
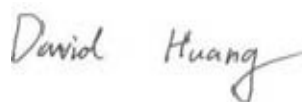



# RF TEST REPORT



Report No.: 16050024-FCC-R1

Supersede Report No.: N/A

Applicant	Quectel Wireless Solutions Co., Ltd.	
Product Name	GSM/GPRS/GNSS Module	
Model No.	MC60	
Serial No.	N/A	
Test Standard	FCC Part 22(H):2015 ;FCC Part 24(E):2015; ANSI/TIA-603-D: 2010	
Test Date	August 24 to September 22, 2016	
Issue Date	September 23, 2016	
Test Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	
Equipment complied with the specification	<input checked="" type="checkbox"/>	
Equipment did not comply with the specification	<input type="checkbox"/>	
		
Loren Luo Test Engineer	David Huang Checked By	
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only		

Issued by:

**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 518108

Phone: +86 0755 2601 4629801 Email: [China@siemic.com.cn](mailto:China@siemic.com.cn)

## Laboratories 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.



In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

### Accreditations for Conformity Assessment

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

Test Report	16050024-FCC-R1
Page	3 of 46

This page has been left blank intentionally.

# CONTENTS

1. REPORT REVISION HISTORY .....	5
2. CUSTOMER INFORMATION .....	5
3. TEST SITE INFORMATION.....	5
4. EQUIPMENT UNDER TEST (EUT) INFORMATION.....	6
5. TEST SUMMARY .....	8
6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS .....	9
6.1 RF EXPOSURE (SAR).....	9
6.2 RF OUTPUT POWER.....	10
6.3 PEAK - AVERAGE RATIO .....	13
6.4 OCCUPIED BANDWIDTH.....	16
6.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS.....	20
6.6 SPURIOUS RADIATED EMISSIONS.....	25
6.7 BAND EDGE.....	29
6.8 FREQUENCY STABILITY .....	33
ANNEX A. TEST INSTRUMENT.....	37
ANNEX B. EUT AND TEST SETUP PHOTOGRAPHS.....	39
ANNEX C. TEST SETUP AND SUPPORTING EQUIPMENT.....	42
ANNEX C.II. EUT OPERATING CONKITIONS.....	44
ANNEX D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PARTLIST.....	45
ANNEX E. DECLARATION OF SIMILARITY.....	46

## 1. Report Revision History

Report No.	Report Version	Description	Issue Date
16050024-FCC-R1	NONE	Original	September 23, 2016

## 2. Customer information

Applicant Name	Quectel Wireless Solutions Co., Ltd.
Applicant Add	RM501,Building 13,No.99 TianZhou Road,Xuhui District,Shanghai,China
Manufacturer	Quectel Wireless Solutions Co., Ltd.
Manufacturer Add	RM501,Building 13,No.99 TianZhou Road,Xuhui District,Shanghai,China

## 3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	718246
IC Test Site No.	4842E-1
Test Software	Radiated Emission Program-To Shenzhen v2.0

## 4. Equipment under Test (EUT) Information

Description of EUT:	GSM/GPRS/GNSS Module
Main Model:	MC60
Serial Model:	N/A
Date EUT received:	August 23, 2016
Test Date(s):	August 24 to September 22, 2016
Equipment Category :	PCB
Antenna Gain:	GSM850: 1dBi PCS1900: 1dBi Bluetooth:1dBi <b>( Note: The radio module will be sold without antenna, this antenna only used limited to ERP/EIRP or radiated spurious emission test. )</b>
Type of Modulation:	GSM / GPRS: GMSK Bluetooth: GFSK, $\pi$ /4DQPSK, 8DPSK
RF Operating Frequency (ies):	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 Bluetooth: 2402-2480 MHz
Maximum Conducted AV Power to Antenna:	GSM Viocce:GSM850: 31.38dBm PCS1900: 28.69dBm GPRS:GSM850: 31.37dBm PCS1900: 28.67dBm
Number of Channels:	GSM 850: 124CH PCS1900: 299CH Bluetooth: 79CH
Port:	N/A
Input Power:	Spec: DC 4.0V



## 5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
§ 1.1307; § 2.1093	RF Exposure (SAR)	Compliance
§2.1046; § 22.913(a); § 24.232(c);	RF Output Power	Compliance
§ 24.232 (d) ;	Peak-Average Ratio	Compliance
§ 2.1049; § 22.905; § 22.917; § 24.238;	99% & -26 dB Occupied Bandwidth	Compliance
§ 2.1051; § 22.917(a); § 24.238(a);	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053; § 22.917(a); § 24.238(a);	Field Strength of Spurious Radiation	Compliance
§ 22.917(a); § 24.238(a);	Out of band emission, Band Edge	Compliance
§ 2.1055; § 22.355; § 24.235;	Frequency stability vs. temperature Frequency stability vs. voltage	Compliance

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

### Measurement Uncertainty

Emissions		
Test Item	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
-	-	-



## 6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

### 6.1 RF Exposure (SAR)

Test Result: Pass

The EUT is a Mobile device, thus requires MPE evaluation;

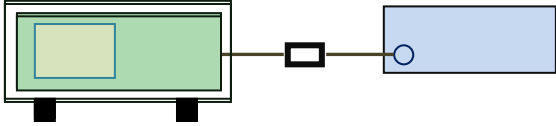
Please refer to RF Exposure Evaluation Report: 16050024-FCC-H.

## 6.2 RF Output Power

Temperature	24°C
Relative Humidity	52%
Atmospheric Pressure	1019mbar
Test date :	September 19, 2016
Tested By :	Loren Luo

### Requirement(s):

Spec	Item	Requirement	Applicable
§22.913 (a)	a)	ERP:38.45dBm	<input checked="" type="checkbox"/>
§24.232 (c)	b)	EIRP:33dBm	<input checked="" type="checkbox"/>

Test Setup	
------------	---

Test Procedure	<p>For Conducted Power:</p> <ul style="list-style-type: none"> <li>- The transmitter output port was connected to base station.</li> <li>- Set EUT at maximum power through base station.</li> <li>- Select lowest, middle, and highest channels for each band and different test mode.</li> </ul> <p>For ERP/EIRP:</p> <p>According with KDB 971168 v02r02</p> <ul style="list-style-type: none"> <li>- The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.</li> <li>- 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.</li> <li>- The frequency range up to tenth harmonic of the fundamental frequency was investigated.</li> </ul>
----------------	---

Test Report	16050024-FCC-R1
Page	11 of 46

	<ul style="list-style-type: none"> <li>- 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.</li> <li>- Spurious emissions in dB = 10 log (TX power in Watts/0.001) – the absolute level</li> <li>- Spurious attenuation limit in dB = 43 + 10 Log10 (power out in Watts).</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

## Conducted Power

### GSM Mode:

Burst Average Power (dBm);								
Band	GSM850				PCS1900			
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	31.22	<b>31.38</b>	31.25	31.75±0.75	28.66	<b>28.69</b>	28.64	28.75±0.75
GPRS Multi-Slot Class 8 (1 uplink),GMSK	31.22	<b>31.37</b>	31.23	31.75±0.75	28.66	<b>28.67</b>	28.64	28.75±0.75
GPRS Multi-Slot Class 10 (2 uplink) GMSK	30.51	31.31	31.19	30.5±1	28.6	28.6	28.53	28.75±0.75
GPRS Multi-Slot Class 12 (4 uplink) GMSK	30.2	30.01	29.90	29.5±1	28.51	28.52	28.45	28.75±0.75

Remark :

GPRS, CS1 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

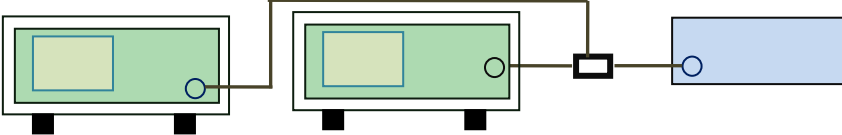
Multi-Slot Class 12 , Support Max 4 downlink, 4 uplink , 5 working link

