

RADIO TEST REPORT

(EN 301 908-1)

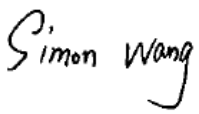

Applicant:	Particle Industries, Inc
Address:	325 9th Street, San Francisco, CA 94103, United States Of America

Manufacturer or Supplier	Particle Industries, Inc
Address	325 9th Street, San Francisco, CA 94103, United States Of America
Product	M SoM
Brand Name	Particle
Model Name	M404
Date of tests	Dec. 27, 2023 ~ Jan. 02, 2024

The tests have been carried out according to the requirements of the following standard:

ETSI EN 301 908-1 V15.2.1(2023-01)

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Prepared by Simon Wang Engineer / Mobile Department	Approved by Luke Lu Manager / Mobile Department
 Date: Jan. 02, 2024	 Date: Jan. 02, 2024

This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.



TABLE OF CONTENTS

RELEASE CONTROL RECORD	3
1 SUMMARY OF TEST RESULTS	4
1.1 TEST INSTRUMENTS	5
1.2 MEASUREMENT UNCERTAINTY	6
2 GENERAL INFORMATION.....	7
2.1 GENERAL DESCRIPTION OF EUT.....	7
2.2 CONDUCTED POWER.....	9
2.3 DESCRIPTION OF TEST MODES.....	21
2.4 GENERAL DESCRIPTION OF APPLIED STANDARDS	22
2.5 DESCRIPTION OF SUPPORT UNITS.....	22
2.6 CONFIGURATION OF SYSTEM UNDER TEST	22
3 TEST TYPES AND RESULTS	23
3.1 RADIATED SPURIOUS EMISSIONS – IN LINK MODE.....	23
3.1.1 LIMIT OF RADIATED SPURIOUS EMISSIONS – IN LINK MODE	23
3.1.2 TEST PROCEDURES	23
3.1.3 TEST SETUP.....	23
3.1.4 DEVIATION FROM TEST STANDARD	23
3.1.5 TEST RESULTS	24
3.2 CONTROL AND MONITORING FUNCTIONS (UE).....	29
3.2.1 LIMIT OF CONTROL AND MONITORING FUNCTIONS (UE)	29
3.2.2 TEST PROCEDURES	29
3.2.3 TEST SETUP	29
3.2.4 DEVIATION FROM TEST STANDARD	29
3.2.5 TEST RESULTS	30
3.3 RADIATED SPURIOUS EMISSIONS – IN IDLE MODE.....	31
3.3.1 LIMIT OF RADIATED SPURIOUS EMISSIONS – IN IDLE MODE	31
3.3.2 TEST PROCEDURES	31
3.3.3 TEST SETUP.....	31
3.3.4 DEVIATION FROM TEST STANDARD	31
3.3.5 TEST RESULTS	32
4 PHOTOGRAPHS OF THE TEST CONFIGURATION	37
5 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB	38



BUREAU Test Report No.: W7L-P23120015RE02
VERITAS

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
W7L-P23120015RE02	Original release	Jan. 02, 2024



1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: EN 301 908-1 V15.2.1			
STANDARD SUBCLAUSE	TEST TYPE AND LIMIT	REMARKS	PASS/FAIL
CROSS REFERENCES FOR USER EQUIPMENT (UE)			
4.2.2	Radiated emissions	Applicable	Pass
4.2.4	Control and monitoring functions	Applicable	Pass
CROSS REFERENCES FOR BASE STATIONS (BS) AND REPEATERS			
4.2.3	Radiated emissions	Not Applicable	NA
APPLIED STANDARD: EN 301 908-13 V13.2.1			
The detail information of the data please refer to the FTA report: R2304A0438-R2V2			



1.1 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal Pre-Amplifier	EMSI	EMC 02325	980224	May. 06,23	May.05,24
Signal Pre-Amplifier	EMSI	EMC 012645B	980258	Aug. 11,23	Aug. 10,24
3m Fully-anechoic Chamber	ETS-LINDGREN	10m*10m*5m	Euroshieldpn-CT0001143-1217	Nov. 13,23	Nov. 12,26
RS Antenna_LF	Rohde&Schwarz	R&S® HL046E	HL064E	NA	NA
Horn Antenna	ETS-LINDGREN	3117	00168692	Feb. 18,23	Feb. 17,24
EXA Signal Analyzer	KEYSIGHT	N9010A-544	MY54510032	Feb. 14,23	Feb. 13,24
Radio Communication Analyzer	ANRITSU	MT8820C	6201465425	Feb. 14,23	Feb. 13,24
DC Source	Kikusui/JP	PMX18-5A	N/A	Aug. 11,23	Aug. 10,24
Test Software	JS1120	3.1.36	N/A	N/A	N/A
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A
Bilog Antenna	ETS-LINDGREN	3143B	00161965	Feb. 18,23	Feb. 17,24
Horn Antenna	ETS-LINDGREN	3117	00168728	Nov. 30,23	Nov. 29,24
Base station R&S CMW500	Rohde&Schwarz	CMW500	153085	May.10,23	May.09,24

NOTE:

1. The calibration interval of the above test instruments is 12 and 36 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
2. The test was performed in 3m Fully-anechoic Chamber.
3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.



