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Project No.: 12CA68576
File No.: MC17215
Report No.: 12CA68576-1-FCC
Date: May 9, 2013
Model No.: DD020315PDA
FCC ID.: BEJDD020315PDA

FCC Maximum Permissible Exposure Report

**in accordance with
FCC Part 1 Subpart I §1.1307(b) & §1.1310, RSS-102**

for

Wireless module

**LG Electronics Inc.
San4-1, Nakseongdeon-dong, Gwanak-gu, Seoul 151-919, Rep. of Korea**

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Summary of Test Results:

The following tests were performed on a sample submitted for evaluation of compliance with FCC Part 1 Subpart I Section 1.1307(b) & 1.1310

No	Reference Clause No.	Conformance Requirements	Result Verdict	Remark
1	1.1307(b)(1) 1.1310	Maximum Permissible Exposure (Exposure of Humans to RF Fields)	Complied	

Conclusion:

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.



Witnessed by
Hongsuk Oh, WiSE Associate Project Engineer
UL Verification Services – 3014ASEO
UL Korea Ltd.
May 9, 2013



Reviewed by
Sung Hoon Baek, WiSE Senior Project Engineer
UL Verification Services – 3014ASEO
UL Korea Ltd.
May 9, 2013

Test Report Details

Witnessed By: UL Korea Ltd.
33rd FL. GFC Center, 737 Yeoksam-dong, Gangnam-gu, Seoul, 135-984, Korea

Test Site: CTK Co., Ltd.
386-1, Ho-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, Korea
The test facility was deemed to have the environment and capabilities necessary to perform the tests included in the test package.

Applicant: LG Electronics Inc.
San4-1, Nakseongdeon-dong, Gwanak-gu, Seoul 151-919, Rep. of Korea

Manufacturer: LG Innotek
93, 2sunhwan-ro 971beon-gil, Heungdeok-gu, Cheongju-si, Chungcheongbuk-do, 361-726, Korea

Applicant Contact: Changhyun Ju
Phone: 82-2-2102-1629
E-mail: changhyun.ju@lge.com

Product Type: Wireless module

Model Number: DD020315PDA

Multiple Model Name: N/A

Trademark: 

Test standards: FCC Part 1 I Section 1.1307(b) & 1.1310
Maximum Permissible Exposure

Sample Serial Number: N/A

Sample Receive Date: Apr. 11, 2013

Testing Start Date: Apr. 12, 2013

Date Testing Complete: Apr. 19, 2013

Overall Results: Pass

UL Korea Ltd. reports apply only to the specific test samples and test results submitted for UL's review. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or any agency of the National Authorities. This report may contain test results that are not covered by the NVLAP or KOLAS accreditation.

Report Directory

1. GENERAL PRODUCT INFORMATION	5
1.1. EQUIPMENT DESCRIPTION:	5
1.2. DETAILS OF TEST EQUIPMENT (EUT):.....	5
1.3. EQUIPMENT CONFIGURATION:	5
1.4. TECHNICAL DATA:	6
1.5. ANTENNA INFORMATION:	7
1.6. EQUIPMENT TYPE:	7
1.7. TECHNICAL DESCRIPTION AND DOCUMENTS:	7
1.8. EQUIPMENT MARKING PLATE.....	8
1.9. DESCRIPTION OF ADDITIONAL MODEL NAME	8
2. TEST SPECIFICATION	9
3. TEST CONDITIONS	10
3.1. EQUIPMENT USED DURING TEST	10
3.2. INPUT/OUTPUT PORTS	10
3.3. POWER INTERFACE	10
3.4. OPERATING FREQUENCIES	11
3.5. OPERATION MODES	12
3.6. ENVIRONMENT CONDITIONS.....	12
3.7. TEST CONFIGURATIONS	12
3.8. LIST OF TEST EQUIPMENT.....	12
4. TEST RESULTS OF RF EXPOSURE EVALUATION	13
4.1. OUTPUT POWER INTO ANTENNA & RF EXPOSURE EVALUATION DISTANCE FOR FCC	15
4.2. OUTPUT POWER INTO ANTENNA & RF EXPOSURE EVALUATION DISTANCE FOR RSS-102	16

1. General Product Information

1.1. Equipment Description:

DD020315PDA is the module that integrates Zigbee. This embedded module is optimized for Zigbee enabled handheld mobile device.