### 6.3 Peak - Average Ratio

Temperature	24°C
Relative Humidity	52%
Atmospheric Pressure	1019mbar
Test date :	September 19, 2016
Tested By :	Loren Luo

Requirement(s):

Spec	Item	Requirement	Applicable
§24.232(d)	a)	The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.	<input checked="" type="checkbox"/>

Test Setup	
------------	--

Test Procedure	<p>According with KDB 971168 v02r02</p> <p><b>5.7.2 Alternate procedure for PAPR</b></p> <p><b>5.1.2 Peak power measurements with a peak power meter</b></p> <p>The total peak output power may be measured using a broadband peak RF power meter. The power meter must have a video bandwidth that is greater than or equal to the emission bandwidth and utilize a fast-responding diode detector.</p> <p><b>5.2.3 Average power measurement with average power meter</b></p> <p>As an alternative to the use of a spectrum/signal analyzer or EMI receiver to perform a measurement of the total in-band average output power, a wideband RF average power meter with a thermocouple detector or equivalent can be used under certain conditions</p> <p>If the EUT can be configured to transmit continuously (i.e., the burst duty cycle <math>\geq 98\%</math>) and at all times the EUT is transmitting at its maximum output power level, then a conventional wide-band RF power meter can be used.</p>
----------------	--

Test Report	16050024-FCC-R1
Page	14 of 46

	<p>If the EUT cannot be configured to transmit continuously (i.e., the burst duty cycle &lt; 98%), then there are two options for the use of an average power meter. First, a gated average power meter can be used to perform the measurement if the gating parameters can be adjusted such that the power is measured only over active transmission bursts at maximum output power levels. A conventional average power meter can also be used if the measured burst duty cycle is constant (i.e., duty cycle variations are less than <math>\pm 2</math> percent) by performing the measurement over the on/off burst cycles and then correcting (increasing) the measured level by a factor equal to <math>10\log(1/\text{duty cycle})</math></p>
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

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

**GSM : GSM 1900 PK-AV POWER (PART 24E)**

Frequency (MHz)	Conducted power(dBm)		Peak-Average Ratio(PAR)
	Peak	Average	
1850.2	30.78	28.66	2.12
1880	30.96	28.69	2.27
1909.8	30.57	28.64	1.93

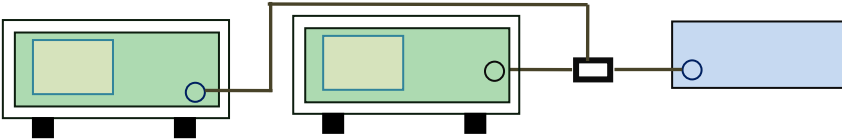
**GPRS 1900 PK-AV POWER (PART 24E)**

Frequency (MHz)	Conducted power(dBm)		Peak-Average Ratio(PAR)
	Peak	Average	
1850.2	29.85	28.66	1.19
1880	30.33	28.67	1.66
1909.8	30.12	28.64	1.48

## 6.4 Occupied Bandwidth

Temperature	24°C
Relative Humidity	52%
Atmospheric Pressure	1019mbar
Test date :	September 19, 2016
Tested By :	Loren Luo

### Requirement(s):

Spec	Item	Requirement	Applicable
§2.1049, §22.917, §22.905 §24.238	a)	99% Occupied Bandwidth(kHz)	<input checked="" type="checkbox"/>
	b)	26 dB Bandwidth(kHz)	<input checked="" type="checkbox"/>
Test Setup			
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



**GSM Voice:**

**Cellular Band (Part 22H) result**

Channel	Frequency (MHz)	26 dB Bandwidth (kHz)
128	824.2	317
190	836.6	318
251	848.8	317

**PCS Band (Part 24E) result**

Channel	Frequency (MHz)	26 dB Bandwidth (kHz)
512	1850.2	323
661	1880.0	323
810	1909.8	325

**GPRS:**

**Cellular Band (Part 22H) result**

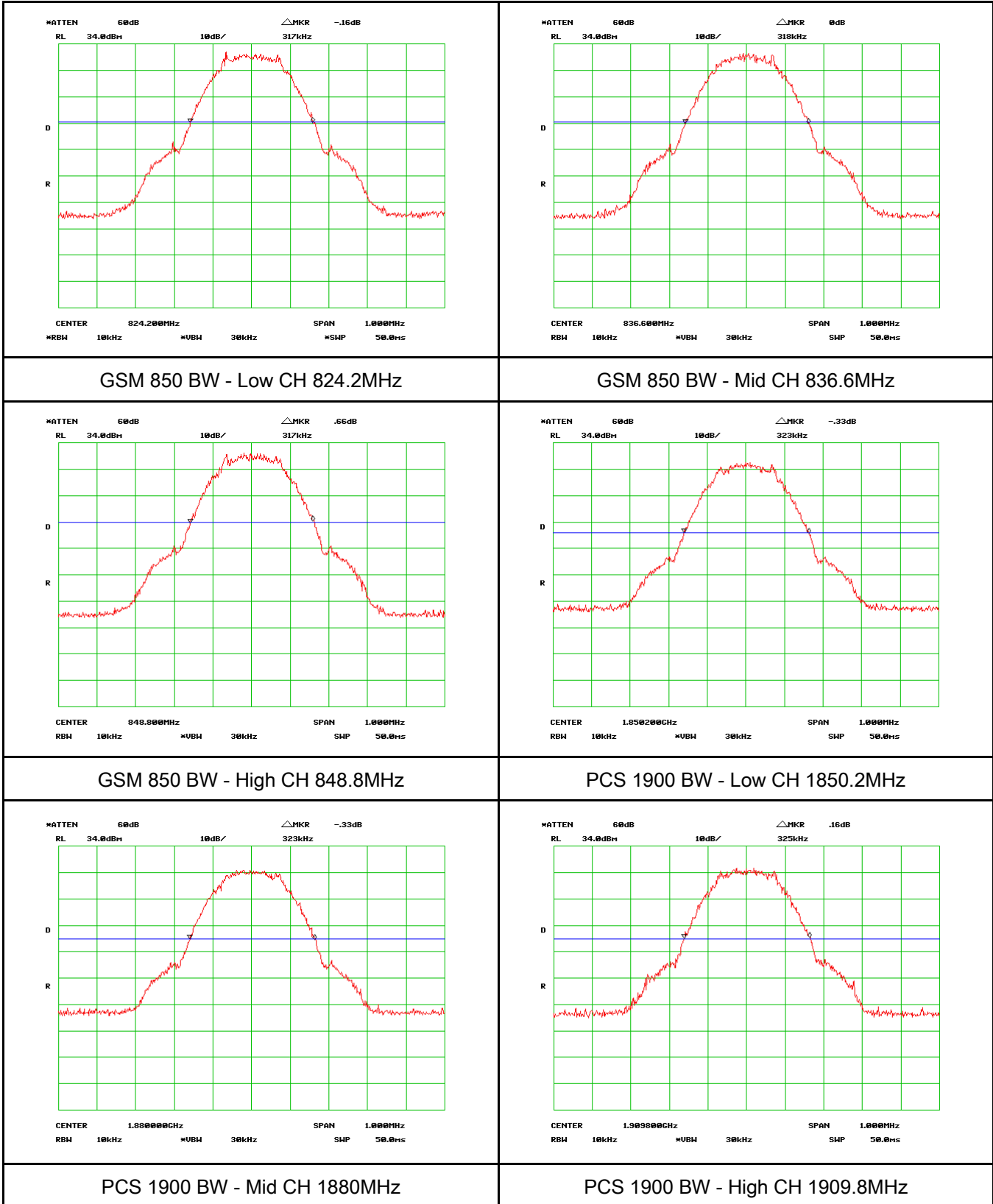
Channel	Frequency (MHz)	26 dB Bandwidth (kHz)
128	824.2	318
190	836.6	317
251	848.8	320

