

Test Report



INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 C and INDUSTRY CANADA REQUIREMENTS

Equipment Under Test: Radiation Meter with BT LE and 915MHz radio

Brand name: Mirion

Type/ Model: RDS-32

Manufacturer: Mirion Technologies (RADOS) Oy
Mustionkatu 2
FI-20101 Turku
FINLAND

Customer: Mirion Technologies (RADOS) Oy
Mustionkatu 2
FI-20101 Turku
FINLAND

FCC Rule Part: 15.249: 2019
IC Rule Part: RSS-210: Issue 10, 2019

Date: 24 May 2021

Issued by:

A blue ink signature of Pekka Kälviäinen.

Pekka Kälviäinen
Test Engineer

24 May 2021

A blue ink signature of Rauno Repo.

Rauno Repo
Senior EMC/RF Specialist

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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	11 June 2020
1.1	Standard version corrected (RSS-210)	24 May 2021

Equipment Under Test (EUT)

Radiation Meter

Brand name: Mirion
Type/ Model: RDS-32
Serial Number: 002
FCC ID: 2AH18-RDS-32
IC: 26167-RDS32

The EUT is a radiation meter. The EUT uses 2.4 GHz Low Energy Bluetooth and 915 MHz transmission. Only 2.4 GHz Low Energy Bluetooth was operating during the tests.

Classification of the device

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

Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

Ratings and declarations

2.4GHz:

Operating Frequency Range (OFR): 2402 - 2480 MHz
Channels: 40 channels
Channel separation: 2 MHz
Transmission technique: FHSS
Modulation: GFSK
Integrated antenna gain: 1.2 dBi

915 MHz:

Operating Frequency Range (OFR): 902 - 928 MHz
Channels: 7 hop sequences share 25 frequencies
Transmission technique: FHSS
Modulation: FSK/GFSK
Integral Antenna gain: 1.9 dBi

Power Supply

The EUT is an internal battery (3.0 V, 2x1.5 V AA batteries) powered device.

Mechanical Size of the EUT

Height: 32 mm

Width: 70 mm

Length: 115 mm

SUMMARY OF TESTING

Test Specification	Description of Test	Result
§15.203	Antenna requirement	PASS
§15.249, a / RSS-210 B.10(a)	Maximum Peak Radiated Output Power	PASS
RSS-GEN 6.6	99 % Occupied Bandwidth	PASS
§15.249, a	20 dB Bandwidth	PASS
§15.249, a / RSS-210 B.10(b)	Unintentional Radiated Emissions	PASS

EUT Test Conditions during Testing

The EUT was configured into the wanted channel and was in continuous transmit mode during all the tests.

During the radiated measurements above 1 GHz the EUT was on 150 cm high Styrofoam table. New battery was installed before the measurements.

The EUT was tested in X, Y, Z positions. The highest levels were reported.

Following channels were used during the tests:

Channel	Frequency/ MHz
Low (CH 0)	2402
Mid (CH 12)	2426
High (CH 39)	2480

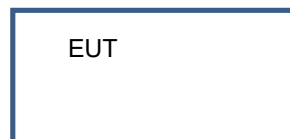


Figure 1: Test setup blocking diagram

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 checked="" type="checkbox"/> K10LAB, ISED Canada registration number: 8708A-1 <input checked="" type="checkbox"/> K5LAB, ISED Canada registration number: 8708A-2 <input type="checkbox"/> T10LAB

Antenna requirement

Standard: FCC Rule §15.203
Tested by: PKA
Date: 09 June 2020

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	

Maximum Peak Conducted Output Power
Maximum Peak Radiated Output Power

Standard: ANSI C63.10 (2013)
Tested by: PKA
Date: 4 - 5 May 2020
Temperature: 22 ± 3 °C
Humidity: 30 - 60 % RH
Measurement uncertainty ± 4.5 dB Level of confidence 95 % (k = 2)

FCC Rule: 15.249
RSS-210

Results:

Channel	Radiated Power/Peak [dBµV/m]	Peak Limit [dBµV/m]	Margin [dB]	Result
Low	96.75	114.0	17.25	PASS
Mid	97.27	114.0	16.73	PASS
High	96.53	114.0	17.45	PASS

