HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO: FCC CFR 47 Part 15 subpart F, section 15.517 and subpart B;

FOR:

EchoCare Technologies Ltd.

Remote Home Care Monitoring System

Model: ECT-1310PC

FCC ID: 2BAUTECT1310PC

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1 Applicant information

Client name:	EchoCare Technologies Ltd.
Address:	5 Golda Meir St. Ness-Ziona 7403649, Israel
Telephone:	+972 54 543 4503
E-mail:	rafiz@echocare-tech.com
Contact name:	Mr. Rafi Zack

2 Equipment under test attributes

Product name:	Remote Home Care monitoring system
Product type:	Transceiver
Model(s):	ECT-1310PC
Trade Mark:	ECHOCARE TECHNOLOGIES
Serial number:	N.A.
Hardware version:	Rev 5
Software release:	N.A.
Receipt date	11-Dec-22

3 Manufacturer information

Manufacturer name:	EchoCare Technologies Ltd.
Address:	5 Golda Meir St. Ness-Ziona 7403649, Israel
Telephone:	+972 54 543 4503
E-Mail:	rafiz@echocare-tech.com
Contact name:	Mr. Rafi Zack

4 Test details

Project ID:	49449
Location:	Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started:	17-Jan-23
Test completed:	20-Mar-23
Test specification(s):	FCC CFR 47 Part 15 subpart F, section 15.517 and subpart B,

5 Tests summary

Test	Status
Transmitter characteristics	
FCC section 15.519(b), Occupied bandwidth	Pass
FCC section 15.517(c)/15.517(e) Peak power within 50 MHz bandwidth and Radiated power density	Pass
FCC section 15.517(c), (d)/15.209 Radiated spurious emission measurements	Pass
FCC section 15.207(a), RSS-Gen, Section 7.2, Conducted emission	Pass
Unintentional emissions	
FCC section 15.107 Conducted emission at AC power port	Pass
FCC section 15.109 Radiated emission measurements	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:	Mrs. E. Pitt, test engineer, EMC & Radio	14-Jan-23 – 20-Mar-23	
Reviewed by:	Mrs. S. Peysahov Sheynin, test engineer, EMC & Radio	20-Apr-23	
Approved by:	Mr. M. Nikishin, group leader, EMC & Radio	01-Jun-23	

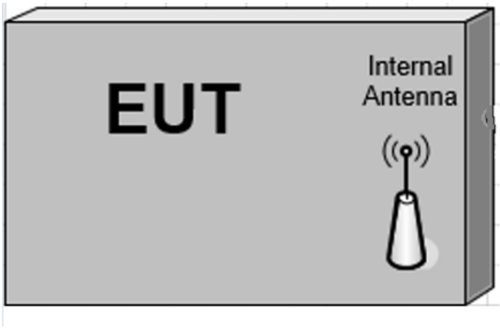
6 EUT description

Note: The following data in this clause is provided by the customer and represents his sole responsibility

6.1 General information

The EUT, ECT-1310PC, is a Remote Home Care Monitoring System that detects abnormal situations such falls, long stay in restroom, long term sedentary as well as tracking the person's daily activities (ADL -Activity of daily living) to identify a significant deviation from the person daily activity that might indicate on a potential health deterioration.

6.2 Test configuration



6.3 Changes made in EUT

No changes were performed in the EUT during testing.

6.4 Transmitter characteristics

Type of equipment		
	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)	
V	Plug-in card (Equipment intended for a variety of host systems)	

Assigned frequency range	3100 – 10600 MHz
Operating frequencies for FCC	8000 - 9500 MHz

Is transmitter output power variable?					
	V	No			
		Yes		continuous variable	
				stepped variable with stepsize	dB
			minimum RF power		dBm
			maximum RF power		dBm

Antenna connection					
unique coupling	standard connector	**V**	Integral		with temporary RF connector
				V	without temporary RF connector

Antenna/s technical characteristics

Type	Manufacturer	Model number	Gain
Embedded PCB based Dipol	EchoCare Technologies Ltd.	NA	4 dBi

Transmitter aggregate data rate/s	No payload
Type of modulation	OOK
Modulating test signal (baseband)	

Transmitter power source

	Battery	**Nominal rated voltage**			
	DC	**Nominal rated voltage**			
V	AC mains	**Nominal rated voltage**	90 – 240 VAC	Frequency	50 / 60 Hz

Test specification:	**Section 15.519(b), 15.503(d), Occupied bandwidth**		
Test procedure:	ANSI C63.10-2013, section 10.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	17-Jan-23 - 22-Jan-23		
Temperature: 21 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 50 Hz
Remarks:			

7 Transmitter tests according to 47CFR part 15 requirements

7.1 Occupied bandwidth test

7.1.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.1.1.

Table 7.1.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Minimum allowed bandwidth, MHz
3100 - 10600	10	500

* - Modulation envelope reference points are provided in terms of attenuation below the unmodulated carrier.

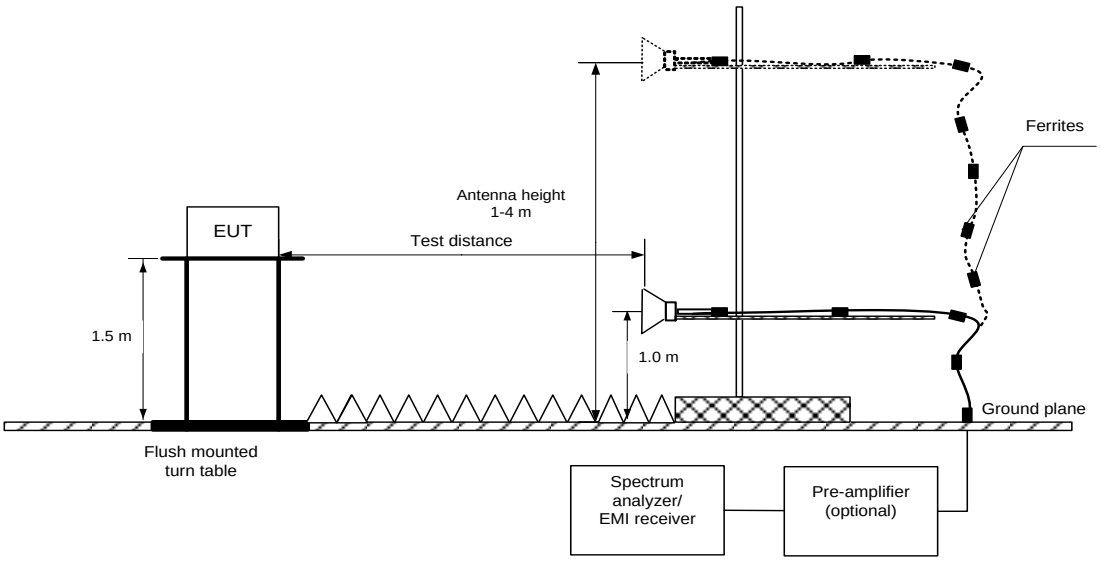
7.1.2 Test procedure

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

7.1.2.2 The EUT was set to transmit the normally modulated carrier and the peak power envelope was captured with PEAK HOLD function.

7.1.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in Table 7.1.2 and the associated plots.

Figure 7.1.1 Occupied bandwidth test setup



Test specification:	**Section 15.519(b), 15.503(d), Occupied bandwidth**		
Test procedure:	ANSI C63.10-2013, section 10.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	17-Jan-23 - 22-Jan-23		
Temperature: 21 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 50 Hz
Remarks:			

Table 7.1.2 Occupied bandwidth test results

DETECTOR USED: Peak hold
RESOLUTION BANDWIDTH: 1 MHz
VIDEO BANDWIDTH: 1 MHz
MODULATION ENVELOPE REFERENCE POINTS: 10 dBc

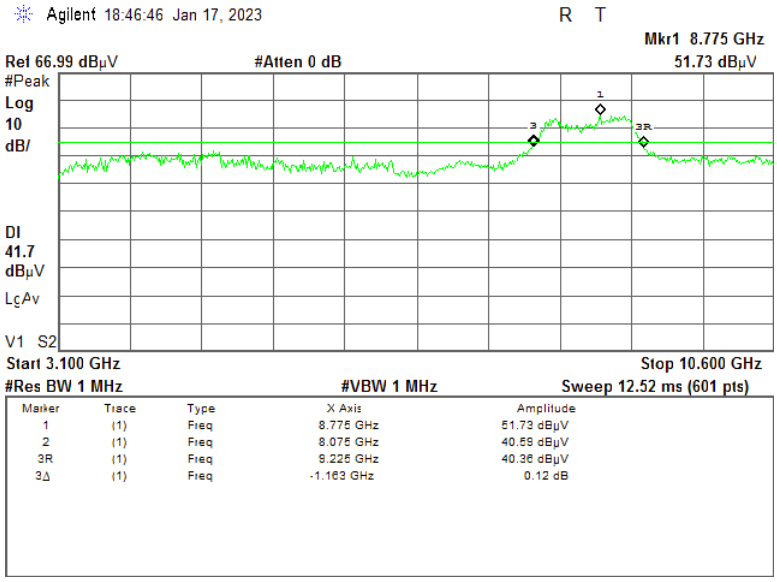
Carrier frequency f_m, MHz	-10 dB envelope points, MHz		Occupied bandwidth, MHz	Limit, MHz	Margin, MHz	Verdict
	f_l	f_h				
8775	8075	9225	1163	500.0	663	Pass

Reference numbers of test equipment used

HL 3903	HL 4933	HL 3818	HL 5902				

Full description is given in Appendix A.