1.2 MEASUREMENT UNCERTAINTY

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated and shall correspond to an expansion factor (coverage factor) $k = 1,96$ (which provides a confidence level of 95 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)). Principles for the calculation of measurement uncertainty are contained in ETSI TR 100 028 [i.3], in particular in annex D of the ETSI TR 100 028-2 [i.3].

Tables 5.2-1 and 5.2-2 are based on such expansion factors.

Table 5.2-1: Maximum measurement uncertainty (UE)

Parameter	Uncertainty
Effective radiated RF power between 30 MHz and 180 MHz	± 6 dB
Effective radiated RF power between 180 MHz and 12,75 GHz	± 3 dB
Conducted RF power	± 1 dB



2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	M SoM
BRAND NAME	Particle
MODEL NAME	M404
NOMINAL VOLTAGE	VCC: 3.8V. 3V3:3.3V
MODULATION TYPE	QPSK,16QAM
RADIO TECHNOLOGY	LTE FDD/ LTE TDD
OPERATING FREQUENCY	LTE Band 1 Tx: 1922.5 ~ 1977.5MHz Rx: 2112.5 ~ 2167.5MHz LTE Band 3 Tx: 1710.7 ~ 1784.3MHz Rx: 1805.7 ~ 1879.3MHz LTE Band 8 Tx: 880.7 ~ 914.3MHz Rx: 925.7 ~ 959.3MHz LTE Band 20 Tx : 834.5 ~ 859.5MHz Rx : 793.5 ~ 818.5MHz LTE Band 28 : Tx: 704.5 ~ 746.5MHz Rx : 759.5~801.5MHz
ANTENNA TYPE	Fixed External Antenna



MAX. ANTENNA GAIN	LTE Band 1 : 5.3dBi LTE Band 3 : 5.3dBi LTE Band 8 : 2.8dBi LTE Band 20 : 2.8dBi LTE Band 28 : 2.8dBi
HW VERSION	v0.2
SW VERSION	v5.5.2
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
3. Antenna gain and EUT conducted cable loss are provided by the customer, and the laboratory will record the results based on these items that involve these two parameters.



2.2 CONDUCTED POWER

LTE Band 1

Band/BW	Modulation	RB Size	RB Offset	Low CH 18025	Mid CH 18300	High CH 18575
				Frequency 1922.5 MHz	Frequency 1950 MHz	Frequency 1977.5 MHz
1/5	QPSK	1	0	23.19	23.10	23.00
		1	5	23.15	23.15	23.03
		3	0	23.14	23.09	23.06
		3	3	23.09	23.09	23.03
		6	0	22.05	22.06	22.00
	16QAM	1	0	23.15	23.05	23.07
		1	5	23.11	23.10	22.97
		3	0	23.11	23.13	23.02
		3	3	23.09	23.10	23.00
		5	0	22.18	22.09	22.00

Band/BW	Modulation	RB Size	RB Offset	Low CH 18050	Mid CH 18300	High CH 18550
				Frequency 1925 MHz	Frequency 1950 MHz	Frequency 1975 MHz
1/10	QPSK	1	0	23.10	23.24	22.98
		1	5	23.18	23.12	22.95
		3	0	23.16	23.21	22.97
		3	3	23.14	23.18	23.01
		6	0	22.16	22.05	21.95
	16QAM	1	0	23.11	23.05	23.06
		1	5	23.13	23.03	23.01
		3	0	23.07	23.06	23.04
		3	3	23.06	23.15	23.01
		5	0	22.09	22.05	22.00



Band/BW	Modulation	RB Size	RB Offset	Low CH 18075	Mid CH 18300	High CH 18525
				Frequency 1927.5 MHz	Frequency 1950 MHz	Frequency 1972.5 MHz
1/ 15	QPSK	1	0	23.19	23.20	22.97
		1	5	23.13	23.13	23.02
		3	0	23.11	23.15	23.04
		3	3	23.19	23.13	23.08
		6	0	22.09	22.07	22.06
	16QAM	1	0	23.13	23.08	23.09
		1	5	23.13	23.04	22.98
		3	0	23.13	23.07	22.99
		3	3	23.09	23.15	23.01
		5	0	22.06	22.05	21.99

Band/BW	Modulation	RB Size	RB Offset	Low CH 18100	Mid CH 18300	High CH 18500
				Frequency 1930 MHz	Frequency 1950 MHz	Frequency 1970 MHz
1/ 20	QPSK	1	0	23.23	23.25	23.12
		1	5	23.21	23.23	23.10
		3	0	23.20	23.22	23.11
		3	3	23.21	23.20	23.09
		6	0	22.18	22.19	22.10
	16QAM	1	0	23.22	23.20	23.10
		1	5	23.20	23.18	23.08
		3	0	23.18	23.21	23.08
		3	3	23.18	23.20	23.09
		5	0	22.19	22.17	22.07



