



TEST REPORT

KCTL Inc. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR19-SRF0181-A Page (1) of (17)	
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1. Client

◦ Name : Samsung Electronics Co., Ltd.

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

◦ Date of Receipt : 2019-07-25

2. Use of Report : -

3. Name of Product and Model : Notebook PC / NP950QCG

4. Manufacturer and Country of Origin : Samsung Electronics Co., Ltd. / Korea

5. FCC ID : A3LNP950QCG

6. Date of Test : 2019-09-11 to 2019-09-22

7. Test Standards : 47 CFR Part 1.1310

8. Test Results : Refer to the test result in the test report

Affirmation	Tested by Name : Kwonse Kim (Signature)	Technical Manager Name : Jaehyong Lee (Signature)
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2019-10-28

KCTL Inc.

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Report revision history

Date	Revision	Page No
2019-10-24	Initial report	-
2019-10-28	Updated	5

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Note. The report No. KR19-SRF0181 is superseded by the report No. KR19-SRF0181-A.

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1. General information

Client : Samsung Electronics Co., Ltd.
 Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
 Manufacturer : Samsung Electronics Co., Ltd.
 Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
 Factory : SESC (Samsung Electronics Suzhou Computer)
 Address : No. 198, Fangzhou Road, Suzhou Industrial Park, Jiangsu Province, 215021, China
 Laboratory : KCTL Inc.
 Address : 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
 Accreditations : FCC Site Designation No: KR0040, FCC Site Registration No: 687132
 VCCI Registration No. : R-20080, G-20078, C-20059, T-20056
 Industry Canada Registration No. : 8035A
 KOLAS No.: KT231

2. Device information

Equipment under test : Notebook PC
 Model : NP950QCG
 Frequency range : 110 kHz ~ 148 kHz (WPT), 530 kHz ~ 600 kHz (S-Pen)
 Modulation technique : AM
 Power source : AC 120 V (Output : 20V/3.25A, 15V/3A, 9V/3A, 5V/3A)
 Antenna specification : Loop Coil Antenna_Flat type (WPT)
 FPCB Antenna_Coil type (S-Pen)
 Software version : 19H1
 Hardware version : REV1.0
 Test device serial No. : 1BRR91ZM900131V, 1BRM91ZM900002J
 Operation temperature : 10 °C ~ 35 °C

Note:

1. Certificated module is mounted in the EUT as following.

- Applicant : Intel Mobile Communications
- Contains FCC ID : PD9AX201D2
- Model : AX201D2W
- SAR test report number : KR19-SPF0029

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source	FCC ID
Stylus Pen	Samsung Electronics Co., Ltd.	EJ-PN970	933280BF0E52	-	A3LEJPN970
Smart Phone	Samsung Electronics Co., Ltd.	SM-G960N	R39JB06Z70	DC 3.85 V	A3LSMG960KOR

2.2. Equipment Approval Considerations item 5.b) of KDB 680106 D01v03

Requirement	Device
A) Power transfer frequency is less than 1 MHz.	WPT: 110 kHz to 148 kHz S-Pen : 530 kHz to 600 kHz
B) Output power from each primary coil is less than or equal to 15 watts.	WPT : 7 W S-Pen : 50 mW
C) 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 includes only single primary and secondary coils.
D) Client device is placed directly in contact with the transmitter.	Yes.
E) Mobile exposure conditions only (portable exposure conditions are not covered by this exclusion)	This device is portable condition. (Refer to PAG)
F) 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.	Aggregate fields were measured at distances < 15 cm / 20 cm following FCC guidance provided in a lab KDB enquiry. All measurements are significantly below 50% of the limit.

