

ETSI EN 301 908-1 V13.1.1 (2019-11)
ETSI EN 301 908-13 V13.1.1 (2019-11)

TEST REPORT

For

Xiamen Milesight IoT Co., Ltd.

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Tested Model: UG65-L00E-868M-EA
Multiple Models: UG65-L00E-868M,
UG65-868M-EA, UG65-868M,
UG65-L04EU-868M-EA, UG65-L04EU-868M

Report Type: Original Report	Product Type: LoRaWAN Gateway
Report Number: RXM200911053-22D	
Report Date: 2021-02-02 Nancy Wang	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	LoRaWAN Gateway
Tested Model	UG65-L00E-868M-EA
Multiple Models	UG65-L00E-868M, UG65-868M-EA, UG65-868M, UG65-L04EU-868M-EA, UG65-L04EU-868M
Model Differences	Refer to the DoS letter
Frequency Range	LTE Band 1: 1920-1980MHz(TX); 2110-2170MHz(RX) LTE Band 3: 1710-1785MHz(TX) ; 1805-1880MHz(RX) LTE Band 7: 2500-2570MHz(TX); 2620-2690MHz(RX) LTE Band 8: 880-915MHz(TX); 925-960MHz(RX) LTE Band 20: 832-862MHz(TX); 791-821MHz(RX)
Transmit Power	LTE: Band 1: 23.5dBm LTE: Band 3: 23.7dBm LTE: Band 7: 23.8dBm LTE: Band 8: 23.7dBm LTE: Band 20: 23.4dBm
Modulation Technique	LTE: QPSK, 16QAM
Voltage Range	DC12.0V from adapter or DC 48V from POE
Date of Test	2020-10-11 to 2021-02-02
Sample serial number	RXM200911053-RF-S1 (Assigned by BACL, Shenzhen)
Received date	2020-09-11
Sample/EUT Status	Good condition
Adapter information	Model: OH-1015A1201000U3-VDE Input: AC 100-240V, 50/60Hz, 0.35A Output: DC 12.0V, 1.0 A, 12.0W

Objective

This report is in accordance with ETSI EN 301 908-1 V13.1.1 (2019-11), IMT cellular networks; ETSI EN 301 908-1 V13.1.1 (2019-11), IMT cellular networks; Harmonised Standard for access to radio spectrum; Part 1: Introduction and common requirements and ETSI EN 301 908-13 V13.1.1 (2019-11), IMT cellular networks; Harmonised Standard for access to radio spectrum; Part 13: Evolved Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE).

The objective is to determine the EUT compliance with ETSI EN 301 908-1 V13.1.1 (2019-11) and ETSI EN 301 908-13 V13.1.1 (2019-11).

Test Methodology

All measurements contained in this report were conducted with ETSI EN 301 908-1 V13.1.1 (2019-11) and ETSI EN 301 908-13 V13.1.1 (2019-11).

Measurement Uncertainty

According to the requirements of ETSI EN 301 908-1 and ETSI EN 301 908-13, F_{lab} (the value of the measurement uncertainty according to the requirements of ETSI TR 100 028) shall be, for each measurement, equal to or lower than the figure in the following table:

Item	Parameter	F_{lab}	Maximum allowable uncertainty
1	ERP 30MHz-180MHz	± 3.62 dB	± 6 dB
2	ERP 180MHz-12750MHz	± 2.6 dB	± 3 dB
3	Transmitter maximum output power	± 0.73 dB*	$\pm 0,7$ dB
4	Transmitter spectrum emissions mask	$\pm 1,6$ dB*	$\pm 1,5$ dB
5	Transmitter spurious emissions $9 \text{ kHz} < f \leq 4 \text{ GHz}$	± 1.6 dB*	$\pm 2,0$ dB
6	Transmitter spurious emissions $4 \text{ GHz} < f \leq 12,75 \text{ GHz}$	± 1.6 dB	$\pm 4,0$ dB
7	Transmitter Minimum output power	± 0.73 dB	$\pm 2,0$ dB
8	Receiver Adjacent Channel Selectivity (ACS)	± 2.8 dB*	$\pm 1,1$ dB
9	Receiver Blocking characteristics $1 \text{ MHz} < \text{finterferer} \leq 3 \text{ GHz}$	± 1.5 dB*	$\pm 1,3$ dB
10	Receiver Blocking characteristics $3 \text{ GHz} < \text{finterferer} \leq 12,75 \text{ GHz}$	± 3.3 dB*	$\pm 3,2$ dB
11	Receiver spurious response $1 \text{ MHz} < \text{finterferer} \leq 3 \text{ GHz}$	± 1.5 dB*	$\pm 1,3$ dB
12	Receiver spurious response $3 \text{ GHz} < \text{finterferer} \leq 12,75 \text{ GHz}$	± 3.3 dB*	$\pm 3,2$ dB
13	Receiver intermodulation characteristics	± 1.3 dB	$\pm 1,4$ dB
14	Receiver spurious emissions $9 \text{ kHz} < f \leq 4 \text{ GHz}$	± 1.6 dB	$\pm 2,0$ dB
15	Receiver spurious emissions $4 \text{ GHz} < f \leq 12,75 \text{ GHz}$	± 1.6 dB	$\pm 4,0$ dB
16	Transmitter adjacent channel leakage power ratio	± 0.8 dB	$\pm 0,8$ dB