Channel	Radiated *) Power/Average [dBµV/m]	AV Limit [dBµV/m]	Margin [dB]	Result
Low	44.76	94.0	49.24	PASS
Mid	45.28	94.0	48.72	PASS
High	44.54	94.0	49.46	PASS

*) Calculated: peak value - correction factor = result

Transmitter Radiated Emissions 0.009 MHz to 26.5 GHz
Transmitter Radiated Emissions 0.009 MHz to 26.5 GHz

Standard: ANSI C63.10 (2013)
Tested by: PKA, HEM
Date: 4 - 5 May 2020
Temperature: 22 ± 3 °C
Humidity: 30 - 60 % RH
Measurement uncertainty ± 4.51 dB Level of confidence 95 % (k = 2)

FCC Rule: 15.249
RSS-210

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.

Results:

low channel

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1.718250	-13.15	29.50	42.65	9.000	100.0	0deg	237.0	-20.5
33.498000	24.07	40.00	15.93	120.000	354.0	H	357.0	16.6
890.136000	27.51	46.00	18.49	120.000	333.0	V	168.0	26.9

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2399.600000 *)	60.50	---	73.90	13.40	1000.000	173.0	V	71.0	13.9
2400.000000 *)	---	45.77	53.90	8.13	1000.000	172.0	V	64.0	13.9
4803.975000	---	45.21	53.90	8.69	1000.000	105.0	H	300.0	7.4
4804.525000	51.02	---	73.90	22.88	1000.000	100.0	H	303.0	7.4
7206.425000	---	51.34	53.90	2.56	1000.000	206.0	H	286.0	10.4
7206.625000	58.17	---	73.90	15.73	1000.000	198.0	H	287.0	10.4
12011.025000	---	45.19	53.90	8.71	1000.000	115.0	H	157.0	17.0
12011.125000	53.82	---	73.90	20.08	1000.000	135.0	H	196.0	17.0

*) Low band edge

Mid Channel

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1.676250	-13.22	23.15	36.37	9.000	100.0	0deg	333.0	-20.5
42.445000	23.36	40.00	16.64	120.000	298.0	H	242.0	17.5
948.732000	27.75	46.00	18.25	120.000	353.0	H	353.0	27.8

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4851.875000	---	44.19	53.90	9.71	1000.000	255.0	V	69.0	7.3
4852.475000	50.52	---	73.90	23.38	1000.000	242.0	V	64.0	7.3
7277.275000	---	51.90	53.90	2.00	1000.000	223.0	V	264.0	10.2
7278.775000	58.24	---	73.90	15.66	1000.000	221.0	V	264.0	10.2
12128.575000	52.32	---	73.90	21.58	1000.000	223.0	V	140.0	16.9
12131.025000	---	42.65	53.90	11.25	1000.000	212.0	V	159.0	16.9

Transmitter Radiated Emissions 0.009 MHz to 26.5 GHz

High channel

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1.666000	-13.17	23.20	36.37	9.000	100.0	90deg	19.0	-20.5
37.738000	23.79	40.00	16.21	120.000	109.0	H	204.0	17.0
922.497000	28.34	46.00	17.66	120.000	172.0	V	124.0	27.5

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.500000 *)	---	37.23	53.90	16.67	1000.000	163.0	V	0.0	13.7
2490.500000 *)	49.67	---	73.90	24.23	1000.000	381.0	V	98.0	13.6
4959.975000	---	43.31	53.90	10.59	1000.000	115.0	V	349.0	7.3
4960.425000	50.02	---	73.90	23.88	1000.000	100.0	V	349.0	7.3
7439.175000	55.48	---	73.90	18.42	1000.000	231.0	V	17.0	10.1
7440.575000	---	46.91	53.90	6.99	1000.000	235.0	V	14.0	10.2
12398.725000	50.83	---	73.90	23.07	1000.000	145.0	V	22.0	16.8
12400.975000	---	40.56	53.90	13.34	1000.000	145.0	V	26.0	16.9

