

TEST REPORT

ACCORDING TO: FCC CFR 47 Part 15 subpart C, section 15.231

FOR:

3M Electronic Monitoring Ltd.
One-Piece Home Curfew RF
Monitoring Unit
Model: 1000B
FCC ID: DGF-TSSDB-830-5

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.
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1 Applicant information

Client name: 3M Electronic Monitoring Ltd.
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Telephone: +972 3-7671700 ext. 6551
Fax: +972 3-7671701
E-mail: hsharet@mmm.com
Contact name: Mr. Hanan Sharet

2 Equipment under test attributes

Product name: One-Piece Home Curfew RF Monitoring Unit
Product type: Transceiver
Model: 1000B
Serial number: 52434671
Hardware version: B08
Software release: 13.1
Receipt date: 09-Mar-16

3 Manufacturer information

Manufacturer name: 3M Electronic Monitoring Ltd.
Address: 2 Habarzel St., P.O. Box13236, Tel-Aviv 6971002, Israel
Telephone: +972 3-7671700 ext. 6551
Fax: +972 3-7671701
E-mail: hsharet@mmm.com
Contact name: Mr. Hanan Sharet

4 Test details

Project ID: 28093
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 09-Mar-16
Test completed: 20-Apr-16
Test specification: FCC 47CFR part 15, subpart C, §15.231

5 Tests summary

Test	Status
Transmitter characteristics	
Section 15.231(a), Periodic operation requirements	Pass
Section 15.231(b), Field strength of emissions	Pass
Section 15.231(c), Occupied bandwidth	Pass
Section 15.203, Antenna requirement	Pass
Section 15.207(a), Conducted 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.

This test report supersedes the previously issued test report identified by Doc ID:3MERAD_FCC.28093F_rev1.

	Name and Title	Date	Signature
Tested by:	Mrs. E. Pitt, test engineer	April 20, 2016	
Reviewed by:	Ms. N. Averin, certification engineer	May 4, 2016	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	June 6, 2016	

6 EUT description

6.1 General information

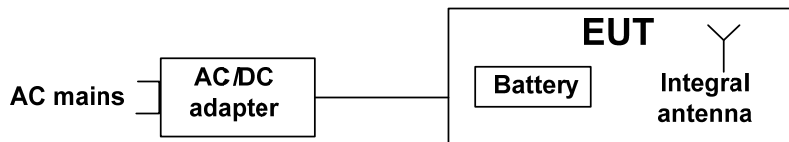
The EUT, One-Piece Home Curfew RF Monitoring Unit, is placed at the Offender's home to provide an enhanced level of home curfew control for offender under supervision of 1Piece GPS tracking program. The EUT provides an alternative RF communication, allowing for continued monitoring of the offender while indoors. This functionality allows the 1 Piece device to discontinue searching for GPS/LBS location when indoors, thus saving on the battery life of the 1 Piece unit. The EUT comprises the 433 MHz transceiver.

The EUT is powered from AC mains via AC/DC adapter. The AC/DC adapters part number KSAS0121200100HU and part number DCA-12PFT-12FUS 120100 were used during the testing. The EUT is equipped with internal backup battery.

6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length	Indoor / outdoor
Power	DC power	EUT	AC/DC adapter	1	Unshielded	1.5 m	Indoor
Power	AC power	AC/DC adapter	AC mains	1	NA	NA	Indoor

6.3 Test configuration



6.4 Transmitter characteristics

Type of equipment						
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)					
Operating frequency		433.92 MHz				
Maximum rated output power		At transmitter 50 Ω RF output connector			dBm	
		Field strength at 3 m distance			99.67 dB(μV/m) -peak 69.67 dB(μV/m)-average	
Is transmitter output power variable?		X	No			
			Yes		continuous variable	
					stepped variable with stepsize	
				minimum RF power		dBm
				maximum RF power		dBm
Antenna connection						
unique coupling		standard connector		X	integral	
				X	with temporary RF connector without temporary RF connector	
Type of modulation		GFSK				
Transmitter aggregate data rate/s		76.8 kbps				
Transmitter power source						
X	Battery	Nominal rated voltage	3.6 VDC	Battery type	Lithium-Ion	
	DC	Nominal rated voltage	VDC			
X	AC mains	Nominal rated voltage	120 VAC	Frequency	60 Hz	
Common power source for transmitter and receiver				X	yes	
					no	

Test specification:	Section 15.231(a), Periodic operation requirements		
Test procedure:	Supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Mar-16		
Temperature: 23 °C	Air Pressure: 1010 hPa	Relative Humidity: 55 %	Power Supply: 120 VAC
Remarks:			

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

7.1 Periodic operation requirements

7.1.1 General

The EUT was verified for compliance with periodic operation requirements listed below:

- Continuous transmissions such as voice, video and the radio control of toys are not permitted;
- A manually operated transmitter shall employ switch that will automatically deactivate the transmitter within not more than 5 seconds of being released;
- A transmitter activated automatically shall cease transmission within 5 seconds after activation;
- Periodic transmissions, excluding polling or supervision transmissions, at regular predetermined intervals are not permitted;
- Total duration of polling or supervision transmissions, including data, to determine system integrity in security or safety applications shall not exceed 2 seconds per hour;
- Transmission of set-up information for security systems may exceed the transmission duration limits of 5 seconds, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

The rationale for compliance with the above requirements was either test results or supplier declaration. The summary of results is provided in Table 7.1.1.

7.1.2 Test procedure for transmitter shut down test

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

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

7.1.2.3 The transmitter was activated automatically.

7.1.2.4 The transmission time was captured and shown in Plot 7.1.1.

7.1.3 Test procedure for measurements of polling / supervision transmission duration

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

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

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

Figure 7.1.1 Setup for transmitter shut down test



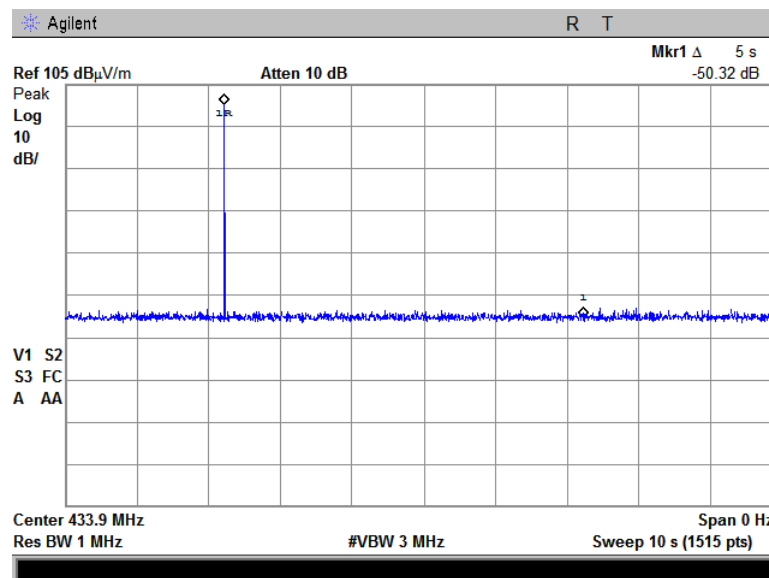


Test specification:	Section 15.231(a), Periodic operation requirements		
Test procedure:	Supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Mar-16		
Temperature: 23 °C	Air Pressure: 1010 hPa	Relative Humidity: 55 %	Power Supply: 120 VAC
Remarks:			

Table 7.1.1 Periodic operation requirements

Requirement	Rationale	Verdict
Continuous transmissions are not permitted	Supplier declaration	Comply
A manually operated transmitter shall be deactivated within not more than 5 seconds of switch being released	NA	NA
Transmitter activated automatically shall cease transmission within 5 seconds	Plot 7.1.1	Comply
Periodic transmissions at regular predetermined intervals are not permitted	Supplier declaration	Comply
Total duration of polling or supervision transmissions shall not exceed 2 seconds per hour	Plot 7.1.2, Plot 7.1.3	Comply
Transmission of set-up information for security systems may exceed the transmission duration limits of 5 seconds, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.	NA	NA

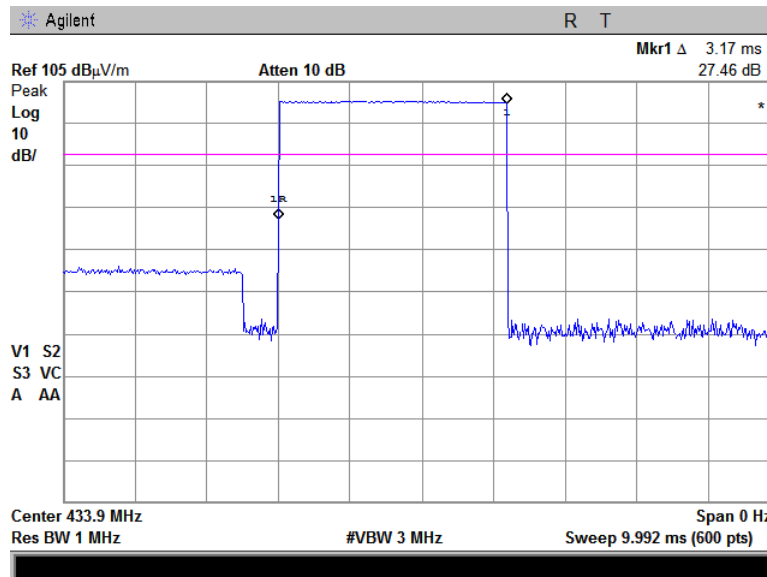
Plot 7.1.1 Transmitter shut down test result





Test specification:	Section 15.231(a), Periodic operation requirements		
Test procedure:	Supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Mar-16		
Temperature: 23 °C	Air Pressure: 1010 hPa	Relative Humidity: 55 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.2 Polling / supervision transmission duration



Plot 7.1.3 Polling / supervision transmission period

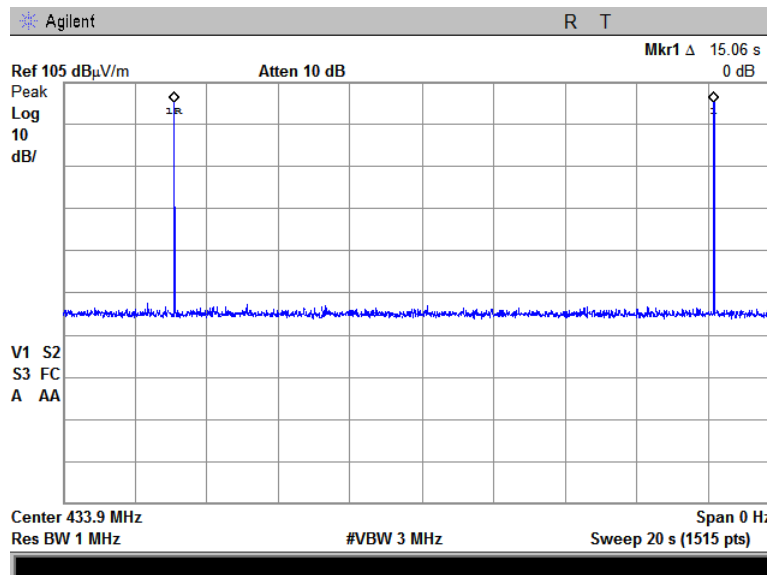


Table 7.1.2 Total duration of polling / supervision transmissions

Duration, ms	Repetition period, s	Maximum number of transmissions within 1 hour	Total duration within 1 hour, ms
3.17	15	240	760.8

Reference numbers of test equipment used

HL 0604	HL 2780	HL 4278	HL 4353				
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Full description is given in Appendix A.



