RF TEST REPORT

Report No.: 16050025-FCC-R1

Supersede Report No.: N/A

Applicant	Quectel Wireless Solutions Co., Ltd.
Product Name	GSM/GPRS/GNSS Module
Model No.	MC20
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 26, 2016
Issue Date	September 27, 2016
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Loren Luo	David Huang	
Loren Luo Test Engineer	David Huang Checked By	

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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

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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

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
16050025-FCC-R1	NONE	Original	September 27, 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:	MC20
Serial Model:	N/A
Date EUT received:	August 23, 2016
Test Date(s):	August 24 to September 26, 2016
Equipment Category：	PCB
Antenna Gain:	GSM850: 1dBi PCS1900: 1dBi **(Note: The GSM radio module will be sold without antenna, this antenna only used limited to ERP/EIRP or radiated spurious emission test.)** Bluetooth:1dBi
Antenna Type：	GSM : External antenna BT: Chip antenna
Type of Modulation:	GSM / GPRS: GMSK Bluetooth: GFSK, π /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 Vioce: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
Trade Name :	Quectel
GPRS Multi-slot class	8/10/12
FCC ID:	XMR201609MC20

Note: Antenna gain including cable loss must not exceed 5.95dBi of 824.2 ~ 848.8 MHz and 3.50dBi of 1850.2 ~ 1909.8MHz.

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)

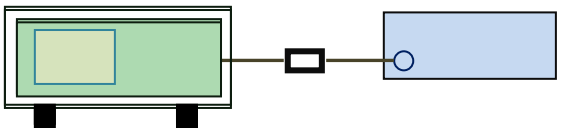
Test Result: Pass

The EUT is a Mobile device, thus requires MPE evaluation;
Please refer to RF Exposure Evaluation Report: 16050025-FCC-H.

6.2 RF Output Power

Temperature	24℃
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	☑
§24.232 (c)	b)	EIRP:33dBm	☑
Test Setup			
Test Procedure	For Conducted Power: - The transmitter output port was connected to base station. - Set EUT at maximum power through base station. - Select lowest, middle, and highest channels for each band and different test mode. For ERP/EIRP: According with KDB 971168 v02r02 - The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable. - 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. - The frequency range up to tenth harmonic of the fundamental frequency was investigated.		

	- 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. - Spurious emissions in dB = 10 log (TX power in Watts/0.001) – the absolute level - Spurious attenuation limit in dB = 43 + 10 Log10 (power out in Watts.
Remark	
Result	☑ Pass ☐ 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	**31.38**	31.25	31.75±0.75	28.66	**28.69**	28.64	28.75±0.75
GPRS Multi-Slot Class 8 (1 uplink),GMSK	31.22	**31.37**	31.23	31.75±0.75	28.66	**28.67**	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								

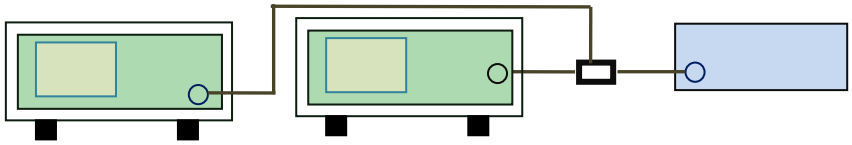
6.3 Peak - Average Ratio

Temperature	24℃
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.	☑

Test Setup



Test Procedure

According with KDB 971168 v02r02

5.7.2 Alternate procedure for PAPR

5.1.2 Peak power measurements with a peak power meter

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.

5.2.3 Average power measurement with average power meter

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

If the EUT can be configured to transmit continuously (i.e., the burst duty cycle ≥ 98%) and at all times the EUT is transmitting at is maximum output power level, then a conventional wide-band RF power meter can be used.

	If the EUT cannot be configured to transmit continuously (i.e., the burst duty cycle < 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 ± 2 percent) by performing the measurement over the on/off burst cycles and then correcting (increasing) the measured level by a factor equal to 10log(1/duty cycle)
Remark	
Result	☑ Pass ☐ 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

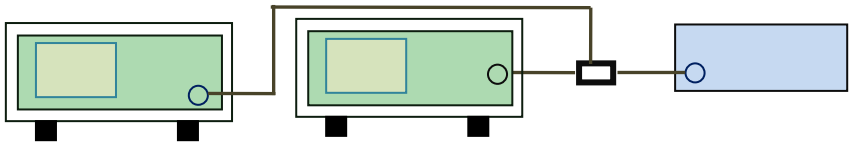
GPRS 1900 PK-AV POWER (PART 24E)

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℃
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)	☑
	b)	26 dB Bandwidth(kHz)	☑
Test Setup			
Test Procedure	- The EUT was connected to Spectrum Analyzer and Base Station via power divider. - The 99% and 26 dB occupied bandwidth (BW) of the middle channel for the highest RF powers.		
Remark			
Result	☑ Pass ☐ 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

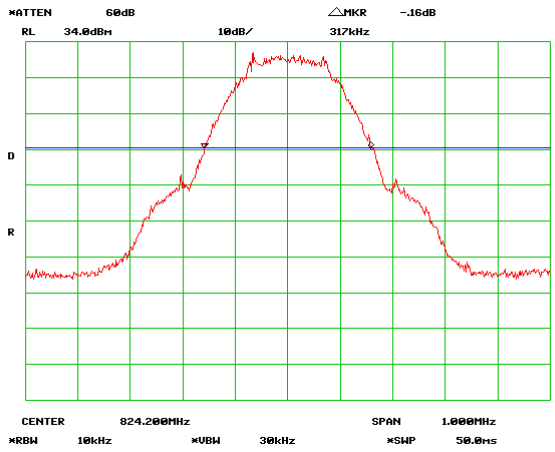
Channel	Frequency (MHz)	26 dB Bandwidth (kHz)
128	824.2	318
190	836.6	317
251	848.8	320

PCS Band (Part 24E) result

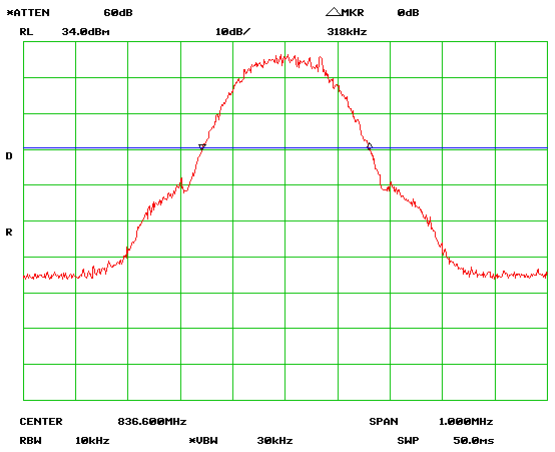
Channel	Frequency (MHz)	26 dB Bandwidth (kHz)
512	1850.2	318
661	1880.0	323
810	1909.8	323

Test Plots

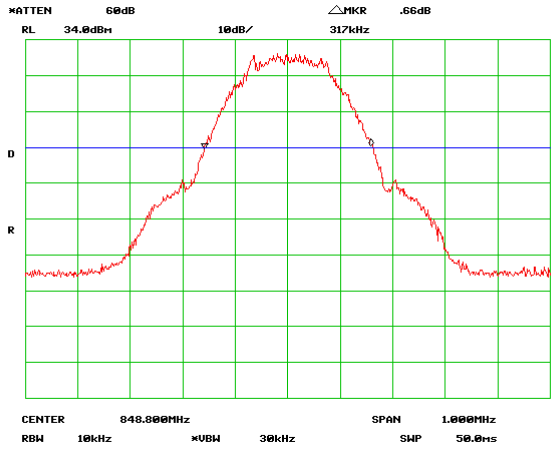
GSM Voice:



