VARIANT RADIO TEST REPORT

(EN 301 908-1)

Applicant:	Particle Industries,Inc
Address:	325 9th St, San Francisco, CA 94103 USA,415-319-1553

Manufacturer or Supplier	Particle Industries,Inc
Address	325 9th St, San Francisco, CA 94103 USA,415-319-1553
Product	Tracker One LTE CAT1/3G/2G
Brand Name	Particle
Model Name	ONE523M, ONE524M, ONE523M-NB, ONE524M-NB
Date of tests	Oct. 10, 2020 ~ Oct. 28, 2020
The tests have been carried out according to the requirements of the following standard:	
☒ **EN 301 908-1 V15.1.1 (2021-09)**	
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
Simon Wang Date: Aug. 17, 2022	Luke Lu Date: Aug. 17, 2022

TABLE OF CONTENTS

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RE201009W001-2	Original release	Oct. 28, 2020
W7L-P22080018RE02	Based on the original report RE201009W001-2 Update the standard and change the address, all the data is copied from the original report.	Aug. 17, 2022

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: EN 301 908-1 V15.1.1			
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 301 908-2 V13.1.1			
The detail information of the data please refer to report：R2101A0075-R2			
APPLIED STANDARD: EN 301 908-13 V13.1.1			
The detail information of the data please refer to report：R2101A0075-R3			

1.1 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal Pre-Amplifier	EMSI	EMC 02325	980224	Jun. 02,20	Jun. 01,21
Signal Pre-Amplifier	EMSI	EMC 012645B	980258	Jun. 02,20	Jun. 01,21
3m Fully-anechoic Chamber	ETS-LINDGREN	10m*5m*5m	Euroshieldpn-CT0001143-1217	May. 19,20	May. 18,23
RS Antenna_LF	Rohde&Schwarz	R&S® HL046E	HL064E	NA	NA
Horn Antenna	ETS-LINDGREN	3117	00168692	Nov. 24,19	Nov. 23,20
EXA Signal Analyzer	KEYSIGHT	N9010A-544	MY54510355	Jun. 03,20	Jun. 02,21
Radio Communication Analyzer	ANRITSU	MT8820C	6201465425	Mar. 10,20	Mar. 09,21

NOTE:

1. The calibration interval of the above test instruments is 12 months or 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	Tracker One LTE CAT1/3G/2G
BRAND NAME	Particle
MODEL NAME	ONE523M, ONE524M, ONE523M-NB, ONE524M-NB
NOMINAL VOLTAGE	LI+ pin：DC+3.6v--4.2V or Vusb PIN： DC+4.5V--5.5V or Vin PIN： DC 6V--30V
MODULATION TYPE	BPSK,QPSK,16QAM
RADIO TECHNOLOGY	WCDMA / HSDPA / HSUPA/ DC-HSDPA / LTE FDD/ LTE TDD
OPERATING FREQUENCY	WCDMA Band I Tx: 1922.6 ~ 1977.4MHz Rx: 2112.6 ~ 2167.4MHz WCDMA Band VIII Tx: 882.4 ~ 912.6MHz Rx: 927.4MHz ~ 957.6MHz 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 7 Tx: 2502.5 ~ 2567.5MHz Rx: 2622.5 ~ 2687.5MHz 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	External Antenna
MAX. ANTENNA GAIN	WCDMA Band I : 2.27dBi WCDMA Band VIII : 1.98dBi LTE Band 1 : 2.27dBi LTE Band 3 : 1.94dBi LTE Band 7 : 2.14dBi LTE Band 8 : 1.98dBi LTE Band 20 : 1.98dBi LTE Band 28：1.98dBi

HW VERSION	V1.0 Product HW Version：V1.0 V1.1 Product HW Version：V1.1
SW VERSION	V1.5.4
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB cable: non-shielded, detachable, 2.0meter

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. The difference of V1.0 and V1.1 is V1.1 update PCBA and add some components, which not affect RF function. At the same time, we add three product models on v1.1, ONE524M, ONE523M-NB, ONE524M-NB, please see the table below for the differences of different model.

Product name	e-SIM company	Built-in LiPo battery
ONE523M	Kore	Yes
ONE524M	Twilio	Yes
ONE523M-NB	Kore	No
ONE524M-NB	Twilio	No

.

