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Project No.: 12CA50022
File No.: MC16901
Report No.: 12CA50022-7-FCC
Date: November 6, 2012
Model No.: 1012WCA
FCC ID.: QIIRY1012WCA

RF Test Report

in accordance with
FCC Part 15 Subpart E §15.407 and IC RSS-210 Issue 8

for

Medical Image Processing Unit
(Telemetry System Transmitter)

Rayence Co., Ltd
1F, 2F, 3F, #402, 14, Samsung 1ro 1-gil, Hwaseong-si, Gyeonggi-do, 445-170, Korea

Summary of Test Results:

The following tests were performed on a sample submitted for evaluation of compliance with FCC Part 15 E Section 15.407 and IC RSS-210 Issue 8.				
No	Reference Clause No.	FCC Part15 Subpart E, 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	15.407(a)(1) 15.407(a)(2)	Peak power spectral density	N/T	*Note [2]
4	15.407(b)(1) 15.407(b)(2) 15.407(b)(3)	Conducted spurious emission	N/T	*Note [2]
5	15.407(a)(6)	Peak excursion	N/T	*Note [2]
6	15.407(b)(1)	Power Limit For the band 5.15-5.25 GHz	N/T	*Note [2]
7	15.407(b)(2)	Power Limit For the 5.25-5.35 GHz and 5.47-5.725 GHz bands	N/T	*Note [2]
9	15.407(h)	DFS	N/T	*Note [2]
10	15.207	Transmitter AC power line conducted emission	N/T	*Note [3]
11	1.1307(b)(1)	Maximum Permissible Exposure (Exposure of Humans to RF Fields)	N/A	*Note [2]
*Note [1]: N/T=Not Tested, N/A=Not Applicable *Note [2]: Test was performed by modular transmitter (FCC ID: PPD-AR5BHB116), Test Report no. FR080603B issued by Sporton International Inc.) *Note [3]: The EUT is battery operating only. *Note 4: Tx module's operation incorporated in the end product is limited only non-DFS frequency band.				

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. 33rd 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	RAYENCE
Test standards:	FCC Part 15 E Section 15.407 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.

Report Directory

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 5 180 ~5 240 MHz ISM frequency band
- 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	1012WCA	-
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	1012WCA
Chipset	AR5BHB116 / Manufacturer : ATHERO
Module	WPEA-121N/W (FCC ID : PPD-AR5BHB116) Manufacturer: ANATEL
IEEE Standard	802.11a 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= 5.81 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

