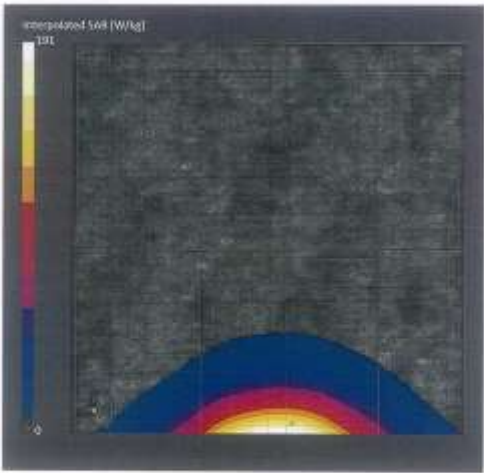


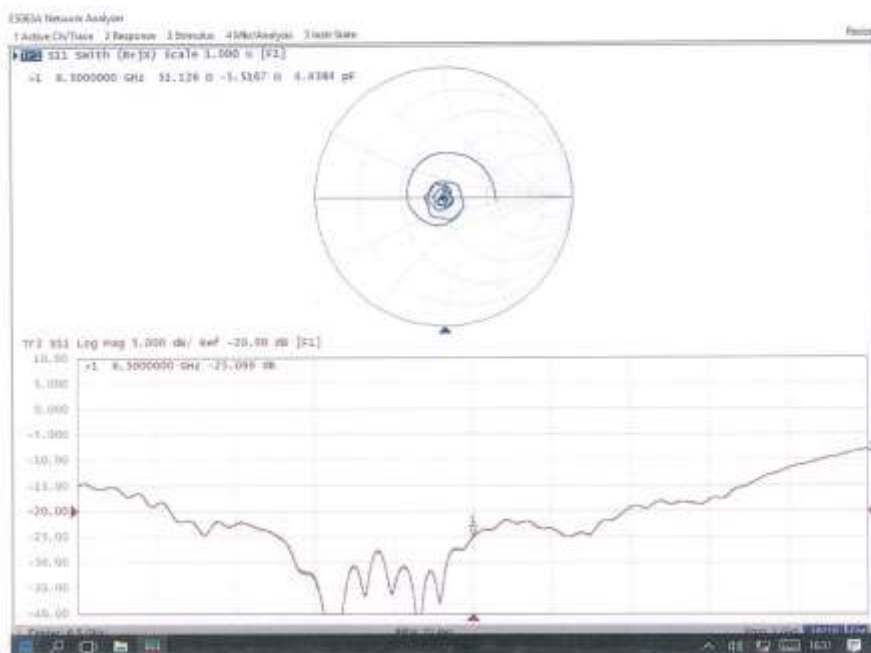
DASY6 Validation Report for Head TSL

Measurement Report for D6.5GHz-1012, UID 0 -, Channel 6500 (6500.0MHz)

Device under Test Properties				DUT Type			
Name, Manufacturer	Dimensions [mm]	IMEI					
D6.5GHz	16.0 x 6.0 x 300.0	SN: 1012					
Exposure Conditions							
Phantom	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz]	Conversion Factor	TSL Cond. [S/m]	TSL Permittivity
Flat, HSL	5.00	Band	CW,	6500	5.14	6.24	34.6
Hardware Setup				Measurement Results			
Phantom	TSL	Probe, Calibration Date	DAE, Calibration Date				
MFP V8.0 Center - 1182	HBBL600-10000V6	EX3DV4 - SN7405, 2024-07-01	DAE4 Sn908, 2024-03-27				
Scan Setup				Zoom Scan			
Grid Extents [mm]	22.0 x 22.0 x 22.0	Date	2024-09-17, 13:56	psSAR1g [W/Kg]	29.7		
Grid Steps [mm]	3.4 x 3.4 x 1.4	psSAR8g [W/Kg]	6.64	psSAR10g [W/Kg]	5.45		
Sensor Surface [mm]	1.4	Power Drift [dB]	-0.02	Power Scaling	Disabled		
Graded Grid	Yes	Scaling Factor [dB]		TSL Correction	No correction		
Grading Ratio	1.4	M2/M1 [%]	50.5	Dist 3dB Peak [mm]	4.8		
MAIA	N/A						
Surface Detection	VMS + 6p						
Scan Method	Measured						



