



ELECTRICAL TESTING
0839.01

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TEST REPORT

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

FOR:

**Essence Smartcare Ltd.
Emergency Pendant with Fall Detection
Model:ES700EPA
FCC ID:YXG-ES700EPA-1**

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.



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1 Applicant information

Client name: Essence Smartcare Ltd.
Address: 12 Abba Eban avenue, Ackerstein Tower Bldg. D, P.O.Box 2073, Herzliya 4612001, Israel
Telephone: +972 732 447 735
Fax: +972 9772 9962
E-mail: israelgo@essence-grp.com
Contact name: Mr. Israel Gottesman

2 Equipment under test attributes

Product name: Emergency Pendant with Fall Detection
Product type: Transceiver
Model(s): ES700EPA
Serial number: 1
Hardware version: 2_PCB
Software release: 1.03
Receipt date 11-Jan-17

3 Manufacturer information

Manufacturer name: Essence Smartcare Ltd.
Address: 12 Abba Eban avenue, Ackerstein Tower Bldg. D, P.O.Box 2073, Herzliya 4612001, Israel
Telephone: +972 732 447 735
Fax: +972 9772 9962
E-Mail: israelgo@essence-grp.com
Contact name: Mr. Israel Gottesman

4 Test details

Project ID: 29153
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 11-Jan-17
Test completed: 16-Jan-17
Test specification(s): FCC 47CFR part 15, subpart C, §15.231 and subpart B



5 Tests summary

Test	Status
Transmitter characteristics	
FCC Part 15, Section 231(a), Periodic operation requirements	Pass
FCC Part 15, Section 231(b), Field strength of emissions	Pass
FCC Part 15, Section 231(c), Occupied bandwidth	Pass
FCC Part 15, Section 207, Conducted emission	Not required
FCC Part 15, Section 203, Antenna requirements	Pass
Unintentional emissions	
FCC Part 15, Section 107, Conducted emission at AC power port	Not required
FCC Part 15, Section 109, Radiated emission	Pass

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.

The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mr.I. Zilberstein, test engineer	January 16, 2017	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	January 18, 2017	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	February 20, 2017	

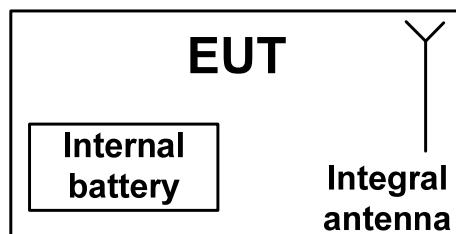
6 EUT description

6.1 General information

The EUT, model ES700EPA, is an emergency device for detecting falls and signaling emergency situations, operating at 916.5 MHz with 2FSK modulation. The EUT is equipped with an integral antenna and is powered by internal 3 V battery.

The EUT was tested in two configurations: with and without strap.

6.2 Test configuration



6.3 Changes made in EUT

No changes were implemented in the EUT during the testing.



6.4 EUT test positions

Photograph 6.4.1 EUT with strap in X-axis orthogonal position



Photograph 6.4.2 EUT with strap in Y-axis orthogonal position

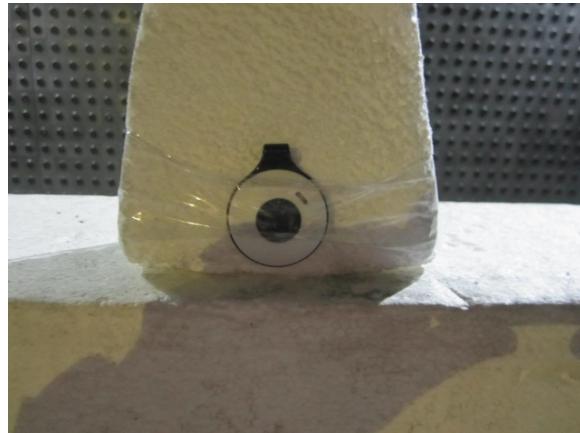


Photograph 6.4.3 EUT with strap in Z-axis orthogonal position





Photograph 6.4.4 EUT without strap in X-axis orthogonal position



Photograph 6.4.5 EUT EUT without strap in Y-axis orthogonal position





6.5 Transmitter characteristics

Type of equipment							
<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)						
Operating frequency		916.5 MHz					
Maximum rated output power		At transmitter 50 Ω RF output connector			dBm		
		Field strength at 3 m distance			87.61 dB(µV/m) -peak 70.69 dB(µV/m)-average		
Is transmitter output power variable?		X	No				
		Yes	continuous variable				
			stepped variable with stepsize	dB			
			minimum RF power	dBm			
			maximum RF power	dBm			
Antenna connection							
unique coupling	standard connector		X	integral	with temporary RF connector X without temporary RF connector		
Antenna/s technical characteristics							
Type	Manufacturer		Model number		Gain		
Integral	Essence Security		Printed		-8.2 dBi		
Type of modulation		2FSK					
Transmitter aggregate data rate/s		38.4 kbps					
Transmitter power source							
<input checked="" type="checkbox"/>	Battery	Nominal rated voltage	3 VDC	Battery type	Alkaline		
<input type="checkbox"/>	DC	Nominal rated voltage					
<input type="checkbox"/>	AC mains	Nominal rated voltage		Frequency			
Common power source for transmitter and receiver			X	yes	no		



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Test specification: FCC Part 15, Section 231(a), Periodic operation requirements		
Test procedure: Supplier declaration		
Test mode: Compliance		Verdict: PASS
Date(s): 11-Jan-17		
Temperature: 23 °C	Relative Humidity: 39 %	Air Pressure: 1018 hPa
Power: Battery		
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 either manually or automatically. Once manually operated transmitter was activated, the switch was immediately released.

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

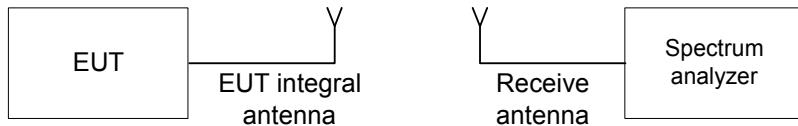
7.1.3 Test procedure for measurements of polling / supervision transmission duration

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

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

7.1.3.3 The transmission time was captured and shown in Plot 7.1.2 to Plot 7.1.4.

Figure 7.1.1 Setup for transmitter shut down test



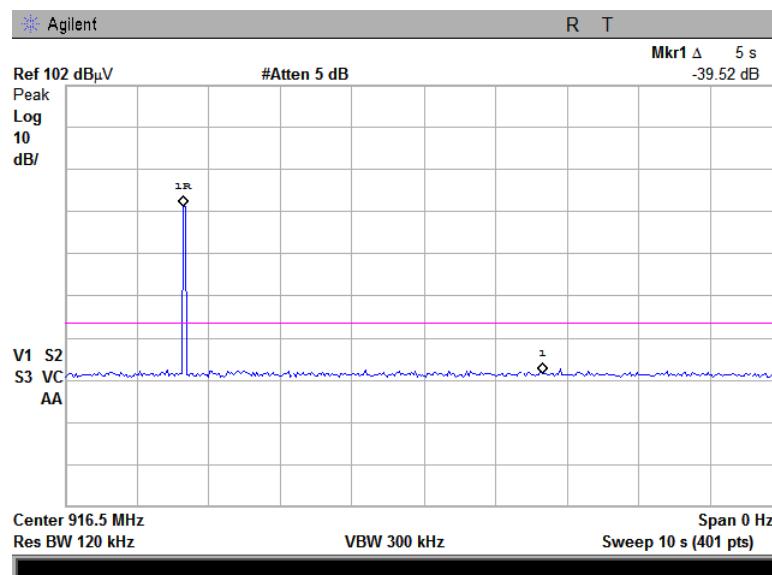


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Test specification: FCC Part 15, Section 231(a), Periodic operation requirements		
Test procedure: Supplier declaration		
Test mode: Compliance	Verdict: PASS	
Date(s): 11-Jan-17		
Temperature: 23 °C	Relative Humidity: 39 %	Air Pressure: 1018 hPa
Remarks:		

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

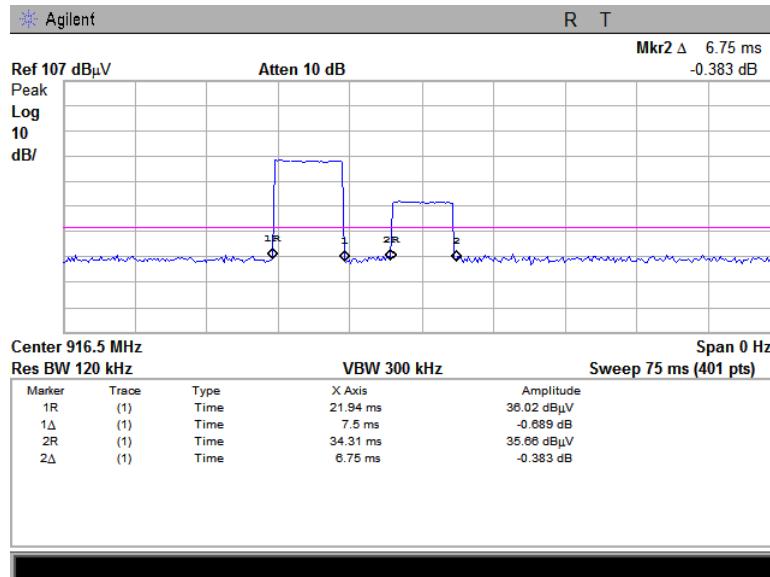
Plot 7.1.1 Transmitter shut down test result



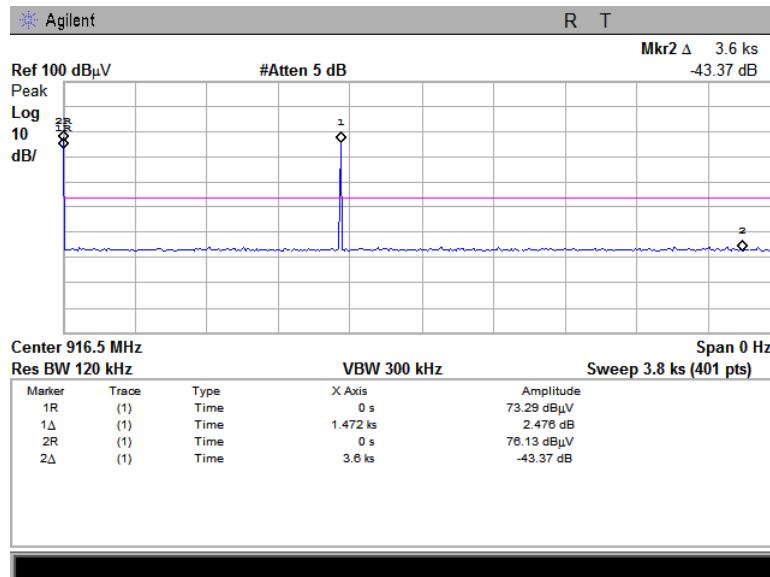
HERMON LABORATORIES

Test specification: FCC Part 15, Section 231(a), Periodic operation requirements		
Test procedure: Supplier declaration		
Test mode: Compliance		Verdict: PASS
Date(s): 11-Jan-17		
Temperature: 23 °C	Relative Humidity: 39 %	Air Pressure: 1018 hPa
Remarks:		

Plot 7.1.2 Polling / supervision transmission duration



Plot 7.1.3 Polling / supervision transmissions in one hour





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Test specification: FCC Part 15, Section 231(a), Periodic operation requirements		
Test procedure: Supplier declaration		
Test mode: Compliance		Verdict: PASS
Date(s): 11-Jan-17		
Temperature: 23 °C	Relative Humidity: 39 %	Air Pressure: 1018 hPa
Power: Battery		
Remarks:		

Table 7.1.2 Total duration of polling / supervision transmissions

Pulses Duration within 100 msec	Maximum number of transmissions within 1 hour	Total duration within 1 hour, ms
14.25 (7.50 + 6.75)	2	28.5

Reference numbers of test equipment used

HL 3003	HL 3903						
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Full description is given in Appendix A.