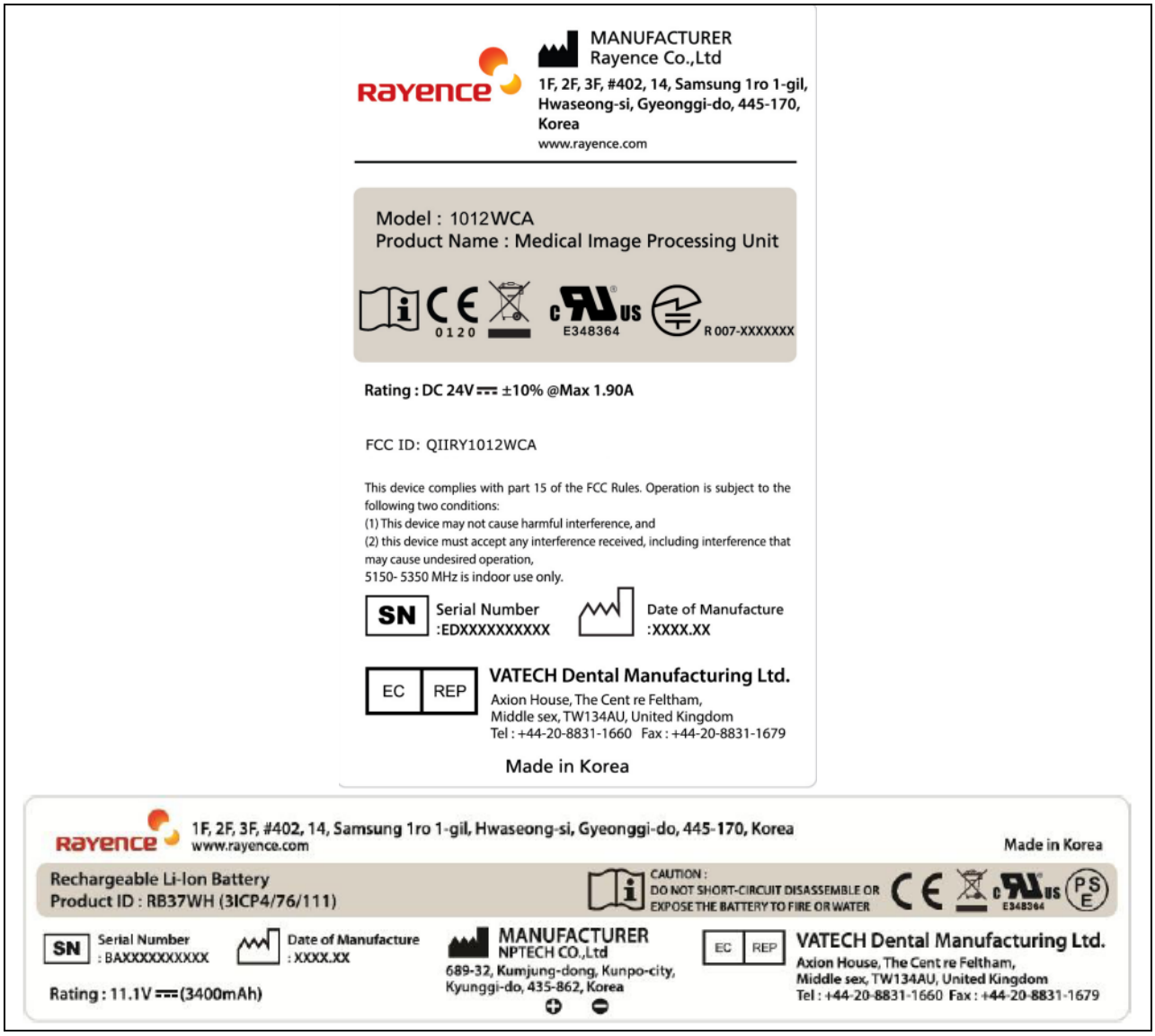
☒ Stand alone ☐ Host connected

☐ Self contained single unit ☒ Module with associated connection or interface

1.7. Technical descriptions 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



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 E Section 15.407

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

1.10. 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	-
Note: Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)				

1.11. 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

1.12. Power Interface

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	11.1V	720mA	-	DC	-	-

1.13. Operating Frequencies

Mode #	Frequency tested
1	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)
2	Operating frequency range : 5 190 MHz ~ 5 230 MHz (11n_HT40) 3 channels in the Transmitter modes of 11n-HT40 are tested. - Low Channel (5190 MHz) -High Channel (5230 MHz)

1.14. Operation Modes

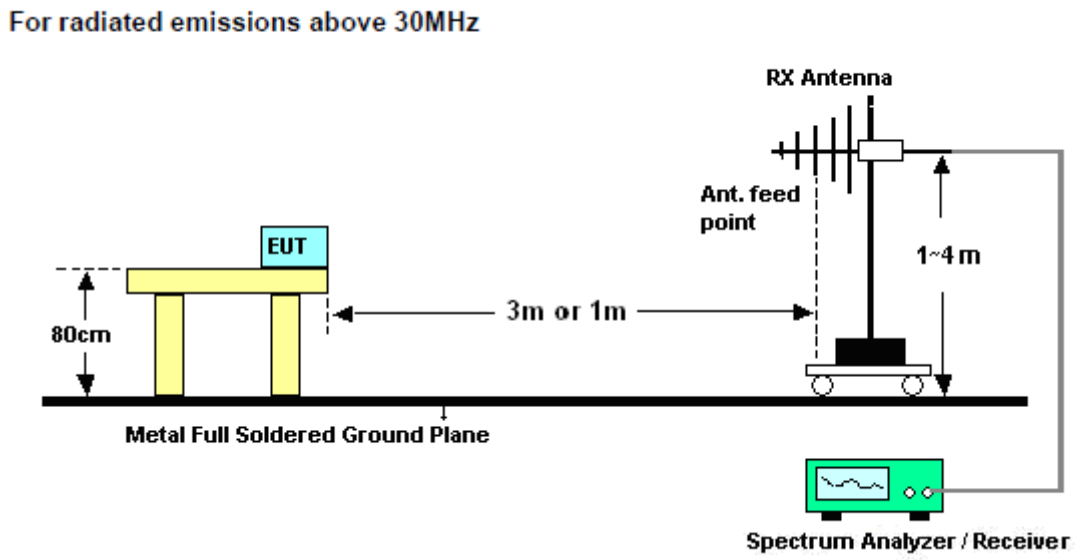
Mode #	Description
1	Carrier on mode: Signal from the RF module was generated continuously for the representative channels (Low, Mid, High) by the test program incorporated.
2	Carrier off (Idle) mode: RF carrier was not activated by the RF module.

