FCC TEST REPORT

Product	:	Mobile Phone
Trade mark	:	MI
Model/Type reference	:	2016117
Report Number	:	1608310293RFM-2
Date of Issue	:	Oct. 24, 2016
FCC ID	:	2AFZZ-RM6117
Test Standards	:	47 CFR Part 24 Subpart E (2015) 47 CFR Part 2 Subpart J (2015)
Test result	:	PASS

Prepared for:

Xiaomi Communications Co., Ltd.
The Rainbow City of China Resources, NO.68, Qinghe Middle Street, Haidian District, Beijing, China

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
TEL: +86-755-2823 0888
FAX: +86-755-2823 0886

Tested by:	Tiny You RF Engineer	Reviewed by:	Jim Long RF Senior Supervisor
Approved by:	Billy Li Technical Director	Date:	Oct. 24, 2016

Version

Version No.	Date	Description
V1.0	Oct. 24, 2016	Original

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1 General Information

1.1 Client Information

Applicant:	Xiaomi Communications Co., Ltd.
Address of Applicant:	The Rainbow City of China Resources, NO.68, Qinghe Middle Street, Haidian District, Beijing, China
Manufacturer:	Xiaomi Communications Co., Ltd.
Address of Manufacturer:	The Rainbow City of China Resources, NO.68, Qinghe Middle Street, Haidian District, Beijing, China

1.2 General Description of EUT

Product Name:	Mobile Phone	
Model No.(EUT):	2016117	
Add. Mode No.:	N/A	
Trade Mark:	MI	
EUT Supports Radios application:	GSM850/900/1800/1900 WCDMA Band I/Band II/Band V/Band VIII LTE FDD Band 1/Band 3/ Band 4/ Band 5/Band 7/Band 8/Band 20 LTE TDD Band 40/Band 41 Wlan 2.4GHz 802.11b/g/n(HT20) Bluetooth V3.0+EDR&Bluetooth V4.0 BLE GPS, Glonass	
Power Supply:	AC adapter	Model:MDY-08-EF Input:100-240V~50/60Hz, 0.35A; Output: 5V ⎓ 2A
	Battery1	Model: BN30 Brand: Sunwoda Rated voltage: 3.84Vdc Battery capacity: 3030mAh(Li-on Rechargeable)
	Battery2	Model: BN30 Brand: SCUD Rated voltage: 3.84Vdc Battery capacity: 3030mAh(Li-on Rechargeable)
USB Micro-B Plug cable:	117cm(Shielded)	
Sample Received Date:	Sep. 09, 2016	
Sample tested Date:	Sep. 11, 2016 to Oct. 14, 2016	

1.3 Product Specification subjective to this standard

Support Networks:	GSM, GPRS, EDGE, WCDMA, HSDPA, HSUPA,DC-HSDPA,HSPA+	
Type of Modulation:	GSM/GPRS:	GMSK
	EDGE:	GMSK, 8PSK
	WCDMA:	BPSK
	LTE:	QPSK, 16QAM
Frequency Range:	GSM/GPRS/EDGE:	1850.2-1909.8 MHz
	WCDMA	1852.4-1907.6 MHz
Max RF Output Power:	GSM/GPRS:	29.41dBm
	EDGE:	24.88dBm
	WCDMA	22.8dBm
Type of Emission:	GSM/GPRS:	245KGXW

	EDGE:	246KG7W
	WCDMA	4M14F9W
IEMI:	862115030005584	
	862115030005592	
Type of Antenna:	LDS Antenna	
Antenna Gain:	-0.6dBi	
GPRS/EDGE Class:	Class 33	
Sample Type:	Portable production	
Normal Test voltage:	3.84Vdc	
Extreme Test voltage:	3.6~4.35Vdc (declared by the manufacturer)	
Operating Temperature:	0℃ to +40℃ (declared by the manufacturer)	
Software Version:	MIUI8	
Hardware Version:	P3	

1.4 Description of Support Units

The EUT has been tested independently

1) Support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
N/A	N/A	N/A	N/A	N/A

2) Cable

Cable No.	Description	Manufacturer	Cable Type/Length	Supplied by
1	N/A	N/A	N/A	N/A

1.5 Test Location

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109

Telephone: +86 (0) 755 2823 0888 Fax:+86 (0) 755 2823 0886

Tested by: Tiny You

Tests were sub-contracted.(EIRP and Field strength of spurious radiation)

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

Address: Building 28/29, Shigu East, Xili Street, Xili Industrial District, Nanshan District, Shenzhen, Guangdong, China

Telephone: +86 (0) 755 26627338 Fax:+86 (0) 755 26627238

Tested by: Fly

1.6 Test Facility

1) Shenzhen UnionTrust Quality and Technology Co., Ltd.

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

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the

ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

2) CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

CNAS-Lab Code: L1659

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. CCIC is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659. A 12.8*6.8*6.4 (m) fully anechoic chamber was used for the radiated spurious emissions test.

1.7 Deviation from Standards

None.

1.8 Abnormalities from Standard Conditions

None.

1.9 Other Information Requested by the Customer

None.

1.10 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 6.3 \times 10^{-8}$
2	RF power, conducted	±0.52 dB
3	Radiated Spurious emissions	±5.9 dB
4	Conducted spurious emission 9KHz-40GHz	±1.60 dB
5	Temperature	±0.64 °C
6	Humidity	±2.8 %
7	Supply voltages	±0.49 %

2 Test Summary

Test Item	Test Requirement	Test method	Result
Equivalent Isotropic Radiated Power (EIRP)	Part 2.1046(a) & Part 24.232(c)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Conducted Output Power	Part 2.1046(a) & Part 24.232(c)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Peak-to-average ratio	Part 24.232(d)	KDB 971168 D01v02r02	PASS
99%&26dB Occupied Bandwidth	Part 2.1049(h) & Part 24.238(b)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Band Edge at antenna terminals	Part 2.1051 & Part 24.238(a)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Spurious emissions at antenna terminals	Part 2.1051 & Part 2.1057& Part 24.238(a)(b)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Field strength of spurious radiation	Part 2.1053 & Part 2.1057 & Part 24.238(a)(b)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Frequency stability	Part 2.1055 & Part 24.235	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS

Remark:
Tx: In this whole report Tx (or tx) means Transmitter.
Rx: In this whole report Rx (or rx) means Receiver.
RF: In this whole report RF means Radiated Frequency.
CH: In this whole report CH means channel.

3 Equipment List

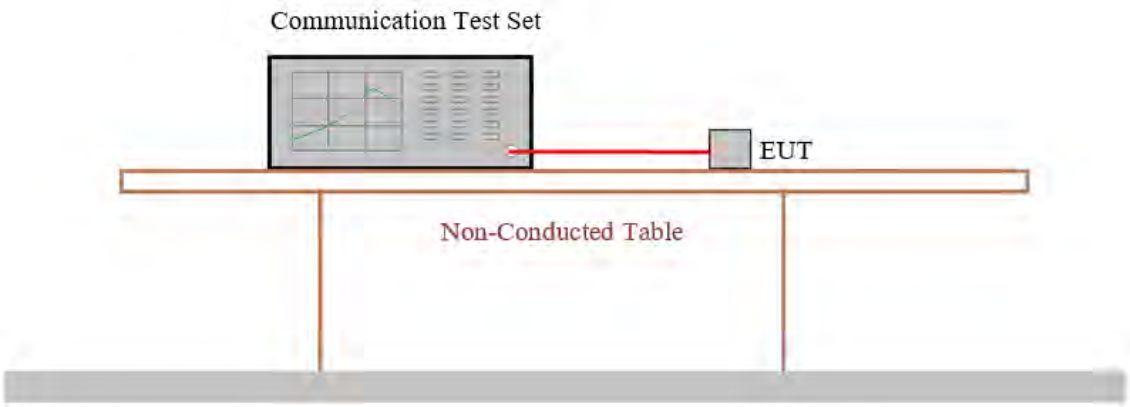
3m (Semi-Anechoic Chamber)					
Equipment	**Manufacturer**	**Mode No.**	**Serial Number**	**Cal date**	**Cal. Due date**
Ultra-Broadband Antenna	SCHWARZBECK	VULB9163	538	11/8/2015	11/7/2017
Double-Ridged-Waveguide Horn Antenna	SCHWARZBECK	9120D	1011	11/8/2015	11/7/2017
Emi Test Receiver	R&S	ESCI	101247	11/1/2015	10/31/2016
Spectrum Analyzer	R&S	FSP40	100597	11/1/2015	10/31/2016
Pre-amplifer	SCHWARZBECK	BBV 9743	9743-0022	11/1/2015	10/31/2016
Broadband Preamplifer	SCHWARZBECK	BBV 9718	9718-248	11/1/2015	10/31/2016
Turntable	Maturo Germany	TT2.0-1T	N/A	N/A	N/A
Antenna Mast	Maturo Germany	CAM-4.0-P-12	N/A	N/A	N/A
Test Software	R&S	ES-K1	N/A	N/A	N/A
Communication test set	R&S	CMW500	130805	10/8/2016	9/8/2017

