

Test Report

Electromagnetic Compatibility (EMC)

HELEM2111000438-5



TESTS ACCORDING TO FCC PART 15 B AND ISED CANADA REQUIREMENTS

Equipment Under Test:	Temperature probe with SRD
Model:	Tango XN 1m
Manufacturer:	Quanturi Oy Lars Sonckin kaari 10 FI-02600 Espoo FINLAND
Customer:	Quanturi Oy Lars Sonckin kaari 10 FI-02600 Espoo FINLAND
FCC Rule Part:	FCC CFR 47 Part 15 Subpart B, Class B
IC Rule Part:	ICES-003 Issue 7, Class B

Date: 14 February 2022

Issued by:

A handwritten signature in blue ink, appearing to read "R. Repo".

Rauno Repo
Senior EMC Specialist

Date: 14 February 2022

Checked by:

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

Henri Mäki
Testing 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	14 February 2022

PRODUCT DESCRIPTION

Equipment Under Test (EUT)

EUT information	
General Product Description	Temperature probe with SRD
Trademark	Quanturi
Model	Tango XN 1m
Type	-
Serial number	-
Power input port type	Internal lithium battery
Rated voltage	3.6 V
Rated current	-
Rated frequency	-
Rated power	-
EUT Highest operation freq.	SRD radio 927 MHz
Hardware Version (if any)	-
Software Version (if any)	-
Mechanical size of the EUT	Height: 130 mm Width: 38 mm Length: 1355 mm
Parallel models	Tango XN 2m, Tango XN 2m, Tango M 2m, Tango M 3m, Tango M 4m
Radio module or chip	ON Semiconductor AX8052F143-D

The EUT was tested as a tabletop unit.

General description

The Tango M probes are for measuring temperatures at every meter inside stored goods such as grains, loose hay, woodchips, or other fermentable materials. The Tango XN probes are extra robust probes specifically designed for highly corrosive environments, such as those found in the composting industry.

The probe transmits a packet once per hour. If the Base Station and/or repeater are in the receiving range they will proceed the message and reply to the probe.

Samples and modifications

No.	Name	Description
1	Sample 1	Normal sample

Ports and cables

None.

Peripherals

None.

TEST CONDITION

EUT Test Conditions During EMC-Testing

Configuration of the EUT was made to correspond to the actual assembling conditions as far as possible. The EUT was set to receiver mode.



Figure 1: Test setup block diagram

Operation modes

During the tests the EUT was in the following operation modes:

Mode	Description
1	EUT in RX mode

Table 1: Test RX frequencies

Channel	Frequency (MHz)
Low	903
Mid	915
High	927

Emission Measurement Uncertainty

The uncertainties comply with CISPR 16-4-2 ed.2 requirements ($U_{lab} < U_{cispr}$).

Summary of Testing

SUMMARY OF TESTING

Test Specification	Description of Test	Result
FCC CFR 47 15/B §15.107, ICES-003 3.2.1	Conducted emissions, Class B	N/A ¹⁾
FCC CFR 47 15/B §15.109, ICES 003 3.2.2	Radiated Emissions, Class B	PASS

¹⁾ Internal battery-operated device

Decision rule used for the emission tests are defined in standard CISPR 16-4-2 / EN 55016-4-2 clause 4.2

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

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

EMISSION TESTS

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

Standard:	ANSI C63.4 (2014)
Tested by:	PKA, RRE
Date:	24 – 25 November 2021
Humidity:	30 – 60 %
Temperature:	22 ± 3 °C
Barometric pressure:	860 – 1 060 mbar
Measurement uncertainty:	± 4.9 dB (30 – 200 MHz) Level of confidence 95 % (k = 2). ± 4.1 dB (200 – 1 000 MHz) ± 4.3 dB (1 – 18 GHz)

FCC Rule: 15.109(a)

ICES-003: 3.2.2

Test plan

The radiated emission measurements were done within a semi anechoic screened chamber. Additional floor absorbers were used on the floor between the EUT and receiving antenna in radiated emission test above 1 GHz. The EUT was placed on a table 0.8 m above the reflecting ground plane. The measurement distance was 3 meters. The worst interferences were determined during measurements by rotating the turntable and adjusting the antenna height. The measurements were done in horizontal and vertical antenna polarizations.

