MPE TEST REPORT

of

FCC CFR 47 part 1, 1.1307(b), 1.1310

FCC ID/IC Certification : A3LXE503C32 / 649E-XE503C32

Equipment Under Test	:	SAMSUNG NOTE PC
Model Name	:	XE503C32
Applicant	:	SAMSUNG ELECTRONICS CO., LTD.
Manufacturer	:	SAMSUNG ELECTRONICS CO., LTD.
Date of Test(s)	:	2014. 02. 14 ~ 2014. 03. 07
Date of Issue	:	2014. 03. 11

In the configuration tested, the EUT complied with the standards specified above.

Tested By: **Wonjun Sim** **Date:** **2014.03.11**

Approved By: **Feel Jeong** **Date:** **2014.03.11**

MPE WORK SHEET

of

FCC CFR 47 part 1, 1.1307(b), 1.1310

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Feel Jeong

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory).

- Wireless Div. 3FL, 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 435-040

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.

Phone No. : +82 31 428 5700

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1.2. Details of Applicant

Applicant : SAMSUNG ELECTRONICS CO., LTD.
Address : 129, Samsung-Ro, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, Korea
Contact Person : Lee, Sang-Cheong
Phone No. : +82 31 277 4784
Fax No. : +82 31 277 9247

1.3. Description of EUT

Kind of Product		SAMGSUNG NOTE PC
Model Name		XE503C32
Power Supply		DC 7.6 V
Frequency Range		2 402 ㎒ ~ 2 480 ㎒ (BT, BT LE), 2 412 ㎒ ~ 2 462 ㎒ (11b/g/n_HT20), 2 422 ㎒ ~ 2 452 ㎒ (11n_HT40), 5 745 ㎒ ~ 5 825 ㎒ (11a/n_HT20, 11ac_VHT20), 5 755 ㎒ ~ 5 795 ㎒ (11n_HT40, 11ac_VHT40), 5 775 ㎒ (11ac_VHT80), 5 180 ㎒ ~ 5 240 ㎒ (11a/n_HT20 – Non DFS, 11ac_VHT20 – Non DFS), 5 190 ㎒ ~ 5 230 ㎒ (11n_HT40 – Non DFS, 11ac_VHT40 – Non DFS), 5 210 ㎒ (11ac_VHT80 – Non DFS), 5 260 ㎒ ~ 5 320 ㎒ (11a/n_HT20 – DFS, 11ac_VHT20 – DFS), 5 270 ㎒ ~ 5 310 ㎒ (11n_HT40 – DFS, 11ac_VHT40 – DFS), 5 290 ㎒ (11ac_VHT80 – DFS), 5 500 ㎒ ~ 5 720 ㎒ (11a/n_HT20 – DFS, 11ac_VHT20 – DFS), 5 510 ㎒ ~ 5 710 ㎒ (11n_HT40 – DFS, 11ac_VHT40 – DFS), 5 530 ㎒ ~ 5 690 ㎒ (11ac_VHT80 – DFS)
Modulation Technique		DSSS, OFDM, GFSK, π/4DQPSK, 8DPSK
Number of Channels		11 channel (11b/g/n_HT20), 7 channel (11n_HT40), 5 channel (11a/n_HT20, 11ac_VHT20), 2 channel (11n_HT40, 11ac_VHT40), 1 channel (11ac_VHT80), 4 channel (11a/n_HT20–Non DFS, 11ac_VHT20–Non DFS), 2 channel (11n_HT40 – Non DFS, 11ac_VHT40–Non DFS), 1 channel (11ac_VHT80–Non DFS), 13 channel (11a/n_HT20 – DFS, 11ac_VHT20 – DFS), 6 channel (11n_HT40 – DFS, 11ac_VHT40 – DFS), 3 channel (11ac_VHT80 – DFS), 79 channel (BT,), 40 channel (BT LE)
Antenna Type		Internal type (MIMO)
Antenna Gain	**ANT0 (Main)**	2 402 ㎒ ~ 2 480 ㎒, 2 412 ㎒ ~ 2 472 ㎒: -2.60 ㏈i, 5 180 ㎒ ~ 5 320 ㎒: -1.88 ㏈i,5 500 ㎒ ~ 5 700 ㎒: -3.55 ㏈i, 5 745 ㎒ ~ 5 805 ㎒: -3.99 ㏈i
	ANT1 (Aux)	2 402 ㎒ ~ 2 480 ㎒, 2 412 ㎒ ~ 2 472 ㎒: -3.08 ㏈i, 5 180 ㎒ ~ 5 320 ㎒: -3.29 ㏈i,5 500 ㎒ ~ 5 700 ㎒: -3.77 ㏈i, 5 745 ㎒ ~ 5 805 ㎒: -3.97 ㏈i

1.4. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL007487	Initial

2. RF Exposure Evaluation

2.1. Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

According to 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)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (㎒)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (㎽/㎠)	Average Time
(A) Limits for Occupational /Control Exposures				
300 – 1 500	--	--	F/300	6
1 500 – 100 000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300 – 1 500	--	--	F/1500	6
1 500 – 100 000	**--**	**--**	**1**	**30**

2.1.1. Friis transmission formula: Pd = (Pout*G)/(4*pi*R^2)

Where Pd = power density in ㎽/㎠

Pout = output power to antenna in ㎽

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in ㎝

Pd the limit of MPE, 1 ㎽/㎠. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

2.2. RF exposure limit according to IC RSS-102

RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (㎒)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (W/m^2)	Average Time (minutes)
0.003 – 1	280	2.19	-	6
1 – 10	280 / *f*	2.19 / *f*	-	6
10 – 30	28	2.19 / *f*	-	6
30 – 300	28	0.073	2*	6
300 – 1 500	1.585 *f* $^{0.5}$	0.004 2 *f* $^{0.5}$	*f* / 150	6
1 500 – 15 000	**61.4**	**0.163**	**10**	**6**
15 000 – 150 000	61.4	0.163	10	616 000 / *f* $^{1.2}$
150 000 – 300 000	0.158 *f* $^{0.5}$	4.21 x 10^{-4} *f* $^{0.5}$	6.67 x 10^{-5} *f*	616 000 / *f* $^{1.2}$

Note: *f* is frequency in ㎒

*Power density limit is applicable at frequencies greater than 100 ㎒

2.2.1. Friis transmission formula: Pd = (Pout*G)/(4*pi*R^2)

Where Pd = power density in W/m^2

Pout = output power to antenna in W

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in m

Pd the limit of MPE, 10 W/m^2. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

2.3. Test Result of RF Exposure Evaluation

Test Item : RF Exposure Evaluation Data

Test Mode : Normal Operation

2.3.1. Output Power into Antenna & RF Exposure Evaluation Distance

Maximum average power

Mode	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Power Density at 20 ㎝ (W/m^2)	FCC Limits (㎽/㎠)	IC Limits (W/m^2)
Max. tolerance	21.01	-2.60	0.013 935	0.139 346	1	10

Note :
1. For Main and Aux port.11b mode (1 Mbps).

2. Ant0+Ant1 (Calculated)
Power: 10log{10^(Ant0_Average power/10)+10^(Ant1_ Average power /10)}
ANT0 Target Power : 16 ㏈m, ANT1 Target Power : 16 ㏈m
10log{10^(Ant0_Average power/10)+10^(Ant1_ Average power /10)} = 19.01 ㏈m
Max Tolerance : 2 ㏈
So, Max Average Power is 21.01 ㏈m

3. The power density Pd (5th column) at a distance of 20 ㎝ calculated from the friis transmission formula is far below the limit of 1 ㎽/㎠ and 10 W/m^2.