

FCC TEST REPORT

Product name: Wireless charging power bank
FCC ID: 2AFKNF704W
Model: F704W
Standards: FCC CFR 47 PART 15 SUBPART C,
Section 15.209 and 15.207
Applicant: Spigen Korea Co., Ltd.
Test Report No.: UCSFR-1510-005

UCS Co., Ltd.

FCC Test Report

Report Number		UCSFR-1510-005		
Applicant	Company Name	Spigen Korea Co., Ltd.		
	Address	NO. 1709 STX-V TOWER, 371-37, GASAN-DONG, GEUMCHEON-GU, SEOUL, 153803, KOREA		
Product	Product Name	Wireless charging power bank		
	FCC ID	2AFKNF704W		
	Model Name	F704W		
	Family Model Name	-		
	Manufacturer	Shenzhen Powerqi Technology Co., Ltd.		
	Serial No.	-	Country of origin	China
Other	Receipt Date	2015.08.06	Receipt Number	UCS-R-2014-591
	Issued Date	2015.10.21	Tested Date	2015.10.19 ~ 2015.10.20
Standards		FCC CFR 47 PART 15 SUBPART C, Section 15.209 and 15.207		
Tested by		Y. Choi (Sign)		
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o This is certified that the above mentioned products have been tested for the sample provided by client. o No part of this document may not be duplicated or reproduced by any means without the express written permission of UCS Co., Ltd.				

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
UCSFR-1510-005	21-Oct-15	Spigen Korea Co., Ltd.	All

1. Applicant Information

Applicant Name : Spigen Korea Co., Ltd.
Address : NO. 1709 STX-V TOWER, 371-37, GASAN-DONG, GEUMCHEON-GU, SEOUL,
153803, KOREA
Manufacturer : Shenzhen Powerqi Technology Co., Ltd.
Address : 14th Floor, 3rd Building, Zhonghaixin Science & Tech Park, Longgang District,
Shenzhen, China
Country of Origin : China

2. EUT (Equipment under test) Information

Product name	Wireless charging power bank
Model name	F704W
Power source	DC 3.7 V (Battery)
Modulation Technique	ASK
Antenna Type	Integral loop coil antenna

3. Laboratory Information

UCS Co., Ltd.

#702, AnyangMegavally, 268 Hagui-ro, Dongan-gu, Anyang-si, Gyeonggi-do, 431-767 Korea.

ER Center

#476-4, Hwalcho-dong, Hwaseong-si, Gyeonggi-do, 445-150, Korea

Test site

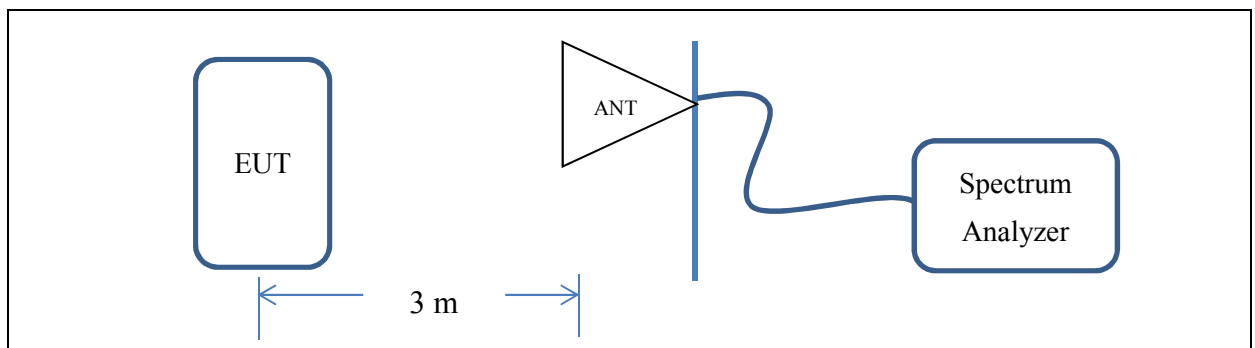
- FCC Registration Number: 803225
- This test site is in compliance with ISO/IEC 17025 for general requirements for the competence of testing and calibration laboratories.

