HCT CO.,LTD.

74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea
TEL: +82-31-645-6300 FAX: +82-31-645-6401

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:** Nov. 12, 2021 **Test Report No.:** HCT-SR-2110-FC010-R1 **Test Site: HCT CO., LTD.**

FCC ID: A3LSMN981B1

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-N981B/DS**
Additional Model Name:	**SM-N981B**
Date of Test:	10/25/2021

This device has been shown to be capable of compliance for the above standars 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	**Reviewed By**
Jung Hun, Park **Test Engineer** **SAR Team** **Certification Division**	**Yun-jeang, Heo** **Technical Manager** **SAR Team** **Certification Division**

DOCUMENT HISTORY

Rev.	DATE	DESCRIPTION
0	Oct. 29, 2021	First Approval Report
1	Nov. 12, 2021	Revised Sec.3.4

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1. Test Methodology

The DUT was assessed in accordance with FCC KDB 680106 D01 RF Exposure Wireless Charging Apps v03r01.

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 Facillities

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 (Tesing No. KT197)

3. DEVICE UNDER TEST DESCRIPTION

Applicant Name:	SAMSUNG Electronics Co., Ltd.
Model:	SM-N981B/DS
Additional Model Name:	SM-N981B
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 charing frequency is between 110 kHz to 148 kHz, and the maximum transfer power consumption is 9.0 W in charging status.

SM-N981B/DS, SM-N981B were tested and the worst case results are reported.
(Worst case :SM-N981B/DS)

3.2 WORST-CASE CONFIGYRATION

Test configration	Description
DUT to Phone test configuration 1	Charging from Phone to DUT
DUT to Phone test configuration 2	Charging from Phone to DUT(TA Carging 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 Carging 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 Carging from DUT)

Note :
1. Configuration 2,4 and 6 were tested with the worst case of configuration 1,3 and 5
2. All test configurations are with s-Pen inserted for charging.

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 5.69 % of the FCC H field limit.

3.4 DESCRUPTION OF TEST SETUP

SUPPORT EQUIPMENT & PERIPHERALS

SUPPORT EQUIPMENT & PERIPHERALS LIST				
Description	**Manufacturer**	**Model**	**Serial Numver**	**FCC ID**
Watch	SAMSUNG Electronics Co., Ltd.	SM-R835F	RFAM80Q6NJW	A3LSMR835
Phone	SAMSUNG Electronics Co., Ltd.	SM-G986B/DS	RF8M70ZA4FH	**A3LSMG986B**

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)

For Simultaneous Charging

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

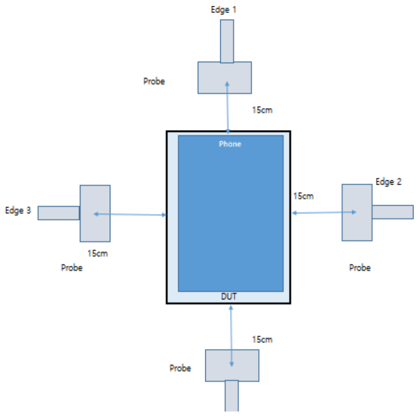
For S-Pen, both fully charged and non-fully charged condition were investigated. Test wer performed non-fully charged condition as worst case. Please refer to S-Pen Test report

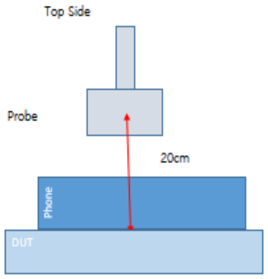
MEASUREMENT TEST SETUP

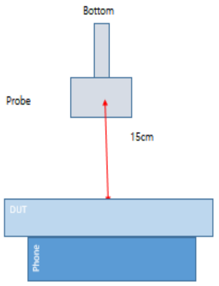
The measurement was taken using a probe place 15 cm from the edges of DUT or20 cm above the DUT. Measurement were from the top and all sides of the DUT per KDB680106 D01 v03. Additionally, as the DUT to phone configuration could result with the DUT place either above or below the phone, measurements 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 resuls.