The EUT was working as described in the section “EUT Test Conditions”.

X, Y, Z axes orientations were determined, the worst-case orientation (X) was measured.

Radiated measurement settings

Preliminary testing:

Turntable movement:	30 ° step
Turntable position:	0 ° to 330°
Antenna movement:	1.5 m step
Antenna height:	1.0 m to 4.0 m
Antenna polarization:	Vertical and horizontal

Final testing:

Turntable movement:	Continuous
Turntable position:	± 15 °
Antenna movement:	Continuous
Antenna height:	± 0.75 m
Antenna polarization:	Vertical and horizontal

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

Measured Quasi-Peak Values In The Frequency Range 9 kHz - 30 MHz

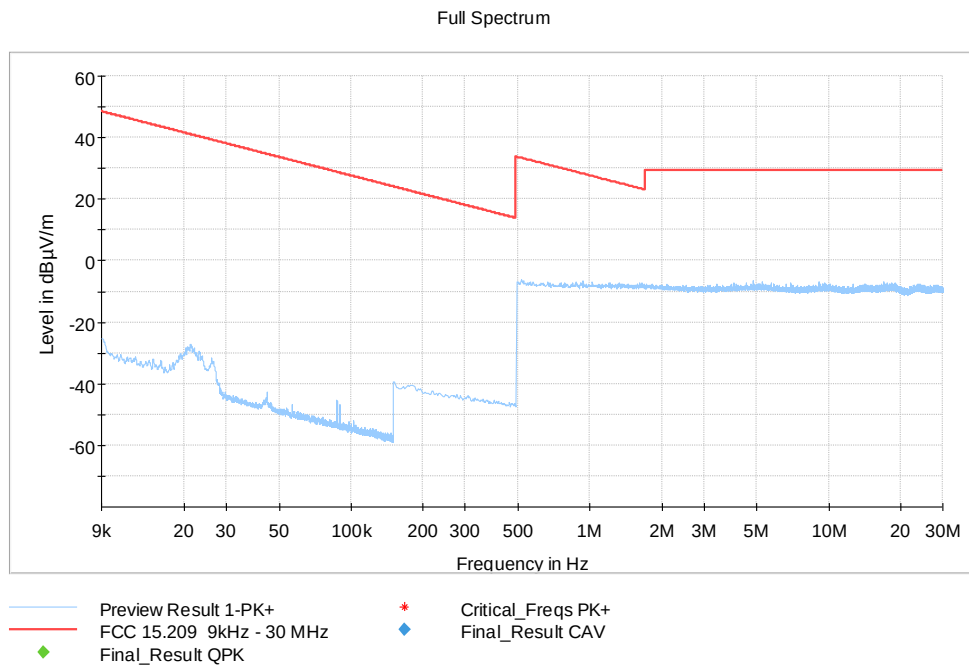


Figure 2: Measured results with peak-detector (Low)

