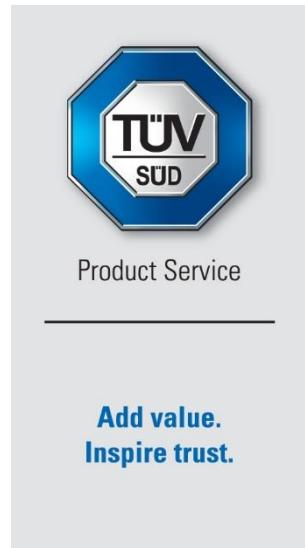


Report on the FCC and IC Testing of the
 Siemens Aktiengesellschaft
 Model: SIMATIC RTLS4083T
 In accordance with FCC 47 CFR Part 15F

Prepared for: Siemens Aktiengesellschaft
 Gleiwitzer Str. 555
 90475 Nürnberg
 Germany

FCC ID: SCF4083T02



COMMERCIAL-IN-CONFIDENCE

Date: 2021-06-18

Document Number: TR- 25679-00450-03 | Issue 2

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Alex Fink	2021-06-18	 SIGN-ID 521950
Authorised Signatory	Matthias Stumpe	2021-06-18	 SIGN-ID 521989

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 15F.

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

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Alex Fink	2021-06-18	 SIGN-ID 521950

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

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 15F.



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Annex to Test Report TR-25679-00450-03 | Issue: 01

4 pages



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.

Issue	Description of changes	Date of Issue
1	First Issue	2021-05-19
2	Section 1.4.1 "technical description" UWB channel 5 frequency range corrected	2021-06-18

Table 1: Report of Modifications

1.2 Introduction

Applicant	Siemens Aktiengesellschaft
Manufacturer	Siemens Aktiengesellschaft
Model Number(s)	SIMATIC RTLS4083T
MLFB	6GT2700-5DC13
Serial Number(s)	VPM6726490 VPM6690524
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(s) /	FCC 47 CFR Part 15F
Issue / Date	
Test Plan/Issue/Date	---
Order Number	9705983967
Date	2020-10-30
Date of Receipt of EUT	2020-11-19
Start of Test	2021-04-10
Finish of Test	2021-04-23
Name of Engineer(s)	Alex Fink, Martin Steindl
Related Document(s)	ANSI C63.10:2013



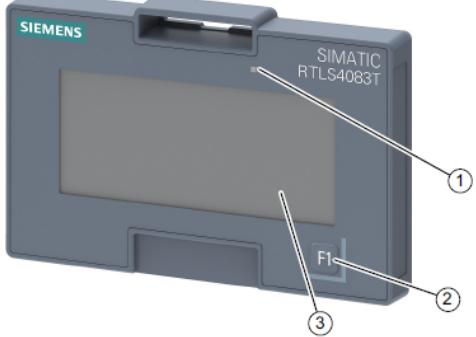
1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15F is shown below.

Section	Specification Clause	Test Description	Result
Transmitting continuously			
2.1	15.503 (a) (d) and 15.519 (b)	Bandwidth of Signal	Pass
2.2	15.519 (e)	Peak Power	Pass
2.3	15.519 (c)	Radiated Emissions	Pass
2.4	15.519 (d)	Radiated Emissions in GPS bands	Pass
2.5	15.519 (a)	Signal deactivation	Pass
N/A	15.207	AC Power Line Conducted Emissions	Not applicable, battery supply

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

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

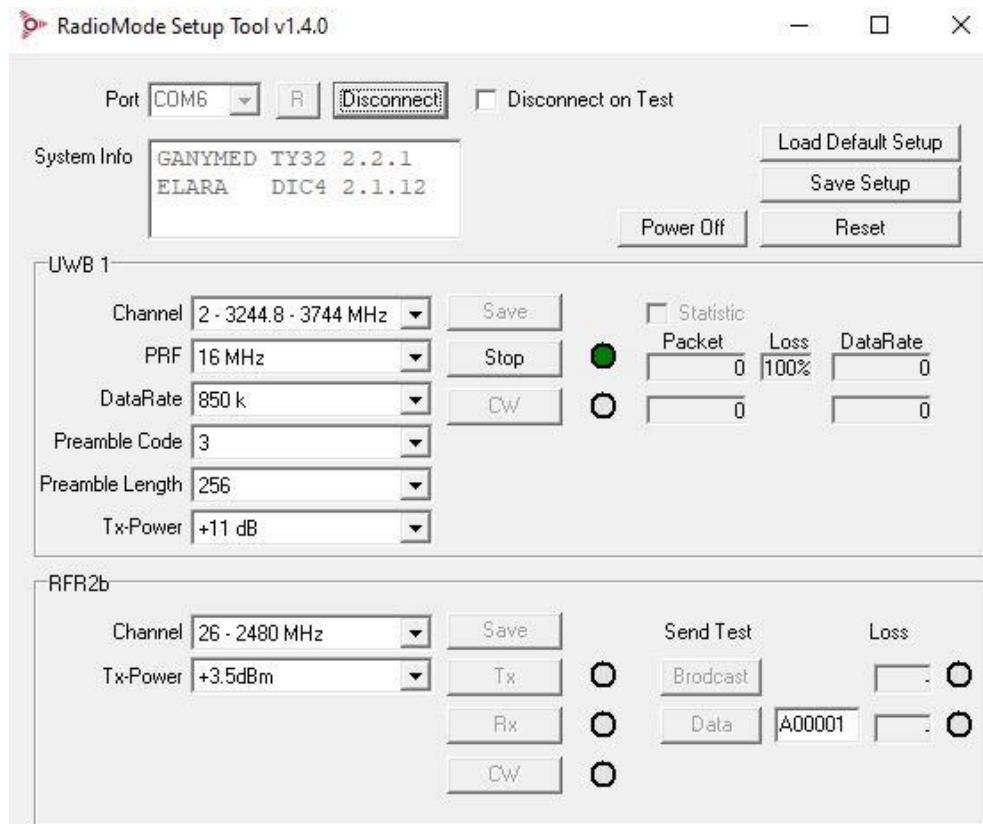
Design, dimensions, weights and connectors

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

1.4.2 Test Configuration

Transmit power und Channel selection were performed with the Software „RadioMode Setup Tool v1.4.0“.

