



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

# TEST REPORT

ACCORDING TO: FCC 47 CFR PART 15 subpart C, section 15.249

FOR:

**SCR Engineers Ltd.**  
**RF module for**  
**SenseTime Controller (STC)**  
**Model: LD Module**  
**FCC ID:AMUBUM**

This report is in conformity with ISO/IEC 17025. The "A2LA Accredited" symbol endorsement applies only to the tests and calibrations that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested. This test report shall not be reproduced in any form except in full with the written approval of Hermon Laboratories Ltd.



## Table of contents

1	Applicant information.....	3
2	Equipment under test attributes .....	3
3	Manufacturer information .....	3
4	Test details.....	3
5	Tests summary.....	4
6	EUT description.....	5
6.1	General information.....	5
6.2	Module test configuration .....	5
6.3	Changes made in EUT .....	5
6.4	Transmitter characteristics .....	6
7	Transmitter tests according to 47CFR part 15 subpart C requirements .....	7
7.1	Field strength of emissions.....	7
8	APPENDIX A Test equipment and ancillaries used for tests.....	26
9	APPENDIX B Measurement uncertainties.....	28
10	APPENDIX C Test laboratory description .....	29
11	APPENDIX D Specification references .....	29
12	APPENDIX E Test equipment correction factors.....	30
13	APPENDIX F Abbreviations and acronyms.....	42
14	APPENDIX G Manufacturer's declaration .....	43

## 1 Applicant information

**Client name:** SCR Engineers Ltd.  
**Address:** 18 Hamelacha street, P.O.B. 13564, Netanya 42138, Israel  
**Telephone:** +972 73 240 6053  
**Fax:** +972 9865 0703  
**E-mail:** zeevk@scrdairy.com  
**Contact name:** Mr. Zeev Kapelnik

## 2 Equipment under test attributes

**Product name:** Long distance module for SenseTime Controller (STC)  
**Product type:** Transceiver  
**Model(s):** LD Module  
**Serial number:** 1137 & 1174  
**Hardware version:** Rev 06.01  
**Software release:** 1.0.0.1  
**Controller model:** CLT00006  
**Controller serial number:** RB11SNSTFS000073  
**Receipt date** 27-Aug-17

## 3 Manufacturer information

**Manufacturer name:** SCR Engineers Ltd.  
**Address:** 18 Hamelacha street, P.O.B. 13564, Netanya 42138, Israel  
**Telephone:** +972 73 240 6053  
**Fax:** +972 9865 0703  
**E-Mail:** zeevk@scrdairy.com  
**Contact name:** Mr. Zeev Kapelnik

## 4 Test details

**Project ID:** 29506  
**Location:** Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel  
**Test started:** 27-Apr-17  
**Test completed:** 27-Apr-17  
**Test specification(s):** FCC 47 CFR Part 15, subpart C, §15.249

## 5 Tests summary

Test	Status
<b>Transmitter characteristics</b>	
Section 15.249(a)(d), Field strength of emissions	Pass
Section 15.215(c), Occupied bandwidth	Not required**
Section 15.249(d), Band edge emissions	Not required**
Section 15.207(a), Conducted emission	Not required
Section 15.203, Antenna requirement	Not required**




This test report is based on the test report SCRRAD\_FCC.26955 issued by Hermon Laboratories assuming that the EUT, LD module, approved under FCC ID: AMUBUM, was not changed as stated in manufacturer's declaration (refer to Appendix G of the test report).

The current test report issued for EUT use in SenseTime Controller (STC) that is why only the relevant tests were performed to submit for Class II Permissive Change certification.

\* Declared by the manufacturer, refer to Appendix G of the test report.

\*\* Refer to test report SCRRAD\_FCC.26955.

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. Morozov, test engineer	August 27, 2017	
<b>Reviewed by:</b>	Mrs. M. Cherniavsky, certification engineer	September 26, 2017	
<b>Approved by:</b>	Mr. K. Zushchuk, project manager	September 28, 2017	

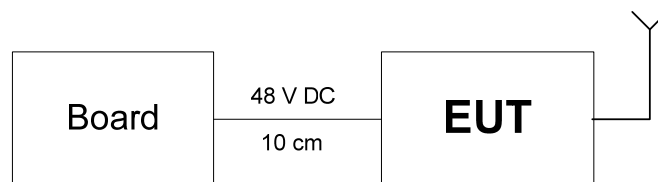
## 6 EUT description

### 6.1 General information

The EUT, LD (long distance) module, is a part of SenseTime Controller (STC) used to collect messages from tags and send them to central management system.

The Controller comprises two LD modules differed for the position in EUT - X or Y: when one module is transmitting, the second module is always in the receive mode.

### 6.2 Module test configuration



### 6.3 Changes made in EUT

No changes were performed in the EUT during yesying



### 6.4 Transmitter characteristics

<b>Type of equipment</b>					
<input checked="" type="checkbox"/>	Stand-alone (Equipment with or without its own control provisions)				
<input type="checkbox"/>	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)				
<input type="checkbox"/>	Plug-in card (Equipment intended for a variety of host systems)				
<b>Assigned frequency range</b>		2400 – 2483.5 MHz			
<b>Operating frequency range</b>		2405 – 2480 MHz			
<b>RF channel spacing</b>		5 MHz			
<b>Maximum field strength of carrier at 3 m distance</b>		106.98 dBµV/m (peak), 72.78 dBµV/m (average)			
<b>Is transmitter output power variable?</b>		<input checked="" type="checkbox"/>	No		
		<input type="checkbox"/>	Yes		
		<input type="checkbox"/>	continuous variable		
		<input type="checkbox"/>	stepped variable with stepsize		dB
		<input type="checkbox"/>	minimum RF power		dBm
		<input type="checkbox"/>	maximum RF power		dBm
<b>Antenna connection</b>					
<input type="checkbox"/>	unique coupling	<input type="checkbox"/>	standard connector	<input checked="" type="checkbox"/>	Integral
<input checked="" type="checkbox"/>					with temporary RF connector
<input checked="" type="checkbox"/>					without temporary RF connector
<b>Antenna/s technical characteristics</b>					
Type	Manufacturer	Model number		Gain	
Integral	SCR Engineers Ltd.	NA		0 dBi	
<b>Transmitter aggregate data rate/s</b>		250 kbps			
<b>Type of modulation</b>		QPSK			
<b>Modulating test signal (baseband)</b>		PRBS			
<b>Transmitter power source</b>					
<input type="checkbox"/>	Battery	<b>Nominal rated voltage</b>		Battery type	
<input checked="" type="checkbox"/>	DC	<b>Nominal rated voltage</b>		48 V	
<input type="checkbox"/>	AC mains	<b>Nominal rated voltage</b>		Frequency	Hz



<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
Test procedure: ANSI C63.10 sections 6.5, 6.6			
Test mode: Compliance		Verdict: PASS	
Date(s): 27-Apr-17			
Temperature: 23 °C	Relative Humidity: 45 %	Air Pressure: 1008 hPa	Power: 48 VDC
Remarks:			

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

### 7.1 Field strength of emissions

#### 7.1.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given in Table 7.1.1, Table 7.1.2 and Table 7.1.3.

Table 7.1.1 Radiated fundamental emission limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)		
	Peak	Average	Quasi-Peak
2400 – 2483.5	114.0	94.0	NA

Table 7.1.2 Harmonics limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)	
	Peak	Average
2400 – 2483.5	74.0	54.0

Table 7.1.3 Radiated spurious emissions limits (other than harmonics)

Frequency, MHz	Field strength at 3 m, dB(μV/m)*			Attenuation below carrier
	Peak	Quasi Peak	Average	
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	50 dBc (whichever is the less stringent)
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: 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 but not exceeding 40 GHz for intentional radiators operated below 10 GHz and up to the fifth harmonic of the highest fundamental frequency but not exceeding 100 GHz for intentional radiators operated above 10 GHz.



<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

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

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

7.1.2.2 The EUT antenna was installed in typical (vertical) position.

7.1.2.3 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.

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

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

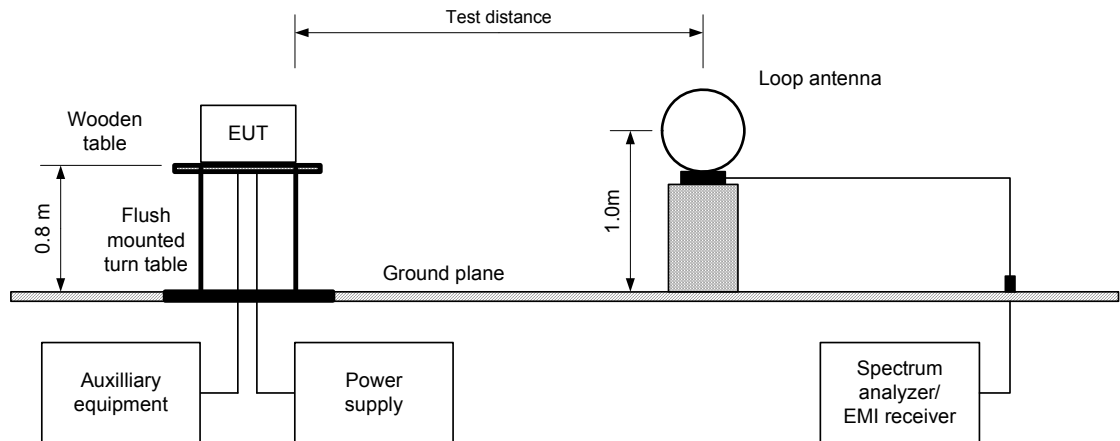
7.1.3.1 The EUT was set up as shown in Figure 7.1.2, Figure 7.1.3, energized and the performance check was conducted.

7.1.3.2 The EUT antenna was installed in typical (vertical) position.

7.1.3.3 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.

7.1.3.4 The worst test results (the lowest margins) were recorded in the associated tables and shown in the associated plots

**Figure 7.1.1 Setup for spurious emission field strength measurements below 30 MHz**







<b>Test specification:</b> Section 15.249(a)(d), Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Figure 7.1.2 Setup for spurious emission field strength measurements in 30 -1000 MHz

