FCC PART 27

FCC PART 22H

MEASUREMENT AND TEST REPORT

For

Shanghai Huace Navigation Technology Ltd.

577 Songying Road, Qingpu District, Shanghai, China 201706

FCC ID: SY4-CTS-A100

Report Type:	**Product Name:**
Original Report	Total Station

Report Number:	RSHA240520001-00B
Report Date:	2024-10-08
Reviewed By:	Bard Liu
Approved By:	Kyle Xu
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan, Jiangsu Province, China Tel: +86-512-86175000 Fax: +86-512-88934268 www.baclcorp.com.cn

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REPORT REVISION HISTORY

Number of Revisions	Report No.	Version	Issue Date	Description
0	RSHA240520001-00B	R1V1	2024-10-08	Initial Release

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant:	Shanghai Huace Navigation Technology Ltd.
Tested Model:	CTS-A100
Product Name:	Total Station
Power Supply:	DC 7.4V battery
RF Function:	LTE
Operating Band/Frequency:	LTE Band 5: 824-849 MHz(TX), 869-894 MHz(RX) LTE Band 41: 2555-2655 MHz(TX), 2555-2655 MHz(RX)
Maximum conducted Output Power:	LTE Band 5: 23.30 dBm LTE Band 41: 24.88 dBm
Modulation Type:	LTE: QPSK, 16QAM
Antenna Type:	PIFA Antenna
★Maximum Antenna Gain:	LTE Band 5: -0.67 dBi LTE Band 41: 1.18 dBi
★Cable Loss:	LTE Band 5: 0.1 dB LTE Band 41: 0.2 dB

Adapter Information:
Model: NC-III
Input: AC100-240V 50/60Hz
Output:DC8.40V, 1400mA

Note: The maximum antenna gain and cable loss was declared by the manufacturer.

All measurement and test data in this report was gathered from production sample serial number: RSHA240520001-1 (Assigned by the BACL (Kunshan). The EUT supplied by the applicant was received on 2024-05-20.)

Objective

This type approval report is prepared for *Shanghai Huace Navigation Technology Ltd.* in accordance with Part 2, Part 22-Subpart H, Part 27 of the Federal Communication Commission's rules.

The objective is to determine the compliance of EUT with FCC rules for output power, modulation characteristic, occupied bandwidth, and spurious emission at antenna terminal, spurious radiated emission, frequency stability, and band edge.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-Part J as well as the following parts:

Part 22 Subpart H - Public Mobile Services
Part 27 – Miscellaneous wireless communications services
Applicable Standards: ANSI C63.26-2015.

Measurement Uncertainty

Item		Uncertainty
RF conducted test		0.9dB
Radiated emission	9 kHz~150 kHz	3.8dB
	150 kHz~30 MHz	3.4dB
	30MHz~1GHz	5.91dB
	1GHz~6GHz	4.68dB
	6GHz~18GHz	4.92dB
	18GHz~40GHz	5.21dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) is accredited in accordance with ISO/IEC 17025:2017 by NVLAP (Lab code: 600338-0), and the lab has been recognized as the FCC accredited lab under the KDB 974614 D01, the FCC Designation No. : CN5055.

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing according to ANSI C63.26-2015.

The final qualification test was performed with the EUT operating at normal mode.

Channel List

Mode		Channel	Frequency (MHz)
LTE Band 5	1.4M	Low	824.7
		Middle	836.5
		High	848.3
	3M	Low	825.5
		Middle	836.5
		High	847.5
	5M	Low	826.5
		Middle	836.5
		High	846.5
	10M	Low	829.0
		Middle	836.5
		High	844.0
LTE Band 41	5M	Low	2557.5
		Middle	2605.0
		High	2652.5
	10M	Low	2560.0
		Middle	2605.0
		High	2650.0
	15M	Low	2562.5
		Middle	2605.0
		High	2647.5
	20M	Low	2565.0
		Middle	2605.0
		High	2645.0

Equipment Modifications

No modifications were made to the EUT.

