HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

Hermon Laboratories Ltd.
P.O. Box 23, Binyamina 3055001, Israel
Tel. +972 4628 8001
Fax. +972 4628 8277
E-mail: mail@hermonlabs.com

TEST REPORT

ACCORDING TO: FCC CFR 47 Part 15 subpart C, section 15.231 and subpart B, RSS-210 issue 10 Annex A, RSS-Gen issue 5, ICES-003 Issue 6:2016

FOR:

Paradox Security Systems Ltd.

Outdoor Wireless Siren

Model: SR230

FCC ID: KDYSR230

IC: 2438A-SR230

Table of contents

1 Applicant information

Client name:	Paradox Security Systems Ltd.
Address:	780 Industrial Boulevard St.Eustache, Quebec J7R 5V3 Canada
Telephone:	450-491-7444
Fax:	450-497-1095
E-mail:	alexc@paradox.com
Contact name:	Mr. Alex Chaplik

2 Equipment under test attributes

Product name:	Outdoor Wireless Siren
Product type:	Transceiver
Model(s):	SR230
Serial number:	215194
Hardware version:	331-6301-991
Software release:	V1.00
Receipt date	05-Jan-21

3 Manufacturer information

Manufacturer name:	Paradox Security Systems Ltd.
Address:	780 Industrial Boulevard St.Eustache, Quebec J7R 5V3 Canada
Telephone:	450-491-7444
Fax:	450-497-1095
E-Mail:	alexc@paradox.com
Contact name:	Mr. Alex Chaplik

4 Test details

Project ID:	36712
Location:	Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started:	23-Dec-20
Test completed:	07-Jan-21
Test specification(s):	FCC 47CFR part 15, subpart C, §15.231 and subpart B; RSS-210 issue 10 Annex A, RSS-Gen issue 5, ICES-003 Issue 6:2016

5 Tests summary

Test	Status
Transmitter characteristics	
FCC Part 15, Section 231(a) / RSS-210, Section A1.1, Periodic operation requirements	Pass
FCC Part 15, Section 231(a) / RSS-210, Section A1.2, Field strength of emissions	Pass
FCC Part 15, Section 231(c) / RSS-210, Section A1.3, Occupied bandwidth	Pass
FCC Part 15, Section 207 / RSS-Gen, Section 8.8, Conducted emission	Not required
FCC Part 15, Section 203 / RSS-Gen, Section 8.3, Antenna requirements	Pass
Unintentional emissions	
FCC Part 15, Section 107 / ICES-003, Section 6.1 class B, Conducted emission at AC power port	Not required
FCC Part 15, Section 109 / RSS-Gen, Section 7.1.2/ ICES-003, Section 6.2 class B, Radiated emission	Pass

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	23-Dec-20 – 07-Jan-21	
Reviewed by:	Mrs. S. Peysahov Sheynin, test engineer, EMC & Radio	20-Jan-21	
Approved by:	Mr. S. Samokha, technical manager, EMC & Radio	28-Jan-21	

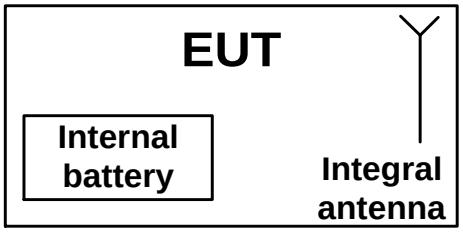
6 EUT description

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

6.1 General information

The EUT is SR230 is a stand-alone, fully supervised outdoor wireless siren with built-in strobe light and wireless transceiver operating at 433.92 MHz. The EUT is equipped with an integral antenna and is powered by three 1.5V Alkaline batteries type C in series.

6.2 Test configuration



6.3 Changes made in EUT

No changes were implemented in the EUT during testing.

6.4 Transmitter characteristics

Type of equipment							
X	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 frequency	433.92 MHz	
Maximum rated output power	At transmitter 50 Ω RF output connector	
	Field strength at 3 m distance	83.83 dB(µV/m) – peak 77.55 dB(µV/m) -average

Is transmitter output power variable?	X	No			
		Yes		continuous variable	
				stepped variable with stepsize	dB
			minimum RF power		dBm
			maximum RF power		dBm

Antenna connection					
unique coupling	standard connector	X	integral		with temporary RF connector
				X	without temporary RF connector

Antenna/s technical characteristics			
Type	Manufacturer	Model number	Gain
Integral	LEVEN CO., LTD	Wire Antenna 146mm, 900-4500-127-R	0 dBi

Transmitter aggregate data rate/s	1.67 kbps
Type of modulation	OOK
Modulating test signal (baseband)	ID code

Transmitter power source					
X	Battery	**Nominal rated voltage**	4.5 VDC	Battery type	Alkaline type C
	DC	**Nominal rated voltage**	VDC		
	AC mains	**Nominal rated voltage**	VAC	Frequency	

Common power source for transmitter and receiver	X	yes	no

Test specification:	**FCC Part 15, Section 231(a) / RSS-210, Section A1.1, Periodic operation requirements**		
Test procedure:	Supplier declaration		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	05-Jan-21		
Temperature: 25 ºC	**Relative Humidity:** 43 %	**Air Pressure:** 1014 hPa	**Power:** 4.5 VDC
Remarks:			

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

7.1 Periodic operation requirements

7.1.1 General

The EUT was verified for compliance with periodic operation requirements listed below:

- Continuous transmissions such as voice, video and the radio control of toys are not permitted;
- A manually operated transmitter shall employ switch that will automatically deactivate the transmitter within not more than 5 seconds of being released;
- A transmitter activated automatically shall cease transmission within 5 seconds after activation;
- Periodic transmissions, excluding polling or supervision transmissions, at regular predetermined intervals are not permitted;
- Total duration of polling or supervision transmissions, including data, to determine system integrity in security or safety applications shall not exceed 2 seconds per hour;
- Transmission of set-up information for security systems may exceed the transmission duration limits of 5 seconds, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

The rationale for compliance with the above requirements was either test results or supplier declaration. The summary of results is provided in Table 7.1.1

7.1.2 Test procedure for transmitter shut down test

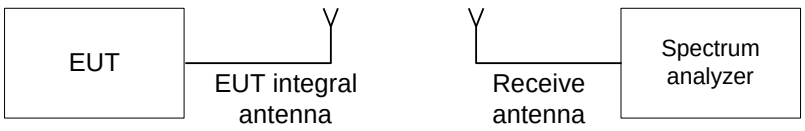
7.1.2.1 The EUT was set up as shown in Figure 7.1.1.

7.1.2.2 The spectrum analyzer center frequency was adjusted to the EUT carrier, span set to zero and video triggered for transmission.

7.1.2.3 The transmitter was activated either manually or automatically. Once manually operated transmitter was activated, the switch was immediately released.

