

FCC TEST REPORT

Product Name: LTE Desk Router
Trade Mark: Eltel
Model No.: R520
Add. Model No.: N/A
Report Number: 180905005RFM-3
Test Standards: FCC 47 CFR Part 27
FCC 47 CFR Part 2
FCC ID: 2AQ5T-R520
Test Result: PASS
Date of Issue: October 12, 2018

Prepared for:

Eltel Group Inc.
19 Calle 5-65 Zona 10, Guatemala

Prepared by:

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Version

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V1.0	October 12, 2018	Original

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Eltel Group Inc.
Address of Applicant:	19 Calle 5-65 Zona 10, Guatemala
Manufacturer:	Shanghai BroadMobi Communication Technology Co., Ltd
Address of Manufacturer:	15F,Building9,No99.Tianzhou Rd.,Xuhui District,Shanghai,P.R.China

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	LTE Desk Router	
Model No.:	R520	
Add. Model No.:	N/A	
Trade Mark:	Eltel	
DUT Stage:	Identical Prototype	
EUT Supports Function:	GSM Bands:	GSM850/1900
	UTRA Bands:	Band II/ Band V
	E-UTRA Bands:	FDD Band 4/ Band 7/ Band 66
	2.4 GHz ISM Band:	IEEE 802.11b/g/n
Software Version:	1.01	
Hardware Version:	2.0	
Sample Received Date:	September 5, 2018	
Sample Tested Date:	September 5, 2018 to September 29, 2018	

1.2.2 Description of Accessories

Adapter 1	
Trade Mark:	AMIGO
Model No.:	AMS159A-1201000FU
Input:	100-240 V~50/60 Hz 0.5 A
Output:	12.0 V $\equiv$ 1.0 A
DC Cable:	1.20 Meter, Shielded without ferrite
Manufacturer:	GLOBAL YEOU DIANN ELECTRIC INDUSTRIAL CO., LTD.

Adapter 2	
Trade Mark:	GANGQI
Model No.:	GQ12-120100-HU
Input:	100-240V~50/60Hz 0.4A
Output:	12.0 V $\equiv$ 1.0 A
DC Cable:	1.20 Meter, Shielded without ferrite
Manufacturer:	DONGGUAN GANGQI ELECTRONICS CO.,LTD

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Support Networks:	LTE	
	LTE Band 4/7/66:	QPSK, 16QAM
IEMI:	Radiation: 869601016155397	
	Conducted: 869601016155389	

Antenna Type:	Integral Antenna	
Antenna Gain:	LTE Band 4:	1 dBi
	LTE Band 7:	1 dBi
	LTE Band 66:	1 dBi
Normal Test Voltage:	12 Vdc	
Extreme Test Voltage:	10.8 to 13.2Vdc	
Extreme Test Temperature:	-30 °C to +50 °C	

Summary of Results:							
Band	BW (MHz)	Frequency Range (MHz)	Max RF Output Power (dBm)		Type of Emission		
			Conducted (Average)	ERP/EIRP (Average)	QPSK	16QAM	64QAM
LTE Band 4	1.4	1710.7-1754.3	22.85	23.85	1M10G7W	1M10D7W	N/A
	3	1711.5-1753.5	22.87	23.87	2M71G7W	2M71D7W	N/A
	5	1712.5-1752.5	22.88	23.88	4M53G7W	4M51D7W	N/A
	10	1715-1750	22.85	23.85	8M99G7W	8M97D7W	N/A
	15	1717.5-1747.5	22.92	23.92	13M4G7W	13M4D7W	N/A
	20	1720-1745	22.93	23.93	18M0G7W	18M0D7W	N/A
LTE Band 7	5	2502.5-2567.5	22.25	23.25	4M52G7W	4M52D7W	N/A
	10	2505-2565	22.68	23.68	8M96G7W	8M99D7W	N/A
	15	2507.5-2562.5	22.49	23.49	13M4G7W	13M5D7W	N/A
	20	2510-2560	22.87	23.87	18M0G7W	18M0D7W	N/A
LTE Band 66	1.4	1710.7-1779.3	23.35	24.35	1M10G7W	1M10D7W	N/A
	3	1711.5-1778.5	23.36	24.36	2M71G7W	2M71D7W	N/A
	5	1712.5-1777.5	23.33	24.33	4M53G7W	4M53D7W	N/A
	10	1715-1775	23.33	24.33	8M97G7W	9M00D7W	N/A
	15	1717.5-1772.5	23.38	24.38	13M4G7W	13M4D7W	N/A
	20	1720-1770	23.41	24.41	18M0G7W	18M0D7W	N/A

1.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.30 Meter	UnionTrust

1.5 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109
Telephone: +86 (0) 755 2823 0888
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1.6 TEST FACILITY

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

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

IC-Registration No.: 21600-1

The 3m Semi-anechoic chamber of Shenzhen UnionTrust Quality and Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 21600-1.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

1.7 DEVIATION FROM STANDARDS

None.

1.8 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.10 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.8 dB
2	Conducted emission 150KHz-30MHz	±3.4 dB
3	Radiated emission 9KHz-30MHz	±4.9 dB
4	Radiated emission 30MHz-1GHz	±4.7 dB
5	Radiated emission 1GHz-18GHz	±5.1 dB
6	Radiated emission 18GHz-26GHz	±5.2 dB
7	Radiated emission 26GHz-40GHz	±5.2 dB

2. TEST SUMMARY

FCC 47 CFR Part 27 Test Cases (LTE Band 4 & Band 66)			
Test Item	Test Requirement	Test Method	Result
Equivalent Isotropic Radiated Power (EIRP)	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(d)(4)	ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(d)(4)	ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01	PASS
Peak-to-average ratio	FCC 47 CFR Part 27.50(d)(5)	KDB 971168 D01v03r01	PASS
99%&26dB Bandwidth	FCC 47 CFR Part 2.1049(h) & FCC 47 CFR Part 27.53(h)	ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 27.53(h)(1)	ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 27.53(h)	ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 27.53(h)	ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 27.54	ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01	PASS

FCC 47 CFR Part 27 Test Cases (LTE Band 7)			
Test Item	Test Requirement	Test Method	Result
Equivalent Isotropic Radiated Power (EIRP)	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(h)(2)	ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(h)(2)	ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01	N/A(Note 1,2)
Peak-to-average ratio	FCC 47 CFR Part 27.50(d)(5)	KDB 971168 D01v03r01	PASS
99%&26dB Bandwidth	FCC 47 CFR Part 2.1049(h)	ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 27.53(m)(4)	ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 27.53(m)(4)	ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 27.53(m)(4)	ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01	N/A(Note 1,2)
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 27.54	ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01	PASS
Note: 1) N/A: In this whole report not application. 2) Refer to Report No.Y1810A0962-R1 for RF Report.			

