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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, ICES-003 Issue 7:2020
FOR: Vayyar Imaging LTD. VMAKERPROUWB Model: VMPRO19EB4 FCC ID: 2AHIS-VMAKERPROUWB IC: 21498-VMAKERPROU
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Table of contents

1	Applicant information	3
2	Equipment under test attributes	3
3	Manufacturer information	3
4	Test details	3
5	Tests summary	4
6	EUT description	5
6.1	General information	5
6.2	Test configuration	5
6.3	Changes made in EUT	5
6.4	Transmitter characteristics	6
7	Transmitter tests according to 47CFR part 15 and RSS-220 requirements	7
7.1	Occupied bandwidth test	7
7.2	Peak power within 50 MHz bandwidth and Radiated power density	9
7.3	Radiated spurious emission measurements	16
7.4	Transmission duration requirements	33
7.5	Conducted emissions	35
8	Emission tests according to 47CFR part 15 subpart B requirements	38
8.1	Conducted emissions	38
8.2	Radiated emission measurements	41
9	APPENDIX A Test equipment and ancillaries used for tests	48
10	APPENDIX B Test equipment correction factors	49
11	APPENDIX C Measurement uncertainties	53
12	APPENDIX D Test laboratory description	54
13	APPENDIX E Specification references	55
14	APPENDIX F Abbreviations and acronyms	56



1 Applicant information

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Contact name:	Mr. Miro Baryakh

2 Equipment under test attributes

Product name:	VMAKERPROUWB
Product type:	UWB handheld device
Model(s):	VMPRO19EB4
Serial number:	DCWCFE03L219000247
Hardware version:	RevE
Software release:	MPR - SDK_3.0.26 ESP32 - OTA_2.4.0
Receipt date	03-May-22

3 Manufacturer information

Manufacturer name:	Vayyar Imaging LTD.
Address:	26 Shabazi street, Yehud, 5623000, Israel
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E-Mail:	miroslav.baryakh@vayyar.com
Contact name:	Mr. Miro Baryakh

4 Test details

Project ID:	46976
Location:	Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started:	15-May-22
Test completed:	23-May-22
Test specification(s):	FCC CFR 47 Part 15 subpart F, section 15.519 and subpart B,
	RSS-220 Issue 1, RSS-Gen Issue 5, ICES-003 Issue 7:2020



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 requirement	nts 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

The original EUT configuration was certified by FCC under FCC ID: 2AHIS-VMAKERPROUWB and by ISED under IC: 21498-VMAKERPROU. The following changes were made in the original equipment:

1. A minor layout modification in the supply network and modified data interface via ESP32 IC.

The relevant tests were performed to support Application for Class II permissive changes certification.

This test report supersedes the previously issued test report identified by Doc ID: VAYRAD_FCC_15.519.46976

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. H.N. Abayev, test engineer, EMC & Radio	15-May-22 – 23-May-22	איא
Reviewed by:	Mrs. S. Peysahov Sheynin, test engineer, EMC & Radio	15-Jun-22	
Approved by: Mr. M. Nikishin, group leader, EMC & Radio		06-Jul-22	ft o



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.



6.4 Transmitter characteristics

Туре о	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 (Eq	uipment	intended fo	r a varie	ety of	host sy	/stems)				
Assign	ed frequency rai	nge		3100 -	- 1060	0 MHz	2				
Operat	ing frequencies	for FCC		6000 ·	- 8500	MHz					
				٧	No						
l								continuous varia	ble		
Is trans	smitter output po	ower vari	able?		Vaa		_	stepped variable	with steps	ize	dB
					Yes	n	ninimum	RF power			dBm
						m	naximur	n RF power			dBm
Antenn	Antenna connection										
			ator	-امتط م		4 - u	V	late a rol	wi	ith temporary F	RF connector
	unique coupling		Star	idaru c	onnec	ctor v integral	V wi	thout tempora	ry RF connector		
Antenn	a/s technical ch	aracteris	tics								
Туре			Manufac	turer			Model	number		Gain	
PCB er	mbedded slot		Vayyar li	maging	Ltd.		NA up to 4dBi				
Transn	nitter aggregate	data rate	/s			No pa	yload				
	_						-				
Type of modulation				multi frequency transmission							
Modulating test signal (baseband)											
Transmitter power source											
Battery Nominal rated voltage											
V	V DC Nominal rated voltage 3.7 V										
	AC mains	Nomina	I rated vol	tage				Frequency	Hz		

Test specification:	est specification: Section 15.519(b), 15.503(d), Occupied bandwidth						
Test procedure: ANSI C63.10-2013, section 10.1							
Test mode:	Compliance	Vordiot	DV66				
Date(s):	15-May-22	veruici.	FASS				
Temperature: 24 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 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,	Modulation envelope reference points*,	Minimum allowed bandwidth,	
MHz	dBc	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:	fication: Section 15.519(b), 15.503(d), Occupied bandwidth					
Test procedure:	est procedure: ANSI C63.10-2013, section 10.1					
Test mode:	Compliance	Vordict	DV66			
Date(s):	15-May-22	verdict:	FA33			
Temperature: 24 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC			
Remarks: UWB						

Table 7.1.2 Occupied bandwidth test results

CENTER FREQUENCY fc: DETECTOR USED: RESOLUTION BANDWIDTH: VIDEO BANDWIDTH: MODULATION: MODULATION ENVILLOPE REFERENCE POINTS:			7362.875 MHz Peak hold 1 MHz 3 MHz Multifrequency 10 dBc			
Carrier frequency f _m , MHz	-10 dB envelope points, MHz		Occupied bandwidth, MHz	Limit, MHz	Margin, MHz	Verdict
7425.35	6300.10	8199.85	1899.75	500.0	1399.75	Pass

Reference numbers of test equipment used

HL 3903	HL 4933	HL 5372	HL 5902		

Full description is given in Appendix A.