7.1.2.4 The transmission time was captured and shown in Plot 7.1.1.

Figure 7.1.1 Setup for transmitter shut down test



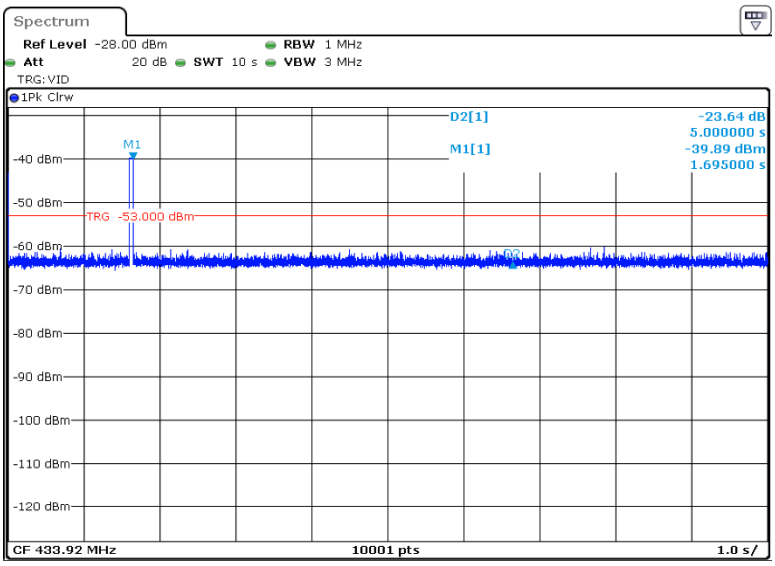
Test specification:	**FCC Part 15, Section 231(a) / RSS-210, Section A1.1, Periodic operation requirements**		
Test procedure:	Supplier declaration		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	05-Jan-21		
Temperature: 25 ºC	**Relative Humidity:** 43 %	**Air Pressure:** 1014 hPa	**Power:** 4.5 VDC
Remarks:			

Table 7.1.1 Periodic operation requirements

Requirement	Rationale	Verdict
Continuous transmissions are not permitted	Supplier declaration*	Comply
A manually operated transmitter shall be deactivated within not more than 5 seconds of switch being released	NA	NA
Transmitter activated automatically shall cease transmission within 5 seconds	Plot 7.1.1	Comply
Periodic transmissions at regular predetermined intervals are not permitted	Supplier declaration*	Comply
Total duration of polling or supervision transmissions shall not exceed 2 seconds per hour	NA	NA
Transmission of set-up information for security systems may exceed the transmission duration limits of 5 seconds, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.	Supplier declaration	Comply

* Provided in Appendix F.

Plot 7.1.1 Transmitter shut down test result



Reference numbers of test equipment used

HL 4136	HL 4355	HL 5397	HL 5410	HL 5693			

Full description is given in Appendix A.

Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Jan-21		
Temperature: 20.5 ºC	Relative Humidity: 52 %	Air Pressure: 1017 hPa	Power: 4.5 VDC
Remarks:			

7.2 Field strength of emissions

7.2.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given in Table 7.2.1 and Table 7.2.2.

Table 7.2.1 Radiated fundamental emission limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)	
	Peak	Average
433.9200	100.8	80.8

Table 7.2.2 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m, dB(μV/m)				
	Within restricted bands			Outside restricted bands	
	Peak	Quasi Peak	Average	Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	80.8	60.8
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	NA	73.8 – 63.0**	NA		
1.705 – 30.0*		69.5			
30 – 88		40.0			
88 – 216		43.5			
216 – 960		46.0			
960 - 1000		54.0			
Above 1000	74.0	NA	54.0		

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

$$Lim_{S2} = Lim_{S1} + 40 \log (S_1/S_2),$$

where S_1 and S_2 – standard defined and test distance respectively in meters.

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

Note 1: The fundamental emission limit in dB(μV/m) was calculated as follows:

$$Lim_{AVR} = 20 \times \log(56.81818 \times F - 6136.3636)$$ - within 130 – 174 MHz band;

$$Lim_{AVR} = 20 \times \log(41.6667 \times F - 7083.3333)$$ - within 260 – 470 MHz band,

where F is the carrier frequency in MHz.

The limit for spurious emissions was 20 dB lower than fundamental emission limit.

The above limits provided in terms of average values, peak limit was 20 dB above the average limit.

Note 2: The above field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency.

Test specification:	**FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions**		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	05-Jan-21		
Temperature: 20.5 ºC	**Relative Humidity:** 52 %	**Air Pressure:** 1017 hPa	**Power:** 4.5 VDC
Remarks:			

7.2.2 Test procedure for spurious emission field strength measurements in 9 kHz to 30 MHz band

7.2.2.1 The EUT was set up as shown in Figure 7.2.1 energized and the performance check was conducted.

7.2.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna was rotated around its vertical axis.

7.2.2.3 The worst test results (the lowest margins), recorded in Table 7.2.3, Table 7.2.4, Table 7.2.5 and shown in the associated plots.

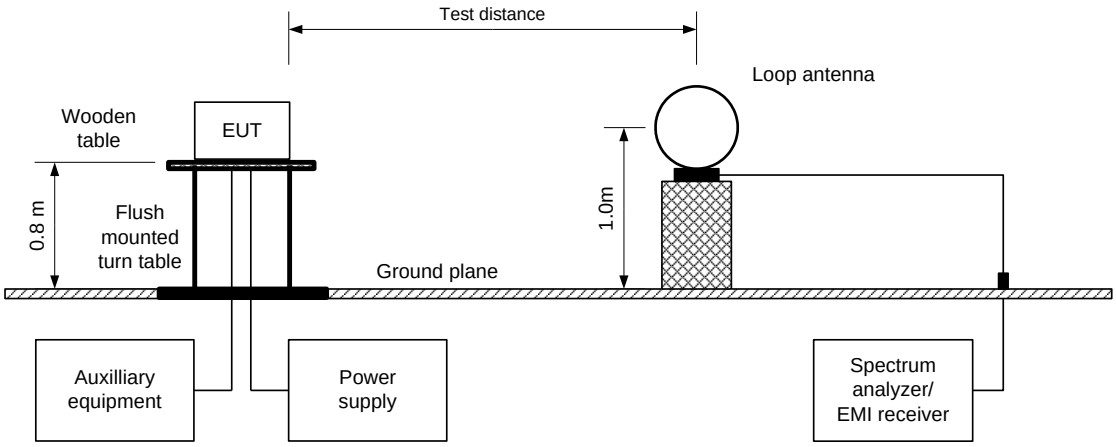
7.2.3 Test procedure for spurious emission field strength measurements above 30 MHz

7.2.3.1 The EUT was set up as shown in Figure 7.2.2, Figure 7.2.3 energized and the performance check was conducted.

7.2.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

7.2.3.3 The worst test results (the lowest margins), recorded in Table 7.2.3, Table 7.2.4 and shown in the associated plots.

Figure 7.2.1 Setup for spurious emission field strength measurements below 30 MHz



Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Jan-21		
Temperature: 20.5 ºC	Relative Humidity: 52 %	Air Pressure: 1017 hPa	Power: 4.5 VDC
Remarks:			

Figure 7.2.2 Setup for spurious emission field strength measurements in 30 -1000 MHz

