

Test Report



INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 C REQUIREMENTS

Equipment Under Test: Handheld PTT communication device

Type: Aina Kepler

Customer: AINA Wireless Finland Oy
Joensuunkatu 7 G
FI-24100 Salo
FINLAND

Manufacturer: AINA Wireless Finland Oy
Joensuunkatu 7 G
FI-24100 Salo
FINLAND

FCC Rule Part: 15.209: 2019

Date: 15 May 2020

Issued by:

A blue ink signature of Pekka Kälviäinen.

Pekka Kälviäinen
Testing Engineer

Date:

15 May 2020

Checked by:

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Rauno Repo
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Equipment Under Test (EUT)

Handheld PTT communication device

Type:	Aina Kepler
Serial no:	NA2
FCC ID:	2AH78-AKEPLER
IC:	21419-AKEPLER
Cellular module:	Quectel EC25-AF
FCC ID:	XMR201808EC25AF
IC:	10224A-2018EC25AF
Battery:	Rechargeable Li-Polymer Battery
Type:	VARTA Storage GmbH, EZPack XL

Description of the EUT

The equipment under test (EUT) is hand held PTT communication device with 2.4GHz ISM, 13.56 MHz NFC, GNSS and cellular capabilities.

Classification of the device

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

Modifications Incorporated in the EUT

No modifications.

Power Supply

EUT:	Rechargeable Li-Polymer Battery
Nominal Voltage:	3.7 VDC
Battery:	
Rated capacity:	3.7V 2400mAh 8.9Wh

Peripherals

none

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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.

SUMMARY OF TESTING

Test Specification	Description of Test	Result
§15.209(a)	Radiated Spurious Emissions	PASS

EUT Test Conditions during Testing

All radio modules were set to operate.

- ISM, txf = 2440 MHz
- 3G WCDMA, txf= 1880 MHz (system simulator 1960 MHz)
- NFC, txf = 13.56 MHz, no tag
- GNSS receiver on

Test Facility

Testing Laboratory / address: FCC designation number: FI0002 ISED CAB identifier: T004	SGS Fimko Ltd Takomotie 3 FI-00380, HELSINKI FINLAND
Test Site:	☐ K10LAB, ISED Canada registration number: 8708A-1 ☒ K5LAB, ISED Canada registration number: 8708A-2 ☐ T10LAB

TEST RESULTS**Transmitter Radiated Spurious Emissions 0.009 MHz – 26.5 GHz**

Standard:	ANSI C63.10	(2013)
Tested by:	JAT	
Date:	18 October 2019	
Temperature:	23 ± 3 °C	
Humidity:	20 - 60 % RH	
Measurement uncertainty:	± 4.51 dB	Level of confidence 95 % (k = 2)

FCC Rule: §15.31(h), §15.209(a)

The correction factor in the final result tables contains the sum of the transducers (antenna + amplifier + cables).
Spurious emissions were measured while the radios of the EUT were set to continuous transmission.