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Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure: ANSI C63.10 sections 6.5, 6.6		
Test mode: Compliance		Verdict: PASS
Date(s):	11-Jan-17	
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
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
916.5	102.0	82.0

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**	82.0	62.0		
0.090 – 0.110	NA	108.5 – 106.8**	NA				
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**				
0.490 – 1.705	NA	73.8 – 63.0**	NA				
1.705 – 30.0*		69.5					
30 – 88		40.0					
88 – 216		43.5					
216 – 960		46.0					
960 – 1000		54.0					
Above 1000		74.0	NA				

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

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

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:

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

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

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.



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Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6	
Test mode:	Compliance	Verdict: PASS
Date(s):	11-Jan-17	
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Remarks:		

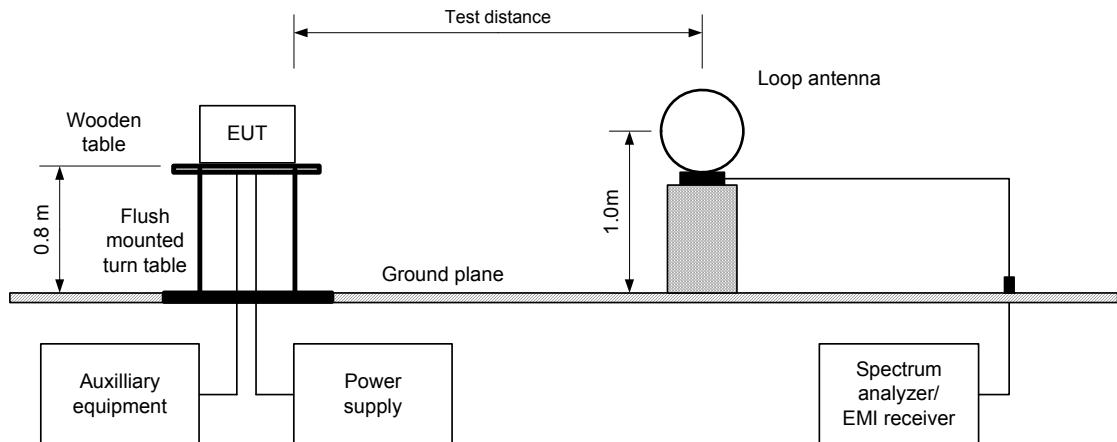
7.2.2 Test procedure for spurious emission field strength measurements in 9 kHz to 30 MHz band

- 7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and the performance check was conducted.
- 7.2.2.2 The measurements were performed in three EUT orthogonal positions.
- 7.2.2.3 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated around its vertical axis.
- 7.2.2.4 The worst test results (the lowest margins) were 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, Figure 7.2.3, energized and the performance check was conducted.
- 7.2.3.2 The measurements were performed in three EUT orthogonal positions.
- 7.2.3.3 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.
- 7.2.3.4 The worst test results (the lowest margins) were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

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





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Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure: ANSI C63.10 sections 6.5, 6.6		
Test mode: Compliance		Verdict: PASS
Date(s): 11-Jan-17		
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Power: Battery		
Remarks:		

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

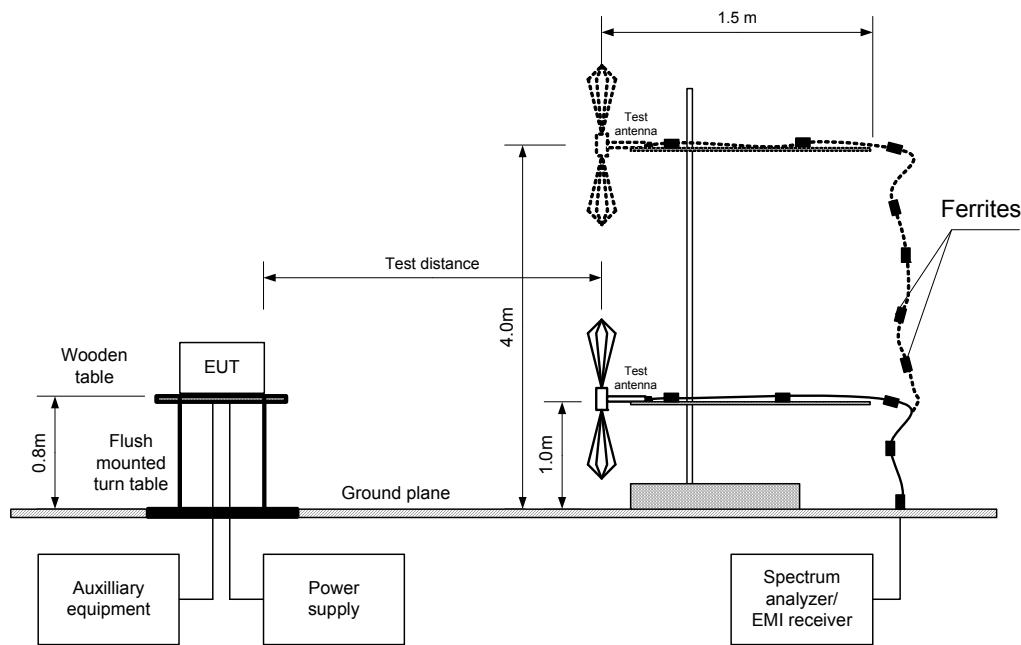
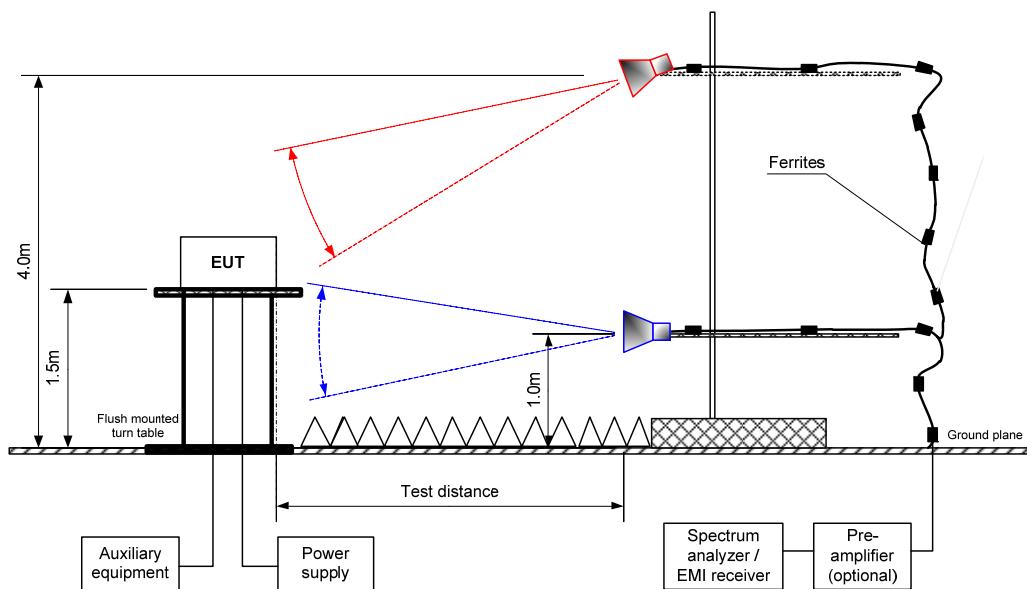


Figure 7.2.3 Setup for spurious emission field strength measurements above 1000 MHz





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Test specification: FCC Part 15, Section 231(b), Field strength of emissions	
Test procedure:	ANSI C63.10 sections 6.5, 6.6
Test mode:	Compliance
Date(s):	11-Jan-17
Temperature: 23 °C	Relative Humidity: 42 %
	Air Pressure: 1022 hPa
Power: Battery	
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:	3 orthogonal (X / Y / Z)
MODULATION:	2FSK
MODULATING SIGNAL:	ID code
INVESTIGATED FREQUENCY RANGE:	0.009 - 10000 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	0.2 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz) 1.0 MHz (above 1000 MHz)
VIDEO BANDWIDTH:	≥ Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz) Double ridged guide (above 1000 MHz)

F, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength			Verdict	
	Pol.	Height, m		Measured, dB(µV/m)	Limit, dB(µV/m)	Margin, dB**	Measured, dB(µV/m)	Calculated, dB(µV/m)	Limit, dB(µV/m)		
Fundamental emission***											
916.5	H	1.46	321	87.61	102	-14.39	87.61	70.69	82.0	-11.31	Pass
Spurious emissions											
1833.00	V	1.2	283	43.35	82.0	-38.65	43.35	26.43	62.0	-35.57	Pass
2749.49	V	1.5	35	56.33	74.0	-17.67	56.33	39.41	54.0	-14.59	
3666.76	H	1.4	0	48.70	74.0	-25.30	48.70	31.78	54.0	-22.22	
4582.53	V	1.6	270	52.36	74.0	-21.64	52.36	35.44	74.0	-38.56	

*- 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 for the EUT without strap in Y-axis orthogonal position.

Table 7.2.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
7.5+6.75	100	N/A	N/A	N/A	-16.92

*- 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 0521	HL 0604	HL 1915	HL 2909	HL 3001	HL 3818	HL 3903
HL 4353	HL 4933	HL 5101	HL 5111				

Full description is given in Appendix A.



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Test specification: FCC Part 15, Section 231(b), Field strength of emissions	
Test procedure:	ANSI C63.10 sections 6.5, 6.6
Test mode:	Compliance
Date(s):	11-Jan-17
Temperature: 23 °C	Relative Humidity: 42 %
	Air Pressure: 1022 hPa
Remarks:	Power: Battery

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

TEST DISTANCE:	3 m
EUT POSITION:	3 orthogonal (X / Y / Z)
MODULATION:	2FSK
MODULATING SIGNAL:	ID code
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) ≥ Resolution bandwidth
VIDEO BANDWIDTH:	

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								

*- Margin = Measured emission - specification limit.

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

Reference numbers of test equipment used

HL 0034	HL 0521	HL 0604	HL 1915	HL 2909	HL 3818	HL 4353	HL 4933
HL 5101	HL 5111						

Full description is given in Appendix A.



