

# TEST REPORT

ACCORDING TO: FCC CFR 47 PART 15 subpart C, section 15.247 (DTS) and  
subpart B

FOR:

**Essence Home and Family Ltd.**

**Indoor Photo Detector**

**Model: M800IPD**

**FCC ID:Y4I-M800IPD**

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## 1 Applicant information

**Client name:** Essence Home and Family Ltd.  
**Address:** 12 Abba Even Avenue, Ackerstein Towers Bldg. D, P.O.B. 2073, Herzliya 46120, Israel  
**Telephone:** +972 73 244 7735  
**Fax:** +972 9772 9962  
**E-mail:** israelgo@essence-grp.com  
**Contact name:** Mr. Israel Gottesman

## 2 Equipment under test attributes

**Product name:** Indoor photo detector  
**Product type:** Transceiver  
**Model(s):** M800IPD  
**Serial number:** 09120986000051A0  
**Hardware version:** 5.N  
**Software release:** 05.01.38.02.01  
**Receipt date** 6/5/2012

## 3 Manufacturer information

**Manufacturer name:** Essence Home and Family Ltd.  
**Address:** 12 Abba Even Avenue, Ackerstein Towers Bldg. D, P.O.B. 2073, Herzliya 46120, Israel  
**Telephone:** +972 73 244 7735  
**Fax:** +972 9772 9962  
**E-Mail:** israelgo@essence-grp.com  
**Contact name:** Mr. Israel Gottesman




## 4 Test details

**Project ID:** 23369  
**Location:** Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel  
**Test started:** 6/5/2012  
**Test completed:** 7/4/2012  
**Test specification(s):** FCC Part 15 subpart C §15.247 (DTS); subpart B §15.109

## 5 Tests summary

Test	Status
<b>Transmitter characteristics</b>	
Section 15.247(a)2, 6 dB bandwidth	Pass
Section 15.247(b)3, Peak output power	Pass
Section 15.247(i), RF exposure	Pass, the exhibit to the application of certification is provided
Section 15.247(d), Radiated spurious emissions	Pass
Section 15.247(d), Band edge emissions	Pass
Section 15.247(d), Peak power density	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

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.

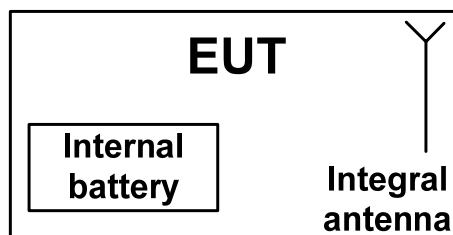
	Name and Title	Date	Signature
<b>Tested by:</b>	Mrs. E. Pitt, test engineer	July 4, 2012	
<b>Reviewed by:</b>	Mrs. M. Cherniavsky, certification engineer	July 5, 2012	
<b>Approved by:</b>	Mr. M. Nikishin, EMC and Radio group manager	July 12, 2012	

## 6 EUT description

### 6.1 General information

The EUT is an indoor photo detector.

### 6.2 Test configuration



### 6.3 Changes made in EUT

No changes were implemented in the EUT.

## 6.4 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			
X	mobile	Always at a distance more than 20 cm from all people			
	portable	May operate at a distance closer than 20 cm to human body			
<b>Assigned frequency range</b>		2400 - 2483.5 MHz			
<b>Operating frequency</b>		2425 MHz			
<b>Maximum rated output power</b>		<b>Peak output power</b>		19 dBm	
<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	without temporary RF connector
<b>Antenna/s technical characteristics</b>					
<b>Type</b>		<b>Manufacturer</b>		<b>Model number</b>	
Integral		YIPSHING		11434	
				Gain	
				-2 dBi	
<b>Modulation</b>		QPSK			
<b>Transmitter aggregate data rate/s</b>		250 kbps			
<b>Modulating test signal (baseband)</b>		PRBS			
<b>Transmitter power source</b>					
X	Battery	<b>Nominal rated voltage</b>	4.5 VDC	<b>Battery type</b>	Alkaline 3 AA
	DC	<b>Nominal rated voltage</b>	VDC		
	AC mains	<b>Nominal rated voltage</b>	VAC	<b>Frequency</b>	
<b>Spread spectrum technique used</b>		Frequency hopping (FHSS)			
		X	Digital transmission system (DTS)		
		Hybrid			

<b>Test specification:</b>		<b>Section 15.247(a)2, 6 dB bandwidth</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/5/2012	
<b>Temperature:</b> 27 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 51 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

## 7 Transmitter tests according to 47CFR part 15 subpart C requirements

### 7.1 Minimum 6 dB bandwidth

#### 7.1.1 General

This test was performed to measure 6 dB bandwidth of the EUT carrier frequency. Specification test limits are given in Table 7.1.1.

Table 7.1.1 The 6 dB bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Minimum bandwidth, kHz
902.0 – 928.0	6.0	500.0
2400.0 – 2483.5		
5725.0 – 5850.0		

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

#### 7.1.2 Test procedure

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

7.1.2.2 The EUT was set to transmit modulated carrier.

7.1.2.3 The transmitter minimum 6 dB bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.1.2 and associated plot.

Figure 7.1.1 The 6 dB bandwidth test setup



<b>Test specification:</b>		<b>Section 15.247(a)2, 6 dB bandwidth</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/5/2012	
<b>Temperature:</b> 27 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 51 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

Table 7.1.2 The 6 dB bandwidth test results

ASSIGNED FREQUENCY BAND: 2400-2483.5 MHz  
 DETECTOR USED: Peak  
 SWEEP MODE: Single  
 SWEEP TIME: Auto  
 RESOLUTION BANDWIDTH: 100 kHz  
 VIDEO BANDWIDTH: 300 kHz  
 MODULATION ENVELOPE REFERENCE POINTS: 6.0 dBc  
 MODULATION: QPSK  
 BIT RATE: 250 kbps

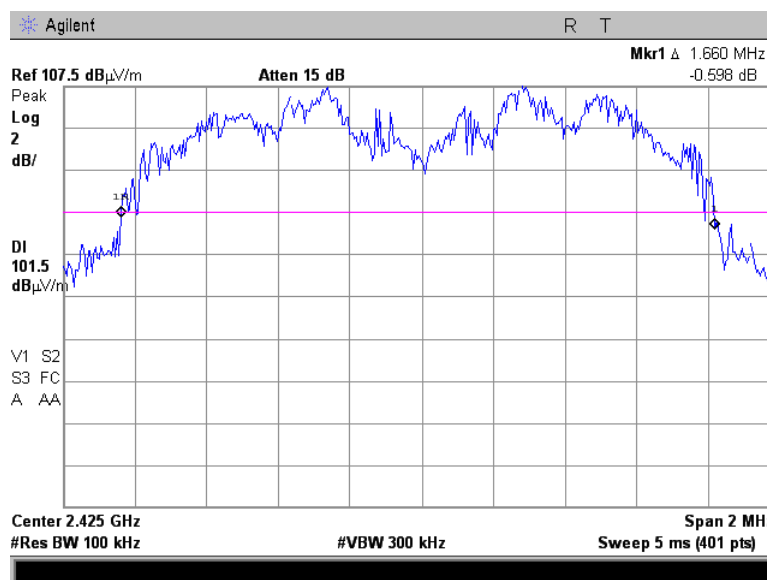
Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2425	1660	500	1160	Pass

Reference numbers of test equipment used

HL 1984	HL 2909	HL 3442	HL 3901					
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Full description is given in Appendix A.

Plot 7.1.1 The 6 dB bandwidth test result







<b>Test specification:</b>		<b>Section 15.247(b)3, Peak output power</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/5/2012	
<b>Temperature:</b> 27 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 51 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

## 7.2 Peak output power

### 7.2.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Peak output power limits

Assigned frequency range, MHz	Maximum antenna gain, dBi	Peak output power*		Equivalent field strength limit @ 3m, dB(μV/m)**
		W	dBm	
902.0 – 928.0	6.0	1.0	30.0	131.2
2400.0 – 2483.5				
5725.0 – 5850.0				

\*- The limit is provided in terms of conducted RF power at the antenna connector. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value as follows:

by 1 dB for every 3 dB that the directional gain of antenna exceeds 6 dBi for fixed point-to-point transmitters operate in 2400-2483.5 MHz band;  
without any corresponding reduction for fixed point-to-point transmitters operate in 5725-5850 MHz band;  
by the amount in dB that the directional gain of antenna exceeds 6 dBi for the rest of transmitters.

\*\* - Equivalent field strength limit was calculated from the peak output power as follows:  $E = \sqrt{30 \times P \times G} / r$ , where P is peak output power in Watts, r is antenna to EUT distance in meters and G is transmitter antenna gain in dBi.

### 7.2.2 Test procedure

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

7.2.2.2 The EUT was adjusted to produce maximum available to end user RF output power.

7.2.2.3 The resolution bandwidth of spectrum analyzer was set wider than 6 dB bandwidth of the EUT and the field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.2.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.2.2 and associated plots.

7.2.2.5 The maximum peak output power was calculated from the field strength of carrier as follows:

$$P = (E \times d)^2 / (30 \times G),$$

where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.

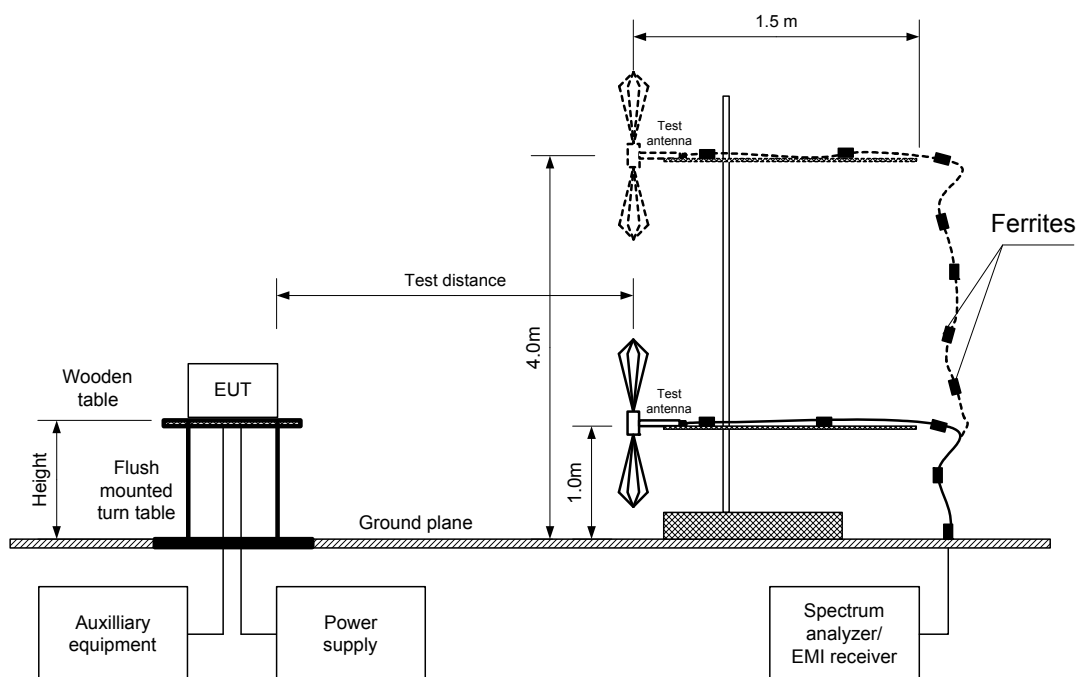
The above equation was converted in logarithmic units for 3 m test distance:

$$\text{Peak output power in dBm} = \text{Field strength in dB}(\mu\text{V/m}) - \text{Transmitter antenna gain in dBi} - 95.2 \text{ dB}$$

7.2.2.6 The worst test results (the lowest margins) were recorded in Table 7.2.2.

<b>Test specification:</b>		<b>Section 15.247(b)3, Peak output power</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/5/2012	
<b>Temperature:</b> 27 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 51 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

Figure 7.2.1 Setup for carrier field strength measurements





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<b>Test specification:</b>		<b>Section 15.247(b)3, Peak output power</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/5/2012	
<b>Temperature:</b> 27 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 51 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

Table 7.2.2 Peak output power test results

ASSIGNED FREQUENCY BAND: 2400-2583.5 MHz  
 TEST DISTANCE: 3 m  
 TEST SITE: OATS  
 EUT HEIGHT: 0.8 m  
 DETECTOR USED: Peak  
 TEST ANTENNA TYPE: Biconilog (30 MHz – 1000 MHz)  
 Double ridged guide (above 1000 MHz)  
 MODULATION: QPSK  
 BIT RATE: 250 kbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 DETECTOR USED: Peak  
 EUT 6 dB BANDWIDTH: 1.66 MHz  
 RESOLUTION BANDWIDTH: 3 MHz  
 VIDEO BANDWIDTH: 3 MHz

Frequency, MHz	Field strength, dB(μV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	EUT antenna gain, dBi	Peak output power, dBm**	Limit, dBm	Margin, dB***	Verdict
2425	112.3	V	1.0	0	-2	19.1	30	-10.9	Pass

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

\*\* - Peak output power was calculated from the field strength of carrier as follows:  $P = (E \times d)^2 / (30 \times G)$ , where P is the peak output power in W, E is the field strength in V/m, d is the test distance in meters and G is the transmitter numeric antenna gain over an isotropic radiator. The above equation was converted in logarithmic units for 3 m test distance: *Peak output power in dBm = Field strength in dB(μV/m) - Transmitter antenna gain in dBi - 95.2 dB*

\*\*\* - Margin = Peak output power – specification limit.

