

# Report on the FCC and IC Testing of the Agrident GmbH

Model: ASR650

In accordance with FCC 47 CFR Part 15C and Industry Canada RSS-210 and Industry Canada RSS-GEN

Prepared for: Agrident GmbH  
Steinklippenstraße 10  
D-30890 Barsinghausen

FCC ID: QG2ASR650  
IC: 6252A-ASR650

## COMMERCIAL-IN-CONFIDENCE

Date: 2018-08-30  
Document Number: TR-09774-36779-04 | Issue: 03



Product Service

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| RESPONSIBLE FOR      | NAME            | DATE       | SIGNATURE |
|----------------------|-----------------|------------|-----------|
| Project Management   | Michael Ingerl  | 2018-08-30 |           |
| Authorised Signatory | Markus Biberger | 2018-08-30 |           |

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 and Industry Canada RSS-210 and Industry Canada RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

| RESPONSIBLE FOR | NAME           | DATE       | SIGNATURE |
|-----------------|----------------|------------|-----------|
| Testing         | Michael Ingerl | 2018-08-30 |           |

Laboratory Accreditation

DAkkS 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 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN:2016, Issue 09 (08-2016) and Issue 04 (11-2014).

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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](http://www.tuev-sued.de)

TÜV SÜD Product Service GmbH  
Äußere Frühlingsstraße 45  
94315 Straubing  
Germany



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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                                             | 2018-07-26    |
| 2     | Chapter "2.4 Field Strength of any Emission" corrected. | 2018-07-31    |
| 3     | Added SPR-002 in Exposure of Humans to RF Fields Test   | 2018-08-30    |

**Table 1**

### 1.2 Introduction

|                               |                                                                                                                          |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Applicant                     | Agrident GmbH                                                                                                            |
| Manufacturer                  | Agrident GmbH                                                                                                            |
| Model Number(s)               | ASR650                                                                                                                   |
| Serial Number(s)              | 2128002028                                                                                                               |
| Hardware Version(s)           | ---                                                                                                                      |
| Software Version(s)           | ---                                                                                                                      |
| Number of Samples Tested      | 1                                                                                                                        |
| Test Specification/Issue/Date | FCC 47 CFR Part 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN:2016, Issue 09 (08-2016) and Issue 04 (11-2014) |
| Test Plan/Issue/Date          | ---                                                                                                                      |
| Order Number                  | 2128                                                                                                                     |
| Date of Receipt of EUT        | 2018-07-11                                                                                                               |
| Start of Test                 | 2018-07-19                                                                                                               |
| Finish of Test                | 2018-07-31                                                                                                               |
| Name of Engineer(s)           | Michael Ingerl, Matthias Stumpe                                                                                          |
| Related Document(s)           | ANSI C63.10 (2013)                                                                                                       |



### 1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C and Industry Canada RSS-210 and Industry Canada RSS-GEN is shown below.

| Section                                                                                       | Specification Clause    | Test Description                  | Result | Comments/Base Standard |
|-----------------------------------------------------------------------------------------------|-------------------------|-----------------------------------|--------|------------------------|
| Configuration and Mode: 12 V DC power supply - Transmitting continuously and waiting for tags |                         |                                   |        |                        |
| 2.1                                                                                           | 15.215 (c), N/A and 6.6 | 20 dB Bandwidth                   | Pass   | ANSI C63.10 (2013)     |
| 2.2                                                                                           | 15.207, N/A and 8.8     | AC Power Line Conducted Emissions | Pass   | ANSI C63.10 (2013)     |
| 2.3                                                                                           | 15.205, 4.1 and 8.10    | Restricted Band Edges             | Pass   | ANSI C63.10 (2013)     |
| 2.4                                                                                           | 15.209, 4.3 and 6.13    | Field Strength of any Emission    | Pass   | ANSI C63.10 (2013)     |
| 2.5                                                                                           | 15.107 and 6.1          | Exposure of Humans to RF Fields   | Pass   | ANSI C63.4: 2014       |
| 2.6                                                                                           | 15.35 and 4.5           | Pulse Train                       | Pass   | ANSI C63.4: 2014       |

**Table 2**



## 1.4 Product Information

### 1.4.1 Technical Description

RFID Reader for electronic animal identification.

### 1.5 Deviations from the Standard

none

### 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 |
|--------------------|-------------------------------------------------|------------------------|--------------------------|
| S/N: 2128002028    |                                                 |                        |                          |
| 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: 12 V DC power supply - Transmitting continuously and waiting for tags |                                 |
| 20 dB Bandwidth                                                                               | Michael Ingerl                  |
| AC Power Line Conducted Emissions                                                             | Michael Ingerl                  |
| Restricted Band Edges                                                                         | Michael Ingerl                  |
| Field Strength of any Emission                                                                | Michael Ingerl, Matthias Stumpe |
| Exposure of Humans to RF Fields                                                               | Michael Ingerl                  |
| Pulse Train                                                                                   | Michael Ingerl                  |

**Table 4**

Office Address:

Äußere Frühlingstraße 45  
94315 Straubing  
Germany



## 2 Test Details

### 2.1 20 dB Bandwidth

#### 2.1.1 Specification Reference

FCC 47 CFR Part 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN, Clause 15.215 (c), N/A and 6.6

#### 2.1.2 Equipment Under Test and Modification State

ASR650, S/N: --- - Modification State 0

#### 2.1.3 Date of Test

2018-07-26

#### 2.1.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.9.1.

#### 2.1.5 Environmental Conditions

Ambient Temperature 23,0 °C

Relative Humidity 38,0 %

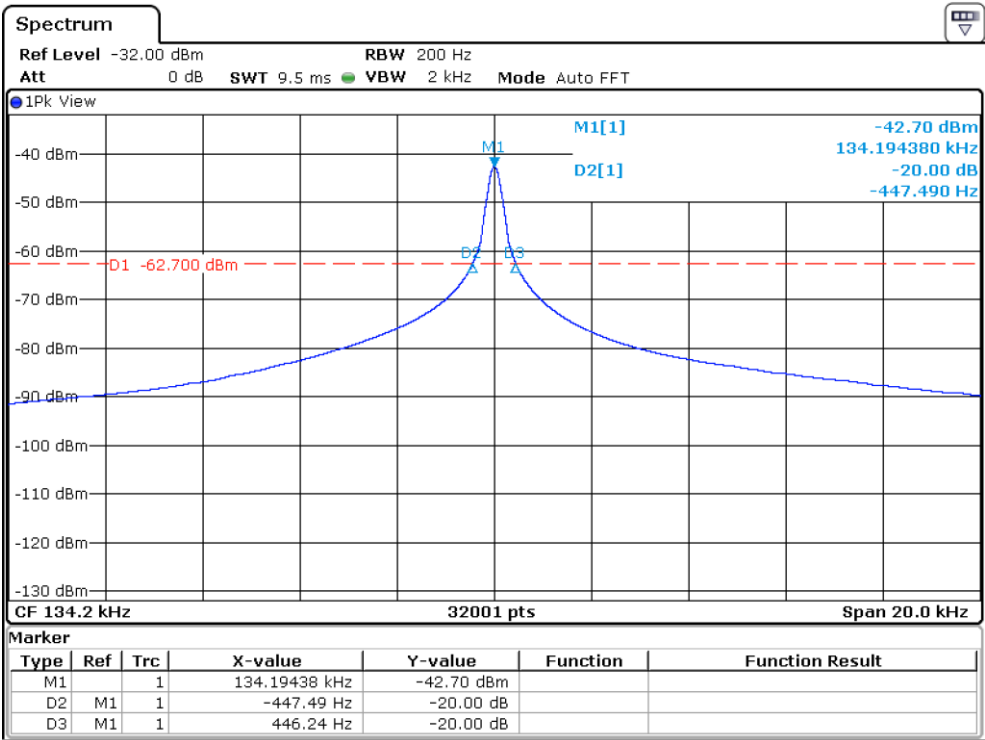
#### 2.1.6 Test Results

12 V DC power supply - Transmitting continuously and waiting for tags

| Frequency (kHz) | 20 dB Bandwidth (kHz) | 99% Occupied Bandwidth (kHz) | F <sub>LOWER</sub> (kHz) | F <sub>UPPER</sub> (kHz) |
|-----------------|-----------------------|------------------------------|--------------------------|--------------------------|
| 134.2           | 0.8937                | 2.4462                       | 133.7426                 | 134.6362                 |