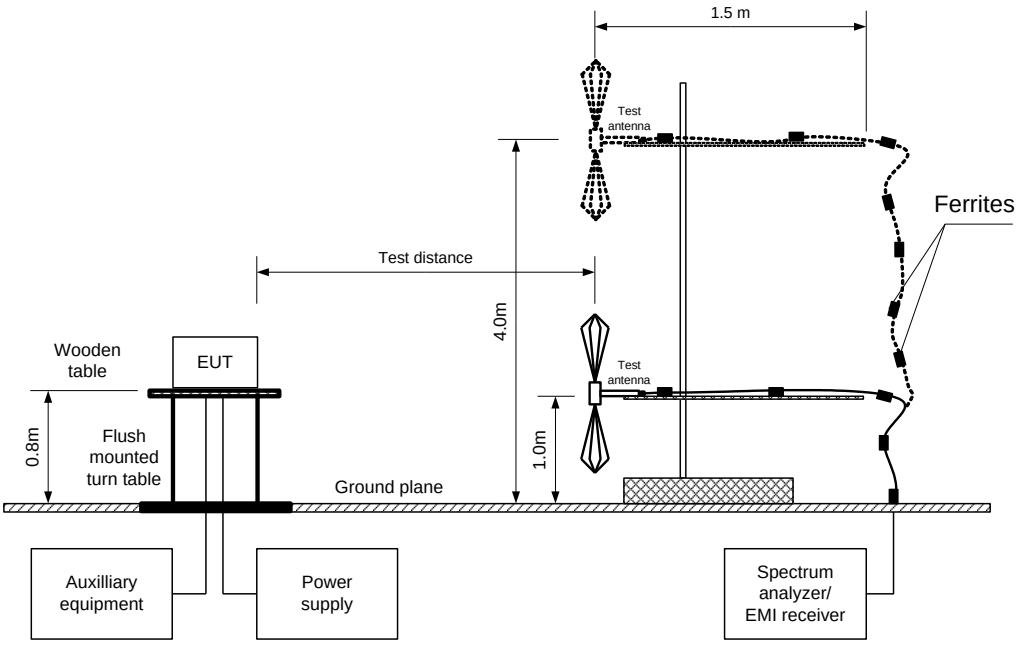
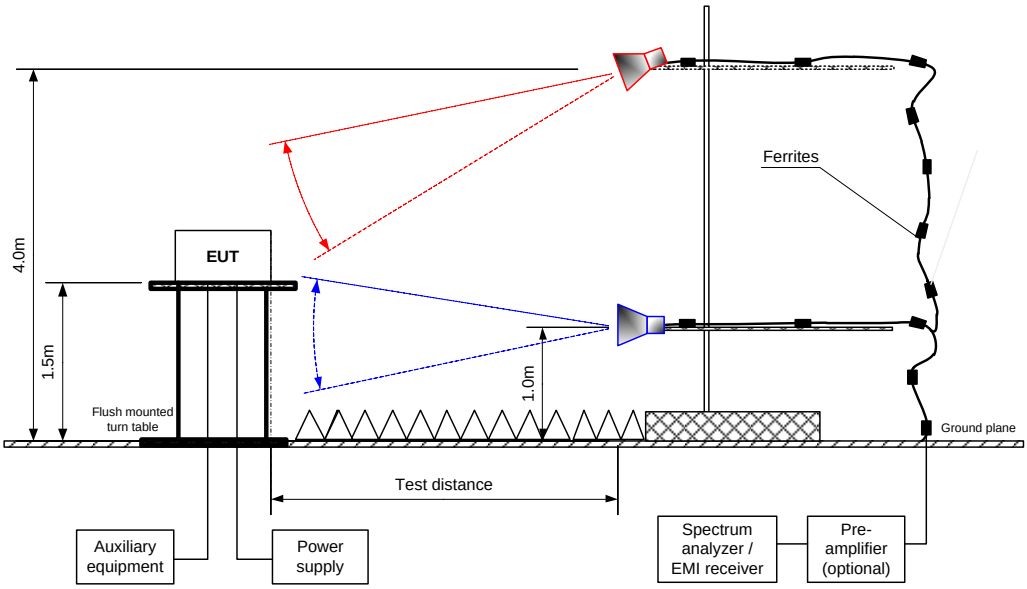


Figure 7.2.3 Setup for spurious emission field strength measurements above1000 MHz



Test specification:	**FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions**		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	05-Jan-21		
Temperature: 20.5 ºC	**Relative Humidity:** 52 %	**Air Pressure:** 1017 hPa	**Power:** 4.5 VDC
Remarks:			

Table 7.2.3 Field strength of fundamental emission, spurious emissions outside restricted bands and within restricted bands at frequencies above 1 GHz

TEST DISTANCE:	3 m
EUT POSITION:	Typical
MODULATION:	OOK
BIT RATE:	1.67 kbps
INVESTIGATED FREQUENCY RANGE:	0.009 -4500 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	0.2 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz) 1.0 MHz (above 1000 MHz)
VIDEO BANDWIDTH:	≥ Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz) Double ridged guide (above 1000 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)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
Fundamental emission* **											
433.92	V	1.0	-70.0	83.83	100.8	-16.97	83.83	77.55	80.8	-3.24	Pass
433.92	H	2.0	180.0	82.63	100.8	-18.17	82.63	76.35	80.8	-4.44	Pass
Spurious emissions											
309.61	V	1.84	161.0	32.92	80.8	-47.88	32.92	26.65	60.8	-34.15	Pass
3471.29	V	1.60	13.0	42.66	80.8	-38.14	42.66	36.39	60.8	-24.41	Pass

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin, dB =Measured (calculated) value, dB(μV/m)-Limit, dB(μV/m)
*** Max value was obtained in typical installation position and at Unom input power voltage.

Table 7.2.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
48.54	100	NA	NA	NA	-6.27

*- Average factor was calculated as follows

for pulse train shorter than 100 ms: $$Average\,factor = 20 \times \log_{10}\left(\frac{Pulse\,duration}{Pulse\,period} \times \frac{Burst\,duration}{Train\,duration} \times Number\,of\,bursts\,within\,pulse\,train\right)$$

for pulse train longer than 100 ms: $$Average\,factor = 20 \times \log_{10}\left(\frac{Pulse\,duration}{Pulse\,period} \times \frac{Burst\,duration}{100ms} \times Number\,of\,bursts\,within\,100ms\right)$$

Test specification:	**FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions**		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	05-Jan-21		
Temperature: 20.5 ºC	**Relative Humidity:** 52 %	**Air Pressure:** 1017 hPa	**Power:** 4.5 VDC
Remarks:			

Table 7.2.5 Field strength of emissions below 1 GHz within restricted bands

TEST DISTANCE:	3 m
EUT POSITION:	Typical
MODULATION:	OOK
BIT RATE:	1.67 kbps
INVESTIGATED FREQUENCY RANGE:	0.009 – 1000 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	0.2 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz)
VIDEO BANDWIDTH:	≥ Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Log periodic (200 MHz – 1000 MHz) Biconilog (30 MHz – 1000 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***				
No emissions were found								Pass

*****- Margin = Measured emission - specification limit.
******- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

HL 2909	HL 3909	HL 4360	HL 4933	HL 5085	HL 5669		
HL 5670	HL 4011						

Full description is given in Appendix A.

Test specification:	**FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions**		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	05-Jan-21		
Temperature: 20.5 ºC	**Relative Humidity:** 52 %	**Air Pressure:** 1017 hPa	**Power:** 4.5 VDC
Remarks:			

Table 7.2.6 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	Above 38.6
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	

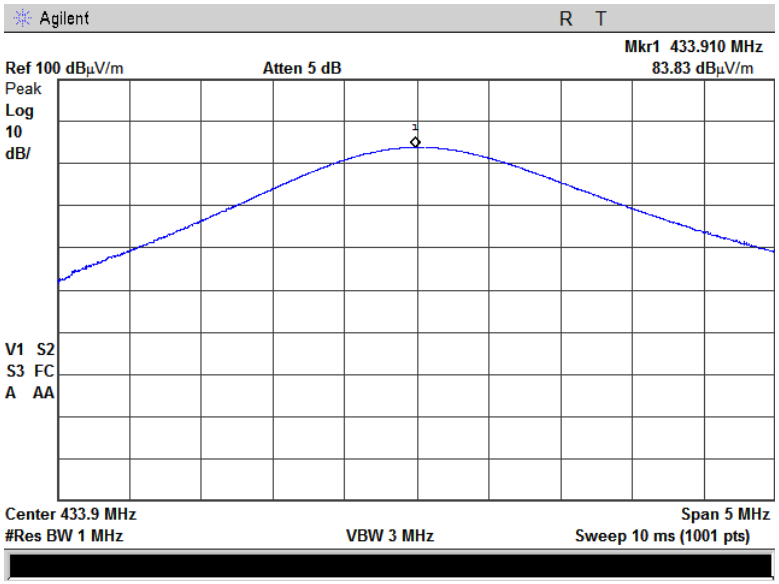
Table 7.2.7 Restricted bands according to RSS-Gen, Table 3

