



# TEST REPORT

**Test Report No. : UL-RPT-RP-11909763-3716-FCC-UNII2A**

**Applicant** : SIEMENS AG  
**Model No.** : MPCIE-R1-ABGNAC-U4  
**FCC ID** : LYHRAPACV1  
**Technology** : WLAN 5 GHz  
**Test Standard(s)** : FCC Parts 15.207 & 15.407(b)(6)

For details of applied tests refer to test result summary

1. This test report shall not be reproduced in full or partial, without the written approval of UL International Germany GmbH.
2. The results in this report apply only to the sample tested.
3. The test results in this report are traceable to the national or international standards.
4. Test Report Version 1.0
5. Result of the tested sample: **PASS**

Prepared by: Krume, Ivanov  
Title: Laboratory Engineer  
Date: 21 February 2020

Approved by: Ajit, Phadtare  
Title: Lead Test Engineer  
Date: 21 February 2020



Deutsche  
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D-PL-19381-02-00

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The tests reported herein have been performed in  
accordance with its' terms of accreditation.

## UL INTERNATIONAL GERMANY GMBH

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## **1. Customer Information**

### **1.1.Applicant Information**

|                                |  |
|--------------------------------|--|
| <b>Company Name:</b>           | SIEMENS AG   |
| <b>Company Address:</b>        | Östliche Rheinbrückenstr. 50, 76187 Karlsruhe, Germany |
| <b>Contact Person:</b>         | Dr. Malgorzata Janson                                  |
| <b>Contact E-Mail Address:</b> | malgorzata.janson@siemens.com                          |
| <b>Contact Phone No.:</b>      | + 49 721 595 2606                                      |

### **1.2.Manufacturer Information**

|                                |                           |
|--------------------------------|---------------------------|
| <b>Company Name:</b>           | SIEMENS AG                |
| <b>Company Address:</b>        | 76181 Karlsruhe, Germany  |
| <b>Contact Person:</b>         | Mr. Kilian Löser          |
| <b>Contact E-Mail Address:</b> | kilian.loeser@siemens.com |
| <b>Contact Phone No.:</b>      | +49 911 895-5363          |

## **2. Summary of Testing**

### **2.1. General Information**

#### **Applied Standards**

|                                 |   |
|---------------------------------|---|
| <b>Specification Reference:</b> | 47CFR15.407 and 47CFR15.403   |
| <b>Specification Title:</b>     | Code of Federal Regulations Volume 47 (Telecommunications):<br>Part 15 Subpart E (Unlicensed National Information Infrastructure Devices) –<br>Sections 15.403 and 15.407 |
| <b>Specification Reference:</b> | 47CFR15.207   |
| <b>Specification Title:</b>     | Code of Federal Regulations Volume 47 (Telecommunications):<br>Part 15 Subpart C (Intentional Radiators) - Sections 15.207  |
| <b>Test Firm Registration:</b>  | 399704  |

#### **Location**

|                             |  |
|-----------------------------|--|
| <b>Location of Testing:</b> | UL International Germany GmbH<br>Hedelfinger Str. 61<br>70327 Stuttgart<br>Germany |
|-----------------------------|--|

#### **Date information**

|                      |                                      |
|----------------------|--------------------------------------|
| <b>Order Date:</b>   | 26 September 2017                    |
| <b>EUT arrived:</b>  | 26 January 2018                      |
| <b>Test Dates:</b>   | 17 February 2020 to 18 February 2020 |
| <b>EUT returned:</b> | -/-                                  |

## 2.2. Summary of Test Results

| Clause                          | Measurement (5.25-5.35 GHz band)   | Complied                            | Did not comply           | Not performed                       | Not applicable                      |
|---------------------------------|--|-------------------------------------|--------------------------|-------------------------------------|-------------------------------------|
| Part 15.207 / Part 15.407(b)(6) | Transmitter AC Conducted Emissions   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Part 15.403(i)                  | Transmitter 26 dB Emission Bandwidth <sup>(Note 1)</sup>                                 | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Part 15.35(c)                   | Transmitter Duty Cycle <sup>(Note 1)</sup>   | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Part 15.407(a)(2)               | Transmitter Maximum Conducted Output Power <sup>(Note 1)</sup>                           | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Part 15.407(a)(2)               | Transmitter Power Spectral Density <sup>(Note 1)</sup>                                   | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Part 15.407(b)/15.209(a)        | Transmitter Out of Band Conducted Emissions <sup>(Note 1)</sup>                          | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Part 15.407(b)/15.209(a)        | Transmitter Out of Band Radiated Emissions <sup>(Note 1)</sup>                           | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Part 15.407(b)/15.209(a)        | Transmitter Band Edge Radiated Emissions <sup>(Note 1)</sup>                             | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Part 15.407(g)                  | Transmitter Frequency Stability <sup>(Note 2)</sup><br>(Temperature & Voltage Variation) | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Part 15.407(h)(1)               | Transmitter Power Control  | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

### Note:

1. Refer separate test report : UL-RPT-RP11909763-3716A.pdf
2. As per applicant's user manual Frequency stability is better than 20 ppm which ensures that the signal remains in the allocated bands under all operational conditions stated in the user manual.

