

TEST REPORT

ACCORDING TO:

**FCC 47CFR part 15 subpart C § 15.209 and subpart B;
RSS-210 issue 10 section 7.2, RSS-Gen issue 5, ICES-003 Issue 6:2019**

FOR:

**Afimilk Agricultural Cooperative Ltd.
AfiPass II Livestock Passive ID System consisting of:
Controller, model AfiPass II, part number 4095910
Passive Antenna, models
AfiPass II Stall external module 50, part number 4095912
AfiPass II Stall external module 40, part number 4095914
AfiPass II Rotary/Sort external module, part number 4095913
FCC ID: JER4095910
IC: 21531-5910**

This report is in conformity with ISO/ IEC 17025. The "A2LA Accredited" symbol endorsement applies only to the tests and calibrations that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested. This test report shall not be reproduced in any form except in full with the written approval of Hermon Laboratories Ltd.

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1 Applicant information

Client name: Afimilk Agricultural Cooperative Ltd
Address: Kibbutz Afikim 1514800, Israel
Telephone: +972 4675 4256
Fax: +972 4675 1862
E-mail: eli_s@afimilk.co.il
Contact name: Mr. Eli Shimshon

2 Equipment under test attributes

Product name: AfiPass II Livestock Passive ID System consisting of:
Model: Controller, model AfiPass II, part number: 4095910
Passive Antenna, model AfiPass II Stall external module 50, part number 4095912 Note
Product type: Transceiver
Hardware version: 4095910 rev 00
Software release: 0.3.3.2
Receipt date 25-Dec-19

Note: According to manufacturer's declaration provided in Appendix G of the test report, models AfiPass II Stall external module 50, part number 4095912, AfiPass II Stall external module 40, part number 4095914, AfiPass II Rotary/Sort external module, part number 4095913 differ in size and electrical spec to optimally suit the purpose of each module in terms of ID range and peripheral area coverage. For more detailed description refer to this declaration. That's why only the model AfiPass II Stall external module 50, part number 4095912 was tested.

3 Manufacturer information

Manufacturer name: Afimilk Agricultural Cooperative Ltd
Address: Kibbutz Afikim 1514800, Israel
Telephone: +972 4675 4256
Fax: +972 4675 1862
E-Mail: eli_s@afimilk.co.il
Contact name: Mr. Eli Shimshon

4 Test details

Project ID: 35230
Location: Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started: 04-Feb-20
Test completed: 05-Feb-20
Test specification(s): FCC 47CFR part 15 subpart C § 15.209 and subpart B;
RSS-210 issue 10 section 7.2, RSS-Gen issue 5,
ICES-003 Issue 6:2019

5 Tests summary

Test	Status
Transmitter characteristics	
Section 15.209, / RSS-Gen, Section 6.5, 6.6	Pass
Field strength of emissions	
Section 15.215 / RSS-Gen, Section 6.7,	Pass
Occupied bandwidth	
Section 15.207(a) / RSS-Gen, Section 7.2,	Pass
Conducted emission	
Section 15.203 / RSS Gen Section 6.8,	Pass
Antenna requirements	
Unintentional emissions	
Section 15.107, Conducted emission at AC power port	Pass
Section 15.109, / ICES-003 , section 6.2,	Pass
Radiated emission	

This test report supersedes the previously issued test report identified by Doc ID: AFIRAD_FCC.35230_Rev1

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mr. A. Morozov, test engineer, EMC & Radio	04-Feb-20 – 05-Feb-20	
Reviewed by:	Mrs. S. Peysahov Sheynin, test engineer, EMC & Radio	11-May-21	
Approved by:	Mr. S. Samokha, technical manager, EMC & Radio	12-May-21	

6 EUT description

Note: The following data in this clause is provided by the customer and represents his sole responsibility

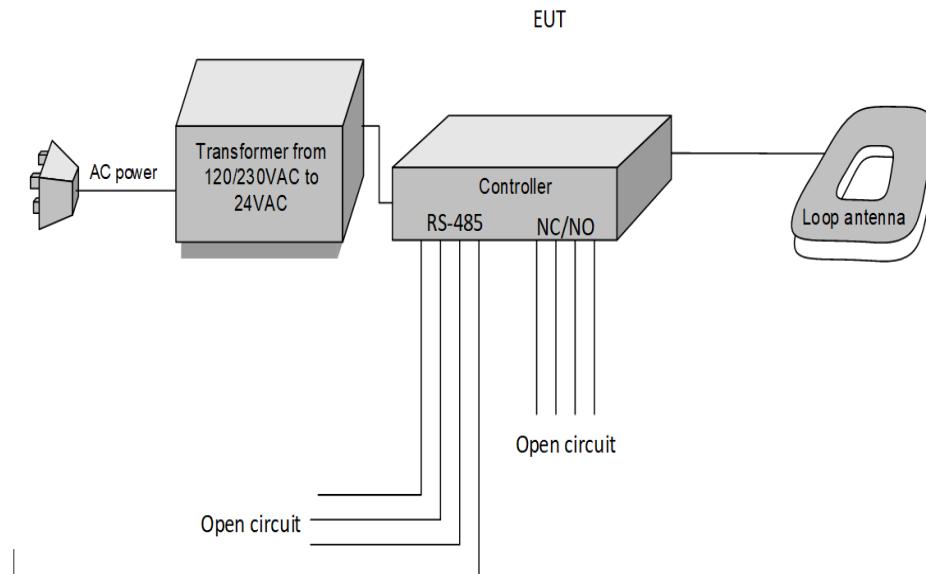
6.1 General information

The EUT is a Passive Identification System with operating frequency 134 kHz for Farm animals that includes Controller, Passive Antenna/s (i.e. external modules) designed to support various applications of livestock identification, 120 VAC / 24 VAC Transformer.

6.2 EUT system parts

Description	Manufacturer	Model or part number	Serial number
Livestock Passive ID System Controller	Afimilk	AfiPass II, Controller PN: 4095910	302000182
Passive Antenna	Afimilk	AfiPass II, External Module 50 PN: 4095912	N/A
Passive Antenna	Afimilk	AfiPass II, External Module 40 PN: 4095914	N/A
Passive Antenna	Afimilk	AfiPass II, Sort/Rotary External Module PN: 4095913	N/A
Power Transformer	Gershon Klein	5009401	N/A

6.3 Test configuration



6.4 Changes made in EUT

No changes were implemented in the EUT during testing.

6.5 Transmitter characteristics

Type of equipment				
<input checked="" type="checkbox"/>	Stand-alone (Equipment with or without its own control provisions)			
	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)			
	Plug-in card (Equipment intended for a variety of host systems)			
Operating frequencies		0.1338 MHz		
Maximum rated output power		At transmitter 50 Ω RF output connector		dBm
		Field strength at 3 m distance		107.37 dB(µV/m) -peak
Is transmitter output power variable?		X	No	
		Yes	continuous variable	
			stepped variable with stepsize	dB
			minimum RF power	dBm
Antenna connection		maximum RF power		dBm
unique coupling	standard connector	X	integral	with temporary RF connector
				X without temporary RF connector
Antenna/s technical characteristics				
Type	Manufacturer	Model number		Gain
Loop (Integral)	Afimilk	AfiPass II, External Module 50 PN: 4095912*		NA
Loop (Integral)	Afimilk	AfiPass II, External Module 40 PN: 4095914		NA
Loop (Integral)	Afimilk	AfiPass II, Sort/Rotary External Module PN: 4095913		NA
Type of modulation	FSK			
Transmitter aggregate data rate/s		7762,5 bit/s (Binary 1 bit) 8387,5 bit/s (Binary 0 bit)		
Transmitter power source				
Battery	Nominal rated voltage	Battery type		
DC	Nominal rated voltage	VDC		
X AC mains	Nominal rated voltage	120 VAC	Frequency	50 Hz
Common power source for transmitter and receiver		X	yes	no

* - According to manufacturer's declaration provided in Appendix G the worst case of antenna configuration with the highest radiation area was tested.



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Test specification: Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions	
Test procedure: ANSI C63.10, Section 6.4, 6.5	
Test mode: Compliance	Verdict: PASS
Date(s): 04-Feb-20	
Temperature: 24 °C	Relative Humidity: 44 %
Air Pressure: 1005 hPa	Power: 120 VAC, 50 Hz
Remarks:	

7 Transmitter tests according to 47CFR part 15 subpart C and RSS-210 requirements

7.1 Field strength of emissions

7.1.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given Table 7.1.1 and Table 7.1.2.