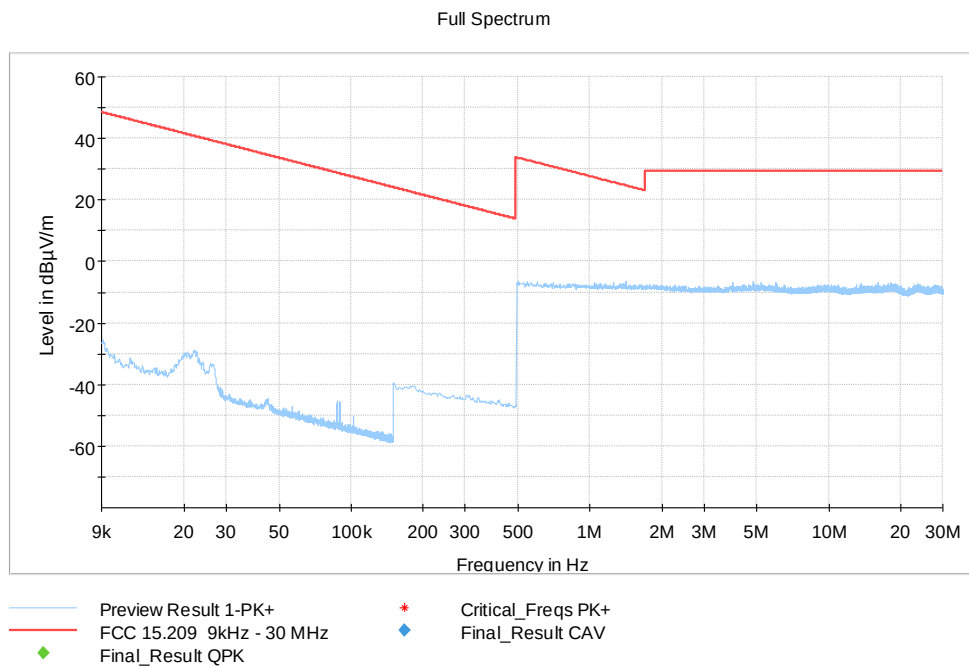


Figure 3: Measured results with peak-detector (Mid)

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

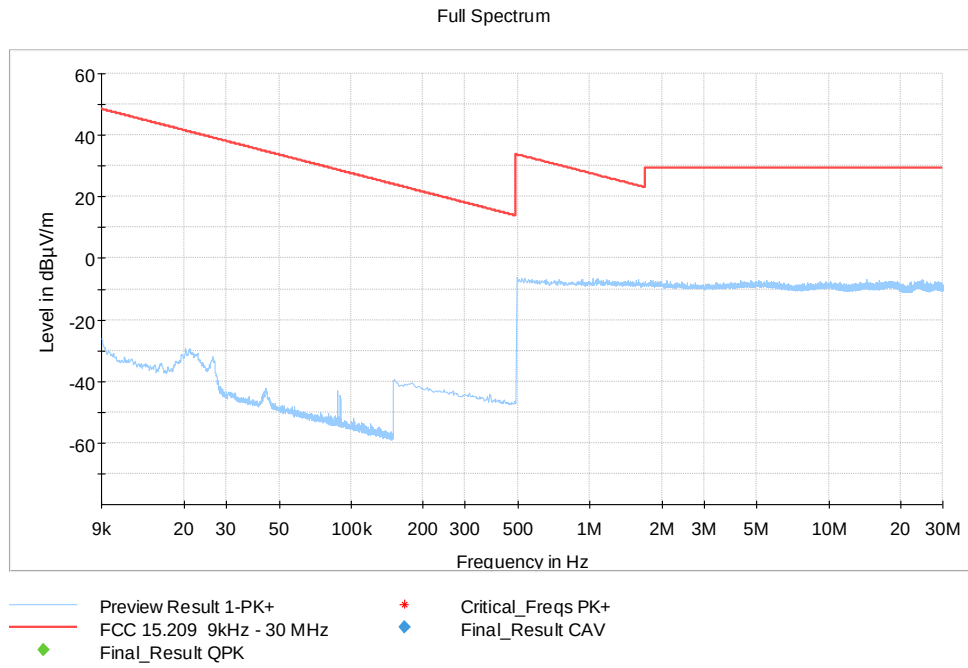


Figure 4: Measured results with peak-detector (High)

No peaks near the limits; no final measurements were performed.

