



ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO: FCC CFR 47 Part 15 subpart F, section 15.519 and subpart B;
RSS-220 issue 1, RSS-Gen Issue 5:2018, ICES-003 Issue 6:2016

FOR:

Vayyar Imaging LTD.

VMAKERPROUWB

Model: VMPRO19CB4

FCC ID: 2AHIS-VMAKERPROUWB

IC: 21498-VMAKERPROUWB

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1 Applicant information

Client name: Vayyar Imaging LTD.
Address: 26 Shabazi street, Yehud, 5621608, Israel
Telephone: +972 54 432 1050
E-mail: mark.popov@vayyar.com
Contact name: Mr. Mark Popov

2 Equipment under test attributes

Product name: VMAKERPROUWB
Product type: UWB handheld device
Model(s): VMPRO19CB4
Serial number: DCUG9BA036202401
Hardware version: RevB 2.4
Software release: MPR 2.4.1
Receipt date 10-Jul-20

3 Manufacturer information

Manufacturer name: Vayyar Imaging LTD.
Address: 26 Shabazi street, Yehud, 5621608, Israel
Telephone: +972 54 432 1050
E-mail: mark.popov@vayyar.com
Contact name: Mr. Mark Popov

4 Test details

Project ID: 39637
Location: Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started: 30-Aug-20
Test completed: 13-Sep-20
Test specification(s): FCC CFR 47 Part 15 subpart F, section 15.519 and subpart B,
RSS-220 Issue 1, RSS-Gen Issue 5:2018, ICES-003 Issue 6:2016

5 Tests summary

Test	Status
Transmitter characteristics	
FCC section 15.519(b), Occupied bandwidth	Pass
FCC section 15.519(c)/15.519(e), RSS-220 sections 5.3.1(d), 5.3.1(g),	Pass
Peak power within 50 MHz bandwidth and Radiated power density	
FCC section 15.519(c), (d)/15.209, RSS-220 section 5.3.1(c), (d),	Pass
Radiated spurious emission measurements	
FCC section 15.519(a)(1), RSS-220 section 5.3.1(b), Transmission duration requirements	Pass
FCC section 15.207(a), RSS-Gen, Section 7.2, Conducted emission	Pass
Unintentional emissions	
FCC section 15.107, RSS-Gen, Section 7.2, Conducted emission at AC power port	Pass
FCC section 15.109, RSS-Gen, Section 7.3, Radiated emission measurements	Pass

This test report supersedes the previously issued test report identified by Doc ID: VAYRAD_FCC_15.519.39637

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

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

	Name and Title	Date	Signature
Tested by:	Mr. A. Morozov, test engineer, EMC & Radio	30-Aug-20 – 13-Sep-20	
Reviewed by:	Mrs. S. Peysahov Sheynin, test engineer, EMC & Radio	01-Oct-20	
Approved by:	Mr. S. Samokha, technical manager, EMC & Radio	26-Oct-20	

6 EUT description

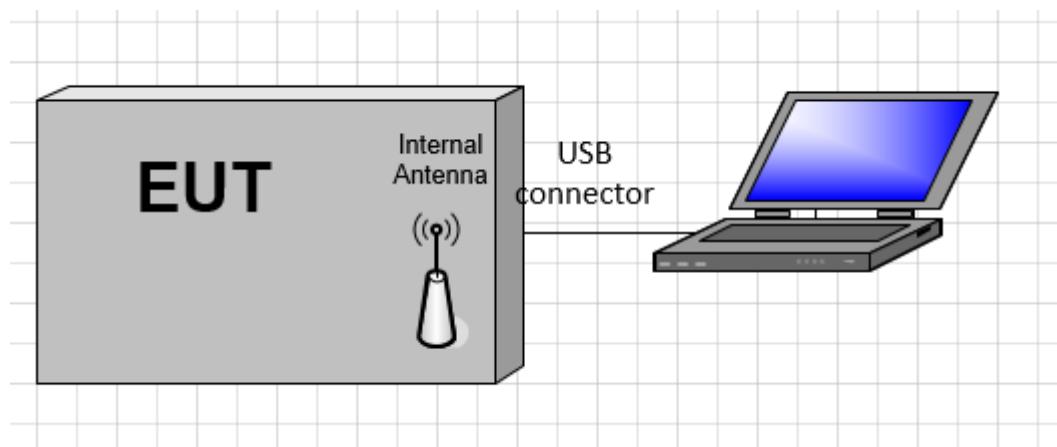
Note: The following data in this clause is provided by the customer and represents his sole responsibility

6.1 General information

The EUT, VMAKERPROUWB product is multi-antenna sensors for characterizing the environment in the vicinity of the sensor by collecting and analyzing propagation information between the antennas, which is affected by the environment. The information is gathered by sequentially transmitting from the available antennas and collecting the received information at the rest of the antennas. The response information is then processed at the hosting device to obtain spatial information about the environment.

The acquisition is controlled by the hosting device. The hosting device may ask VMAKERPROUWB to acquire multiple snapshots, so as to integrate the data into information about larger spatial extent, or to detect changes in the environment.

6.2 Test configuration



6.3 Changes made in EUT

No changes were performed in the EUT during testing.



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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			
6000 - 8500 MHz			
Is transmitter output power variable?			
Yes	V	No	
		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
PCB embedded slot	Vayyar Imaging Ltd.	NA	up to 4dBi
Transmitter aggregate data rate/s			
No payload			
Type of modulation			
multi frequency transmission			
Modulating test signal (baseband)			
Transmitter power source			
	Battery	Nominal rated voltage	
V	DC	Nominal rated voltage	5.0 V
	AC mains	Nominal rated voltage	Frequency Hz



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Date of Issue: 26-Oct-20

Test specification:	Section 15.519(b), 15.503(d), Occupied bandwidth		
Test procedure:	ANSI C63.10-2013, section 10.1		
Test mode:	Compliance		
Date(s):	13-Sep-20		
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks: UWB			

7 Transmitter tests according to 47CFR part 15 and RSS-220 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

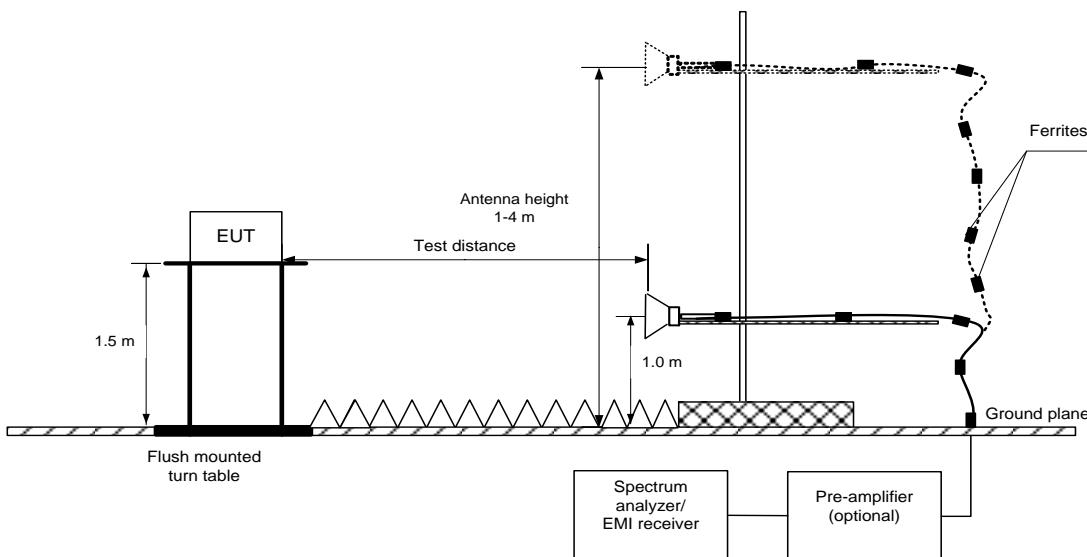
Assigned frequency, MHz	Modulation envelope reference points*, dBc	Minimum allowed bandwidth, MHz
3100 - 10600	10	500

* - 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





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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): 13-Sep-20	
Temperature: 24 °C	Relative Humidity: 44 %
	Air Pressure: 1010 hPa
Remarks: UWB	Power: 5 VDC

Table 7.1.2 Occupied bandwidth test results

CENTER FREQUENCY f_c : 7362.875 MHz

DETECTOR USED: Peak hold

RESOLUTION BANDWIDTH: 1 MHz

VIDEO BANDWIDTH: 3 MHz

MODULATION: Multifrequency

MODULATION ENVELOPE REFERENCE POINTS: 10 dBc

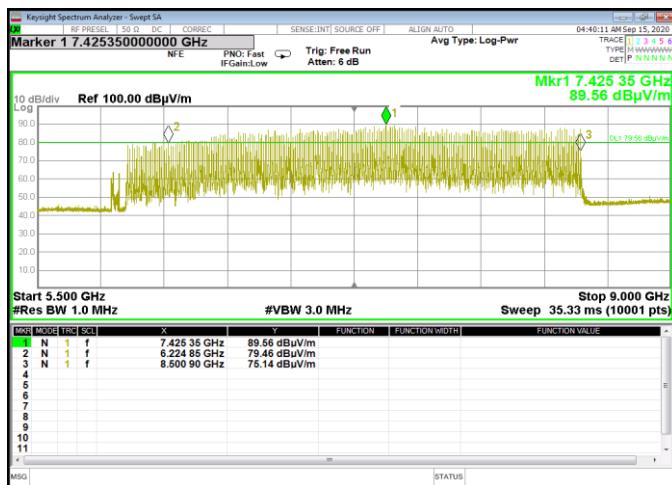
Carrier frequency f_m , MHz	-10 dB envelope points, MHz		Occupied bandwidth, MHz	Limit, MHz	Margin, MHz	Verdict
	f_l	f_h				
7425.35	6224.85	8500.90	2276.05	500.0	1776.05	Pass

Reference numbers of test equipment used

HL 3903	HL 4933	HL 5372	HL 5669	HL 5670			
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Full description is given in Appendix A.

Plot 7.1.1 Occupied bandwidth test result





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Test specification:	Sections 15.519(c),15.519(e), RSS-220 sections 5.3.1(d), 5.3.1(g), 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):	13-Sep-20		
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks: UBW			

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*	Equivalent field strength limit @ 1m, dB(µV/m) in 50 MHz**
3100 - 10600	0	95.2	104.7

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

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

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

Assigned frequency band, MHz	EIRP dBm/1MHz	Equivalent field strength limit @ 3m, dB(µV/m)/1MHz*	Equivalent field strength limit @ 1m, dB(µV/m)/1MHz**
FCC section 15.519(c)			
3100 - 10600	-41.3	53.9	63.4
RSS-220 section 5.3.1(d)			
4750-10600	-41.3	53.9	63.4

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

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

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°, 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.



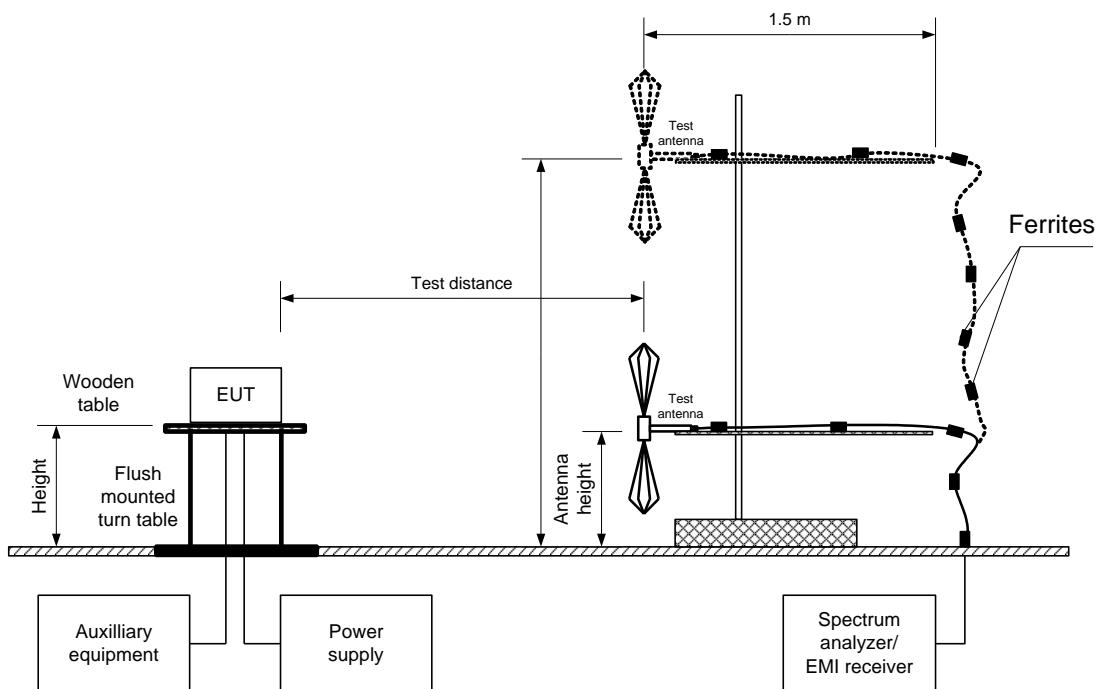
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Test specification:	Sections 15.519(c),15.519(e), RSS-220 sections 5.3.1(d), 5.3.1(g), Peak power within 50 MHz bandwidth and Radiated power density		
Test procedure:	47 CFR, Section 15.521, ANSI C63.10, section 10.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Sep-20		
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks: UBW			

