FCC Test Report

Report No.: AGC03554191103FE07

FCC ID	:	2AVK3GATEWAY
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	Bivar Wireless Gateway Communication Center
BRAND NAME	:	Bivar
MODEL NAME	:	Gateway, BWGCC-0101
APPLICANT	:	BIVAR INC.
DATE OF ISSUE	:	Jan. 02, 2020
STANDARD(S)	:	FCC Part 22 Rules FCC Part 24 Rules FCC Part 27 Rules
REPORT VERSION	:	V1.0

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

REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jan. 02, 2020	Valid	Initial Release

Note: The LTE module of the product has applied for the FCC certificate, and the certificate number is (XMR201605EC25A). Product re-evaluates radiated output power and radiated spurious emission.

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1.VERIFICATION OF COMPLIANCE

Applicant	BIVAR INC.
Address	4 THOMAS, IRVINE, CA 92618 U.S.A.
Manufacturer	BIVAR INC.
Address	4 THOMAS, IRVINE, CA 92618 U.S.A.
Factory	BIVAR INC.
Address	4 THOMAS, IRVINE, CA 92618 U.S.A.
Product Designation	Bivar Wireless Gateway Communication Center
Brand Name	Bivar
Test Model	Gateway
Serial Model	BWGCC-0101
Difference Description	All the same except the model name.
Date of test	Nov. 21, 2019~Dec. 31, 2019
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)
Dec. 31, 2019

Reviewed By

Max Zhang
(Reviewer)
Dec. 31, 2019

Approved By

Forrest Lei
(Authorized Officer)
Dec. 31, 2019

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 4 ☐FDD Band 5 ☐FDD Band 7 ☒FDD Band 12 ☐FDD Band 17 (U.S. Bands) ☐FDD Band 1 ☐FDD Band 3 ☐FDD Band 8 ☐FDD Band 19 ☐FDD Band 20 ☐FDD Band 28 ☐TDD Band 38 ☐TDD Band 39 (Non-U.S. Bands)	
Frequency Range	LTE Band 2	Transmission (TX): 1850 to 1909.9 MHz
		Receiving (RX): 1930 to 1989.9 MHz
	LTE Band 4	Transmission (TX): 1710 to 1754.9 MHz
		Receiving (RX): 2110 to 2154.9 MHz
	LTE Band 12	Transmission (TX): 699 to 715.9MHz
		Receiving (RX): 729 to 745.9MHz
Supported Channel Bandwidth	LTE Band 2	☒ 1.4 MHz ☒ 3 MHz ☒ 5 MHz ☒ 10 MHz ☒ 15 MHz ☒ 20 MHz
	LTE Band 4	☒ 1.4 MHz ☒ 3 MHz ☒ 5 MHz ☒ 10 MHz ☒ 15 MHz ☒ 20 MHz
	LTE Band 12	☒ 1.4 MHz ☒ 3 MHz ☒ 5 MHz ☒ 10 MHz
Hardware Version	V3.1.0	
Software Version	2019110000	
Antenna:	Whip antenna	
Type of Modulation	QPSK/16QAM	
Antenna gain:	Band 2: 1.1dBi; Band 4: 1.5dBi; Band 12:1.35dBi;	
Power Supply:	DC 5V by adapter.	
Power Class	3	
Extreme Vol. Limits:	DC4.25V to 5.72V (Normal: 5V)	
Temperature range	-10℃ to +40℃	
Note1: The High Voltage DC5.72V and Low Voltage DC4.25V 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: 2AVK3GATEWAY** , filing to comply with the FCC Part 22, Part 24 and Pant 27 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.12, 2019	Dec.11, 2020
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep.19, 2019	Sep.18, 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	Oct. 26, 2019	Oct. 25, 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	Bivar Wireless Gateway	Gateway	FCC ID: 2AVK3GATEWAY	EUT
2	Adapter	WS2U050-2000	Iuput: 100-240V 50/60Hz 0.4A Output: 5.0V 2A	AE
3	Antenna	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	Radiated Output Power	2.1046/22.913(a)(2)/24.232(c)/ 27.50(d)(4)/ 27.50(h)(2)	Pass
2	Spurious Emission	Radiated Spurious Emission	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 4	TX (1.4M)	Channel 19957	Channel 20175	Channel 20393
		1710.7 MHz	1732.5 MHz	1754.3 MHz
	TX (3M)	Channel 19965	Channel 20175	Channel 20385
		1711.5 MHz	1732.5 MHz	1753.5 MHz
	TX (5M)	Channel 19975	Channel 20175	Channel 20375
		1712.5 MHz	1732.5 MHz	1752.5 MHz
	TX (10M)	Channel 20000	Channel 20175	Channel 20350
		1715 MHz	1732.5 MHz	1750 MHz
	TX (15M)	Channel 20025	Channel 20175	Channel 20325
		1717.5 MHz	1732.5 MHz	1747.5 MHz
	TX (20M)	Channel 20050	Channel 20175	Channel 20300
		1720 MHz	1732.5 MHz	1745 MHz
	RX (1.4M)	Channel 1957	Channel 2175	Channel 2393
		2110.7 MHz	2132.5 MHz	2154.3 MHz
	RX (3M)	Channel 1965	Channel 2175	Channel 2385
		2111.5 MHz	2132.5 MHz	2153.5 MHz
	RX (5M)	Channel 1975	Channel 2175	Channel 2375
		2112.5 MHz	2132.5 MHz	2152.5 MHz
	RX (10M)	Channel 2000	Channel 2175	Channel 2350
		2115 MHz	2132.5 MHz	2150 MHz
	RX (15M)	Channel 2025	Channel 2175	Channel 2325
		2117.5 MHz	2132.5 MHz	2147.5 MHz
	RX (20M)	Channel 2050	Channel 2175	Channel 2300
		2120 MHz	2132.5 MHz	2145 MHz

