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# TEST REPORT

ACCORDING TO: FCC CFR 47 Part 15 subpart C, section 15.231;  
RSS-210 issue 9 Annex A

FOR:

**Paradox Security Systems Ltd.**

**Wireless control panel board**

**Product name: MG5050V2/MG5000V2**

**FCC ID:KDYMG5050V2**

**IC: 2438A-MG5050V2**

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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 description:** Wireless control panel board  
**Product type:** Transceiver  
**Product name:** MG5050V2 433 MHz  
**Serial number:** M6201A12E2  
**Hardware version:** 910-2002-070  
**Software release:** V6.94  
**Receipt date:** 17-Oct-18

## 3 Manufacturer information

**Manufacturer name:** Paradox Security Systems (Bahamas) Ltd  
**Address:** 780 Industrial Boulevard St.Eustache, Quebec J7R 5V3 Canada  
**Telephone:** 450-491-7444  
**Fax:** 450-497-1095  
**E-Mail:** rhamitouche@paradox.com  
**Contact name:** Mr. Rabah Hamitouche

## 4 Test details




**Project ID:** 31387  
**Location:** Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel  
**Test started:** 17-Oct-18  
**Test completed:** 07-Dec-18  
**Test specification(s):** FCC 47CFR part 15, subpart C, §15.231;  
RSS-210 issue 9 Annex A

## 5 Tests summary

Test	Status
<b>Transmitter characteristics</b>	
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	Pass
FCC Part 15, Section 203 / RSS-Gen, Section 6.8, Antenna requirements	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
<b>Tested by:</b>	Mrs. E.Pitt, test engineer	December 7, 2018	
<b>Reviewed by:</b>	Mrs. M. Cherniavsky, certification engineer	February 6, 2019	
<b>Approved by:</b>	Mr. K. Zushchyk, Projects & Customer Manager, EMC & Radio	February 18, 2019	

## 6 EUT description

### 6.1 General information

The EUT is a wireless control panel board used for alarms systems. The EUT operates at 433.92 MHz. The EUT has a receiver of Class 2.

According to manufacturer's declaration provided in Appendix G of the test report, the EUTs MG5050V2 and MG5000V2 are electronically/electrically/mechanically identical and differ only by number of terminal block outputs for PGM and Zones connections: MG5000V2 includes 2 PGM and 2 Zones while MG5050V2 includes 4 PGM and 5 Zones. That is why the MG5050V2 was tested as a representative of the worst-case option.

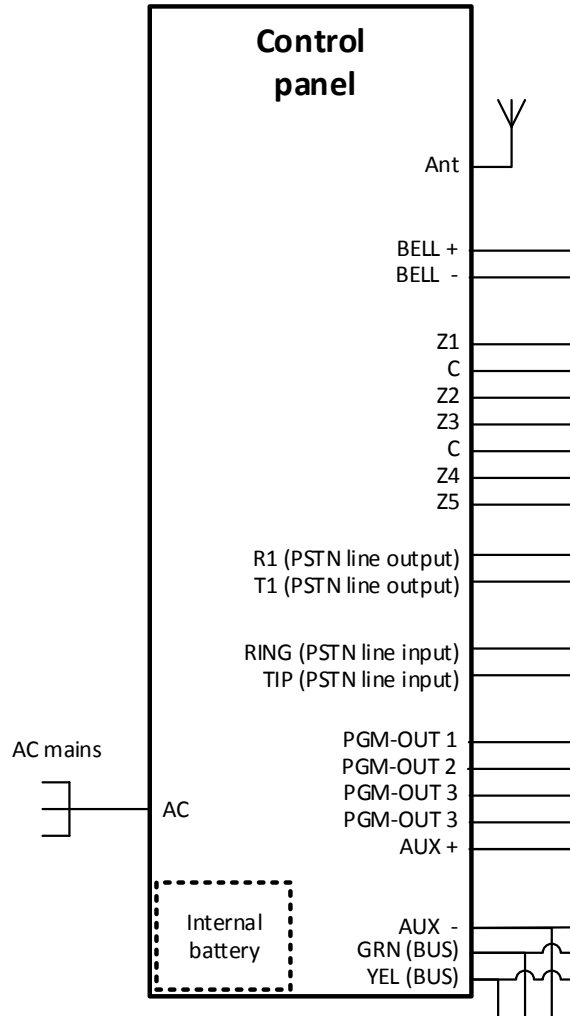
### 6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length	Indoor / outdoor
Power	AC power	EUT	Transformer	1	Unshielded	2 m	Indoor
Power	AC power	Transformer	AC mains	1	Unshielded	2 m	Indoor
Signal	BELL	EUT (BELL +/-)	Open circuit	2	Unshielded	3 m	Indoor
Signal	Zone	EUT (Z1/2/3/4/5/C)	Open circuit	7	Unshielded	3 m	Indoor
Signal	PSTN output	EUT (R1, T1)	Open circuit	2	Unshielded	3 m	Indoor
Telecom	PSTN IN	EUT (RING, TIP)	Open circuit	2	Unshielded	3 m	Indoor
Signal	PGM output	EUT (PGM-OUT1/2/3/AUX+)	Open circuit	5	Unshielded	3 m	Indoor
Signal	BUS	EUT (AUX-/GRN/YEL)	Open circuit	3	Unshielded	3 m	Indoor
RF	Antenna	EUT	Antenna	1	NA	NA	Indoor

### 6.3 Changes made in EUT

No changes were implemented in the EUT during testing.

## 6.4 Test configuration





### 6.5 Transmitter characteristics

<b>Type of equipment</b>						
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)					
<b>Operating frequency</b>		433.92 MHz				
<b>Maximum rated output power</b>		At transmitter 50 Ω RF output connector				
		Field strength at 3 m distance			88.82 dB(μV/m) – peak 80.42 dB(μV/m) -average	
<b>Is transmitter output power variable?</b>		X	No			
			Yes	continuous variable		
				stepped variable with stepsize		dB
				minimum RF power		dBm
		maximum RF power		dBm		
<b>Antenna connection</b>						
unique coupling		standard connector		X	integral	
				X	with temporary RF connector without temporary RF connector	
<b>Antenna/s technical characteristics</b>						
Type	Manufacturer		Model number		Gain	
Integral	FORESIGHT INT. Ltd.		125-0433-400		0 dBi	
<b>Transmitter aggregate data rate/s</b>		1.67 kbps				
<b>Type of modulation</b>		OOK				
<b>Modulating test signal (baseband)</b>		ID code				
<b>Transmitter power source</b>						
	Battery	<b>Nominal rated voltage</b>	VDC	Battery type		
	DC	<b>Nominal rated voltage</b>	VDC			
X	AC mains	<b>Nominal rated voltage</b>	120 VAC	Frequency	60 Hz	
<b>Common power source for transmitter and receiver</b>				X	yes no	



<b>Test specification:</b> FCC Part 15, Section 231(a) / RSS-210, Section A1.1, Periodic operation requirements			
<b>Test procedure:</b> Supplier declaration			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 7-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

## 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.

#### 7.1.3 Test procedure for measurements of polling / supervision transmission duration

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

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

7.1.3.3 The transmission time was captured and shown in Plot 7.1.2, Plot 7.1.3.

Figure 7.1.1 Setup for transmitter shut down test







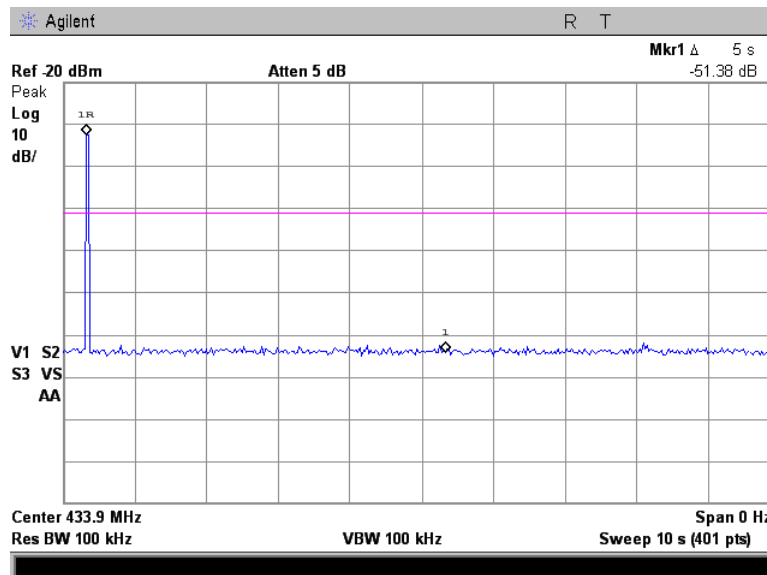
<b>Test specification:</b> FCC Part 15, Section 231(a) / RSS-210, Section A1.1, Periodic operation requirements			
<b>Test procedure:</b> Supplier declaration			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 7-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

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	Plot 7.1.2, Plot 7.1.3	Comply
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 H.

