

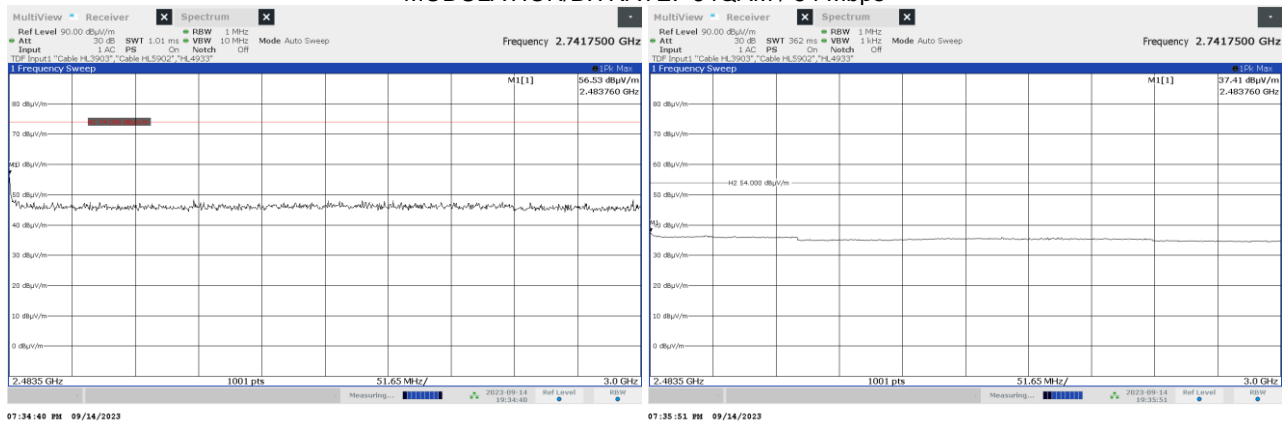


HERMON LABORATORIES

Test specification: Section 15.247(d) / RSS-247 section 5.5, Band edge emissions			
Test procedure: ANSI C63.10 section 11.12.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 14-Sep-23			
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

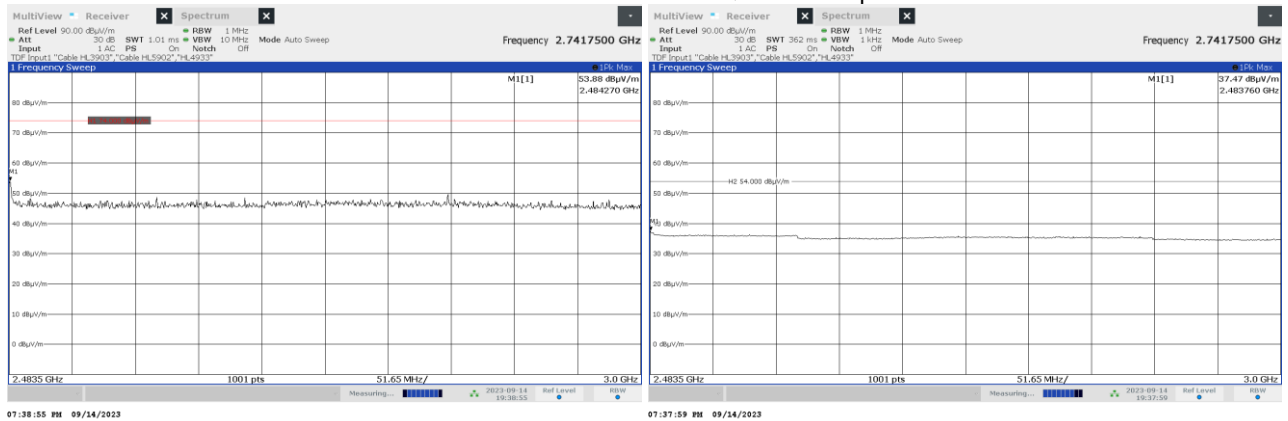
Plot 7.5.21 The highest emission level within restricted band at high carrier frequency

CHANNEL BANDWIDTH: 20MHz
MODULATION/BITRATE: 64QAM / 54 Mbps



Plot 7.5.22 The highest emission level within restricted band at high carrier frequency

CHANNEL BANDWIDTH: 20MHz
MODULATION/BITRATE: 64QAM / 65 Mbps



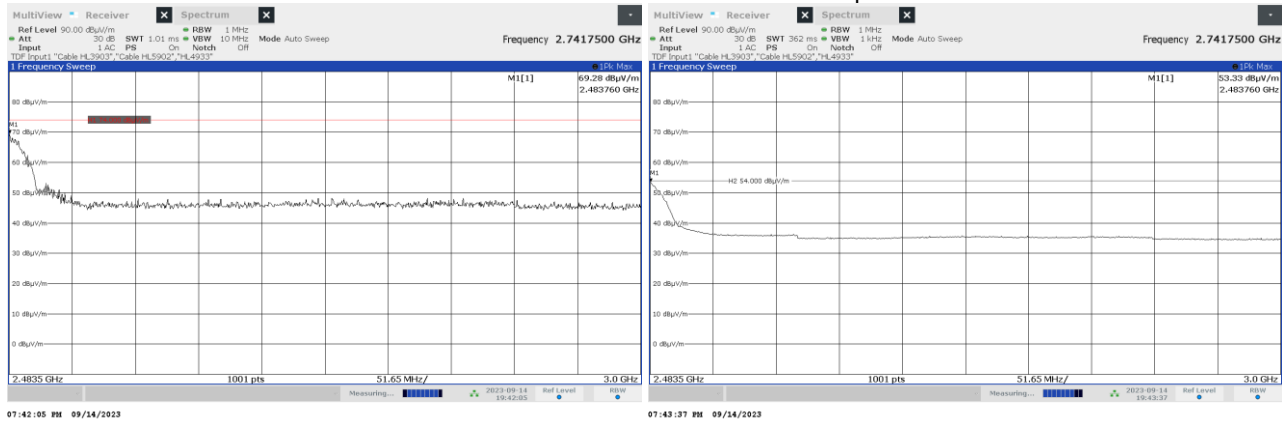


HERMON LABORATORIES

Test specification: Section 15.247(d) / RSS-247 section 5.5, Band edge emissions			
Test procedure: ANSI C63.10 section 11.12.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 14-Sep-23			
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

