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:** Jun. 03, 2023 **Test Report No.:** HCT-SR-2305-FC008-R1 **Test Site: HCT CO., LTD.**

FCC ID:	**A3LSMX810**
Equipment Type:	**Tablet**
Application Type	**Certification**
FCC Rule Part(s):	**47 CFR part 2.1093**
Model Name:	**SM-X810**
Date of Test:	**05/08/2023, 06/03/2023**

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

Dong Seon, Kim
Test Engineer
SAR Team
Certification Division

Reviewed By

Yun-jeang, Heo
Technical Manager
SAR Team
Certification Division

DOCUMENT HISTORY

Rev.	DATE	DESCRIPTION
0	May 16, 2023	First Approval Report
1	Jun 03, 2023	In accordance with FCC guidance, measurements for additional separation distances were performed.

Table of Contents

1. Test Methodology

- FCC KDB 447498 D04 Interim General RF Exposure Guidance v01

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-X810
EUT Type:	Tablet
Application Type:	Certification

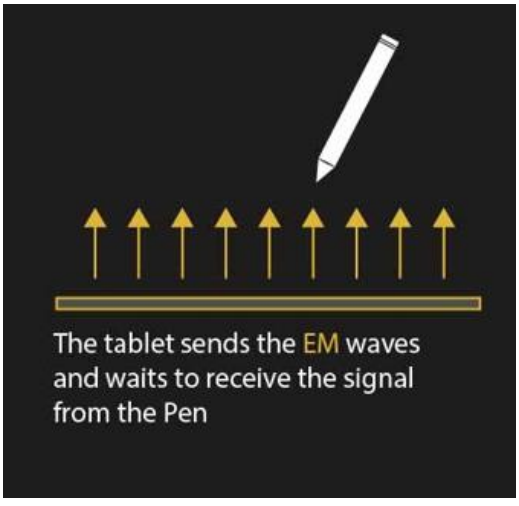
frequency [kHz]	Operation mode [531.25 ~ 656.25 kHz]
531.25	Spen digitizer(Button), charging(main, sub)
562.50	Spen digitizer(Writing, Hover)
593.75	Spen digitizer(Eraser)
656.25	Keyboard cover detection

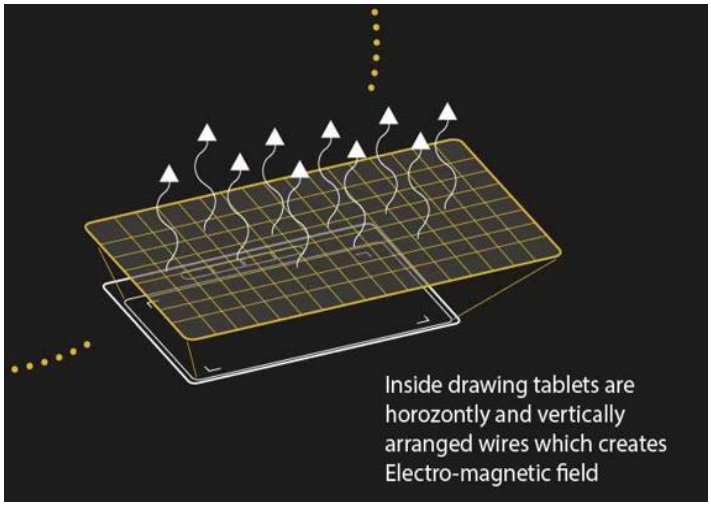
S-PEN:(Model Name : EJ-PX710, FCC ID : A3LEJPX710)

The tablet has a grid of wire throughout the surface which generates an electromagnetic field. These electromagnetic fields are picked up by the pen when it approaches near the surface.

Inside the s-pen, there is a coil of wire which picks up those electromagnetic fields and transforms them into electrical energy. Kind of similar to how wireless chargers convert EM-waves into electric power.

The generated electrical energy is then used to record the pressure, tilt and other data(Button clicks). The generated data goes back to the coil and gets converted into waves that get picked up by the tablet.”



