

TEST REPORT

of

FCC CFR 47 part1, 1.1307(b), 1.1310
IC RSS-102 Issue 5, SPR-002 Issue 1

FCC ID: A3LSMT870
IC Certification: 649E-SMT870

1. Equipment Under Test : Portable Tablet
2. Model Name : SM-T870
3. Variant Model Name(s) : -
4. Applicant : Samsung Electronics Co., Ltd.
5. Date of Receipt : 2020.06.12
6. Date of Test(s) : 2020.07.13 ~ 2020.07.22
7. Date of Issue : 2020.07.24

In the configuration tested, the EUT complied with the standards specified above. This test report does not assure KOLAS accreditation.

- 1) The results of this test report are effective only to the items tested.
- 2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.

Tested by:


Jinhyoung Cho

Technical
Manager:


Jungmin Yang

SGS Korea Co., Ltd. Gunpo Laboratory



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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

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1.2. Details of Applicant

Applicant : Samsung Electronics Co., Ltd.

Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Contact Person : Seo, Deok-ho

Phone No. : +82 10 3955 6246

1.3. Description of EUT

Kind of Product	Portable Tablet
Model Name	SM-T870
Serial Number	R32N60011ZB, R32N60012YN
Power Supply	DC 3.86 V
Operation Mode	S-Pen WPT Digitizer Mode 1 Digitizer Mode 2
Frequency Range	530 kHz ~ 593 kHz
Antenna Type	Flat Coil Antenna
H/W Version	REV1.0
S/W Version	T870.001
Test S/W Version	T870XXE0ATF7

1.4. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Electric and Magnetic field Probe analyzer	NARDA	EHP 200AC	170WX91017	Dec. 05, 2019	Annual	Dec. 05, 2020
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.

► Support Equipment

Description	Manufacturer	Model	FCC ID	IC Certification Number
Samsung Stylus Pen	Samsung Electronics Co., Ltd.	EJ-PT870	A3LEJPT870	649E-EJPT870

1.5. Test Report Revision

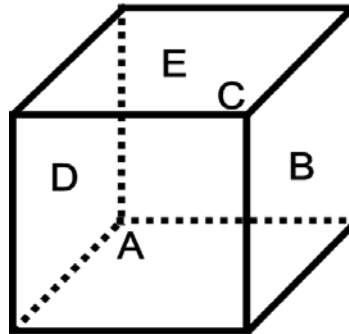
Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL000967	2020.07.17	Initial
1	F690501-RF-RTL000967-1	2020.07.24	Added the E-field measurement results and the worst value of equipment approval considerations item.

2. Test Result

2.1. Test Setup

2.1.1. Isotropic Probe Test Setup

The measurement probe (EHP-200AC) is a regular hexahedron and supports 3-axis isotropic probe.



A: Front of measurement probe

B: Right of measurement probe

C: Rear of measurement probe

D: Left of measurement probe

E: Top of measurement probe

*Bottom of measurement probe is not used to measure RF exposure condition owing to connection with a stick.

In order to demonstrate the probe perturbation is not affecting the measurements,

- For one of the sides of EUT several measurements be made at various distances, starting further away and then moving closer.

