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Project No.: 12CA50022  
File No.: MC16901  
Report No.: 12CA50022-6-FCC  
Date: November 6, 2012  
Model No.: 1012WCA  
FCC ID.: QIIRY1012WCA

## **RF Test Report**

**in accordance with  
FCC Part 15 Subpart E §15.247 and IC RSS-210 Issue 8**

**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, 445-170, 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 15 E Section 15.247 and IC RSS-210 Issue 8.				
No	Reference Clause No.	FCC Part15 Subpart C Conformance Requirements	Result Verdict	Remark
1	15.205(a)	Restricted bands of operation	Complied	-
2	15.209(a)	Radiated emission limits, general requirements	Complied	-
3	15.247(a)(2)	6 dB Bandwidth	N/T	*Note <sup>2</sup>
4	15.247(b)(3)	Maximum peak output power	N/T	*Note <sup>2</sup>
5	15.247(d)	Transmitter radiated spurious emissions (Band edge)	Complied	-
6	15.247(b)(3)	Maximum peak output power	N/T	*Note <sup>2</sup>
7	15.207	Transmitter AC power line conducted emission	N/T	*Note <sup>3</sup>
8	1.1307(b)(1)	Maximum Permissible Exposure (Exposure of Humans to RF Fields)	N/A	-
*Note <sup>1</sup> : N/T=Not Tested, N/A=Not Applicable				
*Note <sup>2</sup> : Test was performed by modular transmitter (FCC ID: PPD-AR5BHB116, Test Report no. FR080603A issued on Sep.16,2010 by Sporton International Inc. )				
*Note <sup>3</sup> : The EUT is battery operating only.				

### **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.  
November 6, 2012



Reviewed by  
Jeawoon Choi, WiSE Engineering Leader  
UL Verification Services – 3014ASEO  
UL Korea Ltd.  
November 6, 2012

### **Test Report Details**

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

Test Site: ONETECH Corp.  
301-14 Daessangryeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862 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, 445-170, Korea

Manufacturer: Rayence Co., Ltd  
1F, 2F, 3F, #402, 14, Samsung 1ro 1-gil, Hwaseong-si, Gyeonggi-do, 445-170, 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: 1012WCA  
Multiple Model Name: N/A  
Trademark



Test standards: FCC Part 15 E Section 15.247 and IC RSS-210 Issue 8

Sample Serial Number: N/A

Sample Receive Date: October 6, 2012

Testing Start Date: November 1, 2012

Date Testing Complete: November 6, 2012

**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:

1012WCA 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. : 1012WCA
- Trade name : N/A
- Type of test Equipment : Portable type
- Operating characteristic : Short range wireless device operating in the 2412 – 2462 MHz ISM frequency band
- Manufacturer : Rayence Co., Ltd  
1F, 2F, 3F, #402, 14, Samsung 1-ro 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	1012WCA	-
EUT	Battery Pack	NPTECH CO.,LTD	RB37WH	
<b>Note:</b> Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)				

### 1.4. Technical Data:

Item	1012WCA
Chipset	AR5BHB116 / Manufacturer : ATHERO
Module	WPEA-121N/W (FCC ID : PPD-AR5BHB116 Manufacturer: ANATEL
IEEE Standard	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 / 5.2~5.8GHz
V.S.W.R	LESS THAN 1 : 5.0
GAIN(dBi) - 2.4GHz	2.8dBi (MIMO Total Antenna Gain= 5.18 dBi)
GAIN(dBi) - 5.8GHz	3.66dBi (MIMO Total Antenna Gain = 6.67dBi)
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

