HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO: FCC CFR 47 Part 15 subpart C, section 15.231
RSS-210 issue 9 Annex A

FOR:

Triple Plus Ltd.

CLM Repeater oval US V2

Model: CLM-RNAMAP-3-02

FCC ID: 2AFOIRPT

IC: 20798-RPT

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1 Applicant information

Client name:	Triple Plus Ltd.
Address:	5 Hamada street, Yokneam 2069200, Israel
Telephone:	+972-72-22-11-370
Fax:	+972-4-959-3991
E-mail:	yuval.abraham@tripleplus.io
Contact name:	Mr. Yuval Abraham

2 Equipment under test attributes

Product name:	CLM Repeater oval US V2
Product type:	Repeater
Model(s):	CLM-RNAMAP-3-02
Serial number:	Prototype
Hardware version:	1.1
Software release:	3.0.2.0
Receipt date	15-Sep-19

3 Manufacturer information

Manufacturer name:	Triple Plus Ltd.
Address:	5 Hamada street, Yokneam 2069200, Israel
Telephone:	+972-72-22-11-370
Fax:	+972-4-959-3991
E-Mail:	yuval.abraham@tripleplus.io
Contact name:	Mr. Yuval Abraham

4 Test details

Project ID:	34184
Location:	Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started:	06-Oct-19
Test completed:	15-Oct-19
Test specification(s):	FCC 47CFR part 15, subpart C, §15.231; RSS-210 issue 9 Annex A

5 Tests summary

Test	Status
Transmitter characteristics	
FCC Part 15, Section 231(a) / RSS-210, Section A1.1, Periodic operation requirements	Pass
FCC Part 15, Section 231(a) / RSS-210, Section A1.2, Field strength of emissions	Pass
FCC Part 15, Section 231(c) / RSS-210, Section A1.3, Occupied bandwidth	Pass
FCC Part 15, Section 207 / RSS-Gen, Section 8.8, Conducted emission	Pass
FCC Part 15, Section 203 / RSS-Gen, Section 8.3, Antenna requirements	Pass

This test report supersedes the previously issued test report identified by Doc ID: TRIRAD_FCC.34184.Repeater_Rev1

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mr. A. Morozov test engineer EMC & Radio Mr. E. Pitt test engineer EMC & Radio	06 Oct 19 – 15 Oct 19	
Reviewed by:	Mrs. S Peysahov Sheynin test engineer EMC & Radio	20 Dec 19 – 07 Jan 20	
Approved by:	Mr. S. Samokha, technical manager, EMC and Radio	09 Jan 20	

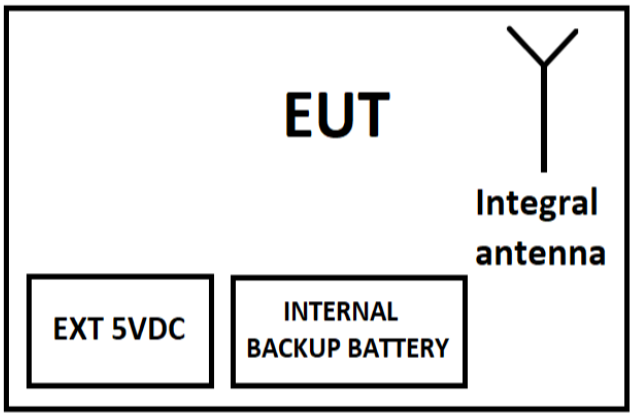
6 EUT description

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

6.1 General information

The CLM Repeater is wireless device that extends the communication range between the CLM system devices and the Hub. It is part of the Tripleplus Cloud leak management system. It is a 5VDC powered device with 2xAAA battery backup and incorporates ISM transceiver with integral antenna.

6.2 Test configuration



6.3 Changes made in EUT

No changes were implemented in the EUT during testing.

6.4 Transmitter characteristics

Type of equipment		
X	Stand-alone (Equipment with or without its own control provisions)	
	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)	
	Plug-in card (Equipment intended for a variety of host systems)	

Operating frequencies	915 MHz

Maximum rated output power	At transmitter 50 Ω RF output connector	dBm
	Field strength at 3 m distance	101.93 dB(µV/m) -peak 76.53 dB(µV/m)-average

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

Antenna connection				
unique coupling	standard connector	X	integral	with temporary RF connector
			X	without temporary RF connector

Antenna/s technical characteristics		
Type	Manufacturer	Model number
Internal	Triple Plus Ltd.	M000006

Type of modulation	2GFSK

Transmitter aggregate data rate/s	38.4 kbps

Transmitter power source					
X	Battery	**Nominal rated voltage**	3 VDC		
X	DC	**Nominal rated voltage**	5 VDC		
	AC mains	**Nominal rated voltage**	VAC	Frequency	

Common power source for transmitter and receiver	X	yes	no

Test specification:	FCC Part 15, Section 231(a) / RSS-210, Section A1.1, Periodic operation requirements		
Test procedure:	Supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Oct-19		
Temperature: 23 ºC	Relative Humidity: 48 %	Air Pressure: 1010 hPa	Power: 120 VAC, 60 Hz
Remarks:			

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

7.1 Periodic operation requirements

7.1.1 General

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

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

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

7.1.2 Test procedure for transmitter shut down test

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

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

7.1.2.3 The transmitter was activated either manually or automatically. Once manually operated transmitter was activated, the switch was immediately released.

7.1.2.4 The transmission time was captured and shown in Plot 7.1.1.

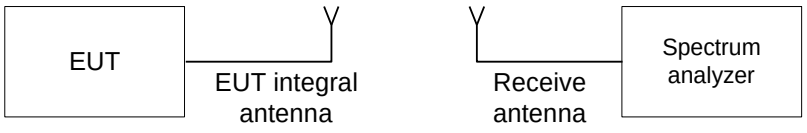
7.1.3 Test procedure for measurements of polling / supervision transmission duration

7.1.3.1 The EUT was set up as shown in Figure 7.1.1.

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

7.1.3.3 The transmission time was captured and shown in Plot 7.1.2, Plot 7.1.3.

Figure 7.1.1 Setup for transmitter shut down test

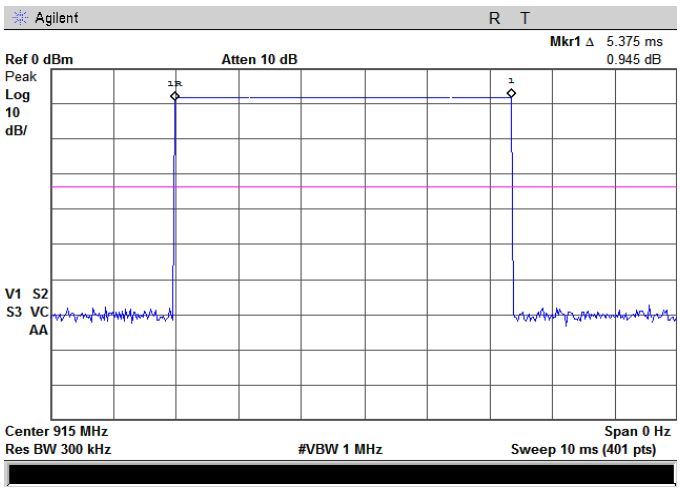


Test specification:	**FCC Part 15, Section 231(a) / RSS-210, Section A1.1, Periodic operation requirements**		
Test procedure:	Supplier declaration		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	10-Oct-19		
Temperature: 23 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1010 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.1.1 Periodic operation requirements

