

RF Test Report

Applicant : MobileHelp, LLC

Product Type : LTE Module

Trade Name : Quectel

Model Number : SC20-A

Test Specification : FCC 47 CFR PART 22H
FCC 47 CFR PART 24E
ANSI C63.26

Receive Date : Apr. 09, 2019

Test Period : Apr. 25 ~ May 08, 2019

Issue Date : Jun. 14, 2019

Issue by

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade District,
Taoyuan City 33465, Taiwan (R.O.C.)
Tel : +886-3-2710188 / Fax : +886-3-2710190



Taiwan Accreditation Eoundation accreditation number: 1330
Test Firm MRA designation number: TW0010

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Revision History

Rev.	Issue Date	Revisions	Revised By
00	Jun. 14, 2019	Initial Issue	Nina Lin

Verification of Compliance

Issued Date: Jun. 14, 2019

Applicant : MobileHelp, LLC

Product Type : LTE Module

Trade Name : Quectel

Model Number : SC20-A

FCC ID : PXT-201706SC20A

EUT Rated Voltage : DC 3.5 V ~ DC 4.2 V

Test Voltage : 120 Vac / 60 Hz

Applicable Standard : FCC 47 CFR PART 22H
FCC 47 CFR PART 24E
ANSI C63.26

Test Result : Complied

Performing Lab. : A Test Lab Techno Corp.
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Taoyuan City 33465, Taiwan (R.O.C.)
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Taiwan Accreditation Foundation accreditation number: 1330
<http://www.atl-lab.com.tw/e-index.htm>

A Test Lab Techno Corp. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Approved By : Fly Lu Reviewed By : Eric Ou Yang
(Manager) (Fly Lu) (Testing Engineer) (Eric Ou Yang)

TABLE OF CONTENTS

1	General Information	5
1.1.	EUT Description	5
1.2.	Mode of Operation.....	6
1.3.	EUT Test Step	6
1.4.	Configuration of Test System Details	7
1.5.	Test Instruments	8
1.6.	Test Site Environment.....	9
1.7.	Summary of Test Result.....	9
2	Measurement Procedure	10
2.1.	RF Output Power Test	10
2.2.	Effective Radiated Power / Equivalent Isotropic Radiated Power Test	11
2.3.	Field Strength of Spurious Radiation Test	14
3	Test Results.....	17
Appendix A: Conducted Output Power		17
Appendix B: Effective Radiated Power / Equivalent Isotropic Radiated Power Test		19
Appendix C: Field Strength of Spurious Radiation		20



1 General Information

1.1. EUT Description

Applicant	MobileHelp, LLC 5050 Conference Way N, Suite 125, Boca Raton, Florida 33431, United States			
Manufacturer	Quectel Wireless Solutions Co., Ltd. 7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China			
Product Type	LTE Module			
Trade Name	Quectel			
Model Number	SC20-A			
FCC ID	PXT-201706SC20A			
Class II Permissive Change	This is to request a Class II permissive change for FCC ID: PXT-201706SC20A, originally granted on 6/13/2019. The major change filed under this application is: Change #1: Host added, MobileHelp, model number: DC-TBS2-01 #2: Disable GSM, WCDMA B4 and LTE bands B7,B13,B25,B26 by firmware. #3: Reduce the Output Power through firmware, and SAR measurement were evaluated. (Only reduce WCDMA band2/LTE band2/Wi-Fi 2.4GHz/Bluetooth output Power, other undescribed parts haven't changes). #4: Addition antennas, the WWAN WCDMA/LTE band 2 antenna gain higher then original grant, WLAN/Bluetooth antenna type different from original grant. The radiated emission has verified and compliance with FCC regulations. Other undescribed parts antenna gain lower then original grant.			
Host Information	Product Type: Tablet Base Station Trade Name: MobileHelp Model Name: DC-TBS2-01			
IMEI No.	015559000091890			
Mode	Band	UL Frequency (MHz)	DL Frequency (MHz)	Modulation
WCDMA(RMC12.2K)/ HSDPA/ HSUPA	II	1852.4 ~ 1907.6	1932.4 ~ 1987.6	QPSK
	V	826.4 ~ 846.6	871.4 ~ 891.6	QPSK
Antenna information	Type		Max. Gain (dBi)	
	SMT PCB Antenna		WCDMA/ HSDPA/ HSUPA Band II	2.91
			WCDMA/ HSDPA/ HSUPA Band V	1.48
Operate Temp. Range	-40 ~ 75 °C			

Frequency Band	Max. RF Output Power (W)	E.R.P. /E.I.R.P. (W)	
WCDMA/ HSDPA/ HSUPA Band II	0.245	0.112	(E.I.R.P.)
WCDMA/ HSDPA/ HSUPA Band V	0.515	---	(E.R.P.)