4. Test Configuration and Condition

4.1 EUT operating condition

Mode	Charging current	Description
Charging mode With load	400 mA	Using Max load
	1200 mA	Using Mid load
	2 600 mA	Using Min load
Charging mode With Mobile Phone	-	< 1% of Battery status
	-	50% of Battery status

4.2 EUT test configuration diagram



[System Block Diagram of Test Configuration]

4.3 Peripheral equipments list for test

Equipment Name	Model	Serial Number	Manufacturer
Mobile Phone	SM-G925S	0054212	Samsung Electronics
-	-	-	

4.4 Cable connections

Start		End		Cable	
Name	I/O Port	Name	I/O Port	Length	Spec.
-	-	-	-	-	-

4.5 EUT modifications

- None

5. Summary of Test Results and Measurement Procedures

5.1 Summary of test results

Standard	Test Item	CFR 47 Section	Result
FCC CFR 47 Subpart C	Radiated Spurious Emission	15.209	PASS
	Conducted Emissions	15.207	N/A

5.2 AC powerline conducted emission test

This test is not performed because the EUT is operated by battery (DC voltage) and is not connected to public low-voltage distribution system. (The EUT during charging to the USB port disable wireless operations.)

5.3 Radiated emission test

Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10:2013 to determine the worse operating conditions. The radiated emissions measurements were performed on the 3 m open area test site.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization

6. Test Results

6.1 Radiated spurious emission

6.1.1 Regulation

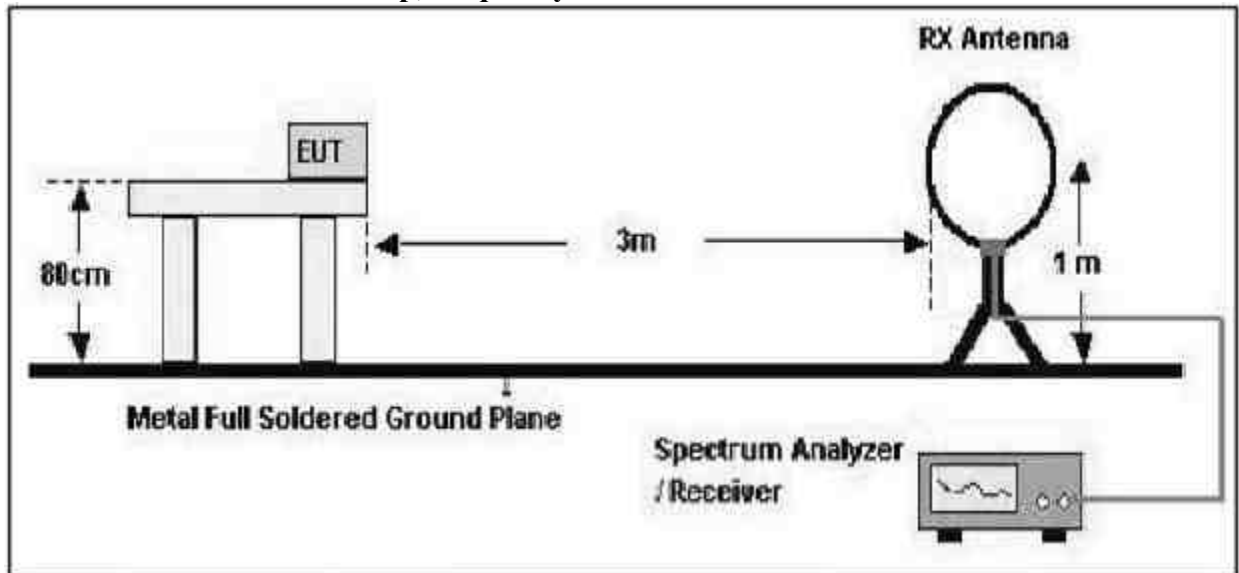
According to §15.209(a), for an intentional device, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency [MHz]	Field strength [μV/m]	Field strength [dBμV/m]	Measurement distance [m]
0.009 ~ 0.490	2 400 / F (kHz)	-	300
0.490 ~ 1.705	24 000 / F (kHz)	-	30
1.705 ~ 30	30	29.50	30
30 ~ 88	100**	40.00	3
88 ~ 216	150**	43.52	3
216 ~ 960	200**	46.02	3
Above 960	500	53.98	3

