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# TEST REPORT

ACCORDING TO: FCC CFR 47 PART 15 subpart C, section 15.231(a) and  
subpart B

FOR:

**Rosslare Enterprises Ltd.**  
**Remote control**  
**Model: SA-33G**

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## 1 Applicant information

**Client name:** Rosslare Enterprises Ltd.  
**Address:** Flat 12, 9 Floor, Wing Fat Ind. Bldg., 12 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong  
**Telephone:** +852 2795 5630  
**Fax:** +852 2795 1508  
**E-mail:** leonid.beckman@rosslaresecurity.com  
**Contact name:** Mr. Leonid Beckman

## 2 Equipment under test attributes

**Product name:** Remote control  
**Product type:** Transmitter  
**Model(s):** SA-33G  
**Serial number:** 000087  
**Hardware version:** 0101-2090070+04  
**Software release:** SA33\_V04.1  
**Receipt date:** 10/17/2010

## 3 Manufacturer information

**Manufacturer name:** Rosslare Enterprises Ltd.  
**Address:** Flat 12, 9 Floor, Wing Fat Ind. Bldg., 12 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong  
**Telephone:** +852 2795 5630  
**Fax:** +852 2795 1508  
**E-Mail:** leonid.beckman@rosslaresecurity.com  
**Contact name:** Mr. Leonid Beckman




## 4 Test details

**Project ID:** 21309  
**Location:** Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel  
**Test started:** 10/18/2010  
**Test completed:** 10/24/2010  
**Test specification(s):** FCC Part 15, subpart C, §15.231; subpart B, §15.109

## 5 Tests summary

Test	Status
<b>Transmitter characteristics</b>	
Section 15.231(a), Periodic operation requirements	Pass
Section 15.231(b), Field strength of emissions	Pass
Section 15.231(c), Occupied bandwidth	Pass
Section 15.207(a), Conducted emission	Not required
Section 15.203, Antenna requirement	Pass
<b>Unintentional emissions</b>	
Section 15.107, Conducted emission at AC power port	Not required
Section 15.109, Radiated emission	Pass
Section 15.111, Conducted emission at receiver antenna port	Not required

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>	Mr. A. Troupiansky, test engineer	October 24, 2010	
<b>Reviewed by:</b>	Mrs. M. Cherniavsky, certification engineer	November 2, 2010	
<b>Approved by:</b>	Mr. M. Nikishin, EMC and Radio group manager	November 25, 2010	

## 6 EUT description

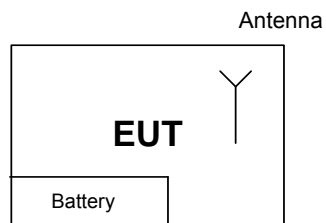
### 6.1 General information

The EUT, a remote control unit, is a wireless handheld transmitter operating at 433.92 MHz and powered by 3 V lithium battery.

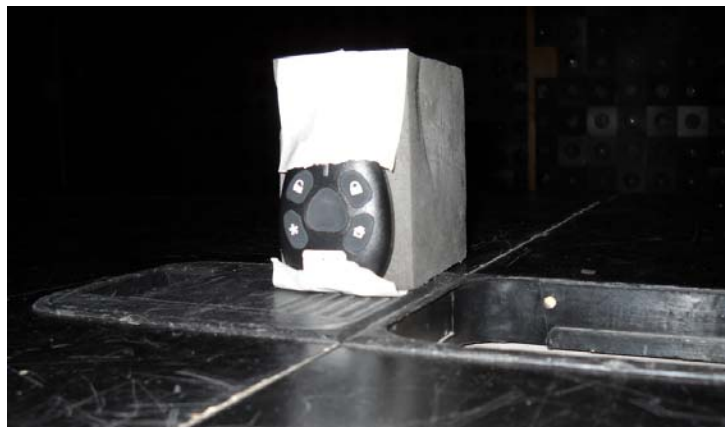
### 6.2 Changes made in EUT

No changes were implemented in the EUT.

### 6.3 Test configuration diagram



### 6.4 EUT test configuration in X-axis position



## 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>Intended use</b>		<b>Condition of use</b>				
	fixed	Always at a distance more than 2 m from all people				
	mobile	Always at a distance more than 20 cm from all people				
X	portable	May operate at a distance closer than 20 cm to human body				
<b>Operating frequencies</b>		433.92 MHz				
<b>Maximum rated output power</b>		Maximum field strength			96.6 dB( $\mu$ V/m) at 3 m test distance	
<b>Is transmitter output power variable?</b>		X	No			
			continuous variable			
			stepped variable with stepsize			dB
		Yes	minimum RF power			dBm
		maximum RF power			dBm	
<b>Antenna connection</b>						
	unique coupling	standard connector	X	integral	with temporary RF connector	
					X without temporary RF connector	
<b>Antenna characteristics</b>						
Type	Manufacturer	Model number		Gain		
Printed	Rosslare	NA		0 dBi		
<b>Type of modulation</b>		OOK				
<b>Modulating test signal (baseband)</b>		ID code				
<b>Transmitter power source</b>						
X	Battery	<b>Nominal rated voltage</b>	3.00 V	Battery type	Lithium CR2450	
	AC mains	<b>Nominal rated voltage</b>		Frequency		
<b>Common power source for transmitter and receiver</b>						
			yes	X	no	

<b>Test specification:</b> Section 15.231(a), Periodic operation requirements	
<b>Test procedure:</b> Supplier declaration	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date:</b> 10/24/2010	
<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1016 hPa
<b>Relative Humidity:</b> 43 %	
<b>Power Supply:</b> 3.00 VDC	
<b>Remarks:</b>	

## 7 Transmitter tests according to 47CFR part 15 subpart C 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 Table 7.1.2.

