TEST REPORT

For GSM

Report No.: CHTEW23110072

Report Verification:

Project No...... SHT2306080101EW

FCC ID.....: 2A80E-F8926-GW-02

Applicant: Xiamen Four-Faith Communication Technology Co., Ltd.

Product Name: LoRaWAN Gateway

Trade Mark

Model No. F8926-GW-02

Listed Model(s):

Standard: FCC CFR Title 47 Part 2

FCC CFR Title 47 Part 22 Subpart H
FCC CFR Title 47 Part 24 Subpart E

Date of receipt of test sample............ Aug. 07, 2023

Date of testing...... Aug. 14, 2023- Nov. 24, 2023

Date of issue...... Nov. 27, 2023

Result..... Pass

Compiled by

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Testing Laboratory Name: Shenzhen Huatongwei International Inspection Co., Ltd.

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The test report merely correspond to the test sample.

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1. TEST STANDARDS AND REPORT VERSION

1.1. Applicable Standards

The tests were performed according to following standards:

FCC CFR Title 47 Part 2: Frequency Allocations and Radio Treaty Matters; General Rules and Regulations

FCC CFR Title 47 Part 22 Subpart H: Cellular Radiotelephone Service

FCC CFR Title 47 Part 24 Subpart E: Broadband PCS

ANSI C63.26-2015: American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

KDB 971168 D01 Power Meas License Digital Systems v03: MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS

1.2. Report version information

Revision No.	Date of issue	Description
N/A	2023-11-27	Original

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2. TEST DESCRIPTION

Section	Test Item	Section in CFR 47	Result #1	Test Engineer
-	Conducted Output Power	Part 2.1046 Part 22.913(a) Part 24.232(c)	Pass*	-
-	Peak-to-Average Ratio	Part 24.232	Pass*	-
-	99% Occupied Bandwidth & 26 dB Bandwidth	Part 2.1049 Part 22.917(b) Part 24.238(b)	Pass*	-
-	Band Edge	Part 2.1051 Part 22.917 Part 24.238	Pass*	-
-	Conducted Spurious Emissions	Part 2.1051 Part 22.917 Part 24.238	Pass*	-
-	Frequency stability vs temperature	Part 2.1055(a)(1)(b) Part 22.355 Part 24.235	Pass*	-
-	Frequency stability vs voltage	Part 2.1055(d)(1)(2) Part 22.355 Part 24.235	Pass*	-
5.1	ERP and EIRP	Part 22.913(a) Part 24.232(b)	Pass	Caspar Chen
5.2	Radiated Spurious Emissions	Part 2.1053 Part 22.917 Part 24.238	Pass	Yifan Wang

Note:

^{1) #1:} The test result does not include measurement uncertainty value

^{2) *:} Refer to module FCC ID: ZMONL668LA05.

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3. **SUMMARY**

3.1. Client Information

Applicant:	Xiamen Four-Faith Communication Technology Co., Ltd.
Address:	11th Floor,A-06 Area,No.370,Chengyi Street,Jimei,Xiamen,Fujian,China.
Manufacturer:	Xiamen Four-Faith Communication Technology Co., Ltd.
Address:	11th Floor,A-06 Area,No.370,Chengyi Street,Jimei,Xiamen,Fujian,China.

3.2. Product Description

Main unit information:			
Product Name:	LoRaWAN Gateway		
Trade Mark:	Four-Faith		
Model No.:	F8926-GW-02		
Listed Model(s):	-		
Power supply:	DC 12V from Adapter		
Hardware version:	V 1.0.0.2		
Software version:	F8926GW-V2-IOTGW-32M-STD-VPN-20230313.flash		
Accessory unit information:			
Adapter information:	MODEL: KL-AD3060VA INPUT: 100-240V~50/60Hz 0.7A OUTPUT: DC 12V, 1.5A		

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3.3. Radio Specification Description

