Testing and Certification

TEST REPORT

WPC RF Exposure Test for certification of SM-S721U

APPLICANT
Samsung Electronics. Co., Ltd.

REPORT NO.
HCT-SR-2406-FC005

DATE OF ISSUE
Jun. 28, 2024

Tested by
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TEST REPORT

FCC WPC RF Exposure Test for certification

REPORT NO.
HCT-SR-2406-FC005

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FCC ID
A3LSMS721U

Applicant	SAMSUNG Electronics Co., Ltd 129, Samsung-ro, Yeongtong-gu, Suwon-Si, Gyeonggi-do, 16677, Korea
Product Name	Mobile Phone
Model Name	SM-S721U
Multi Model Name	SM-S721U1
Date of Test	Jun. 24, 2024
Location of Test	■ Permanent Testing Lab ☐ On Site Testing Lab (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si,
FCC Rule Part(s)	FCC Part 1 SUBPART I FCC Part 2 SUBPART J KDB 680106 D01
Test Results	PASS

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	Jun. 28, 2024	Initial Release

Notice

Content
The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated. The test results have only been applied with the test methods required by the standard(s). The laboratory is not accredited for the test results marked *. Information provided by the applicant is marked **. Test results provided by external providers are marked ***. When confirmation of authenticity of this test report is required, please contact www.hct.co.kr The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA).

CONTENTS

1. Test Methodology

The DUT was assessed in accordance with 680106 D01 Wireless Power Transfer v04.

2. Test Location

2.1 Test Laboratory

Company Name	HCT Co., Ltd.
Address	74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
Telephone	031-645-6300
Fax.	031-645-6401

2.2 Test Facilities

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

Korea	National Radio Research Agency (Designation No. KR0032)
	KOLAS (Testing No. KT197)

3. DEVICE UNDER TEST DESCRIPTION

Applicant Name:	SAMSUNG Electronics Co., Ltd.
Model Name	SM-F721U
Multi Model Name	SM-F721U1
EUT Type:	Mobile Phone
Application Type:	Certification

3.1 Description of DUT

The DUT is a mobile phone with a WPT (Wireless Power Transfer) feature using an inductive charging coil to charge a phone and a watch. The charging frequency is between 110 ㎑ to 148 ㎑, and the maximum transfer power consumption is 9 W in charging status.

3.2 Test Configurations

Test configurations	Description
DUT to Phone test configuration 1	Charging from Phone to DUT
DUT to Phone test configuration 2	Charging from Phone to DUT (TA Charging from DUT)
DUT to Phone test configuration 3	Charging from Phone to DUT
DUT to Phone test configuration 4	Charging from Phone to DUT (TA Charging from DUT)
DUT to Phone test configuration 5	Charging from Watch to DUT
DUT to Phone test configuration 6	Charging from Watch to DUT (TA Charging from DUT)
DUT to Phone test configuration 7	Charging from Ear buds to DUT
DUT to Phone test configuration 8	Charging from Ear buds to DUT (TA Charging from DUT)

Note:

1. Configuration 2,4,6 and 8 were tested with the worst case of configuration 1,3,5 and 7

3.3 KDB 680106 D01 Wireless Power Transfer v04. SECTION 5.2)

Requirement	Device
(1) Power transfer frequency is less than 1 ㎒.	Yes. Operation Frequency is between 110 ㎑ to 148 ㎑.
(2) Output power from each primary coil is less than or equal to 15 watts.	Yes. Maximum power is 9 Watts.
(3) A client device providing the maximum permitted load is placed in physical contact with the transmitter (i.e., the surfaces of the transmitter and client device enclosures need to be in physical contact)	Yes.
(4) Only § 2.1091-Mobile exposure conditions apply	Yes.
(5) The E-field and H-field strengths, at and beyond 20 cm surrounding the device surface, are demonstrated to be less than 50% of the applicable MPE limit, per KDB 447498, Table 1.	Yes. The aggregate field strengths at 20 cm from the device is 3.74 of the H field and 0.19 % of the E-Field Limit
(6) For systems with more than one radiating structure, the conditions specified in (5) must be met when the system is fully loaded (i.e., clients absorbing maximum power available), and with all the radiating structures operating at maximum power at the same time, as per design conditions. If the design allows one or more radiating structures to be powered at a higher level while other radiating structures are not powered, then those cases must be tested as well. For instance, a device may use three RF coils powered at 5 W, or one coil powered at 15 W: in this case, both scenarios shall be tested	No, it is a single radiating structure.

