

Test Report

Electromagnetic Compatibility (EMC)


HELEM2111000438-4



TESTS ACCORDING TO FCC PART 15 B AND ISED CANADA REQUIREMENTS

Equipment Under Test:	Temperature probe with SRD
Model:	Haytech QNT200-00
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: 
Rauno Repo
Senior EMC Specialist

Date: 14 February 2022


Checked by: 
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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	Haytech QNT200-00
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: 60 mm Width: 60 mm Length: 405 mm
Parallel models	-
Radio module or chip	ON Semiconductor AX8052F143-D

The EUT was tested as a tabletop unit.

General description

The HAYTECH system is designed to monitor the temperature of hay bales during storage. The system is used to prevent hay fires from spontaneous combustion and improve hay quality management. 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:	<input type="checkbox"/> K10LAB, ISED Canada registration number: 8708A-1 <input checked="" type="checkbox"/> K5LAB, ISED Canada registration number: 8708A-2 <input type="checkbox"/> 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:	RRE	
Date:	22 – 23 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

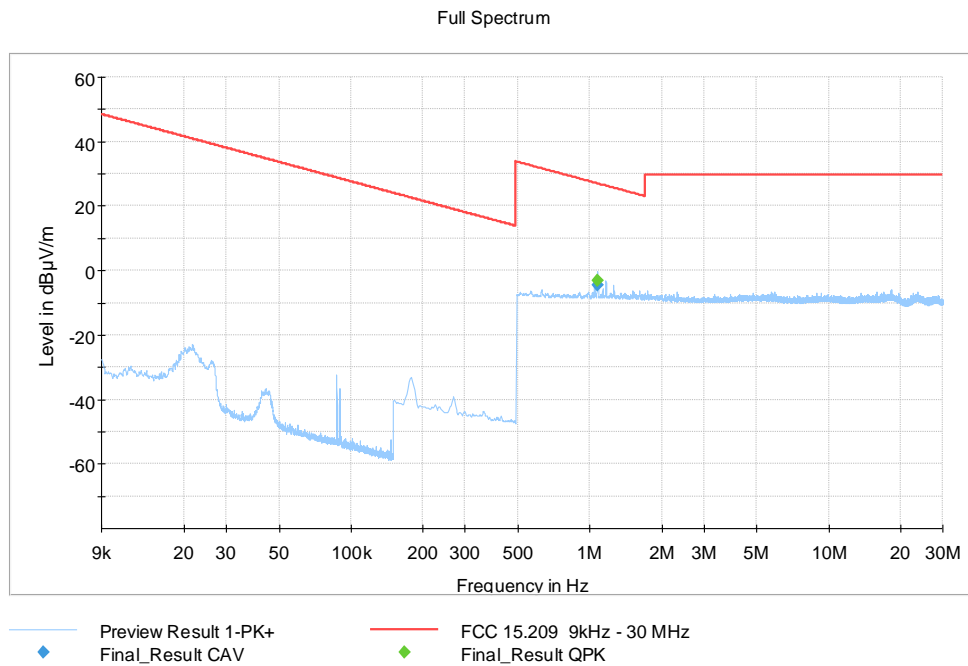


Figure 2: Measured results with peak-detector (Low)

