Test Report

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: IC Rule Part:	15.225: 2019 RSS-210, Issue 10:2019 RSS-GEN, Issue 5:2018, Amd2:2021

Date:	29 March 2021	Date:	29 March 2021
Issued by:	Henri Mäki Testing Engineer	Checked by:	Mikko Halonen Development Engineer

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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	29 March 2021

PRODUCT DESCRIPTION

Equipment Under Test

Trade mark:	GE
Model:	Portrait HUB01
Type:	Mobile Patient Monitor
Serial no:	Sample 1: SRW20440005SP (RF_HUB_RFV_1) Sample 2: SRW20440013SP (RF_HUB_RFV_C1)
FCC ID:	2AO8L-HUB01
IC:	25821-HUB01

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 passive RFID tag (EPCglobal Gen-2) that 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 NFC.

Classification

Fixed device	☐
Mobile Device (Human body distance > 20cm)	☒
Portable Device (Human body distance < 20cm)	☒

Samples and Modifications

No.	Name	Description
1	RF_HUB_RFV_1	Radiated sample
2	RF_HUB_RFV_C1	Conducted sample

In both samples the PWB RF is reworked to be mass production equivalent.

Ratings and declarations

Operating Frequency Range (OFR):	13.56 MHz
Channels:	1
Channel separation:	N/A
Transmission technique:	Digital modulation
Modulation:	ISO/IEC 14443A 106 kbps
Antenna type:	Integrated loop antenna
Integral Antenna gain:	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
4 x Sensor Batteries	GE Portrait SBT01
Charger unit	GE Portrait BCH01, battery charging unit for the EUT and peripheral sensor batteries. Used during conducted emissions on power supply lines test.
AC/DC adapter	XP Power ACM36US12-XZ1110A, power supply for the charger unit.
Laptop	Dell Precision 3541, companion device for conducted emissions on power supply lines test.
AC/DC adapter	Dell HA65NM130, power supply for the laptop.

The peripherals were provided by the customer.

SUMMARY OF TESTING

Test Specification	Description of Test	Result
§15.203	Antenna Requirement	**PASS**
§15.207(a) / RSS-GEN 8.8	Conducted Emissions on Power Supply Lines	**PASS**
§15.209(a) / RSS-210 B.6(a)	Radiated Emissions	**PASS**
§15.215(c)	20 dB Bandwidth	**PASS**
§15.225(e) / RSS-210 B.6(b)	Frequency Stability	**PASS**
RSS-GEN 6.7	99% Occupied Bandwidth	**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:

- 1.0.0.4.0.13738 + NXP NfcFactoryTestApp GE GIT version 1f60180

During Conducted Emissions on Power Supply Lines measurement the EUT and peripheral sensor batteries were placed on a charger unit and the batteries were charging. The charger unit was connected via USB to a peripheral laptop, which was reading the battery charge levels during the test. During the test the EUT was set to transmit continuously. The AC mains input voltage was 120 V, 60 Hz.

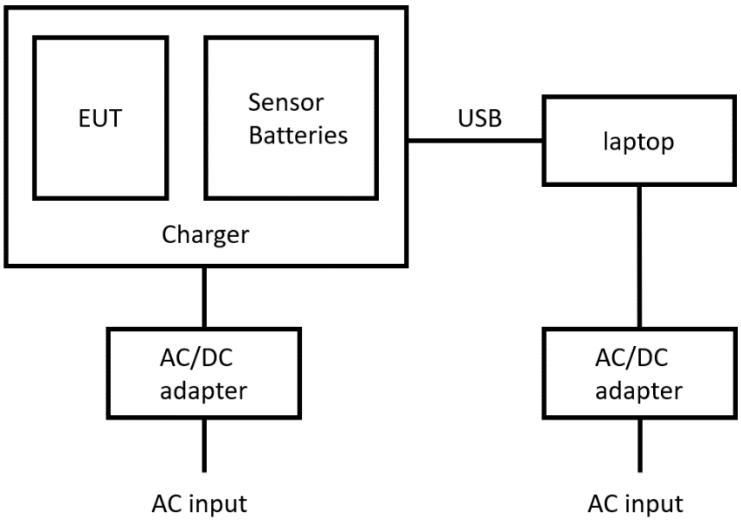

Figure 1: Test setup block diagram for conducted emissions on power supply lines

Table 1: Test frequencies

Channel	Frequency (MHz)
1	13.56

Test Facility

Testing Laboratory / address: FCC designation number: **FI0002** ISED CAB identifier: **T004**	SGS Fimko Ltd Takomotie 8 FI-00380, HELSINKI FINLAND
Test Site:	☐ K10LAB, ISED Canada registration number: **8708A-1** ☒ K5LAB, ISED Canada registration number: **8708A-2** ☐ T10LAB

