RF TEST REPORT

Applicant	trackap
FCC ID	2BLTJ-PEPPINO
Product	IOT GNSS tracker
Brand	trackap
Model	PEPPINO
Report No.	R2410A1489-R3
Issue Date	November 20, 2024

Eurofins TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2023)/ FCC CFR47 Part 27C (2023)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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TABLE OF CONTENT

Summary of Measurement Results

Number	Test Case	Clause in FCC rules	Verdict
1	RF Power Output and Effective Isotropic Radiated Power	2.1046 /27.50(d)(4) /27.50(c)(10)	PASS
2	Radiated Spurious Emission	2.1053 /27.53(h) /27.53(g)	PASS
Date of Testing: October 16, 2024 ~ November 1, 2024 Date of Sample Received: October 16, 2024			
Note: PASS: The EUT complies with the essential requirements in the standard. FAIL: The EUT does not comply with the essential requirements in the standard. All indications of Pass/Fail in this report are opinions expressed by Eurofins TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.			

Only Radiated Spurious Emission is tested for PEPPINO in this report, and because of the change of antenna gain, Effective Isotropic Radiated Power also re-evaluated. Other test items refer to the Module report (Report No.: STS1911256W02, FCC ID: 2AJYU-8VC0002; Grant date: 08/02/2022).

1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **Eurofins TA Technology (Shanghai) Co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2. Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

Eurofins TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

A2LA (Certificate Number: 3857.01)

Eurofins TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform measurement.

1.3 Testing Location

Company:	Eurofins TA Technology (Shanghai) Co., Ltd.
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2 General Description of Equipment under Test

2.1 Applicant and Manufacturer Information

Applicant	trackap
Applicant address	Place Pierre de Saintignon Euratechnologies, Lille, France, 59000
Manufacturer	trackap
Manufacturer address	Place Pierre de Saintignon Euratechnologies, Lille, France, 59000

2.2 General information

EUT Description			
Model	PEPPINO		
IMEI	860016048977867		
Hardware Version	V8		
Software Version	8.2.0.7		
Power Supply	Battery		
Antenna Type	Internal Antenna		
Antenna Gain	NB-IoT Band 4	2.30 dBi	
	NB-IoT Band 12	1.50 dBi	
Test Mode(s)	NB-IoT Band 4/12		
Test Modulation	BPSK, QPSK		
Category	NB1		
Deployment	stand-alone		
Sub-carrier spacing	3.75KHz, 15KHz		
Ntones	single-tone, multi-tone		
Maximum E.I.R.P./ E.R.P.	NB-IoT Band 4	24.22 dBm	
	NB-IoT Band 12	22.66 dBm	
Rated Power Supply Voltage	36V		
Operating Voltage	Minimum: 6V Maximum: 60V		
Operating Temperature	Lowest: -20°C Highest: +60°C		
Testing Temperature	Lowest: -30°C Highest: +50°C		
Operating Frequency Range(s)	Mode	Tx (MHz)	Rx (MHz)
	NB-IoT Band 4	1710 ~ 1755	2110 ~ 2155
	NB-IoT Band 12	699 ~ 716	729 ~ 746
EUT Accessory			
Battery	Manufacturer: A&S Power Model: A&S 18650		
Note: 1. The EUT is sent from the applicant to Eurofins TA and the information of the EUT is declared by the applicant.			

3 Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards:

FCC CFR47 Part 27C (2023)

FCC CFR47 Part 2 (2023)

Reference standard:

ANSI C63.26-2015

KDB 971168 D01 Power Meas License Digital Systems v03r01

4 Test Configuration

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT stand-up position (Z axis), lie-down position (X, Y axis). Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (X axis, vertical polarization) and the worst case was recorded.

All modes as Subcarrier Spacing, modulations, Channel were investigated.
Subsequently, only the worst case emissions are reported.
The following testing in NB-IoT is set based on the maximum RF Output Power.
The following testing in different mode is set to detail in the following table:
Test modes are chosen to be reported as the worst case configuration below for NB-IoT Band 4/12:

Test items	Mode	Deployment mode	Subcarrier Spacing (kHz)		Modulation		Test Channel		
		Stand-alone	3.75	15	BPSK	QPSK	L	M	H
RF Power Output and Effective Isotropic Radiated Power	NB-IoT B4	O	O	O	O	O	O	O	O
	NB-IoT B12	O	O	O	O	O	O	O	O
Radiated Spurious Emission	NB-IoT B4	O	O	-	-	O	O	O	O
	NB-IoT B12	O	O	-	-	O	O	O	O
Note 1. The mark “O” means that this configuration is chosen for testing. 2. The mark “-” means that this configuration is not testing.									