Figure 7.2.1 Setup for carrier field strength measurements





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Test procedure:	47 CFR, Section 15.521, ANSI C63.10, section 10.3		
Test mode:	Compliance	Verdict: PASS	
Date(s):	13-Sep-20		
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks: UBW			

Table 7.2.3 Peak power level contained within 50 MHz test results

ASSIGNED FREQUENCY RANGE: 3100 – 10600 MHz
 TEST SITE: Semi anechoic chamber
 TEST DISTANCE: 1 m
 EUT HEIGHT: 1.5 m
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: > Resolution bandwidth
 TEST ANTENNA TYPE: Horn
 MODULATION: Multifrequency

Frequency, MHz	SA reading (RBW 10 MHz), dB(µV/m)	SA reading (RBW 28 MHz), dB(µV/m)	Conversion factor from 28 MHz to 50 MHz, dB*	EIRP, dBm**	Limit, dBm	Margin, dB***	Verdict
6001.480	79.32	79.85	-5.04	-19.81	0	-19.81	Pass
6136.230	80.03	80.56	-5.04	-19.10	0	-19.10	Pass
6300.270	81.95	82.48	-5.04	-17.18	0	-17.18	Pass
6510.500	84.57	85.10	-5.04	-14.56	0	-14.56	Pass
6649.520	86.55	87.08	-5.04	-12.58	0	-12.58	Pass
6787.420	87.36	87.89	-5.04	-11.77	0	-11.77	Pass
6937.100	87.90	88.43	-5.04	-11.23	0	-11.23	Pass
7049.220	86.48	87.01	-5.04	-12.65	0	-12.65	Pass
7161.920	87.62	88.15	-5.04	-11.51	0	-11.51	Pass
7273.920	89.26	89.79	-5.04	-9.87	0	-9.87	Pass
7412.280	90.64	91.17	-5.04	-8.49	0	-8.49	Pass
7574.450	90.07	90.60	-5.04	-9.06	0	-9.06	Pass
7736.380	88.47	89.00	-5.04	-10.66	0	-10.66	Pass
7899.830	86.49	87.02	-5.04	-12.64	0	-12.64	Pass
8049.280	87.92	88.45	-5.04	-11.21	0	-11.21	Pass
8211.450	88.14	88.67	-5.04	-10.99	0	-10.99	Pass
8375.480	88.22	88.75	-5.04	-10.91	0	-10.91	Pass
8487.250	88.07	88.60	-5.04	-11.06	0	-11.06	Pass

*- Conversion factor=20 log (28/50) = -5.04 dB

**- EIRP, dBm= Equivalent field strength (28 MHz RBW), dB(µV/m) -104.7 dB- Conversion factor (28 to 50 MHz)

*** - Margin, dB = EIRP, dBm – Limit, dBm



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Test specification:	Sections 15.519(c),15.519(e), RSS-220 sections 5.3.1(d), 5.3.1(g), 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):	13-Sep-20		
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks: UBW			

Table 7.2.4 RMS-average emissions test results

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

Frequency, MHz	RMS Field strength, dB(µV/m)	RBW, MHz	Antenna polarization	EIRP, dBm*	Limit, dBm	Margin, dB**	Verdict
6000.030	52.43	1	Vertical	-52.27	-41.3	-10.97	Pass
6137.230	52.35	1	Vertical	-52.35	-41.3	-11.05	Pass
6299.870	54.39	1	Vertical	-50.31	-41.3	-9.01	Pass
6399.970	58.14	1	Vertical	-46.56	-41.3	-5.26	Pass
6612.420	59.63	1	Vertical	-45.07	-41.3	-3.77	Pass
6787.530	59.59	1	Vertical	-45.11	-41.3	-3.81	Pass
6937.450	60.34	1	Vertical	-44.36	-41.3	-3.06	Pass
7200.070	62.11	1	Vertical	-42.59	-41.3	-1.29	Pass
7262.370	62.17	1	Vertical	-42.53	-41.3	-1.23	Pass
7412.280	62.97	1	Vertical	-41.73	-41.3	-0.43	Pass
7500.020	62.88	1	Vertical	-41.82	-41.3	-0.52	Pass
7575.030	62.36	1	Vertical	-42.34	-41.3	-1.04	Pass
7624.850	61.84	1	Vertical	-42.86	-41.3	-1.56	Pass
8000.280	61.57	1	Vertical	-43.13	-41.3	-1.83	Pass
8074.950	61.02	1	Vertical	-43.68	-41.3	-2.38	Pass
8212.500	61.30	1	Vertical	-43.40	-41.3	-2.10	Pass
8462.630	61.25	1	Vertical	-43.45	-41.3	-2.15	Pass

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

**- Margin = EIRP, dBm – specification limit.

Reference numbers of test equipment used

HL 3903	HL 4355	HL 4933	HL 5372	HL 5669	HL 5670		
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Full description is given in Appendix A.



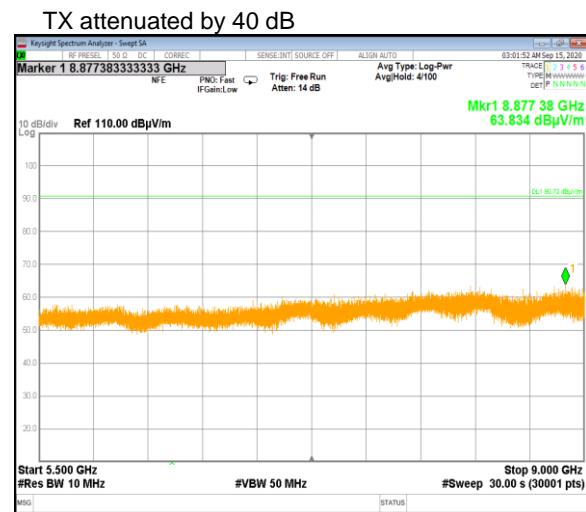
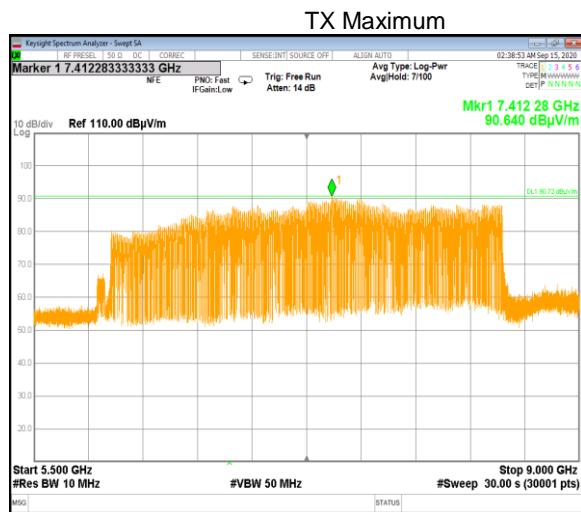
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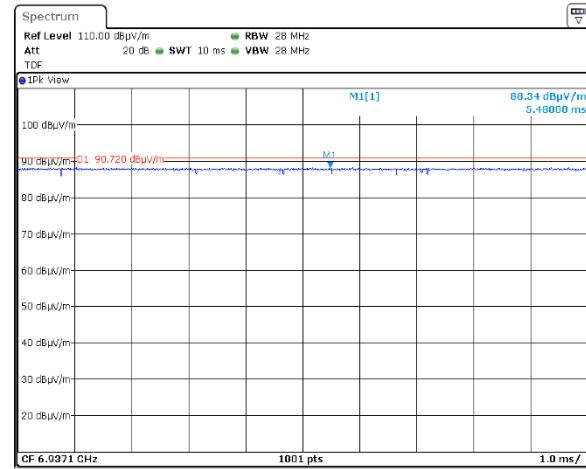
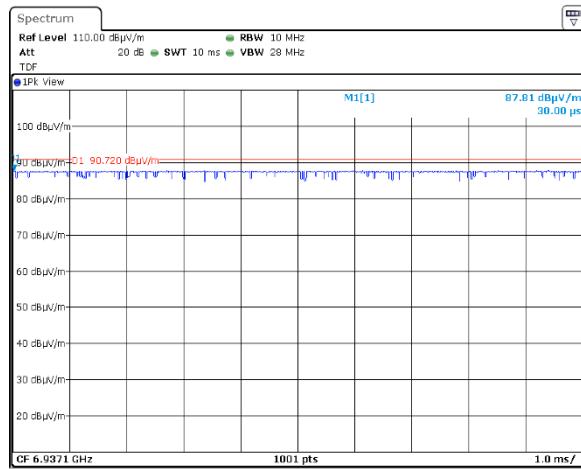
Date of Issue: 26-Oct-20

Test specification:	Sections 15.519(c), 15.519(e), RSS-220 sections 5.3.1(d), 5.3.1(g), 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		
Date(s):	13-Sep-20	Verdict:	PASS
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks: UBW			

Plot 7.2.1 Peak power level contained within 50 MHz



Plot 7.2.2 Peak power level with 10 MHz and 28 MHz resolution bandwidth





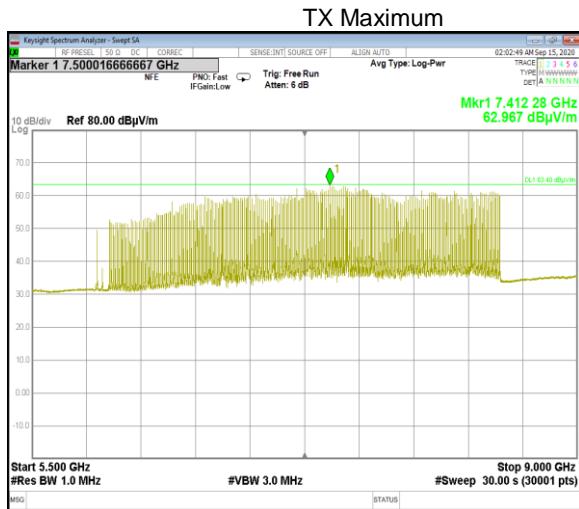
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Test specification:	Sections 15.519(c),15.519(e), RSS-220 sections 5.3.1(d), 5.3.1(g), Peak power within 50 MHz bandwidth and Radiated power density		
Test procedure:	47 CFR, Section 15.521, ANSI C63.10, section 10.3		
Test mode:	Compliance		
Date(s):	13-Sep-20	Verdict:	PASS
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks: UBW			

Plot 7.2.3 RMS-Average emissions measurements





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Report ID: VAYRAD_FCC_15.519.39637_Rev1

Date of Issue: 26-Oct-20

Test specification: Section 15.519(c),(d), RSS-220 section 5.3.1(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): 14-Sep-20			
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC
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, Table 7.3.3. The EUT shall comply with the emission limits of Table 7.3.3 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.

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 – 10 th harmonic	74.0	NA	54.0

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

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

where S₁ and S₂ – 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	-63.3	31.9	41.4
1990-3100	1000	-61.3	33.9	43.4
3100-10600	1000	-41.3	53.9	63.4
Above 10600	1000	-61.3	33.9	43.4
1164-1240	≥1	-85.3	9.9	19.4
1559-1610	≥1	-85.3	9.9	19.4



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Test specification:	Section 15.519(c),(d), RSS-220 section 5.3.1(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):	14-Sep-20		
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

Table 7.3.3 Radiated emission average limits according to RSS-220 section 5.3.1(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
1610-4750	1000	-70.0	25.2	34.7
4750-10600	1000	-41.3	53.9	63.4
Above 10600	1000	-61.3	33.9	43.4
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

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° 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° 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° 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.

7.3.5 Test procedure for spurious emission field strength measurements in 1164-1240 MHz and 1559-1610 MHz

- 7.3.5.1 The EUT was set up as shown in Figure 7.3.3 and energized.
- 7.3.5.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.
- 7.3.5.3 The radiated emissions were measured with a Spectrum analyzer using an RMS detector. The RBW of 1 kHz and VBW of 3 kHz with a 1 msec averaging time were used. The SA settings are shown in the attached Plot 7.3.7 to Plot 7.3.21.
- 7.3.5.4 The worst test results (the lowest margins) were recorded in the associated tables and shown in the associated plots.