Test specification:	Section 15.231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Mar-16 - 20-Apr-16		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

7.2 Field strength of emissions

7.2.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given in Table 7.2.1 and Table 7.2.2.

Table 7.2.1 Radiated fundamental emission limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)	
	Peak	Average
433.92	100.8	80.8

Table 7.2.2 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m, dB(μV/m)				
	Within restricted bands			Outside restricted bands	
	Peak	Quasi Peak	Average	Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	80.8	60.8
0.090 – 0.110	NA	108.5 – 106.8**	NA		
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**		
0.490 – 1.705	NA	73.8 – 63.0**	NA		
1.705 – 30.0*		69.5			
30 – 88		40.0			
88 – 216		43.5			
216 – 960		46.0			
960 - 1000		54.0			
Above 1000	74.0	NA	54.0		

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

$$\text{Lim}_{S2} = \text{Lim}_{S1} + 40 \log (S_1/S_2),$$

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

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

Note 1: The fundamental emission limit in dB(μV/m) was calculated as follows:

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

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

where F is the carrier frequency in MHz.

The limit for spurious emissions was 20 dB lower than fundamental emission limit.

The above limits provided in terms of average values, peak limit was 20 dB above the average limit.

Note 2: The above field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency.

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

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

7.2.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated around its vertical axis.

7.2.2.3 The worst test results (the lowest margins) were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

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

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

7.2.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

7.2.3.3 The worst test results (the lowest margins) were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

Test specification:	Section 15.231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Mar-16 - 20-Apr-16		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

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

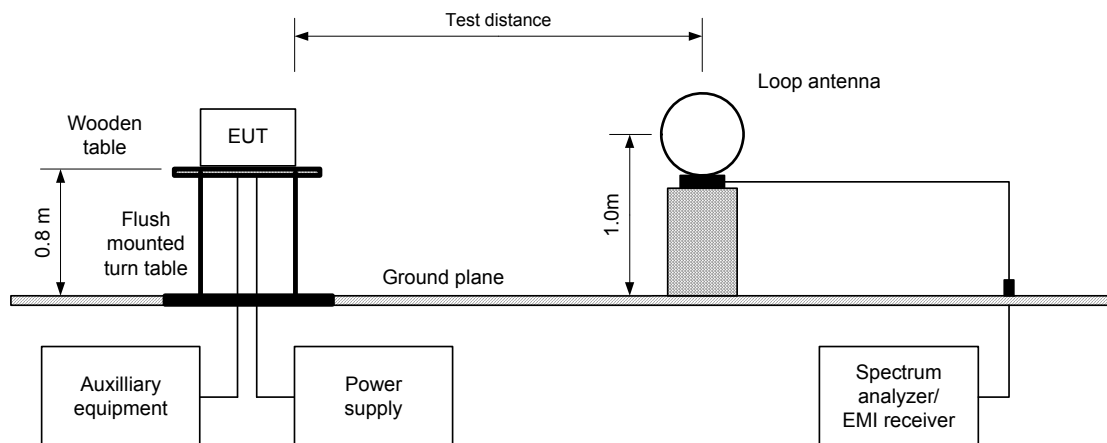
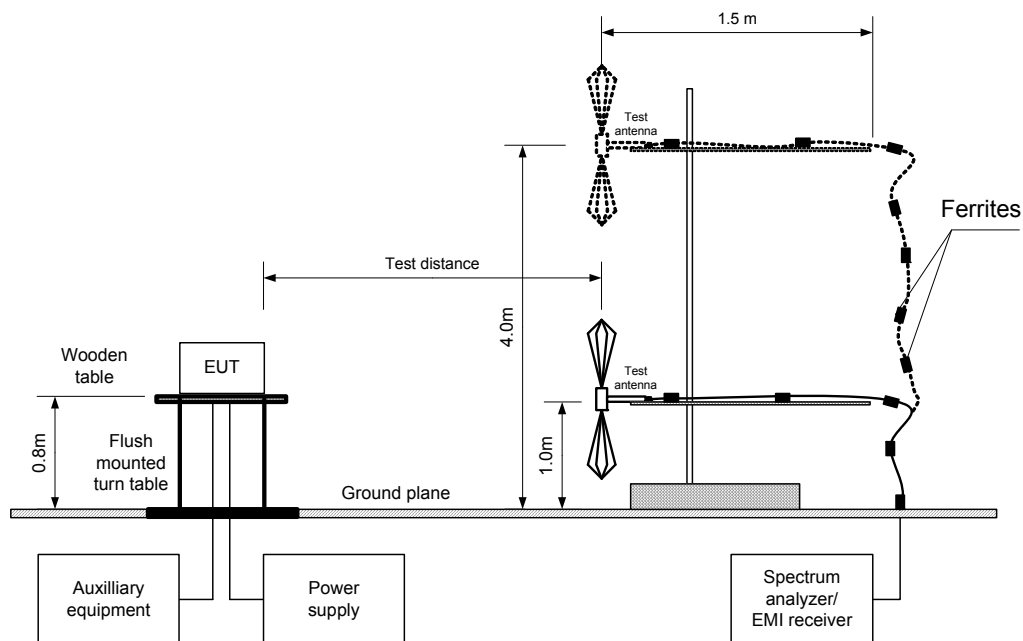


Figure 7.2.2 Setup for spurious emission field strength measurements above 30 MHz





Test specification:	Section 15.231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Mar-16 - 20-Apr-16		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Table 7.2.3 Field strength of fundamental emission, spurious emissions outside restricted bands and within restricted bands at frequencies above 1 GHz

TEST DISTANCE:	3 m
EUT POSITION:	Typical (Vertical)
MODULATION:	GFSK
BIT RATE:	76.8 kbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
INVESTIGATED FREQUENCY RANGE:	0.009 - 4500 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	0.2 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz) 1.0 MHz (above 1000 MHz)
VIDEO BANDWIDTH:	≥ Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Log periodic (200 MHz – 1000 MHz) Biconilog (30 MHz – 1000 MHz) Double ridged guide (above 1000 MHz)

F, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength				Verdict
	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
Fundamental emission***											
433.92	V	1.2	142	99.67	100.8	-1.13	99.67	69.67	80.8	-11.33	Pass
Spurious emissions											
867.763	V	1.1	60	39.69	80.8	-41.11	39.69	9.69	60.8	-51.11	Pass
1301.748	V	1.3	30	47.76	74.0	-26.24	47.76	17.76	54.0	-36.24	
1735.488	V	1.5	80	40.78	80.8	-40.02	40.78	10.78	60.8	-50.02	

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

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

*** Max value was obtained at Unom (115%Unom, 85%Unom) input power voltage.

Table 7.2.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Number pulse within 100 msec,	Duration, ms	Period, ms		
3.17	1	NA	NA	NA	-30

*- 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:

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

Reference numbers of test equipment used

HL 0034	HL 0446	HL 0521	HL 0604	HL 3340	HL 4278	HL 4353	HL 4339
HL 4933							

Full description is given in Appendix A.



Test specification:	Section 15.231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Mar-16 - 20-Apr-16		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

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

TEST DISTANCE: 3 m
 EUT POSITION: Typical (Vertical)
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 0.2 kHz (9 kHz – 150 kHz)
 9.0 kHz (150 kHz – 30 MHz)
 120 kHz (30 MHz – 1000 MHz)
 VIDEO BANDWIDTH: ≥ Resolution bandwidth
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
 Log periodic (200 MHz – 1000 MHz)
 Biconilog (30 MHz – 1000 MHz)

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
No emissions were found.								Pass

*- Margin = Measured emission - specification limit.

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

Table 7.2.6 Restricted bands

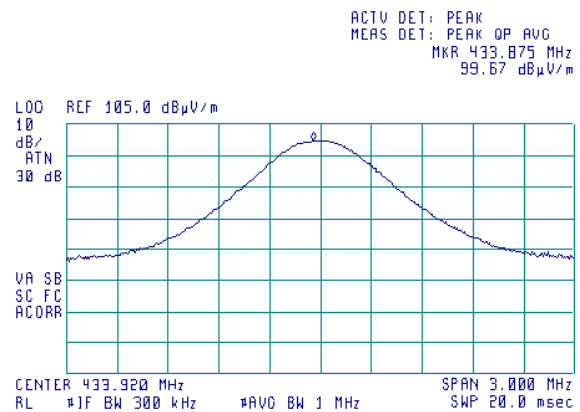
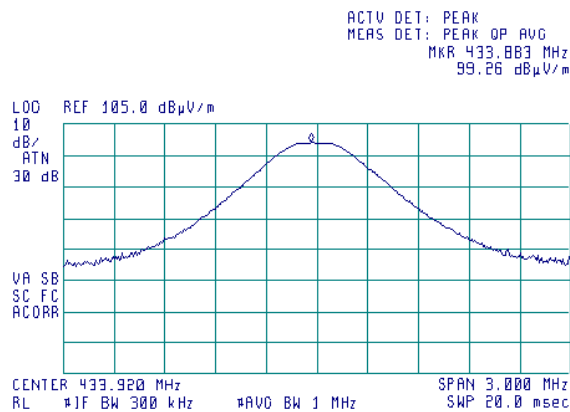
MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.29 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138	1300 - 1427	3345.8 - 3358	15.35 - 16.2
4.17725 - 4.17775	12.57675 - 12.57725	149.9 - 150.05	1435 - 1626.5	3600 - 4400	17.7 - 21.4
4.20725 - 4.20775	13.36 - 13.41	156.52475 - 156.52525	1645.5 - 1646.5	4500 - 5150	22.01 - 23.12
6.215 - 6.218	16.42 - 16.423	156.7 - 156.9	1660 - 1710	5350 - 5460	23.6 - 24
6.26775 - 6.26825	16.69475 - 16.69525	162.0125 - 167.17	1718.8 - 1722.2	7250 - 7750	31.2 - 31.8
6.31175 - 6.31225	16.80425 - 16.80475	167.72 - 173.2	2200 - 2300	8025 - 8500	36.43 - 36.5
8.291 - 8.294	25.5 - 25.67	240 - 285	2310 - 2390	9000 - 9200	Above 38.6
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	



Test specification:	Section 15.231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Mar-16 - 20-Apr-16		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.1 Radiated emission measurements at the fundamental frequency

TEST SITE: OATS
 TEST DISTANCE: 3 m
 ANTENNA POLARIZATION: Vertical
 EUT POSITION: Typical (Vertical)
 INPUT VOLTAGE: Unom