Plot 7.1.1 Occupied bandwidth test result





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	Vardiate	DAGG		
Date(s):	15-May-22	verdict:	FA33		
Temperature: 24 °C	Relative Humidity: 55 %	Air Pressure: 1010 hPa	Power: 3.7 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	EIRP, dBm	Equivalent field strength limit	Equivalent field strength limit @
band, MHz		@ 3m, dB(μV/m) in 50 MHz*	1m, dB(μV/m) in 50 MHz**
3100 - 10600	0	95.2	104.7

* - Equivalent field strength @ 3m, $dB(\mu V/m) = EIRP$, dBm + 95.2 dB

** - Equivalent field strength @ 1m, $dB(\mu V/m) = EIRP$, 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(μ V/m) = EIRP, dBm + 95.2 dB

** - Equivalent field strength @ 1m, $dB(\mu V/m) = EIRP$, 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.



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	Vardiate	DASS		
Date(s):	15-May-22	verdict:	FA33		
Temperature: 24 °C	Relative Humidity: 55 %	Air Pressure: 1010 hPa	Power: 3.7 VDC		
Remarks: UBW					

Figure 7.2.1 Setup for carrier field strength measurements





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	Vardiate	DAGG		
Date(s):	15-May-22	verdict:	FA33		
Temperature: 24 °C	Relative Humidity: 55 %	Air Pressure: 1010 hPa	Power: 3.7 VDC		
Remarks: UBW					

Table 7.2.3 Peak power level contained within 50 MHz test results

ASSIGNED FREQU TEST SITE: TEST DISTANCE: EUT HEIGHT: DETECTOR USED: VIDEO BANDWIDTH TEST ANTENNA TY MODULATION:	ENCY RANGE: H: PE:	3100 – 10600 MHz Semi anechoic chamber 1 m 1.5 m Peak > Resolution bandwidth Horn Multi-frequency				
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
6302.08	76.00	-15.91	-12.79	0	-12.79	Pass
6350.15	75.69	-15.91	-13.10	0	-13.1	Pass
6401.37	76.46	-15.91	-12.33	0	-12.33	Pass
6449.90	76.34	-15.91	-12.45	0	-12.45	Pass
6498.55	76.84	-15.91	-11.95	0	-11.95	Pass
6549.18	76.58	-15.91	-12.21	0	-12.21	Pass
6603.20	76.62	-15.91	-12.17	0	-12.17	Pass
6649.05	76.50	-15.91	-12.29	0	-12.29	Pass
6700.03	76.45	-15.91	-12.34	0	-12.34	Pass
6749.85	76.24	-15.91	-12.55	0	-12.55	Pass
6799.90	76.63	-15.91	-12.16	0	-12.16	Pass
6901.17	74.18	-15.91	-14.61	0	-14.61	Pass
6950.28	74.62	-15.91	-14.17	0	-14.17	Pass
7000.57	70.77	-15.91	-18.02	0	-18.02	Pass
7049.57	70.17	-15.91	-18.62	0	-18.62	Pass
7100.78	71.94	-15.91	-16.85	0	-16.85	Pass
7151.65	70.49	-15.91	-18.30	0	-18.3	Pass
7200.77	71.82	-15.91	-16.97	0	-16.97	Pass
7252.22	70.01	-15.91	-18.78	0	-18.78	Pass
7300.52	69.32	-15.91	-19.47	0	-19.47	Pass
7351.73	69.92	-15.91	-18.87	0	-18.87	Pass
7403.07	72.18	-15.91	-16.61	0	-16.61	Pass
7451.13	70.51	-15.91	-18.28	0	-18.28	Pass
7498.27	72.20	-15.91	-16.59	0	-16.59	Pass
7551.47	72.76	-15.91	-16.03	0	-16.03	Pass
7601.75	72.05	-15.91	-16.74	0	-16.74	Pass
7648.18	67.10	-15.91	-21.69	0	-21.69	Pass
7699.05	68.80	-15.91	-19.99	0	-19.99	Pass
7748.75	71.00	-15.91	-17.79	0	-17.79	Pass
7799.15	71.83	-15.91	-16.96	0	-16.96	Pass
7849.08	74.61	-15.91	-14.18	0	-14.18	Pass

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	Vordict	DV66		
Date(s):	15-May-22	veruici.	FA33		
Temperature: 24 °C	Relative Humidity: 55 %	Air Pressure: 1010 hPa	Power: 3.7 VDC		
Remarks: UBW					

Table 7.2.4 Peak power level contained within 50 MHz test results (continuation)

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
7899.48	82.57	-15.91	-6.22	0	-6.22	Pass
7949.88	81.62	-15.91	-7.17	0	-7.17	Pass
8000.05	79.36	-15.91	-9.43	0	-9.43	Pass
8049.87	78.14	-15.91	-10.65	0	-10.65	Pass
8100.15	79.25	-15.91	-9.54	0	-9.54	Pass
8151.13	79.40	-15.91	-9.39	0	-9.39	Pass
8201.77	79.66	-15.91	-9.13	0	-9.13	Pass

*- Conversion factor=20 log (8/50) = -15.9 dB

**- EIRP, dBm= Equivalent field strength (8 MHz RBW), dB(µV/m) -104.7 dB- Conversion factor (8 to 50 MHz)

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

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	Vardiate	DASS		
Date(s):	15-May-22	verdict:	FA33		
Temperature: 24 °C	Relative Humidity: 55 %	Air Pressure: 1010 hPa	Power: 3.7 VDC		
Remarks: UBW					