Communication RF test					
Equipment	**Manufacturer**	**Mode No.**	**Serial Number**	**Cal date**	**Cal. Due date**
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	27/1/2016	26/1/2017
Receiver/ Spectrum Analyzer	R&S	ESR7	1316.3003K07-101181-K3	23/22016	22/22017
Communication test set	R&S	CMU200	114713	7/12/2015	6/12/2016
Communication test set	R&S	CMW500	130805	10/8/2016	9/8/2017

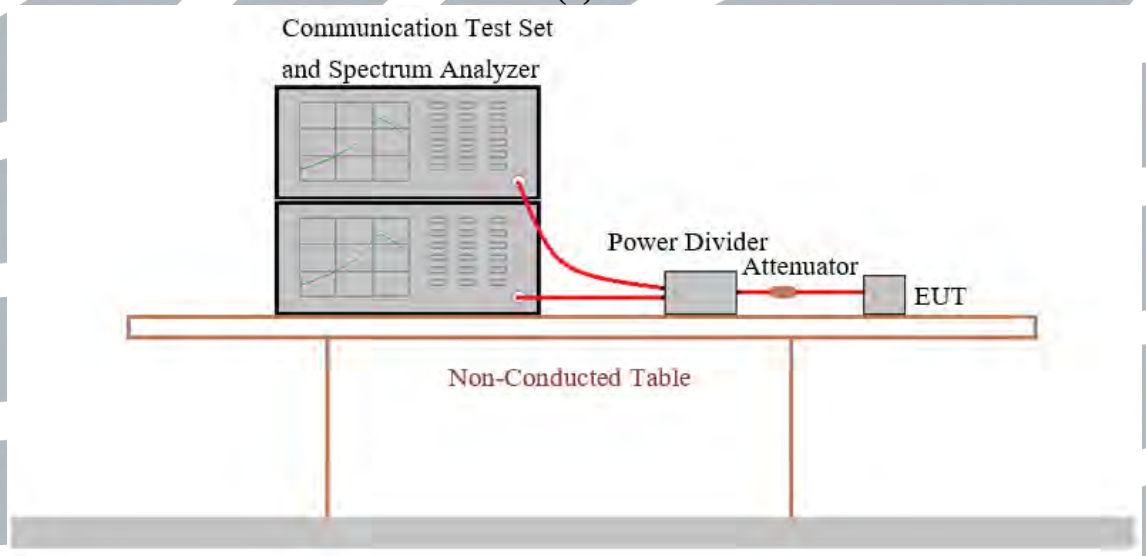
4 Test Requirement

4.1 Test setup

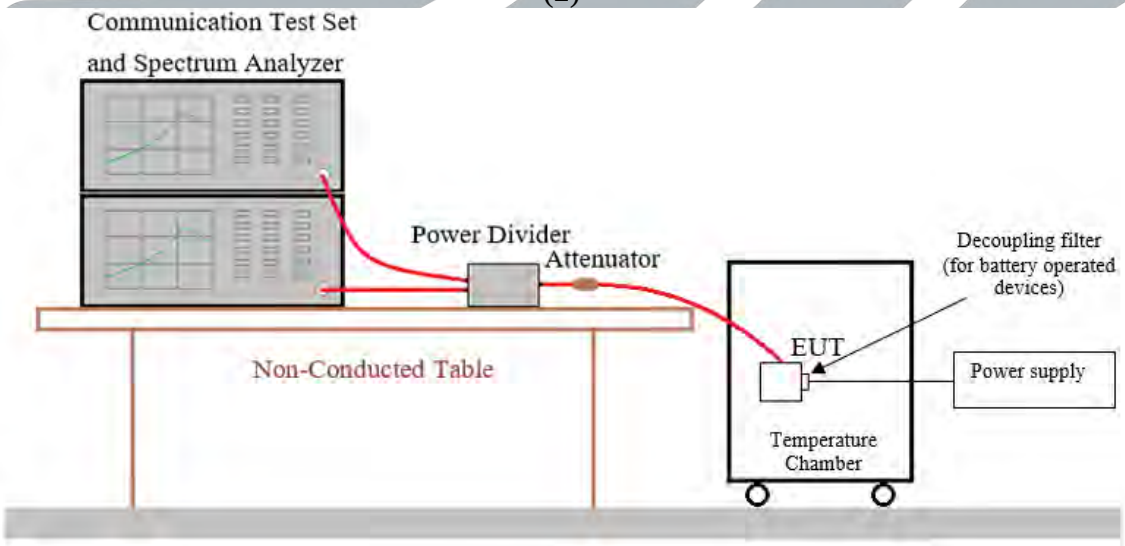
4.1.1 For Conducted test setup



(1)



(2)



(3)

4.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

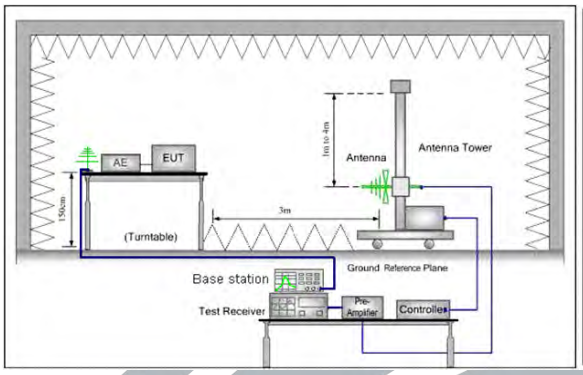


Figure 1.30MHz to 1GHz

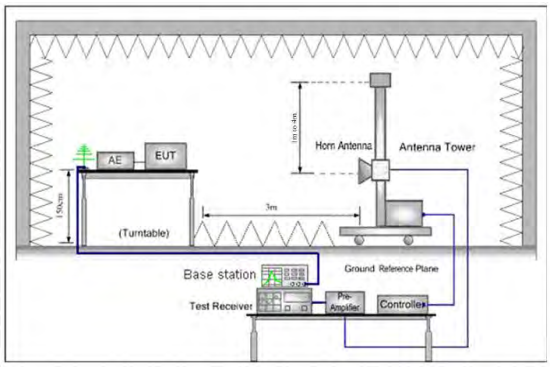


Figure 2. above 1GHz

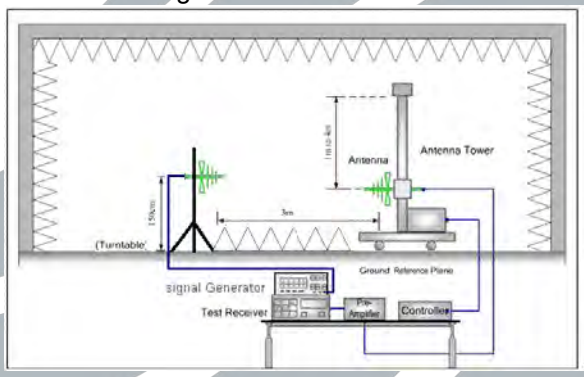


Figure 1. 30MHz to 1GHz

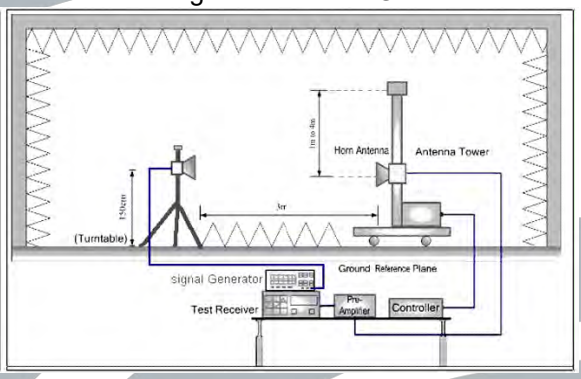


Figure 2. above 1GHz

4.2 Test Environment

Operating Environment:	
Temperature:	25.0 °C
Humidity:	53 % RH
Atmospheric Pressure:	99.87kpa

4.3 System Test Configuration

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 3.85Vdc rechargeable Li-on battery. Only the worst case data were recorded in this test report.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, X, Y, Z axis, and antenna ports.

