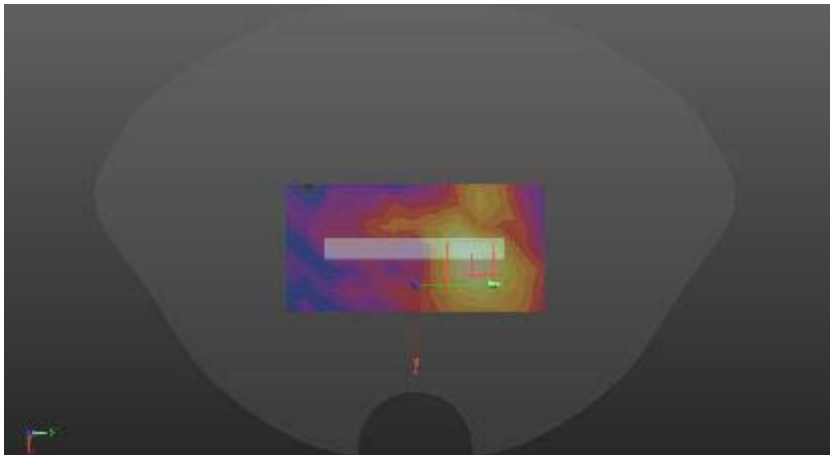
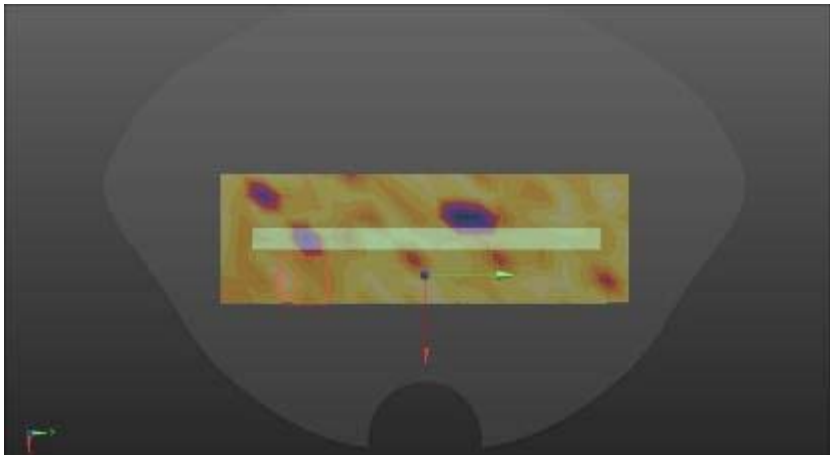
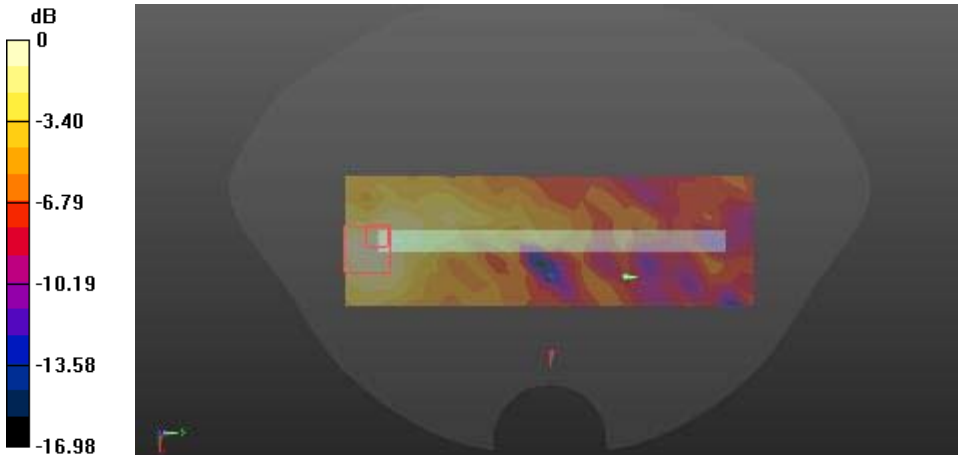


FLAT	EDGE1
Communication System: IEEE 802.11n HT20 WiFi 5 GHz; Frequency: 5785 MHz Medium parameters used (interpolated): $f = 5785 \text{ MHz}$; $\sigma = 5.984 \text{ S/m}$; $\epsilon_r = 48.221$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section DASY5 Configuration: - Probe: EX3DV4 - SN3708; ConvF(4.19, 4.19, 4.19); Calibrated: 11/7/2017; - Sensor-Surface: 1.4mm (Mechanical Surface Detection) - Electronics: DAE4 Sn720; Calibrated: 10/23/2017 - Phantom: Twin-SAM 1560; Type: QD 000 P40 CD; Serial: 1560 - Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373) Flat-Section MSL WIFI 5G mimoHOT/WIFI 5785 mimo EDGE1/Area Scan (7x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$ Maximum value of SAR (measured) = 0.144 W/kg Flat-Section MSL WIFI 5G mimoHOT/WIFI 5785 mimo EDGE1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$ Reference Value = 2.576 V/m; Power Drift = -0.18 dB Peak SAR (extrapolated) = 0.319 W/kg SAR(1 g) = 0.071 W/kg; SAR(10 g) = 0.032 W/kg Maximum value of SAR (measured) = 0.165 W/kg dB 0 -2.72 -5.45 -8.17 -10.90 -13.62  0 dB = 0.165 W/kg = -7.83 dBW/kg	

FLAT	EDGE3
Communication System: IEEE 802.11n HT20 WiFi 5 GHz; Frequency: 5785 MHz Medium parameters used (interpolated): $f = 5785 \text{ MHz}$; $\sigma = 5.984 \text{ S/m}$; $\epsilon_r = 48.221$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section DASY5 Configuration: - Probe: EX3DV4 - SN3708; ConvF(4.19, 4.19, 4.19); Calibrated: 11/7/2017; - Sensor-Surface: 1.4mm (Mechanical Surface Detection) - Electronics: DAE4 Sn720; Calibrated: 10/23/2017 - Phantom: Twin-SAM 1560; Type: QD 000 P40 CD; Serial: 1560 - Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373) Flat-Section MSL WIFI 5G mimoHOT/WIFI 5785 mimo EDGE 3/Area Scan (7x20x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$ Maximum value of SAR (measured) = 0.0296 W/kg Flat-Section MSL WIFI 5G mimoHOT/WIFI 5785 mimo EDGE 3/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$ Reference Value = 1.337 V/m; Power Drift = -0.03 dB Peak SAR (extrapolated) = 0.0370 W/kg SAR(1 g) = 0.017 W/kg; SAR(10 g) = 0.00941 W/kg Maximum value of SAR (measured) = 0.0351 W/kg dB 0 -3.97 -7.95 -11.92 -15.90 -19.87  0 dB = 0.0351 W/kg = -14.55 dBW/kg	

