

## TEST REPORT

ACCORDING TO: FCC 47 CFR part 15 section 15.255;  
RSS-210 issue 10 Annex J, RSS-Gen issue 5 with Am.1

FOR:

**Siklu Communication Ltd.**

**MultiHaul™ Terragraph Point-to-Multipoint wireless V-Band  
system**

**Model: MH-N892-PCN-C-EWB**

**FCC ID: 2ACYESK-MH60TG-A9**

**IC: 12353A-MH60TGA9**

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## 1 Applicant information

**Client name:** Siklu Communication Ltd.  
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**Telephone:** +97235431000  
**E-mail:** [michaelk@ceragon.com](mailto:michaelk@ceragon.com)  
**Contact name:** Mr. Michael Kopit

## 2 Equipment under test attributes

**Product name:** MultiHaul™ Terragraph Point-to-Multipoint wireless  
**Product type:** Transceiver  
**Model(s):** MH-N892-PCN-C-EWB  
**Serial number:** SE14000006  
**Hardware version:** A0  
**Software release:** 2.3.0  
**Receipt date:** 07-Jan-24

## 3 Manufacturer information

**Manufacturer name:** Siklu Communication Ltd.  
**Address:** 3 Uri Ariav St, Rosh Ha'Ayin, Israel 4810002  
**Telephone:** +97235431000  
**E-Mail:** [michaelk@ceragon.com](mailto:michaelk@ceragon.com)  
**Contact name:** Mr. Michael Kopit

## 4 Test details

**Project ID:** 52762  
**Location:** Hermon Laboratories Ltd. 66 HaTachana str., P.O. Box 23, Binyamina 3055001, Israel  
**Test started:** 15-Feb-24  
**Test completed:** 05-Jun-24  
**Test specification(s):** FCC 47CFR part 15 subpart C sec. 15.255;  
RSS-210 issue 10 Annex J, RSS-Gen issue 5 with Am.1




## 5 Tests summary

Test	Status
<b>Transmitter characteristics</b>	
FCC section 15.255(c)(1)(i),(e) / RSS-210 section J.2.2(b), J.4, Transmitter power and power spectral density	Pass
FCC section 15.215(c)/ RSS-210 section J.4(c), RSS-Gen, Section 6.7, Occupied bandwidth	Pass
FCC section 15.255(d)(2)/ RSS-210 section J.3, Radiated spurious emissions below 40 GHz	Pass
FCC section 15.255(d)(3)/ RSS-210 section J.3, Radiated emissions outside assigned band and above 40 GHz up to 200 GHz	Pass
FCC section 15.255(f)/ RSS-210 section J.6, Frequency stability	Pass
FCC Section 15.207(a)/ RSS-Gen, section 8.8, Conducted emission	Pass*

\*The test was performed at DC power ports of MH-N892-PCN-C-EWB to demonstrate compliance with the conducted limits according to FCC 47CFR part 15.107(d) requirements.

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

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

	Name and Title	Date	Signature
<b>Tested by:</b>	Mr. S. Sugatov, test engineer, EMC & Radio	15-Feb-24 - 05-Jun-24	
<b>Reviewed by:</b>	Mrs. S. Peysahov Sheynin, certification engineer, EMC & Radio	28-Aug-24	
<b>Approved by:</b>	Mr. M. Nikishin, group leader, EMC & Radio	09-Jan-25	

## 6 EUT description

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

### 6.1 General information

MultiHaul™ Terragraph Point-to-Multipoint wireless V-Band system

The EUT is the MultiHaul™ TG Node N89x 60GHz 4 sectors system, model MH-N89x-CCP-PCN-C-EWB. It consists of 4 sectors operating in the 57-66GHz regulated millimeter waves V-band, in a self-backhaul redundant mesh and connecting a suite of MultiHaul TG terminal units (TU).

The new model N892 are part of TG family, it is upgraded version of N880.

The model (N892) shall be approved as DC powered equipment with 48-57VDC input ratings, and not paired with external power supply

### 6.2 Ports and lines

Port type	Port description	Conn. from	Conn. to	Qty.	Cable type	Cable length, m
Power	DC power	EUT	Power supply	1	Shielded	1.8 m
Wired network	LAN	EUT	Laptop	1	Shielded	10 m
Signal	SFP	EUT	Not connected	1	NA	NA
RF	Antenna	EUT	Antenna	4	Coax	0.5 m

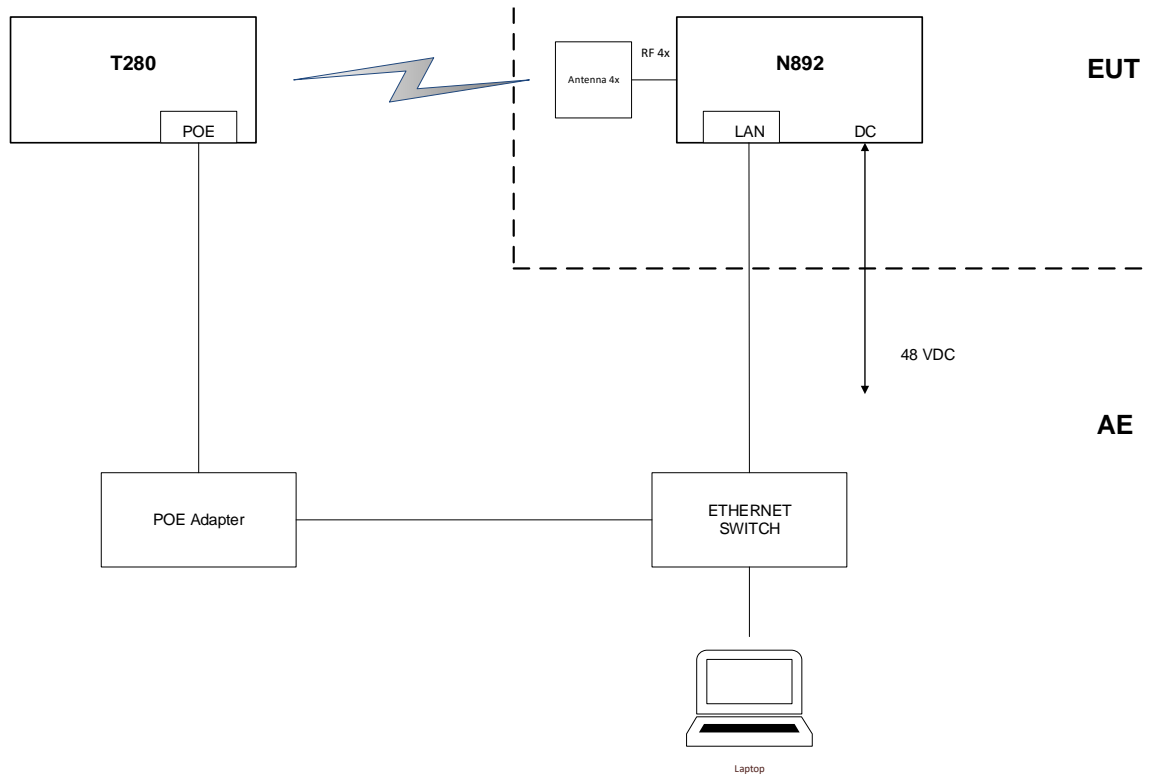
### 6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
Laptop	Lenovo	X260	PC0HP1RC
PoE adapter	Siklu	G0566-550-109	N/A

### 6.4 Changes made in the EUT

No changes were performed in the EUT during testing.

## 6.5 Test configuration





## 6.6 Transmitter characteristics

<b>Type of equipment</b>			
<b>V</b>	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)		
<b>Intended use</b>		<b>Condition of use</b>	
<b>V</b>	fixed	Always at a distance more than 2 m from all people	
	mobile	Always at a distance more than 20 cm from all people	
	portable	May operate at a distance closer than 20 cm to human body	
<b>Assigned frequency range</b>		57.0 GHz – 66.0 GHz	
<b>Operating frequency range</b>		58320 -64800 MHz	
<b>Test frequencies</b>		58320 MHz, 60480, 62640, 64800 MHz	
<b>Maximum rated output power</b>		EIRP	39.20 dBm
<b>Is transmitter output power variable?</b>		<b>V</b>	No
			continuous variable
			stepped variable with stepsize
			minimum RF power
			maximum RF power
<b>Antenna connection</b>			
unique coupling	standard connector	<b>V</b>	Integral
			with temporary RF connector
			without temporary RF connector
<b>Antenna/s technical characteristics</b>			
Type	Manufacturer	Model number	Gain
Patch antenna array	Siklu Ltd.	FARF079A	22.5 dBi
<b>Data Rate Configuration</b>	<b>Transmitter 99% power bandwidth, MHz</b>	<b>Transmitter aggregate data rate/s, Mbps</b>	<b>Type of modulation</b>
MCS1	2126.9	385	BPSK
MCS12	2109.4	4600	16QAM
<b>Type of multiplexing</b>		TDD	
<b>Transmitter power source</b>			
	<b>Nominal rated voltage</b>	Battery type	
<b>V</b>	DC	Nominal rated voltage	48 V
	<b>Voltage range</b>		
	AC mains	Nominal rated voltage	Frequency
<b>Common power source for transmitter and receiver</b>		<b>V</b>	yes no



Test specification:		FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power	
Test procedure:		47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5	
Test mode:		Verdict: PASS	
Date(s):			
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

## 7 Transmitter tests

### 7.1 Transmitter power test

#### 7.1.1 General

This test was performed to measure the peak output power. Specification test limits are given in Table 7.1.1.

**Table 7.1.1 Output power limits**

Assigned frequency range, MHz	Maximum output power			
	Peak conducted output power		EIRP, dBm	
	mW	dBm	Peak	Average
57000 – 71000	500	27.0	43	40

#### 7.1.2 Test procedure

- 7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.
- 7.1.2.2 The EUT was adjusted to produce maximum available for end user RF output power.
- 7.1.2.3 The average and peak voltage was measured at the low and high frequency channels with oscilloscope connected to RF detector and provided in the associated plots.
- 7.1.2.4 The unmodulated signal was applied to Zero-Biased Detector via variable attenuator as shown in Figure 7.1.2.
- 7.1.2.5 The variable attenuator was adjusted such that the oscilloscope indicated a voltage equal to the peak voltage recorded in the step 7.1.2.3.
- 7.1.2.6 The variable attenuator was disconnected from the Zero-Biased Detector.
- 7.1.2.7 Without changing any settings, the variable attenuator was connected to a power meter as shown in Figure 7.1.3.
- 7.1.2.8 The power was measured and result was recorded in Table 7.1.2 and Table 7.1.3.
- 7.1.2.9 The steps 7.1.2.4 through 7.1.2.8 were repeated for the average voltage recorded in the step 7.1.2.3 and 7.1.2.4.





