

Report on the FCC and IC Testing of the  
Dr. Ing. h.c. F. Porsche Aktiengesellschaft  
Charge Manager. Model: Porsche Home Energy  
Manager  
In accordance with FCC 47 CFR Part 15B and  
ICES-003

Prepared for: Dr. Ing. h.c. F. Porsche Aktiengesellschaft  
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70435 Stuttgart  
Germany

FCC ID: 2ATXC-HEM10  
ICES: 25236-HEM10



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Date: 2019-10-02

Document Number: TR-08667-41617-02 | Issue: 03

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|----------------------|-----------------|------------|-----------|
| Project Management   | Alex Fink       | 2019-10-02 |           |
| Authorised Signatory | Markus Biberger | 2019-10-02 |           |

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 15B and ICES-003. The sample tested was found to comply with the requirements defined in the applied rules.

| RESPONSIBLE FOR | NAME                         | DATE       | SIGNATURE |
|-----------------|------------------------------|------------|-----------|
| Testing         | Stefan Moser<br>Laura Werder | 2019-10-02 |           |

Laboratory Accreditation

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

Laboratory recognition

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

Industry Canada test site registration

3050A-2

### EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15B and ICES-003:2017 and 2016.



Bundeszagentur

BNetzA-CAB-16/21-15

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# 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                                                                                                                                                                                                         | 2019-03-13    |
| 2     | Applicant/Manufacturer corrected from "Porsche Engineering Group GmbH" to "Dr. Ing. h.c. F. Porsche Aktiengesellschaft".<br>Model/Typ changed from "HCM" to "Porsche Home Energy Manager".<br>FCC and ISED ID added | 2019-08-12    |
| 3     | Chapter 1.4 "Worst case evaluation" added.<br>Hardware and Software versions corrected.                                                                                                                             | 2019-10-02    |

**Table 1**

## 1.2 Introduction

|                               |                                                |
|-------------------------------|------------------------------------------------|
| Applicant                     | Dr. Ing. h.c. F. Porsche Aktiengesellschaft    |
| Manufacturer                  | Dr. Ing. h.c. F. Porsche Aktiengesellschaft    |
| Model Number(s)               | Porsche Home Energy Manager                    |
| Serial Number(s)              | N/A                                            |
| Hardware Version(s)           | C12                                            |
| Software Version(s)           | 0210                                           |
| Number of Samples Tested      | 1                                              |
| Test Specification/Issue/Date | FCC 47 CFR Part 15B and ICES-003:2017 and 2016 |
| Test Plan/Issue/Date          | ---                                            |
| Order Number                  | 5100067-4                                      |
| Date                          | 2018-09-25                                     |
| Date of Receipt of EUT        | 2019-01-29                                     |
| Start of Test                 | 2019-02-04                                     |
| Finish of Test                | 2019-03-12                                     |
| Name of Engineer(s)           | Stefan Moser and Laura Werder                  |
| Related Document(s)           | ANSI C63.4: 2014                               |



### 1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15B and ICES-003 is shown below.

| Section                                              | Specification Clause | Test Description                         | Result | Comments/Base Standard |
|------------------------------------------------------|----------------------|------------------------------------------|--------|------------------------|
| Configuration and Mode: 120 V / 60 Hz AC Powered OP1 |                      |                                          |        |                        |
| 2.1                                                  | 15.109 and 6.2       | Radiated Disturbance                     | Pass   | ANSI C63.4: 2014---    |
| 2.2                                                  | 15.107 and 6.1       | Conducted Disturbance at Mains Terminals | Pass   | ANSI C63.4: 2014---    |

**Table 2**



#### **1.4 Worst case evaluation**

Testing was performed with following configuration, which was stated by the applicant:

HCM operating mode for worst case

- ☐ Software: Test image v 1.7
- ☐ CPU core utilizes to maximum load using artificial load using Burn-neon and memtester
- ☐ ETH1, WiFi, PLC activated, paired with respective peers (ETH2 only connected)
- ☐ Frequent pings to simulate traffic and verify link status
- ☐ USB flash disk attached and mounted
- ☐ Relays on
- ☐ 3 phase mains voltage connected and continuously measured
- ☐ Current sensors connected to I1, I2 and I3 inputs, I1 carrying current, I2 and I3 left idle and all 12 channels continuously measured
- ☐ RS485/CAN ports are attached only with Cables (Not functional)