Transmitter Radiated Spurious Emissions 30 MHz – 40 GHz

TEST RESULTS, all radios transmit

Full Spectrum

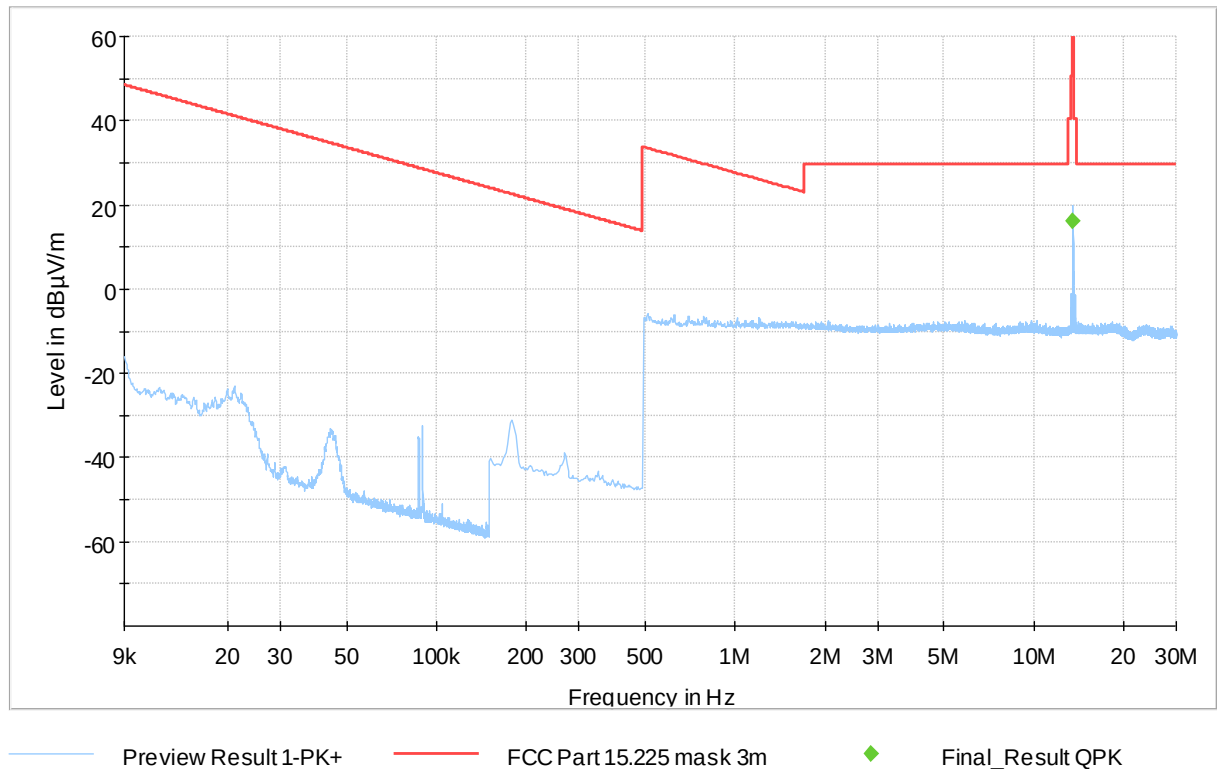


Table 1. Final QP results

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	16.08	*)	*)	1000.0	9.000	190.0	V	53.0	-20.5

*) Fundamental of the NFC (15.225 limit 80.0 dBμV/m)

According to ANSI C63.10 (clause 5.3.2) and RSS-Gen (Clause 4.11) the measurements below 30 MHz can be performed at a closer distance than the EUT limit distance, the results shall be extrapolated to limit distance by using the square of an inverse linear distance extrapolation factor (40 dB/ decade). This method was used when performing measurements at a distance of 3 m instead of limit distances 300 m or 30 m.

