

Calibration Laboratory of
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S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Glossary

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

CW Continuous wave

Accreditation No.: **SCS 0108**

Calibration is Performed According to the Following Standards

- Internal procedure QA CAL-45, Calibration procedure for sources in air above 6 GHz.
- IEC/IEEE 63195-1, "Assessment of power density of human exposure to radio frequency fields from wireless devices in close proximity to the head and body (frequency range of 6 GHz to 300 GHz)", May 2022

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. The forward power is measured prior and after the measurement with a power sensor. 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 (1cm² and 4cm²) 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/m²) averaged over the surface area of 1 cm² and 4cm² 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.

DASY Version	DASY8 Module mmWave	V3.2
Phantom	5G Phantom	
Distance Horn Aperture - plane	10 mm	
Number of measured planes	2 (10mm, 10mm + $\lambda/4$)	
Frequency	10 GHz \pm 10 MHz	

Calibration Parameters, 10 GHz**Circular Averaging**

Distance Horn Aperture to Measured Plane	Prad ^l (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Avg Power Density Avg (psPDn+, psPDtot+, psPDmod+) (W/m ²)	Uncertainty (k = 2)
				1 cm ²	4 cm ²
10 mm	93.3	152	1.27 dB	60.3	56.2

Distance Horn Aperture to Measured Plane	Prad ^l (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Power Density psPDn+, psPDtot+, psPDmod+ (W/m ²)	Uncertainty (k = 2)
				1 cm ²	4 cm ²
10 mm	93.3	152	1.27 dB	60.1, 60.3, 60.5	55.9, 56.2, 56.4

Square Averaging

Distance Horn Aperture to Measured Plane	Prad ^l (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Avg Power Density Avg (psPDn+, psPDtot+, psPDmod+) (W/m ²)	Uncertainty (k = 2)
				1 cm ²	4 cm ²
10 mm	93.3	152	1.27 dB	60.3	56.1

Distance Horn Aperture to Measured Plane	Prad ^l (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Power Density psPDn+, psPDtot+, psPDmod+ (W/m ²)	Uncertainty (k = 2)
				1 cm ²	4 cm ²
10 mm	93.3	152	1.27 dB	60.1, 60.3, 60.4	55.8, 56.1, 56.3

