

EMI - TEST REPORT

- FCC Part 15.407, 5470-5725 MHz, RSS247 -

Type / Model Name : SCALANCE W700 / MSN

Product Description : Industrial WLAN access point

Applicant : Siemens AG, Industrial Automation Division

Address : Gleiwitzer Strasse 555

90475 NUERNBERG, GERMANY

Manufacturer : Siemens AG, Sensors & Communication

Address : Oestliche Rheinbrueckenstrasse 50

76187 KARLSRUHE, GERMANY

Licence holder : Siemens AG, Industrial Automation Division

Address : Gleiwitzer Strasse 555

90475 NUERNBERG, GERMANY

| | |
|--|-----------------|
| Test Result according to the standards listed in clause 1 test standards: | POSITIVE |
|--|-----------------|

| | |
|--|-------------------------------------|
| Test Report No. : T40580-02-03HS | 17. May 2016 <hr/> Date of issue |
|--|-------------------------------------|



Deutsche
Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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ATTACHMENT A as separate supplement

2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT – Detailed photos see ATTACHMENT A

2.2 General remarks:

The EUT is fully tested and approved according the “old Rules”. This test report shall show the further compliance to the “new Rules” under the premise that no operating parameter of the EUT are changed (No change in output power). The measurement values stay the same as under the “old Rules” and are already documented with the test report T36325-00-14HS by mikes testing partners. Therefore, no additional re-measurement under the “new rules”.

2.3 Equipment category

WLAN - AP

2.4 Short description of the equipment under test (EUT)

The EUT is a 2-Port WLAN-access point. The firmware does not support ad-hoc modes. The possibility to choose the channel for data transmission or power setting in relation to the used antenna with antenna cable makes a professional installation necessary. The AP is compatible with 802.11h, 802.11n Standard. It supports the 2.4 GHz and 5 GHz frequency band and supports no beam forming.

Number of tested samples: 1
 Serial number: VPF8196398
 Firmware version: V05.01.01

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

2.5 Variants of the EUT

| Variant | Device-Name | WLAN-Interfaces | LAN connector | Antenna Ports | Order numbers |
|---------|---------------|-----------------|---------------|---------------|--------------------|
| V01 | MSN-W1-RJ-E2 | 1 | RJ45 | 2 | 6GK5734-1FX00-xxxx |
| V02 | MSN-W1-M12-E2 | 1 | M12 | 2 | 6GK5774-1FY00-xxxx |

2.6 Operation frequency and channel plan

The operating frequency is 5470 MHz to 5725 MHz.

Channel plan WLAN Standard 802.11h/n, HT20:

| Channel | Frequency (MHz) |
|---------|-----------------|
| 100 | 5500 |
| 104 | 5520 |
| 108 | 5540 |
| 112 | 5560 |
| 116 | 5580 |
| 120 | 5600 |
| 124 | 5620 |
| 128 | 5640 |
| 132 | 5660 |
| 136 | 5680 |
| 140 | 5700 |

Note: The red marked channels are not supported by the firmware.

Note: The blue marked frequencies are determined for final testing.

HT40 mode:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 100up | 5510 | 104down | 5510 |
| 108up | 5550 | 112down | 5550 |
| 116up | 5590 | 120down | 5590 |
| 124up | 5630 | 128down | 5630 |
| 132up | 5670 | 136down | 5670 |

Note: The red marked channels are not supported by the firmware.

Note: The blue marked frequencies are determined for final testing.

2.7 Transmit operating modes

The module use OFDM modulation and is capable to provide following data rates:

- 802.11h 54, 48, 36, 24, 18, 12, 9, 6 Mbps
- 802.11n HT20, MCS 0 - 15
- 802.11n HT40, MCS 0 - 15