*Note:

1. 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.
   - 802.11a mode, 20 MHz Channel Bandwidth, MSC0, 9 Mb/s, OFDM Modulation
   - 802.11n HT20 mode, 20 MHz Channel Bandwidth, MSC0, 6.5 Mb/s, OFDM Modulation
   - 802.11n HT40 mode, 40 MHz Channel Bandwidth, MSC0, 13.5 Mb/s, OFDM Modulation

2. 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).

1.15. Test Configurations

Mode #	Description
1	

1.16. 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

The following essential requirements and test specifications are relevant to the presumption of conformity FCC Part 15 E Section 15.407 and IC RSS-210 Issue 8			
Reference Clause No.	Essential technical requirements	Test method	Reported
15.205(a)	Restricted bands of operation	Note 1	[X]
15.209(a)	Radiated emission limits, general requirements		[X]
15.207	Transmitter AC power line conducted emission		[X]
1.1307(b)(1)	Maximum Permissible Exposure (Exposure of Humans to RF Fields)	KDB 447498	Replaced by modular report
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. FR080603B issued on Sep.16,2010 by Sporton International Inc.)
-. 26dB bandwidth
-. Tx Output Power
-. Band edge
-. Tx Spectral Power Density
-. Conducted Spurious Emission
-. Peak Excursion Ratio
-. Frequency Stability
-. Discontinuous Transmission

1.17. 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	5.2~5.8GHGz
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 dundamental 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 15.407 (b)	
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 10th harmonics	Enclosure Port

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

For transmitters operating in the 5.15 ~ 5.25 GHz band: all emissions outside of the 5.15 ~ 5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

For transmitters operating in the 5.25 ~ 5.35 GHz band: all emissions outside of the 5.15 ~ 5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

Devices operating in the 5.25 ~ 5.35 GHz band that generate emissions in the 5.15 ~ 5.25 GHz band must meet all applicable technical requirements for operation in the 5.15 ~ 5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15 ~ 5.25 GHz band.

For transmitters operating in the 5.47 ~ 5.725 GHz band: all emissions outside of the 5.47 ~ 5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.

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:

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
Power setting : Max. Power condition declared by the manufacturer
Worst case configuration : 5GHz_HT40

Table 1. Test data for Radiated emission for Below 1 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)
466.50	41.80	Q.P.	V	N/A	17.90	-28.90	30.80	46.00	15.20
540.20	41.60	Q.P.	V	N/A	19.20	-28.60	32.20	46.00	13.80
733.20	41.70	Q.P.	V	N/A	21.20	-27.60	35.30	46.00	10.70
800.10	38.20	Q.P.	H	N/A	22.20	-27.60	32.80	46.00	13.20
867.10	37.20	Q.P.	H	N/A	23.00	-26.70	33.50	46.00	12.50
874.90	36.60	Q.P.	H	N/A	23.10	-26.30	33.40	46.00	12.60

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 30 dB. All reading values are peak values.

