



Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

## Glossary

CW                      Continuous wave

## Calibration is Performed According to the Following Standards

- Internal procedure QA CAL-45-5Gsources
- IEC TR 63170 ED1, "Measurement procedure for the evaluation of power density related to human exposure to radio frequency fields from wireless communication devices operating between 6 GHz and 100 GHz", January 2018

## Methods Applied and Interpretation of Parameters

- *Coordinate System:* z-axis in the waveguide horn boresight, x-axis is in the direction of the E-field, y-axis normal to the others in the field scanning plane parallel to the horn flare and horn flange.
- *Measurement Conditions:* (1) 10 GHz: The radiated power is the forward power to the horn antenna minus ohmic and mismatch loss. During the measurements, the horn is directly connected to the cable and the antenna ohmic and mismatch losses are determined by far-field measurements. (2) 30, 45, 60 and 90 GHz: The verification sources are switched on for at least 30 minutes. Absorbers are used around the probe cub and at the ceiling to minimize reflections.
- *Horn Positioning:* The waveguide horn is mounted vertically on the flange of the waveguide source to allow vertical positioning of the EUmmW probe during the scan. The plane is parallel to the phantom surface. Probe distance is verified using mechanical gauges positioned on the flare of the horn.
- *E- field distribution:* E field is measured in two x-y-plane (10mm, 10mm +  $\lambda/4$ ) with a vectorial E-field probe. The E-field value stated as calibration value represents the E-field-maxima and the averaged (1cm<sup>2</sup> and 4cm<sup>2</sup>) power density values at 10mm in front of the horn.
- *Field polarization:* Above the open horn, linear polarization of the field is expected. This is verified graphically in the field representation.

## Calibrated Quantity

- Local peak E-field (V/m) and average of peak spatial components of the poynting vector (W/m<sup>2</sup>) averaged over the surface area of 1 cm<sup>2</sup> and 4cm<sup>2</sup> at the nominal operational frequency of the verification source. Both square and circular averaging results are listed.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                                       |                               |      |
|---------------------------------------|-------------------------------|------|
| <b>DASY Version</b>                   | cDASY6 Module mmWave          | V2.4 |
| <b>Phantom</b>                        | 5G Phantom                    |      |
| <b>Distance Horn Aperture - plane</b> | 10 mm                         |      |
| <b>XY Scan Resolution</b>             | dx, dy = 1.67 mm              |      |
| <b>Number of measured planes</b>      | 2 (10mm, 10mm + $\lambda/4$ ) |      |
| <b>Frequency</b>                      | 45 GHz $\pm$ 10 MHz           |      |

## Calibration Parameters, 45 GHz

### Circular Averaging

| Distance Horn Aperture to Measured Plane | <b>Prad<sup>1</sup></b><br>(mW) | <b>Max E-field</b><br>(V/m) | Uncertainty<br>(k = 2) | Avg Power Density<br>Avg (psPDn+, psPDtot+, psPDmod+)<br>(W/m <sup>2</sup> ) |                   | Uncertainty<br>(k = 2) |
|------------------------------------------|---------------------------------|-----------------------------|------------------------|------------------------------------------------------------------------------|-------------------|------------------------|
|                                          |                                 |                             |                        | 1 cm <sup>2</sup>                                                            | 4 cm <sup>2</sup> |                        |
| 10 mm                                    | 107                             | 294                         | 1.27 dB                | 185                                                                          | 155               | 1.28 dB                |

### Square Averaging

| Distance Horn Aperture to Measured Plane | <b>Prad<sup>1</sup></b><br>(mW) | <b>Max E-field</b><br>(V/m) | Uncertainty<br>(k = 2) | Avg Power Density<br>Avg (psPDn+, psPDtot+, psPDmod+)<br>(W/m <sup>2</sup> ) |                   | Uncertainty<br>(k = 2) |
|------------------------------------------|---------------------------------|-----------------------------|------------------------|------------------------------------------------------------------------------|-------------------|------------------------|
|                                          |                                 |                             |                        | 1 cm <sup>2</sup>                                                            | 4 cm <sup>2</sup> |                        |
| 10 mm                                    | 107                             | 294                         | 1.27 dB                | 185                                                                          | 155               | 1.28 dB                |

<sup>1</sup> derived from far-field data



# DASY Report

## Measurement Report for 5G Verification Source 45 GHz, UID 0 -, Channel 45000 (45000.0MHz)

### Device under Test Properties

| Name, Manufacturer            | Dimensions [mm]       | IMEI     | DUT Type |
|-------------------------------|-----------------------|----------|----------|
| 5G Verification Source 45 GHz | 100.0 x 100.0 x 100.0 | SN: 1002 | -        |

### Exposure Conditions

| Phantom Section | Position, Test Distance [mm] | Band            | Group, | Frequency [MHz], Channel Number | Conversion Factor |
|-----------------|------------------------------|-----------------|--------|---------------------------------|-------------------|
| 5G -            | 5.55 mm                      | Validation band | CW     | 45000.0, 45000                  | 1.0               |

### Hardware Setup

| Phantom               | Medium | Probe, Calibration Date               | DAE, Calibration Date     |
|-----------------------|--------|---------------------------------------|---------------------------|
| mmWave Phantom - 1002 | Air    | EUmmWV3 - SN9374_F1-78GHz, 2020-12-30 | DAE4ip Sn1602, 2021-06-25 |

### Scan Setup

|                     | 5G Scan       |                              | 5G Scan           |
|---------------------|---------------|------------------------------|-------------------|
| Grid Extents [mm]   | 42.0 x 42.0   | Date                         | 2021-11-29, 15:50 |
| Grid Steps [lambda] | 0.25 x 0.25   | Avg. Area [cm <sup>2</sup> ] | 1.00              |
| Sensor Surface [mm] | 5.55          | psPDn+ [W/m <sup>2</sup> ]   | 184               |
| MAIA                | MAIA not used | psPDtot+ [W/m <sup>2</sup> ] | 185               |
|                     |               | psPDmod+ [W/m <sup>2</sup> ] | 186               |
|                     |               | E <sub>max</sub> [V/m]       | 294               |
|                     |               | Power Drift [dB]             | -0.03             |

### Measurement Results