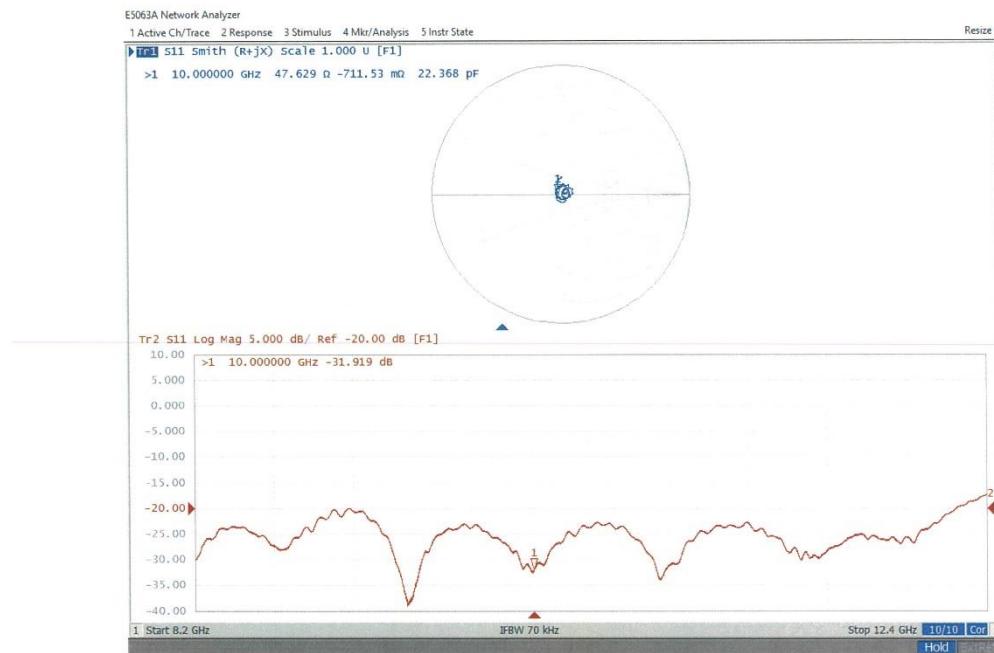
Max Power Density

Distance Horn Aperture to Measured Plane	Prad ^l (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Max Power Density Sn, Stot, Stot (W/m ²)	Uncertainty (k = 2)
10 mm	93.3	152	1.27 dB	61.8, 61.8, 62.0	1.28 dB

^l Assessed ohmic and mismatch loss plus numerical offset: 0.30 dB

Appendix (Additional assessments outside the scope of SCS 0108)**Antenna Parameters**

Impedance, transformed to feed point	47.6 Ω - 0.7 $j\Omega$
Return Loss	- 31.9 dB

Impedance Measurement Plot

DASY Report**Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)****Device under Test Properties**

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 10 GHz	100.0 x 100.0 x 172.0	SN: 1070	-

Exposure Conditions

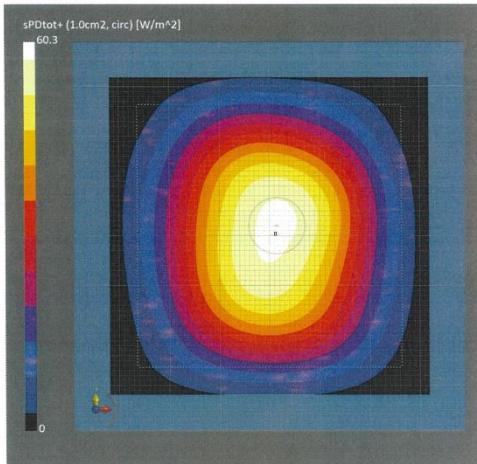
Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	CW	10000.0, 10000	1.0

Hardware Setup

Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-55GHz, 2023-12-04	DAE4ip Sn1602, 2023-11-08

Scan Setup

Sensor Surface [mm]	5G Scan	Measurement Results	5G Scan
MAIA	10.0 MAIA not used	Date Avg. Area [cm ²] Avg. Type psPD ⁺ [W/m ²] psPD ^{tot+} [W/m ²] psPD ^{mod+} [W/m ²] Max(Sn) [W/m ²] Max(Stot) [W/m ²] Max(Stot) [W/m ²] E _{max} [V/m] Power Drift [dB]	2024-08-16, 09:41 1.00 Circular Averaging 60.1 60.3 60.5 61.8 61.8 62.0 152 -0.02



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Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 10 GHz	100.0 x 100.0 x 172.0	SN: 1070	-

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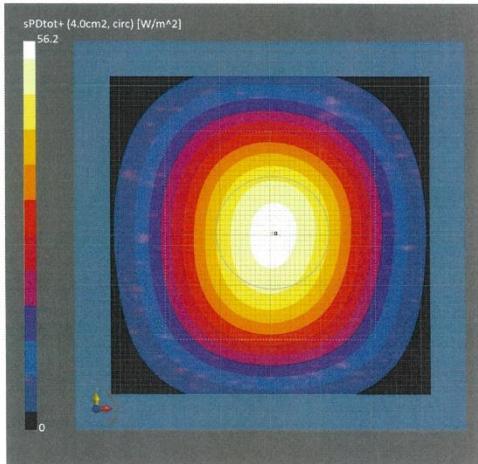
Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	CW	10000.0, 10000	1.0

Hardware Setup

Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-55GHz, 2023-12-04	DAE4ip Sn1602, 2023-11-08