Support Equipment List and Details

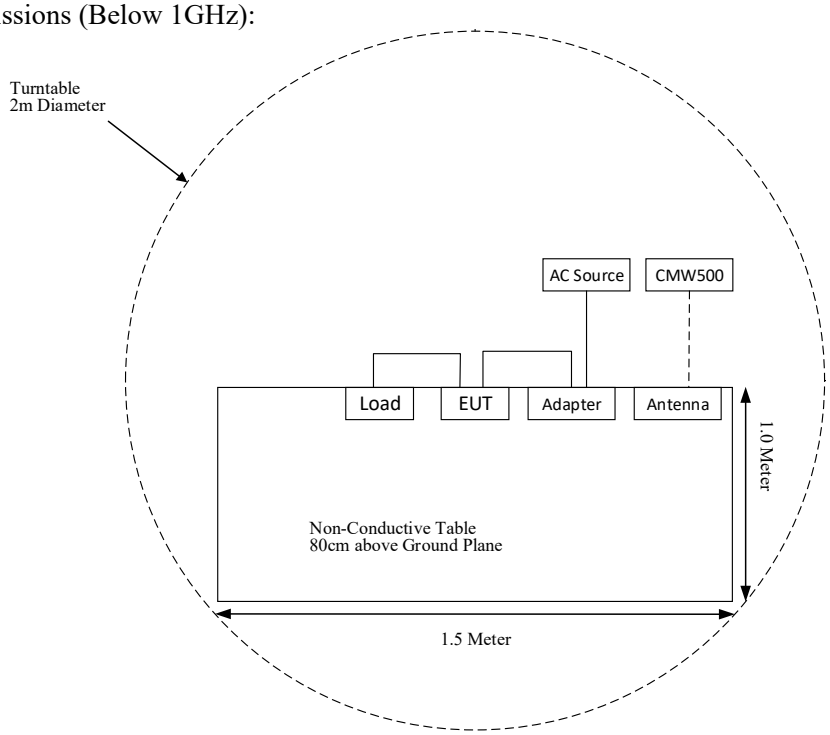
Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	104478
/	Load	/	/

External I/O Cable

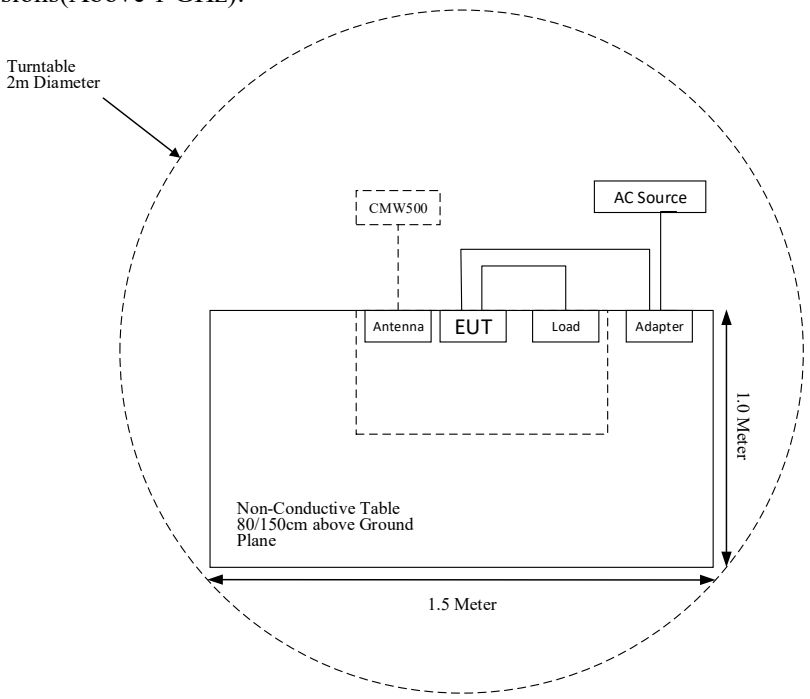
Cable Description	Length (m)	From Port	To
Power Cable 1	1.0	AC Source	Adapter
Power Cable 2	1.0	Adapter	EUT
Power Cable 3	1.0	EUT	Load

Block Diagram of Test Setup

For Radiated Emissions (Below 1GHz):



