

# TEST REPORT

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

FOR:

**Essence Smartcare Ltd.**  
**Care Home Control panel**  
**Model: ES7502HC**  
**FCC ID:YXG-ES7502HC**

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## 1 Applicant information

**Client name:** Essence Smartcare Ltd  
**Address:** 12 Abba Eban Avenue, Ackerstein Towers Bldg. D, Herzliya 4612001, Israel  
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**Fax:** +972 9 772 99 62  
**E-mail:** [talco@essence-grp.com](mailto:talco@essence-grp.com)  
**Contact name:** Mr. Tal Cohen

## 2 Equipment under test attributes

**Product name:** Care Home Control panel  
**Product type:** Transceiver  
**Model:** ES7502HC  
**Serial number:** NA (Sample)  
**Hardware version:** 2  
**Software release:** 6.1  
**Condition of equipment:** Prototype  
**Receipt date:** 13-May-18

## 3 Manufacturer information

**Manufacturer name:** Essence Smartcare Ltd  
**Address:** 12 Abba Eban Avenue, Ackerstein Towers Bldg. D, Herzliya 4612001, Israel  
**Telephone:** +972 73 244 77 77  
**Fax:** +972 9 772 99 62  
**E-Mail:** [talco@essence-grp.com](mailto:talco@essence-grp.com)  
**Contact name:** Mr. Tal Cohen

## 4 Test details




**Project ID:** 30878  
**Location:** Primary: Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel  
Satellite: Hermon Laboratories Ltd. Hefetz-Haim 10, Tel Aviv 6744124, Israel  
**Test started:** 31-May-18  
**Test completed:** 13-Jun-18  
**Test specification:** FCC CFR 47 Part 15 subpart C, section 15.231 and subpart B

## 5 Tests summary

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

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

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

	Name and Title	Date	Signature
<b>Tested by:</b>	Mrs. E. Pitt, test engineer	31-May-18 – 13-Jun-18	
<b>Reviewed by:</b>	Mrs. Y. Rapin, technical writer	13-Jun-18	
<b>Approved by:</b>	Mr. K. Zushchyk, projects and customer manager, EMC and radio group	28-Jun-18	

## 6 EUT description

### 6.1 General information

The EUT (model ES7502HC) is a control panel powered from AC via external adaptor and operating at 916.5 MHz.

The EUT uses the PSTN interface and comprises cellular module (FCC ID: RI7LE910NAV2).

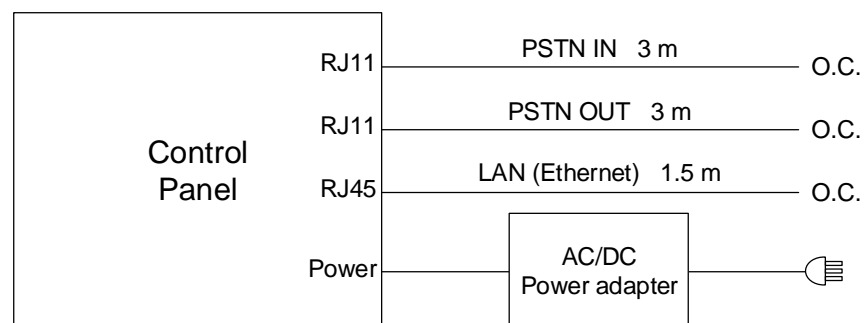
Conducted and radiated emission measurements were performed with four different power supply options as provided in the table below.

Power supply option	Manufacturer	Model	Input	Output	Cable length
1	UMEC	UP0121M-05PA93G	90-264 VAC, 50-60 Hz, 0.4 A	+5VDC, 2.0 A	1.5 m
2	BridgePower Corp.	BI010SO5CO2	100-240 VAC, 50-60 Hz, 0.3 A	+5VDC, 2.0 A	3.0 m
3	DVE	DSA-12PFU-05 FUS 050200	100-240 VAC, 50/60 Hz, 0.5 A	+5VDC, 2.0 A	3.0 m
4	DVE	DSA-12PFU-05 FUS 050200	100-240 VAC, 50/60 Hz, 0.5 A	+5VDC, 2.0 A	1.5 m

### 6.2 Ports and lines

Port type	Port description	Conn. from	Conn. to	Qty.	Cable type	Cable length	Indoor / outdoor
Power	Power	EUT	AC/DC power adapter	1	Unshielded	1.5 m	Indoor
Signal	RJ11	EUT	O.C.	1	Unshielded	3 m	Indoor
Signal	RJ11	EUT	O.C.	1	Unshielded	3 m	Indoor
Telecom	Ethernet	EUT	O.C.	1	Shielded	1.5 m	Indoor

### 6.3 Test configuration



## 6.4 Transmitter characteristics

<b>Type of equipment</b>					
X	Stand-alone (Equipment with or without its own control provisions)				
	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)				
	Plug-in card (Equipment intended for a variety of host systems)				
<b>Operating frequency</b>		916.5 MHz			
<b>Maximum rated output power</b>		At transmitter 50 $\Omega$ RF output connector			
		Field strength at 3 m distance		98.46 dB( $\mu$ V/m) – peak 81.22 dB( $\mu$ V/m) -average	
<b>Is transmitter output power variable?</b>		X	No		
			Yes	continuous variable	
				stepped variable with stepsize	
				dB	
				dBm	
				dBm	
<b>Antenna connection</b>					
unique coupling		standard connector		X	integral
				X	without temporary RF connector
<b>Antenna/s technical characteristics</b>					
<b>Type</b>		<b>Manufacturer</b>		<b>Model number</b>	
Integral		Essence Security		printed	
				Gain	
				1 dBi	
<b>Transmitter aggregate data rate/s</b>		38.4 kbps			
<b>Type of modulation</b>		2FSK			
<b>Transmitter power source</b>					
	Battery	<b>Nominal rated voltage</b>	VDC	Battery type	
	DC	<b>Nominal rated voltage</b>	VDC		
X	AC mains	<b>Nominal rated voltage</b>	120 VAC	Frequency	50 Hz
<b>Common power source for transmitter and receiver</b>			X	yes	no

<b>Test specification:</b>	<b>Periodic operation requirements</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(a); Supplier declaration		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> PASS	
<b>Date(s):</b>	03-Jun-18		
<b>Temperature:</b> 25.1 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1005 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

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

### 7.1 Periodic operation requirements

#### 7.1.1 General

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

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

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

#### 7.1.2 Test procedure for transmitter shut down test

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

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.

7.1.2.5 Upon this the test was completed.

#### 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 and associated photograph.

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.

7.1.3.4 Upon this the test was completed.

Figure 7.1.1 Setup for transmitter shut down test





<b>Test specification:</b>	<b>Periodic operation requirements</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(a); Supplier declaration		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	03-Jun-18		
<b>Temperature:</b> 25.1 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1005 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

Table 7.1.1 Periodic operation requirements

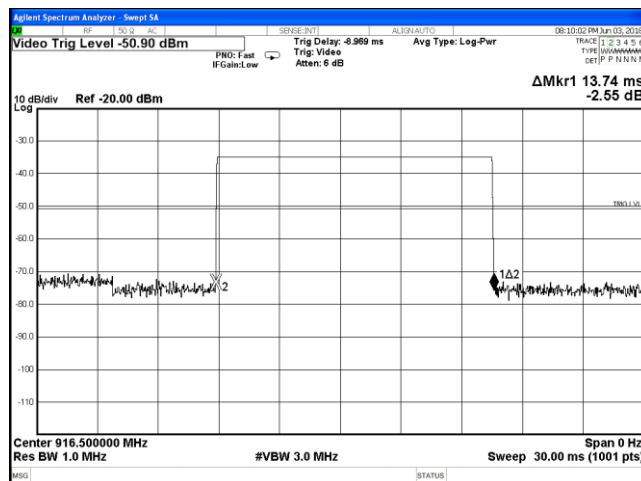
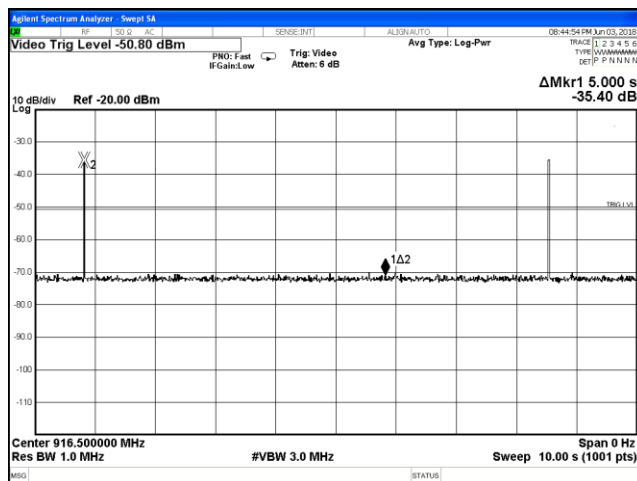
Requirement	Rationale	Verdict
Continuous transmissions are not permitted	Supplier declaration *	Comply
A manually operated transmitter shall be deactivated within not more than 5 seconds of switch being released	Plot 7.1.1	Comply
Transmitter activated automatically shall cease transmission within 5 seconds	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	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

\* Supplier declaration is provided in Appendix E.



<b>Test specification:</b>	<b>Periodic operation requirements</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(a); Supplier declaration		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> <b>PASS</b>	
<b>Date(s):</b>	03-Jun-18		
<b>Temperature:</b> 25.1 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1005 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

Plot 7.1.1 Transmitter shut down test result



Plot 7.1.2 Polling / supervision transmission duration





<b>Test specification:</b>	<b>Periodic operation requirements</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(a); Supplier declaration		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> PASS	
<b>Date(s):</b>	03-Jun-18		
<b>Temperature:</b> 25.1 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1005 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

Table 7.1.2 Total duration of polling / supervision transmissions

Duration, ms	Repetition period, ms	Maximum number of transmissions within 1 hour	Total duration within 1 hour, ms
13.74 X 2	NA	1	27.48

## Reference numbers of test equipment used

HL 4575	HL 4594					
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Full description is given in Appendix A.

<b>Test specification:</b>	<b>Field strength of emissions</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(b); ANSI C63.10, Sections 6.5, 6.6		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	31-May-18		
<b>Temperature:</b> 28 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

## 7.2 Field strength of emissions

### 7.2.1 General

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

**Table 7.2.1 Radiated fundamental emission limits**

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

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

$$\text{Lims}_2 = \text{Lims}_1 + 40 \log(S_1/S_2),$$

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

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

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

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

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

where  $F$  is the carrier frequency in MHz.

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

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

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

<b>Test specification:</b>	<b>Field strength of emissions</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(b); ANSI C63.10, Sections 6.5, 6.6		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	31-May-18		
<b>Temperature:</b> 28 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

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

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

7.2.2.2 The measurements were performed in three EUT orthogonal positions.

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

7.2.2.4 The worst test results (the lowest margins) found in the EUT vertical (X, Y, Z-axis) position 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.

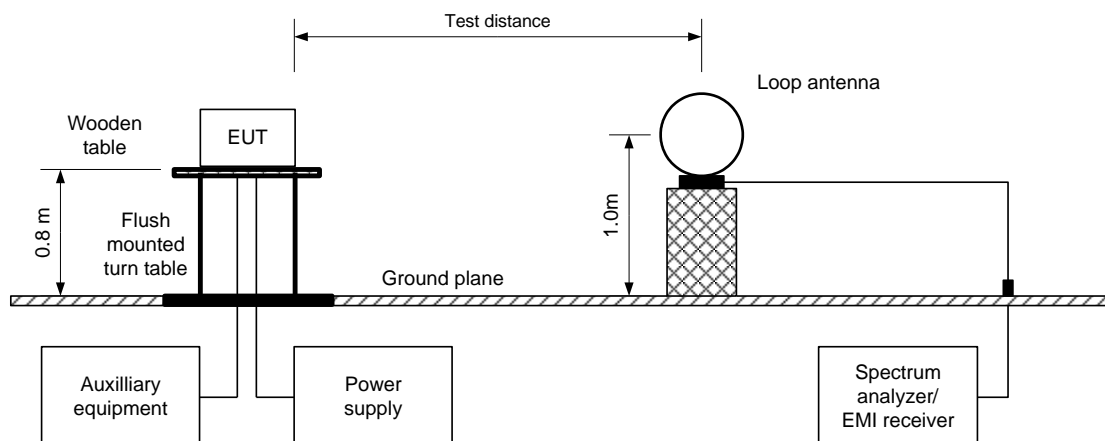
7.2.3.2 The measurements were performed in three EUT orthogonal positions.

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) found in the EUT vertical (X, Y, Z-axis) position were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

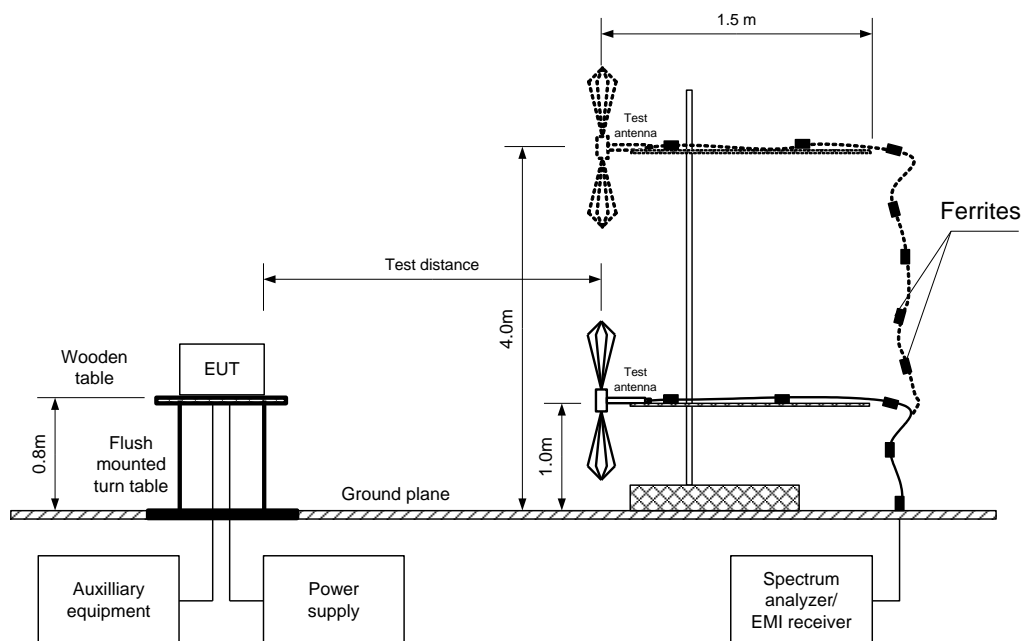
7.2.3.5 Upon this the test was completed.