LTE Band 3

Band/BW	Modulation	RB Size	RB Offset	Low CH 19207	Mid CH 19575	High CH 19943
				Frequency 1710.7 MHz	Frequency 1747.5 MHz	Frequency 1784.3 MHz
3/ 1.4	QPSK	1	0	23.51	23.47	23.41
		1	5	23.43	23.51	23.43
		3	0	23.57	23.43	23.47
		3	3	23.55	23.41	23.45
		6	0	22.44	22.39	22.42
	16QAM	1	0	23.50	23.44	23.38
		1	5	23.44	23.41	23.47
		3	0	23.45	23.40	23.48
		3	3	23.49	23.42	23.34
		5	0	22.49	22.50	22.37

Band/BW	Modulation	RB Size	RB Offset	Low CH 19215	Mid CH 19575	High CH 19935
				Frequency 1711.5 MHz	Frequency 1747.5 MHz	Frequency 1783.5 MHz
3/ 3	QPSK	1	0	23.58	23.51	23.44
		1	5	23.55	23.47	23.45
		3	0	23.48	23.46	23.44
		3	3	23.55	23.50	23.50
		6	0	22.55	22.46	22.43
	16QAM	1	0	23.52	23.46	23.47
		1	5	23.55	23.48	23.45
		3	0	23.50	23.50	23.41
		3	3	23.40	23.49	23.42
		5	0	22.46	22.48	22.43



Band/BW	Modulation	RB Size	RB Offset	Low CH 19225	Mid CH 19575	High CH 19925
				Frequency 1712.5 MHz	Frequency 1747.5 MHz	Frequency 1782.5 MHz
3/ 5	QPSK	1	0	23.50	23.48	23.41
		1	5	23.44	23.53	23.39
		3	0	23.44	23.48	23.35
		3	3	23.52	23.40	23.44
		6	0	22.46	22.46	22.43
	16QAM	1	0	23.44	23.44	23.38
		1	5	23.55	23.46	23.42
		3	0	23.55	23.40	23.45
		3	3	23.42	23.51	23.44
		5	0	22.39	22.45	22.36

Band/BW	Modulation	RB Size	RB Offset	Low CH 19250	Mid CH 19575	High CH 19900
				Frequency 1715 MHz	Frequency 1747.5 MHz	Frequency 1780 MHz
3/ 10	QPSK	1	0	23.51	23.46	23.46
		1	5	23.46	23.46	23.46
		3	0	23.57	23.46	23.49
		3	3	23.43	23.51	23.49
		6	0	22.49	22.40	22.44
	16QAM	1	0	23.44	23.49	23.40
		1	5	23.47	23.38	23.39
		3	0	23.45	23.49	23.49
		3	3	23.44	23.51	23.36
		5	0	22.46	22.53	22.43



Band/BW	Modulation	RB Size	RB Offset	Low CH 19275	Mid CH 19575	High CH 19875
				Frequency 1717.5 MHz	Frequency 1747.5 MHz	Frequency 1777.5 MHz
3/ 15	QPSK	1	0	23.58	23.44	23.44
		1	5	23.50	23.44	23.41
		3	0	23.46	23.50	23.38
		3	3	23.48	23.41	23.46
		6	0	22.42	22.48	22.43
	16QAM	1	0	23.52	23.45	23.46
		1	5	23.45	23.39	23.40
		3	0	23.46	23.49	23.49
		3	3	23.52	23.37	23.43
		5	0	22.45	22.41	22.46

Band/BW	Modulation	RB Size	RB Offset	Low CH 19300	Mid CH 19575	High CH 19850
				Frequency 1720 MHz	Frequency 1747.5 MHz	Frequency 1775 MHz
3/ 20	QPSK	1	0	23.60	23.57	23.53
		1	5	23.58	23.55	23.52
		3	0	23.58	23.53	23.50
		3	3	23.57	23.54	23.52
		6	0	22.56	22.52	22.54
	16QAM	1	0	23.58	23.56	23.51
		1	5	23.56	23.53	23.50
		3	0	23.57	23.55	23.52
		3	3	23.53	23.52	23.47
		5	0	22.54	22.54	22.49



LTE band 8

Band/BW	Modulation	RB Size	RB Offset	Low CH 21457	Mid CH 21625	High CH 21793
				Frequency 880.7 MHz	Frequency 897.5 MHz	Frequency 914.3 MHz
8/ 1.4	QPSK	1	0	23.62	23.66	23.62
		1	5	23.61	23.71	23.59
		3	0	23.64	23.65	23.53
		3	3	23.55	23.60	23.58
		6	0	22.55	22.62	22.54
	16QAM	1	0	23.64	23.71	23.56
		1	5	23.54	23.61	23.61
		3	0	23.58	23.70	23.62
		3	3	23.54	23.67	23.63
		5	0	22.64	22.66	22.57