For Radiated Emissions(Above 1 GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§2.1046; § 22.913 (a);§27.50 (h)(2);	RF Output Power	Compliant
§ 2.1047	Modulation Characteristics	Not Applicable
§2.1049; §22.905; §22.917; §27.53;	Occupied Bandwidth	Compliant
§2.1051; §22.917 (a);§27.53(m);	Spurious Emissions at Antenna Terminal	Compliant
§2.1053; §22.917 (a); §27.53 (m);	Spurious Radiated Emissions	Compliant
§22.917 (a); §27.5 (m);	Band Edge	Compliant
§2.1055; §22.355; §27.54;	Frequency stability	Compliant
§1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test (Chamber #1)					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2024-04-23	2025-04-22
Keysight	Signal Generator	N5183A	MY47420304	2024-04-24	2025-04-23
Sunol Sciences	Broadband Antenna	JB3	A090314-1	2023-11-11	2024-11-10
Sunol Sciences	Hybrid Antenna	JB3	A090314-2	2023-01-12	2026-01-11
Sonoma Instrument	Amplifier	310N	171205	2024-04-23	2025-04-22
Rohde & Schwarz	Auto Test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-7	007	2024-04-23	2025-04-22
MICRO-COAX	Coaxial Cable	Cable-8	008	2024-04-23	2025-04-22
MICRO-COAX	Coaxial Cable	Cable-9	009	2024-04-23	2025-04-22
MICRO-COAX	Coaxial Cable	Cable-10	010	2024-04-23	2025-04-22
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	104478	2024-04-24	2025-04-23
Radiated Emission Test (Chamber #2)					
Keysight	Signal Generator	N5183A	MY47420304	2024-04-24	2025-04-23
Rohde & Schwarz	EMI Test Receiver	ESU40	100207/040	2024-04-25	2025-04-24
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2023-06-27	2026-06-26
ETS-LINDGREN	Horn Antenna	3115	6229	2023-01-16	2026-01-15
ETS-LINDGREN	Horn Antenna	3116	2516	2023-12-08	2024-12-07
ETS-LINDGREN	Horn Antenna	3116	84159	2023-12-08	2024-12-07
Wi	Band reject filter	SN1	WRCGV5-804-824-849-869-30SS	2024-04-25	2025-04-24
Wi	Band reject filter	SN1	WRCJV8-2550-2570-2620-2640-30SS	2024-04-25	2025-04-24
A.H.Systems,inc	Amplifier	PAM-0118P	512	2024-04-25	2025-04-24
EM Electronics Corporation	Amplifier	EM18G40G	060726	2024-04-25	2025-04-24
Rohde & Schwarz	Auto test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-6	006	2024-04-23	2025-04-22
MICRO-COAX	Coaxial Cable	Cable-11	011	2024-04-25	2025-04-24
MICRO-COAX	Coaxial Cable	Cable-12	012	2024-04-25	2025-04-24
MICRO-COAX	Coaxial Cable	Cable-13	013	2024-04-25	2025-04-24
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	104478	2024-04-24	2025-04-23

RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2024-04-24	2025-04-23
Rohde & Schwarz	Spectrum Analyzer	FSIQ26	100048	2024-04-24	2025-04-23
BACL	Temperature & Humidity Chamber	BTH-150	30023	2024-04-25	2025-04-24
EAST	Regulated DC Power Supply	MCH-303D-II	14070562	2023-10-10	2024-10-09
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	104478	2024-04-24	2025-04-23
Narda	Attenuator	10dB	010	2024-04-24	2025-04-23
MACOM	Power Splitter	2090-6214-00	96341	2024-04-23	2025-04-22
XHFDZ	RG316 Coaxial Cable	SMA-316	XHF-1175	Each time	N/A
Unknown	RF Cable	RF Cable C01	C01	Each Time	N/A

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

FCC §1.1310 & §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart §2.1091 and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:
Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Calculation Data:

Mode	Frequency Range (MHz)	Antenna Gain With cable loss		Tune-up Output Power★		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)	MPE Ratio
		(dBi)	(numeric)	(dBm)	(mW)				
BLE	2402-2480	1.76	1.50	-2.00	0.63	20	0.0002	1.0	0.0002
2.4G Wi-Fi	2412-2462	1.76	1.50	23.00	199.53	20	0.0595	1.0	0.0595
LTE Band 5	824-849	-0.77	0.84	23.50	223.87	20	0.0373	0.5493	0.0679
LTE Band 41	2555-2655	0.98	1.25	25.00	316.23	20	0.0788	1.0	0.0788

Note:
1. For the above tune up power were declared by the manufacturer.
2. 2.4G Wi-Fi , LTE Band 41 can transmit simultaneously（worst case）.

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.0595+0.0788=0.1383 < 1.0$$

Result: The device meet FCC MPE at 20 cm distance.

FCC §2.1047 - MODULATION CHARACTERISTIC

According to FCC § 2.1047(d), Part 22H & Part 27 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

FCC §2.1046; § 22.913 (a);§27.50 (h) - RF OUTPUT POWER

Applicable Standards

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts (38.45dBm).

