	7.88	0.85	22.50	33
1880	16.29	H	7.88	0.85	23.32	33
1909.8	15.48	V	7.86	0.85	22.49	33
1909.8	16.5	H	7.86	0.85	23.51	33

**ERP for UMTS-FDD Band V (Part 22H)**

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
826.4	12.83	V	6.8	0.53	19.10	38.45
826.4	12.03	H	6.8	0.53	18.30	38.45
835	12.87	V	6.8	0.53	<b>19.14</b>	38.45
835	12.41	H	6.8	0.53	18.68	38.45
846.6	12.67	V	6.9	0.53	19.04	38.45
846.6	12.34	H	6.9	0.53	18.71	38.45

**EIRP for UMTS-FDD Band II (Part 24E)**

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
1852.4	10.71	V	7.88	0.85	17.74	33
1852.4	11.26	H	7.88	0.85	18.29	33
1880	10.84	V	7.88	0.85	17.87	33
1880	11.79	H	7.88	0.85	<b>18.82</b>	33
1907.6	10.67	V	7.86	0.85	17.68	33
1907.6	11.17	H	7.86	0.85	18.18	33

### **5.3 §2.1047 - Modulation Characteristic**

According to FCC § 2.1047(d), Part 22H & 24E there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

## 5.4 §2.1049, §22.917, §22.905 & §24.238 - Occupied Bandwidth

1. Conducted Measurement  
EUT was set for low, mid, high channel with modulated mode and highest RF output power.  
The spectrum analyser was connected to the antenna terminal.
2. Environmental Conditions

Temperature	23°C
Relative Humidity	53%
Atmospheric Pressure	1018mbar
3. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.
4. Test date : August 19, 2014  
Tested By : Hank Li

### Procedures:

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The 99% and 26 dB occupied bandwidth (BW) of the middle channel for the highest RF powers.
3. Details according with KDB 971168 section 4.1 & 4.2.

### Test Results: Pass

Cellular Band (Part 22H)

Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
128	824.2	247.2897	320.388
190	836.6	245.7528	314.813
251	848.8	246.3163	316.026

PCS Band (Part 24E)

Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
512	1850.2	244.0980	316.430
661	1880.0	244.2986	320.045
810	1909.8	244.8091	322.257



UMTS-FDD Band V (Part 22H)

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
4132	826.4	4.1673	4.702
4175	835.0	4.155	4.693
4233	846.6	4.1391	4.692

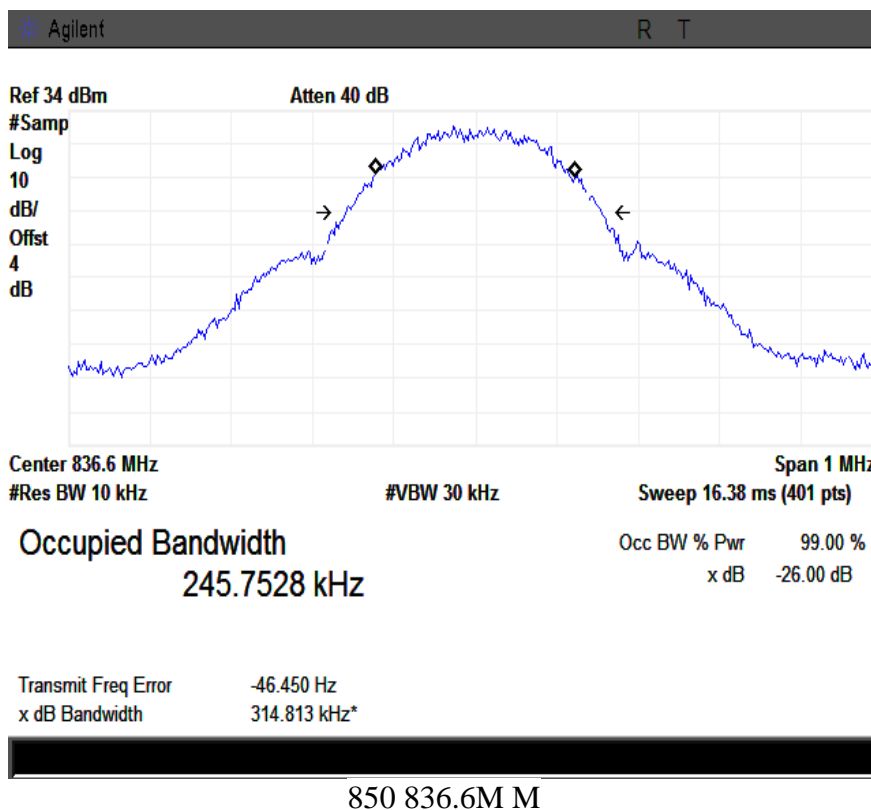
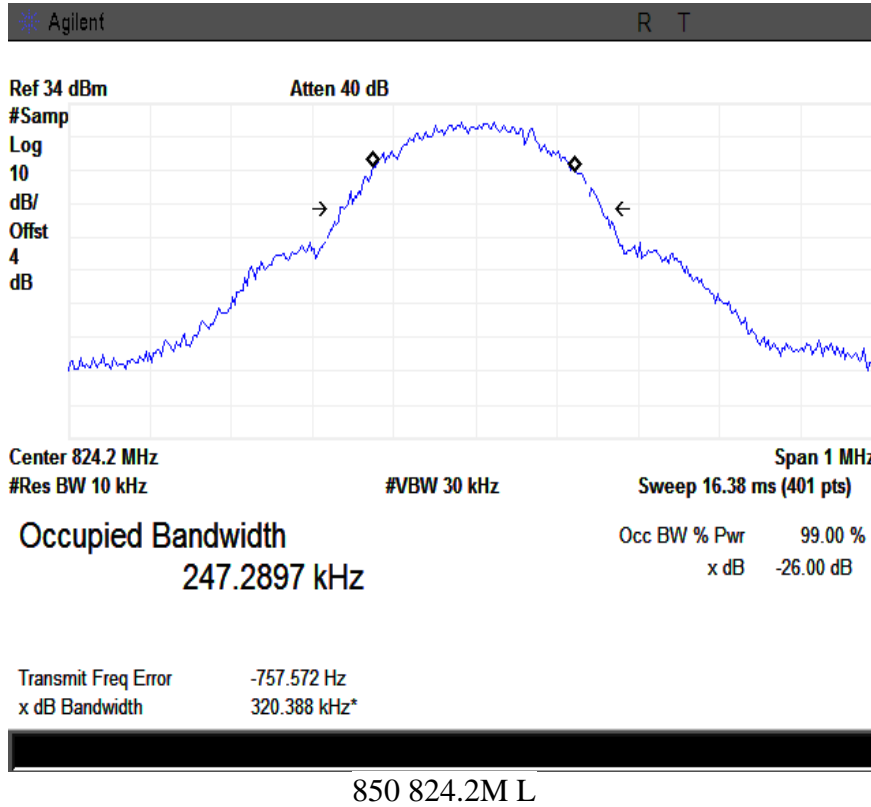
UMTS-FDD Band II (Part 24E)

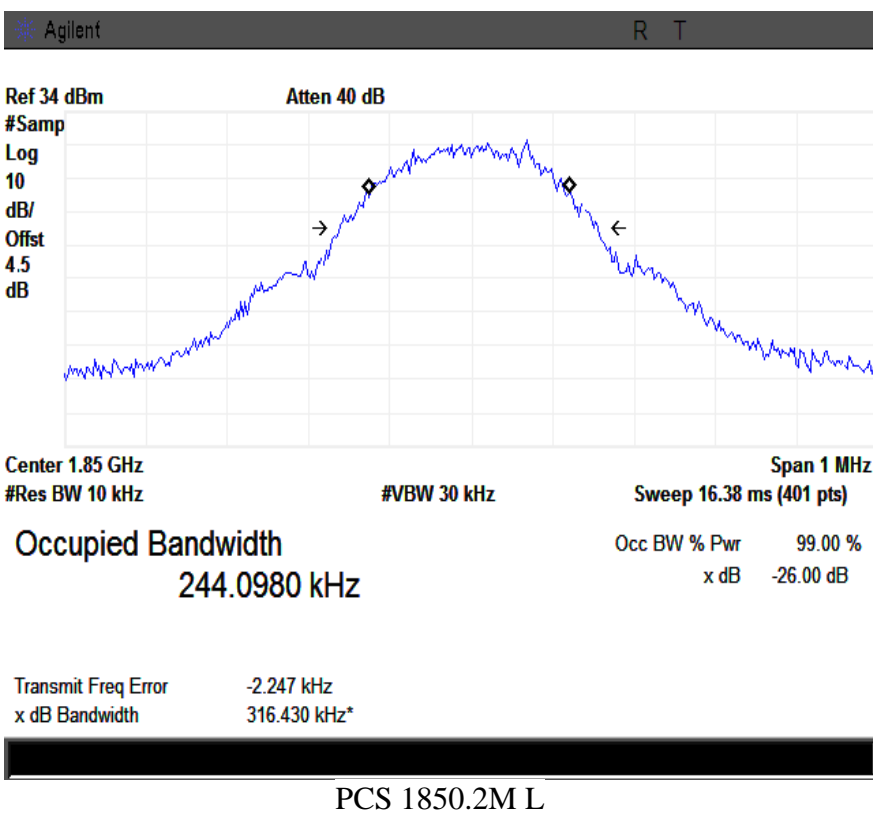
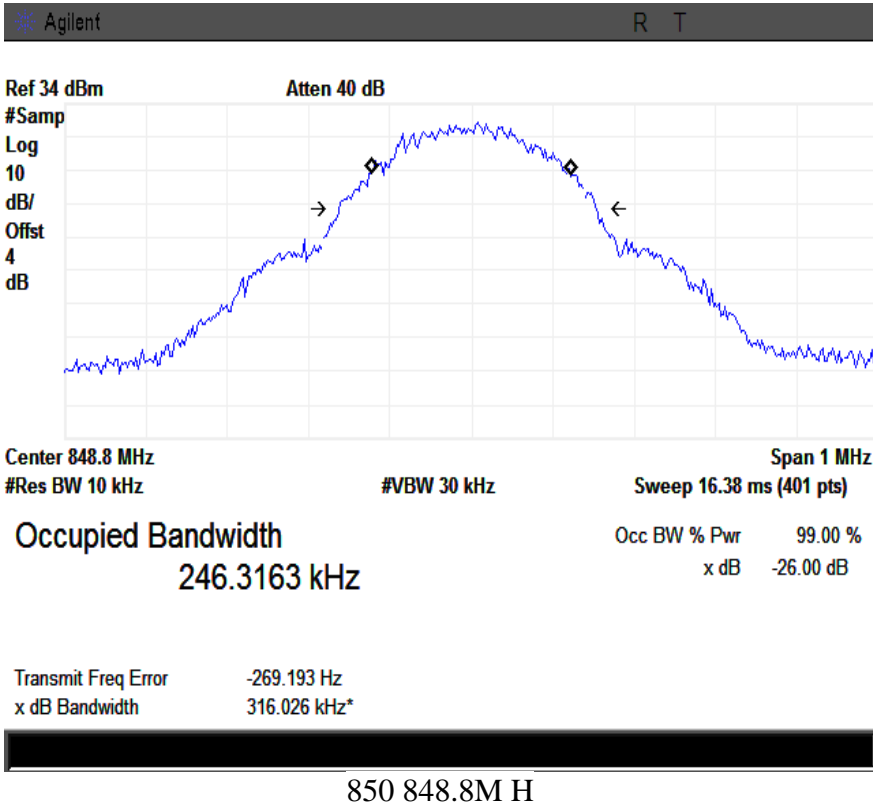
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
9262	1852.4	4.1583	4.719
9400	1880.0	4.1908	4.790
9538	1907.6	4.1908	4.764

Please refer to the following plots.

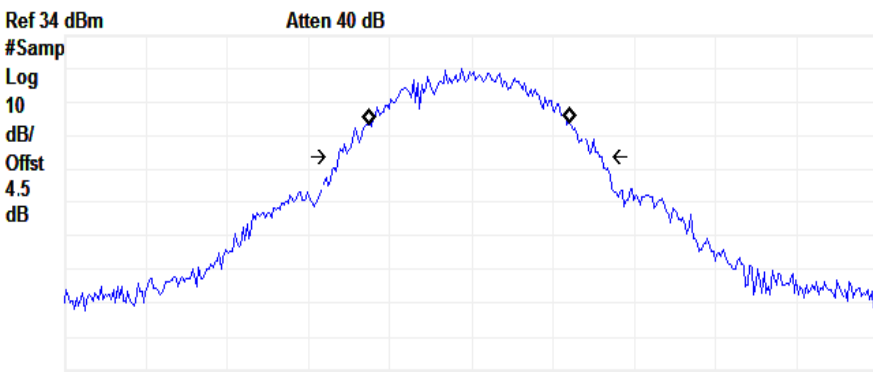
- Note:**  
850: Cellular Band  
PCS: PCS Band  
W850: UMTS-FDD Band V  
W1900: UMTS-FDD Band II
- L: Low Channel  
M: Middle Channel  
H: High Channel

### 99% Occupied Bandwidth & 26 dB Bandwidth





Agilent R T



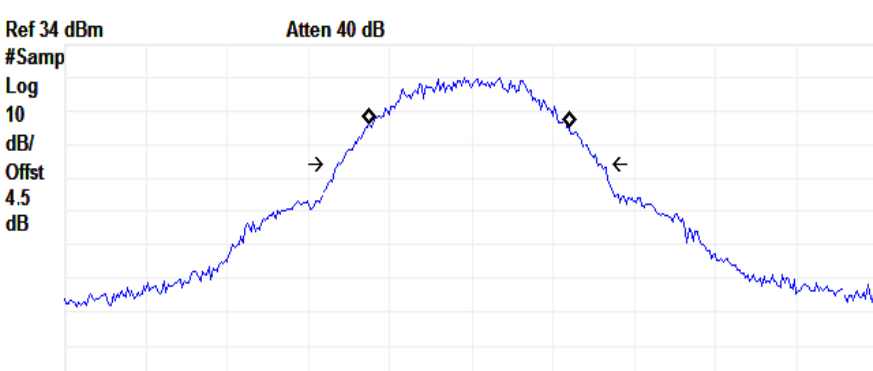
Center 1.88 GHz Span 1 MHz  
 #Res BW 10 kHz #VBW 30 kHz Sweep 16.38 ms (401 pts)

**Occupied Bandwidth** Occ BW % Pwr 99.00 %  
 244.2986 kHz x dB -26.00 dB

Transmit Freq Error -3.126 kHz  
 x dB Bandwidth 320.045 kHz\*

PCS 1880M M

Agilent R T

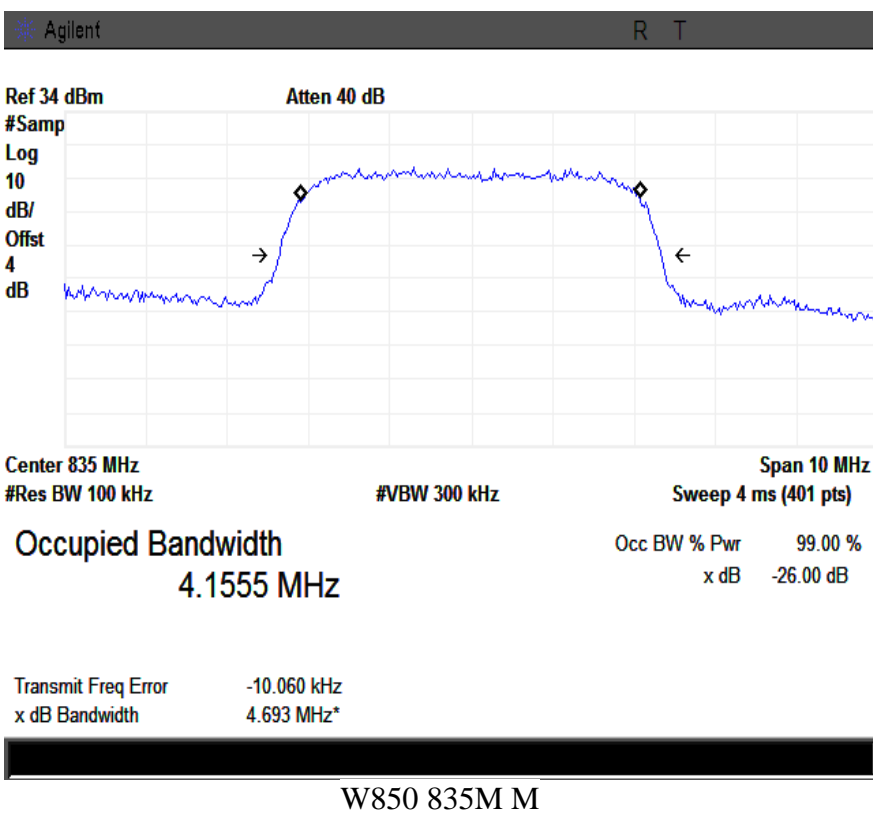
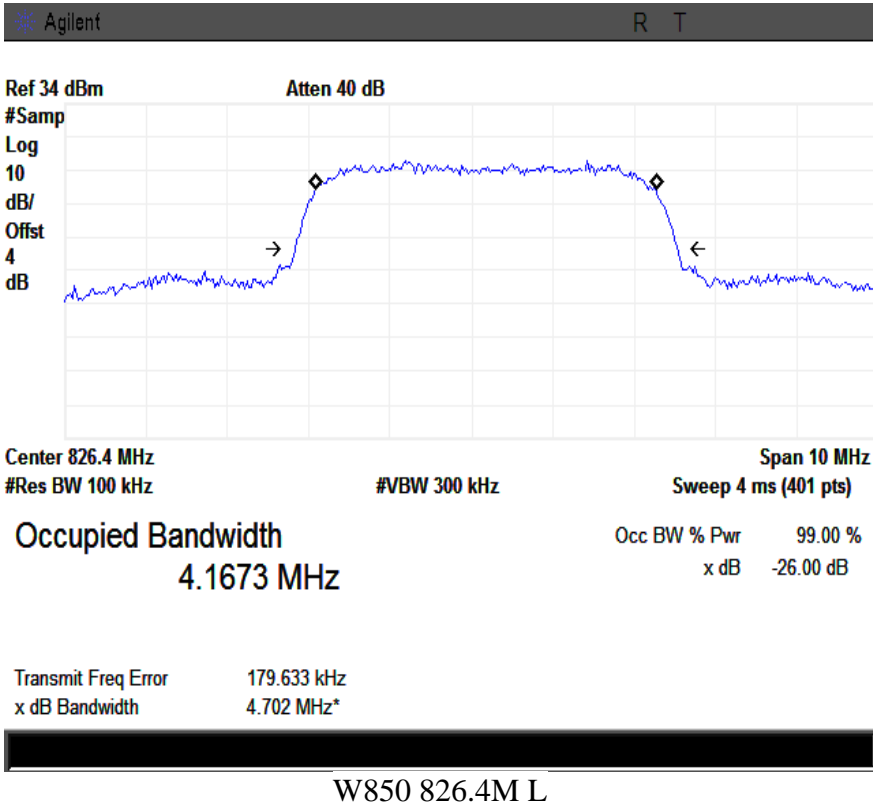