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 20, 2015	Dec. 19, 2018
☒	Receiver	R&S	ESIB26	100114	Dec. 10, 2017	Dec. 10, 2018
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Dec.10, 2017	Dec. 10, 2018
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Dec. 17, 2017	Dec. 17, 2018
☒	Preamplifier	HP	8447F	2805A02960	Dec. 10, 2017	Dec. 10, 2018
☒	Broadband Antenna (Pre-amplifier)	ETS-LINDGREN	3142E-PA	00201891	May 19, 2018	May 19, 2019
☒	Horn Antenna	ETS-LINDGREN	3117	00164202	Dec. 17, 2017	Dec. 17, 2018
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	May 22, 2018	May 22, 2019
☒	Horn Antenna	ETS-LINDGREN	3116C	00200180	May 20, 2018	May 20, 2019
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Dec. 17, 2017	Dec. 17, 2018
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

2/3/4G RF Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	Receiver	R&S	ESR7	1316.3003K07-101181-K3	Dec. 10, 2017	Dec. 10, 2018
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Dec.10, 2017	Dec. 10, 2018
☒	Wideband Radio Communication Tester	R&S	CMW500	116254	June 07, 2018	June 07, 2019
☒	DC Source	KIKUSUI	PWR400L	LK003024	Sep. 14, 2018	Sep. 13, 2019
☒	Temp & Humidity chamber	Votisch	VT4002	58566133290020	June 05, 2018	June 05, 2019
☒	Test Software	ECIT	AutomationTestSystem	Software Version: 2.170530		

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

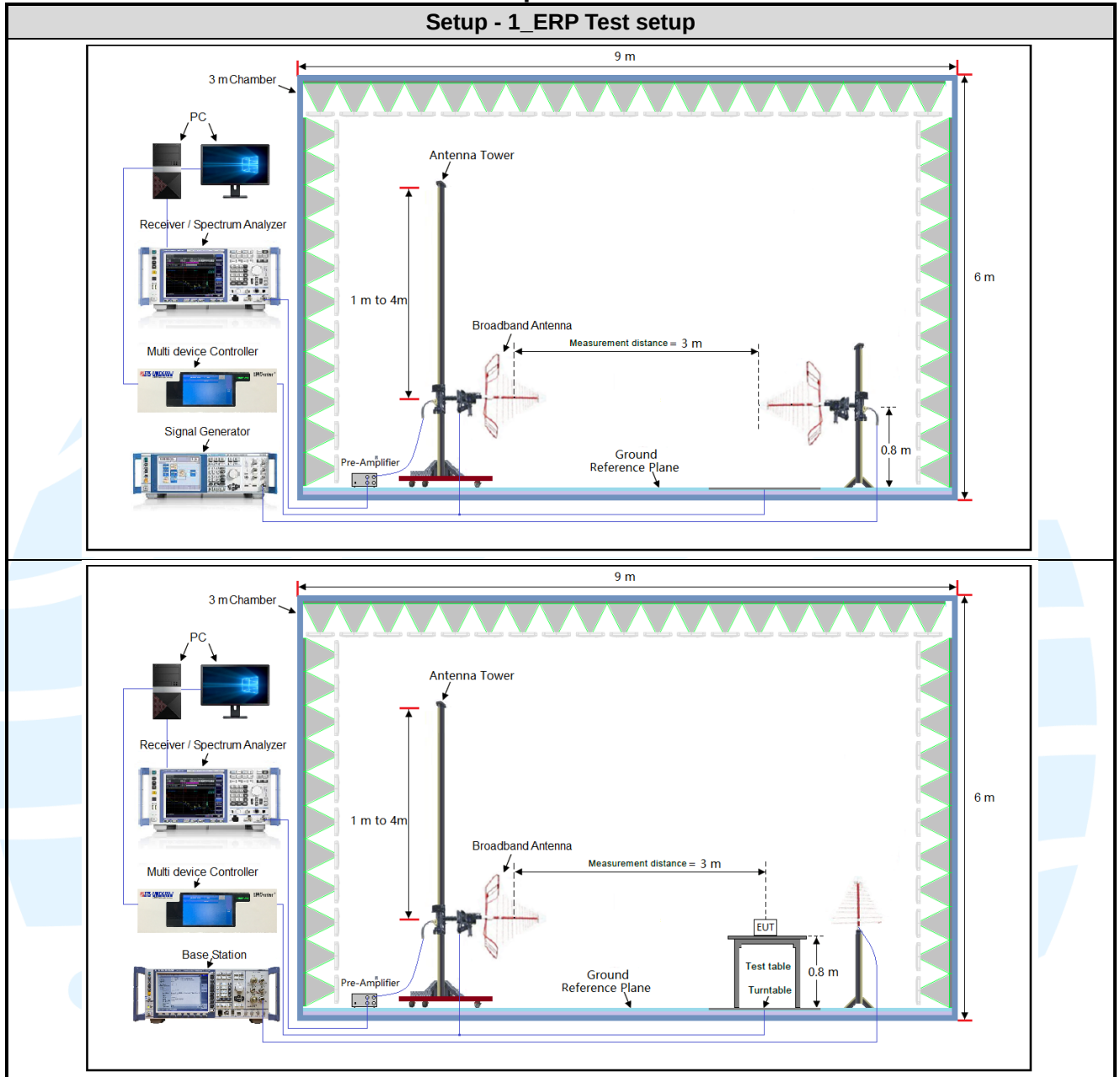
Test Environment	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
TN/VN	+15 to +35	12	20 to 75
TL/VL	-30	10.8	20 to 75
TH/VL	+50	10.8	20 to 75
TL/VH	-30	13.2	20 to 75
TH/VH	+50	13.2	20 to 75