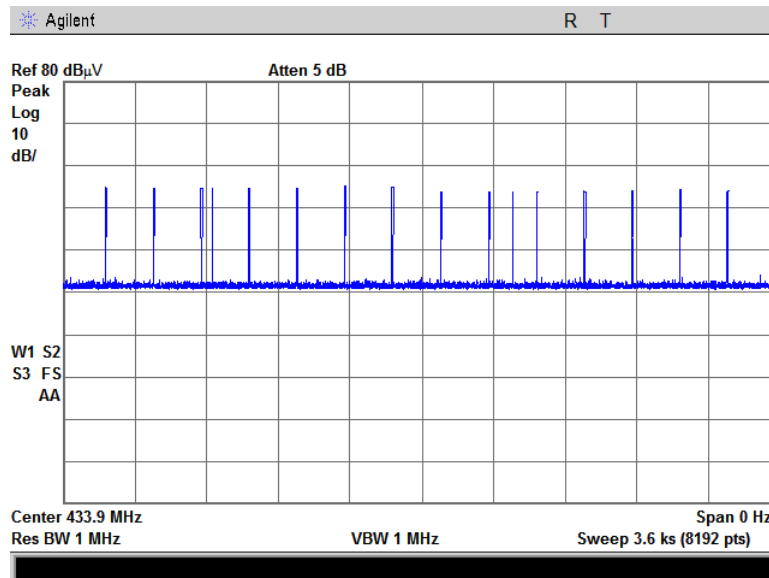
Plot 7.1.1 Transmitter shut down test result



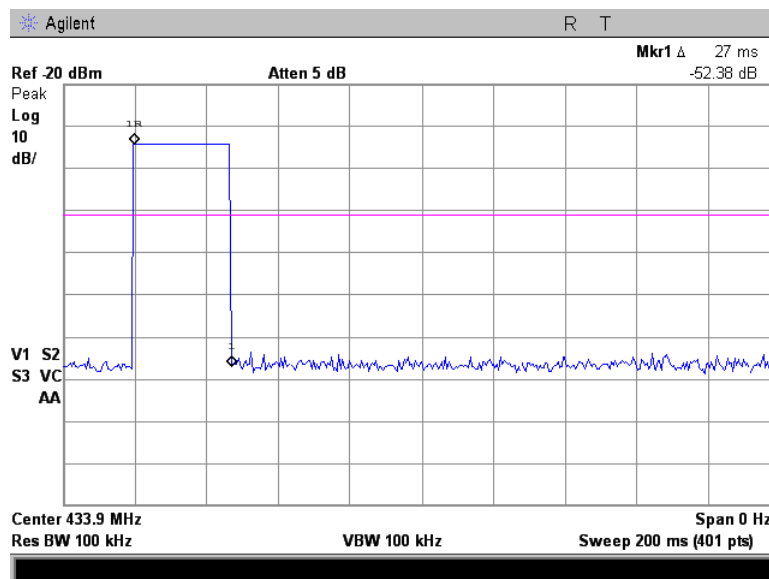


<b>Test specification:</b> FCC Part 15, Section 231(a) / RSS-210, Section A1.1, Periodic operation requirements			
<b>Test procedure:</b> Supplier declaration			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 7-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.1.2 Polling / supervision transmission duration



Plot 7.1.3 Polling / supervision pulseduration





<b>Test specification:</b> FCC Part 15, Section 231(a) / RSS-210, Section A1.1, Periodic operation requirements			
<b>Test procedure:</b> Supplier declaration			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 7-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

Table 7.1.2 Total duration of polling / supervision transmissions

Duration, ms	Repetition period, ms	Maximum number of transmissions within 1 hour	Total duration within 1 hour, ms
27	NA	17	459

Reference numbers of test equipment used

HL 2780	HL 5245					
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Full description is given in Appendix A



<b>Test specification:</b> FCC Part 15, Section 231(b) / RSS-210, Section A1. 2, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 07-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

## 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
433.92	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:  

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

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:

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

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.



<b>Test specification:</b> FCC Part 15, Section 231(b) / RSS-210, Section A1. 2, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 07-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

**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° and the measuring antenna was rotated around its vertical axis.

7.2.2.3 The worst test results (the lowest margins) were recorded in Table 7.2.3, Table 7.2.4, Table 7.2.6, Table 7.2.7 and shown in the associated plots.

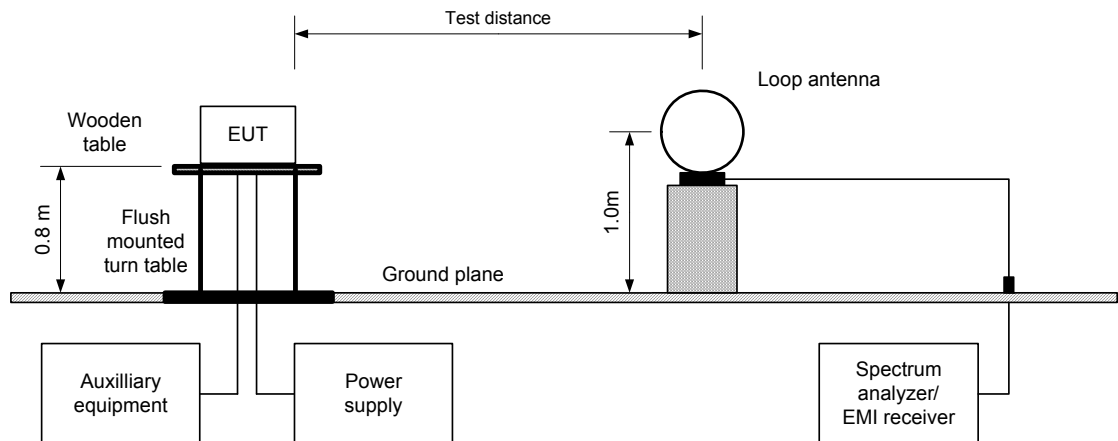
**7.2.3 Test procedure for spurious emission field strength measurements above 30 MHz**

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°, 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) were recorded in Table 7.2.3, Table 7.2.4, Table 7.2.6, Table 7.2.7 and shown in the associated plots.

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





<b>Test specification:</b> FCC Part 15, Section 231(b) / RSS-210, Section A1. 2, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 07-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

