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# RF Exposure Report

<b>Applicant Name:</b> <b>SAMSUNG Electronics Co., Ltd.</b> 129, Samsung-ro, Yeongtong-gu, Suwon-Si, Gyeonggi-do, 16677 Rep. of Korea	<b>Date of Issue: Dec.02, 2021</b> <b>Test Report No.: HCT-SR-2111-FC014</b> <b>Test Site: HCT CO., LTD.</b>
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**FCC ID:**

**A3LSMX700**

<b>Equipment Type:</b>	<b>Tablet</b>
<b>Application Type</b>	<b>Certification</b>
<b>FCC Rule Part(s):</b>	<b>KDB 680106 D01</b>
<b>Model Name:</b>	<b>SM-X700</b>
<b>Date of Test:</b>	<b>11/21/2021</b>

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**

**Jung Hun, Park**  
**Test Engineer**  
**SAR Team**  
**Certification Division**

**Reviewed By**

**Yun-jeang, Heo**  
**Technical Manager**  
**SAR Team**  
**Certification Division**

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## DOCUMENT HISTORY

Rev.	DATE	DESCRIPTION
0	Dec. 02, 2021	First Approval Report

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## 1. Test Methodology

Per FCC Guidance, SPEN WPT Function was evaluated for portable exposure condition.

## 2. Test Location.

### 2.1 Test Laboratory.

<b>Company Name:</b>	HCT Co., LTD
<b>Address:</b>	74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of Korea
<b>Telephone:</b>	+82 31 645 6300
<b>Fax.:</b>	+82 31 645 6401

### 2.2 Test Facilities

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

<b>Korea:</b>	National Radio Research Agency (Designation No. KR0032)
	KOLAS (Teting No. KT197)

### 3. DEVICE UNDER TEST DESCRIPTION

<b>Applicant Name:</b>	SAMSUNG Electronics Co., Ltd.
<b>Model:</b>	SM-X700
<b>EUT Type:</b>	Tablet
<b>Application Type:</b>	Certification

The device uses only magnetic induction which is a technology that charges a battery by generating a magnetic field by flowing a current through the transmitter coil, and then entering a magnetic field into the receiver coil to generate an induced current again.

Therefore, RF exposure through measurement and calculation of H-field were investigated.

- Test mode: power is transferred from “Phone coil” to “S-pen coil”

<b>Operating Frequency(MHz)</b>	530 kHz
<b>Maximum output Power(mW)</b>	50
<b>Charging Type</b>	Inductive wireless Power transfer

#### **Description of S-PEN:( EJ-PT870: FCC ID: A3LEJPT870)**

The device supports S-Pen. The S-Pen is accessories such as touch pen. Usually built into the device, but user take it out, when user uses to note or control on device using BLE mode. The S-Pen is also an electronic product and charges through the device. In this case, S-Pen is charged by WPT(Wireless Power Transfer) function. Charging is the way in which power is transferred from “FPCB’s coil in device” to “S-Pen’s coil”..

Battery in the EJ-PT870 will be charged wirelessly from Tablet via 530 kHz frequency

More detail description, Please refer to Operational description document.

All Position of S-Pen were investigated and the worst position results are reported.

For S-Pen, both fully charged and non-fully charged condition were investigated. Test were performed non-fully charged condition as worst case

## 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/cm <sup>2</sup> )	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 <sup>2</sup> )	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 <sup>2</sup> )	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 <sup>2</sup> )	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

### 6.1 H-Field measurement results of DUT's 6 sides

H-Field Measurement (A/m)						
The Direct contact from the edge of the Device to the center of the measurement Probe	Rear	Front	Left	Right	Top	Bottom
5.4 cm	0.2182	0.0148	0.0053	0.0455	0.017	0.0049

Note: All measurement sides are taken into account with respect to the front side of the DUT.  
The contact distance between the device and the probe is 5.4 cm from the center of the probe.

### 6.2 H-field measurement results

H-Field Results Measurement (A/m) :Rear Side		
The Distance from the Rear of the device to the center of the measurement probe (cm)	H-Field Meas. (A/m)	FCC H-Field Limit (A/m)
5.4	0.2182	1.63
6.4	0.1113	
7.4	0.0530	
8.4	0.0358	
9.4	0.0173	
10.4	0.0113	
11.4	0.0083	
12.4	0.0073	
13.4	0.0053	
14.4	0.0049	
15.4	0.0040	

### 6.3 FCC SUMMARY OF RESULTS

Measurement procedure was performed per FCC Guidance.

