Appendix A.3 Dipole Calibration certificate (D750V3_1217)

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

S C S Schweizerischer Kalibrierdienst
Service suisse d'étalonnage
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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 NTREE (Dymstec) Certificate No: D750V3-1217_May22

CALIBRATION CERTIFICATE

Object D750V3 - SN:1217

Calibration procedure(s) QA CAL-05.v11
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: May 03, 2022

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 NRP	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	Apr-23
Type-N mismatch combination	SN: 310982 / 06327	04-Apr-22 (No. 217-03528)	Apr-23
Reference Probe EX3DV4	SN: 7543	31-Dec-21 (No. EX3-7543_Dec21)	Dec-22
DAE4	SN: 601	02-May-22 (No. DAE4-601_May22)	May-23

Secondary Standards	ID #	Check Date (In house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: May 11, 2022

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Certificate No: D750V3-1217_May22 Page 1 of 6

Calibration Laboratory of
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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	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.4 ± 6 %	0.89 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	250 mW input power	2.16 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.62 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.67 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.9 Ω - 3.0 jΩ
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.038 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: 03.05.2022

Test Laboratory: SPEAG, Zurich, Switzerland

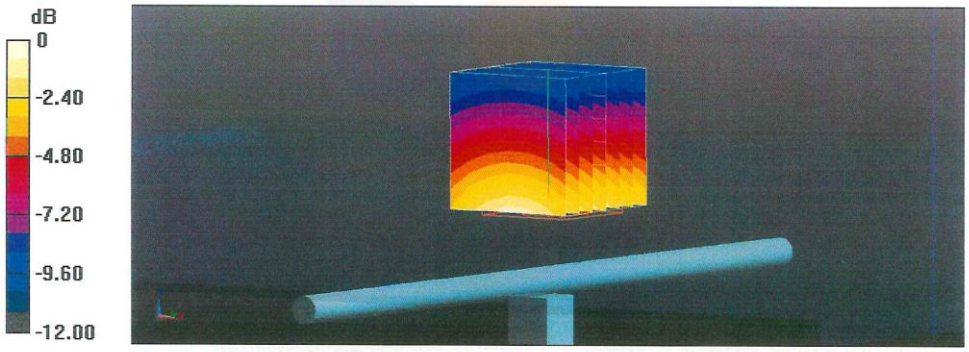
DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1217

Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.89 S/m; ε_r = 41.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

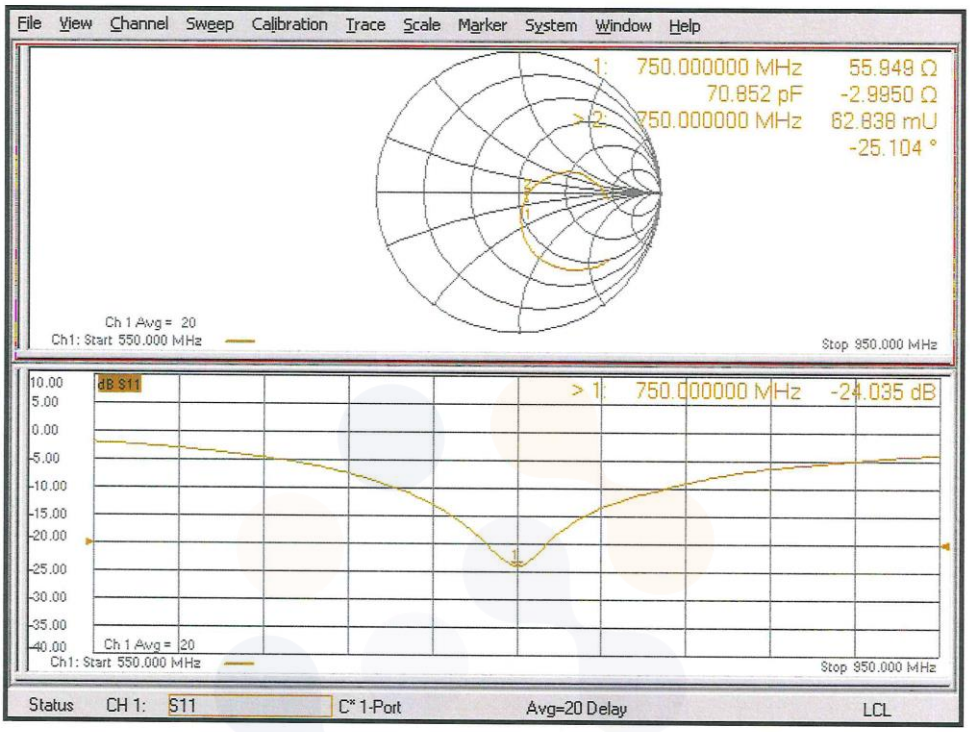
- Probe: EX3DV4 - SN7349; ConvF(10.11, 10.11, 10.11) @ 750 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.08 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 3.23 W/kg
SAR(1 g) = 2.16 W/kg; SAR(10 g) = 1.42 W/kg
Smallest distance from peaks to all points 3 dB below = 19.2 mm
Ratio of SAR at M2 to SAR at M1 = 66.6%
Maximum value of SAR (measured) = 2.86 W/kg



0 dB = 2.86 W/kg = 4.56 dBW/kg

Impedance Measurement Plot for Head TSL



Appendix A.4 Dipole Calibration certificate (D850V2_1006)

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

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Accreditation No.: SCS 0108

Client KCTL (Dymstec) Certificate No: D850V2-1006_Apr22

CALIBRATION CERTIFICATE

Object	D850V2 - SN:1006
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	April 26, 2022

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 NRP	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	Apr-23
Type-N mismatch combination	SN: 310982 / 06327	04-Apr-22 (No. 217-03526)	Apr-23
Reference Probe EX3DV4	SN: 7349	31-Dec-21 (No. EX3-7349_Dec21)	Dec-22
DAE4	SN: 601	01-Nov-21 (No. DAE4-601_Nov21)	Nov-22

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512474	30-Oct-14 (in house check Oct 20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	
Approved by:	Sven Kühn	Deputy Manager	

Issued: April 28, 2022

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Certificate No: D850V2-1006_Apr22 Page 1 of 6

Calibration Laboratory of
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Accredited by the Swiss Accreditation Service (SAS)
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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	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	850 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.92 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.1 ± 6 %	0.92 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	250 mW input power	2.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**10.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.64 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.54 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.2 Ω - 4.6 jΩ
Return Loss	- 26.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.434 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: 26.04.2022

Test Laboratory: SPEAG, Zurich, Switzerland

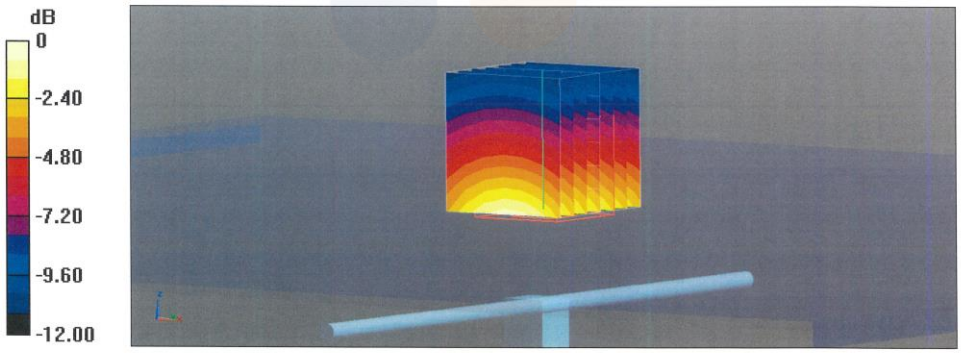
DUT: Dipole 850 MHz; Type: D850V2; Serial: D850V2 - SN:1006

Communication System: UID 0 - CW; Frequency: 850 MHz
Medium parameters used: f = 850 MHz; σ = 0.92 S/m; ε_r = 41.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