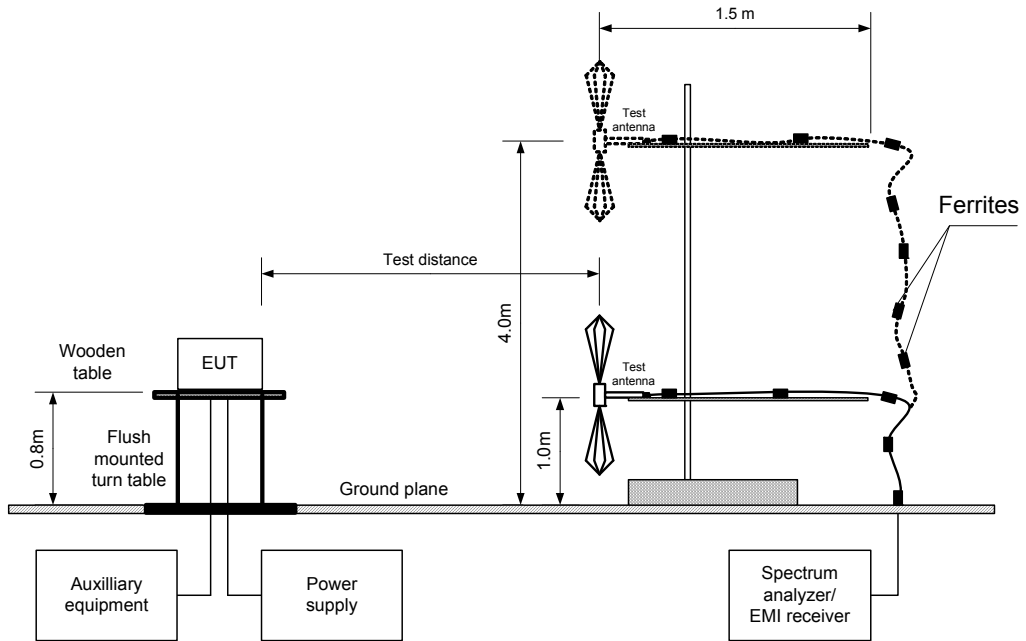
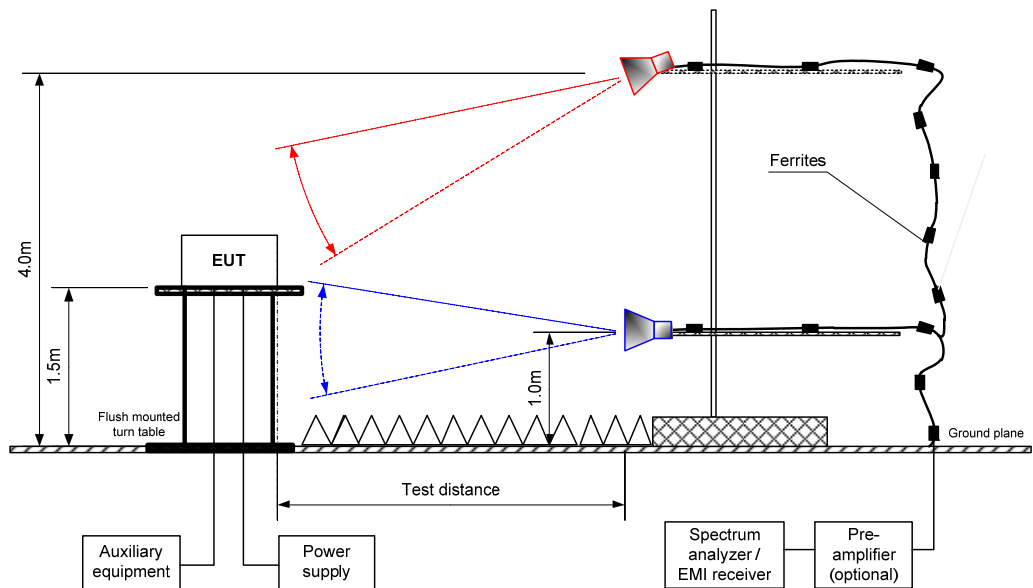


Figure 7.1.3 Setup for spurious emission field strength measurements above 1000 MHz





<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict: PASS</b>	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Table 7.1.4 Field strength of fundamental emission and spurious emissions

TEST DISTANCE: 3 m  
 EUT POSITION: Typical with antenna in vertical position  
 MODULATION: QPSK  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 25000 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**		Calculated dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
<b>Fundamental emission***</b>											
2405.00	H	1.6	0	106.03	114.00	-7.97	-34.20	71.83	94.00	-22.17	Pass
2445.00	H	1.5	20	106.80	114.00	-7.20	-34.20	72.60	94.00	-21.40	Pass
2480.00	H	1.5	10	106.98	114.00	-7.02	-34.20	72.78	94.00	-21.22	Pass
<b>Spurious emissions</b>											
4808.95	V	1.6	0	62.29	74.00	-11.71	-34.20	28.09	54.00	-25.91	Pass
4890.93	V	1.6	0	63.27	74.00	-10.73	-34.20	29.07	54.00	-24.93	
4958.98	V	1.6	0	65.10	74.00	-8.90	-34.20	30.90	54.00	-23.10	

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

EUT SET UP: TABLE-TOP  
 TEST SITE: OATS  
 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*				
54.602500	35.59	25.28	46.00	-20.72	H	1.0	155	Pass
61.775000	38.23	26.85	46.00	-19.15	H	1.8	40	
181.065000	30.83	24.19	46.00	-21.81	V	1.15	25	
203.517500	27.33	21.71	46.00	-24.29	V	1.05	168	
370.520000	25.34	20.06	46.00	-25.94	H	1.1	0	
404.840000	32.78	26.27	46.00	-19.73	V	1.0	230	
487.847000	36.29	28.51	46.00	-17.49	V	1.0	0	
594.907500	31.31	24.71	46.00	-21.29	H	1.0	34	



<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict: PASS</b>	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Table 7.1.5 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
0.975	50.0	NA	NA	NA	-34.2

\*- 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:

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

**Reference numbers of test equipment used**

HL 0415	HL 0521	HL 0569	HL 0651	HL 0748	HL 1552	HL 2697	HL 3612
HL 3818	HL 4277	HL 4663	HL 4778	HL 4933	HL 5105	HL 5107	HL 5110
HL 5111	HL 5112	HL 5121					

Full description is given in Appendix A.

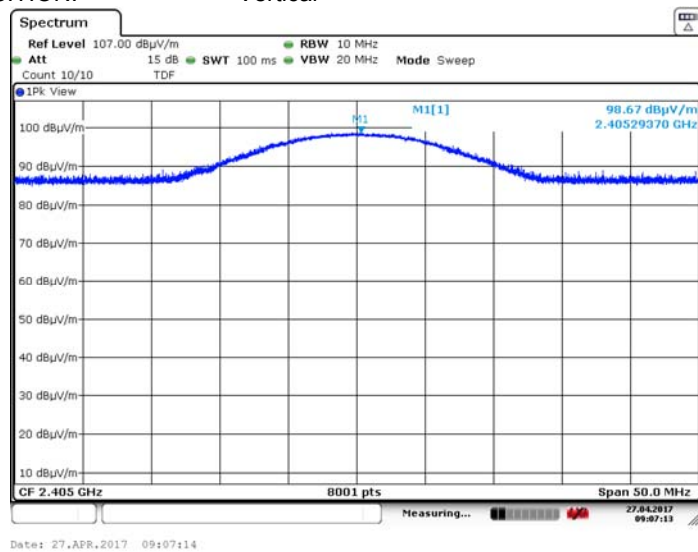


HERMON LABORATORIES

<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

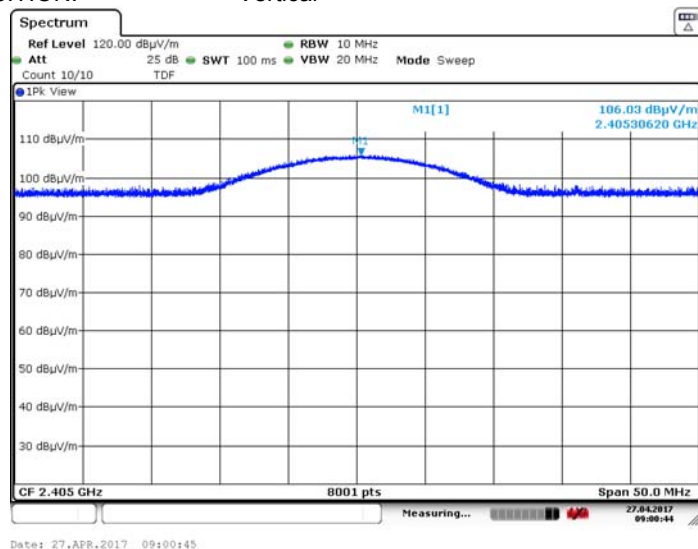
**Plot 7.1.1 Radiated emission measurements at the low fundamental frequency**

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: Vertical



**Plot 7.1.2 Radiated emission measurements at the low fundamental frequency**

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: Vertical

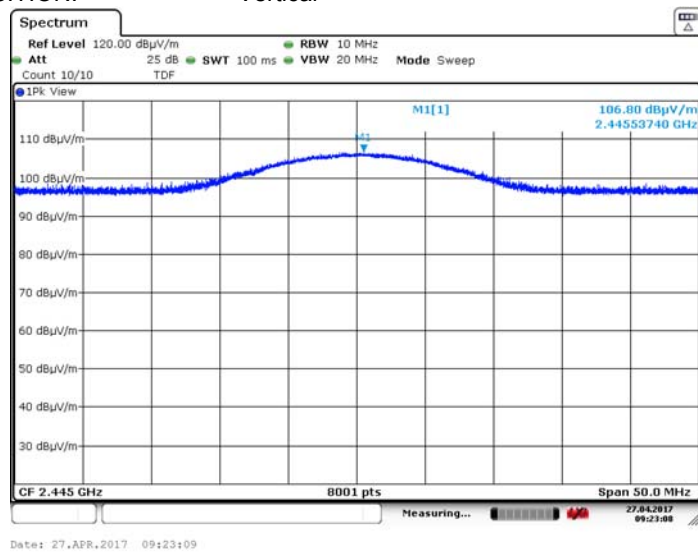




<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

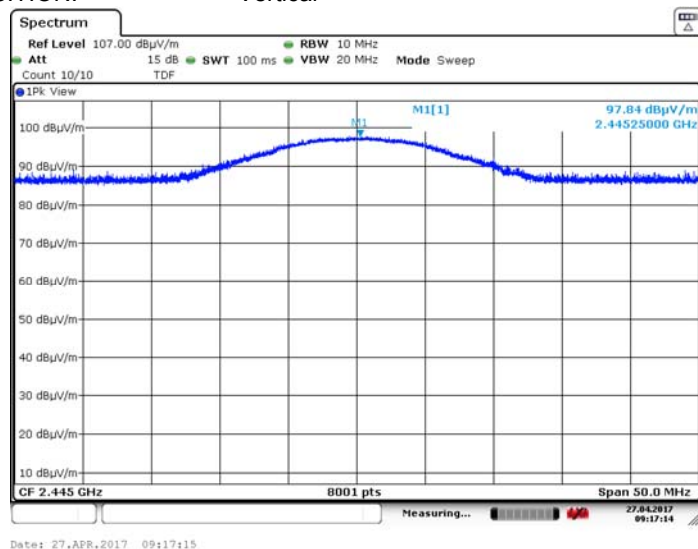
**Plot 7.1.3 Radiated emission measurements at the mid fundamental frequency**

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical  
 EUT POSITION: Vertical



**Plot 7.1.4 Radiated emission measurements at the mid fundamental frequency**

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Horizontal  
 EUT POSITION: Vertical



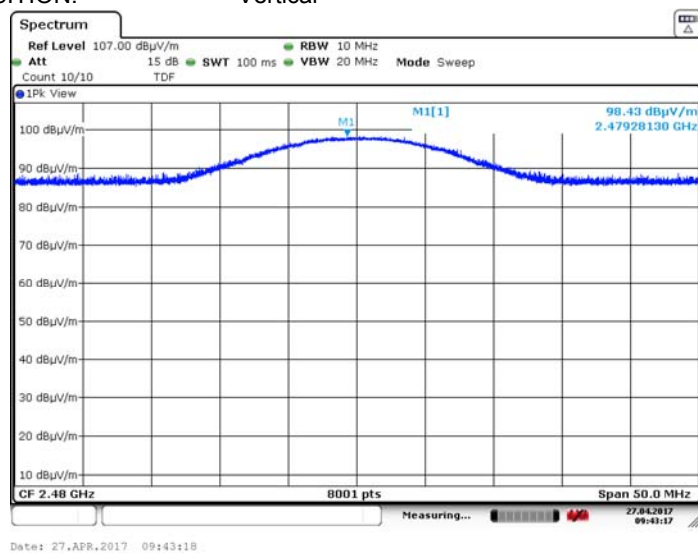


HERMON LABORATORIES

<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

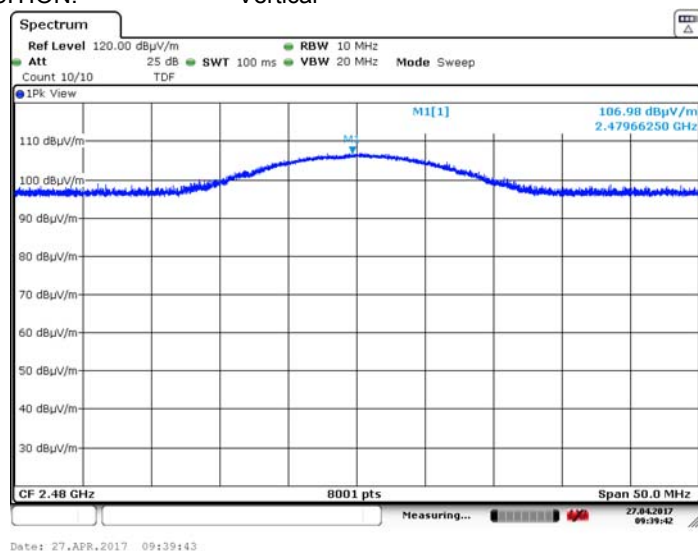
**Plot 7.1.5 Radiated emission measurements at the high fundamental frequency**