 <p><b>MANUFACTURER</b> Rayence Co.,Ltd 1F, 2F, 3F, #402, 14, Samsung 1ro 1-gil, Hwaseong-si, Gyeonggi-do, 445-170, Korea www.rayence.com</p>	
<p>Model : 1012WCA Product Name : Medical Image Processing Unit</p>	
<p>    </p>	
<p>Rating : DC 24V <math>\pm 10\%</math> @Max 1.90A</p>	
<p>FCC ID: QIIRY1012WCA</p>	
<p>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, 5150- 5350 MHz is indoor use only.</p>	
<p><b>SN</b> Serial Number :EDXXXXXXXXXX</p>	<p><b>Date of Manufacture</b> :XXXX.XX</p>
<p><b>EC</b> <b>REP</b></p>	<p><b>VATECH Dental Manufacturing Ltd.</b> Axion House, The Centre Feltham, Middlesex, TW134AU, United Kingdom Tel : +44-20-8831-1660 Fax : +44-20-8831-1679</p>
<p>Made in Korea</p>	

 <p>1F, 2F, 3F, #402, 14, Samsung 1ro 1-gil, Hwaseong-si, Gyeonggi-do, 445-170, Korea www.rayence.com</p>		<p>Made in Korea</p>	
<p>Rechargeable Li-Ion Battery Product ID : RB37WH (3ICP4/76/111)</p>		<p>CAUTION : DO NOT SHORT-CIRCUIT DISASSEMBLE OR EXPOSE THE BATTERY TO FIRE OR WATER</p>	
<p><b>SN</b> Serial Number :BAXXXXXXXXXX</p>	<p><b>Date of Manufacture</b> :XXXX.XX</p>	<p><b>MANUFACTURER</b> NPTECH CO.,Ltd 689-32, Kumsung-dong, Kunpo-city, Kyunggi-do, 435-862, Korea</p>	<p><b>EC</b> <b>REP</b> <b>VATECH Dental Manufacturing Ltd.</b> Axion House, The Centre Feltham, Middlesex, TW134AU, United Kingdom Tel : +44-20-8831-1660 Fax : +44-20-8831-1679</p>
<p>Rating : 11.1V (3400mAh)</p>			

## 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.

1) FCC Part 15 C Section 15.247

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz

2) ANSI C63.4:2009

American National Standard for Methods of Measurement of Radio- Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz



### 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	1012WCA	-
EUT	Battery Pack	NPTECH CO.,LTD	RB37WH	-
<b>Note:</b> 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 Battery
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	-	-

