FCC RF Test Report

APPLICANT	:	Motorola Mobility LLC
EQUIPMENT	:	Mobile Cellular Phone
BRAND NAME	:	Motorola
MODEL NAME	:	10643
FCC ID	:	IHDT56WC1
STANDARD	:	47 CFR Part 2, 22(H), 24(E), 27(L), 27(M), 27(F), 27(H)
CLASSIFICATION	:	PCS Licensed Transmitter Held to Ear

The product was received on Feb. 15, 2017 and completely tested on Mar. 21, 2017. We, Sporton International (KunShan) INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA / EIA-603-D-2010 and the testing has shown the tested sample to be in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (KunShan) INC., the test report shall not be reproduced except in full.

Prepared by: James Huang / Manager

Approved by: Jones Tsai / Manager

Testing Laboratory 2627

Sporton International (KunShan) INC.
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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG721503B	Rev. 01	Initial issue of report	Mar. 31, 2017

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting Only	PASS	-
	§22.913(a)(2)	Effective Radiated Power (Band 5) (Band 26)	ERP < 7 Watt	PASS	-
	§27.50(b)(10) §27.50(c)(10)	Effective Radiated Power (Band 12) (Band 13) (Band 17)	ERP < 3 Watt	PASS	-
	§24.232(c) §27.50(h)(2)	Equivalent Isotropic Radiated Power (Band 2)(Band 25) (Band 7) (Band 38) (Band 41)	EIRP < 2Watt	PASS	-
	§27.50(d)(4)	Equivalent Isotropic Radiated Power (Band 4) (Band 66)	EIRP < 1Watt	PASS	-
3.5	§24.232(d)	Peak-to-Average Ratio	<13 dB	PASS	-
3.6	§2.1049	Occupied Bandwidth	Reporting Only	PASS	-
3.7	§2.1051 §22.917(a) §24.238(a) §27.53(c)(2)(4) §27.53(g) §27.53(h)	Conducted Band Edge Measurement (Band 2) (Band 4) (Band 5) (Band 26) (Band 12) (Band 13) (Band 17) (Band 25) (Band 66)	< 43+10log10(P[Watts])	PASS	-
	§27.53(m)(4)	Conducted Band Edge Measurement (Band 7) (Band 38) (Band 41)	§27.53(m)(4)		
3.8	§2.1051 §22.917(a) §24.238(a) §27.53(c)(2) §27.53(g) §27.53(h)	Conducted Spurious Emission (Band 2) (Band 4) (Band 5) (Band 12) (Band 13) (Band 17) (Band 25) (Band 26) (Band 66)	< 43+10log10(P[Watts])	PASS	-
	§2.1051 §27.53(m)(4)	Conducted Spurious Emission (Band 7) (Band 38)(Band 41)	< 55+10log$_{10}$(P[Watts])		
3.9	§2.1055 §22.355	Frequency Stability Temperature & Voltage	< 2.5 ppm for Part 22H	PASS	-
	§2.1055 §24.235 §27.54		Within Authorized Band		

Report Section	FCC Rule	Description	Limit	Result	Remark
4.4	§2.1053 §22.917(a) §24.238(a) §27.53(c)(2) §27.53(f) §27.53(g) §27.53(h)	Radiated Spurious Emission (Band 2) (Band 4) (Band 5) (Band 12) (Band 13) (Band 17) (Band 25) (Band 26) (Band 66)	< 43+10log$_{10}$(P[Watts])	PASS	Under limit 24.27 dB at 1560.000 MHz
	§2.1053 §27.53(m)(4)	Radiated Spurious Emission (Band 7) (Band 38)(Band 41)	< 55+10log$_{10}$(P[Watts])		

1 General Description

1.1 Applicant

Motorola Mobility LLC
222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

1.2 Manufacturer

Motorola Mobility LLC
222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola
Model Name	10643
FCC ID	IHDT56WC1
EUT supports Radios application	CDMA/EV-DO/GSM/GPRS/EGPRS/WCDMA/HSPA/ HSPA+(16QAM uplink is not supported)/DC-HSDPA/LTE/ WLAN2.4GHz 802.11b/g/n HT20/ WLAN5GHz 802.11a/n HT20/HT40/ Bluetooth v3.0 + EDR/Bluetooth v4.0 LE Bluetooth v4.1 LE/ Bluetooth v4.2 LE
IMEI Code	Conducted: 353308080013139(LTE B2/4/5/7/12/13/26/38/41/66) 35330808001411(LTE B17/25) Radiation: 353308080013360(LTE B2/5/12/13/25/26) 353308080019250(LTE B4/7/38/41/66) 353308080018203(LTE B17)
HW Version	DVT2
SW Version	fastboot_perry_oem_userdebug_7.1.1_NPQ26.46_1467_intcfg-test-keys_oem.tar
EUT Stage	Identical Prototype

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	LTE Band 2 : 1850.7 MHz ~ 1909.3 MHz LTE Band 4 : 1710.7 MHz ~ 1754.3 MHz LTE Band 5 : 824.7 MHz ~ 848.3 MHz LTE Band 7 : 2502.5 MHz ~ 2567.5 MHz LTE Band 12 : 699.7 MHz ~ 715.3 MHz LTE Band 13 : 779.5 MHz ~ 784.5 MHz LTE Band 17 : 706.5 MHz ~ 713.5 MHz LTE Band 25 : 1850.7MHz ~ 1914.3 MHz LTE Band 26 : 824.7MHz ~ 848.3 MHz LTE Band 38 : 2572.5MHz ~ 2617.5MHz LTE Band 41 : 2498.5 MHz ~ 2687.5 MHz LTE Band 66 : 1710.7 MHz ~ 1779.3 MHz
Rx Frequency	LTE Band 2 : 1930.7 MHz ~ 1989.3 MHz LTE Band 4 : 2110.7 MHz ~ 2154.3 MHz LTE Band 5 : 869.7 MHz ~ 893.3 MHz LTE Band 7 : 2622.5 MHz ~ 2687.5 MHz LTE Band 12 : 729.7 MHz ~ 745.3 MHz LTE Band 13 : 748.5 MHz ~ 753.5 MHz LTE Band 17 : 736.5 MHz ~ 743.5 MHz LTE Band 25 : 1930.7 MHz ~ 1994.3 MHz LTE Band 26 : 869.7 MHz ~ 893.3 MHz LTE Band 38 : 2572.5 MHz ~ 2617.5 MHz LTE Band 41 : 2498.5 MHz ~ 2687.5 MHz LTE Band 66 : 2110.7 MHz~ 2179.3 MHz
Bandwidth	LTE Band 2 : 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz LTE Band 4 : 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz LTE Band 5 : 1.4MHz / 3MHz / 5MHz / 10MHz LTE Band 7 : 5MHz/ 10MHz / 15MHz / 20MHz LTE Band 12 : 1.4MHz / 3MHz / 5MHz / 10MHz LTE Band 13 : 5MHz / 10MHz LTE Band 17 : 5MHz / 10MHz LTE Band 25 : 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz LTE Band 26 : 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz LTE Band 38 : 5MHz / 10MHz / 15MHz / 20MHz LTE Band 41 : 5MHz / 10MHz / 15MHz / 20MHz LTE Band 66 : 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz

Maximum Output Power to Antenna	LTE Band 2 : 22.76 dBm LTE Band 4 : 22.82 dBm LTE Band 5 : 23.10 dBm LTE Band 7 : 23.14 dBm LTE Band 12 : 22.65 dBm LTE Band 13 : 22.90 dBm LTE Band 17 : 22.83 dBm LTE Band 25 : 22.88 dBm LTE Band 26 : 22.90 dBm LTE Band 38 : 22.86 dBm LTE Band 41 : 23.31 dBm LTE Band 66 : 22.82 dBm
Antenna Gain	LTE Band 2 : -1.13 dBi LTE Band 4 : 0.41 dBi LTE Band 5 : -2.58 dBi LTE Band 7 : 1.30 dBi LTE Band 12 : -2.35 dBi LTE Band 13 : -3.08 dBi LTE Band 17 : -2.35 dBi LTE Band 25 : -1.13 dBi LTE Band 26 : -2.58 dBi LTE Band 38 : 1.39 dBi LTE Band 41 : 2.37 dBi LTE Band 66 : 0.41 dBi
Type of Modulation	QPSK / 16QAM