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

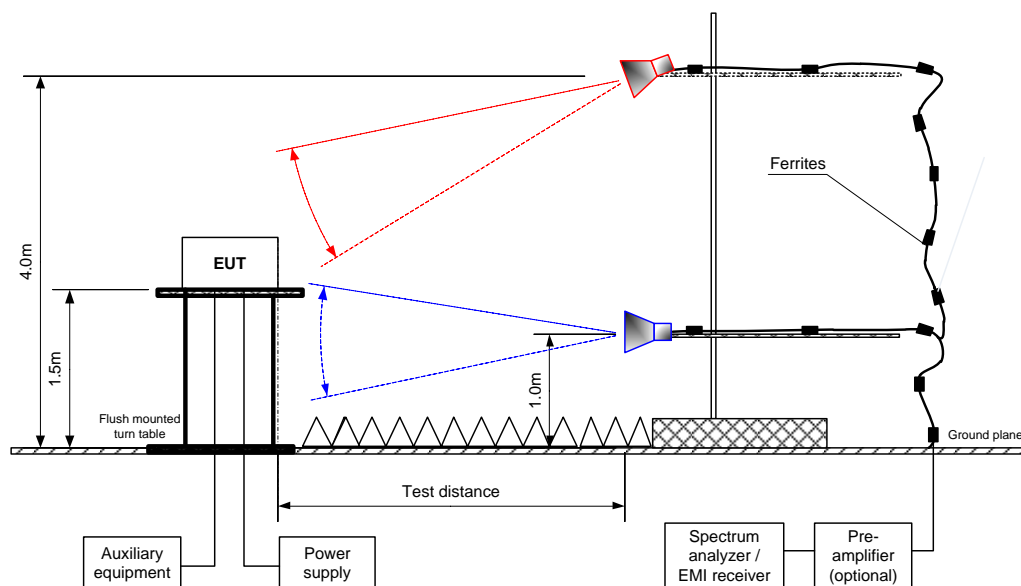


<b>Test specification:</b>	<b>Field strength of emissions</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(b); ANSI C63.10, Sections 6.5, 6.6		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	31-May-18		
<b>Temperature:</b> 28 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

**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**



Test specification:	Field strength of emissions			
Test procedure:	FCC CFR 47, Section 15.231(b); ANSI C63.10, Sections 6.5, 6.6			
Test mode:	Compliance	Verdict: PASS		
Date(s):	31-May-18			
Temperature: 28 °C	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 120 VAC, 50 Hz	
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: Vertical and horizontal  
MODULATION: 2FSK  
BIT RATE: 38.4 kbps  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
INVESTIGATED FREQUENCY RANGE: 0.009 – 10000 MHz  
DETECTOR USED: Peak  
RESOLUTION BANDWIDTH: 1 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)	Margin, dB**	
Fundamental emission***											
916.500	Vert	100.0	-44.0	98.46	102.0	-3.54	98.46	81.22	82.0	-0.78	Pass
Spurious emissions											
32.776	Vert	103.0	-62.0	42.25	82.0	-39.75	42.25	25.01	62.0	-36.99	Pass
35.607	Vert	100.0	-76.0	41.63	82.0	-40.37	41.63	24.39	62.0	-37.61	
49.875	Vert	131.0	-31.0	38.18	82.0	-43.82	38.18	20.94	62.0	-41.06	
101.157	Vert	100.0	-99.0	42.57	82.0	-39.43	42.57	25.33	62.0	-36.67	
203.972	Hor	132.0	-9.0	39.61	82.0	-42.39	39.61	22.37	62.0	-39.63	
300.604	Ver	101.0	71.0	45.81	82.0	-36.19	45.81	28.57	62.0	-33.43	
1182.700	Vert	163.0	23.0	45.72	74.0	-28.28	45.72	28.48	54.0	-25.52	
1451.800	Hor	173.0	-35.0	42.11	74.0	-31.89	42.11	24.87	54.0	-29.13	
1941.700	Vert	152.0	-57.0	40.93	82.0	-41.07	40.93	23.69	62.0	-38.31	

\*- 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 in vertical EUT position and at U<sub>nom</sub> (115%U<sub>nom</sub>, 85%U<sub>nom</sub>) 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 during 100 msec	Duration, ms	Period, ms		
13.74	1	NA	NA	NA	17.24

Average factor for pulse train shorter than 100 ms was calculated as follows:

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

Average factor for pulse train longer than 100 ms was calculated as follows:

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

**Reference numbers of test equipment used**

HL 3615	HL 4277	HL 4360	HL 4933	HL 5111	HL 5288		
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Full description is given in Appendix A.

<b>Test specification:</b>	<b>Field strength of emissions</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(b); ANSI C63.10, Sections 6.5, 6.6		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	31-May-18		
<b>Temperature:</b> 28 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

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

TEST DISTANCE: 3 m  
EUT POSITION: Vertical and horizontal  
MODULATION: 2FSK  
BIT RATE: 38.4 kbps  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz  
DETECTOR USED: Peak  
RESOLUTION BANDWIDTH: 1.0 kHz (9 kHz – 150 kHz)  
9.0 kHz (150 kHz – 30 MHz)  
120 kHz (30 MHz – 1000 MHz)  
≥ Resolution bandwidth  
VIDEO BANDWIDTH: ≥ Resolution bandwidth  
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
Biconilog (30 MHz – 1000 MHz)

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
114.074500	42.44	40.27	43.50	-3.23	Vertical	103.0	-87.0	Pass
133.947500	42.04	39.45	43.50	-4.05	Vertical	104.0	-17.0	
407.986500	45.94	44.87	46.00	-1.13	Horizontal	102.0	24.0	

\*- Margin = Measured emission - specification limit.

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

**Table 7.2.6 Restricted bands**

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

**Reference numbers of test equipment used**

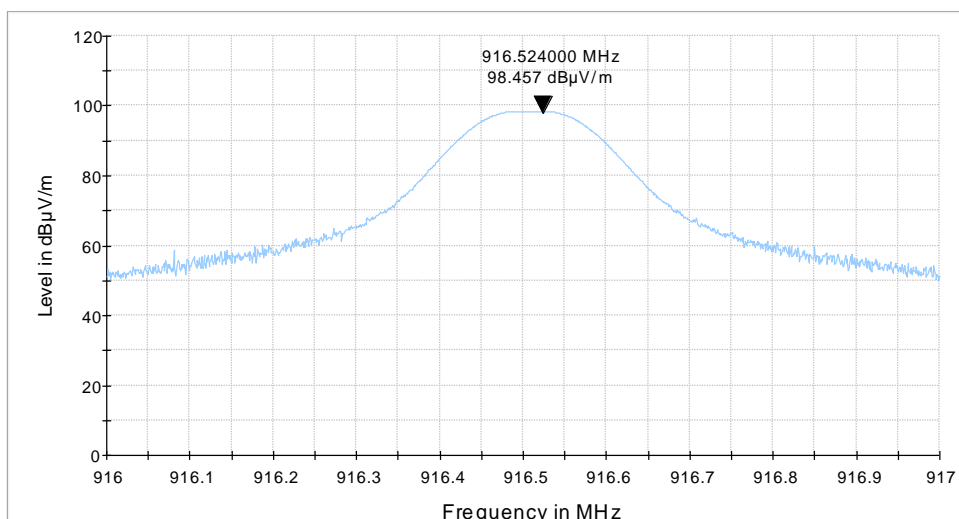
HL 3615	HL 4277	HL 4360	HL 5288				
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Full description is given in Appendix A.

<b>Test specification:</b>	<b>Field strength of emissions</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(b); ANSI C63.10, Sections 6.5, 6.6		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	31-May-18		
<b>Temperature:</b> 28 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

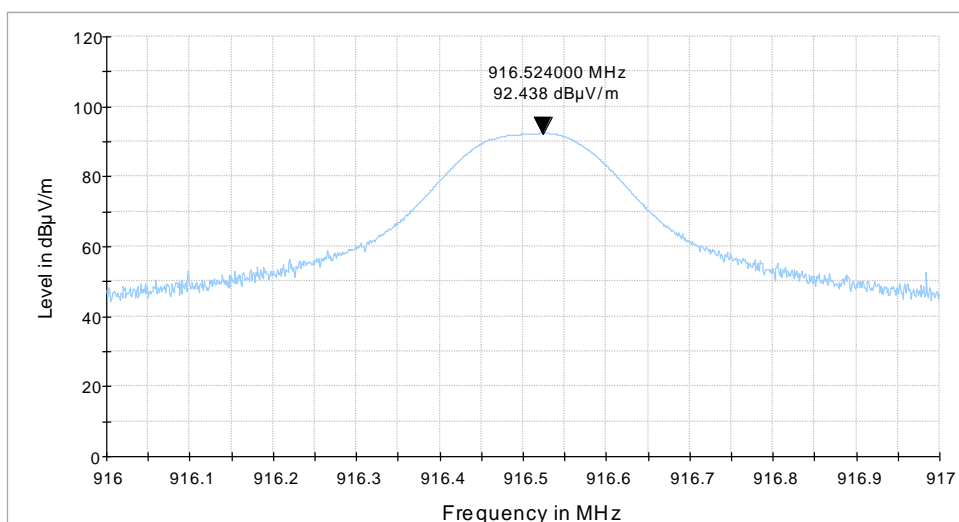
**Plot 7.2.1 Radiated emission measurements at the fundamental frequency**

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



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

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

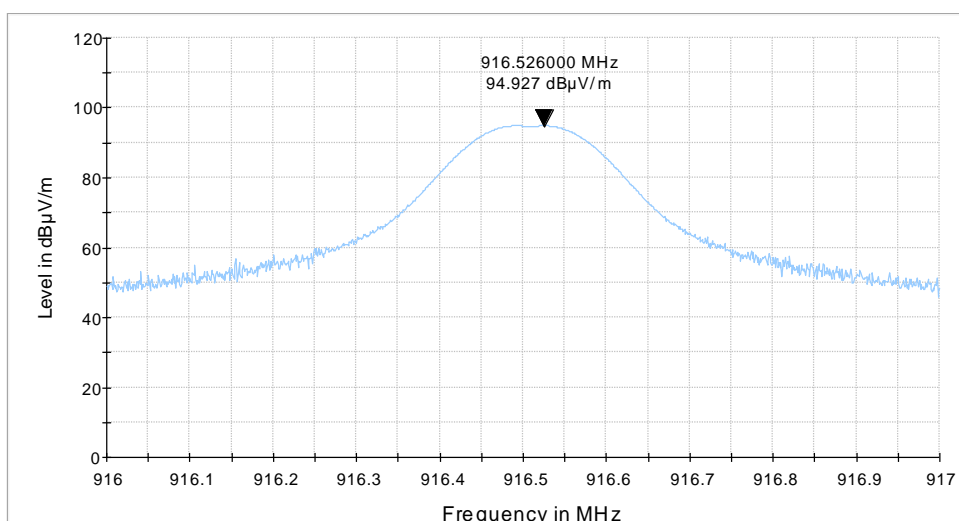




<b>Test specification:</b>	<b>Field strength of emissions</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(b); ANSI C63.10, Sections 6.5, 6.6		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	31-May-18		
<b>Temperature:</b> 28 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

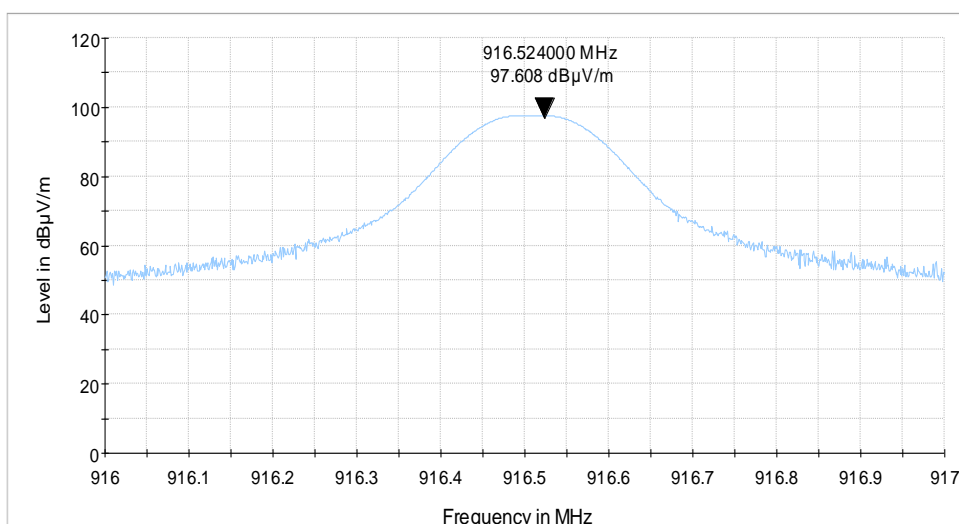
**Plot 7.2.3 Radiated emission measurements at the fundamental frequency**

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



**Plot 7.2.4 Radiated emission measurements at the fundamental frequency**

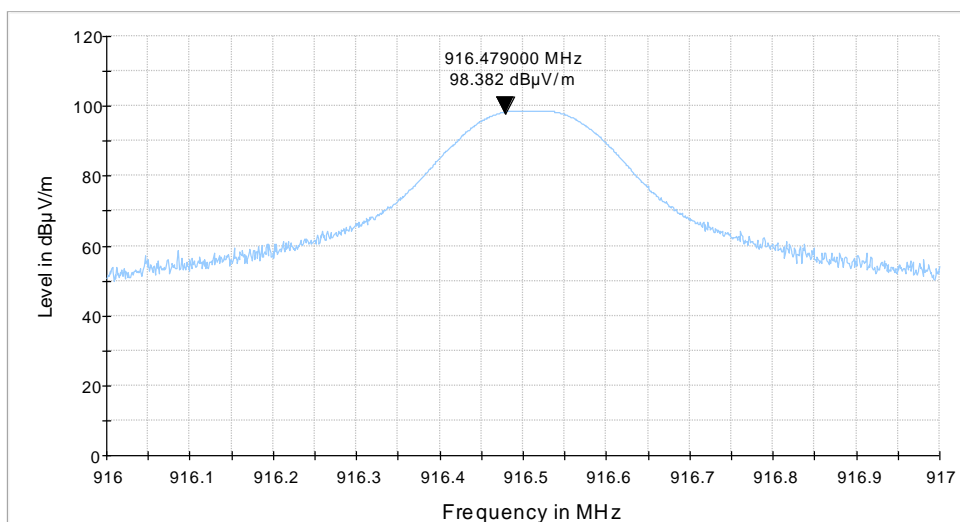
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: Horizontal  
INPUT VOLTAGE: Unom



<b>Test specification:</b>	<b>Field strength of emissions</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(b); ANSI C63.10, Sections 6.5, 6.6		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	31-May-18		
<b>Temperature:</b> 28 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

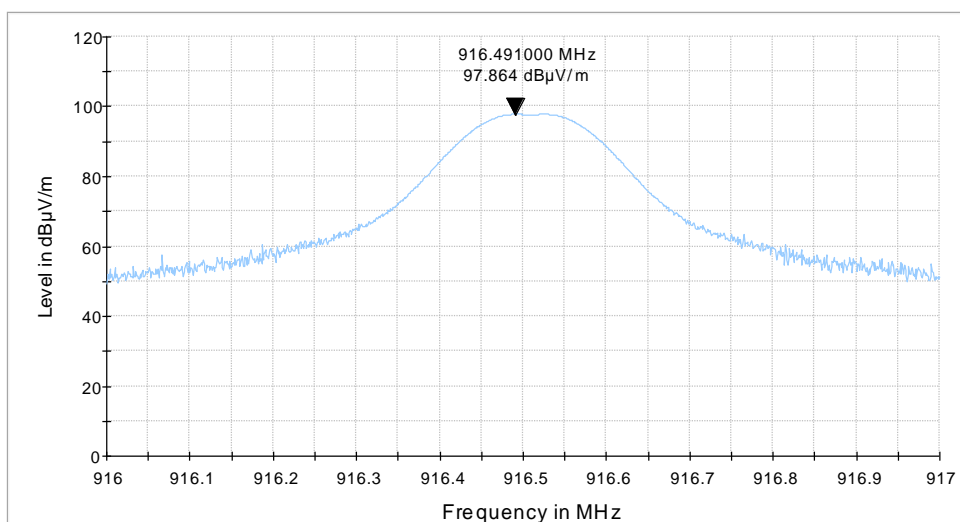
**Plot 7.2.5 Radiated emission measurements at the fundamental frequency**

TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: Vertical  
INPUT VOLTAGE: 115%U<sub>nom</sub>



**Plot 7.2.6 Radiated emission measurements at the fundamental frequency**

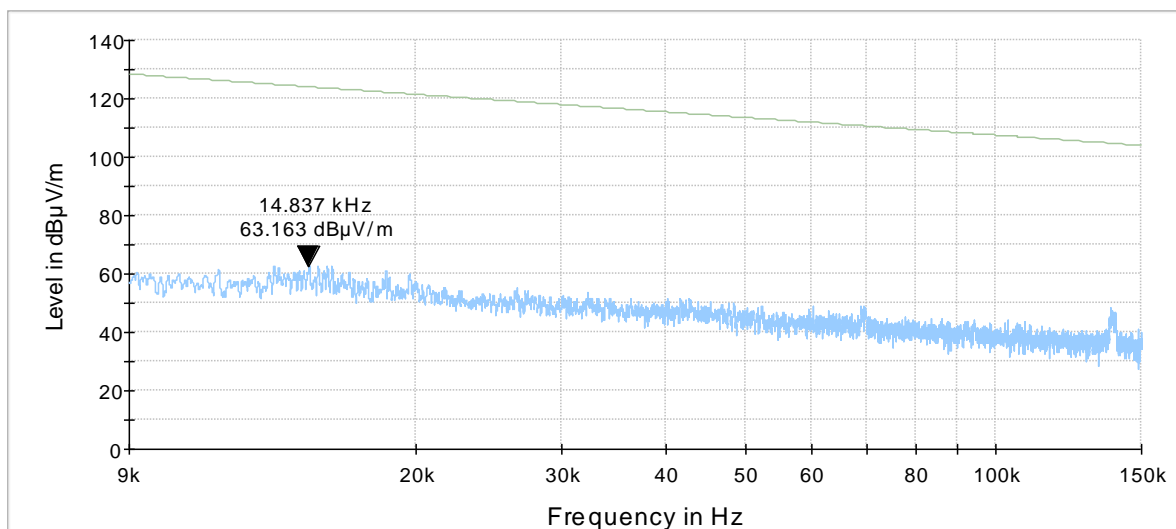
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: Horizontal  
INPUT VOLTAGE: 85%U<sub>nom</sub>



<b>Test specification:</b>	<b>Field strength of emissions</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(b); ANSI C63.10, Sections 6.5, 6.6		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	31-May-18		
<b>Temperature:</b> 28 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