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: Vertical



**Plot 7.1.6 Radiated emission measurements at the high fundamental frequency**

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: Vertical

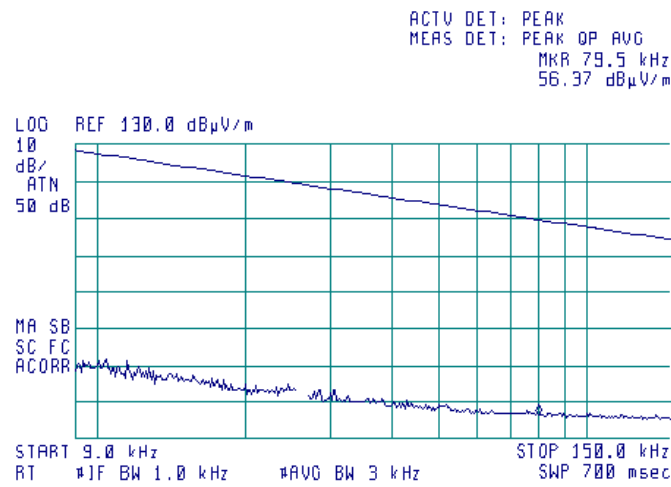




<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

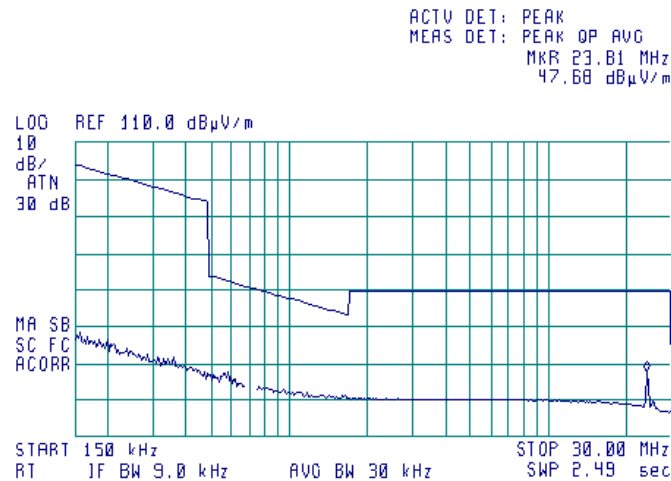
Plot 7.1.7 Radiated emission measurements from 9 to 150 kHz at low, mid and high frequency

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



Plot 7.1.8 Radiated emission measurements from 0.15 to 30 MHz at low, mid and high frequency

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

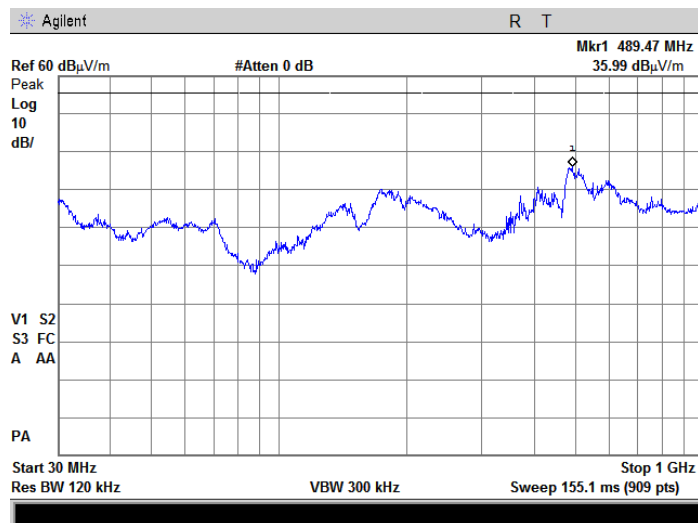




<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
Test procedure: ANSI C63.10 sections 6.5, 6.6			
Test mode: Compliance		Verdict: PASS	
Date(s): 27-Apr-17			
Temperature: 23 °C	Relative Humidity: 45 %	Air Pressure: 1008 hPa	Power: 48 VDC
Remarks:			

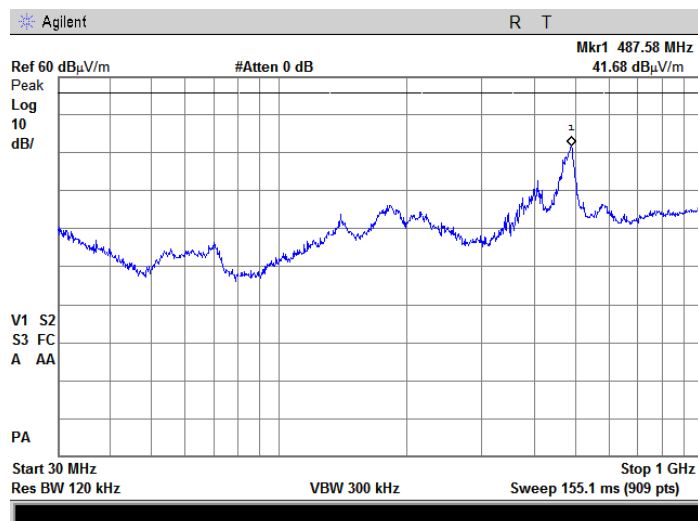
Plot 7.1.9 Radiated emission measurements from 30 to 1000 MHz at low, mid and high frequency

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



Plot 7.1.10 Radiated emission measurements from 30 to 1000 MHz at low, mid and high frequency

TEST SITE: Anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: Typical





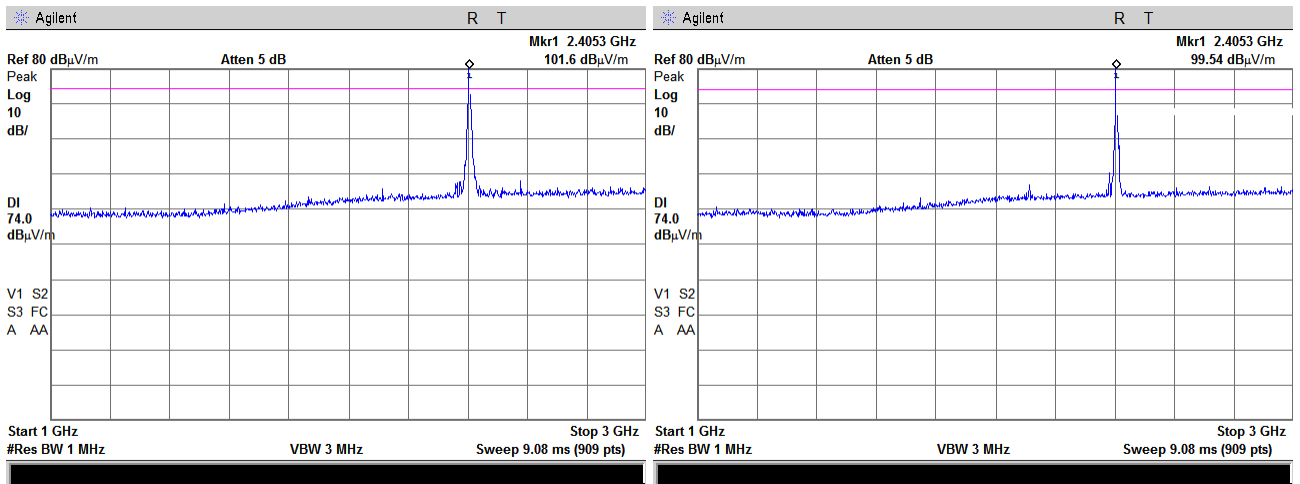


HERMON LABORATORIES

<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

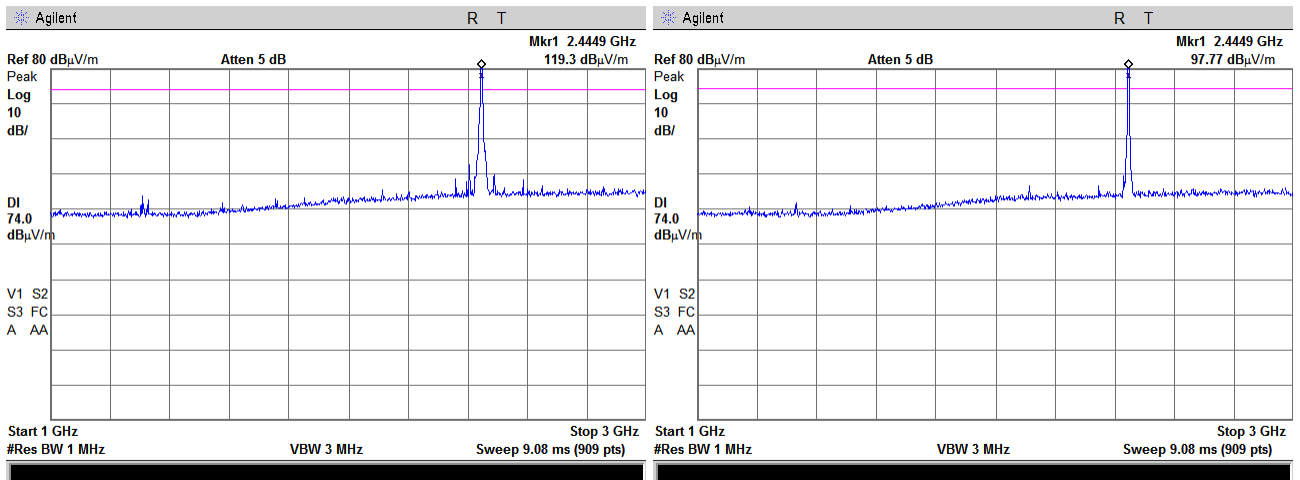
**Plot 7.1.11 Radiated emission measurements from 1.0 to 3.0 MHz at low frequency**

