

Report on the FCC Testing of the Siemens AG

Model: SIMATIC RTLS4060T

In accordance with FCC 47 CFR Part 15F

Prepared for: Siemens AG
Gleiwitzer Str. 555
90475 Nuernberg
Germany



FCC ID: NXW4060T



COMMERCIAL-IN-CONFIDENCE

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| RESPONSIBLE FOR | NAME | DATE | SIGNATURE |
|----------------------|-----------------|------------|--|
| Project Management | Martin Steindl | 2020-05-14 |  SIGN-ID 357648 |
| Authorised Signatory | Matthias Stumpe | 2020-05-14 |  SIGN-ID 358696 |

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

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 15C. The sample tested was found to comply with the requirements defined in the applied rules.

| RESPONSIBLE FOR | NAME | DATE | SIGNATURE |
|-----------------|----------------|------------|---|
| Testing | Martin Steindl | 2020-05-14 |  SIGN-ID 357649 |

Laboratory Accreditation

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

Laboratory recognition

Registration No. BNetzA-CAB-16/21-15

ISED test site registration

3050A-2

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15F

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

Managing Directors:
Dr. Peter Havel (CEO)
Dr. Jens Butenandt

Phone: +49 (0) 9421 55 22-0
Fax: +49 (0) 9421 55 22-99
www.tuev-sued.de

TÜV SÜD Product Service GmbH
Äußere Frühlingsstraße 45
94315 Straubing
Germany



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External photos 4 pages



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 | 2019-10-23 |
| 2 | Removed redundant ISED references. Corrected typo on page 4 Removed Siemens article number from model designation Corrected RF Exposure exemption for 6.5 GHz frequency | 2020-03-05 |
| 3 | Added test protocol "Cease of Transmission" | 2020-05-14 |

Table 1

1.2 Introduction

| | |
|-------------------------------|--------------------------------|
| Applicant | Siemens AG |
| Manufacturer | Siemens AG |
| Model Number | SIMATIC RTLS4060T |
| Siemens Article Number: | 6GT2700-6DE13 |
| Serial Number(s) | --- |
| Hardware Version(s) | 0613 |
| Software Version(s) | 2.1.4 |
| Number of Samples Tested | 1 |
| Test Specification/Issue/Date | FCC 47 CFR Part 15E. |
| Test Plan/Issue/Date | --- |
| Order Number | 5121883 |
| Date | 2018-07-30 |
| Date of Receipt of EUT | 2018-11-19 |
| Start of Test | 2019-01-07 |
| Finish of Test | 2019-09-09 |
| Name of Engineer(s) | Michael Ingerl, Martin Steindl |
| Related Document(s) | ANSI C63.10 (2013) |



Product Service

1.3 Technical data of EUT

Connection of antenna: ☐ Detachable ☒ Not detachable
Type of power supply: ☐ AC ☒ DC
Nominal Voltage: 24V
Minimum Voltage: 8V
Maximum Voltage: 30V

1.4 Configuration Mode(s)

1. Configuration Mode-1
Transmitting continuously on selected Channel



1.5 Brief Summary of Results

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

| Section | Specification Clause | Test Description | Result | Comments/Base Standard |
|--|------------------------------------|-----------------------------------|--------|------------------------|
| Configuration and Mode: Configuration Mode-1 | | | | |
| 2.1 | 47 CFR, § 15.207 | AC Power Line Conducted Emissions | Pass | ANSI C63.10 (2013) |
| 2.2 | 47 CFR § 15.503(d) | Emission Bandwidth | Pass | ANSI C63.10 (2013) |
| 2.3 | 47 CFR § 15.519(e) and § 15.521 | Peak Power | Pass | ANSI C63.10 (2013) |
| 2.4 | 47 CFR § 15.519(c) and (d) | Radiated Emissions | Pass | ANSI C63.10 (2013) |
| 2.5 | 47 CFR § 15.519(a)(1) | Cease of Transmission | Pass | ANSI C63.10 (2013) |
| 2.6 | KDB 447498 D01 V06, section 4.3 a) | RF Exposure | Pass | ANSI C63.10 (2013) |

Table 2



1.6 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 |
|--------------------|---|------------------------|--------------------------|
| Serial Number: --- | | | |
| 0 | As supplied by the customer | Not Applicable | Not Applicable |

Table 3

1.7 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing Test Laboratory.

| Test Name | Name of Engineer(s) |
|--|---------------------|
| Configuration and Mode: Configuration Mode-1 | |
| AC Power Line Conducted Emissions | Michael Ingerl |
| Emission Bandwidth | Martin Steindl |
| Peak Power | Martin Steindl |
| Radiated Emissions | Martin Steindl |
| Cease of Transmission | Martin Steindl |
| RF Exposure | Martin Steindl |

Table 4

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany

2 Test Details

2.1 AC Power Line Conducted Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 15C. Clause 15.207

2.1.2 Equipment Under Test and Modification State

SIMATIC RTLS4060T. S/N: --- - Modification State 0

2.1.3 Date of Test

2019-01-07

2.1.4 Test Method

The test was performed in accordance with ANSI C63.10. clause 6.2.

Conducted emission tests in the frequency range 150 kHz to 30 MHz are performed using Line Impedance Stabilization Networks (LISNs). To simplify testing with quasi-peak and average detector the following procedure is used:

First the whole spectrum of emission caused by the equipment under test (EUT) is recorded with detector set to peak using CISPR bandwidth of 10 kHz. After that all emission levels having less margin than 10 dB to or exceeding the average limit are retested with detector set to quasi-peak. If average limit is kept with quasi-peak levels no additional scan with average detector is necessary. In cases of emission levels between quasi-peak and average limit an additional scan with detector set to average is performed.

According to ANSI C63.4. section 13.1.3.1. testing of intentional radiators with detachable antenna shall be performed using a suitable dummy load connected to the antenna output terminals. Otherwise, the tests shall be made with the antenna connected and, if adjustable, fully extended. Testing with dummy load may be necessary to distinguish (unintentional) conducted emissions on the supply lines from (intentional) emissions radiated by the antenna and coupling directly to supply lines and/or LISN. Usage of dummy load has to be stated in the appropriate test record(s) and notes should be added to clarify the test setup.