HT20

MCS parameters for mandatory 20 MHz, NSS = 1, NES = 1

| MCS Index | Modulation | R | N _{BPSCS(iSS)} | N _{SD} | N _{SP} | N _{CBPS} | N _{DBPS} | Data rate (Mb/s) | |
|-----------|------------|-----|-------------------------|-----------------|-----------------|-------------------|-------------------|------------------|----------------------|
| | | | | | | | | 800 ns GI | 400 ns GI (see NOTE) |
| 0 | BPSK | 1/2 | 1 | 52 | 4 | 52 | 26 | 6.5 | 7.2 |
| 1 | QPSK | 1/2 | 2 | 52 | 4 | 104 | 52 | 13.0 | 14.4 |
| 2 | QPSK | 3/4 | 2 | 52 | 4 | 104 | 78 | 19.5 | 21.7 |
| 3 | 16-QAM | 1/2 | 4 | 52 | 4 | 208 | 104 | 26.0 | 28.9 |
| 4 | 16-QAM | 3/4 | 4 | 52 | 4 | 208 | 156 | 39.0 | 43.3 |
| 5 | 64-QAM | 2/3 | 6 | 52 | 4 | 312 | 208 | 52.0 | 57.8 |
| 6 | 64-QAM | 3/4 | 6 | 52 | 4 | 312 | 234 | 58.5 | 65.0 |
| 7 | 64-QAM | 5/6 | 6 | 52 | 4 | 312 | 260 | 65.0 | 72.2 |

NOTE—Support of 400 ns GI is optional on transmit and receive.

MCS parameters for optional 20 MHz, NSS = 2, NES = 1, EQM

| MCS Index | Modulation | R | $N_{BPSCS(i_{SS})}$ | N_{SD} | N_{SP} | N_{CBPS} | N_{DBPS} | Data rate (Mb/s) | |
|-----------|------------|-----|---------------------|----------|----------|------------|------------|------------------|----------------------|
| | | | | | | | | 800 ns GI | 400 ns GI (see NOTE) |
| 8 | BPSK | 1/2 | 1 | 52 | 4 | 104 | 52 | 13.0 | 14.4 |
| 9 | QPSK | 1/2 | 2 | 52 | 4 | 208 | 104 | 26.0 | 28.9 |
| 10 | QPSK | 3/4 | 2 | 52 | 4 | 208 | 156 | 39.0 | 43.3 |
| 11 | 16-QAM | 1/2 | 4 | 52 | 4 | 416 | 208 | 52.0 | 57.8 |
| 12 | 16-QAM | 3/4 | 4 | 52 | 4 | 416 | 312 | 78.0 | 86.7 |
| 13 | 64-QAM | 2/3 | 6 | 52 | 4 | 624 | 416 | 104.0 | 115.6 |
| 14 | 64-QAM | 3/4 | 6 | 52 | 4 | 624 | 468 | 117.0 | 130.0 |
| 15 | 64-QAM | 5/6 | 6 | 52 | 4 | 624 | 520 | 130.0 | 144.4 |

NOTE—The 400 ns GI rate values are rounded to 1 decimal place.

HT40
MCS parameters for optional 40 MHz, NSS = 1, NES = 1

| MCS Index | Modulation | R | $N_{BPSCS(i_{SS})}$ | N_{SD} | N_{SP} | N_{CBPS} | N_{DBPS} | Data rate (Mb/s) | |
|-----------|------------|-----|---------------------|----------|----------|------------|------------|------------------|-----------|
| | | | | | | | | 800 ns GI | 400 ns GI |
| 0 | BPSK | 1/2 | 1 | 108 | 6 | 108 | 54 | 13.5 | 15.0 |
| 1 | QPSK | 1/2 | 2 | 108 | 6 | 216 | 108 | 27.0 | 30.0 |
| 2 | QPSK | 3/4 | 2 | 108 | 6 | 216 | 162 | 40.5 | 45.0 |
| 3 | 16-QAM | 1/2 | 4 | 108 | 6 | 432 | 216 | 54.0 | 60.0 |
| 4 | 16-QAM | 3/4 | 4 | 108 | 6 | 432 | 324 | 81.0 | 90.0 |
| 5 | 64-QAM | 2/3 | 6 | 108 | 6 | 648 | 432 | 108.0 | 120.0 |
| 6 | 64-QAM | 3/4 | 6 | 108 | 6 | 648 | 486 | 121.5 | 135.0 |
| 7 | 64-QAM | 5/6 | 6 | 108 | 6 | 648 | 540 | 135.0 | 150.0 |