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



**Plot 7.1.12 Radiated emission measurements from 1.0 to 3.0 MHz at mid frequency**

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



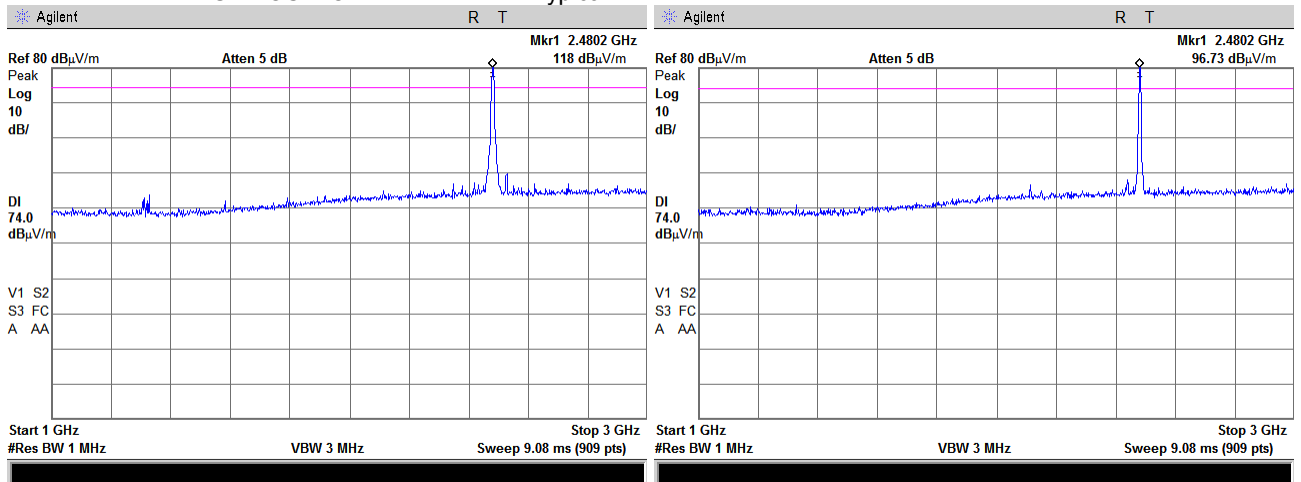


HERMON LABORATORIES

<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

**Plot 7.1.13 Radiated emission measurements from 1.0 to 3.0 MHz at high frequency**

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



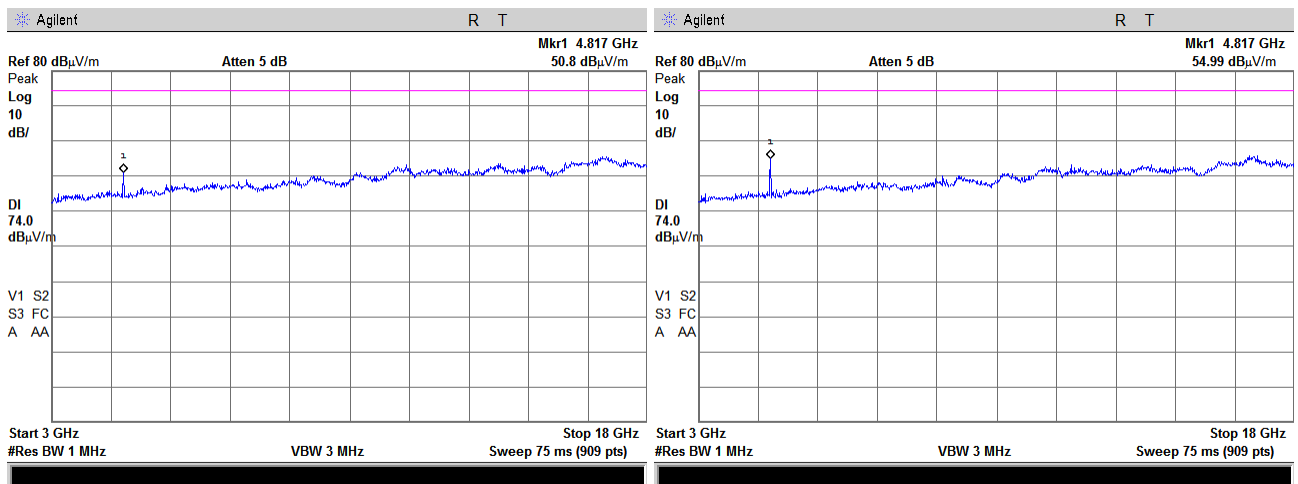


HERMON LABORATORIES

<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

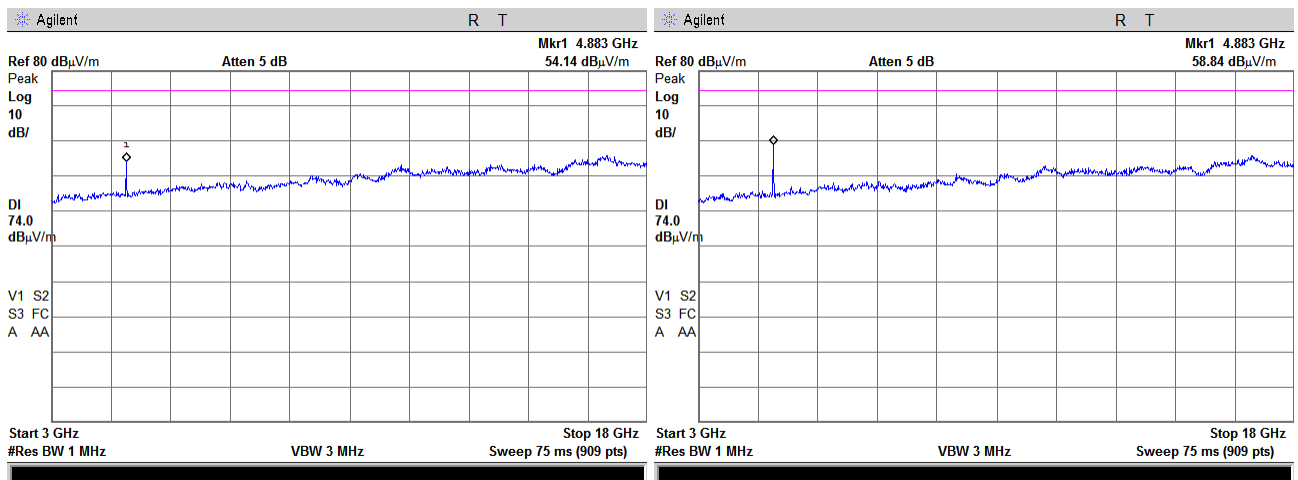
**Plot 7.1.14 Radiated emission measurements from 3.0 to 18.0 GHz at low frequency**

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



**Plot 7.1.15 Radiated emission measurements from 3.0 to 18.0 GHz at mid frequency**

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

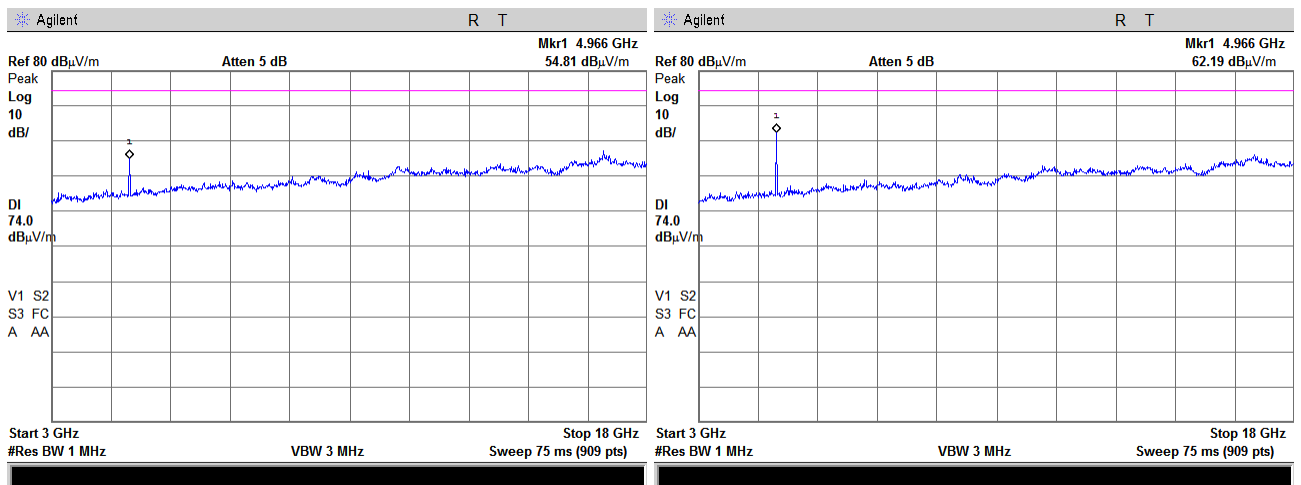




<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict: PASS</b>	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

**Plot 7.1.16 Radiated emission measurements from 3.0 to 18.0 GHz at high frequency**

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



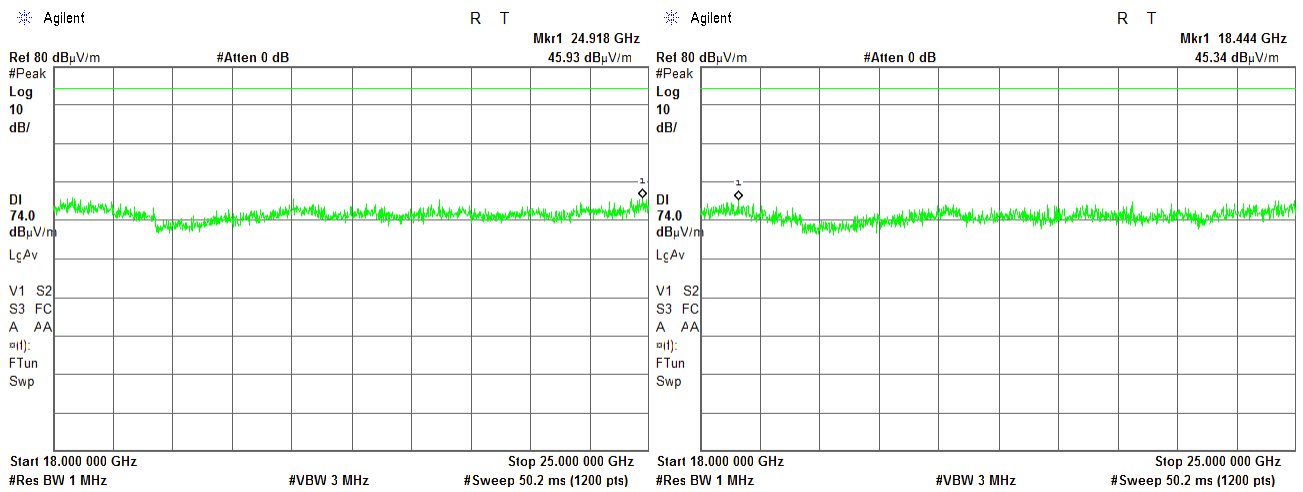


HERMON LABORATORIES

<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

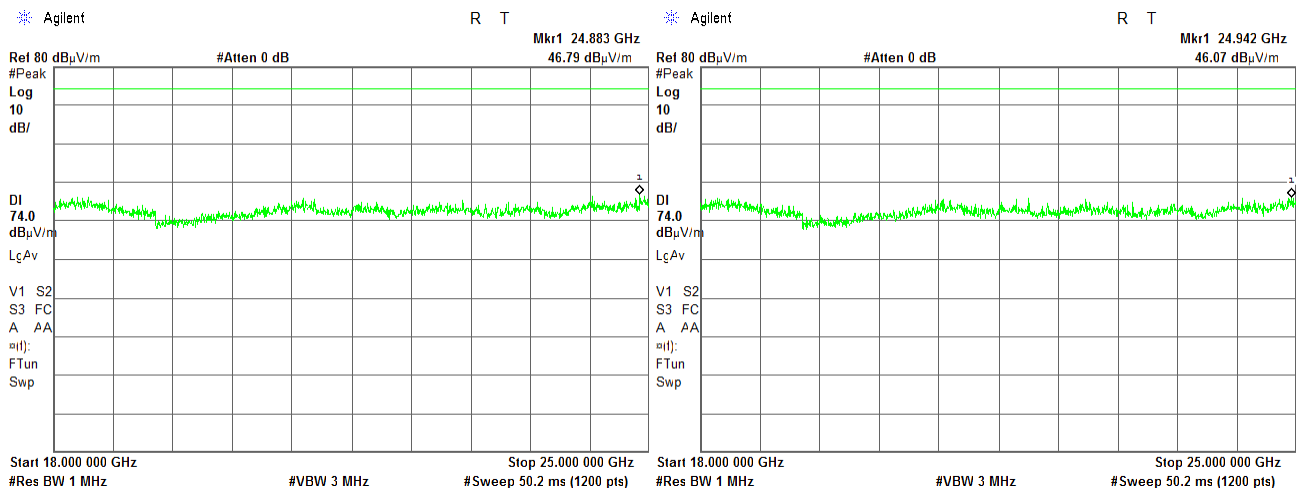
Plot 7.1.17 Radiated emission measurements from 18.0 to 25.0 GHz at low frequency

