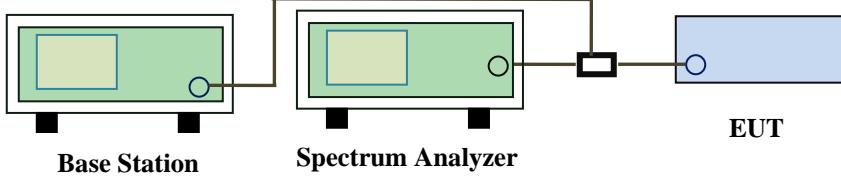


## 6.8 Band Edge 27.53(m)

Temperature	25 °C
Relative Humidity	53%
Atmospheric Pressure	1010mbar
Test date :	December 12, 2017
Tested By :	Aaron Liang

### Requirement(s):

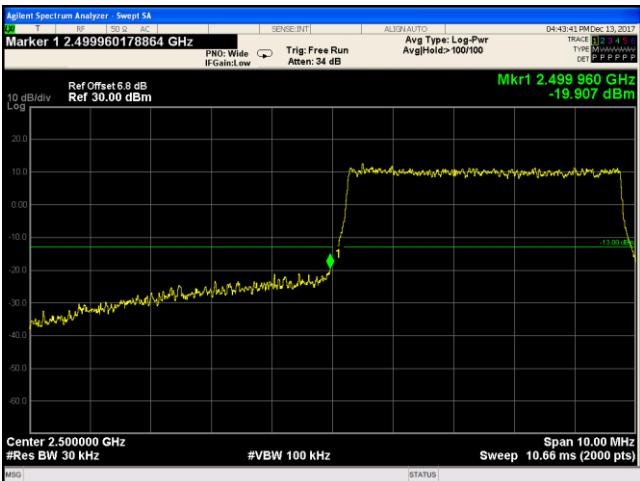
Spec	Requirement	Applicable
§27.53(m)	According to FCC 27.53(m)(4) specified that power of any emission outside of the channel edge must be attenuated below the transmitting power(P) by a factor shall be not less than $43+10\log(P)$ dB at the channel edge, the limit of emission equal to -13dBm. And $55+10\log(P)$ dB at 5.5MHz from the channel edges, the limit of emission equal to -25dBm. In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;"><b>Base Station</b>      <b>Spectrum Analyzer</b>      <b>EUT</b></p>	
Test Procedure	<ul style="list-style-type: none"> <li>The EUT was connected to Spectrum Analyzer and Base Station via power divider.</li> <li>The 99% and 26 dB occupied bandwidth (BW) of the middle channel for the highest RF powers.</li> </ul>	
Remark		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	

Test Data     Yes       N/A  
 Test Plot     Yes (See below)       N/A

### LTE Band VII (Part 27) result

BW(MHz)	Channel	Frequency (MHz)	Mode	Emission (dBm)	Limit (dBm)
5	20775	2500	QPSK	-19.907	-13
			16QAM	-19.792	-13
5	21425	2570	QPSK	-16.821	-13
			16QAM	-16.461	-13
10	20800	2500	QPSK	-21.296	-13
			16QAM	-23.997	-13
10	21400	2570	QPSK	-20.424	-13
			16QAM	-21.157	-13
15	20825	2500	QPSK	-22.498	-13
			16QAM	-23.284	-13
15	21400	2570	QPSK	-17.900	-13
			16QAM	-17.799	-13
20	20850	2500	QPSK	-21.297	-13
			16QAM	-22.879	-13
20	21350	2571	QPSK	-20.260	-13
			16QAM	-20.069	-13

