

Report on Radio Testing of the PRÜFTECHNIK Fluke Deutschland GmbH

Model: ALI 4.901

In accordance with EN 300 328 (partly)

Prepared for: Fluke Deutschland GmbH
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85737 Ismaning



Product Service

**Add value.
Inspire trust.**

COMMERCIAL-IN-CONFIDENCE

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Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

Executive Statement:

A sample of this product was tested (partly) and found to be compliant with EN 300 328 V2.2.2



DAkkS
Deutsche
Akkreditierungsstelle
D-PL-11321-11-02

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1 Report Summary

1.1 Modification Report

Alternations and additions of this report will be issued to the holders of each copy in the form of a complete document.

<i>Revision</i>	<i>Description of changes</i>	<i>Date of Revision</i>
0	Revision 0	2022-10-19

Table 1: Report of Modifications

1.2 Introduction

<i>Applicant</i>	Fluke Deutschland GmbH
<i>Model Number(s)</i>	ALI 4.901
<i>Serial Number(s)</i>	4901 0100
<i>Firmware:</i>	---
<i>Number of Samples Tested</i>	1
<i>Test Specification(s) / Issue / Date</i>	ETSI EN 300 328 V2.2.2 (2019-07)
<i>Order Number</i>	19002
<i>Date of Receipt of EUT</i>	2022-09-19
<i>Start of Test</i>	2022-10-05
<i>Finish of Test</i>	2022-10-05
<i>Name of Engineer(s)</i>	Patrick Müller
<i>Related Document(s)</i>	---



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance EN 300 328 V2.2.1 is shown below.

<i>Section</i>	<i>Specification Clause</i>	<i>Test Description</i>	<i>Result</i>	<i>Comments</i>
Configuration and Mode: 3.7 Vdc Battery powered – Continuously transmitting				
2.1	4.3.1.2, 5.4.2	RF Output Power	Pass	
2.2	4.3.1.10, 5.4.9	Transmitter unwanted emissions in the spurious domain	Pass	

Table 2: Results



1.4 Product Information

1.4.1 General Technical Description

Equipment characteristics	
Type designation:	ALI 4.901
Type of equipment:	Wireless laser optical system
Application ¹ :	Wideband transmission systems
Equipment class:	Equipment for portable use
Kind of equipment	Transceiver
Frequency band ¹ :	3 b
Frequency range:	2400 – 2483.5 MHz
Antenna:	Integrated Antenna
Antenna gain:	---
Temperature range:	---
Power supply:	Battery powered (3.7V DC)
FHSS:	---
Adaptive:	---
Channels:	---
Occupied channel bandwidth:	---
Modulation:	Bluetooth 4.2 (GFSK, $\pi/4$ DQPSK, 8DPSK)

¹ Classification according to CEPT/ERC Recommendation 70-03



Marking Plate(s)

Description	Marking Plate
Marking Plate / sticker as specified by applicant	

1.5 Deviations from Standard

none

1.6 EUT Modifications Record

The table below details modifications made to the EUT during the test programme.
 The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer / SN: 4902 0100	Not Applicable	Not Applicable

Table 3



Product Service

1.7 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing test laboratory:

<i>Test Name</i>	<i>Name of Engineer(s)</i>
Configuration and Mode: 3.7Vdc Battery powered – Continuously transmitting	
RF Output Power	Patrick Müller
Transmitter unwanted emissions in the spurious domain	Patrick Müller

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany



2 Test Details

2.1 RF Output Power

2.1.1 Specification Reference

EN 300 328, clause 4.3.1.2

2.1.2 Equipment under Test and Modification State

ALI 4.901; S/N: 4902 0100; Modification State 0

2.1.3 Date of Test

2022-10-05

2.1.4 Environmental Conditions

Ambient Temperature	22 °C
Relative Humidity	46 %

2.1.5 Specification Limits

The RF output power shall be equal or less than 20 dBm.

2.1.6 Test Method

The test was performed according to EN 300 328, clause 5.4.2.
The test was performed with a spectrum analyzer.



