FCC Test Report

Report No.:AGC01684200404FE07

FCC ID	:	2AV8HMTV101
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	Modeshift Validator
BRAND NAME	:	Modeshift
MODEL NAME	:	MTV101
APPLICANT	:	Telelink City Services .
DATE OF ISSUE	:	Jun. 03, 2020
STANDARD(S)	:	FCC Part 22 Rules FCC Part 24 Rules
REPORT VERSION	:	V1.0

Attestation of ***G***lobal ***C***ompliance (Shenzhen) Co., Ltd.

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jun. 03, 2020	Valid	Initial Release

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1.VERIFICATION OF COMPLIANCE

Applicant	Telelink City Services .
Address	6 Panorama Sofia str., Richhill business center, block B, floor 2, 1766 Sofia, BULGARIA
Manufacturer	Telelink City Services .
Address	6 Panorama Sofia str., Richhill business center, block B, floor 2, 1766 Sofia, BULGARIA
Factory	Telelink City Services .
Address	6 Panorama Sofia str., Richhill business center, block B, floor 2, 1766 Sofia, BULGARIA
Product Designation	Modeshift Validator
Brand Name	Modeshift
Test Model	MTV101
Date of test	Apr. 22, 2020 to Jun. 03, 2020
Deviation	None
Condition of Test Sample	Normal

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance(Shenzhen) Co., Ltd. The data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI/TIA-603-E-2016. The sample tested as described in this report is in compliance with the FCC Rules Part 24 and 27. The test results of this report relate only to the tested sample identified in this report.

Prepared By	Donjon Huang (Project Engineer)	Jun. 01, 2020
Reviewed By	Max Zhang (Reviewer)	Jun. 03, 2020
Approved By	Forrest Lei (Authorized Officer)	Jun. 03, 2020

2. GENERAL INFORMATION

2.1 PRODUCT DESCRIPTION

A major technical description of EUT is described as following:

Radio System Type:	LTE	
Frequency Bands:	☒FDD Band 2 ☒FDD Band 5 (U.S. Bands)	
Frequency Range	LTE Band 2	Transmission (TX): 1850 to 1909.9 MHz
		Receiving (RX): 1930 to 1989.9 MHz
	LTE Band 5	Transmission (TX): 824 to 848.9 MHz
		Receiving (RX): 869 to 893.9 MHz
Supported Channel Bandwidth	LTE Band 2	☒ 1.4 MHz ☒ 3 MHz ☒ 5 MHz ☒ 10 MHz ☒ 15 MHz ☒ 20MHz
	LTE Band 5	☒ 1.4 MHz ☒ 3 MHz ☒ 5 MHz ☒ 10 MHz
Hardware Version	TPS530-MAIN-V1.6	
Software Version	TPS530_ALL_V1.0.0	
Antenna:	PIFA Antenna	
Type of Modulation	QPSK/16QAM	
Antenna gain:	Band 2: 1.35dBi; Band 5:1.76dB	
Power Supply	DC 9-36V	
Test Voltage	DC 12V	
Dual Card:	WCDMA/LTE Card Slot	
Power Class	3	
Extreme Vol. Limits:	DC10.8V to 13.2V (Normal: DC 12V)	
Temperature range	-10℃ to +40℃	
Note1: The High Voltage DC13.2V and Low Voltage DC10.8V were declared by manufacturer, The EUT couldn't be operating normally with higher or lower voltage..		

2.3 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID:2AV8HMTV101**, filing to comply with the FCC Part 22 and FCC Part 24 requirements

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2.4 TEST METHODOLOGY

The radiated emission testing was performed according to the procedures of ANSI/TIA-603-E-2016, and FCC KDB 971168 D01 Power Means License Digital Systems V03R01.

2.5 TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong,China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA

ALL TEST EQUIPMENT LIST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	Jun.12, 2019	Jun.11, 2020
LISN	R&S	ESH2-Z5	100086	Aug.26, 2019	Aug.25, 2020
TEST RECEIVER	R&S	ESCI	10096	Jun.12, 2019	Jun.11, 2020
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec.18, 2019	Dec.17, 2020
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 21, 2019	Sep. 20, 2021
preamplifier	ChengYi	EMC184045SE	980508	Sep. 23, 2019	Sep. 22, 2020
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May.17, 2019	May.16, 2021
Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-205	Jun.12, 2019	Jun.11, 2020
ANTENNA	SCHWARZBECK	VULB9168	D69250	Sep.20, 2019	Sep.19, 2020
SIGNAL ANALYZER	Agilent	N9020A	MY52090123	Sep. 09, 2019	Sep. 08, 2020
USB Wideband Power Sensor	Agilent	U2021XA	MY54110007	Sep. 09, 2019	Sep. 08, 2020
Wireless communication test	R&S	CMW500	120909	July 11, 2019	July 10, 2020
Power Splitter	Agilent	11636A	34	Jun.12, 2019	Jun.11, 2020
Attenuator	JFW	50FHC-006-50	N/A	Jun.12, 2019	Jun.11, 2020

2.5 SPECIAL ACCESSORIES

The battery was supplied by the applicant were used as accessories and being tested with EUT intended for FCC grant together.

2.6 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

3. SYSTEM TEST CONFIGURATION

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The Transmitter was operated in the maximum output power mode through Communication Tester. The TX frequency was fixed which was for the purpose of the measurements.

3.3 GENERAL TECHNICAL REQUIREMENTS

Item Number	Item Description		FCC Rules
1	Output Power	Conducted output power	2.1046/22.913(a)(2)/24.232(c)/ 27.50(d)(4)/ 27.50(h)(2)
		Radiated output power	
2	Peak-to-Average Ratio	Peak-to-Average Ratio	24.232(d)
3	Spurious Emission	Conducted spurious emission	2.1051/22.917(a)/24.238(a) 27.53(h)/ 27.53(g)
		Radiated spurious emission	
4	Frequency Stability		2.1055/22.355/24.235/27.54
5	Occupied Bandwidth		2.1049 (h)(i)
6	Band Edge		2.1051/22.917(a)/24.238(a) 27.53(h)/ 27.53(g)

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

3.4 CONFIGURATION OF EUT SYSTEM

Fig. 2-1 Configuration of EUT System

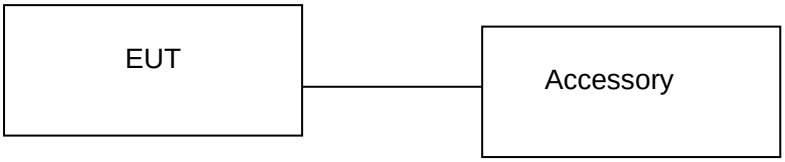


Table 2-1 Equipment Used in EUT System

Item	Equipment	Model No.	ID or Specification	Remark
1	Smart Phone	MTV101	FCC ID: 2AV8HMTV101	EUT
2	Adapter	HB24F-1202000SPA	DC 12V 2A	AE
3	USB Cable	N/A	N/A	AE

***Note: All the accessories have been used during the test. The following “EUT” in setup diagram means EUT system.

4. SUMMARY OF TEST RESULTS

Item Number	Item Description		FCC Rules	Result
1	Output Power	Conducted Output Power	2.1046/22.913(a)(2)/24.232(c)/ 27.50(d)(4)/ 27.50(h)(2)	Pass
		Radiated Output Power		
2	Peak-to-Average Ratio	Peak-to-Average Ratio	24.232(d)	Pass
3	Spurious Emission	Conducted Spurious Emission	2.1051/22.917(a)/24.238(a) 27.53(h)/ 27.53(g)	Pass
		Radiated Spurious Emission		
4	Frequency Stability		2.1055/22.355/24.235/27.54	Pass
5	Occupied Bandwidth		2.1049 (h)(i)	Pass
6	Band Edge		2.1051/22.917(a)/24.238(a) 27.53(h)/ 27.53(g)	Pass

5. DESCRIPTION OF TEST MODES

During the testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication Tester (CMW 500) to ensure max power transmission and proper modulation. Three channels (The top channel, the middle channel and the bottom channel) were chosen for testing on both LTE frequency band.
The worst condition was recorded in the test report if no other modes test data.

Test Mode	Test Modes Description
LTE	LTE system, QPSK modulation
LTE	LTE system, 16QAM modulation

Test Mode	TX / RX	RF Channel		
		Low (B)	Middle (M)	High (T)
LTE Band 2	TX (1.4M)	Channel 18607	Channel 18900	Channel 19193
		1850.7 MHz	1880 MHz	1909.3 MHz
	TX (3M)	Channel 18615	Channel 18900	Channel 19185
		1851.5 MHz	1880 MHz	1908.5 MHz
	TX (5M)	Channel 18625	Channel 18900	Channel 19175
		1852.5 MHz	1880 MHz	1907.5 MHz
	TX (10M)	Channel 18650	Channel 18900	Channel 19150
		1855.0 MHz	1880 MHz	1905.0 MHz
	TX (20M)	Channel 18700	Channel 18900	Channel 19100
		1860.0 MHz	1880 MHz	1900.0 MHz
	RX (1.4M)	Channel 607	Channel 900	Channel 1193
		1930.7 MHz	1960 MHz	1989.3 MHz
	RX (3M)	Channel 615	Channel 900	Channel 1185
		1931.5 MHz	1960 MHz	1988.5 MHz
	RX (5M)	Channel 625	Channel 900	Channel 1175
		1932.5 MHz	1960 MHz	1987.5 MHz
	RX (10M)	Channel 650	Channel 900	Channel 1150
		1935 MHz	1960 MHz	1985 MHz
	RX (20M)	Channel 700	Channel 900	Channel 1100
		1940.0 MHz	1960 MHz	1980 MHz

Test Mode	TX / RX	RF Channel		
		Low (B)	Middle (M)	High (T)
LTE Band 5	TX (1.4M)	Channel 20407	Channel 20525	Channel 20643
		824.7 MHz	836.5 MHz	848.3 MHz
	TX (3M)	Channel 20415	Channel 20525	Channel 20635
		825.5 MHz	836.5 MHz	847.5 MHz
	TX (5M)	Channel 20425	Channel 20525	Channel 20625
		826.5 MHz	836.5 MHz	846.5 MHz
	TX (10M)	Channel 20450	Channel 20525	Channel 20600
		829 MHz	836.5 MHz	844 MHz
	RX (1.4M)	Channel 2404	Channel 2525	Channel 2463
		869.4 MHz	881.5 MHz	893.3 MHz
	RX (3M)	Channel 2415	Channel 2525	Channel 2635
		870.5 MHz	881.5 MHz	892.5 MHz
	RX (5M)	Channel 2425	Channel 2525	Channel 2625
		871.5 MHz	881.5 MHz	891.5 MHz
	RX (10M)	Channel 2450	Channel 2525	Channel 2600
		874 MHz	881.5 MHz	889 MHz

6. OUTPUT POWER

6.1 CONDUCTED OUTPUT POWER

6.1.1 MEASUREMENT METHOD

The EUT is coupled to the SS with attenuator through power splitter; the RF load attached to EUT antenna terminal is 50ohm, the path loss as the factor is calibrated to correct the reading. 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 measurements were performed on all modes at 3 typical channels (the Top Channel, the Middle Channel and the Bottom Channel) for each band.

