In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
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	39.8 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.21 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.6 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.83 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.2 W/kg ± 18.7 % (k=2)**

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.0Ω- 2.09jΩ
Return Loss	- 33.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.129 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

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL Date: 10.19.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1176

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1750 MHz; σ = 1.382 S/m; ε_r = 39.76; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(8.22, 8.22, 8.22) @ 1750 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.37 V/m; Power Drift = 0.01 dB

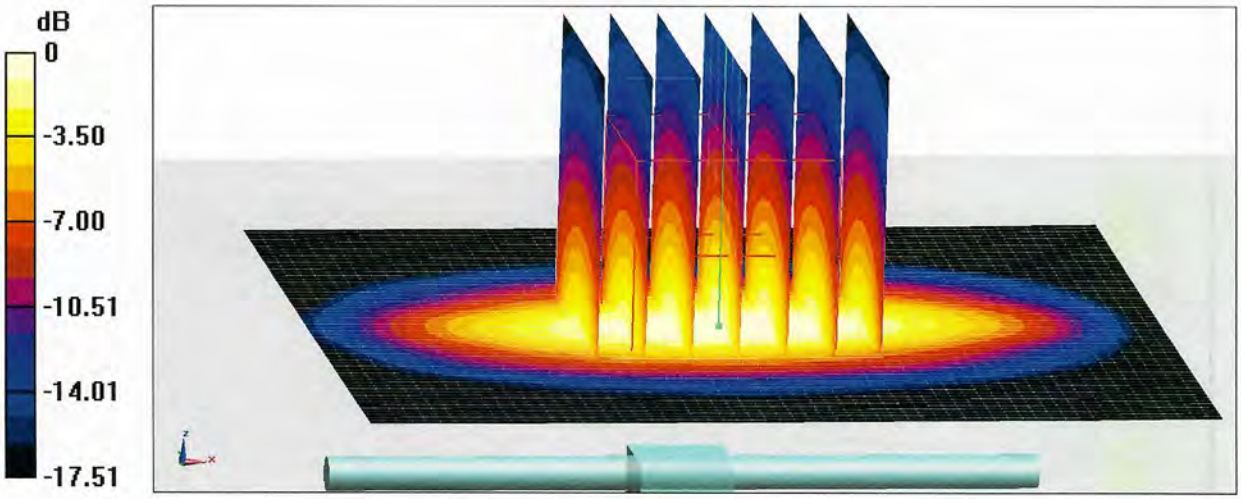
Peak SAR (extrapolated) = 17.4 W/kg

SAR(1 g) = 9.21 W/kg; SAR(10 g) = 4.83 W/kg

Smallest distance from peaks to all points 3 dB below = 10.2 mm

Ratio of SAR at M2 to SAR at M1 = 53%

Maximum value of SAR (measured) = 14.4 W/kg

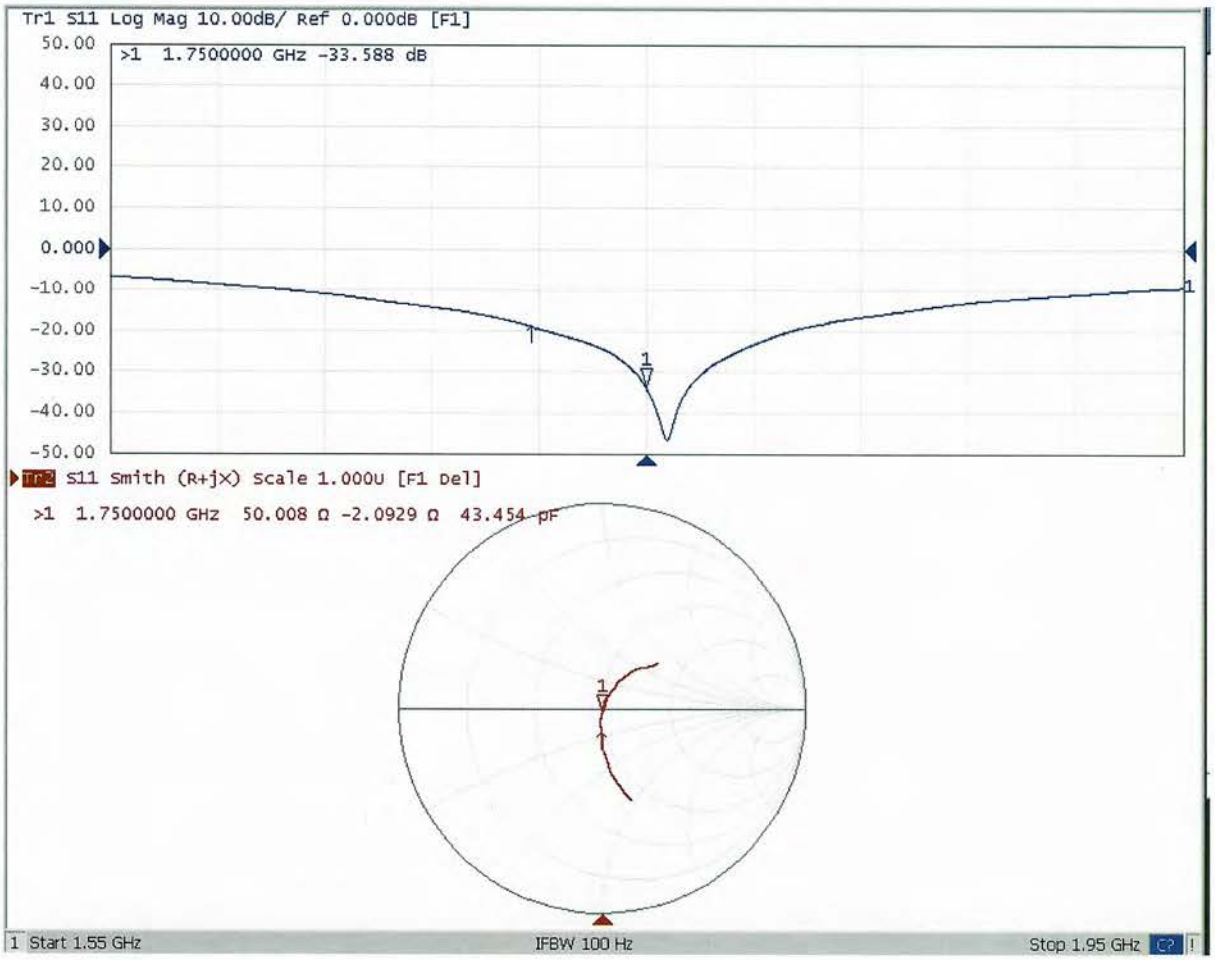


0 dB = 14.4 W/kg = 11.58 dBW/kg

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL



D1750V2 - SN: 1176 Extended Dipole Calibrations

Referring to KDB 865664 D01, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

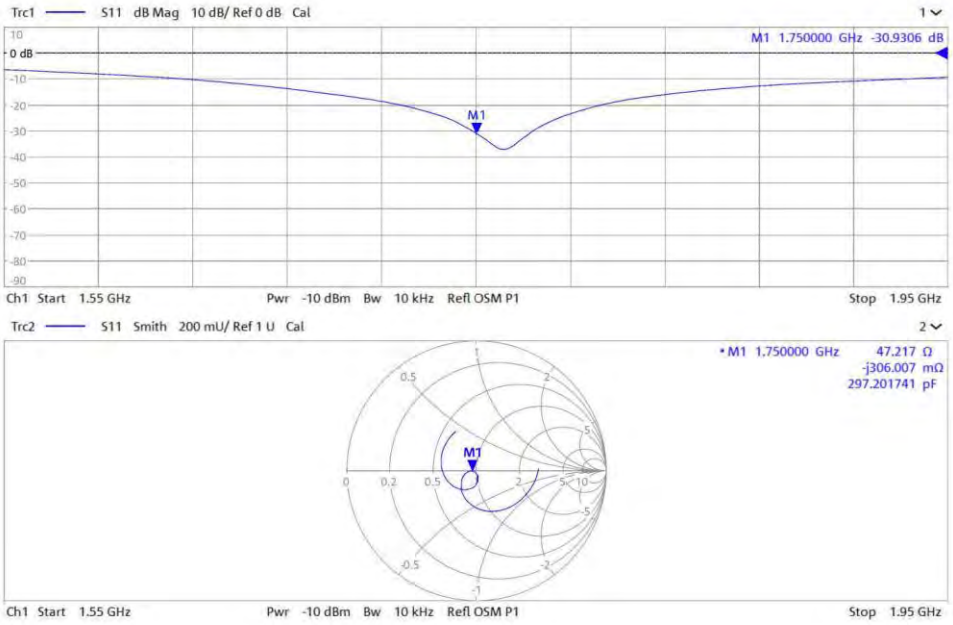
D1750V2 - SN: 1176						
1750MHz Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
10.19.2021	-33.6		50		-2.09	
10.18.2022	-30.9	-7.94	47.2	-2.78	-0.3	1.78