Band/BW	Modulation	RB Size	RB Offset	Low CH 21465	Mid CH 21625	High CH 21785
				Frequency 881.5 MHz	Frequency 897.5 MHz	Frequency 913.5 MHz
8/ 3	QPSK	1	0	23.55	23.59	23.67
		1	5	23.65	23.74	23.65
		3	0	23.58	23.72	23.58
		3	3	23.64	23.60	23.56
		6	0	22.63	22.70	22.59
	16QAM	1	0	23.58	23.62	23.64
		1	5	23.64	23.58	23.49
		3	0	23.66	23.70	23.62
		3	3	23.54	23.60	23.49
		5	0	22.60	22.60	22.62



Band/BW	Modulation	RB Size	RB Offset	Low CH 21475	Mid CH 21625	High CH 21775
				Frequency 882.5 MHz	Frequency 897.5 MHz	Frequency 912.5 MHz
8/ 5	QPSK	1	0	23.64	23.72	23.58
		1	5	23.67	23.73	23.54
		3	0	23.65	23.60	23.66
		3	3	23.63	23.60	23.63
		6	0	22.55	22.62	22.61
	16QAM	1	0	23.54	23.73	23.59
		1	5	23.59	23.57	23.54
		3	0	23.58	23.65	23.61
		3	3	23.59	23.65	23.49
		5	0	22.58	22.60	22.52

Band/BW	Modulation	RB Size	RB Offset	Low CH 21500	Mid CH 21625	High CH 21750
				Frequency 885 MHz	Frequency 897.5 MHz	Frequency 910 MHz
8/ 10	QPSK	1	0	23.70	23.74	23.68
		1	5	23.71	23.76	23.66
		3	0	23.70	23.75	23.67
		3	3	23.68	23.74	23.64
		6	0	22.69	22.75	22.65
	16QAM	1	0	23.68	23.74	23.66
		1	5	23.67	23.72	23.63
		3	0	23.69	23.73	23.65
		3	3	23.65	23.70	23.64
		5	0	22.65	22.72	22.63



LTE band 20

Band/BW	Modulation	RB Size	RB Offset	Low CH 24175	Mid CH 24300	High CH 24425
				Frequency 834.5 MHz	Frequency 847 MHz	Frequency 859.5 MHz
20/ 5	QPSK	1	0	23.47	23.40	23.26
		1	5	23.50	23.40	23.41
		3	0	23.41	23.31	23.35
		3	3	23.41	23.36	23.34
		6	0	22.37	22.34	22.30
	16QAM	1	0	23.39	23.38	23.34
		1	5	23.41	23.39	23.29
		3	0	23.46	23.40	23.23
		3	3	23.45	23.32	23.27
		5	0	22.44	22.32	22.31

Band/BW	Modulation	RB Size	RB Offset	Low CH 24200	Mid CH 24300	High CH 24400
				Frequency 837 MHz	Frequency 847 MHz	Frequency 857 MHz
20/ 10	QPSK	1	0	23.38	23.37	23.26
		1	5	23.44	23.43	23.36
		3	0	23.38	23.29	23.30
		3	3	23.46	23.37	23.31
		6	0	22.47	22.39	22.27
	16QAM	1	0	23.41	23.40	23.38
		1	5	23.41	23.39	23.34
		3	0	23.36	23.38	23.35
		3	3	23.46	23.30	23.30
		5	0	22.45	22.41	22.35



Band/BW	Modulation	RB Size	RB Offset	Low CH 24225	Mid CH 24300	High CH 24375
				Frequency 839.5 MHz	Frequency 847 MHz	Frequency 854.5 MHz
20/ 15	QPSK	1	0	23.46	23.29	23.38
		1	5	23.39	23.37	23.30
		3	0	23.32	23.31	23.29
		3	3	23.40	23.44	23.38
		6	0	22.43	22.38	22.32
	16QAM	1	0	23.34	23.35	23.35
		1	5	23.43	23.40	23.40
		3	0	23.38	23.31	23.30
		3	3	23.46	23.35	23.38
		5	0	22.41	22.34	22.32

Band/BW	Modulation	RB Size	RB Offset	Low CH 24250	Mid CH 24300	High CH 24350
				Frequency 842 MHz	Frequency 847 MHz	Frequency 852 MHz
20/ 20	QPSK	1	0	23.48	23.44	23.40
		1	5	23.51	23.46	23.42
		3	0	23.47	23.43	23.38
		3	3	23.50	23.45	23.40
		6	0	22.48	22.41	22.39
	16QAM	1	0	23.47	23.44	23.39
		1	5	23.50	23.45	23.41
		3	0	23.49	23.43	23.38
		3	3	23.48	23.41	23.39
		5	0	22.47	22.42	22.40



LTE band 28

Band/BW	Modulation	RB Size	RB Offset	Low CH (27225)	Mid CH (27375)	High CH (27645)
				Frequency (704.5)MHz	Frequency (719.5)MHz	Frequency (746.5)MHz
28/ 3	QPSK	1	0	23.60	23.50	23.52
		1	5	23.60	23.45	23.52
		3	0	23.51	23.42	23.57
		3	3	23.52	23.44	23.47
		6	0	22.57	22.54	22.59
	16QAM	1	0	23.53	23.40	23.57
		1	5	23.48	23.48	23.49
		3	0	23.49	23.42	23.55
		3	3	23.44	23.49	23.57
		5	0	22.54	22.43	22.53