Support Operating Band:	⊠ GSM850	□ PCS1900		
Operating Frequency Range:	Please refer to note #2			
Support Network:	□GSM	⊠ GPRS	⊠ EGPRS	
Modulation type:	⊠ GMSK	⊠ 8PSK		
GPRS Multislot Class:	□ 8	□ 10	⊠ 12	□ 33
EGPRS Multislot Class:	□ 8	□ 10	⊠ 12	□ 33
Antenna type:	Stick Antenna			
Antenna gain #3:	GSM850: 1.73dE	Bi	PCS1900: 1.57d	dBi

Note:

- O 🛛 : means that this feature is supported; 🗀 : means that this feature is not supported
- O #2: Operating frequency range is as follow:

Band	Uplink frequency	Downlink frequency
GSM850	824.20 - 848.80MHz	869.20 - 893.80MHz
PCS1900	1850.20 -1909.80MHz	1930.20 -1989.80MHz

 ^{#3:} The antenna gain is provided by the applicant, and the applicant should be responsible for its authenticity, HTW lab has not verified the authenticity of its information

3.4. Testing Laboratory Information

Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.		
Laboratory Location	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China		
Contact information:	Tel: 86-755-26715499 E-mail: cs@szhtw.com.cn http://www.szhtw.com.cn		
Qualifications	Туре	Accreditation Number	
Qualifications	FCC	762235	

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4. TEST CONFIGURATION

4.1. Test frequency list

GSM850		PCS1900		
Channel	Frequency (MHz)	Channel	Frequency (MHz)	
128	824.20	512	1850.20	
190	836.60	661	1880.00	
251	848.80	810	1909.80	

4.2. Test mode

Test mode

- Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems and ANSI C63.26 with maximum output power.
- 2) Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

All modes and data rates and positions were investigated, test modes are chosen to be reported as the worst case configuration below:

Band	Radiated test items	
GSM 850	■ GSM link	
PCS 1900	■ GSM link	

4.3. Test sample information

Test item	HTW sample no.
Radiated test items	YPHT23060801007

Note:

Radiated test items: Radiated Spurious Emission

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4.4. Support unit used in test configuration and system

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The following peripheral devices and interface cables were connected during the measurement:

Whethe	er support unit is used?			
✓	No			
Item	Equipment	Trade Name	Model No.	Other
1				
2				

4.5. Testing environmental condition

Voltage	VN=Nominal Voltage	AC 120V
Temperature	TN=Normal Temperature	25 °C
Humidity	30~60 %	
Air Pressure	950-1050 hPa	

4.6. Statement of the measurement uncertainty

No.	Test Items	Measurement Uncertainty
4	Padiated Spurious Emission	4.54dB for 30MHz-1GHz
	Radiated Spurious Emission	5.10dB for above 1GHz

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

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4.7. Equipments Used during the Test

•	Radiated Spu	urious Emission					
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
•	Semi-Anechoic Chamber	Albatross projects	HTWE0122	SAC-3m-01	C11121	2023/4/17	2026/4/16
•	Spectrum Analyzer	R&S	HTWE0098	FSP40	100597	2023/08/22	2024/08/21
•	Spectrum Analyzer	R&S	HTWE0385	N9020A	MY54486658	2023/08/22	2024/08/21
•	Ultra-Broadband Antenna	SCHWARZBECK	HTWE0123	VULB9163	538	2021/4/6	2024/4/5
•	Horn Antenna	SCHWARZBECK	HTWE0126	BBHA 9120D	1011	2023/2/14	2026/2/13
•	Pre-Amplifer	CD	HTWE0071	PAP-0102	12004	2023/5/25	2024/5/24
•	Broadband Pre- amplifier	SCHWARZBECK	HTWE0201	BBV 9718	9718-248	2023/5/25	2024/5/24
•	Test Software	Audix	N/A	E3	N/A	N/A	N/A

•	Auxiliary Equi	pment					
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
•	Radio communication tester	R&S	HTWE0287	CMW500	137688-Lv	2023/08/25	2024/08/24
•	High pass filter	Wainwright	HTWE0297	WHKX3.0/18G-10SS	38	2023/05/15	2024/05/14
0	Band Stop filter	-	HTWE0039	N/A	N/A	2023/01/26	2024/01/25

