





RF TEST REPORT

Asiatelco Technologies Co. **Applicant**

FCC ID XYO-AS31-2

GPS tracker **Product**

Model AS31-2

Report No. R2108A0670-R2

September 10, 2021 Issue Date

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in FCC CFR47 Part 2 (2020)/ FCC CFR 47 Part 24E (2020). The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Approved by: Kai Xu

TA Technology (Shanghai) Co., Ltd.

No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China TEL: +86-021-50791141/2/3 FAX: +86-021-50791141/2/3-8000



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Summary of measurement results

No.	Test Case	Clause in FCC rules	Verdict
1	RF Power Output and Effective Isotropic	2.1046	PASS
!	Radiated Power	24.232(c)	PASS
2	Radiates Spurious Emission	2.1053 / 24.238(a)	PASS

Date of Testing: August 6, 2021 ~ August 13, 2021

Date of Sample Received: August 4, 2021

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 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.

The report only tests the RF Power Output and Effective Isotropic Radiated Power and Radiates Spurious Emission. Other test items are subject to the module report. (Report No: R2006A0413-R2)



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 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)

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)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory

Accreditation to perform measurement.

1.3. Testing Location

Company:

TA Technology (Shanghai) Co., Ltd.

Address:

No.145, Jintang Rd, Tangzhen Industry Park, Pudong

City:

Shanghai

Post code:

201201

Country:

P. R. China

Contact:

Xu Kai

Telephone:

+86-021-50791141/2/3

Fax:

+86-021-50791141/2/3-8000

Website:

http://www.ta-shanghai.com

E-mail:

xukai@ta-shanghai.com





2. General Description of Equipment under Test

2.3. Applicant and Manufacturer Information

Applicant	Asiatelco Technologies Co.					
Applicant address	289 Bisheng Road, Building 8, 3F, Zhang jiang Hi-Tech					
Applicant address	Park, Pudong, Shanghai 201204, China					
Manufacturer	Asiatelco Technologies Co.					
Manufacturar address	289 Bisheng Road, Building 8, 3F, Zhang jiang Hi-Tech					
Manufacturer address	Park, Pudong, Shanghai 201204, China					

2.4. General information

EUT Description						
Model	AS31-2					
SN	R2108A0670/S01					
Hardware Version	AS31_P1					
Software Version	BG95M6LAR02A02_E	3ETA	0628A			
Power Supply	Battery					
Antenna Type	Internal Antenna					
Antenna Gain	LTE Band 2:1.1dBi					
Antenna Gam	LTE Band 25:1.0dBi					
Test Mode(s)	LTE Band 2/25;					
Test Modulation	(LTE)QPSK,16QAM					
LTE Category	M1					
Maximum E.I.R.P	LTE Band 2:		24.07dBm			
Maximum E.I.K.P	LTE Band 25:		23.72dBm			
Rated Power Supply Voltage	3V					
Operating Voltage	Minimum: 2V Maxin	num:	4V			
Operating Temperature	Lowest: -30°C Hig	hest:	+75°C			
C	Band	 	Tx (MHz)	Rx (MHz)		
Operating Frequency Range(s)	LTE Band 2	18	850 ~ 1910	1930 ~ 1990		
	LTE Band 25	LTE Band 25		1930 ~ 1995		
	EUT Accessory					
Battery Manufacturer: RAMWAY						
Battery	Model: CR123A					
Note: 1. The EUT is sent from the	applicant to TA and the	infor	mation of the E	EUT is declared by		

the applicant.

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3. Applied Standards

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

Test standards:

FCC CFR 47 Part 24E (2020)

ANSI C63.26 (2015)

Reference standard:

FCC CFR47 Part 2 (2020)

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 (Z axis, horizontal polarization) and the worst case was recorded.

All mode and data rates and positions and RB size and modulations were investigated.

Subsequently, only the worst case emissions are reported.

The following testing in LTE is set based on the maximum RF Output Power.