#### **1.5 Product Information**

### 1.5.1 Technical Description



Figure 1 - Porsche Home Energy Manager - Front

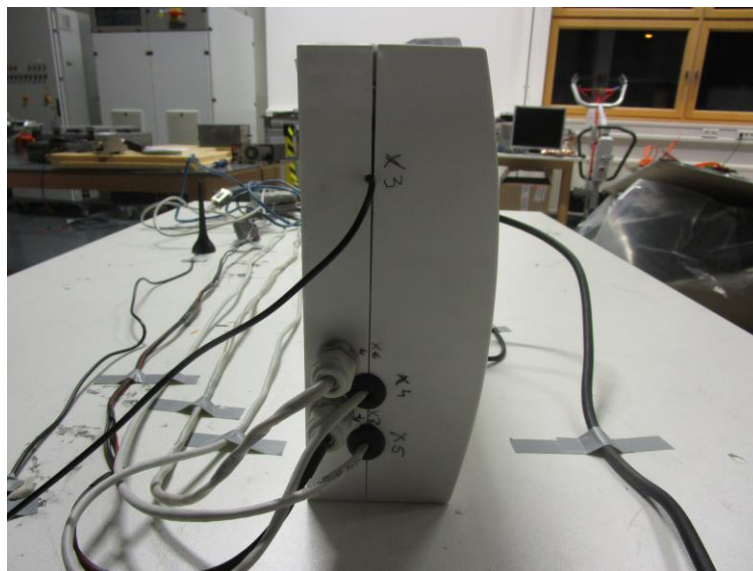


Figure 2 - Porsche Home Energy Manager – Left



Product Service



Figure 3 - Porsche Home Energy Manager - Back

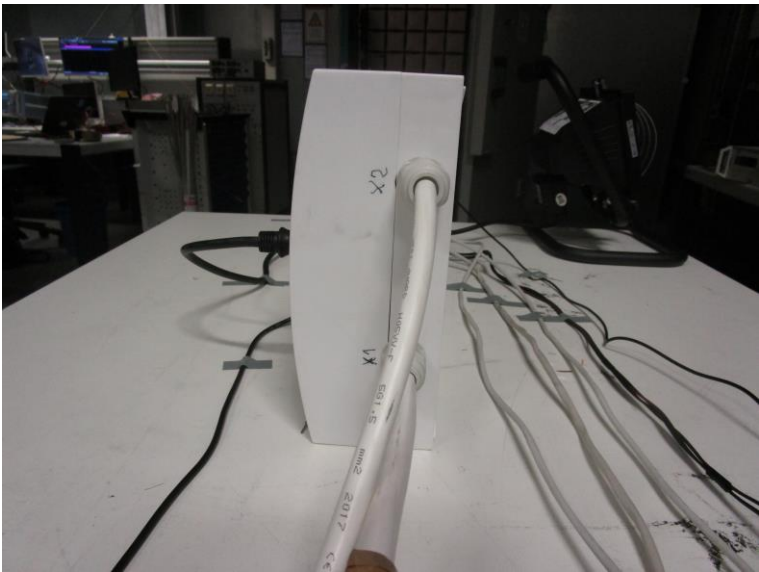


Figure 4 - Porsche Home Energy Manager - Right



1.5.2 EUT Port/Cable Identification

| Port                         | Max Cable Length<br>specified | Usage | Type       | Screened |
|------------------------------|-------------------------------|-------|------------|----------|
| 120 V / 60 Hz AC Powered OP1 |                               |       |            |          |
| AC power input               | ---                           | 2 m   | AC powered | No       |

Table 3

### 1.5.3 Test Configuration

[illegible]

### Table 4

### 1.5.4 Modes of Operation

| Mode | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OP1  | <p>Porsche Home Energy Manager installed in a plastic enclosure, which contains Porsche Home Energy Manager, AC/DC power supply, 3 current transformers, necessary and internal wiring, outlet for external cables (3 PH Mains, Ethernet, USB, RS485, WiFi antenna, Relays)</p> <p>The Porsche Home Energy Manager communicates with non EUT Porsche Home Energy Manager placed in a shielded enclosure which communicates with EUT Porsche Home Energy Manager over WiFi and powerline communication, furthermore the Porsche Home Energy Manager is measuring an load of approx.. 500 W at L1 over current transformer and connected to an USB Flash drive over an 3 m USB cable.</p> <p>The Porsche Home Energy Manager runs an operating mode which is representative for the real use according to the client.</p> |

### Table 5



## 1.6 Deviations from the Standard

---

## 1.7 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 |
|--------------------|--------------------------------------------------------------------------------------------------------|------------------------|--------------------------|
| 0                  | As supplied by the customer                                                                            | Not Applicable         | Not Applicable           |
| 1                  | SPI interface output driver reconfigured from 200MHz and fast edges mode to 50MHz and slow edges mode. | Jiri Naprstek          | 2019-03-12               |

**Table 6**

## 1.8 Test Location

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

| Test Name                                            | Name of Engineer(s) |
|------------------------------------------------------|---------------------|
| Configuration and Mode: 120 V / 60 Hz AC Powered OP1 |                     |
| Radiated Disturbance                                 | Stefan Moser        |
| Conducted Disturbance at Mains Terminals             | Laura Werder        |

**Table 7**

Office Address:

Äußere Frühlingstraße 45  
94315 Straubing  
Germany



## 2 Test Details

### 2.1 Radiated Disturbance

#### 2.1.1 Specification Reference

FCC 47 CFR Part 15B and ICES-003, Clause 15.109 and 6.2

#### 2.1.2 Equipment Under Test and Modification State

Porsche Home Energy Manager, S/N: N/A - Modification State 0  
Porsche Home Energy Manager, S/N: N/A - Modification State 1

#### 2.1.3 Date of Test

2019-02-06 to 2019-03-12

#### 2.1.4 Test Method

The EUT was set up in a semi-anechoic chamber on a remotely controlled turntable and placed on a non-conductive table 0.8m above a reference ground plane.  
A pre-scan of the EUT emissions profile was made while varying the antenna-to-EUT azimuth and antenna-to-EUT polarisation using a peak detector; measurements were taken at a 3m distance. Using the pre-scan list of the highest emissions detected, their bearing and associated antenna polarisation, the EUT was then formally measured using a Quasi-Peak, Peak, Average detector as appropriate. The readings were maximised by adjusting the antenna height, polarisation and turntable azimuth, in accordance with the specification.

#### 2.1.5 Environmental Conditions

Ambient Temperature 22.0 °C  
Relative Humidity 26.0 %

#### 2.1.6 Specification Limits

| Required Specification Limits, Field Strength (Class B @ 3m)                                                                                       |                     |                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------|
| Frequency Range (MHz)                                                                                                                              | ( $\mu\text{V/m}$ ) | (dB $\mu\text{V/m}$ ) |
| 30 to 88                                                                                                                                           | 100                 | 40                    |
| 88 to 216                                                                                                                                          | 150                 | 43.5                  |
| 216 to 960                                                                                                                                         | 200                 | 46.0                  |
| Above 960                                                                                                                                          | 500                 | 54                    |
| <b>Supplementary information:</b><br>Quasi-peak detector to be used for measurements < 1GHz<br>Average detector to be used for measurements > 1GHz |                     |                       |

Table 8

## 2.1.7 Test Results

### Results for Configuration and Mode : 120 V / 60 Hz AC Powered OP1.

Performance assessment of the EUT made during this test: Pass.  
Intended transmitter 2.45 GHz with exclusion band of  $\pm 120$  MHz.

Detailed results are shown below.