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5. TEST CONDITIONS AND RESULTS

5.1. ERP and EIRP

LIMIT

GSM850: 7W (38.45dBm) ERP PCS1900: 2W (33dBm) EIRP

TEST PROCEDURE

- 1. According to the power tested in section 5.1, select the maximum power in each mode, and use the following formula to calculate the corresponding ERP/EIRP.
- 2. ERP = conducted power + Gain(dBd)
- EIRP = conducted power + Gain(dBi)
 ERP = EIRP 2.15

TEST RESULTS

TEST DATA

Refer to the appendix report

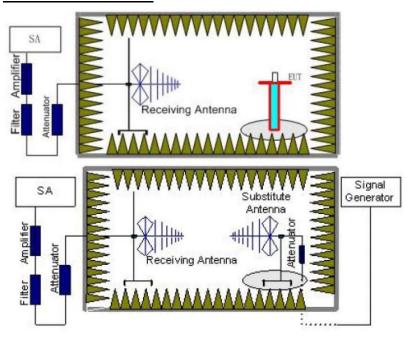
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5.2. Radiated Spurious Emission

LIMIT

-13dBm

TEST CONFIGURATION



TEST PROCEDURE

- Place the EUT in the center of the turntable.
 - a) For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT shall be placed on a RF-transparent table at a nominal height of 80 cm above the reference ground plane
 - b) For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table at a nominal height of 1.5 m above the ground plane.
- 2. Unless the EUT uses an integral antenna, the EUT shall be terminated with a non-radiating transmitter load. In cases where the EUT uses an adjustable antenna, the antenna shall be adjusted through typical positions and lengths to maximize emissions levels.
- 3. The EUT shall be tested while operating on the frequency per manufacturer specification. Set the transmitter to operate in continuous transmit mode.
- 4. Receiver or Spectrum set as follow:
 - Below 1GHz, RBW=100kHz, VBW=300kHz, Detector=Peak, Sweep time=Auto
 - Above 1GHz, RBW=1MHz, VBW=3MHz, Detector=Peck, Sweep time=Auto
- 5. Each emission under consideration shall be evaluated:
 - a) Raise and lower the measurement antenna from 1 m to 4 m, as necessary to enable detection of the maximum emission amplitude relative to measurement antenna height.
 - b) Rotate the EUT through 360° to determine the maximum emission level relative to the axial position.
 - c) Return the turntable to the azimuth where the highest emission amplitude level was observed.
 - d) Vary the measurement antenna height again through 1 m to 4 m again to find the height associated with the maximum emission amplitude.
 - e) Record the measured emission amplitude level and frequency
- 6. Repeat step 5 for each emission frequency with the measurement antenna oriented in both the horizontal and vertical polarizations to determine the orientation that gives the maximum emissions amplitude.
- Set-up the substitution measurement with the reference point of the substitution antenna located as near as possible to where the center of the EUT radiating element was located during the initial EUT

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measurement.

8. Maintain the previous measurement instrument settings and test set-up, with the exception that the EUT is removed and replaced by the substitution antenna.

- 9. Connect a signal generator to the substitution antenna; locate the signal generator so as to minimize any potential influences on the measurement results. Set the signal generator to the frequency where emissions are detected, and set an output power level such that the radiated signal can be detected by the measurement instrument, with sufficient dynamic range relative to the noise floor.
- 10. For each emission that was detected and measured in the initial test
 - a) Vary the measurement antenna height between 1 m to 4 m to maximize the received (measured) signal amplitude.
 - b) Adjust the signal generator output power level until the amplitude detected by the measurement instrument equals the amplitude level of the emission previously measured directly in step 5 and step 6.
 - Record the output power level of the signal generator when equivalence is achieved in step b).
- 11. Repeat step 8 through step 10 with the measurement antenna oriented in the opposite polarization.
- 12. Calculate the emission power in dBm referenced to a half-wave dipole using the following equation:

Pe = Ps(dBm) - cable loss (dB) + antenna gain (dBd)

where

Pe = equivalent emission power in dBm

Ps = source (signal generator) power in dBm

NOTE—dBd refers to the measured antenna gain in decibels relative to a half-wave dipole.