<Justification of the extended calibration>

The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

<Dipole Verification Data>

Head 1750MHz _2022.10.18



In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, Chi
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Client **B.V.ADT** **Certificate No: Z21-60336**

CALIBRATION CERTIFICATE

Object D1900V2 - SN: 5d159

Calibration Procedure(s) FF-Z11-003-01
Calibration Procedures for dipole validation kits

Calibration date: September 16, 2021

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	23-Sep-20 (CTTL, No.J20X08336)	Sep-21
Power sensor NRP8S	104291	23-Sep-20 (CTTL, No.J20X08336)	Sep-21
Reference Probe EX3DV4	SN 7517	03-Feb-21(CTTL-SPEAG,No.Z21-60001)	Feb-22
DAE4	SN 1556	15-Jan-21(SPEAG,No.DAE4-1556_Jan21)	Jan-22
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
NetworkAnalyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: September 21, 2021

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

lossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016

c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010

d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 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%.

In Collaboration with
speag
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
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	40.2 ± 6 %	1.42 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.97 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.7 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.08 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.3 W/kg ± 18.7 % (*k*=2)**

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.2Ω+ 7.76jΩ
Return Loss	- 21.4dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.106 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

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL Date: 09.16.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d159

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.416 S/m; ε_r = 40.23; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(7.81, 7.81, 7.81) @ 1900 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.85 V/m; Power Drift = 0.00 dB

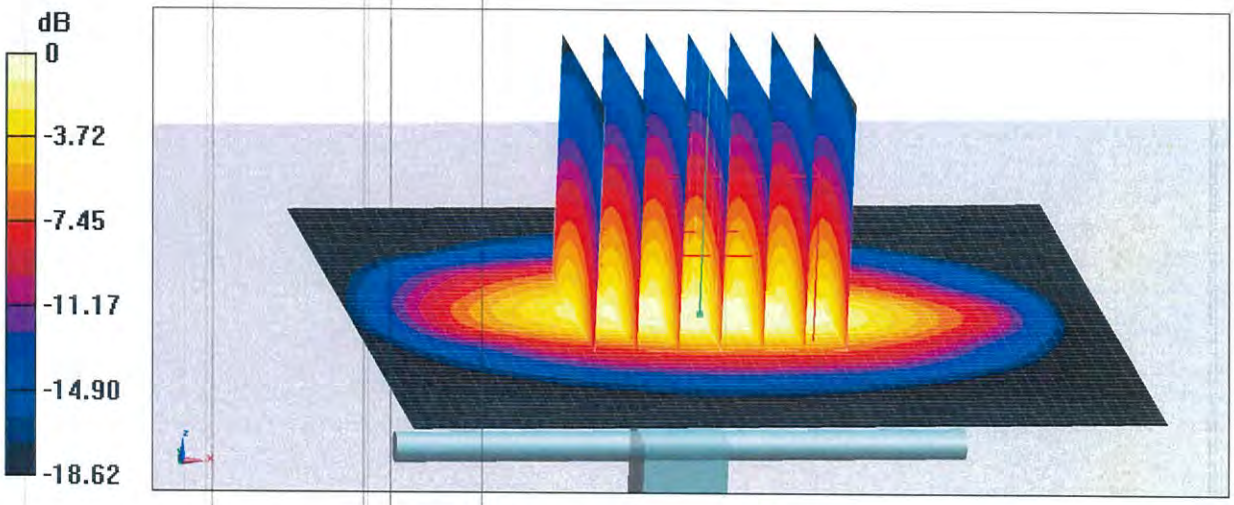
Peak SAR (extrapolated) = 19.4 W/kg

SAR(1 g) = 9.97 W/kg; SAR(10 g) = 5.08 W/kg

Smallest distance from peaks to all points 3 dB below = 10 mm

Ratio of SAR at M2 to SAR at M1 = 51.3%

Maximum value of SAR (measured) = 15.9 W/kg

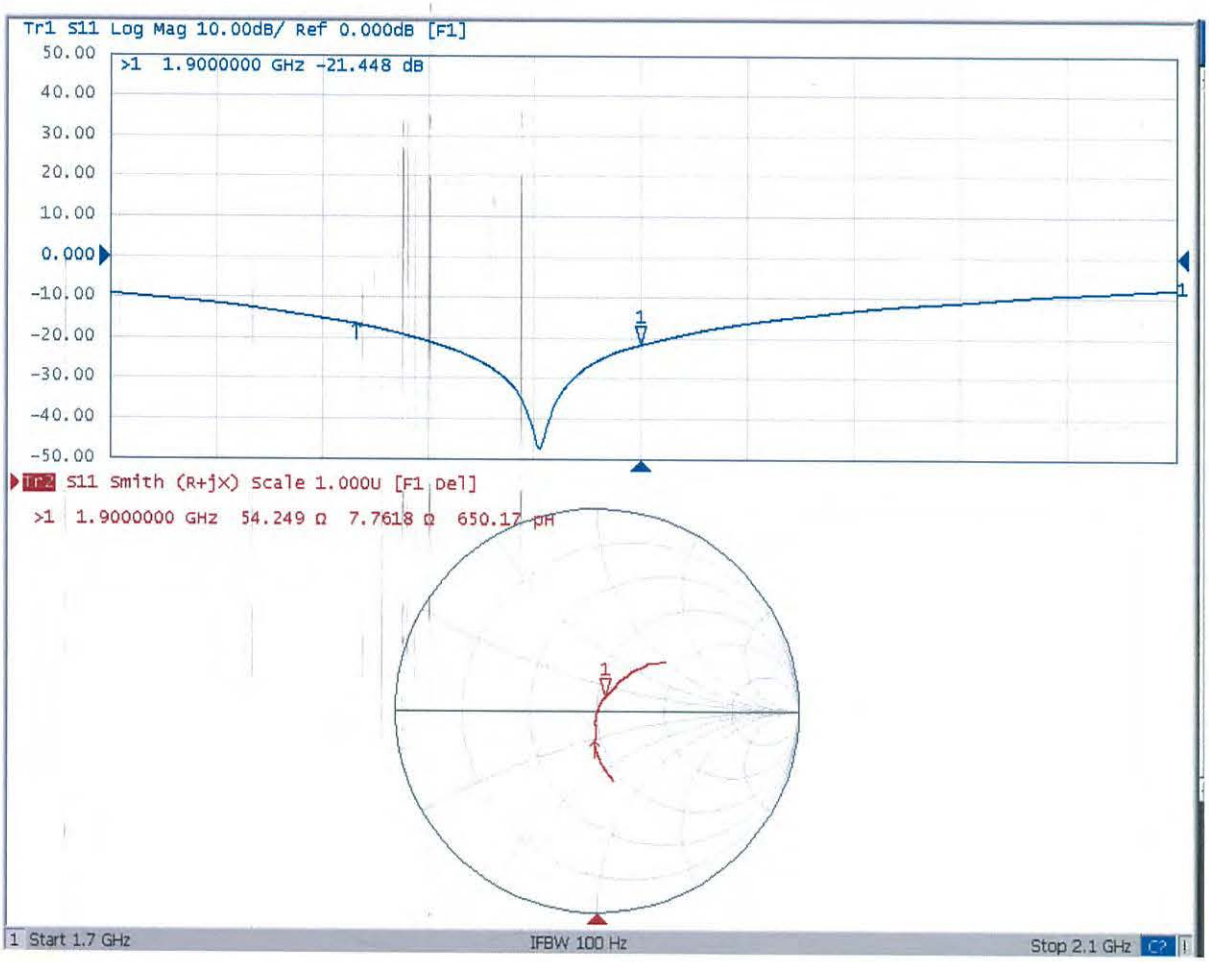


0 dB = 15.9 W/kg = 12.01 dBW/kg

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL



D1900V2 - SN: 5d159 Extended Dipole Calibrations

Referring to KDB 865664 D01, if dipoles are verified in return loss (＜-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

