Appendix A.8 Dipole Calibration certificate (CLA13_SN1019)

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

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

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

Client **Eurofins KCTL**
Gyeonggi-do, Republic of Korea

Certificate No. **CLA13-1019_May24**

CALIBRATION CERTIFICATE

Object	CLA13 - SN: 1019
Calibration procedure(s)	QA CAL-15.v11 Calibration Procedure for SAR Validation Sources below 700 MHz
Calibration date:	May 21, 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
Power meter NRP2	SN: 104778	26-Mar-24 (No. 217-04036/04037)	Mar-25
Power sensor NRP-Z91	SN: 103244	26-Mar-24 (No. 217-04038)	Mar-25
Power sensor NRP-Z91	SN: 103245	26-Mar-24 (No. 217-04037)	Mar-25
Reference 20 dB Attenuator	SN: CC2552 (20x)	26-Mar-24 (No. 217-04046)	Mar-25
Type-N mismatch combination	SN: 310982 / 06327	26-Mar-24 (No. 217-04047)	Mar-25
Reference Probe EX3DV4	SN: 3877	10-Jan-24 (No. EX3-3877_Jan24)	Jan-25
DAE4	SN: 654	15-Jan-24 (No. DAE4-654_Jan24)	Jan-25

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter NRP2	SN: 107183	09-Nov-21 (in house check Dec-22)	In house check: Dec-24
Power sensor NRP-Z91	SN: 130922	15-Dec-09 (in house check Dec-22)	In house check: Dec-24
Power sensor NRP-Z91	SN: 130416	01-Jan-04 (in house check Dec-22)	In house check: Dec-24
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-22)	In house check: Jun-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

	Name	Function	Signature
Calibrated by:	Krešimir Franjic	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: May 22, 2024

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Certificate No: CLA13-1019_May24 Page 1 of 6

Calibration Laboratory of
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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	ELI4 Flat Phantom	Shell thickness: 2 ± 0.2 mm
EUT Positioning	Touch Position	
Zoom Scan Resolution	dx, dy = 4.0 mm dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	13 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	53.0	0.75 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	52.4 ± 6 %	0.72 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	1 W input power	0.545 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**0.557 W/kg ± 18.4 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	1 W input power	0.338 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**0.346 W/kg ± 18.0 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.5 Ω + 4.9 jΩ
Return Loss	-24.8 dB

Additional EUT Data

Manufactured by	SPEAG

DASY5 Validation Report for Head TSL

Date: 21.05.2024

Test Laboratory: SPEAG, Zurich, Switzerland

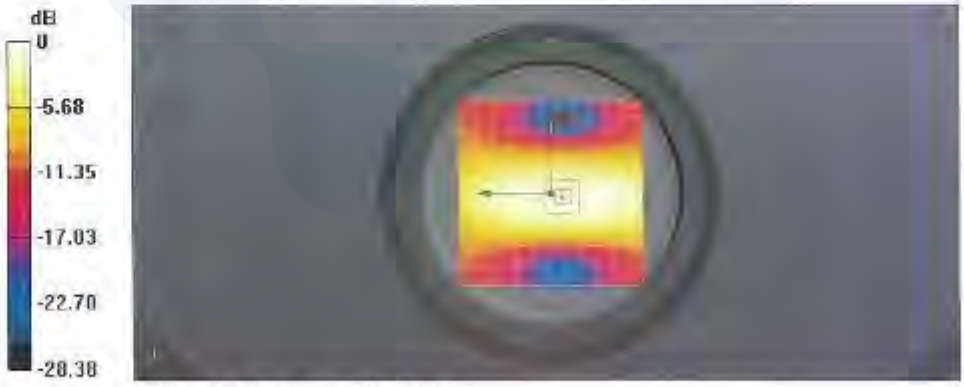
DUT: CLA13; Type: CLA13; Serial: CLA13 - SN: 1019

Communication System: UID 0 - CW; Frequency: 13 MHz
Medium parameters used: f = 13 MHz; σ = 0.72 S/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

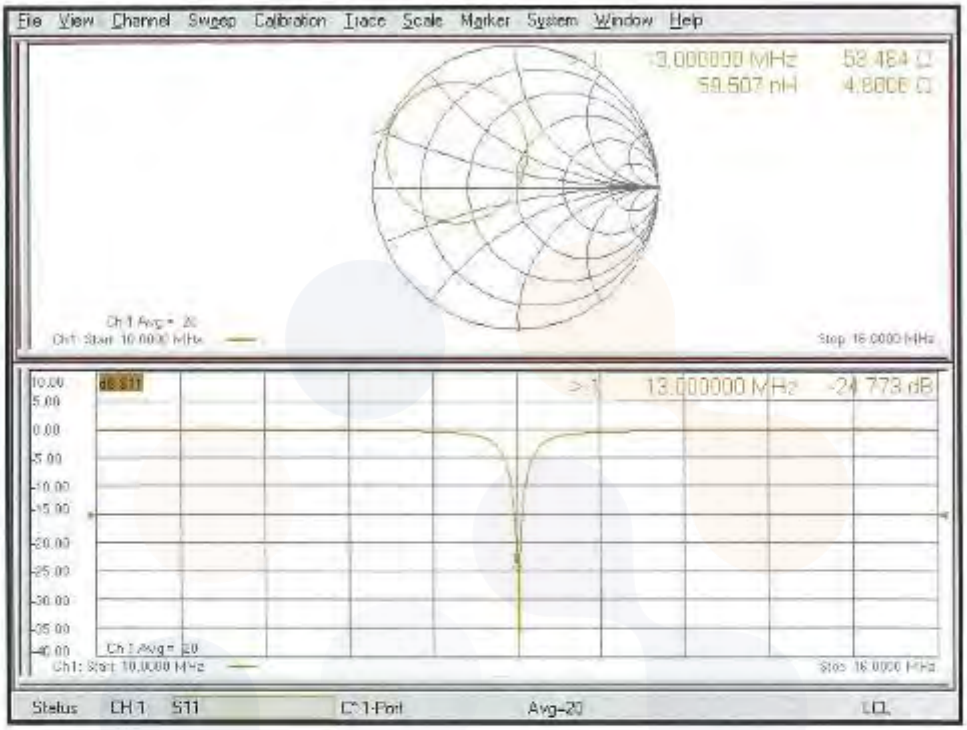
- Probe: EX3DV4 - SN3877; ConvF(15.33, 15.33, 15.33) @ 13 MHz; Calibrated: 10.01.2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 15.01.2024
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2034
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

CLA Calibration for HSL-LF Tissue/CLA-13, touch configuration, Pin=1W/Zoom Scan, dist=1.4mm (8x10x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 31.32 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.14 W/kg
SAR(1 g) = 0.545 W/kg; SAR(10 g) = 0.338 W/kg
Smallest distance from peaks to all points 3 dB below = 20.9 mm
Ratio of SAR at M2 to SAR at M1 = 77.4%
Maximum value of SAR (measured) = 0.807 W/kg



0 dB = 0.807 W/kg = -0.93 dBW/kg

Impedance Measurement Plot for Head TSL



Appendix A.9 Dipole Calibration certificate (D750V3_SN1224)

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

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Accreditation No.: SCS 0108

Client: Eurofins KCTL, Gyeonggi-do, Republic of Korea

Certificate No.: D750V3-1224_Sep24

CALIBRATION CERTIFICATE

Object: D750V3 - SN: 1224

Calibration procedure(s): QA CAL-05.v12
Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz

Calibration date: September 16, 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 Cal
Power Sensor R&S NRP-33T	SN: 100967	28-Mar-24 (No. 217-04038)	Mar-25
Power Sensor R&S NRP18A	SN: 101859	22-Jul-24 (No. 4030A31500854?)	Jul-25
Spectrum Analyzer R&S FSV40	SN: 101852	25-Jan-24 (No. 4030-315007551)	Jan-25
Mismatch: Short [S4188] Attenuator [S4423]	SN: 1152	28-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	05-Oct-23 (No. OCP-DAK12.1016_Oct23)	Oct-24
OCP DAK-3.5	SN: 1249	05-Oct-23 (No. OCP-DAK3.5-1249_Oct23)	Oct-24
Reference Probe EX3DV4	SN: 7949	03-Jun-24 (No. EX3-7949_Jun24)	Jun-25
DAE4ip	SN: 1838	10-Jan-24 (No. DAE4ip-1838_Jan24)	Jan-25

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Source Box	SN: 1000	28-May-24 (No. 675-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMB100A	SN: 182081	28-May-24 (No. 675-CAL16-S4588-240528)	May-25
Mismatch: SMA	SN: 1103	22-May-24 (No. 675-Mismatch_SMA-240522)	May-25

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: September 16, 2024

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Calibration Laboratory of
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Glossary

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards

- IEC/IEEE 62209-1528 "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation

- DASY System Handbook

Methods Applied and Interpretation of Parameters

- *Measurement Conditions*: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL*: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss*: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay*: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured*: SAR measured at the stated antenna input power.
- *SAR normalized*: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters*: The measured TSL parameters are used to calculate the nominal SAR result.

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 SAR	16.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with spacer
Zoom Scan Resolution	dx, dy = 8mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	750MHz ±1MHz	

Head TSL parameters at 750 MHz

The following parameters and calculations were applied

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.890 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	43.2 ±6%	0.880 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 750 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	2.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.52 W/kg ±17.0% (k = 2)

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	1.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.53 W/kg ±16.5% (k = 2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 750 MHz

Impedance	52.3 Ω + 2.0 jΩ
Return Loss	-30.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.034 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.
The dipole is made of standard semi-rigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D750V3 - SN:1224	750	HSL	24

Exposure Conditions

Phantom Section, TS	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	15		CW, 0	750, 0	8.0	0.86	43.2

Hardware Setup

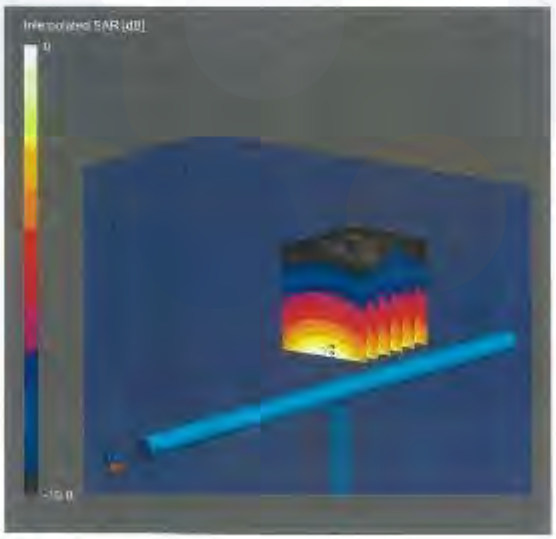
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Flat V4.3 mod	HSL, 2024-09-16	EX3DV4 - SN:7349, 2024-06-03	DAE4ip Sn1336, 2024-01-15

Scans Setup

	Zoom Scan
Grid Extents [mm]	30 x 30 x 30
Grid Steps [mm]	5.0 x 5.0 x 1.5
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	VMS + 6x
Scan Method	Measured

Measurement Results

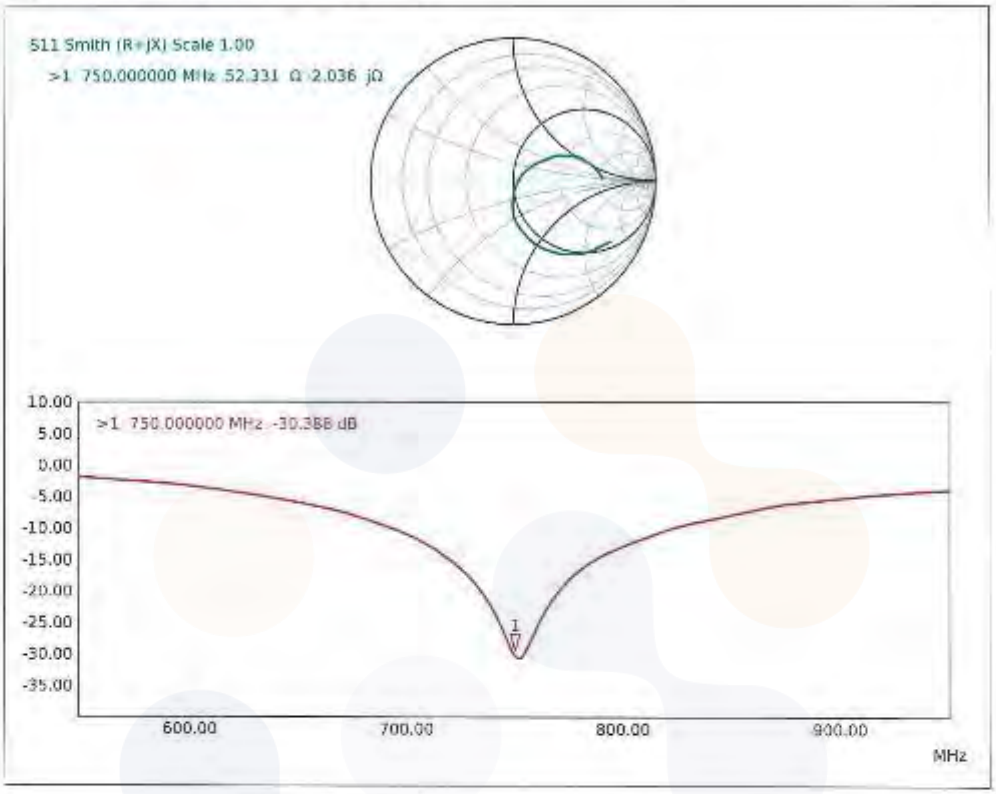
	Zoom Scan
Date	2024-09-16
psSAR1g [W/Kg]	2.14
psSAR 0g [W/Kg]	1.39
Power Drift [dB]	-0.01
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 3.28 W/Kg

D750V3 - SN: 1224 September 16, 2024

Impedance Measurement Plot for Head TSL



Appendix A.10 Dipole Calibration certificate (D850V2_SN1030)

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

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Accreditation No.: SCS 0108

Client	Eurofins KCTL Gyeonggi-do, Republic of Korea	Certificate No.	D850V2-1030_Sep24

CALIBRATION CERTIFICATE

Object	D850V2 - SN: 1030
Calibration procedure(s)	QA CAL-05.v12 Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz
Calibration date	September 16, 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 Cal
Power Sensor R&S NRP-33T	SN: 100967	28-Mar-24 (No. 217-04038)	Mar-25
Power Sensor R&S NRP18A	SN: 101859	22-Jul-24 (No. 4030A315008547)	Jul-25
Spectrum Analyzer R&S FSV40	SN: 101832	25-Jan-24 (No. 4030-315007551)	Jan-25
Mismatch; Short (S4188) Attenuator (S4423)	SN: 1152	28-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	05-Oct-23 (No. OCP-DAK12-1016_Oct23)	Oct-24
OCP DAK-3.5	SN: 1249	05-Oct-23 (No. OCP-DAK3.5-1249_Oct23)	Oct-24
Reference Probe EX3DV4	SN: 7549	03-Jun-24 (No. EX3-7549_Jun24)	Jun-25
DAE4p	SN: 1836	10-Jan-24 (No. DAE4p-1836_Jan24)	Jan-25

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Source Box	SN: 1000	28-May-24 (No. 675-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMB100A	SN: 182051	28-May-24 (No. 675-CAL16-S4588-240528)	May-25
Mismatch; SMA	SN: 1102	28-May-24 (No. 675-Mismatch_SMA-240528)	May-25

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: September 16, 2024

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Accreditation No.: SCS 0108

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Glossary

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards

- IEC/IEEE 62209-1528,"Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation

- DASY System Handbook

Methods Applied and Interpretation of Parameters

- *Measurement Conditions*: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL*: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss*: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay*: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured*: SAR measured at the stated antenna input power.
- *SAR normalized*: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters*: The measured TSL parameters are used to calculate the nominal SAR result.

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 SAR	16.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with spacer
Zoom Scan Resolution	dx, dy = 6mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	850MHz ±1MHz	

Head TSL parameters at 850 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.920 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	42.9 ±6%	0.910 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 850 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	2.51 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.99 W/kg ±17.0% (k = 2)

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	1.62 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.45 W/kg ±16.5% (k = 2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 850 MHz

Impedance	47.8 Ω - 4.0 jΩ
Return Loss	-26.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.436 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured. The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the sub-miniature connectors near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D850V2 - SN1030	850	HSL	21

Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	15	CW, D—	850, 0		9.48	0.91	42.9

Hardware Setup

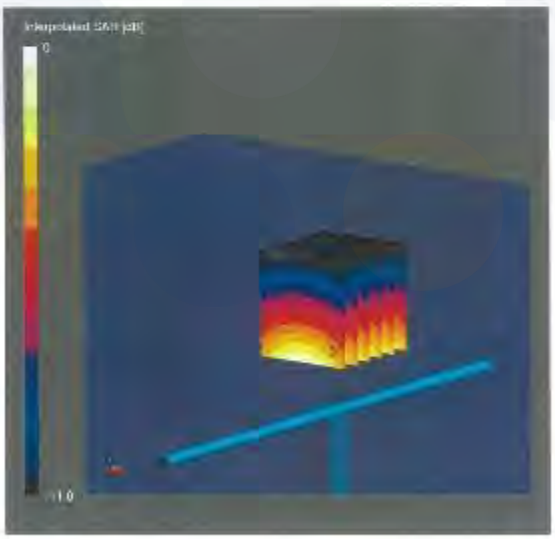
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Flat V4.9 mod	HSL, 2024-09-16	EX3DV4 - SN7349, 2024-06-03	DAE4ip Sn1535, 2024-01-10

Scans Setup

	Zoom Scan
Grid Extent [mm]	30 x 30 x 30
Grid Steps [mm]	6.0 x 6.0 x 1.5
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	VMS - 6D
Scan Method	Measured

Measurement Results

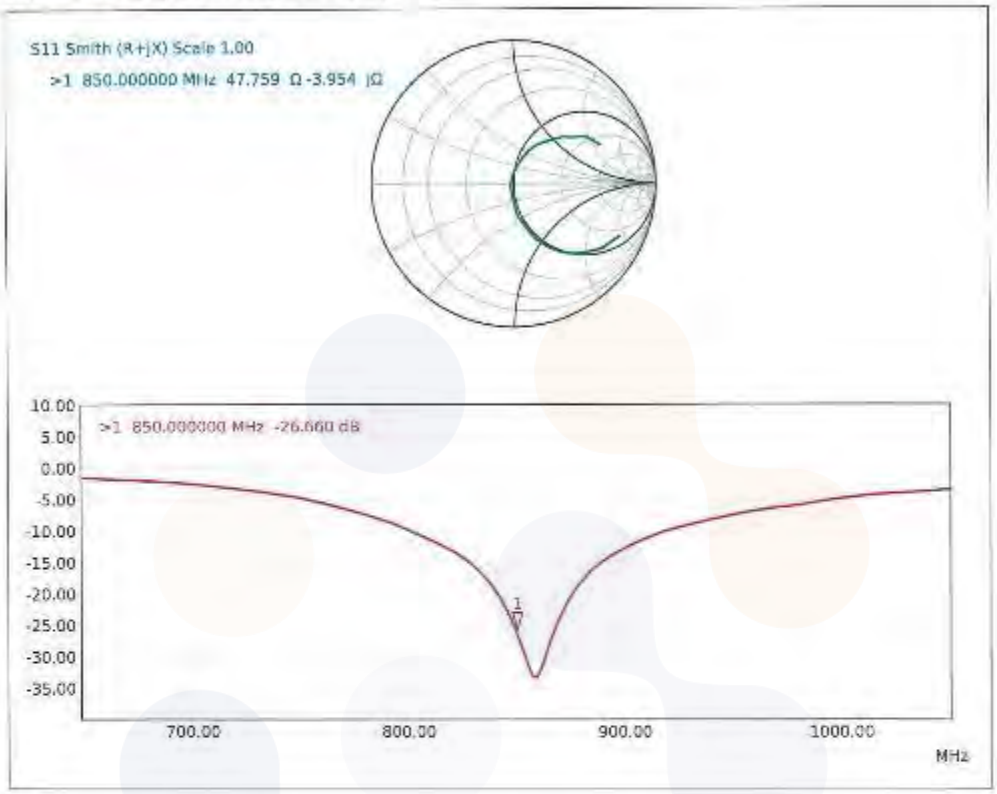
	Zoom Scan
Date	2024-09-16
psSAR1 g [W/Kg]	2.51
psSAR1 0g [W/Kg]	1.62
Power Drift [dB]	0.00
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 3.88 W/Kg