HERMON LABORATORIES

Test specification: FCC Part 15, Section 231(b), Field strength of emissions					
Test procedure: ANSI C63.10 sections 6.5, 6.6					
Test mode: Compliance					Verdict: PASS
Date(s): 11-Jan-17					
Temperature: 23 °C	Relative Humidity: 42 %		Air Pressure: 1022 hPa	Power: Battery	
Remarks:					

Table 7.2.6 Restricted bands according to FCC 15, Section 205

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.290 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138	1300 - 1427	3345.8 - 3358	15.35 - 16.2
4.17725 - 4.17775	12.57675 - 12.57725	149.9 - 150.05	1435 - 1626.5	3600 - 4400	17.7 - 21.4
4.20725 - 4.20775	13.36 - 13.41	156.52475 - 156.52525	1645.5 - 1646.5	4500 - 5150	22.01 - 23.12
6.215 - 6.218	16.420 - 16.423	156.7 - 156.9	1660 - 1710	5350 - 5460	23.6 - 24
6.26775 - 6.26825	16.69475 - 16.69525	162.0125 - 167.17	1718.8 - 1722.2	7250 - 7750	31.2 - 31.8
6.31175 - 6.31225	16.80425 - 16.80475	167.72 - 173.2	2200 - 2300	8025 - 8500	36.43 - 36.5
8.291 - 8.294	25.5 - 25.67	240 - 285	2310 - 2390	9000 - 9200	
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	Above 38.6

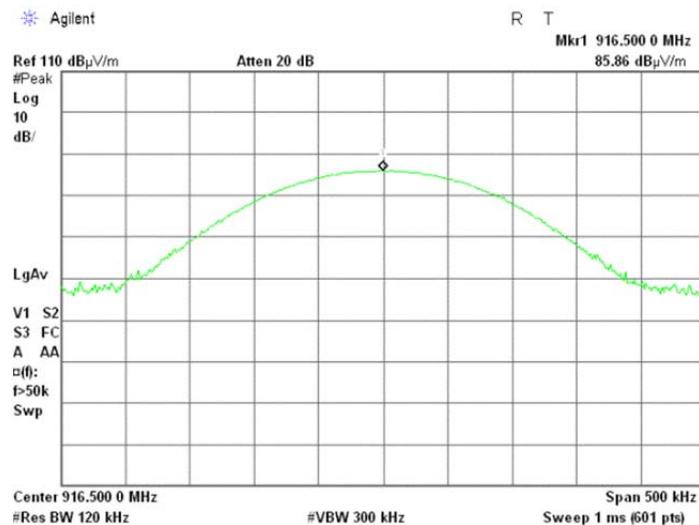


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Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6	
Test mode:	Compliance	Verdict: PASS
Date(s):	11-Jan-17	
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Power: Battery		
Remarks:		

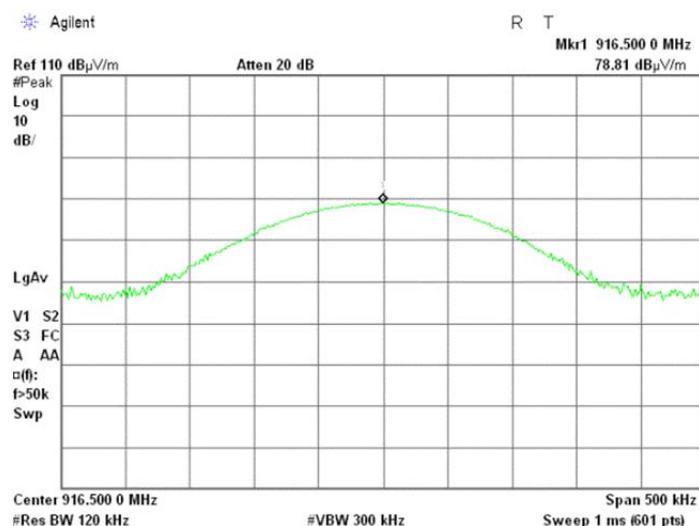
Plot 7.2.1 Radiated emission measurements at the fundamental frequency, EUT without strap

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



Plot 7.2.2 Radiated emission measurements at the fundamental frequency, EUT without strap

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



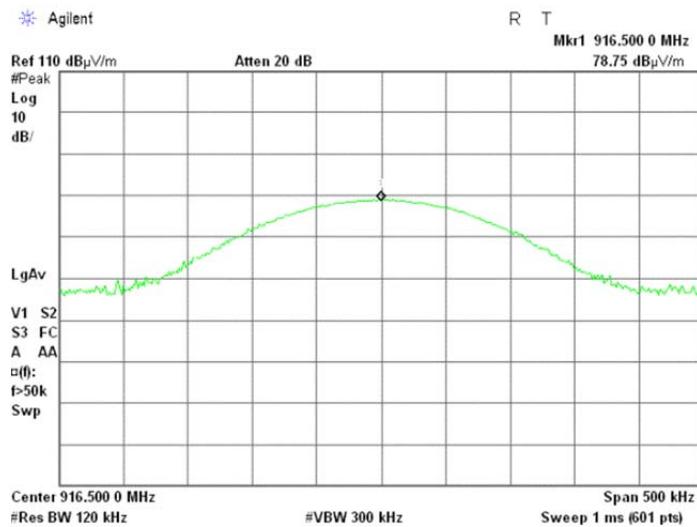


HERMON LABORATORIES

Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure: ANSI C63.10 sections 6.5, 6.6		
Test mode: Compliance		Verdict: PASS
Date(s): 11-Jan-17		
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Remarks:		

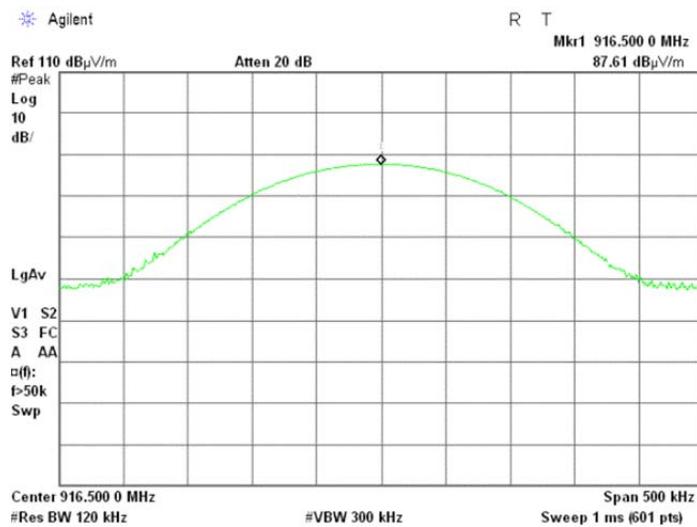
Plot 7.2.3 Radiated emission measurements at the fundamental frequency, EUT without strap

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis



Plot 7.2.4 Radiated emission measurements at the fundamental frequency, EUT without strap

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis



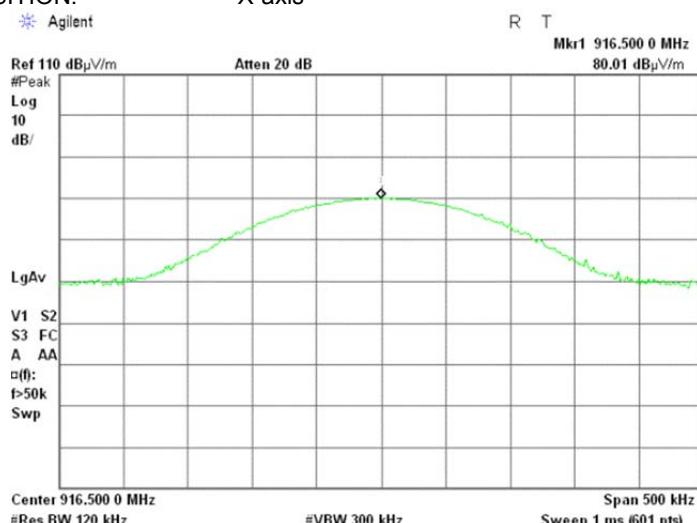


HERMON LABORATORIES

Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6	
Test mode:	Compliance	Verdict: PASS
Date(s):	11-Jan-17	
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Power: Battery		
Remarks:		

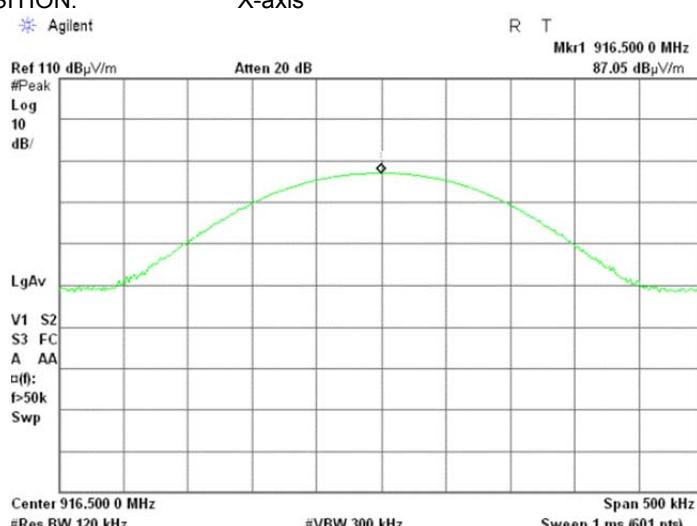
Plot 7.2.5 Radiated emission measurements at the fundamental frequency, EUT with strap

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



Plot 7.2.6 Radiated emission measurements at the fundamental frequency, EUT with strap

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



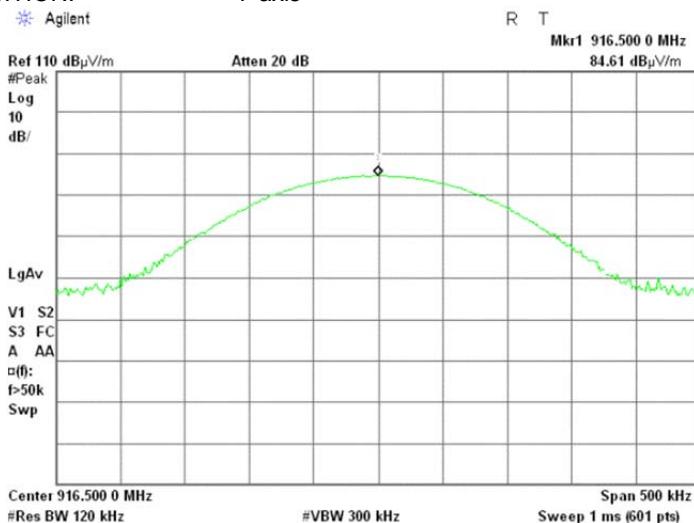


HERMON LABORATORIES

Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure: ANSI C63.10 sections 6.5, 6.6		
Test mode: Compliance	Verdict: PASS	
Date(s): 11-Jan-17		
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Remarks:		

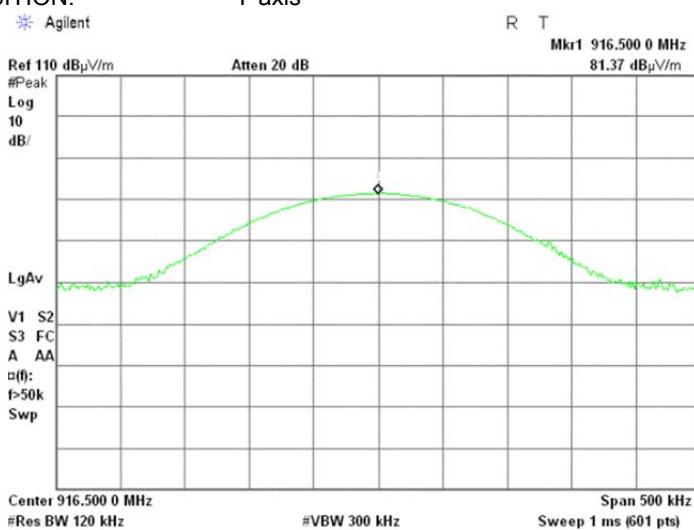
Plot 7.2.7 Radiated emission measurements at the fundamental frequency, EUT with strap