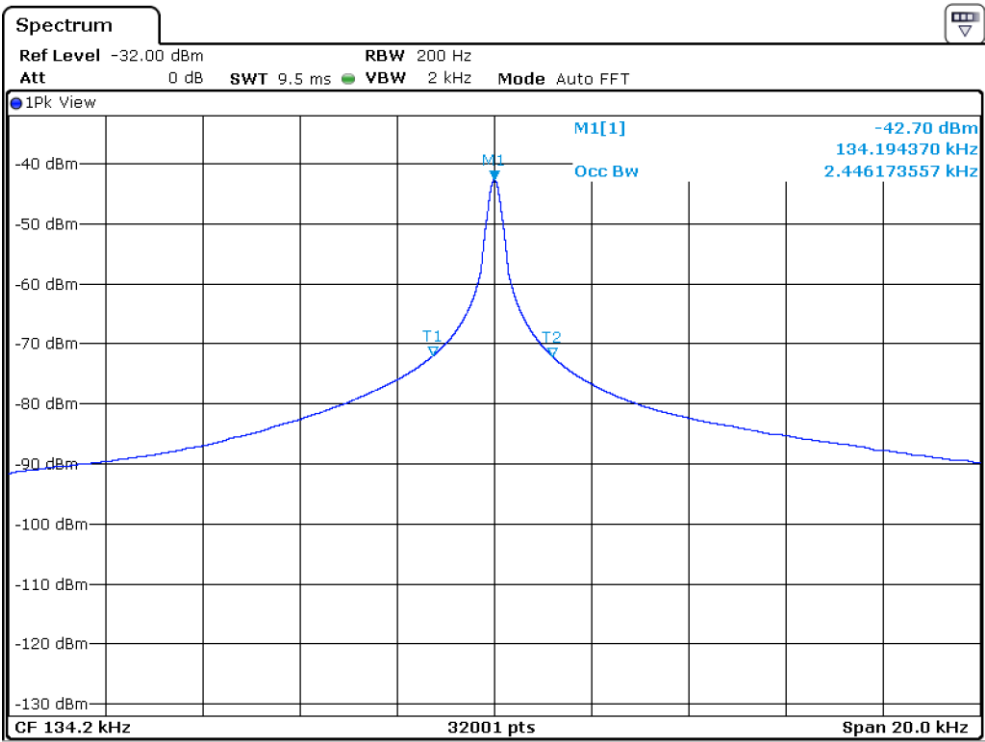


Product Service



Date: 26.JUL.2018 12:25:05

Figure 1 - 20 dB Bandwidth



Date: 26.JUL.2018 12:20:31

Figure 2 - 99% Occupied Bandwidth



### 2.1.7 Test Location and Test Equipment Used

This test was carried out in Non shielded room.

| Instrument            | Manufacturer    | Type No | TE No | Calibration Period (months) | Calibration Due |
|-----------------------|-----------------|---------|-------|-----------------------------|-----------------|
| Spectrum Analyzer     | Rohde & Schwarz | FSV40   | 20219 | 12                          | 2019-01-31      |
| Climatic test chamber | ESPEC           | PL-2J   | 18843 | 24                          | 2019-03-31      |

**Table 5**

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable

## 2.2 AC Power Line Conducted Emissions

### 2.2.1 Specification Reference

FCC 47 CFR Part 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN, Clause 15.207, N/A and 8.8

### 2.2.2 Equipment Under Test and Modification State

ASR650, S/N: --- - Modification State 0

### 2.2.3 Date of Test

2018-07-27

### 2.2.4 Test Method

---

### 2.2.5 Environmental Conditions

Ambient Temperature 25,0 °C  
Relative Humidity 34,0 %

### 2.2.6 Test Results

12 V DC power supply - Transmitting continuously and waiting for tags

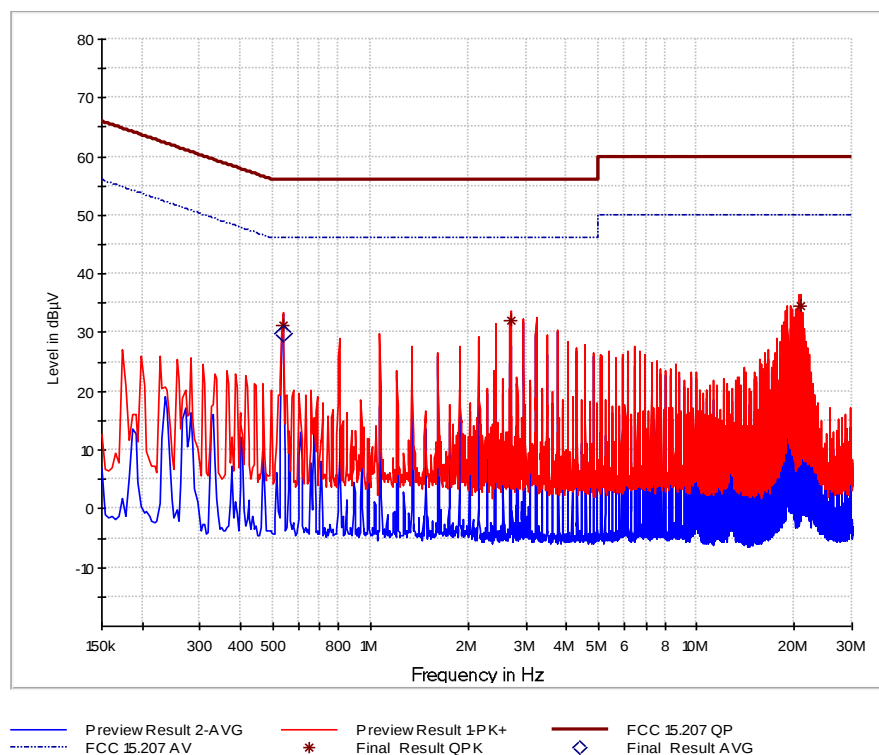


Figure 3 – Plus + Minus Line - 150 kHz to 30 MHz



| Frequency<br>MHz | QuasiPeak<br>dBμV | Average<br>dBμV | Limit<br>dBμV | Margin<br>dB | Meas.<br>Time<br>ms | Bandwidth<br>kHz | Line  | PE  | Corr.<br>dB |
|------------------|-------------------|-----------------|---------------|--------------|---------------------|------------------|-------|-----|-------------|
| 0,538000         | 0,00              | 29,99           | 46,00         | 16,01        | 1000,0              | 9,000            | Plus  | GND | 0,0         |
| 0,538000         | 31,33             | 0,00            | 56,00         | 24,67        | 1000,0              | 9,000            | Plus  | GND | 0,0         |
| 2,686000         | 31,96             | 0,00            | 56,00         | 24,04        | 1000,0              | 9,000            | Minus | GND | 0,1         |
| 20,938000        | 34,67             | 0,00            | 60,00         | 25,33        | 1000,0              | 9,000            | Minus | GND | 0,4         |

### Plus + Minus Line Emissions Results

FCC 47 CFR Part 15, Limit Clause 15.207 and Industry Canada RSS-GEN, Limit Clause 8.8

| 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 6**

\*Decreases with the logarithm of the frequency.