3.4 DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT & PERIPHERALS

SUPPORT EQUIPMENT & PERIPHERALS LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Watch	SAMSUNG Electronics Co., Ltd.	SM-R835F	A2103117677	A3LSMR835
Ear Buds	SAMSUNG Electronics Co., Ltd	SM-R180	A2011103347	A3LSMR180L A3LSMR180R
Phone	SAMSUNG Electronics Co., Ltd.	SM-G986B/DS	R5CN101A0JM	A3LSMG986B

TEST SETUP

The following three modes are tested in test configuration;

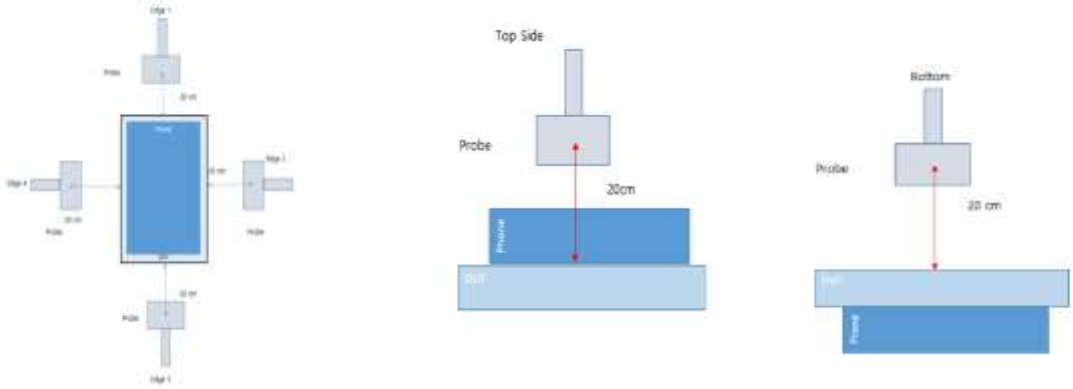
All Position of client device were investigated and the worst position results are reported.

Mode
Operating (SUPPORT Equipment, <10% Power Charging)
Operating (SUPPORT Equipment, 50~55% Power Charging)
Operating (SUPPORT Equipment, 90~95% Power Charging)

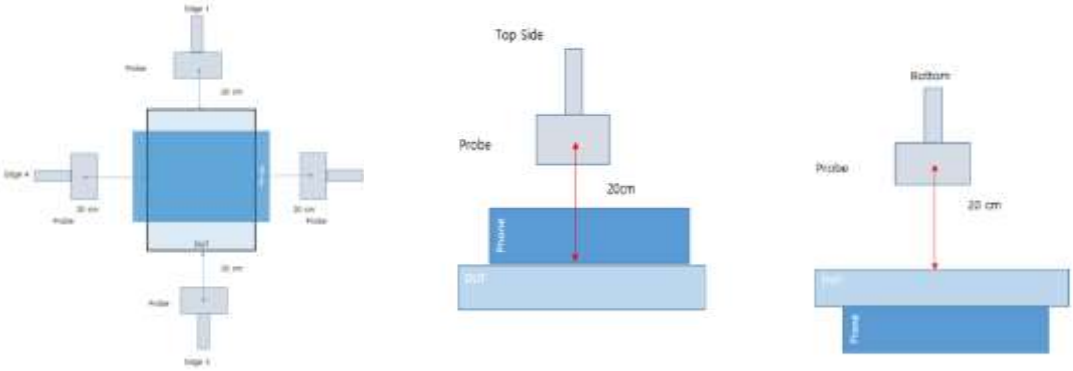
MEASUREMENT TEST SETUP

The measurement was taken using a probe place 20 cm from the all edges of DUT above the DUT. Measurement were from the top and all sides of the DUT per 680106 D01 Wireless Power Transfer v04. Additionally, as the DUT to phone configuration could result with the DUT place either above or below the phone, measurements were performed 'below' the DUT by flipping the DUT/phone so that the DUT was uppermost.

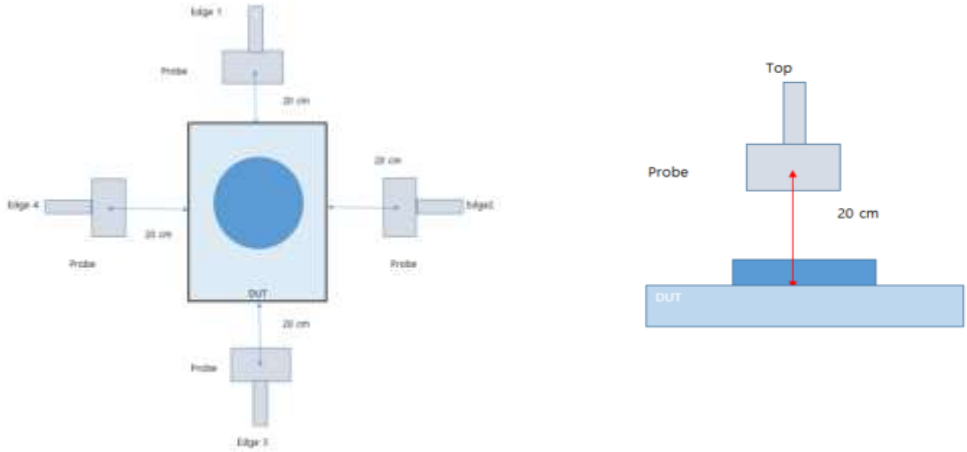
The probe was moved along the edges or above the DUT to a position that showed the maximum field strength. This position was used for the reported result.