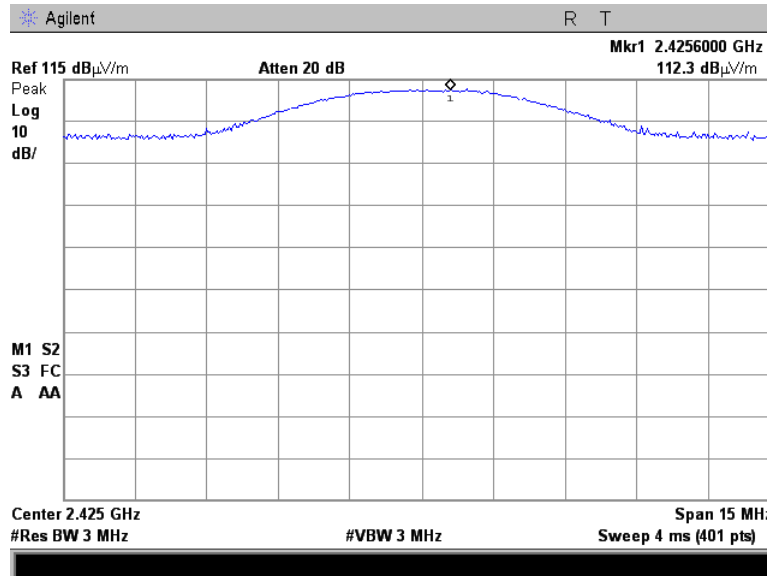
## Reference numbers of test equipment used

HL 1984	HL 2909	HL 3442	HL 3901				
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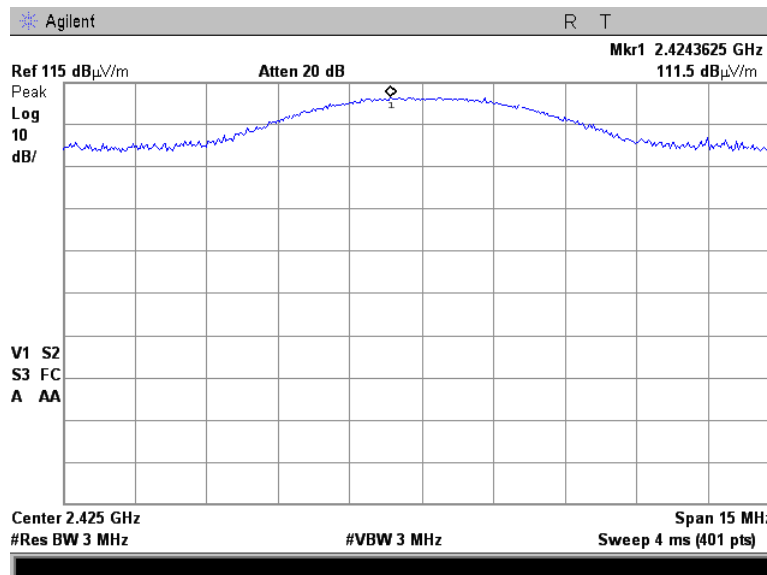
Full description is given in Appendix A.

<b>Test specification:</b>		<b>Section 15.247(b)3, Peak output power</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/5/2012	
<b>Temperature:</b> 27 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 51 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

Plot 7.2.1 Field strength of carrier in vertical antenna polarization



Plot 7.2.2 Field strength of carrier in horizontal antenna polarization





<b>Test specification:</b>		<b>Section 15.247(d), Radiated spurious emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/17/2012 - 6/18/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1005 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

## 7.3 Field strength of spurious emissions

### 7.3.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.3.1.

**Table 7.3.1 Radiated spurious emissions limits**

Frequency, MHz	Field strength at 3 m within restricted bands, dB(μV/m)*			Attenuation of field strength of spurious versus carrier outside restricted bands, dBc***
	Peak	Quasi Peak	Average	
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	20.0
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		
1000 – 10 <sup>th</sup> harmonic	74.0	NA	54.0	

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

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

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

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

\*\*\* - The 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.

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

**7.3.2.1** The EUT was set up as shown in Figure 7.3.1, energized and the performance check was conducted.

**7.3.2.2** 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.

**7.3.2.3** The worst test results (the lowest margins) were recorded and shown in the associated plots.

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

**7.3.3.1** The EUT was set up as shown in Figure 7.3.2, energized and the performance check was conducted.

**7.3.3.2** 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.

**7.3.3.3** The worst test results (the lowest margins) were recorded and shown in the associated plots.



<b>Test specification:</b>		<b>Section 15.247(d), Radiated spurious emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/17/2012 - 6/18/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1005 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

Figure 7.3.1 Setup for spurious emission field strength measurements below 30 MHz

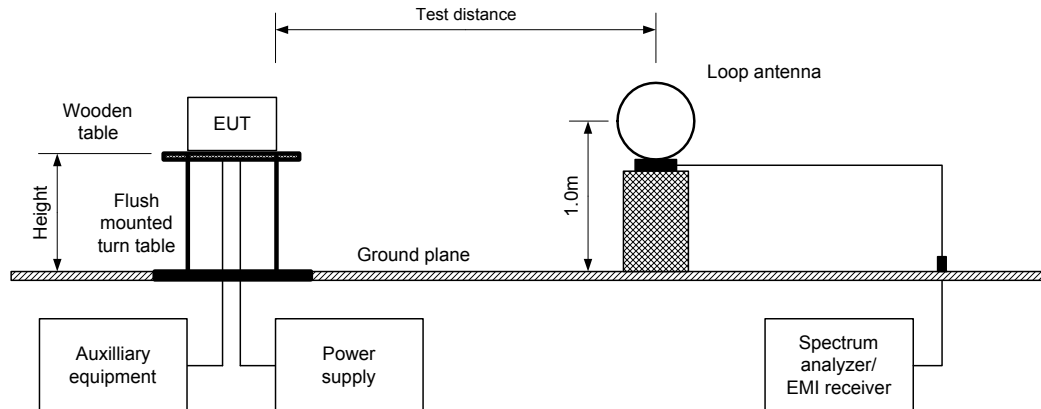
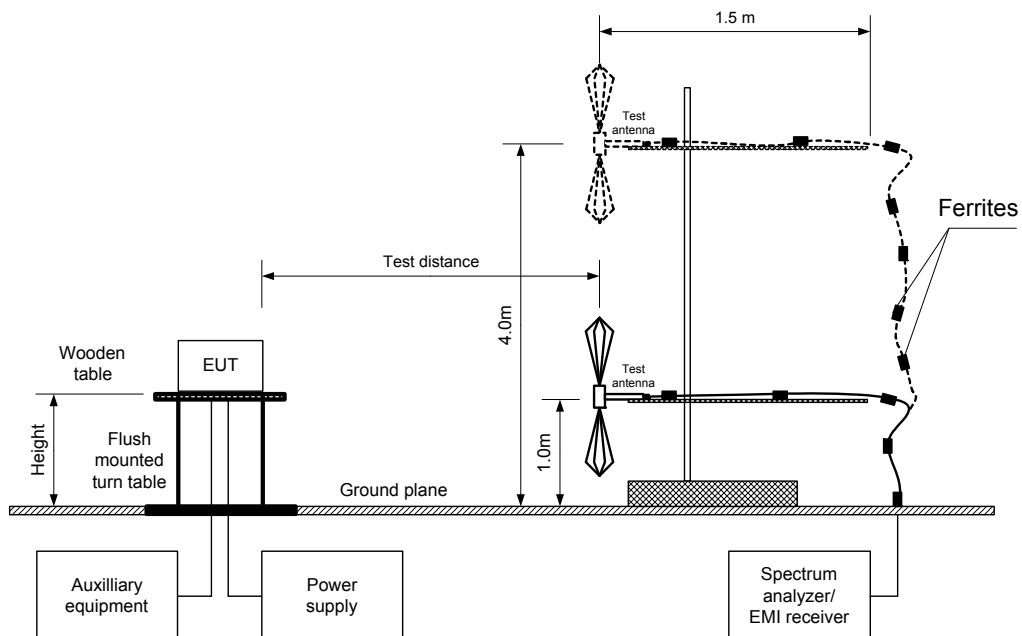


Figure 7.3.2 Setup for spurious emission field strength measurements above 30 MHz





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<b>Test specification:</b>		<b>Section 15.247(d), Radiated spurious emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/17/2012 - 6/18/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1005 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

**Table 7.3.2 Field strength of emissions outside restricted bands**

ASSIGNED FREQUENCY BAND 2400-2483.5 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 -25000 MHz  
 TEST DISTANCE: 3 m  
 MODULATION: QPSK  
 BIT RATE: 250 kbps  
 DUTY CYCLE: 100 %  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 100 kHz  
 VIDEO BANDWIDTH: 300 kHz  
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
 Biconilog (30 MHz – 1000 MHz)  
 Double ridged guide (above 1000 MHz)

Frequency, MHz	Field strength of spurious, dB(μV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	Field strength of carrier, dB(μV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB**	Verdict
9702.00	55.06	V	1.0	14	109.36	54.30	20.0	34.30	Pass
14552.35	53.38	V	1.8	30		55.98		35.98	

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

\*\* - Margin = Attenuation below carrier – specification limit.



<b>Test specification:</b>		<b>Section 15.247(d), Radiated spurious emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/17/2012 - 6/18/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1005 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

**Table 7.3.3 Field strength of spurious emissions above 1 GHz within restricted bands**

ASSIGNED FREQUENCY BAND: 2400-2483.5 MHz  
 INVESTIGATED FREQUENCY RANGE: 1000 - 25000 MHz  
 TEST DISTANCE: 3 m  
 MODULATION: QPSK  
 BIT RATE: 250 kbps  
 DUTY CYCLE: 100 %  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 1000 kHz  
 TEST ANTENNA TYPE: Double ridged guide

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength(VBW=3 MHz)			Average field strength(VBW=1 kHz)				Verdict
	Polarization	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***	
2387.80	V	1.0	0	62.60	74	-11.40	37.63	NA	54	-16.37	Pass
2483.70	V	1.0	0	57.60	74	-16.40	38.50	9.10	54	-44.90	
4848.90	V	1.1	10	65.95	74	-8.05	59.53	30.13	54	-23.87	
7274.85	V	1.9	0	66.17	74	-7.83	58.87	29.47	54	-24.53	
12121.20	V	1.0	318	56.38	74	-17.62	44.25	14.85	54	-39.15	

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

\*\*- Margin = Measured field strength - specification limit.