5 Test Case

5.1 RF Power Output and Effective Isotropic Radiated Power

Ambient condition

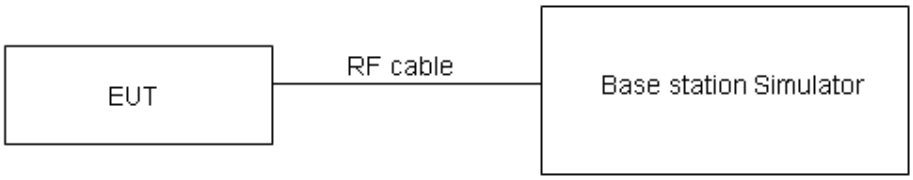
Temperature	Relative humidity	Pressure
15°C ~ 35°C	20% ~ 80%	86 kPa ~ 106 kPa

Methods of Measurement

During the process of the testing, The EUT was connected to the Base Station Simulator with a known loss. The EUT is controlled by the Base Station Simulator test set to ensure max power transmission with proper modulation.

ERP can then be calculated as follows:
EIRP (dBm) = Output Power (dBm) + Antenna Gain (dBi)
EIRP (dBm) = ERP (dBm) + 2.15 (dB.)

Test Setup



Limits

No specific RF power output requirements in part 2.1046.

Rule Part 27.50(c) (10) specifies that “Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP”
Rule Part 27.50(d) (4) specifies that “Fixed, mobile and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP”

Part 27.50(c)(10) Limit	≤ 3 W (34.77 dBm)
Part 27.50(d)(4) Limit	≤ 1 W (30 dBm)

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U=0.4 dB for RF power output, k = 2, U= 1.19 dB for ERP/EIRP.

Test Results

Refer to the section 6.1 of this report for test data.

5.2 Radiated Spurious Emission

Ambient condition

Temperature	Relative humidity	Pressure
15°C ~ 35°C	20% ~ 80%	86 kPa ~ 106 kPa

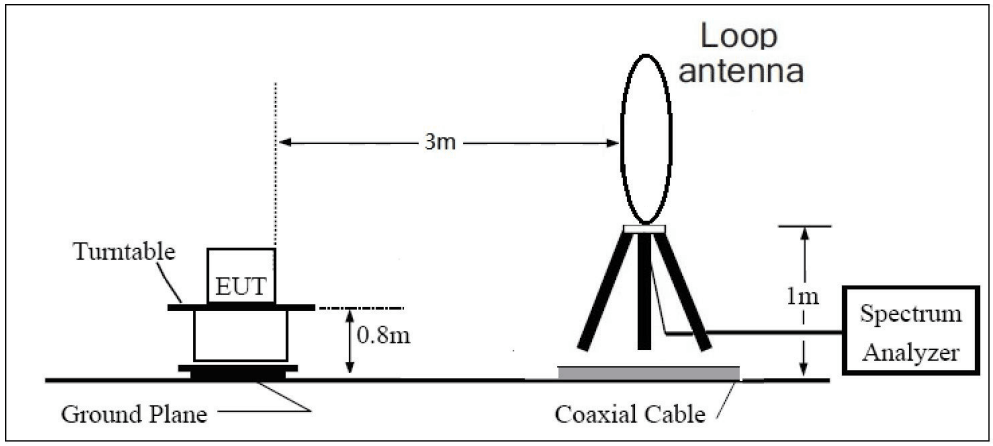
Method of Measurement

1. The testing follows FCC KDB 971168 D01 v03r01 Section 5.8 and ANSI C63.26-2015.
2. Below 1GHz: The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H). Above 1GHz: (Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.) The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).
3. A loop antenna, A log-periodic antenna or horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
4. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=100kHz, VBW=300kHz for 30MHz to 1GHz and RBW=1MHz, VBW=3MHz for above 1GHz, and the maximum value of the receiver should be recorded as (Pr).
5. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
7. The measurement results are obtained as described below:
Power(EIRP)=PMea- PAg - Pcl + Ga
The measurement results are amend as described below:
Power(EIRP)=PMea- Pcl + Ga
8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dB) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dB.