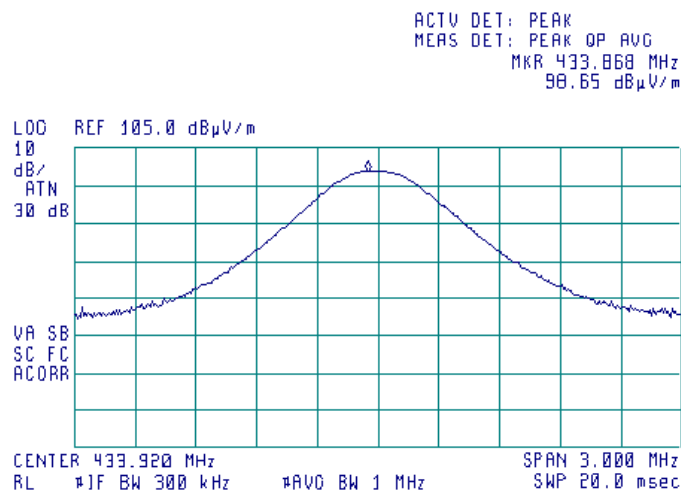


With AC/DC adapter part number KSAS01212200100HU

with AC/DC adapter part number PS DSA-12PFT-12FUS 120100-U22

Plot 7.2.2 Radiated emission measurements at the fundamental frequency

TEST SITE: OATS
 TEST DISTANCE: 3 m
 ANTENNA POLARIZATION: Horizontal
 EUT POSITION: Typical (Vertical)
 INPUT VOLTAGE: Unom



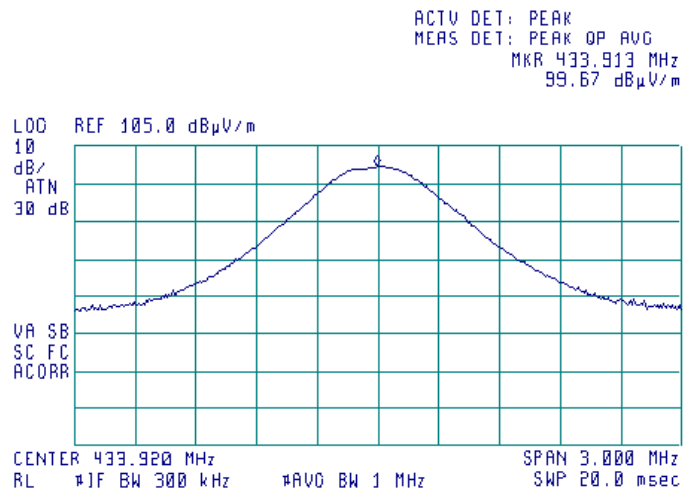
With AC/DC adapter part number KSAS01212200100HU and
 with AC/DC adapter part number PS DSA-12PFT-12FUS 120100-U22



Test specification:	Section 15.231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Mar-16 - 20-Apr-16		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

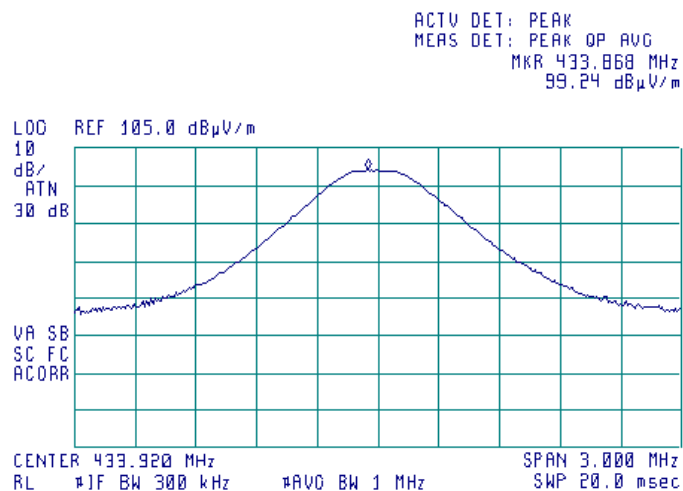
Plot 7.2.3 Radiated emission measurements at the fundamental frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal
EUT POSITION: Typical (Vertical)
INPUT VOLTAGE: 115%Unom



Plot 7.2.4 Radiated emission measurements at the fundamental frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal
EUT POSITION: Typical (Vertical)
INPUT VOLTAGE: 85%Unom

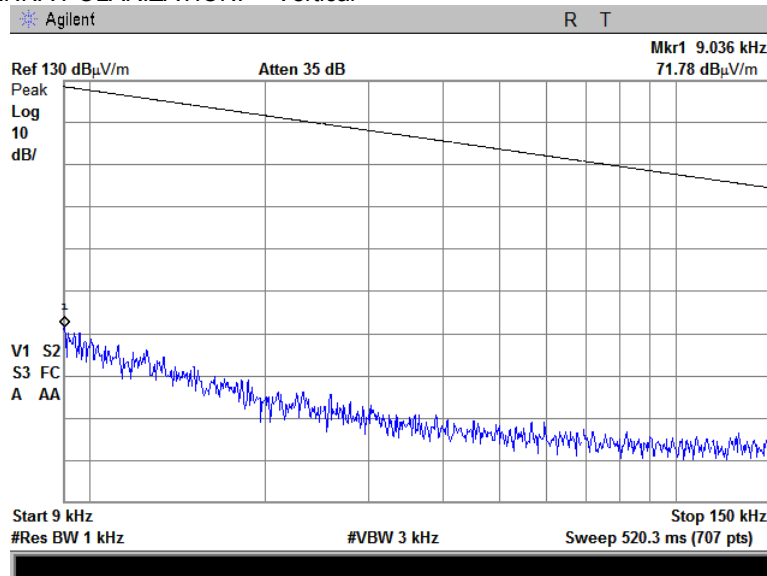




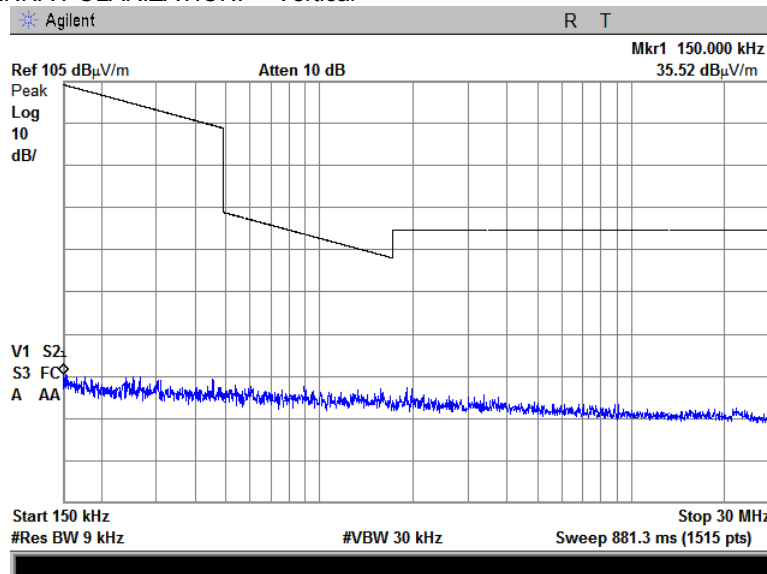
Test specification:	Section 15.231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Mar-16 - 20-Apr-16		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.5 Radiated emission measurements from 9 to 150 kHz

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

**Plot 7.2.6 Radiated emission measurements from 0.15 to 30 MHz**

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

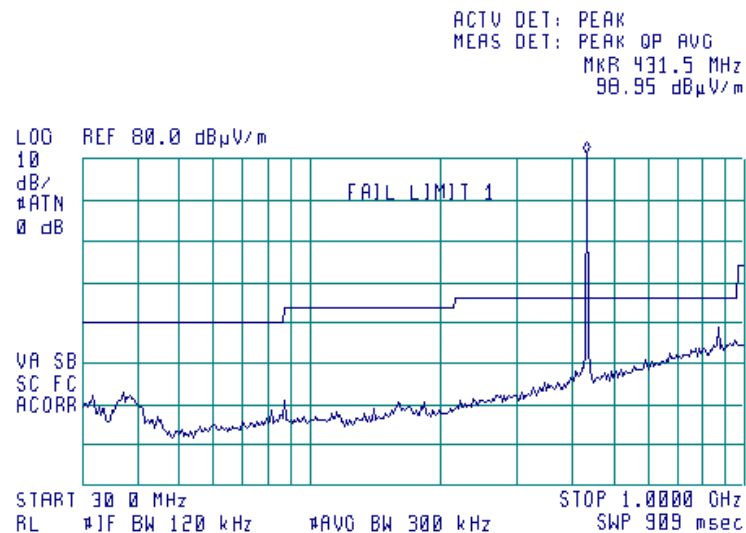




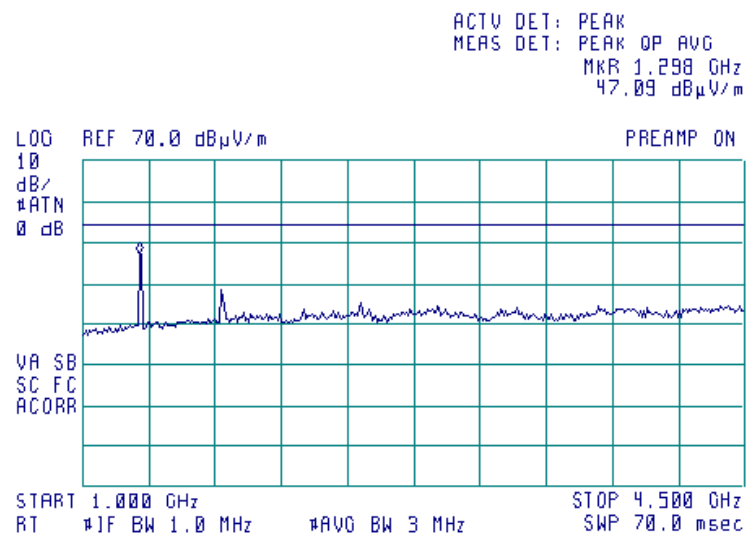
Test specification:	Section 15.231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Mar-16 - 20-Apr-16		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.7 Radiated emission measurements from 30 to 1000 MHz

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

**Plot 7.2.8 Radiated emission measurements from 1000 to 4500 MHz**

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

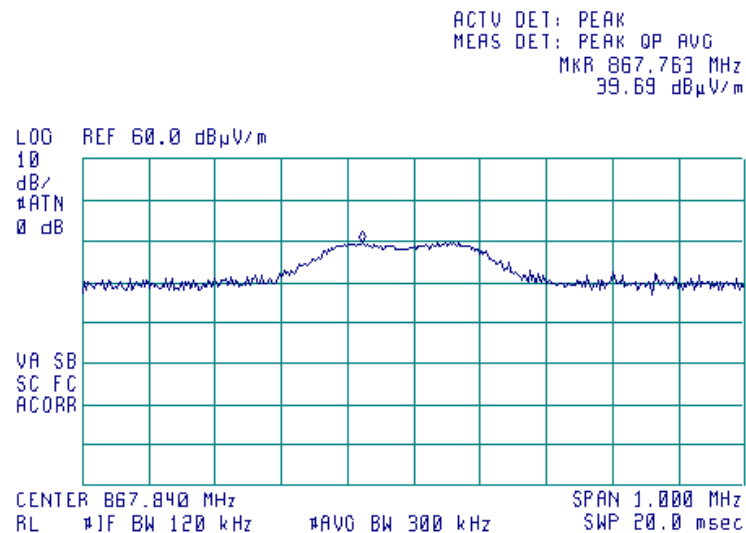




Test specification:	Section 15.231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Mar-16 - 20-Apr-16		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

