

Test Report



INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 C AND ISED CANADA REQUIREMENTS RF CO-LOCATION TEST REPORT

Equipment Under Test: Mobile Patient Monitor

Model: Portrait HUB01

Manufacturer: GE Healthcare Finland Oy
Kuortaneenkatu 2
FI-00510, Helsinki
Finland

Customer: GE Healthcare Finland Oy
Kuortaneenkatu 2
FI-00510, Helsinki
Finland

FCC Rule Part: 2.947(f)
15.207
15.209
15.247(d)

IC Rule Part: RSS-GEN Issue 5 Amendment 2, 2021

Date: 30 May 2022

Issued by:

A handwritten signature in blue ink, appearing to read 'Henri Mäki'.

Henri Mäki
Testing Engineer

Date: 30 May 2022

Checked by:

A handwritten signature in blue ink, appearing to read 'Rauno Repo'.

Rauno Repo
Senior EMC Specialist

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GENERAL REMARKS

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

RELEASE HISTORY

Version	Changes	Issued
1.0	Initial release	30 May 2022

PRODUCT DESCRIPTION

Equipment Under Test

Trade mark:	GE
Model:	Portrait HUB01
Type:	Mobile Patient Monitor
Serial no:	SRW20440005SP
FCC ID:	2AO8L-HUB01
IC:	25821-HUB01
Contains FCC ID:	2AO8L-WL18DBMOD (WLAN/BLE-module)
Contains IC:	25821-WL18DBMOD (WLAN/BLE-module)

General Description

The Portrait HUB01 (later Hub) is a part of GE Healthcare's Portrait Mobile Monitoring Solution system. The Hub enables continuous monitoring of patients by acquiring signals from body-worn sensors through the GE proprietary Medical Body Area Network (MBAN) radio as well as displaying trends and events. The Hub further delivers the patient data to a hospital network through the WLAN (802.11a/b/g/n) radio. Pairing between a Hub and a sensor is made by using an NFC (ISO/IEC 14443) reader in the Hub. In addition to the active MBAN, WLAN and NFC radios, the Hub has a Bluetooth LE (v5.1) and a passive RFID tag (EPCglobal Gen-2) radios. The BLE is primarily used for enabling the Hub indoor positioning but later also other use-cases are possible. The RFID is used for asset management. All Hub antennas are integrated in the mechanics. Besides the wireless interfaces the hub incorporates a 5-pin GE proprietary USB connector in the back of the Hub. The USB connector is used for charging the Hub battery and it enables the SW updates and device configuration.

Classification

Fixed device	<input type="checkbox"/>
Mobile Device (Human body distance > 20cm)	<input checked="" type="checkbox"/>
Portable Device (Human body distance < 20cm)	<input checked="" type="checkbox"/>

Modifications Incorporated in the EUT

No.	Name	Description
1	RF_HUB_RFV_1	Normal sample. The PWB RF is reworked to be mass production equivalent.

Ratings and declarations

Operating Frequency Range:	MBAN 2402.0-2478.8 MHz BLE 2402-2480 MHz WLAN 2412-2462 MHz / 5180-5825 MHz NFC 13.56 MHz RFID 902-928 MHz
Channels:	MBAN 31 BLE 40 WLAN 11 / 21 NFC 1 RFID 50
Channel separation:	MBAN 2.5 / 2.6 / 2.7 MHz BLE 2 MHz WLAN 5 MHz / 20 MHz NFC N/A RFID 500 kHz
Transmission technique:	Digital modulation
Modulation:	MBAN GFSK BLE GFSK WLAN according to IEEE802.11a/b/g/n NFC according to ISO/IEC 14443 106 kbps RFID according to EPCglobal Gen-2
Antenna type:	custom integrated antennas
Integral Antenna gain (max):	MBAN 2.9 dBi (bottom antenna), 5.6 dBi (top antenna) BLE 6.0 dBi WLAN 6.0 dBi (top antenna 2.4 GHz), 4.0 dBi (bottom antenna 5 GHz), 6.8 dBi (top antenna 5 GHz) NFC N/A RFID N/A

Power Supply

Operating voltage range: 3.6 V_{DC} (nominal battery voltage)

Mechanical Size of the EUT

Height: 21 mm

Width: 63 mm

Length: 141 mm

Peripherals

Peripheral	Description / Usage
RFID reader	Nordic ID Sampo S1 813-S1A. Used during radiated emissions to read the RFID tag of the EUT.

