



FCC RF Test Report

APPLICANT : Franklin Technology Inc.
EQUIPMENT : Mobile Hotspot
MODEL NAME : RG2100
FCC ID : XHG-RG2100
STANDARD : 47 CFR Part 2, 22(H), 24(E), 27(L)
CLASSIFICATION : PCS Licensed Transmitter (PCB)
TEST DATE(S) : Sep. 08, 2022

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.26-2015 and shown compliance with the applicable technical standards.

This product installed a RF module (Brand Name: Telit, Model Name: M2500, FCC ID: XHG-M2500) during the test, only ERP/EIRP and RSE test items are tested in this report, all the other test results are leveraged from module RF report.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia

Approved by: Jason Jia



Sporton International Inc. (Kunshan)

**No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China**



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG262007-01A	Rev. 01	Initial issue of report	Sep. 09, 2022



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	-	Report Only	-
	§22.913(a)(5)	Effective Radiated Power	< 7 Watts	PASS	-
	§24.232(c)	Equivalent Isotropic Radiated Power	< 2 Watts	PASS	-
	§27.50(d)(4)	Equivalent Isotropic Radiated Power	< 1 Watts	PASS	-
3.5	§24.232(d)	Peak-to-Average Ratio	< 13 dB	PASS	1
3.6	§2.1049	Occupied Bandwidth	Reporting Only	PASS	1
3.7	§2.1051 §22.917(a) §24.238(a) §27.53(h)	Band Edge Measurement	< 43+10log10(P[Watts])	PASS	1
3.8	§2.1051 §22.917(a) §24.238(a) §27.53(h)	Conducted Emission	< 43+10log10(P[Watts])	PASS	1
3.9	§2.1055 §22.355	Frequency Stability for Temperature & Voltage	< 2.5 ppm for Part 22	PASS	1
	§2.1055 §24.235 §27.54		Within Authorized Band		
4.4	§2.1053; §22.917(a); §24.238(a); §27.53(h)	Field Strength of Spurious Radiation	< 43+10log10(P[Watts])	PASS	Under limit 38.85 dB at 7524.000 MHz

Remark 1:

All test results were leveraged from module RF report which can refer to Report No. FG262007A.

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.



1 General Description

1.1 Applicant

Franklin Technology Inc.

906 JEI Platz, 186, Gasan digital 1-ro, Gumcheon-Gu, Seoul, South Korea, 08502

1.2 Manufacturer

Franklin Technology Inc.

906 JEI Platz, 186, Gasan digital 1-ro, Gumcheon-Gu, Seoul, South Korea, 08502

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Hotspot
Model Name	RG2100
FCC ID	XHG-RG2100
IMEI Code	Radiation: 358563790000942
HW Version	P1
SW Version	RG2100.TM.1354
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. This device antenna is designed for the same Peak Gain/Type as the module for intentional transmit frequency bands and the power is lower as well, Radiated Spurious Emission is verified worse case.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	WCDMA: Band V: 824 MHz ~ 849 MHz Band II: 1850 MHz ~ 1910 MHz Band IV: 1710 MHz ~ 1755 MHz
Rx Frequency	WCDMA: Band V: 869 MHz ~ 894 MHz Band II: 1930 MHz ~ 1990 MHz Band IV: 2110 MHz ~ 2155 MHz
Maximum Output Power to Antenna	WCDMA: Band V: 23.81 dBm Band II: 22.98 dBm Band IV: 23.08dBm
Antenna Type	PIFA Antenna
Antenna Gain	Cellular Band: -0.66 dBi PCS Band: -1.66 dBi AWS Band: -1.56 dBi
Type of Modulation	WCDMA: BPSK HSDPA: QPSK HSUPA: QPSK HSPA+ : 16QAM DC-HSDPA : 64QAM

1.5 Modification of EUT

No modifications are made to the EUT during all test items.