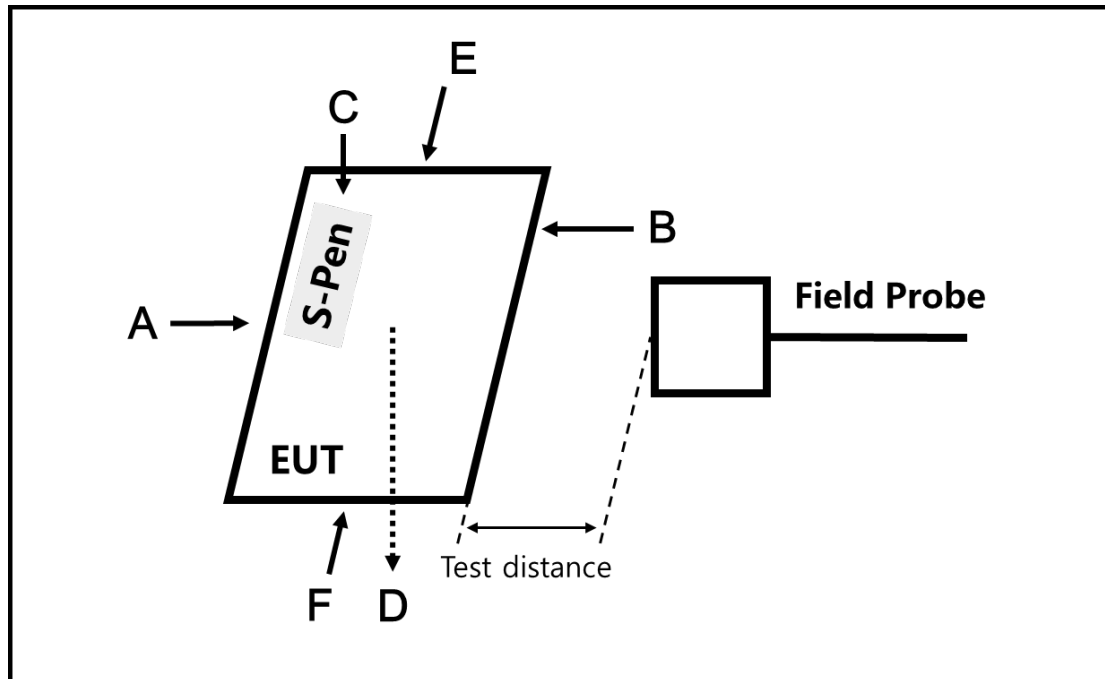
- ✓ Further away: measurement distance of EUT was confirmed until isotropic probe could not read fundamental level anymore (Not detected level).
- ✓ Moving closer: measurement isotropic probe directly contacts with sides of EUT (0 cm)
- ✓ When the worst level of EUT's sides is found out, several measurements should be checked through various distance (1 cm step).

- At 0 cm distance, measurement isotropic probe was investigated by rotating the probe through various angles for one of the EUT's sides as below.

Measurement Point	A	B	C	D	E
Direction	Front	Right	Rear	Left	Top
Measurement Point	A to B	B to C	C to D	D to A	N/A
Direction	Front to Right	Right to Rear	Rear to Left	Left to Front	-
Measurement Point	A to E	B to E	C to E	D to E	N/A
Direction	Front to Top	Right to Top	Rear to Top	Left to Top	-

- When the worst angle among all angles was found, RF exposure measurement should be adjusted from worst angle.

2.1.2. EUT Test Setup



2.1.3. Measurement procedure

- The RF exposure test was performed in anechoic chamber.
- H-field level of WPT (Wireless power transfer) was measured from 0 cm (contact) to possible reading distance (Not detected level) based on EUT's surface.
- Measurement was performed on each side of the EUT as described above picture (A, B, C, D, E, F).
- The EUT was measured according to the dictates of KDB 680106 D01 RF Exposure Wireless Charging Apps v03 and SPR-002 Issue 1.

2.1.4. Operational Correction Factor

The EUT charges of 10 minutes at maximum illumination to full charge. It recharges at maximum illumination when 10 % or more of the battery level drop is detected.

Operational Correction Factor = 10 min / 30 min = 1 / 3

2.2. Test Configuration (Worst Case Configuration and Mode)

Worst case configuration is considered when the RF exposure is performed then worst result should be reported as below.

Test Condition: AC adaptor

Mode	Case	Description
S-Pen charging mode	1	Tablet condition: Charging with AC adaptor Charging from EUT to S-Pen
	2	Tablet condition: Charging without AC adaptor Charging from EUT to S-Pen

Test Condition: All RF communications

Mode	Description
Connections	Bluetooth (2.4 MHz) + WLAN (5 GHz) + GNSS

Remark;

1. The H-field test was conducted while all other wireless technologies / RF communications operating at their under perspective maximum RF output.
2. **Worst case: Case#1: Charging with AC adaptor / Bluetooth (2.4 MHz) + WLAN (5 GHz) + GNSS**