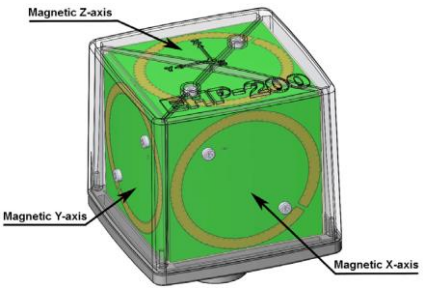


4. TEST EQUIPMENT

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	07/29/2022	07/29/2024
Narda	EHP-200AC	Electric and Magnetic Field Probe	180ZX10229	12/06/2022	12/06/2023

EHP-200AC, the magnetic sensor system is composed by three magnetic loops positioned orthogonal each other. The electric sensor system is composed by three orthogonal parallel plates capacitors installed on the opposite side of the magnetic loops. The uncertainty due to the anisotropy of the magnetic loops and the plates capacitors in the probe is described in the probe manufacturer's specification [1], with values up to ± 0.8dB (10 %). The sensitive elements are located approximately 8 mm below the external surface as shown in below Table



Measurement probe specification

Model	EHP-200AC
Frequency	3 kHz – 30 MHz
Linearity	± 0.5 dB @ 1MHz to full scale
Frequency Response	± 0.5 dB for Electric field ± 0.8 dB for Magnetic field
Anisotropy	±0.8 dB (10%) at 1 MHz
Dimensions	92 × 92 × 109 mm [Center : 46 x 46 x54.5 mm]
Application	Electric and Magnetic field

The sensitive elements are located **approximately 8 mm** below the external surface

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

6.1 Measurement Setup

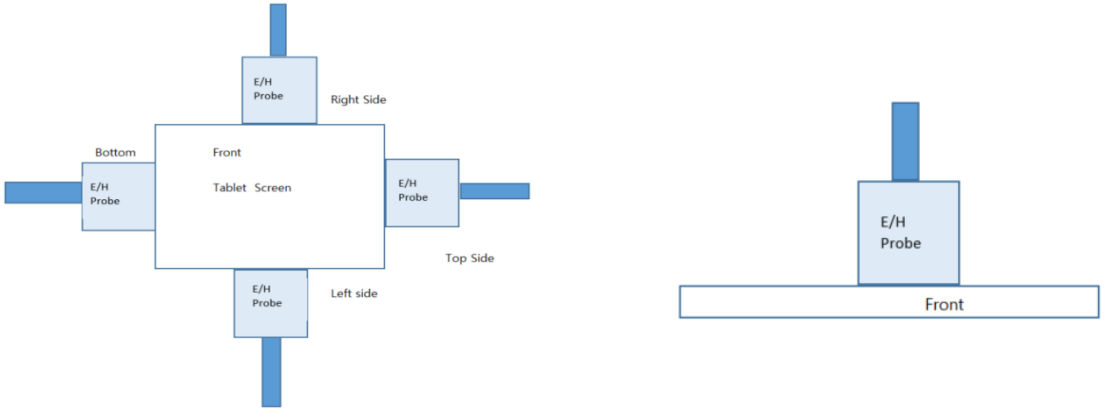


Figure1. H-Field and E-Field Measurement set up

In accordance with FCC guidance, measurements for additional separation distances were performed in accordance with the April 2022 workshop note.[Sec.6.3]

6.2 Measurement Results

Digitizer function test of the DUT is set to forced operation mode through the manufacturer's FTM program and E-Field and H-Field are measured using the narda EHP-200AC probe.

