FCC TEST REPORT

Product Name:	Vitals360 Multi-vitals Mobile Monitor
Trade Mark:	Vitals360
Model No.:	VC-001
Add. Model No.:	N/A
Report Number:	190518003RFM-2
Test Standards:	FCC 47 CFR Part 22 FCC 47 CFR Part 24 FCC 47 CFR Part 27 FCC 47 CFR Part 90
FCC ID:	2AUBA-VC19VTLS09081
Test Result:	PASS
Date of Issue:	August 28, 2019

Prepared for:

VoCare Inc
4950 Turkey Foot Road, Zionsville Indiana 46077, USA

Prepared by:

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Date: August 28, 2019

Version

Version No.	Date	Description
V1.0	August 28, 2019	Original

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	VoCare Inc
Address of Applicant:	4950 Turkey Foot Road, Zionsville Indiana 46077, USA
Manufacturer:	Linktop Technology Co.Ltd
Address of Manufacturer:	North 5F, Huoju Plaza, No.56-58, Huoju Road, Huli district, Xiamen city, Fujian province, China

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Vitals360 Multi-vitals Mobile Monitor		
Model No.:	VC-001		
Add. Model No.:	N/A		
Trade Mark:	Vitals360		
DUT Stage:	Identical Prototype		
EUT Supports Function:	UTRA Bands:	Band II/ Band IV/ Band V	
	E-UTRA Bands:	FDD Band 2/ Band 4/ Band 5/ Band 12/ Band 13/ Band 17	
	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
		Bluetooth V4.0	
	5 GHz U-NII Bands:	5 150 MHz to 5 250 MHz	IEEE 802.11a/n
		5 250 MHz to 5 350 MHz	IEEE 802.11a/n
		5 725 MHz to 5 850 MHz	IEEE 802.11a/n
	RNSS Bands:	1559 MHz to 1610 MHz	GPS/ GLONASS/Beidou
Sample Received Date:	July 23, 2019		
Sample Tested Date:	July 25, 2019 to August 26, 2019		

1.2.2 Description of Accessories

Adapter	
Model No.:	LXCP12-005200XFG
Input:	100-240 V~50/60 Hz 0.5 A Max
Output:	5.0 V ⎓ 2 A
AC Cable:	N/A
DC Cable:	N/A

Battery	
Model No.:	E103737
Battery Type:	Lithium-ion Rechargeable Battery
Rated Voltage:	3.7 Vdc
Rated Capacity:	1500 mAh

Cable (1)	
Description:	USB Changing Cable
Cable Type:	Shielded without ferrite
Length:	1.0 Meter

Cable (2)	
Description:	USB Changing Cable
Cable Type:	Shielded without ferrite
Length:	0.8 Meter

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Support Networks:	LTE	
Type of Modulation:	LTE Band 2/4/5/12/13/17:	QPSK, 16QAM
Antenna Type:	Integral Antenna	
Antenna Gain:	LTE Band 2:	2.0 dBi
	LTE Band 4:	1.5 dBi
	LTE Band 5:	-1.0 dBi
	LTE Band 12:	-1.0 dBi
	LTE Band 13:	-1.0 dBi
	LTE Band 17:	-1.0 dBi
Normal Test Voltage:	3.7 Vdc	
Extreme Test Voltage:	3.5 to 4.25Vdc	
Extreme Test Temperature:	-20 °C to +50 °C	

Summary of Results:

Bands	BW (MHz)	Modulation	Frequency Range (MHz)	Max RF Output Power (dBm) Conducted (Average)	Max RF Output Power (dBm) ERP/EIRP (Average)	EIRP (mW)	99% BW (MHz)	Emission Designator
2	1.4	QPSK	1850.7-1909.3	23.62	25.62	364.754	1.10	1M10G7D
		16QAM		22.69	24.69	294.44	1.11	1M11W7D
	3	QPSK	1851.5-1908.5	23.55	25.55	358.92	2.72	2M72G7D
		16QAM		22.81	24.81	302.69	2.71	2M71W7D
	5	QPSK	1852.5-1907.5	23.61	25.61	363.92	4.53	4M53G7D
		16QAM		22.64	24.64	291.07	4.55	4M55W7D
	10	QPSK	1855.0-1905.0	23.72	25.72	373.25	9.00	9M00G7D
		16QAM		22.81	24.81	302.69	9.00	9M00W7D
	15	QPSK	1857.5-1902.5	23.68	25.68	369.83	13.53	13M5G7D
		16QAM		22.73	24.73	297.17	13.53	13M5W7D
	20	QPSK	1860.0-1900.0	23.73	25.73	374.11	18.06	18M1G7D
		16QAM		22.83	24.83	304.09	18.03	18M0W7D

Summary of Results:

Bands	BW (MHz)	Modulation	Frequency Range (MHz)	Max RF Output Power (dBm) Conducted (Average)	Max RF Output Power (dBm) ERP/EIRP (Average)	EIRP (mW)	99% BW (MHz)	Emission Designator
4	1.4	QPSK	1710.7-1754.3	24.08	25.58	361.410	1.10	1M10G7D
		16QAM		23.05	24.55	285.10	1.09	1M09W7D
	3	QPSK	1711.5-1753.5	24.02	25.52	356.45	2.71	2M71G7D
		16QAM		23.06	24.56	285.76	2.71	2M71W7D
	5	QPSK	1712.5-1752.5	23.97	25.47	352.37	4.52	4M52G7D
		16QAM		23.10	24.60	288.40	4.49	4M49W7D
	10	QPSK	1715-1750	23.97	25.47	352.37	8.99	8M99G7D
		16QAM		23.10	24.56	285.76	9.00	9M00W7D
	15	QPSK	1717.5-1747.5	24.03	25.53	357.27	13.49	13M5G7D
		16QAM		23.13	24.63	290.40	13.48	13M5W7D
	20	QPSK	1720-1745	24.08	25.58	361.41	18.06	18M1G7D
		16QAM		23.13	24.63	290.40	17.95	17M9W7D
5	1.4	QPSK	824.7-848.3	21.35	20.35	108.39	1.10	1M10G7D
		16QAM		21.24	20.24	105.68	1.10	1M10G7D
	3	QPSK	825.5-847.5	21.44	20.44	110.66	2.71	2M71W7D
		16QAM		20.35	19.35	86.10	2.70	2M70G7D
	5	QPSK	826.5-846.5	21.48	20.48	111.686	4.51	4M51W7D
		16QAM		20.32	19.32	85.51	4.54	4M54G7D
	10	QPSK	829-844	21.50	20.50	112.20	9.01	8M97W7D
		16QAM		20.38	19.38	86.70	9.01	9M01G7D
12	1.4	QPSK	699.7-715.3	21.50	20.50	112.20	1.10	1M10G7D
		16QAM		20.53	19.53	89.74	1.09	1M09G7D
	3	QPSK	700.5-714.5	21.39	20.39	109.40	2.71	2M71W7D
		16QAM		20.50	19.50	89.13	2.70	2M70G7D
	5	QPSK	701.5-713.5	21.48	20.48	111.69	4.50	4M50G7D
		16QAM		20.50	19.50	89.13	4.52	4M52W7D
	10	QPSK	704-711	21.56	20.56	113.76	9.01	9M01W7D
		16QAM		20.54	19.54	89.95	9.01	9M01G7D