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

Measured Quasi-Peak Values In The Frequency Range 30 MHz - 1000 MHz

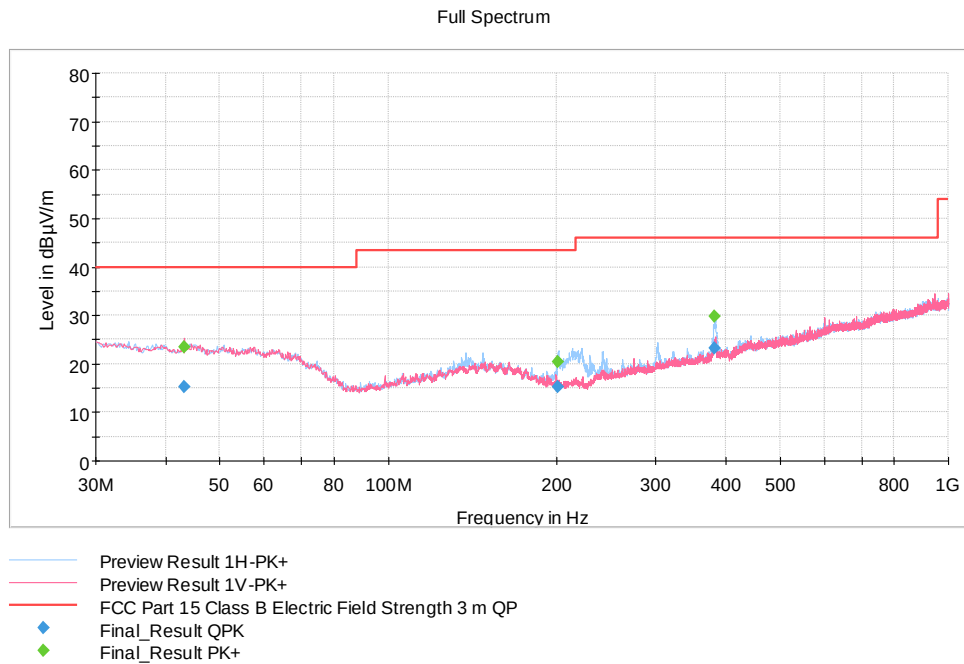


Figure 5: Measured results with peak-detector (Low)

Peak results (green tags) are only for informative purposes

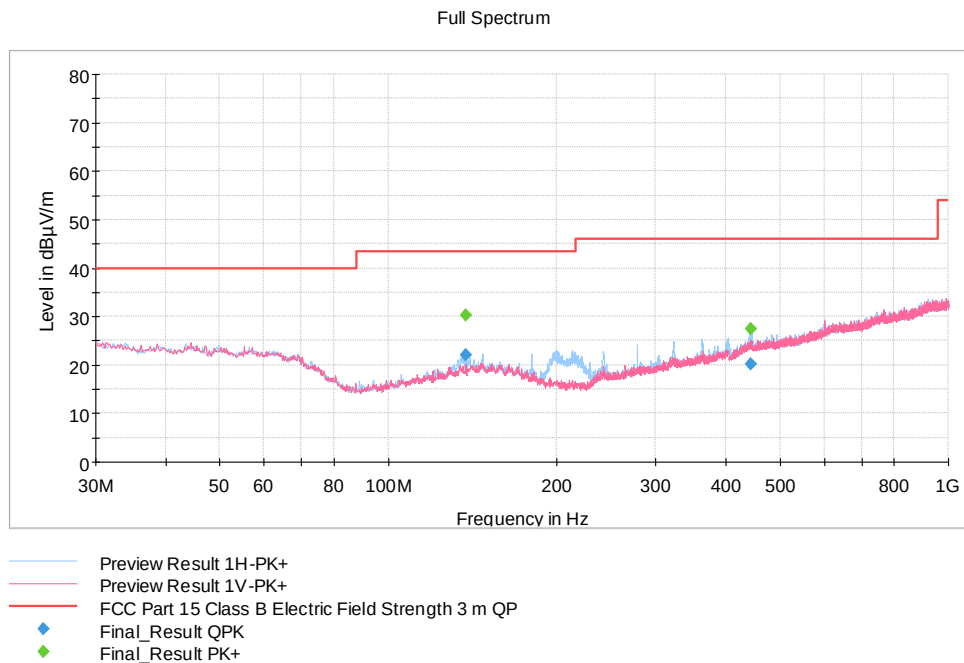


Figure 6: Measured results with peak-detector (Mid)

