EMC TEST REPORT

APPLICANT
PoziTech Inc.

MODEL NAME
CONVMOD_DCDC_72V

REPORT NUMBER
HA230929-POZ-001-E03

TEST REPORT

Date of Issue
August 16, 2024

Test Site
HCT America, Inc.

Applicant	PoziTech Inc.
Applicant Address	3675 Webber St Sarasota, FL, 34232
Model Name	CONVMOD_DCDC_72V
Date of Test	August 13, 2024 – August 15, 2024
Test Standard(s)	FCC CFR 47 Part 15 Subpart B ANSI C63.4-2014
Class Type	Class A
Test Result	Refer to the present document.

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2014. (See Test Report if any modifications were made for compliance) The results of testing in this report apply only to the product which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

HCT America, Inc. certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

Tested By	**Reviewed By**
Stark Choi	James Choi
Test Engineer	Senior Engineer

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REVISION HISTORY

The revision history for this document is shown in table.

Test Report No.	Issue Date	Description
HA230929-POZ-001-E03	08/16/2024	Original Issue

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1. General Information of EUT

1.1. General Information of EUT

Model Name	CONVMOD_DCDC_72V
Product Name	DC-DC Converter and Level-Shifting Circuit
Product Type	DC-DC Converter
Manufacturer	PoziTech Inc.

1.2. Product Specification

Item	Specification
Dimensions	150 mm x 116 mm x 67 mm (L x W x H)
Weight	460 g
Operating Temperature	-20 °C to +50 °C
I/O Ports	Vin Port x1 Vout Port x1
Power Input Voltage	18 VDC to 72 VDC

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2. Configuration and Connections with the EUT

2.1. EUT and Ancillary Equipment

Equipment Type	Model	Serial Number	Manufacturer
EUT	CONVMOD_DCDC_72V	101C008A	PoziTech Inc.
ConnectBox	CBX_V1R3 with CWM_V1R1	0A6502FF	PoziTech Inc.
Relay Module	CRM_V1R1	100D02CA	PoziTech Inc.
Wi-Fi Antenna	ANT-2/5-HDP-2000-SMA	-	Linx Technologies
SafeRadar	ILS_V2R1	0A410348	PoziTech Inc.
SafeMark	ILS_V2R1	0A410356	PoziTech Inc.
Access Point(AP)	hAP	F11B0F87211C/247/r2	MikroTik
AC Adapter(AP)	WA-36A12R	Y15290003472	Asian Power Devices Inc.
Laptop	Legion 5 Pro 16ITH6	PF3NJLA9	Lenovo
AC Adapter(Laptop)	ADL230SLC3A	8SSA10R16889L1CZ1CE0F6F	Lenovo

2.2. Test Ports

Start Connection		End Connection		Cable		Quantity
Equipment	I/O Port	Equipment	I/O Port	Length (m)	Shielding Condition	
EUT	VIN	DC Power Supply	Output	3≥	Unshielded	1
	Vout	ConnectBox	Power Input	1.5	Unshielded	1
ConnectBox	Relay Port	Relay Module	Relay Input Port	1.5	Unshielded	1
	Ant. Port	Wi-Fi Antenna	Ant. Port	1.6	Unshielded	1
	RS485 Port	SafeRadar or SafeMark	Module Input	3≥	Unshielded	1
	-	Access Point	-	-	-	1
Access Point	LAN	Laptop	Ethernet	3≥	Unshielded	1
	Power Input	AC Adapter(AP)	Power Output	1.8	Unshielded	1
Laptop	Power Input	AC Adapter (Laptop)	Power Output	1.8	Unshielded	1
AC Adapter(AP)	Power Input	AC Mains	-	-	Unshielded	1
AC Adapter (Laptop)	Power Input	AC Mains	-	1.8	Unshielded	1

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2.3. EUT Operating Mode(s)

SafeRadar Mode

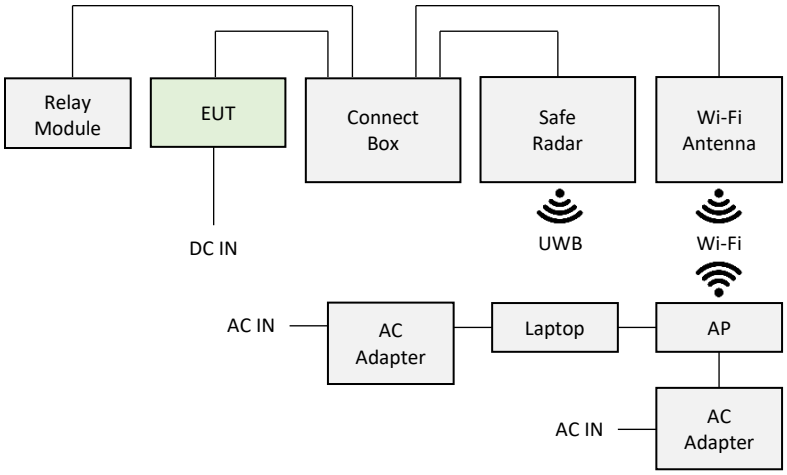
DC/DC Converter convert 48 VDC to 12 VDC and supply with 12 VDC to ConnectBox. ConnectBox is connected to the SafeRadar extension modules to simulate typical usage. In the system, UWB transmission is activated continuously for different radiation measurement. ConnectBox is also configured for 2.4 GHz Wi-Fi communication with the AP via an external antenna.

SafeMark Mode

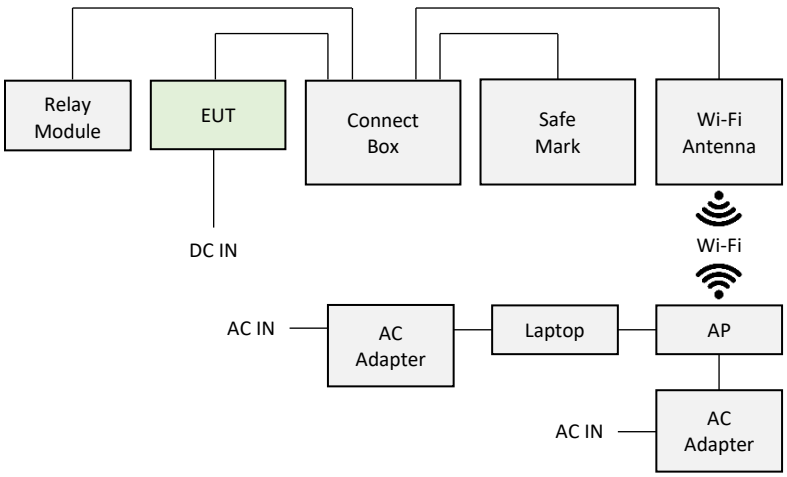
DC/DC Converter convert 48 VDC to 12 VDC and supply with 12 VDC to ConnectBox. ConnectBox is connected to the SafeRadar extension modules to simulate typical usage. ConnectBox is also configured for 2.4 GHz Wi-Fi communication with the AP via an external antenna.

2.4. Connection Diagram of the EUT and Ancillary Equipment

Safe Radar Mode



Safe Mark Mode



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3. Test Facilities and Accreditations

3.1. Test Laboratory

Company Name	HCT America, Inc.
CEO	Sunwoo Kim
Address	1726 Ringwood Ave., San Jose, CA 95131 USA
Telephone	+1 510-933-8848
Fax	+1 510-933-8849

3.2. Test Facility

3 m Semi-Anechoic Chambers Address	1726 Ringwood Avenue, San Jose, CA 95131 USA
10 m Open Site Address	1177 Comstock Road, Hollister, CA 95023 USA

Measurement facilities are constructed in conformance with the requirements of ANSI C63.4-2014. The normalized site attenuations (30 MHz to 1 GHz) and site validation (1 GHz to 18 GHz) were performed in accordance with the standard in ANSI C63.4-2014.

Measurement Facilities	**Test Facility**	
Radiated Field Strength Measurement Facility 3 m Semi-Anechoic Chamber	Chamber #1	Chamber #2
Radiated Field Strength Measurement Facility 10 m Open Site	OATS	

3.3. Instrument Calibration

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturers recommendations for utilizing calibration equipment, which is traceable to recognized national standards.
All antenna for measurement is calibrated in accordance with the requirements of ANSI C63.5-2017.

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3.4. Accreditation Certificate

Accredited Laboratory

A2LA has accredited

HCT AMERICA, INC.