2.1.7 Test Results

<i>Frequency [MHz]</i>	<i>RF Output power e.i.r.p. (dBm)</i>	<i>RF output power Limit e.i.r.p. (dBm)</i>	<i>Test result</i>
2402	-0.80	20	Pass
2440	0.23	20	Pass
2480	0.78	20	Pass

2.1.8 Test Location and Test Equipment

This test was carried out in a fully anechoic room - cabin no. 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Ultralog Antenna	Rohde & Schwarz	HL562E	38401	36	2024-05-31
Spectrum Analyzer	Rohde & Schwarz	FSW43	53496	12	2023-04-30
EMC measurement software	Rohde & Schwarz	EMC32 Emission K2 - V10.40.00	44375	N/A	N/A

Table 4

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable



2.2 Transmitter unwanted emissions in the spurious domain

2.2.1 Specification Reference

EN 300 328, clause 4.3.1.10

2.2.2 Equipment under Test and Modification State

ALI 4.901; S/N: 4902 0100; Modification State 0

2.2.3 Date of Test

2022-10-05

2.2.4 Environmental Conditions

Ambient Temperature 22 °C
Relative Humidity 46 %

2.2.5 Specification Limits

<i>Frequency range(s)</i>	<i>Maximum power</i>	<i>Bandwidth</i>
30 MHz – 47 MHz; 74 MHz – 87.5 MHz; 118 MHz – 174 MHz; 230 MHz – 470 MHz; 694 MHz – 1 GHz	-36 dBm	100 kHz
47 MHz – 74 MHz; 87.5 MHz – 118 MHz; 174 MHz – 230 MHz; 470 MHz – 694 MHz	-54 dBm	100 kHz
1 GHz – 12.75 GHz	-30 dBm	1 MHz

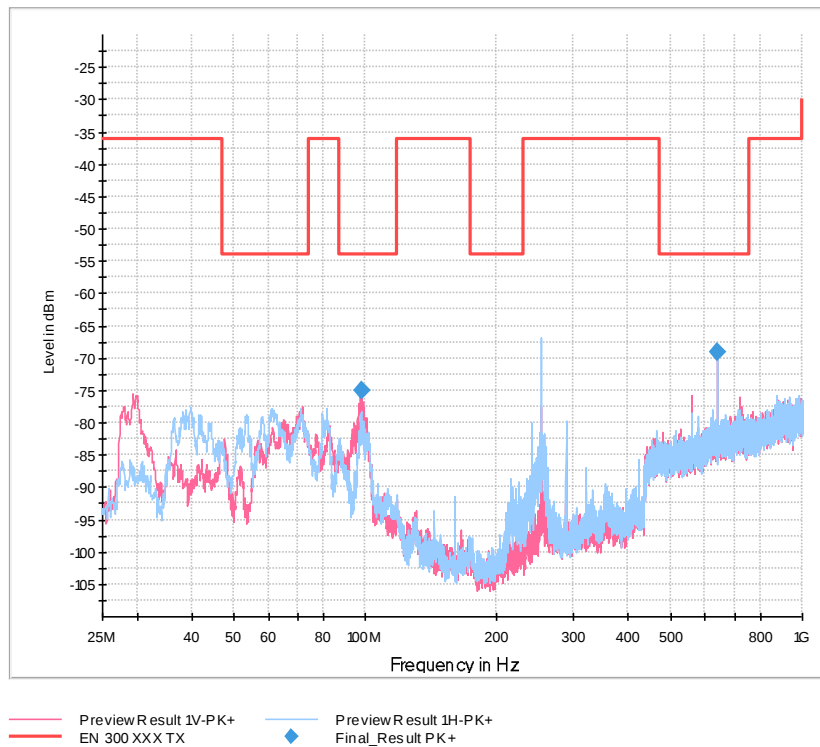
2.2.6 Test Method

The test was performed according to EN 300 328, clause 5.4.9.