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis



Plot 7.2.8 Radiated emission measurements at the fundamental frequency, EUT with strap

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis



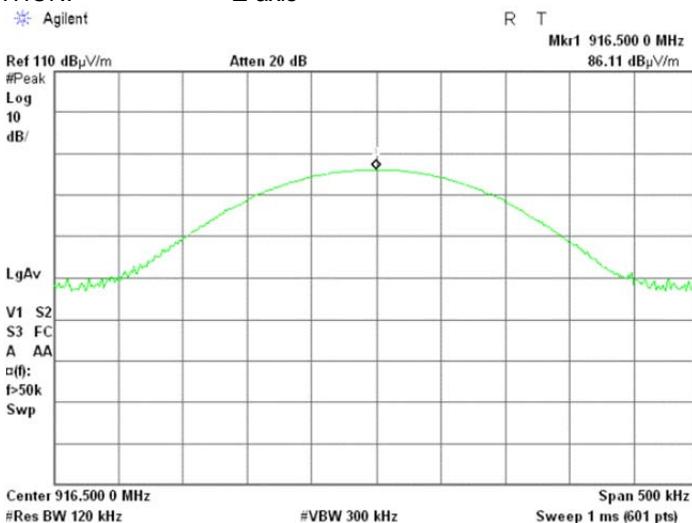


HERMON LABORATORIES

Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure: ANSI C63.10 sections 6.5, 6.6		
Test mode: Compliance	Verdict: PASS	
Date(s): 11-Jan-17		
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Remarks:		

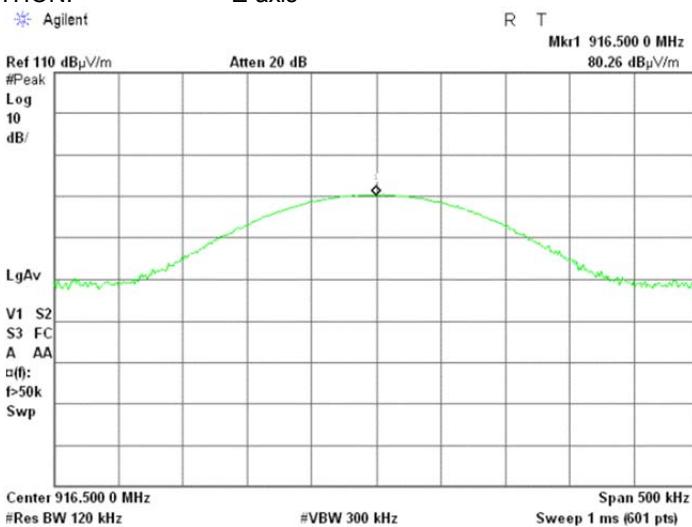
Plot 7.2.9 Radiated emission measurements at the fundamental frequency, EUT with strap

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Z-axis



Plot 7.2.10 Radiated emission measurements at the fundamental frequency, EUT with strap

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Z-axis



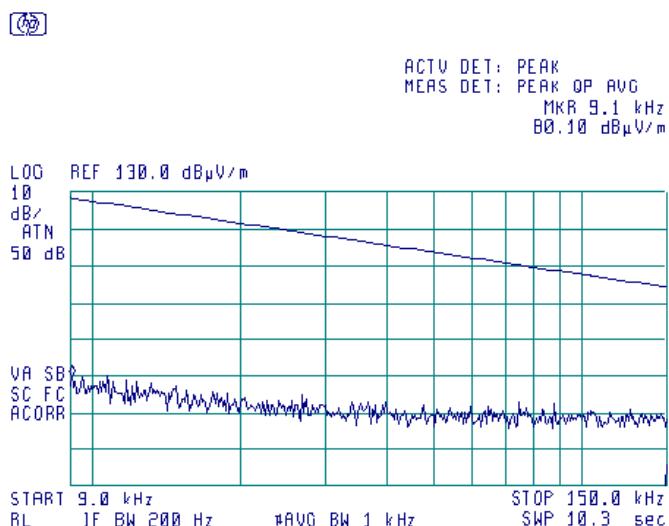


HERMON LABORATORIES

Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure: ANSI C63.10 sections 6.5, 6.6		
Test mode: Compliance		Verdict: PASS
Date(s): 11-Jan-17		
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Power: Battery		
Remarks:		

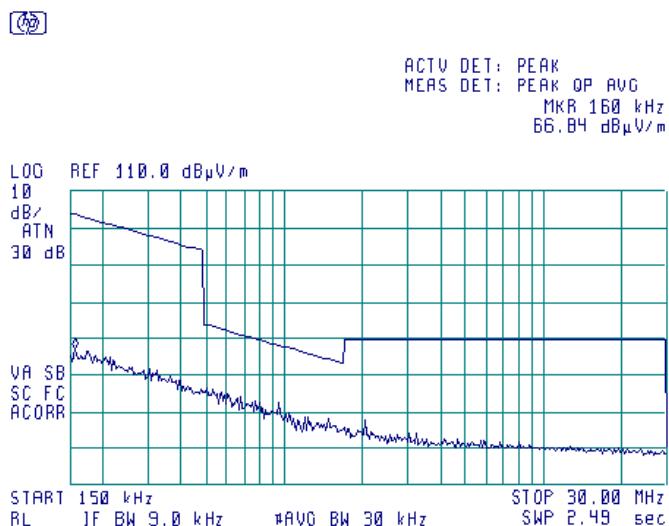
Plot 7.2.11 Radiated emission measurements from 9 to 150 kHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis



Plot 7.2.12 Radiated emission measurements from 0.15 to 30 MHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis



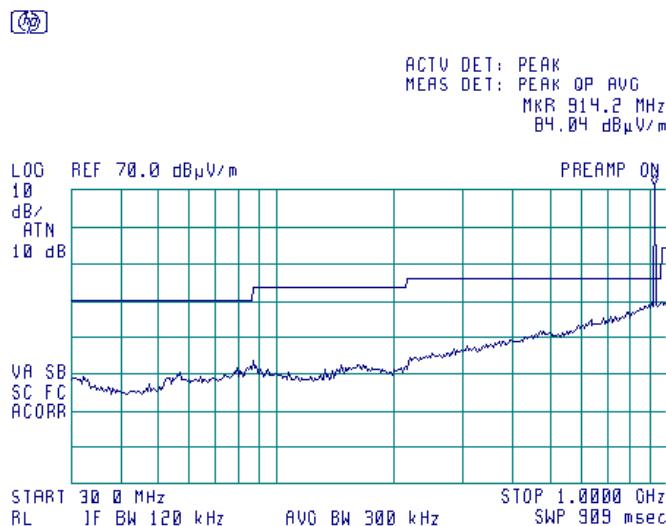


HERMON LABORATORIES

Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure: ANSI C63.10 sections 6.5, 6.6		
Test mode: Compliance		Verdict: PASS
Date(s):	11-Jan-17	
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Power: Battery		
Remarks:		

Plot 7.2.13 Radiated emission measurements from 30 to 1000 MHz

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



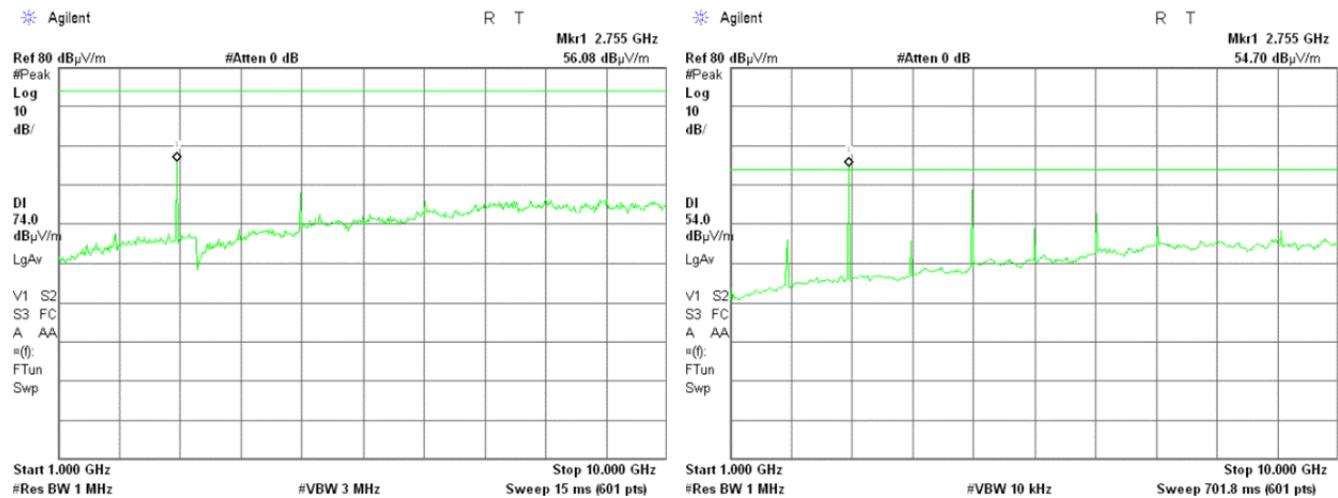


HERMON LABORATORIES

Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6	
Test mode:	Compliance	Verdict: PASS
Date(s):	11-Jan-17	
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Power: Battery		
Remarks:		