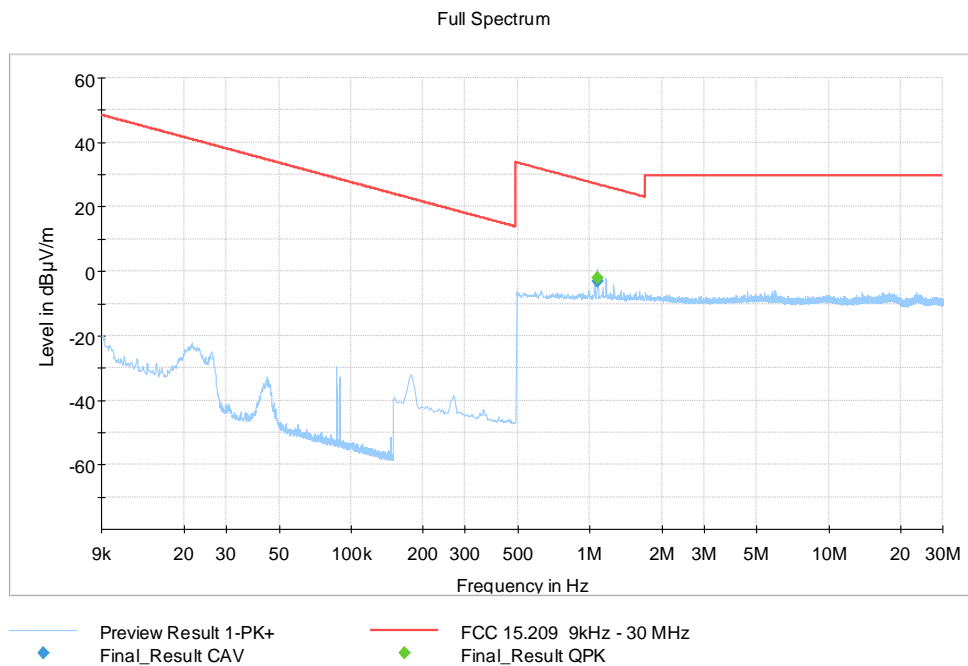


Figure 3: Measured results with peak-detector (Mid)

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

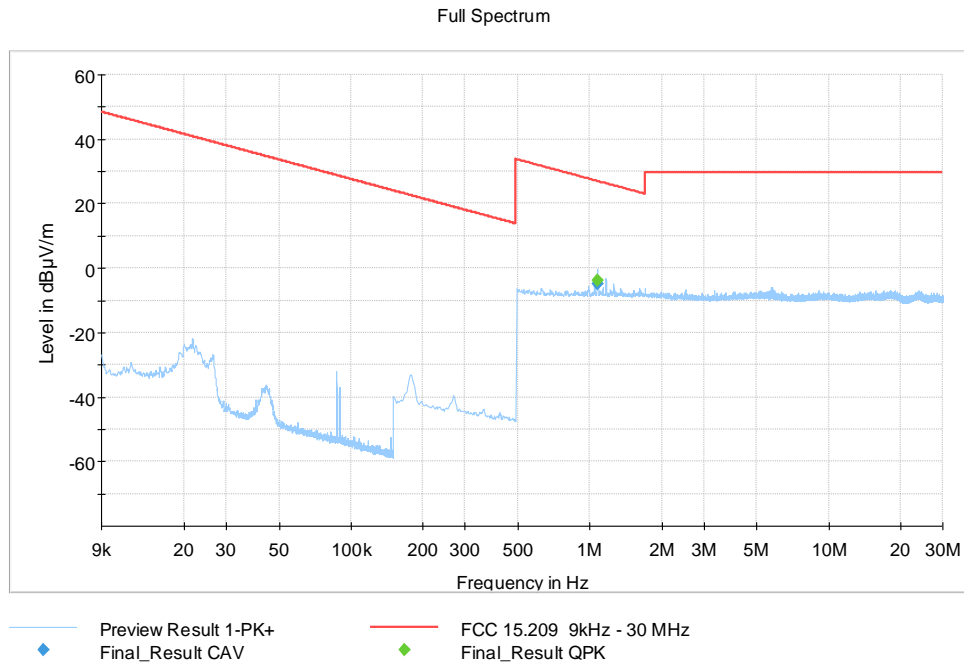


Figure 4: Measured results with peak-detector (High)

Table 2: Final measurement results

Fre- quency	Average (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Angle (°)	Pol	Azimuth (deg)	Corr. (dB/m)	Note
1.076000	---	-3.17	26.99	30.16	15x1000	9.000	0.0	V	245.0	-20.2	Low
1.076000	---	-1.97	26.99	28.96	15x1000	9.000	90.0	V	113.0	-20.2	Mid
1.076000	---	-3.66	26.99	30.65	15x1000	9.000	0.0	V	120.0	-20.2	High