<b>Test specification:</b>		<b>FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5	
<b>Test mode:</b>		<b>Verdict:</b> PASS	
<b>Date(s):</b>			
24-Apr-24			
<b>Temperature:</b> 39 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1004 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Figure 7.1.1 Peak output power test setup

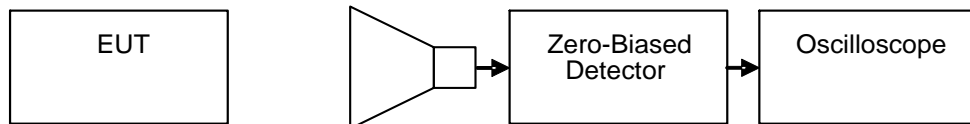


Figure 7.1.2 Peak output power test setup

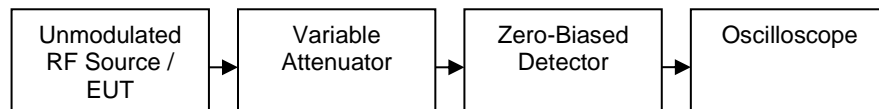
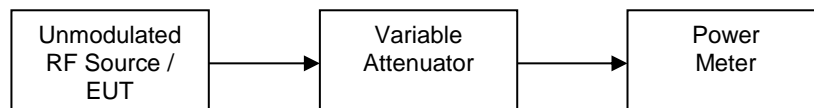


Figure 7.1.3 Peak output power test setup





Test specification:		FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power	
Test procedure:		47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5	
Test mode:		Verdict: PASS	
Date(s):			
24-Apr-24			
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Table 7.1.2 Peak output power test results

ASSIGNED FREQUENCY RANGE: 57.0 – 71.0 GHz  
 DETECTOR USED: Peak  
 MEASUREMENTS DISTANCE: 0.80 m  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 EUT ANTENNA GAIN: 22.5 dBi  
 MODULATION: 16QAM  
 ANTENNA # 1

Frequency, MHz	$\lambda^*$ , m	DSO, mV	Power measured, dBm	Antenna Gain, dBi	$E_{\text{meas}}^{**}$ , dBuV/m	EIRP <sup>***</sup> , dBm	Limit, dBm	Margin <sup>****</sup> , dB	Verdict
58320	0.005144033	14.19	-8.22	24	140.35	33.72	43	-9.28	Pass
60480	0.004960317	20.61	-5.37	24	143.52	36.88	43	-6.12	Pass
62640	0.004789272	43.10	-4.01	24	145.18	38.55	43	-4.45	Pass
64800	0.004629630	46.33	-3.65	24	145.84	39.20	43	-3.80	Pass

ANTENNA # 2

Frequency, MHz	$\lambda^*$ , m	DSO, mV	Power measured, dBm	Antenna Gain, dBi	$E_{\text{meas}}^{**}$ , dBuV/m	EIRP <sup>***</sup> , dBm	Limit, dBm	Margin <sup>****</sup> , dB	Verdict
58320	0.005144033	35.74	-4.01	24	144.56	37.93	43	-5.07	Pass
60480	0.004960317	38.49	-4.62	24	144.27	37.63	43	-5.37	Pass
62640	0.004789272	48.89	-3.74	24	145.45	38.82	43	-4.18	Pass
64800	0.004629630	15.79	-8.93	24	140.56	33.92	43	-9.08	Pass

ANTENNA # 3

Frequency, MHz	$\lambda^*$ , m	DSO, mV	Power measured, dBm	Antenna Gain, dBi	$E_{\text{meas}}^{**}$ , dBuV/m	EIRP <sup>***</sup> , dBm	Limit, dBm	Margin <sup>****</sup> , dB	Verdict
58320	0.005144033	41.93	-3.05	24	145.52	38.89	43	-4.11	Pass
60480	0.004960317	36.66	-4.91	24	143.98	37.34	43	-5.66	Pass
62640	0.004789272	56.68	-3.52	24	145.67	39.04	43	-3.96	Pass
64800	0.004629630	42.35	-4.07	24	145.42	38.78	43	-4.22	Pass

ANTENNA # 4

Frequency, MHz	$\lambda^*$ , m	DSO, mV	Power measured, dBm	Antenna Gain, dBi	$E_{\text{meas}}^{**}$ , dBuV/m	EIRP <sup>***</sup> , dBm	Limit, dBm	Margin <sup>****</sup> , dB	Verdict
58320	0.005144033	26.92	-5.98	24	142.59	35.96	43	-7.04	Pass
60480	0.004960317	30.84	-3.87	24	145.02	38.38	43	-4.62	Pass
62640	0.004789272	58.78	-3.43	24	145.76	39.13	43	-3.87	Pass
64800	0.004629630	73.48	-3.03	24	146.46	39.82	43	-3.18	Pass

Note: Max peak conducted power is 39.82 dBm – 22.5 dBi = 17.32 dBm

\* -  $\lambda = 300/\text{Frequency(MHz)}$

\*\* -  $E_{\text{meas}} = 126.8 - 20\log(\lambda) + \text{Power measured} - \text{Measurement Antenna Gain (24 dBi)}$

\*\*\* -  $\text{EIRP} = E_{\text{meas}} + 20\log(\text{Measurements distance}) - 104.7$

\*\*\*\* -  $\text{Margin} = \text{EIRP} - \text{Limit}$



Test specification:		FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power	
Test procedure:		47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5	
Test mode:		Verdict: PASS	
Date(s):			
24-Apr-24			
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Table 7.1.3 Average output power test results

ASSIGNED FREQUENCY RANGE: 57.0 – 71.0 GHz  
 DETECTOR USED: Average  
 MEASUREMENTS DISTANCE: 0.80 m  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 EUT ANTENNA GAIN: 22.5 dBi  
 ANTENNA GAIN: 24.0 dBi  
 MODULATION: 16QAM  
 ANTENNA # 1

Frequency, MHz	$\lambda^*$ , m	DSO, mV	Power measured, dBm	Antenna Gain, dBi	$E_{\text{meas}}^{**}$ , dBuV/m	EIRP <sup>***</sup> , dBm	Limit, dBm	Margin <sup>****</sup> , dB	Verdict
58320	0.005144033	13.69	-8.57	24	140.00	33.37	40	-6.63	Pass
60480	0.004960317	20.19	-5.47	24	143.42	36.78	40	-3.22	Pass
62640	0.004789272	42.05	-4.14	24	145.05	38.42	40	-1.58	Pass
64800	0.004629630	43.50	-4.03	24	145.46	38.82	40	-1.18	Pass

ANTENNA # 2

Frequency, MHz	$\lambda^*$ , m	DSO, mV	Power measured, dBm	Antenna Gain, dBi	$E_{\text{meas}}^{**}$ , dBuV/m	EIRP <sup>***</sup> , dBm	Limit, dBm	Margin <sup>****</sup> , dB	Verdict
58320	0.005144033	35.23	-4.14	24	144.43	37.80	40	-2.20	Pass
60480	0.004960317	37.77	-4.75	24	144.14	37.50	40	-2.50	Pass
62640	0.004789272	47.21	-3.51	24	145.68	39.05	40	-0.95	Pass
64800	0.004629630	14.98	-9.53	24	139.96	33.32	40	-6.68	Pass

ANTENNA # 3

Frequency, MHz	$\lambda^*$ , m	DSO, mV	Power measured, dBm	Antenna Gain, dBi	$E_{\text{meas}}^{**}$ , dBuV/m	EIRP <sup>***</sup> , dBm	Limit, dBm	Margin <sup>****</sup> , dB	Verdict
58320	0.005144033	41.54	-3.17	24	145.40	38.77	40	-1.23	Pass
60480	0.004960317	35.92	-3.60	24	145.29	38.65	40	-1.35	Pass
62640	0.004789272	55.36	-3.58	24	145.61	38.98	40	-1.02	Pass
64800	0.004629630	39.52	-4.53	24	144.96	38.32	40	-1.68	Pass

ANTENNA # 4

Frequency, MHz	$\lambda^*$ , m	DSO, mV	Power measured, dBm	Antenna Gain, dBi	$E_{\text{meas}}^{**}$ , dBuV/m	EIRP <sup>***</sup> , dBm	Limit, dBm	Margin <sup>****</sup> , dB	Verdict
58320	0.005144033	26.13	-5.58	24	142.99	36.36	40	-3.64	Pass
60480	0.004960317	30.32	-3.91	24	144.98	38.34	40	-1.66	Pass
62640	0.004789272	57.48	-3.49	24	145.70	39.07	40	-0.93	Pass
64800	0.004629630	72.59	-3.04	24	146.45	39.81	40	-0.19	Pass

\* -  $\lambda = 300/\text{Frequency(MHz)}$

\*\* -  $E_{\text{meas}} = 126.8 - 20\log(\lambda) + \text{Power measured} - \text{Measurement Antenna Gain (24 dBi)}$

\*\*\* -  $\text{EIRP} = E_{\text{meas}} + 20\log(\text{Measurements distance}) - 104.7$

\*\*\*\* -  $\text{Margin} = \text{EIRP} - \text{Limit}$

#### Reference numbers of test equipment used

HL 5714	HL 0771	HL 5380	HL 5377	HL 5376	HL 3291	HL 4856	HL 3293
HL 5371	HL 3901						

Full description is given in Appendix A.



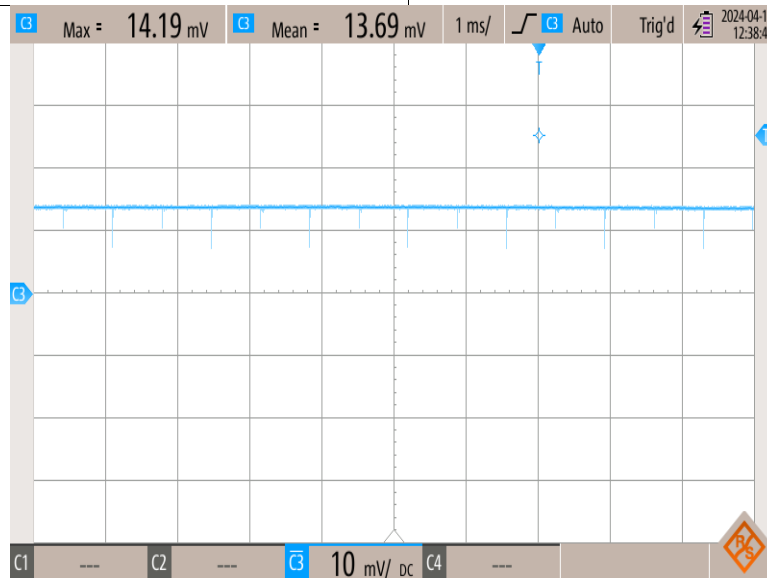
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Date of Issue: 18-Aug-25

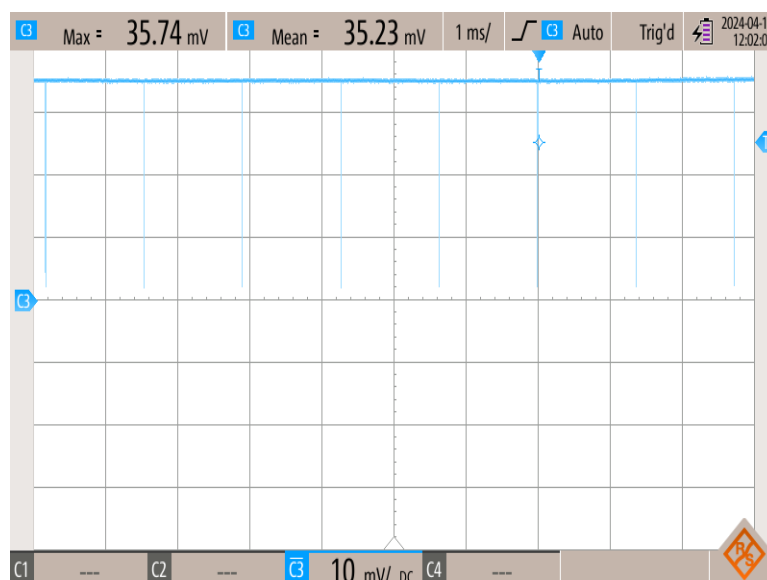
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Test procedure:		47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5	
Test mode:		Verdict: PASS	
Date(s):			
24-Apr-24			
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Plot 7.1.1 Output power test result at the 58.32 GHz frequency

DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	1



DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	2



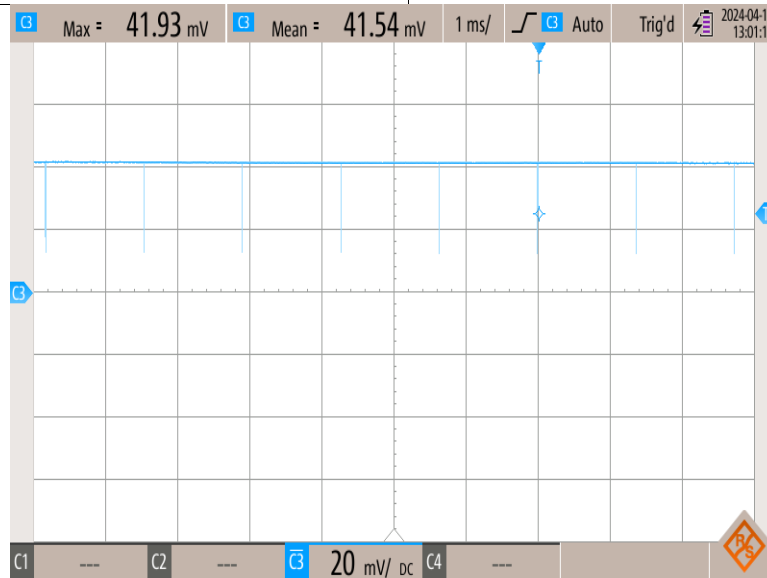


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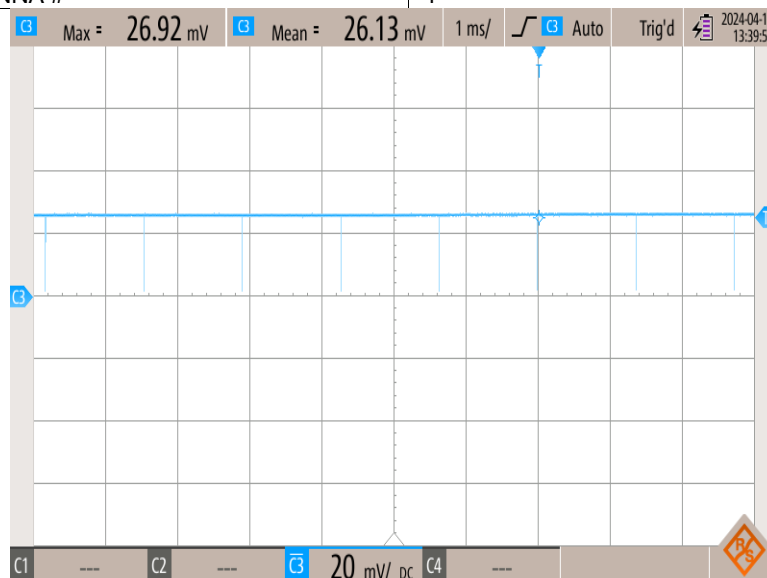
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Test procedure:		47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5	
Test mode:		Verdict: PASS	
Date(s):			
24-Apr-24			
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Plot 7.1.2 Output power test result at the 58.32 GHz frequency

DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	3



DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	4



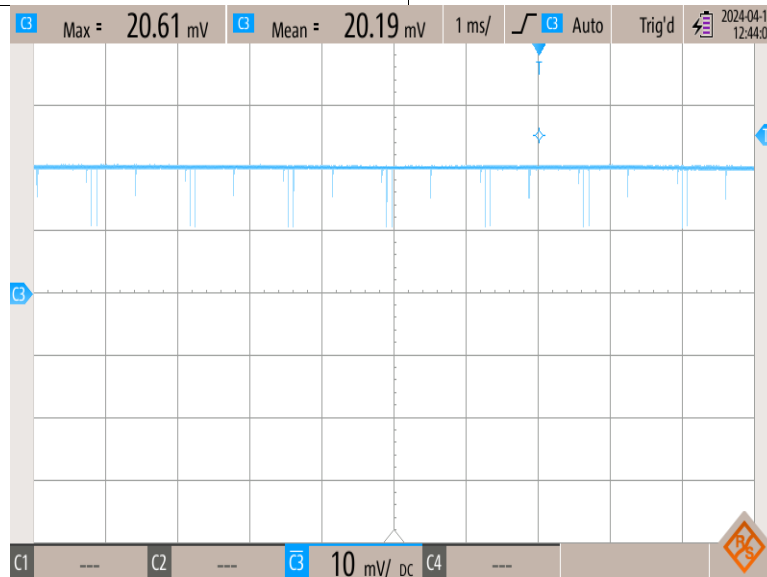


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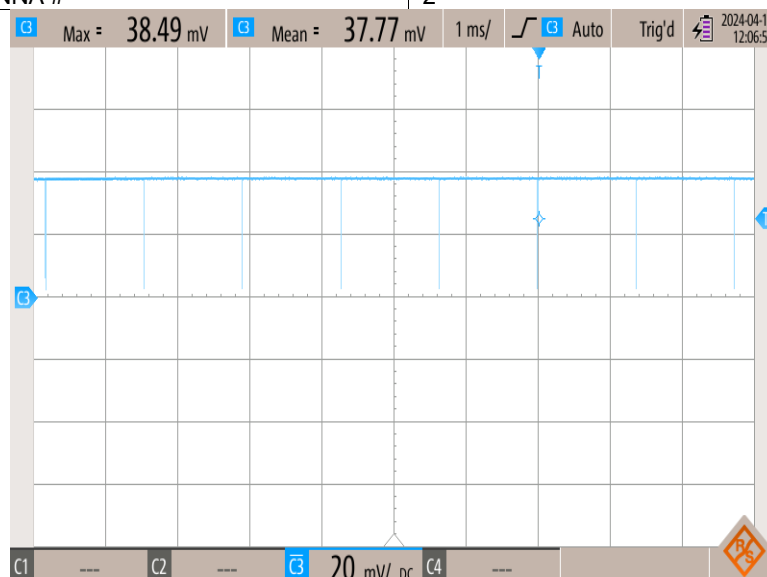
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Test procedure:		47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5	
Test mode:		Verdict: PASS	
Date(s):			
24-Apr-24			
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Plot 7.1.3 Output power test result at the 60.48 GHz frequency

DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	1



DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	2



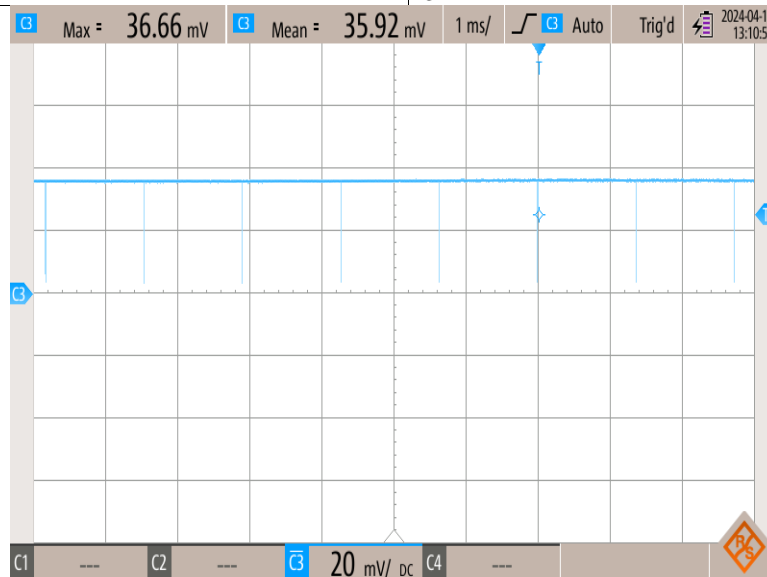


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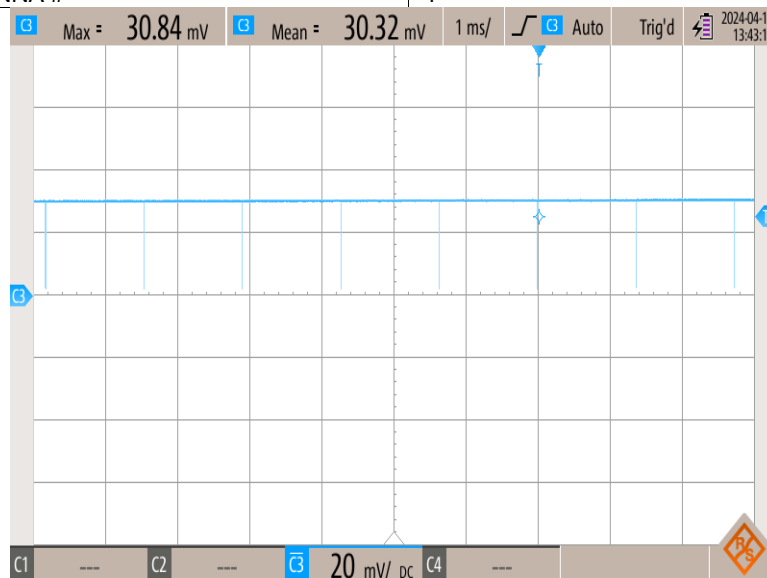
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Test procedure:		47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5	
Test mode:		Verdict: PASS	
Date(s):			
24-Apr-24			
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Plot 7.1.4 Output power test result at the 60.48 GHz frequency

DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	3



DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	4





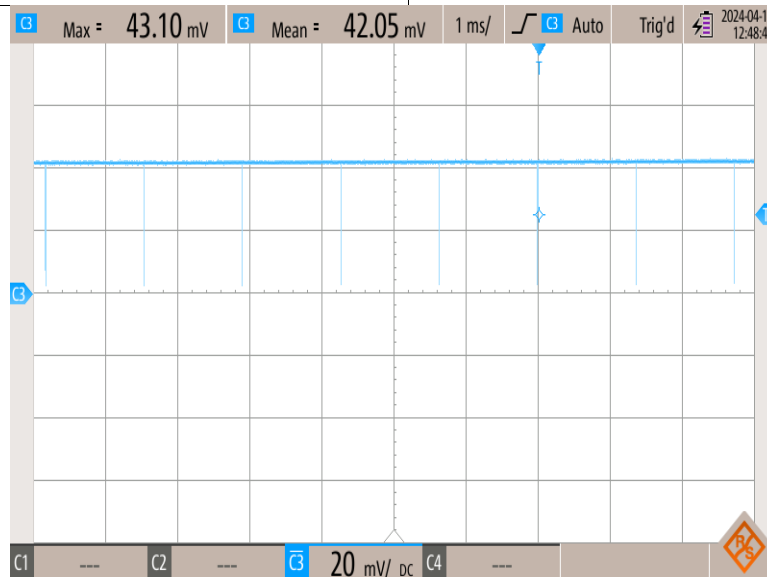
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Date of Issue: 18-Aug-25

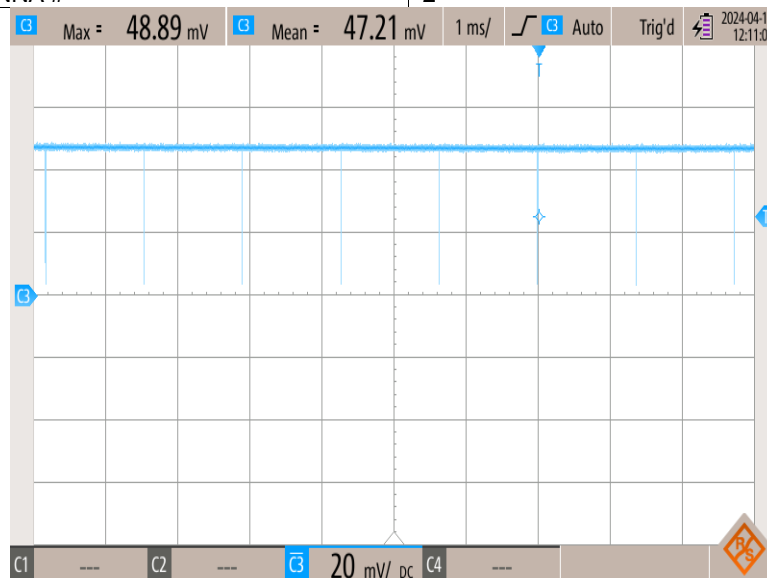
Test specification:		FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power	
Test procedure:		47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5	
Test mode:		Verdict: PASS	
Date(s):			
24-Apr-24			
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Plot 7.1.5 Output power test result at the 62.64 GHz frequency

DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	1



DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	2





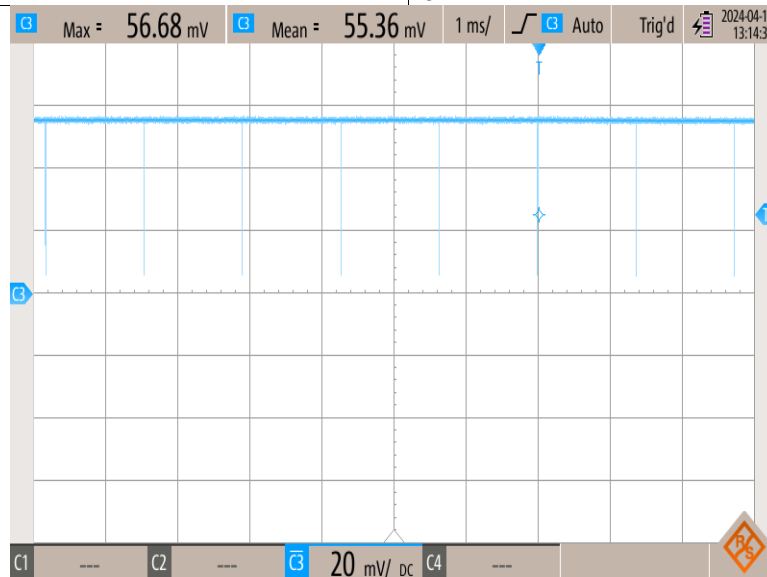


HERMON LABORATORIES

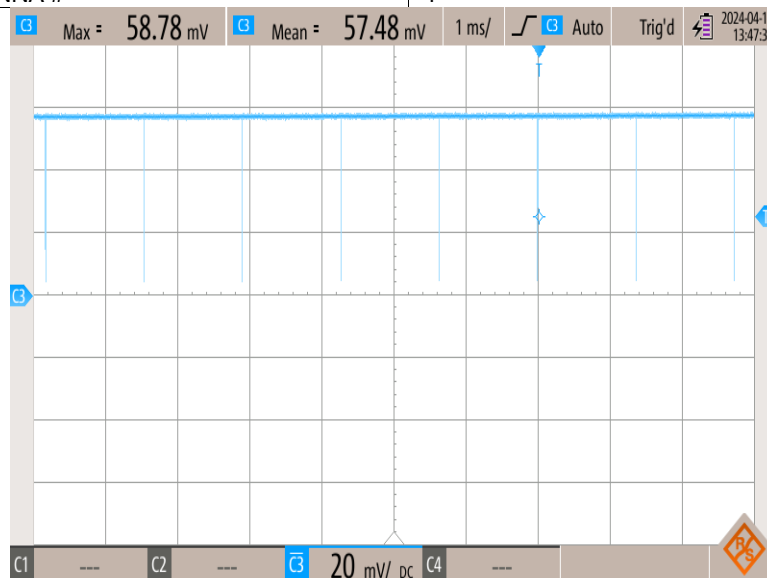
Test specification:		FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power	
Test procedure:		47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5	
Test mode:		Verdict: PASS	
Date(s):			
24-Apr-24			
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Plot 7.1.6 Output power test result at the 62.64 GHz frequency

DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	3



DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	4



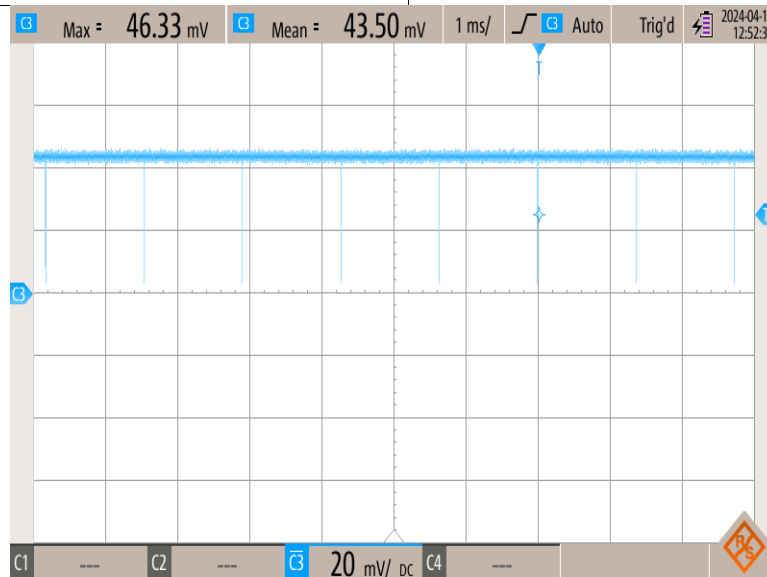


HERMON LABORATORIES

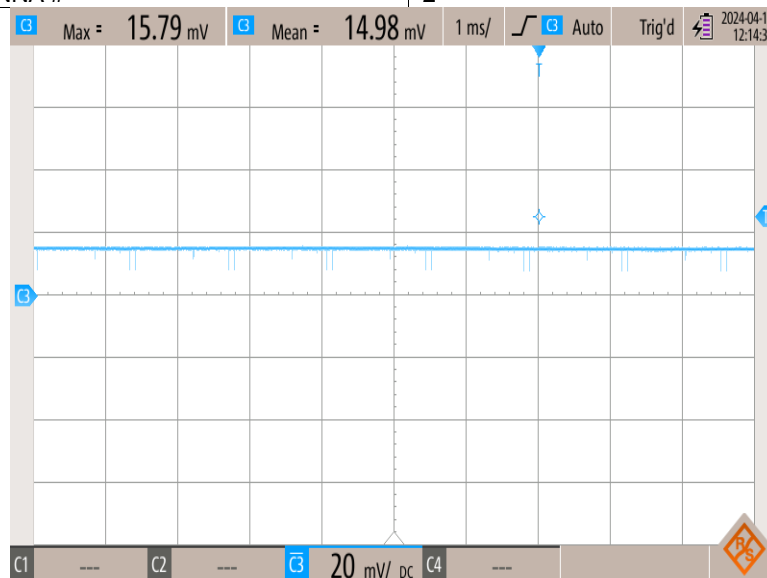
Test specification:		FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power	
Test procedure:		47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5	
Test mode:		Verdict: PASS	
Date(s):			
24-Apr-24			
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Plot 7.1.7 Output power test result at the 64.80 GHz frequency

DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	1



DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	2





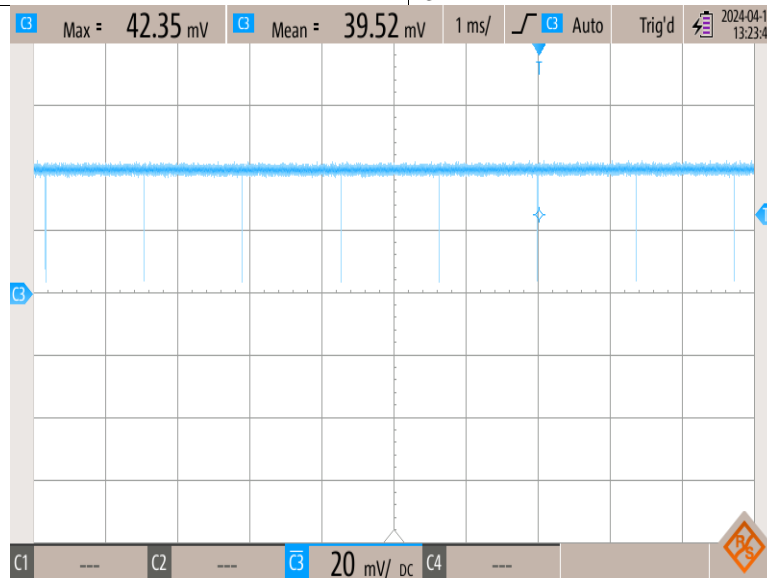
HERMON LABORATORIES

Report ID: SIKRAD\_FCC.52762.docx  
Date of Issue: 18-Aug-25

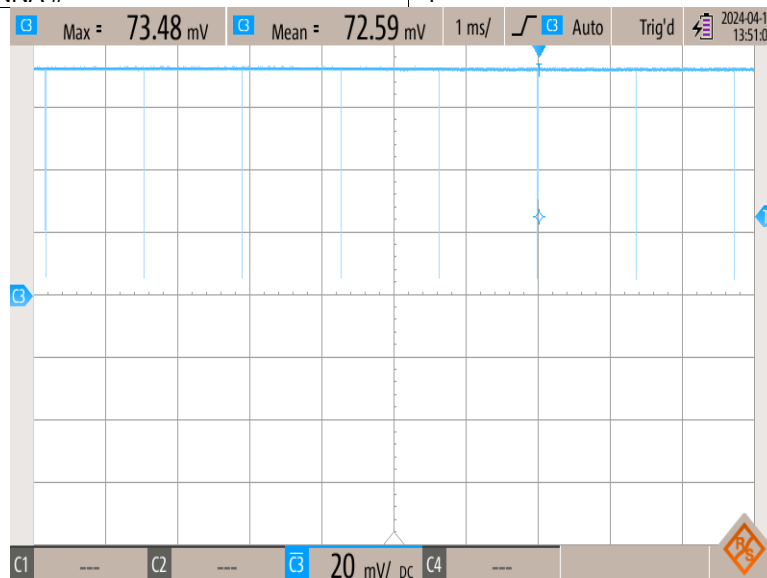
Test specification:		FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power	
Test procedure:		47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5	
Test mode:		Verdict: PASS	
Date(s):			
24-Apr-24			
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Plot 7.1.8 Output power test result at the 64.80 GHz frequency

DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	3



DETECTOR:	Peak/Average
MODULATION:	16QAM
ANTENNA #	4





Test specification:		FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049, ANSI C63.10, Section 9.3	
Test mode:		Verdict: PASS	
Date(s):			
24-Apr-24			
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

## 7.2 Occupied bandwidth test

### 7.2.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Occupied bandwidth limits

Assigned frequency range, MHz	Modulation envelope reference points	
57000 - 71000	6 dBc	99%

NOTE: Modulation envelope reference points provided in terms of attenuation below unmodulated carrier.

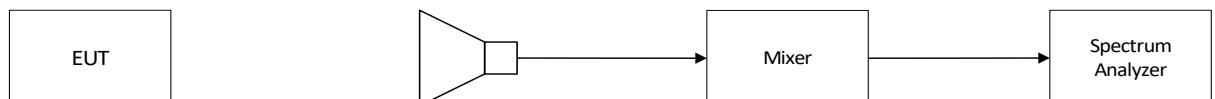
### 7.2.2 Test procedure

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

7.2.2.2 The EUT was set to transmit modulated carrier as provided in Table 7.2.2.

7.2.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope. The test results are provided in Table 7.2.2 and the associated plots.