Transmitter Radiated Spurious Emissions 30 MHz – 40 GHz

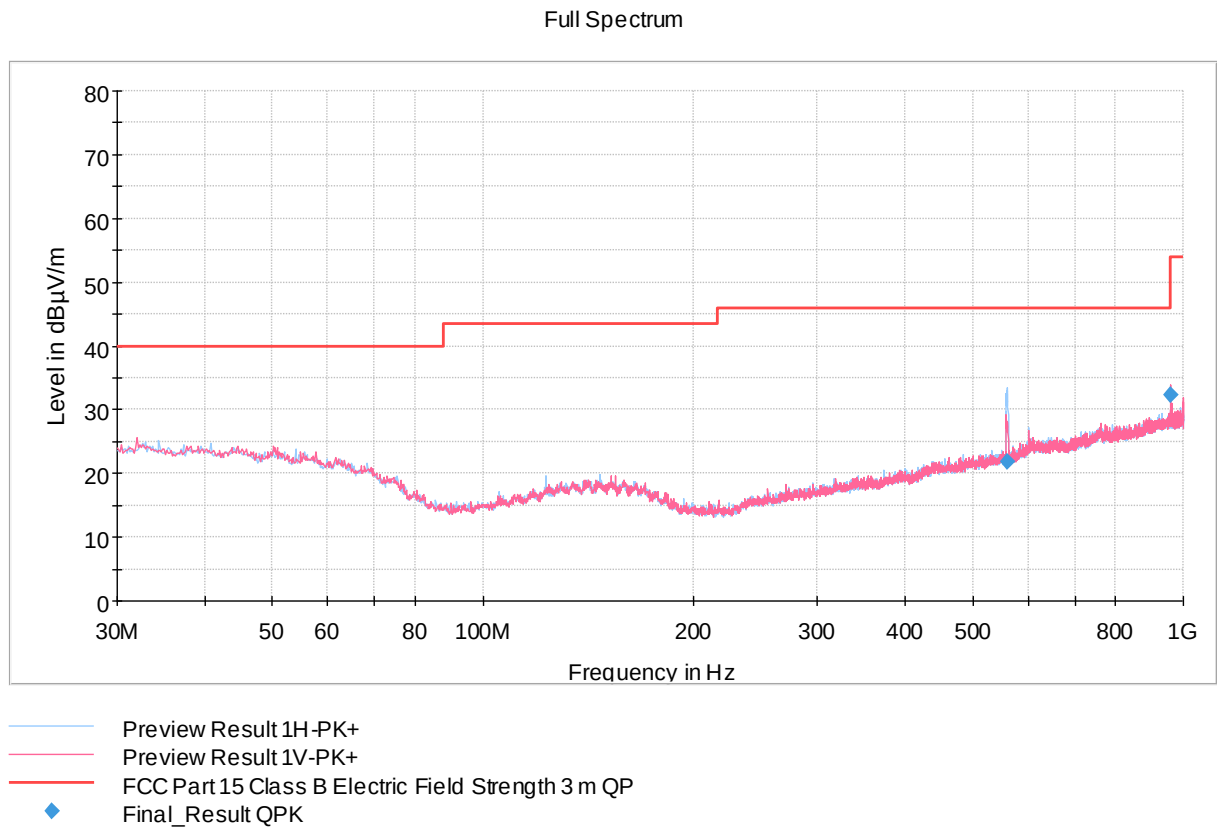


Figure 1. Spurious emissions 30 MHz to 1 GHz

Table 2. Final QP results

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
559.595000	21.88	46.00	24.12	1000.0	120.000	105.0	H	150.0	22.5
960.015000	32.38	53.90	21.52	1000.0	120.000	114.0	V	161.0	27.8