Note: * Test system of laboratory have a measurement uncertainty greater than that specified in harmonized standard, this equipment can still be used provided that an adjustment is made follows: any additional uncertainty in the test system over and above that specified in harmonized standard should be used to tighten the test requirements - making the test harder to pass (for some tests, e.g. receiver tests, this may require modification of stimulus signals). This procedure will ensure that a test system not compliant with harmonized standard does not increase the probability of passing a EUT that would otherwise have failed a test if a test system compliant with harmonized standard had been used.

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing according to EN 301 908-1 and EN 301 908-13.

EUT Exercise Software

No exercise software.

Special Accessories

No special accessory.

Equipment Modifications

No modifications were made to the unit tested.

Support Equipment List and Details

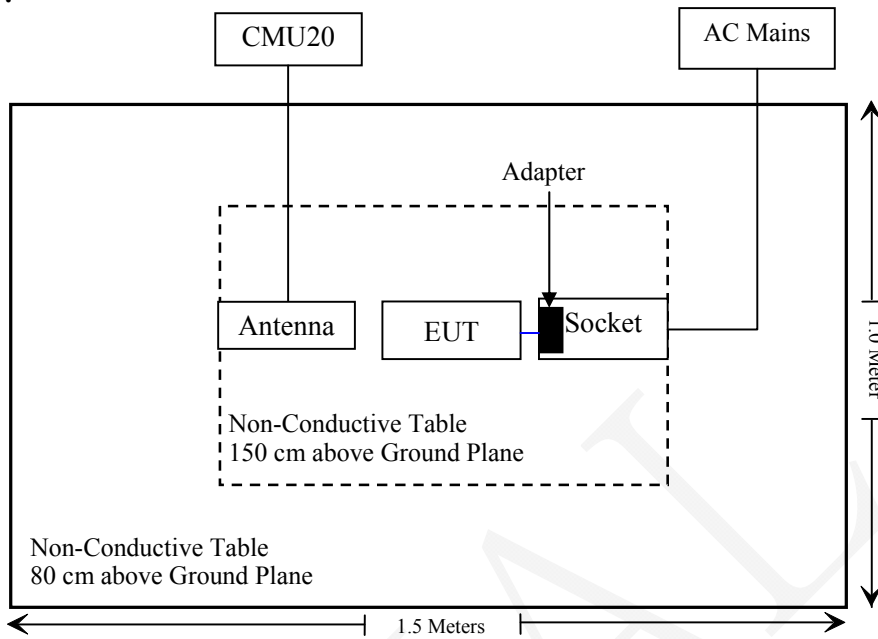
Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	106891
SHENZHEN GOSPELL DIGITAL TECHNOLOGY CO.,LTD.	POE	G0720-480-050	G0720-480-050

External I/O Cable

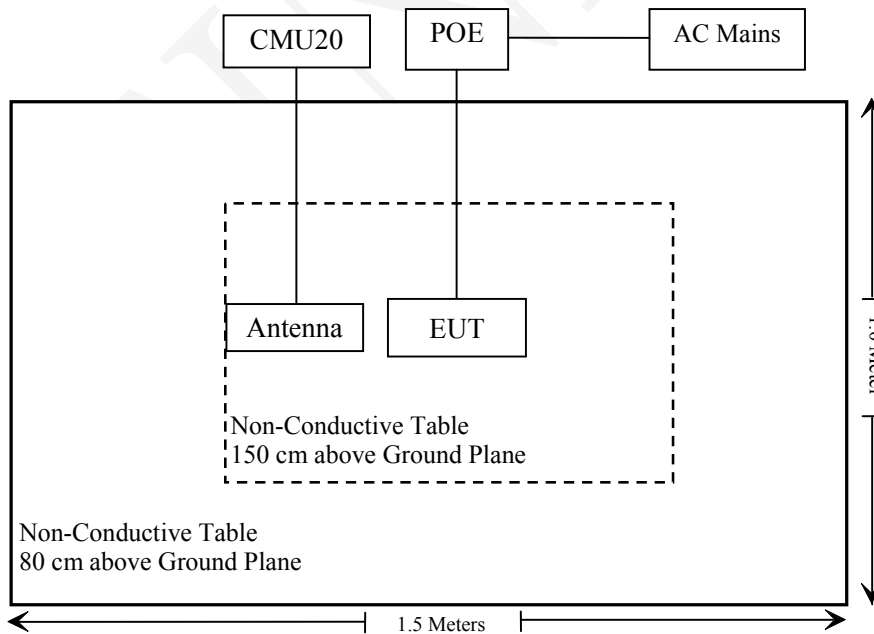
Cable Description	Length (m)	From/Port	To
Un-shielding Un-Detachable AC Cable	1.0	Socket	AC Mains
Un-shielding Un-Detachable DC Cable	2.5	Adapter	EUT
Un-shielding Detachable AC Cable	1.2	POE	AC Mains
Un-shielding Detachable RJ45 Cable	3.0	POE	EUT

