HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart B,
RSS-Gen issue 5, ICES-003 Issue 6:2016

FOR:

Paradox Security Systems Ltd.
Wireless Expansion Module
Model:RTX3
FCC ID:KDYRTX3
IC:2438A-RTX3

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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:	Wireless Expansion Module
Product type:	Transceiver
Model(s):	RTX3
Serial number:	3B301229
Hardware version:	333-7007-030
Software release:	V6.20
Receipt date	14-Dec-18

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:	31843
Location:	Primary: Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel Satellite: Hermon Laboratories Ltd. Hefetz-Haim 10, Tel Aviv 6744124, Israel
Test started:	14-Dec-18
Test completed:	28-Feb-19
Test specification(s):	FCC 47CFR part 15 subpart B; RSS-Gen issue 5, ICES-003 issue 6:2016

5 Tests summary

Test	Status
FCC 47 CFR part 15, subpart B / RSS-Gen / ICES-003	
FCC Part 15, Section 107 / ICES-003, Section 6.1, Class B, Conducted emission at AC power port	Pass
FCC Part 15, Section 109 / RSS-Gen, Section 7.3 / 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:	Mrs. E.Pitt, test engineer	February 28, 2019	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	April 3, 2019	
Approved by:	Mr. K. Zushchyk, Projects & Customer Manager, EMC & Radio	April 10, 2019	

6 EUT description

6.1 General information

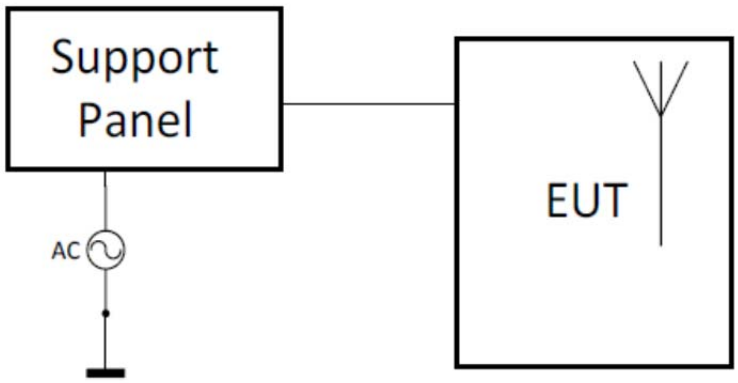
The EUT, RTX3, is a 2-way, 32 zone wireless expansion module which enables EVO and SP Series control panels to support wireless hardware such as sirens, motion detectors, water detectors, and remote controls.

The RTX3 is designed to be powered by 12 VDC from the control panel. It has 4 terminals connector (RED/BLK/GRN/YEL) and connected to control panel by Paradox BUS.

6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length, m
Signal	Data	EUT	Control panel	4	Unshielded	3

6.3 Test configuration



6.4 Changes made in EUT

No changes were implemented in the EUT during testing.

Test specification:	FCC Part 15, Section 107 / ICES-003, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 7.3, 12.2.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	17-Dec-18		
Temperature: 25 ºC	Relative Humidity: 46 %	Air Pressure: 1017 hPa	Power: 120 VAC, 60 Hz
Remarks:			

7 Unintentional emissions

7.1 Conducted emissions

7.1.1 General

This test was performed to measure common mode conducted emissions at the mains power port. Specification test limits are given in Table 7.1.1.

Table 7.1.1 Limits for conducted emissions

Frequency, MHz	Class B limit, dB(µV)		Class A limit, dB(µV)	
	QP	AVRG	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*	79	66
0.5 - 5.0	56	46	73	60
5.0 - 30	60	50	73	60