Table 7.2.5 RMS-average emissions test results

ASSIGNED FREQUENCY RANGE: TEST DISTANCE: TEST SITE: INVESTIGATED FREQUENCY RANGE: DETECTOR USED: VIDEO BANDWIDTH: TEST ANTENNA TYPE: MODULI ATION:				3100 - 10600 MHz 1 m Semi anechoic chamber 6000 - 8500 MHz RMS (1 ms averaging time over bin) > Resolution bandwidth Double ridged guide (above 1000 MHz) Multi-frequency			
Frequency,	RMS Field strength,	RBW, MHz	Antenna	EIRP, dBm*	Limit,	Margin, dB**	Verdict
6299.87		1	Vertical	-60.46	-41.3	-19.16	Pass
63/0.68	/3.03	1	Vertical	-61.67	-41.3	-19.10	Pass
6400.08	43.03	1	Vertical	-01.07	-41.3	-20.37	Pass
6449 78	45.22	1	Vertical	-59.48	-41.3	-18 18	Pass
6499.25	41.00	1	Vertical	-63 70	-41.3	-22.4	Pass
6550.47	41.89	1	Vertical	-62.81	-41.3	-21 51	Pass
6600.06	41 92	1	Vertical	-62 78	-41.3	-21.61	Pass
6650.68	42.40	1	Vertical	-62.30	-41.3	-21	Pass
6699.33	41.83	1	Vertical	-62.87	-41.3	-21.57	Pass
6750.20	43.87	1	Vertical	-60.83	-41.3	-19.53	Pass
6800.02	45.41	1	Vertical	-59.29	-41.3	-17.99	Pass
6849.95	45.74	1	Vertical	-58.96	-41.3	-17.66	Pass
6899.65	45.01	1	Vertical	-59.69	-41.3	-18.39	Pass
6950.05	46.12	1	Vertical	-58.58	-41.3	-17.28	Pass
6999.75	46.17	1	Vertical	-58.53	-41.3	-17.23	Pass
7050.27	44.38	1	Vertical	-60.32	-41.3	-19.02	Pass
7100.55	46.66	1	Vertical	-58.04	-41.3	-16.74	Pass
7149.55	48.24	1	Vertical	-56.46	-41.3	-15.16	Pass
7200.07	47.61	1	Vertical	-57.09	-41.3	-15.79	Pass
7249.42	47.63	1	Vertical	-57.07	-41.3	-15.77	Pass
7300.52	49.35	1	Vertical	-55.35	-41.3	-14.05	Pass
7350.68	47.39	1	Vertical	-57.31	-41.3	-16.01	Pass
7400.73	50.29	1	Vertical	-54.41	-41.3	-13.11	Pass
7450.90	49.6	1	Vertical	-55.10	-41.3	-13.8	Pass
7501.18	50.95	1	Vertical	-53.75	-41.3	-12.45	Pass
7550.18	51.74	1	Vertical	-52.96	-41.3	-11.66	Pass
7600.00	53.30	1	Vertical	-51.40	-41.3	-10.1	Pass
7650.40	52.49	1	Vertical	-52.21	-41.3	-10.91	Pass
7000.33	54.07	1	Vertical	-50.63	-41.3	-9.33	Pass
7749.45	53.45	1	Vertical	-51.25	-41.3	-9.95	Pass
7800.20	53.46	1	Vertical	-51.24	-41.3	-9.94	Pass

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	Vardiate	DASS	
Date(s):	15-May-22	verdict:	FA33	
Temperature: 24 °C	Relative Humidity: 55 %	Air Pressure: 1010 hPa	Power: 3.7 VDC	
Remarks: UBW				

Frequency, MHz	RMS Field strength, dB(μV/m)	RBW, MHz	Antenna polarization	EIRP, dBm*	Limit, dBm	Margin, dB**	Verdict
7850.02	55.27	1	Vertical	-49.43	-41.3	-8.13	Pass
7899.60	54.30	1	Vertical	-50.40	-41.3	-9.1	Pass
7949.77	54.88	1	Vertical	-49.82	-41.3	-8.52	Pass
8000.17	54.43	1	Vertical	-50.27	-41.3	-8.97	Pass
8050.10	53.04	1	Vertical	-51.66	-41.3	-10.36	Pass
8100.03	53.36	1	Vertical	-51.34	-41.3	-10.04	Pass
8146.73	54.16	1	Vertical	-50.54	-41.3	-9.24	Pass
8199.90	52.93	1	Vertical	-51.77	-41.3	-10.47	Pass

*-EIRP, dBm = Field strength, $dB(\mu V/m) - 104.7 dB$

**- 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 15.519(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):	15-May-22	verdict.	FA33
Temperature: 24 °C	Relative Humidity: 55 %	Air Pressure: 1010 hPa	Power: 3.7 VDC
Remarks: UBW			

Plot 7.2.1 Peak power level with 8 MHz resolution bandwidth





With UWB





Test specification:	Section 15.519(c), (d), RSS-220	0 section 5.3.1(c), (d), Radiate	d spurious emissions	
Test procedure:	ANSI C63.10, sections 10.2, 10.3, Section 15.521			
Test mode:	Compliance	Vordiot	DASS	
Date(s):	15-May-22	verdict:	FA33	
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 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

	Field strength at 3 m, dB(μV/m)				
Frequency, MHz					
	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		73.8 - 63.0**			
1.705 - 30.0*		69.5			
30 - 88	NA	40.0	NA		
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: Lims₂ = Lims₁ + 40 log (S₁/S₂),

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	-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



Test specification:	Section 15.519(c), (d), RSS-220	0 section 5.3.1(c), (d), Radiate	d spurious emissions
Test procedure:	ANSI C63.10, sections 10.2, 10.	3, Section 15.521	
Test mode:	Compliance	Vardiate	DASS
Date(s):	15-May-22	verdict:	FA33
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 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(μ V/m) = EIRP, dBm + 95.2 dB

**** - Equivalent field strength @ 1m, $dB(\mu V/m) = EIRP$, 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^o 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^o 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^o 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.