Figure 7.1.1 Setup for transmitter shut down test

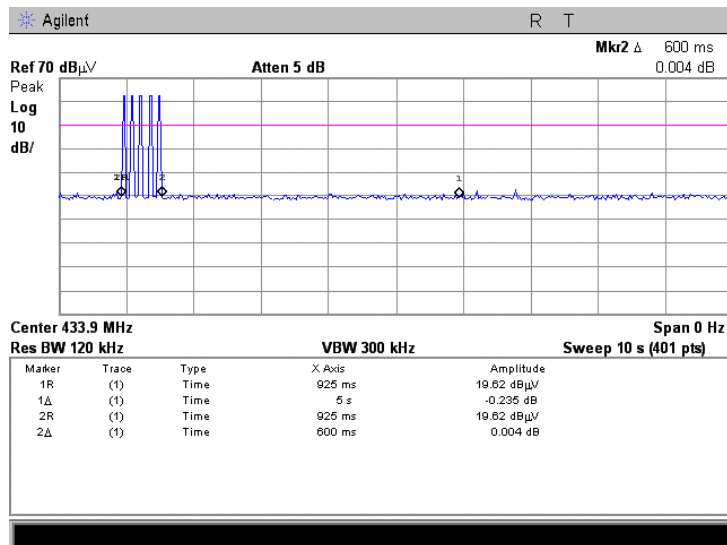


<b>Test specification:</b>	<b>Section 15.231(a), Periodic operation requirements</b>		
<b>Test procedure:</b>	Supplier declaration		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date:</b>	10/24/2010		
<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 43 %	<b>Power Supply:</b> 3.00 VDC
<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	Plot 7.1.1	Comply
Transmitter activated automatically shall cease transmission within 5 seconds	NA	NA
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.	NA	NA

Plot 7.1.1 Transmitter shut down test result



Transmission duration 600 ms (within 5 s)





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<b>Test specification:</b>		<b>Section 15.231(a), Periodic operation requirements</b>	
<b>Test procedure:</b>		Supplier declaration	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	10/24/2010		
<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 43 %	<b>Power Supply:</b> 3.00 VDC
<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
NA	NA	NA	NA *

\* Polling / supervision transmissions are not available

Reference numbers of test equipment used

HL 2780							
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Full description is given in Appendix A.

<b>Test specification:</b>	<b>Section 15.231(b), Field strength of emissions</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 13.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date:</b>	10/20/2010		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 45 %	<b>Power Supply:</b> 3.00 VDC
<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:

$$\text{Lim}_{S_2} = \text{Lim}_{S_1} + 40 \log(S_1/S_2),$$

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:

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

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

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>		<b>Section 15.231(b), Field strength of emissions</b>	
<b>Test procedure:</b>		ANSI C63.4, Section 13.1.4	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	10/20/2010		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 45 %	<b>Power Supply:</b> 3.00 VDC
<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 measurements were performed in three EUT orthogonal positions.

7.2.2.3 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.

7.2.2.4 The worst test results (the lowest margins) were found in the EUT vertical (X-axis) position, recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

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

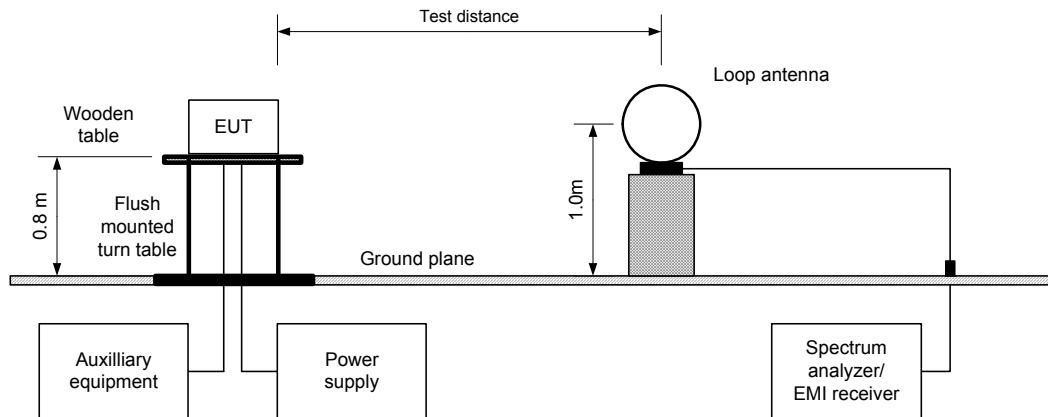
7.2.3.1 The EUT was set up as shown in Figure 7.2.2, energized and the performance check was conducted.

7.2.3.2 The measurements were performed in three EUT orthogonal positions.

7.2.3.3 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.

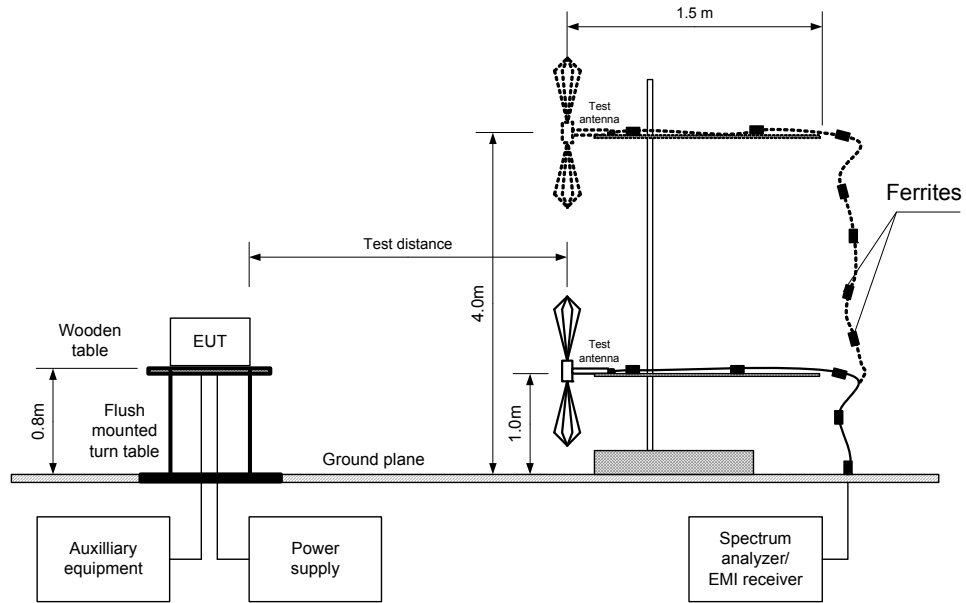
7.2.3.4 The worst test results (the lowest margins) were found in the EUT vertical (X-axis) position, recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

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



<b>Test specification:</b> Section 15.231(b), Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date:</b> 10/20/2010			
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 45 %	<b>Power Supply:</b> 3.00 VDC
<b>Remarks:</b>			

Figure 7.2.2 Setup for spurious emission field strength measurements above 30 MHz



<b>Test specification:</b>		<b>Section 15.231(b), Field strength of emissions</b>			
<b>Test procedure:</b>		ANSI C63.4, Section 13.1.4			
<b>Test mode:</b>	Compliance	<b>Verdict:</b>		<b>PASS</b>	
<b>Date:</b>	10/20/2010				
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 45 %	<b>Power Supply:</b> 3.00 VDC		
<b>Remarks:</b>					