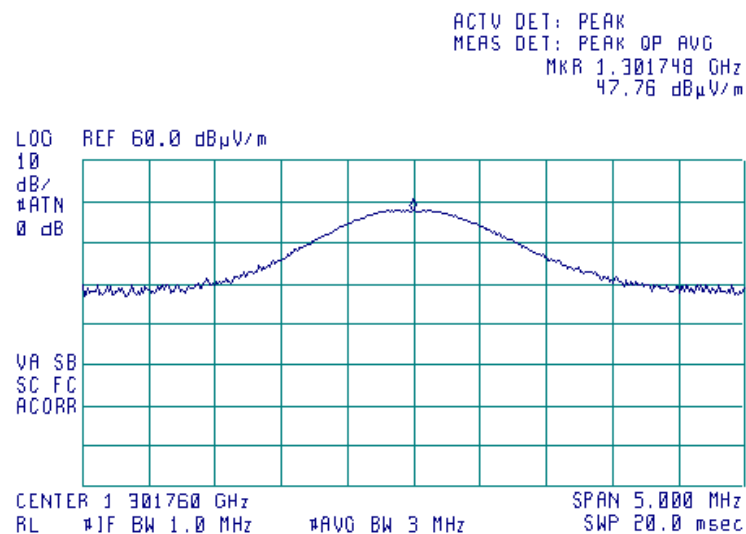
Plot 7.2.9 Radiated emission measurements at the second harmonic frequency

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



Plot 7.2.10 Radiated emission measurements at the third harmonic frequency

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

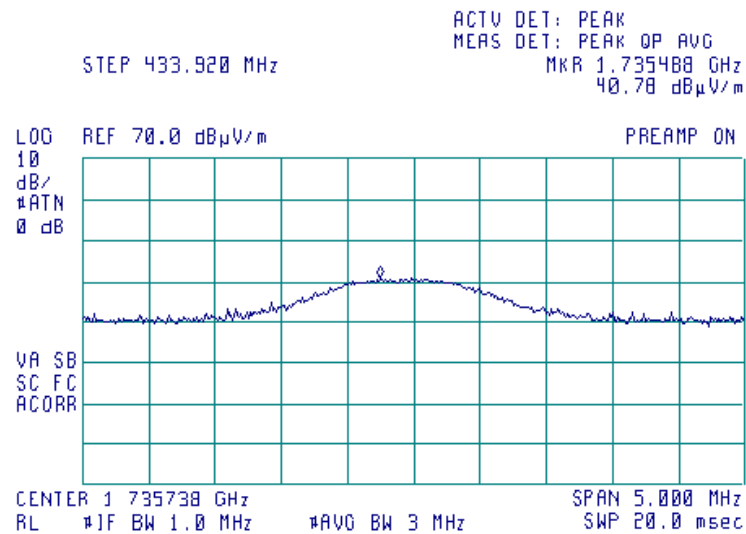




Test specification:	Section 15.231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Mar-16 - 20-Apr-16		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.11 Radiated emission measurements at the 4th harmonic frequency

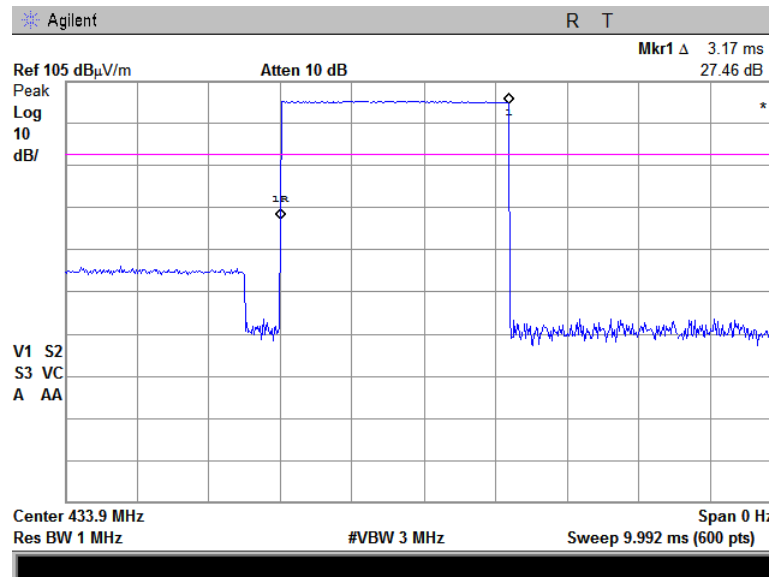
TEST SITE: Semi anechoic chamber
 TEST DISTANCE: 3 m
 ANTENNA POLARIZATION: Vertical & Horizontal



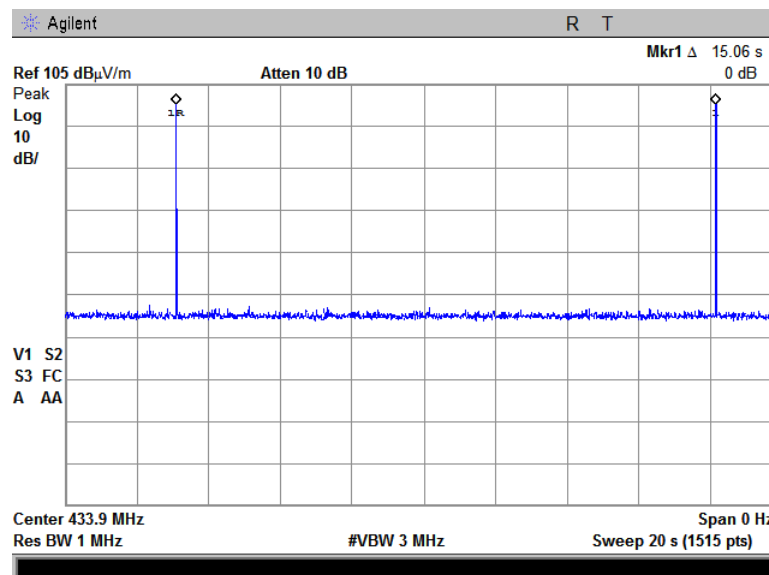


Test specification:	Section 15.231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Mar-16 - 20-Apr-16		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.12 Transmission pulse duration



Plot 7.2.13 Transmission pulse period





Test specification:	Section 15.231(c), Occupied bandwidth		
Test procedure:	ANSI C63.10 section 6.9.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-16		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 54 %	Power Supply: 120 VAC
Remarks:			

7.3 Occupied bandwidth test

7.3.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.3.1. The test results are provided in Table 7.3.2 and associated plots.

Table 7.3.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Maximum allowed bandwidth, % of the carrier frequency
70 - 900	20.0	0.25
Above 900		0.50

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

7.3.2 Test procedure

7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.

7.3.2.2 The EUT was set to transmit modulated carrier.

7.3.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.3.2 and associated plot.

Figure 7.3.1 Occupied bandwidth test setup





Test specification:	Section 15.231(c), Occupied bandwidth		
Test procedure:	ANSI C63.10 section 6.9.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-16		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 54 %	Power Supply: 120 VAC
Remarks:			

Table 7.3.2 Occupied bandwidth test results

DETECTOR USED: Peak hold
 RESOLUTION BANDWIDTH: 10 kHz
 VIDEO BANDWIDTH: 30 kHz
 MODULATION ENVELOPE REFERENCE POINTS: 20 dBc
 MODULATION: GFSK
 BIT RATE: 76.8 kbps

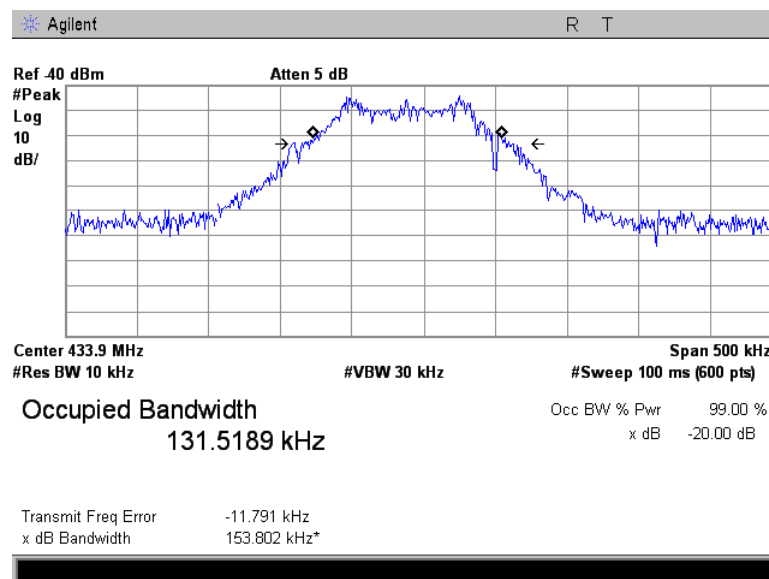
Carrier frequency, MHz	Occupied bandwidth, kHz	Limit		Margin, kHz	Verdict
		% of the carrier frequency	kHz		
433.92	153.802	0.25	1085	-931.198	Pass

Reference numbers of test equipment used

HL 2909								
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Full description is given in Appendix A.

Plot 7.3.1 Occupied bandwidth test result



Test specification:	Section 15.203, Antenna requirement		
Test procedure:	Visual inspection		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Mar-16		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 54 %	Power Supply: 120 VAC
Remarks:			

7.4 Antenna requirements

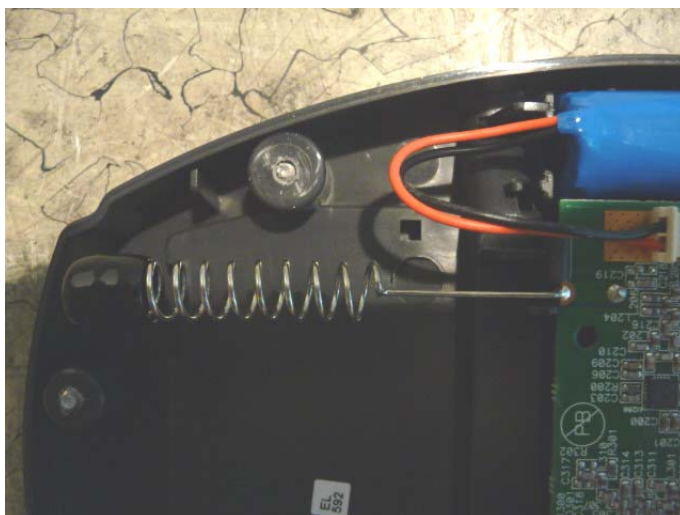
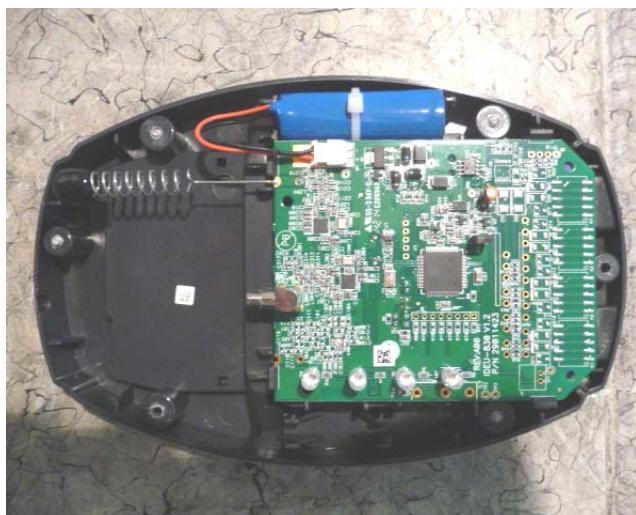
The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.