6.1.2 MEASUREMENT RESULT

LTE Band 2

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)
20MHz	18700	1860.0	QPSK	1	0	0	21.60
				1	49	0	21.99
				1	99	0	21.46
				50	0	1	20.53
				50	25	1	20.53
				50	49	1	20.55
				100	0	1	20.58
			16QAM	1	0	1	20.05
				1	49	1	20.61
				1	99	1	20.19
				50	0	2	20.11
				50	25	2	20.11
				50	49	2	20.12
				100	0	2	19.61
	18900	1880.0	QPSK	1	0	0	21.47
				1	49	0	21.81
				1	99	0	21.84
				50	0	1	20.47
				50	25	1	20.47
				50	49	1	20.51
				100	0	1	20.41
			16QAM	1	0	1	20.14
				1	49	1	20.17
				1	99	1	20.29
				50	0	2	20.07
				50	25	2	20.07
				50	49	2	20.01
				100	0	2	19.45
	19100	1900.0	QPSK	1	0	0	21.76
				1	49	0	22.14
				1	99	0	21.69
				50	0	1	20.71
				50	25	1	20.71
				50	49	1	20.75
				100	0	1	20.75
			16QAM	1	0	1	20.92
				1	49	1	21.18
				1	99	1	20.99
				50	0	2	20.01
				50	25	2	20.01
				50	49	2	20.08
				100	0	2	19.93

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)
15MHz	18675	1857.5	QPSK	1	0	0	21.54
				1	38	0	21.57
				1	74	0	21.56
				38	0	1	20.59
				38	18	1	20.59
				38	37	1	20.58
				75	0	1	20.57
			16QAM	1	0	1	20.34
				1	38	1	20.60
				1	74	1	20.68
				38	0	2	20.08
				38	18	2	20.07
				38	37	2	20.07
				75	0	2	19.47
	18900	1880.0	QPSK	1	0	0	21.37
				1	38	0	21.34
				1	74	0	21.38
				38	0	1	20.35
				38	18	1	20.42
				38	37	1	20.35
				75	0	1	20.35
			16QAM	1	0	1	20.23
				1	38	1	20.23
				1	74	1	20.30
				38	0	2	20.04
				38	18	2	20.05
				38	37	2	20.04
				75	0	2	19.36
	19125	1902.5	QPSK	1	0	0	21.76
				1	38	0	21.63
				1	74	0	21.54
				38	0	1	20.69
				38	18	1	20.69
				38	37	1	20.69
				75	0	1	20.69
			16QAM	1	0	1	20.91
				1	38	1	20.77
				1	74	1	20.54
				38	0	2	20.00
				38	18	2	20.08
				38	37	2	20.09
				75	0	2	19.75

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)
10MHz	18650	1855.0	QPSK	1	0	0	21.44
				1	24	0	21.81
				1	49	0	21.55
				25	0	1	20.41
				25	12	1	20.48
				25	25	1	20.58
				50	0	1	20.50
			16QAM	1	0	1	20.29
				1	24	1	20.59
				1	49	1	20.29
				25	0	2	20.08
				25	12	2	20.09
				25	25	2	20.02
				50	0	2	19.53
	18900	1880.0	QPSK	1	0	0	21.11
				1	24	0	21.54
				1	49	0	21.39
				25	0	1	20.28
				25	12	1	20.29
				25	25	1	20.51
				50	0	1	20.34
			16QAM	1	0	1	19.98
				1	24	1	20.46
				1	49	1	20.23
				25	0	2	20.00
				25	12	2	20.02
				25	25	2	20.02
				50	0	2	19.37
	19150	1905.0	QPSK	1	0	0	21.73
				1	24	0	21.90
				1	49	0	21.44
				25	0	1	20.83
				25	12	1	20.83
				25	25	1	20.85
				50	0	1	20.72
			16QAM	1	0	1	21.06
				1	24	1	21.04
				1	49	1	20.32
				25	0	2	20.02
				25	12	2	20.02
				25	25	2	20.03
				50	0	2	19.83

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)
5MHz	18625	1852.5	QPSK	1	0	0	21.32
				1	12	0	21.40
				1	24	0	21.59
				12	0	1	20.56
				12	6	1	20.55
				12	13	1	20.55
				25	0	1	20.54
			16QAM	1	0	1	20.54
				1	12	1	20.87
				1	24	1	20.74
				12	0	2	20.06
				12	6	2	20.06
				12	13	2	20.04
				25	0	2	19.48
	18900	1880.0	QPSK	1	0	0	21.30
				1	12	0	21.18
				1	24	0	21.21
				12	0	1	20.39
				12	6	1	20.39
				12	13	1	20.38
				25	0	1	20.37
			16QAM	1	0	1	20.36
				1	12	1	20.52
				1	24	1	20.58
				12	0	2	20.08
				12	6	2	20.06
				12	13	2	20.08
				25	0	2	19.58
	19175	1907.5	QPSK	1	0	0	21.60
				1	12	0	21.84
				1	24	0	21.59
				12	0	1	20.79
				12	6	1	20.79
				12	13	1	20.81
				25	0	1	20.77
			16QAM	1	0	1	21.07
				1	12	1	20.67
				1	24	1	20.51
				12	0	2	20.09
				12	6	2	20.08
				12	13	2	20.08
				25	0	2	19.96

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)
3MHz	18615	1851.5	QPSK	1	0	0	21.33
				1	8	0	21.33
				1	14	0	21.45
				8	0	1	20.43
				8	4	1	20.46
				8	8	1	20.43
				15	0	1	20.45
			16QAM	1	0	1	20.34
				1	8	1	20.30
				1	14	1	20.26
				8	0	2	20.13
				8	4	2	20.12
				8	8	2	20.05
				15	0	2	21.18
	18900	1880.0	QPSK	1	0	0	21.20
				1	8	0	21.23
				1	14	0	20.33
				8	0	1	20.33
				8	4	1	20.30
				8	7	1	20.31
				15	0	1	20.08
			16QAM	1	0	1	20.11
				1	8	1	20.30
				1	14	1	20.09
				8	0	2	20.02
				8	4	2	20.01
				8	8	2	19.18
				15	0	2	19.16
	19185	1908.5	QPSK	1	0	0	21.78
				1	8	0	21.56
				1	14	0	21.47
				8	0	1	20.71
				8	4	1	20.70
				8	8	1	20.69
				15	0	1	20.69
			16QAM	1	0	1	20.36
				1	8	1	20.09
				1	14	1	20.03
				8	0	2	20.09
				8	4	2	20.08
				8	8	2	20.00
				15	0	2	19.51

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)
1.4MHz	18607	1850.7	QPSK	1	0	0	21.66
				1	2	0	21.77
				1	5	0	21.73
				3	0	0	21.53
				3	1	0	21.53
				3	2	0	21.55
				6	0	1	20.60
			16QAM	1	0	1	21.12
				1	2	1	21.03
				1	5	1	20.93
				3	0	1	21.11
				3	1	1	21.02
				3	2	1	21.11
				6	0	2	19.65
	18900	1880.0	QPSK	1	0	0	21.36
				1	2	0	21.35
				1	5	0	21.40
				3	0	0	21.19
				3	1	0	21.17
				3	2	0	21.50
				6	0	1	20.34
			16QAM	1	0	1	20.23
				1	2	1	20.31
				1	5	1	20.29
				3	0	1	21.14
				3	1	1	21.05
				3	2	1	21.28
				6	0	2	19.08
	19193	1909.3	QPSK	1	0	0	21.63
				1	2	0	21.60
				1	5	0	21.50
				3	0	0	21.61
				3	1	0	21.60
				3	2	0	21.58
				6	0	1	20.61
			16QAM	1	0	1	20.32
				1	2	1	20.48
				1	5	1	20.27
				3	0	1	21.07
				3	1	1	21.05
				3	2	1	21.02
				6	0	2	19.71

