

# Test Report

HELEM2211000483-1



## INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 C AND ISED CANADA REQUIREMENTS

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: 15.247

IC Rule Part: RSS-247, Issue 2, 2017

RSS-GEN Issue 5 Amendment 2, 2021

KDB: 558074 D01 15.247 Meas Guidance v05r02

Guidance for Compliance Measurements on Digital Transmission Systems,  
Frequency Hopping Spread Spectrum System, and Hybrid System Devices  
Operating Under §15.247 of the FCC rules (April 2, 2019)

Date: 17 November 2022

Date: 17 November 2022

Issued by:

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

Henri Mäki  
Testing Engineer

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**

<b>Version</b>	<b>Changes</b>	<b>Issued</b>
1.0	Initial release	17 November 2022

## PRODUCT DESCRIPTION

### Equipment Under Test

Model:	Portrait HUB01
Type:	Mobile Patient Monitor
Trademark:	GE
Serial no:	SRW20440005SP (RF_HUB_RFV_1)
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.

This test report contains the results for Bluetooth Low Energy.

### 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

The PWB RF is reworked to be mass production equivalent.

### Ratings and declarations

Operating Frequency Range (OFR):	2402-2480 MHz
Channels:	40
Channel separation:	2 MHz
Transmission technique:	DSSS
Modulation:	GFSK
Antenna type:	Integrated
Integral Antenna gain:	6.0 dBi

### Power Supply

Operating voltage range: 3.6 V<sub>DC</sub> (nominal battery voltage)

### Mechanical Size of the EUT

Height: 21 mm                      Width: 63 mm                      Length: 141 mm

## SUMMARY OF TESTING

Test Specification	Description of Test	Result
§15.203	Antenna Requirement	PASS
§15.207(a) / RSS-Gen 8.8	AC Power-Line Conducted Emissions	N/T
§15.247(a)(2) / RSS-247 5.2(a)	6 dB Bandwidth	N/T
§15.247(b)(3) / RSS-247 5.4(d)	Maximum Peak Conducted Output Power	N/T
§15.247(d) / RSS-247 5.5	Radiated Emissions and Band-Edge Measurement	PASS
§15.247(d) / RSS-247 5.5	Conducted Spurious Emissions	N/T
§15.247(e) / RSS-247 5.2(b)	Power Spectral Density	N/T
RSS-Gen 6.7	Occupied Bandwidth 99%	N/T

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)

Normal modulation and maximum transmit power was used during the tests.



Figure 1: Test setup block diagram

Table 1: The test frequencies

Channel	Frequency [MHz]
bottom	2402
middle	2440
top	2480

**Test Facility**

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

**TEST RESULTS**

**Antenna Requirement**

**Standard:** FCC Rule §15.203  
**Tested by:** PKA  
**Date:** 2 November 2022

**FCC Rule: 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.

Specification	Requirement (at least one of the following shall be applied)	Conclusion
§15.203	1. Permanently attached antenna 2. Unique coupling to the intentional radiator 3. Professionally installed radio. The installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.	<b>PASS</b>
Note	Option 1 is used	



## Radiated Emissions and Band-Edge Measurement (9 kHz to 26.5 GHz)

### Radiated Emissions and Band-Edge Measurement (9 kHz to 26.5 GHz)

**Standard:** ANSI C63.10-2013  
**Tested by:** PKA, HEM  
**Date:** 2 November 2022  
**Temperature:** 24 °C  
**Humidity:** 42 %RH  
**Measurement uncertainty:** ± 4.51 dB Level of confidence 95 % (k = 2)

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

#### RSS-247 5.5

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. Attenuation below the general limits specified in §15.209(a) and RSS-Gen 8.9 is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) and RSS-Gen 8.10, must also comply with the radiated emission limits specified in §15.209(a) and RSS-Gen 8.9.