FLAT	EDGE4
Communication System: IEEE 802.11n HT20 WiFi 5 GHz; Frequency: 5785 MHz Medium parameters used (interpolated): $f = 5785 \text{ MHz}$; $\sigma = 5.984 \text{ S/m}$; $\epsilon_r = 48.221$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section DASY5 Configuration: - Probe: EX3DV4 - SN3708; ConvF(4.19, 4.19, 4.19); Calibrated: 11/7/2017; - Sensor-Surface: 1.4mm (Mechanical Surface Detection) - Electronics: DAE4 Sn720; Calibrated: 10/23/2017 - Phantom: Twin-SAM 1560; Type: QD 000 P40 CD; Serial: 1560 - Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373) Flat-Section MSL WIFI 5G mimoHOT/WIFI 5785 mimo EDGE 4/Area Scan (7x20x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$ Maximum value of SAR (measured) = 0.0959 W/kg Flat-Section MSL WIFI 5G mimoHOT/WIFI 5785 mimo EDGE 4/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$ Reference Value = 2.375 V/m; Power Drift = -0.03 dB Peak SAR (extrapolated) = 0.160 W/kg SAR(1 g) = 0.043 W/kg; SAR(10 g) = 0.022 W/kg Maximum value of SAR (measured) = 0.0939 W/kg  0 dB = 0.0939 W/kg = -10.27 dBW/kg	

ANNEX B – RELEVANT PAGES FROM CALIBRATION REPORTS

DAE4 Sn:546

  		中国民航 民用航空 局 CNAS 认可 CALIBRATION CNAS 证书
Address: 11 Airport Road, Sui Hai (Hua) Building, 10101, China Tel: +86-85241112015 E-mail: info@ttnl.com Website: www.ttnl.com		中国民航 民用航空 局 CNAS 认可 CALIBRATION CNAS 证书
Client: RTTC		Certificate No: Z17-07141
CALIBRATION CERTIFICATE		
Object:	DMA-5R-546	
Calibration Procedure(s):	PP-215-02-01 Calibration Procedure for the Data Acquisition Electronics (DAEs)	
Calibration date:	September 15, 2017	
This calibration Certificate documents the traceability to national standards, which realize the physical units of mass, length, time, temperature, and the uncertainties and the uncertainties of probability are given on the following pages and are part of the certificate.		
All calibration have been conducted in the stated laboratory (fully environmental temperature 22±0.5°C and humidity 50±5%)		
Calibration instrument used (NIST certificate for calibration)		
Reference Standards	ID# Calibration Certificate No. Scheduled Calibration	
Process Calibration no:	1011018 27-Jul-15 (NIST) No.: 11000000	June 18
Calculated by:	Name Function Signature	
Reviewed by:	Name Function Signature	
Approved by:	Name Function Signature	

Contract No. 215-97111

New York



In Collaboration with
Calibration Laboratory

J-601 North Yarmouth Road, Suite 100, North Yarmouth, NS, Canada B9A 1P6
Tel: (902) 422-9911 x3118 Fax: (902) 422-9911 x3298
E-mail: info@ttrlab.com Web: www.ttrlab.com

Glossary:

DME data acquisition electronics.
Connecter angle Information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters:

- DC Voltage Measurement: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the instrument in the respective range.
- Connecter angle: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The report provide only calibration results for DME, it does not contain other performance test results.

Certificate No: Z/1-8/141

2000

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CAUTION LABORATORY

100, No. 1, Kuanlin Rd., Madan District, Chiayi, R.O.C., China
 Tel: +86-937-945112/1231 Fax: +86-937-945111/1129
 E-mail: info@ttnai.com.tw URL: <http://www.ttnai.com.tw>

DC Voltage Measurement
 (AC - Convert to Rectified Voltage)
 High Range: 0.5V ~ 1.2V, Full range: ±10 ~ ±50V (4)
 Low Range: 0.05V ~ 0.19V, Full range: ±1 ~ ±30V
 DART System can accommodate up to 20 DART T181-1 Unit. Measuring time: 3 sec

Continuity / Resistance	X	Y	Z
High Range	405.327 ± 0.15% (4x2)	4.04.385 ± 0.15% (4x2)	404.218 ± 0.12% (4x2)
Low Range	3.88126 ± 0.1% (4x2)	3.08771 ± 0.1% (4x2)	3.81618 ± 0.1% (4x2)

Connector Angle

Connector Angle (to be used in DART system)	7.95° ± 1°
---	------------

Check Issue No. ZTT-07147

Figure 13.18 (continued)

DAE4 Sn:720

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CALIBRATION LABORATORY

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CALIBRATION
CNAS L6576

Address: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-42394633-228 Fax: +86-10-42394633-229
E-mail: csl@speaq.com.cn Http://www.speaq.com.cn

Client: **SRTC** Certificate No: **Z17-97215**

CALIBRATION CERTIFICATE

Object: **DAE4 - SN: 720**

Calibration Procedure(s): **FF-Z11-002-Q1
Calibration Procedure for the Data Acquisition Electronics (DAEx)**

Calibration date: **October 24, 2017**

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(23±2)°C and humidity<70%.

Calibration Equipment used (M&E critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Process Calibrator 753	18710-8	27-Jun-17 (CTTL, No.J17X05665)	June-18

Calibrated by: **Yu Zongying** SAR Test Engineer *[Signature]*

Reviewed by: **Lin Hao** SAR Test Engineer *[Signature]*

Approved by: **Qi Danyuan** SAR Project Leader *[Signature]*

Issued: October 26, 2017

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Certificate No: Z17-97215

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CALIBRATION LABORATORY

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CALIBRATION
CNAS L6576

Address: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-42394633-228 Fax: +86-10-42394633-229
E-mail: csl@speaq.com.cn Http://www.speaq.com.cn

Glossary:
DAE: data acquisition electronics
Connector angle: information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters:

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The report provide only calibration results for DAE, it does not contain other performance test results.

Certificate No: Z17-97215

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Address: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-42394633-228 Fax: +86-10-42394633-229
E-mail: csl@speaq.com.cn Http://www.speaq.com.cn

DC Voltage Measurement
A/D - Converter Resolution nominal
High Range: 1LSB = 6.1μV, full range = -100...+300 mV
Low Range: 1LSB = 61nV, full range = -1...+3mV
DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	403.363 ± 0.15% (k=2)	404.822 ± 0.15% (k=2)	403.251 ± 0.15% (k=2)
Low Range	3.95425 ± 0.7% (k=2)	3.96301 ± 0.7% (k=2)	3.95640 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	24.5° ± 1°
---	------------

Certificate No: Z17-97215

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ES3DV3 Sn:3127

TTL Calibration Laboratory
Add: No. 11, Xueyuan Road, Beijing 100081, China
Tel: +86-10-57996183 Fax: +86-10-57996388
E-mail: srtc@163.com

CNAN
中国合格评定国家认可委员会
CALIBRATION LABORATORY

Client: **SRTC** Certificate No.: **Z17-07142**

CALIBRATION CERTIFICATE

Object: **ES3DV3 - SN:3127**

Calibration Procedure(s): **TT-Z17-004-01**
Definition: Procedures for Dielectric G-Ratio Probe.

Calibration date: **October 11, 2017**

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurement (SI). The measurement and the uncertainty with confidence probability are given in the following pages and are not of the certificate.

All calibrations have been conducted in the clean laboratory facility, environmental temperature (20±2)°C and humidity (45±5)%.