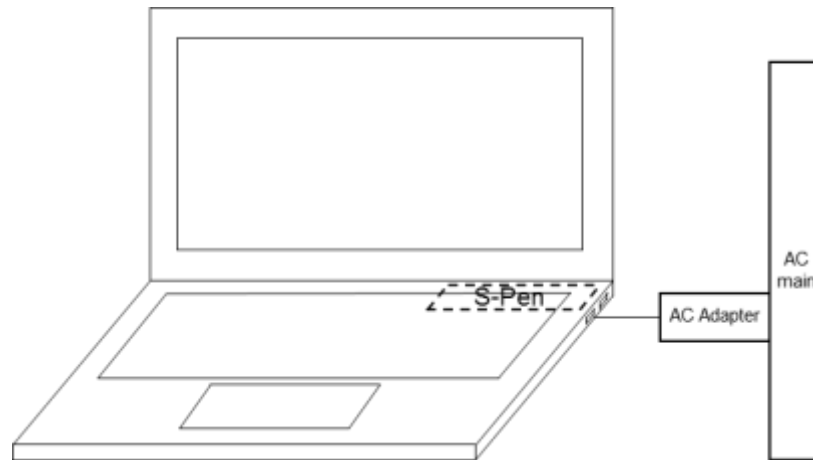
2.3. Worst-case configuration and mode

Mode 1	Test case	Description
S-Pen charging mode	1	EUT position : Clamshell Charging from EUT to S-Pen
	2	EUT position : Clamshell Charging from AC Adaptor to EUT Charging from EUT to S-Pen
	3	EUT position : Tablet Charging from EUT to S-Pen
	4	EUT position : Tablet Charging from AC Adaptor to EUT Charging from EUT to S-Pen
Mode 2	Test case	Description
Power sharing mode (S-Pen is fully charged condition)	5	EUT position : Clamshell Charging from EUT to Phone
	6	EUT position : Clamshell Charging from AC Adaptor to EUT Charging from EUT to Phone
	7	EUT position : Tablet Charging from EUT to Phone
	8	EUT position : Tablet Charging from AC Adaptor to EUT Charging from EUT to Phone
Mode 3	Test case	Description
Simultaneous charging mode(Power sharing and S-Pen charging)	9	EUT position : Clamshell Charging from EUT to Phone and S-Pen(Charging)
	10	EUT position : Clamshell Charging from EUT to Phone and S-Pen(LCD touch)
	11	EUT position : Clamshell Charging from EUT to Phone and S-Pen (Push button after touch of LCD)

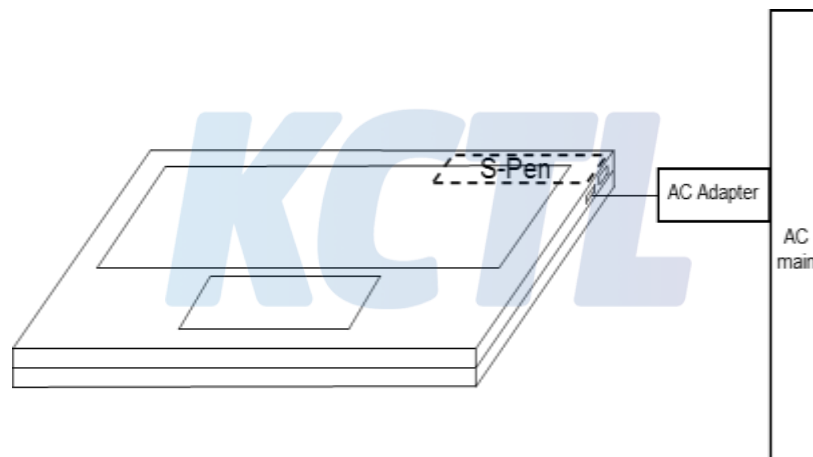
Note:

- For the radiated test, test case 1/3/5/7/9/10/11, the EUT can operate power sharing mode when battery level is over 30%. The test results are not different between fully charged status and battery level 30% status (EUT), test were performed fully charged condition.
- In case of client device, each battery status was investigated then middle condition is reported as a worst result.
Battery status : 1% ~ 20%, 40% ~ 60%, 80% ~ 100%.
- For the S-Pen test, both fully charged and non-fully charged condition were investigated, test case 1/2/3/4/9/10/11 were performed fully charged condition as worst case.
- For the S-Pen charging mode, test results of case 2 and 4 are worst case and power sharing mode, test results of case 6 and 8 are worst case, so this test report described test case 2,4,6 and 8.