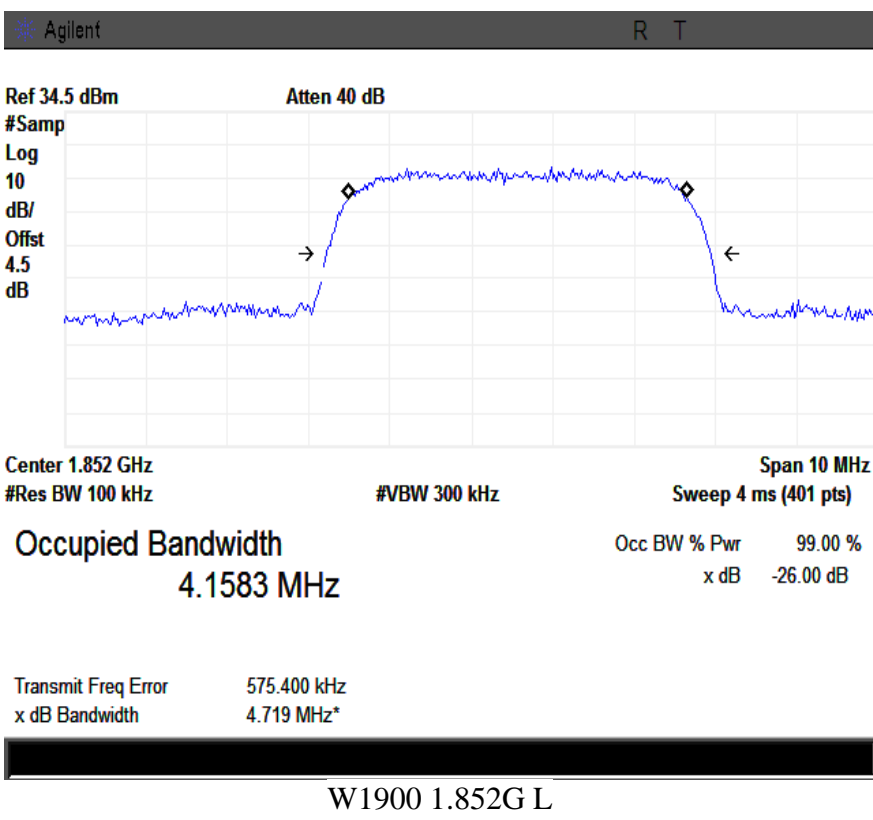
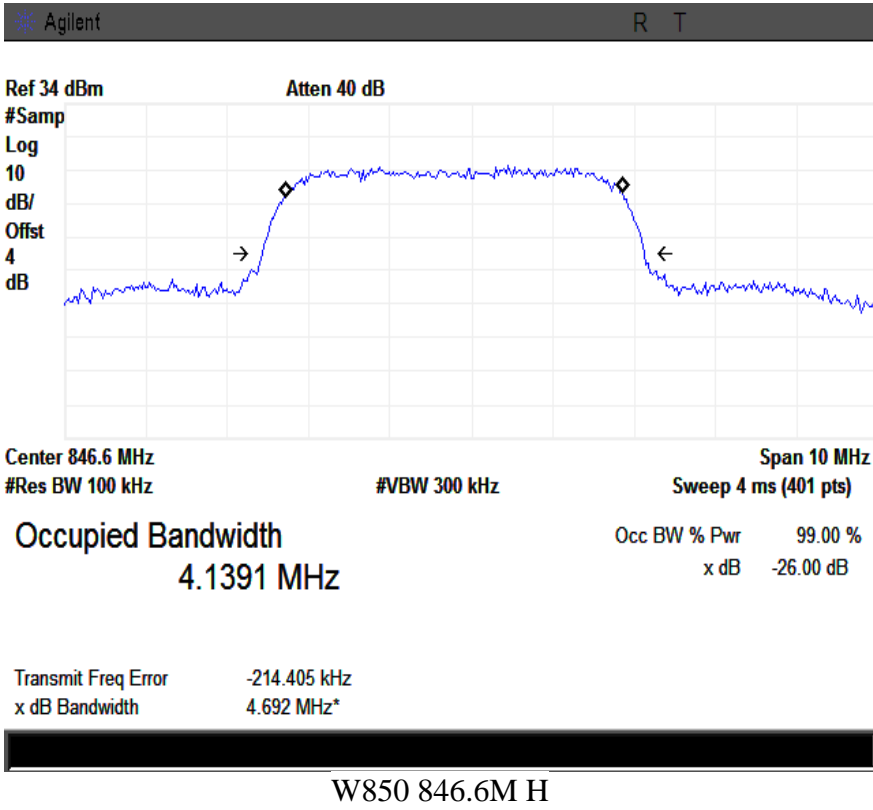
Center 1.91 GHz Span 1 MHz  
 #Res BW 10 kHz #VBW 30 kHz Sweep 16.38 ms (401 pts)

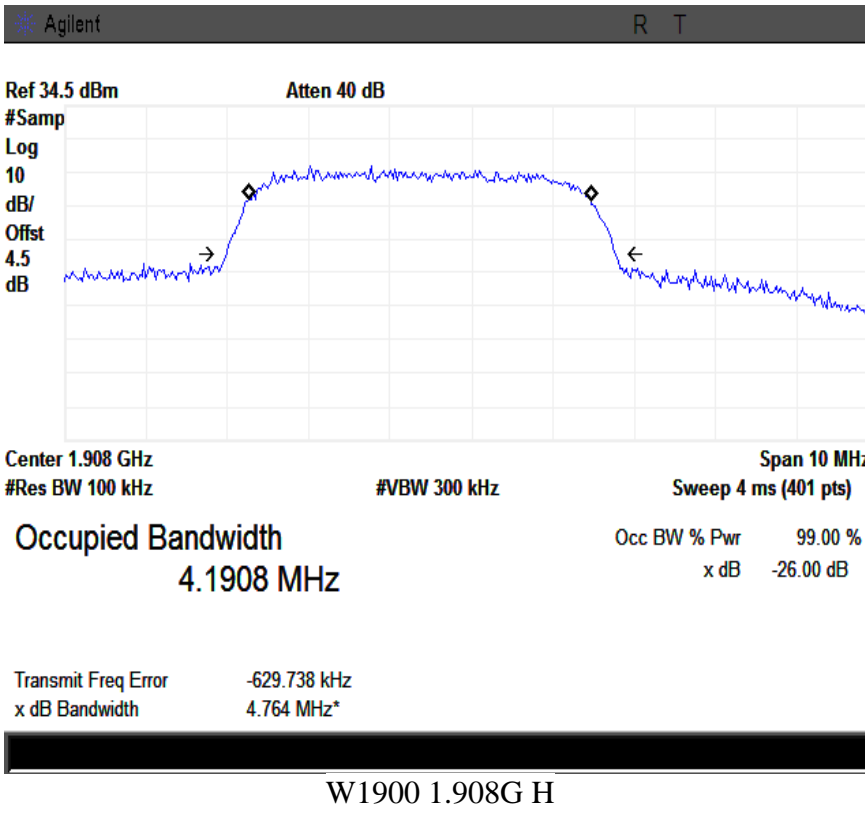
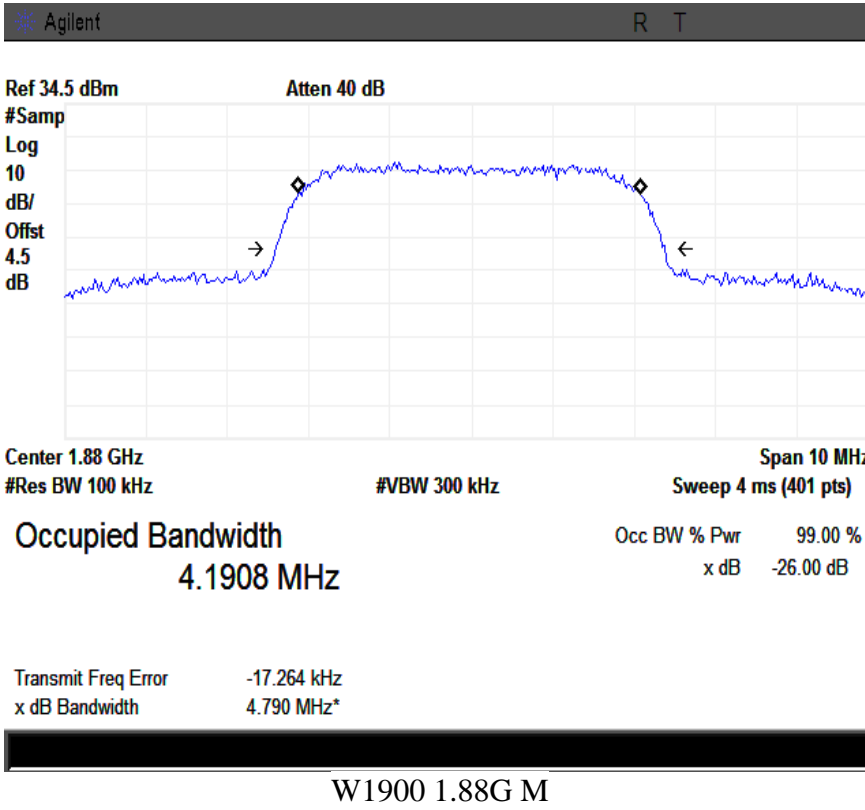
**Occupied Bandwidth** Occ BW % Pwr 99.00 %  
 244.8091 kHz x dB -26.00 dB

Transmit Freq Error -2.667 kHz  
 x dB Bandwidth 322.257 kHz\*

PCS 1909.8M H







## **5.5 §2.1051, §22.917(a) & §24.238(a) - Spurious Emissions at Antenna Terminals**

1. Conducted Measurement  
EUT was set for low, mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is  $\pm 1.5$ dB.
3. Environmental Conditions  

Temperature	23°C
Relative Humidity	57%
Atmospheric Pressure	1012mbar
4. Test date : August 21, 2014  
Tested By : Hank Li

### **Standard Requirement:**

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

### **Procedures:**

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The Band Edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly BW/100.
3. Details according with KDB 971168 section 6.0.

### **Test Result: Pass**

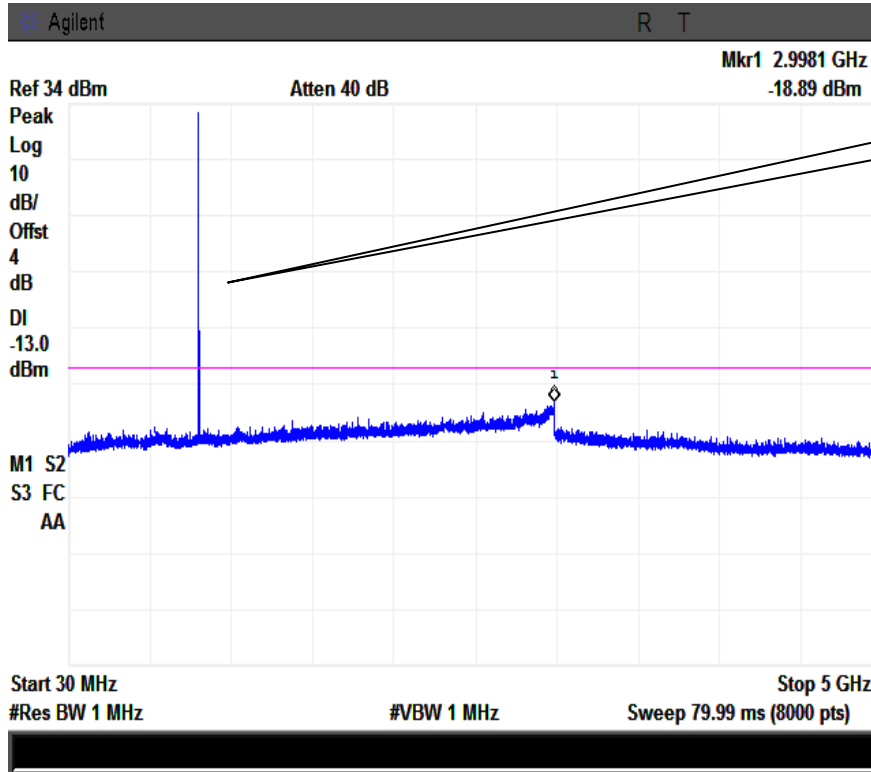
Refer to the attached plots.



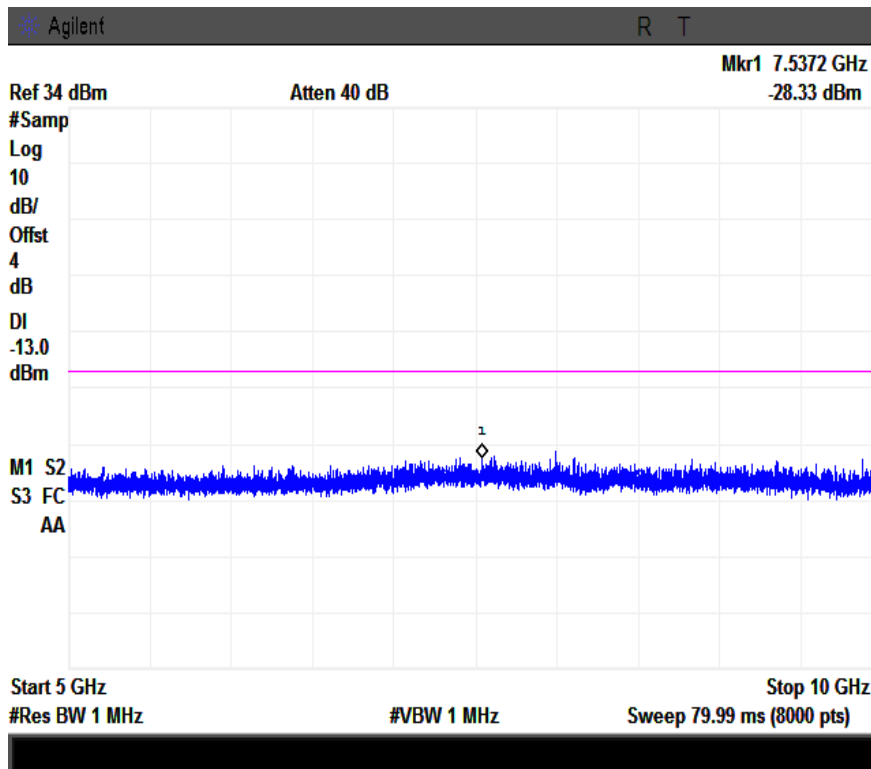
**Cellular Band (Part 22H)**

30MHz -10G – GSM850

Low Channel

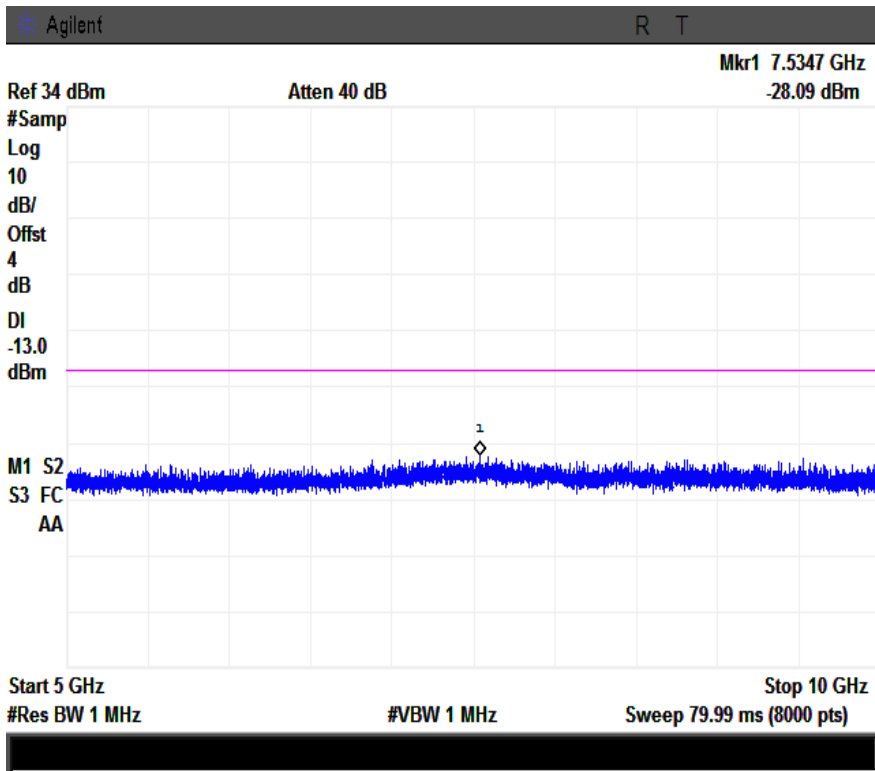
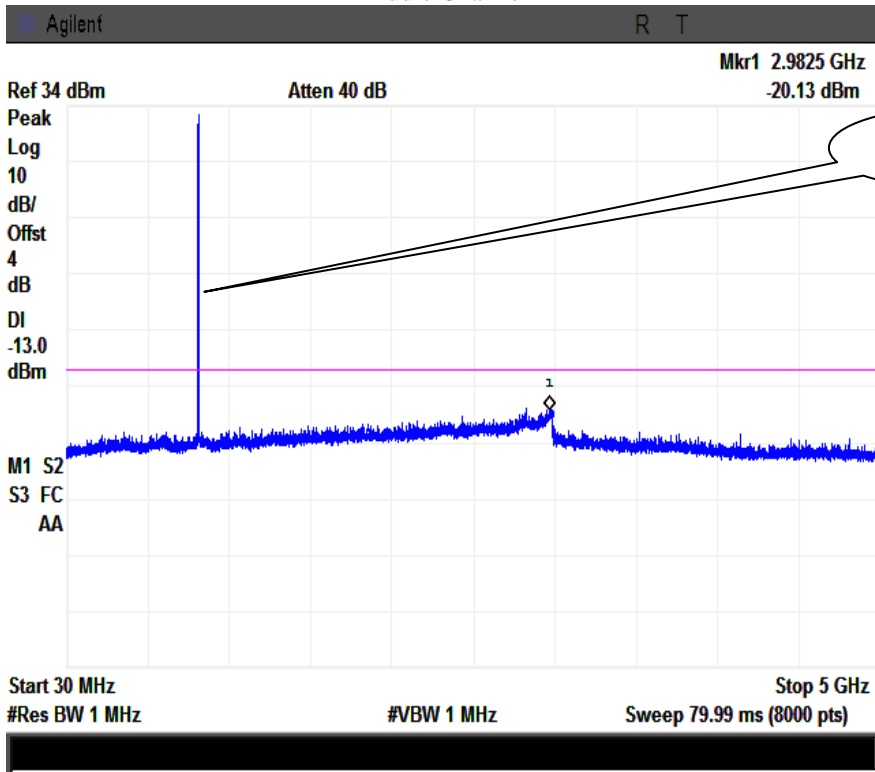


