

Report on the FCC and IC Testing of the Siemens AG

Model: SIMATIC RTLS5201T

In accordance with FCC 47 CFR Part 15 C
and ISED RSS-210 and ISED RSS-Gen

Prepared for:

Siemens AG
Gleiwitzer Str. 555
90475 Nuernberg
Germany

FCC ID: SCF5201T01

IC: 267X-5201T01



Product Service

Add value.
Inspire trust.

COMMERCIAL-IN-CONFIDENCE

Date: 2023-05-22

Document Number: TR-713278992-04 | Revision 0

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Michael Ingerl	2023-05-22	SIGN-ID 794185
Authorised Signatory	Matthias Stumpe	2023-05-22	SIGN-ID 794244

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 FCC 47 CFR Part 15 C and ISED RSS-210 and RSS-GEN.

The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Michael Ingerl	2023-05-22	SIGN-ID 794186

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
3050A-2

Industry Canada test site registration
3050A-2

Executive Statement:

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15 C:2019 and ISED RSS-210:2020 and ISED RSS-Gen:2021

DISCLAIMER AND COPYRIGHT

This non-binding report has been prepared by TÜV SÜD Product Service with all reasonable skill and care. The document is confidential to the potential Client and TÜV SÜD Product Service. No part of this document may be reproduced without the prior written approval of TÜV SÜD Product Service. © 2023 TÜV SÜD Product Service.

Trade Register Munich
HRB 85742
VAT ID No. DE129484267
Information pursuant to Section 2(1)
DL-InfoV (Germany) at
www.tuvsgd.com/imprint

Managing Directors:
Dr. Peter Havel (Sprecher / CEO)
Patrick van Welij

Phone: +49 9421 5682-0
Fax: +49 9421 5682-199
www.tuvsgd.com

TÜV SÜD Product Service GmbH
Äußere Frühlingstraße 45
94315 Straubing
Germany



Content

1	Report Summary.....	2
1.1	Modification Report.....	2
1.2	Introduction.....	2
1.3	Brief Summary of Results.....	3
1.4	Product Information	4
1.5	EUT Modifications Record.....	5
1.6	Test Location	5
2	Test Details.....	6
2.1	Bandwidth of Signal.....	6
2.2	Peak Power	10
2.3	Radiated Emissions.....	13
2.4	Radiated Emissions in GPS bands.....	33
3	Measurement Uncertainty	38

Annex A: Test Setup Photos

Annex B: External Photos



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 Revision
0	First Revision	2023-05-22

Table 1: Report of Modifications

1.2 Introduction

Applicant	Siemens AG
Manufacturer	Siemens AG
Model Number(s)	SIMATIC RTLS5201T
Serial Number(s)	17:A6:10:02:09:56 17:A6:10:02:09:55
MLFB(s)	6GT2752-0TS01
Hardware Version(s)	FS:01
Number of Samples Tested	1
Test Specification(s) /	FCC 47 CFR Part15 C: 2019
Issue / Date	ISED RSS-210, Issue 10, Amd. 1: 2020 ISED RSS-Gen, Issue 5, Amd. 2: 2021
Test Plan/Issue/Date	---
Order Number	713278992
Date of Receipt of EUT	2023-02-28
Start of Test	2023-02-28
Finish of Test	2023-05-11
Name of Engineer(s)	Michael Ingerl
Related Document(s)	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 15 C and ISED RSS-210 and RSS-Gen is shown below.

Section	Specification Clause	Test Description	Result
Configuration and Mode: 3V DC Battery Powered – Continuous transmitting			
2.1	15.250 (a) 15.250 (b)	Bandwidth of Signal	Pass
2.2	15.250 (d)	Peak Power	Pass
2.3	15.250 (d)(1), 15.250 (d)(4), 15.209	Radiated Emissions	Pass
2.4	15.250 (d)(2)	Radiated Emissions in GPS bands	Pass
N/A	15.207	Conducted Disturbance at Mains Terminal	Not applicable, battery supply

Table 2: Results according to FCC 47 CFR Part 15 C

Section	Specification Clause	Test Description	Result
Configuration and Mode: 3V DC Battery Powered – Continuous transmitting			
2.1	K.2	Bandwidth of Signal	Pass
2.2	K.3 (c)	Peak Power	Pass
2.3	K.3 (a) K.3 (d)	Radiated Emissions	Pass
2.4	K.3 (b)	Radiated Emissions in GPS bands	Pass

Table 3: Results according to ISED RSS-210

Section	Specification Clause	Test Description	Result
Configuration and Mode: 3V DC Battery Powered – Continuous transmitting			
2.1	6.7	Bandwidth of Signal	Pass
2.3	8.9	Radiated Emissions	Pass
N/A	8.8	AC Power Line Conducted Emissions	Not applicable, battery supply
2.3	8.9, 8.10	Radiated Emissions	Pass

Table 4: Results according to ISED RSS-Gen



1.4 Product Information

1.4.1 Technical Description

<i>Equipment characteristics:</i>			
<i>Type of equipment:</i>	RTLS Transponder		
<i>Type designation:</i>	SIMATIC RTLS5201T		
<i>Power supply:</i>	<input type="checkbox"/> AC Nominal: Minimum: Maximum: Nominal frequency:	<input type="checkbox"/> DC Nominal:	<input checked="" type="checkbox"/> Battery Nominal: 3 V
<i>Application:</i>	Short Range Device using Ultra Wideband technology		
<i>Device Type:</i>	LT1-System		
<i>Modulation Method:</i>	UWB, BPSK with BPM		
<i>Type of Antenna(s)</i>	Internal PCB Antenna		
<i>Antenna Gain</i>	2 dBi (17:A6:10:02:09:56) 3 dBi (17:A6:10:02:09:55)		
<i>Channel(s)</i>	1 (6489 MHz)		

1.5 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: 17:A6:10:02:09:56	Not Applicable	Not Applicable

Table 5

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer SN: 17:A6:10:02:09:55	Not Applicable	Not Applicable

Table 6

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: Transmitting continuously	
Bandwidth of Signal	Michael Ingerl
Peak Power	Michael Ingerl
Radiated Emissions	Michael Ingerl
Radiated Emissions in GPS bands	Michael Ingerl
Signal deactivation	Michael Ingerl

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany



2 Test Details

2.1 Bandwidth of Signal

2.1.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.250 (a) and 15.250 (b)

ISED RSS-210, K.2

ISED RSS-Gen, Clause 6.7

2.1.2 Equipment under Test and Modification State

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

SIMATIC RTLS5201T, S/N: 17:A6:10:02:09:55 - Modification State 0

2.1.3 Date of Test

2023-02-28 and 2023-05-11

2.1.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	35 %

2.1.5 Specification Limits

The 10 dB bandwidth of the device shall be within the band 5925-7250 MHz under all conditions of operation, including the effects from stepped frequency, frequency hopping or other modulation techniques that may be employed, as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

The 10 dB bandwidth of the device shall be at least 50 MHz and less than 500 MHz. For transmitters that employ frequency hopping, stepped frequency or similar modulation types, measurement of the 10 dB bandwidth specified in this paragraph shall be made with the frequency hop or step function disabled, and with the transmitter operating continuously at a frequency chosen in accordance with the provisions of RSS-Gen for determining measurement frequencies.

2.1.6 Test Method

The test was performed according to ANSI C63.10, clauses 6.9 and 10.1
See section 2.3 of this test report for details.



