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Project No.: 12CA08535

File No.: MC16340

Report No.: 12CA08535-4-FCC

Date: August 17, 2013

Model No.: FXRD-1417WA (Basic), FXRD-1417WB

FCC ID.: RYK-WPEA121N

IC Number: 6158A-WPEA121NW

FCC Maximum Permissible Exposure Report

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

for

Detector

Viewworks Co., Ltd.

#601 ~ 610, Suntechcity 2, 307-2, Sangdaewon-dong Jungwon-Gu

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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.



Witness tested by
Hongsuk Oh, WiSE Associate Project Engineer
UL Verification Services- 3014ASEO
UL Korea Ltd.
Aug. 17, 2013



Reviewed by
Jeawoon, Choi, WiSE Operations Manager
UL Verification Services- 3014ASEO
UL Korea Ltd.
Aug. 17, 2013

Test Report Details

Test Report No: 12CA08535-4-FCC

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

Test Site: KES Co., Ltd.
477-6, Hageo-ri, Yeosu-eup, Yeosu-gun, Gyeonggi-do, 469-803, Korea

Applicant: Viewworks Co., Ltd.
#601 ~ 610, Suntechcity 2, 307-2, Sangdaewon-dong Jungwon-Gu
Seongnam-city Gyeonggi-do, 462-806, South Korea

Applicant Contact: Jeong-mi Kim

Title: Manager

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FCC ID: RYK-WPEA121N

IC Number: 6158A-WPEA121NW

E-mail: salangshy@viewworks.com

Product Type: X-ray Detector

Model Number: FXRD-1417WA

Multiple Model Name: FXRD-1417WB
The manufacturer has declared to all the multiple model names into the basic model without any further evaluation by UL.

Trademark 

Sample Serial Number: N/A

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

Sample Serial Number: N / A

Sample Receive Date: 2013.07.09

Testing Date: 2013.07.30 ~ 2013.08.09

Test Report Date: 2013.08.17

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:

Wireless communication is established between the ViVIX-S Wireless detector and System Control Unit.

1.2. Details of Test Equipment (EUT):

- Equipment Type : X-ray Detector
- Model No. : FXRD-1417WA, FXRD-1417WB
- Operating characteristic : Short range wireless device operating in the 2400 – 2483.5 ISM frequency band
- Manufacturer : Vieworks Co., Ltd.
#601 ~ 610, Suntechcity 2, 307-2, Sangdaewon-dong Jungwon GuSeongnam-city
Gyeonggi-do, 462-806, South korea

1.3. Equipment Configuration:

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

Use*	Product Type	Manufacturer	Model	Comments
EUT	X-ray Detector	Vieworks Co., Ltd.	FXRD-1417WA	S/N : D3CABH001
EUT	Battery	Vieworks Co., Ltd.	FXRB-01A	S/N : B1-AAAT002
*Note: Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)				

1.4. Technical Data:

Item	X-ray Detector
Frequency Ranges	2412 ~ 2462 MHz, 5745~5825 MHz,
Kind of modulation (s)	DSSS (CCK), OFDM(BPSK, QPSK, 16QAM, 64QAM)
Channel	2412 ~ 2462 MHz: 11 channel(11b/g/n_HT20), 2422 ~ 2452 MHz : 7 channel(11n_HT40) 5745~5825 MHz: 5 channel(11a/n_HT20– Non DFS) 5755 ~ 5795 MHz: 2 channel(11n_HT40 – Non DFS)
Antenna information	Integral type (PCB antenna)
Working temperature	-20 ~ 70 °C
Supply Voltage	DC +24 V
*Note: All the technical data described above were provided by the manufacturer.	

Note ;

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

1.5. Antenna Information:

Item	X-ray Detector
Antenna Model Name	AEi-2450/5500DP-C1.13[Vieworks]
Antenna Type	PCB antenna
Manufacturer	Viework Co., Ltd.
GAIN(dBi) - 2.4GHz	4.66 dBi
GAIN(dBi) - 5GHz	2.19 dBi
Polarization	Isotropic
*Note: All the technical data described above were provided by the manufacturer.	

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. Description of additional model name

Model name	Model name Designation	Description of design
FXRD-1417WB	Identical to FXRD-1417WA	Depending on scintillator of detector, the model name is different. Scintillator is Csi(Tl), model name is FXRD-1417WA. And also when the scintillator is Gadox, model name is FXRD-1417WB.