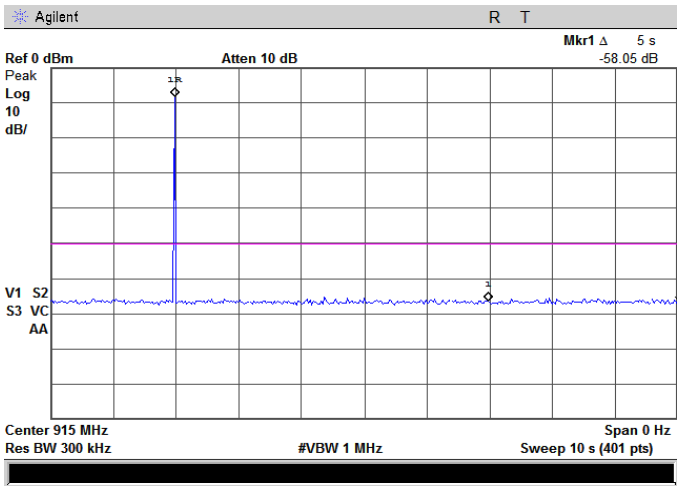
Requirement	Rationale	Verdict
Continuous transmissions are not permitted	Supplier declaration	Comply
A manually operated transmitter shall be deactivated within not more than 5 seconds of switch being released	NA	NA
Transmitter activated automatically shall cease transmission within 5 seconds	Plot 7.1.1	Comply
Periodic transmissions at regular predetermined intervals are not permitted	Supplier declaration	Comply
Total duration of polling or supervision transmissions shall not exceed 2 seconds per hour	Plot 7.1.2, Plot 7.1.3	Comply
Transmission of set-up information for security systems may exceed the transmission duration limits of 5 seconds, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.	Supplier declaration	Comply

Plot 7.1.1 Transmitter shut down test result

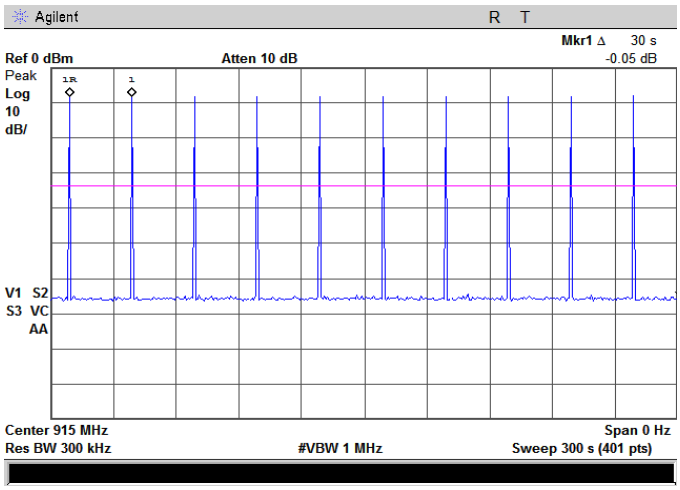


Test specification:	FCC Part 15, Section 231(a) / RSS-210, Section A1.1, Periodic operation requirements		
Test procedure:	Supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Oct-19		
Temperature: 23 ºC	Relative Humidity: 48 %	Air Pressure: 1010 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.1.2 Polling / supervision transmission duration



Plot 7.1.3 Polling / supervision transmission duration



Test specification:	**FCC Part 15, Section 231(a) / RSS-210, Section A1.1, Periodic operation requirements**		
Test procedure:	Supplier declaration		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	10-Oct-19		
Temperature: 23 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1010 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.1.2 Total duration of polling / supervision transmissions

Duration, ms	Repetition period, sec	Maximum number of transmissions within 1 hour	Total duration within 1 hour, ms
5.375	30	120	645

Reference numbers of test equipment used

HL 2780							

Full description is given in Appendix A.

Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.2, Field strength of emissions		
Test procedure:	ANSI C63.10, Section 6.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Oct-19		
Temperature: 24 ºC	Relative Humidity: 41 %	Air Pressure: 1011 hPa	Power: 120 VAC, 60 Hz
Remarks:			

7.2 Field strength of emissions

7.2.1 General

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

Table 7.2.1 Radiated fundamental emission limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)	
	Peak	Average
915.0	102.0	82.0

Table 7.2.2 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m, dB(μV/m)				
	Within restricted bands			Outside restricted bands	
	Peak	Quasi Peak	Average	Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	82.0	62.0
0.090 – 0.110	NA	108.5 – 106.8**	NA		
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**		
0.490 – 1.705	NA	73.8 – 63.0**	NA		
1.705 – 30.0*		69.5			
30 – 88		40.0			
88 – 216		43.5			
216 – 960		46.0			
960 - 1000		54.0			
Above 1000	74.0	NA	54.0		

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

$$Lim_{S2} = Lim_{S1} + 40 \log (S_1/S_2),$$

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

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

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

$$Lim_{AVR} = 20 \times \log\left(56.81818 \times F - 6136.3636\right)$$ - within 130 – 174 MHz band;

$$Lim_{AVR} = 20 \times \log\left(41.6667 \times F - 7083.3333\right)$$ - within 260 – 470 MHz band,

where F is the carrier frequency in MHz.

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

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

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

Test specification:	**FCC Part 15, Section 231(b) / RSS-210, Section A1.2, Field strength of emissions**		
Test procedure:	ANSI C63.10, Section 6.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Oct-19		
Temperature: 24 ºC	**Relative Humidity:** 41 %	**Air Pressure:** 1011 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

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

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

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

7.2.2.3 The worst test results (the lowest margins) recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

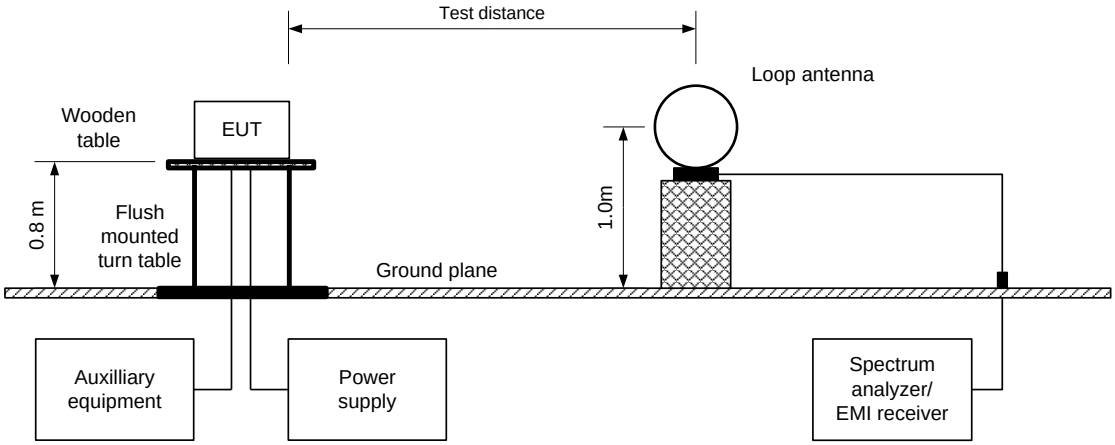
7.2.3 Test procedure for spurious emission field strength measurements above 30 MHz