LTE Band 5

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)
10MHz	20450	829	QPSK	1	0	0	22.63
				1	24	0	22.65
				1	49	0	22.57
				25	0	1	22.36
				25	12	1	22.30
				25	25	1	22.25
				50	0	1	21.42
			16QAM	1	0	1	21.39
				1	24	1	21.55
				1	49	1	20.20
				25	0	2	21.14
				25	12	2	21.36
				25	25	2	21.48
				50	0	2	19.46
	20525	836.5	QPSK	1	0	0	21.63
				1	24	0	21.95
				1	49	0	21.51
				25	0	1	20.47
				25	12	1	21.22
				25	25	1	21.26
				50	0	1	20.80
			16QAM	1	0	1	21.54
				1	24	1	23.36
				1	49	1	23.01
				25	0	2	22.06
				25	12	2	22.08
				25	25	2	22.16
				50	0	2	22.15
	20600	844	QPSK	1	0	0	22.63
				1	24	0	22.24
				1	49	0	22.36
				25	0	1	21.08
				25	12	1	20.74
				25	25	1	22.39
				50	0	1	23.50
			16QAM	1	0	1	21.40
				1	24	1	20.63
				1	49	1	21.36
				25	0	2	23.88
				25	12	2	23.16
				25	25	2	21.45
				50	0	2	20.87

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)
5MHz	20425	826.5	QPSK	1	0	0	24.45
				1	12	0	24.27
				1	24	0	24.22
				12	0	1	23.64
				12	6	1	23.63
				12	11	1	23.45
				25	0	1	23.54
			16QAM	1	0	1	23.28
				1	12	1	23.40
				1	24	1	23.53
				12	0	2	22.62
				12	6	2	22.78
				12	11	2	22.63
				25	0	2	22.59
	20525	836.5	QPSK	1	0	0	23.59
				1	12	0	23.73
				1	24	0	23.92
				12	0	1	22.92
				12	6	1	22.91
				12	11	1	22.84
				25	0	1	22.87
			16QAM	1	0	1	21.81
				1	12	1	21.94
				1	24	1	22.27
				12	0	2	21.86
				12	6	2	21.78
				12	11	2	21.62
				25	0	2	21.86
	20625	846.5	QPSK	1	0	0	23.83
				1	12	0	23.68
				1	24	0	23.81
				12	0	1	22.98
				12	6	1	22.97
				12	11	1	22.84
				25	0	1	22.92
			16QAM	1	0	1	22.59
				1	12	1	22.72
				1	24	1	23.05
				12	0	2	22.22
				12	6	2	22.23
				12	11	2	22.09
				25	0	2	21.99

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)
3MHz	20415	825.5	QPSK	1	0	0	24.76
				1	7	0	24.64
				1	14	0	24.54
				8	0	1	23.54
				8	4	1	23.55
				8	7	1	23.53
				15	0	1	23.52
			16QAM	1	0	1	23.46
				1	7	1	23.36
				1	14	1	23.31
				8	0	2	22.47
				8	4	2	22.48
				8	7	2	22.41
				15	0	2	22.65
	20525	836.5	QPSK	1	0	0	23.69
				1	7	0	23.69
				1	14	0	23.72
				8	0	1	22.89
				8	4	1	22.90
				8	7	1	22.77
				15	0	1	22.83
			16QAM	1	0	1	22.34
				1	7	1	22.28
				1	14	1	22.34
				8	0	2	21.86
				8	4	2	21.87
				8	7	2	21.90
				15	0	2	21.92
	20635	847.5	QPSK	1	0	0	23.82
				1	7	0	23.67
				1	14	0	23.79
				8	0	1	22.90
				8	4	1	22.90
				8	7	1	22.84
				15	0	1	22.81
			16QAM	1	0	1	23.03
				1	7	1	22.85
				1	14	1	22.46
				8	0	2	21.99
				8	4	2	21.90
				8	7	2	21.95
				15	0	2	21.85

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)
1.4MHz	20407	824.7	QPSK	1	0	0	24.63
				1	2	0	24.71
				1	5	0	24.72
				3	0	0	24.48
				3	1	0	24.56
				3	2	0	24.53
				6	0	1	23.70
			16QAM	1	0	1	24.05
				1	2	1	24.23
				1	5	1	23.77
				3	0	1	23.71
				3	1	1	23.71
				3	2	1	23.20
				6	0	2	22.70
	20525	836.5	QPSK	1	0	0	23.80
				1	2	0	23.74
				1	5	0	23.60
				3	0	0	23.73
				3	1	0	23.72
				3	2	0	23.64
				6	0	1	22.74
			16QAM	1	0	1	23.21
				1	2	1	23.69
				1	5	1	23.42
				3	0	1	22.78
				3	1	1	22.77
				3	2	1	22.73
				6	0	2	22.05
	20643	848.3	QPSK	1	0	0	23.91
				1	2	0	23.80
				1	5	0	23.77
				3	0	0	23.95
				3	1	0	23.94
				3	2	0	23.81
				6	0	1	22.83
			16QAM	1	0	1	23.05
				1	2	1	23.16
				1	5	1	23.03
				3	0	1	23.19
				3	1	1	23.08
				3	2	1	22.83
				6	0	2	21.74

According to 3GPP 36.521 sub-clause 6.2.3.3, the maximum output power is allowed to be reduced by following the table.

Table 6.2.3.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	**Channel bandwidth / Transmission bandwidth configuration [RB]**						**MPR (dB)**
	1.4 MHz	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The device supports MPR to solve linearity issues (ACLR or SEM) due to the higher peak-to average ratios (PAR) of the HSUPA signal. This prevents saturating the full range of the TX DAC inside of device and provides a reduced power output to the RF transceiver chip according to the Cubic Metric (For PRACH, PUCCH and SRS transmission, the allowed MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.).

When PRACH, PUCCH are present the beta gains on those channels are reduced firsts to try to get the power under the allowed limit. If the beta gains are lowered as far as possible, then a hard limiting is applied at the maximum allowed level.

For each subframe, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) within the slot, the maximum MPR over the two slots is then applied for the entire subframe.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5.3 apply. The normative reference for this requirement is TS 36.101 clause 6.2.3.

The end effect is that the DUT output power is identical to the case where there is no MPR in the device.

6.2 RADIATED OUTPUT POWER

6.2.1 MEASUREMENT METHOD

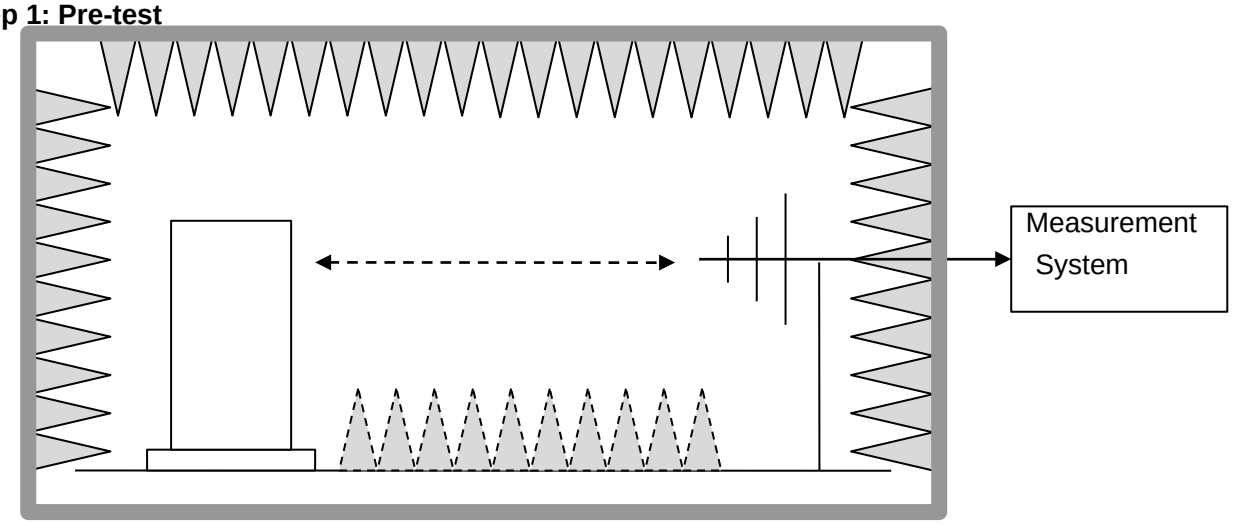
The measurements procedures specified in ANSI/TIA-603-E-2016 were applied.

1. In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference centre of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (Pin) is applied to the input of the dipole, and the power received (Pr) at the chamber's probe antenna is recorded.
2. The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established as ARpl=Pin + 2.15 - Pr. The ARpl is the attenuation of “reference path loss”, and including the gain of receive antenna, the cable loss and the air loss. The measurement results are obtained as described below: Power=PMea+ARpl
3. The EUT is substituted for the dipole at the reference centre of the chamber and a scan is performed to obtain the radiation pattern.
4. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs are identified.
5. The EUT is then put into continuously transmitting mode at its maximum power level.
6. Power mode measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in Rule 27.50(d)(4). The "reference path loss" from Step1 is added to this result.
7. This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.15 dBi) and known input power (Pin).
8. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi..