Frequency range [MHz]	Limit [ $\mu\text{V}/\text{m}$ ]	Distance [m]	Detector
0.009 – 0.490	2400/F(kHz)	300	Quasi-peak
0.490 – 1.705	24000/F(kHz)	30	Quasi-peak
1.705 – 30	30	30	Quasi-peak
30 – 88	100	3	Quasi-peak
88 – 216	150	3	Quasi-peak
216 – 960	200	3	Quasi-peak
960 – 1000	500	3	Quasi-peak

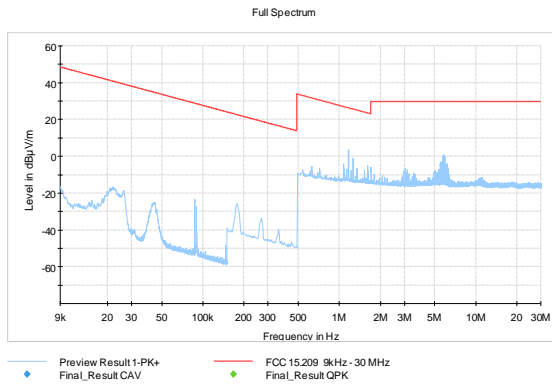
The measurements are performed at a distance of 3 meters, and the results are extrapolated to the specified distance by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

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

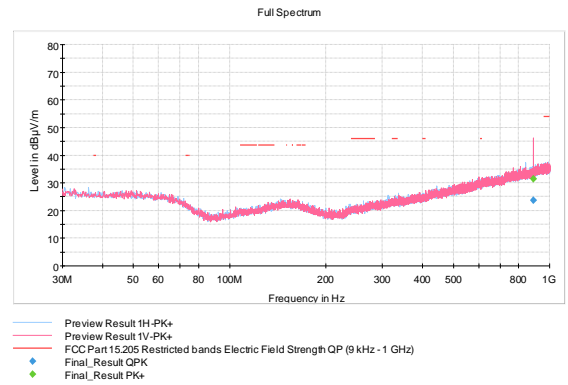
The correction factor in the final result table contains the sum of the transducers (antenna + amplifier + cables). The result value is the measured value corrected with the correction factor.

**Radiated Emissions and Band-Edge Measurement (9 kHz to 26.5 GHz)**

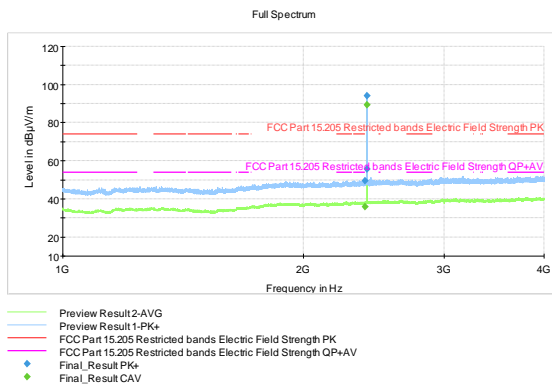
**Test results (bottom channel)**



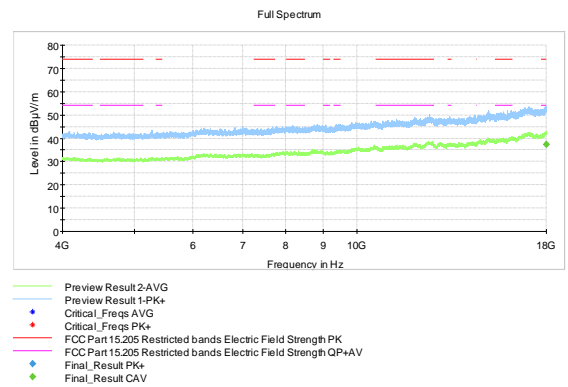
**Figure 2: Bottom channel (9 kHz - 30 MHz)**



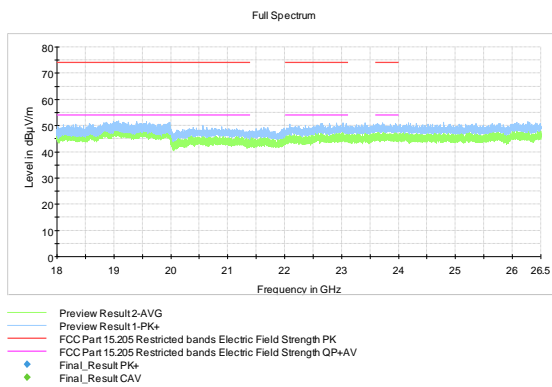
**Figure 3: Bottom channel (30 - 1000 MHz)**