Transmitter Radiated Spurious Emissions 30 MHz – 40 GHz

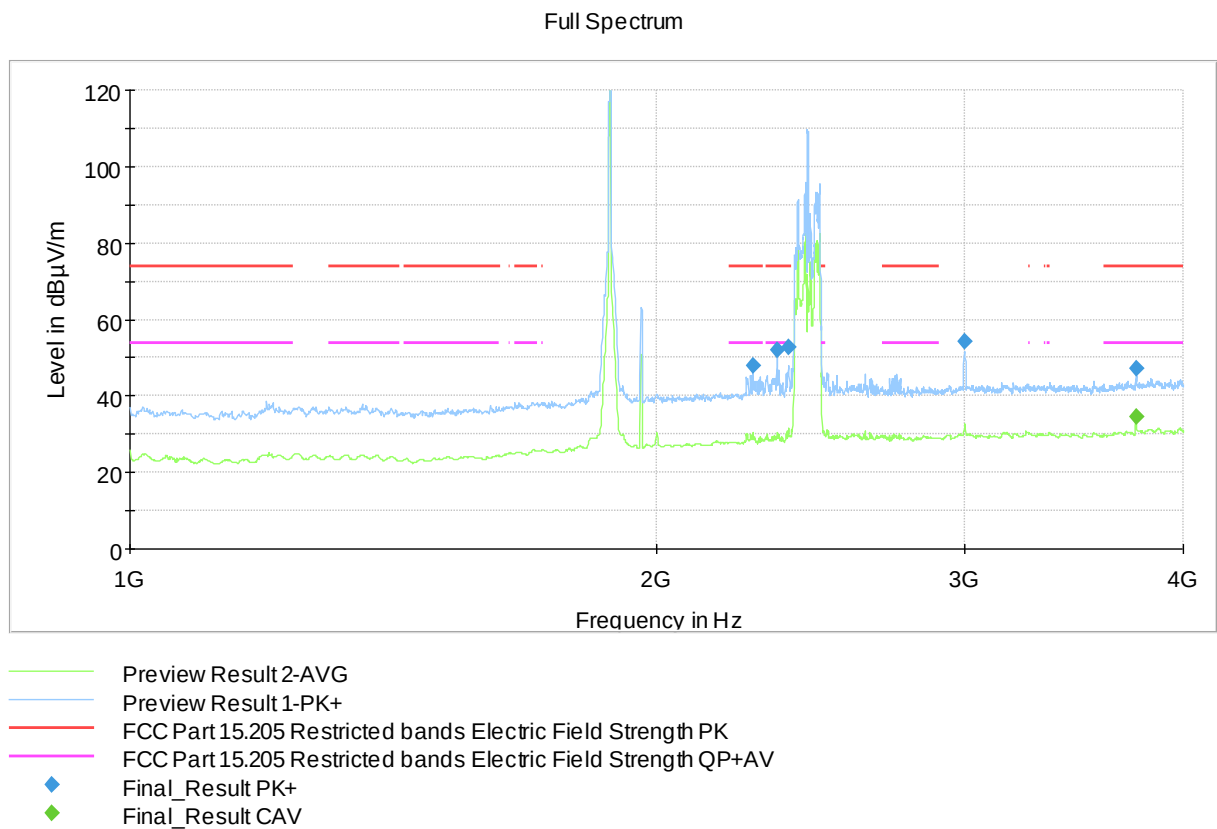


Figure 2. Spurious emissions 1 GHz to 4 GHz

Table 3. Final Peak results

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin	Meas. Time (ms)	Bandwidth h	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2269.975000	47.77	74.00	26.23	1000.0	1000.000	153.0	H	172.0	5.3
2343.975000	51.99	74.00	22.01	1000.0	1000.000	161.0	V	125.0	5.4
2379.175000	52.69	74.00	21.31	1000.0	1000.000	248.0	H	133.0	5.9
2999.925000	-65.70dBc	-20dBc	45.70	1000.0	1000.000	107.0	V	124.0	6.9
3758.525000	47.12	74.00	26.88	1000.0	1000.000	140.0	H	210.0	7.7

Table 4. Final 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)
3761.625000	34.50	54.00	19.50	1000.0	1000.000	107.0	H	194.0	7.7