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

7.1.2 Test procedure

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

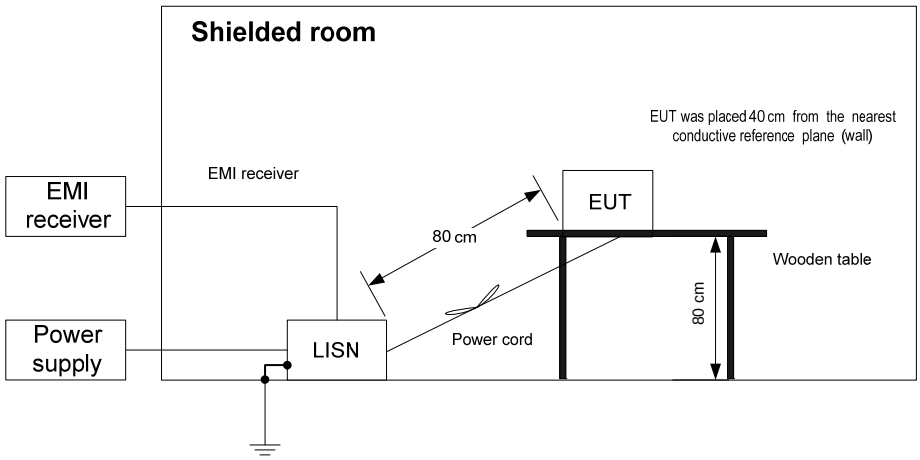
7.1.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer while unused coaxial connector of the LISN was terminated with 50 Ohm.

7.1.2.3 The position of the device cables was varied to determine maximum emission level.

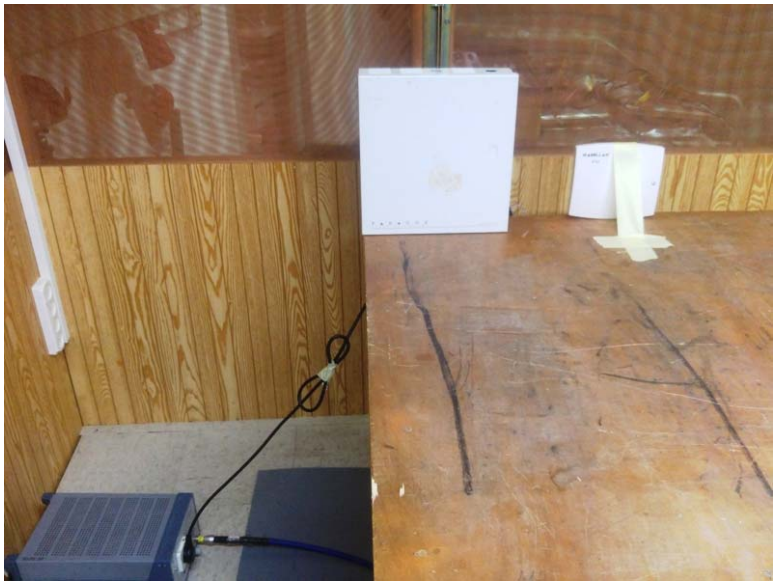
7.1.2.4 The worst test results (the lowest margins) were recorded in Table 7.1.2 and shown in the associated plots.

Test specification:	FCC Part 15, Section 107 / ICES-003, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 7.3, 12.2.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	17-Dec-18		
Temperature: 25 ºC	Relative Humidity: 46 %	Air Pressure: 1017 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Figure 7.1.1 Setup for conducted emission measurements, table-top equipment



Photograph 7.1.1 Setup for conducted emission measurements



Test specification:	**FCC Part 15, Section 107 / ICES-003, Conducted emission at AC power port**		
Test procedure:	ANSI C63.4, Sections 7.3, 12.2.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	17-Dec-18		
Temperature: 25 ºC	**Relative Humidity:** 46 %	**Air Pressure:** 1017 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.1.2 Conducted emission test results

LINE: AC mains
EUT OPERATING MODE: Stand-by and receive
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
FREQUENCY RANGE: 150 kHz - 30 MHz
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*		
0.155	45.7	38.9	65.7	-26.8	20.2	55.7	-35.5	L1	Pass
0.188	45.1	38.8	64.2	-25.4	9.8	54.2	-44.4		
15.542	34.7	31.0	60.0	-29.0	24.2	50.0	-25.8		
17.973	35.6	32.0	60.0	-28.0	19.3	50.0	-30.7		
19.911	35.5	33.2	60.0	-26.8	21.6	50.0	-28.4		
24.057	33.7	27.0	60.0	-33.0	26.0	50.0	-24.0		
0.151	45.7	39.4	66.0	-26.6	12.2	56.0	-43.8	L2	Pass
0.193	44.9	38.6	64.0	-25.4	9.0	54.0	-45.0		
16.752	35.2	31.5	60.0	-28.5	24.6	50.0	-25.4		
17.730	36.1	28.0	60.0	-32.0	18.7	50.0	-31.3		
19.907	35.4	32.0	60.0	-28.0	22.1	50.0	-27.9		
27.912	32.8	29.5	60.0	-30.5	21.8	50.0	-28.2		