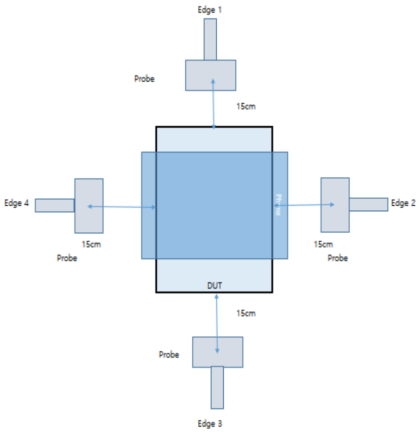
DUT to phone test Configuration 1 & 2

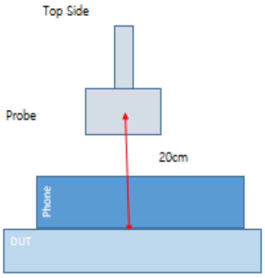


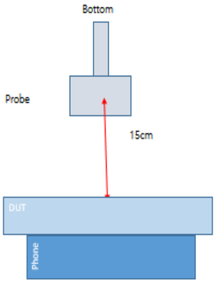




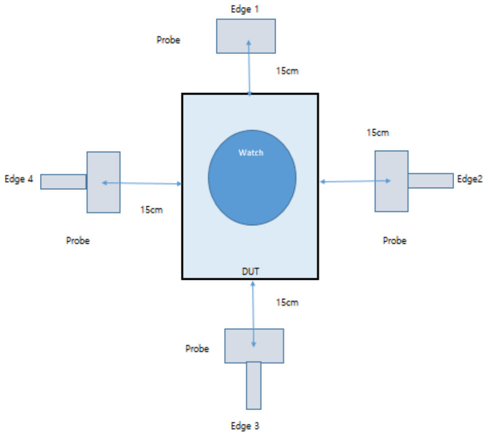
DUT to phone test Configuration 3 & 4

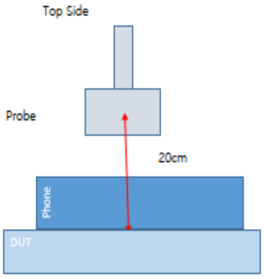






DUT to phone test Configuration 5 & 6





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	11/22/2021

The Narda EHP-200AC has physical dimensions of 92 x 92 x 109mm. So the center of the probe would be at 46 x 46 x 54mm. When the probe measures the H-field of the device,, the long axis of the probe (109mm) is perpendicular to the rear surface of the DUT. So when the probe is in direct contact with the rear of the device, the center of the probe would be 54mm away.

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.

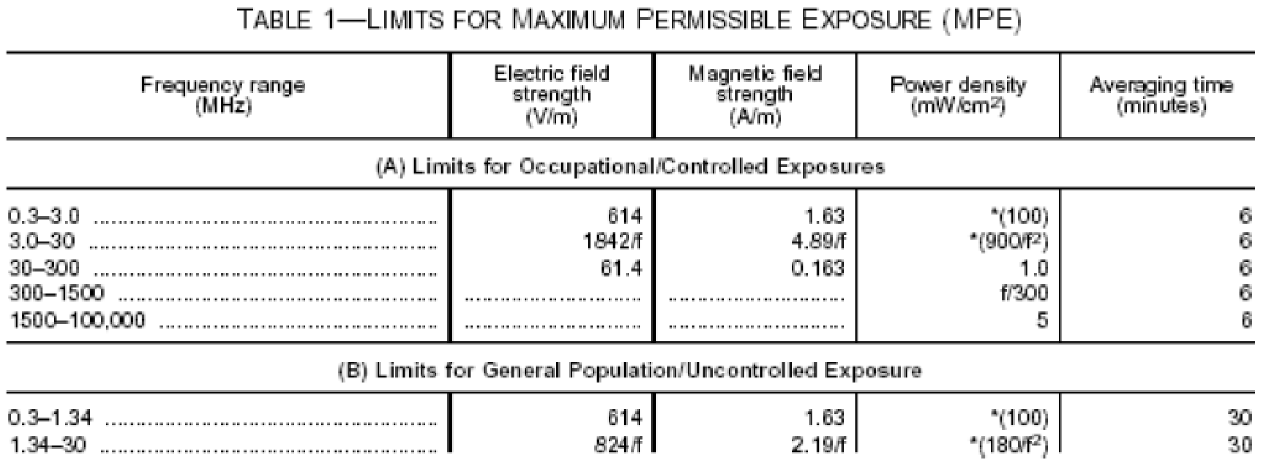


TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	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/f²)	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/f²)	30