Peak results (green tags) are only for informative purposes

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

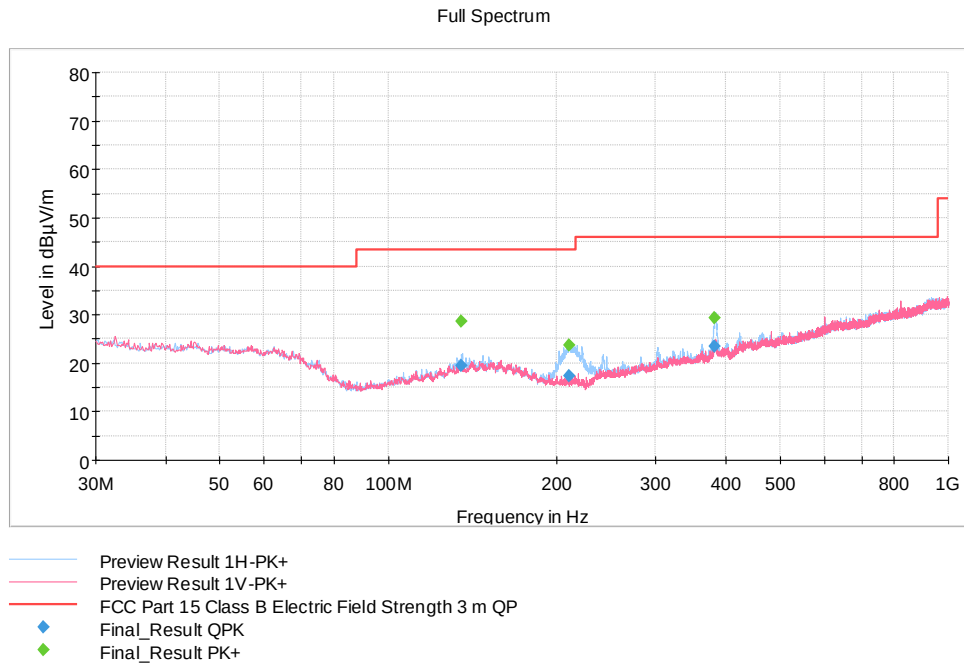


Figure 7: Measured results with peak-detector (High)

Peak results (green tags) are only for informative purposes

Table 2: Final measurement results

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Note
43.115000	15.34	40.00	24.66	15x1000	120.000	354.0	V	219.0	17.5	Low
200.625000	15.34	43.50	28.16	15x1000	120.000	301.0	H	320.0	15.3	Low
382.575000	23.22	46.00	22.78	15x1000	120.000	105.0	H	303.0	21.7	Low
137.425000	22.04	43.50	21.46	15x1000	120.000	248.0	H	345.0	17.7	Mid
444.275000	20.27	46.00	25.73	15x1000	120.000	100.0	H	306.0	23.5	Mid
210.395000	17.37	43.50	26.13	15x1000	120.000	126.0	H	354.0	15.3	High
382.735000	23.38	46.00	22.62	15x1000	120.000	112.0	H	246.0	21.7	High

Correction factor (dB) in the final result tables contains the sum of the transducers (antenna + cables). QuasiPeak values are measured values corrected with the correction factor.