Table 7.1.1 Radiated fundamental emission limits

Fundamental frequency, kHz	Field strength at 3 m, dB(µV/m)	
	Peak	Average
133.8	125.07	105.07

Table 7.1.2 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m, dB(µV/m)		
	Within restricted bands		
	Peak	Quasi Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**
0.090 – 0.110	NA	108.5 – 106.8**	NA
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**
0.490 – 1.705		73.8 – 63.0**	
1.705 – 30.0*		69.5	
30 – 88	NA	40.0	NA
88 – 216		43.5	
216 – 960		46.0	
960 - 1000		54.0	
1000 – 10 th harmonic	74.0	NA	54.0

*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows:

$$\text{Lims}_2 = \text{Lims}_1 + 40 \log \left(\frac{S_1}{S_2} \right),$$

where S₁ and S₂ – standard defined and test distance respectively in meters.

**- The limit decreases linearly with the logarithm of frequency.

7.1.2 Test procedure for fundamental and spurious emission field strength measurements in 9 kHz to 30 MHz

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and the performance check was conducted.

7.1.2.2 The specified frequency range was investigated with a loop antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna was rotated around its vertical axis. The measuring antenna polarization was switched from vertical to horizontal.

7.1.2.3 The worst test results (the lowest margins) were recorded in Table 7.1.3 and shown in the associated plots.



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Report ID: AFIRAD_FCC.35230_Rev2

Date of Issue: 12-May-21

Test specification: Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions			
Test procedure: ANSI C63.10, Section 6.4, 6.5			
Test mode: Compliance			Verdict: PASS
Date(s): 04-Feb-20			
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC, 50 Hz
Remarks:			

Figure 7.1.1 Setup for spurious emission field strength measurements below 30 MHz

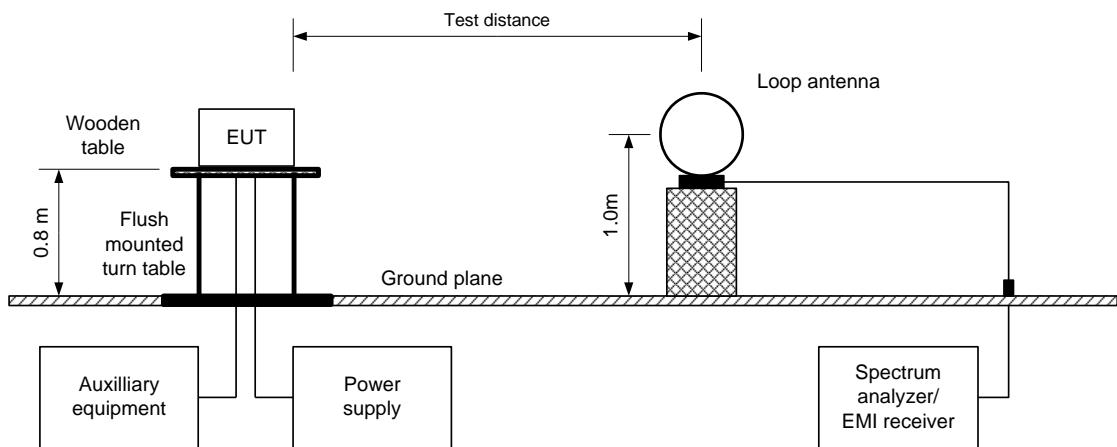
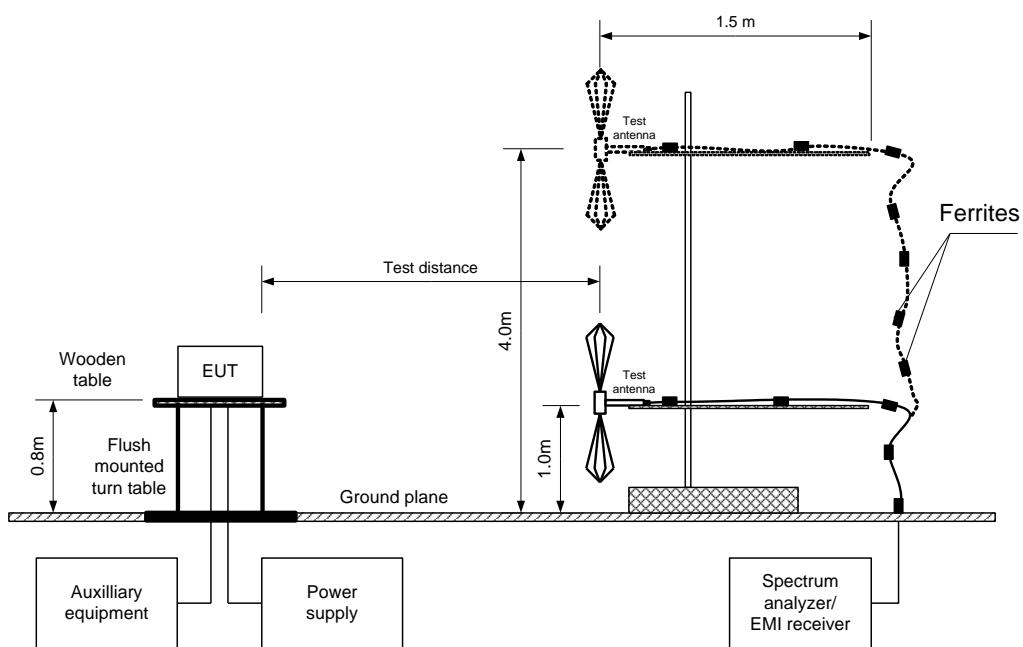


Figure 7.1.2 Setup for spurious emission field strength measurements above 30 MHz





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Test specification: Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions			
Test procedure:	ANSI C63.10, Section 6.4, 6.5		
Test mode:	Compliance		
Date(s):	04-Feb-20		Verdict: PASS
Temperature: 24 °C	Relative Humidity: 44 %		Air Pressure: 1005 hPa
Remarks:			

Table 7.1.3 Field strength of fundamental emission

TEST DISTANCE:	3 m
TEST SITE:	Semi anechoic chamber
EUT POSITION:	Typical (Vertical)
MODULATING SIGNAL:	RFID
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
INVESTIGATED FREQUENCY RANGE:	0.009 – 30 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	1 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz)
VIDEO BANDWIDTH:	≥ Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz)

F, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength			Verdict
	Pol.	Height, m		Measured, dB(µV/m)	Limit, dB(µV/m)	Margin, dB**	Measured, dB(µV/m)	Limit, dB(µV/m)	Margin, dB**	
0.1338	Vertical	1.0	2.0	107.37	124.31	-16.94	104.02	114.31	-10.29	Pass

The fundamental emission results at $U_{nom} \pm 15\%$ are shown in Plots Plot 7.1.1.

*- EUT front panel refers to 0 degrees position of turntable.

**- Margin (dB) = measured result - specification limit.

Reference numbers of test equipment used

HL 4360	HL 3903	HL 4011	HL 5309	HL 5288	HL 5085	HL 5376	HL 5379
HL 0446							

Full description is given in Appendix A.



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Report ID: AFIRAD_FCC.35230_Rev2

Date of Issue: 12-May-21

Test specification: Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions	
Test procedure:	ANSI C63.10, Section 6.4, 6.5
Test mode:	Compliance
Date(s):	04-Feb-20
Temperature: 24 °C	Relative Humidity: 44 %
Air Pressure: 1005 hPa	Power: 120 VAC, 50 Hz
Remarks:	

Table 7.1.4 Field strength of spurious emissions

TEST DISTANCE: 3 m
 TEST SITE: Semi Anechoic chamber
 EUT POSITION: Typical (Vertical)
 MODULATION: RFID
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 INVESTIGATED FREQUENCY RANGE: 0.009 – 30 MHz
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 1 kHz (9 kHz – 150 kHz)
 VIDEO BANDWIDTH: 9.0 kHz (150 kHz – 30 MHz)
 ≥ Resolution bandwidth
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)

Frequency, MHz	Peak emission, dB(µV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
0.667421	73.85	72.82	91.12	-18.3	V	1.0	-8.0	Pass
0.935193	69.76	68.69	88.20	-19.51		1.0	-8.0	
1.202965	65.59	64.17	86.02	-21.85		1.0	-8.0	
1.471683	56.98	54.22	84.28	-30.06		1.0	-8.0	
Frequency, MHz	Peak emission, dB(µV/m)	Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
0.399648	81.64	80.74	95.57	14.83	V	1.0	-8.0	Pass

*- Margin = Measured emission - specification limit.

**- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

HL 4360	HL 3903	HL 4011	HL 5309	HL 5288	HL 5085	HL 5379	HL 446
HL 5376							

Full description is given in Appendix A.



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Report ID: AFIRAD_FCC.35230_Rev2
Date of Issue: 12-May-21

Test specification: Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions					
Test procedure:		ANSI C63.10, Section 6.4, 6.5			
Test mode:		Compliance			Verdict: PASS
Date(s):		04-Feb-20			
Temperature: 24 °C		Relative Humidity: 44 %		Air Pressure: 1005 hPa	Power: 120 VAC, 50 Hz
Remarks:					

Table 7.1.5 Restricted bands according to FCC 15, Section 205

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.290 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138	1300 - 1427	3345.8 - 3358	15.35 - 16.2
4.17725 - 4.17775	12.57675 - 12.57725	149.9 - 150.05	1435 - 1626.5	3600 - 4400	17.7 - 21.4
4.20725 - 4.20775	13.36 - 13.41	156.52475 - 156.52525	1645.5 - 1646.5	4500 - 5150	22.01 - 23.12
6.215 - 6.218	16.420 - 16.423	156.7 - 156.9	1660 - 1710	5350 - 5460	23.6 - 24
6.26775 - 6.26825	16.69475 - 16.69525	162.0125 - 167.17	1718.8 - 1722.2	7250 - 7750	31.2 - 31.8
6.31175 - 6.31225	16.80425 - 16.80475	167.72 - 173.2	2200 - 2300	8025 - 8500	36.43 - 36.5
8.291 - 8.294	25.5 - 25.67	240 - 285	2310 - 2390	9000 - 9200	
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	Above 38.6

Table 7.1.6 Restricted bands according to RSS-Gen, Table 3

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.291 - 8.294	16.80425 - 16.80475	399.9 - 410	3260 - 3267	10.6 - 12.7
2.1735 - 2.190	8.362 - 8.366	25.5 - 25.67	608 - 614	3332 - 3339	13.25 - 13.4
3.020 - 3.026	8.37625 - 8.38675	37.5 - 38.25	960 - 1427	3345.8 - 3358	14.47 - 14.5
4.125 - 4.128	8.41425 - 8.41475	73 - 74.6	1435 - 1626.5	3500 - 4400	15.35 - 16.2
4.17725 - 4.17775	12.290 - 12.293	74.8 - 75.2	1645.5 - 1646.5	4500 - 5150	17.7 - 21.4
4.20725 - 4.20775	12.51975 - 12.52025	108 - 138	1660 - 1710	5350 - 5460	22.01 - 23.12
5.677 - 5.683	12.57675 - 12.57725	156.52475 - 156.52525	1718.8 - 1722.2	7250 - 7750	23.6 - 24.0
6.215 - 6.218	13.36 - 13.41	156.7 - 156.9	2200 - 2300	8025 - 8500	31.2 - 31.8
6.26775 - 6.26825	16.42 - 16.423	240 - 285	2310 - 2390	9000 - 9200	36.43 - 36.5
6.31175 - 6.31225	16.69475 - 16.69525	322 - 335.4	2655 - 2900	9300 - 9500	Above 38.6



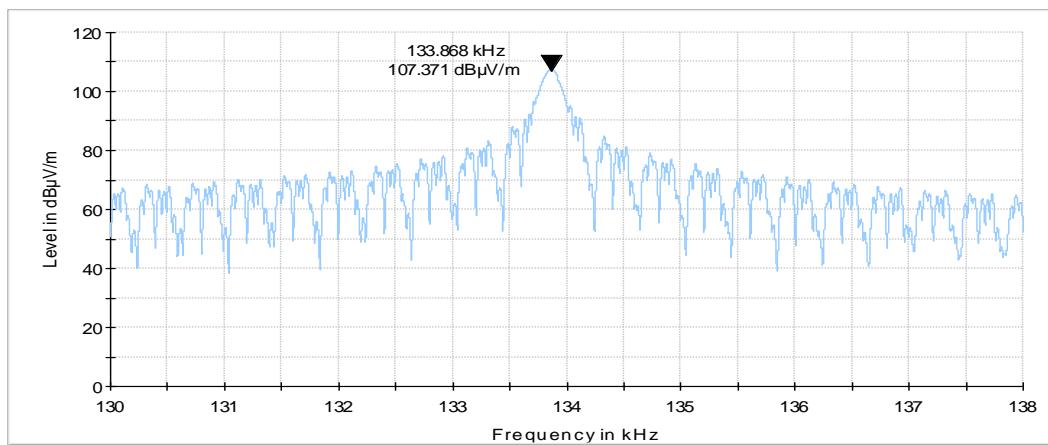
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Report ID: AFIRAD_FCC.35230_Rev2
Date of Issue: 12-May-21

Test specification: Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions			
Test procedure: ANSI C63.10, Section 6.4, 6.5			
Test mode: Compliance			Verdict: PASS
Date(s): 04-Feb-20			
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC, 50 Hz
Remarks:			

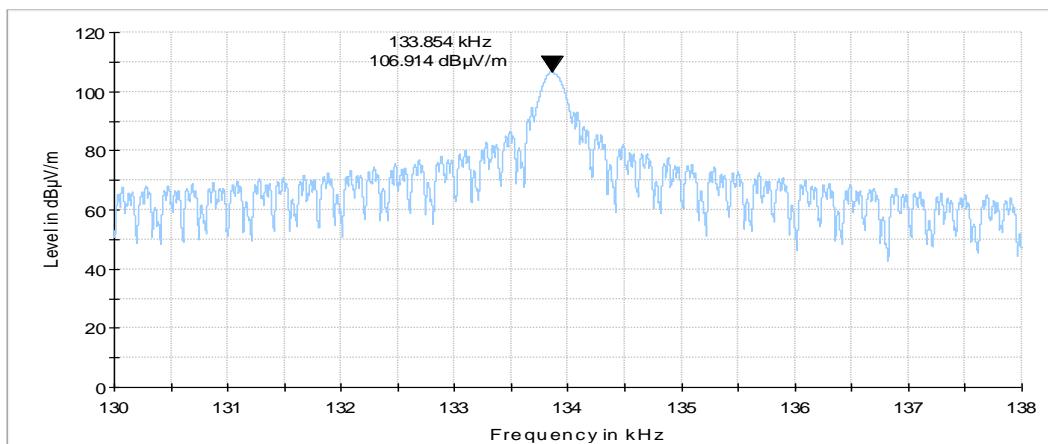
Plot 7.1.1 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical (Vertical)



Plot 7.1.2 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical (Vertical)
VOLTAGE: 115%Unom



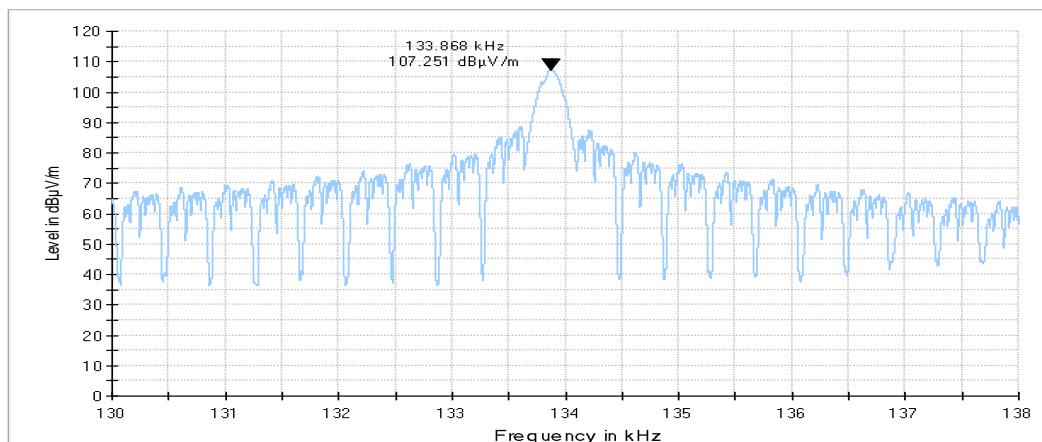


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Test specification: Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions			
Test procedure: ANSI C63.10, Section 6.4, 6.5			
Test mode: Compliance			Verdict: PASS
Date(s): 04-Feb-20			
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC, 50 Hz
Remarks:			