Plot 7.1.1 Occupied bandwidth test result



Test specification:	Sections 15.517(e),15.517(c), Peak power within 50 MHz bandwidth and Radiated power density		
Test procedure:	47 CFR, Section 15.521, ANSI C63.10, section 10.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	17-Jan-23 - 22-Jan-23		
Temperature: 21 ºC	Relative Humidity: 48 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

7.2 Peak power within 50 MHz bandwidth and Radiated power density

7.2.1 General

This test was performed to measure effective radiated power emanated by transmitter at carrier frequency. Specification test limits are given in Table 7.2.1, Table 7.2.2.

Table 7.2.1 Peak level of emissions contained within 50 MHz (EIRP)

Assigned frequency band, MHz	EIRP, dBm	Equivalent field strength limit @ 3m, dB(μV/m) in 50 MHz*
3100 - 10600	0	95.2

* - Equivalent field strength @ 3m, dB(μV/m) = EIRP, dBm + 95.2 dB

Table 7.2.2 Average level of emissions (EIRP) in 1 MHz BW

Assigned frequency band, MHz	EIRP	Equivalent field strength limit @ 3m, dB(μV/m)/1MHz*
	dBm/1MHz	
3100 - 10600	-41.3	53.9

* - Equivalent field strength @ 3m, dB(μV/m) = EIRP, dBm + 95.2 dB

7.2.2 Test procedure for field strength measurements

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 field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was swept throughout the range, specified in Table 7.2.3, in both vertical and horizontal polarizations.

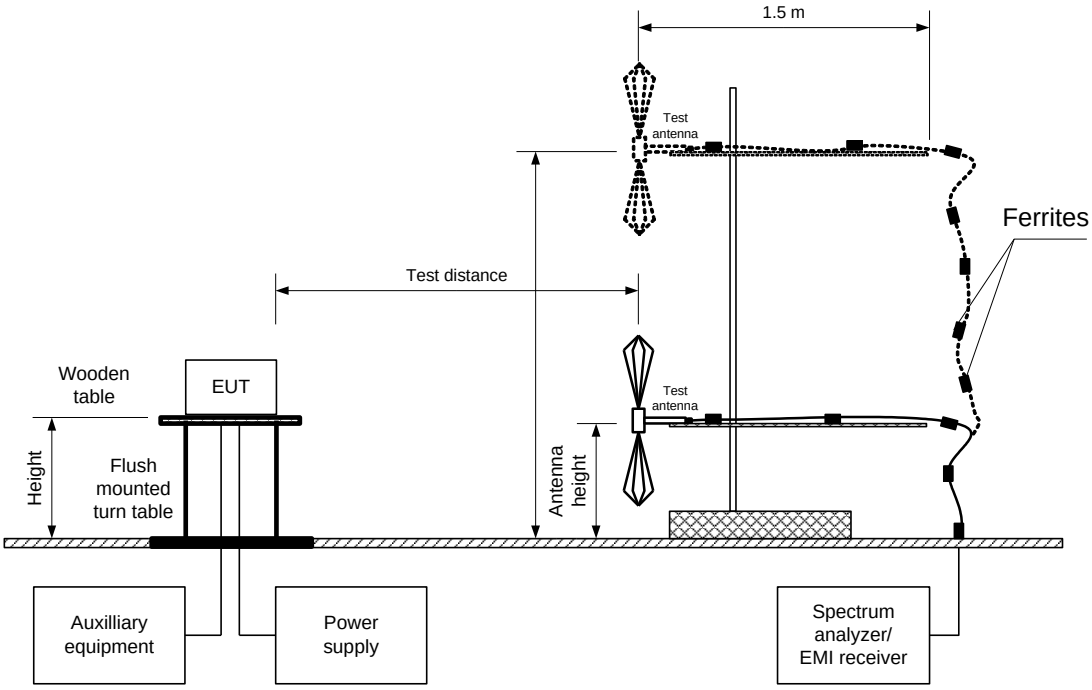
7.2.2.3 The worst test results (the lowest margins) were recorded in Table 7.2.3 and shown in the associated plot.

7.2.2.4 The peak measurements were performed with the widest available RBW of the measuring instrument and extrapolated to 50 MHz BW.

7.2.2.5 The average measurements were performed with an RMS detector with 1 msec averaging time as shown in Table 7.2.4 and the associated plot.

Test specification:	**Sections 15.517(e),15.517(c),** **Peak power within 50 MHz bandwidth and Radiated power density**		
Test procedure:	47 CFR, Section 15.521, ANSI C63.10, section 10.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	17-Jan-23 - 22-Jan-23		
Temperature: 21 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 50 Hz
Remarks:			

Figure 7.2.1 Setup for carrier field strength measurements



Test specification:	**Sections 15.517(e),15.517(c),** **Peak power within 50 MHz bandwidth and Radiated power density**		
Test procedure:	47 CFR, Section 15.521, ANSI C63.10, section 10.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	17-Jan-23 - 22-Jan-23		
Temperature: 21 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 50 Hz
Remarks:			

Table 7.2.3 Peak power level contained within 50 MHz test results

ASSIGNED FREQUENCY RANGE: 3100 - 10600 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
INVESTIGATED FREQUENCY RANGE: 8000 – 9500 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)
MODULATION: OOK

Frequency, MHz	SA reading (RBW 8 MHz), dB(μV/m)	Conversion factor from 8 MHz to 50 MHz, dB*	EIRP, dBm**	Limit, dBm	Margin, dB***	Verdict
8287	67.45	-15.91	-11.84	0	-11.84	Pass

*- Conversion factor=20 log (8/50) = -15.91 dB
**- EIRP, dBm= Equivalent field strength (8 MHz RBW), dB(μV/m) -95.2 dB - Conversion factor (8 to 50 MHz)
***- Margin, dB = EIRP, dBm – Limit, dBm

Table 7.2.4 RMS-average emissions test results

ASSIGNED FREQUENCY RANGE: 3100 - 10600 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
INVESTIGATED FREQUENCY RANGE: 8000 – 9500 MHz
DETECTOR USED: RMS (1 ms averaging time over bin)
VIDEO BANDWIDTH: > Resolution bandwidth
TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)
MODULATION: OOK

Frequency, MHz	RMS Field strength, dB(μV/m)	RBW, MHz	Antenna polarization	EIRP, dBm*	Limit, dBm	Margin, dB**	Verdict
9026.7	51.60	1	Vertical	-43.6	-41.3	-2.3	Pass

*-EIRP, dBm = Field strength, dB(μV/m) – 95.2 dB
**- Margin = EIRP, dBm – specification limit.

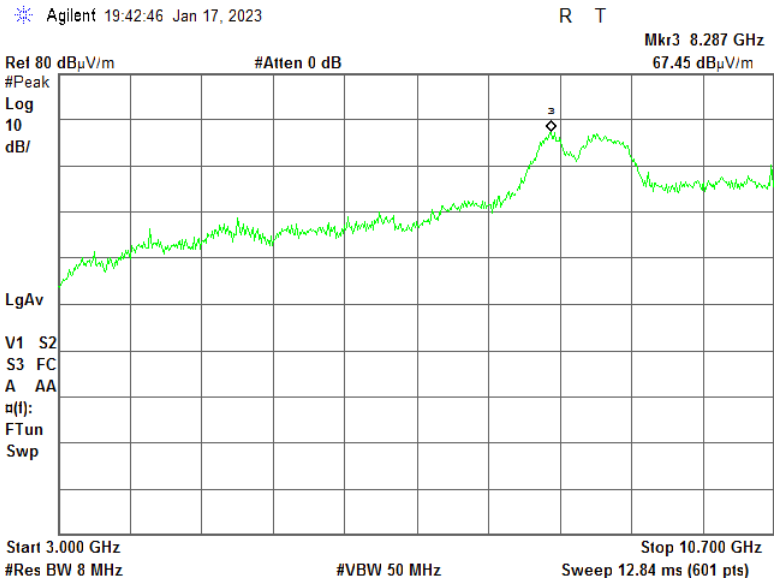
Reference numbers of test equipment used

HL 3901	HL 4933	HL 5376	HL 5902				

Full description is given in Appendix A.