## LTE Band VII (Part 27)



LTE Band VII - Low Channel QPSK-5

Note: Offset=Cable loss (4.5) + 10log  
(50.64/30)=4.5+2.3=6.8 dB



LTE Band VII - High Channel QPSK-5

Note: Offset=Cable loss (4.5) + 10log  
(50.32/30)=4.5+2.3=6.8 dB

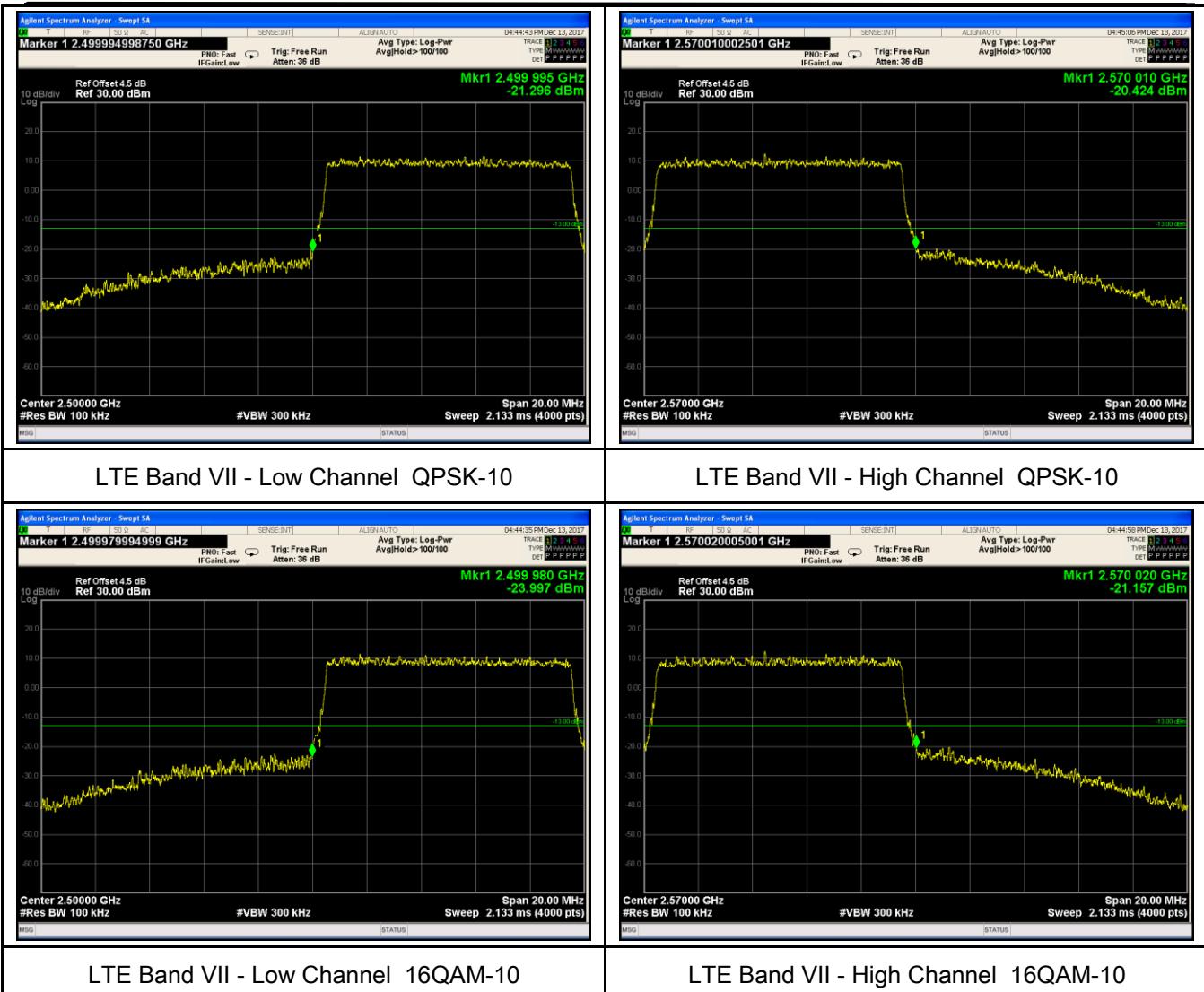


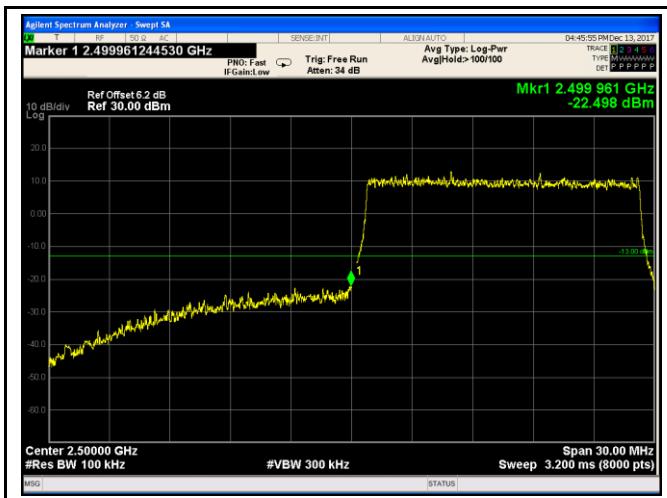
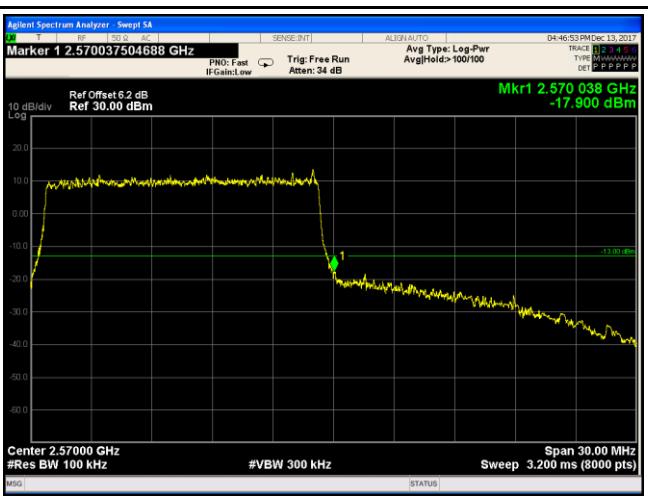
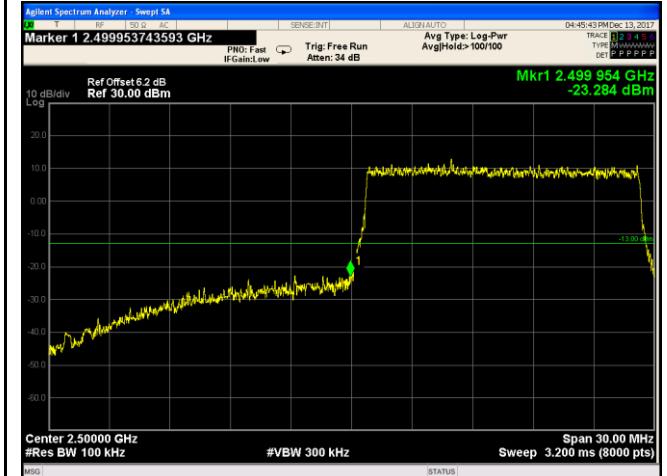
LTE Band VII - Low Channel 16QAM-5

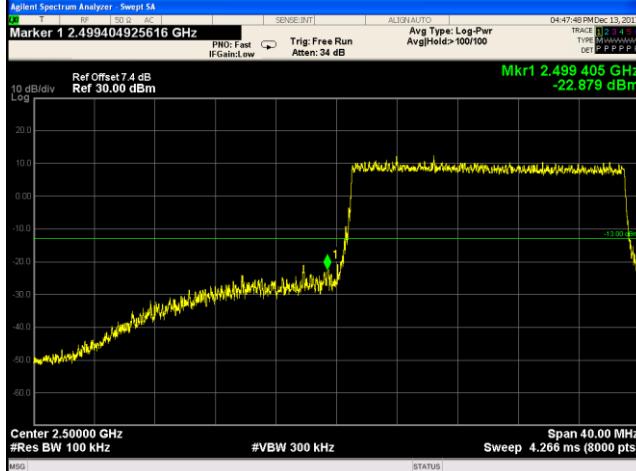
Note: Offset=Cable loss (4.5) + 10log  
(50.75/30)=4.5+2.3=6.8 dB