Fundamental

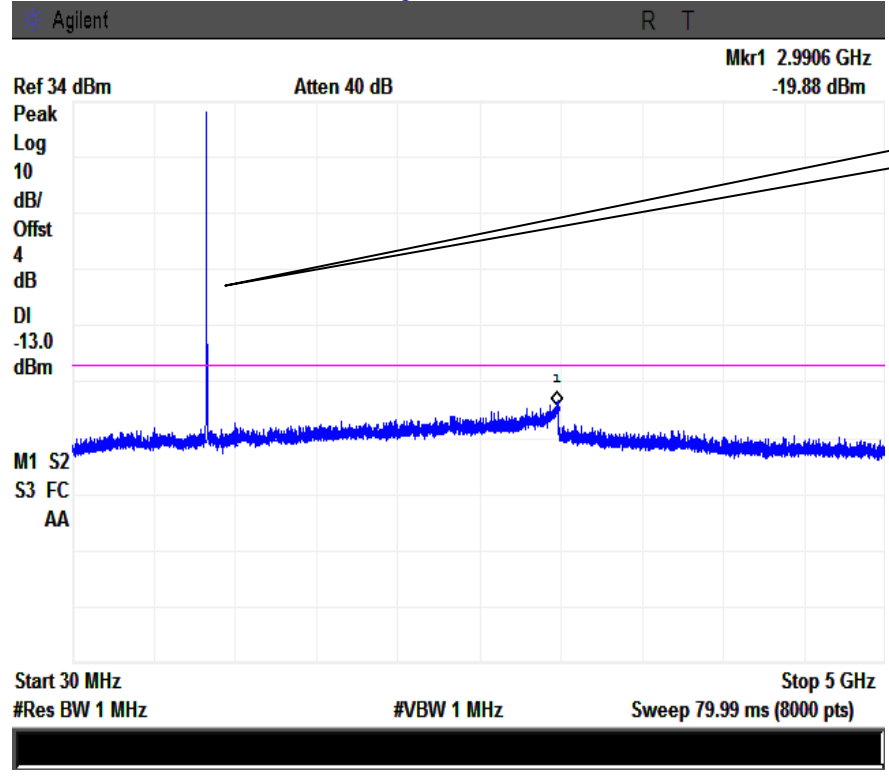


1

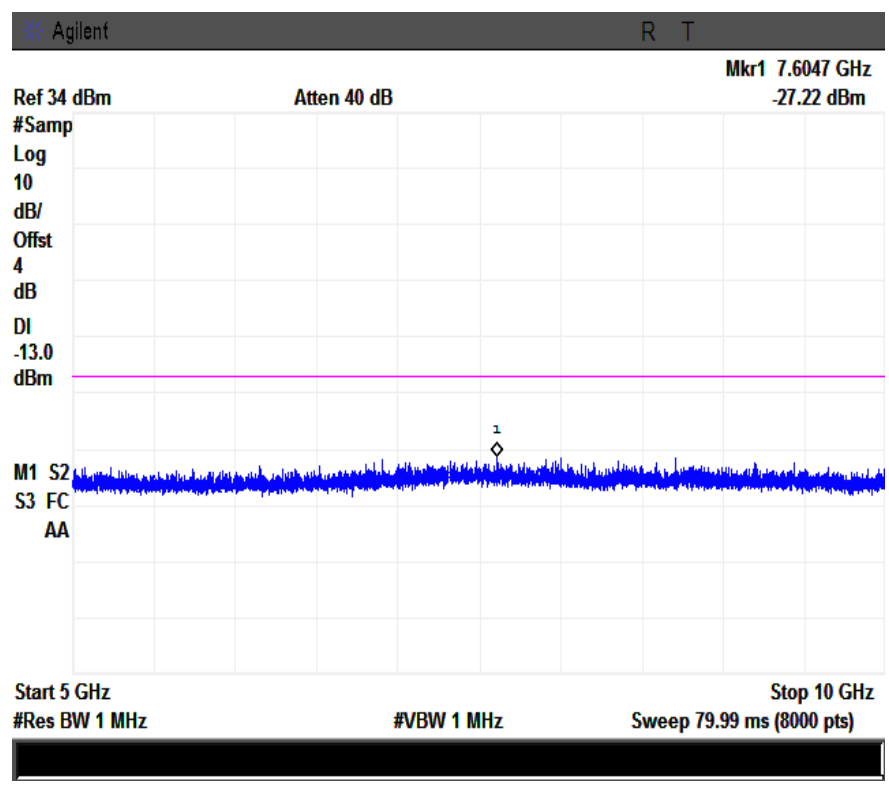
Middle Channel



### High Channel

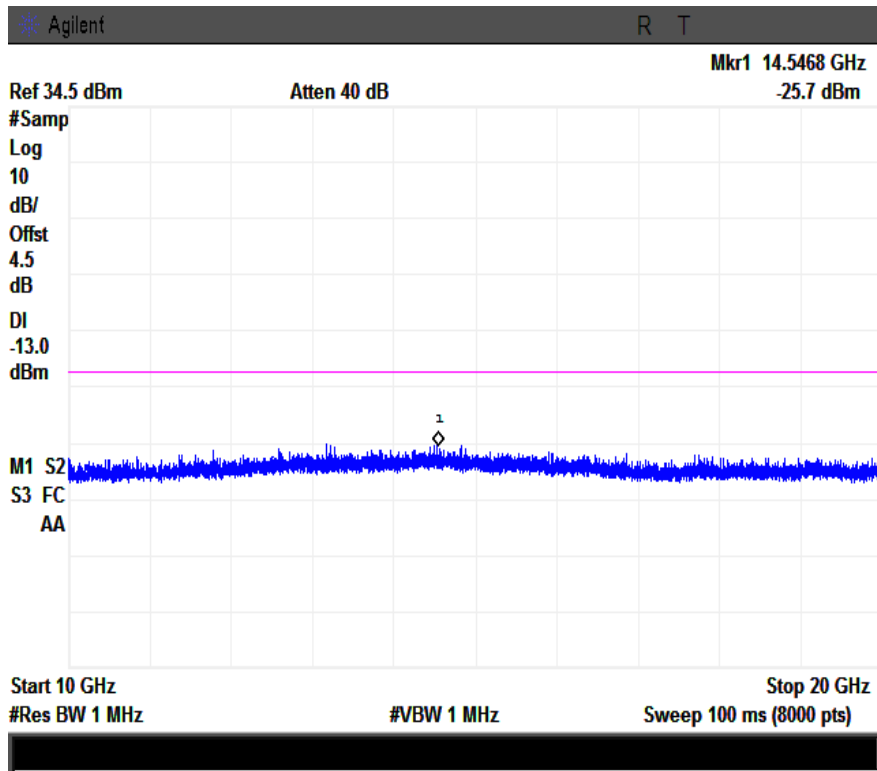
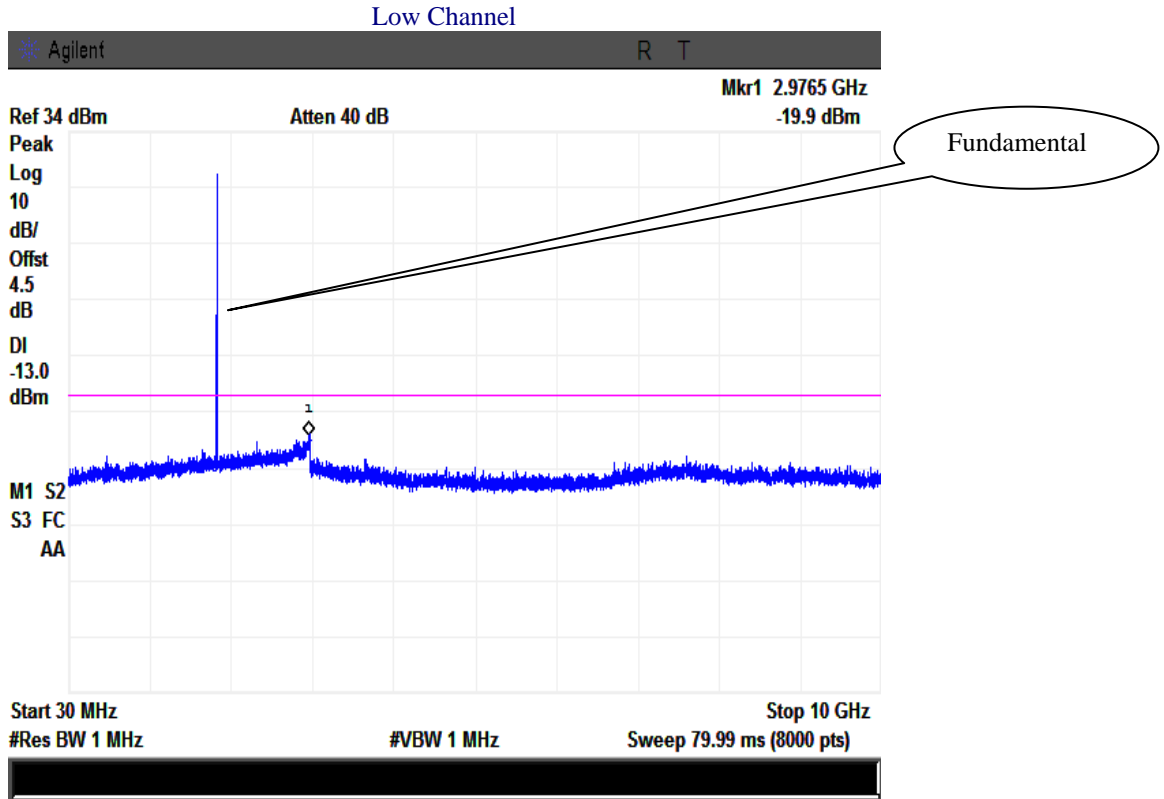


Fundamental

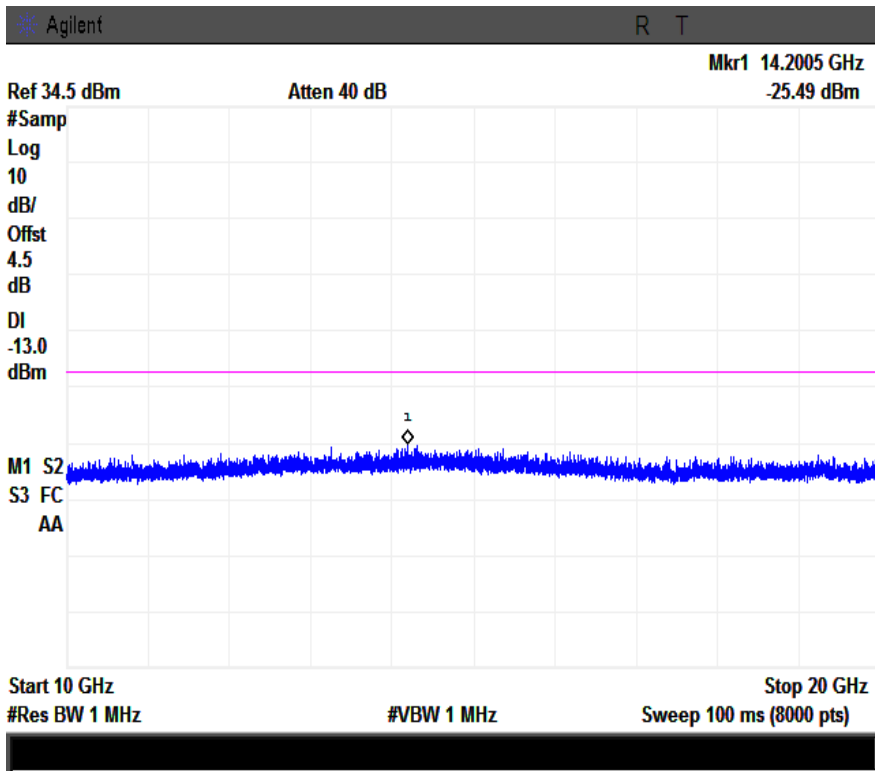
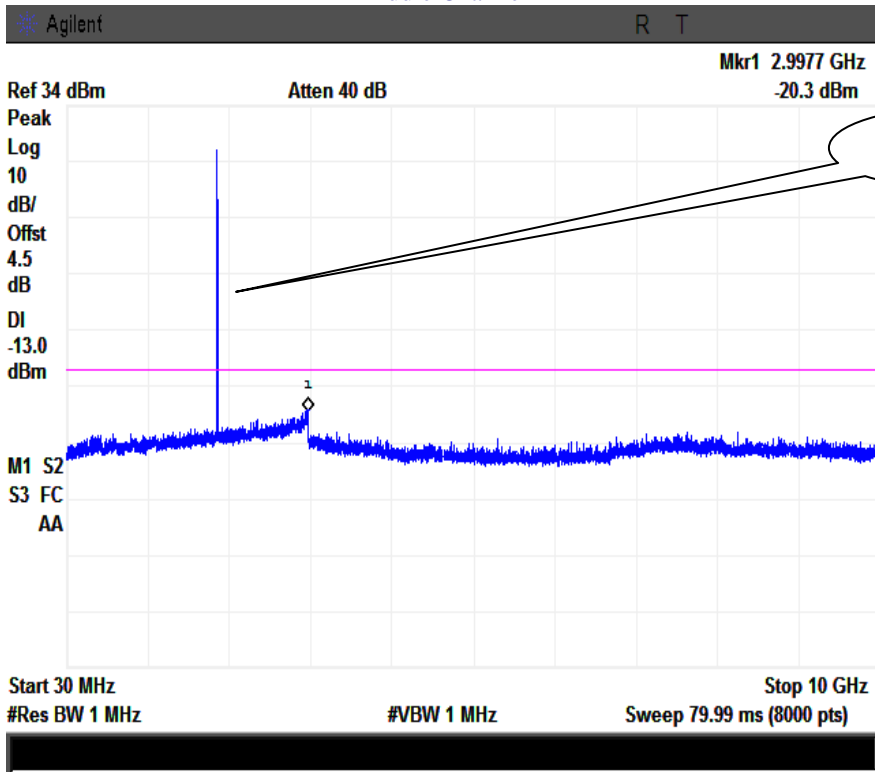


