

Report on the FCC and IC Testing of the
Siemens AG
Radar level transmitter
Model: SITRANS LR500 Series
In accordance with FCC 47 CFR Part 1.1310,
Part 2.1093 and RSS-102

Prepared for: Siemens AG
76181 Karlsruhe
Germany

FCC ID: LYH-LR500
IC: 267AA-LR500



Product Service

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Date: 2024-03-19

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ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 1.1310, Part 2.1093 and RSS 102 Issue 5 (March 2015) + Amendment 1 (February 2021). The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	
Testing	Alex Fink	2024-03-19	 SIGN-ID 896482

Laboratory Accreditation
DAkkS Reg. No. D-PL-11321-11-03
DAkkS Reg. No. D-PL-11321-11-04

Laboratory recognition
Registration No. BNetzA-CAB-16/21-15

ISED Canada test site registration
3050A-2

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 1.1310, Part 2.1093 and RSS 102 Issue 5 (March 2015) + Amendment 1 (February 2021)

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1 Report Summary

1.1 Report Modification Record

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

Revision	Description of Change	Date of Issue
0	First Revision	2024-03-19

Table 1

1.2 Introduction

Applicant	Siemens AG 76181 Karlsruhe Germany
Manufacturer	Siemens Canada Limited 1954 Technology Drive Peterborough, Ontario, K9J 6X7 Canada
Model Number(s)	SITRANS LR500 Series
Serial Number(s)	MS-92
Hardware Version(s)	1.00.00
Software Version(s)	1.00.00
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 1.1310 and Part 2.1093 RSS 102 Issue 5 (March 2015) + Amendment 1 (February 2021)
Test Plan/Issue/Date	NA
Order Number	9707622186
Date	2023-03-02
Date of Receipt of EUT	2023-11-30
Start of Test	2024-02-23
Finish of Test	2024-03-06
Name of Engineer(s)	Alex Fink
Related Document(s)	447498 D04 Interim General RF Exposure Guidance v01 ANSI C63.10 (2013)



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 1.1310, Part 2.1093 and RSS-102 is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: SITRANS LR500 Series continuously transmitting				
2.1	1.1310 2.5.1, 2.5.2, 3	RF Exposure Evaluation	Pass	KDB 447498 D04 v01

Table 2

1.1 Product Information

1.1.1 Technical Description

The SITRANS LR500 Series (LR510, LR530, LR550, LR580) is a continuous level measurement instrument providing 2-wire, 4-20 mA level measurement using microwave radar technology. SITRANS LR500 Series is intended for use in process industries for the determination of material level in open air, tanks and other process vessels. The principle used is Frequency Modulated Continuous Wave (FMCW). A microwave frequency whose frequency varies with time is generated by the internal RF circuits. This signal is directed through an antenna towards the surface of the material to be measured. The signal reflected by the surface is received by the same antenna and processed. The time of flight of the radar wave is calculated by comparing the transmitted and received frequencies.

1.2 Test Configuration

The EUT was supplied by a 24 V DC power supply. SITRANS LR500 Series continuously transmitting.

1.4

1.5 EUT Modification 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 (S/N: MS-92)	Not Applicable	Not Applicable

Table 3

1.6 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing Test Laboratory.

Test Name	Name of Engineer(s)
Configuration and Mode: SITRANS LR500 Series continuously transmitting	
RF Exposure Evaluation	Alex Fink

Table 4

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany



2 Test Details

2.1 RF Exposure Assessment

2.1.1 Specification Reference

CFR 47 Pt.1.1310
RSS-102

2.1.2 Equipment Under Test and Modification State

SITRANS LR500 Series; S/N: MS-92 - Modification State 0

2.1.3 Test Method

The test was performed in accordance with KDB 447498 D04 v01
Evaluation distance is 20 cm.

2.1.4 Test Results

Maximum <i>EIRP</i> (worst case):	33.89 dBm = 2449.0 mW (Peak) 21.84 dBm = 152.76 mW (RMS Integration)
Frequency:	75 GHz to 85 GHz (> 5800 MHz)
Minimum separation distance <i>r</i> :	20 cm (declared by applicant)
Power density <i>S</i> = $\frac{EIRP}{4\pi r^2}$:	0.4872 mW/cm ² (Peak) 0.0304 mW/cm ² (Average)
FCC Limit	1.0 mW/cm ²
ISED Limit:	1.0 mW/cm ²

3 Measurement Uncertainty

The measurement uncertainty in the laboratory is less than or equal to the maximum measurement uncertainty according to EN 55016-4-2: 2011 + A1 + A2 + AC and CISPR16-4-2: 2011 + A1 + A2 + Cor1 (UCISPR). This normative regulation means that the measured value is also the value to be assessed in relation to the limit value.