2.3. Equipment Approval Considerations item 5 b) of KDB 680106 D01 v03.

- (1) Power transfer frequency is less than 1 MHz.
 - The device operates at a frequency 530 kHz ~ 593 kHz.
- (2) Output power from each primary coil is less than or equal to 15 watts.
 - Output power from primary coil: 0.05 watts.
- (3) The transfer system includes only single primary and secondary coils. This includes charging systems that may have multiple primary coils and clients that are able to detect and allow coupling only between individual pairs of coils.
 - The transfer system including a charging system with one primary coils is to detect and allow only between individual pairs of coils.
- (4) Client device is placed directly in contact with the transmitter.
 - Client device is placed directly in contact with the transmitter.
- (5) Mobile exposure conditions only (portable exposure conditions are not covered by this exclusion).
 - Mobile exposure conditions only.
- (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.
 - Refer to following test results.
The EUT H-Field Strength levels at 15 cm < 50 % of the MPE H-Field Strength limit 1.63 A/m
0.0169 A/m < 0.815 A/m
The worst value of whole H-Field test results is 0.1635 A/m.

2.4. Equipment Approval Considerations item 6.4.4 of RSS-216 Issue 2.

- (i) Wireless power transfer frequency is below 1 MHz;
- The device operates at a frequency range 530 kHz ~ 593 kHz.
- (ii) Output power from each primary coil is less than or equal to 5 W;
- Output power from primary coil: 0.05 watts.
- (iii) The WPT device is only capable of wireless power transfer between one source and one client at a time. This includes WPT systems with multiple primary coils(i.e. in the WPT source) as long as they only allow wireless power transfer to take place through a single pair of coils at any given time(one in the source and the other in the client). It also includes WPT systems where the source may use two or more overlapping smaller coils to form a fixed charging/powering zone, as long as they only allow wireless power transfer to take place between this zone and a single client device;
- The WPT device is capable of WPT systems where the source uses the smaller coils to form a fixed charging zone, only allow wireless power transfer to take place between this zone and a single client device.
- (iv) The WPT client device is placed in direct contact with or docked onto the WPT source;
- Client device is placed directly in contact with the transmitter.
- (v) The maximum coupling surface area of the WPT source is less than or equal to 400 cm²;
- The EUT coupling surface area: $0.65 \times 1.94 \text{ (cm}^2\text{)} = 1.261 \text{ cm}^2$
 $1.261 \text{ cm}^2 < 400 \text{ cm}^2$
- (vi) The total leakage fields from all simultaneous transmitting coils are proven to be less than 30 % of the applicable Health Canada's Safety Code 6 limits for uncontrolled environments, as set out in RSS-102, at 10 cm from the WPT system in all directions. The total leakage fields shall be calculated or measured based on actual and typical WPT clients of types selected such that they provide worst-case conditions. For WPT source devices with multiple fixed wireless power transfer zones that are only capable of powering/charging on client at a time, this requirement shall be met separately for each zone.
Magnetic field at 10 cm from the EUT < 30 % x Health Canada's Safety Code 6 limits level < Health Canada's Safety Code 6 limits.
- Refer to following test results.
 $0.0169 \text{ A/m} < 27.00 \text{ A/m}$ (30 % of Health Canada's Safety Code 6 limits level)
The worst value of whole H-Field test results is 0.1635 A/m.

2.5. Limit

2.5.1. FCC

§1.1310: The criteria listed in the following table shall be used to evaluate the environment 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 to the provisions of FCC part 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)	Average Time (minutes)
(A) Limits for Occupational /Control 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
300-1 500			f/300	6
1 500-100 000			5	6
(B) Limits for General Population / Uncontrol Exposures				
<u>0.3-1.34</u>	<u>614</u>	<u>1.63</u>	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1 500			f/1 500	30
1 500-100 000			1.0	30

f = frequency in MHz

* = Plane wave equivalent power density

2.5.2. IC

In case of transmitters operating between 0.003-10 MHz, meeting the exemption from routine RF Exposure evaluation, shall demonstrate compliance to the instantaneous limits in Section 4 of RSS-102 Issue 5.

For the purpose of this standard, Industry Canada has adopted the SAR and RF field strength limits established in Health Canada's RF exposure guideline, Safety Code 6.¹⁸

**Table 4: RF Field Strength Limits for Devices Used by the General Public
(Uncontrolled Environment)**

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ f	-	6**
1.1-10	87/ $f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ $f^{0.25}$	0.1540/ $f^{0.25}$	8.944/ $f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 $f^{0.3417}$	0.008335 $f^{0.3417}$	0.02619 $f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ $f^{1.2}$
150000-300000	0.158 $f^{0.5}$	4.21 x 10 ⁻⁴ $f^{0.5}$	6.67 x 10 ⁻⁵ f	616000/ $f^{1.2}$
Note: f is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

2.6. Test Result

Ambient temperature : $(23 \pm 1) ^\circ\text{C}$
Relative humidity : 47 % R.H.