San Jose, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the A2LA – R256 – Specific Requirements – FDA ASCA Program. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 17th day of July 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 4201.01
Valid to July 31, 2025
Revised July 15, 2024

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

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4. References of Test

4.1. Test Standard

FCC CFR 47 Part 15 Subpart B

4.2. Test Method

FCC CFR 47 Part 15 Subpart B
ANSI C63.4-2014

4.3. Additional Deviations and Exclusions from Standards

No additions, deviations, or exclusions have been made from standards and/or accreditations.

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5. Test Rationale

5.1. Test Limits Guideline

5.1.1. FCC CFR 47 Part 15 Subpart B

Conducted Emissions Limits AC Mains Power Port				
Frequency Range (MHz)	Class A		Class B	
	Average (dBµV)	Quasi-Peak (dBµV)	Average (dBµV)	Quasi-Peak (dBµV)
0.15 – 0.5	66	79	56 to 46[1]	66 to 56[1]
0.5 – 5	60	73	46	56
5 – 30	60	73	50	60

Note 1: The limit level in dBµV decreases linearly with the logarithm of the frequency.

Radiated Emissions Limits 30 MHz to 1 GHz					
Frequency Range (MHz)	Measurement Distance (m)	Class A		Class B	
		Quasi-Peak		Quasi-Peak	
		µV/m	dBµV/m	µV/m	dBµV/m
30 – 88	3	300	49.5	100	40
88 – 216		500	54	150	43.5
216 – 960		700	56.9	200	46
960 – 1 000		1 000	60	500	54
30 – 88	10	90	39	30	29.5
88 – 216		150	43.5	45	33
216 – 960		210	46.4	60	35.5
960 – 1 000		300	49.5	150	43.5

Radiated Emissions Limits 1 GHz to 40 GHz							
Frequency Range (MHz)	Measurement Distance (m)	Class A			Class B		
		Average		Peak	Average		Peak
		µV/m	dBµV/m	dBµV/m	µV/m	dBµV/m	dBµV/m
1 000 – 40 000	3	1 000	60	80	500	54	74

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5.2. Frequency Range of Radiated Measurements

For an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table. F_x is the highest fundamental frequency generated and/or used in the ITE or digital apparatus under test.

Highest Internal Frequency, F_x (MHz)	Upper Frequency of Measurement Range (MHz)
$F_x \leq 108$	1 000
$108 < F_x \leq 500$	2 000
$500 < F_x \leq 1\,000$	5 000
$F_x > 1\,000$	5 x F_x or 40 GHz, whichever is lower

5.3. Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014.

All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Emission (0.15 MHz to 30 MHz)	2.55 dB ($k = 2$)
Radiated Emissions (30 MHz to 1 GHz)	4.73 dB ($k = 2$)
Radiated Emissions (1 GHz to 18 GHz)	5.21 dB ($k = 2$)
Radiated Emissions (18 GHz to 40 GHz)	5.18 dB ($k = 2$)

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6. Test Summary

The results in this report apply only to sample tested:

Test Date	Phenomena	Limit Value / Performance Criteria	Test Result	Test Method
08/15/2024	Radiated Emission (30 MHz to 1 GHz)	See test data	Pass	ANSI C63.4-2014
08/13/2024	Radiated Emission (1 GHz to 40 GHz)	See test data	Pass	ANSI C63.4-2014

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7. Test Equipment

Radiated Emissions (30 MHz to 1 GHz)					
Type	**Manufacturer**	**Model**	**Serial #**	**Cal Cycle**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESU40	100529	1 year	12/01/2024
Hybrid Antenna	Sunol	JB1	A061416	2 years	05/04/2025
Antenna Mast	Innco	MA4640/0800-XP-ET	-	-	-
Turn Table	Sunol Sciences	-	-	-	-
Antenna Mast Controller	Innco	CO3000-1D	CO3000/1449/ 54230322/P	-	-
Turn Table Controller	Sunol Sciences	SC104V	090109-1	-	-
Software	TOYO	EP7RE	-	-	-

Radiated Emissions (1 GHz to 13 GHz)					
Type	**Manufacturer**	**Model**	**Serial #**	**Cal Cycle**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESU40	100529	1 year	12/01/2024
LNA	Com-Power Corporation	PAM-118A	18040059	1 year	04/17/2025
High Pass Filter (3 GHz)	Wainwright Instruments	WHK10-2520-3000-18000-40EF	9	1 year	11/20/2024
Antenna Mast	Innco	MA4640/0800-XP-ET	-	-	-
Turn Table	Sunol Sciences	-	-	-	-
Antenna Mast Controller	Innco	CO3000-1D	CO3000/1449/ 54230322/P	-	-
Turn Table Controller	Sunol Sciences	SC104V	090109-1	-	-
Software	TOYO	EP7RE	-	-	-

Radiated Emissions (18 GHz to 40 GHz)					
Type	**Manufacturer**	**Model**	**Serial #**	**Cal Cycle**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESU40	100529	1 year	12/01/2024
LNA	Cernex	CBL18405045-01	27973	1 year	01/05/2025
Antenna Mast	ETS Lindgren	2171B	-	-	-
Turn Table	Sunol Sciences	-	-	-	-
Turn Table Controller	Sunol Sciences	SC104V	090109-1	-	-
Antenna Mast	Innco	CO3000-1D	CO3000/1449/ 54230322/P	-	-
Antenna Mast Controller	Innco	MA4640/0800-XP-ET	-	-	-
Software	TOYO	EP7RE	-	-	-

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8. EMC Test Results

8.1. Radiated Emission (30 MHz – 1 GHz)

8.1.1. Test Environment

Test Site			
Chamber #1 ☒	Chamber #2 ☐	OATS ☐	Shield Stage #1 ☐
Date	**Temperature**	**Relative Humidity**	**Pressure**
08/15/2024	24.5 °C	36 % R.H.	100.5 kPa

8.1.2. Test Condition

Operating Mode(s)	Power Supply	Applicable Port
SafeRadar Mode	48 VDC	Enclosure Port
SafeMark Mode	48 VDC	Enclosure Port

8.1.3. Test Method and Levels

The test method shall be in accordance with ANSI C63.4-2014.
The equipment shall meet the Class A limits given in FCC CFR 47 Part 15 Subpart B.

Obtained the max. emission point by optimizing the antenna height, antenna polarization, and turntable azimuth.

Frequency Range	30 MHz to 1 000 MHz
Measurement Detector Type	Quasi-Peak
Measurement Bandwidth (IF BW)	120 kHz
Measurement Distance	3 m