**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: 3 orthogonal (X / Y / Z)  
 MODULATION: OOK  
 MODULATING SIGNAL: ID code  
 BIT RATE: 2400 bps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 4500 MHz  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 1.0 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			Avr factor, dB	Average field strength			Verdict
	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
<b>Fundamental emission***</b>											
432.92	H	1.00	8	82.7	100.8	-18.1	-17.0	65.7	80.8	-15.1	Pass
<b>Spurious emissions</b>											
867.840	H	1.00	4	39.5	80.8	-41.3	-17.0	22.5	60.8	-38.3	Pass
1302.00	H	1.50	6	48.8	74.0	-25.2	-17.0	31.8	54.0	-22.2	

\*- EUT front panel refers to 0 degrees position of turntable.  
 \*\*- Margin = dB below (negative if above) specification limit.  
 \*\*\* Max value was obtained in X-axis orthogonal 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		
NA	NA	14.1	22.4	600	-17.0

\*- 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:  $Average\ factor = 20 \times \log_{10} \left( \frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{100\ ms} \times Number\ of\ bursts\ within\ 100\ ms \right)$   
 Average factor = 20log (14.1/100) = -17.0 dB, where  
 Preamble Ton = 1.5 ms x 0.5 = 0.75 ms  
 Data bit, Ton = 18.525 x 2/3 = 12.35 ms  
 CRC Ton = 1.95 ms x 0.5 = 0.975 ms  
 Total Ton duration 14.1 ms

**Reference numbers of test equipment used**

HL 0446	HL 0521	HL 0593	HL 0594	HL 0604	HL 2432	HL 2871	HL 3622
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Full description is given in Appendix A.

<b>Test specification:</b> Section 15.231(b), Field strength of emissions	
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date:</b> 10/20/2010	
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa
<b>Relative Humidity:</b> 45 %	
<b>Power Supply:</b> 3.00 VDC	
<b>Remarks:</b>	

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

TEST DISTANCE: 3 m  
 EUT POSITION: 3 orthogonal (X / Y / Z)  
 MODULATION: OOK  
 MODULATING SIGNAL: ID code  
 BIT RATE: 2400 bps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 TRANSMITTER OUTPUT POWER: W  
 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)  
 Biconical (30 MHz – 200 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.

Table 7.2.6 Restricted bands

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	12.29 - 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	16.42 - 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	

Reference numbers of test equipment used

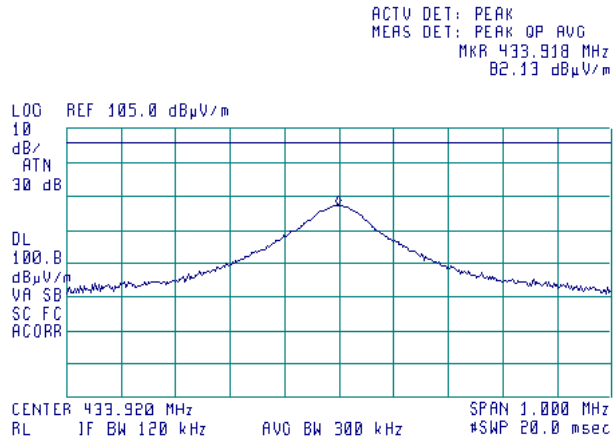
HL 0446	HL 0521	HL 0593	HL 0594	HL 0604	HL 2432	HL 2871	HL 3622
---------	---------	---------	---------	---------	---------	---------	---------

Full description is given in Appendix A.

<b>Test specification:</b> Section 15.231(b), Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date:</b> 10/20/2010			
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 45 %	<b>Power Supply:</b> 3.00 VDC
<b>Remarks:</b>			

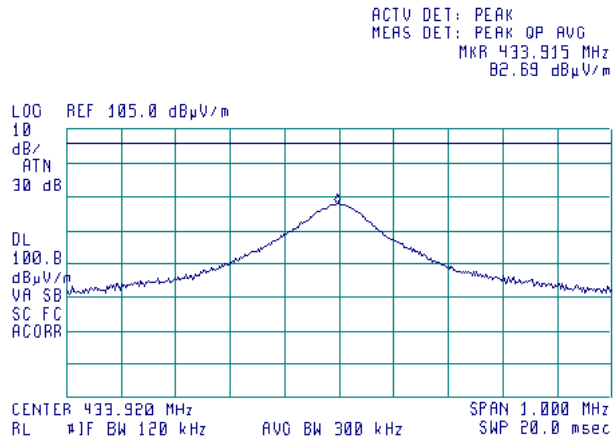
**Plot 7.2.1 Radiated emission measurements at the fundamental frequency**

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



**Plot 7.2.2 Radiated emission measurements at the fundamental frequency**

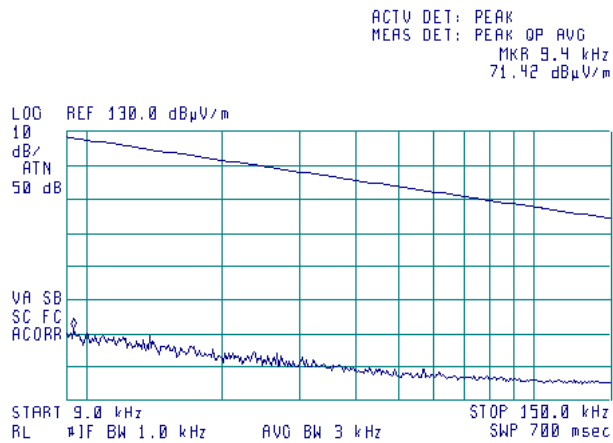
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: X-axis  
INPUT VOLTAGE: Unom



<b>Test specification:</b> Section 15.231(b), Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date:</b> 10/20/2010			
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 45 %	<b>Power Supply:</b> 3.00 VDC
<b>Remarks:</b>			

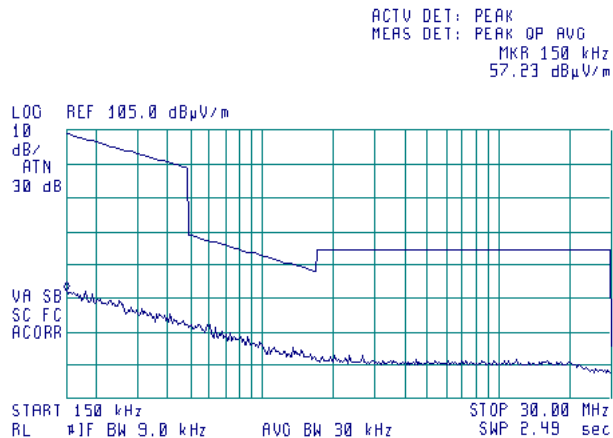
Plot 7.2.3 Radiated emission measurements from 9 to 150 kHz

TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: 3 orthogonal (X/ Y/ Z)



Plot 7.2.4 Radiated emission measurements from 0.15 to 30 MHz

TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: 3 orthogonal (X/ Y/ Z)

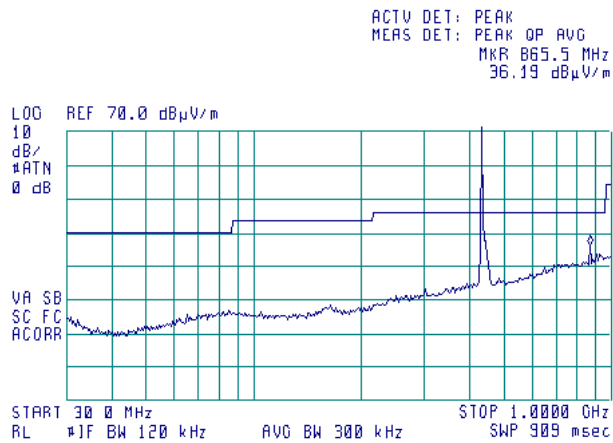




<b>Test specification:</b> Section 15.231(b), Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date:</b> 10/20/2010			
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 45 %	<b>Power Supply:</b> 3.00 VDC
<b>Remarks:</b>			

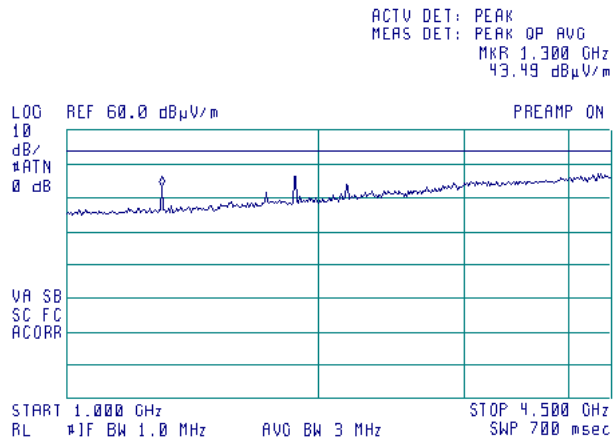
Plot 7.2.5 Radiated emission measurements from 30 to 1000 MHz

TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: 3 orthogonal (X/ Y/ Z)



Plot 7.2.6 Radiated emission measurements from 1000 to 4500 MHz

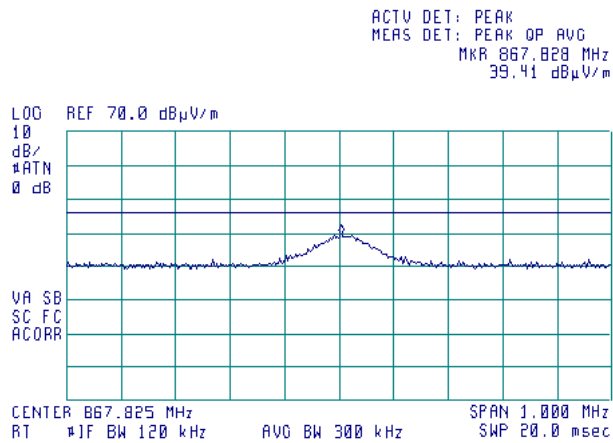
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: 3 orthogonal (X/ Y/ Z)



<b>Test specification:</b> Section 15.231(b), Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date:</b> 10/20/2010			
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 45 %	<b>Power Supply:</b> 3.00 VDC
<b>Remarks:</b>			

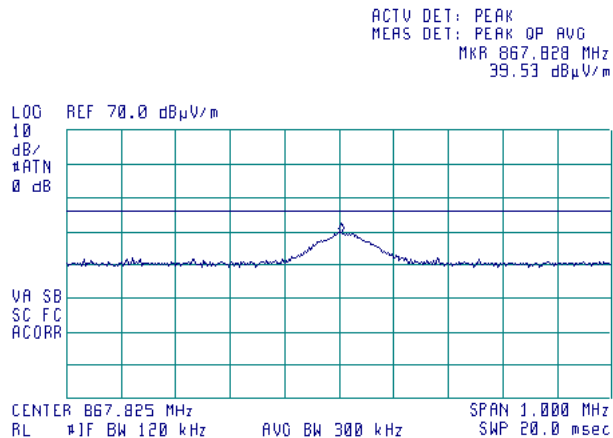
**Plot 7.2.7 Radiated emission measurements at the second harmonic frequency**

TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: 3 orthogonal (X/ Y/ Z)



**Plot 7.2.8 Radiated emission measurements at the second harmonic frequency**

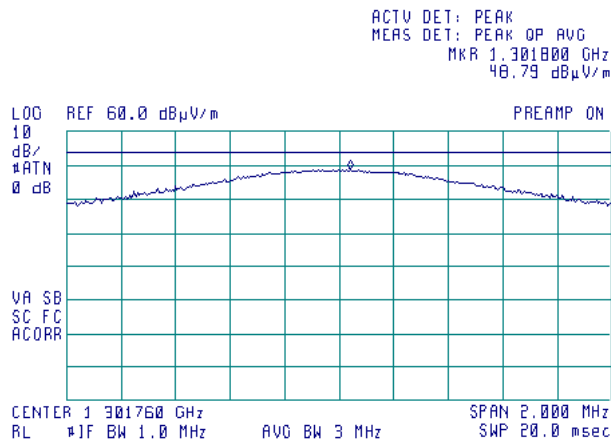
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: 3 orthogonal (X/ Y/ Z)



<b>Test specification:</b> Section 15.231(b), Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date:</b> 10/20/2010			
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 45 %	<b>Power Supply:</b> 3.00 VDC
<b>Remarks:</b>			