According to §27.50(h) (2), Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

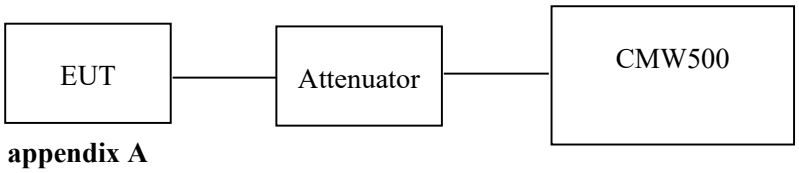
The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

Test Procedure

According to CFR Part 2.1046, ANSI C63.26-2015 Section 5.2.5.5:

Conducted method:

The RF output of the transmitter was connected to the CMW500 through sufficient attenuation.



Test Data: See appendix A

FCC §2.1049, §22.917, §22.905, §27.53- OCCUPIED BANDWIDTH

Applicable Standards

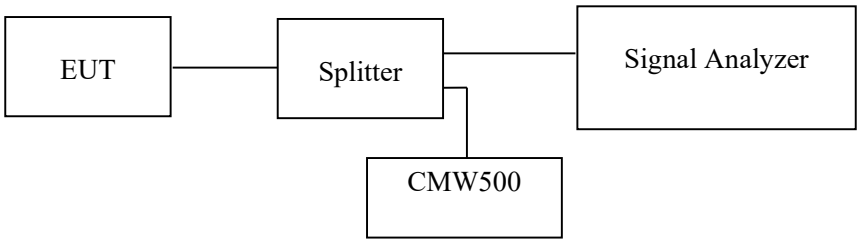
FCC 47 §2.1049, §22.917, §22.905;§27.53;

Test Procedure

According to CFR Part 2.1049, ANSI C63.26-2015 Section 5.4.4

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 30 kHz/50 kHz/100 kHz/200 kHz (LTE), and the 26 dB & 99% bandwidth was recorded.



Test Data: Appendix C

FCC § 2.1051; § 22.917 (a); §27.53 (m) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standards

FCC §2.1051, §22.917(a), §27.53 (m)

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

According to §22.917(a),the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB

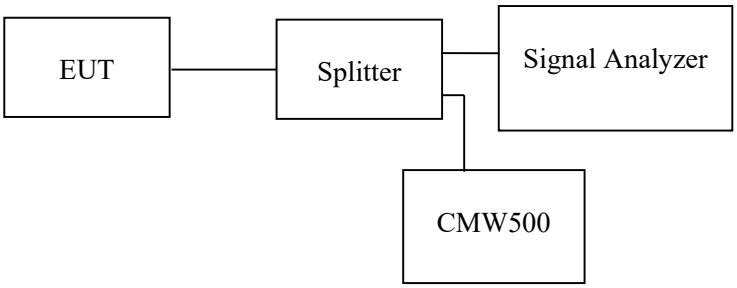
27.53m(4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

According to §27.53(m),for mobile digital stations, any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 55 + 10 log (P) dB

Test Procedure

According to ANSI C63.26-2015 Section 5.7.4:

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for below 1GHz & 1MHz for above 1GHz. sufficient scans were taken to show any out of band emissions up to 10th harmonic.



Test Data: See Appendix D

FCC § 2.1053; § 22.917 (a); §27.53 (m);- SPURIOUS RADIATED EMISSIONS

Applicable Standards

FCC § 2.1053, §22.917(a), § 27.53 (m)

22.917 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB

27.53m(4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TX pwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log_{10} (power out in Watts)

Test Data: See Appendix A

FCC § 22.917 (a); § 27.53 (m) - BAND EDGES

Applicable Standards

22.917 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB

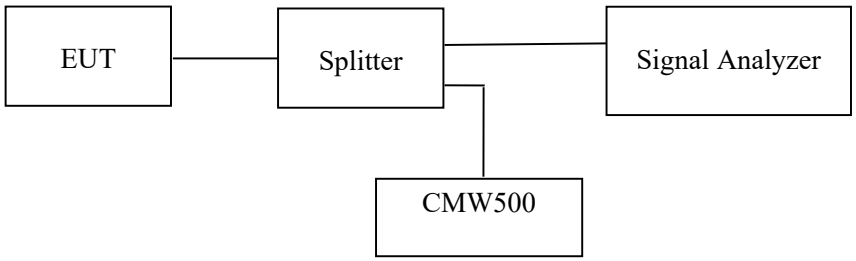
24.238 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB

27.53m(4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency.