1.2. Mode of Operation

ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: WCDMA Band II Link Mode
Mode 2: WCDMA Band V Link Mode

Note: Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.

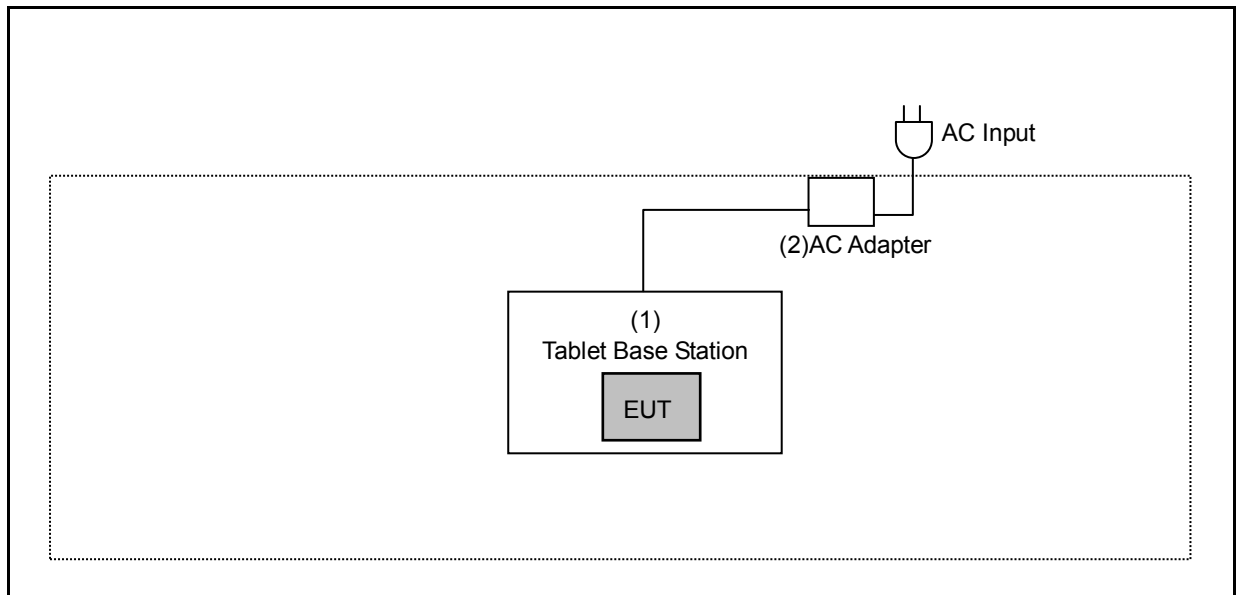
By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "X axis" position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

1.3. EUT Test Step

1	Setup the EUT shown on "Configuration of Test System Details".
2	Turn on the power of all equipment.

Measurement Software			
No.	Description	Software	Version
1	Radiated Emission	EZ EMC	1.1.4.4

1.4. Configuration of Test System Details



Devices Description					
	Product	Manufacturer	Model Number	Serial Number	Power Cord
(1)	Tablet Base Station	MobileHelp	DC-TBS2-01	---	---
(2)	AC Adapter	Keen Ocean Industrial Ltd	S09-012-0050-02000	---	---



1.5. Test Instruments

For Conducted

Test Period: Apr. 25, 2019

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Universal Radio Communication Tester	R&S	CMU200	112387	03/11/2019	1 year

For Radiated Emissions

Test Period: Apr. 28 ~ May 08, 2019

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Spectrum Analyzer (10 Hz~44 GHz)	Keysight	N9010A	MY52221312	01/14/2019	1 year
Pre Amplifier (1~26.5 GHz)	Agilent	8449B	3008A02237	10/16/2018	1 year
Pre Amplifier (100 kHz~1.3 GHz)	Agilent	8447D	2944A11119	01/14/2019	1 year
Broadband Antenna	Schwarzbeck	VULB9168	416	10/19/2018	1 year
Horn Antenna (1~18 GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	08/23/2018	1 year
Horn Antenna (18~40 GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	08/07/2018	1 year
Loop Antenna	COM-POWER CORPORATION	AL-130	121014	03/29/2019	1 year
RF Cable	EMCI	EMC104-N-N-6000	TE01-1	02/20/2019	1 year
Microwave Cable	EMCI	EMC104-SM-SM-1 3000	170814	10/30/2018	1 year
Microwave Cable	EMCI	EMC102-KM-KM-1 4000	151001	02/20/2019	1 year