*****- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

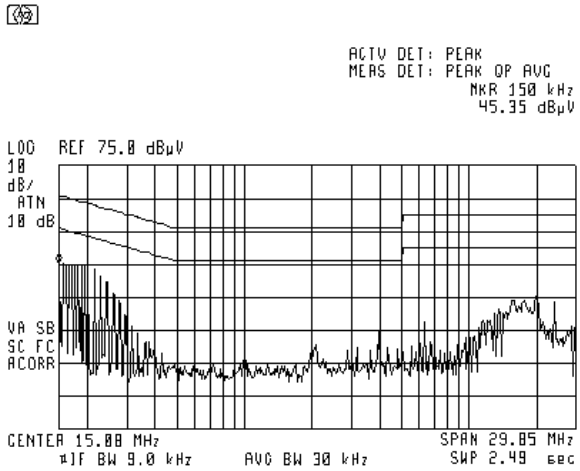
HL 0787	HL 1500	HL 3016	HL 4778				

Full description is given in Appendix A.

Test specification:	**FCC Part 15, Section 107 / ICES-003, Conducted emission at AC power port**		
Test procedure:	ANSI C63.4, Sections 7.3, 12.2.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	17-Dec-18		
Temperature: 25 ºC	**Relative Humidity:** 46 %	**Air Pressure:** 1017 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

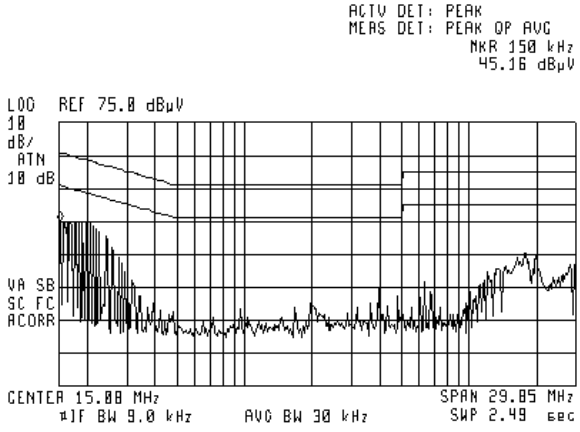
Plot 7.1.1 Conducted emission measurements

LINE: L1
LIMIT: Class B
EUT OPERATING MODE: Stand-by and receive
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 7.1.2 Conducted emission measurements

LINE: L2
LIMIT: Class B
EUT OPERATING MODE: Stand-by and receive
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	**FCC Part 15, Section 109 / RSS-Gen, Section 7.3 / ICES-003, Radiated emission**		
Test procedure:	ANSI C63.4, Section 8.3, 12.2.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	14-Dec-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1008 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

7.2 Radiated emission measurements

7.2.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 7.2.1, Table 7.2.2.

Table 7.2.1 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 - 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.

Table 7.2.2 Radiated emission limits according to RSS-Gen, Section 7.3

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 - 5th harmonic**	54.0

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

7.2.2 Test procedure

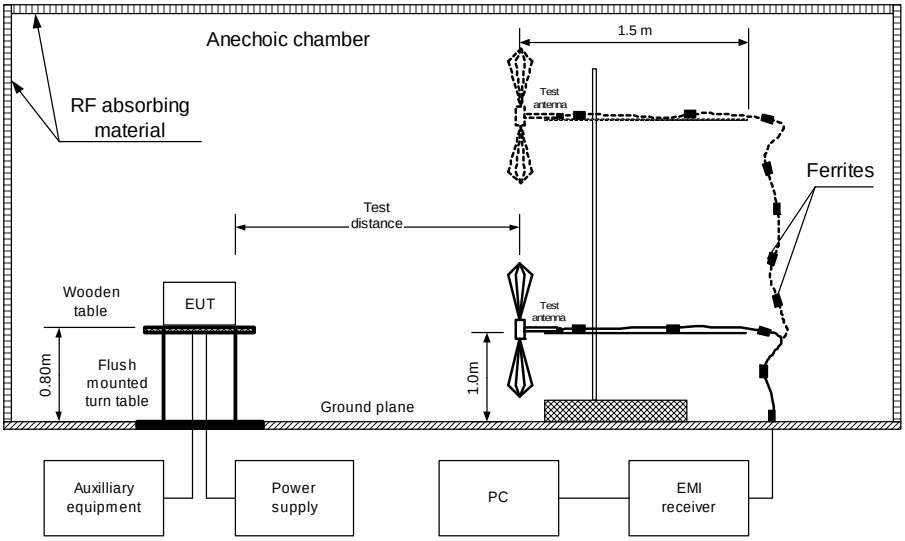
7.2.2.1 The EUT was set up as shown in Figure 7.2.1 and associated photograph/s, energized and the performance check was conducted.