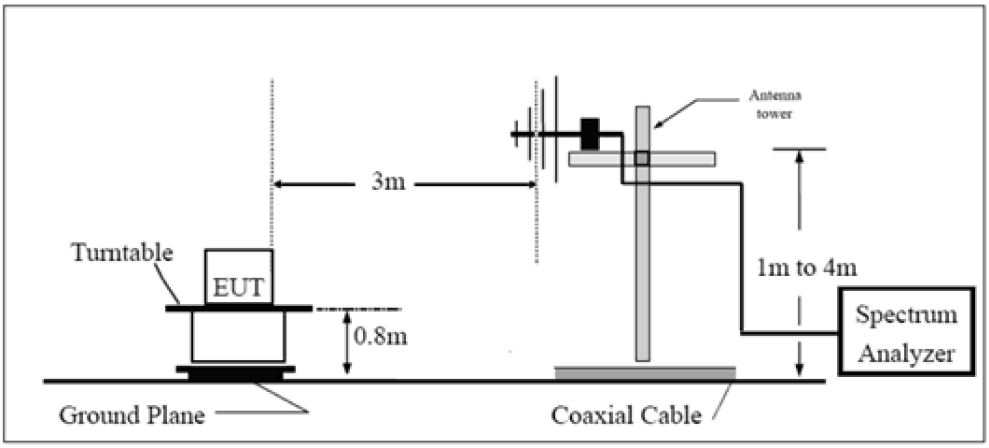
The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup

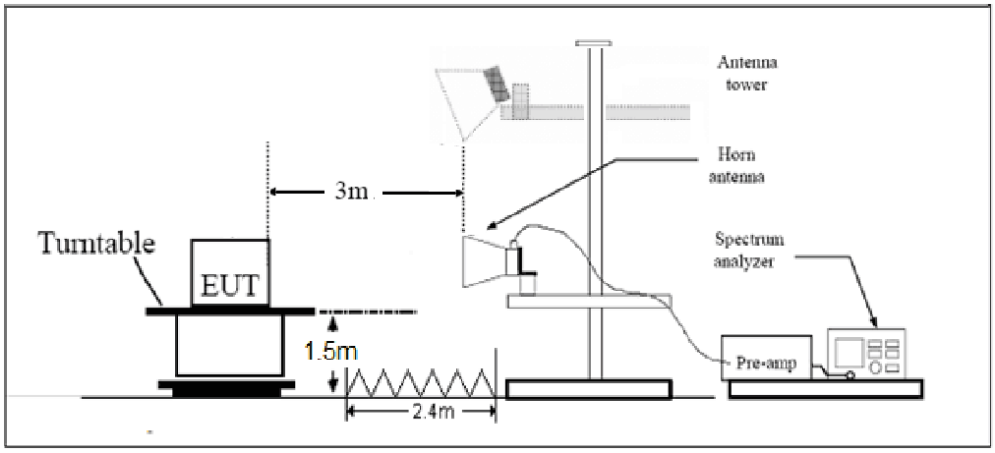
9KHz~ 30MHz



30MHz~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

Limits

Rule Part 27.53(h) specifies that “for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.”
Rule Part 27.53 (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Part 27.53 (h)/(g) Limit	-13 dBm

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95％ confidence level for the normal distribution is with the coverage factor k = ±1.96, U= ±3.55 dB.

Test Results

Refer to the section 6.2 of this report for test data.