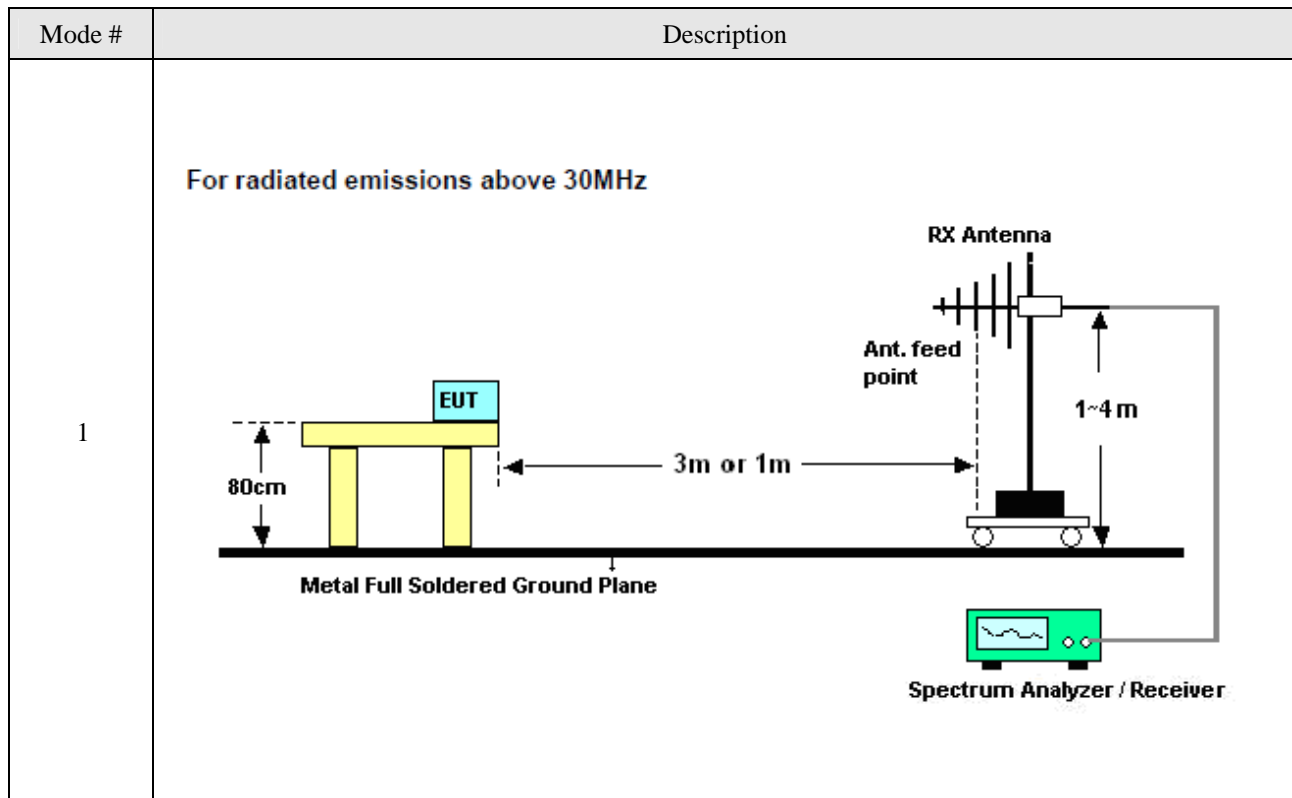
### 3.4. Operating Frequencies

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

### 3.5. 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
2	Carrier off (Idle) mode: RF carrier was not activated by the RF module
<b>*Note:</b> <ol style="list-style-type: none"><li>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. -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</li><li>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).</li></ol>	

### 3.6. Test Configurations



### 3.7. List of Test Equipment

No	Description	Manufacturer	Model	Identifier	Last Cal. (Interval)
1	ESVD	Rohde & Schwarz	Test Receiver	838453/018	Oct. 20, 2012 (1Y)
3	8566B	HP	Spectrum Analyzer	3407A08547	May. 31, 2012 (1Y)
4	FSV30	Rohde & Schwarz	Signal Analyzer	101372	May 31, 2012 (1Y)
5	8447D	Hewlett Packard	Amplifier	2727A04987	Jun. 11, 2012 (1Y)
6	SCU 18	ROHDE&SCHWARZ	Amplifier	10041	Jan. 25, 2012 (1Y)
7	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	Aug. 23, 2011 (2Y)
8	MA240	HD GmbH	Antenna Master	N/A	N/A
9	HD100	HD GmbH	Position Controller	N/A	N/A
10	DS420S	HD GmbH	Turn Table	N/A	N/A
11	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	VULB9163-419	Mar 23, 2011 (2Y)

## 4. Overview of Technical requirements

No	Reference Clause No.	FCC Part15 Subpart C Conformance Requirements	Reported
1	15.205(a)	Restricted bands of operation	[ X ]
2	15.209(a)	Radiated emission limits, general requirements	[ X ]
3	15.247(d)	Transmitter radiated spurious emissions	[ X ]
4	15.207	Transmitter AC power line conducted emission	[ X ]
5	1.1307(b)(1)	Maximum Permissible Exposure (Exposure of Humans to RF Fields)	Replaced by modular report
6	15.203	Antenna Requirement	[ X ]

Note 1: The measurement procedures described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 MHz (ANSI C63.4-2003), the guidance provided in KDB 558074 and KDB 662911 were used in the measurement of the DUT.

Note 2: This device use already certified module so that the below specified test items are not tested in the end product evaluation. (TX Module FCC ID : PPD-AR5BHB116, Test Report no. FR080603A issued on Sep.16,2010 by Sporton International Inc. )

- . 6dB bandwidth
- . Tx Output Power
- . Band edge
- . Tx Spectral Power Density

### 4.1. Antenna Requirement

#### 4.1.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section § 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dBi.

#### 4.1.2. Antenna Connected Construction

The antenna used of this product is dipole Antenna Assembly and peak max gain of each antennas as below. Antenna is permanently installed in the end product enclosure and no user exchange is allowed.