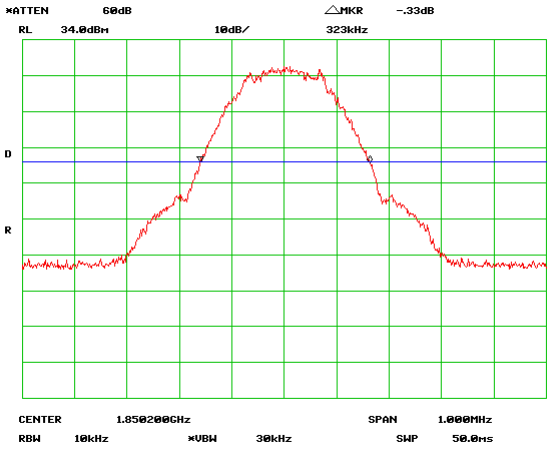
GSM 850 BW - Low CH 824.2MHz



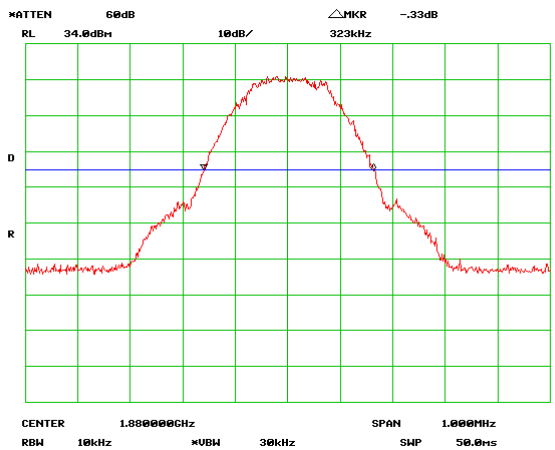
GSM 850 BW - Mid CH 836.6MHz



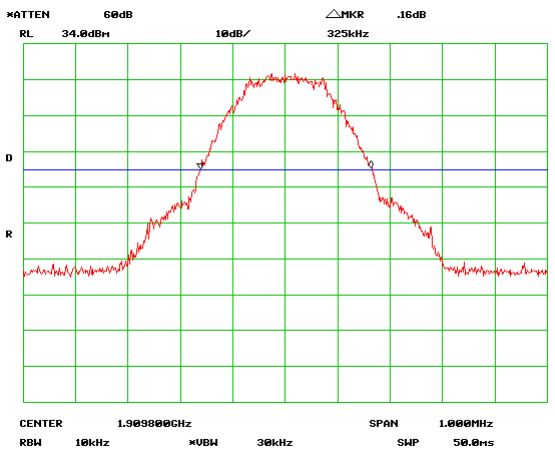
GSM 850 BW - High CH 848.8MHz



PCS 1900 BW - Low CH 1850.2MHz

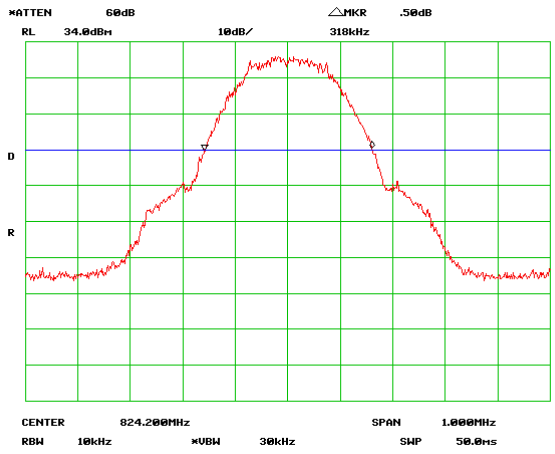


PCS 1900 BW - Mid CH 1880MHz

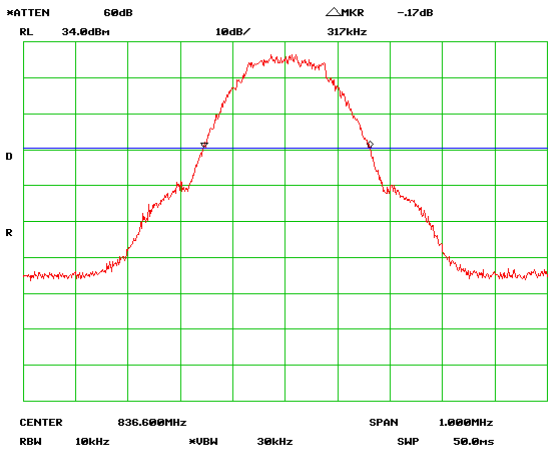


PCS 1900 BW - High CH 1909.8MHz

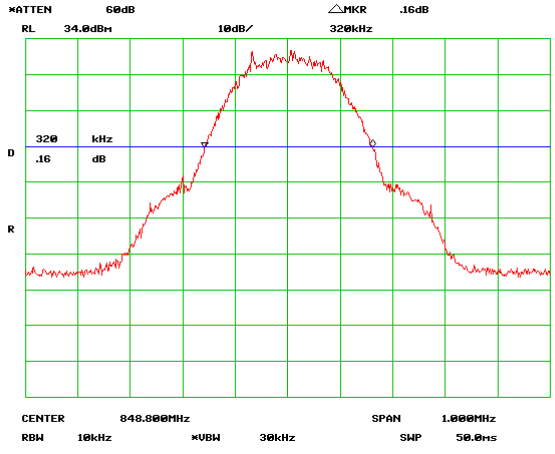
GPRS:



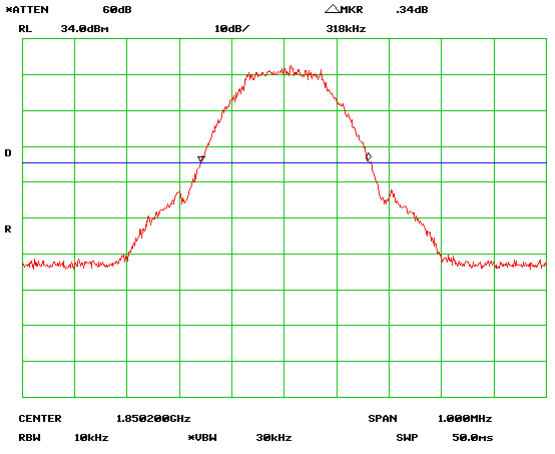
GSM 850 BW - Low CH 824.2MHz



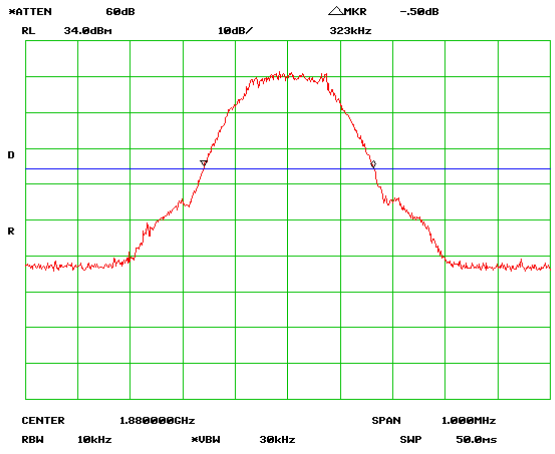
GSM 850 BW - Mid CH 836.6MHz



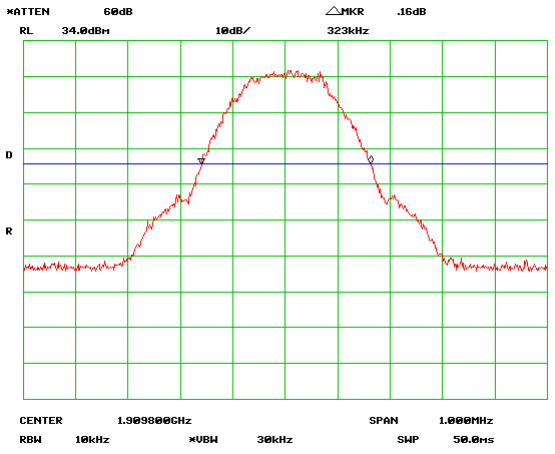
GSM 850 BW - High CH 848.8MHz



PCS 1900 BW - Low CH 1850.2MHz



PCS 1900 BW - Mid CH 1880MHz

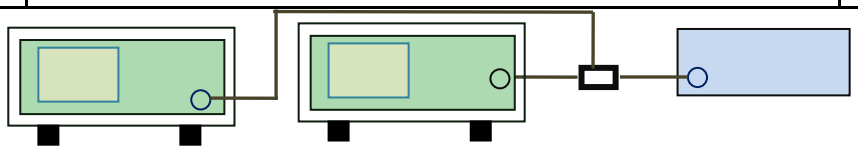


PCS 1900 BW - High CH 1909.8MHz

6.5 Spurious Emissions at Antenna Terminals

Temperature	24℃
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	☑
Test Setup			
Test Procedure	- The EUT was connected to Spectrum Analyzer and Base Station via power divider. - The Band Edges of low and high channels for the highest RF powers were measured. - Setting RBW as roughly BW/100.		
Remark			
Result	☑ Pass ☐ Fail		