**PCS Band (Part 24E) result**

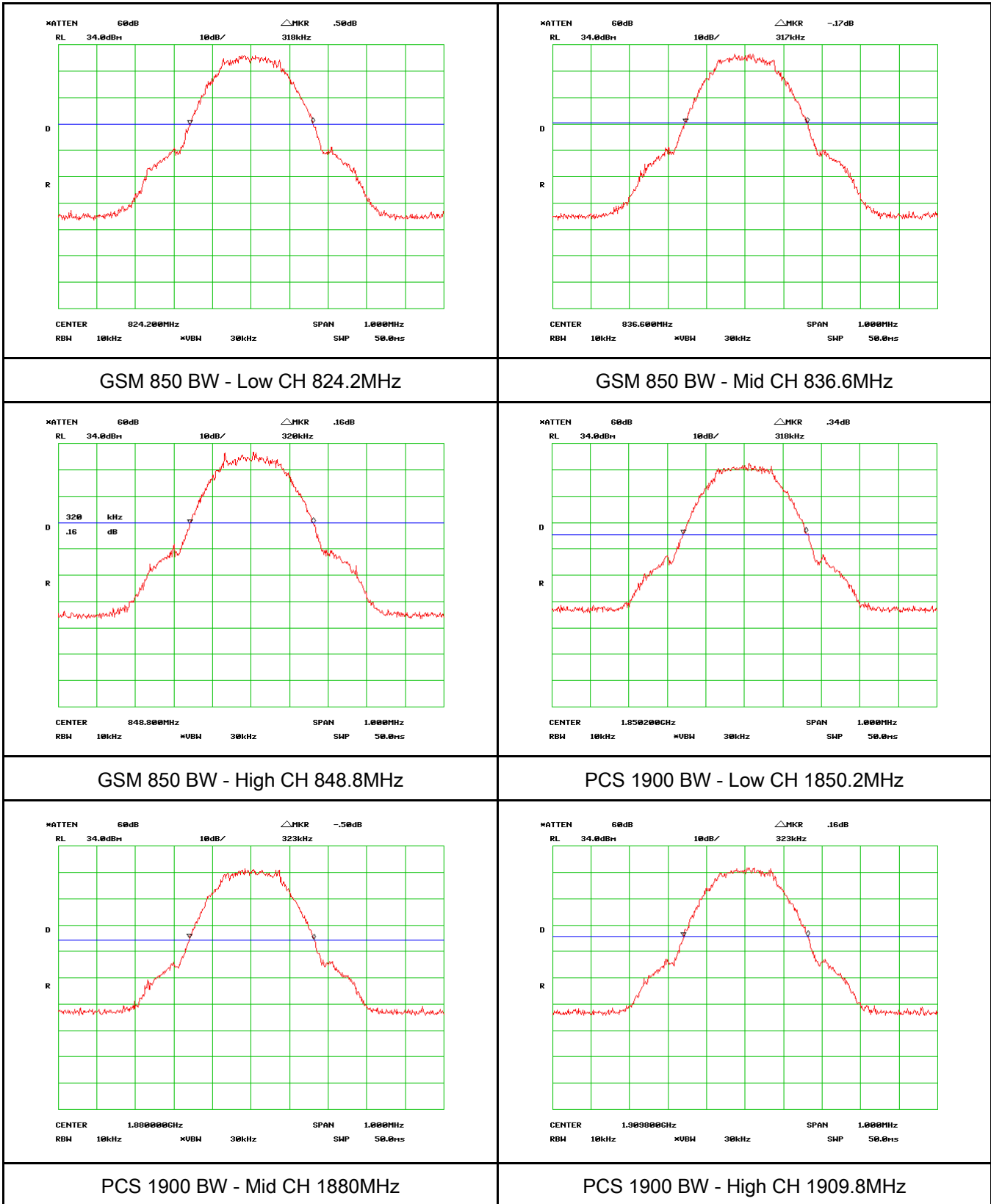
Channel	Frequency (MHz)	26 dB Bandwidth (kHz)
512	1850.2	318
661	1880.0	323
810	1909.8	323

**Test Plots**

**GSM Voice:**



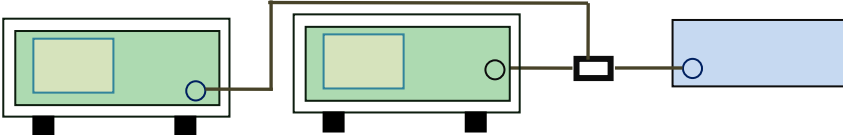
**GPRS:**



## 6.5 Spurious Emissions at Antenna Terminals

Temperature	24°C
Relative Humidity	52%
Atmospheric Pressure	1019mbar
Test date :	September 19, 2016
Tested By :	Loren Luo

### Requirement(s):

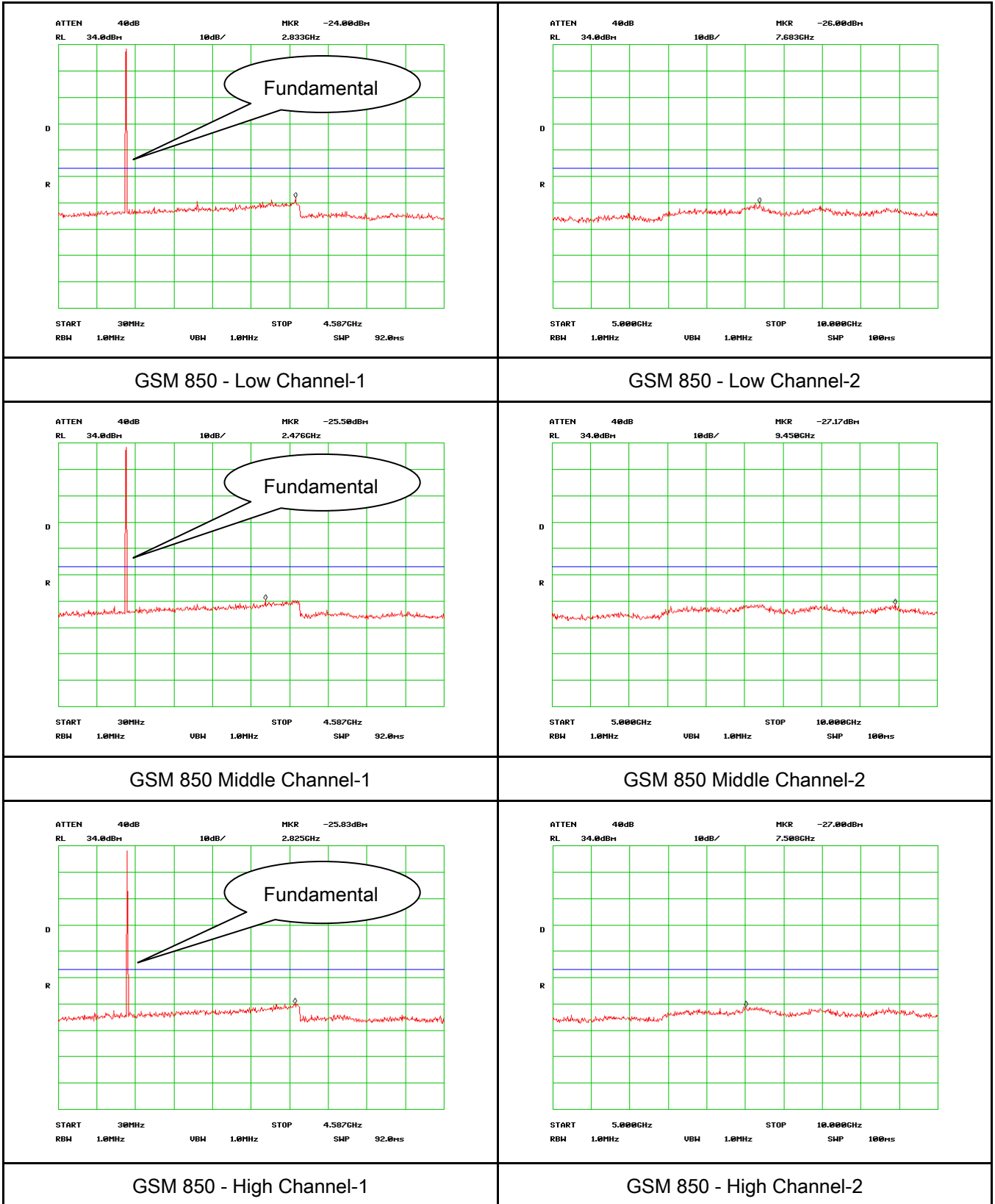
Spec	Item	Requirement	Applicable
§2.1051, §22.917(a)& §24.238(a)	a)	The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log(P)$ dB	<input checked="" type="checkbox"/>
Test Setup			
Test Procedure	<ul style="list-style-type: none"> <li>- The EUT was connected to Spectrum Analyzer and Base Station via power divider.</li> <li>- The Band Edges of low and high channels for the highest RF powers were measured.</li> <li>- Setting RBW as roughly BW/100.</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