2.1.7 Test Results

Tested with S/N: 17:A6:10:02:09:56

Temp °C	f_L (GHz)	f_H (GHz)	f_M (GHz)	-10 dB Fractional Bandwidth (MHz)	Limit (MHz)
-20	6.237	6.732	6.487	495	500
-10	6.237	6.731	6.487	494	500
0	6.236	6.732	6.488	496	500
10	6.237	6.731	6.487	494	500
20	6.236	6.732	6.488	496	500
30	6.235	6.733	6.488	498	500
40	6.236	6.732	6.488	496	500
50	6.235	6.733	6.488	498	500

Table 7: 10 dB bandwidth

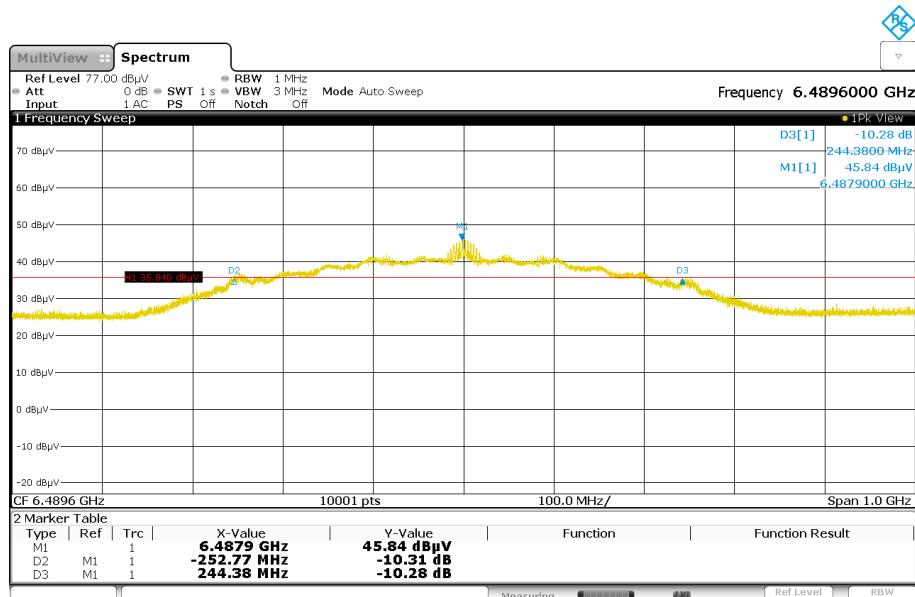


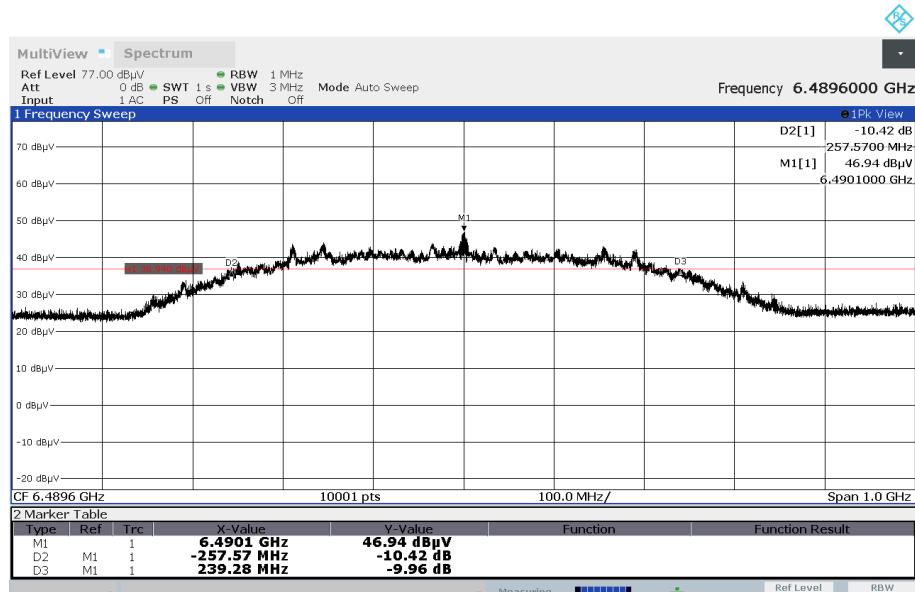
Figure 1 – 10 dB Bandwidth at 20°C



Tested with S/N: 17:A6:10:02:09:55

Temp °C	f_L (GHz)	f_H (GHz)	f_M (GHz)	-10 dB Fractional Bandwidth (MHz)	Limit (MHz)
-20	6.237	6.732	6.487	489	500
-10	6.237	6.731	6.487	489	500
0	6.236	6.732	6.488	490	500
10	6.237	6.731	6.487	489	500
20	6.236	6.732	6.488	490	500
30	6.235	6.733	6.488	491	500
40	6.236	6.732	6.489	493	500
50	6.235	6.733	6.489	493	500

Table 8: 10 dB bandwidth





2.1.8 Test Location and Test Equipment

This test was carried out in Semi anechoic room - cabin no. 11 and Temperature test chamber.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	ESW44	39897	12	2024-04-30
Horn antenna	Rohde & Schwarz	HF907	40089	24	2024-10-31
EMC measurement software	Rohde & Schwarz	EMC32 Emission K11 – V11.50	42986	---	---
Semi anechoic room	Rohde & Schwarz	No. 11	---	---	---
Signal and Spectrum Analysator	Rohde & Schwarz	FSV40	20219	12	2024-02-29
Temperature test chamber	Feutron	KPK200-2	19868	18	2024-08-31

Table 9



2.2 Peak Power

2.2.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.250 (d)
ISED RSS-210, K.3 (c)

2.2.2 Equipment under Test and Modification State

SIMATIC RTLS5201T, S/N: 17:A6:10:02:09:56 - Modification State 0
SIMATIC RTLS5201T, S/N: 17:A6:10:02:09:55 - Modification State 0

2.2.3 Date of Test

2023-02-28 and 2023-05-11

2.2.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	35 %

2.2.5 Specification Limits

There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs and this 50 MHz bandwidth must be contained within the 5925-7250 MHz band. The peak EIRP limit is $20 \log (RBW/50)$ dBm where RBW is the resolution bandwidth in megahertz that is employed by the measurement instrument. RBW shall not be lower than 1 MHz or greater than 50 MHz. The video bandwidth of the measurement instrument shall not be less than RBW. If RBW is greater than 3 MHz, the application for certification filed with the Commission shall contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

2.2.6 Test Method

The test was performed according to ANSI C63.10, section 10.3.5
See section 2.3 of this test report for details.



2.2.7 Test Results

Tested with S/N: 17:A6:10:02:09:56

f_M (GHz)	Resolution Bandwidth (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)
6.492	50	-4.74	0

Table 10: Peak Power

f_M (GHz)	Resolution Bandwidth (MHz)	RMS Power (dBm)	RMS Power Limit (dBm)
6.489	1	-63.18	-41.3

Table 11: RMS Power

Tested with S/N: 17:A6:10:02:09:55

f_M (GHz)	Resolution Bandwidth (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)
6.492	50	-4.68	0

Table 12: Peak Power

f_M (GHz)	Resolution Bandwidth (MHz)	RMS Power (dBm)	RMS Power Limit (dBm)
6.489	1	-63.01	-41.3

Table 13: RMS Power



2.2.8 Test Location and Test Equipment

This test was carried out in Semi anechoic room - cabin no. 11.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	ESW44	39897	12	2024-04-30
Horn antenna	Rohde & Schwarz	HF907	40089	24	2024-10-31
EMC measurement software	Rohde & Schwarz	EMC32 Emission K11 – V11.50	42986	---	---
Semi anechoic room	Rohde & Schwarz	No. 11	---	---	---

Table 14



2.3 Radiated Emissions

2.3.1 Specification Reference

FCC 47 CFR Part 15 C, Clauses 15.250 (d)(1) and 15.250 (d)(4)

FCC 47 CFR Part 15 C, Clauses 15.209

ISED RSS-210, Clause K.3 (a), K.3 (d)

ISED RSS-Gen, Clauses 8.9

2.3.2 Equipment under Test and Modification State

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

SIMATIC RTLS5201T, S/N: 17:A6:10:02:09:55 - Modification State 0

2.3.3 Date of Test

2023-02-28 and 2023-05-11

2.3.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	35 %



2.3.5 Specification Limits

2.3.5.1 Radiated emissions up to 960 MHz according to 47 CFR 15.250 (d)(4) and ISED RSS-210 K.3 (a), K.3 (d)

The radiated emissions at or below 960 MHz from a device operating under the provisions of this sections shall not exceed the general radiated emission limits:

General radiated emission limits:					
Frequency Range (MHz)	Test distance (m)	Field strength		Field strength	
		(μ A/m)	(dB μ A/m)	(μ V/m)	(dB μ V/m)
0.009 – 0.49	300	6.37 / f	20*lg(6.37 / f)	2400 / f	20*lg(2400 / f)
0.49 – 1.705	30	63.7 / f	20*lg(63.7 / f)	24000 / f	20*lg(24000 / f)
1.705 – 30	30	0.08	20*lg(0.08 / f)	30	20*lg(30 / f)
30 – 88	3	---	---	100	40
88 – 216	3	--	---	150	43.5
126 – 960	3	--	---	200	46

Note 1: f in kHz

Table 15 General radiated emission limits

2.3.5.2 Radiated emissions above 960 MHz according to 47 CFR 15.250

The radiated emissions above 960 MHz shall not exceed the following average (RMS) limits when measured using a resolution bandwidth of 1 MHz:

Frequency range (MHz)	EIRP (dBm)
960-1610	-75.3
1610-1990	-63.3
1990-3100	-61.3
3100-5925	-51.3
5925-7250	-41.3
7250-10600	-51.3
Above 10600	-61.3



2.3.5.3 Radiated emissions above 960 MHz according to ISED RSS-210

The radiated emissions above 960 MHz shall not exceed the following average (RMS) limits when measured using a resolution bandwidth of 1 MHz:

Frequency range (MHz)	EIRP (dBm)
960-1610	-75.3
1610-1990	-63.3
1990-3100	-61.3
3100-5925	-51.3
5925-7250	-41.3
7250-10600	-51.3
Above 10600	-61.3

2.3.6 Test Method

The test was performed according to ANSI C63.10, sections 11.11 and 11.12

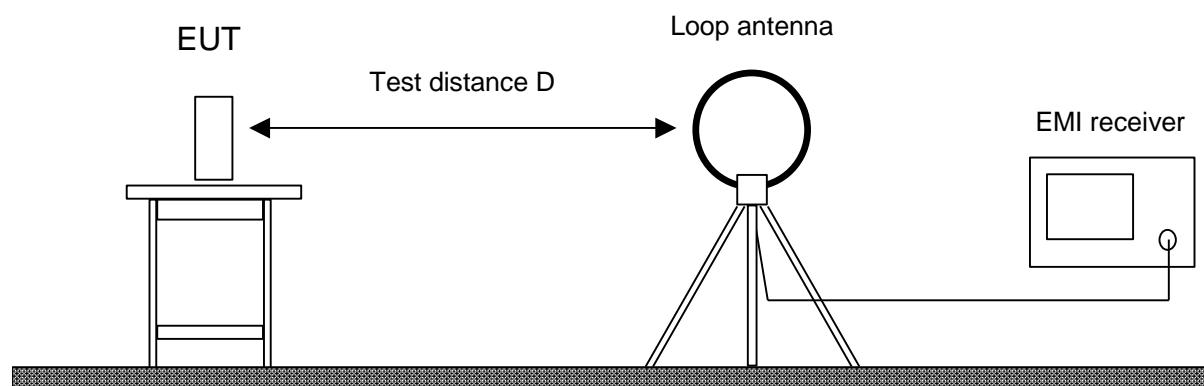
Prescans are performed in six positions of the EUT to get the full spectrum of emission caused by the EUT with the measuring antenna raised and lowered from 1 m to 4 m with vertical and horizontal polarisation to find the combination of table position, antenna height and antenna polarisation for the maximum emission levels.

Data reduction is applied to these results to select those levels having less margin than 10 dB or exceeding the limit using subranges and limited number of maximums.

Further maximisation for adjusting the maximum position is following.

Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

2.3.6.1 Frequency range 9 kHz – 30 MHz

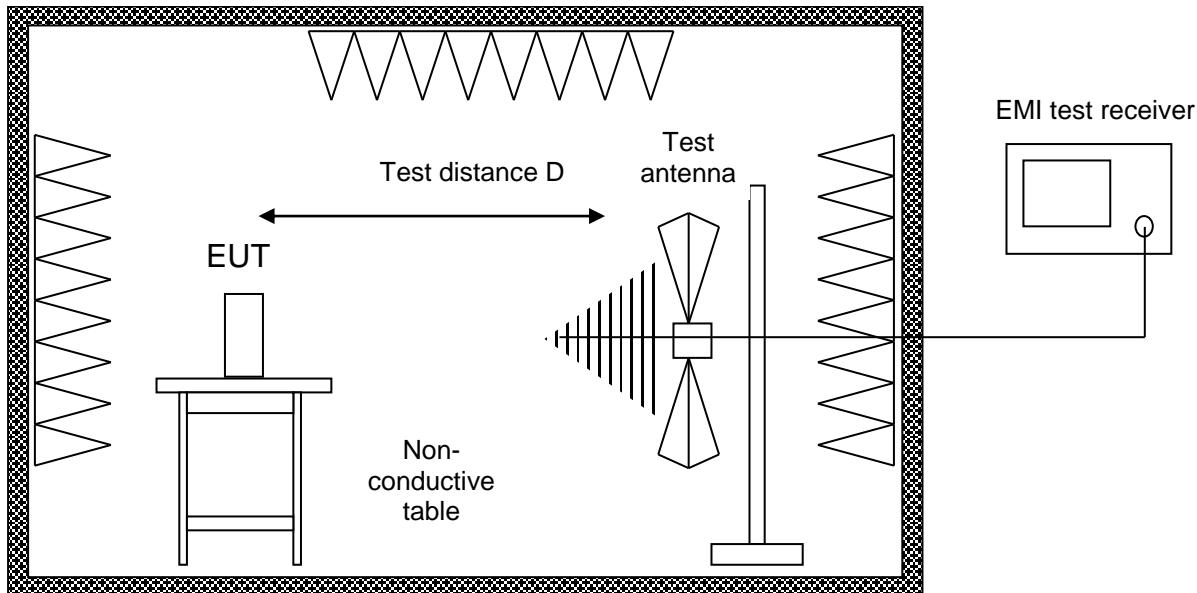


The EUT was placed on a non-conductive table, 0.8 m above the ground.

Radiated emissions in the frequency 9 kHz – 30 MHz is measured within a semi-anechoic room with an active loop antenna with the measurement detector set to peak. In addition in the frequency range 9 kHz to 490 kHz also an average detector was used. The measurement bandwidth of the receiver was set to 300 Hz in the frequency range 9 kHz to 150 kHz and 10 kHz in the frequency range 150 kHz to 30 MHz. Prescans were performed in six positions of the EUT.

For final measurements the detector was set to CISPR quasi-peak and in addition to CISPR average in the frequency range 9 kHz to 490 kHz with a resolution bandwidth 200 Hz in the frequency range 9 kHz to 150 kHz and 9 kHz in the frequency range 150 kHz to 30 MHz. Final tests were performed immediately after a final frequency and zoom (for drifting disturbances) and maximum adjustment.

2.3.6.2 Frequency range 30 MHz – 1 GHz

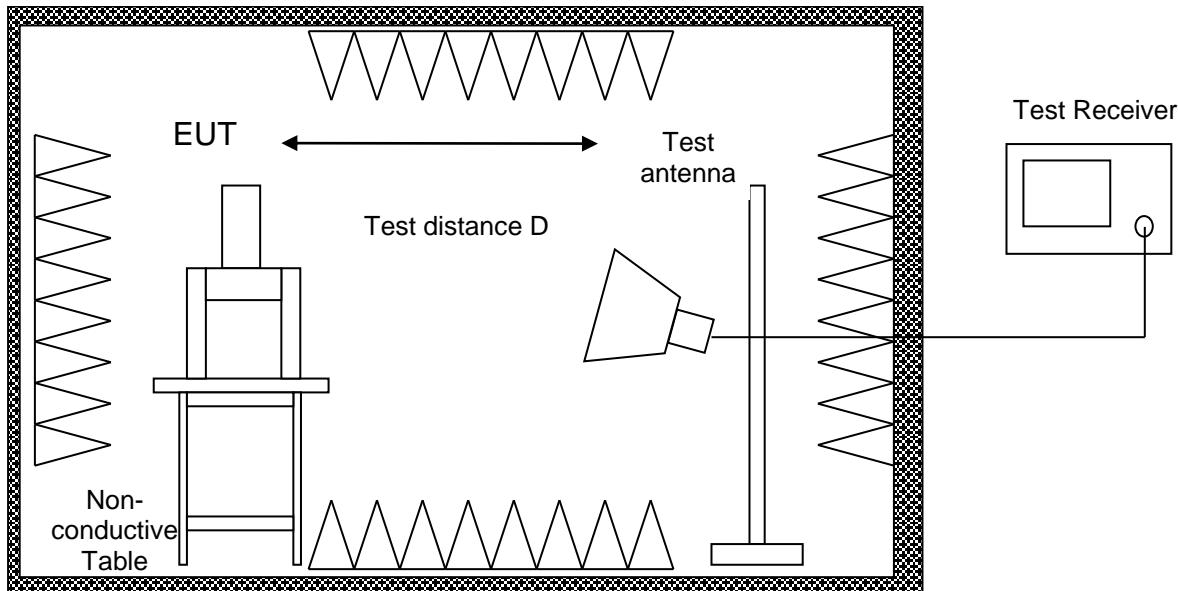


Alternate test site (semi anechoic room)

The EUT was placed on a non-conductive table, 0.8 m above the ground plane. Radiated emissions in the frequency range 30 MHz – 1 GHz is measured within a semi-anechoic room with groundplane complying with the NSA requirements of ANSI C63.4. for alternative test sites. A linear polarised logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna") is used.

