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Project No.: 12CA66728
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Report No.: 12CA66728-4-FCC
Date: February 14, 2013
Model No.: 1417WGA
FCC ID.: QIIRY1417WGA
IC: 10742A-1417WGA

FCC Maximum Permissible Exposure Report

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

for

Medical Image Processing Unit (Telemetry System Transmitter)

**Rayence Co., Ltd
1F, 2F, 3F, #402, 14, Samsung 1-ro 1-gil, Hwaseong-si, Gyeonggi-do, 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

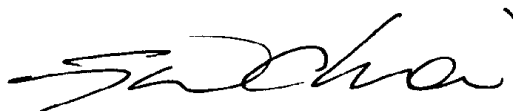
No	Reference Clause No.	Conformance Requirements	Result Verdict	Remark
1	1.1307(b)(1) 1.1310	Maximum Permissible Exposure (Exposure of Humans to RF Fields)	Complied	

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:
Sung Hoon Baek, Senior Project Engineer
UL Verification Services- 3014ASEO
UL Korea Ltd.
February 14, 2013



Reviewed by
Jeawoon Choi, WiSE Engineering Leader
UL Verification Services – 3014ASEO
UL Korea Ltd.
February 14, 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: Rayence Co., Ltd
1F, 2F, 3F, #402, 14, Samsung 1ro 1-gil, Hwaseong-si, Gyeonggi-do, Korea

Manufacturer: Rayence Co., Ltd
1F, 2F, 3F, #402, 14, Samsung 1ro 1-gil, Hwaseong-si, Gyeonggi-do, Korea

Applicant Contact: Keedock, Kim
Title: Quality Manager
Phone: 82.31.80156459
E-mail: Kevin.kim@rayence.com
Product Type: Medical Image Processing Unit (Telemetry System Transmitter)
Model Number: 1417WGA
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: November 28, 2012

Testing Start Date: December 4, 2012

Date Testing Complete: January 25, 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.

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1. General Product Information

1.1. Equipment Description:

1417WGA is the module that integrates Wireless LAN (WLAN). This embedded module is optimized for WLAN enabled handheld mobile device.

1.2. Details of Test Equipment (EUT):

- Equipment Type : Medical Image Processing Unit
- Model No. : 1417WGA
- Trade name : N/A
- Type of test Equipment : Portable type
- Manufacturer : Rayence Co., Ltd
1F, 2F, 3F, #402, 14, Samsung 1ro 1-gil, Hwaseong-si,
Gyeonggi-do, 445-170, Korea

1.3. Equipment Configuration:

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

Use*	Product Type	Manufacturer	Model	Comments
EUT	Medical Image Processing Unit (Telemetry System Transmitter)	Rayence Co., Ltd	1417WGA	-
EUT	Battery Pack	NPTECH CO.,LTD	RB37WH	
Note: Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)				

1.4. Technical Data:

Item	Contents
Chipset	AR5BHB116 / Manufacturer : ATHERO
Module	WPEA-121N/W (FCC ID : PPD-AR5BHB116) Manufacturer: ANATEL
IEEE Standard	802.11a 802.11g 802.11n (2TX/2RX Bandwidth in 2.4GHz, 5GHz)
Security	WPA Personal
*Note: All the technical data described above were provided by the manufacturer.	

1.5. Antenna Information:

Antenna Model Name	AEi-2450/5500DP-C1.13 [Rayence]
Antenna Type	PCB ANTENNA
(MHz)	2.4~2.5GHz / 5.2~5.8GHGz
V.S.W.R	LESS THAN 1 : 5.0
GAIN(dBi) - 2.4GHz	2.8dBi (MIMO Total Antenna Gain= 2.27 dBi)
GAIN(dBi) - 5.8GHz	3.66dBi (MIMO Total Antenna Gain = 3.17 dBi)
Radiation Pattern	OMNI-DIRECTIONAL




















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
2	Product Specification for Antenna / RODEM MICROSYSTEM CO., LTD.
Note: The following documents were provided by the manufacturer.	