\*\*\*- Margin = Calculated field strength - specification limit,  
 where Calculated field strength = Measured field strength + average factor.

**Table 7.3.4 Average factor calculation**

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Number of pulse during 100 msec	Duration, ms	Period, ms		
0.675	5	NA	NA	NA	-29.4

\*- Average factor was calculated as follows

for pulse train shorter than 100 ms:

$$\text{Average factor} = 20 \times \log_{10} \left( \frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{Burst duration}}{\text{Train duration}} \times \text{Number of bursts within pulse train} \right)$$

for pulse train longer than 100 ms:

$$\text{Average factor} = 20 \times \log_{10} \left( \frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{Burst duration}}{100 \text{ ms}} \times \text{Number of bursts within 100 ms} \right)$$





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<b>Test specification:</b>		<b>Section 15.247(d), Radiated spurious emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/17/2012 - 6/18/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1005 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

**Table 7.3.5 Field strength of spurious emissions below 1 GHz within restricted bands**

ASSIGNED FREQUENCY BAND: 2400-2483.5 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz  
 TEST DISTANCE: 3 m  
 MODULATION: QPSK  
 BIT RATE: 250 kbps  
 DUTY CYCLE: 100 %  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 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*				
No signals were found								Pass

\*- Margin = Measured emission - specification limit.

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

**Table 7.3.6 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 0604	HL 0768	HL 1984	HL 2387	HL 2871	HL 3344
HL 3347	HL 3531	HL 3533	HL 3535	HL 3901	HL 3903	HL 4114	HL 4160
HL 4280							

Full description is given in Appendix A.

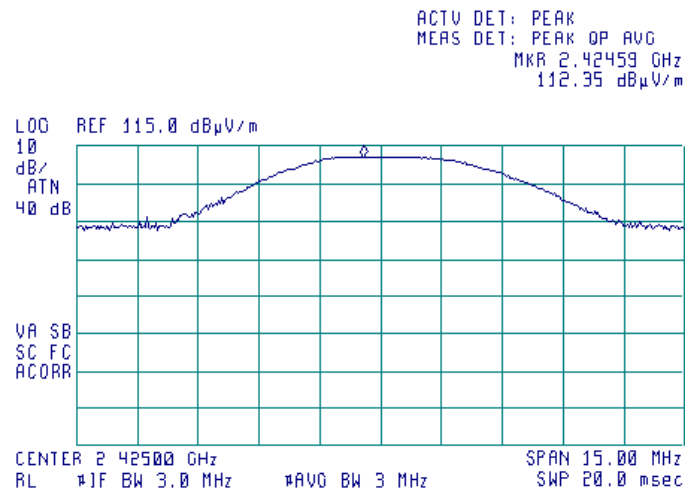


HERMON LABORATORIES

<b>Test specification:</b>		<b>Section 15.247(d), Radiated spurious emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/17/2012 - 6/18/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1005 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

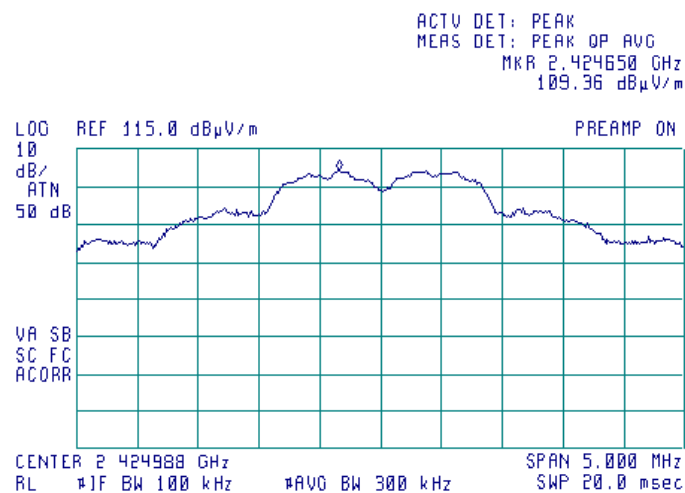
**Plot 7.3.1 Radiated emission measurements at the carrier, RBW=3 MHz**

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



**Plot 7.3.2 Radiated emission measurements at the carrier, RBW=100 kHz**

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



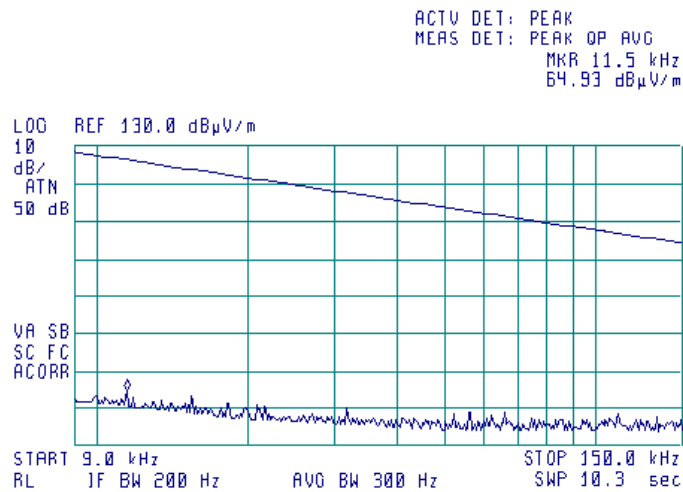


HERMON LABORATORIES

<b>Test specification:</b>		<b>Section 15.247(d), Radiated spurious emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/17/2012 - 6/18/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1005 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

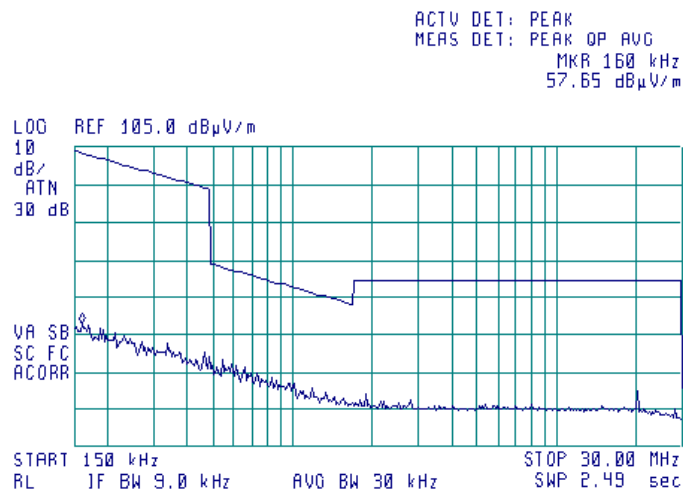
Plot 7.3.3 Radiated emission measurements from 9 to 150 kHz

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



Plot 7.3.4 Radiated emission measurements from 0.15 to 30 MHz

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



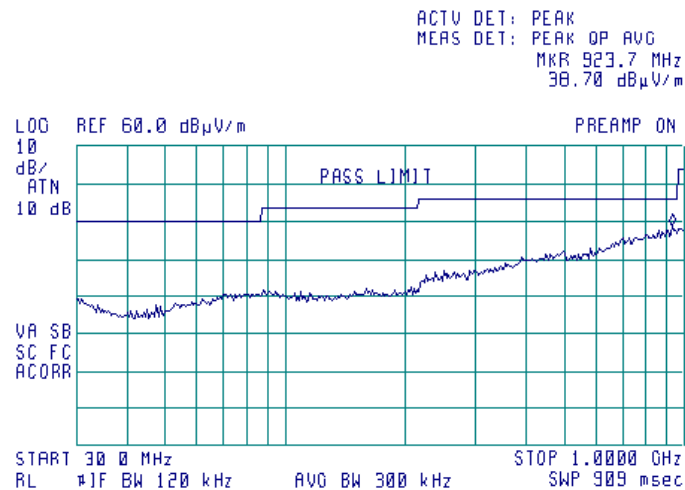


HERMON LABORATORIES

<b>Test specification:</b>		<b>Section 15.247(d), Radiated spurious emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/17/2012 - 6/18/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1005 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

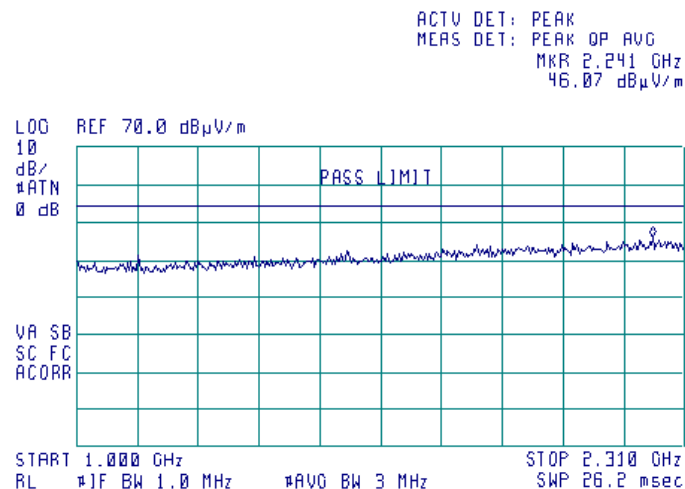
Plot 7.3.5 Radiated emission measurements from 30 to 1000 MHz

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



Plot 7.3.6 Radiated emission measurements from 1000 to 2310 MHz

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



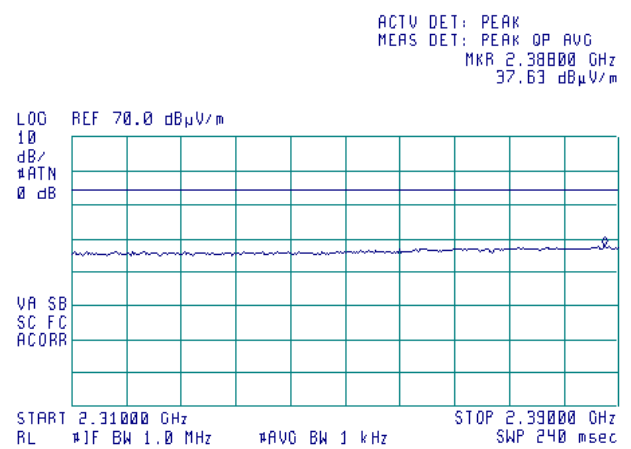
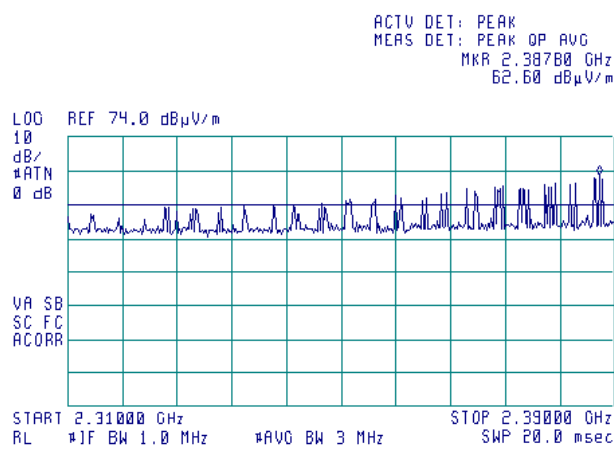


HERMON LABORATORIES

<b>Test specification:</b>		<b>Section 15.247(d), Radiated spurious emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/17/2012 - 6/18/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1005 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