*) High band edge

Test results, graphics

Full Spectrum

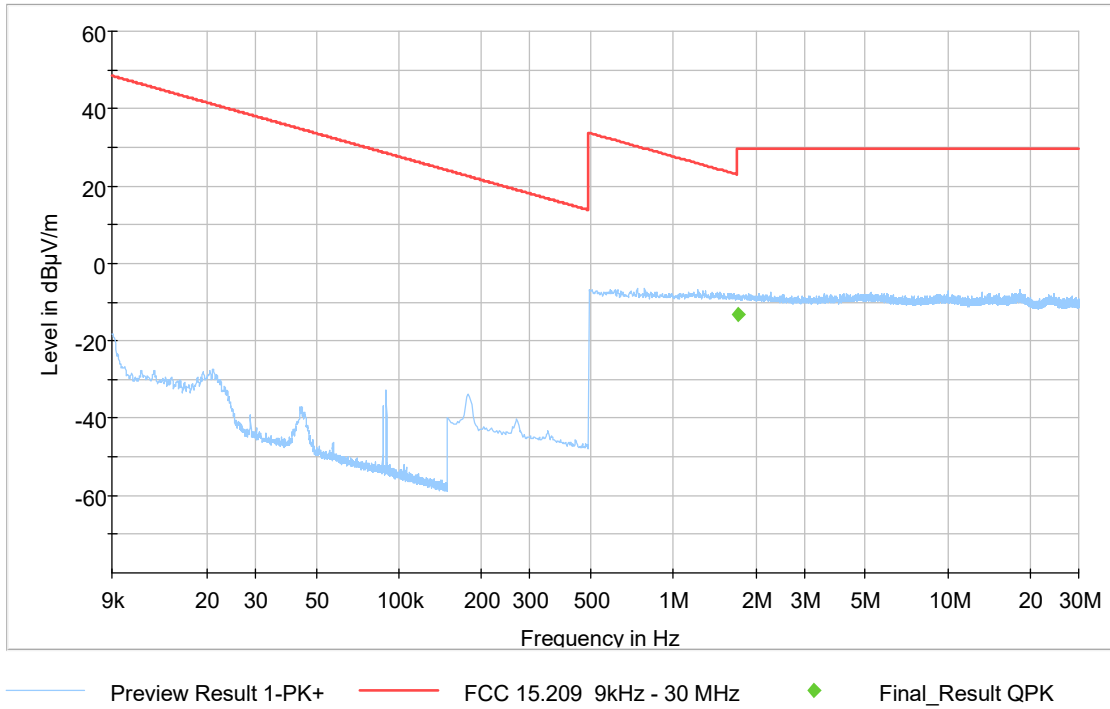


Figure 2. Measured curve with peak detector (Low channel).