2.2.7 Test Results

Continuously transmitting at 2402 MHz

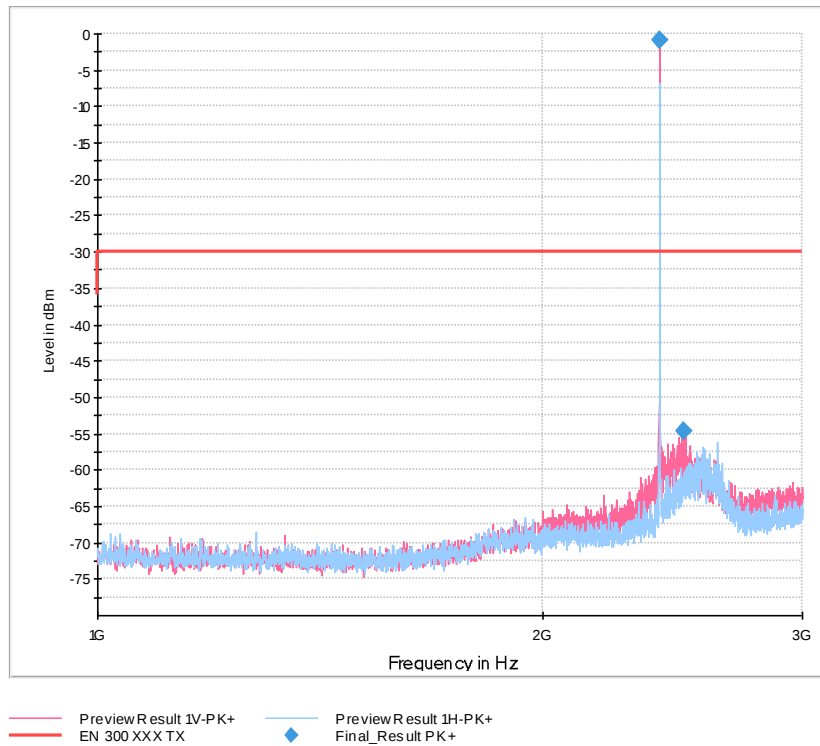


Final Results:

Frequency MHz	MaxPeak dBm	Limit dBm	Mar- gin dB	Meas. Time ms	Band- width kHz	Height cm	Pol	Azi- muth deg	Corr. dB
97.854167	-75.02	-54.00	21.02	2.5	100.000	150.0	V	283.0	-113
640.008333	-69.07	-54.00	15.07	2.5	100.000	150.0	V	358.0	-107



Product Service



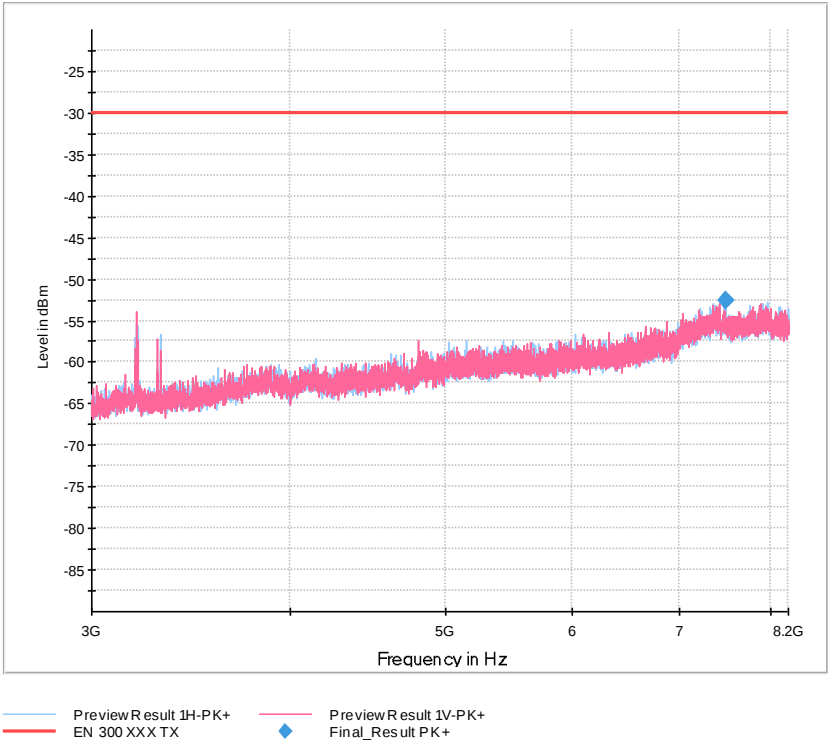
Final Results:

Frequency MHz	MaxPeak dBm	Limit dBm	Margin dB	Meas. Time ms	Band- width kHz	Heigh t cm	P ol	Azi- muth deg	Corr. dB
2402.000000	-0.99	#1	#1	2.5	1000.000	150.0	V	236.0	-102.5
2492.000000	-54.72	-30.00	24.72	2.5	1000.000	150.0	V	249.0	-102.1

#1 Intentional Radiator



Product Service

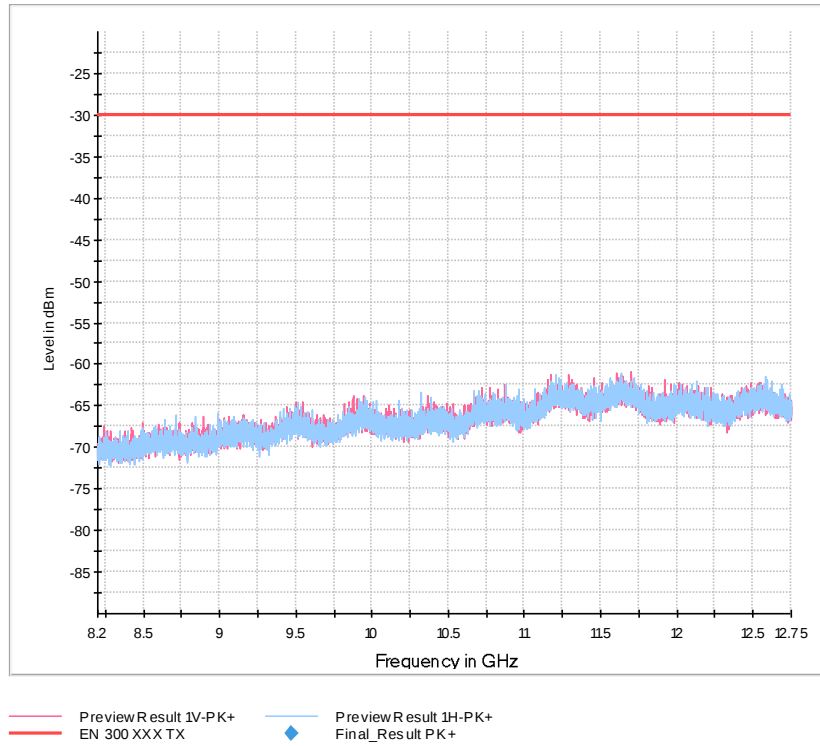


Final Results:

Frequency	MaxPeak	Limit	Mar-	Meas.	Band-	Heigh	Pol	Azi-	Cor
MHz	dBm	dBm	gin	Time	width	t		muth	r.
			dB	ms	kHz	cm		deg	dB
7492.600000	-52.57	-30.00	22.57	2.5	1000.000	150.0	H	104.0	-90



Product Service





2.2.8 Test Location and Test Equipment

This test was carried out in a fully anechoic room - cabin no. 2.