The peripherals were provided by the customer.

SUMMARY OF TESTING

Test Specification	Description of Test	Result
§15.209(a), §15.247(d) / RSS-GEN 8.9, 8.10	Radiated Emissions Within the Restricted Bands	PASS

The decision rule applied for the tests results stated in this test report is according to the requirements of section 1.3 of ANSI C63.10-2013.

EUT Test Conditions during Testing

The EUT was in continuous transmit mode during all the tests. The EUT was configured into the wanted channel using software provided by the manufacturer:

- ge-swu-image-beat3-imx7d-1.1.0.0.1.18967 (Hub main software)
- TIInit_11.8.32_TI_SPv4.8_GE_v1.bts (Bluetooth firmware with GE TX power reduction)

Radiated emissions were measured while NFC, MBAN and BLE radios were enabled and set to transmit (WLAN and BLE cannot transmit simultaneously). The RFID tag was continuously read with the peripheral RFID reader.

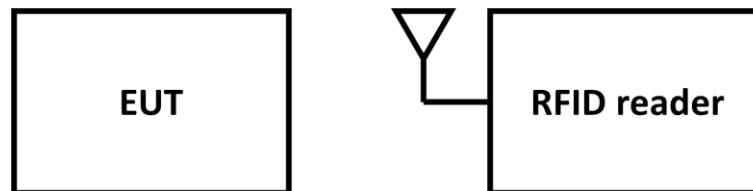


Figure 1: Test setup block diagram

Table 1: Test frequencies

Radio	Channel	Frequency (MHz)
NFC	1	13.56
RFID	-	902-928
MBAN	15	2402.0
BLE	39	2480.0

Test Facility

Testing Laboratory / address: FCC designation number: FI0002 ISED CAB identifier: T004	SGS Fimko Ltd Takomotie 8 FI-00380, HELSINKI FINLAND
Test Site:	<input type="checkbox"/> K10LAB, ISED Canada registration number: 8708A-1 <input checked="" type="checkbox"/> K5LAB, ISED Canada registration number: 8708A-2 <input type="checkbox"/> T10LAB

Transmitter Radiated Spurious Emissions 9 kHz – 26.5 GHz
TEST RESULTS
Transmitter Radiated Spurious Emissions 9 kHz – 26.5 GHz

Standard: ANSI C63.10-2013
Tested by: HEM
Date: 23 May 2022 24 May 2022
Temperature: 23 °C 23 °C
Humidity: 36 %RH 36 %RH
Barometric pressure: 1014 hPa 1013 hPa
Measurement uncertainty: ± 4.51 dB, level of confidence 95 % (k = 2)

FCC Rule: 15.247(d), 15.209(a)

RSS-GEN 8.9, 8.10

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. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