LTE Band VII - High Channel 16QAM-5

Note: Offset=Cable loss (4.5) + 10log  
(49.86/30)=4.5+2.3=6.8 dB



 <p>Agilent Spectrum Analyzer - Swept SA</p> <p>Marker 1 2.499961244530 GHz</p> <p>PNO: Fast IFGainLow Trig: Free Run Avg Type: Log-Pwr AvgHold&gt;100/100</p> <p>Ref Offset 5.2 dB Ref 30.00 dBm</p> <p>10 dB/div Log</p> <p>Mkr1 2.499 961 GHz -22.498 dBm</p> <p>Center 2.50000 GHz #Res BW 100 kHz #VBW 300 kHz Span 30.00 MHz Sweep 3.200 ms (8000 pts)</p>	 <p>Agilent Spectrum Analyzer - Swept SA</p> <p>Marker 1 2.570037504688 GHz</p> <p>PNO: Fast IFGainLow Trig: Free Run Avg Type: Log-Pwr AvgHold&gt;100/100</p> <p>Ref Offset 5.2 dB Ref 30.00 dBm</p> <p>10 dB/div Log</p> <p>Mkr1 2.570 038 GHz -17.900 dBm</p> <p>Center 2.57000 GHz #Res BW 100 kHz #VBW 300 kHz Span 30.00 MHz Sweep 3.200 ms (8000 pts)</p>
<p>LTE Band VII - Low Channel QPSK-15</p> <p>Note: Offset=Cable loss (4.5) + 10log (147.4/100)=4.5+1.7=6.2 dB</p>	<p>LTE Band VII - High Channel QPSK-15</p> <p>Note: Offset=Cable loss (4.5) + 10log (147.2/100)=4.5+1.7=6.2 dB</p>
 <p>Agilent Spectrum Analyzer - Swept SA</p> <p>Marker 1 2.499953743593 GHz</p> <p>PNO: Fast IFGainLow Trig: Free Run Avg Type: Log-Pwr AvgHold&gt;100/100</p> <p>Ref Offset 5.2 dB Ref 30.00 dBm</p> <p>10 dB/div Log</p> <p>Mkr1 2.499 954 GHz -23.284 dBm</p> <p>Center 2.50000 GHz #Res BW 100 kHz #VBW 300 kHz Span 30.00 MHz Sweep 3.200 ms (8000 pts)</p>	 <p>Agilent Spectrum Analyzer - Swept SA</p> <p>Marker 1 2.570030003750 GHz</p> <p>PNO: Fast IFGainLow Trig: Free Run Avg Type: Log-Pwr AvgHold&gt;100/100</p> <p>Ref Offset 5.2 dB Ref 30.00 dBm</p> <p>10 dB/div Log</p> <p>Mkr1 2.570 030 GHz -17.799 dBm</p> <p>Center 2.57000 GHz #Res BW 100 kHz #VBW 300 kHz Span 30.00 MHz Sweep 3.200 ms (8000 pts)</p>
<p>LTE Band VII - Low Channel 16QAM-15</p> <p>Note: Offset=Cable loss (4.5) + 10log (146.8/100)=4.5+1.7=6.2 dB</p>	<p>LTE Band VII - High Channel 16QAM-15</p> <p>Note: Offset=Cable loss (4.5) + 10log (145.2/100)=4.5+1.7=6.2 dB</p>

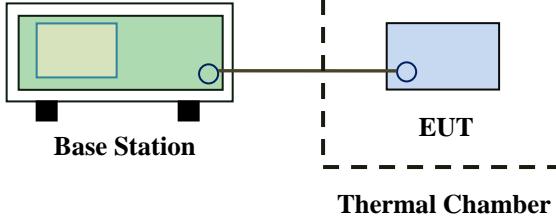
 <p>Marker 1 2.497829728716 GHz PN0: Fast IFGain:Low Trig: Free Run Atten: 34 dB Avg Type: Log-Pwr AvgHold&gt;100/100</p> <p>Mkr1 2.497 830 GHz -21.297 dBm</p> <p>10 dB/div Ref Offset 7.4 dB Ref 30.00 dBm</p> <p>Center 2.50000 GHz #Res BW 100 kHz #VBW 300 kHz Span 4.00 MHz Sweep 4.266 ms (8000 pts)</p>	 <p>Marker 1 2.570128766096 GHz PN0: Fast IFGain:Low Trig: Free Run Atten: 34 dB Avg Type: Log-Pwr AvgHold&gt;100/100</p> <p>Mkr1 2.570 129 GHz -20.260 dBm</p> <p>10 dB/div Ref Offset 7.4 dB Ref 30.00 dBm</p> <p>Center 2.57000 GHz #Res BW 100 kHz #VBW 300 kHz Span 4.00 MHz Sweep 4.266 ms (8000 pts)</p>
<p>LTE Band VII - Low Channel QPSK-20</p> <p>Note: Offset=Cable loss (4.5) + 10log <math>(194.8/100)=4.5+2.9=7.4</math> dB</p>	<p>LTE Band VII - High Channel QPSK-20</p> <p>Note: Offset=Cable loss (4.5) + 10log <math>(193.1/100)=4.5+2.9=7.4</math> dB</p>
 <p>Marker 1 2.499404925616 GHz PN0: Fast IFGain:Low Trig: Free Run Atten: 34 dB Avg Type: Log-Pwr AvgHold&gt;100/100</p> <p>Mkr1 2.499 405 GHz -22.879 dBm</p> <p>10 dB/div Ref Offset 7.4 dB Ref 30.00 dBm</p> <p>Center 2.50000 GHz #Res BW 100 kHz #VBW 300 kHz Span 4.00 MHz Sweep 4.266 ms (8000 pts)</p>	 <p>Marker 1 2.570148768596 GHz PN0: Fast IFGain:Low Trig: Free Run Atten: 34 dB Avg Type: Log-Pwr AvgHold&gt;100/100</p> <p>Mkr1 2.570 149 GHz -20.069 dBm</p> <p>10 dB/div Ref Offset 7.4 dB Ref 30.00 dBm</p> <p>Center 2.57000 GHz #Res BW 100 kHz #VBW 300 kHz Span 4.00 MHz Sweep 4.266 ms (8000 pts)</p>
<p>LTE Band VII - Low Channel 16QAM-20</p> <p>Note: Offset=Cable loss (4.5) + 10log <math>(193.5/100)=4.5+2.9=7.4</math> dB</p>	<p>LTE Band VII - High Channel 16QAM-20</p> <p>Note: Offset=Cable loss (4.5) + 10log <math>(193.0/100)=4.5+2.9=7.4</math> dB</p>

## 6.9 Frequency Stability

Temperature	25 °C
Relative Humidity	54%
Atmospheric Pressure	1010mbar
Test date :	December 06, 2017
Tested By :	Aaron Liang