For all tests following settings were used:



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: VPM6726490 – test sample with antenna	Not Applicable	Not Applicable

Table 3

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer SN: VPM6690524 – test sample for signal deactivation test	Not Applicable	Not Applicable

Table 4

1.6 Test Location

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

Test Name	Name of Engineer(s)
Transmitting continuously	
Bandwidth of Signal	Alex Fink
Peak Power	Alex Fink
Radiated Emissions	Alex Fink, Martin Steindl
Radiated Emissions in GPS bands	Alex Fink
Signal deactivation	Alex Fink
RF Exposure	Alex Fink

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 15F, Clause 15.503 (a) (d) and 15.519 (b)

2.1.2 Equipment under Test and Modification State

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

2.1.3 Date of Test

2021-04-21

2.1.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	38 %

2.1.5 Specification Limits

The UWB bandwidth of a device operating under the provisions of this section shall be contained between 3,100 MHz and 10,600 MHz and at any point in time and has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

2.1.6 Test Method

Test according to FCC title 47 part 15 §15.519 (b) and ANSI C63.10-2013, 10.1
See section 2.3 of this test report for details.

2.1.7 Test Results

Frequency Channel	f_L (GHz)	f_H (GHz)	f_M (GHz)	-10 dB Fractional Bandwidth (MHz)
2	3.625	4.255	3.789	630

Table 5: 10 dB bandwidth

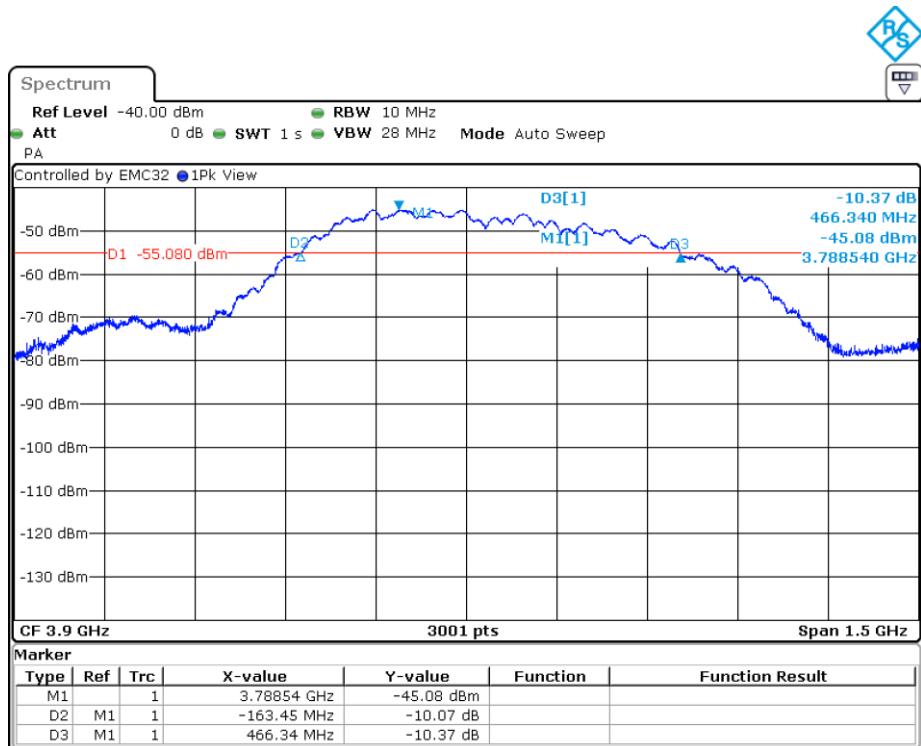


Figure 1 – 10 dB Bandwidth for Channel 2



2.1.8 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
Signal and Spectrum Analysator	Rohde & Schwarz	FSV40	20219	24	01/22
Horn antenna	Rohde & Schwarz	HF907	40089	24	02/23
Semi anechoic room	Rohde & Schwarz	No. 11	---	---	---

Table 6



2.2 Peak Power

2.2.1 Specification Reference

FCC 47 CFR Part 15F, Clause 15.519 (e)

2.2.2 Equipment under Test and Modification State

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

2.2.3 Date of Test

2021-04-10

2.2.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	37 %

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, f_M . That limit is 0 dBm e.i.r.p. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

2.2.6 Test Method

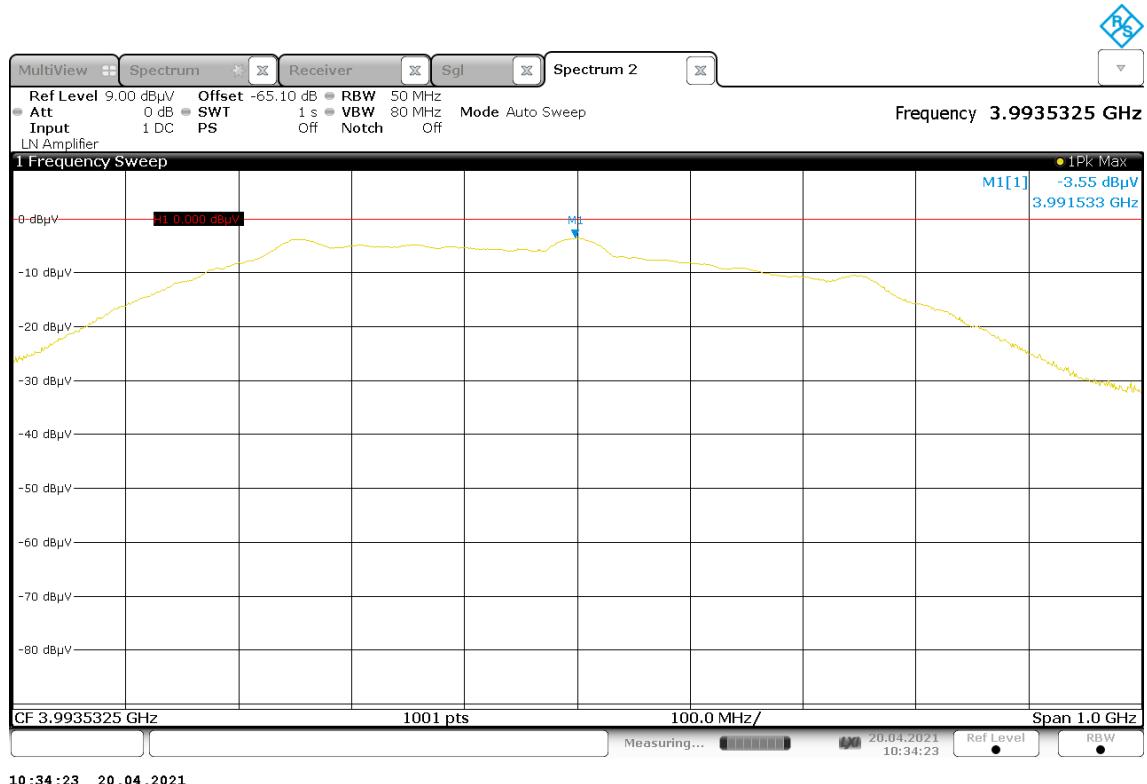
The test was performed according to ANSI C63.10, section 10.3.5
See section 2.3.6 of this test report for details.