2.6.1. Test result of rotating the probe through various angles

- H-field measurement results (Sides of probe)

Frequency (MHz)	Distance (cm)	H-field Measurement [A/m]					Limit (A/m)	
		Probe rotation						
		A	B	C	D	E	FCC	IC
0.53	0	0.125 0	0.082 2	0.018 8	0.071 0	0.455 7	1.63	90

- H-field measurement results (Rotation of probe)

Frequency (MHz)	Distance (cm)	H-field Measurement [A/m]				Limit (A/m)	
		Probe rotation					
		A to B	B to C	C to D	D to A	FCC	IC
0.53	0	0.164 8	0.014 3	0.036 8	0.100 4	1.63	90
		A to E	B to E	C to E	D to E		
		0.066 0	0.241 6	0.167 3	0.285 9		

- Corrected H-field measurement results (Sides of probe)

Frequency (MHz)	Distance (cm)	H-field Measurement [A/m]					Limit (A/m)	
		Probe rotation						
		A	B	C	D	E	FCC	IC
0.53	0	0.041 7	0.027 4	0.006 3	0.023 7	0.151 9	1.63	90

- Corrected H-field measurement results (Rotation of probe)

Frequency (MHz)	Distance (cm)	H-field Measurement [A/m]				Limit (A/m)	
		Probe rotation					
		A to B	B to C	C to D	D to A	FCC	IC
0.53	0	0.054 9	0.004 8	0.012 3	0.033 5	1.63	90
		A to E	B to E	C to E	D to E		
		0.022 0	0.080 5	0.055 8	0.095 3		

Remark;

- Operating duty factor is based on averaging time of table 1.
Corrected H-field measurement results = Measurement results (A/m) / 3
- Worst Case: one of the several angles was found as **E-side** of isotropic probe.

- E-field measurement results (Sides of probe)

Frequency (MHz)	Distance (cm)	E-field Measurement [V/m]					Limit (V/m)	
		Probe rotation						
		A	B	C	D	E	FCC	IC
0.53	0	0.808 1	3.902 1	4.625 1	0.445 7	0.924 1	614	83

- E-field measurement results (Rotation of probe)

Frequency (MHz)	Distance (cm)	E-field Measurement [V/m]				Limit (V/m)	
		Probe rotation					
		A to B	B to C	C to D	D to A	FCC	IC
0.53	0	2.752 8	3.743 8	1.393 1	0.721 4	614	83
		A to E	B to E	C to E	D to E		
		0.832 2	2.947 5	3.419 3	0.872 2		

- Corrected E-field measurement results (Sides of probe)

Frequency (MHz)	Distance (cm)	E-field Measurement [V/m]					Limit (V/m)	
		Probe rotation						
		A	B	C	D	E	FCC	IC
0.53	0	0.269 4	1.300 7	1.541 7	0.148 6	0.308 0	614	83

- Corrected E-field measurement results (Rotation of probe)

Frequency (MHz)	Distance (cm)	E-field Measurement [V/m]				Limit (V/m)	
		Probe rotation					
		A to B	B to C	C to D	D to A	FCC	IC
0.53	0	0.917 6	1.247 9	0.464 4	0.240 5	614	83
		A to E	B to E	C to E	D to E		
		0.277 4	0.982 5	1.139 8	0.290 7		

Remark;

- Operating duty factor is based on averaging time of table 1.
- Corrected H-field measurement results = Measurement results (V/m) / 3
- Worst Case: one of the several angles was found as **C-side** of isotropic probe.