7.2.2.2 The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360^0, 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.

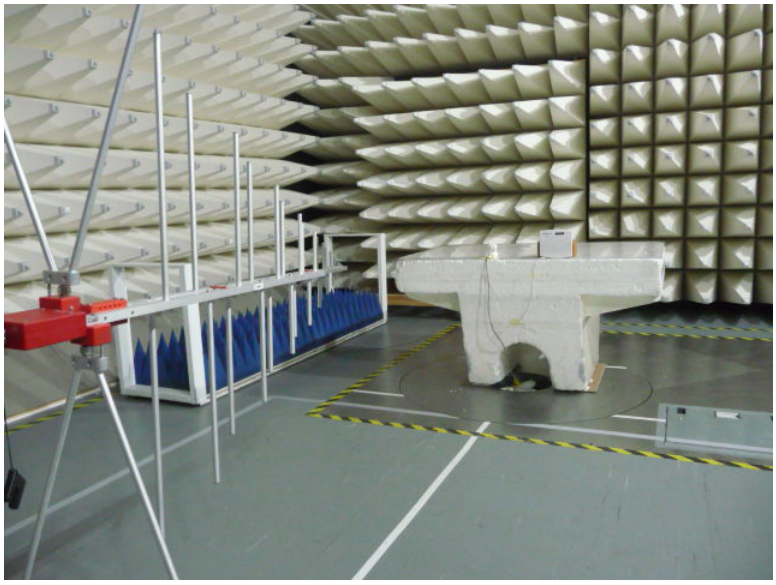
7.2.2.3 The worst test results (the lowest margins) were provided in the associated tables and plots.

Test specification:	FCC Part 15, Section 109 / RSS-Gen, Section 7.3 / ICES-003, Radiated emission		
Test procedure:	ANSI C63.4, Section 8.3, 12.2.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Dec-18		
Temperature: 23 ºC	Relative Humidity: 55 %	Air Pressure: 1008 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Figure 7.2.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment

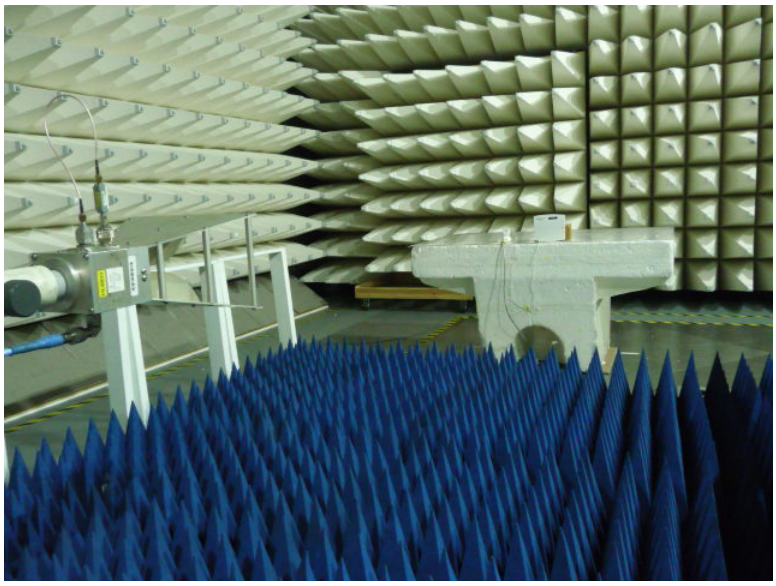


Photograph 7.2.1 Setup for radiated emission measurements

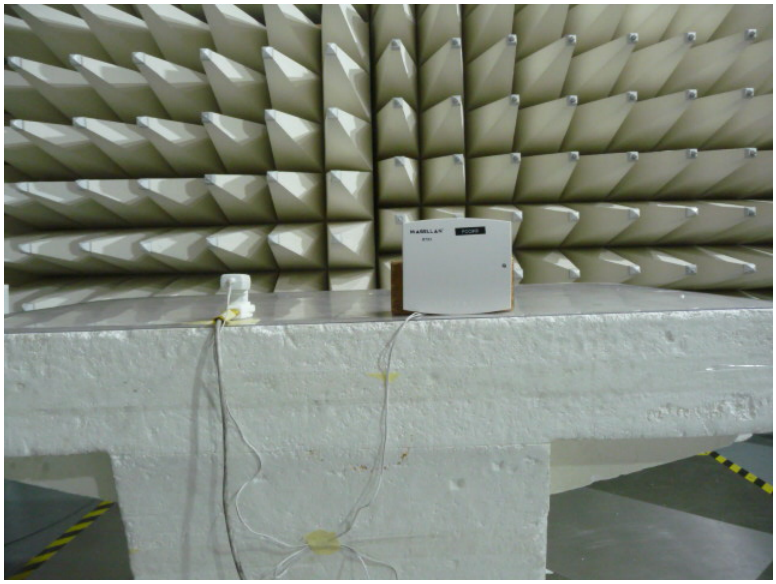


Test specification:	FCC Part 15, Section 109 / RSS-Gen, Section 7.3 / ICES-003, Radiated emission		
Test procedure:	ANSI C63.4, Section 8.3, 12.2.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Dec-18		
Temperature: 23 ºC	Relative Humidity: 55 %	Air Pressure: 1008 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Photograph 7.2.2 Setup for radiated emission measurements



Photograph 7.2.3 Setup for final radiated emission measurements, EUT cabling



Test specification:	**FCC Part 15, Section 109 / RSS-Gen, Section 7.3 / ICES-003, Radiated emission**		
Test procedure:	ANSI C63.4, Section 8.3, 12.2.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	14-Dec-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1008 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.2.3 Radiated emission test results

EUT SET UP: TABLE-TOP
LIMIT: Class B
EUT OPERATING MODE: Stand-by and 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*				
31.61	34.77	31.48	40	-8.52	Vertical	1.0	-164	Pass
37.53	37.93	34.24	40	-5.76	Vertical	1.0	87	
60.00	31.08	27.43	40	-12.57	Vertical	1.0	91	

TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 4500 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*				
No signals were found										Pass

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

Reference numbers of test equipment used

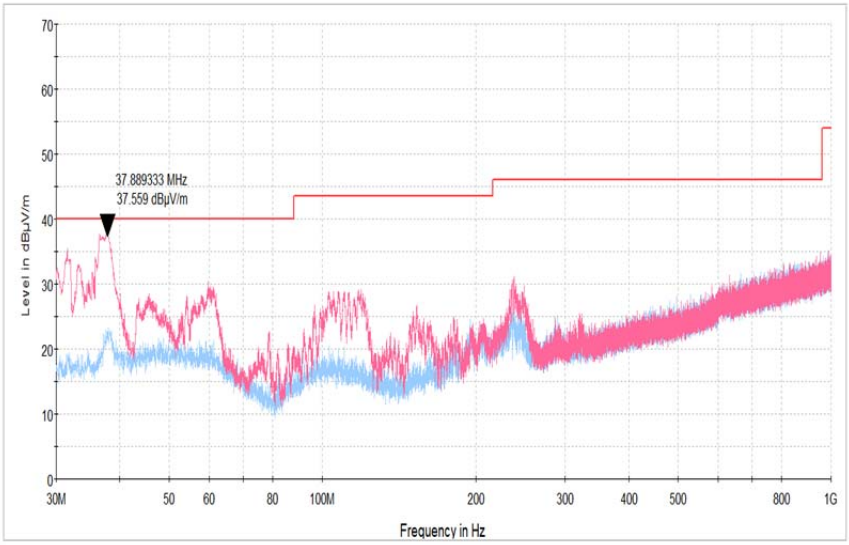
HL 3903	HL 4360	HL 4933	HL 5288	HL 5405			

Full description is given in Appendix A.