Block Diagram of Test Setup

For Adapter:



For POE:



SUMMARY OF TEST RESULTS

ETSI EN 301 908-1 V13.1.1	Description of Test	Test Result
§4.2.2	Radiated emissions (UE)	Compliance
§4.2.3	Radiated emissions (BS and repeater)	Not Applicable
§4.2.4	Control and monitoring functions (UE)	Compliance*

ETSI EN 301 908-13 V11.1.2	Description of Test	Test Result
§4.2.2	Transmitter maximum output power	Compliance*
§4.2.3	Transmitter spectrum emission mask	Compliance*
§4.2.4	Transmitter spurious emissions	Compliance
§4.2.5	Transmitter minimum output power	Compliance*
§4.2.6	Receiver Adjacent Channel Selectivity (ACS)	Compliance*
§4.2.7	Receiver blocking characteristics	Compliance*
§4.2.8	Receiver spurious response	Compliance*
§4.2.9	Receiver intermodulation characteristics	Compliance*
§4.2.10	Receiver spurious emissions	Compliance*
§4.2.11	Transmitter Adjacent Channel Leakage power Ratio	Compliance*
§4.2.12	Receiver Reference Sensitivity Level	Compliance*

Note: Compliance*: The EUT has a certified LTE module (Model: EC25-EC). The related test items can refer to the module report: R1805A0247-R3, which was issued by TA Technology (Shanghai) Co., Ltd. on 07-03-2018.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2020/08/04	2021/08/03
Sonoma instrument	Pre-amplifier	310 N	186238	2020/08/04	2021/08/03
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
COM-POWER	Dipole Antenna	AD-100	721027	NCR	NCR
Unknown	Cable 2	RF Cable 2	F-03-EM197	2019/11/29	2020/11/28
Unknown	Cable	Chamber Cable 1	F-03-EM236	2019/11/29	2020/11/28
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2020/08/04	2021/08/03
COM-POWER	Pre-amplifier	PA-122	181919	2019/11/29	2020/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
A.H.System	Horn Antenna	SAS-200/571	135	2018/09/01	2021/08/31
Insulated Wire Inc.	RF Cable	SPS-2503-3150	02222010	2019/11/29	2020/11/28
Unknown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2019/11/29	2020/11/28
MICRO-TRONICS	Passband filter	HPM50111	F-19-EM006	2020/04/20	2021/04/19
Unknown	High Pass filter	1.3GHz	101120	2020/04/20	2021/04/19
Agilent	Signal Generator	N5183A	MY51040755	2019/12/04	2020/12/03
R&S	Wideband Radio Communication tester	CMW500	146520	2020/09/12	2021/09/11
RF Conducted Test					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2020/04/03	2021/04/02
Weinschel	Power divider	1515	RH386	2020/04/20	2021/04/19
Unknown	RF Cable	Unknown	DLO J5/W6102	2020/11/29	2021/11/28
R&S	Wideband Radio Communication tester	CMW500	146520	2020/09/12	2021/09/11

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

ETSI EN 301 908-1 V13.1.1 (2019-11) §4.2.2 – RADIATED EMISSIONS (UE)

Applicable Standard

This test assesses the ability of radio communications equipment and ancillary equipment to limit unwanted emissions from the enclosure port.

This test is applicable to radio communications equipment and ancillary equipment.

This test shall be performed on the radio communications equipment and/or a representative configuration of the ancillary equipment.

Limits

The frequency boundary and reference bandwidths for the detailed transitions of the limits between the requirements for out-of-band emissions and spurious emissions are based on Recommendations ITU-R SM.329-12 [1] and SM.1539-1 [i.6].

The requirements shown in table 4.2.2.2-1 are only applicable for frequencies in the spurious domain.