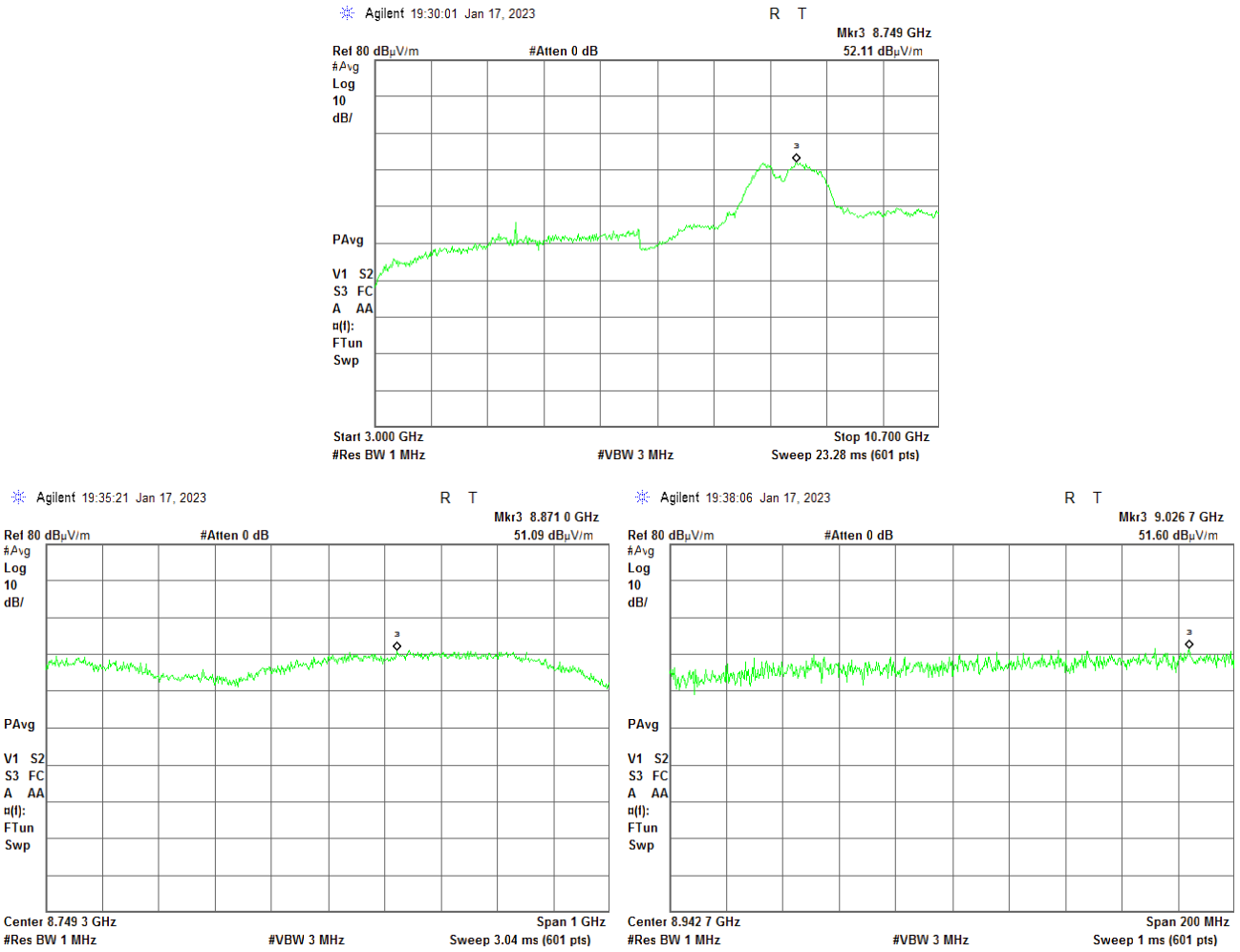
Test specification:	**Sections 15.517(e),15.517(c),** **Peak power within 50 MHz bandwidth and Radiated power density**		
Test procedure:	47 CFR, Section 15.521, ANSI C63.10, section 10.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	17-Jan-23 - 22-Jan-23		
Temperature: 21 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 50 Hz
Remarks:			

Plot 7.2.1 Peak power level with 8 MHz resolution bandwidth



Test specification:	**Sections 15.517(e),15.517(c),** **Peak power within 50 MHz bandwidth and Radiated power density**		
Test procedure:	47 CFR, Section 15.521, ANSI C63.10, section 10.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	17-Jan-23 - 22-Jan-23		
Temperature: 21 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 50 Hz
Remarks:			

Plot 7.2.4 RMS-Average emissions measurements



Test specification:	Section 15.517(c), (d), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 10.2, 10.3, Section 15.521		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Jan-23 - 12-Feb-23		
Temperature: 23 ºC	Relative Humidity: 48 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

7.3 Radiated spurious emission measurements

7.3.1 General

This test was performed to measure radiated spurious emissions from the EUT. Specification test limits are given in Table 7.3.1, Table 7.3.2. The EUT shall comply with the emission limits of Table 7.3.2 for UWB transmissions and associated spurious emissions while emissions from digital circuitry and other emissions not associated with UWB transmission shall comply with the limits of Table 7.3.1.

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Table 7.3.1 Radiated spurious emission test limits according to section 15.209

Frequency, MHz	Field strength at 3 m, dB(μV/m)		
	Within restricted bands		
	Peak	Quasi Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**
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 – 10th harmonic	74.0	NA	54.0

* - 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.

Table 7.3.2 Radiated emission average limits according to sections 15.519(c), 15.519(d)

Frequency, MHz	RBW, kHz	EIRP of spurious, dBm	Equivalent field strength limit @ 3m, dB(μV/m)***	Equivalent field strength limit @ 1m, dB(μV/m)****
960-1610	1000	-75.3	19.9	29.4
1610-1990	1000	-53.3	41.9	51.4
1990-3100	1000	-51.3	43.9	53.4
3100-10600	1000	-41.3	53.9	63.4
Above 10600	1000	-51.3	43.9	53.4
1164-1240	≥1	-85.3	9.9	19.4
1559-1610	≥1	-85.3	9.9	19.4

*** - Equivalent field strength @ 3m, dB(μV/m) = EIRP, dBm + 95.2 dB

**** - Equivalent field strength @ 1m, dB(μV/m) = EIRP, dBm + 104.7 dB

Test specification:	**Section 15.517(c), (d), Radiated spurious emissions**		
Test procedure:	ANSI C63.10, sections 10.2, 10.3, Section 15.521		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Jan-23 - 12-Feb-23		
Temperature: 23 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 50 Hz
Remarks:			

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

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

7.3.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna was rotated around its vertical axis.

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

7.3.3 Test procedure for spurious emission field strength measurements within 30-1000 MHz

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

7.3.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.

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

7.3.4 Test procedure for spurious emission field strength measurements above 1000 MHz

7.3.4.1 The EUT was set up as shown in Figure 7.3.3, energized and the performance check was conducted.

7.3.4.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations while keeping the EUT within antenna 3 dB beamwidth.

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

Test specification:	Section 15.517(c), (d), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 10.2, 10.3, Section 15.521		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Jan-23 - 12-Feb-23		
Temperature: 23 ºC	Relative Humidity: 48 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

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

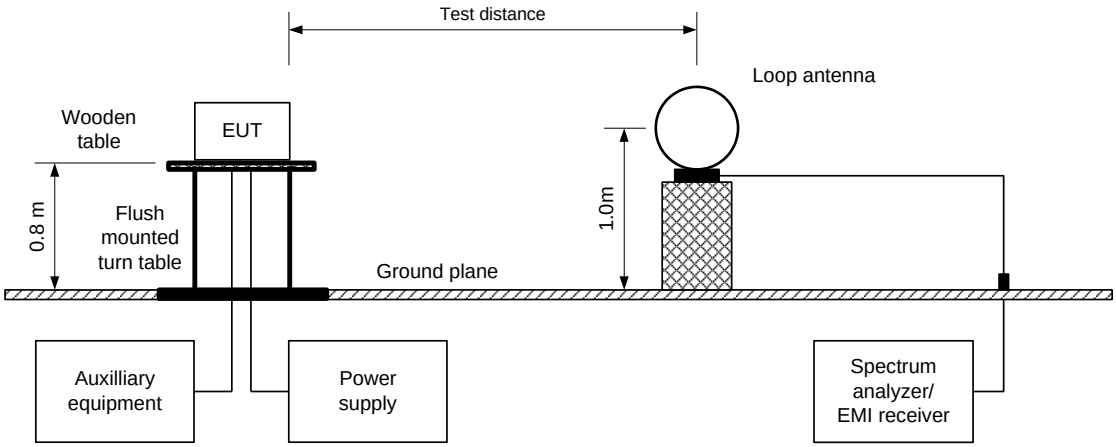
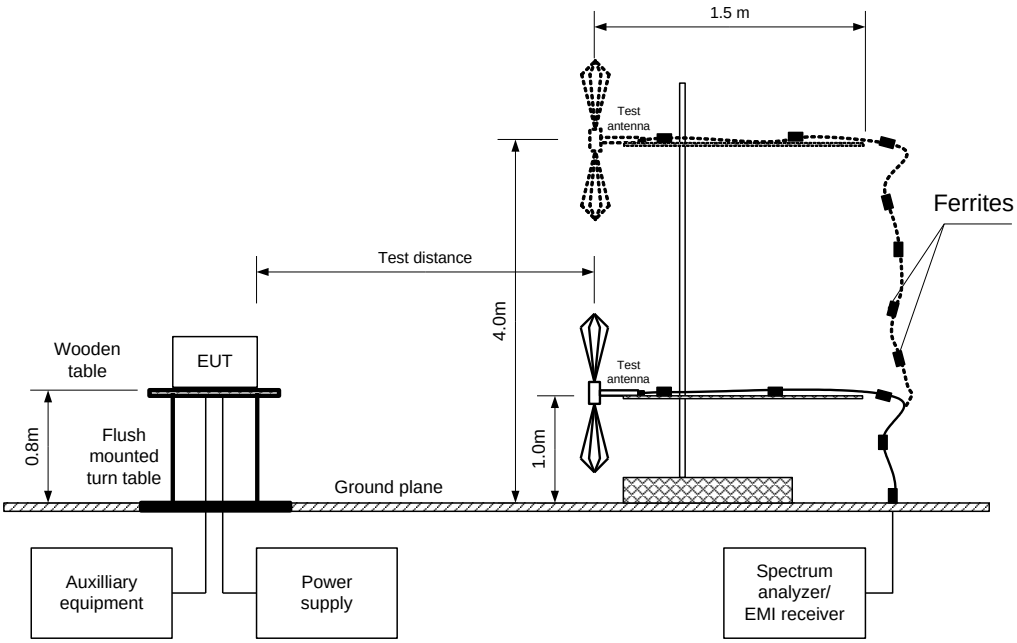
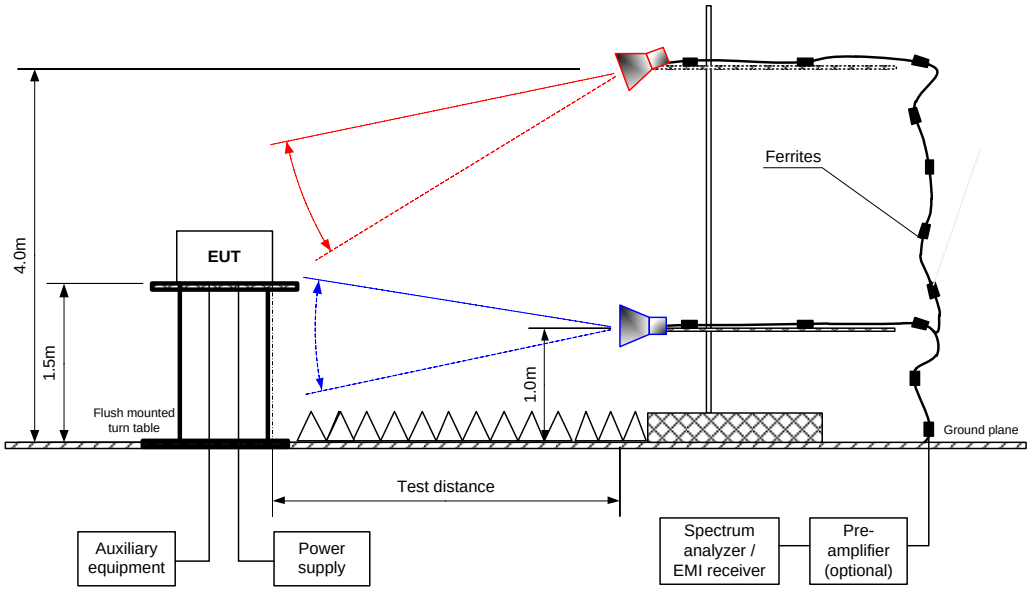