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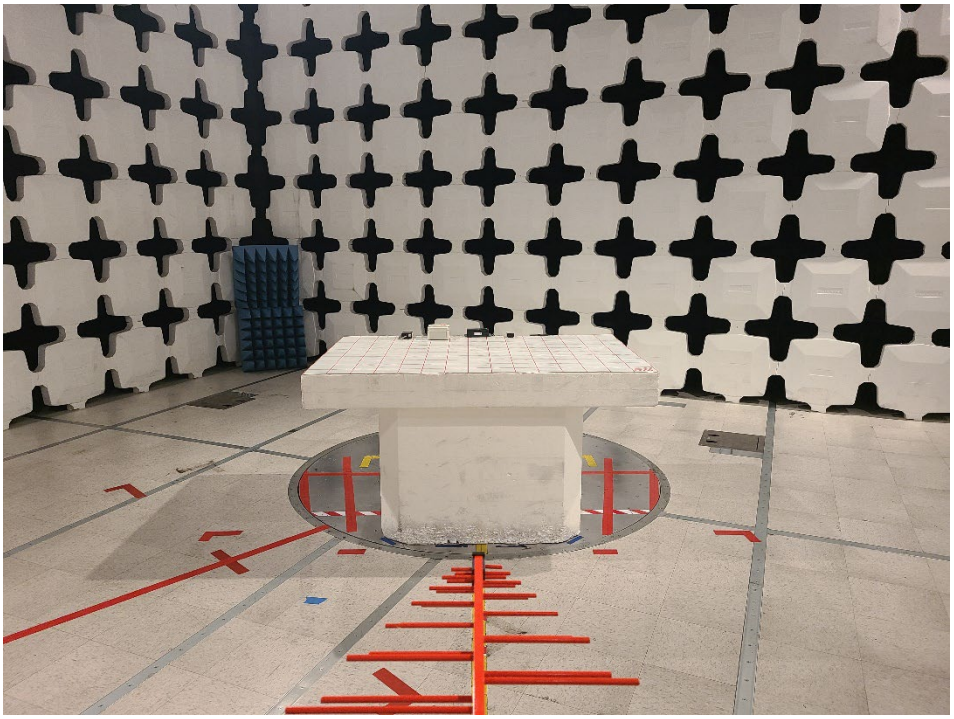
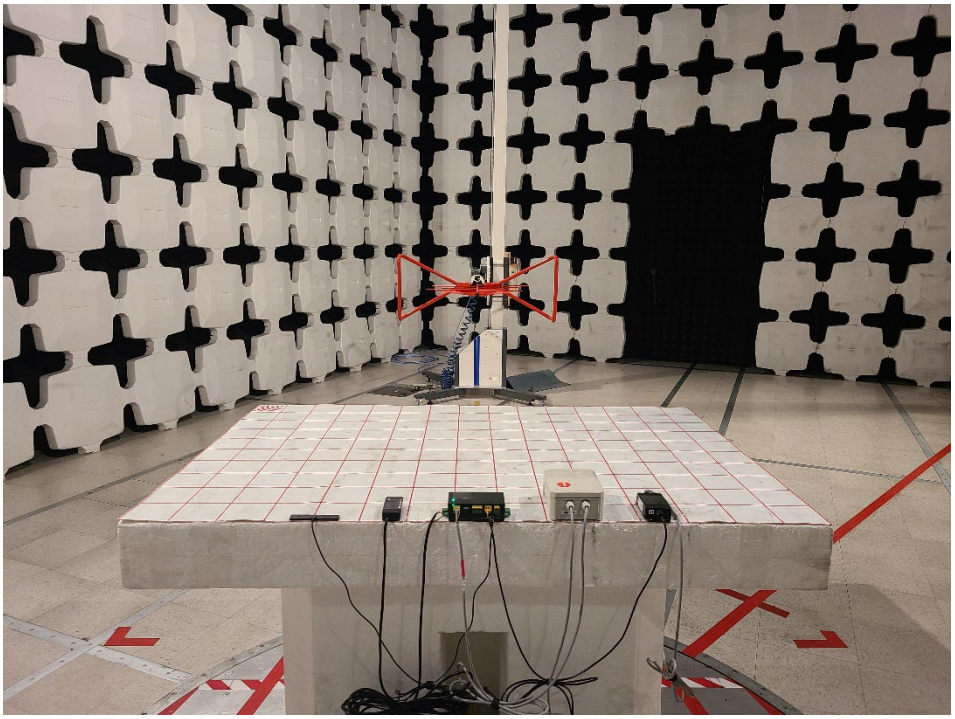
8.1.4. Test Setup Photos

SafeRadar/SafeMark Mode

[30 MHz – 1 000 MHz]





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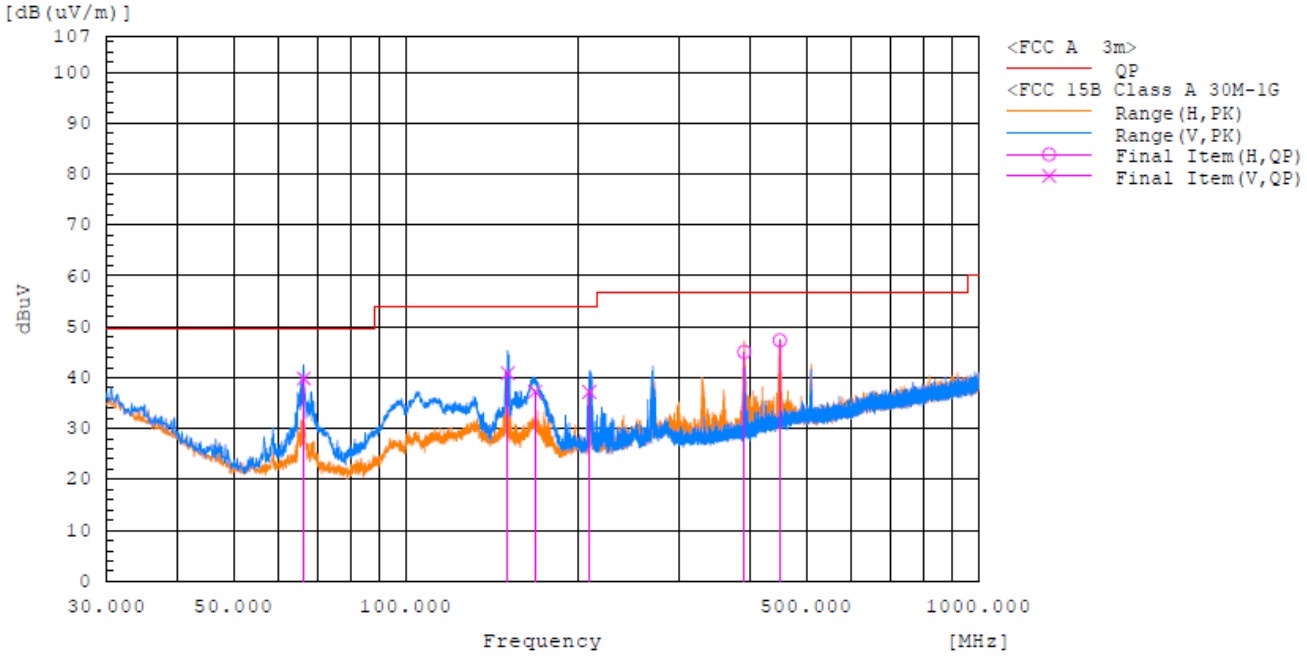
8.1.5. Test Data

Operating Mode: SafeRadar Mode
Power Supply: 48 VDC
Frequency Range: 30 MHz – 1 000 MHz
Test Limit: FCC Part 15 Subpart B Class A



Frequency MHz	Polarization	Reading dB(uV)	Corr. dB(1/m)	Level dB(uV/m)	Limit dB(uV/m)	Margin dB	Height cm	Angle deg
		QP		QP	QP	QP		
66.294	V	25.3	14.5	39.8	49.5	9.7	115.4	226.3
150.624	V	21.6	19.3	40.9	54	13.1	162.9	63.8
168.094	V	18.6	18.6	37.2	54	16.8	100.9	271.8
208.952	V	19.9	17.3	37.2	54	16.8	233.3	246.0
389.784	H	22.8	22.2	45.0	56.9	11.9	100.4	217.0
449.776	H	23.2	24.1	47.3	56.9	9.6	241.0	330.0

Calculation Formula:

1. Polarization: H = Horizontal, V = Vertical
2. Corr. (Correction Factor) = Antenna Factor + Cable Loss + LNA
3. QuasiPeak Level = Reading (Receiver Reading) + Corr.
4. Margin = Limit - QuasiPeak Level

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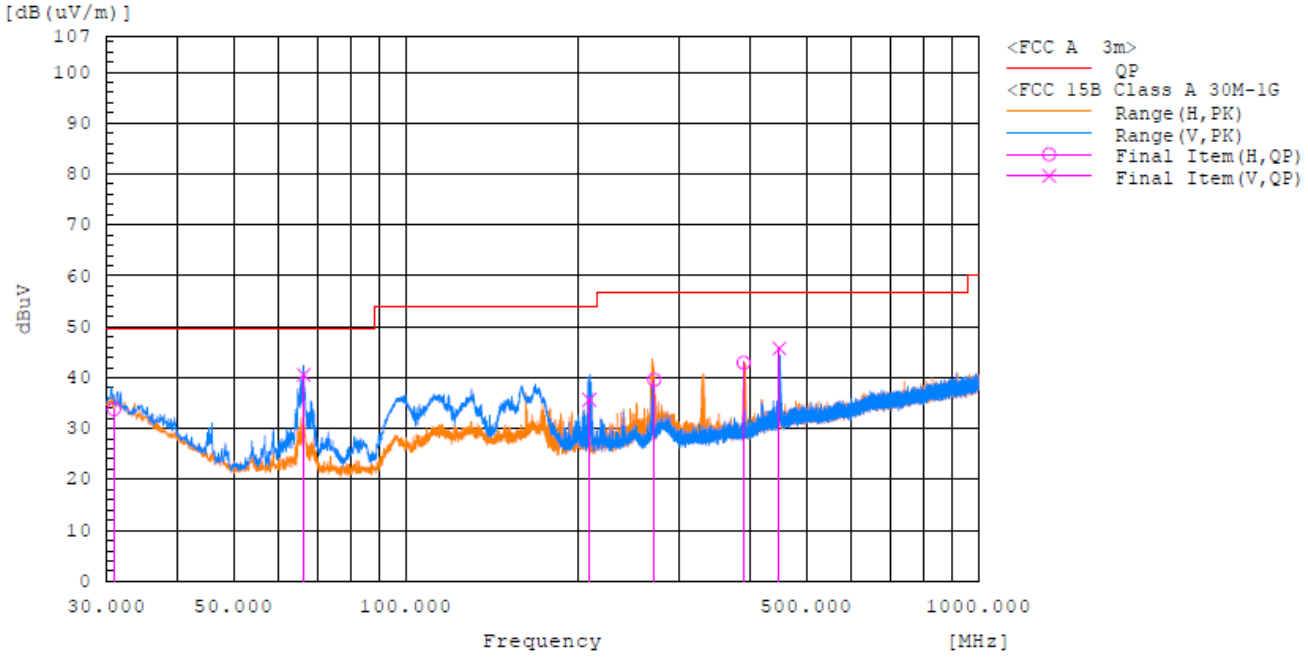
Operating Mode: SafeMark Mode
Power Supply: 48 VDC
Frequency Range: 30 MHz – 1 000 MHz
Test Limit: ICES-003 Issue 7 Class A