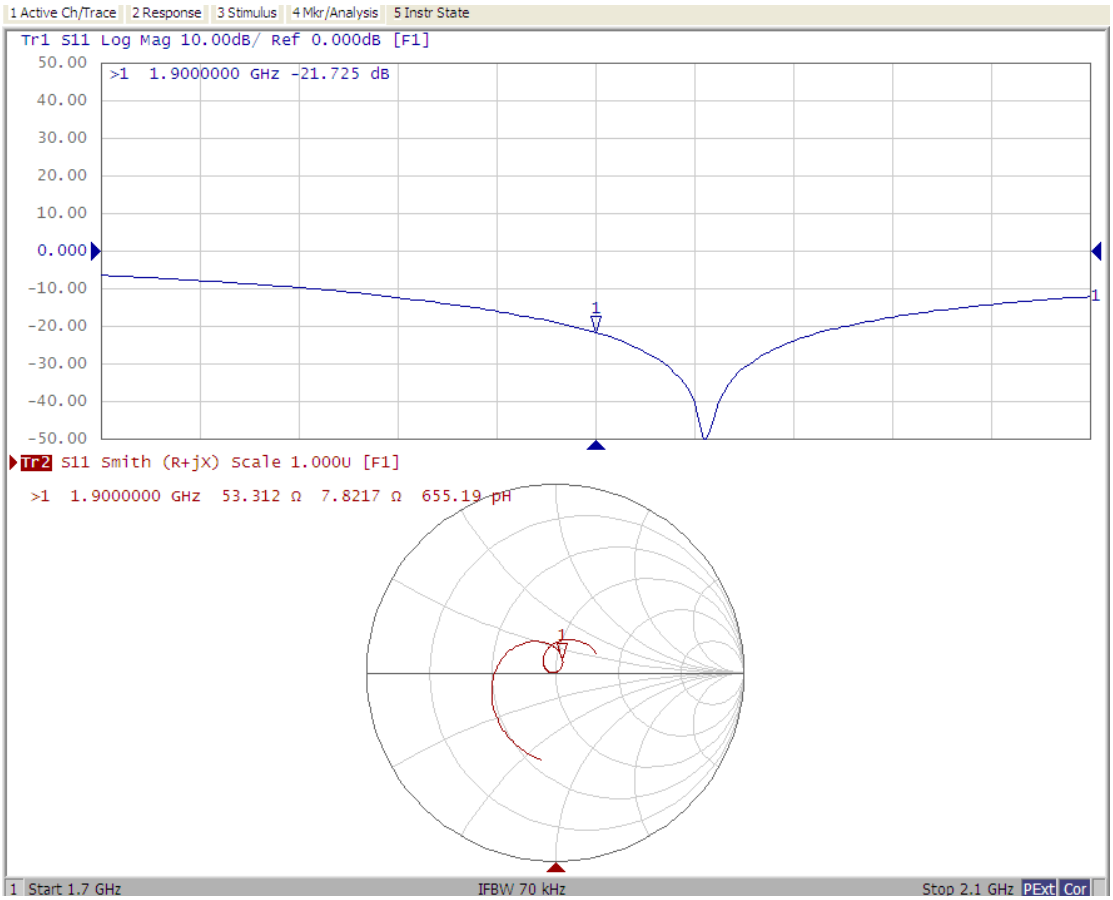
D1900V2 - SN: 5d159						
1900 Head						
Date of Measurement	Return-loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2021.09.16	-21.4		54.2		7.8	
2022.09.16	-21.7	-1.4	53.3	-0.9	7.8	0

<Justification of the extended calibration>

The return loss is ＜-20dB, within 20% of prior calibration, and the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

<Dipole Verification Data>

Head 1900MHz _2022.09.16



In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, Chi
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Client 7layers Certificate No: Z21-60425

CALIBRATION CERTIFICATE

Object D2450V2 - SN: 1048

Calibration Procedure(s) FF-Z11-003-01
Calibration Procedures for dipole validation kits

Calibration date: October 21, 2021

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Power sensor NRP8S	104291	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Reference Probe EX3DV4	SN 7517	03-Feb-21(CTTL-SPEAG,No.Z21-60001)	Feb-22
DAE4	SN 1556	15-Jan-21(SPEAG,No.DAE4-1556_Jan21)	Jan-22
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
NetworkAnalyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: October 27, 2021

In Collaboration with
speag
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016

c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010

d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 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%.

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
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	39.5 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.8 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.2 W/kg ± 18.7 % (*k*=2)**

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.6Ω+ 8.39jΩ
Return Loss	- 21.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.057 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

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL Date: 10.21.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 1048

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.809 S/m; ε_r = 39.51; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(7.34, 7.34, 7.34) @ 2450 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 108.6 V/m; Power Drift = -0.02 dB

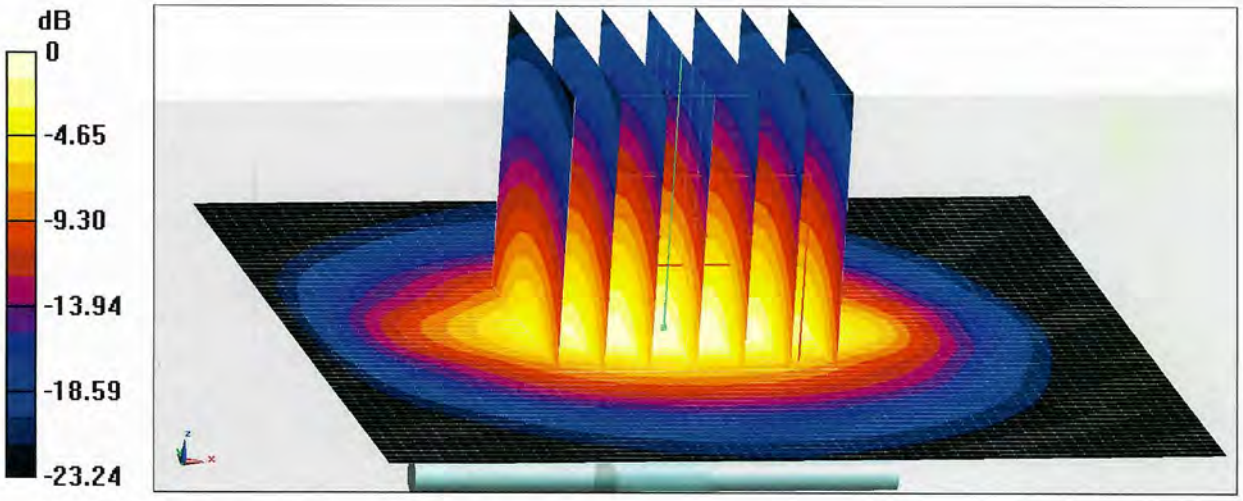
Peak SAR (extrapolated) = 28.0 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.05 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 47.1%