Figure 7.2.1 Occupied bandwidth test setup





<b>Test specification:</b>		<b>FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1049, ANSI C63.10, Section 9.3	
<b>Test mode:</b>		Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b>		24-Apr-24	
<b>Temperature:</b> 39 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1004 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

**Table 7.2.2 Occupied bandwidth test results**

ASSIGNED FREQUENCY RANGE: 57000 –71000 MHz  
DETECTOR USED: Peak  
MODULATION: 16QAM

Frequency, GHz	Antenna #	Occupied bandwidth 6 dBc, MHz	Occupied bandwidth 99%, MHz	Verdict
58.320	1	1587	2069.1	Pass
	2	1487	1966.0	Pass
	3	1530	2049.8	Pass
	4	1571	2037.6	Pass
60.480	1	1633	2089.8	Pass
	2	1760	2037.3	Pass
	3	1685	2071.1	Pass
	4	1719	1984.2	Pass
62.640	1	1480	2000.4	Pass
	2	1647	1944.5	Pass
	3	1619	1998.1	Pass
	4	1518	1991.5	Pass
64.800	1	1530	1988.7	Pass
	2	1429	1946.9	Pass
	3	1430	1956.8	Pass
	4	1515	1932.8	Pass

**Reference numbers of test equipment used**

HL 5986	HL 5376	HL 5380					
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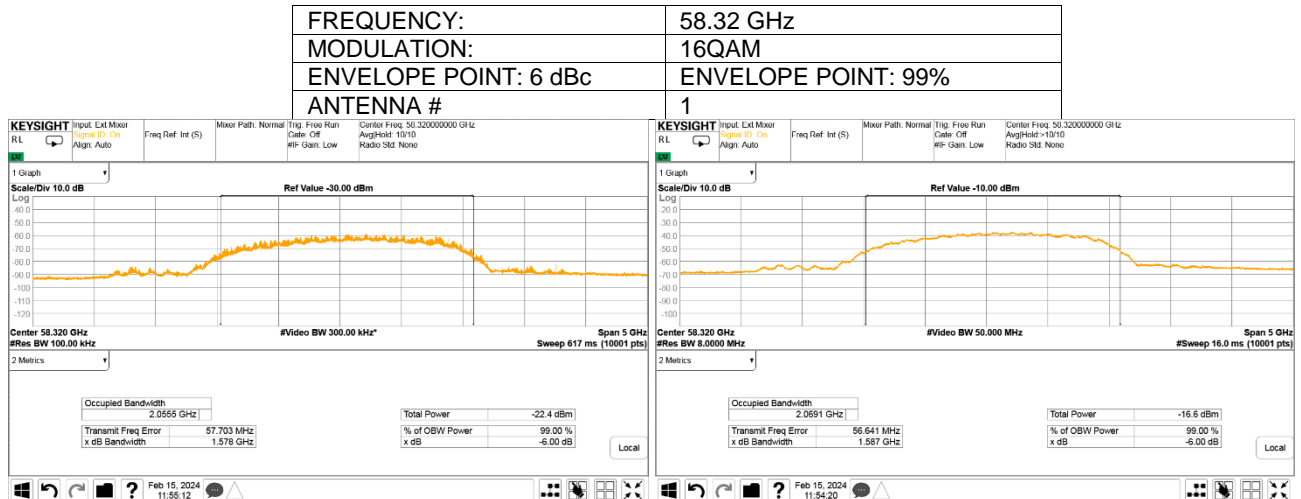
Full description is given in Appendix A.



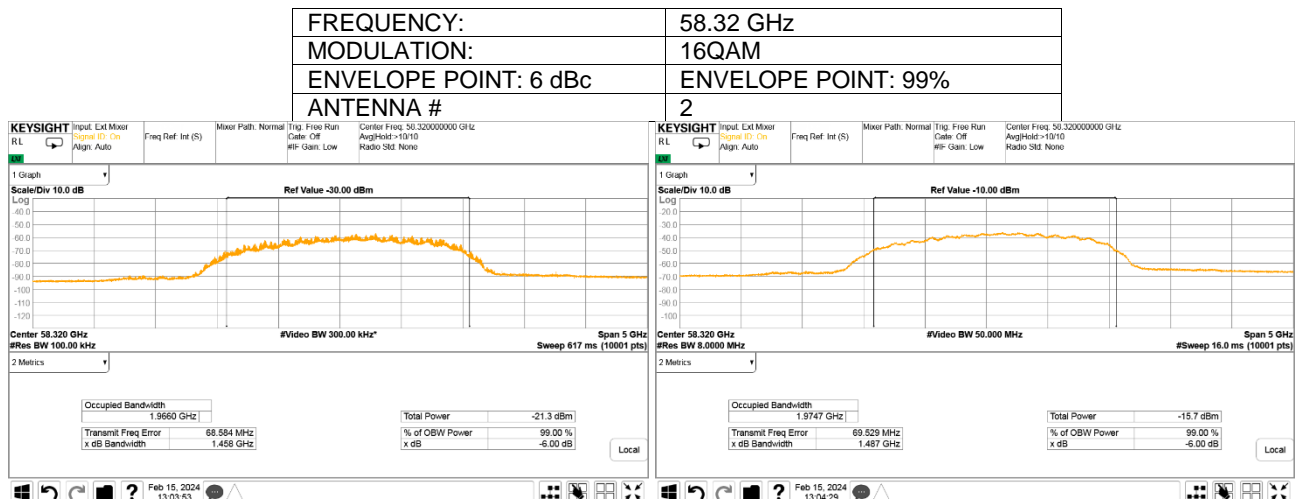
HERMON LABORATORIES

Test specification:	FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049, ANSI C63.10, Section 9.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-24		
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Plot 7.2.1 The 6dBc and 99% occupied bandwidth



Plot 7.2.2 The 6dBc and 99% occupied bandwidth

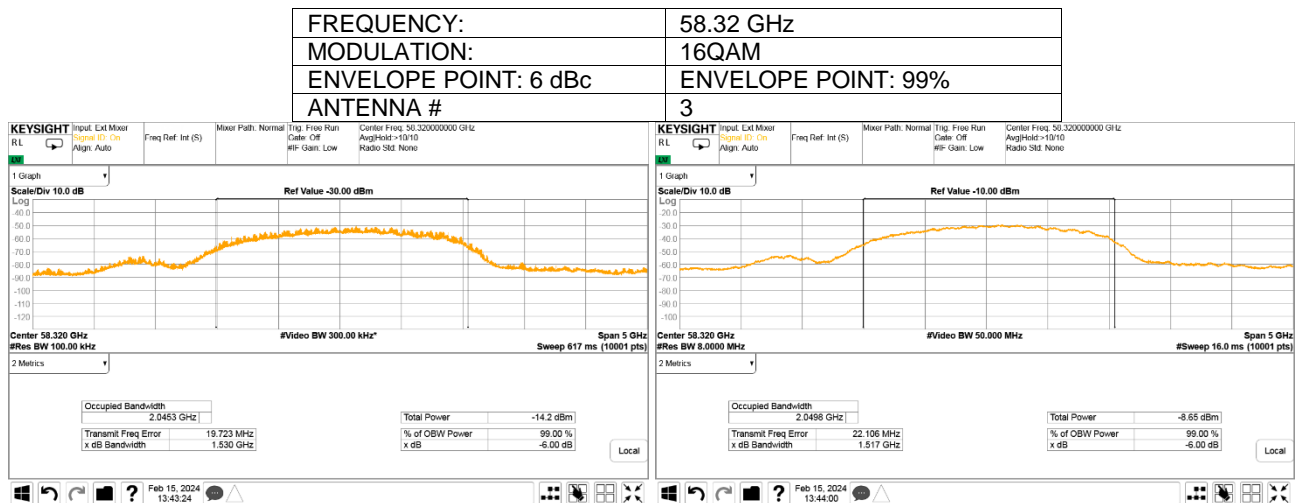




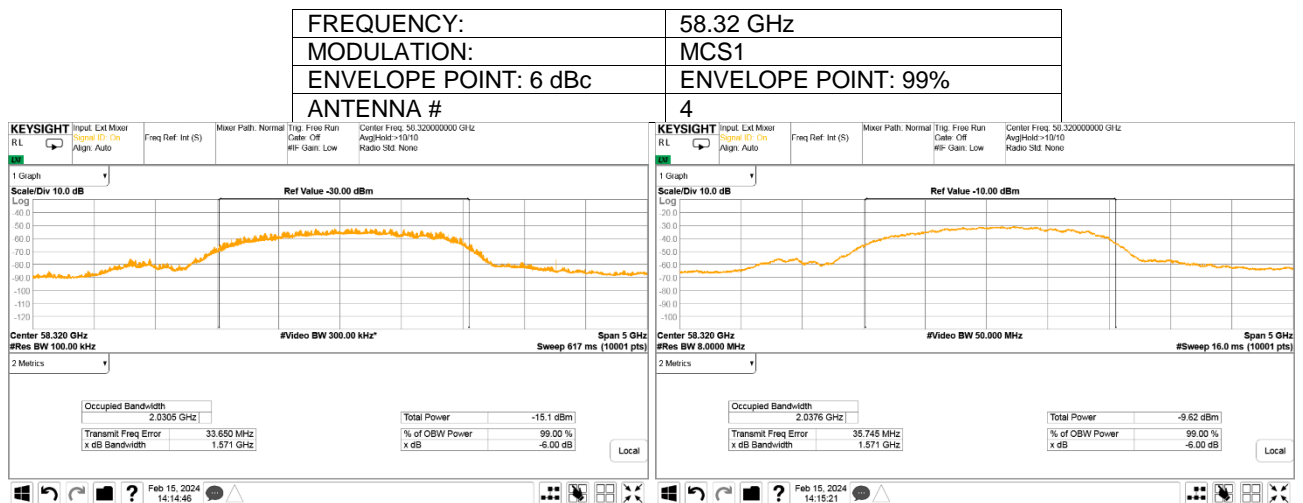
HERMON LABORATORIES

Test specification:		FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049, ANSI C63.10, Section 9.3	
Test mode:		Compliance	Verdict: PASS
Date(s):		24-Apr-24	
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Plot 7.2.3 The 6dBc and 99% occupied bandwidth



Plot 7.2.4 The 6dBc and 99% occupied bandwidth



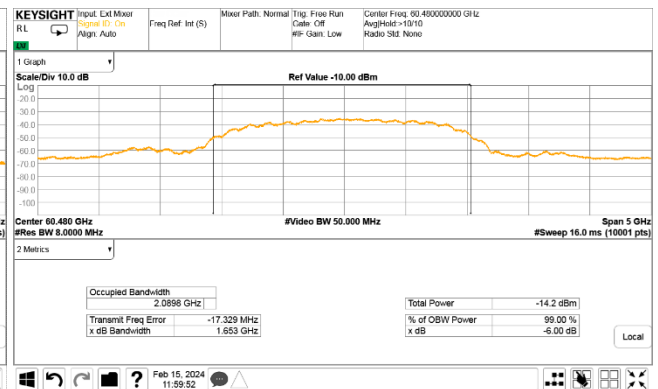
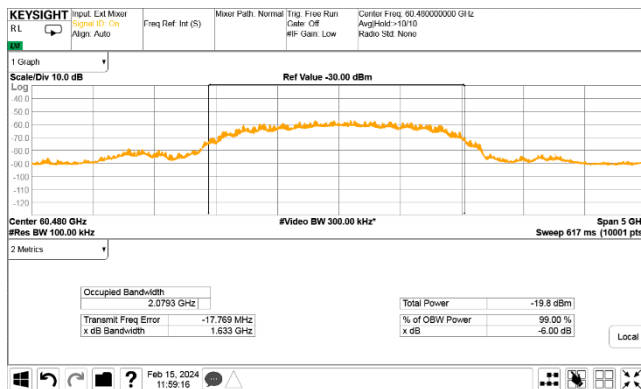


HERMON LABORATORIES

Test specification:		FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049, ANSI C63.10, Section 9.3	
Test mode:		Compliance	Verdict: PASS
Date(s):		24-Apr-24	
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

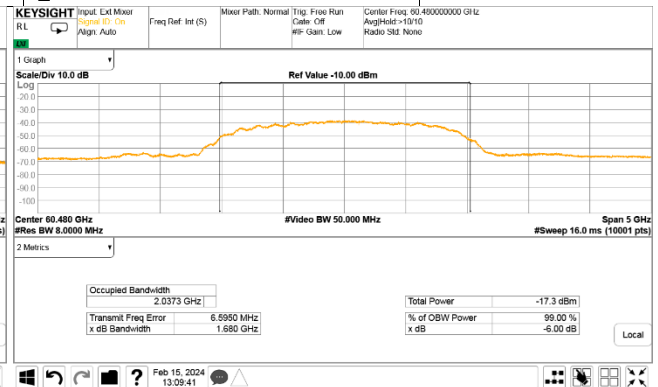
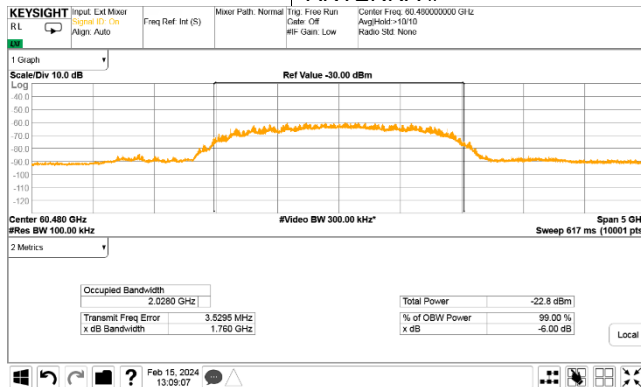
Plot 7.2.5 The 6dBc and 99% occupied bandwidth