Highest frequency generated or used within the EUT: 2,45  
Which necessitates an upper frequency test limit of: 13 GHz

Frequency Range of Test: 30 MHz to 1 GHz

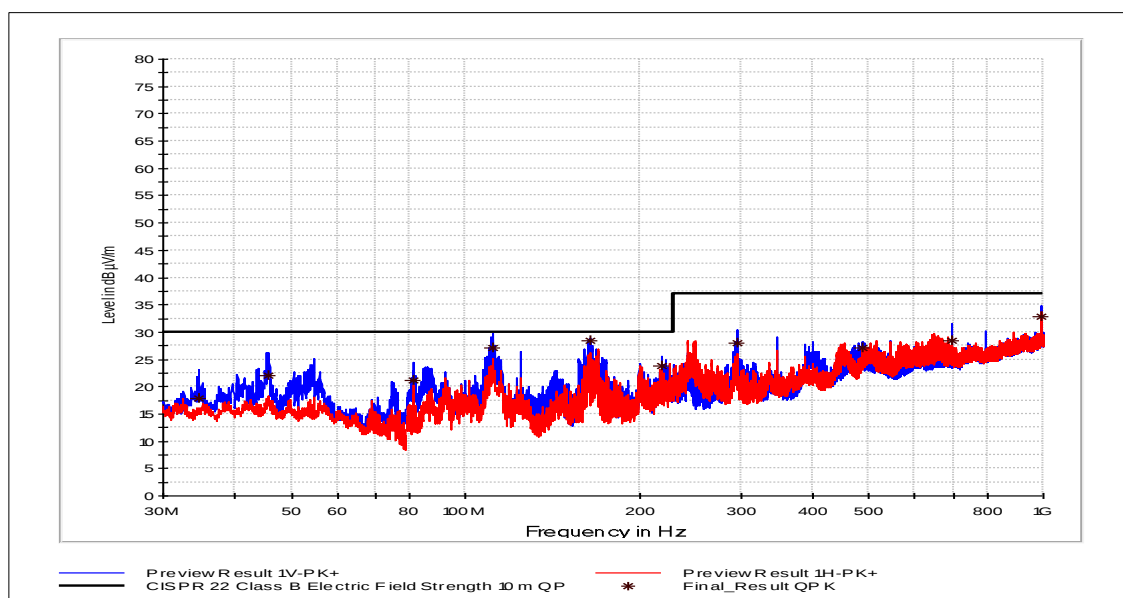


Figure 5 - Graphical Results - Horizontal and Vertical Polarity

| Frequency MHz | QuasiPeak dBµV/m | Limit dBµV/m | Margin dB | Meas. Time ms | Bandwidth kHz | Height cm | Pol | Azimuth deg | Corr. dB |
|---------------|------------------|--------------|-----------|---------------|---------------|-----------|-----|-------------|----------|
| 34.650000     | 17.83            | 30.00        | 12.17     | 1000.0        | 120.000       | 198.0     | V   | 121.0       | 12.9     |
| 45.750000     | 22.12            | 30.00        | 7.88      | 1000.0        | 120.000       | 300.0     | V   | 138.0       | 14.7     |
| 81.180000     | 21.22            | 30.00        | 8.78      | 1000.0        | 120.000       | 200.0     | V   | 76.0        | 8.1      |
| 111.390000    | 27.18            | 30.00        | 2.82      | 1000.0        | 120.000       | 125.0     | V   | -21.0       | 12.6     |
| 164.490000    | 28.36            | 30.00        | 1.64      | 1000.0        | 120.000       | 100.0     | V   | 135.0       | 10.0     |
| 219.240000    | 23.73            | 30.00        | 6.27      | 1000.0        | 120.000       | 100.0     | V   | -28.0       | 12.8     |
| 295.320000    | 28.07            | 37.00        | 8.93      | 1000.0        | 120.000       | 121.0     | V   | -24.0       | 15.2     |
| 486.360000    | 27.08            | 37.00        | 9.92      | 1000.0        | 120.000       | 100.0     | V   | -24.0       | 19.8     |
| 692.940000    | 28.41            | 37.00        | 8.59      | 1000.0        | 120.000       | 214.0     | V   | 27.0        | 22.8     |
| 995.940000    | 32.73            | 37.00        | 4.27      | 1000.0        | 120.000       | 165.0     | V   | -28.0       | 26.8     |