Test Data: See Appendix B

FCC § 2.1055; § 22.355;§27.54 - FREQUENCY STABILITY

Applicable Standards

FCC § 2.1055, §22.355§27.54

According to FCC §2.1055, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency Range (MHz)	Base, fixed (ppm)	Mobile > 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929.	5.0	N/A	N/A
929 to 960.	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

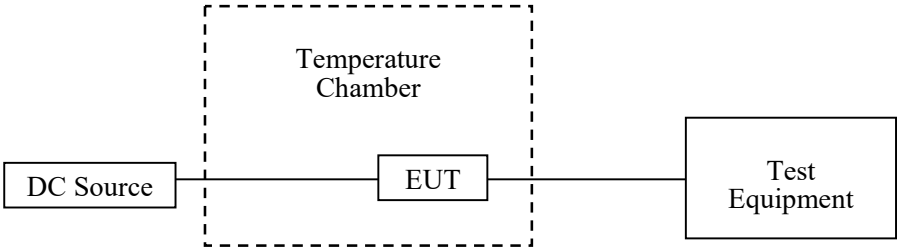
According to §27.54 Frequency stability, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: For hand carried, battery powered equipment; reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



Test Data: See appendix A

EUT PHOTOGRAPHS

Please refer to the attachment EXHIBIT A - EUT EXTERNAL PHOTOGRAPHS and EXHIBIT B - EUT INTERNAL PHOTOGRAPHS.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment EXHIBIT D - TEST SETUP PHOTOGRAPHS.

APPENDIX A - TEST DATA

Environmental Conditions & Test Information

Test Item:	RF OUTPUT POWER& Peak-to-average ratio	OCCUPIED BANDWIDTH	SPURIOUS RADIATED EMISSIONS	FREQUENCY STABILITY
Test Date:	2024-06-21	2024-06-13 to 2024-10-08	2024-06-12	2024-06-12
Temperature:	17.3 ℃	17.5-23.2 ℃	17.5 ℃	17.5 ℃
Relative Humidity:	51 %	45-58 %	45 %	45 %
ATM Pressure:	101.8 kPa	101.5-102.4 kPa	101.5 kPa	101.5 kPa
Test Result:	Pass	Pass	Pass	Pass
Test Engineer:	Jenny Yang	Jason Lu	Jenny Yang	Jenny Yang

Test Item:	Spurious Emissions at Antenna Terminal	Band Edge
Test Date:	2024-06-13 to 2024-06-17	2024-06-13 to 2024-09-24
Temperature:	17.5-20.1 ℃	17.5-21.2 ℃
Relative Humidity:	45-52 %	45-58 %
ATM Pressure:	101.5-101.8 kPa	101.5-102.4 kPa
Test Result:	Pass	Pass
Test Engineer:	Jason Lu	Jason Lu

RF OUTPUT POWER

LTE Band 5

Bandwidth (MHz)	Modulation	RB size/ RB Offset	Conducted Average Output Power (dBm)			ERP (dBm)		
			Low	Mid	High	Low	Mid	High
1.4	QPSK	1#0	22.96	22.97	22.83	20.04	20.05	19.91
		1#3	23.17	23.02	23.04	20.25	20.10	20.12
		1#5	22.84	**23.24**	22.82	19.92	20.32	19.90
		3#0	22.96	23.05	23.00	20.04	20.13	20.08
		3#3	22.80	23.09	22.94	19.88	20.17	20.02
		6#0	22.18	22.06	21.91	19.26	19.14	18.99
	16QAM	1#0	21.45	22.17	21.78	18.53	19.25	18.86
		1#3	21.53	**22.23**	21.84	18.61	19.31	18.92
		1#5	21.38	22.10	21.86	18.46	19.18	18.94
		3#0	21.41	22.10	21.81	18.49	19.18	18.89
		3#3	21.64	22.02	21.72	18.72	19.10	18.80
		6#0	21.03	20.71	20.72	18.11	17.79	17.80
3	QPSK	1#0	22.81	23.02	22.93	19.89	20.10	20.01
		1#8	23.03	**23.29**	22.88	20.11	20.37	19.96
		1#14	22.92	23.01	23.11	20.00	20.09	20.19
		6#0	22.08	22.08	21.98	19.16	19.16	19.06
		6#9	22.11	22.12	22.04	19.19	19.20	19.12
		15#0	22.06	22.05	22.02	19.14	19.13	19.10
	16QAM	1#0	21.97	21.51	**22.11**	19.05	18.59	19.19
		1#8	21.57	21.46	21.93	18.65	18.54	19.01
		1#14	22.03	21.43	21.94	19.11	18.51	19.02
		6#0	21.00	21.07	20.70	18.08	18.15	17.78
		6#9	20.85	20.78	20.66	17.93	17.86	17.74
		15#0	20.60	20.81	20.68	17.68	17.89	17.76