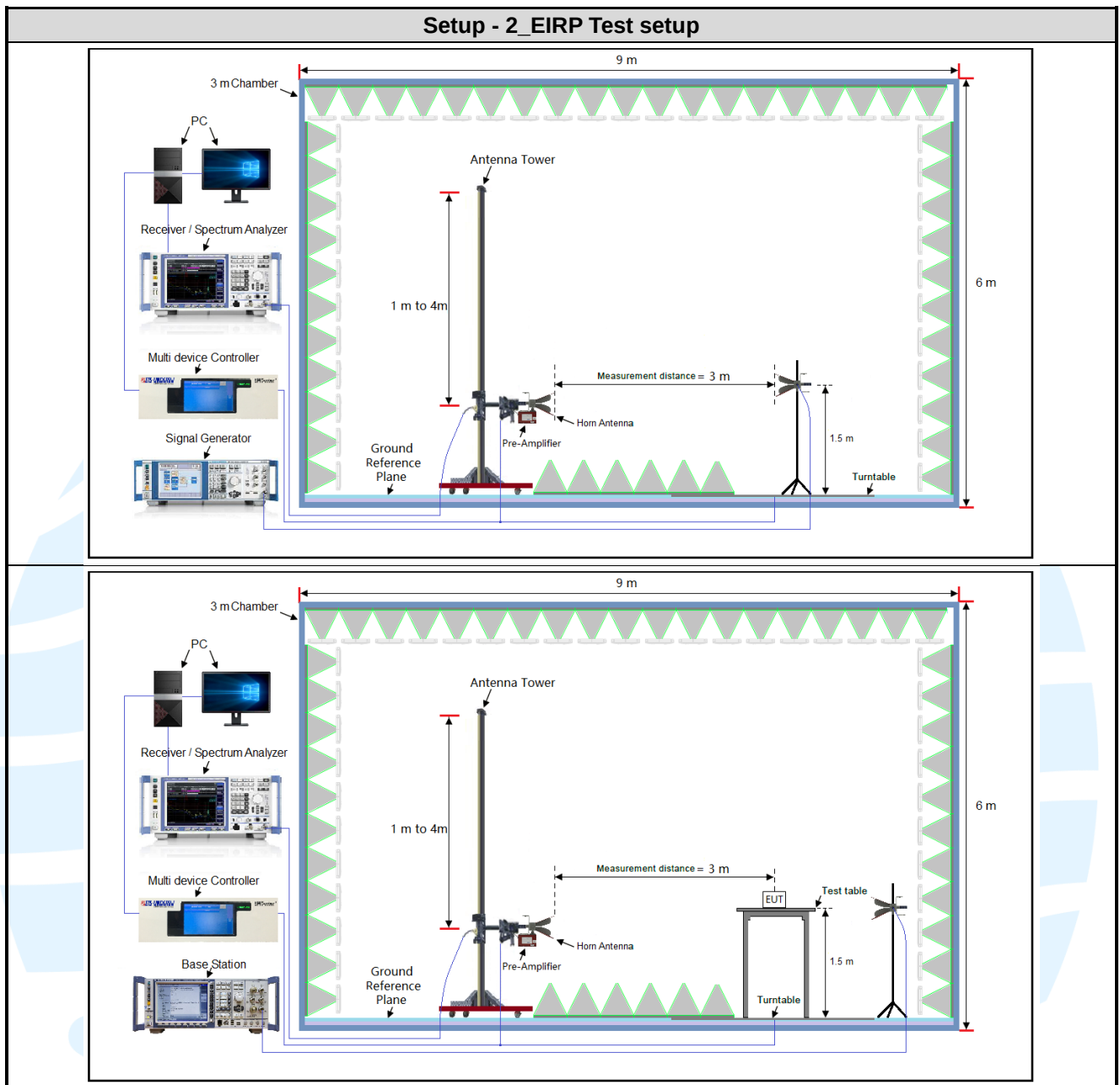
Remark:

- 1) The EUT just work in such extreme temperature of -30 °C to +50 °C and the extreme voltage of 10.8 V to 13.2 V, so here the EUT is tested in the temperature of -30 °C to +50 °C and the voltage of 10.8 V to 13.2 V.
- 2) VN: Normal Voltage; TN: Normal Temperature;
TL: Low Extreme Test Temperature; TH: High Extreme Test Temperature;
VL: Low Extreme Test Voltage; VH: High Extreme Test Voltage.