D850V2 - SN: 1030 September 16, 2024

Impedance Measurement Plot for Head TSL



Appendix A.11 Dipole Calibration certificate (D1750V2_SN1195)

Calibration Laboratory of
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Accreditation No.: SCS 0108

Client	Eurofins KCTL Gyeonggi-do, Republic of Korea	Certificate No.	D1750V2-1195_Sep24

CALIBRATION CERTIFICATE

Object	D1750V2 - SN: 1195
Calibration procedure(s)	QA CAL-05.v12 Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz
Calibration date	September 13, 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 Cal
Power Sensor R&S NRP-33T	SN: 100967	28-Mar-24 (No. 217-04038)	Mar-25
Power Sensor R&S NRP18A	SN: 101899	22-Jul-24 (No. 4030A315008547)	Jul-25
Spectrum Analyzer R&S FSV40	SN: 101832	25-Jan-24 (No. 4030-315007551)	Jan-25
Mismatch; Short [54186] Attenuator [54423]	SN: 1152	28-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	05-Oct-23 (No. OCP-DAK12-1016_Oct23)	Oct-24
OCP DAK-3.5	SN: 1249	05-Oct-23 (No. OCP-DAK3.5-1249_Oct23)	Oct-24
Reference Probe EX3DV4	SN: 7549	03-Jun-24 (No. EX3-7549_Jun24)	Jun-25
DAE4p	SN: 1936	10-Jun-24 (No. DAE4p-1936_Jun24)	Jun-25

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Source Box	SN: 1000	28-May-24 (No. 675-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMB100A	SN: 182081	28-May-24 (No. 675-CAL16-SA586-240528)	May-25
Mismatch; SMA	SN: 1102	22-May-24 (No. 675-Mismatch_SMA-240522)	May-25

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: September 16, 2024

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Certificate No: D1750V2-1195_Sep24 Page 1 of 8

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Accreditation No.: **SCS 0108**

Glossary

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards

- IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation

- DASY System Handbook

Methods Applied and Interpretation of Parameters

- *Measurement Conditions*: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL*: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss*: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay*: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured*: SAR measured at the stated antenna input power.
- *SAR normalized*: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters*: The measured TSL parameters are used to calculate the nominal SAR result.

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 SAR	16.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with spacer
Zoom Scan Resolution	dx, dy = 6mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	1750MHz ±1MHz	

Head TSL parameters at 1750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	41.3 ±6%	1.34 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 1750 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	9.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	37.0 W/kg ±17.0% (k = 2)

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	4.96 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.7 W/kg ±16.5% (k = 2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 1750 MHz

Impedance	47.1 Ω + 2.5 jΩ
Return Loss	-28.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.217 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.
The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

System Performance Check Report

Summary

Device	Frequency [MHz]	TSL	Power [dBm]
D1750V2 - SN:1195	1750	HSL	24

Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	0	CW, 0--	CW, 0--	1750, 0	2.66	1.34	41.3

Hardware Setup

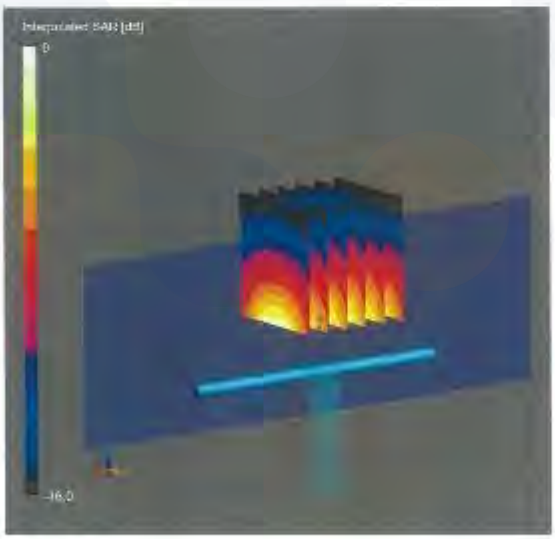
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V6.0 Right	HSL, 2024-09-13	EX3DV4 - SN7349, 2024-06-03	DAE4ip Sn1830, 2024-01-10

Scans Setup

	Zoom Scan
Grid Extents [mm]	30 x 30 x 30
Grid Steps [mm]	8.0 x 8.0 x 1.5
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	All points
Scan Method	Measured

Measurement Results

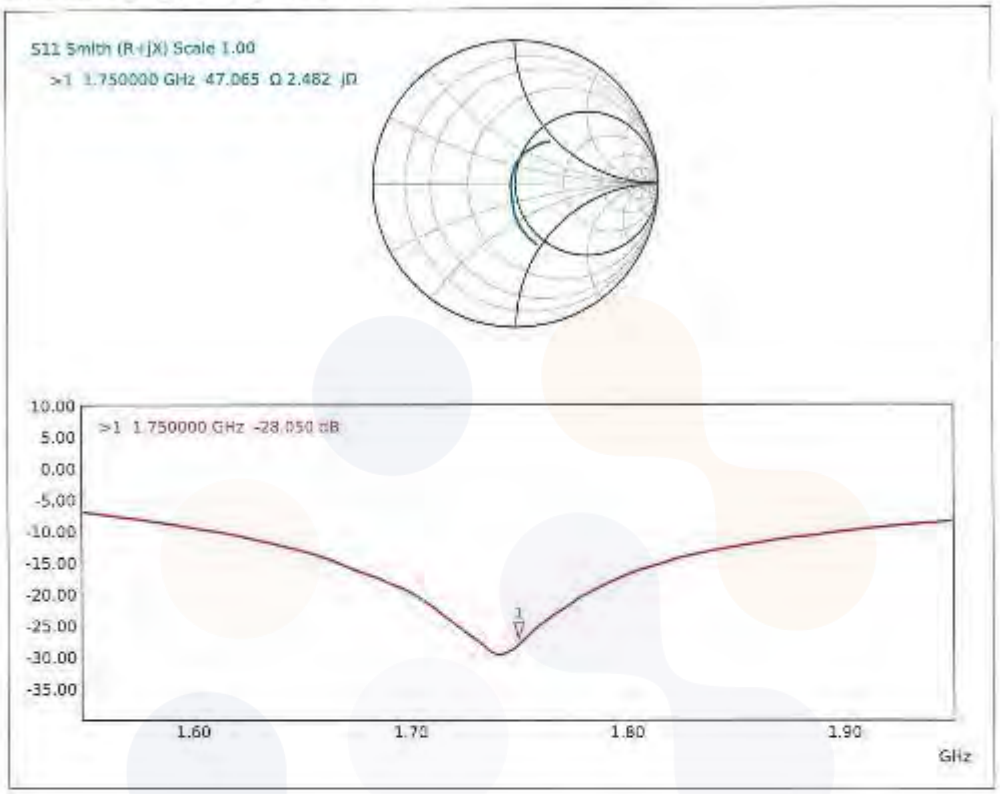
	Zoom Scan
Date	2024-09-13
psSAR1g [W/Kg]	9.29
psSAR10g [W/Kg]	4.98
Power Drift [dB]	0.06
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 16.2 W/Kg

D1750V2 - SN: 1195 September 13, 2024

Impedance Measurement Plot for Head TSL



Appendix A.12 Dipole Calibration certificate (D1900V2_SN5d248)

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Accreditation No.: SCS 0108

Client: Eurofins KCTL
Gyeonggi-do, Republic of Korea

Certificate No.: D1900V2-5d248_Sep24

CALIBRATION CERTIFICATE

Object: D1900V2 - SN: 5d248

Calibration procedure(s): QA CAL-05.v12
Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz

Calibration date: September 16, 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 Cal
Power Sensor R&S NRP-33T	SN: 100937	28-Mar-24 (No. 217-04038)	Mar-25
Power Sensor R&S NRP18A	SN: 101859	22-Jul-24 (No. 4030A315008547)	Jul-25
Spectrum Analyzer R&S FSV40	SN: 101832	25-Jan-24 (No. 4030-315007551)	Jan-25
Mismatch: Short [S4188] Attenuator [S4423]	SN: 1152	28-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	05-Oct-23 (No. OCP-DAK12-1016_Oct23)	Oct-24
OCP DAK-3.5	SN: 1249	05-Oct-23 (No. OCP-DAK3.5-1249_Oct23)	Oct-24
Reference Probe EX3DV4	SN: 7349	03-Jun-24 (No. EX3-7349_Jun24)	Jun-25
DAE4p	SN: 1836	10-Jan-24 (No. DAE4p-1836_Jan24)	Jan-25

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Source Box	SN: 1003	28-May-24 (No. 675-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMB100A	SN: 162361	28-May-24 (No. 675-CAL16-S4588-240528)	May-25
Mismatch; SMA	SN: 1102	22-May-24 (No. 675-Mismatch_SMA-240522)	May-25

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: September 16, 2024

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Glossary

TSL tissue simulating liquid
ConvF sensitivity in TSL / NORM x,y,z
N/A not applicable or not measured

Calibration is Performed According to the Following Standards

- IEC/IEEE 62209-1528,"Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation

- DASY System Handbook

Methods Applied and Interpretation of Parameters

- *Measurement Conditions*: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL*: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss*: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay*: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured*: SAR measured at the stated antenna input power.
- *SAR normalized*: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters*: The measured TSL parameters are used to calculate the nominal SAR result.

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 SAR	16.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with spacer
Zoom Scan Resolution	dx, dy = 6mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	1900MHz ±1MHz	

Head TSL parameters at 1900 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	40.5 ±6%	1.40 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 1900 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	9.96 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.7 W/kg ±17.0% (k = 2)

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	5.22 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.8 W/kg ±16.5% (k = 2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 1900 MHz

Impedance	48.9 Ω + 5.9 jΩ
Return Loss	-24.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.194 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured. The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

System Performance Check Report

Summary

Device	Frequency [MHz]	TSL	Power [dBm]
D1900V2 - SN:5d248	1900	HSL	24

Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	10		CW, 0---	1900, 0	7.73	1.40	40.5

Hardware Setup

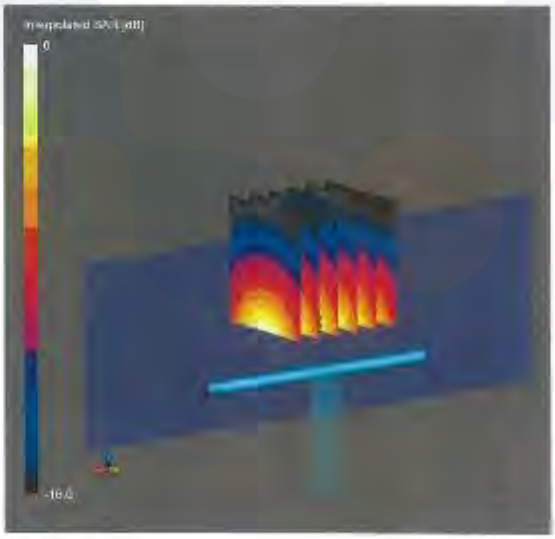
Phantom	TSL Measured Date	Probe, Calibration Date	DAE, Calibration Date
WP V8.0 Center	HSL, 2024-09-16	EX3DV4 - SN:7349, 2024-06-03	DAE4ip Sn1836, 2024-01-10

Scans Setup

	Zoom Scan
Grid Extents [mm]	30 x 30 x 30
Grid Steps [mm]	8.0 x 8.0 x 1.5
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	All points
Scan Method	Measured

Measurement Results

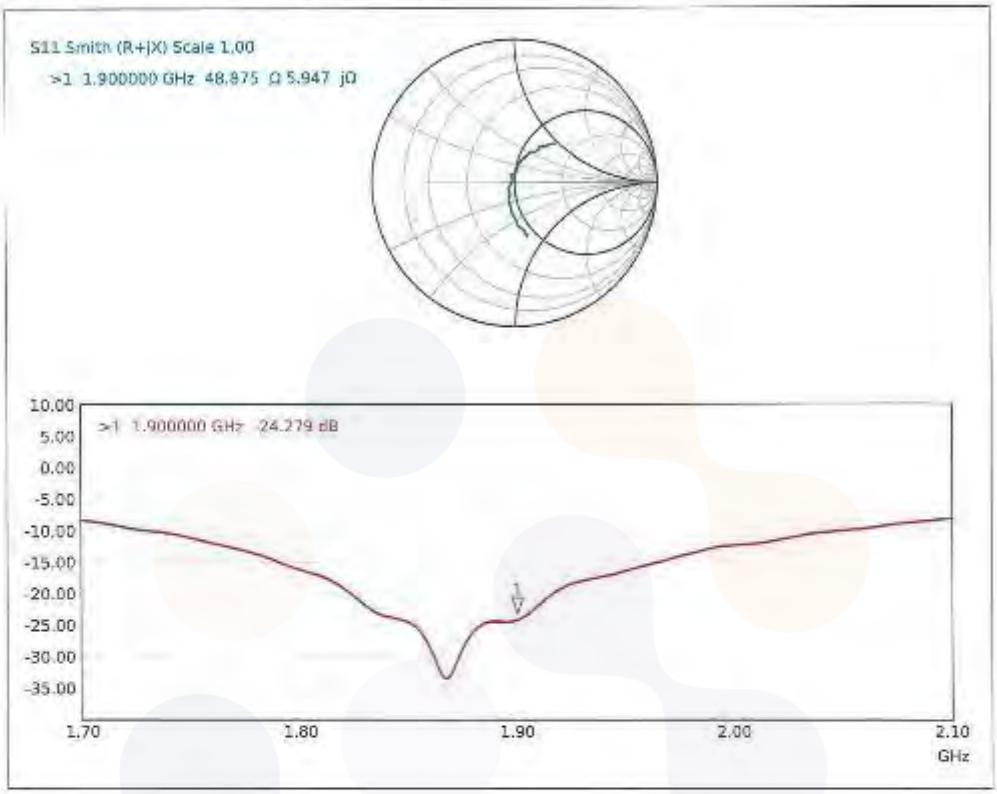
	Zoom Scan
Date	2024-09-16
psSAR1g [W/Kg]	9.96
psSAR10g [W/Kg]	5.22
Power Drift [dB]	0.01
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 17.9 W/Kg

D1900V2 - SN: 5d248 September 16, 2024

Impedance Measurement Plot for Head TSL



Appendix A.13 Dipole Calibration certificate (D2450V2_SN1091)

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Accreditation No.: SCS 0108

Client	Eurofins KCTL Gyeonggi-do, Republic of Korea	Certificate No.	D2450V2-1091_Sep24

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 1091
Calibration procedure(s)	QA CAL-05.v12 Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz
Calibration date	September 13, 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 Ca
Power Sensor R&S NRP-33T	SN: 100367	28-Mar-24 (No. 217-04038)	Mar-25
Power Sensor R&S NRP18A	SN: 101959	22-Jul-24 (No. 4030A315008547)	Jul-25
Spectrum Analyzer R&S FSV40	SN: 101832	25-Jan-24 (No. 4030-315007551)	Jan-25
Mismatch; Shon [S4189] Attenuator [S4423]	SN: 1152	28-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	05-Oct-23 (No. OCP-DAK12-1016_Oct23)	Oct-24
OCP DAK 3.5	SN: 1249	05-Oct-23 (No. OCP-DAK3.5-1249_Oct23)	Oct-24
Reference Probe EX3DV4	SN: 7349	03-Jun-24 (No. EX3-7349_Jun24)	Jun-25
DAE4ip	SN: 1836	10-Jan-24 (No. DAE4ip-1836_Jan24)	Jan-25

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Source Box	SN: 1000	28-May-24 (No. 675-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMB100A	SN: 182081	28-May-24 (No. 675-CAL16-S4598-24052B)	May-25
Mismatch: SMA	SN: 1102	22-May-24 (No. 675-Mismatch_SMA-240522)	May-25

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: September 16, 2024

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Accreditation No.: SCS 0108

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Glossary

TSL tissue simulating liquid
ConvF sensitivity in TSL / NORM x,y,z
N/A not applicable or not measured

Calibration is Performed According to the Following Standards

- IEC/IEEE 62209-1528,"Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation

- DASY System Handbook

Methods Applied and Interpretation of Parameters

- *Measurement Conditions*: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL*: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss*: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay*: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured*: SAR measured at the stated antenna input power.
- *SAR normalized*: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters*: The measured TSL parameters are used to calculate the nominal SAR result.