The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.4.1.

Table 7.4.1 Antenna requirements

Requirement	Rationale	Verdict
The transmitter antenna is permanently attached	Visual inspection	Comply
The transmitter employs a unique antenna connector	NA	
The transmitter requires professional installation	NA	

Photograph 7.4.1 Antenna assembly



Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.10 section 6.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Mar-16		
Temperature: 23 °C	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

7.5 Conducted emissions

7.5.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.5.1. The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.

Table 7.5.1 Limits for conducted emissions

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

* The limit decreases linearly with the logarithm of frequency.

7.5.2 Test procedure

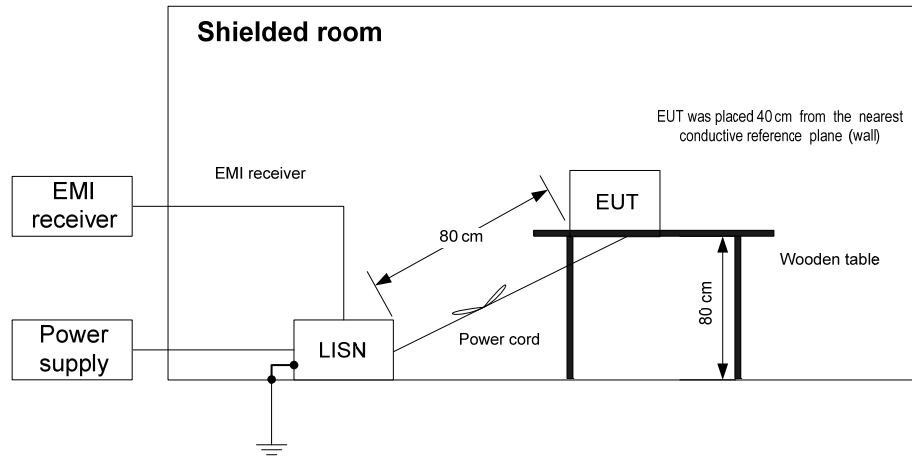
7.5.2.1 The EUT was set up as shown in Figure 7.5.1 and associated photographs, energized and the performance check was conducted.

7.5.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.5.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

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

Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.10 section 6.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Mar-16		
Temperature: 23 °C	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Figure 7.5.1 Setup for conducted emission measurements, table-top equipment



Photograph 7.5.1 Setup for conducted emission measurements



Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.10 section 6.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Mar-16		
Temperature: 23 °C	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Table 7.5.2 Conducted emission test results

LINE: AC mains input of AC/DC adapter
 EUT OPERATING MODE: Transmit
 EUT SET UP: TABLE-TOP
 TEST SITE: SHIELDED ROOM
 DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
 FREQUENCY RANGE: 150 kHz - 30 MHz
 RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
Part number KSAS0121200100HU									
0.151	57.82	55.03	65.96	-10.93	43.15	55.96	-12.81	L1	Pass
0.200	50.56	47.29	63.65	-16.36	31.42	53.65	-22.23		
0.251	44.93	41.71	61.77	-20.06	26.36	51.77	-25.41		
0.304	42.45	38.78	60.15	-21.37	29.01	50.15	-21.14		
0.354	43.08	38.17	58.92	-20.75	27.46	48.92	-21.46		
0.154	58.18	56.70	65.78	-9.08	44.03	55.78	-11.75	L2	Pass
0.201	50.98	48.03	63.62	-15.59	32.05	53.62	-21.57		
0.257	45.00	42.82	61.58	-18.76	30.23	51.58	-21.35		
0.335	42.07	39.91	59.39	-19.48	35.03	49.39	-14.36		
0.404	38.82	33.57	57.79	-24.22	20.17	47.79	-27.62		
Part number DCA-12PFT-12FUS 120100									
0.152720	52.64	50.52	65.87	-15.35	38.00	55.87	-17.87	L1	Pass
0.202940	46.89	44.45	63.54	-19.09	30.70	53.54	-22.84		
0.250905	43.10	38.45	61.76	-23.31	23.36	51.76	-28.40		
0.336215	40.89	38.76	59.35	-20.59	34.35	49.35	-15.00		
8.005535	34.79	29.93	60.00	-30.07	20.98	50.00	-29.02		
0.151900	53.71	51.55	65.91	-14.36	38.37	55.91	-17.54	L2	Pass
0.200185	48.45	44.74	63.65	-18.91	29.04	53.65	-24.61		
0.259785	42.30	39.73	61.49	-21.76	27.74	51.49	-23.75		
0.318080	39.03	34.95	59.78	-24.83	23.38	49.78	-26.40		
9.501135	39.29	32.43	60.00	-27.57	23.17	50.00	-26.83		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

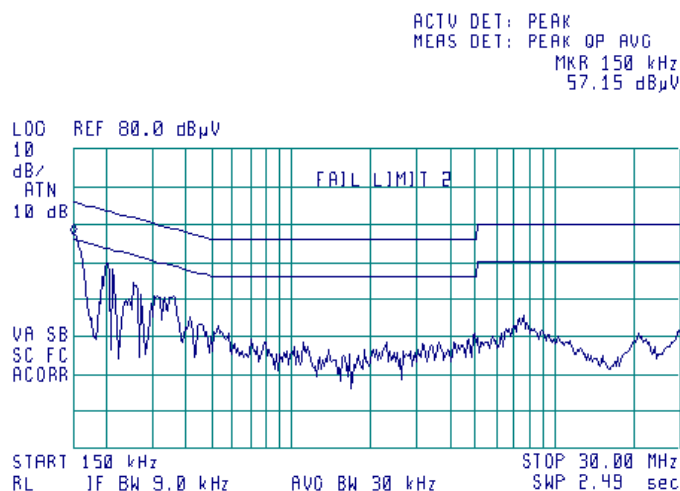
HL 0447	HL 0787	HL 1513	HL 3612	HL 4778			
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Full description is given in Appendix A.

Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.10 section 6.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Mar-16		
Temperature: 23 °C	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

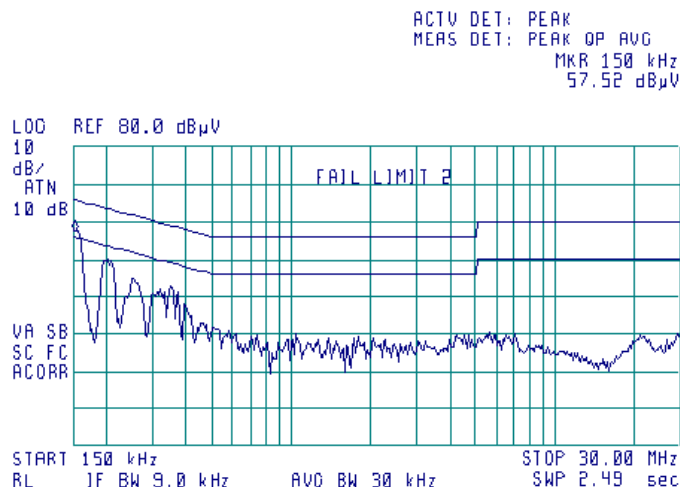
Plot 7.5.1 Conducted emission measurements, AC mains input of AC/DC adapter, Part number KSAS0121200100HU

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



Plot 7.5.2 Conducted emission measurements, AC mains input of AC/DC adapter, Part number KSAS0121200100HU

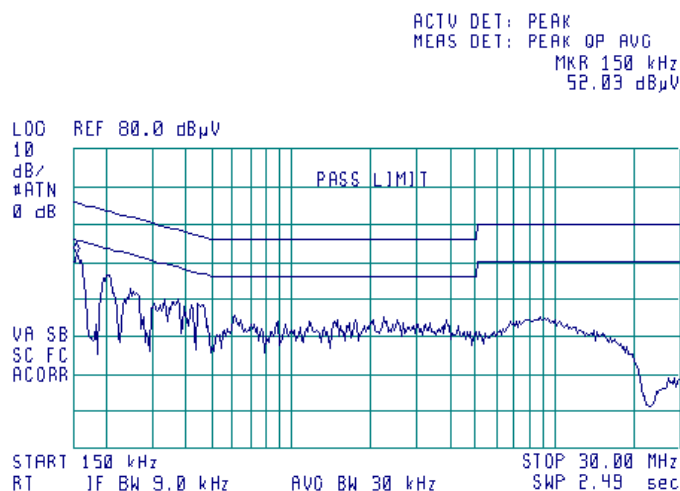
LINE: L2
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.10 section 6.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Mar-16		
Temperature: 23 °C	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

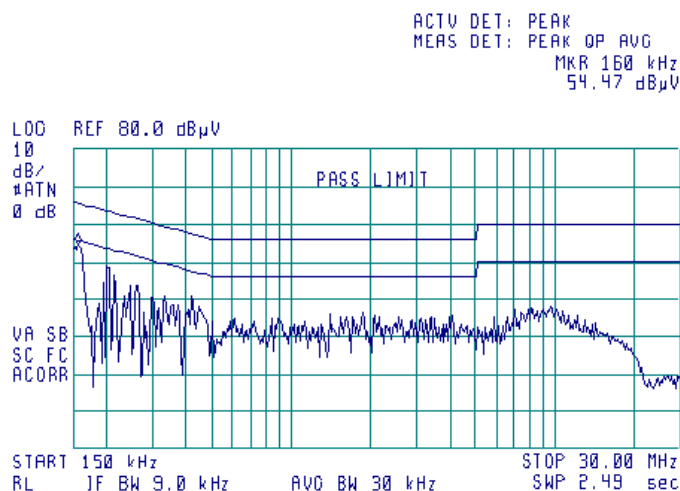
Plot 7.5.3 Conducted emission measurements, AC mains input of AC/DC adapter,
Part number DCA-12PFT-12FUS 120100

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



Plot 7.5.4 Conducted emission measurements, AC mains input of AC/DC adapter,
Part number DCA-12PFT-12FUS 120100

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



8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./Check	Due Cal./Check
0034	Antenna, Log Periodic, 200 - 1000 MHz	Electro-Metrics	LPA 25/30	1988	17-Mar-16	17-Sep-17
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	18-Jan-16	18-Jan-17
0447	LISN, 16/2, 300V RMS, 50 Ohm/50 uH + 5 Ohm, STD CISPR 16-1	Hermon Laboratories	LISN 16 - 1	066	13-Oct-15	13-Oct-16
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A00319, 3448A00253	27-Oct-15	27-Oct-16
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	15-May-16	15-May-17
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A01877	12-Oct-15	12-Oct-16
1513	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1513	08-Sep-15	08-Sep-16
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY45102462	08-Sep-15	08-Sep-16
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY41444762	21-Feb-16	21-Feb-17
3340	High Pass Filter, 50 Ohm, 1000 to 3000 MHz.	Mini-Circuits	SHP-1000+	NA	01-Oct-15	01-Oct-17
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	07-Dec-15	07-Dec-16
4278	Test Cable , DC-18 GHz, 4.6 m, N/M - N/M	Mini-Circuits	APC-15FT-NMNM+	0755A	22-Nov-15	22-Nov-16
4339	High pass Filter, 50 Ohm, 1000 to 18000 MHz, SMA-FM / SMA-M	Micro-Tronics	HPM50115-02	001	06-May-16	06-May-17
4353	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101 003	15-Mar-16	15-Mar-17
4778	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL4777	Hewlett Packard	8542E	30807A00262, 3427A00123	05-Nov-15	05-Nov-16
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATION	AHA-118	701046	04-Sep-15	04-Sep-16

9 APPENDIX B 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 number IC 2186A-1 for OATS, certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, 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 IL1001.