**PCS Band (Part24E)**

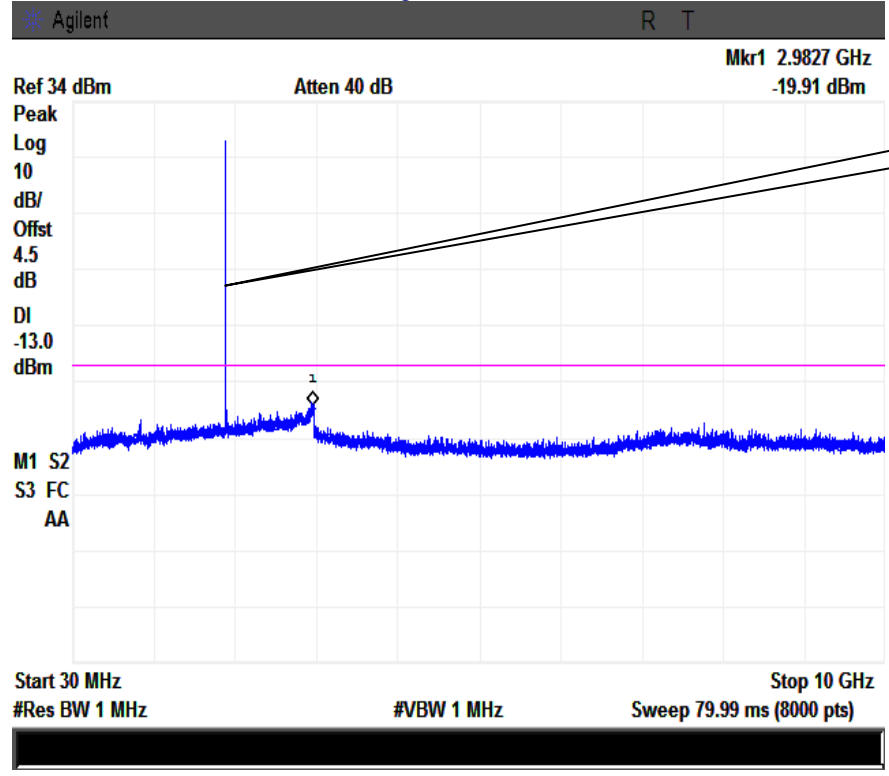
30MHz -20G – PCS1900



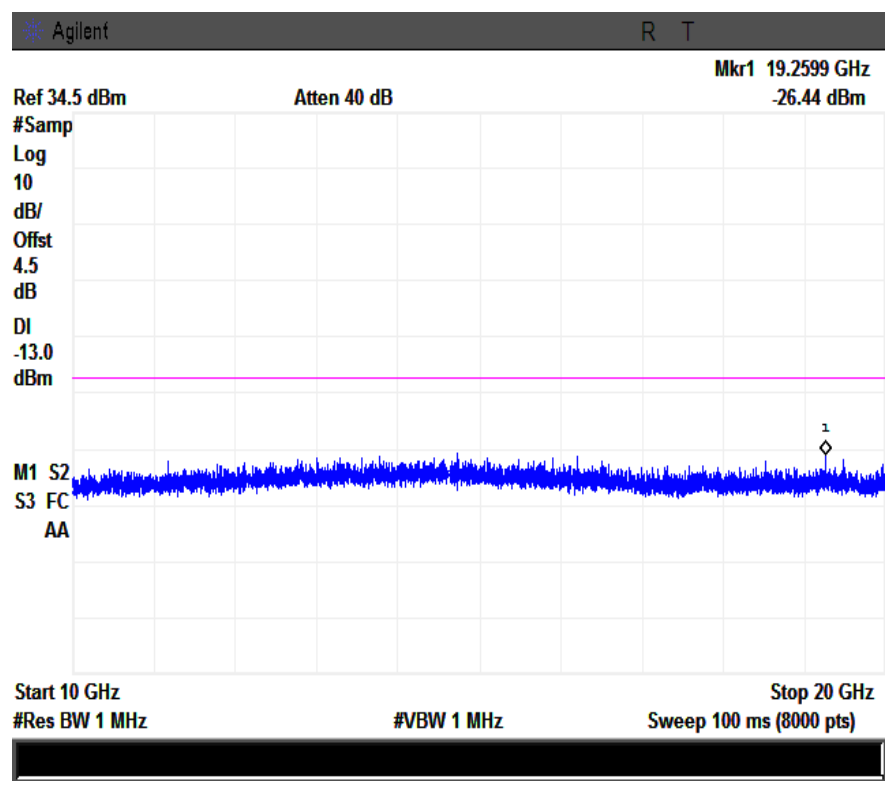
Middle Channel



### High Channel

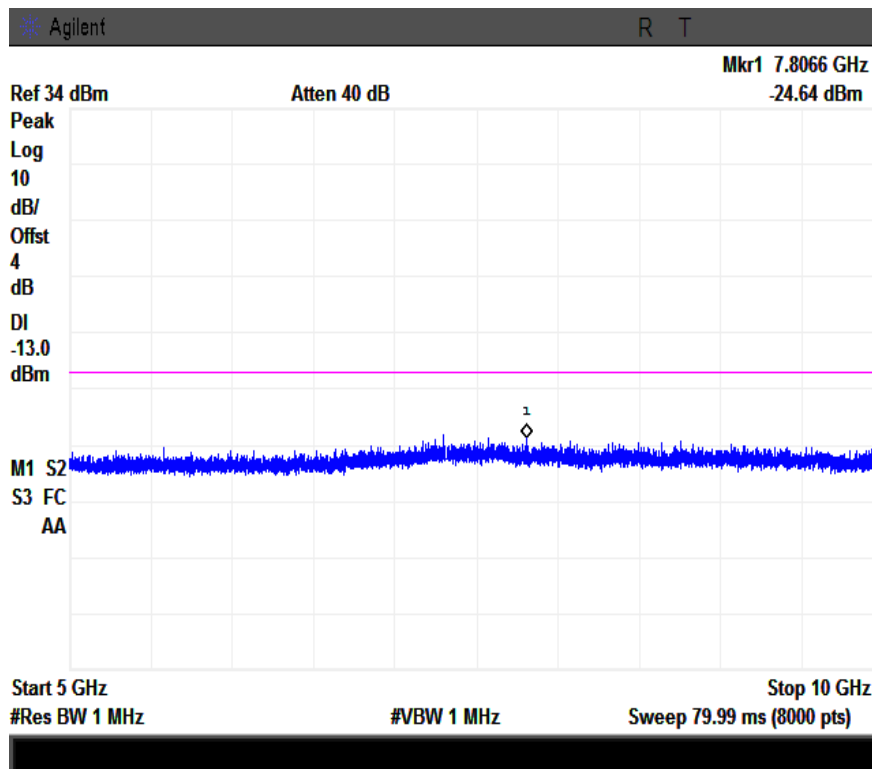
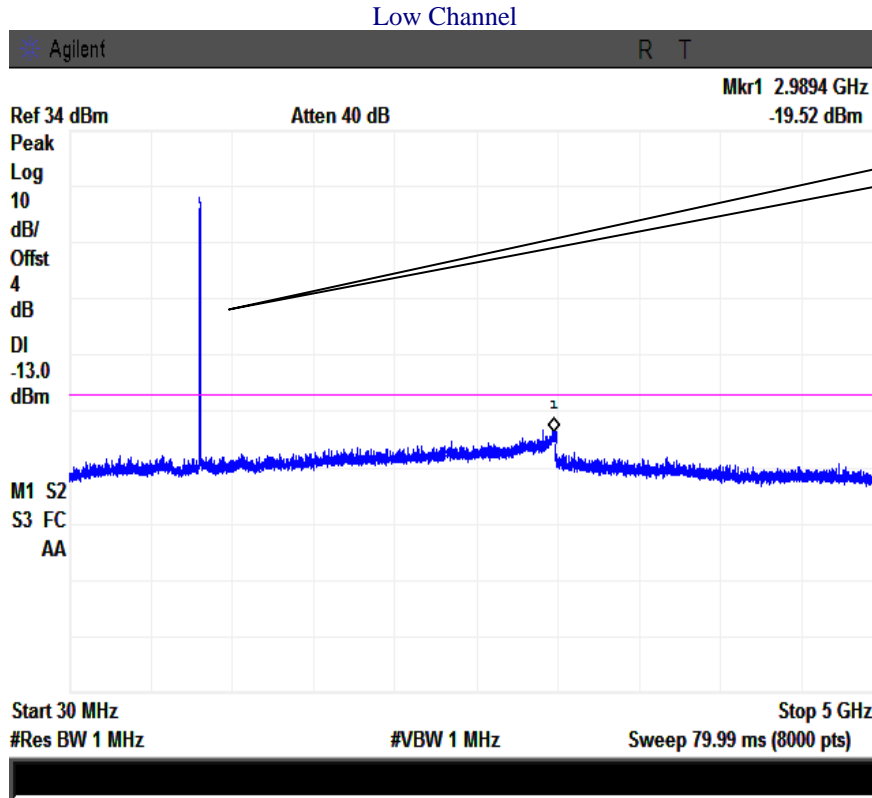


Fundamental

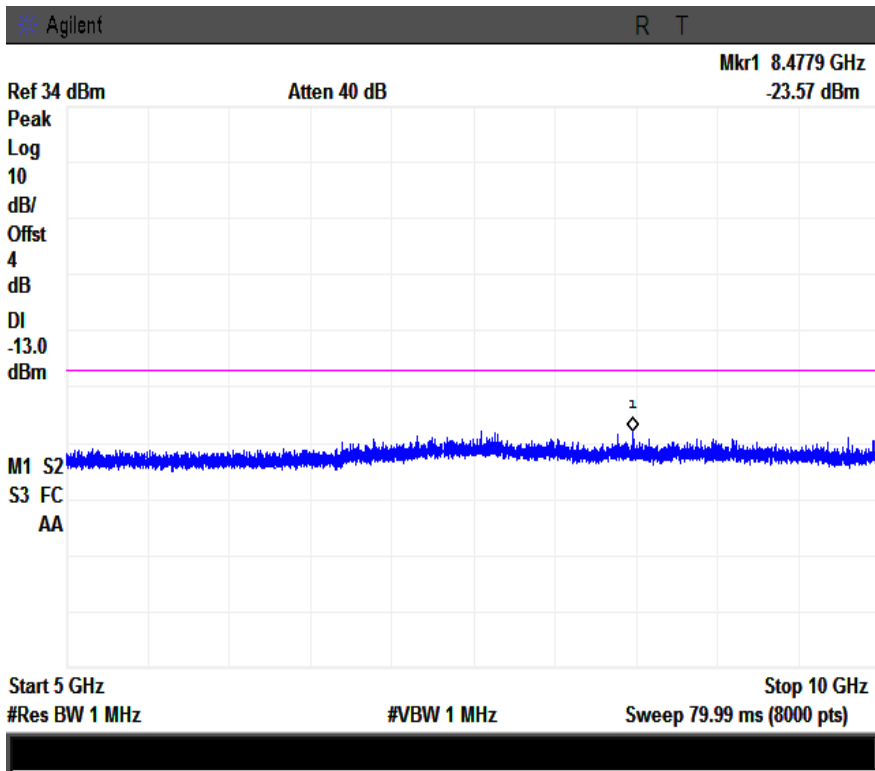
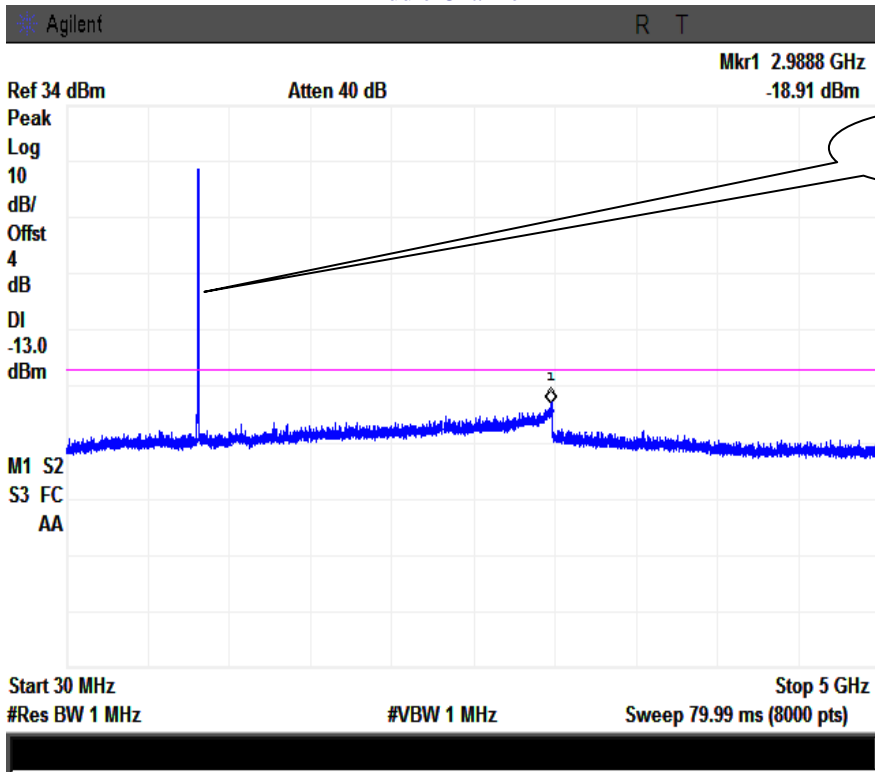


