

Test specification:	Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions						
Test procedure:	ANSI C63.10, sections 6.5, 6.6						
Test mode:	Compliance	Vardiate	DAGG				
Date(s):	08-Jul-24 - 11-Jul-24	verdict:	PASS				
Temperature: 24 °C	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3.6 VDC				
Remarks:							



TEST SITE: TEST DISTANCE:	Sem 3 m	Semi anechoic chamber 3 m					
MultiView = Sj RefLevel 80.00 dB/ Att Input TOF inputs "Cable HLS	Pectrum         RBW         (CISPR)         1 MF           V/m         • RBW         (CISPR)         1 MF           0.db         • SWT         500 ms         • VBW         3 MF           1.AC         PS         On         Notch         C           0.2', "Cable HL3903","H-4933"         • C         • C         • C	tz tz Mode Auto Sweep Iff	Frequency 2.7261000 GHz				
1 Frequency Sweep	74,023 (8) 7/8		M1[1] 47.26 dBµV/m -2.72589520 GHz				
20 dByV/m							
50 d8µV/m	H2 54.000 dBµV/m	M1					
40 d8µV/m	Addy of the second seco		Webstrates and the second states and the sec				
30 dbjuv/m							
10 dBµV/m							
0 dBµV/m							
-10 dBµ/v/m							
CF 2.7261 GHz	1001 pts	500.0 kHz/	Span 5.0 MHz 2024-07-08 Ref Level RBW				
11:32:11 AM 07/08	/2024	-reasuring	** 11:32:10				

#### Plot 7.6.15 Radiated emission measurements at the 3 harmonic of high carrier frequency

TEST SITE	: ANCE:		Sen 3 m	ni aneo	choic (	chamb	ber		
	MultiView Sp Ref Level 80.00 db; Att Input TDF Input "Cable HL33	Dectrum AV/m • F 0 dB • SWT 500 ms • 1AC PS 0n N 903", "Cable HL5902", "HL49	NBW (6dB)1MH NBW 3MH Jotch 0 933°	z z Mode Auto : ff	Sweep		Fre	quency 2.74	• 47000 GHz
	1 Frequency Sweep							M1[1]	1Pk Max 47-16 dBuV/m
		74.000 dBu //m						2.7	44579840 GHz
	/u dbu//m								
	60 d8µV/m								
		H2 54.00	dBµV/m						
	S0 d8µV/m								
	40 d8µV/m								
	an tang biya na shi na shuka a	المعتله ومسقدته والمعاودة وال						أسعتو فيتعلقها فيعاس	un de las destas annais
	30 dBµiV/m								
	20 d8µV/m								
	10 d8µV/m								
	0 d8µV/m								
	-10 dBµV/m								
	CE 2 7447 CH*		20001 pt		50	0.0 kH+/			Spap 5.0 Miliz
	0 20 10 012		50001 pt	,	- Measuring		2024-07	08 Ref Level	RBW
	01:28:18 PM 07/08	/2024					13:28	17	•



Test specification:	Section 15.247(d), RSS-247	section 5.5, Radiated sput	rious emissions
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Vardiate	DAGG
Date(s):	08-Jul-24 - 11-Jul-24	veraici.	FA33
Temperature: 24 °C	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			



TEST SITE: TEST DISTAN	ICE:	Semi anecho 3 m	ic chamber	
Mul Ref Att Input TOF B	tiView Spectrum Level 90.00 dBμV/m • RBW 0 dB • SWT 500 ms • RBW at 1AC PS 0n Noto nput: "Cable HL5902","Cable HL3903","HL4933	(CISFR) 1 MHz 3 MHz Mode Auto Sweep Off	Fr	equency 4.5435000 GHz
	RI 74.000 dBuy/m			M1[1] 44.48 dBµV/m 4.54314540 GHz
70 d8	µV/m			
60 d8	µV/m			
50 dB	µV/m H2 54.000 de	µV/m M1		
40 d8	uv/m	have been a second and a second a	and a second designed and the second	
30 d8	IV/m			an a
20 d8	uv/m			
10 dB	JV/m			
o dBµr	V/m			
-10 di	3µN/m			
	E42E CIL:	1001 min	500.0 kHz/	Come E Citeri
<u>CF 4</u> .	5435 GHZ	1001 pts	500.0 KH2/	7-08 Ref Level RBW
11:27	:30 AMI 07/08/2024	NIC NIC	11:5	7:29 • •