13. Correct the antenna gain of the substitution antenna if necessary to reference the emission power to a half-wave dipole. When using measurement antennas with the gain specified in dBi, the equivalent dipole-referenced gain can be determined from:

gain (dBd) = gain (dBi) - 2.15 dB.

If necessary, the antenna gain can be calculated from calibrated antenna factor information

14. Provide the complete measurement results as a part of the test report.

TEST MODE

Please refer to the clause 4.2

TEST RESULTS

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				GSM8	50				
Test channel:		128		F	Polarizatio	n:	ŀ	Horizonta	d
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	99.52	-80.31	25.76	1.87	30.65	-83.33	-13.00	-70.33	Peak
2	762.33	-77.82	29.08	5.62	29.45	-72.57	-13.00	-59.57	Peak
3	1819.83	-64.48	36.66	9.17	29.11	-47.76	-13.00	-34.76	Peak
4	2164.79	-69.97	41.15	10.16	29.07	-47.73	-13.00	-34.73	Peak
5	3681.47	-64.68	42.37	5.14	41.60	-58.77	-13.00	-45.77	Peak
6	11457.21	-67.46	53.17	10.33	42.30	-46.26	-13.00	-33.26	Peak
Γest channel:		128		F	Polarizatio	n:	١	/ertical	
Mark	Frequency	Reading	Antenna	Cable	Preamp	Level	Limit		Remark
	MHZ	dBm	dB	dB	dB	dBm	dBm		
1	40.74	-80.49	27.43	1.16	30.59	-82.49	-13.00		Peak
2	850.14	-79.29	29.76	5.97	29.35	-72.91	-13.00		Peak
3	1809.86	-61.83	36.84	9.14	29.02	-44.87	-13.00	-31.87	Peak
4	2708.63	-72.61	39.84	11.67	25.54	-46.64	-13.00	-33.64	Peak
5	4512.97	-65.57	43.23	5.94	41.40	-57.80	-13.00	-44.80	Peak
6	8083.96	-64.43	47.83	8.13	40.64	-49.11	-13.00	-36.11	Peak

Test channel:		190	190			n:	H	Horizontal	
Mark	Frequency	Reading	Antenna	Cable	Preamp	Level	Limit	0ver	Remark
	MHZ	dBm	dB	dB	dB	dBm	dBr	ı limit	
1	40.74	-80.39	27.43	1.16	30.59	-82.39	-13.00	-69.39	Peak
2	948.05	-74.85	29.40	6.35	29.27	-68.37	-13.00	-55.37	Peak
3	1809.86	-62.99	36.84	9.14	29.02	-46.03	-13.00	-33.03	Peak
4	2793.24	-73.98	40.67	11.86	24.75	-46.20	-13.00	-33.20	Peak
5	5352.19	-65.62	44.05	6.34	40.92	-56.15	-13.00	-43.15	Peak
6	11312.31	-67.20	52.95	10.23	42.30	-46.32	-13.00	-33.32	Peak
Test channel:		190		F	Polarization	n:	١	/ertical	
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm		Remark
1	90.82	-78.60	25.88	1.78	30.69	-81.63	-13.00		Peak
2	754.33	-79.42	29.21	5.57	29.45	-74.09	-13.00		Peak
3	1807.88	-62.51	36.55	9.13	28.98	-45.81	-13.00		Peak
_	2842.77	-73.25	40.75	12.02	24.71	-45.19	-13.00		Peak
4									
4 5	4748.67	-65.81	43.60	5.89	41.40	-57.72	-13.00	-44.72	Peak