1.6. Test Site Environment

Items	Required (IEC 60068-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	990

Test Setting Condition		
N.V.	Normal Voltage	AC 120 V
L.T.	Low Temperature	-40 °C
N.T.	Normal Temperature	+25 °C
H.T.	High Temperature	+75 °C

1.7. Summary of Test Result

FCC Rule	Description	Result
§2.1046	Conducted Output Power	PASS
§22.913(a)(5)	Effective Radiated Power	N/A (Note1)
§24.232(c)	Equivalent Isotropic Radiated Power	PASS (Note2)
§24.232(d) KDB 971168 D01 (5.7.1)	Peak to average ratio	N/A (Note1)
§2.1049 §22.917(a) §24.238(a)	Emission Bandwidth & Occupied Bandwidth	N/A (Note1)
§2.1051 §22.917(a) §24.238(a)	Band Edge Measurement	N/A (Note1)
§2.1051 §22.917(a) §24.238(a)	Conducted Spurious Emission	N/A (Note1)
§2.1053 §22.917(a) §24.238(a)	Field Strength of Spurious Radiation	PASS (Note2)
§2.1055 §22.355 §24.235	Frequency Stability for Temperature & Voltage	N/A (Note1)

Note1: Class II permissive change. No need for verification.

Note2: WWAN WCDMA band 2 antenna gain higher than original certificate grant, So we verify
Effective Radiated Power / Equivalent Isotropic Radiated Power and Field Strength of Spurious Radiation.

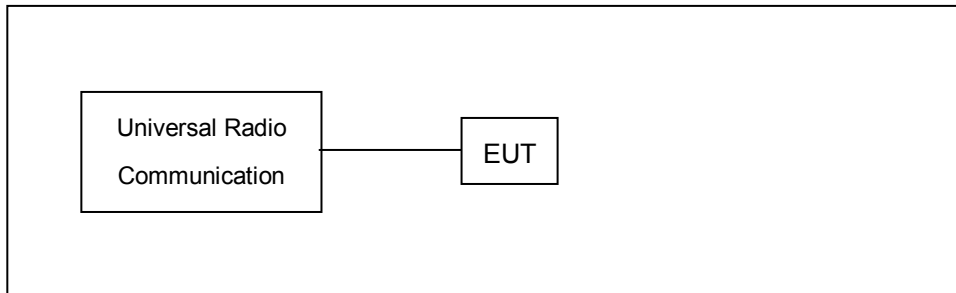
2 Measurement Procedure

2.1. RF Output Power Test

■ Limit

N/A

■ Test Setup



■ Test Procedure

- The EUT was set up for the maximum power with with simulator.
- Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

■ Uncertainty

The measurement uncertainty is defined as for RF output power measurement is 1.2 dB.