6 Test Results

6.1 RF Power Output and Effective Isotropic Radiated Power

NB-IoT Band 4 Maximum Average Power [dBm]							EIRP [dBm]		
Mode	Modulation	Subcarrier Space (KHz)	RB Configure	Lowest	Middle	Highest	Lowest	Middle	Highest
Band 4 Standalone	BPSK	3.75	1@0	21.73	21.80	21.76	24.03	24.10	24.06
			1@47	21.53	21.57	21.54	23.83	23.87	23.84
		15	1@0	21.30	21.36	21.25	23.60	23.66	23.55
			1@11	21.01	21.14	21.00	23.31	23.44	23.30
	QPSK	3.75	1@0	20.80	20.88	20.72	23.10	23.18	23.02
			1@47	20.55	20.63	20.49	22.85	22.93	22.79
		15	1@0	20.32	20.37	20.29	22.62	22.67	22.59
			1@11	21.49	21.58	21.53	23.79	23.88	23.83
			12@0	21.86	21.92	21.74	24.16	24.22	24.04

NB-IoT Band 12 Maximum Average Power [dBm]							ERP [dBm]		
Mode	Modulation	Subcarrier Space (KHz)	RB Configure	Lowest	Middle	Highest	Lowest	Middle	Highest
Band 12 Standalone	BPSK	3.75	1@0	22.97	22.96	22.81	22.32	22.31	22.16
			1@47	22.68	22.68	22.57	22.03	22.03	21.92
		15	1@0	22.40	22.42	22.34	21.75	21.77	21.69
			1@11	22.11	22.16	22.07	21.46	21.51	21.42
	QPSK	3.75	@0	21.86	21.88	21.86	21.21	21.23	21.21
			1@47	21.65	21.66	21.64	21.00	21.01	20.99
		15	1@0	21.43	21.46	21.42	20.78	20.81	20.77
			1@11	22.76	22.67	22.61	22.11	22.02	21.96
			12@0	23.31	23.18	23.27	22.66	22.53	22.62

6.2 Radiated Spurious Emission

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions below the noise floor will not be recorded in the report.

LTE Band 4 3.75kHz+BPSK _CH- Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3420.00	-58.00	2.70	12.70	Vertical	-48.00	-13.00	35.00	44
3	5130.00	-62.52	3.20	12.50	Vertical	-53.22	-13.00	40.22	90
4	6840.00	-48.91	4.20	11.80	Vertical	-41.31	-13.00	28.31	270
5	8550.00	-49.85	4.40	12.50	Vertical	-41.75	-13.00	28.75	14
6	10260.00	-45.50	4.70	11.30	Vertical	-38.90	-13.00	25.90	45
7	11970.00	-49.39	5.20	13.80	Vertical	-40.79	-13.00	27.79	26
8	13680.00	-41.83	5.70	11.30	Vertical	-36.23	-13.00	23.23	175
9	15390.00	-56.92	6.10	16.80	Vertical	-46.22	-13.00	33.22	14
10	17100.00	-57.09	6.10	14.20	Vertical	-48.99	-13.00	35.99	274
Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

LTE Band 4 3.75kHz+BPSK CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3465.00	-64.32	2.70	12.70	Vertical	-54.32	-13.00	41.32	12
3	5197.50	-61.11	3.20	12.50	Vertical	-51.81	-13.00	38.81	135
4	6930.00	-56.07	4.20	11.80	Vertical	-48.47	-13.00	35.47	180
5	8662.50	-59.71	4.40	12.50	Vertical	-51.61	-13.00	38.61	90
6	10395.00	-51.87	4.70	11.30	Vertical	-45.27	-13.00	32.27	0
7	12127.50	-44.42	5.20	13.80	Vertical	-35.82	-13.00	22.82	24
8	13860.00	-41.93	5.70	11.30	Vertical	-36.33	-13.00	23.33	142
9	15592.50	-63.51	6.10	16.80	Vertical	-52.81	-13.00	39.81	138
10	17325.00	-57.24	6.10	14.20	Vertical	-49.14	-13.00	36.14	175
Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

LTE Band 4 3.75kHz+BPSK CH- High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3509.80	-66.21	2.70	12.70	Vertical	-56.21	-13.00	43.21	17
3	5264.70	-55.80	3.20	12.50	Vertical	-46.50	-13.00	33.50	135
4	7019.60	-60.87	4.20	11.80	Vertical	-53.27	-13.00	40.27	75
5	8774.50	-65.80	4.40	12.50	Vertical	-57.70	-13.00	44.70	23
6	10529.40	-57.50	4.70	11.30	Vertical	-50.90	-13.00	37.90	13
7	12284.30	-54.67	5.20	13.80	Vertical	-46.07	-13.00	33.07	78
8	14039.20	-51.16	5.70	11.30	Vertical	-45.56	-13.00	32.56	135
9	15794.10	-67.16	6.10	16.80	Vertical	-56.46	-13.00	43.46	2
10	17549.00	-61.59	6.10	14.20	Vertical	-53.49	-13.00	40.49	79

Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Vertical position.