1.5 Specification of Accessory

Specification of Accessory				
AC Adapter 1	**Brand Name**	Motorola (AcBel)	**Model Name**	C-P35 SPN5945A
	Power Rating	I/P: 100-240 Vac, 300mA, O/P: 5.2 Vdc, 2000mA		
AC Adapter 2	**Brand Name**	Motorola(Salom)	**Model Name**	SSW-2919UMTJ C-P35 SPN5945A
	Power Rating	I/P: 100-240 Vac, 300mA, O/P: 5.2 Vdc, 2000mA		
Battery	**Brand Name**	Motorola (Amperex)	**Model Name**	GK40
	Power Rating	3.8Vdc,2685/2800mAh (Min/Typ)	**Type**	Li-ion
USB Cable	**Brand Name**	Motorola	**Model Name**	SKN6462A
	Signal Line Type	1.0 meter, shielded cable, without ferrite core		

1.6 Modification of EUT

No modifications are made to the EUT during all test items.

1.7 Maximum ERP/EIRP Power, Frequency Tolerance, and Emission Designator

LTE Band 2		QPSK			16QAM		
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)
1.4	1850.7 ~ 1909.3	1M09G7D	-	0.1452	1M09W7D	-	0.1161
3	1851.5 ~ 1908.5	2M72G7D	-	0.1439	2M75W7D	-	0.1033
5	1852.5 ~ 1907.5	4M51G7D	-	0.1445	4M52W7D	-	0.1076
10	1855.0 ~ 1905.0	9M03G7D	0.0034	0.1449	9M03W7D	-	0.1125
15	1857.5 ~ 1902.5	13M4G7D	-	0.1442	13M4W7D	-	0.1062
20	1860.0 ~ 1900.0	18M3G7D	-	0.1455	18M4W7D	-	0.1084
LTE Band 25		QPSK			16QAM		
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)
1.4	1850.7 ~ 1914.3	1M10G7D	-	0.1496	1M10W7D	-	0.1211
3	1851.5 ~ 1913.5	2M73G7D	-	0.1472	2M73W7D	-	0.1172
5	1852.5 ~ 1912.5	4M50G7D	-	0.1489	4M50W7D	-	0.1127
10	1855.0 ~ 1910.0	9M01G7D	0.0047	0.1403	9M01W7D	-	0.1140
15	1857.5 ~ 1907.5	13M4G7D	-	0.1459	13M3W7D	-	0.1081
20	1860.0 ~ 1905.0	18M3G7D	-	0.1422	18M2W7D	-	0.1132
LTE Band 4		QPSK			16QAM		
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)
1.4	1710.7 ~ 1754.3	1M10G7D	-	0.2094	1M10W7D	-	0.1726
3	1711.5 ~ 1753.5	2M72G7D	-	0.2094	2M73W7D	-	0.1687
5	1712.5 ~ 1752.5	4M50G7D	-	0.2104	4M52W7D	-	0.1722
10	1715.0 ~ 1750.0	9M03G7D	0.0036	0.2099	9M05W7D	-	0.1648
15	1717.5 ~ 1747.5	13M5G7D	-	0.2051	13M4W7D	-	0.1644
20	1720.0 ~ 1745.0	18M4G7D	-	0.2104	18M4W7D	-	0.1622

LTE Band 5		QPSK			16QAM		
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)
1.4	824.7 ~ 848.3	1M10G7D	-	0.0656	1M10W7D	-	0.0519
3	825.5 ~ 847.5	2M73G7D	-	0.0653	2M72W7D	-	0.0469
5	826.5 ~ 846.5	4M52G7D	-	0.0675	4M49W7D	-	0.0484
10	829.0 ~ 844.0	9M03G7D	0.0088	0.0687	9M05W7D	-	0.0485
LTE Band 7		QPSK			16QAM		
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)
5	2502.5 ~ 2567.5	4M51G7D	-	0.2582	4M50W7D	-	0.2094
10	2505.0 ~ 2565.0	9M03G7D	0.0022	0.2600	9M01W7D	-	0.2089
15	2507.5 ~ 2562.5	13M5G7D	-	0.2698	13M5W7D	-	0.2244
20	2510.0 ~ 2560.0	18M3G7D	-	0.2780	18M3W7D	-	0.1959
LTE Band 12		QPSK			16QAM		
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)
1.4	699.7 ~ 715.3	1M10G7D	-	0.0649	1M10W7D	-	0.0530
3	700.5 ~ 714.5	2M72G7D	-	0.0632	2M74W7D	-	0.0466
5	701.5 ~ 713.5	4M51G7D	-	0.0632	4M51W7D	-	0.0462
10	704.0 ~ 711.0	9M03G7D	0.0082	0.0653	9M03W7D	-	0.0471
LTE Band 13		QPSK			16QAM		
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)
5	779.5 ~ 784.5	4M51G7D	-	0.0583	4M49W7D	-	0.0458
10	782.0	9M05G7D	0.0073	0.0585	9M01W7D	-	0.0455
LTE Band 17		QPSK			16QAM		
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)
5	706.5 ~ 713.5	4M49G7D	-	0.0661	4M51W7D	-	0.0513
10	709.0 ~ 711.0	9M09G7D	0.0113	0.0681	9M07W7D	-	0.0497

LTE Band 26		QPSK			16QAM		
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)
1.4	824.7 ~ 848.3	1M10G7D	-	0.0631	1M09W7D	-	0.0490
3	825.5 ~ 847.5	2M72G7D	-	0.0615	2M73W7D	-	0.0447
5	826.5 ~ 846.5	4M51G7D	-	0.0608	4M49W7D	-	0.0507
10	829.0 ~ 844.0	9M01G7D	0.0029	0.0612	8M99W7D	-	0.0512
15	831.5 ~ 841.5	13M4G7D	-	0.0656	13M4W7D	-	0.0656
CH26765	821.5	13M5G7D	-	0.0652	13M5W7D	-	0.0533
LTE Band 38		QPSK			16QAM		
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)
5	2572.5 ~ 2617.5	4M50G7D	-	0.2564	4M48W7D	-	0.1928
10	2575.0 ~ 2615.0	9M07G7D	0.0024	0.2547	9M05W7D	-	0.1954
15	2577.5 ~ 2612.5	13M5G7D	-	0.2661	13M5W7D	-	0.1959
20	2580.0 ~ 2610.0	18M5G7D	-	0.2564	18M4W7D	-	0.1972
LTE Band 41		QPSK			16QAM		
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)
5	2498.5 ~ 2687.5	4M49G7D	-	0.3404	4M51W7D	-	0.2692
10	2501.0 ~ 2685.0	9M09G7D	0.0016	0.3573	8M99W7D	-	0.2767
15	2503.5 ~ 2682.5	13M4G7D	-	0.3698	13M5W7D	-	0.2655
20	2506.0 ~ 2680.0	18M5G7D	-	0.3548	18M3W7D	-	0.2729
LTE Band 66		QPSK			16QAM		
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)
1.4	1710.7 ~ 1779.3	1M10G7D	-	0.2018	1M10W7D	-	0.1556
3	1711.5 ~ 1778.5	2M72G7D	-	0.1879	2M71W7D	-	0.1409
5	1712.5 ~ 1777.5	4M52G7D	-	0.2004	4M50W7D	-	0.1531
10	1715.0 ~ 1775.0	9M01G7D	0.0025	0.1968	9M07W7D	-	0.1656
15	1717.5 ~ 1772.5	13M4G7D	-	0.2104	13M5W7D	-	0.1614
20	1720.0 ~ 1770.0	18M4G7D	-	0.2018	18M3W7D	-	0.1442

1.8 Testing Location

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.		
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958		
Test Site No.	Sporton Site No.		FCC Registration No.
	TH01-KS	03CH03-KS	306251

Note: The test site complies with ANSI C63.4 2014 requirement.