2.2. Effective Radiated Power / Equivalent Isotropic Radiated Power Test

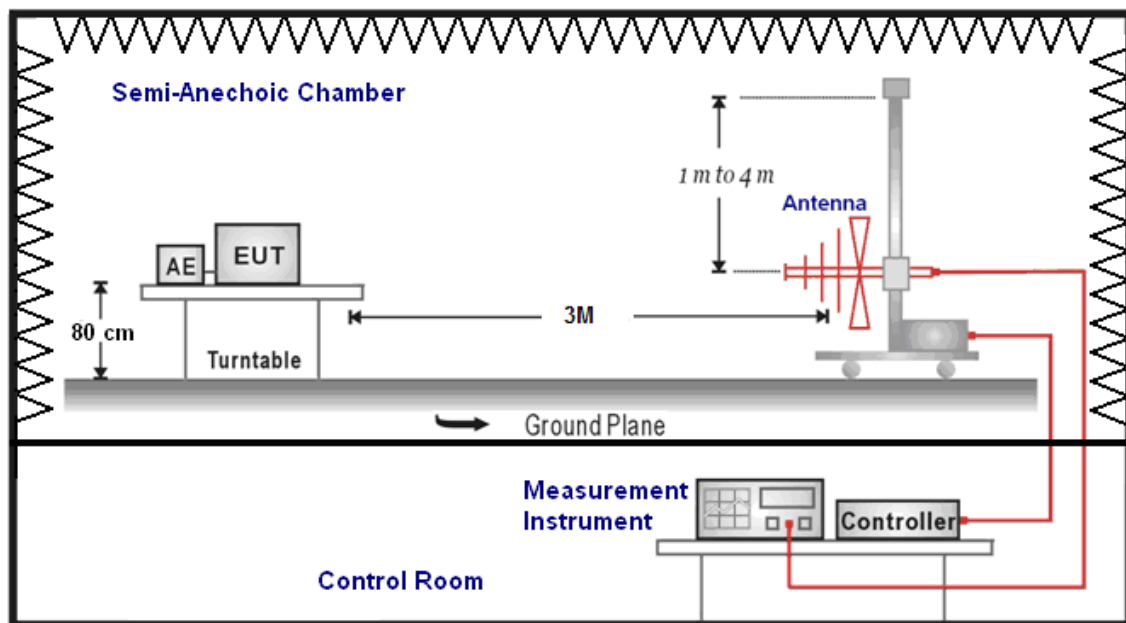
■ Limit

Part 22.913(a)(5): The E.R.P. of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

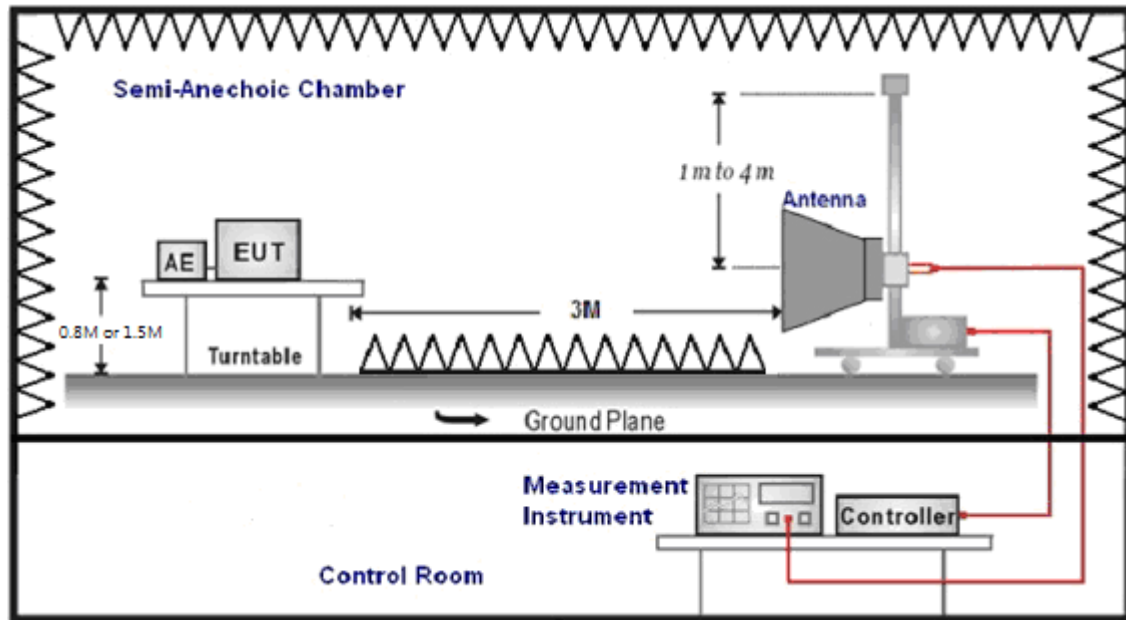
Part 24.232(c): The E.I.R.P. of Mobile and portable stations test transmitters must not exceed 2 Watts.