Calibration Equipment used (MSTC critical for calibration)

Primary Standards	ID#	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Power Meter: N42P	101019	27-Jun-17 (CITL No. 17005897)	Jun-18
Power sensor: N42P-P1	101047	27-Jun-17 (CITL No. 17005897)	Jun-18
Power sensor: N42P-P1	101048	27-Jun-17 (CITL No. 17005897)	Jun-18
Reference 10dB Attenuator	180306-10dB	15-Mar-18 (CITL No. 18031647)	Mar-18
Reference 10dB Attenuator	180306-20dB	15-Mar-18 (CITL No. 18031647)	Mar-18
Reference Probe ES3DV3	SN 7433	25-Oct-18 (SN 616 No. 18057433_0618)	Oct-19
Probe	SN 545	13-Oct-18 (SN 616 No. 18054442_0618)	Oct-19

Secondary Standards

ID#	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Signal Generator 8331052006	27-Jun-17 (CITL No. 17005897)	Jun-18
Network Analyzer 833110	10-Jun-17 (CITL No. 17005897)	Jun-18

Calibrated by: **Yu Zangyong** SRTC Test Engineer

Reviewed by: **Li Hui** SRTC Test Engineer

Approved by: **Guo Shuyuan** SRTC Project Leader

Issued: October 12, 2017

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

Certificate No: Z17-07142

Page 1 of 12

TTL Calibration Laboratory
Add: No. 11, Xueyuan Road, Beijing 100081, China
Tel: +86-10-57996183 Fax: +86-10-57996388
E-mail: srtc@163.com

CNAN
中国合格评定国家认可委员会
CALIBRATION LABORATORY

Client: **SRTC** Certificate No.: **Z17-07142**

CALIBRATION CERTIFICATE

Object: **ES3DV3 - SN:3127**

Calibration Procedure(s): **TT-Z17-004-01**
Definition: Procedures for Dielectric G-Ratio Probe.

Calibration date: **October 11, 2017**

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurement (SI). The measurement and the uncertainty with confidence probability are given in the following pages and are not of the certificate.

All calibrations have been conducted in the clean laboratory facility, environmental temperature (20±2)°C and humidity (45±5)%.

Calibration Equipment used (MSTC critical for calibration)

Primary Standards	ID#	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Power Meter: N42P	101019	27-Jun-17 (CITL No. 17005897)	Jun-18
Power sensor: N42P-P1	101047	27-Jun-17 (CITL No. 17005897)	Jun-18
Power sensor: N42P-P1	101048	27-Jun-17 (CITL No. 17005897)	Jun-18
Reference 10dB Attenuator	180306-10dB	15-Mar-18 (CITL No. 18031647)	Mar-18
Reference 10dB Attenuator	180306-20dB	15-Mar-18 (CITL No. 18031647)	Mar-18
Reference Probe ES3DV3	SN 7433	25-Oct-18 (SN 616 No. 18057433_0618)	Oct-19
Probe	SN 545	13-Oct-18 (SN 616 No. 18054442_0618)	Oct-19

Secondary Standards

ID#	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Signal Generator 8331052006	27-Jun-17 (CITL No. 17005897)	Jun-18
Network Analyzer 833110	10-Jun-17 (CITL No. 17005897)	Jun-18

Calibrated by: **Yu Zangyong** SRTC Test Engineer

Reviewed by: **Li Hui** SRTC Test Engineer

Approved by: **Guo Shuyuan** SRTC Project Leader

Issued: October 12, 2017

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Probe ES3DV3

SN: 3127

Calibrated: October 11, 2017

Calibrated for DASY/EASY Systems
(Note: not compatible with DASY7 system)

Certificate No: Z17-07142

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DASY/EASY - Parameters of Probe: ES3DV3 - SN: 3127

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm [uV/Vm] ^{1/2}	1.98	1.20	1.23	+10.0%
DCP [mV]	119.2	125.3	120.1	

Modulation Calibration Parameters

USB	Communication System Name	A dB	B dB	C	D dB	VW dB	Unc (k=2)
0	OW	0.0	0.0	1.0	0.0	282.8	+2.5%
		0.0	0.0	1.0		282.9	
		0.0	0.0	1.0		279.1	

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%).

¹ The uncertainty of Norm X, Y, Z do not affect the 2.5% uncertainty inside 180, see Page 5 and Page 6.
² Numerical interpolation parameter, uncertainty not required.
³ Uncertainty is determined using the mean deviation from linear response, assuming rectangular distribution and is expressed in the square of the field value.

Certificate No: Z17-07142

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ES3DV3 Sn:3127



DASY/EASY – Parameters of Probe: ES3DV3 - SN: 3127

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Relative Permittivity ¹⁾	Conductivity [S/m] ²⁾	CorrF X	CorrF Y	CorrF Z	Alpha ³⁾	Depth [mm]	Unc. [k=2]
750	41.0	0.89	8.29	8.29	6.20	1.93	1.20	±12.1%
900	41.0	0.97	8.15	8.15	6.11	0.37	1.60	±12.1%
1010	40.0	1.40	5.05	5.06	5.05	0.07	1.28	±12.1%
2300	40.0	1.40	5.89	5.89	4.88	0.07	1.23	±12.1%
2300	39.2	1.67	4.71	4.71	4.71	0.90	1.05	±12.1%
2422	39.2	1.80	4.56	4.56	4.68	0.90	1.13	±12.1%
2500	39.0	1.58	4.52	4.52	4.52	0.60	1.39	±12.1%

¹⁾ Frequency validity above 100 MHz and 100MHz to 200 MHz for ES3DV3 and higher (Page 71, also 8) is restricted to ±0.0040. The uncertainty is the RMS of CorrF, uncertainty at resonance frequency is at 0.0000 uncertainty for the indicated frequency band. Frequency validity below 100 MHz is ±0.25, 43, 90 and 180 MHz for ES3DV3 measurements at 30, 64, 128, 256 and 512 MHz respectively. Above 5.040 frequency validity can be extended to a 110 MHz.

²⁾ At frequencies below 5 GHz, the validity of tissue parameters is verified; results released is ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 5 GHz, the validity of tissue parameters is also at ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 5 GHz, the validity of tissue parameters is also at ±10% if liquid compensation formula is applied to measured SAR values.

³⁾ Alpha/Delta are determined during calibration. SAR/DASD measurements that the resulting deviation due to the boundary effect after compensation is always less than ±1% for frequencies below 2 GHz and below ±2% for the frequencies between 2-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Certificate No: Z1747142

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DASY/EASY – Parameters of Probe: ES3DV3 - SN: 3127

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Relative Permittivity ¹⁾	Conductivity [S/m] ²⁾	CorrF X	CorrF Y	CorrF Z	Alpha ³⁾	Depth [mm]	Unc. [k=2]
750	55.5	0.98	6.10	6.10	6.10	0.46	1.45	±12.1%
900	59.0	1.08	6.06	6.06	6.06	0.46	1.48	±12.1%
1010	59.3	1.52	4.60	4.60	4.60	0.65	1.29	±12.1%
2000	59.3	1.52	4.60	4.60	4.60	0.44	1.00	±12.1%
2200	59.8	1.81	4.43	4.43	4.43	0.61	1.16	±12.1%
2400	59.7	1.88	4.28	4.28	4.28	0.72	1.04	±12.1%
2500	59.0	2.35	4.07	4.07	4.07	0.50	1.12	±12.1%

¹⁾ Frequency validity above 100 MHz and 100MHz to 200 MHz for ES3DV3 and higher (Page 71, also 8) is restricted to ±0.0040. The uncertainty is the RMS of CorrF, uncertainty at resonance frequency is at 0.0000 uncertainty for the indicated frequency band. Frequency validity below 100 MHz is ±0.25, 43, 90 and 180 MHz for ES3DV3 measurements at 30, 64, 128, 256 and 512 MHz respectively. Above 5.040 frequency validity can be extended to a 110 MHz.