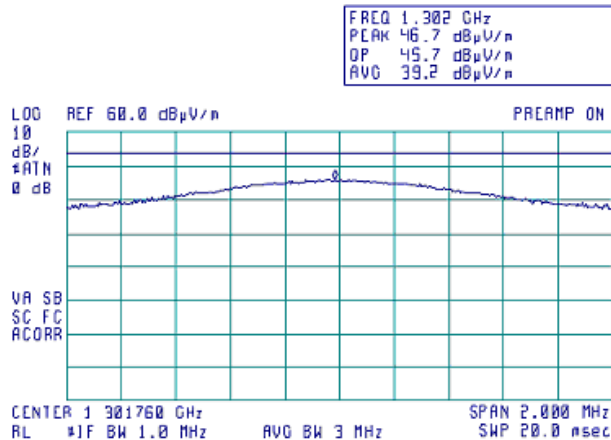
**Plot 7.2.9 Radiated emission measurements at the third harmonic frequency**

TEST SITE: Semi anechoic chamber  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical  
 EUT POSITION: 3 orthogonal (X/ Y/ Z)



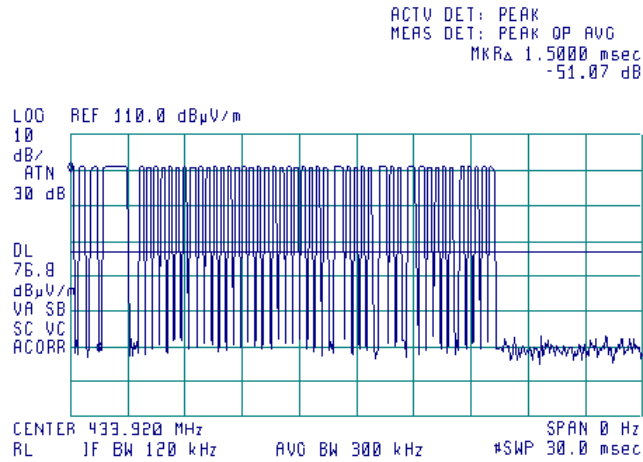
**Plot 7.2.10 Radiated emission measurements at the third harmonic frequency**

TEST SITE: Semi anechoic chamber  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Horizontal  
 EUT POSITION: 3 orthogonal (X/ Y/ Z)



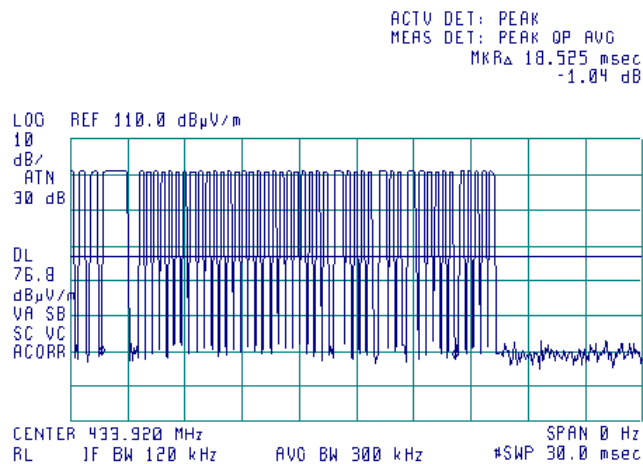
<b>Test specification:</b>	<b>Section 15.231(b), Field strength of emissions</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 13.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date:</b>	10/20/2010		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 45 %	<b>Power Supply:</b> 3.00 VDC
<b>Remarks:</b>			

Plot 7.2.11 Transmission burst duration



Preamble Ton = 1.5 ms x 0.5 = 0.75 ms

Plot 7.2.12 Transmission burst duration



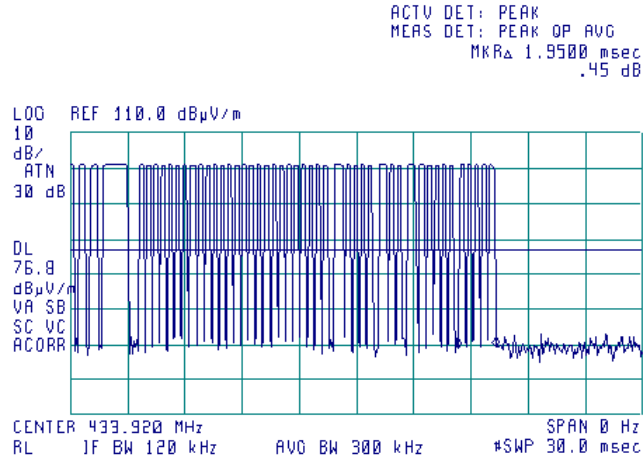
Data bit, Ton = 18.53 x 2/3 = 12.4 ms



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<b>Test specification:</b> Section 15.231(b), Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date:</b> 10/20/2010			
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 45 %	<b>Power Supply:</b> 3.00 VDC
<b>Remarks:</b>			

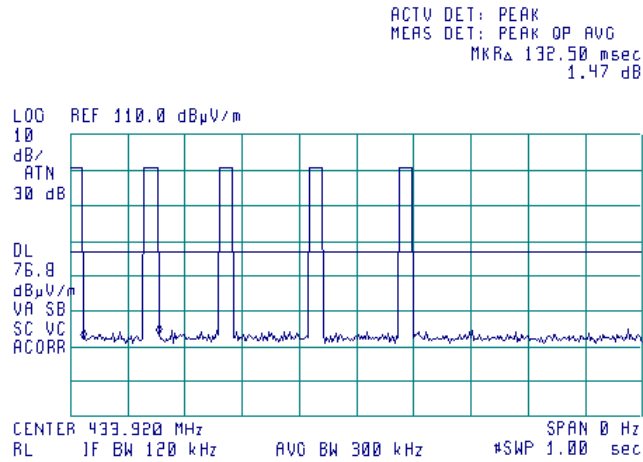
Plot 7.2.13 Transmission burst duration



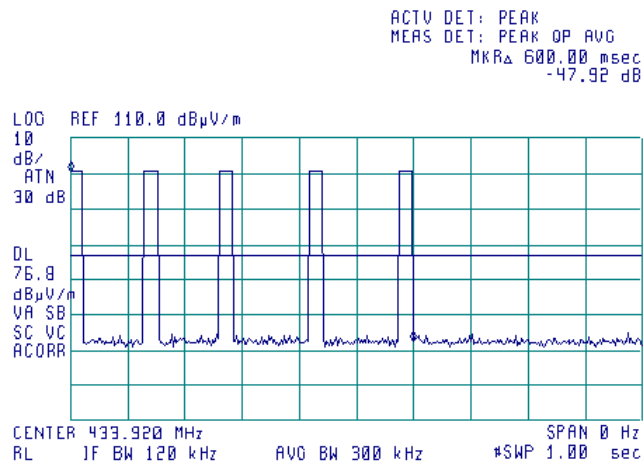
CRC Ton = 1.95 ms x 0.5 = 1.525 ms

<b>Test specification:</b>	<b>Section 15.231(b), Field strength of emissions</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 13.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date:</b>	10/20/2010		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 45 %	<b>Power Supply:</b> 3.00 VDC
<b>Remarks:</b>			

Plot 7.2.14 Transmission burst period



Plot 7.2.15 Transmission train duration



<b>Test specification:</b> Section 15.231(c), Occupied bandwidth	
<b>Test procedure:</b> ANSI C63.4, Section 13.1.7	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date:</b> 10/21/2010	
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1013 hPa
<b>Relative Humidity:</b> 38 %	
<b>Power Supply:</b> 3.00 VDC	
<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 the associated plots.