## 2.3. Methods and Procedures

|            |  |
|------------|--|
| Reference: | ANSI C63.10-2013   |
| Title:     | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices |
| Reference: | KDB 174176 D01 Line Conducted FAQ v01r01 June 3, 2015  |
| Title:     | AC Power-Line Conducted Emissions Frequently Asked Questions                                   |

## 2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

### **3. Equipment Under Test (EUT)**

#### **3.1. Identification of Equipment Under Test (EUT)**

|                                 |   |
|---------------------------------|---|
| <b>Brand Name:</b>              | SIEMENS                                 |
| <b>Model Name or Number:</b>    | MPCI-E-R1-ABGNAC-U4                     |
| <b>Model Type:</b>              | A5E36528526                             |
| <b>Serial/ Fixed IP Number:</b> | 192.168.0.70 (AC Conducted Test Sample) |
| <b>Hardware Version Number:</b> | 1                                       |
| <b>Software Version Number:</b> | V02.00.00                               |
| <b>FCC ID:</b>                  | LYHRAPACV1                              |

#### **3.2. Description of EUT**

The equipment under test was a 4 X 4 MIMO radio module supporting WLAN 2.4 GHz & WLAN 5 GHz technologies.

#### **3.3. Modifications Incorporated in the EUT**

No modifications were applied to the EUT during testing.

**3.4. Additional Information Related to Testing**

|   |                                      |  |        |
|---|--------------------------------------|--|--------|
| <b>Technology Tested:</b>                                 | WLAN (IEEE 802.11a,n, ac)            |  |        |
| <b>Type of Unit:</b>                                      | Transceiver                          |  |        |
| <b>Test Evaluation Board Power Supply Requirement(s):</b> | Nominal                              | 24.0 V DC  |        |
|   | Minimum                              | 16.8 V DC  |        |
|   | Maximum                              | 31.2 V DC  |        |
| <b>EUT Power Supply Requirement(s):</b>                   | Power Range                          | 3.3 V DC ± 5 %   | 520 mA |
|   | Power Range                          | 5.0 V DC ± 5 %   | 700 mA |
| <b>Supported Modulation Types:</b>                        | BPSK, QPSK, 16QAM, 64QAM, 256QAM     |  |        |
| <b>Supported Data rates:</b>                              | 802.11a                              | 6, 9, 12, 18, 24, 36 ,48 & 54 Mbit/s (SISO or MIMO)  |        |
|   | 802.11n HT20                         | MCS0 to MCS7 (1 spatial stream)<br>MCS8 to MCS15 (2 spatial streams)<br>MCS16 to MCS23 (3 spatial streams)<br>MCS24 to MCS31 (4 spatial streams) |        |
|   | 802.11n HT40                         | MCS0 to MCS7 (1 spatial stream)<br>MCS8 to MCS15 (2 spatial streams)<br>MCS16 to MCS23 (3 spatial streams)<br>MCS24 to MCS31 (4 spatial streams) |        |
|   | 802.11ac HT20                        | MCS0 to MCS8 (up to 4 spatial streams)   |        |
|   | 802.11ac HT40                        | MCS0 to MCS9 (up to 4 spatial streams)   |        |
|   | 802.11ac HT80                        | MCS0 to MCS9 (up to 4 spatial streams)   |        |
|   | <b>Antenna Gain:</b>                 | Refer Section 3.5  |        |
| <b>Transceiver Frequency Band:</b>                        | 5250 MHz to 5350 MHz [U-NII-2A Band] |  |        |



### **3.5. Antenna Information**

Antenna type with highest antenna gain amongst supported radiation pattern was used for the EUT testing:

|                                     |                      |
|-------------------------------------|----------------------|
| <b>Antenna Group:</b>               | 23 dBi Antenna Group |
| <b>Antenna Radiation Type:</b>      | Directed             |
| <b>Antenna Model Number:</b>        | ANT793-8DK           |
| <b>Antenna Gain:</b>                | 23 dBi @ 5 GHz       |
| <b>Antenna Cable Loss:</b>          | 8.8 dB @ 5 GHz       |
| <b>Effective Antenna Gain:</b>      | 14.2 dBi @ 5 GHz     |
| <b>Antenna Beamwidth:</b>           | 55°H / 55°V          |
| <b>Antenna Connector Type:</b>      | N                    |
| <b>Manufacturer Article Number:</b> | 6GK5793-8DK00-0AA0   |
| <b>Batch Number:</b>                | 02 722467            |