MCS parameters for optional 40 MHz, NSS = 2, NES = 1, EQM

| MCS Index | Modulation | R | $N_{BPSCS(i_{SS})}$ | N_{SD} | N_{SP} | N_{CBPS} | N_{DBPS} | Data rate (Mb/s) | |
|-----------|------------|-----|---------------------|----------|----------|------------|------------|------------------|-----------|
| | | | | | | | | 800 ns GI | 400 ns GI |
| 8 | BPSK | 1/2 | 1 | 108 | 6 | 216 | 108 | 27.0 | 30.0 |
| 9 | QPSK | 1/2 | 2 | 108 | 6 | 432 | 216 | 54.0 | 60.0 |
| 10 | QPSK | 3/4 | 2 | 108 | 6 | 432 | 324 | 81.0 | 90.0 |
| 11 | 16-QAM | 1/2 | 4 | 108 | 6 | 864 | 432 | 108.0 | 120.0 |
| 12 | 16-QAM | 3/4 | 4 | 108 | 6 | 864 | 648 | 162.0 | 180.0 |
| 13 | 64-QAM | 2/3 | 6 | 108 | 6 | 1296 | 864 | 216.0 | 240.0 |
| 14 | 64-QAM | 3/4 | 6 | 108 | 6 | 1296 | 972 | 243.0 | 270.0 |
| 15 | 64-QAM | 5/6 | 6 | 108 | 6 | 1296 | 1080 | 270.0 | 300.0 |

2.11 Determination of worst case conditions for final measurement

Measurements are made in all three orthogonal axes and the settings of the EUT are changed to locate at which position and at what setting of the EUT produce the maximum of the emissions.

The tests are carried out in the following frequency band:

5470 - 5725 MHz

Preliminary tests are performed to find the worst-case mode from all possible combinations between available modulations and data rates. The maximum output power depends on used data rate. The EUT is controlled for several tests with special test software used for testing only where continuous signals are needed. For the tests a max possible duty cycle (x) is set.

Following channels and test modes are selected for the final test as listed below:

| WLAN | Available channel | Tested channels | Power setting | Modulation | Modulation type | Data rate |
|---------------|-------------------|------------------------|---------------|------------|-----------------|---------------------|
| 802.11h | 100 to 140 | 100, 116, 140 | P14, P17, P20 | OFDM | BPSK | 6 Mbps |
| 802.11n; HT20 | 52 to 64 | 100, 116, 140 | P14, P17, P20 | OFDM | BPSK | MCS0 (BW=20 MHz) |
| 802.11n; HT40 | 100up to 132up | 100up, 108up, 132up | P14, P17, P20 | OFDM | BPSK | MCS8 (BW=40 MHz) |

- TX continuous mode, 802.11h
One port mode, 2 port mode,
- TX continuous mode, 802.11n
One port mode, 2 port mode,

2.11.1 Test jig

No test jig is used.

2.11.2 Test software

Test software is used to set TX continuous in device service mode. Power, channel and modulation (data rate) setting is done via network interface which is available for professional settings.

3 TEST RESULT SUMMARY

UNII device using the operating band 5470 MHz - 5725 MHz:

| FCC Rule Part (new rules) | FCC Rule Part (old rules) | Description | Result |
|---------------------------|---------------------------|-----------------------------------|------------|
| 15.407(b)(6) | 15.207(a) | AC power line conducted emissions | Not tested |
| 15.407(a)(5) | 15.407(a) | EBW 26 dB | Not tested |
| 15.407(a)(2) | 15.407(a) | Maximum conducted output power | Not tested |
| 15.407(a)(2) | 15.407(a) | Maximum conducted PSD | Not tested |
| 15.407(b)(2) | 15.407(b) | Undesirable emissions | Not tested |
| 15.407(b)(7) | 15.205(a) | Emissions in restricted bands | Not tested |
| 15.407(a) | 15.407(a) | Antenna requirement | Not tested |
| 15.407(g) | 15.407(g) | Frequency stability | Not tested |

| RSS Rule Part (new rules) | RSS Rule Part (old rules) | Description | Result |
|---------------------------|---------------------------|--|------------|
| RSS-Gen, 8.8 | RSS Gen, 7.2.4. | AC power line conducted emissions | Not tested |
| RSS247, 6.2.3(1) | RSS210, A9.2 | Maximum conducted output power | Not tested |
| RSS247, 6.2.3(2) | RSS210, A9.2 | Unwanted emission, radiated | Not tested |
| RSS-Gen, 8.9 | RSS-Gen, 7.2.2 | Unwanted emissions in restricted bands | Not tested |
| RSS247, 6.2.3(1) | RSS210, A9.2 | Maximum power spectral density | Not tested |
| RSS-Gen, 6.10 | RSS-Gen, 4.5 | Pulsed operation | Not tested |
| RSS-Gen, 6.6 | RSS-Gen, 7.1.2 | Antenna requirement | Not tested |
| RSS-Gen, 6.11 | RSS-Gen, 7.2.6 | Transmitter frequency stability | Not tested |
| RSS-Gen, 6.6 | RSS210, A9.2 | 99 % Bandwidth | Not tested |
| RSS 102, 2.5.2 | RSS 102, 2.5.2 | MPE | Not tested |

