

MPE TEST REPORT

of

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

FCC ID/IC Certification: YZP-RBFAC21XX / 7414A-RBFAC21XX

Equipment Under Test : Bluetooth Complete Module
Model Name : RBFA-C217A (Alt: RBFA-C218A, RBFA-C219A)
Serial No. : N/A
Applicant : LG INNOTEK CO., LTD.
Manufacturer : LG INNOTEK CO., LTD.
Date of Test(s) : 2013. 10. 23 ~ 2013. 10. 29
Date of Issue : 2013. 11. 15

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

Tested By:



Alvin Kim

Date:

2013. 11.15

Approved By:



Feel Jeong

Date:

2013. 11.15

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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

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 : LG INNOTEK CO., LTD.

Address : Hanyang Univ., 1271, Sa-dong, Sangrok-gu, Ansan-si, Gyeonggi-do, 426-791, Korea

Contact Person : Seo, Jun-Suk

Phone No. : +82 31 436 7632

1.3. Description of EUT

Kind of Product	Bluetooth Complete Module
Model Name	RBFA-C217A (Alt: RBFA-C218A, RBFA-C219A)
Serial Number	N/A
Power Supply	DC 3.3 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	1.0 dBi

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1.4. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL007087	Initial
1	F690501/RF-RTL007087-1	Modified the basic and alternative model name
2	F690501/RF-RTL007087-2	Inserted IC limit
3	F690501/RF-RTL007087-3	Modified details of applicant
4	F690501/RF-RTL007087-4	Added MPE calculation for maximum average power
5	F690501/RF-RTL007087-5	Removed duty cycle
6	F690501/RF-RTL007087-6	Modified FCC ID

1.5. Alternative models

Model name	Information
RBFA-C217A	Class2 Antenna Integrated Bluetooth Complete Module(v3.0 with EDR). Support for HFP1.6, A2DP1.2, AVRCP1.4, SPP1.1, GAP, OPP, PBAP1.0, GAVDP1.3, HID(Device), MAP1.0, and DID.
RBFA-C218A	Class2 Antenna Integrated Bluetooth Complete Module(v3.0 with EDR). Support for HFP1.6, A2DP1.2, AVRCP1.4, SPP1.1, GAP, OPP, PBAP1.0, GAVDP1.3, HID(Device), MAP1.0, DID, and PAN.
RBFA-C219A	Class2 Antenna Integrated Bluetooth Complete Module(v3.0 with EDR). Support for HFP1.6, A2DP1.2 with apt-X, AVRCP1.4, SPP1.1, GAP, OPP, PBAP1.0, GAVDP1.3, HID(Device), MAP1.0, DID, and PAN.

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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: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

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: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

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.

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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

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	-4.64	1.0	0.000 086	0.000 860	1	10
Middle	2 441	-4.70	1.0	0.000 085	0.000 849	1	10
High	2 480	-4.60	1.0	0.000 087	0.000 868	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	-2.26	1.0	0.000 149	0.001 488	1	10
Middle	2 441	-2.42	1.0	0.000 143	0.001 435	1	10
High	2 480	-2.40	1.0	0.000 144	0.001 441	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	-2.29	1.0	0.000 148	0.001 478	1	10
Middle	2 441	-2.36	1.0	0.000 145	0.001 455	1	10
High	2 480	-2.49	1.0	0.000 141	0.001 412	1	10

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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	2.00	1.0	0.000 397	0.003 969	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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