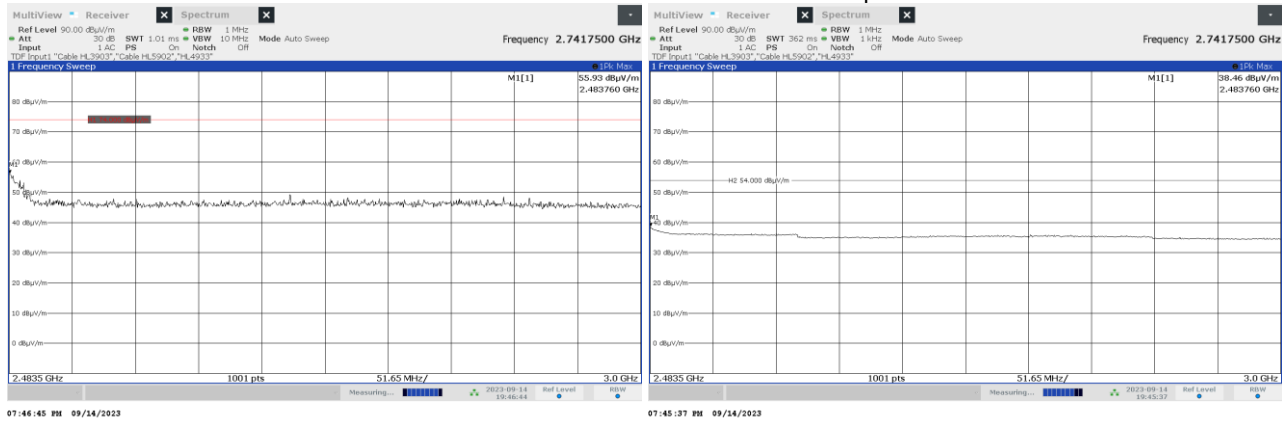
Plot 7.5.23 The highest emission level within restricted band at high carrier frequency

CHANNEL BANDWIDTH: 40MHz
MODULATION/BITRATE: BPSK / 6.5 Mbps



Plot 7.5.24 The highest emission level within restricted band at high carrier frequency

CHANNEL BANDWIDTH: 40MHz
MODULATION/BITRATE: 64-QAM / 65 Mbps





Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

7.6 Peak spectral power density

7.6.1 General

This test was performed to measure the peak spectral power density radiated by the transmitter RF antenna. Specification test limits are given in Table 7.6.1.

Table 7.6.1 Peak spectral power density limits

Assigned frequency range, MHz	Measurement bandwidth, kHz	Peak spectral power density, dBm	Equivalent Peak spectral power density limit @ 3m, dB(μV/m)*
2400.0 – 2483.5	3.0	8.0	103.2

* - Equivalent Peak spectral power density limit was calculated from the peak spectral power density as follows: $E = \sqrt{30 \times P} / r$, where P is peak spectral power density and r is antenna to EUT distance in meters.

7.6.2 Test procedure for Peak spectral power density measurements

7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized and its proper operation was checked.

7.6.2.2 The EUT was adjusted to produce maximum available to end user RF output power.

7.6.2.3 The Peak spectral power density of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept in both vertical and horizontal polarizations.

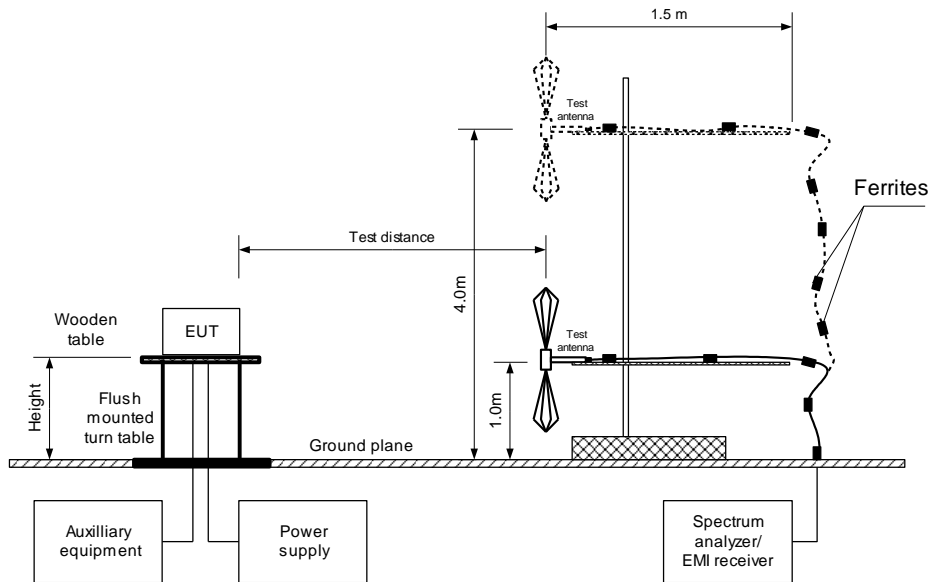
7.6.2.4 The frequency span of spectrum analyzer was set to capture the entire 6 dB band of the transmitter, in peak hold mode with resolution bandwidth set to 3.0 kHz, video bandwidth wider than resolution bandwidth, auto sweep time and sufficient number of sweeps was allowed for trace stabilization. The spectrum lines spacing was verified to be wider than 3 kHz. Otherwise the resolution bandwidth was reduced until individual spectrum lines were resolved and the power of individual spectrum lines was integrated over 3 kHz band.

7.6.2.5 The peak of emission was zoomed with span set just wide enough to capture the emission peak area and sweep time was set equal to span width divided by resolution bandwidth. Spectrum analyzer was set in peak hold mode, sufficient number of sweeps was allowed for trace stabilization and peak spectral power density was measured as provided in Table 7.6.1 and associated plots.



Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Figure 7.6.1 Setup for carrier Peak spectral power density measurements





Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Table 7.6.2 Field strength measurement of peak spectral power density

ASSIGNED FREQUENCY: 2400.0 – 2483.5 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 1.5 m
DETECTOR USED: RMS
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 1 MHz
TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: CCK / 1 Mbps

Frequency, MHz	Peak spectral power density, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(μV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412.0	80.18	0	103.2	-23.02	Vertical	1.5	-145	Pass
2442.0	80.42	0	103.2	-22.78	Vertical	1.5	-150	Pass
2462.0	80.00	0	103.2	-23.20	Vertical	1.5	-138	Pass

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: CCK / 11 Mbps

Frequency, MHz	Peak spectral power density, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(μV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412.0	79.89	0	103.2	-23.31	Vertical	1.5	-145	Pass
2442.0	81.16	0	103.2	-22.04	Vertical	1.5	-155	Pass
2462.0	79.93	0	103.2	-23.27	Vertical	1.5	-136	Pass

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: BPSK / 6 Mbps

Frequency, MHz	Peak spectral power density, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(μV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412.0	76.44	0	103.2	-26.76	Vertical	1.5	-144	Pass
2442.0	76.68	0	103.2	-26.52	Vertical	1.5	-150	Pass
2462.0	76.51	0	103.2	-26.69	Vertical	1.5	-145	Pass

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: BPSK / 6.5 Mbps

Frequency, MHz	Peak spectral power density, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(μV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412.0	75.55	0	103.2	-27.65	Vertical	1.5	-148	Pass
2442.0	75.67	0	103.2	-27.53	Vertical	1.5	-145	Pass
2462.0	75.52	0	103.2	-27.68	Vertical	1.5	-152	Pass



Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Table 7.6.3 Field strength measurement of peak spectral power density (continuation)

ASSIGNED FREQUENCY: 2400.0 – 2483.5 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 1.5 m
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 1 MHz
TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: 64QAM / 54 Mbps

Frequency, MHz	Peak spectral power density, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(μV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412.0	70.98	0	103.2	-32.22	Vertical	1.5	-145	Pass
2442.0	71.14	0	103.2	-32.06	Vertical	1.5	-150	Pass
2462.0	71.00	0	103.2	-32.20	Vertical	1.5	-138	Pass