Figure 7.3.2 Setup for spurious emission field strength measurements in 30 – 1000 MHz



Test specification:	Section 15.517(c), (d), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 10.2, 10.3, Section 15.521		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Jan-23 - 12-Feb-23		
Temperature: 23 ºC	Relative Humidity: 48 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Figure 7.3.3 Setup for spurious emission field strength measurements above1000 MHz



Test specification:	**Section 15.517(c), (d), Radiated spurious emissions**		
Test procedure:	ANSI C63.10, sections 10.2, 10.3, Section 15.521		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Jan-23 - 12-Feb-23		
Temperature: 23 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 50 Hz
Remarks:			

Table 7.3.3 Field strength of spurious emissions according to the Section 15.209

ASSIGNED FREQUENCY RANGE: 3100 - 10600 MHz
TEST DISTANCE: 3 m
EUT POSITION: Typical (Horizontal)
MODULATION: OOK
INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 0.2 kHz (9 kHz – 150 kHz)
9.0 kHz (150 kHz – 30 MHz)
120 kHz (30 MHz – 1000 MHz)
VIDEO BANDWIDTH: ≥ Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
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*				
37.8	35.4	30.9	40.0	-9.1	Vertical	1.0	27	Pass
360.0	38.3	36.5	46.0	-9.5	Horizontal	3.4	59	
456.0	39.7	37.4	46.0	-8.6	Vertical	1.0	92	
600.0	41.1	39.6	46.0	-6.4	Vertical	1.0	44	
624.0	38.5	36.2	46.0	-9.8	Vertical	1.0	-21	
975.0	37.0	35.7	46.0	-10.3	Horizontal	1.0	30	

*****- Margin = Measured emission - specification limit.
******- EUT front panel refer to 0 degrees position of turntable.

TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 40 000 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*				
1056.0	40.31	74	-33.69	36.2	54	-17.8	Horizontal	1.4	42	Pass
1992.0	47.80	74	-26.20	41.3	54	-12.7	Vertical	1.5	60	
2111.0	52.84	74	-21.16	45.8	54	-8.2	Vertical	1.5	37	
2987.0	44.40	74	-29.60	40.4	54	-13.6	Vertical	1.5	45	

Test specification:	**Section 15.517(c), (d), Radiated spurious emissions**		
Test procedure:	ANSI C63.10, sections 10.2, 10.3, Section 15.521		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Jan-23 - 12-Feb-23		
Temperature: 23 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 50 Hz
Remarks:			

Table 7.3.4 Spurious emission field strength test results according to sections 15.519

ASSIGNED FREQUENCY RANGE: 3100 - 10600 MHz
TEST DISTANCE: 1 m
TEST SITE: Semi anechoic chamber
INVESTIGATED FREQUENCY RANGE: 960 - 1610 & 10600 – 40000 MHz
8500 – 40000 MHz
DETECTOR USED: RMS with 1 ms averaging time
VIDEO BANDWIDTH: > Resolution bandwidth
TEST ANTENNA TYPE: Logperiodic (960 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: OOK

Frequency, MHz	Peak field strength, dB(μV/m)	RMS field strength, dB(μV/m)	RBW, kHz	Antenna polarization	EIRP, dBm*	Limit, dBm	Margin, dB**	Verdict
All emissions are produced by digital parts of the EUT and were measured according to the Section 15.209								Pass

*- EIRP, dBm = Field strength, dB(μV/m) – 104.7 dB
**- Margin = EIRP, dBm – specification limit.

Table 7.3.5 Spurious emission field strength test results according to sections 15.519

ASSIGNED FREQUENCY RANGE: 3100 - 10600 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
INVESTIGATED FREQUENCY RANGE: 1610 – 6000 & 8500 – 10600 MHz
DETECTOR USED: RMS with 1 ms averaging time
VIDEO BANDWIDTH: > Resolution bandwidth
TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)
MODULATION: OOK

Frequency, MHz	Peak field strength, dB(μV/m	RMS field strength, dB(μV/m)	RBW, kHz	Antenna polarization	EIRP, dBm*	Limit, dBm	Margin, dB**	Verdict
All emissions are produced by digital parts of the EUT and were measured according to the Section 15.209								Pass

*-EIRP, dBm = Field strength, dB(μV/m) – 95.2 dB
**- Margin = EIRP, dBm – specification limit.

Reference numbers of test equipment used

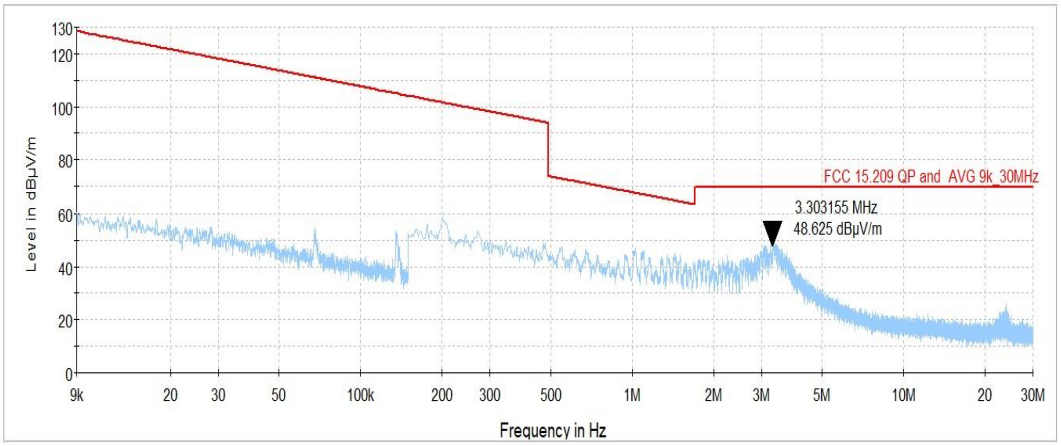
HL 0446	HL 5288	HL 4933	HL 4956	HL 3903	HL 5902	HL 5112	

Full description is given in Appendix A.

Test specification:	**Section 15.517(c), (d), Radiated spurious emissions**		
Test procedure:	ANSI C63.10, sections 10.2, 10.3, Section 15.521		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Jan-23 - 12-Feb-23		
Temperature: 23 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 50 Hz
Remarks:			

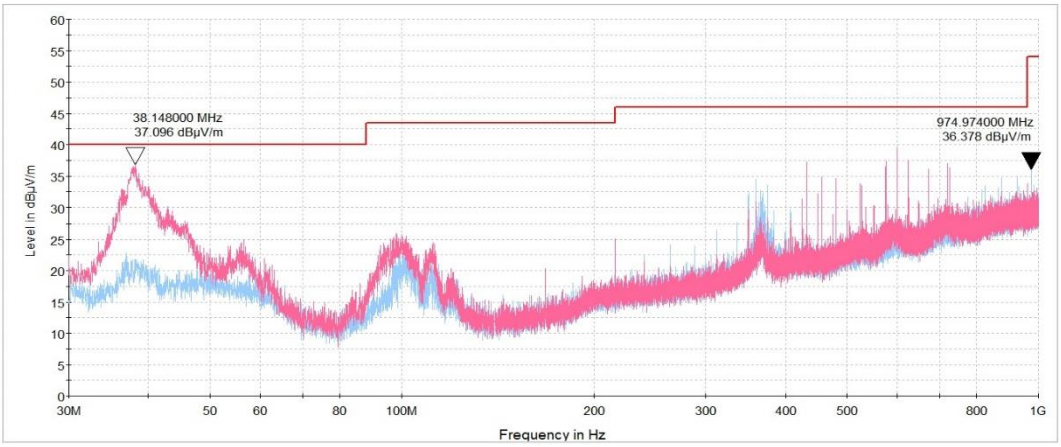
Plot 7.3.1 Radiated emission measurements from 9 kHz to 30 MHz range according to the Section 15.209

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



Plot 7.3.2 Radiated emission measurements from 30 to 1000 MHz range according to the Section 15.209