Summary of Results:								
Bands	BW (MHz)	Modulation	Frequency Range (MHz)	Max RF Output Power (dBm) Conducted (Average)	Max RF Output Power (dBm) ERP/EIRP (Average)	EIRP (mW)	99% BW (MHz)	Emission Designator
13	5	QPSK	779.5-784.5	21.79	20.79	119.950	4.52	4M52G7D
		16QAM		20.84	19.84	96.38	4.51	4M51W7D
	10	QPSK	782-782	21.56	20.56	113.76	8.95	8M95G7D
		16QAM		20.84	19.84	96.38	8.96	8M96W7D
17	5	QPSK	706.5-713.5	21.76	20.76	119.12	4.53	4M53G7D
		16QAM		20.78	19.78	95.06	4.51	4M51W7D
	10	QPSK	709-711	21.83	20.83	121.06	9.01	9M01G7D
		16QAM		20.88	19.88	97.27	9.01	9M01W7D

1.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
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2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.3 Meter	Applicant

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
Fax: +86 (0) 755 2823 0886

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.

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.

ISED Wireless Device Testing Laboratories
CAB identifier: CN0032

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 24 Test Cases (Band 2)			
Test Item	**Test Requirement**	**Test Method**	**Result**
Equivalent Isotropic Radiated Power (EIRP)	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 24.232(c)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 24.232(c)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Peak-to-average ratio	FCC 47 CFR Part 24.232(d)	KDB 971168 D01v03r01	PASS
99%&26dB Bandwidth	FCC 47 CFR Part 2.1049(h) & FCC 47 CFR Part 24.238(b)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 24.238(a)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 24.238(a)(b)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 24.238(a)(b)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 24.235	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS

FCC 47 CFR Part 27 Test Cases (LTE Band 4)			
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 C63.26-2015 & KDB 971168 D01v03r01	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(d)(4)	ANSI C63.26-2015 & 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 C63.26-2015 & KDB 971168 D01v03r01	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 27.53(h)(1)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 27.53(h)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 27.53(h)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 27.54	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS

FCC 47 CFR Part 22 Test Cases (Band 5)			
Test Item	**Test Requirement**	**Test Method**	**Result**
Effective Radiated Power (ERP)	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 22.913(a)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 22.913(a)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Peak-to-average ratio	FCC 47 CFR Part 22.913(a)	KDB 971168 D01v03r01	PASS
99%&26dB Bandwidth	FCC 47 CFR Part 2.1049(h)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 22.917(a)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 22.917(a)(b)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 22.917(a)(b)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 22.355	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS

FCC 47 CFR Part 27 Test Cases (LTE Band 12)			
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 C63.26-2015 & KDB 971168 D01v03r01	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(h)(2)	ANSI C63.26-2015 & 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)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 27.53(m)(4)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 27.53(m)(4)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 27.53(m)(4)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 27.54	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS

FCC 47 CFR Part 27 Test Cases (LTE Band 13)			
Test Item	**Test Requirement**	**Test Method**	**Result**
Effective Radiated Power (ERP)	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(c)(10)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(c)(10)	ANSI C63.26-2015 & 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(g)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 27.53(g)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 27.53(g)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 27.53(g)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 27.54	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS

FCC 47 CFR Part 27 Test Cases (LTE Band 17)			
Test Item	**Test Requirement**	**Test Method**	**Result**
Effective Radiated Power (ERP)	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(b)(10)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(b)(10)	ANSI C63.26-2015 & 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)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 27.53	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 27.53	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 27.53	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 27.54	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS

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. 03, 2018	Dec. 03, 2021
☒	Receiver	R&S	ESIB26	100114	Nov. 24, 2018	Nov. 24, 2019
☐	Loop Antenna	ETS-LINDGREN	6502	00202525	Dec. 03, 2018	Dec. 03, 2019
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Dec. 08, 2018	Dec. 08, 2019
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	Dec. 08, 2018	Dec. 08, 2019
☒	Preamplifier	HP	8447F	2805A02960	Nov. 24, 2018	Nov. 24, 2019
☐	Broadband Antenna (Pre-amplifier)	ETS-LINDGREN	3142E-PA	00201891	May 18, 2019	May 18, 2020
☐	6dB Attenuator	Talent	RA6A5-N-18	18103002	Nov. 24, 2018	Nov. 24, 2019
☐	Horn Antenna	ETS-LINDGREN	3117	00164202	Dec. 08, 2018	Dec. 08, 2019
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	May 18, 2019	May 18, 2020
☐	Horn Antenna	ETS-LINDGREN	3116C	00200180	Jun. 23, 2019	Jun. 23, 2020
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Jan. 05, 2019	Jan. 05, 2020
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160333		

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	Nov. 24, 2018	Nov. 24, 2019
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Nov. 24, 2018	Nov. 24, 2019
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY57471561	Nov. 24, 2018	Nov. 24, 2019
☒	Wideband Radio Communication Tester	R&S	CMW500	119583	Jun. 07, 2019	Jun. 07, 2020
☐	Universal Radio Communication Tester	R&S	CMU200	114713	Nov. 24, 2018	Nov. 24, 2019
☒	DC Source	KIKUSUI	PWR400L	LK003024	Sep. 18, 2018	Sep. 18, 2019
☐	Temp & Humidity chamber	Espec	GL(U)04K A(W)	16921H201P3	Sep. 20, 2018	Sep. 20, 2019
☒	Temp & Humidity chamber	Votisch	VT4002	58566133290 020	Jun. 05, 2018	Jun. 05, 2020

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

Test Environment	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
TN/VN	+15 to +35	3.7	20 to 75
TL/VL	-20	3.5	20 to 75
TH/VL	+50	3.5	20 to 75
TL/VH	-20	4.25	20 to 75
TH/VH	+50	4.25	20 to 75