2. Test Specification

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

KDB 447498 D01 General RF Exposure Guidance v05r01 : 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	X-Ray Detector	Vieworks Co., Ltd.	FXRD-1417WA	S/N : D3CABH001
EUT	Battery	Vieworks Co., Ltd.	FXRB-01A	S/N : B1-AAAT002
AE	System Control Unit	Vieworks Co., Ltd.	FXRS-03A	-
AE	Note PC	Lenovo	X2000	-
*Note: Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)				

3.2. Input/Output Ports

Port #	Name	Type*	Cable Max. >3m	Shielded	Comments
1	Signal port	I/O	15 m	Shielded	SCU to X-Ray detector Cable
*Note 1: All the interface cables and Power Cable have been provided by the manufacturer					
*Note 2: *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)	Comments
Rated	DC +24 V	Max. 0.5 A	-	DC	Rated of Battery
1	DC +24 V	-	-	DC	

3.4. Operating Frequencies

Mode #	Frequency tested
1	Operating frequency range: 2 412 MHz ~ 2 462 MHz (11b/g & n_HT20) 3 channels in the Transmitter modes of 11b/g/n-HT20 are tested. - Low : 2412 MHz / CH = 1 - Mid : 2437 MHz / CH = 6 - Top : 2462 MHz / CH= 11
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 / CH = 3 - Mid : 2437 MHz / CH = 6 - Top : 2452 MHz / CH= 9
3	Operating frequency range : 5 745 MHz ~ 5 825 MHz (11a & n_HT20) 3 channels in the Transmitter modes of 11a/n-HT20 are tested. - Low : 5745 MHz / CH = 149 - Mid : 5785 MHz / CH = 157 - Top : 5825 MHz / CH= 165
4	Operating frequency range : 5 755 MHz ~ 5 795 MHz (11an_HT40) 2 channels in the Transmitter modes of 11n-HT40 are tested. - Low : 5755 MHz / CH = 151 - Top : 5795 MHz / CH= 159

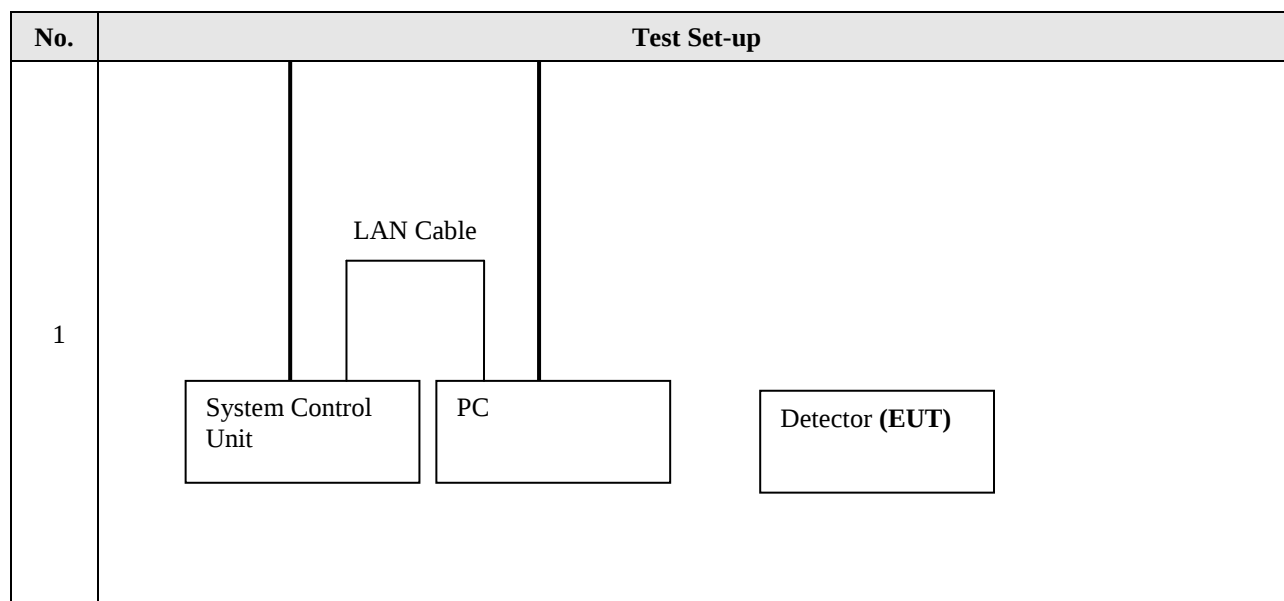
3.5. Operation Modes

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.
*Note: - 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. - 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). 11b/g : 17.0 dBm, 11n-HT20 : 16.0 dBm, 11n-HT40: 13.0 dBm for each channel 11a/n-HT20/40 : 16.0 dBm for each channel.	

3.6. Environment Conditions

Parameters	Normal condition
Temperature	+ 15°C ~ +35°C
Humidity	20% ~ 75%
Supply voltage	AC 120 V (Rated nominal voltage)
Note ; - 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.	