All Position of S-Pen were investigated and the worst position results a reported

FCC RF Exposure H-Field Limit [A/m]	Maximum meas data (A/m)	Percentage(%)
1.63	0.2182	13.4

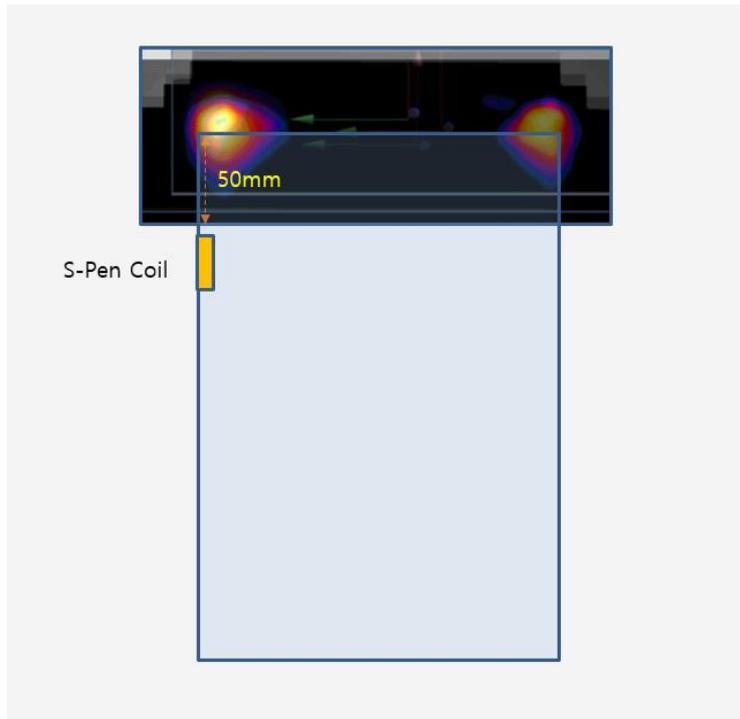
H-Field test result was less than 50% of MPE limit

**2) Simultaneous Transmission Analysys.**

The Location of the WPT Tx coils of the S-Pen is far enough not to affect considering the position of the SAR distribution plot in the 3G/4G/5GWLAN/BT mode. In addition, when measuring the H-field of WPT of SPEN, it was measured by activating the Tx of other antennas, and the measurement results were lower than 50% of FCC's Limit.

In addition, the SAR measurement results of Main band and WLAN with S-Pen(8mm Width) touched on the DUT were much lower than those measured without S-Pen.

The results of the simultaneous transmission evaluation are as follows



Rear side overlay showing SAR and PD peak distribution

**TER Considerations**

1.Total Exposure Ratio : SAR +S-PEN WPT

The total TER result obtained by summing the test results of the SAR worst case equipped with S-Pen (8mmwith S-PEN)in the DUT and the WPT test results of S-Pen is 0.906. FCC's limit was satisfied because the TER result is less than 1

Configuration	H-Field	Bluetooth Ant1	Bluetooth Ant2	2.4GHz Ant1	2.4GHz Ant2	2.4GHz MIMO	2.4GHz Ant.2 RSDB	2.4GHz RSDB MIMO	5GHz Ant.2	5GHz MIMO	5GHz RSDB MIMO	WI-FI 6E MIMO	WI-FI 6E RSDB MIMO	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	
	S- PEN A/m																						
0	1	2	3	4	5	6	7	8	9	10	11	12											
Limit	1.630	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	2+9	2+11	1+9	1+11	1+4	7+10	7+12	1+6+10	1+6+12	
Rear (8mm)	0.218	0.471	0.437	0.538	0.764	0.500	0.398	0.223	0.887	0.730	0.022	0.094	0.107	1.167	0.531	1.201	0.565	1.235	0.245	0.330	0.891	0.976	
Limit to Ratio	0.134													0.863	0.466	0.885	0.487	0.906	0.287	0.340	0.691	0.744	