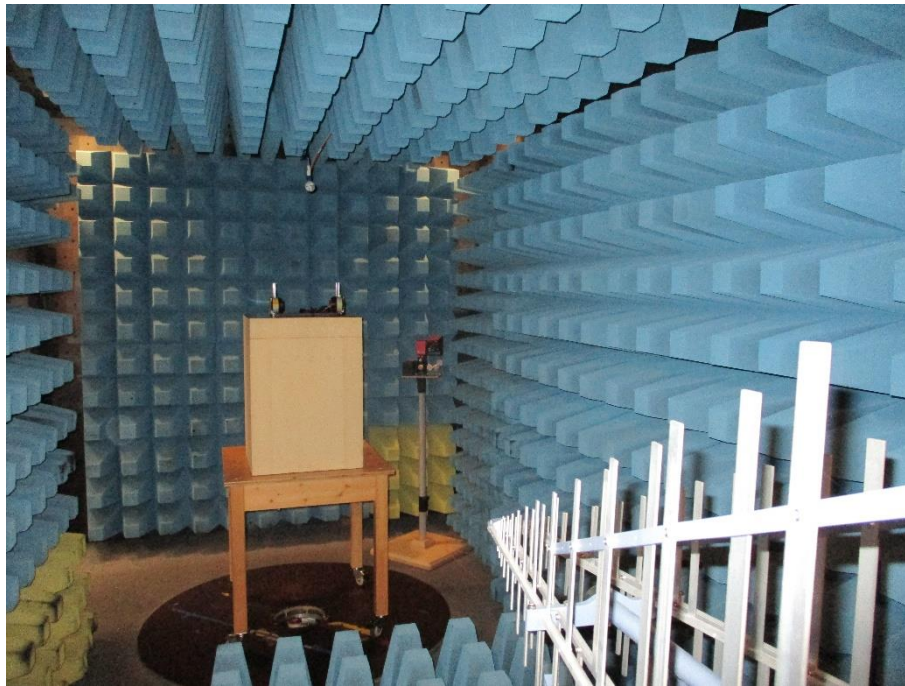
Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Ultralog Antenna	Rohde & Schwarz	HL562E	38401	36	2024-05-31
Waveguide Horn Antenna	EMCO	3115	19383	36	2023-03-31
Spectrum Analyzer	Rohde & Schwarz	FSW43	53496	12	2023-04-30
EMC measurement software	Rohde & Schwarz	EMC32 Emission K2 - V10.40.00	44375	N/A	N/A

Table 5

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable

3 Photographs

3.1 Equipment Under Test (EUT)





4 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

The measurement uncertainty in the laboratory is less than or equal to the maximum measurement uncertainty according to CISPR16-4-2: 2011 + A1 + A2 + Cor1 (U_{CISPR}). This normative regulation means that the measured value is also the value to be assessed in relation to the limit value.

<i>Radio Interference Emission Testing</i>		
<i>Test Name</i>	<i>kp</i>	<i>Expanded Uncertainty</i>
Conducted Voltage Emission		
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB
100 kHz to 200 MHz (50Ω/5μH AMN)	2	± 3.6 dB
Discontinuous Conducted Emission		
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB
Conducted Current Emission		
9 kHz to 200 MHz	2	± 3.5 dB
Magnetic Fieldstrength		
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB
Radiated Emission		
30 MHz to 300 MHz	2	± 4.9 dB
300 MHz to 1 GHz	2	± 5.0 dB
1 GHz to 6 GHz	2	± 4.6 dB
Test distance 10 m		
30 MHz to 300 MHz	2	± 4.9 dB
300 MHz to 1 GHz	2	± 4.9 dB
The expanded uncertainty reported according to CISPR16-4-2: 2011 + A1 + A2 + Cor1 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$		

Table 6 Measurement uncertainty based on CISPR 16-4-2



<i>Radio Interference Emission Testing</i>		
<i>Test Name</i>	<i>kp</i>	<i>Expanded Uncertainty</i>
Occupied Bandwidth	2	± 5 %
Conducted Power		
9 kHz ≤ f < 30 MHz	2	± 1.0 dB
30 MHz ≤ f < 1 GHz	2	± 1.5 dB
1 GHz ≤ f ≤ 40 GHz	2	± 2.5 dB
1 MS/s power sensor (TS8997)	2	± 1.5 dB
Occupied Bandwidth	2	± 5 %
Power Spectral Density	2	± 3.0 dB
Radiated Power		
9 kHz ≤ f < 26.5 GHz	2	± 6.5 dB
26.5 GHz ≤ f < 60 GHz	2	± 8.0 dB
60 GHz ≤ f < 325 GHz	2	± 10 dB
Conducted Spurious Emissions	2	± 3.0 dB
Radiated Spurious Emissions	2	± 6.0 dB
Voltage		
DC	2	± 1.0 %
AC	2	± 2.0 %
Time (automatic)	2	± 5 %
Frequency	2	± 10 ⁻⁷
The expanded uncertainty reported according to to ETSI TR 100 028:2001 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%		

Table 7 Measurement uncertainty based on ETSI TR 100 028