### **3.6. Support Equipment**

The following support equipment was used to exercise the EUT during testing:

#### **A. Support Equipment (In-house)**

| Item | Description | Brand Name | Model Name or Number | Serial Number   |
|------|-------------|------------|----------------------|-----------------|
| 1    | Laptop      | Lenovo     | L560                 | MP-16X73B 16/11 |

#### **B. Support Equipment (Manufacturer supplied)**

| Item | Description   | Brand Name                              | Model Name or Number  | Serial Number    |
|------|---|---|---|------------------|
| 1    | DC Power Supply Cable<br>(Length: 0.5 m   Quantity: 2 Pcs)  | --                                      | Standard 2 wire cable                                       | --               |
| 2    | M12- RJ45 Ethernet Cable<br>(Length: 2 m   Quantity: 2 Pcs)   | SIEMENS                                 | LEONI L<br>INDUSTRIAL<br>ETHERNET<br>FLEXIBLE<br>6XV1870-2E | --               |
| 3    | N-N Connector Antenna Cable<br>(Length: 10 m   Quantity: 4 Pcs)   | SIEMENS<br>Simatic Net<br>Antenna Cable | 6XV1875-5AN10<br>J39  | --               |
| 4    | Test Evaluation Board<br>(Quantity: 2 Pcs)  | SIEMENS                                 | A5E36374290-AE<br>GTW 18 94V-0                              | --               |
| 5    | UMCC- N Connector Cable<br>(Length: 0.25 m   Quantity: 4 Pcs)   | SIEMENS                                 | --  | --               |
| 6    | N Connector-50 $\Omega$ Terminations<br>(Quantity: 4 Pcs)   | SIEMENS                                 | --  | --               |
| 7    | SIMATIC PS 307 Power Supply<br>(Input: AC 120 /230 V   2.3 /1.2 A   50-60 Hz)<br>(Output: DC 24 V  5 A)   (Quantity: 1 Pcs) | SIEMENS                                 | 6ES7307-1EA01-<br>0AA0                                      | YSU/HO<br>165357 |

## **4. Operation and Monitoring of the EUT during Testing**

### **4.1. Operating Mode**

The EUT was tested in the following operating mode(s):

**Continuously transmitting modulated carrier with the following settings:**

- **Maximum Power Settings\*: PWL 18**
- **Test Channel\*: 56**
- **Worst Case\*: n(HT20)-MCS 1-MIMO 1+2+3+4 mode**

\*Multiple supported modulation schemes, nominal channel bandwidths and SISO/MIMO configurations were initially investigated to determine the above mentioned worst case data rates in terms of highest output power & widest bandwidth.

**4.2. Configuration and Peripherals**

The EUT was tested in the following configuration(s):

- **EUT Power Supply:**
  - For AC Conducted measurement EUT(the radio module) was mounted on Test Evaluation Board. Using Siemens SIMATIC PS 307 Power Supply, 24 V DC was supplied to this board; which in turn supplying 3.3 V DC to EUT.
- **Test Mode Activation:**
  - For continuous transmit tests the EUT was controlled using the chipset manufacturers ‘cli’ console over tera-term and putty. This was run from within the terminal application on the EUT. The application was used to enable continuous transmission mode and to select the test channel, data rate and modulation scheme as required.
- **AC Conducted Emissions Measurements:**
  - For AC conducted emission measurements, tests were performed with MIMO Port 1+2+3+4, connected with the UMCC- N Connector Cable + N-N Connector Antenna Cable to each of the antenna.
  - The Toyo EMI Software EP5/CE Ver 4.0.1. was used for these measurements.

**4.3. Used RF Cables**

For AC conducted emission measurements performed with 4 Antennas, EUT ports were connected with following RF cables to the 10 m Antenna Cable which in turn connected to each of the antenna. For further details refer Section 3. B.

| Antenna Group Type   | EUT to Antennas Cable Details                                      |
|--|--|
|  | MIMO Mode Port 1+2+3+4   |
| 23 dBi Antenna Group   | UMCC- N Connector Cables +<br>N-N Connector Antenna Cables (10 m)* |
| *As per applicant’s declaration 23 dBi Antenna Group radiated tests have been carried out with N-N Connector Antenna Cable (10 m) having maximum loss of 8.8 dB @ 5 GHz bands. An RF level offset was entered in GUI settings to compensate the loss of those N-N Connector Antenna Cable. |  |

## **5. Measurements, Examinations and Derived Results**

### **5.1. General Comments**

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to Section 6 *Measurement Uncertainty* for details.