The worst case was found when positioned as the table below.

Band	**Worst-case Orientation**	
	EIRP	**Radiated Emission**
GSM	Y axis	Y axis
EDGE	Y axis	Y axis
WCDMA	Y axis	Y axis
LTE Band 2	Y axis	Y axis

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000MHz. The resolution is 1 MHz or greater for frequencies above 1000MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.4 Test Condition

4.4.1 Test channel

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(cm)	High(H)
GSM/GPRE/ EDGE1900	Tx (1850 MHz ~1910 MHz)	Channel 512	Channel 661	Channel 810
		1850.2MHz	1880.0 MHz	1909.8 MHz
	Rx (1930 MHz ~1990 MHz)	Channel 512	Channel 661	Channel 810
		1930.2 MHz	1960.0 MHz	1989.8 MHz
WCDMA Band II	Tx (1850 MHz ~1910 MHz)	Channel 9262	Channel 9400	Channel 9538
		1852.4 MHz	1880.0 MHz	1907.6 MHz
	Rx (1930 MHz ~1990 MHz)	Channel 9662	Channel 9800	Channel 9938
		1932.4 MHz	1960.0 MHz	1987.6 MHz

4.4.2 Test mode

Pre-scan under all rate at lowest middle and highest channel, find the transmitter power as below:

SIM 1 Card Conducted transmitter power measurement result (Units: dBm).

band	GSM1900		
Channel	**512**	**661**	**810**
Frequency(MHz)	**1850.2MHz**	**1880MHz**	**1909.8MHz**
GSM	29.17	**29.41**	29.19
GPRS Class 8	29.19	29.40	29.21
GPRS Class 10	27.45	27.53	27.37
GPRS Class 11	25.89	25.82	25.91
GPRS Class 12	24.71	24.78	24.76
EDGE Class 8	24.83	**24.88**	24.71
EDGE Class 10	23.75	23.82	23.77
EDGE Class 11	22.67	22.72	22.71
EDGE Class 12	21.62	21.57	21.60

band	WCDMA Band II		
Channel	**9262**	**9400**	**9538**
Frequency(MHz)	**1852.4MHz**	**1880MHz**	**1907.6MHz**
RMC 12.2K	22.76	22.63	**22.8**
HSDPA Subtest-1	21.38	21.33	21.36
HSDPA Subtest-2	21.29	21.23	21.37

HSDPA Subtest-3	20.78	20.81	20.75
HSDPA Subtest-4	20.57	20.61	20.58
HSUPA Subtest-1	20.15	20.09	20.11
HSUPA Subtest-2	19.14	19.21	19.18
HSUPA Subtest-3	19.45	19.37	19.41
HSUPA Subtest-4	19.32	19.25	19.31
HSUPA Subtest-5	20.51	20.47	20.58
DC-HSDPA Subtest-1	21.34	21.31	21.32
DC-HSDPA Subtest-2	21.26	21.25	21.34
DC-HSDPA Subtest-3	20.75	20.8	20.77
DC-HSDPA Subtest-4	20.54	20.63	20.55
HSPA+	20.48	20.52	20.55

Pre-scan all mode and data rates and positions, find worse case mode are chosen to the report, the worse mode as below:

band	Radiated	Conducted
GSM/GPRS/EDGE 1900	1) GSM (GMSK, 1Tx-slot) Link 2) GPRS (GMSK, 1Tx-slot) Link 3) EDGE (8PSK, 1Tx-slot) Link	1) GSM (GMSK,1Tx-slot) Link 2) GPRS (GMSK, 1Tx-slot) Link 3) EDGE (8PSK, 1Tx-slot) Link
WCDMA Band II	RMC 12.2Kbps Link	RMC 12.2Kbps Link

5 Radio Technical Requirements Specification

Reference documents for testing:

No.	Identity	Document Title
1	47 CFR Part 24 Subpart E	PART 24 – PERSONAL COMMUNICATIONS SERVICES Subpart E – Broadband PCS
2	47 CFR Part 2 Subpart J	Frequency allocations and radio treaty matters; general rules and regulations
3	ANSI/TIA/EIA-603-D 2010	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
4	KDB 971168 D01	KDB 971168 D01 Power Meas License Digital Systems v02r02

5.1 Equivalent Isotropic Radiated Power

Test Requirement: Part 2.1046(a) & Part 24.232(c)

Test Method: KDB 971168 D01v02r02 & ANSI/TIA/EIA-603-D 2010

Limit: Mobile and portable stations are limited to 2 watts EIRP.

Test Procedure: Test procedure as below:

1) The EUT was powered ON and placed on a 1.5m high table at a 3 meter fully Anechoic Chamber. The antenna of the transmitter was extended to its maximum length. Modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
2) The EUT was set 3 meters (above 18GHz the distance is 1 meter) away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3) The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
4) Steps 1) to 3) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
5) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
6) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 3) is obtained for this set of conditions.
7) The output power into the substitution antenna was then measured.
8) Steps 6) and 7) were repeated with both antennas polarized.
9) Calculate power in dBm by the following formula:

   ERP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBd)

   EIRP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBi)

   EIRP=ERP+2.15dB

   where:

   Pg is the generator output power into the substitution antenna.
10) Test the EUT in the lowest channel, the middle channel the Highest channel
11) The radiation measurements are performed in X, Y, Z axis positioning for EUT operation mode, and found the Y axis positioning which it is worse case.
12) Repeat above procedures until all frequencies measured was complete.

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Peak	100kHz	300kHz	Peak
Above 1GHz	Peak	1MHz	3MHz	Peak

Test Setup: Refer to section 4.1.2 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data:

Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Result	Antenna Polaxis.
GSM 1Tx-slot					
512	1850.2	27.70	33.01	Pass	H
		26.61	33.01	Pass	V
661	1880	27.55	33.01	Pass	H
		26.97	33.01	Pass	V
810	1909.8	27.78	33.01	Pass	H
		26.76	33.01	Pass	V
EDGE 1Tx-slot					
512	1850.2	23.60	33.01	Pass	H
		22.57	33.01	Pass	V
661	1880	23.50	33.01	Pass	H
		22.50	33.01	Pass	V
810	1909.8	23.49	33.01	Pass	H
		22.58	33.01	Pass	V
WCDMA RMC 12.2Kbps					
9262	1852.4	21.59	33.01	Pass	H
		20.36	33.01	Pass	V
9400	1880	20.64	33.01	Pass	H
		19.55	33.01	Pass	V
9538	1907.6	21.42	33.01	Pass	H
		19.97	33.01	Pass	V

5.2 Conducted Output Power

Test Requirement: Part 2.1046(a) & Part 24.232(c)

Test Method: ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02

Limit: Mobile and portable stations are limited to 2 watts EIRP.

Test Procedure: The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA, CDMA, and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.
Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.1.1(1) for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data: The full result can be also refer to section 4.4.2 for details.