2.6.2. Test result of EUT's side about the distance

- H-field measurement results

H-field Measurement Results											
Frequency (MHz)	Distance (cm)	H-field Measurement [A/m]								Limit (A/m)	
		Probe rotation									
		A	B	C			D	E	F	FCC	IC
0.53	0	0.033 4	0.031 5	0.478 3	0.439 9	0.490 5	0.059 9	0.014 6	0.015 2	1.63	90
	1			0.268 6	0.268 2	0.236 9					
	2			0.126 8	0.150 4	0.144 3					
	3			0.069 2	0.081 2	0.078 8					
	4			0.050 1	0.051 1	0.065 2					
	5			0.033 4	0.034 1	0.030 8					
	6			0.022 0	0.023 5	0.022 4					
	7			0.020 3	0.020 8	0.019 9					
	8			0.016 9	0.016 1	0.016 5					
	9			0.015 7	0.015 3	0.014 7					
	10			0.014 2	0.014 2	0.014 2					
	11	Not Detected (similar level between 8 cm and 10 cm)									

- Corrected H-field measurement results

Frequency (MHz)	Distance (cm)	H-field Measurement [A/m]								Limit (A/m)	
		Probe rotation								FCC	IC
		A	B	C			D	E	F		
0.53	0	0.011 1	0.010 5	0.159 4	0.146 6	0.163 5	0.020 0	0.004 9	0.005 1	1.63	90
	1			0.089 5	0.089 4	0.079 0					
	2			0.042 3	0.050 1	0.048 1					
	3			0.023 1	0.027 1	0.026 3					
	4			0.016 7	0.017 0	0.021 7					
	5			0.011 1	0.011 4	0.010 3					
	6			0.007 3	0.007 8	0.007 5					
	7			0.006 8	0.006 9	0.006 6					
	8			0.005 6	0.005 4	0.005 5					
	9			0.005 2	0.005 1	0.004 9					
	10			0.004 7	0.004 7	0.004 7					
	11	Not Detected (similar level between 8 cm and 10 cm)									

Remark;

- Operating duty factor is based on averaging time of table 1.
Corrected H-field measurement results = Measurement results (A/m) / 3
- When the worst level of EUT's sides is found out, several measurements should be checked through various distance (1 cm step).
- Above RF exposure measurement was performed considering worst position (E-side) of isotropic probe.

- E-field measurement results

Frequency (MHz)	Distance (cm)	E-field Measurement [V/m]								Limit (V/m)	
		Probe rotation								FCC	IC
		A	B	C			D	E	F		
0.53	0	0.610 8	0.574 9	4.625 1	4.896 7	4.966 0	0.441 5	0.568 9	0.403 2	614	83
	1			2.393 9	2.513 1	2.650 2					
	2			1.207 3	1.465 4	1.337 3					
	3			0.816 7	0.823 8	0.796 3					
	4			0.592 3	0.609 4	0.659 0					
	5			0.518 7	0.491 9	0.562 5					
	6			0.356 6	0.341 4	0.421 0					
	7			0.385 4	0.387 8	0.420 4					
	8			0.399 2	0.409 7	0.415 5					
	9			0.401 0	0.396 0	0.412 5					
	10			0.413 8	0.446 9	0.392 9					
	11	Not Detected (similar level between 6 cm and 10 cm)									

- Corrected E-field measurement results

Frequency (MHz)	Distance (cm)	E-field Measurement [V/m]								Limit (V/m)	
		Probe rotation								FCC	IC
		A	B	C			D	E	F		
0.53	0	0.203 6	0.191 6	1.541 7	1.632 2	1.655 3	0.147 2	0.189 6	0.134 4	614	83
	1			0.798 0	0.837 7	0.883 4					
	2			0.402 4	0.488 5	0.445 8					
	3			0.272 2	0.274 6	0.265 4					
	4			0.197 4	0.203 1	0.219 7					
	5			0.172 9	0.164 0	0.187 5					
	6			0.118 9	0.113 8	0.140 3					
	7			0.128 5	0.129 3	0.140 1					
	8			0.133 1	0.136 6	0.138 5					
	9			0.133 7	0.132 0	0.137 5					
	10			0.137 9	0.149 0	0.131 0					
	11	Not Detected (similar level between 6 cm and 10 cm)									

Remark;

- Operating duty factor is based on averaging time of table 1.
Corrected H-field measurement results = Measurement results (V/m) / 3
- When the worst level of EUT's sides is found out, several measurements should be checked through various distance (1 cm step).
- Above RF exposure measurement was performed considering worst position (C-side) of isotropic probe.

- End of the Test Report -