Test specification:	Section 15.519(c), (d), RSS-220	0 section 5.3.1(c), (d), Radiate	d spurious emissions
Test procedure:	ANSI C63.10, sections 10.2, 10.	3, Section 15.521	
Test mode:	Compliance	Vardiate	DACC
Date(s):	15-May-22	verdict:	FA33
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC
Remarks:			

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









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	Vardiate	DACC	
Date(s):	15-May-22	verdict:	FA33	
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC	
Remarks:				

Figure 7.3.3 Setup for spurious emission field strength measurements above1000 MHz





Test specification:	Section 15.519(c), (d), RSS-220	0 section 5.3.1(c), (d), Radiate	d spurious emissions
Test procedure:	ANSI C63.10, sections 10.2, 10.	3, Section 15.521	
Test mode:	Compliance	Vordict	DVCC
Date(s):	15-May-22	verdict:	FA33
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC
Remarks:			

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

ASSIGNED FREQUENCY RANGE: TEST DISTANCE: TEST SITE: INVESTIGATED FREQUENCY RANGE: DETECTOR USED: VIDEO BANDWIDTH: RESOLUTION BANDWIDTH: 3100 - 10600 MHz 3 m Semi anechoic chamber 0.009 - 1000 MHz Peak ≥ Resolution bandwidth 1 kHz (9 kHz - 150 kHz) 9.0 kHz (150 kHz - 30 MHz) 120 kHz (30 MHz - 1000 MHz) Active loop (9 kHz - 30 MHz) Biconilog (30 MHz - 960 MHz) Multi-frequency

TEST ANTENNA TYPE:

MODULATION:

	Poak	Quasi-peak					Turn table	
Frequency, MHz	emission, dB(μV/m)	Measured emission, dB(μV/m)	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	position**, degrees	Verdict
239.982666	29.60	27.21	46.00	-18.79	Horizontal	1.00	-83	
319.992334	38.30	37.15	46.00	-8.85	Horizontal	1.50	-52	
399.979000	38.53	37.22	46.00	-8.78	Horizontal	1.20	-21	Page
479.997732	35.47	33.34	46.00	-12.66	Horizontal	1.00	-21	r ass
749.187531	32.63	26.57	46.00	-19.43	Horizontal	1.41	-145	
951.774660	35.18	28.86	46.00	-17.14	Vertical	1.00	-95	

*- Margin = Measured emission - specification limit.

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

TEST SITE: TEST DISTANCE: DETECTORS USED: FREQUENCY RANGE: RESOLUTION BANDWIDTH: SEMI ANECHOIC CHAMBER 3 m PEAK / AVERAGE 1000 MHz – 40 000 MHz 1000 kHz

Franciscon	Peak				Average			Antonno	Turn table	
MHz	Measured emission, dB(μV/m)	Limit, dB(µV/m)	Margin, dB*	Measured emission, dB(μV/m)	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	height, m	position**, degrees	Verdict
3236.1323	38.23	74	-35.77	30.32	54	-23.68	Horizontal	1.02	7	
4854.6176	46.93	74	-27.07	28.54	54	-25.46	Vertical	1.55	-29	Pass
8100.0000	70.64	74	-3.36	33.53	54	-20.47	Vertical	2.32	173	

*- Margin = Measured emission - specification limit.

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



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	Vardiate	DAGG		
Date(s):	15-May-22	verdict:	FA33		
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC		
Remarks:					

Table 7.3.5 Spurious emission field strength test results according to sections 15.519 and RSS-220

ASSIGNED FRE	ED 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: BMS with 1 ms averaging time					е				
VIDEO BANDWI	IDTH:				> Resolution bandwidth				
TEST ANTENNA	A TYPE:		Logperiodic (960 MHz – 1000 MHz)						
					Double ridged guide (above 1000 MHz)				
MODULATION:			Multi-frequency						
	Peak field	RMS field							

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 Parts						Pass	1		

*- EIRP, dBm = Field strength, $dB(\mu V/m) - 104.7 dB$

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

Table 7.3.6 Spurious emission field strength test results according to sections 15.519 and 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 Peak field **RMS** field Frequency RRW Antonna FIRP Limit Margin

MHz	strength, dB(μV/m	strength, dB(μV/m)	kHz	polarization	dBm*	dBm	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(μ V/m) – 95.2 dB

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

Reference numbers of test equipment used

HL 0446	HL 3903	HL 4360	HL 4933	HL 4956	HL 5209	HL 5288	HL 5902

Full description is given in Appendix A.