1.2. Details of Test Equipment (EUT):

- Equipment Type : Wireless module
- Model No. : DD020315PDA
- Type of test Equipment : module type
- Operating characteristic : Short range wireless device operating in the 2400 – 2483.5 ISM frequency band

1.3. Equipment Configuration:

The EUT is consisted of the following component provided by the manufacturer.

Use*	Product Type	Manufacturer	Model	Comments
EUT	Wireless module	LG Innotek	DD020315PDA	-
Note: Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)				

1.4. Technical Data:

Item	Type of Wireless module
Frequency Ranges	2400 – 2483.5 MHz
Output power	4 dBm, Typical : 1.0 dBm
Kind of modulation (s)	DSSS
Emission Designator	G1D
Channel	16 channel
Antenna Gain	2.62 dBi
Antenna information	PCB antenna
Working temperature	-30 ~ 85 °C
Supply Voltage	DC 3 V

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Frequency(MHz)	2400	2404	2408	2412	2416	2420	2424	2428	2432	2436	2440	2444	2448	2452	2456	2460	2464	2468	2472	2476
Efficiency(dB)	-2.26	-2.18	-2.14	-2.09	-2.06	-2.20	-1.99	-1.93	-1.89	-1.84	-1.72	-1.65	-1.61	-1.54	-1.56	-1.58	-1.60	-1.74	-1.85	-1.95
Efficiency(%)	59.44	60.49	61.07	61.77	62.23	60.25	63.21	64.10	64.71	65.39	67.35	68.40	68.99	70.13	69.81	69.45	69.11	66.96	65.35	63.89
TRG(dB)	-2.26	-2.18	-2.14	-2.09	-2.06	-2.20	-1.99	-1.93	-1.89	-1.84	-1.72	-1.65	-1.61	-1.54	-1.56	-1.58	-1.60	-1.74	-1.85	-1.95
TRGmetal(dB)	-4.77	-4.71	-4.68	-4.65	-4.62	-4.61	-4.57	-4.51	-4.47	-4.42	-4.30	-4.22	-4.18	-4.10	-4.11	-4.12	-4.12	-4.25	-4.36	-4.47
TRGppl(dB)	-5.83	-5.74	-5.68	-5.61	-5.57	-5.51	-5.49	-5.42	-5.38	-5.33	-5.20	-5.16	-5.12	-5.05	-5.09	-5.13	-5.17	-5.32	-5.42	-5.51
UHRG(dB)	-5.46	-5.39	-5.36	-5.31	-5.29	-5.42	-5.23	-5.18	-5.15	-5.12	-5.00	-4.94	-4.92	-4.86	-4.88	-4.91	-4.93	-5.08	-5.19	-5.28
UHRG/TRG(%)	47.87	47.74	47.65	47.61	47.55	47.62	47.40	47.30	47.18	47.08	46.93	46.83	46.71	46.59	46.52	46.47	46.45	46.38	46.35	46.36
H-Plane	-3.09	-3.06	-3.07	-3.09	-3.12	-3.17	-3.21	-3.23	-3.28	-3.33	-3.30	-3.33	-3.41	-3.45	-3.60	-3.73	-3.87	-4.14	-4.39	-4.62
E1-Plane, AVG(dB)	-5.86	-5.83	-5.83	-5.82	-5.81	-5.81	-5.78	-5.73	-5.71	-5.66	-5.53	-5.46	-5.43	-5.36	-5.36	-5.39	-5.38	-5.53	-5.66	-5.78
E2-Plane, AVG(dB)	-4.08	-3.98	-3.95	-3.89	-3.85	-3.82	-3.76	-3.69	-3.64	-3.58	-3.45	-3.35	-3.29	-3.20	-3.20	-3.20	-3.20	-3.30	-3.39	-3.47
Peak Gain(dB)	2.30	2.36	2.39	2.42	2.41	2.23	2.42	2.46	2.47	2.47	2.57	2.59	2.59	2.62	2.55	2.47	2.37	2.21	2.06	1.94
Directivity(dB)	4.56	4.54	4.53	4.51	4.47	4.43	4.42	4.39	4.36	4.31	4.29	4.24	4.21	4.16	4.11	4.06	3.97	3.95	3.91	3.88
Minimum Gain(dB)	-12.59	-12.48	-12.53	-12.47	-12.59	-13.09	-12.69	-12.81	-12.78	-12.75	-12.56	-12.43	-12.29	-12.05	-11.97	-11.84	-11.75	-11.76	-11.73	-11.63
Test Condition	FS																			
Antenna Type																				
Average Efficiency	-1.86 dB, 65.10 %																			