2.2.7 Test Results

Frequency Channel	f_M (GHz)	Resolution Bandwidth (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)
2	3.992	50	-3.55	0

Table 7: Peak Power

Peak Power for Channel 2



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	04/22
Horn antenna	Rohde & Schwarz	HF907	40089	24	02/23
Semi anechoic room	Rohde & Schwarz	No. 11	---	---	---

Table 8



2.3 Radiated Emissions

2.3.1 Specification Reference

FCC 47 CFR Part 15F, Clause 15.519 (c)

2.3.2 Equipment under Test and Modification State

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

2.3.3 Date of Test

2021-04-20 and 2021-04-21

2.3.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	37 %



2.3.5 Specification Limits

2.3.5.1 Radiated emissions up to 960 MHz according to 47 CFR 15.517(c), 15.519(c) and ISED RSS-220, Clause 5.2.1 (c), 5.2.1 (c), 5.3.1 (d), 5.3.1 (d)

The radiated emissions at or below 960 MHz from a device operating under the provisions of this section 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 9 General radiated emission limits

2.3.5.2 Radiated emissions above 960 MHz according to FCC 47 CFR Part 15, Clause 15.519 (c)

The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency (MHz)	EIRP (dBm)
960 to 1610	-75.3
1610 to 1990	-63.3
1990 to 3100	-61.3
3100 to 10600	-41.3
Above 10600	-61.3

2.3.6 Test Method

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

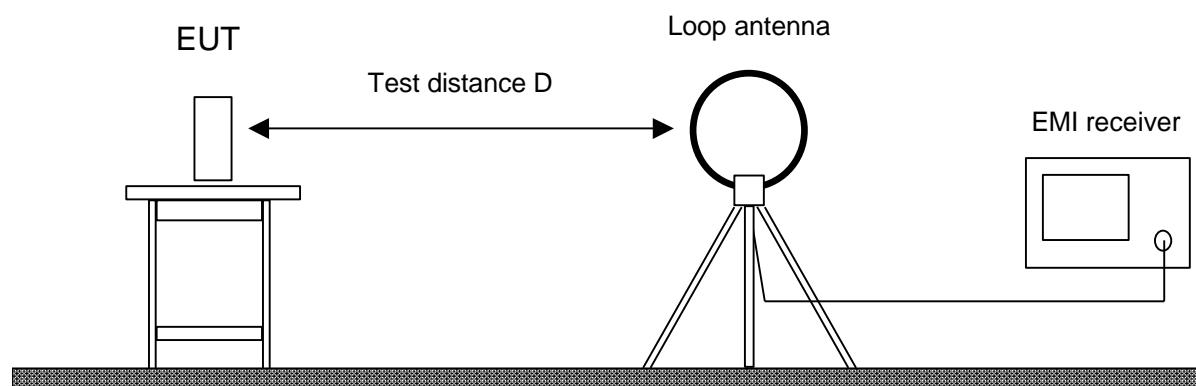
Prescans are performed in six positions of the EUT to get the full spectrum of emission caused by the EUT with the measuring antenna raised and lowered from 1 m to 4 m with vertical and horizontal polarisation to find the combination of table position, antenna height and antenna polarisation for the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

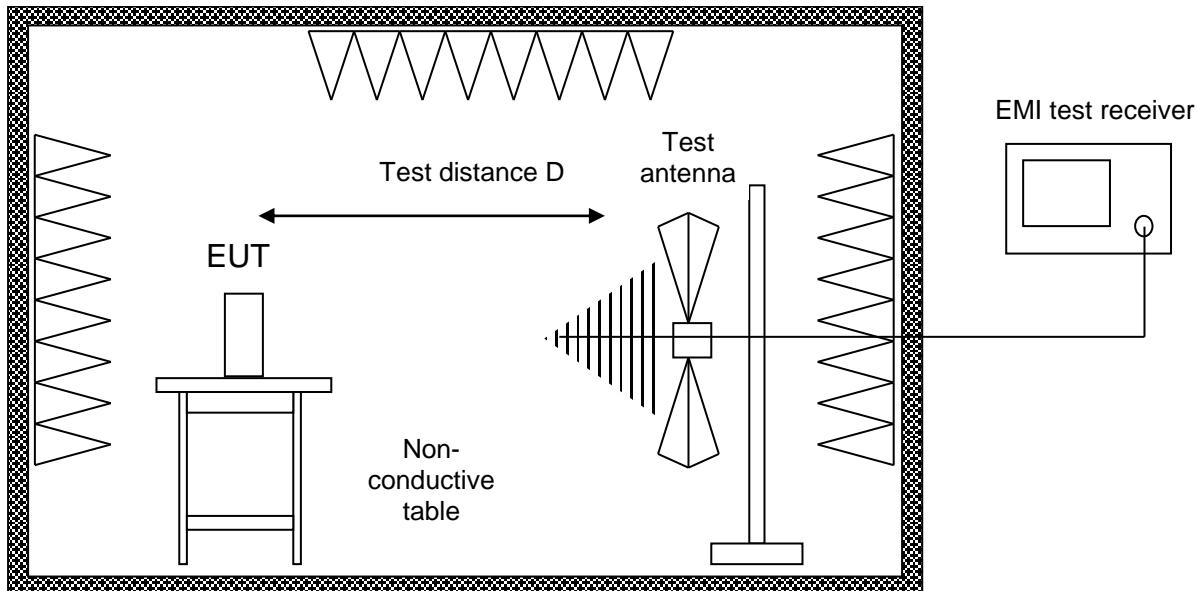


The EUT was placed on a non-conductive table, 0.8 m above the ground.