Band	2.4~2.5GHz	5.2~5.8GHz
Antenna Gain (dBi)	-9.8dBi (MIMO Total Antenna Gain = 2.27 dBi).	-3.35dBi (MIMO Total Antenna Gain = 3.17 dBi)

## 5. Test Results

### 5.1. Transmitter radiated spurious emissions

TEST: Transmitter radiated spurious emissions		
Method	Radiated emissions from the EUT were measured according to ANSI C63.4 procedure. 1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation. The antenna is is varied from 1 to 4 meters above the ground to find the maximum field strength. Measurement are made with both horizontal and vertical polarizations For undamental investigation, the EUT was positioned for 3 orthogonal orientations. 2. For measurement below 1GHz, the resolution bandwidth is set to 100 kHz for peak detection or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak. 3. For measurement above 1GHz, the resolution bandwidth is set to 1 MHz and video bandwidth is set to 1 MHz for peak measurement and 10 Hz for average measurement. 4. For 2.4GHz transmitter measurement, the spectrum from 30 MHz to 26GHz is investigated for Low, Mid and High channels. For 5 GHz transmitter measurement, the spectrum from 30 MHz to 40GHz is investigated for Low, Mid and High channels.	
Supplementary information: Radiated emission which fall in the restricted bands must also comply with FCC section 15.209.		
Reference Clause	Part15 C Section 15.247 (d)	
Parameters recorded during the test	Laboratory Ambient Temperature	22 °C
	Relative Humidity	36 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz to 10 <sup>th</sup> harmonics	Enclosure Port (3 meter distance)

### Configuration Settings

Test Item	Power Interface Mode # (See Section 3.3)	Test Configurations Mode # (See Section 3.6)	EUT Operation Mode # (See 3.5)
Radiated Spurious emission	1	1	1
Conducted Spurious emission	N/A	N/A	N/A
Supplementary information: None			

### Limits

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval , as permitted under paragraph(b)(3) of this section , the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

According to § 15.209(a), Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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Frequency (MHz)	Distance (meters)	Field Strength (dBuV/m)	Field Strength (uV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

### 5.1.1. Radiated Spurious Emissions for Below 1 GHz

Measurement method : ☒ Radiated ☐ Conducted  
Mode of operation : Continuous Wave

**Table 1. Test data for Radiated emission for Below 1 GHz\_2.4GHz**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
466.5	39.00	Q.P.	V	N/A	17.90	-28.90	28.00	46.00	18.00
540.2	40.20	Q.P.	V	N/A	19.20	-28.60	30.80	46.00	15.20
733.2	40.20	Q.P.	V	N/A	21.20	-27.60	33.80	46.00	12.20
800.1	35.60	Q.P.	H	N/A	22.20	-27.60	30.20	46.00	15.80
867.1	35.50	Q.P.	H	N/A	23.00	-26.70	31.80	46.00	14.20
874.9	34.80	Q.P.	H	N/A	23.10	-26.30	31.60	46.00	14.40

**Table 2. Test data for Radiated emission for Below 1 GHz\_5 GHz**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
466.5	41.20	Q.P.	V	N/A	17.90	-28.90	30.20	46	15.80
540.2	42.70	Q.P.	V	N/A	19.20	-28.60	33.30	46	12.70
733.2	42.30	Q.P.	V	N/A	21.20	-27.60	35.90	46	10.10
800.1	37.10	Q.P.	H	N/A	22.20	-27.60	31.70	46	14.30
867.1	37.90	Q.P.	H	N/A	23.00	-26.70	34.20	46	11.80
874.9	36.40	Q.P.	H	N/A	23.10	-26.30	33.20	46	12.80

#### Supplementary information:

-. The frequency spectrum from 30 MHz to 1 000 MHz was investigated. Emission levels are not reported much lower than the limits by over 20 dB. All reading values are peak values.