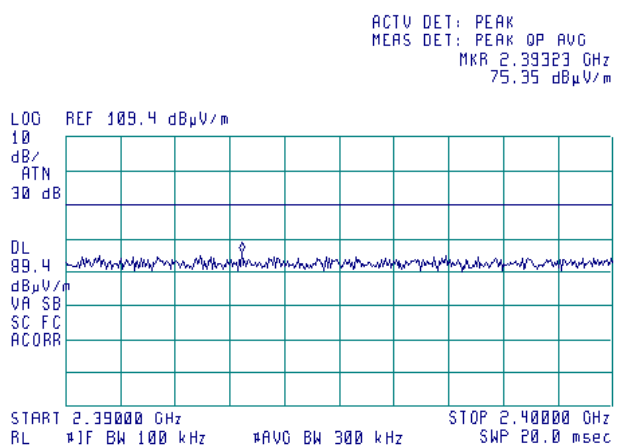
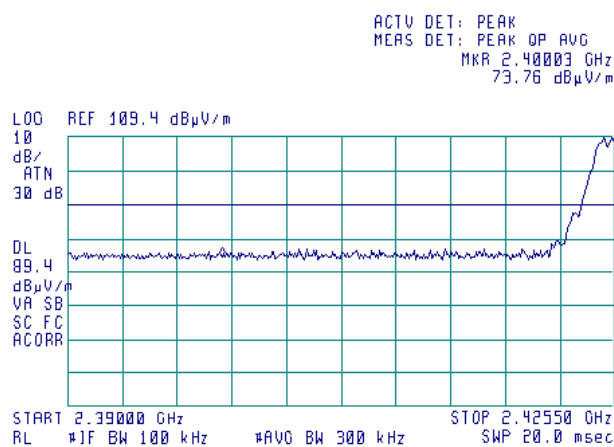
Plot 7.3.7 Radiated emission measurements from 2310 to 2390 MHz

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



Plot 7.3.8 Radiated emission measurements from 2390 to 2400 MHz

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



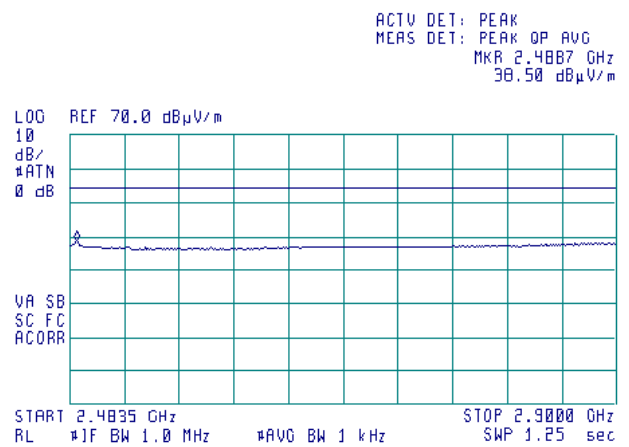
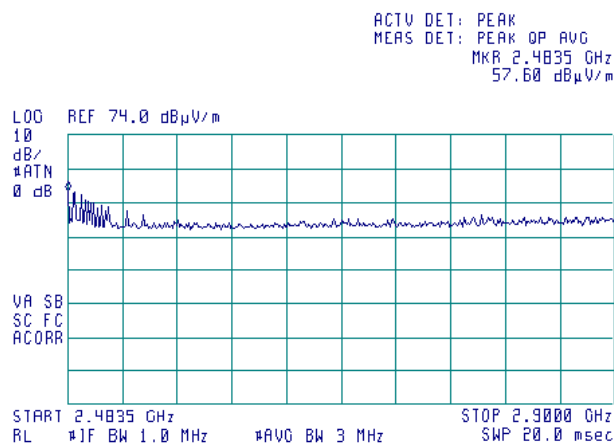


HERMON LABORATORIES

<b>Test specification:</b>		<b>Section 15.247(d), Radiated spurious emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/17/2012 - 6/18/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1005 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

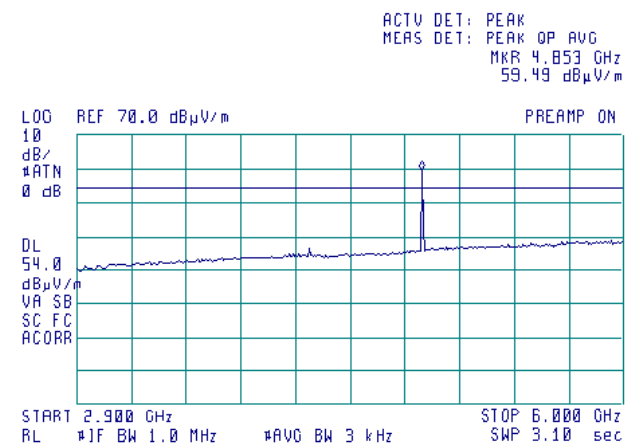
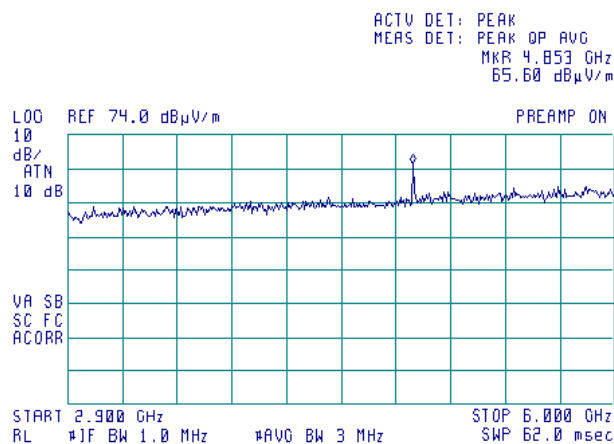
Plot 7.3.9 Radiated emission measurements from 2483.5 to 2900 MHz

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



Plot 7.3.10 Radiated emission measurements from 2900 to 6000 MHz

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





HERMON LABORATORIES

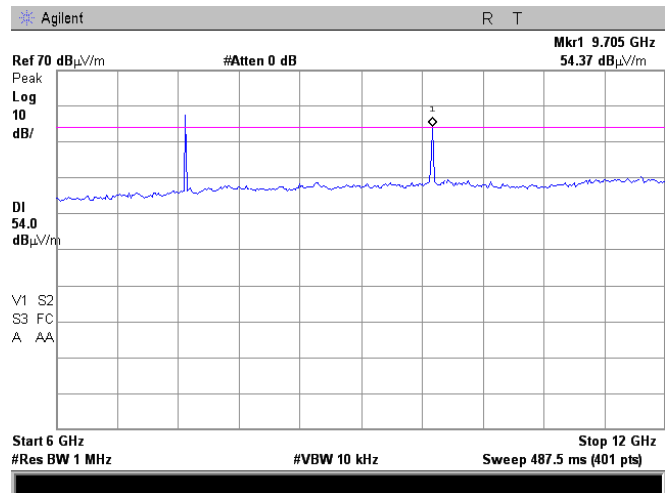
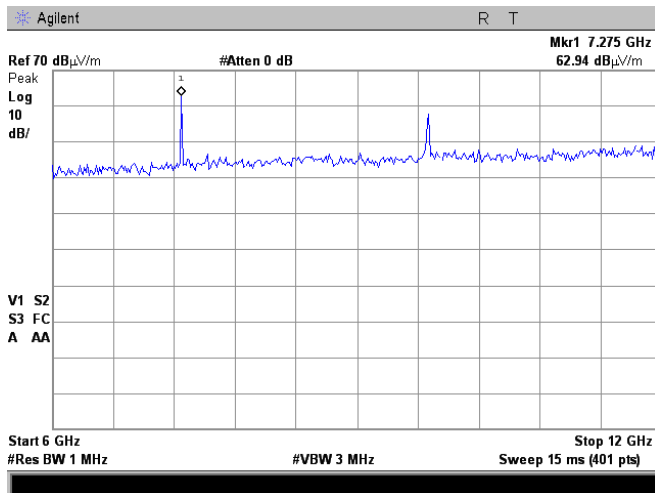
Report ID: ESSRAD\_FCC.23369.doc

Date of Issue: 12-Jul-12

<b>Test specification:</b>		<b>Section 15.247(d), Radiated spurious emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/17/2012 - 6/18/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1005 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

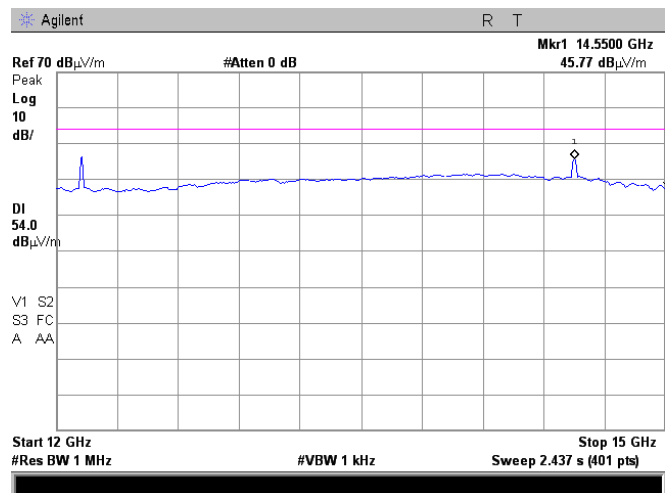
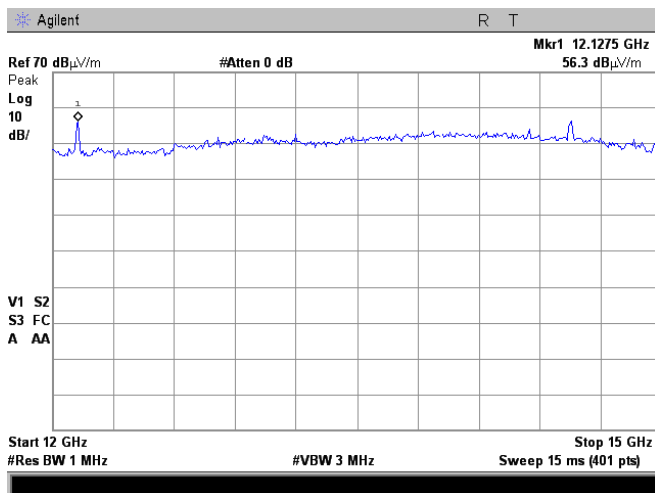
Plot 7.3.11 Radiated emission measurements from 6000 to 12000 MHz

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



Plot 7.3.12 Radiated emission measurements from 12000 to 15000 MHz

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



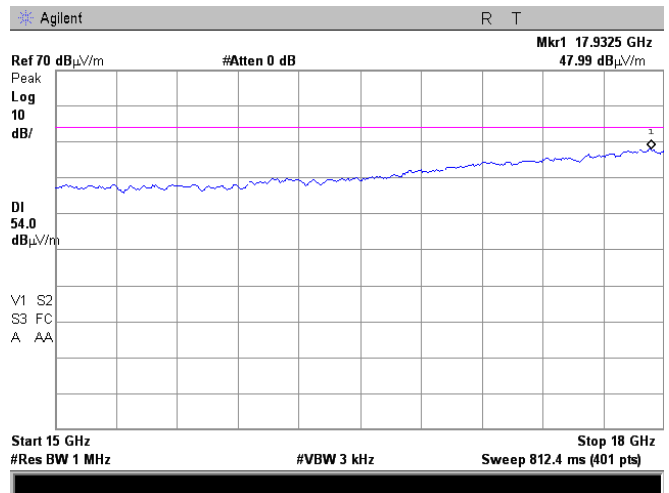
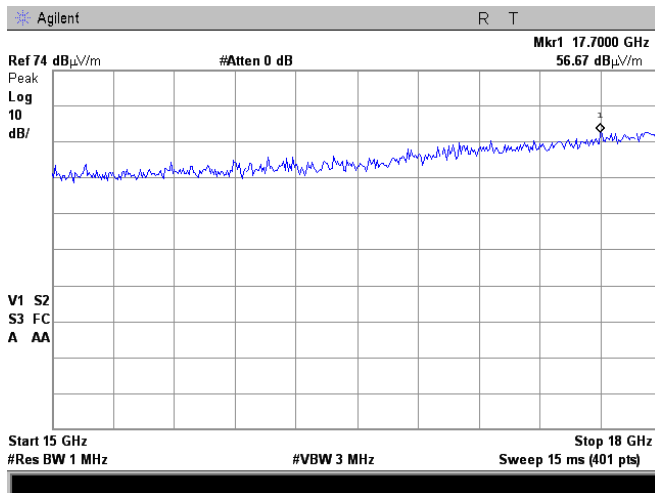


HERMON LABORATORIES

Test specification:		Section 15.247(d), Radiated spurious emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	Verdict: PASS
Date(s):		6/17/2012 - 6/18/2012	
Temperature: 22 °C	Air Pressure: 1005 hPa	Relative Humidity: 47 %	Power Supply: Battery
Remarks:			