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

Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Jan-21		
Temperature: 20.5 ºC	Relative Humidity: 52 %	Air Pressure: 1017 hPa	Power: 4.5 VDC
Remarks:			

Plot 7.2.1 Radiated emission measurements at the fundamental frequency

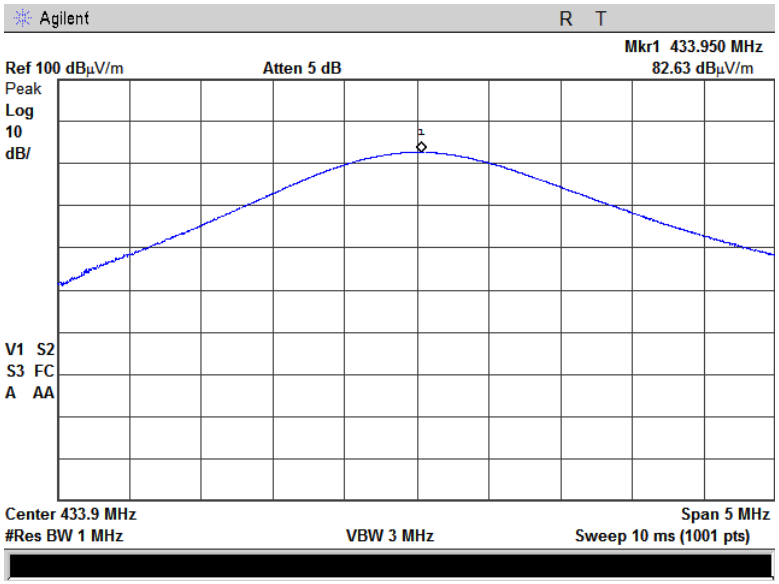
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical
EUT POSITION:	Typical
INPUT VOLTAGE:	Unom



Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Jan-21		
Temperature: 20.5 ºC	Relative Humidity: 52 %	Air Pressure: 1017 hPa	Power: 4.5 VDC
Remarks:			

Plot 7.2.2 Radiated emission measurements at the fundamental frequency

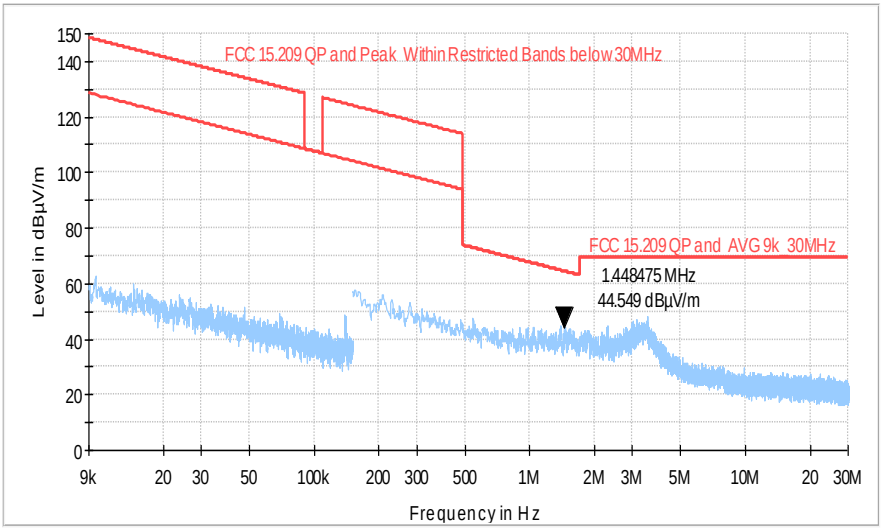
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Horizontal
EUT POSITION:	Typical
INPUT VOLTAGE:	Unom



Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Jan-21		
Temperature: 20.5 ºC	Relative Humidity: 52 %	Air Pressure: 1017 hPa	Power: 4.5 VDC
Remarks:			

Plot 7.2.3 Radiated emission measurements from 9 kHz to 30 MHz

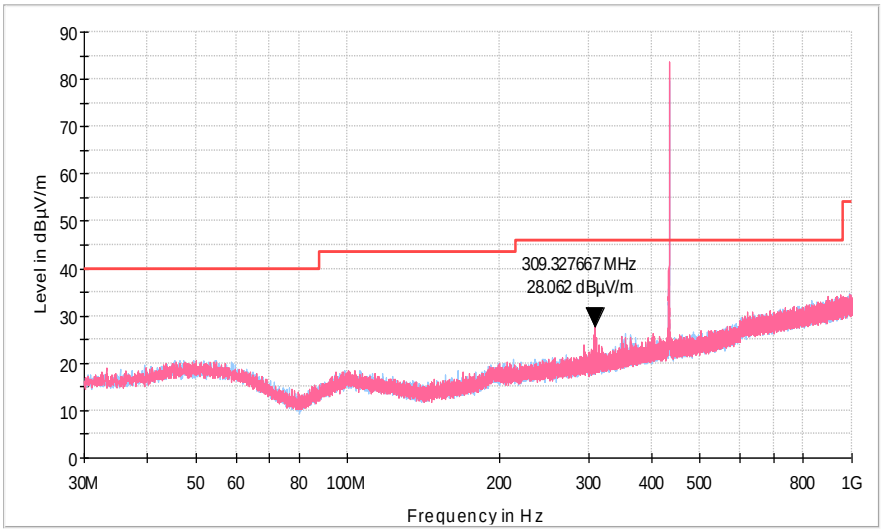
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
EUT POSITION:	Typical



Test specification:	**FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions**		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	05-Jan-21		
Temperature: 20.5 ºC	**Relative Humidity:** 52 %	**Air Pressure:** 1017 hPa	**Power:** 4.5 VDC
Remarks:			

Plot 7.2.4 Radiated emission measurements from 30 to 1000 MHz

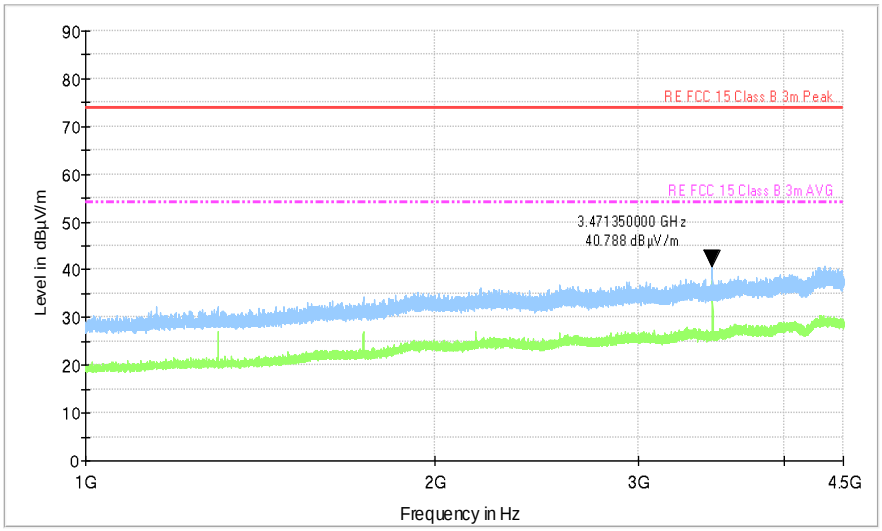
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Jan-21		
Temperature: 20.5 ºC	Relative Humidity: 52 %	Air Pressure: 1017 hPa	Power: 4.5 VDC
Remarks:			