Table 4.2.2.2-1: Radiated spurious emissions requirements (UE)

Frequency	Minimum requirement (e.r.p./ reference bandwidth idle mode)	Minimum requirement (e.r.p./ reference bandwidth traffic mode)	Applicability
$30 \text{ MHz} \leq f < 1\,000 \text{ MHz}$	-57 dBm/100 kHz	-36 dBm/100 kHz	All
$1 \text{ GHz} \leq f < 12,75 \text{ GHz}$	-47 dBm/1 MHz	-30 dBm/1 MHz	All
$f_c - 2,5 \times 5 \text{ MHz} < f < f_c + 2,5 \times 5 \text{ MHz}$ (note 2)		Not defined	UTRA FDD, UTRA TDD, 3,84 Mcps option, cdma2000, spreading rate 3
$f_c - 2,5 \times BW_{\text{Channel}} \text{ MHz} < f < f_c + 2,5 \times BW_{\text{Channel}} \text{ MHz}$ (note 2)		Not defined	E-UTRA FDD, E-UTRA TDD, Mobile WiMAX™
$f_c - 2,5 \times 10 \text{ MHz} < f < f_c + 2,5 \times 10 \text{ MHz}$ (note 2)		Not defined	UTRA TDD, 7,68 Mcps option
$f_c - 4 \text{ MHz} < f < f_c + 4 \text{ MHz}$ (note 2)		Not defined	UTRA TDD, 1,28 Mcps option cdma2000, spreading rate 1

NOTE 1: f_c is the UE transmit centre frequency.
NOTE 2: This frequency range is not in the spurious domain, no requirement is then defined for this frequency range.

Test configurations

The equipment shall be tested under normal test conditions;

The test configuration shall be as close to normal intended use as possible;

If the equipment is part of a system, or can be connected to ancillary equipment, then it shall be acceptable to test the equipment while connected to the minimum configuration of ancillary equipment necessary to exercise the ports;

If the equipment has a large number of ports, then a sufficient number shall be selected to simulate actual operation conditions and to ensure that all the different types of termination are tested;

The test conditions, test configuration and mode of operation shall be recorded in the test report; ports which in normal operation are connected shall be connected to an ancillary equipment or to a representative piece of cable correctly terminated to simulate the input/output characteristics of the ancillary equipment, RF input/output ports shall be correctly terminated;

Ports that are not connected to cables during normal operation, e.g. service connectors, programming connectors; temporary connectors, etc. Shall not be connected to any cables for the purpose of this test. Where cables have to be connected to these ports, or interconnecting cables have to be extended in length in order to exercise the EUT, precautions shall be taken to ensure that the evaluation of the EUT is not affected by the addition or extension of these cables:

Emission tests shall be performed in two modes of operation:

With a communication link established (traffic mode); and

In the idle mode;

The traffic mode configuration which uses the UE maximum output power for testing shall be declared by the manufacturer.

Ancillary equipment shall be tested with it connected to a UE in which case compliance shall be demonstrated to the appropriate clauses of the present document.

Test Data

Environmental Conditions

Temperature:	28~31.7 °C
Relative Humidity:	54~58 %
ATM Pressure:	100.9~101.0 kPa

The testing was performed by Holland Yang on 2020-10-11 for below 1GHz and Alan He on 2020-11-03 for above 1GHz.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to following data tables.

Pre-test with low, middle, high channel, the worst case is middle channel as below:

Below 1GHz:

Traffic Mode

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	EN 301 908-1	
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)		Limit (dBm)	Margin (dB)
For Adapter										
Band 1										
216.0	37.61	306	2.0	H	-62.4	0.57	0.0	-62.97	-36	26.97
216.0	38.48	142	1.6	V	-60.8	0.57	0.0	-61.37	-36	25.37
Band 3										
215.9	37.55	293	2.2	H	-62.5	0.57	0.0	-63.07	-36	27.07
215.9	38.46	4	2.3	V	-60.9	0.57	0.0	-61.47	-36	25.47
Band 7										
215.9	37.61	255	1.3	H	-62.4	0.57	0.0	-62.97	-36	26.97
215.9	38.52	126	1.8	V	-60.8	0.57	0.0	-61.37	-36	25.37
Band 8										
216.0	37.63	45	2.4	H	-62.4	0.57	0.0	-62.97	-36	26.97
216.0	38.54	317	1.0	V	-60.8	0.57	0.0	-61.37	-36	25.37
Band 20										
216.1	37.62	319	1.7	H	-62.4	0.57	0.0	-62.97	-36	26.97
216.1	38.59	28	2.5	V	-60.7	0.57	0.0	-61.27	-36	25.27
For POE										
Band 1										
215.9	37.55	173	1.1	H	-62.5	0.57	0.0	-63.07	-36	27.07
215.9	38.63	70	2.0	V	-60.7	0.57	0.0	-61.27	-36	25.27
Band 3										
215.9	37.51	6	2.2	H	-62.5	0.57	0.0	-63.07	-36	27.07
215.9	38.62	281	1.7	V	-60.7	0.57	0.0	-61.27	-36	25.27
Band 7										
216.1	37.49	126	1.4	H	-62.6	0.57	0.0	-63.17	-36	27.17
216.1	38.54	299	1.0	V	-60.8	0.57	0.0	-61.37	-36	25.37
Band 8										
215.9	37.58	7	1.9	H	-62.5	0.57	0.0	-63.07	-36	27.07
215.9	38.44	283	1.2	V	-60.9	0.57	0.0	-61.47	-36	25.47
Band 20										
216.0	37.64	266	1.7	H	-62.4	0.57	0.0	-62.97	-36	26.97
216.0	38.54	319	2.4	V	-60.8	0.57	0.0	-61.37	-36	25.37