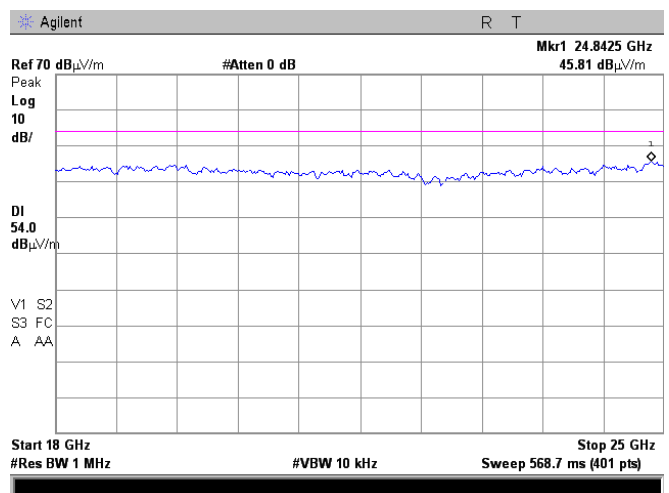
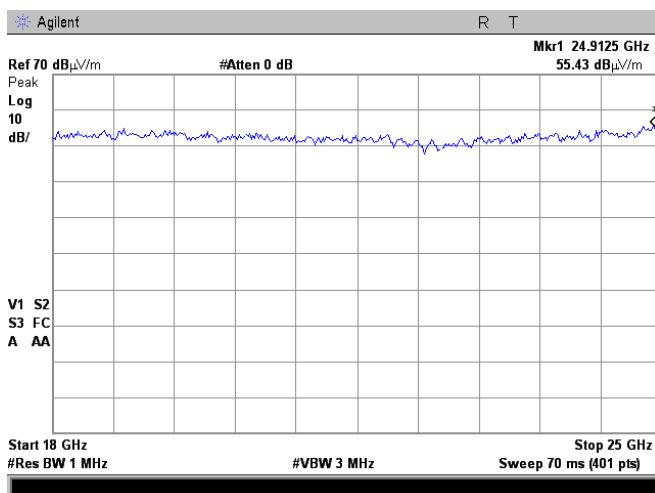
Plot 7.3.13 Radiated emission measurements from 15000 to 18000 MHz

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.3.14 Radiated emission measurements from 18000 to 25000 MHz

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal





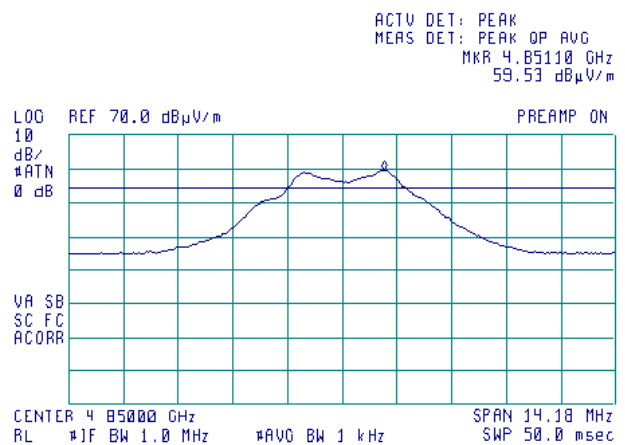
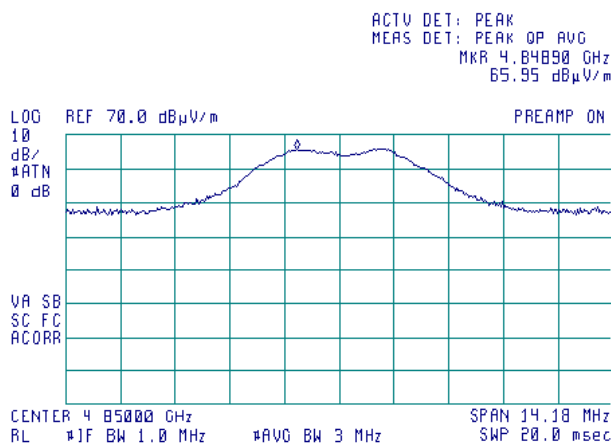


HERMON LABORATORIES

<b>Test specification:</b>		<b>Section 15.247(d), Radiated spurious emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/17/2012 - 6/18/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1005 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

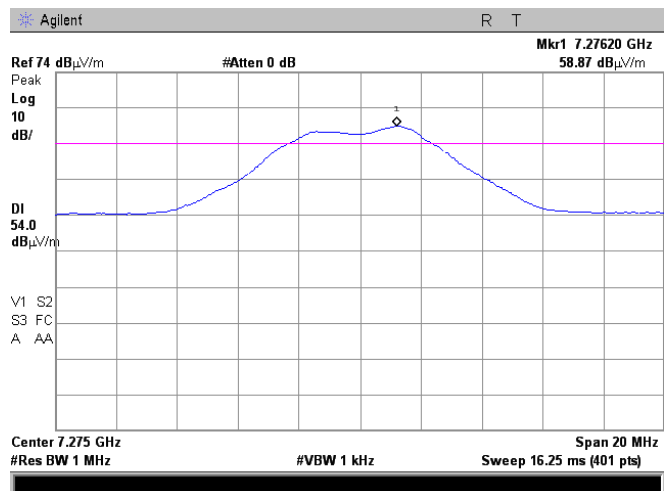
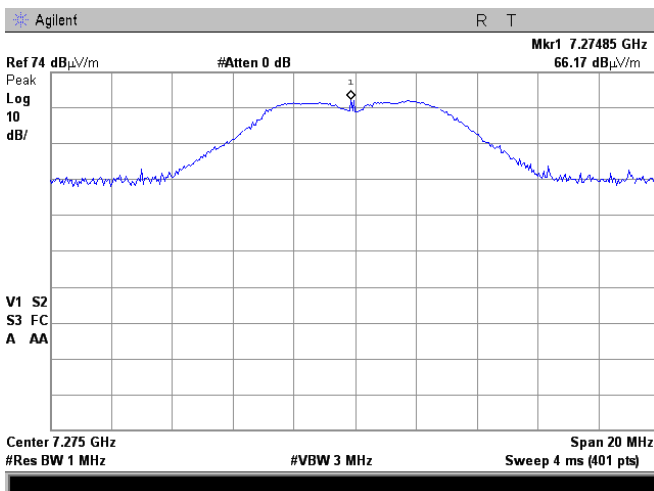
Plot 7.3.15 Radiated emission measurements at the second harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.3.16 Radiated emission measurements at the third harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal





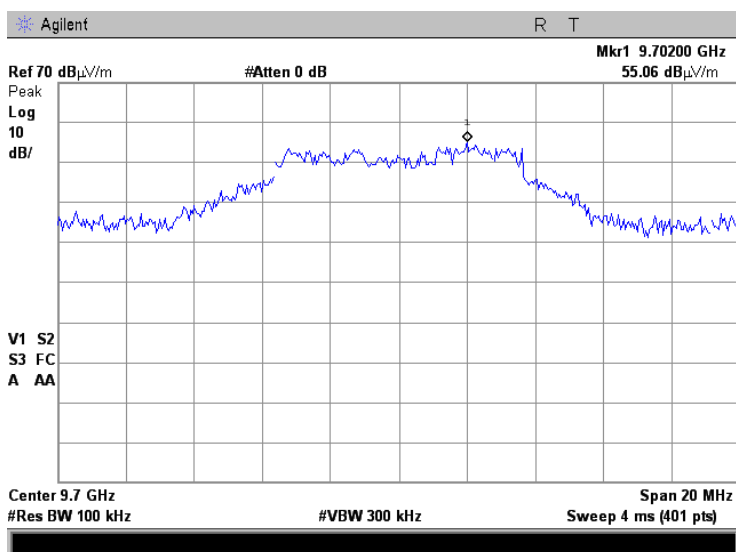
HERMON LABORATORIES

Report ID: ESSRAD\_FCC.23369.doc  
Date of Issue: 12-Jul-12

Test specification:		Section 15.247(d), Radiated spurious emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	Verdict: PASS
Date(s):		6/17/2012 - 6/18/2012	
Temperature: 22 °C	Air Pressure: 1005 hPa	Relative Humidity: 47 %	Power Supply: Battery
Remarks:			

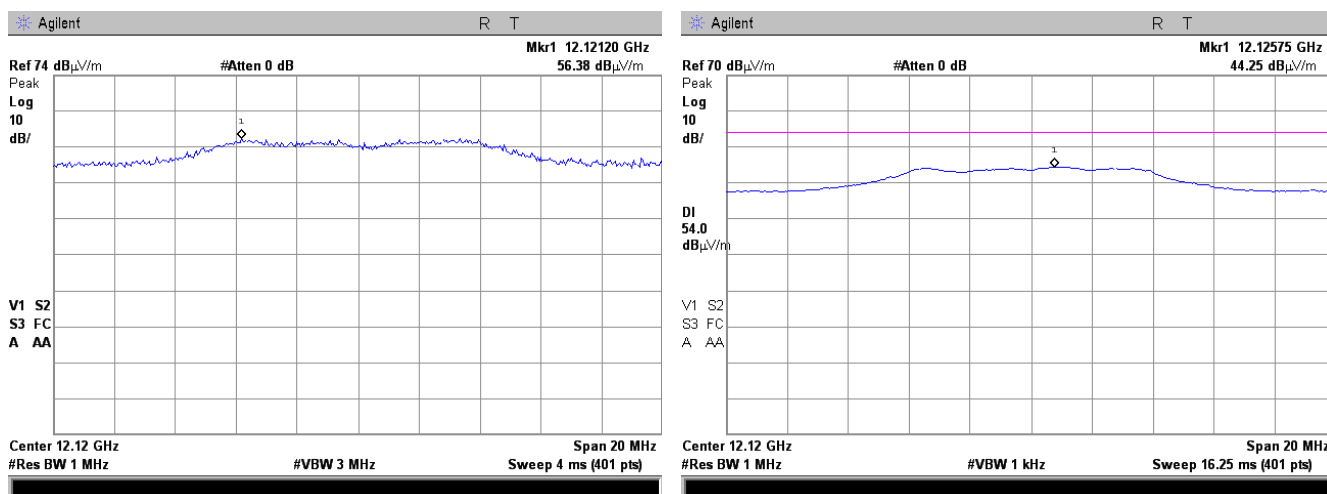
Plot 7.3.17 Radiated emission measurements at the fourth harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.3.18 Radiated emission measurements at the fifth harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal





HERMON LABORATORIES

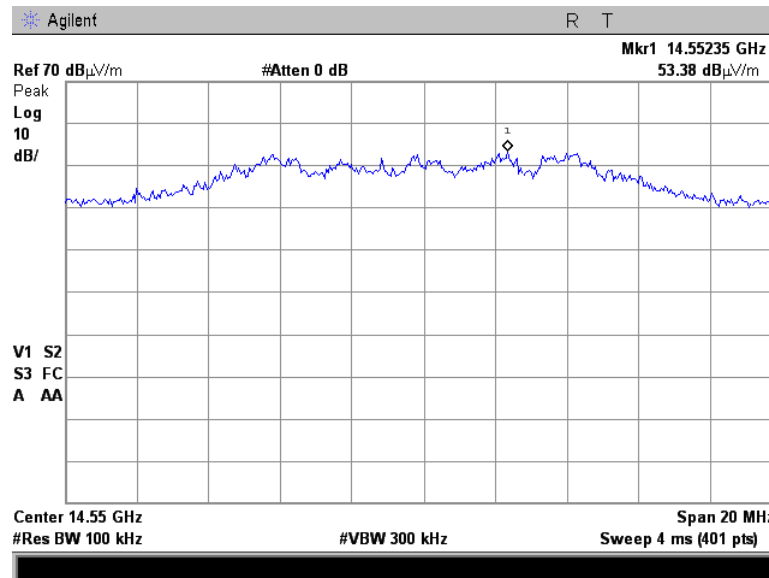
Report ID: ESSRAD\_FCC.23369.doc

Date of Issue: 12-Jul-12

<b>Test specification:</b>		<b>Section 15.247(d), Radiated spurious emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/17/2012 - 6/18/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1005 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