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

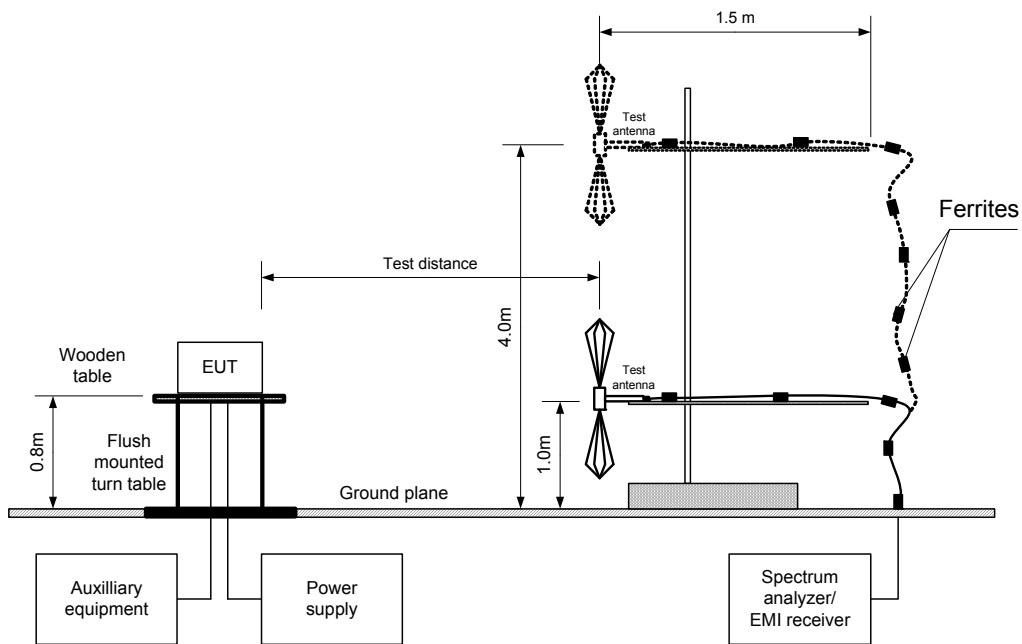
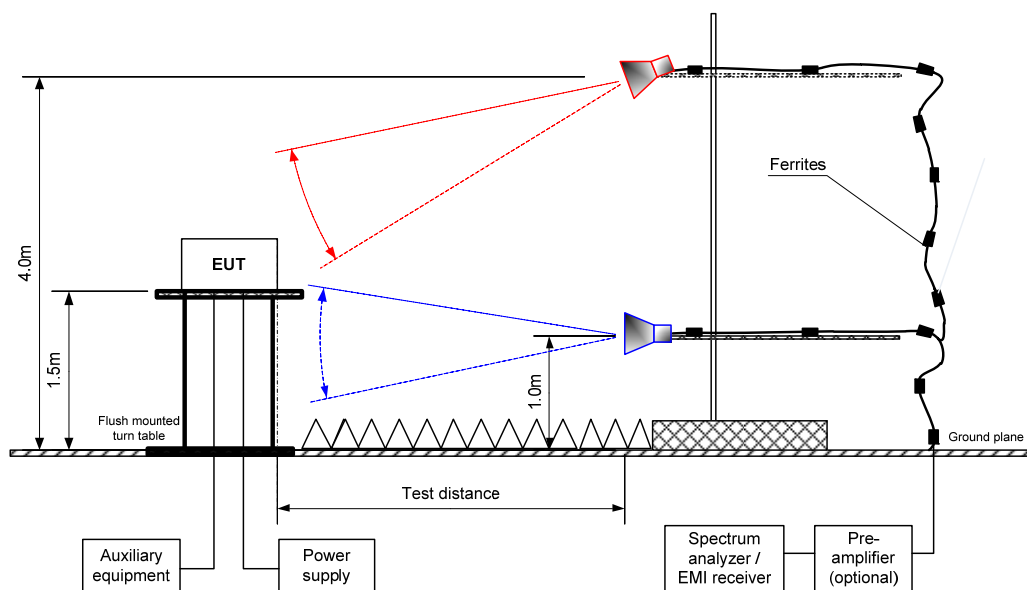


Figure 7.2.3 Setup for spurious emission field strength measurements above 1000 MHz





<b>Test specification:</b> FCC Part 15, Section 231(b) / RSS-210, Section A1. 2, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 07-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

**Table 7.2.3 Field strength of fundamental emission, spurious emissions outside restricted bands below 1 GHz**

TEST DISTANCE: 3 m  
 EUT POSITION: Typical ( Vertical)  
 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)  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
 Biconilog (30 MHz – 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**	
<b>Fundamental emission***</b>											
433.9471	V	1.04	-105.0	88.82	100.8	-11.98	88.82	80.42	80.8	-0.38	Pass
<b>Spurious emissions</b>											
30.32	V	1.0	-180	38.96	80.8	-41.84	38.96	30.56	60.8	-30.24	Pass
32.00	V	1.0	-180	37.15	80.8	-43.65	37.15	28.75	60.8	-32.05	
68.51	V	1.7	180	36.40	80.8	-44.40	36.40	28.00	60.8	-32.80	
867.83	H	1.0	180	43.43	80.8	-37.37	43.43	35.03	60.8	-25.77	

\*- EUT front panel refers to 0 degrees position of turntable.  
 \*\*- Margin, dB =Measured (calculated) value, dB(μV/m)-Limit, dB(μV/m)

**Table 7.2.4 Spurious emissions 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: 1000 – 4500 MHz  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 1.0 MHz (above 1000 MHz)  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 TEST ANTENNA TYPE: 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**	
1301.6575	V	2.88	10.0	58.81	74.00	-15.19	58.81	47.44	54.0	-6.56	Pass
3854.4438	V	2.35	180.0	41.42	74.00	-32.58	41.42	30.05	54.0	-23.95	
4354.3660	H	2.08	-48.0	42.27	74.00	-31.73	42.27	30.90	54.0	-23.10	

\*- EUT front panel refers to 0 degrees position of turntable.  
 \*\*- Margin, dB =Measured (calculated) value, dB(μV/m)-Limit, dB(μV/m)



<b>Test specification:</b> FCC Part 15, Section 231(b) / RSS-210, Section A1. 2, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 07-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

Table 7.2.5 Average factor calculation

Transmission pulse A during burst		Transmission pulse B during burst		Quantity bursts during 100 msec	Average factor, dB
Duration, ms	Quantity	Duration, ms	Quantity		
0.2125	13	0.525	2	10	-8.4

\*- Average factor was calculated as follows  
 $20 \log ((0.2125 \times 13 + 0.525 \times 2) \times 10 / 100) = -8.4 \text{ dB}$

Table 7.2.6 Field strength of spurious emissions outside 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**	
1735.6938	V	1.00	136.0	59.97	80.8	-20.83	59.97	51.57	60.8	-9.23	Pass
2169.7302	H	2.35	-130.0	52.84	80.8	-27.96	52.84	44.44	60.8	-16.36	
2603.4938	V	2.34	170.0	48.29	80.8	-32.51	48.29	39.89	60.8	-20.91	
3037.5302	H	2.34	-133.0	51.42	80.8	-29.38	51.42	43.02	60.8	-17.78	
3471.4523	H	3.78	180.0	50.97	80.8	-29.83	50.97	42.57	60.8	-18.23	

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

\*\* - Margin, dB = Measured (calculated) value, dB(μV/m) - Limit, dB(μV/m)





<b>Test specification:</b> FCC Part 15, Section 231(b) / RSS-210, Section A1. 2, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 07-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

**Table 7.2.7 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)  
 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*				
All signals were found below limit at least 20 dB								Pass

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

**Reference numbers of test equipment used**

HL 0446	HL 3903	HL 4360	HL 4933	HL 5288	HL 5405		
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Full description is given in Appendix A.



<b>Test specification:</b> FCC Part 15, Section 231(b) / RSS-210, Section A1. 2, Field strength of emissions	
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6	
<b>Test mode:</b> Compliance	<b>Verdict: PASS</b>
<b>Date(s):</b> 07-Dec-18	
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %
<b>Remarks:</b>	

Table 7.2.8 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 7.2.9 Restricted bands according to RSS-Gen, Table 3

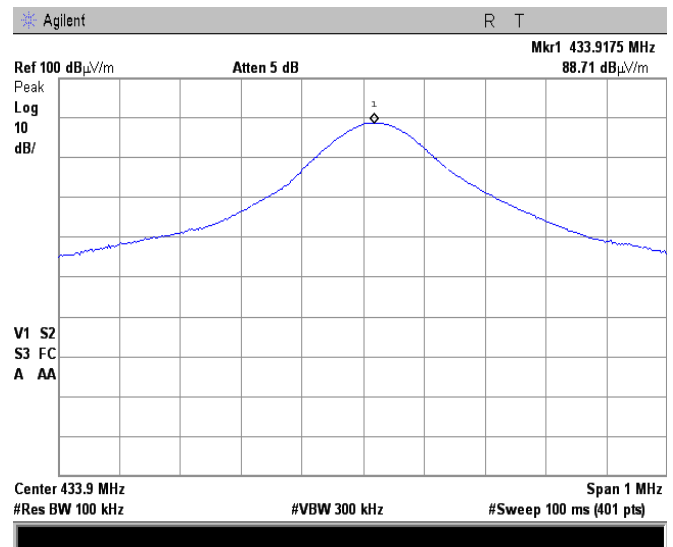
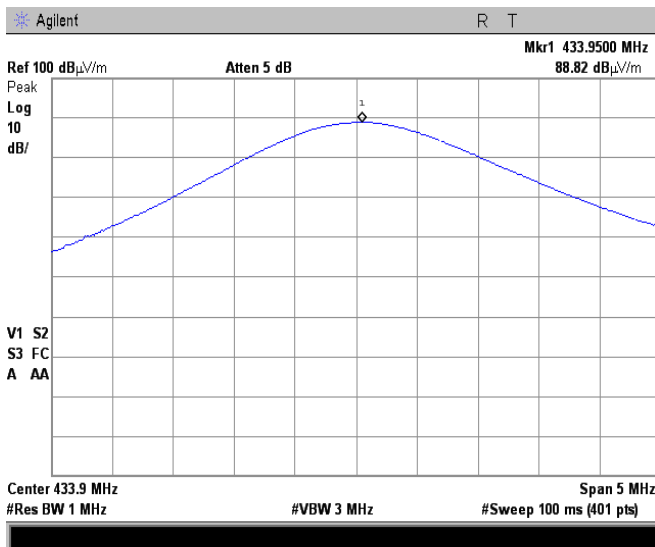
MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.291 - 8.294	16.80425 - 16.80475	399.9 - 410	3260 - 3267	10.6 - 12.7
2.1735 - 2.190	8.362 - 8.366	25.5 - 25.67	608 - 614	3332 - 3339	13.25 - 13.4
3.020 - 3.026	8.37625 - 8.38675	37.5 - 38.25	960 - 1427	3345.8 - 3358	14.47 - 14.5
4.125 - 4.128	8.41425 - 8.41475	73 - 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