Remark
a. To get a maximum emission level from the EUT, the EUT was moved throughout the x-axis, Y-axis and Z-axis. The worst case is Y-axis.
b. Actual = Reading + AF + AMP + CL (AF : Antenna factor, AMP : Amp gain, CL : Cable loss)
c. Distance factor = 20log(Measurement distance / The measured distance)
d. 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

802.11a_Non DFS (5 180 – 5 240 MHz)

Table 2. Low Channel (5 180 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)
10360	46.11	Peak	H	N/A	39.70	-28.10	57.71	74.00	16.29
10360	30.17	Average	H	N/A	39.70	-28.10	41.77	54.00	12.23
10360	53.75	Peak	V	N/A	39.70	-28.10	65.35	74.00	8.65
10360	37.88	Average	V	N/A	39.70	-28.10	49.48	54.00	4.52

Table 3. Middle Channel (5 220 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)
10440	43.42	Peak	H	N/A	39.72	-27.90	55.24	74.00	18.76
10440	30.42	Average	H	N/A	39.72	-27.90	42.24	54.00	11.76
10440	51.78	Peak	V	N/A	39.72	-27.90	63.60	74.00	10.40
10440	30.87	Average	V	N/A	39.72	-27.90	42.69	54.00	11.31

Table 4. High Channel (5 240 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)
10480	49.37	Peak	H	N/A	39.72	-27.90	61.19	74.00	12.81
10480	32.18	Average	H	N/A	39.72	-27.90	44.00	54.00	10.00
10480	53.33	Peak	V	N/A	39.72	-27.90	65.15	74.00	8.85
10480	37.82	Average	V	N/A	39.72	-27.90	49.64	54.00	4.36

11n_HT20

Table 5. Low Channel (5 180 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)
10360	45.26	Peak	H	N/A	39.70	-28.10	56.86	74.00	17.14
10360	30.55	Average	H	N/A	39.70	-28.10	42.15	54.00	11.85
10360	54.29	Peak	V	N/A	39.70	-28.10	65.89	74.00	8.11
10360	38.62	Average	V	N/A	39.70	-28.10	50.22	54.00	3.78

Table 6. Middle Channel (5 220 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)
10440	42.25	Peak	H	N/A	39.72	-27.90	54.07	74.00	19.93
10440	30.89	Average	H	N/A	39.72	-27.90	42.71	54.00	11.29
10440	51.28	Peak	V	N/A	39.72	-27.90	63.10	74.00	10.90
10440	36.79	Average	V	N/A	39.72	-27.90	48.61	54.00	5.39

Table 7. High Channel (5 240 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)
10480	49.37	Peak	H	N/A	39.72	-27.90	61.19	74.00	12.81
10480	31.57	Average	H	N/A	39.72	-27.90	43.39	54.00	10.61
10480	52.27	Peak	V	N/A	39.72	-27.90	64.09	74.00	9.91
10480	36.32	Average	V	N/A	39.72	-27.90	48.14	54.00	5.86

11n_HT40

Table 8. Low Channel (5 190 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)
10380	40.89	Peak	H	N/A	39.70	-28.10	52.49	74.00	21.51
10380	31.39	Average	H	N/A	39.70	-28.10	42.99	54.00	11.01
10380	48.79	Peak	V	N/A	39.70	-28.10	60.39	74.00	13.61
10380	30.27	Average	V	N/A	39.70	-28.10	41.87	54.00	12.13

Table 9. High Channel (5 230 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)
10460	43.22	Peak	H	N/A	39.72	-27.90	55.04	74.00	18.96
10460	30.29	Average	H	N/A	39.72	-27.90	42.11	54.00	11.89
10460	50.47	Peak	V	N/A	39.72	-27.90	62.29	74.00	11.71
10460	33.48	Average	V	N/A	39.72	-27.90	45.30	54.00	8.70

Supplementary information:

-. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental Frequency. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using peak/average detector mode.

Remark

1) Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using Peak/average detector mode if frequency was in restricted band. Otherwise the frequency was in outside of restricted band, only peak detector should be used.
2) Average test would be performed if the peak result were greater than the average limit and frequency was in the restricted band.
3) To get a maximum emission level from the EUT, the EUT was moved throughout the x-axis, Y-axis and Z-axis. The worst case is Y -axis.
4) Actual = Reading + AF + AMP + CL (AF : Antenna factor, AMP : Amp gain, CL : Cable loss)
5) Distance factor = 20log(Measurement distance / The measured distance)
6) Margin = Limit (dBuV/m) - Actual (dBuV/m)
7) If frequency was outside of restricted band, the calculation method for peak limit is same as below: 68.23 dBuV/m = EIRP – 20 log(d) + 104.77 = -27 – 20 log (3) + 104.77
   *distance: 3 m, *EIRP: -27 dBm/MHz