1.9 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 2, 22(H), 24(E), 27(L), 27(M), 27(F), 27(H)
- ANSI / TIA / EIA-603-D-2010
- FCC KDB 971168 D01 Power Meas. License Digital Systems v02r02
- FCC KDB 412172 D01 Determining ERP and EIRP v01r01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r02 with maximum output power.

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes to find the maximum emission.

Test Items	Band	Bandwidth (MHz)						Modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
Max. Output Power	2	v	v	v	v	v	v	v	v	v	v	v	v	v	v
	4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
	5	v	v	v	v	-	-	v	v	v	v	v	v	v	v
	7	-	-	v	v	v	v	v	v	v	v	v	v	v	v
	13	-	-	v		-	-	v	v	v	v	v	v	v	v
	13	-	-		v	-	-	v	v	v	v	v		v	
	38	-	-	v	v	v	v	v	v	v	v	v	v	v	v
	12	v	v	v	v	-	-	v	v	v	v	v	v	v	v
	17	-	-	v	v	-	-	v	v	v	v	v	v	v	v
	25	v	v	v	v	v	v	v	v	v	v	v	v	v	v
	26	v	v	v	v	v	-	v	v	v	v	v	v	v	v
	41	-	-	v	v	v	v	v	v	v	v	v	v	v	v
	66	v	v	v	v	v	v	v	v	v	v	v	v	v	v
Peak-to-Average Ratio	2						v	v	v	v		v	v	v	v
	4						v	v	v	v		v	v	v	v
	5				v	-	-	v	v	v		v	v	v	v
	7	-	-				v	v	v	v		v	v	v	v
	13	-	-		v	-	-	v	v	v		v		v	
	38	-	-				v	v	v	v		v	v	v	v
	12				v	-	-	v	v	v		v	v	v	v
	17	-	-		v	-	-	v	v	v		v	v	v	v
	25						v	v	v	v		v			v
	26					v	-	v	v	v		v	v	v	v
	41	-	-				v	v	v	v		v	v	v	v
	66						v	v	v	v		v	v	v	v

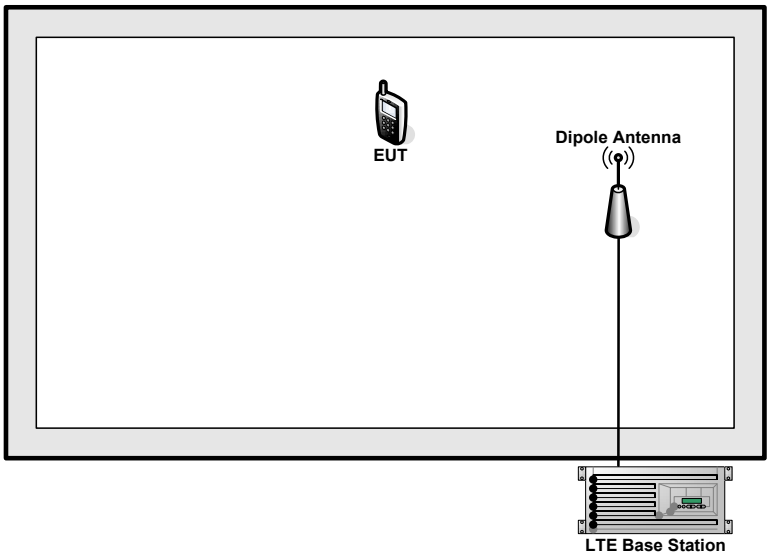
Test Items	Band	Bandwidth (MHz)						Modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
26dB and 99% Bandwidth	2	v	v	v	v	v	v	v	v			v	v	v	v
	4	v	v	v	v	v	v	v	v			v	v	v	v
	5	v	v	v	v	-	-	v	v			v	v	v	v
	7	-	-	v	v	v	v	v	v			v	v	v	v
	13	-	-	v		-	-	v	v			v	v	v	v
	13	-	-		v	-	-	v	v			v		v	
	38	-	-	v	v	v	v	v	v			v	v	v	v
	12	v	v	v	v	-	-	v	v			v	v	v	v
	17	-	-	v	v	-	-	v	v			v	v	v	v
	25	v	v	v	v	v	v	v	v			v			v
	26	v	v	v	v	v	-	v	v			v	v	v	v
	41	-	-	v	v	v	v	v	v			v	v	v	v
	66	v	v	v	v	v	v	v	v			v	v	v	v
Conducted Band Edge	2	v	v	v	v	v	v	v	v	v		v	v		v
	4	v	v	v	v	v	v	v	v	v		v	v		v
	5	v	v	v	v	-	-	v	v	v		v	v		v
	7	-	-	v	v	v	v	v	v	v		v	v		v
	13	-	-	v		-	-	v	v	v		v	v		v
	13	-	-		v	-	-	v	v	v		v		v	
	38	-	-	v	v	v	v	v	v	v		v	v		v
	12	v	v	v	v	-	-	v	v	v		v	v		v
	17	-	-	v	v	-	-	v	v	v		v	v		v
	25	v	v	v	v	v	v	v	v	v		v			v
	26	v	v	v	v	v	-	v	v	v		v	v		v
	41	-	-	v	v	v	v	v	v	v		v	v		v
	66	v	v	v	v	v	v	v	v	v		v	v		v

Test Items	Band	Bandwidth (MHz)						Modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
Conducted Spurious Emission	2	v	v	v	v	v	v	v	v	v			v	v	v
	4	v	v	v	v	v	v	v	v	v			v	v	v
	5	v	v	v	v	-	-	v	v	v			v	v	v
	7	-	-	v	v	v	v	v	v	v			v	v	v
	13	-	-	v		-	-	v	v	v			v	v	v
	13	-	-		v	-	-	v	v	v				v	
	38	-	-	v	v	v	v	v	v	v			v	v	v
	12	v	v	v	v	-	-	v	v	v			v	v	v
	17	-	-	v	v	-	-	v	v	v			v	v	v
	25	v	v	v	v	v	v	v	v	v					v
	26	v	v	v	v	v	-	v	v	v			v	v	v
	41	-	-	v	v	v	v	v	v	v			v	v	v
	66	v	v	v	v	v	v	v	v	v			v	v	v
Frequency Stability	2				v			v				v		v	
	4				v			v				v		v	
	5				v	-	-	v				v		v	
	7	-	-		v			v				v		v	
	13	-	-		v	-	-	v				v		v	
	38	-	-		v			v				v		v	
	12				v	-	-	v				v		v	
	17	-	-		v	-	-	v				v		v	
	25				v			v				v		v	
	26				v		-	v				v		v	
	41	-	-		v			v				v		v	
	66				v			v				v		v	