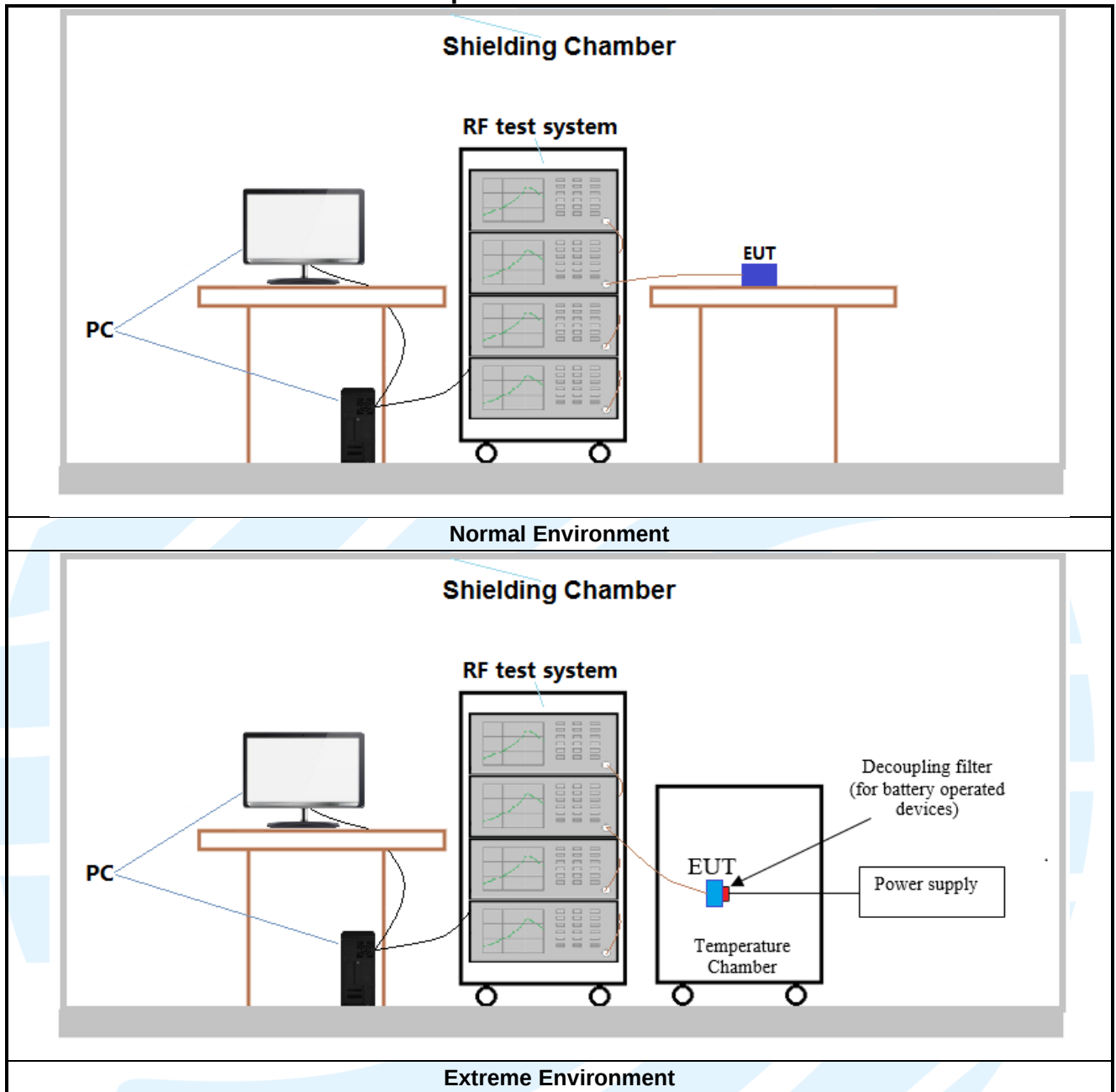
4.2 TEST SETUP

4.2.1 For Radiated Emissions test setup





4.2.2 For Conducted RF test setup



4.3 TEST CHANNELS

Band	Test Frequency ID	Bandwidth (MHz)	Number [UL]	Frequency of Uplink (MHz)
LTE Band 4 TX:1710-1755MHz	Low Range	1.4	19957	1710.7
		3	19965	1711.5
		5	19975	1712.5
		10	20000	1715
		15	20025	1717.5
		20	20050	1720
	Middle Range	1.4/3/5/10/ 15/20	20175	1732.5
	High Range	1.4	20393	1754.3
		3	20385	1753.5
		5	20375	1752.5
		10	20350	1750
		15	20325	1747.5
		20	20300	1745
LTE Band 7 TX:2500-2570MHz	Low Range	5	20775	2502.5
		10	20800	2505
		15	20825	2507.5
		20	20850	2510
	Middle Range	5/10/15/20	21100	2535
	High Range	5	21425	2567.5
		10	21400	2565
		15	21375	2562.5
		20	21350	2560
LTE Band 66 TX:1710-1780MHz	Low Range	1.4	131979	1710.7
		3	131987	1711.5
		5	131997	1712.5
		10	132022	1715
		15	132047	1717.5
		20	132072	1720
	Middle Range	1.4/3/5/10/ 15/20	132322	1745
	High Range	1.4	132665	1779.3
		3	132657	1778.5
		5	132647	1777.5
		10	132622	1775
		15	132597	1772.5
		20	132572	1770

4.4 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 12V adapter. Only the worst case data were recorded in this test report.

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

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

Band	Mode	Antenna Port	Worst-case axis positioning
LTE Band 4	1TX	Chain 0	Y axis
LTE Band 7	1TX	Chain 0	Y axis
LTE Band 66	1TX	Chain 0	Y axis

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

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

4.5 PRE-SCAN

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

4.5.1 LTE Band 4

LTE Band 4 Maximum Average Power (dBm)										
Modulation	RB		Test Channel			RB		Test Channel		
	Size	Offset	Low	Mid	High	Size	Offset	Low	Mid	High
Channel Bandwidth: 1.4 MHz						Channel Bandwidth: 3 MHz				
QPSK	1	0	22.85	21.84	22.43	1	0	22.87	21.86	22.42
	1	2	22.82	22.52	22.65	1	7	22.78	22.53	22.65
	1	5	22.69	22.36	22.31	1	14	22.65	22.36	22.31
	3	0	22.51	22.27	22.56	8	0	21.50	21.30	21.56
	3	1	22.50	22.24	22.56	8	3	21.43	21.24	21.58
	3	3	22.49	22.38	22.27	8	7	21.46	21.45	21.31
	6	0	21.50	21.39	21.30	15	0	21.47	21.40	21.24
16QAM	1	0	22.44	22.39	22.15	1	0	22.41	22.45	22.18
	1	2	22.51	22.33	22.17	1	7	22.48	22.36	22.15
	1	5	22.54	22.30	22.15	1	14	22.57	22.30	22.15
	3	0	23.38	22.50	22.44	8	0	22.34	21.51	21.44
	3	1	23.26	22.29	22.15	8	3	22.31	21.24	21.18
	3	3	23.22	22.23	22.23	8	7	22.24	21.21	21.19
	6	0	21.30	21.25	21.20	15	0	21.30	21.19	21.23