For prescan tests the test receiver is set to peak-detector with a bandwidth of 120 kHz. With the measurement bandwidth of the test receiver set to 120 kHz CISPR quasi-peak detector is selected for final measurements following immediately after a final frequency zoom (for drifting disturbances) and maximum adjustment.

2.3.6.3 Frequency range above 1 GHz



Fully anechoic room

The EUT was placed on a non-conductive table, 1.5 m above the ground plane. Radiated emission tests above 1 GHz are performed in a fully anechoic room with the S_{VSWR} requirements of ANSI C63.4. Measurements are performed both in the horizontal and vertical planes of polarisation using a test receiver with the detector function set to peak and average and the resolution bandwidth set to 1 MHz. Testing above 1 GHz is performed with horn antennas with the EUT in boresight of the antenna.

For prescan tests the test receiver is set to peak- and average-detector with a bandwidth of 1 MHz. With the measurement bandwidth of the test receiver set to 1 MHz and peak- and CISPR average-detector is selected for final measurements following immediately after a final frequency zoom (for drifting disturbances) and maximum adjustment.



2.3.7 Test Results

<i>Frequency range</i>	<i>Test distance</i>
9 kHz to 1 GHz	3 m
1 GHz to 18 GHz	1 m
18 GHz to 40 GHz	0.3 m

Table 16

Sample calculation:

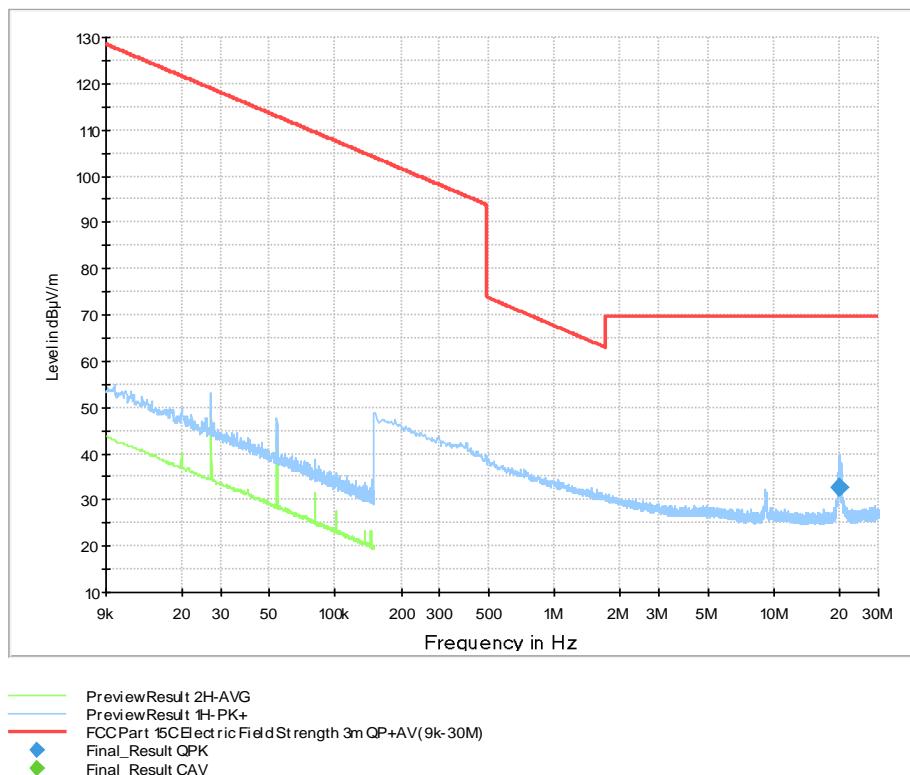
Final Value (dB μ V/m) = Reading Value (dB μ V) + (Cable attenuation (dB)
+ Antenna Transducer (dB(1/m)))

The tested orientation is the worst-case position (Pre-scans made for the worst-case orientation)

Transmitting continuously

Tested with S/N: 17:A6:10:02:09:56

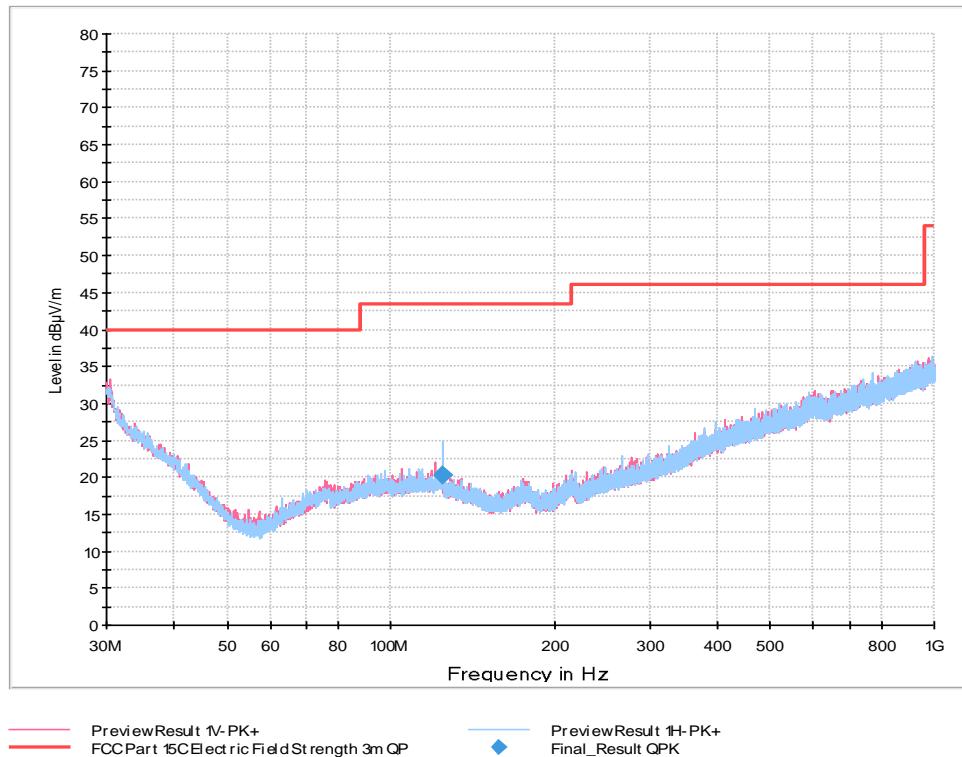
Frequency range 9 kHz – 30 MHz:



Final Results 1:

Frequency MHz	Qua- siPeak dB μ V/m	Limit dB μ V/m	Margin dB	Meas. Time ms	Band- width kHz	Height cm	Pol	Azi- muth deg	Corr. dB
19.974750	32.46	69.54	37.08	1000.0	9.000	100.0	H	-3.0	18.9

Frequency range 30 MHz – 1 GHz:



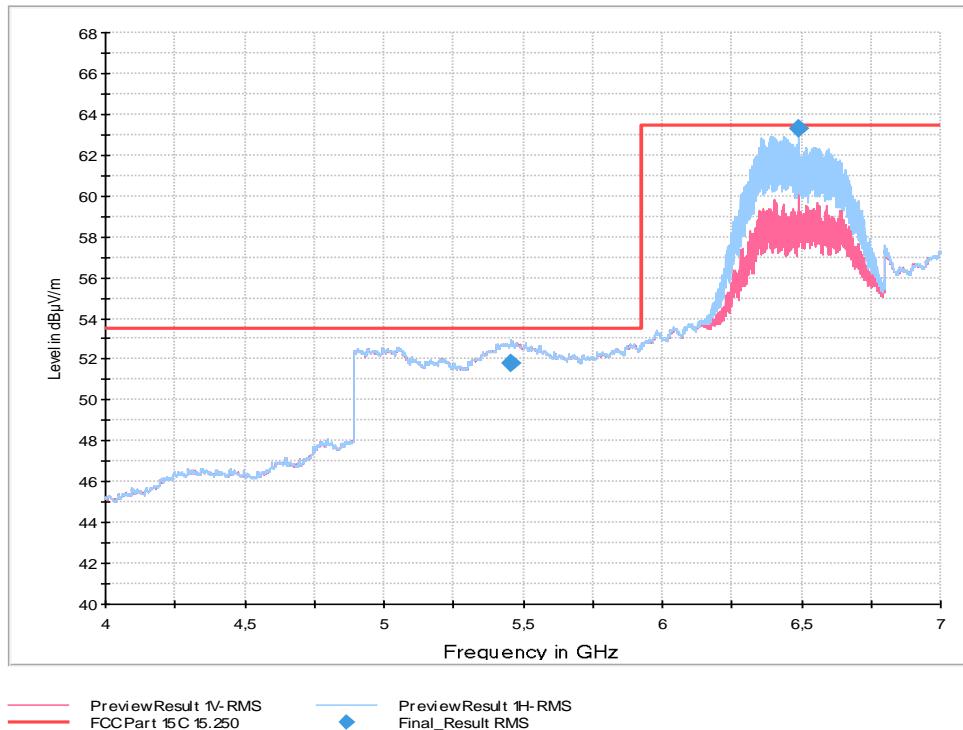
Final Results 1:

Frequency MHz	Qua- siPeak dB μ V/m	Limit dB μ V/m	Mar- gin dB	Meas. Time ms	Band- width kHz	Height cm	Pol	Azi- muth deg	Corr. dB
125.010000	20.36	43.50	23.14	1000.0	120.000	105.0	H	100.0	17.1



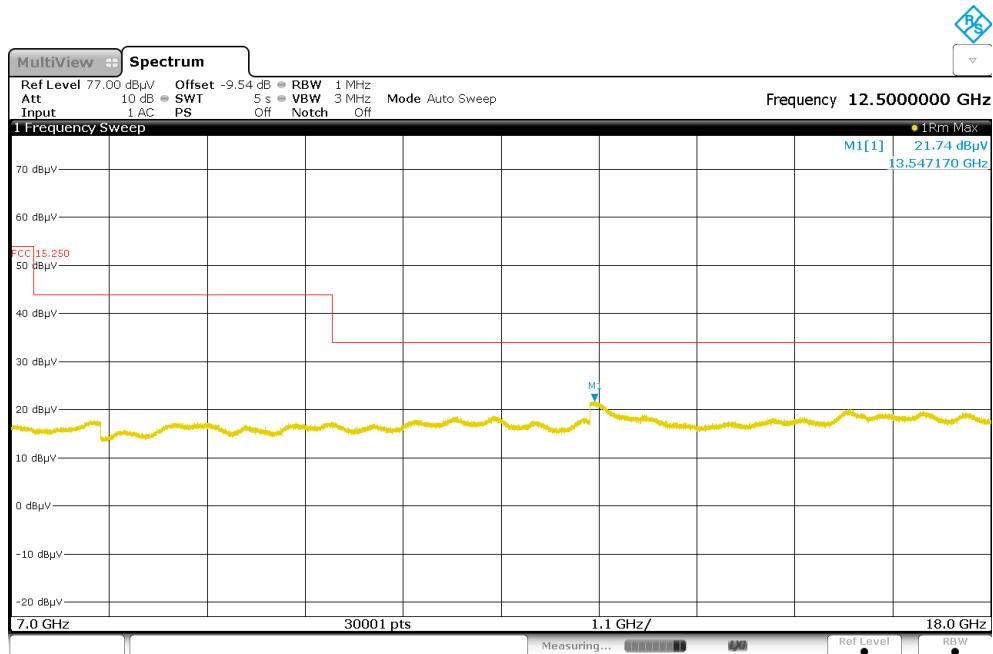
Frequency range 1 GHz – 40 GHz:





Final Results 1:

Frequency MHz	RMS dB μ V/m	Limit dB μ V/m	Margin dB	Meas. Time ms	Band- width kHz	Height cm	Pol	Azi- muth deg	Corr. dB/m
5457.500000	51.77	53.47	1.70	1000.0	1000.000	149.0	V	-65.0	44.4
6489.500000	63.33	63.47	0.14	1000.0	1000.000	150.0	H	60.0	45.8