Plot 7.2.14 Radiated emission measurements from 1000 to 10000 MHz

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



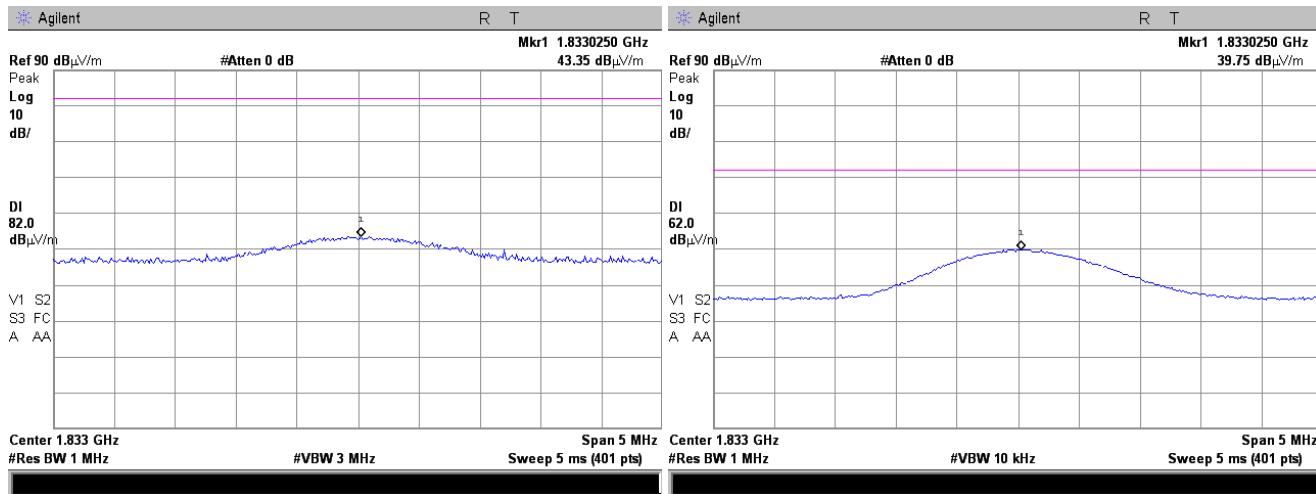


HERMON LABORATORIES

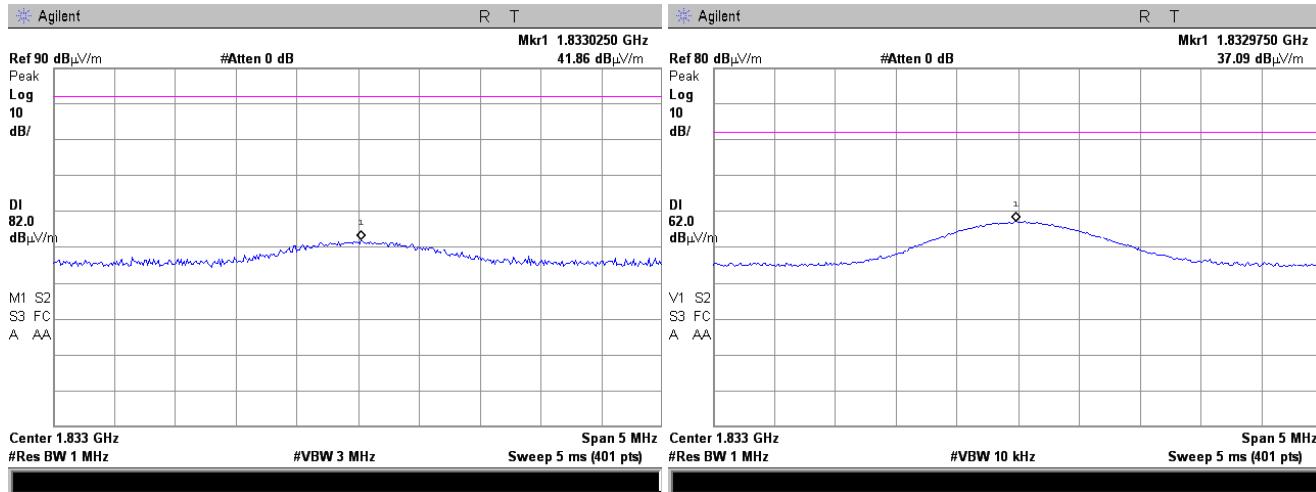
Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure: ANSI C63.10 sections 6.5, 6.6		
Test mode: Compliance	Verdict: PASS	
Date(s): 11-Jan-17		
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Remarks:		

Plot 7.2.15 Radiated emission measurements at the second harmonic frequency

TEST SITE: Semi anechoic chamber
 TEST DISTANCE: 3 m
 ANTENNA POLARIZATION: Vertical
 EUT POSITION: Y-axis

**Plot 7.2.16 Radiated emission measurements at the second harmonic frequency**

TEST SITE: Semi anechoic chamber
 TEST DISTANCE: 3 m
 ANTENNA POLARIZATION: Horizontal
 EUT POSITION: Y-axis



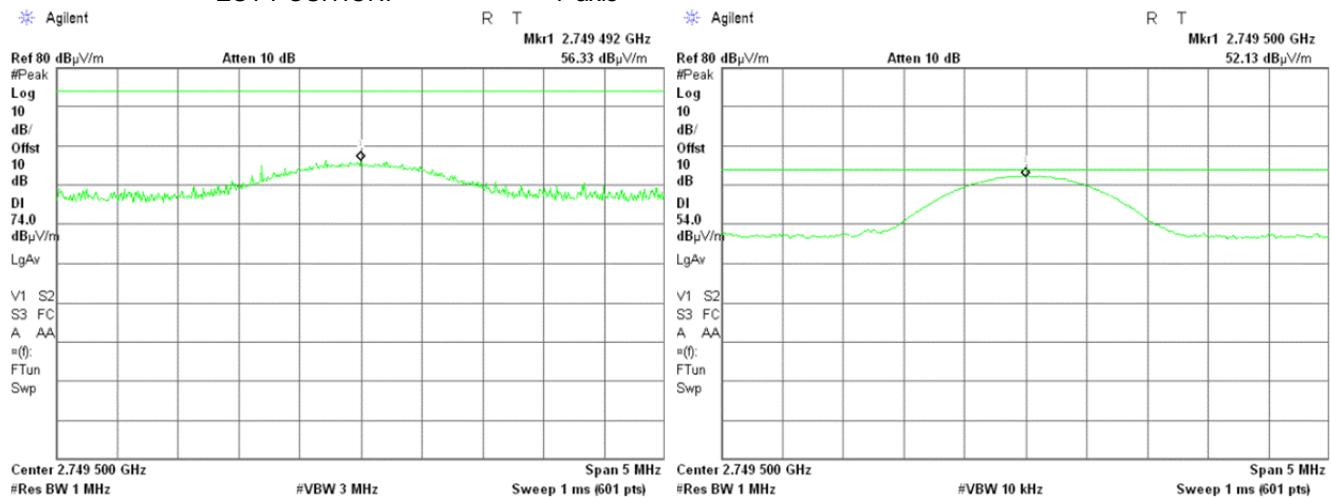


HERMON LABORATORIES

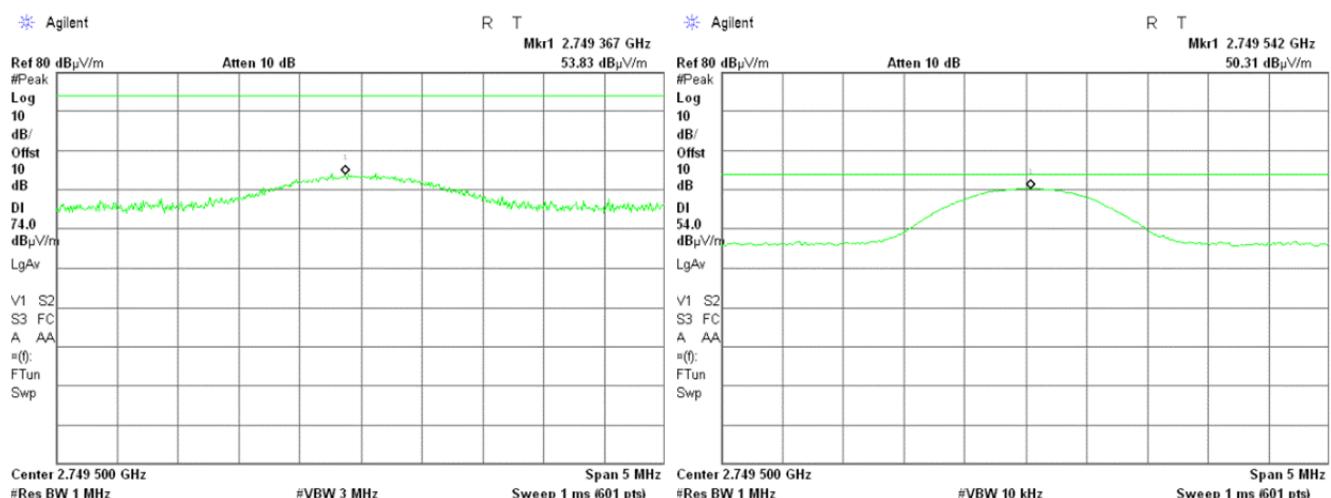
Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure: ANSI C63.10 sections 6.5, 6.6		
Test mode: Compliance	Verdict: PASS	
Date(s): 11-Jan-17		
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Remarks:		

Plot 7.2.17 Radiated emission measurements at the third harmonic frequency

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

**Plot 7.2.18 Radiated emission measurements at the third harmonic frequency**

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis



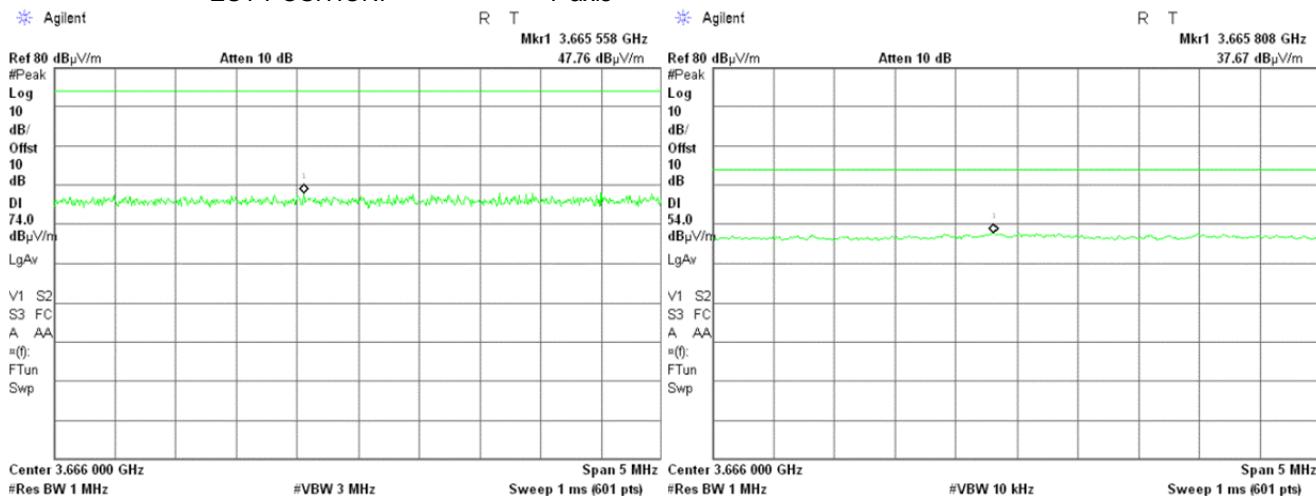


HERMON LABORATORIES

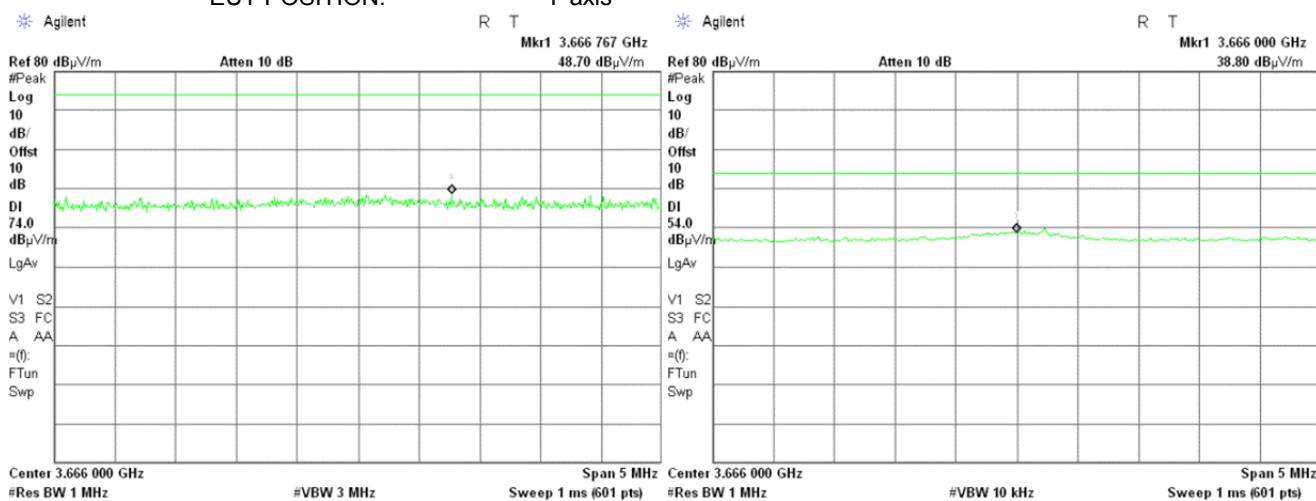
Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure: ANSI C63.10 sections 6.5, 6.6		
Test mode: Compliance	Verdict: PASS	
Date(s): 11-Jan-17		
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Remarks:		