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Test specification:	Section 15.519(c),(d), RSS-220 section 5.3.1(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):	14-Sep-20		
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

Figure 7.3.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

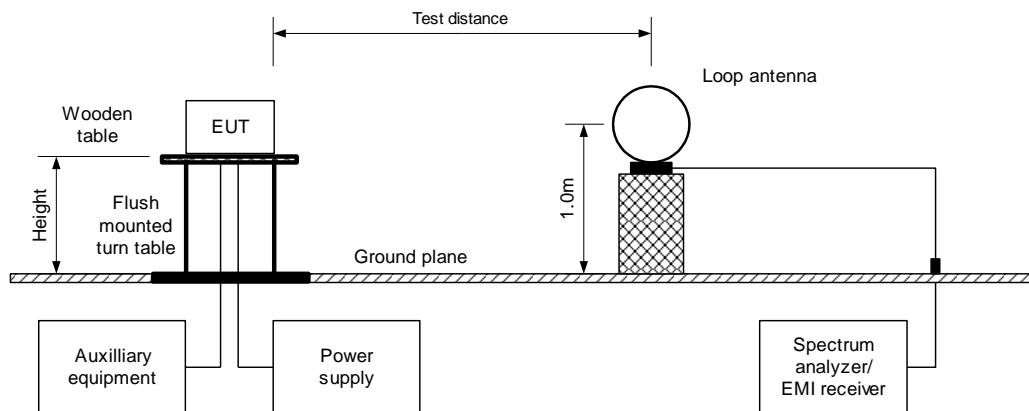
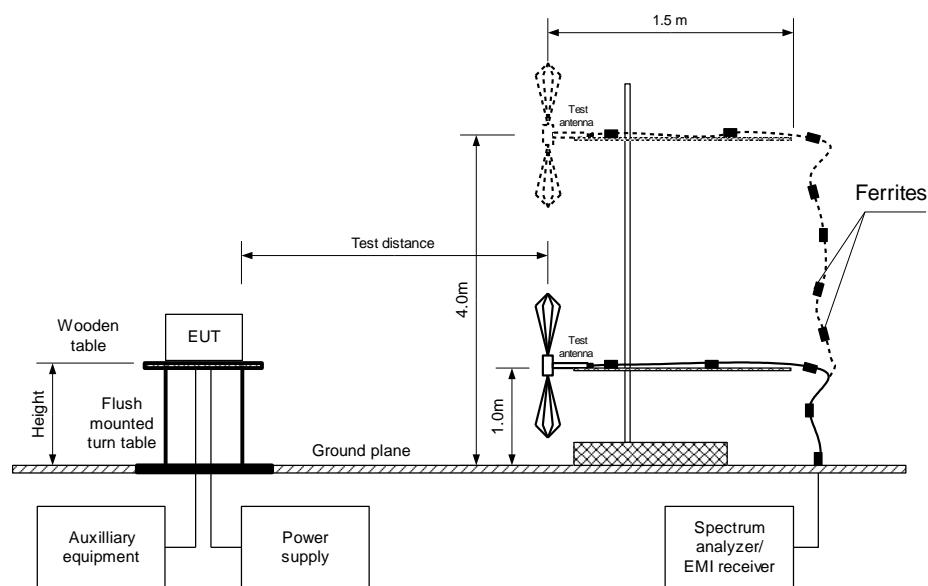


Figure 7.3.2 Setup for spurious emission field strength measurements within 30-1000 MHz





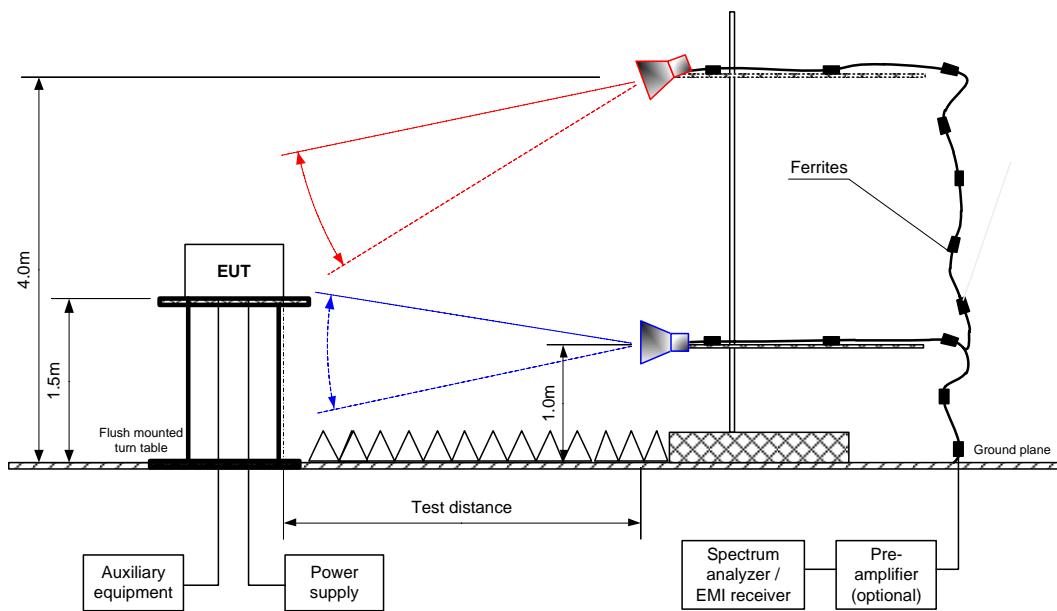
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Test specification:	Section 15.519(c),(d), RSS-220 section 5.3.1(c), (d), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 10.2, 10.3, Section 15.521		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Sep-20		
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

Figure 7.3.3 Setup for spurious emission field strength measurements above 1000 MHz





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Test procedure:		ANSI C63.10, sections 10.2, 10.3, Section 15.521		
Test mode:		Compliance		
Date(s):		14-Sep-20		
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC	
Remarks:				

Table 7.3.4 Field strength of spurious emissions according to the Section 15.209

ASSIGNED FREQUENCY RANGE: 3100 - 10600 MHz
 TEST DISTANCE: 3 m
 TEST SITE: Semi anechoic chamber
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: \geq Resolution bandwidth
 RESOLUTION BANDWIDTH: 1 kHz (9 kHz – 150 kHz)
 TEST ANTENNA TYPE: 9.0 kHz (150 kHz – 30 MHz)
 MODULATION: 120 kHz (30 MHz – 1000 MHz)
 Biconilog (30 MHz – 960 MHz)
 Multifrequency

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*				
120.002	36.70	33.95	43.5	-9.55	Vertical	1.02	163	Pass
167.991	37.94	36.37	43.5	-7.13	Vertical	1.00	360	
240.014	34.36	31.15	46.0	-14.85	Horizontal	1.00	275	
264.003	37.33	33.47	46.0	-12.53	Horizontal	1.00	336	
319.993	43.18	42.36	46.0	-3.64	Horizontal	1.00	22	
360.000	42.65	41.55	46.0	-4.45	Horizontal	1.00	360	
400.002	37.88	36.38	46.0	-9.62	Horizontal	1.00	349	

*- 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*				
1600.033	40.91	74.0	-33.09	33.73	54.0	-20.27	Vertical	2.24	294	Pass
1759.900	38.24	74.0	-35.76	31.23	54.0	-22.77	Horizontal	1.92	187	
1839.800	38.06	74.0	-35.94	30.09	54.0	-23.91	Horizontal	1.31	203	
1920.200	39.51	74.0	-34.49	32.08	54.0	-21.92	Horizontal	1.41	203	
4259.067	49.64	74.0	-24.36	36.58	54.0	-17.42	Vertical	1.32	104	
16319.833	48.76	74.0	-25.24	31.78	54.0	-22.22	Vertical	1.62	330	
16640.500	50.40	74.0	-23.60	37.15	54.0	-16.85	Vertical	1.62	36	
26879.200	49.41	74.0	-24.59	43.40	54.0	-10.60	Horizontal	1.02	11	
29449.500	49.42	74.0	-24.58	44.88	54.0	-9.12	Vertical	1.02	82	
31185.367	49.69	74.0	-24.31	40.34	54.0	-13.66	Horizontal	1.62	208	
33251.033	50.80	74.0	-23.20	43.64	54.0	-10.36	Horizontal	1.02	15	

*- Margin = Measured emission - specification limit.

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



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Test specification:		Section 15.519(c),(d), RSS-220 section 5.3.1(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):		14-Sep-20		
Temperature: 25 °C		Relative Humidity: 41 %		Air Pressure: 1010 hPa Power: 5 VDC
Remarks:				

Table 7.3.5 Spurious emission field strength test results according to RSS-220

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

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 7.3.6 Spurious emission field strength test results according to RSS-220

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:	Multifrequency

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 5669	HL 5670	HL 0446	HL 3903	HL 4360	HL 4933		
HL 4956	HL 5085	HL 5288	HL 5112	HL 4011			

Full description is given in Appendix A.



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Test procedure:	ANSI C63.10, sections 10.2, 10.3, Section 15.521		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Sep-20		
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

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

TEST SITE:

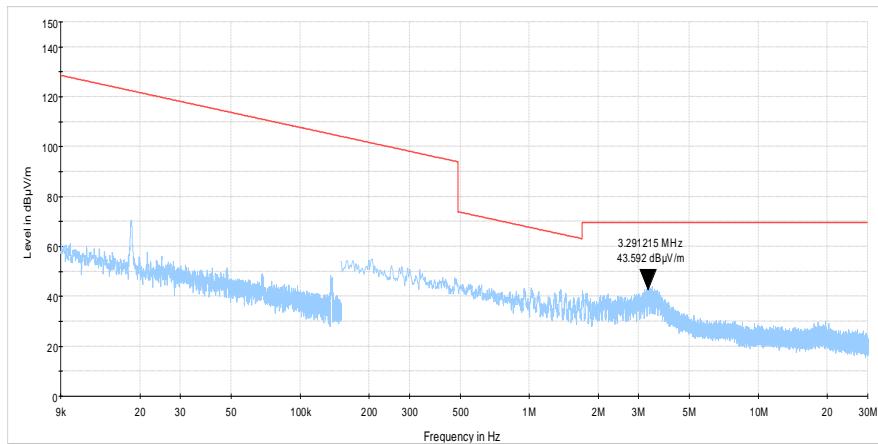
Semi anechoic chamber

ANTENNA POLARIZATION:

Vertical

TEST DISTANCE:

3 m



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

TEST SITE:

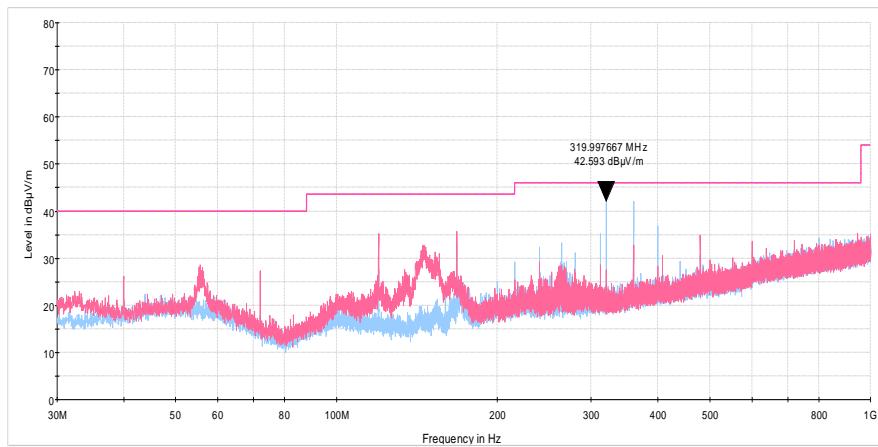
Semi anechoic chamber

ANTENNA POLARIZATION:

Vertical and Horizontal

TEST DISTANCE:

3 m





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Test specification:	Section 15.519(c),(d), RSS-220 section 5.3.1(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):	14-Sep-20		
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

Plot 7.3.3 Radiated emission measurements in 1 – 18 GHz range according to the Section 15.209

TEST SITE:

Semi anechoic chamber

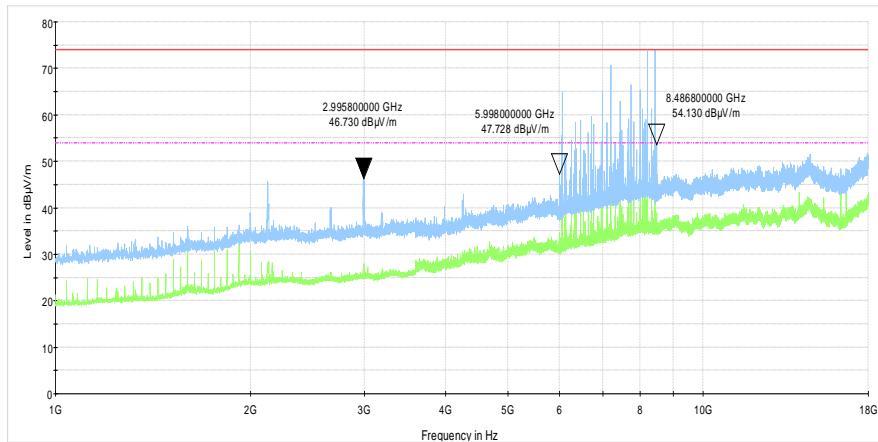
ANTENNA POLARIZATION:

Vertical and Horizontal

TEST DISTANCE:

3 m

TX Maximum



Note: Frequencies from 5.996 GHz to 8.487 GHz – UWB signal

Plot 7.3.4 Radiated emission measurements in 1 – 18 GHz range according to the Section 15.209