Bandwidth (MHz)	Modulation	RB size/ RB Offset	Conducted Average Output Power (dBm)			ERP (dBm)		
			Low	Mid	High	Low	Mid	High
5	QPSK	1#0	23.04	23.04	22.76	20.12	20.12	19.84
		1#13	23.30	**23.30**	22.66	20.38	20.38	19.74
		1#24	22.97	23.05	22.72	20.05	20.13	19.80
		15#0	22.10	22.07	21.97	19.18	19.15	19.05
		15#10	22.14	22.04	21.90	19.22	19.12	18.98
		25#0	22.04	22.04	22.00	19.12	19.12	19.08
	16QAM	1#0	22.23	21.74	21.85	19.31	18.82	18.93
		1#13	**22.26**	21.29	21.49	19.34	18.37	18.57
		1#24	21.62	21.72	21.63	18.70	18.80	18.71
		15#0	21.11	20.90	21.14	18.19	17.98	18.22
		15#10	20.81	20.83	20.96	17.89	17.91	18.04
		25#0	21.11	20.92	20.91	18.19	18.00	17.99
10	QPSK	1#0	22.85	22.95	23.05	19.93	20.03	20.13
		1#25	22.93	**23.16**	22.96	20.01	20.24	20.04
		1#49	22.87	22.92	22.88	19.95	20.00	19.96
		25#0	22.10	22.12	22.06	19.18	19.20	19.14
		25#25	22.16	22.15	22.03	19.24	19.23	19.11
		50#0	22.13	22.08	22.05	19.21	19.16	19.13
	16QAM	1#0	22.07	21.78	**22.23**	19.15	18.86	19.31
		1#25	22.16	21.55	22.07	19.24	18.63	19.15
		1#49	21.98	21.07	22.12	19.06	18.15	19.20
		25#0	20.84	21.28	21.21	17.92	18.36	18.29
		25#25	20.93	21.22	21.18	18.01	18.30	18.26
		50#0	21.01	20.93	21.02	18.09	18.01	18.10

Note: ERP(dBm) = Conducted Power(dBm) + Antenna Gain(dBd)
Antenna Gain(dBd) = Antenna Gain(dBi)-cable loss（dB）-2.15
Limit: ERP≤38.45dBm

LTE Band 41

Bandwidth (MHz)	Modulation	RB size/ RB Offset	Conducted Average Output Power (dBm)			EIRP (dBm)		
			Low	Mid	High	Low	Mid	High
5	QPSK	1#0	24.50	23.86	24.31	25.48	24.84	25.29
		1#13	**24.88**	24.10	24.76	25.86	25.08	25.74
		1#24	24.26	24.11	24.21	25.24	25.09	25.19
		15#0	23.61	23.19	23.47	24.59	24.17	24.45
		15#10	23.63	23.21	23.51	24.61	24.19	24.49
		25#0	23.59	23.33	23.39	24.57	24.31	24.37
	16QAM	1#0	23.23	23.03	22.93	24.21	24.01	23.91
		1#13	**23.57**	23.13	22.89	24.55	24.11	23.87
		1#24	23.14	23.15	22.81	24.12	24.13	23.79
		15#0	22.69	22.23	22.22	23.67	23.21	23.20
		15#10	22.74	22.28	22.28	23.72	23.26	23.26
		25#0	22.41	22.30	22.47	23.39	23.28	23.45
10	QPSK	1#0	**24.85**	24.16	24.61	25.83	25.14	25.59
		1#25	24.70	24.38	24.47	25.68	25.36	25.45
		1#49	24.57	24.37	24.35	25.55	25.35	25.33
		25#0	23.61	23.28	23.58	24.59	24.26	24.56
		25#25	23.53	23.35	23.52	24.51	24.33	24.50
		50#0	23.50	23.37	23.39	24.48	24.35	24.37
	16QAM	1#0	**24.34**	23.34	22.96	25.32	24.32	23.94
		1#25	23.91	23.60	22.89	24.89	24.58	23.87
		1#49	24.01	23.53	22.76	24.99	24.51	23.74
		25#0	22.61	22.23	22.38	23.59	23.21	23.36
		25#25	22.45	22.31	22.32	23.43	23.29	23.30
		50#0	22.49	22.04	22.43	23.47	23.02	23.41

