

Report on the FCC and IC Testing of the Siemens AG

Model: SIMATIC RTLS5201T

In accordance with
FCC 47 CFR Part 1.1310 and Part 2.1093 &
ISED RSS-GEN Issue 5, section 3.4 and ISED RSS-102,
Issue 5, section 2.5

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FCC ID: SCF5201T01
IC: 267X-5201T01



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Date: 2023-03-08

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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 & ISED RSS-GEN Issue 5, section 3.4 and ISED RSS-102, Issue 5, section 2.5. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	
Testing	Michael Ingerl	2023-03-08	 SIGN-ID 768488

Laboratory Accreditation

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

DAkS 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 & ISED RSS-GEN Issue 5, section 3.4 and ISED RSS-102, Issue 5, section 2.5

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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	2023-03-08

Table 1

1.2 Introduction

Applicant	Siemens AG
Manufacturer	Siemens AG
Model Number(s)	SIMATIC RTLS5201T
Serial Number(s)	17:A6:10:02:09:56
MLFB(s)	6GT2752-0TS01
Hardware Version(s)	FS:01
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 1.1310 and Part 2.1093 & ISED RSS-GEN Issue 5, section 3.4 and ISED RSS-102, Issue 5, section 2.5
Test Plan/Issue/Date	---
Order Number	713278992
Date of Receipt of EUT	2023-02-28
Start of Test	2023-02-28
Finish of Test	2023-02-28
Name of Engineer(s)	Michael Ingerl
Related Document(s)	KDB 447498 D04 General RF Exposure Guidance 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 & ISED RSS-GEN Issue 5, section 3.4 and ISED RSS-102, Issue 5, section 2.5 is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: 3V DC Battery Powered – Continuous transmitting				
2.1	1.1310	Exposure of Humans to RF Fields	Pass	KDB 447498 D04

Table 2



1.4 Basic information of EUT

Equipment characteristics:			
Type of equipment:	RTLS Transponder		
Type designation:	SIMATIC RTLS5201T		
	<input type="checkbox"/> AC Nominal: Minimum: Maximum: Nominal frequency:	<input type="checkbox"/> DC Nominal:	<input checked="" type="checkbox"/> Battery Nominal: 3 V
	Short Range Device using Ultra Wideband technology		
	LT1-System		
	UWB, BPSK with BPM		
	Internal PCB Antenna		
	2 dBi		
	1 (6489 MHz)		



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 / SN: 17:A6:10:02:09:56	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: 3V DC Battery Powered – Continuous transmitting	
Exposure of Humans to RF Fields	Michael Ingerl

Table 4

Office Address:

Äußere Frühlingsstraße 45
94315 Straubing
Germany



2 Test Details

2.1 Exposure of Humans to RF Fields

2.1.1 Specification Reference

FCC 47 CFR Part 1.1310 and Part 2.1093 &
ISED RSS-GEN Issue 5, section 3.4 and ISED RSS-102, Issue 5, section 2.5
KDB 447498 D04 General RF Exposure Guidance

2.1.2 Equipment Under Test and Modification State

SIMATIC RTLS5201T, S/N: 17:A6:10:02:09:56 - Modification State 0

2.1.3 Date of Test

2023-02-28

2.1.4 Evaluation Results

acc. to KDB 447498 D04:

EIRP: -63.18 dBm / MHz (RMS) = 0.000000481 mW / MHz

UWB Bandwidth: 498 MHz

Total EIRP Power: 0.000000481 x 498 MHz = 0.00024 mW

Antenna gain declared to be 2 dBi therefore conducted power is 0.00015 mW

Limit: 1 mW -> **Pass**

Note: Values taken from Test Report TR-713278992-04.



ISED RSS-GEN Issue 5, section 3.2 and ISED RSS-102, Issue 5, section 2.5 :

Exposure of Humans to RF Fields	Applicable	Declared by applicant	Measured	Exemption
The antenna is				
<input type="checkbox"/> detachable				
<p>The conducted output power (CP in watts) is measured at the antenna connector:</p> <p>$CP =$</p> <p>The effective isotropic radiated power (EIRP in watts) is calculated using</p> <p><input type="checkbox"/> the numerical antenna gain: $G =$</p> <p>$EIRP = G \cdot CP \Rightarrow EIRP =$</p> <p><input type="checkbox"/> the field strength¹ in V/m: $FS = \dots\dots\dots$ V/m</p> <p>$EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP =$ mW</p> <p>with:</p> <p>Distance between the antennas in m: $D =$ mm</p>			<input type="checkbox"/>	
<input checked="" type="checkbox"/> not detachable				
<p>A field strength measurement is used to determine the effective isotropic radiated power (EIRP in watts) given by:</p> <p>$EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP = 0.00024 \text{ mW}$ (See at TR-713278992-04)</p> <p>with:</p> <p>Field strength in V/m: $FS =$</p> <p>$=$</p> <p>Distance between the two antennas in m: $D =$</p>			<input type="checkbox"/>	
Selection of output power				
<p>The output power TP is the higher of the conducted or effective isotropic radiated power (e.i.r.p.):</p> <p>$TP = 0.00024 \text{ mW}$</p>				

¹ The conversion formula is valid only for properly matched antennas. In other cases the transmitter output power may have to be measured by a terminated measurement when applying the exemption clauses. If an open area test site is used for field strength measurement, the effect due to the metal ground reflecting plane should be subtracted from the maximum field strength value in order to reference it to free space, before calculating TP.



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Exposure of Humans to RF Fields (continued)	Applicable	Declared by applicant	Measured	Exemption
Separation distance between the user and the transmitting device is				
<input checked="" type="checkbox"/> less than or equal to 20 cm	<input type="checkbox"/> greater than 20 cm	<input checked="" type="checkbox"/>		
Transmitting device is				
<input type="checkbox"/> in the vicinity of the human head	<input type="checkbox"/> body-worn	<input type="checkbox"/>		



SAR evaluation										
<p>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.</p> <p>For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in the table, 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.</p> <p>For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants 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.</p>										
Frequency (MHz)	Exemption limits (mW) ² at separation distance of									
	≤5 mm	10 mm	15 mm	20 mm	25 mm	30 mm	35 mm	40 mm	45 mm	≥50 mm
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
Carrier frequency:	$f = 6489 \text{ MHz}$									
Distance:	$d = 5 \text{ mm}$									
Transmitter output power:	$TP = 0.00024 \text{ mW}$									
Limit:	$TP_{limit} = 1.00 \text{ mW}$									

² The exemption limit in the table are based on measurements and simulations on half-wave dipole antennas at separation distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from a linear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from a third order polynomial fit.

3 Measurement Uncertainty

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.

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:

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 $p = 95.45\%$