Transmitter Radiated Spurious Emissions 30 MHz – 40 GHz

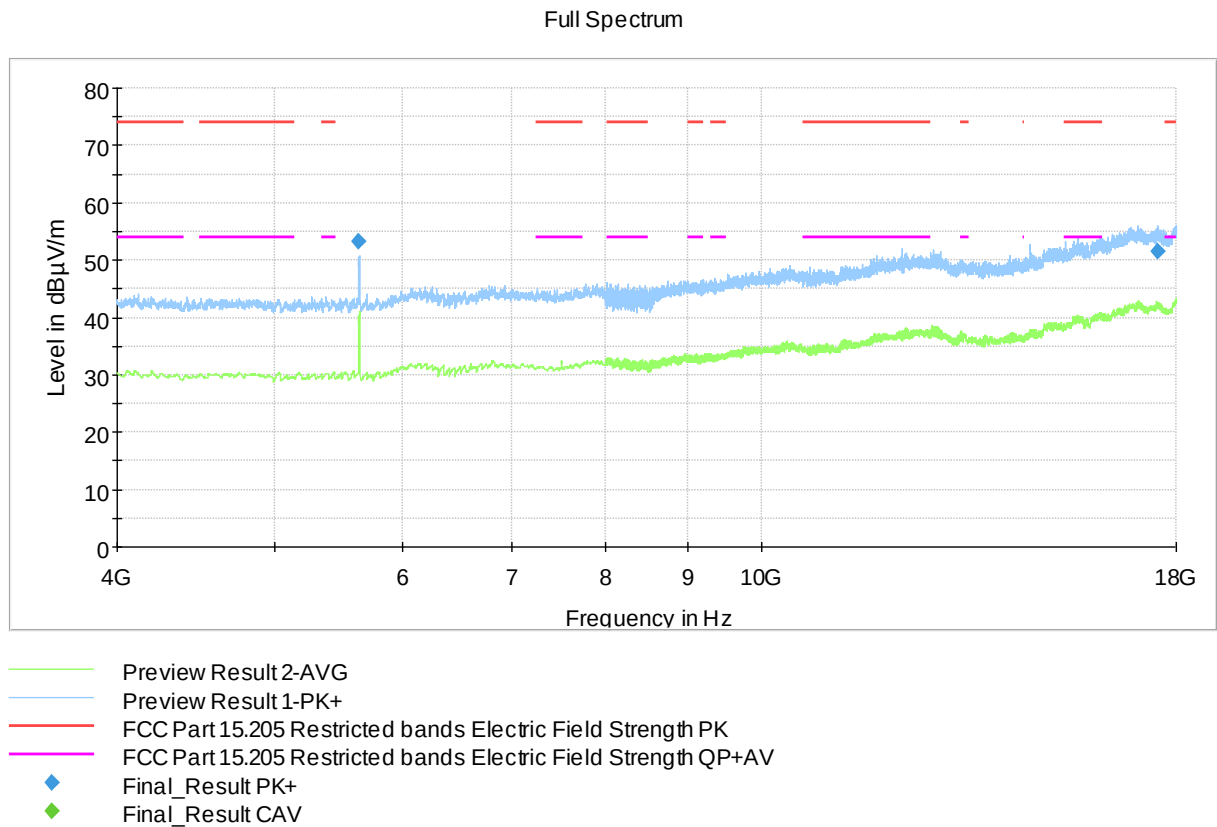


Figure 4. Spurious emissions 4 GHz to 18 GHz

Table 5. Final Peak results

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
5637.875000	-66.76dBc	-20dBc	46.76	1000.0	1000.000	105.0	H	213.0	8.2
17516.925000	-68.37dBc	-20dBc	48.37	1000.0	1000.000	324.0	H	348.0	23.6