Test modes are chosen to be reported as the worst case configuration below for LTE Band 2/25:

Toot itomo	Bandwidth (MHz)				Modulation		RB			Test Channel				
Test items	1.4	3	5	10	15	20	QPSK	16QAM	1	50%	100%	L	М	н
RF Power Output and Effective Isotropic Radiated Power	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Radiates Spurious Emission	0	-	0	-	-	0	0	-	0	-	-	-	0	-
Note		 The mark "O" means that this configuration is chosen for testing. The mark "-" means that this configuration is not testing. 												

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TA-MB-05-002R



5. Test Case Results

5.1.RF Power Output and Effective Isotropic Radiated Power

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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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.

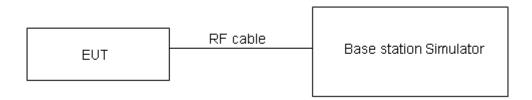
ERP can then be calculated as follows:

EIRP (dBm) = Output Power (dBm) - Losses (dB) + Antenna Gain (dBi)

where:dBd refers to gain relative to an ideal dipole.

EIRP (dBm) = ERP (dBm) + 2.15 (dB.)

Test Setup



Limits

No specific RF power output requirements in part 2.1046.

Rule Part 24.232(c) Mobile and portable stations are limited to 2 watts EIRP.

Rule Part 24.232(e) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

Limit	≤ 2 W (33 dBm)
	\ 2 11 (00 dB)

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 EIRP.





Test Results

Band2	Channel/	Index	RB#		ed Power 3m)	EIRP	(dBm)
	Frequency(MHz)		RBstart	QPSK	16QAM	QPSK	16QAM
	18607/1850.7	0	1#0	22.51	21.62	23.61	22.72
	10007/1000.7	0	6#0	20.25	20.23	21.35	21.33
1.4MHz	18900/1880	0	1#0	22.60	21.95	23.70	23.05
1.4IVI⊓Z	10900/1000	0	6#0	20.38	20.32	21.48	21.42
	19193/1909.3	0	1#5	22.36	21.30	23.46	22.40
	19193/1909.3	0	6#0	20.18	20.10	21.28	21.20
	18615/1851.5	0	1#0	22.56	21.63	23.66	22.73
	10015/1051.5	0	6#0	20.22	20.18	21.32	21.28
3MHz	19000/1990	0	1#0	22.50	21.63	23.60	22.73
SIVITZ	18900/1880	0	6#0	20.23	20.28	21.33	21.38
	10195/1009 F	1	1#5	22.51	21.67	23.61	22.77
	19185/1908.5	1	6#0	20.29	20.26	21.39	21.36
	18625/1852.5	3	1#0	22.57	22.73	23.67	23.83
	18023/1832.3	0	6#0	21.38	20.32	22.48	21.42
5MHz	18900/1880	0	1#0	22.48	22.97	23.58	24.07
SIVITZ		0	6#0	21.34	20.26	22.44	21.36
	40475/4007.5	0	1#5	22.33	22.07	23.43	23.17
	19175/1907.5	3	6#0	21.44	20.53	22.54	21.63
	18650/1855	3	1#0	22.46	22.24	23.56	23.34
	16030/1633	0	4#0	22.47	21.00	23.57	22.10
10MHz	18900/1880	0	1#0	22.64	22.96	23.74	24.06
TOWINZ	16900/1660	0	4#0	22.49	21.24	23.59	22.34
	19150/1905	4	1#5	22.30	22.09	23.40	23.19
	19150/1905	7	4#2	22.39	20.85	23.49	21.95
	18675/1857.5	3	1#0	22.51	22.21	23.61	23.31
	10075/1057.5	0	6#0	22.36	22.61	23.46	23.71
15MHz	18900/1880	0	1#0	22.37	22.95	23.47	24.05
ISIVITZ	16900/1660	0	6#0	22.39	22.45	23.49	23.55
	10125/1002 F	8	1#5	22.27	22.13	23.37	23.23
	19125/1902.5	11	6#0	22.41	22.62	23.51	23.72
	18700/1860	3	1#0	22.17	22.16	23.27	23.26
	10700/1000	0	6#0	22.48	22.70	23.58	23.80
20MHz	18000/1990	0	1#0	22.50	22.90	23.60	24.00
ZUIVITZ	18900/1880	0	6#0	22.43	22.49	23.53	23.59
	19100/1900	12	1#5	22.30	21.87	23.40	22.97
	19100/1900	15	6#0	22.43	22.62	23.53	23.72