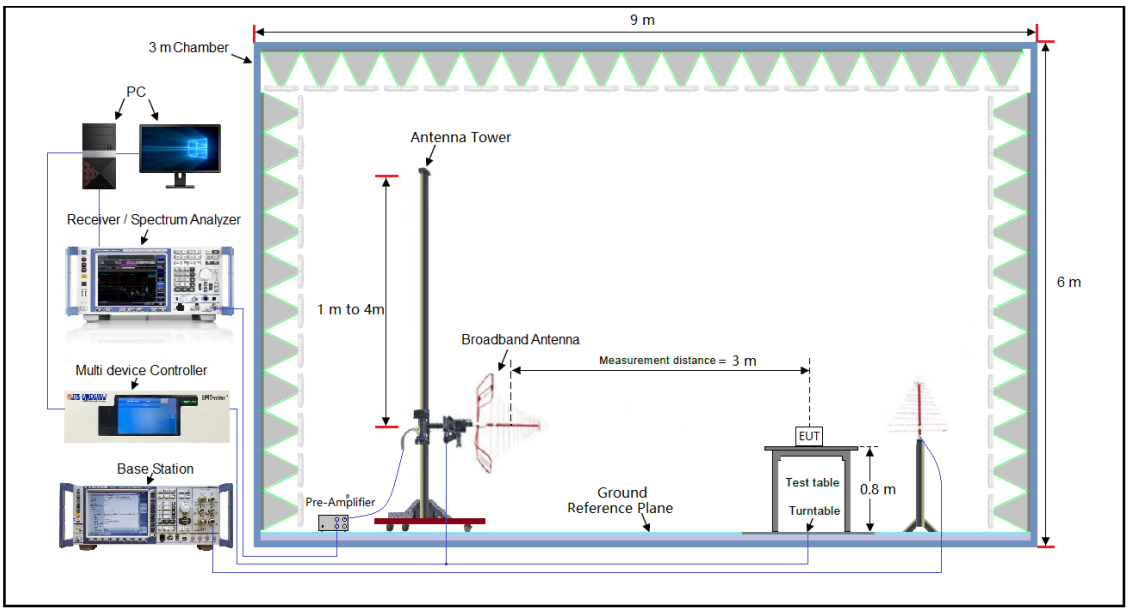
Remark:

1) The EUT just work in such extreme temperature of -20 °C to +50 °C and the extreme voltage of 3.5 V to 4.25 V, so here the EUT is tested in the temperature of -20 °C to +50 °C and the voltage of 3.5 V to 4.25 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.

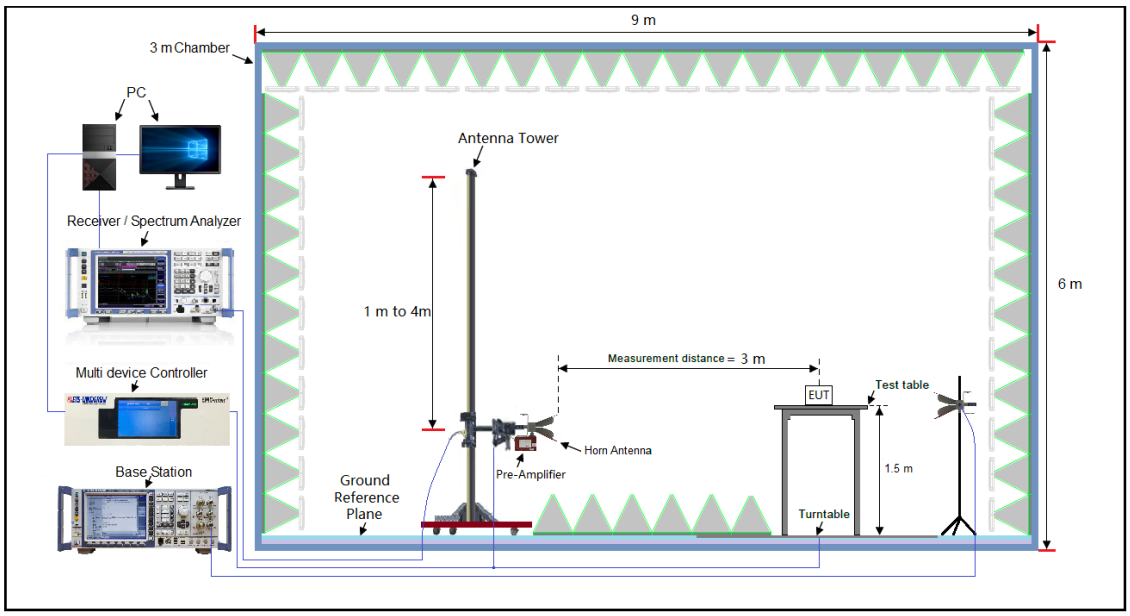
4.2 TEST SETUP

4.2.1 For Radiated Emissions test setup

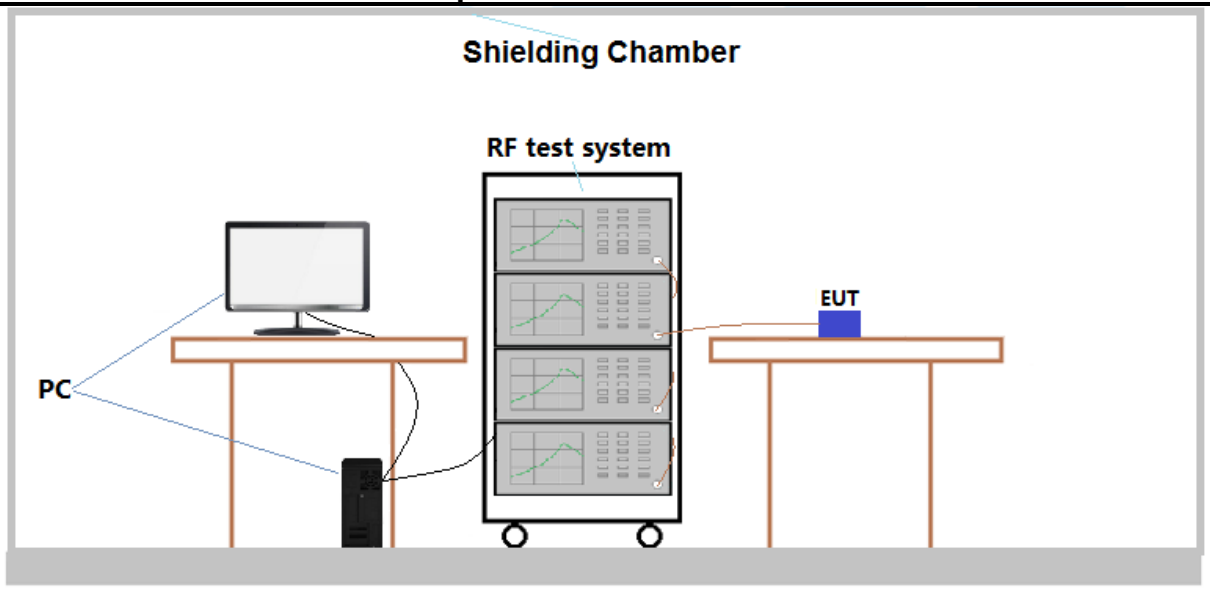
Radiated Emissions 30MHz to 1GHz Test setup