Band/BW	Modulation	RB Size	RB Offset	Low CH (27235)	Mid CH (27385)	High CH (27635)
				Frequency (705.5)MHz	Frequency (720.5)MHz	Frequency (745.5)MHz
28/ 5	QPSK	1	0	23.50	23.44	23.59
		1	5	23.58	23.50	23.61
		3	0	23.58	23.51	23.48
		3	3	23.54	23.46	23.56
		6	0	22.48	22.43	22.55
	16QAM	1	0	23.53	23.47	23.49
		1	5	23.54	23.48	23.53
		3	0	23.44	23.51	23.57
		3	3	23.52	23.41	23.53
		5	0	22.43	22.39	22.51



Band/BW	Modulation	RB Size	RB Offset	Low CH (27260)	Mid CH (27410)	High CH (27610)
				Frequency (708)MHz	Frequency (723)MHz	Frequency (743)MHz
28/ 10	QPSK	1	0	23.61	23.40	23.46
		1	5	23.54	23.49	23.50
		3	0	23.53	23.43	23.49
		3	3	23.54	23.50	23.58
		6	0	22.48	22.44	22.48
	16QAM	1	0	23.57	23.46	23.54
		1	5	23.54	23.50	23.59
		3	0	23.42	23.43	23.56
		3	3	23.54	23.47	23.58
		5	0	22.43	22.47	22.48

Band/BW	Modulation	RB Size	RB Offset	Low CH (27285)	Mid CH (27435)	High CH (27585)
				Frequency (710.5)MHz	Frequency (725.5)MHz	Frequency (740.5)MHz
28/ 15	QPSK	1	0	23.52	23.41	23.58
		1	5	23.59	23.47	23.56
		3	0	23.58	23.50	23.59
		3	3	23.46	23.47	23.49
		6	0	22.55	22.41	22.51
	16QAM	1	0	23.51	23.49	23.44
		1	5	23.55	23.43	23.57
		3	0	23.52	23.47	23.54
		3	3	23.44	23.48	23.54
		5	0	22.46	22.45	22.54



Band/BW	Modulation	RB Size	RB Offset	Low CH 27310	Mid CH 27460	High CH (27560)
				Frequency (713)MHz	Frequency (728)MHz	Frequency (738)MHz
28/ 20	QPSK	1	0	23.63	23.55	23.61
		1	5	23.65	23.58	23.63
		3	0	23.60	23.56	23.60
		3	3	23.61	23.56	23.61
		6	0	22.61	22.55	22.60
	16QAM	1	0	23.60	23.54	23.59
		1	5	23.62	23.56	23.61
		3	0	23.57	23.55	23.60
		3	3	23.59	23.53	23.61
		5	0	22.58	22.54	22.59



2.3 DESCRIPTION OF TEST MODES

The EUT was tested under following conditions:

BAND	OPERATING CONDITIONS	AXIS
LTE Band 1	Linking / Idle mode at middle channel (CH 18300)	Y-Plane
LTE Band 3	Linking / Idle mode at middle channel (CH 19575)	Z-Plane
LTE Band 8	Linking / Idle mode at middle channel (CH 21625)	X-Plane
LTE Band 20	Linking / Idle mode at middle channel (CH 24300)	Z-Plane
LTE Band 28	Linking / Idle mode at middle channel (CH 27460)	X-Plane

NOTE:

1. Since the EUT is considered a portable unit, it was pre-tested on the positioned of each 3 axis. Only the worst case was present in this report positioned. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture), although the BT can simultaneously transmit, but has no effect on the RF signal level in spurious emissions test.
2. The applicant defined the working voltage as follows:

NORMAL VOLTAGE (NV):	3.8V
MAXIMUM VOLTAGE (HV):	4.3V
MINIMUM VOLTAGE (LV):	3.3V



2.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standard:

EN 301 908-1 V15.2.1(2023-01)

All tests have been performed and recorded as per the above standard.

2.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together without any other necessary accessories or support units.

For test

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	N/A	N/A	N/A	N/A	N/A

NO.	DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A

2.6 CONFIGURATION OF SYSTEM UNDER TEST

Please see section 4 photograph of the test configuration for reference.



3 TEST TYPES AND RESULTS

3.1 RADIATED SPURIOUS EMISSIONS – IN LINK MODE

3.1.1 LIMIT OF RADIATED SPURIOUS EMISSIONS – IN LINK MODE

FREQUENCY RANGE	FREQUENCIES BELOW 1GHz	FREQUENCIES ABOVE 1GHz
Limit value	250nW (-36dBm/100KHz)	1µW (-30dBm/1MHz)

3.1.2 TEST PROCEDURES

Whenever possible the test site should be a fully anechoic chamber simulating the free-space conditions. EUT shall be placed on a non-conducting support. Mean power of any spurious components shall be detected by the test antenna and measuring receiver (e.g. a spectrum analyser).

Measurements are made with a tuned dipole antenna or a reference antenna with a known gain referenced to an isotropic antenna. Unless otherwise stated, all measurements are done as mean power (RMS).