Band25	Channel/	Index	RB#		ed Power 3m)	EIRP	(dBm)
	Frequency(MHz)		RBstart	QPSK	16QAM	QPSK	16QAM
	00047/4050-7	0	1#0	22.51	21.46	23.51	22.46
	26047/1850.7	0	6#0	20.31	20.30	21.31	21.30
4 41411-	26265/4002 F	0	1#0	22.41	21.31	23.41	22.31
1.4MHz	26365/1882.5	0	6#0	20.06	20.21	21.06	21.21
	26692/1014.2	0	1#5	21.63	20.47	22.63	21.47
	26683/1914.3	0	6#0	19.49	19.45	20.49	20.45
	26055/1951 5	0	1#0	22.45	21.35	23.45	22.35
	26055/1851.5	0	6#0	20.36	20.20	21.36	21.20
3MHz	26365/1882.5	0	1#0	22.49	21.34	23.49	22.34
SIVITZ	20303/1002.3	0	6#0	20.20	20.21	21.20	21.21
	26675/1012 5	1	1#5	21.60	20.40	22.60	21.40
	26675/1913.5	1	6#0	19.58	19.57	20.58	20.57
	00005/4050.5	3	1#0	22.44	21.99	23.44	22.99
	26065/1852.5	0	6#0	21.34	20.27	22.34	21.27
5MHz	20205/4002.5	0	1#0	22.47	22.67	23.47	23.67
SIVITZ	26365/1882.5	0	6#0	21.23	20.32	22.23	21.32
	26665/1912.5	0	1#5	21.53	21.34	22.53	22.34
	20005/1912.5	3	6#0	20.66	19.71	21.66	20.71
	26090/1855	3	1#0	22.32	22.26	23.32	23.26
	20090/1000	0	4#0	22.31	20.96	23.31	21.96
10MHz	26365/1882.5	0	1#0	22.59	22.70	23.59	23.70
TOWN 12	20303/1002.3	0	4#0	22.23	21.16	23.23	22.16
	26640/1910	4	1#5	21.60	21.21	22.60	22.21
	20040/1910	7	4#2	21.48	20.10	22.48	21.10
	26115/1857.5	3	1#0	22.45	22.04	23.45	23.04
	20113/1037.3	0	6#0	22.26	22.70	23.26	23.70
15MHz	26365/1882.5	0	1#0	22.28	22.72	23.28	23.72
I JIVII IZ	20000/1002.0	0	6#0	22.18	22.29	23.18	23.29
	26615/1907.5	8	1#5	21.41	21.27	22.41	22.27
	20010/1901.0	11	6#0	21.56	21.71	22.56	22.71
	26140/1860	3	1#0	22.29	22.06	23.29	23.06
	20140/1000	0	6#0	22.38	22.64	23.38	23.64
20MHz	26365/1882.5	0	1#0	22.40	22.71	23.40	23.71
ZUIVITZ	20303/1002.3	0	6#0	22.10	22.30	23.10	23.30
	26590/1905	12	1#5	21.62	21.15	22.62	22.15
	20330/1303	15	6#0	21.51	21.72	22.51	22.72



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5.2. Radiates Spurious Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

- 1. The testing follows FCC KDB 971168 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=1MHz, VBW=3MHz, 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 (PcI) ,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 dBi)