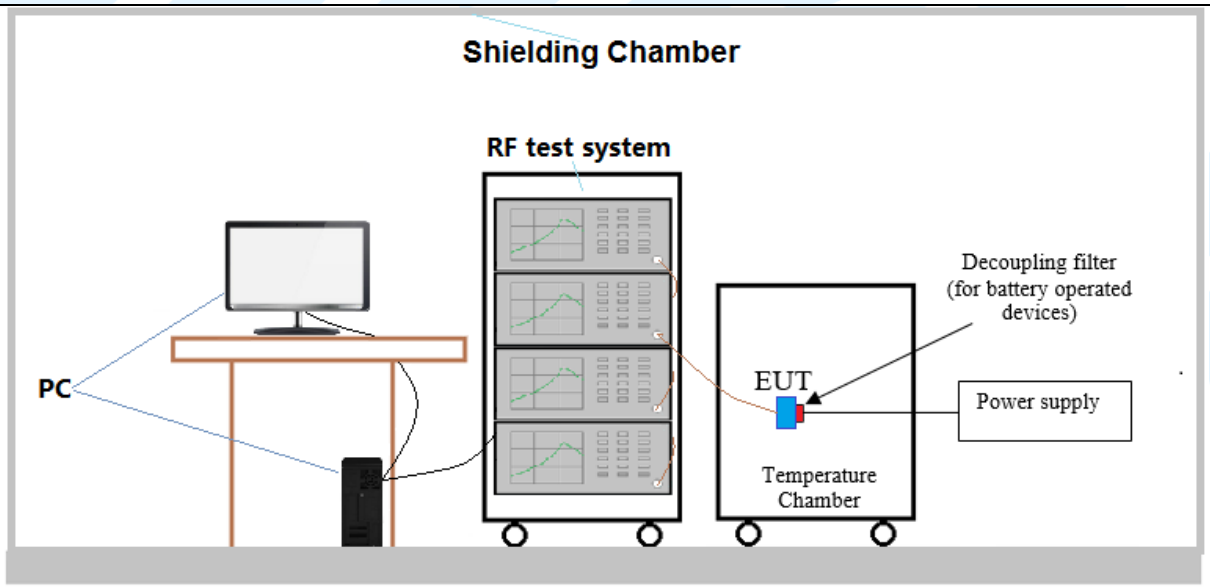
Radiated Emissions Above 1GHz Test setup



4.2.2 For Conducted RF test setup



Normal Environment



Extreme Environment

4.3 TEST CHANNELS

Band	Test Frequency ID	Bandwidth (MHz)	Number [UL]	Frequency of Uplink (MHz)
LTE Band 2 TX: 1850-1910MHz	Low Range	1.4	18607	1850.7
		3	18615	1851.5
		5	18625	1852.5
		10	18650	1855
		15	18675	1857.5
		20	18700	1860
	Middle Range	1.4/3/5/10/15/20	18900	1880
	High Range	1.4	19193	1909.3
		3	19185	1908.5
		5	19175	1907.5
		10	19150	1905
		15	19125	1902.5
		20	19100	1900
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 5 TX: 824–849MHz	Low Range	1.4	20407	824.7
		3	20415	825.5
		5	20425	826.5
		10	20450	829
	Middle Range	1.4/3/5/10	20525	836.5
	High Range	1.4	20643	848.3
		3	20635	847.5
		5	20625	846.5
		10	20600	844
LTE Band 12 TX: 699-716MHz	Low Range	1.4	23017	699.7
		3	23025	700.5
		5	23035	701.5
		10	23060	704
	Middle Range	1.4/3/5/10	23095	707.5
	High Range	1.4	23173	715.3
		3	23165	714.5
		5	23155	713.5
		10	23130	711

LTE Band 13 TX: 777-787MHz	Low Range	5	23205	779.5
		10	23230	782
	Middle Range	5/10	23230	782
	High Range	5	23255	784.5
		10	23230	782
LTE Band 17 TX: 704-716MHz	Low Range	5	23755	706.5
		10	23780	709
	Middle Range	5/10	23790	710
	High Range	5	23825	713.5
		10	23800	711

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 3.7V battery. 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 2	1TX	Chain 0	X axis
LTE Band 4	1TX	Chain 0	X axis
LTE Band 5	1TX	Chain 0	X axis
LTE Band 12	1TX	Chain 0	X axis
LTE Band 13	1TX	Chain 0	X axis
LTE Band 17	1TX	Chain 0	X 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 2

LTE Band 2 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	23.34	23.56	23.15	1	0	23.32	23.54	23.22
	1	2	23.15	**23.62**	23.23	1	7	23.23	**23.55**	23.15
	1	5	23.12	23.09	23.09	1	14	23.15	22.98	23.16
	3	0	23.33	23.20	23.23	8	0	22.32	22.20	22.19
	3	1	23.21	23.20	23.15	8	3	22.26	22.23	22.16
	3	3	23.24	23.39	23.32	8	7	22.23	22.39	22.41
	6	0	22.15	22.36	22.12	15	0	22.22	22.44	22.13
16QAM	1	0	22.35	22.40	**22.69**	1	0	22.40	22.40	**22.81**
	1	2	22.58	22.38	22.46	1	7	22.47	22.28	22.37
	1	5	22.50	22.12	22.57	1	14	22.36	22.29	22.56
	3	0	22.08	22.40	22.22	8	0	20.95	21.25	21.33
	3	1	22.11	22.18	22.18	8	3	21.14	21.11	21.32
	3	3	22.16	22.10	22.46	8	7	21.25	21.10	21.44
	6	0	21.17	21.28	21.28	15	0	21.10	21.33	21.22
Channel Bandwidth: 5 MHz						Channel Bandwidth: 10 MHz				
QPSK	1	0	23.38	23.57	23.24	1	0	23.44	23.45	23.22
	1	12	23.08	**23.61**	23.16	1	24	23.19	**23.72**	23.24
	1	24	23.22	23.06	23.21	1	49	23.14	23.10	23.16
	12	0	22.27	22.29	22.15	25	0	22.31	22.30	22.31
	12	6	22.13	22.21	22.30	25	12	22.26	22.20	22.22
	12	13	22.35	22.41	22.40	25	25	22.21	22.25	22.27
	25	0	22.23	22.39	22.26	50	0	22.22	22.37	22.25
16QAM	1	0	22.49	22.33	**22.64**	1	0	22.50	22.37	**22.81**
	1	12	22.63	22.45	22.39	1	24	22.54	22.26	22.34
	1	24	22.40	22.23	22.48	1	49	22.50	22.23	22.46
	12	0	20.96	21.37	21.29	25	0	20.96	21.24	21.32
	12	6	21.01	21.26	21.34	25	12	21.00	21.10	21.29
	12	13	21.12	21.18	21.57	25	25	21.17	21.12	21.41
	25	0	21.08	21.45	21.31	50	0	21.14	21.31	21.19
Channel Bandwidth: 15 MHz						Channel Bandwidth: 20 MHz				
QPSK	1	0	23.46	23.43	23.24	1	0	23.49	23.57	23.29
	1	37	23.05	**23.68**	23.07	1	50	23.25	**23.73**	23.26
	1	74	23.21	23.01	23.18	1	99	23.28	23.16	23.25
	37	0	22.33	22.27	22.20	50	0	22.37	22.35	22.33
	37	19	22.25	22.21	22.28	50	25	22.31	22.37	22.34
	37	39	22.31	22.37	22.37	50	50	22.38	22.42	22.42
	75	0	22.19	22.35	22.14	100	0	22.29	22.46	22.30
16QAM	1	0	22.45	22.35	**22.73**	1	0	22.52	22.44	**22.83**
	1	37	22.62	22.45	22.40	1	50	22.63	22.46	22.52
	1	74	22.47	22.18	22.59	1	99	22.55	22.32	22.65
	37	0	20.91	21.37	21.30	50	0	21.09	21.42	21.38
	37	19	21.13	21.21	21.28	50	25	21.15	21.30	21.35
	37	39	21.23	21.14	21.56	50	50	21.27	21.21	21.58
	75	0	21.03	21.38	21.18	100	0	21.19	21.46	21.32