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: 64QAM / 65 Mbps

Frequency, MHz	Peak spectral power density, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(μV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412.0	70.42	0	103.2	-32.78	Vertical	1.5	-145	Pass
2442.0	70.95	0	103.2	-32.25	Vertical	1.5	-150	Pass
2462.0	70.67	0	103.2	-32.53	Vertical	1.5	-138	Pass

CHANNEL BANDWIDTH: 40 MHz
MODULATION/BITRATE: BPSK / 6.5 Mbps

Frequency, MHz	Peak spectral power density, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(μV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2422.0	71.63	0	103.2	-31.57	Vertical	1.5	-145	Pass
2437.0	71.35	0	103.2	-31.85	Vertical	1.5	-150	Pass
2452.0	71.10	0	103.2	-32.10	Vertical	1.5	-148	Pass

CHANNEL BANDWIDTH: 40 MHz
MODULATION/BITRATE: 64-QAM 65 Mbps

Frequency, MHz	Peak spectral power density, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(μV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2422.0	67.66	0	103.2	-35.54	Vertical	1.5	-145	Pass
2437.0	67.98	0	103.2	-35.22	Vertical	1.5	-148	Pass
2452.0	68.15	0	103.2	-35.05	Vertical	1.5	-140	Pass

*- Margin = Field strength - EUT antenna gain - calculated field strength limit.

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

Reference numbers of test equipment used

HL 7802	HL 5902	HL 3903	HL 4933			
---------	---------	---------	---------	--	--	--

Full description is given in Appendix A.

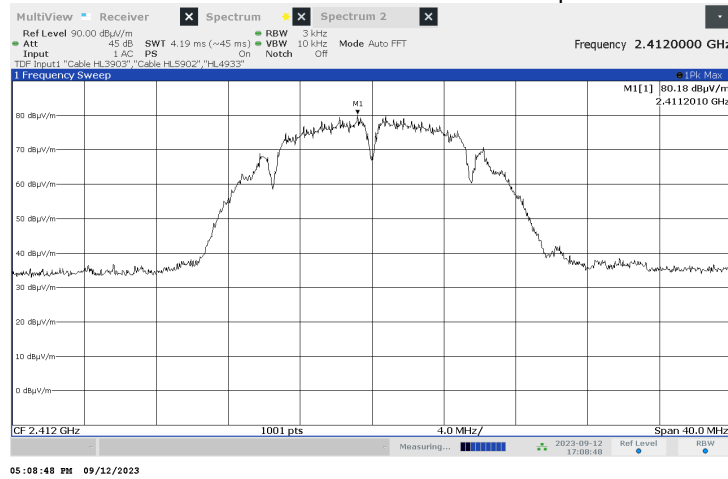


HERMON LABORATORIES

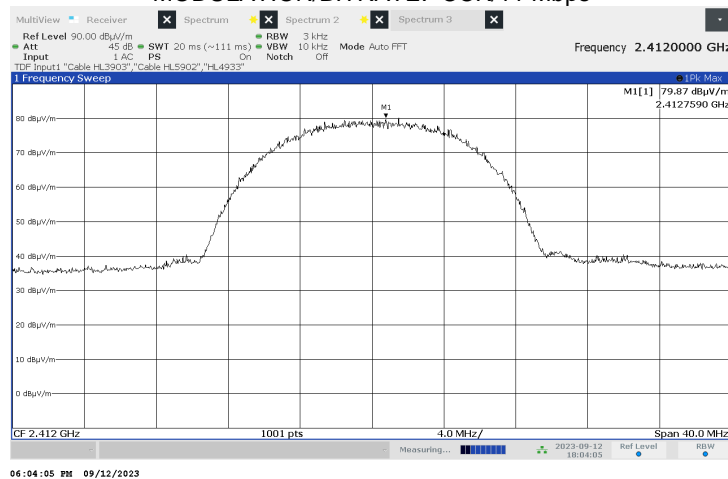
Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Plot 7.6.1 Peak spectral power density of carrier at low frequency

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: CCK/1 Mbps



CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: CCK/11 Mbps

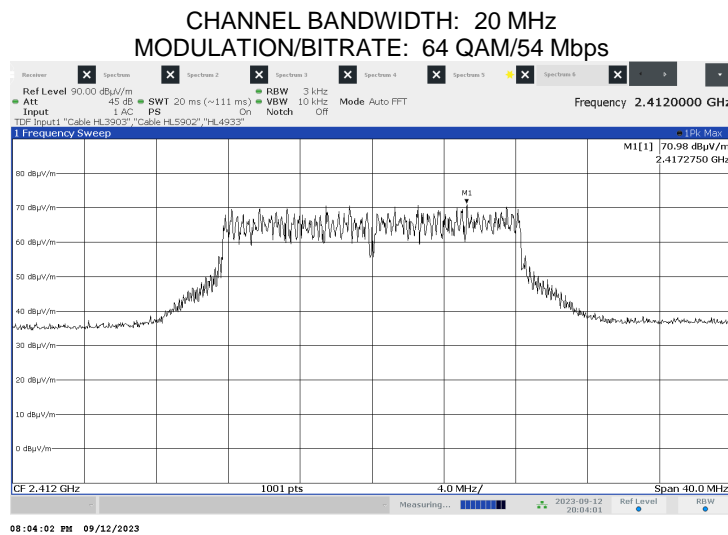
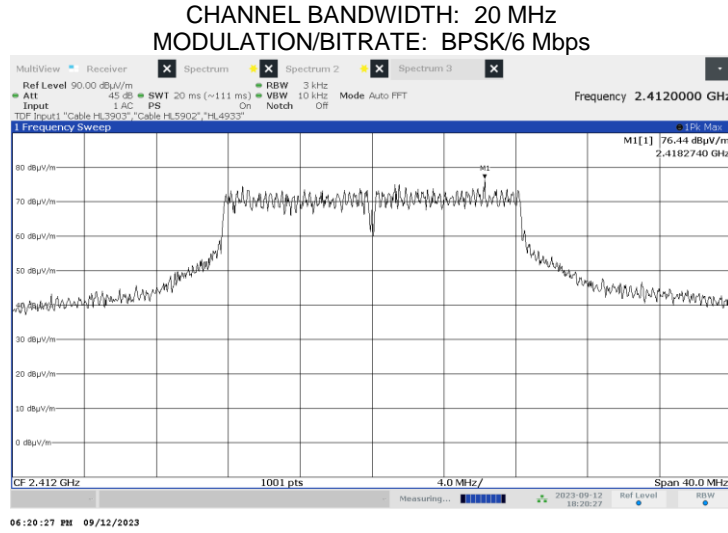




HERMON LABORATORIES

Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Plot 7.6.2 Peak spectral power density of carrier at low frequency (continuation)