²⁾ At frequencies below 5 GHz, the validity of tissue parameters is verified; results released is ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 5 GHz, the validity of tissue parameters is also at ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 5 GHz, the validity of tissue parameters is also at ±10% if liquid compensation formula is applied to measured SAR values.

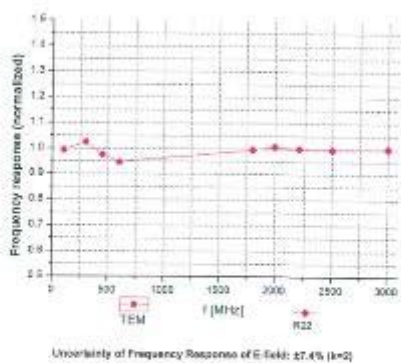
³⁾ Alpha/Delta are determined during calibration. SAR/DASD measurements that the resulting deviation due to the boundary effect after compensation is always less than ±1% for frequencies below 2 GHz and below ±2% for the frequencies between 2-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Certificate No: Z1747142

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Frequency Response of E-Field (TEM-Cell: 10110 EXX, Waveguide: R22)

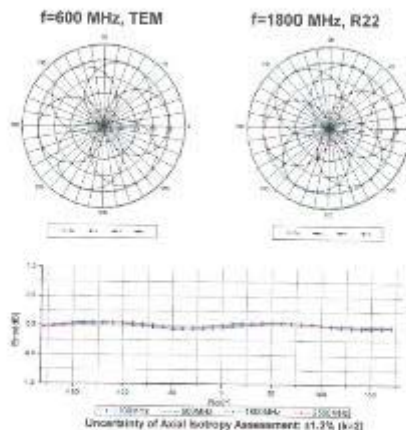


Certificate No: Z1747142

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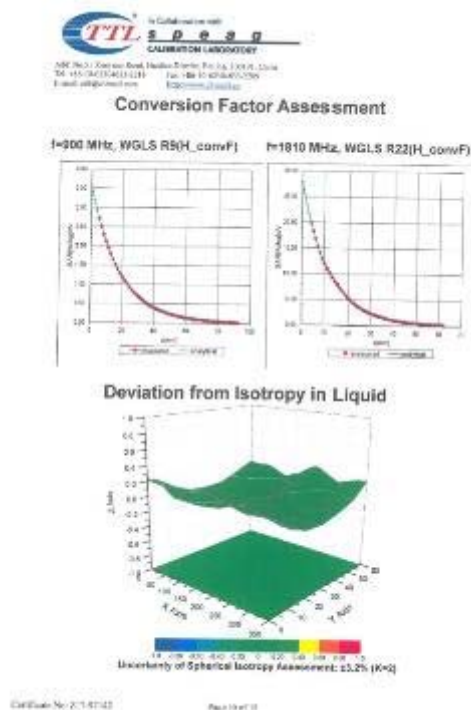
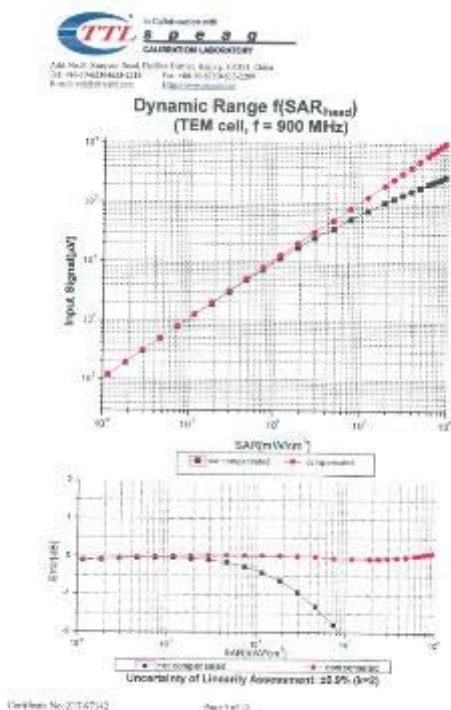
Receiving Pattern (Φ, θ=0°)



Certificate No: Z1747142

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ES3DV3 Sn:3127



DASY/EASY – Parameters of Probe: ES3DV3 - SN: 3127

Other Probe Parameters	
Sensor Arrangement	Triangular
Connector Angle (°)	166.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	4mm
Probe Tip to Sensor X Calibration Point	2mm
Probe Tip to Sensor Y Calibration Point	2mm
Probe Tip to Sensor Z Calibration Point	2mm
Recommended Measurement Distance from Surface	2mm

Certificate No: ZC1747142 Page 13 of 12

Appendix: Modulation Calibration Parameters

UID	Communication System Name	PAR	A dB	B dB	C dB	NR mV	Line ¹ (k=2)
8	QW	2.00	X: 2.0 2.0 2.0	Y: 2.0 2.0 2.0	Z: 2.0 2.0 2.0	282.3	±0.3%
10E12	IEEE 802.11a WLAN 2.4 GHz (QSSS, 1 Mbps)	1.83	X: 2.77 68.32 16.45	Y: 2.75 68.35 16.32	Z: 2.71 67.30 16.25	143.0	±0.8%
10100	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	5.07	X: 6.15 66.4 18.07	Y: 6.15 66.49 18.16	Z: 6.09 66.32 18.06	140.4	±0.5%
10108	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	5.00	X: 6.00 66.24 18.07	Y: 6.10 66.33 18.15	Z: 6.05 66.16 18.05	139.3	±0.3%
10456	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	5.75	X: 5.81 65.85 18.00	Y: 5.82 65.82 18.01	Z: 5.79 65.84 18.01	135.7	±0.5%
10160	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	5.75	X: 4.81 65.95 18.28	Y: 4.82 65.98 18.37	Z: 4.80 66.00 18.24	131.3	±0.3%
10175	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	5.71	X: 4.85 66.14 18.41	Y: 4.87 66.08 18.35	Z: 4.79 66.02 18.29	131.6	±0.5%
10287	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	5.81	X: 5.15 65.61 18.42	Y: 5.13 65.41 18.26	Z: 5.14 65.52 18.11	129.5	±0.5%

Certificate No: ZC1747142 Page 14 of 12

EX3DV4 Sn:3708

TTL Calibration Laboratory
In Collaboration with
CNAS
Add: No. 31 Xuyuan Road, Baifu District, Beijing, 100191, China
Tel: +86-10-42304633-2218 Fax: +86-10-42304633-2209
E-mail: cti@ttll.com.cn http://www.ttll.com.cn

Client: **SRTC** Certificate No: **Z17-97214**

CALIBRATION CERTIFICATE

Object: **EX3DV4 - SN:3708**

Calibration Procedure(s): **FF-Z11-004-01**
Calibration Procedures for Dosimetric E-field Probe

Calibration date: **November 07, 2017**

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(23±1)°C and humidity<70%.