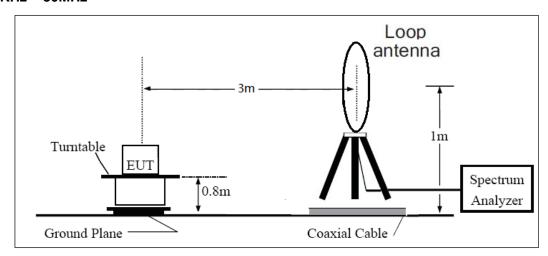
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and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

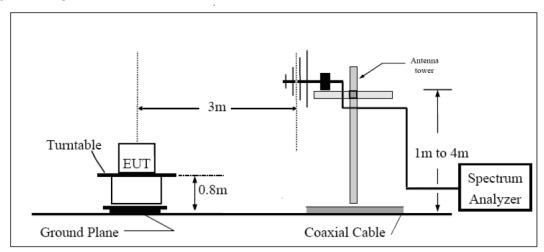
The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup

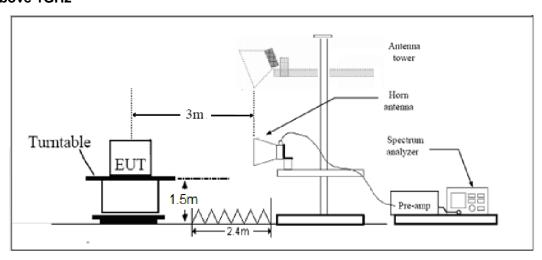
9KHz ~ 30MHz



30MHz ~ 1GHz



Above 1GHz





Note: Area side: 2.4mX3.6m

Limits

Rule Part 24.238(a) specifies that "on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log10 (P) dB."

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Limit	-13 dBm
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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.

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Test Result

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 2 1.4MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3759.00	-37.87	2.60	12.50	Horizontal	-27.97	-13.00	14.97	270
3	5638.88	-46.30	3.30	12.50	Horizontal	-37.10	-13.00	24.10	180
4	7520.00	-45.43	4.20	12.20	Horizontal	-37.43	-13.00	24.43	45
5	9400.00	-50.85	4.30	11.10	Horizontal	-44.05	-13.00	31.05	225
6	11280.00	-48.86	5.90	11.90	Horizontal	-42.86	-13.00	29.86	90
7	13160.00	-51.17	5.70	14.00	Horizontal	-42.87	-13.00	29.87	45
8	15040.00	-44.69	5.80	13.10	Horizontal	-37.39	-13.00	24.39	315
9	16920.00	-47.95	6.10	14.60	Horizontal	-39.45	-13.00	26.45	90
10	18800.00								

Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

LTE Band 2 5MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3755.63	-38.39	2.60	12.50	Horizontal	-28.49	-13.00	15.49	180
3	5633.63	-46.55	3.30	12.50	Horizontal	-37.35	-13.00	24.35	225
4	7520.00	-45.05	4.20	12.20	Horizontal	-37.05	-13.00	24.05	90
5	9400.00	-51.12	4.30	11.10	Horizontal	-44.32	-13.00	31.32	45
6	11280.00	-49.68	5.90	11.90	Horizontal	-43.68	-13.00	30.68	315
7	13160.00	-50.90	5.70	14.00	Horizontal	-42.60	-13.00	29.60	90
8	15040.00	-45.20	5.80	13.10	Horizontal	-37.90	-13.00	24.90	45
9	16920.00	-48.72	6.10	14.60	Horizontal	-40.22	-13.00	27.22	225
10	18800.00								

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 Horizontal position.

^{2.} The worst emission was found in the antenna is Horizontal position.