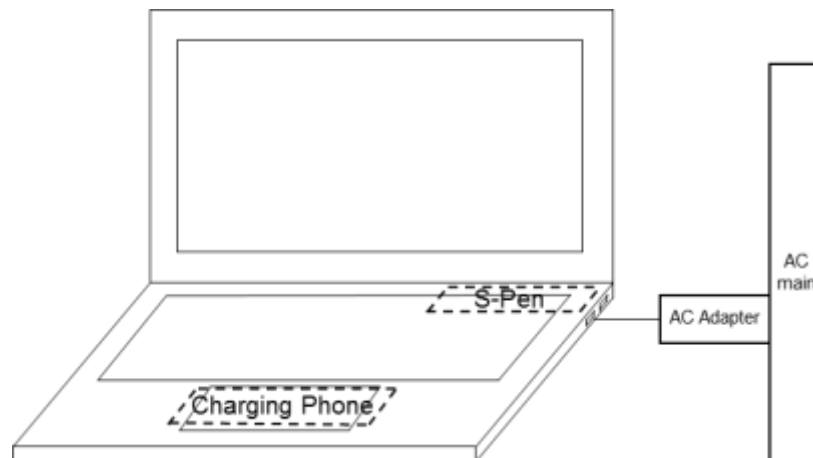
2.4. Test setup diagram



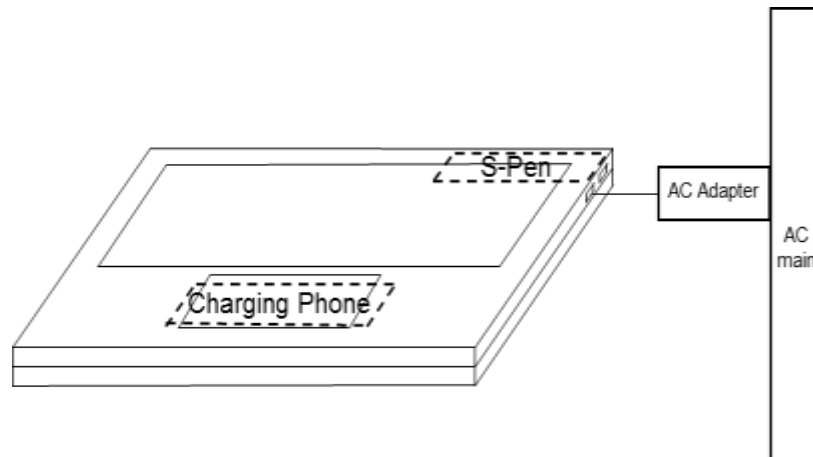
2.4.1 Test case 1 & 2_S-Pen Charging



2.4.2 Test case 3 & 4_S-Pen Charging



2.4.3 Test case 5 & 6_Charging Phone (S-Pen is built-in and fully charged condition)
Test case 9 & 10 & 11_Simultaneous charging (S-Pen charging and Power Sharing)



2.4.4 Test case 7 & 8_Charging Phone (S-Pen is built-in and fully charged condition)

Note:

Test case 1/3/5/7/9/10/11, EUT did not be connected to AC Adaptor in above setup diagram for the test.

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3. RF Exposure

3.1. FCC Regulation

This document is prepared to show compliance with the RF Exposure requirements as required in §1.1310 of the FCC rules and Regulations.

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1. According to FCC §1.1310: the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b).

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 [minute]
(A) Limits for Occupational / Controlled Exposure				
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 ~ 15 000	/	/	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
30 ~ 300	27.5	0.073	0.2	30
300 ~ 1 500	/	/	f/1 500	30
1 500 ~ 15 000	/	/	1.0	30

f=frequency in MHz, * = plane-wave equivalent power density

3.2. Test Set-up

3.2.1. Description of test setup

- 1) Testing was performed with a calibrated H field probe.
- 2) Measurement was performed on each side of the EUT as described per below table.

A	B	C	D	E	F
Right	Left	Back	Front	Top (Keyboard, Touch pad)	Bottom

- 3) Testing was performed at the distances and different battery level as indicated on test result table.
- 4) Measurement procedure was performed per FCC Guidance.

3.2.2. Operational correction factor

- 1) S-Pen condition
 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 = 0.333
- 2) WPS condition
 The EUT need to be charged more than 30 minutes before it can be full charged.
 Operational correction factor = 30 min / 30 min = 1.000

3.2.3. Support equipment

Client device	Model	FCCID
Stylus Pen(S-pen)	EJ-PN970	A3LEJPN970
Mobile Phone	SM-G960N	A3LSMG960KOR

3.3. Test results

3.3.1. Test mode 1: S-pen charging (Test case 2)

- H-field measurement results

Frequency [MHz]	Distance [cm]	H-field Measurement [A/m]						Limits [A/m]
		EUT sides						
		A	B	C	D	E	F	
0.593	0	0.029 3	0.029 1	0.028 5	0.028 8	0.037 9	0.054 2	1.63
0.593	1						0.042 3	1.63
0.593	2						0.037 8	1.63
0.593	3						0.032 7	1.63
0.593	4						0.029 5	1.63
0.593	5						0.029 1	1.63
0.593	6						0.029 1	1.63
0.593	7						0.029 0	1.63
0.593	8						0.028 7	1.63
0.593	9						0.028 6	1.63
0.593	10						0.028 4	1.63