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website:	www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

10 APPENDIX C 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(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ 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
μ s	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
Ω	Ohm
PM	pulse modulation
PS	power supply
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
WB	wideband

11 APPENDIX D Test equipment correction factors

Correction factor
Line impedance stabilization network
Model LISN 16 - 1
Hermon Laboratories

Voltage division factor (insertion loss)

Frequency, kHz	L1, dB	L2, dB	Uncertainty, dB
150	0.00	0.10	±0.09
170	0.00	0.09	±0.09
200	0.00	0.08	±0.09
250	0.01	0.07	±0.09
300	0.02	0.07	±0.09
350	0.03	0.06	±0.09
400	0.03	0.05	±0.09
500	0.04	0.05	±0.09
600	0.05	0.06	±0.09
700	0.05	0.06	±0.09
800	0.05	0.06	±0.09
900	0.06	0.06	±0.09
1000	0.06	0.06	±0.09
1200	0.06	0.06	±0.16
1500	0.07	0.07	±0.16
2000	0.07	0.06	±0.16
2500	0.08	0.07	±0.16
3000	0.08	0.07	±0.16
4000	0.08	0.08	±0.16
5000	0.09	0.09	±0.16
7000	0.11	0.10	±0.16
10000	0.13	0.14	±0.16
15000	0.18	0.19	±0.16
20000	0.26	0.27	±0.16
30000	0.45	0.50	±0.32

The correction factor in dB is to be added to meter readings of an interference analyzer or a spectrum analyzer.

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

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(μ V) to convert it into field strength in dB(μ V/m).

**Antenna Factor
Log Periodic Antenna Electro-Metrics Model LPA-25/30
Ser.No.1988**

Frequency, MHz	Antenna factor, dB/m		
	Measured	Historical in-house data	Deviation
200	11.9	12.3	-0.3
250	12.4	12.7	-0.3
300	14.4	14.8	-0.4
350	15.5	15.4	0.1
400	16.0	16.2	-0.2
450	16.8	17.0	-0.2
500	17.9	18.2	-0.3
550	18.3	18.6	-0.3
600	18.8	19.2	-0.5
650	19.5	20.0	-0.5
700	21.7	21.5	0.2
750	21.4	21.5	0.0
800	21.7	21.8	0.0
850	22.7	22.7	0.0
900	22.7	23.2	-0.5
950	23.2	23.6	-0.3
1000	24.4	24.6	-0.2

Antenna factor is to be added to receiver meter reading in dB(μ V) to convert to field intensity in dB(μ V/meter)

Antenna factor
Biconilog antenna EMCO, model 3141, serial number 1011

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(μ V) to convert it into field intensity in dB(μ V/m).

Horn antenna factor
COM-POWER CORPORATION, Model ANA-118
Serial number 701046

Frequency, MHz	Measured antenna factor (with preamplifier), dB/m
1000	-16.0
1500	-13.9
2000	-12.1
2500	-12.0
3000	-11.4
3500	-10.9
4000	-10.1
4500	-8.8
5000	-6.3
5500	-5.4
6000	-4.8
6500	-3.1
7000	-2.7
7500	-1.8
8000	-1.0
8500	-0.5
9000	-0.8
9500	-1.3
10000	-0.6
10500	0.5
11000	0.5
11500	1.6
12000	0.5
12500	0.7
13000	0.0
13500	0.6
14000	1.1
14500	2.3
15000	0.9
15500	-0.6
16000	0.1
16500	0.0
17000	0.3
17500	2.7
18000	4.1

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

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

No.	Parameter	SET, MHz	Measured, dB	Deviation, dB	Tolerance, dB	Meas. Uncert., dB
1	Insertion loss	0.10	0.04	NA	NA	+0.11 / -0.11
2		10.0	0.37	NA	NA	+0.11 / -0.11
3		20.0	0.54	NA	NA	+0.11 / -0.11
4		30.0	0.69	NA	NA	+0.11 / -0.11
5		40.0	0.80	NA	NA	+0.11 / -0.11
6		50	0.91	NA	NA	+0.11 / -0.11
7		60	1.00	NA	NA	+0.11 / -0.11
8		70	1.08	NA	NA	+0.12 / -0.12
9		80	1.16	NA	NA	+0.12 / -0.12
10		90	1.24	NA	NA	+0.12 / -0.12
11		100	1.31	NA	NA	+0.12 / -0.12
12		110	1.38	NA	NA	+0.12 / -0.12
13		120	1.44	NA	NA	+0.12 / -0.12
14		130	1.50	NA	NA	+0.12 / -0.12
15		140	1.57	NA	NA	+0.12 / -0.12
16		150	1.63	NA	NA	+0.12 / -0.12
17		160	1.68	NA	NA	+0.12 / -0.12
18		170	1.74	NA	NA	+0.12 / -0.12
19		180	1.79	NA	NA	+0.12 / -0.12
20		190	1.85	NA	NA	+0.12 / -0.12
21		200	1.90	NA	NA	+0.12 / -0.12
22		210	1.95	NA	NA	+0.12 / -0.12
23		220	2.00	NA	NA	+0.12 / -0.12
24		230	2.05	NA	NA	+0.12 / -0.12
25		240	2.10	NA	NA	+0.12 / -0.12
26		250	2.15	NA	NA	+0.12 / -0.12
27		260	2.20	NA	NA	+0.12 / -0.12
28		270	2.24	NA	NA	+0.13 / -0.13
29		280	2.29	NA	NA	+0.12 / -0.12
30		290	2.34	NA	NA	+0.13 / -0.13

No.	Parameter	SET, MHz	Measured, dB	Deviation, dB	Tolerance, dB	Meas. Uncert., dB
31	Insertion loss	300	2.38	NA	NA	+0.12 / -0.12
32		310	2.43	NA	NA	+0.12 / -0.12
33		320	2.47	NA	NA	+0.12 / -0.12
34		330	2.51	NA	NA	+0.12 / -0.12
35		340	2.56	NA	NA	+0.12 / -0.12
36		350	2.60	NA	NA	+0.12 / -0.12
37		360	2.64	NA	NA	+0.12 / -0.12
38		370	2.68	NA	NA	+0.12 / -0.12
39		380	2.72	NA	NA	+0.12 / -0.12
40		390	2.76	NA	NA	+0.12 / -0.12
41		400	2.80	NA	NA	+0.12 / -0.12
42		410	2.84	NA	NA	+0.12 / -0.12
43		420	2.88	NA	NA	+0.12 / -0.12
44		430	2.92	NA	NA	+0.12 / -0.12
45		440	2.96	NA	NA	+0.12 / -0.12
46		450	3.00	NA	NA	+0.12 / -0.12
47		460	3.03	NA	NA	+0.12 / -0.12
48		470	3.07	NA	NA	+0.12 / -0.12
49		480	3.11	NA	NA	+0.12 / -0.12
50		490	3.14	NA	NA	+0.12 / -0.12
51		500	3.18	NA	NA	+0.12 / -0.12
52		510	3.22	NA	NA	+0.14 / -0.14
53		520	3.25	NA	NA	+0.14 / -0.14
54		530	3.29	NA	NA	+0.14 / -0.14
55		540	3.33	NA	NA	+0.14 / -0.14
56		550	3.36	NA	NA	+0.14 / -0.14
57		560	3.40	NA	NA	+0.14 / -0.14
58		570	3.44	NA	NA	+0.14 / -0.15
59		580	3.47	NA	NA	+0.14 / -0.14
60		590	3.51	NA	NA	+0.14 / -0.15

No.	Parameter	SET, MHz	Measured, dB	Deviation, dB	Tolerance, dB	Meas. Uncert., dB
61	Insertion loss	600	3.54	NA	NA	+0.14 / -0.14
62		610	3.58	NA	NA	+0.14 / -0.14
63		620	3.61	NA	NA	+0.14 / -0.14
64		630	3.64	NA	NA	+0.14 / -0.14
65		640	3.67	NA	NA	+0.14 / -0.14
66		650	3.71	NA	NA	+0.14 / -0.14
67		660	3.77	NA	NA	+0.14 / -0.14
68		670	3.79	NA	NA	+0.14 / -0.14
69		680	3.81	NA	NA	+0.14 / -0.14
70		690	3.84	NA	NA	+0.14 / -0.14
71		700	3.87	NA	NA	+0.14 / -0.14
72		710	3.91	NA	NA	+0.14 / -0.14
73		720	3.94	NA	NA	+0.14 / -0.14
74		730	3.97	NA	NA	+0.14 / -0.14
75		740	4.01	NA	NA	+0.14 / -0.14
76		750	4.04	NA	NA	+0.14 / -0.14
77		760	4.07	NA	NA	+0.14 / -0.14
78		770	4.11	NA	NA	+0.14 / -0.14
79		780	4.14	NA	NA	+0.14 / -0.14
80		790	4.17	NA	NA	+0.14 / -0.14
81		800	4.20	NA	NA	+0.14 / -0.14
82		810	4.23	NA	NA	+0.14 / -0.14
83		820	4.26	NA	NA	+0.14 / -0.14
84		830	4.29	NA	NA	+0.14 / -0.14
85		840	4.32	NA	NA	+0.14 / -0.14
86		850	4.35	NA	NA	+0.14 / -0.14
87		860	4.38	NA	NA	+0.14 / -0.14
88		870	4.42	NA	NA	+0.14 / -0.15
89		880	4.45	NA	NA	+0.14 / -0.14
90		890	4.48	NA	NA	+0.14 / -0.15
91		900	4.51	NA	NA	+0.14 / -0.14
92		910	4.54	NA	NA	+0.14 / -0.14
93		920	4.57	NA	NA	+0.14 / -0.14
94		930	4.60	NA	NA	+0.14 / -0.14
95		940	4.63	NA	NA	+0.14 / -0.14
96		950	4.66	NA	NA	+0.14 / -0.14
97		960	4.69	NA	NA	+0.14 / -0.14
98		970	4.72	NA	NA	+0.14 / -0.14
99		980	4.75	NA	NA	+0.14 / -0.14
100		990	4.78	NA	NA	+0.14 / -0.14
101		1000	4.81	NA	NA	+0.14 / -0.14