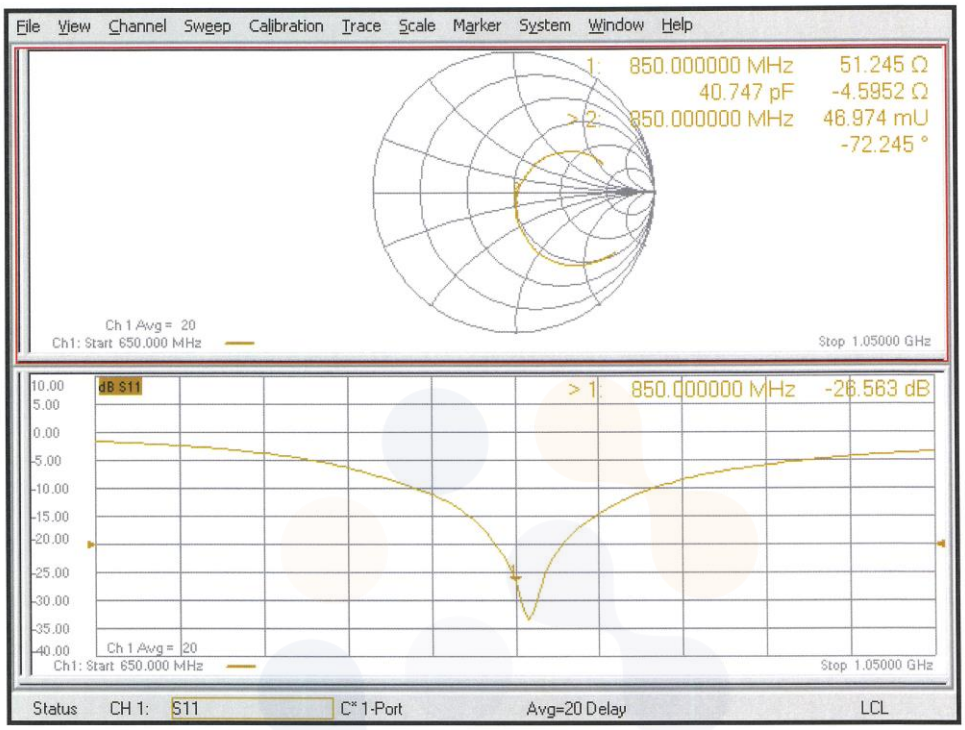
- Probe: EX3DV4 - SN7349; ConvF(9.63, 9.63, 9.63) @ 850 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 01.11.2021
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 64.62 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.83 W/kg
SAR(1 g) = 2.53 W/kg; SAR(10 g) = 1.64 W/kg
Smallest distance from peaks to all points 3 dB below = 16.5 mm
Ratio of SAR at M2 to SAR at M1 = 65.7%
Maximum value of SAR (measured) = 3.40 W/kg



0 dB = 3.40 W/kg = 5.32 dBW/kg

Impedance Measurement Plot for Head TSL



Appendix A.5 Dipole Calibration certificate (D1750V2_1072)

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

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Accreditation No.: **SCS 0108**

Client **KCTL (Dymstec)** Certificate No: **D1750V2-1072_Apr22**

CALIBRATION CERTIFICATE

Object	D1750V2 - SN:1072
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	April 27, 2022

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 NRP	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	Apr-23
Type-N mismatch combination	SN: 310982 / 06327	04-Apr-22 (No. 217-03528)	Apr-23
Reference Probe EX3DV4	SN: 7349	31-Dec-21 (No. EX3-7349_Dec21)	Dec-22
DAE4	SN: 601	01-Nov-21 (No. DAE4-601_Nov21)	Nov-22

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Joanna Lleshaj	Laboratory Technician	
Approved by:	Sven Kühn	Deputy Manager	

Issued: April 28, 2022

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Certificate No: D1750V2-1072_Apr22 Page 1 of 6

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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	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

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	39.4 ± 6 %	1.35 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	250 mW input power	9.08 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.80 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.3 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.6 Ω - 1.3 jΩ
Return Loss	- 36.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.216 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: 27.04.2022

Test Laboratory: SPEAG, Zurich, Switzerland

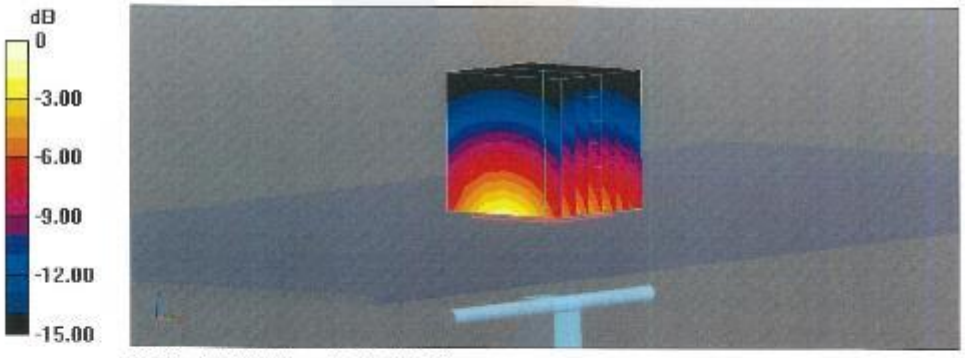
DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1072

Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.35 S/m; ε_r = 39.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

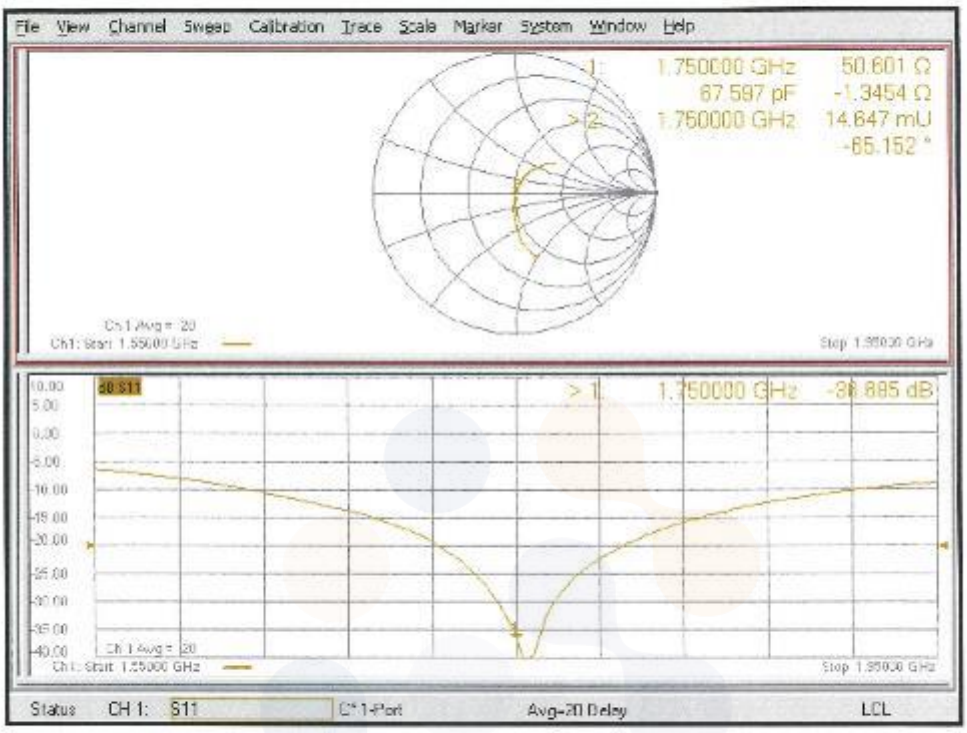
- Probe: EX3DV4 - SN7349; ConvF(8.67, 8.67, 8.67) @ 1750 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 01.11.2021
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.4 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 9.08 W/kg; SAR(10 g) = 4.80 W/kg
Smallest distance from peaks to all points 3 dB below = 10 mm
Ratio of SAR at M2 to SAR at M1 = 54.3%
Maximum value of SAR (measured) = 14.1 W/kg



0 dB = 14.1 W/kg = 11.49 dBW/kg

Impedance Measurement Plot for Head TSL



Appendix A.6 Dipole Calibration certificate (D1900V2_5d160)

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: KCTL (Dymstec)

Certificate No: D1900V2-5d160_Apr22

CALIBRATION CERTIFICATE

Object: D1900V2 - SN:5d160

Calibration procedure(s): QA CAL-05.v11
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: April 29, 2022

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 NRP	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	Apr-23
Type-N mismatch combination	SN: 310982 / 06327	04-Apr-22 (No. 217-03526)	Apr-23
Reference Probe EX3DV4	SN: 7349	31-Dec-21 (No. EX3-7349_Dec21)	Dec-22
DAE4	SN: 601	01-Nov-21 (No. DAE4-601_Nov21)	Nov-22

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39511475	30-Oct-14 (in house check Oct 20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Jeffrey Katzman	Laboratory Technician	
Approved by:	Sven Kühn	Deputy Manager	

Issued: May 4, 2022

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Certificate No: D1900V2-5d160_Apr22 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	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

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	39.1 ± 6 %	1.41 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	250 mW input power	10.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW 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

Impedance, transformed to feed point	52.1 Ω + 6.3 jΩ
Return Loss	- 23.6 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