Calibration Equipment used (MATE critical for calibration)

Primary Standards	ID #	Cal Date/Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter	NRP2	101919 27-Jun-17 (CTTL No.J17X05857)	Jun-18
Power sensor	NRP-Z91	101547 27-Jun-17 (CTTL No.J17X05857)	Jun-18
Power sensor	NRP-Z91	101548 27-Jun-17 (CTTL No.J17X05857)	Jun-18
Reference 10dB Attenuator	18N5RW-10dB	13-Mar-16 (CTTL No.J16X01547)	Mar-18
Reference 20dB Attenuator	18N5RW-20dB	13-Mar-16 (CTTL No.J16X01548)	Mar-18
Reference Probe EX3DV4	SN 3617	23-Jan-17 (SPEAG, No EX3-3617_Jan17)	Jan-18
DAE4	SN 549	13-Dec-16 (SPEAG, No DAE4-549_Dec16)	Dec-17

Secondary Standards	ID #	Cal Date/Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator MG370DA	620102805	27-Jun-17 (CTTL No.J17X05856)	Jun-18
Network Analyzer E5071C	MY48110673	13-Jan-17 (CTTL No.J17X02085)	Jan-18

Calibrated by: **Yu Zongying** SAR Test Engineer

Reviewed by: **Lin Hai** SAR Test Engineer

Approved by: **Qi Diaryuan** SAR Project Leader

Issued: November 06, 2017

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Certificate No: Z17-97214

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Glossary:

TSL: tissue simulating liquid
NORM_{x,y,z}: sensitivity in free space
ConvF: sensitivity in TSL / NORM_{x,y,z}
DCP: diode compression point
CF: crest factor (1/duty_cycle) of the RF signal
A,B,C,D: modulation dependent linearization parameters
Polarization @: rotation around probe axis
Polarization @: rotation around an axis that is in the plane normal to probe axis (at measurement center, i
@=0 is normal to probe axis
Connector Angle: information used in DASY system to align probe sensor X to the robot coordinate system

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 the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2016
d) K2B 855664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}: Assessed for E-field polarization @=0 (for 300MHz to 1.8GHz) in TEM-cell; >1800MHz: waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E^2 field uncertainty inside TSL (see below ConvF).
- NORM_{x,y,z} = NORM_{x,y,z} * Frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.3. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- A_{x,y,z}, B_{x,y,z}, C_{x,y,z}, V₀, x₀, y₀, z₀, A₀, B₀, C₀ are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f>300MHz) and inside waveguide using analytical field distributions based on power measurements for f>300MHz. The same setups are used for assessment of the parameters applied for boundary compensation (shape, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from 50MHz to 100MHz.
- Spherical isotropy (3D deviation from isotropy): in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle: The angle is assessed using the information gained by determining the NORM_{x,y,z} (no uncertainty required).

Certificate No: Z17-97214

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Probe EX3DV4

SN: 3708

Calibrated: November 07, 2017
Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system)

Certificate No: Z17-97214

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DASY/EASY - Parameters of Probe: EX3DV4 - SN: 3708

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ₀ (V/m) ^A	0.19	0.36	0.44	±10.0%
DCP(mV) ^B	95.1	102.7	105.5	

Modulation Calibration Parameters

UID	Communication System Name	A dB	B dB/μV	C dB	D dB	VR mV	Unc ^C (k=2)
0	CW	X 0.0	0.0	1.0	0.00	95.9	±3.1%
		Y 0.0	0.0	1.0		149.0	
		Z 0.0	0.0	1.0		169.4	

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%.

^A The uncertainties of Norm₀ X, Y, Z do not affect the E^2 field uncertainty inside TSL (see Page 6 and Page 9).
^B Numerical linearization parameter: uncertainty not required.
^C Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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EX3DV4 Sn:3708



DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3708

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Relative Permittivity ¹	Conductivity [S/m]	ConvF X	ConvF Y	ConvF Z	Alpha ²	Depth ³ (mm)	Uncert. (k=2)
900	41.5	0.97	9.07	9.07	9.07	0.15	1.37	±12.1%
1810	40.0	1.40	7.77	7.77	7.77	0.24	1.04	±12.1%
2000	40.0	1.40	7.80	7.80	7.80	0.28	0.88	±12.1%
2450	39.2	1.80	7.19	7.19	7.19	0.34	1.03	±12.1%
5200	36.0	4.66	5.64	5.64	5.64	0.40	1.35	±13.3%
5300	35.9	4.76	5.43	5.43	5.43	0.40	1.35	±13.3%
5500	35.6	4.96	5.03	5.03	5.03	0.40	1.50	±13.3%
5600	35.5	5.07	4.89	4.89	4.89	0.40	1.60	±13.3%
5800	35.3	5.27	5.03	5.03	5.03	0.45	1.45	±13.3%

¹ Frequency validity above 300 MHz of a 100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ±10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ±110 MHz.

² At frequency below 3 GHz, the validity of tissue parameters (α and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (α and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

³ Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ±1% for frequencies below 3 GHz and below ±2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3708

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Relative Permittivity ¹	Conductivity [S/m]	ConvF X	ConvF Y	ConvF Z	Alpha ²	Depth ³ (mm)	Uncert. (k=2)
900	56.0	1.05	9.18	9.16	9.16	0.17	1.40	±12.1%
1810	53.3	1.52	7.70	7.70	7.70	0.20	1.13	±12.1%
2000	53.3	1.52	7.76	7.76	7.76	0.14	1.60	±12.1%
2450	52.7	1.95	7.30	7.30	7.30	0.66	0.70	±12.1%
5200	49.0	5.30	4.79	4.79	4.79	0.45	1.80	±13.3%
5300	48.9	5.42	4.56	4.56	4.56	0.45	1.80	±13.3%
5500	48.6	5.65	4.17	4.17	4.17	0.50	1.75	±13.3%
5600	48.5	5.77	4.10	4.10	4.10	0.50	1.60	±13.3%
5800	48.2	6.00	4.19	4.19	4.19	0.55	1.85	±13.3%

¹ Frequency validity above 300 MHz of a 100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ±10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ±110 MHz.