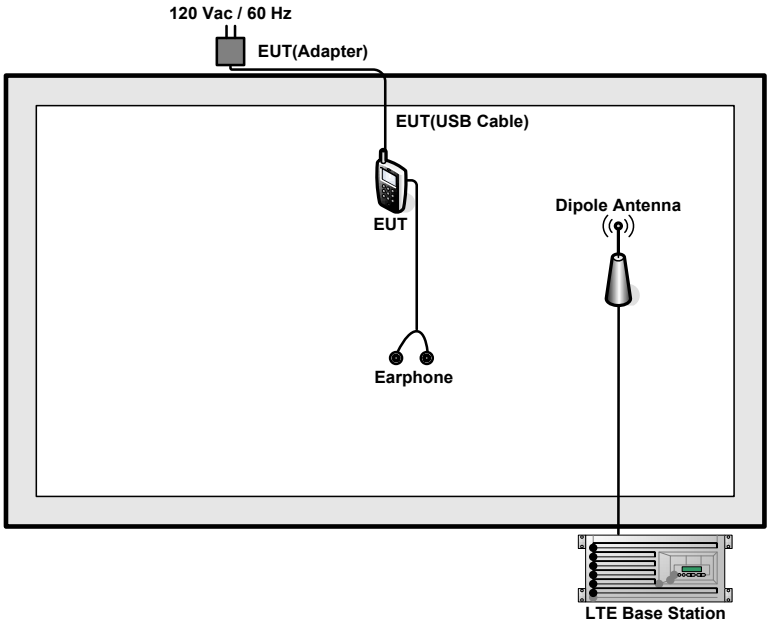
Test Items	Band	Bandwidth (MHz)						Modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
E.R.P./ E.I.R.P.	2	v	v	v	v	v	v	v	v	v			v	v	v
	4	v	v	v	v	v	v	v	v	v			v	v	v
	5	v	v	v	v	-	-	v	v	v			v	v	v
	7	-	-	v	v	v	v	v	v	v			v	v	v
	13	-	-	v		-	-	v	v	v			v	v	v
	13	-	-		v	-	-	v	v	v				v	
	38	-	-	v	v	v	v	v	v	v			v	v	v
	12	v	v	v	v	-	-	v	v	v			v	v	v
	17	-	-	v	v	-	-	v	v	v			v	v	v
	25	v	v	v	v	v	v	v	v	v			v	v	v
	26	v	v	v	v	v	-	v	v	v			v	v	v
	41	-	-	v	v	v	v	v	v	v			v	v	v
	66	v	v	v	v	v	v	v	v	v			v	v	v
Radiated Spurious Emission	2	v	v	v	v	v	v	v		v				v	
	4	v	v	v	v	v	v	v		v				v	
	5	v	v	v	v	-	-	v		v				v	
	7	-	-	v	v	v	v	v		v				v	
	13	-	-	v	v	-	-	v		v				v	
	38	-	-	v	v	v	v	v		v				v	
	12	v	v	v	v	-	-	v		v				v	
	17	-	-	v	v	-	-	v		v				v	
	25	v	v	v	v	v	v	v		v				v	
	26	v	v	v	v	v	-	v		v				v	
	41	-	-	v	v	v	v	v		v				v	
	66	v	v	v	v	v	v	v		v				v	
Note	1. The mark "v " means that this configuration is chosen for testing 2. The mark "-" means that this bandwidth is not supported. 3. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.														

2.2 Connection Diagram of Test System

LTE Band 41



LTE Band 2 / 4 / 5 / 7/ 12 / 13 / 17 / 25 / 26 / 38 / 66



2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	Power Supply	GWINSTEK	PSS-2002	N/A	N/A	Unshielded, 1.8 m
2.	LTE Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
3.	Earphone	Lenovo	LH102	N/A	Unshielded,1.2m	N/A

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss.

Offset = RF cable loss

Following shows an offset computation example with cable loss 5.3 dB

Offset (dB) = RF cable loss (dB).

= 5.3 (dB)

2.5 Frequency List of Low/Middle/High Channels

LTE Band 2 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	18700	18900	19100
	Frequency	1860	1880	1900
15	Channel	18675	18900	19125
	Frequency	1857.5	1880	1902.5
10	Channel	18650	18900	19150
	Frequency	1855	1880	1905
5	Channel	18625	18900	19175
	Frequency	1852.5	1880	1907.5
3	Channel	18615	18900	19185
	Frequency	1851.5	1880	1908.5
1.4	Channel	18607	18900	19193
	Frequency	1850.7	1880	1909.3

LTE Band 4 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	20050	20175	20300
	Frequency	1720	1732.5	1745
15	Channel	20025	20175	20325
	Frequency	1717.5	1732.5	1747.5
10	Channel	20000	20175	20350
	Frequency	1715	1732.5	1750
5	Channel	19975	20175	20375
	Frequency	1712.5	1732.5	1752.5
3	Channel	19965	20175	20385
	Frequency	1711.5	1732.5	1753.5
1.4	Channel	19957	20175	20393
	Frequency	1710.7	1732.5	1754.3

LTE Band 5 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	20450	20525	20600
	Frequency	829	836.5	844
5	Channel	20425	20525	20625
	Frequency	826.5	836.5	846.5
3	Channel	20415	20525	20635
	Frequency	825.5	836.5	847.5
1.4	Channel	20407	20525	20643
	Frequency	824.7	836.5	848.3

LTE Band 7 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	20850	21100	21350
	Frequency	2510	2535	2560
15	Channel	20825	21100	21375
	Frequency	2507.5	2535	2562.5
10	Channel	20800	21100	21400
	Frequency	2505	2535	2565
5	Channel	20775	21100	21425
	Frequency	2502.5	2535	2567.5

LTE Band 12 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	23060	23095	23130
	Frequency	704	707.5	711
5	Channel	23035	23095	23155
	Frequency	701.5	707.5	713.5
3	Channel	23025	23095	23165
	Frequency	700.5	707.5	714.5
1.4	Channel	23017	23095	23173
	Frequency	699.7	707.5	715.3

LTE Band 13 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	-	23230	-
	Frequency	-	782	-
5	Channel	23205	23230	23255
	Frequency	779.5	782	784.5

LTE Band 17 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	23780	23790	23800
	Frequency	709	710	711
5	Channel	23755	23790	23825
	Frequency	706.5	710	713.5

LTE Band 25 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	26140	26340	26590
	Frequency	1860	1880	1905
15	Channel	26115	26340	26615
	Frequency	1857.5	1880	1907.5
10	Channel	26090	26340	26640
	Frequency	1855	1880	1910
5	Channel	26065	26340	26665
	Frequency	1852.5	1880	1912.5
3	Channel	26055	26340	26675
	Frequency	1851.5	1880	1913.5
1.4	Channel	26047	26340	26683
	Frequency	1850.7	1880	1914.3

LTE Band 26 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
15	Channel	26865	26915	26965
	Frequency	831.5	836.5	841.5
10	Channel	26840	26915	26990
	Frequency	829	836.5	844
5	Channel	26815	26915	27015
	Frequency	826.5	836.5	846.5
3	Channel	26805	26915	27025
	Frequency	825.5	836.5	847.5
1.4	Channel	26797	26915	27033
	Frequency	824.7	836.5	848.3

LTE Band 38 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	37850	38000	38150
	Frequency	2580	2595	2610
15	Channel	37825	38000	38175
	Frequency	2577.5	2595	2612.5
10	Channel	37800	38000	38200
	Frequency	2575	2595	2615
5	Channel	37775	38000	38225
	Frequency	2572.5	2595	2617.5

LTE Band 41 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	39750	40620	41490
	Frequency	2506	2593	2680
15	Channel	39725	40620	41515
	Frequency	2503.5	2593	2682.5
10	Channel	39700	40620	41540
	Frequency	2501	2593	2685
5	Channel	39675	40620	41565
	Frequency	2498.5	2593	2687.5

LTE Band 66 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	132072	132322	132572
	Frequency	1720	1745	1770
15	Channel	132047	132322	132597
	Frequency	1717.5	1745	1772.5
10	Channel	132022	132322	132622
	Frequency	1715	1745	1775
5	Channel	131997	132322	132647
	Frequency	1712.5	1745	1777.5
3	Channel	131987	132322	132657
	Frequency	1711.5	1745	1778.5
1.4	Channel	131979	132322	132665
	Frequency	1710.7	1745	1779.3