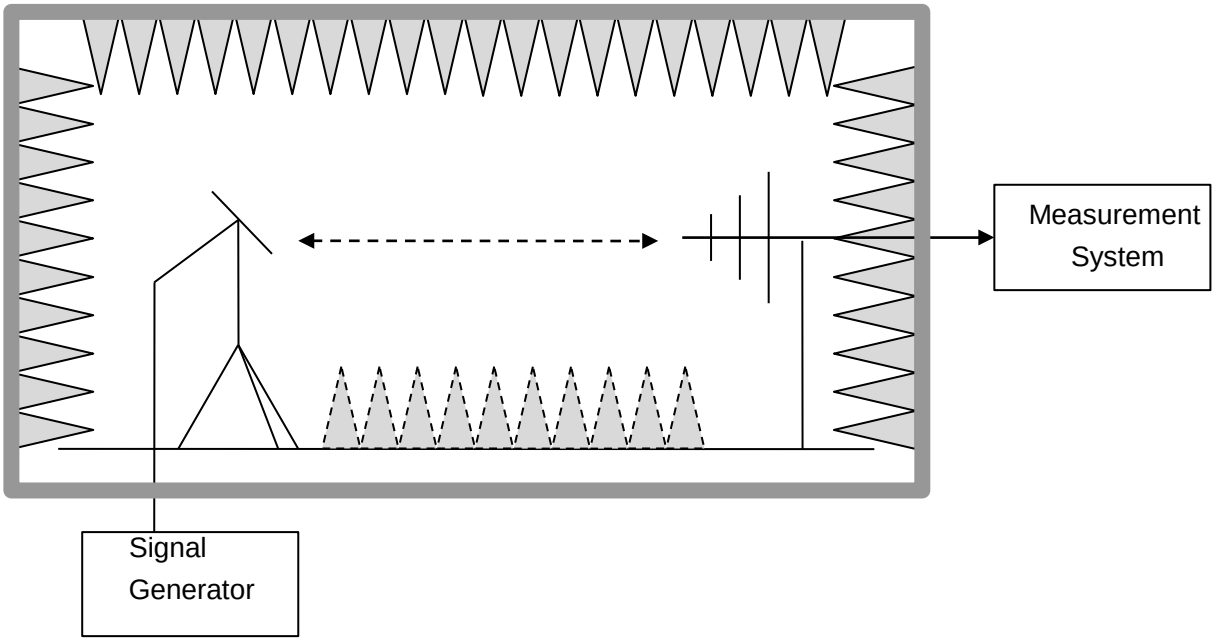
Test Setup

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

Step 1: Pre-test



Step 2: Substitution method to verify the maximum ERP



6.2.2 PROVISIONS APPLICABLE

Mode	FCC Part Section(s)	Nominal Peak Power
LTE Band 2	24.229(b)	<=33dBm (2W)
LTE Band 5	22.905(a)	<=38.45dBm (7W)

6.2.3 MEASUREMENT RESULT

EIRP for LTE Band 2

Frequency	Channel Bandwidth	Mode.	RB	Substituted level	Antenna Polarization	Antenna Gain correction	Cable Loss	Absolute Level	Limit (dBm)
1850.7	1.4	QPSK	1/0	13.06	V	7.95	0.79	20.22	33
1880.0	1.4	QPSK	1/0	13.17	V	7.95	0.79	20.33	33
1909.3	1.4	QPSK	1/0	13.13	V	7.95	0.79	20.29	33
1850.7	1.4	QPSK	1/0	12.93	H	7.95	0.79	20.09	33
1880.0	1.4	QPSK	1/0	12.93	H	7.95	0.79	20.09	33
1909.3	1.4	QPSK	1/0	12.95	H	7.95	0.79	20.11	33
1850.7	1.4	16-QAM	1/5	12.53	V	7.95	0.79	19.69	33
1880.0	1.4	16-QAM	1/0	12.52	V	7.95	0.79	19.68	33
1909.3	1.4	16-QAM	1/0	12.43	V	7.95	0.79	19.59	33
1850.7	1.4	16-QAM	1/5	12.33	H	7.95	0.79	19.49	33
1880.0	1.4	16-QAM	1/0	12.51	H	7.95	0.79	19.67	33
1909.3	1.4	16-QAM	1/0	12.42	H	7.95	0.79	19.58	33
1851.5	3	QPSK	1/0	12.43	V	7.95	0.79	19.59	33
1880.0	3	QPSK	1/0	12.43	V	7.95	0.79	19.59	33
1908.5	3	QPSK	1/0	12.55	V	7.95	0.79	19.71	33
1851.5	3	QPSK	1/0	11.53	H	7.95	0.79	18.69	33
1880.0	3	QPSK	1/0	11.56	H	7.95	0.79	18.72	33
1908.5	3	QPSK	1/0	11.53	H	7.95	0.79	18.69	33
1851.5	3	16-QAM	1/0	11.55	V	7.95	0.79	18.71	33
1880.0	3	16-QAM	1/0	11.44	V	7.95	0.79	18.6	33
1908.5	3	16-QAM	1/0	11.43	V	7.95	0.79	18.59	33
1851.5	3	16-QAM	1/0	11.36	H	7.95	0.79	18.52	33
1880.0	3	16-QAM	1/0	11.23	H	7.95	0.79	18.39	33
1908.5	3	16-QAM	1/0	11.22	H	7.95	0.79	18.38	33
1852.5	5	QPSK	1/0	12.82	V	7.95	0.79	19.98	33
1880.0	5	QPSK	1/0	12.91	V	7.95	0.79	20.07	33
1907.5	5	QPSK	1/24	13.09	V	7.95	0.79	20.25	33
1852.5	5	QPSK	1/0	12.06	H	7.95	0.79	19.22	33
1880.0	5	QPSK	1/0	12.05	H	7.95	0.79	19.21	33
1907.5	5	QPSK	1/24	12.05	H	7.95	0.79	19.21	33
1852.5	5	16-QAM	1/0	12.04	V	7.95	0.79	19.2	33
1880.0	5	16-QAM	1/0	12.04	V	7.95	0.79	19.2	33
1907.5	5	16-QAM	1/24	12.37	V	7.95	0.79	19.53	33

1852.5	5	16-QAM	1/0	12.24	H	7.95	0.79	19.4	33
1880.0	5	16-QAM	1/0	11.56	H	7.95	0.79	18.72	33
1907.5	5	16-QAM	1/24	11.56	H	7.95	0.79	18.72	33
1855	10	QPSK	1/0	12.64	V	7.95	0.79	19.8	33
1880	10	QPSK	1/49	13.01	V	7.95	0.79	20.17	33
1905	10	QPSK	1/0	12.75	V	7.95	0.79	19.91	33
1855	10	QPSK	1/0	11.61	H	7.95	0.79	18.77	33
1880	10	QPSK	1/49	11.68	H	7.95	0.79	18.84	33
1905	10	QPSK	1/0	11.78	H	7.95	0.79	18.94	33
1855	10	16-QAM	1/0	11.71	V	7.95	0.79	18.87	33
1880	10	16-QAM	1/49	11.49	V	7.95	0.79	18.65	33
1905	10	16-QAM	1/0	11.79	V	7.95	0.79	18.95	33
1855	10	16-QAM	1/0	11.49	H	7.95	0.79	18.65	33
1880	10	16-QAM	1/49	11.28	H	7.95	0.79	18.44	33
1905	10	16-QAM	1/0	11.29	H	7.95	0.79	18.45	33
1857.5	15	QPSK	1/0	12.84	V	7.95	0.79	20	33
1880	15	QPSK	1/74	12.87	V	7.95	0.79	20.03	33
1902.5	15	QPSK	1/0	12.86	V	7.95	0.79	20.02	33
1857.5	15	QPSK	1/0	11.89	H	7.95	0.79	19.05	33
1880	15	QPSK	1/74	11.89	H	7.95	0.79	19.05	33
1902.5	15	QPSK	1/0	11.88	H	7.95	0.79	19.04	33
1857.5	15	16-QAM	1/0	11.87	V	7.95	0.79	19.03	33
1880	15	16-QAM	1/74	11.64	V	7.95	0.79	18.8	33
1902.5	15	16-QAM	1/0	11.95	V	7.95	0.79	19.11	33
1857.5	15	16-QAM	1/0	11.98	H	7.95	0.79	19.14	33
1880	15	16-QAM	1/74	11.38	H	7.95	0.79	18.54	33
1902.5	15	16-QAM	1/0	11.37	H	7.95	0.79	18.53	33
1860	20	QPSK	1/99	12.84	V	7.95	0.79	20	33
1880	20	QPSK	1/99	13.19	V	7.95	0.79	20.35	33
1900	20	QPSK	1/0	12.66	V	7.95	0.79	19.82	33
1860	20	QPSK	1/99	11.73	H	7.95	0.79	18.89	33
1880	20	QPSK	1/99	11.73	H	7.95	0.79	18.89	33
1900	20	QPSK	1/0	11.75	H	7.95	0.79	18.91	33
1860	20	16-QAM	1/99	11.78	V	7.95	0.79	18.94	33
1880	20	16-QAM	1/99	11.25	V	7.95	0.79	18.41	33
1900	20	16-QAM	1/0	11.81	V	7.95	0.79	18.97	33
1860	20	16-QAM	1/99	11.39	H	7.95	0.79	18.55	33