TEST RESULTS

Antenna requirement

Standard: FCC Rule §15.203
Tested by: HEM
Date: 14 January 2021

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.	**PASS**
Note	Option 1 is used	

Conducted Emissions In The Frequency Range 150 kHz - 30 MHz

Standard:	ANSI C63.10-2013	
Tested by:	HEM	
Date:	1 February 2021	
Temperature:	23.1 °C	
Humidity:	17.1 %RH	
Barometric pressure:	990.6 mbar	
Measurement uncertainty:	± 2.9 dB	Level of confidence 95 % (k = 2)

FCC Rule: 15.207(a)
RSS-GEN 8.8

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in §15.207(a) and RSS-GEN 8.8, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN).

For equipment that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the equipment.

Conducted disturbance voltage was measured with an artificial mains network from 150 kHz to 30 MHz with 4 kHz steps and a resolution bandwidth of 9 kHz. Measurements were carried out with peak and average detectors.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *)	56 to 46 *)
0.5-5	56	46
5-30	60	50

*) Decreases with the logarithm of the frequency.

Results

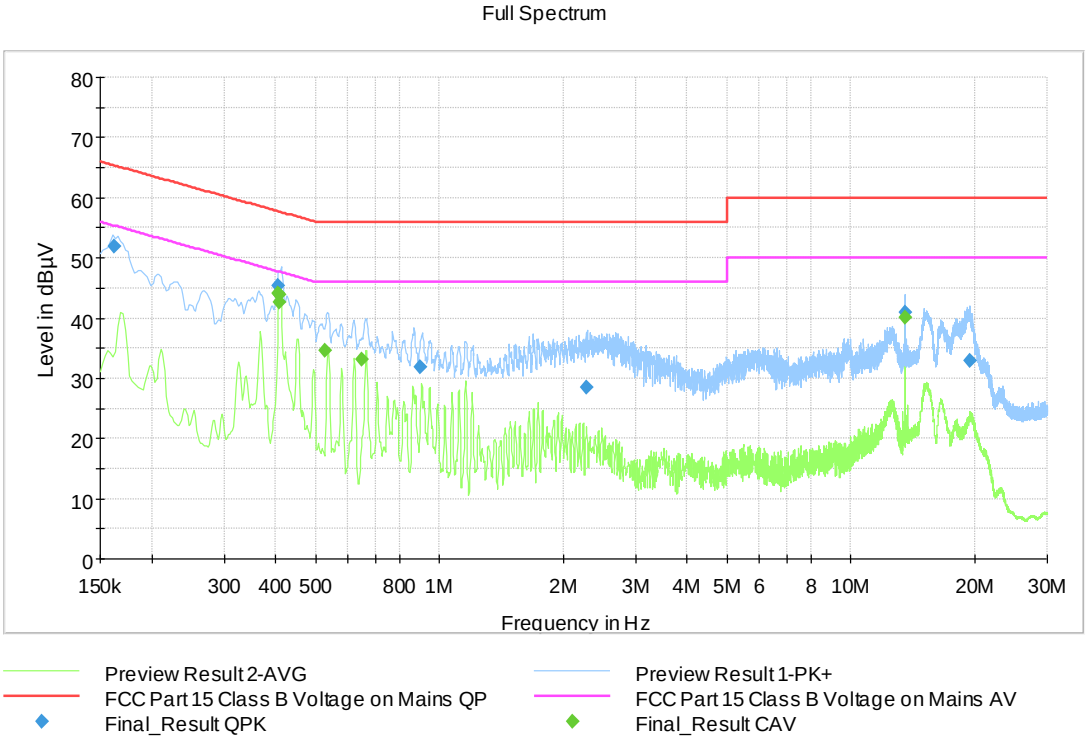

Figure 2: The measured curves with peak- and average detector

Table 2: Final QuasiPeak measurements from the worst frequencies

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.162000	51.96	65.36	13.40	1000.0	9.000	L1	9.6
0.404250	45.29	57.77	12.48	1000.0	9.000	L1	9.7
0.898750	31.85	56.00	24.15	1000.0	9.000	L1	9.8
2.270000	28.49	56.00	27.51	1000.0	9.000	N	9.9
13.562500	40.94	60.00	19.06	1000.0	9.000	N	10.3
19.416000	32.91	60.00	27.09	1000.0	9.000	N	10.5