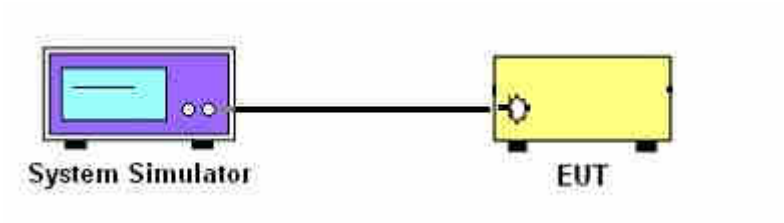
3 Conducted Test Items

3.1 Measuring Instruments

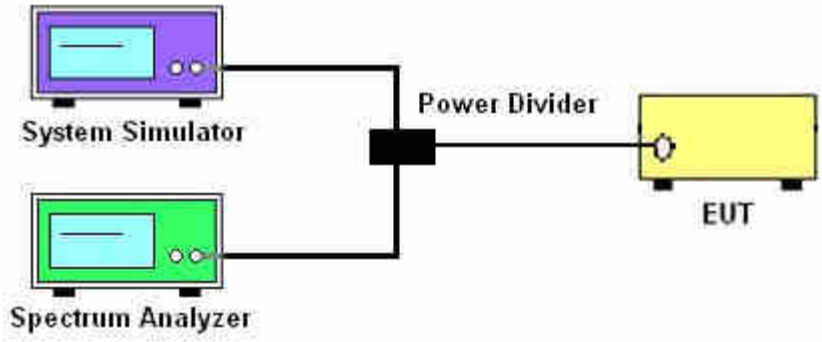
See list of measuring instruments of this test report.

3.2 Test Setup

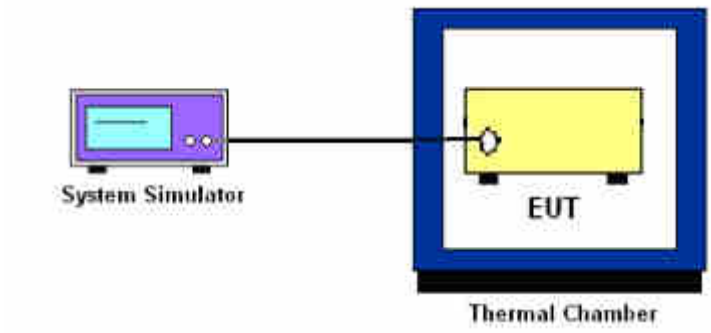
3.2.1 Conducted Output Power



3.2.2 Peak-to-Average Ratio, Occupied Bandwidth ,Conducted Band-Edge and Conducted Spurious Emission



3.2.3 Frequency Stability



3.3 Test Result of Conducted Test

Please refer to Appendix A.

3.4 Conducted Output Power and ERP/EIRP

3.4.1 Description of the Conducted Output Power Measurement and ERP/EIRP Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to force the EUT transmitting at maximum output power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 7 Watts for LTE Band 5 and Band 26.
The ERP of mobile transmitters must not exceed 3 Watts for LTE Band 12, Band 13 and Band 17.
The EIRP of mobile transmitters must not exceed 2 Watts for LTE Band 2 and Band 25 and Band 7 and Band 38 and Band 41.
The EIRP of mobile transmitters must not exceed 1 Watts for LTE Band 4 and Band 66.
According to KDB 412172 D01 Power Approach,
EIRP = $P_T + G_T – L_C$, ERP = EIRP -2.15, where
P_T = transmitter output power in dBm
G_T = gain of the transmitting antenna in dBi
L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

3.4.2 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through the system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record the power level from the system simulator.

3.5 Peak-to-Average Ratio

3.5.1 Description of the PAR Measurement

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. 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.

3.5.2 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 5.7.1.
2. The EUT was connected to spectrum and system simulator via a power divider.
3. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
4. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
5. Record the deviation as Peak to Average Ratio.

3.6 Occupied Bandwidth

3.6.1 Description of Occupied Bandwidth Measurement

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

3.6.2 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 4.2.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.
4. The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
5. Set the detection mode to peak, and the trace mode to max hold.
6. Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace. (this is the reference value)
7. Determine the “-26 dB down amplitude” as equal to (Reference Value – X).
8. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “–X dB down amplitude” determined in step 6. If a marker is below this “-X dB down amplitude” value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
9. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

3.7 Conducted Band Edge

3.7.1 Description of Conducted Band Edge Measurement

22.917(a)

For operations in the 824 – 849 MHz band, the FCC limit is 43 + $10\log_{10}$(P[Watts]) dB below the transmitter power P(Watts) in a 100kHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

24.238 (a)

For operations in the 1850-1910 and 1930-1990 MHz band, the FCC limit is 43 + $10\log_{10}$(P[Watts]) dB below the transmitter power P(Watts) in a 1MHz bandwidth. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

27.53 (c)

For operations in the 776-788 MHz band, the FCC limit is 43 + $10\log_{10}$(P[Watts]) dB below the transmitter power P(Watts) in a 100 kHz bandwidth. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed. In addition, the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least 65 + 10 log10 p(watts), dB, for mobile and portable equipment.

27.53 (g)

For operations in the 698 -746 MHz band, the FCC limit is 43 + 10log10(P[Watts]) dB below the transmitter power P(Watts) in a 100 kHz bandwidth. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

27.53 (h)

For operations in the 1710 – 1755 MHz and 1710-1780 MHz band, the FCC limit is 43 + $10\log_{10}$(P[Watts]) dB below the transmitter power P(Watts) in a 1 MHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

27.53(m)(4)

For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

3.7.2 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 6.0.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The band edges of low and high channels for the highest RF powers were measured.
4. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
5. Beyond the 1 MHz band from the band edge, RBW=1MHz was used.
6. Set spectrum analyzer with RMS detector.
7. Offset has included the duty factor for LTE Band 38/41. Duty factor =10 log (1/x), where x is the measured duty cycle.
8. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
9. Checked that all the results comply with the emission limit line.

   Example:

   The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)

   = P(W)- [43 + 10log(P)] (dB)

   = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB) = -13dBm.
10. For LTE Band 7, 38, 41, the other 40 dB, and 55 dB have additionally applied same calculation above.

3.8 Conducted Spurious Emission

3.8.1 Description of Conducted Spurious Emission Measurement

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.

For Band 7,38,41:

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 55 + 10 log (P) dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 9kHz up to a frequency including its 10th harmonic.

3.8.2 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 6.0.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The middle channel for the highest RF power within the transmitting frequency was measured.
5. The conducted spurious emission for the whole frequency range was taken.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz.
7. Set spectrum analyzer with RMS detector.
8. Taking the record of maximum spurious emission.
9. Offset has included the duty factor for LTE Band 38/41. Duty factor =10 log (1/x), where x is the measured duty cycle
10. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
11. The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
    = P(W)- [43 + 10log(P)] (dB)
    = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
    = -13dBm.
12. For Band 7, 38, 41
    The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)
    = P(W)- [55+ 10log(P)] (dB)
    = [30+ 10log(P)] (dBm) - [55+ 10log(P)] (dB)
    = -25dBm.

3.9 Frequency Stability

3.9.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency.

3.9.2 Test Procedures for Temperature Variation

1. The testing follows FCC KDB 971168 v02r02 Section 9.0.
2. The EUT was set up in the thermal chamber and connected with the system simulator.
3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
4. With power OFF, the temperature was raised in 10°C step up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

3.9.3 Test Procedures for Voltage Variation

1. The testing follows FCC KDB 971168 v02r02 Section 9.0.
2. The EUT was placed in a temperature chamber at 20±5° C and connected with the system simulator.
3. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
4. The variation in frequency was measured for the worst case.