**UMTS-FDD Band V (Part 22H)**

30MHz -10G – WCDMA 850

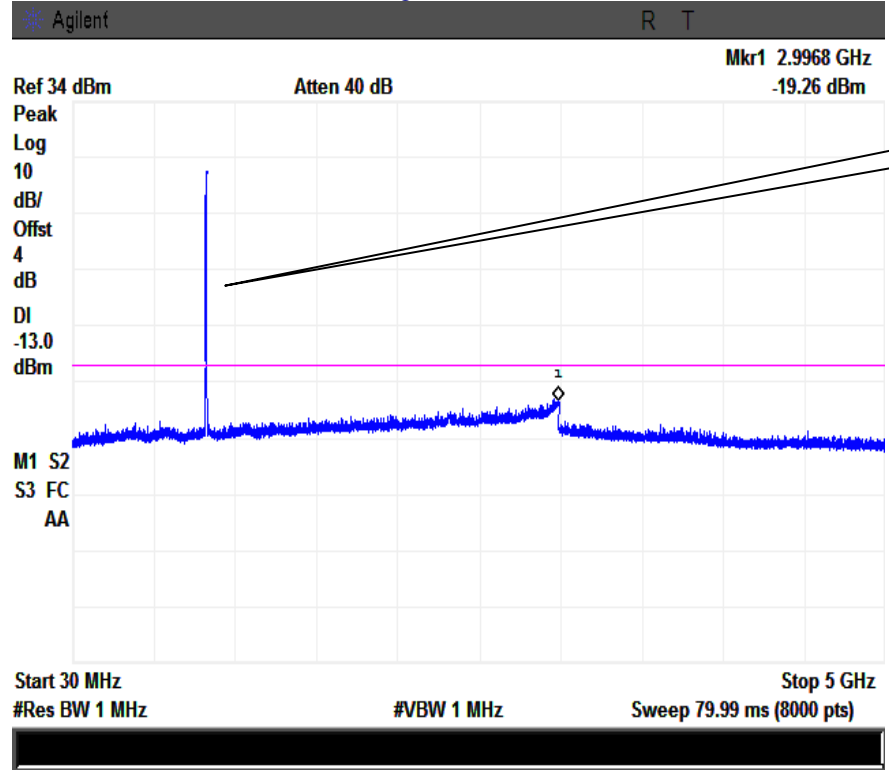


Middle Channel

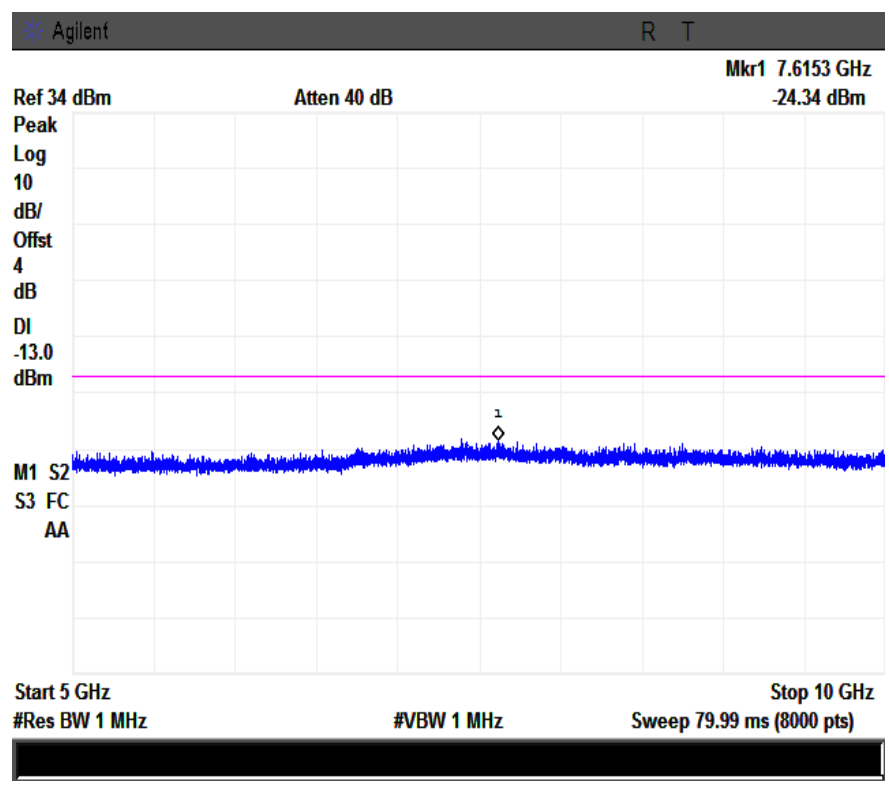




### High Channel



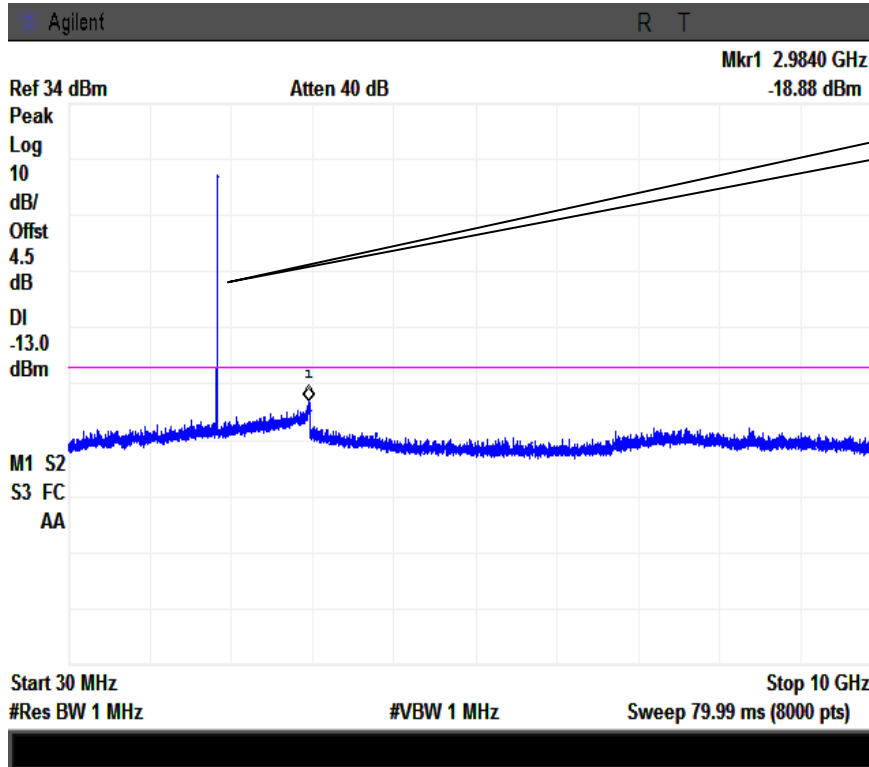
Fundamental



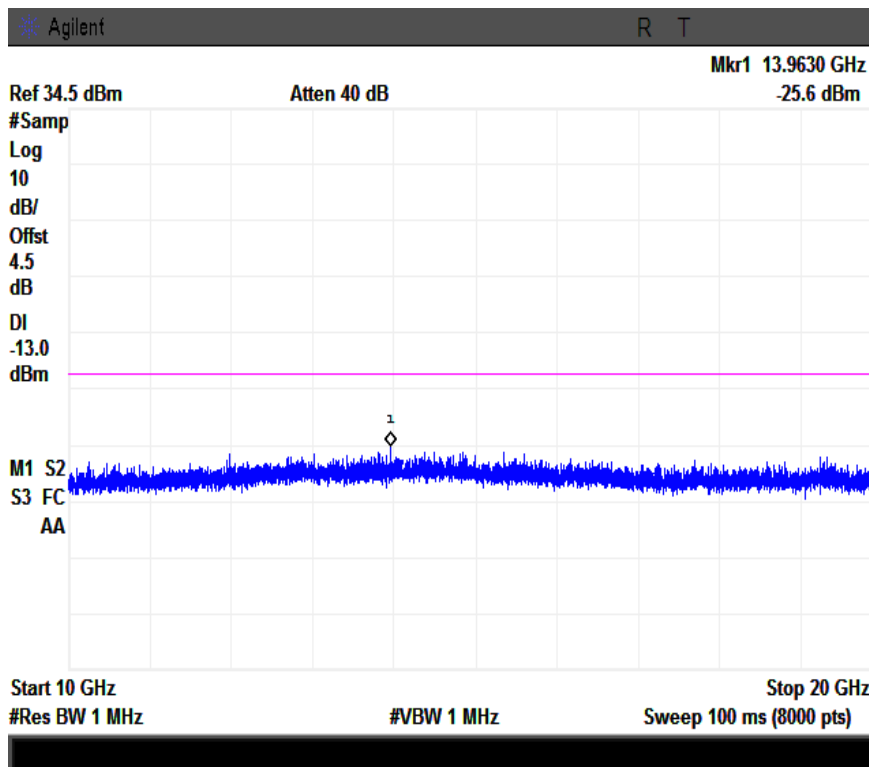
**UMTS-FDD Band II (Part24E)**

30MHz -20G – WCDMA1900

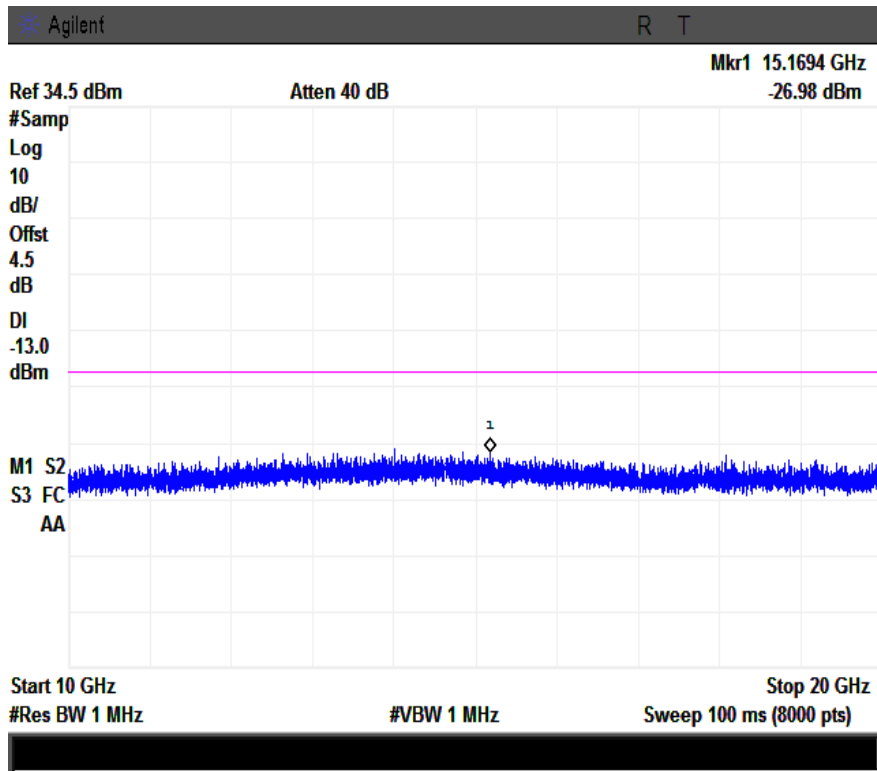
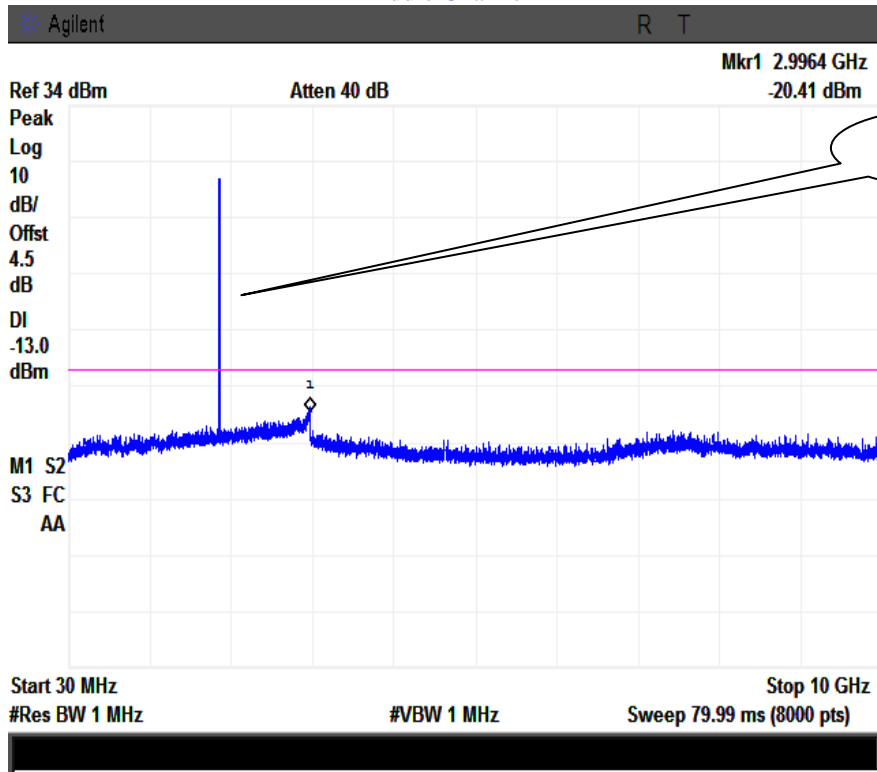
Low Channel



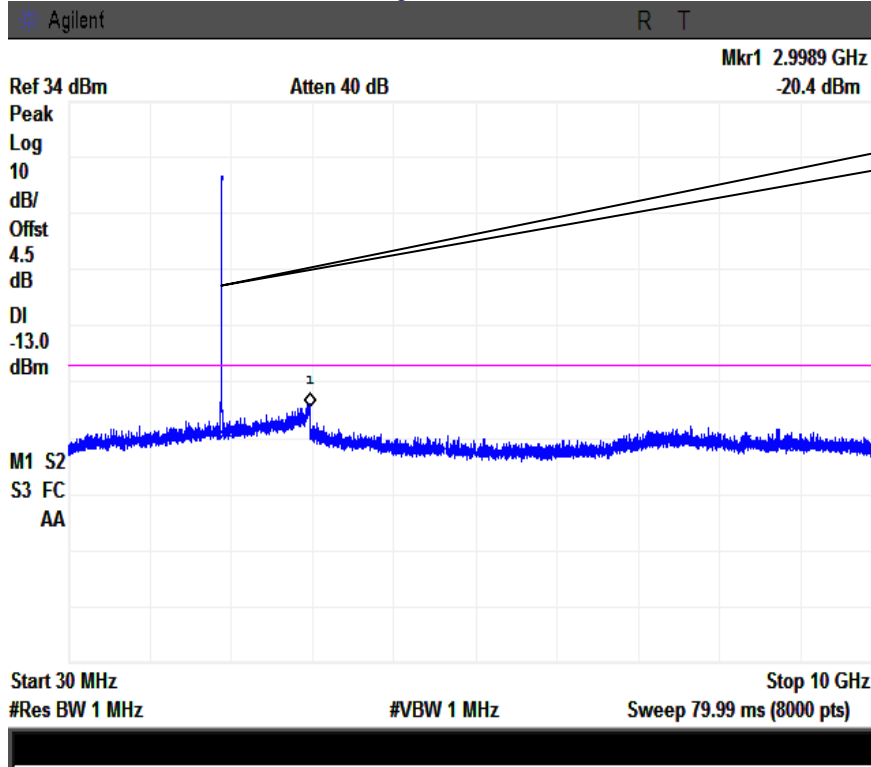
Fundamental



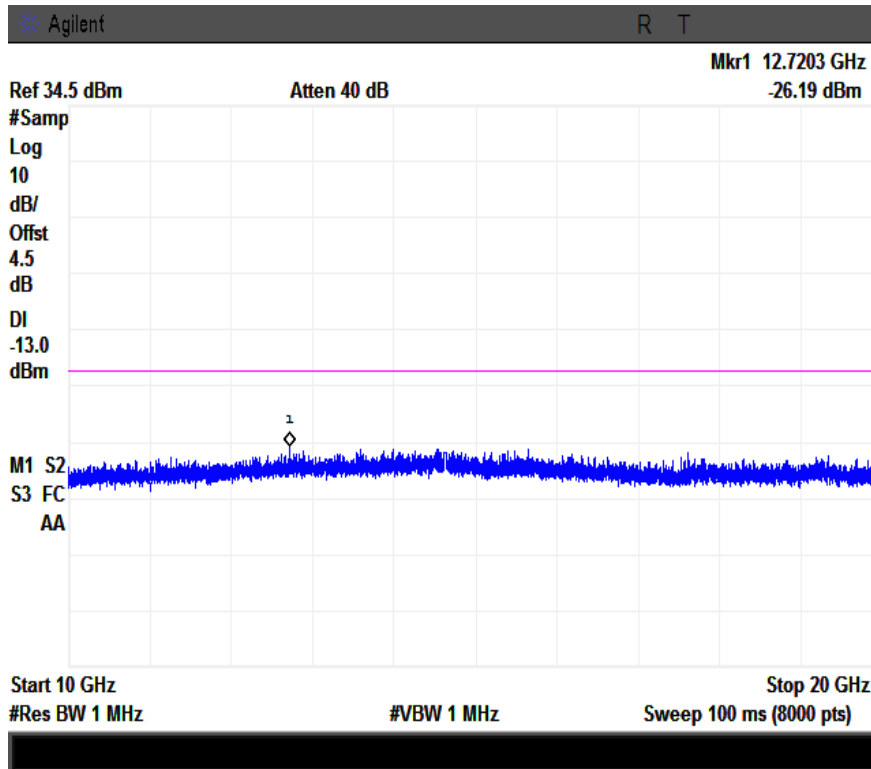
Middle Channel



### High Channel



Fundamental



## **5.6 §2.1053, §22.917 & §24.238 - Spurious Radiated Emissions**

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 1GHz – 40GH is  $\pm 6.0\text{dB}$  (for EUTs < 0.5m X 0.5m X 0.5m).
4. Environmental Conditions

Temperature	23°C
Relative Humidity	55%
Atmospheric Pressure	1017mbar
5. Test date : August 28, 2014  
Tested By : Hank Li

### **Standard Requirement:**

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. The spectrum is scanned from 30 MHz up to a frequency including its 10<sup>th</sup> harmonic.

### **Procedures: (According with TIA 603D)**

1. The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Sample Calculation:

EUT Field Strength (dBm) = Reading (Signal generator) + Antenna Gain (substitution antenna) - Cable loss (From Signal Generator to substitution antenna)

**Test Result: Pass**

**Cellular Band (Part 22H)**

**Low channel**

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1648.4	-37.68	V	7.95	0.78	-30.51	-13	-17.51
1648.4	-36.71	H	7.95	0.78	-29.54	-13	-16.54
289.6	-51.02	V	6	0.25	-45.27	-13	-32.27
710.3	-50.43	H	6.8	0.41	-44.04	-13	-31.04

**Middle channel**

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1673.2	-38.36	V	7.95	0.78	-31.19	-13	-18.19
1673.2	-37.15	H	7.95	0.78	-29.98	-13	-16.98
290.2	-53.64	V	6	0.25	-47.89	-13	-34.89
711.2	-50.03	H	6.8	0.41	-43.64	-13	-30.64

**High channel**

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1697.6	-38.62	V	7.95	0.78	-31.45	-13	-18.45
1697.6	-36.84	H	7.95	0.78	-29.67	-13	-16.67
289.4	-54.78	V	6	0.25	-49.03	-13	-36.03
710.8	-50.17	H	6.8	0.41	-43.78	-13	-30.78

## PCS Band (Part 24E)

### Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3700.4	-44.88	V	10.25	2.73	-37.36	-13	-24.36
3700.4	-45.64	H	10.25	2.73	-38.12	-13	-25.12
290.6	-53.89	V	6	0.25	-48.14	-13	-35.14
710.7	-51.47	H	6.8	0.41	-45.08	-13	-32.08

### Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3760	-46.03	V	10.25	2.73	-38.51	-13	-25.51
3760	-45.61	H	10.25	2.73	-38.09	-13	-25.09
292.4	-54.36	V	6	0.25	-48.61	-13	-35.61
711.1	-51.57	H	6.8	0.41	-45.18	-13	-32.18

### High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3819.6	-46.11	V	10.36	2.73	-38.48	-13	-25.48
3819.6	-45.29	H	10.36	2.73	-37.66	-13	-24.66
289.4	-53.76	V	6	0.25	-48.01	-13	-35.01
709.8	-51.27	H	6.8	0.41	-44.88	-13	-31.88

## UMTS-FDD Band V (Part 22H)

### Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1652.8	-45.21	V	7.95	0.78	-38.04	-13	-25.04
1652.8	-44.39	H	7.95	0.78	-37.22	-13	-24.22
289.6	-55.12	V	6	0.25	-49.37	-13	-36.37
710.5	-52.41	H	6.8	0.41	-46.02	-13	-33.02

### Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1670	-45.44	V	7.95	0.78	-38.27	-13	-25.27
1670	-44.51	H	7.95	0.78	-37.34	-13	-24.34
288.8	-53.46	V	6	0.25	-47.71	-13	-34.71
712.3	-51.27	H	6.8	0.41	-44.88	-13	-31.88

### High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1693.2	-45.07	V	7.95	0.78	-37.9	-13	-24.9
1693.2	-44.38	H	7.95	0.78	-37.21	-13	-24.21
287.3	-53.74	V	6	0.25	-47.99	-13	-34.99
712.2	-50.43	H	6.8	0.41	-44.04	-13	-31.04



## UMTS-FDD Band II (Part 24E)

### Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3704.8	-46.26	V	10.25	2.73	-38.74	-13	-25.74
3704.8	-47.21	H	10.25	2.73	-39.69	-13	-26.69
289.6	-54.73	V	6	0.25	-48.98	-13	-35.98
711.3	-51.48	H	6.8	0.41	-45.09	-13	-32.09

### Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3760	-46.3	V	10.25	2.73	-38.78	-13	-25.78
3760	-47.34	H	10.25	2.73	-39.82	-13	-26.82
290.1	-53.41	V	6	0.25	-47.66	-13	-34.66
711.5	-50.18	H	6.8	0.41	-43.79	-13	-30.79

### High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3815.2	-45.42	V	10.36	2.73	-37.79	-13	-24.79
3815.2	-46.39	H	10.36	2.73	-38.76	-13	-25.76
287.8	-53.24	V	6	0.25	-47.49	-13	-34.49
710.6	-50.57	H	6.8	0.41	-44.18	-13	-31.18

## **5.7 §22.917(a) & §24.238(a) - Band Edge**

1. Conducted Measurement  
EUT was set for low, mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is  $\pm 1.5$ dB.
3. Environmental Conditions  

Temperature	24°C
Relative Humidity	56%
Atmospheric Pressure	1016mbar
4. Test date : August 22, 2014  
Tested By : Hank Li

### **Standard Requirement:**

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

### **Procedures:**

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The Band Edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly BW/100.
3. Details according with KDB 971168 section 6.0.

### **Test Result: Pass**

Refer to the attached plots.

**Cellular Band (Part 22H)**

Frequency (MHz)	Emission (dBm)	Limit (dBm)
823.9800	-13.45	-13
849.0150	-15.40	-13

**PCS Band (Part 24E)**

Frequency (MHz)	Emission (dBm)	Limit (dBm)
1849.9775	-17.22	-13
1910.0200	-18.21	-13

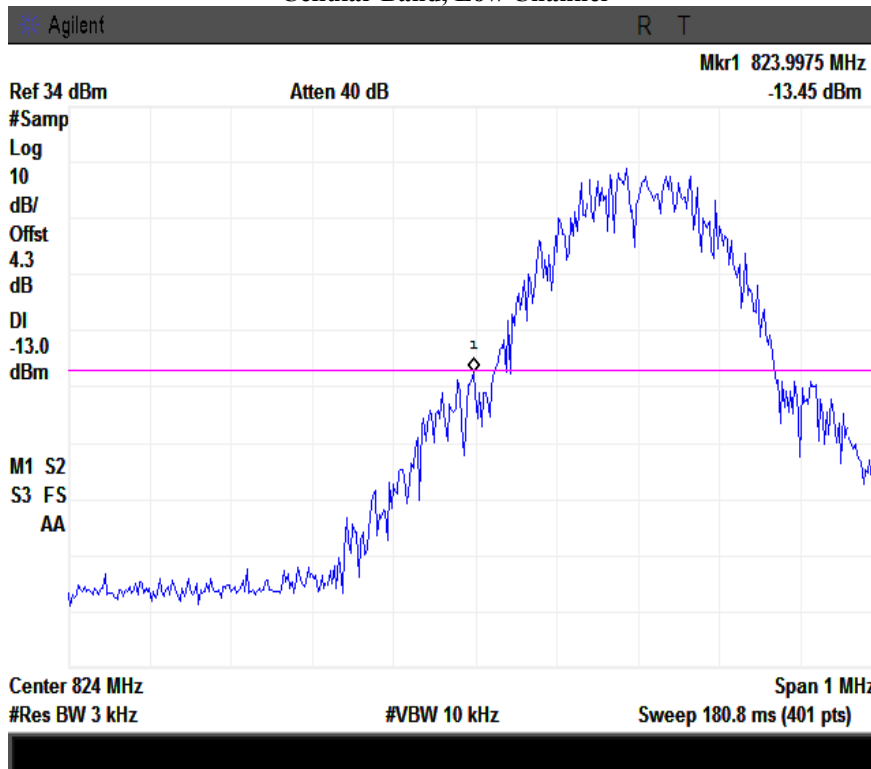
**UMTS-FDD Band V (Part 22H)**

Frequency (MHz)	Emission (dBm)	Limit (dBm)
824.000	-19.37	-13
849.000	-22.99	-13

**UMTS-FDD Band II (Part 24E)**

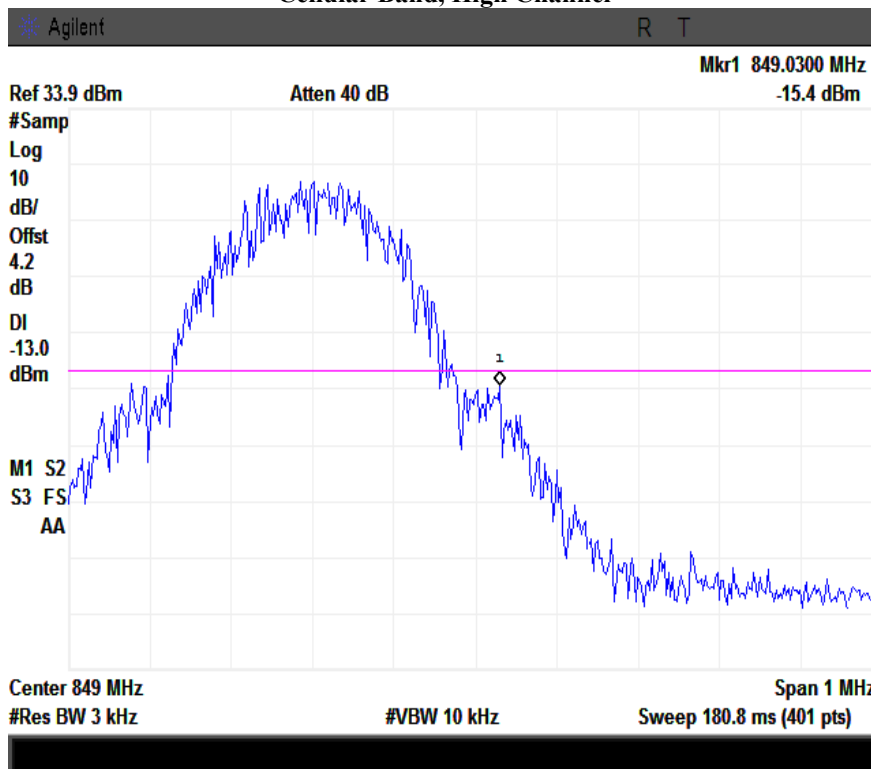
Frequency (MHz)	Emission (dBm)	Limit (dBm)
1850.000	-24.06	-13
1910.000	-17.38	-13

