

Report on the FCC and IC Testing of the
Siemens Aktiengesellschaft
SIMATIC RTLS4083T
In accordance with FCC 47 CFR Part 1.1310 and
Part 2.1093

Prepared for: Siemens Aktiengesellschaft
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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 and Part 2.1093. The sample tested was found to comply with the requirements defined in the applied rules.

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Testing	Martin Steindl	2021-09-13	<i>Martin Steindl</i> SIGN-ID 553746

Laboratory Accreditation

DAkKS Reg. No. D-PL-11321-11-02

DAkKS Reg. No. D-PL-11321-11-03

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 and Part 2.1093.

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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.

Issue	Description of Change	Date of Issue
1	First Issue	2021-06-30
2	Chapter 2.1.4 – Statement corrected from “Maximum calculated MPE value for co-location assessment” to “Maximum calculated MPE value for simultaneous transmission of colocated modules”	2021-07-21
3	MPE-based exemption replaced with SAR-based exemption	2021-08-05
4	Evaluation distance changed to 0.7 cm and duty cycle of 95% in normal operation added to calculation	2021-09-01
5	Added section 1.4.2 Placement of antenna	2021-09-10
6	Corrected typo in 1.4.2	2021-09-14

Table 1

1.2 Introduction

Applicant	Siemens Aktiengesellschaft
Manufacturer	Siemens Aktiengesellschaft
Model Number(s)	SIMATIC RTLS4083T
MLFB	6GT2700-5DC13
Serial Number(s)	VPM6726490
Hardware Version(s)	0615 FS:02
Software Version(s)	2.1.10
UWB device subclass	Hand-held Communication Device
Additional information	No data port in the radio terminal available
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 1.1310 and Part 2.1093
Test Plan/Issue/Date	NA
Order Number	9705983967
Date	2020-10-30
Date of Receipt of EUT	2020-11-19
Start of Test	2021-04-10
Finish of Test	2021-04-28
Name of Engineer(s)	Alex Fink
Related Document(s)	KDB 447498 D01 General RF Exposure Guidance v07 ANSI C63.10 (2013)



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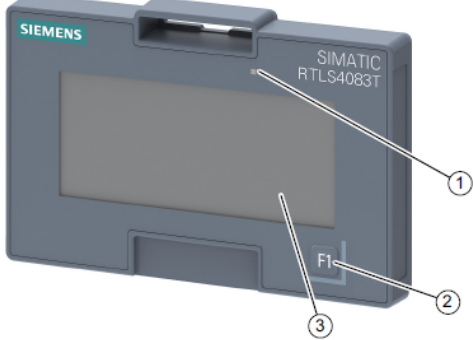
1.3 Brief Summary of Results

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

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: Continuously transmitting				
2.1	1.1310	RF Exposure Evaluation	Pass	KDB 447498 D01 v07

Table 2

1.4 Product Information

SIMATIC RTLS4083T	Characteristics	
	Design	① Status indicators (LED) ② F1 function key ③ display
	General	The transponder is a mobile device for localization in the RTLS localizing system. It sends data to gateways to determine its position. The gateways transmit the data to the Locating Manager Server. Information can be transmitted to the transponder via a programming interface on the Locating Manager and shown on the display.
	Area of application	The device is designed for an operating temperature of 0 ... +50 °C. If you only need localization without change of the display information, the lower temperature limit can be lowered to -10 °C. The device is protected from water spray on all sides (IP54).