Impedance Measurement Plot for Head TSL



Calibration Laboratory of
Schmid & Partner
Engineering AG
 Zeughausstrasse 43, 8004 Zurich, Switzerland



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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **HCT**
 Gyeonggi-do, Republic of Korea

Certificate No. **5G-Veri10-1018_Apr24**

CALIBRATION CERTIFICATE

Object **5G Verification Source 10 GHz - SN: 1018**

Calibration procedure(s) **QA CAL-45.v5**
 Calibration procedure for sources in air above 6 GHz

Calibration date: **April 17, 2024**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Reference Probe EUMmWV3	SN: 9374	04-Dec-23 (No. EUMm-9374_Dec23)	Dec-24
DAE4ip	SN: 1602	08-Nov-23 (No. DAE4ip-1602_Nov23)	Nov-24

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMF100A	SN: 100184	29-Nov-23 (in house check Nov-23)	In house check: Nov-24
Power sensor R&S NRP18S-10	SN: 101258	29-Nov-23 (in house check Nov-23)	In house check: Nov-24
Network Analyzer Keysight E5063A	SN: MY54504221	31-Oct-19 (in house check Oct-22)	In house check: Oct-25

결	담	담	자	확	인	자
재	7131					
서명	SV	7131				
일	2024.04.03					

Calibrated by: **Leif Klysner** Function: **Laboratory Technician** Signature: *Leif Klysner*

Approved by: **Sven Kühn** Function: **Technical Manager** Signature: *Sven Kühn*

Issued: April 20, 2024

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: 5G-Veri10-1018_Apr24

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Calibration Laboratory of
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Glossary

CW Continuous wave

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	$Prad^i$ (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	154	1.27 dB	61.4	57.0	1.28 dB

Distance Horn Aperture to Measured Plane	$Prad^i$ (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	154	1.27 dB	61.0, 61.5, 61.7	56.5, 57.1, 57.3	1.28 dB

Square Averaging

Distance Horn Aperture to Measured Plane	$Prad^i$ (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	154	1.27 dB	61.4	56.9	1.28 dB

Distance Horn Aperture to Measured Plane	$Prad^i$ (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	154	1.27 dB	61.0, 61.5, 61.7	56.4, 57.0, 57.2	1.28 dB

Max Power Density

Distance Horn Aperture to Measured Plane	$Prad^i$ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Max Power Density S_n , S_{tot} , $ S_{tot} $ (W/m ²)	Uncertainty (k = 2)
10 mm	93.3	154	1.27 dB	62.6, 63.1, 63.3	1.28 dB

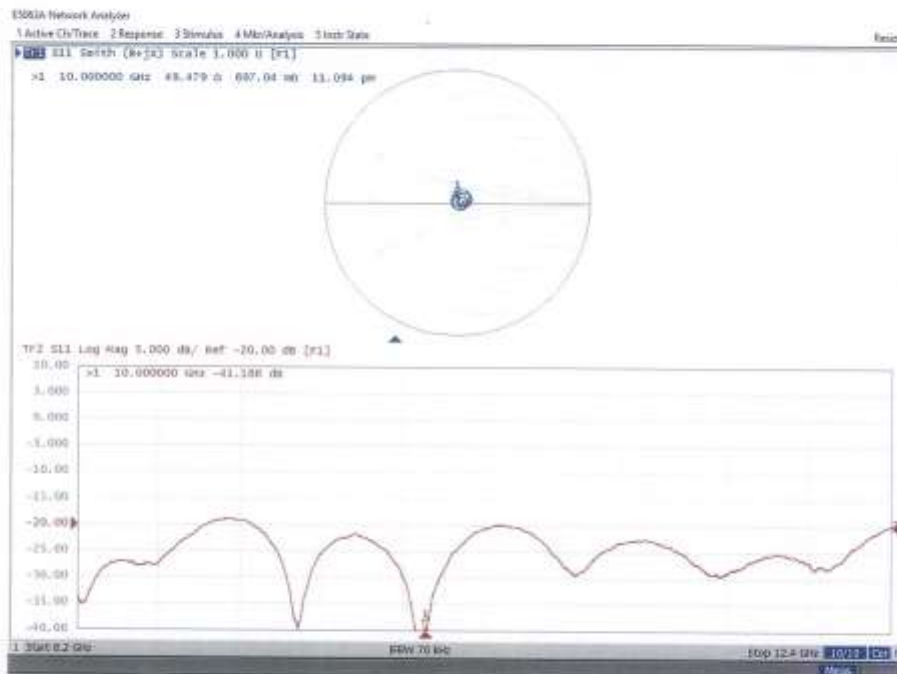
ⁱ Assessed ohmic and mismatch loss plus numerical offset: 0.30 dB