Frequency MHz	Polarization	Reading dB(uV)	Corr. dB(1/m)	Level dB(uV/m)	Limit dB(uV/m)	Margin dB	Height cm	Angle deg
		QP		QP	QP	QP		
30.931	H	7.2	26.6	33.8	49.5	15.7	187.9	22.3
66.297	V	26.0	14.5	40.5	49.5	9.0	100.0	311.8
208.952	V	18.4	17.3	35.7	54	18.3	234.4	124.5
271.466	H	19.5	20.1	39.6	56.9	17.3	137.8	135.8
388.962	H	20.8	22.2	43.0	56.9	13.9	122.8	72.3
448.937	V	21.6	24.1	45.7	56.9	11.2	149.9	141.0

Calculation Formula:

1. Polarization: H = Horizontal, V = Vertical
2. Corr. (Correction Factor) = Antenna Factor + Cable Loss + LNA
3. QuasiPeak Level = Reading (Receiver Reading) + Corr.
4. Margin = Limit - QuasiPeak Level

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8.2. Radiated Emission (1 GHz – 40 GHz)

8.2.1. Test Environment

Test Site			
Chamber #1 ☒	Chamber #2 ☐	OATS ☐	Shield Stage #1 ☐
Date	**Temperature**	**Relative Humidity**	**Pressure**
08/13/2024	26.2 °C	30 % R.H.	101.5 kPa

8.2.2. Test Condition

Operating Mode(s)	Power Supply	Applicable Port
SafeRadar Mode	48 VDC	Enclosure Port
SafeMark Mode	48 VDC	Enclosure Port

8.2.3. Test Method and Levels

The test method shall be in accordance with ANSI C63.4-2014.
The equipment shall meet the Class A limits given in FCC CFR 47 Part 15 Subpart B.

Obtained the max. emission point by optimizing the antenna height, antenna polarization, and turntable azimuth.

Frequency Range	1 000 MHz to 40 000 MHz
Measurement Detector Type	Peak / Average
Measurement Bandwidth (IF BW)	1 MHz
Measurement Distance	3 m

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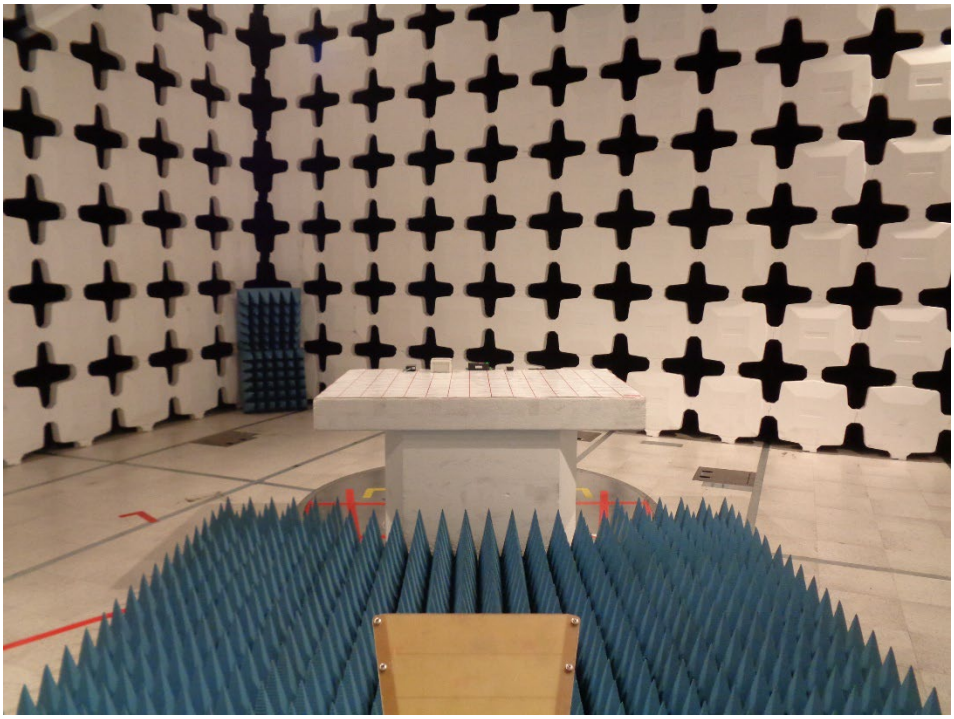
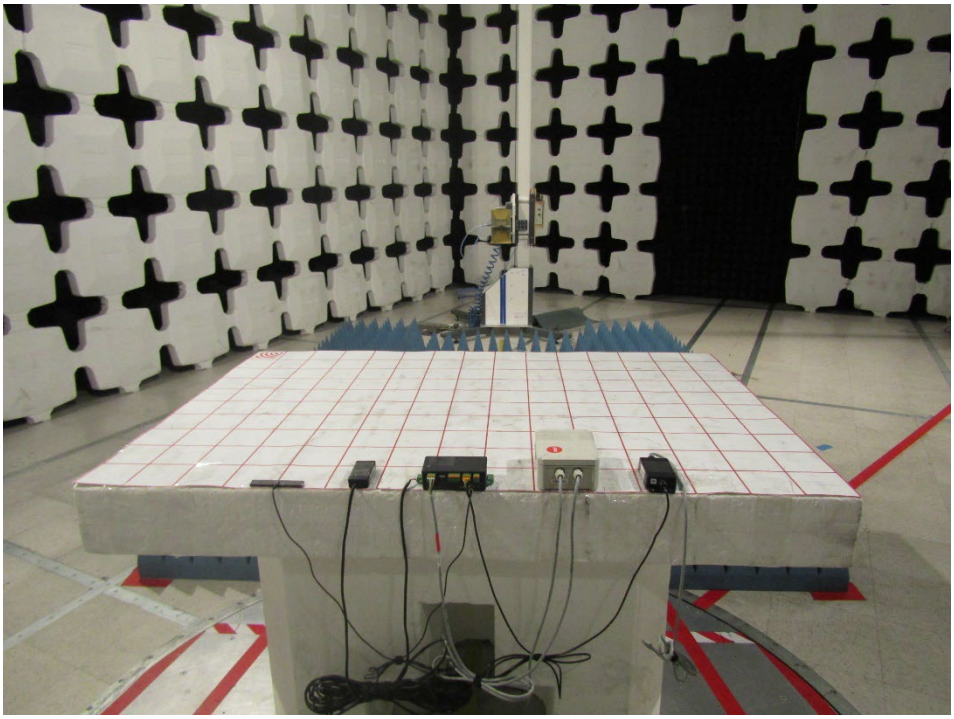
8.2.4. Test Setup Photos

SafeRadar/SafeMark Mode

[1 000 MHz – 18 000 MHz]