1.4.1 Technical Description

Product name	SIMATIC RTLS4083T
PULSE radio frequencies (localization)	
Wireless method	IEEE 802.15.4-2015 HRP UWB
Transmission speed	850 Kbps
Operating frequency rated value	3993.6 MHz (UWB channel 2; CE, FCC)
	6489.6 MHz (UWB channel 5; CE, IC, CMIIT)
Bandwidth	499.2 MHz
Frequency range	3100 MHz ... 4800 MHz (CE, FCC)
	6000 MHz ... 7000 MHz (CE, IC, CMIIT)
Transmit power	0.037 mW (-41.3 dBm/MHz)
Range	Maximum 30 m
Accuracy of the localization	0.2 m
Antennas	Built-in UWB antenna



PHASE radio frequencies (communication and optional localization)

Wireless method	IEEE 802.15.4
Transmission speed	1 Mbit/s
Operating frequency rated value	2400 ... 2480 MHz ISM band
Bandwidth	2 MHz; data transmission on 802.15.4; channels configurable
Frequency range	2400 MHz ... 2483.5 MHz
Transmit power	Maximum 2.5 mW (configurable)
Range	Maximum 50 m
Accuracy of the localization	1 m
Antennas	Built-in 2.4 GHz antenna

Supply voltage, power consumption

Supply voltage	3.7 V lithium ion rechargeable battery (1900 mAh)
Service life (at 20 °C)	Standby: 1 year Operation: 100% UWB localization at 1 second: 6 months Display updates every 10 seconds without localization: 25 days

Ambient temperature

• During operation	• -10 ... +50 °C
• During storage	• -10 ... +50 °C
• During transport	• -10 ... +50 °C
• During display operation	• 0 ... +40 °C
• During charging	• +10 ... +40 °C

Design, dimensions, weights and connectors

Dimensions (L x W x H)	95 x 62 x 13 mm
Weight	85 g
Degree of protection	IP54
Method of securing	Mounting clips
Enclosure	Plastic housing
Color	Titanium gray



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1.4.2 Placement of Antenna

The PCBA antenna is placed at least 7 mm within the surface of the housing (worst case).



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: VPM6726490)	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: 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

2.1.2 Equipment Under Test and Modification State

SIMATIC RTLS4083T, S/N: VPM6726490 - Modification State 0

2.1.3 Test Method

The test was performed in accordance with KDB 447498 D01 v07

Evaluation distance is 0.7 cm.

SIMATIC RTLS4083T has a max. duty cycle of 95% in normal operation mode.

RF tests were performed with 100% duty cycle.

2.1.4 Test Results

In accordance with KDB 447498 D01 v07:

Operation Mode	Operating frequency	Measured maximum EIRP [dBm]	Measured maximum EIRP with 100 % duty cycle [mW]	Max Duty cycle in normal operation [%]	Threshold P_{th} [mW]	Ratio maximum EIRP with 95% DC to P_{th}
ZigBee 2.4 GHz	2405 MHz	+ 6.9	4.898	95	5.27	0.8829
	2440 MHz	+ 6.5	4.467		5.22	0.8557
	2480 MHz	+ 6.4	4.365		5.16	0.8459
UWB 4 GHz	3.99 GHz	- 3.55 [dBm/50MHz]	0.442	95	3.65	0.1150



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$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

Maximum calculated SAR-based value for simultaneous transmission of collocated modules (ZigBee 2405 MHz and UWB 4 GHz):

$$0.8829 + 0.1150 = \underline{0.9980} \leq 1$$

The measurements results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure of portable devices.



3 Measurement Uncertainty

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	$+0.94 \text{ dB} / -1.05$	7
RF power, conducted, spurious emissions	1.96	$+1.4 \text{ dB} / -1.6 \text{ dB}$	7
RF power, radiated			
25 MHz – 4 GHz	1.96	$+3.6 \text{ dB} / -5.2 \text{ dB}$	8
1 GHz – 18 GHz	1.96	$+3.8 \text{ dB} / -5.6 \text{ dB}$	8
18 GHz – 26.5 GHz	1.96	$+3.4 \text{ dB} / -4.5 \text{ dB}$	8
40 GHz – 170 GHz	1.96	$+4.2 \text{ dB} / -7.1 \text{ dB}$	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	± 0.9 %	2
Frequency setting	2	± 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 $k_p = 2$. 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 $k_p = 2$. 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 $k_p = 2.05$. 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 $k_p = 2$. 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 $k_p = 2$. 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 $k_p = 1.96$. 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 $p = 95.45\%$