DASY5 Validation Report for Head TSL

Date: 29.04.2022

Test Laboratory: SPEAG, Zurich, Switzerland

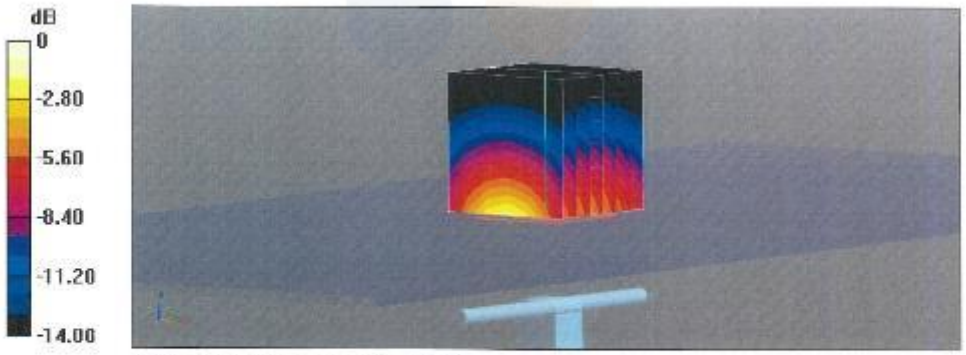
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d160

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.41 S/m; ε_r = 39.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

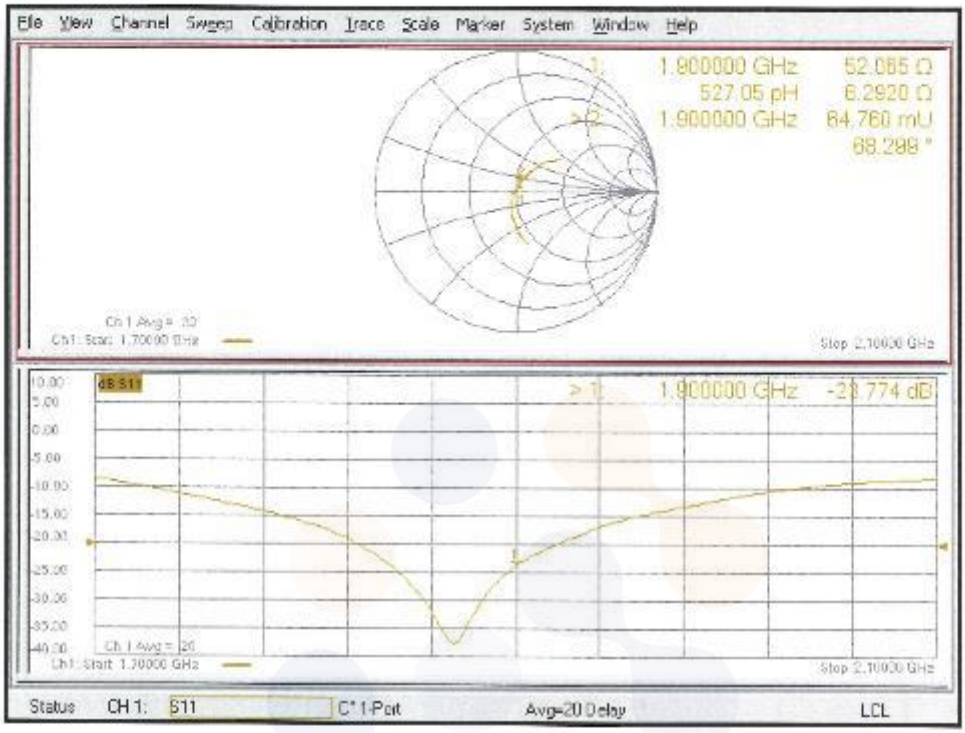
- Probe: EX3DV4 - SN7349; ConvF(8.43, 8.43, 8.43) @ 1900 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 01.11.2021
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 110.1 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 10.0 W/kg; SAR(10 g) = 5.22 W/kg
Smallest distance from peaks to all points 3 dB below = 10 mm
Ratio of SAR at M2 to SAR at M1 = 54.3%
Maximum value of SAR (measured) = 15.6 W/kg



0 dB = 15.6 W/kg = 11.93 dBW/kg

Impedance Measurement Plot for Head TSL



Appendix A.7 Dipole Calibration certificate (D2450V2_895)

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 (Dymstec) Certificate No: D2450V2-895_Jul22

CALIBRATION CERTIFICATE

Object: D2450V2 - SN:895

Calibration procedure(s): QA CAL-05.v11
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: July 15, 2022

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 NRP	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	Apr-23
Type-N mismatch combination	SN: 310982 / 06327	04-Apr-22 (No. 217-03526)	Apr-23
Reference Probe EX3DV4	SN: 7349	31-Dec-21 (No. EX3-7349_Dec21)	Dec-22
DAE4	SN: 601	02-May-22 (No. DAE4-601_May22)	May-23

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Aidonia Georgiadou	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: July 25, 2022

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Certificate No: D2450V2-895_Jul22 Page 1 of 6

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	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

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	37.9 ± 6 %	1.85 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	250 mW input power	13.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.22 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.2 Ω + 3.5 jΩ
Return Loss	- 24.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.156 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: 15.07.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:895

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.85 S/m; ε_r = 37.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

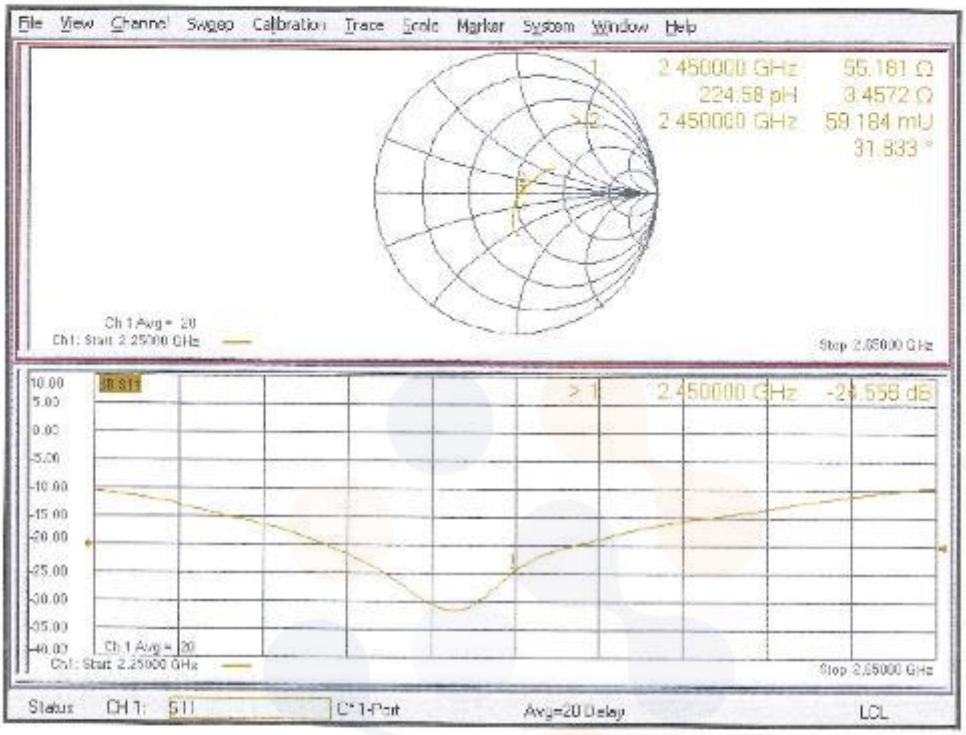
DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.96, 7.96, 7.96) @ 2450 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022
- 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=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 114.7 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 26.5 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.22 W/kg
Smallest distance from peaks to all points 3 dB below = 9 mm
Ratio of SAR at M2 to SAR at M1 = 50.7%
Maximum value of SAR (measured) = 21.9 W/kg

0 dB = 21.9 W/kg = 13.41 dBW/kg

Impedance Measurement Plot for Head TSL



Appendix A.8 Dipole Calibration certificate (D2600V2_1050)

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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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 (Dymstec) Certificate No: D2600V2-1050_Jul22

CALIBRATION CERTIFICATE

Object: D2600V2 - SN:1050

Calibration procedure(s): QA CAL-05.v11
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: July 15, 2022

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&T is critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	Apr-23
Type-N mismatch combination	SN: 310982 / 06327	04-Apr-22 (No. 217-03528)	Apr-23
Reference Probe EX3DV4	SN: 7349	31-Dec-21 (No. EX3-7349_Dec21)	Dec-22
DAE4	SN: 601	02-May-22 (No. DAE4-601_May22)	May-23

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct 20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Alexandra Georgiadou	Laboratory Technician	
Approved by:	Sven Kühn	Deputy Manager	

Issued: July 26, 2022

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Certificate No: D2600V2-1050_Jul22 Page 1 of 6

Calibration Laboratory of
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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	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

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	37.3 ± 6 %	2.01 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	250 mW input power	14.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**56.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.4 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.8 Ω - 7.0 jΩ
Return Loss	- 23.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.151 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: 15.07.2022