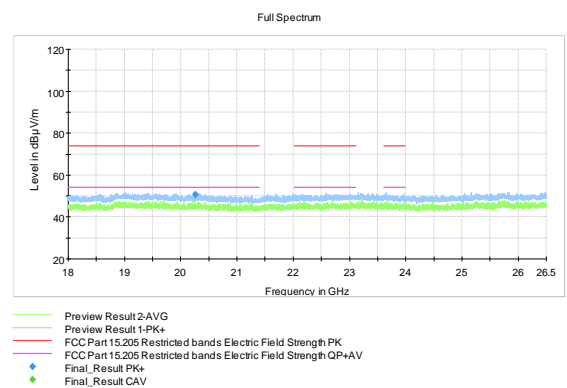
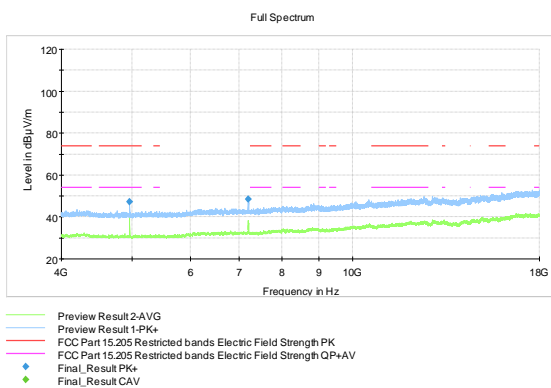
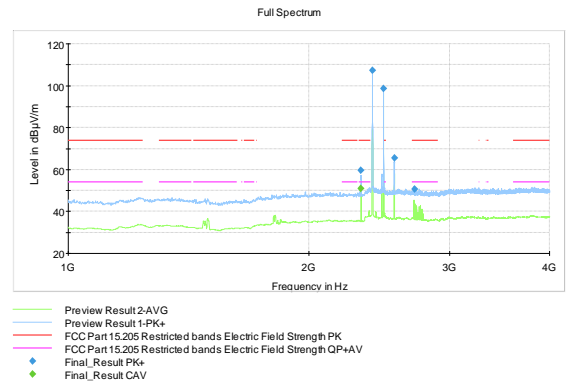
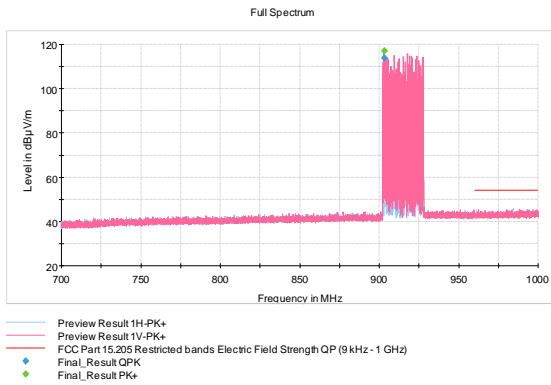
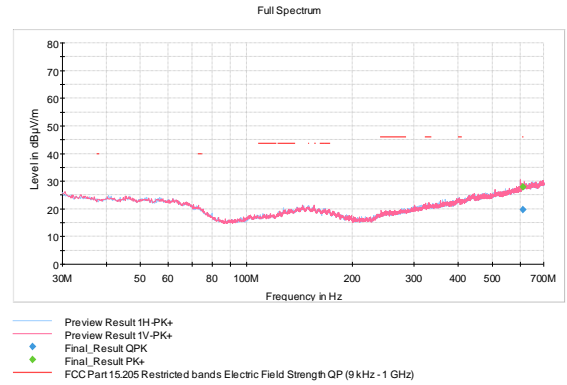
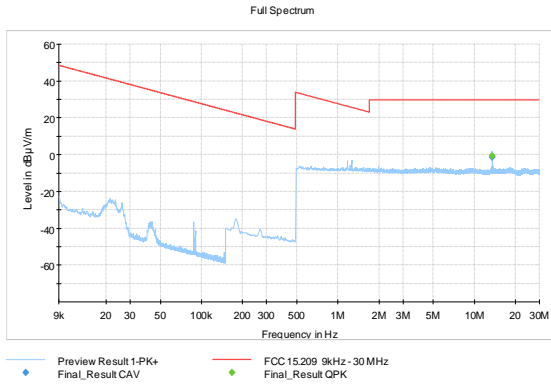
The correction factor in the final result table contains the sum of the transducers (antenna + amplifier + cables).