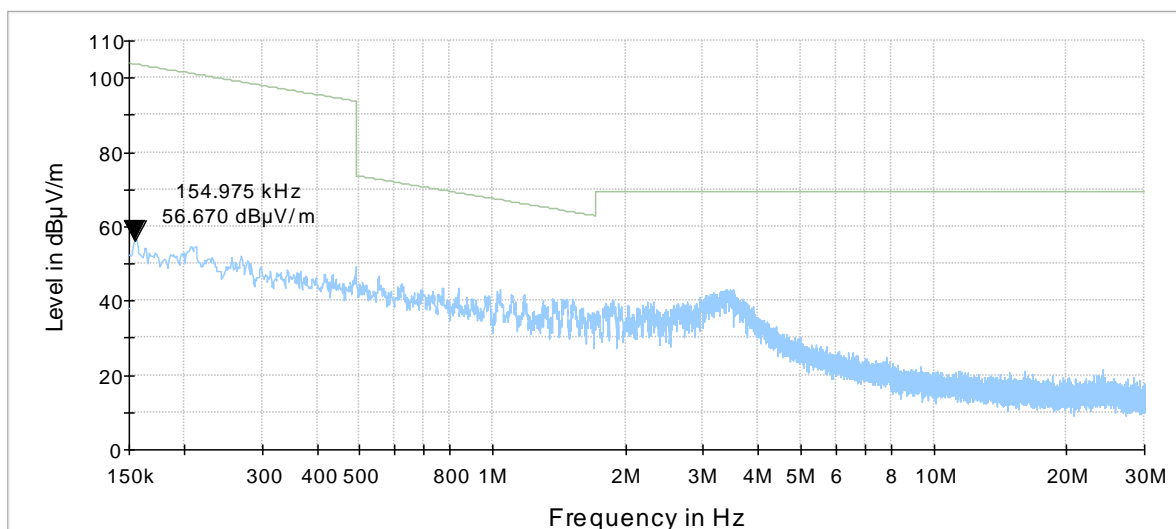
**Plot 7.2.7 Radiated emission measurements from 9 to 150 kHz**

TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
EUT POSITION: Vertical and Horizontal



**Plot 7.2.8 Radiated emission measurements from 0.15 to 30 MHz**

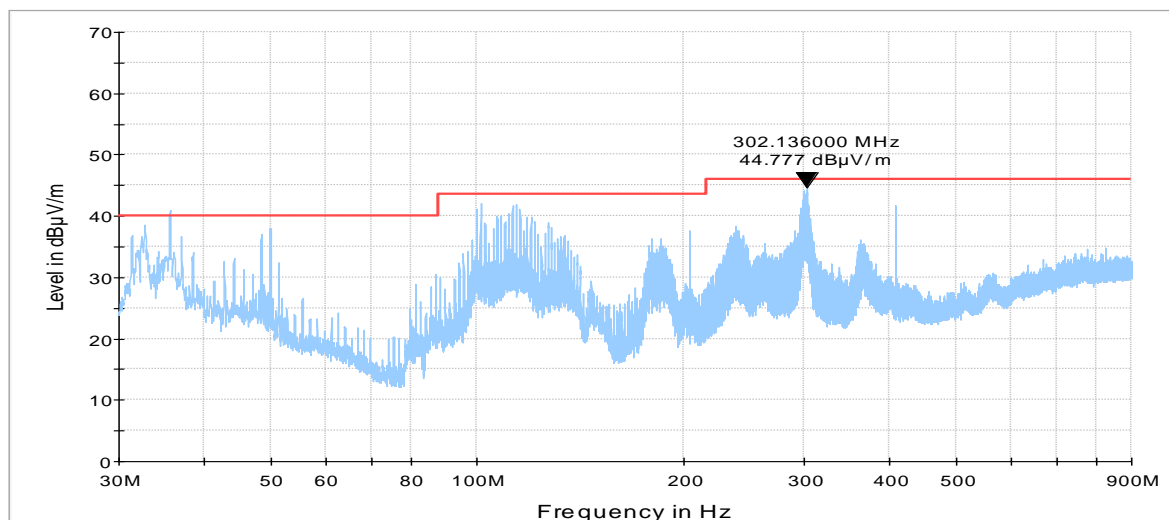
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
EUT POSITION: Vertical and Horizontal



<b>Test specification:</b>	<b>Field strength of emissions</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(b); ANSI C63.10, Sections 6.5, 6.6		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	31-May-18		
<b>Temperature:</b> 28 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

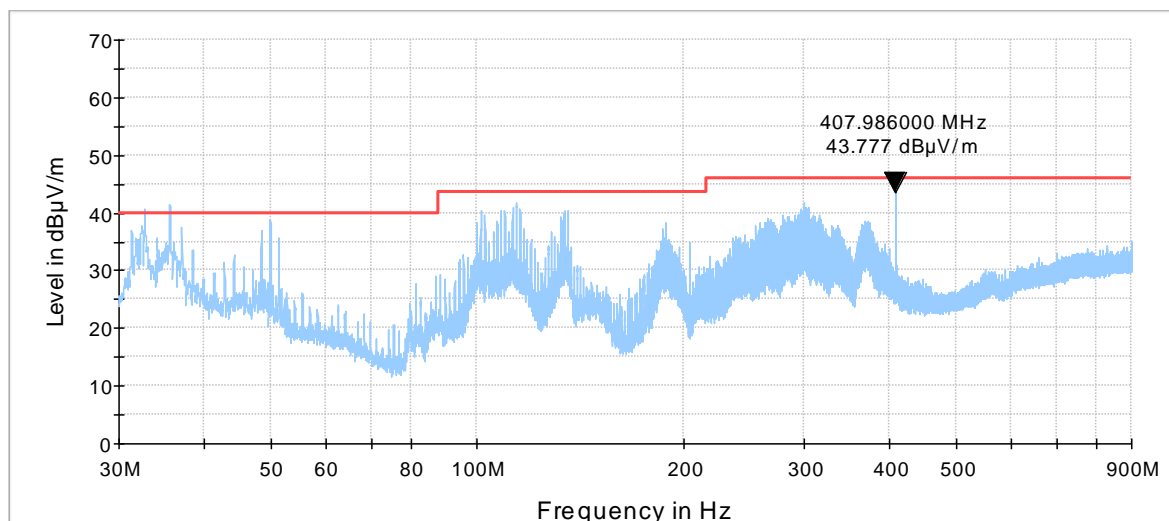
**Plot 7.2.9 Radiated emission measurements from 30 to 900 MHz**

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



**Plot 7.2.10 Radiated emission measurements from 30 to 900 MHz**

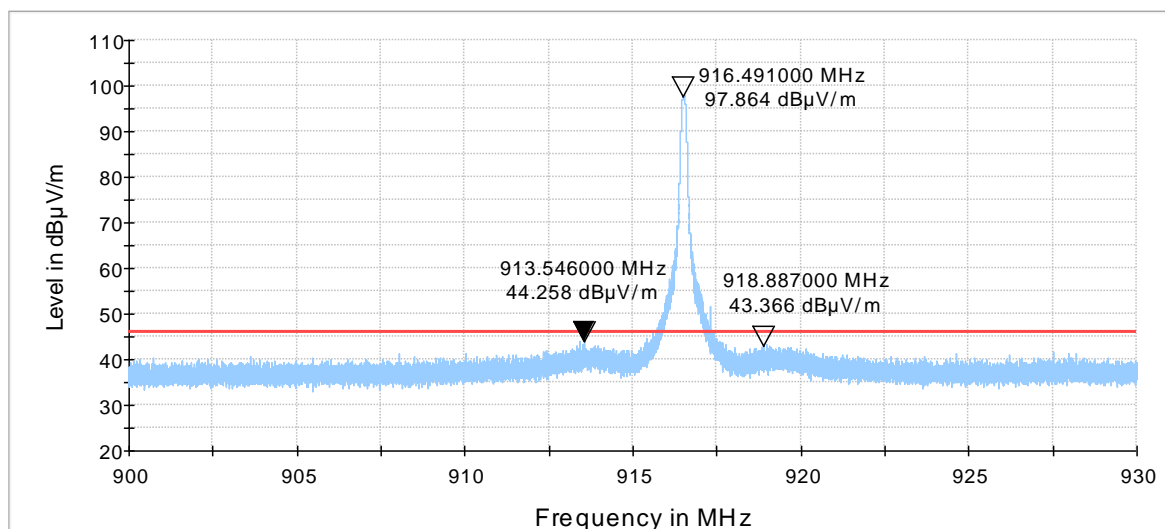
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: Horizontal



<b>Test specification:</b>	<b>Field strength of emissions</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(b); ANSI C63.10, Sections 6.5, 6.6		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	31-May-18		
<b>Temperature:</b> 28 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

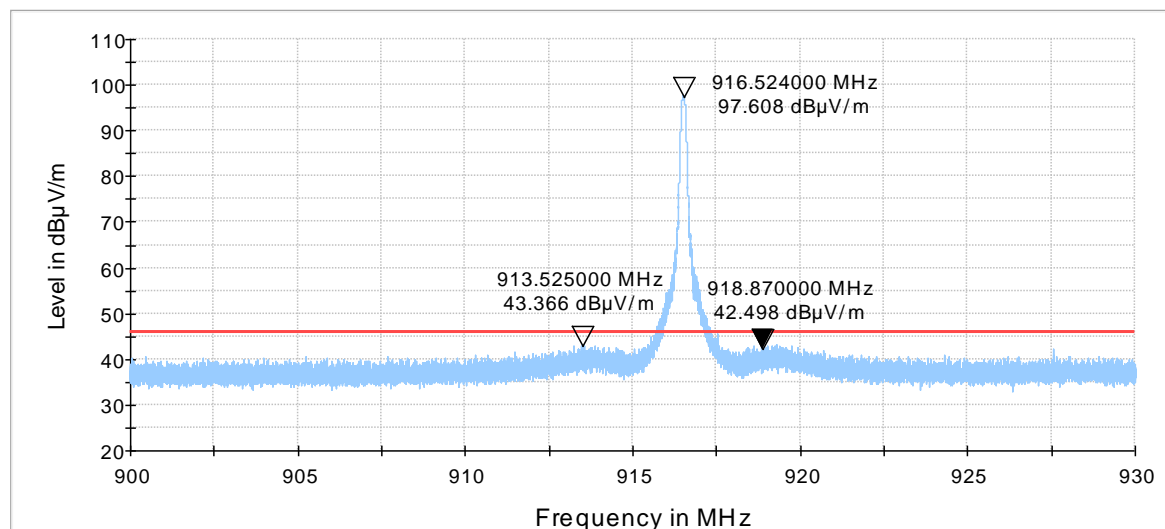
**Plot 7.2.11 Radiated emission measurements from 900 to 930 MHz**

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



**Plot 7.2.12 Radiated emission measurements from 900 to 930 MHz**

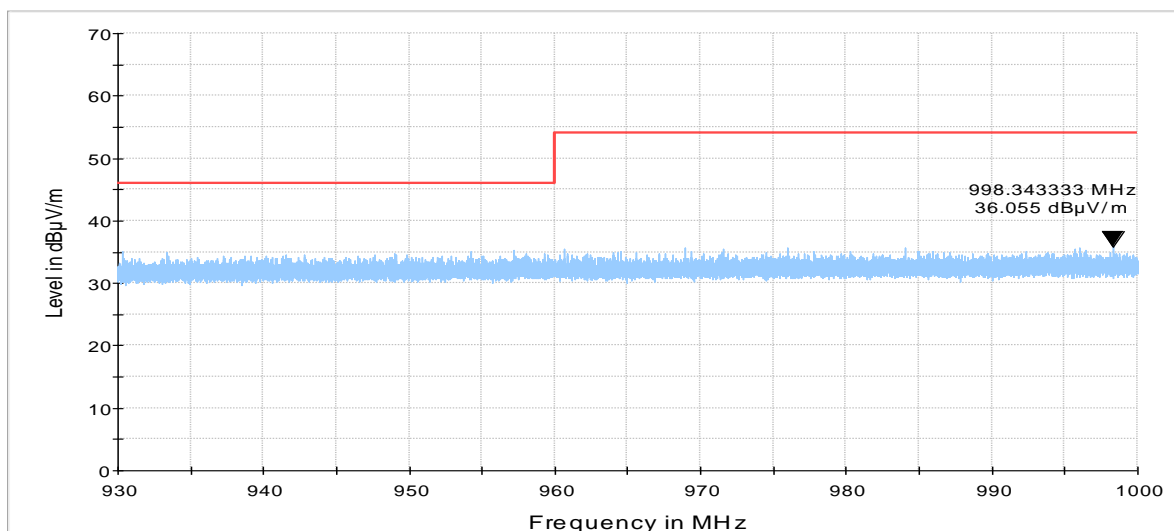
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: Horizontal



<b>Test specification:</b>	<b>Field strength of emissions</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(b); ANSI C63.10, Sections 6.5, 6.6		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	31-May-18		
<b>Temperature:</b> 28 °C	<b>Relative Humidity:</b> 51 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

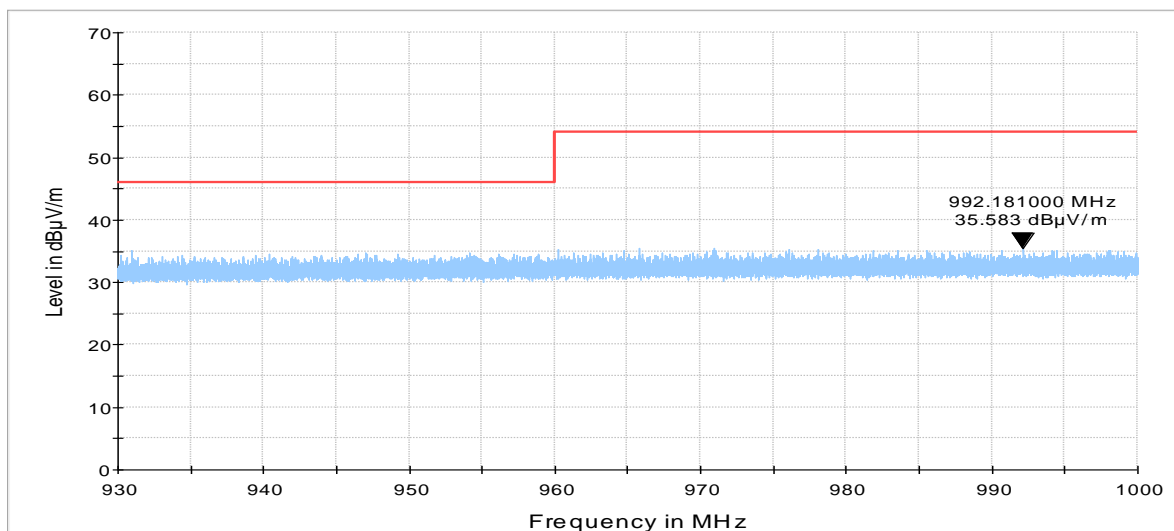
**Plot 7.2.13 Radiated emission measurements from 930 to 1000 MHz**

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



**Plot 7.2.14 Radiated emission measurements from 930 to 1000 MHz**

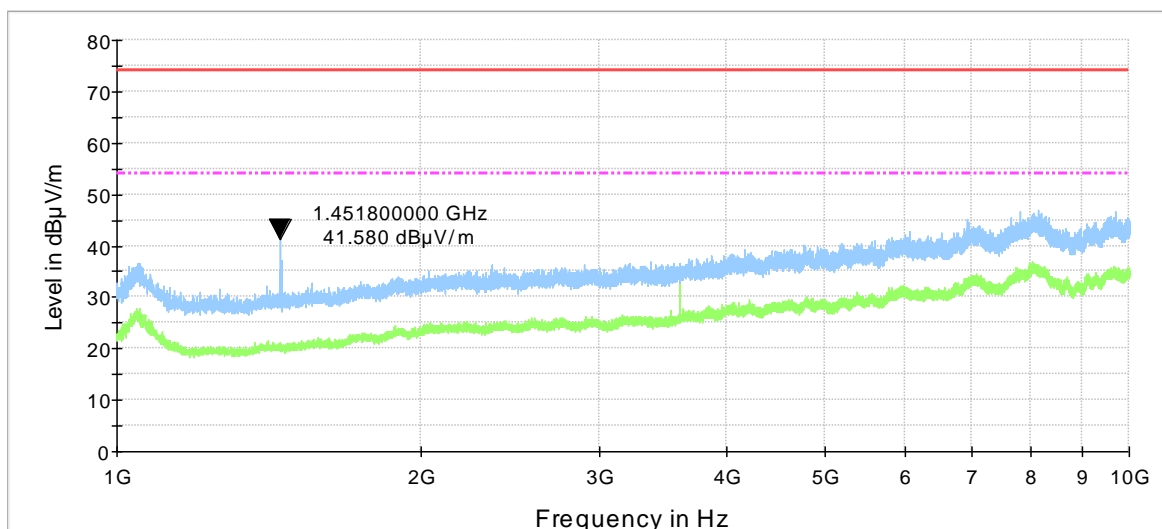
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: Horizontal