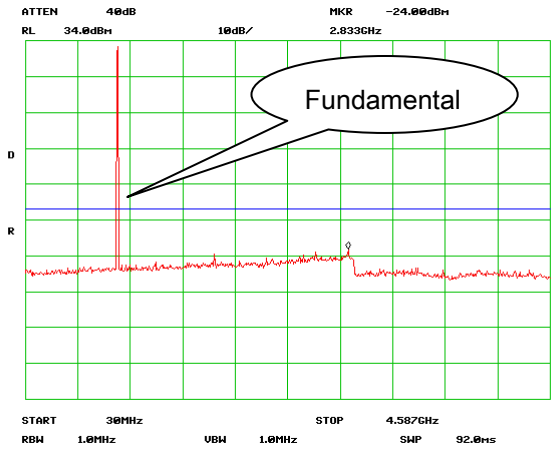
Test Data ☐ Yes ☑ N/A

Test Plot ☑ Yes (See below) ☐ N/A

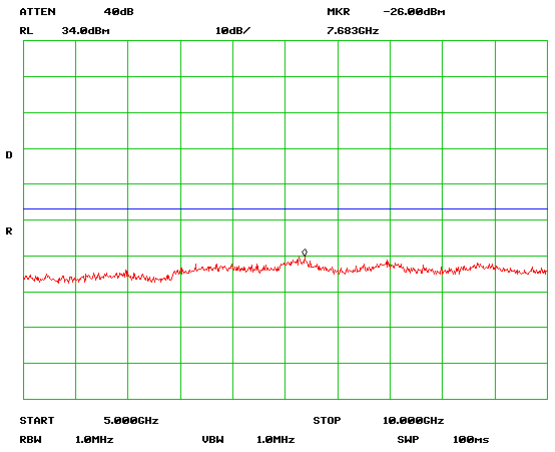
Test Plots

GSM Voice:

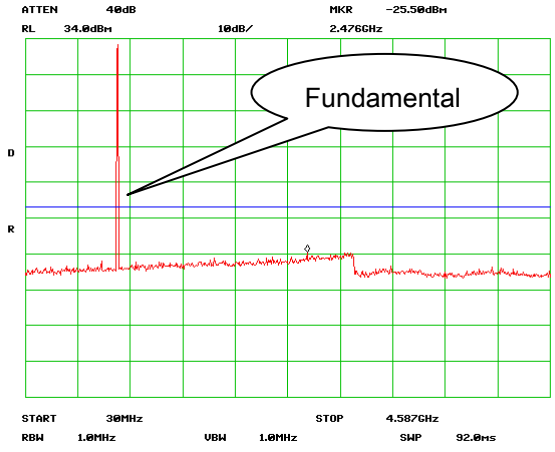
Cellular Band (Part 22H) result



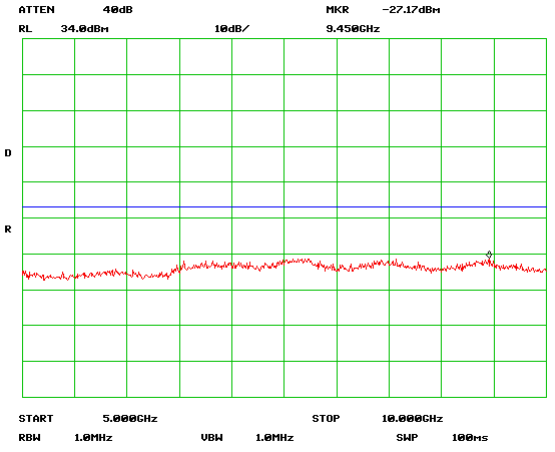
GSM 850 - Low Channel-1



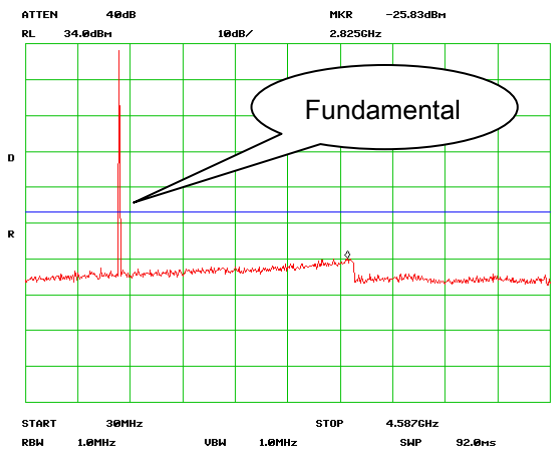
GSM 850 - Low Channel-2



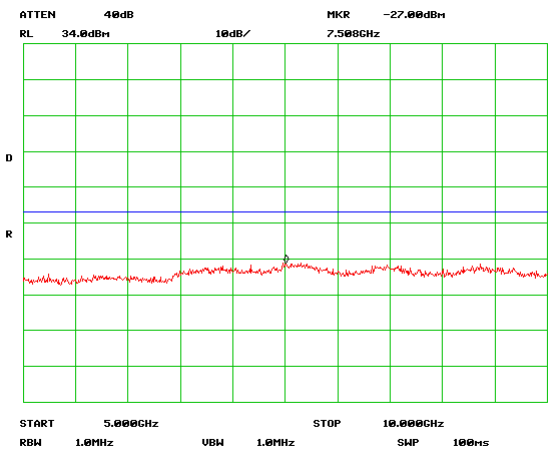
GSM 850 Middle Channel-1



GSM 850 Middle Channel-2

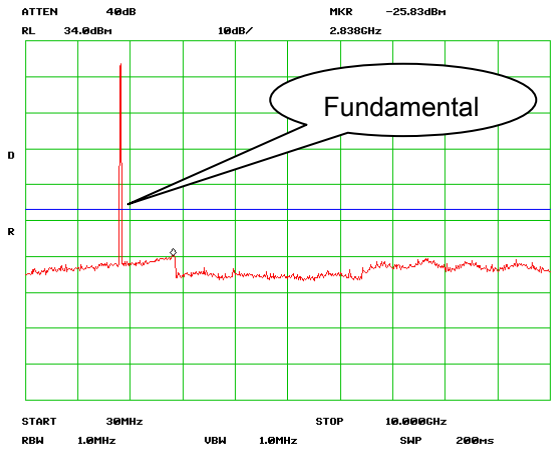


GSM 850 - High Channel-1

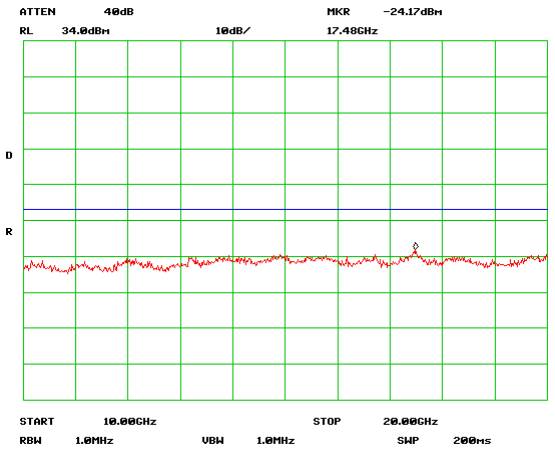


GSM 850 - High Channel-2

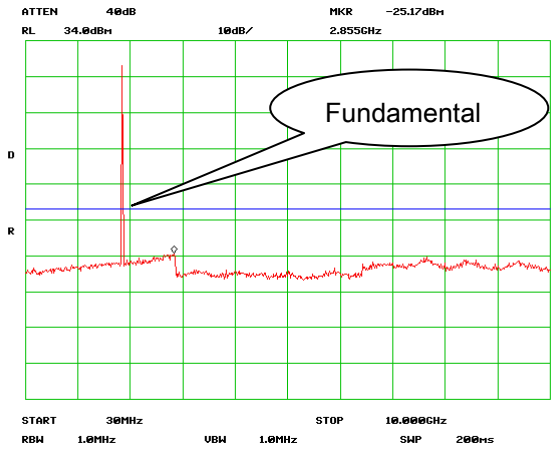
PCS Band (Part24E) result



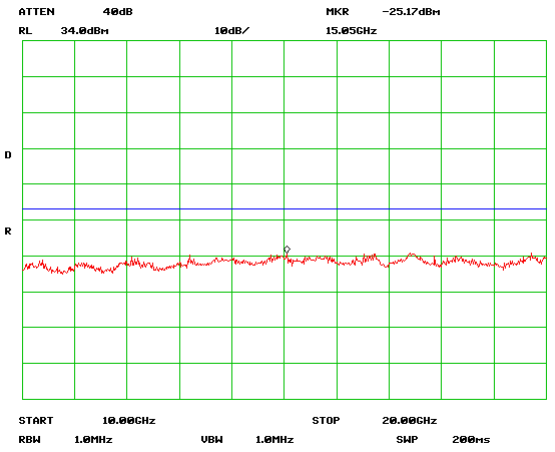
PCS1900 - Low Channel-1



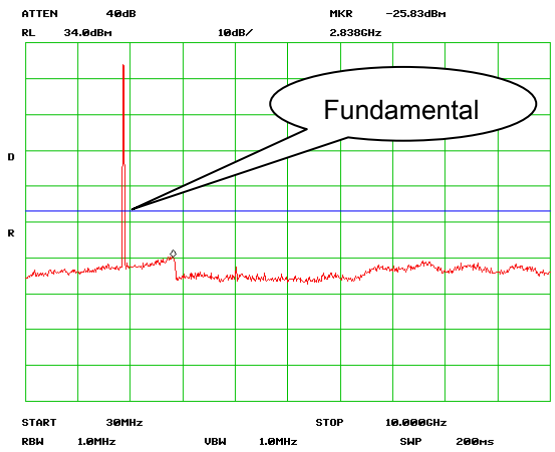
PCS 1900 - Low Channel-2



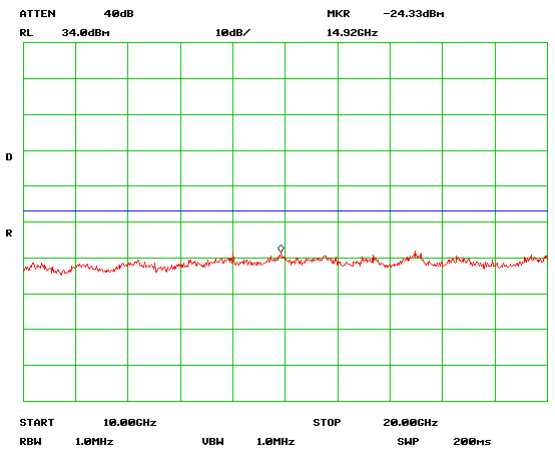
PCS1900 - Middle Channel-1



PCS 1900 - Middle Channel-2



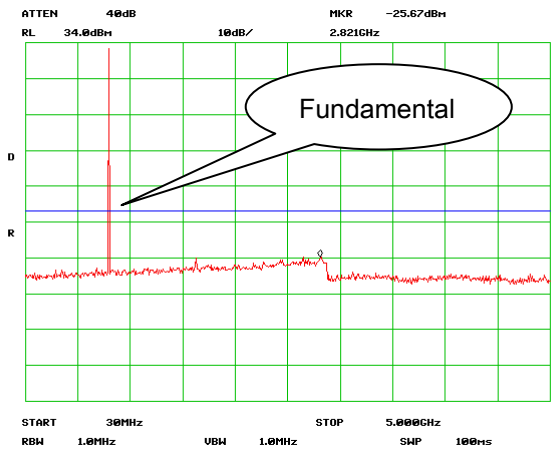
PCS1900 - High Channel-1



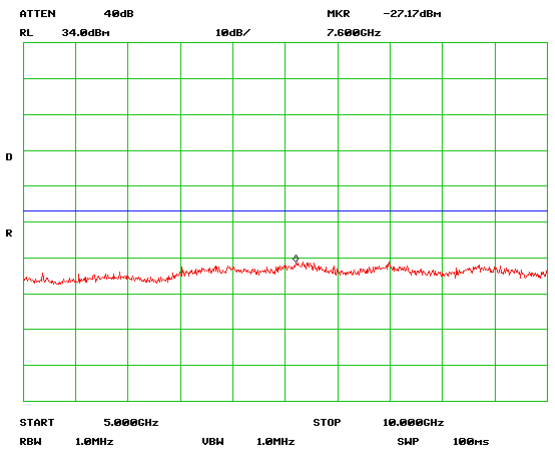
PCS 1900 - High Channel-2

GPRS:

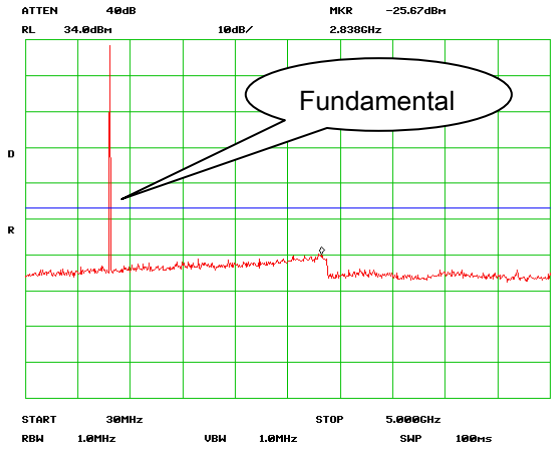
Cellular Band (Part 22H) result



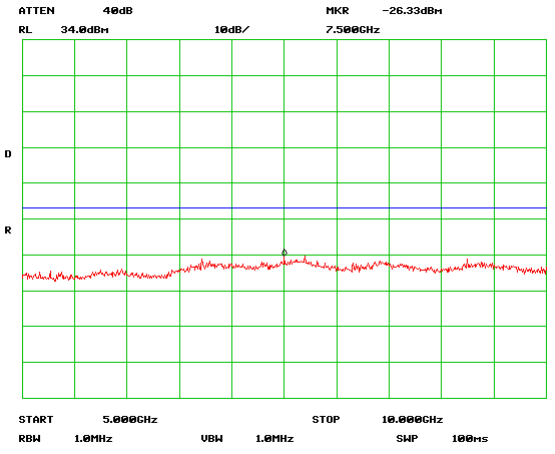
GSM 850 - Low Channel-1



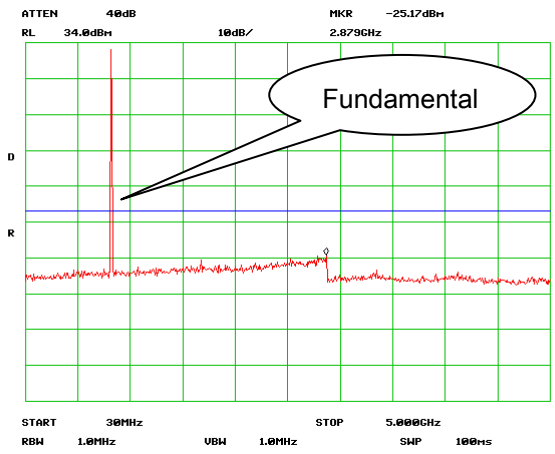
GSM 850 - Low Channel-2



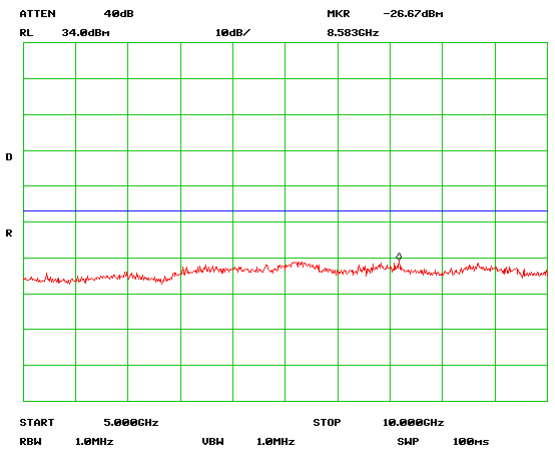
GSM 850 Middle Channel-1



GSM 850 Middle Channel-2

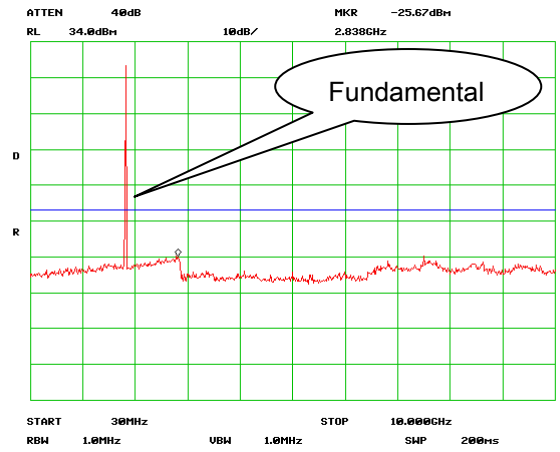


GSM 850 - High Channel-1

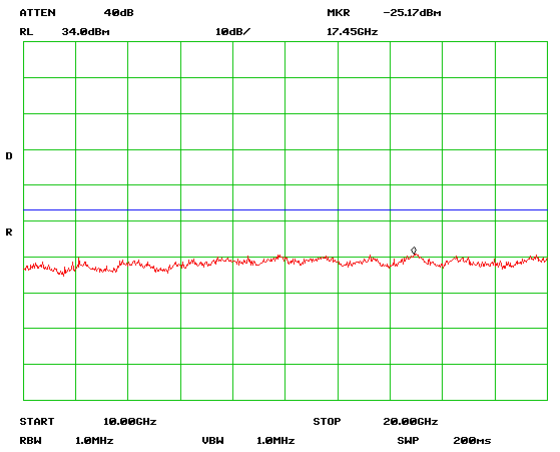


GSM 850 - High Channel-2

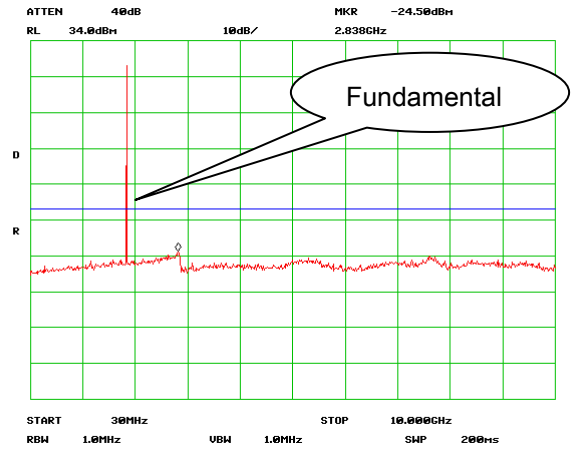
PCS Band (Part24E) result



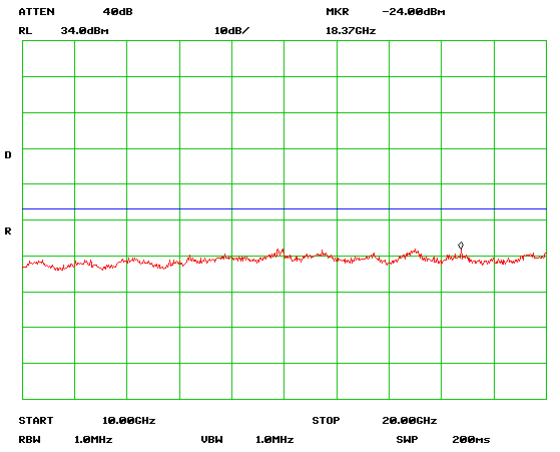
PCS1900 - Low Channel-1



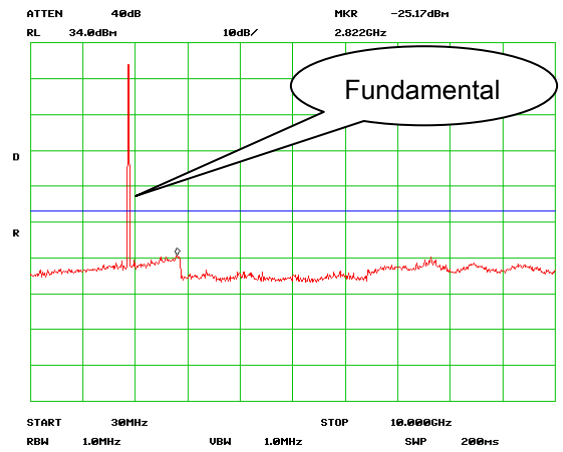
PCS 1900 - Low Channel-2



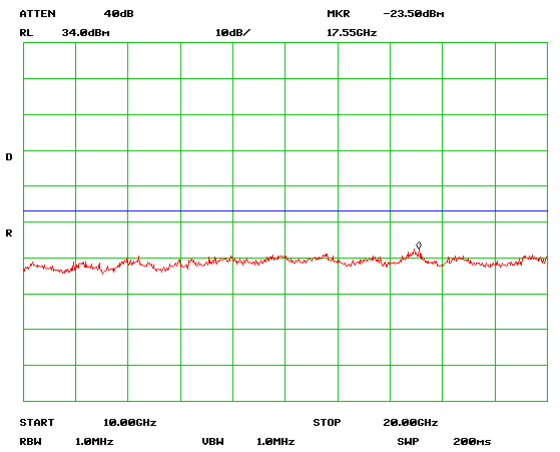
PCS1900 - Middle Channel-1



PCS 1900 - Middle Channel-2



PCS1900 - High Channel-1

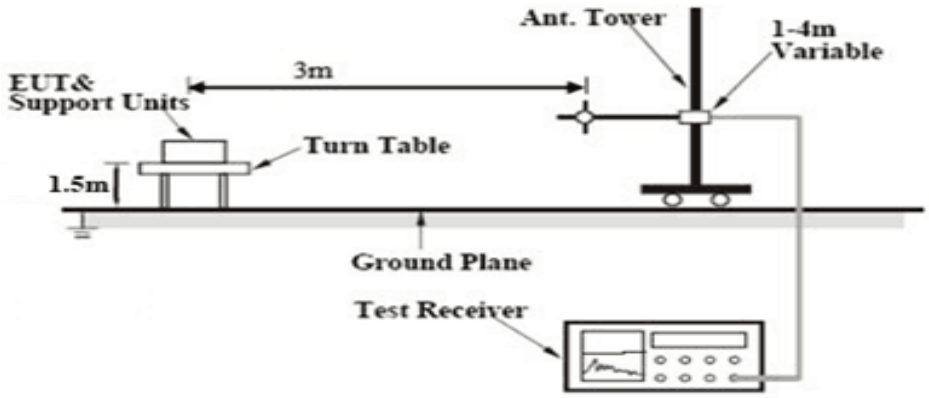


PCS 1900 - High Channel-2

6.6 Spurious Radiated Emissions

Temperature	23℃
Relative Humidity	55%
Atmospheric Pressure	1022mbar
Test date :	September 22, 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.	☑
Test setup			
Test Procedure	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 = Raw Amplitude (dBμV/m) – Amplifier Gain (dB) + Antenna Factor (dB) + Cable Loss (dB) + Filter Attenuation (dB, if used)		

Remark	
Result	☑ Pass ☐ 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	-43.44	V	7.95	0.78	-36.27	-13	-23.27
1648.4	-44.65	H	7.95	0.78	-37.48	-13	-24.48
329.4	-52.37	V	6.4	0.26	-46.23	-13	-33.23
604.1	-53.02	H	6.8	0.37	-46.59	-13	-33.59

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	-43.87	V	7.95	0.78	-36.7	-13	-23.70
1673.2	-44.32	H	7.95	0.78	-37.15	-13	-24.15
329.7	-52.87	V	6.4	0.26	-46.73	-13	-33.73
603.9	-53.02	H	6.8	0.37	-46.59	-13	-33.59