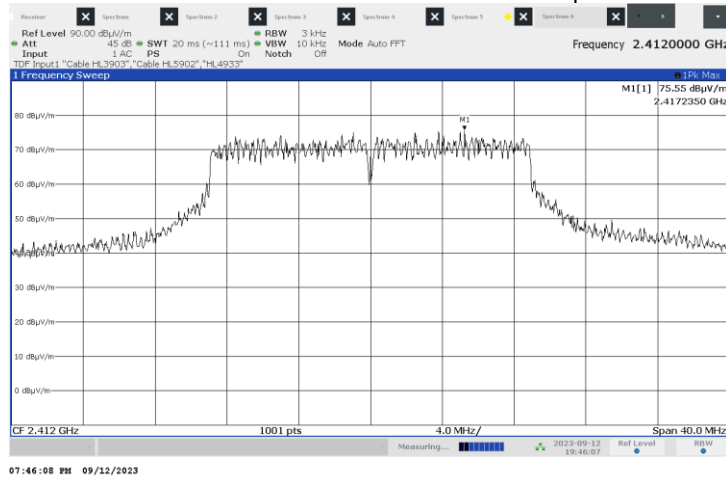


HERMON LABORATORIES

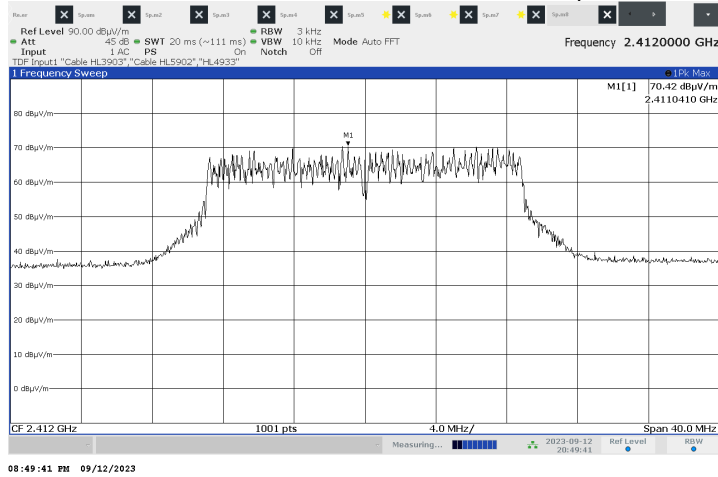
Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Plot 7.6.3 Peak spectral power density of carrier at low frequency (continuation)

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: BPSK/6.5 Mbps



CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: 64 QAM/65 Mbps



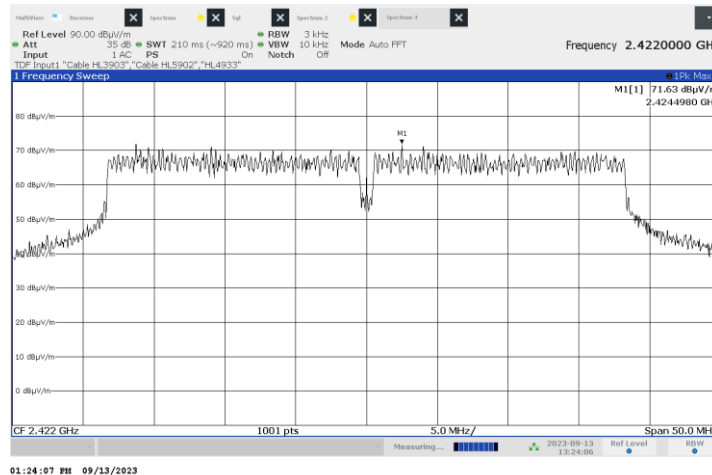


HERMON LABORATORIES

Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

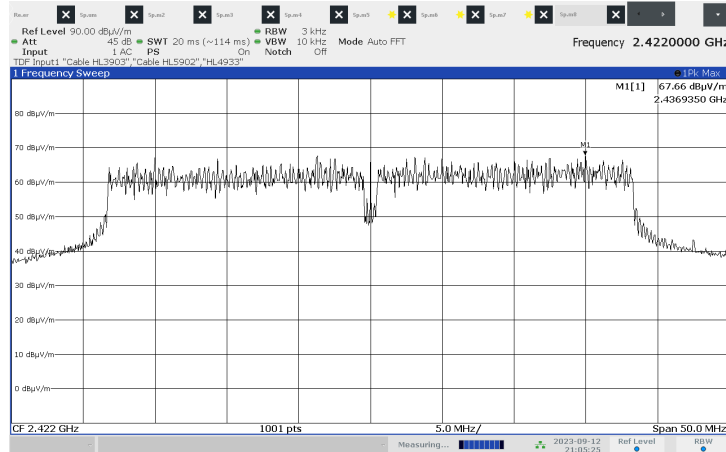
Plot 7.6.4 Peak spectral power density of carrier at low frequency (continuation)

CHANNEL BANDWIDTH: 40 MHz
MODULATION/BITRATE: BPSK / 6.5 Mbps



01:24:07 PM 09/13/2023

CHANNEL BANDWIDTH: 40 MHz
MODULATION/BITRATE: 64QAM / 65 Mbps



09:05:25 PM 09/12/2023

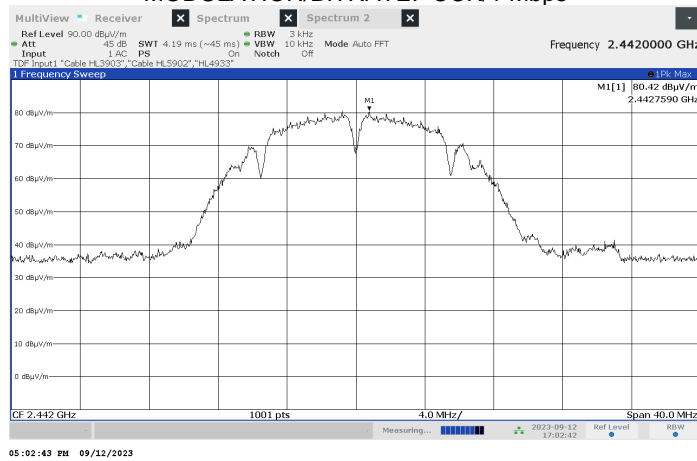


HERMON LABORATORIES

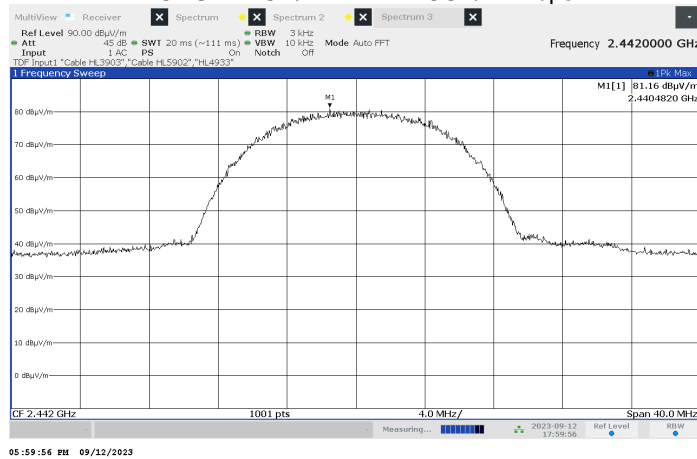
Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Plot 7.6.5 Peak spectral power density of carrier at mid frequency