Idle Mode

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	EN 301 908-1	
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)		Limit (dBm)	Margin (dB)
For Adapter										
Band 1										
216.0	37.51	134	1.5	H	-62.5	0.57	0.0	-63.07	-57	6.07
216.0	38.63	172	2.3	V	-60.7	0.57	0.0	-61.27	-57	4.27
Band 3										
216.1	37.61	22	1.7	H	-62.4	0.57	0.0	-62.97	-57	5.97
216.1	38.56	64	1.7	V	-60.8	0.57	0.0	-61.37	-57	4.37
Band 7										
215.9	37.58	127	1.3	H	-62.5	0.57	0.0	-63.07	-57	6.07
215.9	38.66	261	1.4	V	-60.7	0.57	0.0	-61.27	-57	4.27
Band 8										
216.0	37.51	74	2.1	H	-62.5	0.57	0.0	-63.07	-57	6.07
216.0	38.57	214	1.9	V	-60.7	0.57	0.0	-61.27	-57	4.27
Band 20										
215.9	37.59	122	2.3	H	-62.5	0.57	0.0	-63.07	-57	6.07
215.9	38.47	345	1.3	V	-60.8	0.57	0.0	-61.37	-57	4.37
For POE										
Band 1										
216.0	37.61	204	1.3	H	-62.4	0.57	0.0	-62.97	-57	5.97
216.0	38.49	321	2.0	V	-60.8	0.57	0.0	-61.37	-57	4.37
Band 3										
215.9	37.64	172	2.2	H	-62.4	0.57	0.0	-62.97	-57	5.97
215.9	38.57	120	2.0	V	-60.7	0.57	0.0	-61.27	-57	4.27
Band 7										
216.0	37.55	201	2.2	H	-62.5	0.57	0.0	-63.07	-57	6.07
216.0	38.63	297	1.0	V	-60.7	0.57	0.0	-61.27	-57	4.27
Band 8										
216.1	37.67	65	1.6	H	-62.4	0.57	0.0	-62.97	-57	5.97
216.1	38.54	308	1.3	V	-60.8	0.57	0.0	-61.37	-57	4.37
Band 20										
215.9	37.54	114	2.3	H	-62.5	0.57	0.0	-63.07	-57	6.07
215.9	38.48	233	1.8	V	-60.8	0.57	0.0	-61.37	-57	4.37

Above 1GHz:

Traffic Mode

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	EN 301 908-1	
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)		Limit (dBm)	Margin (dB)
Band 1										
3900.00	55.95	57	2.4	H	-45.1	1.60	11.90	-34.80	-30	4.80
3900.00	58.94	143	1.5	V	-42.0	1.60	11.90	-31.70	-30	1.70
5850.00	51.47	144	1.6	H	-48.3	1.70	12.20	-37.80	-30	7.80
5850.00	54.30	48	2.0	V	-44.8	1.70	12.20	-34.30	-30	4.30
7800.00	46.54	143	1.7	H	-49.7	2.00	10.50	-41.20	-30	11.20
7800.00	47.86	27	2.2	V	-48.3	2.00	10.50	-39.80	-30	9.80
Band 3										
3495.00	51.32	194	1.4	H	-49.4	1.50	12.00	-38.90	-30	8.90
3495.00	52.93	233	2.4	V	-48.6	1.50	12.00	-38.10	-30	8.10
5242.50	44.57	234	1.2	H	-55.5	1.60	12.10	-45.00	-30	15.00
5242.50	45.28	288	1.3	V	-54.3	1.60	12.10	-43.80	-30	13.80
Band 7										
5070.00	49.06	287	1.1	H	-50.9	1.60	12.10	-40.40	-30	10.40
5070.00	51.09	97	1.9	V	-48.9	1.60	12.10	-38.40	-30	8.40
Band 8										
1795.00	50.75	188	1.3	H	-54.3	1.30	9.30	-46.30	-30	16.30
1795.00	50.97	220	2.2	V	-53.7	1.30	9.30	-45.70	-30	15.70
2692.50	49.79	182	1.9	H	-53.3	2.00	10.40	-44.90	-30	14.90
2692.50	48.50	283	1.7	V	-54.2	2.00	10.40	-45.80	-30	15.80
Band 20										
1694.00	49.49	247	2.4	H	-56.8	1.30	8.90	-49.20	-30	19.20
1694.00	49.88	121	1.6	V	-55.9	1.30	8.90	-48.30	-30	18.30
2541.00	47.22	164	2.5	H	-56.1	2.60	10.20	-48.50	-30	18.50
2541.00	47.49	128	2.5	V	-55.3	2.60	10.20	-47.70	-30	17.70