7.2.3.1 The EUT was set up as shown in Figure 7.2.2, Figure 7.2.3, energized and the performance check was conducted.

7.2.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

7.2.3.3 The worst test results (the lowest margins) recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

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



Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.2, Field strength of emissions		
Test procedure:	ANSI C63.10, Section 6.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Oct-19		
Temperature: 24 ºC	Relative Humidity: 41 %	Air Pressure: 1011 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Figure 7.2.2 Setup for spurious emission field strength measurements in 30 -1000 MHz

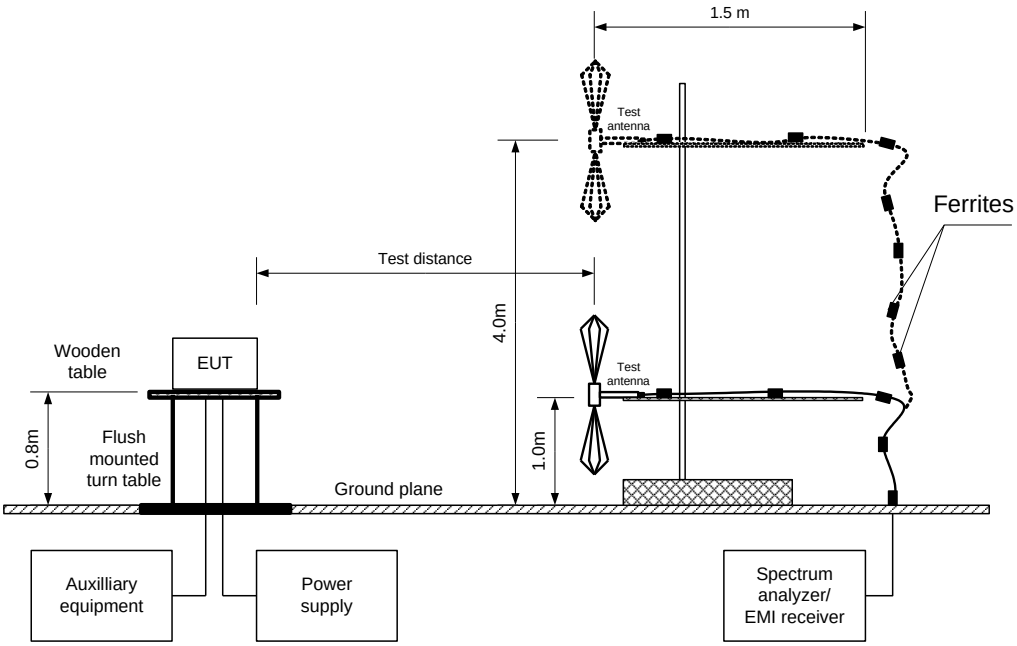
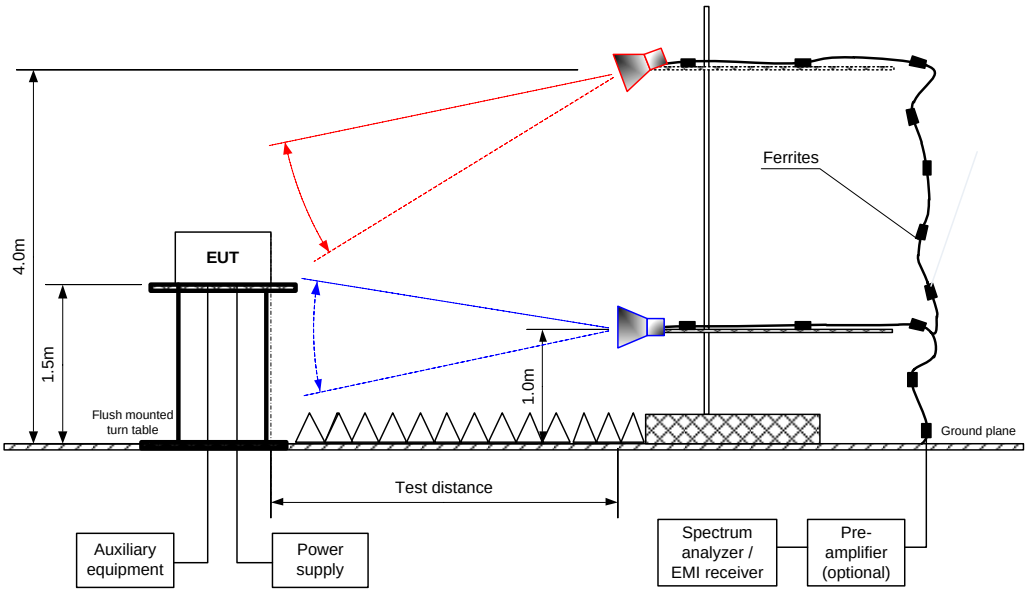


Figure 7.2.3 Setup for spurious emission field strength measurements above1000 MHz



Test specification:	**FCC Part 15, Section 231(b) / RSS-210, Section A1.2, Field strength of emissions**		
Test procedure:	ANSI C63.10, Section 6.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Oct-19		
Temperature: 24 ºC	**Relative Humidity:** 41 %	**Air Pressure:** 1011 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.2.3 Field strength of fundamental emission, spurious emissions outside restricted bands and within restricted bands at frequencies above 1 GHz

TEST DISTANCE:	3 m
EUT POSITION:	Typical (Vertical)
MODULATION:	2GFSK
BIT RATE:	38.4 kbps
TRANSMITTER OUTPUT POWER SETTINGS:	6 dBm
INVESTIGATED FREQUENCY RANGE:	0.009 - 9500 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	0.2 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz) 1.0 MHz (above 1000 MHz)
VIDEO BANDWIDTH:	≥ Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz) Double ridged guide (above 1000 MHz)

F, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength				Verdict
	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
Fundamental emission* **											
915.000	V	1.0	100	101.93	102.0	-0.07	101.93	76.53	82.0	-5.47	Pass
Spurious emissions											
1829.913	V	2.31	335	39.33	82.0	-34.67	39.33	13.93	62.0	-48.07	Pass
2744.924	V	1.01	353	43.87	74.0	-30.13	43.87	18.47	54.0	-35.53	
3660.159	V	1.78	0	43.97	74.0	-30.03	43.97	18.57	54.0	-35.43	
4574.946	V	1.52	360	45.47	74.0	-28.53	45.47	20.07	54.0	-33.93	

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin, dB =Measured (calculated) value, dB(μV/m)-Limit, dB(μV/m)
*** Max value was obtained in X (Y, Z)-axis orthogonal position and at Unom (115%Unom, 85%Unom) input power voltage.