Test specification:	**FCC Part 15, Section 109 / RSS-Gen, Section 7.3 / ICES-003, Radiated emission**		
Test procedure:	ANSI C63.4, Section 8.3, 12.2.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	14-Dec-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1008 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

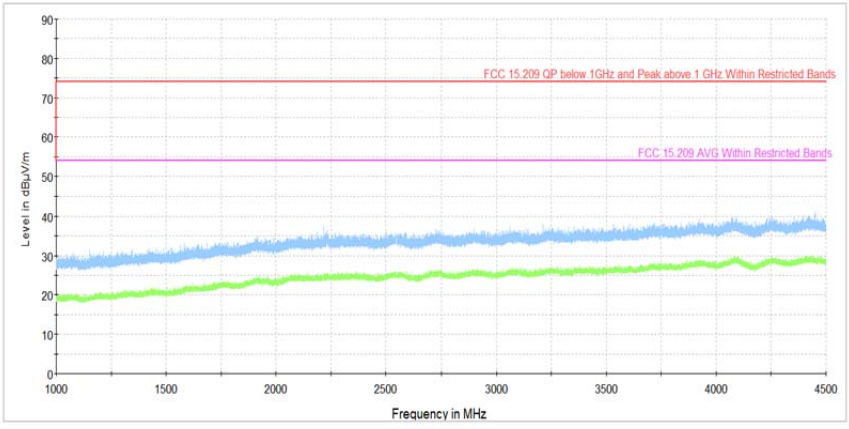
Plot 7.2.1 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal
EUT OPERATING MODE: Receive / Stand-by



Plot 7.2.2 Radiated emission measurements above 1000 MHz,

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal
EUT OPERATING MODE: Receive / Stand-by



8 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	08-Oct-18	08-Oct-19
1500	Cable RF, 15 m, N/N-type	Suhner Switzerland	RG 214/U	1500	11-Feb-19	11-Feb-20
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY41444762	27-Mar-18	27-Apr-19
3016	LISN, Two-line V-network, 9 kHz to 30 MHz, (50 uH+5 Ohm), CISPR16-1, MIL-461E	Rohde & Schwarz	ESH 3-Z5	892239/002	27-Jan-19	27-Jan-20
3339	High Pass Filter, 50 Ohm, 600 to 3000 MHz.	Mini-Circuits	SHP-600+	NA	17-May-18	17-May-19
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	07-Feb-18	07-Apr-19
4339	High pass Filter, 50 Ohm, 1000 to 18000 MHz, SMA-FM / SMA-M	Micro-Tronics	HPM50115-02	001	14-May-17	14-Mar-19
4360	EMI Test Receiver, 20 Hz to 40 GHz.	Rohde & Schwarz	ESU40	100322	31-Dec-18	31-Dec-19
4778	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL4777	Hewlett Packard	8542E	30807A00262, 3427A00123	28-Oct-18	28-Oct-19
4933	Active Horn Antenna, 1 GHz to 18 GHz	Com-Power Corporation	AHA-118	701046	06-Jan-19	06-Jan-20
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX-8000E	00809	08-Feb-19	08-Feb-22
5405	RF cable, 18 GHz, N-N, 6 m	Huber-Suhner	SF118/11N(x2)	500023/118	01-Aug-18	01-Aug-19

9 APPENDIX B 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 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

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.

10 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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website: www.hermonlabs.com

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

11 APPENDIX D Specification references

47CFR part 15:2018	Radio Frequency 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: 2018	General Requirements for Compliance of Radio Apparatus
ICES-003: 2016, Issue 6	Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement

12 APPENDIX E Test equipment correction factors

Antenna factor
Trilog antenna
Model ALX-8000E, Frankonia, S/N 00809, HL 5288, 30-1000 MHz

Frequency, MHz	Antenna factor, dB/m		
	Vert Up	Vert Down	Delta
30	-51.19	-51.28	0.09
35	-44.03	-44.12	0.09
40	-43.07	-43.12	0.05
45	-39.61	-39.79	0.18
50	-37.84	-38.14	0.3
60	-34.93	-34.9	0.03
70	-29.76	-29.66	0.1
80	-27.69	-27.82	0.13
90	-29.05	-29.07	0.02
100	-31.19	-31.19	0
120	-31.61	-31.6	0.01
140	-28.13	-28.06	0.07
160	-27.71	-27.75	0.04
180	-26.19	-26.15	0.04
200	-28.2	-28.15	0.05
250	-27.45	-27.47	0.02
300	-29.61	-29.63	0.02
400	-31.77	-31.78	0.01
500	-32.81	-32.81	0
600	-33.64	-33.61	0.03
700	-34.21	-34.21	0
800	-35.66	-35.66	0
900	-36.99	-36.91	0.08
1000	-38	-37.91	0.09

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field intensity in dB(μV/m).