Test Mode	TX / RX	RF Channel		
		Low (B)	Middle (M)	High (T)
LTE Band 12	TX (1.4M)	Channel 23017	Channel 23095	Channel 23173
		699.7 MHz	707.5 MHz	715.3 MHz
	TX (3M)	Channel 23025	Channel 23095	Channel 23165
		700.5 MHz	707.5 MHz	714.5 MHz
	TX (5M)	Channel 23035	Channel 23095	Channel 23155
		701.5 MHz	707.5 MHz	713.5 MHz
	TX (10M)	Channel 23060	Channel 23095	Channel 23130
		704.0 MHz	707.5 MHz	711.0 MHz
	RX (1.4M)	Channel 5017	Channel 5095	Channel 5173
		729.7 MHz	737.5 MHz	745.3 MHz
	RX (3M)	Channel 5025	Channel 5095	Channel 5165
		730.5 MHz	737.5 MHz	744.5 MHz
	RX (5M)	Channel 5035	Channel 5095	Channel 5155
		731.5 MHz	737.5 MHz	743.5 MHz
	RX (10M)	Channel 5060	Channel 5095	Channel 5130
		734.0 MHz	737.5 MHz	741.0 MHz

6. RADIATED OUTPUT POWER

6.1. 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.

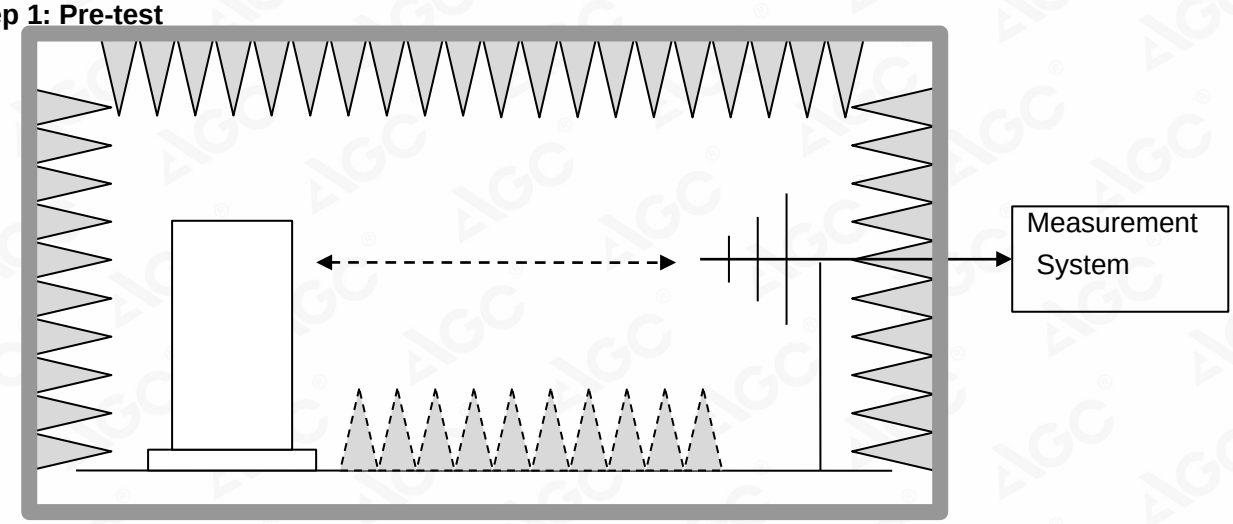
7 This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.15 dBi) and known input power (Pin).

8 ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi..