■ Setup

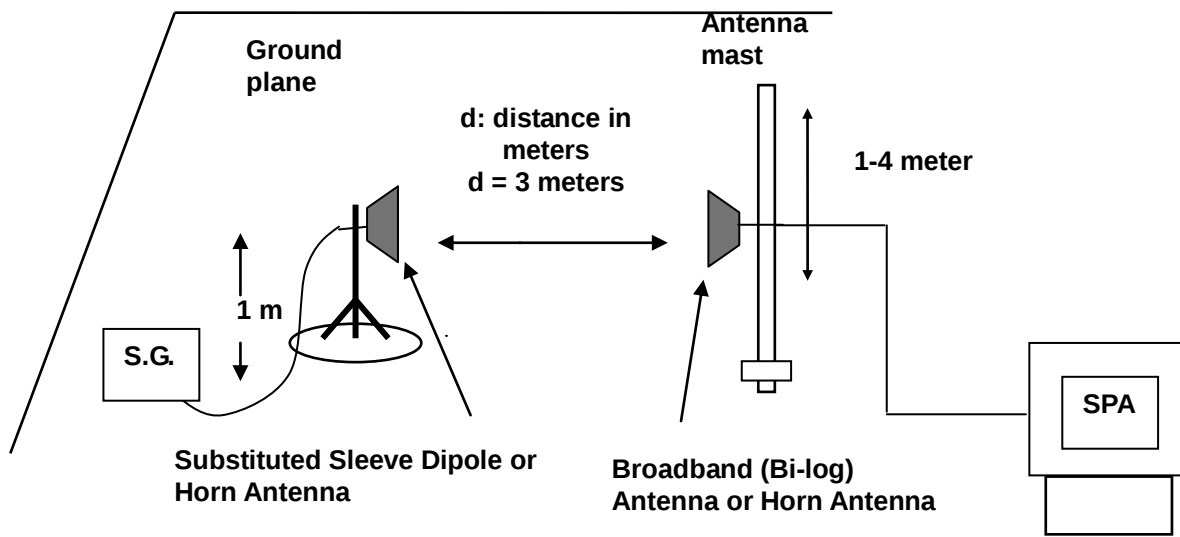
Below 1 GHz



Above 1 GHz



For Substituted Method Test Set-UP



■ Test Procedure

- a. The EUT was set up for the maximum power with wwan link data modulation. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high operational frequency range).
- b. E.I.R.P power measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (1.5 m for above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- c. The substitution antenna (Note:1 & 2) is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step a. Record the power level of S.G.
- d. $E.I.R.P. = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$
- e. $E.R.P. = E.I.R.P. - 2.15 \text{ dB}$

Note: 1. Below 1 GHz Substituted Method Test : Sleeve dipole antenna to Bi-Log Antenna

2. Above 1 GHz Substituted Method Test : Horn antenna to Horn Antenna

■ Uncertainty

The measurement uncertainty is defined as for Field Strength of Spurious Radiation measurement is $\pm 3.072 \text{ dB}$.

2.3. Field Strength of Spurious Radiation Test

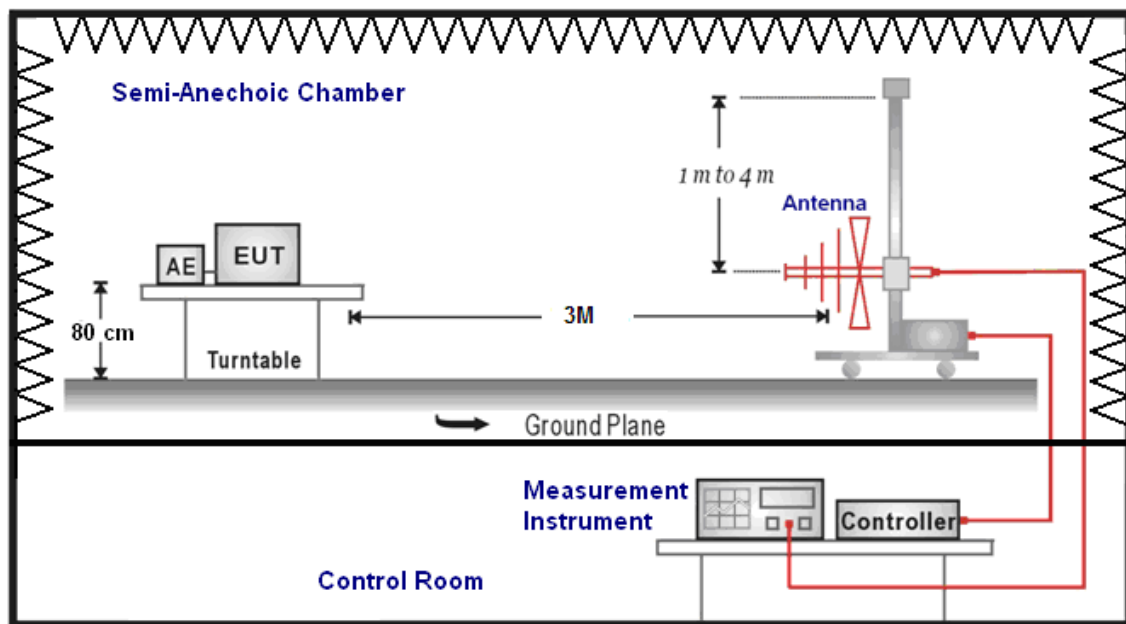
■ Limit

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.