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Test channel:		251		ı	Polarizatio	n:	H	Horizonta	al
Mark	Frequency	Reading	Antenna	Cable	Preamp	Level	Limit		Remark
	MHZ	dBm	dB	dB	dB	dBm	dBm	limit	
1	36.92	-80.24	27.32	1.10	30.65	-82.47	-13.00	-69.47	Peak
2	948.05	-75.91	29.40	6.35	29.27	-69.43	-13.00	-56.43	Peak
3	1809.86	-65.21	36.84	9.14	29.02	-48.25	-13.00	-35.25	Peak
4	2533.06	-70.65	39.10	11.20	26.86	-47.21	-13.00	-34.21	Peak
5	7394.88	-66.38	48.53	7.78	41.00	-51.07	-13.00	-38.07	Peak
6	11399.03	-67.62	52.97	10.29	42.30	-46.66	-13.00	-33.66	Peak
Test channel:		251		í	Polarizatio	n:	١	/ertical	
Manda				e-61-					
Mark	Frequency MHZ	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level	Limit dBm	Over	Remark
1	96.76	-80.37	25.79	1.84	30.66	-83.40	-13.00	-70.40	Peak
2	948.05	-77.04	29.13	6.35	29.27	-70.83	-13.00	-57.83	Peak
3	1555.26	-70.78	37.76	8.39	28.75	-53.38	-13.00	-40.38	Peak
4	2225.07	-70.00	41.42	10.33	28.88	-47.13	-13.00	-34.13	Peak
5	4524.47	-64.84	43.32	5.90	41.40	-57.02	-13.00	-44.02	Peak
	11842.69	-68.12	53.04	10.59	42.30	-46.79	-13.00	-33.79	Peak

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				PCS19	900				
Test channe	l:	512			Polarizatio	n:	H	Horizontal	
Mark	Frequency	Reading	Antenna	Cable	Preamp	Level	Limit	over	Remark
	MHZ	dBm	dB	dB	dB	dBm	dBm	limit	
1	36.92	-80.61	27.32	1.10	30.65	-82.84	-13.00	-69.84	Peak
2	765.02	-78.40	29.30	5.63	29.45	-72.92	-13.00	-59.92	Peak
3	1811.85	-65.88	36.87	9.15	29.05	-48.91	-13.00	-35.91	Peak
4	2732.54	-72.92	40.08	11.68	25.35	-46.51	-13.00	-33.51	Peak
5	7413.73	-66.66	48.49	7.84	41.02	-51.35	-13.00	-38.35	Peak
6	10971.98	-67.23	52.84	9.99	42.30	-46.70	-13.00	-33.70	Peak
Test channel:		512		ı	Polarizatio	n:	١	/ertical	
	Facations	Donding				Lovel			Domanic
Mark		Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBn		Remark
1	MHZ 104.54	-79.30	25.14	1.92		-82.86	-13.06		Peak
2	762.33		29.08	5.62		-82.86 -73.35	-13.00		Peak
		-78.60							Peak
3	1821.83	-62.70	36.68	9.17		-45.96		-32.96	
4	2353.30	-70.59	39.86	10.62		-48.35		-35.35	Peak
5	5821.21	-65.13	44.20	6.73		-54.89	-13.00		Peak
6	11399.03	-67.90	53.13	10.29	42.30	-46.78	-13.00	-33.78	Peak

Test channel:		661		F	olarizatio	n:	F	lorizontal	
Mark	Frequency	Reading	Antenna	Cable	Preamp	Level	Limit		Remark
	MHZ	dBm	dB	dB	dB	dBm	dBm	ı limit	
1	89.87	-71.56	17.92	1.77	30.69	-82.56	-13.00	-69.56	Peak
2	765.02	-75.09	29.30	5.63	29.45	-69.61	-13.00	-56.61	Peak
3	1811.85	-67.43	36.87	9.15	29.05	-50.46	-13.00	-37.46	Peak
4	2793.24	-74.15	40.67	11.86	24.75	-46.37	-13.00	-33.37	Peak
5	4676.70	-64.98	43.53	5.88	41.40	-56.97	-13.00	-43.97	Peak
6	11545.04	-66.26	52.94	10.39	42.30	-45.23	-13.00	-32.23	Peak
Test channel:		661		F	olarizatio	า:	V	'ertical	
Mark	Frequency	Reading	Antenna	Cable	Preamp	Level	Limit	Over	Remark
	MHZ	dBm	dB	dB	dB	dBm	dBm	limit	
1	91.78	-79.56	25.86	1.79	30.68	-82.59	-13.00	-69.59	Peak
	751.69	-79.91	29.29	5.56	29.45	-74.51	-13.00	-61.51	Peak
2	/ 31.03								
2	1807.88	-65.17	36.55	9.13	28.98	-48.47	-13.00	-35.47	Peak
			36.55 41.08	9.13 10.39	28.98 28.59	-48.47 -47.17	-13.00 -13.00		Peak Peak
3	1807.88	-65.17						-34.17	