FREQUENCY:	60.48 GHz
MODULATION:	16QAM
ENVELOPE POINT: 6 dBc	ENVELOPE POINT: 99%
ANTENNA #	1



Plot 7.2.6 The 6dBc and 99% occupied bandwidth

FREQUENCY:	60.48 GHz
MODULATION:	16QAM
ENVELOPE POINT: 6 dBc	ENVELOPE POINT: 99%
ANTENNA #	2



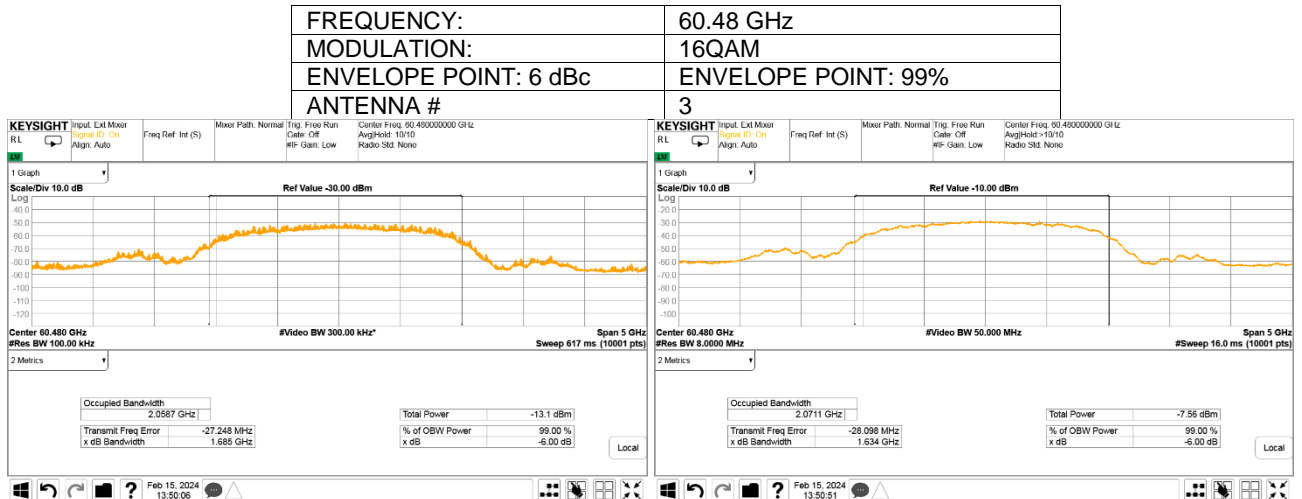




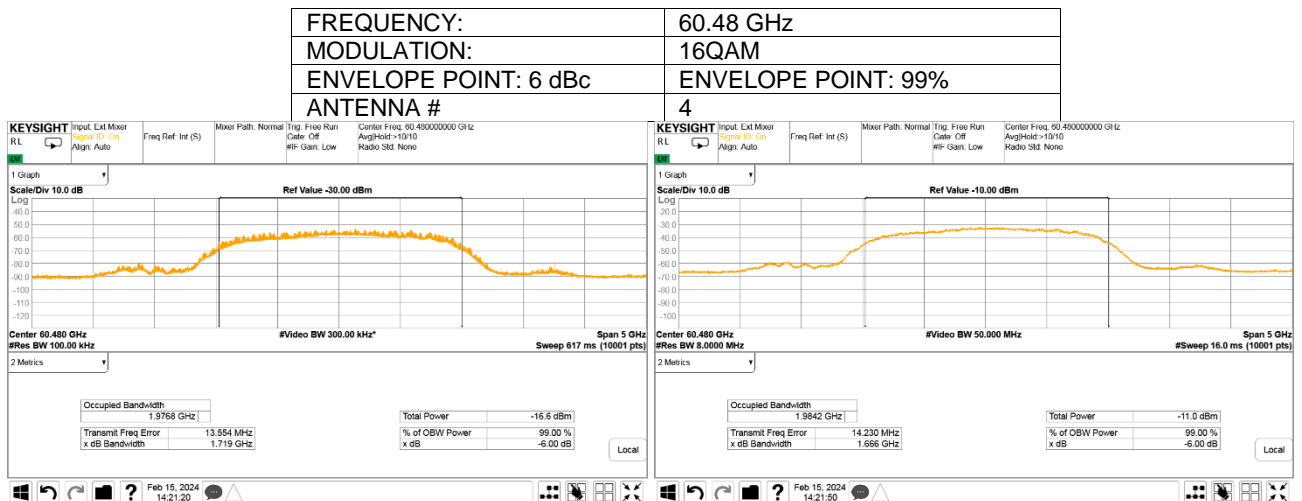
HERMON LABORATORIES

Test specification:	FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049, ANSI C63.10, Section 9.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-24		
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Plot 7.2.7 The 6dBc and 99% occupied bandwidth



Plot 7.2.8 The 6dBc and 99% occupied bandwidth



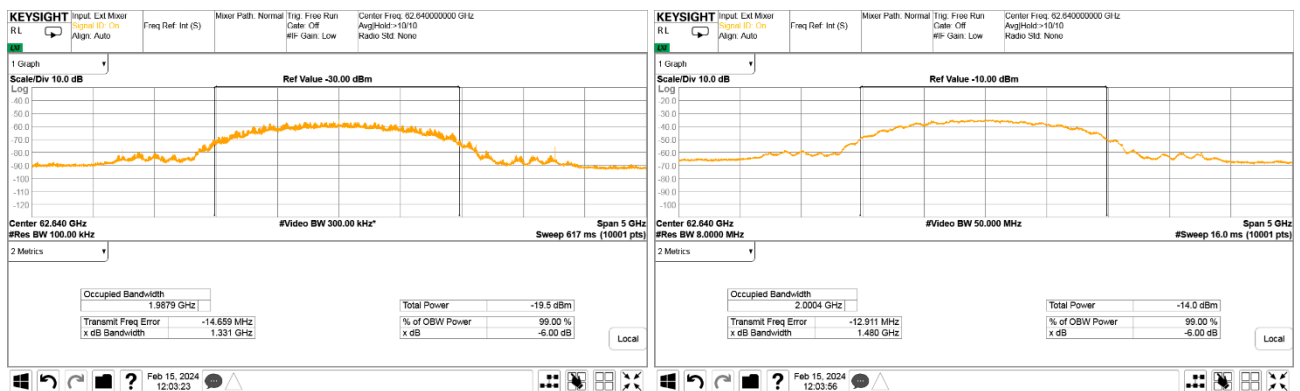


HERMON LABORATORIES

Test specification:	FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049, ANSI C63.10, Section 9.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-24		
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

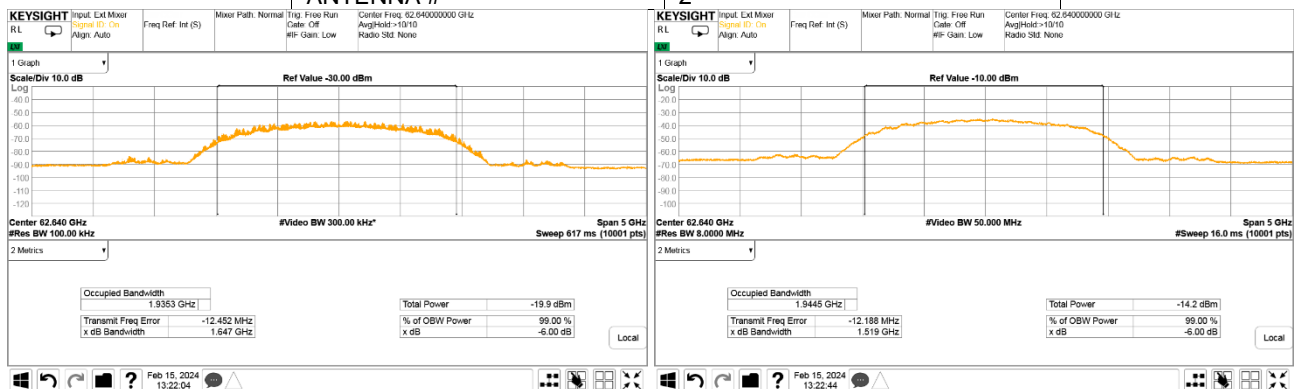
Plot 7.2.9 The 6dBc and 99% occupied bandwidth

FREQUENCY:	62.64 GHz
MODULATION:	16QAM
ENVELOPE POINT: 6 dBc	ENVELOPE POINT: 99%
ANTENNA #	1



Plot 7.2.10 The 6dBc and 99% occupied bandwidth

FREQUENCY:	62.64 GHz
MODULATION:	16QAM
ENVELOPE POINT: 6 dBc	ENVELOPE POINT: 99%
ANTENNA #	2

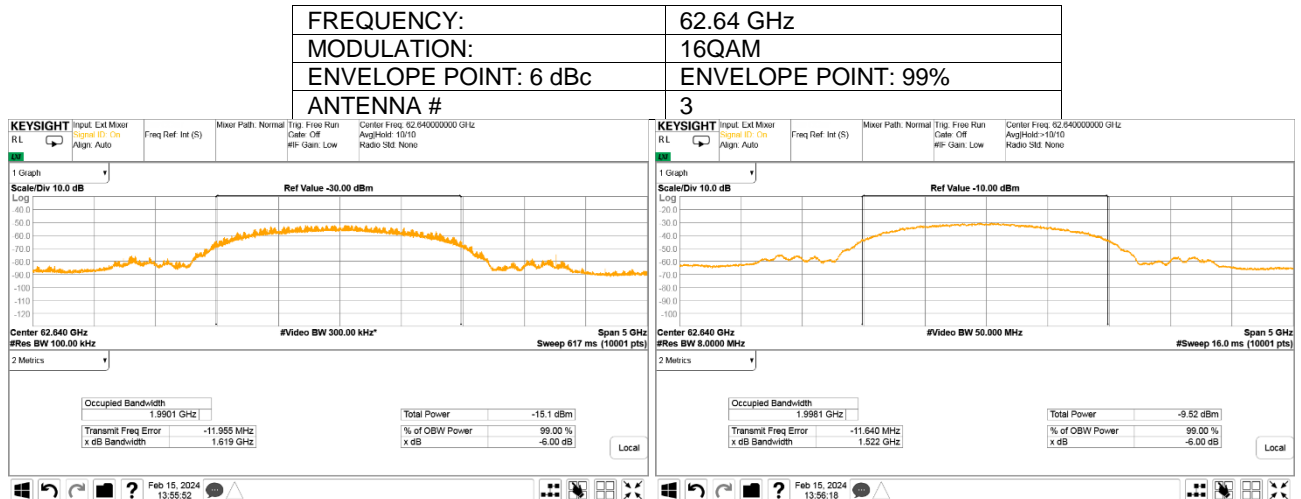




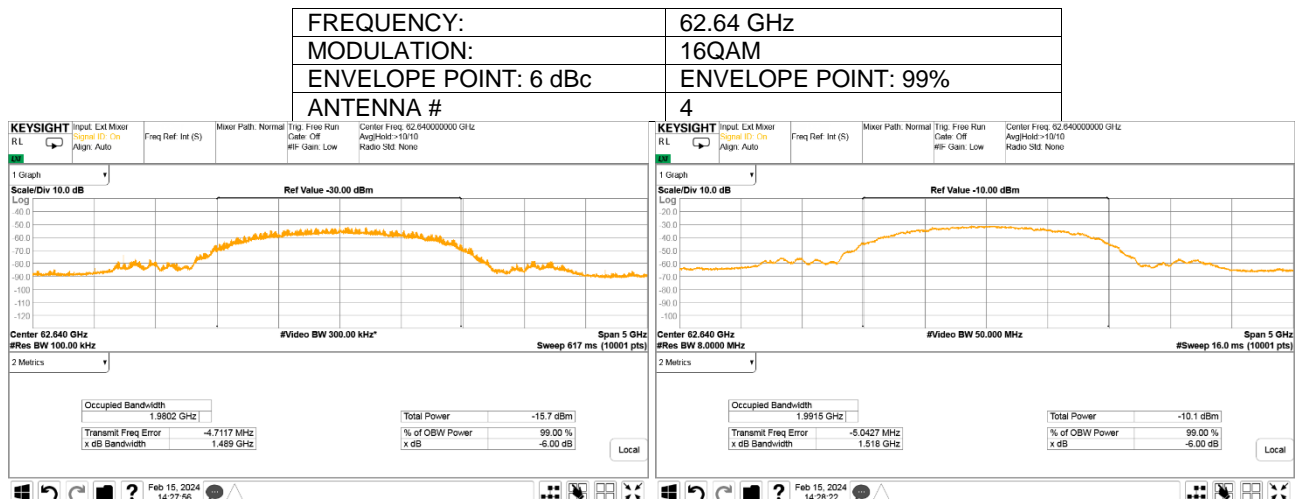
HERMON LABORATORIES

Test specification:	FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049, ANSI C63.10, Section 9.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-24		
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Plot 7.2.11 The 6dBc and 99% occupied bandwidth