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

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

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

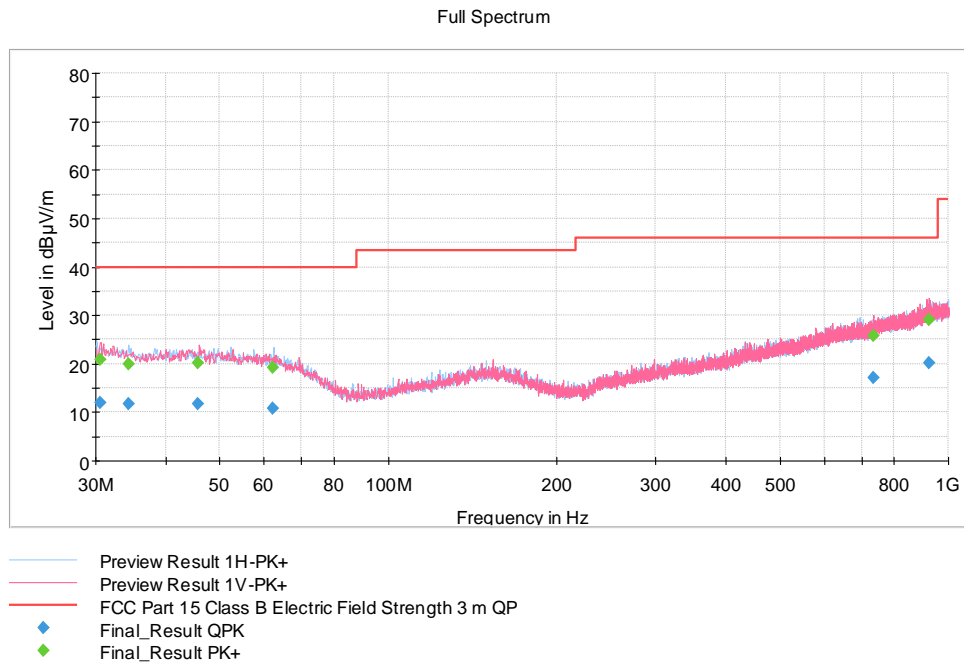


Figure 5: Measured results with peak-detector (Low)