5.1.3. Radiated Restricted Band Edge Measurements

Measurement method : ☒ Radiated ☐ Conducted

Table 10. Measurement for restricted band of 11a – Non DFS

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)
5150.00	61.28	Peak	V	N/A	31.60	-31.90	60.98	74.00	13.02
5150.00	50.31	Average	V	N/A	31.60	-31.90	50.01	54.00	3.99
5150.00	49.33	Peak	H	N/A	31.60	-31.90	49.03	74.00	24.97
5150.00	42.28	Average	H	N/A	31.60	-31.90	41.98	54.00	12.02

Table 11. Measurement for restricted band of 11n(HT20) – Non DFS(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)
5150.00	61.00	Peak	V	N/A	31.60	-31.90	60.70	74.00	13.30
5150.00	49.96	Average	V	N/A	31.60	-31.90	49.66	54.00	4.34
5150.00	48.99	Peak	H	N/A	31.60	-31.90	48.69	74.00	25.31
5150.00	41.94	Average	H	N/A	31.60	-31.90	41.64	54.00	12.36

Table 12. Measurement for restricted band of 11n(HT40) – Non DFS(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)
5150.00	61.08	Peak	V	N/A	31.60	-31.90	60.78	74.00	13.22
5150.00	50.09	Average	V	N/A	31.60	-31.90	49.79	54.00	4.21
5150.00	49.08	Peak	H	N/A	31.60	-31.90	48.78	74.00	25.22
5150.00	41.94	Average	H	N/A	31.60	-31.90	41.64	54.00	12.36

Remark

1) Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using Peak/average detector mode if frequency was in restricted band. Otherwise the frequency was in outside of restricted band, only peak detector should be used.
2) Average test would be performed if the peak result were greater than the average limit and frequency was in the restricted band.
3) To get a maximum emission level from the EUT, the EUT was moved throughout the x-axis, Y-axis and Z-axis. The worst case is Y -axis.
4) Actual = Reading + AF + AMP + CL (AF : Antenna factor, AMP : Amp gain, CL : Cable loss)
5) Distance factor = 20log(Measurement distance / The measured distance)
6) Margin = Limit (dBuV/m) - Actual (dBuV/m)
7) If frequency was outside of restricted band, the calculation method for peak limit is same as below: 68.23 dBuV/m = EIRP – 20 log(d) + 104.77 = -27 – 20 log (3) + 104.77
   *distance: 3 m, *EIRP: -27 dBm/MHz

5.1.4. Radiated Spurious Emissions for Below 1 GHz

Measurement method : ☒ Radiated ☐ Conducted
Mode of operation : Receiving mode
Power setting : Max. Power condition declared by the manufacturer
Worst case configuration : 5GHz_HT40

Table 13. Test data for Radiated emission for Below 1 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)
466.50	37.20	Q.P.	V	N/A	17.90	-28.90	26.20	46.00	19.80
540.20	37.90	Q.P.	V	N/A	19.20	-28.60	28.50	46.00	17.50
733.20	39.20	Q.P.	V	N/A	21.20	-27.60	32.80	46.00	13.20
800.10	33.50	Q.P.	H	N/A	22.20	-27.60	28.10	46.00	17.90
867.10	32.80	Q.P.	H	N/A	23.00	-26.70	29.10	46.00	16.90
874.90	34.10	Q.P.	H	N/A	23.10	-26.30	30.90	46.00	15.10

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 30 dB. All reading values are peak values.

Remark
e. To get a maximum emission level from the EUT, the EUT was moved throughout the x-axis, Y-axis and Z-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 = 20log(Measurement distance / The measured distance)
h. Margin = Limit (dBuV/m) - Actual (dBuV/m)

5.1.5. Receiving mode Radiated Spurious Emissions for Above 1 GHz

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

802.11a_Non DFS (5 180 – 5 240 MHz)

Table 14. Low Channel (5 180 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)
10360.00	41.22	Peak	H	N/A	39.70	-28.10	52.82	74.00	21.18
10360.00	30.98	Average	H	N/A	39.70	-28.10	42.58	54.00	11.42
10360.00	41.53	Peak	V	N/A	39.70	-28.10	53.13	74.00	20.87
10360.00	31.14	Average	V	N/A	39.70	-28.10	42.74	54.00	11.26