TEST SITE:

Semi anechoic chamber

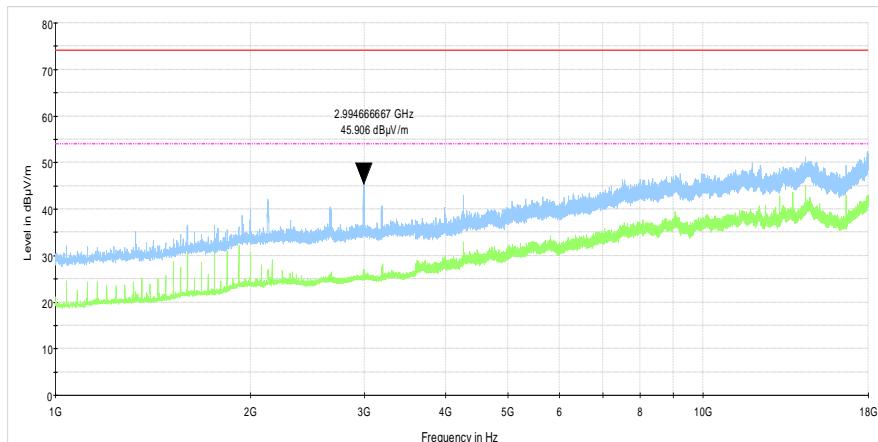
ANTENNA POLARIZATION:

Vertical and Horizontal

TEST DISTANCE:

3 m

TX attenuated by 40 dB





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Test specification:	Section 15.519(c),(d), RSS-220 section 5.3.1(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):	14-Sep-20		
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

Plot 7.3.5 Radiated emission measurements in 18 – 40 GHz range according to the Section 15.209

TEST SITE:

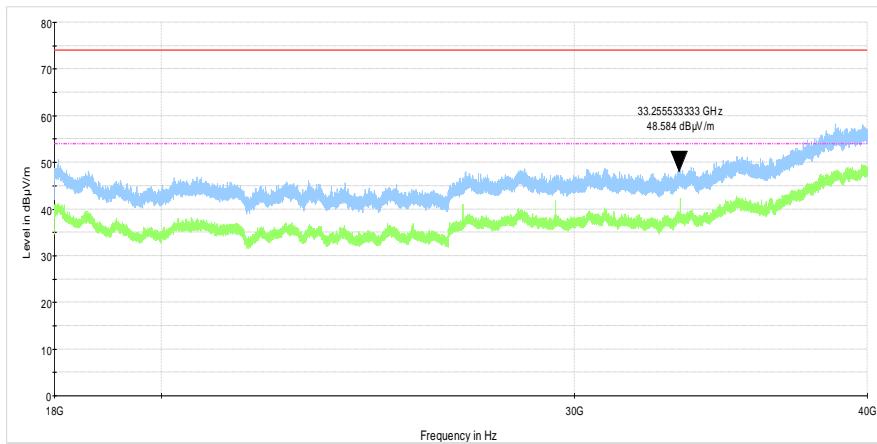
Semi anechoic chamber

ANTENNA POLARIZATION:

Vertical and Horizontal

TEST DISTANCE:

3 m





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Test specification: Section 15.519(c),(d), RSS-220 section 5.3.1(c), (d), Radiated spurious emissions			
Test procedure: ANSI C63.10, sections 10.2, 10.3, Section 15.521			
Test mode: Compliance			
Date(s): 14-Sep-20			Verdict: PASS
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

Plot 7.3.6 Radiated emission measurements in 960 – 1000 MHz range according to RSS-220

TEST SITE:

Semi anechoic chamber

TEST DISTANCE:

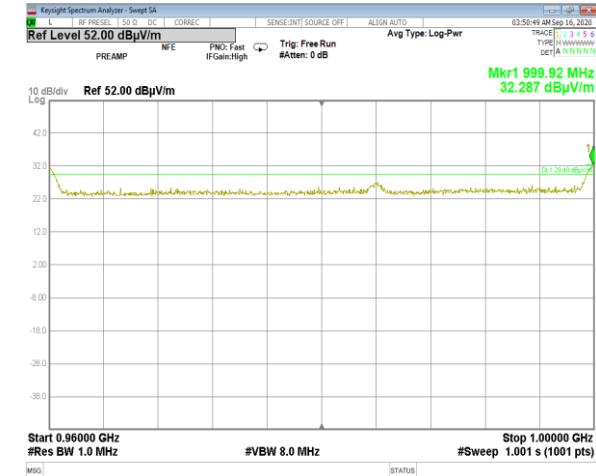
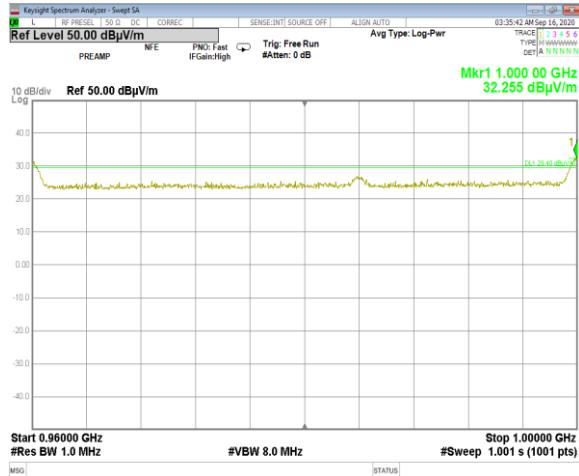
1 m

ANTENNA POLARIZATION:

Vertical

TX Maximum

TX attenuated in 40 dB

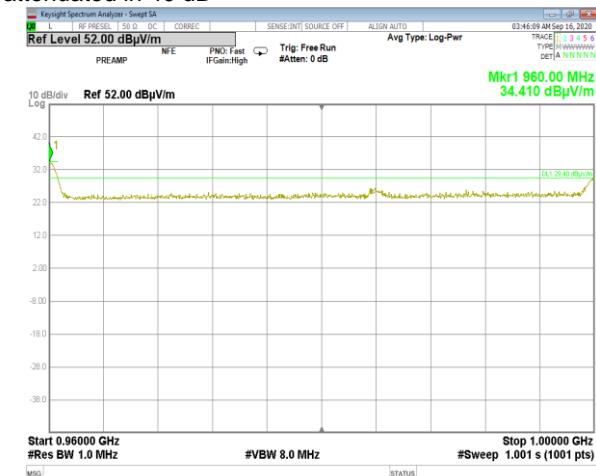
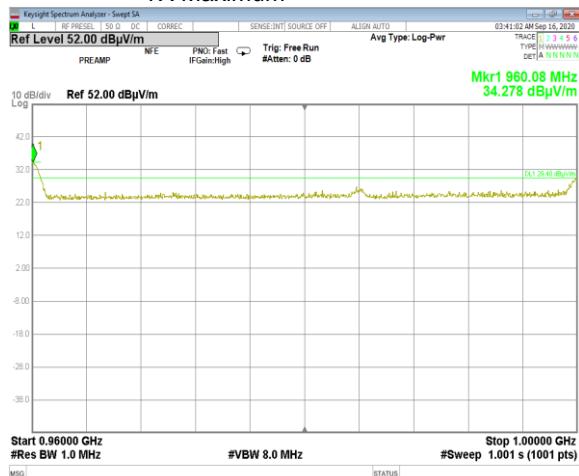


ANTENNA POLARIZATION:

Horizontal

TX Maximum

TX attenuated in 40 dB





Test specification:	Section 15.519(c),(d), RSS-220 section 5.3.1(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):	14-Sep-20		
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

Plot 7.3.7 Radiated emission measurements in 1000 – 1610 MHz range according to RSS-220

TEST SITE:

ANTENNA POLARIZATION:

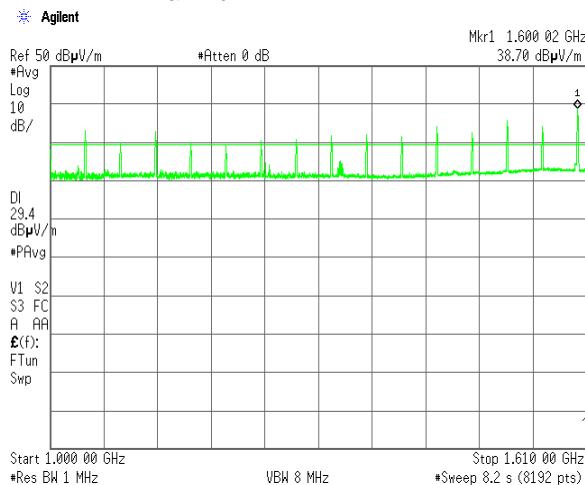
TEST DISTANCE:

Semi anechoic chamber

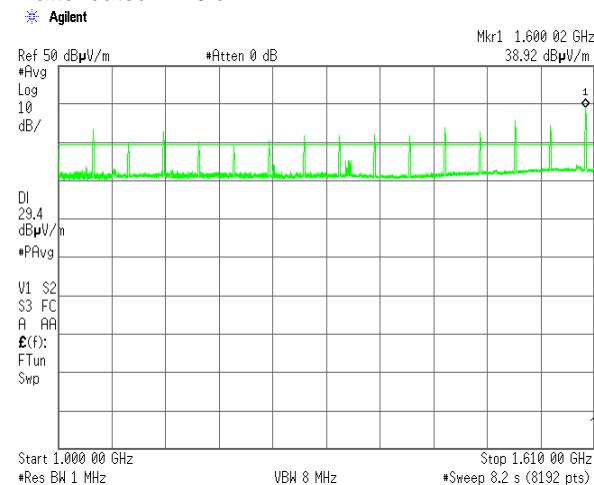
Vertical and Horizontal

1 m

TX Maximum



TX attenuated in 40 dB



Plot 7.3.8 Radiated emission measurements in 1610 - 3000 MHz range according to RSS-220

TEST SITE:

ANTENNA POLARIZATION:

TEST DISTANCE:

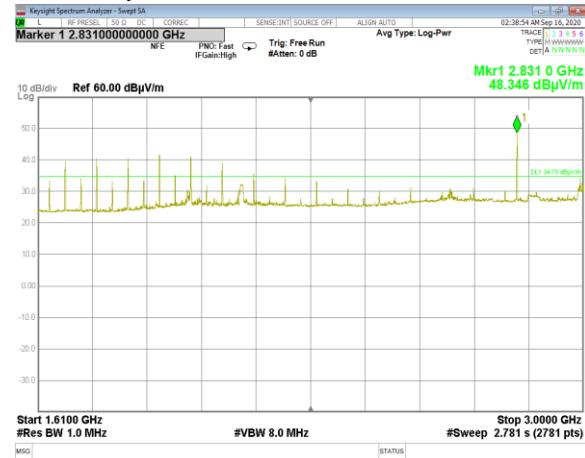
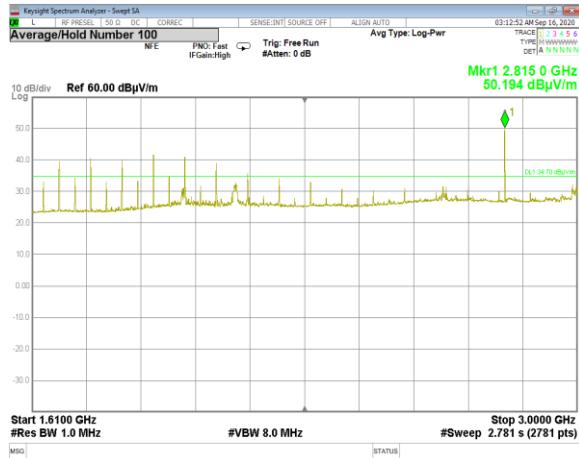
TX Maximum

Semi anechoic chamber

Vertical and Horizontal

1 m

TX attenuated by 40 dB





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Test procedure: ANSI C63.10, sections 10.2, 10.3, Section 15.521			
Test mode: Compliance			
Date(s): 14-Sep-20			
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

Plot 7.3.9 Radiated emission measurements in 3000 - 5500 MHz range according to RSS-220

TEST SITE:

Semi anechoic chamber

ANTENNA POLARIZATION:

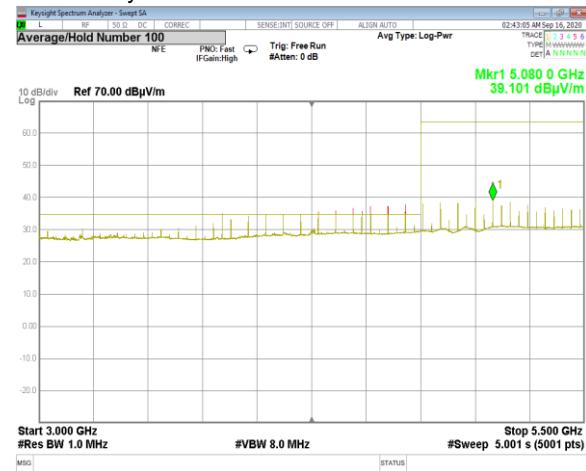
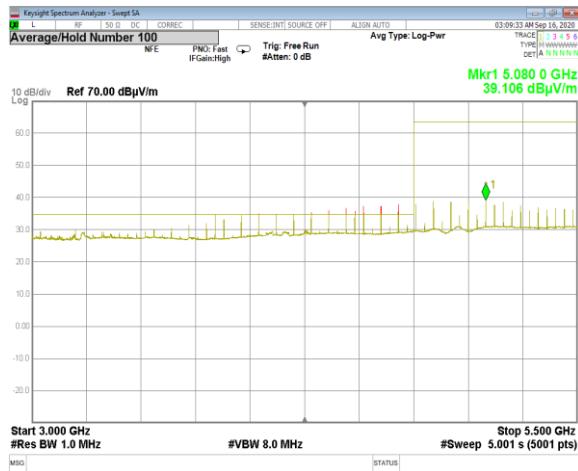
Vertical

