

Report on the FCC and IC Testing of the Siemens AG

Model: SIMATIC RTLS4083T
MLFB: 6GT2700-5DC15

Partly in accordance with FCC 47 CFR Part 15 C and ISED RSS-GEN and ISED RSS-102

Prepared for: Siemens AG
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Germany

Contains:
FCC ID: SCF4083T02
IC: ---

COMMERCIAL-IN-CONFIDENCE

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Product Service

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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
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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.

Engineering Statement:

This measurement 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 with FCC 47 CFR Part 15 C and ISED RSS-102 and RSS-GEN.
The sample tested was found to comply with the requirements in the tested parts

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Alexander Deese	2024-02-06	 SIGN-ID 880782

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	Industry Canada test site registration 3050A-2
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Executive Statement:

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15 C:2021 and ISED RSS-102:2015 + A1:2021 and ISED RSS-Gen:2018 + A1:2019 + A2:2021 in the tested parts

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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.

Revision	Description of changes	Date of Issue
0	First Issue	2023-11-29
1	Evaluation according to KDB 447498 D04 v01 corrected	2023-12-18
2	KDB 393764 D01 v02r01 added.	2024-01-10
3	Evaluation distance corrected to 20 cm	2024-01-17
4	Evaluation distance corrected to 2 cm	2024-01-29
5	Evaluation distance corrected to 7 mm. EIRP Peak value for 2.405 GHz corrected to 6.9 dBm.	2024-02-06

Table 1: Report of Modifications

1.2 Introduction

Applicant	Siemens AG
Manufacturer	Siemens AG
Model Number(s)	SIMATIC RTLS4083T MLFB: 6GT2700-5DC15
Serial Number(s)	A50503
Hardware Version(s)	FS:01
Software Version(s)	FS:01
Number of Samples Tested	1
Test Specification(s) / Issue / Date	FCC 47 CFR, Part 1, § 1.1307: 2021 and ISED RSS-102, Issue 5, Amd. 1: 2021
Test Plan/Issue/Date	---
Order Number	9707940255
Date	2023-08-16
Date of Receipt of EUT	2023-07-31
Start of Test	2023-09-15
Finish of Test	2023-11-28
Name of Engineer(s)	Alexander Deese
Related Document(s)	ANSI C63.10:2013 KDB 447498 D04 v01 KDB 393764 D01 v02r01



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR, Part 1, § 1.1307 and ISED RSS-102 is shown below.

<i>Section</i>	<i>Specification Clause</i>	<i>Test Description</i>	<i>Result</i>
2.1	(ii)(A)	RF Exposure Exemption	Pass

Table 2: Results according to FCC 47 CFR, Part 1, § 1.1307(b)(3)

<i>Section</i>	<i>Specification Clause</i>	<i>Test Description</i>	<i>Result</i>
2.1	2.5.1	RF Exposure Exemption	Pass

Table 3: Results according to ISED RSS-102



1.4 Product Information

1.4.1 Technical Description

RTLS-Transponder

<i>Frequency Band</i>	2405 – 2480 MHz 3993.6 – 6489.6 MHz
<i>Supply Voltage:</i>	3.7 V
<i>Supply Frequency:</i>	DC, battery supplied

1.5 Test Configuration

The device was 3.7 V DC power supplied. UWB was transmitting continuously. Y-axis of the device was determined as the worst case for measurements in this report.

1.6 Modes of Operation

A screenshot of a software configuration window titled 'UWB 1'. It contains several dropdown menus for configuring UWB parameters: Channel (5 - 6240 - 6739.2 MHz), PRF (16 MHz), DataRate (850 k), Preamble Code (3), Preamble Length (256), and Tx-Power (-4 dB). A 'Save' button is located at the bottom right of the configuration area.