### Cellular Band, Low Channel



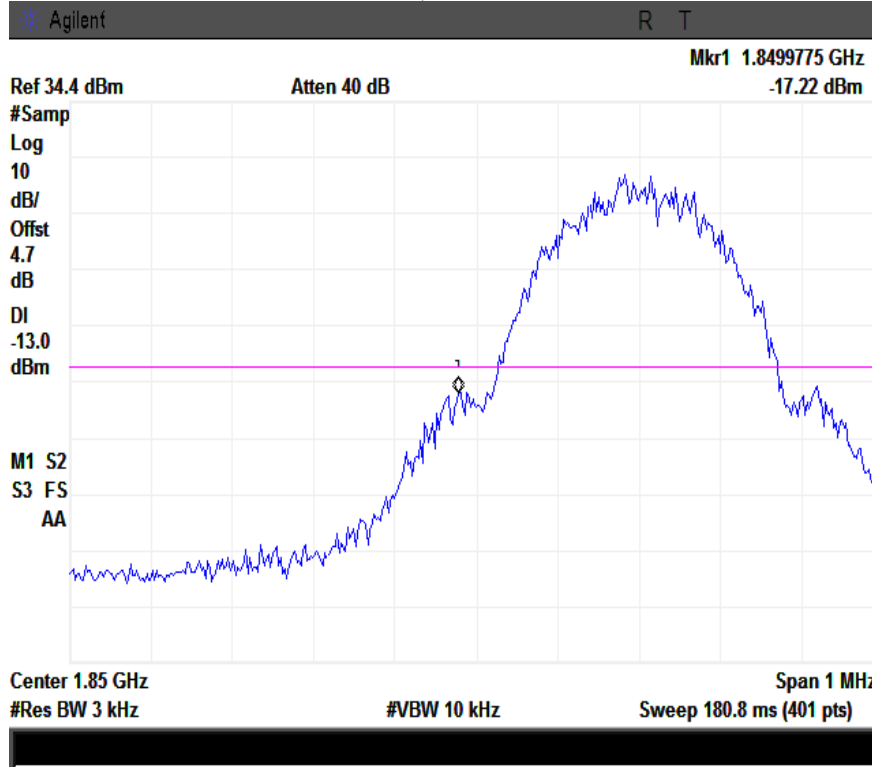
Note: Offset=Cable loss (4.0) + 10log (3.20/3)=4.0+0.3=4.3 dB

### Cellular Band, High Channel



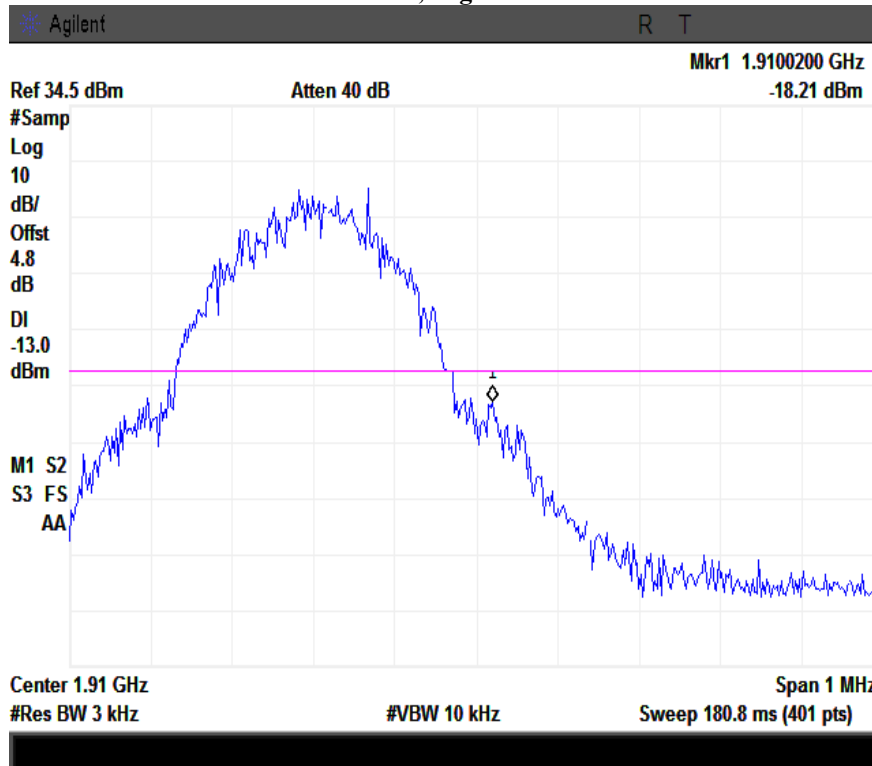
Note: Offset=Cable loss (4.0) + 10log (3.16/3)=4.0+0.2=4.2 dB

### PCS Band, Low Channel



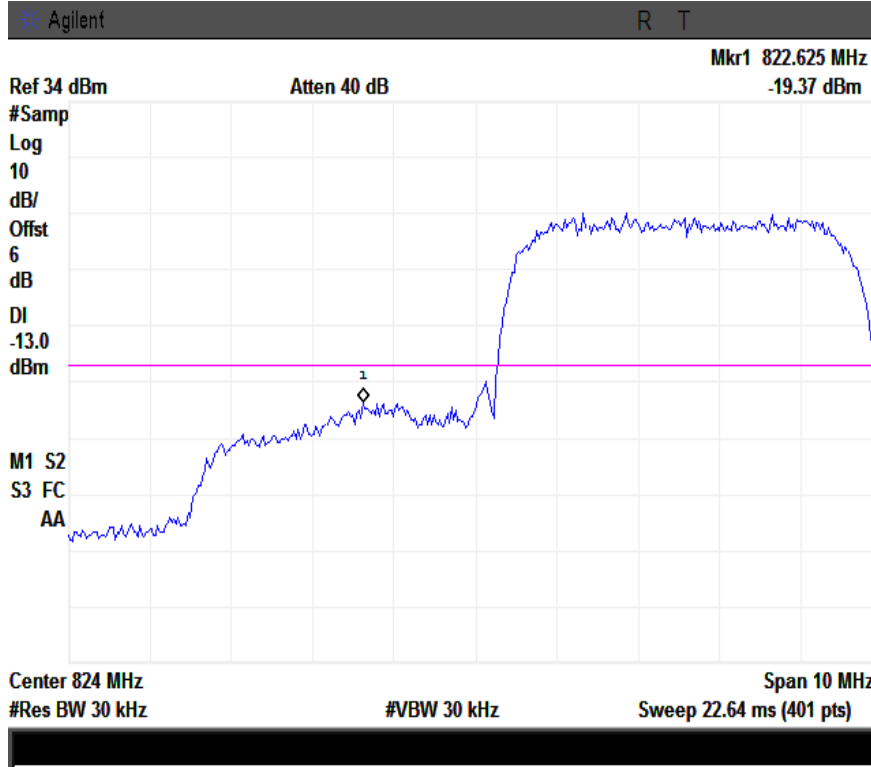
Note: Offset=Cable loss (4.5) + 10log (3.16/3)=4.5+0.2=4.7 dB

### PCS Band, High Channel



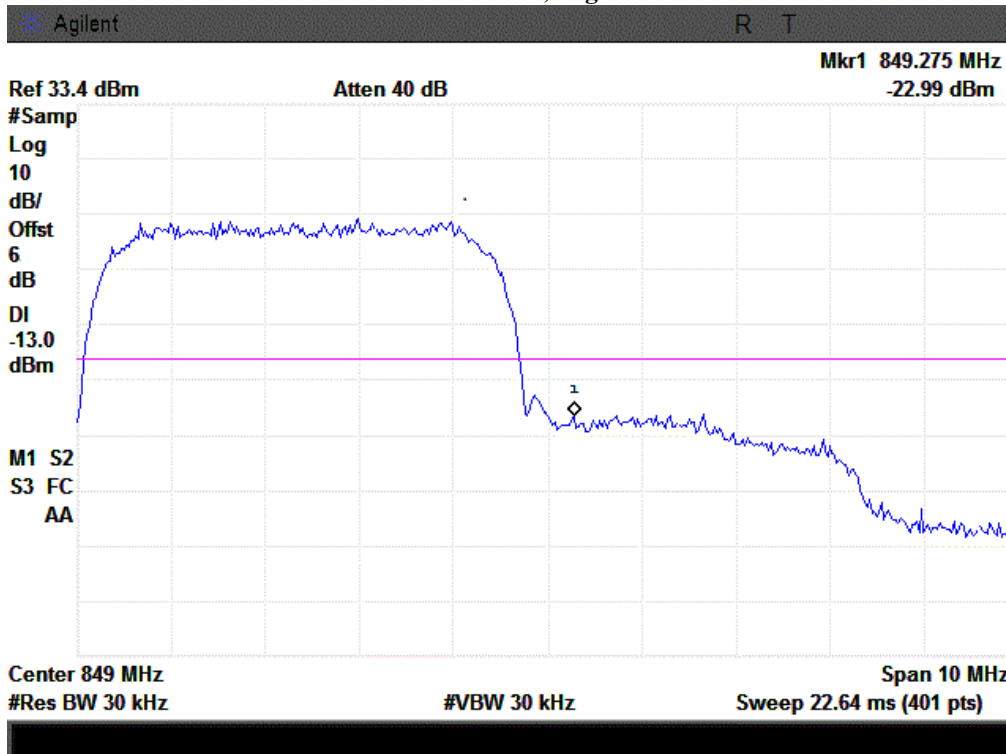
Note: Offset=Cable loss (4.5) + 10log (3.22/3)=4.5+0.3=4.8 dB

### UMTS-FDD Band V, Low Channel



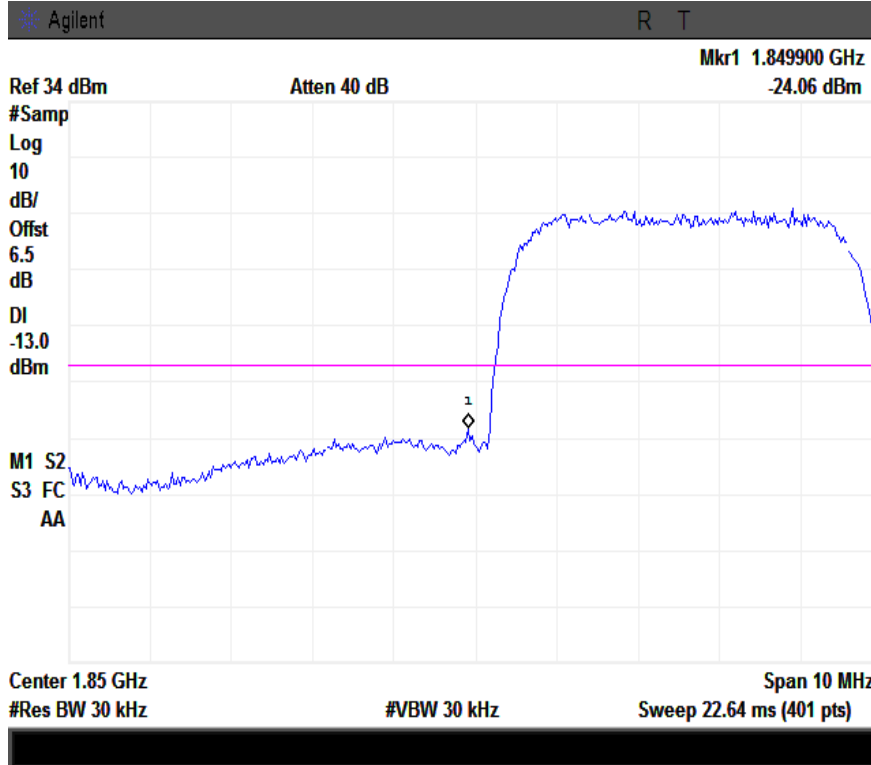
Note: Offset=Cable loss (4) + 10log (47/30) =4+2=6 dB

### UMTS-FDD Band V, High Channel



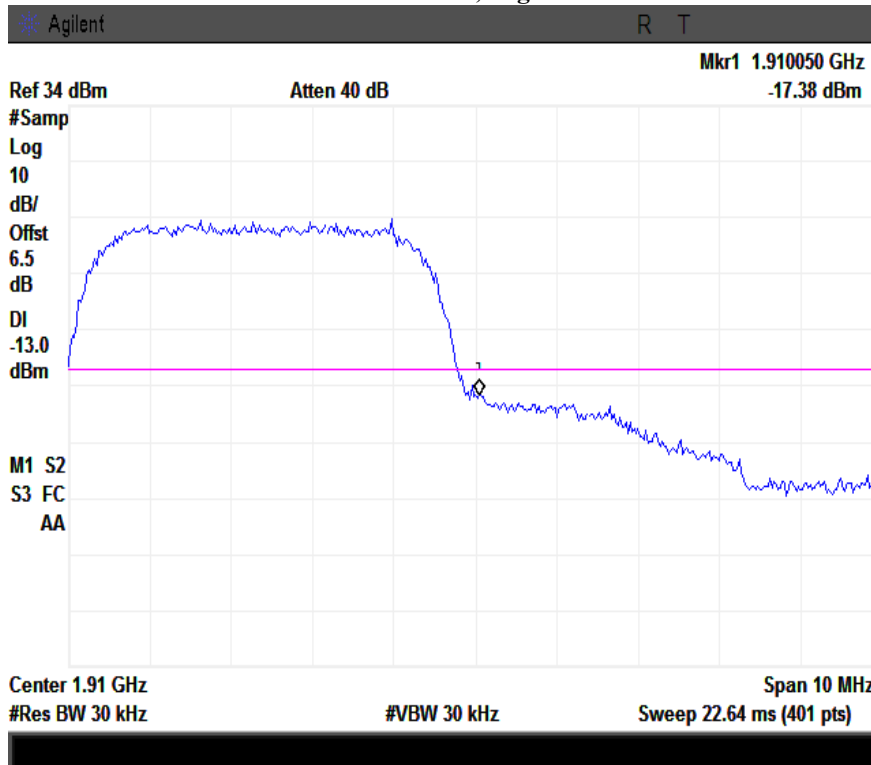
Note: Offset=Cable loss (4) + 10log (47/30)=4+2=6 dB

### UMTS-FDD Band II, Low Channel



Note: Offset=Cable loss (4.5) + 10log (47/30)=4.5+2=6.5 dB

### UMTS-FDD Band II, High Channel



Note: Offset=Cable loss (4.5) + 10log (47.6/30)=4.5+2=6.5 dB

## **5.8 §2.1055, §22.355 & §24.235 - Frequency Stability**

- |    |  |                      |          |
|----|--|----------------------|----------|
| 1. | Environmental Conditions                           | Temperature          | 23°C     |
|    |  | Relative Humidity    | 54%      |
|    |  | Atmospheric Pressure | 1020mbar |
| 2. | Test date : August 27, 2014<br>Tested By : Hank Li |                      |          |

### **Standard Requirement:**

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency Range (MHz)	Base, fixed (ppm)	Mobile ≤ 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929.	5.0	N/A	N/A
929 to 960.	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized frequency block.

### **Procedures:**

A communication link was established between EUT and base station. The frequency error was monitored and measured by base station under variation of ambient temperature and variation of primary supply voltage.

Limit: The frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5\text{ppm}$ ) of the center frequency.

**Test Results: Pass**



**Frequency Stability versus Temperature:** The Frequency tolerance of the carrier signal shall be maintained within 2.5ppm of the operating frequency over a temperature variation of -10°C to +55°C at normal supply voltage.

**Cellular Band (Part 22H)**

<b>Middle Channel, <math>f_0 = 836.6</math> MHz</b>				
<b>Temperature (°C)</b>	<b>Power Supplied (V<sub>DC</sub>)</b>	<b>Frequency Error (Hz)</b>	<b>Frequency Error (ppm)</b>	<b>Limit (ppm)</b>
-10	3.7	17	0.0203	2.5
0		19	0.0227	2.5
10		20	0.0239	2.5
20		19	0.0227	2.5
30		17	0.0203	2.5
40		16	0.0191	2.5
50		19	0.0227	2.5
55		21	0.0251	2.5
25	4.2	20	0.0239	2.5
	3.5	21	0.0251	2.5

**PCS Band (Part 24E)**

<b>Middle Channel, <math>f_0 = 1880</math> MHz</b>				
<b>Temperature (°C)</b>	<b>Power Supplied (V<sub>DC</sub>)</b>	<b>Frequency Error (Hz)</b>	<b>Frequency Error (ppm)</b>	<b>Limit (ppm)</b>
-10	3.7	16	0.0085	2.5
0		18	0.0096	2.5
10		19	0.0101	2.5
20		20	0.0106	2.5
30		21	0.0112	2.5
40		17	0.0090	2.5
50		18	0.0096	2.5
55		21	0.0112	2.5
25	4.2	20	0.0106	2.5
	3.5	23	0.0122	2.5

**UMTS-FDD Band V (Part 22H)**

<b>Middle Channel, <math>f_0 = 835</math> MHz</b>				
<b>Temperature (°C)</b>	<b>Power Supplied (V<sub>DC</sub>)</b>	<b>Frequency Error (Hz)</b>	<b>Frequency Error (ppm)</b>	<b>Limit (ppm)</b>
-10	3.7	19	0.0228	2.5
0		17	0.0204	2.5
10		15	0.0180	2.5
20		18	0.0216	2.5
30		16	0.0192	2.5
40		17	0.0204	2.5
50		20	0.0240	2.5
55		18	0.0216	2.5
25	4.2	21	0.0251	2.5
	3.5	17	0.0204	2.5

**UMTS-FDD Band II (Part 24E)**

<b>Middle Channel, <math>f_0 = 1880</math> MHz</b>				
<b>Temperature (°C)</b>	<b>Power Supplied (V<sub>DC</sub>)</b>	<b>Frequency Error (Hz)</b>	<b>Frequency Error (ppm)</b>	<b>Limit (ppm)</b>
-10	3.7	-5	-0.0027	2.5
0		6	0.0032	2.5
10		-4	-0.0021	2.5
20		5	0.0027	2.5
30		7	0.0037	2.5
40		9	0.0048	2.5
50		6	0.0032	2.5
55		-7	-0.0037	2.5
25	4.2	-6	-0.0032	2.5
	3.5	5	0.0027	2.5

## **Annex A. TEST INSTRUMENT & METHOD**

### **Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES**

<b>Instrument</b>	<b>Model</b>	<b>Serial #</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
<b>RF conducted test</b>				
Agilent ESA-E SERIES SPECTRUM ANALYZER	E4407B	MY45108319	09/17/2013	09/16/2014
Power Splitter	1#	1#	09/02/2014	09/01/2015
Universal Radio Communication Tester	CMU200	121393	09/17/2013	09/16/2014
Temperature/Humidity Chamber	UHL-270	001	10/22/2013	10/21/2014
DC Power Supply	E3640A	MY40004013	09/17/2013	09/16/2014
<b>Radiated Emissions</b>				
EMI test receiver	ESL6	100262	11/23/2013	11/22/2014
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/02/2014	09/01/2015
Microwave Preamplifier (0.5~18GHz)	PAM-118	443008	09/02/2014	09/01/2015
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/23/2013	09/22/2014
Bilog Antenna (30MHz~2GHz)	JB1	A112017	09/23/2013	09/22/2014
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71259	11/20/2013	11/19/2014
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	11/20/2013	11/19/2014
SYNTHESIZED SIGNAL GENERATOR	8665B	3744A01293	09/17/2013	09/16/2014
Tunable Notch Filter	3NF-800/1000-S	AA4	09/02/2014	09/01/2015
Tunable Notch Filter	3NF-1000/2000-S	AM 4	09/02/2014	09/01/2015

**Annex A. ii. RADIATED EMISSIONS TEST DESCRIPTION**

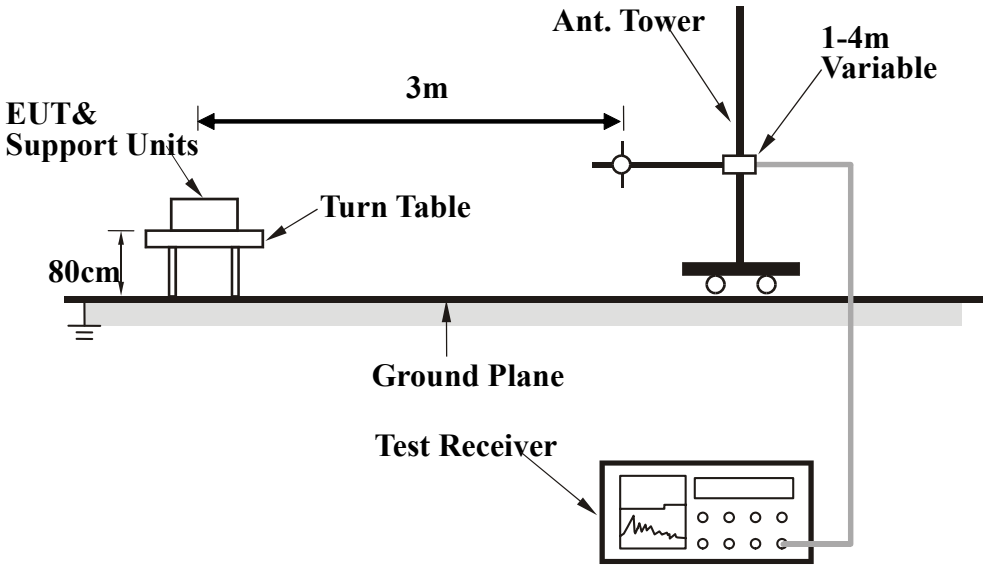
**EUT Characterisation**

EUT characterisation, over the frequency range from 30MHz to 1GHz (for FCC tests, until the 10<sup>th</sup> harmonic for operating frequencies  $\geq 108\text{MHz}$ ), was done in order to minimise radiated emissions testing time while still maintaining high confidence in the test results.