Cable loss
Cable RF, M17/167 MIL-C-17, 8 m
Belden, HL 1513

No.	Parameter	Measured attenuation	Meas. Uncert.
1	Frequency 10 kHz	0.01 dB	±0.05 dB
2	Frequency 100 kHz	0.05 dB	±0.05 dB
3	Frequency 1 MHz	0.11 dB	±0.05 dB
4	Frequency 10 MHz	0.35 dB	±0.05 dB
5	Frequency 20 MHz	0.48 dB	±0.05 dB
6	Frequency 30 MHz	0.58 dB	±0.05 dB
7	Frequency 40 MHz	0.65 dB	±0.05 dB
8	Frequency 50 MHz	0.71 dB	±0.05 dB
9	Frequency 60 MHz	0.79 dB	±0.05 dB
10	Frequency 70 MHz	0.84 dB	±0.05 dB
11	Frequency 80 MHz	0.92 dB	±0.05 dB
12	Frequency 90 MHz	0.96 dB	±0.05 dB
13	Frequency 100 MHz	1.03 dB	±0.05 dB
14	Frequency 200 MHz	1.58 dB	±0.05 dB
15	Frequency 300 MHz	2.04 dB	±0.05 dB
16	Frequency 400 MHz	2.43 dB	±0.05 dB
17	Frequency 500 MHz	2.46 dB	±0.05 dB
18	Frequency 600 MHz	3.11 dB	±0.05 dB
19	Frequency 700 MHz	3.38 dB	±0.05 dB
20	Frequency 800 MHz	3.71 dB	±0.05 dB
21	Frequency 900 MHz	3.94 dB	±0.05 dB
22	Frequency 1000 MHz	4.25 dB	±0.05 dB
23	Frequency 1200 MHz	4.58 dB	±0.05 dB
24	Frequency 1400 MHz	5.04 dB	±0.05 dB
25	Frequency 1600 MHz	5.55 dB	±0.05 dB
26	Frequency 1800 MHz	6.04 dB	±0.05 dB
27	Frequency 2000 MHz	6.62 dB	±0.05 dB
28	Frequency 2500 MHz	7.67 dB	±0.05 dB
29	Frequency 2900 MHz	8.12 dB	±0.05 dB

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

No.	Parameter	Set / Applied	Measured	Deviation	Tolerance	Uncertainty
1	Insertion loss	0.1 MHz	0.04 dB	NA	NA	+0.07 / -0.07 dB
2		50 MHz	0.39 dB	NA	NA	+0.07 / -0.07 dB
3		100 MHz	0.57 dB	NA	NA	+0.07 / -0.07 dB
4		200 MHz	0.82 dB	NA	NA	+0.07 / -0.07 dB
5		300 MHz	1.02 dB	NA	NA	+0.08 / -0.09 dB
6		400 MHz	1.19 dB	NA	NA	+0.08 / -0.09 dB
7		500 MHz	1.33 dB	NA	NA	+0.08 / -0.09 dB
8		600 MHz	1.47 dB	NA	NA	+0.08 / -0.09 dB
9		700 MHz	1.60 dB	NA	NA	+0.08 / -0.09 dB
10		800 MHz	1.70 dB	NA	NA	+0.08 / -0.09 dB
11		900 MHz	1.83 dB	NA	NA	+0.08 / -0.09 dB
12		1000 MHz	1.92 dB	NA	NA	+0.08 / -0.09 dB
13		1100 MHz	2.02 dB	NA	NA	+0.12 / -0.13 dB
14		1200 MHz	2.12 dB	NA	NA	+0.12 / -0.13 dB
15		1300 MHz	2.20 dB	NA	NA	+0.12 / -0.13 dB
16		1400 MHz	2.30 dB	NA	NA	+0.12 / -0.13 dB
17		1500 MHz	2.39 dB	NA	NA	+0.12 / -0.13 dB
18		1600 MHz	2.47 dB	NA	NA	+0.12 / -0.13 dB
19		1700 MHz	2.55 dB	NA	NA	+0.12 / -0.13 dB
20		1800 MHz	2.64 dB	NA	NA	+0.12 / -0.13 dB
21		1900 MHz	2.71 dB	NA	NA	+0.12 / -0.13 dB
22		2000 MHz	2.78 dB	NA	NA	+0.12 / -0.13 dB
23		2100 MHz	2.87 dB	NA	NA	+0.12 / -0.13 dB
24		2200 MHz	2.94 dB	NA	NA	+0.12 / -0.13 dB
25		2300 MHz	3.01 dB	NA	NA	+0.12 / -0.13 dB
26		2400 MHz	3.09 dB	NA	NA	+0.12 / -0.13 dB
27		2500 MHz	3.16 dB	NA	NA	+0.17 / -0.18 dB
28		2600 MHz	3.23 dB	NA	NA	+0.17 / -0.18 dB
29		2700 MHz	3.30 dB	NA	NA	+0.17 / -0.18 dB
30		2800 MHz	3.38 dB	NA	NA	+0.17 / -0.18 dB
31		2900 MHz	3.44 dB	NA	NA	+0.17 / -0.18 dB
32		3000 MHz	3.52 dB	NA	NA	+0.17 / -0.18 dB
33		3100 MHz	3.58 dB	NA	NA	+0.19 / -0.2 dB
34		3200 MHz	3.64 dB	NA	NA	+0.19 / -0.2 dB
35		3300 MHz	3.72 dB	NA	NA	+0.19 / -0.2 dB
36		3400 MHz	3.77 dB	NA	NA	+0.19 / -0.2 dB
37		3500 MHz	3.84 dB	NA	NA	+0.19 / -0.2 dB
38		3600 MHz	3.90 dB	NA	NA	+0.19 / -0.2 dB
39		3700 MHz	3.97 dB	NA	NA	+0.19 / -0.2 dB
40		3800 MHz	4.03 dB	NA	NA	+0.19 / -0.2 dB

No.	Parameter	Set / Applied	Measured	Deviation	Tolerance	Uncertainty
41	Insertion loss	3900 MHz	4.09 dB	NA	NA	+0.19 / -0.2 dB
42		4000 MHz	4.14 dB	NA	NA	+0.19 / -0.2 dB
43		4100 MHz	4.20 dB	NA	NA	+0.3 / -0.33 dB
44		4200 MHz	4.26 dB	NA	NA	+0.3 / -0.33 dB
45		4300 MHz	4.32 dB	NA	NA	+0.3 / -0.33 dB
46		4400 MHz	4.37 dB	NA	NA	+0.3 / -0.33 dB
47		4500 MHz	4.43 dB	NA	NA	+0.3 / -0.33 dB
48		4600 MHz	4.50 dB	NA	NA	+0.3 / -0.33 dB
49		4700 MHz	4.54 dB	NA	NA	+0.3 / -0.33 dB
50		4800 MHz	4.60 dB	NA	NA	+0.3 / -0.33 dB
51		4900 MHz	4.67 dB	NA	NA	+0.3 / -0.33 dB
52		5000 MHz	4.72 dB	NA	NA	+0.3 / -0.33 dB
53		5100 MHz	4.77 dB	NA	NA	+0.3 / -0.33 dB
54		5200 MHz	4.82 dB	NA	NA	+0.3 / -0.33 dB
55		5300 MHz	4.89 dB	NA	NA	+0.3 / -0.33 dB
56		5400 MHz	4.94 dB	NA	NA	+0.3 / -0.33 dB
57		5500 MHz	4.99 dB	NA	NA	+0.3 / -0.33 dB
58		5600 MHz	5.05 dB	NA	NA	+0.3 / -0.33 dB
59		5700 MHz	5.11 dB	NA	NA	+0.3 / -0.33 dB
60		5800 MHz	5.15 dB	NA	NA	+0.3 / -0.33 dB
61		5900 MHz	5.21 dB	NA	NA	+0.3 / -0.33 dB
62		6000 MHz	5.26 dB	NA	NA	+0.3 / -0.33 dB
63		6100 MHz	5.31 dB	NA	NA	+0.3 / -0.33 dB
64		6200 MHz	5.38 dB	NA	NA	+0.3 / -0.33 dB
65		6300 MHz	5.43 dB	NA	NA	+0.3 / -0.33 dB
66		6400 MHz	5.49 dB	NA	NA	+0.3 / -0.33 dB
67		6500 MHz	5.54 dB	NA	NA	+0.3 / -0.33 dB
68		6600 MHz	5.60 dB	NA	NA	+0.3 / -0.33 dB
69		6700 MHz	5.65 dB	NA	NA	+0.3 / -0.33 dB
70		6800 MHz	5.71 dB	NA	NA	+0.3 / -0.33 dB
71		6900 MHz	5.76 dB	NA	NA	+0.3 / -0.33 dB
72		7000 MHz	5.81 dB	NA	NA	+0.3 / -0.33 dB
73		7100 MHz	5.86 dB	NA	NA	+0.3 / -0.33 dB
74		7200 MHz	5.91 dB	NA	NA	+0.3 / -0.33 dB
75		7300 MHz	5.96 dB	NA	NA	+0.3 / -0.33 dB
76		7400 MHz	6.00 dB	NA	NA	+0.3 / -0.33 dB
77		7500 MHz	6.07 dB	NA	NA	+0.3 / -0.33 dB
78		7600 MHz	6.12 dB	NA	NA	+0.3 / -0.33 dB
79		7700 MHz	6.16 dB	NA	NA	+0.3 / -0.33 dB
80		7800 MHz	6.22 dB	NA	NA	+0.3 / -0.33 dB

No.	Parameter	Set / Applied	Measured	Deviation	Tolerance	Uncertainty
81	Insertion loss	7900 MHz	6.27 dB	NA	NA	+0.3 / -0.33 dB
82		8000 MHz	6.31 dB	NA	NA	+0.3 / -0.33 dB
83		8100 MHz	6.38 dB	NA	NA	+0.34 / -0.36 dB
84		8200 MHz	6.42 dB	NA	NA	+0.34 / -0.36 dB
85		8300 MHz	6.46 dB	NA	NA	+0.34 / -0.36 dB
86		8400 MHz	6.51 dB	NA	NA	+0.34 / -0.36 dB
87		8500 MHz	6.57 dB	NA	NA	+0.34 / -0.36 dB
88		8600 MHz	6.62 dB	NA	NA	+0.34 / -0.36 dB
89		8700 MHz	6.67 dB	NA	NA	+0.34 / -0.36 dB
90		8800 MHz	6.72 dB	NA	NA	+0.34 / -0.36 dB
91		8900 MHz	6.76 dB	NA	NA	+0.34 / -0.36 dB
92		9000 MHz	6.80 dB	NA	NA	+0.34 / -0.36 dB
93		9100 MHz	6.86 dB	NA	NA	+0.34 / -0.36 dB
94		9200 MHz	6.90 dB	NA	NA	+0.34 / -0.36 dB
95		9300 MHz	6.95 dB	NA	NA	+0.34 / -0.36 dB
96		9400 MHz	7.01 dB	NA	NA	+0.34 / -0.36 dB
97		9500 MHz	7.05 dB	NA	NA	+0.34 / -0.36 dB
98		9600 MHz	7.09 dB	NA	NA	+0.34 / -0.36 dB
99		9700 MHz	7.14 dB	NA	NA	+0.34 / -0.36 dB
100		9800 MHz	7.16 dB	NA	NA	+0.34 / -0.36 dB
101		9900 MHz	7.22 dB	NA	NA	+0.34 / -0.36 dB
102		10000 MHz	7.25 dB	NA	NA	+0.34 / -0.36 dB
103		10100 MHz	7.26 dB	NA	NA	+0.4 / -0.44 dB
104		10200 MHz	7.30 dB	NA	NA	+0.4 / -0.44 dB
105		10300 MHz	7.33 dB	NA	NA	+0.4 / -0.44 dB
106		10400 MHz	7.35 dB	NA	NA	+0.4 / -0.44 dB
107		10500 MHz	7.40 dB	NA	NA	+0.4 / -0.44 dB
108		10600 MHz	7.40 dB	NA	NA	+0.4 / -0.44 dB
109		10700 MHz	7.43 dB	NA	NA	+0.4 / -0.44 dB
110		10800 MHz	7.47 dB	NA	NA	+0.4 / -0.44 dB
111		10900 MHz	7.50 dB	NA	NA	+0.4 / -0.44 dB
112		11000 MHz	7.53 dB	NA	NA	+0.4 / -0.44 dB
113		11100 MHz	7.56 dB	NA	NA	+0.4 / -0.44 dB
114		11200 MHz	7.58 dB	NA	NA	+0.4 / -0.44 dB
115		11300 MHz	7.63 dB	NA	NA	+0.4 / -0.44 dB
116		11400 MHz	7.67 dB	NA	NA	+0.4 / -0.44 dB
117		11500 MHz	7.72 dB	NA	NA	+0.4 / -0.44 dB
118		11600 MHz	7.77 dB	NA	NA	+0.4 / -0.44 dB
119		11700 MHz	7.81 dB	NA	NA	+0.4 / -0.44 dB
120		11800 MHz	7.85 dB	NA	NA	+0.4 / -0.44 dB