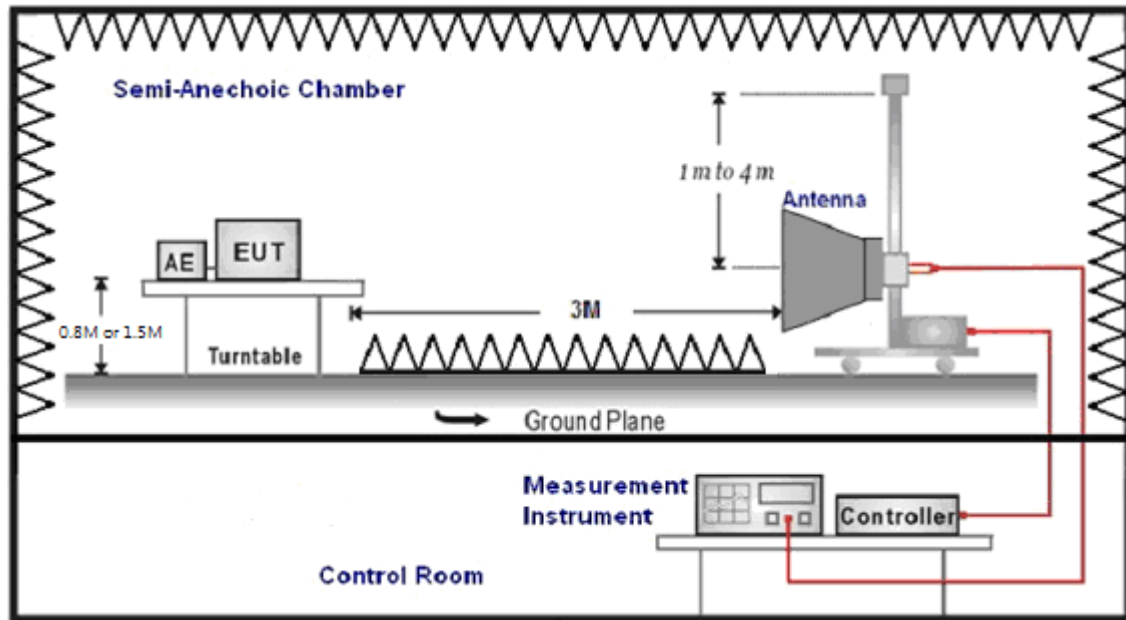
It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10th harmonic.

■ Setup

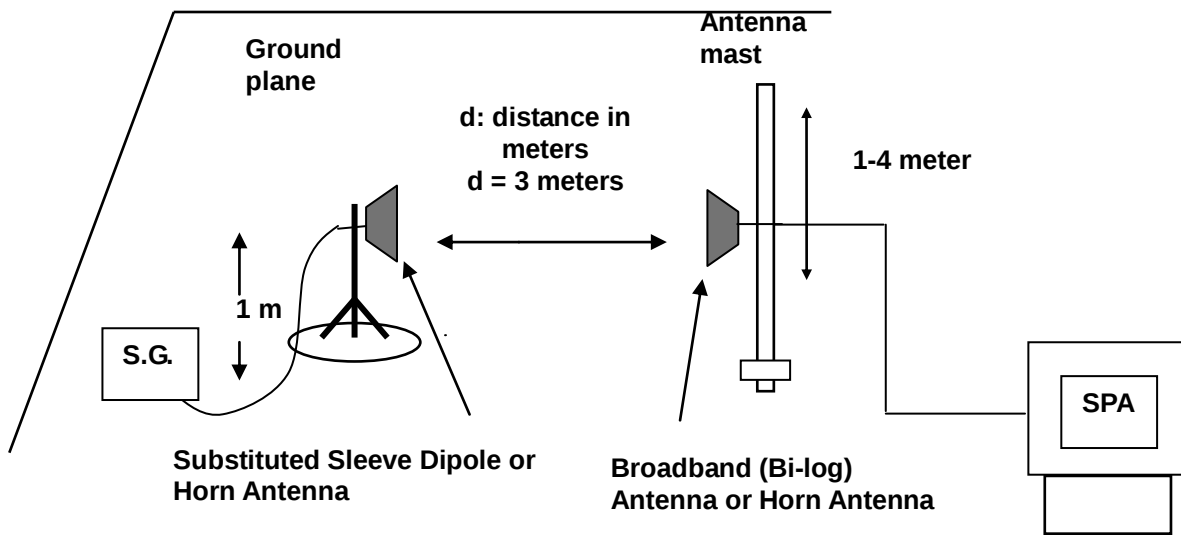
Below 1 GHz



Above 1 GHz



For Substituted Method Test Set-UP



■ Test Procedure

- a. The EUT was set up for the maximum power with wwan link data modulation. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high operational frequency range).
- b. E.I.R.P power measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (1.5 m for above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- c. The substitution antenna (Note:1 & 2) is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step a. Record the power level of S.G.
- d. E.I.R.P. = Output power level of S.G - TX cable loss + Antenna gain of substitution horn
- e. E.R.P. = E.I.R.P.- 2.15 dB