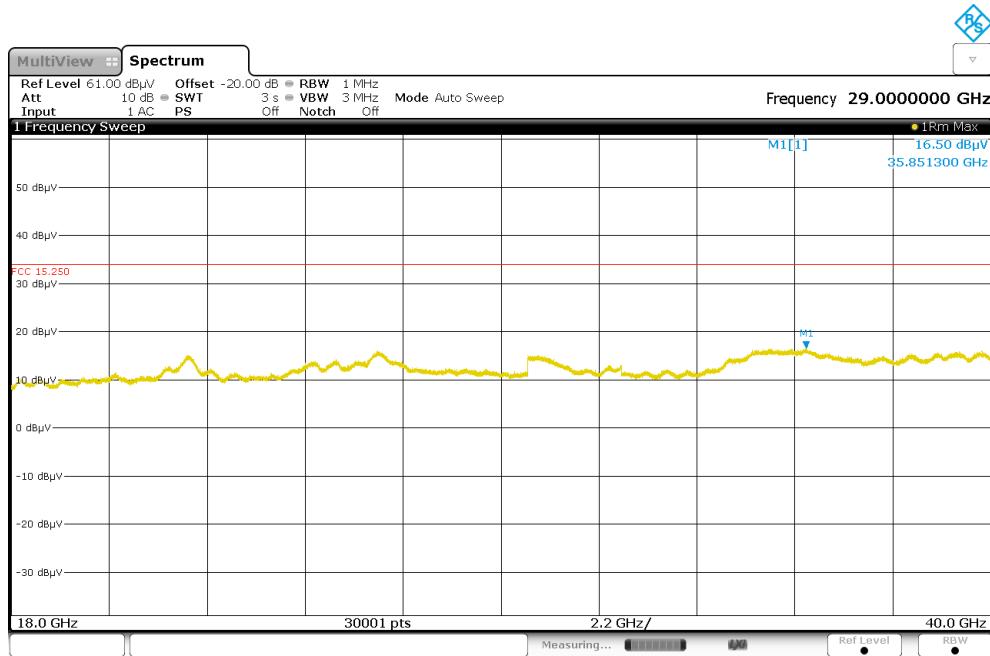




Product Service

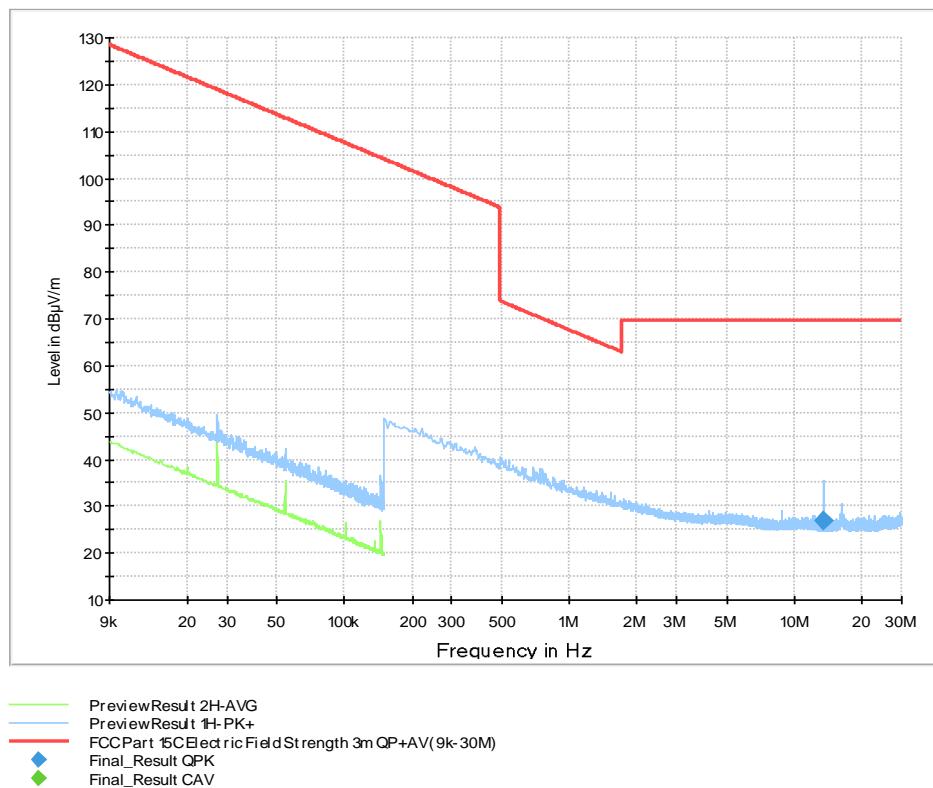


Product Service



Tested with S/N: 17:A6:10:02:09:55

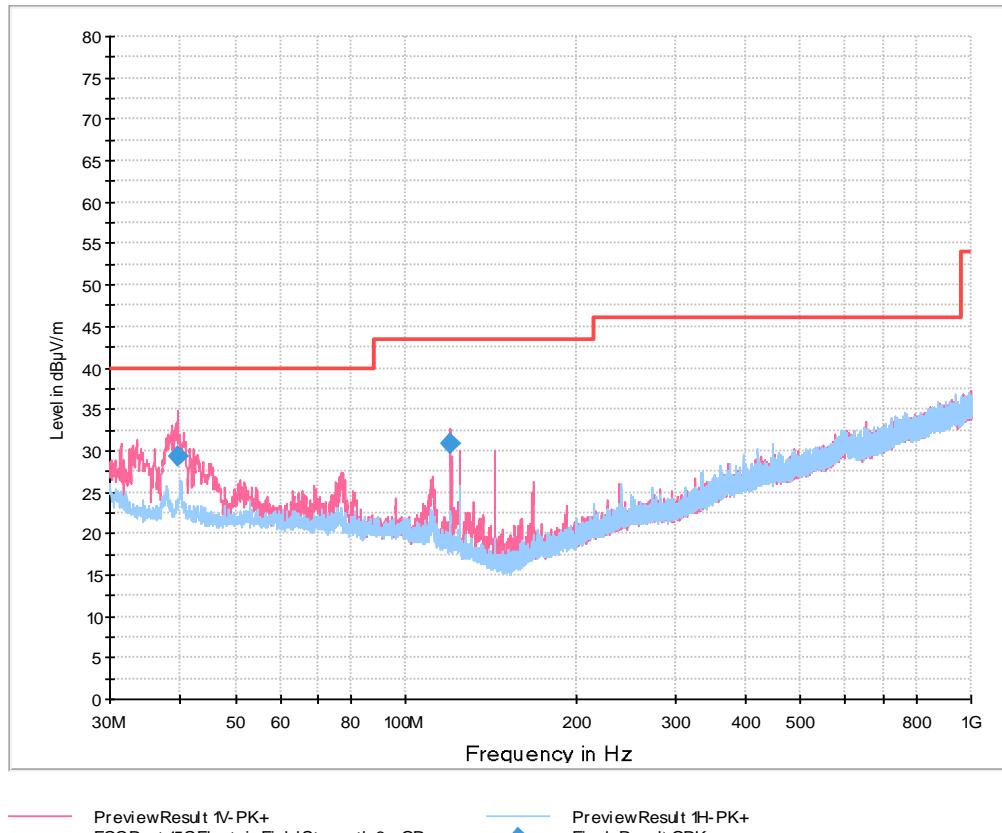
Frequency range 9 kHz – 30 MHz:



Final Results 1:

Frequency MHz	Qua- siPeak dB μ V/m	Limit dB μ V/m	Margin dB	Meas. Time ms	Band- width kHz	Height cm	Pol	Azi- muth deg	Corr. dB
13.506000	26.80	69.54	42.74	1000.0	9.000	100.0	H	-23.0	18.9

Frequency range 30 MHz – 1 GHz:

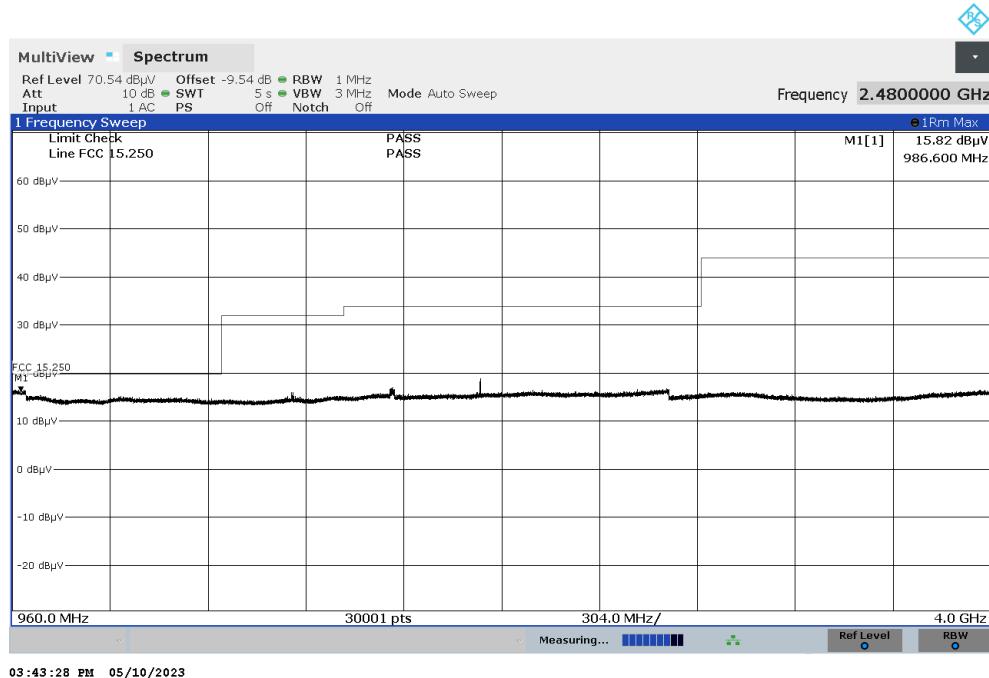


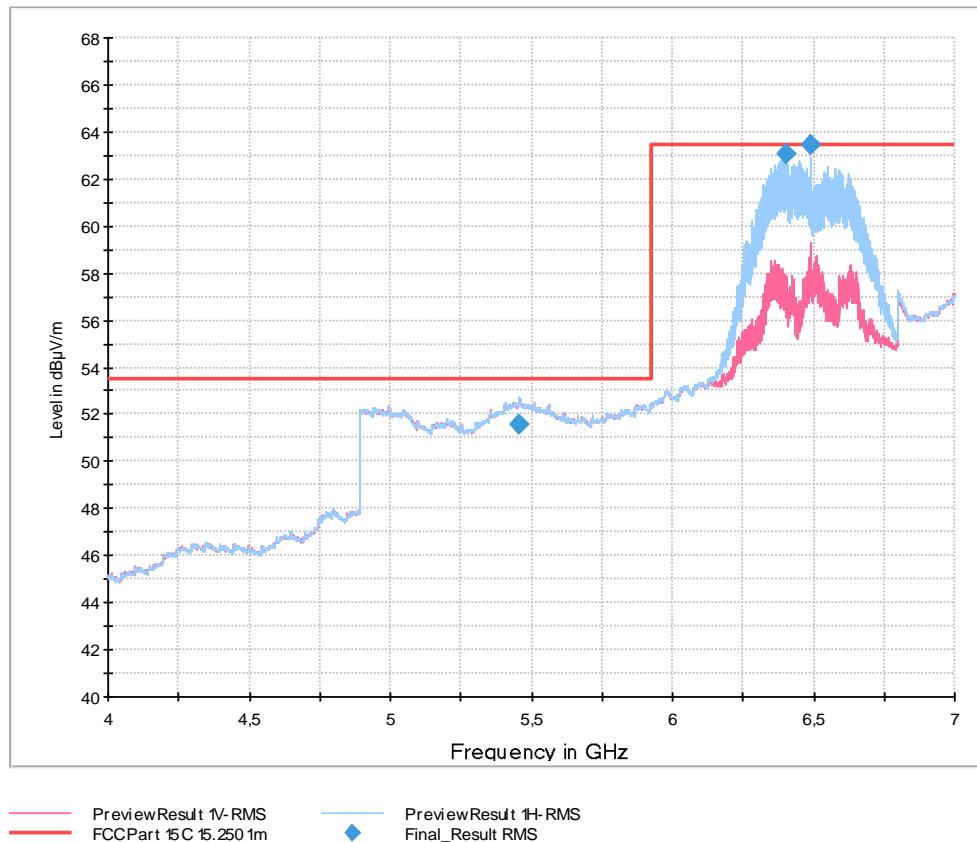
Final Results 1:

Frequency MHz	Qua- siPeak dB μ V/m	Limit dB μ V/m	Margin dB	Meas. Time ms	Band- width kHz	Height cm	Pol	Azi- muth deg	Corr. dB
39.480000	29.34	40.00	10.66	1000.0	120.000	100.0	V	89.0	19.9
120.030000	30.75	43.50	12.75	1000.0	120.000	105.0	V	8.0	16.9



Frequency range 1 GHz – 40 GHz:



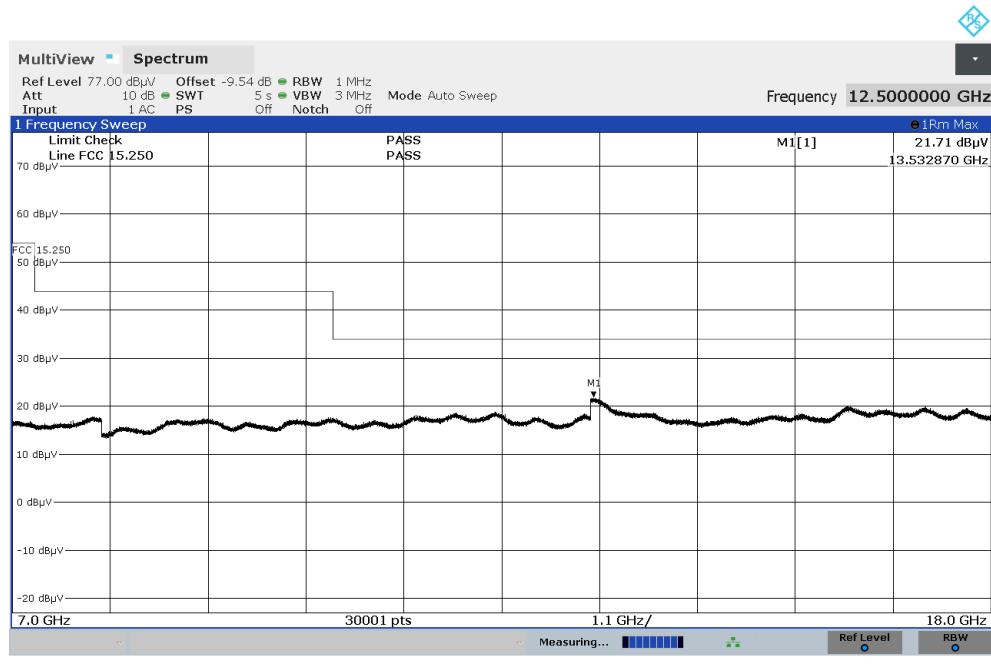


Final Results 1:

Frequency MHz	RMS dB μ V/m	Limit dB μ V/m	Margin dB	Meas. Time ms	Band- width kHz	Height cm	Pol	Azimuth deg	Corr. dB
5454.750000	51.59	53.47	1.88	1000.0	1000.000	155.0	H	10.0	44.4
6404.000000	63.07	63.47	0.40	1000.0	1000.000	151.0	H	50.0	45.5
6489.500000	63.42	63.47	0.05	1000.0	1000.000	145.0	H	50.0	45.8

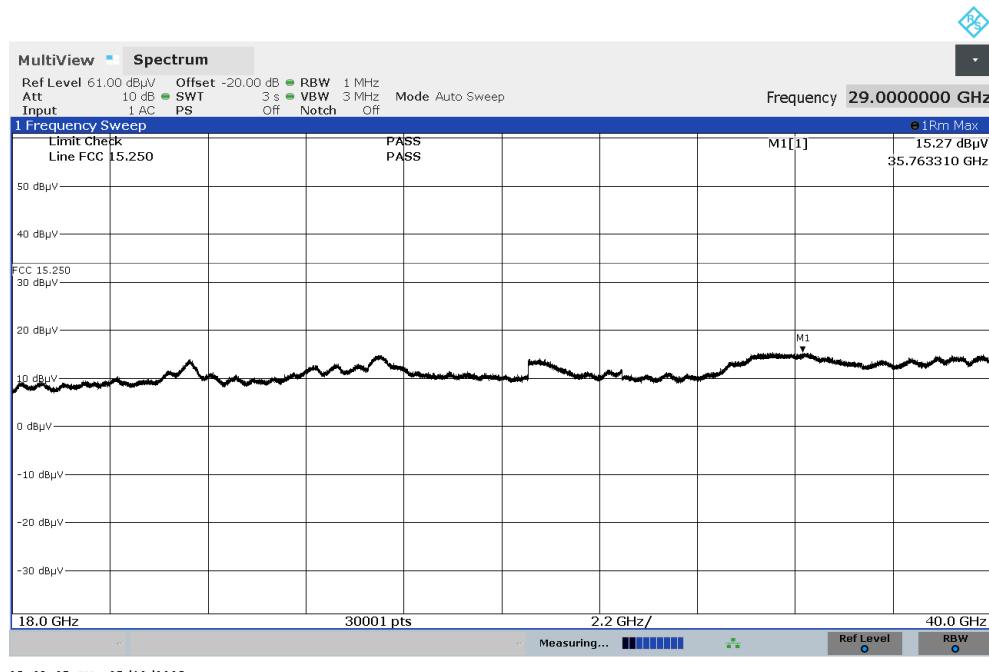


Product Service





Product Service





2.3.8 Test Location and Test Equipment

This test was carried out in Semi anechoic room - cabin no. 11.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	ESW44	39897	12	2024-04-30
Loop antenna	Schwarzbeck	FMZB 1519 B	44334	36	2024-01-31
ULTRALOG Antenna	Rohde & Schwarz	HL562E	38401	36	2026-01-31
Horn antenna	Rohde & Schwarz	HF907	40089	24	2024-10-31
Horn Antenna with preamplifier	Rohde & Schwarz	A-INFOMW LB-180400H-KF+ TS-	43661	24	2025-01-17
Semi anechoic room	Rohde & Schwarz	No. 11	---	---	---
EMC measurement software	Rohde & Schwarz	EMC32 Emission K11 – V11.50	42986	---	---

Table 17



2.4 Radiated Emissions in GPS bands

2.4.1 Specification Reference

FCC 47 CFR Part 15 C, Clauses 15.250 (d)(2)
ISED RSS-210, K.3 (b)

2.4.2 Equipment under Test and Modification State

SIMATIC RTLS5201T, S/N: 17:A6:10:02:09:56 - Modification State 0
SIMATIC RTLS5201T, S/N: 17:A6:10:02:09:55 - Modification State 0

2.4.3 Date of Test

2023-02-28 and 2023-05-11

2.4.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	35 %

2.4.5 Specification Limits

In addition to the radiated emission limits above, UWB transmitters shall not exceed the following average (RMS) limits when measured using a resolution bandwidth of no less than 1 kHz:

<i>Frequency range</i>	<i>EIRP</i>
1164 MHz – 1240 MHz	-85.3 dBm
1559 MHz – 1610 MHz	-85.3 dBm



2.4.6 Test Method

The test was performed according to ANSI C63.10, sections 11.11 and 11.12
See section 2.4.6 for details.

2.4.7 Test Results

<i>Frequency range</i>	<i>Test distance</i>
1164 MHz – 1240 MHz	1 m
1559 MHz – 1610 MHz	1 m