3. The EUT was powered by the following Battery:

BATTERY	
BRAND:	Zhaoneng
MODEL:	113450
MANUFACTURER	Zhaoneng Battery Industrial Co., Ltd
POWER RATING:	3.7V, 2000mAh

4. The EUT matched the following USB cable:

USB CABLE	
BRAND:	KAWEEI
MODEL:	CBUSB31-AM-CM-2000
SIGNAL LINE:	2.0 METER

5. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

2.2 DESCRIPTION OF TEST MODES

✧ The EUT was tested under following conditions:

BAND	OPERATING CONDITIONS	AXIS
WCDMA Band I	Linking / Idle mode at middle channel (CH 9750)	X-Plane
WCDMA Band VIII	Linking / Idle mode at middle channel (CH 2788)	Y-Plane
LTE Band 1	Linking / Idle mode at middle channel (CH 18300)	Z-Plane
LTE Band 3	Linking / Idle mode at middle channel (CH 19575)	Y-Plane
LTE Band 7	Linking / Idle mode at middle channel (CH 21100)	Y-Plane
LTE Band 8	Linking / Idle mode at middle channel (CH 21625)	Y-Plane
LTE Band 20	Linking / Idle mode at middle channel (CH 24300)	X-Plane
LTE Band 28	Linking / Idle mode at middle channel (CH 27435)	Z-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&WIFI can simultaneously transmit, but has no effect on the RF signal level in spurious emissions test.
2. The RSE Measurement for LTE was based on the worst BW conducted power for each LTE Band.

2.3 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 V13.1.1(2019-11)

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

2.4 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

2.5 CONFIGURATION OF SYSTEM UNDER TEST

Please see section 5 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 WCDMA B1

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
OPERATING CONDITIONS	Linking mode at middle channel (CH 9750)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.00	H	-78.06	-36.00	-42.06
244.37	H	-90.46	-36.00	-54.46
512.09	H	-85.66	-36.00	-49.66
624.61	H	-85.44	-36.00	-49.44
812.79	H	-84.25	-36.00	-48.25
892.33	H	-83.62	-36.00	-47.62
3902.20	H	-49.94	-30.00	-19.94
5853.10	H	-52.90	-30.00	-22.90
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.00	V	-74.58	-36.00	-38.58
45.52	V	-76.06	-36.00	-40.06
244.37	V	-91.42	-36.00	-55.42
508.21	V	-86.80	-36.00	-50.80
657.59	V	-86.45	-36.00	-50.45
845.77	V	-83.72	-36.00	-47.72
3901.76	V	-44.79	-30.00	-14.79
5847.08	V	-47.30	-30.00	-17.30

LINKING MODE AT MIDDLE CHANNEL WCDMA B8

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
OPERATING CONDITIONS	Linking mode at middle channel (CH 2788)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
35.82	H	-76.90	-36.00	-40.90
244.37	H	-89.63	-36.00	-53.63
413.15	H	-87.07	-36.00	-51.07
512.09	H	-85.75	-36.00	-49.75
616.85	H	-84.71	-36.00	-48.71
776.90	H	-79.27	-36.00	-43.27
1796.60	H	-49.48	-30.00	-19.48
2696.40	H	-44.02	-30.00	-14.02
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.00	V	-75.93	-36.00	-39.93
46.49	V	-75.22	-36.00	-39.22
244.37	V	-91.00	-36.00	-55.00
560.59	V	-86.38	-36.00	-50.38
724.52	V	-86.48	-36.00	-50.48
777.87	V	-80.66	-36.00	-44.66
1797.86	V	-50.32	-30.00	-20.32
2696.34	V	-46.00	-30.00	-16.00

LINKING MODE AT MIDDLE CHANNEL (LTE B1)