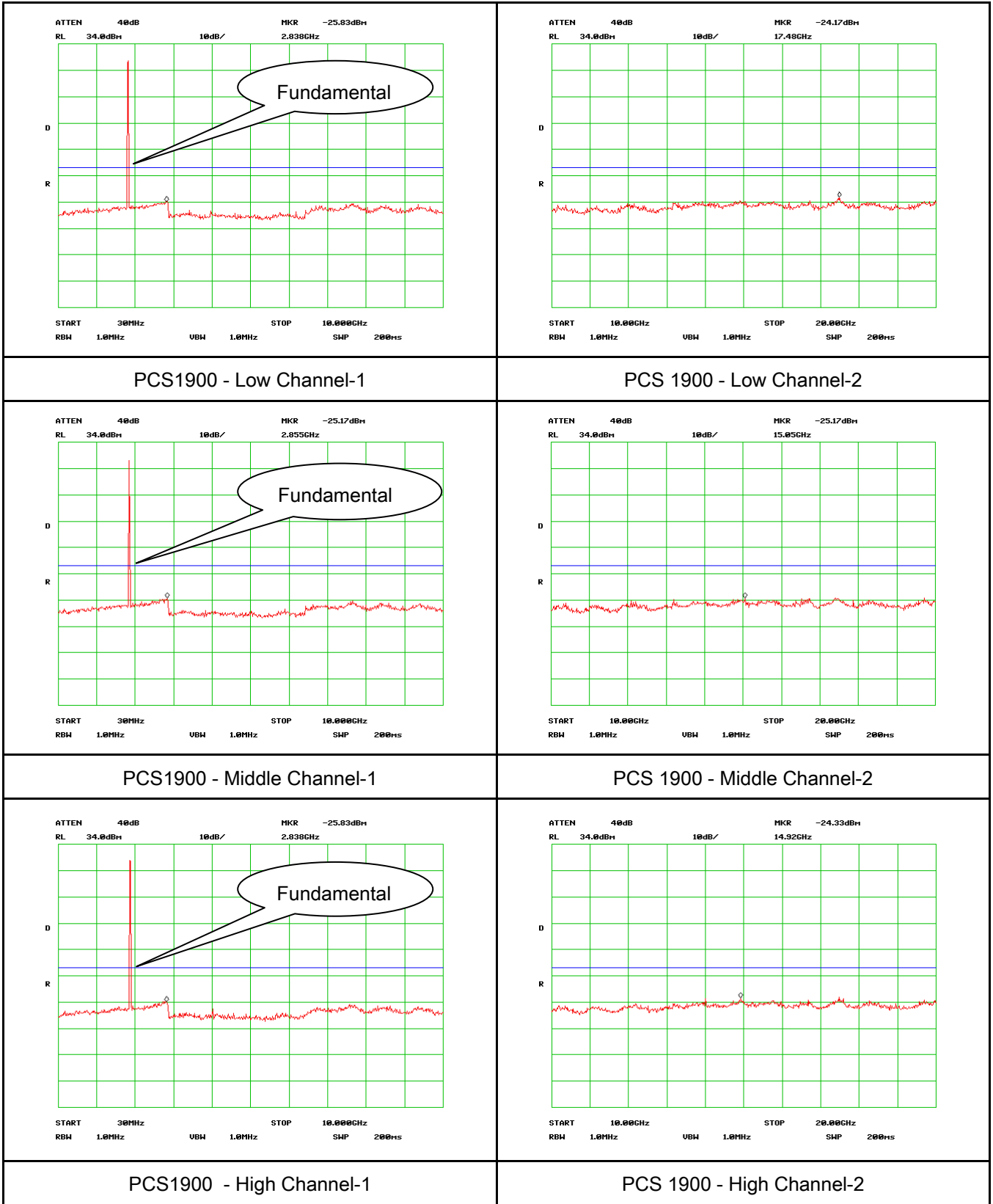
**Test Plots**

**GSM Voice:**

**Cellular Band (Part 22H) result**

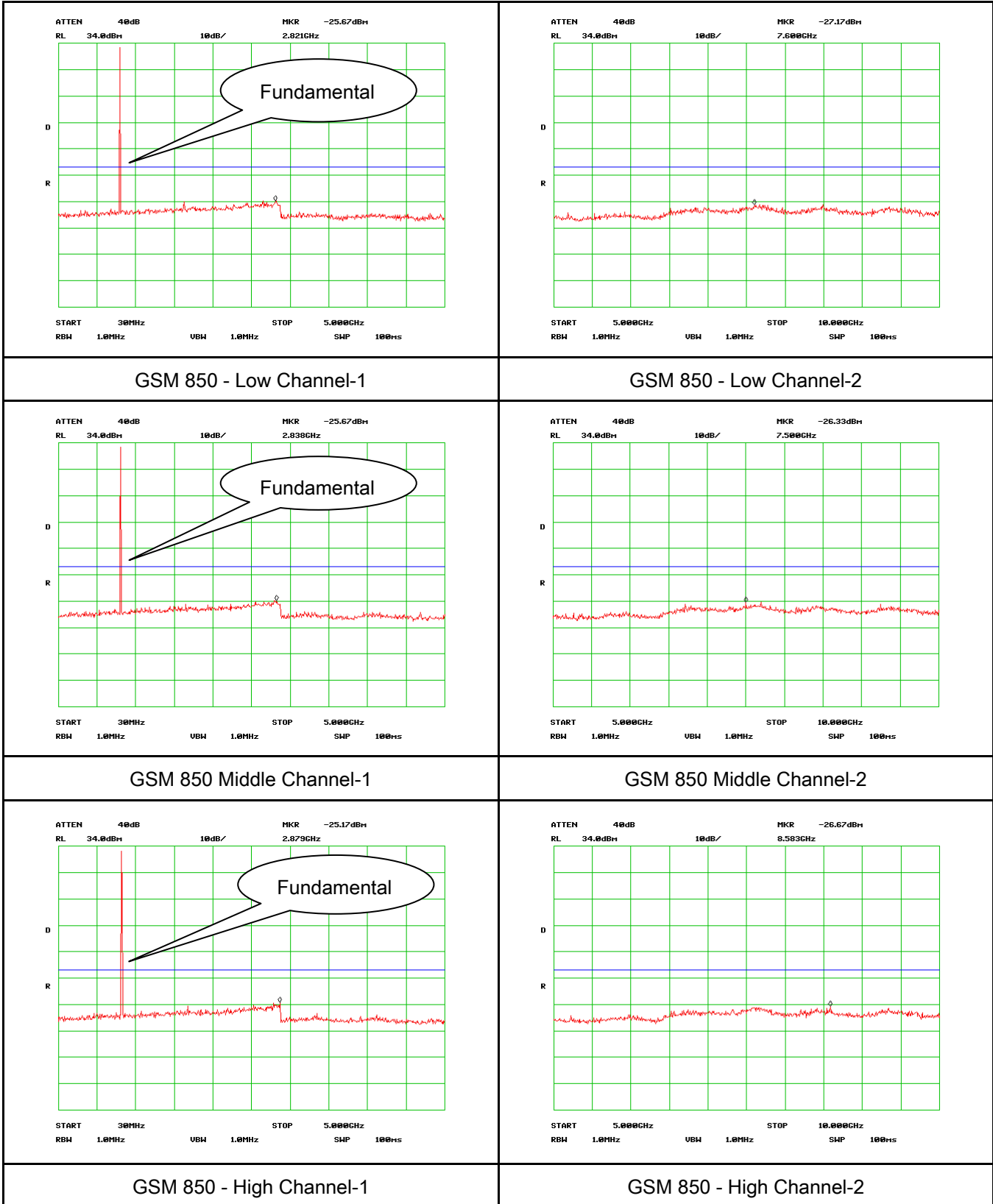


**PCS Band (Part24E) result**

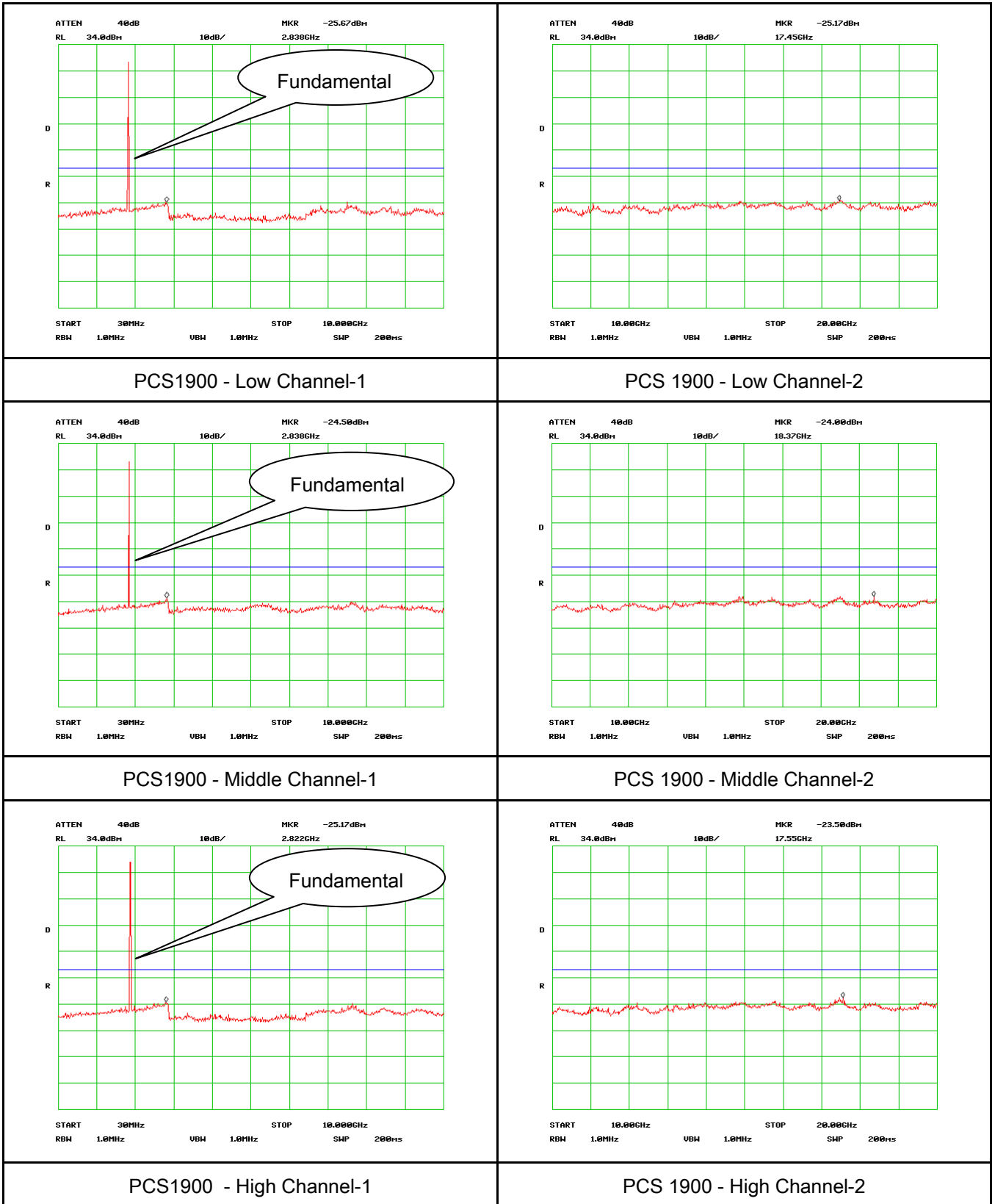


**GPRS:**

**Cellular Band (Part 22H) result**



**PCS Band (Part24E) result**





## 6.6 Spurious Radiated Emissions

Temperature	24°C
Relative Humidity	52%
Atmospheric Pressure	1019mbar
Test date :	September 19, 2016
Tested By :	Loren Luo

### Requirement(s):

Spec	Item	Requirement	Applicable
§2.1053, §22.917 & §24.238	a)	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 10th harmonic.	<input checked="" type="checkbox"/>

Test setup	
------------	--

Test Procedure	<ol style="list-style-type: none"> <li>The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.</li> <li>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.</li> <li>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 = Raw Amplitude (dBµV/m) – Amplifier Gain (dB) + Antenna Factor (dB) + Cable Loss (dB) + Filter Attenuation (dB, if used)</li> </ol>
----------------	---

Test Report	16050024-FCC-R1
Page	26 of 46

Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data  Yes  N/A

Test Plot  Yes (See below)  N/A

## Cellular Band (Part 22H) result

### 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	-43.45	V	7.95	0.78	-36.28	-13	-23.28
1648.4	-44.16	H	7.95	0.78	-36.99	-13	-23.99
329.4	-52.47	V	6.4	0.26	-46.33	-13	-33.33
604.1	-52.98	H	6.8	0.37	-46.55	-13	-33.55

### 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	-43.59	V	7.95	0.78	-36.42	-13	-23.42
1673.2	-44.02	H	7.95	0.78	-36.85	-13	-23.85
329.7	-52.43	V	6.4	0.26	-46.29	-13	-33.29
603.9	-52.94	H	6.8	0.37	-46.51	-13	-33.51

### 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	-43.22	V	7.95	0.78	-36.05	-13	-23.05
1697.6	-43.85	H	7.95	0.78	-36.68	-13	-23.68
328.8	-52.45	V	6.4	0.26	-46.31	-13	-33.31
604.3	-53.12	H	6.8	0.37	-46.69	-13	-33.69

#### Note:

- 1, The testing has been conformed to  $10 \times 848.8 \text{ MHz} = 8,488 \text{ MHz}$
- 2, All other emissions more than 30 dB below the limit
- 3, GSM voice, GPRS mode were investigated. The results above show only the worse cases
- 4, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.