Full Spectrum

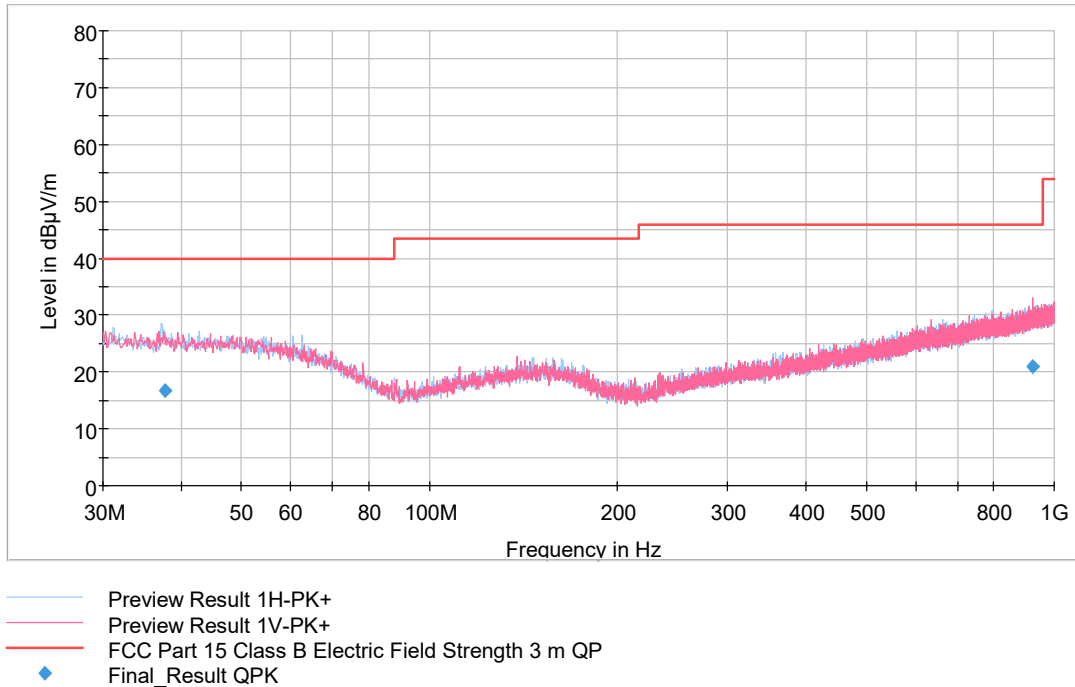


Figure 3. Measured curve with peak detector (High channel).

Transmitter Radiated Emissions 0.009 MHz to 26.5 GHz

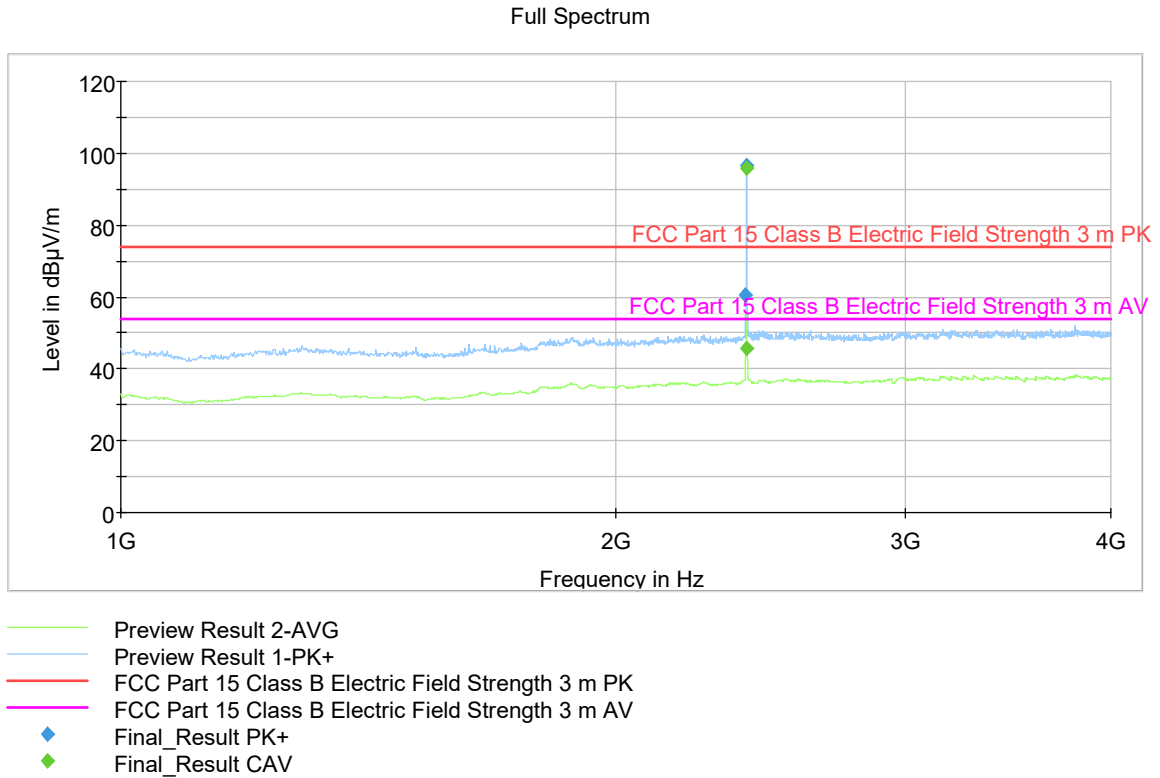


Figure 4. Measured curve with peak and average detectors (Low channel).