Note: The following is the worst conducted output power (Units: dBm), the full result can be also refer to section 4.4.2 for details.

For PCS Band			
Channel	**512**	**661**	**810**
Frequency(MHz)	**1850.2MHz**	**1880MHz**	**1909.8MHz**
GSM 1Tx-slot	29.17	29.41	29.19
GPRS 1Tx-slot	29.19	29.43	29.21
EDGE 1Tx-slot	24.83	24.88	24.71

WCDMA RMC 12.2Kbps			
Channel	**9262**	**9400**	**9538**
Frequency(MHz)	**1852.4MHz**	**1880MHz**	**1907.6MHz**
RMC 12.2K	22.76	22.63	22.8

5.3 Peak-to-average ratio

Test Requirement: Part 24.232(d)

Test Method: KDB 971168 D01v02r02

Limit: In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB

Test Procedure: The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer.

a) Set resolution/measurement bandwidth ≥ signal's occupied bandwidth
b) Set the number of counts to a value that stabilizes the measured CCDF curve
c) Record the maximum PAPR level associated with a probability of 0.1 %

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.1.1(1) for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data: The full result can be also refer to section 4.4.2 for details.

Peak-to-average ratio (dB)

For PCS Band			
Channel	**512**	**661**	**810**
Frequency(MHz)	**1850.2MHz**	**1880MHz**	**1909.8MHz**
GSM 1Tx-slot	0.32	0.33	0.32
EDGE 1Tx-slot	2.75	2.67	2.77

WCDMA			
Channel	**9262**	**9400**	**9538**
Frequency(MHz)	**1852.4MHz**	**1880MHz**	**1907.6MHz**
RMC 12.2Kbps	3.04	2.90	2.81

The worst test plot as follows:

GSM 1Tx-slot	EDGE 1Tx-slot
512	
661	
810	

WCDMA RMC 12.2Kbps

9262

9400

9538

5.4 99%&26dB Occupied Bandwidth

Test Requirement: Part 2.1049(h) & Part 24.238(b)

Test Method: ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02

Test Procedure: The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The 99% and -26dB bandwidths was also measured and recorded.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.1.1(2) for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data:

For PCS Band				
Test Mode	**Channel**	**Frequency (MHz)**	**26 dB BW (kHz)**	**99% BW (kHz)**
For PCS Band				
GSM 1Tx-slot	512	1850.2	316.9	244.5731
	661	1880.0	315.5	244.5731
	810	1909.8	315.5	243.1259
EDGE 1Tx-slot	512	1850.2	315.5	246.0203
	661	1880.0	315.5	241.6787
	810	1909.8	315.5	243.1259

For WCDMA				
Test Mode	**Channel**	**Frequency (MHz)**	**26 dB BW (MHz)**	**99% BW (MHz)**
RMC 12.2Kbps	9262	1852.4	4.718	4.1389
	9400	1880.0	4.732	4.1389
	9538	1907.6	4.718	4.1389

The test plot as follows:

GSM 1Tx-slot	
26 dB BW	**99% BW**
512 Channel	
661 Channel	
810 Channel	

EDGE 1Tx-slot	
26 dB BW	**99% BW**
512 Channel	
661 Channel	
810 Channel	

WCDMARMC 12.2Kbps

9262 Channel

9400 Channel

9538 Channel

5.5 Band Edge at antenna terminals

Test Requirement: Part 2.1051 & Part 24.238(a)

Test Method: ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02

Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to –13 dBm.

Test Procedure: The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer.

For each band edge measurement:

1) Set the spectrum analyzer span to include the block edge frequency.
2) Set a marker to point the corresponding band edge frequency in each test case.
3) Set display line at -13 dBm
4) Set resolution bandwidth to at least 1% of emission bandwidth.

Such as:

a) The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 3 kHz and VB of the spectrum is 10 kHz (GSM/GPRS/EDGE).
b) The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is100 kHz and VB of the spectrum is 300 kHz (WCDMA).
c) The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 20 kHz and VB of the spectrum is 20 kHz (LTE Bandwidth 1.4 MHz).
d) The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 30 kHz (LTE Bandwidth 3 MHz).
e) The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 51 kHz and VB of the spectrum is 51 kHz (LTE Bandwidth 5 MHz)
f) The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 10 MHz)

5) Record the max trace plot into the test report

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.1.1(2) for details.

Instruments Used: Refer to section 3 for details

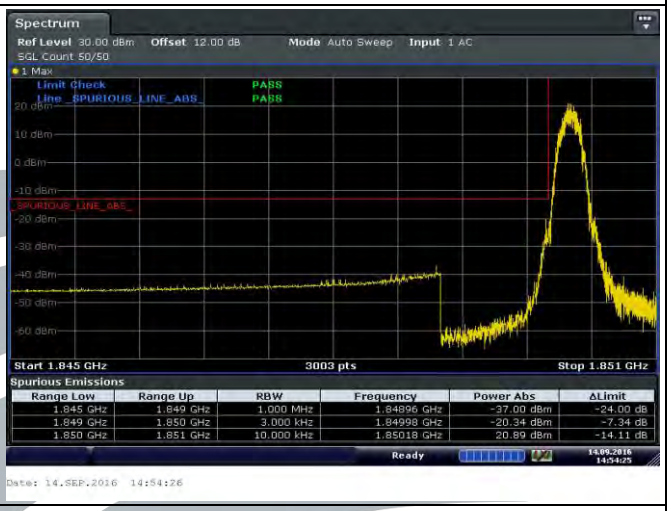
Test Mode: Link mode

Test Results: Pass

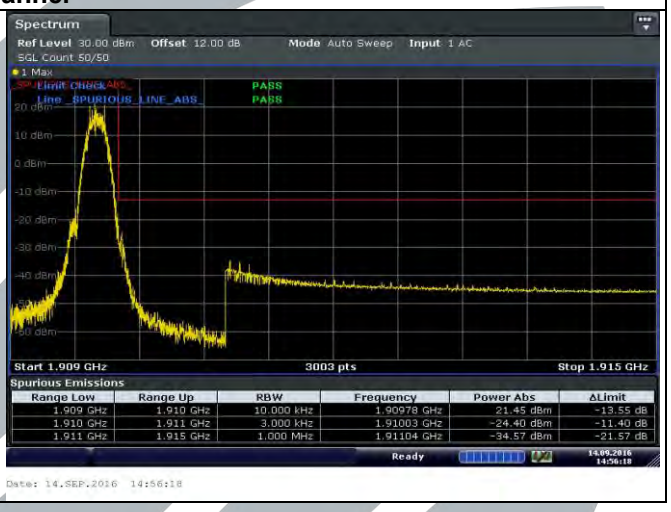
The test plot as follows:

GSM 1Tx-slot	EDGE 错误!未找到引用源。

512 Channel



810 Channel



WCDMA RMC 12.2Kbps

9262 Channel	9538 Channel

5.6 Spurious emissions at antenna terminals

Test Requirement: Part 2.1051 & Part 2.1057 & Part 24.238(a)(b)

Test Method: ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02

Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to –13 dBm.