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

Measured Peak and Average Values In The Frequency Range 1 GHz - 10 GHz

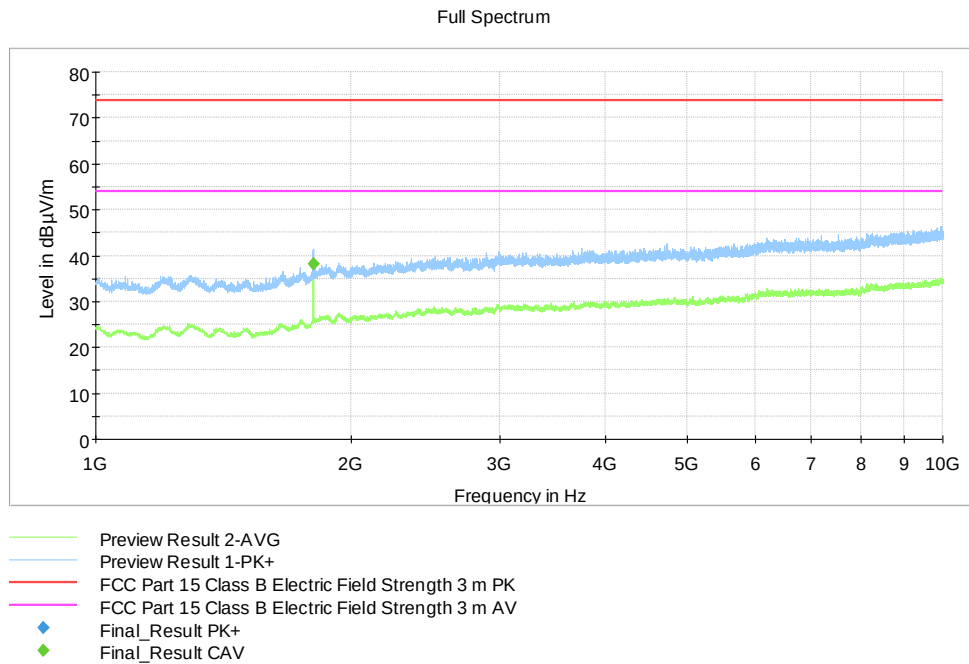


Figure 8: Measured result with peak and average detector (Low)

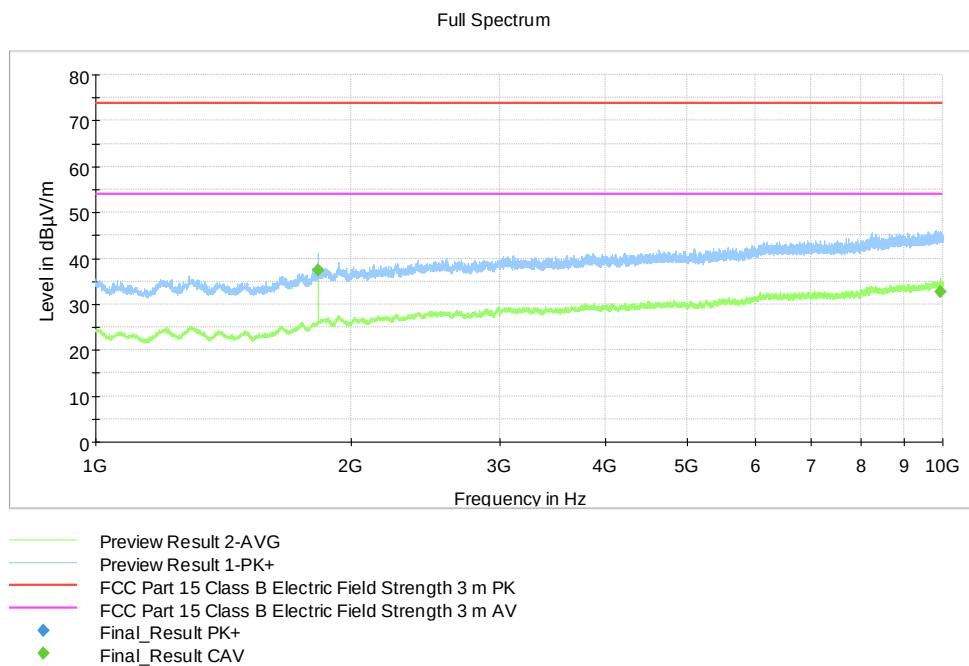


Figure 9: Measured result with peak and average detector (Mid)