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	-43.29	V	7.95	0.78	-36.12	-13	-23.12
1697.6	-43.87	H	7.95	0.78	-36.7	-13	-23.70
328.8	-52.55	V	6.4	0.26	-46.41	-13	-33.41
604.3	-53.28	H	6.8	0.37	-46.85	-13	-33.85

Note:

*1, The testing has been conformed to 10*848.8MHz=8,488MHz*
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	-48.49	V	10.25	2.73	-40.97	-13	-27.97
3700.4	-49.36	H	10.25	2.73	-41.84	-13	-28.84
328.7	-53.68	V	6.4	0.26	-47.54	-13	-34.54
604.5	-54.01	H	6.8	0.37	-47.58	-13	-34.58

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	-48.45	V	10.25	2.73	-40.93	-13	-27.93
3760	-49.37	H	10.25	2.73	-41.85	-13	-28.85
327.4	-53.19	V	6.4	0.26	-47.05	-13	-34.05
603.2	-53.64	H	6.8	0.37	-47.21	-13	-34.21

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	-48.44	V	10.36	2.73	-40.81	-13	-27.81
3819.6	-49.29	H	10.36	2.73	-41.66	-13	-28.66
327.8	-53.72	V	6.4	0.26	-47.58	-13	-34.58
604.6	-54.21	H	6.8	0.37	-47.78	-13	-34.78

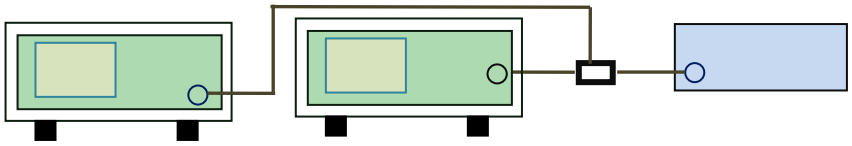
Note:

*1, The testing has been conformed to 10*1909.8MHz=19,098MHz*
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℃
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.	☑
Test setup			
Procedure	- The EUT was connected to Spectrum Analyzer and Base Station via power divider. - The Band Edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly BW/100.		
Remark			
Result	☑ Pass ☐ 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

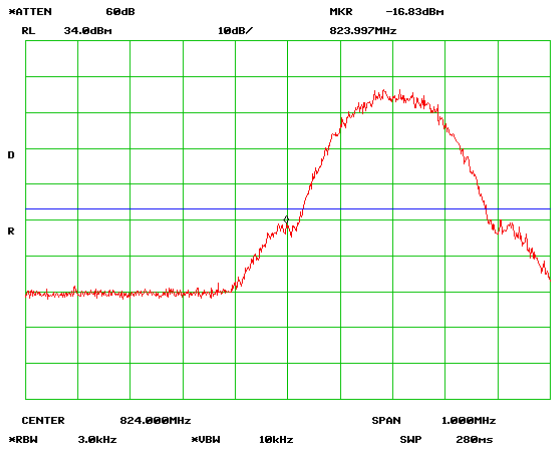
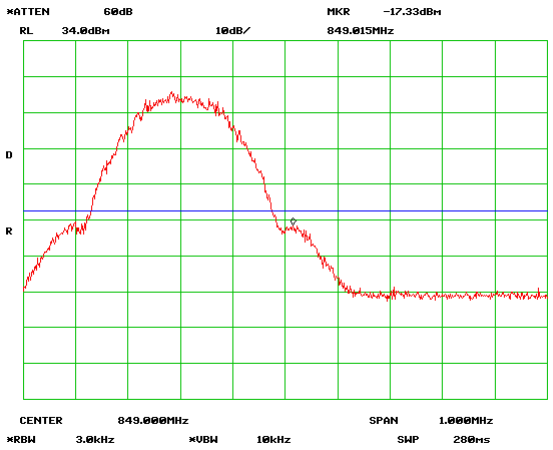
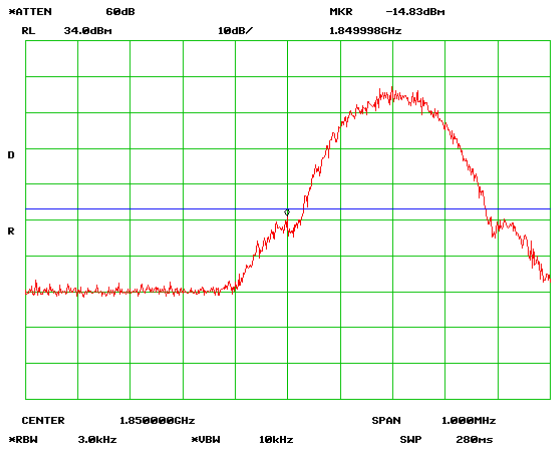
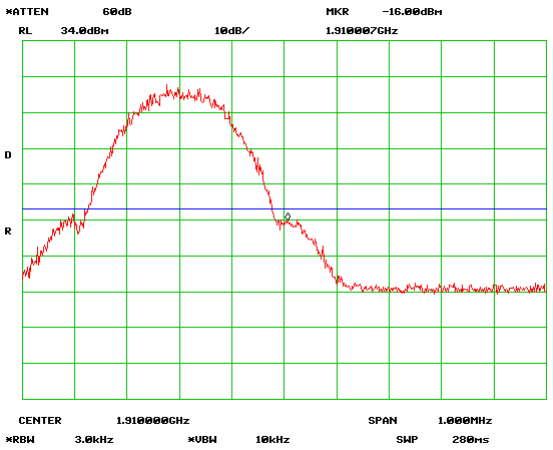
Frequency (MHz)	Emission (dBm)	Limit (dBm)
823.992	-16.67	-13
849.022	-17.00	-13

PCS Band (Part24E) result

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

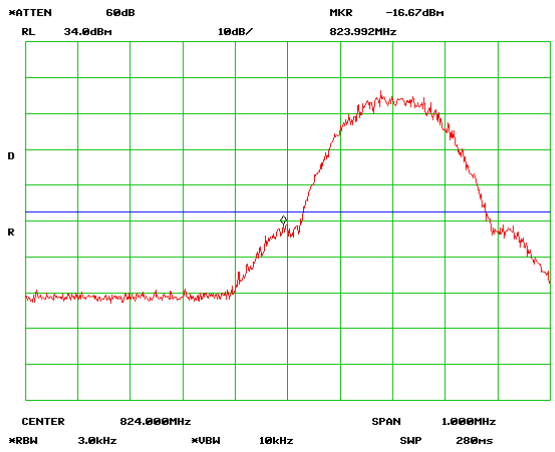
GSM Voice:

Test Plots

	
Cellular Band - Low Channel	Cellular Band - High Channel
Note: Offset=Cable loss (4.0) + 10log (3.17/3)=4.0+0.2=4.2dB	Note: Offset=Cable loss (4.0) + 10log (3.17/3)=4.0+0.2=4.2dB
	
PCS Band - Low Channel	PCS Band - High Channel
Note: Offset=Cable loss (4.0) + 10log (3.23/3)=4.5+0.3=4.8dB	Note: Offset=Cable loss (4.0) + 10log (3.25/3)=4.5+0.3=4.8dB

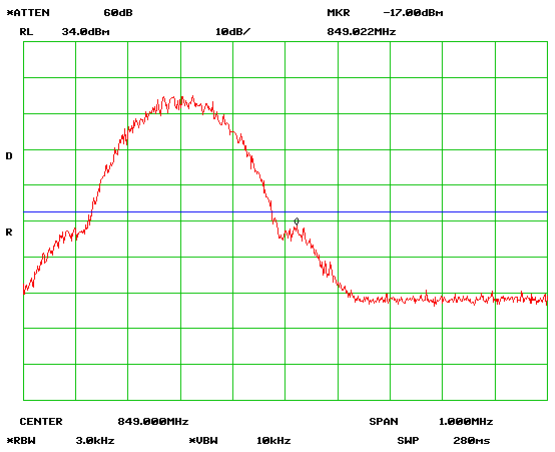
GPRS:

Test Plots



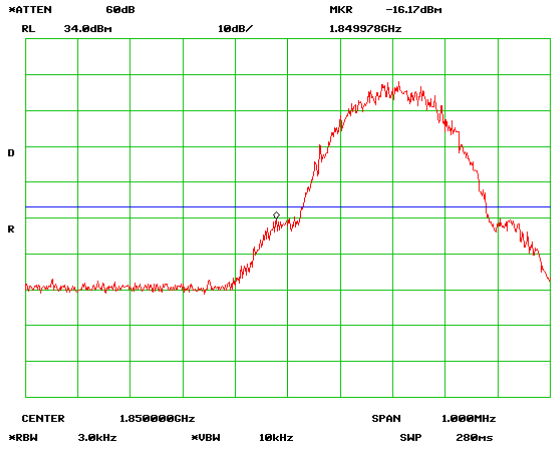
Cellular Band - Low Channel

Note: Offset=Cable loss (4.0) + 10log (3.18/3)=4.0+0.3=4.3 dB



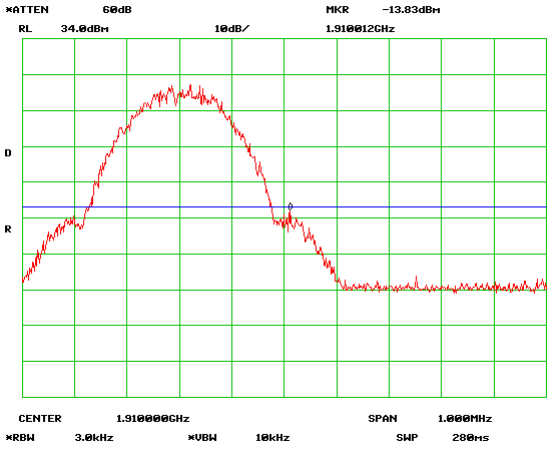
Cellular Band - High Channel

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



PCS Band - Low Channel

Note: Offset=Cable loss (4.5) + 10log (3.18/3)=4.5+0.3=4.8dB



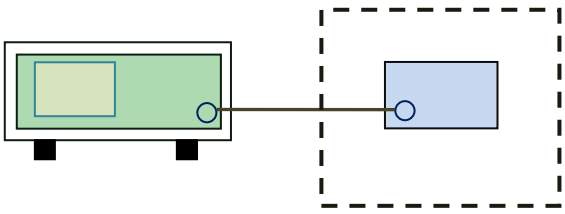
PCS Band - High Channel

Note: Offset=Cable loss (4.5) + 10log (3.23/3)=4.5+0.3=4.8dB

6.8 Frequency Stability

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

Requirement(s):

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>§2.1055, §22.355 & §24.235</td><td>a)</td><td>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
<table>
<tr><th>Frequency Range (MHz)</th><th>Base, fixed (ppm)</th><th>Mobile ≤ 3 watts (pm)</th><th>Mobile ≤ 3 watts (ppm)</th></tr>
<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>
</table>
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized frequency block.</td><td>☑</td></tr>
<tr><td>Test setup</td><td colspan="3">  </td></tr>
</table>

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 ±0.00025% (±2.5ppm) of the center frequency.
Remark	
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☑ N/A

GSM Voice:

Cellular Band (Part 22H) result

Middle Channel, f_o = 836.6 MHz				
Temperature (℃)	Power Supplied (V_{DC})	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_o = 1880 MHz				
Temperature (℃)	Power Supplied (V_{DC})	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_o = 836.6 MHz				
Temperature (℃)	Power Supplied (V_{DC})	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_o = 1880 MHz				
Temperature (℃)	Power Supplied (V_{DC})	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

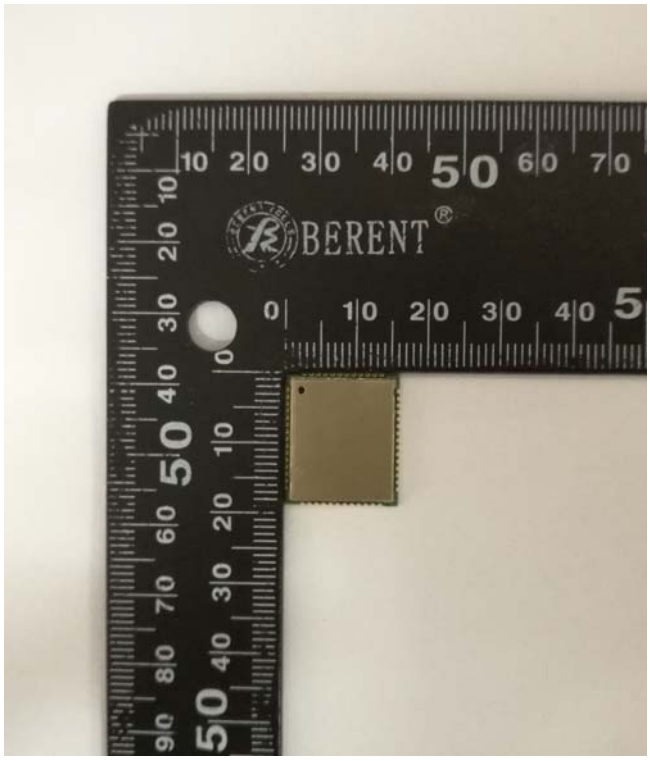
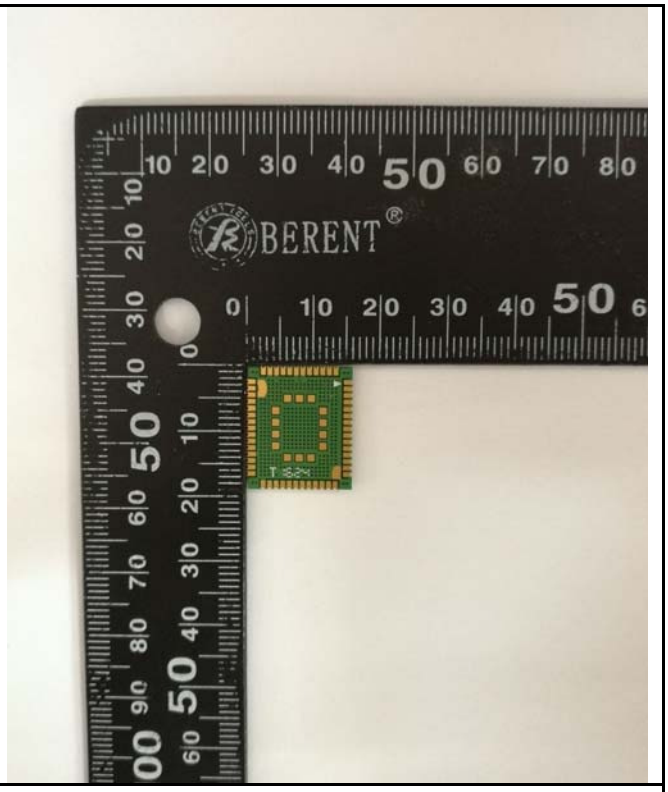
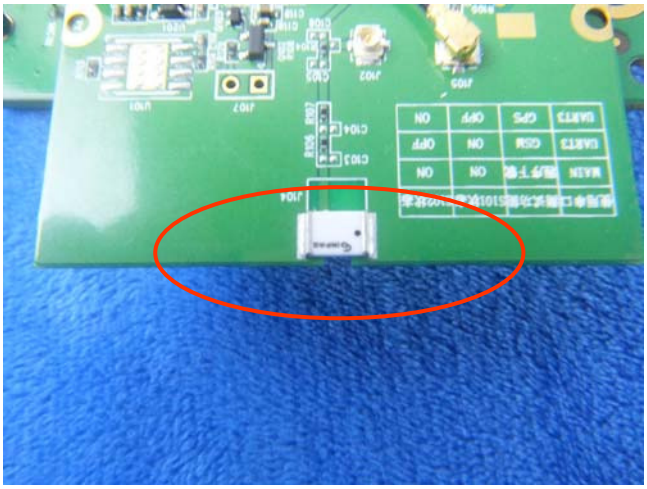
Annex A. TEST INSTRUMENT