### 2.2.7 Test Location and Test Equipment Used

This test was carried out in Shielded room - cabin no. 4.

| Instrument        | Manufacturer    | Type No    | TE No | Calibration<br>Period<br>(months) | Calibration Due |
|-------------------|-----------------|------------|-------|-----------------------------------|-----------------|
| EMI test receiver | Rohde & Schwarz | 100008     | 19730 | 12                                | 2018-10-31      |
| V-network         | Rohde & Schwarz | 894785/005 | 18919 | 36                                | 2019-10-31      |

**Table 7**

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable

## 2.3 Restricted Band Edges

### 2.3.1 Specification Reference

FCC 47 CFR Part 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN, Clause 15.205, 4.1 and 8.10

### 2.3.2 Equipment Under Test and Modification State

ASR650, S/N: --- - Modification State 0

### 2.3.3 Date of Test

2018-07-26

### 2.3.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.13.1.

Plots for average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.3.

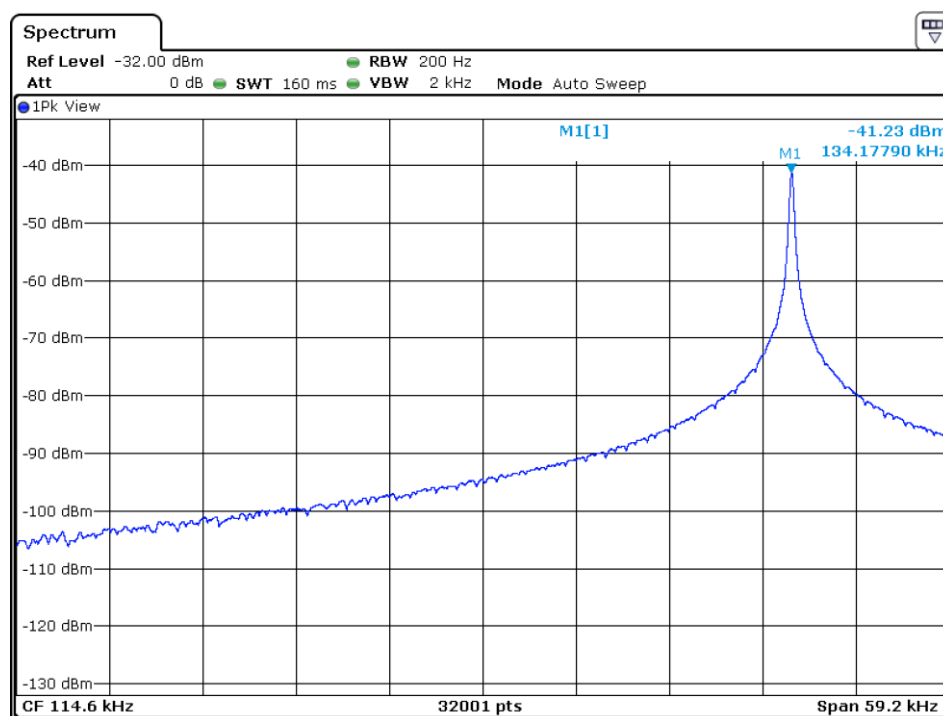
Final average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.2.

### 2.3.5 Environmental Conditions

Ambient Temperature 23,0 °C  
Relative Humidity 38,0 %

### 2.3.6 Test Results

12 V DC power supply - Transmitting continuously and waiting for tags



Date: 26 JUL 2018 12:41:06

Figure 4 – Restricted Band Edges



### 2.3.7 Test Location and Test Equipment Used

This test was carried out in Non shielded room.

| Instrument            | Manufacturer    | Type No | TE No | Calibration Period (months) | Calibration Due |
|-----------------------|-----------------|---------|-------|-----------------------------|-----------------|
| Spectrum Analyzer     | Rohde & Schwarz | FSV40   | 20219 | 12                          | 2019-01-31      |
| Climatic test chamber | ESPEC           | PL-2J   | 18843 | 24                          | 2019-03-31      |

**Table 8**

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable



## **2.4 Field Strength of any Emission**

### **2.4.1 Specification Reference**

FCC 47 CFR Part 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN, Clause 15.209, 4.3 and 6.13

### **2.4.2 Equipment Under Test and Modification State**

ASR650, S/N: --- - Modification State 0

### **2.4.3 Date of Test**

2018-07-19 and 2018-07-31

### **2.4.4 Test Method**

This test was performed in accordance with ANSI C63.10, clause 6.3, 6.4 and 6.5. and Industry Canada RSS-Gen clause 6.13.

Measurements were made at a distance of 10 m. The limit lines shown on the plot were extrapolated from either 300 m or 30 m to the measurement distance of 10 m in accordance with ANSI C63.10 Clause 6.4.4.2.

For any emissions detected within 20 dB of the limit, a final measurement was made at 5 m and 30 m test distance. Final result was calculated in acc. with ANSI C63.10 Clause 6.4.4.6 and recorded in the table below. The detector used for these measurements was a quasi-peak detector except for emissions within the bands 9 kHz to 90 kHz and 110 kHz to 490 kHz where a CISPR average detector was used.

### **2.4.5 Environmental Conditions**

|                     |         |
|---------------------|---------|
| Ambient Temperature | 21,0 °C |
| Relative Humidity   | 31,0 %  |



## 2.4.6 Test Results

12 V DC power supply - Transmitting continuously and waiting for tags

| Frequency<br>(MHz) | Distance  |           |          | Reading Value |              | Correction<br>Factor<br>(dB/m) | Extrapolation<br>Factor |       | Final<br>Value<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|--------------------|-----------|-----------|----------|---------------|--------------|--------------------------------|-------------------------|-------|----------------------------|-------------------|----------------|
|                    | d1<br>(m) | d2<br>(m) | d<br>(m) | d1<br>(dBμV)  | d2<br>(dBμV) |                                | (dB/dec)                | (dB)  |                            |                   |                |
| 0,13420            | 5         | 30        | 300      | 95,7          | 48,6         | 20,0                           | -60,5                   | -60,5 | 8,1                        | 25,0              | 17,0           |

**Table 9**

**Sample calculation of final values:**

$$\text{Extrapolation Factor (dB/decade)} = \begin{cases} -40 \text{ (dB/decade)} & \text{if } d_1 = d_2 \\ \frac{\text{Reading Value } d_2 \text{ (dB}\mu\text{V)} - \text{Reading Value } d_1 \text{ (dB}\mu\text{V)}}{\text{Log}(d_2) - \text{Log}(d_1)} & \text{if } d_1 \neq d_2 \end{cases}$$

$$\begin{aligned} \text{Extrapolation Factor (dB)} &= (\text{Log}(d) - \text{Log}(d_2)) \cdot \text{Extrapolation Factor (dB/decade)} \\ \text{Final Value (dB}\mu\text{V/m)} &= \text{Reading Value } d_2 \text{ (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} \\ &\quad + \text{Extrapolation Factor (dB)} \end{aligned}$$

Note: Extrapolation factor (dB) and final value (dBμV/m) are relating to distance d.