Test specification:	Field strength of emissions		
Test procedure:	FCC CFR 47, Section 15.231(b); ANSI C63.10, Sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	31-May-18		
Temperature: 28 °C	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 120 VAC, 50 Hz
Remarks:			

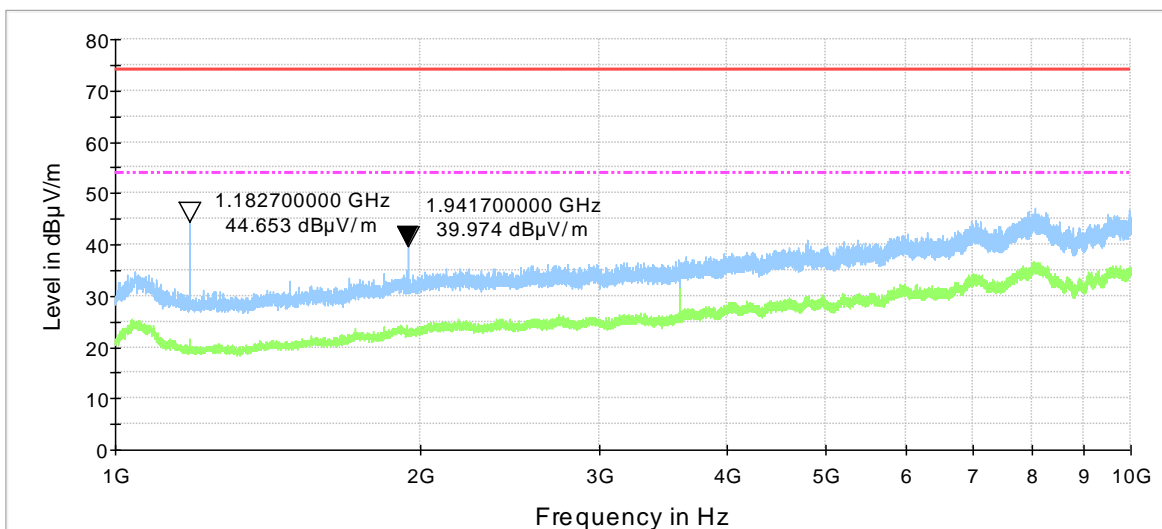
Plot 7.2.15 Radiated emission measurements from 1 to 10 GHz

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



Plot 7.2.16 Radiated emission measurements from 1 to 10 GHz

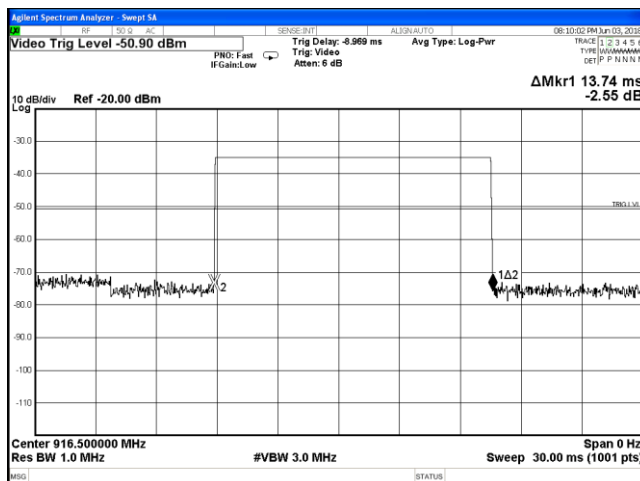
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: Horizontal



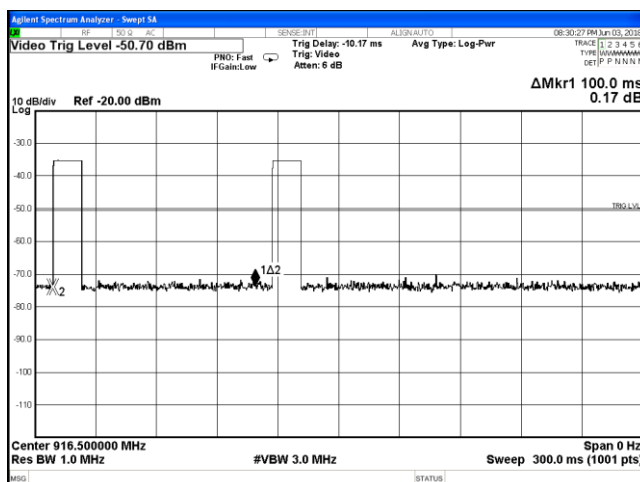


Test specification:	Field strength of emissions		
Test procedure:	FCC CFR 47, Section 15.231(b); ANSI C63.10, Sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	31-May-18		
Temperature: 28 °C	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 120 VAC, 50 Hz
Remarks:			

Plot 7.2.17 Transmission pulse duration



Plot 7.2.18 Transmission pulse period





<b>Test specification:</b>	<b>Occupied bandwidth</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(c); ANSI C63.10, Section 6.9.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	03-Jun-18		
<b>Temperature:</b> 25.2 °C	<b>Relative Humidity:</b> 46 %	<b>Air Pressure:</b> 1005 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

## 7.3 Occupied bandwidth test

### 7.3.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.3.1. 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**



<b>Test specification:</b>	<b>Occupied bandwidth</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.231(c); ANSI C63.10, Section 6.9.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	03-Jun-18		
<b>Temperature:</b> 25.2 °C	<b>Relative Humidity:</b> 46 %	<b>Air Pressure:</b> 1005 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

**Table 7.3.2 Occupied bandwidth test results**

DETECTOR USED: Peak hold  
RESOLUTION BANDWIDTH: 1kHz  
VIDEO BANDWIDTH: 3kHz  
MODULATION ENVELOPE REFERENCE POINTS: 20 dBc  
MODULATION: 2 FSK  
BIT RATE: 38.4kbps

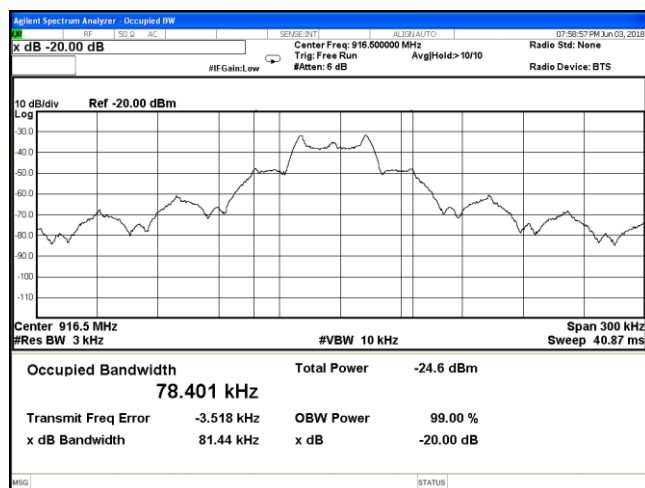
Carrier frequency, MHz	Occupied bandwidth, kHz	Limit		Margin, kHz	Verdict
		% of the carrier frequency	kHz		
916.5	78.40	0.5	4582.5	-4504.1	Pass

**Reference numbers of test equipment used**

HL 4575	HL 4594							
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Full description is given in Appendix A.

**Plot 7.3.1 Occupied bandwidth test results**



<b>Test specification:</b>	<b>Section 15.207, Conducted emission</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	13-Jun-18		
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 50 %	<b>Air Pressure:</b> 999 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

## 7.4 Conducted emissions

### 7.4.1 General

This test was performed to measure common mode conducted emissions at the mains power port. Specification test limits are given in Table 7.4.1. The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

**Table 7.4.1 Limits for conducted emissions**

Frequency, MHz	Class B limit, dB(μV)		Class A limit, dB(μV)	
	QP	AVRG	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*	79	66
0.5 - 5.0	56	46	73	60
5.0 - 30	60	50	73	60

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

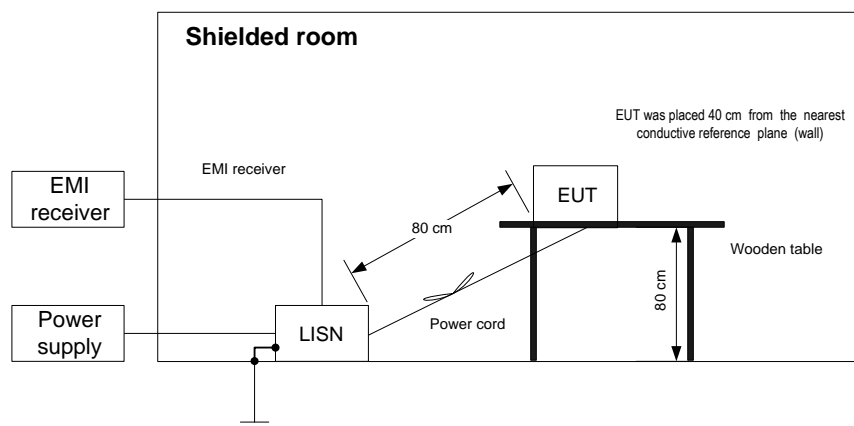
### 7.4.2 Test procedure

**7.4.2.1** The EUT was set up as shown in Figure 7.4.1 and associated photographs, energized and the performance check was conducted.

**7.4.2.2** The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.4.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and Average detectors were used for the testing.

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

**Figure 7.4.1 Setup for conducted emission measurements**



<b>Test specification:</b>	<b>Section 15.207, Conducted emission</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date(s):</b>	13-Jun-18		
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 50 %	<b>Air Pressure:</b> 999 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

**Table 7.4.2 Conducted emission test results**

LINE: AC mains  
 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*		
0.15	40.2	35.5	66.0	-30.5	25.0	56.0	-31.0	L1	Pass
0.34	43.7	40.6	59.3	-18.7	32.4	49.3	-16.9		
0.41	36.5	33.0	57.7	-24.7	25.8	47.7	-21.9		
1.74	35.5	30.0	56.0	-26.0	23.6	46.0	-22.4		
25.5	38.2	32.7	60.0	-27.3	27.2	50.0	-22.8		
0.18	39.5	34.1	64.6	-30.5	18.6	54.6	-36.0	L2	Pass
0.33	43.6	39.5	59.3	-19.8	28.3	49.3	-21.0		
0.41	38.8	33.6	57.7	-24.1	22.2	47.7	-25.5		
2.36	35.0	29.7	56.0	-26.3	18.2	46.0	-27.8		
25.13	34.6	30.0	60.0	-30.0	21.4	50.0	-28.6		

\*- Margin = Measured emission - specification limit.


**Reference numbers of test equipment used**

HL 4778	HL 0787	HL 3016	HL 1194	HL 4276			
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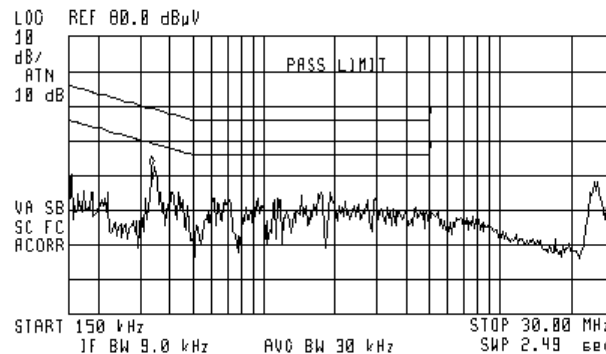
Full description is given in Appendix A.

<b>Test specification:</b>	<b>Section 15.207, Conducted emission</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	13-Jun-18		
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 50 %	<b>Air Pressure:</b> 999 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			


**Plot 7.4.1 Conducted emission measurements**

LINE: L1  
 LIMIT: Class B  
 EUT OPERATING MODE: Receive  
 LIMIT: QUASI-PEAK, AVERAGE  
 DETECTOR: PEAK  
 AC/DC ADAPTER: UMEC, s/n: UP0121M-05PA93G, 1.5 m cable  


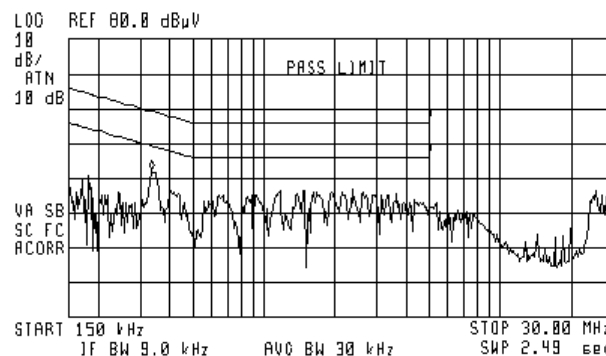
ACTV DET: PEAK  
 MEAS DET: PEAK QP AVG  
 MKR 340 kHz  
 42.56 dBµV



**Plot 7.4.2 Conducted emission measurements**

LINE: L2  
 LIMIT: Class B  
 EUT OPERATING MODE: Receive  
 LIMIT: QUASI-PEAK, AVERAGE  
 DETECTOR: PEAK  
 AC/DC ADAPTER: UMEC, s/n: UP0121M-05PA93G, 1.5 m cable  


ACTV DET: PEAK  
 MEAS DET: PEAK QP AVG  
 MKR 340 kHz  
 42.18 dBµV



<b>Test specification:</b>	<b>Antenna requirement</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.203; Supplier declaration		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> PASS	
<b>Date(s):</b>	11-Jun-18		
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> NA
<b>Remarks:</b>			

## 7.5 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 7.5.1 Antenna assembly**



<b>Test specification:</b>	<b>Section 15.107, Conducted emission at AC power port</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	13-Jun-18		
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 50 %	<b>Air Pressure:</b> 999 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

## 8 Unintentional emissions according to 47CFR part 15 subpart B requirements

### 8.1 Conducted emissions

#### 8.1.1 General

This test was performed to measure common mode conducted emissions at the mains power port. Specification test limits are given in Table 8.1.1. The worst test results (the lowest margins) were recorded in Table 8.1.2 and shown in the associated plots.

**Table 8.1.1 Limits for conducted emissions**

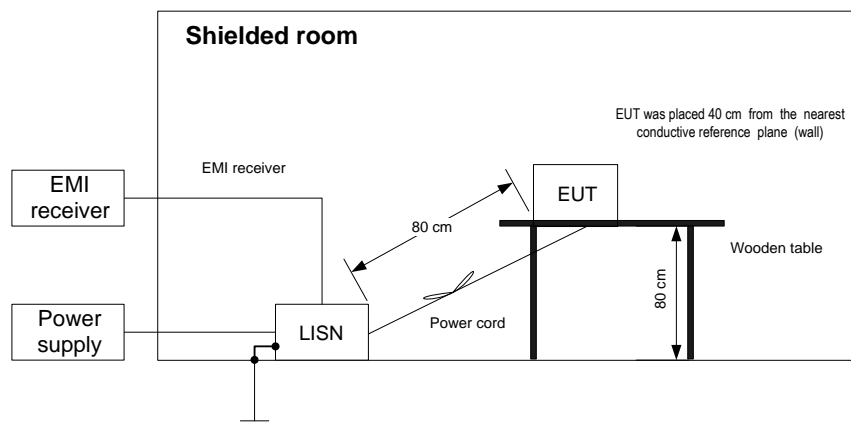
Frequency, MHz	Class B limit, dB(μV)		Class A limit, dB(μV)	
	QP	AVRG	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*	79	66
0.5 - 5.0	56	46	73	60
5.0 - 30	60	50	73	60

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

#### 8.1.2 Test procedure

- 8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and associated photographs, energized and the performance check was conducted.
- 8.1.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 8.1.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and Average detectors were used for the testing.
- 8.1.2.3 The position of the device cables was varied to determine maximum emission level.
- 8.1.2.4 The EUT was tested with power supply options 1, 2, 3 and 4 as provided in Section 6.1 of this report.
- 8.1.2.5 The worst test results (the lowest margins) were recorded in Table 8.1.2 and shown in the associated plots.