4.5.2 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	23.42	23.40	23.39	1	0	23.38	23.49	**23.52**
	1	2	23.24	**23.48**	23.20	1	7	23.36	23.42	23.21
	1	5	23.43	23.06	23.26	1	14	23.42	22.97	23.15
	3	0	23.22	23.36	23.19	8	0	22.30	22.38	22.13
	3	1	23.34	23.45	23.09	8	3	22.27	22.47	22.23
	3	3	23.42	23.39	23.26	8	7	22.32	22.41	22.21
	6	0	22.32	22.47	22.22	15	0	22.41	22.41	22.20
16QAM	1	0	22.47	22.44	22.37	1	0	22.54	22.53	22.39
	1	2	22.10	**22.55**	22.17	1	7	22.22	22.42	22.24
	1	5	22.49	22.55	22.28	1	14	22.45	**22.56**	22.27
	3	0	22.19	22.10	22.15	8	0	21.13	21.10	21.15
	3	1	22.23	22.20	22.19	8	3	21.24	21.17	21.30
	3	3	22.27	22.50	22.28	8	7	21.25	21.49	21.39
	6	0	21.14	21.25	21.24	15	0	21.30	21.28	21.27
Channel Bandwidth: 5 MHz						Channel Bandwidth: 10 MHz				
QPSK	1	0	23.42	23.37	23.44	1	0	23.42	23.37	23.41
	1	12	23.34	23.42	23.18	1	24	23.25	23.46	23.20
	1	24	**23.47**	23.13	23.25	1	49	**23.47**	22.96	23.17
	12	0	22.41	22.33	22.12	25	0	22.28	22.35	22.26
	12	6	22.22	22.41	22.20	25	12	22.22	22.36	22.21
	12	13	22.33	22.57	22.17	25	25	22.43	22.43	22.15
	25	0	22.37	22.41	22.27	50	0	22.32	22.33	22.23
16QAM	1	0	22.58	22.53	22.36	1	0	**22.56**	22.48	22.43
	1	12	22.06	**22.60**	22.18	1	24	22.09	22.45	22.30
	1	24	22.52	22.58	22.28	1	49	22.39	22.48	22.22
	12	0	21.15	21.17	21.30	25	0	21.19	21.15	21.29
	12	6	21.13	21.23	21.22	25	12	21.08	21.19	21.30
	12	13	21.25	21.54	21.42	25	25	21.25	21.54	21.37
	25	0	21.30	21.22	21.30	50	0	21.27	21.24	21.27
Channel Bandwidth: 15 MHz						Channel Bandwidth: 20 MHz				
QPSK	1	0	23.46	23.48	23.38	1	0	23.50	23.53	23.55
	1	37	23.19	**23.53**	23.27	1	50	23.36	**23.58**	23.31
	1	74	23.29	23.08	23.30	1	99	23.49	23.15	23.32
	37	0	22.23	22.29	22.23	50	0	22.41	22.47	22.26
	37	19	22.33	22.47	22.22	50	25	22.40	22.48	22.23
	37	39	22.30	22.48	22.24	50	50	22.44	22.58	22.27
	75	0	22.34	22.39	22.24	100	0	22.43	22.52	22.29
16QAM	1	0	22.46	**22.50**	22.39	1	0	**22.63**	22.54	22.49
	1	37	22.24	22.45	22.23	1	50	22.24	22.60	22.35
	1	74	22.48	22.47	22.37	1	99	22.56	22.61	22.40
	37	0	21.27	21.10	21.17	50	0	21.28	21.23	21.33
	37	19	21.13	21.16	21.30	50	25	21.28	21.34	21.35
	37	39	21.14	21.56	21.29	50	50	21.33	21.62	21.43
	75	0	21.12	21.33	21.14	100	0	21.31	21.34	21.30

4.5.3 LTE Band 5

LTE Band 5 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	23.33	23.29	23.21	1	0	23.34	23.32	23.26
	1	2	23.11	23.35	23.34	1	7	23.10	23.49	23.39
	1	5	23.03	**23.50**	23.29	1	14	23.20	**23.59**	23.15
	3	0	23.27	23.20	23.38	8	0	22.29	22.36	22.37
	3	1	23.26	23.23	23.20	8	3	22.20	22.24	22.23
	3	3	22.95	23.38	23.16	8	7	22.02	22.42	22.24
	6	0	22.13	22.18	22.22	15	0	22.17	22.25	22.22
16QAM	1	0	22.39	22.12	22.39	1	0	22.30	22.04	22.36
	1	2	22.32	22.39	22.05	1	7	22.43	22.31	21.97
	1	5	21.70	22.50	22.33	1	14	21.67	22.48	**22.50**
	3	0	22.61	22.24	**22.62**	8	0	21.58	21.25	21.67
	3	1	22.51	22.41	22.21	8	3	21.52	21.37	21.24
	3	3	22.49	22.42	22.16	8	7	21.49	21.41	21.25
	6	0	21.17	21.29	21.43	15	0	21.13	21.24	21.42
Channel Bandwidth: 5 MHz						Channel Bandwidth: 10 MHz				
QPSK	1	0	23.40	23.28	23.29	1	0	23.44	23.42	23.37
	1	12	23.09	23.53	23.47	1	24	23.28	23.54	23.50
	1	24	23.02	**23.63**	23.24	1	49	23.22	**23.65**	23.31
	12	0	22.17	22.25	22.37	25	0	22.31	22.36	22.38
	12	6	22.16	22.18	22.18	25	12	22.29	22.38	22.35
	12	13	22.01	22.38	22.20	25	25	22.12	22.47	22.24
	25	0	22.24	22.29	22.18	50	0	22.27	22.37	22.28
16QAM	1	0	22.30	22.18	22.31	1	0	22.42	22.21	22.49
	1	12	22.25	22.25	22.04	1	24	22.43	22.40	22.09
	1	24	21.77	**22.47**	22.46	1	49	21.83	**22.53**	22.53
	12	0	21.57	21.26	21.61	25	0	21.65	21.33	21.76
	12	6	21.43	21.30	21.16	25	12	21.56	21.44	21.29
	12	13	21.49	21.43	21.27	25	25	21.51	21.49	21.35
	25	0	21.09	21.30	21.30	50	0	21.24	21.37	21.45