Peak results (green tags) are only for informative purposes

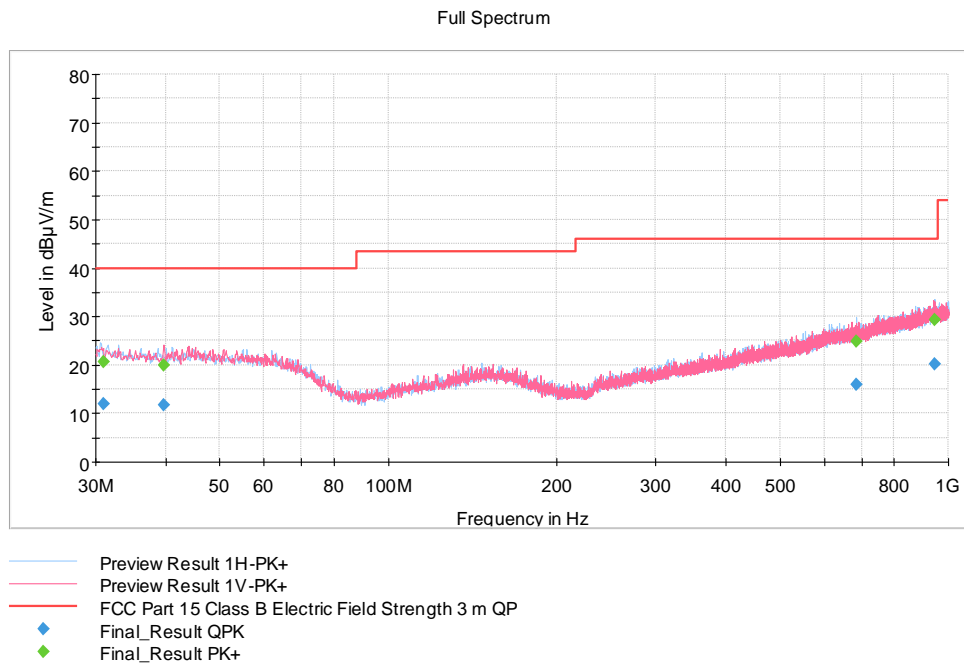


Figure 6: Measured results with peak-detector (Mid)

Peak results (green tags) are only for informative purposes

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

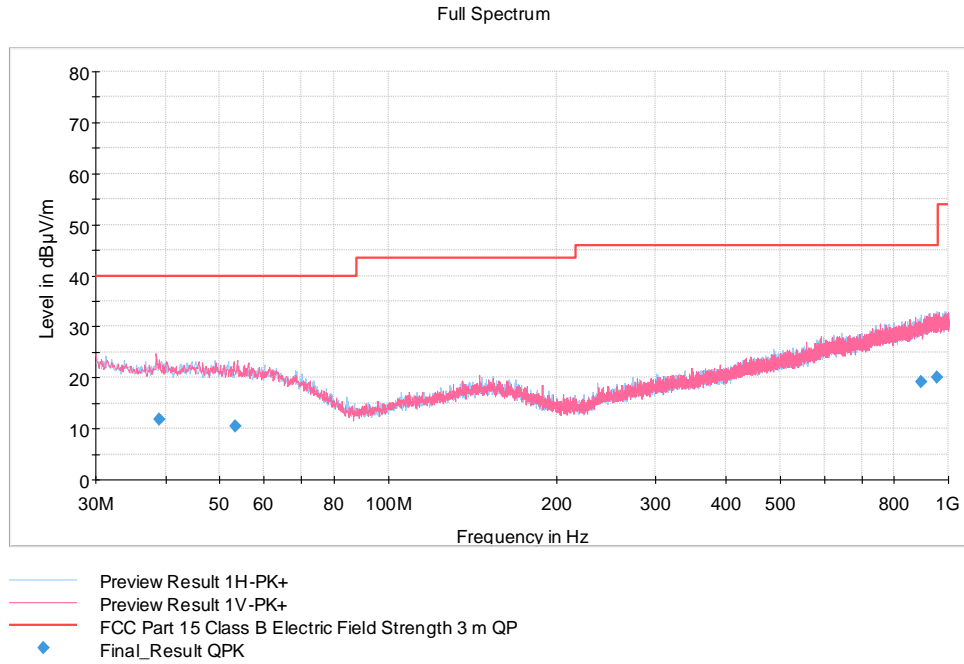


Figure 7: Measured results with peak-detector (High)

Table 3: Final measurement results

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band-width (kHz)	Height (cm)	Pol	Azi-muth (deg)	Corr. (dB/m)	Note
30.500000	12.07	40.00	27.93	15x1000	120.000	181.0	H	133.0	12.9	Low
34.325000	11.62	40.00	28.38	15x1000	120.000	360.0	H	66.0	12.7	Low
45.568000	11.81	40.00	28.19	15x1000	120.000	136.0	V	319.0	13.8	Low
62.098000	10.77	40.00	29.23	15x1000	120.000	373.0	H	288.0	13.7	Low
734.215000	17.01	46.00	28.99	15x1000	120.000	180.0	V	323.0	25.1	Low
923.352000	20.28	46.00	25.72	15x1000	120.000	189.0	V	205.0	27.9	Low
31.040000	11.95	40.00	28.05	15x1000	120.000	163.0	H	61.0	12.9	Mid
39.660000	11.65	40.00	28.35	15x1000	120.000	361.0	V	108.0	13.2	Mid
685.155000	15.97	46.00	30.03	15x1000	120.000	281.0	H	58.0	24.1	Mid
946.290000	20.25	46.00	25.75	15x1000	120.000	118.0	H	138.0	28.0	Mid
38.959000	11.71	40.00	28.29	15x1000	120.000	283.0	V	269.0	13.0	High
53.208000	10.46	40.00	29.54	15x1000	120.000	262.0	V	179.0	14.0	High
893.328000	19.26	46.00	26.74	15x1000	120.000	253.0	H	128.0	27.1	High
953.164000	20.07	46.00	25.93	15x1000	120.000	190.0	H	0.0	28.0	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