**Figure 8.1.1 Setup for conducted emission measurements**



<b>Test specification:</b>	<b>Section 15.107, Conducted emission at AC power port</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	13-Jun-18		
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 50 %	<b>Air Pressure:</b> 999 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

Photograph 8.1.1 Setup for conducted emission measurements, AC/DC adapter: UMEC



Photograph 8.1.2 Setup for conducted emission measurements, AC/DC adapter: BridgePower



Photograph 8.1.3 Setup for conducted emission measurements, AC/DC adapter: DVE





<b>Test specification:</b>	<b>Section 15.107, Conducted emission at AC power port</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> PASS	
<b>Date(s):</b>	13-Jun-18		
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 50 %	<b>Air Pressure:</b> 999 hPa	<b>Power:</b> 120 VAC, 50 Hz
<b>Remarks:</b>			

**Table 8.1.2 Conducted emission test results**

LINE: AC mains  
 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  
 AC/DC ADAPTER: UMEC, s/n UP0121M-05PA93G, 1.5 m cable

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*		
0.15	40.2	35.5	66.0	-30.5	25.0	56.0	-31.0	L1	Pass
0.34	43.7	40.6	59.3	-18.7	32.4	49.3	-16.9		
0.41	36.5	33.0	57.7	-24.7	25.8	47.7	-21.9		
1.74	35.5	30.0	56.0	-26.0	23.6	46.0	-22.4		
25.5	38.2	32.7	60.0	-27.3	27.2	50.0	-22.8		
0.18	39.5	34.1	64.6	-30.5	18.6	54.6	-36.0	L2	Pass
0.33	43.6	39.5	59.3	-19.8	28.3	49.3	-21.0		
0.41	38.8	33.6	57.7	-24.1	22.2	47.7	-25.5		
2.36	35.0	29.7	56.0	-26.3	18.2	46.0	-27.8		
25.13	34.6	30.0	60.0	-30.0	21.4	50.0	-28.6		

AC/DC ADAPTER: BridgePower, s/n: BI010SO5CO2, 3.0 m cable

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*		
0.150325	52.7	49.8	66.0	-16.2	30.8	56.0	-25.2	L1	Pass
0.156925	52.9	49.1	65.7	-16.6	30.3	55.7	-25.4		
0.158675	51.6	48.7	65.6	-16.9	29.8	55.6	-25.8		
0.204250	45.3	42.1	63.5	-21.4	27.9	53.5	-25.6		
0.361825	39.6	37.5	58.8	-21.3	28.1	48.8	-20.7		
28.399132	39.2	36.7	60.0	-23.3	35.5	50.0	-14.5		
0.152000	54.5	49.7	65.9	-16.2	31.9	55.9	-24.0	L2	Pass
0.159050	51.3	48.8	65.6	-16.8	31.2	55.6	-24.4		
0.193963	49.7	44.8	63.9	-19.1	28.1	53.9	-25.8		
0.368155	47.9	40.4	58.6	-18.2	27.9	48.6	-20.7		
8.746250	32.7	29.0	60.0	-31.0	22.7	50.0	-27.3		
28.397846	37.2	35.8	60.0	-24.2	34.3	50.0	-15.7		

\*- Margin = Measured emission - specification limit.


**Reference numbers of test equipment used**

HL 4778	HL 0787	HL 3016	HL 1194	HL 4276			
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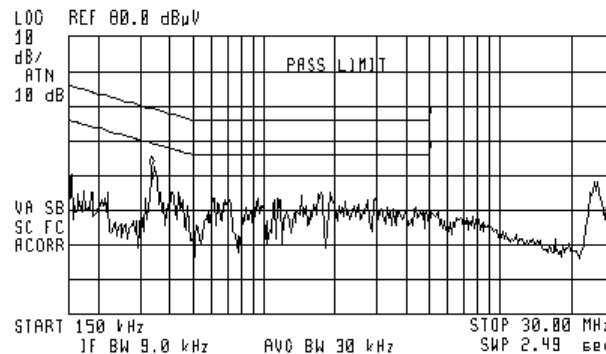
Full description is given in Appendix A.

Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Jun-18		
Temperature: 24 °C	Relative Humidity: 50 %	Air Pressure: 999 hPa	Power: 120 VAC, 50 Hz
Remarks:			


#### Plot 8.1.1 Conducted emission measurements

LINE: L1  
 LIMIT: Class B  
 EUT OPERATING MODE: Receive  
 LIMIT: QUASI-PEAK, AVERAGE  
 DETECTOR: PEAK  
 AC/DC ADAPTER: UMEC, s/n UP0121M-05PA93G, 1.5 m cable  


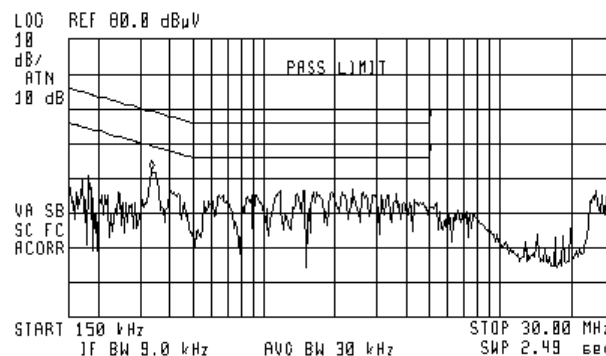
ACTV DET: PEAK  
 MEAS DET: PEAK QP AVG  
 MKR 340 kHz  
 42.56 dBµV



#### Plot 8.1.2 Conducted emission measurements

LINE: L2  
 LIMIT: Class B  
 EUT OPERATING MODE: Receive  
 LIMIT: QUASI-PEAK, AVERAGE  
 DETECTOR: PEAK  
 AC/DC ADAPTER: UMEC, s/n UP0121M-05PA93G, 1.5 m cable  


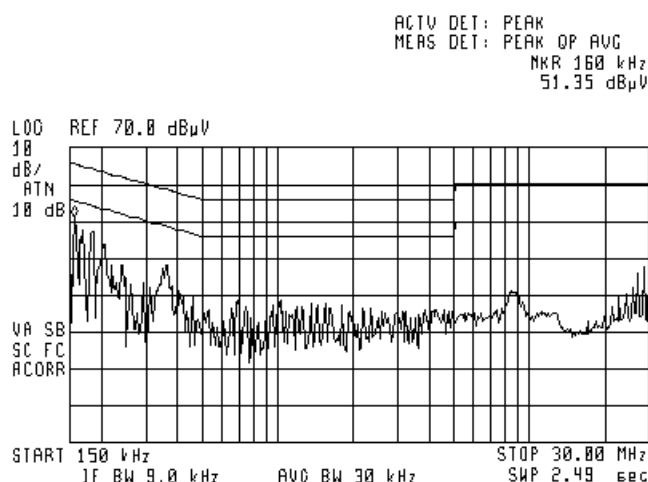
ACTV DET: PEAK  
 MEAS DET: PEAK QP AVG  
 MKR 340 kHz  
 42.18 dBµV



Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Jun-18		
Temperature: 24 °C	Relative Humidity: 50 %	Air Pressure: 999 hPa	Power: 120 VAC, 50 Hz
Remarks:			

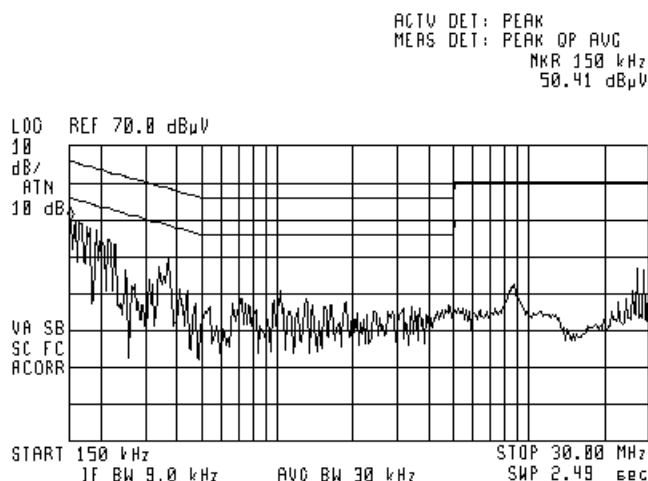
#### Plot 8.1.3 Conducted emission measurements

LINE: L1  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK  
AC/DC ADAPTER: BridgePower; s/n BIO10S05C02, 3 m cable



#### Plot 8.1.4 Conducted emission measurements

LINE: L2  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK  
AC/DC ADAPTER: BridgePower; BIO10S05C02, 3 m cable



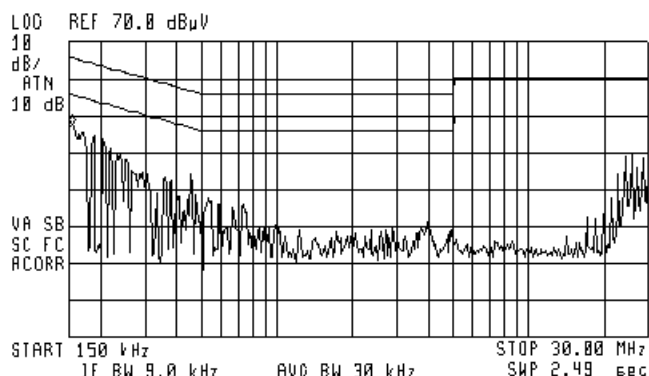
Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Jun-18		
Temperature: 24 °C	Relative Humidity: 50 %	Air Pressure: 999 hPa	Power: 120 VAC, 50 Hz
Remarks:			

#### Plot 8.1.5 Conducted emission measurements

LINE: L1  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK  
AC/DC ADAPTER: DVE; s/n DSA-12PFU-05 FUS 050200, 3.0 m cable



ACTV DET: PEAK  
MERS DET: PEAK OP AVG  
NR 150 kHz  
47.51 dBμV

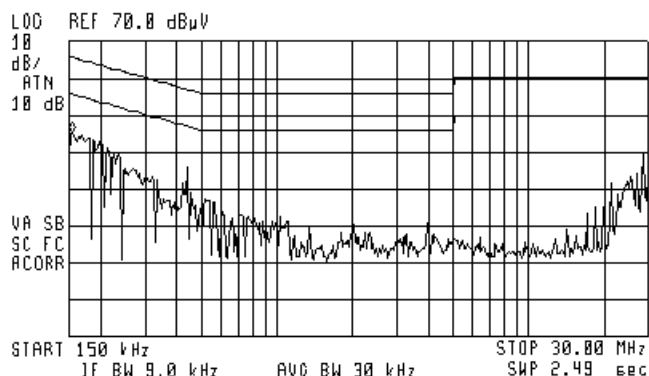


#### Plot 8.1.6 Conducted emission measurements

LINE: L2  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK  
AC/DC ADAPTER: DVE; s/n DSA -12PFU-05 FUS 050200, 3.0 m cable



ACTV DET: PEAK  
MERS DET: PEAK OP AVG  
NR 150 kHz  
45.37 dBμV



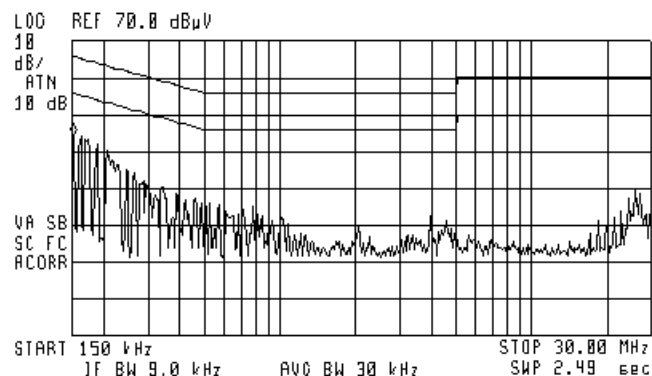
Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Jun-18		
Temperature: 24 °C	Relative Humidity: 50 %	Air Pressure: 999 hPa	Power: 120 VAC, 50 Hz
Remarks:			

#### Plot 8.1.7 Conducted emission measurements

LINE: L1  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK  
AC/DC ADAPTER: DVE; s/n DSA -12PFU-05 FUS 050200, 1.5 m cable

(42)

ACTV DET: PEAK  
MERS DET: PEAK OP AVG  
MKR 150 kHz  
44.73 dBμV

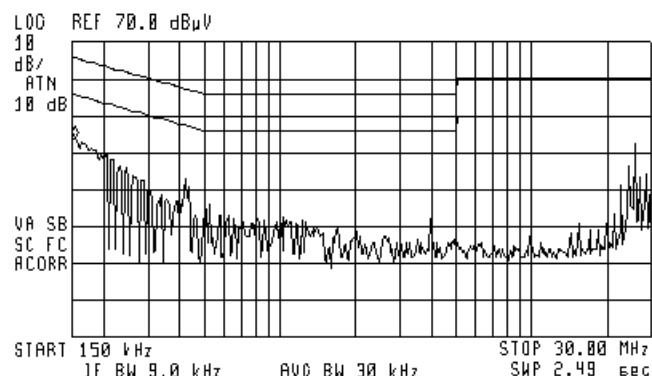


#### Plot 8.1.8 Conducted emission measurements

LINE: L2  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK  
AC/DC ADAPTER: DVE; s/n DSA -12PFU-05 FUS 050200, 1.5 m cable

(42)

ACTV DET: PEAK  
MERS DET: PEAK OP AVG  
MKR 150 kHz  
44.14 dBμV



<b>Test specification:</b>	<b>Radiated emission</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.109; ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> <b>PASS</b>	
<b>Date(s):</b>	06-Feb-18 - 11-Feb-18		
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3 VDC
<b>Remarks:</b>			

## 8.2 Radiated emission measurements

### 8.2.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.2.1.

**Table 8.2.1 Radiated emission test limits**

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

\* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows:  $Lims_2 = Lims_1 + 20 \log (S_1/S_2)$ , where  $S_1$  and  $S_2$  – standard defined and test distance respectively in meters.

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

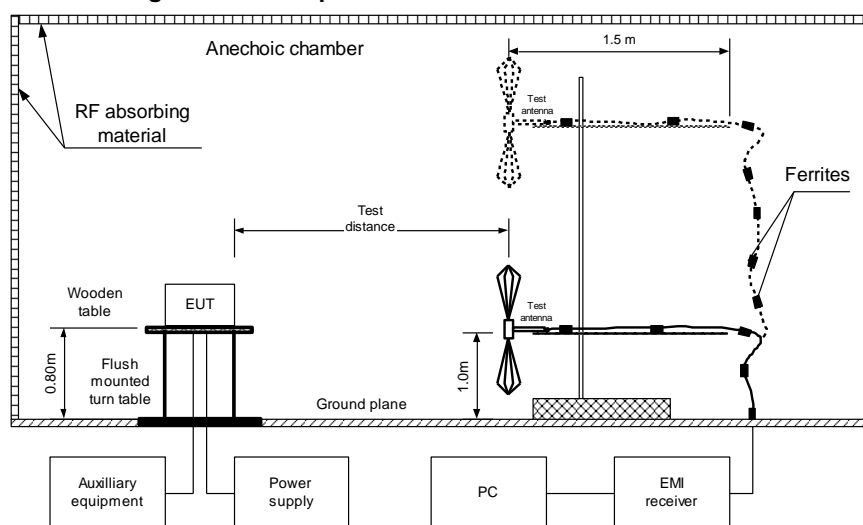
**8.2.2.1** The EUT was set up as shown in Figure 8.2.1 and associated photograph, energized and the performance check was conducted.

**8.2.2.2** 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.

**8.2.2.3** The EUT was tested with power supply options 1, 2, 3 and 4 as provided in Section 6.1 of this report.

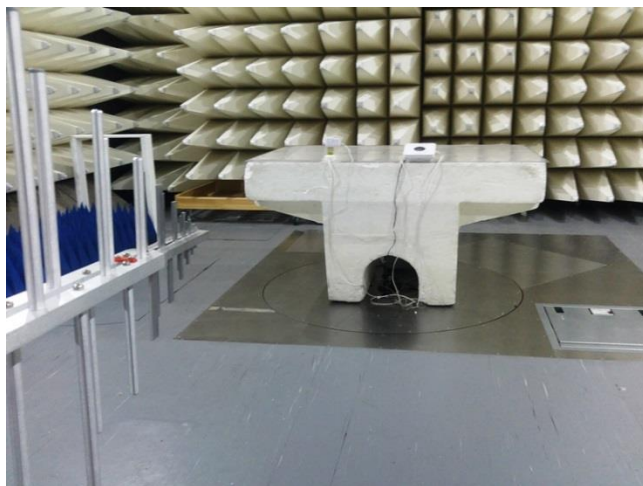
**8.2.2.4** The worst test results (the lowest margins) were recorded in Table 8.2.2, Table 8.2.3 and shown in the associated plots.