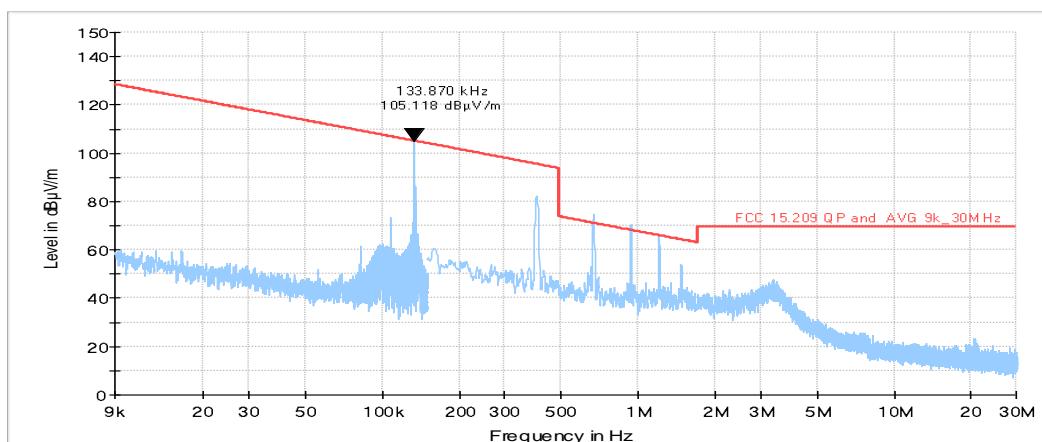
Plot 7.1.3 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical (Vertical)
VOLTAGE: 85%Unom



Plot 7.1.4 Radiated emission measurements from 9 to 150 kHz

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical (Vertical)



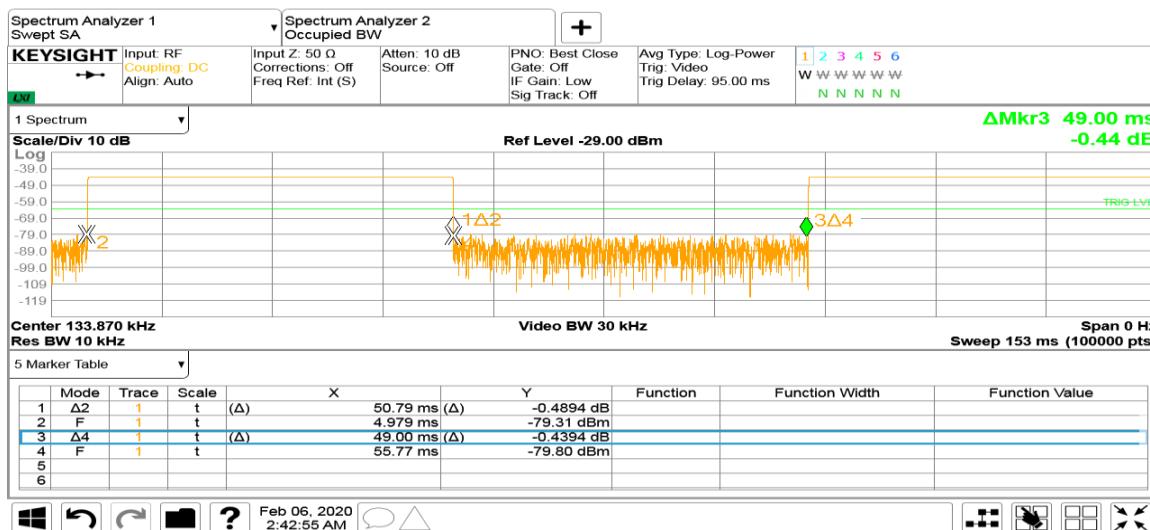


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Report ID: AFIRAD_FCC.35230_Rev2
Date of Issue: 12-May-21

Test specification: Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions			
Test procedure: ANSI C63.10, Section 6.4, 6.5			
Test mode: Compliance			Verdict: PASS
Date(s): 04-Feb-20			
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC, 50 Hz
Remarks:			

Plot 7.1.5 Transmission pulse duration





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Test specification: Section 15.215 / RSS-Gen, Section 6.7, Occupied bandwidth			
Test procedure: ANSI C63.10, Section 6.9.2			
Test mode: Compliance		Verdict: PASS	
Date(s):	04-Feb-20		
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC, 50 Hz
Remarks:			

7.2 Occupied bandwidth test

7.2.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.2.1. The test results are provided in Table 7.2.2 and associated plots.

Table 7.2.1 Occupied bandwidth limits

Assigned frequency, kHz	Modulation envelope reference points*, %	Maximum allowed bandwidth, % of the carrier frequency
9 - 150	99%	NA

*- Modulation envelope reference points provided in terms of attenuation below modulated carrier.

7.2.2 Test procedure

- 7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.
- 7.2.2.2 The EUT was set to transmit modulated carrier.
- 7.2.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.2.2 and associated plot.

Figure 7.2.1 Occupied bandwidth test setup





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Report ID: AFIRAD_FCC.35230_Rev2
Date of Issue: 12-May-21

Test specification: Section 15.215 / RSS-Gen, Section 6.7, Occupied bandwidth					
Test procedure: ANSI C63.10, Section 6.9.2					
Test mode: Compliance					Verdict: PASS
Date(s): 04-Feb-20					
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC, 50 Hz		
Remarks:					

Table 7.2.2 Occupied bandwidth test results

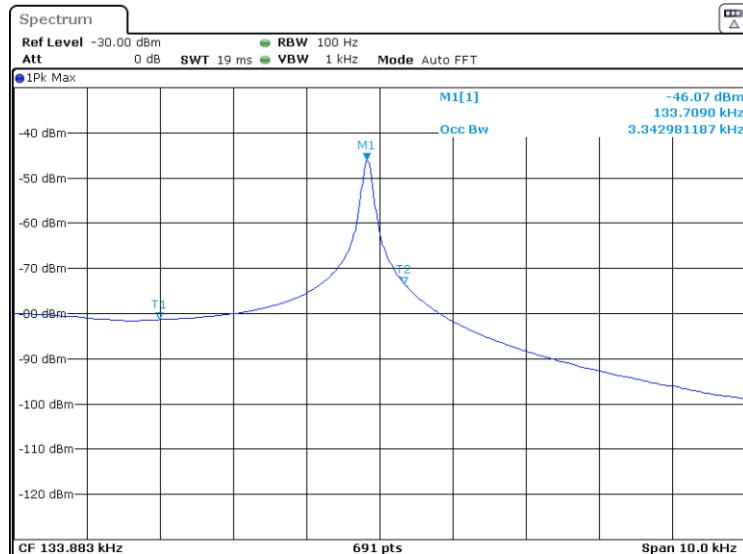
DETECTOR USED: Peak hold
 RESOLUTION BANDWIDTH: 100Hz
 VIDEO BANDWIDTH: 1kHz
 MODULATION ENVELOPE REFERENCE POINTS: 99 %
 MODULATION: Unmodulated

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit		Margin, kHz	Verdict
		% of the carrier frequency	kHz		
0.1338	3.3429	NA	NA	NA	Pass

Reference numbers of test equipment used

HL 4355	HL	HL						
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Full description is given in Appendix A.