<b>Test specification:</b> FCC Part 15, Section 231(b) / RSS-210, Section A1. 2, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 07-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

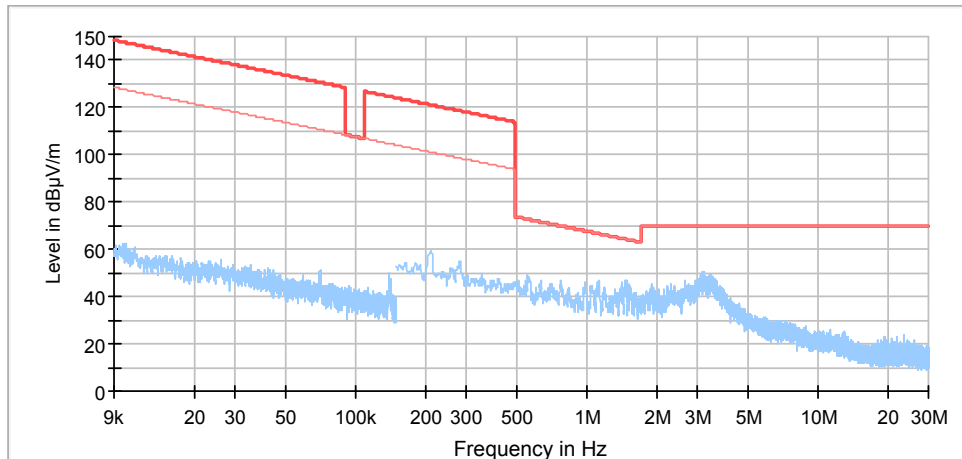
**Plot 7.2.1 Radiated emission measurements at the fundamental frequency**

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



**Plot 7.2.2 Radiated emission measurements from 9 kHz to 30 MHz**

TEST SITE: Semi anechoic chamber  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical

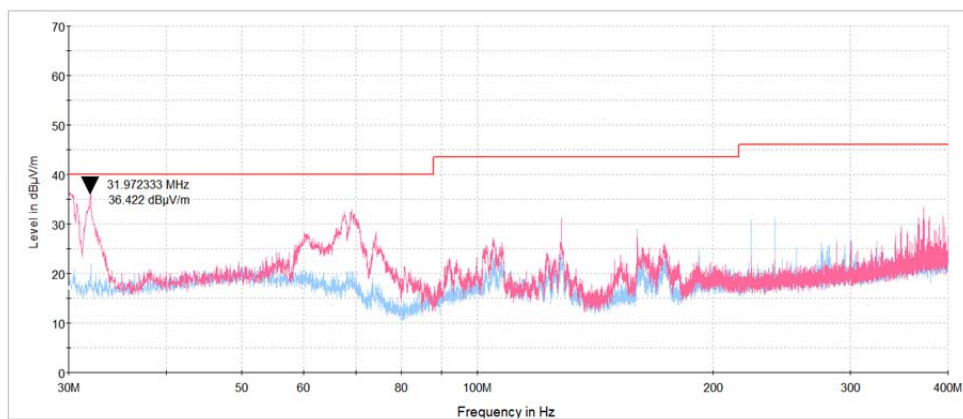




<b>Test specification:</b> FCC Part 15, Section 231(b) / RSS-210, Section A1. 2, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 07-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

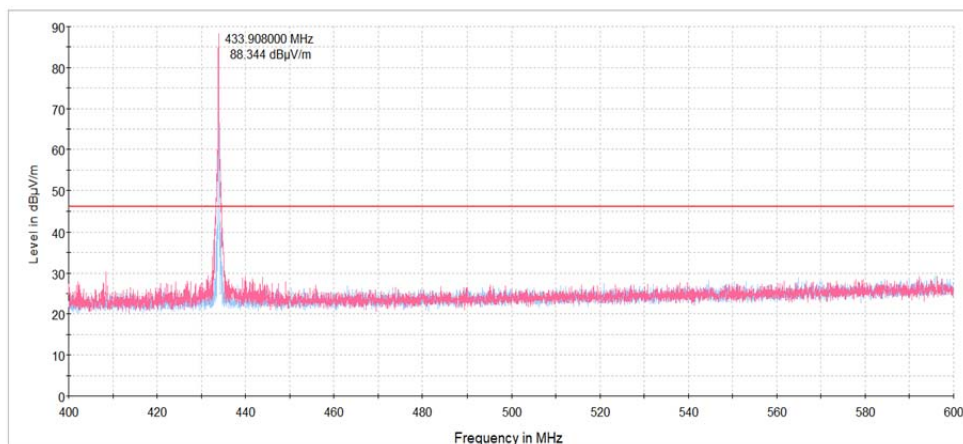
**Plot 7.2.3 Radiated emission measurements from 30 to 400 MHz**

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



**Plot 7.2.4 Radiated emission measurements from 400 to 600 MHz**

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

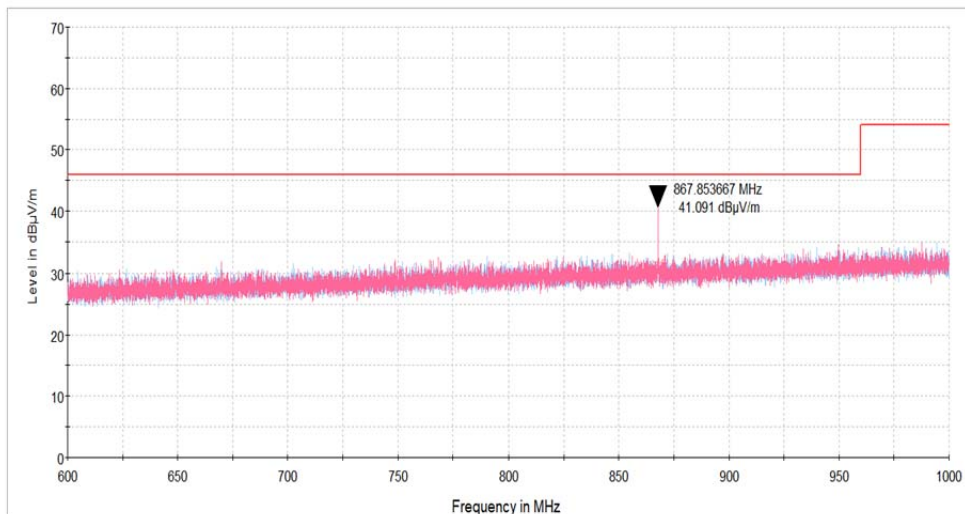




<b>Test specification:</b> FCC Part 15, Section 231(b) / RSS-210, Section A1. 2, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 07-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

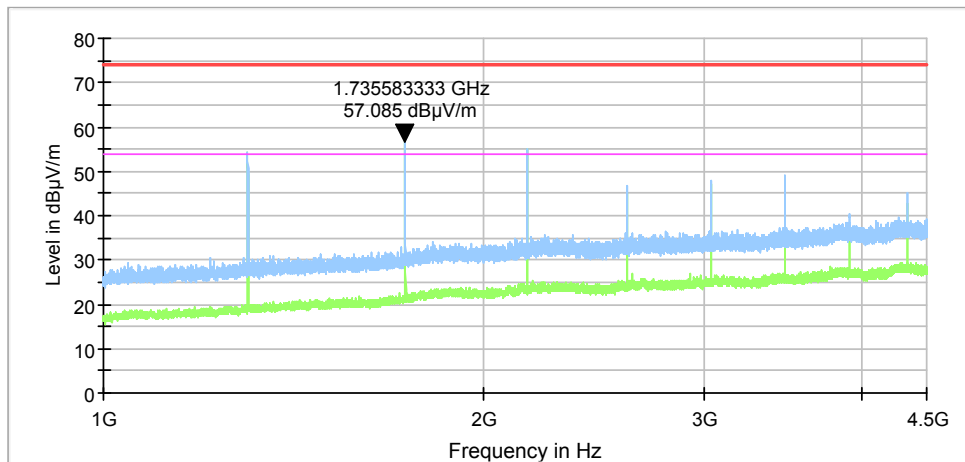
**Plot 7.2.5 Radiated emission measurements from 600 to 1000 MHz**