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 SAR	16.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with spacer
Zoom Scan Resolution	dx, dy = 5mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	2450MHz ±1MHz	

Head TSL parameters at 2450 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	37.8 ±6%	1.85 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 2450 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	12.9 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	51.4 W/kg ±17.0% (k = 2)

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	6.08 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.2 W/kg ±16.5% (k = 2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 2450 MHz

Impedance	51.7 Ω - 2.5 jΩ
Return Loss	-30.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured. The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D2450V2 - SN:1091	2450	HSL	24

Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	10		CW, 0	2450, 0	7.24	1.85	37.8

Hardware Setup

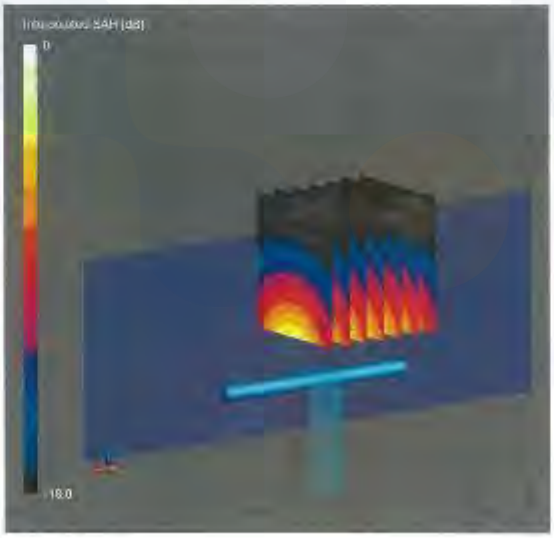
Phantom	TSL Measured Date	Probe Calibration Date	DAE Calibration Date
MFP V5.0 Right	HSL, 2024-09-13	EX3DV4 - SN:3849, 2024-06-03	DAE4 p Sn1836, 2024-01-10

Scans Setup

	Zoom Scan
Grid Extents [mm]	30 x 30 x 30
Grid Steps [mm]	5.0 x 5.0 x 1.5
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	VMS + 6p
Scan Method	Measured

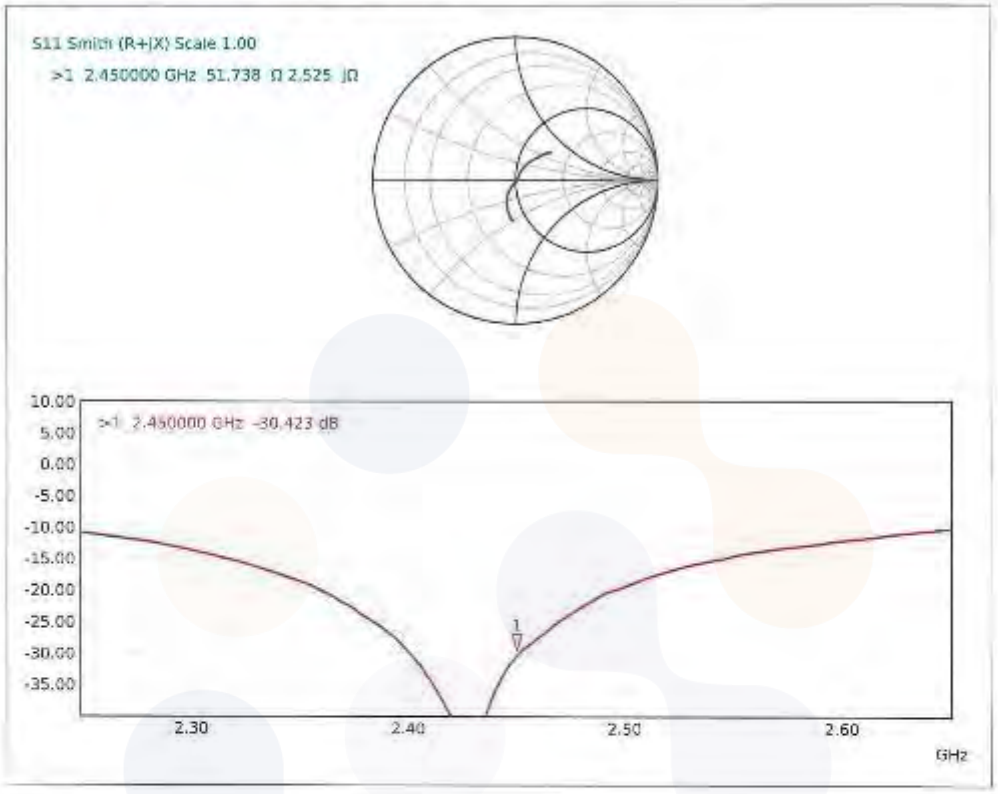
Measurement Results

	Zoom Scan
Date	2024-09-13
psSAR1g [W/Kg]	13.9
psSAR10g [W/Kg]	6.08
Power Drift [dB]	-0.01
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 26.8 W/Kg

Impedance Measurement Plot for Head TSL



Appendix A.14 Dipole Calibration certificate (D2600V2_SN1200)

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

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

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

Client: Eurofins KCTL, Gyeonggi-do, Republic of Korea

Certificate No.: D2600V2-1200_Sep24

CALIBRATION CERTIFICATE

Object: D2600V2 - SN: 1200

Calibration procedure(s): QA CAL-05.v12
Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz

Calibration date: September 13, 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 Cal
Power Sensor R&S NRP-33T	SN: 100567	28-Mar-24 (No. 217-04039)	Mar-25
Power Sensor R&S NRP18A	SN: 101658	22-Jul-24 (No. 4030A31500854?)	Jul-25
Spectrum Analyzer R&S FSW40	SN: 101832	25-Jan-24 (No. 4030-31500755)	Jan-25
Mismatch: Short (S4-86) Attenuator (S4423)	SN: 1152	28-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	05-Oct-23 (No. OCP-DAK12-1016_Oct23)	Oct-24
OCP DAK-3.5	SN: 1249	05-Oct-23 (No. OCP-DAK3.5-1249_Oct23)	Oct-24
Reference Probe EX3DV4	SN: 7349	03-Jun-24 (No. EX3-7349_Jun24)	Jun-25
DAE4ip	SN: 1836	10-Jan-24 (No. DAE4ip-1836_Jan24)	Jan-25

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Source Box	SN: 1000	28-May-24 (No. 675-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMB100A	SN: 182081	28-May-24 (No. 675-CAL16-54588-240528)	May-25
Mismatch: SMA	SN: 1102	22-May-24 (No. 675-Mismatch_SMA-240522)	May-25

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: September 16, 2024

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

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

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

Accreditation No.: SCS 0108

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

Glossary

TSL tissue simulating liquid
ConvF sensitivity in TSL / NORM x,y,z
N/A not applicable or not measured

Calibration is Performed According to the Following Standards

- IEC/IEEE 62209-1528,"Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation

- DASY System Handbook

Methods Applied and Interpretation of Parameters

- *Measurement Conditions*: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL*: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss*: These parameters are measured with the dipole positioned under the liquid filled phantom. The Impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay*: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured*: SAR measured at the stated antenna input power.
- *SAR normalized*: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters*: The measured TSL parameters are used to calculate the nominal SAR result.

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 SAR	16.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with spacer
Zoom Scan Resolution	dx, dy = 5mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	2600MHz ±1MHz	

Head TSL parameters at 2600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	37.2 ±6%	2.01 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 2600 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	14.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	57.3 W/kg ±17.0% (k = 2)

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	6.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	25.5 W/kg ±16.5% (k = 2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 2600 MHz

Impedance	48.2 Ω – 1.8 jΩ
Return Loss	-31.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.152 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured. The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

System Performance Check Report

Summary

Dipole	Frequency (MHz)	TSL	Power (dBm)
D2600V2 - SN:1200	2600	HSL	24

Exposure Conditions

Phantom Section, TSL	Test Distance (mm)	Band	Group, UID	Frequency (MHz), Channel Number	Conversion Factor	TSL Conductivity (S/m)	TSL Permittivity
Flat	10		CW, 0	2600, 0	7.29	2.01	37.2

Hardware Setup

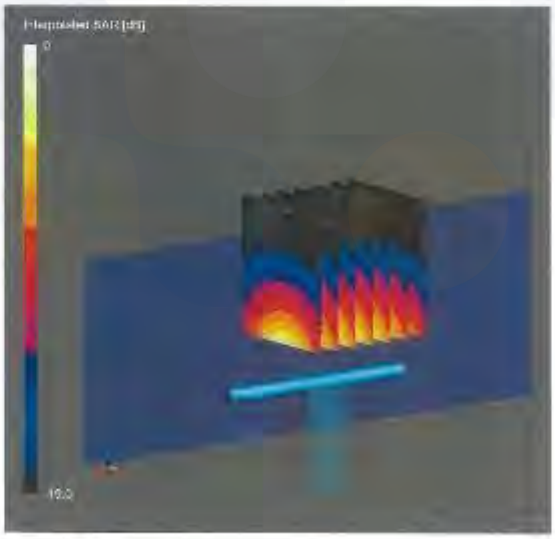
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V6.0 Right	HSL, 2024-09-13	EX3DV4 - SN7349, 2024-06-03	DAE4ip Sn1330, 2024-01-15

Scans Setup

	Zoom Scan
Grid Extents (mm)	30 x 30 x 30
Grid Steps (mm)	5.0 x 5.0 x 1.5
Sensor Surface (mm)	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	All points
Scan Method	Measured

Measurement Results

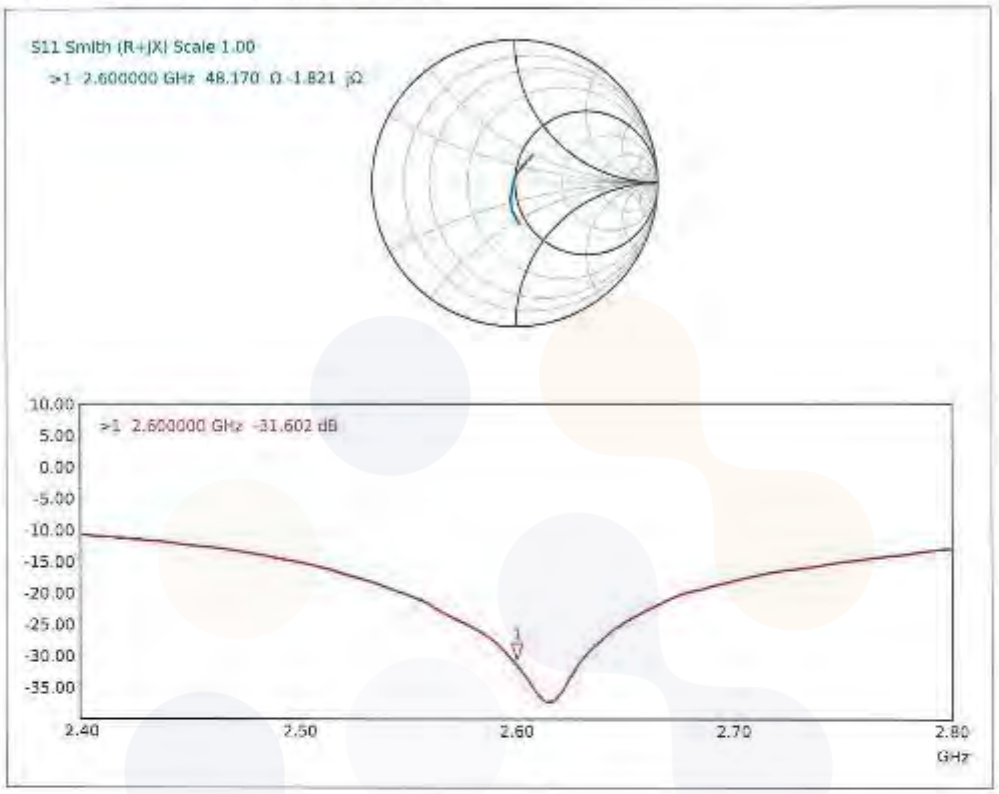
	Zoom Scan
Date	2024-09-13
psSAR1g (W/Kg)	14.4
psSAR10g (W/Kg)	6.40
Power Drift (dB)	-0.04
Power Scaling	Disabled
Scaling Factor (dB)	
TSL Correction	Positive / Negative



0 dB = 31.8 W/Kg

D2600V2 - SN: 1200 September 13, 2024

Impedance Measurement Plot for Head TSL



Appendix A.15 Dipole Calibration certificate (D3500V2_SN1146)

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

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

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

Client: Eurofins KCTL, Gyeonggi-do, Republic of Korea

Certificate No.: D3500V2-1146_Sep24

CALIBRATION CERTIFICATE

Object: D3500V2 - SN: 1146

Calibration procedure(s): QA CAL-22.v7
Calibration Procedure for SAR Validation Sources between 3 - 10 GHz

Calibration date: September 19, 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 Cal
Power Sensor R&S NRP-33T	SN: 100957	28-Mar-24 (No. 217-04039)	Mar-25
Power Sensor R&S NRP18A	SN: 101659	22-Jul-24 (No. 4030A315008547)	Jul-25
Spectrum Analyzer R&S FSV40	SN: 101632	25-Jan-24 (No. 4030-315007551)	Jan-25
Mismatch; Short [54188], Attenuator [54423]	SN: 1152	28-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	05-Oct-23 (No. OCP-DAK12-1016_Oct23)	Oct-24
OCP DAK-3.5	SN: 1249	05-Oct-23 (No. OCP-DAK3.5-1249_Oct23)	Oct-24
Reference Probe EX3DV4	SN: 7349	03-Jun-24 (No. EX3-7349_Jun24)	Jun-25
DAE4ip	SN: 1836	10-Jan-24 (No. DAE4ip-1836_Jan24)	Jan-25

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Source Box	SN: 1000	28-May-24 (No. 675-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMB100A	SN: 182081	28-May-24 (No. 675-CALIS-54588-240528)	May-25
Mismatch; SMA	SN: 1102	22-May-24 (No. 675-Mismatch_SMA-240522)	May-25

	Name	Function	Signature
Calibrated by	Pauo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: September 19, 2024

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

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

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

Accreditation No.: SCS 0108

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

Glossary

TSL tissue simulating liquid
ConvF sensitivity in TSL / NORM x,y,z
N/A not applicable or not measured

Calibration is Performed According to the Following Standards

- IEC/IEEE 62209-1528:"Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz".

Additional Documentation

- DASY System Handbook

Methods Applied and Interpretation of Parameters

- *Measurement Conditions*: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL*: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss*: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay*: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured*: SAR measured at the stated antenna input power.
- *SAR normalized*: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters*: The measured TSL parameters are used to calculate the nominal SAR result.

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 SAR	18.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with spacer
Zoom Scan Resolution	dx, dy = 5mm, dz = 1.4mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	3400MHz ±1MHz 3500MHz ±1MHz	

Head TSL parameters at 3400 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	38.0	2.81 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	37.8 ±6%	2.84 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 3400 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	20 dBm input power	7.01 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	70.1 W/kg ±19.9% (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	20 dBm input power	2.55 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	25.5 W/kg ±19.5% (k=2)

Head TSL parameters at 3500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.9	2.91 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	37.6 ±6%	2.91 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 3500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	20 dBm input power	6.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	65.7 W/kg ±19.9% (k = 2)

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	20 dBm input power	2.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.7 W/kg ±19.5% (k = 2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 3400 MHz

Impedance	43.0 Ω – 5.9 jΩ
Return Loss	-20.1 dB

Antenna Parameters with Head TSL at 3500 MHz

Impedance	50.3 Ω – 1.6 jΩ
Return Loss	-35.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.135 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured. The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D3500V2 – SN:1146	3400	HSL	20

Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	10		CW, 0	3400, 0	6.56	2.84	37.8

Hardware Setup

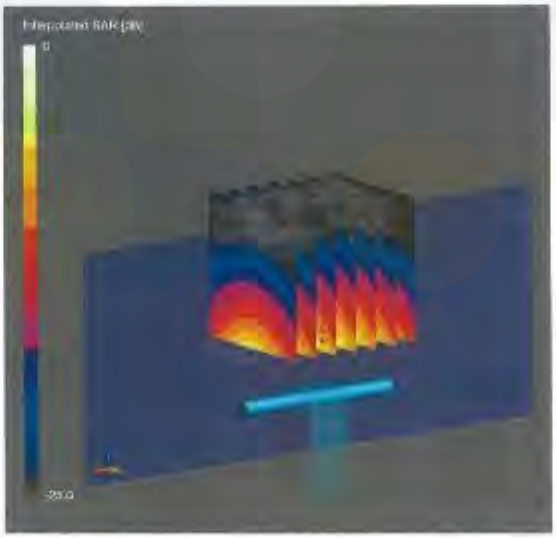
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V6.0 Center	HSL, 2024-09-19	EX3DV4 – SN7349, 2024-06-03	DAE4ip SN1830, 2024-01-10

Scans Setup

	Zoom Scan
Grid Extents [mm]	28 x 28 x 28
Grid Steps [mm]	5.0 x 5.0 x 1.4
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	All points
Scan Method	Measured

Measurement Results

	Zoom Scan
Date	2024-09-19
psSAR1g [W/Kg]	7.01
psSAR10g [W/Kg]	2.65
Power Drift [dB]	0.06
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 18.5 W/Kg

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D3500V2 – SN:1146	3500	HSL	20

Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	10		CW, 0	3500, 0	6.61	2.91	37.6

Hardware Setup

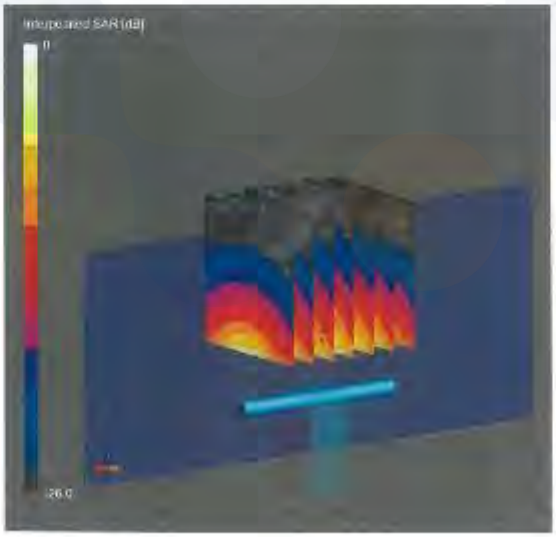
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V6.0 Center	HSL, 2024-09-19	EX3DV4 - SN7349, 2024-06-03	DAE4ip Sn1836, 2024-01-10

Scans Setup

	Zoom Scan
Grid Extents [mm]	28 x 28 x 28
Grid Steps [mm]	5.0 x 5.0 x 1.4
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	All points
Scan Method	Measured

Measurement Results

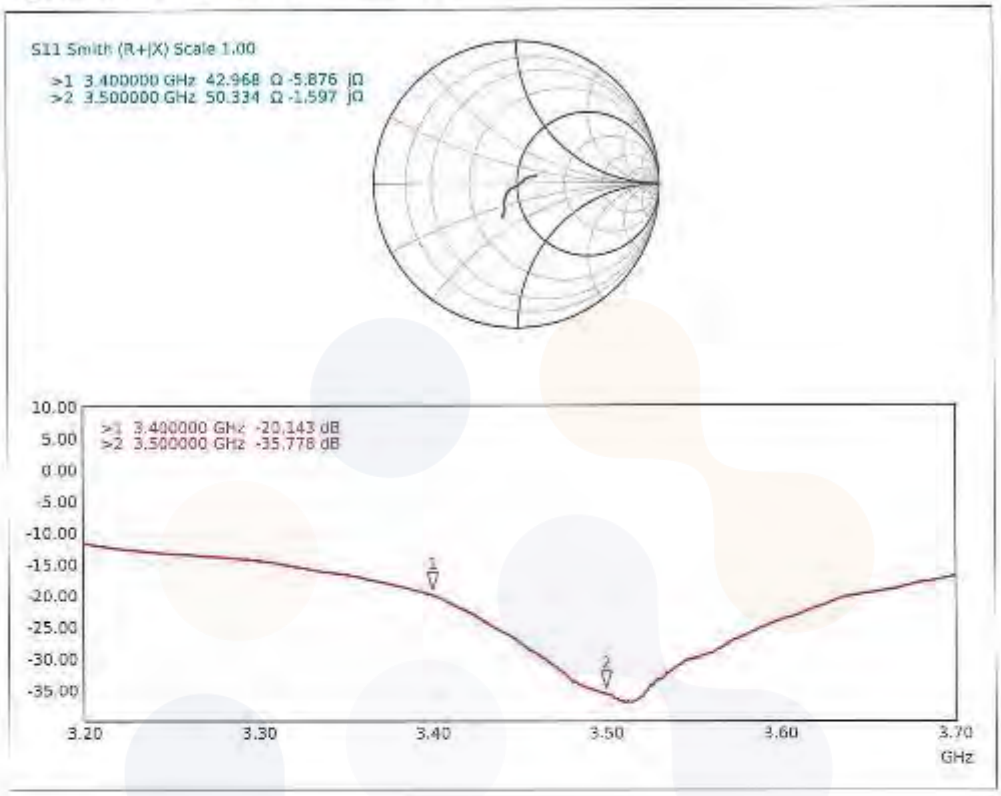
	Zoom Scan
Date	2024-09-19
peSAR1g [W/Kg]	6.57
ssSAR10g [W/Kg]	2.47
Power Drift [dB]	-0.03
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 17.4 W/Kg

D3500V2 - SN: 1146 September 19, 2024

Impedance Measurement Plot for Head TSL



Appendix A.16 Dipole Calibration certificate (D3700V2_SN1027)

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

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

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

Client: **Eurofins KCTL**
Gyeonggi-do, Republic of Korea

Certificate No.: **D3700V2-1027_Aug24**

CALIBRATION CERTIFICATE

Object: D3700V2 - SN: 1027

Calibration procedure(s): QA CAL-22.v7
Calibration Procedure for SAR Validation Sources between 3 - 10 GHz

Calibration date: August 21, 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 Cal
Power Sensor R&S NRP-33T	SN: 100967	26-Mar-24 (No. 217-04038)	Mar-25
Power Sensor R&S NRP18A	SN: 101659	21-Mar-24 (No. 4030A315007801)	Mar-25
Spectrum Analyzer R&S FSV40	SN: 101832	25-Jan-24 (No. 4030-315007551)	Jan-25
Mismatch; Short [S4168] Attenuator [S4423]	SN: 1152	26-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	05-Oct-23 (No. OCP-DAK12-1016_Oct23)	Oct-24
OCP DAK-3.5	SN: 1249	05-Oct-23 (No. OCP-DAK3.5-1249_Oct23)	Oct-24
Reference Probe EX3DV4	SN: 7349	03-Jun-24 (No. EX3-7349_Jun24)	Jun-25
DAE4ip	SN: 1836	10-Jan-24 (No. DAE4ip-1836_Jan24)	Jan-25

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Source Box	SN: 1000	28 May 24 (No. 675-ACAD_Source_Box 240528)	May 25
Signal Generator R&S SMB100A	SN: 182081	29-May-24 (No. 3001-3007194041)	May-25
Mismatch; SMA	SN: 1102	22-May-24 (No. 675-Mismatch_SMA-240522)	May-25

	Name	Function	Signature
Calibrated by	Kreslmir Frenjić	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: August 22, 2024

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

Certificate No: D3700V2-1027_Aug24 Page 1 of 6

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

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

Accreditation No.: SCS 0108

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

Glossary

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards

- IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation

- DASY System Handbook

Methods Applied and Interpretation of Parameters

- *Measurement Conditions*: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL*: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss*: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay*: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured*: SAR measured at the stated antenna input power.
- *SAR normalized*: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters*: The measured TSL parameters are used to calculate the nominal SAR result.