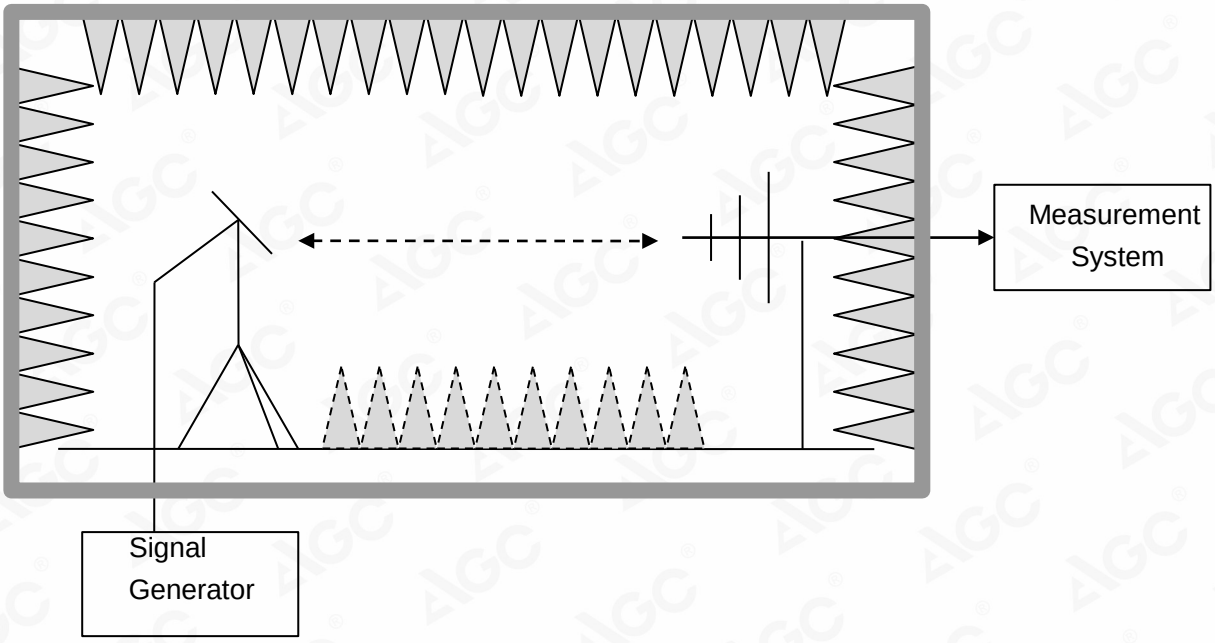
Test Setup

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. PROVISIONS APPLICABLE

This is the test for the maximum radiated power from the EUT. Rule Part 24.232(c) specifies, “Mobile/portable stations are limited to 2 watts e.i.r.p.

Mode	FCC Part Section(s)	Nominal Peak Power
LTE Band 2	24.229(b)	<=33dBm (2W)
LTE Band 4	24.5(h)	<=30dBm (1W)
LTE Band 12	27.5(c)	<=34.77dBm(3W)

6.3.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	13.53	V	7.95	0.79	20.69	33
1880.0	1.4	QPSK	1/0	13.23	V	7.95	0.79	20.39	33
1909.3	1.4	QPSK	1/0	12.88	V	7.95	0.79	20.04	33
1850.7	1.4	QPSK	1/0	13.01	H	7.95	0.79	20.17	33
1880.0	1.4	QPSK	1/0	13.37	H	7.95	0.79	20.53	33
1909.3	1.4	QPSK	1/0	11.43	H	7.95	0.79	18.59	33
1850.7	1.4	16-QAM	1/5	12.07	V	7.95	0.79	19.23	33
1880.0	1.4	16-QAM	1/0	14.35	V	7.95	0.79	21.51	33
1909.3	1.4	16-QAM	1/0	15.08	V	7.95	0.79	**22.24**	33
1850.7	1.4	16-QAM	1/5	13.15	H	7.95	0.79	20.31	33
1880.0	1.4	16-QAM	1/0	12.75	H	7.95	0.79	19.91	33
1909.3	1.4	16-QAM	1/0	13.07	H	7.95	0.79	20.23	33
1851.5	3	QPSK	1/0	14.56	V	7.95	0.79	21.72	33
1880.0	3	QPSK	1/0	12.21	V	7.95	0.79	19.37	33
1908.5	3	QPSK	1/0	13.32	V	7.95	0.79	20.48	33
1851.5	3	QPSK	1/0	11.46	H	7.95	0.79	18.62	33
1880.0	3	QPSK	1/0	11.53	H	7.95	0.79	18.69	33
1908.5	3	QPSK	1/0	14.15	H	7.95	0.79	21.31	33
1851.5	3	16-QAM	1/0	12.48	V	7.95	0.79	19.64	33
1880.0	3	16-QAM	1/0	13.79	V	7.95	0.79	20.95	33
1908.5	3	16-QAM	1/0	14.03	V	7.95	0.79	21.19	33
1851.5	3	16-QAM	1/0	11.23	H	7.95	0.79	18.39	33
1880.0	3	16-QAM	1/0	12.58	H	7.95	0.79	19.74	33
1908.5	3	16-QAM	1/0	14.19	H	7.95	0.79	21.35	33
1852.5	5	QPSK	1/0	10.98	V	7.95	0.79	18.14	33
1880.0	5	QPSK	1/0	14.77	V	7.95	0.79	21.93	33
1907.5	5	QPSK	1/24	11.51	V	7.95	0.79	18.67	33
1852.5	5	QPSK	1/0	14.27	H	7.95	0.79	21.43	33
1880.0	5	QPSK	1/0	12.03	H	7.95	0.79	19.19	33
1907.5	5	QPSK	1/24	13.55	H	7.95	0.79	20.71	33
1852.5	5	16-QAM	1/0	13.01	V	7.95	0.79	20.17	33
1880.0	5	16-QAM	1/0	12.23	V	7.95	0.79	19.39	33
1907.5	5	16-QAM	1/24	13.92	V	7.95	0.79	21.08	33