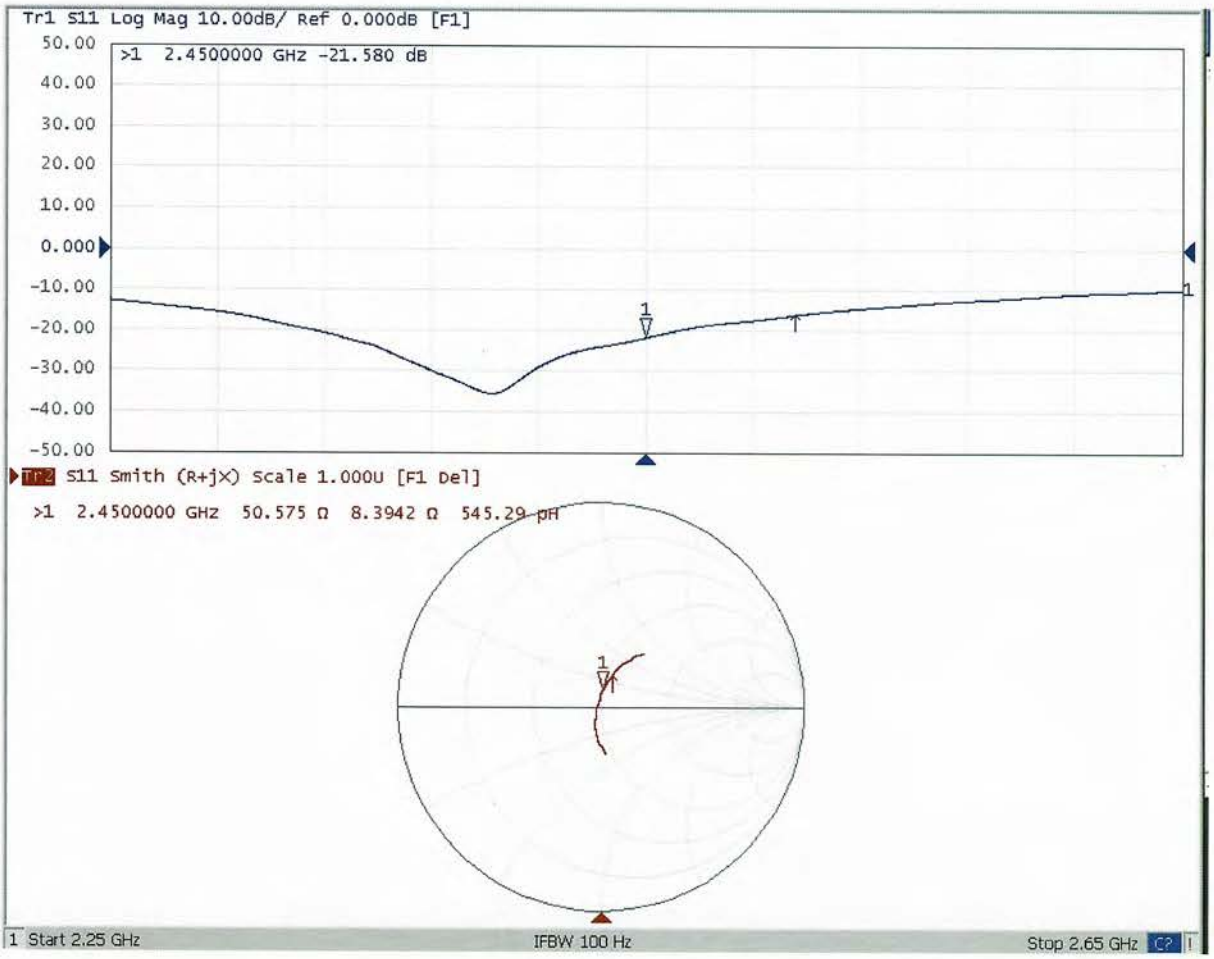
Maximum value of SAR (measured) = 22.5 W/kg



0 dB = 22.5 W/kg = 13.52 dBW/kg

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.cn http://www.chinattl.cn

Impedance Measurement Plot for Head TSL



D2450V2 - SN: 1048 Extended Dipole Calibrations

Referring to KDB 865664 D01, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

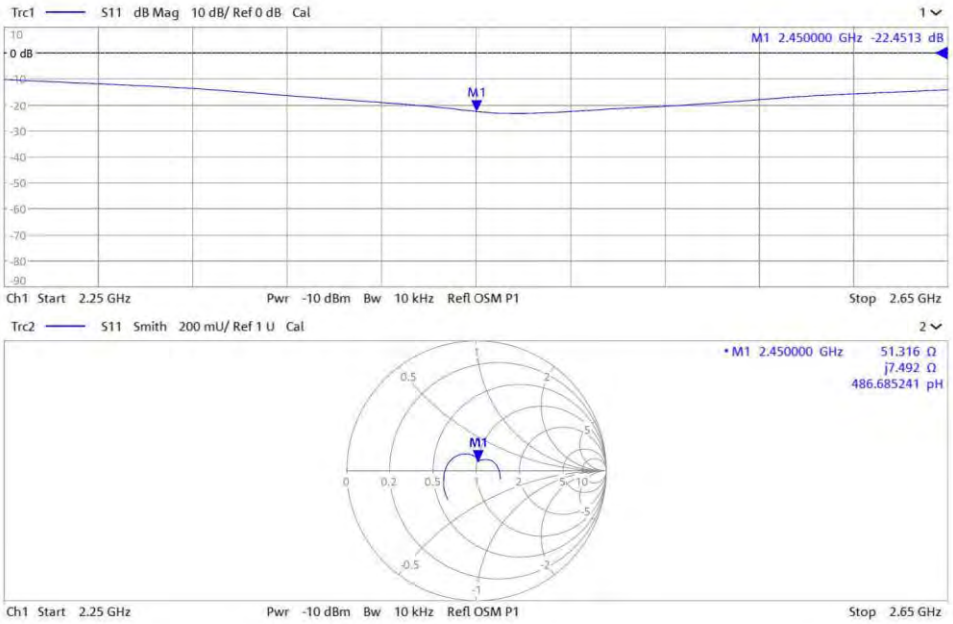
D2450V2 - SN: 1048						
2450MHz Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
10.21.2021	-21.6		50.6		8.39	
10.20.2022	-22.5	3.94	51.3	0.72	7.5	-0.90

<Justification of the extended calibration>

The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

<Dipole Verification Data>

Head 2450MHz _2022.10.20



In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, Chi
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Client **B.V.ADT** **Certificate No: Z21-60339**

CALIBRATION CERTIFICATE

Object D2600V2 - SN: 1110

Calibration Procedure(s) FF-Z11-003-01
Calibration Procedures for dipole validation kits

Calibration date: September 16, 2021

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	23-Sep-20 (CTTL, No.J20X08336)	Sep-21
Power sensor NRP8S	104291	23-Sep-20 (CTTL, No.J20X08336)	Sep-21
Reference Probe EX3DV4	SN 7517	03-Feb-21(CTTL-SPEAG,No.Z21-60001)	Feb-22
DAE4	SN 1556	15-Jan-21(SPEAG,No.DAE4-1556_Jan21)	Jan-22
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
Network Analyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: September 21, 2021

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 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%.

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
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	39.0 ± 6 %	1.95 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.9 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**55.8 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 W/kg ± 18.7 % (*k*=2)**

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix(Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.1Ω- 5.12jΩ
Return Loss	- 25.7dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.058 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

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL Date: 09.16.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1110

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2600 MHz; σ = 1.949 S/m; ε_r = 39.04; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(7.1, 7.1, 7.1) @ 2600 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.3 V/m; Power Drift = 0.01 dB

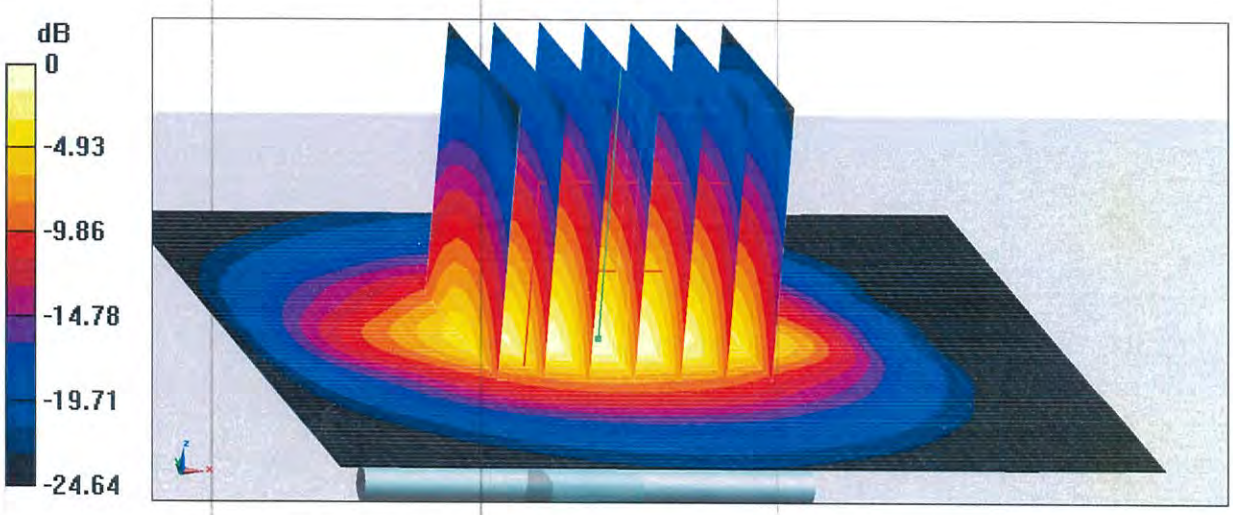
Peak SAR (extrapolated) = 30.6 W/kg

SAR(1 g) = 13.9 W/kg; SAR(10 g) = 6.13 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 45.2%