TEST DISTANCE:

1 m

TX Maximum

TX attenuated by 40 dB



Plot 7.3.10 Radiated emission measurements in 9000 - 10600 MHz range according to RSS-220

TEST SITE:

Semi anechoic chamber

ANTENNA POLARIZATION:

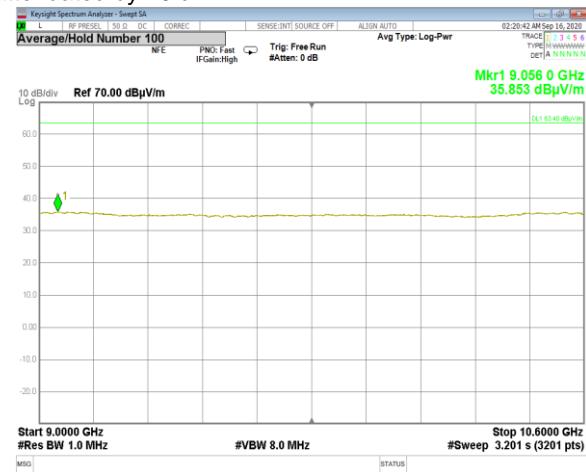
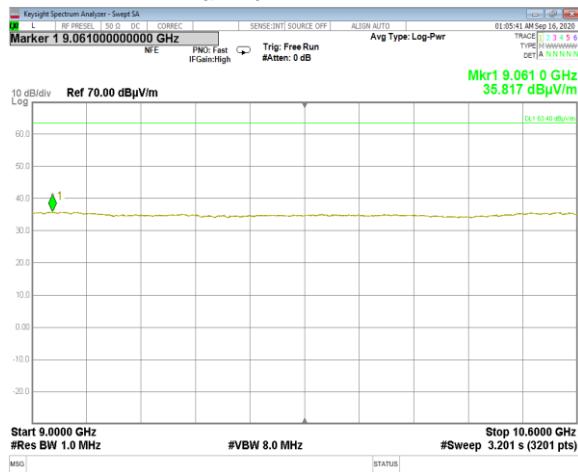
Vertical and Horizontal

TEST DISTANCE:

1 m

TX Maximum

TX attenuated by 40 dB





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Test procedure: ANSI C63.10, sections 10.2, 10.3, Section 15.521			
Test mode: Compliance			
Date(s): 14-Sep-20			Verdict: PASS
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

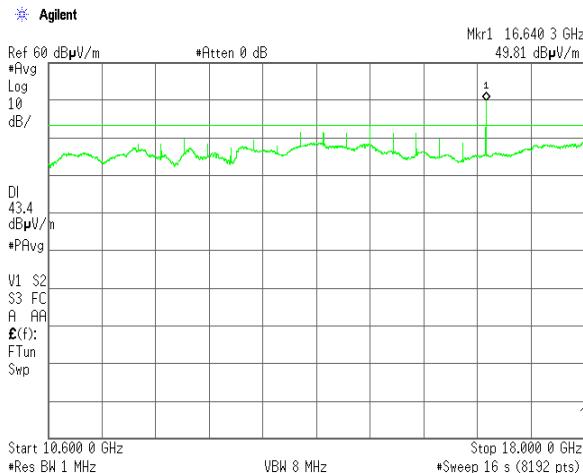
Plot 7.3.11 Radiated emission measurements in 10600 – 18000 MHz range according to RSS-220

TEST SITE:

TEST DISTANCE:

ANTENNA POLARIZATION:

TX Maximum

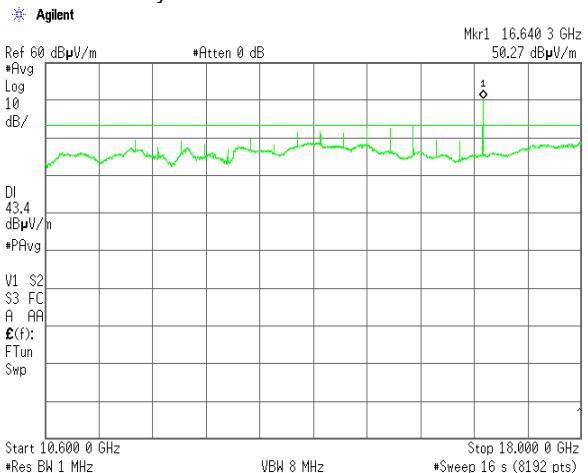


Semi anechoic chamber

1 m

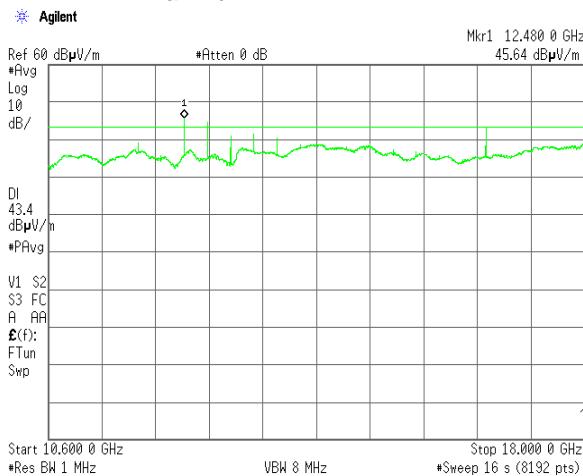
Vertical

TX attenuated by 40 dB



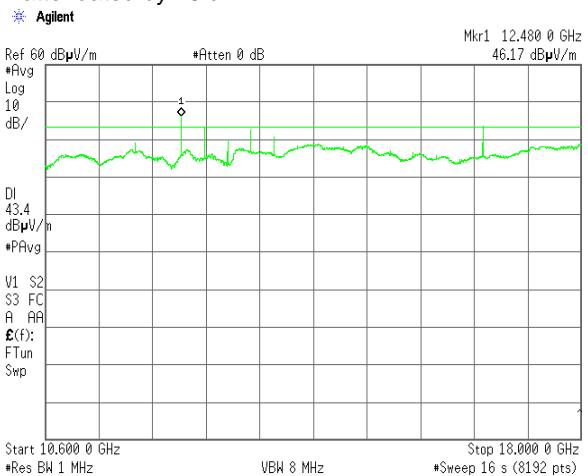
ANTENNA POLARIZATION:

TX Maximum



Horizontal

TX attenuated by 40 dB





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Test procedure:	ANSI C63.10, sections 10.2, 10.3, Section 15.521		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Sep-20		
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

Plot 7.3.12 Radiated emission measurements in 18000 –40000 MHz range

TEST SITE:

Semi anechoic chamber

ANTENNA POLARIZATION:

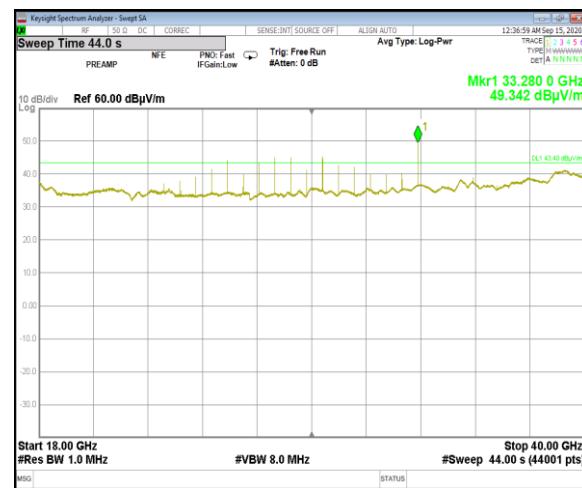
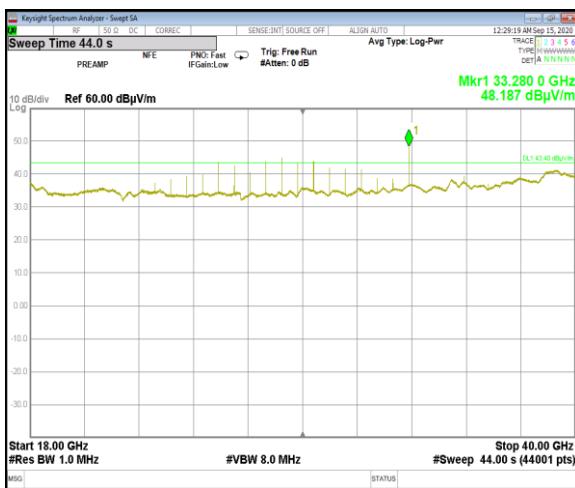
Vertical and Horizontal

TEST DISTANCE:

1 m

TX Maximum

TX attenuated by 40 dB





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Test procedure: ANSI C63.10, sections 10.2, 10.3, Section 15.521			
Test mode: Compliance			
Date(s): 14-Sep-20			Verdict: PASS
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

Plot 7.3.13 Radiated emission measurements in 1164 – 1240 MHz range according to RSS-220

TEST SITE:

Semi anechoic chamber

TEST DISTANCE:

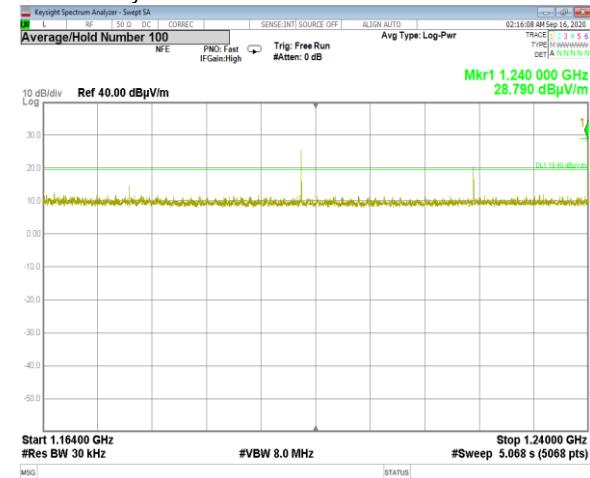
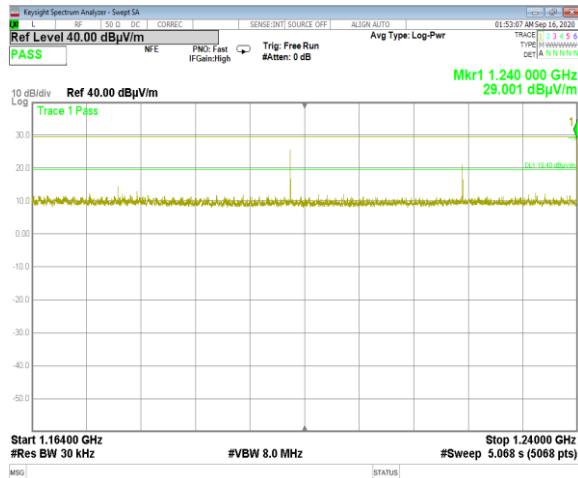
1 m

ANTENNA POLARIZATION:

Vertical

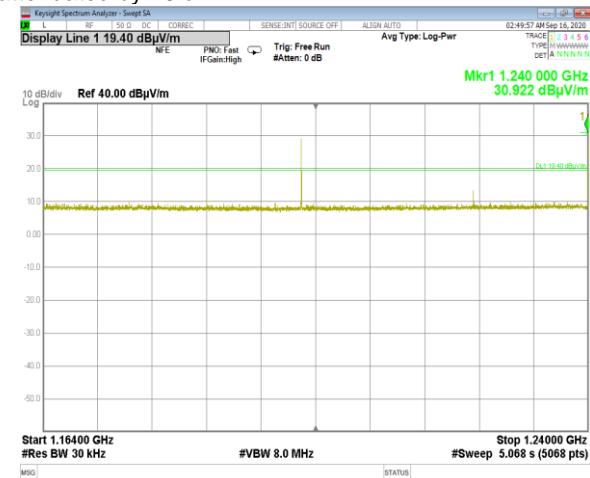
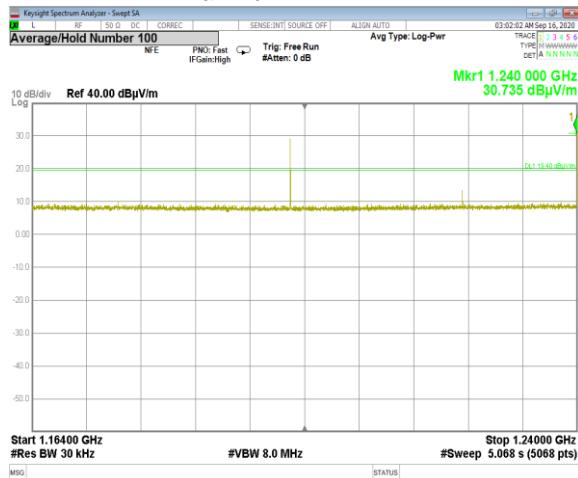
TX Maximum

