

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

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MPE WORK SHEET

of

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

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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

Fax No. : +82 31 427 2370

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 Mhz ~ 2 480 Mhz (BT, BT LE), 2 412 Mhz ~ 2 462 Mhz (11b/g/n_HT20), 2 422 Mhz ~ 2 452 Mhz (11n_HT40), 5 745 Mhz ~ 5 825 Mhz (11a/n_HT20, 11ac_VHT20), 5 755 Mhz ~ 5 795 Mhz (11n_HT40, 11ac_VHT40), 5 775 Mhz (11ac_VHT80), 5 180 Mhz ~ 5 240 Mhz (11a/n_HT20 – Non DFS, 11ac_VHT20 – Non DFS), 5 190 Mhz ~ 5 230 Mhz (11n_HT40 – Non DFS, 11ac_VHT40 – Non DFS), 5 210 Mhz (11ac_VHT80 – Non DFS), 5 260 Mhz ~ 5 320 Mhz (11a/n_HT20 – DFS, 11ac_VHT20 – DFS), 5 270 Mhz ~ 5 310 Mhz (11n_HT40 – DFS, 11ac_VHT40 – DFS), 5 290 Mhz (11ac_VHT80 – DFS), 5 500 Mhz ~ 5 720 Mhz (11a/n_HT20 – DFS, 11ac_VHT20 – DFS), 5 510 Mhz ~ 5 710 Mhz (11n_HT40 – DFS, 11ac_VHT40 – DFS), 5 530 Mhz ~ 5 690 Mhz (11ac_VHT80 – DFS)
Modulation Technique		DSSS, OFDM, GFSK, $\pi/4$ DQPSK, 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 Mhz ~ 2 480 Mhz, 2 412 Mhz ~ 2 472 Mhz: -2.60 dB i, 5 180 Mhz ~ 5 320 Mhz: -1.88 dB i, 5 500 Mhz ~ 5 700 Mhz: -3.55 dB i, 5 745 Mhz ~ 5 805 Mhz: -3.99 dB i
	ANT1 (Aux)	2 402 Mhz ~ 2 480 Mhz, 2 412 Mhz ~ 2 472 Mhz: -3.08 dB i, 5 180 Mhz ~ 5 320 Mhz: -3.29 dB i, 5 500 Mhz ~ 5 700 Mhz: -3.77 dB i, 5 745 Mhz ~ 5 805 Mhz: -3.97 dB i

1.4. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL007487	Initial

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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 (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	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
<u>1 500 – 100 000</u>	--	--	<u>1</u>	<u>30</u>

2.1.1. Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

Where P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

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

P_d the limit of MPE, 1 mW/cm². 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.

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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 (MHz)	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 MHz

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

2.2.1. Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

Where Pd = power density in W/m²

P_{out} = 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/m². 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

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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 cm (mW/cm ²)	Power Density at 20 cm (W/m ²)	FCC Limits (mW/cm ²)	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: $10\log\{10^{Ant0_Average\ power/10}+10^{Ant1_Average\ power/10}\}$

ANT0 Target Power : 16 dB m, ANT1 Target Power : 16 dB m

$10\log\{10^{Ant0_Average\ power/10}+10^{Ant1_Average\ power/10}\} = 19.01\ dB\ m$

Max Tolerance : 2 dB

So, Max Average Power is 21.01 dB m

3. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit of 1 mW/cm² and 10 W/m².

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