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: CCK/1 Mbps



CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: CCK/11 Mbps

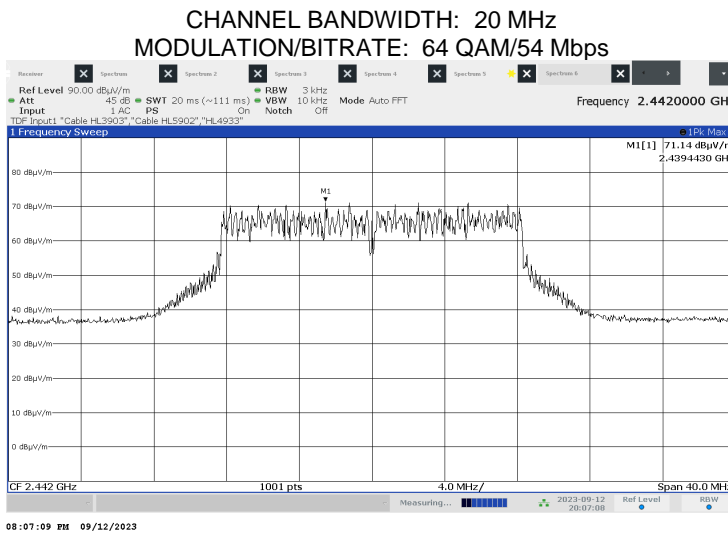
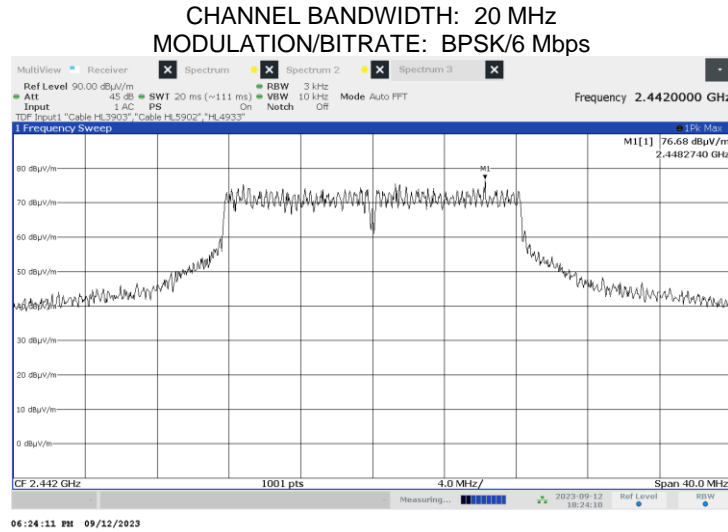




HERMON LABORATORIES

Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Plot 7.6.6 Peak spectral power density of carrier at mid frequency (continuation)



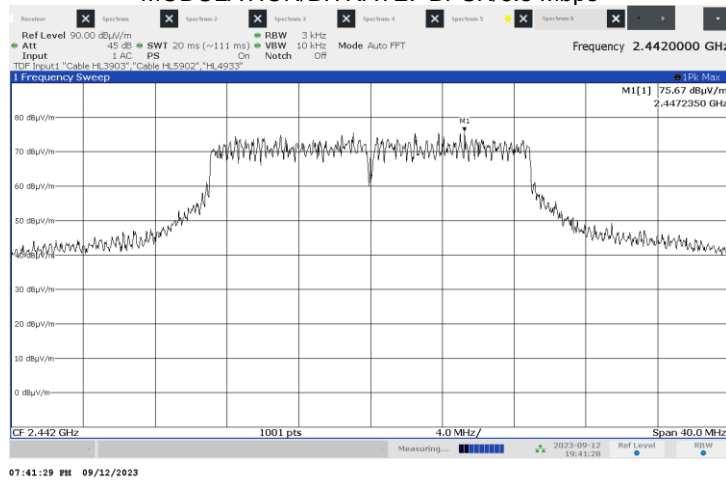


HERMON LABORATORIES

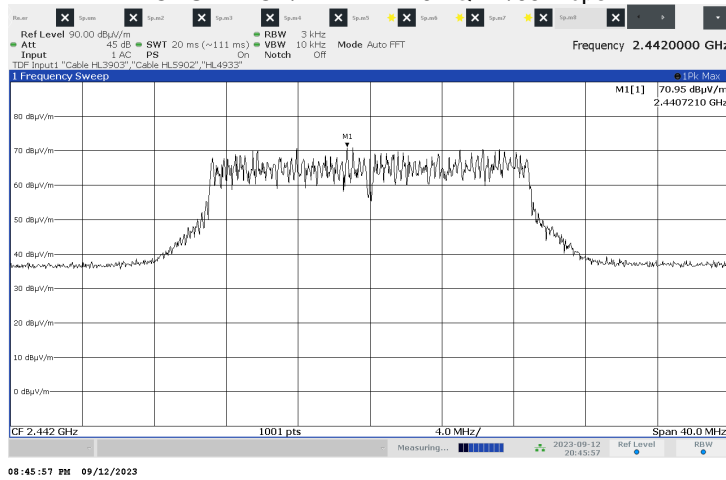
Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Plot 7.6.7 Peak spectral power density of carrier at mid frequency (continuation)

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: BPSK/6.5 Mbps



CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: 64 QAM/65 Mbps



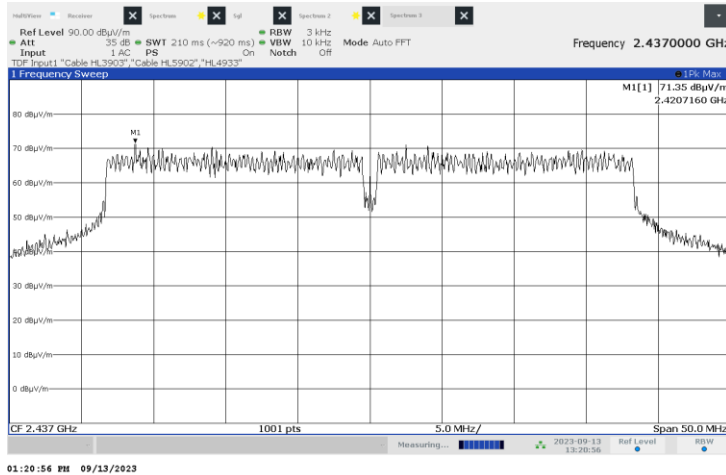


HERMON LABORATORIES

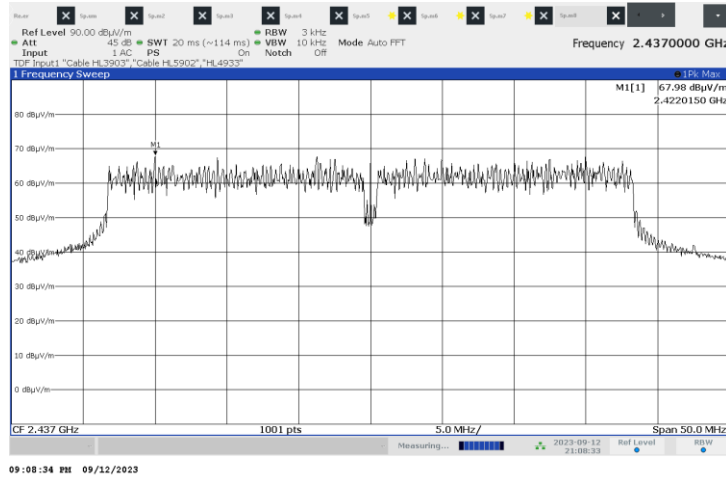
Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Plot 7.6.8 Peak spectral power density of carrier at mid frequency (continuation)