1880	20	16-QAM	1/99	11.26	H	7.95	0.79	18.42	33
1900	20	16-QAM	1/0	11.28	H	7.95	0.79	18.44	33

EIRP for LTE Band 5

Frequency	Channel Bandwidth	Mode.	RB	Substituted level	Antenna Polarization	Antenna Gain correction	Cable Loss	Absolute Level	Limit (dBm)
824.7	1.4	QPSK	1/0	16.13	V	6.7	0.49	22.34	38.45
836.5	1.4	QPSK	1/0	16.21	V	6.7	0.49	22.42	38.45
848.3	1.4	QPSK	1/0	16.22	V	6.7	0.49	22.43	38.45
824.7	1.4	QPSK	1/0	15.98	H	6.7	0.49	22.19	38.45
836.5	1.4	QPSK	1/0	16.06	H	6.7	0.49	22.27	38.45
848.3	1.4	QPSK	1/0	16.03	H	6.7	0.49	22.24	38.45
824.7	1.4	16-QAM	1/0	15.2	V	6.7	0.49	21.41	38.45
836.5	1.4	16-QAM	1/0	15.55	V	6.7	0.49	21.76	38.45
848.3	1.4	16-QAM	1/0	15.73	V	6.7	0.49	21.94	38.45
824.7	1.4	16-QAM	1/0	15.27	H	6.7	0.49	21.48	38.45
836.5	1.4	16-QAM	1/0	15.21	H	6.7	0.49	21.42	38.45
848.3	1.4	16-QAM	1/0	15.21	H	6.7	0.49	21.42	38.45
825.5	3	QPSK	1/0	16.26	V	6.7	0.49	22.47	38.45
836.5	3	QPSK	1/0	16.14	V	6.7	0.49	22.35	38.45
847.5	3	QPSK	1/0	16.04	V	6.7	0.49	22.25	38.45
825.5	3	QPSK	1/0	15.04	H	6.7	0.49	21.25	38.45
836.5	3	QPSK	1/0	15.05	H	6.7	0.49	21.26	38.45
847.5	3	QPSK	1/0	15.03	H	6.7	0.49	21.24	38.45
825.5	3	16-QAM	1/0	15.02	V	6.7	0.49	21.23	38.45
836.5	3	16-QAM	1/0	14.96	V	6.7	0.49	21.17	38.45
847.5	3	16-QAM	1/0	14.86	V	6.7	0.49	21.07	38.45
825.5	3	16-QAM	1/0	14.81	H	6.7	0.49	21.02	38.45
836.5	3	16-QAM	1/0	13.97	H	6.7	0.49	20.18	38.45
847.5	3	16-QAM	1/0	13.98	H	6.7	0.49	20.19	38.45
826.5	5	QPSK	1/0	15.95	V	6.7	0.49	22.16	38.45
836.5	5	QPSK	1/0	15.77	V	6.7	0.49	21.98	38.45
846.5	5	QPSK	1/0	15.72	V	6.7	0.49	21.93	38.45
826.5	5	QPSK	1/0	15.14	H	6.7	0.49	21.35	38.45
836.5	5	QPSK	1/0	15.13	H	6.7	0.49	21.34	38.45
846.5	5	QPSK	1/0	14.95	H	6.7	0.49	21.16	38.45

826.5	5	16-QAM	1/0	15.04	V	6.7	0.49	21.25	38.45
836.5	5	16-QAM	1/0	14.78	V	6.7	0.49	20.99	38.45
846.5	5	16-QAM	1/0	14.9	V	6.7	0.49	21.11	38.45
826.5	5	16-QAM	1/0	15.03	H	6.7	0.49	21.24	38.45
836.5	5	16-QAM	1/0	14.12	H	6.7	0.49	20.33	38.45
846.5	5	16-QAM	1/0	14.28	H	6.7	0.49	20.49	38.45
829	10	QPSK	1/0	14.13	V	6.7	0.49	20.34	38.45
836.5	10	QPSK	1/0	14.15	V	6.7	0.49	20.36	38.45
844	10	QPSK	1/0	14.07	V	6.7	0.49	20.28	38.45
829	10	QPSK	1/0	13.86	H	6.7	0.49	20.07	38.45
836.5	10	QPSK	1/0	13.8	H	6.7	0.49	20.01	38.45
844	10	QPSK	1/0	13.75	H	6.7	0.49	19.96	38.45
829	10	16-QAM	1/0	12.92	V	6.7	0.49	19.13	38.45
836.5	10	16-QAM	1/0	12.89	V	6.7	0.49	19.10	38.45
844	10	16-QAM	1/0	13.05	V	6.7	0.49	19.26	38.45
829	10	16-QAM	1/0	11.7	H	6.7	0.49	17.91	38.45
836.5	10	16-QAM	1/0	12.64	H	6.7	0.49	18.85	38.45
844	10	16-QAM	1/0	12.86	H	6.7	0.49	19.07	38.45

Note: Above is the worst mode data.

6.3. PEAK-TO-AVERAGE RATIO

6.3.1 MEASUREMENT METHOD

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.

According to KDB 971168 D01v03 - Section 5.7:

a)Refer to instrument’s analyzer instruction manual for details on how to use the power statistics /CCDF function;

b) Set resolution/measurement bandwidth ≥ signal’s occupied bandwidth;

c) Set the number of counts to a value that stabilizes the measured CCDF curve;

d) Set the measurement interval to 1 ms

e) Record the maximum PAPR level associated with a probability of 0.1%

6.3.2 PROVISIONS APPLICABLE

This is the test for the Peak-to-Average Ratio from the EUT.

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.

6.3.3 MEASUREMENT RESULT

LTE Band 2

Channel Bandwidth: 1.4 MHz

Channel Bandwidth: 1.4 MHz						
Modulation	Channel	RB Configuration		Peak-to-Average Ratio (dB)	Limit (dB)	Verdict
		Size	Offset			
QPSK	LCH	1	0	4.15	<13	PASS
		1	3	4.18	<13	PASS
		1	5	4.21	<13	PASS
		3	0	4.38	<13	PASS
		3	2	4.36	<13	PASS
		3	3	4.42	<13	PASS
		6	0	5.19	<13	PASS
	MCH	1	0	4.21	<13	PASS
		1	3	4.25	<13	PASS
		1	5	4.27	<13	PASS
		3	0	4.50	<13	PASS
		3	2	4.44	<13	PASS
		3	3	4.41	<13	PASS
		6	0	5.27	<13	PASS
	HCH	1	0	4.48	<13	PASS
		1	3	4.44	<13	PASS
		1	5	4.57	<13	PASS
		3	0	4.68	<13	PASS
		3	2	4.79	<13	PASS
		3	3	4.77	<13	PASS
		6	0	5.73	<13	PASS
16QAM	LCH	1	0	5.1	<13	PASS
		1	3	4.94	<13	PASS
		1	5	5.12	<13	PASS
		3	0	4.37	<13	PASS
		3	2	4.36	<13	PASS
		3	3	4.41	<13	PASS
		6	0	6.14	<13	PASS
	MCH	1	0	5.41	<13	PASS
		1	3	4.99	<13	PASS
		1	5	5.24	<13	PASS
		3	0	4.43	<13	PASS
		3	2	4.5	<13	PASS

		3	3	4.42	<13	PASS
		6	0	6.2	<13	PASS
	HCH	1	0	5.57	<13	PASS
		1	3	5.51	<13	PASS
		1	5	5.64	<13	PASS
		3	0	4.71	<13	PASS
		3	2	4.78	<13	PASS
		3	3	4.72	<13	PASS
		6	0	6.44	<13	PASS

Channel Bandwidth: 3 MHz

Channel Bandwidth: 3 MHz						
Modulation	Channel	RB Configuration		Peak-to-Average Ratio [dB]	Limit [dB]	Verdict
		Size	Offset			
QPSK	LCH	1	0	4.19	<13	PASS
		1	7	4.11	<13	PASS
		1	14	4.35	<13	PASS
		8	0	5.42	<13	PASS
		8	4	5.66	<13	PASS
		8	7	5.38	<13	PASS
		15	0	5.45	<13	PASS
	MCH	1	0	4.24	<13	PASS
		1	7	4.11	<13	PASS
		1	14	4.26	<13	PASS
		8	0	5.57	<13	PASS
		8	4	5.65	<13	PASS
		8	7	5.57	<13	PASS
		15	0	5.54	<13	PASS
	HCH	1	0	4.39	<13	PASS
		1	7	4.46	<13	PASS
		1	14	4.74	<13	PASS
		8	0	5.7	<13	PASS
		8	4	5.7	<13	PASS
		8	7	5.69	<13	PASS
		15	0	5.84	<13	PASS
16QAM	LCH	1	0	5.2	<13	PASS
		1	7	5.34	<13	PASS

		1	14	5.46	<13	PASS
		8	0	5.45	<13	PASS
		8	4	5.68	<13	PASS
		8	7	5.6	<13	PASS
		15	0	6.59	<13	PASS
	MCH	1	0	5.52	<13	PASS
		1	7	5.3	<13	PASS
		1	14	5.52	<13	PASS
		8	0	5.56	<13	PASS
		8	4	5.64	<13	PASS
		8	7	5.56	<13	PASS
		15	0	6.38	<13	PASS
	HCH	1	0	5.27	<13	PASS
		1	7	5.33	<13	PASS
		1	14	5.64	<13	PASS
		8	0	5.69	<13	PASS
		8	4	5.98	<13	PASS
		8	7	5.64	<13	PASS
		15	0	6.75	<13	PASS

Channel Bandwidth: 5 MHz

Channel Bandwidth: 5 MHz						
Modulation	Channel	RB Configuration		Peak-to-Average Ratio [dB]	Limit [dB]	Verdict
		Size	Offset			
QPSK	LCH	1	0	4.29	<13	PASS
		1	12	4.35	<13	PASS
		1	24	4.44	<13	PASS
		12	0	5.85	<13	PASS
		12	6	5.75	<13	PASS
		12	13	5.76	<13	PASS
		25	0	5.68	<13	PASS
	MCH	1	0	4.32	<13	PASS
		1	12	4.19	<13	PASS
		1	24	4.32	<13	PASS
		12	0	5.8	<13	PASS
		12	6	5.8	<13	PASS

		12	13	5.8	<13	PASS
		25	0	5.66	<13	PASS
	HCH	1	0	4.29	<13	PASS
		1	12	4.3	<13	PASS
		1	24	4.55	<13	PASS
		12	0	5.69	<13	PASS
		12	6	5.98	<13	PASS
		12	13	5.84	<13	PASS
		25	0	5.83	<13	PASS
16QAM	LCH	1	0	5.21	<13	PASS
		1	12	5.43	<13	PASS
		1	24	5.48	<13	PASS
		12	0	5.82	<13	PASS
		12	6	5.75	<13	PASS
		12	13	5.69	<13	PASS
		25	0	6.86	<13	PASS
	MCH	1	0	5.41	<13	PASS
		1	12	5.19	<13	PASS
		1	24	5.48	<13	PASS
		12	0	5.74	<13	PASS
		12	6	5.74	<13	PASS
		12	13	5.8	<13	PASS
		25	0	6.38	<13	PASS
	HCH	1	0	5.18	<13	PASS
		1	12	5.16	<13	PASS
		1	24	5.38	<13	PASS
		12	0	5.71	<13	PASS
		12	6	5.76	<13	PASS
		12	13	5.84	<13	PASS
		25	0	6.52	<13	PASS