3.7. Test Configurations



3.8. List of Test Equipment

No	Description	Manufacturer	Model	Identifier	Cal. Due
1	Spectrum Analyzer	R&S	FSV30	100736	2014.01.10
2	8360B Series Swept Signal Generator	HP	83630B	3844A00786	2014.06.06
3	Low Pass Filter	Mini-Circuits	NLP-1200+	V8979400903-1	2014.07.11
4	High Pass Filter	Wainwright Instrument	WHK6.0/18G-10SS	11	2014.07.07
5	High Pass Filter	Wainwright Instrument	WHJS3000-10TT	1	2014.01.10
6	Trilog-BroadBand Antenna	Schwarzbeck	VULB 9168	9168-462	2014.10.25
7	Horn Antenna	A.H.	SAS-571	414	2014.03.22
8	Preamplifier	R&S	SCU18	0117	2014.01.12

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	27 °C
	Relative Humidity	47 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	2412 MHz - 2462 MHz 5745 MHz - 5825 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

Max conducted power for IEEE 802.11a: 24.66 dBm

Test Mode	Min. User Distance(cm)	Output Peak Power (dBm)	Output Peak Power (mW)	Antenna Gain (dBi)	Numeric Gain	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
5G	20	24.66	292.42	2.19	1.66	0.09632	1

Max conducted power for IEEE 802.11b/g: 22.49 dBm

Test Mode	Min. User Distance(cm)	Output Peak Power (dBm)	Output Peak Power (mW)	Antenna Gain (dBi)	Numeric Gain	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
2.4G	20	22.49	177.42	4.66	2.92	0.10321	1

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.
3. The output power values were obtained original module test report. (FCC ID:RYK-WPEA121N, Test Report no. FR131667AC/ FR131667AI).

Max conducted power for IEEE 802.11n(20 MHz) port A: 21.54 dBm

Test Mode	Min. User Distance(cm)	Output Peak Power (dBm)	Output Peak Power (mW)	Antenna Gain (dBi)	Numeric Gain	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
5 G	20	21.54	142.56	2.19	1.66	0.04696	1

Max conducted power for IEEE 802.11n(20 MHz) port B: 22.36 dBm

Test Mode	Min. User Distance(cm)	Output Peak Power (dBm)	Output Peak Power (mW)	Antenna Gain (dBi)	Numeric Gain	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
5 G	20	22.36	172.19	2.19	1.66	0.05672	1

IEEE 802.11n (20 MHz) port A + port B power Density = 0.04696 + 0.05672 = 0.10368

Max conducted power for IEEE 802.11n (40 MHz) port A: 20.61 dBm

Test Mode	Min. User Distance(cm)	Output Peak Power (dBm)	Output Peak Power (mW)	Antenna Gain (dBi)	Numeric Gain	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
5 G	20	20.61	115.08	2.19	1.66	0.03791	1

Max conducted power for IEEE 802.11n (40 MHz) port B: 21.87 dBm

Test Mode	Min. User Distance(cm)	Output Peak Power (dBm)	Output Peak Power (mW)	Antenna Gain (dBi)	Numeric Gain	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
5 G	20	21.87	153.82	2.19	1.66	0.05067	1

IEEE 802.11n (40 MHz) port A + port B power Density = 0.03791 + 0.05067 = 0.08858

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.
3. The output power values were obtained original module test report. (FCC ID:RYK-WPEA121N, Test Report no. FR131667AC/ FR131667AI).

Max conducted power for IEEE 802.11n(20 MHz) port A: 19.52 dBm

Test Mode	Min. User Distance(cm)	Output Peak Power (dBm)	Output Peak Power (mW)	Antenna Gain (dBi)	Numeric Gain	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
2.4 G	20	19.52	89.54	4.66	2.92	0.05209	1

Max conducted power for IEEE 802.11n(20 MHz) port B: 18.53 dBm

Test Mode	Min. User Distance(cm)	Output Peak Power (dBm)	Output Peak Power (mW)	Antenna Gain (dBi)	Numeric Gain	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
2.4 G	20	18.53	71.29	4.66	2.92	0.04147	1

IEEE 802.11n (20 MHz) port A + port B power Density = 0.05209 + 0.04147 = 0.09356

Max conducted power for IEEE 802.11n (40 MHz) port A: 18.16 dBm

Test Mode	Min. User Distance(cm)	Output Peak Power (dBm)	Output Peak Power (mW)	Antenna Gain (dBi)	Numeric Gain	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
2.4 G	20	18.16	65.46	4.66	2.92	0.03808	1

Max conducted power for IEEE 802.11n (40 MHz) port B: 17.32 dBm

Test Mode	Min. User Distance(cm)	Output Peak Power (dBm)	Output Peak Power (mW)	Antenna Gain (dBi)	Numeric Gain	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
2.4 G	20	17.32	53.95	4.66	2.92	0.03139	1

IEEE 802.11n (40 MHz) port A + port B power Density = 0.03808 + 0.03139 = 0.06947

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.
3. The output power values were obtained original module test report. (FCC ID:RYK-WPEA121N, Test Report no. FR131667AC/ FR131667AI).