Test Laboratory: SPEAG, Zurich, Switzerland

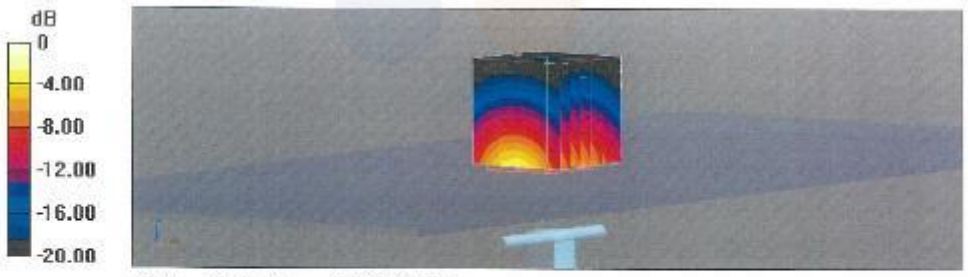
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1050

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.01 S/m; ε_r = 37.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

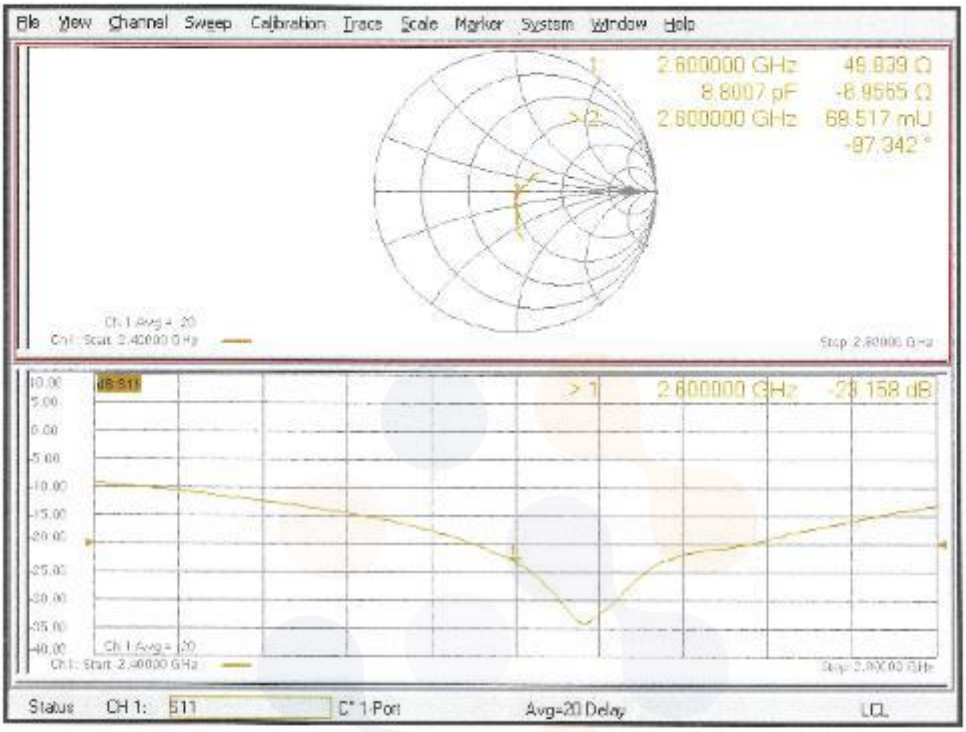
- Probe: EX3DV4 - SN7349; ConvF(7.84, 7.84, 7.84) @ 2600 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 117.4 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 28.9 W/kg
SAR(1 g) = 14.5 W/kg; SAR(10 g) = 6.45 W/kg
Smallest distance from peaks to all points 3 dB below = 8.5 mm
Ratio of SAR at M2 to SAR at M1 = 50.3%
Maximum value of SAR (measured) = 23.9 W/kg



0 dB = 23.9 W/kg = 13.78 dBW/kg

Impedance Measurement Plot for Head TSL



Appendix A.9 Dipole Calibration certificate (D5GHzV2_1134)

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 KCTL (Dymstec) Certificate No: D5GHzV2-1134_Jan22

CALIBRATION CERTIFICATE

Object D5GHzV2 - SN:1134

Calibration procedure(s) QA CAL-22.v6
Calibration Procedure for SAR Validation Sources between 3-10 GHz

Calibration date: January 27, 2022

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 NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 3503	31-Dec-21 (No. EX3-3503_Dec21)	Dec-22
DAE4	SN: 601	01-Nov-21 (No. DAE4-601_Nov21)	Nov-22

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Aldonia Georgiadou	Laboratory Technician	
Approved by:	Sven Kühn	Deputy Manager	

Issued: February 2, 2022

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

Certificate No: D5GHzV2-1134_Jan22 Page 1 of 8

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

S Schweizerischer Kalibrierdienst
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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	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	34.9 ± 6 %	4.52 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	8.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.2 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	34.4 ± 6 %	4.87 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	8.52 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.5 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	**23.9 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	34.1 ± 6 %	5.07 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	8.34 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.34 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.1 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	49.8 Ω - 8.8 jΩ
Return Loss	- 21.1 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	54.1 Ω - 2.6 jΩ
Return Loss	- 26.5 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	54.3 Ω - 5.2 jΩ
Return Loss	- 23.8 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: 27.01.2022

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 = 4.52 S/m; εr = 34.9; ρ = 1000 kg/m3 ,
Medium parameters used: f = 5600 MHz; σ = 4.87 S/m; εr = 34.4; ρ = 1000 kg/m3 ,
Medium parameters used: f = 5800 MHz; σ = 5.07 S/m; εr = 34.1; ρ = 1000 kg/m3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

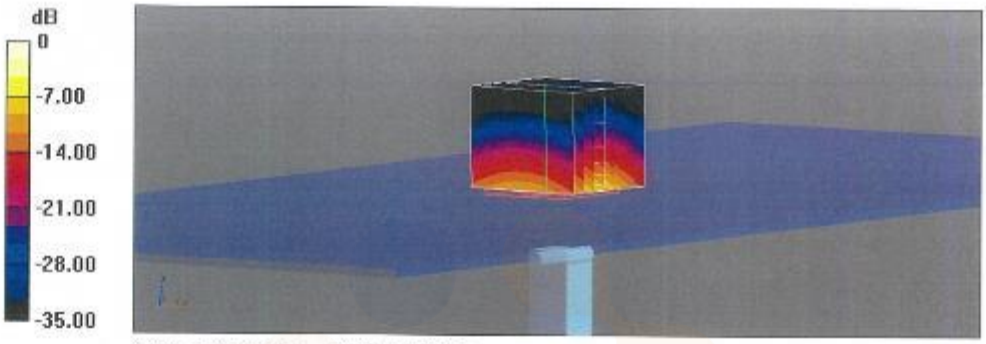
DASY52 Configuration:

- 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: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 01.11.2021
- 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=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 = 78.11 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 27.9 W/kg
SAR(1 g) = 8.20 W/kg; SAR(10 g) = 2.35 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 70.3%
Maximum value of SAR (measured) = 19.2 W/kg

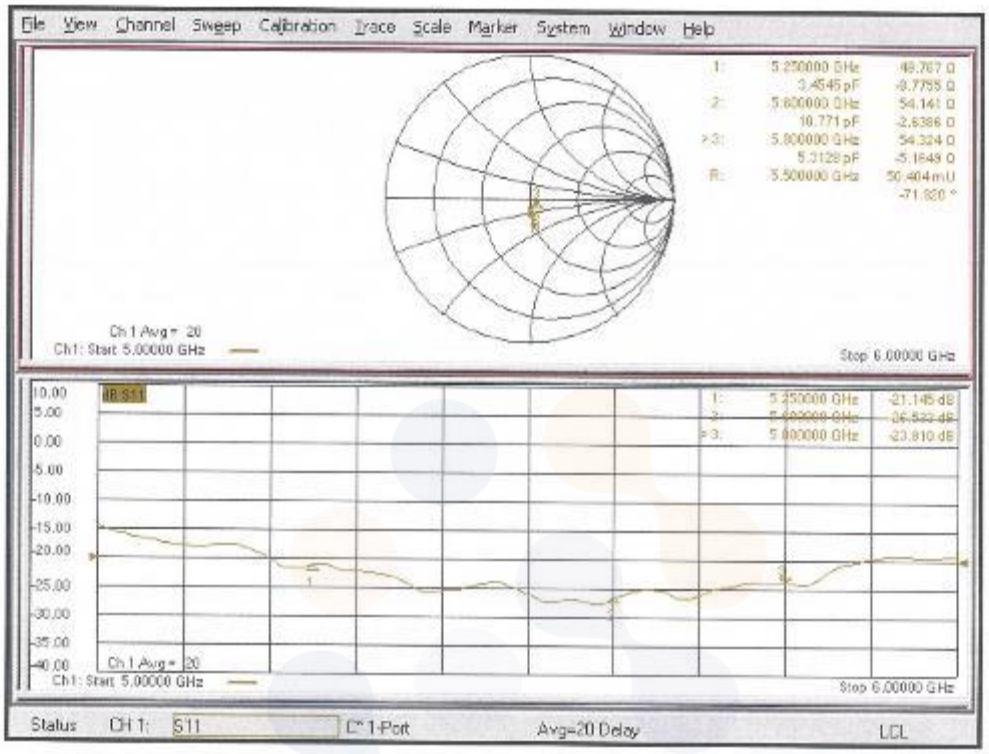
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 78.44 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 31.5 W/kg
SAR(1 g) = 8.52 W/kg; SAR(10 g) = 2.41 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 67.3%
Maximum value of SAR (measured) = 20.8 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 = 76.19 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 33.0 W/kg
SAR(1 g) = 8.34 W/kg; SAR(10 g) = 2.34 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 65.5%
Maximum value of SAR (measured) = 20.9 W/kg