Table 7.2.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, sec	Duration, ms	Period, ms		
5.375	30	NA	NA	NA	-25.4

*- Average factor was calculated as follows

for pulse train shorter than 100 ms: $$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{Train\ duration} \times Number\ of\ bursts\ within\ pulse\ train\right)$$

for pulse train longer than 100 ms: $$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{100\ ms} \times Number\ of\ bursts\ within\ 100\ ms\right)$$

Test specification:	**FCC Part 15, Section 231(b) / RSS-210, Section A1.2, Field strength of emissions**		
Test procedure:	ANSI C63.10, Section 6.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Oct-19		
Temperature: 24 ºC	**Relative Humidity:** 41 %	**Air Pressure:** 1011 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

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

TEST DISTANCE:	3 m
EUT POSITION:	Typical (Vertical)
MODULATION:	2GFSK
BIT RATE:	38.4 kbps
TRANSMITTER OUTPUT POWER SETTINGS:	6 dBm
INVESTIGATED FREQUENCY RANGE:	0.009 – 1000 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	0.2 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz)
VIDEO BANDWIDTH:	≥ Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz)

Frequency, MHz	**Peak emission, dB(μV/m)**	**Quasi-peak**			**Antenna polarization**	**Antenna height, m**	**Turn-table position**, degrees**	**Verdict**
		Measured emission, dB(μV/m)	**Limit, dB(μV/m)**	**Margin, dB***				
No emissions were found								Pass

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

Reference numbers of test equipment used

HL 0446	HL 3903	HL 4360	HL 4933	HL 5288	HL 5404		

Full description is given in Appendix A.

Test specification:	**FCC Part 15, Section 231(b) / RSS-210, Section A1.2, Field strength of emissions**		
Test procedure:	ANSI C63.10, Section 6.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Oct-19		
Temperature: 24 ºC	**Relative Humidity:** 41 %	**Air Pressure:** 1011 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.2.6 Restricted bands according to FCC 15, Section 205

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.290 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138	1300 - 1427	3345.8 - 3358	15.35 - 16.2
4.17725 - 4.17775	12.57675 - 12.57725	149.9 - 150.05	1435 - 1626.5	3600 - 4400	17.7 - 21.4
4.20725 - 4.20775	13.36 - 13.41	156.52475 - 156.52525	1645.5 - 1646.5	4500 - 5150	22.01 - 23.12
6.215 - 6.218	16.420 - 16.423	156.7 - 156.9	1660 - 1710	5350 – 5460	23.6 - 24
6.26775 - 6.26825	16.69475 - 16.69525	162.0125 - 167.17	1718.8 - 1722.2	7250 - 7750	31.2 - 31.8
6.31175 - 6.31225	16.80425 - 16.80475	167.72 - 173.2	2200 - 2300	8025 - 8500	36.43 - 36.5
8.291 - 8.294	25.5 - 25.67	240 - 285	2310 - 2390	9000 - 9200	Above 38.6
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	

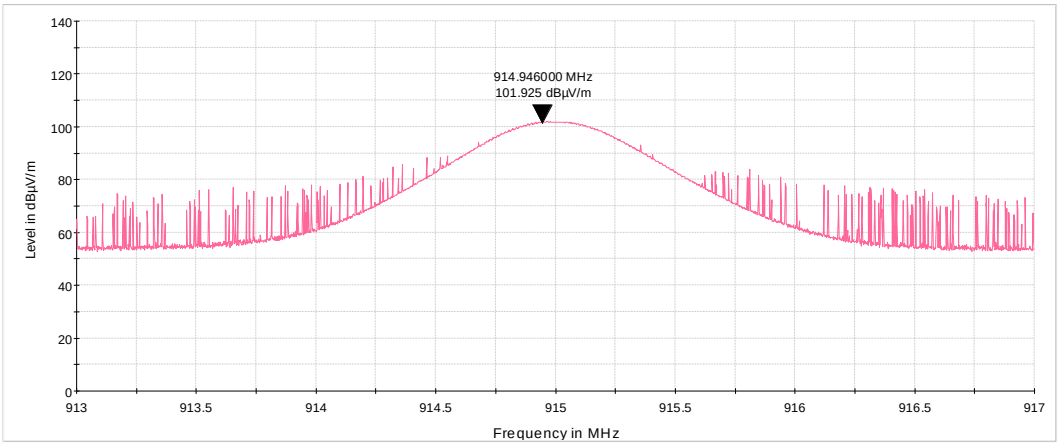
Table 7.2.7 Restricted bands according to RSS-Gen, Table 3

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.291 - 8.294	16.80425 - 16.80475	399.9 - 410	3260 - 3267	10.6 - 12.7
2.1735 - 2.190	8.362 - 8.366	25.5 - 25.67	608 - 614	3332 - 3339	13.25 - 13.4
3.020 - 3.026	8.37625 - 8.38675	37.5 - 38.25	960 - 1427	3345.8 - 3358	14.47 - 14.5
4.125 - 4.128	8.41425 - 8.41475	73 - 74.6	1435 - 1626.5	3500 - 4400	15.35 - 16.2
4.17725 - 4.17775	12.290 - 12.293	74.8 - 75.2	1645.5 - 1646.5	4500 - 5150	17.7 - 21.4
4.20725 - 4.20775	12.51975 - 12.52025	108 - 138	1660 - 1710	5350 – 5460	22.01 - 23.12
5.677 - 5.683	12.57675 - 12.57725	156.52475 - 156.52525	1718.8 - 1722.2	7250 - 7750	23.6 – 24.0
6.215 - 6.218	13.36 - 13.41	156.7 - 156.9	2200 - 2300	8025 - 8500	31.2 - 31.8
6.26775 - 6.26825	16.42 - 16.423	240 - 285	2310 - 2390	9000 - 9200	36.43 - 36.5
6.31175 - 6.31225	16.69475 - 16.69525	322 - 335.4	2655 - 2900	9300 - 9500	Above 38.6

Test specification:	**FCC Part 15, Section 231(b) / RSS-210, Section A1.2, Field strength of emissions**		
Test procedure:	ANSI C63.10, Section 6.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Oct-19		
Temperature: 24 ºC	**Relative Humidity:** 41 %	**Air Pressure:** 1011 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

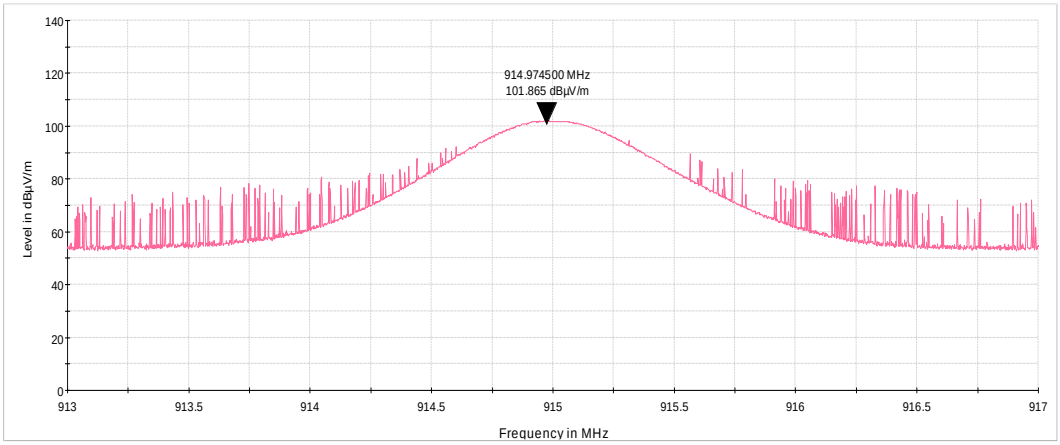
Plot 7.2.1 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
EUT POSITION: Typical (Vertical)
INPUT VOLTAGE: Unom