#### Remark

- To get a maximum emission level from the EUT, the Antenna was moved throughout the x-axis and Y-axis.  
The worst case is Y-axis.
- Actual = Reading + AF + AMP + CL (AF : Antenna factor, AMP : Amp gain, CL : Cable loss)
- Distance factor =  $20\log(\text{Measurement distance} / \text{The measured distance})$
- Margin = Limit (dBuV/m) - Actual (dBuV/m)

### 5.1.2. Radiated Spurious Emissions for Above 1 GHz

Measurement method : ☒ Radiated ☐ Conducted  
Mode of operation : Continuous Wave  
Power setting : Max. Power condition declared by the manufacturer

#### 802.11g

**Table 3. Low Channel (2412 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4824.00	46.58	Peak	H	N/A	31.10	-32.90	44.78	74.00	29.22
4824.00	35.21	Average	H	N/A	31.10	-32.90	33.41	54.00	20.59
4824.00	46.77	Peak	V	N/A	31.10	-32.90	44.97	74.00	29.03
4824.00	35.46	Average	V	N/A	31.10	-32.90	33.66	54.00	20.34

**Table 4. Middle Channel (2437 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4874.00	54.32	Peak	H	N/A	31.20	-32.70	52.82	74.00	21.18
4874.00	40.08	Average	H	N/A	31.20	-32.70	38.58	54.00	15.42
4874.00	55.66	Peak	V	N/A	31.20	-32.70	54.16	74.00	19.84
4874.00	41.28	Average	V	N/A	31.20	-32.70	39.78	54.00	14.22

**Table 5. High Channel (2462 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4924.00	41.11	Peak	H	N/A	31.30	-32.60	39.81	74.00	34.19
4924.00	30.25	Average	H	N/A	31.30	-32.60	28.95	54.00	25.05
4924.00	41.66	Peak	V	N/A	31.30	-32.60	40.36	74.00	33.64
4924.00	30.72	Average	V	N/A	31.30	-32.60	29.42	54.00	24.58



## 802.11n\_HT20

**Table 6. Low Channel (2412 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4824.00	47.14	Peak	H	N/A	31.10	-32.90	45.34	74.00	28.66
4824.00	37.56	Average	H	N/A	31.10	-32.90	35.76	54.00	18.24
4824.00	47.98	Peak	V	N/A	31.10	-32.90	46.18	74.00	27.82
4824.00	38.11	Average	V	N/A	31.10	-32.90	36.31	54.00	17.69

**Table 7. Middle Channel (2437 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4874.00	50.21	Peak	H	N/A	31.20	-32.70	48.71	74.00	25.29
4874.00	36.92	Average	H	N/A	31.20	-32.70	35.42	54.00	18.58
4874.00	52.30	Peak	V	N/A	31.20	-32.70	50.80	74.00	23.20
4874.00	39.04	Average	V	N/A	31.20	-32.70	37.54	54.00	16.46

**Table 8. High Channel (2462 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4924.00	45.25	Peak	H	N/A	31.30	-32.60	43.95	74.00	30.05
4924.00	35.17	Average	H	N/A	31.30	-32.60	33.87	54.00	20.13
4924.00	45.63	Peak	V	N/A	31.30	-32.60	44.33	74.00	29.67
4924.00	35.82	Average	V	N/A	31.30	-32.60	34.52	54.00	19.48

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**Table 9. Low Channel (2422 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4844.00	42.74	Peak	H	N/A	31.10	-32.90	40.94	74.00	33.06
4844.00	31.12	Average	H	N/A	31.10	-32.90	29.32	54.00	24.68
4844.00	43.12	Peak	V	N/A	31.10	-32.90	41.32	74.00	32.68
4844.00	31.22	Average	V	N/A	31.10	-32.90	29.42	54.00	24.58

**Table 10. Middle Channel (2437 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4874.00	44.24	Peak	H	N/A	31.20	-32.70	42.74	74.00	31.26
4874.00	32.28	Average	H	N/A	31.20	-32.70	30.78	54.00	23.22
4874.00	45.96	Peak	V	N/A	31.20	-32.70	44.46	74.00	29.54
4874.00	33.12	Average	V	N/A	31.20	-32.70	31.62	54.00	22.38