### Requirement(s):

Spec	Item	Requirement	Applicable																																
§2.1055, §22.355 & §24.235 § 27.5(h); § 27.54	a)	<p>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:</p> <p>Frequency Tolerance for Transmitters in the Public Mobile Services</p> <table border="1"> <thead> <tr> <th>Frequency Range (MHz)</th> <th>Base, fixed (ppm)</th> <th>Mobile ≤ 3 watts (ppm)</th> <th>Mobile ≤ 3 watts (ppm)</th> </tr> </thead> <tbody> <tr> <td>25 to 50</td> <td>20.0</td> <td>20.0</td> <td>50.0</td> </tr> <tr> <td>50 to 450</td> <td>5.0</td> <td>5.0</td> <td>50.0</td> </tr> <tr> <td>450 to 512</td> <td>2.5</td> <td>5.0</td> <td>50.0</td> </tr> <tr> <td>821 to 896</td> <td>1.5</td> <td>2.5</td> <td>2.5</td> </tr> <tr> <td>928 to 929.</td> <td>5.0</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td>929 to 960.</td> <td>1.5</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td>2110 to 2220</td> <td>10.0</td> <td>N/A</td> <td>N/A</td> </tr> </tbody> </table> <p>According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized frequency block.</p> <p>According to §27.54, The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.</p>	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	50.0	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	<input checked="" type="checkbox"/>
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	50.0																																
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																																

Test setup	 <p>Base Station      EUT Thermal Chamber</p>
Procedure	<p>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.</p> <p>Limit: The frequency stability of the transmitter shall be maintained within <math>\pm 0.00025\%</math> (<math>\pm 2.5\text{ppm}</math>) of the center frequency.</p>
Remark	<p>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 <math>-10^\circ\text{C}</math> to <math>+55^\circ\text{C}</math> at normal supply voltage.</p>
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data     Yes       N/A

Test Plot     Yes (See below)       N/A

### LTE Band II (Part 24E) result

Middle Channel, $f_0 = 1880$ MHz				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	-12	0.0069	2.5
0		-12	0.0069	2.5
10		-13	0.0075	2.5
20		-9	0.0052	2.5
30		-17	0.0098	2.5
40		-15	0.0087	2.5
50		-16	0.0092	2.5
55		-10	0.0058	2.5
25	4.2	-13	0.0075	2.5
	3.5	-14	0.0081	2.5

### LTE Band IV (Part 27) result

Middle Channel, $f_0 = 1732.5$ MHz				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	-12	0.0069	2.5
0		-16	0.0092	2.5
10		-17	0.0098	2.5
20		-14	0.0081	2.5
30		-12	0.0069	2.5
40		-16	0.0092	2.5
50		-13	0.0075	2.5
55		-14	0.0081	2.5
25	4.2	-17	0.0098	2.5
	3.5	-12	0.0069	2.5

### LTE Band VII (Part 27) result

Middle Channel, $f_0 = 2535$ MHz				
Temperature (°C)	Power Supplied (V <sub>dc</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	-12	0.0069	2.5
0		-7	0.0040	2.5
10		-8	0.0046	2.5
20		-13	0.0075	2.5
30		-9	0.0052	2.5
40		-8	0.0046	2.5
50		-11	0.0063	2.5
55		-12	0.0069	2.5
25	4.2	-10	0.0058	2.5
	3.5	-17	0.0098	2.5

### LTE Band XII (Part 27) result

Middle Channel, $f_0 = 707.5$ MHz				
Temperature (°C)	Power Supplied (V <sub>dc</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	-12	0.0069	2.5
0		-17	0.0098	2.5
10		-8	0.0046	2.5
20		-17	0.0098	2.5
30		-16	0.0092	2.5
40		-15	0.0087	2.5
50		-12	0.0069	2.5
55		-13	0.0075	2.5
25	4.2	-13	0.0075	2.5
	3.5	-9	0.0052	2.5

### LTE Band XVII (Part 27) result

Middle Channel, $f_o = 710$ MHz				
Temperature (°C)	Power Supplied (V <sub>dc</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	-12	0.0069	2.5
0		-16	0.0092	2.5
10		-16	0.0092	2.5
20		-14	0.0081	2.5
30		-8	0.0046	2.5
40		-15	0.0087	2.5
50		-11	0.0063	2.5
55		-15	0.0087	2.5
25	4.2	-8	0.0046	2.5
	3.5	-15	0.0087	2.5

## Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
<b>RF Conducted Test</b>					
Agilent ESA-E SERIES SPECTRUM ANALYZER	E4407B	MY45108319	09/14/2017	09/13/2018	<input checked="" type="checkbox"/>
Power Splitter	1#	1#	08/30/2017	08/29/2018	<input checked="" type="checkbox"/>
Universal Radio Communication Tester	CMU200	121393	09/23/2017	09/22/2018	<input checked="" type="checkbox"/>
Wideband Radio Communication Tester	CMW500	120906	03/26/2017	03/25/2018	<input checked="" type="checkbox"/>
Temperature/Humidity Chamber	UHL-270	001	10/07/2017	10/06/2018	<input checked="" type="checkbox"/>
DC Power Supply	E3640A	MY40004013	09/15/2017	09/14/2018	<input checked="" type="checkbox"/>
RF Power Sensor	Dare RPR3006C/P/W	AY554013	09/15/2017	09/14/2018	<input checked="" type="checkbox"/>
<b>Radiated Emissions</b>					
EMI test receiver	ESL6	100262	09/15/2017	09/14/2018	<input checked="" type="checkbox"/>
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	08/30/2017	08/29/2018	<input checked="" type="checkbox"/>
Microwave Preamplifier (0.5 ~ 18GHz)	PAM-118	443008	08/30/2017	08/29/2018	<input checked="" type="checkbox"/>
Horn Antenna	BBHA9170	3145226D1	09/27/2017	09/26/2018	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/19/2017	09/18/2018	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~2GHz)	JB1	A112017	09/19/2017	09/18/2018	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71259	09/22/2017	09/21/2018	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/22/2017	09/21/2018	<input checked="" type="checkbox"/>
SYNTHESIZED SIGNAL GENERATOR	8665B	3744A01293	09/15/2017	09/14/2018	<input checked="" type="checkbox"/>

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Tunable Notch Filter	3NF-800/1000-S	AA4	08/30/2017	08/29/2018	<input checked="" type="checkbox"/>
Tunable Notch Filter	3NF-1000/2000-S	AM 4	08/30/2017	08/29/2018	<input checked="" type="checkbox"/>