#### Plot 7.6.17 Radiated emission measurements at the 7 harmonic of mid carrier frequency

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m

Ref Level 80.00 dBµk Att 0 Input 1 IDE Input 1 Cable H 59	/m dB = SWT 500 m AC PS 0 02". "Cable HI 3903"	RBW (CISPR)     VBW     Notch     'HL4933"	MHz Mode Aut Off	to Sweep		Fn	equency 6.3	509000 G
Frequency Sweep		, 104555					MILLI	1Pk Ma 47.96 dBuV
							6	36118970 0
70 d8µV/m								
60 d8uV/m								
S0 d8µV/m				MI				
		- land and and the			- wex-delively-	Mondalin		
40 dbµV/m								and a constrained
30 d8uV/m								
20 d8µV/m								
10 d8pv/m								
0 d8µV/m								
-10 dBµV/m								
CF 6.3609 GHz		1001	pts	50	0.0 kHz/			Span 5.0

12:45:10 PM 07/08/2024



Test specification:	Section 15.247(d), RSS-247	section 5.5, Radiated spu	rious emissions
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Vardiate	DASS
Date(s):	08-Jul-24 - 11-Jul-24	verdict.	FA33
Temperature: 24 °C	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			



TEST SITE: TEST DISTANCE:				Semi anechoic chamber 3 m						
										-
	MultiView Ref Level 80.00 Att Input TDF Input1 "HL493	Spectrum 0 dBµV/m 0 dB • S <sup>1</sup> 1 AC Pf 3","Ceble HL59	R     R     WT 500 ms      V     S     On N     N     02","Cable HL39	BW (6dB)1MH BW 3MH otch 0 03*	z Mode Auto ř	Sweep		Fn	equency 7.2	• 184000 GHz
	70 d8µV/m	seb							M1[1] 7	<ul> <li>1Pk Max</li> <li>51.71 dBμV/m</li> <li>21825510 GHz</li> </ul>
	60 d8µV/m				M1					
	50 d8µV/m	an a	warding	and the second second	urana kau	and a second		ange'y de hanne fig with the second	r jangstar migrander mi	ger Walassig Stor Incessioned
	30 d8µV/m									
	20 d8µV/m									
	0 d8µV/m									
	-10 dBµV/m									
	CF 7.2184 GHz			1001 pts		- Measuring	0.0 kHz/	2024-03 15:4	7-08 Ref Level	Span 5.0 MHz
0	3:46:29 PM 07	/08/2024								

#### Plot 7.6.19 Radiated emission measurements at the eighth harmonic of mid carrier frequency

	TEST SITE TEST DIST	: ANCE:	Semi ane 3 m	choic chamber	
MultiView         Spectrum           Ref Level 80.00 db;k/m         # F           Att         0 db e SWT 500 ms + V           Input         1 AC - PS         DOn	XBW (CISPR) 1 MHz 78W 3 MHz Mode Auto 5 Worldh Off	weep	Frequency 7.2696000 GHz	MultiView         Spectrum           RefLevel 8000 83///n         @ BW (CISPA) 1/Hg Att         @ BW St # VBW         2/Hg Mode /Ltb Sweep         Frequency 7.2696000           Trput         1/40 Pb         Node /Ltb Sweep         Frequency 7.2696000	GHz
If Enclarativy Structury     If Enclarativy Structury     If Adjuv/In     In     Adjuv/In     In	20 (lipt/)m - 41		<u>#151</u> , Мос 90,70 Фру/л 7,26935020 Фк 7,26935020 Фк 9,26935020 Фк	Interpretative         Interpr	View 3µV/m 30 GHz
20 dbp///m				2: diμ/h	
CF 7.2696 GHz	1001 pts	500.0 kHz/	Span 5.0 MHz 2024-07-08 Ref Level RBW 10:29:16 • •	CF 7.2696 GHz 1001 pts 500.0 HHz/ Span 52 10:33:90 AM 07/08/2024	0 MHz



Test specification:	Section 15.247(d), RSS-247	section 5.5, Radiated sput	rious emissions
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Vardiate	DAGG
Date(s):	08-Jul-24 - 11-Jul-24	veraici.	FA33
Temperature: 24 °C	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