In accordance with DAkkS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

## 5.2. Test Results

### 5.2.1. Transmitter AC Conducted Spurious Emissions

#### Test Summary:

|                            |                            |             |                       |
|----------------------------|----------------------------|-------------|-----------------------|
| Test Engineers:            | Krume Ivanov & Bernd Woerl | Test Dates: | 17 & 18 February 2020 |
| Test Sample Serial Number: | 192.168.0.70               |             |                       |
| Test Site Identification   | SR 7/8                     |             |                       |

|                   |  |
|-------------------|--|
| FCC Reference:    | Part 15.207  |
| Test Method Used: | ANSI C63.10 Section 6.2 / FCC KDB 174176 and notes below |

#### Environmental Conditions:

|                        |          |
|------------------------|----------|
| Temperature (°C):      | 21 to 23 |
| Relative Humidity (%): | 34 to 40 |

#### Settings of the Instrument

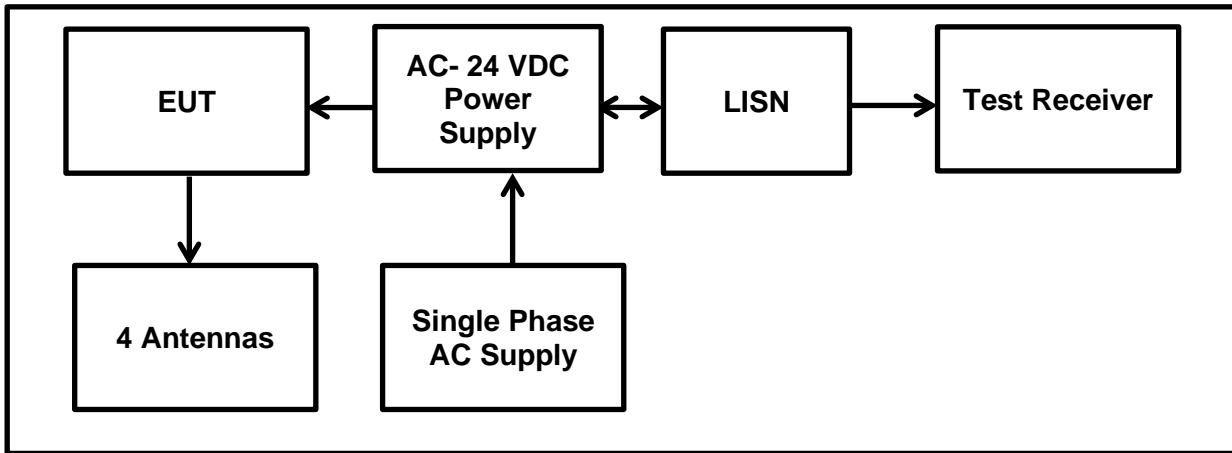
|          |                          |
|----------|--------------------------|
| Detector | Quasi Peak/ Average Peak |
|----------|--------------------------|

#### Notes:

- Measurement software used: Toyo EMI Software; CE measurement software EP5/CE Ver 4.0.1.
- The EUT was powered by supplying 24 V DC via SIEMENS SIMATIC PS 307 Power Supply.
- In accordance with FCC KDB 174176 Q4; the SIEMENS SIMATIC PS 307 Power Supply was connected to 120 VAC 60 Hz single phase supply via a LISN.
- In accordance with FCC KDB 174176 Q4; the SIEMENS SIMATIC PS 307 Power Supply was connected to 240 VAC 60 Hz single phase supply via a LISN.
- AC conducted tests were performed with the EUT set to the worst case mode:
  - MIMO Port 1+2+3+4 employing maximum possible Antennas
  - maximum power level setting (PWL 18) | n-Mode | Data rate: MCS1 | Bandwidth: 20 MHz | Channel 56 (5280 MHz)
- Measurements were performed in shielded room (SR7/ 8 Asset Number 1603671). The EUT was placed at a height of 80 cm above the reference ground plane and in a distance of 40 cm from the vertical ground plane at the edge of the table.
- Pre-scans were performed and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.
- All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
- The final measured value, for the given emission, in the table below incorporates the cable loss. Calculation: Level = test receiver reading + path loss (cable attenuation + correction LISN).