Plot 7.2.2 Radiated emission measurements at the fundamental frequency

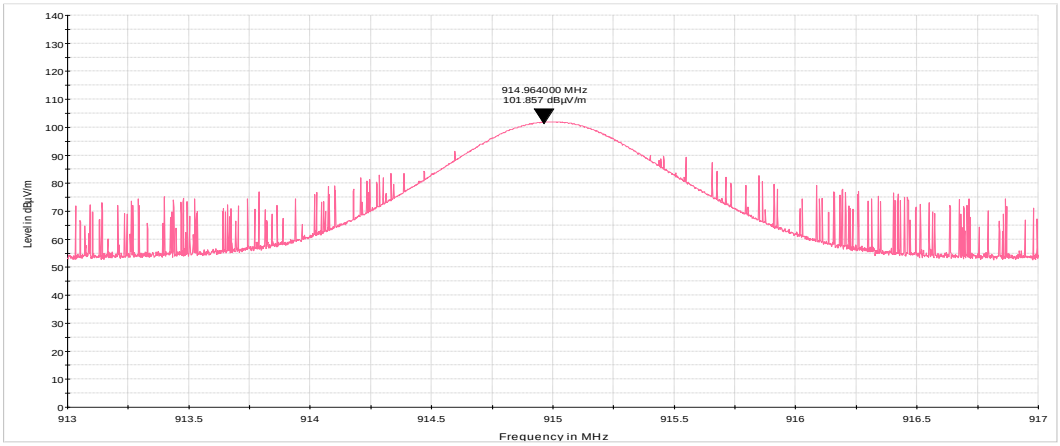
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
EUT POSITION: Typical (Vertical)
INPUT VOLTAGE: 115%Unom



Test specification:	**FCC Part 15, Section 231(b) / RSS-210, Section A1.2, Field strength of emissions**		
Test procedure:	ANSI C63.10, Section 6.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Oct-19		
Temperature: 24 ºC	**Relative Humidity:** 41 %	**Air Pressure:** 1011 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

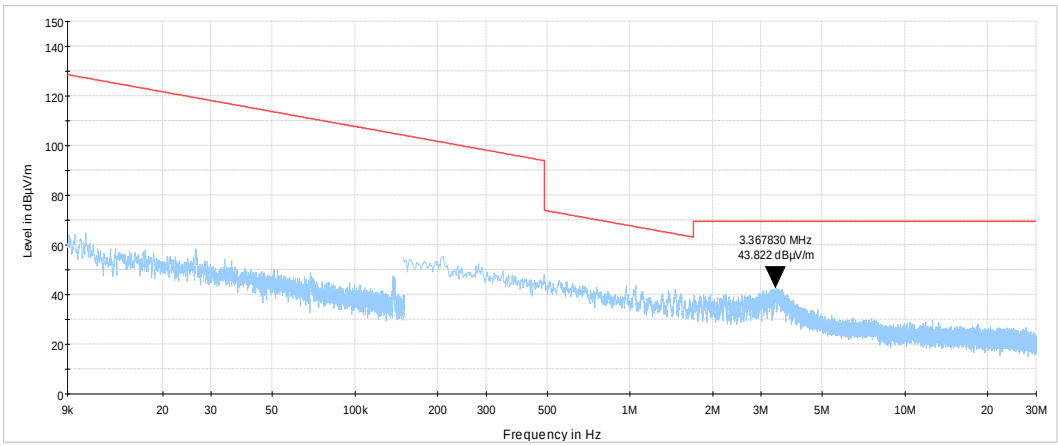
Plot 7.2.3 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
EUT POSITION: Typical (Vertical)
INPUT VOLTAGE: 85%Unom



Plot 7.2.4 Radiated emission measurements from 9 kHz to 30 MHz

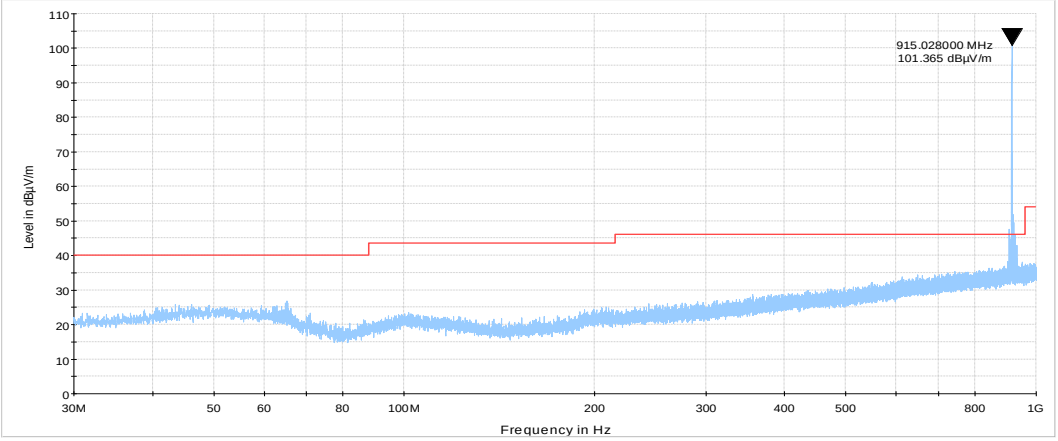
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical (Vertical)



Test specification:	**FCC Part 15, Section 231(b) / RSS-210, Section A1.2, Field strength of emissions**		
Test procedure:	ANSI C63.10, Section 6.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Oct-19		
Temperature: 24 ºC	**Relative Humidity:** 41 %	**Air Pressure:** 1011 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

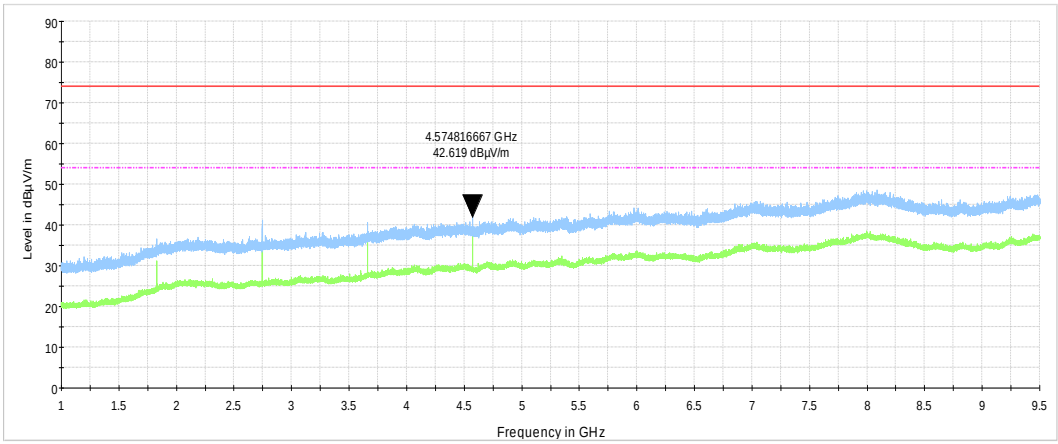
Plot 7.2.5 Radiated emission measurements from 30 to 1000 MHz