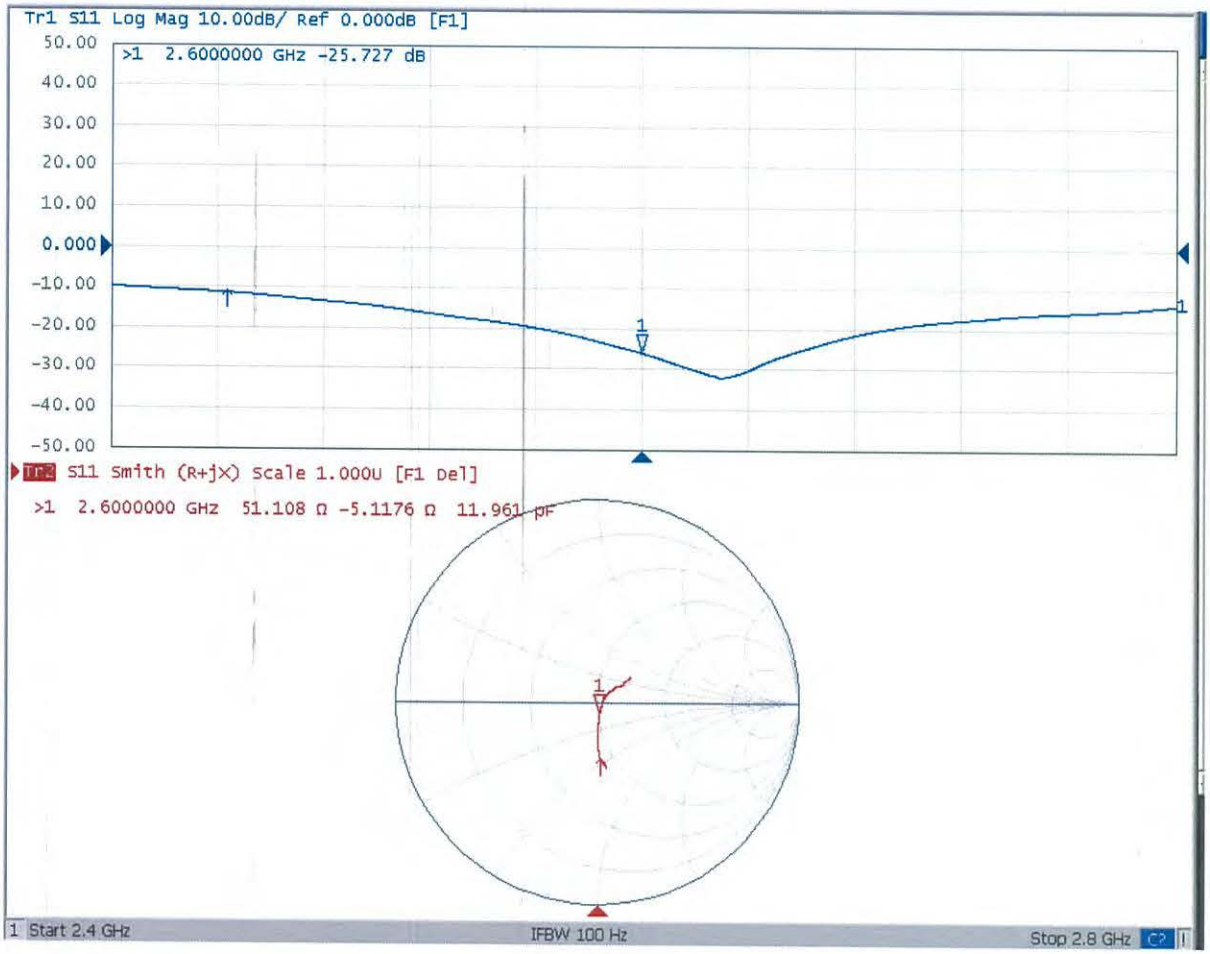
Maximum value of SAR (measured) = 24.1 W/kg



0 dB = 24.1 W/kg = 13.82 dBW/kg

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL



D2600V2 - SN: 1110 Extended Dipole Calibrations

Referring to KDB 865664 D01, if dipoles are verified in return loss (＜-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

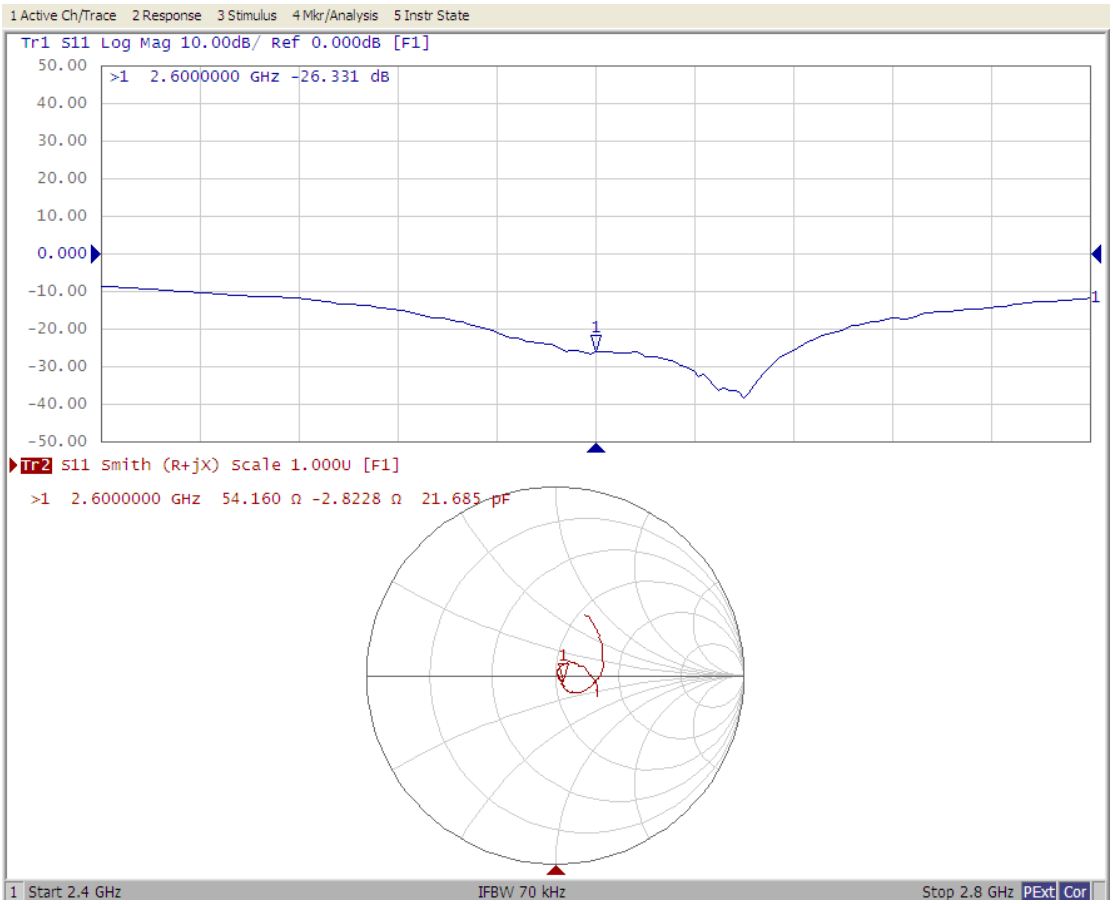
D2600V2 - SN: 1110						
2600 Head						
Date of Measurement	Return-loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2021.09.16	-25.7		51.1		-5.1	
2022.09.16	-26.3	2.7	54.2	3.1	-2.8	2.3

<Justification of the extended calibration>

The return loss is ＜-20dB, within 20% of prior calibration, and the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

<Dipole Verification Data>

Head 2600MHz _2022.09.16



Appendix D. Conducted Power Result

Band	GSM850				GSM1900			
Channel	128	189	251	Max. Tune-up Power	512	661	810	Max. Tune-up Power
Frequency	824.2	836.4	848.8		1850.2	1880	1909.8	
GSM	31.86	31.82	**31.93**	33.00	**29.81**	29.74	29.76	30.00
GPRS 1Tx Slot	31.85	31.84	31.91	33.00	29.79	29.73	29.74	30.00
GPRS 2Tx Slot	28.89	28.90	28.99	30.00	27.65	27.62	27.73	28.00
GPRS 3Tx Slot	26.80	26.79	26.87	28.00	26.07	26.08	26.17	26.00
GPRS 4Tx Slot	24.91	24.95	24.97	26.00	23.97	23.96	24.04	24.00