Plot 7.2.1 Occupied bandwidth test result



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Report ID: AFIRAD_FCC.35230_Rev2
Date of Issue: 12-May-21

Test specification: Section 15.207(a) / RSS-Gen, Section 7.2, Conducted emission			
Test procedure: ANSI C63.10, Section 6.2			
Test mode: Compliance			Verdict: PASS
Date(s): 04-Feb-20			
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC, 50 Hz
Remarks:			

7.3 Conducted emissions

7.3.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.3.1

Table 7.3.1 Limits for conducted emissions

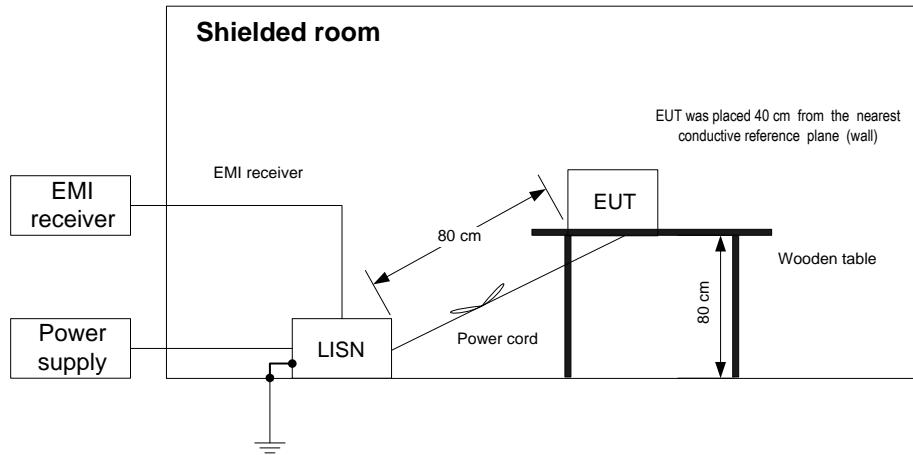
Frequency, MHz	Class B limit, dB(μ V)	
	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5.0	56	46
5.0 - 30	60	50

* - The limit decreases linearly with the logarithm of frequency.

7.3.2 Test procedure

- 7.3.2.1 The EUT was set up as shown in Figure 7.3.1 and associated photographs, energized and the performance check was conducted.
- 7.3.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer while unused coaxial connector of the LISN was terminated with 50 Ohm.
- 7.3.2.3 The position of the device cables was varied to determine maximum emission level.
- 7.3.2.4 The worst test results (the lowest margins) were recorded in Table 7.3.2 and shown in the associated plots.

Figure 7.3.1 Setup for conducted emission measurements, table-top equipment





HERMON LABORATORIES

Report ID: AFIRAD_FCC.35230_Rev2

Date of Issue: 12-May-21

Test specification:	Section 15.207(a) / RSS-Gen, Section 7.2, Conducted emission		
Test procedure:	ANSI C63.10, Section 6.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	04-Feb-20		
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC, 50 Hz
Remarks:			

Table 7.3.2 Conducted emission test results

LINE:

EUT OPERATING MODE:

FUT SET UP:

TEST SITE

TEST SITE:
FREQUENCY RANGE:

FREQUENCY RANGE: 150 kHz - 50 MHz
RESOLUTION/BANDWIDTH: 9 kHz

RESOLUTION BANDWIDTH. 9 KHZ

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
								L1	Pass
								L2	Pass

*- Margin = Measured emission - specification limit.

L1

Frequency	QPeak	Limit	Delta	Avg	Limit	Delta	Factor	Factor	Factor	
[MHz]	[dBpV]	[dBpV]	[dB]	[dBpV]	[dBpV]	[dB]	DC Limite..	LISN HL 2..	Cable HL ..	
1	5.35657	37.33	60.00	---	32.58	50.00	-17.42	10.00	0.25	0.41
2	16.896505	47.69	60.00	-12.31	42.74	50.00	-7.26	10.00	0.80	0.70
3	19.841305	47.08	60.00	-12.92	42.25	50.00	-7.75	10.00	0.93	0.76
4	20.1092	47.09	60.00	-12.91	42.26	50.00	-7.74	10.00	0.95	0.77

L2

Frequency [MHz]	QPeak [dBpV]	Limit 55022bqp		Delta [dB]	Avg [dBpV]	Limit 55022bav		Delta [dB]	Factor DC Limite.. [dB]	Factor LISN HL 2.. [dB]	Factor Cable HL .. [dB]
		55022bqp [dBpV]	55022bav [dBpV]			55022bav [dBpV]	55022bav [dBpV]				
1	5.08663	37.57	60.00	---	32.43	50.00	-17.57	10.00	0.24	0.40	
2	5.35657	42.51	60.00	-17.49	37.39	50.00	-12.61	10.00	0.25	0.41	
3	5.62242	38.25	60.00	---	33.08	50.00	-16.92	10.00	0.26	0.42	
4	14.62042	34.78	60.00	---	30.12	50.00	-19.88	10.00	0.69	0.65	
5	14.888315	35.30	60.00	---	30.38	50.00	-19.62	10.00	0.70	0.66	
6	16.896505	49.08	60.00	-10.92	43.86	50.00	-6.14	10.00	0.80	0.70	
7	19.841305	48.94	60.00	-11.06	43.50	50.00	-6.50	10.00	0.93	0.76	
8	20.1092	49.39	60.00	-10.61	43.87	50.00	-6.13	10.00	0.95	0.77	

Reference numbers of test equipment used

HL 5700 HL 2888 HL 2874 HL 1205 HL 5707

Full description is given in Appendix A.



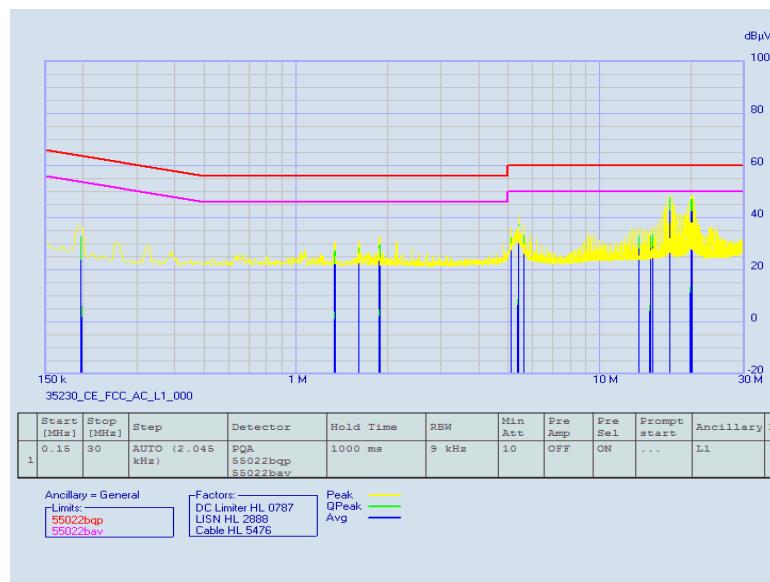
HERMON LABORATORIES

Report ID: AFIRAD_FCC.35230_Rev2
Date of Issue: 12-May-21

Test specification: Section 15.207(a) / RSS-Gen, Section 7.2, Conducted emission			
Test procedure:	ANSI C63.10, Section 6.2		
Test mode:	Compliance		
Date(s):	04-Feb-20		
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC, 50 Hz
Remarks:			

Plot 7.3.1 Conducted emission measurements

LINE: L1
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK





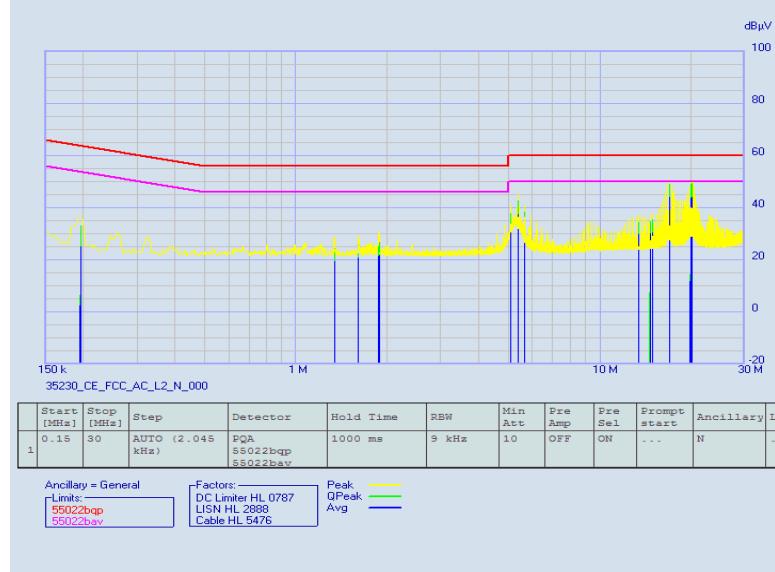
HERMON LABORATORIES

Report ID: AFIRAD_FCC.35230_Rev2
Date of Issue: 12-May-21

Test specification: Section 15.207(a) / RSS-Gen, Section 7.2, Conducted emission			
Test procedure:	ANSI C63.10, Section 6.2		
Test mode:	Compliance		
Date(s):	04-Feb-20		
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC, 50 Hz
Remarks:			

Plot 7.3.2 Conducted emission measurements

LINE: L2
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK





HERMON LABORATORIES

Report ID: AFIRAD_FCC.35230_Rev2
Date of Issue: 12-May-21

Test specification: Section 15.203 / RSS Gen Section 6.8, Antenna requirements			
Test procedure:	Visual inspection		
Test mode:	Compliance		
Date(s):	04-Feb-20	Verdict:	PASS
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC, 50 Hz
Remarks:			

7.4 Antenna requirements

The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.