TX attenuated by 40 dB



ANTENNA POLARIZATION:
TX Maximum

Horizontal
TX attenuated by 40 dB





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Report ID: VAYRAD_FCC_15.519.39637_Rev1
Date of Issue: 26-Oct-20

Test specification: Section 15.519(c),(d), RSS-220 section 5.3.1(c), (d), Radiated spurious emissions			
Test procedure: ANSI C63.10, sections 10.2, 10.3, Section 15.521			
Test mode: Compliance			
Date(s): 14-Sep-20			Verdict: PASS
Temperature: 25 °C	Relative Humidity: 41 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

Plot 7.3.14 Radiated emission measurements in 1559 - 1610 MHz range according to RSS-220

TEST SITE:

Semi anechoic chamber

ANTENNA POLARIZATION:

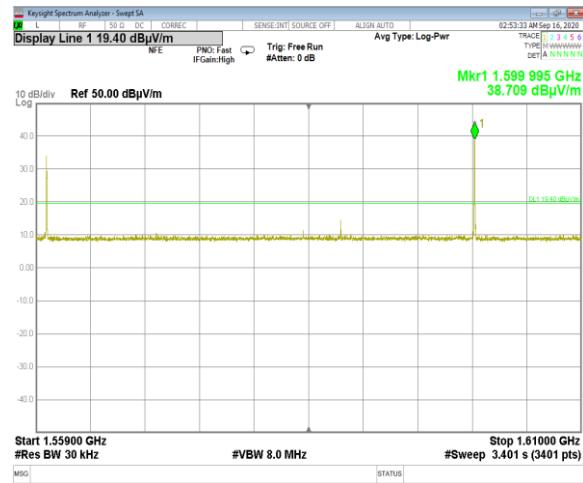
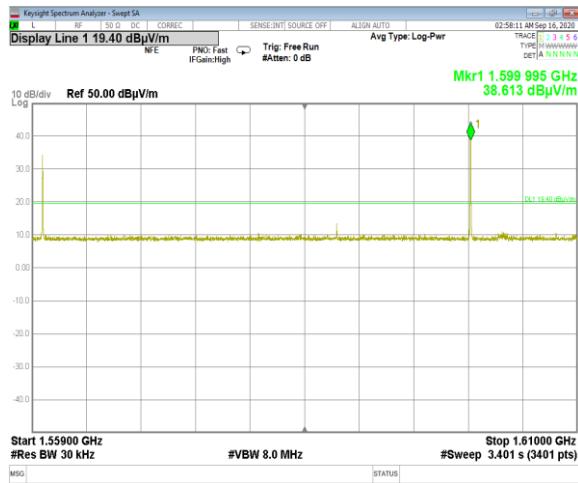
Vertical and Horizontal

TEST DISTANCE:

1 m

TX Maximum

TX attenuated by 40 dB





HERMON LABORATORIES

Test specification:	Section 15.519(a)(1), RSS-220 section 5.3.1(b), Transmission duration requirements		
Test procedure:	47 CFR, Section 15.521		
Test mode:	Compliance		
Date(s):	15-Sep-20	Verdict:	PASS
Temperature: 24 °C	Relative Humidity: 47 %	Air Pressure: 1009 hPa	Power: 5 VDC
Remarks: UWB			

7.4 Transmission duration requirements

7.4.1 General

The EUT was verified for compliance with transmission duration requirements listed below:

- A transmitter shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission was received.

7.4.2 Test procedure for transmitter shut down test

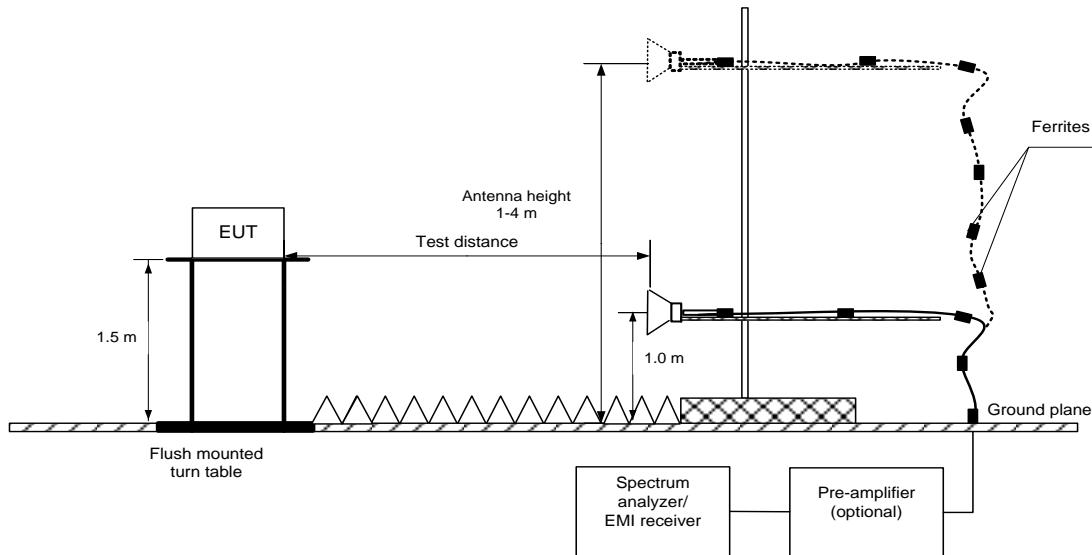
7.4.2.1 The EUT was set up as shown in Figure 7.4.1

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

7.4.2.3 The transmitter was triggered once by the host.

7.4.2.4 The transmission time was captured and shown in the associated plots. The test results for cease of transmitter operating is shown in Plot 7.4.1.

Figure 7.4.1 Setup for transmitter shut down test



Reference numbers of test equipment used

HL 3903	HL 4360	HL 4933						
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Full description is given in Appendix A.



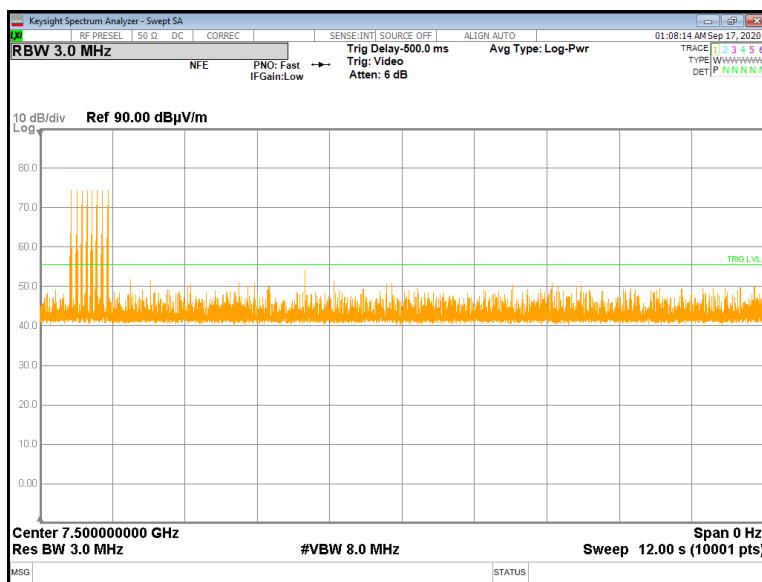
HERMON LABORATORIES

Report ID: VAYRAD_FCC_15.519.39637_Rev1

Date of Issue: 26-Oct-20

Test specification:	Section 15.519(a)(1), RSS-220 section 5.3.1(b), Transmission duration requirements		
Test procedure:	47 CFR, Section 15.521		
Test mode:	Compliance		
Date(s):	15-Sep-20	Verdict:	PASS
Temperature: 24 °C	Relative Humidity: 47 %	Air Pressure: 1009 hPa	Power: 5 VDC
Remarks: UWB			

Plot 7.4.1 RF transmission duration in 12 sec period





HERMON LABORATORIES

Report ID: VAYRAD_FCC_15.519.39637_Rev1

Date of Issue: 26-Oct-20

Test specification: Section 15.207(a), RSS-Gen, Section 7.2, Conducted emission			
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance		
Date(s):	15-Sep-20	Verdict:	PASS
Temperature: 24 °C	Relative Humidity: 47 %	Air Pressure: 1009 hPa	Power: 115 VAC, 60 Hz
Remarks:			

7.5 Conducted emissions

7.5.1 General

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

Table 7.5.1 Limits for conducted emissions

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

* The limit decreases linearly with the logarithm of frequency.

7.5.2 Test procedure

- 7.5.2.1 The EUT was set up as shown in Figure 7.5.1 and associated photographs, energized and the performance check was conducted.
- 7.5.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.5.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.
- 7.5.2.3 The position of the device cables was varied to determine maximum emission level.
- 7.5.2.4 The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.



HERMON LABORATORIES

Report ID: VAYRAD_FCC_15.519.39637_Rev1

Date of Issue: 26-Oct-20

Test specification: Section 15.207(a), RSS-Gen, Section 7.2, Conducted emission			
Test procedure: ANSI C63.4, Section 13.1.3			
Test mode: Compliance		Verdict: PASS	
Date(s): 15-Sep-20			
Temperature: 24 °C	Relative Humidity: 47 %	Air Pressure: 1009 hPa	Power: 115 VAC, 60 Hz
Remarks:			

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

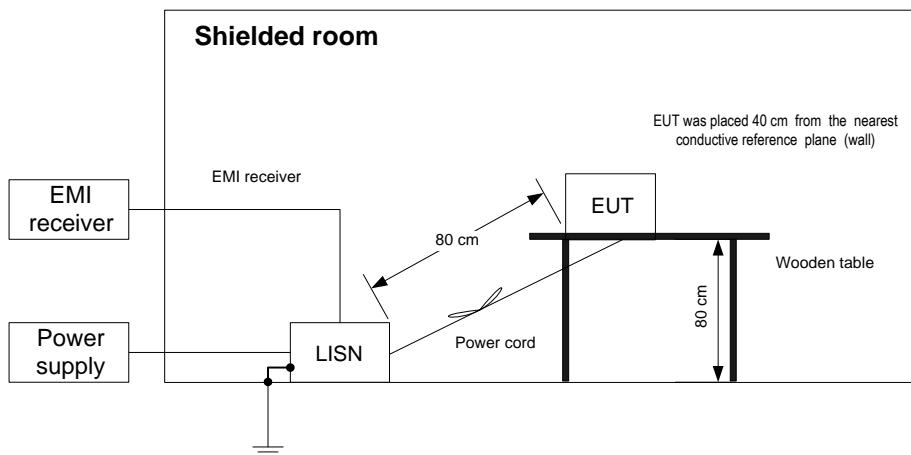


Table 7.5.2 Conducted emission test results

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*		
0.166	NA	45.93	65.14	-19.21	27.80	55.14	-27.34	L1	Pass
13.896	NA	39.35	60.00	-20.65	32.12	50.00	-17.88		
16.336	NA	50.06	60.00	-9.94	40.92	50.00	-9.08		
14.933	NA	38.88	60.00	-21.12	31.64	50.00	-18.36		
16.166	NA	48.61	60.00	-11.39	39.24	50.00	-10.76	L2	Pass

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

HL 0787	HL 3016	HL 5476	HL 5707				
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Full description is given in Appendix A.