**Figure 8.2.1 Setup for radiated emission measurements**

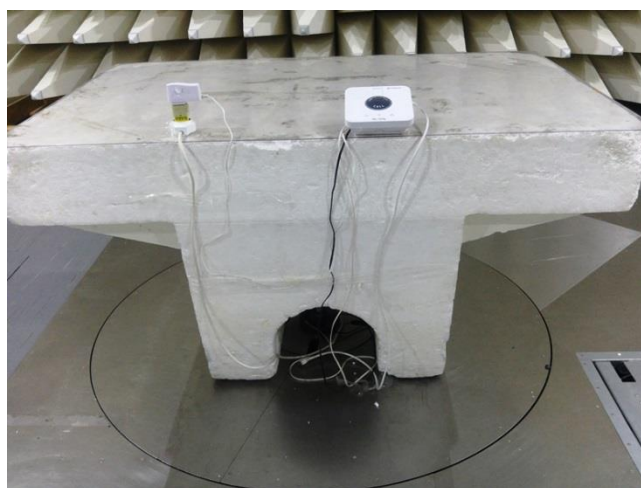


<b>Test specification:</b>	<b>Radiated emission</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.109; ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> PASS	
<b>Date(s):</b>	06-Feb-18 - 11-Feb-18		
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3 VDC
<b>Remarks:</b>			

**Photograph 8.2.1 Setup for radiated emission measurements, general view**  
AC/DC adapter: UMEC



**Photograph 8.2.2 Setup for radiated emission measurements, EUT cabling**  
AC/DC adapter: UMEC



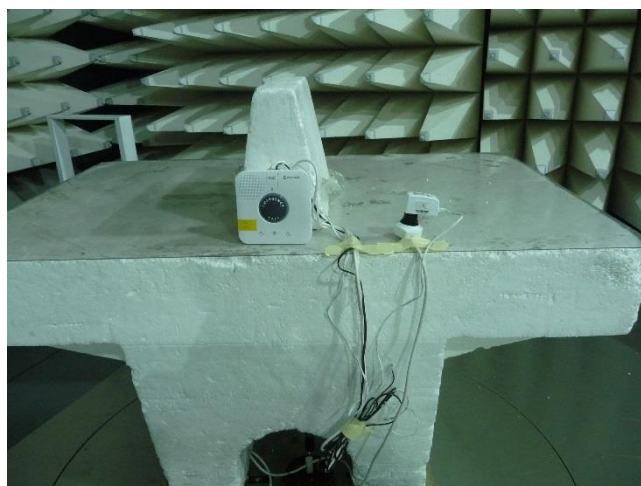


<b>Test specification:</b>	<b>Radiated emission</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.109; ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> PASS	
<b>Date(s):</b>	06-Feb-18 - 11-Feb-18		
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3 VDC
<b>Remarks:</b>			

**Photograph 8.2.3 Setup for final radiated emission measurements, general view**  
AC/DC adapter: BridgePower



**Photograph 8.2.4 Setup for radiated emission measurements, EUT cabling**  
AC/DC adapter: BridgePower





<b>Test specification:</b>	<b>Radiated emission</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.109; ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> <b>PASS</b>	
<b>Date(s):</b>	06-Feb-18 - 11-Feb-18		
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3 VDC
<b>Remarks:</b>			

Photograph 8.2.5 Setup for radiated emission measurements, EUT positions



Horizontal



Vertical

<b>Test specification:</b>	<b>Radiated emission</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.109; ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> <b>PASS</b>	
<b>Date(s):</b>	06-Feb-18 - 11-Feb-18		
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3 VDC
<b>Remarks:</b>			

**Table 8.2.2 Radiated emission test results**

AC/DC ADAPTER: UMEC, s/n UP0121M-05PA93G, 1.5 m cable  
EUT SET UP: TABLE-TOP  
LIMIT: Class B  
EUT OPERATING MODE: Receive  
TEST SITE: SEMI ANECHOIC CHAMBER  
TEST DISTANCE: 3 m  
DETECTORS USED: PEAK / QUASI-PEAK  
FREQUENCY RANGE: 30 MHz – 1000 MHz  
RESOLUTION BANDWIDTH: 120 kHz

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
32.422667	34.29	30.85	40.00	-9.15	Vertical	100.0	-111.0	Pass
55.065833	37.35	33.72	40.00	-6.28	Vertical	100.0	-180.0	
69.103500	36.99	33.68	40.00	-6.32	Vertical	102.0	-171.0	
76.187500	42.90	39.37	40.00	-0.63	Vertical	134.0	-99.0	
95.929667	43.35	39.21	43.50	-4.29	Vertical	102.0	118.0	
100.147500	44.13	41.68	43.50	-1.82	Vertical	102.0	83.0	
119.925000	42.87	40.43	43.50	-3.07	Vertical	102.0	173.0	
121.305000	43.35	41.05	43.50	-2.45	Vertical	104.0	-155.0	
214.513167	43.85	39.77	43.50	-3.73	Vertical	102.0	81.0	
242.777000	45.58	37.69	46.00	-8.31	Vertical	104.0	117.0	
407.977167	40.54	39.31	46.00	-6.69	Horizontal	222.0	-155.0	

TEST SITE: SEMI ANECHOIC CHAMBER  
TEST DISTANCE: 3 m  
DETECTORS USED: PEAK / AVERAGE  
FREQUENCY RANGE: 1000 MHz – 5000 MHz  
RESOLUTION BANDWIDTH: 1000 kHz

RECESSION BANDWIDTH:				1000 KHz			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
Frequency, MHz	Peak			Average						
	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										Pass

\*- Margin = Measured emission - specification limit.

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

<b>Test specification:</b>	<b>Radiated emission</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.109; ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> <b>PASS</b>	
<b>Date(s):</b>	06-Feb-18 - 11-Feb-18		
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3 VDC
<b>Remarks:</b>			

**Table 8.2.3 Radiated emission test results**

AC/DC ADAPTER: BridgePower, s/n: BI010SO5CO2, 3 m cable  
EUT SET UP: TABLE-TOP  
LIMIT: Class B  
EUT OPERATING MODE: Receive  
TEST SITE: SEMI ANECHOIC CHAMBER  
TEST DISTANCE: 3 m  
DETECTORS USED: PEAK / QUASI-PEAK  
FREQUENCY RANGE: 30 MHz – 1000 MHz  
RESOLUTION BANDWIDTH: 120 kHz

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
98.00	38.82	34.96	43.50	-8.54	Vertical	1.0	-122	Pass
129.21	37.89	35.00	43.50	-8.50	Vertical	1.0	-156	
244.20	40.13	36.45	46.00	-9.55	Vertical	1.0	-141	
301.02	41.58	37.78	46.00	-8.22	Vertical	1.0	-133	
408.01	42.57	41.57	46.00	-3.43	Vertical	1.0	50	

TEST SITE: SEMI ANECHOIC CHAMBER  
TEST DISTANCE: 3 m  
DETECTORS USED: PEAK / AVERAGE  
FREQUENCY RANGE: 1000 MHz – 5000 MHz  
RESOLUTION BANDWIDTH: 1000 kHz

RECESSION BANDWIDTH:				1000 KHz			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
Frequency, MHz	Peak			Average						
	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										Pass

\*- Margin = Measured emission - specification limit.

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

**Reference numbers of test equipment used**

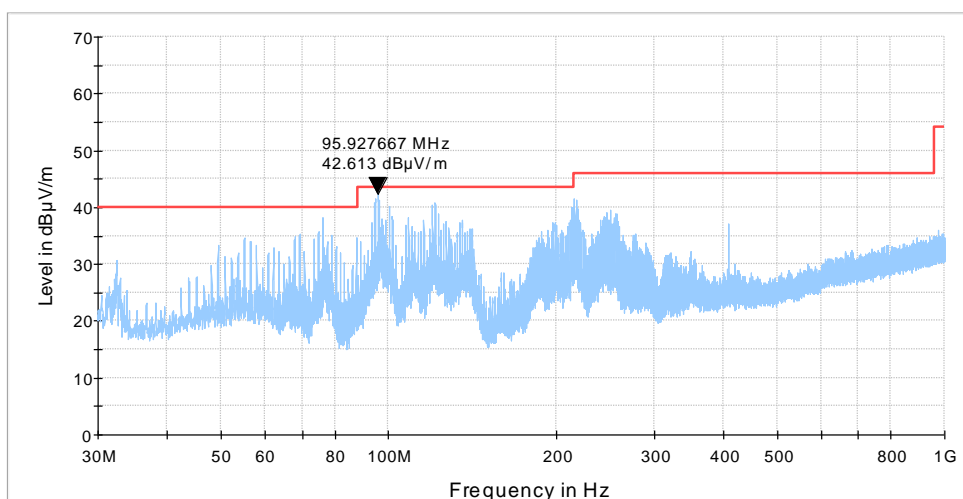
HL 3615	HL 4277	HL 4360	HL 4933	HL 5288			
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Full description is given in Appendix A.

<b>Test specification:</b>	<b>Radiated emission</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.109; ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> <b>PASS</b>	
<b>Date(s):</b>	06-Feb-18 - 11-Feb-18		
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3 VDC
<b>Remarks:</b>			

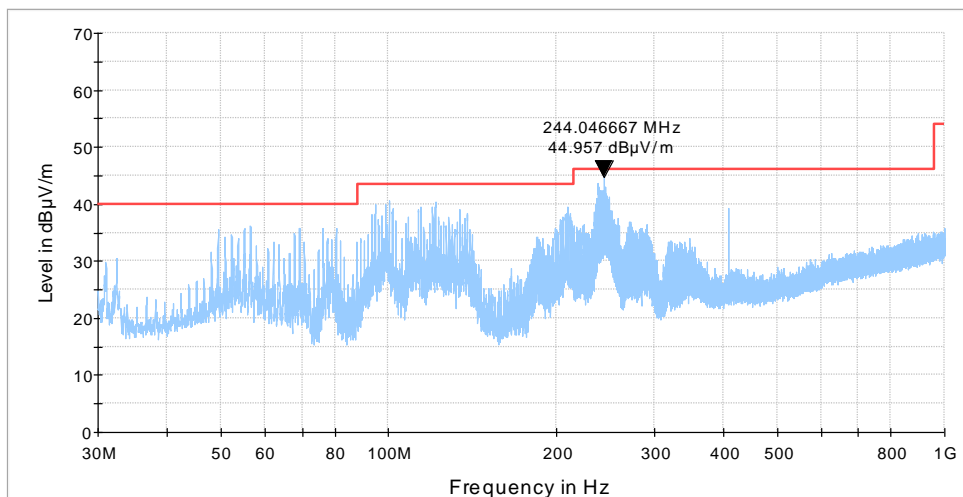
**Plot 8.2.1 Radiated emission measurements in 30 - 1000 MHz range,  
vertical and horizontal antenna polarization**

TEST SITE: Semi anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by  
EUT POSITION: Vertical  
AC/DC ADAPTER: UMEC, s/n UP0121M-05PA93G, 1.5 m cable



**Plot 8.2.2 Radiated emission measurements in 30 - 1000 MHz range,  
vertical and horizontal antenna polarization**

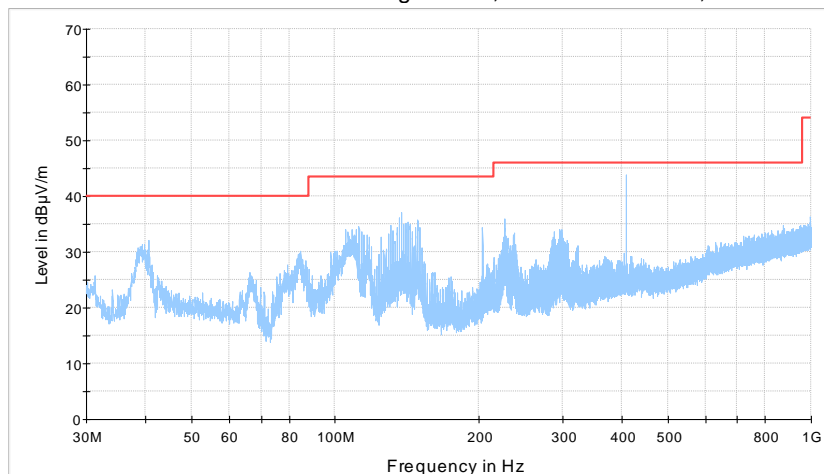
TEST SITE: Semi anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by  
EUT POSITION: Horizontal  
AC/DC ADAPTER: UMEC, s/n UP0121M-05PA93G, 1.5 m cable



<b>Test specification:</b>	<b>Radiated emission</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.109; ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> PASS	
<b>Date(s):</b>	06-Feb-18 - 11-Feb-18		
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3 VDC
<b>Remarks:</b>			

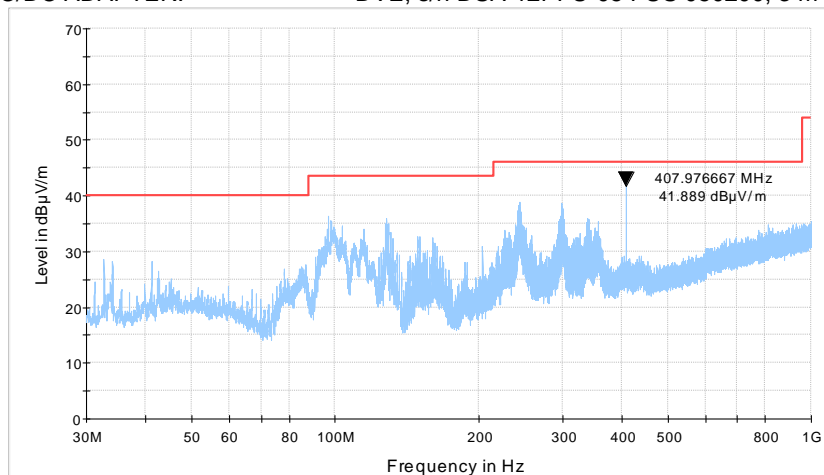
**Plot 8.2.3 Radiated emission measurements in 30 - 1000 MHz range,  
vertical & horizontal antenna polarization**

TEST SITE: Semi anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive  
AC/DC ADAPTER: BridgePower; s/n BIO10S05C02, 3 m cable



**Plot 8.2.4 Radiated emission measurements in 30 - 1000 MHz range,  
vertical & horizontal antenna polarization**

TEST SITE: Semi anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive  
AC/DC ADAPTER: DVE, s/n DSA-12PFU-05 FUS 050200, 3 m cable

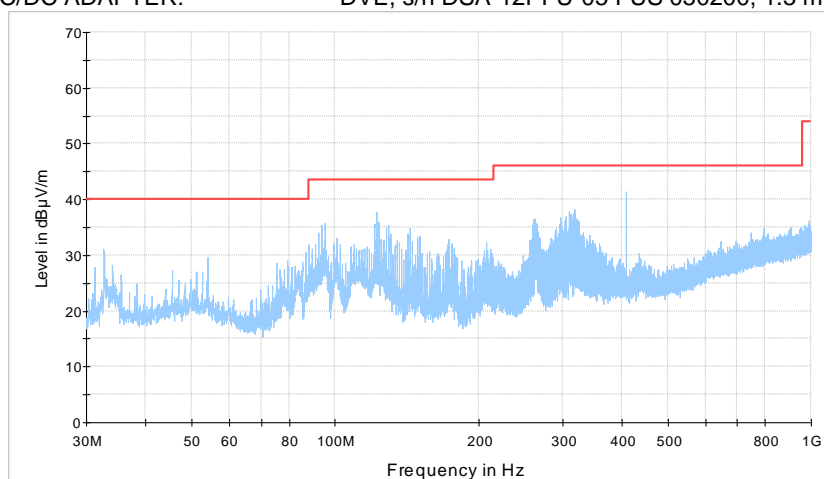




<b>Test specification:</b>	<b>Radiated emission</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.109; ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> PASS	
<b>Date(s):</b>	06-Feb-18 - 11-Feb-18		
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3 VDC
<b>Remarks:</b>			

**Plot 8.2.5 Radiated emission measurements in 30 - 1000 MHz range,  
vertical & horizontal antenna polarization**

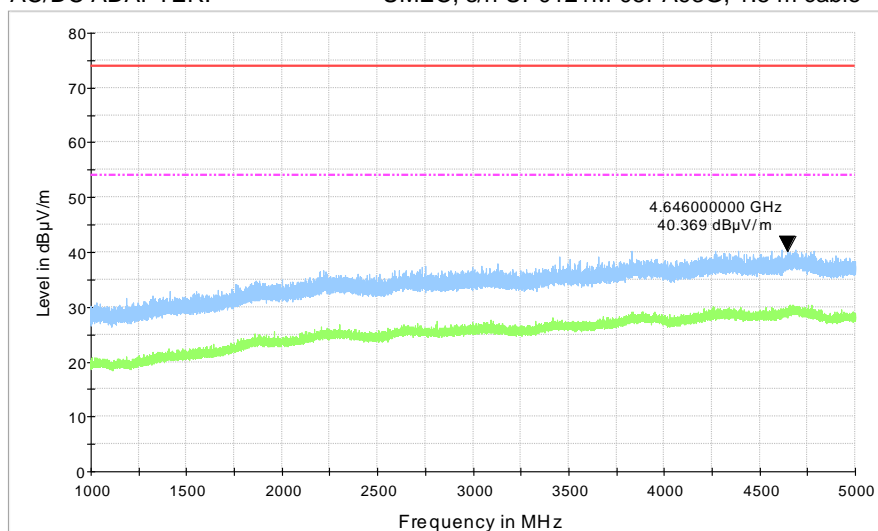
TEST SITE: Semi anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive  
AC/DC ADAPTER: DVE, s/n DSA-12PFU-05 FUS 050200, 1.5 m cable