CHANNEL BANDWIDTH: 40 MHz
MODULATION/BITRATE: BPSK / 6.5 Mbps



CHANNEL BANDWIDTH: 40 MHz
MODULATION/BITRATE: 64QAM / 65 Mbps



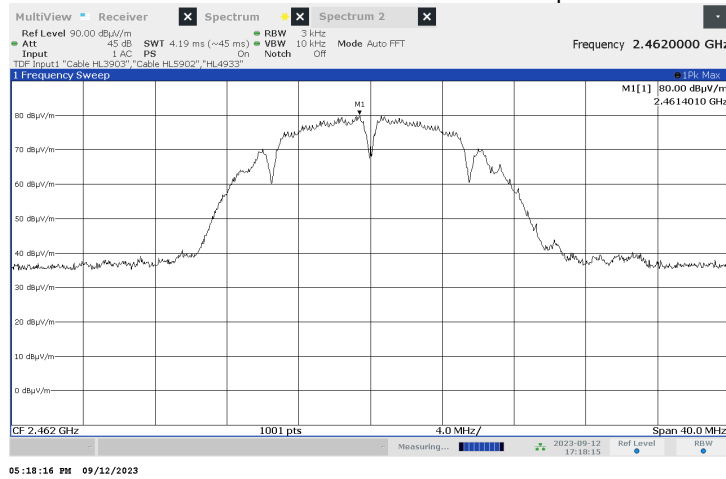


HERMON LABORATORIES

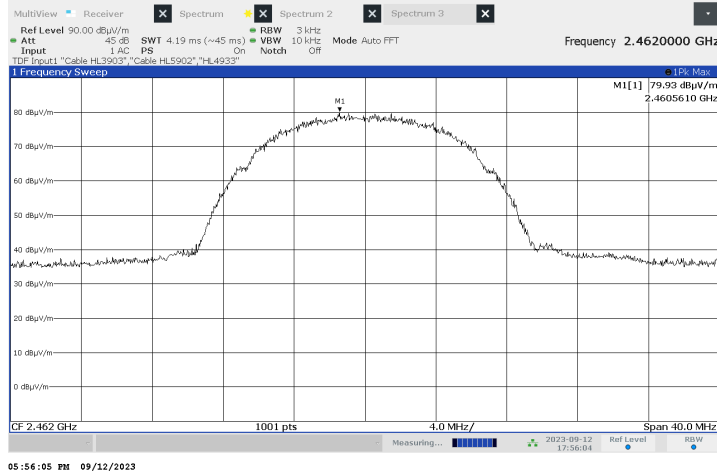
Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Plot 7.6.9 Peak spectral power density of carrier at high frequency

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: CCK/1 Mbps



CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: CCK/11 Mbps



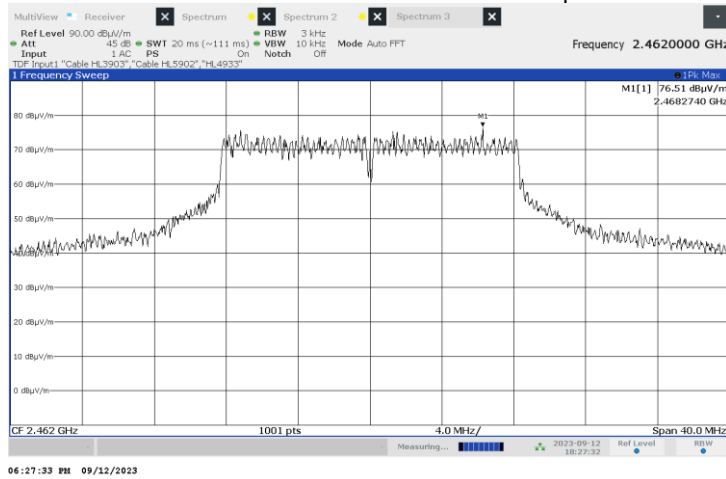


HERMON LABORATORIES

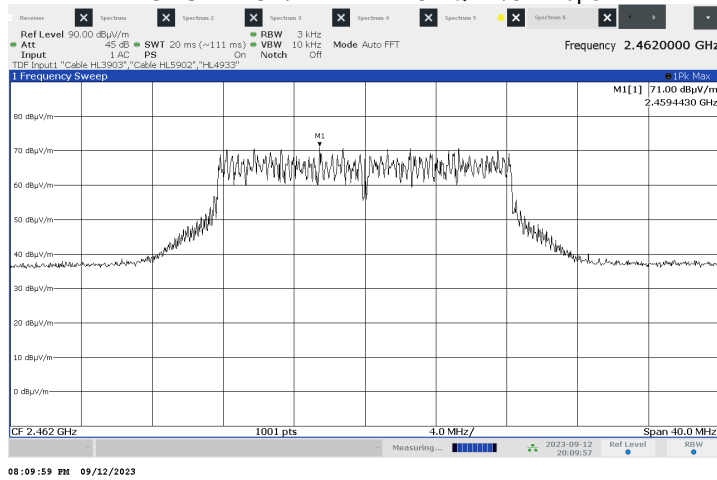
Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Plot 7.6.10 Peak spectral power density of carrier at high frequency (continuation)

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: BPSK/6 Mbps



CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: 64 QAM/54 Mbps



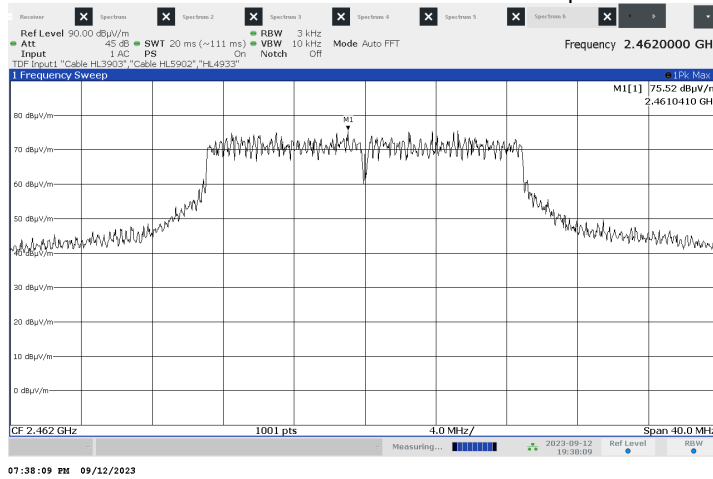


HERMON LABORATORIES

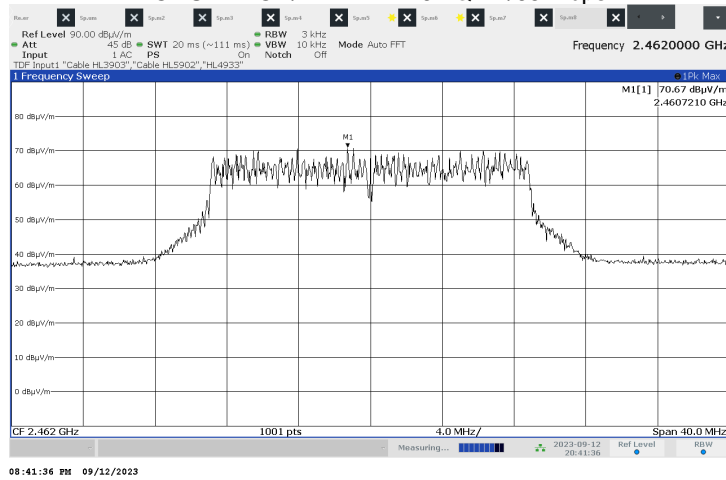
Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Plot 7.6.11 Peak spectral power density of carrier at high frequency (continuation)