4.5.4 LTE Band 12

LTE Band 12 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	23.18	23.17	23.41	1	0	23.16	23.11	23.30
	1	2	23.17	23.14	**23.65**	1	7	23.08	23.18	**23.54**
	1	5	23.37	23.12	23.07	1	14	23.40	23.18	23.17
	3	0	23.13	23.18	23.31	8	0	22.14	22.28	22.48
	3	1	23.30	23.28	23.23	8	3	22.26	22.29	22.37
	3	3	23.33	23.27	23.36	8	7	22.23	22.17	22.34
	6	0	22.03	22.28	22.40	15	0	22.08	22.33	22.43
16QAM	1	0	22.38	21.36	22.36	1	0	22.41	21.40	22.36
	1	2	22.17	22.04	22.63	1	7	22.20	22.13	**22.65**
	1	5	**22.68**	22.15	21.97	1	14	22.60	22.26	22.15
	3	0	21.95	22.26	22.39	8	0	21.01	21.17	21.29
	3	1	22.18	22.22	22.34	8	3	21.25	21.22	21.35
	3	3	22.15	22.37	22.39	8	7	21.17	21.29	21.46
	6	0	21.28	21.14	21.48	15	0	21.29	21.13	21.34
Channel Bandwidth: 5 MHz						Channel Bandwidth: 10 MHz				
QPSK	1	0	23.16	23.11	23.46	1	0	23.22	23.27	23.50
	1	12	23.11	23.19	**23.63**	1	24	23.23	23.24	**23.71**
	1	24	23.28	23.07	23.19	1	49	23.45	23.27	23.22
	12	0	22.24	22.24	22.33	25	0	22.26	22.30	22.49
	12	6	22.21	22.22	22.21	25	12	22.35	22.33	22.39
	12	13	22.17	22.32	22.22	25	25	22.37	22.36	22.36
	25	0	22.16	22.36	22.30	50	0	22.17	22.40	22.43
16QAM	1	0	22.48	21.31	22.36	1	0	22.55	21.43	22.45
	1	12	22.20	22.05	**22.65**	1	24	22.26	22.15	**22.69**
	1	24	22.54	22.13	22.00	1	49	22.68	22.29	22.16
	12	0	21.00	21.24	21.27	25	0	21.15	21.32	21.41
	12	6	21.22	21.29	21.42	25	12	21.31	21.36	21.43
	12	13	21.16	21.19	21.43	25	25	21.33	21.39	21.46
	25	0	21.19	21.11	21.41	50	0	21.31	21.29	21.50

4.5.5 LTE Band 13

LTE Band 13 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	**23.94**	23.68	23.40	1	0	/	**23.71**	/
	1	12	23.49	23.48	23.27	1	24	/	23.57	/
	1	24	23.72	23.52	23.37	1	49	/	23.53	/
	12	0	22.75	22.75	22.69	25	0	/	22.75	/
	12	6	22.64	22.57	22.61	25	12	/	22.69	/
	12	13	22.57	22.49	22.65	25	25	/	22.68	/
	25	0	22.63	22.58	22.65	50	0	/	22.73	/
16QAM	1	0	22.51	22.76	22.18	1	0	/	22.86	/
	1	12	22.45	**22.99**	22.19	1	24	/	**22.99**	/
	1	24	22.71	22.72	22.05	1	49	/	22.75	/
	12	0	21.64	21.53	21.49	25	0	/	21.65	/
	12	6	21.52	21.58	21.61	25	12	/	21.66	/
	12	13	21.50	21.45	21.63	25	25	/	21.54	/
	25	0	21.61	21.60	21.75	50	0	/	21.63	/

4.5.6 LTE Band 17

LTE Band 17 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	23.53	23.62	23.85	1	0	23.67	23.65	23.85
	1	12	23.80	23.64	**23.91**	1	24	23.94	23.79	**23.98**
	1	24	23.68	23.83	23.81	1	49	23.88	23.84	23.83
	12	0	22.72	22.76	22.53	25	0	22.81	22.76	22.71
	12	6	22.68	22.74	22.62	25	12	22.83	22.79	22.72
	12	13	22.68	22.65	22.70	25	25	22.77	22.73	22.73
	25	0	22.62	22.56	22.75	50	0	22.71	22.64	22.81
16QAM	1	0	22.50	22.79	22.42	1	0	22.59	22.80	22.56
	1	12	22.84	22.78	22.66	1	24	22.89	22.94	22.71
	1	24	**22.93**	22.85	22.40	1	49	23.02	**23.03**	22.40
	12	0	21.64	21.65	21.70	25	0	21.77	21.65	21.76
	12	6	21.75	21.66	21.62	25	12	21.79	21.68	21.79
	12	13	21.71	21.70	21.80	25	25	21.77	21.71	21.82
	25	0	21.72	21.57	21.69	50	0	21.82	21.64	21.73

Pre-scan all bandwidth and RB, find worse case mode are chosen to the report, the 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	2	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	☐	☒	☒	☒
	4	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	☐	☒	☒	☒
	5	☒	☒	☒	☒	--	--	☒	☒	☐	☒	☐	☐	☒	☒	☒
	12	☒	☒	☒	☒	-	-	☒	☒	☐	☒	☐	☐	☒	☒	☒
	13	-	-	☒	☒	-	-	☒	☒	☐	☒	☐	☐	☒	☒	☒
	17	-	-	☒	☒	-	-	☒	☒	☐	☒	☐	☐	☒	☒	☒
Conducted output power	2	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☒	☒	☒	☒
	4	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☒	☒	☒	☒
	5	☒	☒	☒	☒	--	--	☒	☒	☐	☒	☒	☒	☒	☒	☒
	12	☒	☒	☒	☒	-	-	☒	☒	☐	☒	☒	☒	☒	☒	☒
	13	-	-	☒	☒	-	-	☒	☒	☐	☒	☒	☒	☒	☒	☒
	17	-	-	☒	☒	-	-	☒	☒	☐	☒	☒	☒	☒	☒	☒