1852.5	5	16-QAM	1/0	13.86	H	7.95	0.79	21.02	33
1880.0	5	16-QAM	1/0	14.05	H	7.95	0.79	21.21	33
1907.5	5	16-QAM	1/24	13.19	H	7.95	0.79	20.35	33
1855	10	QPSK	1/0	13.87	V	7.95	0.79	21.03	33
1880	10	QPSK	1/49	11.96	V	7.95	0.79	19.12	33
1905	10	QPSK	1/0	12.62	V	7.95	0.79	19.78	33
1855	10	QPSK	1/0	13.72	H	7.95	0.79	20.88	33
1880	10	QPSK	1/49	15.02	H	7.95	0.79	22.18	33
1905	10	QPSK	1/0	12.95	H	7.95	0.79	20.11	33
1855	10	16-QAM	1/0	13.36	V	7.95	0.79	20.52	33
1880	10	16-QAM	1/49	14.81	V	7.95	0.79	21.97	33
1905	10	16-QAM	1/0	12.17	V	7.95	0.79	19.33	33
1855	10	16-QAM	1/0	12.36	H	7.95	0.79	19.52	33
1880	10	16-QAM	1/49	11.71	H	7.95	0.79	18.87	33
1905	10	16-QAM	1/0	14.09	H	7.95	0.79	21.25	33
1857.5	15	QPSK	1/0	13.65	V	7.95	0.79	20.81	33
1880	15	QPSK	1/74	13.21	V	7.95	0.79	20.37	33
1902.5	15	QPSK	1/0	14.03	V	7.95	0.79	21.19	33
1857.5	15	QPSK	1/0	12.77	H	7.95	0.79	19.93	33
1880	15	QPSK	1/74	14.46	H	7.95	0.79	21.62	33
1902.5	15	QPSK	1/0	13.57	H	7.95	0.79	20.73	33
1857.5	15	16-QAM	1/0	13.46	V	7.95	0.79	20.62	33
1880	15	16-QAM	1/74	11.9	V	7.95	0.79	19.06	33
1902.5	15	16-QAM	1/0	13.43	V	7.95	0.79	20.59	33
1857.5	15	16-QAM	1/0	14.06	H	7.95	0.79	21.22	33
1880	15	16-QAM	1/74	10.39	H	7.95	0.79	17.55	33
1902.5	15	16-QAM	1/0	11.9	H	7.95	0.79	19.06	33
1860	20	QPSK	1/99	13.68	V	7.95	0.79	20.84	33
1880	20	QPSK	1/99	13.92	V	7.95	0.79	21.08	33
1900	20	QPSK	1/0	12.88	V	7.95	0.79	20.04	33
1860	20	QPSK	1/99	13.67	H	7.95	0.79	20.83	33
1880	20	QPSK	1/99	12.31	H	7.95	0.79	19.47	33
1900	20	QPSK	1/0	11.68	H	7.95	0.79	18.84	33
1860	20	16-QAM	1/99	13.38	V	7.95	0.79	20.54	33
1880	20	16-QAM	1/99	11.77	V	7.95	0.79	18.93	33
1900	20	16-QAM	1/0	13.33	V	7.95	0.79	20.49	33
1860	20	16-QAM	1/99	13.79	H	7.95	0.79	20.95	33

1880	20	16-QAM	1/99	13.13	H	7.95	0.79	20.29	33
1900	20	16-QAM	1/0	12.83	H	7.95	0.79	19.99	33

EIRP for LTE Band 4

Frequency	Channel Bandwidth	Mode.	RB	Substituted level	Antenna Polarization	Antenna Gain correction	Cable Loss	Absolute Level	Limit (dBm)
1710.7	1.4	QPSK	1/0	11.31	V	7.95	0.79	18.47	30
1732.5	1.4	QPSK	1/0	12.04	V	7.95	0.79	19.20	30
1754.3	1.4	QPSK	1/0	12.96	V	7.95	0.79	20.12	30
1710.7	1.4	QPSK	1/0	13.6	H	7.95	0.79	20.76	30
1732.5	1.4	QPSK	1/0	11.33	H	7.95	0.79	18.49	30
1754.3	1.4	QPSK	1/0	12.38	H	7.95	0.79	19.54	30
1710.7	1.4	16-QAM	1/5	11.97	V	7.95	0.79	19.13	30
1732.5	1.4	16-QAM	1/0	13.36	V	7.95	0.79	20.52	30
1754.3	1.4	16-QAM	1/0	14.07	V	7.95	0.79	21.23	30
1710.7	1.4	16-QAM	1/5	12.16	H	7.95	0.79	19.32	30
1732.5	1.4	16-QAM	1/0	12.83	H	7.95	0.79	19.99	30
1754.3	1.4	16-QAM	1/0	13.09	H	7.95	0.79	20.25	30
1711.5	3	QPSK	1/0	13.87	V	7.95	0.79	21.03	30
1732.5	3	QPSK	1/0	12.82	V	7.95	0.79	19.98	30
1753.5	3	QPSK	1/0	13.52	V	7.95	0.79	20.68	30
1711.5	3	QPSK	1/0	11.09	H	7.95	0.79	18.25	30
1732.5	3	QPSK	1/0	13.36	H	7.95	0.79	20.52	30
1753.5	3	QPSK	1/0	14.08	H	7.95	0.79	21.24	30
1711.5	3	16-QAM	1/0	13.68	V	7.95	0.79	20.84	30
1732.5	3	16-QAM	1/0	13.99	V	7.95	0.79	21.15	30
1753.5	3	16-QAM	1/0	14.33	V	7.95	0.79	21.49	30
1711.5	3	16-QAM	1/0	12.19	H	7.95	0.79	19.35	30
1732.5	3	16-QAM	1/0	13.94	H	7.95	0.79	21.10	30
1753.5	3	16-QAM	1/0	12.76	H	7.95	0.79	19.92	30
1712.5	5	QPSK	1/0	13.18	V	7.95	0.79	20.34	30
1732.5	5	QPSK	1/0	14.03	V	7.95	0.79	21.19	30
1752.5	5	QPSK	1/24	13.07	V	7.95	0.79	20.23	30
1712.5	5	QPSK	1/0	13.53	H	7.95	0.79	20.69	30
1732.5	5	QPSK	1/0	14.68	H	7.95	0.79	**21.84**	30
1752.5	5	QPSK	1/24	12.48	H	7.95	0.79	19.64	30
1712.5	5	16-QAM	1/0	13.75	V	7.95	0.79	20.91	30
1732.5	5	16-QAM	1/0	13.97	V	7.95	0.79	21.13	30
1752.5	5	16-QAM	1/24	14.03	V	7.95	0.79	21.19	30
1712.5	5	16-QAM	1/0	12.41	H	7.95	0.79	19.57	30
1732.5	5	16-QAM	1/0	12.38	H	7.95	0.79	19.54	30
1752.5	5	16-QAM	1/24	13.93	H	7.95	0.79	21.09	30