**Table 11. High Channel (2452 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4904.00	42.52	Peak	H	N/A	31.30	-32.60	41.22	74.00	32.78
4904.00	31.27	Average	H	N/A	31.30	-32.60	29.97	54.00	24.03
4904.00	43.74	Peak	V	N/A	31.30	-32.60	42.44	74.00	31.56
4904.00	31.42	Average	V	N/A	31.30	-32.60	30.12	54.00	23.88

### 5.1.3. Radiated Restricted Band Edge Measurements

Measurement method : ☒ Radiated ☐ Conducted  
Mode of operation : Receiving Mode

**Table 12. Measurement for restricted band of 11g**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (DB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2390.00	58.43	Peak	H	N/A	27.30	-36.00	49.73	74.00	24.27
2390.00	46.77	Average	H	N/A	27.30	-36.00	38.07	54.00	15.93
2390.00	71.98	Peak	V	N/A	27.30	-36.00	63.28	74.00	10.72
2390.00	50.02	Average	V	N/A	27.30	-36.00	41.32	54.00	12.68
2483.50	62.90	Peak	H	N/A	27.40	-36.00	54.30	74.00	19.70
2483.50	42.27	Average	H	N/A	27.40	-36.00	33.67	54.00	20.33
2483.50	71.82	Peak	V	N/A	27.40	-36.00	63.22	74.00	10.78
2483.50	52.11	Average	V	N/A	27.40	-36.00	43.51	54.00	10.49

**Table 13. Measurement for restricted band of 11n (HT20)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (DB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2390.00	57.56	Peak	H	N/A	27.30	-36.00	48.86	74.00	25.14
2390.00	49.21	Average	H	N/A	27.30	-36.00	40.51	54.00	13.49
2390.00	68.91	Peak	V	N/A	27.30	-36.00	60.21	74.00	13.79
2390.00	51.22	Average	V	N/A	27.30	-36.00	42.52	54.00	11.48
2483.50	62.60	Peak	H	N/A	27.40	-36.00	54.00	74.00	20.00
2483.50	41.92	Average	H	N/A	27.40	-36.00	33.32	54.00	20.68
2483.50	74.01	Peak	V	N/A	27.40	-36.00	65.41	74.00	8.59
2483.50	46.96	Average	V	N/A	27.40	-36.00	38.36	54.00	15.64

**Table 14. Measurement for restricted band of 11n (HT40)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (DB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2390.00	57.97	Peak	H	N/A	27.30	-36.00	49.27	74.00	24.73
2390.00	47.83	Average	H	N/A	27.30	-36.00	39.13	54.00	14.87
2390.00	64.12	Peak	V	N/A	27.30	-36.00	55.42	74.00	18.58
2390.00	53.67	Average	V	N/A	27.30	-36.00	44.97	54.00	9.03
2483.50	65.27	Peak	H	N/A	27.40	-36.00	56.67	74.00	17.33
2483.50	43.19	Average	H	N/A	27.40	-36.00	34.59	54.00	19.41
2483.50	71.84	Peak	V	N/A	27.40	-36.00	63.24	74.00	10.76
2483.50	49.94	Average	V	N/A	27.40	-36.00	41.34	54.00	12.66

**Table 15. Measurement for restricted band of 802.11a**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (DB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5745.00	91.21	Peak	H	N/A	32.20	-31.40	92.01	-	-
5745.00	105.17	Peak	V	N/A	32.20	-31.40	105.97	-	-
5825.00	90.41	Peak	H	N/A	32.30	-31.30	91.41	-	-
5825.00	103.77	Peak	V	N/A	32.30	-31.30	104.77	-	-
5725.00	68.14	Peak	H	N/A	32.20	-31.40	68.94	72.01	3.07
5725.00	79.48	Peak	V	N/A	32.20	-31.40	80.28	85.97	5.69
5850.00	55.14	Peak	H	N/A	32.30	-31.30	56.14	71.21	14.27
5850.00	64.27	Peak	V	N/A	32.30	-31.30	65.27	84.77	18.50