1.8. Equipment Marking Plate

<div>MANUFACTURER Rayence Co.,Ltd</div> <div>1F, 2F, 3F, #402, 14, Samsung 1-ro 1-gil, Hwaseong-si, Gyeonggi-do, Korea www.rayence.com</div>		
<div>Model : 1417WGA Product Name : Medical Image Processing Unit (Telemetry System Transmitter)</div> <div> E348364</div>		
<div>Rating : DC 24V $\pm 10\%$ @Max 1.90A Associated equipment (1417WGA) of this equipment complies with IEC 60601-1, IEC 60601-1-2, CFR Subchapter J.</div> <div></div> <div>FCC ID: QIIRY1417WGA This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation,</div> <div>IC: XXXXX-1417WGA This Class A digital apparatus complies with Canadian ICES-003.</div> <div><div>SN</div>Serial Number :XXXXXXXXXX<div></div>Date of Manufacture :XXXX.XX</div> <div><div>EC</div><div>REP</div>VATECH Dental Manufacturing Ltd. Axion House, The Centre Feltham, Middlesex, TW134AU, United Kingdom Tel : +44-20-8831-1660 Fax : +44-20-8831-1679</div> <div>Made in Korea</div>		
<div><div>1F, 2F, 3F, #402, 14, Samsung 1-ro 1-gil, Hwaseong-si, Gyeonggi-do, Korea www.rayence.com</div></div> <div>Made in Korea</div> <div>Rechargeable Li-Ion Battery Product ID : RB37WH (3ICP4/76/111)</div> <div>CAUTION : DO NOT SHORT-CIRCUIT DISASSEMBLE OR EXPOSE THE BATTERY TO FIRE OR WATER</div> <div> E348364</div> <div><div>SN</div>Serial Number : BAXXXXXXXXXX<div></div>Date of Manufacture : XXXX.XX</div> <div>MANUFACTURER NPTECH CO.,Ltd 689-32, Kumjung-dong, Kunpo-city, Kyunggi-do, 435-862, Korea</div> <div><div>EC</div><div>REP</div>VATECH Dental Manufacturing Ltd. Axion House, The Centre Feltham, Middlesex, TW134AU, United Kingdom Tel : +44-20-8831-1660 Fax : +44-20-8831-1679</div> <div>Rating : 11.1V (3400mAh)</div>		

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	Medical Image Processing Unit (Telemetry System Transmitter)	Rayence Co., Ltd	1417WGA	-
EUT	Battery Pack	NPTECH CO.,LTD	RB37WH	-
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	11.1V	720mA	-	DC	-	-

3.4. Operating Frequencies

Mode #	Frequency tested
1	Operating frequency range: 2 412 MHz ~ 2 462 MHz (11g & n_HT20) 3 channels in the Transmitter modes of 11b/g/n-HT20 are tested. - Low : 2412 MHz - Mid : 2437 MHz - Top : 2462 MHz
2	Operating frequency range: 2 422 MHz ~ 2 452 MHz (11n_HT40) 3 channels in the Transmitter modes of 11n-HT40 are tested. - Low : 2422 MHz - Mid : 2437 MHz - Top : 2452 MHz
3	Operating frequency range : 5 180 MHz ~ 5 240 MHz (11a & 11n_HT20) 3 channels in the Transmitter modes of 11b/g/n-HT20 are tested. - Low Channel (5 180 MHz) - Middle Channel (5 220 MHz) - High Channel (5 240 MHz)
4	Operating frequency range : 5 190 MHz ~ 5 230 MHz (11n_HT40) 2 channels in the Transmitter modes of 11n-HT40 are tested. - Low Channel (5190 MHz) -High Channel (5230 MHz)