Table 9

Frequency Range of Test: 1 GHz to 6 GHz

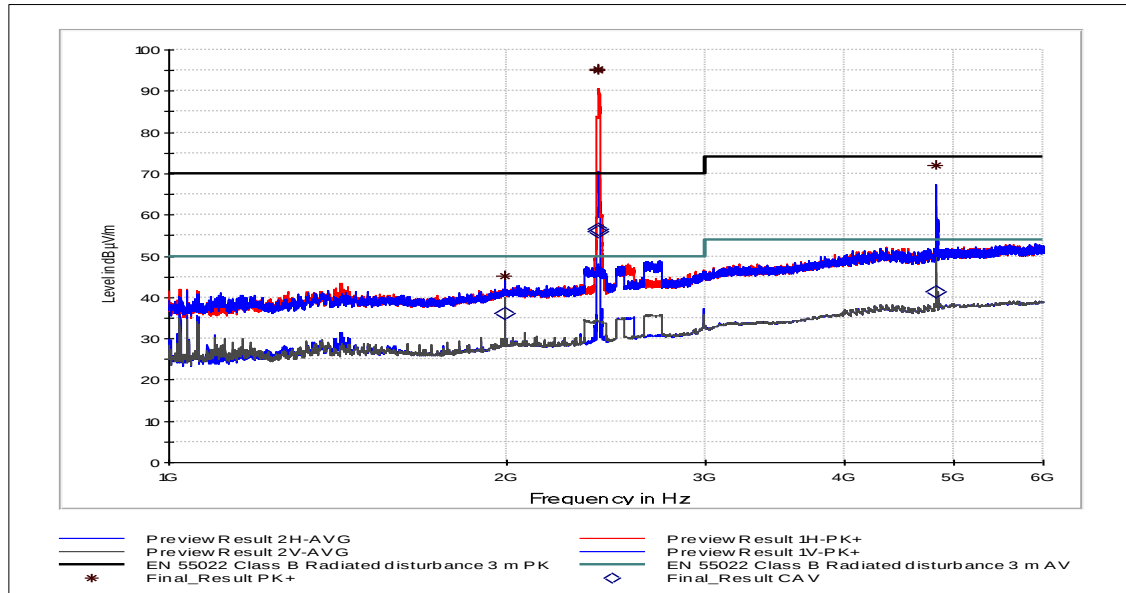


Figure 6 - Graphical Results - Horizontal and Vertical Polarity

| Frequency   | MaxPeak | CAverage | Limit  | Margin | Meas. Time | Bandwidth | Height | Pol | Azimuth | Corr. |
|-------------|---------|----------|--------|--------|------------|-----------|--------|-----|---------|-------|
| MHz         | dBµV/m  | dBµV/m   | dBµV/m | dB     | ms         | kHz       | cm     |     | deg     | dB    |
| 1991.750000 | ---     | 36.03    | 50.00  | 13.97  | 1000.0     | 1000.000  | 200.0  | V   | 15.0    | 32.6  |
| 1991.750000 | 45.16   | ---      | 70.00  | 24.84  | 1000.0     | 1000.000  | 200.0  | V   | 15.0    | 32.6  |
| 2412.750000 | ---     | 56.02    | 50.00  | -6.02  | 1000.0     | 1000.000  | 250.0  | H   | 126.0   | 33.3  |
| 2412.750000 | 95.01   | ---      | 70.00  | -25.01 | 1000.0     | 1000.000  | 250.0  | H   | 126.0   | 33.3  |
| 2413.000000 | ---     | 56.56    | 50.00  | -6.56  | 1000.0     | 1000.000  | 250.0  | H   | 129.0   | 33.3  |
| 2413.000000 | 95.41   | ---      | 70.00  | -25.41 | 1000.0     | 1000.000  | 250.0  | H   | 129.0   | 33.3  |
| 4824.000000 | ---     | 41.54    | 54.00  | 12.46  | 1000.0     | 1000.000  | 300.0  | V   | 125.0   | 40.9  |
| 4824.000000 | 71.95   | ---      | 74.00  | 2.05   | 1000.0     | 1000.000  | 300.0  | V   | 125.0   | 40.9  |