Note: 1. Below 1 GHz Substituted Method Test : Sleeve dipole antenna to Bi-Log Antenna

2. Above 1 GHz Substituted Method Test : Horn antenna to Horn Antenna

■ Uncertainty

The measurement uncertainty is defined as for Field Strength of Spurious Radiation measurement is ± 3.072 dB.

3 Test Results

Appendix A: Conducted Output Power

Bands	Modulation Type	Sub-Test	Frequency (MHz)	Burst Average Power		Peak Power	
				(dBm)	(W)	(dBm)	(W)
WCDMA Band II	QPSK	-----	1852.4	20.56	0.114	23.71	0.235
			1880.0	20.65	0.116	23.85	0.243
			1907.6	20.72	0.118	23.89	0.245
HSDPA Band II	QPSK	1	1852.4	20.38	0.109	23.43	0.220
			1880.0	20.41	0.110	23.41	0.219
			1907.6	20.44	0.111	23.45	0.221
		2	1852.4	20.33	0.108	23.27	0.212
			1880.0	20.34	0.108	23.38	0.218
			1907.6	20.37	0.109	23.48	0.223
		3	1852.4	19.91	0.098	22.89	0.195
			1880.0	19.97	0.099	23.00	0.200
			1907.6	20.03	0.101	23.11	0.205
		4	1852.4	19.86	0.097	22.83	0.192
			1880.0	19.89	0.097	22.94	0.197
			1907.6	19.94	0.099	22.99	0.199
HSUPA Band II	QPSK	1	1852.4	19.71	0.094	22.77	0.189
			1880.0	19.80	0.095	22.86	0.193
			1907.6	19.87	0.097	22.92	0.196
		2	1852.4	17.70	0.059	20.68	0.117
			1880.0	17.79	0.060	20.86	0.122
			1907.6	17.86	0.061	20.95	0.124
		3	1852.4	18.69	0.074	21.76	0.150
			1880.0	18.78	0.076	21.96	0.157
			1907.6	18.85	0.077	21.97	0.157
		4	1852.4	17.68	0.059	20.82	0.121
			1880.0	17.77	0.060	20.80	0.120
			1907.6	17.84	0.061	20.97	0.125
		5	1852.4	20.31	0.107	23.36	0.217
			1880.0	20.32	0.108	23.32	0.215
			1907.6	20.34	0.108	23.35	0.216

Note: The peak power testing result was used peak detector.

Bands	Modulation Type	Sub-Test	Frequency (MHz)	Burst Average Power		Peak Power	
				(dBm)	(W)	(dBm)	(W)
WCDMA Band V	QPSK	-----	826.4	23.32	0.215	26.91	0.491
			836.6	23.44	0.221	27.08	0.511
			846.6	23.48	0.223	27.12	0.515
HSDPA Band V	QPSK	1	826.4	22.46	0.176	26.04	0.402
			836.6	22.56	0.180	26.13	0.410
			846.6	22.61	0.182	26.33	0.430
		2	826.4	22.24	0.167	25.81	0.381
			836.6	22.39	0.173	25.99	0.397
			846.6	22.52	0.179	26.11	0.408
		3	826.4	21.85	0.153	25.52	0.356
			836.6	21.96	0.157	25.59	0.362
			846.6	22.16	0.164	25.73	0.374
		4	826.4	21.91	0.155	25.56	0.360
			836.6	22.05	0.160	25.76	0.377
			846.6	22.10	0.162	25.79	0.379
HSUPA Band V	QPSK	1	826.4	21.87	0.154	25.41	0.348
			836.6	22.01	0.159	25.71	0.372
			846.6	22.06	0.161	25.64	0.366
		2	826.4	19.82	0.096	23.38	0.218
			836.6	20.03	0.101	23.58	0.228
			846.6	20.01	0.100	23.61	0.230
		3	826.4	20.81	0.121	24.30	0.269
			836.6	20.92	0.124	24.56	0.286
			846.6	21.04	0.127	24.74	0.298
		4	826.4	19.75	0.094	23.29	0.213
			836.6	19.96	0.099	23.52	0.225
			846.6	19.93	0.098	23.50	0.224
		5	826.4	21.79	0.151	25.32	0.340
			836.6	21.82	0.152	25.39	0.346
			846.6	21.92	0.156	25.47	0.352

Note: The peak power testing result was used peak detector.