Table 3: Final Average measurements from the worst frequencies

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.406000	44.13	47.73	3.60	1000.0	9.000	L1	9.7
0.407250	43.92	47.70	3.78	1000.0	9.000	L1	9.7
0.408750	42.62	47.67	5.05	1000.0	9.000	N	9.7
0.528000	34.69	46.00	11.31	1000.0	9.000	L1	9.7
0.648250	33.24	46.00	12.76	1000.0	9.000	L1	9.7
13.558500	40.18	50.00	9.82	1000.0	9.000	N	10.3

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

Radiated Emissions 9 kHz – 1 GHz

Standard:	ANSI C63.10-2013	
Tested by:	HEM	PKA
Date:	26 January 2021	27 January 2021
Temperature:	23.4 °C	23.5 °C
Humidity:	24.2 %RH	24.6 %RH
Barometric pressure:	994.1 mbar	992.9 mbar
Measurement uncertainty:	± 4.51 dB, level of confidence 95 % (k = 2)	

FCC Rule: 15.225(a)-(d)

RSS-210 B.6(a)

The field strength of any emissions within the band 13.110-14.010 MHz shall not exceed the following limits:

Frequency range [MHz]	Limit [µV/m]	Distance [m]	Detector
13.110 - 13.410	106	30 *)	Quasi-peak
13.410 - 13.553	334	30 *)	Quasi-peak
13.553 - 13.567	15848	30 *)	Quasi-peak
13.567 - 13.710	334	30 *)	Quasi-peak
13.710 - 14.010	106	30 *)	Quasi-peak

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209 and RSS-GEN.

Frequency range [MHz]	Limit [µV/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 - 30.0	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

*) 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.

