

MPE TEST REPORT

of

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

FCC ID/IC Certification : A3LWIBT40A / 649E-WIBT40A

Equipment Under Test : Bluetooth module
Model Name : WIBT40A
Applicant : Samsung Electronics Co., Ltd.
Manufacturer : Samsung Electronics Co., Ltd.
Date of Test(s) : 2013. 11. 30 ~ 2013. 12. 21
Date of Issue : 2013. 12. 23

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

Tested By:



Youngmin Park

Date:

2013. 12. 23

Approved By:



Logan Lee

Date:

2013. 12. 23

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INDEX

<u>Table of Contents</u>	Page
1. General Information -----	3
2. RF Exposure Evaluation -----	4

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- Wireless Div. 3FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040 (Lab)
- 413-15, Goma-e-Dong, Giheung-Gu, Yongin-Si, Gyeonggi-Do, South Korea. (Chamber)

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>.

Telephone : +82 31 428 5700

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1.2. Details of Applicant

Applicant : Samsung Electronics Co., Ltd.

Address : 129, Samsung-Ro, Maetan-Dong, Yeongtong-Gu, Suwon-City, Gyeonggi-Do

Contact Person : Lee, Jay-Woo

Phone No. : +82 31 277 2659

1.3. Description of EUT

Kind of Product	Bluetooth module
Model Name	WIBT40A
Power Supply	DC 5 V (used Notebook battery AC 220 V)
Frequency Range	2 402 MHz ~ 2 480 MHz
Modulation Technique	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels	79
Antenna Type	Internal Type
Antenna Gain	4.5 dBi

1.4. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL007165	Initial
1	F690501/RF-RTL007165-1	Retested due to a change in power setting value

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RTT5041-20(2013.07.27)(1)

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A4(210mm x 297mm)

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	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616\,000 / f^{1.2}$

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 P_d = power density in W/m²

P_{out} = output power to antenna in W

G = gain of antenna in linear scale

π = 3.1416

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

P_d 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

FHSS: GFSK

Channel	Channel Frequency (MHz)	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)
Low	2 402	6.15	4.50	0.003 001	0.030 008	1	10
Middle	2 441	6.75	4.50	0.003 445	0.034 454	1	10
High	2 480	6.84	4.50	0.003 518	0.035 175	1	10

FHSS: π/4DQPSK

Channel	Channel Frequency (MHz)	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)
Low	2 402	6.35	4.50	0.003 142	0.031 422	1	10
Middle	2 441	6.32	4.50	0.003 121	0.031 206	1	10
High	2 480	6.42	4.50	0.003 193	0.031 933	1	10

FHSS: 8DPSK

Channel	Channel Frequency (MHz)	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)
Low	2 402	6.36	4.50	0.003 149	0.031 495	1	10
Middle	2 441	6.15	4.50	0.003 001	0.030 008	1	10
High	2 480	6.50	4.50	0.003 253	0.032 527	1	10

FHSS: 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	10.00	4.50	0.007 282	0.072 818	1	10

Note :

1. 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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