1715	10	QPSK	1/0	11.99	V	7.95	0.79	19.15	30
1732.5	10	QPSK	1/49	12.38	V	7.95	0.79	19.54	30
1750	10	QPSK	1/0	13.26	V	7.95	0.79	20.42	30
1715	10	QPSK	1/0	12.69	H	7.95	0.79	19.85	30
1732.5	10	QPSK	1/49	14.33	H	7.95	0.79	21.49	30
1750	10	QPSK	1/0	12.29	H	7.95	0.79	19.45	30
1715	10	16-QAM	1/0	13.41	V	7.95	0.79	20.57	30
1732.5	10	16-QAM	1/49	12.48	V	7.95	0.79	19.64	30
1750	10	16-QAM	1/0	13.45	V	7.95	0.79	20.61	30
1715	10	16-QAM	1/0	11.55	H	7.95	0.79	18.71	30
1732.5	10	16-QAM	1/49	13.03	H	7.95	0.79	20.19	30
1750	10	16-QAM	1/0	14.11	H	7.95	0.79	21.27	30
1717.5	15	QPSK	1/0	12.95	V	7.95	0.79	20.11	30
1732.5	15	QPSK	1/74	11.85	V	7.95	0.79	19.01	30
1747.5	15	QPSK	1/0	13.09	V	7.95	0.79	20.25	30
1717.5	15	QPSK	1/0	12.58	H	7.95	0.79	19.74	30
1732.5	15	QPSK	1/74	11.73	H	7.95	0.79	18.89	30
1747.5	15	QPSK	1/0	12.64	H	7.95	0.79	19.80	30
1717.5	15	16-QAM	1/0	13.55	V	7.95	0.79	20.71	30
1732.5	15	16-QAM	1/74	13.28	V	7.95	0.79	20.44	30
1747.5	15	16-QAM	1/0	12.88	V	7.95	0.79	20.04	30
1717.5	15	16-QAM	1/0	12.25	H	7.95	0.79	19.41	30
1732.5	15	16-QAM	1/74	14.06	H	7.95	0.79	21.22	30
1747.5	15	16-QAM	1/0	11.21	H	7.95	0.79	18.37	30
1720	20	QPSK	1/99	13.68	V	7.95	0.79	20.84	30
1732.5	20	QPSK	1/99	14.13	V	7.95	0.79	21.29	30
1745	20	QPSK	1/0	12.90	V	7.95	0.79	20.06	30
1720	20	QPSK	1/99	11.56	H	7.95	0.79	18.72	30
1732.5	20	QPSK	1/99	12.07	H	7.95	0.79	19.23	30
1745	20	QPSK	1/0	11.99	H	7.95	0.79	19.15	30
1720	20	16-QAM	1/99	13.31	V	7.95	0.79	20.47	30
1732.5	20	16-QAM	1/99	12.48	V	7.95	0.79	19.64	30
1745	20	16-QAM	1/0	13.97	V	7.95	0.79	21.13	30
1720	20	16-QAM	1/99	12.46	H	7.95	0.79	19.62	30
1732.5	20	16-QAM	1/99	13.66	H	7.95	0.79	20.82	30
1745	20	16-QAM	1/0	12.45	H	7.95	0.79	19.61	30

EIRP for LTE Band 12

Frequency	Channel Bandwidth	Mode.	RB	Substituted level	Antenna Polarization	Antenna Gain correction	Cable Loss	Absolute Level	Limit (dBm)
699.7	1.4	QPSK	1/0	13.75	V	6.6	0.47	19.88	34.77
707.5	1.4	QPSK	1/0	12.79	V	6.6	0.47	18.92	34.77
715.3	1.4	QPSK	1/24	12.14	V	6.6	0.47	18.27	34.77
699.7	1.4	QPSK	1/0	13.78	H	6.6	0.47	19.91	34.77
707.5	1.4	QPSK	1/0	12.59	H	6.6	0.47	18.72	34.77
715.3	1.4	QPSK	1/24	12.38	H	6.6	0.47	18.51	34.77
699.7	1.4	16-QAM	1/0	13.41	V	6.6	0.47	19.54	34.77
707.5	1.4	16-QAM	1/0	11.99	V	6.6	0.47	18.12	34.77
715.3	1.4	16-QAM	1/24	13.68	V	6.6	0.47	19.81	34.77
699.7	1.4	16-QAM	1/0	14.04	H	6.6	0.47	20.17	34.77
707.5	1.4	16-QAM	1/0	12.68	H	6.6	0.47	18.81	34.77
715.3	1.4	16-QAM	1/24	13.22	H	6.6	0.47	19.35	34.77
700.5	3	QPSK	1/0	13.49	V	6.6	0.47	19.62	34.77
707.5	3	QPSK	1/49	12.25	V	6.6	0.47	18.38	34.77
714.5	3	QPSK	1/0	13.39	V	6.6	0.47	19.52	34.77
700.5	3	QPSK	1/0	13.16	H	6.6	0.47	19.29	34.77
707.5	3	QPSK	1/49	14.08	H	6.6	0.47	20.21	34.77
714.5	3	QPSK	1/0	11.98	H	6.6	0.47	18.11	34.77
700.5	3	16-QAM	1/0	14.06	V	6.6	0.47	20.19	34.77
707.5	3	16-QAM	1/49	13.25	V	6.6	0.47	19.38	34.77
714.5	3	16-QAM	1/0	13.41	V	6.6	0.47	19.54	34.77
700.5	3	16-QAM	1/0	12.90	H	6.6	0.47	19.03	34.77
707.5	3	16-QAM	1/49	13.39	H	6.6	0.47	19.52	34.77
714.5	3	16-QAM	1/0	12.09	H	6.6	0.47	18.22	34.77
701.5	5	QPSK	1/0	13.45	V	6.6	0.47	19.58	34.77
707.5	5	QPSK	1/74	13.84	V	6.6	0.47	19.97	34.77
713.5	5	QPSK	1/0	11.92	V	6.6	0.47	18.05	34.77
701.5	5	QPSK	1/0	12.90	H	6.6	0.47	19.03	34.77
707.5	5	QPSK	1/74	13.61	H	6.6	0.47	19.74	34.77
713.5	5	QPSK	1/0	12.78	H	6.6	0.47	18.91	34.77
701.5	5	16-QAM	1/0	13.68	V	6.6	0.47	19.81	34.77
707.5	5	16-QAM	1/74	12.51	V	6.6	0.47	18.64	34.77
713.5	5	16-QAM	1/0	13.72	V	6.6	0.47	19.85	34.77
701.5	5	16-QAM	1/0	13.1	H	6.6	0.47	19.23	34.77
707.5	5	16-QAM	1/74	13.98	H	6.6	0.47	20.11	34.77
713.5	5	16-QAM	1/0	13.66	H	6.6	0.47	19.79	34.77
704.0	10	QPSK	1/99	14.15	V	6.6	0.47	**20.28**	34.77