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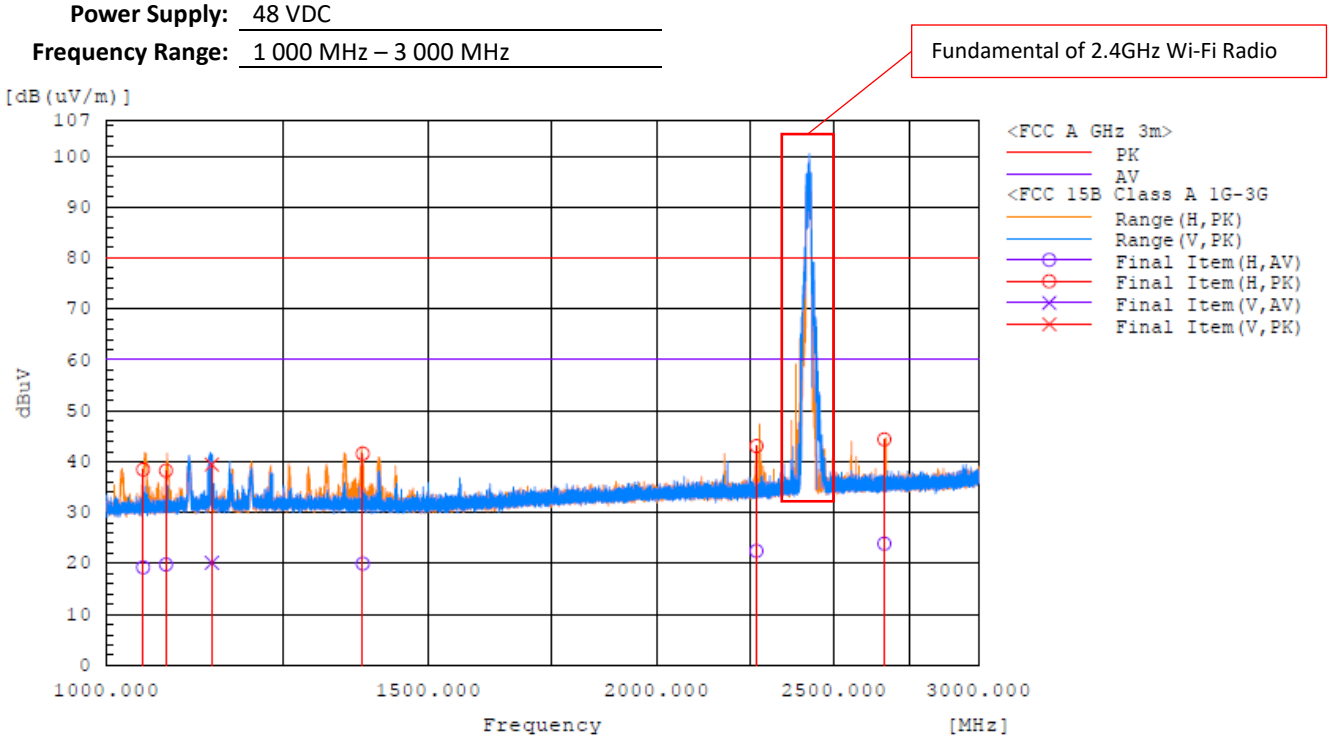
8.2.5. Test Data

Operating Mode: SafeRadar Mode

Power Supply: 48 VDC

Frequency Range: 1 000 MHz – 3 000 MHz



Frequency MHz	Polarization	Reading dB(uV)		Corr. dB(1/m)	Level dB(uV/m)		Limit dB(uV/m)		Margin dB		Height cm	Angle deg
		AV	PK		AV	PK	AV	PK	AV	PK		
1 047.270	H	32.7	51.9	-13.4	19.3	38.5	60	80	40.7	41.5	204.3	298.0
1 077.985	H	33.1	51.5	-13.3	19.8	38.2	60	80	40.2	41.8	135.8	355.5
1 141.935	V	33.2	52.5	-13.0	20.2	39.5	60	80	39.8	40.5	134.5	307.0
1 380.997	H	33.0	54.6	-13.0	20.0	41.6	60	80	40.0	38.4	196.6	189.5
2 267.611	H	33.3	54.0	-10.9	22.4	43.1	60	80	37.6	36.9	231.9	345.3
2 664.110	H	33.8	54.3	-9.9	23.9	44.4	60	80	36.1	35.6	110.5	351.8

Calculation Formula:

1. Polarization: H = Horizontal, V = Vertical
2. Corr. (Correction Factor) = Antenna Factor + Cable Loss + LNA
3. CAverage or Peak Level = Reading (Receiver Reading) + Corr.
4. Margin = Limit – CAverage or Peak Level

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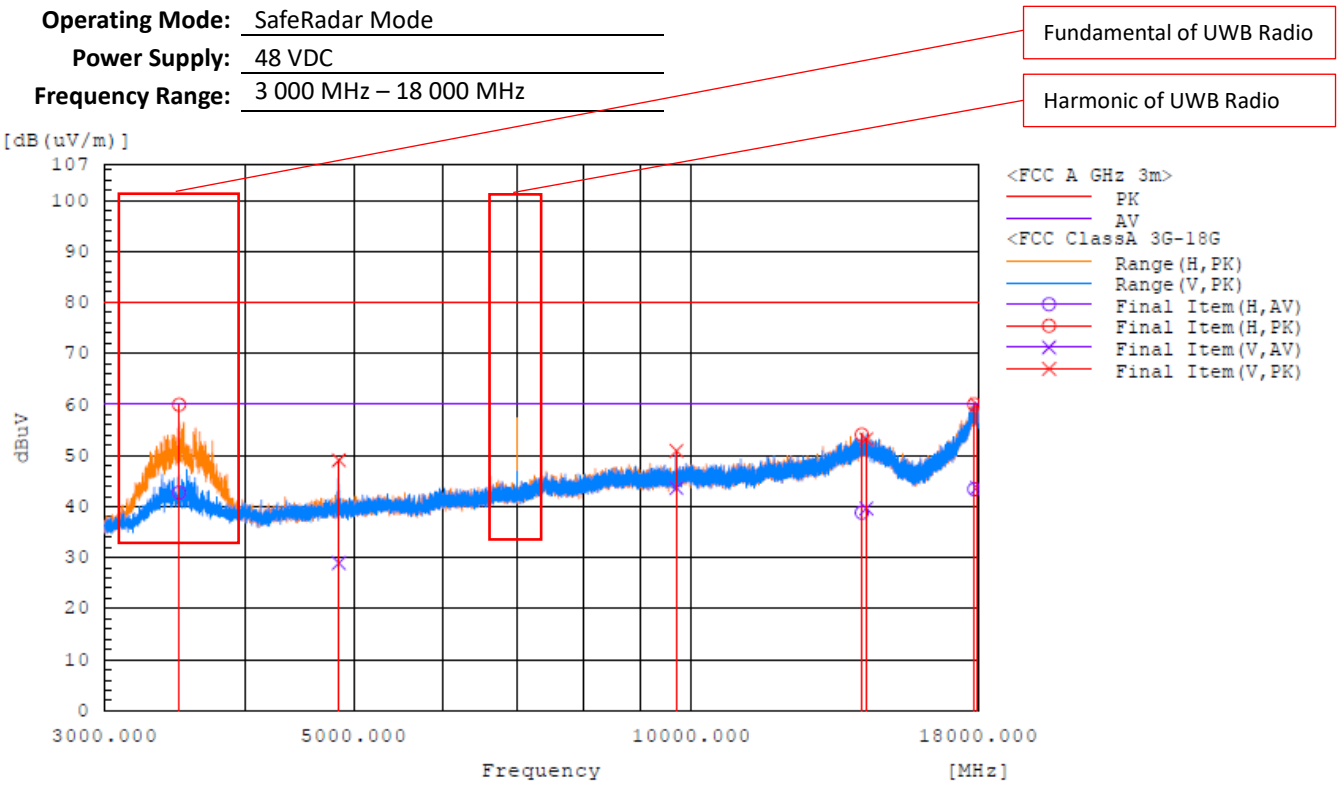
Operating Mode: SafeRadar Mode
Power Supply: 48 VDC
Frequency Range: 3 000 MHz – 18 000 MHz



Frequency MHz	Polarization	Reading dB(uV)		Corr. dB(1/m)	Level dB(uV/m)		Limit dB(uV/m)		Margin dB		Height cm	Angle deg
		AV	PK		AV	PK	AV	PK	AV	PK		
3 494.715	H	50.2	67.5	-7.5	42.7	60.0	60	80	17.3	20.0	100.0	124.5
4 848.518	V	33.3	53.5	-4.4	28.9	49.1	60	80	31.1	30.9	167.8	21.3
9 688.290	V	41.3	48.6	2.4	43.7	51.0	60	80	16.3	29.0	103.1	275.8
14 178.770	H	28.2	43.5	10.6	38.8	54.1	60	80	21.2	25.9	101.2	244.0
14 298.050	V	28.9	42.5	10.7	39.6	53.2	60	80	20.4	26.8	112.5	204.0
17 847.930	H	25.3	41.9	18.1	43.4	60.0	60	80	16.6	20.0	100.0	48.3
17 946.120	V	25.7	42.0	18.0	43.7	60.0	60	80	16.3	20.0	101.4	286.3

Note: The remaining frequency range from 18 000 MHz to 40 000 MHz is at ambient levels with 10 dB or more margin.