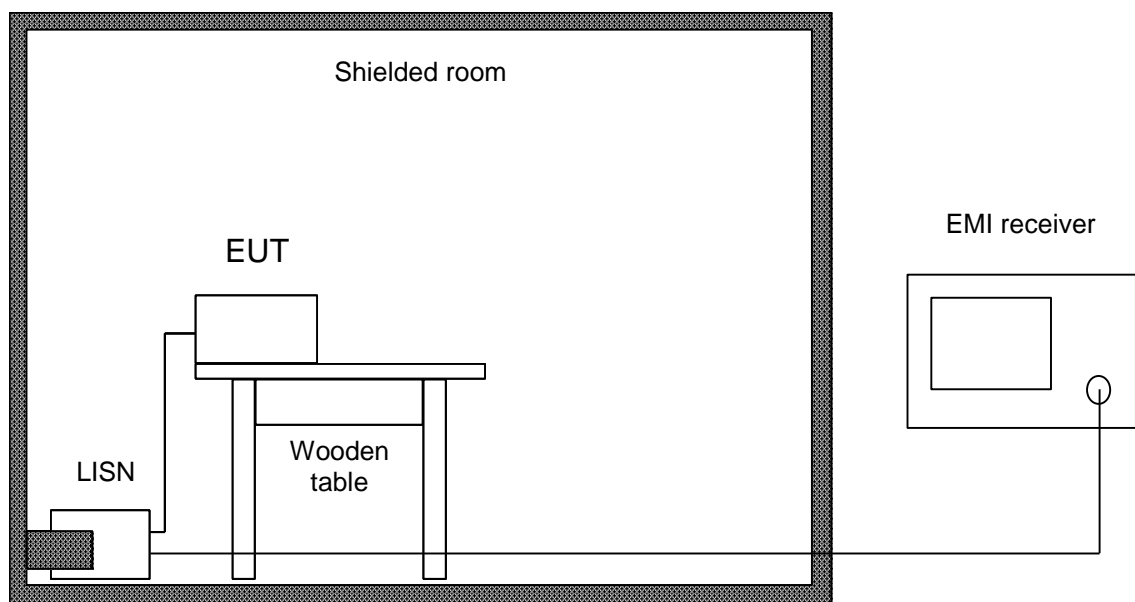


Figure 1 – Test setup for AC mains conducted emissions



2.1.5 Environmental Conditions

Ambient Temperature 21 °C
 Relative Humidity 30 %

2.1.6 Test Results

Configuration Mode-1

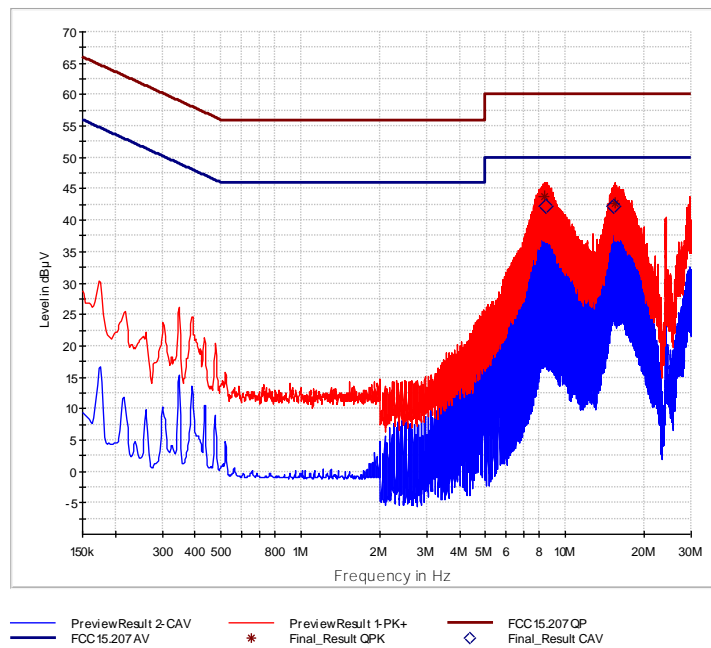


Figure 2 - Live Line - 150 kHz to 30 MHz

| Frequency MHz | QuasiPeak dBµV | CAverage dBµV | Limit dBµV | Margin dB | Meas. Time ms | Bandwidth kHz | Line | PE | Corr. dB |
|---------------|----------------|---------------|------------|-----------|---------------|---------------|------|-----|----------|
| 8.344500 | 43.82 | --- | 60.00 | 16.18 | 1000.0 | 9.000 | L1 | GND | 0.0 |
| 8.517750 | --- | 42.16 | 50.00 | 7.84 | 1000.0 | 9.000 | L1 | GND | 0.0 |
| 15.252000 | --- | 42.17 | 50.00 | 7.83 | 1000.0 | 9.000 | L1 | GND | 0.4 |
| 15.560250 | 42.69 | --- | 60.00 | 17.31 | 1000.0 | 9.000 | L1 | GND | 0.4 |

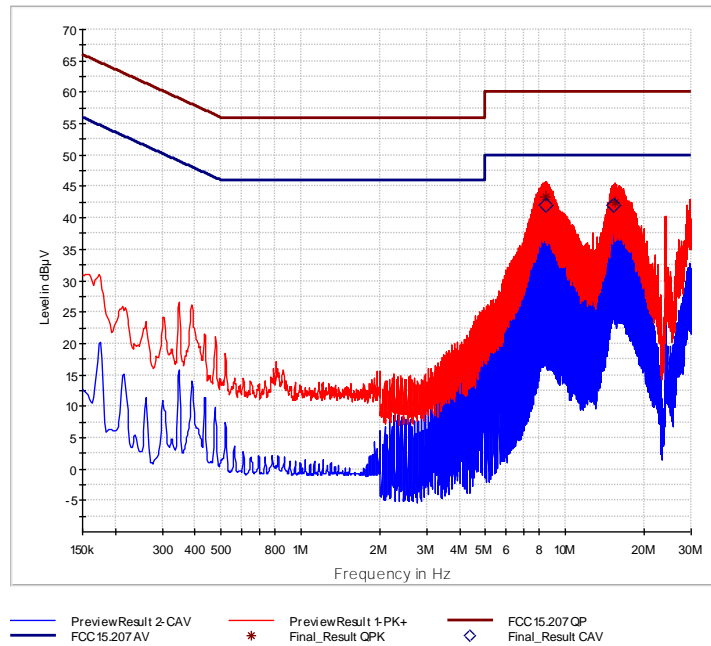


Figure 3 - Neutral Line - 150 kHz to 30 MHz

| Frequency MHz | QuasiPeak dBμV | CAverage dBμV | Limit dBμV | Margin dB | Meas. Time ms | Bandwidth kHz | Line | PE | Corr. dB |
|---------------|----------------|---------------|------------|-----------|---------------|---------------|------|-----|----------|
| 8.432250 | 43.42 | --- | 60.00 | 16.58 | 1000.0 | 9.000 | N | GND | 0.0 |
| 8.517750 | --- | 41.97 | 50.00 | 8.03 | 1000.0 | 9.000 | N | GND | 0.0 |
| 15.252000 | --- | 42.11 | 50.00 | 7.89 | 1000.0 | 9.000 | N | GND | 0.4 |
| 15.470250 | 42.48 | --- | 60.00 | 17.52 | 1000.0 | 9.000 | N | GND | 0.4 |

Sample calculation of final values:

Final Value (dBμV) = Reading Value (dBμV) + Correction Factor (dB)



FCC 47 CFR Part 15. Limit Clause 15.207

| Frequency of Emission (MHz) | Conducted Limit (dBμV) | |
|-----------------------------|------------------------|-----------|
| | Quasi-Peak | Average |
| 0.15 to 0.5 | 66 to 56* | 56 to 46* |
| 0.5 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

Table 5

*Decreases with the logarithm of the frequency.

2.1.7 Test Location and Test Equipment Used

This test was carried out in Shielded room - cabin no. 9.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--------------------------|-----------------|-------------------|-------|-----------------------------|-----------------|
| EMI test receiver | Rohde & Schwarz | ESU8 | 19904 | 12 | 2019-12-31 |
| V-network | Rohde & Schwarz | ESH 3-Z5 | 18919 | 36 | 2019-10-31 |
| EMC Measurement Software | Rohde&Schwarz | EMC32 V9.26.01 | 20090 | N/A | N/A |

Table 6

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable



Product Service

2.2 Emission Bandwidth

2.2.1 Specification Reference

FCC 47 CFR Part 15F. Clause §15.503(d)

2.2.2 Equipment Under Test and Modification State

SIMATIC RTLS4060T. S/N: --- - Modification State 0

2.2.3 Date of Test

2019-09-09

2.2.4 Test Method

This test was performed in accordance with ANSI C63.10. clause 10.1
The test was performed as radiated emission test.

2.2.5 Environmental Conditions

| | |
|---------------------|-------|
| Ambient Temperature | 23 °C |
| Relative Humidity | 48 % |



2.2.6 Test Results

| UWB Channel | -10 dB bandwidth | -10 dB fractional bandwidth | -10 dB bandwidth limit | -10 dB fractional bandwidth limit |
|-------------|------------------|-----------------------------|------------------------|-----------------------------------|
| 2 | 715.0 MHz | 0.18 | > 500 MHz | > 0.20 |
| 5 | 677.5 MHz | 0.10 | > 500 MHz | > 0.20 |

Fractional bandwidth not evaluated since bandwidth is greater than 500 MHz.