## PCS Band (Part24E) result

### 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	-48.51	V	10.25	2.73	-40.99	-13	-27.99
3700.4	-49.32	H	10.25	2.73	-41.8	-13	-28.80
328.7	-53.16	V	6.4	0.26	-47.02	-13	-34.02
604.5	-53.78	H	6.8	0.37	-47.35	-13	-34.35

### 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	-48.56	V	10.25	2.73	-41.04	-13	-28.04
3760	-49.74	H	10.25	2.73	-42.22	-13	-29.22
327.4	-53.24	V	6.4	0.26	-47.1	-13	-34.10
603.2	-53.49	H	6.8	0.37	-47.06	-13	-34.06

### 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	-48.57	V	10.36	2.73	-40.94	-13	-27.94
3819.6	-49.68	H	10.36	2.73	-42.05	-13	-29.05
327.8	-53.51	V	6.4	0.26	-47.37	-13	-34.37
604.6	-54.13	H	6.8	0.37	-47.70	-13	-34.70

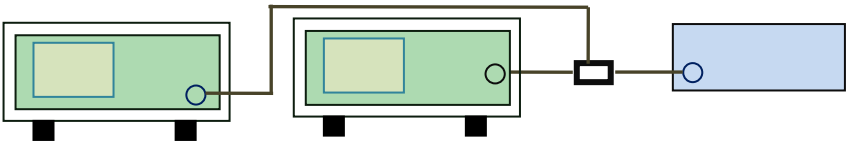
**Note:**

- 1, The testing has been conformed to  $10 \times 1909.8 \text{ MHz} = 19,098 \text{ MHz}$
- 2, All other emissions more than 30 dB below the limit
- 3, GSM voice, GPRS mode were investigated. The results above show only the worse cases
- 4, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.

## 6.7 Band Edge

Temperature	22°C
Relative Humidity	54%
Atmospheric Pressure	1021mbar
Test date :	September 21, 2016
Tested By :	Loren Luo

### Requirement(s):

Spec	Item	Requirement	Applicable
§22.917(a) §24.238(a)	a)	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.	<input checked="" type="checkbox"/>
Test setup			
Procedure	<ul style="list-style-type: none"> <li>- The EUT was connected to Spectrum Analyzer and Base Station via power divider.</li> <li>- The Band Edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly BW/100.</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

**GSM Voice:**

**Cellular Band (Part 22H) result**

Frequency (MHz)	Emission (dBm)	Limit (dBm)
823.997	-16.83	-13
849.015	-17.33	-13

**PCS Band (Part24E) result**

Frequency (MHz)	Emission (dBm)	Limit (dBm)
1849.998	-14.83	-13
1910.007	-16.00	-13

**GPRS:**

**Cellular Band (Part 22H) result**

Frequency (MHz)	Emission (dBm)	Limit (dBm)
823.992	-16.67	-13
849.022	-17.00	-13

**PCS Band (Part24E) result**

Frequency (MHz)	Emission (dBm)	Limit (dBm)
1849.978	-16.17	-13
1910.012	-13.83	-13

**GSM Voice:  
 Test Plots**

<p style="text-align: center;">Cellular Band - Low Channel</p>	<p style="text-align: center;">Cellular Band - High Channel</p>
<p>Note: Offset=Cable loss (4.0) + 10log        (3.17/3)=4.0+0.2=4.2dB</p>	<p>Note: Offset=Cable loss (4.0) + 10log        (3.17/3)=4.0+0.2=4.2dB</p>
<p style="text-align: center;">PCS Band - Low Channel</p>	<p style="text-align: center;">PCS Band - High Channel</p>
<p>Note: Offset=Cable loss (4.0) + 10log        (3.23/3)=4.5+0.3=4.8dB</p>	<p>Note: Offset=Cable loss (4.0) + 10log        (3.25/3)=4.5+0.3=4.8dB</p>

**GPRS:**

**Test Plots**

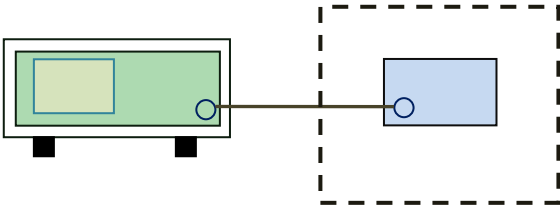
<p>Cellular Band - Low Channel</p>	<p>Cellular Band - High Channel</p>
<p>Note: Offset=Cable loss (4.0) + 10log        (3.18/3)=4.0+0.3=4.3 dB</p>	<p>Note: Offset=Cable loss (4.0) + 10log        (3.20/3)=4.0+0.3=4.3dB</p>
<p>PCS Band - Low Channel</p>	<p>PCS Band - High Channel</p>
<p>Note: Offset=Cable loss (4.5) + 10log        (3.18/3)=4.5+0.3=4.8dB</p>	<p>Note: Offset=Cable loss (4.5) + 10log        (3.23/3)=4.5+0.3=4.8dB</p>



## 6.8 Frequency Stability

Temperature	22°C
Relative Humidity	54%
Atmospheric Pressure	1021mbar
Test date :	September 21, 2016
Tested By :	Loren Luo

### Requirement(s):

Spec	Item	Requirement	Applicable																																
§2.1055, §22.355 & §24.235	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>45 to 512</td> <td>2.5</td> <td>5.0</td> <td>.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 29.</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>	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	45 to 512	2.5	5.0	.0	821 to 896	1.5	2.5	2.5	928 to 29.	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																														
		45 to 512	2.5	5.0	.0																														
		821 to 896	1.5	2.5	2.5																														
		928 to 29.	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>The diagram illustrates a test setup. On the left, there is a green rectangular device representing a transmitter, with a small circle on its right side. A horizontal line connects this circle to another small circle on the left side of a blue rectangular device representing a receiver. The receiver is enclosed within a dashed rectangular box, indicating it is the subject of the test.</p>																																		

Test Report	16050024-FCC-R1
Page	34 of 46

Procedure	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.
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data     Yes                       N/A

Test Plot     Yes (See below)             N/A

**GSM Voice:**

**Cellular Band (Part 22H) result**

Middle Channel, $f_0 = 836.6$ MHz				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	20	0.0239	2.5
0		20	0.0239	2.5
10		14	0.0167	2.5
20		15	0.0179	2.5
30		13	0.0155	2.5
40		19	0.0227	2.5
50		20	0.0239	2.5
55		21	0.0251	2.5
25	4.2	19	0.0227	2.5
	3.5	20	0.0239	2.5

**PCS Band (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	10	0.0053	2.5
0		13	0.0069	2.5
10		14	0.0074	2.5
20		11	0.0059	2.5
30		15	0.0080	2.5
40		16	0.0085	2.5
50		14	0.0074	2.5
55		15	0.0080	2.5
25	4.2	16	0.0085	2.5
	3.5	20	0.0106	2.5

**GPRS:**

**Cellular Band (Part 22H) result**

Middle Channel, $f_0 = 836.6$ MHz				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	21	0.0251	2.5
0		16	0.0191	2.5
10		13	0.0155	2.5
20		13	0.0155	2.5
30		12	0.0143	2.5
40		14	0.0167	2.5
50		14	0.0167	2.5
55		20	0.0239	2.5
25	4.2	19	0.0227	2.5
	3.5	21	0.0251	2.5

**PCS Band (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	18	0.0096	2.5
0		15	0.0080	2.5
10		16	0.0085	2.5
20		11	0.0059	2.5
30		13	0.0069	2.5
40		15	0.0080	2.5
50		16	0.0085	2.5
55		15	0.0080	2.5
25	4.2	21	0.0112	2.5
	3.5	20	0.0106	2.5