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	Vardiate	DASS		
Date(s):	15-May-22	verdict: PASS			
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC		
Remarks:					

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



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





Test specification:	tion: 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	Vardiate	DASS			
Date(s):	15-May-22	verdict:	FA33			
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC			
Remarks:						

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

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



TX with UWB





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	Vardiate	DASS			
Date(s):	15-May-22	Verdict: PASS				
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC			
Remarks:						

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

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





Frequency in GHz

TX without UWB



Test specification:	Section 15.519(c), (d), RSS-220	0 section 5.3.1(c), (d), Radiate	d spurious emissions
Test procedure:	ANSI C63.10, sections 10.2, 10.	3, Section 15.521	
Test mode:	Compliance	Vardiate	DACC
Date(s):	15-May-22	verdict:	FA33
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC
Remarks:			

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





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, 10.2	3, Section 15.521			
Test mode:	Compliance	Vordiot	DV66		
Date(s):	15-May-22	verdict:	FA33		
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC		
Remarks:					

Plot 7.3.6 Radiated emission measurements in 960 – 1000 MHz range according to Section 15.519 and RSS-220 (The Highest Limit)

TEST SITE: TEST DISTANCE: ANTENNA POLARIZATION: With UWB Semi anechoic chamber 1 m Vertical Without UWB



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ANTENNA POLARIZATION: With UWB

Horizontal Without UWB

L U	Keysight S	ipectrum Analyzer - Swept S	A							
Marker 1 999.960000000 MHz Trg: Free Run Avg Type Log-Per Aughtod: 11 Mkr 1 999.96 MHz 10 dBidly Ref 50.00 dBptV/m 33.845 dBptV/m 33.845 dBptV/m 00 0 0 0 0 00 0 0 0 0 0 00 0 0 0 0 0 0 00 0	L L	RF PRESEL 50 Q D	C CORREC		SENSE:INT SOUR	CE OFF AL	IGN AUTO		10:16:0	3 AM May 12, 2022
Industry Producting Water 900 10 dBidly Ref 50.00 dBpV/m 33.845 dBpV/m 0.00	Marker	1 999.9600000	NFE	PNO: Fast	Trig: Free F	Run	NAvg Type: Avg Hold:>	Log-Pwr 1/1	T	TYPE NWWWWW DET A NNNNN
100 33.845 dBjv/m 000 0.00000000000000000000000000000000000		PREAMP		IP-Gain:High	ertten. v u				Miles 1 00	
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30	-10.0									
30 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	-20.0									
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40 0 51art 0.96000 GHz #VBW 8.0 MHz* Stop 1.00000 GHz #Sweep 1.000 s (1001 pts) stop stop	-30.0									
Start 0.96000 CHz Stop 1.0000 CHz Stop 1.0000 CHz Stop 1.0000 CHz #VBW 8.0 MHz* #Sweep 1.000 s (1001 pts)										
Start 0.96000 GHz Stop 1.00000 GHz RF8es BW 1.0 MHz #VBW 8.0 MHz* #Sweep 1.000 s (1001 pts) 455 Stop 1.000 s (1001 pts)	-40.0									
Start 0.90000 GHZ Stop 1.00000 GHZ #Res BW 1.0 MHz #VBW 8.0 MHz* #Sweep 1.000 s (1001 pts) usp							,		Oton 4	
49G STATUS	start 0.9 #Res BV	0000 GHZ		#VB	W 8.0 MHz	,		#Swe	stop 1. ep 1.000 f	s (1001 pts)
	MSG						STATUS			,





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.	NSI C63.10, sections 10.2, 10.3, Section 15.521					
Test mode:	Compliance	Vardiate	DACC				
Date(s):	15-May-22	verdict:	FA33				
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC				
Remarks:							

Plot 7.3.7 Radiated emission measurements in 1000 – 1610 MHz range according to Section 15.519 and RSS-220 (The Highest Limit)



Plot 7.3.8 Radiated emission measurements in 1610 – 3000 MHz range according to Section 15.519 and RSS-220 (The Highest Limit)



Semi anechoic chamber Vertical and Horizontal 1 m Without UWB



Page 27 of 56



Test specification:	Section 15.519(c), (d), RSS-220	D section 5.3.1(c), (d), Radiate	d spurious emissions				
Test procedure:	ANSI C63.10, sections 10.2, 10.	NSI C63.10, sections 10.2, 10.3, Section 15.521					
Test mode:	Compliance	Vardiate	DACC				
Date(s):	15-May-22	verdict:	FA33				
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC				
Remarks:							

Plot 7.3.9 Radiated emission measurements in 3000 – 4750 MHz range according to Section 15.519 and RSS-220 (The Highest Limit)



Plot 7.3.10 Radiated emission measurements in 4750 – 5500 MHz range according to Section 15.519 and RSS-220 (The Highest Limit)



Semi anechoic chamber Vertical and Horizontal 1 m

Without UWB



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	Vordiot	DV66			
Date(s):	15-May-22	verdict:	FA33			
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC			
Remarks:						

Plot 7.3.11 Radiated emission measurements in 5500 – 10600 MHz range according to Section 15.519 and RSS-220 (The Highest Limit)

TEST SITE: TEST DISTANCE: ANTENNA POLARIZATION: With UWB Semi anechoic chamber 1 m Vertical and horizontal Without UWB





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	Vordiot	DV66			
Date(s):	15-May-22	verdict:	FA33			
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC			
Remarks:						

Plot 7.3.12 Radiated emission measurements in 10600 – 18000 MHz range according to Section 15.519 and RSS-220 (The Highest Limit)

TEST SITE: TEST DISTANCE: ANTENNA POLARIZATION: With UWB Semi anechoic chamber 1 m Vertical Without UWB





ANTENNA POLARIZATION: With UWB



Horizontal Without UWB





Test specification:	Section 15.519(c), (d), RSS-220	0 section 5.3.1(c), (d), Radiate	d spurious emissions
Test procedure:	ANSI C63.10, sections 10.2, 10.	3, Section 15.521	
Test mode:	Compliance	Vardiate	DAGG
Date(s):	15-May-22	verdict:	FA33
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC
Remarks:			

Plot 7.3.13 Radiated emission measurements in 18000 – 34500 MHz range according to Section 15.519 and RSS-220 (The Highest Limit)