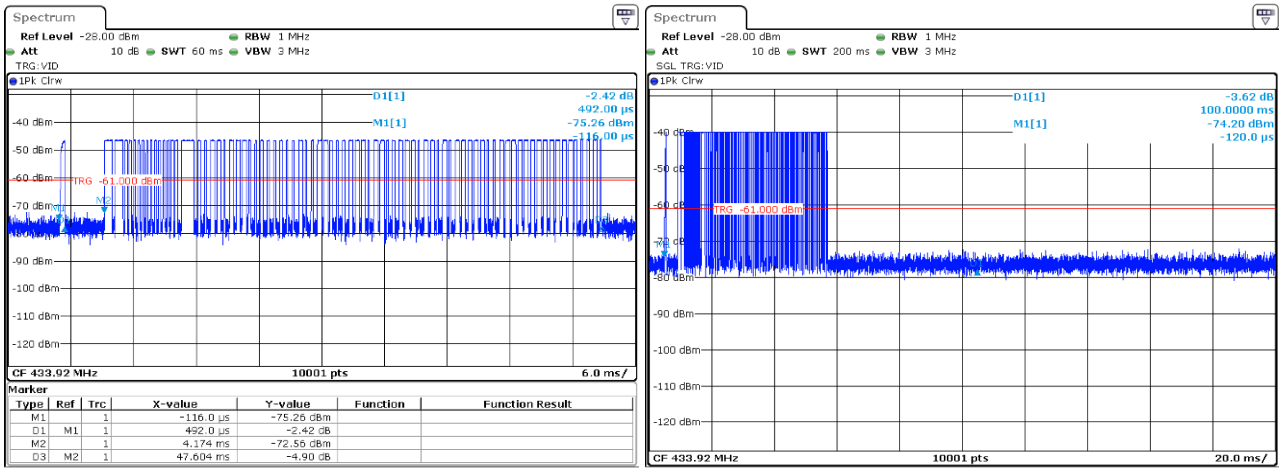
Plot 7.2.5 Radiated emission measurements from 1000 to 4500MHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Jan-21		
Temperature: 20.5 ºC	Relative Humidity: 52 %	Air Pressure: 1017 hPa	Power: 4.5 VDC
Remarks:			

Plot 7.2.6 Transmission pulse duration



Test specification:	FCC Part 15, Section 231(c) / RSS-210, Section A1.3, Occupied bandwidth		
Test procedure:	ANSI C63.10 section 6.9.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Dec-20		
Temperature: 20.9 ºC	Relative Humidity: 40 %	Air Pressure: 1017 hPa	Power: 4.5 VDC
Remarks:			

7.3 Occupied bandwidth test

7.3.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.3.1. The test results are provided in Table 7.3.2 and associated plots.

Table 7.3.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Maximum allowed bandwidth, % of the carrier frequency
70 - 900	20.0	0.25
Above 900		0.50

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

7.3.2 Test procedure

7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.

7.3.2.2 The EUT was set to transmit modulated carrier.

7.3.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.3.2 and associated plot.

Figure 7.3.1 Occupied bandwidth test setup

Test specification:	**FCC Part 15, Section 231(c) / RSS-210, Section A1.3, Occupied bandwidth**		
Test procedure:	ANSI C63.10 section 6.9.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	29-Dec-20		
Temperature: 20.9 ºC	**Relative Humidity:** 40 %	**Air Pressure:** 1017 hPa	**Power:** 4.5 VDC
Remarks:			

Table 7.3.2 Occupied bandwidth test results

DETECTOR USED: Peak hold
RESOLUTION BANDWIDTH: 0.3 kHz
VIDEO BANDWIDTH: 1 kHz
MODULATION: OOK
BIT RATE: 1.67 kbps

MODULATION ENVELOPE REFERENCE POINTS: 20 dBc

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit		Margin, kHz	Verdict
		% of the carrier frequency	kHz		
433.92	15.498	0.25	1084.8	-1069.302	Pass

DETECTOR USED: Peak hold
RESOLUTION BANDWIDTH: 1 kHz
VIDEO BANDWIDTH: 3 kHz
MODULATION: OOK
BIT RATE: 1.67 kbps

MODULATION ENVELOPE REFERENCE POINTS: 99 %

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit		Margin, kHz	Verdict
		% of the carrier frequency	kHz		
433.92	27.747	0.25	1084.8	-1057.053	Pass

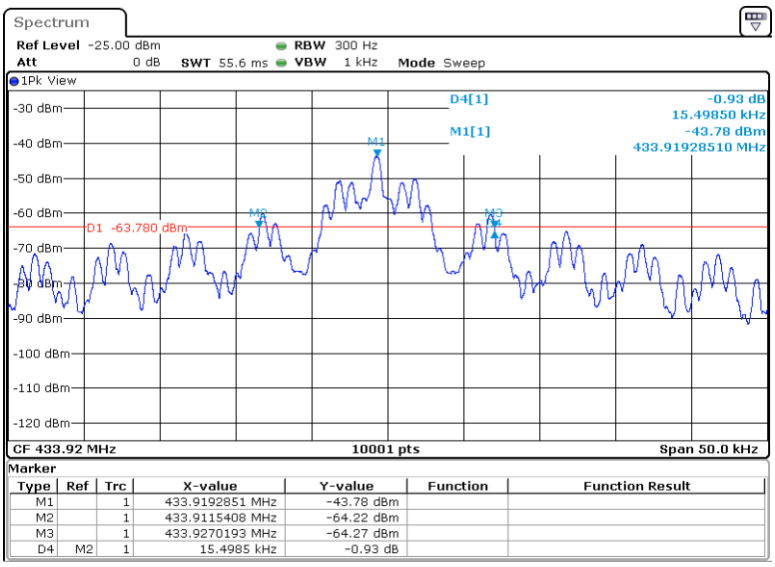
Reference numbers of test equipment used

HL 4136	HL 4355	HL 5397	HL 5410					

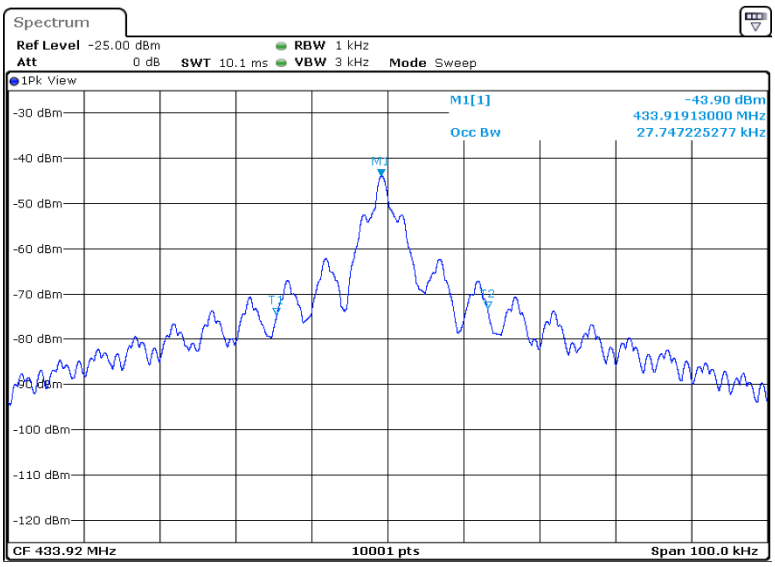
Full description is given in Appendix A.