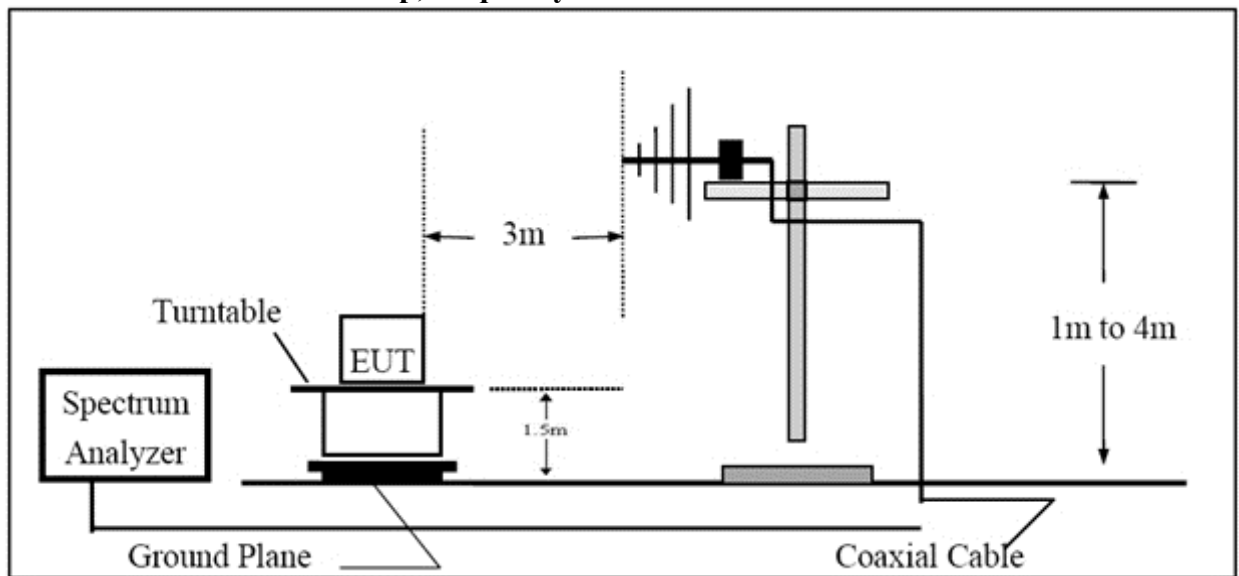
**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 ~ 72 MHz, 76 ~ 88 MHz, 174 ~ 216 MHz or 470 ~ 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

6.1.2 Test setup layout

6.1.2.1 Radiated emission test set-up, frequency below 30 MHz



6.1.2.2 Radiated emission test set-up, frequency above 30 MHz



6.1.3 Test procedure

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters for above 30 MHz, and at 1 meter distance for below 30 MHz.
2. The EUT was placed on the top of the 0.8-meter height, 1×1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360° .
3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 9 kHz to 30 MHz using the loop antenna, from 30 to 1 000 MHz using the Trilog broadband antenna, and from 1 GHz to tenth harmonic of the highest fundamental frequency using the horn antenna.
4. To obtain the final measurement data, the EUT was arranged on a turntable situated on a 4×4 meter at the Open Area Test Site. The EUT was tested at a distance 3 meters.
5. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.
6. The EUT is situated in three orthogonal planes (if appropriate)
7. The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT.
8. If the emission on which a radiated measurement must be made is located at the edge of the authorized band of operation, then the alternative “marker-delta” method may be employed.

6.1.4 Test data for below 30 MHz

Table 1 : Using Max load (400 mA)							
Frequency [MHz]	Reading [dBμV]	Ant. Pol. [V/H]	Ant. Factor [dB/m]	Cable Loss [dB]	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
peak data, emissions below 30 MHz							
0.038 32	55.82	H	12.47	0.14	68.43	115.93	-47.50
0.045 37	54.27	H	12.36	0.13	66.76	114.46	-47.70
0.059 47	52.85	H	12.28	0.03	65.16	112.11	-46.95
0.112 21*	76.30	H	12.18	0.02	88.50	106.60	-18.10
0.150 00	68.77	H	12.12	0.02	80.91	104.08	-23.17
0.329 10	59.56	H	11.88	0.01	71.45	97.25	-25.80

Table 2 : Using Mid load (1 200 mA)							
Frequency [MHz]	Reading [dBμV]	Ant. Pol. [V/H]	Ant. Factor [dB/m]	Cable Loss [dB]	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
peak data, emissions below 30 MHz							
0.036 68	51.34	H	12.50	0.14	63.98	116.31	-52.33
0.044 63	53.72	H	12.38	0.13	66.23	112.85	-46.62
0.061 63	53.97	H	12.27	0.03	66.27	111.80	-45.53
0.121 65*	76.49	H	12.16	0.02	88.67	105.90	-17.23
0.232 31	67.37	H	12.00	0.23	79.60	100.28	-20.68
0.331 72	57.24	H	11.88	0.01	69.13	97.18	-28.05