TEST SITE: TEST DISTANCE: ANTENNA POLARIZATION: With UWB Semi anechoic chamber 1 m Vertical and horizontal Without UWB



Plot 7.3.14 Radiated emission measurements in 34500 – 40000 MHz range according to Section 15.519 and RSS-220 (The Highest Limit)

TEST SITE: TEST DISTANCE: ANTENNA POLARIZATION: With UWB



Semi anechoic chamber 1 m Vertical and horizontal Without UWB



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.	NSI C63.10, sections 10.2, 10.3, Section 15.521					
Test mode:	Compliance	Vardiate	DASS				
Date(s):	15-May-22	verdict:	FA33				
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1010 hPa	Power: 3.7 VDC				
Remarks:							

Plot 7.3.15 Radiated emission measurements in 1164 - 1240 MHz range according to Section 15.519 and RSS-220 (The Highest Limit)



Plot 7.3.16 Radiated emission measurements in 1559 - 1610 MHz range according to Section 15.519 and RSS-220 (The Highest Limit)









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	Vordict	DAGG		
Date(s):	15-May-22	verdict.	FA33		
Temperature: 24 °C	Relative Humidity: 52 %	Air Pressure: 1009 hPa	Power: 3.7 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 4933	HL 5372	HL 5902		
E all also a site the s		a va alla a A			

Full description is given in Appendix A.



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	Vordict	DAGG			
Date(s):	15-May-22	verdict.	FA33			
Temperature: 24 °C	Relative Humidity: 52 %	Air Pressure: 1009 hPa	Power: 3.7 VDC			
Remarks: UWB						

Plot 7.4.1 RF transmission duration in 100 ms period

Keysight Spectrum Analyz	er - Swept SA	1 1					
RF PRESEL	NFE	PNO: Fast ↔→ IFGain:High	Trig Delay100.2 ms Trig: Video #Atten: 0 dB	ALIGN AUTO Avg Type:	Log-Pwr	04:11:25 TR	PM May 11, 2022 ACE 1 2 3 4 5 TYPE WWWWW DET P NNNN
10 dB/div Ref 10	2.46 dBµV/m						
92.5							
82.5				-		÷	
72.5		2				2	
62.5							TRIGLVI
52.5 Alta data bendundure	and analysine of represent reaction which will be a produced by the register	hay a second heard growing and as you as growing the hear and second sec	en (personal and personal and	nin dan Bankara ang	n fransisi kana katalah filoma	naldaraata adalaada a	hander of the sector
42.5		2				2	-
32.5							
12.5							
12.0							
Center 7.5000000 Res BW 3.0 MHz	00 GHz	#VBW	/ 8.0 MHz		Sweep	100.0 ms	Span 0 Hz (10001 pts
SG				STATUS			



Test specification:	Section 15.207(a), RSS-Ger	n, Section 7.2, Conducted e	emission
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Vardiate	DASS
Date(s):	15-May-22	verdict:	FA33
Temperature: 24 °C	Relative Humidity: 50 %	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,	Class B lin	nit, dB(μV)
MHz	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.



Test specification:	Section 15.207(a), RSS-Ger	n. Section 7.2. Conducted e	emission
Test procedure:	ANSI C63.4. Section 13.1.3	., ••••••••	
Test mode:	Compliance		5400
Date(s):	15-May-22	Verdict:	PASS
Temperature: 24 °C	Relative Humidity: 50 %	Air Pressure: 1009 hPa	Power: 115 VAC, 60 Hz
Remarks:			







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

Frequency	Book	Q	uasi-peak			Average			-
Frequency,	emission	Measured	Limit,	Margin,	Measured	Limit,	Margin,		
MHz	dB(uV)	emission,			emission,			Line	Verdict
	u=(µ · ·)	dB(μV)	dB(μV)	dB*	dB(μV)	dB(μV)	dB*		
0.168	NA	47.75	65.04	-17.29	30.15	55.04	-24.89		
0.170	NA	48.06	64.94	-16.88	30.81	54.94	-24.13		
0.172	NA	47.65	64.84	-17.19	30.16	54.84	-24.68	14	Page
0.203	NA	45.77	63.48	-17.71	28.60	53.48	-24.88	L1	F 855
0.205	NA	45.68	63.40	-17.72	28.81	53.40	-24.59		
0.207	NA	45.14	63.31	-18.17	27.71	53.31	-25.60		
0.168	NA	44.42	65.04	-20.62	28.43	55.04	-26.61		
0.170	NA	45.20	64.94	-19.74	29.83	54.94	-25.11		
0.172	NA	45.13	64.84	-19.71	29.78	54.84	-25.06	1.2	Deee
0.174	NA	44.09	64.74	-20.65	28.17	54.74	-26.57	LZ	Pass
0.205	NA	41.90	63.40	-21.50	28.15	53.40	-25.25		
0.207	NA	41.70	63.31	-21.61	27.73	53.31	-25.58		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

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



Test specification:	Section 15.207(a), RSS-Ge	n, Section 7.2, Conducted	emission
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Vardiate	DASS
Date(s):	15-May-22	verdict:	FA33
Temperature: 24 °C	Relative Humidity: 50 %	Air Pressure: 1009 hPa	Power: 115 VAC, 60 Hz
Remarks:			

Plot 7.5.1 Conducted emission measurements









Test specification:	Section 15.107, RSS-Gen, S power port	Section 7.2, ICES-003, Con	ducted emission at AC
Test procedure:	ANSI C63.4, Sections 11.5 and	12.1.3	
Test mode:	Compliance	Vordiot	DAGG
Date(s):	23-May-22	verdict.	FA33
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.