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

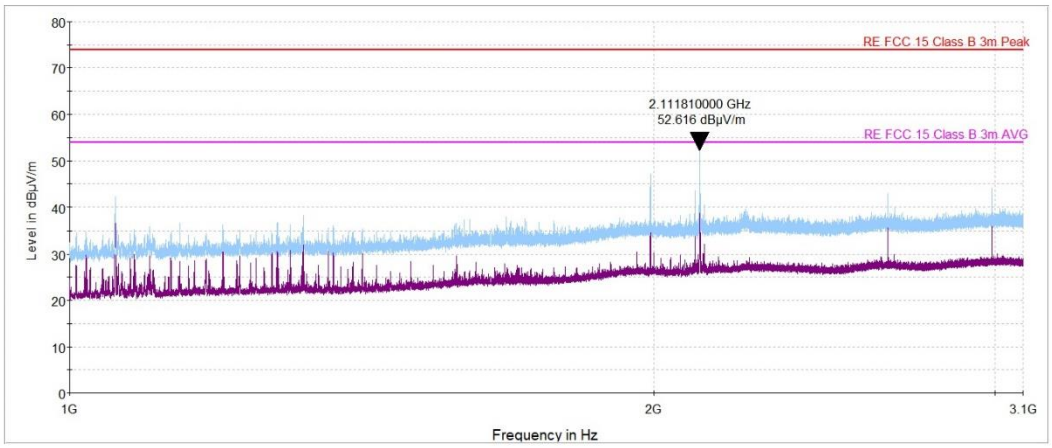


Test specification:	**Section 15.517(c), (d), Radiated spurious emissions**		
Test procedure:	ANSI C63.10, sections 10.2, 10.3, Section 15.521		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Jan-23 - 12-Feb-23		
Temperature: 23 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 50 Hz
Remarks:			

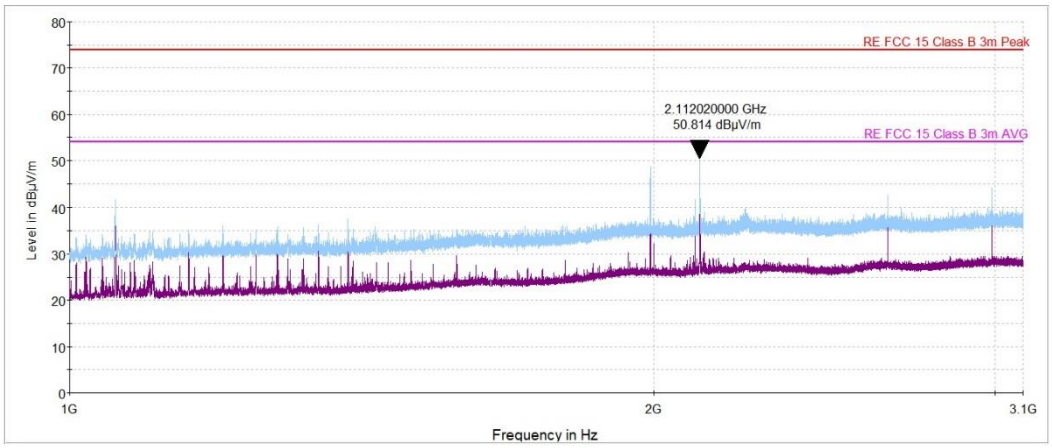
Plot 7.3.3 Radiated emission measurements from 1.0 to 3.1 MHz range according to the Section 15.209

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

TX with UWB

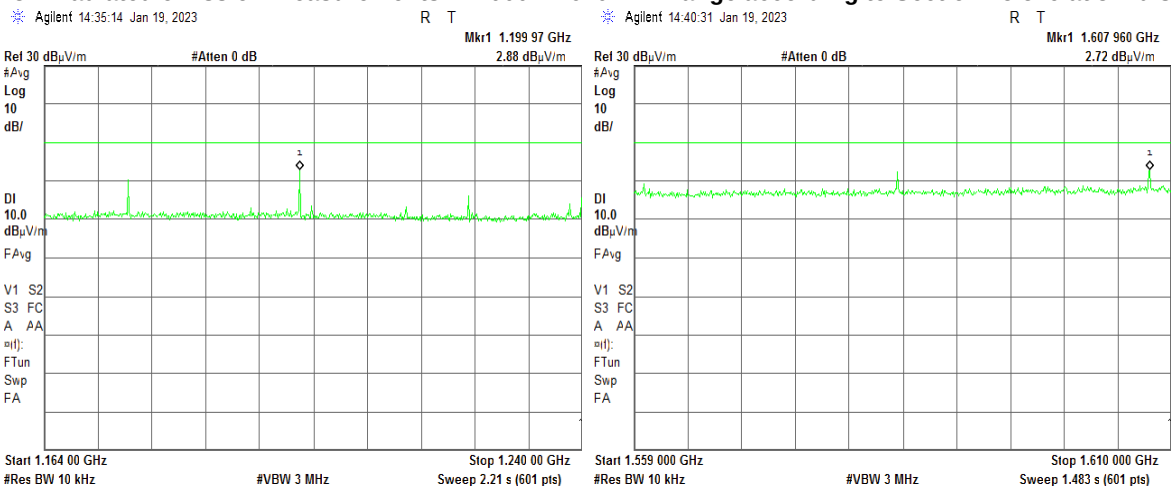


TX with UWB turned OFF



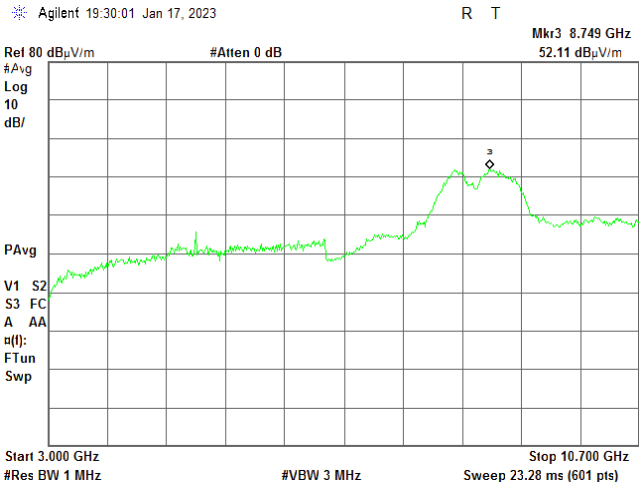
Test specification:	Section 15.517(c), (d), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 10.2, 10.3, Section 15.521		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Jan-23 - 12-Feb-23		
Temperature: 23 ºC	Relative Humidity: 48 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Plot 7.3.4 Radiated emission measurements in 1000 – 1610 MHz range according to Section 15.519 at 3m distance



Plot 7.3.5 Radiated emission measurements from 3.0 to 10.7 MHz range according to Section 15.519 at 3m distance

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

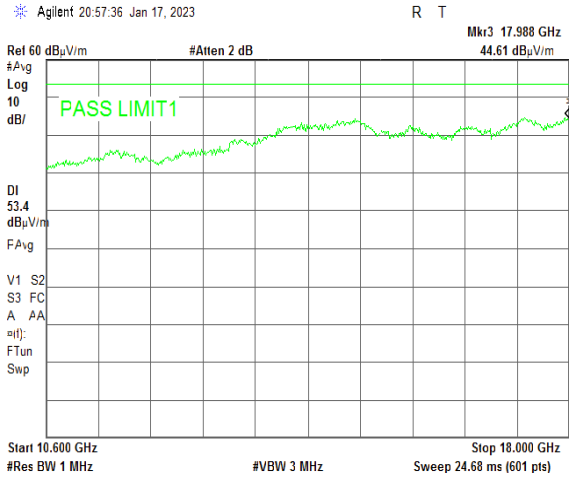


*Will be applied limit of 53.9 dB(µV/m)

Test specification:	**Section 15.517(c), (d), Radiated spurious emissions**		
Test procedure:	ANSI C63.10, sections 10.2, 10.3, Section 15.521		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Jan-23 - 12-Feb-23		
Temperature: 23 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 50 Hz
Remarks:			

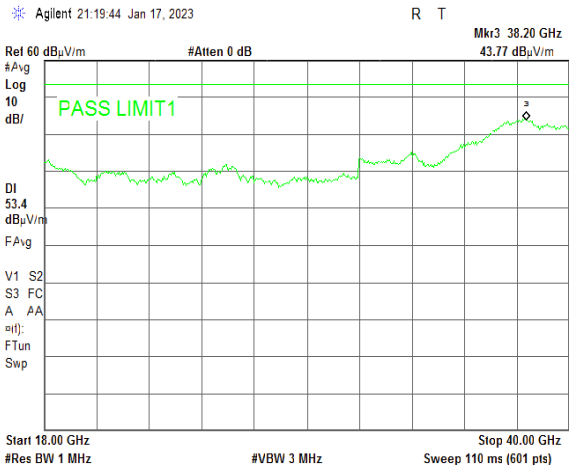
Plot 7.3.6 Radiated emission measurements from 10.6 to 18.0 GHz range according to FCC 15.517 at 1m distance

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 1 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical (Horizontal)



Plot 7.3.7 Radiated emission measurements from 18.0 to 40.0 GHz range according to FCC 15.517 at 1m distance

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 1 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical (Horizontal)



Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Feb-23		
Temperature: 20 ºC	Relative Humidity: 49 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

7.4 Conducted emissions

7.4.1 General

This test was performed to measure common mode conducted emissions at the 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)	
	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5.0	56	46
5.0 - 30	60	50

* The limit decreases linearly with the logarithm of frequency.