Figure 7.3.1 Occupied bandwidth test setup





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<b>Test specification:</b>		<b>Section 15.231(c), Occupied bandwidth</b>	
<b>Test procedure:</b>		ANSI C63.4, Section 13.1.7	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	10/21/2010		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1013 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 3.00 VDC
<b>Remarks:</b>			

Table 7.3.2 Occupied bandwidth test results

DETECTOR USED: Peak hold  
 RESOLUTION BANDWIDTH: 0.3 kHz  
 VIDEO BANDWIDTH: 1 kHz  
 MODULATION ENVELOPE REFERENCE POINTS: 20 dBc  
 MODULATION: FSK  
 MODULATING SIGNAL: ID code  
 BIT RATE: 2400 bps

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit		Margin, kHz	Verdict
		% of the carrier frequency	kHz		
433.920	183.0	0.25	1084.800	-901.8	Pass

Reference numbers of test equipment used

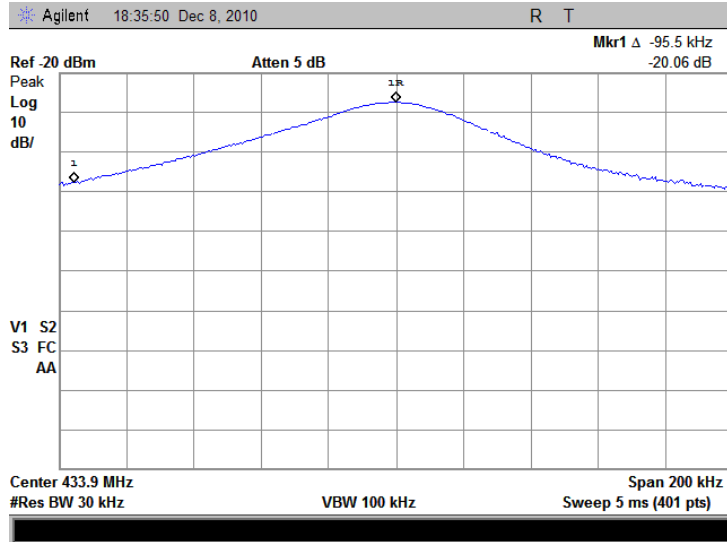
HL 3001								
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Full description is given in Appendix A.

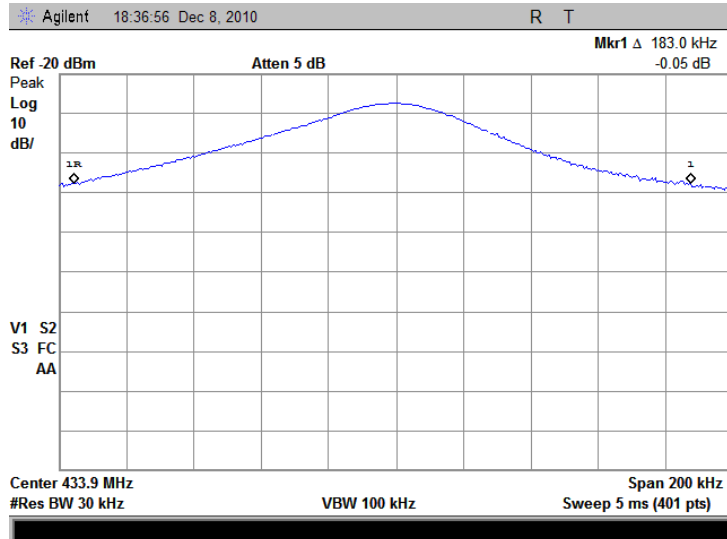


<b>Test specification:</b> Section 15.231(c), Occupied bandwidth			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.7			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date:</b> 10/21/2010			
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1013 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 3.00 VDC
<b>Remarks:</b>			

Plot 7.3.1 Occupied bandwidth test result



Plot 7.3.2 Occupied bandwidth test result



<b>Test specification:</b>	<b>Section 15.203, Antenna requirement</b>		
<b>Test procedure:</b>	Visual inspection / supplier declaration		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date:</b>	10/24/2010		
<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1013 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 3.00 VDC
<b>Remarks:</b>			

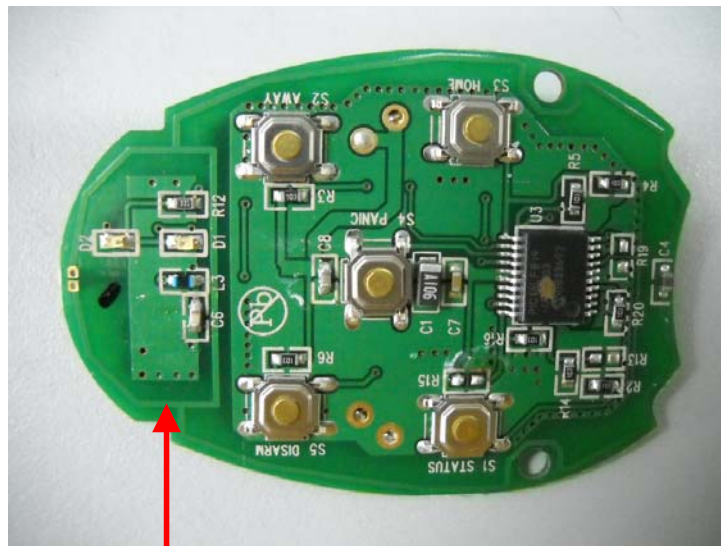
## 7.4 Antenna requirements

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**



Antenna

<b>Test specification:</b> Section 15.109, Radiated emission	
<b>Test procedure:</b> ANSI C63.4, Sections 11.6 and 12.1.4	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date:</b> 10/20/2010	
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa
<b>Relative Humidity:</b> 37 %	
<b>Power Supply:</b> 3.00	
<b>Remarks:</b>	

## 8 Emission tests according to 47CFR part 15 subpart B 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*
Above 960	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:  $Lim_{S_2} = Lim_{S_1} + 20 \log(S_1/S_2)$ , where  $S_1$  and  $S_2$  – standard defined and test distance respectively in meters.