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

Tunable Notch Filter	3NF-1000/2000-S	AM 4	08/31/2016	08/30/2017	☑

Annex B. EUT And Test Setup Photographs

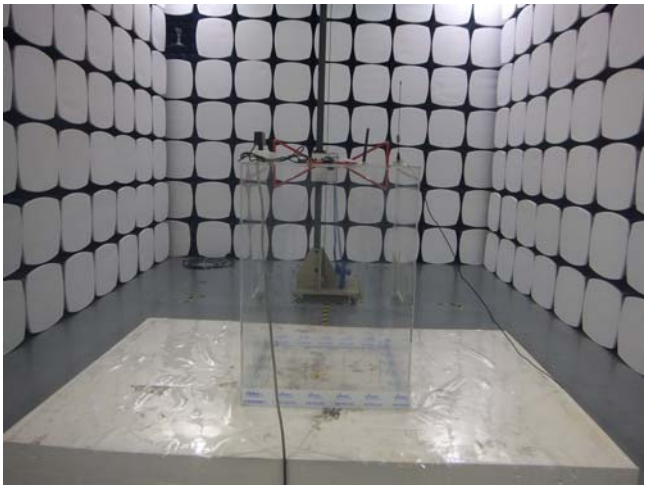
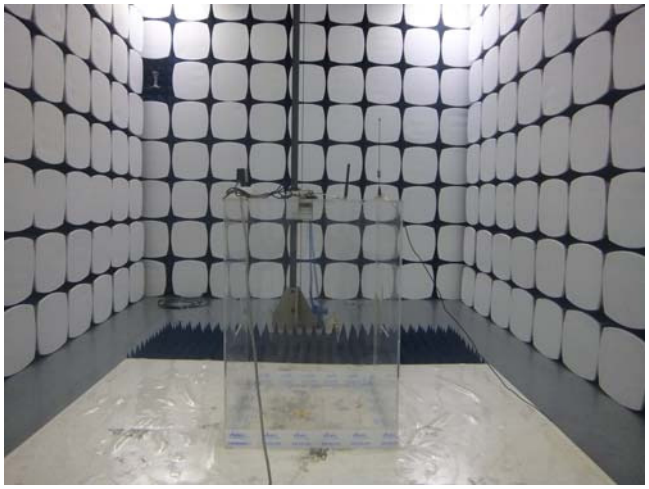
Annex B.i. Photograph: EUT External Photo

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>EUT- Front View</td><td>EUT -Rear Side</td></tr>
<tr><td>  </td><td></td></tr>
<tr><td>BT Antenna</td><td></td></tr>
</table>

Annex B.ii. Photograph: EUT Internal Photo

	
EUT- without Shielding – Front View	BT Antenna

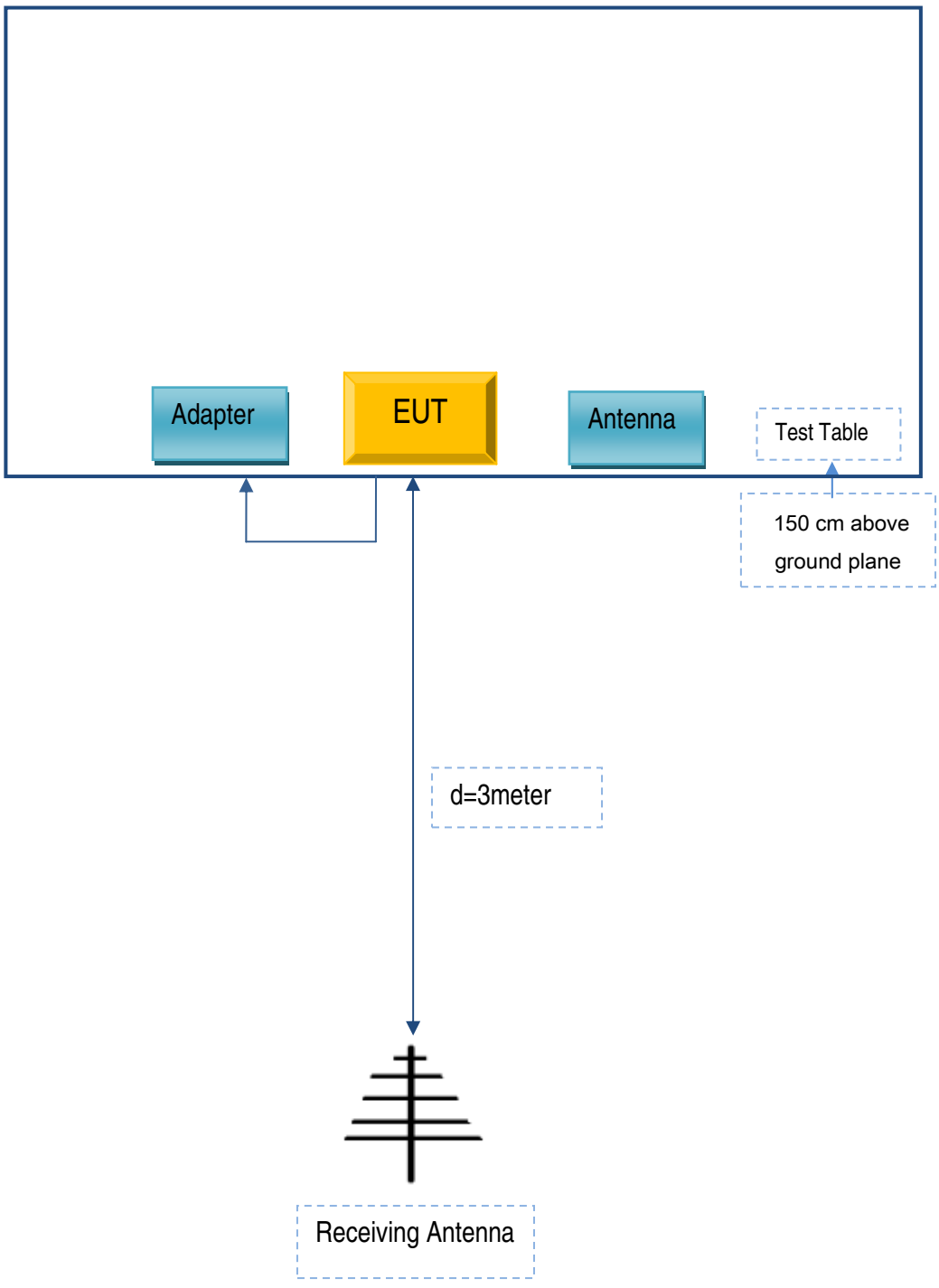
Annex B.iii. Photograph: Test Setup Photo

	
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. il. 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

Annex C.ii. EUT OPERATING CONKITIONS

N/A

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

Please see the attachments

Annex E. DECLARATION OF SIMILARITY

Quectel Wireless Solutions Co., Ltd

Statement

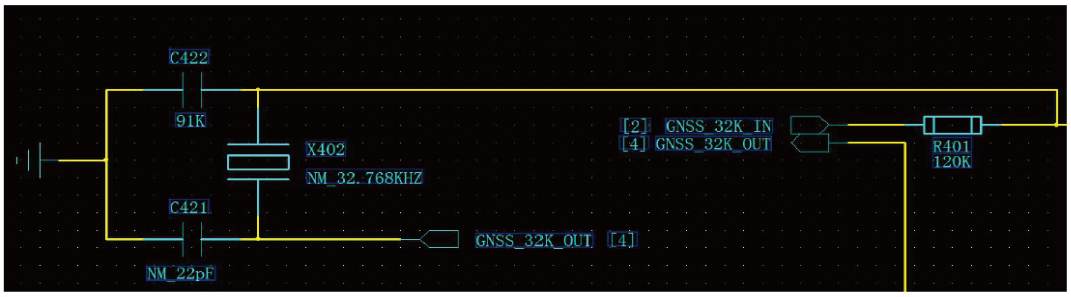
We Quectel Wireless Solutions Co., Ltd declare the following models as series application.

Name: GSM/GPRS/GNSS Module

Model number:MC60, MC20

MC60 and MC20 Module are GSM/GPRS/GNSS modules. They have different name for marketing. We hereby state that two models are identical in interior structure and components, expect the below difference.

NO.	MC20	MC60
C421	-	22pF
C422	91kΩ	22pF
X402	-	32kHZ
R401	120 kΩ	-



Your assistance on this matter is highly appreciated.

Sincerely,
Name: Jean HU
Title: Certification engineer

Signature: Jean Hu