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
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)**
30.97	H	-77.35	-36.00	-41.35
249.22	H	-91.21	-36.00	-55.21
422.85	H	-87.53	-36.00	-51.53
571.26	H	-86.12	-36.00	-50.12
662.44	H	-86.29	-36.00	-50.29
821.52	H	-83.26	-36.00	-47.26
3891.17	H	-36.78	-30.00	-6.78
5837.03	H	-45.11	-30.00	-15.11
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
50.37	V	-74.48	-36.00	-38.48
249.22	V	-90.64	-36.00	-54.64
385.02	V	-89.41	-36.00	-53.41
522.76	V	-86.30	-36.00	-50.30
748.77	V	-85.03	-36.00	-49.03
877.78	V	-83.26	-36.00	-47.26
3891.28	V	-36.86	-30.00	-6.86
5836.68	V	-43.36	-30.00	-13.36

LINKING MODE AT MIDDLE CHANNEL (LTE B3)

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
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)**
35.82	H	-77.54	-36.00	-41.54
243.40	H	-90.86	-36.00	-54.86
487.84	H	-87.34	-36.00	-51.34
624.61	H	-86.05	-36.00	-50.05
751.68	H	-85.36	-36.00	-49.36
833.16	H	-83.46	-36.00	-47.46
3486.11	H	-34.49	-30.00	-4.49
5229.15	H	-47.33	-30.00	-17.33
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.00	V	-75.22	-36.00	-39.22
49.40	V	-75.61	-36.00	-39.61
246.31	V	-90.87	-36.00	-54.87
594.54	V	-84.50	-36.00	-48.50
688.63	V	-86.16	-36.00	-50.16
829.28	V	-83.41	-36.00	-47.41
3486.09	V	-40.67	-30.00	-10.67
5229.11	V	-49.99	-30.00	-19.99

LINKING MODE AT MIDDLE CHANNEL (LTE B7)

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
OPERATING CONDITIONS	Linking mode at middle channel (CH21100 RB=1 Offset=0)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.00	H	-77.00	-36.00	-41.00
74.62	H	-89.56	-36.00	-53.56
253.10	H	-90.13	-36.00	-54.13
594.54	H	-84.92	-36.00	-48.92
751.68	H	-83.38	-36.00	-47.38
827.34	H	-82.80	-36.00	-46.80
5061.11	H	-48.07	-30.00	-18.07
7591.66	H	-37.50	-30.00	-7.50
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.00	V	-75.39	-36.00	-39.39
45.52	V	-75.99	-36.00	-39.99
243.40	V	-90.33	-36.00	-54.33
428.67	V	-87.42	-36.00	-51.42
547.01	V	-86.16	-36.00	-50.16
741.01	V	-84.21	-36.00	-48.21
5061.30	V	-47.39	-30.00	-17.39
7591.75	V	-40.94	-30.00	-10.94

LINKING MODE AT MIDDLE CHANNEL (LTE B8)

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
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)**
31.94	H	-77.37	-36.00	-41.37
260.86	H	-90.65	-36.00	-54.65
486.87	H	-86.62	-36.00	-50.62
614.91	H	-85.60	-36.00	-49.60
749.74	H	-84.71	-36.00	-48.71
852.56	H	-82.67	-36.00	-46.67
1786.32	H	-45.40	-30.00	-15.40
2679.24	H	-35.32	-30.00	-5.32
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.00	V	-75.68	-36.00	-39.68
46.49	V	-75.39	-36.00	-39.39
252.13	V	-90.80	-36.00	-54.80
414.12	V	-87.79	-36.00	-51.79
567.38	V	-86.31	-36.00	-50.31
693.48	V	-85.74	-36.00	-49.74
1786.16	V	-44.26	-30.00	-14.26
2679.34	V	-39.32	-30.00	-9.32

LINKING MODE AT MIDDLE CHANNEL (LTE B20)

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
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)**
35.82	H	-76.16	-36.00	-40.16
243.40	H	-90.57	-36.00	-54.57
431.58	H	-86.30	-36.00	-50.30
600.36	H	-84.85	-36.00	-48.85
781.75	H	-84.44	-36.00	-48.44
918.52	H	-83.71	-36.00	-47.71
1442.46	H	-40.03	-30.00	-10.03
2163.36	H	-50.71	-30.00	-20.71
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.97	V	-76.06	-36.00	-40.06
50.37	V	-74.82	-36.00	-38.82
260.86	V	-91.14	-36.00	-55.14
446.13	V	-87.64	-36.00	-51.64
572.23	V	-86.00	-36.00	-50.00
750.71	V	-85.35	-36.00	-49.35
1442.34	V	-46.49	-30.00	-16.49
2163.44	V	-50.46	-30.00	-20.46