3.1.3 TEST SETUP

For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).

3.1.4 DEVIATION FROM TEST STANDARD

No deviation



3.1.5 TEST RESULTS

Note: For higher frequency, the emission is too low to be detected.

LINKING MODE AT MIDDLE CHANNEL (LTE B1)

FREQUENCY RANGE	30 ~ 12750 MHz	TEST VOLTAGE	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	22deg.C,57%RH	TESTED BY	David Yuan
OPERATING CONDITIONS	Linking mode at middle channel (CH18300 RB=1 Offset=0)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	H	-64.86	-36.00	-28.86
218.18	H	-76.05	-36.00	-40.05
436.43	H	-82.72	-36.00	-46.72
589.69	H	-85.47	-36.00	-49.47
723.55	H	-83.85	-36.00	-47.85
890.39	H	-82.44	-36.00	-46.44
3900.00	H	-58.24	-30.00	-28.24
5850.00	H	-59.83	-30.00	-29.83
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	V	-63.00	-36.00	-27.00
219.15	V	-76.29	-36.00	-40.29
387.93	V	-84.92	-36.00	-48.92
568.35	V	-84.97	-36.00	-48.97
793.39	V	-83.96	-36.00	-47.96
900.09	V	-80.65	-36.00	-44.65
3900.00	V	-59.69	-30.00	-29.69
5850.00	V	-59.01	-30.00	-29.01



LINKING MODE AT MIDDLE CHANNEL (LTE B3)

FREQUENCY RANGE	30 ~ 12750 MHz	TEST VOLTAGE	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	22deg.C,57%RH	TESTED BY	David Yuan
OPERATING CONDITIONS	Linking mode at middle channel (CH19575 RB=1 Offset=0)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	H	-64.41	-36.00	-28.41
218.18	H	-76.62	-36.00	-40.62
386.96	H	-84.45	-36.00	-48.45
438.37	H	-83.11	-36.00	-47.11
723.55	H	-83.93	-36.00	-47.93
908.82	H	-82.13	-36.00	-46.13
3495.00	H	-59.61	-30.00	-29.61
5242.50	H	-60.68	-30.00	-30.68
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	V	-62.17	-36.00	-26.17
216.24	V	-76.55	-36.00	-40.55
386.96	V	-84.53	-36.00	-48.53
437.40	V	-82.93	-36.00	-46.93
597.45	V	-84.17	-36.00	-48.17
798.24	V	-83.73	-36.00	-47.73
3495.00	V	-61.02	-30.00	-31.02
5242.50	V	-59.28	-30.00	-29.28



LINKING MODE AT MIDDLE CHANNEL (LTE B8)

FREQUENCY RANGE	30 ~ 12750 MHz	TEST VOLTAGE	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	22deg.C,57%RH	TESTED BY	David Yuan
OPERATING CONDITIONS	Linking mode at middle channel (CH21625 RB=1 Offset=0)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	H	-65.33	-36.00	-29.33
218.18	H	-76.80	-36.00	-40.80
320.03	H	-84.54	-36.00	-48.54
438.37	H	-82.98	-36.00	-46.98
638.19	H	-84.53	-36.00	-48.53
892.33	H	-82.04	-36.00	-46.04
1795.00	H	-65.58	-30.00	-35.58
2692.50	H	-62.28	-30.00	-32.28
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	V	-61.46	-36.00	-25.46
218.18	V	-76.04	-36.00	-40.04
387.93	V	-84.78	-36.00	-48.78
438.37	V	-83.56	-36.00	-47.56
639.16	V	-84.24	-36.00	-48.24
903.00	V	-79.50	-36.00	-43.50
1795.00	V	-65.42	-30.00	-35.42
2692.50	V	-61.39	-30.00	-31.39



LINKING MODE AT MIDDLE CHANNEL (LTE B20)

FREQUENCY RANGE	30 ~ 12750 MHz	TEST VOLTAGE	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	22deg.C,57%RH	TESTED BY	David Yuan
OPERATING CONDITIONS	Linking mode at middle channel (CH24300 RB=1 Offset=0)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	H	-64.56	-36.00	-28.56
218.18	H	-76.44	-36.00	-40.44
304.51	H	-85.56	-36.00	-49.56
440.31	H	-83.35	-36.00	-47.35
632.37	H	-84.57	-36.00	-48.57
893.30	H	-81.14	-36.00	-45.14
1694.00	H	-65.20	-30.00	-35.20
2541.00	H	-62.54	-30.00	-32.54
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	V	-62.93	-36.00	-26.93
218.18	V	-77.50	-36.00	-41.50
387.93	V	-84.60	-36.00	-48.60
439.34	V	-83.68	-36.00	-47.68
589.69	V	-84.14	-36.00	-48.14
825.40	V	-83.08	-36.00	-47.08
1694.00	V	-65.19	-30.00	-35.19
2541.00	V	-62.34	-30.00	-32.34



LINKING MODE AT MIDDLE CHANNEL (LTE B28)