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



Plot 7.1.18 Radiated emission measurements from 18.0 to 25.0 GHz at mid frequency

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



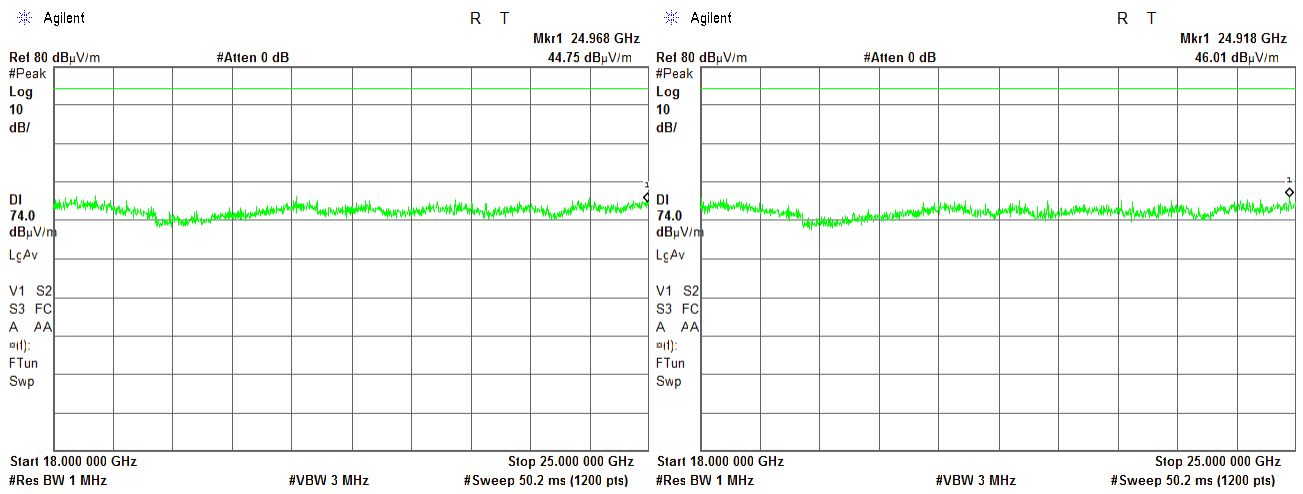


HERMON LABORATORIES

<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict: PASS</b>	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Plot 7.1.19 Radiated emission measurements from 18.0 to 25.0 GHz at high frequency

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



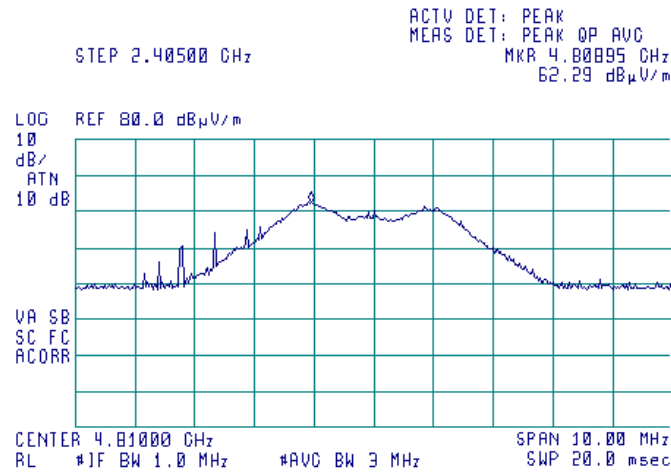


HERMON LABORATORIES

<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
Test procedure: ANSI C63.10 sections 6.5, 6.6			
Test mode: Compliance		Verdict: PASS	
Date(s): 27-Apr-17			
Temperature: 23 °C	Relative Humidity: 45 %	Air Pressure: 1008 hPa	Power: 48 VDC
Remarks:			

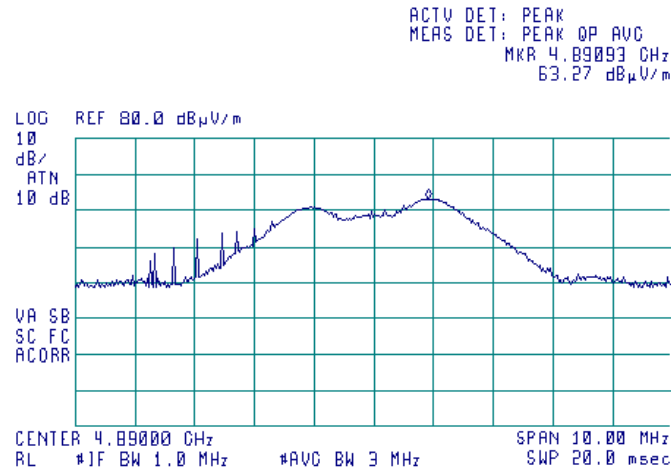
**Plot 7.1.20 Radiated emission measurements at the second harmonic of the low frequency**

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



**Plot 7.1.21 Radiated emission measurements at the second harmonic of the mid frequency**

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





HERMON LABORATORIES

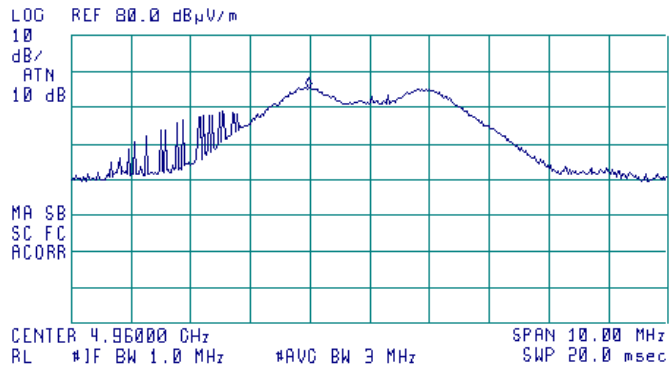
<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict: PASS</b>	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

**Plot 7.1.22 Radiated emission measurements at the second harmonic of the high frequency**

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



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 4.95898 CHz  
65.10 dB $\mu$ V/m



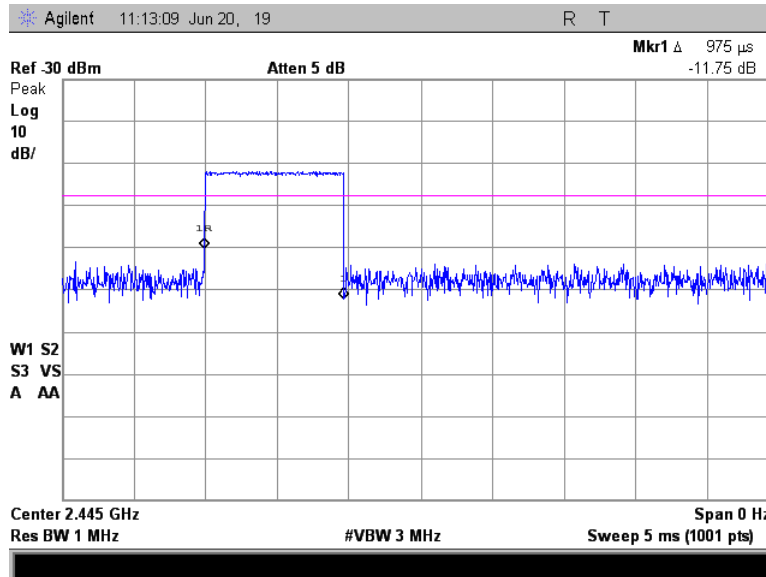




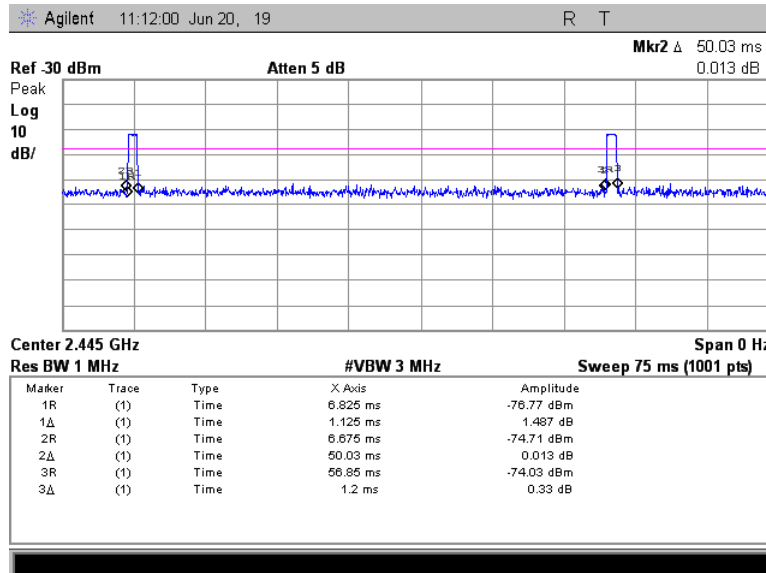
HERMON LABORATORIES

<b>Test specification: Section 15.249(a)(d), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict: PASS</b>	
<b>Date(s):</b> 27-Apr-17			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1008 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Plot 7.1.23 Transmission pulse duration



Plot 7.1.24 Transmission pulse period





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

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0415	Cable, Coax, RF, RG-214, 12.3 m	Hermon Laboratories	CC-3	056	18-Dec-16	18-Dec-17
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	27-Oct-16	27-Oct-17
0569	Antenna, Log Periodic, 200 - 1000 MHz	Electro-Metrics	LPA 25/30	1953	05-May-17	05-May-18
0651	Antenna, Biconical, 30 - 200 MHz	Hermon Laboratories	AB-200	124	16-Mar-16	16-Mar-18
0748	Mixer Millimeter Wave Harmonic 60 - 90 GHz	Oleson Microwave Labs	M12 HW	E 804 29-1	13-Apr-17	13-Apr-20
1552	Cable RF, 8 m	Alpha Wire	RG-214	1552	18-Dec-16	18-Dec-17
2697	Antenna, 30 MHz - 3.0 GHz	Sunol Sciences. Corp. Pleasanton, California USA	JB3	A022805	12-May-17	12-May-18
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	18-Dec-16	18-Dec-17
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	07-May-17	07-May-18
4277	Test Cable , DC-18 GHz, 3.05 m, N/M - N/M	Mini-Circuits	APC-10FT-NMNM+	0748A	10-Sep-17	10-Sep-18
4663	Spectrum Analyzer, 9 kHz - 1.5 GHz	Hewlett Packard	E7401A	US391501 41	15-Mar-17	15-Mar-18
4778	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL4777	Hewlett Packard	8542E	30807A00 262, 3427A001 23	31-Oct-16	31-Oct-17
4933	Active Horn Antenna, 1 GHz to 18 GHz	Com-Power Corporation	AHA-118	701046	14-Oct-16	14-Oct-17
5104	RF cable, 18 GHz, 6 m, N-type	Huber-Suhner	SF106A/1 1N/11N/6 000MM	500850/6A	30-Dec-99	30-Dec-00
5105	RF cable, 18 GHz, 6 m, N-type	Huber-Suhner	SF106A/1 1N/11N/6 000MM	500851/6A	27-Jul-17	27-Jul-18
5107	RF cable, 18 GHz, 4.5 m, N-type	Huber-Suhner	SF106A/1 1N/11N/4 500MM	500845/6A	27-Jul-17	27-Jul-18
5110	RF cable, 18 GHz, 3 m, N-type	Huber-Suhner	ST18A/N m/Nm/300 0	600818/18 A	27-Jul-17	27-Jul-18
5111	RF cable, 40 GHz, 5.5 m, K-type	Huber-Suhner	SF102EA/ 11SK/11S K/5500M M	502493/2E A	27-Jul-17	27-Jul-18