² At frequency below 3 GHz, the validity of tissue parameters (α and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (α and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

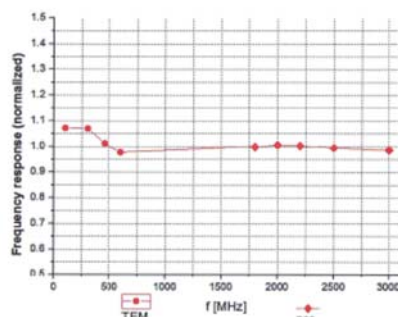
³ Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ±1% for frequencies below 3 GHz and below ±2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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Frequency Response of E-Field (TEM-Cell: IF110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.4% (k=2)

Certificate No: Z17-97214

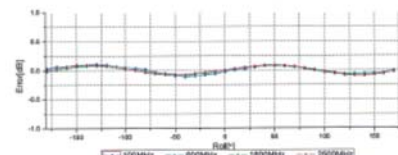
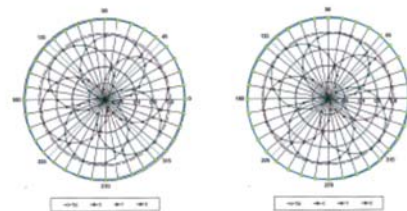
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Receiving Pattern (Φ, θ=0°)

f=600 MHz, TEM

f=1800 MHz, R22

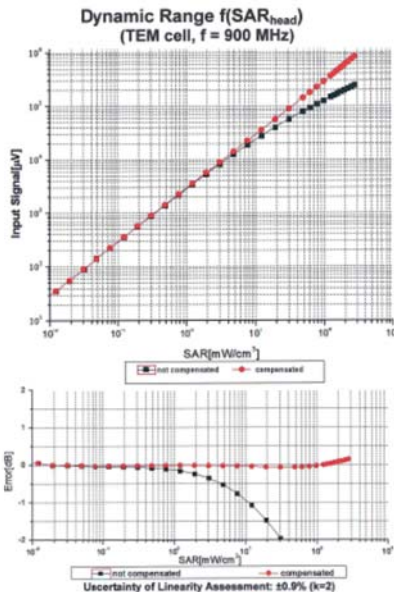


Uncertainty of Axial Isotropy Assessment: ±1.2% (k=2)

Certificate No: Z17-97214

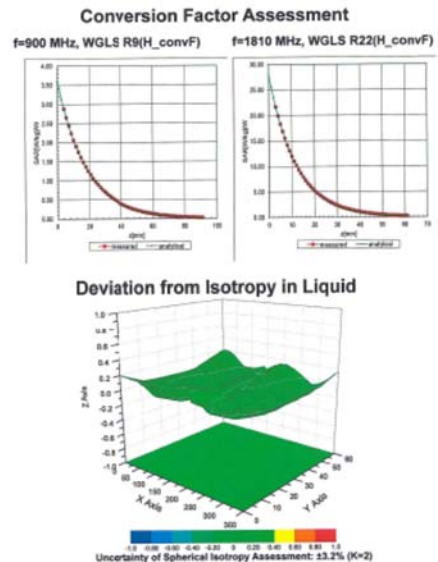
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EX3DV4 Sn:3708



Certificate No: Z17-97214

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Certificate No: Z17-97214

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3708

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	177.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

Certificate No: Z17-97214

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Appendix (Additional assessments outside the scope of FCC approved dual-logo scope)

Modulation Calibration Parameters

UID	Communication System Name	PAR	A	B	C	VR	Unc [†]
0	CW	0.00	X 0.0 0.0 1.0 95.9	Y 0.0 0.0 1.0 149.0	Z 0.0 0.0 1.0 169.4		±3.1%
10011	UMTS-FDD (WCDMA)	2.91	X 2.97 64.29 16.82 147.4	Y 3.15 66.44 17.98 144.1	Z 3.21 67.23 18.44 141.7		±1.8%
10021	GSM-FDD (TDMA GMSK)	9.39	X 0.95 57.62 9.60 48.2	Y 1.22 59.57 9.93 44.1	Z 1.13 59.66 9.94 43.4		±2.4%
10062	IEEE 802.11a/b WIF 5 GHz (OFDM 6 Mbps)	8.68	X 9.01 65.22 19.38 92.1	Y 8.26 63.95 18.73 71.9	Z 8.53 64.77 19.13 85.3		±2.1%

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D750V3 Sn:1101

TTL CALIBRATION LABORATORY
In Collaboration with
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中国合格评定国家认可委员会

Client: SRTC Certificate No: 217-67134

CALIBRATION CERTIFICATE

Object: D750V3-SN:1101

Calibration Procedure(s): PT-011-002-01
Defender Procedures for specific calibration item

Calibration date: September 12, 2017

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

All operations have been conducted in the stated laboratory facility, environment temperature (23°C), and humidity (70%).

Calibration Equipment used (MPE criteria for calibration)

Primary Standards	ID#	Cal Date/Calibrated by: Certificate No. ()	Scheduled Calibration
Power Meter: NRPV2	109108	22-Mar-17 (CITL No. 21701344)	Mar-18
Power source: NRPV2	109108	22-Mar-17 (CITL No. 21701344)	Mar-18
Reference Power: RPS200	8511433	20-Sep-16 (SPTL No. 21701344_Sep16)	May-17
ISN#4	8511433	19-Jun-17 (CITL No. 21701344)	Jun-18

Reference Standards	ID#	Cal Date/Calibrated by: Certificate No. ()	Scheduled Calibration
Signal Generator: S418C	8514031001	19-Jun-17 (CITL No. 21701344)	Jun-18
Network Analyzer: S207C	8514031001	19-Jun-17 (CITL No. 21701344)	Jun-18

Calibrated by: Name: Zhen Jiang Function: SAR Test Engineer Signature: [Signature]

Reviewed by: No Copying Function: SAR Test Engineer Signature: [Signature]

Approved by: Qi Chenyuan Function: SAR Project Leader Signature: [Signature]

Issued: September 15, 2017

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Certificate No: 217-67134

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Object: D750V3-SN:1101

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Power source: NRPV2	109108	22-Mar-17 (CITL No. 21701344)	Mar-18
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Calibrated by: Name: Zhen Jiang Function: SAR Test Engineer Signature: [Signature]

Reviewed by: No Copying Function: SAR Test Engineer Signature: [Signature]

Approved by: Qi Chenyuan Function: SAR Project Leader Signature: [Signature]

Issued: September 15, 2017

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Calibrated by: Name: Zhen Jiang Function: SAR Test Engineer Signature: [Signature]

Reviewed by: No Copying Function: SAR Test Engineer Signature: [Signature]

Approved by: Qi Chenyuan Function: SAR Project Leader Signature: [Signature]

Issued: September 15, 2017

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Reviewed by: No Copying Function: SAR Test Engineer Signature: [Signature]

Approved by: Qi Chenyuan Function: SAR Project Leader Signature: [Signature]