FREQUENCY RANGE	30 ~ 12750 MHz	TEST VOLTAGE	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	22deg.C,57%RH	TESTED BY	David Yuan
OPERATING CONDITIONS	Linking mode at middle channel (CH27460 RB=1 Offset=0)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
59.10	H	-64.39	-36.00	-28.39
218.18	H	-76.39	-36.00	-40.39
439.34	H	-82.81	-36.00	-46.81
590.66	H	-85.23	-36.00	-49.23
774.96	H	-83.73	-36.00	-47.73
903.00	H	-78.21	-36.00	-42.21
1451.00	H	-66.59	-30.00	-36.59
2176.50	H	-62.42	-30.00	-32.42
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	V	-62.26	-36.00	-26.26
216.24	V	-76.58	-36.00	-40.58
385.99	V	-84.76	-36.00	-48.76
438.37	V	-83.37	-36.00	-47.37
590.66	V	-84.69	-36.00	-48.69
849.65	V	-82.79	-36.00	-46.79
1451.00	V	-66.55	-30.00	-36.55
2176.50	V	-64.50	-30.00	-34.50



3.2 CONTROL AND MONITORING FUNCTIONS (UE)

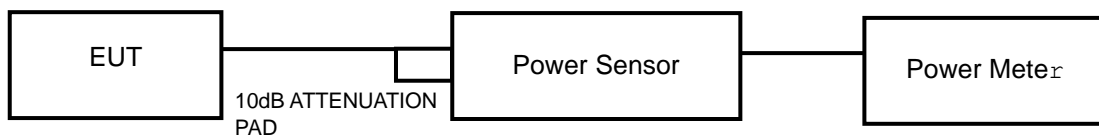
3.2.1 LIMIT OF CONTROL AND MONITORING FUNCTIONS (UE)

The maximum measured power during the duration of the test shall not exceed -30 dBm.

3.2.2 TEST PROCEDURES

At the start of the test, the UE shall be switched off. The UE antenna connector shall be connected to a power. The UE shall be switched on for a period of approximately fifteen minutes, and then switched off. The EUT shall remain switched off for a period of at least thirty seconds, and shall then be switched on for a period of approximately one minute. The maximum power emitted from the UE throughout the duration of the test shall be recorded.

3.2.3 TEST SETUP



3.2.4 DEVIATION FROM TEST STANDARD

No deviation



3.2.5 TEST RESULTS

TEST VOLTAGE	230Vac, 50Hz	ENVIRONMENTAL CONDITIONS	24deg.C,61%RH
OPERATING CONDITIONS	Switch on/Switch off	TESTED BY	James FU

LTE:

THE MAXIMUM MEASURED POWER DURING THE DURATION OF THE TEST LEVEL			
TEST FREQUENCY(MHZ)	MEASUREMENT POWER LEVEL (dBm)	LIMIT (dBm)	RESULT
109.12	-64.28	-30.0	PASS
3062.5	-63.37	-30.0	PASS



3.3 RADIATED SPURIOUS EMISSIONS – IN IDLE MODE

3.3.1 LIMIT OF RADIATED SPURIOUS EMISSIONS – IN IDLE MODE

FREQUENCY RANGE	FREQUENCIES BELOW 1GHz	OTHER FREQUENCIES ABOVE 1GHz
Limit value	-57dBm/100KHz	-47dBm/1MHz

3.3.2 TEST PROCEDURES

Whenever possible the test site should be a fully anechoic chamber simulating the free-space conditions. EUT shall be placed on a non-conducting support. Mean power of any spurious components shall be detected by the test antenna and measuring receiver (e.g. a spectrum analyser).

Measurements are made with a tuned dipole antenna or a reference antenna with a known gain referenced to an isotropic antenna. Unless otherwise stated, all measurements are done as mean power (RMS).

3.3.3 TEST SETUP

For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).

3.3.4 DEVIATION FROM TEST STANDARD

No deviation



3.3.5 TEST RESULTS

Note: For higher frequency, the emission is too low to be detected.

IDLE MODE AT MIDDLE CHANNEL (LTE B1)

FREQUENCY RANGE	30 ~ 12750 MHz	TEST VOLTAGE	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	22deg.C,57%RH	TESTED BY	David Yuan
OPERATING CONDITIONS	Idle mode at middle channel (CH18300 RB=1 Offset=0)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
59.10	H	-64.46	-57.00	-7.46
219.15	H	-76.66	-57.00	-19.66
386.96	H	-84.46	-57.00	-27.46
439.34	H	-83.50	-57.00	-26.50
681.84	H	-84.23	-57.00	-27.23
900.09	H	-78.93	-57.00	-21.93
4626.41	H	-57.24	-47.00	-10.24
11626.59	H	-52.83	-47.00	-5.83
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	V	-62.70	-57.00	-5.70
217.21	V	-76.51	-57.00	-19.51
387.93	V	-85.47	-57.00	-28.47
438.37	V	-83.78	-57.00	-26.78
631.40	V	-84.98	-57.00	-27.98
868.08	V	-82.18	-57.00	-25.18
4557.08	V	-59.28	-47.00	-12.28
11691.22	V	-54.57	-47.00	-7.57