LTE Band 12 3.75kHz+BPSK _CH- Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1398.20	-41.00	1.70	8.70	Vertical	-36.15	-13.00	23.15	2
3	2097.30	-47.60	2.10	11.10	Vertical	-40.75	-13.00	27.75	178
4	2796.40	-53.70	2.30	13.10	Vertical	-45.05	-13.00	32.05	120
5	3495.50	-55.77	2.60	12.70	Vertical	-47.82	-13.00	34.82	14
6	4194.60	-55.68	3.30	12.50	Vertical	-48.63	-13.00	35.63	224
7	4893.70	-60.48	3.40	12.50	Vertical	-53.53	-13.00	40.53	142
8	5592.80	-61.83	3.30	12.50	Vertical	-54.78	-13.00	41.78	78
9	6291.90	-52.80	3.80	11.50	Vertical	-47.25	-13.00	34.25	96
10	6991.00	-53.07	4.20	11.80	Vertical	-47.62	-13.00	34.62	136

Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Vertical position.

LTE Band 12 3.75kHz+BPSK CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1414.73	-36.06	1.70	8.70	Vertical	-31.21	-13.00	18.21	176
3	2122.50	-52.08	2.10	11.10	Vertical	-45.23	-13.00	32.23	91
4	2829.60	-58.97	2.30	13.10	Vertical	-50.32	-13.00	37.32	69
5	3525.50	-60.43	2.60	12.70	Vertical	-52.48	-13.00	39.48	0
6	4230.60	-57.86	3.30	12.50	Vertical	-50.81	-13.00	37.81	312
7	4935.70	-60.68	3.40	12.50	Vertical	-53.73	-13.00	40.73	12
8	5640.80	-60.06	3.30	12.50	Vertical	-53.01	-13.00	40.01	99
9	6345.90	-54.43	3.80	11.50	Vertical	-48.88	-13.00	35.88	45
10	7051.00	-47.29	4.20	11.80	Vertical	-41.84	-13.00	28.84	120
Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

LTE Band 12 3.75kHz+BPSK CH- High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1431.80	-38.58	1.70	8.70	Vertical	-33.73	-13.00	20.73	78
3	2147.70	-50.44	2.10	11.10	Vertical	-43.59	-13.00	30.59	45
4	2863.60	-57.53	2.30	13.10	Vertical	-48.88	-13.00	35.88	123
5	3579.50	-52.59	2.60	12.70	Vertical	-44.64	-13.00	31.64	7
6	4295.40	-57.94	3.30	12.50	Vertical	-50.89	-13.00	37.89	98
7	5011.30	-57.72	3.40	12.50	Vertical	-50.77	-13.00	37.77	12
8	5727.20	-60.91	3.30	12.50	Vertical	-53.86	-13.00	40.86	142
9	6443.10	-53.02	3.80	11.50	Vertical	-47.47	-13.00	34.47	42
10	7159.00	-42.02	4.20	11.80	Vertical	-36.57	-13.00	23.57	21
Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

7 Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Wireless Communication Tester	R&S	CMW500	150415	2024-05-07	2025-05-06
Spectrum Analyzer	R&S	FSV30	100815	2023-12-05	2024-12-04
High-pass filter	Chengyi	HPF 1000MHz	2024021	2024-02-21	2025-02-21
High-pass filter	R&S	HPF 1500MHz	HPF 002	2024-02-21	2025-02-21
High-pass filter	R&S	HPF 3000MHz	HPF 003	2024-02-21	2025-02-21
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2023-04-16	2026-04-15
TRILOG Broadband Antenna	SCHWARZBECK	VULB 9163	391	2022-09-29	2025-09-28
Horn Antenna	SCHWARZBECK	BBHA 9120D	1594	2023-12-05	2026-12-04
Horn Antenna	ETS-Lindgren	3160-09	00102643	2021-10-10	2024-10-09
Software	R&S	EMC32	10.35.10	/	/

ANNEX A: The EUT Appearance

The EUT Appearance are submitted separately.

ANNEX B: Test Setup Photos

The Test Setup Photos are submitted separately.

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