**Transmitter AC Conducted Spurious Emissions (continued)**

**Test setup:**



**Transmitter AC Conducted Spurious Emissions (continued)****Results: Live (L1) / Quasi Peak / 120 VAC 60 Hz / 23 dBi Antenna Group**

| Frequency [MHz] | Line Phase | Reading QP [dB(μV)] | Correction Factor [dB] | Level QP [dB(μV)] | Limit QP [dB(μV)] | Margin QP [dB] | Result   |
|-----------------|------------|---------------------|------------------------|-------------------|-------------------|----------------|----------|
| 0.16303         | Live (L1)  | 29.5                | 9.9                    | 39.4              | 65.3              | 25.9           | Complied |
| 0.22365         | Live (L1)  | 27.0                | 9.9                    | 36.9              | 62.7              | 25.8           | Complied |
| 0.33537         | Live (L1)  | 23.8                | 9.8                    | 33.6              | 59.3              | 25.7           | Complied |
| 3.59519         | Live (L1)  | 24.7                | 9.9                    | 34.6              | 56.0              | 21.4           | Complied |
| 10.23246        | Live (L1)  | 15.7                | 10.0                   | 25.7              | 60.0              | 34.3           | Complied |
| 16.55912        | Live (L1)  | 18.7                | 10.1                   | 28.8              | 60.0              | 31.2           | Complied |

**Results: Live (L1) / Average / 120 VAC 60 Hz / 23 dBi Antenna Group**

| Frequency [MHz] | Line Phase | Reading AV [dB(μV)] | Correction Factor [dB] | Level AV [dB(μV)] | Limit AV [dB(μV)] | Margin AV [dB] | Result   |
|-----------------|------------|---------------------|------------------------|-------------------|-------------------|----------------|----------|
| 0.16303         | Live (L1)  | 16.4                | 9.9                    | 26.3              | 55.3              | 29.0           | Complied |
| 0.22365         | Live (L1)  | 15.9                | 9.9                    | 25.8              | 52.7              | 26.9           | Complied |
| 0.33537         | Live (L1)  | 10.8                | 9.8                    | 20.6              | 49.3              | 28.7           | Complied |
| 3.59519         | Live (L1)  | 9.6                 | 9.9                    | 19.5              | 46.0              | 26.5           | Complied |
| 10.23246        | Live (L1)  | 11.6                | 10.0                   | 21.6              | 50.0              | 28.4           | Complied |
| 16.55912        | Live (L1)  | 9.4                 | 10.1                   | 19.5              | 50.0              | 30.5           | Complied |

**Result: Pass**



**Transmitter AC Conducted Spurious Emissions (continued)****Results: Neutral (N) / Quasi Peak / 120 VAC 60 Hz / 23 dBi Antenna Group**

| Frequency [MHz] | Line Phase  | Reading QP [dB(μV)] | Correction Factor [dB] | Level QP [dB(μV)] | Limit QP [dB(μV)] | Margin QP [dB] | Result   |
|-----------------|-------------|---------------------|------------------------|-------------------|-------------------|----------------|----------|
| 0.16553         | Neutral (N) | 29.2                | 9.9                    | 39.1              | 65.2              | 26.1           | Complied |
| 0.18657         | Neutral (N) | 28.0                | 9.9                    | 37.9              | 64.2              | 26.3           | Complied |
| 0.23918         | Neutral (N) | 25.9                | 9.9                    | 35.8              | 62.1              | 26.3           | Complied |
| 0.30030         | Neutral (N) | 23.9                | 9.8                    | 33.7              | 60.2              | 26.5           | Complied |
| 3.31062         | Neutral (N) | 14.1                | 9.9                    | 24.0              | 56.0              | 32.0           | Complied |
| 14.69539        | Neutral (N) | 16.5                | 10.1                   | 26.6              | 60.0              | 33.4           | Complied |