<b>Test specification:</b>	<b>Radiated emission</b>		
<b>Test procedure:</b>	FCC CFR 47, Section 15.109; ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> <b>PASS</b>	
<b>Date(s):</b>	06-Feb-18 - 11-Feb-18		
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 55 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3 VDC
<b>Remarks:</b>			

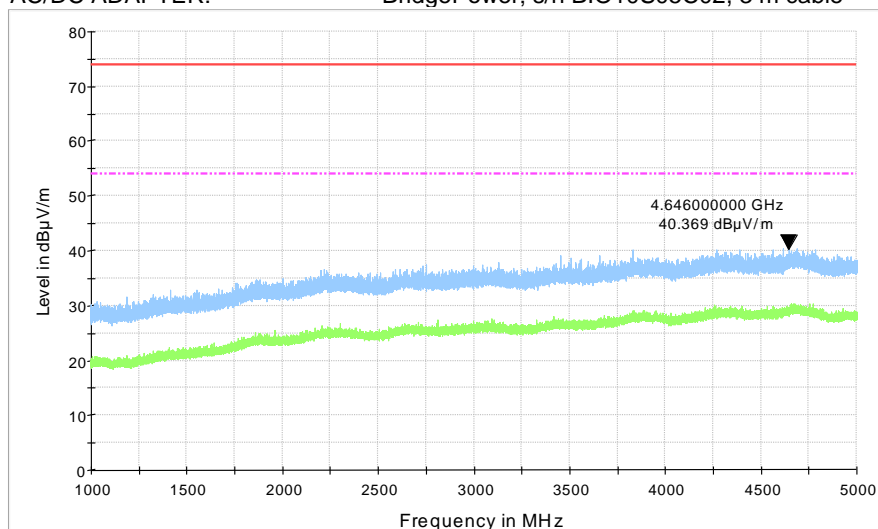
**Plot 8.2.6 Radiated emission measurements 1 – 5 GHz,  
vertical and horizontal antenna polarization**

TEST SITE: Semi anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by  
EUT POSITION: Vertical and Horizontal  
AC/DC ADAPTER: UMEC, s/n UP0121M-05PA93G, 1.5 m cable



**Plot 8.2.7 Radiated emission measurements 1 – 5 GHz,  
vertical and horizontal antenna polarization**

TEST SITE: Semi anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive  
EUT POSITION: Vertical and Horizontal  
AC/DC ADAPTER: BridgePower; s/n BIO10S05C02, 3 m cable



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

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A01877	24-Oct-17	24-Oct-18
1194	Variac, 220 V/ 2.5 A	Matsunaga	NA	2962	22-May-18	22-May-19
3016	LISN, Two-line V-network, 9 kHz to 30 MHz, (50 uH+5 Ohm), CISPR16-1, MIL-461E	Rohde & Schwarz	ESH 3-Z5	892239/002	11-Jan-18	11-Jan-19
3615	Cable RF, 6.5 m, N type-N type, DC-6 GHz	Suhner Switzerland	RG 214/U	NA	10-Jun-18	10-Jun-19
4276	Test Cable , DC-18 GHz, 3.05 m, N/M - N/M	Mini-Circuits	APC-10FT-NMNM+	0747A	24-Aug-17	24-Aug-18
4277	Test Cable , DC-18 GHz, 3.05 m, N/M - N/M	Mini-Circuits	APC-10FT-NMNM+	0748A	10-Sep-17	10-Sep-18
4360	EMI Test Receiver, 20 Hz to 40 GHz.	Rohde & Schwarz	ESU40	100322	26-Dec-17	26-Dec-18
4575	EXA Signal Analyzer, 9 kHz - 26.5 GHz	Agilent Technologies	N9010A	MY48030110	28-Dec-17	28-Dec-18
4594	Precision Fixed Attenuator, 50 Ohm, 2W, 20dB, DC to 18000 MHz	M/A-COM	3082-6144-20	NA	23-Jan-18	23-Jan-19
4778	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL4777	Hewlett Packard	8542E	30807A00262, 3427A00123	02-Nov-17	02-Nov-18
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATION	AHA-118	701046	04-Jan-18	04-Jan-19
5111	RF cable, 40 GHz, 5.5 m, K-type	Huber-Suhner	SF102EA/11SK/11SK/5500MM	502493/2EA	09-Apr-18	09-Apr-19
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX-8000E	809	21-Jan-18	21-Jan-19



## 10 APPENDIX B Test equipment correction factors

HL 4933: Active Horn Antenna  
COM-POWER CORPORATION, model: AHA-118, s/n 701046

Frequency, MHz	Measured antenna factor (with preamplifier), dB/m
1000	-16.1
1500	-15.1
2000	-10.9
2500	-11.9
3000	-11.1
3500	-10.6
4000	-8.6
4500	-8.3
5000	-5.9
5500	-5.7
6000	-3.3
6500	-4.0
7000	-2.2
7500	-1.7
8000	1.1
8500	-0.8
9000	-1.5
9500	-0.2

Frequency, MHz	Measured antenna factor (with preamplifier), dB/m
10000	1.8
10500	1.0
11000	0.3
11500	-0.5
12000	3.1
12500	1.4
13000	-0.3
13500	-0.4
14000	2.5
14500	2.2
15000	1.9
15500	0.5
16000	2.1
16500	1.2
17000	0.6
17500	3.1
18000	4.2

The antenna factor shall be added to receiver reading in dB $\mu$ V to obtain field strength in dB $\mu$ V/m.

HL 5288: Trilog Antenna  
Frankonia, model: ALX-8000E, s/n: 00809

Frequency, MHz	Antenna factor, dB/m
1000	26.9
1100	28.1
1200	28.4
1300	29.6
1400	29.1
1500	30.4
1600	30.7
1700	31.5
1800	32.3
1900	32.6
2000	32.5
2100	32.9
2200	33.5
2300	33.2
2400	33.7
2500	34.6
2600	34.7
2700	34.6
2800	35.0
2900	35.5
3000	36.2
3100	36.8
3200	36.8
3300	37.0
3400	37.5
3500	38.2

Frequency, MHz	Antenna factor, dB/m
3600	38.9
3700	39.4
3800	39.4
3900	39.6
4000	39.7
4100	39.8
4200	40.5
4300	40.9
4400	41.1
4500	41.4
4600	41.3
4700	41.6
4800	41.9
4900	42.3
5000	42.7
5100	43.0
5200	42.9
5300	43.5
5400	43.6
5500	44.3
5600	44.7
5700	45.0
5800	45.0
5900	45.3
6000	45.9

The antenna factor shall be added to receiver reading in dB $\mu$ V to obtain field strength in dB $\mu$ V/m.

HL 3615: Cable RF

Suhner Switzerland, model: RG 214/U, s/n: NA, HL 3615

Set / Applied, MHz	Measured, dB	Uncertainty, dB
50	0.31	+0.08 / -0.08
100	0.45	+0.08 / -0.08
200	0.66	+0.08 / -0.08
300	0.83	+0.09 / -0.09
400	0.98	+0.09 / -0.09
500	1.12	+0.09 / -0.09
600	1.26	+0.09 / -0.09
700	1.38	+0.09 / -0.09
800	1.50	+0.09 / -0.09
900	1.63	+0.09 / -0.09
1000	1.74	+0.09 / -0.09
1100	1.85	+0.09 / -0.09
1200	1.97	+0.09 / -0.09
1300	2.08	+0.09 / -0.09
1400	2.19	+0.09 / -0.09
1500	2.30	+0.09 / -0.09
1600	2.41	+0.09 / -0.09
1700	2.53	+0.09 / -0.09
1800	2.63	+0.09 / -0.09
1900	2.74	+0.09 / -0.09
2000	2.83	+0.09 / -0.09
2100	2.93	+0.11 / -0.11
2200	3.00	+0.11 / -0.11
2300	3.07	+0.11 / -0.11
2400	3.13	+0.11 / -0.11
2500	3.19	+0.15 / -0.15
2600	3.25	+0.15 / -0.15
2700	3.33	+0.15 / -0.15
2800	3.40	+0.15 / -0.15
2900	3.48	+0.15 / -0.15
3000	3.57	+0.15 / -0.15
3100	3.63	+0.17 / -0.17
3200	3.71	+0.17 / -0.17

Set / Applied, MHz	Measured, dB	Uncertainty, dB
3300	3.78	+0.17 / -0.17
3400	3.88	+0.17 / -0.17
3500	3.96	+0.17 / -0.17
3600	4.06	+0.17 / -0.17
3700	4.15	+0.17 / -0.17
3800	4.26	+0.17 / -0.17
3900	4.36	+0.17 / -0.17
4000	4.48	+0.17 / -0.17
4100	4.58	+0.22 / -0.23
4200	4.72	+0.22 / -0.23
4300	4.80	+0.22 / -0.23
4400	4.93	+0.22 / -0.23
4500	5.00	+0.22 / -0.23
4600	5.10	+0.22 / -0.23
4700	5.20	+0.22 / -0.23
4800	5.30	+0.22 / -0.23
4900	5.43	+0.22 / -0.23
5000	5.54	+0.22 / -0.23
5100	5.65	+0.22 / -0.23
5200	5.73	+0.22 / -0.23
5300	5.86	+0.22 / -0.23
5400	5.95	+0.22 / -0.23
5500	6.05	+0.22 / -0.23
5600	6.16	+0.22 / -0.23
5700	6.28	+0.22 / -0.23
5800	6.38	+0.22 / -0.23
5900	6.53	+0.22 / -0.23
6000	6.63	+0.22 / -0.23
6100	6.75	+0.22 / -0.23
6200	6.82	+0.22 / -0.23
6300	6.93	+0.22 / -0.23
6400	7.00	+0.22 / -0.23
6500	7.05	+0.22 / -0.23

HL 4276: Test Cable

Mini-Circuits, model: APC-10FT-NMNM+, s/n 0748A

Set / Applied, MHz	Measured, dB	Uncertainty, dB
0.1	0.02	+0.07 / -0.07
50	0.26	+0.07 / -0.07
100	0.38	+0.07 / -0.07
200	0.55	+0.07 / -0.07
300	0.68	+0.08 / -0.09
400	0.79	+0.08 / -0.09
500	0.89	+0.08 / -0.09
600	0.98	+0.08 / -0.09
700	1.07	+0.08 / -0.09
800	1.15	+0.08 / -0.09
900	1.23	+0.08 / -0.09
1000	1.30	+0.08 / -0.09
1100	1.37	+0.12 / -0.13
1200	1.43	+0.12 / -0.13
1300	1.49	+0.12 / -0.13
1400	1.56	+0.12 / -0.13
1500	1.62	+0.12 / -0.13
1600	1.68	+0.12 / -0.13
1700	1.73	+0.12 / -0.13
1800	1.79	+0.12 / -0.13
1900	1.84	+0.12 / -0.13
2000	1.90	+0.12 / -0.13
2100	1.96	+0.12 / -0.13
2200	2.01	+0.12 / -0.13
2300	2.06	+0.12 / -0.13
2400	2.12	+0.12 / -0.13
2500	2.17	+0.17 / -0.18
2600	2.24	+0.17 / -0.18
2700	2.30	+0.17 / -0.18
2800	2.37	+0.17 / -0.18
2900	2.44	+0.17 / -0.18
3000	2.53	+0.17 / -0.18
3100	2.59	+0.19 / -0.2
3200	2.62	+0.19 / -0.2
3300	2.64	+0.19 / -0.2
3400	2.66	+0.19 / -0.2
3500	2.68	+0.19 / -0.2
3600	2.71	+0.19 / -0.2
3700	2.74	+0.19 / -0.2
3800	2.78	+0.19 / -0.2
3900	2.81	+0.19 / -0.2
4000	2.85	+0.19 / -0.2

Set / Applied, MHz	Measured, dB	Uncertainty, dB
4100	2.89	+0.3 / -0.33
4200	2.94	+0.3 / -0.33
4300	2.97	+0.3 / -0.33
4400	3.01	+0.3 / -0.33
4500	3.05	+0.3 / -0.33
4600	3.09	+0.3 / -0.33
4700	3.12	+0.3 / -0.33
4800	3.16	+0.3 / -0.33
4900	3.20	+0.3 / -0.33
5000	3.24	+0.3 / -0.33
5100	3.28	+0.3 / -0.33
5200	3.32	+0.3 / -0.33
5300	3.35	+0.3 / -0.33
5400	3.39	+0.3 / -0.33
5500	3.42	+0.3 / -0.33
5600	3.46	+0.3 / -0.33
5700	3.50	+0.3 / -0.33
5800	3.54	+0.3 / -0.33
5900	3.59	+0.3 / -0.33
6000	3.62	+0.3 / -0.33
6100	3.66	+0.3 / -0.33
6200	3.70	+0.3 / -0.33
6300	3.73	+0.3 / -0.33
6400	3.77	+0.3 / -0.33
6500	3.80	+0.3 / -0.33
6600	3.85	+0.3 / -0.33
6700	3.88	+0.3 / -0.33
6800	3.92	+0.3 / -0.33
6900	3.95	+0.3 / -0.33
7000	4.00	+0.3 / -0.33
7100	4.04	+0.3 / -0.33
7200	4.07	+0.3 / -0.33
7300	4.12	+0.3 / -0.33
7400	4.15	+0.3 / -0.33
7500	4.19	+0.3 / -0.33
7600	4.23	+0.3 / -0.33
7700	4.26	+0.3 / -0.33
7800	4.29	+0.3 / -0.33
7900	4.33	+0.3 / -0.33
8000	4.36	+0.3 / -0.33
8100	4.40	+0.34 / -0.36
8200	4.42	+0.34 / -0.36

HL 4276: Test Cable

Set / Applied, MHz	Measured, dB	Uncertainty, dB
8300	4.45	+0.34 / -0.36
8400	4.48	+0.34 / -0.36
8500	4.52	+0.34 / -0.36
8600	4.54	+0.34 / -0.36
8700	4.56	+0.34 / -0.36
8800	4.59	+0.34 / -0.36
8900	4.62	+0.34 / -0.36
9000	4.65	+0.34 / -0.36
9100	4.68	+0.34 / -0.36
9200	4.69	+0.34 / -0.36
9300	4.71	+0.34 / -0.36
9400	4.73	+0.34 / -0.36
9500	4.75	+0.34 / -0.36
9600	4.79	+0.34 / -0.36
9700	4.81	+0.34 / -0.36
9800	4.85	+0.34 / -0.36
9900	4.88	+0.34 / -0.36
10000	4.91	+0.34 / -0.36
10100	4.93	+0.4 / -0.44
10200	4.97	+0.4 / -0.44
10300	5.00	+0.4 / -0.44
10400	5.04	+0.4 / -0.44
10500	5.07	+0.4 / -0.44
10600	5.12	+0.4 / -0.44
10700	5.14	+0.4 / -0.44
10800	5.15	+0.4 / -0.44
10900	5.18	+0.4 / -0.44
11000	5.19	+0.4 / -0.44
11100	5.21	+0.4 / -0.44
11200	5.24	+0.4 / -0.44
11300	5.28	+0.4 / -0.44
11400	5.32	+0.4 / -0.44
11500	5.35	+0.4 / -0.44
11600	5.39	+0.4 / -0.44
11700	5.42	+0.4 / -0.44
11800	5.45	+0.4 / -0.44
11900	5.47	+0.4 / -0.44
12000	5.50	+0.4 / -0.44
12100	5.54	+0.4 / -0.44
12200	5.57	+0.4 / -0.44
12300	5.60	+0.4 / -0.44
12400	5.63	+0.4 / -0.44
12500	5.64	+0.47 / -0.52
12600	5.67	+0.47 / -0.52
12700	5.68	+0.47 / -0.52
12800	5.70	+0.47 / -0.52
12900	5.72	+0.47 / -0.52
13000	5.75	+0.47 / -0.52
13100	5.47	+0.4 / -0.44
13200	5.50	+0.4 / -0.44
13300	5.54	+0.4 / -0.44