Idle Mode

Frequency (MHz)	Receiver Reading (dB μ V)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	EN 301 908-1	
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)		Limit (dBm)	Margin (dB)
Band 1										
1602.30	42.56	139	1.5	H	-65.8	1.40	8.70	-58.50	-47	11.50
1602.30	42.43	162	1.5	V	-65.7	1.40	8.70	-58.40	-47	11.40
Band 3										
1665.20	42.57	351	1.8	H	-64.2	1.30	8.90	-56.60	-47	9.60
1665.20	41.64	88	1.4	V	-64.5	1.30	8.90	-56.90	-47	9.90
Band 7										
1558.62	42.96	218	2.5	H	-65.4	1.40	8.70	-58.10	-47	11.10
1558.62	42.07	214	2.4	V	-66.1	1.40	8.70	-58.80	-47	11.80
Band 8										
1774.24	42.01	99	1.9	H	-63.4	1.30	9.30	-55.40	-47	8.40
1774.24	41.44	235	2.3	V	-63.5	1.30	9.30	-55.50	-47	8.50
Band 20										
1582.10	42.41	126	2.3	H	-65.9	1.40	8.70	-58.60	-47	11.60
1582.10	41.43	236	2.1	V	-66.7	1.40	8.70	-59.40	-47	12.40

Note 1: The unit of antenna gain is dBd for frequency below 1GHz and is dBi for frequency above 1GHz.

Note 2:

Absolute Level = SG Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

ETSI EN 301 908-13 V13.1.1 (2019-11) §4.2.4 – TRANSMITTER SPURIOUS EMISSIONS

Applicable Standard

According to ETSI EN 301 908-13 V13.1.1 (2019-11) §4.2.4.1, Transmitter spurious emissions for Single Carrier:

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions. The spurious emission limits are specified in terms of general requirements in line with Recommendation ITU-R SM.329-12 [i.4] and E-UTRA operating band requirement to address UE co-existence.

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

Limits

The spurious emission limits in table 4.2.4.1.2-2 apply for the frequency ranges that are more than Δf_{OOB} (MHz) from the edge of the channel bandwidth shown in table 4.2.4.1.2-1.

The measured average power of spurious emission for general requirements shall not exceed the described values in table 4.2.4.1.2-2.

The measured average power of spurious emission for E-UTRA operating band specific requirements to protected bands shall not exceed the described values in tables 4.2.4.1.2-3 and 4.2.4.1.2-6.

Table 4.2.4.1.2-1: Δf_{OOB} boundary between E-UTRA channel and spurious emission domain

Channel bandwidth	1,4 MHz	3,0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	20 MHz
Δf_{OOB} (MHz)	2,8	6	10	15	20	25	

Table 4.2.4.1.2-2: General spurious emissions limits

Frequency range	Maximum level	Measurement bandwidth	Comment
$9 \text{ kHz} \leq f < 150 \text{ kHz}$	-36 dBm	1 kHz	
$150 \text{ kHz} \leq f < 30 \text{ MHz}$	-36 dBm	10 kHz	
$30 \text{ MHz} \leq f < 1 \text{ 000 MHz}$	-36 dBm	100 kHz	
$1 \text{ GHz} \leq f < 12,75 \text{ GHz}$	-30 dBm	1 MHz	
$12,75 \text{ GHz} \leq f < 5^{\text{th}}$ harmonic of the upper frequency edge of the UL operating band in GHz	-30 dBm	1 MHz	See note
NOTE: Shall apply for Band 22, 42 and Band 43.			

NOTE 1: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

The additional requirements in table 4.2.4.1.2-3 apply for the frequency ranges that are more and less than Δf_{OoB} (MHz) from the edge of the channel bandwidth shown in table 4.2.4.1.2-1.

Table 4.2.4.1.2-3: Spurious emission band UE co-existence limits (network signalled value "NS_01")