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

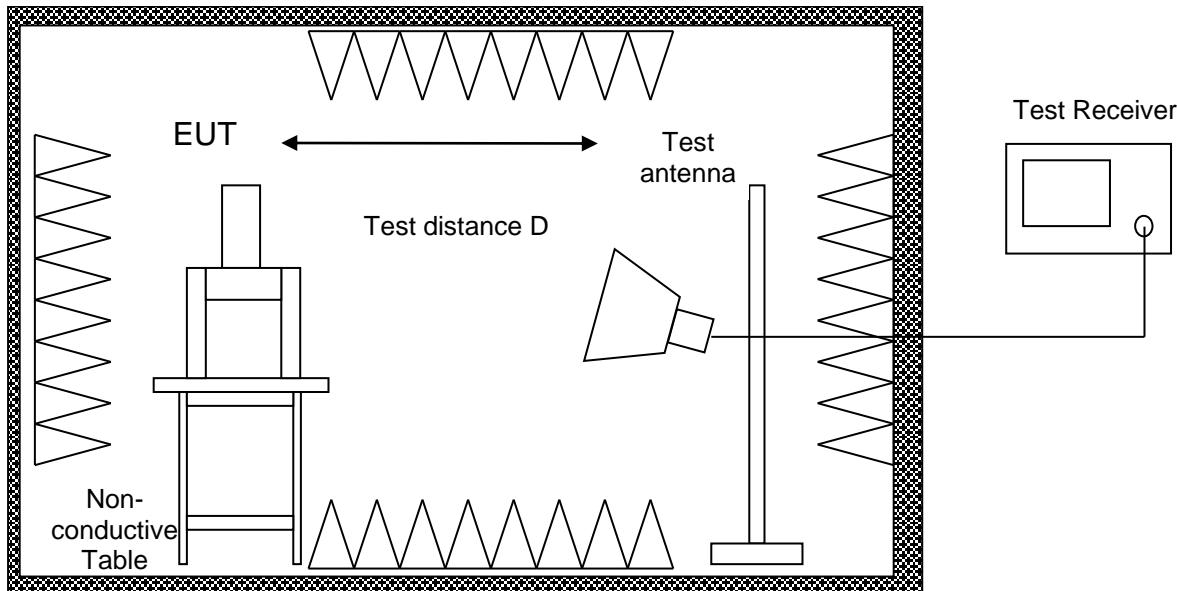


Alternate test site (semi anechoic room)

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 4 GHz	0.1 m
4 GHz to 8 GHz	0.5 m
8 GHz to 18 GHz	0.25 m
18 GHz to 40 GHz	0.1 m
Mean Power Spectral Density	1.0 m

Table 10

Sample calculation:

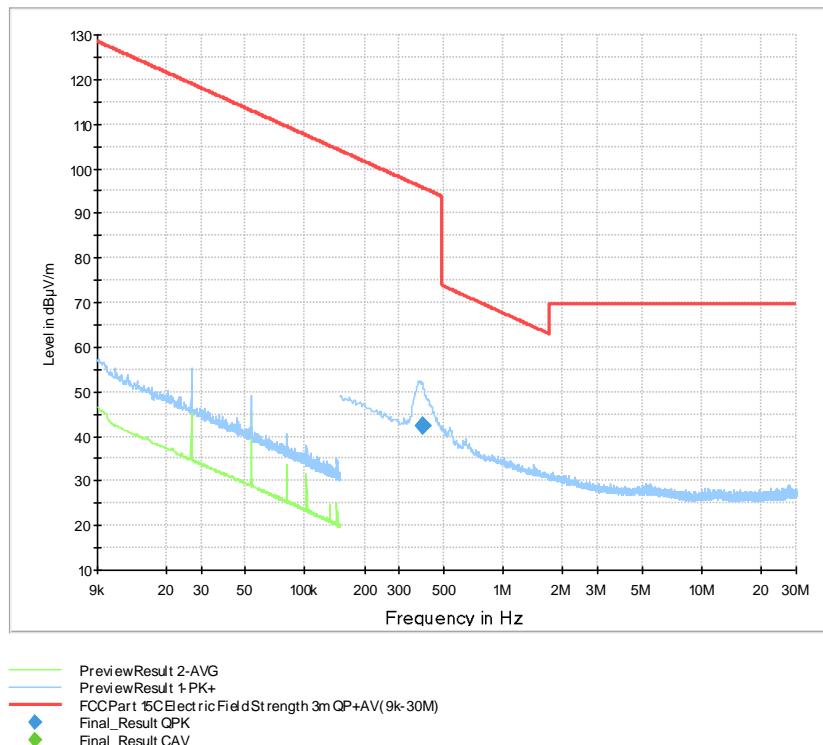
$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value (dB}\mu\text{V)} + (\text{Cable attenuation (dB)} + \text{Antenna Transducer (dB(1/m)))}$$

Premeasurements for x,y and z axis were performed.

Final measurements were performed in y axis, the orthogonal axis with highest peak and mean power.