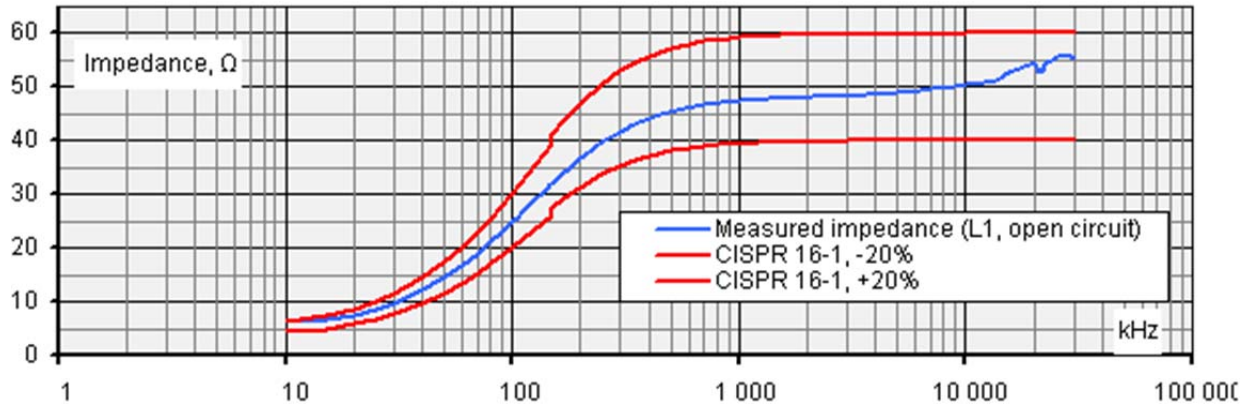
Antenna factor
Active Horn Antenna,
Com-Power Corporation, model: AHA-118, s/n 701046, HL 4933

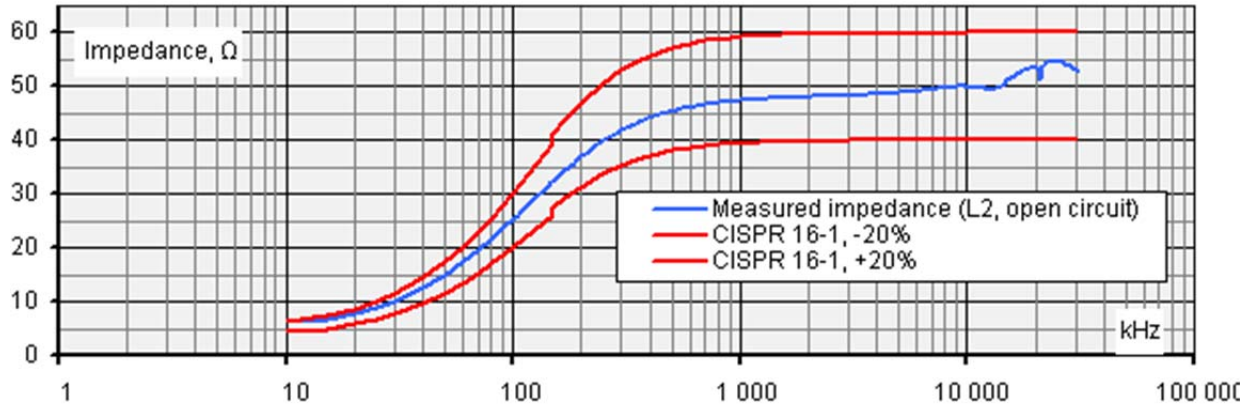
Frequency, MHz	Measured antenna factor (with preamplifier), dB/m
1000	-16.1
1500	-15.1
2000	-10.9
2500	-11.9
3000	-11.1
3500	-10.6
4000	-8.6
4500	-8.3
5000	-5.9
5500	-5.7
6000	-3.3
6500	-4.0
7000	-2.2
7500	-1.7
8000	1.1
8500	-0.8
9000	-1.5
9500	-0.2

Frequency, MHz	Measured antenna factor (with preamplifier), dB/m
10000	1.8
10500	1.0
11000	0.3
11500	-0.5
12000	3.1
12500	1.4
13000	-0.3
13500	-0.4
14000	2.5
14500	2.2
15000	1.9
15500	0.5
16000	2.1
16500	1.2
17000	0.6
17500	3.1
18000	4.2

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

Correction factor
Line impedance stabilization network
Model ESH 3-Z5, Rhode&Schwarz, HL 3016





13 APPENDIX F 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