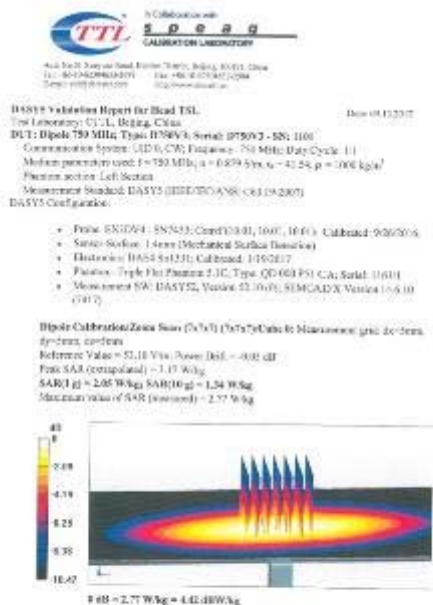
Issued: September 15, 2017

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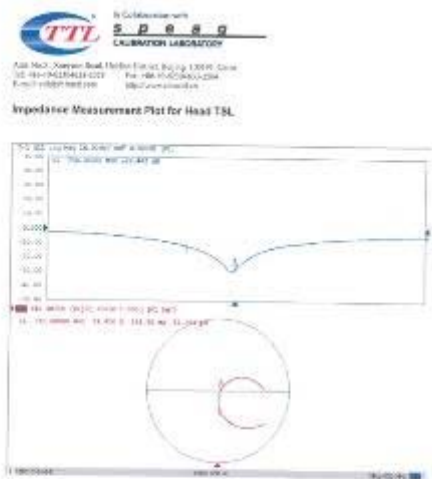
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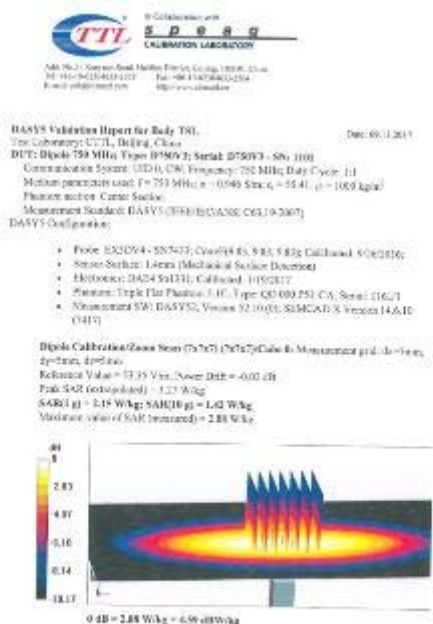
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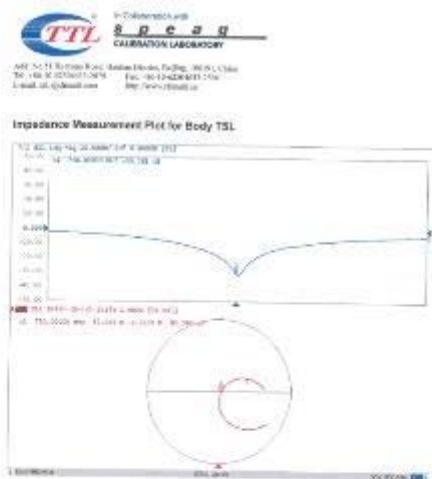
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Certificate No: Z1707124

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D835V2 Sn:4d023

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CALIBRATION CERTIFICATE

Client: SRTC Certificate No.: Z17-01136

Calibration Certificate No.: D835V2-Sn:4d023

Calibration Procedure: FF 211 (05.01)
Calibration date: September 13, 2017

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurement (SI). The measurement and the associated self-confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the stated laboratory facility environment (temperature/humidity) and humidity (70%).

Calibration Equipment used (MUTUAL for calibration)

Primary Standards	Calibrated by Certificate No.	Calibration Date
Power Meter: N9910C	122186	02 Mar 17 (TTL No. 1701254)
Power source: N9910C	02 Mar 17 (TTL No. 1701254)	Mar 16
Reference Pulse: EX3024	01 Jul 16	20 Mar 16 (TTL No. 1601254)
SWR	01 Jul 16	20 Mar 16 (TTL No. 1601254)

Secondary Standards

Calibrated by Certificate No.	Calibration Date
Signal Generator: G4400	13 Jan 17 (TTL No. 1701254)
Reference Antenna: G4400	13 Jan 17 (TTL No. 1701254)

Calibrated by: Zhao Jing, SRTC Test Engineer

Reviewed by: Yu Zongyong, SRTC Test Engineer

Approved by: Qi Danyuan, SRTC Project Leader

Issued: September 13, 2017

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Certificate No.: Z17-01136 Page 1 of 3

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CALIBRATION CERTIFICATE

Client: SRTC Certificate No.: Z17-01136

Calibration Certificate No.: D835V2-Sn:4d023

Calibration Procedure: FF 211 (05.01)
Calibration date: September 13, 2017

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurement (SI). The measurement and the associated self-confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the stated laboratory facility environment (temperature/humidity) and humidity (70%).

Calibration Equipment used (MUTUAL for calibration)

Primary Standards	Calibrated by Certificate No.	Calibration Date
Power Meter: N9910C	122186	02 Mar 17 (TTL No. 1701254)
Power source: N9910C	02 Mar 17 (TTL No. 1701254)	Mar 16
Reference Pulse: EX3024	01 Jul 16	20 Mar 16 (TTL No. 1601254)
SWR	01 Jul 16	20 Mar 16 (TTL No. 1601254)

Secondary Standards

Calibrated by Certificate No.	Calibration Date
Signal Generator: G4400	13 Jan 17 (TTL No. 1701254)
Reference Antenna: G4400	13 Jan 17 (TTL No. 1701254)

Calibrated by: Zhao Jing, SRTC Test Engineer

Reviewed by: Yu Zongyong, SRTC Test Engineer

Approved by: Qi Danyuan, SRTC Project Leader

Issued: September 13, 2017

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Calibration Certificate No.: D835V2-Sn:4d023

Calibration Procedure: FF 211 (05.01)
Calibration date: September 13, 2017

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurement (SI). The measurement and the associated self-confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the stated laboratory facility environment (temperature/humidity) and humidity (70%).

Calibration Equipment used (MUTUAL for calibration)

Primary Standards	Calibrated by Certificate No.	Calibration Date
Power Meter: N9910C	122186	02 Mar 17 (TTL No. 1701254)
Power source: N9910C	02 Mar 17 (TTL No. 1701254)	Mar 16
Reference Pulse: EX3024	01 Jul 16	20 Mar 16 (TTL No. 1601254)
SWR	01 Jul 16	20 Mar 16 (TTL No. 1601254)

Secondary Standards

Calibrated by Certificate No.	Calibration Date
Signal Generator: G4400	13 Jan 17 (TTL No. 1701254)
Reference Antenna: G4400	13 Jan 17 (TTL No. 1701254)

Calibrated by: Zhao Jing, SRTC Test Engineer

Reviewed by: Yu Zongyong, SRTC Test Engineer

Approved by: Qi Danyuan, SRTC Project Leader

Issued: September 13, 2017

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Certificate No.: Z17-01136 Page 3 of 3

TTL Calibration Laboratory
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CNAS
CALIBRATION CERTIFICATE

Client: SRTC Certificate No.: Z17-01136

Calibration Certificate No.: D835V2-Sn:4d023

Calibration Procedure: FF 211 (05.01)
Calibration date: September 13, 2017

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurement (SI). The measurement and the associated self-confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the stated laboratory facility environment (temperature/humidity) and humidity (70%).