Transmitting continuously, Channel 2 – final measurement in y axis

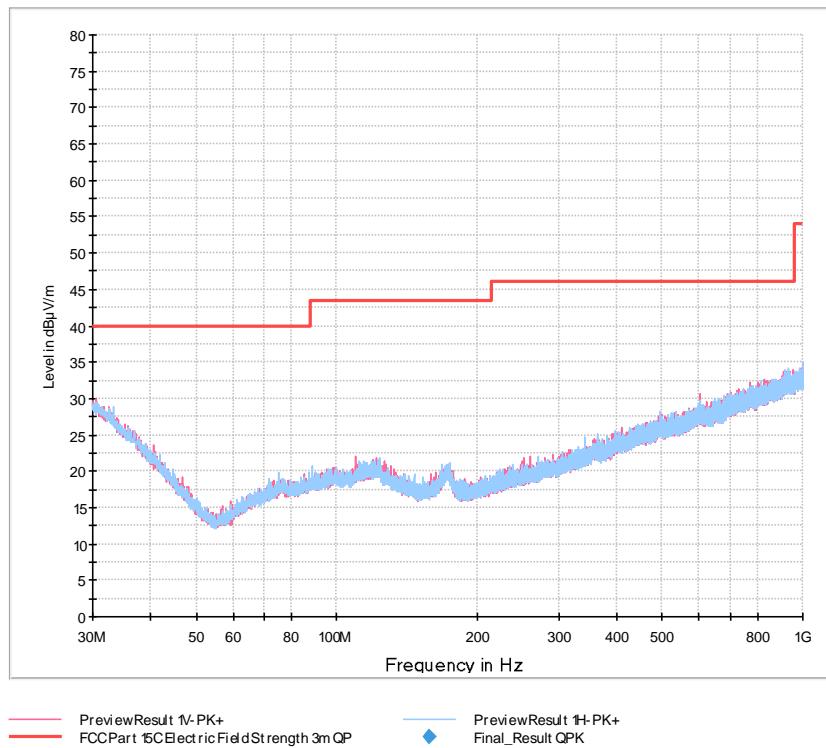
Frequency range 9 kHz – 30 MHz:



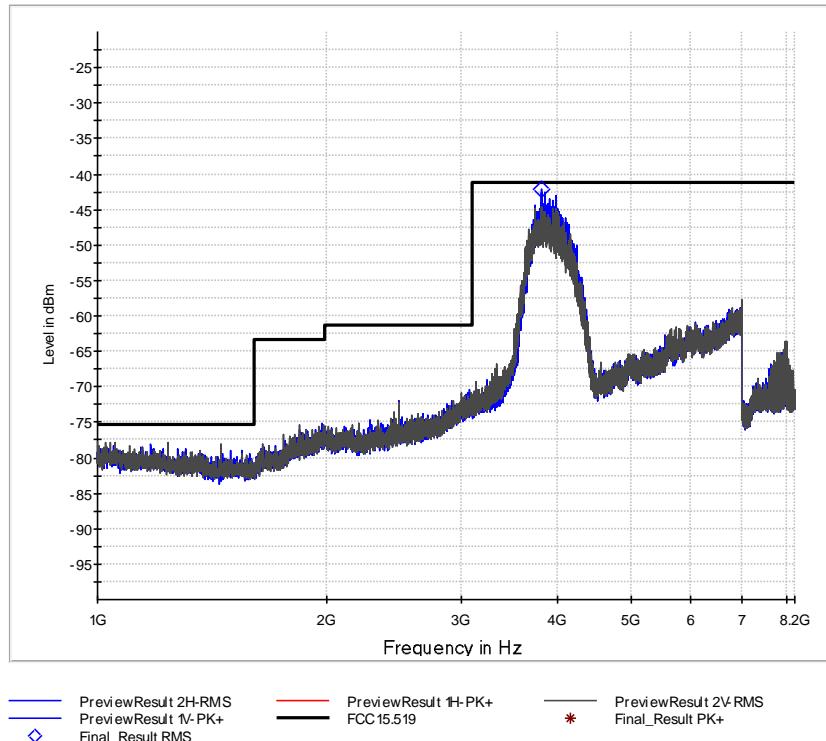
Final Results:

Frequency MHz	QuasiPeak dBµV/m	CAverage dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
0.390750	42.29	---	95.77	53.48	1000.0	9.000	100.0	H	229.0	19.2

Frequency range 30 MHz – 1 GHz:



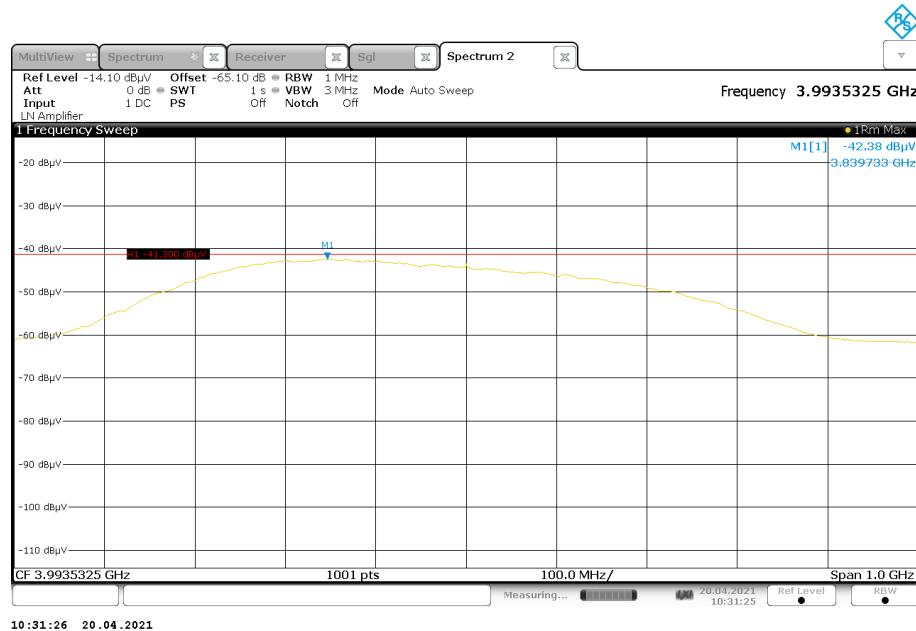
Frequency range 1 GHz – 40 GHz:



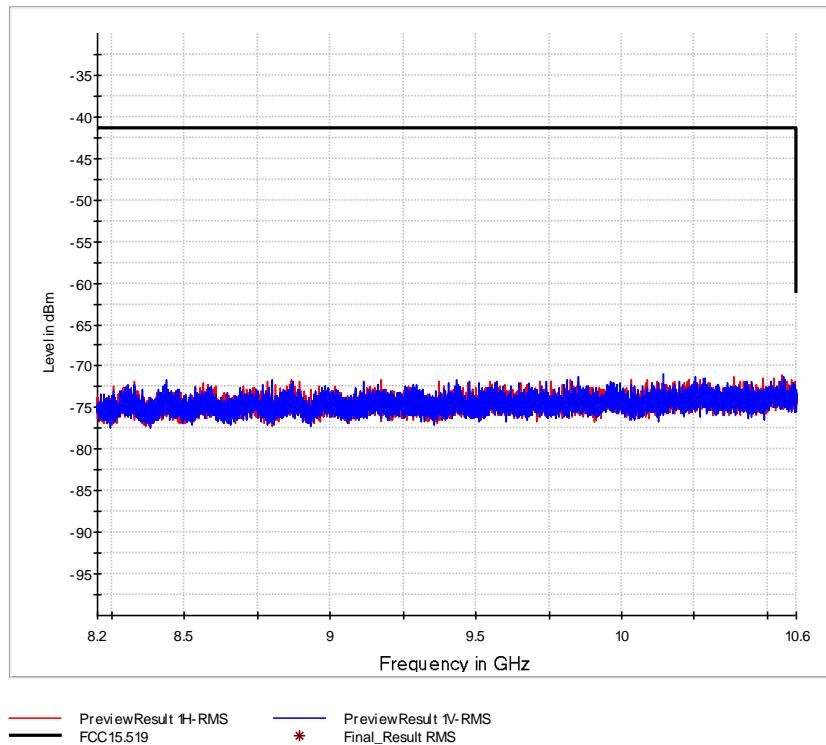
Final Results:

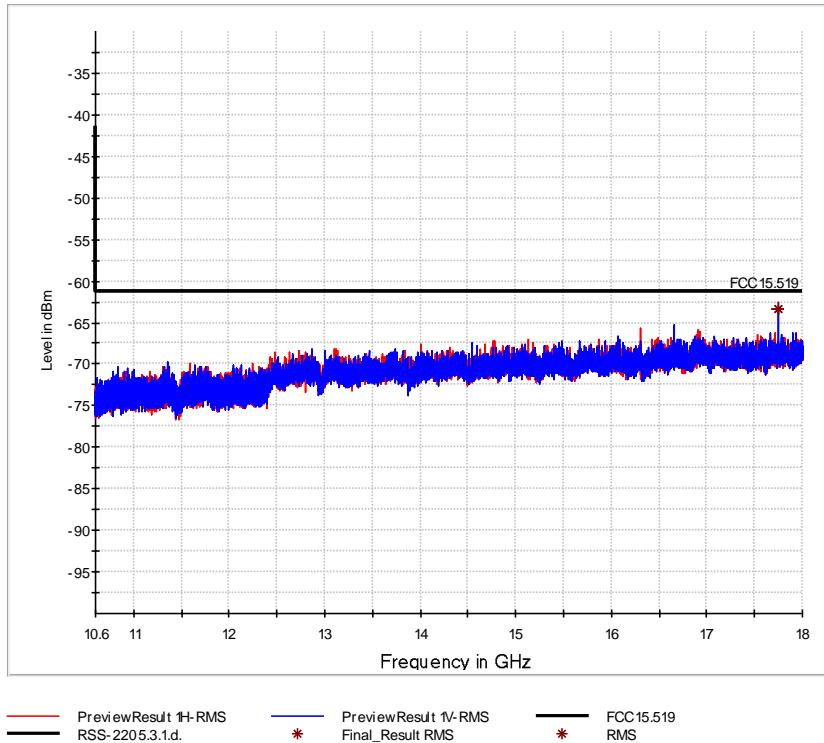
Frequency MHz	RMS dBm	Limit dBm	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azi- muth deg	Corr. dB
3815.6500	-42.26 ^{#1}	-41.30	0.96	5.0	1000.000	150.0	H	79.0	-83

Note #1: see measurement plot at 1 m distance and 1sec sweep time on next page



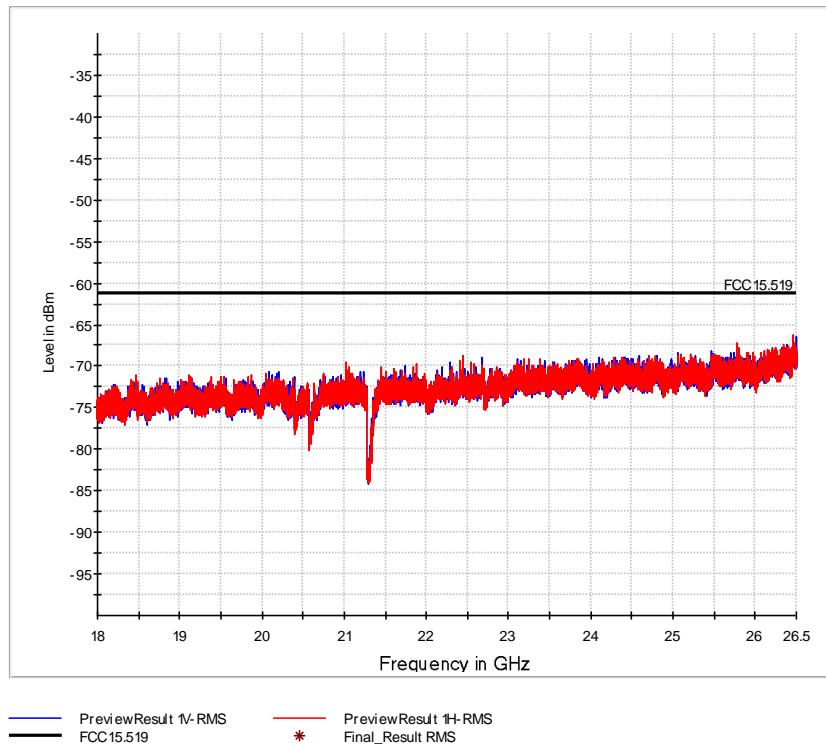
Frequency Channel	f_M (GHz)	Mean Power (dBm/MHz)	Mean Power Limit (dBm/MHz)
2	3.840	-42.38	-41.30