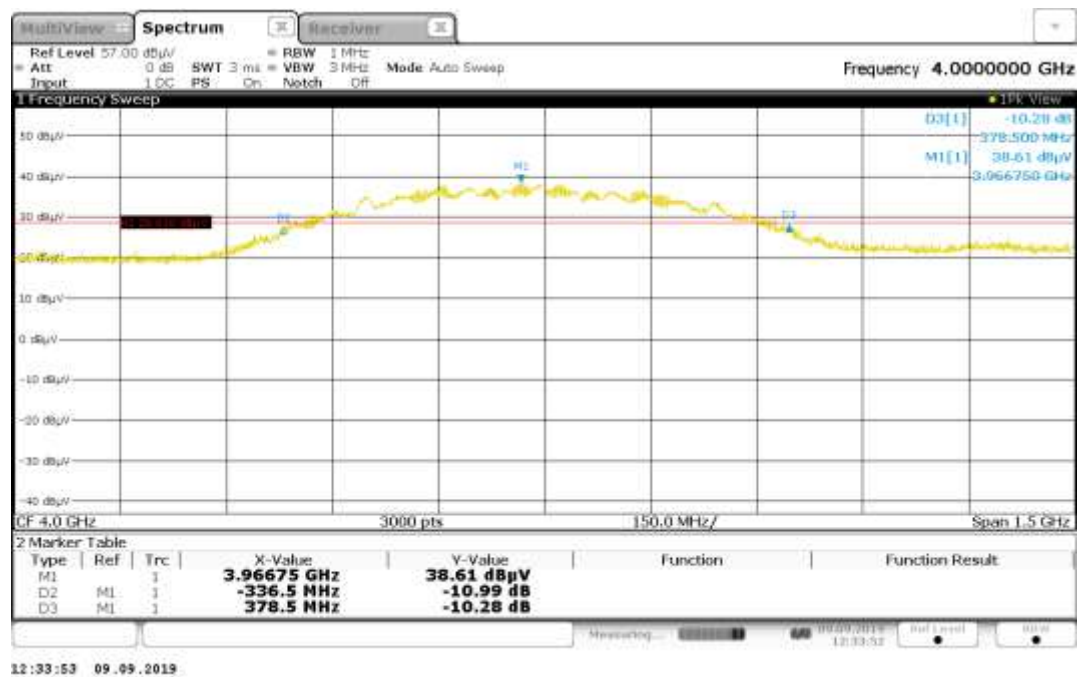


Figure 4 – -10 dB bandwidth, Channel 2



Figure 5 – -10 dB bandwidth, Channel 5



FCC 47 CFR Part 15. Limit Clause 15.503(d)

A *UBW device* is an intentional radiator that has either a *-10 dB bandwidth* ($f_H - f_L$) of at least 500 MHz or a *-10 dB fractional bandwidth* ($\frac{2(f_H - f_L)}{(f_H + f_L)}$) greater than 0.2

2.2.7 Test Location and Test Equipment Used

This test was carried out in shielded room No. 11

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|----------------------------|-----------------|--------------------|-------|-----------------------------|-----------------|
| EMI test receiver | Rohde & Schwarz | ESW44 | 39897 | 12 | 2020-02 |
| Double ridged horn antenna | Rohde & Schwarz | HF907 | 40089 | 24 | 2021-02 |
| Semi anechoic room | Frankonia | | | | |
| EMC Measurement Software | Rohde & Schwarz | EMC32 V10.50.10 | 19893 | N/A | N/A |

Table 7

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable



2.3 Peak Power

2.3.1 Specification Reference

FCC 47 CFR Part 15E, Clauses § 15.519(e) and § 15.521

2.3.2 Equipment Under Test and Modification State

SIMATIC RTLS4060T. S/N: --- - Modification State 0

2.3.3 Date of Test

2019-09-09

2.3.4 Test Method

The test was performed in accordance with ANSI C63.10. clause 10.3.5
The test was performed according to description in section 18

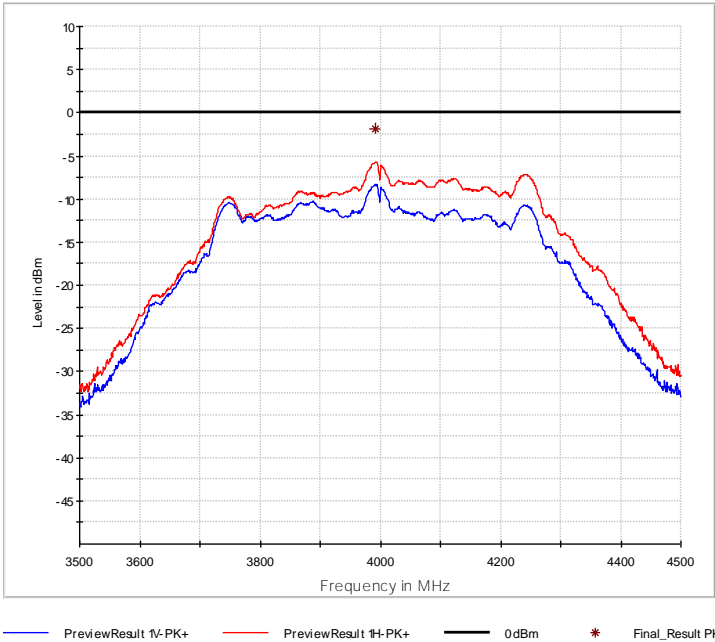
2.3.5 Environmental Conditions

| | |
|---------------------|-------|
| Ambient Temperature | 23 °C |
| Relative Humidity | 48 % |



2.3.6 Test Results

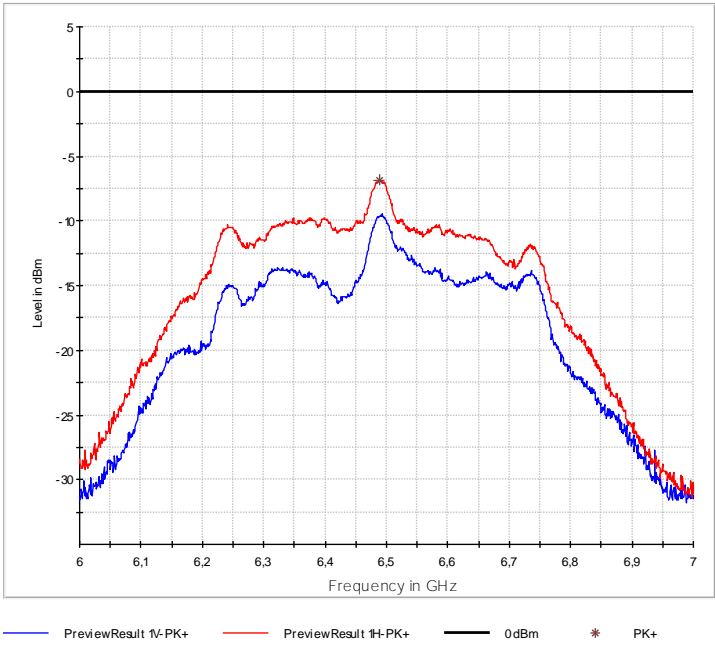
Radiated emissions for channel 2:



| Frequency | MaxPeak | Limit | Margin | Meas. Time | Bandwidth | Height | Pol | Azimuth | Corr. |
|-------------|---------|--------|--------|------------|-----------|--------|-----|---------|-------|
| MHz | dBm | dBm | dB | Ms | kHz | cm | | deg | dB |
| 3993.000000 | -1.90 | -41.30 | -39.40 | 1000 | 50000 | 167 | H | -24 | -66.8 |



Radiated emissions for channel 5:



| Frequency | MaxPeak | Limit | Margin | Meas. | Bandwidth | Height | Pol | Azimuth | Corr. |
|-------------|---------|-------|--------|------------|-----------|--------|-----|---------|-------|
| MHz | dBm | dBm | dB | Time Ms | kHz | cm | | deg | dB |
| 6489.565000 | -6.88 | 0.00 | 6.88 | 1000 | 50000 | 150 | H | 120 | -63.2 |



FCC 47 CFR Part 15. Limit Clause 15.519(e)

For UWB devices where the frequency at which the highest radiation occurs, $f_M = \frac{f_H + f_L}{2}$, is above 960 MHz, there is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on f_M . That limit is 0 dBm EIRP.

2.3.7 Test Location and Test Equipment Used

This test was carried out in shielded room No. 11

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|----------------------------|-----------------|--------------------|-------|-----------------------------|-----------------|
| EMI test receiver | Rohde & Schwarz | ESW44 | 39897 | 12 | 2020-02 |
| Double ridged horn antenna | Rohde & Schwarz | HF907 | 40089 | 24 | 2021-02 |
| Semi anechoic room | Frankonia | | | | |
| EMC Measurement Software | Rohde & Schwarz | EMC32 V10.50.10 | 19893 | N/A | N/A |

Table 8

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable



Product Service

2.4 Radiated Emissions

2.4.1 Specification Reference

FCC 47 CFR Part 15E, Clauses § 15.519(c) and (d)

2.4.2 Equipment Under Test and Modification State

SIMATIC RTLS4060T. S/N: --- - Modification State 0

2.4.3 Date of Test

2019-09-05 to 2019-09-09

2.4.4 Test Method

Testing was performed in accordance with ANSI C63.10-2013 clause 10.2 and 10.3

Radiated emission in the frequency range 30 MHz to 1 GHz is measured within a semi-anechoic room with ground plane complying with the NSA requirements of ANSI C63.4 for alternative test sites. A linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna") is used. The measurement bandwidth of the test receiver is set to 120 kHz with quasi-peak detector selected.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit.

Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are tested in the position producing the highest emission relative to the limit as verified by prescans in fully anechoic room.

If no prescan in a fully anechoic room is used first a peak scan is performed in four positions to get the whole spectrum of emission caused by EUT with the measuring antenna raised and lowered from 1 to 4 m to find table position, antenna height and antenna polarization for the maximum emission levels.

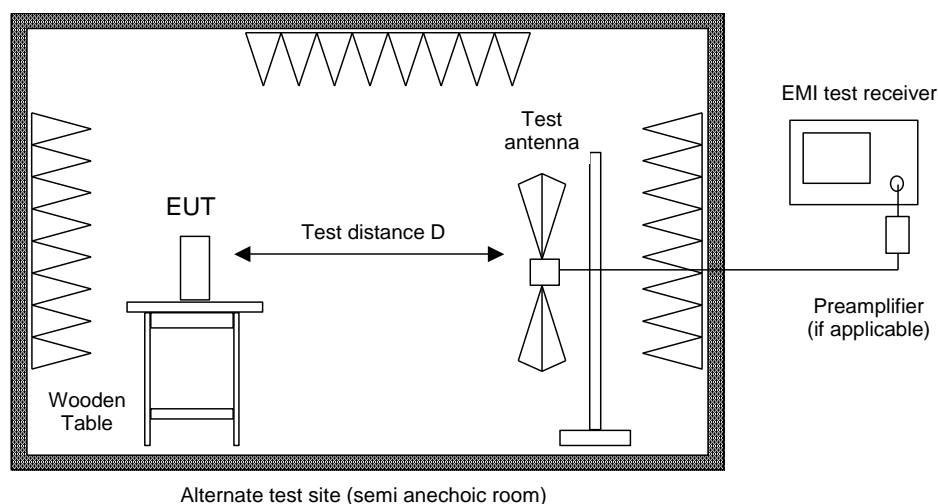
Data reduction is applied to these results to select those levels having less margin than 10 dB to or exceeding the limit using subranges and limited number of maximums. Further maximization is following.

With detector of the test receiver set to quasi-peak final measurements are performed immediately after frequency zoom (for drifting disturbances) and maximum adjustment.

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

In cases where prescans in a fully anechoic room are taken (e. g. if EUT is operating for a short time only or battery is discharged quickly) final measurements with quasi-peak detector are performed manually at frequencies indicated by prescan with EUT rotating all around and receiving antenna raising and lowering within 1 meter to 4 meters to find the maximum levels of emission. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

For measuring emissions of intentional radiators and receivers a test distance D of 3 meters is selected. Testing of unintentional radiators is performed at a distance of 10 meters. If limits specified for 3 meters shall be used for measurements performed at 10 meters distance the limits are calculated according to CFR 47 Part 15 section 15.31(d) and (f)(1) using an inverse linear-distance extrapolation factor of 20 dB/decade.



Radiated emission in fully or semi anechoic room is measured in the frequency range from 1 GHz to the maximum frequency as specified in CFR 47 Part 15 section 15.33.

Measurements are made in both the horizontal and vertical planes of polarization using a spectrum analyzer with the detector function set to peak and resolution as well as video bandwidth set 1 MHz (above 1 GHz).

All tests below 10.6 GHz are performed at a test distance D of 1 meters. For higher frequencies the test distance may be reduced (e.g. to 0.5 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation factor of 20 dB/decade. If required, preamplifiers are used for the whole frequency range. Special care is taken to avoid overload, using appropriate attenuators and filters, if necessary.

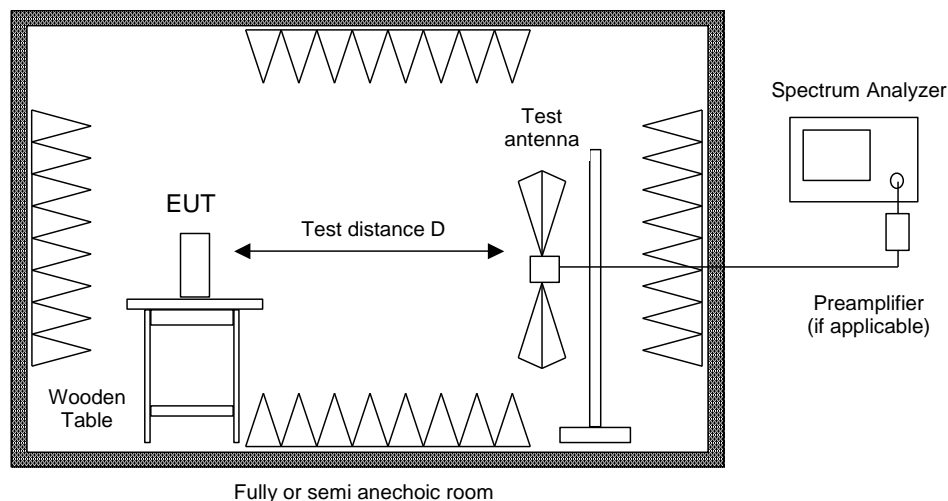
If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit.

Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

During testing the EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

For final testing below 1 GHz a semi anechoic room complying with the NSA requirements of ANSI C63.4 for alternative test sites is used (see 6.5). If prescans are recorded in fully anechoic room they are indicated appropriately.



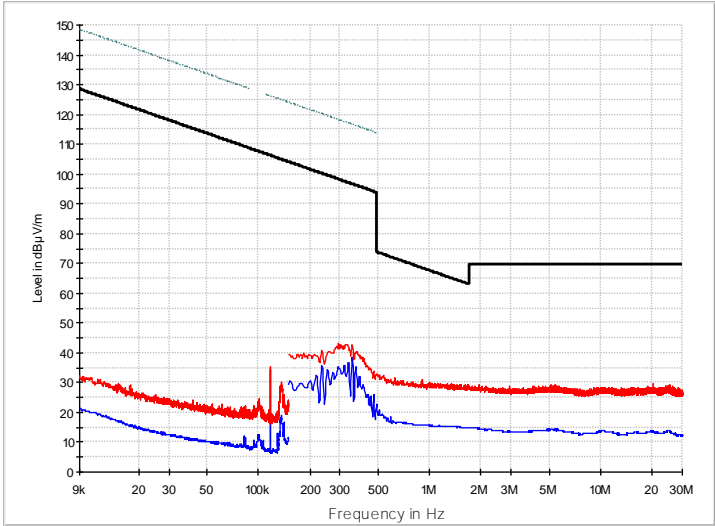
2.4.5 Environmental Conditions

| | |
|---------------------|-------|
| Ambient Temperature | 23 °C |
| Relative Humidity | 48 % |

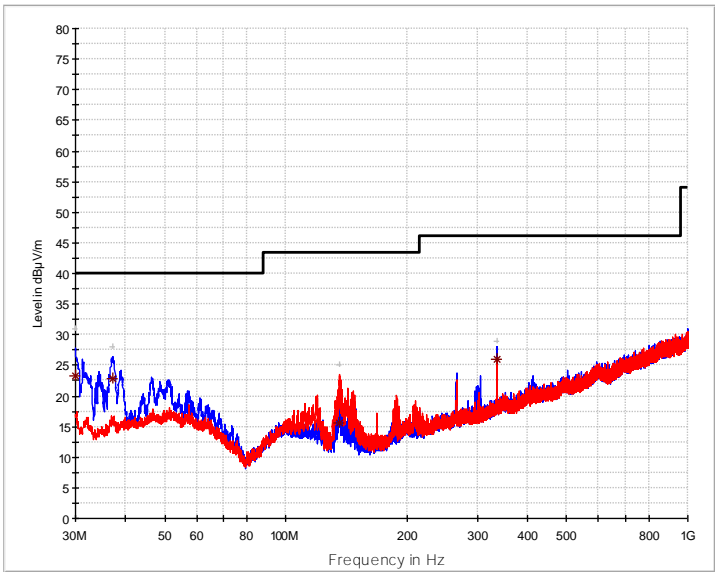


2.4.6 Test Results

Radiated emissions for channel 2:



PreviewResult 2-AVG
PreviewResult 1-PK+
FCCPart 15CElectric Field Strength3mQP+AV(9k-30M)
FCCPart 15CElectric Field Strength3mPK(9k-30M)
Final_Result QPK
Final_Result CAV