Plot 7.2.19 Radiated emission measurements at the fourth harmonic frequency

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

**Plot 7.2.20 Radiated emission measurements at the fourth harmonic frequency**

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis



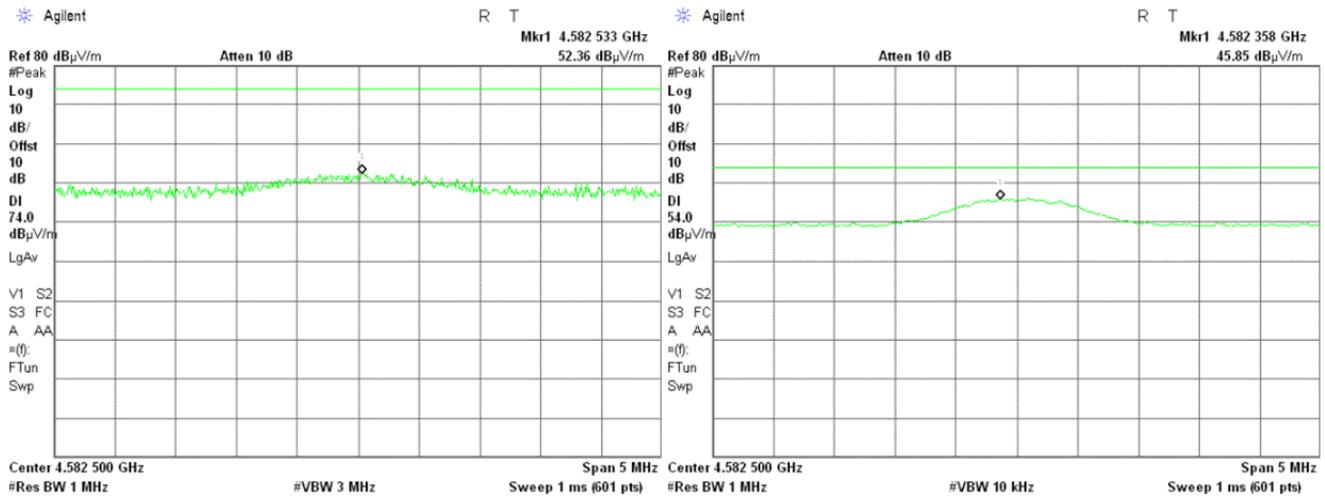


HERMON LABORATORIES

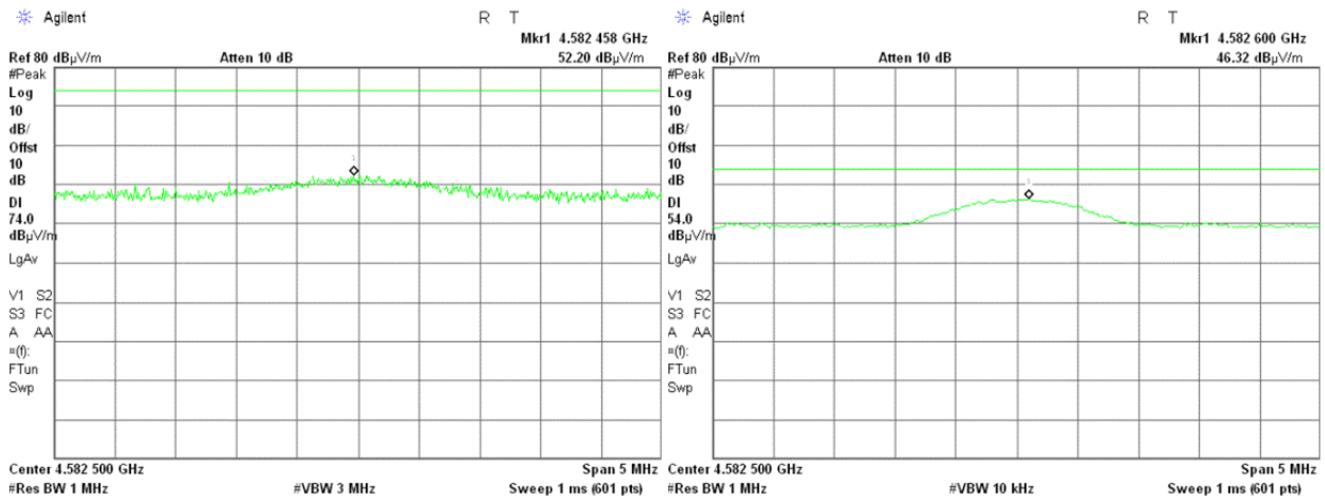
Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure: ANSI C63.10 sections 6.5, 6.6		
Test mode: Compliance		Verdict: PASS
Date(s):	11-Jan-17	
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Power: Battery		
Remarks:		

Plot 7.2.21 Radiated emission measurements at the fifth harmonic frequency

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

**Plot 7.2.22 Radiated emission measurements at the fifth harmonic frequency**

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis

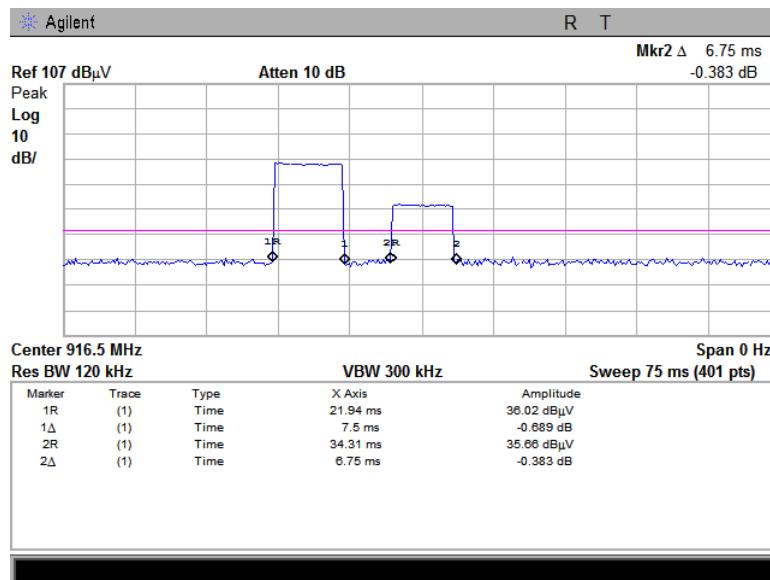




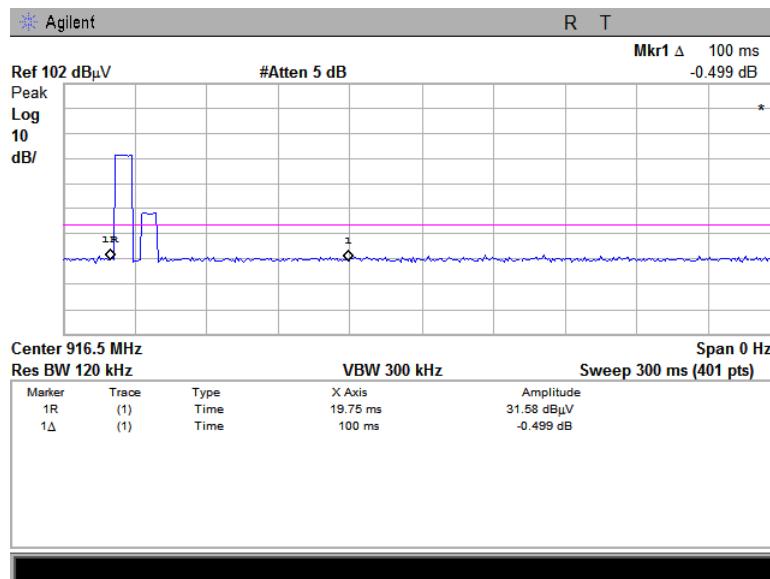
HERMON LABORATORIES

Test specification: FCC Part 15, Section 231(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6	
Test mode:	Compliance	Verdict: PASS
Date(s):	11-Jan-17	
Temperature: 23 °C	Relative Humidity: 42 %	Air Pressure: 1022 hPa
Remarks:		

Plot 7.2.23 Transmission pulse duration



Plot 7.2.24 Transmission pulse period





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Test specification: FCC Part 15, Section 231(c), Occupied bandwidth		
Test procedure: ANSI C63.10 section 6.9.2		
Test mode: Compliance		Verdict: PASS
Date(s): 15-Jan-17		
Temperature: 20 °C	Relative Humidity: 44 %	Air Pressure: 1013 hPa
Power: Battery		
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..

Table 7.3.1 Occupied bandwidth limits

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





HERMON LABORATORIES

Test specification: FCC Part 15, Section 231(c), Occupied bandwidth					
Test procedure: ANSI C63.10 section 6.9.2					
Test mode: Compliance					Verdict: PASS
Date(s): 15-Jan-17					
Temperature: 20 °C		Relative Humidity: 44 %	Air Pressure: 1013 hPa	Power: Battery	
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: 2 FSK

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit		Margin, kHz	Verdict
		% of the carrier frequency	kHz		
916.5	92.191	0.5	4582.5	4490.309	Pass

Reference numbers of test equipment used

HL 3818	HL 5111						
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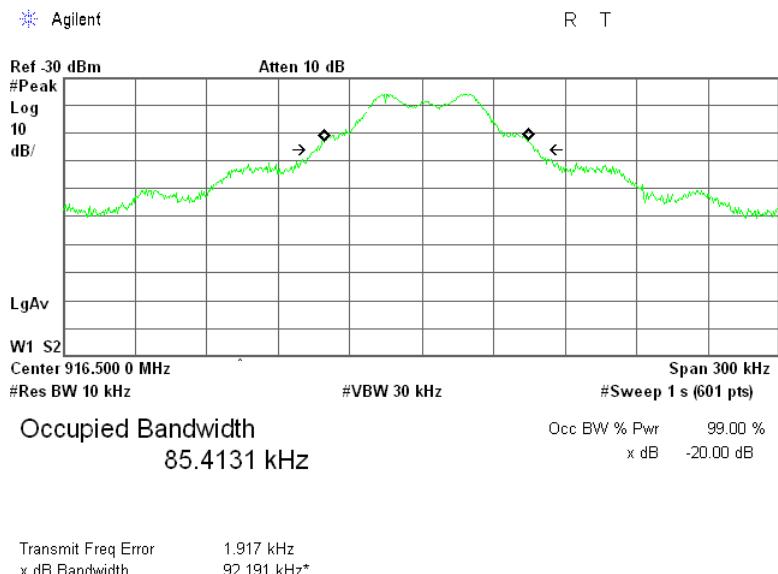
Full description is given in Appendix A.