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



**Plot 7.2.6 Radiated emission measurements from 1000 to 4500 MHz**

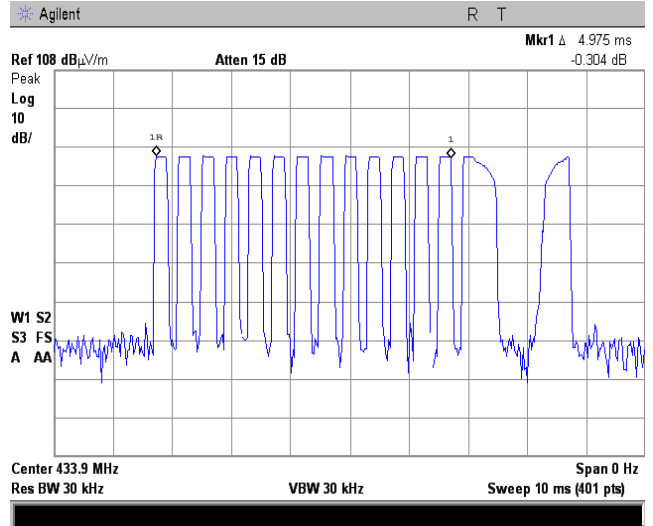
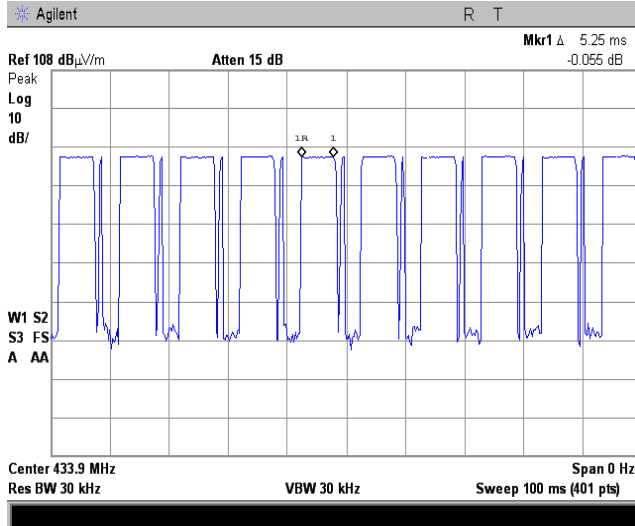
TEST SITE: Semi anechoic chamber  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical



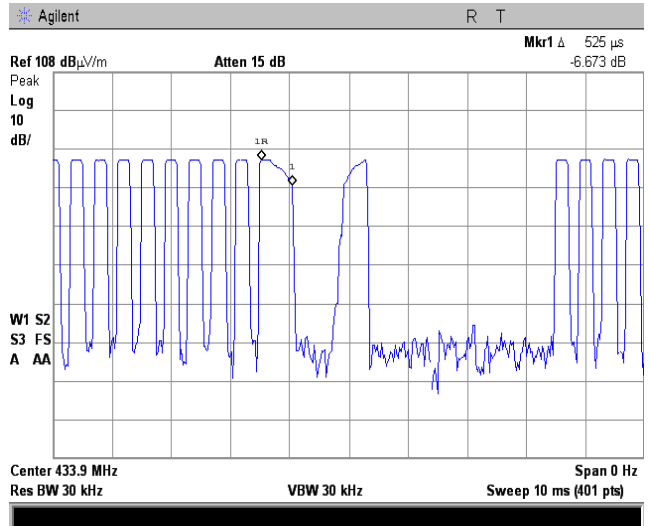
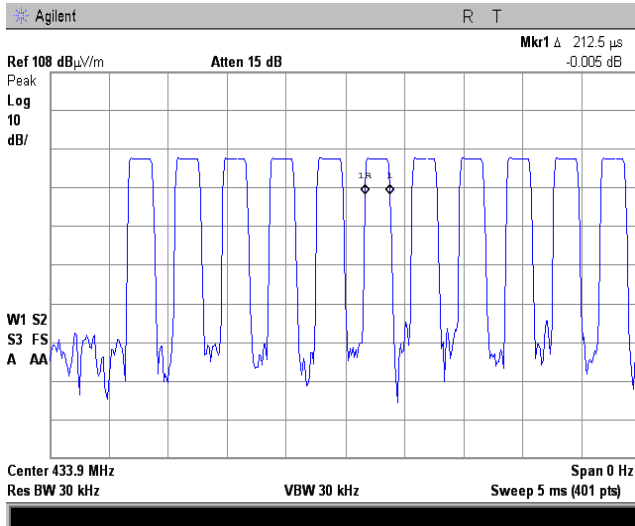


<b>Test specification:</b> FCC Part 15, Section 231(b) / RSS-210, Section A1. 2, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 07-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.2.7 Transmission duration (pulse B)



Plot 7.2.8 Transmission duration (pulse A)

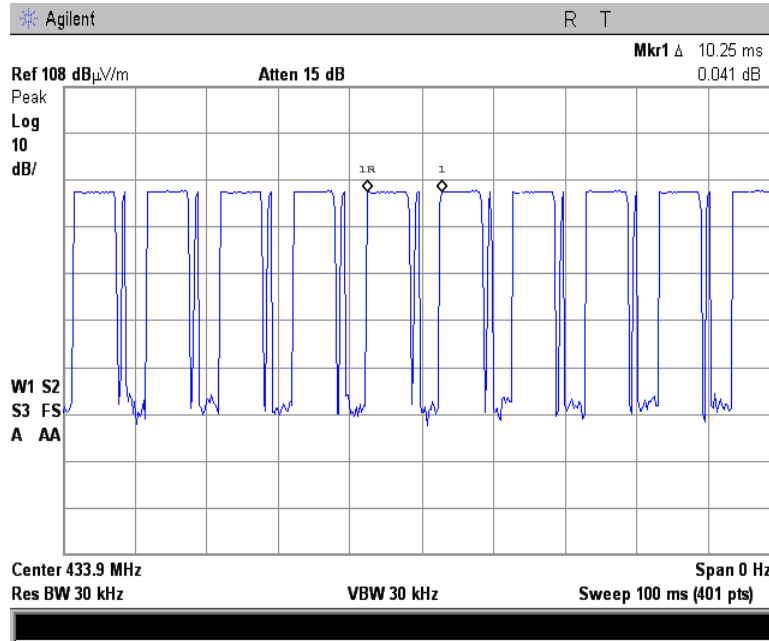




HERMON LABORATORIES

<b>Test specification:</b> FCC Part 15, Section 231(b) / RSS-210, Section A1. 2, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance			<b>Verdict:</b> PASS
<b>Date(s):</b> 07-Dec-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.2.9 Transmission period





<b>Test specification:</b> FCC Part 15, Section 231(c) / RSS-210, Section A1.3, Occupied bandwidth			
<b>Test procedure:</b> ANSI C63.10 section 6.9.2			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 17-Oct-18			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1011 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

### 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.

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







<b>Test specification:</b> FCC Part 15, Section 231(c) / RSS-210, Section A1.3, Occupied bandwidth			
<b>Test procedure:</b> ANSI C63.10 section 6.9.2			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 17-Oct-18			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1011 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

Table 7.3.2 Occupied bandwidth test results

DETECTOR USED: Peak hold  
 RESOLUTION BANDWIDTH: 1 kHz  
 VIDEO BANDWIDTH: 3 kHz  
 MODULATION ENVELOPE REFERENCE POINTS: 99%  
 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	25	0.25	1082.5	1057.5	Pass

MODULATION ENVELOPE REFERENCE POINTS 99%

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit		Margin, kHz	Verdict
		% of the carrier frequency	kHz		
433.92	29.497	0.25	1082.5	1053.003	Pass