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



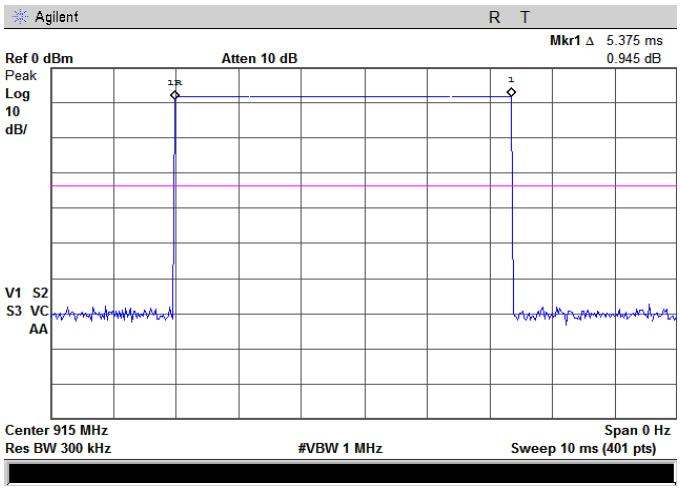
Plot 7.2.6 Radiated emission measurements from 1000 to 9500 MHz

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

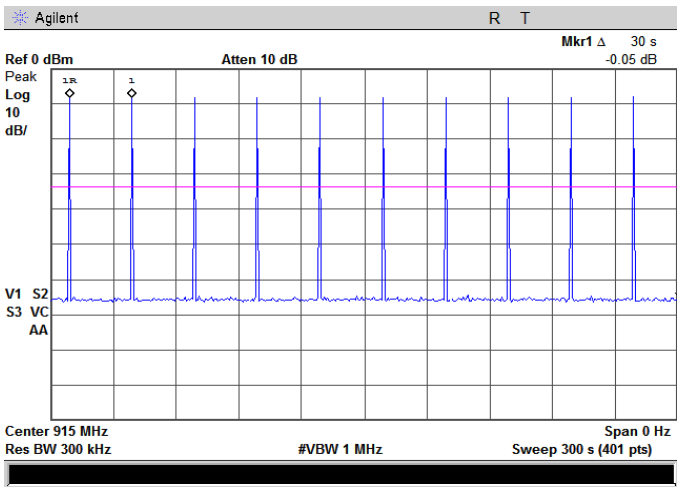


Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.2, Field strength of emissions		
Test procedure:	ANSI C63.10, Section 6.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Oct-19		
Temperature: 24 ºC	Relative Humidity: 41 %	Air Pressure: 1011 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.2.7 Transmission pulse duration



Plot 7.2.8 Transmission pulse period



Test specification:	FCC Part 15, Section 231(c) / RSS-210, Section A1.3, Occupied bandwidth		
Test procedure:	ANSI C63.10, Section 6.9.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Oct-19		
Temperature: 23 ºC	Relative Humidity: 48 %	Air Pressure: 1010 hPa	Power: 120 VAC, 60 Hz
Remarks:			

7.3 Occupied bandwidth test

7.3.1 General

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

Table 7.3.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Maximum allowed bandwidth, % of the carrier frequency
70 - 900	20.0	0.25
Above 900		0.50

*- Modulation envelope reference points provided in terms of attenuation below modulated carrier.

7.3.2 Test procedure

7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.

7.3.2.2 The EUT was set to transmit modulated carrier.

7.3.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.3.2 and associated plot.

Figure 7.3.1 Occupied bandwidth test setup

Test specification:	FCC Part 15, Section 231(c) / RSS-210, Section A1.3, Occupied bandwidth		
Test procedure:	ANSI C63.10, Section 6.9.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Oct-19		
Temperature: 23 ºC	Relative Humidity: 48 %	Air Pressure: 1010 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Table 7.3.2 Occupied bandwidth test results

DETECTOR USED:	Peak hold
RESOLUTION BANDWIDTH:	3 kHz
VIDEO BANDWIDTH:	30 kHz
MODULATION ENVELOPE REFERENCE POINTS:	20 dBc
MODULATION:	2GFSK
BIT RATE:	38.4 kbps

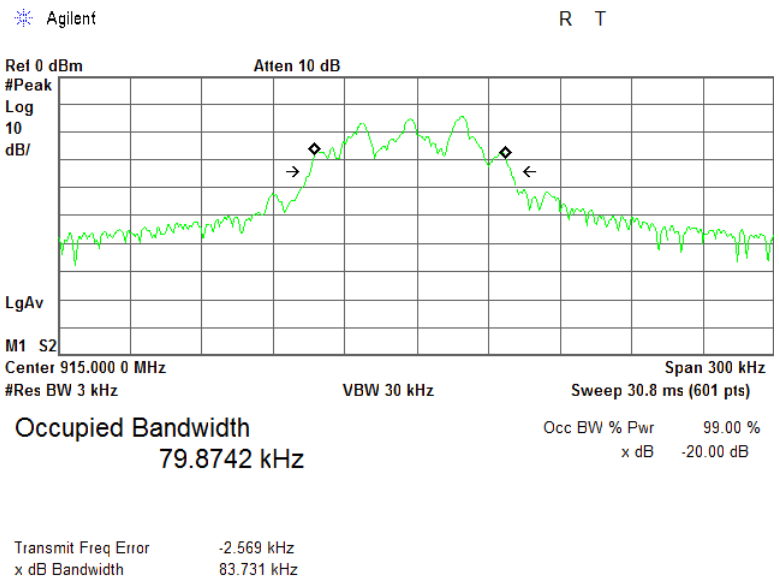
Carrier frequency, MHz	Occupied bandwidth, kHz	Limit		Margin, kHz	Verdict
		% of the carrier frequency	kHz		
915	83.731	0.5	4575	4491.269	Pass

Reference numbers of test equipment used

HL 3818	HL	HL						

Full description is given in Appendix A.

Plot 7.3.1 Occupied bandwidth test result



Test specification:	FCC Part 15, Section 207 / RSS-Gen, Section 7.2.2, Conducted emission		
Test procedure:	ANSI C63.10, Section 6.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	15-Oct-19		
Temperature: 23 ºC	**Relative Humidity:** 43 %	**Air Pressure:** 1013 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

7.4 Conducted emissions

7.4.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Limits for conducted emissions according to FCC Part 15, Section 207 / RSS-Gen, Section 7.2.2

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

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

7.4.2 Test procedure

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

7.4.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer while unused coaxial connector of the LISN was terminated with 50 Ohm.

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

7.4.2.4 The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

Test specification:	**FCC Part 15, Section 207 / RSS-Gen, Section 7.2.2, Conducted emission**		
Test procedure:	ANSI C63.10, Section 6.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	15-Oct-19		
Temperature: 23 ºC	**Relative Humidity:** 43 %	**Air Pressure:** 1013 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

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

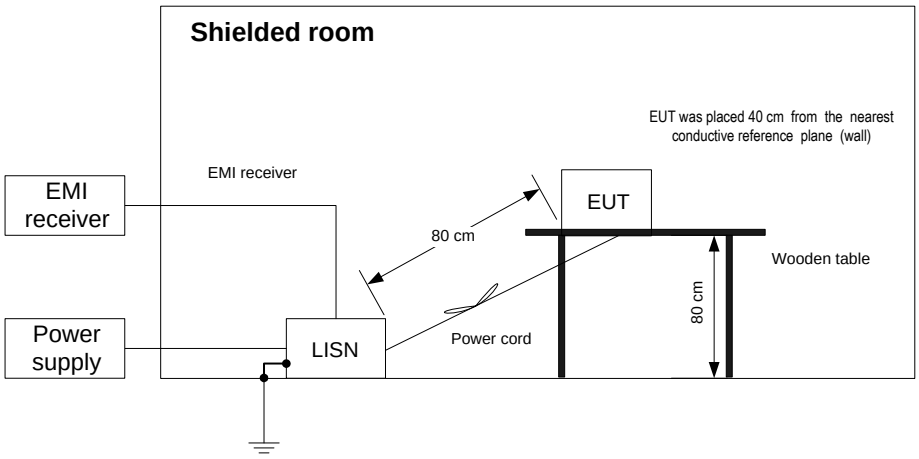


Table 7.4.2 Conducted emission test results according to FCC Part 15, Section 207 / RSS-Gen, Section 7.2.2