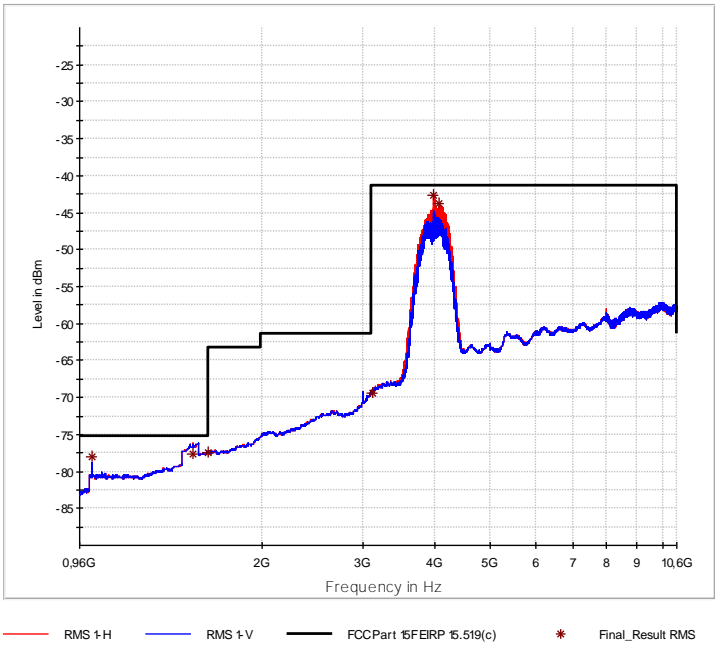


PreviewResult 1-PK+
Critical_FreqsPK+
Final_Result QPK
PreviewResult 1-PK+
FCCPart 15CElectric Field Strength3mQP

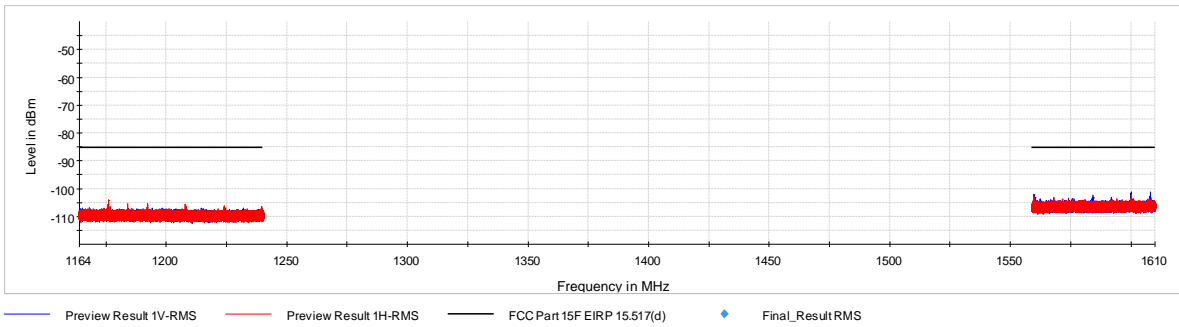
| Frequency | QuasiPeak | Limit | Margin | Meas. Time | Bandwidth | Height | Pol | Azimuth | Corr. |
|------------|-----------|--------|--------|------------|-----------|--------|-----|---------|-------|
| MHz | dBµV/m | dBµV/m | dB | ms | kHz | cm | | deg | dB/m |
| 30.000000 | 23.35 | 40.00 | 16.65 | 1000 | 120 | 122 | V | -2 | 10.6 |
| 37.020000 | 22.88 | 40.00 | 17.12 | 1000 | 120 | 102 | V | -151 | 11.8 |
| 136.050000 | 15.55 | 43.50 | 27.95 | 1000 | 120 | 193 | H | -42 | 8.9 |
| 335.940000 | 25.96 | 46.02 | 20.06 | 1000 | 120 | 159 | V | 0 | 15.9 |



Product Service

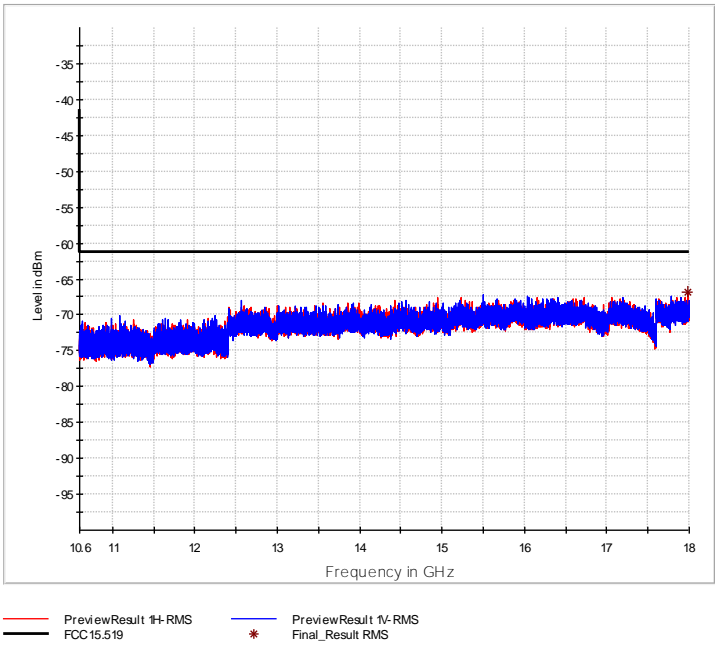


| Frequency MHz | RMS dBm | Limit dBm | Margin dB | Meas. Time ms | Bandwidth kHz | Height cm | Pol | Azimuth deg | Corr. dB |
|---------------|---------|-----------|-----------|---------------|---------------|-----------|-----|-------------|----------|
| 1007.960000 | -78.10 | -75.30 | 2.80 | 1000 | 1000 | 128 | V | -70 | -77.9 |
| 1511.940000 | -77.61 | -75.30 | 2.31 | 1000 | 1000 | 138 | H | 132 | -75.8 |
| 1609.700000 | -77.47 | -75.30 | 2.17 | 1000 | 1000 | 152 | H | -4 | -75.2 |
| 3112.005000 | -69.34 | -41.30 | 28.04 | 1000 | 1000 | 125 | V | 171 | -68.9 |
| 3993.522500 | -42.69 | -41.30 | 1.39 | 1000 | 1000 | 182 | H | -121 | -66.8 |
| 4083.084000 | -43.79 | -41.30 | 2.49 | 1000 | 1000 | 182 | H | -122 | -66.6 |