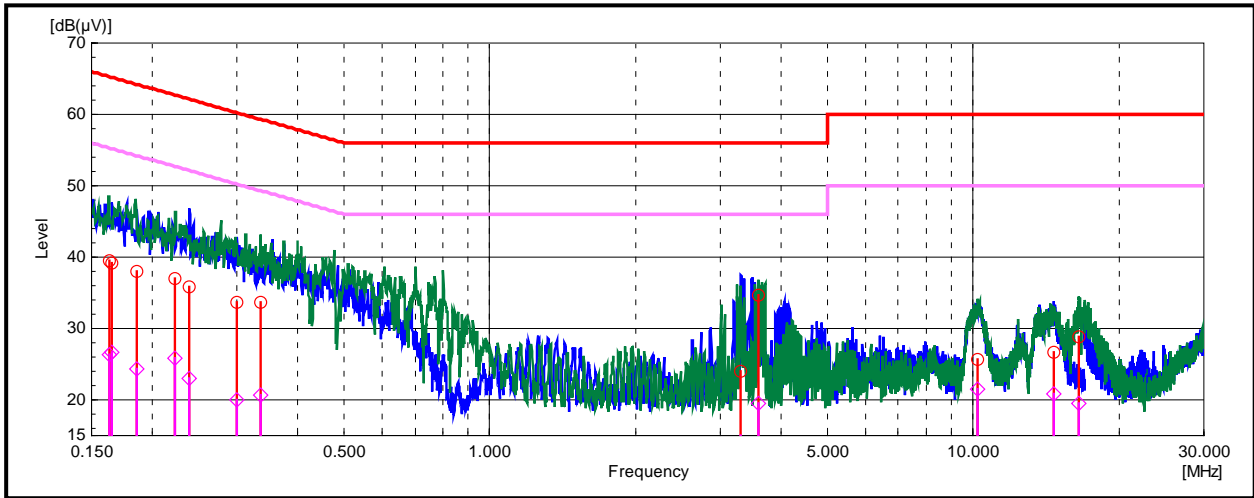
**Results: Neutral (N) / Average / 120 VAC 60 Hz / 23 dBi Antenna Group**

| Frequency [MHz] | Line Phase  | Reading AV [dB(μV)] | Correction Factor [dB] | Level AV [dB(μV)] | Limit AV [dB(μV)] | Margin AV [dB] | Result   |
|-----------------|-------------|---------------------|------------------------|-------------------|-------------------|----------------|----------|
| 0.16553         | Neutral (N) | 16.8                | 9.9                    | 26.7              | 55.2              | 28.5           | Complied |
| 0.18657         | Neutral (N) | 14.4                | 9.9                    | 24.3              | 54.2              | 29.9           | Complied |
| 0.23918         | Neutral (N) | 13.0                | 9.9                    | 22.9              | 52.1              | 29.2           | Complied |
| 0.30030         | Neutral (N) | 10.3                | 9.8                    | 20.1              | 50.2              | 30.1           | Complied |
| 3.31062         | Neutral (N) | 2.7                 | 9.9                    | 12.6              | 46.0              | 33.4           | Complied |
| 14.69539        | Neutral (N) | 10.7                | 10.1                   | 20.8              | 50.0              | 29.2           | Complied |

**Result: Pass**

**Transmitter AC Conducted Spurious Emissions (continued)**

**Plot: Live and Neutral Line / 120 VAC 60 Hz / 23 dBi Antenna Group**



Note: The plots show the max hold (peak detector) pre-scan results measured. Blue graph represents the result of the N-Line; green graph - the results for L1-Line. The bar graphs indicate the final measurement result applying the dedicated detector at selected frequencies for each limit line (red cycle for quasi peak limit; violet cycle for average limit).

| Legend (Conducted Emissions) |   |
|------------------------------|---|
| Items                        | Description   |
|                              | Blue graph is the result of peak measurement phase L  |
|                              | Green graph is the result of peak measurement phase N |
|                              | Limit line <b>Quasi-Peak</b>                          |
|                              | Limit line <b>Average</b>                             |
|                              | Final item <b>Quasi-Peak</b>                          |
|                              | Final item <b>Average</b>                             |

**Transmitter AC Conducted Spurious Emissions (continued) :****Results: Live (L1) / Quasi Peak / 240 VAC 60 Hz / 23 dBi Antenna Group**

| Frequency [MHz] | Line Phase | Reading QP [dB(μV)] | Correction Factor [dB] | Level QP [dB(μV)] | Limit QP [dB(μV)] | Margin QP [dB] | Result   |
|-----------------|------------|---------------------|------------------------|-------------------|-------------------|----------------|----------|
| 0.16653         | Live (L1)  | 29.5                | 9.9                    | 39.4              | 65.1              | 25.7           | Complied |
| 0.19459         | Live (L1)  | 27.0                | 9.9                    | 36.9              | 63.8              | 26.9           | Complied |
| 0.21713         | Live (L1)  | 26.2                | 9.9                    | 36.1              | 62.9              | 26.8           | Complied |
| 0.34790         | Live (L1)  | 22.4                | 9.8                    | 32.2              | 59.0              | 26.8           | Complied |
| 3.63527         | Live (L1)  | 16.1                | 9.9                    | 26.0              | 56.0              | 30.0           | Complied |
| 13.65331        | Live (L1)  | 8.4                 | 10.1                   | 18.5              | 60.0              | 41.5           | Complied |