HERMON LABORATORIES

Test specification: FCC Part 15, Section 231(c), Occupied bandwidth		
Test procedure: ANSI C63.10 section 6.9.2		
Test mode: Compliance		Verdict: PASS
Date(s): 15-Jan-17		
Temperature: 20 °C	Relative Humidity: 44 %	Air Pressure: 1013 hPa
Remarks:		Power: Battery

Plot 7.3.1 Occupied bandwidth test result





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Test specification: FCC Part 15, Section 203 / RSS-Gen, Section 7.1.4, Antenna requirements		
Test procedure: Visual inspection / supplier declaration		
Test mode: Compliance		Verdict: PASS
Date(s): 16-Jan-17		
Temperature: 23 °C	Relative Humidity: 38 %	Air Pressure: 1020 hPa
Power: Battery		
Remarks:		

7.4 Antenna requirements

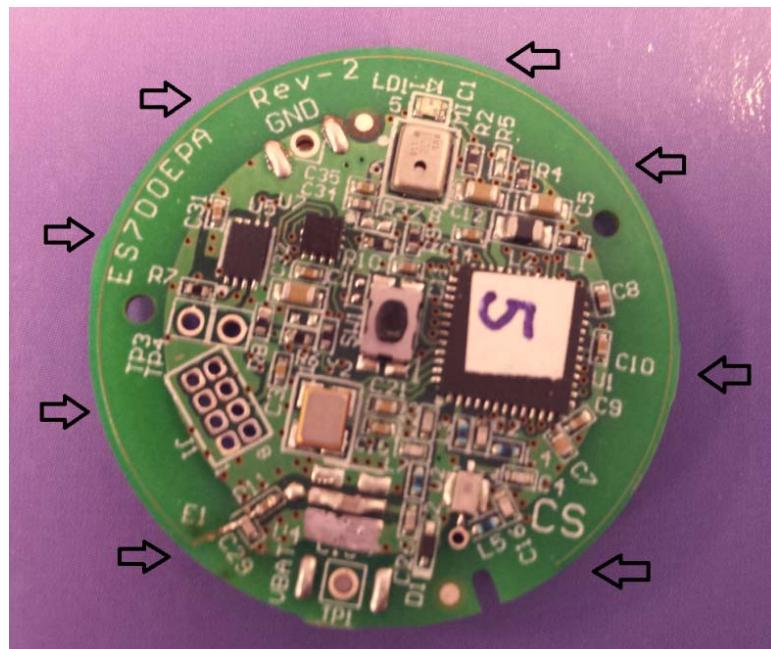
The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed 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



The antenna is printed, from E1 on left side around the PCB



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Test specification: FCC Part 15, Section 109, Radiated emission			
Test procedure: ANSI C63.4, Sections 8.3 and 12.2.5			
Test mode: Compliance		Verdict: PASS	
Date(s): 16-Jan-17			
Temperature: 23 °C	Relative Humidity: 38 %	Air Pressure: 1020 hPa	Power: Battery
Remarks:			

8 Emissions tests according to FCC 47CFR part 15 subpart B requirements

8.1 Radiated emission measurements

8.1.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.1.1.

Table 8.1.1 Radiated emission limits

Frequency, MHz	Class B limit, dB(µV/m)		Class A limit, dB(µV/m)	
	10 m distance	3 m distance	10 m distance	3 m distance
30 - 88	29.5*	40.0	39.0	49.5*
88 - 216	33.0*	43.5	43.5	54.0*
216 - 960	35.5*	46.0	46.4	56.9*
960 - 5 th harmonic**	43.5*	54.0	49.5	60.0*

* - The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $\text{Lim}_{S_2} = \text{Lim}_{S_1} + 20 \log (S_1/S_2)$,
where S_1 and S_2 – standard defined and test distance respectively in meters.

8.1.2 Test procedure

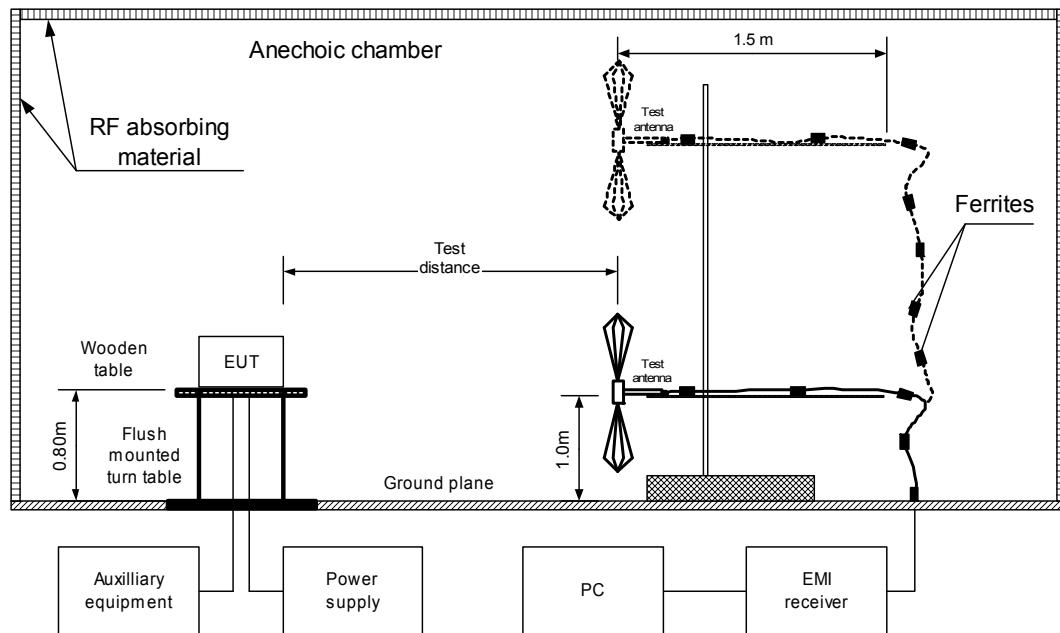
- 8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and associated photograph/s, energized and the performance check was conducted.
- 8.1.2.2 The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.
- 8.1.2.3 The worst test results (the lowest margins) were provided in the associated tables and plots.



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Test specification: FCC Part 15, Section 109, Radiated emission		
Test procedure: ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode: Compliance		Verdict: PASS
Date(s): 16-Jan-17		
Temperature: 23 °C	Relative Humidity: 38 %	Air Pressure: 1020 hPa
Power: Battery		
Remarks:		

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

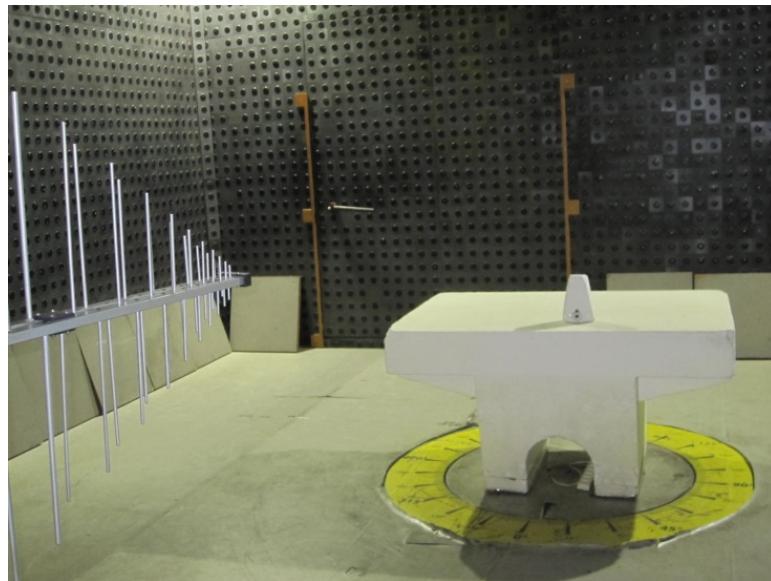




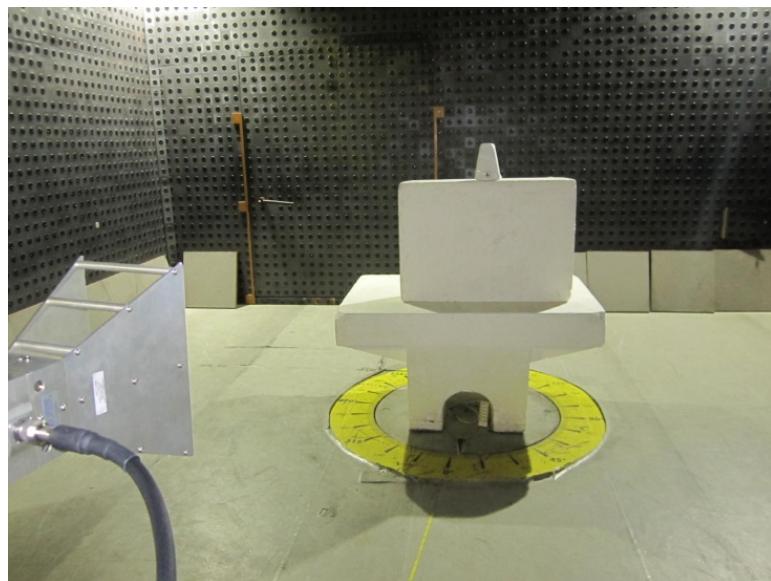
HERMON LABORATORIES

Test specification:	FCC Part 15, Section 109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jan-17		
Temperature: 23 °C	Relative Humidity: 38 %	Air Pressure: 1020 hPa	Power: Battery
Remarks:			

Photograph 8.1.1 Setup for final radiated emission measurements



Photograph 8.1.2 Setup for final radiated emission measurements





HERMON LABORATORIES

Test specification: FCC Part 15, Section 109, Radiated emission		
Test procedure: ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode: Compliance		Verdict: PASS
Date(s): 16-Jan-17		
Temperature: 23 °C	Relative Humidity: 38 %	Air Pressure: 1020 hPa
Power: Battery		
Remarks:		

Table 8.1.2 Radiated emission test results

EUT SET UP: TABLE-TOP
 LIMIT: Class B
 EUT OPERATING MODE: Receive
 TEST SITE: SEMI ANECHOIC CHAMBER
 TEST DISTANCE: 3 m
 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
No emissions were found								

TEST SITE: SEMI ANECHOIC CHAMBER
 TEST DISTANCE: 3 m
 DETECTORS USED: PEAK / AVERAGE
 FREQUENCY RANGE: 1000 MHz -10000 MHz
 RESOLUTION BANDWIDTH: 1000 kHz

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

*- Margin = Measured emission - specification limit.

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

Reference numbers of test equipment used

HL 0521	HL 0604	HL 2909	HL 4353	HL 4933	HL 5101		
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Full description is given in Appendix A.