Test specification:	FCC Part 15, Section 231(c) / RSS-210, Section A1.3, Occupied bandwidth		
Test procedure:	ANSI C63.10 section 6.9.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Dec-20		
Temperature: 20.9 ºC	Relative Humidity: 40 %	Air Pressure: 1017 hPa	Power: 4.5 VDC
Remarks:			

Plot 7.3.1 Occupied bandwidth test result 20 dBc



Plot 7.3.2 Occupied bandwidth test result 99 %



Test specification:	FCC Part 15, Section 203 / RSS-Gen, Section 6.8, Antenna requirements		
Test procedure:	Visual inspection / supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Jan-21		
Temperature: 23.5 ºC	Relative Humidity: 36 %	Air Pressure: 1017 hPa	Power: 4.5 VDC
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	Visual inspection	Comply
The transmitter employs a unique antenna connector	NA	
The transmitter requires professional installation	NA	

Photograph 7.4.1 Antenna assembly

Test specification:	**FCC Part 15, Section 109 / RSS-Gen, Section 7.2.3 / ICES-003, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	23-Dec-20		
Temperature: 20.8 ºC	**Relative Humidity:** 54 %	**Air Pressure:** 1015 hPa	**Power:** 4.5 VDC
Remarks:			

8 Unintentional emissions according to 47CFR part 15 subpart B and ICES-003 requirements

8.1 Radiated emission measurements

8.1.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.1.1.

Table 8.1.1 Radiated emission test 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 - 5th 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: $Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$,
where S_1 and S_2 – standard defined and test distance respectively in meters.

8.1.1.1 **30 – 1000 MHz range.** The EUT was set up as shown in Figure 8.2.1 and the associated photographs, energized and the EUT performance was checked.

8.1.1.2 The measurements were performed in the semi anechoic chamber at 3 m test distance. The specified frequency range was investigated with the antenna connected to the EMI receiver. To find the highest emission the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal polarizations. The EUT cables position was varied to maximize emission.

8.1.1.3 **1000 – 2300 MHz range.** The EUT was set up as shown in Figure 8.2.2 and the associated photographs, energized and the EUT performance was checked.

8.1.1.4 The measurements were performed in the semi anechoic chamber at 3 m test distance. The specified frequency range was investigated with the antenna connected to the EMI receiver. To find the highest emission the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal polarizations. In order to stay within the 3 dB beamwidth while keeping the antenna height scanned from 1 to 4 m, a few sweeps with different antenna angles over the entire height were performed.

8.1.1.5 The worst test results with respect to the limits were recorded in Table 8.2.2 and shown in the associated plots.

Test specification:	FCC Part 15, Section 109 / RSS-Gen, Section 7.2.3 / ICES-003, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	Verdict:	PASS
Date(s):	23-Dec-20		
Temperature: 20.8 ºC	Relative Humidity: 54 %	Air Pressure: 1015 hPa	Power: 4.5 VDC
Remarks:			

Figure 8.1.1 Setup for radiated emission measurements in 30 – 1000 MHz range, table-top EUT

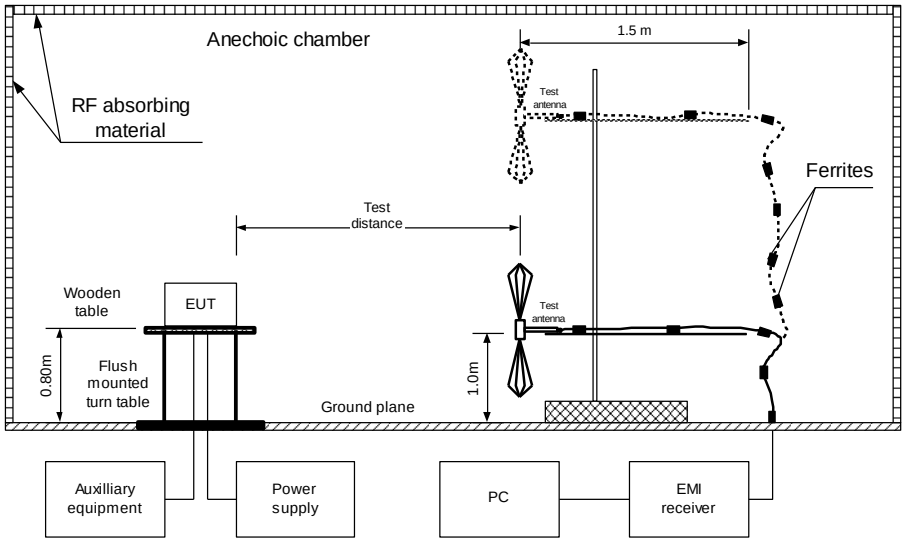
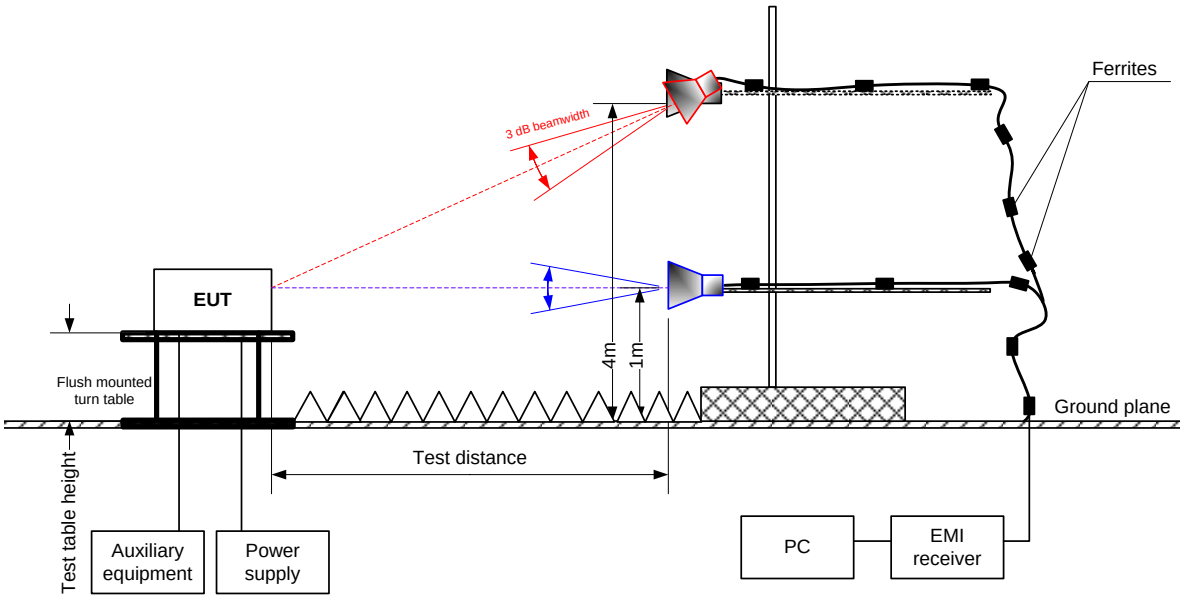


Figure 8.1.2 Setup for radiated emission measurements in 1000 – 2300 MHz range, table-top EUT



Test specification:	**FCC Part 15, Section 109 / RSS-Gen, Section 7.2.3 / ICES-003, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	23-Dec-20		
Temperature: 20.8 ºC	**Relative Humidity:** 54 %	**Air Pressure:** 1015 hPa	**Power:** 4.5 VDC
Remarks:			

Table 8.1.2 Radiated emission test results

EUT SET UP: TABLE-TOP
LIMIT: Class B
EUT OPERATING MODE: Receive
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***				
All emissions were found more than 20 dB below limit								Pass

TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz -2300 MHz
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	**Peak**			**Average**			**Antenna polarization**	**Antenna height, m**	**Turn-table position**, degrees**	**Verdict**
	Measured emission, dB(μV/m)	**Limit, dB(μV/m)**	**Margin, dB***	**Measured emission, dB(μV/m)**	**Limit, dB(μV/m)**	**Margin, dB***				
All emissions were found more than 20 dB below limit										Pass