0 dB = 20.9 W/kg = 13.20 dBW/kg

Impedance Measurement Plot for Head TSL



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. Downlink LTE CA RF Conducted Power

C.1 LTE Downlink Carrier Aggregation

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	CA_2A-2A	N/A	No	N/A
2CC #2	CA_2C	N/A	No	N/A
2CC #3	CA_2A-4A	N/A	3CC #1	Yes
2CC #4	CA_2A-5A	N/A	3CC #1	Yes
2CC #5	CA_2A-12A	N/A	No	Yes
2CC #6	CA_2A-13A	N/A	3CC #2	Yes
2CC #7	CA_2A-17A	N/A	No	Yes
2CC #8	CA_2A-66A	N/A	No	Yes
2CC #9	CA_4A-4A	N/A	3CC #3	N/A
2CC #10	CA_4A-5A	N/A	3CC #1	Yes
2CC #11	CA_4A-12A	N/A	3CC #3	Yes
2CC #12	CA_4A-13A	N/A	3CC #2	Yes
2CC #13	CA_4A-17A	N/A	No	Yes
2CC #14	CA_5A-41A	B41 SCC Only	No	N/A
2CC #15	CA_5A-66A	N/A	3CC #4	Yes
2CC #16	CA_12A-66A	N/A	3CC #5	Yes
2CC #17	CA_26A-41A	B41 SCC Only	No	N/A
2CC #18	CA_41A-41A	N/A	No	N/A
2CC #19	CA_41C	N/A	3CC #7	N/A
2CC #20	CA_66A-66A	N/A	3CC #4	N/A
2CC #21	CA_66B	N/A	No	N/A
2CC #22	CA_66C	N/A	No	N/A

Index	3CC	Restriction	Completely Covered by Measurement Superset	Reverse
3CC #1	CA_2A-4A-5A	N/A	No	Yes
3CC #2	CA_2A-4A-13A	N/A	No	Yes
3CC #3	CA_4A-4A-12A	N/A	No	Yes
3CC #4	CA_5A-66A-66A	N/A	No	Yes
3CC #5	CA_12A-66A-66A	N/A	No	Yes
3CC #6	CA_26A-41C	B41 SCC Only	No	N/A
3CC #7	CA_41A-41C	N/A	No	Yes
3CC #8	CA_41D	N/A	4CC #1	N/A

Index	4CC	Restriction	Completely Covered by Measurement Superset	Reverse
4CC #1	CA_41A-41D	N/A	No	Yes
4CC #2	CA_41C-41C	N/A	No	N/A

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.2 Downlink Carrier Aggregation RF Conducted Powers

C.2.1 LTE Band 2 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-2A	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B2	20	1100	1980.0	N/A				23.05	23.10
CA_2C	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B2	20	1098	1979.8	N/A				22.95	23.10
CA_2A-12A	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B12	10	5095	737.5	N/A				22.99	23.10
CA_2A-17A	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B17	10	5790	740.0	N/A				23.01	23.10
CA_2A-66A	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B66	20	66786	2145.0	N/A				23.02	23.10
CA_2A-4A-5A	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B4	20	2175	2132.5	LTE B5	10	2525	881.5	22.98	23.10
CA_2A-4A-13A	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B4	20	2175	2132.5	LTE B13	10	5230	751.0	23.00	23.10

C.2.2 LTE Band 4 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_4A-17A	LTE B4	20	20175	1732.5	QPSK	1	49	2175	2132.5	LTE B17	10	5790	740.0	N/A				23.45	23.52
CA_2A-4A-5A	LTE B4	20	20175	1732.5	QPSK	1	49	2175	2132.5	LTE B2	20	900	1960.0	LTE B5	10	2525	881.5	23.44	23.52
CA_2A-4A-13A	LTE B4	20	20175	1732.5	QPSK	1	49	2175	2132.5	LTE B2	20	900	1960.0	LTE B13	10	5230	751.0	23.40	23.52
CA_4A-4A-12A	LTE B4	20	20050	1720.0	QPSK	1	49	2050	2120.0	LTE B4	20	2300	2145.0	LTE B12	10	5095	737.5	23.41	23.51

C.2.3 LTE Band 5 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_5A-41A	LTE B5	10	20525	836.5	QPSK	1	0	2525	881.5	LTE B41	20	40620	2593.0	N/A				23.30	23.34
CA_2A-4A-5A	LTE B5	10	20525	836.5	QPSK	1	0	2525	881.5	LTE B2	20	900	1960.0	LTE B4	20	2175	2132.5	23.25	23.34
CA_5A-66A-66A	LTE B5	10	20525	836.5	QPSK	1	0	2525	881.5	LTE B66	20	66786	2145.0	LTE B66	20	67036	2170.0	23.29	23.34

C.2.4 LTE Band 12 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-12A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B2	20	900	1960.0	N/A				23.01	23.11
CA_4A-4A-12A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B4	20	2050	2120.0	LTE B4	20	2300	2145.0	23.05	23.11
CA_12A-66A-66A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B66	20	66786	2145.0	LTE B66	20	67036	2170.0	23.08	23.11

C.2.5 LTE Band 13 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-4A-13A	LTE B13	10	23230	782.0	QPSK	1	0	5230	751.0	LTE B2	20	900	1960.0	LTE B4	20	2175	2132.5	23.31	23.45

C.2.6 LTE Band 17 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-17A	LTE B17	10	23790	710.0	QPSK	1	49	5790	740.0	LTE B2	10	900	1960.0	N/A				23.40	23.49
CA_4A-17A	LTE B17	10	23790	710.0	QPSK	1	49	5790	740.0	LTE B4	10	2050	2120.0	N/A				23.41	23.49

C.2.7 LTE Band 26 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_26A-41A	LTE B26	15	26865	831.5	QPSK	1	0	8865	876.5	LTE B41	20	40620	2593.0	N/A				22.40	22.41
CA_26A-41C	LTE B26	15	26865	831.5	QPSK	1	0	8865	876.5	LTE B41	20	40620	2593.0	LTE B41	20	40818	2612.8	22.35	22.41

C.2.8 LTE Band 41 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA-41A-41A	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	41490	2680.0	N/A								22.55	22.68
CA-41A-41C	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	41490	2680.0	LTE B41	20	41292	2660.2	N/A				22.61	22.68
CA-41C-41A	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	39948	2525.8	LTE B41	20	41490	2680.0	N/A				22.59	22.68
CA-41A-41D	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	41490	2680.0	LTE B41	20	41292	2660.2	LTE B41	20	41094	2640.4	22.51	22.68
CA-41D-41A	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	39948	2525.8	LTE B41	20	40146	2545.6	LTE B41	20	41490	2680.0	22.59	22.68
CA-41C-41C	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	39948	2525.8	LTE B41	20	41490	2680.0	LTE B41	20	41292	2660.2	22.55	22.68

C.2.9 LTE Band 66 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-66A	LTE B66	20	132322	1745.0	QPSK	1	49	66786	2145.0	LTE B2	20	900	1960.0	N/A				23.51	23.61
CA_66B	LTE B66	15	132322	1745.0	QPSK	1	36	66786	2145.0	LTE B66	5	66693	2135.7	N/A				23.61	23.75
CA_66C	LTE B66	20	132322	1745.0	QPSK	1	49	66786	2145.0	LTE B66	20	66984	2164.8	N/A				23.55	23.61
CA_5A-66A-66A	LTE B66	20	132322	1745.0	QPSK	1	49	66786	2145.0	LTE B66	20	67036	2170.0	LTE B5	10	2525	881.5	23.50	23.61
CA 12A-66A-66A	LTE B66	20	132322	1745.0	QPSK	1	49	66786	2145.0	LTE B66	20	67036	2170.0	LTE B12	10	5095	737.5	23.54	23.61

