

RF Exposure Report

Applicant Name:

SAMSUNG Electronics Co., Ltd.

129, Samsung-ro, Yeongtong-gu, Suwon-Si, Gyeonggi-do, 16677 Rep. of Korea

Date of Issue: 01. 24, 2020

Test Report No.: HCT-SR-2001-FC004-R1

Test Site: HCT CO., LTD.

FCC ID:**A3LSMG988B**

Equipment Type:

Mobile Phone

Application Type

Certification

FCC Rule Part(s):

FCC Part 1 SUBPART I
FCC Part 2 SUBPART J
KDB 680106 D01

Model Name:

SM-G988B/DS

Additional Model Name:

SM-G988B

Date of Test:

12/18/2019

This device has been shown to be capable of compliance for the above standards for uncontrolled environment/general population exposure limits specified in FCC KDB procedures and had been tested in accordance with the measurement procedures specified in FCC KDB procedures.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested By



Moon Pyung, Choi
Test Engineer
SAR Team
Certification Division

Reviewed By



Yun-jeang, Heo
Technical Manager
SAR Team
Certification Division

This report only responds to the tested sample and may not be reproduced, except in full, without written approval of the HCT Co., Ltd.

DOCUMENT HISTORY

Rev.	DATE	DESCRIPTION
HCT-SR-2001-FC004	01. 15, 2020	First Approval Report
HCT-SR-2001-FC004-R1	01.24,2020	Added the note page 6

Table of Contents

1. Test Methodology	4
2. Test Location.....	4
3. DEVICE UNDER TEST DESCRIPTION.....	5
4. TEST AND MEASUREMENT EQUIPMENT	10
5. MAXIMUM PERMISSIBLE RE EXPOSURE	10
6. TEST RESULTS	11

1. Test Methodology

The DUT was assessed in accordance with FCC KDB 680106 D01 RF Exposure Wireless Charging App v03.

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, Rep. of Korea
Telephone:	+82 31 645 6300
Fax.:	+82 31 645 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:	SM-G988B/DS
Additional Model Name:	SM-G988B
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 or watch. The charging frequency is between 110 kHz to 148 kHz, and the maximum transfer power consumption is 9.0 W in charging status.

3.2 WORST-CASE CONFIGURATION

Test configuration	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)

Note : Configuration 2,4 and 6 were tested with the worst case of configuration 1,3 and 5

3.3 KDB 680106 D01 v03 SECTION 5.b) EQUIPMENT APPROVAL CONSIDERATIONS

Requirement	Device
(1) Power transfer frequenct is less than 1 MHz.	Yes. Operation Frequency is between 110 kHz to 148 Khz.
(2) Output power from each primary coil is less than or equal to 15 watts.	Yes. Maximum power is 9.0 Watts.
(3) The transfer system includes onlt single primary and secondart coils. This includes charging systems that may have multiple primary coils and client that are able to detect and allow coupling only between individual pairs of coils	Yes.
(4) Client device is placed directly in contact with the transmitter.	Yes.
(5) Mobile expousure conditions only(portable exposure conditions are not convered by this exclusion).	Yes.
(6) The aggregate H-field strengths at 15 cm surrounding the device and 20 cm above the top surface from all simultaneous transmitting coils are demonstrated to be less than 50% of the MPE limit.	Yes. The aggregate field at 15 cm from the device are 3.56 % of the FCC H field limit. Note : While 20cm above top side is required in guidance, the 15cm was used and considered the worst case

3.4 DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT & PERIPHERALS

SUPPORT EQUIPMENT & PERIPHERALS LIST				
Description	Manufacturer	Model	Serial Numver	FCC ID
Watch	SAMSUNG Electronics Co., Ltd.	SM-R820	RFAM80Q6NJW	A3LSMR820
Phone	SAMSUNG Electronics Co., Ltd.	SM-N975F/DS	RF8M70ZA4FH	A3LSMN975F
Travel Adapter	Solu-M	EP-TA800	-	
USB Data Cable	RF Tehck	EP-DG980BBE		

TEST SETUP

The following three modes are tested in test configuration;