Reference numbers of test equipment used

HL 0337	HL 3901	HL 5376					
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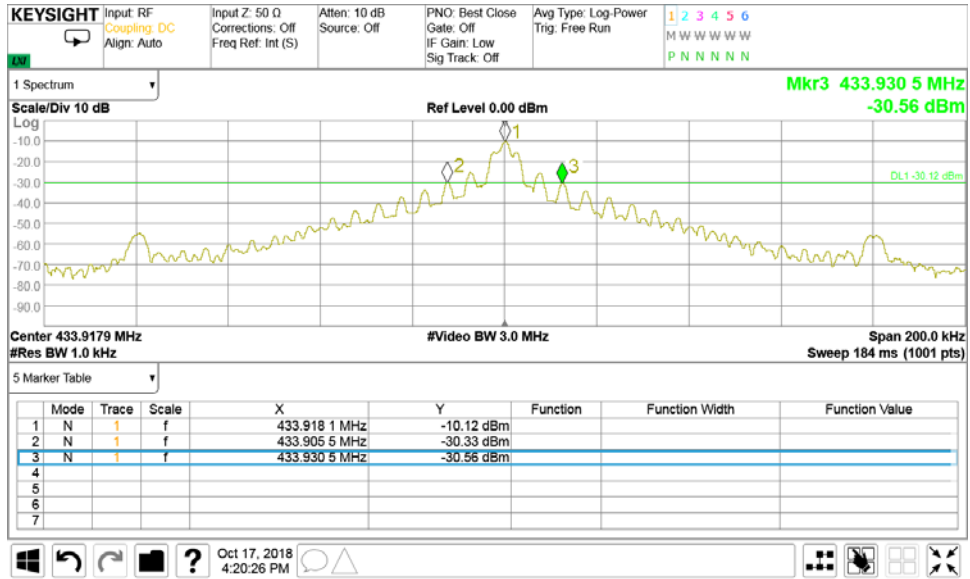
Full description is given in Appendix A.



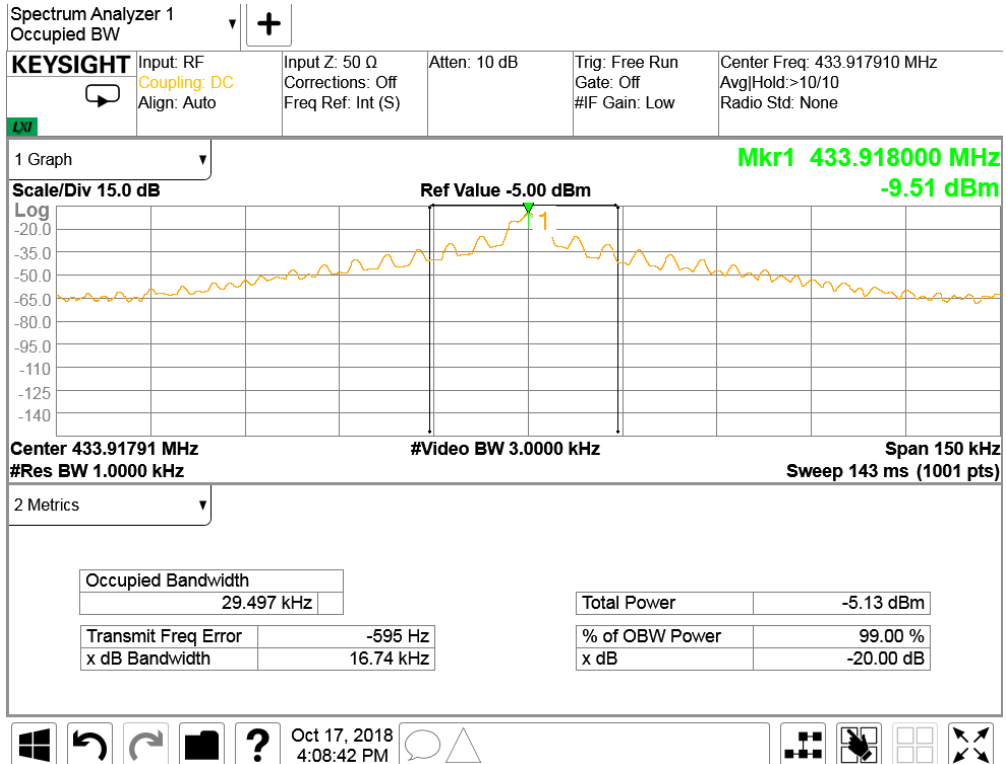
HERMON LABORATORIES

<b>Test specification:</b> FCC Part 15, Section 231(c) / RSS-210, Section A1.3, Occupied bandwidth			
<b>Test procedure:</b> ANSI C63.10 section 6.9.2			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 17-Oct-18			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1011 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.3.1 The 20 dBc occupied bandwidth test result



Plot 7.3.2 The 99% occupied bandwidth test result





<b>Test specification: FCC Part 15, Section 207 / RSS-Gen, Section 8.8, Conducted emission</b>			
<b>Test procedure:</b> ANSI C63.4, Section 7.3 and 12.2.4			
<b>Test mode:</b> Compliance		<b>Verdict: PASS</b>	
<b>Date(s):</b> 20-Nov-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 42 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

## 7.4 Conducted emissions

### 7.4.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.4.1.

Table 7.4.1 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.

### 7.4.2 Test procedure

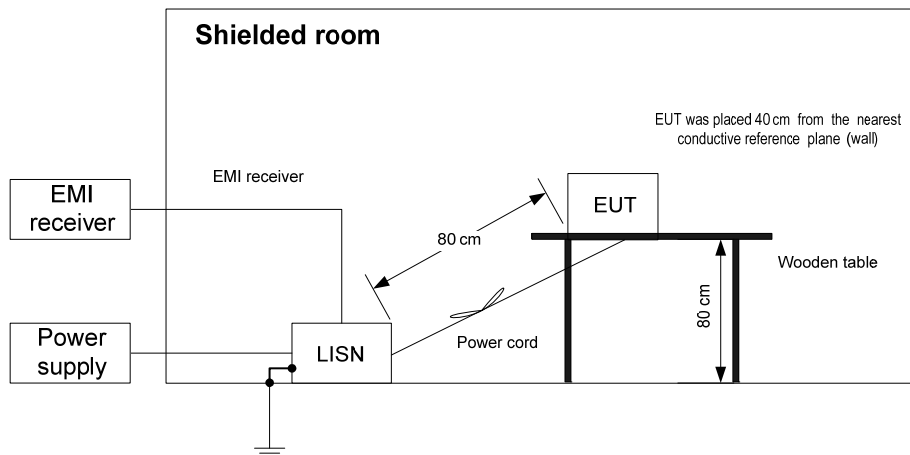
7.4.2.1 The EUT was set up as shown in Figure 7.4.1 and associated photographs, energized and the performance check was conducted.

7.4.2.2 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.

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

7.4.2.4 The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

Figure 7.4.1 Setup for conducted emission measurements, table-top equipment





<b>Test specification:</b> FCC Part 15, Section 207 / RSS-Gen, Section 8.8, Conducted emission			
<b>Test procedure:</b> ANSI C63.4, Section 7.3 and 12.2.4			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 20-Nov-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 42 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

Table 7.4.2 Conducted emission test results

LINE: AC mains  
 EUT SET UP: TABLE-TOP  
 TEST SITE: SHIELDED ROOM  
 DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE  
 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*		
0.166	47.1	46.4	65.16	-18.76	38.7	55.16	-16.46	L1	Pass
0.200	43.5	42.3	63.61	-21.31	37.5	53.61	-16.11		
0.268	40.9	39.4	61.18	-21.78	38.0	51.18	-13.18		
0.298	51.6	50.0	60.30	-10.30	48.5	50.30	-1.80		
4.001	32.4	30.0	56.00	-26.00	27.9	46.00	-18.10		
18.800	35.4	31.0	60.00	-29.00	21.9	50.00	-28.10		
0.167	48.1	47.1	65.11	-18.01	39.6	55.11	-15.51	L2	Pass
0.200	44.2	43.3	63.61	-20.31	30.3	53.61	-23.31		
0.267	41.8	40.6	61.21	-20.61	39.7	51.21	-11.51		
0.296	51.2	47.9	60.35	-12.45	45.4	50.35	-4.95		
16.780	41.3	36.0	60.00	-24.00	27.5	50.00	-22.50		
18.01	37.1	32.9	60.00	-27.10	23.5	50.00	-26.50		

\*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

HL 0787	HL 1500	HL 3016	HL 4778				
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Full description is given in Appendix A.