Item	Band	Bandwidth(MHz)						Modulation			RB			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	64QAM	1	Half	Full	L	M	H
99%&26dB Bandwidth	2	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☐	☒	☒	☒	☒
	4	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☐	☒	☒	☒	☒
	5	☒	☒	☒	☒	--	--	☒	☒	☐	☐	☐	☒	☒	☒	☒
	12	☒	☒	☒	☒	-	-	☒	☒	☐	☐	☐	☒	☒	☒	☒
	13	-	-	☒	☒	-	-	☒	☒	☐	☐	☐	☒	☒	☒	☒
	17	-	-	☒	☒	-	-	☒	☒	☐	☐	☐	☒	☒	☒	☒
peak-to-average ratio	2	☐	☐	☐	☐	☐	☒	☒	☒	☐	☒	☐	☒	☒	☐	☒
	4	☐	☐	☐	☐	☐	☒	☒	☒	☐	☒	☐	☒	☒	☐	☒
	5	☐	☐	☐	☒	--	--	☒	☒	☐	☒	☐	☒	☒	☐	☒
	12	☐	☐	☐	☒	-	-	☒	☒	☐	☒	☐	☒	☒	☐	☒
	13	-	-	☐	☒	-	-	☒	☒	☐	☒	☐	☒	☒	☐	☒
	17	-	-	☐	☒	-	-	☒	☒	☐	☒	☐	☒	☒	☐	☒

Item	Band	Bandwidth(MHz)						Modulation			RB			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	64QAM	1	Half	Full	L	M	H
Band Edge at antenna terminals	2	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	☒	☒	☐	☒
	4	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	☒	☒	☐	☒
	5	☒	☒	☒	☒	--	--	☒	☒	☐	☒	☐	☒	☒	☐	☒
	12	☒	☒	☒	☒	-	-	☒	☒	☐	☒	☐	☒	☒	☐	☒
	13	-	-	☒	☒	-	-	☒	☒	☐	☒	☐	☒	☒	☐	☒
	17	-	-	☒	☒	-	-	☒	☒	☐	☒	☐	☒	☒	☐	☒
Spurious emissions at antenna terminals	2	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	☐	☒	☒	☒
	4	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	☐	☒	☒	☒
	5	☒	☒	☒	☒	--	--	☒	☒	☐	☒	☐	☐	☒	☒	☒
	12	☒	☒	☒	☒	-	-	☒	☒	☐	☒	☐	☐	☒	☒	☒
	13	-	-	☒	☒	-	-	☒	☒	☐	☒	☐	☐	☒	☒	☒
	17	-	-	☒	☒	-	-	☒	☒	☐	☒	☐	☐	☒	☒	☒

Item	Band	Bandwidth(MHz)						Modulation			RB			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	64QAM	1	Half	Full	L	M	H
Field strength of spurious radiation	2	☐	☐	☐	☐	☐	☒	☒	☐	☐	☒	☐	☐	☒	☒	☒
	4	☐	☐	☐	☐	☐	☒	☒	☐	☐	☒	☐	☐	☒	☒	☒
	5	☐	☐	☐	☒	--	--	☒	☐	☐	☒	☐	☐	☒	☒	☒
	12	☐	☐	☐	☒	-	-	☒	☐	☐	☒	☐	☐	☒	☒	☒
	13	-	-	☐	☒	-	-	☒	☐	☐	☒	☐	☐	☒	☒	☒
	17	-	-	☐	☒	-	-	☒	☐	☐	☒	☐	☐	☒	☒	☒
Frequency stability	2	☐	☐	☐	☐	☐	☒	☒	☐	☐	☐	☐	☒	☐	☒	☐
	4	☐	☐	☐	☐	☐	☒	☒	☐	☐	☐	☐	☒	☐	☒	☐
	5	☐	☐	☐	☒	--	--	☒	☐	☐	☐	☐	☒	☐	☒	☐
	12	☐	☐	☐	☒	-	-	☒	☐	☐	☐	☐	☒	☐	☒	☐
	13	-	-	☐	☒	-	-	☒	☐	☐	☐	☐	☒	☐	☒	☐
	17	-	-	☐	☒	-	-	☒	☐	☐	☐	☐	☒	☐	☒	☐

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	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 22	Public Mobile Services
3	FCC 47 CFR Part 27	Miscellaneous Wireless Communications Services
4	FCC 47 CFR Part 24	Personal Communications Services
5	FCC 47 CFR Part 90	Private Land Mobile Radio Services
6	ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
7	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 2 FCC 47 CFR Part 24.232(c)
LTE Band 4 FCC 47 CFR Part 27.50(d)(4)
LTE Band 5 FCC 47 CFR Part 22.913(a)
LTE Band 12&17 FCC 47 CFR Part 27.50(c)(10)
LTE Band 13 FCC 47 CFR Part 27.50(b)(10)

Test Method: KDB 971168 D01v03r01 Section 5.6 & ANSI C63.26-2015

Limit:

FCC 47 CFR Part 22.913(a):
The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

FCC 47 CFR Part 24.232(c):
Mobile and portable stations are limited to 2 watts EIRP.

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(c)(10):
Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

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.

FCC 47 CFR Part 27.50(b)(10):
Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

Test Procedure:

$$\text{ERP or EIRP} = P_{Meas} + G_T - L_C$$

where:
ERP or EIRP = effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);
P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;
G_T = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);
1) L_C = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

Test Setup: Refer to section 4.2.1 for details.

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 2

LTE Band 2 Maximum EIRP (dBm)					
Channel	QPSK; RB:1	16QAM; RB:1	64QAM; RB:1	Limit (dBm)	Result
Channel Bandwidth: 1.4MHz					
Lowest	25.34	24.58	/	33.01	Pass
Middle	25.62	24.40	/	33.01	Pass
Highest	25.32	24.69	/	33.01	Pass
Channel Bandwidth: 3MHz					
Lowest	25.32	24.47	/	33.01	Pass
Middle	25.55	24.40	/	33.01	Pass
Highest	25.22	24.81	/	33.01	Pass
Channel Bandwidth: 5MHz					
Lowest	25.38	24.63	/	33.01	Pass
Middle	25.61	24.45	/	33.01	Pass
Highest	25.24	24.64	/	33.01	Pass
Channel Bandwidth: 10MHz					
Lowest	25.44	24.54	/	33.01	Pass
Middle	25.72	24.37	/	33.01	Pass
Highest	25.24	24.81	/	33.01	Pass
Channel Bandwidth: 15MHz					
Lowest	25.46	24.62	/	33.01	Pass
Middle	25.68	24.45	/	33.01	Pass
Highest	25.24	24.73	/	33.01	Pass
Channel Bandwidth: 20MHz					
Lowest	25.49	24.63	/	33.01	Pass
Middle	25.73	24.46	/	33.01	Pass
Highest	25.29	24.83	/	33.01	Pass