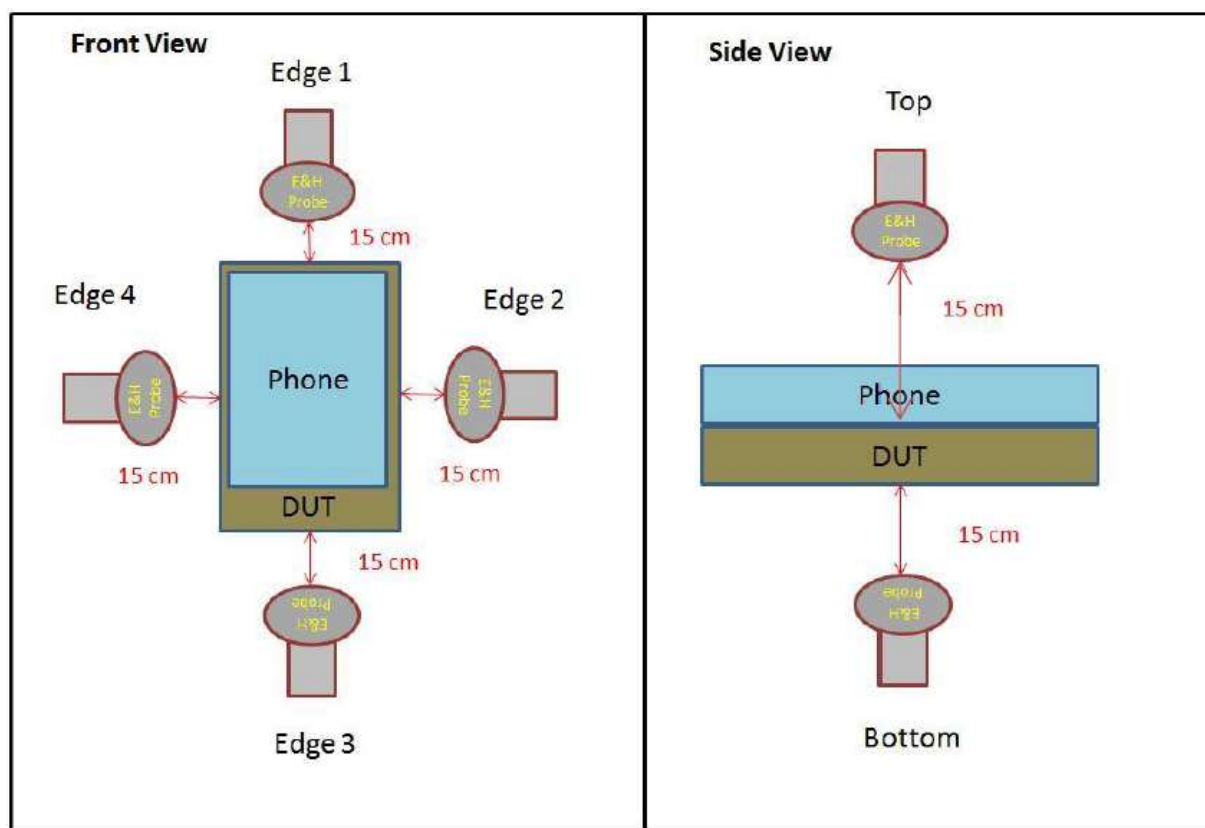
Mode
Operationg (SUPPORT Equipment, <10% Power Charging)
Operationg (SUPPORT Equipment, 50~55% Power Charging)
Operationg (SUPPORT Equipment, 90~95% Power Charging)