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	DASY5 Module SAR	16.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with spacer
Zoom Scan Resolution	dx, dy = 5mm, dz = 1.4mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	3700MHz ±1MHz	

Head TSL parameters at 3700 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.7	3.12 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	38.1 ±6%	3.08 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 3700 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	20 dBm input power	6.82 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	68.2 W/kg ±19.3% (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	20 dBm input power	2.50 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	25.0 W/kg ±19.5% (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 3700 MHz

Impedance	45.1 Ω + 4.0 jΩ
Return Loss	-23.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.131 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured. The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

System Performance Check Report

Summary

Device	Frequency (MHz)	TSL	Power (dBm)
D3700V2 – SN:1027	3700	HSL	20

Exposure Conditions

Phantom Section, TSL	Test Distance (mm)	Band	Group, UID	Frequency (MHz), Channel Number	Conversion Factor	TSL Conductivity (S/m)	TSL Permittivity
Flat	10	CW, C==	3700, 0		8.54	5.08	38.1

Hardware Setup

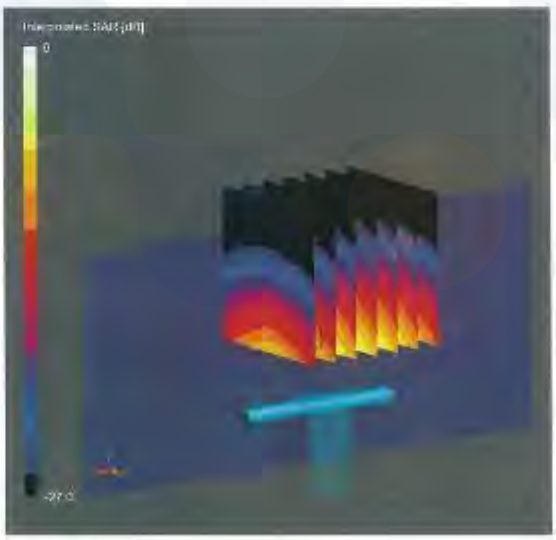
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V5.0 (C2V1)	HSL, 2024-08-21	EX3DV4 - SN7349, 2024-06-03	DAE4ip Sn1836, 2024-01-10

Scans Setup

	Zoom Scan
Grid Extents [mm]	28 x 28 x 28
Grid Steps [mm]	5.0 x 5.0 x 1.4
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	VMS + 6p
Scan Method	Measured

Measurement Results

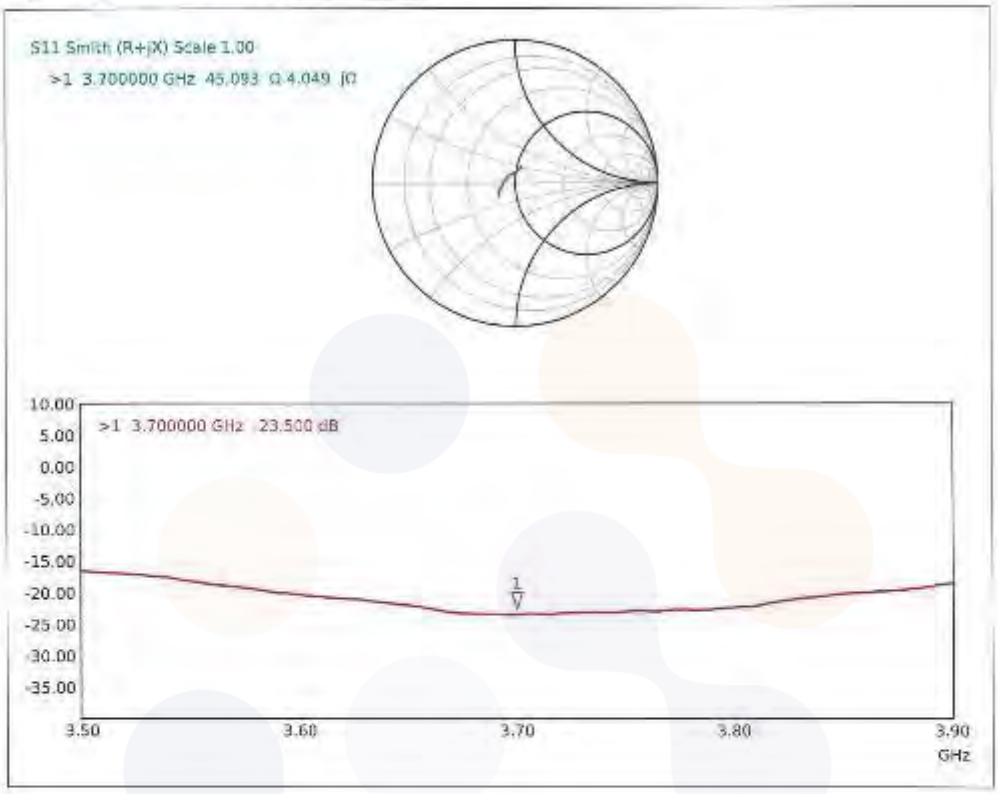
	Zoom Scan
Date	2024-08-21
psSAR1g [W/Kg]	9.82
psSAR10g [W/Kg]	2.90
Power Drift [dB]	-0.03
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 18.9 W/Kg

D3700V2 - SN: 1027 August 21, 2024

Impedance Measurement Plot for Head TSL



Appendix A.17 Dipole Calibration certificate (D3900V2_SN1043)

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

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

Accreditation No.: SCS 0108

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

Client: Eurofins KCTL, Gyeonggi-do, Republic of Korea

Certificate No.: D3900V2-1043_Feb24

CALIBRATION CERTIFICATE

Object: D3900V2 - SN:1043

Calibration procedure(s): QA CAL-22.v7
Calibration Procedure for SAR Validation Sources between 3-10 GHz

Calibration date: February 15, 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
Power meter NRP2	SN: 104778	30-Mar-23 (No. 217-03804/03805)	Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
Power sensor NRP-Z91	SN: 103245	30-Mar-23 (No. 217-03805)	Mar-24
Reference 20 dB Attenuator	SN: BH9394 (20k)	30-Mar-23 (No. 217-03809)	Mar-24
Type-N mismatch combination	SN: 310982 / 06327	30-Mar-23 (No. 217-03810)	Mar-24
Reference Probe EX3DV4	SN: 3503	07-Mar-23 (No. EX3-3503_Mar23)	Mar-24
DAE4	SN: 601	30-Jan-24 (No. DAE4-601_Jan24)	Jan-25

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-22)	In house check: Oct-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

	Name	Function	Signature
Calibrated by:	Paulin Pina	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: February 19, 2024

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

Certificate No: D3900V2-1043_Feb24 Page 1 of 7

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

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

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:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	3900 MHz ± 1 MHz 4100 MHz ± 1 MHz	

Head TSL parameters at 3900 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.5	3.32 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.8 ± 6 %	3.24 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL at 3900 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.87 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**69.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.1 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 4100 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.2	3.53 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.6 ± 6 %	3.42 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL at 4100 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.70 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**67.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.34 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.5 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 3900 MHz

Impedance, transformed to feed point	47.0 Ω - 2.9 jΩ
Return Loss	- 27.3 dB

Antenna Parameters with Head TSL at 4100 MHz

Impedance, transformed to feed point	57.0 Ω + 0.3 jΩ
Return Loss	- 23.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.105 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

DASY5 Validation Report for Head TSL

Date: 15.02.2024

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 3900 MHz; Type: D3900V2; Serial: D3900V2 - SN:1043

Communication System: UID 0 - CW; Frequency: 3900 MHz. Frequency: 4100 MHz
Medium parameters used: f = 3900 MHz; σ = 3.24 S/m; ε_r = 37.8; ρ = 1000 kg/m^3
Medium parameters used: f = 4100 MHz; σ = 3.42 S/m; ε_r = 37.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

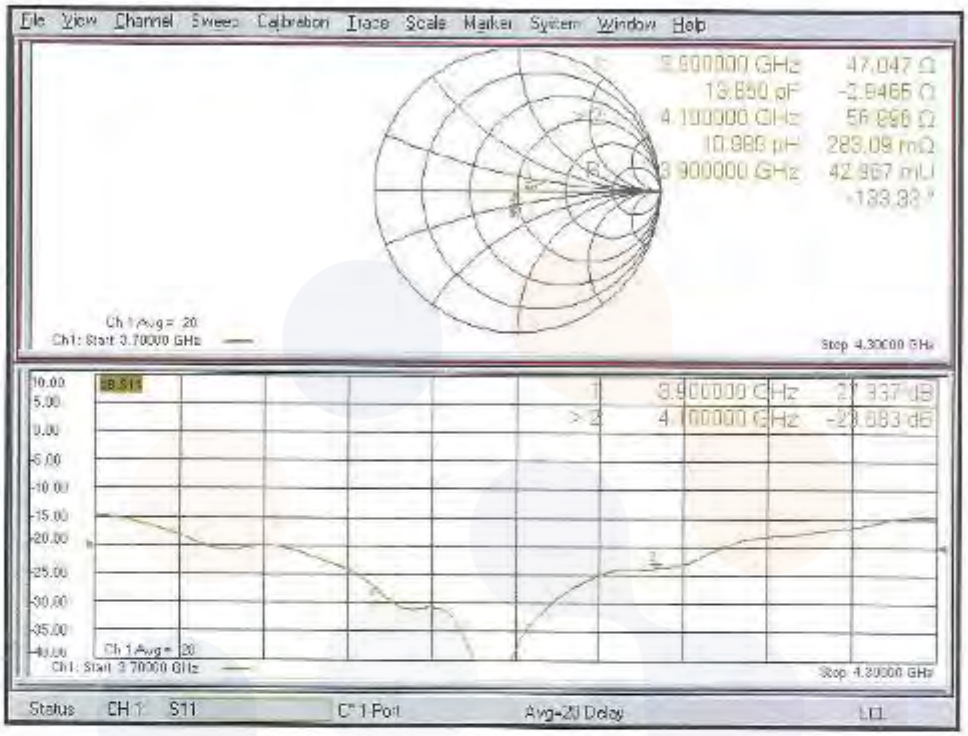
- Probe: EX3DV4 - SN3503; ConvF(7.39, 7.39, 7.39) @ 3900 MHz, ConvF(7.26, 7.26, 7.26) @ 4100 MHz; Calibrated: 07.03.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2024
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3900MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.03 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 19.4 W/kg
SAR(1 g) = 6.87 W/kg; SAR(10 g) = 2.41 W/kg
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 74.3%
Maximum value of SAR (measured) = 13.6 W/kg

Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=4100MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 68.30 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 19.1 W/kg
SAR(1 g) = 6.70 W/kg; SAR(10 g) = 2.34 W/kg
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 74.3%
Maximum value of SAR (measured) = 13.3 W/kg

0 dB = 13.6 W/kg = 11.32 dBW/kg

Impedance Measurement Plot for Head TSL



Appendix A.18 Dipole Calibration certificate (D5GHzV2_SN1134)

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

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

Accreditation No.: SCS 0108

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

Client: Eurofins KCTL, Gyeonggi-do, Republic of Korea

Certificate No.: D5GHzV2-1134_Jan24

CALIBRATION CERTIFICATE

Object: D5GHzV2 - SN:1134

Calibration procedure(s): QA CAL-22.v7
Calibration Procedure for SAR Validation Sources between 3-10 GHz

Calibration date: January 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
Power meter NRP2	SN: 104778	30-Mar-23 (No. 217-03804/03805)	Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
Power sensor NRP-Z91	SN: 103245	30-Mar-23 (No. 217-03805)	Mar-24
Reference 20 dB Attenuator	SN: BH9394 (20k)	30-Mar-23 (No. 217-03809)	Mar-24
Type-N mismatch combination	SN: 310982 / 06327	30-Mar-23 (No. 217-03813)	Mar-24
Reference Probe EX3DV4	SN: 3503	07-Mar-23 (No. EX3-3503_Mar23)	Mar-24
DAE4	SN: 601	03-Oct-23 (No. DAE4-601_Oct23)	Oct-24

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4416B	SN: GB39512475	30-Oct-14 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-22)	In house check: Oct-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

	Name	Function	Signature
Calibrated by:	Paulo Pina	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: January 18, 2024

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

Certificate No: D5GHzV2-1134_Jan24 Page 1 of 8

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

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C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 1.4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.5 ± 6 %	4.65 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.88 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.8 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.1 ± 6 %	5.04 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.22 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.7 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.9 ± 6 %	5.22 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.84 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**78.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.22 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.4 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	48.6 Ω - 7.8 jΩ
Return Loss	- 22.0 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	54.8 Ω - 2.2 jΩ
Return Loss	- 25.9 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	54.8 Ω - 2.7 jΩ
Return Loss	- 25.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.204 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

DASY5 Validation Report for Head TSL

Date: 17.01.2024

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1134

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5250 MHz; σ = 4.65 S/m; ε_r = 36.5; ρ = 1000 kg/m^3
Medium parameters used: f = 5600 MHz; σ = 5.04 S/m; ε_r = 36.1; ρ = 1000 kg/m^3
Medium parameters used: f = 5800 MHz; σ = 5.22 S/m; ε_r = 35.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

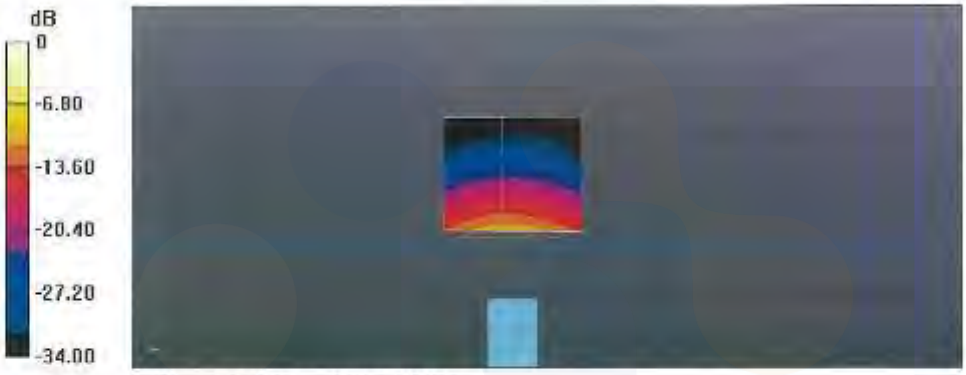
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.5, 5.5, 5.5) @ 5250 MHz, ConvF(5.1, 5.1, 5.1) @ 5600 MHz, ConvF(5.01, 5.01, 5.01) @ 5800 MHz; Calibrated: 07.03.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 03.10.2023
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 75.52 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 26.5 W/kg
SAR(1 g) = 7.88 W/kg; SAR(10 g) = 2.28 W/kg
Smallest distance from peaks to all points 3 dB below = 7.4 mm
Ratio of SAR at M2 to SAR at M1 = 71.1%
Maximum value of SAR (measured) = 18.2 W/kg

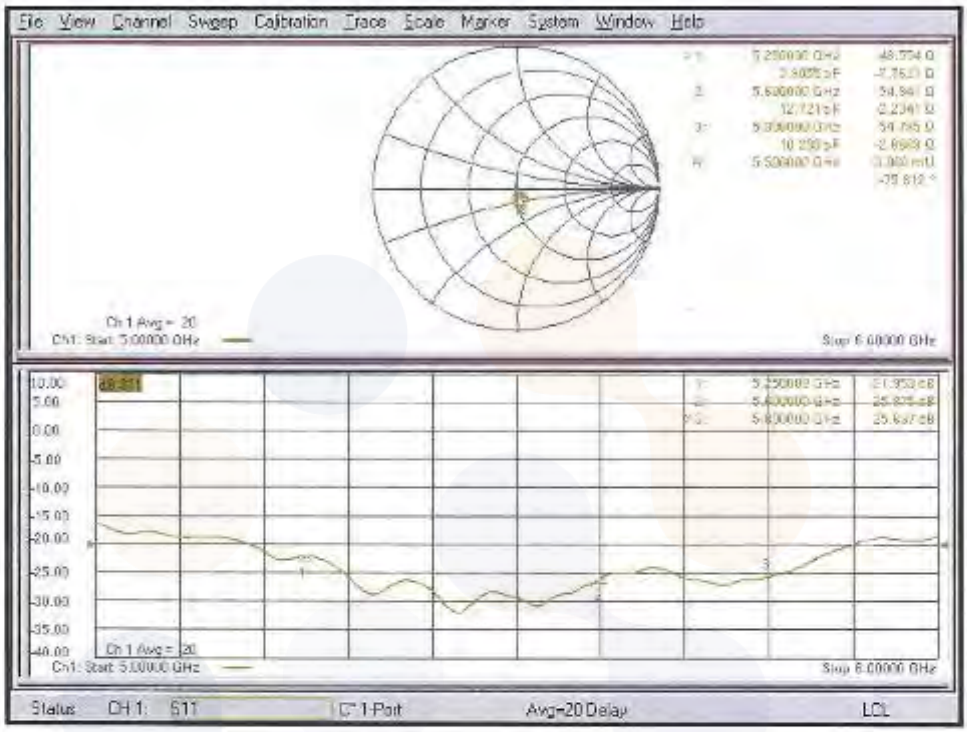
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 73.91 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 29.6 W/kg
SAR(1 g) = 8.22 W/kg; SAR(10 g) = 2.36 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 68.6%
Maximum value of SAR (measured) = 19.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 72.16 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 30.0 W/kg
SAR(1 g) = 7.84 W/kg; SAR(10 g) = 2.23 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 66.5%
Maximum value of SAR (measured) = 19.2 W/kg