HERMON LABORATORIES

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
5112	RF cable, 40 GHz, 5.5 m, K-type	Huber-Suhner	SF102EA/ 11SK/11S K/5500M M	502494/2E A	27-Jul-17	27-Jul-18
5121	Microwave preamplifier, 500 MHz to 18 GHz, 40 dB Gain	COM-POWER CORPORATIO N	PAM- 118A	551119	23-Aug-17	23-Aug-18

**9 APPENDIX B Measurement uncertainties****Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements**

Test description	Expanded uncertainty
Conducted emissions with LISN	9 kHz to 150 kHz: $\pm 3.9$ dB 150 kHz to 30 MHz: $\pm 3.8$ dB
Radiated emissions at 10 m measuring distance Horizontal polarization  Vertical polarization	Biconilog antenna: $\pm 5.0$ dB Biconical antenna: $\pm 5.0$ dB Log periodic antenna: $\pm 5.1$ dB Double ridged horn antenna: $\pm 5.3$ dB Biconilog antenna: $\pm 5.5$ dB Biconical antenna: $\pm 5.5$ dB Log periodic antenna: $\pm 5.6$ dB Double ridged horn antenna: $\pm 5.8$ dB
Radiated emissions at 3 m measuring distance Horizontal polarization  Vertical polarization	Biconilog antenna: $\pm 5.3$ dB Biconical antenna: $\pm 5.0$ dB Log periodic antenna: $\pm 5.3$ dB Double ridged horn antenna: $\pm 5.3$ dB Biconilog antenna: $\pm 6.0$ dB Biconical antenna: $\pm 5.7$ dB Log periodic antenna: $\pm 6.0$ dB Double ridged horn antenna: $\pm 6.0$ dB
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: $\pm 2.6$ dB 2.9 GHz to 6.46 GHz: $\pm 3.5$ dB 6.46 GHz to 13.2 GHz: $\pm 4.3$ dB 13.2 GHz to 22.0 GHz: $\pm 5.0$ dB 22.0 GHz to 26.8 GHz: $\pm 5.5$ dB 26.8 GHz to 40.0 GHz: $\pm 4.8$ dB
Duty cycle, timing (Tx ON / OFF) and average factor measurements	$\pm 1.0$ %
Occupied bandwidth	$\pm 8.0$ %

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.



## 10 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, Radio, Safety, Environmental and Telecommunication testing facility.

Hermon Laboratories is recognized and accredited by the Federal Communications Commission (USA) for 1, 2, 15, 18 parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; registered by Industry Canada for electromagnetic emissions, file number IC 2186A-1 for OATS, certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-869 for RE measurements above 1 GHz, C-845 for conducted emissions site and T-1606 for conducted emissions at telecommunication ports).

The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing, environmental simulation and calibration (for exact scope please refer to Certificate No. 839.01, 839.03 and 839.04).

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

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

## 11 APPENDIX D Specification references

47CFR part 15: 2016	Radio Frequency Devices.
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications
ANSI C63.4: 2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.



## 12 APPENDIX E Test equipment correction factors

**Antenna factor**  
**Log periodic antenna**  
**Electro-Metrics, model LPA-25/30**  
**Ser.No.1953, HL 0569**

Frequency MHz	Antenna Factor dB(1/m)	Frequency MHz	Antenna Factor dB(1/m)
200	15.2	625	25.2
225	15.1	650	25.8
250	16.3	675	27.2
275	17.2	700	27.6
300	19.6	725	27.6
325	18.4	750	27.6
350	19.0	775	28.0
375	20.0	800	28.2
400	20.9	825	29.4
425	21.3	850	29.9
450	22.1	875	30.0
475	22.7	900	30.4
500	23.2	925	30.6
525	23.9	950	30.8
550	24.2	975	31.6
575	24.6	1000	32.1
600	24.7		

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**  
**Biconical antenna**  
**HL, model LPA 200/1000**  
**Ser.No.124, HL 0651**

Frequency MHz	Antenna Factor dB(1/m)
30	14.0
35	11.9
40	10.9
45	10.3
50	10.1
60	9.7
70	7.9
80	7.1
90	9.1
100	11.1
120	15.3
140	13.1
160	14.8
180	16.0
200	17.4

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 calibration  
Sunlo Sciences Inc., model JB3, serial number A022805, HL 2697

Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain
30	22.2	-22.5	0.01	620	19.7	6.3	4.27	1215	24.9	7.0	5.05	1810	28.3	7.1	5.08	2405	30.9	6.9	4.89
35	18.5	-17.4	0.02	625	19.7	6.5	4.42	1220	24.9	7.0	4.99	1815	28.5	6.9	4.91	2410	30.9	6.9	4.89
40	14.7	-12.5	0.06	630	19.6	6.6	4.57	1225	25.1	6.9	4.91	1820	28.6	6.8	4.74	2415	31.0	6.9	4.85
45	11.3	-8.1	0.16	635	19.7	6.5	4.48	1230	25.2	6.8	4.82	1825	28.7	6.8	4.75	2420	31.0	6.8	4.82
45	11.3	-8.1	0.16	640	19.9	6.4	4.40	1235	25.1	7.0	4.96	1830	28.7	6.8	4.76	2425	31.1	6.8	4.81
50	8.9	-4.7	0.34	645	19.9	6.5	4.45	1240	25.0	7.1	5.09	1835	28.7	6.7	4.72	2430	31.0	6.9	4.87
55	7.9	-2.8	0.52	650	19.9	6.5	4.51	1245	25.0	7.1	5.12	1840	28.8	6.7	4.69	2435	31.0	6.9	4.86
60	7.8	-2.1	0.82	655	19.9	6.6	4.60	1250	25.0	7.1	5.15	1845	28.8	6.9	4.93	2440	31.2	6.8	4.74
65	8.5	-2.0	0.63	660	19.9	6.7	4.69	1255	25.0	7.2	5.25	1850	28.4	7.1	5.12	2445	31.1	6.9	4.91
70	9.0	-1.9	0.64	665	19.9	6.7	4.70	1260	24.9	7.3	5.36	1855	28.5	7.0	5.07	2450	31.0	7.0	4.96
75	8.8	-1.1	0.78	670	20.0	6.7	4.71	1265	25.0	7.3	5.31	1860	28.6	7.0	5.01	2455	31.0	7.0	5.01
80	8.4	-0.2	0.97	675	20.1	6.7	4.71	1270	25.1	7.2	5.26	1865	28.5	7.1	5.17	2460	30.9	7.2	5.19
85	8.0	0.8	1.20	680	20.1	6.7	4.71	1275	25.3	7.0	5.05	1870	28.4	7.3	5.33	2465	31.1	6.9	4.95
90	8.2	1.1	1.29	685	20.1	6.8	4.79	1280	25.5	6.8	4.94	1875	28.4	7.2	5.28	2470	31.3	6.8	4.78
95	9.2	0.5	1.13	690	20.1	6.9	4.88	1285	25.4	7.0	4.97	1880	28.5	7.2	5.32	2475	31.4	6.7	4.69
100	10.6	-0.4	0.92	695	20.2	6.8	4.82	1290	25.3	7.1	5.10	1885	28.5	7.2	5.22	2480	31.3	6.8	4.79
110	12.6	-1.6	0.70	705	20.4	6.8	4.75	1300	25.2	7.3	5.33	1895	28.6	7.2	5.24	2490	31.1	7.0	4.99
120	13.9	-2.1	0.62	715	20.5	6.8	4.80	1310	25.5	7.1	5.09	1905	28.5	7.3	5.36	2500	30.9	7.2	5.27
125	14.2	-2.0	0.63	720	20.5	6.9	4.85	1315	25.4	7.2	5.23	1910	28.5	7.4	5.45	2505	31.1	7.1	5.15
130	14.2	-1.7	0.68	725	20.6	6.8	4.81	1320	25.3	7.3	5.36	1915	28.5	7.3	5.38	2510	31.0	7.2	5.22
140	13.4	-0.3	0.94	735	20.9	6.7	4.85	1330	25.6	7.0	5.08	1925	28.5	7.3	5.35	2520	31.2	7.0	5.05
150	12.9	0.8	1.21	745	21.0	6.6	4.59	1340	25.7	7.1	5.09	1935	28.5	7.4	5.54	2530	31.0	7.3	5.37
160	12.7	1.6	1.44	755	21.0	6.8	4.74	1350	25.7	7.1	5.17	1945	28.5	7.5	5.59	2540	31.2	7.1	5.09
165	12.5	2.0	1.59	760	21.0	6.8	4.83	1355	25.8	7.0	5.06	1950	28.6	7.4	5.48	2545	31.0	7.3	5.43
170	12.2	2.6	1.83	765	21.1	6.8	4.73	1360	25.9	6.9	4.95	1955	28.6	7.5	5.57	2550	31.0	7.3	5.39
175	11.8	3.3	2.13	770	21.3	6.7	4.64	1365	26.0	6.9	4.95	1960	28.6	7.5	5.65	2555	31.1	7.2	5.30
180	11.6	3.7	2.36	775	21.3	6.7	4.68	1370	26.0	7.0	4.98	1965	28.7	7.4	5.47	2560	31.0	7.4	5.47
185	11.5	4.0	2.54	780	21.3	6.7	4.72	1375	26.0	7.0	5.01	1970	28.6	7.2	5.29	2565	31.2	7.0	5.05
190	11.6	4.2	2.61	785	21.3	6.8	4.77	1380	26.0	7.0	5.06	1975	28.9	7.2	5.22	2570	31.1	7.3	5.37
200	13.1	3.2	2.07	795	21.4	6.8	4.79	1390	26.1	6.9	4.92	1985	29.1	7.1	5.11	2580	31.6	6.9	4.87
205	12.0	4.4	2.76	800	21.5	6.8	4.77	1395	26.2	6.9	4.94	1990	29.1	7.0	5.06	2585	31.6	6.8	4.79
210	11.0	5.6	3.66	805	21.6	6.7	4.71	1400	26.2	7.0	4.96	1995	29.1	7.1	5.09	2590	31.6	6.9	4.88
215	11.3	5.6	3.59	810	21.7	6.7	4.65	1405	26.1	7.0	5.02	2000	29.1	7.1	5.11	2595	31.5	7.0	4.97
220	11.6	5.5	3.52	815	21.7	6.7	4.72	1410	26.1	7.1	5.09	2005	29.1	7.1	5.16	2600	31.6	6.9	4.86
225	11.7	5.5	3.45	820	21.7	6.8	4.80	1415	26.2	7.0	5.02	2010	29.2	7.1	5.15	2605	31.3	7.2	5.30
230	11.9	5.5	3.37	825	21.7	6.8	4.82	1420	26.3	7.0	4.96	2015	29.2	7.1	5.13	2610	31.4	7.1	5.15
235	12.1	5.5	3.56	830	21.7	6.9	4.85	1425	26.2	7.1	5.10	2020	29.2	7.1	5.18	2615	31.7	6.9	4.88
240	12.3	5.5	3.54	835	21.8	6.8	4.82	1430	26.1	7.2	5.25	2025	29.3	7.1	5.08	2620	31.6	7.0	4.97
245	12.3	5.7	3.71	840	21.9	6.8	4.80	1435	26.1	7.2	5.24	2030	29.3	7.0	5.05	2625	31.4	7.1	5.17
250	12.3	5.9	3.88	845	21.9	6.8	4.83	1440	26.2	7.2	5.24	2035	29.3	7.1	5.07	2630	31.6	7.0	5.00
255	12.5	5.9	3.85	850	21.9	6.9	4.86	1445	26.3	1	5.11	2040	29.3	7.1	5.13	2635	31.8	6.8	4.82
260	12.7	5.8	3.83	855	22.0	6.8	4.80	1450	26.5	7.0	4.98	2045	29.2	7.2	5.23	2640	31.7	7.0	4.98
265	13.2	5.5	3.54	860	22.1	6.8	4.74	1455	26.4	7.1	5.07	2050	29.2	7.2	5.27	2645	31.7	6.9	4.93
270	13.7	5.2	3.32	865	22.0	6.9	4.92	1460	26.4	7.1	5.17	2055	29.3	7.2	5.21	2650	31.8	6.9	4.85
275	13.7	5.3	3.39	870	21.9	7.1	5.11	1465	26.4	7.2	5.19	2060	29.5	7.0	5.02	2655	31.8	6.9	4.85
280	13.7	5.4	3.50	875	22.0	7.1	5.08	1470	26.4	7.2	5.22	2065	29.4	7.1	5.08	2660	31.7	7.0	5.02
285	13.7	5.6	3.61	880	22.1	7.0	5.05	1475	26.4	7.1	5.17	2070	29.4	7.1	5.10	2665	32.0	6.7	4.71
290	13.7	5.7	3.72	885	22.1	7.0	5.06	1480	26.5	7.1	5.12	2075	29.5	7.0	5.01	2670	32.0	6.7	4.67
295	13.8	5.8	3.77	890	22.1	7.0	5.06	1485	26.5	7.1	5.14	2080	29.6	6.8	4.76	2675	31.9	6.8	4.81
300	13.9	5.8	3.81	895	22.2	7.1	5.09	1490	26.5	7.1	5.17	2085	29.7	6.9	4.89	2680	31.7	7.0	5.04
305	14.0	5.9	3.85	900	22.2	7.1	5.12	1495	26.5	7.2	5.24	2090	29.7	6.9	4.86	2685	31.9	6.8	4.83
310	14.1	5.9	3.88	905	22.3	7.1	5.09	1500	26.5	7.2	5.31	2095	29.8	6.8	4.78	2690	32.1	6.7	4.72
315	14.3	5.8	3.89	910	22.3	7.0	5.05	1505	26.5	7.2	5.27	2100	29.8	6.8	4.75	2695	32.1	6.7	4.71
320	14.4	5.8	3.90	915	22.4	7.0	4.99	1510	26.6	7.2	5.23	2105	29.8	6.8	4.81	2700	32.0	6.8	4.81
325	14.5	5.9	3.92	920	22.6	6.9	4.92	1515	26.6	7.2	5.30	2110	29.8	6.8	4.78	2705	32.0	6.8	4.80
330	14.6	5.9	3.93	925	22.7	6.9	4.85	1520	26.5	7.3	5.38	2115	29.9	6.8	4.76	2710	32.1	6.8	4.79
335	14.7	6.0	4.02	930	22.8	6.8	4.77	1525	26.6	7.3	5.37	2120	29.9	6.8	4.84	2715	32.1	6.7	4.71
340	14.7	6.2	4.12	935	22.8	6.8	4.83	1530	26.6	7.3	5.36	2125	29.9	6.9	4.89	2720	32.4	6.5	4.47
345	14.9	6.1	4.06	940	22.8	6.9	4.89	1535	26.6	7.4	5.44	2130	29.9	6.9	4.90	2725	32.2	6.7	4.63
350	15.1	6.0	3.99	945	22.8	6.9	4.87	1540	26.5	7.4	5.53	2135	29.8	6.9	4.94	2730	31.9	7.0	5.05
355	15.3	5.9	3.88	950	22.9	6.9	4.85	1545	26.5	7.5	5.58	2140	29.8	7.1	5.08	2735	31.6	7.4	5.44
360	15.7	5.8	3.78	955	23.0	6.8	4.81	1550	26.5	7.5	5.63	2145	29.8	6.9	4.92	2740	31.8	7.1	5.45
365	15.5	5.9	3.80	960	23.1	6.8	4.77	1555	26.7	7.3	5.63	2150	29.9	7.0	4.98	2745	31.9	7.0	5.06
370	15.5	6.0	4.01	965	23.1	6.7	4.73	1560	26.9	7.1	5.18	2155	29.8	7.1	5.10	2750	32.0	6.9	4.94
375	15.6	6.1	4.03	970	23.2	6.7	4.69	1565	26.9	7.2	5.23	2160	29.8	7.1	5.09	2755	32.0	7.0	4.98
380	15.7	6.1	4.05	975	23.3	6.6	4.62	1570	26.9	7.2	5.30	2165	29.9	7.0	5.00	2760	32.0	7.0	5.06
385	15.7	6.2	4.15	980	23.5	6.6	4.54	1575	27.0	7.2	5.23	2170	29.9	7.1	5.07	2765	32.2	6.8	4.80
390	15.7	6.3	4.25	985	23.5	6.6	4.52</												