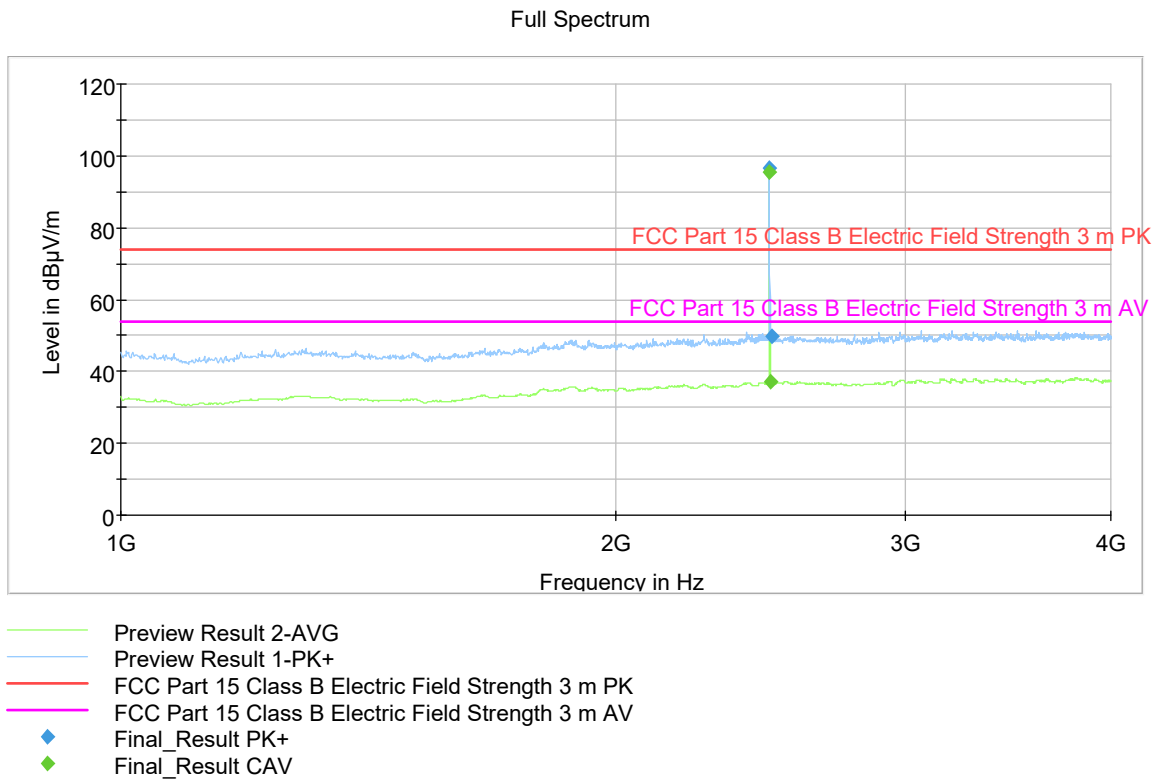


Figure 5. Measured curve with peak and average detectors (High channel).