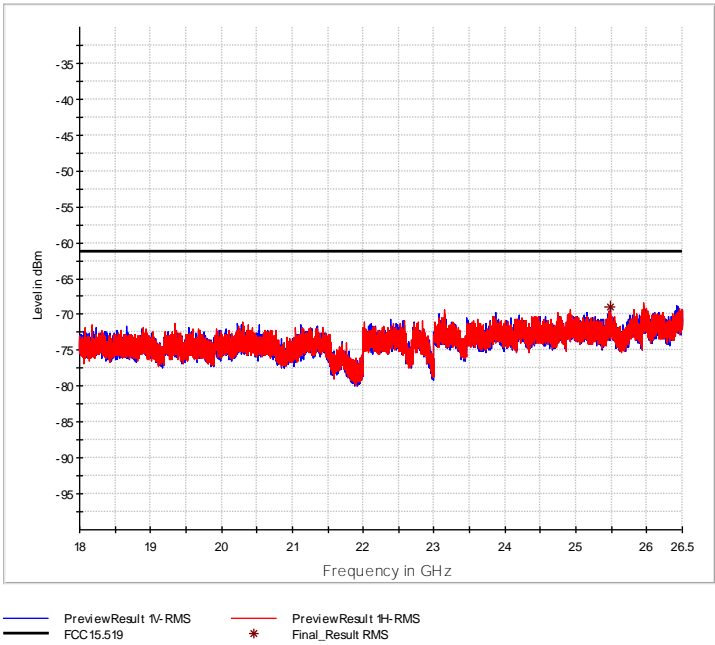




Product Service



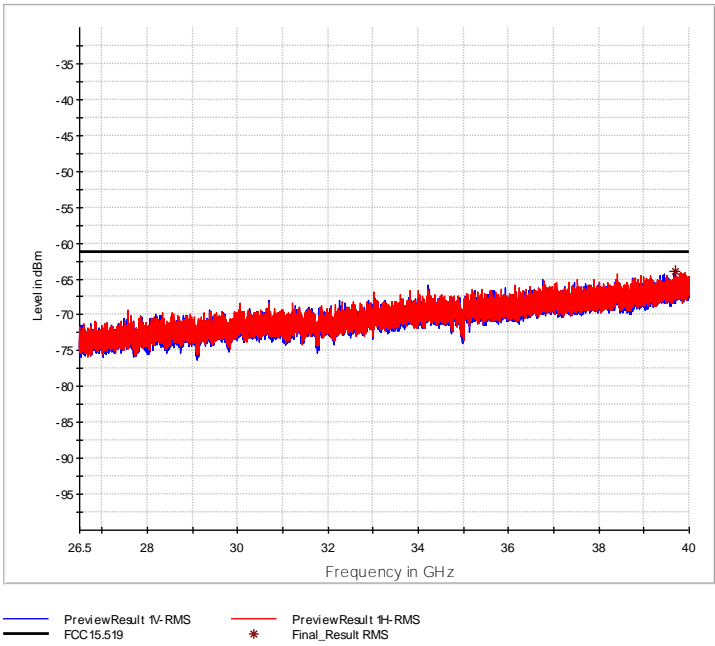
| Frequency MHz | RMS dBm | Limit dBm | Margin dB | Meas. Time ms | Bandwidth kHz | Height cm | Pol | Azimuth deg | Corr. dB |
|---------------|---------|-----------|-----------|---------------|---------------|-----------|-----|-------------|----------|
| 17984.133333 | -66.90 | -61.30 | 5.60 | 5 | 1000 | 150 | H | 20 | -78 |



| Frequency MHz | RMS dBm | Limit dBm | Margin dB | Meas. Time ms | Bandwidth kHz | Height cm | Pol | Azimuth deg | Corr. dB |
|---------------|---------|-----------|-----------|---------------|---------------|-----------|-----|-------------|----------|
| 25478.583333 | -68.88 | -61.30 | 7.58 | 20 | 1000 | 150 | V | 269 | -82 |



Product Service

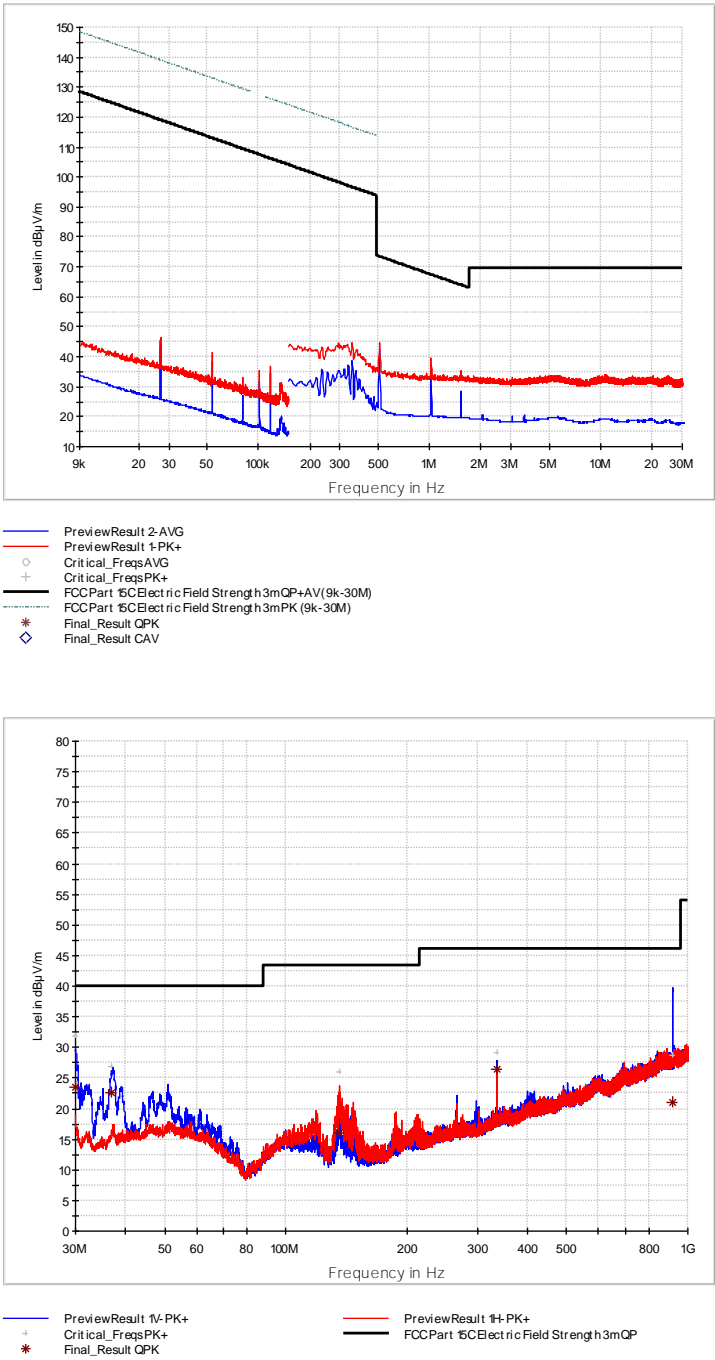


| Frequency MHz | RMS dBm | Limit dBm | Margin dB | Meas. Time ms | Bandwidth kHz | Height cm | Pol | Azimuth deg | Corr. dB |
|------------------|------------|--------------|--------------|------------------|------------------|--------------|-----|----------------|-------------|
| 39681.303571 | -63.90 | -61.30 | 2.60 | 20 | 1000 | 150 | H | 161 | -81.1 |



Product Service

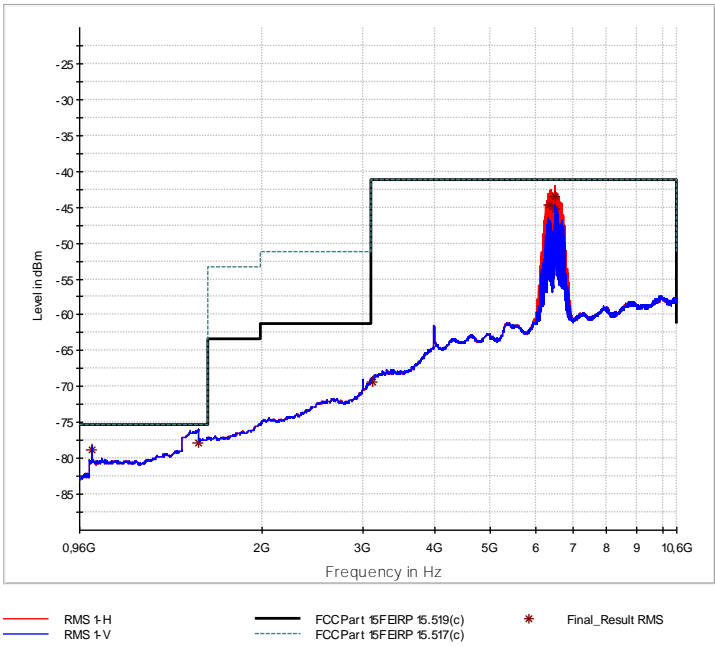
Radiated emissions for channel 5:



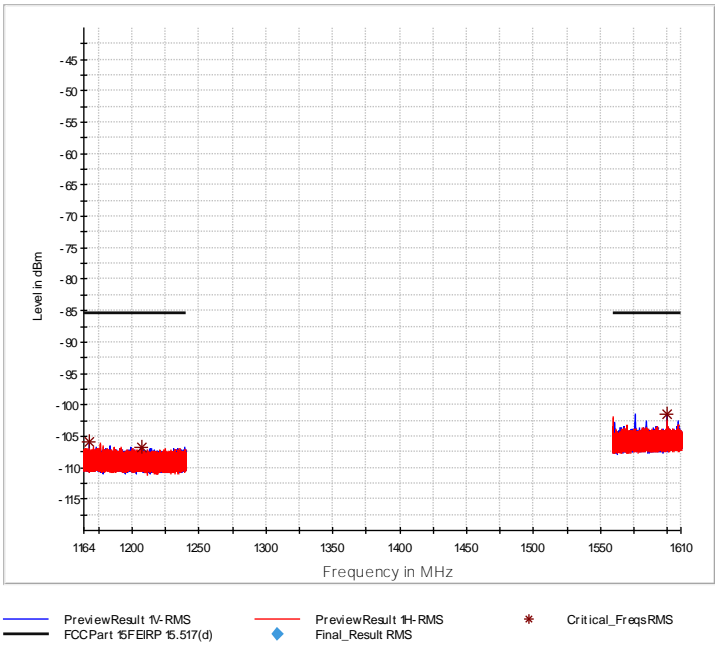
| Frequency | QuasiPeak | Limit | Margin | Meas. Time | Bandwidth | Height | Pol | Azimuth | Corr. |
|------------|-----------|--------|--------|------------|-----------|--------|-----|---------|-------|
| MHz | dBµV/m | dBµV/m | dB | ms | kHz | cm | | deg | dB/m |
| 30.060000 | 23.53 | 40.00 | 16.47 | 1000 | 120 | 118 | V | -60 | 10.6 |
| 36.990000 | 22.68 | 40.00 | 17.32 | 1000 | 120 | 116 | V | 66 | 11.7 |
| 135.690000 | 16.04 | 43.50 | 27.46 | 1000 | 120 | 168 | H | -30 | 9.0 |
| 335.970000 | 26.47 | 46.02 | 19.55 | 1000 | 120 | 140 | V | 3 | 15.9 |
| 915.570000 | 20.93 | 46.02 | 25.09 | 1000 | 120 | 387 | V | 47 | 24.6 |



Product Service

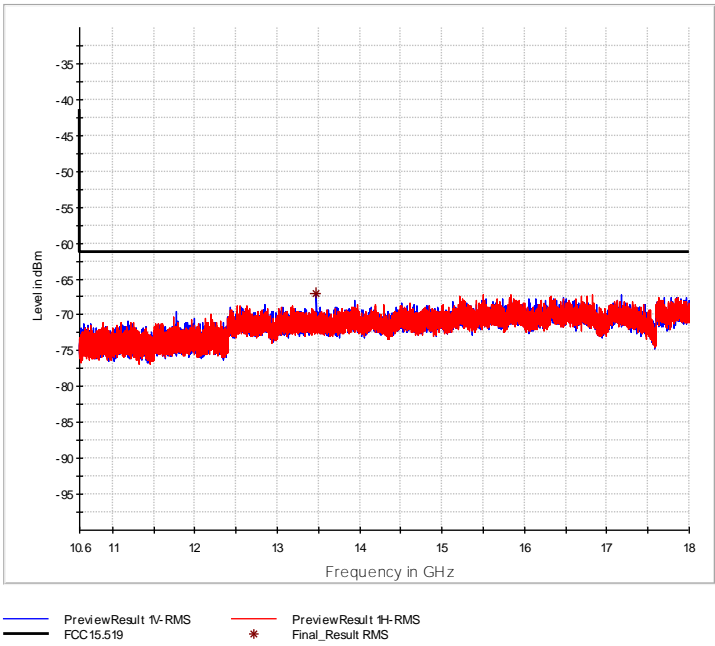


| Frequency MHz | RMS dBm | Limit dBm | Margin dB | Meas. Time ms | Bandwidth kHz | Height cm | Pol | Azimuth deg | Corr. dB |
|---------------|---------|-----------|-----------|---------------|---------------|-----------|-----|-------------|----------|
| 1007.960000 | -78.82 | -75.30 | 3.52 | 1000 | 1000 | 100 | V | -62 | -77.9 |
| 1549.759000 | -77.89 | -75.30 | 2.59 | 1000 | 1000 | 175 | H | -74 | -75.5 |
| 3112.234000 | -69.33 | -41.30 | 28.03 | 1000 | 1000 | 225 | H | 193 | -68.9 |
| 6360.790000 | -44.59 | -41.30 | 3.29 | 1000 | 1000 | 150 | H | 64 | -63.5 |
| 6489.552500 | -43.49 | -41.30 | 2.19 | 1000 | 1000 | 153 | H | 62 | -63.1 |
| 6493.626000 | -45.31 | -41.30 | 4.01 | 1000 | 1000 | 151 | H | 62 | -63.1 |

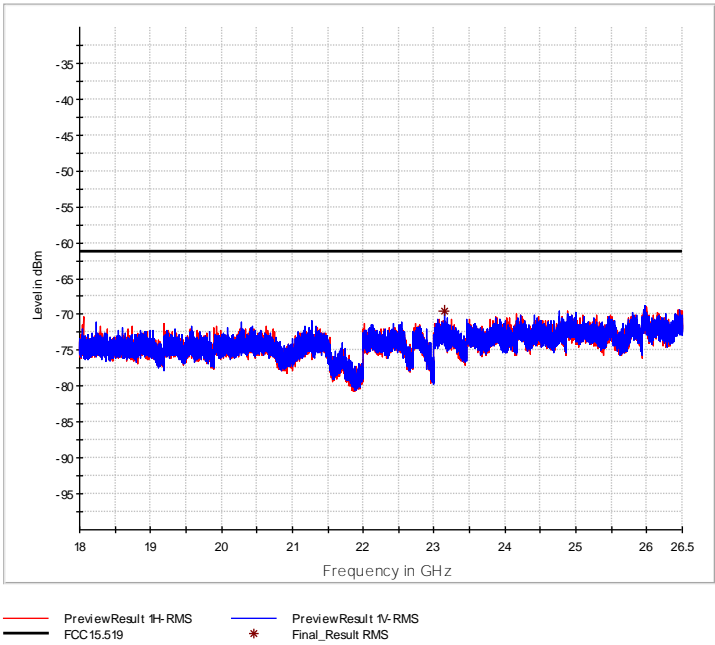




Product Service



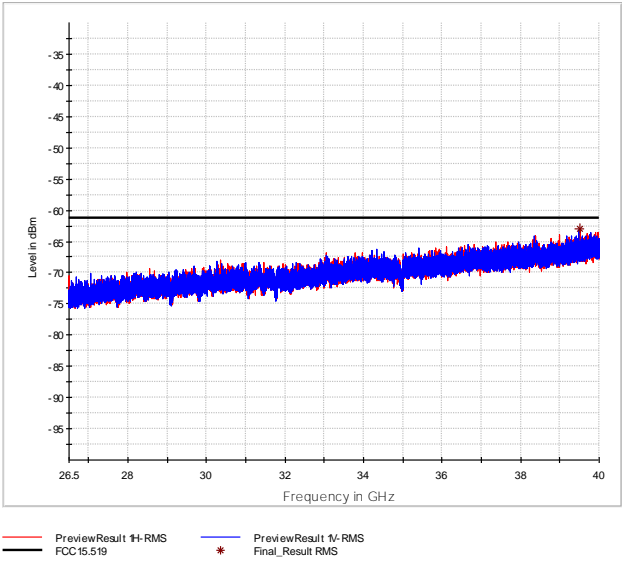
| Frequency MHz | RMS dBm | Limit dBm | Margin dB | Meas. Time ms | Bandwidth kHz | Height cm | Pol | Azimuth deg | Corr. dB |
|------------------|------------|--------------|--------------|------------------|------------------|--------------|-----|----------------|-------------|
| 13477.533333 | -67.08 | -61.30 | 5.78 | 5 | 1000 | 150 | V | 226 | -78.2 |



| Frequency MHz | RMS dBm | Limit dBm | Margin dB | Meas. Time ms | Bandwidth kHz | Height cm | Pol | Azimuth deg | Corr. dB |
|------------------|------------|--------------|--------------|------------------|------------------|--------------|-----|----------------|-------------|
| 23146.277778 | -69.52 | -61.30 | 8.22 | 20 | 1000 | 150 | V | 324 | -82.1 |



Product Service



| Frequency MHz | RMS dBm | Limit dBm | Margin dB | Meas. Time ms | Bandwidth kHz | Height cm | Pol | Azimuth deg | Corr. dB |
|------------------|------------|--------------|--------------|------------------|------------------|--------------|-----|----------------|-------------|
| 39499.535714 | -63.07 | -61.30 | 1.77 | 20 | 1000 | 150 | H | 12 | -81 |



Sample calculation of final values:

Final Value (dBμV/m) = Reading Value (dBμV) + Antenna Correction Factor (dB/m)
 + Cable Correction Factor (dB)