Channel	5 - 6240 - 6739.2 MHz
PRF	16 MHz
DataRate	850 k
Preamble Code	3
Preamble Length	256
Tx-Power	-4 dB

Save

1.7 Deviations from Standard



1.8 EUT Modifications Record

The table below details modifications made to the EUT during the test program.
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	Not Applicable	Not Applicable

Table 4

1.9 Test Location

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

Test Name	Name of Engineer(s)
RF Exposure	Alexander Deese

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany



Product Service

2 Test Details

2.1 RF Exposure Exemption

2.1.1 Specification Reference

47 CFR, Part 1, § 1.1307(b)(3)
KDB 447489 D04 v01
RSS-102, Issue 5 (2015-03-19) + Amendment 1 (2021-02-02)

2.1.2 Equipment under Test and Modification State

SIMATIC RTLS4083T; S/N A50503; Modification state 0

2.1.3 Date of Test

2023-09-15 to 2023-11-28

2.1.4 Environmental Conditions

Ambient Temperature	22 °C
Relative Humidity	48 %



2.1.5 Specification Limits

47 CFR, Part 1, § 1.1307(b)(3)

- (i) For single RF sources (i.e. any single fixed RF source, mobile device, or portable device, as defined in paragraph(b)(2) of this section): A single RF source is exempt if:
- (A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);
- (B) Or the available maximum time-averaged power or effective radiate power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by

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

where

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

and

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

d = the test separation distance (cm);

- (C) Or using the table below and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value described for that frequency. For the exemption in the table to apply, R must be at least $\lambda/2\pi$ where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

RF source frequency (MHz)	Threshold ERP (Watts)
0.3 – 1.34	$1920 R^2$
1.34 – 30	$3450 R^2 / f^2$
30 – 300	$3.83 R^2$
300 – 1500	$0.0128 R^2 f^2$
1500 – 100000	$19.2 R^2$

- (ii) For multiple RF sources: Multiple RF sources are exempt if:
- (A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of 2 cm between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).
- (B) In case of fixed RF sources operating in the same time-averaging period, or of multiple or portable RF sources within a device in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{ExposureLimit_k} \leq 1$$



RSS-102, section 2.5.1

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in the table below:

f (MHz)	Exemption Limits (mW) at separation distance of									
	≤ 5 mm	10 mm	15 mm	20 mm	25 mm	30 mm	35 mm	40 mm	45 mm	≥ 50 mm
≤ 300	71	101	132	162	193	223	254	284	315	345
450	52	70	88	106	123	141	159	177	195	213
835	17	30	42	55	67	80	92	105	117	130
1900	7	10	18	34	60	99	153	225	316	431
2450	4	7	15	30	52	83	123	173	235	309
3500	2	6	16	32	55	86	124	170	225	290
5800	1	6	15	27	41	56	71	85	97	106

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for route evaluation are multiplied by a factor of 5. For limb-worn devices where the 10 grams value applies, the exemption limits for routine evaluation are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required.

For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implant device is defined as the higher of the conducted or e.i.r.p. to determine whether the device is exempt from the SAR evaluation.



2.1.6 Test Method

The RF Exposure is based on a SAR exemption calculation.

2.1.7 Test Results

Carrier frequency:	f	=	6.4896 GHz
Transmitter output power:	TP	=	142 μW (-8.49 dBm)

Note: The 6489.6 MHz radio is exempt from SAR based on the output power (0.142 mW) being less than 1 mW.

At the present time ISED Canada SAR Exemption calculations are valid only for frequencies up to and including 6 GHz, and RSS-102 Clause 2.5.1 refers. Furthermore, ISED Canada RF Exposure calculations are valid only for distances of 20 cm or more. Therefore, the applicant cannot perform RF Exposure calculations at 7 mm for demonstration of compliance without ISED Canada permission.

The power density calculation at a minimum distance of 7 mm based on power with no accounting for duty cycle is:

Evaluation according to KDB 447498 D04 v01 Table B.1 and B.4:

Frequency (GHz)	Max EIRP Peak Level (dBm)	Max ERP Peak Level (dBm)	Max ERP Peak Level (mW)	Min. distance (cm)	Threshold ERP (mW)	Ratio
6.4896	-8.49	-10.6	0.0871	0.7	0.940	0.0927
2.405	6.9*	4.8	3.0	0.7	5.27	0.57

Table 5

*Value taken from Test report TR-25679-00450-01.

Multiple frequencies / Sum of max ratios:

$$0.0927 + 0.57 = 0.66 < 1$$



3 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 Field strength		
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	± 5.6 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