

MPE TEST REPORT

of

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

FCC ID/IC Certification : A3LBTM740B / 649E-BTM740B

Equipment Under Test : Bluetooth Module

Model Name : BTM740B

Applicant : SAMSUNG ELECTRONICS CO., LTD.

Manufacturer : SAMSUNG ELECTRONICS CO., LTD.

Date of Test(s) : 2014.01.03 ~ 2014.01.08

Date of Issue : 2014.01.17

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

Tested By:



Wonjun Sim

Date:

2014. 01.17

Approved By:



Feel Jeong

Date:

2014. 01. 17

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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>.

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1.2. Details of Applicant

Applicant : SAMSUNG ELECTRONICS CO., LTD.

Address : 129, Samsung-Ro, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, 433-742, Rep of Korea

Contact Person : Lee, Sang-Cheong

Phone No. : +82 31 277 4784

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1.3. Description of EUT

Kind of Product	Bluetooth Module
Model Name	BTM740B
Power Supply	DC 3.3 V
Frequency Range	2 402 MHz ~ 2 480 MHz (BT)
Modulation Technique	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels	79 channel (BT)
Antenna Type	Internal type
Antenna Gain	2 400 MHz ~ 2 500 MHz : 3.28 dBi

1.4. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL007303	Initial
1	F690501/RF-RTL007303-1	Add Maximum average power result

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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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A4(210mm x 297mm)

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 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	4.57	3.28	0.001 639	0.016 387	1	10
Middle	2 441	4.75	3.28	0.001 708	0.017 080	1	10
High	2 480	5.41	3.28	0.001 988	0.019 884	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	0.67	3.28	0.000 668	0.006 676	1	10
Middle	2 441	1.25	3.28	0.000 763	0.007 630	1	10
High	2 480	2.07	3.28	0.000 922	0.009 215	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	0.66	3.28	0.000 666	0.006 660	1	10
Middle	2 441	1.30	3.28	0.000 772	0.007 718	1	10
High	2 480	2.08	3.28	0.000 924	0.009 236	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	5.73	3.28	0.002 140	0.021 404	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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