MEASUREMENT TEST SETUP

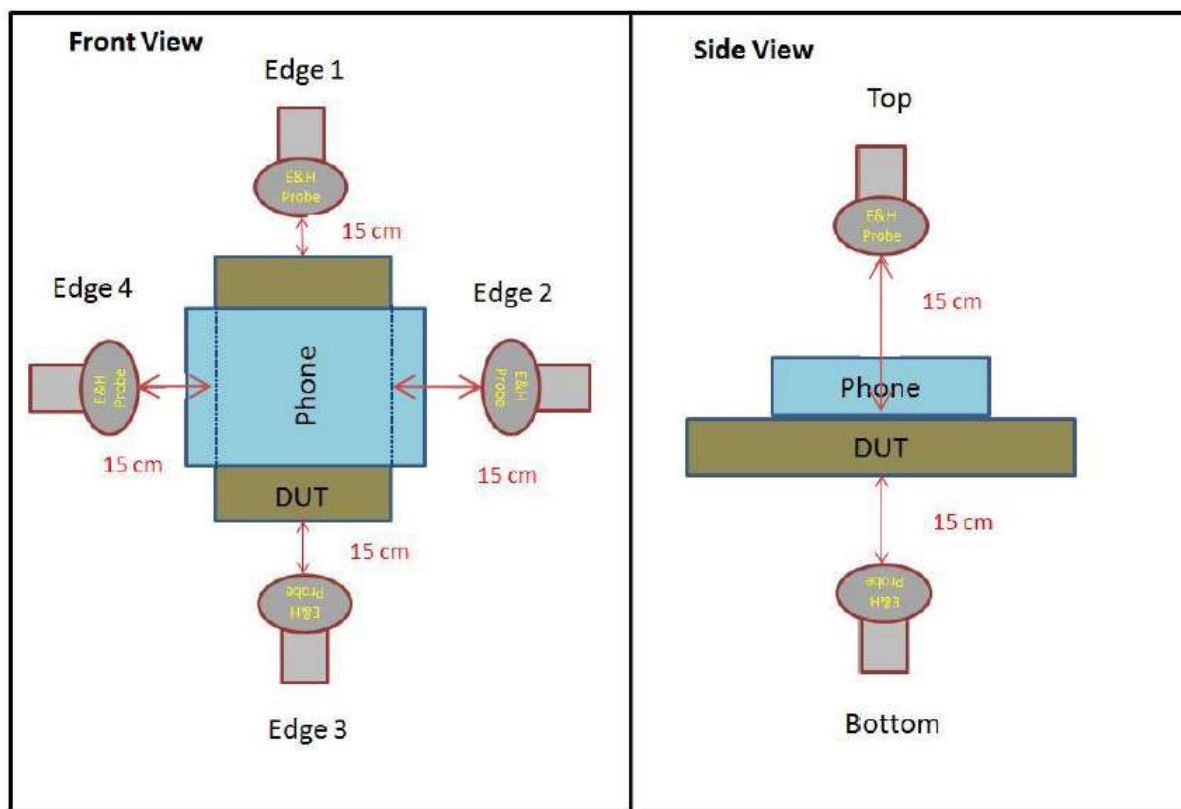
The measurement was taken using a probe place 15 cm from the edges of DUT or 15 cm above the DUT. Measurement were from the top and all sides of the DUT per KDB680106 D01 v03. Additionally, as the DUT to phone configuration could result with the DUT place either above or below the phone, measurements were performed 'below' th 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 resul.