Transmitter Radiated Spurious Emissions 30 MHz – 40 GHz

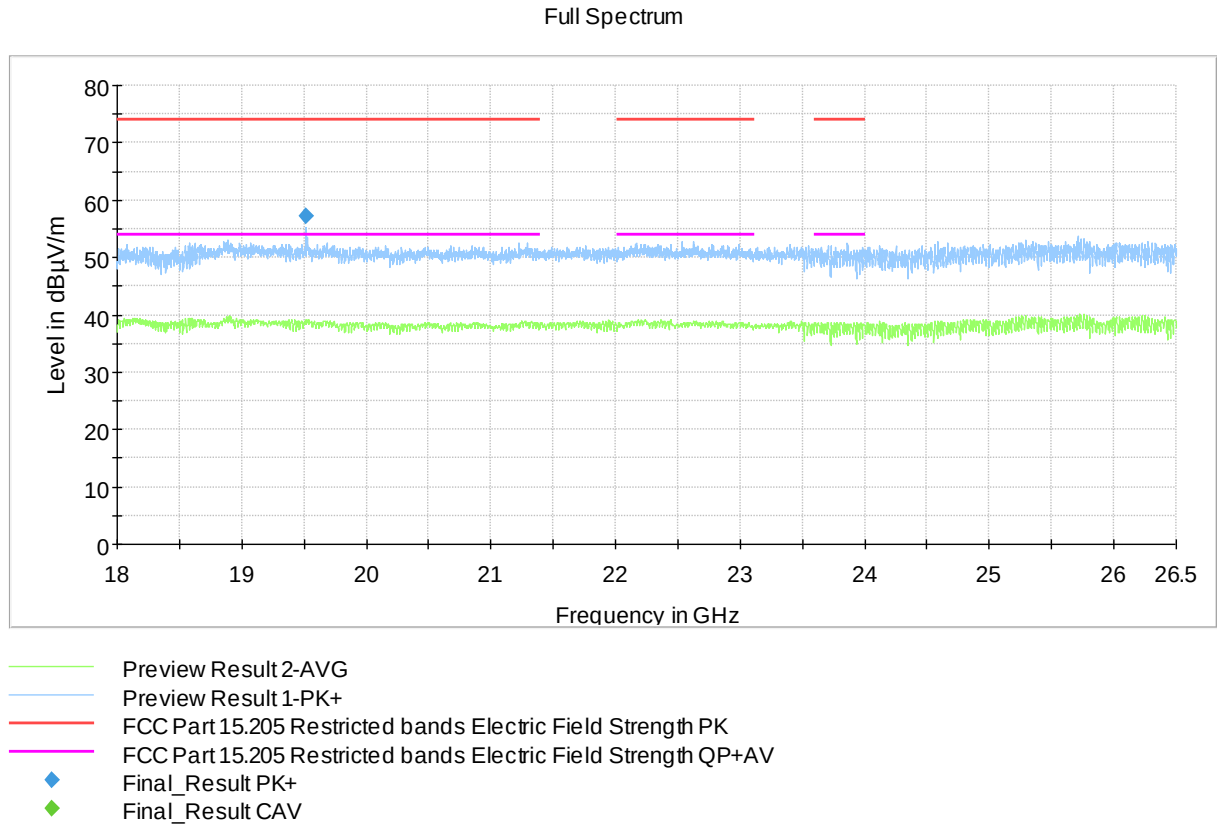


Figure 5. Spurious emissions 18 GHz to 26.5 GHz

Table 6. Final Peak results

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19515.775000	57.28	73.90	16.62	1000.0	1000.000	162.0	V	343.0	5.9

TEST EQUIPMENT

RF-Test Equipment

Equipment	Manufacturer	Type	Inv or serial	Prev Calib	Next Calib
ANTENNA (MONITORING)	A.H. SYSTEMS	SAS-200/518	inv:7873	NCR	-
SPECTRUM ANALYZER	AGILENT	E7405A	inv:9746	2016-01-07	2020-01-08
PREAMPLIFIER	CIAO	CA118-3123	inv:10278	2019-10-09	2020-10-09
RF PREAMPLIFIER	CIAO	CA1840-5019	inv:10593	2019-10-08	2020-10-08
ANTENNA	EMCO	3117	inv:7293	2018-03-14	2020-03-14
ANTENNA	EMCO	3160-09	inv:7294	2019-03-11	2020-03-11
ANTENNA	ROHDE & SCHWARZ	HFH2-Z2	inv:8013	2018-03-23	2020-03-23
ANTENNA	SCHWARZBECK	VULB 9168	inv:8911	2018-03-23	2020-03-23
TURNTABLE	MATURO	DS430 UPGRADED	inv:10182	NCR	-
MAST & TURNTABLE CONTROLLER	MATURO	NCD	inv:10183	NCR	-
ANTENNA MAST	MATURO	TAM 4.0E	inv:10181	NCR	-
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	NCR	-
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv:10679	2019-06-28	2020-06-27
ATTENUATOR	PASTERNAK	PE 7004-4	inv:10126	2019-04-01	2021-04-01
ATTENUATOR	HUBER&SUHNER	6606.19.AA (A4)	inv:10393	2019-04-01	2021-04-01
HIGH PASS FILTER	WAINWRIGHT	WHKX4.0/18G-10SS	inv:10403	2019-04-01	2021-04-01
BAND REJECT FILTER	WAINWRIGHT	WRCG2400/2483-2490/2493-35/10SS	inv:8029	2019-04-01	2021-04-01
BAND REJECT FILTER	WAINWRIGHT	WRCD1877.5/1882.5-1875/1885-40/10SS	inv:10613	2019-04-01	2021-04-01
COMMUNICATION ANALYZER	ANRITSU	MT8820C	inv:10669	2019-06-19	2020-06-12

NCR = No calibration required

END OF TEST REPORT