Source-Based Time-Averaged Power								
Band	GSM850			Max. Tune-up Power	GSM1900			Max. Tune-up Power
Channel	128	189	251		512	661	810	
GSM	22.86	22.82	22.93	24.00	20.81	20.74	20.76	21.00
GPRS 1Tx Slot	22.85	22.84	22.91	24.00	20.79	20.73	20.74	21.00
GPRS 2Tx Slot	22.89	22.90	22.99	24.00	21.65	21.62	21.73	22.00
GPRS 3Tx Slot	22.54	22.53	22.61	23.74	21.81	21.82	21.91	21.74
GPRS 4Tx Slot	21.91	21.95	21.97	23.00	20.97	20.96	21.04	21.00

Band	WCDMA II			WCDMA II	WCDMA IV			WCDMA IV	WCDMA V			WCDMA V
TX Channel	9262	9400	9538	Max. Tune-up Power	1312	1413	1513	Max. Tune-up Power	4132	4182	4233	Max. Tune-up Power
Rx Channel	9662	9800	9938		1537	1638	1738		4357	4407	4458	
Frequency	1852.4	1880	1907.6		1712.4	1732.6	1752.6		826.4	836.4	846.6	
RMC 12.2K	22.75	22.79	**22.82**	**23.00**	22.53	22.56	**22.64**	**23.00**	22.18	22.15	**22.37**	**23.00**
HSDPA Subtest-1	21.67	21.75	21.77	22.00	21.49	21.51	21.59	22.00	21.16	21.07	21.36	22.00
HSDPA Subtest-2	21.72	21.73	21.80	22.00	21.45	21.55	21.59	22.00	21.10	21.11	21.32	22.00
HSDPA Subtest-3	21.21	21.18	21.22	21.50	20.91	21.00	21.08	21.50	20.57	20.55	20.80	21.50
HSDPA Subtest-4	21.11	21.22	21.23	21.50	20.93	20.99	21.04	21.50	20.64	20.50	20.81	21.50
HSUPA Subtest-1	21.73	21.78	21.78	22.00	21.47	21.54	21.58	22.00	21.16	21.08	21.32	22.00
HSUPA Subtest-2	19.73	19.71	19.81	20.00	19.46	19.51	19.62	20.00	19.12	19.07	19.35	20.00
HSUPA Subtest-3	20.71	20.63	20.80	21.00	20.40	20.44	20.57	21.00	20.10	19.99	20.34	21.00
HSUPA Subtest-4	19.71	19.70	19.77	20.00	19.39	19.46	19.60	20.00	19.04	19.03	19.30	20.00
HSUPA Subtest-5	21.70	21.77	21.72	22.00	21.39	21.52	21.52	22.00	21.14	21.00	21.31	22.00

LTE Band 2

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	Max. Tune-up (dBm)
		Channel		18700	18900	19100	
		Frequence (MHz)		1860	1880	1900	
20M	QPSK	1	0	23.02	22.98	23.01	24
		1	50	22.98	22.84	22.95	24
		1	99	22.89	22.85	22.88	24
		50	0	21.77	21.66	21.74	23
		50	25	21.70	21.57	21.63	23
		50	50	21.70	21.60	21.70	23
		100	0	21.68	21.59	21.57	23
	16QAM	1	0	21.77	21.68	21.74	23
		1	50	21.69	21.58	21.66	23
		1	99	21.67	21.54	21.60	23
		50	0	20.75	20.65	20.75	22
		50	25	20.78	20.64	20.75	22
		50	50	20.74	20.70	20.73	22
		100	0	20.76	20.62	20.73	22
BW	MCS Index	Channel		18675	18900	19125	Max. Tune-up
		Frequence (MHz)		1857.5	1880	1902.5	
15M	QPSK	1	0	22.94	22.94	22.96	**24**
		1	37	22.96	22.76	22.94	24
		1	74	22.81	22.81	22.83	24
		36	0	21.74	21.60	21.72	23
		36	19	21.68	21.50	21.58	23
		36	39	21.64	21.52	21.68	23
		75	0	21.67	21.57	21.49	23
	16QAM	1	0	21.70	21.60	21.68	23
		1	37	21.66	21.52	21.64	23
		1	74	21.65	21.47	21.55	23
		36	0	20.69	20.57	20.73	22
		36	19	20.76	20.56	20.74	22
		36	39	20.66	20.66	20.68	22
		75	0	20.74	20.54	20.72	22
BW	MCS Index	Channel		18650	18900	19150	Max. Tune-up
		Frequence (MHz)		1855	1880	1905	
10M	QPSK	1	0	23.01	22.94	22.93	**24**
		1	24	22.94	22.81	22.89	24
		1	49	22.87	22.84	22.84	24
		25	0	21.71	21.61	21.73	23
		25	12	21.69	21.55	21.58	23
		25	25	21.62	21.53	21.68	23
		50	0	21.67	21.55	21.54	23
	16QAM	1	0	21.74	21.67	21.68	23
		1	24	21.65	21.53	21.64	23
		1	49	21.61	21.52	21.57	23
		25	0	20.73	20.57	20.74	22
		25	12	20.70	20.60	20.70	22
		25	25	20.71	20.64	20.71	22
		50	0	20.75	20.57	20.65	22
BW	MCS Index	Channel		18625	18900	19175	Max. Tune-up
		Frequence (MHz)		1852.5	1880	1907.5	
5M	QPSK	1	0	22.96	22.96	22.95	**24**
		1	12	22.91	22.79	22.93	24
		1	24	22.83	22.78	22.83	24
		12	0	21.70	21.61	21.72	23
		12	6	21.62	21.55	21.57	23
		12	13	21.62	21.59	21.68	23
		25	0	21.64	21.54	21.49	23
	16QAM	1	0	21.69	21.67	21.72	23
		1	12	21.64	21.53	21.62	23
		1	24	21.65	21.46	21.59	23
		12	0	20.67	20.61	20.70	22
		12	6	20.75	20.58	20.73	22
		12	13	20.72	20.63	20.68	22
		25	0	20.70	20.54	20.71	22
BW	MCS Index	Channel		18615	18900	19185	Max. Tune-up
		Frequence (MHz)		1851.5	1880	1908.5	
3M	QPSK	1	0	22.96	22.90	22.99	24
		1	7	22.96	22.76	22.93	24
		1	14	22.84	22.77	22.87	24
		8	0	21.73	21.61	21.69	23
		8	3	21.62	21.56	21.58	23
		8	7	21.66	21.55	21.69	23
		15	0	21.62	21.57	21.52	23
	16QAM	1	0	21.70	21.63	21.72	23
		1	7	21.61	21.56	21.61	23
		1	14	21.65	21.46	21.58	23
		8	0	20.67	20.59	20.67	22
		8	3	20.72	20.62	20.69	22
		8	7	20.67	20.65	20.71	22
		15	0	20.70	20.55	20.68	22
BW	MCS Index	Channel		18607	18900	19193	Max. Tune-up
		Frequence (MHz)		1850.7	1880	1909.3	
1.4M	QPSK	1	0	22.97	22.91	22.96	24
		1	2	22.95	22.78	22.93	24
		1	5	22.87	22.78	22.83	24
		3	0	22.71	22.58	22.72	24
		3	1	22.69	22.55	22.55	24
		3	3	22.65	22.52	22.64	24
		6	0	21.67	21.53	21.55	23
	16QAM	1	0	21.72	21.61	21.69	23
		1	2	21.67	21.50	21.64	23
		1	5	21.62	21.46	21.59	23
		3	0	21.71	21.60	21.70	23
		3	1	21.70	21.63	21.70	23
		3	3	21.70	21.65	21.72	23
		6	0	20.70	20.60	20.68	22