Plot 7.2.12 The 6dBc and 99% occupied bandwidth

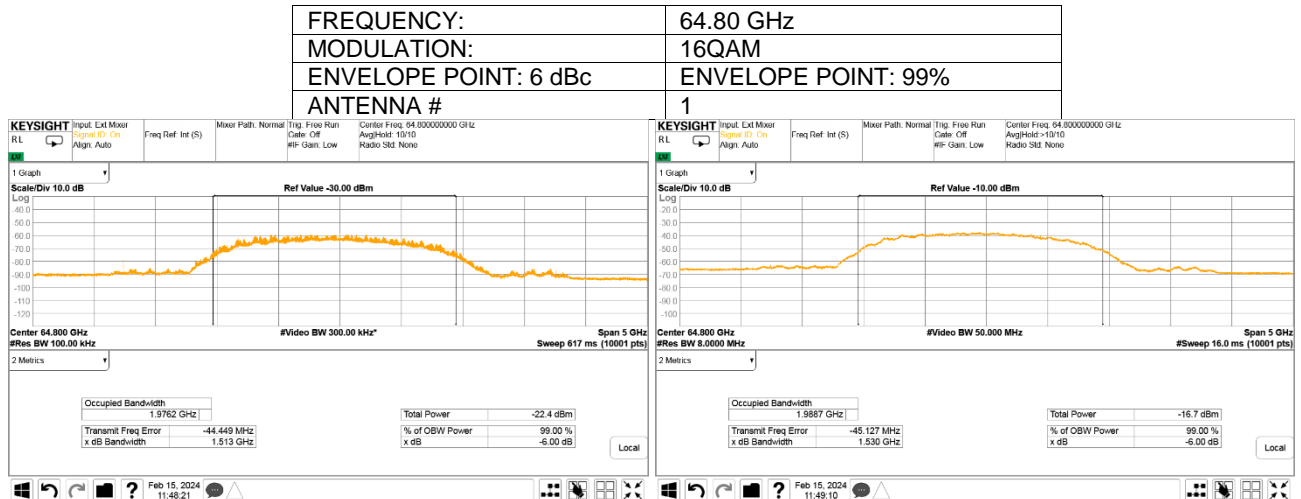




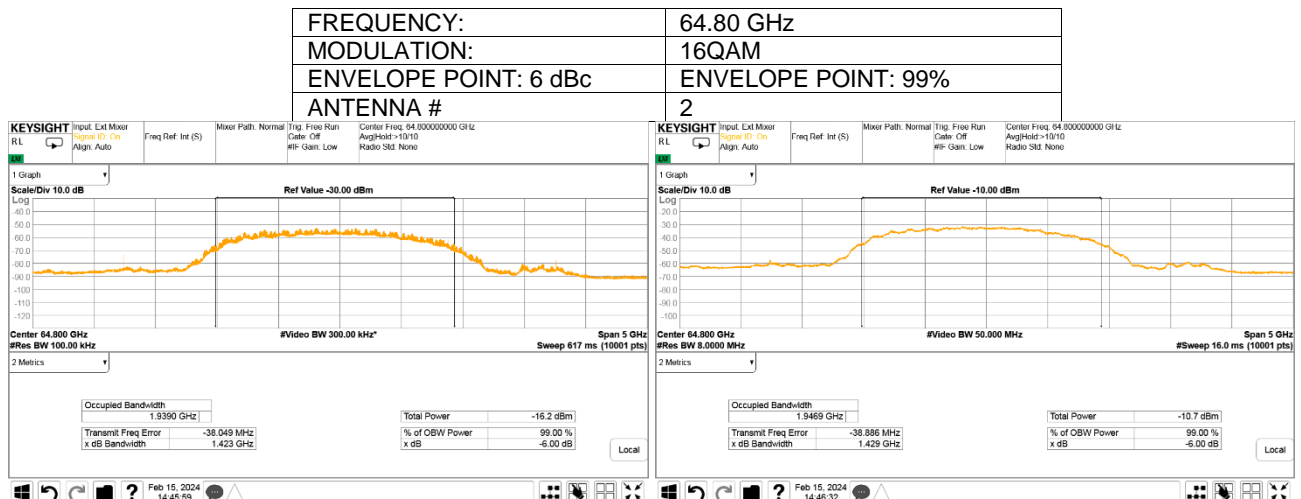
HERMON LABORATORIES

Test specification:	FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049, ANSI C63.10, Section 9.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-24		
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Plot 7.2.13 The 6dBc and 99% occupied bandwidth



Plot 7.2.14 The 6dBc and 99% occupied bandwidth

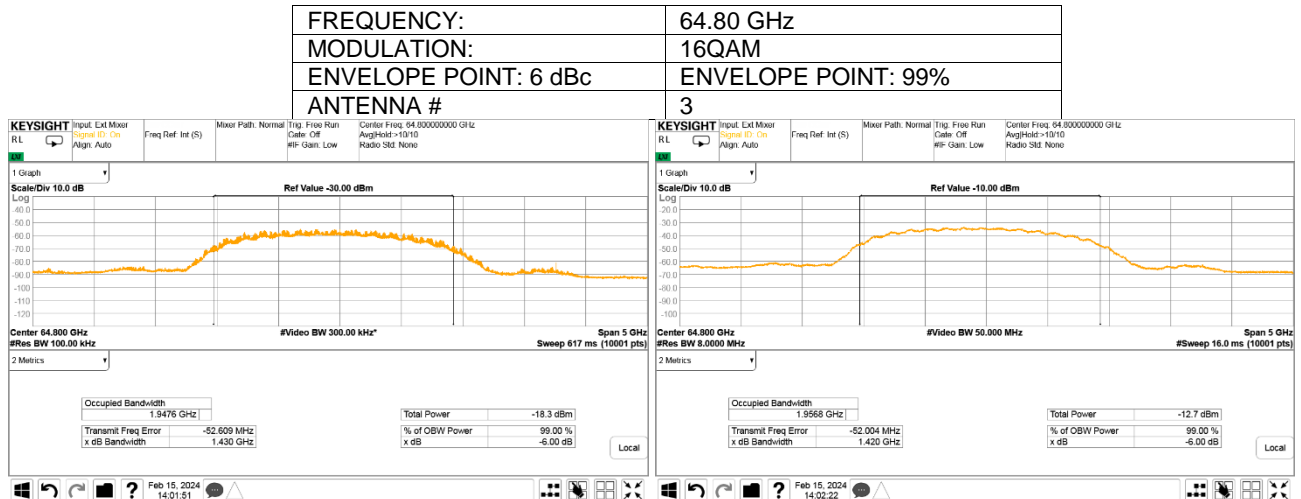




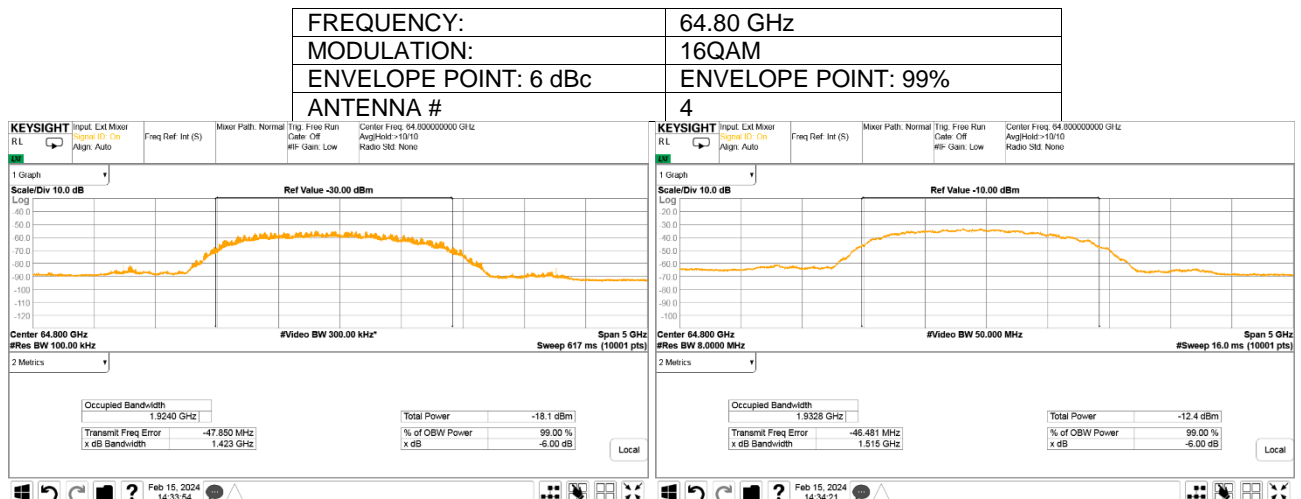
HERMON LABORATORIES

Test specification:	FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049, ANSI C63.10, Section 9.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-24		
Temperature: 39 °C	Relative Humidity: 45 %	Air Pressure: 1004 hPa	Power: 48 VDC
Remarks:			

Plot 7.2.15 The 6dBc and 99% occupied bandwidth



Plot 7.2.16 The 6dBc and 99% occupied bandwidth





<b>Test specification:</b>		<b>Section 15.245(b), Field strength of emissions</b>	
<b>Test procedure:</b>		ANSI C63.4, Section 13.1.4	
<b>Test mode:</b>		<b>Verdict:</b>	
<b>Date(s):</b>			
05-Jun-24			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1005 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

## 7.3 Field strength of emissions

### 7.3.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given in Table 7.3.1.

**Table 7.3.1 Radiated spurious emissions limits**

Frequency range, MHz	Field strength at 3 m, dB(μV/m)*		
	Within restricted bands		
	Peak	Quasi Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**
0.090 – 0.110	NA	108.5 – 106.8**	NA
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**
0.490 – 1.705	NA	73.8 – 63.0**	NA
1.705 – 30.0*		69.5	
30 – 88		40.0	
88 – 216		43.5	
216 – 960		46.0	
960 – 1000		54.0	
1000 – 40000	74.0	NA	54.0

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

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

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

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

Note: 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 but not exceeding 40 GHz for intentional radiators operated below 10 GHz and up to the fifth harmonic of the highest fundamental frequency but not exceeding 100 GHz for intentional radiators operated above 10 GHz.