DUT to phone test Configuration 1 & 2



DUT to phone test Configuration 3 & 4



DUT to Watch/Ear buds test Configuration 5 & 6 and 7 & 8

4. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was used for the tests documented in this report:

Manufacturer	Model name	Description	S/N	Calib. Date	Calib.Due
Narda	EHP 200AC	Electric and Magnetic Field Probe	170WX91009	07/29/2022	07/29/2024

5. MAXIMUM PERMISSIBLE RF EXPOSURE

1.13010 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency(RF) radiation as specified in 1.1307(b), except in the case of portable devices which shall be evaluated according the provisions of 2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
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

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

6. TEST RESULTS

H-Field Measurements

Note : peak measurements were performed. RMS values were calculated from the peak measurement.
Please refer to the formula for calculating the RMS value: [Field Strength * √Duty Cycle]

TEST results of DUT to phone test Configuration 1&2

FCC RF Exposure Result					
Test Configuration	Test mode	Test distance	Test Position	H-Field Limit (A/m)	H-Field meas data (A/m)
Configuration 1	Operation Real Product (Power <10% charging)	20 cm	Top	1.63	0.057
			Bottom		0.059
			Edge 1		0.058
			Edge 2		0.057
			Edge 3		0.053
			Edge 4		0.051
	Operation Real Product (Power 50~55% charging)	20 cm	Top	1.63	0.053
			Bottom		0.056
			Edge 1		0.052
			Edge 2		0.053
			Edge 3		0.051
			Edge 4		0.054
	Operation Real Product (Power 90~95% charging)	20 cm	Top	1.63	0.055
			Bottom		0.053
			Edge 1		**0.060**
			Edge 2		0.052
			Edge 3		0.057
			Edge 4		0.051
Configuration 2	Operation Real Product (Power 90~95% charging)	20 cm	Edge 1	1.63	0.057

TEST results of DUT to phone test Configuration 3&4

FCC RF Exposure Result					
Test Configuration	Test mode	Test distance	Test Position	H-Field Limit (A/m)	H-Field meas data (A/m)
Configuration 3	Operation Real Product (Power <10% charging)	20 cm	Top	1.63	0.052
			Bottom		0.054
			Edge 1		0.053
			Edge 2		0.057
			Edge 3		0.058
			Edge 4		0.051
	Operation Real Product (Power 50~55% charging)	20 cm	Top	1.63	0.053
			Bottom		0.058
			Edge 1		0.054
			Edge 2		0.059
			Edge 3		0.055
			Edge 4		0.052
	Operation Real Product (Power 90~95% charging)	20 cm	Top	1.63	0.057
			Bottom		0.051
			Edge 1		0.052
			Edge 2		0.051
			Edge 3		0.053
			Edge 4		0.051
Configuration 4	Operation Real Product (Power 50~55% charging)	20 cm	**Edge 2**	1.63	**0.061**

TEST results of DUT to Watch test Configuration 5&6

FCC RF Exposure Result					
Test Configuration	Test mode	Test distance	Test Position	H-Field Limit (A/m)	H-Field meas data (A/m)
Configuration 5	Operation Real Product (Power <10% charging)	20 cm	Top	1.63	0.053
			Edge 1		0.054
			Edge 2		0.057
			Edge 3		0.055
			Edge 4		0.056
	Operation Real Product (Power 50~55% charging)	20 cm	Top	1.63	0.058
			Edge 1		0.053
			Edge 2		**0.059**
			Edge 3		0.057
			Edge 4		0.055
	Operation Real Product (Power 90~95% charging)	20 cm	Top	1.63	0.054
			Edge 1		0.055
			Edge 2		0.054
			Edge 3		0.056
			Edge 4		0.057
Configuration 6	Operation Real Product (Power 50~55% charging)	20 cm	Edge 2	1.63	0.057

TEST results of DUT to Ear Buds test Configuration 7&8

FCC RF Exposure Result					
Test Configuration	Test mode	Test distance	Test Position	H-Field Limit (A/m)	H-Field meas data (A/m)
Configuration 7	Operation Real Product (Power <10% charging)	20 cm	Top	1.63	0.053
			Edge 1		0.056
			Edge 2		0.055
			Edge 3		0.055
			Edge 4		0.056
	Operation Real Product (Power 50~55% charging)	20 cm	Top	1.63	0.051
			Edge 1		0.055
			Edge 2		0.056
			Edge 3		0.060
			Edge 4		0.056
	Operation Real Product (Power 90~95% charging)	20 cm	Top	1.63	0.052
			Edge 1		0.054
			Edge 2		0.056
			Edge 3		0.057
			Edge 4		0.061
Configuration 8	Operation Real Product (Power 90~95% charging	20 cm	**Edge 4**	1.63	**0.061**

E-Field Measurements

Note : peak measurements were performed. RMS values were calculated from the peak measurement.