Table 18

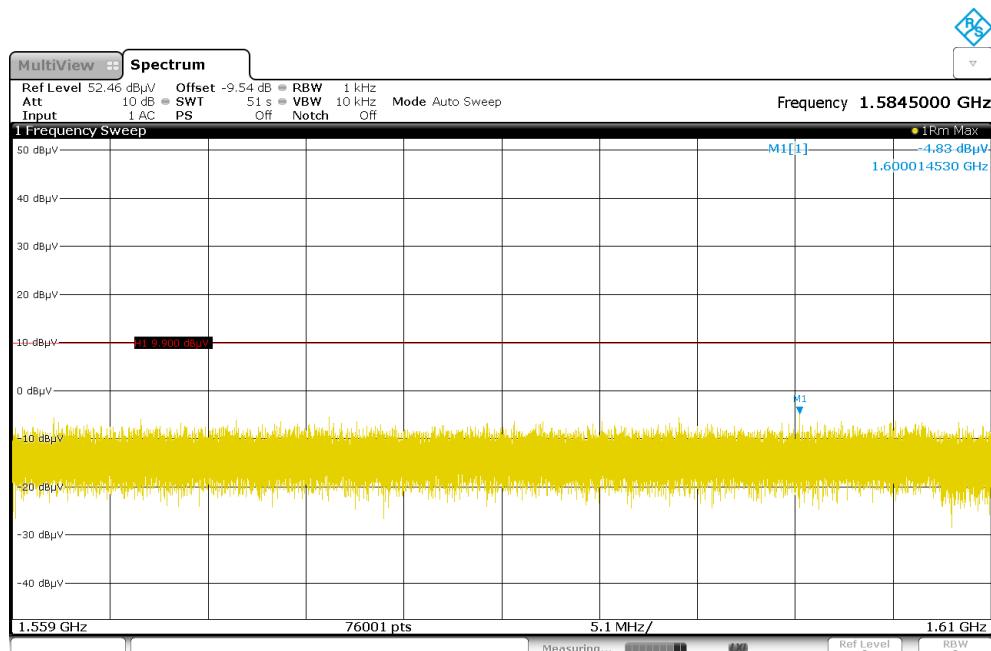
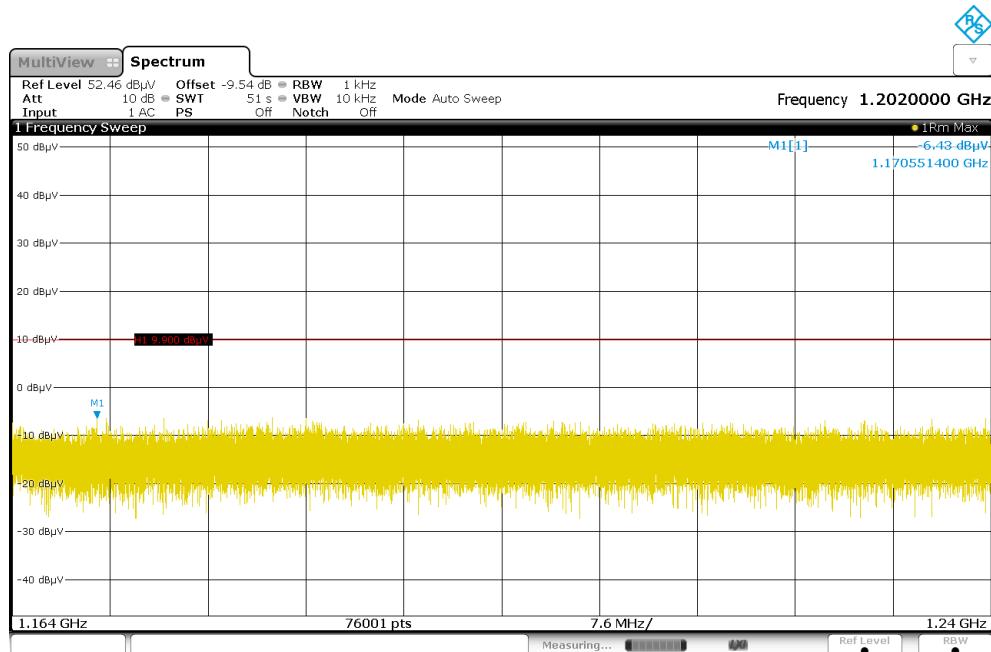
Sample calculation:

Final Value (dB μ V/m) = Reading Value (dB μ V) + (Cable attenuation (dB) + Antenna Transducer (dB(1/m)))



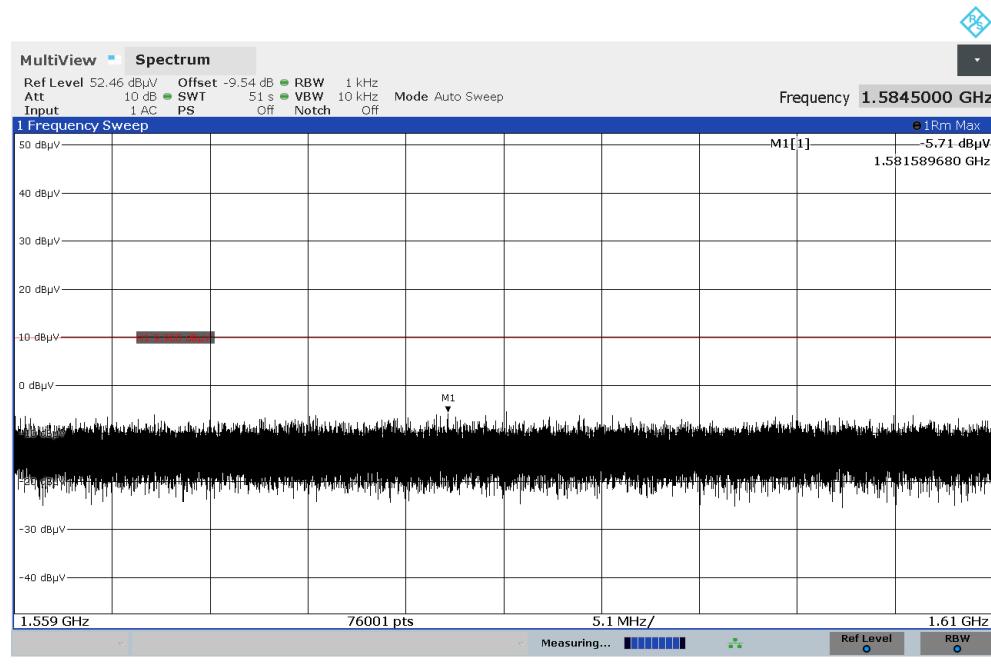
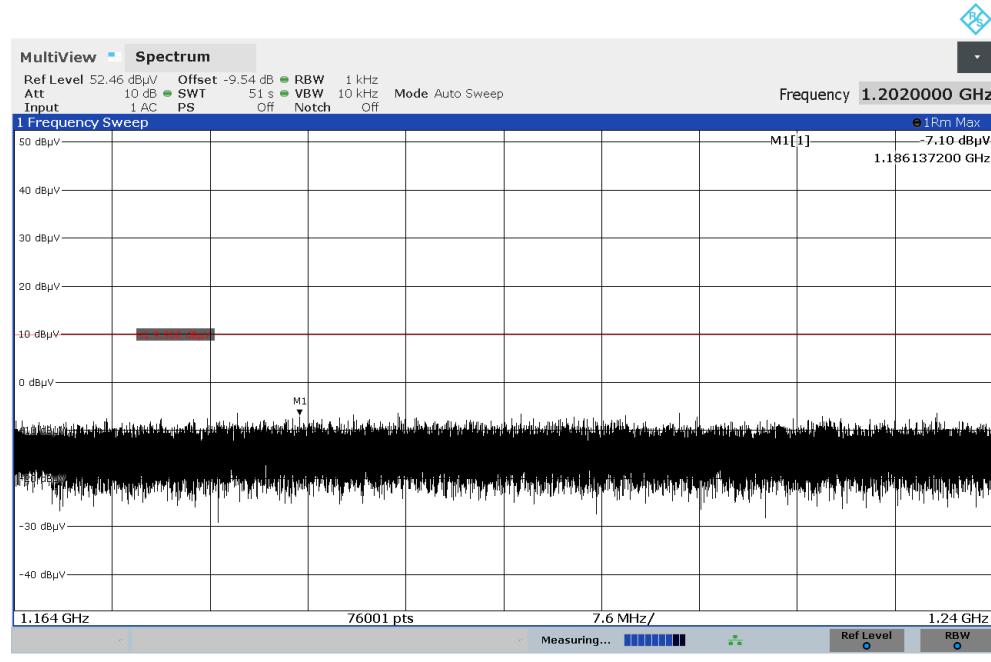
Transmitting continuously

Tested with S/N: 17:A6:10:02:09:56





Tested with S/N: 17:A6:10:02:09:55





2.4.8 Test Location and Test Equipment

This test was carried out in Semi anechoic room - cabin no. 11.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	ESW44	39897	12	2024-04-30
Horn antenna	Rohde & Schwarz	HF907	40089	24	2024-10-31
Semi anechoic room	Rohde & Schwarz	No. 11	---	---	---
EMC measurement software	Rohde & Schwarz	EMC32 Emission K11 – V11.50	42986	---	---

Table 19

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:

<i>Radio Interference Emission Testing</i>		<i>kp</i>	<i>Expanded Uncertainty</i>
<i>Test Name</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 $kp = 2$, providing a level of confidence of $p = 95.45\%$			

Table 20 Measurement uncertainty based on CISPR 16-4-2



Radio Interference Emission Testing		
Test Name	<i>kp</i>	Expanded Uncertainty
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 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 21 Measurement uncertainty based on ETSI TR 100 028