LINE: AC mains
EUT OPERATING MODE: Transmit
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
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*		
0.152	41.0	37.2	66.0	-28.8	20.0	56.0	-36.0	L1	Pass
0.176	39.6	35.4	64.7	-29.3	18.2	54.7	-36.5		
0.250	35.8	31.7	61.8	-30.1	14.8	51.8	-37.0		
0.497	33.0	29.1	56.1	-27.0	16.3	46.1	-29.8		
1.525	26.8	20.1	56.0	-35.9	7.6	46.0	-38.4		
19.252	29.9	26.1	60.0	-33.9	13.0	50.0	-37.0		
0.152	40.3	37.0	66.0	-29.0	20.7	56.0	-35.3	L2	Pass
0.168	38.8	35.8	65.2	-29.4	20.2	55.2	-35.0		
0.189	37.3	33.9	64.1	-30.2	19.2	54.1	-34.9		
0.499	36.0	32.8	56.0	-23.2	29.5	46.0	-16.5		
0.904	26.1	21.8	56.0	-34.2	17.2	46.0	-28.8		
18.441	30.0	24.9	60.0	-35.1	11.7	50.0	-38.3		

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

Reference numbers of test equipment used

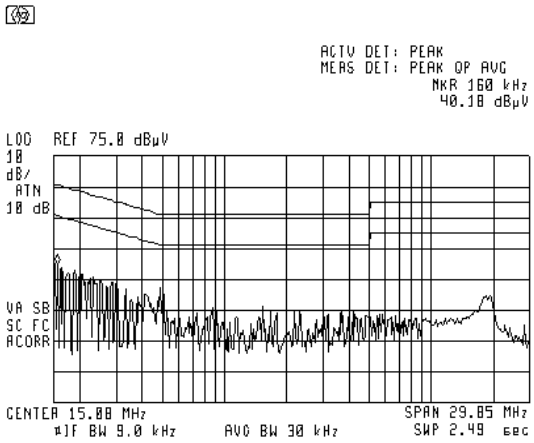
HL 787	HL 3016	HL 4778	HL 5476				

Full description is given in Appendix A.

Test specification:	**FCC Part 15, Section 207 / RSS-Gen, Section 7.2.2, Conducted emission**		
Test procedure:	ANSI C63.10, Section 6.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	15-Oct-19		
Temperature: 23 ºC	**Relative Humidity:** 43 %	**Air Pressure:** 1013 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

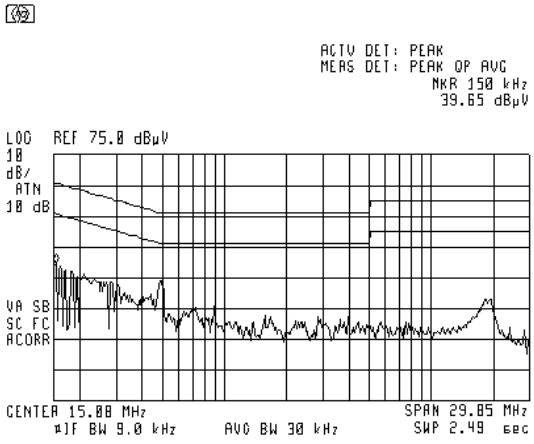
Plot 7.4.1 Conducted emission measurements according to FCC Part 15, Section 207 / RSS-Gen, Section 7.2.2

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



Plot 7.4.2 Conducted emission measurements according to FCC Part 15, Section 207 / RSS-Gen, Section 7.2.2

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



Test specification:	FCC Part 15, Section 203 / RSS-Gen, Section 7.1.4, Antenna requirements		
Test procedure:	Visual inspection / supplier declaration		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	15-Oct-19		
Temperature: 23 ºC	**Relative Humidity:** 43 %	**Air Pressure:** 1013 hPa	**Power:** 115 VAC, 60 Hz
Remarks: Repeater			

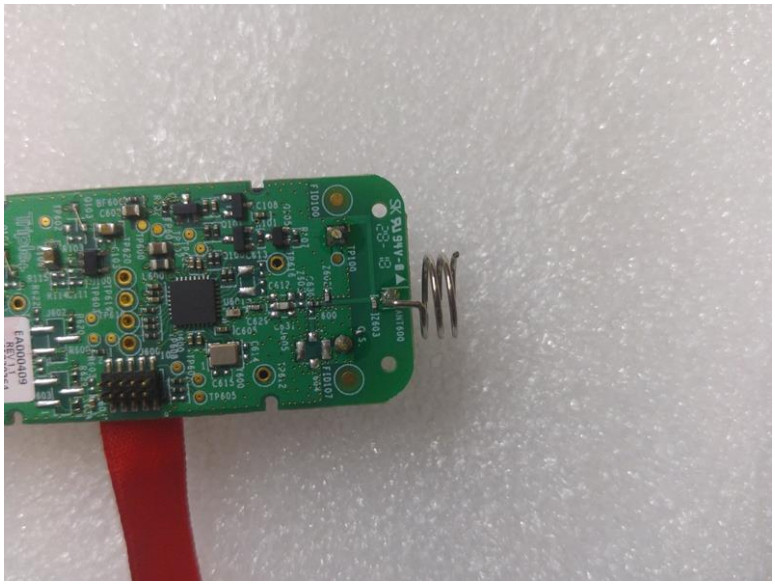
7.5 Antenna requirements

The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.
The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.5.1

Table 7.5.1 Antenna requirements

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

Photograph 7.5.1 Antenna assembly



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	24-Feb-19	24-Feb-20
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A01877	08-Oct-19	08-Oct-20
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY45102462	28-Feb-19	28-Feb-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	892239/002	27-Jan-19	27-Jan-20
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY48250288	24-Apr-19	24-Apr-20
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	07-Apr-19	07-Apr-20
4360	EMI Test Receiver, 20 Hz to 40 GHz.	Rohde & Schwarz	ESU40	100322	31-Dec-18	31-Dec-19
4778	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL4777	Hewlett Packard	8542E	30807A00262, 3427A00123	28-Oct-18	28-Oct-19
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATION	AHA-118	701046	06-Jan-19	06-Jan-20
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX-8000E	00809	08-Feb-19	08-Feb-22
5404	RF cable, 18 GHz, N-N, 6 m	Huber-Suhner	SF118/11N(x2)	500024/18	11-Aug-19	11-Aug-20
5476	Cable, BNC/BNC, 10.5 m	Western wire	MIL-C-17G	NA	30-Jan-19	30-Jan-20