Transmitter Radiated Emissions 0.009 MHz to 26.5 GHz

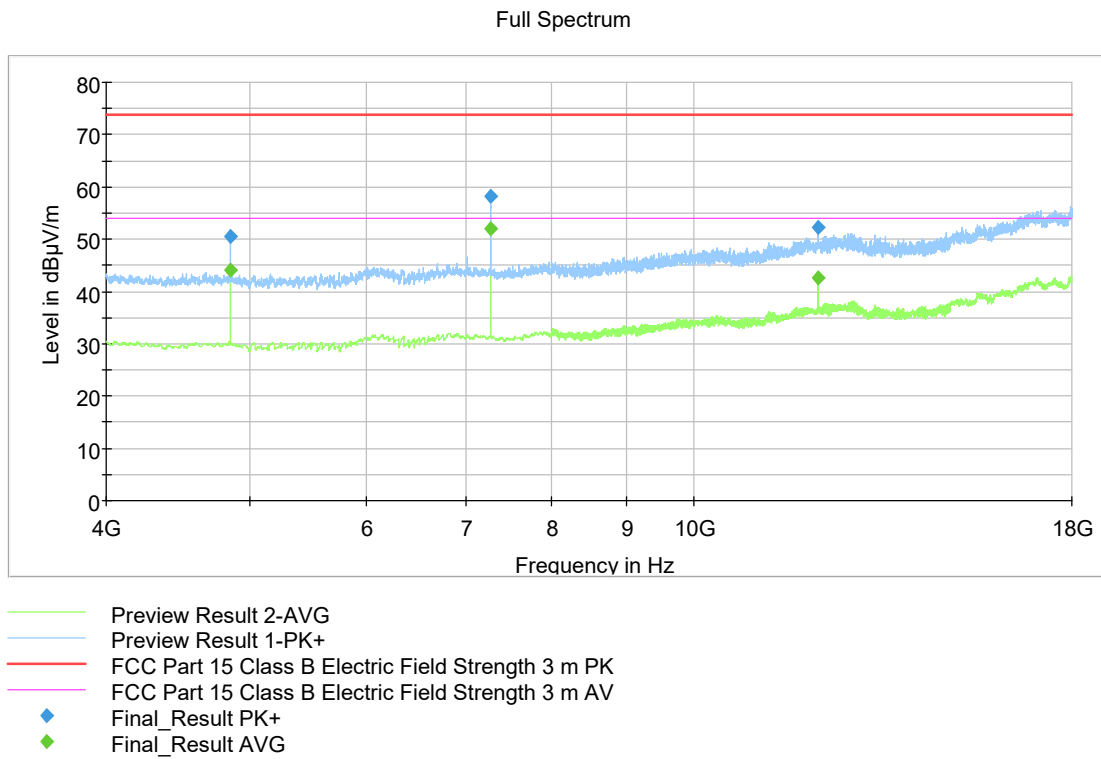


Figure 6. Measured curve with peak and average detectors (Mid channel).

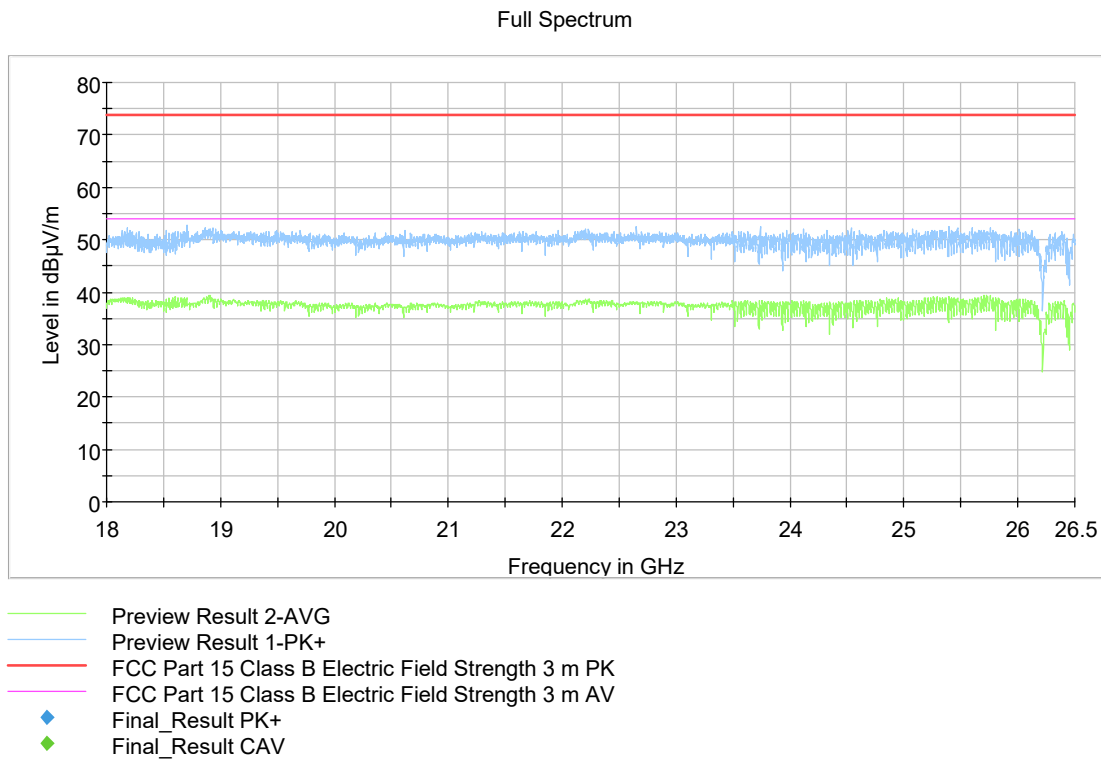


Figure 7. Measured curve with peak and average detectors (Low channel).