Antenna factor, HL 4933



### Active Horn Antenna Factor Calibration

1 GHz to 18 GHz

<b>Equipment:</b>	<b>ACTIVE HORN ANTENNA</b>
<b>Model:</b>	<b>AHA-118</b>
<b>Serial Number:</b>	<b>701046</b>
<b>Calibration Distance:</b>	<b>3 Meter</b>
<b>Polarization:</b>	<b>Horizontal</b>
<b>Calibration Date:</b>	<b>11/12/2014</b>

Frequency (GHz)	Preamplifier Gain (dB)	Antenna Factor with pre-amp (dB/m)	Frequency (GHz)	Preamplifier Gain (dB)	Antenna Factor with pre-amp (dB/m)
1	40.96	-16.47	10	40.94	-1.97
1.5	41.21	-14.53	10.5	40.63	-1.06
2	41.44	-13.30	11	40.74	-1.50
2.5	41.71	-12.87	11.5	40.65	-0.52
3	41.96	-12.26	12	40.76	-0.15
3.5	42.14	-11.77	12.5	41.03	-0.85
4	42.13	-10.91	13	41.37	-0.81
4.5	41.79	-9.41	13.5	41.18	0.05
5	41.44	-7.54	14	40.98	0.36
5.5	40.91	-6.47	14.5	40.81	1.26
6	40.69	-5.48	15	40.65	0.25
6.5	40.64	-5.53	15.5	40.93	-1.05
7	40.76	-4.12	16	41.31	-1.44
7.5	40.94	-3.12	16.5	40.96	-0.80
8	40.68	-1.69	17	40.64	-0.02
8.5	40.08	-1.71	17.5	40.57	1.81
9	40.41	-1.86	18	40.08	3.63
9.5	41.21	-2.73			

Calibration according to ARP 958

**Antenna Factor to be added to receiver reading:**

Meter Reading (dBuV) + Antenna Factor (dB/m) = Corrected Reading (dBuV/m)





**Cable loss**  
**Cable coax, RG-214, 12.3 m, s/n 056, HL 0415**

No.	Frequency, MHz	Cable loss, dB	Measured uncertainty, dB
1	10	0.23	±0.12
2	30	0.44	±0.12
3	50	0.60	±0.12
4	100	0.89	±0.12
5	150	1.11	±0.13
6	200	1.30	±0.13
7	250	1.45	±0.13
8	300	1.61	±0.13
9	400	1.94	±0.13
10	500	2.18	±0.13
11	600	2.45	±0.14
12	700	2.67	±0.14
13	800	2.94	±0.14
14	900	3.16	±0.14
15	1000	3.38	±0.14



**Cable loss**  
**Cable coaxial, RG-214/U, N type-N type, 17 m**  
**Teldor, HL 3612**

Frequency, MHz	Measured, dB
0.10	0.04
10.0	0.37
20.0	0.54
30.0	0.69
40.0	0.80
50	0.91
60	1.00
70	1.08
80	1.16
90	1.24
100	1.31
150	1.63
200	1.90
250	2.15
300	2.38
350	2.60
400	2.80
450	3.00
500	3.18
550	3.36
600	3.54
650	3.71
700	3.87
750	4.04
800	4.20
850	4.35
900	4.51
950	4.66
1000	4.81



**Cable loss**  
**Test cable, Mini-Circuits, S/N 0748A, 18 GHz, 3.05 m, N/M - N/M**  
**APC-10FT-NMNM+, HL 4277**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.12	4400	3.19	9000	4.82	13600	5.97
30	0.21	4500	3.24	9100	4.87	13700	6.01
50	0.28	4600	3.29	9200	4.90	13800	6.04
100	0.40	4700	3.34	9300	4.96	13900	6.09
200	0.59	4800	3.37	9400	4.99	14000	6.12
300	0.73	4900	3.41	9500	5.03	14100	6.16
400	0.86	5000	3.45	9600	5.07	14200	6.20
500	0.97	5100	3.48	9700	5.11	14300	6.22
600	1.07	5200	3.52	9800	5.13	14400	6.26
700	1.15	5300	3.56	9900	5.15	14500	6.29
800	1.23	5400	3.58	10000	5.17	14600	6.33
900	1.31	5500	3.62	10100	5.19	14700	6.33
1000	1.39	5600	3.65	10200	5.19	14800	6.35
1100	1.46	5700	3.69	10300	5.21	14900	6.38
1200	1.54	5800	3.72	10400	5.22	15000	6.38
1300	1.60	5900	3.76	10500	5.22	15100	6.40
1400	1.67	6000	3.80	10600	5.22	15200	6.42
1500	1.74	6100	3.84	10700	5.25	15300	6.46
1600	1.79	6200	3.89	10800	5.25	15400	6.51
1700	1.86	6300	3.92	10900	5.26	15500	6.55
1800	1.92	6400	3.96	11000	5.29	15600	6.56
1900	1.98	6500	4.00	11100	5.30	15700	6.59
2000	2.04	6600	4.04	11200	5.31	15800	6.60
2100	2.09	6700	4.07	11300	5.35	15900	6.64
2200	2.14	6800	4.11	11400	5.36	16000	6.65
2300	2.20	6900	4.14	11500	5.39	16100	6.65
2400	2.25	7000	4.17	11600	5.41	16200	6.67
2500	2.31	7100	4.21	11700	5.45	16300	6.69
2600	2.36	7200	4.23	11800	5.48	16400	6.71
2700	2.42	7300	4.27	11900	5.51	16500	6.72
2800	2.46	7400	4.30	12000	5.53	16600	6.73
2900	2.51	7500	4.34	12100	5.56	16700	6.75
3000	2.56	7600	4.37	12200	5.59	16800	6.80
3100	2.60	7700	4.40	12300	5.61	16900	6.82
3200	2.65	7800	4.44	12400	5.62	17000	6.85
3300	2.70	7900	4.47	12500	5.65	17100	6.90
3400	2.75	8000	4.49	12600	5.68	17200	6.96
3500	2.80	8100	4.53	12700	5.71	17300	7.02
3600	2.85	8200	4.57	12800	5.73	17400	7.07
3700	2.90	8300	4.60	12900	5.76	17500	7.06
3800	2.95	8400	4.63	13000	5.80	17600	7.06
3900	2.98	8500	4.67	13100	5.83	17700	7.08
4000	3.02	8600	4.69	13200	5.86	17800	7.09
4100	3.07	8700	4.73	13300	5.88	17900	7.07
4200	3.10	8800	4.76	13400	5.91	18000	7.08
4300	3.14	8900	4.79	13500	5.94		