**Table 16. Measurement for restricted band of 802.11a HT20**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (DB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5745.00	89.14	Peak	H	N/A	32.20	-31.40	89.94	-	-
5745.00	105.48	Peak	V	N/A	32.20	-31.40	106.28	-	-
5825.00	91.22	Peak	H	N/A	32.30	-31.30	92.22	-	-
5825.00	103.27	Peak	V	N/A	32.30	-31.30	104.27	-	-
5725.00	65.25	Peak	H	N/A	32.20	-31.40	66.05	69.94	3.89
5725.00	80.21	Peak	V	N/A	32.20	-31.40	81.01	86.28	5.27
5850.00	54.43	Peak	H	N/A	32.30	-31.30	55.43	72.22	16.79
5850.00	69.37	Peak	V	N/A	32.30	-31.30	70.37	84.27	13.90

**Table 17. Measurement for restricted band of 802.11a\_HT40**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (DB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5755.00	85.85	Peak	H	N/A	32.20	-31.30	86.75	-	-
5755.00	102.24	Peak	V	N/A	32.20	-31.30	103.14	-	-
5795.00	84.22	Peak	H	N/A	32.30	-31.30	85.22	-	-
5795.00	102.17	Peak	V	N/A	32.30	-31.30	103.17	-	-
5725.00	61.12	Peak	H	N/A	32.20	-31.40	61.92	66.75	4.83
5725.00	77.35	Peak	V	N/A	32.20	-31.40	78.15	83.14	4.99
5850.00	51.32	Peak	H	N/A	32.30	-31.30	52.32	65.22	12.90
5850.00	60.44	Peak	V	N/A	32.30	-31.30	61.44	83.17	21.73

#### 5.14 Receiving mode Radiated Spurious Emissions for Below 1 GHz

Measurement method : ☒ Radiated ☐ Conducted  
Mode of operation : Receiving mode

**Table 18. Test data for Radiated emission for Below 1 GHz\_2.4GHz**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
466.5	38.10	Q.P.	V	N/A	17.90	-28.90	27.10	46.00	18.90
540.2	38.50	Q.P.	V	N/A	19.20	-28.60	29.10	46.00	16.90
733.2	39.20	Q.P.	V	N/A	21.20	-27.60	32.80	46.00	13.20
800.1	33.50	Q.P.	H	N/A	22.20	-27.60	28.10	46.00	17.90
867.1	33.60	Q.P.	H	N/A	23.00	-26.70	29.90	46.00	16.10
874.9	35.10	Q.P.	H	N/A	23.10	-26.30	31.90	46.00	14.10

**Table 19. Test data for Radiated emission for Below 1 GHz\_5 GHz**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
466.5	37.70	Q.P.	V	N/A	17.90	-28.90	26.70	46.00	19.30
540.2	38.10	Q.P.	V	N/A	19.20	-28.60	28.70	46.00	17.30
733.2	39.70	Q.P.	V	N/A	21.20	-27.60	33.30	46.00	12.70
800.1	33.20	Q.P.	H	N/A	22.20	-27.60	27.80	46.00	18.20
867.1	33.10	Q.P.	H	N/A	23.00	-26.70	29.40	46.00	16.60
874.9	34.80	Q.P.	H	N/A	23.10	-26.30	31.60	46.00	14.40

#### Supplementary information:

-. The frequency spectrum from 30 MHz to 1 000 MHz was investigated. Emission levels are not reported much lower than the limits by over 20 dB. All reading values are peak values.