Please refer to the formula for calculating the RMS value: [Field Strength * √Duty Cycle]

TEST results of DUT to phone test Configuration 1&2

FCC RF Exposure Result					
Test Configuration	Test mode	Test distance	Test Position	E-Field Limit (V/m)	E-Field meas data (V/m)
Configuration 1	Operation Real Product (Power <10% charging)	20 cm	Top	614	1.123
		20 cm	Bottom		0.466
			Edge 1		0.362
			Edge 2		0.355
			Edge 3		0.365
			Edge 4		0.321
	Operation Real Product (Power 50~55% charging)	20 cm	Top	614	1.108
		20 cm	Bottom		0.467
			Edge 1		0.366
			Edge 2		0.364
			Edge 3		0.381
			Edge 4		0.378
	Operation Real Product (Power 90~95% charging)	20 cm	**Top**	614	**1.190**
		20 cm	Bottom		0.478
			Edge 1		0.378
			Edge 2		0.368
			Edge 3		0.379
			Edge 4		0.381
Configuration 2	Operation Real Product (Power 90~95% charging)	20 cm	Top	614	1.059

TEST results of DUT to phone test Configuration 3&4

FCC RF Exposure Result					
Test Configuration	Test mode	Test distance	Test Position	E-Field Limit (V/m)	E-Field meas data (V/m)
Configuration 3	Operation Real Product (Power <10% charging)	20 cm	Top	614	0.870
		20 cm	Bottom		0.751
			Edge 1		0.381
			Edge 2		0.380
			Edge 3		0.378
			Edge 4		0.364
	Operation Real Product (Power 50~55% charging)	20 cm	Top	614	0.918
		20 cm	Bottom		0.747
			Edge 1		0.377
			Edge 2		0.401
			Edge 3		0.357
			Edge 4		0.354
	Operation Real Product (Power 90~95% charging)	20 cm	Top	614	0.908
		20 cm	Bottom		0.779
			Edge 1		0.373
			Edge 2		0.365
			Edge 3		0.357
			Edge 4		0.362
Configuration 4	Operation Real Product (Power 50~55% charging)	20 cm	**Top**	614	**0.987**

TEST results of DUT to Watch test Configuration 5&6

FCC RF Exposure Result					
Test Configuration	Test mode	Test distance	Test Position	E-Field Limit (V/m)	E-Field meas data (V/m)
Configuration 5	Operation Real Product (Power <10% charging)	20 cm	Top	614	0.916
		20 cm	Edge 1		0.365
			Edge 2		0.375
			Edge 3		0.366
			Edge 4		0.354
	Operation Real Product (Power 50~55% charging)	20 cm	Top	614	0.931
		20 cm	Edge 1		0.380
			Edge 2		0.387
			Edge 3		0.354
			Edge 4		0.362
	Operation Real Product (Power 90~95% charging)	20 cm	**Top**	614	**0.987**
		20 cm	Edge 1		0.375
			Edge 2		0.364
			Edge 3		0.373
			Edge 4		0.373
Configuration 6	Operation Real Product (Power 90~95% charging)	20 cm	Top	614	0.985

TEST results of DUT to Ear Buds test Configuration 7&8

FCC RF Exposure Result					
Test Configuration	Test mode	Test distance	Test Position	E-Field Limit (V/m)	E-Field meas data (V/m)
Configuration 7	Operation Real Product (Power <10% charging)	20 cm	Top	614	0.797
		20 cm	Edge 1		0.362
			Edge 2		0.345
			Edge 3		0.346
			Edge 4		0.332
	Operation Real Product (Power 50~55% charging)	20 cm	Top	614	0.798
		20 cm	Edge 1		0.361
			Edge 2		0.373
			Edge 3		0.346
			Edge 4		0.352
	Operation Real Product (Power 90~95% charging)	20 cm	**Top**	614	**0.805**
		20 cm	Edge 1		0.381
			Edge 2		0.362
			Edge 3		0.377
			Edge 4		0.382
Configuration 8	Operation Real Product (Power 90~95% charging)	20 cm	Top	614	0.795

7. Conclusion

	H-Field (A/m)	E-Field (V/m)
MPE Limit	1.63	614
Maximum Measurement Result	0.061	1.190
Percentage (%)	3.74	0.19

H-Field, E-Field test result was less than 50% of MPE Limit