T	able	8.1.	1 L	imits	for	conducted	emissions

Frequency,	Class B lin	nit, dB(μV)	Class A lin	nit, dB(μV)
MHz	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, 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.



Test specification:	Section 15.107, RSS-Gen power port	, Section 7.2, ICES-003, Con	ducted emission at AC
Test procedure:	ANSI C63.4, Sections 11.5 an	d 12.1.3	
Test mode:	Compliance	Vordict	DACC
Date(s):	23-May-22	verdict.	FA33
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: LIMIT: EUT OPERATING MODE: EUT SET UP: TEST SITE: DETECTORS USED: FREQUENCY RANGE: RESOLUTION BANDWIDTH:

AC mains Class B Receive TABLE-TOP SHIELDED ROOM PEAK / QUASI-PEAK / AVERAGE 150 kHz - 30 MHz 9 kHz

		0	Quasi-peak	-		Average			
Frequency, MHz	Peak emissio n, dB(μV)	Measured emission, dB(μV)	Limit, dB(µV)	Margin, dB*	Measure d emissio n, dB(μV)	Limit, dB(μV)	Margin, dB*	Line	Verdict
0.168	NA	47.75	65.04	-17.29	30.15	55.04	-24.89		
0.170	NA	48.06	64.94	-16.88	30.81	54.94	-24.13		
0.172	NA	47.65	64.84	-17.19	30.16	54.84	-24.68	14	Bass
0.203	NA	45.77	63.48	-17.71	28.60	53.48	-24.88	L1	F 855
0.205	NA	45.68	63.40	-17.72	28.81	53.40	-24.59		
0.207	NA	45.14	63.31	-18.17	27.71	53.31	-25.60		
0.168	NA	44.42	65.04	-20.62	28.43	55.04	-26.61		
0.170	NA	45.20	64.94	-19.74	29.83	54.94	-25.11		
0.172	NA	45.13	64.84	-19.71	29.78	54.84	-25.06	1.2	Deee
0.174	NA	44.09	64.74	-20.65	28.17	54.74	-26.57	LZ	F 455
0.205	NA	41.90	63.40	-21.50	28.15	53.40	-25.25		
0.207	NA	41.70	63.31	-21.61	27.73	53.31	-25.58		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

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



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	Vordiot	DACC	
Date(s):	23-May-22	verdict.	FA33	
Temperature: 24 °C	Relative Humidity: 47 %	Air Pressure: 1009 hPa	Power: 115 VAC, 60 Hz	
Remarks:	·	·	·	

Plot 8.1.1 Conducted emission measurements









Test specification:	Section 15.109, RSS-Gen, S	Section 7.3, ICES-003, Radi	ated emission	
Test procedure:	ANSI C63.4, Sections 11.6 and	12.1.4		
Test mode:	Compliance	Vordiot	DV66	
Date(s):	15-May-22	verdict:	FA00	
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1004 hPa	Power: 3.7 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,	Class B limit, dB(μV/m)		Class A limit, dB(µV/m)		
MHz	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: $\lim_{s_2} \lim_{s_3} \lim_{s_4} \lim_{s_4}$

where S1 and S2-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, 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 360⁰, 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 spurious emission field strength measurements within 30-1000 MHz





Test specification:	Section 15.109, RSS-Gen, S	Section 7.3, ICES-003, Radi	ated emission
Test procedure:	ANSI C63.4, Sections 11.6 and	12.1.4	
Test mode:	Compliance	Vardiate	DASS
Date(s):	15-May-22	verdict:	FA33
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1004 hPa	Power: 3.7 VDC
Remarks:			

Figure 8.2.2 Setup for spurious emission field strength measurements above1000 MHz





Test specification:	Section 15.109, RSS-Gen, S	Section 7.3, ICES-003, Radi	ated emission
Test procedure:	ANSI C63.4, Sections 11.6 and	12.1.4	
Test mode:	Compliance	Vordiot	DV66
Date(s):	15-May-22	verdict:	FA33
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1004 hPa	Power: 3.7 VDC
Remarks:			

Table 8.2.2 Radiated emission test results

EUT SET UP:TABLE-TOPLIMIT:BEUT OPERATING MODE:Stand-byTEST SITE:SEMI ANECHOIC CHAMBERTEST DISTANCE:3 mDETECTORS USED:PEAK / QUASI-PEAKFREQUENCY RANGE:30 MHz – 1000 MHzRESOLUTION BANDWIDTH:120 kHz								
-	Peak		Quasi-peak	-	•		Turn-table	
Frequency, MHz	emission, dB(μV/m)	Measured emission, dB(μV/m)	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	position**, degrees	Verdict
239.982666	29.60	27.21	46.00	-18.79	Horizontal	1.00	-83	
319.992334	38.30	37.15	46.00	-8.85	Horizontal	1.50	-52	
399.979000	38.53	37.22	46.00	-8.78	Horizontal	1.20	-21	Pass
479.997732	35.47	33.34	46.00	-12.66	Horizontal	1.00	-21	1 055
749.187531	32.63	26.57	46.00	-19.43	Horizontal	1.41	-145	

-17.14

TEST SITE: TEST DISTANCE: DETECTORS USED: FREQUENCY RANGE: RESOLUTION BANDWIDTH:

35.18

28.86

46.00

951.774660

SEMI ANECHOIC CHAMBER 3 m

1.00

-95

PEAK / AVERAGE 1000 -40000 MHz 1000 kHz

Vertical

KE90E0 H										
Freesworney		Peak			Average			Antonno	Turn table	
MHz	Measured emission, dB(μV/m)	Limit, dB(µV/m)	Margin, dB*	Measured emission, dB(μV/m)	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	height, m	position**, degrees	Verdict
3236.1323	38.23	74	-35.77	30.32	54	-23.68	Horizontal	1.02	7	
4854.6176	46.93	74	-27.07	28.54	54	-25.46	Vertical	1.55	-29	Pass
8100.0000	70.64	74	-3.36	33.53	54	-20.47	Vertical	2.32	173	

*- 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 5288	HL 5902		
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Full description is given in Appendix A.