C.3 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	CA_5A-[41A]	B41 SCC Only	No	No
2CC #2	CA_26A-[41A]	B41 SCC Only	No	No
2CC #3	CA_[41A]-[41A]	N/A	No	N/A
2CC #4	CA_[41C]	N/A	3CC #2	No

Index	3CC	Restriction	Completely Covered by Measurement Superset	Reverse
3CC #1	CA_26A-[41C]	B41 SCC Only	No	No
3CC #2	CA_[41A]-[41C]	N/A	No	Yes
3CC #3	CA_[41D]	N/A	4CC #1	No

Index	3CC	Restriction	Completely Covered by Measurement Superset	Reverse
4CC #1	CA_[41A]-[41D]	N/A	No	Yes
4CC #2	CA_[41C]-[41C]	N/A	No	Yes

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

C.4 Downlink Carrier Aggregation RF Conducted Powers With 4X4 MIMO

C.4.1 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 (dBm)
41	20	39750	2506.0	QPSK	1	0	22.55	22.68

C.4.2 LTE Band 5 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_5A-[41A]	LTE B5	10	20525	836.5	QPSK	1	0	2525	881.5	LTE B41	20	40620	2593.0	N/A				23.19	23.34

C.4.3 LTE Band 26 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_26A-[41A]	LTE B26	15	26865	831.5	QPSK	1	0	8865	876.5	LTE B41	20	40620	2593.0	N/A				22.33	22.41
CA_26A-[41C]	LTE B26	15	26865	831.5	QPSK	1	0	8865	876.5	LTE B41	20	40620	2593.0	LTE B41	20	40818	2612.8	22.38	22.41

C.4.4 LTE Band 41 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA-[41A]-[41A]	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	41490	2680.0	N/A								22.51	22.68
CA-[41A]-[41C]	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	41490	2680.0	LTE B41	20	41292	2660.2	N/A				22.60	22.68
CA-[41C]-[41A]	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	39948	2525.8	LTE B41	20	41490	2680.0	N/A				22.54	22.68
CA-[41A]-[41D]	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	41490	2680.0	LTE B41	20	41292	2660.2	LTE B41	20	41094	2640.4	22.51	22.68
CA-[41D]-[41A]	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	39948	2525.8	LTE B41	20	40146	2545.6	LTE B41	20	41490	2680.0	22.60	22.68
CA-[41C]-[41C]	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	39948	2525.8	LTE B41	20	41490	2680.0	LTE B41	20	41292	2660.2	22.59	22.68

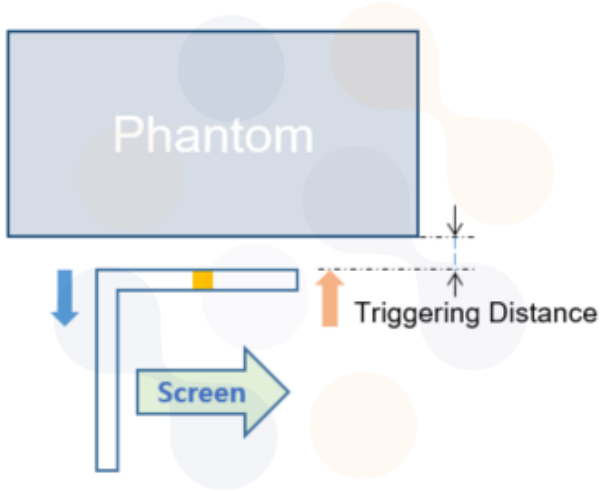
Appendix D. Power Reduction Verification

Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Rear 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

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	18 mm	18 mm	17 mm
	LTE Band 13			
	LTE Band 17			
850 Head	WCDMA V	18 mm	18 mm	17 mm
	LTE Band 5			
	LTE Band 26			
	5G NR n5			

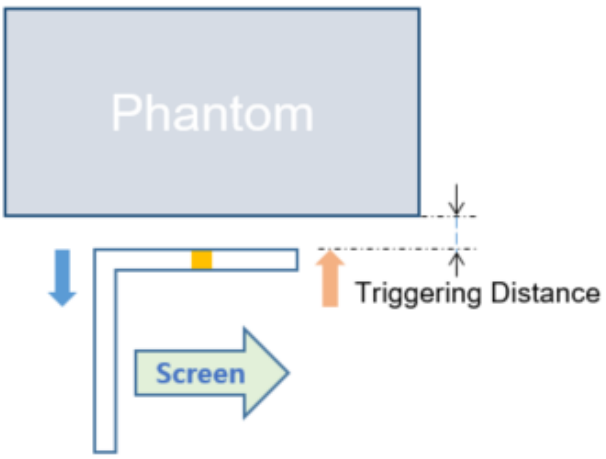
Proximity Sensor Triggering Distance Measurement Results – Rear Side (Main 1)

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	23	22	21	20	19	18	17	16	15	14
WCDMA V	23.70	23.78	23.71	23.72	23.77	19.18	19.15	19.21	19.15	19.24
LTE Band 5	23.36	23.38	23.36	23.36	23.34	19.15	19.21	19.14	19.13	19.22
LTE Band 12	23.03	23.08	23.06	23.14	23.03	18.93	18.87	18.93	18.92	18.93
LTE Band 13	23.40	23.49	23.47	23.43	23.48	19.28	19.29	19.28	19.19	19.22
LTE Band 17	23.54	23.54	23.50	23.46	23.54	19.16	19.27	19.19	19.28	19.28
LTE Band 26	22.39	22.40	22.35	22.43	22.47	19.03	19.01	19.05	18.99	18.96
5G NR n5	24.32	24.36	24.34	24.38	24.33	20.07	20.08	20.08	20.04	20.06

DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	14	15	16	17	18	19	20	21	22	23
WCDMA V	19.22	19.14	19.16	19.15	19.14	23.70	23.68	23.79	23.80	23.78
LTE Band 5	19.17	19.13	19.12	19.12	19.16	23.39	23.37	23.34	23.30	23.38
LTE Band 12	18.94	18.91	18.93	18.93	18.89	23.15	23.06	23.01	23.05	23.04
LTE Band 13	19.28	19.27	19.27	19.19	19.19	23.45	23.43	23.39	23.41	23.45
LTE Band 17	19.20	19.26	19.16	19.27	19.26	23.49	23.46	23.45	23.44	23.44
LTE Band 26	19.02	18.97	19.06	18.96	19.00	22.38	22.39	22.40	22.35	22.43
5G NR n5	20.06	20.13	20.11	20.06	20.03	24.37	24.27	24.39	24.39	24.30



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

Resulting test positions for SAR mearsurementes

Tissue simulating liquid	Band	Trigger distance – Rear		
		Moving toward phantom	Moving from phantom	Worst case distance for SAR
1750 Head	WCDMA IV	14 mm	14 mm	13 mm
	LTE Band 4			
	LTE Band 66			
	5G NR n66			
1900 Head	WCDMA II	14 mm	14 mm	13 mm
	LTE Band 2			
2600 Head	LTE Band 41	14 mm	14 mm	13 mm

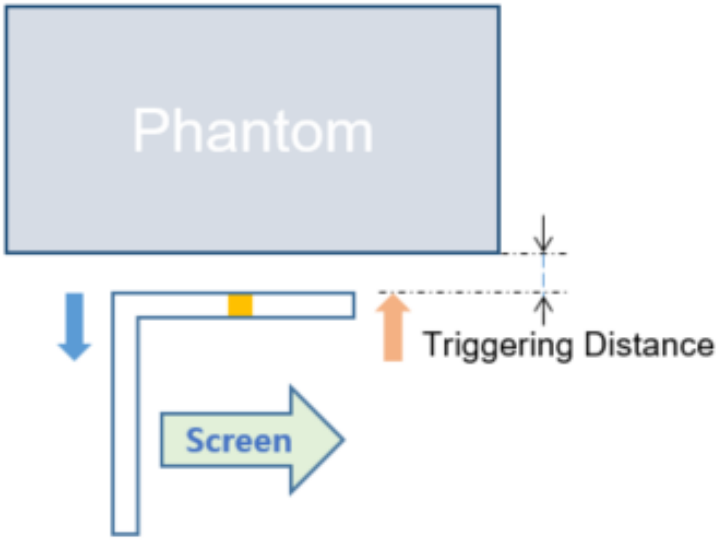
Proximity Sensor Triggering Distance Measurement Results – Rear Side (Main 2)