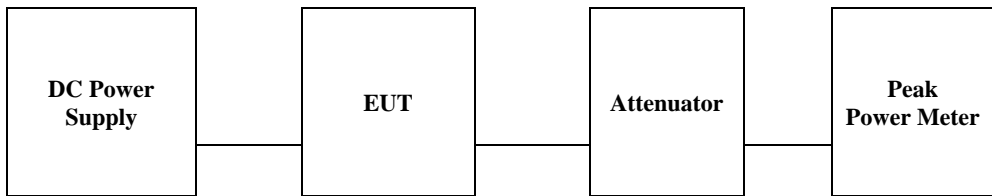
3.5. Operation Modes

Mode #	Description
1	Carrier on mode: Signal from the Medical Image Processing Unit (Telemetry System Transmitter) was generated continuously for the representative channels (Low, Mid, High) by the test program incorporated
Note: <ol style="list-style-type: none"> The worst-case condition is determined by the baseline measurement of RF output power of the modular transmitter test report. The worst-case channel was determined as the channel with highest output power. <ul style="list-style-type: none"> -802.11g mode, 20MHz Channel Bandwidth, 9 Mb/s, OFDM Modulation - 802.11n HT20 mode, 20 MHz Channel Bandwidth, MCS0,6.5 Mb/s, OFDM Modulation - 802.11n HT40 mode, 40 MHz Channel Bandwidth, MCS0,13.5 Mb/s, OFDM Modulation Output power from the device during the radiated spurious measurements are within expected tolerance of the module test results to justify using the original conducted antenna port measurements for the module(average power). 	

3.6. Environment Conditions

Parameters	Normal condition
Temperature	+ 15°C ~ +35°C
Humidity	20% ~ 75%
Supply voltage	11.1 Vdc (Rated nominal voltage)
Note ; <ul style="list-style-type: none"> - 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. 	

3.7. Test Configurations

Mode #	Description
1	 <pre> graph LR A[DC Power Supply] --- B[EUT] B --- C[Attenuator] C --- D[Peak Power Meter] </pre>

3.8. List of Test Equipment

No	Description	Manufacturer	Model	Identifier	Cal. Due
1	Power Meter	Anritsu	ML2495A	0932001	2010.09.16
2	Power Sensor	HP	MA2411B	0846202	2010.09.09

4. Test Results of RF Exposure Evaluation

TEST: RF Exposure Evaluation		
Method	<p>RF Exposure Evaluation of the EUT were measured according to the dictates in KDB 447498</p> <p>Pd 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.</p> <p>Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$</p> <p>Where P_d = power density in mW/cm²</p> <p>P_{out} = output power to antenna in mW</p> <p>G = gain of antenna in linear scale</p> <p>π = 3.1416</p> <p>R = distance between observation point and center of the radiator in cm</p> <p>General SAR test exclusion guidance</p> <p>The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at <i>test separation distances</i> ≤ 50 mm are determined by:</p> <p>$[(max. \text{ power of channel, including tune-up tolerance, mW}) / (min. \text{ test separation distance, mm})] * [\sqrt{f_{(GHz)}}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where</p> <p>$f_{(GHz)}$ is the RF channel transmit frequency in GHz</p> <p>Power and distance are rounded to the nearest mW and mm before calculation¹⁷</p> <p>The result is rounded to one decimal place for comparison</p> <p>When the minimum <i>test separation distance</i> is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.</p>	
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	2 412 MHz – 2 462 MHz 5 180 MHz – 5 320 MHz 5 500 MHz – 5 700 MHz 5 745 MHz – 5 825 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)
Rated	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
<u>1 500 – 100 000</u>	<u>--</u>	<u>--</u>	<u>1</u>	<u>30</u>