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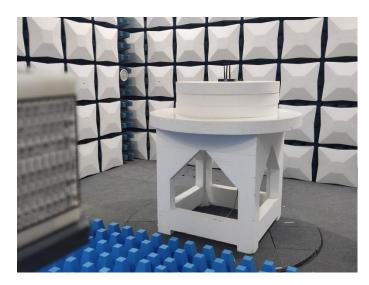
Test channel	810	810			Polarization:				
Mark	Frequency	Reading	Antenna	Cable	Preamp	Level	Limit	Over	Remark
	MHZ	dBm	dB	dB	dB	dBm	dBm	limit	
1	37.84	-79.44	27.46	1.12	30.64	-81.50	-13.00	-68.50	Peak
2	948.05	-77.75	29.40	6.35	29.27	-71.27	-13.00	-58.27	Peak
3	1807.88	-65.49	36.82	9.13	28.98	-48.52	-13.00	-35.52	Peak
4	2257.08	-70.24	40.63	10.43	28.58	-47.76	-13.00	-34.76	Peak
5	5284.50	-66.04	44.01	6.34	40.98	-56.67	-13.00	-43.67	Peak
6	10534.09	-67.48	51.77	9.77	41.04	-46.98	-13.00	-33.98	Peak
Test channel		810		Р	olarizatio	n:	V	ertical	
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over	Remark
1	90.82	-80.40	25.88	1.78	30.69	-83.43	-13.00	-70.43	Peak
2	762.33	-76.45	29.08	5.62	29.45	-71.20	-13.00	-58.20	Peak
3	1811.85	-65.54	36.58	9.15	29.05	-48.86	-13.00	-35.86	Peak
4	2222.63	-70.40	41.45	10.31	28.92	-47.56	-13.00	-34.56	Peak
	5073.59	-65.80	44.29	6.22	41.07	-56.36	-13.00	-43.36	Peak
5									

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6. TEST SETUP PHOTOS OF THE EUT







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7. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Refer to the test report No.: CHTEW23110070

8. APPENDIX REPORT

Project No.: SHT2306080101EW Radio Specification: GSM

APPENDIX REPORT

Project No.	SHT2306080101EW	Radio Specification	GSM
Test sample No.	YPHT23060801007	Model No.	F8926-GW-02
Start test date	2023-08-14	Finish date	2023-08-18
Temperature	25.4℃	Humidity	49%
Test Engineer	Caspar Chen	Auditor	Xiaodong Zheo

Appendix clause	Test item	Result	
А	ERP and EIRP	PASS	

Project No.: SHT2306080101EW Radio Specification: GSM

8.1 Appendix A: ERP and EIRP

Test Result

Dand	Mode	Conducted Power	Antenna Gain	EF	RP Limit		Vandiet
Band		(dBm)	(dBi)	(dBm)	(W)	(W) verdic	Verdict
CCMOFO	GPRS	31.72	1.73	31.30	1.3490	7	PASS
GSM850	EGPRS	26.71	1.73	26.29	0.4256	7	PASS

Dand	Mode	Conducted Power	Antenna Gain	EII	RP	Limit	Verdict
Band		(dBm)	(dBi)	(dBm)	(W)	(W)	
CCM1000	GPRS	28.35	1.57	29.92	0.9817	2	PASS
GSM1900	EGPRS	24.12	1.57	25.69	0.3707	2	PASS

-----End of the Report -----