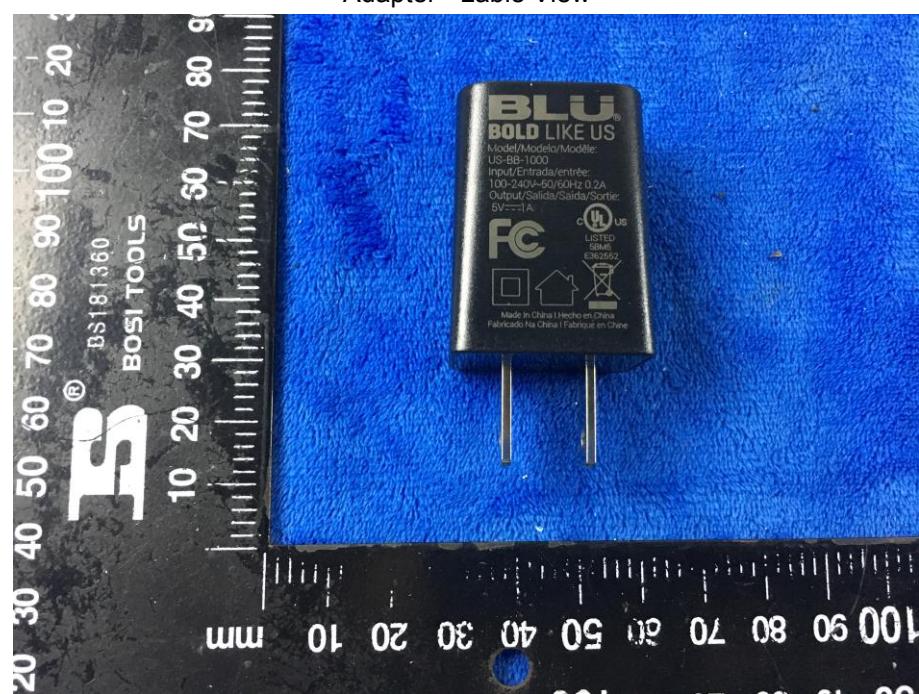
## Annex B. EUT And Test Setup Photographs