LINKING MODE AT MIDDLE CHANNEL (LTE B28)

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
OPERATING CONDITIONS	Linking mode at middle channel (CH 27435 RB=1 Offset=0)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.00	H	-77.38	-36.00	-41.38
275.41	H	-91.80	-36.00	-55.80
589.69	H	-86.48	-36.00	-50.48
683.78	H	-86.52	-36.00	-50.52
818.61	H	-83.61	-36.00	-47.61
885.54	H	-83.80	-36.00	-47.80
1442.06	H	-41.73	-30.00	-11.73
2163.20	H	-53.90	-30.00	-23.90
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.00	V	-75.34	-36.00	-39.34
46.49	V	-74.78	-36.00	-38.78
244.37	V	-91.42	-36.00	-55.42
430.61	V	-87.51	-36.00	-51.51
522.76	V	-86.65	-36.00	-50.65
868.08	V	-83.46	-36.00	-47.46
1442.12	V	-48.28	-30.00	-18.28
2163.32	V	-54.27	-30.00	-24.27

3.2 CONTROL AND MONITORING FUNCTIONS (UE)

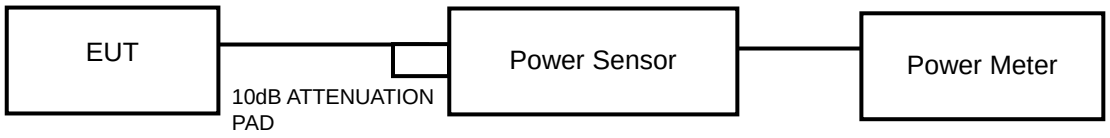
3.2.1 LIMIT OF CONTROL AND MONITORING FUNCTIONS (UE)

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**	23deg.C,59%RH
OPERATING CONDITIONS	Switch on/Switch off	**TESTED BY**	Ezreal Tan

THE MAXIMUM MEASURED POWER DURING THE DURATION OF THE TEST LEVEL			
TEST TIMES	**MEASUREMENT POWER LEVEL (dBm)**	**LIMIT (dBm)**	**RESULT**
1	-62.20	-30.0	PASS
2	-62.35	-30.0	PASS
3	-62.79	-30.0	PASS
4	-62.22	-30.0	PASS
5	-62.66	-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 WCDMA B1

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
OPERATING CONDITIONS	Idle mode at middle channel (CH 9750)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
31.94	H	-78.24	-57.00	-21.24
200.72	H	-94.71	-57.00	-37.71
288.02	H	-92.16	-57.00	-35.16
420.91	H	-88.18	-57.00	-31.18
556.71	H	-86.26	-57.00	-29.26
776.90	H	-79.53	-57.00	-22.53
3890.50	H	-60.54	-47.00	-13.54
5852.22	H	-58.13	-47.00	-11.13
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
44.55	V	-75.51	-57.00	-18.51
248.25	V	-90.58	-57.00	-33.58
430.61	V	-87.87	-57.00	-30.87
520.82	V	-86.55	-57.00	-29.55
683.78	V	-86.47	-57.00	-29.47
776.90	V	-80.27	-57.00	-23.27
3900.14	V	-61.45	-47.00	-14.45
5840.50	V	-58.50	-47.00	-11.50

IDLE MODE AT MIDDLE CHANNEL WCDMA B8

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
OPERATING CONDITIONS	Idle mode at middle channel (CH 2788)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
31.94	H	-76.72	-57.00	-19.72
261.83	H	-90.30	-57.00	-33.30
530.52	H	-86.03	-57.00	-29.03
624.61	H	-84.78	-57.00	-27.78
776.90	H	-79.08	-57.00	-22.08
901.06	H	-83.57	-57.00	-26.57
2698.82	H	-60.41	-47.00	-13.41
3581.72	H	-61.43	-47.00	-14.43
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
32.91	V	-73.41	-57.00	-16.41
51.34	V	-74.82	-57.00	-17.82
260.86	V	-91.11	-57.00	-34.11
522.76	V	-86.20	-57.00	-29.20
681.84	V	-85.68	-57.00	-28.68
776.90	V	-79.21	-57.00	-22.21
1799.78	V	-64.18	-47.00	-17.18
2684.66	V	-61.41	-47.00	-14.41