No.	Parameter	Set / Applied	Measured	Deviation	Tolerance	Uncertainty
121	Insertion loss	11900 MHz	7.88 dB	NA	NA	+0.4 / -0.44 dB
122		12000 MHz	7.94 dB	NA	NA	+0.4 / -0.44 dB
123		12100 MHz	7.99 dB	NA	NA	+0.4 / -0.44 dB
124		12200 MHz	8.03 dB	NA	NA	+0.4 / -0.44 dB
125		12300 MHz	8.06 dB	NA	NA	+0.4 / -0.44 dB
126		12400 MHz	8.09 dB	NA	NA	+0.4 / -0.44 dB
127		12500 MHz	8.14 dB	NA	NA	+0.47 / -0.52 dB
128		12600 MHz	8.16 dB	NA	NA	+0.47 / -0.52 dB
129		12700 MHz	8.21 dB	NA	NA	+0.47 / -0.52 dB
130		12800 MHz	8.29 dB	NA	NA	+0.47 / -0.52 dB
131		12900 MHz	8.32 dB	NA	NA	+0.47 / -0.52 dB
132		13000 MHz	8.34 dB	NA	NA	+0.47 / -0.52 dB
133		13100 MHz	8.39 dB	NA	NA	+0.47 / -0.52 dB
134		13200 MHz	8.46 dB	NA	NA	+0.47 / -0.52 dB
135		13300 MHz	8.47 dB	NA	NA	+0.47 / -0.52 dB
136		13400 MHz	8.53 dB	NA	NA	+0.47 / -0.52 dB
137		13500 MHz	8.55 dB	NA	NA	+0.47 / -0.52 dB
138		13600 MHz	8.58 dB	NA	NA	+0.47 / -0.52 dB
139		13700 MHz	8.64 dB	NA	NA	+0.47 / -0.52 dB
140		13800 MHz	8.67 dB	NA	NA	+0.47 / -0.52 dB
141		13900 MHz	8.72 dB	NA	NA	+0.47 / -0.52 dB
142		14000 MHz	8.76 dB	NA	NA	+0.47 / -0.52 dB
143		14100 MHz	8.81 dB	NA	NA	+0.47 / -0.52 dB
144		14200 MHz	8.86 dB	NA	NA	+0.47 / -0.52 dB
145		14300 MHz	8.91 dB	NA	NA	+0.47 / -0.52 dB
146		14400 MHz	8.94 dB	NA	NA	+0.47 / -0.52 dB
147		14500 MHz	9.00 dB	NA	NA	+0.47 / -0.52 dB
148		14600 MHz	9.05 dB	NA	NA	+0.47 / -0.52 dB
149		14700 MHz	9.13 dB	NA	NA	+0.47 / -0.52 dB
150		14800 MHz	9.18 dB	NA	NA	+0.47 / -0.52 dB
151		14900 MHz	9.20 dB	NA	NA	+0.47 / -0.52 dB
152		15000 MHz	9.25 dB	NA	NA	+0.47 / -0.52 dB
153		15100 MHz	9.26 dB	NA	NA	+0.47 / -0.52 dB
154		15200 MHz	9.32 dB	NA	NA	+0.47 / -0.52 dB
155		15300 MHz	9.36 dB	NA	NA	+0.47 / -0.52 dB
156		15400 MHz	9.38 dB	NA	NA	+0.47 / -0.52 dB
157		15500 MHz	9.40 dB	NA	NA	+0.47 / -0.52 dB
158		15600 MHz	9.40 dB	NA	NA	+0.47 / -0.52 dB
159		15700 MHz	9.46 dB	NA	NA	+0.47 / -0.52 dB
160		15800 MHz	9.48 dB	NA	NA	+0.47 / -0.52 dB

No.	Parameter	Set / Applied	Measured	Deviation	Tolerance	Uncertainty
161	Insertion loss	15900 MHz	9.51 dB	NA	NA	+0.47 / -0.52 dB
162		16000 MHz	9.56 dB	NA	NA	+0.47 / -0.52 dB
163		16100 MHz	9.58 dB	NA	NA	+0.47 / -0.52 dB
164		16200 MHz	9.62 dB	NA	NA	+0.47 / -0.52 dB
165		16300 MHz	9.66 dB	NA	NA	+0.47 / -0.52 dB
166		16400 MHz	9.70 dB	NA	NA	+0.47 / -0.52 dB
167		16500 MHz	9.71 dB	NA	NA	+0.47 / -0.52 dB
168		16600 MHz	9.75 dB	NA	NA	+0.47 / -0.52 dB
169		16700 MHz	9.80 dB	NA	NA	+0.47 / -0.52 dB
170		16800 MHz	9.88 dB	NA	NA	+0.47 / -0.52 dB
171		16900 MHz	9.94 dB	NA	NA	+0.47 / -0.52 dB
172		17000 MHz	9.99 dB	NA	NA	+0.47 / -0.52 dB
173		17100 MHz	10.04 dB	NA	NA	+0.47 / -0.52 dB
174		17200 MHz	10.07 dB	NA	NA	+0.47 / -0.52 dB
175		17300 MHz	10.14 dB	NA	NA	+0.47 / -0.52 dB
176		17400 MHz	10.17 dB	NA	NA	+0.47 / -0.52 dB
177		17500 MHz	10.18 dB	NA	NA	+0.47 / -0.52 dB
178		17600 MHz	10.24 dB	NA	NA	+0.47 / -0.52 dB
179		17700 MHz	10.26 dB	NA	NA	+0.47 / -0.52 dB
180		17800 MHz	10.31 dB	NA	NA	+0.47 / -0.52 dB
181		17900 MHz	10.31 dB	NA	NA	+0.47 / -0.52 dB
182		18000 MHz	10.37 dB	NA	NA	+0.47 / -0.52 dB

Cable loss
Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M, MegaPhase, model NC29-N1N1-244, S/N 12025101 003
HL 4353

No.	Parameter	Set / Applied	Measured	Deviation	Tolerance	Uncertainty
1	Insertion loss	50 MHz	0.23 dB	NA	NA	+0.06 / -0.06 dB
2		100 MHz	0.31 dB	NA	NA	+0.06 / -0.06 dB
3		300 MHz	0.52 dB	NA	NA	+0.07 / -0.07 dB
4		500 MHz	0.66 dB	NA	NA	+0.07 / -0.07 dB
5		1000 MHz	0.93 dB	NA	NA	+0.07 / -0.07 dB
6		1500 MHz	1.14 dB	NA	NA	+0.07 / -0.07 dB
7		2000 MHz	1.32 dB	NA	NA	+0.07 / -0.07 dB
8		2500 MHz	1.48 dB	NA	NA	+0.09 / -0.1 dB
9		3000 MHz	1.62 dB	NA	NA	+0.09 / -0.1 dB
10		3500 MHz	1.76 dB	NA	NA	+0.12 / -0.12 dB
11		4000 MHz	1.89 dB	NA	NA	+0.16 / -0.17 dB
12		4500 MHz	2.02 dB	NA	NA	+0.21 / -0.22 dB
13		5000 MHz	2.12 dB	NA	NA	+0.21 / -0.22 dB
14		5500 MHz	2.25 dB	NA	NA	+0.21 / -0.22 dB
15		6000 MHz	2.38 dB	NA	NA	+0.21 / -0.22 dB
16		6500 MHz	2.47 dB	NA	NA	+0.21 / -0.22 dB
17		7000 MHz	2.57 dB	NA	NA	+0.21 / -0.22 dB
18		7500 MHz	2.67 dB	NA	NA	+0.21 / -0.22 dB
19		8000 MHz	2.76 dB	NA	NA	+0.24 / -0.26 dB
20		8500 MHz	2.83 dB	NA	NA	+0.27 / -0.29 dB
21		9000 MHz	2.94 dB	NA	NA	+0.27 / -0.29 dB
22		9500 MHz	3.04 dB	NA	NA	+0.27 / -0.29 dB
23		10000 MHz	3.13 dB	NA	NA	+0.27 / -0.29 dB
24		10500 MHz	3.21 dB	NA	NA	+0.27 / -0.29 dB
25		11000 MHz	3.29 dB	NA	NA	+0.27 / -0.29 dB
26		11500 MHz	3.37 dB	NA	NA	+0.27 / -0.29 dB
27		12000 MHz	3.42 dB	NA	NA	+0.27 / -0.29 dB
28		12500 MHz	3.50 dB	NA	NA	+0.36 / -0.4 dB
29		13000 MHz	3.60 dB	NA	NA	+0.36 / -0.4 dB
30		13500 MHz	3.72 dB	NA	NA	+0.36 / -0.4 dB
31		14000 MHz	3.75 dB	NA	NA	+0.36 / -0.4 dB
32		14500 MHz	3.81 dB	NA	NA	+0.36 / -0.4 dB
33		15000 MHz	3.91 dB	NA	NA	+0.36 / -0.4 dB
34		15500 MHz	3.92 dB	NA	NA	+0.36 / -0.4 dB
35		16000 MHz	4.01 dB	NA	NA	+0.36 / -0.4 dB
36		16500 MHz	4.13 dB	NA	NA	+0.36 / -0.4 dB
37		17000 MHz	4.16 dB	NA	NA	+0.36 / -0.4 dB
38		17500 MHz	4.26 dB	NA	NA	+0.36 / -0.4 dB
39		18000 MHz	4.33 dB	NA	NA	+0.36 / -0.4 dB

12 APPENDIX E Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

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

13 APPENDIX F Specification references

FCC 47CFR part 15: 2015

ANSI C63.10: 2013

ANSI C63.2: 1996

Radio Frequency Devices

American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications

END OF DOCUMENT