0 dB = 19.7 W/kg = 12.94 dBW/kg

Impedance Measurement Plot for Head TSL

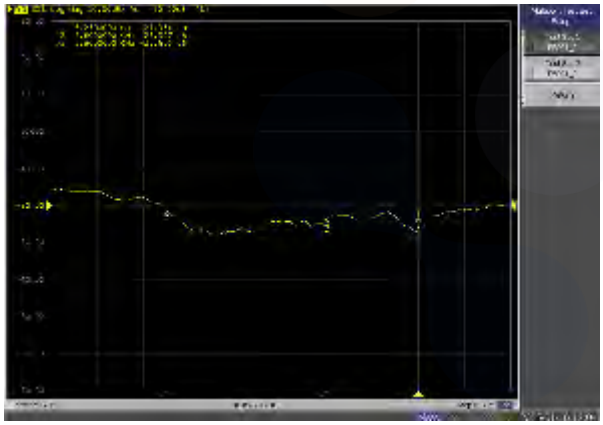


Appendix A.19 Justification for Extended SAR Dipole Calibrations

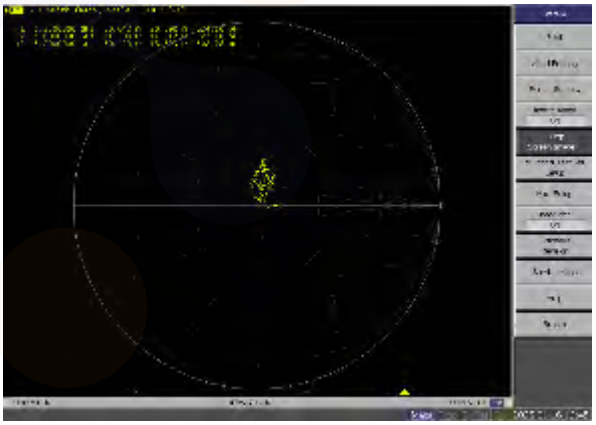
Instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements

KDB 865664 D01v01r04 requirements
a) return loss : < - 20 dB, within 20 % of previous measurement
b) impedance : within 5 Ω from previous measurement.

Dipole Antenna	Head/ Body	Freq. (MHz)	Date of Measurement	Return Loss (dB)	Δ %	Impedance (Ω)	Δ Ω
D5GHzV2 SN 1134	Head	5 250.0	2024-01-17	-21.95	2.73	48.55	1.49
			2025-01-16	-21.35		50.04	
		5 600.0	2024-01-17	-25.88	9.92	54.84	-3.73
			2025-01-16	-23.31		51.11	
		5 800.0	2024-01-17	-25.64	-0.89	54.79	-4.65
			2025-01-16	-25.87		50.14	



< Figure 1. Measurement result of Head Return Loss>



< Figure 2. Measurement result of Head Impedance>

Appendix B. SAR Tissue Specification

The brain mixtures consist of a viscous gel using hydrox-ethl cellullose(HEC) gelling agent and saline solution. Preservation with a bacteriacide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue.

Frequency (㎒)	**750 ~ 835**		**1 750**		**1 900**		**2 450**		**5 200 ~ 5 800**	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Ingredient	**% by weight**									
Water	40.29	51.97	53.00	68.00	55.00	70.50	72.00	73.00	65.52	80.00
Salt (NaCl)	1.38	0.93	0.40	0.20	0.35	0.30	0.10	0.10	0	0
Sugar	57.90	47.00	0	0	0	0	0	0	0	0
HEC	0.24	0	0	0	0	0	0	0	0	0
Bactericide	0.19	0.10	0	0	0	0	0	0	0	0
Triton X-100	0	0	0	0	0	0	20.00	0	17.24	0
DGBE	0	0	46.60	31.80	44.65	29.20	0	26.90	0	0
Diethylene glycol hexyl ether	0	0	0	0	0	0	7.90	0	17.24	0
Polysorbate (Tween) 80	0	0	0	0	0	0	0	0	0	20.00
Tissue parameter target by C. Gabriel and G. Harts grove.										

Salt: 99 % Pure Sodium Chloride
Sucrose: 98 % Pure Sucrose
Water: De-ionized, 16 M resistivity
HEC: Hydroxyethyl Cellulose
DGBE: 99 % Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy) ethanol]
Triton X-100(ultra-pure): Polyethylene glycol mono[4-(1,1,3,3-tetramethybutyl)phenyl] ether

Appendix C. LTE CA RF Conducted Power

The tables below show the supported frequency bands of the device for DL Inter-band and DL Intra-band combinations.

Power measurements were performed on the channel with the highest maximum output power from Tune-up Procedure.

In applying the power measurement procedures of KDB 941225 D05A for DL CA to qualify for UL SAR test exclusion, power measurement is required only for the subset in each row with the largest combination of frequency bands and CCs

Index	2CC	Restriction	Completely Covered by Measurement Superset	Reverse
2CC #1	2A-2A	-	3CC #1	-
2CC #2	2A-4A	-	3CC #1	Yes
2CC #3	2A-5A	-	3CC #2	Yes
2CC #4	2A-12A	-	3CC #3	Yes
2CC #5	2A-13A	-	3CC #6	Yes
2CC #6	2A-17A	-	-	Yes
2CC #7	2A-26A	-	3CC #8	Yes
2CC #8	2A-66A	-	3CC #8	Yes
2CC #9	2C	-	3CC #10	-
2CC #10	4A-4A	-	3CC #11	-
2CC #11	4A-5A	-	3CC #11	Yes
2CC #12	4A-12A	-	3CC #12	Yes
2CC #13	4A-13A	-	3CC #6	Yes
2CC #14	4A-17A	-	-	Yes
2CC #15	5A-41A	41A SCC Only	-	-
2CC #16	5A-66A	-	3CC #13	Yes
2CC #17	12A-25A	-	-	Yes
2CC #18	12A-66A	-	3CC #15	Yes
2CC #19	26A-41A	41A SCC Only	-	-
2CC #20	41A-41A	-	-	-
2CC #21	41C	-	3CC #16	-
2CC #22	66A-66A	-	3CC #13	-
2CC #23	66B	-	-	-
2CC #24	66C	-	3CC #14	-

Index	3CC	Restriction	Completely Covered by Measurement Superset	Reverse
3CC #1	2A-2A-4A	-	4CC #1	Yes
3CC #2	2A-2A-5A	-	4CC #1	Yes
3CC #3	2A-2A-12A	-	-	Yes
3CC #4	2A-4A-4A	-	4CC #2	Yes
3CC #5	2A-4A-5A	-	4CC #2	Yes
3CC #6	2A-4A-13A	-	-	Yes
3CC #7	2A-5A-66A	-	4CC #3	Yes
3CC #8	2A-26A-66A	-	-	Yes
3CC #9	2A-66A-66A	-	-	Yes
3CC #10	2C-66A	-	-	Yes
3CC #11	4A-4A-5A	-	4CC #2	Yes
3CC #12	4A-4A-12A	-	-	Yes
3CC #13	5A-66A-66A	-	4CC #3	Yes
3CC #14	5A-66C	-	-	Yes
3CC #15	12A-66A-66A	-	-	Yes
3CC #16	26A-41C	41A SCC Only	-	-
3CC #17	41A-41C	-	-	Yes
3CC #18	41D	-	4CC #4	-

Index	4CC	Restriction	Completely Covered by Measurement Superset	Reverse
4CC #1	2A-2A-4A-5A	-	-	Yes
4CC #2	2A-4A-4A-5A	-	-	Yes
4CC #3	2A-5A-66A-66A	-	-	Yes
4CC #4	41A-41D	-	-	Yes
4CC #5	41C-41C	-	-	-
4CC #6	41E	-	-	-

Note: Only yellow highlight cells need power measurement according to LTE DL CA SAR test Exclusion in TCB workshop (April 2018).

In applying the power measurement procedures of KDB 941225 D05A for DL CA to qualify for UL SAR test exclusion, power measurement is required only for the CA configuration with the largest aggregated DL CA BW in each frequency band, independently for contiguous and non-contiguous CA; however, if the same frequency band is used for both contiguous and non-contiguous CA, power measurement was performed using the configuration with the largest aggregated BW and maximum output power among contiguous and non-contiguous CA.

C.1 Downlink Carrier Aggregation RF Conducted Powers

C.1.1 LTE Band 2 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_2A-17A	B2	10	18650	1855.0	QPSK	1	0	650	1935.0	B17	10	5790	740.0													23.01	23.04
CA_2A-2A-12A	B2	20	18700	1860.0	QPSK	1	0	700	1940.0	B2	20	1100	1980.0	B12	10	5095	737.5									22.95	23.12
CA_2A-4A-13A	B2	20	18700	1860.0	QPSK	1	0	700	1940.0	B4	20	2175	2132.5	B13	10	5230	751.0									22.91	23.12
CA_2A-26A-66A	B2	20	18700	1860.0	QPSK	1	0	700	1940.0	B26	15	8865	876.5	B66	20	66786	2145.0									22.88	23.12
CA_2A-66A-66A	B2	20	18700	1860.0	QPSK	1	0	700	1940.0	B66	20	66786	2145.0	B66	20	67036	2170.0									23.05	23.12
CA_2C-66A	B2	20	18700	1860.0	QPSK	1	0	700	1940.0	B2	20	898	1959.8	B66	20	66786	2145.0									23.05	23.12
CA_2A-2A-4A-5A	B2	20	18700	1860.0	QPSK	1	0	700	1940.0	B2	20	1100	1980.0	B4	20	2175	2132.5	B5	10	2525	881.5					22.94	23.12
CA_2A-4A-4A-5A	B2	20	18700	1860.0	QPSK	1	0	700	1940.0	B4	20	2175	2132.5	B4	20	2300	2145.0	B5	10	2525	881.5					22.90	23.12
CA_2A-5A-66A-66A	B2	20	18700	1860.0	QPSK	1	0	700	1940.0	B5	10	2525	881.5	B66	20	66786	2145.0	B66	20	67036	2170.0					22.93	23.12

C.1.2 LTE Band 4 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_4A-13A	B4	20	20175	1732.5	QPSK	1	0	2175	2132.5	B13	10	5230	751.0													23.88	24.00
CA_4A-17A	B4	10	20000	1715.0	QPSK	1	25	2000	2115.0	B17	10	5790	740.0													24.08	24.22
CA_2A-4A-13A	B4	20	20175	1732.5	QPSK	1	0	2175	2132.5	B2	20	900	1960.0	B13	10	5230	751.0									23.95	24.00
CA_4A-4A-5A	B4	20	20175	1732.5	QPSK	1	0	2175	2132.5	B4	20	2300	2145.0	B5	10	2525	881.5									23.95	24.00
CA_4A-4A-12A	B4	20	20175	1732.5	QPSK	1	0	2175	2132.5	B4	20	2300	2145.0	B12	10	5095	737.5									23.91	24.00
CA_2A-2A-4A-5A	B4	20	20175	1732.5	QPSK	1	0	2175	2132.5	B2	20	900	1960.0	B2	20	1100	1980.0	B5	10	2525	881.5					23.90	24.00
CA_2A-4A-4A-5A	B4	20	20175	1732.5	QPSK	1	0	2175	2132.5	B4	20	2300	2145.0	B2	20	900	1960.0	B5	10	2525	881.5					23.94	24.00

C.1.3 LTE Band 5 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_5A-41A	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B41	20	40620	2593.0													23.66	23.76
CA_4A-4A-5A	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B4	20	2175	2132.5	B4	20	2300	2145.0									23.71	23.76
CA_5A-66A-66A	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B66	20	66786	2145.0	B66	20	67036	2170.0									23.75	23.76
CA_5A-66C	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B66	20	66786	2145.0	B66	20	66984	2164.8									23.72	23.76
CA_2A-2A-4A-5A	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B2	20	900	1960.0	B2	20	1100	1980.0	B4	20	2175	2132.5					23.65	23.76
CA_2A-4A-4A-5A	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B2	20	900	1960.0	B4	20	2175	2132.5	B4	20	2300	2145.0					23.66	23.76
CA_2A-5A-66A-66A	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B66	20	66786	2145.0	B66	20	67036	2170.0	B2	20	900	1960.0					23.68	23.76

C.1.4 LTE Band 12 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_12A-25A	B12	10	23095	707.5	QPSK	1	0	5095	737.5	B25	20	8365	1962.5													23.66	23.76
CA_2A-2A-12A	B12	10	23095	707.5	QPSK	1	0	5095	737.5	B2	20	900	1960.0	B2	20	1100	1980.0									23.71	23.76
CA_4A-4A-12A	B12	10	23095	707.5	QPSK	1	0	5095	737.5	B4	20	2175	2132.5	B4	20	2300	2145.0									23.72	23.76
CA_12A-66A-66A	B12	10	23095	707.5	QPSK	1	0	5095	737.5	B66	20	66786	2145.0	B66	20	67036	2170.0									23.68	23.76

C.1.5 LTE Band 13 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_4A-13A	B13	10	23230	782.0	QPSK	1	0	5230	751.0	B4	20	2175	2132.5													23.95	24.03
CA_2A-4A-13A	B13	10	23230	782.0	QPSK	1	0	5230	751.0	B2	20	900	1960.0	B4	20	2175	2132.5									23.92	24.03

C.1.6 LTE Band 17 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_2A-17A	B17	10	23790	710.0	QPSK	1	49	5790	740.0	B2	10	900	1960.0													23.84	23.87
CA_4A-17A	B17	10	23790	710.0	QPSK	1	49	5790	740.0	B4	10	2175	2132.5													23.79	23.87

C.1.7 LTE Band 25 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_12A-25A	B25	20	26140	1860.0	QPSK	1	0	8140	1940.0	B12	10	5095	737.5													22.95	23.10

C.1.8 LTE Band 26 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_26A-41A	B26	15	26865	831.5	QPSK	1	0	8865	876.5	B41	20	40620	2593.0													22.56	22.70
CA_2A-26A-66A	B26	15	26865	831.5	QPSK	1	0	8865	876.5	B2	20	900	1960.0	B66	20	66786	2145.0									22.62	22.70
CA_26A-41C	B26	15	26865	831.5	QPSK	1	0	8865	876.5	B41	20	40620	2593.0	B41	20	40818	2612.8									22.65	22.70

C.1.9 LTE Band 41 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_41A-41A	B41	20	40620	2593.0	QPSK	1	49	40620	2593.0	B41	20	41490	2680.0													23.55	23.62
CA_41A-41C	B41	20	40620	2593.0	QPSK	1	49	40620	2593.0	B41	20	41490	2680.0	B41	20	41292	2660.2									23.42	23.62
CA_41A-41C	B41	20	40620	2593.0	QPSK	1	49	40620	2593.0	B41	20	40818	2612.8	B41	20	41490	2680.0									23.56	23.62
CA_41D	B41	20	40620	2593.0	QPSK	1	49	40620	2593.0	B41	20	40818	2612.8	B41	20	41016	2632.6									23.58	23.62
CA_41A-41D	B41	20	40620	2593.0	QPSK	1	49	40620	2593.0	B41	20	41490	2680.0	B41	20	41292	2660.2	B41	20	41094	2640.4					23.49	23.62
CA_41A-41D	B41	20	40620	2593.0	QPSK	1	49	40620	2593.0	B41	20	40818	2612.8	B41	20	41016	2632.6	B41	20	41490	2680.0					23.54	23.62
CA_41C-41C	B41	20	40620	2593.0	QPSK	1	49	40620	2593.0	B41	20	40818	2612.8	B41	20	41490	2680.0	B41	20	41292	2660.2					23.59	23.62
CA_41E	B41	20	40620	2593.0	QPSK	1	49	40620	2593.0	B41	20	40818	2612.8	B41	20	41490	2632.6	B41	20	41214	2652.4					23.51	23.62

C.1.10 LTE Band 66 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_66B	B66	15	132047	1717.5	QPSK	1	0	66511	2117.5	B66	5	66604	2126.8													24.01	24.07
CA_2A-26A-66A	B66	20	132072	1720.0	QPSK	1	0	66536	2120.0	B2	20	900	1960.0	B26	15	8865	876.5									23.95	24.07
CA_2A-66A-66A	B66	20	132072	1720.0	QPSK	1	0	66536	2120.0	B66	20	67036	2170.0	B2	20	900	1960.0									23.97	24.07
CA_2C-66A	B66	20	132072	1720.0	QPSK	1	0	66536	2120.0	B2	20	700	1940.0	B2	20	898	1959.8									23.91	24.07
CA_5A-66A-66A	B66	20	132072	1720.0	QPSK	1	0	66536	2120.0	B66	20	67036	2170.0	B5	10	2525	881.5									24.11	24.23
CA_5A-66C	B66	20	132072	1720.0	QPSK	1	0	66536	2120.0	B66	20	66734	2139.8	B5	10	2525	881.5									24.02	24.07
CA_12A-66A-66A	B66	20	132072	1720.0	QPSK	1	0	66536	2120.0	B66	20	67036	2170.0	B12	10	5095	737.5									23.94	24.07
CA_2A-5A-66A-66A	B66	20	132072	1720.0	QPSK	1	0	66536	2120.0	B66	20	67036	2170.0	B2	20	900	1960.0	B5	10	2525	881.5					23.97	24.07

C.2 LTE Downlink Carrier Aggregation with 4X4 MIMO

This device supports downlink 4x4 MIMO operations for some LTE bands.

Uplink transmission is limited to a single output stream. When carrier aggregation was applicable, the general test selection and setup procedures described in Appendix C.1 were applied.

According to LTE Test conditions in TCB workshop(May, 2017), SAR is excluded for LTE downlink 4x4 MIMO operation when uplink output with DL MIMO does not exceed highest uplink output power configuration without DL MIMO by more than a 1/4 dB. And for DL MIMO with carrier aggregation, the same SAR test exclusion procedure is considered.