7.4.2 Test procedure

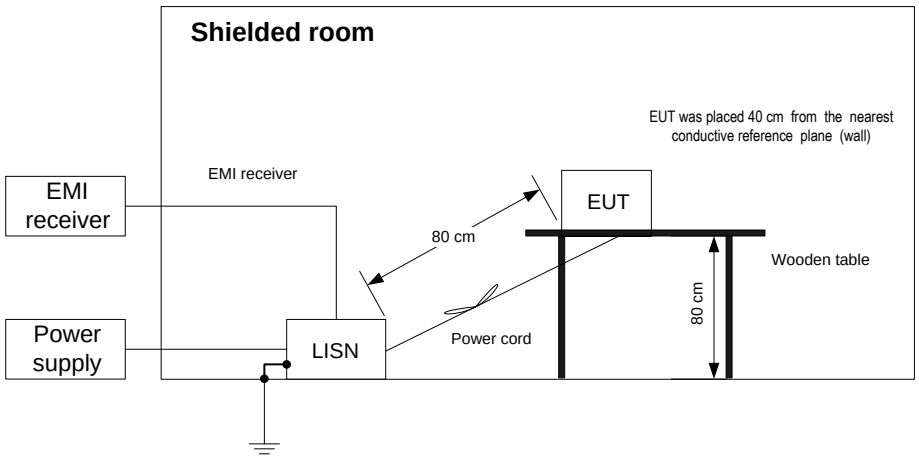
7.4.2.1 The EUT was set up as shown in Figure 7.4.1 and associated photographs, energized and the performance check was conducted.

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 throughout the testing.

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

Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Feb-23		
Temperature: 20 ºC	Relative Humidity: 49 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Figure 7.4.1 Setup for conducted emission measurements, table-top equipment



Test specification:	**Section 15.207(a), Conducted emission**		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Feb-23		
Temperature: 20 ºC	**Relative Humidity:** 49 %	**Air Pressure:** 1010 hPa	**Power:** 110 VAC, 60 Hz
Remarks:			

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	48.8	44.8	66	-21.2	27.4	56	-28.6	L1	Pass
20.1	39. 5	27.5	60	-32.5	21.6	50	-28.4		
0.15	48.8	44.8	66	-21.2	27.4	56	-28.6	L2	Pass
3.62	36.1	30.7	56	-25.3	23.4	46	-22.6		

*****- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

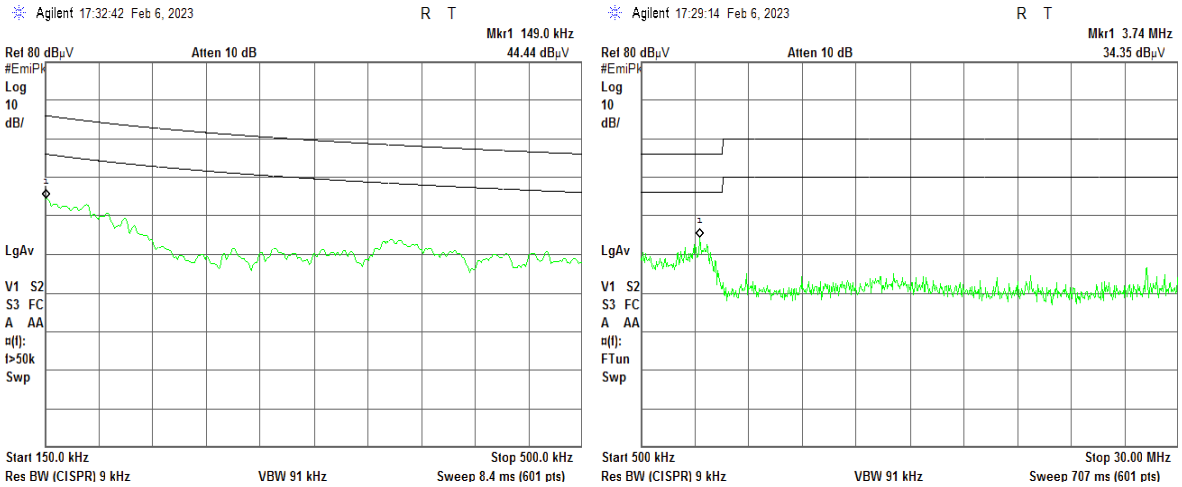
HL 3818	HL 2888	HL 5476	HL 0787				

Full description is given in Appendix A.

Test specification:	**Section 15.207(a), Conducted emission**		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Feb-23		
Temperature: 20 ºC	**Relative Humidity:** 49 %	**Air Pressure:** 1010 hPa	**Power:** 110 VAC, 60 Hz
Remarks:			

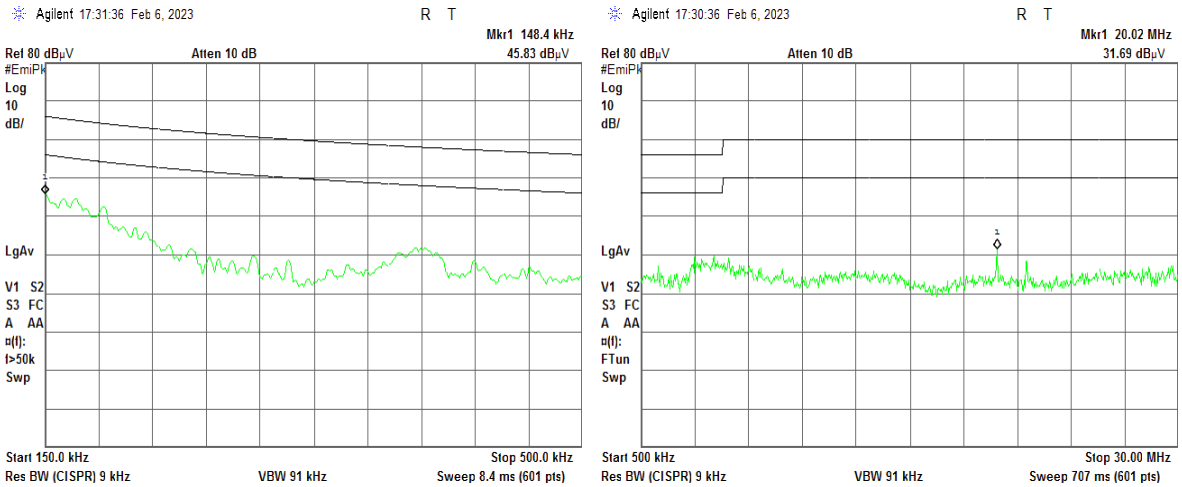
Plot 7.4.1 Conducted emission measurements

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



Plot 7.4.2 Conducted emission measurements

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



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):	06-Feb-23		
Temperature: 20 ºC	Relative Humidity: 49 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

8 Emission tests 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

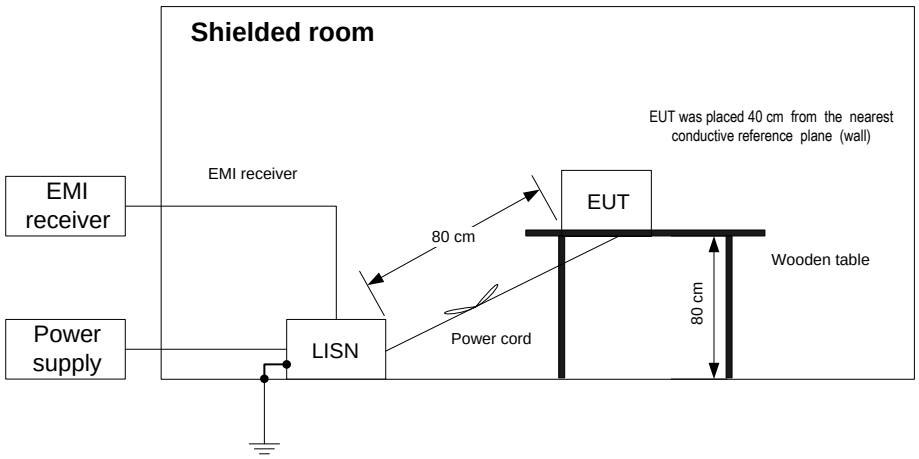
8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and associated photographs, energized and the performance check was conducted.

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 throughout the testing.

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

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):	06-Feb-23		
Temperature: 20 ºC	**Relative Humidity:** 49 %	**Air Pressure:** 1010 hPa	**Power:** 110 VAC, 60 Hz
Remarks:			

Figure 8.1.1 Setup for conducted emission measurements, table-top equipment



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):	06-Feb-23		
Temperature: 20 ºC	**Relative Humidity:** 49 %	**Air Pressure:** 1010 hPa	**Power:** 110 VAC, 60 Hz
Remarks:			

Table 8.1.2 Conducted emission test results

LINE: AC mains
LIMIT: Class B
EUT OPERATING MODE: Stand-by
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*		
0.16	46.1	43.2	65.5	-22.3	27.3	45.5	-18.2	L1	Pass
4.20	35.5	30.5	56.0	-25.5	24.3	46.0	-21.7		
0.17	42.2	38.3	65.0	-26.7	27.2	45.0	-17.8	L2	Pass
3.4	34.7	31.4	56.0	-24.6	23.8	46.0	-22.2		