The mentioned new RSS Rule Parts in the above table are related to:

RSS Gen, Issue 4, November 2014

RSS 247, Issue 1, May 2015

RSS 102, Issue 4, March 2015

The mentioned old RSS Rule Parts in the above table are related to:

RSS Gen, Issue 3, December 2010

RSS 210, Issue 8, December 2010

RSS 102, Issue 4, March 2010

3.1 Final assessment

The equipment under test fulfills the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 03 May 2016

Testing concluded on : 04 May 2016

Checked by:



Klaus Gegenfurtner
I confirm the correctness
and Integrity of this
document
2016.05.18 12:38:17
+02'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:



Hermann Smetana
I am the author of
this document
2016.05.17
21:20:33 +02'00'

Hermann Smetana
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

**CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY**

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 °C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Measurement uncertainty table

| | |
|---|------------------------|
| Measurement output power, conducted | ± 1.5 dB |
| Measurement PSD, conducted | ± 1.5 dB |
| Measurement spurious emissions, conducted | ± 3.0 dB |
| Measurement spurious emissions, radiated | ± 6.0 dB |
| Measurement frequency | $\pm 1 \times 10^{-6}$ |

4.1 Measurement protocol for FCC and ISED

4.1.1 General information

4.1.1.1 Test methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

The open area test site is a listed under the Canadian Test-Sites File-No:

IC 3009A-1

In compliance with RSS 247 testing for RSS compliance may be achieved by following the procedures set out in ANSI C63.10 and applying the CISPR 22 limits.

4.1.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left without termination. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.1.1.3 Details of test procedures

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.10 - "American national standard of procedures for compliance testing of unlicensed wireless devices". In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.10 and applying the CISPR 22 limits.

5 TEST CONDITIONS AND RESULTS

5.1 AC power line conducted emissions

For test instruments and accessories used see section 6 Part **A 4**.

5.1.1 Description of the test location

Test location: NONE

Remarks: This measurement is already documented in the test report T36325-00-14HS.

5.2 EBW and OBW

For test instruments and accessories used see section 6 Part **MB**.

5.2.1 Description of the test location

Test location: NONE

Remarks: This measurement is already documented in the test report T35625-00-14HS.

5.3 Maximum conducted output power

For test instruments and accessories used see section 6 Part **CPC 3**.

5.3.1 Description of the test location

Test location: NONE

Remarks: This measurement is already documented in the test report T35625-00-14HS.

5.3.2 Maximum power spectral density

For test instruments and accessories used see section 6 Part **CPC 3**.

5.3.3 Description of the test location

Test location: AREA 4

Remarks: This measurement is already documented in the test report T36325-00-14HS.

5.4 Defacto limit

For test instruments and accessories used see section 6 Part **CPC 3**.

5.4.1 Description of the test location

Test location: AREA 4

Remarks: This measurement is already documented in the test report T36325-00-14HS.

5.5 Unwanted emissions in restricted bands, conducted

For test instruments and accessories used see section 6 Part **SEC 1, 2** and **SEC 3**.

5.5.1 Description of the test location

Test location: NONE

Remarks: This measurement is already documented in the test report T36325-00-14HS.

5.6 Frequency stability

For test instruments and accessories used see section 6 Part **MB**.

5.6.1 Description of the test location

Test location: NONE

Remarks: This measurement is already documented in the test report T36325-00-14HS.

5.7 Antenna application

5.7.1 Applicable standard

According to FCC Part 15C, Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT use the listed antennas for MIMO technique. The equipment connector is SMA-R.

Remarks: This measurement is already documented in the test report T36325-00-14HS.

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

| Test ID | Model Type | Equipment No. | Next Calib. | Last Calib. | Next Verif. | Last Verif. |
|---------|------------|---------------|-------------|-------------|-------------|-------------|
| - | - | - | - | - | - | - |