**Results: Live (L1) / Average / 240 VAC 60 Hz / 23 dBi Antenna Group**

| Frequency [MHz] | Line Phase | Reading AV [dB(μV)] | Correction Factor [dB] | Level AV [dB(μV)] | Limit AV [dB(μV)] | Margin AV [dB] | Result   |
|-----------------|------------|---------------------|------------------------|-------------------|-------------------|----------------|----------|
| 0.16653         | Live (L1)  | 19.3                | 9.9                    | 29.2              | 55.1              | 25.9           | Complied |
| 0.19459         | Live (L1)  | 10.7                | 9.9                    | 20.6              | 53.8              | 33.2           | Complied |
| 0.21713         | Live (L1)  | 10.0                | 9.9                    | 19.9              | 52.9              | 33.0           | Complied |
| 0.34790         | Live (L1)  | 10.0                | 9.8                    | 19.8              | 49.0              | 29.2           | Complied |
| 3.63527         | Live (L1)  | 4.5                 | 9.9                    | 14.4              | 46.0              | 31.6           | Complied |
| 13.65331        | Live (L1)  | 2.0                 | 10.1                   | 12.1              | 50.0              | 37.9           | Complied |

**Result: Pass**

**Transmitter AC Conducted Spurious Emissions (continued)****Results: Neutral (N) / Quasi Peak / 240 VAC 60 Hz / 23 dBi Antenna Group**

| Frequency [MHz] | Line Phase  | Reading QP [dB(μV)] | Correction Factor [dB] | Level QP [dB(μV)] | Limit QP [dB(μV)] | Margin QP [dB] | Result   |
|-----------------|-------------|---------------------|------------------------|-------------------|-------------------|----------------|----------|
| 0.17655         | Neutral (N) | 32.0                | 9.9                    | 41.9              | 64.6              | 22.7           | Complied |
| 0.20411         | Neutral (N) | 26.6                | 9.9                    | 36.5              | 63.4              | 26.9           | Complied |
| 0.23267         | Neutral (N) | 29.5                | 9.9                    | 39.4              | 62.4              | 23.0           | Complied |
| 0.28978         | Neutral (N) | 25.6                | 9.8                    | 35.4              | 60.5              | 25.1           | Complied |
| 3.36273         | Neutral (N) | 16.1                | 9.9                    | 26.0              | 56.0              | 30.0           | Complied |
| 14.66533        | Neutral (N) | 15.3                | 10.1                   | 25.4              | 60.0              | 34.6           | Complied |

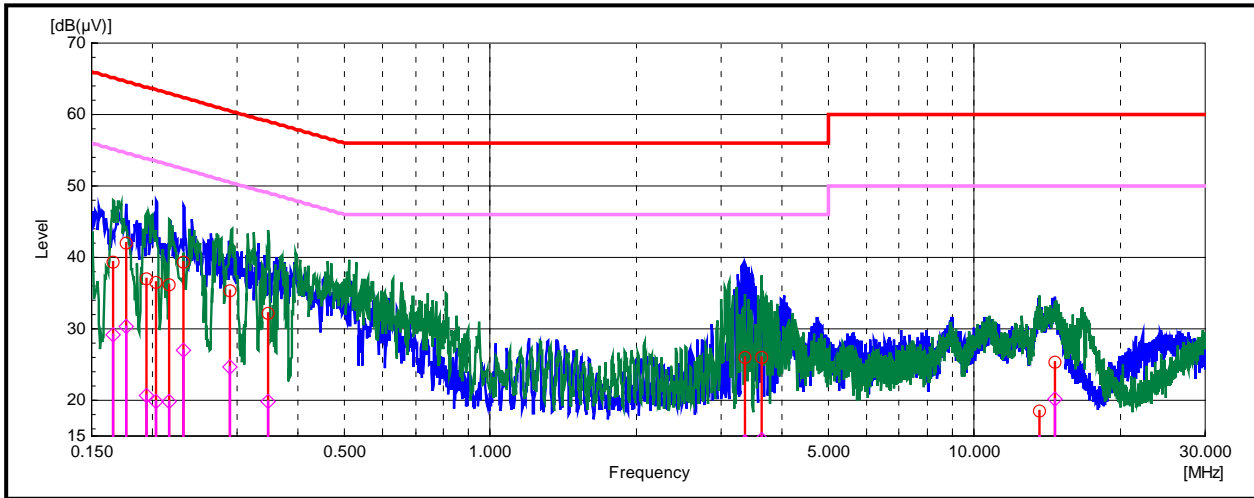
**Results: Neutral (N) / Average / 240 VAC 60 Hz / 23 dBi Antenna Group**