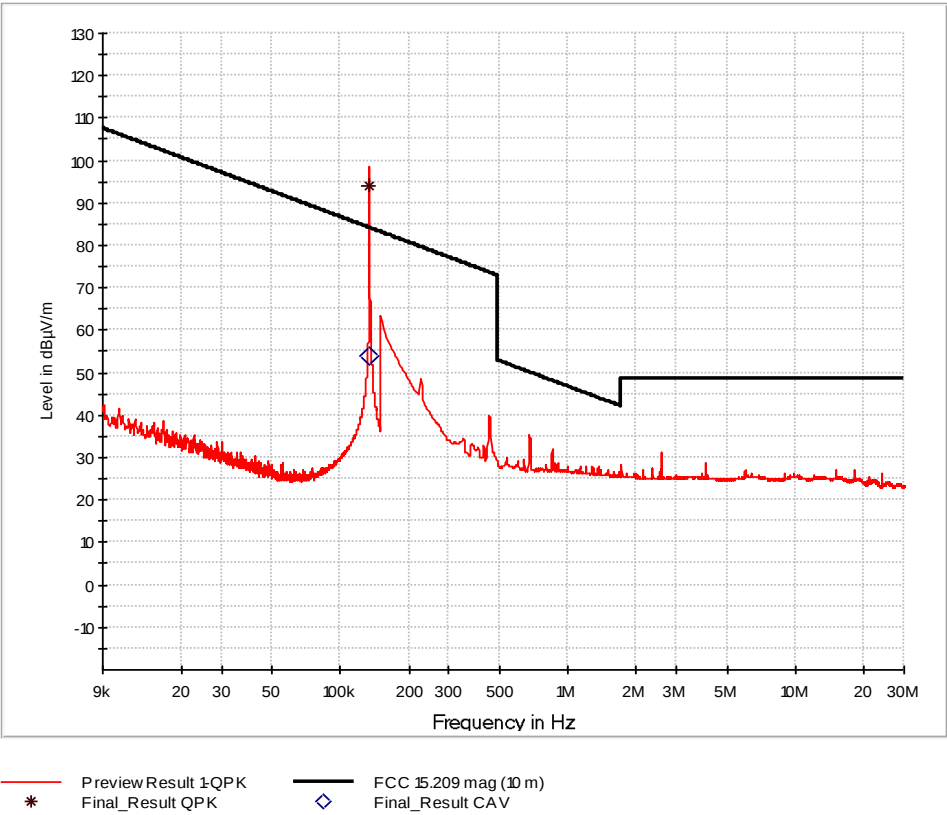


Figure 5 - 9 kHz to 30 MHz

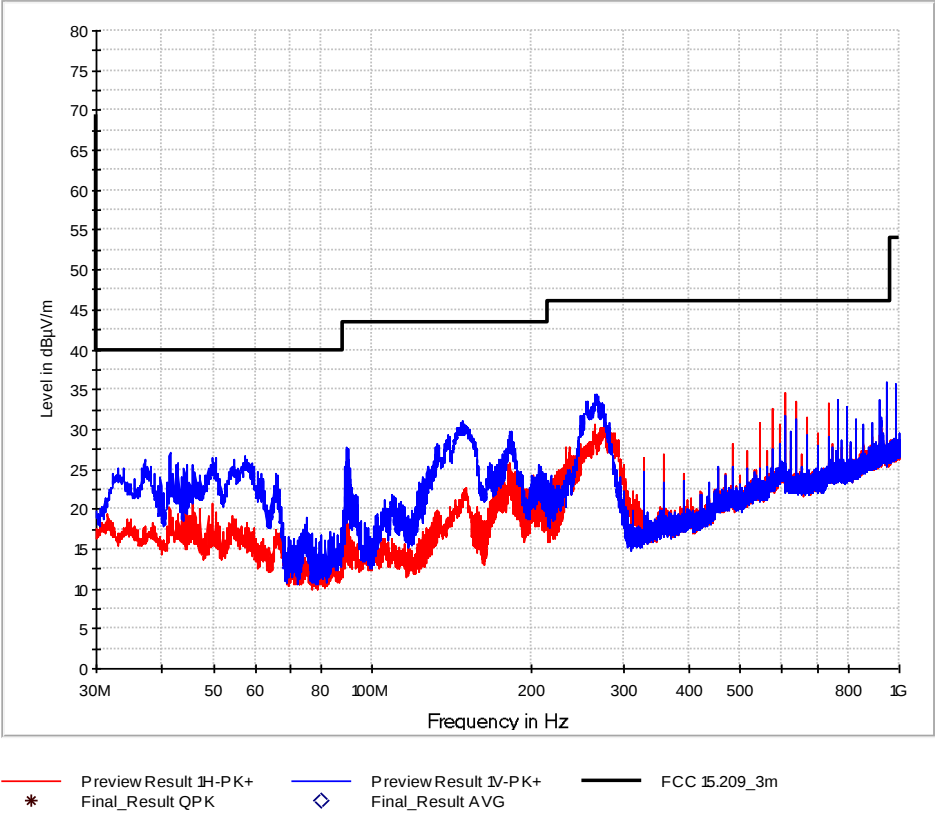


Figure 6 - 30 MHz to 1 GHz



#### 2.4.7 Test Location and Test Equipment Used

This test was carried out in Semi anechoic room - cabin no. 8 and Open area test site for fundamental emission level test.

| Instrument                 | Manufacturer    | Type No   | T-ID  | Calibration Period (months) | Calibration Due |
|----------------------------|-----------------|-----------|-------|-----------------------------|-----------------|
| Loop Antenna               | Rohde & Schwarz | HFH2-Z2   | 18876 | 36                          | 2019-07-31      |
| Double ridged horn antenna | Rohde & Schwarz | HF907     | 19933 | 24                          | 2019-06-30      |
| TRILOG Antenna             | Schwarzbeck     | VULB 9163 | 19691 | 24                          | 2020-12-31      |
| EMI test receiver          | Rohde & Schwarz | ESW26     | 28268 | 12                          | 2019-05-31      |

**Table 10**

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



## 2.5 Exposure of Humans to RF Fields

### 2.5.1 Specification Reference

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

### 2.5.2 Guide

IC RSS-102 Issue 5, section 2.5

### 2.5.3 Equipment Under Test and Modification State

ASR650, S/N: --- - Modification State 0

### 2.5.4 Date of Test

2018-07-27

### 2.5.5 Test Results

12 V DC power supply - Transmitting continuously and waiting for tags

| Exposure of Humans to RF Fields                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Applicable | Declared by applicant | Measured                 | Exemption |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------|--------------------------|-----------|
| The antenna is                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |                       |                          |           |
| <input type="checkbox"/> detachable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |            |                       |                          |           |
| <p>The conducted output power (CP in watts) is measured at the antenna connector:<br/> <math>CP = \dots\dots\dots W</math></p> <p>The effective isotropic radiated power (EIRP in watts) is calculated using</p> <p><input type="checkbox"/> the numerical antenna gain: <math>G = \dots\dots\dots</math><br/> <math>EIRP = G \cdot CP \Rightarrow EIRP = \dots\dots\dots W</math></p> <p><input type="checkbox"/> the field strength<sup>1</sup> in V/m: <math>FS = \dots\dots\dots V/m</math><br/> <math>EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP = \dots\dots\dots W</math></p> <p>with:<br/>           Distance between the antennas in m: <math>D = \dots\dots\dots m</math></p> |            |                       | <input type="checkbox"/> |           |
| <input checked="" type="checkbox"/> not detachable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                       |                          |           |
| A field strength measurement is used to determine the effective isotropic radiated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                       |                          |           |

<sup>1</sup> The conversion formula is valid only for properly matched antennas. In other cases the transmitter output power may have to be measured by a terminated measurement when applying the exemption clauses. If an open area test site is used for field strength measurement, the effect due to the metal ground reflecting plane should be subtracted from the maximum field strength value in order to reference it to free space, before calculating TP.