99% Occupied Bandwidth, 20 dB Bandwidth

Standard: RSS-GEN (2019) ANSI C63.10 (2013)
Tested by: PKA
Date: 5 May 2020
Temperature: 22 ± 3 °C
Humidity: 30 - 60 % RH

RSS-GEN 6.6

FCC Rule: 15.249

Results:

99 % OBW test results.

Channel	Limit	99 % BW [MHz]	Result
Low	-	1.053946054	PASS
Mid	-	1.058941059	PASS
High	-	1.058941059	PASS

20 dB BW test results.

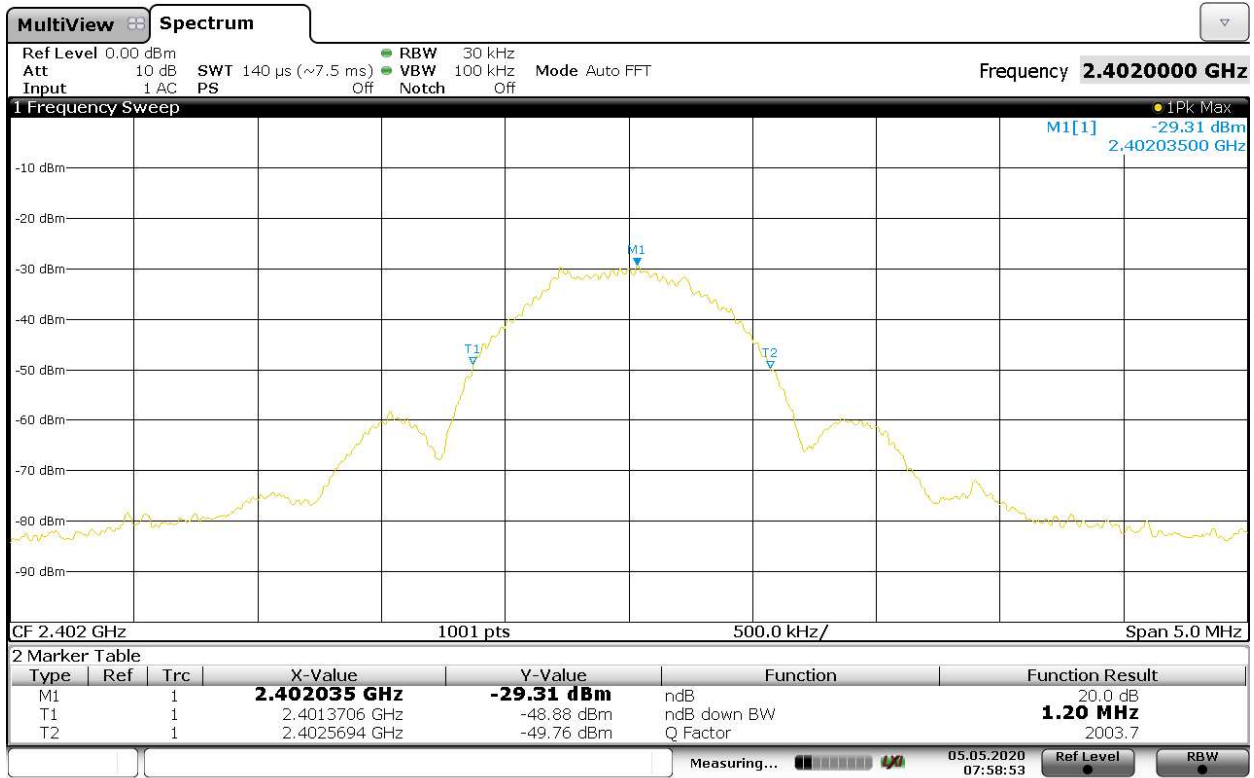
Channel	Limit	20 dB BW [MHz]	Result
Low	-	1.20	PASS
Mid	-	1.20	PASS
High	-	1.20	PASS

99% Occupied Bandwidth



07:48:51 05.05.2020

Figure 8. 99 % OBW. High channel.



07:58:53 05.05.2020

Figure 9. 20 dB BW. Low channel.

Duty cycle correction factor, Transmit time in 100 ms

Spectrum analyzer with zero span was used to investigate spectrum.