*****- Margin = Measured emission - specification limit.
******- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

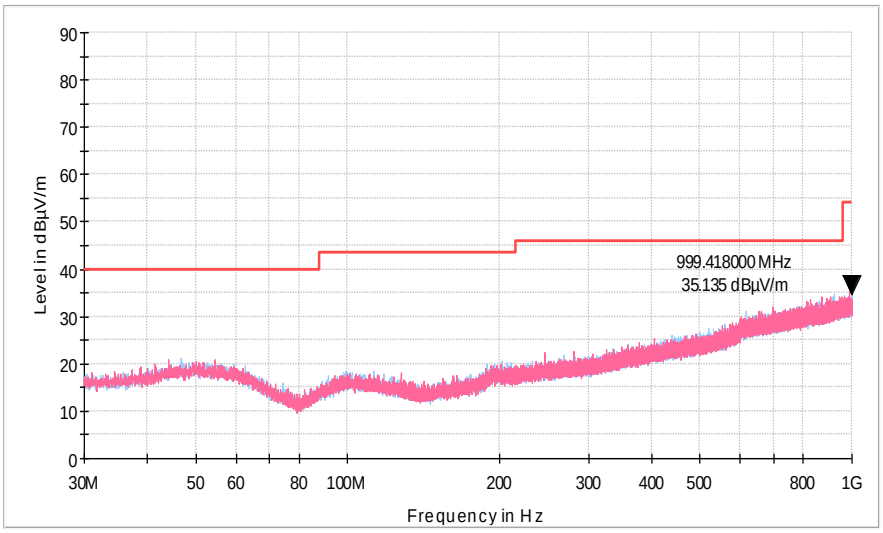
HL 3903	HL 4360	HL 4933	HL 5085	HL 5288	HL 5669		
HL 5670	HL 4011						

Full description is given in Appendix A.

Test specification:	**FCC Part 15, Section 109 / RSS-Gen, Section 7.2.3 / ICES-003, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	23-Dec-20		
Temperature: 20.8 ºC	**Relative Humidity:** 54 %	**Air Pressure:** 1015 hPa	**Power:** 4.5 VDC
Remarks:			

Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range, vertical and horizontal antenna polarization

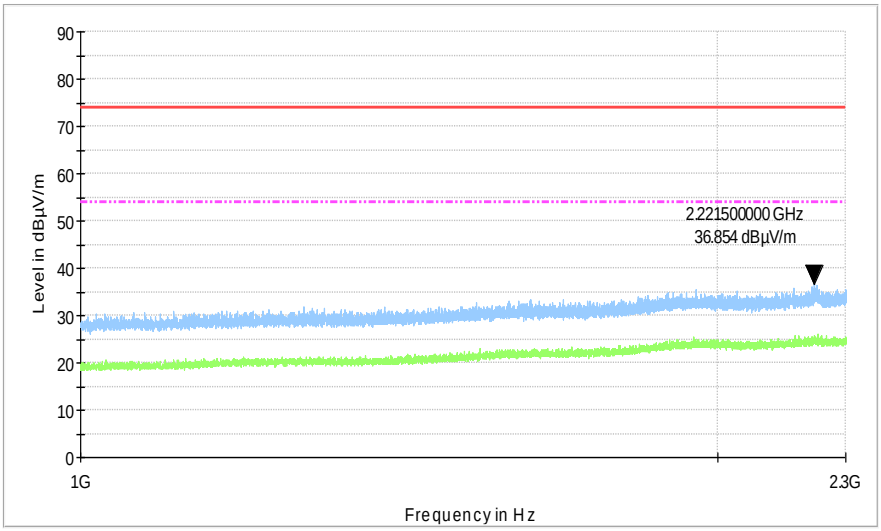
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive



Test specification:	FCC Part 15, Section 109 / RSS-Gen, Section 7.2.3 / ICES-003, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	Verdict:	PASS
Date(s):	23-Dec-20		
Temperature: 20.8 ºC	Relative Humidity: 54 %	Air Pressure: 1015 hPa	Power: 4.5 VDC
Remarks:			

Plot 8.1.2 Radiated emission measurements above 1000 MHz, vertical and horizontal antenna polarization

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



9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A01877	06-Oct-20	06-Oct-21
2382	Transformer, Isolation, 230/230, 1.8 kVA	Taiyo Yuden, Inc.	LGY1.8-21	FJ0411	03-Feb-20	03-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
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY41444762	05-Apr-20	05-Apr-21
3047	AC Power Supply, 0 - 130 & 260v, 45 - 2000 Hz	BEHLMAN	150-C-202	5033	03-Nov-20	03-Nov-21
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	06-Apr-20	06-Apr-21
3909	Average Power Sensor, 10 MHz to 33 GHz	Rohde & Schwarz	NRP-Z31	101689	08-Mar-18	08-Mar-21
4011	Temp. & Humidity Meter, (-50 - +70) deg, (20 - 99)% RH	Mad Electronics	HTC-1	NA	12-Aug-20	12-Aug-21
4136	Shield Box	TESCOM CO., LTD	TC-5916A	5916A000137	23-Apr-20	23-Apr-21
4355	Signal and Spectrum Analyzer, 9 kHz to 7 GHz	Rohde & Schwarz	FSV 7	101630	09-Sep-20	09-Sep-21
4360	EMI Test Receiver, 20 Hz to 40 GHz.	Rohde & Schwarz	ESU40	100322	20-Jan-20	20-Jan-21
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATION	AHA-118	701046	06-Jan-20	06-Feb-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
5397	H-field near field probe, 3 cm	ETS Lindgren	7405-902	NA	16-Aug-20	16-Aug-22
5410	RF cable, 40 GHz, SMA-SMA, 5.5 m	Huber-Suhner	SF102EA/11SK/11SK/5500MM	503974/EA	03-Aug-20	03-Aug-21
5476	Cable, BNC/BNC, 10.5 m	Western wire	MIL-C-17G	NA	14-May-20	14-May-21
5669	Cable SF126EA/11N(x2)/3.0M, 18 GHz	Huber-Suhner	SF126EA	506775/126EA	25-Oct-20	25-Oct-21
5670	Cable SF126EA/11N(x2)/3M, 18 GHz	Huber-Suhner	SF126EA	506774/126EA	25-Oct-20	25-Oct-21
5693	Temp. & Humidity Meter, (-10 - +50) deg, (10 - 99)% RH	Mad Electronics	HTC-1	NA	13-Dec-20	13-Dec-21
5707	EMI receiver	PMM / Narda	PMM 9010F	060WW91101	22-Nov-19	22-Jan-21

10 APPENDIX B Test equipment correction factors

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

HL 4933 Active Horn Antenna, 1 GHz to 18 GHz
COM-POWER CORPORATION AHA-118 , s/n 701046

Frequency, MHz	Measured antenna factor, dB/m
1000	-16.1
1050	-16.0
1100	-15.1
1150	-16.4
1200	-16.0
1250	-15.6
1300	-15.1
1350	-14.8
1400	-15.1
1450	-15.1
1500	-15.5
1550	-15.2
1600	-14.7
1650	-14.4
1700	-14.4
1750	-14.0
1800	-13.6
1850	-12.7
1900	-11.9
1950	-11.9
2000	-11.8
2050	-11.3
2100	-11.3
2150	-11.7
2200	-12.3
2250	-12.3
2300	-12.4
2350	-12.2
2400	-11.7
2450	-11.5
2500	-11.5
2550	-11.5
2600	-11.5
2650	-11.3
2700	-11.3
2750	-11.1
2800	-11.1
2850	-11.3
2900	-11.1
2950	-11.0
3000	-11.1
3050	-10.9
3100	-10.7
3150	-10.6