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: BPSK/6.5 Mbps



CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: 64 QAM/65 Mbps



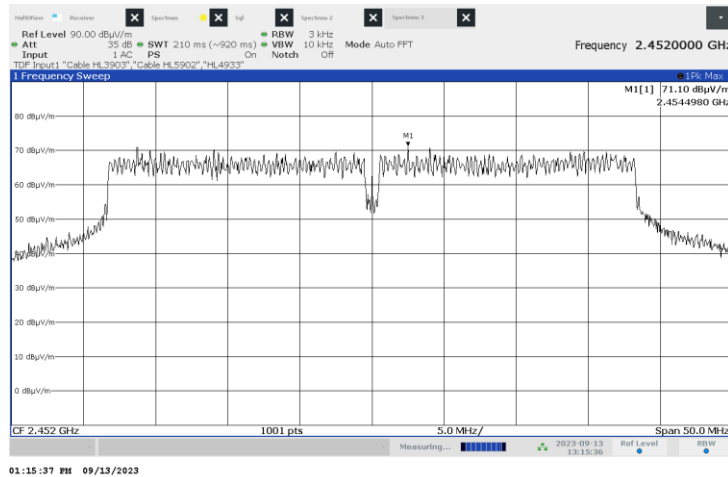


HERMON LABORATORIES

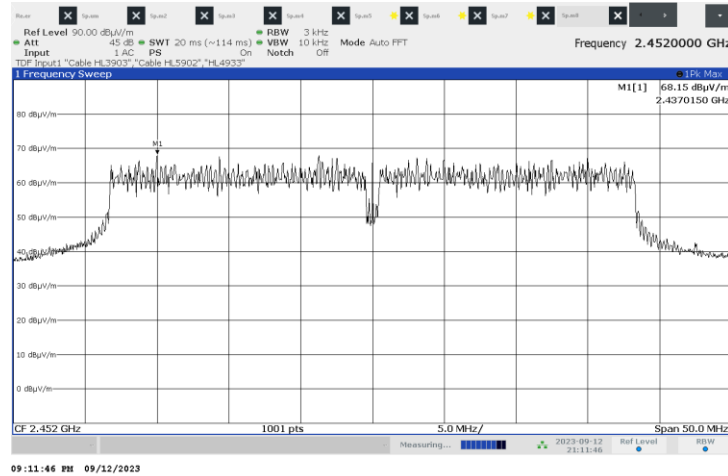
Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Plot 7.6.12 Peak spectral power density of carrier at high frequency (continuation)

CHANNEL BANDWIDTH: 40 MHz
MODULATION/BITRATE: BPSK / 6.5 Mbps



CHANNEL BANDWIDTH: 40 MHz
MODULATION/BITRATE: 64QAM / 65 Mbps





Test specification: Section 15.207(a), RSS-Gen, Section 7.2, Conducted emission			
Test procedure: ANSI C63.4, Section 13.1.3			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

7.7 Conducted emissions

7.7.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.7.1. The worst test results (the lowest margins) were recorded in Table 7.7.2 and shown in the associated plots.

Table 7.7.1 Limits for conducted emissions

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

* The limit decreases linearly with the logarithm of frequency.

7.7.2 Test procedure

- 7.7.2.1 The EUT was set up as shown in Figure 7.7.1 and associated photographs, energized and the performance check was conducted.
- 7.7.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.7.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.
- 7.7.2.3 The position of the device cables was varied to determine maximum emission level.
- 7.7.2.4 The worst test results (the lowest margins) were recorded in Table 7.7.2 and shown in the associated plots.



Test specification: Section 15.207(a), RSS-Gen, Section 7.2, Conducted emission			
Test procedure: ANSI C63.4, Section 13.1.3			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Figure 7.7.1 Setup for conducted emission measurements, table-top equipment

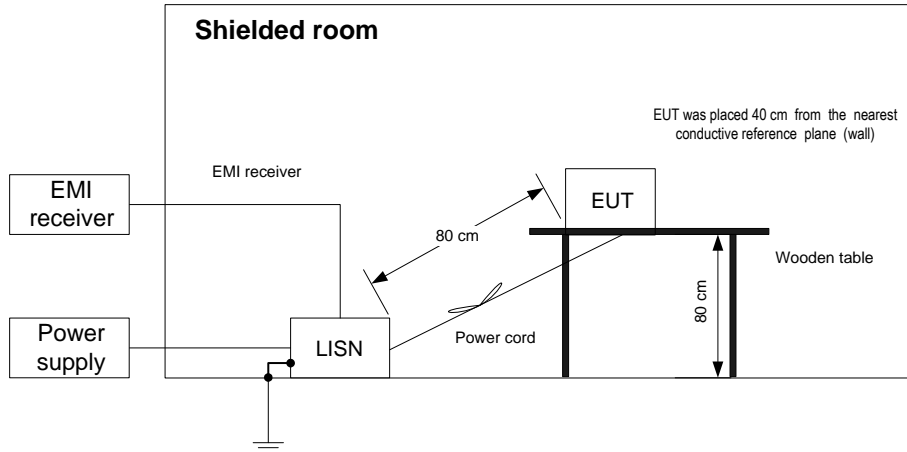


Table 7.7.2 Conducted emission test results

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

Frequency, MHz	Quasi-peak			Average			Line ID	Verdict
	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
No emission found 20dB below limit							L1	Pass
No emission found 20dB below limit							L2	Pass

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

HL 0787	HL 3016	HL 5476	HL 5707				
---------	---------	---------	---------	--	--	--	--

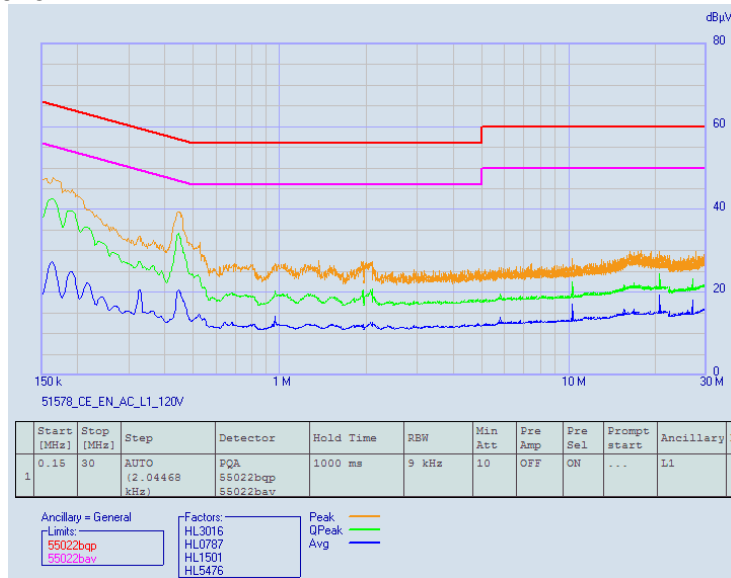
Full description is given in Appendix A.