Table 10



Frequency Range of Test: 6 GHz to 13 GHz

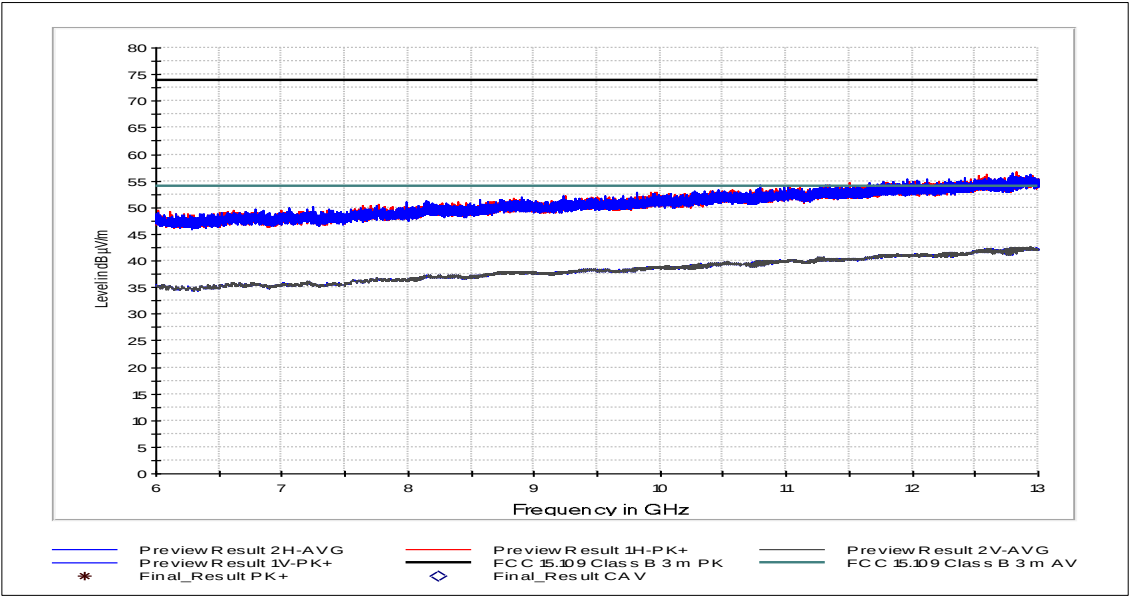


Figure 7 - Graphical Results - Horizontal and Vertical Polarity

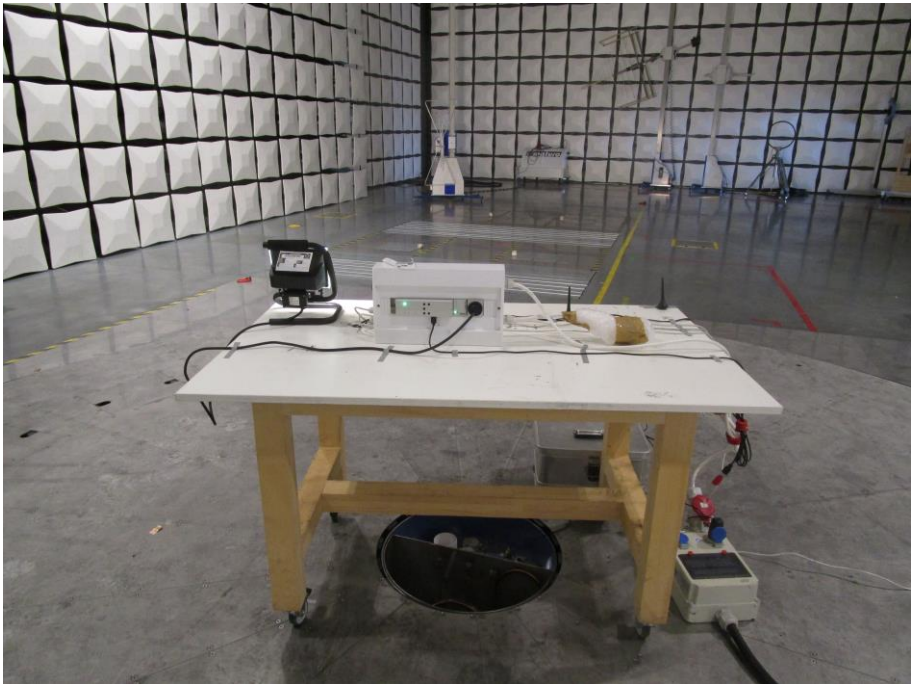


Figure 8 – Test setup

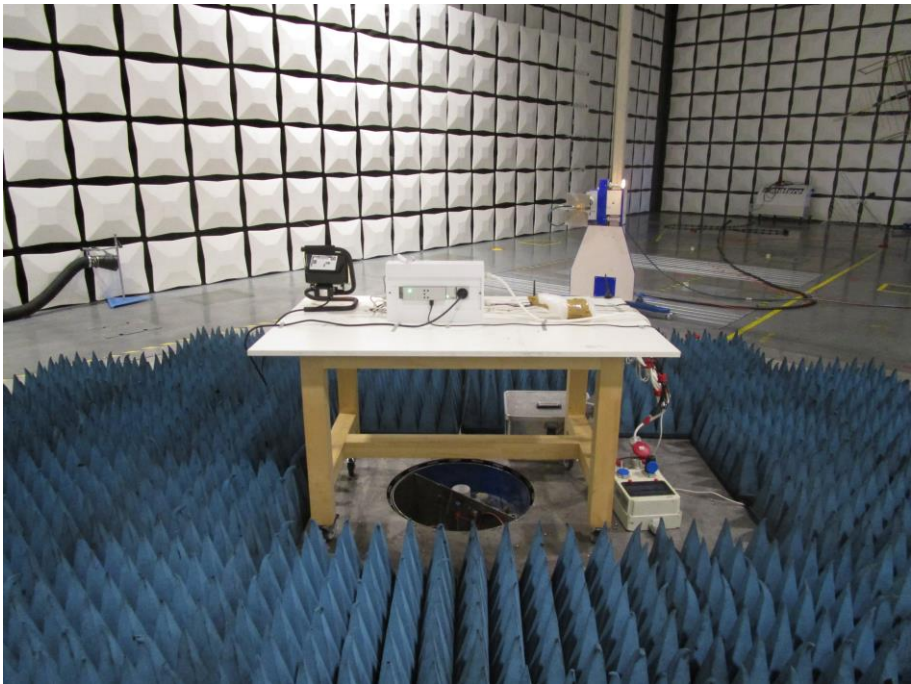


Figure 9 – Test setup



### 2.1.8 Test Location and Test Equipment Used

This test was carried out in Semi anechoic room - cabin no. 8.

| Instrument                           | Manufacturer                                  | Type No                  | TE No | Calibration Period (months) | Calibration Due |
|--------------------------------------|-----------------------------------------------|--------------------------|-------|-----------------------------|-----------------|
| TRILOG Broadband Antenna             | Schwarzbeck Mess-Elektronik                   | VULB 9163                | 19669 | 36                          | 31.07.2020      |
| Microwave cable                      | Rosenberger Micro-Coax                        | FB293C1080005050         | 19915 | ---                         | ---             |
| Microwave cable                      | Rosenberger Micro-Coax                        | FA210AF04000505G         | 19916 | ---                         | ---             |
| Semi anechoic room                   | Albatross Projects GmbH                       | Cabin no. 8              | 19917 | 36                          | 30.09.2020      |
| Microwave cable                      | Rosenberger Micro-Coax                        | FA210AF04000505          | 19928 | ---                         | ---             |
| Double ridged horn antenna           | Rohde & Schwarz GmbH & Co. KG                 | HF907                    | 19933 | 24                          | 30.06.2019      |
| Double ridged waveguide horn antenna | EMCO Elektronik GmbH                          | 3115                     | 1516  | 36                          | 29.02.2020      |
| Microwave cable                      | Rosenberger Micro-Coax                        | FA210AF040005050G        | 19994 | ---                         | ---             |
| RF test cable with ferrites          | Albatross Projects GmbH                       | EF393/11N50/11N50/8000 F | 20050 | ---                         | ---             |
| HF-cable for TS8997                  | Rosenberger Hochfrequenztechnik GmbH & Co. KG | LU1-037-1500             | 23262 | ---                         | ---             |
| EMI test receiver                    | Rohde & Schwarz GmbH & Co. KG                 | ESW26                    | 28268 | 12                          | 31.05.2019      |

**Table 11**

TU - Traceability Unscheduled  
 O/P Mon – Output Monitored using calibrated equipment  
 N/A - Not Applicable



## 2.2 Conducted Disturbance at Mains Terminals

### 2.2.1 Specification Reference

FCC 47 CFR Part 15B and ICES-003, Clause 15.107 and 6.1

### 2.2.2 Equipment Under Test and Modification State

Porsche Home Energy Manager, S/N: N/A - Modification State 0

### 2.2.3 Date of Test

2019-02-04

### 2.2.4 Test Method

The EUT was placed on a non-conductive table 0.8m above a reference ground plane and 0.4m away from a vertical coupling plane. All power was connected to the EUT through an Artificial Mains Network (AMN). Conducted disturbance voltage measurements on mains lines were made at the output of the AMN. The AMN was placed 0.8m from the boundary of the EUT and bonded to the reference ground plane.