Frequency, MHz	Measured antenna factor, dB/m
3200	-11.2
3250	-10.8
3300	-10.8
3350	-10.7
3400	-10.3
3450	-10.2
3500	-10.1
3550	-10.4
3600	-10.5
3650	-10.4
3700	-10.4
3750	-10.3
3800	-10.1
3850	-10.0
3900	-9.9
3950	-9.8
4000	-9.7
4050	-9.3
4100	-8.6
4150	-8.2
4200	-8.3
4250	-8.5
4300	-8.5
4350	-8.3
4400	-8.0
4450	-7.7
4500	-7.6
4550	-7.4
4600	-7.5
4650	-7.8
4700	-7.6
4750	-6.8
4800	-6.1
4850	-5.7
4900	-5.8
4950	-5.8
5000	-6.0
5050	-5.7
5100	-5.4
5150	-5.1
5200	-4.6
5250	-4.6
5300	-4.8
5350	-5.1

Frequency, MHz	Measured antenna factor, dB/m	Frequency, MHz	Measured antenna factor, dB/m
5400	-5.1	8200	1.1
5450	-4.6	8250	1.0
5500	-4.0	8300	0.8
5550	-3.5	8350	0.5
5600	-3.1	8400	0.3
5650	-3.3	8450	0.5
5700	-3.8	8500	0.8
5750	-4.3	8550	0.9
5800	-4.3	8600	0.9
5850	-4.0	8650	0.6
5900	-3.5	8700	0.0
5950	-3.2	8750	-0.3
6000	-3.2	8800	0.0
6050	-3.2	8850	0.5
6100	-3.3	8900	0.6
6150	-3.3	8950	0.4
6200	-3.1	9000	-0.3
6250	-2.9	9050	-1.0
6300	-2.8	9100	-1.2
6350	-3.0	9150	-0.6
6400	-3.2	9200	-0.1
6450	-3.4	9250	0.0
6500	-3.7	9300	-0.1
6550	-3.6	9350	-0.5
6600	-3.4	9400	-0.7
6650	-2.9	9450	-0.4
6700	-2.6	9500	0.2
6750	-2.5	9550	0.5
6800	-2.6	9600	0.5
6850	-2.8	9650	0.3
6900	-2.7	9700	0.0
6950	-2.3	9750	0.0
7000	-2.0	9800	0.6
7050	-1.9	9850	1.4
7100	-1.8	9900	1.8
7150	-1.8	9950	1.7
7200	-1.7	10000	1.4
7250	-1.7	10100	0.8
7300	-1.6	10200	1.2
7350	-1.5	10300	1.5
7400	-1.5	10400	1.1
7450	-1.3	10500	1.6
7500	-1.4	10600	3.0
7550	-1.3	10700	2.9
7600	-1.0	10800	1.3
7650	-0.7	10900	1.0
7700	-0.3	11000	1.1
7750	0.1	11100	0.7
7800	0.3	11200	1.1
7850	0.4	11300	1.5
7900	0.2	11400	1.4
7950	0.1	11500	0.6
8000	0.2	11600	1.0
8050	0.3	11700	1.4
8100	0.8	11800	0.7
8150	1.1	11900	0.9

Frequency, MHz	Measured antenna factor, dB/m
12400	2.1
12500	1.2
12600	1.3
12700	2.4
12800	1.8
12900	0.6
13000	0.9
13100	1.1
13200	0.7
13300	0.9
13400	1.8
13500	2.1
13600	1.2
13700	0.8
13800	1.2
13900	1.5
14000	1.7
14100	2.2
14200	2.8
14300	3.0
14400	3.0
14500	3.3
14600	4.0
14700	5.4
14800	5.4
14900	4.7
15000	3.1
15100	2.0
15200	1.5
15300	1.4
15400	1.7

Frequency, MHz	Measured antenna factor, dB/m
15500	1.9
15600	1.2
15700	0.2
15800	0.6
15900	1.2
16000	0.6
16100	0.6
16200	1.9
16300	2.2
16400	0.9
16500	0.7
16600	1.7
16700	1.3
16800	1.0
16900	2.0
17000	2.4
17100	1.8
17200	1.8
17300	2.5
17400	2.7
17500	3.1
17600	3.7
17700	4.3
17800	4.8
17900	5.7
18000	5.1

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

Frequency, MHz	Antenna factor, dB/m	Frequency, MHz	Antenna factor, dB/m
30	14.96	160	12.67
35	15.33	180	13.34
40	16.37	200	15.40
45	17.56	250	16.42
50	17.95	300	17.28
60	16.87	400	19.98
70	13.22	500	21.11
80	10.56	600	22.90
90	13.61	700	24.13
100	15.46	800	25.25
120	14.03	900	26.35
140	12.23	1000	27.18

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

above 1000 MHz

Frequency, MHz	Antenna factor, dB/m	Frequency, MHz	Antenna factor, dB/m
1000	26.9	3600	38.9
1100	28.1	3700	39.4
1200	28.4	3800	39.4
1300	29.6	3900	39.6
1400	29.1	4000	39.7
1500	30.4	4100	39.8
1600	30.7	4200	40.5
1700	31.5	4300	40.9
1800	32.3	4400	41.1
1900	32.6	4500	41.4
2000	32.5	4600	41.3
2100	32.9	4700	41.6
2200	33.5	4800	41.9
2300	33.2	4900	42.3
2400	33.7	5000	42.7
2500	34.6	5100	43.0
2600	34.7	5200	42.9
2700	34.6	5300	43.5
2800	35.0	5400	43.6
2900	35.5	5500	44.3
3000	36.2	5600	44.7
3100	36.8	5700	45.0
3200	36.8	5800	45.0
3300	37.0	5900	45.3
3400	37.5	6000	45.9
3500	38.2		

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

11 APPENDIX C 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 Vertical polarization	 Biconilog antenna: ± 5.0 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.1 dB Double ridged horn antenna: ± 5.3 dB 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 Vertical polarization	 Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB 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.

12 APPENDIX D 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).

Address: P.O. Box 23, Binyamina 3055001, Israel.
Telephone: +972 4628 8001
Fax: +972 4628 8277
e-mail: mail@hermonlabs.com
website: www.hermonlabs.com

Person for contact: Mr. Michael Nikishin, EMC&Radio group manager

13 APPENDIX E Specification references

47CFR part 15: 2019	Radio Frequency 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-210 Issue 10: 2019	Licence-Exempt Radio Apparatus: Category I Equipment
RSS-Gen Issue 5: 2018	General Requirements and Information for the certification of Radiocommunication Equipment
ICES-003 Issue 6: 2016	Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement

14 APPENDIX F Manufacturer's declaration about periodic operation

PARADOX™

December 28th, 2020

To: Hermon Laboratories

Attention: Mr. Sergey Samokha

Manufacturer's Declaration

We, Paradox Security Systems Ltd. located in 780 Industrial Boulevard St.Eustache, Quebec J7R 5V3, Canada declare under our sole responsibility that the product Outdoor Wireless Siren with built-in strobe light and wireless transceiver, model SR230 is operate on 433.92 MHz and designed to comply and satisfy periodic operational requirements.

The siren SR230 does not allow continuous transmitting (such as voice, video and radio control).

The siren SR230 is not manually operated device.

The transmissions of SR230 are not periodical and occur upon intrusion only.

SR230 is an intrusion alarm system device and will send automatically its supervision/battery check status to control panel in a certain interval depends on siren configuration. This interval can be selected by operator between two following options (once in 80 minutes or once in 24 hours).

Since, there is no periodical behavior except supervision transmissions, there are no predetermined intervals of any kind included in device's algorithm.

Alex Chaplik
Certification Manager

Ref : FCC Declaration SR230_rev0

780 boul. Industriel, St-Eustache (Montréal), Québec, Canada J7R 5V3 Tel. : (450) 491-7444
PARADOX.COM

15 APPENDIX G Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
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

END OF DOCUMENT