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

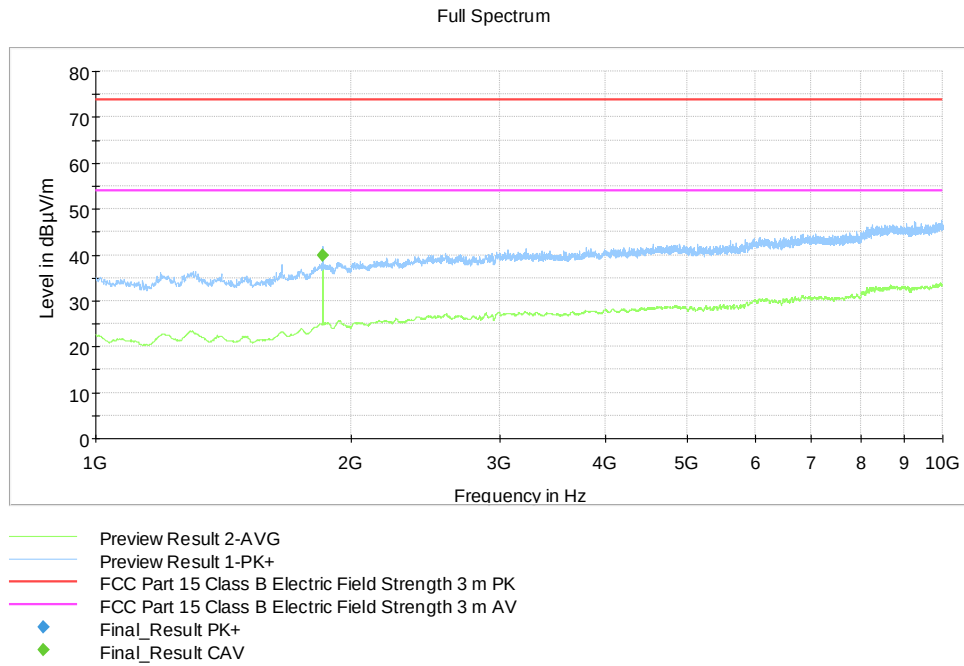


Figure 10: Measured result with peak and average detector (High)

Table 3: Final measurement results

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Note
1805.950000	---	38.22	53.90	15.68	15x1000	1000.000	100.0	H	117.0	2.1	Low
1830.000000	---	37.52	53.90	16.38	15x1000	1000.000	231.0	H	129.0	1.7	Mid
9950.500000	---	32.64	53.90	21.26	15x1000	1000.000	115.0	H	182.0	14.4	Mid
1853.975000	---	39.83	53.90	14.07	15x1000	1000.000	105.0	H	131.0	2.1	High

Correction factor (dB) in the final result tables contains the sum of the transducers (antenna + cables). MaxPeak and Average values are measured values corrected with the correction factor.

TEST EQUIPMENT

RF-Test Equipment

Equipment	Manufacturer	Type	Inv or serial	Prev Calib	Next Calib
ATTENUATOR	HUBER&SUHNER	6810.17.B (10dB)	inv:10390	2021-01-25	2023-01-25
ANTENNA	A.H. SYSTEMS	SAS-200/518	inv:7873	NCR	NCR
SPECTRUM ANALYZER	AGILENT	E7405A, monitoring	inv:9746	2020-02-17	2022-02-17
RF PREAMPLIFIER	CIAO	CA118-3123	inv:10278	2021-10-05	2022-10-05
TEMPERATURE/ HUMIDITY SENSOR	EDS	OW-ENV-TH, K5 SAC	inv:10517	2021-10-22	2022-10-22
ANTENNA	EMCO	3117, emi 1-18GHz	inv:7293	2020-03-11	2022-03-11
TURNTABLE	MATURO	DS430 UPGRADED	inv:10182	NCR	NCR
MAST & TURNTABLE CONTROLLER	MATURO	NCD	inv:10183	NCR	NCR
ANTENNA MAST	MATURO	TAM 4.0E	inv:10181	NCR	NCR
ATTENUATOR	PASTERNAK	PE 7004-4 (4dB)	inv:10126	2021-03-26	2022-03-26
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	NCR	NCR
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv:10679	2021-06-21	2022-06-21
GPS REFERENCE	PENDELUM	GPS-88	inv:8032	NCR	NCR
ANTENNA	SCHWARZBECK	VULB 9168	inv:8911	2020-11-04	2022-11-04

NCR = No calibration required

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