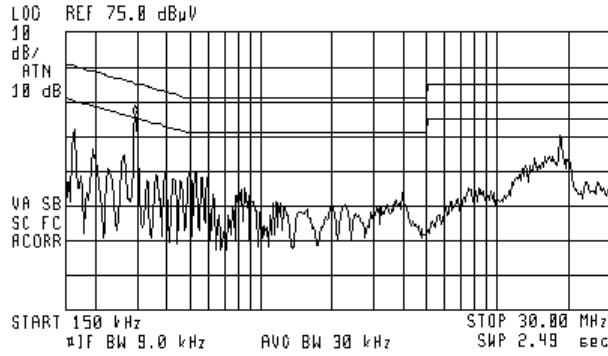
<b>Test specification: FCC Part 15, Section 207 / RSS-Gen, Section 8.8, Conducted emission</b>			
<b>Test procedure:</b> ANSI C63.4, Section 7.3 and 12.2.4			
<b>Test mode:</b> Compliance		<b>Verdict: PASS</b>	
<b>Date(s):</b> 20-Nov-18			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 42 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.4.1 Conducted emission measurements test results**

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



ACTV DET: PEAK  
MERS DET: PEAK QP AVG  
NKR 300 kHz  
51.12 dBµV

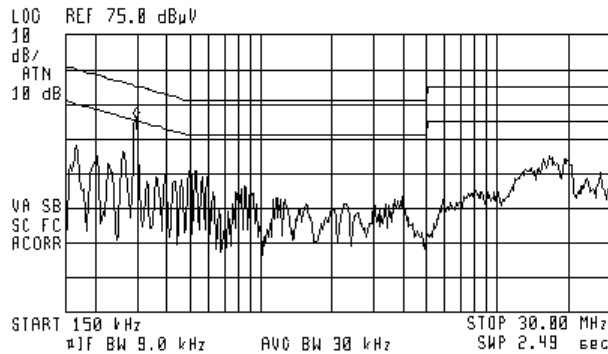


**Plot 7.4.2 Conducted emission measurements test results**

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



ACTV DET: PEAK  
MERS DET: PEAK QP AVG  
NKR 300 kHz  
51.88 dBµV





<b>Test specification:</b> FCC Part 15, Section 203 / RSS-Gen, Section 6.8, Antenna requirements			
<b>Test procedure:</b> Visual inspection / supplier declaration			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 17-Oct-18			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1011 hPa	<b>Power:</b> 120 VAC
<b>Remarks:</b>			

### 7.5 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 7.5.1.

Table 7.5.1 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	

**8 APPENDIX A Test equipment and ancillaries used for tests**

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0337	Probe Set, Hand held, 5 probes	Electro-Metrics	EHFP-30	238	03-Jun-18	03-Jun-19
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	11-Feb-18	11-Feb-19
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A018 77	08-Oct-18	08-Oct-19
1500	Cable RF, 15 m, N/N-type	Suhner Switzerland	RG 214/U	1500	07-Aug-18	07-Aug-19
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 62	25-Feb-18	25-Feb-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	892239/00 2	27-Jan-19	27-Jan-20
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLE X 102A	1225/2A	07-Feb-18	07-Feb-19
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLE X 102A	1226/2A	07-Feb-18	07-Feb-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	30807A00 262, 3427A001 23	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
5245	RF cable, 18 GHz, 3 m, N-type	Huber-Suhner	ST18A/N m/Nm/300 0	602211/18 A	01-Aug-18	01-Aug-19
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX- 8000E	00809	21-Jan-18	21-Jan-19
5376	EXA Signal Analyzer, 10 Hz - 32 GHz	Keysight Technologies	N9010B	MY574704 04	16-Mar-18	16-Mar-19
5405	RF cable, 18 GHz, N-N, 6 m	Huber-Suhner	SF118/11 N(x2)	500023/11 8	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: $\pm 3.9$ dB 150 kHz to 30 MHz: $\pm 3.8$ dB
Radiated emissions at 10 m measuring distance Horizontal polarization  Vertical polarization	Biconilog antenna: $\pm 5.0$ dB Biconical antenna: $\pm 5.0$ dB Log periodic antenna: $\pm 5.1$ dB Double ridged horn antenna: $\pm 5.3$ dB Biconilog antenna: $\pm 5.5$ dB Biconical antenna: $\pm 5.5$ dB Log periodic antenna: $\pm 5.6$ dB Double ridged horn antenna: $\pm 5.8$ dB
Radiated emissions at 3 m measuring distance Horizontal polarization  Vertical polarization	Biconilog antenna: $\pm 5.3$ dB Biconical antenna: $\pm 5.0$ dB Log periodic antenna: $\pm 5.3$ dB Double ridged horn antenna: $\pm 5.3$ dB Biconilog antenna: $\pm 6.0$ dB Biconical antenna: $\pm 5.7$ dB Log periodic antenna: $\pm 6.0$ dB Double ridged horn antenna: $\pm 6.0$ dB
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: $\pm 2.6$ dB 2.9 GHz to 6.46 GHz: $\pm 3.5$ dB 6.46 GHz to 13.2 GHz: $\pm 4.3$ dB 13.2 GHz to 22.0 GHz: $\pm 5.0$ dB 22.0 GHz to 26.8 GHz: $\pm 5.5$ dB 26.8 GHz to 40.0 GHz: $\pm 4.8$ dB
Duty cycle, timing (Tx ON / OFF) and average factor measurements	$\pm 1.0$ %
Occupied bandwidth	$\pm 8.0$ %

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.



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

## 11 APPENDIX D Specification references

47CFR part 15: 2017	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 9:2016	Licence- Exempt Radio Apparatus:Category I Equipment
RSS-Gen Issue 5: 2018	General Requirements for Compliance of Radio Apparatus



## 12 APPENDIX E Test equipment correction factors

Antenna factor  
Active loop antenna  
Model 6502, S/N 2857, HL 0446

Frequency, MHz	Magnetic antenna factor, dB	Electric antenna factor, dB
0.009	-32.8	18.7
0.010	-33.8	17.7
0.020	-38.3	13.2
0.050	-41.1	10.4
0.075	-41.3	10.2
0.100	-41.6	9.9
0.150	-41.7	9.8
0.250	-41.6	9.9
0.500	-41.8	9.8
0.750	-41.9	9.7
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.2
4.000	-41.4	10.1
5.000	-41.5	10.1
10.000	-41.9	9.6
15.000	-41.9	9.6
20.000	-42.2	9.3
25.000	-42.8	8.7
30.000	-44.0	7.5

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field strength in dB( $\mu$ V/m).



**Antenna factor**  
**Trilog antenna**  
**Model ALX-8000E, Frankonia, S/N 00809, HL 5288, 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
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 $\mu$ V to obtain field strength in dB $\mu$ V/m.



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

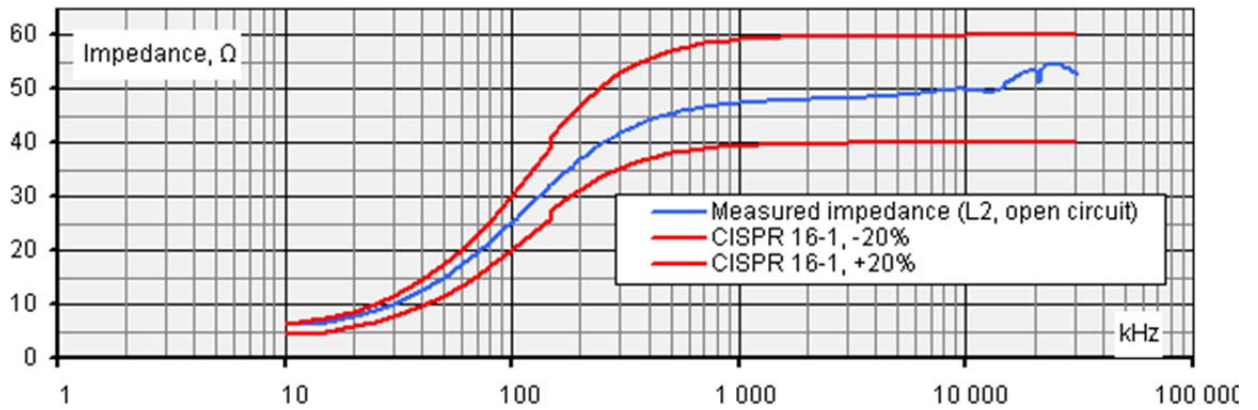
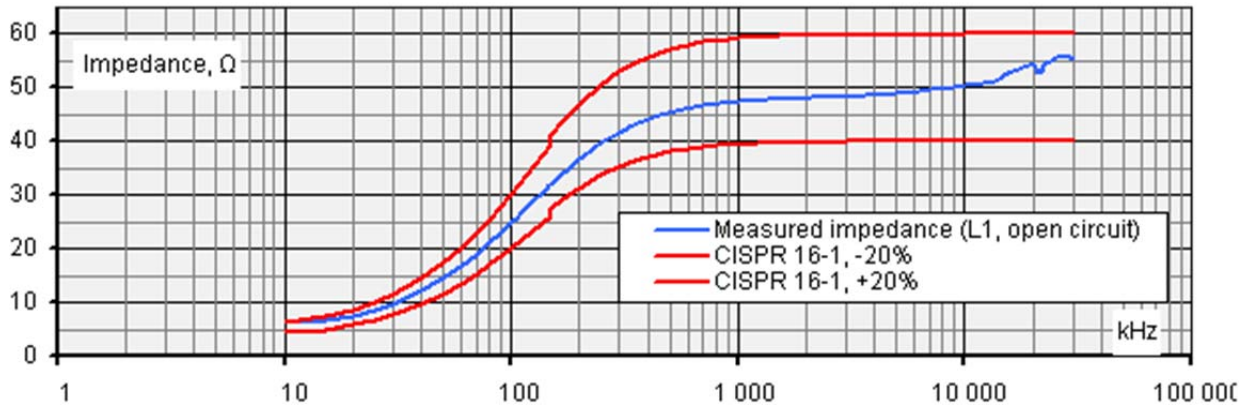
Frequency, MHz	Measured antenna factor (with preamplifier), dB/m
1000	-16.1
1500	-15.1
2000	-10.9
2500	-11.9
3000	-11.1
3500	-10.6
4000	-8.6
4500	-8.3
5000	-5.9
5500	-5.7
6000	-3.3
6500	-4.0
7000	-2.2
7500	-1.7
8000	1.1
8500	-0.8
9000	-1.5
9500	-0.2