1.6 Maximum ERP/EIRP Power, and Emission Designator

FCC Rule	Frequency Band	Frequency Range (MHz)	Type of Modulation	Maximum ERP/EIRP (W)
Part 22H	WCDMA Band V	826.4 ~ 846.6	BPSK	0.1259
Part 24E	WCDMA Band II	1852.4 ~ 1907.6	BPSK	0.1355
Part 27L	WCDMA Band IV	1712.4 ~ 1752.6	BPSK	0.1419

1.7 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	03CH04-KS	CN1257	314309

1.8 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH04-KS	AUDIX	E3	6.2009-8-24a



1.9 Applicable Standards

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

- ♦ 47 CFR Part 2, 22(H), 24(E), 27(L)
- ♦ ANSI C63.26-2015
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- ♦ FCC KDB 412172 D01 Determining ERP and EIRP v01r01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.(Y-Plane)

Radiated emissions were investigated as following frequency range:

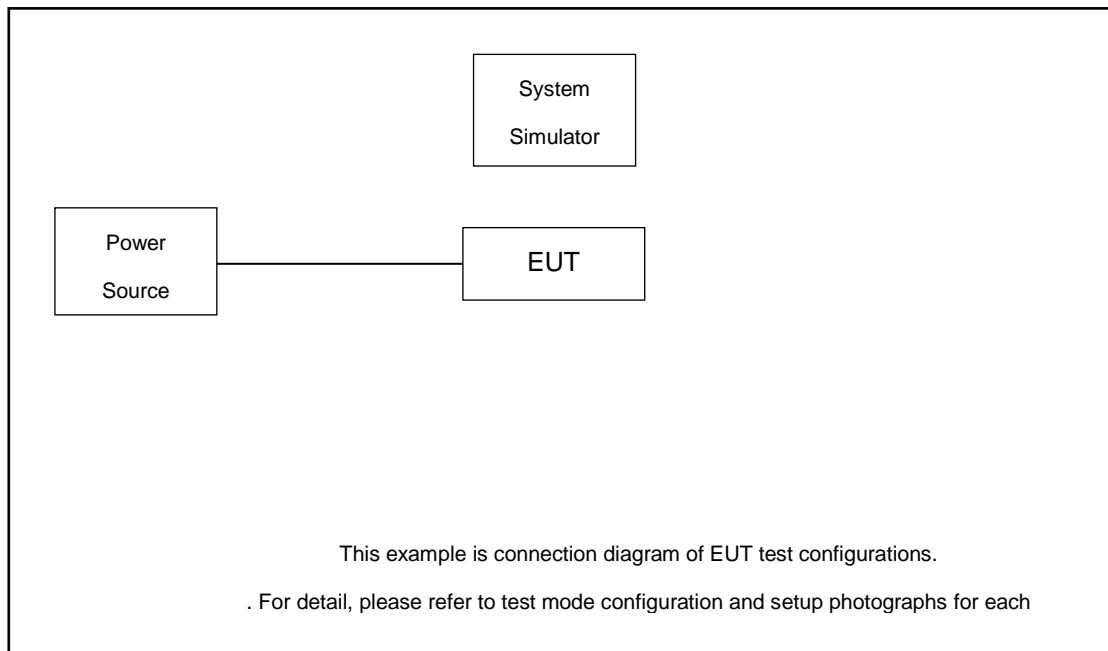
1. 30 MHz to 9000 MHz for WCDMA Band V.
2. 30 MHz to 18000 MHz for WCDMA Band IV.
3. 30 MHz to 19100 MHz for WCDMA Band II.

All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

Test Modes		
Band	Radiated TCs	
WCDMA Band V	■ RMC 12.2Kbps Link	
WCDMA Band II	■ RMC 12.2Kbps Link	
WCDMA Band IV	■ RMC 12.2Kbps Link	

2.2 Connection Diagram of Test System



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

2.3 Support Unit used in test configuration

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	Base Station	Anritsu	MT8820/8821	N/A	N/A	Unshielded,1.8m

2.4 Frequency List of Low/Middle/High Channels

Frequency List				
Band	Channel/Frequency(MHz)	Lowest	Middle	Highest
WCDMA Band V	Channel	4132	4182	4233
	Frequency	826.4	836.4	846.6
WCDMA Band II	Channel	9262	9400	9538
	Frequency	1852.4	1880.0	1907.6
WCDMA Band IV	Channel	1312	1413	1513
	Frequency	1712.4	1732.6	1752.6



3 Conducted Test Result

3.1 Conducted Output Power and ERP/EIRP

3.1.1 Description of the Conducted Output Power and ERP/EIRP

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 7 Watts for WCDMA Band V.

The EIRP of mobile transmitters must not exceed 2 Watts for WCDMA Band II.

The EIRP of mobile transmitters must not exceed 1 Watts for WCDMA Band IV.

According to KDB 412172 D01 Power Approach,

$EIRP = P_T + G_T - L_C$, $ERP = EIRP - 2.15$, where

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

3.1.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.2
2. The transmitter output port was connected to the system simulator.
3. Set EUT at maximum power through the system simulator.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure and record the power level from the system simulator.