**Plot 7.3.19 Radiated emission measurements at the sixth harmonic**

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal

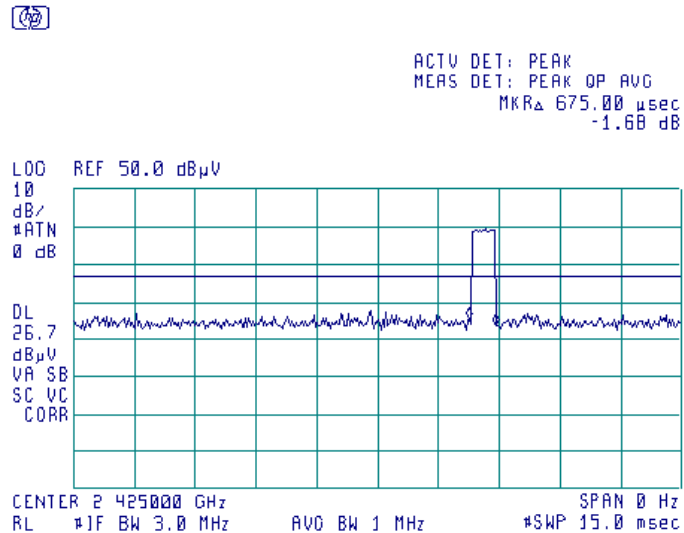




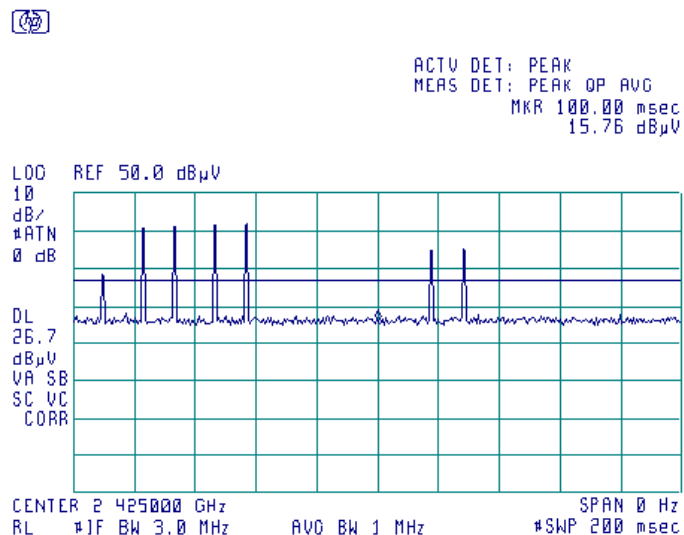
HERMON LABORATORIES

<b>Test specification:</b>		<b>Section 15.247(d), Radiated spurious emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/17/2012 - 6/18/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1005 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

Plot 7.3.20 Transmission pulse duration



Plot 7.3.21 Number of pulses during 100 msec period



<b>Test specification:</b>		<b>Section 15.247(d), Band edge emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/6/2012	
<b>Temperature:</b> 21 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 54 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

## 7.4 Band edge radiated emissions

### 7.4.1 General

This test was performed to measure emissions, radiated from the EUT at the assigned frequency band edges. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Band edge emission limits

Output power	Assigned frequency, MHz	Attenuation below carrier*, dBc	Field strength at 3 m within restricted bands, dB(μV/m)	
			Peak	Average
Peak	902.0 – 928.0	20.0	74.0	54.0
	2400.0 – 2483.5			
	5725.0 – 5850.0			
Averaged over a time interval	902.0 – 928.0	30.0	74.0	54.0
	2400.0 – 2483.5			
	5725.0 – 5850.0			

\* - Band edge emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth.

### 7.4.2 Test procedure

- 7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized normally modulated at the maximum data rate and its proper operation was checked.
- 7.4.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.
- 7.4.2.3 The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set wider than 1 % of the frequency span.
- 7.4.2.4 The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.
- 7.4.2.5 The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.4.2 and associated plots and referenced to the highest emission level measured within the authorized band.
- 7.4.2.6 The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.

Figure 7.4.1 Band edge emission test setup





<b>Test specification:</b>		<b>Section 15.247(d), Band edge emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/6/2012	
<b>Temperature:</b> 21 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 54 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

Table 7.4.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 2400-2483.5 MHz  
 DETECTOR USED: Peak  
 MODULATION: QPSK  
 BIT RATE: 250 kbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 RESOLUTION BANDWIDTH:  $\geq 1\%$  of the span  
 VIDEO BANDWIDTH:  $\geq$  RBW

Frequency, MHz	Band edge emission, dB $\mu$ V/m, peak	Emission at carrier, dB $\mu$ V/m	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
2400	72.7	108.5	35.8	20	15.8	Pass

\*- Margin = Attenuation below carrier – specification limit.

Frequency, MHz	Band edge emission, dB $\mu$ V/m, peak	Limit, dB $\mu$ V/m	Margin, dB**	Band edge emission, dB $\mu$ V/m, average	Limit, dB $\mu$ V/m	Margin, dB**	Verdict
2483.5	58.4	74	-15.6	37.3	54	-16.7	Pass

\*- Margin = Measured emission – specification limit.

## Reference numbers of test equipment used

HL 0521	HL 1984	HL 2871	HL 4279				
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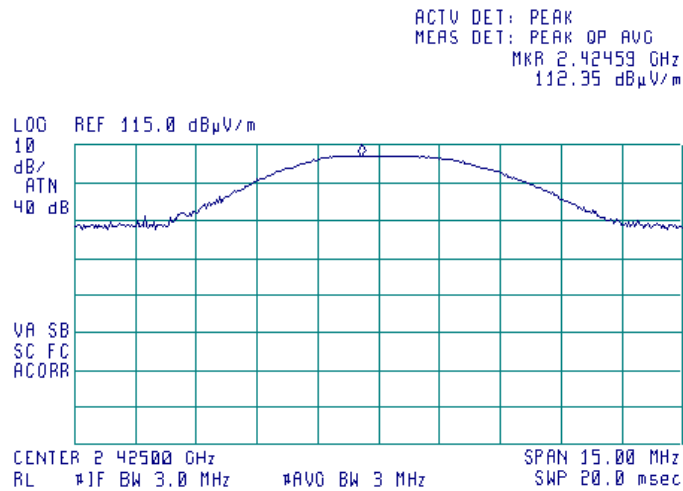
Full description is given in Appendix A.



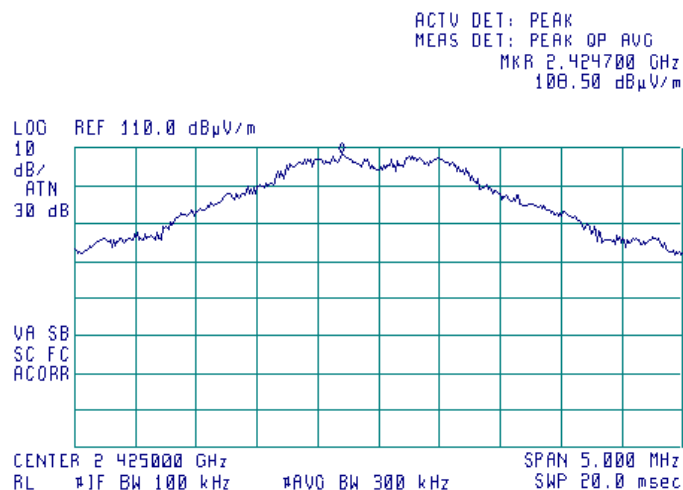
HERMON LABORATORIES

Test specification: Section 15.247(d), Band edge emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01			
Test mode: Compliance			Verdict: PASS
Date(s): 6/6/2012			
Temperature: 21 °C	Air Pressure: 1010 hPa	Relative Humidity: 54 %	Power Supply: Battery
Remarks:			

Plot 7.4.1 The highest emission level within the assigned band, RBW=3 MHz

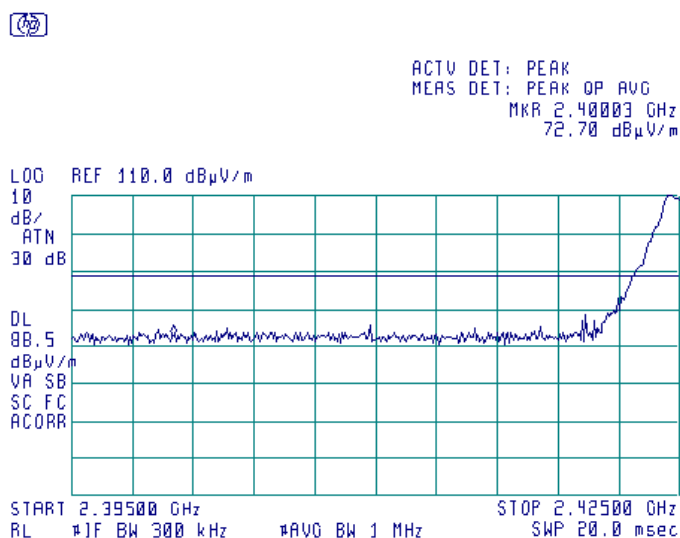


Plot 7.4.2 The highest emission level within the assigned band, RBW=100 kHz

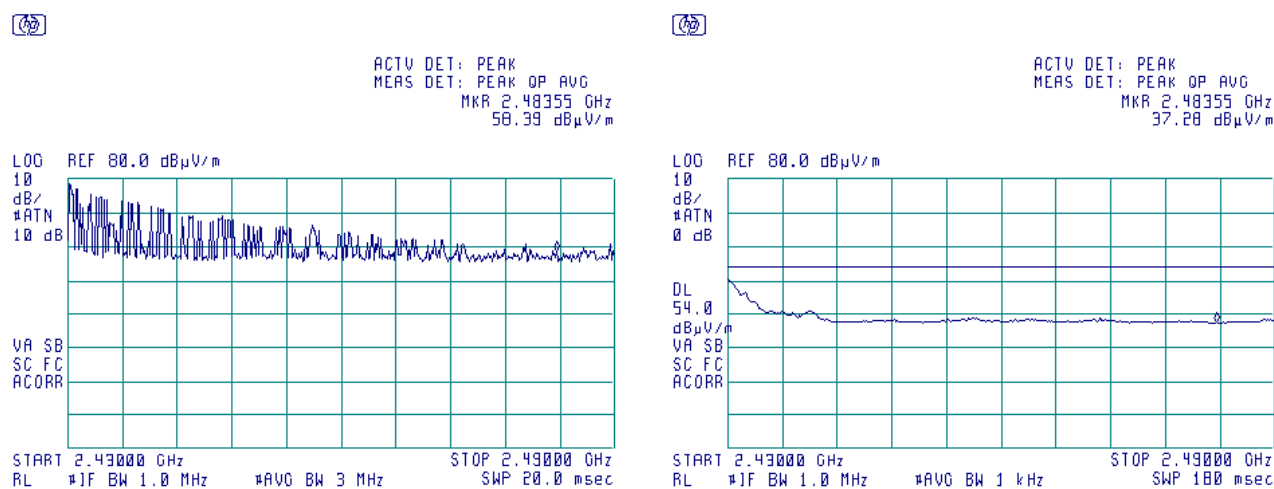


<b>Test specification:</b>		<b>Section 15.247(d), Band edge emissions</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/6/2012	
<b>Temperature:</b> 21 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 54 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

Plot 7.4.3 The band edge emission measurement at 2400 MHz



Plot 7.4.4 The band edge emission measurement at 2483.5 MHz







<b>Test specification:</b>		<b>Section 15.247(d), Peak power density</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/5/2012	
<b>Temperature:</b> 27 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 51 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

## 7.5 Peak spectral power density

### 7.5.1 General

This test was performed to measure the peak spectral power density radiated by the transmitter RF antenna. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Peak spectral power density limits

Assigned frequency range, MHz	Measurement bandwidth, kHz	Peak spectral power density, dBm	Equivalent field strength limit @ 3m, dB(μV/m)*
902.0 – 928.0	3.0	8.0	103.2
2400.0 – 2483.5			
5725.0 – 5850.0			

\* - Equivalent field strength limit was calculated from the peak spectral power density as follows:  $E = \sqrt{30 \times P} / r$ , where P is peak spectral power density and r is antenna to EUT distance in meters.