Calculation Formula:

1. Polarization: H = Horizontal, V = Vertical
2. Corr. (Correction Factor) = Antenna Factor + Cable Loss + LNA
3. CAverage or Peak Level = Reading (Receiver Reading) + Corr.
4. Margin = Limit – CAverage or Peak Level

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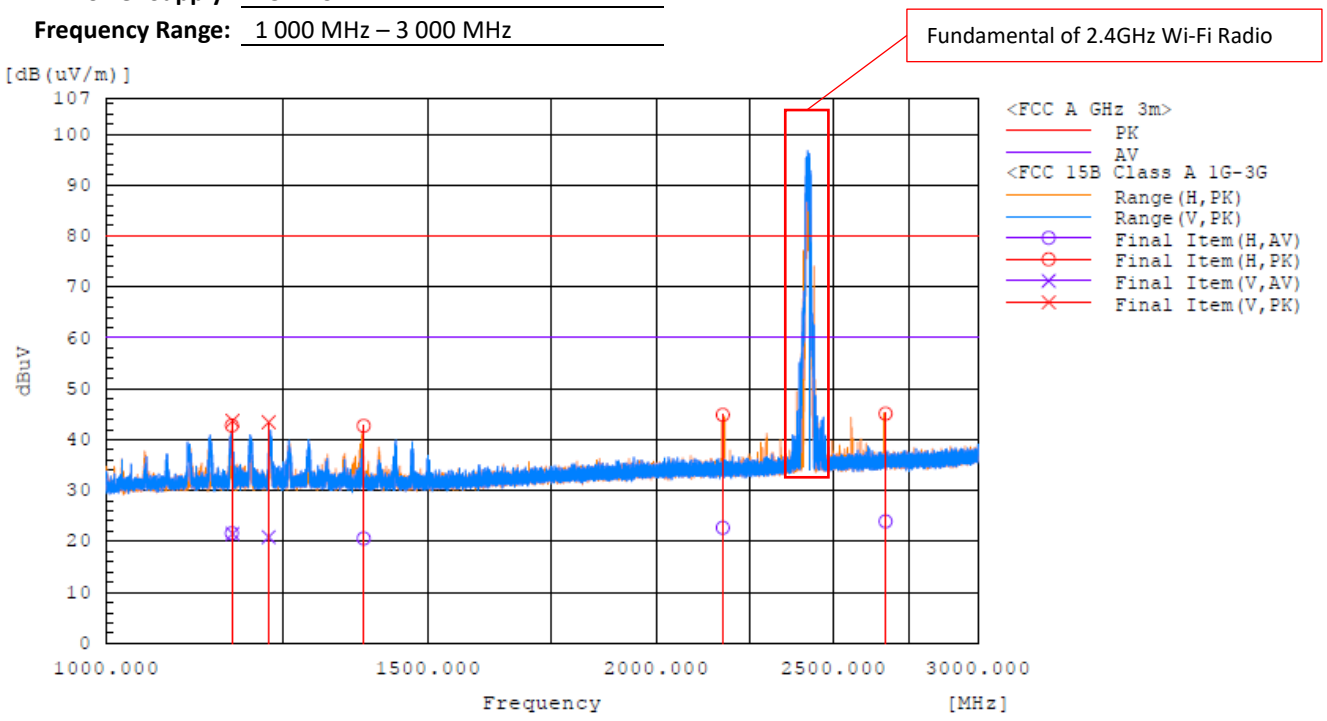
Operating Mode: SafeMark Mode

Power Supply: 48 VDC

Frequency Range: 1 000 MHz – 3 000 MHz



Frequency MHz	Polarization	Reading dB(uV)		Corr. dB(1/m)	Level dB(uV/m)		Limit dB(uV/m)		Margin dB		Height cm	Angle deg
		AV	PK		AV	PK	AV	PK	AV	PK		
1 171.543	H	34.4	55.6	-12.8	21.6	42.8	60	80	38.4	37.2	123.5	330.0
1 172.248	V	34.3	56.6	-12.8	21.5	43.8	60	80	38.5	36.2	172.3	173.5
1 226.901	V	33.7	56.2	-12.8	20.9	43.4	60	80	39.1	36.6	150.0	180.8
1 383.314	H	33.6	55.7	-13.0	20.6	42.7	60	80	39.4	37.3	124.1	307.0
2 174.986	H	33.7	55.9	-11.0	22.7	44.9	60	80	37.3	35.1	101.9	321.0
2 669.593	H	33.8	55.0	-9.9	23.9	45.1	60	80	36.1	34.9	208.4	3.5

Calculation Formula:

1. Polarization: H = Horizontal, V = Vertical
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3. CAverage or Peak Level = Reading (Receiver Reading) + Corr.
4. Margin = Limit – CAverage or Peak Level

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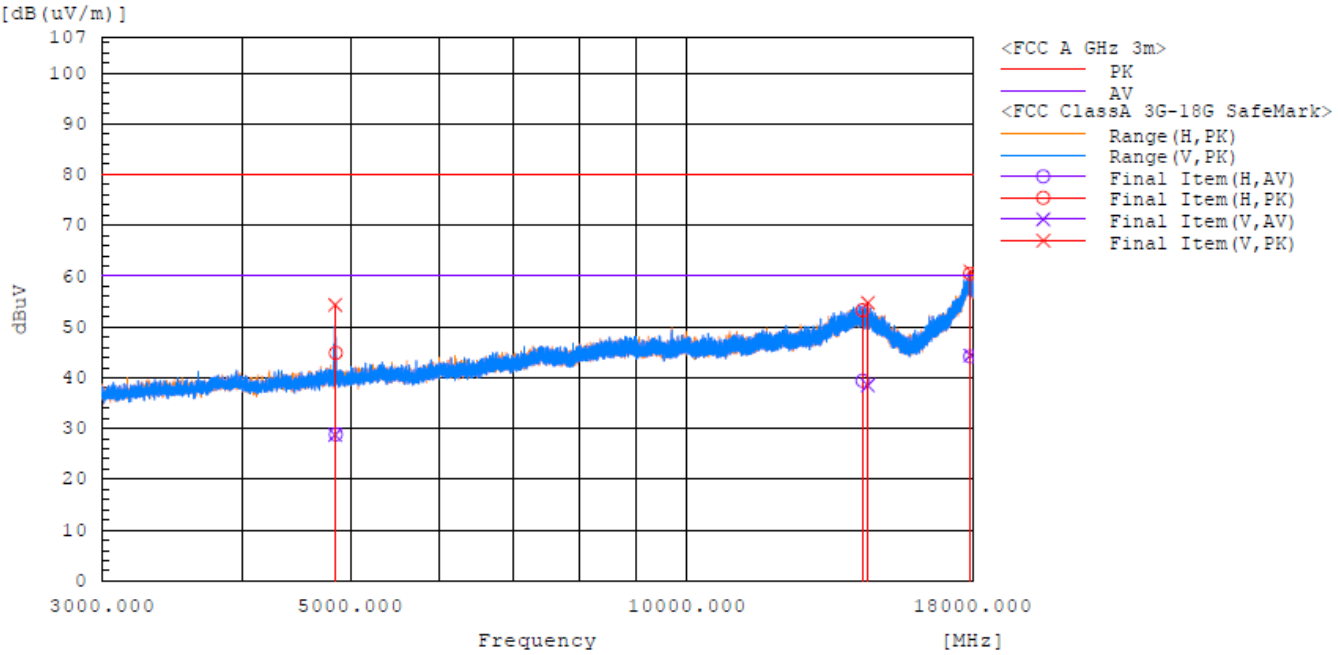
Operating Mode: SafeMark Mode

Power Supply: 48 VDC

Frequency Range: 3 000 MHz – 18 000 MHz



Frequency MHz	Polarization	Reading dB(uV)		Corr. dB(1/m)	Level dB(uV/m)		Limit dB(uV/m)		Margin dB		Height cm	Angle deg
		AV	PK		AV	PK	AV	PK	AV	PK		
4 843.050	V	33.1	58.8	-4.4	28.7	54.4	60	80	31.3	25.6	208.2	312.5
4 851.488	H	33.2	49.3	-4.4	28.8	44.9	60	80	31.2	35.1	210.0	149.8
14 340.840	H	28.7	42.6	10.7	39.4	53.3	60	80	20.6	26.7	100.0	33.0
14 501.240	V	28.1	44.4	10.4	38.5	54.8	60	80	21.5	25.2	101.6	183.5
17 900.520	V	26.3	42.9	18.1	44.4	61.0	60	80	15.6	19.0	245.0	277.5
17 904.780	H	26.1	42.4	18.1	44.2	60.5	60	80	15.8	19.5	219.9	259.8

Note: The remaining frequency range from 18 000 MHz to 40 000 MHz is at ambient levels with 10 dB or more margin.