### 2.2.5 Environmental Conditions

Ambient Temperature 22,0 °C

Relative Humidity 31,0 %

### 2.2.6 Specification Limits

| Required Specification Limits (Class B)                                    |                       |                   |                |
|----------------------------------------------------------------------------|-----------------------|-------------------|----------------|
| Line Under Test                                                            | Frequency Range (MHz) | Quasi-peak (dBμV) | Average (dBμV) |
| AC Power Port                                                              | 0.15 to 0.5           | 66 to 56*         | 56 to 46*      |
|                                                                            | 0.5 to 5              | 56                | 46             |
|                                                                            | 5 to 30               | 60                | 50             |
| Supplementary information: *Decreases with the logarithm of the frequency. |                       |                   |                |

Table 12

### 2.2.7 Test Results

#### Results for Configuration and Mode : 120 V / 60 Hz AC Powered OP1.

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Line Under Test: AC power input - L1

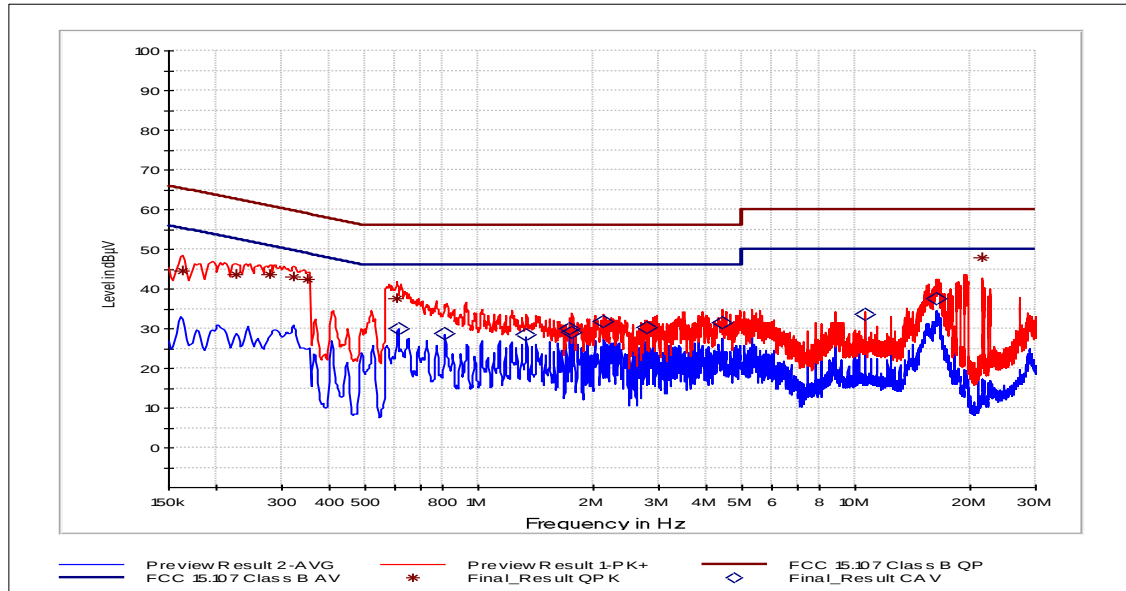


Figure 10 - Graphical Results - AC power input - L1

| Frequency MHz | QuasiPeak dBµV | CAverage dBµV | Limit dBµV | Margin dB | Meas. Time ms | Bandwidth kHz | Line | Corr. dB |
|---------------|----------------|---------------|------------|-----------|---------------|---------------|------|----------|
| 0.163500      | 44.62          | ---           | 65.28      | 20.67     | 1000.0        | 9.000         | L1   | 0.0      |
| 0.226500      | 43.51          | ---           | 62.58      | 19.07     | 1000.0        | 9.000         | L1   | 0.0      |
| 0.278250      | 43.49          | ---           | 60.87      | 17.38     | 1000.0        | 9.000         | L1   | 0.0      |
| 0.323250      | 43.04          | ---           | 59.62      | 16.58     | 1000.0        | 9.000         | L1   | 0.0      |
| 0.352500      | 42.51          | ---           | 58.90      | 16.39     | 1000.0        | 9.000         | L1   | 0.0      |
| 0.604500      | 37.50          | ---           | 56.00      | 18.50     | 1000.0        | 9.000         | L1   | 0.0      |
| 0.609000      | ---            | 30.06         | 46.00      | 15.94     | 1000.0        | 9.000         | L1   | 0.0      |
| 0.811500      | ---            | 28.88         | 46.00      | 17.12     | 1000.0        | 9.000         | L1   | 0.0      |
| 1.335750      | ---            | 28.63         | 46.00      | 17.37     | 1000.0        | 9.000         | L1   | 0.0      |
| 1.740750      | ---            | 29.86         | 46.00      | 16.14     | 1000.0        | 9.000         | L1   | 0.1      |
| 1.767750      | ---            | 28.95         | 46.00      | 17.05     | 1000.0        | 9.000         | L1   | 0.1      |
| 2.145750      | ---            | 31.85         | 46.00      | 14.15     | 1000.0        | 9.000         | L1   | 0.1      |
| 2.793750      | ---            | 30.27         | 46.00      | 15.73     | 1000.0        | 9.000         | L1   | 0.2      |
| 4.416000      | ---            | 31.55         | 46.00      | 14.45     | 1000.0        | 9.000         | L1   | 0.3      |
| 10.603500     | ---            | 33.49         | 5---       | 16.51     | 1000.0        | 9.000         | L1   | 0.0      |
| 16.401750     | ---            | 37.63         | 5---       | 12.37     | 1000.0        | 9.000         | L1   | 0.4      |
| 21.646500     | 47.92          | ---           | 6---       | 12.08     | 1000.0        | 9.000         | L1   | 0.2      |