The EIRP values at and above 960 MHz were calculated according to ANSI C63.10, equation (22) (section 9.5):

$$EIRP = E_{Meas} + 20 \log_{10}(d_{Meas}) - 104.7 \text{ dB/m}$$

FCC 47 CFR Part 15, Limit Clauses 15.519(c) and (d) and

The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the levels in § 15.209:

| Frequency | Fieldstrength | | Measurement distance |
|---------------------|---------------------------------|--|----------------------|
| 9 kHz – 490 kHz | $2400/f_{(kHz)} \mu\text{V/m}$ | $67.6 \text{ dB}\mu\text{V/m} - 20 \log_{10}(f_{(kHz)})$ | 300 m |
| 490 kHz – 1.705 MHz | $24000/f_{(kHz)} \mu\text{V/m}$ | $87.6 \text{ dB}\mu\text{V/m} - 20 \log_{10}(f_{(kHz)})$ | 30 m |
| 1.705 MHz – 30 MHz | 30 μV/m | 29.5 dBμV/m | 30 m |
| 30 MHz – 88 MHz | 100 μV/m | 40.0 dBμV/m | 3 m |
| 88 MHz – 216 MHz | 150 μV/m | 43.5 dBμV/m | 3 m |
| 216 MHz – 960 MHz | 200 μV/m | 46.0 dBμV/m | 3 m |

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

| Frequency | EIRP |
|---------------------|-----------|
| 960 MHz – 1610 MHz | -75.3 dBm |
| 1610 MHz – 1990 MHz | -63.3 dBm |
| 1990 MHz – 3.1 GHz | -61.3 dBm |
| 3.1 GHz – 10.6 GHz | -41.3 dBm |
| Above 10.6 GHz | -61.3 dBm |

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

| Frequency | EIRP |
|---------------------|-----------|
| 1164 MHz – 1240 MHz | -85.3 dBm |
| 1559 MHz – 1620 MHz | -85.3 dBm |



2.4.7 Test Location and Test Equipment Used

This test was carried out in Semi anechoic room - cabin no. 8 and a non-shielded-room.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--------------------------------|-------------------------------|------------------|-------|-----------------------------|-----------------|
| TRILOG Antenna (4dB) | Schwarzbeck | VULB 9162 | 20116 | 36 | 2022-01-31 |
| Double ridged horn antenna | Rohde & Schwarz | HF907 | 40089 | 24 | 2021-02 |
| Horn antenna | EMCO | 3160-09 | 19125 | N/A | N/A |
| Horn antenna | EMCO | 3160-10 | 19442 | N/A | N/A |
| EMI test receiver | Rohde & Schwarz | ESW44 | 39897 | 12 | 2020-02 |
| Signal and Spectrum Analysator | Rohde & Schwarz GmbH & Co. KG | FSV40 for TS8997 | 20219 | 12 | 2020-01-31 |
| EMC Measurement Software | Rohde & Schwarz | EMC32 V10.50.10 | 19893 | N/A | N/A |

Table 9

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable



2.5 Cease of Transmission

2.5.1 Specification Reference

FCC 47 CFR Part 15E, Clauses § 15.519(a)(1)

2.5.2 Equipment Under Test and Modification State

SIMATIC RTLS4060T . S/N: --- - Modification State 1

2.5.3 Date of Test

2020-03-31

2.5.4 Test Method

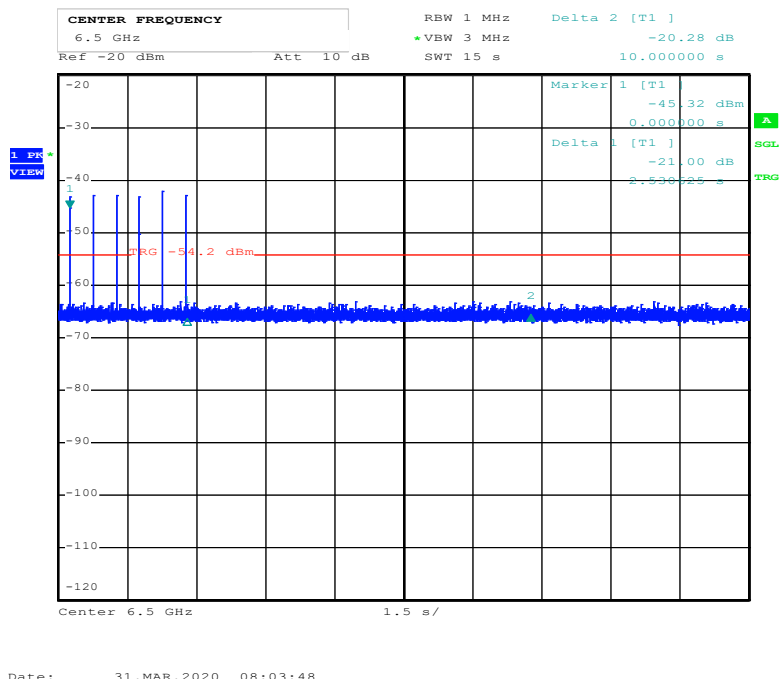
The EUT was connected to an associated receiver (Wireless Mesh Gateway) and the EUT was set to continuous transmission (parameter IF2_AnchorLimit was set to 0). The associated receiver was turned off at 0 s (Marker 1). The RF output of the EUT was observed with a spectrum analyser set to zero-span at 6.5 GHz (center frequency of UWB channel).

2.5.5 Environmental Conditions

| | |
|---------------------|-------|
| Ambient Temperature | 21 °C |
| Relative Humidity | 24 % |



2.5.6 Test Results



The EUT shuts off within 2.53 s, which is shorter than 10 s. The requirement is fulfilled.

47 CFR, § 15.519(a)(1)

The device is to transmit only when it is sending information to an associated receiver. The device shall cease transmission of information within 10 s 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 s 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.

2.5.7 Test Location and Test Equipment Used

This test was carried out in fully anechoic room - cabin No. 2

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|---------------------|-----------------|---------|-------|-----------------------------|-----------------|
| Horn antenna | EMCO | 3160-06 | 18873 | O/P | |
| Spectrum analysator | Rohde & Schwarz | FSP30 | 19533 | 12 | 2020-08 |

Table 10

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable



2.6 RF Exposure

2.6.1 Specification Reference

KDB 447498 D01, V06; section 4.3 a)

2.6.2 Equipment Under Test and Modification State

SIMATIC RTLS4060T, S/N: --- - Modification State 0

2.6.3 Date of Test

2019-09-09

2.6.4 Test Results

| | | | | | | | |
|---------------------------|------|---|---------------------|--|--|--|-------------------------------------|
| Carrier frequency: | f | = | 4 GHz | | | | |
| Distance: | d | = | 5 mm | | | | |
| Transmitter output power: | TP | = | 53.7 nW (-42.7 dBm) | | | | |
| SAR Threshold | | | $2.1 \cdot 10^{-8}$ | | | | |
| SAR Threshold Limit: | | | 3.0 | | | | <input checked="" type="checkbox"/> |

Note: The 6487.565 MHz UWB radio is exempt from SAR based on the output power (0.205 mW) being less than 1 mW.

Limit definition:

For 100 MHz to 6 GHz and test separation distances ≤ 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.

2.6.5 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 | 2020-02 |
| Double ridged horn antenna | Rohde & Schwarz | HF907 | 40089 | 24 | 2021-02 |
| EMC Measurement Software | Rohde & Schwarz | EMC32 V10.50.10 | 19893 | N/A | N/A |

Table 11



Product Service

3 Photographs

3.1 Photographs of EUT

For external photos please refer to Annex B of this test report.

3.2 Photographs of EUT

For test setup photos please refer to Annex A of this test report.



4 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 12



| Radio Interference Emission Testing | | | |
|---|----|----------------------|------|
| Test Name | kp | Expanded Uncertainty | Note |
| Conducted Voltage Emission | | | |
| 9 kHz to 150 kHz (50 Ω /50 μ H AMN) | 2 | ± 3.8 dB | 1 |
| 150 kHz to 30 MHz (50 Ω /50 μ H AMN) | 2 | ± 3.4 dB | 1 |
| 100 kHz to 200 MHz (50 Ω /5 μ H AMN) | 2 | ± 3.6 dB | 1 |
| Discontinuous Conducted Emission | | | |
| 9 kHz to 150 kHz (50 Ω /50 μ H AMN) | 2 | ± 3.8 dB | 1 |
| 150 kHz to 30 MHz (50 Ω /50 μ H 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 13



| 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 14

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 to ETSI TR 100 028 V1.4.1 (all parts) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 1.96$, providing a level of confidence of $p = 95.45\%$

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 $p = 95.45\%$