Appendix B: Effective Radiated Power / Equivalent Isotropic Radiated Power Test

Band 2								
Band	Modulation	Frequency (MHz)	Ant. Polar.	Read Level (dBm)	Correction Factor (dBm)	E.I.R.P.		Limit (W)
						(dBm)	(W)	
WCDMA	QPSK	1852.4	H	23.29	-2.26	19.93	0.098	< 2
			V	23.30	-1.74	20.46	0.111	< 2
		1880.0	H	23.34	-2.45	20.29	0.107	< 2
			V	23.03	-1.92	20.51	0.112	< 2
		1907.6	H	23.49	-2.62	19.97	0.099	< 2
			V	23.67	-2.09	20.48	0.112	< 2

Appendix C: Field Strength of Spurious Radiation

Standard:	FCC Part 22H / 24E	Test Distance:	3 m
Test item:	Harmonic	Power:	AC 120 V/60 Hz
Frequency:	1852.4 MHz	Temp.(°C)/Hum.(%RH):	26(°C)/60 %RH
Mode:	3 G_BAND 2_CH9262		
Ant.Polar.:	Horizontal		

No.	Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	3704.800	-48.27	-6.81	-55.08	-13.00	-42.08	peak
2	5557.200	-48.19	-4.10	-52.29	-13.00	-39.29	peak

Standard:	FCC Part 22H / 24E	Test Distance:	3 m
Test item:	Harmonic	Power:	AC 120 V/60 Hz
Frequency:	1852.4 MHz	Temp.(°C)/Hum.(%RH):	26(°C)/60 %RH
Mode:	3 G_BAND 2_CH9262		
Ant.Polar.:	Vertical		

No.	Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	3704.800	-48.18	-6.81	-54.99	-13.00	-41.99	peak
2	5557.200	-47.13	-4.10	-51.23	-13.00	-38.23	peak



Standard:	FCC Part 22H / 24E	Test Distance:	3 m
Test item:	Harmonic	Power:	AC 120 V/60 Hz
Frequency:	1880 MHz	Temp.(°C)/Hum.(%RH):	26(°C)/60 %RH
Mode:	3 G_BAND 2_CH9400		
Ant.Polar.:	Horizontal		

No.	Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	3760.000	-49.12	-6.68	-55.80	-13.00	-42.80	peak
2	5640.000	-48.56	-3.90	-52.46	-13.00	-39.46	peak

Standard:	FCC Part 22H / 24E	Test Distance:	3 m
Test item:	Harmonic	Power:	AC 120 V/60 Hz
Frequency:	1880 MHz	Temp.(°C)/Hum.(%RH):	26(°C)/60 %RH
Mode:	3 G_BAND 2_CH9400		
Ant.Polar.:	Vertical		

No.	Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	3760.000	-47.65	-6.68	-54.33	-13.00	-41.33	peak
2	5640.000	-46.84	-3.90	-50.74	-13.00	-37.74	peak



Standard:	FCC Part 22H / 24E	Test Distance:	3 m
Test item:	Harmonic	Power:	AC 120 V/60 Hz
Frequency:	1907.6 MHz	Temp.(°C)/Hum.(%RH):	26(°C)/60 %RH
Mode:	3 G_BAND 2_CH9538		
Ant.Polar.:	Horizontal		

No.	Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	3815.200	-47.47	-6.58	-54.05	-13.00	-41.05	peak
2	5722.850	-47.73	-3.68	-51.41	-13.00	-38.41	peak

Standard:	FCC Part 22H / 24E	Test Distance:	3 m
Test item:	Harmonic	Power:	AC 120 V/60 Hz
Frequency:	1907.6 MHz	Temp.(°C)/Hum.(%RH):	26(°C)/60 %RH
Mode:	3 G_BAND 2_CH9538		
Ant.Polar.:	Vertical		

No.	Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	3815.200	-47.97	-6.58	-54.55	-13.00	-41.55	peak
2	5722.800	-48.25	-3.68	-51.93	-13.00	-38.93	peak