707.5	10	QPSK	1/99	13.58	V	6.6	0.47	19.71	34.77
711.0	10	QPSK	1/0	12.26	V	6.6	0.47	18.39	34.77
704.0	10	QPSK	1/99	13.88	H	6.6	0.47	20.01	34.77
707.5	10	QPSK	1/99	12.97	H	6.6	0.47	19.1	34.77
711.0	10	QPSK	1/0	11.03	H	6.6	0.47	17.16	34.77
704.0	10	16-QAM	1/99	11.82	V	6.6	0.47	17.95	34.77
707.5	10	16-QAM	1/99	12.26	V	6.6	0.47	18.39	34.77
711.0	10	16-QAM	1/0	13.92	V	6.6	0.47	20.05	34.77
704.0	10	16-QAM	1/99	12.70	H	6.6	0.47	18.83	34.77
707.5	10	16-QAM	1/99	13.54	H	6.6	0.47	19.67	34.77
711.0	10	16-QAM	1/0	12.64	H	6.6	0.47	18.77	34.77

Note: Above is the worst mode data.

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.

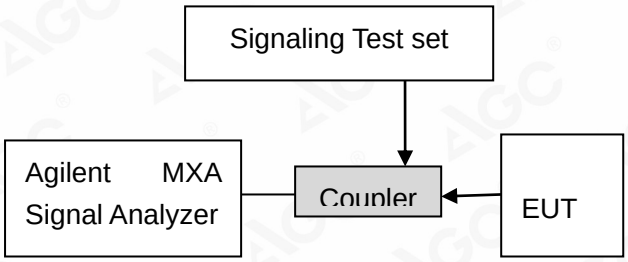
Test Procedure Used
KDB 971168 D01v03 – Section 6.0

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.