|                                                                                                                                                                                                                |  |  |                                     |                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|-------------------------------------|-------------------------------------|
| power (EIRP in watts) given by:<br><br>$EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP = 2.63 \text{ mW}$ with:<br>Field strength in V/m: $FS = 2,81$<br>Distance between the two antennas in m: $D = 0.10$ |  |  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Selection of output power                                                                                                                                                                                      |  |  |                                     |                                     |
| The output power TP is the higher of the conducted or effective isotropic radiated power (e.i.r.p.):<br><br>$TP = 2.63 \text{ mW}$                                                                             |  |  |                                     |                                     |

| Exposure of Humans to RF Fields (continued)                                                                 | Applicable | Declared by applicant    | Measured | Exemption |
|-------------------------------------------------------------------------------------------------------------|------------|--------------------------|----------|-----------|
| Separation distance between the user and the transmitting device is                                         |            |                          |          |           |
| <input checked="" type="checkbox"/> less than or equal to 20 cm <input type="checkbox"/> greater than 20 cm |            | <input type="checkbox"/> |          |           |
| Transmitting device is                                                                                      |            |                          |          |           |
| <input type="checkbox"/> in the vicinity of the human head <input type="checkbox"/> body-worn               |            | <input type="checkbox"/> |          |           |



| SAR evaluation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                              |       |       |       |       |       |       |       |       |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| <p>SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in the table.</p> <p>For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in the table, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required.</p> <p>For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants device is defined as the higher of the conducted or e.i.r.p to determine whether the device is exempt from the SAR evaluation.</p> |                                                              |       |       |       |       |       |       |       |       |        |
| Frequency<br>(MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Exemption limits (mW) <sup>2</sup> at separation distance of |       |       |       |       |       |       |       |       |        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ≤5 mm                                                        | 10 mm | 15 mm | 20 mm | 25 mm | 30 mm | 35 mm | 40 mm | 45 mm | ≥50 mm |
| ≤300 <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 71                                                           | 101   | 132   | 162   | 193   | 223   | 254   | 284   | 315   | 345    |
| 450                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 52                                                           | 70    | 88    | 106   | 123   | 141   | 159   | 177   | 195   | 213    |
| 835                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 17                                                           | 30    | 42    | 55    | 67    | 80    | 92    | 105   | 117   | 130    |
| 1900                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 7                                                            | 10    | 18    | 34    | 60    | 99    | 153   | 225   | 316   | 431    |
| 2450                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 4                                                            | 7     | 15    | 30    | 52    | 83    | 123   | 173   | 235   | 309    |
| 3500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2                                                            | 6     | 16    | 32    | 55    | 86    | 124   | 170   | 225   | 290    |
| 5800                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1                                                            | 6     | 15    | 27    | 41    | 56    | 71    | 85    | 97    | 106    |

<sup>2</sup> The exemption limit in the table are based on measurements and simulations on half-wave dipole antennas at separation distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from a linear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from a third order polynomial fit.

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



|                                                                              |              |   |                  |  |  |  |                                     |
|------------------------------------------------------------------------------|--------------|---|------------------|--|--|--|-------------------------------------|
| Carrier frequency:                                                           | $f$          | = | <b>134.2 kHz</b> |  |  |  |                                     |
| Distance:                                                                    | $d$          | = | <b>5 mm</b>      |  |  |  |                                     |
| Transmitter output power:                                                    | $TP$         | = | <b>2.63 mW</b>   |  |  |  |                                     |
| Limit:                                                                       | $TP_{limit}$ | = | <b>71 mW</b>     |  |  |  | <input checked="" type="checkbox"/> |
| <input type="checkbox"/> SAR evaluation is documented in test report no. ... |              |   |                  |  |  |  |                                     |

|                 |                                                                                                                                                    |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Specifications: | RSS-102, Issue 5, Section 4, Table 4, Uncontrolled Environment<br>SPR-002, Issue 1                                                                 |
| Operation mode: | 12 V DC power supply - Transmitting continuously and waiting for tags                                                                              |
| Comment:        | The nerve stimulation exposure limit is defined for the frequency range 3 kHz to 10 MHz, only. Thus, the carrier at 134.2 kHz was evaluated, only. |

|                 |                                                                                                              |                                |                                |                         |
|-----------------|--------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------------|-------------------------|
| Test procedure: | IEC 62236-1, Section 4.2 "Measurement to show accordance to the reference levels"                            |                                |                                |                         |
| Test distance:  | Direct contact to EUT                                                                                        |                                |                                |                         |
| Limit:          | Frequency Range (MHz)                                                                                        | Electric Field ( $V/m_{rms}$ ) | Magnetic Field ( $A/m_{rms}$ ) | Reference Periode (min) |
|                 | 0.003 – 10                                                                                                   | 83                             | 90                             | Instantaneous           |
|                 | 0.1 – 10                                                                                                     | ---                            | $0.73 / f$                     | 6                       |
|                 | 1.1 - 10                                                                                                     | $87/f^{0.5}$                   | ---                            | 6                       |
|                 | $f$ in MHz                                                                                                   |                                |                                |                         |
| Test positions: | All surfaces: The antenna was moved all over the equipment under test using a test distance as stated above. |                                |                                |                         |

| Measured maximum value<br>(V/m) | Maximum Limit at 134.2 kHz<br>(V/m) | Margin to reference value<br>(V/m) |
|---------------------------------|-------------------------------------|------------------------------------|
| 5.24                            | 83.00                               | 77.76                              |

| Measured maximum value<br>(A/m) | Maximum Limit at 134.2 kHz<br>(A/m) | Margin to reference value<br>(A/m) |
|---------------------------------|-------------------------------------|------------------------------------|
| 0.46                            | 90.00                               | 89.54                              |

| Measured average value<br>(A/m) | Average Limit at 134.2 kHz<br>(A/m) | Margin to reference value<br>(A/m) |
|---------------------------------|-------------------------------------|------------------------------------|
| 0.24                            | 5.84                                | 5.60                               |



### 2.5.6 Test Location and Test Equipment Used

This test was carried out in a Shielded room - cabin no. 4.

| Instrument                      | Manufacturer | Type No   | TE No | Calibration Period (months) | Calibration Due |
|---------------------------------|--------------|-----------|-------|-----------------------------|-----------------|
| Electromagnetic radiation meter | Narda Safety | EMR-200   | 19590 | 36                          | 2019-10-31      |
| Electric field probe            | Narda Safety | Type 8.3  | 19591 | 36                          | 2019-10-31      |
| Magnetic field probe            | Narda Safety | Type 12.1 | 19592 | 36                          | 2019-10-31      |
| Exposure level tester           | Narda Safety | ELT-400   | 19725 | 24                          | 2020-06-30      |