Table 3 : Using Min load (2 600 mA)							
Frequency [MHz]	Reading [dBμV]	Ant. Pol. [V/H]	Ant. Factor [dB/m]	Cable Loss [dB]	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
peak data, emissions below 30 MHz							
0.042 12	54.92	H	12.41	0.13	67.46	124.08	-56.62
0.044 46	54.30	H	12.38	0.13	66.81	119.64	-52.83
0.062 47	52.89	H	12.27	0.03	65.19	105.52	-40.33
0.137 65*	73.79	H	12.14	0.02	85.95	104.82	-18.87
0.233 55	68.59	H	12.00	0.01	80.60	96.21	-15.61
0.332 10	58.45	H	11.88	0.01	70.34	102.54	-32.20

Table 4 : < 1% of Battery status							
Frequency [MHz]	Reading [dBμV]	Ant. Pol. [V/H]	Ant. Factor [dB/m]	Cable Loss [dB]	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
peak data, emissions below 30 MHz							
0.039 86	55.77	H	12.45	0.14	68.36	115.11	-46.75
0.043 72	54.12	H	12.39	0.13	66.64	113.00	-46.36
0.060 36	51.46	H	12.27	0.03	63.76	111.98	-48.22
0.122.32*	76.67	H	12.18	0.02	88.87	106.59	-17.72
0.167 65	68.13	H	12.09	0.02	80.24	103.11	-22.87
0.329 14	55.27	H	11.88	0.01	67.16	97.25	-30.09

Table 5 : 50% of Battery status							
Frequency [MHz]	Reading [dBμV]	Ant. Pol. [V/H]	Ant. Factor [dB/m]	Cable Loss [dB]	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
peak data, emissions below 30 MHz							
0.041 24	56.03	H	12.43	0.13	68.59	115.29	-46.70
0.043 78	55.23	H	12.39	0.13	67.75	114.77	-47.02
0.061 68	52.06	H	12.27	0.03	64.36	111.08	-46.72
0.137 72*	73.39	H	12.14	0.02	85.55	104.82	-19.27
0.184 54	67.96	H	12.07	0.01	80.04	102.28	-22.24
0.330 32	54.89	H	11.88	0.01	66.78	97.22	-30.44

-. Remark: "H" Horizontal, "V" Vertical

-. "*" Means Fundamental frequency

-. **Emission Level [dBμV/m]** = Reading [dBμV] + Ant. Factor [dB/m] + Cable Loss [dB]

-. **Margin [dB]** = Emission Level [dBμV/m] – Limit [dBμV/m]

-. **Limit calculation:** Limit at specified distance + 40log (300/3) = Limit + 80 dB for up to 0.49 MHz

Limit at specified distance + 40log (30/3) = Limit + 40 dB for above 0.49 MHz, Below 30 MHz

6.1.5 Test data for above 30 MHz

Table 6 : Using Max load (400 mA)								
Frequency [MHz]	Reading [dBμV]	Ant. Pol. [V/H]	Ant. Factor [dB/m]	Cable Loss [dB]	Amp Gain [dB]	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
55.06	50.65	V	12.48	2.15	31.66	31.88	40.00	-8.12
120.05	52.50	V	10.50	2.74	31.66	25.03	40.00	-14.97
265.60	46.92	V	7.85	4.34	31.64	21.19	43.52	-22.33
303.48	48.93	V	11.72	5.73	31.59	21.69	46.02	-24.33
384.00	38.53	V	12.80	6.14	31.59	24.95	46.02	-21.07
456.98	44.94	V	15.72	7.99	31.65	24.39	46.02	-21.63

Table 7 : Using Mid load (1 200 mA)								
Frequency [MHz]	Reading [dBμV]	Ant. Pol. [V/H]	Ant. Factor [dB/m]	Cable Loss [dB]	Amp Gain [dB]	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
41.32	49.04	V	12.48	2.15	31.66	32.01	40.00	-7.99
64.21	43.55	V	10.44	2.75	31.66	25.08	40.00	-14.92
144.11	40.61	V	7.86	4.34	31.64	21.17	43.52	-22.35
228.24	35.89	V	11.72	5.73	31.59	21.75	46.02	-24.27
259.98	37.69	V	12.80	6.14	31.59	25.04	46.02	-20.98
397.72	32.45	V	15.72	7.99	31.65	24.51	46.02	-21.51