### 7.5.2 Test procedure for field strength measurements

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.

7.5.2.2 The EUT was adjusted to produce maximum available to end user RF output power.

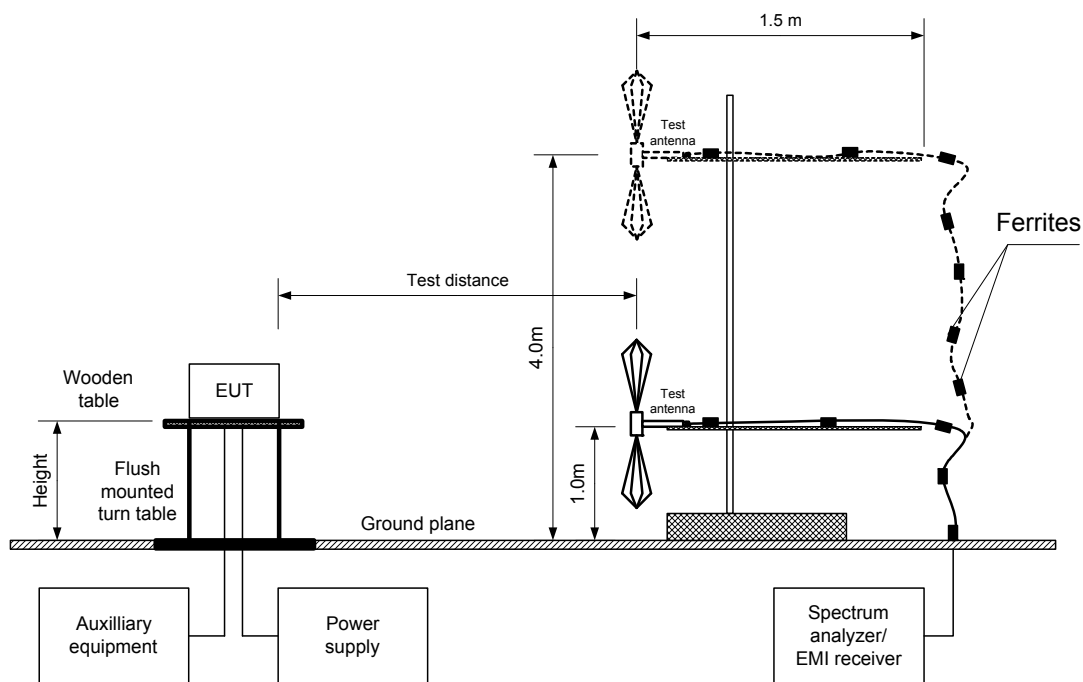
7.5.2.3 The field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.5.2.4 The frequency span of spectrum analyzer was set to capture the entire 6 dB band of the transmitter, in peak hold mode with resolution bandwidth set to 3.0 kHz, video bandwidth wider than resolution bandwidth, auto sweep time and sufficient number of sweeps was allowed for trace stabilization. The spectrum lines spacing was verified to be wider than 3 kHz. Otherwise the resolution bandwidth was reduced until individual spectrum lines were resolved and the power of individual spectrum lines was integrated over 3 kHz band.

7.5.2.5 The peak of emission was zoomed with span set just wide enough to capture the emission peak area and sweep time was set equal to span width divided by resolution bandwidth. Spectrum analyzer was set in peak hold mode, sufficient number of sweeps was allowed for trace stabilization and peak spectral power density was measured as provided in Table 7.5.2 and associated plots.

<b>Test specification:</b>	<b>Section 15.247(d), Peak power density</b>		
<b>Test procedure:</b>	558074 D01 DTS Meas Guidance v01		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> PASS	
<b>Date(s):</b>	6/5/2012		
<b>Temperature:</b> 27 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 51 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

**Figure 7.5.1 Setup for carrier field strength measurements**





<b>Test specification:</b>		<b>Section 15.247(d), Peak power density</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/5/2012	
<b>Temperature:</b> 27 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 51 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

Table 7.5.2 Field strength measurement of peak spectral power density

ASSIGNED FREQUENCY: 2425 MHz  
 TEST DISTANCE: 3 m  
 TEST SITE: OATS  
 EUT HEIGHT: 0.8 m  
 DETECTOR USED: Peak  
 TEST ANTENNA TYPE: Biconilog (30 MHz – 1000 MHz)  
 Double ridged guide (above 1000 MHz)  
 MODULATION: QPSK  
 BIT RATE: 250 kbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Field strength, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2425	92.4	103.2	-10.8	V	1.0	0	Pass

\*- Margin = Field strength - EUT antenna gain - calculated field strength limit.

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

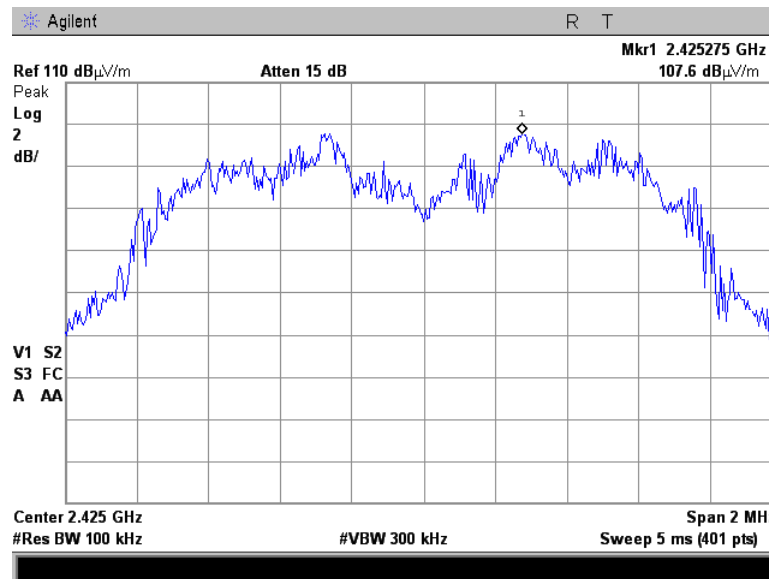
**Reference numbers of test equipment used**

HL 1984	HL 2909	HL 3442	HL 3901				
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Full description is given in Appendix A.

<b>Test specification:</b>		<b>Section 15.247(d), Peak power density</b>	
<b>Test procedure:</b>		558074 D01 DTS Meas Guidance v01	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/5/2012	
<b>Temperature:</b> 27 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 51 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

Plot 7.5.1 Peak spectral power density within 6 dB band



Bandwidth correction factor  $BWCF = 10 \log (3 \text{ kHz} / 100 \text{ kHz}) = -15.2 \text{ dB}$   
 $PSD = 107.6 \text{ dB}\mu\text{V/m} - 15.2 \text{ dB} = 92.4 \text{ dB}\mu\text{V/m}$



<b>Test specification:</b>		<b>Section 15.203, Antenna requirements</b>	
<b>Test procedure:</b>		Visual inspection	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		6/5/2012	
<b>Temperature:</b> 27 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 51 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

## 7.6 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 7.6.1.

**Table 7.6.1 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	



<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(s):</b>		7/4/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1004 hPa	<b>Relative Humidity:</b> 48 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

## 8 Unintentional emissions

### 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:  $\text{Lim}_{S_2} = \text{Lim}_{S_1} + 20 \log(S_1/S_2)$ , where  $S_1$  and  $S_2$  – standard defined and test distance respectively in meters.

#### 8.1.2 Test procedure

8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and associated photograph, 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.

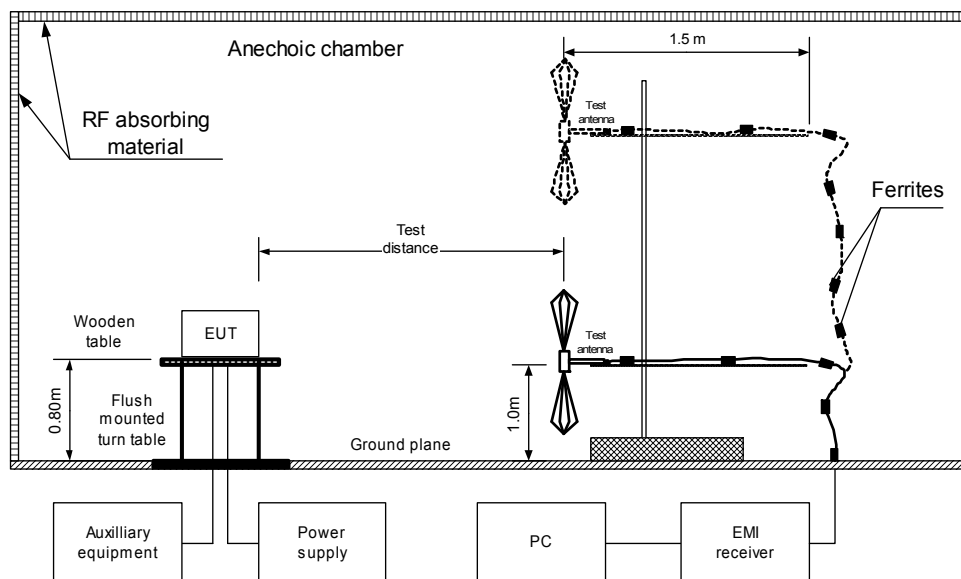
8.1.2.3 The worst test results (the lowest margins) were recorded in Table 8.1.2 and shown in the associated plots.



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<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(s):</b>		7/4/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1004 hPa	<b>Relative Humidity:</b> 48 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

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



Photograph 8.1.1 Setup for radiated emission measurements





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Report ID: ESSRAD\_FCC.23369.doc

Date of Issue: 12-Jul-12

<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(s):</b>		7/4/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1004 hPa	<b>Relative Humidity:</b> 48 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

Table 8.1.2 Radiated emission test results

EUT SET UP: TABLE-TOP  
LIMIT: Class B  
EUT OPERATING MODE: 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 signals were found								Pass

## Reference numbers of test equipment used

HL 0521	HL 0604	HL 2871	HL 4278				
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Full description is given in Appendix A.