<b>Test specification:</b> <b>Section 15.245(b), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance		<b>Verdict:</b>	
<b>Date(s):</b> 05-Jun-24			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1005 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

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

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

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

7.3.2.3 The worst test results (the lowest margins) were recorded in Table 7.3.3 and shown in the associated plots.

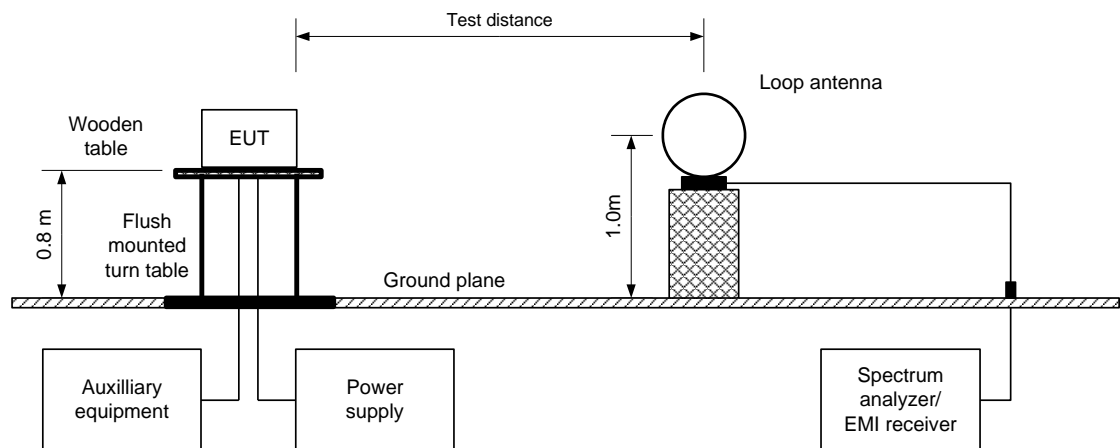
### 7.3.3 Test procedure for spurious emission field strength measurements above 30 MHz

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

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

7.3.3.3 The worst test results (the lowest margins) were recorded in Table 7.3.2 and Table 7.3.3 and shown in the associated plots.

**Figure 7.3.1 Setup for spurious emission field strength measurements below 30 MHz**





<b>Test specification:</b> <b>Section 15.245(b), Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance		<b>Verdict:</b>	
<b>Date(s):</b> 05-Jun-24			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1005 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Figure 7.3.2 Setup for spurious emission field strength measurements in 30 – 1000 MHz

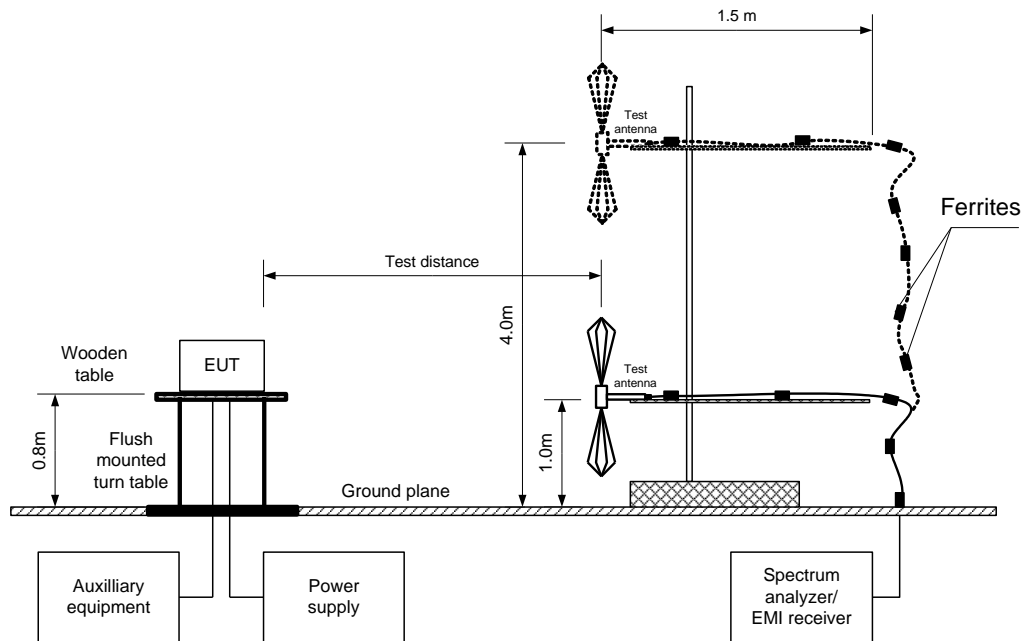
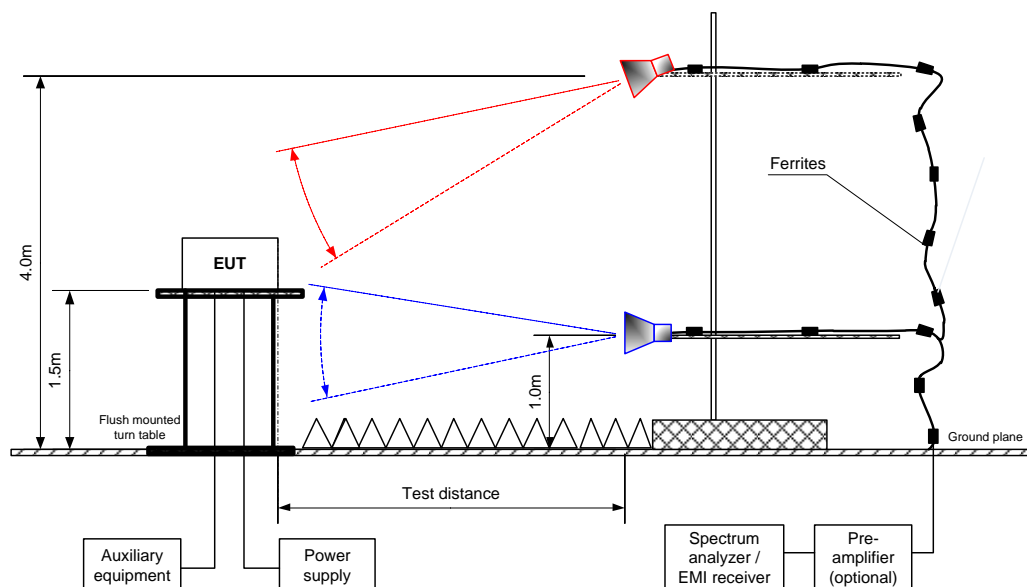


Figure 7.3.3 Setup for spurious emission field strength measurements above 1000 MHz







Test specification: Section 15.245(b), Field strength of emissions			
Test procedure: ANSI C63.4, Section 13.1.4			
Test mode: Compliance		Verdict:	
Date(s): 05-Jun-24			
Temperature: 23 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 48 VDC
Remarks:			

Table 7.3.2 Field strength of spurious emissions at frequencies above 1 GHz

TEST DISTANCE: 3 m  
 EUT POSITION: Typical (Vertical)  
 MODULATION: 16QAM  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 INVESTIGATED FREQUENCY RANGE: 0.009 - 40000 MHz  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 1.0 MHz  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)

Antenna			Azimuth, degrees*	Peak field strength			Avr factor, dB	Average field strength			Verdict
F, MHz	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
Low frequency 58.32 GHz											
2099.9	H	1.94	14	40.22	74.0	-33.78	NA	40.22	54.0	-13.78	Pass
7289.7	H	1.93	267	53.03	74.0	-20.97	NA	53.03	54.0	-0.97	
Mid frequency 60.48 GHz											
2099.9	H	1.94	24	40.26	74.0	-33.74	NA	40.26	54.0	-13.74	Pass
7559.7	H	1.94	262	52.37	74.0	-21.63	NA	52.37	54.0	-1.63	
Mid frequency 62.64 GHz											
2099.9	H	1.95	37	39.88	74.0	-34.12	NA	39.88	54.0	-14.12	Pass
7829.7	H	1.64	246	50.86	74.0	-23.14	NA	50.86	54.0	-3.14	
High frequency 64.80 GHz											
2099.9	H	1.97	14	40.25	74.0	-33.75	NA	40.25	54.0	-13.75	Pass
8099.8	H	1.84	331	51.54	74.0	-22.46	NA	51.54	54.0	-2.46	

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

\*\* - Margin = dB below (negative if above) specification limit.

## Reference numbers of test equipment used

HL 4360	HL 4933	HL 5404	HL 4360	HL 3903	HL 4956		
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Full description is given in Appendix A.



<b>Test specification:</b> Section 15.245(b), Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance		<b>Verdict:</b>	
<b>Date(s):</b> 05-Jun-24			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 45 %	<b>Air Pressure:</b> 1005 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Table 7.3.3 Field strength of emissions below 1 GHz

TEST DISTANCE:	3 m
EUT POSITION:	Typical
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
INVESTIGATED FREQUENCY RANGE:	0.009 – 1000 MHz
DETECTOR USED:	Peak / Quasi-peak
RESOLUTION BANDWIDTH:	0.2 kHz (9 kHz – 150 kHz)
	9.0 kHz (150 kHz – 30 MHz)
	120 kHz (30 MHz – 1000 MHz)
	≥ Resolution bandwidth
VIDEO BANDWIDTH:	Active loop (9 kHz – 30 MHz)
TEST ANTENNA TYPE:	Biconilog (30 MHz – 1000 MHz)

## Low Frequency 58.32 GHz

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
39.242	39.79	33.66	40.00	-6.34	Vertical	1.00	57	Pass
88.981	41.16	35.01	43.50	-8.49	Vertical	1.00	-2	
240.940	36.91	30.37	46.00	-15.63	Horizontal	2.41	103	
422.927	37.79	25.36	46.00	-20.64	Horizontal	1.02	-180	
641.051	42.05	35.37	46.00	-10.63	Vertical	1.00	-180	

## Mid Frequency 60.48 GHz

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*				
32.854	44.71	38.92	40.00	-1.08	Vertical	1.00	-147	Pass
39.491	39.46	32.74	40.00	-7.26	Vertical	1.00	56	
88.013	38.35	32.13	43.50	-11.37	Vertical	1.00	8	
241.320	33.65	27.36	46.00	-18.64	Horizontal	2.58	114	
422.906	38.28	25.60	46.00	-20.40	Horizontal	2.04	-171	
641.657	41.54	34.60	46.00	-11.40	Vertical	1.00	-180	

## Mid Frequency 62.64 GHz

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*				
34.690	44.44	38.49	40.00	-1.51	Vertical	1.21	69	Pass
39.990	41.69	35.16	40.00	-4.84	Vertical	1.00	100	
70.678	29.89	22.23	40.00	-17.77	Horizontal	2.81	68	
224.185	43.77	37.80	46.00	-8.20	Horizontal	2.59	58	
329.959	36.94	29.90	46.00	-16.10	Vertical	1.00	-75	
422.369	46.03	38.06	46.00	-7.94	Horizontal	1.02	-158	
576.012	41.92	38.49	46.00	-7.51	Horizontal	1.41	-110	
638.162	40.81	34.25	46.00	-11.75	Vertical	1.00	-4	



HERMON LABORATORIES

Test specification: Section 15.245(b), Field strength of emissions			
Test procedure: ANSI C63.4, Section 13.1.4			
Test mode: Compliance		Verdict:	
Date(s): 05-Jun-24			
Temperature: 23 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 48 VDC
Remarks:			

**Table 7.3.4 Field strength of emissions below 1 GHz (continuation)**

TEST DISTANCE:	3 m
EUT POSITION:	Typical
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
INVESTIGATED FREQUENCY RANGE:	0.009 – 1000 MHz
DETECTOR USED:	Peak / Quasi-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)

**High Frequency 64.80 GHz**

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*				
34.563	45.17	39.07	40.00	-0.93	Vertical	1.00	141	Pass
39.327	41.83	35.34	40.00	-4.66	Vertical	1.00	117	
63.539	40.12	33.02	40.00	-6.98	Vertical	1.42	180	
224.149	42.91	37.17	46.00	-8.83	Horizontal	2.59	76	
422.426	45.88	38.90	46.00	-7.10	Horizontal	1.02	-158	
575.981	41.86	38.27	46.00	-7.73	Horizontal	1.41	-111	
640.090	41.88	35.10	46.00	-10.90	Vertical	1.00	-3	
777.214	40.59	29.52	46.00	-16.48	Horizontal	1.02	-171	

\*- 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 4956	HL 5112	HL 5288	HL 5669
HL 5670							

Full description is given in Appendix A.