#### 8.1.2 Test procedure for measurements in semi-anechoic chamber

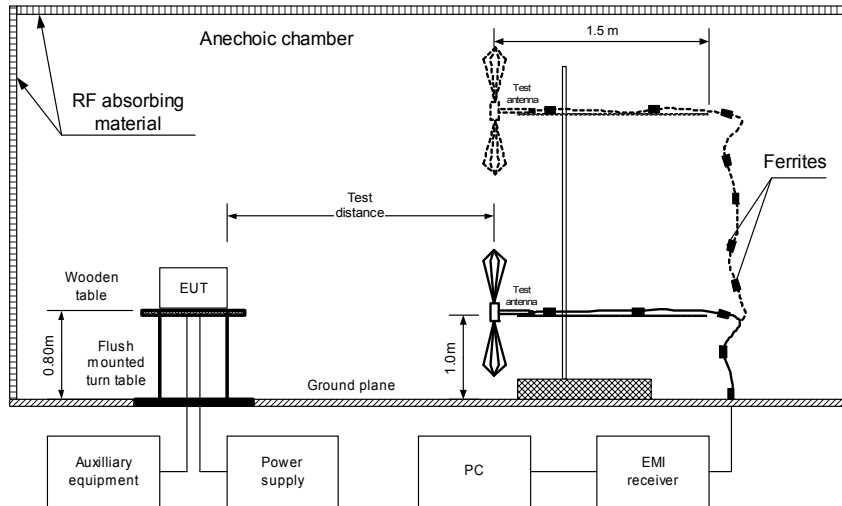
8.1.2.1 The EUT was set up as shown in Figure 8.1.1, energized and the performance check was conducted.

8.1.2.2 The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.

8.1.2.3 The worst test results (the lowest margins) were recorded in Table 8.1.2 and shown in the associated plots.

<b>Test specification:</b> Section 15.109, Radiated emission			
<b>Test procedure:</b> ANSI C63.4, Sections 11.6 and 12.1.4			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date:</b> 10/20/2010			
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 37 %	<b>Power Supply:</b> 3.00
<b>Remarks:</b>			

Figure 8.1.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment





<b>Test specification:</b>		<b>Section 15.109, Radiated emission</b>	
<b>Test procedure:</b>		ANSI C63.4, Sections 11.6 and 12.1.4	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	10/20/2010		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 37 %	<b>Power Supply:</b> 3.00
<b>Remarks:</b>			

Table 8.1.2 Radiated emission test results

EUT SET UP:	TABLE-TOP
LIMIT:	Class B
EUT OPERATING MODE:	Receive / Stand-by
TEST SITE:	SEMI ANECHOIC CHAMBER
TEST DISTANCE:	3 m
DETECTORS USED:	PEAK / QUASI-PEAK
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*				
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

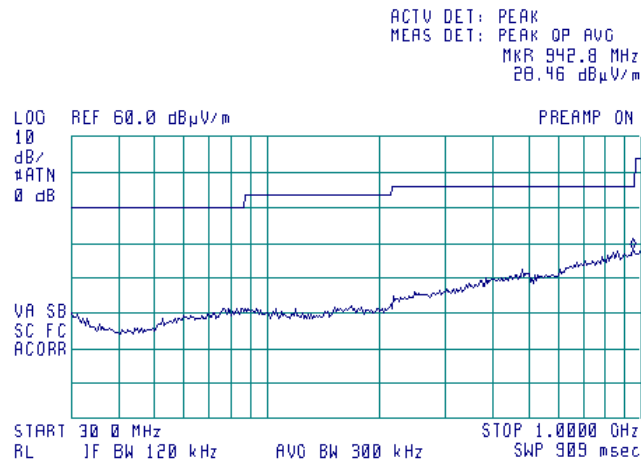
HL 0521	HL 0593	HL 0594	HL 0604	HL 2871	HL 3622		
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Full description is given in Appendix A.

<b>Test specification:</b> Section 15.109, Radiated emission			
<b>Test procedure:</b> ANSI C63.4, Sections 11.6 and 12.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date:</b> 10/20/2010			
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 37 %	<b>Power Supply:</b> 3.00
<b>Remarks:</b>			

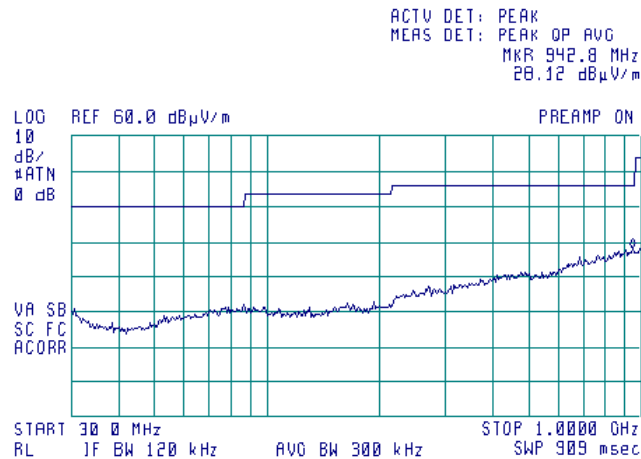
**Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization**

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



**Plot 8.1.2 Radiated emission measurements in 30 - 1000 MHz range, horizontal antenna polarization**

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



## 9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	29-Jun-10	29-Jun-11
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	25-Aug-10	25-Aug-11
0593	Antenna Mast, 1-4 m Pneumatic	Madgesh	AM-F1	101	04-Feb-10	04-Feb-11
0594	Turn Table FOR ANECHOIC CHAMBER flush mount d=1.2 m Pneumatic	Hermon Laboratories	TT-WDC1	102	12-Oct-10	12-Oct-11
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	11-Jan-10	11-Jan-11
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	11-Jun-10	11-Jun-11
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	14-Sep-10	14-Sep-11
3001	EMC Analyzer, 9 kHz to 3 GHz	Agilent Technologies	E7402A	US39440180	31-Dec-09	31-Dec-10
3622	Cable RF, 6.0 m, N type-N type, DC-6.5 GHz	Alpha Wire	RG 214/U	NA	27-May-10	27-May-11
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY48250288	26-Sep-10	26-Sep-11

## 10 APPENDIX B Measurement uncertainties

### Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
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.