The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.4.1.

Table 7.4.1 Antenna requirements

Requirement	Rationale	Verdict
The transmitter antenna is permanently attached	NA	Comply
The transmitter employs a unique antenna connector	NA	
The transmitter requires professional installation	Supplier declaration	

Photograph 7.4.1 Antenna assembly





HERMON LABORATORIES

Test specification: Section 15.107, Conducted emission at AC power port			
Test procedure: ANSI C63.4, Sections 11.5 and 12.1.3			
Test mode: Compliance			Verdict: PASS
Date(s): 05-Feb-20			
Temperature: 21.2 °C	Relative Humidity: 49 %	Air Pressure: 1017 hPa	Power: 120 VAC, 50 Hz
Remarks:			

8 Unintentional emissions according to 47CFR part 15 subpart B

8.1 Conducted emissions

8.1.1 General

This test was performed to measure common mode conducted emissions at the mains power port. Specification test limits according to FCC Part 15, Section 107 and RSS-Gen, Section 7.1.6 / ICES-003 are given in Table 8.1.1.

Table 8.1.1 Limits for conducted emissions

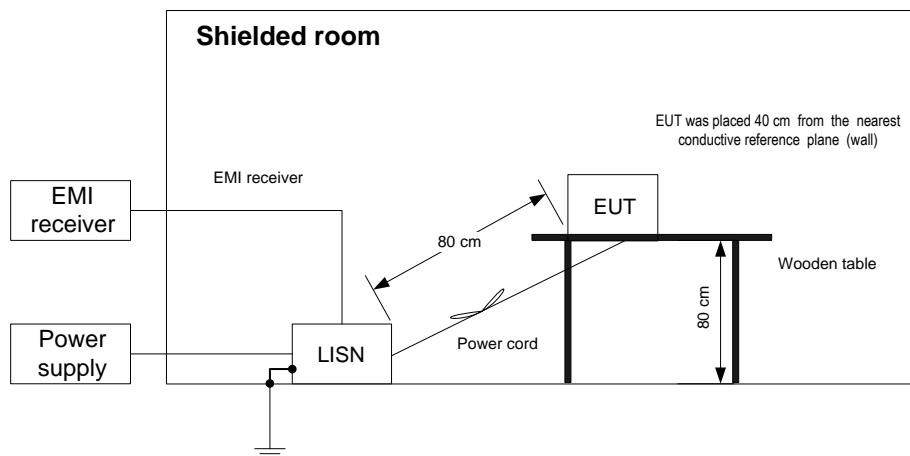
Frequency, MHz	Class B limit, dB(µV)	
	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5.0	56	46
5.0 - 30	60	50

* - The limit decreases linearly with the logarithm of frequency.

8.1.2 Test procedure

- 8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and associated photographs, energized and the performance check was conducted.
- 8.1.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer while unused coaxial connector of the LISN was terminated with 50 Ohm.
- 8.1.2.3 The position of the device cables was varied to determine maximum emission level.
- 8.1.2.4 The worst test results (the lowest margins) were recorded in Table 8.1.2 and shown in the associated plots.

Figure 8.1.1 Setup for conducted emission measurements, table-top equipment





HERMON LABORATORIES

Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Feb-20		
Temperature: 21.2 °C	Relative Humidity: 49 %	Air Pressure: 1017 hPa	Power: 120 VAC, 50 Hz
Remarks:			

Table 8.1.2 Conducted emission test results

LINE:

EUT OPERATING MODE:

FUT SET UP:

TEST SITE

TEST SITE:
FREQUENCY RANGE:

FREQUENCY RANGE: 150 kHz - 36 MHz
RESOLUTION/BANDWIDTH: 9 kHz

RESOLUTION BANDWIDTH. 9 kHz

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
								L1	Pass
								L2	Pass

*- Margin = Measured emission - specification limit.

L1

Frequency [MHz]	QPeak [dBpV]	Limit	Delta	Avg	Limit	Delta	Factor DC Limite..	Factor LISN HL 2..	Factor Cable HL ..	
		55022bqp [dBpV]	[dB]	[dBpV]	55022bav [dBpV]	[dB]	[dB]	[dB]	[dB]	
1	5.35657	37.33	60.00	---	32.58	50.00	-17.42	10.00	0.25	0.41
2	16.896505	47.69	60.00	-12.31	42.74	50.00	-7.26	10.00	0.80	0.70
3	19.841305	47.08	60.00	-12.92	42.25	50.00	-7.75	10.00	0.93	0.76
4	20.1092	47.09	60.00	-12.91	42.26	50.00	-7.74	10.00	0.95	0.77

L2

Frequency [MHz]	QPeak [dBpV]	Limit	Delta	Avg	Limit	Delta	Factor DC Limite..	Factor LISN HL 2..	Factor Cable HL ..	
		55022bqp [dBpV]	[dB]	[dBpV]	55022bav [dBpV]	[dB]	[dB]	[dB]	[dB]	
1	5.08663	37.57	60.00	---	32.43	50.00	-17.57	10.00	0.24	0.40
2	5.35657	42.51	60.00	-17.49	37.39	50.00	-12.61	10.00	0.25	0.41
3	5.62242	38.25	60.00	---	33.08	50.00	-16.92	10.00	0.26	0.42
4	14.620242	34.78	60.00	---	30.12	50.00	-19.88	10.00	0.69	0.65
5	14.888315	35.30	60.00	---	30.38	50.00	-19.62	10.00	0.70	0.66
6	16.896505	49.08	60.00	-10.92	43.86	50.00	-6.14	10.00	0.80	0.70
7	19.841305	48.94	60.00	-11.06	43.50	50.00	-6.50	10.00	0.93	0.76
8	20.1092	49.39	60.00	-10.61	43.87	50.00	-6.13	10.00	0.95	0.77

Reference numbers of test equipment used

HL 5700 HL 2888 HL 2874 HL 1205 HL 5707

Full description is given in Appendix A.



HERMON LABORATORIES

Report ID: AFIRAD_FCC.35230_Rev2
Date of Issue: 12-May-21

Test specification: Section 15.107, Conducted emission at AC power port			
Test procedure: ANSI C63.4, Sections 11.5 and 12.1.3			
Test mode: Compliance		Verdict: PASS	
Date(s):	05-Feb-20	Air Pressure:	1017 hPa
Temperature: 21.2 °C	Relative Humidity: 49 %	Power:	120 VAC, 50 Hz
Remarks:			

Plot 8.1.1 Conducted emission measurements

LINE: L1
LIMIT: Class B
EUT OPERATING MODE: Tx
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK





HERMON LABORATORIES

Report ID: AFIRAD_FCC.35230_Rev2
Date of Issue: 12-May-21

Test specification: Section 15.107, Conducted emission at AC power port			
Test procedure: ANSI C63.4, Sections 11.5 and 12.1.3			
Test mode: Compliance		Verdict: PASS	
Date(s):	05-Feb-20	Air Pressure:	1017 hPa
Temperature: 21.2 °C	Relative Humidity: 49 %	Power:	120 VAC, 50 Hz
Remarks:			

Plot 8.1.2 Conducted emission measurements

LINE:

L2

LIMIT:

Class B

EUT OPERATING MODE:

Tx

LIMIT:

QUASI-PEAK, AVERAGE

DETECTOR:

PEAK





HERMON LABORATORIES

Test specification: Section 15.109, ICES-003 , section 6.2 , Class B Radiated emission			
Test procedure: ANSI C63.4, Sections 8.3 and 12.2.5			
Test mode: Compliance			Verdict: PASS
Date(s):	05-Feb-20		
Temperature: 24 °C	Relative Humidity: 40 %	Air Pressure: 1015 hPa	Power: 120 VAC, 50 Hz
Remarks:			

8.2 Radiated emission measurements

8.2.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.2.1.