LTE Band 4 Maximum Average Power (dBm)										
Modulation	RB		Test Channel			RB		Test Channel		
	Size	Offset	Low	Mid	High	Size	Offset	Low	Mid	High
Channel Bandwidth: 5 MHz						Channel Bandwidth: 10 MHz				
QPSK	1	0	22.88	21.81	22.43	1	0	22.85	21.84	22.43
	1	12	22.83	22.50	22.65	1	24	22.83	22.50	22.66
	1	24	22.66	22.35	22.35	1	49	22.63	22.39	22.31
	12	0	21.53	21.30	21.53	25	0	21.54	21.29	21.56
	12	6	21.43	21.25	21.59	25	12	21.49	21.19	21.59
	12	13	21.50	21.41	21.32	25	25	21.48	21.38	21.31
	25	0	21.45	21.43	21.27	50	0	21.50	21.43	21.24
16QAM	1	0	22.42	22.41	22.18	1	0	22.42	22.38	22.14
	1	12	22.45	22.39	22.14	1	24	22.50	22.35	22.17
	1	24	22.57	22.30	22.14	1	49	22.57	22.31	22.11
	12	0	22.34	21.49	21.41	25	0	22.36	21.47	21.47
	12	6	22.28	21.28	21.14	25	12	22.32	21.22	21.19
	12	13	22.19	21.23	21.22	25	25	22.18	21.24	21.19
	25	0	21.30	21.20	21.20	50	0	21.34	21.19	21.24
Channel Bandwidth: 15 MHz						Channel Bandwidth: 20 MHz				
QPSK	1	0	22.92	21.84	22.40	1	0	22.93	21.88	22.48
	1	37	22.81	22.55	22.61	1	50	22.85	22.58	22.67
	1	74	22.69	22.42	22.32	1	99	22.71	22.43	22.36
	37	0	21.51	21.30	21.57	50	0	21.57	21.35	21.58
	37	19	21.50	21.24	21.59	50	25	21.51	21.26	21.64
	37	39	21.46	21.39	21.31	50	50	21.54	21.46	21.33
	75	0	21.50	21.41	21.29	100	0	21.51	21.45	21.32
16QAM	1	0	22.46	22.45	22.14	1	0	22.49	22.46	22.20
	1	37	22.49	22.36	22.17	1	50	22.53	22.41	22.19
	1	74	22.53	22.36	22.13	1	99	22.59	22.38	22.16
	37	0	22.40	21.47	21.48	50	0	22.42	21.55	21.49
	37	19	22.26	21.26	21.15	50	25	22.34	21.30	21.20
	37	39	22.23	21.22	21.22	50	50	22.26	21.28	21.24
	75	0	21.35	21.22	21.17	100	0	21.36	21.27	21.25

4.5.2 LTE Band 66

LTE Band 66 Maximum Average Power (dBm)										
Modulation	RB		Test Channel			RB		Test Channel		
	Size	Offset	Low	Mid	High	Size	Offset	Low	Mid	High
Channel Bandwidth: 1.4 MHz						Channel Bandwidth: 3 MHz				
QPSK	1	0	22.77	23.32	22.66	1	0	22.79	23.34	22.65
	1	2	22.90	23.35	22.76	1	7	22.86	23.36	22.76
	1	5	22.71	22.80	22.36	1	14	22.67	22.80	22.36
	3	0	22.60	22.99	22.73	8	0	21.59	22.02	21.73
	3	1	22.66	23.08	22.55	8	3	21.59	22.08	21.57
	3	3	22.55	23.02	22.57	8	7	21.52	22.09	21.61
16QAM	6	0	21.66	22.07	21.60	15	0	21.63	22.08	21.54
	1	0	22.36	22.23	22.49	1	0	22.33	22.29	22.52
	1	2	22.81	22.79	22.58	1	7	22.78	22.82	22.56
	1	5	22.20	22.49	22.22	1	14	22.23	22.49	22.22
	3	0	21.63	22.14	21.78	8	0	20.59	21.15	20.78
	3	1	21.41	22.04	21.54	8	3	20.46	20.99	20.57
QPSK	3	3	21.72	22.04	21.84	8	7	20.74	21.02	20.80
	6	0	20.67	21.05	20.80	15	0	20.67	20.99	20.83
Channel Bandwidth: 5 MHz						Channel Bandwidth: 10 MHz				
QPSK	1	0	22.80	23.29	22.66	1	0	22.77	23.32	22.66
	1	12	22.91	23.33	22.76	1	24	22.91	23.33	22.77
	1	24	22.68	22.79	22.40	1	49	22.65	22.83	22.36
	12	0	21.62	22.02	21.70	25	0	21.63	22.01	21.73
	12	6	21.59	22.09	21.58	25	12	21.65	22.03	21.58
	12	13	21.56	22.05	21.62	25	25	21.54	22.02	21.61
16QAM	25	0	21.61	22.11	21.57	50	0	21.66	22.11	21.54
	1	0	22.34	22.25	22.52	1	0	22.34	22.22	22.48
	1	12	22.75	22.85	22.55	1	24	22.80	22.81	22.58
	1	24	22.23	22.49	22.21	1	49	22.23	22.50	22.18
	12	0	20.59	21.13	20.75	25	0	20.61	21.11	20.81
	12	6	20.43	21.03	20.53	25	12	20.47	20.97	20.58
QPSK	12	13	20.69	21.04	20.83	25	25	20.68	21.05	20.80
	25	0	20.67	21.00	20.80	50	0	20.71	20.99	20.84