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	19	18	17	16	15	14	13	12	11	10
WCDMA II	24.06	24.09	24.15	24.12	24.09	15.75	15.76	15.85	15.73	15.78
WCDMA IV	24.39	24.45	24.44	24.43	24.46	15.69	15.77	15.73	15.78	15.72
LTE Band 2	23.15	23.14	23.09	23.04	23.14	15.79	15.76	15.86	15.85	15.82
LTE Band 4	23.53	23.54	23.47	23.53	23.49	15.80	15.88	15.81	15.85	15.88
LTE Band 41	22.68	22.74	22.69	22.63	22.69	16.43	16.46	16.46	16.41	16.44
LTE Band 66	23.62	23.65	23.65	23.64	23.56	15.95	15.96	15.90	15.91	15.96
5G NR n66	24.07	24.04	24.11	24.06	24.12	15.99	16.09	16.08	16.03	16.10

DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	10	11	12	13	14	15	16	17	18	19
WCDMA II	15.74	15.74	15.79	15.76	15.77	24.14	24.13	24.03	24.14	24.13
WCDMA IV	15.74	15.76	15.74	15.81	15.74	24.39	24.40	24.38	24.37	24.39
LTE Band 2	15.79	15.85	15.84	15.88	15.87	23.14	23.07	23.09	23.12	23.11
LTE Band 4	15.82	15.91	15.91	15.81	15.91	23.51	23.54	23.53	23.52	23.47
LTE Band 41	16.46	16.42	16.45	16.37	16.48	22.69	22.73	22.70	22.73	22.70
LTE Band 66	15.90	15.89	15.89	15.94	15.90	23.64	23.67	23.62	23.62	23.65
5G NR n66	16.11	16.01	16.05	16.03	16.00	24.06	24.11	24.06	24.11	24.10



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

Resulting test positions for SAR mearsurementes

Tissue simulating liquid	Band	Trigger distance – Rear		
		Moving toward phantom	Moving from phantom	Worst case distance for SAR
1750 Head	LTE Band 66	18 mm	18 mm	17 mm
1900 Head	LTE Band 2	18 mm	18 mm	17 mm

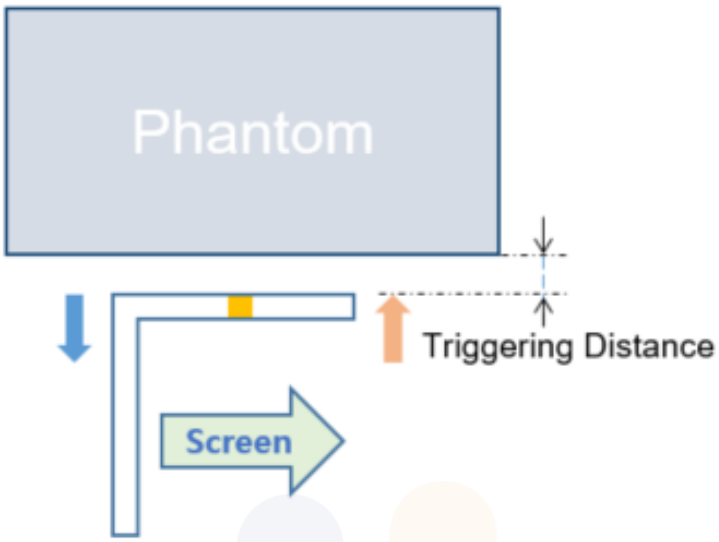
Proximity Sensor Triggering Distance Measurement Results – Rear Side (Sub 1)

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	23	22	21	20	19	18	17	16	15	14
LTE Band 2	23.63	23.68	23.60	23.65	23.70	16.87	16.78	16.79	16.83	16.87
LTE Band 66	24.04	23.99	24.00	24.05	24.06	17.04	17.07	17.02	17.00	17.08

DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	14	15	16	17	18	19	20	21	22	23
LTE Band 2	16.90	16.90	16.90	16.90	16.85	23.71	23.69	23.66	23.59	23.68
LTE Band 66	17.02	17.09	17.09	17.09	17.04	24.08	24.00	23.99	24.02	24.07



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

Resulting test positions for SAR mearsurementes

Tissue simulating liquid	Band	Trigger distance – Rear		
		Moving toward phantom	Moving from phantom	Worst case distance for SAR
2450 Head	WIFI 1	10 mm	10 mm	9 mm
5000 Head		10 mm	10 mm	9 mm
6500 Head		10 mm	10 mm	9 mm

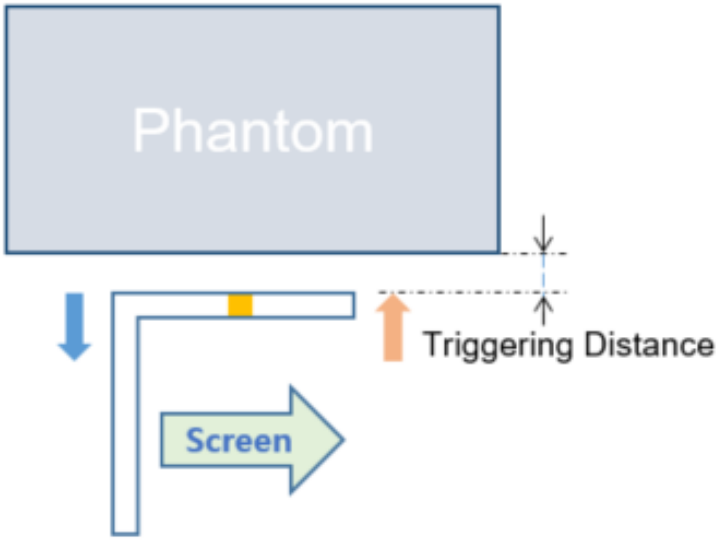
Proximity Sensor Triggering Distance Measurement Results – Rear Side (WIFI 1)

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	15	14	13	12	11	10	9	8	7	6
2.4 GHz 802.11b	17.94	17.84	17.92	17.86	17.84	12.69	12.66	12.61	12.66	12.61
2.4 GHz 802.11g	15.99	16.04	15.97	16.03	15.97	12.84	12.80	12.79	12.80	12.86
2.4 GHz 802.11n 20MHz	15.68	15.69	15.67	15.74	15.68	12.52	12.44	12.41	12.52	12.46
2.4 GHz 802.11ac 20MHz	13.15	13.13	13.22	13.19	13.12	11.50	11.44	11.49	11.44	11.40
5 GHz 802.11a 20MHz	13.91	13.85	13.85	13.87	13.89	8.57	8.67	8.68	8.68	8.67
5 GHz 802.11n 20MHz	13.83	13.72	13.82	13.82	13.76	8.39	8.48	8.37	8.43	8.38
5 GHz 802.11n 40MHz	13.64	13.69	13.65	13.63	13.63	7.53	7.58	7.51	7.54	7.60
5 GHz 802.11ac 20MHz	13.86	13.86	13.83	13.87	13.84	8.43	8.43	8.39	8.44	8.46
5 GHz 802.11ac 40MHz	13.81	13.79	13.80	13.77	13.74	7.53	7.55	7.47	7.53	7.49
5 GHz 802.11ac 80MHz	13.70	13.65	13.63	13.74	13.65	7.47	7.47	7.51	7.44	7.45
5 GHz 802.11ac 160MHz	12.39	12.40	12.39	12.36	12.29	7.64	7.64	7.72	7.66	7.65
5 GHz 802.11ax 20MHz	13.25	13.23	13.27	13.29	13.25	8.71	8.73	8.72	8.67	8.65
5 GHz 802.11ax 40MHz	11.69	11.74	11.72	11.75	11.71	8.02	8.01	8.03	8.11	8.04
5 GHz 802.11ax 80MHz	10.48	10.51	10.58	10.53	10.54	8.20	8.23	8.22	8.16	8.16
5 GHz 802.11ax 160MHz	9.54	9.51	9.49	9.56	9.54	8.09	8.09	8.10	8.16	8.18
6 GHz 802.11a 20MHz	9.44	9.48	9.53	9.53	9.48	8.56	8.60	8.55	8.63	8.64
6 GHz 802.11ax 20MHz	9.65	9.61	9.67	9.62	9.66	8.58	8.67	8.58	8.68	8.59
6 GHz 802.11ax 40MHz	9.14	9.16	9.14	9.20	9.25	8.19	8.15	8.13	8.18	8.16
6 GHz 802.11ax 80MHz	9.14	9.21	9.19	9.15	9.18	8.15	8.22	8.15	8.17	8.15
6 GHz 802.11ax 160MHz	8.96	9.03	8.99	8.99	9.02	8.11	8.14	8.11	8.08	8.07

DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	6	7	8	9	10	11	12	13	14	15
2.4 GHz 802.11b	12.66	12.63	12.70	12.63	12.67	17.95	17.86	17.91	17.92	17.95
2.4 GHz 802.11g	12.84	12.78	12.85	12.83	12.82	16.05	15.99	16.09	16.00	15.98
2.4 GHz 802.11n 20MHz	12.41	12.43	12.50	12.44	12.45	15.71	15.77	15.75	15.71	15.67
2.4 GHz 802.11ac 20MHz	11.39	11.51	11.46	11.51	11.39	13.18	13.16	13.13	13.11	13.12
5 GHz 802.11a 20MHz	8.61	8.68	8.68	8.61	8.56	13.80	13.89	13.79	13.87	13.86
5 GHz 802.11n 20MHz	8.37	8.47	8.36	8.42	8.44	13.83	13.71	13.81	13.77	13.73
5 GHz 802.11n 40MHz	7.49	7.48	7.59	7.58	7.52	13.69	13.61	13.63	13.60	13.64
5 GHz 802.11ac 20MHz	8.36	8.44	8.37	8.35	8.44	13.82	13.85	13.90	13.84	13.87
5 GHz 802.11ac 40MHz	7.51	7.50	7.48	7.55	7.49	13.78	13.73	13.80	13.78	13.76
5 GHz 802.11ac 80MHz	7.40	7.43	7.48	7.49	7.43	13.69	13.74	13.65	13.67	13.74
5 GHz 802.11ac 160MHz	7.64	7.64	7.67	7.68	7.70	12.37	12.41	12.35	12.29	12.30
5 GHz 802.11ax 20MHz	8.74	8.67	8.66	8.74	8.67	13.27	13.27	13.25	13.31	13.26
5 GHz 802.11ax 40MHz	8.08	8.09	8.12	8.13	8.07	11.70	11.72	11.63	11.73	11.63
5 GHz 802.11ax 80MHz	8.27	8.24	8.18	8.19	8.27	10.59	10.57	10.52	10.55	10.51
5 GHz 802.11ax 160MHz	8.16	8.09	8.09	8.17	8.19	9.53	9.50	9.57	9.50	9.52
6 GHz 802.11a 20MHz	8.61	8.56	8.61	8.53	8.63	9.55	9.48	9.46	9.54	9.45
6 GHz 802.11ax 20MHz	8.66	8.60	8.60	8.60	8.58	9.65	9.62	9.66	9.64	9.67
6 GHz 802.11ax 40MHz	8.16	8.15	8.24	8.15	8.15	9.18	9.15	9.17	9.25	9.25
6 GHz 802.11ax 80MHz	8.24	8.18	8.18	8.16	8.14	9.14	9.09	9.13	9.18	9.11
6 GHz 802.11ax 160MHz	8.15	8.03	8.11	8.15	8.12	9.07	9.02	8.96	8.98	8.99



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

Resulting test positions for SAR mearsurementes

Tissue simulating liquid	Band	Trigger distance – Rear		
		Moving toward phantom	Moving from phantom	Worst case distance for SAR
2450 Head	WIFI 2	5 mm	5 mm	4 mm
5000 Head		5 mm	5 mm	4 mm
6500 Head		5 mm	5 mm	4 mm

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

DUT Moving Toward (Trigger) to the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	10	9	8	7	6	5	4	3	2	1
2.4 GHz 802.11b	17.73	17.73	17.80	17.72	17.72	12.03	12.05	11.96	12.00	11.94
2.4 GHz 802.11g	16.07	16.09	16.04	15.98	16.04	12.74	12.71	12.72	12.73	12.64
2.4 GHz 802.11n 20MHz	14.96	14.92	14.99	14.91	14.95	12.43	12.46	12.46	12.42	12.42
2.4 GHz 802.11ac 20MHz	14.81	14.72	14.75	14.77	14.82	12.56	12.57	12.49	12.47	12.49
5 GHz 802.11a 20MHz	13.36	13.34	13.36	13.36	13.34	8.36	8.32	8.33	8.28	8.32
5 GHz 802.11n 20MHz	13.14	13.12	13.09	13.12	13.04	8.02	8.00	7.90	8.00	8.01
5 GHz 802.11n 40MHz	13.04	13.05	13.11	13.01	13.04	7.99	7.98	7.94	8.03	8.03
5 GHz 802.11ac 20MHz	13.10	13.05	13.04	13.03	13.02	8.43	8.47	8.42	8.48	8.42
5 GHz 802.11ac 40MHz	13.01	13.10	13.00	13.03	13.03	7.85	7.84	7.80	7.91	7.82
5 GHz 802.11ac 80MHz	13.28	13.31	13.33	13.26	13.34	8.34	8.25	8.27	8.29	8.24
5 GHz 802.11ac 160MHz	11.84	11.87	11.88	11.85	11.81	8.04	8.04	8.04	8.14	8.13
5 GHz 802.11ax 20MHz	13.13	13.14	13.16	13.20	13.19	8.07	8.02	8.14	8.10	8.08
5 GHz 802.11ax 40MHz	11.65	11.68	11.75	11.70	11.77	8.31	8.32	8.29	8.30	8.34
5 GHz 802.11ax 80MHz	10.55	10.53	10.50	10.52	10.50	8.15	8.20	8.08	8.14	8.11
5 GHz 802.11ax 160MHz	9.78	9.79	9.77	9.70	9.78	8.17	8.17	8.14	8.22	8.24
6 GHz 802.11a 20MHz	9.61	9.52	9.60	9.54	9.52	8.76	8.81	8.73	8.76	8.73
6 GHz 802.11ax 20MHz	9.67	9.65	9.68	9.77	9.66	8.66	8.69	8.71	8.66	8.68
6 GHz 802.11ax 40MHz	9.20	9.27	9.30	9.22	9.31	8.09	8.12	8.10	8.06	8.10
6 GHz 802.11ax 80MHz	9.30	9.28	9.23	9.22	9.30	8.13	8.06	8.08	8.10	8.06
6 GHz 802.11ax 160MHz	9.15	9.19	9.21	9.13	9.19	8.25	8.30	8.31	8.27	8.25

DUT Moving Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	1	2	3	4	5	6	7	8	9	10
2.4 GHz 802.11b	12.03	12.05	12.03	11.94	11.97	17.71	17.79	17.80	17.80	17.76
2.4 GHz 802.11g	12.63	12.68	12.68	12.63	12.75	15.98	16.07	16.02	16.05	16.03
2.4 GHz 802.11n 20MHz	12.46	12.46	12.47	12.38	12.38	14.97	14.91	14.96	14.98	15.00
2.4 GHz 802.11ac 20MHz	12.49	12.46	12.57	12.56	12.56	14.80	14.80	14.73	14.71	14.78
5 GHz 802.11a 20MHz	8.30	8.33	8.31	8.30	8.34	13.38	13.39	13.37	13.38	13.34
5 GHz 802.11n 20MHz	7.95	8.00	7.92	7.97	7.91	13.12	13.12	13.12	13.05	13.09
5 GHz 802.11n 40MHz	7.93	7.93	7.99	7.99	8.01	13.11	13.02	13.08	13.12	13.00
5 GHz 802.11ac 20MHz	8.45	8.53	8.43	8.51	8.43	13.03	13.07	13.04	13.03	13.01
5 GHz 802.11ac 40MHz	7.80	7.85	7.92	7.81	7.85	13.03	13.06	13.09	13.03	13.06
5 GHz 802.11ac 80MHz	8.29	8.23	8.27	8.33	8.26	13.27	13.23	13.31	13.26	13.31
5 GHz 802.11ac 160MHz	8.08	8.08	8.09	8.04	8.06	11.80	11.83	11.80	11.89	11.89
5 GHz 802.11ax 20MHz	8.05	8.14	8.13	8.14	8.10	13.12	13.11	13.21	13.21	13.20
5 GHz 802.11ax 40MHz	8.32	8.30	8.36	8.36	8.28	11.70	11.65	11.66	11.74	11.76
5 GHz 802.11ax 80MHz	8.19	8.18	8.16	8.11	8.20	10.53	10.53	10.49	10.49	10.51
5 GHz 802.11ax 160MHz	8.21	8.23	8.18	8.25	8.17	9.70	9.80	9.76	9.72	9.73
6 GHz 802.11a 20MHz	8.82	8.72	8.78	8.76	8.75	9.52	9.56	9.57	9.53	9.62
6 GHz 802.11ax 20MHz	8.67	8.71	8.68	8.69	8.70	9.73	9.71	9.67	9.74	9.75
6 GHz 802.11ax 40MHz	8.17	8.16	8.08	8.17	8.10	9.22	9.26	9.26	9.20	9.21
6 GHz 802.11ax 80MHz	8.15	8.10	8.11	8.11	8.07	9.29	9.26	9.21	9.31	9.23
6 GHz 802.11ax 160MHz	8.25	8.34	8.31	8.30	8.35	9.20	9.24	9.18	9.24	9.16