## Annex A. TEST INSTRUMENT

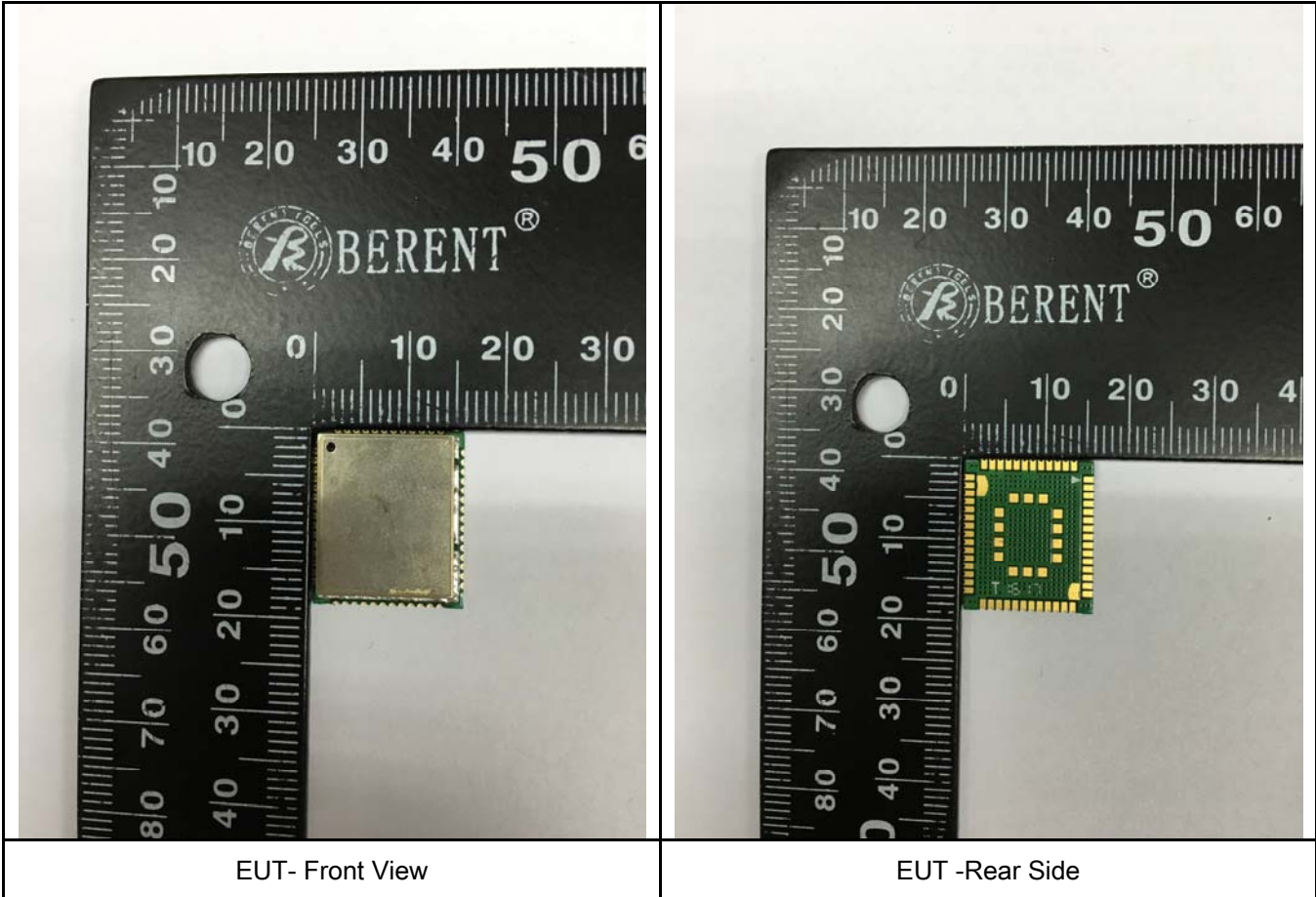
Instrument	Model	Serial #	Cal Date	Cal Due	In use
<b>RF Conducted Test</b>					
Agilent ESA-E SERIES SPECTRUM ANALYZER	E4407B	MY45108319	09/15/2016	09/14/2017	<input checked="" type="checkbox"/>
Power Splitter	1#	1#	08/31/2016	08/30/2017	<input checked="" type="checkbox"/>
Universal Radio Communication Tester	CMU200	121393	09/25/2015	09/24/2016	<input checked="" type="checkbox"/>
Temperature/Humidity Chamber	UHL-270	001	10/09/2015	10/08/2016	<input checked="" type="checkbox"/>
DC Power Supply	E3640A	MY40004013	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
RF Power Sensor	Dare RPR3006C/P/W	AY554013	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
<b>Radiated Emissions</b>					
EMI test receiver	ESL6	100262	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	08/31/2016	08/30/2017	<input checked="" type="checkbox"/>
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/24/2016	03/23/2017	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/20/2016	09/19/2017	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~2GHz)	JB1	A112017	09/20/2016	09/19/2017	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71259	09/24/2015	09/23/2016	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/24/2015	09/23/2016	<input checked="" type="checkbox"/>
SYNTHESIZED SIGNAL GENERATOR	8665B	3744A01293	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
Power Amplifier	SMC150D	R1553-0313	03/09/2016	03/08/2017	<input checked="" type="checkbox"/>
Power Amplifier	S41-25D	R1553-0314	05/27/2016	05/26/2017	<input checked="" type="checkbox"/>
Tunable Notch Filter	3NF-800/1000-S	AA4	08/31/2016	08/30/2017	<input checked="" type="checkbox"/>

Test Report	16050024-FCC-R1
Page	38 of 46

Tunable Notch Filter	3NF- 1000/2000-S	AM 4	08/31/2016	08/30/2017	<input checked="" type="checkbox"/>
----------------------	---------------------	------	------------	------------	-------------------------------------

**Annex B. EUT And Test Setup Photographs**

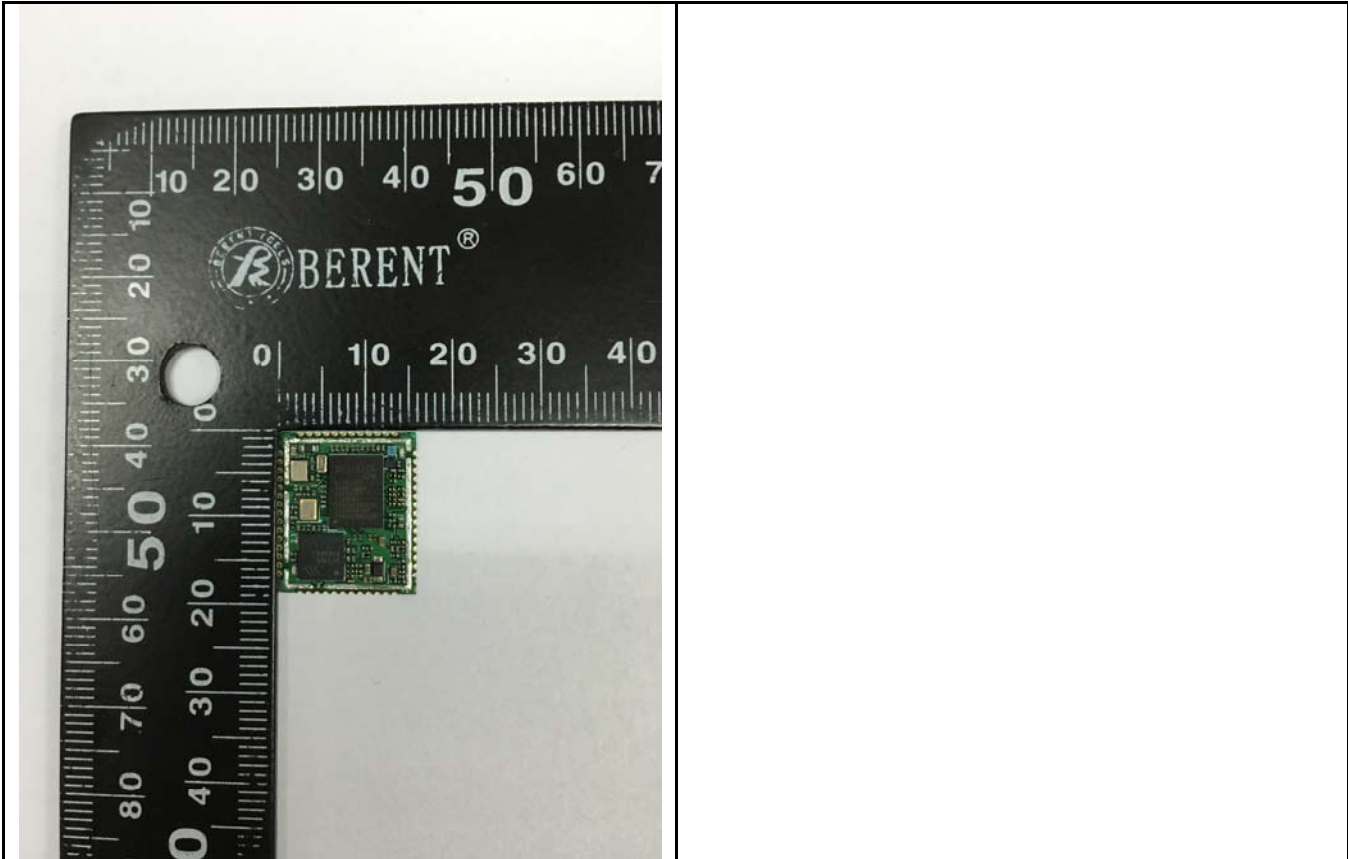
Annex B.i. Photograph: EUT External Photo