LTE Band 4

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	Max. Tune-up (dBm)
		Channel		20050	20175	20300	
		Frequence (MHz)		1720	1732.5	1745	
20M	QPSK	1	0	22.86	22.82	22.66	24
		1	50	22.79	22.75	22.59	24
		1	99	22.71	22.67	22.58	24
		50	0	21.45	21.39	21.23	23
		50	25	21.44	21.40	21.32	23
		50	50	21.53	21.45	21.33	23
		100	0	21.45	21.42	21.24	23
	16QAM	1	0	21.59	21.53	21.43	23
		1	50	21.52	21.51	21.37	23
		1	99	21.58	21.47	21.41	23
		50	0	20.53	20.52	20.38	22
		50	25	20.57	20.49	20.40	22
		50	50	20.58	20.49	20.33	22
		100	0	20.60	20.58	20.44	22
BW	MCS Index	Channel		20025	20175	20325	Max. Tune-up
		Frequence (MHz)		1717.5	1732.5	1747.5	
15M	QPSK	1	0	22.82	22.79	22.60	24
		1	37	22.77	22.74	22.55	24
		1	74	22.65	22.62	22.57	24
		36	0	21.44	21.37	21.18	23
		36	19	21.36	21.33	21.30	23
		36	39	21.52	21.41	21.30	23
		75	0	21.42	21.41	21.18	23
	16QAM	1	0	21.55	21.48	21.41	23
		1	37	21.46	21.49	21.34	23
		1	74	21.56	21.39	21.40	23
		36	0	20.45	20.48	20.33	22
		36	19	20.54	20.43	20.38	22
		36	39	20.57	20.44	20.25	22
		75	0	20.54	20.55	20.40	22
BW	MCS Index	Channel		20000	20175	20350	Max. Tune-up
		Frequence (MHz)		1715	1732.5	1750	
10M	QPSK	1	0	22.78	22.78	22.61	24
		1	24	22.76	22.69	22.57	24
		1	49	22.69	22.60	22.53	24
		25	0	21.39	21.31	21.21	23
		25	12	21.43	21.38	21.24	23
		25	25	21.46	21.37	21.27	23
		50	0	21.42	21.36	21.22	23
	16QAM	1	0	21.57	21.46	21.38	23
		1	24	21.46	21.43	21.35	23
		1	49	21.56	21.39	21.40	23
		25	0	20.45	20.48	20.33	22
		25	12	20.55	20.41	20.39	22
		25	25	20.50	20.45	20.28	22
		50	0	20.57	20.52	20.42	22
BW	MCS Index	Channel		19975	20175	20375	Max. Tune-up
		Frequence (MHz)		1712.5	1732.5	1752.5	
5M	QPSK	1	0	22.81	22.74	22.65	24
		1	12	22.75	22.70	22.54	24
		1	24	22.63	22.66	22.53	24
		12	0	21.41	21.34	21.22	23
		12	6	21.38	21.38	21.27	23
		12	13	21.46	21.40	21.31	23
		25	0	21.37	21.40	21.19	23
	16QAM	1	0	21.57	21.45	21.41	23
		1	12	21.44	21.45	21.29	23
		1	24	21.52	21.45	21.35	23
		12	0	20.46	20.47	20.36	22
		12	6	20.51	20.42	20.35	22
		12	13	20.51	20.44	20.31	22
		25	0	20.52	20.56	20.38	22
BW	MCS Index	Channel		19965	20175	20385	Max. Tune-up
		Frequence (MHz)		1711.5	1732.5	1753.5	
3M	QPSK	1	0	22.80	22.75	22.61	24
		1	7	22.72	22.70	22.57	24
		1	14	22.63	22.65	22.52	24
		8	0	21.37	21.38	21.21	23
		8	3	21.40	21.35	21.24	23
		8	7	21.45	21.44	21.31	23
		15	0	21.40	21.37	21.20	23
	16QAM	1	0	21.57	21.45	21.42	23
		1	7	21.44	21.47	21.32	23
		1	14	21.55	21.41	21.39	23
		8	0	20.51	20.45	20.33	22
		8	3	20.51	20.41	20.38	22
		8	7	20.57	20.47	20.25	22
		15	0	20.55	20.50	20.38	22
BW	MCS Index	Channel		19957	20175	20393	Max. Tune-up
		Frequence (MHz)		1710.7	1732.5	1754.3	
1.4M	QPSK	1	0	22.85	22.76	22.64	24
		1	2	22.76	22.69	22.57	24
		1	5	22.69	22.60	22.53	24
		3	0	22.39	22.31	22.21	24
		3	1	22.43	22.38	22.24	24
		3	3	22.48	22.37	22.27	24
		6	0	21.44	21.36	21.22	23
	16QAM	1	0	21.54	21.46	21.38	23
		1	2	21.50	21.43	21.35	23
		1	5	21.53	21.39	21.40	23
		3	0	21.49	21.47	21.33	23
		3	1	21.49	21.48	21.35	23
		3	3	21.54	21.44	21.32	23
		6	0	20.54	20.56	20.39	22

LTE Band 5

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	Max. Tune-up (dBm)
		Channel		20450	20525	20600	
		Frequence (MHz)		829	836.5	844	
10M	QPSK	1	0	22.44	22.59	22.51	24
		1	24	22.34	22.57	22.45	24
		1	49	22.35	22.50	22.46	24
		25	0	21.03	21.23	21.12	23
		25	12	21.10	21.28	21.23	23
		25	25	21.11	21.33	21.22	23
		50	0	21.24	21.34	21.32	23
	16QAM	1	0	21.13	21.31	21.21	23
		1	24	21.08	21.28	21.16	23
		1	49	21.19	21.37	21.32	23
		25	0	20.35	20.50	20.44	22
		25	12	20.76	20.94	20.89	22
		25	25	20.72	20.94	20.82	22
		50	0	20.53	20.76	20.67	22
BW	MCS Index	Channel		20425	20525	20625	Max. Tune-up
		Frequence (MHz)		826.5	836.5	846.5	
5M	QPSK	1	0	22.40	22.54	22.46	24
		1	12	22.26	22.56	22.40	24
		1	24	22.31	22.45	22.45	24
		12	0	20.97	21.21	21.07	23
		12	6	21.03	21.23	21.21	23
		12	13	21.03	21.31	21.17	23
		25	0	21.22	21.26	21.30	23
	16QAM	1	0	21.05	21.25	21.13	23
		1	12	21.02	21.26	21.10	23
		1	24	21.12	21.32	21.30	23
		12	0	20.29	20.43	20.39	22
		12	6	20.69	20.89	20.87	22
		12	13	20.64	20.92	20.76	22
		25	0	20.45	20.75	20.65	22
BW	MCS Index	Channel		20415	20525	20635	Max. Tune-up
		Frequence (MHz)		825.5	836.5	847.5	
3M	QPSK	1	0	22.38	22.52	22.46	24
		1	7	22.27	22.52	22.43	24
		1	14	22.27	22.48	22.40	24
		8	0	20.95	21.22	21.10	23
		8	3	21.06	21.23	21.15	23
		8	7	21.03	21.32	21.20	23
		15	0	21.19	21.29	21.28	23
	16QAM	1	0	21.11	21.23	21.20	23
		1	7	21.00	21.24	21.11	23
		1	14	21.16	21.31	21.30	23
		8	0	20.33	20.43	20.39	22
		8	3	20.70	20.86	20.87	22
		8	7	20.71	20.92	20.74	22
		15	0	20.48	20.68	20.61	22
BW	MCS Index	Channel		20407	20525	20643	Max. Tune-up
		Frequence (MHz)		824.7	836.5	848.3	
1.4M	QPSK	1	0	22.43	22.53	22.49	24
		1	2	22.29	22.50	22.40	24
		1	5	22.33	22.42	22.44	24
		3	0	21.98	22.15	22.11	23
		3	1	22.06	22.23	22.18	23
		3	3	22.03	22.32	22.17	23
		6	0	21.20	21.29	21.31	23
	16QAM	1	0	21.07	21.29	21.16	23
		1	2	21.01	21.23	21.14	23
		1	5	21.11	21.35	21.27	23
		3	0	21.33	21.42	21.42	22
		3	1	21.68	21.88	21.81	22
		3	3	21.66	21.92	21.76	22
		6	0	20.48	20.68	20.66	22