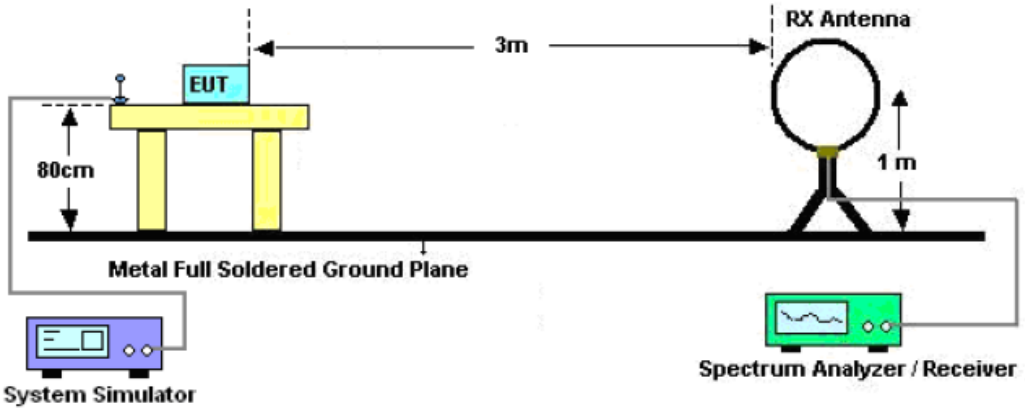
7.2 RADIATED SPURIOUS EMISSION

7.2.1. MEASUREMENT PROCEDURE

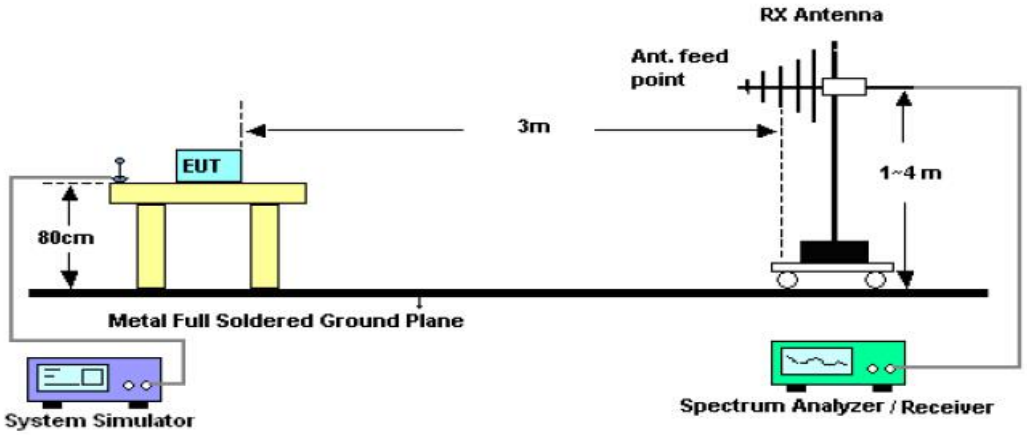
1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated 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

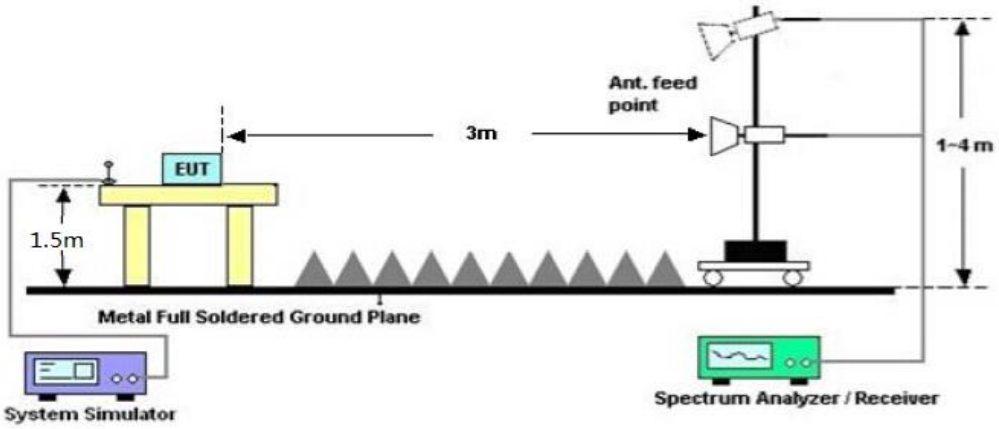
Radiated Emission Test-Setup Frequency Below 30MHz



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	-36.56	-13	-23.56
715.2	V	-43.33	-13	-30.33
556.8	V	-46.55	-13	-33.55
3720	H	-38.69	-13	-25.69
785.3	H	-44.24	-13	-31.24
520.1	H	-46.59	-13	-33.59

Middle channel

Frequency (MHz)	Polarity (H/V)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
3760	V	-37.63	-13	-24.63
712.4	V	-43.83	-13	-30.83
665.3	V	-45.14	-13	-32.14
3760	H	-38.17	-13	-25.17
683.5	H	-44.23	-13	-31.23
505.6	H	-46.20	-13	-33.20

High channel

Frequency (MHz)	Polarity (H/V)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
3800	V	-37.27	-13	-24.27
774.5	V	-44.52	-13	-31.52
619.4	V	-45.44	-13	-32.44
3800	H	-36.78	-13	-23.78
712.3	H	-45.29	-13	-32.29
583.9	H	-46.18	-13	-33.18

LTE Band 4

Low channel

Frequency (MHz)	Polarity (H/V)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
3440	V	-37.67	-13	-24.67
812.2	V	-41.69	-13	-28.69
769.3	V	-43.60	-13	-30.60
3440	H	-36.87	-13	-23.87
746.2	H	-43.57	-13	-30.57
617.7	H	-42.62	-13	-29.62

Middle channel

Frequency (MHz)	Polarity (H/V)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
3465	V	-35.91	-13	-22.91
771.4	V	-43.33	-13	-30.33
693.5	V	-44.72	-13	-31.72
3465	H	-35.79	-13	-22.79
782.9	H	-41.72	-13	-28.72
558.1	H	-43.27	-13	-30.27

High channel

Frequency (MHz)	Polarity (H/V)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
3490	V	-36.89	-13	-23.89
689.4	V	-44.28	-13	-31.28
435.7	V	-43.60	-13	-30.60
3490	H	-36.83	-13	-23.83
584.3	H	-42.06	-13	-29.06
477.5	H	-43.80	-13	-30.80

LTE Band 12
Low channel

Frequency (MHz)	Polarity (H/V)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
1408	V	-39.15	-13	-26.15
693.1	V	-45.82	-13	-32.82
582.3	V	-45.44	-13	-32.44
1408	H	-38.99	-13	-25.99
691.7	H	-46.28	-13	-33.28
514.0	H	-45.38	-13	-32.38

Middle channel

Frequency (MHz)	Polarity (H/V)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
1415	V	-42.16	-13	-29.16
641.2	V	-45.69	-13	-32.69
458.3	V	-47.42	-13	-34.42
1415	H	-41.97	-13	-28.97
495.1	H	-45.76	-13	-32.76
368.7	H	-46.67	-13	-33.67