15.35(c) Unless otherwise specified, e.g. § 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

Pulses / 100 ms = 1

Length of one pulse = 0.2514 ms

DutyCycleCorrectionFactor = $20 \cdot \log(\text{Tocc}/100) = 20 \cdot \log(1 \cdot 0.2514/100) = -51.99 \text{ dB}$

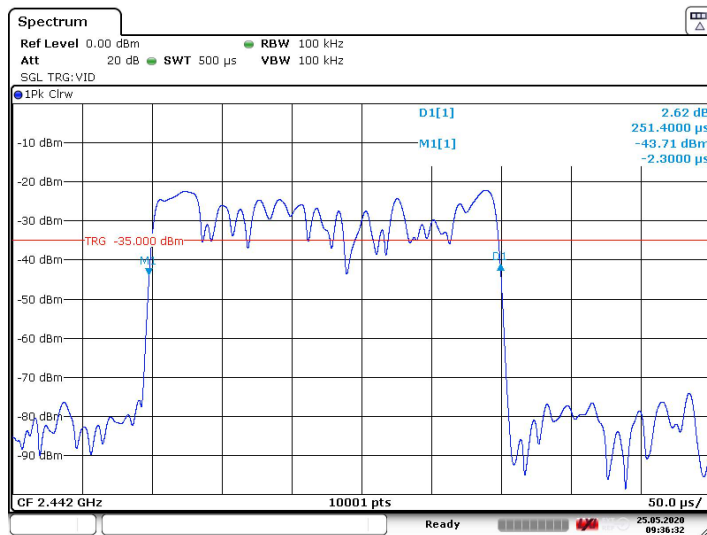


Figure 10. Pulse length

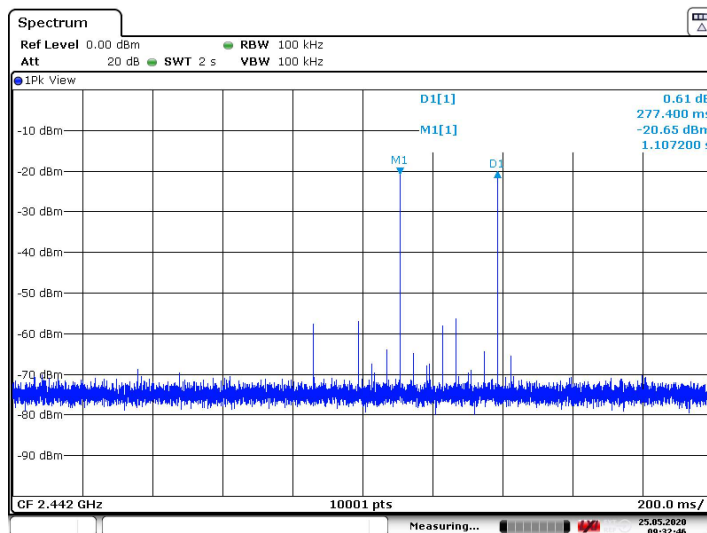


Figure 11. Minimum distance between pulses on the same frequency

LIST OF TEST EQUIPMENT

Equipment	Manufacturer	Type	Inv or serial	Prev Calib	Next Calib
TURNTABLE	MATURO	DS430 UPGRADED	inv:10182	NCR	-
MAST & TURNTABLE CONTROLLER	MATURO	NCD	inv:10183	NCR	-
ANTENNA MAST	MATURO	TAM 4.0E	inv:10181	NCR	-
ATTENUATOR	PASTERNAK	PE 7004-4	inv:10126	2019-04-01	2021-04-01
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	NCR	-
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv:10679	2019-06-28	2020-06-27
ANTENNA	SCHWARZBECK	VULB 9168	inv:8911	2018-10-25	2020-10-25
RF 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
FILTER	WAINWRIGHT	HP, WHKX4.0/18G-10SS	inv:10403	2019-04-01	2021-04-01
ANTENNA	EMCO	3117, emi 1-18GHz	inv:7293	2020-03-11	2022-03-11
ANTENNA	ETS LINDGREN	3160-10, emi 26.5-40GHz	inv:9151	2019-08-07	2020-08-07
ANTENNA	ROHDE & SCHWARZ	HFH2-Z2 , 335.4711.52	inv:8013	2018-10-30	2020-10-30

NCR = No calibration required

END OF REPORT