Table 13

Line Under Test: AC power input - N

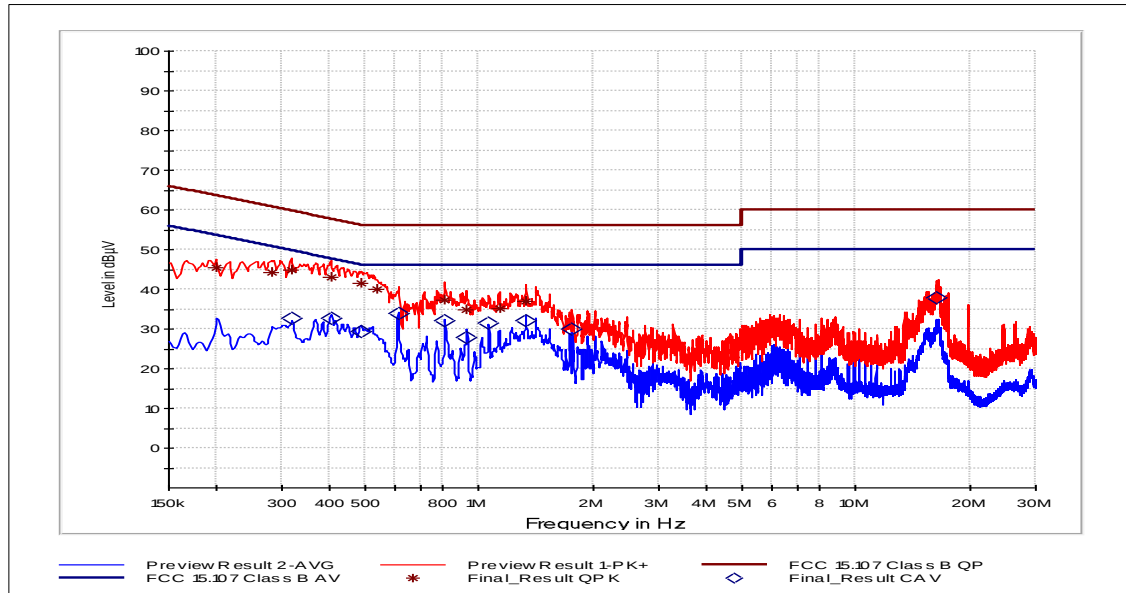


Figure 11 - Graphical Results - AC power input - N

| Frequency MHz | QuasiPeak dBµV | CAverage dBµV | Limit dBµV | Margin dB | Meas. Time ms | Bandwidth kHz | Line | Corr. dB |
|---------------|----------------|---------------|------------|-----------|---------------|---------------|------|----------|
| 0.199500      | 45.52          | ---           | 63.63      | 18.11     | 1000.0        | 9.000         | N    | 0.0      |
| 0.280500      | 44.38          | ---           | 60.80      | 16.42     | 1000.0        | 9.000         | N    | 0.0      |
| 0.316500      | 44.85          | ---           | 59.80      | 14.95     | 1000.0        | 9.000         | N    | 0.0      |
| 0.318750      | ---            | 32.83         | 49.74      | 16.90     | 1000.0        | 9.000         | N    | 0.0      |
| 0.404250      | ---            | 32.70         | 47.77      | 15.06     | 1000.0        | 9.000         | N    | 0.0      |
| 0.404250      | 43.16          | ---           | 57.77      | 14.60     | 1000.0        | 9.000         | N    | 0.0      |
| 0.485250      | ---            | 29.29         | 46.25      | 16.96     | 1000.0        | 9.000         | N    | 0.0      |
| 0.487500      | 41.39          | ---           | 56.21      | 14.82     | 1000.0        | 9.000         | N    | 0.0      |
| 0.537000      | 39.90          | ---           | 56.00      | 16.10     | 1000.0        | 9.000         | N    | 0.0      |
| 0.609000      | ---            | 33.95         | 46.00      | 12.05     | 1000.0        | 9.000         | N    | 0.0      |
| 0.811500      | 37.22          | ---           | 56.00      | 18.78     | 1000.0        | 9.000         | N    | 0.0      |
| 0.811500      | ---            | 32.12         | 46.00      | 13.88     | 1000.0        | 9.000         | N    | 0.0      |
| 0.924000      | 34.90          | ---           | 56.00      | 21.10     | 1000.0        | 9.000         | N    | 0.0      |
| 0.926250      | ---            | 27.91         | 46.00      | 18.09     | 1000.0        | 9.000         | N    | 0.0      |
| 1.059000      | ---            | 31.53         | 46.00      | 14.47     | 1000.0        | 9.000         | N    | 0.0      |
| 1.131000      | 35.18          | ---           | 56.00      | 20.82     | 1000.0        | 9.000         | N    | 0.0      |
| 1.333500      | ---            | 32.21         | 46.00      | 13.79     | 1000.0        | 9.000         | N    | 0.0      |
| 1.335750      | 37.02          | ---           | 56.00      | 18.98     | 1000.0        | 9.000         | N    | 0.0      |
| 1.767750      | ---            | 29.88         | 46.00      | 16.12     | 1000.0        | 9.000         | N    | 0.1      |
| 16.458000     | ---            | 37.74         | 5---       | 12.26     | 1000.0        | 9.000         | N    | 0.4      |