### Annex B.i. Photograph: EUT External Photo

Whole Package View



Adapter - Label View



EUT - Front View



EUT - Rear View



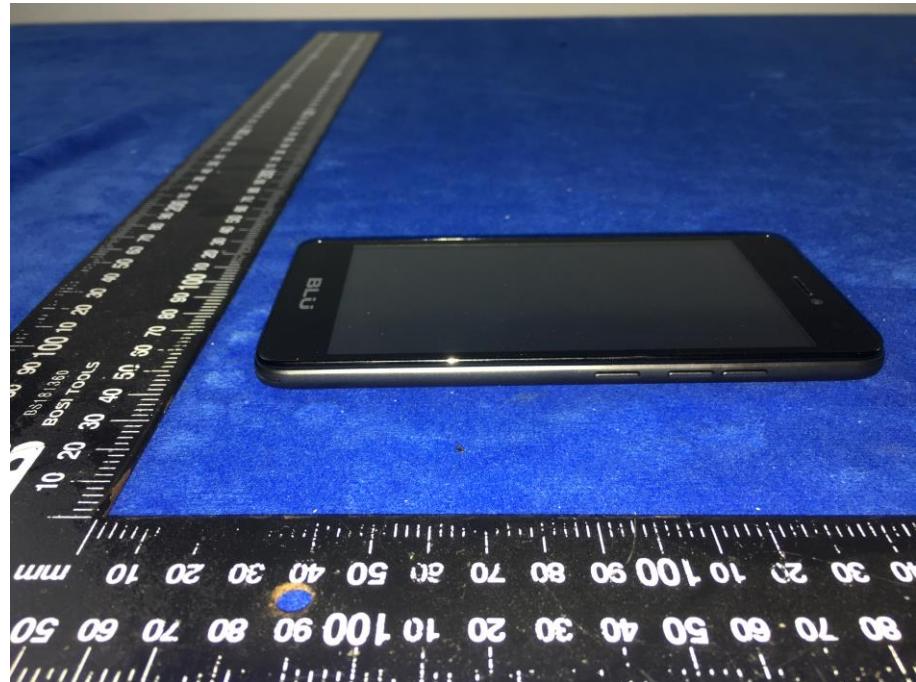
EUT - Top View



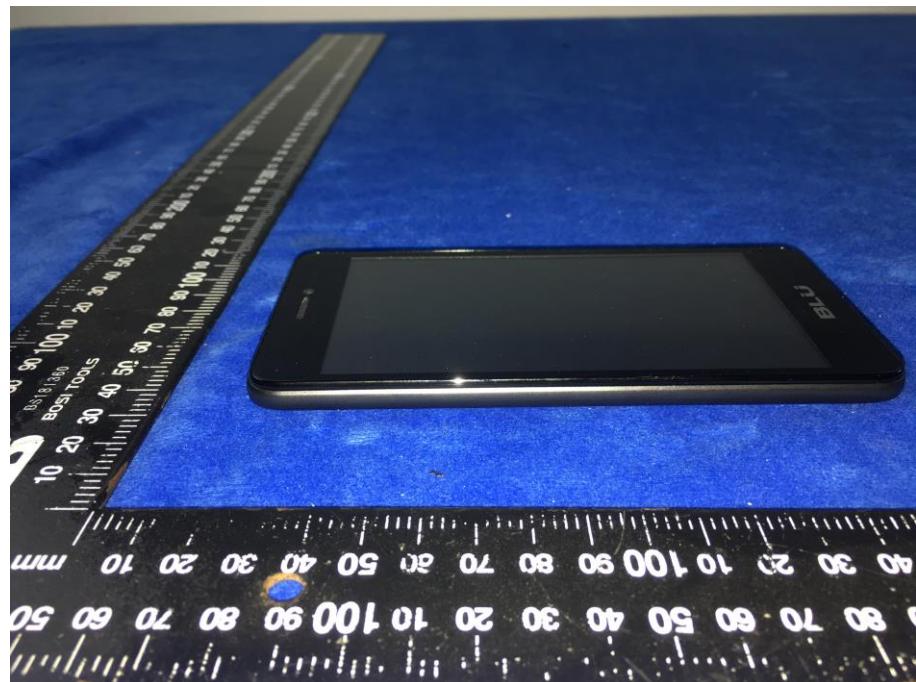
EUT - Bottom View



EUT - Left View



EUT - Right View



### Annex B.ii. Photograph: EUT Internal Photo

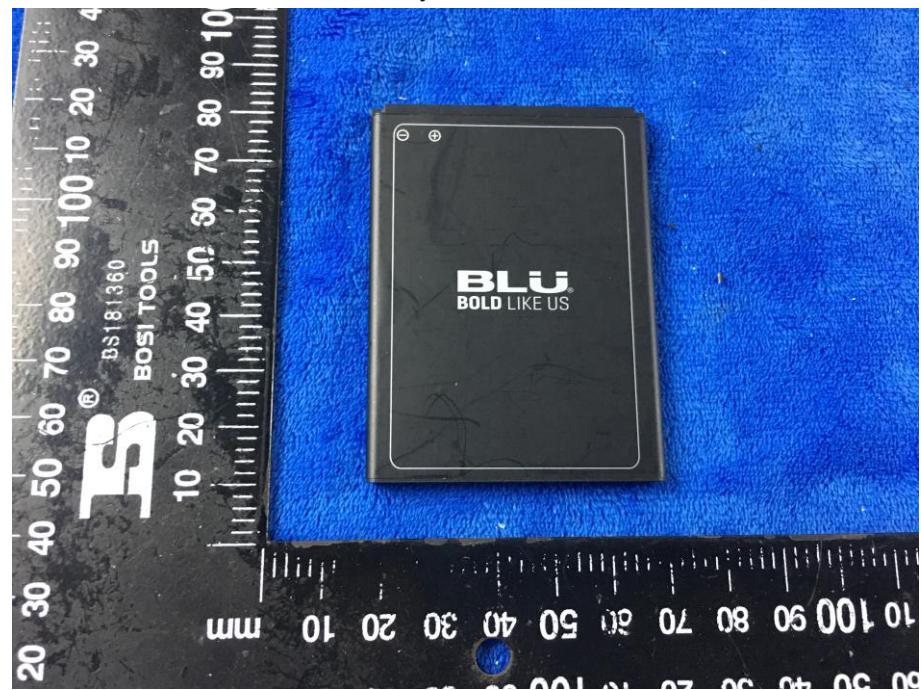