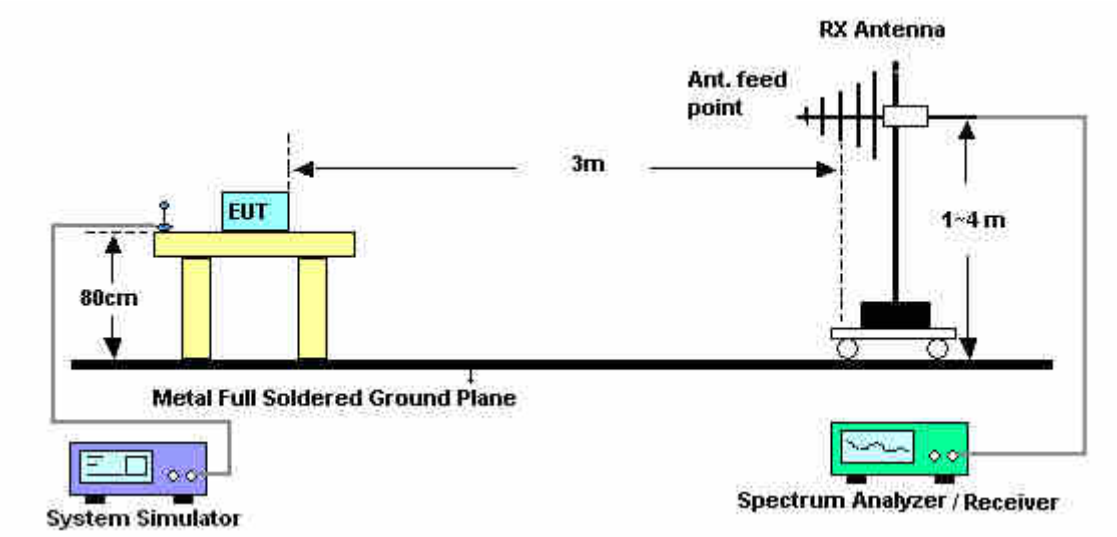
4 Radiated Test Items

4.1 Measuring Instruments

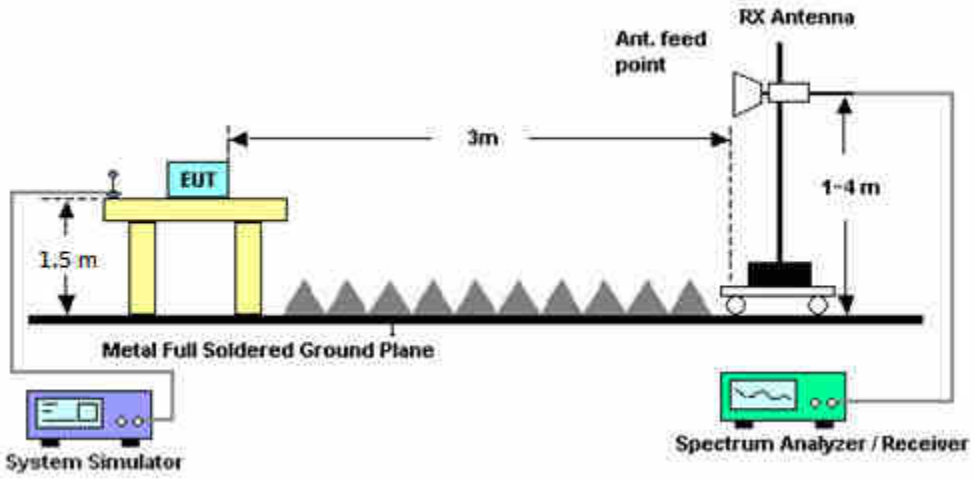
See list of measuring instruments of this test report.

4.2 Test Setup

4.2.1 For radiated test from 30MHz to 1GHz



4.2.2 For radiated test above 1GHz



4.3 Test Result of Radiated Test

Please refer to Appendix B.

4.4 Radiated Spurious Emission

4.4.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI / TIA / EIA-603-D-2010. 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.

For Band 7, 38, 41

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 55 + 10 log (P) dB.

For LTE Band 12,13,17

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

4.4.2 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 5.8 and ANSI / TIA-603-D-2010 Section 2.2.12.
2. The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the receiving antenna mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between 1m to 4m to search the maximum spurious emission for both horizontal and vertical polarizations.
6. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
7. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
8. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
9. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
10. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
11. ERP (dBm) = EIRP - 2.15
12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
    The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
    = P(W)- [43 + 10log(P)] (dB)
    = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
    = -13dBm.

13. For Band 7, 38, 41:
    The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)
    EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
    ERP (dBm) = EIRP - 2.15

5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Aug. 09, 2016	Feb. 25, 2017~ Mar. 21, 2017	Aug. 08, 2017	Conducted (TH01-KS)
Thermal Chamber	Ten Billion	TTC-B3S	TBN-960502	-40~+150°C	Oct. 13, 2016	Feb. 25, 2017~ Mar. 21, 2017	Oct. 12, 2017	Conducted (TH01-KS)
Radio communication	Anritsu	MT8820C	6201300652	2G/3G/LTE Band	Aug. 08, 2016	Feb. 25, 2017~ Mar. 21, 2017	Aug. 07, 2017	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz~44GHz	Apr. 22, 2016	Feb. 26, 2017~ Mar. 11, 2017	Apr. 21, 2017	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	35406	25MHz~2GHz	Apr. 16, 2016	Feb. 26, 2017~ Mar. 11, 2017	Apr. 15, 2017	Radiation (03CH03-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1356	1GHz~18GHz	Apr. 16, 2016	Feb. 26, 2017~ Mar. 11, 2017	Apr. 15, 2017	Radiation (03CH03-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz~40GHz	Feb. 15, 2017	Feb. 26, 2017~ Mar. 11, 2017	Feb. 14, 2018	Radiation (03CH03-KS)
Amplifier	SONOMA	310N	187289	9kHz~1GHz	Aug. 09, 2016	Feb. 26, 2017~ Mar. 11, 2017	Aug. 08, 2017	Radiation (03CH03-KS)
High Gain Amplifier	MITEQ	AMF-7D-00 101800-30-1	1943529	1GHz~18GHz	Jan. 19, 2017	Feb. 26, 2017~ Mar. 11, 2017	Jan. 18, 2018	Radiation (03CH03-KS)
Amplifier	Agilent	8449B	3008A02370	1GHz~26.5GHz	Oct. 13, 2016	Feb. 26, 2017~ Mar. 11, 2017	Oct. 12, 2017	Radiation (03CH03-KS)
Amplifier	MITEQ	TTA1840-35 -HG	1887435	18GHz~40GHz	Oct. 13, 2016	Feb. 26, 2017~ Mar. 11, 2017	Oct. 12, 2017	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Feb. 26, 2017~ Mar. 11, 2017	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Feb. 26, 2017~ Mar. 11, 2017	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Feb. 26, 2017~ Mar. 11, 2017	NCR	Radiation (03CH03-KS)

NCR: No Calibration Required

6 Uncertainty of Evaluation

ncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.8dB

Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.3dB

Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power)

LTE Band 2 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
20	1	0	QPSK	22.57	22.69	22.51
20	1	49		22.76	22.59	22.64
20	1	99		22.59	22.56	22.62
20	50	0		21.84	21.66	21.64
20	50	24		21.81	21.68	21.52
20	50	50		21.77	21.41	21.48
20	100	0		21.85	21.57	21.55
20	1	0	16-QAM	21.48	21.43	21.02
20	1	49		21.48	21.19	21.05
20	1	99		21.01	21.11	21.02
20	50	0		20.75	20.67	20.71
20	50	24		20.84	20.66	20.69
20	50	50		20.80	20.48	20.67
20	100	0		20.79	20.53	20.62
15	1	0	QPSK	22.47	22.31	22.32
15	1	37		22.72	22.44	22.53
15	1	74		22.70	22.33	22.14
15	36	0		21.84	21.65	21.51
15	36	20		21.72	21.57	21.45
15	36	39		21.72	21.38	21.34
15	75	0		21.80	21.59	21.45
15	1	0	16-QAM	21.34	21.09	21.08
15	1	37		21.39	21.09	21.06
15	1	74		21.23	21.04	21.01
15	36	0		20.71	20.62	20.50
15	36	20		20.75	20.65	20.50
15	36	39		20.69	20.47	20.36
15	75	0		20.78	20.58	20.53