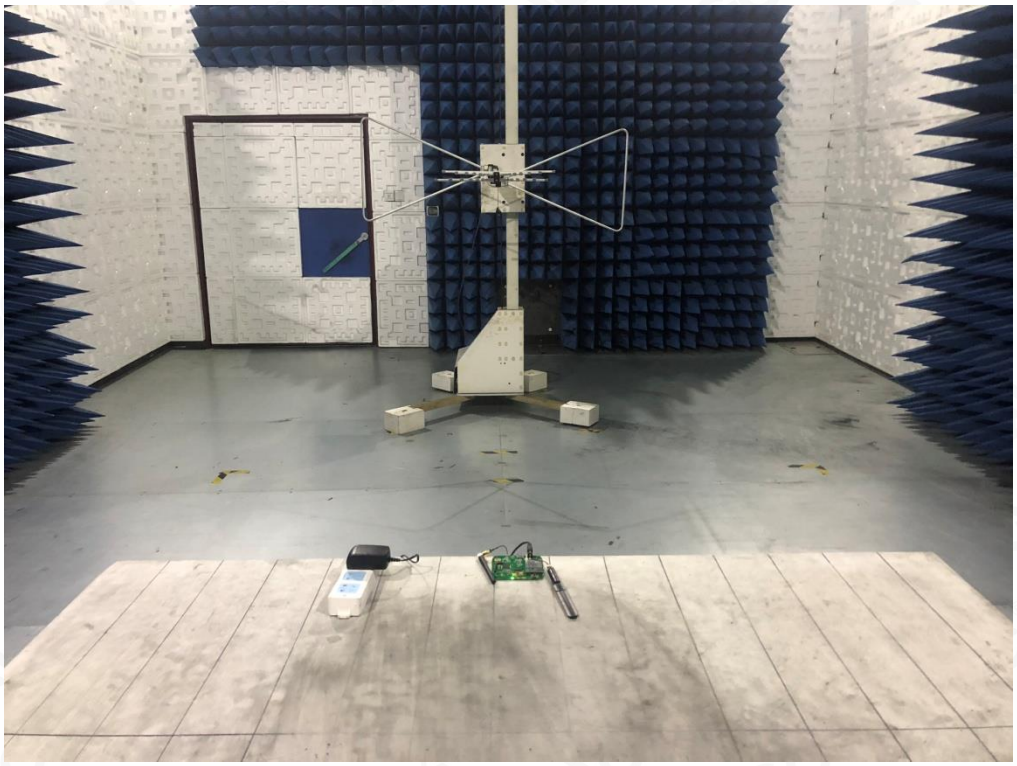
High channel

Frequency (MHz)	Polarity (H/V)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
1422	V	-42.67	-13	-29.67
747.2	V	-45.26	-13	-32.26
592.7	V	-45.79	-13	-32.79
1422	H	-39.70	-13	-26.70
693.58	H	-46.78	-13	-33.78
556.1	H	-48.26	-13	-35.26

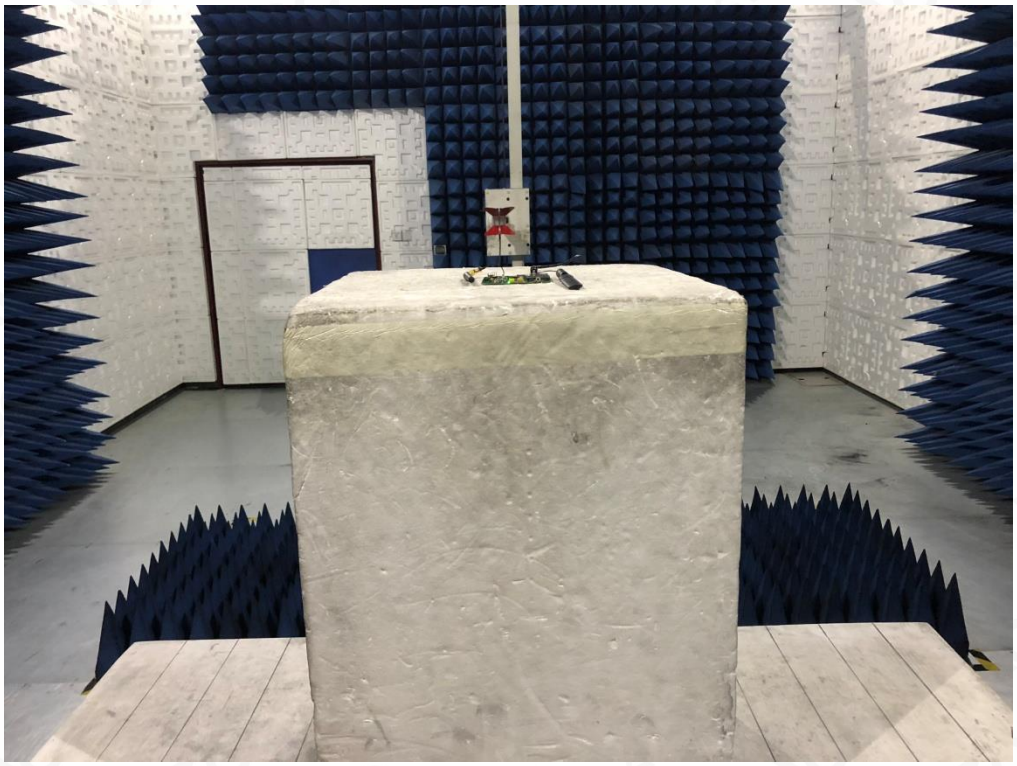
Note: 1. Margin = Emission Level -Limit
2. (30MHz-26GHz) Below 30MHZ no Spurious found and above is the worst mode data

APPENDIX D PHOTOGRAPHS OF TEST SETUP

RADIATED SPURIOUS EMISSION



RADIATED SPURIOUS ABOVE 1G EMISSION



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