LTE Band 66 Maximum Average Power (dBm)										
Modulation	RB		Test Channel			RB		Test Channel		
	Size	Offset	Low	Mid	High	Size	Offset	Low	Mid	High
Channel Bandwidth: 15 MHz						Channel Bandwidth: 20 MHz				
QPSK	1	0	22.84	23.32	22.63	1	0	22.85	23.36	22.71
	1	37	22.89	23.38	22.72	1	50	22.93	23.41	22.78
	1	74	22.71	22.86	22.37	1	99	22.73	22.87	22.41
	37	0	21.60	22.02	21.74	50	0	21.66	22.07	21.75
	37	19	21.66	22.08	21.58	50	25	21.67	22.10	21.63
	37	39	21.52	22.03	21.61	50	50	21.60	22.10	21.63
	75	0	21.66	22.09	21.59	100	0	21.67	22.13	21.62
16QAM	1	0	22.38	22.29	22.48	1	0	22.41	22.30	22.54
	1	37	22.79	22.82	22.58	1	50	22.83	22.87	22.60
	1	74	22.19	22.55	22.20	1	99	22.25	22.57	22.23
	37	0	20.65	21.11	20.82	50	0	20.67	21.19	20.83
	37	19	20.41	21.01	20.54	50	25	20.49	21.05	20.59
	37	39	20.73	21.03	20.83	50	50	20.76	21.09	20.85
	75	0	20.72	21.02	20.77	100	0	20.73	21.07	20.85

Pre-scan all bandwidth and RB, find worse case mode are chosen to the report, the worse mode applicability and tested channel detail as below:

LTE worse case mode applicability and tested channel detail as below:

Item	Band	Bandwidth(MHz)						Modulation			RB			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	64QAM	1	Half	Full	L	M	H
ERP/EIRP	4	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	☐	☒	☒	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☐	☒	-	-	☒	☒	☒
	66	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	☐	☒	☒	☒
Conducted output power	4	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☒	☒	☒	☒
	7	-	-	-	-	-	-	-	-	☐	-	-	-	-	-	-
	66	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☒	☒	☒	☒
99%&26dB Bandwidth	4	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☐	☒	☒	☒	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☐	☐	☐	☒	☒	☒	☒
	66	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☐	☒	☒	☒	☒
peak-to-average ratio	4	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	☒	☒	☒	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☐	☒	☐	☒	☒	☒	☒
	66	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	☒	☒	☒	☒
Band Edge at antenna terminals	4	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	☒	☒	☐	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☐	☒	☐	☒	☒	☐	☒
	66	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	☒	☒	☐	☒
Spurious emissions at antenna terminals	4	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	☐	☒	☒	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☐	☒	☐	☐	☒	☒	☒
	66	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	☐	☒	☒	☒
Field strength of spurious radiation	4	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☐	☐	☐	☒	☐
	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	66	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☐	☐	☐	☒	☐
Frequency stability	4	☒	☒	☒	☒	☒	☒	☒	☐	☐	☐	☐	☒	☐	☒	☐
	7	-	-	☒	☒	☒	☒	☒	☐	☐	☐	☐	☒	☐	☒	☐
	66	☒	☒	☒	☒	☒	☒	☒	☐	☐	☐	☐	☒	☐	☒	☐
Remark: The mark " ☒ " means is chosen for testing; The mark " ☐ " means is not chosen for testing; The mark "-" means is not supported bandwidth																

5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 2 Subpart J	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 27	Miscellaneous Wireless Communications Services
3	ANSI/TIA-603-E-2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
4	KDB 971168 D01	KDB 971168 D01 Power Meas License Digital Systems v03r01

5.2 ERP OR EIRP

Test Requirement: FCC 47 CFR Part 2.1046(a)
LTE Band 4 & LTE Band 66: FCC 47 CFR Part 27.50(d)(4)
LTE Band 7: FCC 47 CFR Part 27.50(h)(2)

Test Method: KDB 971168 D01v03r01 & ANSI/TIA-603-E-2016

Limit:

FCC 47 CFR Part 27.50(d)(4): Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

FCC 47 CFR Part 27.50(h)(2): Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

Test Procedure:

Test procedure as below:

- 1) The EUT was powered ON and placed on a 0.8/1.5m high table at a 3 meter semi/fully Anechoic Chamber. The antenna of the transmitter was extended to its maximum length. Modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- 2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 3) The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
- 4) Steps 1) to 3) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
- 5) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
- 6) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 3) is obtained for this set of conditions.
- 7) The output power into the substitution antenna was then measured.
- 8) Steps 6) and 7) were repeated with both antennas polarized.
- 9) Calculate power in dBm by the following formula:

$$\text{ERP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBd)}$$

$$\text{EIRP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBi)}$$

$$\text{EIRP} = \text{ERP} + 2.15\text{dB}$$

where:

Pg is the generator output power into the substitution antenna.

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

Receiver Setup:

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

Test Setup: Refer to section 4.2.1 for details.

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Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data: See table below

5.2.1 LTE Band 4

Maximum EIRP (dBm)					
Channel	QPSK; RB:1	16QAM; RB:1	64QAM; RB:1	Limit (dBm)	Result
Channel Bandwidth: 1.4MHz					
Lowest	23.85	23.44	N/A	30.00	Pass
Middle	22.84	23.39	N/A	30.00	Pass
Highest	23.43	23.15	N/A	30.00	Pass
Channel Bandwidth: 3MHz					
Lowest	23.87	23.41	N/A	30.00	Pass
Middle	22.86	23.45	N/A	30.00	Pass
Highest	23.42	23.18	N/A	30.00	Pass
Channel Bandwidth: 5MHz					
Lowest	23.88	23.42	N/A	30.00	Pass
Middle	22.81	23.41	N/A	30.00	Pass
Highest	23.43	23.18	N/A	30.00	Pass
Channel Bandwidth: 10MHz					
Lowest	23.85	23.42	N/A	30.00	Pass
Middle	22.84	23.38	N/A	30.00	Pass
Highest	23.43	23.14	N/A	30.00	Pass
Channel Bandwidth: 15MHz					
Lowest	23.92	23.46	N/A	30.00	Pass
Middle	22.84	23.45	N/A	30.00	Pass
Highest	23.40	23.14	N/A	30.00	Pass
Channel Bandwidth: 20MHz					
Lowest	23.93	23.49	N/A	30.00	Pass
Middle	22.88	23.46	N/A	30.00	Pass
Highest	23.48	23.20	N/A	30.00	Pass