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

4.1.1. Evaluation at 20 cm distance

Operation Mode	Data Rate (Mbps)	Channel	Channel Frequency (MHz)	Output Peak Power (dBm)	Duty Cycle (%)	Antenna Gain (dBi)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
802.11b	5.5	Low	2412	22.19	100	5.01	0.104460	1
		Middle	2437	23.18	100	5.01	0.131205	
		High	2462	22.89	100	5.01	0.122730	
802.11g	9	Low	2412	23.51	100	5.01	0.141563	
		Middle	2437	27.19	100	5.01	0.330332	
		High	2462	22.72	100	5.01	0.118019	
802.11n-HT20	6.5	Low	2412	23.48	100	5.01	0.140589	
		Middle	2437	26.86	100	5.01	0.306161	
		High	2462	21.94	100	5.01	0.098617	
802.11n-HT40	13.5	Low	2422	21.88	100	5.01	0.097264	
		Middle	2437	24.70	100	5.01	0.186187	
		High	2452	21.43	100	5.01	0.087690	
802.11a	9	Low	5180	14.65	100	6.67	0.026976	
		Middle	5220	14.39	100	6.67	0.025408	
		High	5240	14.74	100	6.67	0.027540	
802.11n-HT20	6.5	Low	5180	14.43	100	6.67	0.025643	
		Middle	5220	15.32	100	6.67	0.031475	
		High	5240	16.41	100	6.67	0.040455	
802.11n-HT40	13.5	Low	5190	13.76	100	6.67	0.021977	
		High	5230	16.89	100	6.67	0.045183	
802.11a	9	Low	5500	17.89	100	6.67	0.056881	
		Middle	5600	16.85	100	6.67	0.044768	
		High	5700	17.73	100	6.67	0.054824	
802.11n-HT20	6.5	Low	5500	17.99	100	6.67	0.058206	
		Middle	5600	16.93	100	6.67	0.045601	
		High	5700	17.77	100	6.67	0.055331	
802.11n-HT40	13.5	Low	5510	16.96	100	6.67	0.045917	
		Middle	5590	17.09	100	6.67	0.047312	
		High	5670	18.38	100	6.67	0.063675	
802.11a	9	Low	5745	23.69	100	5.47	0.164040	
		Middle	5785	23.50	100	5.47	0.157018	
		High	5825	23.30	100	5.47	0.149951	
802.11n-HT20	6.5	Low	5745	23.76	100	5.47	0.166706	
		Middle	5785	23.41	100	5.47	0.153798	
		High	5825	23.18	100	5.47	0.145865	
802.11n-HT40	13.5	Low	5755	23.47	100	5.47	0.155937	
		High	5795	23.25	100	5.47	0.148235	

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 Mode	Data Rate (Mbps)	Channel	Channel Frequency (MHz)	Output Peak Power (dBm)	Duty Cycle (%)	Antenna Gain (dBi)	Power Density at 20 cm (W/m ²)	LIMITS (W/m ²)
802.11b	5.5	Low	2412	22.19	100	5.01	1.04460	10
		Middle	2437	23.18	100	5.01	1.31205	
		High	2462	22.89	100	5.01	1.22730	
802.11g	9	Low	2412	23.51	100	5.01	1.41563	
		Middle	2437	27.19	100	5.01	3.30332	
		High	2462	22.72	100	5.01	1.18019	
802.11n-HT20	6.5	Low	2412	23.48	100	5.01	1.40589	
		Middle	2437	26.86	100	5.01	3.06161	
		High	2462	21.94	100	5.01	0.98617	
802.11n-HT40	13.5	Low	2422	21.88	100	5.01	0.97264	
		Middle	2437	24.70	100	5.01	1.86187	
		High	2452	21.43	100	5.01	0.87690	
802.11a	9	Low	5180	14.65	100	6.67	0.26976	
		Middle	5220	14.39	100	6.67	0.25408	
		High	5240	14.74	100	6.67	0.27540	
802.11n-HT20	6.5	Low	5180	14.43	100	6.67	0.25643	
		Middle	5220	15.32	100	6.67	0.31475	
		High	5240	16.41	100	6.67	0.40455	
802.11n-HT40	13.5	Low	5190	13.76	100	6.67	0.21977	
		High	5230	16.89	100	6.67	0.45183	
802.11a	9	Low	5500	17.89	100	6.67	0.56881	
		Middle	5600	16.85	100	6.67	0.44768	
		High	5700	17.73	100	6.67	0.54824	
802.11n-HT20	6.5	Low	5500	17.99	100	6.67	0.58206	
		Middle	5600	16.93	100	6.67	0.45601	
		High	5700	17.77	100	6.67	0.55331	
802.11n-HT40	13.5	Low	5510	16.96	100	6.67	0.45917	
		Middle	5590	17.09	100	6.67	0.47312	
		High	5670	18.38	100	6.67	0.63675	
802.11a	9	Low	5745	23.69	100	5.47	1.64040	
		Middle	5785	23.50	100	5.47	1.57018	
		High	5825	23.30	100	5.47	1.49951	
802.11n-HT20	6.5	Low	5745	23.76	100	5.47	1.66706	
		Middle	5785	23.41	100	5.47	1.53798	
		High	5825	23.18	100	5.47	1.45865	
802.11n-HT40	13.5	Low	5755	23.47	100	5.47	1.55937	
		High	5795	23.25	100	5.47	1.48235	

Note :

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