#### Plot 7.6.20 Radiated emission measurements at the eighth harmonic of high carrier frequency



#### Plot 7.6.21 Radiated emission measurements at the 9 harmonic of low carrier frequency

	TEST SI TEST DI	TE: STANCE:	Semi an 3 m	echoic chamber			
MultiView Spectrum Ref Level 80.00 dbuVm	RBW (6dB)1MHz		<b>*</b>	MultiView Spectrum	RBW (CISPR) 1 MHz		<b>*</b>
Att 0 d8 • SWT 500 ms •     Input 1 AC PS 0n     TDF Input1 "HL4933","Cable HL5902","Cable HL	VBW 3 MHz Mode Auto Notch Off 3903*	Sweep	Frequency 8.1207000 GHz	Att 0 d8 SWT 5 s     Input 1 AC PS 0n     TDF Input1 "HL4933","Cable HL5902","Ci	VBW 3 MHz Mode Auto Sv     Notch Off able HL3903*	reep	Frequency 8.1207000 GHz
1 Frequency Sweep			●1Fk Max M1[1] 58.30 dBµV/m 8.12123450 GHz	1 Frequency Sweep			● 1CA View M1[1] 53.45 dBµV/m 8.12088480 GHz
70 d8µv/m-		193		70 d8µV/m 60 d8µV/m			
50 dBuV/m			Annual L	50 d8µV/m		M1	
dicensenting and a state of the				40 d8µV/m			
30 d8µV/m				30 d8µV/m			
20 dBµV/m				20 d8µV/m			
10 dBµV/m				10 d8µV/m			
0 dBµV/m				0 dBµV/m-			
-10 dBµ///m-				-10 dBµV/m-			
CF 8.1207 GHz	1001 pts	500.0 kHz/	2024-07-08 Ref Level RBW	CF 8.1207 GHz	1001 pts	500.0 kHz/	2024-07-08 Ref Level RBW
03:48:34 PM 07/08/2024			15:48:34	03:51:19 PM 07/08/2024			15:51:19



Test specification:	Section 15.247(d), RSS-247	section 5.5, Radiated sput	rious emissions
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Vardiate	DASS
Date(s):	08-Jul-24 - 11-Jul-24	veraici.	FA33
Temperature: 24 °C	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

#### Plot 7.6.22 Radiated emission measurements at the 9 harmonic of mid carrier frequency



#### Plot 7.6.23 Radiated emission measurements at the 9harmonic of high carrier frequency

#### TEST SITE: TEST DISTANCE:

Semi anechoic chamber



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Test specification:	Section 15.247(d), RSS-247 section 5.5, Emissions at band edges			
Test procedure:	ANSI C63.10, section 7.8.6			
Test mode:	Compliance	Vardiate		
Date(s):	08-Jul-24 - 11-Jul-24	verdict.		
Temperature: 25 °C	Relative Humidity: 47 %	Air Pressure: 1003 hPa	Power: 3.6 VDC	
Remarks:				

#### 7.7 Band edge radiated emissions

#### 7.7.1 General

This test was performed to measure emissions, radiated from the EUT at the assigned frequency band edges. Specification test limits are given in Table 7.7.1.

#### Table 7.7.1 Band edge emission limits

Assigned frequency,	Attenuation below	Field strength at 3 m within restricted bands, $dB(\mu)$		
MHz	carrier*, dBc	Peak	Average	
902.0 - 928.0				
2400.0 - 2483.5	20.0	74.0	54.0	
5725.0 - 5850.0				

\* - Band edge emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth.

#### 7.7.2 Test procedure

- **7.7.2.1** The EUT was set up as shown in Figure 7.7.1, energized normally modulated at the maximum data rate with its hopping function disabled and its proper operation was checked.
- 7.7.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.
- **7.7.2.3** The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set wider than 1 % of the frequency span.
- **7.7.2.4** The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.
- **7.7.2.5** The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.7.2 and associated plots and referenced to the highest emission level measured within the authorized band.
- **7.7.2.6** The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.
- **7.7.2.7** The above procedure was repeated with the frequency hopping function enabled.