LTE Band 2 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
10	1	0	QPSK	22.63	22.26	22.43
10	1	25		22.74	22.66	22.50
10	1	49		22.37	22.18	22.16
10	25	0		21.85	21.63	21.40
10	25	12		21.87	21.60	21.49
10	25	25		21.70	21.42	21.31
10	50	0		21.74	21.54	21.47
10	1	0	16-QAM	21.31	21.19	21.08
10	1	25		21.38	21.21	21.64
10	1	49		21.35	21.02	21.19
10	25	0		20.69	20.64	20.48
10	25	12		20.86	20.59	20.52
10	25	25		20.74	20.54	20.32
10	50	0		20.63	20.54	20.40
5	1	0	QPSK	22.61	22.38	22.33
5	1	12		22.73	22.39	22.41
5	1	24		22.59	22.46	22.01
5	12	0		21.75	21.51	21.35
5	12	7		21.86	21.54	21.32
5	12	13		21.78	21.49	21.31
5	25	0		21.72	21.47	21.31
5	1	0	16-QAM	21.35	21.21	21.05
5	1	12		21.45	21.19	21.13
5	1	24		21.33	21.03	21.01
5	12	0		20.54	20.39	20.29
5	12	7		20.66	20.36	20.16
5	12	13		20.59	20.38	20.13
5	25	0		20.71	20.47	20.34

LTE Band 2 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
3	1	0	QPSK	22.71	22.36	22.53
3	1	8		22.55	22.25	22.11
3	1	14		22.55	22.32	22.17
3	8	0		21.81	21.44	21.46
3	8	4		21.80	21.51	21.29
3	8	7		21.81	21.47	21.41
3	15	0		21.76	21.42	21.30
3	1	0	16-QAM	21.27	21.24	21.17
3	1	8		21.25	21.19	21.13
3	1	14		21.19	21.14	21.07
3	8	0		20.77	20.58	20.31
3	8	4		20.86	20.65	20.35
3	8	7		20.84	20.61	20.29
3	15	0		20.88	20.53	20.33
1.4	1	0	QPSK	22.48	22.41	22.35
1.4	1	3		22.51	22.55	22.33
1.4	1	5		22.68	22.43	22.32
1.4	3	0		22.69	22.52	22.43
1.4	3	1		22.59	22.64	22.42
1.4	3	3		22.75	22.50	22.47
1.4	6	0		21.81	21.52	21.36
1.4	1	0	16-QAM	21.20	21.10	21.13
1.4	1	3		21.30	21.13	21.25
1.4	1	5		21.18	21.02	21.11
1.4	3	0		21.71	21.12	21.17
1.4	3	1		21.78	21.35	21.26
1.4	3	3		21.76	21.36	21.21
1.4	6	0		20.58	20.46	20.34

LTE Band 4 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
20	1	0	QPSK	22.65	22.53	22.50
20	1	49		22.82	22.39	22.73
20	1	99		22.20	22.58	22.21
20	50	0		21.84	21.59	21.84
20	50	24		21.71	21.64	21.79
20	50	50		21.66	21.51	21.70
20	100	0		21.76	21.59	21.80
20	1	0	16-QAM	21.66	21.27	21.28
20	1	49		21.41	21.18	21.40
20	1	99		21.12	21.69	21.08
20	50	0		20.75	20.62	20.72
20	50	24		20.65	20.54	20.77
20	50	50		20.67	20.51	20.74
20	100	0		20.78	20.52	20.69
15	1	0	QPSK	22.54	22.56	22.71
15	1	37		22.60	22.58	22.68
15	1	74		22.65	22.43	22.53
15	36	0		21.97	21.62	21.89
15	36	20		21.79	21.55	21.81
15	36	39		21.71	21.51	21.71
15	75	0		21.81	21.54	21.79
15	1	0	16-QAM	21.65	21.27	21.32
15	1	37		21.75	21.18	21.35
15	1	74		21.29	21.22	21.15
15	36	0		20.91	20.54	20.80
15	36	20		20.81	20.63	20.70
15	36	39		20.72	20.42	20.62
15	75	0		20.85	20.66	20.69

LTE Band 4 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
10	1	0	QPSK	22.60	22.35	22.51
10	1	25		22.76	22.54	22.81
10	1	49		22.55	22.25	22.29
10	25	0		21.94	21.53	21.79
10	25	12		21.91	21.58	21.81
10	25	25		21.74	21.54	21.62
10	50	0		21.92	21.59	21.74
10	1	0	16-QAM	21.69	21.09	21.48
10	1	25		21.66	21.76	21.54
10	1	49		21.00	21.00	21.13
10	25	0		20.95	20.46	20.98
10	25	12		20.93	20.61	20.91
10	25	25		20.67	20.46	20.73
10	50	0		20.88	20.52	20.65
5	1	0	QPSK	22.82	22.11	22.55
5	1	12		22.62	22.51	22.59
5	1	24		22.67	22.37	22.35
5	12	0		21.88	21.50	21.71
5	12	7		21.79	21.66	21.67
5	12	13		21.89	21.48	21.57
5	25	0		21.99	21.63	21.66
5	1	0	16-QAM	21.95	21.47	21.71
5	1	12		21.94	21.72	21.51
5	1	24		21.33	21.55	21.19
5	12	0		20.92	20.52	20.54
5	12	7		20.95	20.70	20.42
5	12	13		20.94	20.59	20.55
5	25	0		20.92	20.66	20.60

LTE Band 4 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
3	1	0	QPSK	22.78	22.36	22.52
3	1	8		22.80	22.29	22.32
3	1	14		22.74	22.32	22.25
3	8	0		21.96	21.54	21.47
3	8	4		21.97	21.64	21.47
3	8	7		21.98	21.58	21.55
3	15	0		21.97	21.57	21.48
3	1	0	16-QAM	21.86	21.26	21.47
3	1	8		21.38	21.42	21.10
3	1	14		21.36	21.57	21.08
3	8	0		20.98	20.58	20.19
3	8	4		20.96	20.62	20.29
3	8	7		20.95	20.66	20.62
3	15	0		20.92	20.65	20.62
1.4	1	0	QPSK	22.73	22.34	22.41
1.4	1	3		22.70	22.46	22.35
1.4	1	5		22.71	22.42	22.41
1.4	3	0		22.80	22.52	22.53
1.4	3	1		22.56	22.66	22.54
1.4	3	3		22.80	22.58	22.45
1.4	6	0		21.95	21.54	21.45
1.4	1	0	16-QAM	21.39	21.13	21.05
1.4	1	3		21.73	21.74	21.00
1.4	1	5		21.40	21.69	21.01
1.4	3	0		21.82	21.39	21.66
1.4	3	1		21.96	21.36	21.71
1.4	3	3		21.91	21.36	21.61
1.4	6	0		20.78	20.46	20.58

LTE Band 5 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
10	1	0	QPSK	22.60	22.56	22.36
10	1	25		23.10	22.96	22.89
10	1	49		22.55	22.38	22.25
10	25	0		21.98	21.96	21.87
10	25	12		21.95	21.95	21.75
10	25	25		21.92	21.76	21.71
10	50	0		21.97	21.79	21.74
10	1	0	16-QAM	21.59	21.58	21.43
10	1	25		21.51	21.37	21.14
10	1	49		21.34	21.33	21.17
10	25	0		20.98	20.94	20.8
10	25	12		20.95	20.92	20.82
10	25	25		20.91	20.64	20.68
10	50	0		20.96	20.87	20.72
5	1	0	QPSK	22.66	22.53	22.36
5	1	12		23.02	22.79	22.54
5	1	24		22.86	22.43	22.25
5	12	0		21.96	21.82	21.60
5	12	7		21.99	21.83	21.65
5	12	13		21.94	21.78	21.60
5	25	0		21.92	21.76	21.57
5	1	0	16-QAM	21.16	21.07	21.00
5	1	12		21.58	21.54	21.23
5	1	24		21.31	21.58	21.10
5	12	0		20.75	20.76	20.51
5	12	7		21.05	21.00	20.72
5	12	13		21.01	20.93	20.68
5	25	0		20.96	20.89	20.66