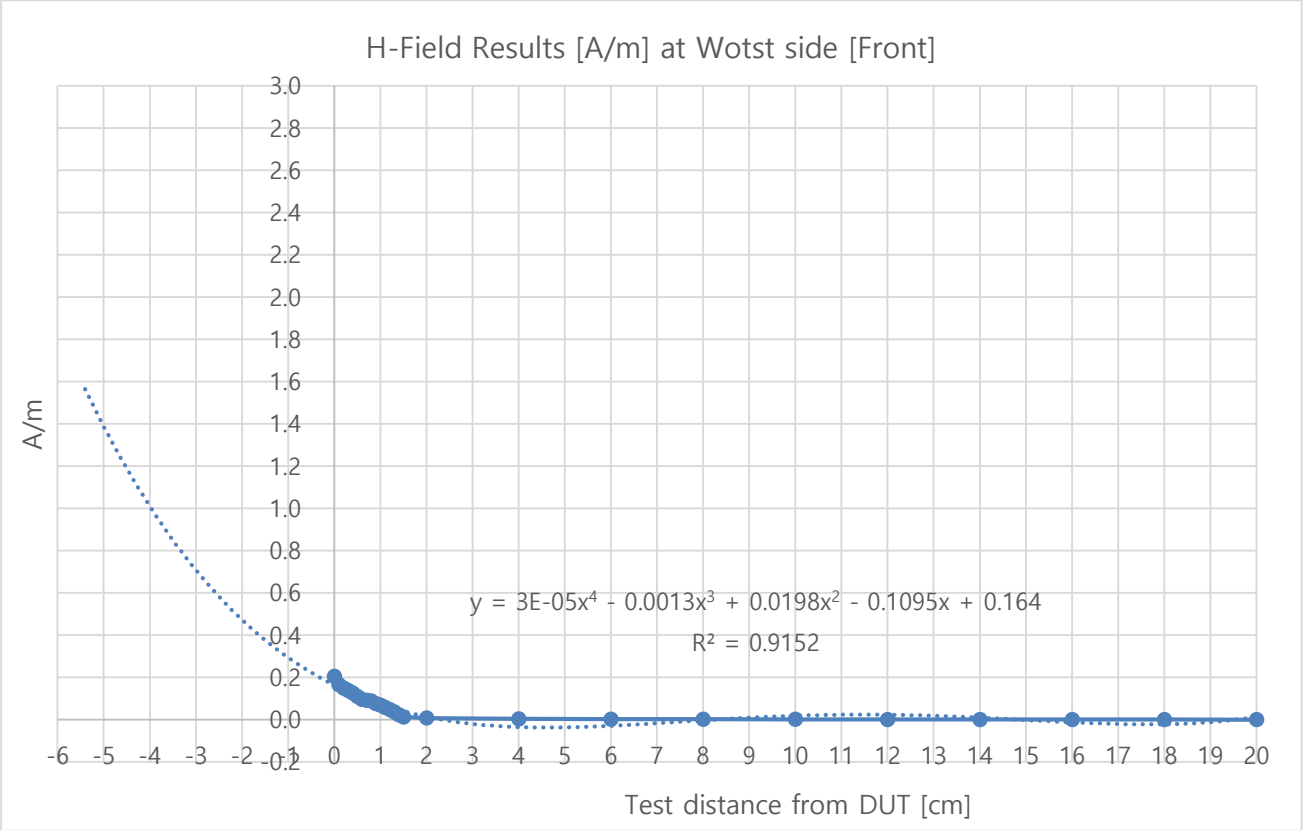
charging condition	Distance	H-field Measurement (A/m)						FCC Limit H-Field [A/m]
		Rear	Front	Left	Right	Top	Bottom	
Operating	0cm	0.0058	0.2050	0.0069	0.0056	0.0071	0.0089	1.63
	Margin Limit[%]	0.36%	12.58%	0.42%	0.34%	0.44%	0.55%	
	Seperation Distance	E-field Measurement (V/m)						FCC Limit E-Field[V/m]
		Rear	Front	Left	Right	Top	Bottom	
	0cm	0.3894	0.4472	0.3834	0.3707	0.3894	0.3795	614
	Margin Limit[%]	0.06%	0.07%	0.06%	0.06%	0.06%	0.06%	

Among all measured results of the digitizer function of the DUT, the worst case measurement result is reported.