Test specification: Section 15.207(a), RSS-Gen, Section 7.2, Conducted emission			
Test procedure: ANSI C63.4, Section 13.1.3			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

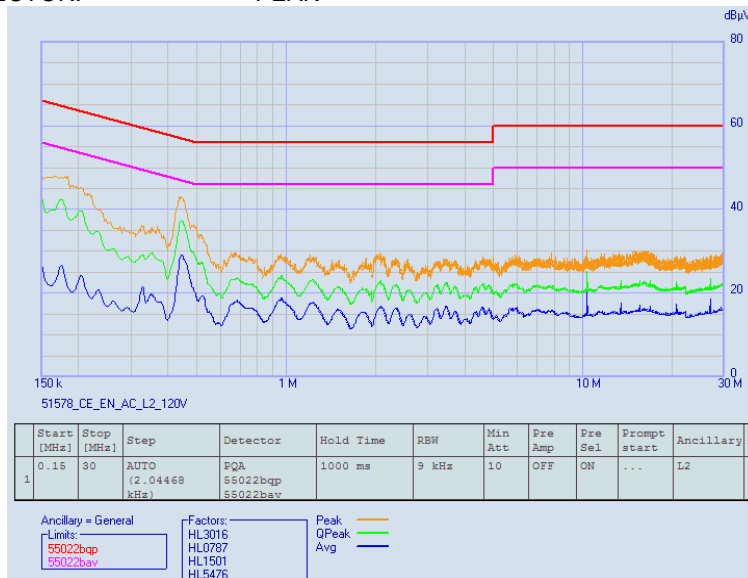
Plot 7.7.1 Conducted emission measurements

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



Plot 7.7.2 Conducted emission measurements

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





HERMON LABORATORIES

Test specification: Section 15.207(a), RSS-Gen, Section 7.2, Conducted emission			
Test procedure: ANSI C63.4, Section 13.1.3			
Test mode: Compliance		Verdict: PASS	
Date(s): 12-Sep-23 - 13-Sep-23			
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			



Test specification: Section 15.203 / RSS-Gen section 6.8, Antenna requirement			
Test procedure: Visual inspection			
Test mode: Compliance		Verdict: PASS	
Date(s): 01-Oct-23			
Temperature: 24 °C	Relative Humidity: 46 %	Air Pressure: 1004 hPa	Power:
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	Comply
The transmitter employs a unique antenna connector	NA	
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	07-Mar-23	07-Mar-24
3356	Low Pass Filter, 50 Ohm, DC to 1800 MHz.	Mini-Circuits	VLV-1800+	NA	20-Jun-23	20-Jun-25
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFL EX 102A	1226/2A	16-Apr-23	16-Apr-24
4015	Temp. & Humidity Meter, (-50 - +70) deg, (20 - 99) % RH	Mad Electronics	HTC-1	NA	01-May-23	01-May-24
4135	Shield Box	TESCOM CO., LTD	TC-5916A	5916A000 136	03-May-23	03-May-24
4355	Signal and Spectrum Analyzer, 9 kHz to 7 GHz	Rohde & Schwarz	FSV 7	101630	11-Oct-22	11-Oct-23
4433	Bandpass filter, 1.7 GHz - 2.3 GHz	K&L Microwave Incorporated	6B120-2000/X60 0-0	F032-5	22-Jun-23	22-Jun-25
4909	High Pass Filter, 50 Ohm, 2640 to 6230 MHz., SMA-FM / SMA-M	Mini-Circuits	VHF-2275+	NA	22-Jun-23	22-Jun-25
4919	High Pass Filter, 50 Ohm, 3900 to 9800 MHz, SMA-FM / SMA-M	Mini-Circuits	VHF-3500+	NA	21-Jun-23	21-Jun-25
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATION	AHA-118	701046	19-Jan-23	19-Jan-24
4938	Test Cable, 50Ω, 1.8 m, DC to 18 GHz	Mini-Circuits	CBL-6FT-SMNM+	NA	23-Apr-23	23-Apr-24
4956	Active horn antenna, 18 to 40 GHz	COM-POWER CORPORATION	AHA-840	105004	08-Mar-23	08-Mar-24
5112	RF cable, 40 GHz, 5.5 m, K-type	Huber-Suhner	SF102EA/11SK/11SK/5500MM	502494/2EA	16-Apr-23	16-Apr-24
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX-8000E	00809	24-Mar-22	24-Mar-25
5838	Set near field probes	COM-POWER CORPORATION	PS-400	151724	05-Jul-22	05-Jul-24
5902	RF cable, 18 GHz, 6.0m, N-type	Huber-Suhner	SF126EA/11N/11N/6000	NA	08-Dec-22	08-Dec-23
7585	EMI Test Receiver, 1 Hz to 44 GHz	Rohde & Schwarz	ESW44	103130	19-May-22	19-May-23
7802	EMI Test Receiver, 1 Hz to 44 GHz	Rohde & Schwarz	ESW44	103170	15-Sep-22	15-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 μ V to obtain field strength in dB μ V/m.
above 1000 MHz

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

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

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



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 dB μ V to obtain field strength in dB μ 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 μ V to obtain field strength in dB μ 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 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

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.



HERMON LABORATORIES

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 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).

Address: P.O. Box 23, Binyamina 3055001, Israel.

Telephone: +972 4628 8001

Fax: +972 4628 8277

e-mail: mail@hermonlabs.com

website: www.hermonlabs.com

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



12 APPENDIX E Specification references

FCC 47CFR part 15: 2020	Radio Frequency Devices
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.4: 2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
RSS-247 Issue 2: 2017	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
ICES-003: 2020, Issue 7	Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement



13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ A)	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
μ s	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



14 APPENDIX G Manufacturer's declaration



Declaration of Identity

We, the undersigned,

Company: Vayyar Imaging Ltd.
Address: Shabazi 26, Yehud
Country: Israel
Telephone number: +972-54-42254549

declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
Vayyar Imaging LTD.	VMPRO19CB4BAT, VMPRO19EB4BAT	Handheld UWB device with optional WI-FI/BLE communication

Has an identical RF system as the following equipment:

Brand/Item	Type/Model	Short Product description
Vayyar Imaging LTD.	VMPRO19CB4WREP VMPRO19EB4WREP	Handheld UWB device with optional WI-FI/BLE communication

The reason for name change is: VMPRO19CB4BAT, VMPRO19EB4BAT has an integrated battery and can be supplied by either the battery or by external power source (through USBC port). VMPRO19CB4WREP, VMPRO19EB4WREP doesn't contain battery and thus can only be powered by external power source.

21/07/2022
(date)

.....
(signature)

Naftali Chayat
(printed name)

CTO
(position)

END OF DOCUMENT