Results

Figure 3: 9 kHz – 30 MHz

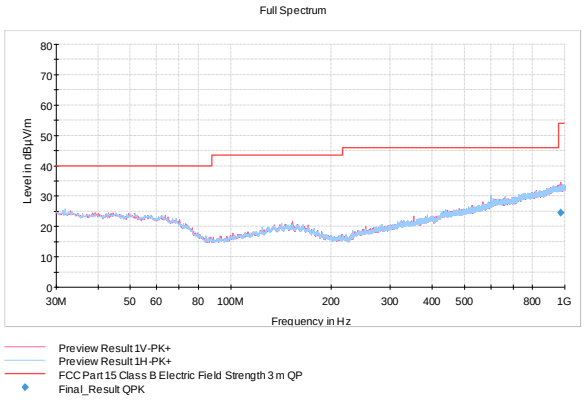

Figure 4: 30 – 1000 MHz

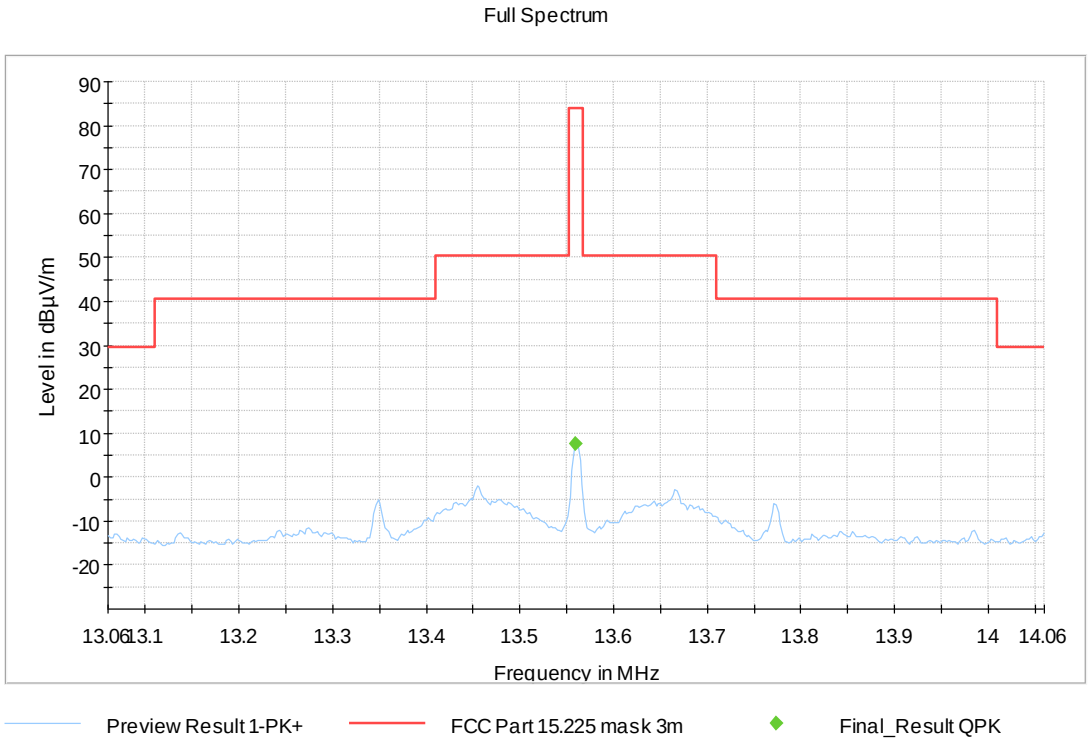

Figure 5: Operation within the band 13.110 – 14.010 MHz

Table 4: Quasi-peak results

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
13.559000	7.63	84.00	76.37	1000.0	9.000	190.0	V	0.0	-20.0
973.785000	24.55	53.90	29.35	1000.0	120.000	207.0	V	22.0	32.2

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

20 dB Bandwidth

Standard:	ANSI C63.10-2013
Tested by:	HEM
Date:	14 January 2021
Temperature:	22.0 °C
Humidity:	15.7 %RH
Barometric pressure:	1014.2 mbar
Measurement uncertainty:	0.0005 %, level of confidence 95 % (k = 2)

FCC Rule: 15.215(c)

Intentional radiators operating under the alternative provisions to the general emission limits must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated.

Results:

Table 5: 20 dB bandwidth test results

20 dB BW [kHz]	Limit	Result
332.302	within 13.110-14.010 MHz	PASS

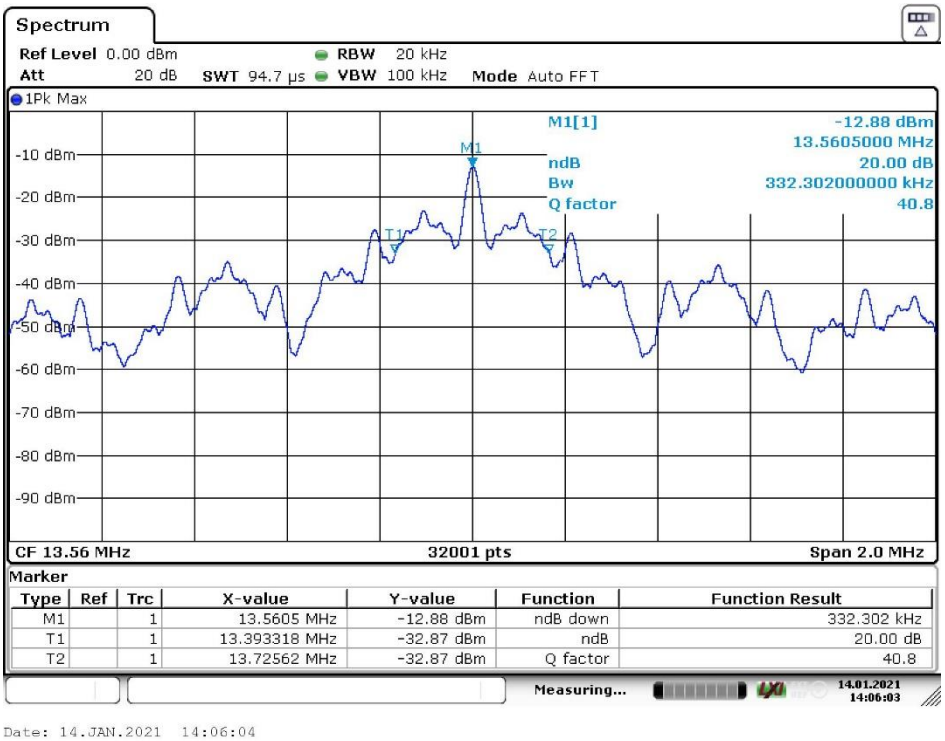

Figure 6: 20 dB bandwidth

Frequency Stability

Standard:	ANSI C63.10-2013
Tested by:	HEM
Date:	14 January 2021
Temperature:	22.0 °C
Humidity:	15.7 %RH
Barometric pressure:	1014.2 mbar
Measurement uncertainty:	±5.380 ppm, level of confidence 95 % (k = 2)

FCC Rule: 15.225(e)
RSS-210 B.6(b)

The frequency tolerance of the carrier signal shall be maintained within ±0.01% (±100 ppm) of the operating frequency over a temperature variation.