3.1.3 Test Result

Please refer to Appendix A.

4 Radiated Test Items

4.1 Measuring Instruments

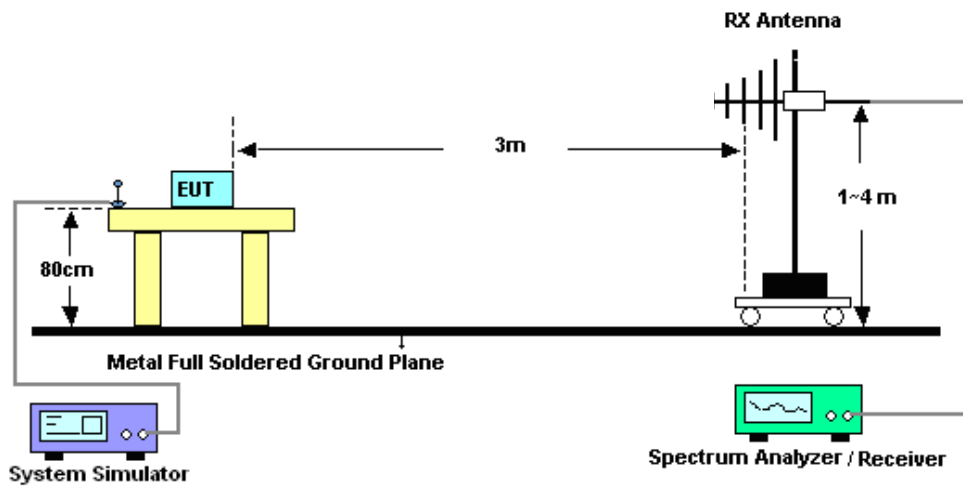
See list of measuring instruments of this test report.

4.2 Test Setup

4.2.1 For radiated test below 30MHz



4.2.2 For radiated test from 30MHz to 1GHz



4.2.3 For radiated test above 1GHz



4.3 Test Result of Radiated Test

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

Please refer to Appendix B.



4.4 Field Strength of Spurious Radiation Measurement

4.4.1 Description of Field Strength of Spurious Radiated Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

4.4.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.5
2. The EUT was placed on a rotatable wooden table 0.8 meters for frequency below 1GHz and 1.5 meter for frequency above 1GHz above the ground.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
9. Taking the record of output power at antenna port.
10. Repeat step 7 to step 8 for another polarization.
11. $EIRP \text{ (dBm)} = S.G. \text{ Power} - Tx \text{ Cable Loss} + Tx \text{ Antenna Gain}$
12. $ERP \text{ (dBm)} = EIRP - 2.15$
13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
14. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)



5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EXA Spectrum Analyzer	Keysight	N9010B	MY57541079	10Hz-44G,MAX 30dB	Oct. 14, 2021	Sep. 08, 2022	Oct. 13, 2022	Radiation (03CH04-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Sep. 08, 2022	Oct. 29, 2022	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	May 30, 2022	Sep. 08, 2022	May 29, 2023	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	1284	1GHz~18GHz	Oct. 18, 2021	Sep. 08, 2022	Oct. 17, 2022	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2022	Sep. 08, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Jan. 05, 2022	Sep. 08, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40G GA	060728	18~40GHz	Jan. 05, 2022	Sep. 08, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
high gain Amplifier	EM	EM01G18G A	060839	1Ghz-18Ghz	Oct. 14, 2021	Sep. 08, 2022	Oct. 13, 2022	Radiation (03CH04-KS)
Amplifier	Keysight	83017A	MY57280106	500MHz~26.5GHz	Oct. 13, 2021	Sep. 08, 2022	Oct. 12, 2022	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Sep. 08, 2022	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Sep. 08, 2022	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Sep. 08, 2022	NCR	Radiation (03CH04-KS)

NCR: No Calibration Required



6 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.26-2015. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.3 dB
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.8dB
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Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.8dB
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----- THE END -----



Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power) and ERP/EIRP

Band		WCDMA V			ERP(W)		
TX Channel		4132	4182	4233			
Rx Channel		4357	4407	4458			
Frequency (MHz)		826.4	836.4	846.6	L	M	H
3GPP Rel 99	RMC 12.2Kbps	23.81	23.77	23.79	0.1259	0.1247	0.1253
3GPP Rel 6	HSDPA Subtest-1	22.86	22.82	22.80	0.1012	0.1002	0.0998
3GPP Rel 6	HSDPA Subtest-2	22.86	22.79	22.87	0.1012	0.0995	0.1014
3GPP Rel 6	HSDPA Subtest-3	22.22	22.31	22.39	0.0873	0.0891	0.0908
3GPP Rel 6	HSDPA Subtest-4	22.34	22.37	22.29	0.0897	0.0904	0.0887
3GPP Rel 6	HSUPA Subtest-1	22.83	22.86	22.73	0.1005	0.1012	0.0982
3GPP Rel 6	HSUPA Subtest-2	20.77	20.86	20.74	0.0625	0.0638	0.0621
3GPP Rel 6	HSUPA Subtest-3	21.82	21.81	21.72	0.0796	0.0794	0.0778
3GPP Rel 6	HSUPA Subtest-4	20.74	20.76	20.76	0.0621	0.0624	0.0624
3GPP Rel 6	HSUPA Subtest-5	22.66	22.69	22.66	0.0966	0.0973	0.0966

Band		WCDMA II			EIRP(W)		
TX Channel		9262	9400	9538			
Rx Channel		9662	9800	9938			
Frequency (MHz)		1852.4	1880	1907.6	L	M	H
3GPP Rel 99	RMC 12.2Kbps	22.92	22.88	22.98	0.1337	0.1324	0.1355
3GPP Rel 6	HSDPA Subtest-1	22.02	22.02	21.97	0.1086	0.1086	0.1074
3GPP Rel 6	HSDPA Subtest-2	22.06	21.94	22.02	0.1096	0.1067	0.1086
3GPP Rel 6	HSDPA Subtest-3	21.43	21.43	21.59	0.0948	0.0948	0.0984
3GPP Rel 6	HSDPA Subtest-4	21.49	21.57	21.47	0.0962	0.0979	0.0957
3GPP Rel 6	HSUPA Subtest-1	21.97	22.02	21.86	0.1074	0.1086	0.1047
3GPP Rel 6	HSUPA Subtest-2	19.96	20.05	19.89	0.0676	0.0690	0.0665
3GPP Rel 6	HSUPA Subtest-3	21.01	20.99	20.90	0.0861	0.0857	0.0839
3GPP Rel 6	HSUPA Subtest-4	19.94	19.97	19.87	0.0673	0.0678	0.0662
3GPP Rel 6	HSUPA Subtest-5	21.83	21.86	21.87	0.1040	0.1047	0.1050



Band		WCDMA IV			EIRP(W)		
TX Channel		1312	1413	1513			
Rx Channel		1537	1638	1738			
Frequency (MHz)		1712.4	1732.6	1752.6	L	M	H
3GPP Rel 99	RMC 12.2Kbps	22.96	22.96	23.08	0.1380	0.1380	0.1419
3GPP Rel 6	HSDPA Subtest-1	21.97	21.87	21.87	0.1099	0.1074	0.1074
3GPP Rel 6	HSDPA Subtest-2	21.94	21.92	21.90	0.1091	0.1086	0.1081
3GPP Rel 6	HSDPA Subtest-3	21.27	21.34	21.44	0.0935	0.0951	0.0973
3GPP Rel 6	HSDPA Subtest-4	21.37	21.41	21.38	0.0957	0.0966	0.0959
3GPP Rel 6	HSUPA Subtest-1	21.92	21.89	21.82	0.1086	0.1079	0.1062
3GPP Rel 6	HSUPA Subtest-2	19.88	19.95	19.81	0.0679	0.0690	0.0668
3GPP Rel 6	HSUPA Subtest-3	20.90	20.84	20.79	0.0859	0.0847	0.0838
3GPP Rel 6	HSUPA Subtest-4	19.84	19.84	19.85	0.0673	0.0673	0.0675
3GPP Rel 6	HSUPA Subtest-5	21.78	21.81	21.77	0.1052	0.1059	0.1050



Appendix B. Test Results of Radiated Test

Radiated Spurious Emission

Test Engineer :	Levi zhuo	Temperature :	22~23°C
		Relative Humidity :	41~42%

WCDMA Band II(RMC 12.2Kbps)								
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	3759	-56.34	-13	-43.34	-68.60	2.64	14.90	H
	5640	-54.73	-13	-41.73	-66.59	2.94	14.80	H
	7524	-52.01	-13	-39.01	-61.78	3.39	13.16	H
	3759	-56.73	-13	-43.73	-68.99	2.64	14.90	V
	5640	-55.27	-13	-42.27	-67.13	2.94	14.80	V
	7524	-51.85	-13	-38.85	-61.62	3.39	13.16	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.