Cover Off - Top View 1



Cover Off - Top View 2



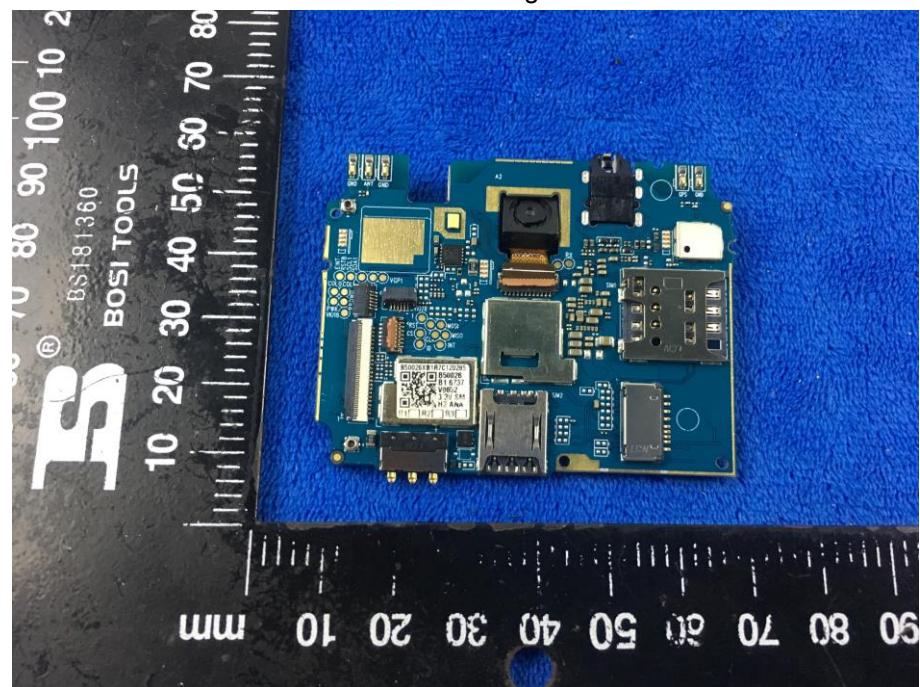
Battery - Front View



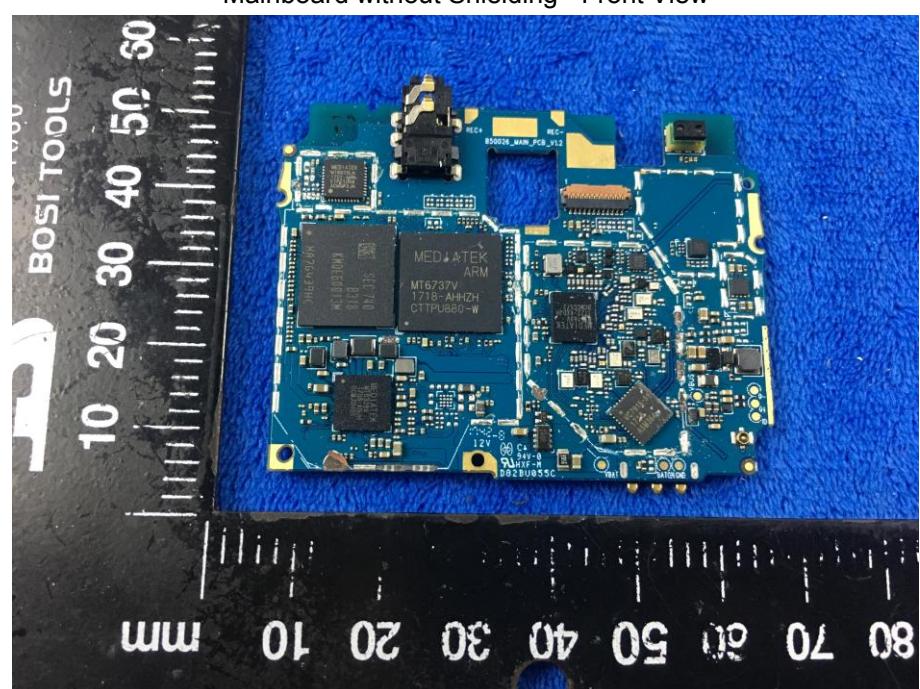
Battery - Rear View



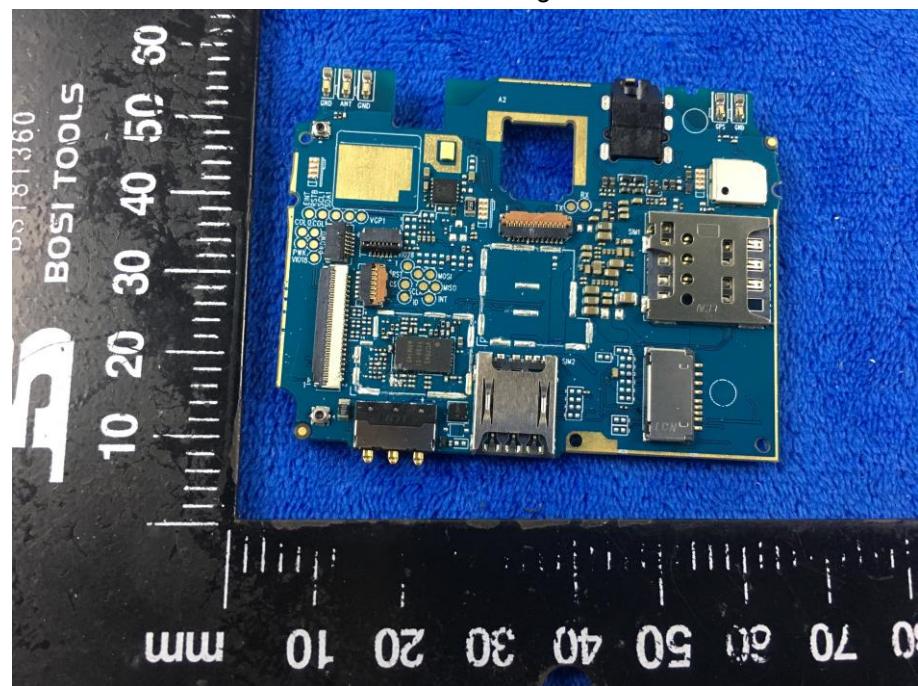
Mainboard with Shielding - Front View



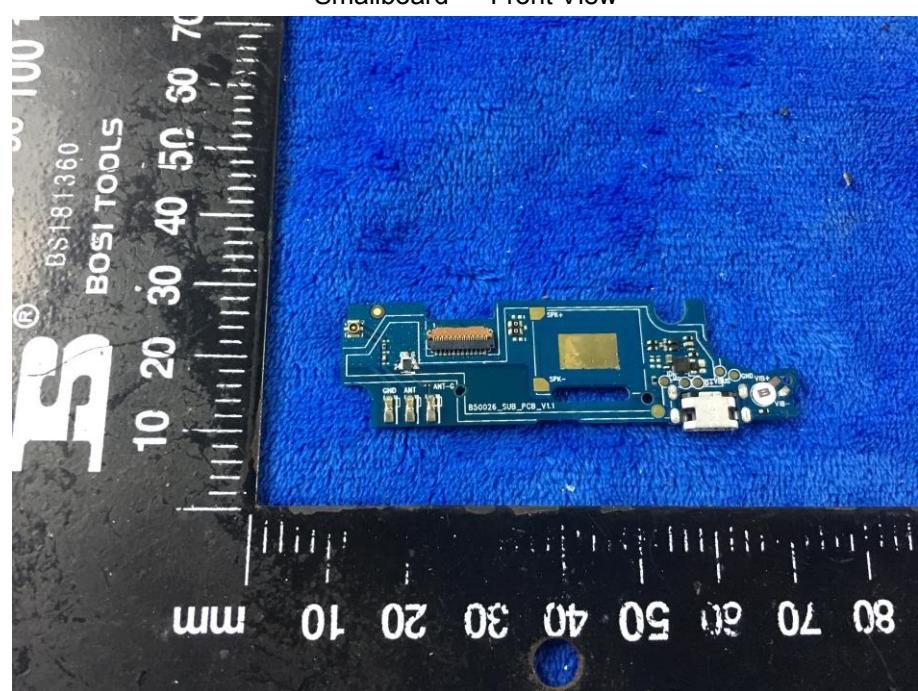
Mainboard without Shielding - Front View