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LTE Band 2 20MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3742.13	-39.87	2.60	12.50	Horizontal	-29.97	-13.00	16.97	90
3	5613.38	-46.57	3.30	12.50	Horizontal	-37.37	-13.00	24.37	135
4	7484.63	-45.24	4.20	12.20	Horizontal	-37.24	-13.00	24.24	90
5	9400.00	-50.54	4.30	11.10	Horizontal	-43.74	-13.00	30.74	0
6	11280.00	-49.85	5.90	11.90	Horizontal	-43.85	-13.00	30.85	45
7	13160.00	-50.48	5.70	14.00	Horizontal	-42.18	-13.00	29.18	45
8	15040.00	-45.49	5.80	13.10	Horizontal	-38.19	-13.00	25.19	315
9	16920.00	-48.72	6.10	14.60	Horizontal	-40.22	-13.00	27.22	180
10	18800.00								

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

LTE Band 25 1.4MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3765.00	-57.12	2.60	12.50	Horizontal	-47.22	-13.00	34.22	135
3	5647.50	-49.00	3.30	12.50	Horizontal	-39.80	-13.00	26.80	270
4	7530.00	-49.63	4.20	12.20	Horizontal	-41.63	-13.00	28.63	45
5	9412.50	-53.05	4.30	11.10	Horizontal	-46.25	-13.00	33.25	180
6	11295.00	-49.26	5.90	11.90	Horizontal	-43.26	-13.00	30.26	315
7	13177.50	-51.43	5.70	14.00	Horizontal	-43.13	-13.00	30.13	45
8	15060.00	-47.51	5.80	13.10	Horizontal	-40.21	-13.00	27.21	135
9	16942.50	-49.85	6.10	14.60	Horizontal	-41.35	-13.00	28.35	270
10	18825.00								

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 Horizontal position.

^{2.} The worst emission was found in the antenna is Horizontal position.



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LTE Band 25 5MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3765.00	-56.91	2.60	12.50	Horizontal	-47.01	-13.00	34.01	135
3	5647.50	-49.41	3.30	12.50	Horizontal	-40.21	-13.00	27.21	270
4	7530.00	-51.38	4.20	12.20	Horizontal	-43.38	-13.00	30.38	45
5	9412.50	-54.12	4.30	11.10	Horizontal	-47.32	-13.00	34.32	180
6	11295.00	-50.63	5.90	11.90	Horizontal	-44.63	-13.00	31.63	45
7	13177.50	-51.21	5.70	14.00	Horizontal	-42.91	-13.00	29.91	135
8	15060.00	-47.59	5.80	13.10	Horizontal	-40.29	-13.00	27.29	270
9	16942.50	-49.72	6.10	14.60	Horizontal	-41.22	-13.00	28.22	45
10	18825.00								

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 Horizontal position.

LTE Band 25 20MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3748.13	-56.58	2.60	12.50	Horizontal	-46.68	-13.00	33.68	45
3	5622.00	-51.90	3.30	12.50	Horizontal	-42.70	-13.00	29.70	180
4	7496.00	-49.69	4.20	12.20	Horizontal	-41.69	-13.00	28.69	315
5	9370.00	-51.93	4.30	11.10	Horizontal	-45.13	-13.00	32.13	45
6	11244.00	-50.25	5.90	11.90	Horizontal	-44.25	-13.00	31.25	135
7	13118.00	-53.06	5.70	14.00	Horizontal	-44.76	-13.00	31.76	270
8	14992.00	-47.15	5.80	13.10	Horizontal	-39.85	-13.00	26.85	45
9	16866.00	-48.63	6.10	14.60	Horizontal	-40.13	-13.00	27.13	180
10	18740.00		1						

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 Horizontal position.





6. Main Test Instruments

Name	Manufacturer	Туре	Serial Number	Calibration Date	Expiration Date
Base Station Simulator	R&S	CMW500	113824	2021-05-15	2022-05-14
Spectrum Analyzer	R&S	FSV30	104028	2021-05-15	2022-05-14
Horn Antenna	Schwarzbeck	BBHA 9120D	1594	2020-12-17	2021-12-16
Software	R&S	EMC32	10.35.10	/	/

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



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ANNEX A: The EUT Appearance

The EUT Appearance are submitted separately.



F Test Report No.: R2108A0670-R2

ANNEX B: Test Setup Photos

The Test Setup Photos are submitted separately.