Calculation Formula:

1. Polarization: H = Horizontal, V = Vertical
2. Corr. (Correction Factor) = Antenna Factor + Cable Loss + LNA
3. CAverage or Peak Level = Reading (Receiver Reading) + Corr.
4. Margin = Limit – CAverage or Peak Level

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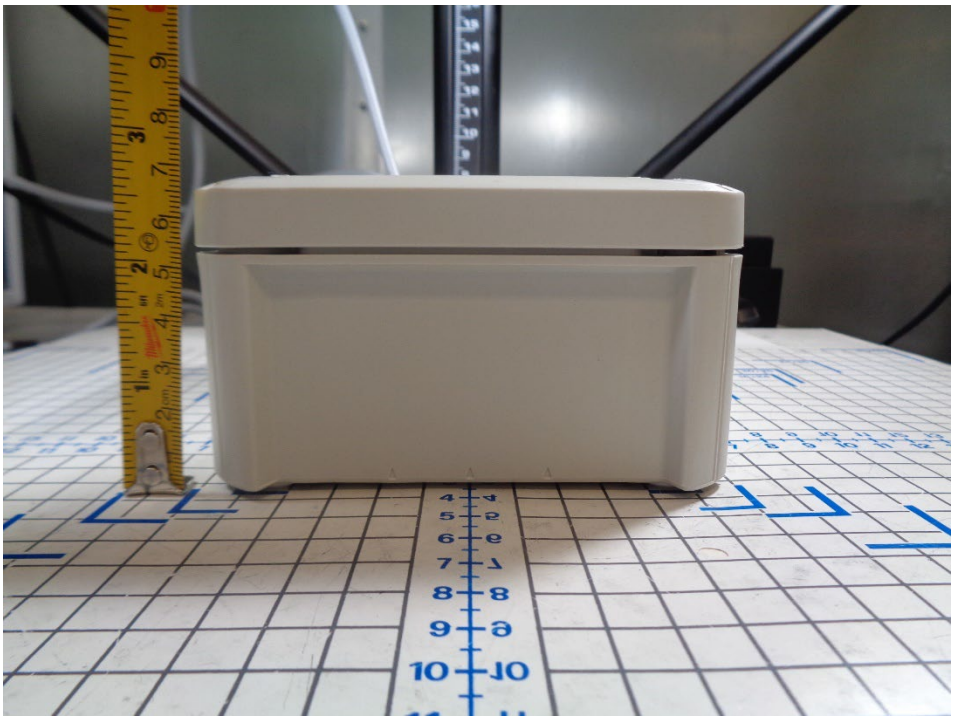
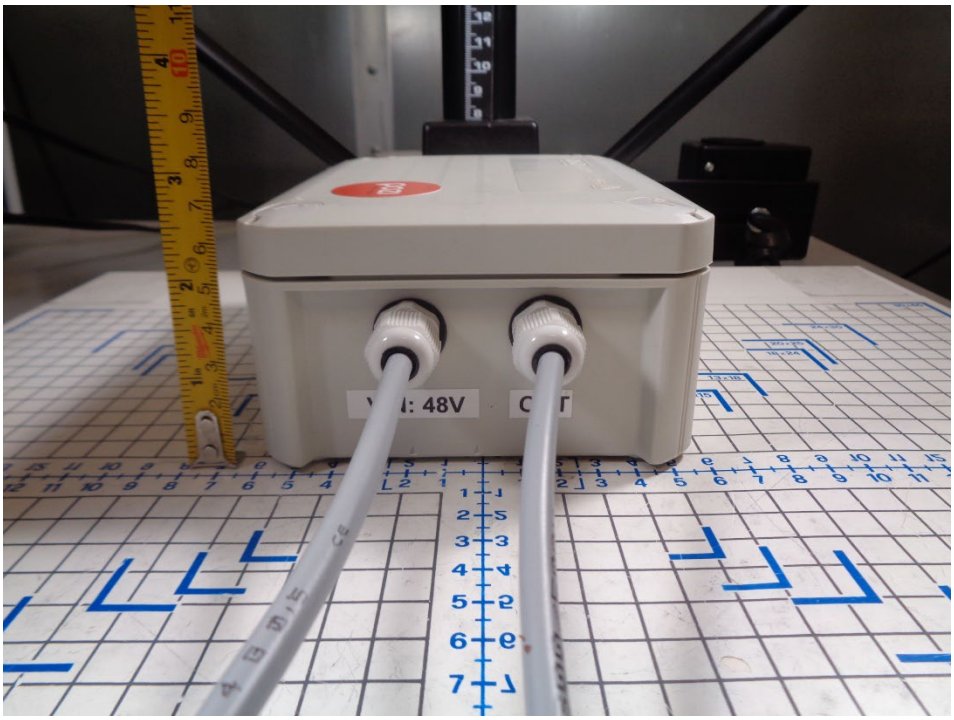
9. Photographs of EUT

Exterior of Front



Exterior of Rear



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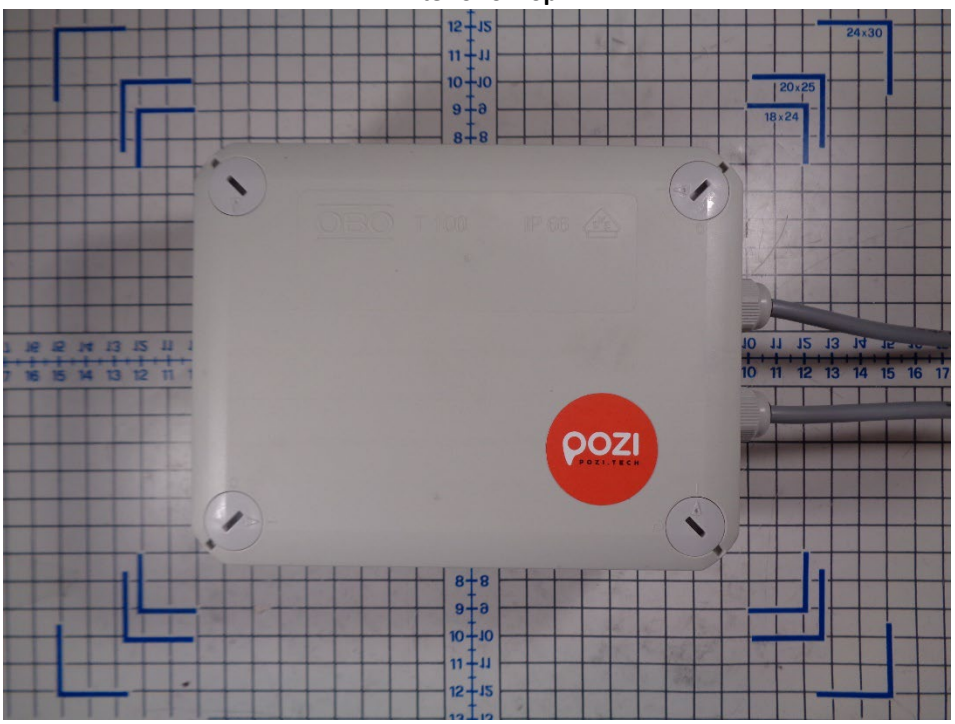
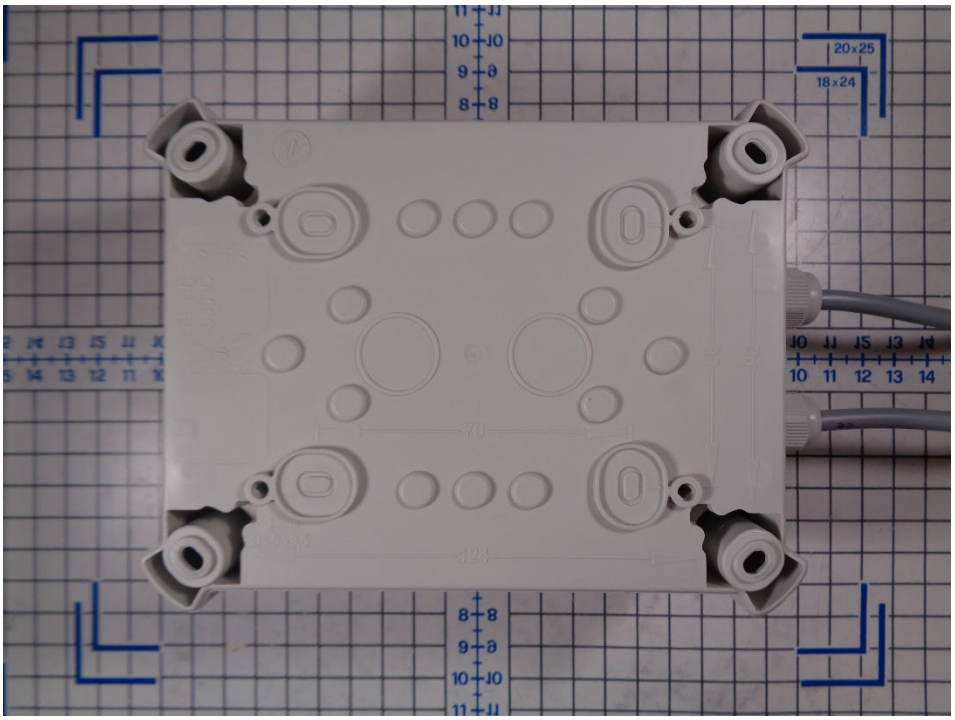
Exterior of Top