E-UTRA Band	Spurious emission						
	Protected band	Frequency range (MHz)		Maximum Level (dBm)	MBW (MHz)	Comment	
1	E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 65, 67, 68	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	
	E-UTRA Band 3, 34	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 3
	Frequency range	1 895	-	1 915	-15,5	5	Notes 3, 8
	Frequency range	1 915	-	1 920	+1,6	5	Notes 3, 8, 42
3	E-UTRA Band 1, 7, 8, 20, 28, 31, 32, 33, 34, 38, 40, 43, 65, 67, 68	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	
	E-UTRA Band 3	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 3
	E-UTRA Band 22, 42	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 2
7	E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 31, 32, 33, 34, 40, 42, 43, 65, 67, 68	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	
	Frequency range	2 570	-	2 575	+1,6	5	Notes 3, 4
	Frequency range	2 575	-	2 595	-15,5	5	Notes 3, 4
	Frequency range	2 595	-	2 620	-40	1	Notes 3, 4
8	E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 40, 65, 67, 68	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	
	E-UTRA Band 3	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 2
	E-UTRA Band 7	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 2
	E-UTRA Band 8	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 3
	E-UTRA Band 22, 42, 43	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 2
20	E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 65, 67, 68	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	
	E-UTRA Band 20	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 3
	E-UTRA Band 38, 42	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 2
	Frequency range	758	-	788	-50	1	
22	E-UTRA Band 1, 3, 7, 8, 20, 28, 31, 32, 33, 34, 38, 40, 43, 65, 67, 68	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	
	Frequency range	3 510	-	3 525	-40	1	Note 3
	Frequency range	3 525	-	3 590	-50	1	

E-UTRA Band	Spurious emission						
	Protected band	Frequency range (MHz)		Maximum Level (dBm)	MBW (MHz)	Comment	
28	E-UTRA Band 3, 7, 8, 20, 31, 34, 38	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 1, 22, 32, 42, 43, 65	F_{DL_low}	-	F_{DL_high}	-50	1	Note 2
	E-UTRA Band 1	F_{DL_low}	-	F_{DL_high}	-50	1	Note 6
	Frequency range	758	-	773	-32	1	Note 3
	Frequency range	773	-	803	-50	1	
	Frequency range	470	-	694	-42	8	Notes 3, 7
31	E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 33, 34, 38, 40, 42, 43, 65, 67, 68	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 3	F_{DL_low}	-	F_{DL_high}	-50	1	Note 2
33	E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 34, 38, 40, 42, 43, 65, 67	F_{DL_low}	-	F_{DL_high}	-50	1	Note 9
	E-UTRA Band 3	F_{DL_low}	-	F_{DL_high}	-50	1	Note 3
34	E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 31, 32, 33, 38, 40, 42, 43, 65, 67	F_{DL_low}	-	F_{DL_high}	-50	1	Note 9
38	E-UTRA Band 1, 3, 8, 20, 22, 28, 31, 32, 33, 34, 40, 42, 43, 65, 67, 68	F_{DL_low}	-	F_{DL_high}	-50	1	
	Frequency range	2 620	-	2 645	-15,5	5	Notes 3, 5
	Frequency range	2 645	-	2 690	-40	1	Notes 3, 5
40	E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 31, 32, 33, 34, 38, 42, 43, 65, 67, 68	F_{DL_low}	-	F_{DL_high}	-50	1	
42	E-UTRA Band 1, 3, 7, 8, 20, 28, 31, 32, 33, 34, 38, 40, 65, 67, 68	F_{DL_low}	-	F_{DL_high}	-50	1	
43	E-UTRA Band 1, 3, 7, 8, 20, 28, 31, 32, 33, 34, 38, 40, 65, 67, 68	F_{DL_low}	-	F_{DL_high}	-50	1	
65	E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 65, 68	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 3	F_{DL_low}	-	F_{DL_high}	-50	1	Note 3
	E-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 34	F_{DL_low}	-	F_{DL_high}	-50	1	Note 36
	Frequency range	1 884,5	-	1 915,7	-41	0,3	Note 37
	Frequency range	1 900	-	1 915	-15,5	5	Notes 3, 8
68	E-UTRA Band 3, 7, 8, 20, 22, 28, 31, 38, 40, 42, 43, 65	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 1	F_{DL_low}	-	F_{DL_high}	-50	1	Note 2
NOTE 1: F_{DL_low} and F_{DL_high} refer to each frequency range of the protected E-UTRA band.							
NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in table 4.2.4.1.2-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2 nd , 3 rd or 4 th harmonic spurious emissions. Due to spreading of the harmonic emission the exception shall be allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x L_{CRB} x 180 kHz), where N is 2, 3, 4 for the 2 nd , 3 rd or 4 th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.							
NOTE 3: These requirements shall also apply for the frequency ranges that are less than Δf_{OoB} (MHz) in table 4.2.4.1.2-1 from the edge of the channel bandwidth.							