EUT- Front View

EUT -Rear Side

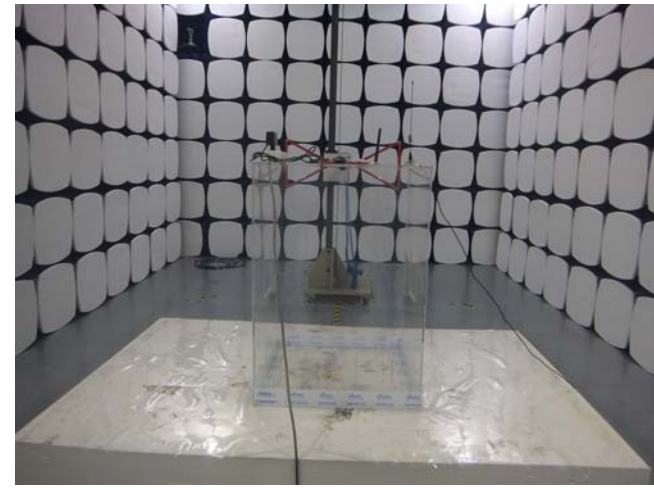
**Annex B.ii. Photograph: EUT Internal Photo**



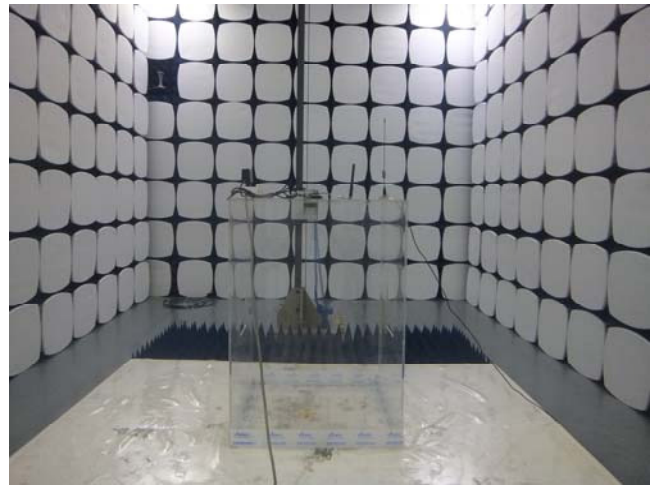
EUT- without Shielding – Front View



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



Radiated Spurious Emissions Test Setup Below 1GHz

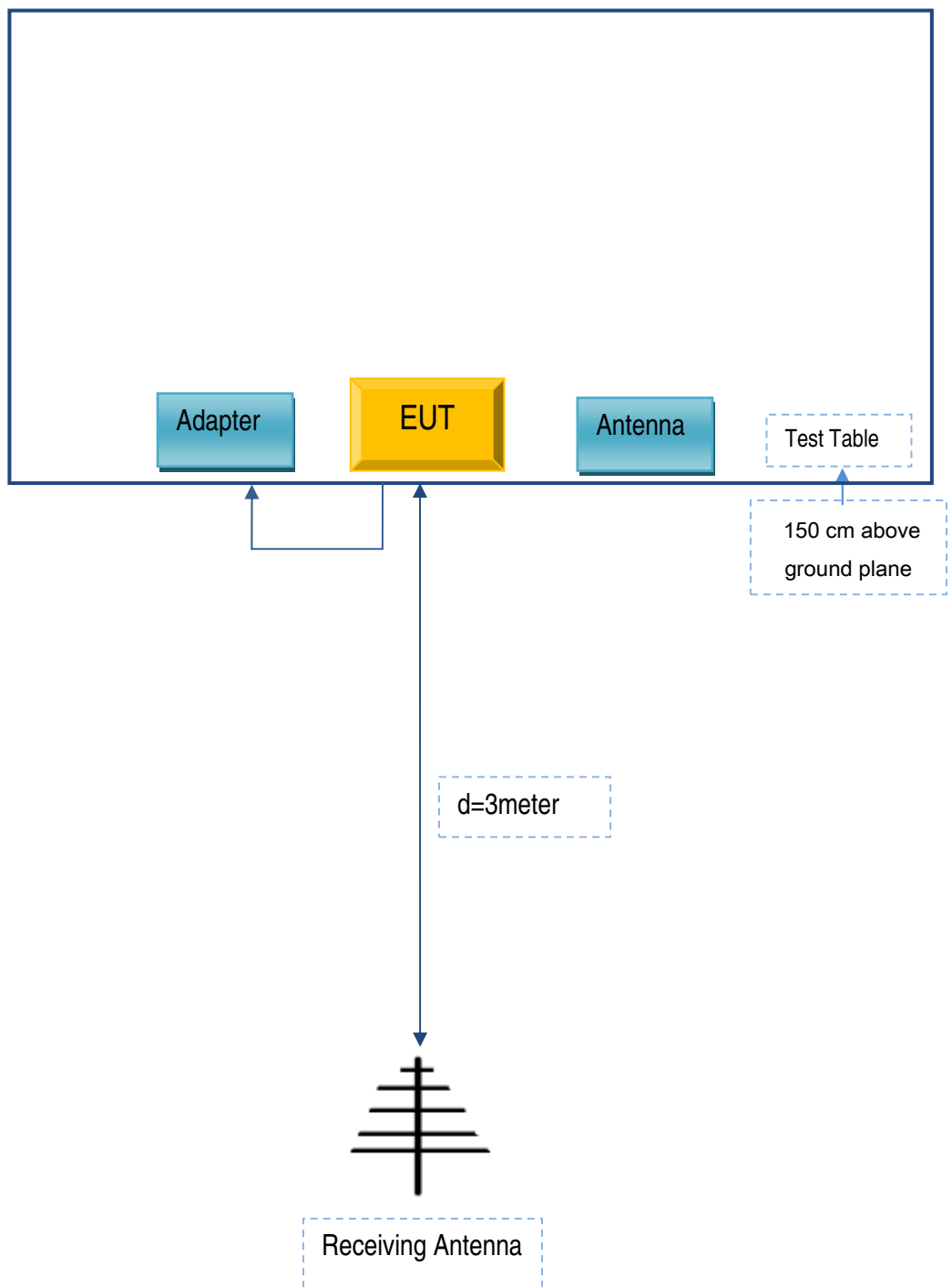


Radiated Spurious Emissions Test Setup Above  
1GHz

## 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
DCA	Adaptor	E2164A	DCN026423

### Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
USB Cable	Un-shielding	No	1.5m	DCN026423

Test Report	16050024-FCC-R1
Page	44 of 46

## Annex C.ii. EUT OPERATING CONKITIONS

N/A

Test Report	16050024-FCC-R1
Page	45 of 46

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

Please see the attachments

Test Report	16050024-FCC-R1
Page	46 of 46

## Annex E. DECLARATION OF SIMILARITY

N/A