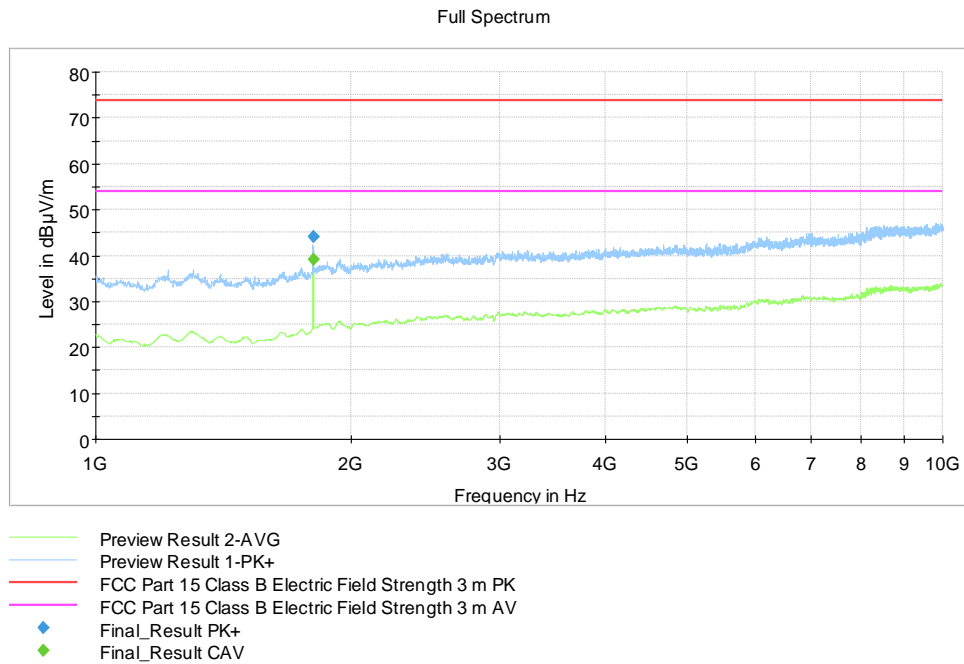


Figure 8: Measured result with peak and average detector (Low)