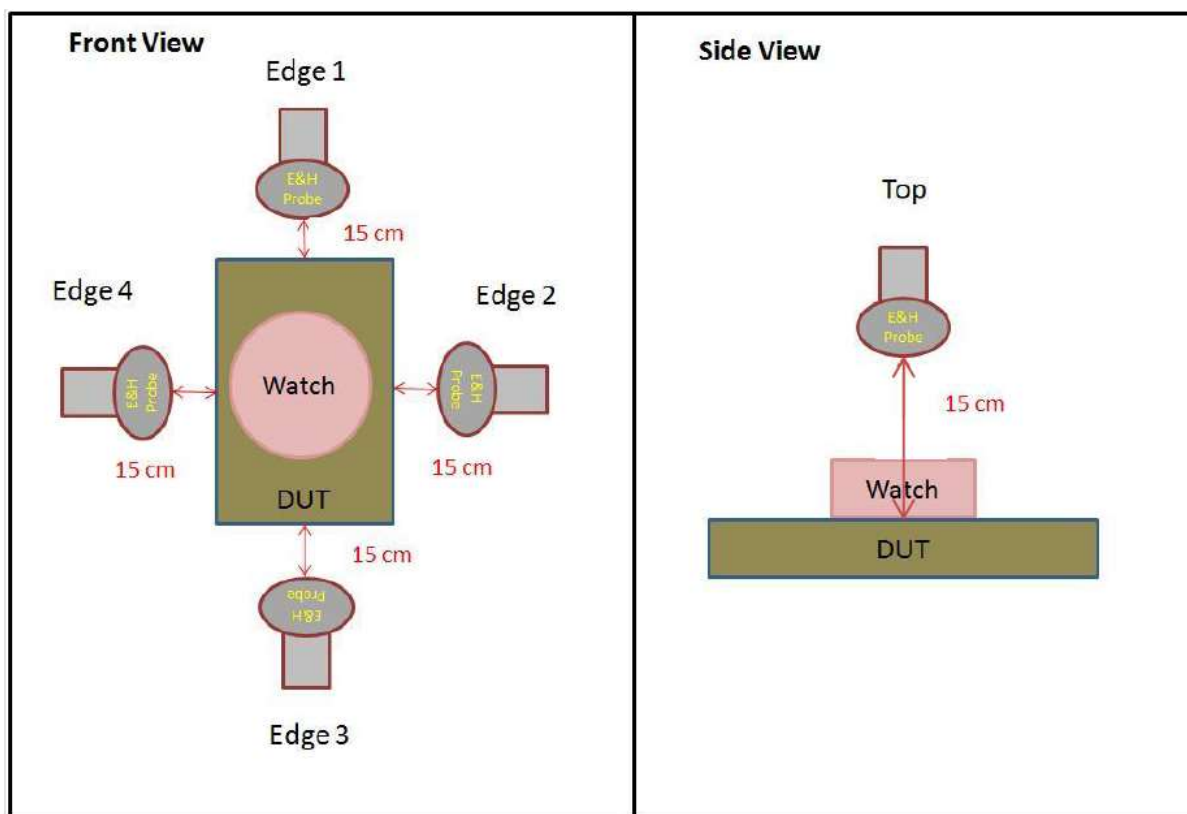
DUT to phone test Configuration 1 & 2



DUT to phone test Configuration 3 & 4



DUT to phone test Configuration 5 & 6



4. TEST AND MEASUREMENT EQUIPMENT

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

Manufacturer	Model namr	Description	S/N	Calib. Date	Calib.Due
Narda	EHP-200AC	Electric and Magnetic Field Probe	170WX91009	11/22/2019	11/22/2020

5. MAXIMUM PERMISSIBLE RE EXPOSURE

5.1 FCC RULES

1.13010 The criteria listed in Table 1 shall be used to evaluate the envirimental impact of human exposure to radio-frequency(RF) ragiation as specified in 1.1307(b), except in the case of portable devices which shall ge evaluated according th 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 * $\sqrt{\text{Duty Cycle}}$]

TEST results of DUT to phone test Configuraion 1 &2

FCC RF Exposurs 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)	15 cm	Top	1.63	0.033
			Bottom		0.018
			Edge 1		0.035
			Edge 2		0.041
			Edge 3		0.02
			Edge 4		0.037
	Operation Real Product (Power 50~55% charging)	15 cm	Top	1.63	0.032
			Bottom		0.022
			Edge 1		0.032
			Edge 2		0.039
			Edge 3		0.02
			Edge 4		0.037
	Operation Real Product (Power 90~95% charging)	15 cm	Top	1.63	0.031
			Bottom		0.018
			Edge 1		0.029
			Edge 2		0.038
			Edge 3		0.018
			Edge 4		0.038
Configuration 2	Operation Real Product (Power <10% charging)	15 cm	Edge 2	1.63	0.037

TEST results of DUT to phone test Configuraion 3 &4

FCC RF Exposurs 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)	15 cm	Top	1.63	0.035
			Bottom		0.015
			Edge 1		0.037
			Edge 2		0.051
			Edge 3		0.03
			Edge 4		0.041
	Operation Real Product (Power 50~55% charging)	15 cm	Top	1.63	0.033
			Bottom		0.024
			Edge 1		0.037
			Edge 2		0.044
			Edge 3		0.028
			Edge 4		0.036
	Operation Real Product (Power 90~95% charging)	15 cm	Top	1.63	0.035
			Bottom		0.015
			Edge 1		0.037
			Edge 2		0.041
			Edge 3		0.021
			Edge 4		0.032
Configuration 4	Operation Real Product (Power <10% charging)	15 cm	Edge 2	1.63	0.033

TEST results of DUT to phone test Configuraion 5 &6

FCC RF Exposurs 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)	15 cm	Top	1.63	0.034
			Edge 1		0.021
			Edge 2		0.036
			Edge 3		0.024
			Edge 4		0.025
	Operation Real Product (Power 50~55% charging)	15 cm	Top	1.63	0.058
			Edge 1		0.023
			Edge 2		0.053
			Edge 3		0.034
			Edge 4		0.035
	Operation Real Product (Power 90~95% charging)	15 cm	Top	1.63	0.054
			Edge 1		0.014
			Edge 2		0.036
			Edge 3		0.034
			Edge 4		0.051
Configuration 6	Operation Real Product (Power <10% charging)	15 cm	Top	1.63	0.049

6.2 FCC SUMMARYOF RESULTS

H-Field Limit		
FCC RF Exposure	Maximum meas data (A/m)	Percentage(%)
1.63	0.058	3.56

H-Field test result was less than 50% of MPE limit