Exterior of Bottom



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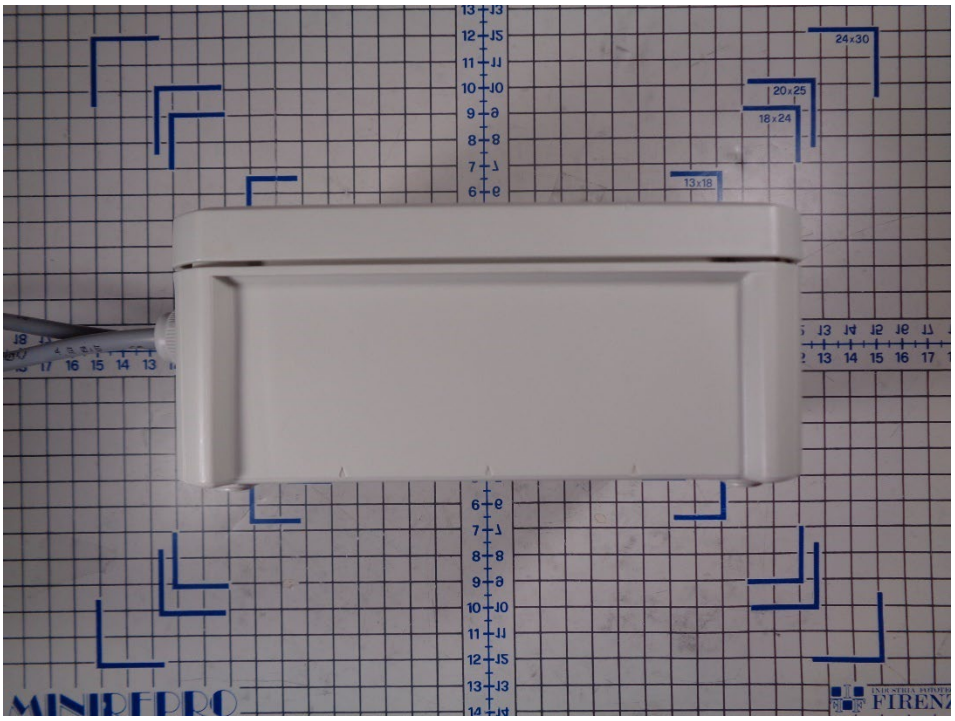
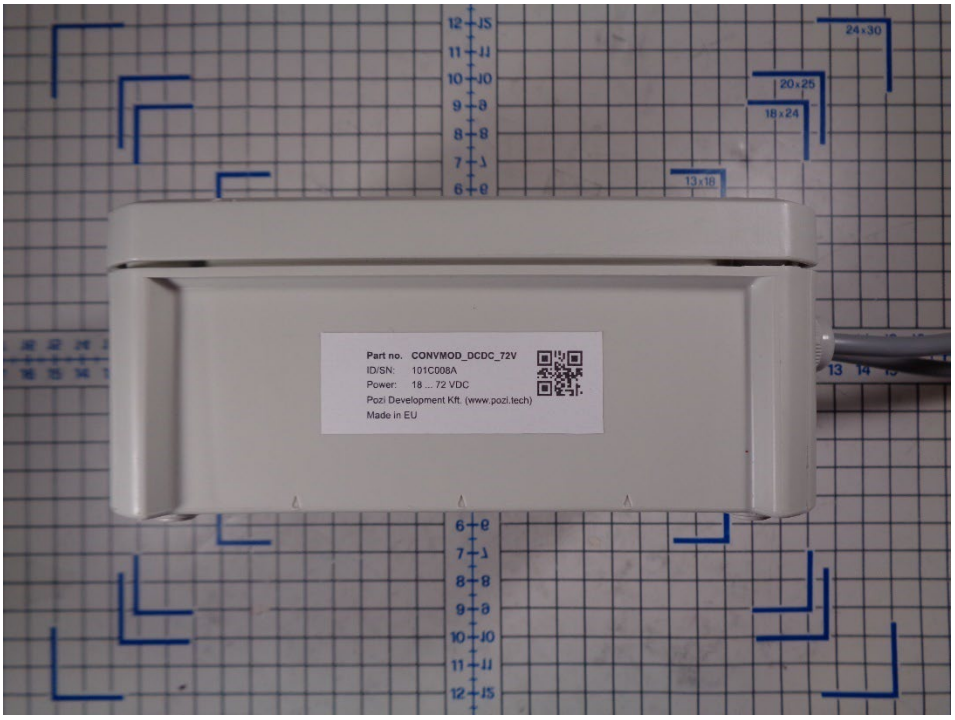
Exterior of Left



Exterior of Right



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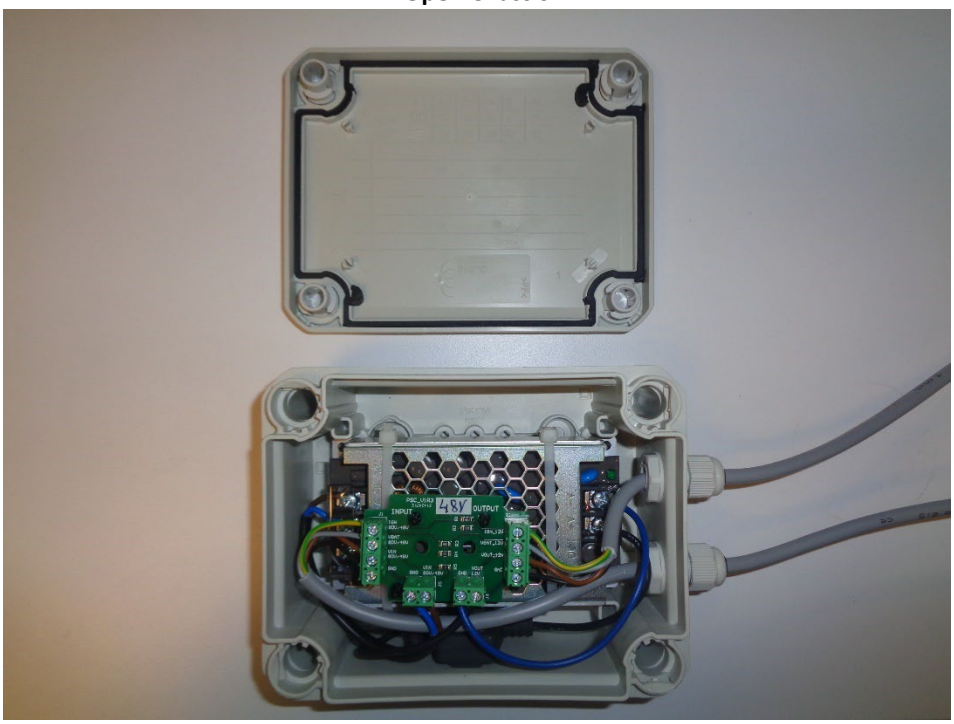
Open Chassis



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END OF TEST REPORT

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