Table 15. Middle Channel (5 220 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)
10440.00	40.95	Peak	H	N/A	39.72	-27.90	52.77	74.00	21.23
10440.00	30.70	Average	H	N/A	39.72	-27.90	42.52	54.00	11.48
10440.00	41.29	Peak	V	N/A	39.72	-27.90	53.11	74.00	20.89
10440.00	30.78	Average	V	N/A	39.72	-27.90	42.60	54.00	11.40

Table 16. High Channel (5 240 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)
10480.00	40.85	Peak	H	N/A	39.72	-27.90	52.67	74.00	21.33
10480.00	30.77	Average	H	N/A	39.72	-27.90	42.59	54.00	11.41
10480.00	41.31	Peak	V	N/A	39.72	-27.90	53.13	74.00	20.87
10480.00	30.75	Average	V	N/A	39.72	-27.90	42.57	54.00	11.43

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Table 17. Low Channel (5 180 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)
10360.00	40.99	Peak	H	N/A	39.70	-28.10	52.59	74.00	21.41
10360.00	30.68	Average	H	N/A	39.70	-28.10	42.28	54.00	11.72
10360.00	41.15	Peak	V	N/A	39.70	-28.10	52.75	74.00	21.25
10360.00	30.81	Average	V	N/A	39.70	-28.10	42.41	54.00	11.59

Table 18. Middle Channel (5 220 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)
10440.00	40.99	Peak	H	N/A	39.72	-27.90	52.81	74.00	21.19
10440.00	30.77	Average	H	N/A	39.72	-27.90	42.59	54.00	11.41
10440.00	41.16	Peak	V	N/A	39.72	-27.90	52.98	74.00	21.02
10440.00	30.84	Average	V	N/A	39.72	-27.90	42.66	54.00	11.34

Table 19. High Channel (5 240 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)
10480.00	40.93	Peak	H	N/A	39.72	-27.90	52.75	74.00	21.25
10480.00	30.65	Average	H	N/A	39.72	-27.90	42.47	54.00	11.53
10480.00	41.32	Peak	V	N/A	39.72	-27.90	53.14	74.00	20.86
10480.00	30.83	Average	V	N/A	39.72	-27.90	42.65	54.00	11.35

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Table 20. Low Channel (5 190 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)
10380.00	40.85	Peak	H	N/A	39.70	-28.10	52.45	74.00	21.55
10380.00	30.72	Average	H	N/A	39.70	-28.10	42.32	54.00	11.68
10380.00	41.29	Peak	V	N/A	39.70	-28.10	52.89	74.00	21.11
10380.00	30.27	Average	V	N/A	39.70	-28.10	41.87	54.00	12.13

Table 21. High Channel (5 230 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)
10460.00	40.98	Peak	H	N/A	39.72	-27.90	52.80	74.00	21.20
10460.00	30.65	Average	H	N/A	39.72	-27.90	42.47	54.00	11.53
10460.00	41.15	Peak	V	N/A	39.72	-27.90	52.97	74.00	21.03
10460.00	30.82	Average	V	N/A	39.72	-27.90	42.64	54.00	11.36

Supplementary information:

-. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental Frequency. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using peak/average detector mode.

Remark

8) Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using Peak/average detector mode if frequency was in restricted band. Otherwise the frequency was in outside of restricted band, only peak detector should be used.
9) Average test would be performed if the peak result were greater than the average limit and frequency was in the restricted band.
10) To get a maximum emission level from the EUT, the EUT was moved throughout the x-axis, Y-axis and Z-axis. The worst case is Y -axis.
11) Actual = Reading + AF + AMP + CL (AF : Antenna factor, AMP : Amp gain, CL : Cable loss)
12) Distance factor = 20log(Measurement distance / The measured distance)
13) Margin = Limit (dBuV/m) - Actual (dBuV/m)
14) If frequency was outside of restricted band, the calculation method for peak limit is same as below: 68.23 dBuV/m = EIRP – 20 log(d) + 104.77 = -27 – 20 log (3) + 104.77
*distance: 3 m, *EIRP: -27 dBm/MHz