## 11 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.

Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS, IC 2186A-2 for anechoic chamber, IC 2186A-3 for full-anechoic chamber for RE measurements above 1 GHz), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-27 for full-anechoic chamber for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01). The FCC Designation Number is US1003.

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Person for contact: Mr. Alex Usoskin, CEO.

## 12 APPENDIX D Specification references

47CFR part 15: 2009	Radio Frequency Devices.
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2003	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.

### 13 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 intensity in dB( $\mu$ V/m).

**Antenna factor**  
**Biconilog antenna EMCO Model 3141**  
**Ser.No.1011, HL 0604**

Frequency, MHz	Antenna Factor, dB(1/m)	Frequency, MHz	Antenna Factor, dB(1/m)
26	7.8	940	24.0
28	7.8	960	24.1
30	7.8	980	24.5
40	7.2	1000	24.9
60	7.1	1020	25.0
70	8.5	1040	25.2
80	9.4	1060	25.4
90	9.8	1080	25.6
100	9.7	1100	25.7
110	9.3	1120	26.0
120	8.8	1140	26.4
130	8.7	1160	27.0
140	9.2	1180	27.0
150	9.8	1200	26.7
160	10.2	1220	26.5
170	10.4	1240	26.5
180	10.4	1260	26.5
190	10.3	1280	26.6
200	10.6	1300	27.0
220	11.6	1320	27.8
240	12.4	1340	28.3
260	12.8	1360	28.2
280	13.7	1380	27.9
300	14.7	1400	27.9
320	15.2	1420	27.9
340	15.4	1440	27.8
360	16.1	1460	27.8
380	16.4	1480	28.0
400	16.6	1500	28.5
420	16.7	1520	28.9
440	17.0	1540	29.6
460	17.7	1560	29.8
480	18.1	1580	29.6
500	18.5	1600	29.5
520	19.1	1620	29.3
540	19.5	1640	29.2
560	19.8	1660	29.4
580	20.6	1680	29.6
600	21.3	1700	29.8
620	21.5	1720	30.3
640	21.2	1740	30.8
660	21.4	1760	31.1
680	21.9	1780	31.0
700	22.2	1800	30.9
720	22.2	1820	30.7
740	22.1	1840	30.6
760	22.3	1860	30.6
780	22.6	1880	30.6
800	22.7	1900	30.6
820	22.9	1920	30.7
840	23.1	1940	30.9
860	23.4	1960	31.2
880	23.8	1980	31.6
900	24.1	2000	32.0
920	24.1		

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

**Antenna factor**  
**Double-ridged guide horn antenna**  
**Model 3115, serial number: 00027177, HL 2432**

Frequency, MHz	Antenna factor. dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.8
2500.0	28.9
3000.0	30.7
3500.0	31.8
4000.0	33.0
4500.0	32.8
5000.0	34.2
5500.0	34.9
6000.0	35.2
6500.0	35.4
7000.0	36.3
7500.0	37.3
8000.0	37.5
8500.0	38.0
9000.0	38.3
9500.0	38.3
10000.0	38.7
10500.0	38.7
11000.0	38.9
11500.0	39.5
12000.0	39.5
12500.0	39.4
13000.0	40.5
13500.0	40.8
14000.0	41.5
14500.0	41.3
15000.0	40.2
15500.0	38.7
16000.0	38.5
16500.0	39.8
17000.0	41.9
17500.0	45.8
18000.0	49.1

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

**Cable loss**  
Cable coaxial, Huber-Suhner, 18 GHz, 6.4 m, SMA - SMA, model 198-8155-00,  
HL 2871

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.12	5750	2.34	12000	3.55
30	0.14	6000	2.39	12250	3.61
100	0.27	6250	2.46	12500	3.67
250	0.45	6500	2.52	12750	3.74
500	0.63	6750	2.58	13000	3.79
750	0.76	7000	2.64	13250	3.82
1000	0.89	7250	2.68	13500	3.83
1250	1.01	7500	2.73	13750	3.83
1500	1.12	7750	2.78	14000	3.88
1750	1.23	8000	2.83	14250	3.93
2000	1.32	8250	2.88	14500	3.96
2250	1.41	8500	2.94	14750	4.01
2500	1.49	8750	2.97	15000	4.00
2750	1.58	9000	3.02	15250	4.01
3000	1.66	9250	3.07	15500	4.00
3250	1.73	9500	3.13	15750	4.13
3500	1.80	9750	3.18	16000	4.22
3750	1.87	10000	3.21	16250	4.29
4000	1.93	10250	3.26	16500	4.29
4250	2.01	10500	3.30	16750	4.32
4500	2.06	10750	3.36	17000	4.37
4750	2.12	11000	3.39	17250	4.45
5000	2.17	11250	3.44	17500	4.49
5250	2.24	11500	3.48	17750	4.53
5500	2.29	11750	3.52	18000	4.55

**Cable loss**  
**Cable coaxial, RG-214/U, N type-N type, 6 m**  
**Alpha Wire, HL 3622**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.13	2100	2.95	4400	4.99
30	0.24	2200	2.99	4500	5.00
50	0.32	2300	3.11	4600	5.17
100	0.47	2400	3.16	4700	5.18
200	0.70	2500	3.31	4800	5.33
300	0.88	2600	3.36	4900	5.34
400	1.05	2700	3.46	5000	5.50
500	1.21	2800	3.52	5100	5.56
600	1.36	2900	3.65	5200	5.76
700	1.49	3000	3.70	5300	5.76
800	1.63	3100	3.82	5400	5.85
900	1.72	3200	3.88	5500	5.88
1000	1.84	3300	3.99	5600	5.96
1100	1.96	3400	4.08	5700	6.02
1200	2.06	3500	4.19	5800	6.06
1300	2.15	3600	4.28	5900	6.14
1400	2.28	3700	4.42	6000	6.17
1500	2.35	3800	4.40	6100	6.28
1600	2.43	3900	4.51	6200	6.36
1700	2.57	4000	4.62	6300	6.47
1800	2.62	4100	4.70	6400	6.51
1900	2.75	4200	4.78	6500	6.65
2000	2.80	4300	4.83		

## 14 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB( $\mu$ 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
OATS	open area test site
$\Omega$	Ohm
PCB	printed circuit board
PM	pulse modulation
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
VA	volt-ampere
WB	wideband

END OF DOCUMENT