9 APPENDIX B Test equipment correction factors

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

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

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

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

HL 3016: LISN, Two-line V-network, 9 to 30 MHz, (50 uH+5 Ohm)
Rohde & Schwarz, model: ESH 3-Z5, s/n 892239/002, HL 3016

Voltage division factor (insertion loss)

Frequency,	L1, dB	N, dB	Uncertainty, dB
10	0.70	0.72	±0.12
15	0.43	0.42	±0.12
20	0.30	0.28	±0.12
25	0.23	0.21	±0.12
30	0.18	0.17	±0.08
40	0.15	0.12	±0.08
50	0.13	0.11	±0.08
60	0.12	0.10	±0.09
70	0.11	0.09	±0.09
80	0.10	0.08	±0.09
90	0.10	0.08	±0.09
100	0.10	0.08	±0.09
150	0.10	0.08	±0.09
170	0.10	0.08	±0.09
200	0.09	0.08	±0.09
250	0.09	0.08	±0.09
300	0.10	0.08	±0.09
350	0.10	0.09	±0.09
400	0.10	0.08	±0.09
500	0.11	0.08	±0.09
600	0.11	0.09	±0.09
700	0.11	0.09	±0.09
800	0.11	0.09	±0.09
900	0.12	0.10	±0.09
1000	0.12	0.10	±0.09
1200	0.13	0.10	±0.16
1500	0.13	0.12	±0.16
2000	0.15	0.13	±0.16
2500	0.17	0.14	±0.16
3000	0.18	0.15	±0.16
4000	0.21	0.19	±0.16
5000	0.25	0.21	±0.16
7000	0.38	0.32	±0.16
10000	0.49	0.40	±0.16
15000	0.82	0.72	±0.16
20000	1.03	0.87	±0.16
30000	1.34	0.98	±0.32

HL 4933 Active Horn Antenna, 1 GHz to 18 GHz
COM-POWER CORPORATION AHA-118 , s/n 701046 HL 4933

Frequency, MHz	Measured antenna factor, dB/m		Frequency, MHz	Measured antenna factor, dB/m
1000	-16.1		3200	-11.2
1050	-16.0		3250	-10.8
1100	-15.1		3300	-10.8
1150	-16.4		3350	-10.7
1200	-16.0		3400	-10.3
1250	-15.6		3450	-10.2
1300	-15.1		3500	-10.1
1350	-14.8		3550	-10.4
1400	-15.1		3600	-10.5
1450	-15.1		3650	-10.4
1500	-15.5		3700	-10.4
1550	-15.2		3750	-10.3
1600	-14.7		3800	-10.1
1650	-14.4		3850	-10.0
1700	-14.4		3900	-9.9
1750	-14.0		3950	-9.8
1800	-13.6		4000	-9.7
1850	-12.7		4050	-9.3
1900	-11.9		4100	-8.6
1950	-11.9		4150	-8.2
2000	-11.8		4200	-8.3
2050	-11.3		4250	-8.5
2100	-11.3		4300	-8.5
2150	-11.7		4350	-8.3
2200	-12.3		4400	-8.0
2250	-12.3		4450	-7.7
2300	-12.4		4500	-7.6
2350	-12.2		4550	-7.4
2400	-11.7		4600	-7.5
2450	-11.5		4650	-7.8
2500	-11.5		4700	-7.6
2550	-11.5		4750	-6.8
2600	-11.5		4800	-6.1
2650	-11.3		4850	-5.7
2700	-11.3		4900	-5.8
2750	-11.1		4950	-5.8
2800	-11.1		5000	-6.0
2850	-11.3		5050	-5.7
2900	-11.1		5100	-5.4
2950	-11.0		5150	-5.1
3000	-11.1		5200	-4.6
3050	-10.9		5250	-4.6
3100	-10.7		5300	-4.8
3150	-10.6		5350	-5.1

Frequency, MHz	Measured antenna factor, dB/m
5400	-5.1
5450	-4.6
5500	-4.0
5550	-3.5
5600	-3.1
5650	-3.3
5700	-3.8
5750	-4.3
5800	-4.3
5850	-4.0
5900	-3.5
5950	-3.2
6000	-3.2
6050	-3.2
6100	-3.3
6150	-3.3
6200	-3.1
6250	-2.9
6300	-2.8
6350	-3.0
6400	-3.2
6450	-3.4
6500	-3.7
6550	-3.6
6600	-3.4
6650	-2.9
6700	-2.6
6750	-2.5
6800	-2.6
6850	-2.8
6900	-2.7
6950	-2.3
7000	-2.0
7050	-1.9
7100	-1.8
7150	-1.8
7200	-1.7
7250	-1.7
7300	-1.6
7350	-1.5
7400	-1.5
7450	-1.3
7500	-1.4
7550	-1.3
7600	-1.0
7650	-0.7
7700	-0.3
7750	0.1
7800	0.3
7850	0.4
7900	0.2
7950	0.1
8000	0.2
8050	0.3
8100	0.8
8150	1.1
8200	1.1
8250	1.0
12400	2.1
12500	1.2
12600	1.3
12700	2.4

Frequency, MHz	Measured antenna factor, dB/m
8300	0.8
8350	0.5
8400	0.3
8450	0.5
8500	0.8
8550	0.9
8600	0.9
8650	0.6
8700	0.0
8750	-0.3
8800	0.0
8850	0.5
8900	0.6
8950	0.4
9000	-0.3
9050	-1.0
9100	-1.2
9150	-0.6
9200	-0.1
9250	0.0
9300	-0.1
9350	-0.5
9400	-0.7
9450	-0.4
9500	0.2
9550	0.5
9600	0.5
9650	0.3
9700	0.0
9750	0.0
9800	0.6
9850	1.4
9900	1.8
9950	1.7
10000	1.4
10100	0.8
10200	1.2
10300	1.5
10400	1.1
10500	1.6
10600	3.0
10700	2.9
10800	1.3
10900	1.0
11000	1.1
11100	0.7
11200	1.1
11300	1.5
11400	1.4
11500	0.6
11600	1.0
11700	1.4
11800	0.7
11900	0.9
12000	2.1
12100	2.1
12200	0.9
12300	1.6

12800	1.8
12900	0.6
13000	0.9
13100	1.1
13200	0.7
13300	0.9
13400	1.8
13500	2.1
13600	1.2
13700	0.8
13800	1.2
13900	1.5
14000	1.7
14100	2.2
14200	2.8
14300	3.0
14400	3.0
14500	3.3
14600	4.0
14700	5.4
14800	5.4
14900	4.7
15000	3.1
15100	2.0
15200	1.5
15300	1.4
15400	1.7
15500	1.9
15600	1.2
15700	0.2
15800	0.6
15900	1.2
16000	0.6
16100	0.6
16200	1.9
16300	2.2
16400	0.9
16500	0.7
16600	1.7
16700	1.3
16800	1.0
16900	2.0
17000	2.4
17100	1.8
17200	1.8
17300	2.5
17400	2.7
17500	3.1
17600	3.7
17700	4.3
17800	4.8
17900	5.7
18000	5.1

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

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

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

above 1000 MHz

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

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

10 APPENDIX C 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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11 APPENDIX D Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

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

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

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

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

12 APPENDIX E Specification references

47CFR part 15: 2019	Radio Frequency Devices
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.4: 2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
RSS-210 Issue 9: 2018	Licence- Exempt Radio Apparatus:Category I Equipment

13 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