Frequency range [MHz]	Limit [$\mu\text{V/m}$]	Limit [$\text{dB}\mu\text{V/m}$]	Detector
30 - 80	100	40.0	Quasi-peak
88 - 216	150	43.5	Quasi-peak
216 - 960	200	46.0	Quasi-peak
960 - 1000	500	54.0	Quasi-peak
Above 1000	500	54.0	Average
Above 1000	5000	74.0	Peak

Investigative measurements were made to determine the worst EUT orientation. The presented final results are the results in the worst orientation.

Transmitter Radiated Spurious Emissions 9 kHz – 26.5 GHz

Results



Transmitter Radiated Spurious Emissions 9 kHz – 26.5 GHz
Table 2: Peak results

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2322.325000	59.64	73.98	14.34	15 x 1000.0	1000.000	198.0	H	0.0	13.3
2402.600000	107.39	---	---	15 x 1000.0	1000.000	166.0	H	345.0	13.9
2479.750000	98.72	---	---	15 x 1000.0	1000.000	244.0	H	186.0	14.3
2557.750000	65.47	78.72 ¹⁾	13.25	15 x 1000.0	1000.000	256.0	H	184.0	13.9
2711.850000	50.53	73.98	23.45	15 x 1000.0	1000.000	132.0	H	161.0	13.8
4960.400000	47.34	73.98	26.64	15 x 1000.0	1000.000	107.0	H	184.0	7.6
7204.000000	48.43	87.39 ²⁾	38.96	15 x 1000.0	1000.000	100.0	V	116.0	10.7
20257.250000	50.65	73.98	23.33	15 x 1000.0	1000.000	361.0	V	120.0	7.0

- 1) -20 dBc relative to the BLE transmitter fundamental
- 2) -20 dBc relative to the MBAN transmitter fundamental

Table 3: Average results

Frequency (MHz)	CAverage (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2322.925000	50.87	53.98	3.11	15 x 1000.0	1000.000	198.0	H	2.0	13.3

Table 4: Quasi-peak results

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
610.115000	19.65	46.00	26.35	15 x 1000.0	120.000	385.0	H	334.0	27.5

TEST EQUIPMENT

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
ANTENNA	ROHDE & SCHWARZ	HFH2-Z2 , 335.4711.52	inv. 8013	2020-10-28	2022-10-28
ANTENNA	SCHWARZBECK	VULB 9168	inv. 8911	2020-11-04	2022-11-04
ANTENNA	EMCO	3160-09	inv. 7294	2022-02-22	2023-02-22
ANTENNA	ETS LINDGREN	3117	inv. 9569	2021-04-09	2023-04-09
ANTENNA MAST	MATURO	TAM 4.0E	inv. 10181	NCR	NCR
ATTENUATOR	HUBER & SUHNER	6806.17.B (6dB)	inv. 10391	2021-01-25	2023-01-25
ATTENUATOR	HUBER & SUHNER	6810.17.B (10dB)	inv. 10390	2021-01-25	2023-01-25
ATTENUATOR	PASTERNAK	10 dB, DC-40 GHz	sn. A1	2021-04-20	2023-04-20
ATTENUATOR	PASTERNAK	PE 7004-4 (4dB)	inv. 10126	2021-03-30	2023-03-30
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv. 10679	2021-06-21	2022-06-21
FILTER	WAINWRIGHT	WHKX1.0/15G-10SS	inv. 8267	2021-01-29	2023-01-29
FILTER	WAINWRIGHT	WHKX4.0/18G-10SS	inv. 10403	2021-01-29	2023-01-29
FILTER	WAINWRIGHT	WLKS700-9SS	inv. 10606	2021-01-29	2023-01-29
MAST & TURNTABLE CONTROLLER	MATURO	NCD	inv. 10183	NCR	NCR
RF PREAMPLIFIER	CIAO	CA118-3123	inv. 10278	2021-10-05	2022-10-05
RF PREAMPLIFIER	CIAO	CA1840-5019	inv. 10593	2021-10-05	2022-10-05
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	-	-
TURNTABLE	MATURO	DS430 UPGRADED	inv. 10182	NCR	NCR

NCR = No Calibration Required

END OF REPORT