Set / Applied, MHz	Measured, dB	Uncertainty, dB
13100	5.77	+0.47 / -0.52
13200	5.82	+0.47 / -0.52
13300	5.84	+0.47 / -0.52
13400	5.88	+0.47 / -0.52
13500	5.90	+0.47 / -0.52
13600	5.93	+0.47 / -0.52
13700	5.95	+0.47 / -0.52
13800	6.00	+0.47 / -0.52
13900	6.02	+0.47 / -0.52
14000	6.05	+0.47 / -0.52
14100	6.08	+0.47 / -0.52
14200	6.11	+0.47 / -0.52
14300	6.12	+0.47 / -0.52
14400	6.15	+0.47 / -0.52
14500	6.18	+0.47 / -0.52
14600	6.22	+0.47 / -0.52
14700	6.25	+0.47 / -0.52
14800	6.29	+0.47 / -0.52
14900	6.33	+0.47 / -0.52
15000	6.35	+0.47 / -0.52
15100	6.38	+0.47 / -0.52
15200	6.40	+0.47 / -0.52
15300	6.44	+0.47 / -0.52
15400	6.48	+0.47 / -0.52
15500	6.52	+0.47 / -0.52
15600	6.54	+0.47 / -0.52
15700	6.59	+0.47 / -0.52
15800	6.60	+0.47 / -0.52
15900	6.64	+0.47 / -0.52
16000	6.62	+0.47 / -0.52
16100	6.67	+0.47 / -0.52
16200	6.71	+0.47 / -0.52
16300	6.75	+0.47 / -0.52
16400	6.79	+0.47 / -0.52
16500	6.81	+0.47 / -0.52
16600	6.85	+0.47 / -0.52
16700	6.85	+0.47 / -0.52
16800	6.89	+0.47 / -0.52
16900	6.89	+0.47 / -0.52
17000	6.93	+0.47 / -0.52
17100	6.93	+0.47 / -0.52
17200	6.99	+0.47 / -0.52
17300	7.00	+0.47 / -0.52
17400	7.01	+0.47 / -0.52
17500	7.01	+0.47 / -0.52
17600	7.02	+0.47 / -0.52
17700	7.05	+0.47 / -0.52
17800	7.06	+0.47 / -0.52
17900	7.08	+0.47 / -0.52
18000	7.09	+0.47 / -0.52

HL 4277: Test Cable

Mini-Circuits, model: APC-10FT-NMNM+, s/n 0748A

Set / Applied, MHz	Measured, dB	Uncertainty, dB
0.1	0.26	+0.07 / -0.07
50	0.27	+0.07 / -0.07
100	0.38	+0.07 / -0.07
200	0.55	+0.07 / -0.07
300	0.69	+0.08 / -0.09
400	0.80	+0.08 / -0.09
500	0.91	+0.08 / -0.09
600	1.00	+0.08 / -0.09
700	1.08	+0.08 / -0.09
800	1.17	+0.08 / -0.09
900	1.24	+0.08 / -0.09
1000	1.32	+0.08 / -0.09
1100	1.39	+0.12 / -0.13
1200	1.45	+0.12 / -0.13
1300	1.52	+0.12 / -0.13
1400	1.58	+0.12 / -0.13
1500	1.65	+0.12 / -0.13
1600	1.71	+0.12 / -0.13
1700	1.77	+0.12 / -0.13
1800	1.82	+0.12 / -0.13
1900	1.88	+0.12 / -0.13
2000	1.93	+0.12 / -0.13
2100	1.99	+0.12 / -0.13
2200	2.05	+0.12 / -0.13
2300	2.10	+0.12 / -0.13
2400	2.15	+0.12 / -0.13
2500	2.20	+0.17 / -0.18
2600	2.25	+0.17 / -0.18
2700	2.30	+0.17 / -0.18
2800	2.35	+0.17 / -0.18
2900	2.40	+0.17 / -0.18
3000	2.44	+0.17 / -0.18
3100	2.49	+0.19 / -0.2
3200	2.54	+0.19 / -0.2
3300	2.58	+0.19 / -0.2
3400	2.62	+0.19 / -0.2
3500	2.66	+0.19 / -0.2
3600	2.71	+0.19 / -0.2
3700	2.75	+0.19 / -0.2
3800	2.79	+0.19 / -0.2
3900	2.84	+0.19 / -0.2
4000	2.88	+0.19 / -0.2

Set / Applied, MHz	Measured, dB	Uncertainty, dB
4100	2.84	+0.19 / -0.2
4200	2.88	+0.19 / -0.2
4300	2.92	+0.3 / -0.33
4400	2.96	+0.3 / -0.33
4500	3.01	+0.3 / -0.33
4600	3.05	+0.3 / -0.33
4700	3.09	+0.3 / -0.33
4800	3.13	+0.3 / -0.33
4900	3.18	+0.3 / -0.33
5000	3.21	+0.3 / -0.33
5100	3.25	+0.3 / -0.33
5200	3.30	+0.3 / -0.33
5300	3.34	+0.3 / -0.33
5400	3.39	+0.3 / -0.33
5500	3.44	+0.3 / -0.33
5600	3.48	+0.3 / -0.33
5700	3.53	+0.3 / -0.33
5800	3.57	+0.3 / -0.33
5900	3.60	+0.3 / -0.33
6000	3.65	+0.3 / -0.33
6100	3.68	+0.3 / -0.33
6200	3.72	+0.3 / -0.33
6300	3.77	+0.3 / -0.33
6400	3.83	+0.3 / -0.33
6500	3.86	+0.3 / -0.33
6600	3.92	+0.3 / -0.33
6700	3.96	+0.3 / -0.33
6800	4.00	+0.3 / -0.33
6900	4.04	+0.3 / -0.33
7000	4.08	+0.3 / -0.33
7100	4.11	+0.3 / -0.33
7200	4.16	+0.3 / -0.33
7300	4.20	+0.3 / -0.33
7400	4.24	+0.3 / -0.33
7500	4.29	+0.3 / -0.33
7600	4.33	+0.3 / -0.33
7700	4.38	+0.3 / -0.33
7800	4.42	+0.3 / -0.33
7900	4.51	+0.3 / -0.33
8000	4.52	+0.3 / -0.33
8100	4.55	+0.34 / -0.36
8200	4.55	+0.34 / -0.36

HL 4277: Test Cable

Set / Applied, MHz	Measured, dB	Uncertainty, dB
8300	4.57	+0.34 / -0.36
8400	4.60	+0.34 / -0.36
8500	4.60	+0.34 / -0.36
8600	4.63	+0.34 / -0.36
8700	4.63	+0.34 / -0.36
8800	4.64	+0.34 / -0.36
8900	4.65	+0.34 / -0.36
9000	4.67	+0.34 / -0.36
9100	4.69	+0.34 / -0.36
9200	4.71	+0.34 / -0.36
9300	4.73	+0.34 / -0.36
9400	4.76	+0.34 / -0.36
9500	4.78	+0.34 / -0.36
9600	4.81	+0.34 / -0.36
9700	4.85	+0.34 / -0.36
9800	4.87	+0.34 / -0.36
9900	4.89	+0.34 / -0.36
10000	4.93	+0.34 / -0.36
10100	4.96	+0.4 / -0.44
10200	4.99	+0.4 / -0.44
10300	5.02	+0.4 / -0.44
10400	5.05	+0.4 / -0.44
10500	5.08	+0.4 / -0.44
10600	5.11	+0.4 / -0.44
10700	5.14	+0.4 / -0.44
10800	5.17	+0.4 / -0.44
10900	5.19	+0.4 / -0.44
11000	5.22	+0.4 / -0.44
11100	5.25	+0.4 / -0.44
11200	5.28	+0.4 / -0.44
11300	5.31	+0.4 / -0.44
11400	5.34	+0.4 / -0.44
11500	5.38	+0.4 / -0.44
11600	5.41	+0.4 / -0.44
11700	5.45	+0.4 / -0.44
11800	5.49	+0.4 / -0.44
11900	5.53	+0.4 / -0.44
12000	5.56	+0.4 / -0.44
12100	5.60	+0.4 / -0.44
12200	5.63	+0.4 / -0.44
12300	5.68	+0.4 / -0.44
12400	5.72	+0.4 / -0.44
12500	5.75	+0.47 / -0.52
12600	5.80	+0.47 / -0.52
12700	5.84	+0.47 / -0.52
12800	5.93	+0.47 / -0.52
12900	5.94	+0.47 / -0.52
13000	5.98	+0.47 / -0.52
13100	6.03	+0.47 / -0.52

Set / Applied, MHz	Measured, dB	Uncertainty, dB
13200	6.09	+0.47 / -0.52
13300	6.17	+0.47 / -0.52
13400	6.27	+0.47 / -0.52
13500	6.37	+0.47 / -0.52
13600	6.49	+0.47 / -0.52
13700	6.57	+0.47 / -0.52
13800	6.60	+0.47 / -0.52
13900	6.61	+0.47 / -0.52
14000	6.59	+0.47 / -0.52
14100	6.57	+0.47 / -0.52
14200	6.54	+0.47 / -0.52
14300	6.53	+0.47 / -0.52
14400	6.49	+0.47 / -0.52
14500	6.48	+0.47 / -0.52
14600	6.46	+0.47 / -0.52
14700	6.46	+0.47 / -0.52
14800	6.49	+0.47 / -0.52
14900	6.51	+0.47 / -0.52
15000	6.54	+0.47 / -0.52
15100	6.57	+0.47 / -0.52
15200	6.62	+0.47 / -0.52
15300	6.64	+0.47 / -0.52
15400	6.68	+0.47 / -0.52
15500	6.71	+0.47 / -0.52
15600	6.78	+0.47 / -0.52
15700	6.79	+0.47 / -0.52
15800	6.82	+0.47 / -0.52
15900	6.88	+0.47 / -0.52
16000	6.89	+0.47 / -0.52
16100	6.96	+0.47 / -0.52
16200	6.97	+0.47 / -0.52
16300	7.02	+0.47 / -0.52
16400	7.07	+0.47 / -0.52
16500	7.12	+0.47 / -0.52
16600	7.17	+0.47 / -0.52
16700	7.20	+0.47 / -0.52
16800	7.22	+0.47 / -0.52
16900	7.23	+0.47 / -0.52
17000	7.24	+0.47 / -0.52
17100	7.27	+0.47 / -0.52
17200	7.28	+0.47 / -0.52
17300	7.28	+0.47 / -0.52
17400	7.30	+0.47 / -0.52
17500	7.34	+0.47 / -0.52
17600	7.35	+0.47 / -0.52
17700	7.39	+0.47 / -0.52
17800	7.41	+0.47 / -0.52
17900	7.41	+0.47 / -0.52
18000	7.44	+0.47 / -0.52

HL 4353: Low Loss Armored Test Cable  
MegaPhase, model: NC29-N1N1-244, s/n: 12025101 003

Set / Applied, MHz	Measured, dB	Uncertainty, dB
50	0.23	+0.06 / -0.06
100	0.31	+0.06 / -0.06
300	0.52	+0.07 / -0.07
500	0.66	+0.07 / -0.07
1000	0.93	+0.07 / -0.07
1500	1.14	+0.07 / -0.07
2000	1.32	+0.07 / -0.07
2500	1.48	+0.09 / -0.1
3000	1.62	+0.09 / -0.1
3500	1.76	+0.12 / -0.12
4000	1.89	+0.16 / -0.17
4500	2.02	+0.21 / -0.22
5000	2.12	+0.21 / -0.22
5500	2.25	+0.21 / -0.22
6000	2.38	+0.21 / -0.22
6500	2.47	+0.21 / -0.22
7000	2.57	+0.21 / -0.22
7500	2.67	+0.21 / -0.22
8000	2.76	+0.24 / -0.26
8500	2.83	+0.27 / -0.29

Set / Applied, MHz	Measured, dB	Uncertainty, dB
9000	2.94	+0.27 / -0.29
9500	3.04	+0.27 / -0.29
10000	3.13	+0.27 / -0.29
10500	3.21	+0.27 / -0.29
11000	3.29	+0.27 / -0.29
11500	3.37	+0.27 / -0.29
12000	3.42	+0.27 / -0.29
12500	3.50	+0.36 / -0.4
13000	3.60	+0.36 / -0.4
13500	3.72	+0.36 / -0.4
14000	3.75	+0.36 / -0.4
14500	3.81	+0.36 / -0.4
15000	3.91	+0.36 / -0.4
15500	3.92	+0.36 / -0.4
16000	4.01	+0.36 / -0.4
16500	4.13	+0.36 / -0.4
17000	4.16	+0.36 / -0.4
17500	4.26	+0.36 / -0.4
18000	4.33	+0.36 / -0.4

RF cable, 40 GHz, 5.5 m, K-type  
Huber-Suhner, SF102EA/11SK/11SK/5500MM, s/n 502493/2EA,

HL 5111: Insertion loss

Set / Applied, MHz	Measured, dB	Uncertainty, dB
100	0.70	±0.07
200	0.99	±0.08
300	1.21	±0.08
500	1.56	±0.08
1000	2.20	±0.08
1500	2.69	±0.08
2000	3.11	±0.08
2500	3.50	±0.10
3000	3.85	±0.10
3500	4.16	±0.10
4000	4.47	±0.10
4500	4.74	±0.10
5000	5.03	±0.10
5500	5.30	±0.10
6000	5.57	±0.10
6500	5.76	±0.10
7000	6.00	±0.10
7500	6.20	±0.10
8000	6.44	±0.10
8500	6.67	±0.10
9000	6.82	±0.10
9500	7.04	±0.10
10000	7.18	±0.10
10500	7.36	±0.10
11000	7.55	±0.10
11500	7.75	±0.10
12000	7.90	±0.10
12500	8.08	±0.13
13000	8.19	±0.13
13500	8.39	±0.13
14000	8.58	±0.13
14500	8.76	±0.18
15000	8.92	±0.18
15500	9.03	±0.18
16000	9.18	±0.18
16500	9.34	±0.18
17000	9.51	±0.18
17500	9.66	±0.18
18000	9.80	±0.18
18500	9.94	±0.23
19000	10.05	±0.23
19500	10.22	±0.23

Set / Applied, MHz	Measured, dB	Uncertainty, dB
20000	10.32	±0.23
20500	10.48	±0.23
21000	10.60	±0.23
21500	10.73	±0.23
22000	10.87	±0.23
22500	10.97	±0.29
23000	11.09	±0.29
23500	11.26	±0.29
24000	11.37	±0.29
24500	11.50	±0.29
25000	11.61	±0.23
25500	11.72	±0.23
26000	11.87	±0.23
26500	11.99	±0.23
27000	12.09	±0.33
27500	12.24	±0.33
28000	12.34	±0.40
28500	12.47	±0.40
29000	12.61	±0.40
29500	12.70	±0.40
30000	12.86	±0.40
30500	12.92	±0.33
31000	13.09	±0.33
31500	13.16	±0.33
32000	13.33	±0.33
32500	13.40	±0.33
33000	13.62	±0.33
33500	13.70	±0.33
34000	13.88	±0.33
34500	13.97	±0.40
35000	14.05	±0.40
35500	14.23	±0.40
36000	14.25	±0.40
36500	14.46	±0.40
37000	14.49	±0.33
37500	14.72	±0.33
38000	14.77	±0.33
38500	14.97	±0.33
39000	15.04	±0.33
39500	15.22	±0.33
40000	15.63	±0.47



## 11 APPENDIX C Measurement uncertainties

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

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

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

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

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

## 12 APPENDIX D Specification references

FCC 47CFR part 15: 2017	Radio Frequency Devices.
ANSI C63.2: 2016	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.
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

## 13 APPENDIX E Supplier declaration



### Declaration about periodic operation

We: Essence Smartcare Ltd  
Name: Tal Cohen  
Address: 12 Abba Eban Avenue, Ackerstein Towers Bldg. D, P.O. Box 2073  
City: Herzliya 4612001  
Country: Israel

The ES7502HC is compliant with periodic operation requirements, listed below:

1. The ES7502HC device does not allow continuous transmitting.
2. The ES7502HC is not manually operated. Its transmission pattern include up to six re-tries (in case of no response). The patterns of these re-tries are built as follows:
  - a. Pulse duration: 13.74ms
  - b. Maximum number of transmissions within 1 hour: 2
  - c. Total duration within 1 hour: 27.48ms
3. These transmissions occur upon intrusion only – none periodical in concept. Therefore, no manual activation/deactivation mechanism is necessary.
4. Since there is no periodical behavior except supervision transmissions and information signals, there are no predetermined intervals of any kind included in its algorithms.

Name: Tal Cohen  
Function: Certification Manager

Signature:



## 14 APPENDIX F Abbreviations and acronyms

A	ampere	m	meter
AC	alternating current	MHz	megahertz
A/m	ampere per meter	min	minute
AM	amplitude modulation	mm	millimeter
AVRG	average (detector)	ms	millisecond
cm	centimeter	μs	microsecond
dB	decibel	NA	not applicable
dBm	decibel referred to one milliwatt	NB	narrow band
dB(μV)	decibel referred to one microvolt	OATS	open area test site
dB(μV/m)	decibel referred to one microvolt per meter	Ω	Ohm
dB(μA)	decibel referred to one microampere	PM	pulse modulation
DC	direct current	PS	power supply
EIRP	equivalent isotropically radiated power	ppm	part per million (10 <sup>-6</sup> )
ERP	effective radiated power	QP	quasi-peak
EUT	equipment under test	RE	radiated emission
F	frequency	RF	radio frequency
GHz	gigahertz	rms	root mean square
GND	ground	Rx	receive
HL	Hermon laboratories	s	second
Hz	hertz	T	temperature
k	kilo	Tx	transmit
kHz	kilohertz	V	volt
LO	local oscillator	WB	wideband

END OF DOCUMENT