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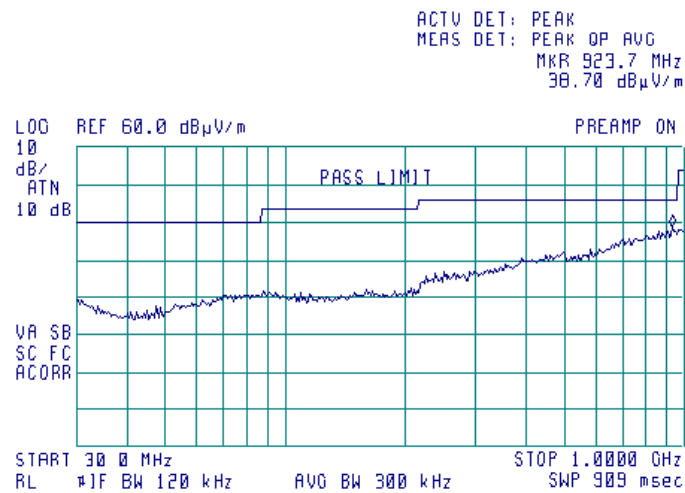
Report ID: ESSRAD\_FCC.23369.doc

Date of Issue: 12-Jul-12

<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(s):</b>		7/4/2012	
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1004 hPa	<b>Relative Humidity:</b> 48 %	<b>Power Supply:</b> Battery
<b>Remarks:</b>			

**Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range**

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



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

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	03-Jul-12	03-Jul-13
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	29-Aug-11	29-Sep-12
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	20-May-12	20-May-14
0768	Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	03-Feb-12	03-Feb-15
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	25-Nov-11	25-Nov-12
2387	Filter Bandpass, 8-14 GHz	Hermon Laboratories	FBP8-14	2387	02-Oct-11	02-Oct-13
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	15-Jan-12	15-Jan-13
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	08-May-12	08-May-13
3344	High Pass Filter, 50 Ohm, 3400 to 9900 MHz.	Mini-Circuits	VHF-3100+	NA	02-Oct-11	02-Oct-12
3347	High Pass Filter, 50 Ohm, 6000 to 11500 MHz.	Mini-Circuits	VHF-5500+	NA	02-Oct-11	02-Oct-12
3442	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	07-Mar-12	07-Mar-13
3531	Amplifier, low noise, 2 to 8 GHz	Quinstar Technology	QLJ-02084040-J0	111590020 02	25-Dec-11	25-Dec-12
3533	Amplifier, low noise, 6 to 18 GHz	Quinstar Technology	QLJ-06184040-J0	111590010 01	25-Dec-11	25-Dec-12
3535	Amplifier, low noise, 18 to 40 GHz	Quinstar Technology	QLJ-18404537-J0	111590030 01	11-Jul-11	11-Jul-12
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1225/2A	08-Feb-12	08-Feb-13
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	08-Feb-12	08-Feb-13
4114	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz	ETS Lindgren	3117	00123515	23-Jan-12	23-Jan-13
4160	Preamplifier, 0.1 to 18 GHz, Gain 25 dB, N-type(f) in, N-type(m) out.	Agilent Technologies	87405C	MY470105 94	30-Dec-11	30-Dec-12
4279	Test Cable , DC-18 GHz, 4.6 m, N/M - N/M	Mini-Circuits	APC-15FT-NMNM+	0757A	23-Nov-11	23-Nov-12
4280	Test Cable , DC-18 GHz, 4.6 m, N/M - N/M	Mini-Circuits	APC-15FT-NMNM+	0763A	23-Nov-11	23-Nov-12

## 10 APPENDIX B Measurement uncertainties

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

Test description	Expanded uncertainty
Conducted carrier power at RF antenna connector	Below 12.4 GHz: $\pm 1.7$ dB 12.4 GHz to 40 GHz: $\pm 2.3$ 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
Occupied bandwidth	$\pm 8.0$ %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	$\pm 1.0$ %
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 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

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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## 12 APPENDIX D Specification references

FCC 47CFR part 15: 2011	Radio Frequency Devices
558074 D01 DTS Meas Guidance v01, 1/18/2012	FCC Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
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**  
**Standard gain horn antenna**  
**Quinstar Technology**  
**Model QWH**  
**Ser.No.110, HL 0768**

Frequency min, GHz	Frequency max, GHz	Antenna factor, dB(1/m)
18.000	26.500	32.01
26.500	40.000	35.48
40.000	60.000	39.03
60.000	90.000	42.55
90.000	140.000	46.23
140.000	220.000	50.11

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**  
**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 wave guide horn antenna**  
**Model 3115, S/N 9911-5964, HL1984**

Frequency, MHz	Antenna factor, dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.6
2500.0	28.9
3000.0	31.2
3500.0	32.0
4000.0	32.5
4500.0	32.7
5000.0	33.6
5500.0	35.1
6000.0	35.4
6500.0	34.9
7000.0	36.1
7500.0	37.8
8000.0	38.0
8500.0	38.1
9000.0	39.1
9500.0	38.3
10000.0	38.6
10500.0	38.2
11000.0	38.7
11500.0	39.5
12000.0	40.0
12500.0	40.4
13000.0	40.5
13500.0	41.1
14000.0	41.6
14500.0	41.7
15000.0	38.7
15500.0	38.2
16000.0	38.8
16500.0	40.5
17000.0	42.5
17500.0	45.9
18000.0	49.4

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**  
**Double-ridged waveguide horn antenna**  
**ETS Lindgren, Model 3117, serial number: 00123515, HL 4114**

Frequency, MHz	Antenna factor, dB/m		
	Measured	Manufacturer	Deviation
1000	28.0	28.4	-0.4
1500	28.0	27.4	0.6
2000	31.2	30.9	0.3
2500	32.5	33.4	-0.9
3000	32.9	32.6	0.3
3500	32.7	32.8	-0.1
4000	33.1	33.4	-0.3
4500	33.8	33.9	-0.1
5000	33.8	34.1	-0.3
5500	34.4	34.5	-0.1
6000	35.0	35.2	-0.2
6500	35.4	35.5	-0.1
7000	35.7	35.7	0.0
7500	35.9	35.7	0.2
8000	35.8	35.8	0.0
8500	35.9	35.8	0.1
9000	36.3	36.2	0.1
9500	36.6	36.6	0.0
10000	37.1	37.1	0.0
10500	37.6	37.5	0.1
11000	37.9	37.7	0.2
11500	38.5	38.1	0.4
12000	39.2	38.7	0.5
12500	39.0	38.9	0.1
13000	39.1	39.1	0.0
13500	38.9	38.8	0.1
14000	39.0	38.8	0.2
14500	39.6	39.9	-0.3
15000	39.9	39.7	0.2
15500	39.9	40.1	-0.2
16000	40.7	40.8	-0.1
16500	41.3	41.8	-0.5
17000	42.5	42.1	0.4
17500	41.3	41.2	0.1
18000	41.4	40.9	0.5

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



**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**  
**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**  
**Test cable, Mini-Circuits, S/N 0757A, 18 GHz, 4.6 m, N/M - N/M**  
**APC-15FT-NMNM+, HL 4279**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.26	5000	4.23	10200	6.47	15400	8.46
30	0.26	5100	4.28	10300	6.53	15500	8.49
50	0.34	5200	4.32	10400	6.57	15600	8.50
100	0.50	5300	4.37	10500	6.59	15700	8.53
200	0.72	5400	4.41	10600	6.62	15800	8.56
300	0.90	5500	4.46	10700	6.64	15900	8.60
400	1.05	5600	4.51	10800	6.66	16000	8.62
500	1.20	5700	4.57	10900	6.69	16100	8.65
600	1.31	5800	4.61	11000	6.69	16200	8.68
700	1.44	5900	4.64	11100	6.70	16300	8.70
800	1.53	6000	4.70	11200	6.72	16400	8.72
900	1.63	6100	4.75	11300	6.74	16500	8.76
1000	1.74	6200	4.76	11400	6.79	16600	8.77
1100	1.83	6300	4.82	11500	6.83	16700	8.78
1200	1.92	6400	4.83	11600	6.85	16800	8.82
1300	2.01	6500	4.88	11700	6.89	16900	8.85
1400	2.09	6600	4.90	11800	6.94	17000	8.91
1500	2.17	6700	4.95	11900	7.00	17100	8.94
1600	2.25	6800	5.01	12000	7.04	17200	8.98
1700	2.33	6900	4.98	12100	7.10	17300	9.03
1800	2.39	7000	5.03	12200	7.18	17400	9.05
1900	2.47	7100	5.11	12300	7.23	17500	9.08
2000	2.53	7200	5.13	12400	7.29	17600	9.10
2100	2.60	7300	5.20	12500	7.34	17700	9.12
2200	2.67	7400	5.28	12600	7.39	17800	9.14
2300	2.74	7500	5.33	12700	7.45	17900	9.17
2400	2.80	7600	5.37	12800	7.49	18000	9.21
2500	2.87	7700	5.44	12900	7.53		
2600	2.92	7800	5.52	13000	7.58		
2700	3.00	7900	5.56	13100	7.62		
2800	3.06	8000	5.63	13200	7.67		
2900	3.12	8100	5.67	13300	7.71		
3000	3.18	8200	5.71	13400	7.74		
3100	3.24	8300	5.76	13500	7.79		
3200	3.30	8400	5.79	13600	7.82		
3300	3.35	8500	5.85	13700	7.84		
3400	3.41	8600	5.88	13800	7.87		
3500	3.46	8700	5.92	13900	7.90		
3600	3.51	8800	5.96	14000	7.94		
3700	3.56	8900	6.02	14100	7.98		
3800	3.61	9000	6.05	14200	8.01		
3900	3.66	9100	6.08	14300	8.05		
4000	3.71	9200	6.15	14400	8.10		
4100	3.77	9300	6.18	14500	8.12		
4200	3.83	9400	6.20	14600	8.16		
4300	3.89	9500	6.25	14700	8.22		
4400	3.94	9600	6.28	14800	8.26		
4500	3.99	9700	6.31	14900	8.29		
4600	4.05	9800	6.35	15000	8.33		
4700	4.09	9900	6.37	15100	8.39		
4800	4.15	10000	6.40	15200	8.41		
4900	4.19	10100	6.45	15300	8.44		

**Cable loss**  
**Test cable, Mini-Circuits, S/N 0763A, 18 GHz, 4.6 m, N/M - N/M**  
**APC-15FT-NMNM+, HL 4280**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.21	5000	4.27	10200	6.50	15400	8.49
30	0.26	5100	4.32	10300	6.55	15500	8.50
50	0.34	5200	4.35	10400	6.59	15600	8.55
100	0.51	5300	4.41	10500	6.62	15700	8.58
200	0.63	5400	4.43	10600	6.65	15800	8.61
300	0.73	5500	4.49	10700	6.66	15900	8.64
400	0.91	5600	4.54	10800	6.68	16000	8.68
500	1.07	5700	4.58	10900	6.70	16100	8.72
600	1.21	5800	4.63	11000	6.71	16200	8.73
700	1.33	5900	4.67	11100	6.72	16300	8.75
800	1.45	6000	4.73	11200	6.74	16400	8.77
900	1.55	6100	4.76	11300	6.77	16500	8.80
1000	1.65	6200	4.81	11400	6.81	16600	8.80
1100	1.75	6300	4.86	11500	6.84	16700	8.82
1200	1.85	6400	4.89	11600	6.87	16800	8.83
1300	1.94	6500	4.94	11700	6.89	16900	8.87
1400	2.03	6600	4.95	11800	6.94	17000	8.92
1500	2.11	6700	4.99	11900	7.00	17100	8.96
1600	2.19	6800	5.04	12000	7.05	17200	9.01
1700	2.27	6900	5.04	12100	7.10	17300	9.07
1800	2.34	7000	5.09	12200	7.17	17400	9.09
1900	2.42	7100	5.15	12300	7.23	17500	9.14
2000	2.49	7200	5.19	12400	7.29	17600	9.17
2100	2.56	7300	5.25	12500	7.34	17700	9.21
2200	2.63	7400	5.33	12600	7.38	17800	9.24
2300	2.69	7500	5.39	12700	7.44	17900	9.28
2400	2.76	7600	5.42	12800	7.48	18000	9.31
2500	2.83	7700	5.51	12900	7.55		
2600	2.89	7800	5.58	13000	7.58		
2700	2.95	7900	5.62	13100	7.63		
2800	3.02	8000	5.68	13200	7.67		
2900	3.08	8100	5.73	13300	7.72		
3000	3.15	8200	5.78	13400	7.76		
3100	3.21	8300	5.83	13500	7.81		
3200	3.27	8400	5.87	13600	7.85		
3300	3.33	8500	5.92	13700	7.88		
3400	3.38	8600	5.96	13800	7.93		
3500	3.44	8700	6.00	13900	7.97		
3600	3.49	8800	6.04	14000	8.01		
3700	3.55	8900	6.10	14100	8.05		
3800	3.60	9000	6.13	14200	8.09		
3900	3.65	9100	6.17	14300	8.12		
4000	3.71	9200	6.22	14400	8.15		
4100	3.75	9300	6.25	14500	8.19		
4200	3.81	9400	6.28	14600	8.22		
4300	3.86	9500	6.32	14700	8.26		
4400	3.93	9600	6.36	14800	8.29		
4500	3.98	9700	6.37	14900	8.32		
4600	4.03	9800	6.41	15000	8.36		
4700	4.08	9900	6.42	15100	8.40		
4800	4.13	10000	6.45	15200	8.43		
4900	4.18	10100	6.48	15300	8.44		

## 14 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

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