**Figure 4: Bottom channel (1 - 4 GHz)**



**Figure 5: Bottom channel (4 - 18 GHz)**



**Figure 6: Bottom channel (18 - 26.5 GHz)**

**Radiated Emissions and Band-Edge Measurement (9 kHz to 26.5 GHz)**
**Table 2:** Average results (bottom channel)

Frequency (MHz)	CAverage (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.200000	35.77	53.90	18.13	15 x 1000.0	1000.000	100.0	H	114.0	13.8
17999.800000	37.37	53.90	16.53	15 x 1000.0	1000.000	100.0	H	0.0	26.3

**Table 3:** Peak results (bottom channel)

Frequency (MHz)	MaxPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
891.106000	31.34	74.15 *)	42.81	15 x 1000.0	120.000	324.0	V	303.0	31.1
2389.800000	49.57	74.15 *)	24.58	15 x 1000.0	1000.000	355.0	V	349.0	13.8
2400.000000	55.77	74.15 *)	18.38	15 x 1000.0	1000.000	125.0	V	284.0	13.9
2402.100000	94.15	---	---	15 x 1000.0	1000.000	107.0	V	282.0	13.9

\*) -20 dBc

Radiated Emissions and Band-Edge Measurement (9 kHz to 26.5 GHz)

Test results (middle channel)

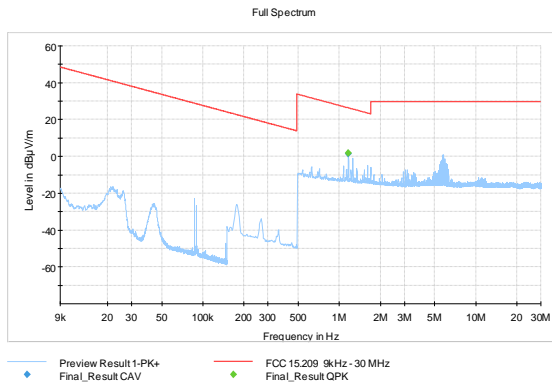


Figure 7: Middle channel (9 kHz - 30 MHz)

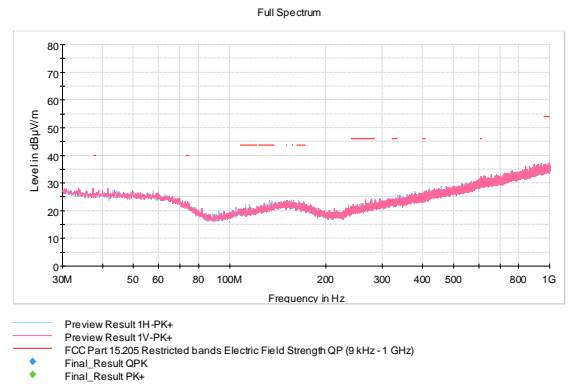


Figure 8: Middle channel (30 - 1000 MHz)

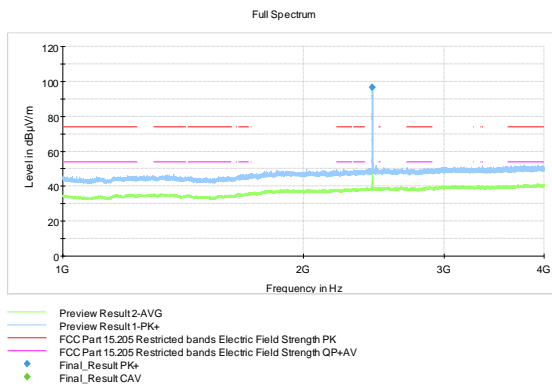


Figure 9: Middle channel (1 - 4 GHz)