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 dB $\mu$ V to obtain field strength in dB $\mu$ V/m.



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





**Cable loss**  
**Microwave Cable Assembly, Huber-Suhner, 40 GHz, 3.5 m, SMA-SMA, S/N 1225/2A**  
**HL 3901**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.09	9500	4.29	21000	6.67
100	0.41	10000	4.40	22000	6.92
500	0.93	10500	4.52	23000	7.00
1000	1.33	11000	4.64	24000	7.18
1500	1.63	11500	4.76	25000	7.29
2000	1.90	12000	4.87	26000	7.55
2500	2.12	12500	4.99	27000	7.70
3000	2.33	13000	5.11	28000	7.88
3500	2.50	13500	5.20	29000	8.02
4000	2.67	14000	5.31	30000	8.15
4500	2.82	14500	5.42	31000	8.35
5000	2.99	15000	5.51	32000	8.40
5500	3.16	15500	5.58	33000	8.62
6000	3.32	16000	5.68	34000	8.73
6500	3.51	16500	5.78	35000	8.78
7000	3.65	17000	5.91	36000	8.94
7500	3.79	17500	5.99	37000	9.21
8000	3.92	18000	6.07	38000	9.37
8500	4.04	19000	6.36	39000	9.45
9000	4.18	20000	6.49	40000	9.52



**Cable loss**  
**Microwave Cable Assembly, Huber-Suhner, 40 GHz, 1.5 m, SMA-SMA, S/N 1226/2A**  
**HL 3903**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	-0.02	9500	1.84	21000	2.98
100	0.15	10000	1.86	22000	3.07
500	0.38	10500	1.93	23000	3.13
1000	0.56	11000	1.99	24000	3.21
1500	0.69	11500	2.04	25000	3.26
2000	0.82	12000	2.10	26000	3.48
2500	0.90	12500	2.15	27000	3.44
3000	0.98	13000	2.21	28000	3.53
3500	1.06	13500	2.25	29000	3.59
4000	1.11	14000	2.29	30000	3.66
4500	1.17	14500	2.34	31000	3.70
5000	1.24	15000	2.36	32000	3.79
5500	1.32	15500	2.40	33000	3.88
6000	1.40	16000	2.45	34000	3.94
6500	1.50	16500	2.48	35000	3.91
7000	1.56	17000	2.56	36000	4.05
7500	1.62	17500	2.58	37000	4.22
8000	1.68	18000	2.60	38000	4.25
8500	1.74	19000	2.84	39000	4.27
9000	1.78	20000	2.88	40000	4.33



**Cable loss**  
**RF Cable, Huber-Suhner, 18 GHz, 3 m, N- type,**  
**ST18A/Nm/Nm/3000, S/N 602211/18A**  
**HL 5245**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
0.1	0.01	5500	1.76
50	0.16	6000	1.85
100	0.23	6500	1.93
200	0.32	7000	2.02
300	0.39	7500	2.11
400	0.45	8000	2.19
500	0.51	8500	2.26
600	0.56	9000	2.30
700	0.60	9500	2.33
800	0.65	10000	2.37
900	0.68	10500	10500
1000	0.72	11000	11000
1100	0.76	11500	11500
1200	0.80	12000	12000
1300	0.83	12500	12500
1400	0.86	13000	13000
1500	0.89	13500	13500
1600	0.92	14000	14000
1700	0.95	14500	14500
1800	0.98	15000	15000
1900	1.01	15500	15500
2000	1.03	16000	16000
2500	1.16	16500	16500
3000	1.27	17000	17000
3500	1.38	17500	17500
4000	1.48	18000	18000
4500	1.58		
5000	1.67		





**Cable loss**  
RF Cable, Huber-Suhner, 18 GHz, 6 m,  
SF118/11N(x2), S/N 500023/118  
HL 5405

3405

# Specific Test Report



Frequency Range [GHz]	IL min S21 [dB]	IL min S12 [dB]	RL max S11 [dB]	RL max S22 [dB]
0.040 - 1.836	-1.431	-1.431	-37.037	-37.704
1.836 - 3.632	-2.062	-2.066	-33.573	-32.848
3.632 - 5.428	-2.576	-2.576	-28.548	-29.602
5.428 - 7.224	-3.013	-3.014	-30.738	-32.523
7.224 - 9.020	-3.415	-3.416	-33.728	-32.257
9.020 - 10.816	-3.772	-3.772	-29.302	-30.735
10.816 - 12.612	-4.138	-4.138	-28.768	-26.255
12.612 - 14.408	-4.456	-4.462	-27.109	-26.151
14.408 - 16.204	-4.786	-4.786	-26.056	-27.116
16.204 - 18.000	-5.113	-5.111	-27.762	-28.508

Type: SF118/11N/11N/6000MM  
Sales no.: 10497130  
Serial no.: 500023 /118  
PA no.: 1956306  
Ring no.:  
Cable length: 6 m  
Test length:  
Connector 1: SF\_11\_N-656  
Connector 2: SF\_11\_N-656  
Cable: SUCOFLEX\_118  
Meas. System: N5230C,MY49001834,A.09.42.22  
Time: 7:04:21 AM  
Date: 6/6/2018  
Inspected by: AZ /111  
Start Freq.: 0.04000 GHz  
Stop Freq.: 18.00000 GHz  
Meas Points: 801  
Source Power: -5 dBm

## 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( $\mu$ V)	decibel referred to one microvolt
dB( $\mu$ V/m)	decibel referred to one microvolt per meter
dB( $\mu$ A)	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
$\mu$ s	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
$\Omega$	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 TEST REPORT

## 14 APPENDIX G Manufacturer's declaration of identity

P ▲ R ▲ D O X™

To: Hermon Labs

### Declaration of Similarity

It is hereby declared that Wireless Control Panel MG5000V2 operates on 433.92 MHz is a variant of MG5050V2 Wireless Control Panel.

Both Control Panel models have the same Layout, Electronic Hardware, Firmware and Metal Enclosure.

The only difference between MG5050V2 and MG5000V2 is in number of terminal blocks (on-board zones and PGMs):

MG5050V2 (5 zones, 4 PGMs) vs MG5000V2 (2 zones, 2 PGMs)

The setup includes MG5050V2 Control Panel (MG5000V2 similar product and will not be tested).

## 15 APPENDIX H Manufacturer's declaration about periodic operation

P ▲ R ▲ D O X™

January 15<sup>th</sup>, 2019

To: Hermon Laboratories

Attention: Mr. Michael Nikishin and Ms. Ella Pitt

### 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 Wireless Control Panel MG5050V2 is operate on 433.92 MHz and designed to comply and satisfy periodic operational requirements.

Wireless Control Panel MG5000V2 is a variant of MG5050V2 panel.

MG5050V2/MG5000V2 panels do not allow continuous transmitting (such as voice, video and radio control).

The Wireless Control Panels MG5050V2/MG5000V2 are not manually operated devices.

The transmissions of MG5050V2/MG5000V2 are not periodical and occur upon intrusion only.

MG5050V2/MG5000V2 panels are an intrusion alarm system device and will send automatically its synchronization message to two-way devices (wireless sirens and wireless keypads) in a certain interval (once in 4 minutes).

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



Alex Chaplik  
Certification Manager

END OF DOCUMENT