Channel Bandwidth: 10 MHz

Channel Bandwidth: 10 MHz						
Modulation	Channel	RB Configuration		Peak-to-Average Ratio [dB]	Limit [dB]	Verdict
		Size	Offset			
QPSK	LCH	1	0	4.3	<13	PASS
		1	24	4.4	<13	PASS
		1	49	4.64	<13	PASS
		25	0	5.07	<13	PASS
		25	12	5.08	<13	PASS
		25	25	6.16	<13	PASS
		50	0	6.02	<13	PASS
	MCH	1	0	4.33	<13	PASS
		1	24	4.21	<13	PASS
		1	49	4.4	<13	PASS
		25	0	4.97	<13	PASS
		25	12	4.98	<13	PASS
		25	25	6.05	<13	PASS
		50	0	6.39	<13	PASS
	HCH	1	0	4.2	<13	PASS
		1	24	4.19	<13	PASS
		1	49	4.59	<13	PASS
		25	0	4.79	<13	PASS
		25	12	4.8	<13	PASS
		25	25	5.85	<13	PASS
		50	0	6.01	<13	PASS
16QAM	LCH	1	0	5.35	<13	PASS
		1	24	5.42	<13	PASS
		1	49	5.49	<13	PASS
		25	0	5.16	<13	PASS
		25	12	5.06	<13	PASS
		25	25	6.23	<13	PASS
		50	0	7.4	<13	PASS
	MCH	1	0	5.37	<13	PASS
		1	24	5.14	<13	PASS
		1	49	5.41	<13	PASS
		25	0	4.98	<13	PASS

		25	12	4.9	<13	PASS
		25	25	5.97	<13	PASS
		50	0	8.05	<13	PASS
	HCH	1	0	4.82	<13	PASS
		1	24	5.24	<13	PASS
		1	49	5.72	<13	PASS
		25	0	4.81	<13	PASS
		25	12	4.85	<13	PASS
		25	25	5.81	<13	PASS
		50	0	7.16	<13	PASS

Channel Bandwidth: 15 MHz

Channel Bandwidth: 15 MHz						
Modulation	Channel	RB Configuration		Peak-to-Average Ratio [dB]	Limit [dB]	Verdict
		Size	Offset			
QPSK	LCH	1	0	9.9	<13	PASS
		1	37	4.5	<13	PASS
		1	74	11.68	<13	PASS
		37	0	6.99	<13	PASS
		37	18	6.7	<13	PASS
		37	38	6.88	<13	PASS
		75	0	6.76	<13	PASS
	MCH	1	0	9.71	<13	PASS
		1	37	4.21	<13	PASS
		1	74	9.86	<13	PASS
		37	0	6.91	<13	PASS
		37	18	6.73	<13	PASS
		37	38	6.86	<13	PASS
		75	0	7.11	<13	PASS
	HCH	1	0	9.74	<13	PASS
		1	37	4.02	<13	PASS
		1	74	10.19	<13	PASS
		37	0	6.88	<13	PASS
		37	18	6.61	<13	PASS
		37	38	6.76	<13	PASS
		75	0	6.66	<13	PASS
16QAM	LCH	1	0	9.55	<13	PASS
		1	37	5.64	<13	PASS
		1	74	10.15	<13	PASS

		37	0	6.92	<13	PASS
		37	18	6.65	<13	PASS
		37	38	6.93	<13	PASS
		75	0	8.43	<13	PASS
	MCH	1	0	10.09	<13	PASS
		1	37	5.13	<13	PASS
		1	74	6.52	<13	PASS
		37	0	6.85	<13	PASS
		37	18	6.7	<13	PASS
		37	38	6.69	<13	PASS
		75	0	8.16	<13	PASS
	HCH	1	0	10.28	<13	PASS
		1	37	4.86	<13	PASS
		1	74	11.55	<13	PASS
		37	0	6.67	<13	PASS
		37	18	6.6	<13	PASS
		37	38	6.54	<13	PASS
		75	0	8.4	<13	PASS

Channel Bandwidth: 20 MHz

Channel Bandwidth: 20 MHz						
Modulation	Channel	RB Configuration		Peak-to-Average Ratio [dB]	Limit [dB]	Verdict
		Size	Offset			
QPSK	LCH	1	0	9.71	<13	PASS
		1	49	4.43	<13	PASS
		1	99	10.22	<13	PASS
		50	0	6.85	<13	PASS
		50	25	6.93	<13	PASS
		50	50	7.69	<13	PASS
		100	0	7.36	<13	PASS
	MCH	1	0	9.59	<13	PASS
		1	49	4.12	<13	PASS
		1	99	10.39	<13	PASS
		50	0	6.61	<13	PASS
		50	25	6.67	<13	PASS
		50	50	7.68	<13	PASS
		100	0	7.57	<13	PASS
	HCH	1	0	10.79	<13	PASS
		1	49	4.04	<13	PASS

		1	99	9.48	<13	PASS
		50	0	6.75	<13	PASS
		50	25	6.71	<13	PASS
		50	50	7.65	<13	PASS
		100	0	7.58	<13	PASS
16QAM	LCH	1	0	10.25	<13	PASS
		1	49	5.44	<13	PASS
		1	99	9.86	<13	PASS
		50	0	6.99	<13	PASS
		50	25	6.96	<13	PASS
		50	50	7.7	<13	PASS
		100	0	8.73	<13	PASS
	MCH	1	0	9.74	<13	PASS
		1	49	4.92	<13	PASS
		1	99	10.45	<13	PASS
		50	0	6.54	<13	PASS
		50	25	6.61	<13	PASS
		50	50	7.65	<13	PASS
		100	0	8.81	<13	PASS
	HCH	1	0	10.24	<13	PASS
		1	49	4.6	<13	PASS
		1	99	10.1	<13	PASS
		50	0	6.81	<13	PASS
		50	25	7.04	<13	PASS
		50	50	7.67	<13	PASS
		100	0	8.58	<13	PASS

LTE Band 5

Channel Bandwidth: 1.4 MHz

Channel Bandwidth: 1.4 MHz						
Modulation	Channel	RB Configuration		Peak-to-Average Ratio (dB)	Limit (dB)	Verdict
		Size	Offset			
QPSK	LCH	1	0	4.6	<13	PASS
		1	3	4.47	<13	PASS
		1	5	4.54	<13	PASS
		3	0	4.76	<13	PASS
		3	2	4.76	<13	PASS
		3	3	4.73	<13	PASS
		6	0	5.22	<13	PASS
	MCH	1	0	5.15	<13	PASS
		1	3	5	<13	PASS
		1	5	5.07	<13	PASS
		3	0	5.37	<13	PASS
		3	2	5.39	<13	PASS
		3	3	5.34	<13	PASS
		6	0	5.44	<13	PASS
	HCH	1	0	4.88	<13	PASS
		1	3	4.54	<13	PASS
		1	5	4.38	<13	PASS
		3	0	5.08	<13	PASS
		3	2	5.07	<13	PASS
		3	3	4.71	<13	PASS
		6	0	5.41	<13	PASS
16QAM	LCH	1	0	5.18	<13	PASS
		1	3	5.2	<13	PASS
		1	5	5.07	<13	PASS
		3	0	5.63	<13	PASS
		3	2	5.61	<13	PASS
		3	3	5.59	<13	PASS
		6	0	6.07	<13	PASS
	MCH	1	0	5.99	<13	PASS
		1	3	5.84	<13	PASS
		1	5	6.03	<13	PASS
		3	0	6.33	<13	PASS
		3	2	5.98	<13	PASS
		3	3	5.95	<13	PASS

		6	0	6.18	<13	PASS
	HCH	1	0	5.86	<13	PASS
		1	3	5.51	<13	PASS
		1	5	5.44	<13	PASS
		3	0	5.97	<13	PASS
		3	2	6.04	<13	PASS
		3	3	5.86	<13	PASS
		6	0	6.43	<13	PASS

Channel Bandwidth: 3 MHz

Channel Bandwidth: 3 MHz						
Modulation	Channel	RB Configuration		Peak-to-Average Ratio [dB]	Limit [dB]	Verdict
		Size	Offset			
QPSK	LCH	1	0	4.61	<13	PASS
		1	7	4.43	<13	PASS
		1	14	4.7	<13	PASS
		8	0	5.03	<13	PASS
		8	4	5.04	<13	PASS
		8	7	5.02	<13	PASS
		15	0	5.35	<13	PASS
	MCH	1	0	5.15	<13	PASS
		1	7	4.96	<13	PASS
		1	14	5.03	<13	PASS
		8	0	5.52	<13	PASS
		8	4	5.53	<13	PASS
		8	7	5.52	<13	PASS
		15	0	5.91	<13	PASS
	HCH	1	0	4.89	<13	PASS
		1	7	4.8	<13	PASS
		1	14	4.45	<13	PASS
		8	0	5.46	<13	PASS
		8	4	5.43	<13	PASS
		8	7	5.34	<13	PASS
		15	0	5.77	<13	PASS
16QAM	LCH	1	0	5.19	<13	PASS
		1	7	5.15	<13	PASS
		1	14	5.27	<13	PASS
		8	0	5.91	<13	PASS
		8	4	5.89	<13	PASS

		8	7	5.89	<13	PASS
		15	0	6.21	<13	PASS
	MCH	1	0	6.02	<13	PASS
		1	7	5.84	<13	PASS
		1	14	5.89	<13	PASS
		8	0	6.39	<13	PASS
		8	4	6.37	<13	PASS
		8	7	6.36	<13	PASS
		15	0	6.71	<13	PASS
	HCH	1	0	5.86	<13	PASS
		1	7	5.74	<13	PASS
		1	14	5.27	<13	PASS
		8	0	6.35	<13	PASS
		8	4	6.33	<13	PASS
		8	7	6.26	<13	PASS
		15	0	6.64	<13	PASS