IDLE MODE AT MIDDLE CHANNEL (LTE B1)

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
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)**
31.94	H	-76.77	-57.00	-19.77
244.37	H	-90.09	-57.00	-33.09
413.15	H	-87.46	-57.00	-30.46
625.58	H	-84.78	-57.00	-27.78
777.87	H	-79.27	-57.00	-22.27
898.15	H	-83.42	-57.00	-26.42
3887.24	H	-60.49	-47.00	-13.49
5833.90	H	-58.65	-47.00	-11.65
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.97	V	-78.37	-57.00	-21.37
45.52	V	-80.72	-57.00	-23.72
377.26	V	-89.85	-57.00	-32.85
565.44	V	-86.88	-57.00	-29.88
776.90	V	-80.22	-57.00	-23.22
3880.18	V	-61.31	-47.00	-14.31
5839.28	V	-58.92	-47.00	-11.92

IDLE MODE AT MIDDLE CHANNEL (LTE B3)

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
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)**
32.91	H	-77.76	-57.00	-20.76
244.37	H	-90.83	-57.00	-33.83
429.64	H	-87.37	-57.00	-30.37
624.61	H	-85.51	-57.00	-28.51
776.90	H	-80.34	-57.00	-23.34
918.52	H	-84.01	-57.00	-27.01
2943.40	H	-58.18	-47.00	-11.18
4411.72	H	-60.27	-47.00	-13.27
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.97	V	-75.29	-57.00	-18.29
49.40	V	-75.26	-57.00	-18.26
241.46	V	-90.62	-57.00	-33.62
594.54	V	-85.39	-57.00	-28.39
777.87	V	-78.86	-57.00	-21.86
900.09	V	-82.75	-57.00	-25.75
2953.84	V	-58.75	-47.00	-11.75
4407.60	V	-58.64	-47.00	-11.64

IDLE MODE AT MIDDLE CHANNEL (LTE B7)

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
OPERATING CONDITIONS	Idle mode at middle channel (CH 21100 RB=1 Offset=0)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
32.91	H	-75.73	-57.00	-18.73
259.89	H	-90.59	-57.00	-33.59
422.85	H	-87.56	-57.00	-30.56
565.44	H	-85.96	-57.00	-28.96
776.90	H	-79.47	-57.00	-22.47
850.62	H	-83.01	-57.00	-26.01
2532.00	H	-61.46	-47.00	-14.46
5056.82	H	-58.45	-47.00	-11.45
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.00	V	-75.88	-57.00	-18.88
47.46	V	-76.46	-57.00	-19.46
258.92	V	-90.22	-57.00	-33.22
423.82	V	-87.91	-57.00	-30.91
625.58	V	-85.96	-57.00	-28.96
777.87	V	-79.47	-57.00	-22.47
2529.66	V	-60.60	-47.00	-13.60
5066.44	V	-58.99	-47.00	-11.99

IDLE MODE AT MIDDLE CHANNEL (LTE B8)

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
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)**
30.00	H	-78.58	-57.00	-21.58
46.49	H	-80.58	-57.00	-23.58
244.37	H	-91.09	-57.00	-34.09
448.07	H	-88.26	-57.00	-31.26
658.56	H	-86.55	-57.00	-29.55
776.90	H	-78.72	-57.00	-21.72
1786.89	H	-60.12	-47.00	-13.12
2679.89	H	-57.16	-47.00	-10.16
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.00	V	-74.72	-57.00	-17.72
49.40	V	-75.59	-57.00	-18.59
243.40	V	-90.82	-57.00	-33.82
564.47	V	-86.37	-57.00	-29.37
775.93	V	-79.59	-57.00	-22.59
849.65	V	-83.17	-57.00	-26.17
1786.66	V	-59.46	-47.00	-12.46
2679.21	V	-58.69	-47.00	-11.69

IDLE MODE AT MIDDLE CHANNEL (LTE B20)