Bandwidth (MHz)	Modulation	RB size/ RB Offset	Conducted Average Output Power (dBm)			EIRP (dBm)		
			Low	Mid	High	Low	Mid	High
15	QPSK	1#0	24.65	24.23	**24.76**	25.63	25.21	25.74
		1#38	24.61	24.60	24.56	25.59	25.58	25.54
		1#74	24.33	24.42	24.36	25.31	25.4	25.34
		36#0	23.56	23.25	23.78	24.54	24.23	24.76
		36#39	23.48	23.29	23.55	24.46	24.27	24.53
		75#0	23.42	23.36	23.58	24.4	24.34	24.56
	16QAM	1#0	**24.05**	23.48	23.18	25.03	24.46	24.16
		1#38	23.68	23.60	22.96	24.66	24.58	23.94
		1#74	23.58	23.68	22.69	24.56	24.66	23.67
		36#0	22.45	22.14	22.72	23.43	23.12	23.7
		36#39	22.36	22.26	22.41	23.34	23.24	23.39
		75#0	22.47	22.37	22.61	23.45	23.35	23.59
20	QPSK	1#0	**24.85**	23.87	24.66	25.83	24.85	25.64
		1#50	24.51	24.34	24.84	25.49	25.32	25.82
		1#99	24.50	24.42	24.52	25.48	25.4	25.5
		50#0	23.64	23.27	23.88	24.62	24.25	24.86
		50#50	23.46	23.34	23.71	24.44	24.32	24.69
		100#0	23.45	23.40	23.69	24.43	24.38	24.67
	16QAM	1#0	23.50	22.74	22.66	24.48	23.72	23.64
		1#50	23.55	22.90	23.07	24.53	23.88	24.05
		1#99	**23.61**	23.04	22.67	24.59	24.02	23.65
		50#0	22.47	22.29	22.75	23.45	23.27	23.73
		50#50	22.43	22.26	22.62	23.41	23.24	23.6
		100#0	22.46	22.30	22.48	23.44	23.28	23.46

Note: EIRP (dBm) = Conducted Power(dBm) + Antenna Gain(dBi)-cable loss（dB）
Limit: EIRP≤33dBm

Peak-to-average ratio (PAR):

LTE Band 5

Test Modulation		Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit(dB)
QPSK	1 RB	10M	4.78	4.84	4.78	≤ 13
	50 RB		5.01	5.04	4.96	≤ 13
16-QAM	1 RB	10M	5.48	6.00	5.65	≤ 13
	50 RB		6.06	6.12	5.97	≤ 13

LTE Band 41

Test Modulation		Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit(dB)
QPSK	1 RB	20M	5.65	8.55	5.22	≤ 13
	100 RB		4.41	8.35	4.32	≤ 13
16-QAM	1 RB	20M	5.59	5.57	5.57	≤ 13
	100 RB		3.86	3.88	3.91	≤ 13

SPURIOUS RADIATED EMISSIONS

Test mode: Transmitting (Pre-scan with 1RB of all the bandwidth, and worst case as below)

30 MHz ~ 10 GHz:

LTE Band 5:

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)			
QPSK 1.4MHz Bandwidth Low Channel										
239.52	44.52	92	200	H	-57.78	0.44	-2.61	-60.83	-13	47.83
239.52	51.16	213	100	V	-57.57	0.44	-2.61	-60.62	-13	47.62
1649.40	52.60	104	150	H	-60.74	0.84	8.44	-53.14	-13	40.14
1649.40	52.91	200	150	V	-60.43	0.84	8.44	-52.83	-13	39.83
QPSK 1.4MHz Bandwidth Middle Channel										
239.52	44.59	98	200	H	-57.71	0.44	-2.61	-60.76	-13	47.76
239.52	51.23	220	100	V	-57.50	0.44	-2.61	-60.55	-13	47.55
1673.00	51.03	101	200	H	-62.14	0.84	8.48	-54.50	-13	41.50
1673.00	50.71	287	200	V	-62.46	0.84	8.48	-54.82	-13	41.82
QPSK 1.4MHz Bandwidth High Channel										
239.52	44.58	193	100	H	-57.72	0.44	-2.61	-60.77	-13	47.77
239.52	51.16	314	200	V	-57.57	0.44	-2.61	-60.62	-13	47.62
1696.60	59.19	341	200	H	-53.82	0.84	8.52	-46.14	-13	33.14
1696.60	58.60	185	200	V	-54.41	0.84	8.52	-46.73	-13	33.73