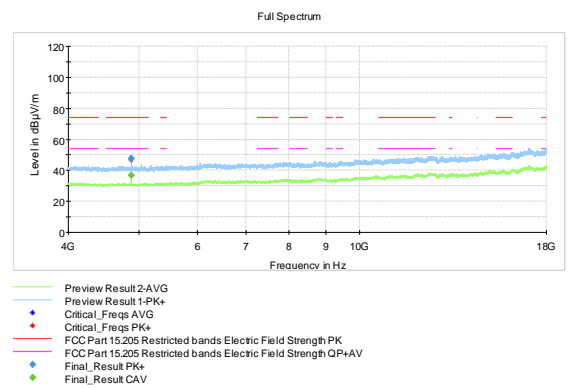


Figure 10: Middle channel (4 - 18 GHz)

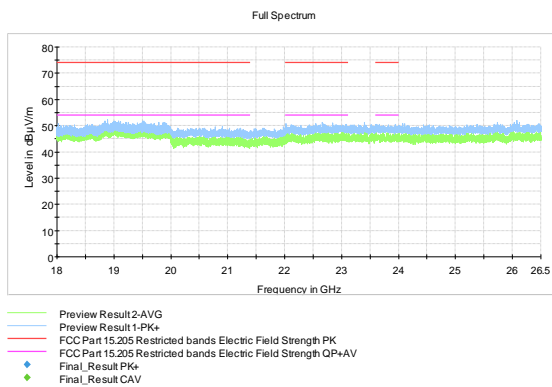


Figure 11: Middle channel (18 - 26.5 GHz)

**Radiated Emissions and Band-Edge Measurement (9 kHz to 26.5 GHz)**
**Table 4:** Quasi-peak results (middle channel)

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1.163750	1.88	26.31	24.43	15 x 1000.0	9.000	100.0	V	115.0	-20.2

**Table 5:** Average results (middle channel)

Frequency (MHz)	CAverage (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4879.900000	36.96	54.00	17.04	15 x 1000.0	1000.000	127.0	V	267.0	7.5

**Table 6:** Peak results (middle channel)

Frequency (MHz)	MaxPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2440.250000	96.67	---	---	15 x 1000.0	1000.000	107.0	V	254.0	13.9
4880.400000	47.68	74.00	26.32	15 x 1000.0	1000.000	127.0	V	281.0	7.5

Radiated Emissions and Band-Edge Measurement (9 kHz to 26.5 GHz)

Test results (top channel)

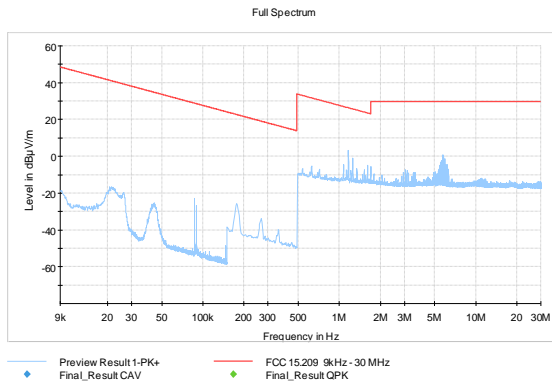


Figure 12: Top channel (9 kHz - 30 MHz)

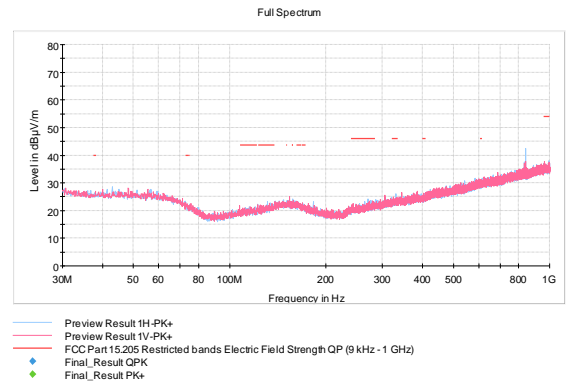


Figure 13: Top channel (30 - 1000 MHz)