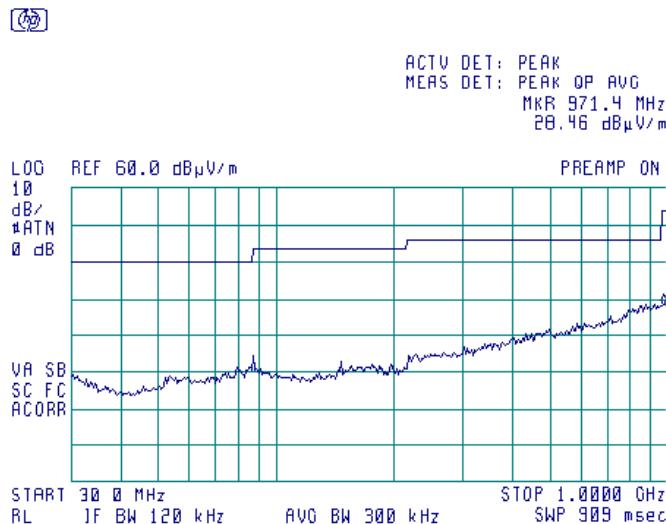


HERMON LABORATORIES

Test specification: FCC Part 15, Section 109, Radiated emission		
Test procedure: ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode: Compliance		Verdict: PASS
Date(s): 16-Jan-17		
Temperature: 23 °C	Relative Humidity: 38 %	Air Pressure: 1020 hPa
Remarks:		

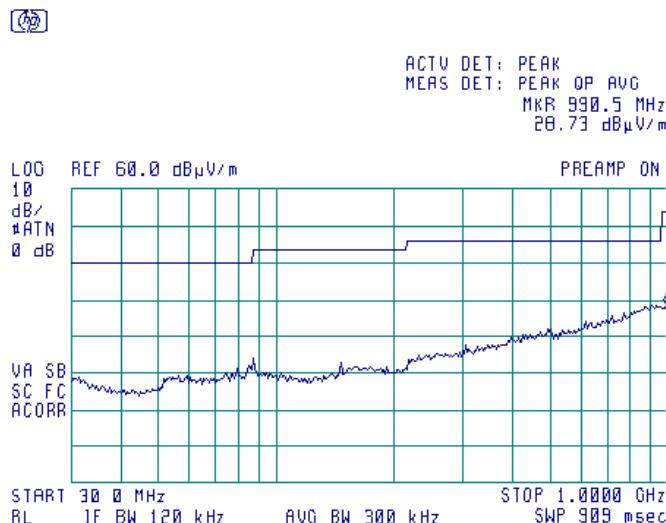
Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization

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



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

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



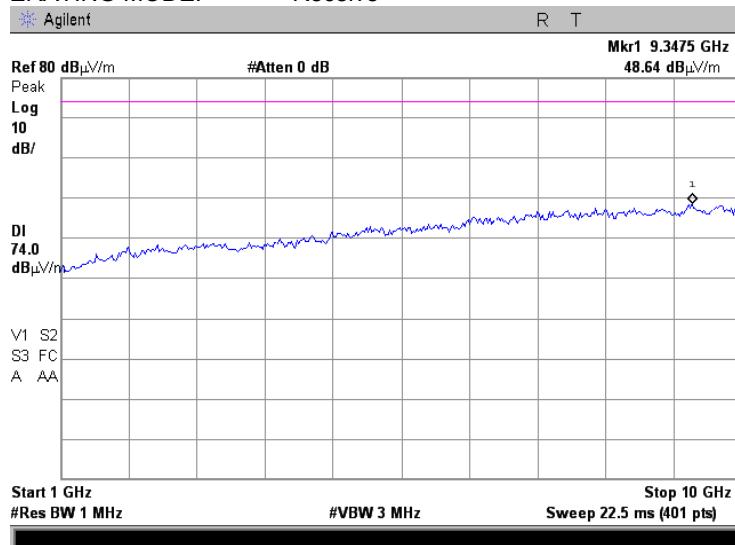


HERMON LABORATORIES

Test specification: FCC Part 15, Section 109, Radiated emission		
Test procedure: ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode: Compliance		Verdict: PASS
Date(s): 16-Jan-17		
Temperature: 23 °C	Relative Humidity: 38 %	Air Pressure: 1020 hPa
Remarks:		

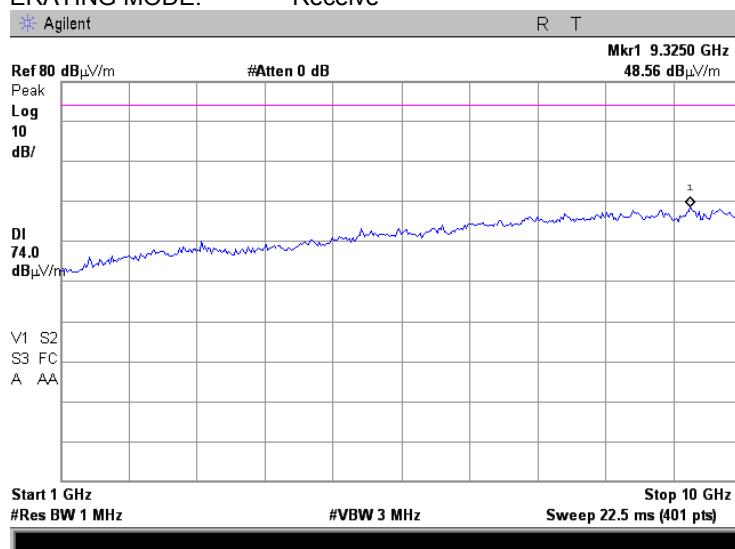
Plot 8.1.3 Radiated emission measurements above 1000 MHz, vertical antenna polarization

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



Plot 8.1.4 Radiated emission measurements above 1000 MHz, horizontal antenna polarization

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





HERMON LABORATORIES

9 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	30-Sep-16	30-Sep-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
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	10-May-16	10-May-17
1915	Antenna, Loop, Active Receiving, 1 kHz - 30 MHz	EMC Test Systems	6507	1457	18-Jan-16	18-Jan-17
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	21-Feb-16	21-Feb-17
3001	EMC Analyzer, 9 kHz to 3 GHz	Agilent Technologies	E7402A	US394401 80	08-Jun-16	08-Jun-17
3003	Flowmeters with Metric-Reading Scales for air applications, Flow rate 2-20 LPM, 100mm scale	Cole-Parmer Instrument Co.	A-32458-54	3003	18-Sep-16	18-Sep-17
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	03-May-16	03-May-17
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	15-Feb-16	15-Feb-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
4933	Active Horn Antenna, 1 GHz to 18 GHz	Com-Power Corporation	AHA-118	701046	14-Oct-16	14-Oct-17
5101	RF cable, 18 GHz, 6 m, N-type	Huber-Suhner	SF106A/1 1N/11N/6 000MM	500847/6A	26-Jul-16	26-Jul-17
5111	RF cable, 40 GHz, 5.5 m, K-type	Huber-Suhner	SF102EA/ 11SK/11S K/5500M M	502493/2E A	26-Jul-16	26-Jul-17



HERMON LABORATORIES

10 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Radiated emissions at 10 m measuring distance Horizontal polarization	Biconilog antenna: ± 5.0 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.1 dB Double ridged horn antenna: ± 5.3 dB
Vertical polarization	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	Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB
Vertical polarization	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.



HERMON LABORATORIES

11 APPENDIX C Test laboratory description

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

Hermon Laboratories is 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, 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 and environmental simulation (for exact scope please refer to Certificate No. 839.01).

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12 APPENDIX D Specification references

47CFR part 15: 2015	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



HERMON LABORATORIES

13 APPENDIX E Test equipment correction factors

Antenna factor
Log periodic antenna
Electro-Metrics, model LPA-25/30
Ser.No.1988, HL 0034

Frequency MHz	Antenna Factor dB(1/m)	Frequency MHz	Antenna Factor dB(1/m)
200	12.6	625	20.4
225	12.2	650	20.9
250	13.4	675	22.0
275	14.3	700	22.2
300	15.2	725	22.7
325	15.7	750	22.5
350	15.9	775	22.7
375	16.4	800	22.8
400	17.0	825	23.2
425	17.4	850	23.5
450	17.9	875	23.9
475	18.6	900	24.0
500	19.1	925	24.0
525	19.3	950	24.2
550	19.6	975	24.7
575	19.8	1000	25.1
600	20.0		

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).



HERMON LABORATORIES

**Antenna factor
Active loop antenna
EMC Test Systems
Model 6507, S/N 1457, HL 1915**

Frequency, kHz	Measured antenna factor, dB _S /m
10	-22.7
20	-27.6
50	-31.3
75	-31.8
100	-32.2
150	-32.3
250	-32.6
500	-32.8
750	-33.0
1000	-33.1
2000	-33.4
3000	-33.7
4000	-34.0
5000	-34.3
10000	-34.9
15000	-35.6
20000	-35.9
25000	-36.1
30000	-36.7

The antenna factor shall be added to receiver reading in dB_μV to obtain field strength in dB_μA/m.



HERMON LABORATORIES

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

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

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).



HERMON LABORATORIES

Antenna factor, HL 4933

**Active Horn Antenna Factor Calibration**

1 GHz to 18 GHz

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



HERMON LABORATORIES

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

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



HERMON LABORATORIES

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

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.20	9000	2.71
100	0.27	9500	2.81
300	0.47	10000	2.90
500	0.61	10500	2.97
1000	0.87	11000	3.06
1500	1.07	11500	3.13
2000	1.24	12000	3.20
2500	1.39	12500	3.26
3000	1.53	13000	3.34
3500	1.65	13500	3.39
4000	1.77	14000	3.47
4500	1.89	14500	3.54
5000	1.99	15000	3.62
5500	2.07	15500	3.69
6000	2.20	16000	3.76
6500	2.30	16500	3.83
7000	2.39	17000	3.86
7500	2.51	17500	3.94
8000	2.58	18000	4.02
8500	2.65		



HERMON LABORATORIES

Cable loss
RF Cable, Huber-Suhner, 18 GHz, 6 m, N- type,
SF106A/11N/11N/6000MM, S/N 500847/6A
HL 5101

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
0.1	0.01	5500	2.42
50	0.22	6000	2.53
100	0.31	6500	2.65
200	0.43	7000	2.76
300	0.53	7500	2.86
400	0.62	8000	2.96
500	0.69	8500	3.06
600	0.76	9000	3.16
700	0.82	9500	3.26
800	0.87	10000	3.35
900	0.93	10500	3.44
1000	0.98	11000	3.54
1100	1.03	11500	3.62
1200	1.08	12000	3.70
1300	1.12	12500	3.80
1400	1.17	13000	3.88
1500	1.21	13500	3.97
1600	1.25	14000	4.04
1700	1.29	14500	4.13
1800	1.33	15000	4.22
1900	1.37	15500	4.31
2000	1.41	16000	4.39
2500	1.59	16500	4.47
3000	1.75	17000	4.54
3500	1.90	17500	4.61
4000	2.04	18000	4.68
4500	2.17		
5000	2.30		



HERMON LABORATORIES

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		



HERMON LABORATORIES

14 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(µV)	decibel referred to one microvolt
dB(µV/m)	decibel referred to one microvolt per meter
dB(µA)	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
µs	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

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