LTE Band 5 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
3	1	0	QPSK	22.88	22.75	22.37
3	1	8		22.68	22.81	22.39
3	1	14		22.51	22.68	22.36
3	8	0		21.88	21.89	21.58
3	8	4		21.86	21.83	21.66
3	8	7		21.95	21.89	21.61
3	15	0		21.93	21.81	21.65
3	1	0	16-QAM	21.17	21.17	21.17
3	1	8		21.23	21.13	21.10
3	1	14		21.44	21.09	21.11
3	8	0		21.01	20.90	20.68
3	8	4		21.00	20.95	20.57
3	8	7		20.98	20.92	20.63
3	15	0		21.10	20.85	20.63
1.4	1	0	QPSK	22.70	22.71	22.61
1.4	1	3		22.83	22.78	22.66
1.4	1	5		22.78	22.65	22.55
1.4	3	0		22.84	22.69	22.57
1.4	3	1		22.90	22.87	22.68
1.4	3	3		22.90	22.80	22.60
1.4	6	0		21.86	21.83	21.57
1.4	1	0	16-QAM	21.42	21.06	21.12
1.4	1	3		21.47	21.65	21.05
1.4	1	5		21.41	21.40	21.12
1.4	3	0		21.85	21.68	21.47
1.4	3	1		21.88	21.81	21.57
1.4	3	3		21.78	21.60	21.49
1.4	6	0		20.79	20.62	20.47

LTE Band 7 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
20	1	0	QPSK	22.40	22.49	22.49
20	1	49		23.14	22.97	23.04
20	1	99		22.60	22.70	22.44
20	50	0		21.76	21.93	21.95
20	50	24		21.81	22.01	21.93
20	50	50		21.95	21.94	21.70
20	100	0		21.83	21.97	21.85
20	1	0	16-QAM	21.31	21.39	21.44
20	1	49		21.50	21.62	21.41
20	1	99		21.47	21.58	21.05
20	50	0		20.74	21.00	21.09
20	50	24		20.76	21.09	20.80
20	50	50		20.79	21.02	20.76
20	100	0		20.88	20.92	20.79
15	1	0	QPSK	22.61	22.74	22.65
15	1	37		23.01	22.74	22.90
15	1	74		22.75	22.76	22.74
15	36	0		21.81	22.02	22.00
15	36	20		21.84	22.01	21.85
15	36	39		21.84	22.02	21.70
15	75	0		21.80	22.00	21.88
15	1	0	16-QAM	21.62	21.69	21.66
15	1	37		22.21	21.71	22.11
15	1	74		21.81	21.59	21.38
15	36	0		20.78	21.02	20.94
15	36	20		20.89	21.08	20.81
15	36	39		20.80	20.91	20.76
15	75	0		20.86	21.06	21.02

LTE Band 7 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
10	1	0	QPSK	22.39	22.59	22.60
10	1	25		22.69	22.85	22.79
10	1	49		22.48	22.65	22.51
10	25	0		21.83	22.04	21.85
10	25	12		21.82	22.04	21.89
10	25	25		21.75	21.94	21.74
10	50	0		21.78	22.04	21.75
10	1	0	16-QAM	21.35	21.49	21.22
10	1	25		21.90	21.63	21.43
10	1	49		21.28	21.46	21.29
10	25	0		20.79	21.01	20.99
10	25	12		20.94	21.11	21.03
10	25	25		20.80	20.93	20.76
10	50	0		20.86	20.94	20.90
5	1	0	QPSK	22.53	22.75	22.55
5	1	12		22.64	22.82	22.78
5	1	24		22.55	22.66	22.51
5	12	0		21.86	21.92	21.72
5	12	7		21.91	21.91	21.72
5	12	13		21.78	21.89	21.70
5	25	0		21.87	21.96	21.68
5	1	0	16-QAM	21.19	21.39	21.91
5	1	12		21.51	21.70	21.88
5	1	24		21.22	21.78	21.43
5	12	0		20.85	20.90	20.87
5	12	7		20.88	20.90	20.75
5	12	13		20.94	20.98	20.64
5	25	0		20.85	21.04	20.82

LTE Band 12 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
10	1	0	QPSK	22.17	22.22	22.45
10	1	25		22.65	22.52	22.57
10	1	49		22.33	22.40	22.29
10	25	0		21.51	21.57	21.64
10	25	12		21.44	21.56	21.59
10	25	25		21.57	21.48	21.50
10	50	0		21.53	21.53	21.60
10	1	0	16-QAM	21.04	21.07	21.02
10	1	25		21.08	21.00	21.16
10	1	49		21.22	21.15	21.23
10	25	0		20.50	20.81	20.55
10	25	12		20.63	20.64	20.60
10	25	25		20.62	20.59	20.61
10	50	0		20.52	20.49	20.59
5	1	0	QPSK	22.24	22.32	22.31
5	1	12		22.46	22.51	22.42
5	1	24		22.28	22.48	22.50
5	12	0		21.43	21.49	21.52
5	12	7		21.42	21.50	21.58
5	12	13		21.44	21.57	21.58
5	25	0		21.53	21.49	21.55
5	1	0	16-QAM	21.15	21.07	21.10
5	1	12		21.15	21.04	21.09
5	1	24		21.05	21.03	21.02
5	12	0		20.32	20.46	20.38
5	12	7		20.37	20.50	20.67
5	12	13		20.32	20.47	20.57
5	25	0		20.43	20.57	20.54

LTE Band 12 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
3	1	0	QPSK	22.33	22.48	22.45
3	1	8		22.24	22.51	22.37
3	1	14		22.37	22.50	22.51
3	8	0		21.51	21.52	21.46
3	8	4		21.55	21.57	21.54
3	8	7		21.48	21.57	21.53
3	15	0		21.49	21.50	21.54
3	1	0	16-QAM	21.12	21.13	21.10
3	1	8		21.15	21.14	21.08
3	1	14		21.13	21.18	21.04
3	8	0		20.59	20.26	20.66
3	8	4		20.54	20.50	20.66
3	8	7		20.58	20.61	20.65
3	15	0		20.64	20.61	20.53
1.4	1	0	QPSK	22.42	22.34	22.36
1.4	1	3		22.45	22.41	22.51
1.4	1	5		22.41	22.44	22.49
1.4	3	0		22.53	22.48	22.52
1.4	3	1		22.57	22.55	22.62
1.4	3	3		22.58	22.52	22.50
1.4	6	0		21.45	21.50	21.63
1.4	1	0	16-QAM	21.25	21.11	21.17
1.4	1	3		21.39	21.20	21.30
1.4	1	5		21.46	21.10	21.16
1.4	3	0		21.58	21.40	21.47
1.4	3	1		21.74	21.44	21.55
1.4	3	3		21.74	21.33	21.50
1.4	6	0		20.40	20.26	20.40

LTE Band 13 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
10	1	0	QPSK		22.61	
10	1	25			22.90	
10	1	49			22.61	
10	25	0			21.90	
10	25	12			21.84	
10	25	25			21.96	
10	50	0			21.98	
10	1	0	16-QAM		21.45	
10	1	25			21.81	
10	1	49			21.45	
10	25	0			20.78	
10	25	12			20.90	
10	25	25			20.95	
10	50	0			20.88	
5	1	0	QPSK	22.54	22.88	22.74
5	1	12		22.85	22.85	22.89
5	1	24		22.66	22.80	22.77
5	12	0		22.05	21.98	21.83
5	12	7		22.12	21.78	22.08
5	12	13		21.86	21.83	21.96
5	25	0		21.90	21.83	22.03
5	1	0	16-QAM	21.46	21.47	21.43
5	1	12		21.84	21.63	21.62
5	1	24		21.46	21.42	21.65
5	12	0		21.17	20.92	20.74
5	12	7		21.14	20.71	21.08
5	12	13		20.80	20.67	20.86
5	25	0		20.82	20.75	21.06