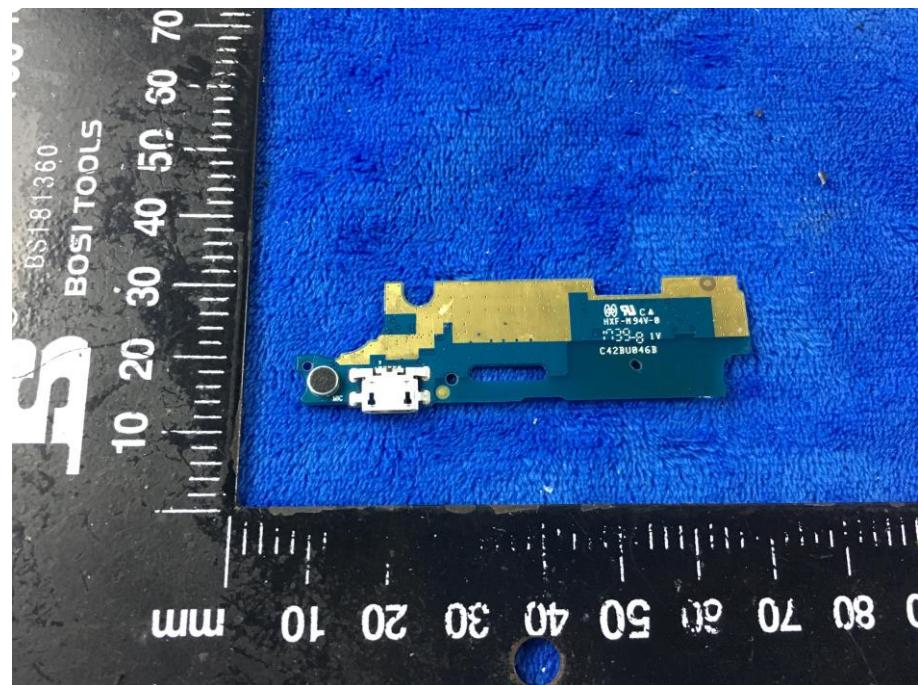
Mainboard without Shielding – Rear View



Smallboard – Front View



Smallboard – Rear View



LCD – Front View



LCD – Rear View



GSM/PCS/UMTS-FDD/LTE Antenna View



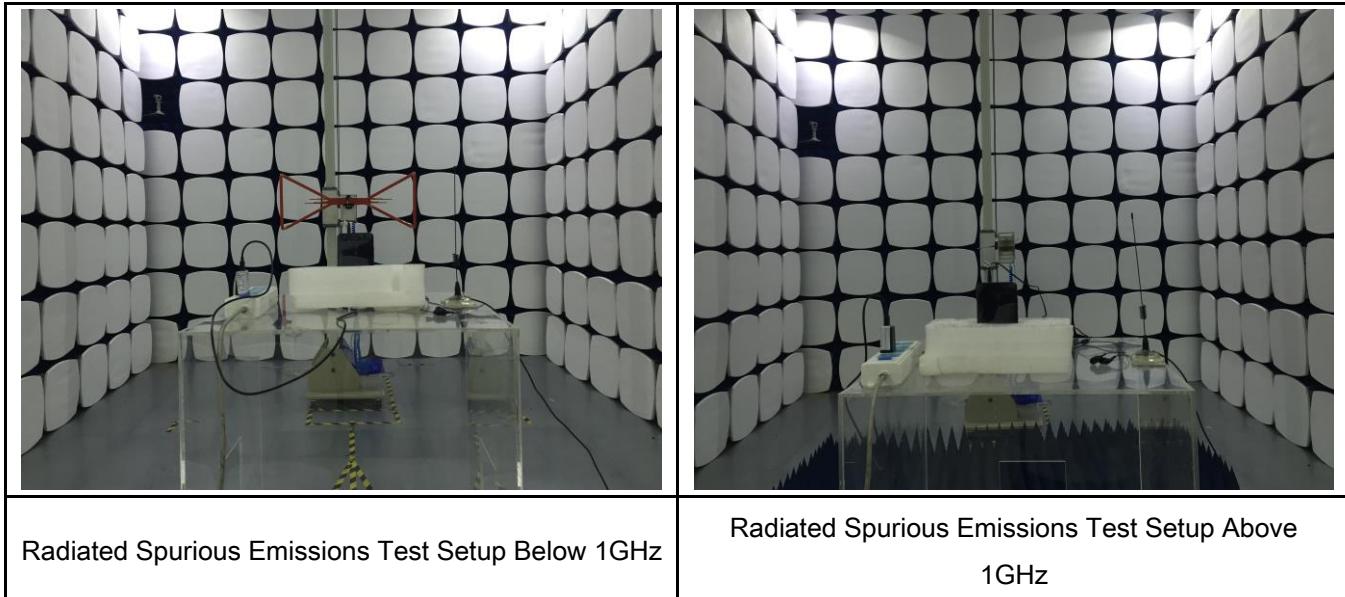
WIFI/BT/BLE/GPS - Antenna View



RXD- Antenna View



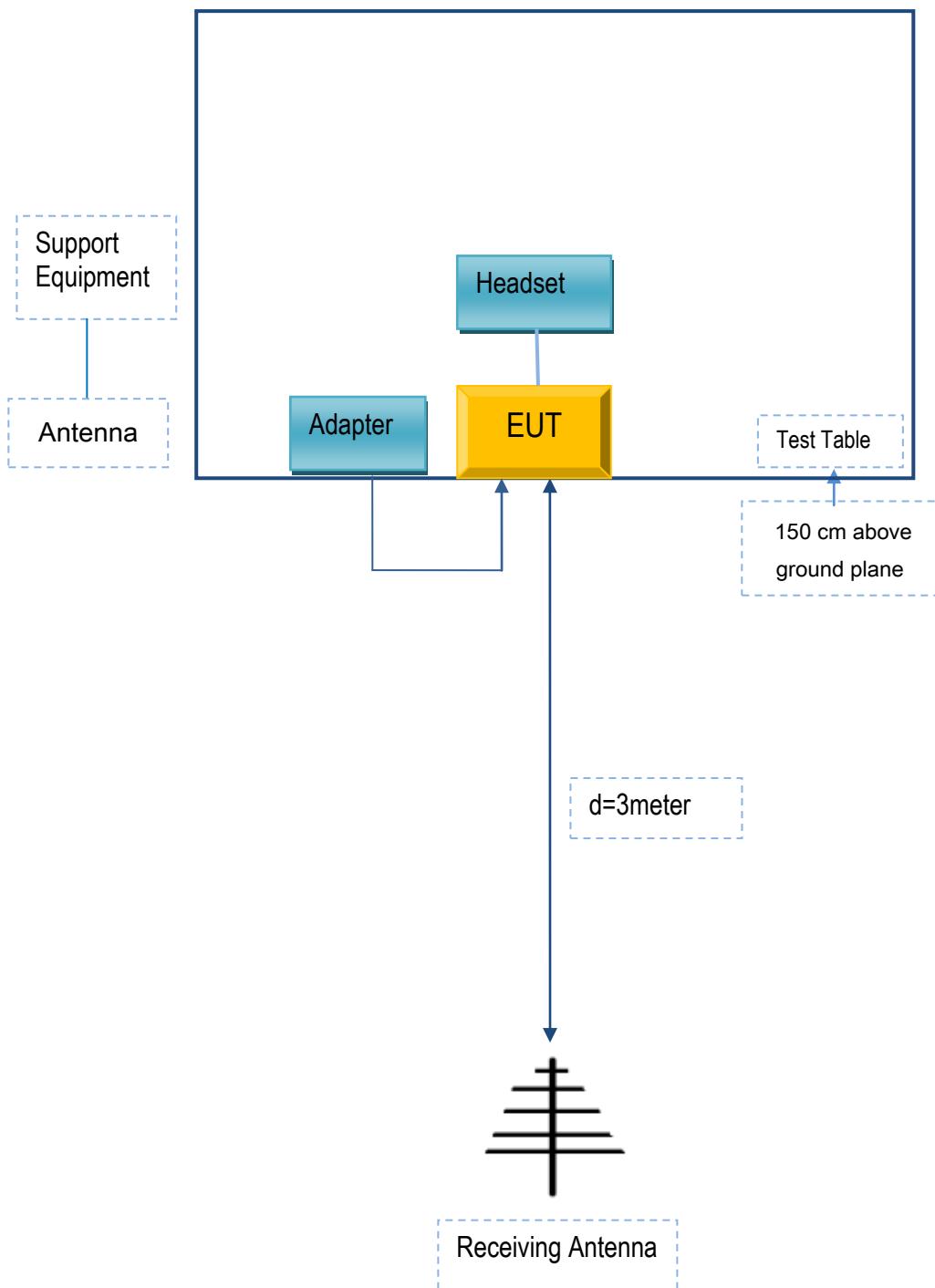
**Annex B.iii. Photograph: Test Setup Photo**



## Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

### Annex C.ii. TEST SET UP BLOCK

Block Configuration Diagram for Radiated Emissions



## Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

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

### Supporting Equipment:

Manufacturer	Equipment Description	Model	Serial No
BLU Products, Inc.	Adapter	US-BB-1000	N/A
SAMSUNG	headset	HS330	N/A
Agilent	Wireless Connectivity Test Set	N4010A	N/A
OEM	omnidirectional antenna	AntSuck	N/A

### Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
USB Cable	Un-shielding	No	0.8m	N/A

## Annex C.ii. EUT OPERATING CONDITIONS

N/A

## Annex D. User Manual / Block Diagram / Schematics / Partlist

Please see the attachment

## Annex E. DECLARATION OF SIMILARITY

N/A