#### Remark

- e. To get a maximum emission level from the EUT, the Antenna was moved throughout the x-axis and Y-axis.  
The worst case is Y-axis.
- f. Actual = Reading + AF + AMP + CL (AF : Antenna factor, AMP : Amp gain, CL : Cable loss)
- g. Distance factor =  $20\log(\text{Measurement distance} / \text{The measured distance})$
- h. Margin = Limit (dBuV/m) - Actual (dBuV/m)

### 5.1.2. Receiving mode Radiated Spurious Emissions for Above 1 GHz

Measurement method : ☒ Radiated ☐ Conducted  
Mode of operation : Receiving mode

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**Table 20. Low Channel (2412 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4824.00	41.21	Peak	H	N/A	31.10	-32.90	39.41	74.00	34.59
4824.00	30.05	Average	H	N/A	31.10	-32.90	28.25	54.00	25.75
4824.00	41.39	Peak	V	N/A	31.10	-32.90	39.59	74.00	34.41
4824.00	31.24	Average	V	N/A	31.10	-32.90	29.44	54.00	24.56

**Table 21. Middle Channel (2437 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4874.00	41.11	Peak	H	N/A	31.20	-32.70	39.61	74.00	34.39
4874.00	30.48	Average	H	N/A	31.20	-32.70	28.98	54.00	25.02
4874.00	41.32	Peak	V	N/A	31.20	-32.70	39.82	74.00	34.18
4874.00	30.68	Average	V	N/A	31.20	-32.70	29.18	54.00	24.82

**Table 22. High Channel (2462 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4924.00	40.93	Peak	H	N/A	31.30	-32.60	39.63	74.00	34.37
4924.00	30.33	Average	H	N/A	31.30	-32.60	29.03	54.00	24.97
4924.00	41.32	Peak	V	N/A	31.30	-32.60	40.02	74.00	33.98
4924.00	30.59	Average	V	N/A	31.30	-32.60	29.29	54.00	24.71



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**Table 23. Low Channel (2412 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4824.00	42.21	Peak	H	N/A	31.10	-32.90	40.41	74.00	33.59
4824.00	31.52	Average	H	N/A	31.10	-32.90	29.72	54.00	24.28
4824.00	42.43	Peak	V	N/A	31.10	-32.90	40.63	74.00	33.37
4824.00	31.32	Average	V	N/A	31.10	-32.90	29.52	54.00	24.48

**Table 24. Middle Channel (2437 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4874.00	40.83	Peak	H	N/A	31.20	-32.70	39.33	74.00	34.67
4874.00	30.32	Average	H	N/A	31.20	-32.70	28.82	54.00	25.18
4874.00	41.22	Peak	V	N/A	31.20	-32.70	39.72	74.00	34.28
4874.00	31.34	Average	V	N/A	31.20	-32.70	29.84	54.00	24.16

**Table 25. High Channel (2462 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4924.00	40.59	Peak	H	N/A	31.30	-32.60	39.29	74.00	34.71
4924.00	30.25	Average	H	N/A	31.30	-32.60	28.95	54.00	25.05
4924.00	41.17	Peak	V	N/A	31.30	-32.60	39.87	74.00	34.13
4924.00	31.11	Average	V	N/A	31.30	-32.60	29.81	54.00	24.19

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**Table 26. Low Channel (2422 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4844.00	42.02	Peak	H	N/A	31.10	-32.90	40.22	74.00	33.78
4844.00	30.92	Average	H	N/A	31.10	-32.90	29.12	54.00	24.88
4844.00	41.43	Peak	V	N/A	31.10	-32.90	39.63	74.00	34.37
4844.00	31.24	Average	V	N/A	31.10	-32.90	29.44	54.00	24.56

**Table 27. Middle Channel (2437 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4874.00	41.09	Peak	H	N/A	31.20	-32.70	39.59	74.00	34.41
4874.00	30.55	Average	H	N/A	31.20	-32.70	29.05	54.00	24.95
4874.00	41.26	Peak	V	N/A	31.20	-32.70	39.76	74.00	34.24
4874.00	31.13	Average	V	N/A	31.20	-32.70	29.63	54.00	22.38

**Table 28. High Channel (2452 MHz)**

Radiated emissions			Ant	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Distance (dB)	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4904.00	41.15	Peak	H	N/A	31.30	-32.60	39.85	74.00	34.15
4904.00	30.42	Average	H	N/A	31.30	-32.60	29.12	54.00	24.88
4904.00	40.76	Peak	V	N/A	31.30	-32.60	39.46	74.00	34.54
4904.00	31.48	Average	V	N/A	31.30	-32.60	30.18	54.00	23.82