Index	2CC	Restriction	Completely Covered by Measurement Superset	Reverse
2CC #1	2A-[4A]	-	3CC #1	Yes
2CC #2	2A-[66A]	-	3CC #6	Yes
2CC #3	[4A]-4A	-	3CC #2	-
2CC #4	[4A]-[4A]	-	3CC #3	-
2CC #5	[4A]-5A	-	3CC #4	Yes
2CC #6	[4A]-13A	-	3CC #5	Yes
2CC #7	[4A]-12A	-	3CC #11	Yes
2CC #8	[4A]-17A	-	-	Yes
2CC #9	5A-[41A]	-	-	Yes
2CC #10	5A-[66A]	-	3CC #13	Yes
2CC #11	12A-[66A]	-	3CC #16	Yes
2CC #12	26A-[41A]	41A SCC Only	-	-
2CC #13	[41A]-41A	-	-	-
2CC #14	[41A]-[41A]	-	-	-
2CC #15	[41C]	-	3CC #20	-
2CC #16	[66A]-66A	-	3CC #7	-
2CC #17	[66A]-[66A]	-	3CC #8	-
2CC #18	[66B]	-	-	-
2CC #19	[66C]	-	3CC #15	-

Index	3CC	Restriction	Completely Covered by Measurement Superset	Reverse
3CC #1	2A-2A-[4A]	-	4CC #1	Yes
3CC #2	2A-[4A]-4A	-	-	Yes
3CC #3	2A-[4A]-[4A]	-	-	Yes
3CC #4	2A-[4A]-5A	-	4CC #1	Yes
3CC #5	2A-[4A]-13A	-	-	Yes
3CC #6	2A-5A-[66A]	-	-	Yes
3CC #7	2A-[66A]-66A	-	-	Yes
3CC #8	2A-[66A]-[66A]	-	-	Yes
3CC #9	[4A]-4A-5A	-	-	Yes
3CC #10	[4A]-[4A]-5A	-	-	Yes
3CC #11	[4A]-4A-12A	-	-	Yes
3CC #12	[4A]-[4A]-12A	-	-	Yes
3CC #13	5A-[66A]-66A	-	-	Yes
3CC #14	5A-[66A]-[66A]	-	-	Yes
3CC #15	5A-[66C]	-	-	Yes
3CC #16	12A-[66A]-66A	-	-	Yes
3CC #17	12A-[66A]-[66A]	-	-	Yes
3CC #18	26A-[41C]	41A SCC Only	-	-
3CC #19	[41A]-41C	-	-	-
3CC #20	41A-[41C]	-	-	-

Index	4CC	Restriction	Completely Covered by Measurement Superset	Reverse
4CC #1	2A-2A-[4A]-5A	-	4CC #1	Yes
4CC #2	[41A]-41D	-	-	-

Note: “[ ]” is 4X4 MIMO Configuration.

C.2 Downlink Carrier Aggregation RF Conducted Powers

C.2.1 LTE 4X4 MIMO DL Standalone Powers

LTE Band	BW [MHz]	Ch.	Freq. [MHz]	Mod.	RB Size	RB Offset	4X4 DL MIMO Tx. Power (dBm)	Single Antenna Tx Power
4	20	20175	1732.5	QPSK	1	0	23.85	24.00
41	20	40620	2593.0	QPSK	1	49	23.54	23.62
66	20	132572	1770.0	QPSK	1	49	23.89	24.07

C.2.2 LTE Band 2 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_2A-[4A]-4A	B2	20	18700	1860.0	QPSK	1	0	650	1935.0	B[4]	20	2175	2132.5	B4	20	2175	2132.5									23.05	23.12
CA_2A-[4A]-[4A]	B2	20	18700	1860.0	QPSK	1	0	650	1935.0	B[4]	20	2175	2132.5	B[4]	20	2175	2132.5									23.06	23.12
CA_2A-[4A]-13A	B2	20	18700	1860	QPSK	1	0	700	1940.0	B[4]	20	2175	2132.5	B13	10	5230	751.0									23.02	23.12
CA_2A-5A-[66A]	B2	20	18700	1860	QPSK	1	0	700	1940.0	B5	10	2525	881.5	B[66]	20	66786	2145									23.05	23.12
CA_2A-[66A]-66A	B2	20	18700	1860	QPSK	1	0	700	1940.0	B[66]	20	66786	2145.0	B66	20	66786	2145.0									23.01	23.12
CA_2A-[66A]-[66A]	B2	20	18700	1860	QPSK	1	0	700	1940.0	B[66]	20	66786	2145.0	B[66]	20	66786	2145.0									23.06	23.12
CA_2A-2A-[4A]-5A	B2	20	18700	1860	QPSK	1	0	650	1935.0	B2	20	900	1960.0	B[4]	20	2175	2132.5	B5	10	2525	881.5					22.98	23.12

C.2.3 LTE Band 4 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_[4A]-17A	B[4]	10	20000	1715	QPSK	1	25	2175	2132.5	B17	10	5790	740.0													24.15	24.22
CA_2A-[4A]-4A	B[4]	20	20175	1732.5	QPSK	1	0	2175	2132.5	B4	20	2175	2132.5	B2	20	900	1960.0									23.88	24.00
CA_2A-[4A]-[4A]	B[4]	20	20175	1732.5	QPSK	1	0	2175	2132.5	B[4]	20	2175	2132.5	B2	20	900	1960.0									23.91	24.00
CA_2A-[4A]-13A	B[4]	20	20175	1732.5	QPSK	1	0	2175	2132.5	B2	20	900	1960.0	B13	10	5230	751.0									23.95	24.00
CA_[4A]-4A-5A	B[4]	20	20175	1732.5	QPSK	1	0	2175	2132.5	B4	20	2175	2132.5	B5	10	2525	881.5									23.84	24.00
[4A]-[4A]-5A	B[4]	20	20175	1732.5	QPSK	1	0	2175	2132.5	B[4]	20	2175	2132.5	B5	10	2525	881.5									23.91	24.00
CA_[4A]-4A-12A	B[4]	20	20175	1732.5	QPSK	1	0	2175	2132.5	B4	20	2175	2132.5	B12	10	5095	737.5									23.86	24.00
CA_[4A]-[4A]-12A	B[4]	20	20175	1732.5	QPSK	1	0	2175	2132.5	B[4]	20	2175	2132.5	B12	10	5095	737.5									23.92	24.00
CA_2A-2A-[4A]-5A	B[4]	20	20175	1732.5	QPSK	1	0	2175	2132.5	B2	20	900	1960.0	B2	20	900	1960.0	B5	10	2525	881.5					23.94	24.00

C.2.4 LTE Band 5 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_5A-[41A]	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B[41]	20	40620	2593.0													23.58	23.76
CA_2A-5A-[66A]	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B2	20	900	1960	B[66]	20	66786	2145.0									23.66	23.76
CA_[4A]-4A-5A	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B[4]	20	2175	2132.5	B4	20	2175	2132.5									23.71	23.76
[4A]-[4A]-5A	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B[4]	20	2175	2132.5	B[4]	20	2175	2132.5									23.69	23.76
CA_5A-[66A]-66A	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B[66]	20	66786	2145	B66	20	66786	2145									23.72	23.76
CA_5A-[66A]-[66A]	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B[66]	20	66786	2145	B[66]	20	66786	2145									23.59	23.76
CA_5A-[66C]	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B[66]	20	66786	2145.0	B[66]	20	66984	2164.8									23.64	23.76
CA_2A-2A-[4A]-5A	B5	10	20525	836.5	QPSK	1	25	2525	881.5	B2	20	900	1960.0	B2	20	900	1960.0	B[4]	20	2175	2132.5					23.68	23.76

C.2.5 LTE Band 12 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_[4A]-4A-12A	B12	10	23095	707.5	QPSK	1	0	5095	737.5	B[4]	20	2175	2132.5	B4	20	2175	2132.5									23.69	23.76
CA_[4A]-[4A]-12A	B12	10	23095	707.5	QPSK	1	0	5095	737.5	B[4]	20	2175	2132.5	B[4]	20	2175	2132.5									23.66	23.76
CA_12A-[66A]-66A	B12	10	23095	707.5	QPSK	1	0	5765	737.5	B[66]	20	66786	2145	B66	20	66786	2145									23.64	23.76
CA_12A-[66A]-[66A]	B12	10	23095	707.5	QPSK	1	0	5765	737.5	B[66]	20	66786	2145	B[66]	20	66984	2164.8									23.71	23.76

C.2.6 LTE Band 13 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_2A-[4A]-13A	B13	10	23230	782	QPSK	1	0	5230	751.0	B2	20	900	1960.0	B[4]	20	2175	2132.5									23.95	24.03

C.2.7 LTE Band 17 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_[4A]-17A	B17	10	23790	710	QPSK	1	49	5120	740.0	B[4]	10	1425	1827.5													23.79	23.87

C.2.8 LTE Band 26 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_26A-[41A]	B26	15	26865	831.5	QPSK	1	0	8865	876.5	B[41]	20	40620	2593.0													22.56	22.70
CA_26A-[41C]	B26	15	26865	831.5	QPSK	1	0	8865	876.5	B[41]	20	40620	2593.0	B[41]	20	40818	2612.8									22.62	22.70

C.2.9 LTE Band 41 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	Band	BW [MHz]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_[41A]-41A	B[41]	20	40620	2593	QPSK	1	49	40620	2593.0	B41	20	40818	2612.8													23.54	23.62
CA_[41A]-[41A]	B[41]	20	40620	2593	QPSK	1	49	40620	2593.0	B[41]	20	40818	2612.8													23.58	23.62
CA_[41A]-41C	B[41]	20	40620	2593	QPSK	1	49	40620	2593.0	B41	20	40620	2593.0	B41	20	40818	2612.8									23.59	23.62
CA_[41A]-41C	B41	20	40620	2593	QPSK	1	49	40620	2593.0	B41	20	40818	2612.8	B[41]	20	40620	2593.0									23.51	23.62
CA_41A-[41C]	B41	20	40620	2593	QPSK	1	49	40620	2593.0	B[41]	20	41490	2680.0	B[41]	20	41292	2660.2									23.52	23.62
CA_41A-[41C]	B[41]	20	40620	2593	QPSK	1	49	40620	2593.0	B[41]	20	40818	2612.8	B41	20	41490	2680.0									23.48	23.62
CA_[41A]-41D	B[41]	20	40620	2593	QPSK	1	49	40620	2593.0	B41	20	41490	2680.0	B41	20	41292	2660.2	B41	20	41094	2640.4					23.51	23.62
CA_[41A]-41D	B41	20	40620	2593	QPSK	1	49	40620	2593.0	B41	20	40818	2612.8	B41	20	41016	2632.6	B[41]	20	41490	2680.0					23.49	23.62

C.2.1.10 LTE Band 66 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	Band	BW [㎒]	(UL) Ch.	(UL) Freq.	Mod.	(UL) RB	(UL) RB	(DL) Ch.	(DL) Freq.	Band	BW [㎒]	(DL) Ch.	(DL) Freq.	Band	BW [㎒]	(DL) Ch.	(DL) Freq.	Band	BW [㎒]	(DL) Ch.	(DL) Freq.	Band	BW [㎒]	(DL) Ch.	(DL) Freq.	LTE Tx. Power with	LTE Single Carrier Tx
CA_[66B]	B[66]	15	132047	1717.5	QPSK	1	0	66511	2117.5	B[66]	5	66604	2126.8													24.01	24.07
CA_2A-5A-[66A]	B[66]	20	132072	1720	QPSK	1	0	66536	2120.0	B2	20	900	1960.0	B5	10	2525	881.5									23.95	24.07
CA_2A-[66A]-66A	B[66]	20	132072	1720	QPSK	1	0	66536	2120.0	B66	20	66786	2145.0	B2	20	900	1960.0									23.98	24.07
CA_2A-[66A]-[66A]	B[66]	20	132072	1720	QPSK	1	0	66536	2120.0	B[66]	20	66786	2145.0	B2	20	900	1960.0									24.02	24.07
CA_5A-[66A]-66A	B66	20	132072	1720	QPSK	1	0	66536	2120.0	B[66]	20	66786	2145	B5	10	2525	881.5									24.01	24.07
CA_5A-[66A]-[66A]	B[66]	20	132072	1720	QPSK	1	0	66536	2120.0	B[66]	20	66786	2145	B5	10	2525	881.5									23.95	24.07
CA_5A-[66C]	B[66]	20	132072	1720	QPSK	1	0	66536	2120.0	B[66]	20	66734	2139.8	B5	10	2525	881.5									24.11	24.23
CA_12A-[66A]-66A	B[66]	20	132072	1720	QPSK	1	0	66536	2120.0	B66	20	66734	2139.8	B12	10	5095	737.5									24.03	24.07
CA_12A-[66A]-[66A]	B[66]	20	132072	1720	QPSK	1	0	66536	2120.0	B[66]	20	66734	2139.8	B12	10	5095	737.5									24.04	24.07

Appendix D. Power Reduction Verification

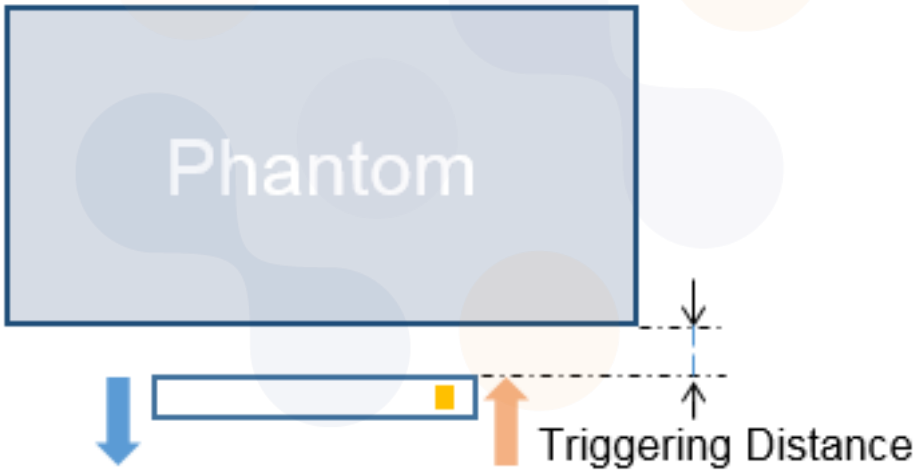
D.1 Proximity Sensor Triggering Distance

Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Rear, Top, Bottom of the DUT was placed directly below the flat phantom. The DUT was moved toward the phantom in accordance with the steps outlined in KDB 616217 §6.2 to determine the trigger distance for enabling power reduction. The DUT was moved away from the phantom to determine the trigger distance for resuming full power.

The DUT featured a visual indicator on its display that showed the status of the proximity sensor (Triggered or not triggered).This was used to determine the status of the sensor during the proximity sensor assessment as monitoring the output power directly was not practical without affecting the measurement.

It was confirmed separately that the output power was altered according to the proximity sensor status indication. This was achieved by observing the proximity sensor status at the same time as monitoring the conducted power contains both the full and reduced conducted power measurements.



LEGEND

Direction of DUT travel for determination of power reduction triggering point

Direction of DUT travel for determination of full power resumption triggering point

D.1.1 Rear

Resulting test positions for SAR mearsurementes

Tissue simulating liquid	Band	Trigger distance – Rear		
		Moving toward phantom	Moving from phantom	Worst case distance for SAR
750 Head	LTE Band 12	20 mm	20 mm	19 mm
	LTE Band 13			
	LTE Band 17			
	5G NR n71			
850 Head	GSM 850	20 mm	20 mm	19 mm
	WCDMA Band 5			
	LTE Band 5			
	LTE Band 26			
	5G NR n5			
	5G NR n26			
1750 Head	WCDMA Band 4	20 mm	20 mm	19 mm
	LTE Band 4 (Main1)			
	LTE Band 66 (Main1)			
	5G NR n66			
	LTE Band 4 (Sub1)	19 mm	19 mm	18 mm
	LTE Band 66 (Sub1)			
1900 Head	GSM 1900	20 mm	20 mm	19 mm
	WCDMA Band 2			
	LTE Band 2 (Main1)			
	LTE Band 25			
	LTE Band 2 (Sub1)	19 mm	19 mm	18 mm
2600 Head	LTE Band 41	17 mm	17 mm	16 mm
	5G NR n41			
3700 Head	5G NR n77 (PC2)	17 mm	17 mm	16 mm
	5G NR n77 (PC3)			
	5G NR n78 (PC2)			
	5G NR n78 (PC3)			
2450 Head	WLAN Ant. 1	16 mm	16 mm	15 mm
	Bluetooth Ant. 1			
5000 Head	WLAN Ant. 1	16 mm	16 mm	15 mm
2450 Head	WLAN Ant. 2	20 mm	20 mm	19 mm
	Bluetooth Ant. 2			
5000 Head	WLAN Ant. 2	20 mm	20 mm	19 mm

Proximity Sensor Triggering Distance Measurement Results – Rear Side (Main1 Ant)

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	25	24	23	22	21	20	19	18	17	16
GSM850 Voice & GPRS 1Tx	32.27	32.21	32.22	32.21	32.27	23.28	23.44	23.47	23.41	23.39
GSM850 GPRS 2Tx	31.06	30.96	30.93	30.92	31.06	20.36	20.36	20.36	20.34	20.41
GSM850 GPRS 3Tx	28.72	28.71	28.71	28.69	28.84	18.64	18.60	18.57	18.61	18.50
GSM850 GPRS 4Tx	26.77	26.78	26.89	26.82	26.74	17.39	17.34	17.37	17.25	17.24
GSM1900 Voice &GPRS 1Tx	29.33	29.39	29.30	29.30	29.35	19.51	19.42	19.41	19.40	19.46
GSM1900 GPRS 2Tx	27.69	27.63	27.69	27.78	27.67	16.38	16.34	16.34	16.33	16.43
GSM1900 GPRS 3Tx	26.18	26.31	26.34	26.25	26.31	14.63	14.68	14.61	14.76	14.78
GSM1900 GPRS 4Tx	24.22	24.14	24.21	24.19	24.23	13.38	13.39	13.37	13.54	13.41
WCDMA II	23.00	23.07	23.05	23.13	23.19	11.52	11.54	11.58	11.63	11.69
WCDMA IV	24.01	24.09	24.04	23.97	23.98	13.22	13.30	13.24	13.28	13.20
WCDMA V	23.66	23.81	23.65	23.65	23.83	13.71	13.70	13.65	13.64	13.77
LTE Band 2 (Main1)	23.15	23.22	23.06	23.12	23.21	11.31	11.34	11.38	11.32	11.29
LTE Band 4 (Main1)	23.91	23.95	23.99	23.92	23.82	12.96	12.86	12.90	12.97	12.96
LTE Band 5	23.74	23.72	23.75	23.66	23.79	14.69	14.70	14.83	14.66	14.83
LTE Band 12	23.71	23.79	23.69	23.86	23.84	15.65	15.72	15.82	15.79	15.62
LTE Band 13	23.93	23.99	24.07	24.05	23.99	14.02	14.00	14.00	14.13	14.13
LTE Band 17	23.85	23.91	23.87	23.84	23.77	15.79	15.71	15.82	15.77	15.75
LTE Band 25	23.09	23.06	23.20	23.17	23.07	11.20	11.40	11.23	11.32	11.27
LTE Band 26	22.61	22.74	22.73	22.66	22.79	15.66	15.78	15.71	15.71	15.80
LTE Band 66 (Main1)	24.10	24.14	24.15	24.15	24.00	12.35	12.34	12.36	12.35	12.44
5G NR n5	23.00	23.11	23.14	23.04	23.01	15.97	15.93	16.06	16.01	15.99
5G NR n26	23.01	22.98	22.95	22.97	23.05	15.93	15.89	15.84	15.90	15.98
5G NR n66	24.16	24.14	24.05	24.07	24.20	13.23	13.16	13.18	13.12	13.10
5G NR n71	24.15	24.12	24.10	24.05	24.10	15.92	15.92	15.95	15.99	15.93

DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	16	17	18	19	20	21	22	23	24	25
GSM850 Voice & GPRS 1Tx	23.47	23.46	23.46	23.41	23.38	32.27	32.11	32.31	32.26	32.25
GSM850 GPRS 2Tx	20.22	20.40	20.34	20.23	20.33	31.04	30.97	30.95	31.05	31.04
GSM850 GPRS 3Tx	18.55	18.45	18.61	18.55	18.65	28.74	28.69	28.70	28.80	28.85
GSM850 GPRS 4Tx	17.23	17.30	17.25	17.41	17.23	26.77	26.87	26.85	26.87	26.76
GSM1900 Voice &GPRS 1Tx	19.39	19.42	19.52	19.42	19.37	29.27	29.28	29.38	29.38	29.25
GSM1900 GPRS 2Tx	16.50	16.43	16.40	16.49	16.37	27.69	27.62	27.81	27.72	27.69
GSM1900 GPRS 3Tx	14.75	14.75	14.66	14.77	14.74	26.19	26.29	26.32	26.23	26.20
GSM1900 GPRS 4Tx	13.38	13.55	13.44	13.47	13.46	24.23	24.27	24.16	24.23	24.18
WCDMA II	11.70	11.58	11.60	11.57	11.55	23.17	23.10	23.10	23.09	23.11
WCDMA IV	13.11	13.29	13.26	13.13	13.29	24.10	23.96	24.10	24.10	23.96
WCDMA V	13.72	13.58	13.65	13.66	13.60	23.71	23.78	23.80	23.70	23.85
LTE Band 2 (Main1)	11.31	11.35	11.38	11.25	11.36	23.19	23.15	23.12	23.14	23.04
LTE Band 4 (Main1)	12.93	12.89	12.96	12.94	12.86	23.92	23.87	23.88	23.99	23.91
LTE Band 5	14.85	14.65	14.65	14.78	14.67	23.74	23.84	23.82	23.67	23.68
LTE Band 12	15.81	15.79	15.78	15.75	15.71	23.66	23.69	23.85	23.68	23.75
LTE Band 13	14.13	13.98	14.08	13.96	14.06	24.12	23.94	23.97	24.03	24.13
LTE Band 17	15.84	15.88	15.73	15.85	15.78	23.86	23.88	23.86	23.80	23.94
LTE Band 25	11.40	11.20	11.28	11.27	11.27	23.11	23.01	23.11	23.08	23.13
LTE Band 26	15.67	15.75	15.65	15.67	15.71	22.80	22.79	22.65	22.79	22.74
LTE Band 66 (Main1)	12.45	12.46	12.47	12.30	12.42	24.09	24.01	23.99	24.11	24.05
5G NR n5	16.04	15.95	16.02	16.06	16.06	23.06	23.03	22.99	23.04	23.04
5G NR n26	15.89	15.97	15.89	15.93	15.88	23.10	22.99	22.94	23.09	23.06
5G NR n66	13.14	13.23	13.06	13.15	13.05	24.04	24.08	24.17	24.17	24.12
5G NR n71	16.07	15.99	15.93	15.97	16.01	24.06	24.15	24.09	24.16	24.07

Proximity Sensor Triggering Distance Measurement Results – Rear Side (Main2 Ant)

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	22	21	20	19	18	17	16	15	14	13
LTE Band 41	23.65	23.66	23.71	23.59	23.67	13.99	13.84	13.90	13.81	13.88
5G NR n41	23.60	23.66	23.62	23.75	23.73	15.96	15.91	15.95	15.89	15.94
5G NR n77(PC2)	24.97	24.92	24.98	24.94	25.06	15.80	15.86	15.81	15.81	15.79
5G NR n77(PC3)	24.00	24.14	24.15	24.03	23.97	15.50	15.50	15.59	15.47	15.54
5G NR n78(PC2)	24.36	24.40	24.43	24.49	24.29	15.33	15.34	15.41	15.33	15.37
5G NR n78(PC3)	23.44	23.44	23.40	23.29	23.33	15.31	15.18	15.16	15.15	15.22

DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	13	14	15	16	17	18	19	20	21	22
LTE Band 41	13.90	13.93	13.97	13.84	13.99	23.72	23.58	23.72	23.64	23.67
5G NR n41	15.89	15.84	15.98	15.90	15.99	23.74	23.61	23.69	23.66	23.71
5G NR n77(PC2)	15.69	15.76	15.74	15.79	15.68	25.10	24.92	24.92	25.03	25.09
5G NR n77(PC3)	15.59	15.52	15.46	15.42	15.48	24.08	24.05	23.98	24.04	23.98
5G NR n78(PC2)	15.35	15.35	15.28	15.32	15.26	24.46	24.35	24.47	24.43	24.40
5G NR n78(PC3)	15.17	15.16	15.30	15.29	15.14	23.24	23.26	23.44	23.40	23.38

Proximity Sensor Triggering Distance Measurement Results – Rear Side (Sub1 Ant)

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	24	23	22	21	20	19	18	17	16	15
LTE Band 2 (Sub1)	22.30	22.28	22.39	22.44	22.46	13.20	13.25	13.08	13.18	13.08
LTE Band 4 (Sub1)	22.25	22.35	22.41	22.41	22.39	13.71	13.79	13.75	13.74	13.91
LTE Band 66 (Sub1)	22.54	22.44	22.63	22.55	22.52	13.32	13.35	13.23	13.27	13.25

DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	15	16	17	18	19	20	21	22	23	24
LTE Band 2 (Sub1)	13.23	13.21	13.17	13.24	13.25	22.42	22.34	22.41	22.36	22.31
LTE Band 4 (Sub1)	13.80	13.79	13.72	13.83	13.75	22.37	22.33	22.30	22.26	22.33
LTE Band 66 (Sub1)	13.31	13.34	13.22	13.37	13.35	22.52	22.61	22.50	22.63	22.57

Proximity Sensor Triggering Distance Measurement Results – Rear Side (WIFI Ant.1)

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	21	20	19	18	17	16	15	14	13	12
2.4 GHz 802.11b	19.26	19.31	19.17	19.19	19.22	10.82	10.90	10.82	10.76	10.84
2.4 GHz 802.11g	14.96	15.10	15.02	15.12	15.07	10.96	11.01	11.01	10.88	10.93
2.4 GHz 802.11n	14.77	14.76	14.73	14.62	14.64	11.12	10.97	10.94	10.99	11.04
2.4 GHz 802.11ac	15.19	15.16	15.13	15.07	15.19	10.95	10.97	10.85	10.93	10.77
2.4 GHz 802.11ax SU	14.77	14.81	14.77	14.72	14.84	10.70	10.63	10.72	10.71	10.55
5 GHz 802.11a	16.82	16.82	16.81	16.91	16.91	7.19	7.18	7.18	7.07	7.08
5 GHz 802.11n 20MHz	16.35	16.21	16.23	16.26	16.31	6.74	6.69	6.61	6.77	6.67
5 GHz 802.11n 40MHz	16.11	15.96	16.08	16.01	16.03	6.59	6.71	6.60	6.65	6.77
5 GHz 802.11ac 20MHz	15.58	15.57	15.66	15.55	15.48	7.49	7.51	7.46	7.40	7.48
5 GHz 802.11ac 40MHz	15.48	15.39	15.33	15.33	15.36	6.88	6.72	6.71	6.76	6.87
5 GHz 802.11ac 80MHz	15.31	15.36	15.30	15.39	15.38	7.40	7.53	7.53	7.48	7.41
5 GHz 802.11ac 160MHz	14.53	14.49	14.48	14.58	14.48	7.46	7.39	7.39	7.37	7.34
5 GHz 802.11ax SU(20M)	15.95	15.89	15.91	16.03	16.07	7.45	7.32	7.44	7.45	7.27
5 GHz 802.11ax SU(40M)	16.07	16.24	16.08	16.11	16.17	6.86	6.97	6.99	6.84	6.87
5 GHz 802.11ax SU(80M)	14.99	14.88	14.95	14.99	14.90	7.28	7.18	7.29	7.35	7.34
5 GHz 802.11ax SU(160M)	13.75	13.80	13.88	13.75	13.91	6.98	6.94	6.91	6.89	6.89
Bluetooth(DH5)	19.01	19.03	19.06	18.87	18.97	10.28	10.44	10.45	10.35	10.29

DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	12	13	14	15	16	17	18	19	20	21
2.4 GHz 802.11b	10.88	10.80	10.87	10.78	10.81	19.17	19.29	19.25	19.17	19.37
2.4 GHz 802.11g	10.92	10.93	11.00	10.94	10.83	14.92	14.99	15.08	15.00	14.97
2.4 GHz 802.11n	10.98	10.93	11.03	11.08	10.95	14.68	14.59	14.75	14.70	14.73
2.4 GHz 802.11ac	10.86	10.77	10.92	10.95	10.92	15.05	15.18	15.10	15.08	15.22
2.4 GHz 802.11ax SU	10.58	10.68	10.52	10.58	10.60	14.76	14.70	14.72	14.71	14.85
5 GHz 802.11a	7.05	7.14	7.21	7.14	7.13	16.82	16.94	16.85	16.77	16.74
5 GHz 802.11n 20MHz	6.72	6.60	6.65	6.66	6.70	16.36	16.20	16.26	16.27	16.37
5 GHz 802.11n 40MHz	6.62	6.73	6.67	6.74	6.70	15.94	16.00	15.93	16.13	16.09
5 GHz 802.11ac 20MHz	7.48	7.42	7.40	7.48	7.57	15.60	15.62	15.50	15.61	15.65
5 GHz 802.11ac 40MHz	6.86	6.87	6.77	6.84	6.77	15.37	15.44	15.48	15.43	15.52
5 GHz 802.11ac 80MHz	7.34	7.52	7.48	7.40	7.44	15.26	15.41	15.35	15.29	15.29
5 GHz 802.11ac 160MHz	7.52	7.48	7.49	7.41	7.48	14.49	14.50	14.57	14.51	14.39
5 GHz 802.11ax SU(20M)	7.27	7.36	7.30	7.29	7.37	16.05	15.96	15.96	16.02	16.01
5 GHz 802.11ax SU(40M)	6.92	6.82	6.91	6.89	6.87	16.10	16.07	16.10	16.16	16.23
5 GHz 802.11ax SU(80M)	7.16	7.34	7.20	7.20	7.29	14.86	14.89	14.97	14.86	14.85
5 GHz 802.11ax SU(160M)	7.01	6.99	6.86	6.82	6.94	13.90	13.89	13.91	13.86	13.80
Bluetooth(DH5)	10.27	10.25	10.27	10.32	10.25	18.92	19.07	19.00	19.04	18.90

Proximity Sensor Triggering Distance Measurement Results – Rear Side (WIFI Ant.2)

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	25	24	23	22	21	20	19	18	17	16
2.4 GHz 802.11b	18.55	18.60	18.59	18.51	18.53	11.46	11.32	11.40	11.39	11.48
2.4 GHz 802.11g	15.35	15.37	15.32	15.41	15.31	10.64	10.45	10.46	10.62	10.55
2.4 GHz 802.11n	14.71	14.70	14.81	14.65	14.79	11.12	11.24	11.11	11.19	11.15
2.4 GHz 802.11ac	15.27	15.29	15.14	15.29	15.27	11.48	11.50	11.55	11.48	11.50
2.4 GHz 802.11ax SU	15.22	15.26	15.10	15.26	15.14	10.89	10.91	10.92	10.87	10.91
5 GHz 802.11a	17.11	17.12	17.12	17.08	17.13	7.32	7.37	7.34	7.23	7.22
5 GHz 802.11n 20MHz	15.70	15.66	15.76	15.63	15.67	6.99	6.96	6.86	7.03	6.96
5 GHz 802.11n 40MHz	15.90	15.92	15.83	16.00	15.97	6.97	6.88	7.03	6.98	6.98
5 GHz 802.11ac 20MHz	15.87	15.88	15.92	15.83	15.73	6.92	6.82	6.86	6.86	6.83
5 GHz 802.11ac 40MHz	14.89	14.93	15.01	14.89	14.98	7.35	7.41	7.38	7.26	7.37
5 GHz 802.11ac 80MHz	14.77	14.77	14.72	14.89	14.72	7.10	7.01	6.97	6.95	7.10
5 GHz 802.11ac 160MHz	14.00	13.93	13.90	13.95	13.99	7.28	7.26	7.15	7.24	7.26
5 GHz 802.11ax SU(20M)	16.39	16.34	16.33	16.28	16.28	6.54	6.63	6.65	6.63	6.65
5 GHz 802.11ax SU(40M)	15.97	15.80	15.96	15.87	15.80	6.92	6.90	6.93	6.97	7.00
5 GHz 802.11ax SU(80M)	14.70	14.73	14.62	14.74	14.73	7.08	7.22	7.21	7.23	7.09
5 GHz 802.11ax SU(160M)	14.43	14.32	14.44	14.28	14.35	6.87	6.69	6.80	6.82	6.74
Bluetooth(DH5)	17.77	17.70	17.73	17.81	17.67	10.39	10.36	10.23	10.36	10.40

DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	16	17	18	19	20	21	22	23	24	25
2.4 GHz 802.11b	11.37	11.48	11.39	11.34	11.48	18.51	18.58	18.56	18.49	18.66
2.4 GHz 802.11g	10.57	10.64	10.48	10.59	10.47	15.28	15.42	15.41	15.41	15.35
2.4 GHz 802.11n	11.20	11.22	11.12	11.09	11.18	14.70	14.76	14.81	14.66	14.67
2.4 GHz 802.11ac	11.55	11.44	11.50	11.47	11.37	15.13	15.20	15.25	15.17	15.26
2.4 GHz 802.11ax SU	10.93	10.95	10.83	10.77	10.80	15.23	15.28	15.16	15.23	15.26
5 GHz 802.11a	7.38	7.25	7.30	7.31	7.22	17.16	17.16	17.19	17.13	17.18
5 GHz 802.11n 20MHz	6.94	6.86	6.87	7.02	6.86	15.72	15.72	15.77	15.61	15.72
5 GHz 802.11n 40MHz	6.91	6.96	6.98	6.98	7.06	15.97	15.83	15.91	15.80	15.82
5 GHz 802.11ac 20MHz	6.90	6.85	6.93	6.80	6.77	15.80	15.78	15.83	15.79	15.74
5 GHz 802.11ac 40MHz	7.43	7.44	7.26	7.28	7.34	15.01	14.89	14.98	14.87	14.81
5 GHz 802.11ac 80MHz	7.03	6.94	7.00	7.07	7.13	14.88	14.72	14.70	14.89	14.70
5 GHz 802.11ac 160MHz	7.21	7.18	7.11	7.14	7.15	13.98	14.10	13.92	13.98	14.02
5 GHz 802.11ax SU(20M)	6.69	6.57	6.63	6.52	6.70	16.24	16.36	16.25	16.33	16.30
5 GHz 802.11ax SU(40M)	7.00	6.91	6.99	6.98	6.88	15.99	15.97	15.94	15.92	15.90
5 GHz 802.11ax SU(80M)	7.17	7.25	7.13	7.21	7.12	14.75	14.63	14.71	14.60	14.77
5 GHz 802.11ax SU(160M)	6.79	6.85	6.70	6.68	6.79	14.34	14.43	14.31	14.33	14.27
Bluetooth(DH5)	10.23	10.28	10.31	10.34	10.40	17.86	17.78	17.80	17.72	17.78

D.1.2 Top

Resulting test positions for SAR mearsurementes

Tissue simulating liquid	Band	Trigger distance – Top		
		Moving toward phantom	Moving from phantom	Worst case distance for SAR
750 Head	LTE Band 12	19 mm	19 mm	18 mm
	LTE Band 13			
	LTE Band 17			
	5G NR n71			
850 Head	GSM 850	19 mm	19 mm	18 mm
	WCDMA Band 5			
	LTE Band 5			
	LTE Band 26			
	5G NR n5			
	5G NR n26			
1750 Head	WCDMA Band 4	19 mm	19 mm	18 mm
	LTE Band 4 (Main1)			
	LTE Band 66 (Main1)			
	5G NR n66			
1900 Head	GSM 1900	19 mm	19 mm	18 mm
	WCDMA Band 2			
	LTE Band 2 (Main1)			
	LTE Band 25			
2600 Head	LTE Band 41	12 mm	12 mm	11 mm
	5G NR n41			
3700 Head	5G NR n77 (PC2)	12 mm	12 mm	11 mm
	5G NR n77 (PC3)			
	5G NR n78 (PC2)			
	5G NR n78 (PC3)			
2450 Head	WLAN Ant. 1	16 mm	16 mm	15 mm
	Bluetooth Ant. 1			
5000 Head	WLAN Ant. 1	16 mm	16 mm	15 mm

Proximity Sensor Triggering Distance Measurement Results – Top (Main1 Ant)

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	24	23	22	21	20	19	18	17	16	15
GSM850 Voice & GPRS 1Tx	32.27	32.16	32.21	32.14	32.19	23.47	23.37	23.32	23.33	23.39
GSM850 GPRS 2Tx	31.02	30.98	30.93	31.06	30.92	20.39	20.35	20.27	20.38	20.29
GSM850 GPRS 3Tx	28.86	28.83	28.80	28.87	28.80	18.55	18.60	18.59	18.45	18.53
GSM850 GPRS 4Tx	26.78	26.92	26.91	26.87	26.86	17.25	17.41	17.35	17.26	17.30
GSM1900 Voice &GPRS 1Tx	29.36	29.34	29.35	29.22	29.40	19.52	19.36	19.45	19.51	19.55
GSM1900 GPRS 2Tx	27.81	27.81	27.65	27.69	27.62	16.37	16.42	16.35	16.46	16.31
GSM1900 GPRS 3Tx	26.30	26.21	26.22	26.34	26.28	14.79	14.77	14.70	14.81	14.76
GSM1900 GPRS 4Tx	24.29	24.17	24.19	24.19	24.19	13.42	13.42	13.41	13.54	13.43
WCDMA II	23.06	23.06	23.04	23.04	23.00	11.61	11.59	11.65	11.60	11.56
WCDMA IV	24.01	23.94	23.99	23.98	23.95	13.29	13.26	13.20	13.18	13.17
WCDMA V	23.84	23.76	23.78	23.79	23.75	13.65	13.60	13.71	13.70	13.66
LTE Band 2 (Main1)	23.06	23.02	23.06	23.18	23.02	11.22	11.37	11.21	11.28	11.30
LTE Band 4 (Main1)	24.01	23.91	23.91	24.01	23.92	13.00	12.91	12.90	13.02	12.94
LTE Band 5	23.66	23.78	23.81	23.86	23.79	14.70	14.65	14.67	14.70	14.79
LTE Band 12	23.84	23.68	23.74	23.73	23.84	15.81	15.67	15.69	15.67	15.79
LTE Band 13	24.01	23.94	24.03	23.98	24.04	14.10	14.06	13.96	14.06	14.13
LTE Band 17	23.87	23.94	23.82	23.81	23.83	15.83	15.73	15.78	15.73	15.71
LTE Band 25	23.03	23.06	23.10	23.06	23.01	11.30	11.30	11.39	11.37	11.34
LTE Band 26	22.71	22.71	22.77	22.68	22.75	15.78	15.75	15.78	15.67	15.80
LTE Band 66 (Main1)	24.11	23.97	24.15	23.97	24.17	12.33	12.40	12.43	12.37	12.39
5G NR n5	23.13	23.11	23.07	23.04	23.06	15.98	15.99	16.10	15.92	16.07
5G NR n26	22.91	23.09	23.02	22.97	22.99	15.89	15.98	15.93	15.91	15.90
5G NR n66	24.18	24.23	24.07	24.24	24.13	13.20	13.20	13.23	13.13	13.15
5G NR n71	24.10	24.16	24.02	24.03	23.99	16.00	15.99	15.94	15.99	15.88

DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	15	16	17	18	19	20	21	22	23	24
GSM850 Voice & GPRS 1Tx	23.31	23.44	23.40	23.38	23.42	32.31	32.27	32.21	32.19	32.11
GSM850 GPRS 2Tx	20.28	20.34	20.41	20.22	20.29	31.06	31.02	31.05	30.97	30.99
GSM850 GPRS 3Tx	18.59	18.51	18.55	18.58	18.65	28.69	28.79	28.72	28.83	28.79
GSM850 GPRS 4Tx	17.42	17.35	17.38	17.30	17.23	26.84	26.80	26.86	26.87	26.87
GSM1900 Voice &GPRS 1Tx	19.43	19.49	19.49	19.36	19.39	29.26	29.30	29.40	29.31	29.40
GSM1900 GPRS 2Tx	16.44	16.48	16.45	16.48	16.39	27.75	27.68	27.66	27.80	27.73
GSM1900 GPRS 3Tx	14.68	14.73	14.65	14.75	14.62	26.27	26.28	26.15	26.17	26.29
GSM1900 GPRS 4Tx	13.40	13.43	13.51	13.51	13.49	24.25	24.12	24.19	24.13	24.30
WCDMA II	11.56	11.69	11.60	11.59	11.59	23.17	23.19	23.09	23.19	23.16
WCDMA IV	13.28	13.14	13.11	13.24	13.22	24.07	23.97	23.97	24.07	23.97
WCDMA V	13.59	13.58	13.59	13.74	13.64	23.79	23.69	23.85	23.73	23.78
LTE Band 2 (Main1)	11.38	11.37	11.26	11.30	11.38	23.12	23.07	23.22	23.15	23.08
LTE Band 4 (Main1)	13.00	12.88	12.88	12.92	13.04	23.95	23.83	23.92	23.91	23.86
LTE Band 5	14.83	14.84	14.70	14.79	14.70	23.83	23.71	23.69	23.84	23.84
LTE Band 12	15.76	15.76	15.74	15.78	15.69	23.82	23.76	23.81	23.67	23.68
LTE Band 13	14.06	13.94	14.10	13.99	13.95	23.97	23.96	24.09	24.05	24.02
LTE Band 17	15.79	15.84	15.86	15.81	15.78	23.78	23.82	23.82	23.92	23.97
LTE Band 25	11.37	11.31	11.26	11.25	11.24	23.18	23.15	23.08	23.10	23.15
LTE Band 26	15.73	15.60	15.73	15.79	15.78	22.74	22.71	22.78	22.69	22.68
LTE Band 66 (Main1)	12.47	12.46	12.36	12.48	12.37	24.06	24.15	24.09	24.09	24.02
5G NR n5	16.11	15.91	15.96	16.06	16.05	23.02	23.09	23.02	23.13	23.13
5G NR n26	15.92	15.97	15.82	15.86	15.85	22.96	22.98	23.07	22.93	23.04
5G NR n66	13.23	13.05	13.24	13.22	13.17	24.08	24.16	24.11	24.23	24.15
5G NR n71	16.07	15.98	15.97	15.88	15.90	24.11	24.12	24.01	24.13	24.08

Proximity Sensor Triggering Distance Measurement Results – Top (Main2 Ant)

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	17	16	15	14	13	12	11	10	9	8
LTE Band 41	23.54	23.56	23.66	23.66	23.62	13.85	14.00	13.98	13.92	13.80
5G NR n41	23.58	23.56	23.66	23.73	23.74	15.87	15.92	15.82	15.89	15.81
5G NR n77(PC2)	25.03	25.05	25.05	25.12	25.08	15.72	15.76	15.66	15.74	15.72
5G NR n77(PC3)	23.99	24.14	24.07	23.95	24.11	15.55	15.43	15.45	15.49	15.42
5G NR n78(PC2)	24.33	24.34	24.34	24.45	24.47	15.29	15.29	15.29	15.39	15.31
5G NR n78(PC3)	23.40	23.35	23.24	23.27	23.29	15.24	15.20	15.11	15.19	15.31

DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	8	9	10	11	12	13	14	15	16	17
LTE Band 41	13.83	13.95	13.99	13.94	13.90	23.63	23.61	23.52	23.64	23.60
5G NR n41	15.96	15.97	15.81	15.80	15.97	23.63	23.71	23.62	23.67	23.75
5G NR n77(PC2)	15.85	15.80	15.79	15.83	15.86	25.08	25.01	25.03	25.03	24.99
5G NR n77(PC3)	15.42	15.52	15.62	15.42	15.52	24.05	24.15	23.98	24.09	23.99
5G NR n78(PC2)	15.31	15.37	15.26	15.39	15.44	24.33	24.49	24.43	24.45	24.35
5G NR n78(PC3)	15.18	15.30	15.29	15.14	15.15	23.24	23.29	23.35	23.41	23.44

Proximity Sensor Triggering Distance Measurement Results – Top (WIFI Ant.1)

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	21	20	19	18	17	16	15	14	13	12
2.4 GHz 802.11b	19.19	19.28	19.25	19.19	19.28	10.89	10.91	10.86	10.85	10.75
2.4 GHz 802.11g	15.11	15.01	15.03	14.98	15.09	10.83	10.89	10.88	10.89	10.98
2.4 GHz 802.11n	14.71	14.78	14.78	14.71	14.72	11.13	11.09	11.06	10.98	10.97
2.4 GHz 802.11ac	15.12	15.10	15.17	15.04	15.10	10.96	10.79	10.78	10.81	10.93
2.4 GHz 802.11ax SU	14.82	14.71	14.72	14.87	14.84	10.66	10.64	10.57	10.53	10.60
5 GHz 802.11a	16.90	16.79	16.87	16.93	16.91	7.24	7.24	7.06	7.09	7.08
5 GHz 802.11n 20MHz	16.31	16.17	16.27	16.32	16.28	6.67	6.59	6.79	6.71	6.62
5 GHz 802.11n 40MHz	16.09	15.98	15.98	16.02	15.95	6.69	6.72	6.72	6.62	6.77
5 GHz 802.11ac 20MHz	15.67	15.50	15.53	15.56	15.54	7.54	7.38	7.48	7.45	7.48
5 GHz 802.11ac 40MHz	15.51	15.36	15.52	15.41	15.45	6.82	6.72	6.86	6.85	6.80
5 GHz 802.11ac 80MHz	15.25	15.31	15.28	15.25	15.39	7.36	7.51	7.48	7.43	7.41
5 GHz 802.11ac 160MHz	14.54	14.59	14.45	14.47	14.44	7.48	7.33	7.43	7.42	7.42
5 GHz 802.11ax SU(20M)	15.94	15.97	16.01	16.02	16.03	7.36	7.28	7.41	7.29	7.32
5 GHz 802.11ax SU(40M)	16.22	16.23	16.22	16.11	16.07	6.89	6.92	6.82	6.86	6.97
5 GHz 802.11ax SU(80M)	14.84	14.94	15.00	14.96	14.99	7.22	7.33	7.20	7.34	7.21
5 GHz 802.11ax SU(160M)	13.95	13.87	13.78	13.87	13.85	7.01	6.82	6.97	6.97	6.97
Bluetooth(DH5)	19.07	18.93	19.00	18.87	18.99	10.35	10.31	10.32	10.27	10.36

DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	12	13	14	15	16	17	18	19	20	21
2.4 GHz 802.11b	10.83	10.92	10.75	10.82	10.79	19.21	19.37	19.28	19.17	19.21
2.4 GHz 802.11g	10.82	10.86	10.87	10.89	10.93	15.07	15.10	15.05	15.11	14.96
2.4 GHz 802.11n	10.98	11.06	11.08	11.05	10.95	14.72	14.61	14.76	14.78	14.68
2.4 GHz 802.11ac	10.89	10.85	10.80	10.83	10.94	15.14	15.06	15.11	15.06	15.08
2.4 GHz 802.11ax SU	10.63	10.56	10.66	10.69	10.65	14.74	14.79	14.88	14.70	14.84
5 GHz 802.11a	7.17	7.08	7.21	7.19	7.13	16.89	16.92	16.77	16.75	16.92
5 GHz 802.11n 20MHz	6.62	6.68	6.73	6.77	6.74	16.35	16.28	16.33	16.31	16.25
5 GHz 802.11n 40MHz	6.62	6.76	6.72	6.79	6.73	16.07	16.03	16.12	16.03	15.93
5 GHz 802.11ac 20MHz	7.39	7.51	7.49	7.49	7.42	15.64	15.50	15.60	15.49	15.62
5 GHz 802.11ac 40MHz	6.71	6.78	6.80	6.77	6.79	15.34	15.41	15.34	15.48	15.42
5 GHz 802.11ac 80MHz	7.53	7.49	7.45	7.54	7.54	15.36	15.31	15.31	15.21	15.36
5 GHz 802.11ac 160MHz	7.34	7.51	7.47	7.38	7.42	14.52	14.57	14.47	14.50	14.42
5 GHz 802.11ax SU(20M)	7.33	7.27	7.33	7.38	7.43	15.89	16.09	15.97	15.94	16.07
5 GHz 802.11ax SU(40M)	6.97	6.87	6.93	6.91	6.82	16.09	16.22	16.22	16.25	16.06
5 GHz 802.11ax SU(80M)	7.19	7.30	7.23	7.29	7.15	15.03	14.96	14.98	14.99	15.03
5 GHz 802.11ax SU(160M)	6.98	6.84	6.89	6.86	6.95	13.95	13.86	13.87	13.95	13.88
Bluetooth(DH5)	10.43	10.39	10.36	10.31	10.45	19.03	18.88	18.93	18.95	18.97

D.1.3 Bottom

Resulting test positions for SAR mearsurementes

Tissue simulating liquid	Band	Trigger distance – Bottom		
		Moving toward phantom	Moving from phantom	Worst case distance for SAR
1750 Head	LTE Band 4 (Sub1)	19 mm	19 mm	18 mm
	LTE Band 66 (Sub1)			
1900 Head	LTE Band 2 (Sub1)	19 mm	19 mm	18 mm
2450 Head	WLAN Ant. 2	15 mm	15 mm	14 mm
	Bluetooth Ant. 2			
5000 Head	WLAN Ant. 2	15 mm	15 mm	14 mm

Proximity Sensor Triggering Distance Measurement Results – Bottom (Sub1 Ant)

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	24	23	22	21	20	19	18	17	16	15
LTE Band 2 (Sub1)	22.38	22.41	22.39	22.29	22.42	13.14	13.19	13.20	13.20	13.15
LTE Band 4 (Sub1)	22.39	22.35	22.40	22.29	22.26	13.74	13.87	13.88	13.87	13.83
LTE Band 66 (Sub1)	22.49	22.62	22.51	22.63	22.56	13.27	13.40	13.32	13.31	13.38

DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	15	16	17	18	19	20	21	22	23	24
LTE Band 2 (Sub1)	13.25	13.20	13.11	13.06	13.08	22.43	22.32	22.35	22.28	22.40
LTE Band 4 (Sub1)	13.75	13.74	13.84	13.88	13.80	22.32	22.28	22.32	22.29	22.26
LTE Band 66 (Sub1)	13.20	13.32	13.23	13.29	13.40	22.57	22.58	22.61	22.62	22.61

Proximity Sensor Triggering Distance Measurement Results – Bottom (WIFI Ant.2)

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	20	19	18	17	16	15	14	13	12	11
2.4 GHz 802.11b	18.58	18.55	18.50	18.63	18.67	11.51	11.45	11.42	11.39	11.48
2.4 GHz 802.11g	15.31	15.39	15.45	15.37	15.41	10.64	10.48	10.63	10.45	10.58
2.4 GHz 802.11n	14.73	14.72	14.71	14.78	14.78	11.28	11.12	11.26	11.18	11.22
2.4 GHz 802.11ac	15.23	15.27	15.18	15.30	15.20	11.49	11.38	11.54	11.37	11.48
2.4 GHz 802.11ax SU	15.27	15.16	15.23	15.16	15.12	10.93	10.85	10.78	10.76	10.80
5 GHz 802.11a	17.04	17.24	17.16	17.21	17.20	7.41	7.39	7.33	7.42	7.32
5 GHz 802.11n 20MHz	15.70	15.70	15.78	15.78	15.78	6.92	6.94	6.89	6.93	6.93
5 GHz 802.11n 40MHz	15.93	15.85	15.81	15.82	15.84	7.06	6.98	6.92	7.04	7.05
5 GHz 802.11ac 20MHz	15.85	15.89	15.92	15.81	15.88	6.80	6.81	6.76	6.85	6.93
5 GHz 802.11ac 40MHz	14.83	14.94	14.86	14.95	15.00	7.33	7.27	7.39	7.30	7.29
5 GHz 802.11ac 80MHz	14.77	14.88	14.72	14.80	14.82	7.00	6.96	6.96	6.99	7.11
5 GHz 802.11ac 160MHz	13.92	14.07	13.91	13.92	14.09	7.17	7.20	7.29	7.13	7.27
5 GHz 802.11ax SU(20M)	16.30	16.27	16.38	16.39	16.40	6.61	6.71	6.61	6.51	6.56
5 GHz 802.11ax SU(40M)	15.97	15.92	15.80	15.98	15.97	6.99	6.82	6.99	6.99	6.92
5 GHz 802.11ax SU(80M)	14.70	14.62	14.72	14.64	14.68	7.25	7.15	7.14	7.19	7.12
5 GHz 802.11ax SU(160M)	14.36	14.37	14.38	14.37	14.29	6.77	6.85	6.68	6.81	6.68
Bluetooth(DH5)	17.76	17.85	17.86	17.85	17.76	10.31	10.41	10.37	10.23	10.38

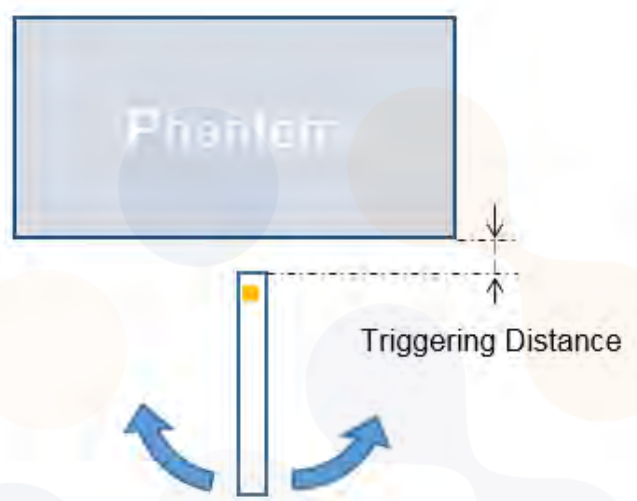
DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	11	12	13	14	15	16	17	18	19	20
2.4 GHz 802.11b	11.36	11.33	11.37	11.52	11.52	18.62	18.58	18.68	18.59	18.68
2.4 GHz 802.11g	10.49	10.46	10.50	10.48	10.49	15.40	15.43	15.25	15.28	15.25
2.4 GHz 802.11n	11.16	11.27	11.27	11.21	11.22	14.67	14.79	14.69	14.74	14.73
2.4 GHz 802.11ac	11.39	11.42	11.55	11.42	11.37	15.29	15.28	15.29	15.31	15.15
2.4 GHz 802.11ax SU	10.93	10.87	10.90	10.88	10.85	15.26	15.28	15.10	15.21	15.29
5 GHz 802.11a	7.40	7.35	7.40	7.41	7.26	17.21	17.16	17.12	17.22	17.12
5 GHz 802.11n 20MHz	6.90	6.99	6.87	6.95	7.01	15.71	15.72	15.70	15.62	15.65
5 GHz 802.11n 40MHz	6.95	6.99	7.06	7.05	7.08	16.00	15.92	15.81	15.82	15.82
5 GHz 802.11ac 20MHz	6.94	6.87	6.90	6.76	6.79	15.79	15.77	15.81	15.88	15.86
5 GHz 802.11ac 40MHz	7.32	7.35	7.27	7.34	7.29	14.98	14.91	14.89	14.93	14.87
5 GHz 802.11ac 80MHz	7.07	7.09	7.13	7.09	7.14	14.69	14.76	14.81	14.87	14.85
5 GHz 802.11ac 160MHz	7.13	7.17	7.13	7.24	7.27	14.09	13.92	14.01	13.94	13.90
5 GHz 802.11ax SU(20M)	6.64	6.63	6.67	6.68	6.67	16.24	16.30	16.34	16.34	16.29
5 GHz 802.11ax SU(40M)	6.97	6.91	6.93	6.83	6.98	15.99	15.94	15.99	15.81	15.96
5 GHz 802.11ax SU(80M)	7.16	7.19	7.19	7.14	7.16	14.71	14.59	14.69	14.61	14.76
5 GHz 802.11ax SU(160M)	6.68	6.71	6.81	6.71	6.71	14.26	14.30	14.35	14.37	14.38
Bluetooth(DH5)	10.31	10.31	10.34	10.33	10.33	17.69	17.71	17.72	17.68	17.76

D.2 Proximity Sensor Tilt Angle Assessment

Proximity Sensor Tilt Angle Assessment (KDB 616217 §6.4)
The DUT was positioned directly below the flat phantom at the minimum measured trigger distance with Bottom parallel to the base of the flat phantom for each band.

The EUT was rotated about Bottom for angles up to +/- 45°. If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated.
This procedure was repeated until the power remained reduced for all angles up to +/- 45°.



Proximity sensor tilt angle assessment KDB 616217 §6.4

Summary of Tilt Angle Influence to Proximity Sensor Triggering (Top)

Band [MHz]	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
750	19 mm	19 mm	On	On	On	On	On	On	On	On	On	On	On
850	19 mm	19 mm	On	On	On	On	On	On	On	On	On	On	On
1750	19 mm	19 mm	On	On	On	On	On	On	On	On	On	On	On
1900	19 mm	19 mm	On	On	On	On	On	On	On	On	On	On	On
2600	12 mm	12 mm	On	On	On	On	On	On	On	On	On	On	On
3700	12 mm	12 mm	On	On	On	On	On	On	On	On	On	On	On
2450(Ant.1)	16 mm	16 mm	On	On	On	On	On	On	On	On	On	On	On
5000(Ant.1)	16 mm	16 mm	On	On	On	On	On	On	On	On	On	On	On

Summary of Tilt Angle Influence to Proximity Sensor Triggering (Bottom)

Band [MHz]	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
1750	19 mm	19 mm	On	On	On	On	On	On	On	On	On	On	On
1900	19 mm	19 mm	On	On	On	On	On	On	On	On	On	On	On
2450(Ant.2)	15 mm	15 mm	On	On	On	On	On	On	On	On	On	On	On
5000(Ant.2)	15 mm	15 mm	On	On	On	On	On	On	On	On	On	On	On