HERMON LABORATORIES

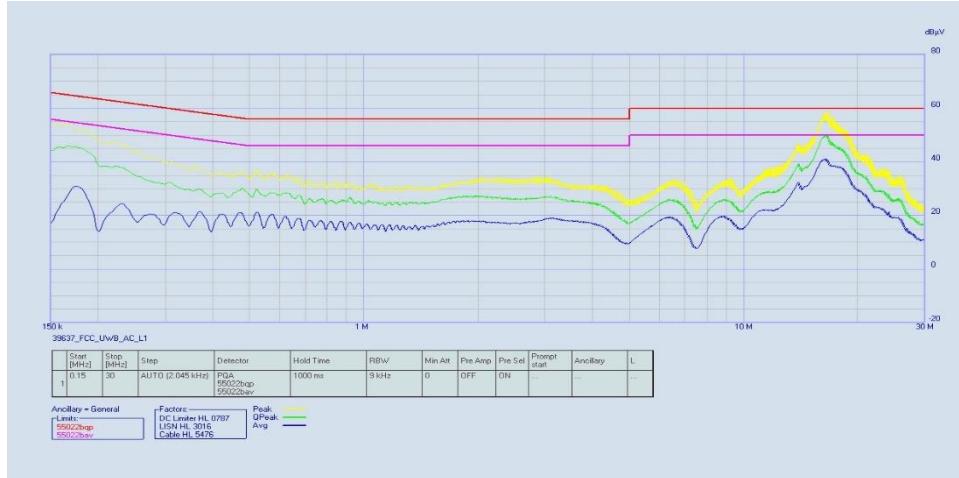
Report ID: VAYRAD_FCC_15.519.39637_Rev1

Date of Issue: 26-Oct-20

Test specification: Section 15.207(a), RSS-Gen, Section 7.2, Conducted emission			
Test procedure: ANSI C63.4, Section 13.1.3			
Test mode: Compliance		Verdict: PASS	
Date(s): 15-Sep-20			
Temperature: 24 °C	Relative Humidity: 47 %	Air Pressure: 1009 hPa	Power: 115 VAC, 60 Hz
Remarks:			

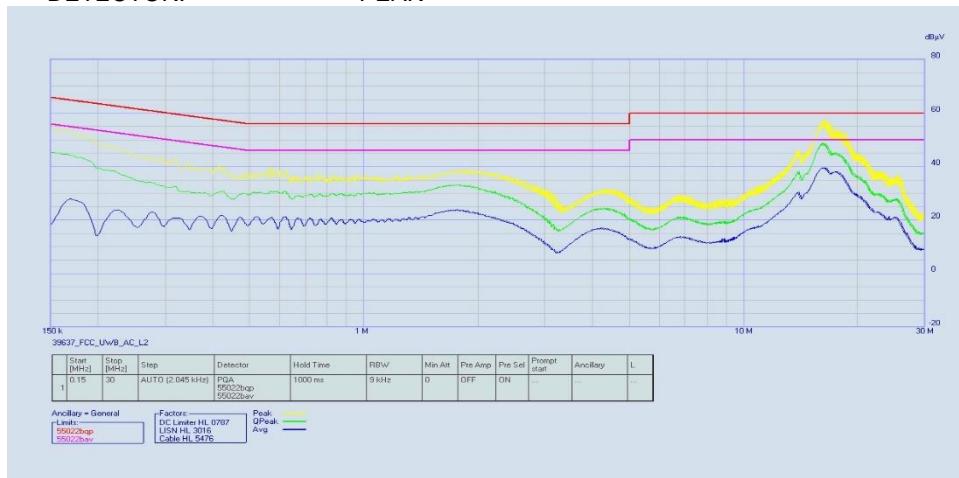
Plot 7.5.1 Conducted emission measurements

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



Plot 7.5.2 Conducted emission measurements

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





HERMON LABORATORIES

Report ID: VAYRAD_FCC_15.519.39637_Rev1

Date of Issue: 26-Oct-20

Test specification:	Section 15.107, RSS-Gen, Section 7.2, ICES-003, 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):	15-Sep-20		
Temperature: 24 °C	Relative Humidity: 47 %	Air Pressure: 1009 hPa	Power: 115 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.
- 8.1.2.4 The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.



HERMON LABORATORIES

Report ID: VAYRAD_FCC_15.519.39637_Rev1

Date of Issue: 26-Oct-20

Test specification: Section 15.107, RSS-Gen, Section 7.2, ICES-003, 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): 15-Sep-20			
Temperature: 24 °C	Relative Humidity: 47 %	Air Pressure: 1009 hPa	Power: 115 VAC, 60 Hz
Remarks:			

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

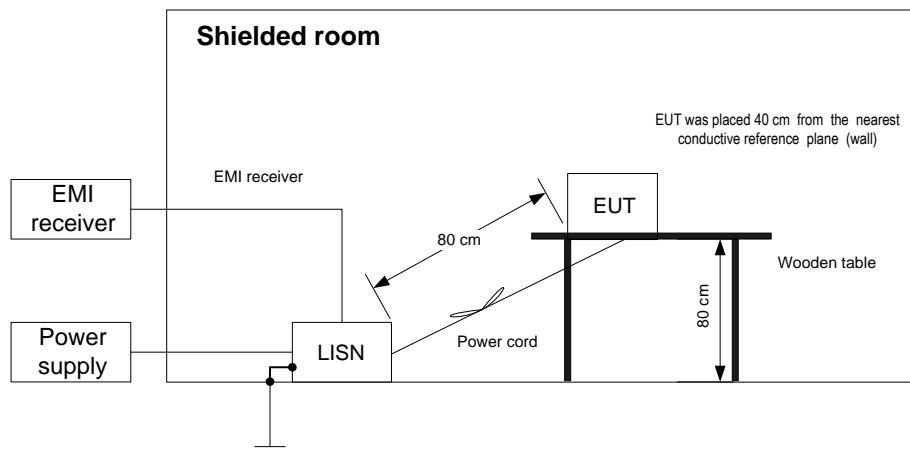


Table 8.1.2 Conducted emission test results

LINE:	AC mains
LIMIT:	Class B
EUT OPERATING MODE:	Receive
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*		
14.937	NA	38.07	60.00	-21.93	31.54	50.00	-18.46	L1	Pass
16.575	NA	45.79	60.00	-14.21	37.53	50.00	-12.47		
14.948	NA	39.08	60.00	-20.92	31.68	50.00	-18.32	L2	Pass
16.019	NA	45.30	60.00	-14.70	36.45	50.00	-13.55		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

HL 0787	HL 3016	HL 5476	HL 5707				
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Full description is given in Appendix A.



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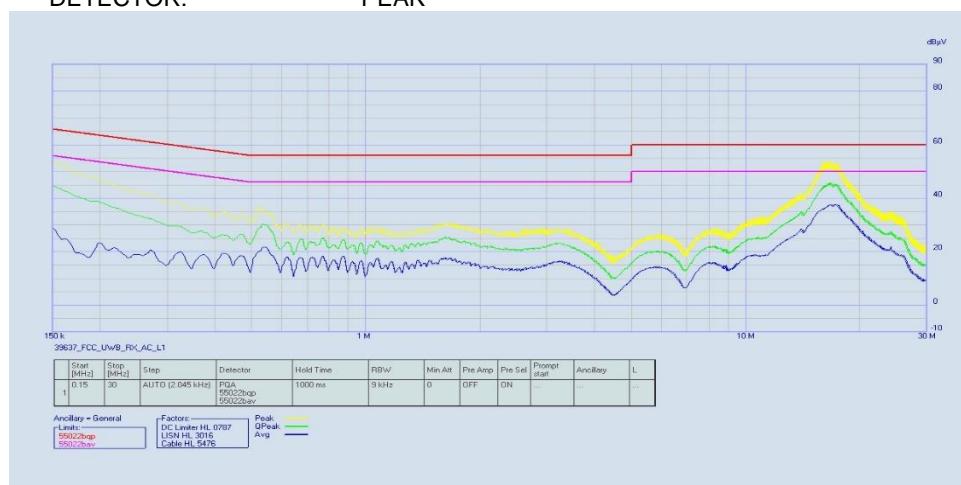
Report ID: VAYRAD_FCC_15.519.39637_Rev1

Date of Issue: 26-Oct-20

Test specification:	Section 15.107, RSS-Gen, Section 7.2, ICES-003, 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):	15-Sep-20		
Temperature: 24 °C	Relative Humidity: 47 %	Air Pressure: 1009 hPa	Power: 115 VAC, 60 Hz
Remarks:			

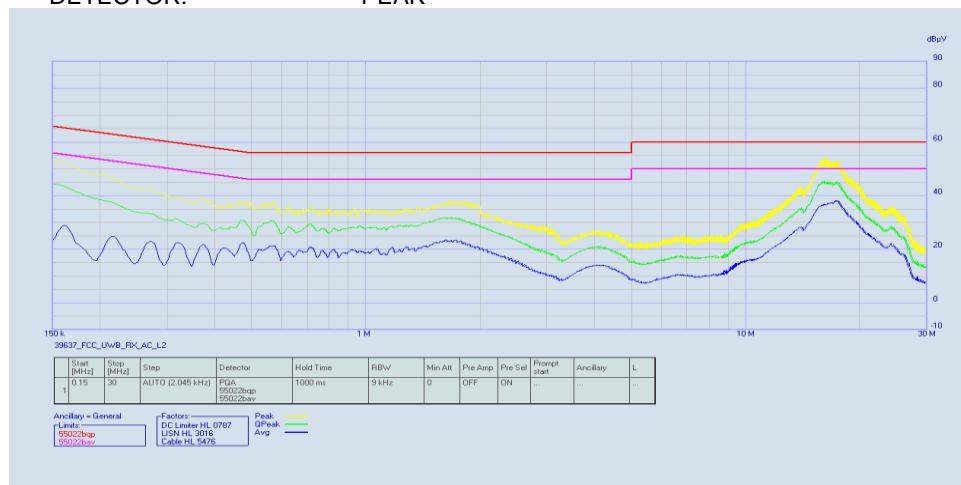
Plot 8.1.1 Conducted emission measurements

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



Plot 8.1.2 Conducted emission measurements

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





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Report ID: VAYRAD_FCC_15.519.39637_Rev1

Date of Issue: 26-Oct-20

Test specification: Section 15.109, RSS-Gen, Section 7.3, ICES-003, Radiated emission			
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode: Compliance		Verdict: PASS	
Date(s): 15-Sep-20 - 16-Sep-20			
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1004 hPa	Power: 5 VDC
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: $L_{mS2} = L_{mS1} + 20 \log(S_1/S_2)$, where S_1 and S_2 – standard defined and test distance respectively in meters.

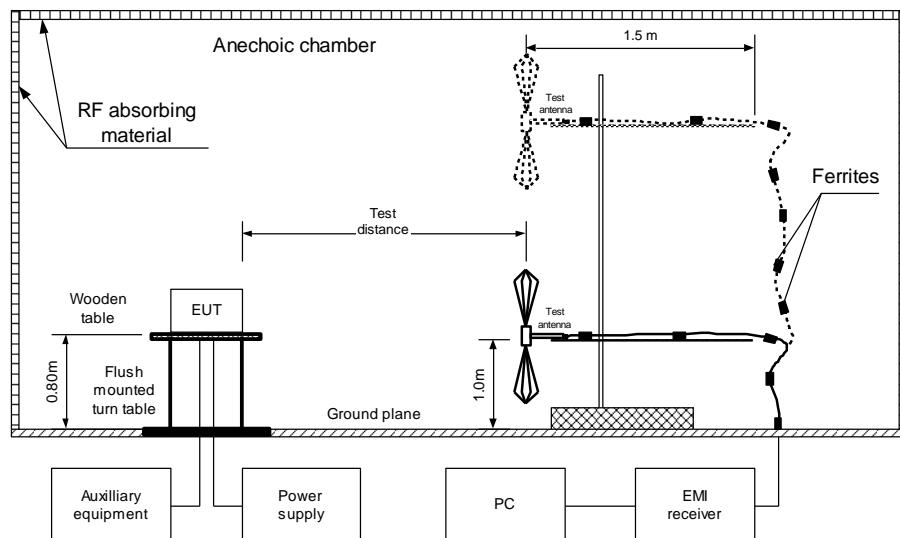
8.2.2 Test procedure for measurements in semi-anechoic chamber

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 biconical 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 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





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Report ID: VAYRAD_FCC_15.519.39637_Rev1

Date of Issue: 26-Oct-20

Test specification: Section 15.109, RSS-Gen, Section 7.3, ICES-003, Radiated emission	
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode: Compliance	Verdict: PASS
Date(s): 15-Sep-20 - 16-Sep-20	
Temperature: 25 °C	Relative Humidity: 57 %
Air Pressure: 1004 hPa	
Power: 5 VDC	
Remarks:	

Table 8.2.2 Radiated emission test results

EUT SET UP:

TABLE-TOP

LIMIT:

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*				
39.986	28.21	25.54	40.0	-14.46	Vertical	1.04	274	Pass
119.996	34.85	33.47	43.5	-10.03	Vertical	1.00	291	
142.308	31.30	25.09	43.5	-18.41	Vertical	1.02	174	
168.010	35.64	34.37	43.5	-9.13	Vertical	1.02	8	
280.000	34.27	32.41	46.0	-13.59	Horizontal	1.02	193	
319.997	42.68	41.88	46.0	-4.12	Horizontal	1.00	47	
360.001	40.44	39.30	46.0	-6.70	Horizontal	1.02	283	
400.008	38.33	36.65	46.0	-9.35	Horizontal	1.02	218	

TEST SITE:

SEMI ANECHOIC CHAMBER

TEST DISTANCE:

3 m

DETECTORS USED:

PEAK / AVERAGE

FREQUENCY RANGE:

1000 -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*				
1600.033	40.91	74.0	-33.09	33.73	54.0	-20.27	Vertical	2.24	294	Pass
1759.900	38.24	74.0	-35.76	31.23	54.0	-22.77	Horizontal	1.92	187	
1839.800	38.06	74.0	-35.94	30.09	54.0	-23.91	Horizontal	1.31	203	
1920.200	39.51	74.0	-34.49	32.08	54.0	-21.92	Horizontal	1.41	203	
3990.167	47.14	74.0	-26.86	25.39	54.0	-28.61	Vertical	1.02	0	
16640.067	51.30	74.0	-22.70	45.12	54.0	-8.88	Vertical	1.04	36	
33279.733	54.83	74.0	-19.17	45.92	54.0	-8.08	Horizontal	1.02	86	

*- Margin = Measured emission - specification limit.