Test Procedure: The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range. b. Measuring frequency range is from 9 kHz to 20 GHz. Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

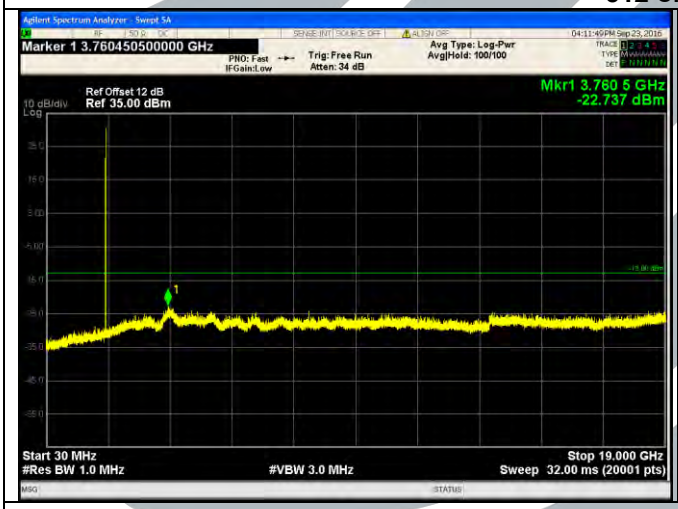
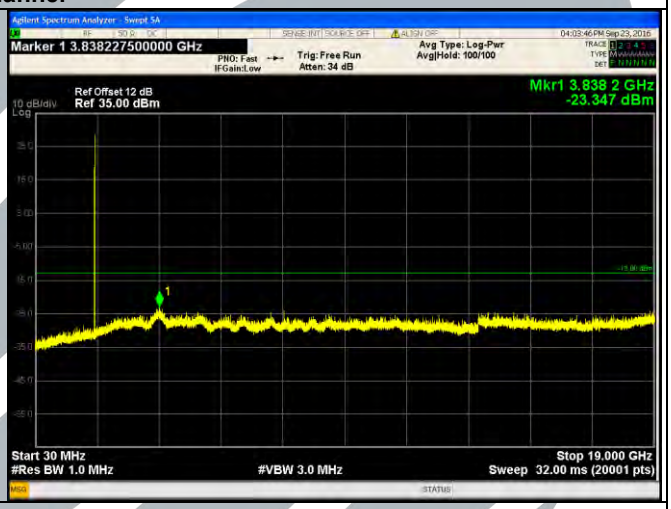
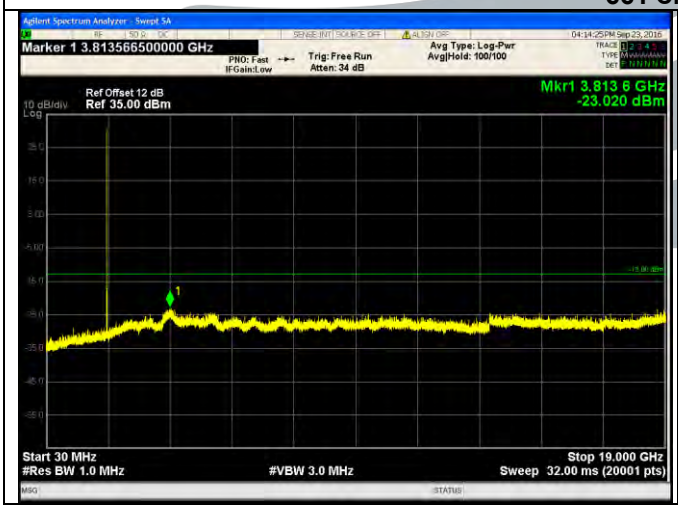
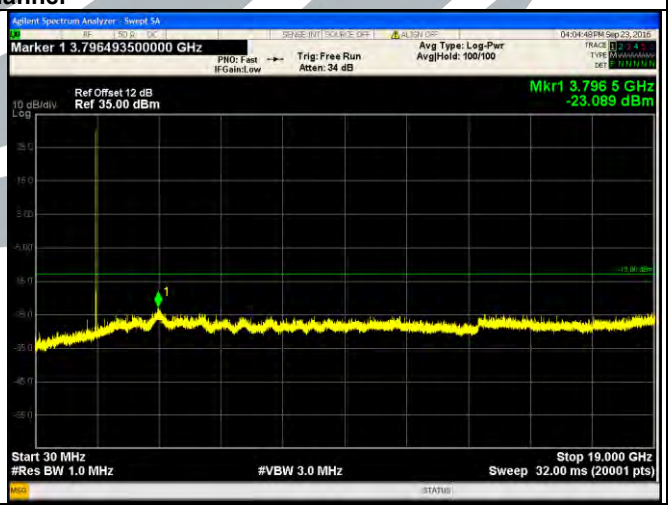
Test Setup: Refer to section 4.1.1(2) for details.

Instruments Used: Refer to section 3 for details

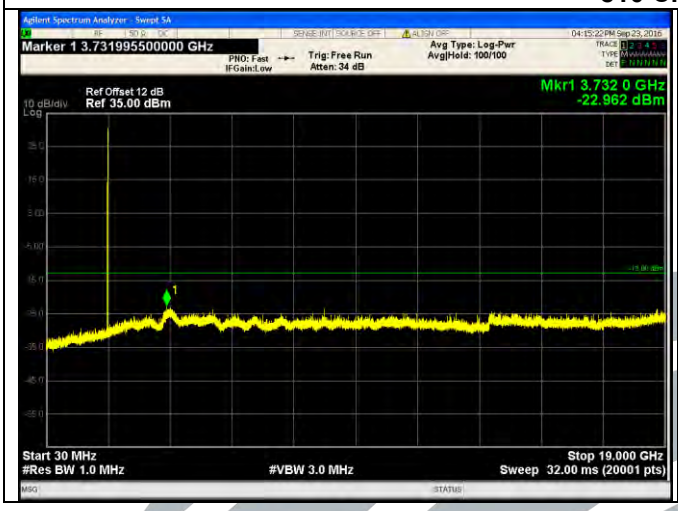
Test Mode: Link mode

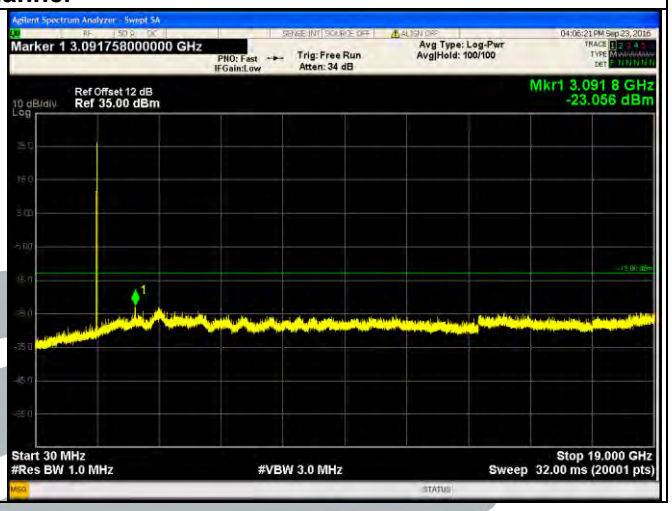
Test Results: Pass

The test plot as follows:

GSM 1Tx-slot	EDGE 错误!未找到引用源。
512 Channel	
	
661 Channel	
	

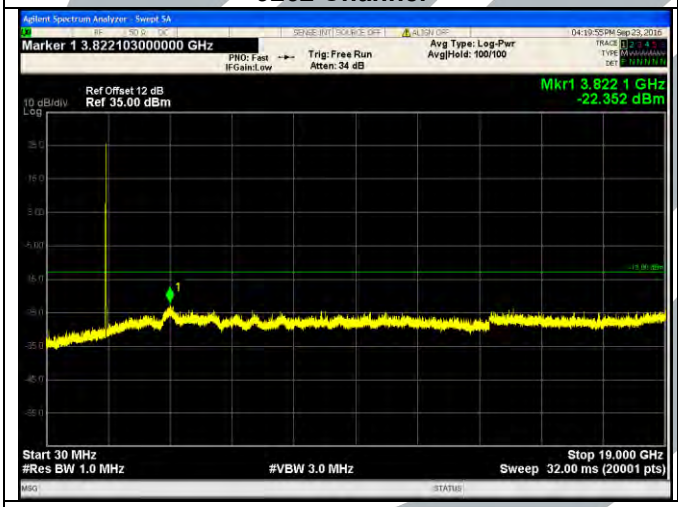
810 Channel



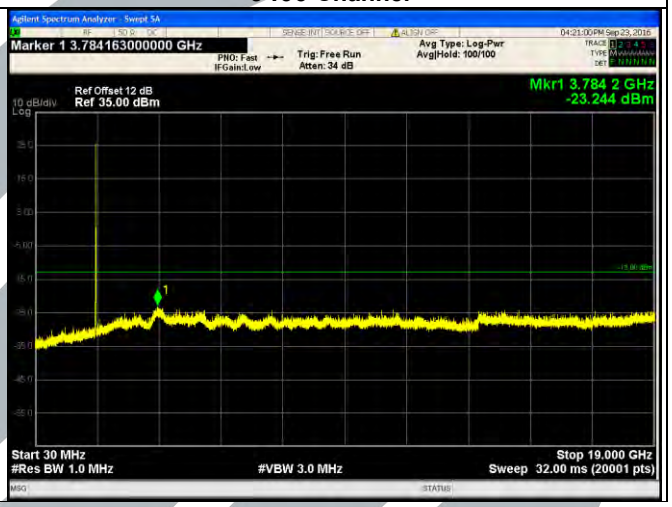


WCDMA RMC 12.2Kbps

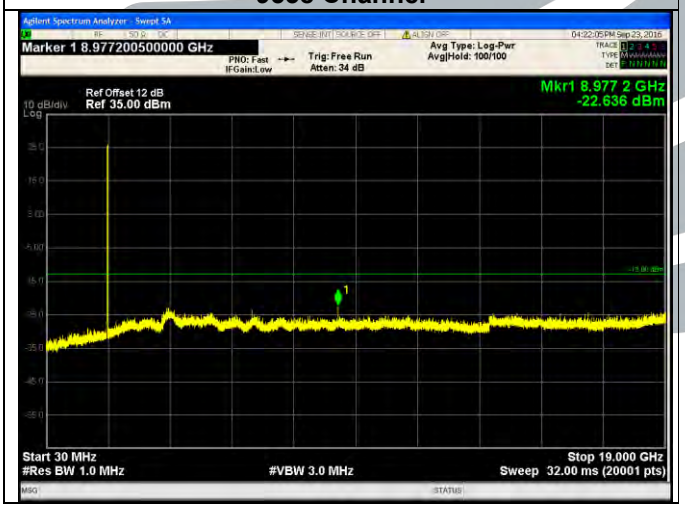
9262 Channel



9400 Channel



9538 Channel



5.7 Field strength of spurious radiation

Test Requirement: Part 2.1053 & Part 22.917(a)(b)

Test Method: ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02

Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to –13 dBm.

Test Procedure:

1. Scan up to 10th harmonic, find the maximum radiation frequency to measure.
2. The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.

Test procedure as below:

1) The EUT was powered ON and placed on a 1.5m high table at a 3 meter fully Anechoic Chamber. The antenna of the transmitter was extended to its maximum length. Modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
2) The EUT was set 3 meters (above 18GHz the distance is 1 meter) away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3) The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
4) Steps 1) to 3) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
5) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
6) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 3) is obtained for this set of conditions.
7) The output power into the substitution antenna was then measured.
8) Steps 6) and 7) were repeated with both antennas polarized.
9) Calculate power in dBm by the following formula:

   ERP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBd)

   EIRP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBi)

   EIRP=ERP+2.15dB

   where:

   Pg is the generator output power into the substitution antenna.
10) Test the EUT in the lowest channel, the middle channel the Highest channel
11) The radiation measurements are performed in X, Y, Z axis positioning for EUT operation mode, and found the Y axis positioning which it is worse case.
12) Repeat above procedures until all frequencies measured was complete.

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-30MHz	Peak	10kHz	30kHz	Peak
30MHz-1GHz	Peak	100kHz	300kHz	Peak
Above 1GHz	Peak	1MHz	3MHz	Peak

Test Setup: Refer to section 4.1.2 for details.

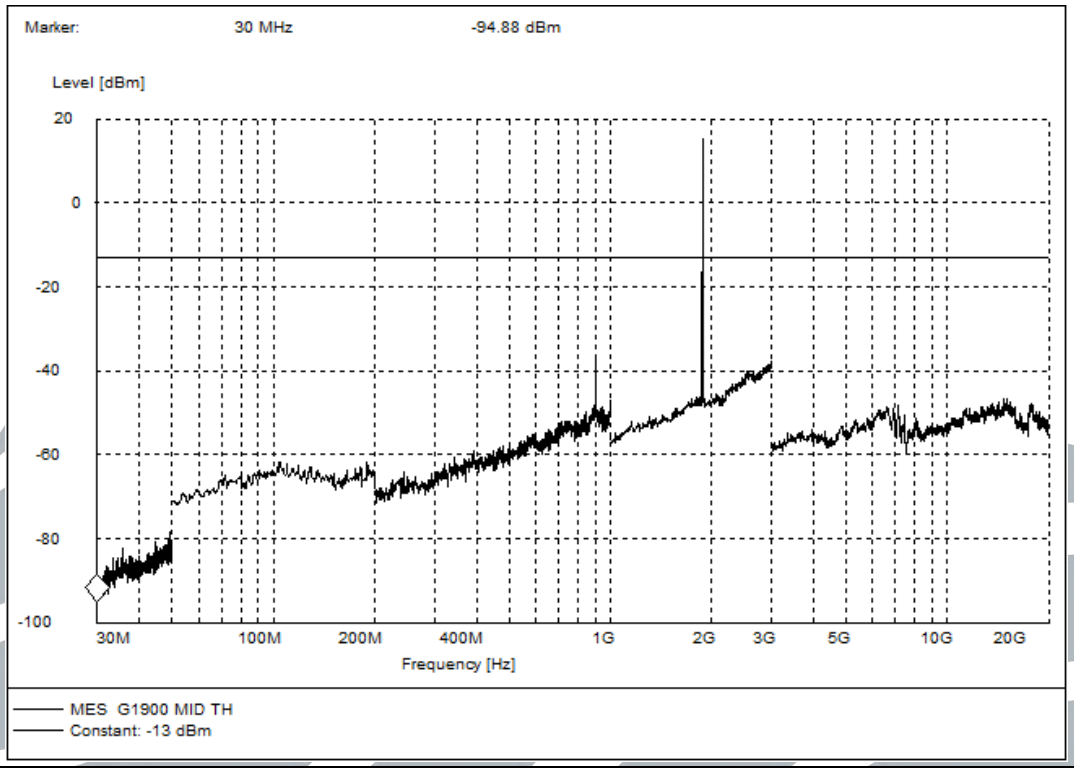
Instruments Used: Refer to section 3 for details

Test Mode: Link mode

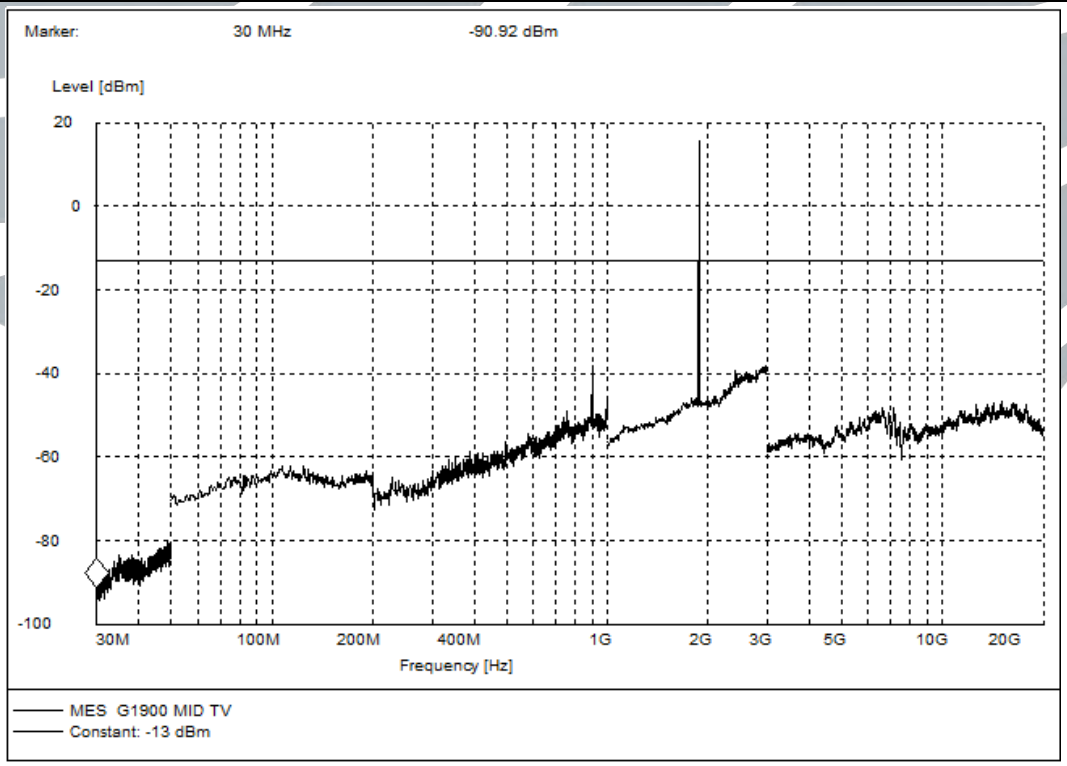
Test Results: Pass

Test Data:

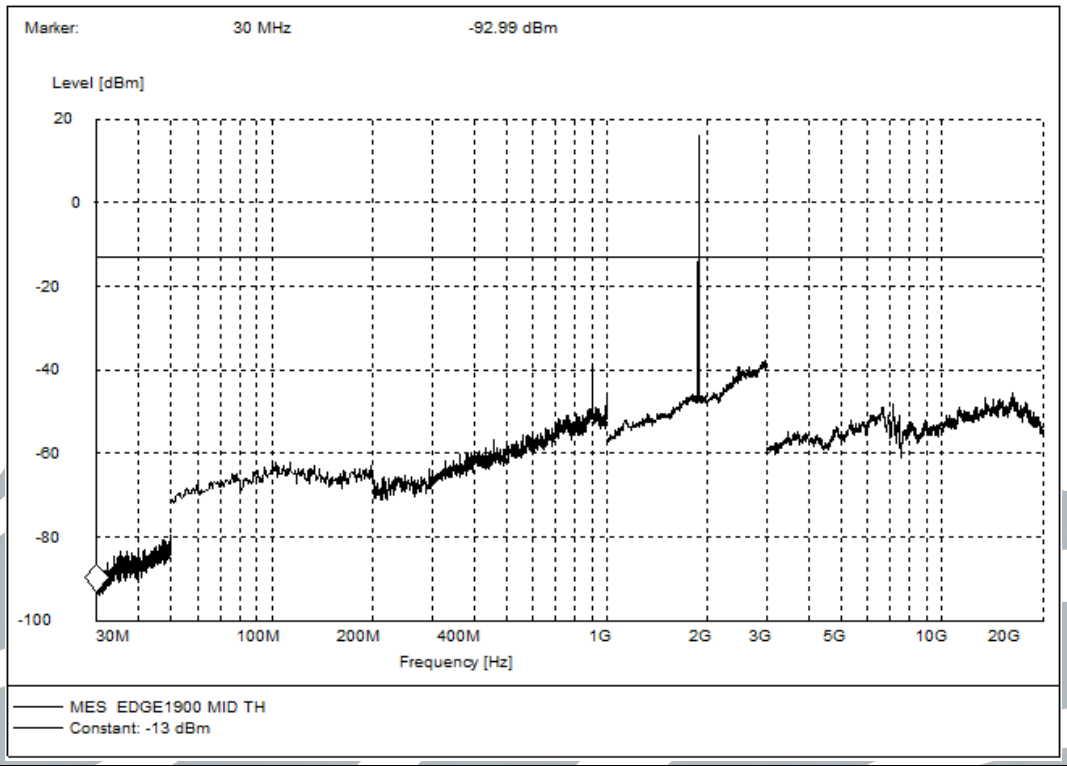
GSM 1Tx-slot_661 channel/1880.0MHz_Horizontal



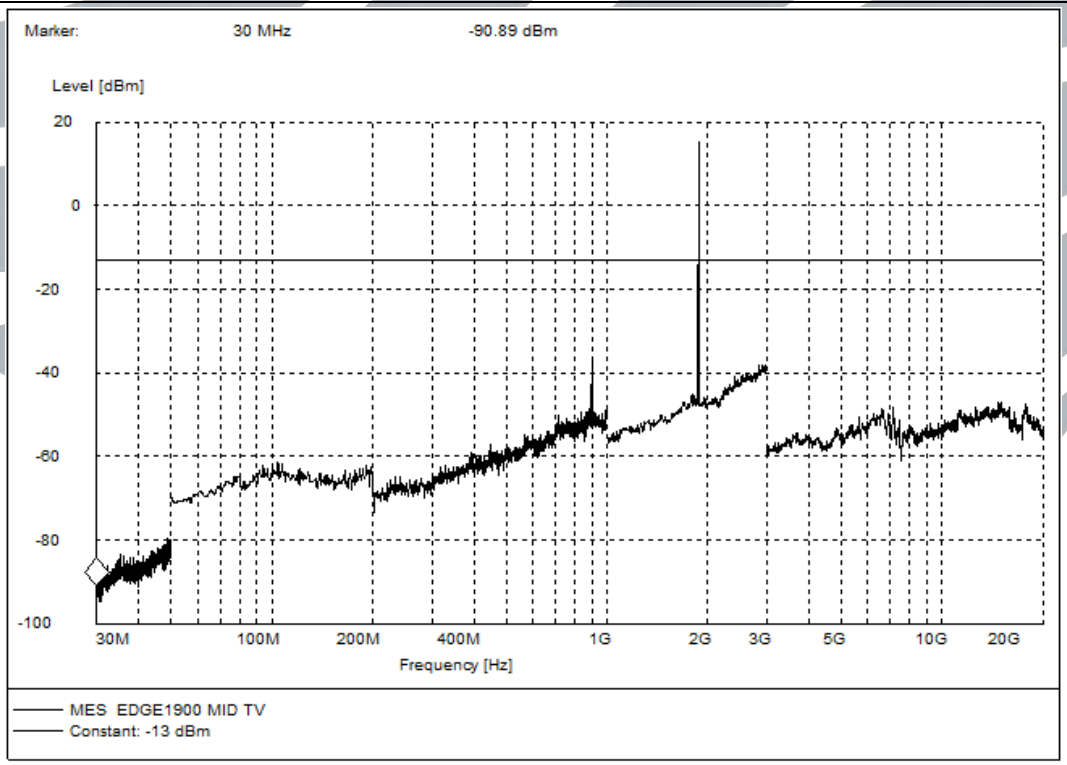
GSM 1Tx-slot_661 channel/1880.0MHz_Vertical