- Corrected H-field measurement results

Frequency [MHz]	Distance [cm]	H-field Measurement [A/m]						Limits [A/m]
		EUT sides						
		A	B	C	D	E	F	
0.593	0	0.009 8	0.009 7	0.009 5	0.009 6	0.012 6	0.018 1	1.63
0.593	1						0.014 1	1.63
0.593	2						0.012 6	1.63
0.593	3						0.010 9	1.63
0.593	4						0.009 8	1.63
0.593	5						0.009 7	1.63
0.593	6						0.009 7	1.63
0.593	7						0.009 7	1.63
0.593	8						0.009 6	1.63
0.593	9						0.009 5	1.63
0.593	10						0.009 5	1.63

Note:

Operating duty factor is based on averaging time of §table 1.

Corrected H-field measurement results = Measurement results(A/m) x 0.333

3.3.2. Test mode 1: S-pen charging (Test case 4)

- H-field measurement results

Frequency [MHz]	Distance [cm]	H-field Measurement [A/m]						Limits [A/m]
		EUT sides						
		A	B	C	D	E	F	
0.593	0	0.032 1	0.032 0	0.031 6	0.040 0	0.033 4	0.031 9	1.63
0.593	1				0.035 5			1.63
0.593	2				0.032 9			1.63
0.593	3				0.032 6			1.63
0.593	4				0.032 5			1.63
0.593	5				0.032 5			1.63
0.593	6				0.032 5			1.63
0.593	7				0.032 4			1.63
0.593	8				0.032 3			1.63
0.593	9				0.032 1			1.63
0.593	10				0.032 1			1.63

- Corrected H-field measurement results

Frequency [MHz]	Distance [cm]	H-field Measurement [A/m]						Limits [A/m]
		EUT sides						
		A	B	C	D	E	F	
0.593	0	0.010 7	0.010 7	0.010 5	0.013 3	0.011 1	0.010 6	1.63
0.593	1				0.011 8			1.63
0.593	2				0.011 0			1.63
0.593	3				0.010 9			1.63
0.593	4				0.010 8			1.63
0.593	5				0.010 8			1.63
0.593	6				0.010 8			1.63
0.593	7				0.010 8			1.63
0.593	8				0.010 8			1.63
0.593	9				0.010 7			1.63
0.593	10				0.010 7			1.63

Note:

Operating duty factor is based on averaging time of §table 1.

Corrected H-field measurement results = Measurement results(A/m) x 0.333

3.3.3. Test mode 2: Wireless Power Sharing (Test case 6)

- H-field measurement results

Frequency [MHz]	Distance [cm]	H-field Measurement [A/m]						Limits [A/m]
		EUT sides						
		A	B	C	D	E	F	
0.110 ~ 0.148	0	0.031 8	0.032 5	0.031 7	0.089 8	0.299 6	0.076 1	1.63
0.110 ~ 0.148	1					0.240 3		1.63
0.110 ~ 0.148	2					0.214 9		1.63
0.110 ~ 0.148	3					0.195 3		1.63
0.110 ~ 0.148	4					0.157 3		1.63
0.110 ~ 0.148	5					0.138 2		1.63
0.110 ~ 0.148	6					0.115 1		1.63
0.110 ~ 0.148	7					0.102 3		1.63
0.110 ~ 0.148	8					0.084 0		1.63
0.110 ~ 0.148	9					0.078 4		1.63
0.110 ~ 0.148	10					0.069 2		1.63

- Corrected H-field measurement results

Frequency [MHz]	Distance [cm]	H-field Measurement [A/m]						Limits [A/m]
		EUT sides						
		A	B	C	D	E	F	
0.110 ~ 0.148	0	0.031 8	0.032 5	0.031 7	0.089 8	0.299 6	0.076 1	1.63
0.110 ~ 0.148	1					0.240 3		1.63
0.110 ~ 0.148	2					0.214 9		1.63
0.110 ~ 0.148	3					0.195 3		1.63
0.110 ~ 0.148	4					0.157 3		1.63
0.110 ~ 0.148	5					0.138 2		1.63
0.110 ~ 0.148	6					0.115 1		1.63
0.110 ~ 0.148	7					0.102 3		1.63
0.110 ~ 0.148	8					0.084 0		1.63
0.110 ~ 0.148	9					0.078 4		1.63
0.110 ~ 0.148	10					0.069 2		1.63

Note:

Operating duty factor is based on averaging time of §table 1.