Results:

Table 6: Frequency stability test results

Temperature [°C]	Measured [MHz]	Deviation [ppm]	Result
+0	13.5605384850	39.7	**PASS**
+10	13.5605267900	38.8	**PASS**
+20	13.5605031450	37.1	**PASS**
+30	13.5604719580	34.8	**PASS**
+40	13.5604507710	33.2	**PASS**

99% Occupied Bandwidth

Standard: RSS-GEN (2019)
Tested by: HEM
Date: 14 January 2021
Temperature: 22.0 °C
Humidity: 15.7 %RH
Barometric pressure: 1014.2 mbar
Measurement uncertainty: 0.0005 %, level of confidence 95 % (k = 2)

RSS-GEN 6.7

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained.

Results:

Table 7: 99% occupied bandwidth test results

99% BW [kHz]	Limit
1136.339489	-

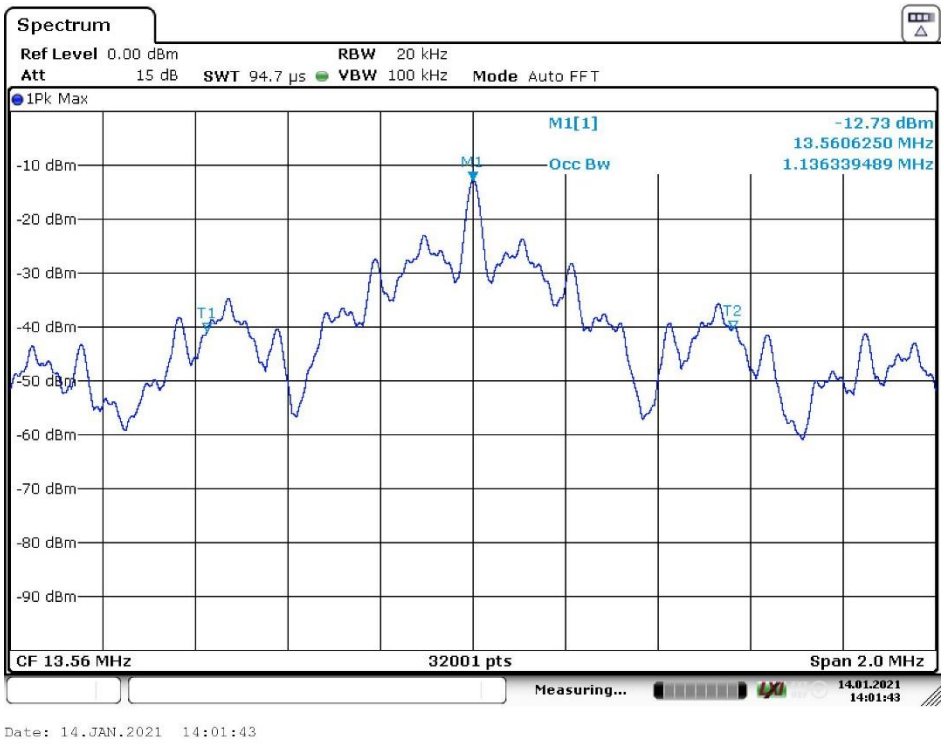

Figure 7: 99% occupied bandwidth

TEST EQUIPMENT

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
ANTENNA	ROHDE & SCHWARZ	HFH-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 MAST	MATURO	TAM 4.0E	inv. 10181	NCR	NCR
ATTENUATOR	PASTERNACK	PE 7004-4 (4dB)	inv. 10126	2019-04-01	2021-04-01
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv. 10679	2020-07-20	2021-07-20
LISN	ROHDE & SCHWARZ	ENV216	inv. 9611	2020-03-03	2021-03-03
LISN	ROHDE & SCHWARZ	ESH3-Z5	inv. 8019	2020-05-19	2021-05-19
MAST & TURNTABLE CONTROLLER	MATURO	NCD	inv. 10183	NCR	NCR
POWER SUPPLY	CALIFORNIA INSTR.	5001 iX Series II	inv. 7826	NCR	NCR
SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSV40	inv. 10881	2020-06-10	2021-09-06
TEMPERATURE CHAMBER	CTS	T-65/50	inv. 10521	NCR	NCR
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	-	-
TURNTABLE	MATURO	DS430 UPGRADED	inv. 10182	NCR	NCR

NCR = No calibration required

END OF REPORT