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

Radio Testing			
Test Name	kp	Expanded Uncertainty	Note
Occupied Bandwidth	2.0	$\pm 1.14 \%$	2
RF-Frequency error	1.96	$\pm 1 \cdot 10^{-7}$	7
RF-Power. conducted carrier	2	$\pm 0.079 \text{ dB}$	2
RF-Power uncertainty for given BER	1.96	+0.94 dB / -1.05	7
RF power. conducted. spurious emissions	1.96	+1.4 dB / -1.6 dB	7
RF power. radiated			
25 MHz – 4 GHz	1.96	+3.6 dB / -5.2 dB	8
1 GHz – 18 GHz	1.96	+3.8 dB / -5.6 dB	8
18 GHz – 26.5 GHz	1.96	+3.4 dB / -4.5 dB	8
40 GHz – 170 GHz	1.96	+4.2 dB / -7.1 dB	8
Spectral Power Density. conducted	2.0	$\pm 0.53 \text{ dB}$	2
Maximum frequency deviation			
300 Hz – 6 kHz	2	$\pm 2.89 \%$	2
6 kHz – 25 kHz	2	$\pm 0.2 \text{ dB}$	2
Maximum frequency deviation for FM	2	$\pm 2.89 \%$	2
Adjacent channel power 25 MHz – 1 GHz	2	$\pm 2.31 \%$	2
Temperature	2	$\pm 0.39 \text{ K}$	4
(Relative) Humidity	2	$\pm 2.28 \%$	2
DC- and low frequency AC voltage			
DC voltage	2	$\pm 0.01 \%$	2
AC voltage up to 1 kHz	2	$\pm 1.2 \%$	2
Time	2	$\pm 0.6 \%$	2

Table 5

Radio Interference Emission Testing			
Test Name	kp	Expanded Uncertainty	Note
Conducted Voltage Emission			
9 kHz to 150 kHz (50Ω/50µH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50µH AMN)	2	± 3.4 dB	1
100 kHz to 200 MHz (50Ω/5µH AMN)	2	± 3.6 dB	1
Discontinuous Conducted Emission			
9 kHz to 150 kHz (50Ω/50µH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50µH AMN)	2	± 3.4 dB	1
Conducted Current Emission			
9 kHz to 200 MHz	2	± 3.5 dB	1
Magnetic Fieldstrength			
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB	1
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB	1
Radiated Emission			
Test distance 1 m (ALSE)			
9 kHz to 150 kHz	2	± 4.6 dB	1
150 kHz to 30 MHz	2	± 4.1 dB	1
30 MHz to 200 MHz	2	± 5.2 dB	1
200 MHz to 2 GHz	2	± 4.4 dB	1
2 GHz to 3 GHz	2	± 4.6 dB	1
Test distance 3 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 5.0 dB	1
1 GHz to 6 GHz	2	± 4.6 dB	1
Test distance 10 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 4.9 dB	1
Radio Interference Power			
30 MHz to 300 MHz	2	± 3.5 dB	1
Harmonic Current Emissions			4
Voltage Changes. Voltage Fluctuations and Flicker			4

Table 6

Immunity Testing			
Test Name	kp	Expanded Uncertainty	Note
Electrostatic Discharges			4
Radiated RF-Field			
Pre-calibrated field level	2	+32.2 / -24.3 %	5
Dynamic feedback field level	2.05	+21.2 / -17.5 %	3
Electrical Fast Transients (EFT) / Bursts			4
Surges			4
Conducted Disturbances. induced by RF-Fields			
via CDN	2	+15.1 / -13.1 %	6
via EM clamp	2	+42.6 / -29.9 %	6
via current clamp	2	+43.9 / -30.5 %	6
Power Frequency Magnetic Field	2	+20.7 / -17.1 %	2
Pulse Magnetic Field			4
Voltage Dips. Short Interruptions and Voltage Variations			4
Oscillatory Waves			4
Conducted Low Frequency Disturbances			
Voltage setting	2	$\pm 0.9\%$	2
Frequency setting	2	$\pm 0.1\%$	2
Electrical Transient Transmission in Road Vehicles			4

Table 7

Note 1:

The expanded uncertainty reported according to CISPR 16-4-2:2003-11 is based on a standard uncertainty multiplied by a coverage factor of kp = 2. providing a level of confidence of p = 95.45%

Note 2:

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1. 2002-08) is based on a standard uncertainty multiplied by a coverage factor of kp = 2. providing a level of confidence of p = 95.45%

Note 3:

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1. 2002-08) is based on a standard uncertainty multiplied by a coverage factor of kp = 2.05. providing a level of confidence of p = 95.45%

Note 4:

It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95%confidence.

Note 5:

The expanded uncertainty reported according to IEC 61000-4-3 is based on a standard uncertainty multiplied by a coverage factor of kp = 2. providing a level of confidence of p = 95.45%

Note 6:

The expanded uncertainty reported according to IEC 61000-4-6 is based on a standard uncertainty multiplied by a coverage factor of kp = 2. providing a level of confidence of p = 95.45%

Note 7:

The expanded uncertainty reported according ETSI TR 100 028 V1.4.1 (all parts) to is based on a standard uncertainty multiplied by a coverage factor of kp = 1.96. providing a level of confidence of p = 95.45%

Note 8:



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The expanded uncertainty reported according to ETSI TR 102 273 V1.2.1 (all parts) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 1.96$, providing a level of confidence of $p = 95.45\%$