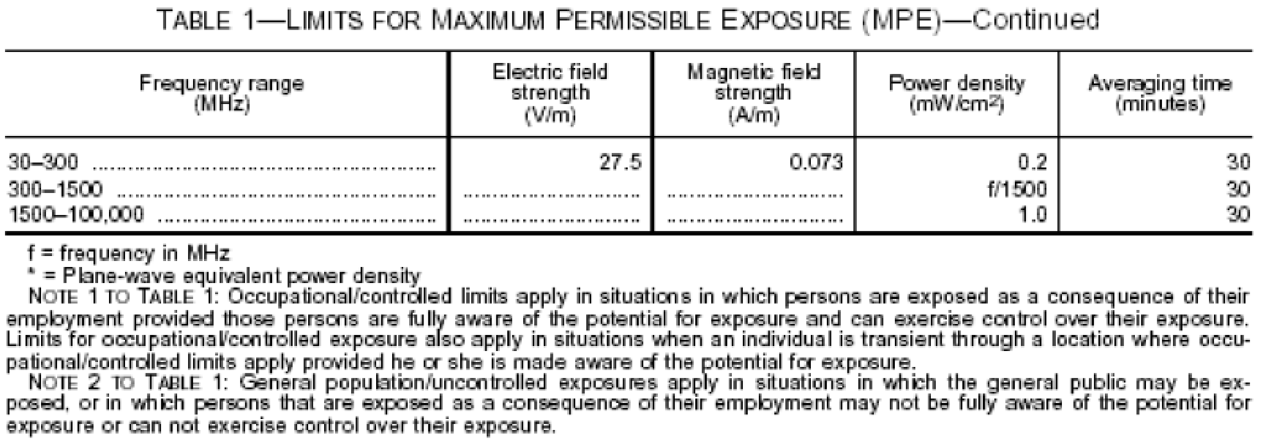


TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	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 Comfiguraion 1 &2

FCC RF Exposurs Result					
Test Configuration	**Test mode**	**Test distance from the edge of the device to the center of the probe**	**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	0.0396
		15 cm	Bottom		0.0414
			Edge 1		0.0424
			Edge 2		0.0741
			Edge 3		0.0434
			Edge 4		**0.0894**
	Operation Real Product (Power 50~55% charging)	20 cm	Top	1.63	0.0355
		15 cm	Bottom		0.0391
			Edge 1		0.0420
			Edge 2		0.0740
			Edge 3		0.0411
			Edge 4		0.0869
	Operation Real Product (Power 90~95% charging)	20 cm	Top	1.63	0.0391
		15 cm	Bottom		0.0373
			Edge 1		0.0402
			Edge 2		0.0721
			Edge 3		0.0410
			Edge 4		0.0892
Configuration 2	Operation Real Product (Power <10% charging)	15 cm	**Edge 4**	1.63	0.0836

TEST results of DUT to phone test Comfiguraion 3 &4

FCC RF Exposurs Result					
Test Configuration	**Test mode**	**Test distance from the edge of the device to the center of the probe**	**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	0.0581
		15 cm	Bottom		0.0412
			Edge 1		0.0427
			Edge 2		0.0811
			Edge 3		0.0412
			Edge 4		**0.0928**
	Operation Real Product (Power 50~55% charging)	20 cm	Top	1.63	0.0537
		15 cm	Bottom		0.0369
			Edge 1		0.0422
			Edge 2		0.0811
			Edge 3		0.0370
			Edge 4		0.0903
	Operation Real Product (Power 90~95% charging)	20 cm	Top	1.63	0.0558
		15 cm	Bottom		0.0390
			Edge 1		0.0426
			Edge 2		0.0809
			Edge 3		0.0412
			Edge 4		0.0926
Configuration 4	Operation Real Product (Power <10% charging)	15 cm	**Edge 4**	1.63	0.0878

TEST results of DUT to phone test Comfiguraion 5 &6

FCC RF Exposurs Result					
Test Configuration	**Test mode**	**Test distance from the edge of the device to the center of the probe**	**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	0.0719
		15 cm	Edge 1		0.0417
			Edge 2		0.0447
			Edge 3		0.0465
			Edge 4		0.0402
	Operation Real Product (Power 50~55% charging)	20 cm	Top	1.63	0.0674
		15 cm	Edge 1		0.0377
			Edge 2		0.0422
			Edge 3		0.0445
			Edge 4		0.0357
	Operation Real Product (Power 90~95% charging)	20 cm	Top	1.63	0.0678
		15 cm	Edge 1		0.0373
			Edge 2		0.0424
			Edge 3		0.0441
			Edge 4		0.0359
Configuration 6	Operation Real Product (Power <10% charging)	15 cm	**Top**	1.63	0.0689

6.2 FCC SUMMARYOF RESULTS

H-Field Limit		
FCC RF Exposure	**Maximum meas data (A/m)**	**Percentage(%)**
1.63	0.0928	5.69

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