The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer/receiver with the appropriate broadband antenna placed 3m or 10m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable manually, changing the antenna polarisation and manipulating the EUT cables while observing the frequency profile on the spectrum analyzer / receiver. Frequency points at which maximum emissions occurred, clock frequencies and operating frequencies were then noted for the formal radiated emissions test at the Open Area Test Site (OATS) or EMC 3m chamber.

**Test Set-up**

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.



**Test Method**

The following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

**Final Radiated Emission Measurement**

1. Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site or EMC 10m chamber. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	Peak	100 kHz	100 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

**Description of Radiated Emission Program**

This EMC Measurement software run LabView automation software and offers a common user interface for electromagnetic interference (EMI) measurements. This software is a modern and powerful tool for controlling and monitoring EMI test receivers and EMC test systems. It guarantees reliable collection, evaluation, and documentation of measurement results. Basically, this program will run a pre-scan measurement before it proceeds with the final measurement. The pre-scan routine will run the scan on four different antenna heights, 2 antenna polarity, and 360 degrees table rotation. For example, the program was set to run 30 MHz to 1 GHz scan; the program will first start from a meter antenna height and divide the 30 MHz to 1 GHz into 10 separate parts of maximum hold sweeps. Each parts of maximum hold sweep, the program will collect the data from 0 degree to 360 degrees table rotation. After the program complete the 1m scan, the antenna continues to rise to 2m and continue the scan. The step will repeated for all specified antenna height and polarity. This program will perform the Quasi Peak measurement after the signal maximization process and pre-scan routine. The final measurement will be base on the pre-scan data reduction result.

**Sample Calculation Example**

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

$$\text{Peak} = \text{Reading} + \text{Corrected Factor}$$

where

$$\text{Corr. Factor} = \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain (if any)}$$

And the average value is

$$\text{Average} = \text{Peak Value} + \text{Duty Factor or}$$

$$\text{Set RBW} = 1\text{MHz, VBW} = 10\text{Hz.}$$

Note:

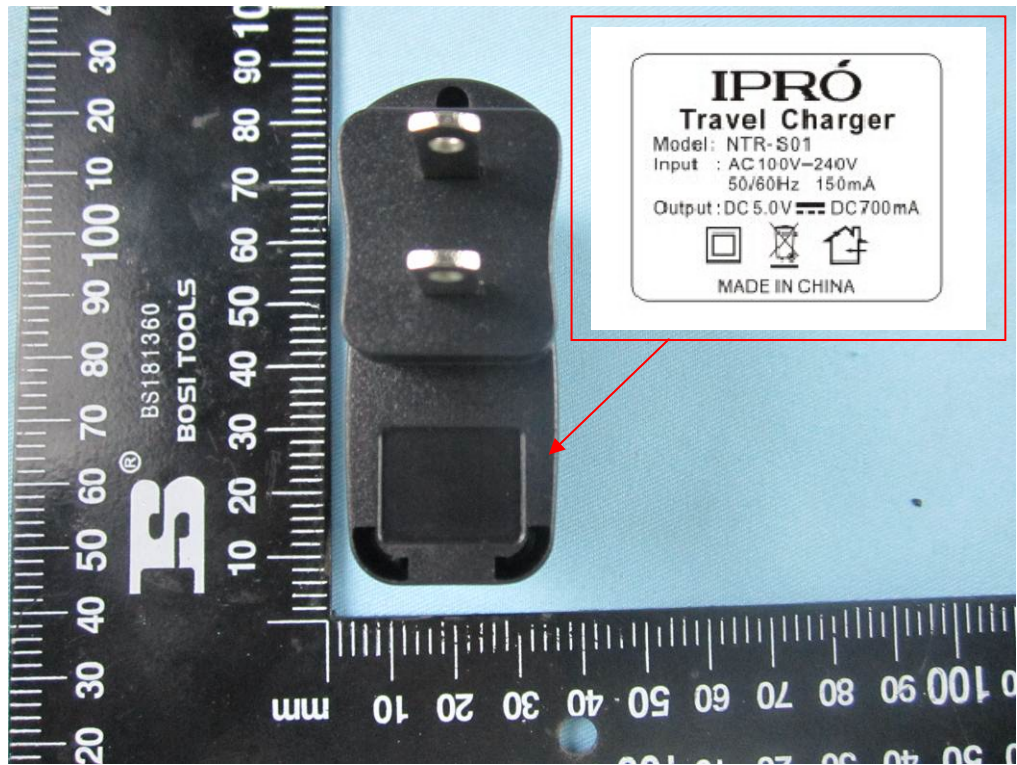
If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.

**Annex B. EUT AND TEST SETUP PHOTOGRAPHS**

**Annex B.i. Photograph 1: EUT External Photo**



Whole Package - Top View



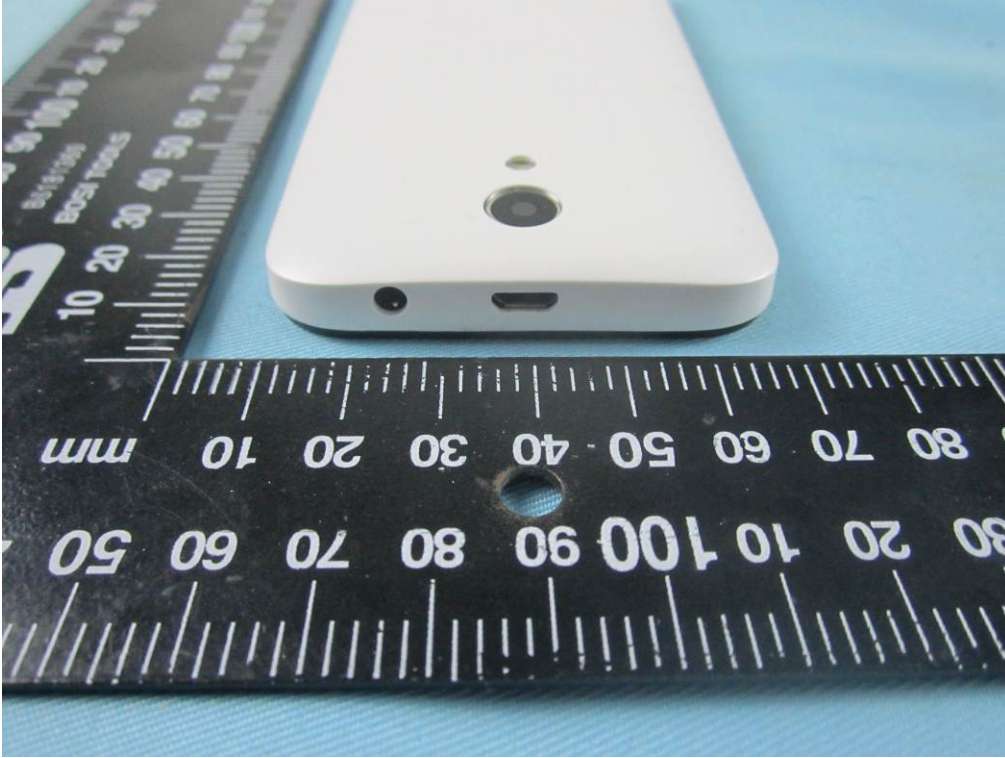
Adapter – Front View



EUT - Front View



EUT - Rear View

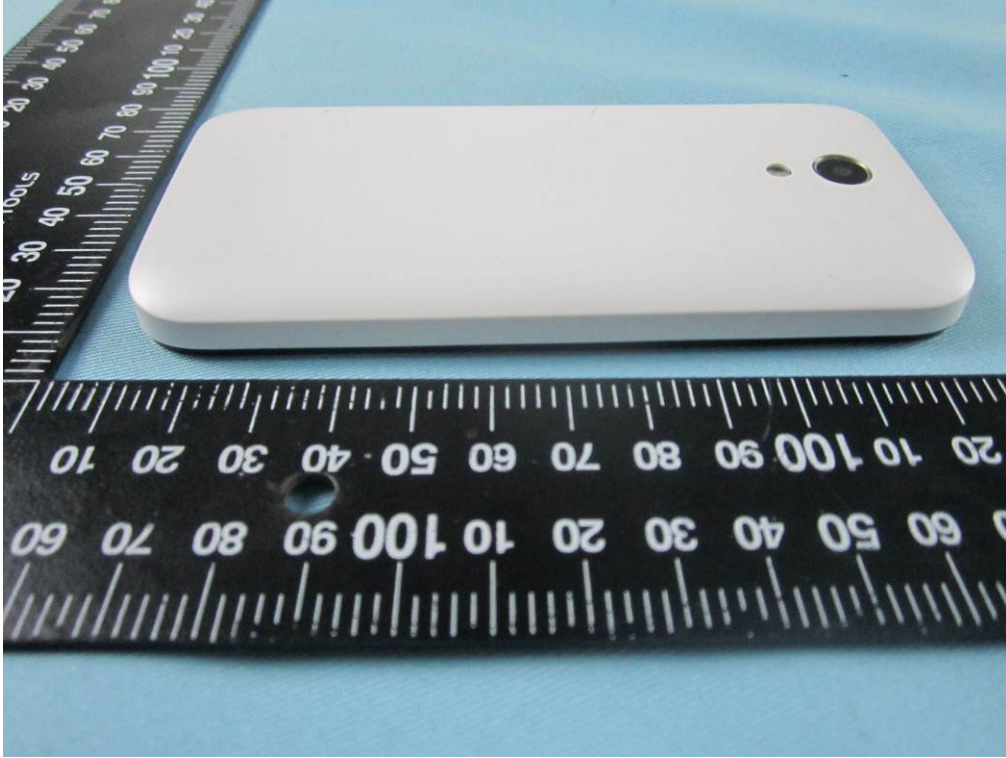


EUT - Top View



EUT - Bottom View





EUT - Left View



EUT - Right View

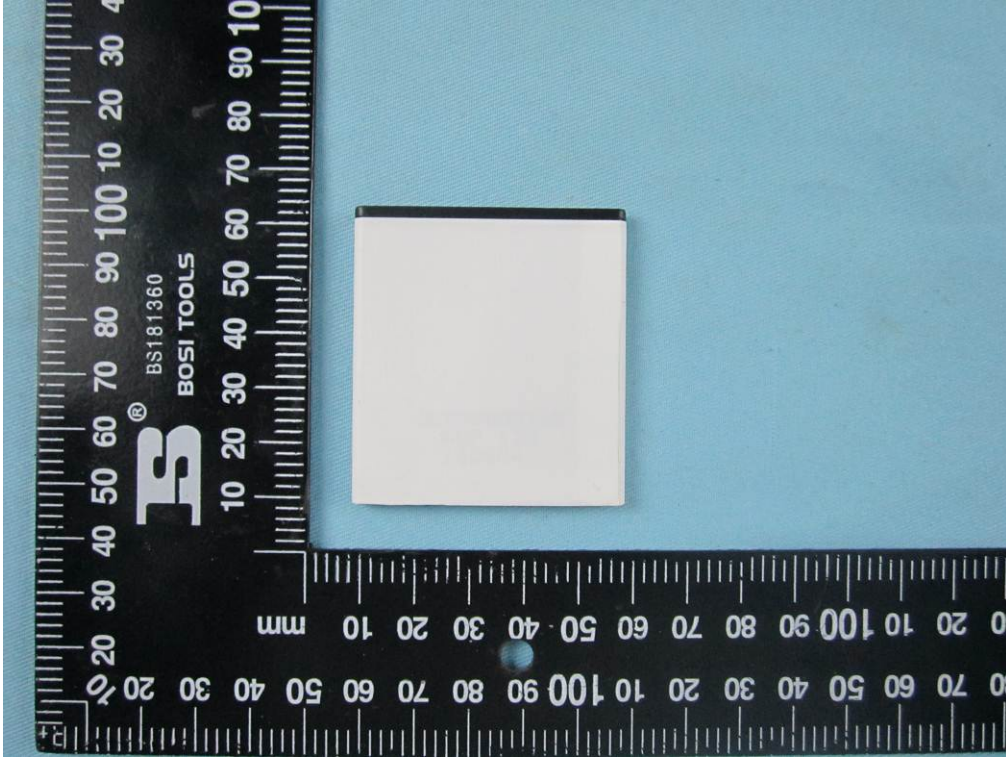
**Annex B.ii. Photograph 2: EUT Internal Photo**