Scan Setup

Sensor Surface [mm]	5G Scan	Measurement Results	5G Scan
MAIA	10.0 MAIA not used	Date Avg. Area [cm ²] Avg. Type psPDn+ [W/m ²] psPdot+ [W/m ²] psPDmod+ [W/m ²] Max(Sn) [W/m ²] Max(Stot) [W/m ²] Max(Stot) [W/m ²] E _{max} [V/m] Power Drift [dB]	2024-08-16, 09:41 4.00 Circular Averaging 55.9 56.2 56.4 61.8 61.8 62.0 152 -0.02



DASY Report**Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)****Device under Test Properties**

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 10 GHz	100.0 x 100.0 x 172.0	SN: 1070	-

Exposure Conditions

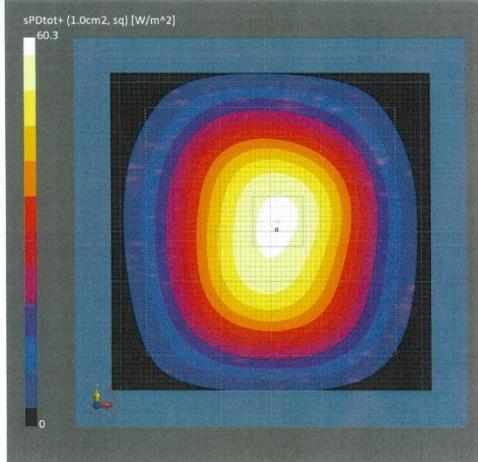
Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	CW	10000.0, 10000	1.0

Hardware Setup

Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-55GHz, 2023-12-04	DAE4ip Sn1602, 2023-11-08

Scan Setup

Sensor Surface [mm]	5G Scan	Measurement Results	5G Scan
MAIA	10.0	Date	2024-08-16, 09:41
	MAIA not used	Avg. Area [cm ²]	1.00
		Avg. Type	Square Averaging
		psPDtot+ [W/m ²]	60.1
		psPDtot+ [W/m ²]	60.3
		psPDmod+ [W/m ²]	60.4
		Max(Sn) [W/m ²]	61.8
		Max(Stot) [W/m ²]	61.8
		Max(Stot) [W/m ²]	62.0
		E _{max} [V/m]	152
		Power Drift [dB]	-0.02



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Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 10 GHz	100.0 x 100.0 x 172.0	SN: 1070	-

Exposure Conditions

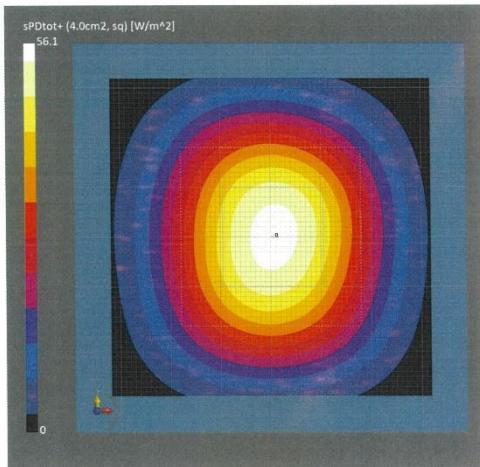
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5G -	10.0 mm	Validation band	CW	10000.0, 10000	1.0

Hardware Setup

Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
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Scan Setup

Sensor Surface [mm]	5G Scan	Measurement Results	5G Scan
MAIA	10.0 MAIA not used	Date Avg. Area [cm ²] Avg. Type psPdot+ [W/m ²] psPdot+ [W/m ²] psPdot+ [W/m ²] Max(Sn) [W/m ²] Max(Stot) [W/m ²] Max(Stot) [W/m ²] E _{max} [V/m] Power Drift [dB]	2024-08-16, 09:41 4.00 Square Averaging 55.8 56.1 56.3 61.8 61.8 62.0 152 -0.02

**- End of report -**

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.
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