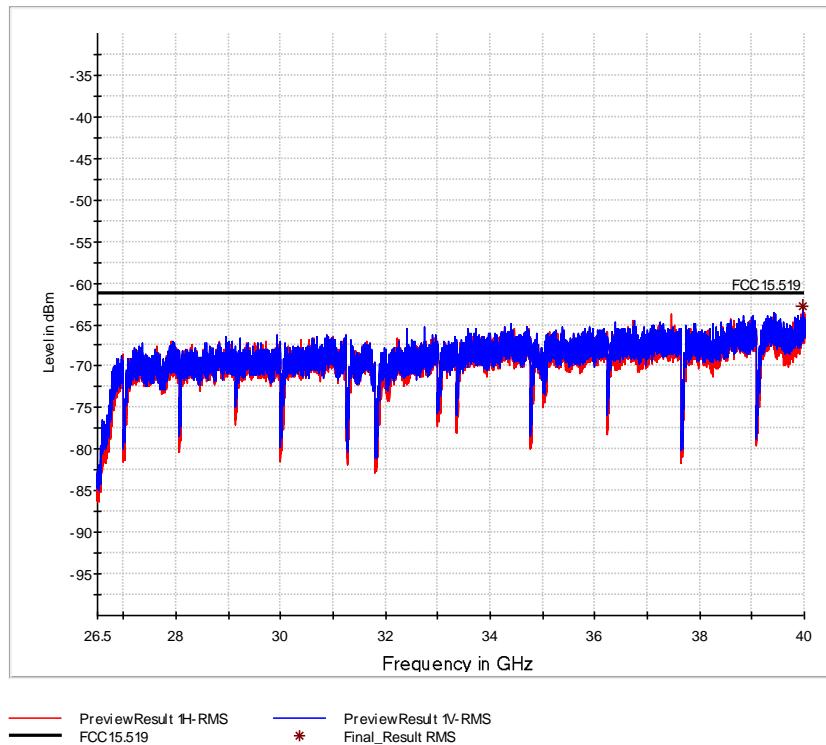




Final Results:

Frequency MHz	RMS dBm	Limit dBm	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
17741.466667	-63.29	-61.30	1.99	5.0	1000.000	150.0	V	233.0	-77.7





Final Results:

Frequency MHz	RMS dBm	Limit dBm	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
39974.928571	-62.86	-61.30	1.56	20.0	1000.000	150.0	V	218.0	-81

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	2022-04-30
Loop antenna	Schwarzbeck	FMZB 1519 B	44334	36	2023-01-31
ULTRALOG Antenna	Rohde & Schwarz	HL562E	38401	36	2021-05-31
Horn antenna	Rohde & Schwarz	HF907	40089	24	2023-02-28
Horn Antenna with preamplifier	Rohde & Schwarz	A-INFOMW LB-180400H-KF+ TS-	43661	12	2021-12-31
Semi anechoic room	Rohde & Schwarz	No. 11	---	---	---
EMC measurement software	Rohde & Schwarz	EMC32 Emission K11 - V10.50.10	42986	---	---

Table 11



2.4 Radiated Emissions in GPS bands

2.4.1 Specification Reference

FCC 47 CFR Part 15F, 15.519 (d)

2.4.2 Equipment under Test and Modification State

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

2.4.3 Date of Test

2021-04-21

2.4.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	38 %

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 – 1620 MHz	-85.3 dBm



2.4.6 Test Method

The test was performed according to ANSI C63.10, sections 11.11 and 11.12
Radiated emissions in the GPS bands were only evaluated in the 1. orthogonal axis (xz plane),
The plane with the highest emissions.

2.4.7 Test Results

<i>Frequency range</i>	<i>Limit applied</i>	<i>Test distance</i>
1164 MHz – 1240 MHz	-85.3 dBm	0.1 m
1559 MHz – 1620 MHz	-85.3 dBm	0.1 m

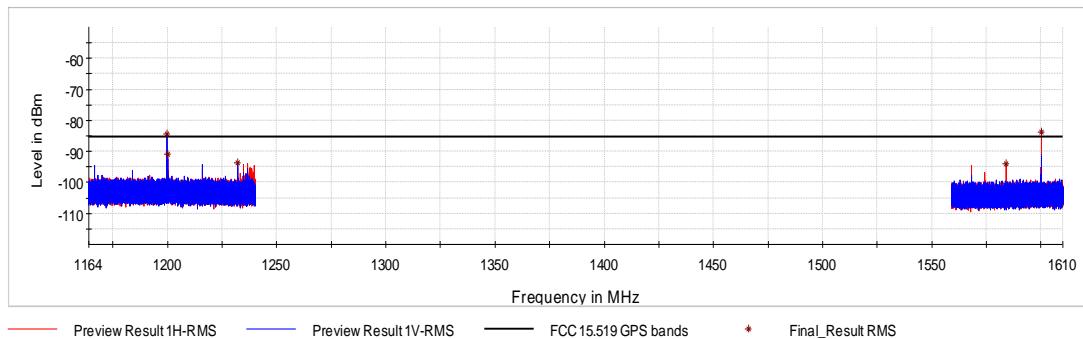
Table 12

Sample calculation:

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



Transmitting continuously, Channel 2 – y axis



Final Results:

Frequency MHz	RMS dBm	Limit dBm	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
1199.921875	-84.51	-85.30	-0.79#1	5.0	1.000	150.0	V	199.0	-84
1200.034375	-90.95	-85.30	5.65#1	5.0	1.000	150.0	H	0.0	-84
1232.006250	-93.55	-85.30	8.25#1	5.0	1.000	150.0	V	310.0	-84
1584.007938	-93.85	-85.30	8.55#1	5.0	1.000	150.0	H	28.0	-85
1600.046094	-83.76	-85.30	-1.54#1	5.0	1.000	150.0	H	0.0	-85

Note: #1: Emission is created by digital circuitry and not subjected to this limit.