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
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)**
30.00	H	-76.37	-57.00	-19.37
246.31	H	-91.02	-57.00	-34.02
426.73	H	-87.81	-57.00	-30.81
547.98	H	-86.26	-57.00	-29.26
776.90	H	-80.27	-57.00	-23.27
831.22	H	-83.07	-57.00	-26.07
1682.74	H	-63.97	-47.00	-16.97
2523.02	H	-61.13	-47.00	-14.13
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.97	V	-76.22	-57.00	-19.22
45.52	V	-76.22	-57.00	-19.22
251.16	V	-91.58	-57.00	-34.58
512.09	V	-87.02	-57.00	-30.02
663.41	V	-85.93	-57.00	-28.93
776.90	V	-80.93	-57.00	-23.93
1688.74	V	-63.55	-47.00	-16.55
2517.16	V	-59.71	-47.00	-12.71

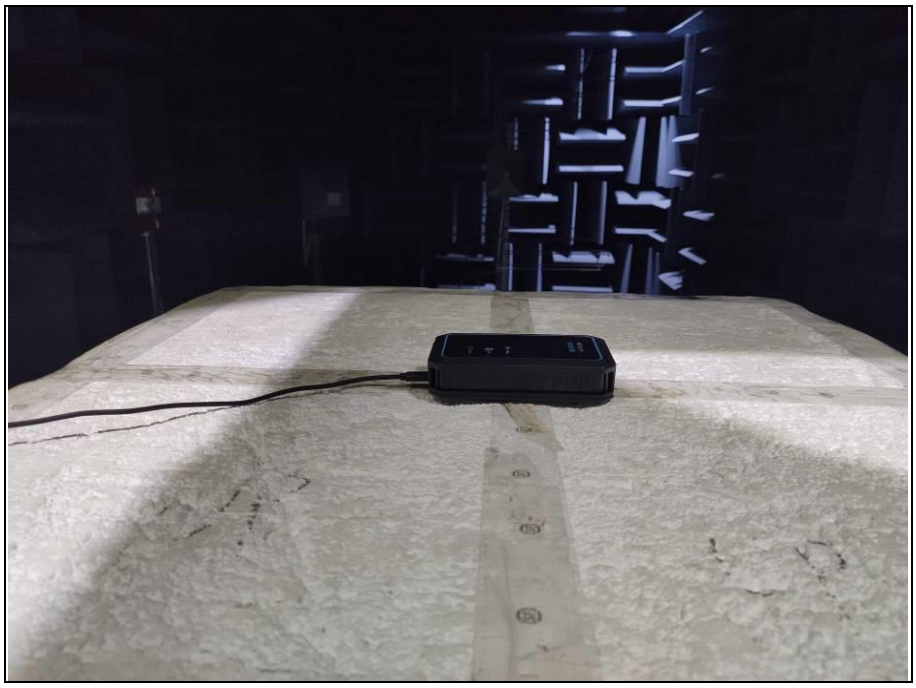
IDLE MODE AT MIDDLE CHANNEL (LTE B28)

FREQUENCY RANGE	30 ~ 12750 MHz	**TEST VOLTAGE**	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS	23deg.C,59%RH	**TESTED BY**	Ezreal Tan
OPERATING CONDITIONS	Idle mode at middle channel (CH 27435 RB=1 Offset=0)		

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.00	H	-78.25	-57.00	-21.25
244.37	H	-90.38	-57.00	-33.38
428.67	H	-87.86	-57.00	-30.86
548.95	H	-86.57	-57.00	-29.57
617.82	H	-85.79	-57.00	-28.79
777.87	H	-78.76	-57.00	-21.76
1439.82	H	-64.90	-47.00	-17.90
2153.38	H	-61.47	-47.00	-14.47
SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
30.00	V	-74.80	-57.00	-17.80
45.52	V	-75.51	-57.00	-18.51
251.16	V	-90.81	-57.00	-33.81
444.19	V	-87.41	-57.00	-30.41
613.94	V	-85.32	-57.00	-28.32
776.90	V	-79.40	-57.00	-22.40
1439.82	V	-64.90	-47.00	-17.90
2153.38	V	-61.47	-47.00	-14.47

4 PHOTOGRAPHS OF THE TEST CONFIGURATION

LINK AND IDLE SPURIOUS EMISSION (BELOW 1GHz)



LINK AND IDLE SPURIOUS EMISSION (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 ---