Table 8.2.1 Radiated emission limits

Frequency, MHz	Class B limit, dB(µV/m)		Class A limit, dB(µV/m)	
	10 m distance	3 m distance	10 m distance	3 m distance
30 - 88	29.5*	40.0	39.0	49.5*
88 - 216	33.0*	43.5	43.5	54.0*
216 - 960	35.5*	46.0	46.4	56.9*
960 - 5 th harmonic**	43.5*	54.0	49.5	60.0*

* - The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $\text{Lim}_{S2} = \text{Lim}_{S1} + 20 \log (S_1/S_2)$, where S_1 and S_2 – standard defined and test distance respectively in meters.

Table 8.2.2 Radiated emission limits

Frequency, MHz	Field strength limit at 3 m test distance, dB(µV/m)
30 - 88	40.0
88 - 216	43.5
216 - 960	46.0
960 - 3 rd harmonic**	54.0

** - harmonic of the highest frequency the EUT generates, uses, operates or tunes to.

8.2.2 Test procedure for measurements in semi-anechoic chamber

- 8.2.2.1 The EUT was set up as shown in Figure 8.2.1 and associated photograph/s, energized and the performance check was conducted.
- 8.2.2.2 The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.
- 8.2.2.3 The worst test results (the lowest margins) were provided in the associated tables and plots.



HERMON LABORATORIES

Report ID: AFIRAD_FCC.35230_Rev2

Date of Issue: 12-May-21

Test specification: Section 15.109, ICES-003 , section 6.2 , Class B Radiated emission			
Test procedure: ANSI C63.4, Sections 8.3 and 12.2.5			
Test mode: Compliance		Verdict: PASS	
Date(s): 05-Feb-20			
Temperature: 24 °C	Relative Humidity: 40 %	Air Pressure: 1015 hPa	Power: 120 VAC, 50 Hz
Remarks:			

Figure 8.2.1 Setup for radiated emission measurements in semi anechoic chamber, table-top equipment

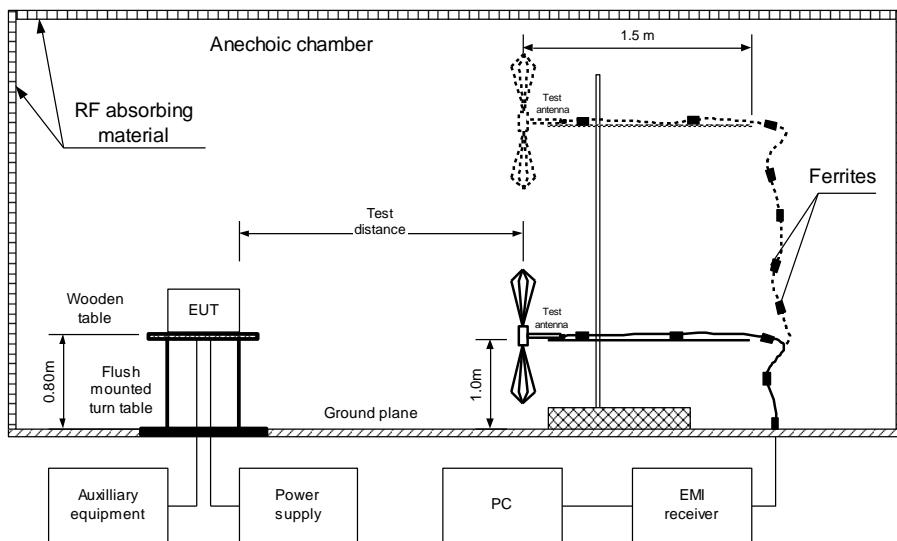


Table 8.2.3 Radiated emission test results

EUT SET UP:

TABLE-TOP

LIMIT:

Class B

EUT OPERATING MODE:

Rx

TEST SITE:

SEMI ANECHOIC CHAMBER

TEST DISTANCE:

3 m

FREQUENCY RANGE:

30 MHz – 1000 MHz

RESOLUTION BANDWIDTH:

120 kHz

Frequency, MHz	Peak emission, dB(µV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
36.376	41.30	31.50	40.0	-8.50	Vertical	1.02	-53	Pass
108.817	48.00	36.50	43.5	-7.00	Horizontal	2.68	-63	
110.009	47.76	36.06	43.5	-7.44	Vertical	1.35	13	
114.759	51.46	37.21	43.5	-6.29	Vertical	1.00	-65	
125.625	49.63	38.41	43.5	-5.09	Vertical	1.32	180	
724.065	41.96	39.01	46.0	-6.99	Horizontal	1.02	-86	

Reference numbers of test equipment used

HL 4360	HL 3903	HL 4011	HL 5311	HL 5309	HL 5288	HL 5085	
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Full description is given in Appendix A.



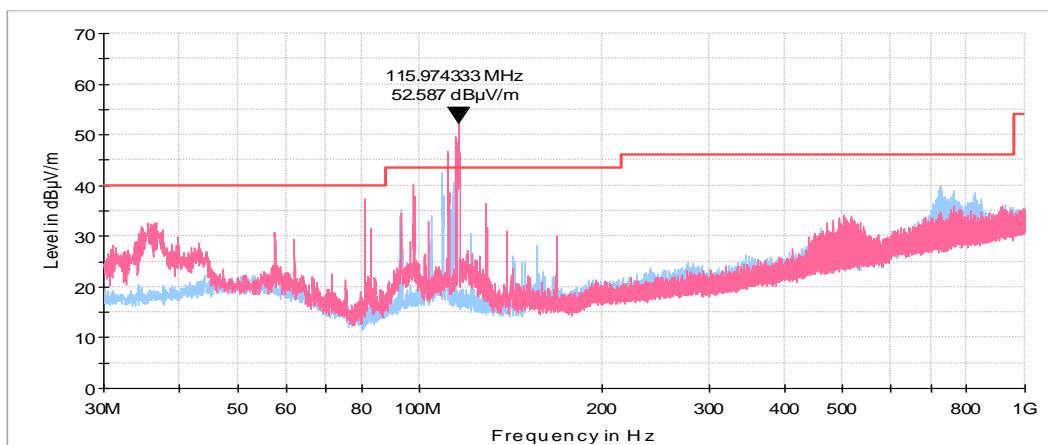
HERMON LABORATORIES

Report ID: AFIRAD_FCC.35230_Rev2
Date of Issue: 12-May-21

Test specification:	Section 15.109, ICES-003 , section 6.2 , Class B Radiated emission		
Test procedure:	ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Feb-20		
Temperature: 24 °C	Relative Humidity: 40 %	Air Pressure: 1015 hPa	Power: 120 VAC, 50 Hz
Remarks:			

Plot 8.2.1 Radiated emission measurements in 30 - 1000 MHz range, vertical and horizontal antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Tx





HERMON LABORATORIES

Report ID: AFIRAD_FCC.35230_Rev2
Date of Issue: 12-May-21

9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./Check	Due Cal./Check
0446	Antenna, Loop, Active, 10 (9) kHz - 30 MHz	EMCO	6502	2857	24-Feb-20	24-Feb-21
1205	One phase voltage regulator, 2kVA, 0-250V	Hermon Laboratories	TDGC-2	109	21-Apr-20	21-Apr-21
2874	Life - Guard Extreme Isolation Transformer, 230/230, 50 Hz, 1Phase, 1.8 kVA	Taiyo Yuden, Inc.	LGY1.8k-21	FI0412	05-Feb-20	05-Feb-21
2888	LISN Two-line V-Network 50 Ohm / 50 uH + 5 Ohm, 16A, MIL STD 461E, CISPR 16-1	Rolf Heine	NNB-2/16Z	02/10018	17-Mar-20	17-Mar-21
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFL EX 102A	1226/2A	06-Apr-20	06-Apr-21
4011	Temp. & Humidity Meter, (-50 - +70) deg, (20 - 99)% RH	Mad Electronics	HTC-1	NA	12-Aug-20	12-Aug-21
4360	EMI Test Receiver, 20 Hz to 40 GHz.	Rohde & Schwarz	ESU40	100322	20-Jan-20	20-Jan-21
5085	Attenuator, 4 dB, DC - 6 GHz, 1 W	Mini-Circuits	UNAT-4+	NA	22-May-20	22-May-21
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX-8000E	00809	08-Feb-19	08-Feb-22
5309	Antenna Mast, 1-4 meter, Pneumatic polarization	Frankonia	FMB 1-4	NA	23-Apr-20	23-Apr-21
5311	Controller	Dolev Ltd	FC-06	FC06.1-2016-024	23-Apr-20	23-Apr-21
5376	EXA Signal Analyzer, 10 Hz - 32 GHz	Keysight Technologies	N9010B	MY574704 04	18-Mar-20	18-Mar-21
5379	1/4" Free-field Microphone Preamplifier	Brüel & Kjaer	2670	3166281	19-Aug-20	19-Aug-22
5700	Temp. & Humidity Meter, (-10 - +50) deg, (10 - 99)% RH	Mad Electronics	HTC-1	NA	02-Dec-19	02-Dec-20
5707	EMI receiver	PMM / Narda	PMM 9010F	060WW91 101	22-Nov-19	22-Nov-21