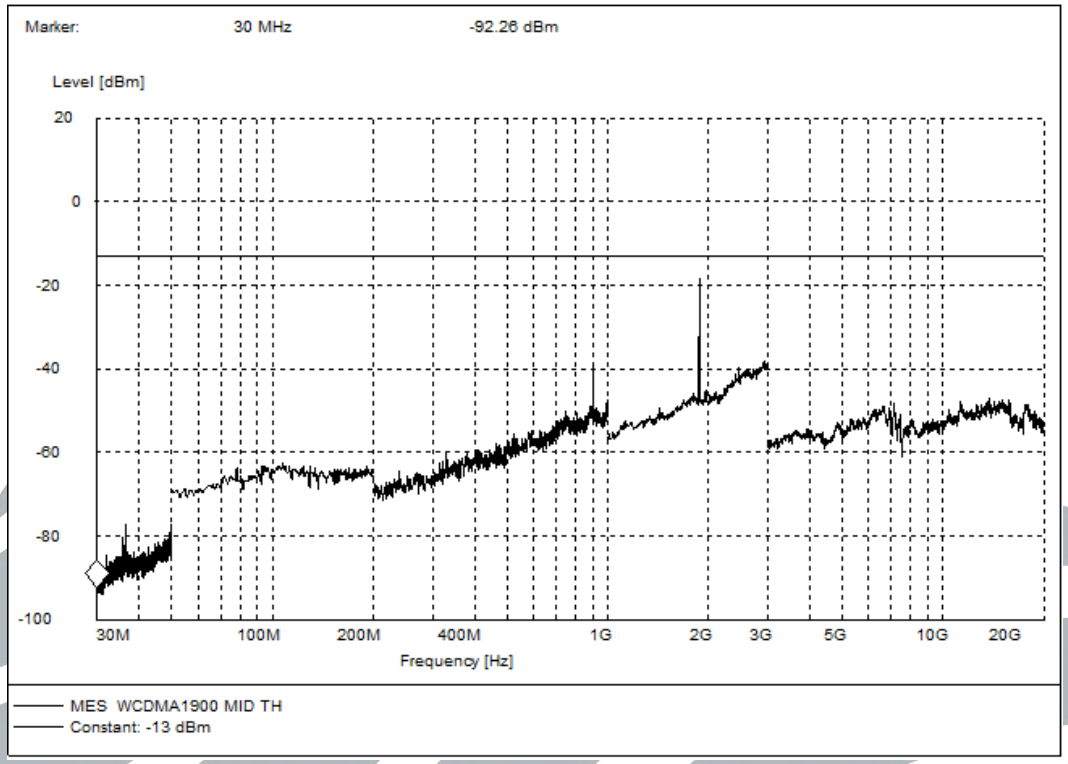
EDGE 1Tx-slot_661 channel/1880.0MHz_Horizontal



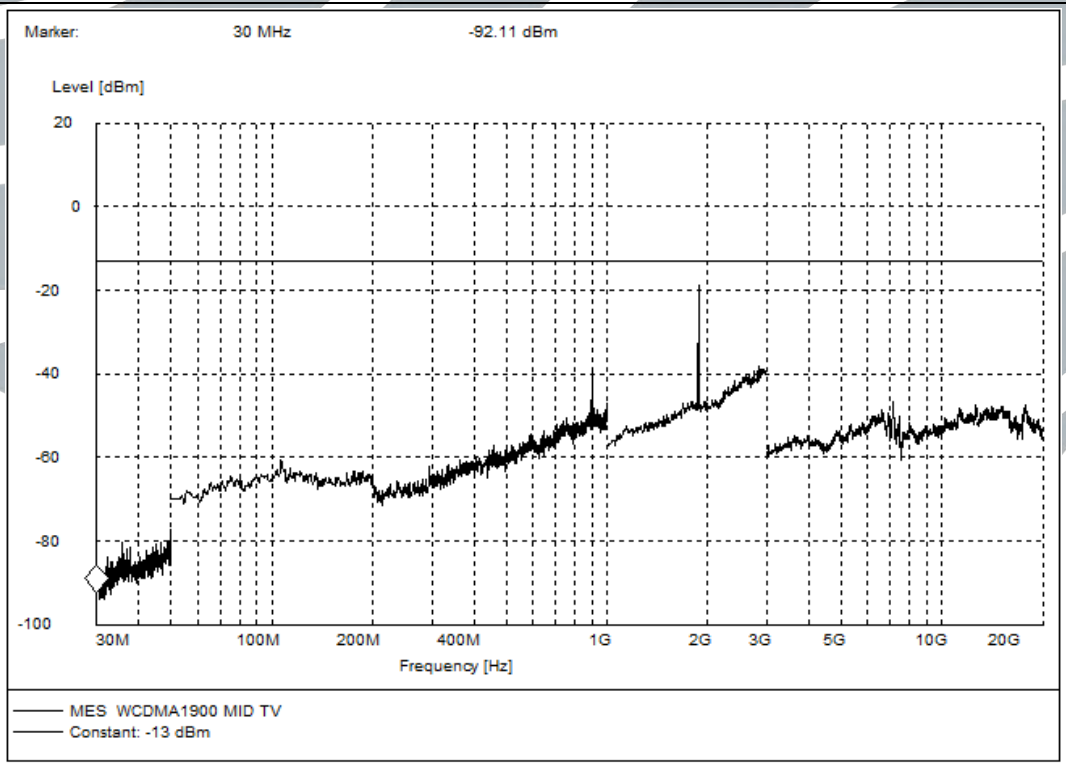
EDGE 1Tx-slot_661 channel/1880.0MHz_Vertical



WCDMA RMC 12.2Kbps_ 9400 channel/1880.0MHz_Horizontal



WCDMA RMC 12.2Kbps_ 9400 channel/1880.0MHz_Vertical



Note:

1) Scan from 9 kHz to 20 GHz, the disturbance above 20GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

5.8 Frequency stability

Test Requirement: Part 2.1055 & Part 24.235

Test Method: ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02

Limit: The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure:

1) Use CMW 500 or CMU 200 with Frequency Error measurement capability.
   a) Temp. =−30° to +50°C
      The applicant declared that the normal operating temperature of the EUT is from −30° to +50°C. The EUT would shut down automatically as below -10°C.
   b) Voltage =low voltage, 3.6Vdc, Normal, 3.84Vdc and High voltage, 4.35Vdc.
      The applicant defined the normal working voltage of the battery is from 3.6~4.35Vdc.
2) Frequency Stability vs Temperature:
The EUT is place inside a temperature chamber. The temperature is set to 20ºC and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50ºC is reached.
3) Frequency Stability vs Voltage:
The peak frequency error is recorded (worst-case).

Test Setup: Refer to section 4.1.1(3) for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data:

Modulation	Channel / Frequency (MHz)	Voltage (Vdc)	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Pass/ Fail
GSM 1Tx-slot							
GMSK	661/ 1880	3.6	Normal	-24	-0.0128	± 2.5	PASS
		3.84		-25	-0.0133	± 2.5	PASS
		4.35		-23	-0.0122	± 2.5	PASS
		3.84	50	-17	-0.0090	± 2.5	PASS
			40	-20	-0.0106	± 2.5	PASS
			30	-23	-0.0122	± 2.5	PASS
			20	-24	-0.0128	± 2.5	PASS
			20	-21	-0.0112	± 2.5	PASS
			0	-25	-0.0133	± 2.5	PASS
			-10	-19	-0.0101	± 2.5	PASS
			-20	-17	-0.0090	± 2.5	PASS
			-30	-20	-0.0106	± 2.5	PASS

Modulation	Channel/ Frequency (MHz)	Voltage (Vdc)	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Pass/ Fail
EDGE 1Tx-slot							
8PSK	661/ 1880	3.6	Normal	32	0.0170	± 2.5	PASS
		3.84		33	0.0176	± 2.5	PASS
		4.35		29	0.0154	± 2.5	PASS
		3.84	50	23	0.0122	± 2.5	PASS
			40	25	0.0133	± 2.5	PASS
			30	24	0.0128	± 2.5	PASS
			20	27	0.0144	± 2.5	PASS
			20	32	0.0170	± 2.5	PASS
			0	35	0.0186	± 2.5	PASS
			-10	26	0.0138	± 2.5	PASS
			-20	23	0.0122	± 2.5	PASS
			-30	25	0.0133	± 2.5	PASS

Modulation	Channel/ Frequency (MHz)	Voltage (Vdc)	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Pass/ Fail
WCDMA RMC 12.2Kbps							
BPSK	9400/1880	3.6	Normal	-17	-0.0090	± 2.5	PASS
		3.84		-16	-0.0085	± 2.5	PASS
		4.35		-13	-0.0069	± 2.5	PASS
		3.84	50	-10	-0.0053	± 2.5	PASS
			40	5	0.0027	± 2.5	PASS
			30	11	0.0059	± 2.5	PASS
			20	6	0.0032	± 2.5	PASS
			20	7	0.0037	± 2.5	PASS
			0	10	0.0053	± 2.5	PASS
			-10	-13	-0.0069	± 2.5	PASS
			-20	-10	-0.0053	± 2.5	PASS
			-30	-12	-0.0064	± 2.5	PASS

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

See test photographs attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photographs.

*** End of Report ***

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