Note ;

1. All the technical data described above were provided by the manufacturer.

Project Number: 12CA68576
Model Number: DD020315PDA

File Number : MC17215

Page : 7 of 16

1.5. Antenna Information:

Antenna Model Name : N/A
Antenna Type : PCB Antenna
Manufacturer : N/A
Transmit Gain dBi : 2.4 G : Max. 2.62 dBi

1.6. Equipment Type:

- ☒ Radio and ancillary equipment for fixed or semi-fixed use
☐ Radio and ancillary equipment for vehicular mounted use
☐ Radio and ancillary equipment for portable or handheld use
- ☐ Stand alone ☒ Host connected
- ☐ Self contained single unit ☒ Module with associated connection or interface

1.7. Technical description and documents:

No.	Document Title and Description
1	User Manual
Note: The following documents were provided by the manufacturer.	

1.8. Equipment Marking Plate

N/A

1.9. Description of additional model name

Model name	Model name Designation	Description of design
N/A	N/A	N/A

2. Test Specification

The following test specifications and standards have been applied and used for testing.

KDB 447498 D01 : Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

3. Test Conditions

3.1. Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	Wireless module	LG Innotek	DD020315PDA	-
AE	Note PC	DELL INC.	Inspiron 6400	-
Note: Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)				

3.2. Input/Output Ports

No	Port Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
1	Power Input	DC	N	N	Connected to DC Power supply
2	Radio Antenna	I/O	N	Y	-
Note: *AC = AC Power Port DC = DC Power Port N/E = Non-Electrical I/O = Signal Input or Output Port (Not Involved in Process Control) TP = Telecommunication Ports					

3.3. Power Interface

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	DC 3 V	0.028	-	DC	-	Rated of EUT
1	DC 3 V	-	-	DC	-	Normal operating voltage

3.4. Operating Frequencies

Mode #	Frequency tested
1	- Low : 2405 MHz - Mid : 2445MHz - Top : 2480 MHz

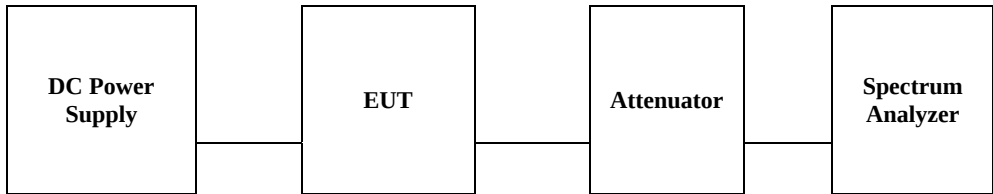
3.5. Operation Modes

Mode #	Description
1	Carrier on mode: Signal from the RF module was generated continuously for the representative channels (Low, Mid, High) by the test program incorporated

3.6. Environment Conditions

Parameters	Normal condition
Temperature	+ 15°C ~ +35°C
Humidity	20% ~ 75%
Supply voltage	DC 3 V (Rated nominal voltage)
Note ; - The extreme condition is applied to the boundary limits of the declared operational environmental condition by the manufacturer. - The operating condition for humidity requirement has not been declared in the manufacturer's specification. - Test has been carried out for three frequencies specified above under the normal condition and for the extreme condition, minimum and maximum frequencies has been tested.	