Corrected H-field measurement results = Measurement results(A/m) x 1.000

3.3.4. Test mode 2: Wireless Power Sharing (Test case 8)

- H-field measurement results

Frequency [MHz]	Distance [cm]	H-field Measurement [A/m]						Limits [A/m]
		EUT sides						
		A	B	C	D	E	F	
0.110 ~ 0.148	0	0.031 0	0.034 0	0.037 8	0.143 4	0.273 5	0.029 1	1.63
0.110 ~ 0.148	1					0.241 7		1.63
0.110 ~ 0.148	2					0.169 9		1.63
0.110 ~ 0.148	3					0.149 6		1.63
0.110 ~ 0.148	4					0.111 9		1.63
0.110 ~ 0.148	5					0.087 5		1.63
0.110 ~ 0.148	6					0.078 9		1.63
0.110 ~ 0.148	7					0.057 7		1.63
0.110 ~ 0.148	8					0.050 7		1.63
0.110 ~ 0.148	9					0.047 2		1.63
0.110 ~ 0.148	10					0.042 4		1.63

- Corrected H-field measurement results

Frequency [MHz]	Distance [cm]	H-field Measurement [A/m]						Limits [A/m]
		EUT sides						
		A	B	C	D	E	F	
0.110 ~ 0.148	0	0.031 0	0.034 0	0.037 8	0.143 4	0.273 5	0.029 1	1.63
0.110 ~ 0.148	1					0.241 7		1.63
0.110 ~ 0.148	2					0.169 9		1.63
0.110 ~ 0.148	3					0.149 6		1.63
0.110 ~ 0.148	4					0.111 9		1.63
0.110 ~ 0.148	5					0.087 5		1.63
0.110 ~ 0.148	6					0.078 9		1.63
0.110 ~ 0.148	7					0.057 7		1.63
0.110 ~ 0.148	8					0.050 7		1.63
0.110 ~ 0.148	9					0.047 2		1.63
0.110 ~ 0.148	10					0.042 4		1.63

Note:

Operating duty factor is based on averaging time of §table 1.

Corrected H-field measurement results = Measurement results(A/m) x 1.000

3.3.5. Conclusion_Correlation between Measured and Simulated H-field

Numerical analysis for WPT was carried out to establish correlation between measured and simulated H-field. Following Table shows that correlation information. The Measured H-field shows good agreement with numerical analysis.

Test mode	Probe Position (Worst Case)	Distance [cm]	H-field Measurement [A/m]	H-field Simulation [A/m]
S-pen charging	Bottom	0	0.018 1	0.019 0
		1	0.014 1	0.017 6
		2	0.012 6	0.016 0
Wireless Power Sharing	Top	0	0.299 6	0.332 6
		1	0.240 3	0.171 9
		2	0.214 9	0.085 5

4. Measurement Equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
E&H Field Probe	narda	EHP-200A	170WX81015	20.02.08

5 Simultaneous transmission

According to KDB 447498 D01v06, When one of the following test exclusion conditions is satisfied for all combinations of simultaneous transmission configurations, further equipment approval is not required to incorporate transmitter modules in host devices that operate in the mixed mobile and portable host platform exposure conditions.

- The $\sum$ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / 1.6 W/kg) + $\sum$ of MPE ratios] is ≤ 1.0
- The SAR to peak location separation ratios of all simultaneously transmitting antenna pairs operating in portable device exposure conditions are all ≤ 0.04 , and the $\sum$ of MPE ratios] is ≤ 1.0 .

Test exclusion condition a): The sum of the same evaluation positions.

$$\frac{\sum \text{ of Highest Reported SAR(WLAN + Bluetooth)}}{\text{Limit}} + \frac{\sum \text{ of SAR Field measured}}{\text{Limit}} = < 1.0$$

5.1 Simultaneous Transmission Configurations

No	Scenario
1	WLAN 2.4 GHz Main + Bluetooth Aux + Wireless Power Sharing + S-Pen
2	WLAN 5 GHz Main + Bluetooth Aux + Wireless Power Sharing + S-Pen
3	WLAN 5 GHz Aux + Bluetooth Aux + Wireless Power Sharing + S-Pen
4	WLAN 5 GHz MIMO + Bluetooth Aux + Wireless Power Sharing + S-Pen

5.2 Estimated SAR

When standalone SAR is not required to be measured, SAR must also be estimated to determine simultaneous transmission SAR test exclusion. A diagram showing the location of the device antennas can be found in SAR test report number: KR19-SPF0029 section appendix D.