LTE Band 7

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	Max. Tune-up (dBm)
		Channel		20850	21100	21350	
		Frequence (MHz)		2510	2535	2560	
20M	QPSK	1	0	22.29	22.70	22.99	24
		1	50	22.41	22.82	23.19	24
		1	99	22.58	22.97	**23.36**	24
		50	0	21.43	21.80	22.17	23
		50	25	21.38	21.78	22.19	23
		50	50	21.56	21.92	22.34	23
		100	0	21.46	21.92	22.26	23
	16QAM	1	0	22.11	22.47	22.89	23
		1	50	22.00	22.46	22.80	23
		1	99	22.07	22.46	22.85	23
		50	0	20.50	20.87	21.24	22
		50	25	20.52	20.92	21.33	22
		50	50	20.70	21.11	21.40	22
		100	0	20.63	21.02	21.39	22
BW	MCS Index	Channel		20825	21100	21375	Max. Tune-up
		Frequence (MHz)		2507.5	2535	2562.5	
15M	QPSK	1	0	22.28	22.68	22.91	24
		1	37	22.34	22.74	23.13	24
		1	74	22.55	22.91	23.34	24
		36	0	21.41	21.73	22.12	23
		36	19	21.32	21.70	22.17	23
		36	39	21.54	21.84	22.33	23
		75	0	21.38	21.88	22.21	23
	16QAM	1	0	22.09	22.39	22.88	23
		1	37	21.92	22.42	22.75	23
		1	74	22.04	22.40	22.83	23
		36	0	20.48	20.80	21.19	22
		36	19	20.46	20.84	21.31	22
		36	39	20.69	21.09	21.32	22
		75	0	20.58	20.94	21.33	22
BW	MCS Index	Channel		20800	21100	21400	Max. Tune-up
		Frequence (MHz)		2505	2535	2565	
10M	QPSK	1	0	22.23	22.62	22.97	24
		1	24	22.39	22.74	23.18	24
		1	49	22.50	22.93	23.31	24
		25	0	21.41	21.72	22.16	23
		25	12	21.30	21.74	22.14	23
		25	25	21.53	21.86	22.32	23
		50	0	21.44	21.85	22.21	23
	16QAM	1	0	22.05	22.39	22.87	23
		1	24	21.99	22.44	22.72	23
		1	49	22.02	22.38	22.79	23
		25	0	20.49	20.81	21.22	22
		25	12	20.50	20.84	21.32	22
		25	25	20.62	21.07	21.35	22
		50	0	20.61	20.94	21.38	22
BW	MCS Index	Channel		20775	21100	21425	Max. Tune-up
		Frequence (MHz)		2502.5	2535	2567.5	
5M	QPSK	1	0	22.25	22.65	22.94	24
		1	12	22.33	22.81	23.14	24
		1	24	22.54	22.92	23.35	24
		12	0	21.37	21.78	22.12	23
		12	6	21.31	21.73	22.17	23
		12	13	21.48	21.90	22.29	23
		25	0	21.44	21.84	22.24	23
	16QAM	1	0	22.03	22.41	22.81	23
		1	12	21.94	22.44	22.74	23
		1	24	22.00	22.41	22.83	23
		12	0	20.44	20.80	21.19	22
		12	6	20.45	20.87	21.31	22
		12	13	20.62	21.09	21.34	22
		25	0	20.55	21.01	21.37	22

LTE Band 66

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	Max. Tune-up (dBm)
		Channel		132072	132322	132572	
		Frequence (MHz)		1720	1745	1770	
20M	QPSK	1	0	22.77	22.71	23.03	24
		1	50	22.77	22.69	**23.08**	24
		1	99	22.73	22.62	23.00	24
		50	0	21.45	21.37	21.76	23
		50	25	21.37	21.33	21.65	23
		50	50	21.40	21.37	21.72	23
		100	0	21.52	21.41	21.74	23
	16QAM	1	0	21.51	21.48	21.83	23
		1	50	21.45	21.35	21.72	23
		1	99	21.54	21.38	21.81	23
		50	0	20.49	20.43	20.78	22
		50	25	20.56	20.43	20.83	22
		50	50	20.55	20.40	20.78	22
		100	0	20.54	20.42	20.84	22
BW	MCS Index	Channel		132047	132322	132597	Max. Tune-up
		Frequence (MHz)		1717.5	1745	1772.5	
15M	QPSK	1	0	22.71	22.69	22.97	24
		1	37	22.70	22.64	23.06	24
		1	74	22.67	22.55	22.95	24
		36	0	21.38	21.32	21.74	23
		36	19	21.29	21.31	21.59	23
		36	39	21.32	21.36	21.70	23
		75	0	21.48	21.36	21.66	23
	16QAM	1	0	21.43	21.47	21.81	23
		1	37	21.40	21.30	21.68	23
		1	74	21.52	21.30	21.80	23
		36	0	20.41	20.39	20.73	22
		36	19	20.53	20.37	20.81	22
		36	39	20.53	20.33	20.73	22
		75	0	20.48	20.34	20.82	22
BW	MCS Index	Channel		132022	132322	132622	Max. Tune-up
		Frequence (MHz)		1715	1745	1775	
10M	QPSK	1	0	22.74	22.65	23.01	24
		1	24	22.75	22.61	23.07	24
		1	49	22.65	22.58	22.95	24
		25	0	21.42	21.31	21.74	23
		25	12	21.35	21.26	21.60	23
		25	25	21.34	21.29	21.70	23
		50	0	21.51	21.39	21.66	23
	16QAM	1	0	21.44	21.40	21.77	23
		1	24	21.42	21.29	21.70	23
		1	49	21.52	21.31	21.76	23
		25	0	20.43	20.35	20.76	22
		25	12	20.54	20.35	20.82	22
		25	25	20.47	20.36	20.73	22
		50	0	20.52	20.34	20.83	22
BW	MCS Index	Channel		131997	132322	132647	Max. Tune-up
		Frequence (MHz)		1712.5	1745	1777.5	
5M	QPSK	1	0	22.72	22.64	22.98	24
		1	12	22.75	22.61	23.06	24
		1	24	22.68	22.54	22.99	24
		12	0	21.41	21.32	21.71	23
		12	6	21.29	21.32	21.60	23
		12	13	21.36	21.32	21.71	23
		25	0	21.46	21.39	21.69	23
	16QAM	1	0	21.44	21.43	21.81	23
		1	12	21.37	21.33	21.67	23
		1	24	21.52	21.30	21.79	23
		12	0	20.41	20.37	20.70	22
		12	6	20.50	20.41	20.77	22
		12	13	20.48	20.35	20.76	22
		25	0	20.48	20.35	20.79	22
BW	MCS Index	Channel		131987	132322	132657	Max. Tune-up
		Frequence (MHz)		1711.5	1745	1778.5	
3M	QPSK	1	0	22.71	22.66	23.02	24
		1	7	22.76	22.67	23.03	24
		1	14	22.65	22.55	22.98	24
		8	0	21.44	21.33	21.73	23
		8	3	21.34	21.32	21.59	23
		8	7	21.36	21.32	21.70	23
		15	0	21.46	21.39	21.71	23
	16QAM	1	0	21.49	21.40	21.82	23
		1	7	21.37	21.31	21.67	23
		1	14	21.51	21.32	21.79	23
		8	0	20.48	20.38	20.70	22
		8	3	20.50	20.40	20.79	22
		8	7	20.53	20.33	20.73	22
		15	0	20.48	20.34	20.82	22
BW	MCS Index	Channel		131979	132322	132665	Max. Tune-up
		Frequence (MHz)		1710.7	1745	1779.3	
1.4M	QPSK	1	0	22.69	22.67	22.98	24
		1	2	22.74	22.63	23.06	24
		1	5	22.71	22.55	22.95	24
		3	0	22.39	22.29	22.74	24
		3	1	22.36	22.31	22.57	24
		3	3	22.35	22.29	22.66	24
		6	0	21.51	21.35	21.72	23
	16QAM	1	0	21.46	21.41	21.78	23
		1	2	21.43	21.27	21.70	23
		1	5	21.49	21.30	21.80	23
		3	0	21.45	21.38	21.73	23
		3	1	21.48	21.42	21.78	23
		3	3	21.51	21.35	21.77	23
		6	0	20.48	20.40	20.79	22

Mode	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit
BR / EDR	GFSK	CH 0	2402	8.03	9.00
		CH 39	2441	7.37	8.50
		CH 78	2480	7.12	8.50
	DQPSK	CH 0	2402	6.28	7.50
		CH 39	2441	5.48	6.50
		CH 78	2480	4.67	5.50
	8DPSK	CH 0	2402	6.18	7.50
		CH 39	2441	5.49	6.50
		CH 78	2480	4.49	5.50