Channel Bandwidth: 5 MHz

Channel Bandwidth: 5 MHz						
Modulation	Channel	RB Configuration		Peak-to-Average Ratio [dB]	Limit [dB]	Verdict
		Size	Offset			
QPSK	LCH	1	0	4.97	<13	PASS
		1	12	4.86	<13	PASS
		1	24	4.92	<13	PASS
		12	0	5.36	<13	PASS
		12	6	5.35	<13	PASS
		12	13	5.34	<13	PASS
		25	0	5.83	<13	PASS
	MCH	1	0	4.74	<13	PASS
		1	12	4.69	<13	PASS
		1	24	4.88	<13	PASS
		12	0	5.17	<13	PASS
		12	6	5.17	<13	PASS
		12	13	5.25	<13	PASS
		25	0	5.62	<13	PASS
	HCH	1	0	4.55	<13	PASS
		1	12	4.27	<13	PASS
		1	24	4.37	<13	PASS
		12	0	4.96	<13	PASS

		12	6	4.98	<13	PASS
		12	13	4.88	<13	PASS
		25	0	5.26	<13	PASS
16QAM	LCH	1	0	6.01	<13	PASS
		1	12	5.8	<13	PASS
		1	24	5.85	<13	PASS
		12	0	6.29	<13	PASS
		12	6	6.3	<13	PASS
		12	13	6.25	<13	PASS
		25	0	6.55	<13	PASS
	MCH	1	0	5.37	<13	PASS
		1	12	5.73	<13	PASS
		1	24	5.86	<13	PASS
		12	0	6.14	<13	PASS
		12	6	6.14	<13	PASS
		12	13	6.18	<13	PASS
		25	0	6.37	<13	PASS
	HCH	1	0	5.49	<13	PASS
		1	12	5.06	<13	PASS
		1	24	5.2	<13	PASS
		12	0	5.89	<13	PASS
		12	6	5.84	<13	PASS
		12	13	5.78	<13	PASS
		25	0	6.12	<13	PASS

Channel Bandwidth: 10 MHz

Channel Bandwidth: 10 MHz						
Modulation	Channel	RB Configuration		Peak-to-Average Ratio [dB]	Limit [dB]	Verdict
		Size	Offset			
QPSK	LCH	1	0	4.64	<13	PASS
		1	24	4.96	<13	PASS
		1	49	4.84	<13	PASS
		25	0	5.13	<13	PASS
		25	12	5.26	<13	PASS
		25	25	5.3	<13	PASS
		50	0	5.74	<13	PASS
	MCH	1	0	4.96	<13	PASS
		1	24	4.68	<13	PASS
		1	49	4.87	<13	PASS

		25	0	5.02	<13	PASS
		25	12	5.03	<13	PASS
		25	25	5.15	<13	PASS
		50	0	5.64	<13	PASS
	HCH	1	0	4.95	<13	PASS
		1	24	4.35	<13	PASS
		1	49	4.38	<13	PASS
		25	0	4.87	<13	PASS
		25	12	4.64	<13	PASS
		25	25	4.78	<13	PASS
		50	0	5.23	<13	PASS
16QAM	LCH	1	0	5.99	<13	PASS
		1	24	5.81	<13	PASS
		1	49	5.61	<13	PASS
		25	0	6.3	<13	PASS
		25	12	6.35	<13	PASS
		25	25	6.3	<13	PASS
		50	0	6.48	<13	PASS
	MCH	1	0	5.39	<13	PASS
		1	24	5.84	<13	PASS
		1	49	5.74	<13	PASS
		25	0	6.26	<13	PASS
		25	12	6.30	<13	PASS
		25	25	6.29	<13	PASS
		50	0	6.38	<13	PASS
	HCH	1	0	5.45	<13	PASS
		1	24	5.15	<13	PASS
		1	49	5.36	<13	PASS
		25	0	5.84	<13	PASS
		25	12	5.75	<13	PASS
		25	25	5.76	<13	PASS
		50	0	6.15	<13	PASS

7. SPURIOUS EMISSION

7.1 CONDUCTED SPURIOUS EMISSION

7.1.1 MEASUREMENT METHOD

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + log10(P[Watts]), where P is the transmitter power in Watts.

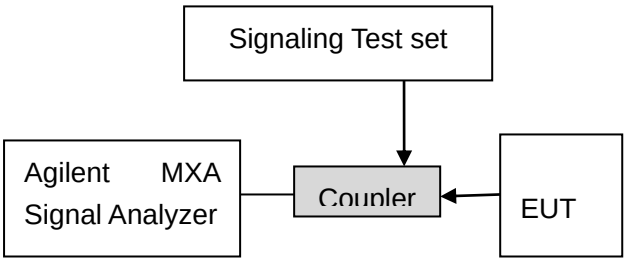
Test Procedure Used
KDB 971168 D01v03 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 * the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = max hold
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



Test Instrument & Measurement Setup

shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

Test Note

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. 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. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

7.1.2 MEASUREMENT RESULT

PLEASE REFER TO: APPENDIX A TEST PLOTS FOR CONDUCTED SPURIOUS EMISSION

Note: 1. No emission found in standby or receive mode, no recording in this report.

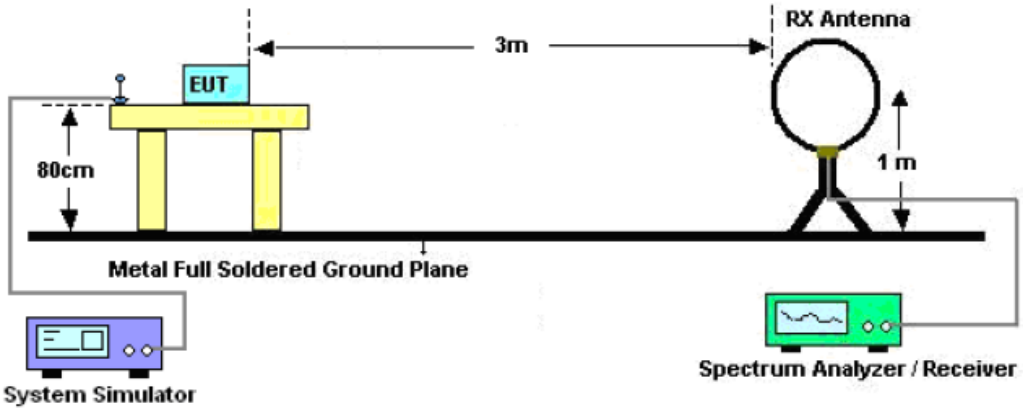
7.2 RADIATED SPURIOUS EMISSION

7.2.1. MEASUREMENT PROCEDURE

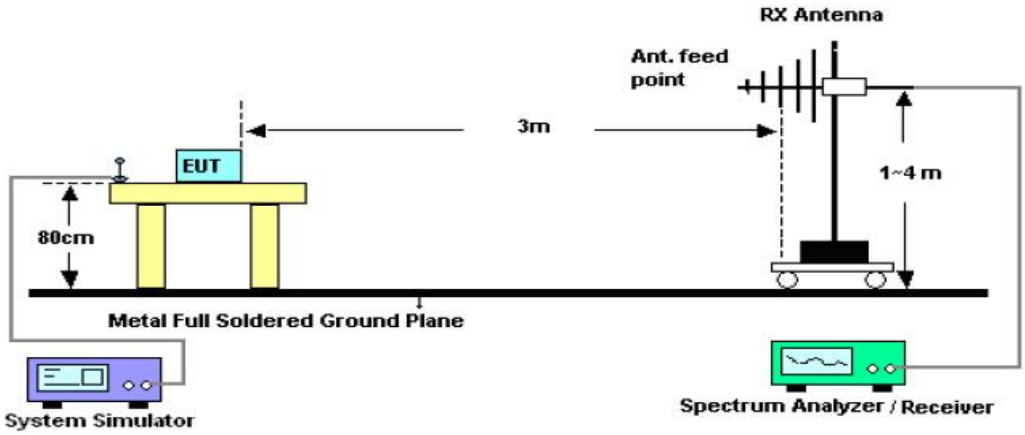
1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

7.2.2. TEST SETUP

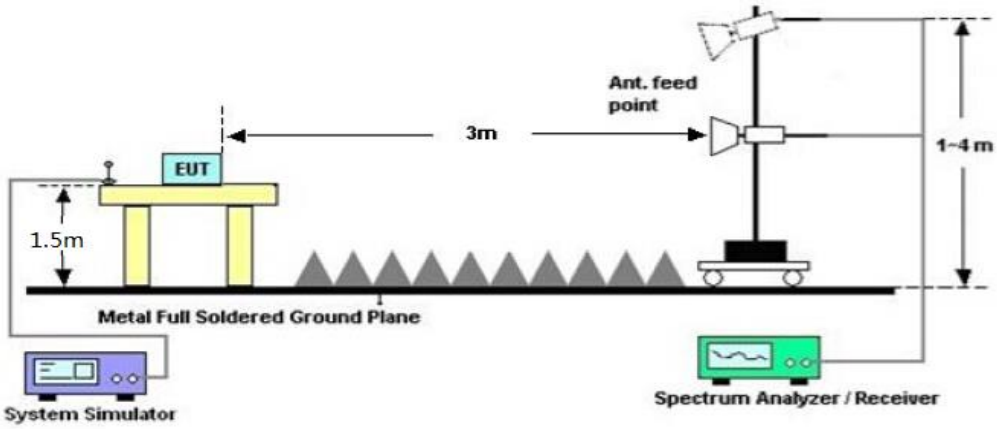
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



7.2.3 PROVISIONS APPLICABLE

(a) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Note: Only record the worst condition of each test mode:

7.2.4 MEASUREMENT RESULT

LTE Band 2
Low channel

Frequency (MHz)	Polarity (H/V)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
3720	V	-47.08	-13	-34.08
691.3	V	-35.64	-13	-22.64
712.5	V	-27.31	-13	-14.31
3720	H	-49.05	-13	-36.05
642.6	H	-37.33	-13	-24.33
586.6	H	-28.28	-13	-15.28

Middle channel

Frequency (MHz)	Polarity (H/V)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
3760	V	-47.78	-13	-34.78
524.3	V	-35.68	-13	-22.68
493.6	V	-26.86	-13	-13.86
3760	H	-49.07	-13	-36.07
619.6	H	-36.00	-13	-23.00
336.9	H	-27.38	-13	-14.38

High channel

Frequency (MHz)	Polarity (H/V)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
3800	V	-48.24	-13	-35.24
647.5	V	-34.70	-13	-21.70
442.3	V	-26.96	-13	-13.96
3800	H	-48.96	-13	-35.96
751.5	H	-36.44	-13	-23.44
610.6	H	-27.66	-13	-14.66

LTE Band 5

Low channel

Frequency (MHz)	Polarity (H/V)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
1658	V	-47.55	-13	-34.55
514.3	V	-34.59	-13	-21.59
369.5	V	-27.42	-13	-14.42
1658	H	-48.24	-13	-35.24
569.1	H	-36.16	-13	-23.16
352.8	H	-27.81	-13	-14.81

Middle channel

Frequency (MHz)	Polarity (H/V)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
1673	V	-48.29	-13	-35.29
591.2	V	-35.65	-13	-22.65
484.9	V	-27.72	-13	-14.72
1673	H	-48.76	-13	-35.76
601.5	H	-36.20	-13	-23.20
473.4	H	-27.98	-13	-14.98

High channel

Frequency (MHz)	Polarity (H/V)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
1688	V	-47.98	-13	-34.98
674.2	V	-34.81	-13	-21.81
586.1	V	-27.94	-13	-14.94
1688	H	-49.30	-13	-36.30
614.3	H	-37.03	-13	-24.03
474.2	H	-27.45	-13	-14.45

Note: 1. Margin = Emission Level -Limit

2. (30MHz-26GHz) Below 30MHZ no Spurious found and above is the worst mode data

8. FREQUENCY STABILITY

8.1 MEASUREMENT METHOD

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMW500 DIGITAL RADIO COMMUNICATION TESTER.

1 Measure the carrier frequency at room temperature.

2 Subject the EUT to overnight soak at -10℃. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on channel measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.

3 Repeat the above measurements at 10℃ increments from -10℃ to +40℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.

4 Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.

5 Subject the EUT to overnight soak at +40℃.

6 With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.

7 Repeat the above measurements at 10℃ increments from +40℃ to -10℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.

8 At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

8.2 PROVISIONS APPLICABLE

8.2.1 For Hand carried battery powered equipment

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

a.) Temperature: The temperature is varied from -10°C to +40°C in 10°C increments using an environmental chamber.

b.) Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 22, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24 and Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

8.2.2 For equipment powered by primary supply voltage

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -10°C to +40°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

8.3 MEASUREMENT RESULT (WORST)

LTE Band 2

Middle Channel, f_O = 1880 MHz			
Temperature (℃)	Power Supplied (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
-10	12	-1.32	-0.000711
0		-0.82	-0.000441
10		-2.85	-0.001514
20		-2.85	-0.001514
30		-1.00	-0.000524
40		-1.92	-0.001004
25	13.2	-1.19	-0.000642
	10.8	-2.13	-0.001152

Note: Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very samll. As such it is determined that channels at the band edge would remain in-band when the maximum measured frequency deviation noted duing the frequency stability tests is applied. Therefore the device is detemined to remain operating in band over the temperture and voltage range as tested.

The EUT doesn't work below -10℃

LTE Band 5

Middle Channel, f_O=836.5MHz				
Temperature (℃)	Power Supplied (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	12	-1.69	-0.002047	±2.5
0		-1.07	-0.001301	±2.5
10		-0.50	-0.000599	±2.5
20		-1.47	-0.001761	±2.5
30		-0.31	-0.000382	±2.5
40		-2.25	-0.002723	±2.5
25	13.2	-0.92	-0.001094	±2.5
	10.8	-1.06	-0.001265	±2.5

9. OCCUPIED BANDWIDTH

9.1 MEASUREMENT METHOD

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

9.2 PROVISIONS APPLICABLE

The emission bandwidth is defined as two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power

9.3 MEASUREMENT RESULT

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

LTE Band 2

Channel Bandwidth: 1.4 MHz

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	6	0	1.075	PASS
	MCH	6	0	1.075	PASS
	HCH	6	0	1.081	PASS
16QAM	LCH	6	0	1.075	PASS
	MCH	6	0	1.075	PASS
	HCH	6	0	1.075	PASS

Channel Bandwidth: 3 MHz

Channel Bandwidth: 3 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	15	0	2.700	PASS
	MCH	15	0	2.700	PASS
	HCH	15	0	2.688	PASS
16QAM	LCH	15	0	2.688	PASS
	MCH	15	0	2.688	PASS
	HCH	15	0	2.688	PASS

Channel Bandwidth: 5 MHz

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	25	0	4.480	PASS
	MCH	25	0	4.480	PASS
	HCH	25	0	4.480	PASS
16QAM	LCH	25	0	4.480	PASS
	MCH	25	0	4.480	PASS
	HCH	25	0	4.480	PASS

Channel Bandwidth: 10 MHz

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	50	0	8.960	PASS
	MCH	50	0	8.960	PASS
	HCH	50	0	8.920	PASS
16QAM	LCH	50	0	8.920	PASS
	MCH	50	0	8.960	PASS
	HCH	50	0	8.920	PASS

Channel Bandwidth: 15 MHz

Channel Bandwidth: 15 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	75	0	13.440	PASS
	MCH	75	0	13.440	13.372
	HCH	75	0	13.320	PASS
16QAM	LCH	75	0	13.440	PASS
	MCH	75	0	13.440	PASS
	HCH	75	0	13.320	PASS

Channel Bandwidth: 20 MHz

Channel Bandwidth: 20 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	100	0	17.920	PASS
	MCH	100	0	17.920	PASS
	HCH	100	0	17.760	PASS
16QAM	LCH	100	0	17.840	PASS
	MCH	100	0	17.920	PASS
	HCH	100	0	17.760	PASS

LTE Band 5

Channel Bandwidth: 1.4 MHz

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	6	0	1.0805	PASS
	MCH	6	0	1.0775	PASS
	HCH	6	0	1.0760	PASS
16QAM	LCH	6	0	1.0794	PASS
	MCH	6	0	1.0783	PASS
	HCH	6	0	1.0749	PASS

Channel Bandwidth: 3 MHz

Channel Bandwidth: 3 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	15	0	2.6884	PASS
	MCH	15	0	2.6809	PASS
	HCH	15	0	2.6885	PASS
16QAM	LCH	15	0	2.6851	PASS
	MCH	15	0	2.6848	PASS
	HCH	15	0	2.6849	PASS

Channel Bandwidth: 5 MHz

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	25	0	4.4750	PASS
	MCH	25	0	4.4784	PASS
	HCH	25	0	4.4761	PASS
16QAM	LCH	25	0	4.4819	PASS
	MCH	25	0	4.4860	PASS
	HCH	25	0	4.4756	PASS

Channel Bandwidth: 10 MHz

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	50	0	8.9337	PASS
	MCH	50	0	8.9414	PASS
	HCH	50	0	8.9159	PASS
16QAM	LCH	50	0	8.9324	PASS
	MCH	50	0	8.9449	PASS
	HCH	50	0	8.9140	PASS

Note: Please refers to Appendix B for compliance test plots for Occupied Bandwidth (99%)

10. EMISSION BANDWIDTH

10.1 MEASUREMENT METHOD

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

10.2 PROVISIONS APPLICABLE

The emission bandwidth is defined as two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

10.3 MEASUREMENT RESULT

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

LTE Band 2

Channel Bandwidth: 1.4 MHz

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	6	0	1.221	PASS
	MCH	6	0	1.232	PASS
	HCH	6	0	1.294	PASS
16QAM	LCH	6	0	1.232	PASS
	MCH	6	0	1.232	PASS
	HCH	6	0	1.249	PASS

Channel Bandwidth: 3 MHz

Channel Bandwidth: 3 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	15	0	2.868	PASS
	MCH	15	0	2.844	PASS
	HCH	15	0	2.880	PASS
16QAM	LCH	15	0	2.868	PASS
	MCH	15	0	2.868	PASS
	HCH	15	0	2.892	PASS

Channel Bandwidth: 5 MHz

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	25	0	4.780	PASS
	MCH	25	0	4.740	PASS
	HCH	25	0	4.740	PASS
16QAM	LCH	25	0	4.720	PASS
	MCH	25	0	4.720	PASS
	HCH	25	0	4.740	PASS

Channel Bandwidth: 10 MHz

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	50	0	9.320	PASS
	MCH	50	0	9.360	PASS
	HCH	50	0	9.360	PASS
16QAM	LCH	50	0	9.320	PASS
	MCH	50	0	9.360	PASS
	HCH	50	0	9.280	PASS

Channel Bandwidth: 15 MHz

Channel Bandwidth: 15 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	75	0	13.800	PASS
	MCH	75	0	13.860	PASS
	HCH	75	0	13.800	PASS
16QAM	LCH	75	0	13.860	PASS
	MCH	75	0	13.860	PASS
	HCH	75	0	13.800	PASS

Channel Bandwidth: 20 MHz

Channel Bandwidth: 20 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	100	0	18.400	PASS
	MCH	100	0	18.400	PASS
	HCH	100	0	18.400	PASS
16QAM	LCH	100	0	18.400	PASS
	MCH	100	0	18.400	PASS
	HCH	100	0	18.400	PASS