Table 14

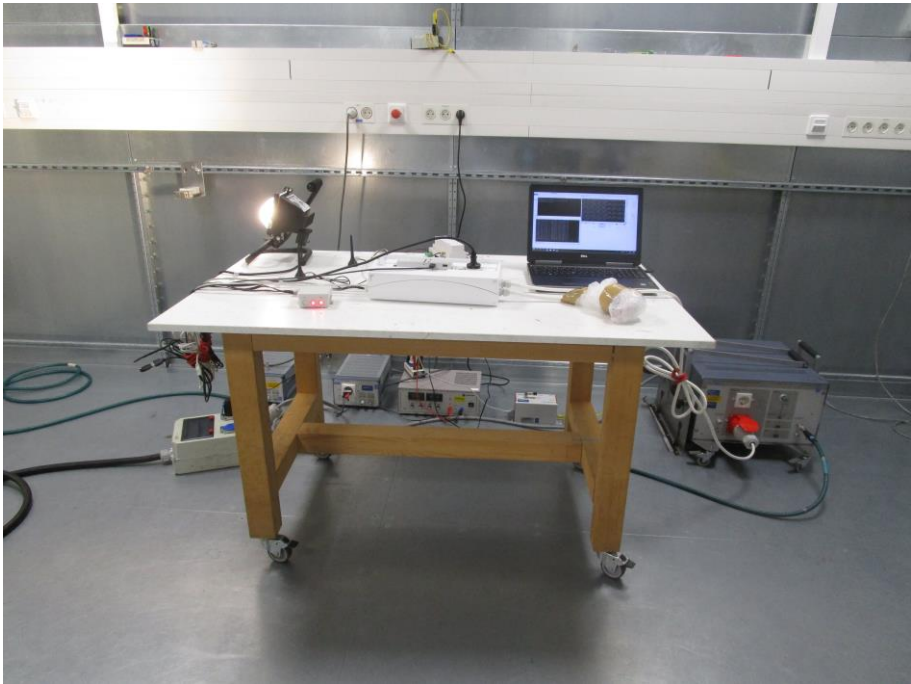


Figure 12 – Test setup

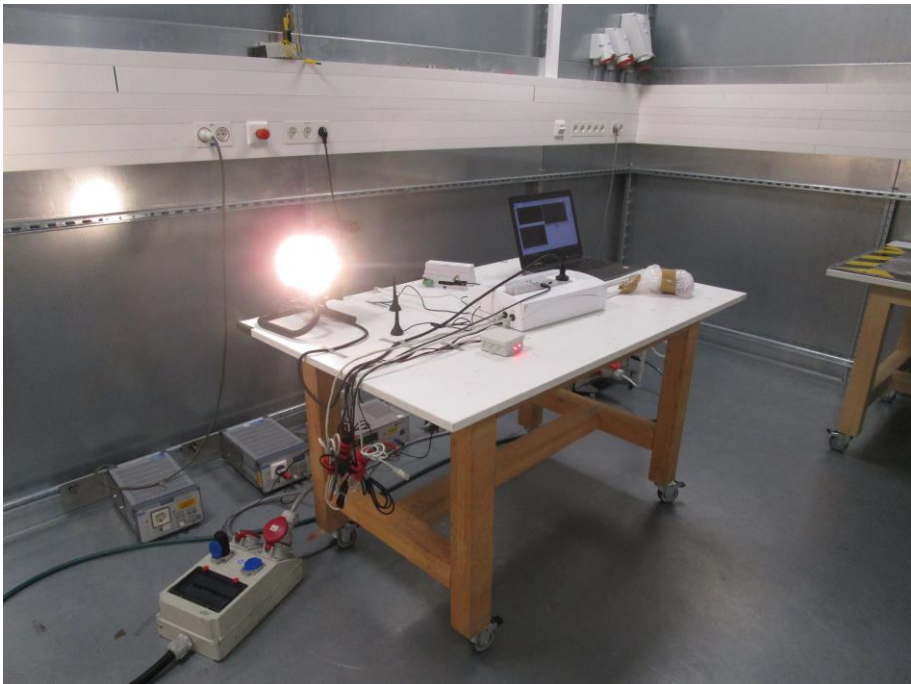


Figure 13 – Test setup



## 2.2.8 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 |
|-------------------|-------------------------------|------------------|-------|-----------------------------|-----------------|
| V-network         | Rohde & Schwarz GmbH & Co. KG | ESH3-Z5          | 18919 | 36                          | 31.10.2019      |
| EMI test receiver | Rohde & Schwarz GmbH & Co. KG | ESU8             | 19904 | 12                          | 31.12.2019      |
| Microwave cable   | Rosenberger Micro-Coax        | FB293C1080005050 | 20024 | ---                         | ---             |
| Shielded room     | Albatross Projects GmbH       | Cabin no. 9      | 21083 | ---                         | ---             |

**Table 15**

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable



### 3 Test Equipment Information

#### 3.1 General Test Equipment Used

| Instrument                           | Manufacturer                                  | Type No                  | TE No | Calibration Period (months) | Calibration Due |
|--------------------------------------|-----------------------------------------------|--------------------------|-------|-----------------------------|-----------------|
| TRILOG Broadband Antenna             | Schwarzbeck Mess-Elektronik                   | VULB 9163                | 19669 | 36                          | 31.07.2020      |
| Microwave cable                      | Rosenberger Micro-Coax                        | FB293C1080005050         | 19915 | ---                         | ---             |
| Microwave cable                      | Rosenberger Micro-Coax                        | FA210AF04000505G         | 19916 | ---                         | ---             |
| Semi anechoic room                   | Albatross Projects GmbH                       | Cabin no. 8              | 19917 | 36                          | 30.09.2020      |
| Microwave cable                      | Rosenberger Micro-Coax                        | FA210AF04000505          | 19928 | ---                         | ---             |
| Double ridged horn antenna           | Rohde & Schwarz GmbH & Co. KG                 | HF907                    | 19933 | 24                          | 30.06.2019      |
| Double ridged waveguide horn antenna | EMCO Elektronik GmbH                          | 3115                     | 1516  | 36                          | 29.02.2020      |
| Microwave cable                      | Rosenberger Micro-Coax                        | FA210AF040005050G        | 19994 | ---                         | ---             |
| RF test cable with ferrites          | Albatross Projects GmbH                       | EF393/11N50/11N50/8000 F | 20050 | ---                         | ---             |
| HF-cable for TS8997                  | Rosenberger Hochfrequenztechnik GmbH & Co. KG | LU1-037-1500             | 23262 | ---                         | ---             |
| EMI test receiver                    | Rohde & Schwarz GmbH & Co. KG                 | ESW26                    | 28268 | 12                          | 31.05.2019      |
| V-network                            | Rohde & Schwarz GmbH & Co. KG                 | ESH3-Z5                  | 18919 | 36                          | 31.10.2019      |
| EMI test receiver                    | Rohde & Schwarz GmbH & Co. KG                 | ESU8                     | 19904 | 12                          | 31.12.2019      |
| Microwave cable                      | Rosenberger Micro-Coax                        | FB293C1080005050         | 20024 | ---                         | ---             |

**Table 16**

TU - Traceability Unscheduled  
O/P Mon – Output Monitored using calibrated equipment  
N/A - Not Applicable



Product Service

## 4 Incident Reports

No incidents reports were raised.

## 5 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

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

**Table 17**

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  $p = 95.45\%$