**Table 11**



## 2.6 Pulse Train

### 2.6.1 Specification Reference

CFR 47 Part 15, section 15.35(c)  
IC RSS-Gen Issue 3, section 4.5

### 2.6.2 Equipment Under Test and Modification State

ASR650, S/N: --- - Modification State 0

### 2.6.3 Date of Test

2018-07-26

### 2.6.4 Test Method

This test was performed in accordance with ANSI C63.4

### 2.6.5 Environmental Conditions

Ambient Temperature 23,0 °C  
Relative Humidity 38,0 %

### 2.6.6 Test Results

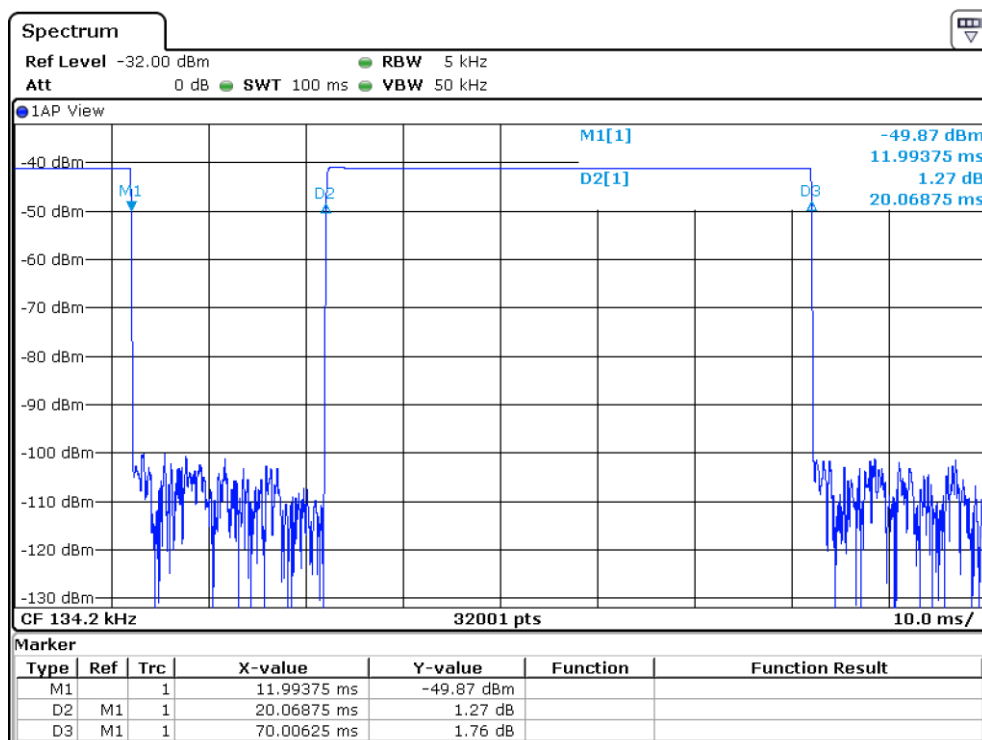
12 V DC power supply - Transmitting continuously and waiting for tags

#### Calculation of pulse train correction:

|                          |              |   |                                                       |
|--------------------------|--------------|---|-------------------------------------------------------|
| TX-On-Time (worst case): | $T_{on}$     | = | 49.938 ms                                             |
| Pulse Train Time:        | $T_{pt}$     | = | 70.006 ms                                             |
| Period Time:             | $T_{period}$ | = | 70.006 ms                                             |
| Pulse Train Correction:  | $C_{pt}$     | = | $20 \cdot \text{Log}(T_{on} / T_{period}) \text{ dB}$ |
|                          |              | = | <b>-2.934 dB</b>                                      |



Product Service



Date: 26.JUL.2018 12:36:46

Figure 7 – Pulse Train

## 2.6.7 Test Location and Test Equipment Used

This test was carried out in Non shielded room.

| Instrument            | Manufacturer    | Type No | TE No | Calibration Period (months) | Calibration Due |
|-----------------------|-----------------|---------|-------|-----------------------------|-----------------|
| Spectrum Analyzer     | Rohde & Schwarz | FSV40   | 20219 | 12                          | 2019-01-31      |
| Climatic test chamber | ESPEC           | PL-2J   | 18843 | 24                          | 2019-03-31      |

Table 12

TU - Traceability Unscheduled

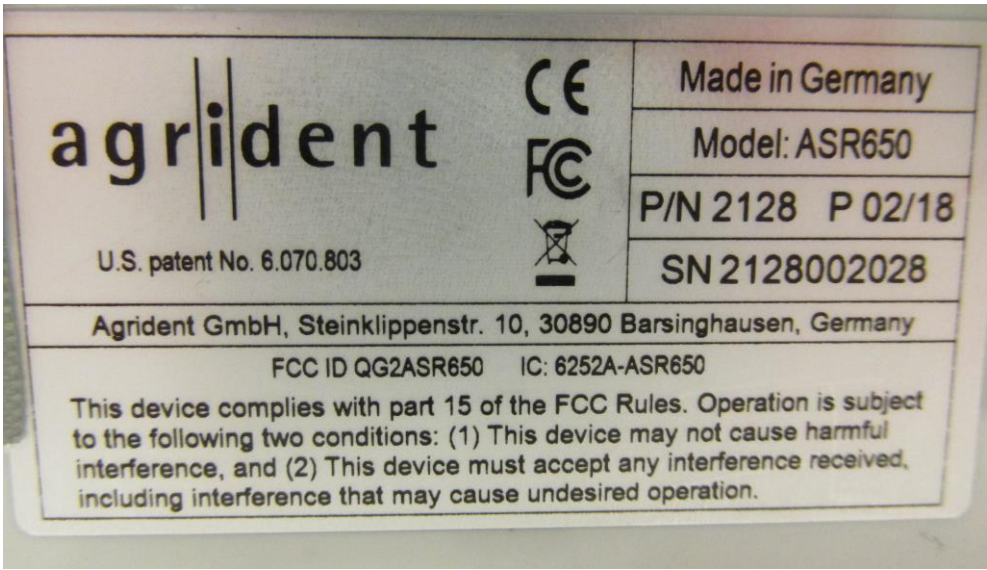
O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable



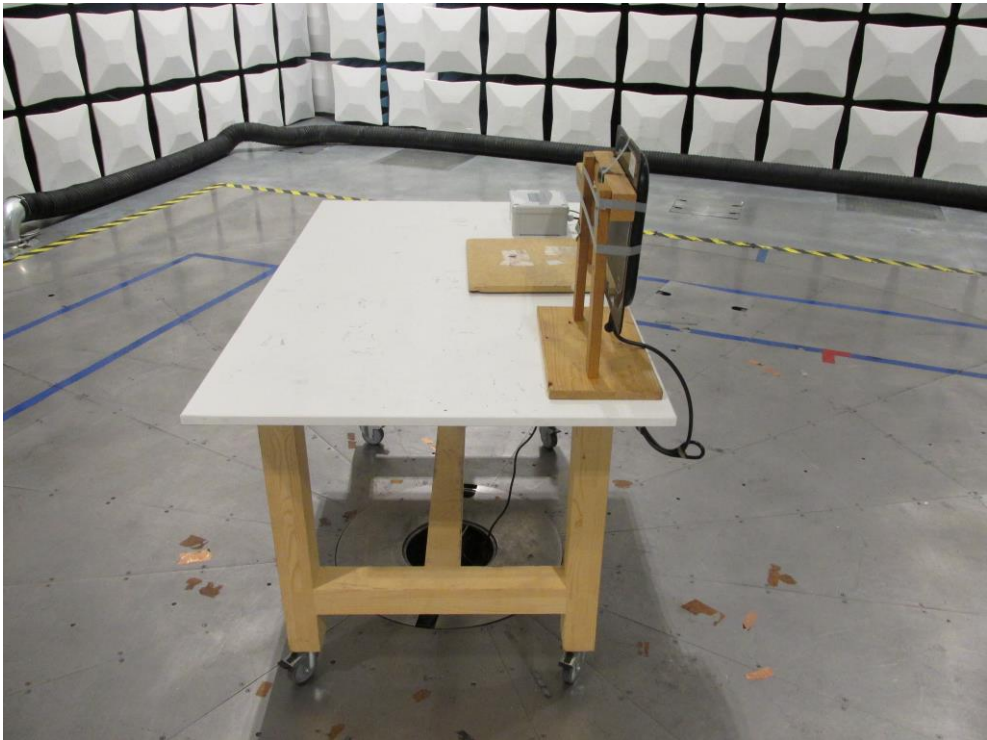
3      Photographs

3.1      Equipment Under Test (EUT)



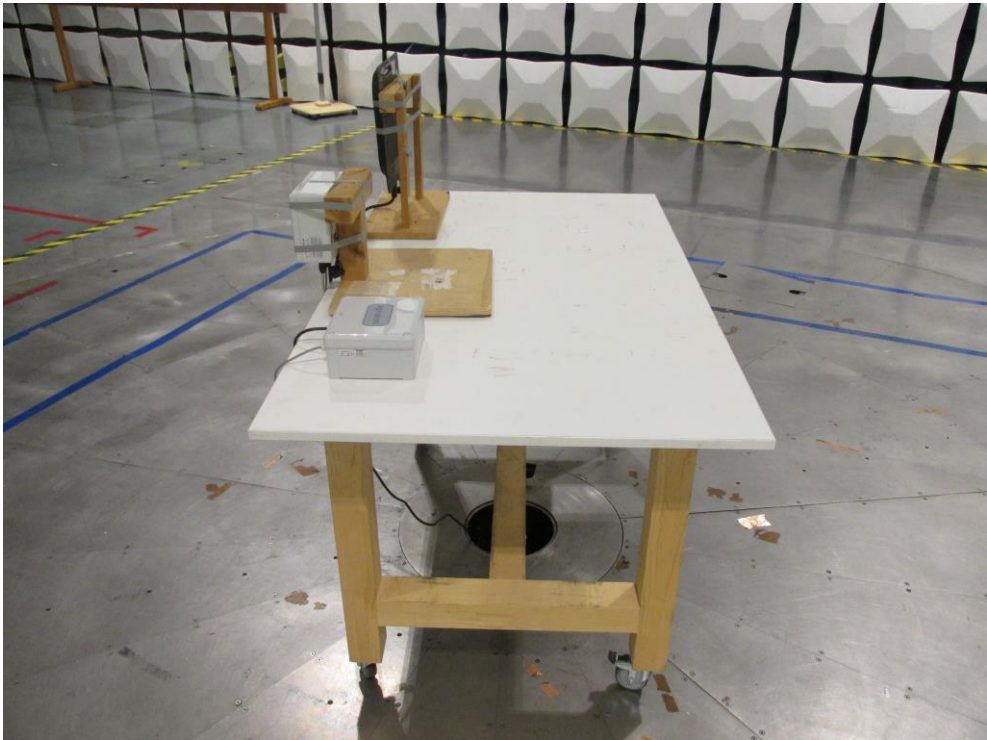
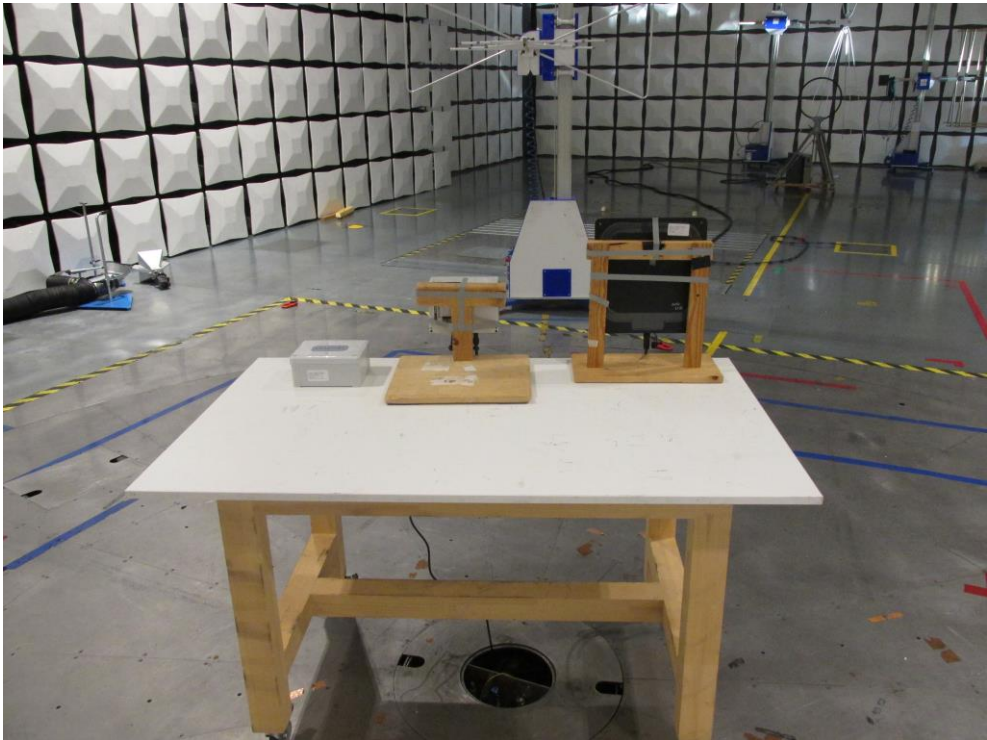


Product Service



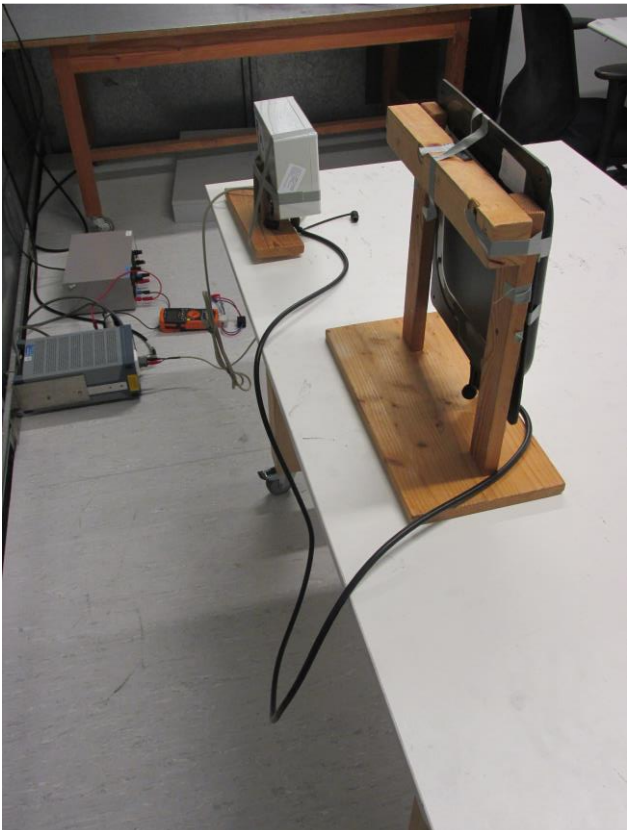
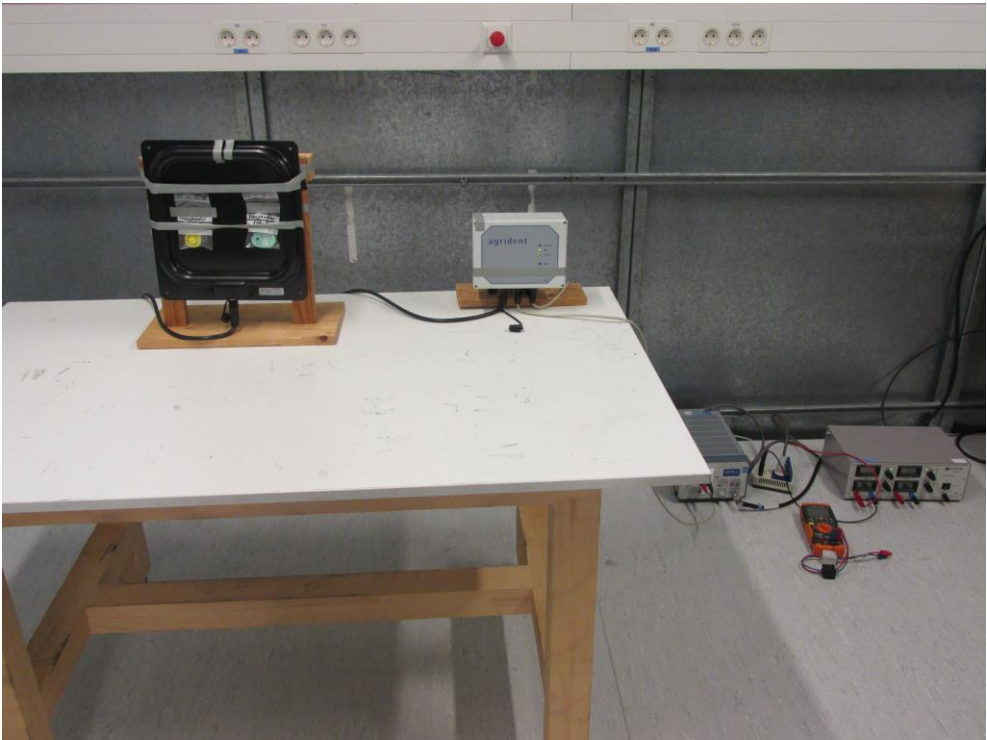