HERMON LABORATORIES

Report ID: AFIRAD_FCC.35230_Rev2
Date of Issue: 12-May-21

10 APPENDIX B Test equipment correction factors

HL 0446: Active Loop Antenna
EMCO, model: 6502, s/n 2857

Frequency,	Measured antenna factor, dB _S /m	Measurement uncertainty, dB
10	-33.4	±1.0
20	-37.8	±1.0
50	-40.5	±1.0
75	-41.0	±1.0
100	-41.2	±1.0
150	-41.2	±1.0
250	-41.1	±1.0
500	-41.2	±1.0
750	-41.3	±1.0
1000	-41.3	±1.0

Frequency,	Measured antenna factor, dB _S /m	Measurement uncertainty, dB
2000	-41.4	±1.0
3000	-41.4	±1.0
4000	-41.5	±1.0
5000	-41.5	±1.0
10000	-41.7	±1.0
15000	-42.1	±1.0
20000	-42.7	±1.0
25000	-44.2	±1.0
30000	-45.8	±1.0

The antenna factor shall be added to receiver reading in dB_μV to obtain field strength in dB_μA/m.



HERMON LABORATORIES

Report ID: AFIRAD_FCC.35230_Rev2
Date of Issue: 12-May-21

**HL 2888 LISN Two-line V-Network 50 Ohm / 50 uH + 5 Ohm, 16A
Rolf Heine, model: NNB-2/16Z, s/n 02/10018, HL 2888**

Voltage division factor (insertion loss)

Frequency,	L1, dB	L2, dB	Uncertainty, dB
150	0.09	0.07	±0.09
170	0.08	0.07	±0.09
200	0.08	0.06	±0.09
250	0.09	0.06	±0.09
300	0.09	0.06	±0.09
350	0.09	0.07	±0.09
400	0.09	0.07	±0.09
500	0.09	0.07	±0.09
600	0.09	0.07	±0.09
700	0.10	0.08	±0.09
800	0.10	0.08	±0.09
900	0.11	0.08	±0.09
1000	0.11	0.08	±0.09
1200	0.11	0.09	±0.16
1500	0.12	0.10	±0.16
2000	0.14	0.12	±0.16
2500	0.15	0.12	±0.16
3000	0.16	0.14	±0.16
4000	0.19	0.16	±0.16
5000	0.23	0.19	±0.16
7000	0.30	0.25	±0.16
10000	0.46	0.40	±0.16
15000	0.71	0.62	±0.16
20000	0.94	0.85	±0.16
30000	1.41	1.33	±0.32



HERMON LABORATORIES

HL 5288: Trilog Antenna
Frankonia, model: ALX-8000E, s/n: 00809
30-1000 MHz

Frequency, MHz	Antenna factor, dB/m
30	14.96
35	15.33
40	16.37
45	17.56
50	17.95
60	16.87
70	13.22
80	10.56
90	13.61
100	15.46
120	14.03
140	12.23

Frequency, MHz	Antenna factor, dB/m
160	12.67
180	13.34
200	15.40
250	16.42
300	17.28
400	19.98
500	21.11
600	22.90
700	24.13
800	25.25
900	26.35
1000	27.18

The antenna factor shall be added to receiver reading in dB μ V to obtain field strength in dB μ V/m.
above 1000 MHz

Frequency, MHz	Antenna factor, dB/m
1000	26.9
1100	28.1
1200	28.4
1300	29.6
1400	29.1
1500	30.4
1600	30.7
1700	31.5
1800	32.3
1900	32.6
2000	32.5
2100	32.9
2200	33.5
2300	33.2
2400	33.7
2500	34.6
2600	34.7
2700	34.6
2800	35.0
2900	35.5
3000	36.2
3100	36.8
3200	36.8
3300	37.0
3400	37.5
3500	38.2

Frequency, MHz	Antenna factor, dB/m
3600	38.9
3700	39.4
3800	39.4
3900	39.6
4000	39.7
4100	39.8
4200	40.5
4300	40.9
4400	41.1
4500	41.4
4600	41.3
4700	41.6
4800	41.9
4900	42.3
5000	42.7
5100	43.0
5200	42.9
5300	43.5
5400	43.6
5500	44.3
5600	44.7
5700	45.0
5800	45.0
5900	45.3
6000	45.9

The antenna factor shall be added to receiver reading in dB μ V to obtain field strength in dB μ V/m.



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11 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, Radio, Safety, Environmental and Telecommunication testing facility.

Hermon Laboratories is recognized and accredited by the Federal Communications Commission (USA) for relevant parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; Recognized by Innovation, Science and Economic Development Canada for wireless and terminal testing (ISED), ISED #2186A, CAB identifier is IL1001; Certified by VCCI, Japan (the registration numbers are R-10808 for OATS, R-1082 for anechoic chamber, G-10869 for RE measurements above 1 GHz, C-10845 for conducted emissions site and T-11606 for conducted emissions at telecommunication ports).

The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing, environmental simulation and calibration (for exact scope please refer to Certificate No. 839.01, 839.03 and 839.04).

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12 APPENDIX D Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 10 m measuring distance Horizontal polarization	Biconilog antenna: ± 5.0 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.1 dB Double ridged horn antenna: ± 5.3 dB
Vertical polarization	Biconilog antenna: ± 5.5 dB Biconical antenna: ± 5.5 dB Log periodic antenna: ± 5.6 dB Double ridged horn antenna: ± 5.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization	Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB
Vertical polarization	Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Occupied bandwidth	± 8.0 %

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.



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13 APPENDIX E

Specification references

47CFR part 15: 2019	Radio Frequency Devices.
RSS-210 Issue 10: 2019	Low Power Licence- Exempt Radiocommunication Devices
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.4: 2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
RSS-Gen Issue 5, April 2018	General Requirements for Compliance of Radio Apparatus
ICES-003 Issue 6: 2016	Information Technology Equipment (Including Digital Apparatus) – Limits and Methods of Measurement



HERMON LABORATORIES

14 APPENDIX F

Abbreviations and acronyms

A	ampere
AC	alternating current
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(µV)	decibel referred to one microvolt
dB(µV/m)	decibel referred to one microvolt per meter
dB(µA)	decibel referred to one microampere
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
µs	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
Ω	Ohm
PM	pulse modulation
PS	power supply
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
WB	wideband



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15 APPENDIX G Manufacturer's declaration

afimilk®

AfiPass II External Modules Specification

AfiPass II livestock Passive ID system comprise of a controller and antenna/s (i.e. external modules) designed to support various applications of livestock identification according to ISO standards 11784 and 11785.

The external modules differ in size and electrical spec to optimally suit the purpose of each module in terms of ID range and peripheral area coverage:

- **External Module 50 (Part Number: 4095912)**
A 500mmX260mm air loop antenna pre-wired with a 15m RG58 coaxial cable. Suitable for most applications which require a long-distance ID range with medium-high peripheral area coverage (circular-elliptic). Enables the strongest transmission power for the system.
- **External Module 40 (Part Number: 4095914)**
A 400mmX145mm air loop antenna pre-wired with a 15m RG58 coaxial cable. Suitable for specific applications which require short to medium distance ID range with small peripheral area coverage (elliptic).
- **Sort/Rotary External Module (Part Number: 4095913)**
A 1235mmX285mm air loop antenna pre-wired with a 10m RG58 coaxial cable. Suitable for specific applications which require medium to long distance ID range with medium peripheral area coverage (squared-elliptic).

Afimilk rep: Barak Yosef

Head of Hardware Development

Date: 22/12/2020

Place of issue: Kibbutz Afikim, ISRAEL

END OF DOCUMENT