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters

Impedance, transformed to feed point	49.5 Ω + 0.70 j Ω
Return Loss	- 41.2 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: 1018	-

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
MAIA	10.0 MAIA not used

Measurement Results

Date	5G Scan
2024-04-17, 09:50	
Avg. Area [cm ²]	1.00
Avg. Type	Circular Averaging
psPDn+ [W/m ²]	61.0
psPDtot+ [W/m ²]	61.5
psPDmod+ [W/m ²]	61.7
Max(Sn) [W/m ²]	62.6
Max(Stot) [W/m ²]	63.1
Max(Stot) [W/m ²]	63.3
E _{max} [V/m]	154
Power Drift [dB]	-0.00



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: 1018	

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Band	Group	Frequency [MHz], Channel Number	Conversion Factor
SG -	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	EUMmW3 - SN9374_F1-55GHz, 2023-12-04	DAE4ip-Sn1602, 2023-11-08

Scan Setup

Sensor Surface [mm]	5G Scan
MAIA	10.0 MAIA not used

Measurement Results

Date	5G Scan
	2024-04-17, 09:50
Avg. Area [cm ²]	4.00
Avg. Type	Circular Averaging
psPDn+ [W/m ²]	56.5
psPDtot+ [W/m ²]	57.1
psPDmod+ [W/m ²]	57.3
Max(Sn) [W/m ²]	62.6
Max(Stot) [W/m ²]	63.1
Max(Stot) [W/m ²]	63.3
E _{ref} [V/m]	154
Power Drift [dB]	-0.00



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: 1018	-

Exposure Conditions

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

Hardware Setup

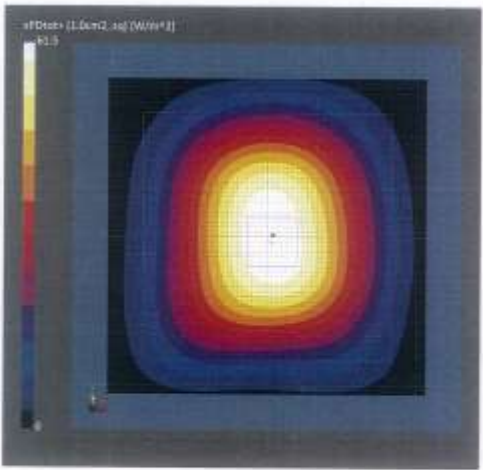
Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	IUmmWV3 - SN9374_F1-55GHz, 2023-12-04	DAE4ip 5n1602, 2023-11-08

Scan Setup

Sensor Surface [mm]	SG Scan
MAIA	10.0 MAIA not used

Measurement Results

Date	SG Scan
2024-04-17, 09:50	2024-04-17, 09:50
Avg. Area [cm ²]	1.00
Avg. Type	Square Averaging
psPDn+ [W/m ²]	61.0
psPDtot+ [W/m ²]	61.5
psPDmod+ [W/m ²]	61.7
Max(Sn) [W/m ²]	62.6
Max(Stot) [W/m ²]	63.1
Max(Stot) [W/m ²]	63.3
E _{max} [V/m]	154
Power Drift [dB]	-0.00



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: 1018	-

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 - SR9374_F1-55GHz, 2023-12-04	DAL4ip Sn1602, 2023-11-08

Scan Setup

Sensor Surface [mm]	5G Scan
MAIA	10.0 MAIA not used

Measurement Results

Date	5G Scan
2024-04-17, 09:50	
Avg. Area [cm ²]	4.00
Avg. Type	Square Averaging
psPDtot+ [W/m ²]	56.4
psPDtot+ [W/m ²]	57.0
psPDmod+ [W/m ²]	57.2
Max[Sr] [W/m ²]	62.6
Max[Stot] [W/m ²]	63.1
Max[Stot] [W/m ²]	63.3
E _{max} [V/m]	154
Power Drift [dB]	-0.00