5.2.2 LTE Band 7

Maximum EIRP (dBm)					
Channel	QPSK; RB:1	16QAM; RB:1	64QAM; RB:1	Limit (dBm)	Result
Channel Bandwidth: 5MHz					
Lowest	23.12	21.63	N/A	33.01	Pass
Middle	23.01	21.43	N/A	33.01	Pass
Highest	23.25	21.98	N/A	33.01	Pass
Channel Bandwidth: 10MHz					
Lowest	23.60	23.27	N/A	33.01	Pass
Middle	22.96	22.47	N/A	33.01	Pass
Highest	23.68	22.08	N/A	33.01	Pass
Channel Bandwidth: 15MHz					
Lowest	23.27	22.73	N/A	33.01	Pass
Middle	23.28	22.18	N/A	33.01	Pass
Highest	23.49	21.97	N/A	33.01	Pass
Channel Bandwidth: 20MHz					
Lowest	23.04	22.19	N/A	33.01	Pass
Middle	23.02	22.84	N/A	33.01	Pass
Highest	23.87	22.58	N/A	33.01	Pass

5.2.3 LTE Band 66

Maximum EIRP (dBm)					
Channel	QPSK; RB:1	16QAM; RB:1	64QAM; RB:1	Limit (dBm)	Result
Channel Bandwidth: 1.4MHz					
Lowest	23.77	23.36	N/A	30.00	Pass
Middle	24.32	23.23	N/A	30.00	Pass
Highest	23.66	23.49	N/A	30.00	Pass
Channel Bandwidth: 3MHz					
Lowest	23.79	23.33	N/A	30.00	Pass
Middle	24.34	23.29	N/A	30.00	Pass
Highest	23.65	23.52	N/A	30.00	Pass
Channel Bandwidth: 5MHz					
Lowest	23.80	23.34	N/A	30.00	Pass
Middle	24.29	23.25	N/A	30.00	Pass
Highest	23.66	23.52	N/A	30.00	Pass
Channel Bandwidth: 10MHz					
Lowest	23.77	23.34	N/A	30.00	Pass
Middle	24.32	23.22	N/A	30.00	Pass
Highest	23.66	23.48	N/A	30.00	Pass
Channel Bandwidth: 15MHz					
Lowest	23.84	23.38	N/A	30.00	Pass
Middle	24.32	23.29	N/A	30.00	Pass
Highest	23.63	23.48	N/A	30.00	Pass
Channel Bandwidth: 20MHz					
Lowest	23.85	23.41	N/A	30.00	Pass
Middle	24.36	23.30	N/A	30.00	Pass
Highest	23.71	23.54	N/A	30.00	Pass

5.3 CONDUCTED OUTPUT POWER

FCC 47 CFR Part 2.1046(a)

Test Requirement: **LTE Band 4 & LTE Band 66:** FCC 47 CFR Part 27.50(d)(4)

LTE Band 7: FCC 47 CFR Part 27.50(h)(2)

Test Method: KDB 971168 D01v03r01 & ANSI/TIA-603-E-2016

Limit:

FCC 47 CFR Part 27.50(d)(4): Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

FCC 47 CFR Part 27.50(h)(2): Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

Test Procedure:

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

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

Test Setup: Refer to section 4.2.2 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data: [The full result refer to section 4.5 for details.](#)

5.4 PEAK-TO-AVERAGE RATIO

Test Requirement: LTE Band 4 & LTE Band 66: FCC 47 CFR Part 27.50(d)(5)
LTE Band 7: FCC 47 CFR Part 27.50(d)(5)

Test Method: KDB 971168 D01v03r01

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

Test Procedure:

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

- Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth
- Set the number of counts to a value that stabilizes the measured CCDF curve
- Record the maximum PAPR level associated with a probability of 0.1 %

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

Test Setup: Refer to section 4.2.2 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