#### Figure 7.7.1 Band edge emission test setup





Test specification:	Section 15.247(d), RSS-247 section 5.5, Emissions at band edges			
Test procedure:	ANSI C63.10, section 7.8.6			
Test mode:	Compliance	Vordiot		
Date(s):	08-Jul-24 - 11-Jul-24	verdict:		
Temperature: 25 °C	Relative Humidity: 47 %	Air Pressure: 1003 hPa	Power: 3.6 VDC	
Remarks:				

#### Table 7.7.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE:	902-928 MHz
DETECTOR USED:	Peak
MODULATION:	LoRa
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	≥ RBW

#### Bitrate 980 bps

Frequency, MHz	Band edge emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Frequency hop	ping disabled					
902.3	-17.4	27.2	44.6	20.0	24.6	Deee
914.9	-49.2	21.2	76.4	20.0	56.4	F 855
Frequency hopping enabled						
902.3	-20.3	27.7	48.0	20.0	28.0	Dooo
914.9	-50.8	21.1	78.5	20.0	58.5	rd\$\$

#### Bitrate 5470 bps

Frequency, MHz	Band edge emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Frequency hop	ping disabled					
902.3	-22.2	27.7	49.9	20.0	29.9	Deee
914.9	-51.4	21.1	79.1	20.0	59.1	Fass
Frequency hopping enabled						
902.3	-22.6	27 F	50.1	20.0	30.1	Deee
914.9	-48.0	27.5	75.5	20.0	55.5	Fass

\*- Margin = Attenuation below carrier – specification limit.

#### Reference numbers of test equipment used

	HL 3818	HL 5644	HL 4136	HL 3768				
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Full description is given in Appendix A.



Test specification:	Section 15.247(d), RSS-247 section 5.5, Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Vordiot	
Date(s):	08-Jul-24 - 11-Jul-24	verdict:	
Temperature: 25 °C	Relative Humidity: 47 %	Air Pressure: 1003 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.7.1 The highest band edge emission at low carrier frequency with hopping function disabled



Bit rate 980 bps

Bit rate 5470 bps



#### Plot 7.7.2 The highest band edge emission at high carrier frequency with hopping function disabled

Bit rate 980bps

Bit rate 5470 bps



Test specification:	Section 15.247(d), RSS-247 section 5.5, Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Vordiot	
Date(s):	08-Jul-24 - 11-Jul-24	Verdict	•
Temperature: 25 °C	Relative Humidity: 47 %	Air Pressure: 1003 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.7.3 The highest band edge emission at low carrier frequency with hopping function enabled



#### Plot 7.7.4 The highest band edge emission at high carrier frequency with hopping function enabled



Bit rate 980bps

Bit rate 5470 bps



Test specification:	FCC Section 15.203/ RSS-Gen, Section 7.1.4, Antenna requirement			
Test procedure:	Visual inspection / supplier declaration			
Test mode:	Compliance	Vordiot		
Date(s):	08-Jul-24 - 11-Jul-24	verdict:		
Temperature: 25 °C	Relative Humidity: 47 %	Air Pressure: 1003 hPa	Power: 3.6 VDC	
Remarks:				

#### 7.8 Antenna requirements

The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.

The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.8.1.

#### Table 7.8.1 Antenna requirements

Requirement	Rationale	Verdict
The transmitter antenna is permanently attached	Visual inspection	
The transmitter employs a unique antenna connector	NA	Comply
The transmitter requires professional installation	NA	



# 8 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	29-Feb-24	28-Feb-25
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 62	17-Oct-23	17-Oct-24
3434	Test Cable , DC-18 GHz, 1.5 m, SMA - SMA	Mini-Circuits	CBL-5FT- SMSM+	25683	06-May-24	06-May-25
3768	Attenuator, N-type, 20 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW- N20W5+	NA	09-Aug-23	09-Aug-24
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	23-Jul-23	23-Jul-24
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFL EX 102A	1226/2A	06-May-24	06-May-25
4136	Shield Box	TESCOM CO., LTD	TC-5916A	5916A000 137	20-May-24	20-May-25
4339	High pass Filter, 50 Ohm, 1000 to 18000 MHz, SMA-FM / SMA-M	Micro-Tronics	HPM5011 5-02	001	21-Jun-23	21-Jun-25
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATI ON	AHA-118	701046	20-Feb-24	20-Feb-25
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX- 8000E	00809	24-Mar-22	24-Mar-25
5622	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini Circuits	BW- N20W5+	NA	10-Aug-23	10-Aug-24
5644	Cable, 50 Ohm, DC to 18 GHz, 1.8 m, SMA/SMA	Mini Circuits	CBL-6FT- SMSM+	NA	06-May-24	06-May-25
5902	RF cable, 18 GHz, 6.0m, N-type	Huber-Suhner	SF126EA/ 11N/11N/ 6000	NA	19-Nov-23	19-Nov-24
7546	Power supply 60VDC/12.5A	Agilent Technologies	N5747A	US25F676 2C	29-May-24	29-May-25
7585	EMI Test Receiver, 1 Hz to 44 GHz	Rohde & Schwarz	ESW44	103130	21-Sep-23	21-Sep-24