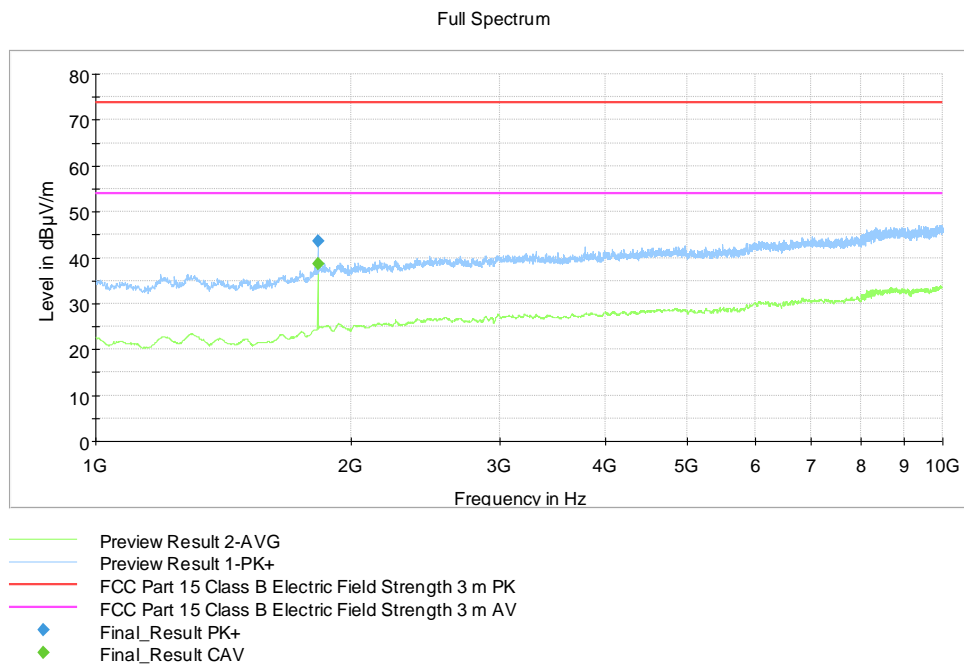


Figure 9: Measured result with peak and average detector (Mid)

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

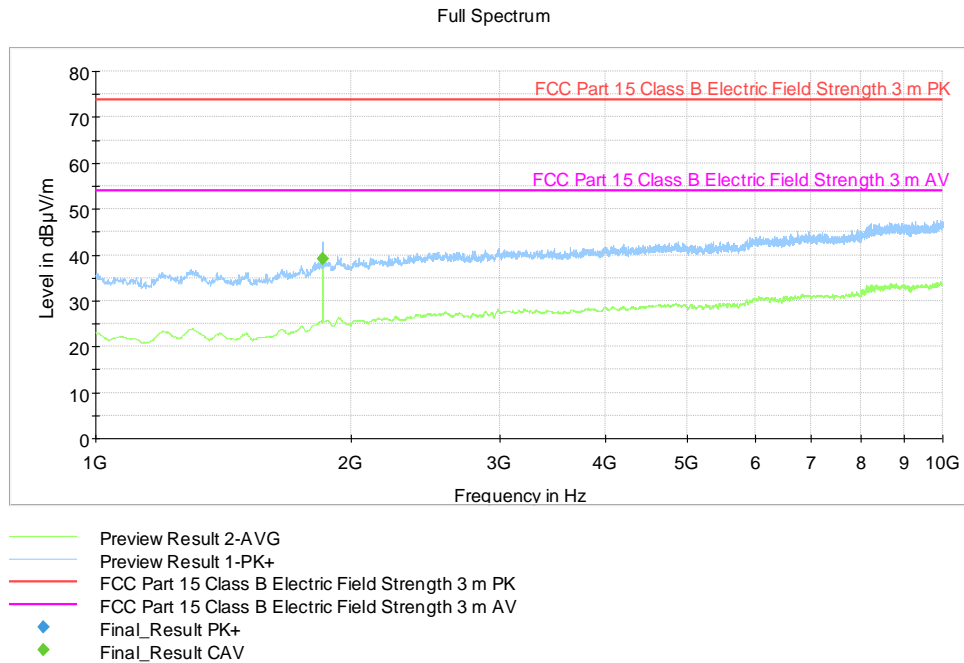


Figure 10: Measured result with peak and average detector (High)

Table 4: 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
1806.025000	---	39.12	53.90	14.78	15x1000	1000.000	147.0	H	324.0	2.1	Low
1806.025000	44.10	---	73.90	29.80	15x1000	1000.000	201.0	H	326.0	2.1	Low
1830.025000	---	38.76	53.90	15.14	15x1000	1000.000	198.0	H	322.0	1.7	Mid
1830.025000	43.64	---	73.90	30.26	15x1000	1000.000	198.0	H	317.0	1.7	Mid
1853.975000	---	39.20	53.90	14.70	15x1000	1000.000	178.0	H	211.0	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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