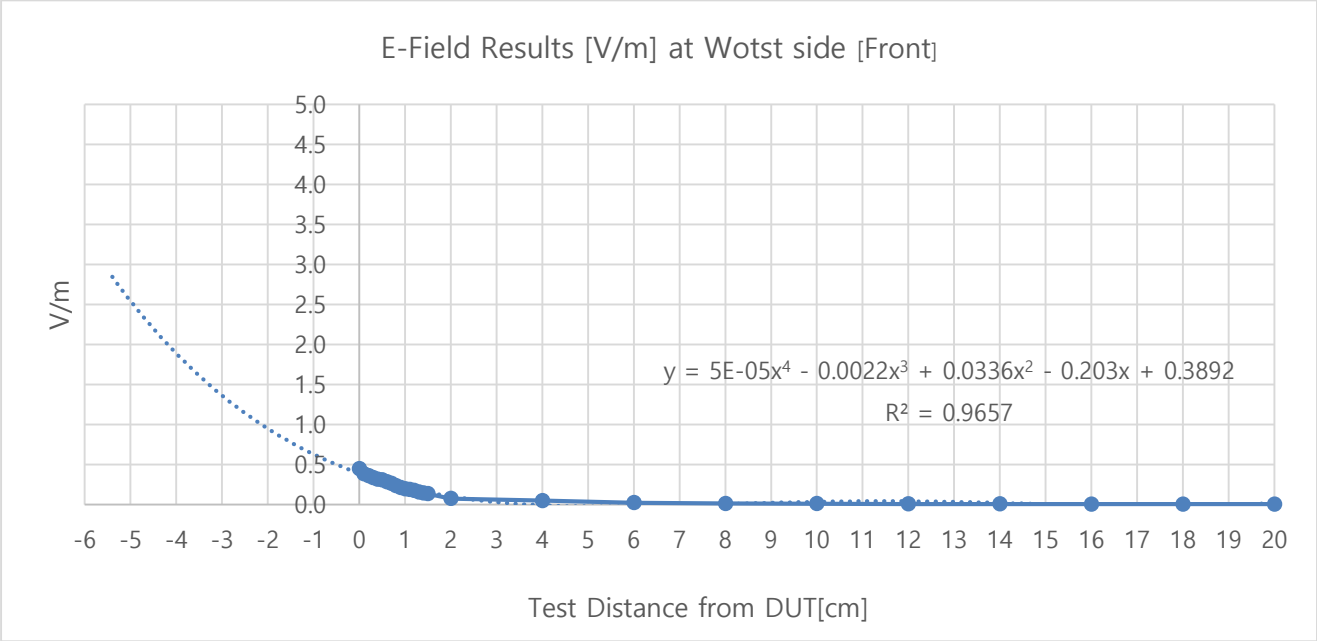
6.3 Measurement Results per FCC Guidance

In accordance with FCC guidance, measurements for additional separation distances were performed in accordance with the April 2022 workshop note.

Distance	H-Field Results[RMS],[A/m]					
(cm)	Rear	Front	Left	Right	Top	Bottom
0	0.0058	0.205	0.0069	0.0056	0.0071	0.0089
0.1		0.1658				
0.2		0.1497				
0.3		0.1378				
0.4		0.1258				
0.5		0.1101				
0.6		0.0964				
0.7		0.0919				
0.8		0.0885				
0.9		0.0765				
1		0.0685				
1.1		0.0587				
1.2		0.0472				
1.3		0.0367				
1.4		0.0229				
1.5		0.0128				
2		0.0077				
4		0.0038				
6		0.0025				
8		0.0022				
10		0.0017				
12		0.0009				
14		0.0008				
16		0.0007				
18		0.0006				
20		0.0003				


H-Field Results [A/m] at Wotst side [Front]
A/m
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
y = 3E-05x⁴ - 0.0013x³ + 0.0198x² - 0.1095x + 0.164
R² = 0.9152
Test distance from DUT [cm]

Distance	E-Field Results[RMS],[V/m]					
(cm)	Rear	Front	Left	Right	Top	Bottom
0	0.3894	0.4472	0.3834	0.3707	0.3894	0.3795
0.1		0.3827				
0.2		0.3594				
0.3		0.3362				
0.4		0.3144				
0.5		0.3075				
0.6		0.2842				
0.7		0.2624				
0.8		0.2352				
0.9		0.2115				
1		0.1940				
1.1		0.1885				
1.2		0.1761				
1.3		0.1564				
1.4		0.1443				
1.5		0.1331				
2		0.0743				
4		0.0487				
6		0.0214				
8		0.0111				
10		0.0091				
12		0.0061				
14		0.0052				
16		0.0044				
18		0.0042				
20		0.0038				


E-Field Results [V/m] at Wotst side [Front]
V/m
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
y = 5E-05x⁴ - 0.0022x³ + 0.0336x² - 0.203x + 0.3892
R² = 0.9657
Test Distance from DUT[cm]