*****- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

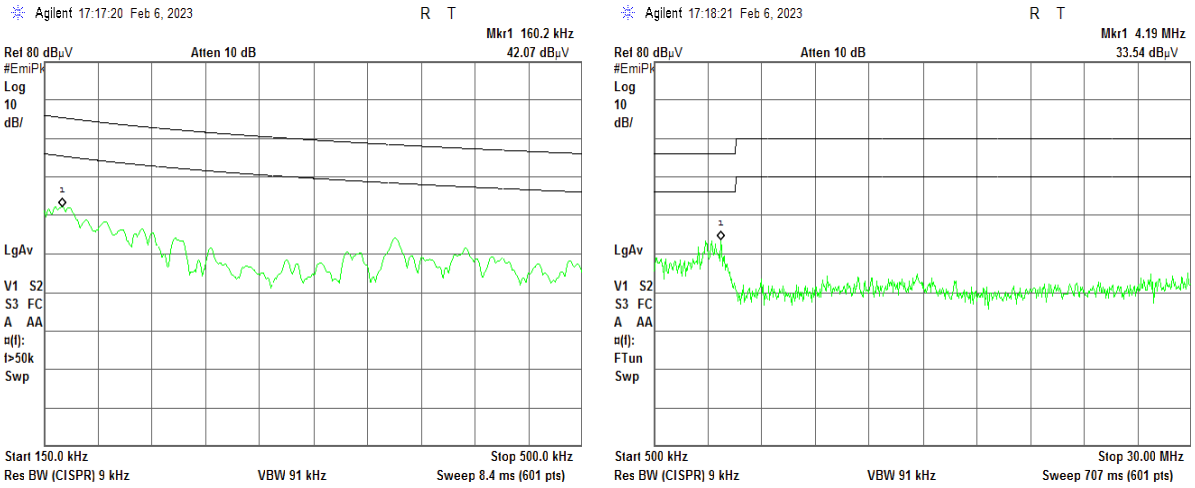
HL 3818	HL 2888	HL 787	HL 5476				

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):	06-Feb-23		
Temperature: 20 ºC	Relative Humidity: 49 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

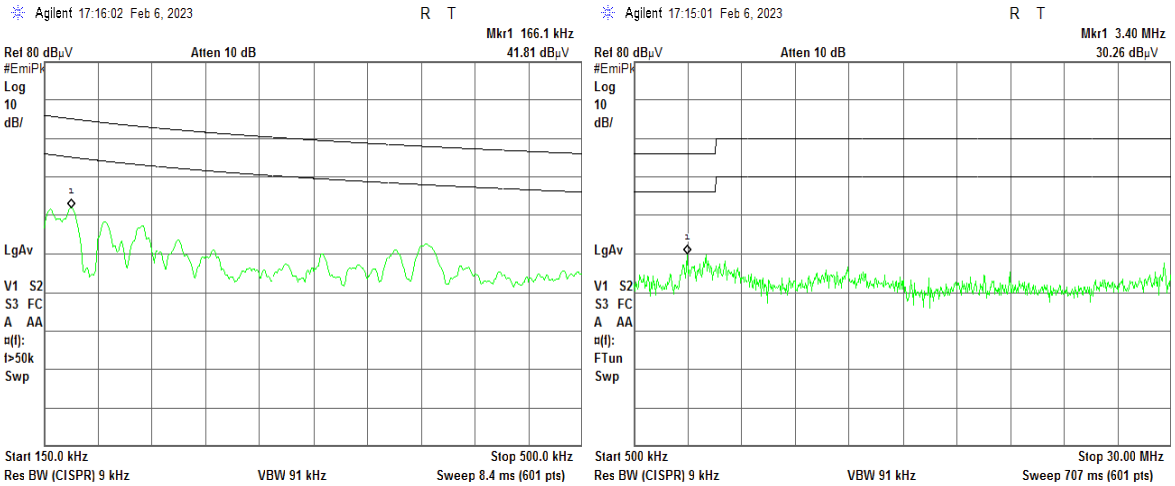
Plot 8.1.1 Conducted emission measurements

LINE: L1
LIMIT: Class B
EUT OPERATING MODE: Stand-by
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 8.1.2 Conducted emission measurements

LINE: L2
LIMIT: Class B
EUT OPERATING MODE: Stand-by
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	19-Jan-23 - 22-Jan-23		
Temperature: 23 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 60 Hz
Remarks:			

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: $Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$,
where S_1 and S_2 – standard defined and test distance respectively in meters.

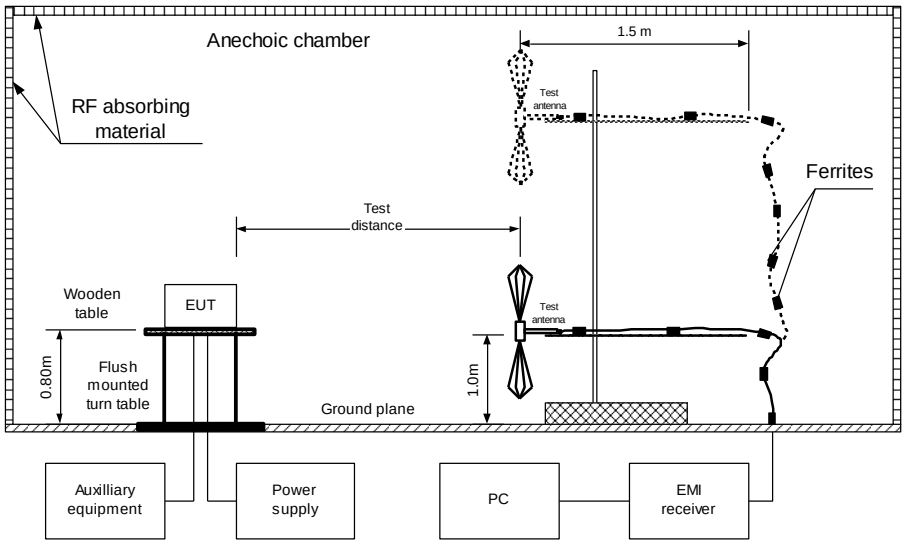
8.2.2 Test procedure for measurements in semi-anechoic chamber

8.2.2.1 The EUT was set up as shown in Figure 8.2.1 and associated photograph/s, 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 360^0, 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 worst test results (the lowest margins) were recorded in **Table 8.2.2** and shown in the associated plots.

Figure 8.2.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	19-Jan-23 - 22-Jan-23		
Temperature: 23 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 60 Hz
Remarks:			

Table 8.2.2 Radiated emission test results

EUT SET UP: TABLE-TOP
LIMIT: Class B
EUT OPERATING MODE: Stand-by
TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / QUASI-PEAK
FREQUENCY RANGE: 30 MHz – 1000 MHz
RESOLUTION BANDWIDTH: 120 kHz

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
37.8	35.4	30.9	40.0	-9.1	Vertical	1.0	27	Pass
360.0	38.3	36.5	46.0	-9.5	Horizontal	3.4	59	
456.0	39.7	37.4	46.0	-8.6	Vertical	1.0	92	
600.0	41.1	39.6	46.0	-6.4	Vertical	1.0	44	
624.0	38.5	36.2	46.0	-9.8	Vertical	1.0	-21	

TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 40000 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*				
1057	40.3	74	-33.7	36.2	54	-17.8	Vertical	1.0	45	Pass
1993	45.8	74	-28.2	41.3	54	-12.7	Vertical	1.0	60	
2113	50.8	74	-23.2	45.8	54	-8.2	Vertical	1.0	37	
2987	44.4	74	-29.6	40.4	54	-13.6	Vertical	1.0	45	

*****- Margin = Measured emission - specification limit.
******- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

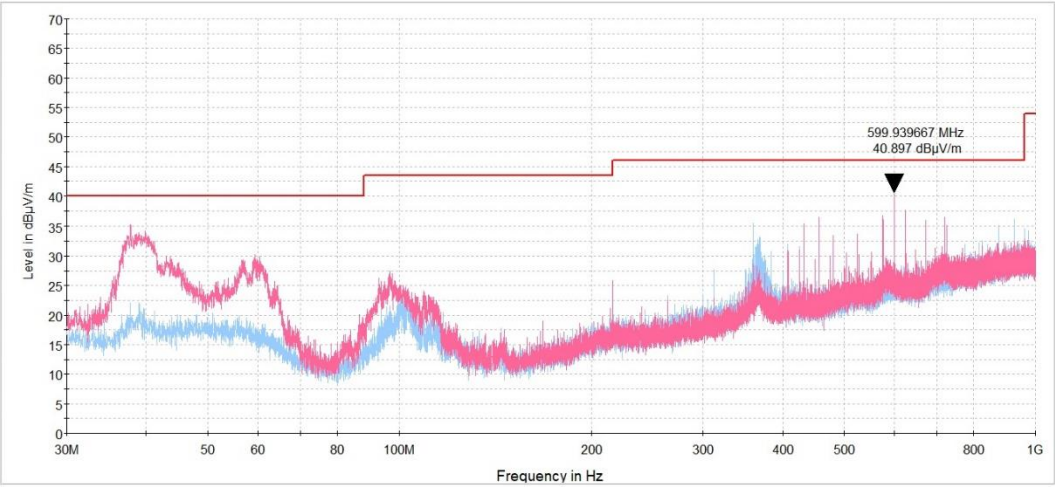
HL 7585	HL 5288	HL 4933	HL 3903	HL 5902	HL 4956		

Full description is given in Appendix A.

Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	19-Jan-23 - 22-Jan-23		
Temperature: 23 ºC	Relative Humidity: 48 %	Air Pressure: 1012 hPa	Power: 110 VAC, 60 Hz
Remarks:			

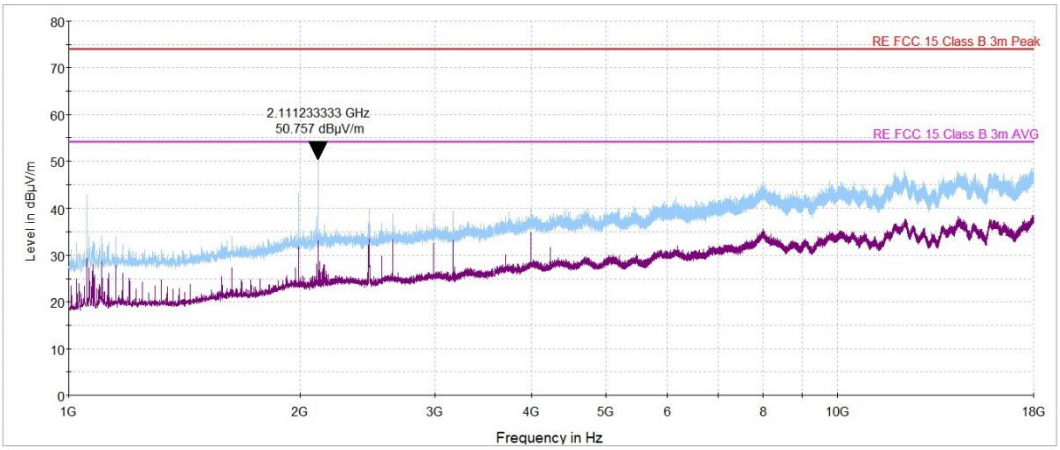
Plot 8.2.1 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE:	Semi anechoic chamber
LIMIT:	Class B
TEST DISTANCE:	3 m
EUT OPERATING MODE:	Stand-by
ANTENNA POLARIZATION:	Vertical & Horizontal



Plot 8.2.2 Radiated emission measurements in 1 -18GHz range

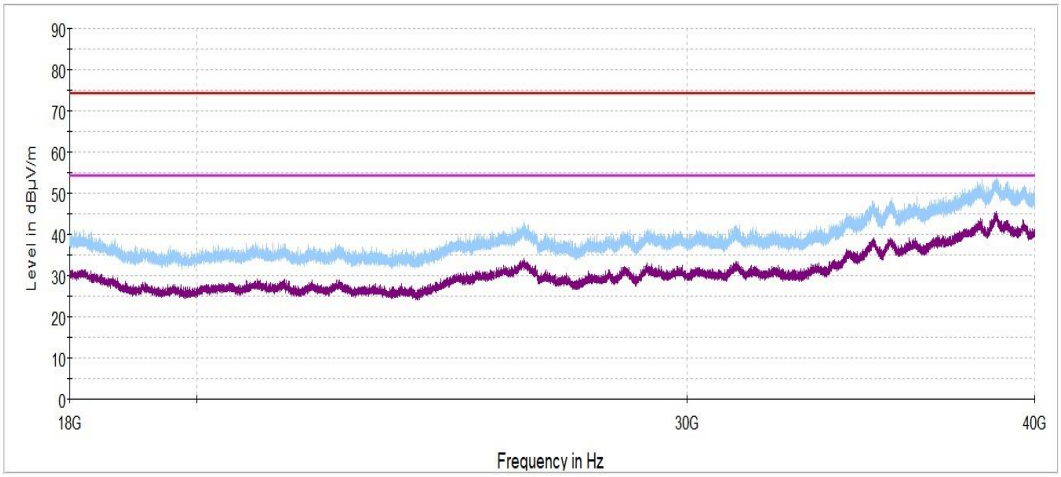
TEST SITE:	Semi anechoic chamber
LIMIT:	Class B
TEST DISTANCE:	3 m
EUT OPERATING MODE:	Stand-by
ANTENNA POLARIZATION:	Vertical & Horizontal



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	19-Jan-23 - 22-Jan-23		
Temperature: 23 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 110 VAC, 60 Hz
Remarks:			

Plot 8.2.3 Radiated emission measurements in 18-40 GHz range

TEST SITE:	Semi anechoic chamber
LIMIT:	Class B
TEST DISTANCE:	3 m
EUT OPERATING MODE:	Stand-by



9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0446	Antenna, Loop, Active, 10 (9) kHz - 30 MHz	EMCO	6502	2857	28-Feb-22	28-Mar-23
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A01877	11-Sep-22	11-Sep-23
2888	LISN Two-line V-Network 50 Ohm / 50 uH + 5 Ohm, 16A, MIL STD 461E, CISPR 16-1	Rolf Heine	NNB-2/16Z	02/10018	20-Mar-22	20-Mar-23
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY48250288	19-Jul-22	19-Jul-23
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1225/2A	07-Apr-22	07-Apr-23
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	07-Apr-22	07-Apr-23
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATION	AHA-118	701046	19-Jan-23	19-Jan-24
4956	Active horn antenna, 18 to 40 GHz	COM-POWER CORPORATION	AHA-840	105004	07-Mar-22	07-Mar-23
5112	RF cable, 40 GHz, 5.5 m, K-type	Huber-Suhner	SF102EA/11SK/11SK/5500MM	502494/2EA	25-Apr-22	25-Apr-23
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX-8000E	00809	24-Mar-22	24-Mar-25
5376	EXA Signal Analyzer, 10 Hz - 32 GHz	Keysight Technologies	N9010B	MY57470404	27-Dec-22	27-Dec-23
5476	Cable, BNC/BNC, 10.5 m	Western wire	MIL-C-17G	NA	22-May-22	22-May-23
5902	RF cable, 18 GHz, 6.0m, N-type	Huber-Suhner	SF126EA/11N/11N/6000	NA	08-Dec-22	08-Dec-23
7585	EMI Test Receiver, 1 Hz to 44 GHz	Rohde & Schwarz	ESW44	103130	19-May-22	19-May-23

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 dBμV to obtain field strength in dBμV/m.

HL 0446: Active Loop Antenna
EMCO, model: 6502, s/n 2857

Frequency,	Measured antenna factor, dBS/m	Measurement uncertainty, dB
10	-33.4	±1.0
20	-37.8	±1.0
50	-40.5	±1.0
75	-41.0	±1.0
100	-41.2	±1.0
150	-41.2	±1.0
250	-41.1	±1.0
500	-41.2	±1.0
750	-41.3	±1.0
1000	-41.3	±1.0

Frequency,	Measured antenna factor, dBS/m	Measurement uncertainty, dB
2000	-41.4	±1.0
3000	-41.4	±1.0
4000	-41.5	±1.0
5000	-41.5	±1.0
10000	-41.7	±1.0
15000	-42.1	±1.0
20000	-42.7	±1.0
25000	-44.2	±1.0
30000	-45.8	±1.0

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

HL 4956: Active horn antenna
COM-POWER Corp., model: AHA-840, s/n 105004

Frequency, MHz	Measured antenna factor, dB/m	Frequency, MHz	Measured antenna factor, dB/m
18000	5.1	29500	1.4
18500	3.6	30000	2.9
19000	2.2	30500	2.9
19500	0.7	31000	2.9
20000	0.7	31500	1.2
20500	0.8	32000	0.7
21000	0.5	32500	0.2
21500	-1.3	33000	-1.7
22000	-2.1	33500	-2.2
22500	-2.0	34000	2.3
23000	-1.6	34500	-1.1
23500	-2.9	35000	0.7
24000	-2.3	35500	-1.1
24500	-2.6	36000	0.1
25000	-1.8	36500	1.4
25500	-1.2	37000	3.7
26000	-0.5	37500	5.8
26500	-1.2	38000	6.6
27000	-0.1	38500	7.3
27500	-1.0	39000	6.5
28000	-0.7	39500	7.3
28500	0.5	40000	7.1

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

HL 5288: Trilog Antenna
Frankonia, model: ALX-8000E, s/n: 00809
30-1000 MHz

Frequency, MHz	Antenna factor, dB/m	Frequency, MHz	Antenna factor, dB/m
30	14.96	160	12.67
35	15.33	180	13.34
40	16.37	200	15.40
45	17.56	250	16.42
50	17.95	300	17.28
60	16.87	400	19.98
70	13.22	500	21.11
80	10.56	600	22.90
90	13.61	700	24.13
100	15.46	800	25.25
120	14.03	900	26.35
140	12.23	1000	27.18

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

above 1000 MHz

Frequency, MHz	Antenna factor, dB/m	Frequency, MHz	Antenna factor, dB/m
1000	26.9	3600	38.9
1100	28.1	3700	39.4
1200	28.4	3800	39.4
1300	29.6	3900	39.6
1400	29.1	4000	39.7
1500	30.4	4100	39.8
1600	30.7	4200	40.5
1700	31.5	4300	40.9
1800	32.3	4400	41.1
1900	32.6	4500	41.4
2000	32.5	4600	41.3
2100	32.9	4700	41.6
2200	33.5	4800	41.9
2300	33.2	4900	42.3
2400	33.7	5000	42.7
2500	34.6	5100	43.0
2600	34.7	5200	42.9
2700	34.6	5300	43.5
2800	35.0	5400	43.6
2900	35.5	5500	44.3
3000	36.2	5600	44.7
3100	36.8	5700	45.0
3200	36.8	5800	45.0
3300	37.0	5900	45.3
3400	37.5	6000	45.9
3500	38.2		

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

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: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 10 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.0 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.1 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 5.5 dB Biconical antenna: ± 5.5 dB Log periodic antenna: ± 5.6 dB Double ridged horn antenna: ± 5.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB

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 Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, Radio, Safety, Environmental and Telecommunication testing facility.
Hermon Laboratories is recognized and accredited by the Federal Communications Commission (USA) for relevant parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; Recognized by Innovation, Science and Economic Development Canada for wireless and terminal testing (ISED), ISED #2186A, CAB identifier is IL1001; Certified by VCCI, Japan (the registration numbers for OATS are R-10808 for RE measurements below 1 GHz, G-20112 for RE measurements above 1 GHz, R-11082 for anechoic chamber for RE measurements below 1 GHz, G-10869 for RE measurements above 1 GHz, C-10845 for conducted emissions site and T-11606 for conducted emissions at telecommunication ports).
The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing, environmental simulation and calibration (for exact scope please refer to Certificate No. 839.01, 839.03 and 839.04).

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13 APPENDIX E Specification references

FCC 47CFR part 15: 2020	Radio Frequency Devices
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.4: 2014	American National Standard for Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

14 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(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

END OF DOCUMENT