E-UTRA Band	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Comment
NOTE 4:	This requirement shall be applicable for any channel bandwidths within the range 2 500 - 2 570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2 560,5 - 2 562,5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2 552 - 2 560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.				
NOTE 5:	This requirement shall be applicable for any channel bandwidths within the range 2 570 - 2 615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2 605,5 - 2 607,5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2 597 - 2 605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. For carriers with channel bandwidth overlapping the frequency range 2 615 - 2 620 MHz the requirement shall apply with the maximum output power configured to +19 dBm.				
NOTE 6:	As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3 rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see figure 5.4.2-1 in ETSI TS 136 521-1 [1]) for which the 3 rd harmonic totally or partially overlaps the measurement bandwidth (MBW).				
NOTE 7:	This requirement shall be applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.				
NOTE 8:	This requirement shall be applicable for any channel bandwidths within the range 1 920 - 1 980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1 927,5 - 1 929,5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1 930 - 1 938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.				
NOTE 9:	For non-synchronized TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band.				
NOTE 10 to 35:	N/A.				
NOTE 36:	This requirement is applicable for E-UTRA channel bandwidth allocated within 1 920 - 1 980 MHz.				
NOTE 37:	Applicable when the upper edge of the channel bandwidth frequency is greater than 1 980 MHz.				
NOTES 38 to 41:	N/A.				
NOTE 42:	For category NB1 and NB2 UE when carrier centre frequency is 1 920,1 MHz, in case of single-tone uplink transmission the requirement is applicable only for sub-carrier index > 2.				

NOTE 2: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

Table 4.2.4.1.2-4: Additional spurious emissions limits (network signalled value "NS_01")

E-UTRA band	Protected Frequency range	Maximum Level (dBm)	MBW (MHz)
20	$470 \text{ MHz} \leq f \leq 790 \text{ MHz}$	-65	8 MHz
NOTE: The conformance shall be assessed using the measurement position placed at the following centre frequencies: 474 MHz, 586 MHz, 690 MHz, 754 MHz, 770 MHz and 786 MHz.			

Table 4.2.4.1.2-5: Additional spurious emissions limits (network signalled value "NS_22")

E-UTRA band	Protected Frequency range (MHz)	Channel bandwidth/ Maximum Level (dBm)	MBW (MHz)
		5, 10, 15, 20 MHz	
42, 43	$3\,400 \leq f \leq 3\,800$	-23 (note 1)	5 MHz
		-40 (note 2)	1 MHz
NOTE 1: This requirement shall apply within an offset between 5 MHz and 25 MHz from the lower and from the upper edge of the channel bandwidth.			
NOTE 2: This requirement shall apply from 3 400 MHz up to 25 MHz below the lower E-UTRA channel edge and from 25 MHz above the upper E-UTRA channel edge up to 3 800 MHz.			

Table 4.2.4.1.2-6: Additional spurious emissions limits (network signalled value "NS_23")

E-UTRA band	Protected Frequency range (MHz)	Channel bandwidth/ Maximum Level (dBm)	MBW (MHz)
		5, 10, 15, 20 MHz	
42, 43	$3\,400 \leq f \leq 3\,800$	-23 (note 1)	5 MHz
		-40 (note 2)	1 MHz
NOTE 1: This requirement shall apply within an offset between $5 \text{ MHz} + F_{\text{offset_NS_23}}$ and $25 + F_{\text{offset_NS_23}}$ MHz from the lower and from the upper edge of the channel bandwidth.			
NOTE 2: This requirement shall apply from 3 400 MHz up to $25 + F_{\text{offset_NS_23}}$ MHz below the lower E-UTRA channel edge and from 25 MHz above the upper E-UTRA channel edge up to 3 800 MHz.			
NOTE 3: $F_{\text{offset_NS_23}}$ is: 0 MHz for 5 MHz channel BW, 5 MHz for 10 MHz channel BW, 9 MHz for 15 MHz channel BW, and 12 MHz for 20 MHz channel BW.			

Test Condition

Test Environment: normal, as specified in annex B.

Frequencies to be tested: low range, mid range, high range; see ETSI TS 136 508 [2].

Channel bandwidth to be tested: lowest, 5 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2].

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

Connect the SS to the UE antenna connectors.

The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.

Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.

The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1].

Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.

Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

Test Procedure

SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 6.6.3.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

Send continuously Up power control commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

For each applicable requirement in tables from 4.2.4.1.2-2 to 4.2.4.1.2-6; measure the power of the transmitted signal with a measurement filter of bandwidths. The center frequency of the filter shall be stepped in contiguous steps according to the tables. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

Repeat for applicable test frequencies, channel bandwidths and operating bands.

Details of the test method can be found in ETSI TS 136 521-1 [1], clauses 6.6.3.1, 6.6.3.2 and 6.6.3.3.

Test Data

Environmental Conditions

Temperature:	24.8 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Coco Liu 2021-02-02.

EUT operation mode: Transmitting

Test Result: Compliant

Please refer to plot in the Appendix.

Note: This report has added the test data of the standard updated frequency band. Please refer to the original report for the remaining data.

EXHIBIT A - EUT PHOTOGRAPHS

Please refer to the Attachment.

FUNVAL

EXHIBIT B - TEST SETUP PHOTOGRAPHS

Radiated Spurious Emissions Test View (Below 1GHz, For Adapter)



Radiated Spurious Emissions Test View (Below 1GHz, For POE)



Radiated Spurious Emissions Test View (Above 1GHz)



*******END OF REPORT*******