3.7. Test Configurations

Mode #	Description
1	

3.8. List of Test Equipment

No	Description	Manufacturer	Model	Identifier	Cal. Due
1	Spectrum Analyzer	Rohde & Schwarz	FSP-30	100994	2013.11.08
2	Attenuator	HP	8498A	1801A06913	2013.11.09

4. Test Results of RF Exposure Evaluation

TEST: RF Exposure Evaluation		
Method	RF Exposure Evaluation of the EUT were measured according to the dictates in KDB 447498 Pd the limit of MPE, 1 mW/cm^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. Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$ Where P_d = power density in mW/cm^2 P_{out} = output power to antenna in mW G = gain of antenna in linear scale $\pi = 3.1416$ R = distance between observation point and center of the radiator in cm General SAR test exclusion guidance The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at <i>test separation distances</i> $\leq 50 \text{ mm}$ are determined by: $[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f_{\text{GHz}}}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where f_{GHz} is the RF channel transmit frequency in GHz Power and distance are rounded to the nearest mW and mm before calculation¹⁷ The result is rounded to one decimal place for comparison When the minimum <i>test separation distance</i> is $< 5 \text{ mm}$, a distance of 5 mm is applied to determine SAR test exclusion.	
Reference Clause	Part1 I Section 1.1307(b) & 1.1310	
Parameters recorded during the test	Laboratory Ambient Temperature	19 ~ 21 °C
	Relative Humidity	44 ~ 46 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	2405 MHz - 2480 MHz	Antenna port

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
1	1	1
Supplementary information: None		

Limits

Environmental evaluation and exposure limit according to FCC Part 1, Subpart I, Section 1.1307(b) & 1.1310

According to Section 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)

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
1 500 – 100 000	--	--	1	30

Environmental evaluation and exposure limit according to RSS-102

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

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Averaging Time (minutes)
0.003-1	280	2.19	-	6
1-10	280/ <i>f</i>	2.19/ <i>f</i>	-	6
10-30	28	2.19/ <i>f</i>	-	6
30-300	28	0.073	2*	6
300-1500	1.585 <i>f</i> ^{0.5}	0.0042 <i>f</i> ^{0.5}	<i>f</i> /150	6
1500-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}

Note: *f* is frequency in MHz.

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

RF Field Strength Limits for Controlled Use Devices (Controlled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Averaging Time (minutes)
0.003-1	600	4.9	-	6
1-10	600/ <i>f</i>	4.9/ <i>f</i>	-	6
10-30	60	4.9/ <i>f</i>	-	6
30-300	60	0.163	10*	6
300-1500	3.54 <i>f</i> ^{0.5}	0.0094 <i>f</i> ^{0.5}	<i>f</i> /30	6
1500-15000	137	0.364	50	6
15000-150000	137	0.364	50	616000/ <i>f</i> ^{1.2}
150000-300000	0.354 <i>f</i> ^{0.5}	9.4 x 10 ⁻⁴ <i>f</i> ^{0.5}	3.33 x 10 ⁻⁴ <i>f</i>	616000/ <i>f</i> ^{1.2}

Note: *f* is frequency in MHz.

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

4.1. Output Power into Antenna & RF Exposure Evaluation Distance for FCC

4.1.1. Evaluation at 20 cm distance

Operation Frequency (MHz)	Channel No.	Channel	Output Peak Power (dBm)	Duty Cycle (%)	Antenna Gain (dBi)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
2405	11	Low	4.76	100	2.62	0.001088	1
2445	19	Middle	4.49	100	2.62	0.001023	
2480	26	High	4.67	100	2.62	0.001066	

Note :

1. The power density at a distance of 20 cm calculated from the friis transmission formula is far below each limits.
2. WLAN function of Equipment will be disabled when it is detected the patient.

4.2. Output Power into Antenna & RF Exposure Evaluation Distance for RSS-102

4.2.1. Evaluation at 20 cm distance

Operation Frequency (MHz)	Channel No.	Channel	Output Peak Power (dBm)	Duty Cycle (%)	Antenna Gain (dBi)	Power Density at 20 cm (W/m ²)	LIMITS (W/m ²)
2405	11	Low	4.76	100	2.62	0.01088	10
2445	19	Middle	4.49	100	2.62	0.01023	
2480	26	High	4.67	100	2.62	0.01066	

Note :

3. The power density at a distance of 20 cm calculated from the friis transmission formula is far below each limits.
4. WLAN function of Equipment will be disabled when it is detected the patient.