Band / Ant.	Freq. [MHz]	Output Power		Tablet-Separation distances [mm]					Tablet-Estimated 1g SAR Value (W/kg)				
		dBm	mW	Rear (F)	Left (B)	Right (A)	Top (C)	Bot. (D)	Rear (F)	Left (B)	Right (A)	Top (C)	Bot. (D)
2.4 GHz Main	2 462	2462	16.00	5	5	341.94	75.36	105.6	Measure	Measure	> 20 cm	0.400	0.400
U-NII-2A Main	5 320	5320	10.50	5	5	341.94	75.36	105.6	Measure	Measure	> 20 cm	0.400	0.400
U-NII-2C Main	5 720	5720	10.50	5	5	341.94	75.36	105.6	Measure	Measure	> 20 cm	0.400	0.400
U-NII-3 Main	5 825	5825	10.50	5	5	341.94	75.36	105.6	Measure	Measure	> 20 cm	0.400	0.400
2.4 GHz Aux	2 462	2462	16.00	5	341.94	5	75.36	105.6	Measure	> 20 cm	Measure	0.400	0.400
U-NII-2A Aux	5 320	5320	10.50	5	341.94	5	75.36	105.6	Measure	> 20 cm	Measure	0.400	0.400
U-NII-2C Aux	5 720	5720	10.50	5	341.94	5	75.36	105.6	Measure	> 20 cm	Measure	0.400	0.400
U-NII-3 Aux	5 825	5825	10.50	5	341.94	5	75.36	105.6	Measure	> 20 cm	Measure	0.400	0.400
Bluetooth Aux	2 480	11.00	13	5	341.94	5	75.36	105.6	Measure	> 20 cm	Measure	0.400	0.400

5.3 Simultaneous Transmission Analysis

RF Exposure	Position	WLAN				Bluetooth Ant.1	Summation				WPS	S-Pen
		2.4 GHz Ant. 0	5 GHz Ant. 0	5 GHz Ant. 1	5 GHz MIMO							
		SAR								Field Strength		
		[①]	[②]	[③]	[④]	[⑤]	[①+⑤]	[②+⑤]	[③+⑤]	[④+⑤]	⑥	⑦
Clamshell	A	Not required								0.0318	0.0098	
	B									0.0325	0.0097	
	C									0.0317	0.0095	
	D									0.0898	0.0096	
	E									0.2996	0.0126	
	F	0.950	0.0761	0.0181	0.327	0.048	0.998	0.661	0.375	0.375	0.0181	0.0761
Tablet	A	> 20 cm	> 20 cm	0.937	0.525	0.043	0.043	0.043	0.980	0.568	0.0310	0.0107
	B	0.632	1.197	> 20 cm	0.627	> 20 cm	0.632	1.197	> 20 cm	0.627	0.0340	0.0107
	C	0.400	0.400	0.400	0.400	0.400	0.800	0.800	0.800	0.800	0.0378	0.0105
	D	0.400	0.400	0.400	0.400	0.400	0.800	0.800	0.800	0.800	0.1434	0.0133
	E	Not required								0.2735	0.0111	
	F	0.520	0.351	0.239	0.166	0.037	0.557	0.388	0.276	0.203	0.0291	0.0106
RF Exposure Limit							1.60				1.63	
Clamshell	A	Ratio [results / Limit]					Not required				0.02	0.01
	B										0.02	0.01
	C										0.02	0.01
	D										0.06	0.01
	E										0.18	0.01
	F						0.62	0.41	0.23	0.23	0.05	0.01
Tablet	A	Ratio [results / Limit]					0.03	0.03	0.61	0.36	0.02	0.01
	B						0.40	0.75	0.00	0.39	0.02	0.01
	C						0.50	0.50	0.50	0.50	0.02	0.01
	D						0.50	0.50	0.50	0.50	0.09	0.01
	E						Not required				0.17	0.01
	F						0.34	0.19	0.24	0.18	0.02	0.01
Worst Ratio Summation: Tablet Type “B” Position: ([②+⑤]) + ⑥ + ⑦ = 0.78												

Worst Ratio Summation: Tablet Type "B" Position: ([②+⑤]) + ⑥ + ⑦ = 0.78

When the sum of ratios of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the 1.0 the additional equipment approval is not required.

End of test report