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

Reference numbers of test equipment used

HL 3903	HL 4360	HL 4933	HL 4956	HL 5085	HL 5111		
HL 5288	HL 5669	HL 5670					

Full description is given in Appendix A.



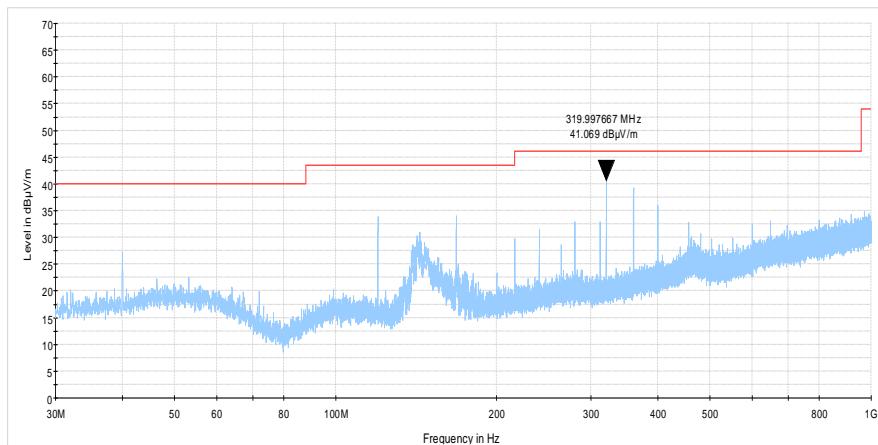
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Report ID: VAYRAD_FCC_15.519.39637_Rev1
Date of Issue: 26-Oct-20

Test specification: Section 15.109, RSS-Gen, Section 7.3, ICES-003, Radiated emission			
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode: Compliance			Verdict: PASS
Date(s): 15-Sep-20 - 16-Sep-20			
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1004 hPa	Power: 5 VDC
Remarks:			

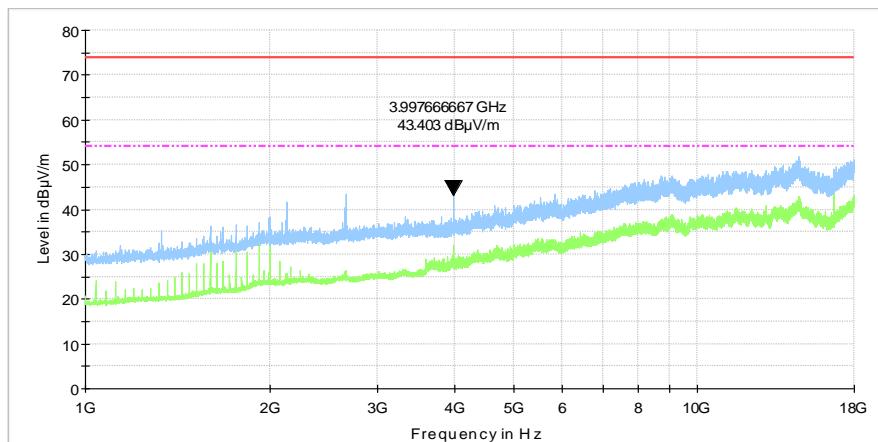
Plot 8.2.1 Radiated emission measurements in 30 - 1000 MHz range, vertical and horizontal antenna polarization

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



Plot 8.2.2 Radiated emission measurements in 1 - 18 GHz range, vertical and horizontal antenna polarization

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





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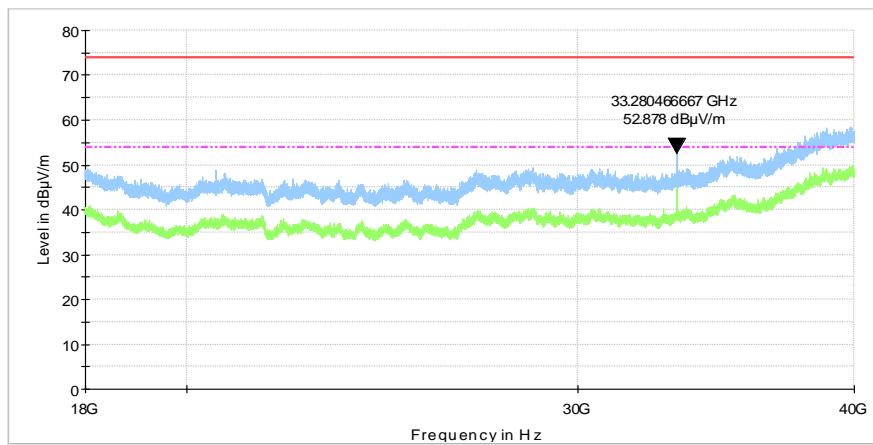
Report ID: VAYRAD_FCC_15.519.39637_Rev1

Date of Issue: 26-Oct-20

Test specification:	Section 15.109, RSS-Gen, Section 7.3, ICES-003, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	15-Sep-20 - 16-Sep-20		
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1004 hPa	Power: 5 VDC
Remarks:			

Plot 8.2.3 Radiated emission measurements in 18 - 40 GHz range, vertical and horizontal antenna polarization

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





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Report ID: VAYRAD_FCC_15.519.39637_Rev1

Date of Issue: 26-Oct-20

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	24-Feb-20	24-Feb-21
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A018 77	08-Oct-19	08-Oct-20
3016	LISN, Two-line V-network, 9 kHz to 30 MHz, (50 uH+5 Ohm), CISPR16-1, MIL-461E	Rohde & Schwarz	ESH 3-Z5	892239/00 2	09-Feb-20	09-Feb-21
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFL EX 102A	1226/2A	06-Apr-20	06-Apr-21
4011	Temp. & Humidity Meter, (-50 - +70) deg, (20 - 99)% RH	Mad Electronics	HTC-1	NA	12-Aug-20	12-Aug-21
4355	Signal and Spectrum Analyzer, 9 kHz to 7 GHz	Rohde & Schwarz	FSV 7	101630	09-Sep-20	09-Sep-21
4360	EMI Test Receiver, 20 Hz to 40 GHz.	Rohde & Schwarz	ESU40	100322	20-Jan-20	20-Jan-21
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATION	AHA-118	701046	06-Jan-20	06-Jan-21
4956	Active horn antenna, 18 to 40 GHz	COM-POWER CORPORATION	AHA-840	105004	29-Jan-20	29-Jan-21
5085	Attenuator, 4 dB, DC - 6 GHz, 1 W	Mini-Circuits	UNAT-4+	NA	22-May-20	22-May-21
5111	RF cable, 40 GHz, 5.5 m, K-type	Huber-Suhner	SF102EA/ 11SK/11S K/5500M M	502493/2E A	03-Aug-20	03-Aug-21
5112	RF cable, 40 GHz, 5.5 m, K-type	Huber-Suhner	SF102EA/ 11SK/11S K/5500M M	502494/2E A	19-Apr-20	19-Apr-21
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX- 8000E	00809	08-Feb-19	08-Feb-22
5372	MXE EMI receiver, 3 Hz to 44 GHz	Keysight Technologies	N9038A	MY572901 55	10-Aug-20	10-Aug-21
5476	Cable, BNC/BNC, 10.5 m	Western wire	MIL-C- 17G	NA	14-May-20	14-May-21
5669	Cable SF126EA/11N(x2)/3.0M, 18 GHz	Huber-Suhner	SF126EA	506775/12 6EA	23-Oct-19	23-Oct-20
5670	Cable SF126EA/11N(x2)/3M, 18 GHz	Huber-Suhner	SF126EA	506774/12 6EA	23-Oct-19	23-Oct-20
5707	EMI receiver	PMM / Narda	PMM 9010F	060WW91 101	22-Nov-19	22-Nov-21



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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 μ V to obtain field strength in dB μ V/m.



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

Frequency,	Measured antenna factor, dB _S /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, dB _S /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 dB_μV to obtain field strength in dB_μA/m.



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

Frequency, MHz	Measured antenna factor, dB/m
18000	5.1
18500	3.6
19000	2.2
19500	0.7
20000	0.7
20500	0.8
21000	0.5
21500	-1.3
22000	-2.1
22500	-2.0
23000	-1.6
23500	-2.9
24000	-2.3
24500	-2.6
25000	-1.8
25500	-1.2
26000	-0.5
26500	-1.2
27000	-0.1
27500	-1.0
28000	-0.7
28500	0.5

Frequency, MHz	Measured antenna factor, dB/m
29500	1.4
30000	2.9
30500	2.9
31000	2.9
31500	1.2
32000	0.7
32500	0.2
33000	-1.7
33500	-2.2
34000	2.3
34500	-1.1
35000	0.7
35500	-1.1
36000	0.1
36500	1.4
37000	3.7
37500	5.8
38000	6.6
38500	7.3
39000	6.5
39500	7.3
40000	7.1

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



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

Frequency, MHz	Antenna factor, dB/m
30	14.96
35	15.33
40	16.37
45	17.56
50	17.95
60	16.87
70	13.22
80	10.56
90	13.61
100	15.46
120	14.03
140	12.23

Frequency, MHz	Antenna factor, dB/m
160	12.67
180	13.34
200	15.40
250	16.42
300	17.28
400	19.98
500	21.11
600	22.90
700	24.13
800	25.25
900	26.35
1000	27.18

The antenna factor shall be added to receiver reading in dB μ V to obtain field strength in dB μ V/m.
above 1000 MHz

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 μ V to obtain field strength in dB μ V/m.



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**HL 5112 RF cable, 40 GHz, 5.5 m, K-type,
Huber-Suhner, SF102EA/11SK/11SK/5500MM, s/n 502494/2EA, HL 5112**

Set / Applied, MHz	Measured, dB	Uncertainty, dB
100	0.70	±0.07
200	0.99	±0.08
300	1.21	±0.08
500	1.55	±0.08
1000	2.18	±0.08
1500	2.67	±0.08
2000	3.09	±0.08
2500	3.46	±0.10
3000	3.80	±0.10
3500	4.12	±0.10
4000	4.41	±0.10
4500	4.69	±0.10
5000	4.95	±0.10
5500	5.20	±0.10
6000	5.45	±0.10
6500	5.68	±0.10
7000	5.91	±0.10
7500	6.13	±0.10
8000	6.34	±0.10
8500	6.56	±0.10
9000	6.76	±0.10
9500	6.95	±0.10
10000	7.16	±0.10
10500	7.33	±0.10
11000	7.51	±0.10
11500	7.68	±0.10
12000	7.85	±0.10
12500	8.02	±0.13
13000	8.17	±0.13
13500	8.31	±0.13
14000	8.46	±0.13
14500	8.61	±0.18
15000	8.76	±0.18
15500	8.91	±0.18
16000	9.07	±0.18
16500	9.22	±0.18
17000	9.36	±0.18
17500	9.51	±0.18
18000	9.66	±0.18
18500	9.81	±0.23
19000	9.95	±0.23
19500	10.10	±0.23

Set / Applied, MHz	Measured, dB	Uncertainty, dB
20000	10.25	±0.23
20500	10.38	±0.23
21000	10.52	±0.23
21500	10.67	±0.23
22000	10.84	±0.23
22500	11.00	±0.29
23000	11.10	±0.29
23500	11.20	±0.29
24000	11.32	±0.29
24500	11.42	±0.29
25000	11.59	±0.23
25500	11.70	±0.23
26000	11.85	±0.23
26500	11.97	±0.23
27000	12.07	±0.33
27500	12.17	±0.33
28000	12.26	±0.40
28500	12.38	±0.40
29000	12.50	±0.40
29500	12.63	±0.40
30000	12.75	±0.40
30500	12.82	±0.33
31000	12.93	±0.33
31500	13.09	±0.33
32000	13.22	±0.33
32500	13.35	±0.33
33000	13.48	±0.33
33500	13.60	±0.33
34000	13.72	±0.33
34500	13.80	±0.40
35000	13.92	±0.40
35500	14.01	±0.40
36000	14.12	±0.40
36500	14.23	±0.40
37000	14.34	±0.33
37500	14.44	±0.33
38000	14.57	±0.33
38500	14.72	±0.33
39000	14.82	±0.33
39500	14.94	±0.33
40000	15.08	±0.47



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HL 5111: RF cable

Huber-Suhner, SF102EA/11SK/11SK/5500MM, s/n 502493/2EA

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



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

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.



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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 1, 2, 15, 18 parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; registered by Industry Canada for electromagnetic emissions, file number IC 2186A-1 for OATS, certified by VCCI, Japan (the registration numbers are R-10808 for OATS, R-1082 for anechoic chamber, 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: 2019	Radio Frequency Devices
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications
ANSI C63.4: 2014	American National Standard for Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
RSS-220 Issue 1:2018	Devices Using Ultra-Wideband (UWB) Technology
RSS-Gen Issue 5: 2018	General Requirements and Information for the Certification of Radiocommunication Equipment
ICES-003: 2016, Issue 6	Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement



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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