5.2.2 LTE Band 4

LTE Band 4 Maximum EIRP (dBm)					
Channel	QPSK; RB:1	16QAM; RB:1	64QAM; RB:1	Limit (dBm)	Result
Channel Bandwidth: 1.4MHz					
Lowest	25.42	24.49	/	30.00	Pass
Middle	25.48	24.55	/	30.00	Pass
Highest	25.39	24.37	/	30.00	Pass
Channel Bandwidth: 3MHz					
Lowest	25.42	24.52	/	30.00	Pass
Middle	25.49	24.56	/	30.00	Pass
Highest	25.52	24.39	/	30.00	Pass
Channel Bandwidth: 5MHz					
Lowest	25.47	24.58	/	30.00	Pass
Middle	25.42	24.60	/	30.00	Pass
Highest	25.44	24.36	/	30.00	Pass
Channel Bandwidth: 10MHz					
Lowest	25.47	24.56	/	30.00	Pass
Middle	25.46	24.48	/	30.00	Pass
Highest	25.41	24.43	/	30.00	Pass
Channel Bandwidth: 15MHz					
Lowest	25.46	24.48	/	30.00	Pass
Middle	25.53	24.50	/	30.00	Pass
Highest	25.38	25.39	/	30.00	Pass
Channel Bandwidth: 20MHz					
Lowest	25.50	24.63	/	30.00	Pass
Middle	25.58	24.61	/	30.00	Pass
Highest	25.55	24.49	/	30.00	Pass

5.2.3 LTE Band 5

LTE Band 5 Maximum ERP (dBm)					
Channel	QPSK; RB:1	16QAM; RB:1	64QAM; RB:1	Limit (dBm)	Result
Channel Bandwidth: 1.4MHz					
Lowest	20.18	20.24	/	38.45	Pass
Middle	20.35	19.35	/	38.45	Pass
Highest	20.23	19.47	/	38.45	Pass
Channel Bandwidth: 3MHz					
Lowest	20.19	19.28	/	38.45	Pass
Middle	20.44	19.33	/	38.45	Pass
Highest	20.24	19.35	/	38.45	Pass
Channel Bandwidth: 5MHz					
Lowest	20.25	19.15	/	38.45	Pass
Middle	20.48	19.32	/	38.45	Pass
Highest	20.32	19.31	/	38.45	Pass
Channel Bandwidth: 10MHz					
Lowest	20.29	19.28	/	38.45	Pass
Middle	20.50	19.38	/	38.45	Pass
Highest	20.35	19.38	/	38.45	Pass

5.2.4 LTE Band 12

LTE Band 12 Maximum ERP (dBm)					
Channel	QPSK; RB:1	16QAM; RB:1	64QAM; RB:1	Limit (dBm)	Result
Channel Bandwidth: 1.4MHz					
Lowest	20.22	19.53	/	34.77	Pass
Middle	20.13	19.11	/	34.77	Pass
Highest	20.50	19.48	/	34.77	Pass
Channel Bandwidth: 3MHz					
Lowest	20.25	19.45	/	34.77	Pass
Middle	20.03	19.11	/	34.77	Pass
Highest	20.39	19.50	/	34.77	Pass
Channel Bandwidth: 5MHz					
Lowest	20.13	19.39	/	34.77	Pass
Middle	20.04	18.99	/	34.77	Pass
Highest	20.48	19.50	/	34.77	Pass
Channel Bandwidth: 10MHz					
Lowest	20.30	19.53	/	34.77	Pass
Middle	20.15	19.14	/	34.77	Pass
Highest	20.56	19.54	/	34.77	Pass

5.2.5 LTE Band 13

LTE Band 13 Maximum ERP (dBm)					
Channel	QPSK; RB:1	16QAM; RB:1	64QAM; RB:1	Limit (dBm)	Result
Channel Bandwidth: 5MHz					
Lowest	20.79	19.56	/	34.77	Pass
Middle	20.53	19.84	/	34.77	Pass
Highest	20.25	19.04	/	34.77	Pass
Channel Bandwidth: 10MHz					
Lowest	/	/	/	34.77	Pass
Middle	20.56	19.84	/	34.77	Pass
Highest	/	/	/	34.77	Pass

5.2.6 LTE Band 17

LTE Band 13 Maximum ERP (dBm)					
Channel	QPSK; RB:1	16QAM; RB:1	64QAM; RB:1	Limit (dBm)	Result
Channel Bandwidth: 5MHz					
Lowest	20.65	19.78	/	34.77	Pass
Middle	20.68	19.70	/	34.77	Pass
Highest	20.76	19.51	/	34.77	Pass
Channel Bandwidth: 10MHz					
Lowest	20.79	19.87	/	34.77	Pass
Middle	20.69	19.88	/	34.77	Pass
Highest	20.83	19.56	/	34.77	Pass

5.3 CONDUCTED OUTPUT POWER

Test Requirement:
FCC 47 CFR Part 2.1046(a)
LTE Band 2: FCC 47 CFR Part 24.232(c)
LTE Band 4: FCC 47 CFR Part 27.50(d)(4)
LTE Band 5: FCC 47 CFR Part 22.913(a)
LTE Band 7: FCC 47 CFR Part 27.50(h)(2)
LTE Band 12&17: FCC 47 CFR Part 27.50(c)(10)
LTE Band 13: FCC 47 CFR Part 27.50(b)(10)

Test Method: KDB 971168 D01v03r01 & ANSI C63.26-2015

Limit:

FCC 47 CFR Part 22.913(a):
The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

FCC 47 CFR Part 24.232(c):
Mobile and portable stations are limited to 2 watts EIRP.

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(c)(10):
Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

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.

FCC 47 CFR Part 27.50(b)(10):
Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

Test Procedure:
The EUT was set up for the maximum power with 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 2:** FCC 47 CFR Part 24.232(d)
LTE Band 4: FCC 47 CFR Part 27.50(d)(5)
LTE Band 5: FCC 47 CFR Part 22.913(a)
LTE Band 7: FCC 47 CFR Part 27.50(d)(5)
LTE Band 12&17: FCC 47 CFR Part 27.50(d)(5)
LTE Band 13: FCC 47 CFR Part 27.50(d)(5)

Test Method: KDB 971168 D01v03r01 Section 5.7

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.

a) Set resolution/measurement bandwidth ≥ signal's occupied bandwidth
b) Set the number of counts to a value that stabilizes the measured CCDF curve
c) 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 2

LTE Band 2 Peak-to-average ratio (dB)						
Channel	RB Configuration	Channel Bandwidth: 20 MHz			Limit (dB)	Result
		QPSK	16QAM	64QAM		
Lowest	1 RB	3.04	3.71	/	13	Pass
	Full RB	2.96	5.39	/	13	Pass
Middle	1 RB	4.58	5.62	/	13	Pass
	Full RB	4.75	5.77	/	13	Pass
Highest	1 RB	3.77	4.81	/	13	Pass
	Full RB	4.64	5.39	/	13	Pass