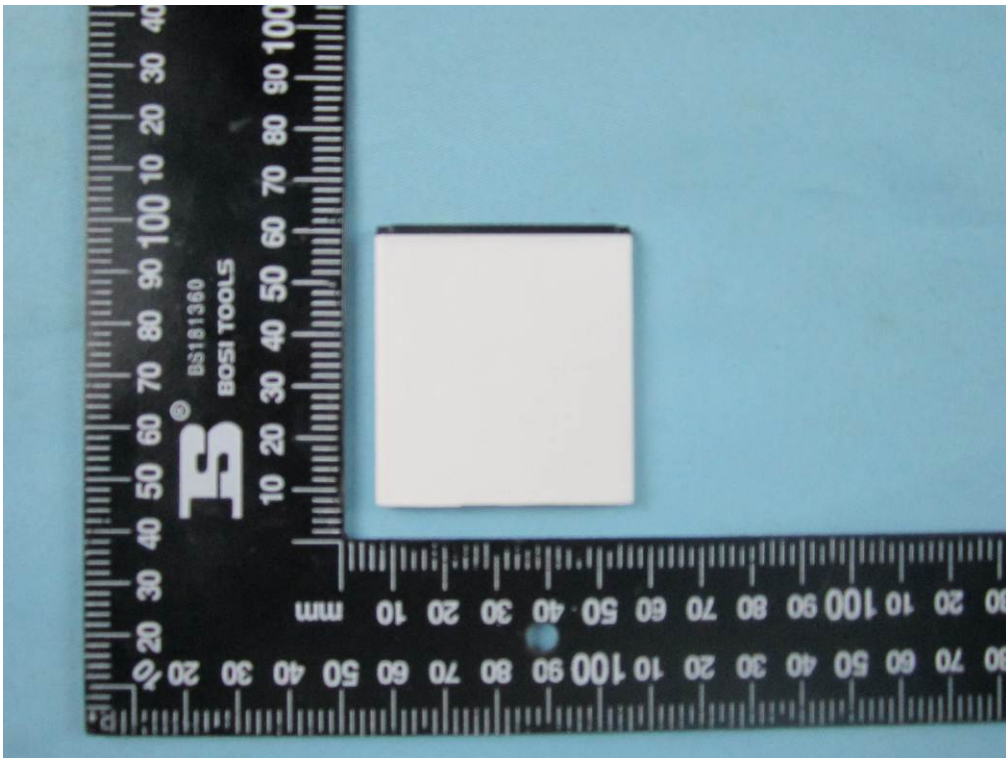
Cover Off - Top View 1



Cover Off - Top View 2



Battery - Top View



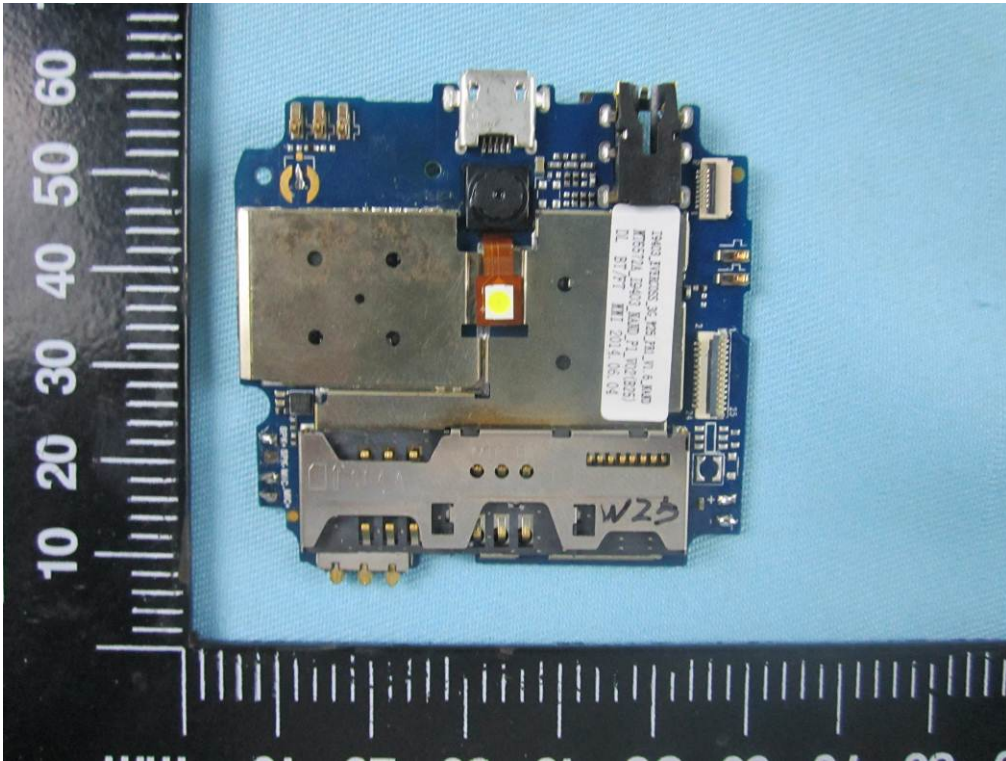
Battery - Bottom View



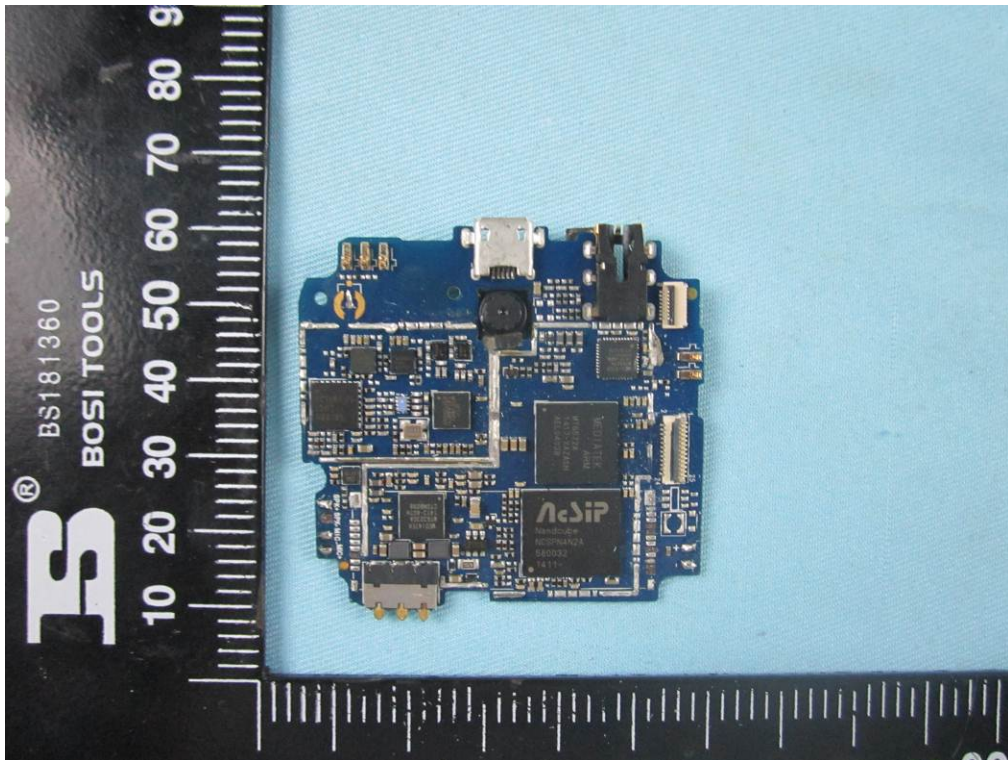
LCD – Front View



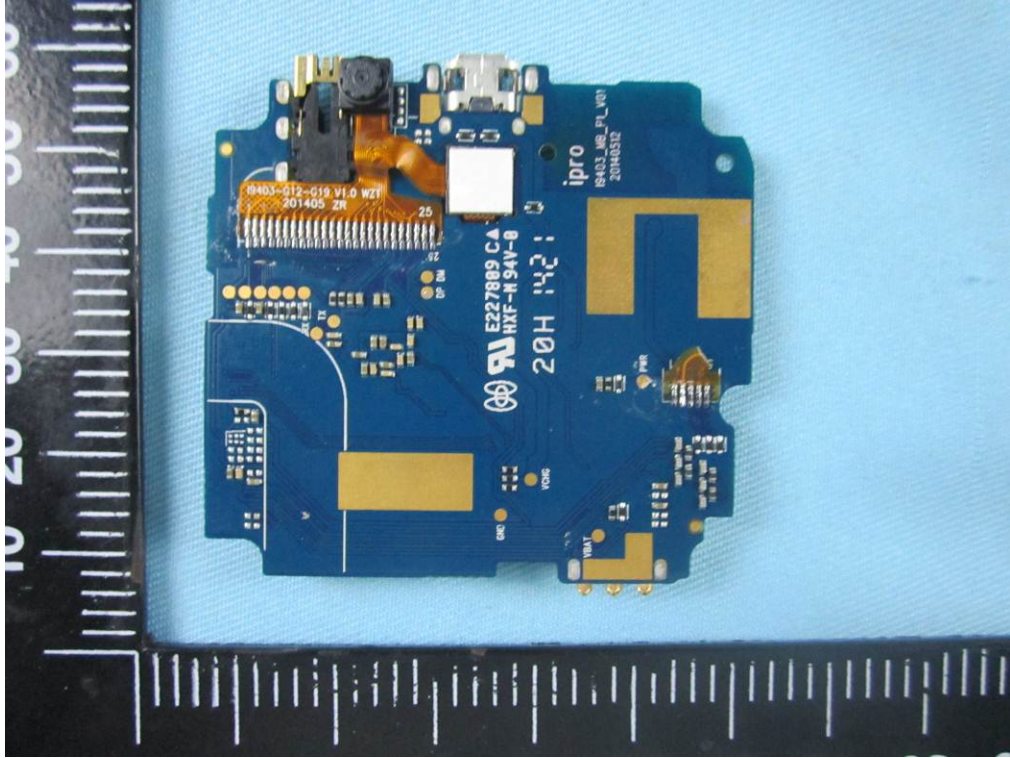
LCD – Rear View



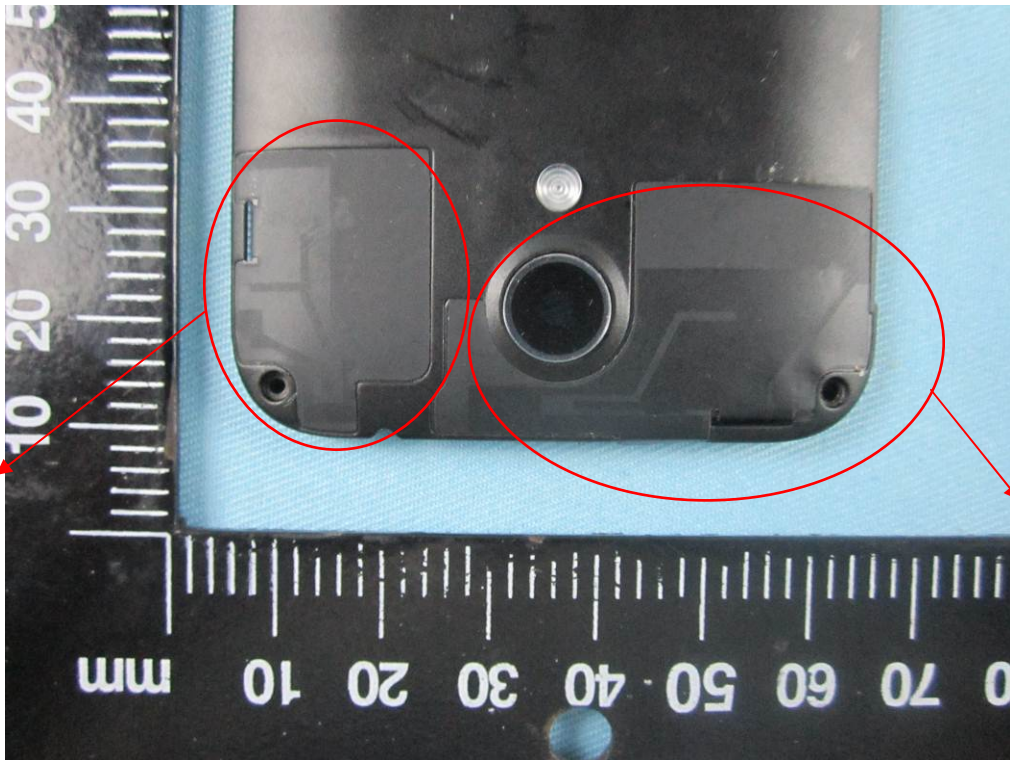
Mainboard With Shielding - Front View



Mainboard Without Shielding - Front View



Mainboard – Rear View

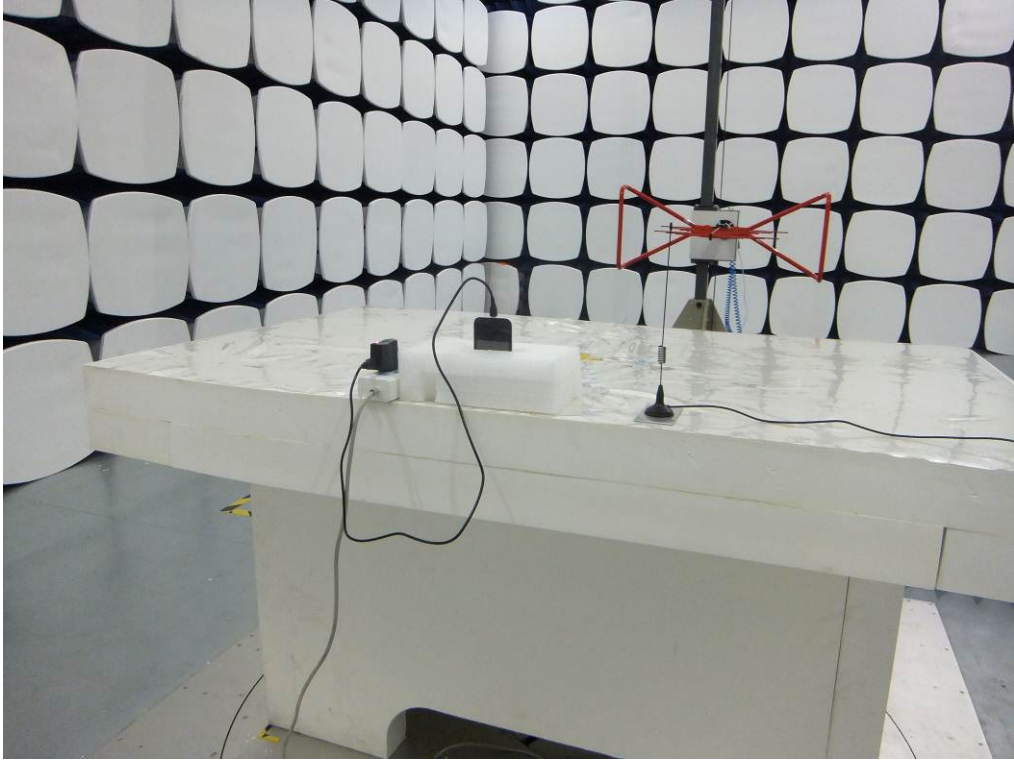


BT/WiFi/Bluetooth Antenna

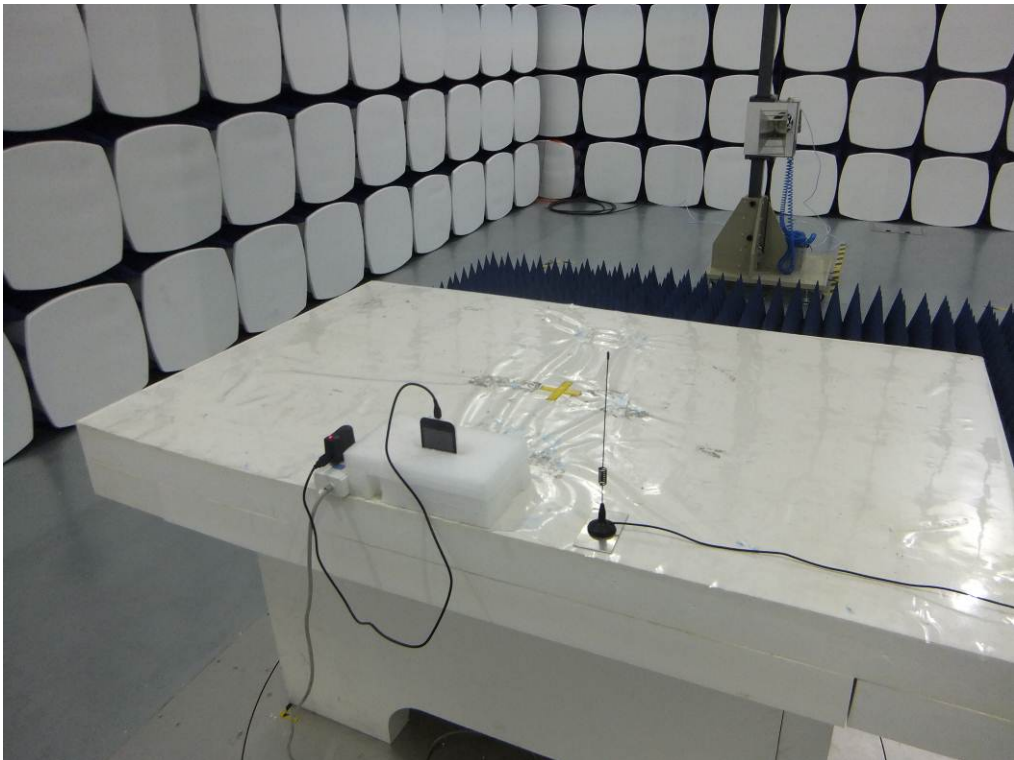
GSM/PCS/UMTS-FDD Antenna

Antenna View

**Annex B.iii. Photograph 3: Test Setup Photo**



Radiated Spurious Emissions Test Setup Below 1GHz - Front View



Radiated Spurious Emissions Test Setup Above 1GHz –Front View

**Annex C. TEST SETUP AND SUPPORTING EQUIPMENT**

**EUT TEST CONDITIONS**

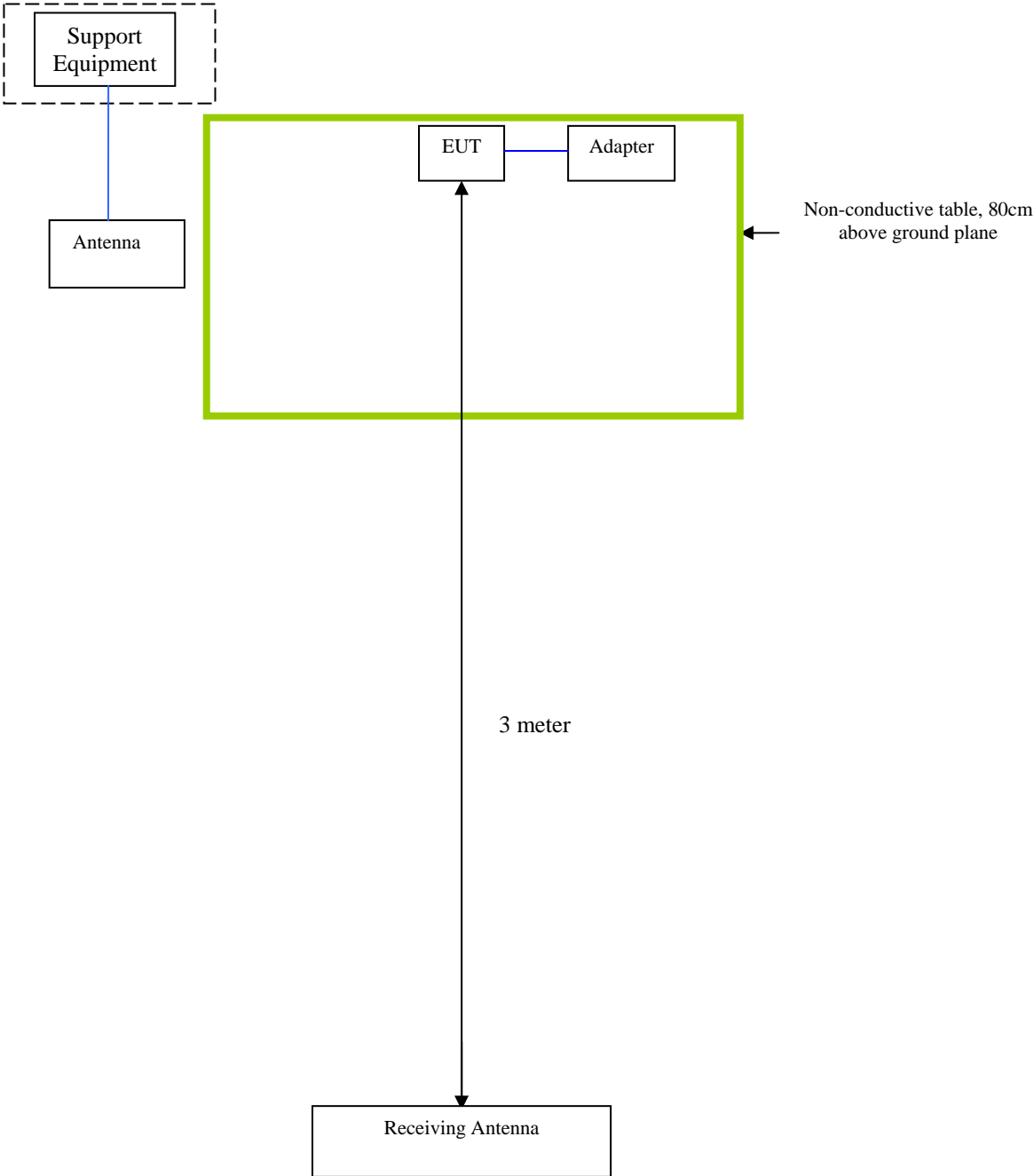
**Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION**

The following is a description of supporting equipment and details of cables used with the EUT.

Manufacturer	Equipment Description (Including Brand Name)	Model	Calibration Date	Calibration Due Date
N/A	N/A	N/A	N/A	N/A



### Block Configuration Diagram for Radiated Emissions



**Annex C.ii. EUT OPERATING CONDITIONS**

The following is the description of how the EUT is exercised during testing.

Test	Description Of Operation
<b>Emissions Testing</b>	The EUT was communicating with base station and set to work at maximum output power.
<b>Others Testing</b>	The EUT was communicating with base station and set to work at maximum output power.

**Annex D.USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PART LIST**

**Please see attachment**

**Annex E. DECLARATION OF SIMILARITY**

N/A