Product Service



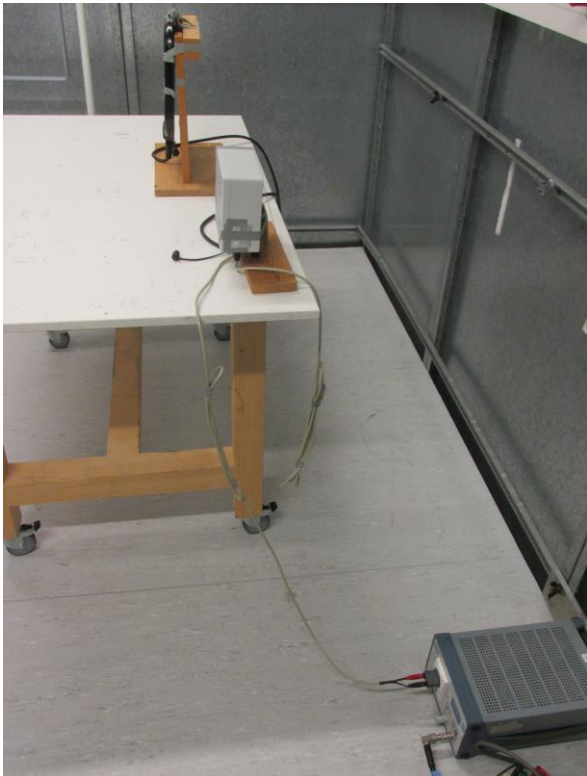


Product Service





Product Service







## 4 Test Equipment Information

### 4.1 General Test Equipment Used

| Instrument                      | Manufacturer    | Type No    | TE No | Calibration Period (months) | Calibration Due |
|---------------------------------|-----------------|------------|-------|-----------------------------|-----------------|
| Spectrum Analyzer               | Rohde & Schwarz | FSV40      | 20219 | 12                          | 2019-01-31      |
| Climatic test chamber           | ESPEC           | PL-2J      | 18843 | 24                          | 2019-03-31      |
| EMI test receiver               | Rohde & Schwarz | 100008     | 19730 | 12                          | 2018-10-31      |
| V-network                       | Rohde & Schwarz | 894785/005 | 18919 | 36                          | 2019-10-31      |
| Double ridged horn antenna      | Rohde & Schwarz | HF907      | 19933 | 24                          | 2019-06-30      |
| TRILOG Antenna                  | Schwarzbeck     | VULB 9163  | 19691 | 24                          | 2020-12-31      |
| EMI test receiver               | Rohde & Schwarz | ESW26      | 28268 | 12                          | 2019-05-31      |
| Electromagnetic radiation meter | Narda Safety    | EMR-200    | 19590 | 36                          | 2019-10-31      |
| Electric field probe            | Narda Safety    | Type 8.3   | 19591 | 36                          | 2019-10-31      |
| Magnetic field probe            | Narda Safety    | Type 12.1  | 19592 | 36                          | 2019-10-31      |
| Exposure level tester           | Narda Safety    | ELT-400    | 19725 | 24                          | 2020-06-30      |

**Table 13**

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable

## 5 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 14



| Radio Interference Emission Testing               |    |                      |      |
|---------------------------------------------------|----|----------------------|------|
| Test Name                                         | kp | Expanded Uncertainty | Note |
| Conducted Voltage Emission                        |    |                      |      |
| 9 kHz to 150 kHz (50 $\Omega$ /50 $\mu$ H AMN)    | 2  | $\pm 3.8$ dB         | 1    |
| 150 kHz to 30 MHz (50 $\Omega$ /50 $\mu$ H AMN)   | 2  | $\pm 3.4$ dB         | 1    |
| 100 kHz to 200 MHz (50 $\Omega$ /5 $\mu$ H AMN)   | 2  | $\pm 3.6$ dB         | 1    |
| Discontinuous Conducted Emission                  |    |                      |      |
| 9 kHz to 150 kHz (50 $\Omega$ /50 $\mu$ H AMN)    | 2  | $\pm 3.8$ dB         | 1    |
| 150 kHz to 30 MHz (50 $\Omega$ /50 $\mu$ H AMN)   | 2  | $\pm 3.4$ dB         | 1    |
| Conducted Current Emission                        |    |                      |      |
| 9 kHz to 200 MHz                                  | 2  | $\pm 3.5$ dB         | 1    |
| Magnetic Fieldstrength                            |    |                      |      |
| 9 kHz to 30 MHz (with loop antenna)               | 2  | $\pm 3.9$ dB         | 1    |
| 9 kHz to 30 MHz (large-loop antenna 2 m)          | 2  | $\pm 3.5$ dB         | 1    |
| Radiated Emission                                 |    |                      |      |
| Test distance 1 m (ALSE)                          |    |                      |      |
| 9 kHz to 150 kHz                                  | 2  | $\pm 4.6$ dB         | 1    |
| 150 kHz to 30 MHz                                 | 2  | $\pm 4.1$ dB         | 1    |
| 30 MHz to 200 MHz                                 | 2  | $\pm 5.2$ dB         | 1    |
| 200 MHz to 2 GHz                                  | 2  | $\pm 4.4$ dB         | 1    |
| 2 GHz to 3 GHz                                    | 2  | $\pm 4.6$ dB         | 1    |
| Test distance 3 m                                 |    |                      |      |
| 30 MHz to 300 MHz                                 | 2  | $\pm 4.9$ dB         | 1    |
| 300 MHz to 1 GHz                                  | 2  | $\pm 5.0$ dB         | 1    |
| 1 GHz to 6 GHz                                    | 2  | $\pm 4.6$ dB         | 1    |
| Test distance 10 m                                |    |                      |      |
| 30 MHz to 300 MHz                                 | 2  | $\pm 4.9$ dB         | 1    |
| 300 MHz to 1 GHz                                  | 2  | $\pm 4.9$ dB         | 1    |
| Radio Interference Power                          |    |                      |      |
| 30 MHz to 300 MHz                                 | 2  | $\pm 3.5$ dB         | 1    |
| Harmonic Current Emissions                        |    |                      | 4    |
| Voltage Changes, Voltage Fluctuations and Flicker |    |                      | 4    |

Table 15



| 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 16**

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  $p = 95.45\%$