30 MHz ~ 27 GHz:

LTE Band 41:

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)			
QPSK 5MHz Bandwidth Low Channel										
240.13	44.30	289	100	H	-57.95	0.44	-2.59	-60.98	-25	35.98
240.13	50.69	146	150	V	-58.10	0.44	-2.59	-61.13	-25	36.13
5115.00	59.65	288	100	H	-45.73	1.09	10.30	-36.52	-25	11.52
5115.00	60.14	270	100	V	-45.24	1.09	10.30	-36.03	-25	11.03
QPSK 5MHz Bandwidth Middle Channel										
240.13	44.07	190	150	H	-58.18	0.44	-2.59	-61.21	-25	36.21
240.13	50.36	356	200	V	-58.43	0.44	-2.59	-61.46	-25	36.46
5210.00	58.23	9	100	H	-46.62	1.11	10.30	-37.43	-25	12.43
5210.00	58.38	36	150	V	-46.47	1.11	10.30	-37.28	-25	12.28
QPSK 5MHz Bandwidth High Channel										
240.13	44.06	246	200	H	-58.19	0.44	-2.59	-61.22	-25	36.22
240.13	50.43	63	150	V	-58.36	0.44	-2.59	-61.39	-25	36.39
5305.00	58.89	82	150	H	-45.43	1.12	10.30	-36.25	-25	11.25
5305.00	58.46	227	200	V	-45.86	1.12	10.30	-36.68	-25	11.68

FREQUENCY STABILITY

EUT operation mode: Transmitting

Test Result: Compliance.

LTE Band 5:

QPSK, 10.0 MHz, Middle channel				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	7.4	11	0.01315	2.5
-20		27	0.03228	2.5
-10		21	0.02510	2.5
0		15	0.01793	2.5
10		12	0.01435	2.5
20		23	0.02750	2.5
30		29	0.03467	2.5
40		12	0.01435	2.5
50		15	0.01793	2.5
20	6.66	28	0.03347	2.5
	8.14	25	0.02989	2.5

16-QAM, 10.0 MHz, Middle channel				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	7.4	19	0.02271	2.5
-20		25	0.02989	2.5
-10		31	0.03706	2.5
0		28	0.03347	2.5
10		21	0.02510	2.5
20		16	0.01913	2.5
30		18	0.02152	2.5
40		20	0.02391	2.5
50		23	0.02750	2.5
20	6.66	31	0.03706	2.5
	8.14	26	0.03108	2.5

LTE Band 41:

QPSK, 20MHz, low channel& high channel					
Temperature (°C)	**Voltage Supplied (V_{DC})**	**F_L (MHz)**	**F_H (MHz)**	**F_L Limit (MHz)**	**F_H Limit (MHz)**
-30	7.4	2555.861	2654.002	2555	2655
-20		2555.914	2654.025	2555	2655
-10		2555.925	2654.027	2555	2655
0		2555.991	2654.012	2555	2655
10		2555.933	2654.026	2555	2655
20		2555.982	2654.018	2555	2655
30		2555.959	2654.010	2555	2655
40		2555.961	2654.023	2555	2655
50		2555.977	2654.017	2555	2655
20	6.66	2555.975	2654.025	2555	2655
	8.14	2555.980	2654.018	2555	2655

16-QAM, 20MHz, low channel& high channel					
Temperature (°C)	**Voltage Supplied (V_{DC})**	**F_L (MHz)**	**F_H (MHz)**	**F_L Limit (MHz)**	**F_H Limit (MHz)**
-30	7.4	2555.918	2654.022	2555	2655
-20		2555.937	2654.013	2555	2655
-10		2555.958	2654.017	2555	2655
0		2555.971	2654.029	2555	2655
10		2555.982	2654.017	2555	2655
20		2555.977	2654.012	2555	2655
30		2555.962	2654.003	2555	2655
40		2555.959	2654.019	2555	2655
50		2555.996	2654.015	2555	2655
20	6.66	2555.925	2654.023	2555	2655
	8.14	2555.939	2654.019	2555	2655

Declarations

1. The laboratory is not responsible for the authenticity of any information provided by the applicant. Information from the applicant that may affect test results is marked with "★".

2. The test data was only valid for the test sample(s).

3. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

4. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

5. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor k=2 with the 95.45% confidence interval.

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