Table 8 : Using Min load (2 600 mA)								
Frequency [MHz]	Reading [dBμV]	Ant. Pol. [V/H]	Ant. Factor [dB/m]	Cable Loss [dB]	Amp Gain [dB]	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
41.23	49.12	V	12.47	2.15	31.66	32.08	40.00	-7.92
64.13	43.49	V	10.46	2.74	31.66	25.03	40.00	-14.97
143.97	40.58	V	7.85	4.34	31.64	21.13	43.52	-22.39
228.17	35.94	V	11.72	5.73	31.59	21.80	46.02	-24.22
259.92	37.71	V	12.80	6.14	31.59	25.06	46.02	-20.96
397.69	32.40	V	15.72	7.99	31.65	24.46	46.02	-21.56

Table 9 : < 1% of Battery status

Frequency [MHz]	Reading [dBμV]	Ant. Pol. [V/H]	Ant. Factor [dB/m]	Cable Loss [dB]	Amp Gain [dB]	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
41.19	49.10	V	12.46	2.15	31.66	32.05	40.00	-7.95
64.10	43.44	V	10.47	2.74	31.66	24.99	40.00	-15.01
144.02	40.62	V	7.85	4.34	31.64	21.17	43.52	-22.35
228.13	36.03	V	11.72	5.73	31.59	21.89	46.02	-24.13
259.88	37.77	V	12.80	6.14	31.59	25.12	46.02	-20.90
397.63	32.37	V	15.71	7.99	31.65	24.42	46.02	-21.60

Table 10 : 50% of Battery status

Frequency [MHz]	Reading [dBμV]	Ant. Pol. [V/H]	Ant. Factor [dB/m]	Cable Loss [dB]	Amp Gain [dB]	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
41.22	48.98	V	12.46	2.15	31.66	31.93	40.00	-8.07
63.97	43.33	V	10.51	2.74	31.66	24.92	40.00	-15.08
143.92	40.76	V	7.85	4.34	31.64	21.31	43.52	-22.21
228.10	36.14	V	11.72	5.73	31.59	22.00	46.02	-24.02
259.81	37.82	V	12.80	6.14	31.59	25.17	46.02	-20.85
397.59	32.44	V	15.71	7.99	31.65	24.49	46.02	-21.53

-. Remark: "H" Horizontal, "V" Vertical

-. **Emission Level [dBμV/m]** = Reading [dBμV] + Ant. Factor [dB/m] + Cable Loss [dB] - Amp Gain [dB]

-. **Margin [dB]** = Emission Level [dBμV/m] – Limit [dBμV/m]

7. Test Equipment Used For Test

Used	Description	Manufacturer	Model Name	Serial Number	Specifications	Next Cal. Data
☐	Spectrum Analyzer	H.P	E4407B	US39010225	9 kHz ~ 26.5 GHz	2016-02-10
☐	EPM-P SERIES POWER METER	Agilent	E4416A	GB38272722	1 CH 100-240 VAC	2016-08-05
☐	Power Sensor	Agilent	8481A	US41030240	MAX.23 dBm AVG, 18 GHz	2016-08-04
☒	Test receiver	ROHDE& SCHWARZ	ESPI3	101171	9 kHz ~ 3 GHz	2016-08-04
☒	BI-LOG ANT	SCHWARZBECK	VULB 9163	691	30 MHz ~ 1 GHz	2016-05-28
☒	Loop Antenna	EMCO	6502	9801-3191	9 kHz ~ 30 MHz	2016-02-04
☐	Horn antenna	Schwarzbeck	BBHA 9120D	769	1 GHz ~ 18 GHz	2015-11-29
☐	Horn antenna	Schwarzbeck	BBHA 9120D	768	1 GHz ~ 18 GHz	2015-12-11
☐	Horn antenna	Schwarzbeck	BBHA9170	BBHA9170178	18 GHz ~ 40 GHz	2016-02-26
☒	Amplifier	310N	291723	SONOMA	9 kHz ~ 1 GHz	2016-08-04
☒	Microwave Preamplifier	Agilent	8449B	3008A02014	1 GHz ~ 26.5 GHz	2016-02-12
☐	DC Power Supply	Maynuo	M8811	0800109600111030 46	30 V 5 A	2016-08-04
☐	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESR7	101120	10 Hz ~ 7 GHz	2016-08-04
☐	LISN/AMN	PMM	L3-32	1220X20311	32 A - 6 h	2016-08-05
☐	PULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	100059	0 MHz ~ 30 MHz	2016-04-16
☐	Two-Line V-Network	ROHDE & SCHWARZ	ENV216	3560.6550.12- 101874-Rq	9 kHz ~ 30 MHz	2016-08-04