| Frequency [MHz] | Line Phase  | Reading AV [dB(μV)] | Correction Factor [dB] | Level AV [dB(μV)] | Limit AV [dB(μV)] | Margin AV [dB] | Result   |
|-----------------|-------------|---------------------|------------------------|-------------------|-------------------|----------------|----------|
| 0.17655         | Neutral (N) | 20.4                | 9.9                    | 30.3              | 54.6              | 24.3           | Complied |
| 0.20411         | Neutral (N) | 9.9                 | 9.9                    | 19.8              | 53.4              | 33.6           | Complied |
| 0.23267         | Neutral (N) | 17.2                | 9.9                    | 27.1              | 52.4              | 25.3           | Complied |
| 0.28978         | Neutral (N) | 14.9                | 9.8                    | 24.7              | 50.5              | 25.8           | Complied |
| 3.36273         | Neutral (N) | 4.3                 | 9.9                    | 14.2              | 46.0              | 31.8           | Complied |
| 14.66533        | Neutral (N) | 10.1                | 10.1                   | 20.2              | 50.0              | 29.8           | Complied |

**Result: Pass**

**Transmitter AC Conducted Spurious Emissions (continued)**

**Plot: Live and Neutral Line / 240 VAC 60 Hz / 23 dBi Antenna Group**



Note: The plots show the max hold (peak detector) pre-scan results measured. Blue graph represents the result of the N-Line; green graph - the results for L1-Line. The bar graphs indicate the final measurement result applying the dedicated detector at selected frequencies for each limit line (red cycle for quasi peak limit; violet cycle for average limit).

| Legend (Conducted Emissions) |   |
|------------------------------|---|
| Items                        | Description   |
|                              | Blue graph is the result of peak measurement phase L  |
|                              | Green graph is the result of peak measurement phase N |
|                              | Limit line <b>Quasi-Peak</b>                          |
|                              | Limit line <b>Average</b>                             |
|                              | Final item <b>Quasi-Peak</b>                          |
|                              | Final item <b>Average</b>                             |

## **6. Measurement Uncertainty**

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

| <b>Measurement Type</b>         | <b>Confidence Level (%)</b> | <b>Calculated Uncertainty</b> |
|---------------------------------|-----------------------------|-------------------------------|
| AC Conducted Spurious Emissions | 95%                         | ±2.49 dB                      |

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

## **7. Used equipment**

### **Test site: SR 7/8**

| <b>ID</b> | <b>Manufacturer</b>                 | <b>Type</b>                           | <b>Model</b> | <b>Serial</b>         | <b>Cal Date</b>  | <b>Cal. Cycle</b> |
|-----------|-------------------------------------|---------------------------------------|--------------|-----------------------|------------------|-------------------|
| 22        | Rohde & Schwarz                     | Artificial Mains                      | ESH3-Z5      | 831767/014            | 2019-07-09       | 12                |
| 23        | Rohde & Schwarz                     | Artificial Mains                      | ESH3-Z5      | 831767/013            | 2019-07-09       | 12                |
| 28        | Rohde & Schwarz                     | Passive Probe                         | ESH2-Z3      | none                  | 2019-07-11       | 12                |
| 215       | Rohde & Schwarz                     | Artificial Mains Network              | ESH2-Z5      | 879675/002            | 2019-07-05       | 12                |
| 349       | Rohde & Schwarz                     | Receiver, EMI Test                    | ESIB7        | 836697/009            | 2019-07-10       | 12                |
| 351       | Rohde & Schwarz                     | network, Artificial Mains             | ESH3-Z5      | 862770/018            | 2019-07-08       | 12                |
| 370       | Rohde & Schwarz                     | Current probe                         | EZ-17        | 833335/010            | 2019-07-11       | 24                |
| 564       | Teseq                               | Impedance stabilisation network (ISN) | ISN T800     | 26076                 | 2019-07-08       | 24                |
| 565       | Teseq                               | Impedance stabilisation network (ISN) | ISN ST08     | 26575                 | 2019-07-09       | 12                |
| 616       | Rohde & Schwarz                     | ISN                                   | ENY81-CA6    | 101656                | 2019-07-09       | 12                |
| -/-       | Testo                               | Thermo-Hygrometer                     | 608-H1       | 08                    | lab verification | n/a               |
| 1603671   | Siemens<br>Matsushita<br>Components | shielded room                         |              | B83117-<br>A1421-T162 | n/a              | n/a               |

## 8. Report Revision History

| Version Number | Revision Details |        |                 |
|----------------|------------------|--------|-----------------|
|                | Page No(s)       | Clause | Details         |
| 1.0            | 24               | -      | Initial Version |