IDLE MODE AT MIDDLE CHANNEL (LTE B3)

FREQUENCY RANGE	30 ~ 12750 MHz	TEST VOLTAGE	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	22deg.C,62%RH	TESTED BY	David Yuan
OPERATING CONDITIONS	Idle mode at middle channel (CH 19575 RB=1 Offset=0)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
59.10	H	-64.99	-57.00	-7.99
218.18	H	-76.22	-57.00	-19.22
437.40	H	-82.55	-57.00	-25.55
634.31	H	-84.74	-57.00	-27.74
825.40	H	-83.66	-57.00	-26.66
917.55	H	-81.46	-57.00	-24.46
3795.60	H	-57.09	-47.00	-10.09
11544.33	H	-54.21	-47.00	-7.21
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	V	-60.15	-57.00	-3.15
218.18	V	-76.74	-57.00	-19.74
385.99	V	-85.32	-57.00	-28.32
438.37	V	-83.90	-57.00	-26.90
609.09	V	-84.67	-57.00	-27.67
868.08	V	-82.06	-57.00	-25.06
3918.99	V	-57.59	-47.00	-10.59
11654.79	V	-53.49	-47.00	-6.49



IDLE MODE AT MIDDLE CHANNEL (LTE B8)

FREQUENCY RANGE	30 ~ 12750 MHz	TEST VOLTAGE	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	22deg.C,57%RH	TESTED BY	David Yuan
OPERATING CONDITIONS	Idle mode at middle channel (CH 21625 RB=1 Offset=0)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
59.10	H	-65.84	-57.00	-8.84
218.18	H	-76.98	-57.00	-19.98
387.93	H	-84.42	-57.00	-27.42
436.43	H	-83.19	-57.00	-26.19
701.24	H	-84.11	-57.00	-27.11
900.09	H	-76.34	-57.00	-19.34
3275.03	H	-58.42	-47.00	-11.42
10734.67	H	-54.43	-47.00	-7.43
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	V	-61.76	-57.00	-4.76
219.15	V	-76.84	-57.00	-19.84
389.87	V	-84.78	-57.00	-27.78
440.31	V	-83.67	-57.00	-26.67
609.09	V	-84.53	-57.00	-27.53
843.83	V	-83.11	-57.00	-26.11
3714.52	V	-59.02	-47.00	-12.02
11735.87	V	-53.10	-47.00	-6.10



IDLE MODE AT MIDDLE CHANNEL (LTE B20)

FREQUENCY RANGE	30 ~ 12750 MHz	TEST VOLTAGE	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	22deg.C,57%RH	TESTED BY	David Yuan
OPERATING CONDITIONS	Idle mode at middle channel (CH 24300 RB=1 Offset=0)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	H	-64.36	-57.00	-7.36
216.24	H	-76.73	-57.00	-19.73
438.37	H	-82.97	-57.00	-25.97
642.07	H	-84.23	-57.00	-27.23
754.59	H	-82.97	-57.00	-25.97
900.09	H	-75.92	-57.00	-18.92
4250.38	H	-59.06	-47.00	-12.06
10299.88	H	-54.30	-47.00	-7.30
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	V	-62.83	-57.00	-5.83
218.18	V	-77.62	-57.00	-20.62
386.96	V	-85.15	-57.00	-28.15
437.40	V	-83.49	-57.00	-26.49
716.76	V	-84.49	-57.00	-27.49
900.09	V	-74.95	-57.00	-17.95
3846.13	V	-57.19	-47.00	-10.19
11137.74	V	-53.42	-47.00	-6.42



IDLE MODE AT MIDDLE CHANNEL (LTE B28)

FREQUENCY RANGE	30 ~ 12750 MHz	TEST VOLTAGE	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	22deg.C,57%RH	TESTED BY	David Yuan
OPERATING CONDITIONS	Idle mode at middle channel (CH 27460 RB=1 Offset=0)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	H	-65.26	-57.00	-8.26
219.15	H	-77.23	-57.00	-20.23
385.99	H	-84.93	-57.00	-27.93
438.37	H	-83.26	-57.00	-26.26
690.57	H	-84.18	-57.00	-27.18
918.52	H	-82.02	-57.00	-25.02
3869.64	H	-58.51	-47.00	-11.51
11554.91	H	-54.15	-47.00	-7.15
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
60.07	V	-61.25	-57.00	-4.25
218.18	V	-77.29	-57.00	-20.29
387.93	V	-85.07	-57.00	-28.07
439.34	V	-83.66	-57.00	-26.66
663.41	V	-84.92	-57.00	-27.92
875.84	V	-82.44	-57.00	-25.44
3736.85	V	-57.47	-47.00	-10.47
11241.15	V	-53.62	-47.00	-6.62



4 TOGRAPHS OF THE TEST CONFIGURATION

TX / RX SPURIOUS EMISSION TEST (BELOW 1GHz)



TX / RX SPURIOUS EMISSION TEST (ABOVE 1GHz)





5 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications were made to the EUT by the lab during the test.

--- END ---