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	2022-04-30
Horn antenna	Rohde & Schwarz	HF907	40089	36	2023-02-28
Semi anechoic room	Rohde & Schwarz	No. 11	---	---	---
EMC measurement software	Rohde & Schwarz	EMC32 Emission K11 - V10.50.10	42986	---	---

Table 13



2.5 Signal deactivation

2.5.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.519 (a)

2.5.2 Equipment under Test and Modification State

SIMATIC RTLS4083T, S/N: VPM6690524 - Modification State 0

2.5.3 Date of Test

2021-04-23

2.5.4 Environmental Conditions

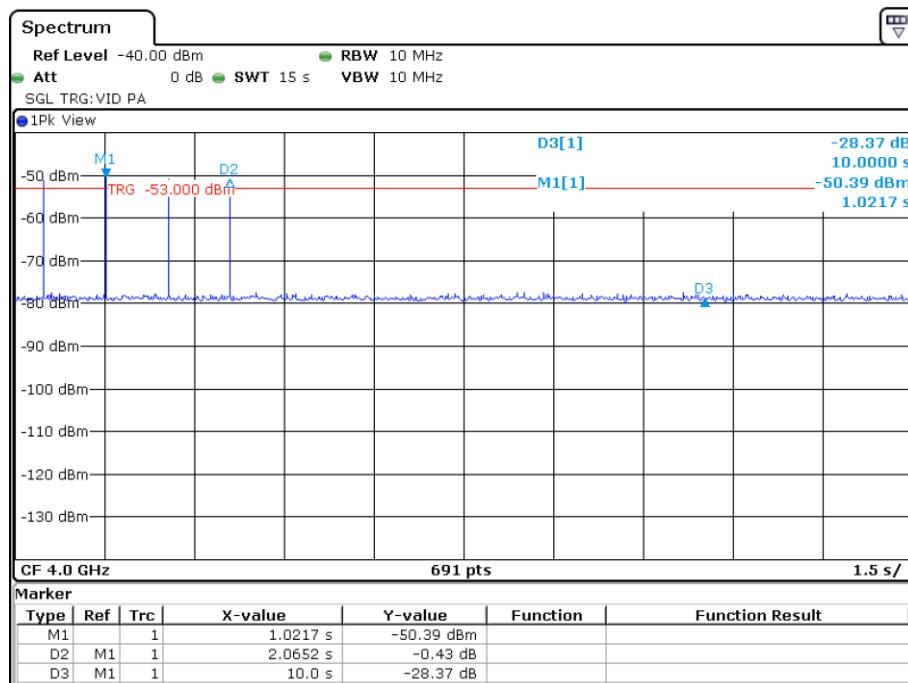
Ambient Temperature	22 °C
Relative Humidity	27 %

2.5.5 Specification Limits

The device is to transmit only when it is sending information to an associated receiver. The device shall cease transmission of information within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB device at least every 10 seconds or the UWB device shall cease transmitting any information other than periodic signals used for the establishment or re-establishment of a communication link with an associated receiver

2.5.6 Test Method

2.5.7 Test Results



Date: 22.APR.2021 08:41:56

Description:

Associated receiver (Wireless Mesh Gateway Pulse Phase, S/N: A51471) was turned off at 1.0 seconds (Marker 1) Device under test, SIMATIC RTLS4083T, stopped transmission after 2.0 seconds (Marker 2).

Result:

The requirement is fulfilled.



2.5.8 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	FSV40	20219	24	01/22
Horn antenna	Rohde & Schwarz	HF907	40089	24	02/23
Semi anechoic room	Rohde & Schwarz	No. 11	---	---	---

Table 14



2.6 RF Exposure

2.6.1 Specification Reference

FCC 47 CFR Part 2 J, Clause 2.1093

KDB 447498 D01 V06, section 4.3.1

ISED RSS-Gen, Clause 3.4

ISED RSS-102, Clause

2.6.2 Equipment under Test and Modification State

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

2.6.3 Date of Test

2021-04-20

2.6.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	37 %

2.6.5 Test Method

Estimation is based on output power test.

For details please refer to section 2.2.6 of this test report.

2.6.6 Specification Limits

Acc. to KDB 477498:

The 1 g and 10 g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$\frac{\text{max. power of channel, incl. tune-up tol., mW}}{\text{min. test separation distance, mm}} \cdot \sqrt{f, \text{GHz}} \leq \begin{cases} 3.0 & \text{for 1 g} \\ 7.5 & \text{for 10 g} \end{cases} \text{extremity SAR}$$

1. f (GHz) is the RF channel frequency in GHz;
2. Power and distance are rounded to the nearest mW and mm before calculation;
3. The result is rounded to one decimal place for comparison;
4. 3.0 and 7.5 are referred to as the numeric thresholds

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied.

ISED RSS-102, Clause 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.

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.

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.:.

Frequency (MHz)	Exemption limits (mW) ¹ 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 ²	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

¹ 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.

² Transmitters operating between 3 kHz and 10 MHz, meeting the exemption from routine SAR evaluation, shall demonstrate compliance to the instantaneous limits in IC RSS-102, issue 5, section 4.



2.6.7 Test Results

acc. to KDB 447498 D01:

Carrier frequency:	f	= 3.99 GHz
Distance:	d	= 20 mm
Transmitter output power:	TP	= 0.442 mW (-3.55 dBm)
SAR Threshold		0.044
SAR Threshold Limit:		3.0

For Max. EIRP Peak level emission test, please refer to test report section 2.2.6

Limit definition:

For 100 MHz to 6 GHz and test separation distances \leq 50 mm, the 1 g- and 10 g-SAR test exclusion thresholds are determined by the following:

$\sqrt{f, \text{ GHz}}(\text{max power of channel, mW}) / (\text{min test separation distance, mm}) \leq 3.0$ for 1 g-SAR and ≤ 7.5 for 10 g SAR.

2.6.8 Test Location and Test Equipment Used

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	2022-04-30
Double ridged horn antenna	Rohde & Schwarz	HF907	40089	24	2023-02-28
EMC Measurement Software	Rohde & Schwarz	EMC32 V10.50.10	19893	N/A	N/A

Table 15

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.

Radio Interference Emission Testing			
Test Name	k_p	Expanded Uncertainty	
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 $k_p = 2$, providing a level of confidence of $p = 95.45\%$			

Table 16 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 17 Measurement uncertainty based on ETSI TR 100 028