## 9 APPENDIX B Test equipment correction factors

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  $dB\mu V$  to obtain field strength in  $dB\mu V/m$ . above 1000 MHz

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

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

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

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 $dB\mu A/m$ .
--





#### 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<sub> $\mu$ </sub>V to obtain field strength in dB<sub> $\mu$ </sub>V/m.



### 10 APPENDIX C Measurement uncertainties

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

Test description	Expanded uncertainty
Conducted carrier power at RF antenna connector	Below 12.4 GHz: ± 1.7 dB
	12.4 GHz to 40 GHz: ± 2.3 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
Occupied bandwidth	± 8.0 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB
	150 kHz to 30 MHz: ± 3.8 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
Mention la classication	Double ridged horn antenna: $\pm$ 5.3 dB
vertical polarization	Biconilog antenna: ± 6.0 dB
	Biconical antenna: ± 5.7 dB
	Log periodic antenna: $\pm$ 6.0 dB
	Double ridged horn antenna: $\pm$ 6.0 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.



### 11 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 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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Person for contact: Mr. Michael Nikishin, EMC&Radio group manager



## 12 APPENDIX E Specification references

FCC 47CFR part 15: 2022	Radio Frequency Devices
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
RSS-247 Issue 3: 2023	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence- Exempt Local Area Network (LE-LAN) Devices
RSS-Gen Issue 5 with_amendment_1_2: 2021	General Requirements and Information for the Certification of Radiocommunication Equipment





### 13 APPENDIX F Abbreviations and acronyms

٨	omnoro
A	allipere
AC	
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	decibel referred to one microampere
DCŰ	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	around
Н	height
н	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
	local oscillator
m	meter
MHz	merchertz
min	minute
mm	millimeter
me	millisecond
1115	microsocond
μ5 ΝΔ	not applicable
	nor applicable
	apon area test site
OATS O	Obm
52	
	pulse modulation
P3	power supply
ppm	part per million (10°)
	quasi-peak
KF	radio frequency
rms	root mean square
RX	receive
s T	second
	temperature
IX	
V	VOIL
vvВ	wideband



# 14 APPENDIX G Manufacturer's declaration

# **Model Difference Letter**

We, the undersigned hereby declare, that the following equipment:

Product Name: Allegro Cellular

Model: PIT\_Unit X

Is electrically equal to:

Models: PIT Unit X

### Their Difference is:

These is a subset product of the product *Allegro Cellular*. For this product some components were added/replaced because they are required for the functionality of their specific application. (please relate to *Appendix A* for further details). The subset product is identical externally which includes mechanical housing dimensions and labelling (please relate to *Appendix B* for further details).



# Point of contact:

Date:

26/09/2024

Signature:

Negreanu Vily

Name: Negreanu Vily

Company Name: Arad Technologies Ltd.

# Appendix A

The following equipment:

Brand/Item	Type/Model	Short Product description
Allegro Cellular	PIT_Unit X	Spread Spectrum Transceiver

# Is a **Superset** to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
Allegro Cellular	PIT Unit X	Spread Spectrum Transceiver



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# External and internal photos of each Model:

# PIT Unit X















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# PIT\_Unit X











# Appendix B



Allegro Cellular PIT\_Unit X, is a battery-operated radio module designed for automated water meter reading. The Allegro cellular is capable of reading water consumption data from residential and commercial water meters equipped with an Encoder or Solid-State Register.

# Subset product of: Allegro Cellular

PIT Unit X has a subset product which is listed in this document. The subset product has the same enclosure and the same electronic card as its superset product but for the subset product certain components are added to the electronic card compared to the corresponding superset product. The components that are added are not changing the radio functions. The reason for adding these components is because they are required for the functionality of their specific application.



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