**Cable loss**  
**Test cable, Mini-Circuits, S/N 0755A, 18 GHz, 4.6 m, N/M - N/M**  
**APC-15FT-NMNM+, HL 4278**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.24	4900	4.19	10000	6.47	15100	8.33
30	0.26	5000	4.25	10100	6.50	15200	8.35
50	0.34	5100	4.29	10200	6.52	15300	8.37
100	0.50	5200	4.32	10300	6.57	15400	8.40
200	0.72	5300	4.38	10400	6.59	15500	8.42
300	0.90	5400	4.41	10500	6.61	15600	8.46
400	1.06	5500	4.46	10600	6.64	15700	8.50
500	1.20	5600	4.51	10700	6.64	15800	8.52
600	1.32	5700	4.56	10800	6.65	15900	8.56
700	1.44	5800	4.59	10900	6.68	16000	8.61
800	1.54	5900	4.64	11000	6.68	16100	8.64
900	1.64	6000	4.69	11100	6.69	16200	8.66
1000	1.74	6100	4.72	11200	6.70	16300	8.70
1100	1.83	6200	4.77	11300	6.74	16400	8.73
1200	1.92	6300	4.80	11400	6.78	16500	8.74
1300	2.01	6400	4.83	11500	6.81	16600	8.75
1400	2.09	6500	4.89	11600	6.84	16700	8.78
1500	2.18	6600	4.90	11700	6.87	16800	8.79
1600	2.25	6700	4.95	11800	6.92	16900	8.81
1700	2.33	6800	5.01	11900	6.98	17000	8.85
1800	2.39	6900	4.99	12000	7.02	17100	8.90
1900	2.47	7000	5.04	12100	7.08	17200	8.95
2000	2.53	7100	5.11	12200	7.15	17300	8.99
2100	2.60	7200	5.14	12300	7.20	17400	9.03
2200	2.67	7300	5.21	12400	7.26	17500	9.07
2300	2.73	7400	5.29	12500	7.31	17600	9.11
2400	2.80	7500	5.33	12600	7.36	17700	9.15
2500	2.87	7600	5.38	12700	7.41	17800	9.19
2600	2.93	7700	5.46	12800	7.46	17900	9.24
2700	3.00	7800	5.52	12900	7.51	18000	9.28
2800	3.06	7900	5.58	13000	7.55		
2900	3.12	8000	5.64	13100	7.59		
3000	3.18	8100	5.69	13200	7.65		
3100	3.24	8200	5.75	13300	7.69		
3200	3.30	8300	5.80	13400	7.72		
3300	3.35	8400	5.84	13500	7.78		
3400	3.42	8500	5.90	13600	7.82		
3500	3.46	8600	5.97	13700	7.86		
3600	3.52	8700	5.99	13800	7.91		
3700	3.57	8800	6.04	13900	7.96		
3800	3.61	8900	6.10	14000	8.01		
3900	3.67	9000	6.13	14100	8.06		
4000	3.71	9100	6.17	14200	8.10		
4100	3.77	9200	6.23	14300	8.13		
4200	3.83	9300	6.27	14400	8.16		
4300	3.89	9400	6.30	14500	8.19		
4400	3.94	9500	6.35	14600	8.21		
4500	4.00	9600	6.37	14700	8.23		
4600	4.05	9700	6.40	14800	8.26		
4700	4.10	9800	6.44	14900	8.28		
4800	4.16	9900	6.45	15000	8.30		



**Cable loss**  
**RF Cable, Huber-Suhner, 18 GHz, 6 m, N- type,**  
**SF106A/11N/11N/6000MM, S/N 500851/6A**  
**HL 5105**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
0.1	0.01	5500	2.41
50	0.22	6000	2.53
100	0.31	6500	2.64
200	0.43	7000	2.75
300	0.53	7500	2.85
400	0.61	8000	2.96
500	0.68	8500	3.05
600	0.75	9000	3.15
700	0.81	9500	3.26
800	0.87	10000	3.34
900	0.93	10500	3.44
1000	0.98	11000	3.53
1100	1.03	11500	3.61
1200	1.07	12000	3.71
1300	1.12	12500	3.81
1400	1.16	13000	3.89
1500	1.21	13500	3.97
1600	1.25	14000	4.05
1700	1.28	14500	4.13
1800	1.32	15000	4.21
1900	1.37	15500	4.29
2000	1.40	16000	4.36
2500	1.58	16500	4.43
3000	1.74	17000	4.49
3500	1.89	17500	4.58
4000	2.03	18000	4.67
4500	2.17		
5000	2.29		



**Cable loss**  
**RF Cable, Huber-Suhner, 18 GHz, 6 m, N- type,**  
**SF106A/11N/11N/4500MM, S/N 500845/6A**  
**HL 5107**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
0.1	0.01	5500	1.75
50	0.16	6000	1.84
100	0.22	6500	1.92
200	0.31	7000	2.00
300	0.38	7500	2.07
400	0.44	8000	2.15
500	0.49	8500	2.23
600	0.54	9000	2.29
700	0.58	9500	2.38
800	0.63	10000	2.43
900	0.67	10500	2.50
1000	0.71	11000	2.57
1100	0.74	11500	2.63
1200	0.77	12000	2.69
1300	0.81	12500	2.76
1400	0.84	13000	2.82
1500	0.87	13500	2.87
1600	0.91	14000	2.93
1700	0.93	14500	3.00
1800	0.96	15000	3.06
1900	0.99	15500	3.12
2000	1.01	16000	3.18
2500	1.14	16500	3.22
3000	1.26	17000	3.28
3500	1.37	17500	3.36
4000	1.47	18000	3.43
4500	1.57		
5000	1.66		



**Cable loss**  
**RF Cable, Huber-Suhner, 18 GHz, 3 m, N- type,**  
**ST18A/Nm/Nm/3000, S/N 600818/18A**  
**HL 5110**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
0.1	0.01	5500	1.99
50	0.17	6000	2.10
100	0.24	6500	2.20
200	0.34	7000	2.29
300	0.42	7500	2.38
400	0.48	8000	2.47
500	0.54	8500	2.57
600	0.59	9000	2.65
700	0.64	9500	2.74
800	0.69	10000	2.83
900	0.73	10500	2.91
1000	0.77	11000	2.99
1100	0.82	11500	3.07
1200	0.86	12000	3.14
1300	0.89	12500	3.22
1400	0.93	13000	3.29
1500	0.96	13500	3.37
1600	1.00	14000	3.45
1700	1.03	14500	3.52
1800	1.06	15000	3.59
1900	1.10	15500	3.66
2000	1.13	16000	3.74
2500	1.28	16500	3.80
3000	1.41	17000	3.88
3500	1.54	17500	4.00
4000	1.66	18000	4.02
4500	1.78		
5000	1.89		



**Cable loss**  
**RF Cable, Huber-Suhner, 40 GHz, 5.5 m, K type,**  
**SF102EA/11SK/11SK/5500MM, S/N 502493/2EA**  
**HL 5111**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
100	0.68	20500	10.17
200	0.97	21000	10.30
300	1.18	21500	10.43
500	1.52	22000	10.58
1000	2.14	22500	10.73
1500	2.62	23000	10.85
2000	3.03	23500	10.98
2500	3.39	24000	11.11
3000	3.72	24500	11.20
3500	4.03	25000	11.32
4000	4.32	25500	11.47
4500	4.59	26000	11.59
5000	4.84	26500	11.72
5500	5.09	27000	11.83
6000	5.32	27500	11.94
6500	5.55	28000	12.04
7000	5.77	28500	12.16
7500	5.99	29000	12.28
8000	6.19	29500	12.40
8500	6.40	30000	12.50
9000	6.60	30500	12.59
9500	6.79	31000	12.68
10000	6.98	31500	12.80
10500	7.16	32000	12.94
11000	7.34	32500	13.09
11500	7.51	33000	13.23
12000	7.68	33500	13.32
12500	7.84	34000	13.44
13000	8.00	34500	13.54
13500	8.15	35000	13.68
14000	8.31	35500	13.81
14500	8.46	36000	13.90
15000	8.62	36500	13.99
15500	8.76	37000	14.12
16000	8.91	37500	14.22
16500	9.06	38000	14.33
17000	9.21	38500	14.47
17500	9.35	39000	14.54
18000	9.49	39500	14.62
18500	9.62	40000	14.75
19000	9.76		
19500	9.90		
20000	10.05		





**Cable loss**  
**RF Cable, Huber-Suhner, 40 GHz, 5.5 m, K type,**  
**SF102EA/11SK/11SK/5500MM, S/N 502494/2EA**  
**HL 5112**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
100	0.69	20500	10.18
200	0.97	21000	10.32
300	1.18	21500	10.47
500	1.52	22000	10.60
1000	2.14	22500	10.75
1500	2.62	23000	10.87
2000	3.03	23500	11.00
2500	3.40	24000	11.12
3000	3.73	24500	11.23
3500	4.04	25000	11.35
4000	4.33	25500	11.52
4500	4.60	26000	11.64
5000	4.86	26500	11.73
5500	5.10	27000	11.84
6000	5.34	27500	11.93
6500	5.57	28000	12.05
7000	5.79	28500	12.19
7500	6.00	29000	12.33
8000	6.21	29500	12.44
8500	6.43	30000	12.53
9000	6.62	30500	12.58
9500	6.82	31000	12.71
10000	7.01	31500	12.86
10500	7.17	32000	13.00
11000	7.34	32500	13.11
11500	7.51	33000	13.24
12000	7.68	33500	13.33
12500	7.84	34000	13.44
13000	8.00	34500	13.58
13500	8.16	35000	13.69
14000	8.32	35500	13.81
14500	8.48	36000	13.93
15000	8.63	36500	14.05
15500	8.77	37000	14.24
16000	8.92	37500	14.28
16500	9.08	38000	14.38
17000	9.23	38500	14.50
17500	9.37	39000	14.61
18000	9.51	39500	14.70
18500	9.66	40000	14.83
19000	9.78		
19500	9.92		
20000	10.07		



### 13 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
NB	narrow band
OATS	open area test site
$\Omega$	Ohm
PM	pulse modulation
PS	power supply
ppm	part per million ( $10^{-6}$ )
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
WB	wideband

END OF TEST REPORT

14 APPENDIX G Manufacturer's declaration



Declaration of Identity

We, the undersigned,

Manufacturer	SCR Engineers Ltd.
Address, city	18 Hamelacha St. Poleg Industrial Park, 4250440 Netanya
Country	Israel
Phone number	+972-9-8652050
Fax number/e-mail	+972-9-8650703

declare under our sole responsibility that the following equipment:

LD module and internal antenna installed in BU500 and BU500E units is electrically/electronically/mechanically identical to LD module installed in SenseTime Controller (STC).

Note:- Each equipment contains 2 LD modules and one Antenna

Name and position of person binding the manufacturer authorized representative	Signature Z.K. 
Mr. Zeev Kapelnik Engineering & NPI	5 June 2017

END OF DOCUMENT