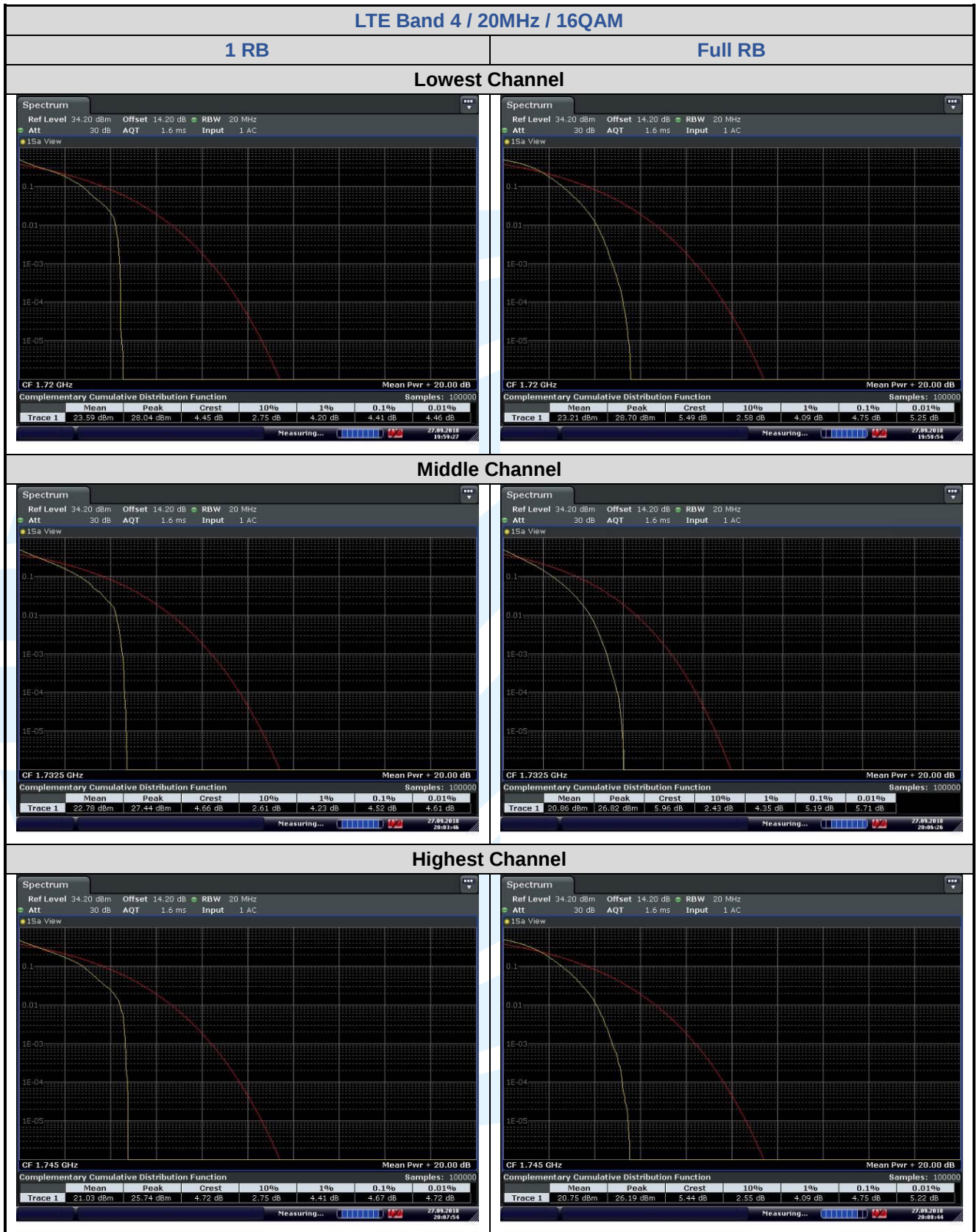
Test Results: Pass

Test Data: See table below

5.4.1 LTE Band 4

Peak-to-average ratio (dB)						
Channel	RB Configuration	Channel Bandwidth: 20 MHz			Limit (dB)	Result
		QPSK	16QAM	64QAM		
Lowest	1 RB	4.49	4.41	N/A	13	Pass
	Full RB	4.78	4.75	N/A	13	Pass
Middle	1 RB	4.58	4.52	N/A	13	Pass
	Full RB	5.19	5.19	N/A	13	Pass
Highest	1 RB	4.90	4.67	N/A	13	Pass
	Full RB	4.75	4.75	N/A	13	Pass





5.4.2 LTE Band 7

Peak-to-average ratio (dB)						
Channel	RB Configuration	Channel Bandwidth: 20 MHz			Limit (dB)	Result
		QPSK	16QAM	64QAM		
Lowest	1 RB	4.06	4.17	N/A	13	Pass
	Full RB	4.70	4.67	N/A	13	Pass
Middle	1 RB	3.57	3.54	N/A	13	Pass
	Full RB	4.46	4.46	N/A	13	Pass
Highest	1 RB	4.09	4.06	N/A	13	Pass
	Full RB	4.06	4.32	N/A	13	Pass





5.4.3 LTE Band 66

Peak-to-average ratio (dB)						
Channel	RB Configuration	Channel Bandwidth: 20 MHz			Limit (dB)	Result
		QPSK	16QAM	64QAM		
Lowest	1 RB	4.00	4.06	N/A	13	Pass
	Full RB	4.67	4.72	N/A	13	Pass
Middle	1 RB	3.57	3.57	N/A	13	Pass
	Full RB	4.46	4.43	N/A	13	Pass
Highest	1 RB	4.14	4.09	N/A	13	Pass
	Full RB	4.35	4.29	N/A	13	Pass





5.5 99%&26DB BANDWIDTH

Test Requirement: FCC 47 CFR Part 2.1049(h),
FCC 47 CFR Part 27.53(h),
FCC 47 CFR Part 27.53(g),
FCC 47 CFR Part 27.50(a)

Test Method: ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01

Limit: No Limit

Test Procedure:

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

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

Test Setup: Refer to section 4.2.2 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data: See table below

5.5.1 LTE Band 4

LTE Band 4								
Channel	RB Configuration		26 dB BW (MHz)			99% BW (MHz)		
	Size	Offset	QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
Channel Bandwidth: 1.4 MHz								
Lowest	6	0	1.291	1.285	N/A	1.0928	1.0971	N/A
Middle	6	0	1.277	1.280	N/A	1.0978	1.0967	N/A
Highest	6	0	1.302	1.287	N/A	1.0944	1.0981	N/A
Channel Bandwidth: 3 MHz								
Lowest	15	0	2.960	2.983	N/A	2.7120	2.7070	N/A
Middle	15	0	2.999	2.989	N/A	2.7102	2.7102	N/A
Highest	15	0	2.981	2.988	N/A	2.7080	2.7068	N/A
Channel Bandwidth: 5 MHz								
Lowest	25	0	5.012	5.041	N/A	4.5251	4.5023	N/A
Middle	25	0	4.908	4.937	N/A	4.5214	4.5118	N/A
Highest	25	0	4.979	4.938	N/A	4.5006	4.5029	N/A
Channel Bandwidth: 10 MHz								
Lowest	50	0	9.746	9.820	N/A	8.9507	8.9608	N/A
Middle	50	0	9.844	9.804	N/A	8.9853	8.9744	N/A
Highest	50	0	9.806	9.813	N/A	8.9549	8.9319	N/A
Channel Bandwidth: 15 MHz								
Lowest	75	0	14.58	14.62	N/A	13.383	13.389	N/A
Middle	75	0	14.71	14.69	N/A	13.444	13.448	N/A
Highest	75	0	14.68	14.59	N/A	13.378	13.403	N/A
Channel Bandwidth: 20 MHz								
Lowest	100	0	19.08	19.26	N/A	17.857	17.859	N/A
Middle	100	0	19.29	19.46	N/A	18.004	17.970	N/A
Highest	100	0	19.44	19.35	N/A	17.835	17.838	N/A