Test specification:	Section 15.109, RSS-Gen, S	Section 7.3, ICES-003, Radi	ated emission
Test procedure:	ANSI C63.4, Sections 11.6 and	12.1.4	
Test mode:	Compliance	Vardiate	DASS
Date(s):	15-May-22	verdict:	FA33
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1004 hPa	Power: 3.7 VDC
Remarks:			

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





Test specification:	Section 15.109, RSS-Gen, S	Section 7.3, ICES-003, Radi	ated emission
Test procedure:	ANSI C63.4, Sections 11.6 and	12.1.4	
Test mode:	Compliance	Vordict	DV66
Date(s):	15-May-22	verdict:	FA33
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1004 hPa	Power: 3.7 VDC
Remarks:			

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

TEST SITE:
LIMIT:
TEST DISTANCE:

Semi anechoic chamber B 3 m



TX with UWB



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

Test specification:	Section 15.109, RSS-Gen, S	Section 7.3, ICES-003, Radi	ated emission
Test procedure:	ANSI C63.4, Sections 11.6 and	12.1.4	
Test mode:	Compliance	Vardiate	DAGG
Date(s):	15-May-22	verdict:	FA33
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1004 hPa	Power: 3.7 VDC
Remarks:			

Plot 8.2.3 Radiated emission measurements in 1 - 18 GHz range, vertical and horizontal antenna polarization

TEST SITE:
LIMIT:
TEST DISTANCE:

Semi anechoic chamber B 3 m



TX without UWB



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	Vardiate	DASS
Date(s):	15-May-22	verdict:	FA33
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1004 hPa	Power: 3.7 VDC
Remarks:			

Plot 8.2.4 Radiated emission measurements in 18 - 40 GHz range, vertical and horizontal antenna polarization





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-Feb-23
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	08-Feb-22	08-Feb-23
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFL EX 102A	1225/2A	07-Apr-22	07-Apr-23
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFL EX 102A	1226/2A	07-Apr-22	07-Apr-23
4360	EMI Test Receiver, 20 Hz to 40 GHz.	Rohde & Schwarz	ESU40	100322	13-Jan-22	13-Jan-23
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATI ON	AHA-118	701046	13-Jan-22	13-Jan-23
4956	Active horn antenna, 18 to 40 GHz	COM-POWER CORPORATI ON	AHA-840	105004	07-Mar-22	07-Mar-23
5209	Load Termination 50 Ohm, 0.5 W, DC- 1GHz	RELM	LT-50	NA	08-May-22	08-May-23
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX- 8000E	00809	24-Mar-22	24-Apr-25
5372	MXE EMI receiver, 3 Hz to 44 GHz	Keysight Technologies	N9038A	MY572901 55	16-Mar-22	16-Mar-23
5376	EXA Signal Analyzer, 10 Hz - 32 GHz	Keysight Technologies	N9010B	MY574704 04	01-Nov-21	01-Nov-22
5476	Cable, BNC/BNC, 10.5 m	Western wire	MIL-C- 17G	NA	22-May-22	22-May-23
5707	EMI receiver	PMM / Narda	PMM 9010F	060WW91 101	02-Feb-22	02-Feb-23
5902	RF cable, 18 GHz, 6.0m, N-type	Huber-Suhner	SF126EA/ 11N/11N/ 6000	NA	16-Jan-22	16-Jan-23

9 APPENDIX A Test equipment and ancillaries used for tests



10 APPENDIX B Test equipment correction factors

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

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 preamplimer), 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.

Measured antenna

factor, dBS/m -41.4

-41.4

-41.5

-41.5

-41.7

-42.1

-42.7

-44.2

-45.8

Measurement

uncertainty, dB

±1.0

±1.0

±1.0

±1.0

±1.0

±1.0

±1.0

±1.0

±1.0



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

Frequency,	Measured antenna factor, dBS/m	Measurement uncertainty, dB	Frequency,
10	-33.4	±1.0	2000
20	-37.8	±1.0	3000
50	-40.5	±1.0	4000
75	-41.0	±1.0	5000
100	-41.2	±1.0	10000
150	-41.2	±1.0	15000
250	-41.1	±1.0	20000
500	-41.2	±1.0	25000
750	-41.3	±1.0	30000
1000	-41.3	±1.0	

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



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

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

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



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.

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

MHZ		
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	

to obtain field strength in $dB\mu V/m$.



11 APPENDIX C Measurement uncertainties

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
Vertical polarization	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	Biconilog antenna: ± 5.3 dB
Vertical polarization	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

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

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 C63.2: 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	General Requirements and Information for the Certification of Radiocommunication Equipment
with_amendment_1_2: 2021	
ICES-003: 2020, Issue 7	Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement



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(uV/m)	decibel referred to one microvolt per meter
dB(uA)	decibel referred to one microampere
	direct current
FIRP	equivalent isotropically radiated power
FRP	effective radiated power
FUT	equipment under test
F	frequency
г СН7	digabertz
GND	around
U	ground boight
	height
	hermoniaboratories
HZ	
ĸ	
KHZ	KIIOnertz
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
Тх	transmit
V	volt
ŴB	wideband
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