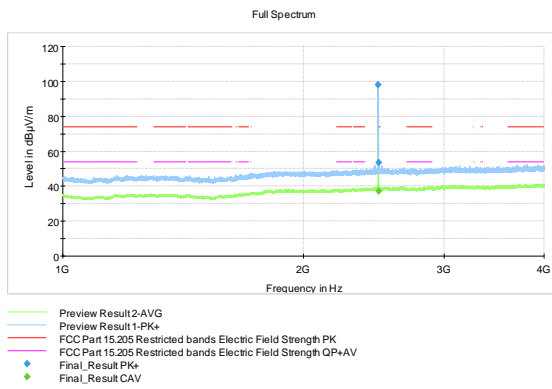


Figure 14: Top channel (1 - 4 GHz)

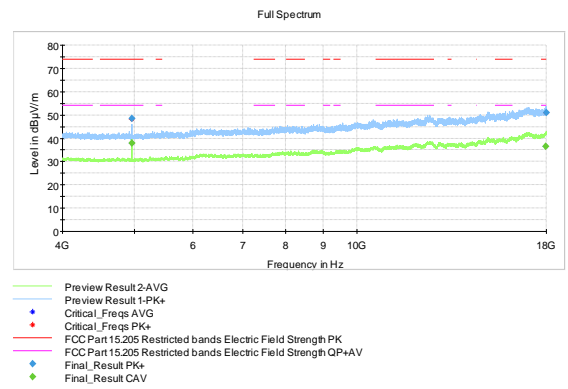


Figure 15: Top channel (4 - 18 GHz)

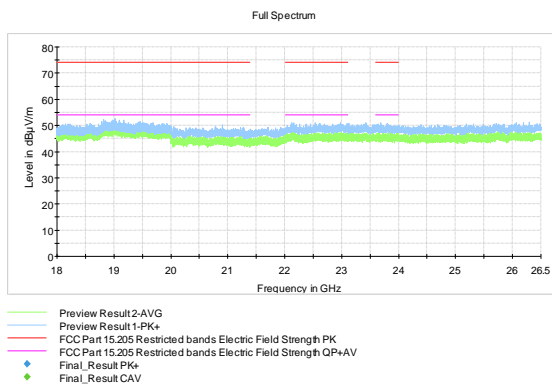


Figure 16: Top channel (18 - 26.5 GHz)

**Radiated Emissions and Band-Edge Measurement (9 kHz to 26.5 GHz)**
**Table 7:** Average results (top channel)

Frequency (MHz)	CAverage (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2485.100000	37.14	54.00	16.86	15 x 1000.0	1000.000	138.0	V	282.0	14.0
4959.900000	37.78	54.00	16.22	15 x 1000.0	1000.000	123.0	V	269.0	7.3
17958.200000	36.44	54.00	17.56	15 x 1000.0	1000.000	107.0	H	0.0	25.5

**Table 8:** Peak results (top channel)

Frequency (MHz)	MaxPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2480.250000	98.16	---	---	15 x 1000.0	1000.000	146.0	V	284.0	13.9
2483.500000	53.57	74.00	20.43	15 x 1000.0	1000.000	107.0	V	263.0	14.0
4959.600000	48.40	74.00	25.60	15 x 1000.0	1000.000	123.0	V	274.0	7.3
17984.000000	50.93	74.00	23.07	15 x 1000.0	1000.000	131.0	V	48.0	25.9

**TEST EQUIPMENT**

**Radiated Emissions**

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
ANTENNA	ROHDE & SCHWARZ	HFH2-Z2 , 335.4711.52	inv. 8013	2022-10-25	2024-10-25
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	EMCO	3117	inv. 7293	2022-06-16	2024-06-16
ANTENNA MAST	MATURO	TAM 4.0E	inv. 10181	NCR	NCR
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	2022-06-20	2023-06-20
FILTER	WAINWRIGHT	WHKX4.0/18G-10SS	inv. 10403	2021-01-29	2023-01-29
MAST & TURNTABLE CONTROLLER	MATURO	NCD	inv. 10183	NCR	NCR
RF PREAMPLIFIER	CIAO	CA118-3123	inv. 10278	2022-09-21	2023-09-21
RF PREAMPLIFIER	CIAO	CA1840-5019	inv. 10593	2022-09-21	2023-09-21
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	-	-
TURNTABLE	MATURO	DS430 UPGRADED	inv. 10182	NCR	NCR

NCR = No Calibration Required

**END OF REPORT**