Calibration Equipment used (MUTUAL for calibration)

Primary Standards	Calibrated by Certificate No.	Calibration Date
Power Meter: N9910C	122186	02 Mar 17 (TTL No. 1701254)
Power source: N9910C	02 Mar 17 (TTL No. 1701254)	Mar 16
Reference Pulse: EX3024	01 Jul 16	20 Mar 16 (TTL No. 1601254)
SWR	01 Jul 16	20 Mar 16 (TTL No. 1601254)

Secondary Standards

Calibrated by Certificate No.	Calibration Date
Signal Generator: G4400	13 Jan 17 (TTL No. 1701254)
Reference Antenna: G4400	13 Jan 17 (TTL No. 1701254)

Calibrated by: Zhao Jing, SRTC Test Engineer

Reviewed by: Yu Zongyong, SRTC Test Engineer

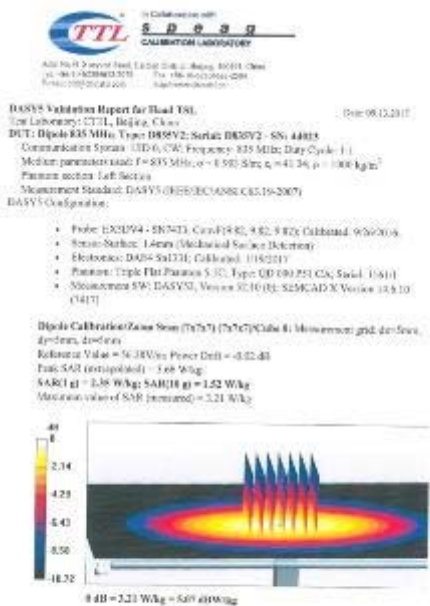
Approved by: Qi Danyuan, SRTC Project Leader

Issued: September 13, 2017

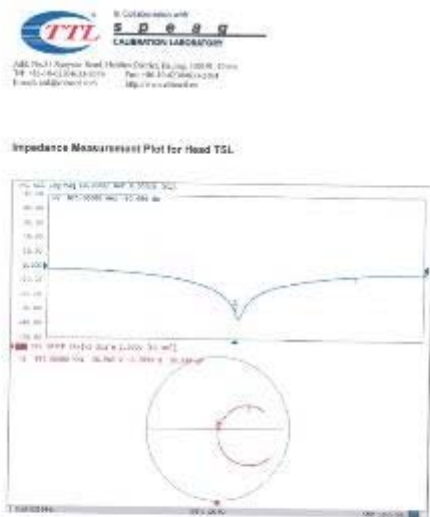
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Certificate No.: Z17-01136 Page 4 of 3

D835V2 Sn:4d023



Certification No. Z1740118 Page 1 of 8



D1800V2 Sn:2d084

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Client: SRTC **Certificate No.: Z17-07138**

CALIBRATION CERTIFICATE

Client: D1800V2 - 0102004

Calibration Model and No.: PP-Z17-001-01
Calibration Procedure for dipole calibration kit

Calibration date: September 18, 2017

This calibration Certificate documents the conformity to national standards, which enables the physical value in measurement results. The measurement and the uncertainty with coverage probability are given in the following pages and are part of the certificate.

All calibrations have been conducted in the stated laboratory facility, environment, atmosphere and under normality.

Calibration Equipment used (NIST traceable for calibration):

Primary Standards	SI#	Cal Date/Calibrated By: Certificate No.1	Scheduled Calibration
Power Meter: N9197	100108	30-Mar-17 (JCTL, No. J170110140)	Mar-18
Power sensor: N9197-231	100006	30-Mar-17 (JCTL, No. J170110140)	Mar-18
Reference Probe: P3000M	SM7435	26-Sep-16 (SPTA, No. 163-1033, Exp15)	Sep-17
OMG	SM1331	19-Jan-17 (JCTL, SPTA, No. 217-07015)	Jan-18

Secondary Standards	SI#	Cal Date/Calibrated By: Certificate No.1	Scheduled Calibration
Signal Generator: S4430C	N91971528	13-Jun-17 (JCTL, No. J170303305)	Jun-18
Network Analyzer: E5071C	N91971528	13-Jun-17 (JCTL, No. J170303305)	Jun-18

Calibrated by: Name: Zhang Jie, Function: SAR Test Engineer, Signature: [Signature]

Reviewed by: Yu Zhenping, SAR Test Engineer, Signature: [Signature]

Approved by: G. Danyuan, SAR Project Leader, Signature: [Signature]

Issued: September 18, 2017

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Continue See Z17-07138

Page 1 of 4

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http://www.ttslab.com.cn

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 60528-1, Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 30MHz to 2GHz), February 2005
- 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 2GHz), March 2010
- d) IEC 62209-2, SAR Measurement Requirements for 100 MHz to 2 GHz

Additional Documentation:

- a) DAS445 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Variation 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 space to position its feed point exactly below the center marking of the flat phantom section, with the antenna 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 shown is transformed from the measurement of the SMA connector to the feed point. The Return Loss shows a low reflected power. No uncertainty required.
- Electrical Delay: Consistency check between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured SAR: SAR measured at the stated antenna input power.
- SAR normalized SAR: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for normal TSL parameters: The measured TSL parameters are used to calculate the normal 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%.

Continue See Z17-07138

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Measurement Conditions

DASY 4000, DASY 4000S, SAR 1A, No. 101000000

Parameter	Value	Unit
Antenna Type	DASY 4000	101000000
Antenna Connector	Advanced Connector	
Phantom	Trilex Flat Phantom & TSL	
Distance Dipole Center - TSL	10 mm	mm
Zone Scan Resolution	10 mm x 10 mm	mm
Frequency	1800 MHz ± 1 MHz	MHz

Head TSL parameters

The following parameters and uncertainties apply:

Parameter	Value	Unit
Head TSL parameters	20.0 °C	°C
Measured Head TSL parameters	47.0 ± 0.2 °C	°C
Head TSL temperature change during test	± 0.2 °C	°C

SAR result with Head TSL

Parameter	Value	Unit
SAR averaged over 1 cm ² of Head TSL	0.0000	W/kg
SAR measured	0.0000	W/kg
SAR for normal Head TSL parameters	0.0000	W/kg
SAR averaged over 10 cm ² of Head TSL	0.0000	W/kg
SAR measured	0.0000	W/kg
SAR for normal Head TSL parameters	0.0000	W/kg

Body TSL parameters

The following parameters and uncertainties apply:

Parameter	Value	Unit
Body TSL parameters	20.0 °C	°C
Measured Body TSL parameters	42.0 ± 0.2 °C	°C
Body TSL temperature change during test	± 0.2 °C	°C

SAR result with Body TSL

Parameter	Value	Unit
SAR averaged over 1 cm ² of Body TSL	0.0000	W/kg
SAR measured	0.0000	W/kg
SAR for normal Body TSL parameters	0.0000	W/kg
SAR averaged over 10 cm ² of Body TSL	0.0000	W/kg
SAR measured	0.0000	W/kg
SAR for normal Body TSL parameters	0.0000	W/kg

Continue See Z17-07138

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Appendix (Add) and measurements outside the scope of GNAS 180721

Antenna Parameters with Head TSL

Parameter	Value	Unit
Impedance, transformed to feed point	48.32 ± 1.00 Ω	Ω
Return Loss	20.0 dB	dB

Antenna Parameters with Body TSL

Parameter	Value	Unit
Impedance, transformed to feed point	48.32 ± 1.00 Ω	Ω
Return Loss	20.0 dB	dB

General Antenna Parameters and Design

Parameter	Value	Unit
Electrical Delay from connector	1.315 ns	ns

After being tested with 100W input power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of stainless steel wire. 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 devices, small metal tabs are added to the dipole arms in order to improve matching when used according to the position description in the Measurement Condition. The SAR values can be affected by this change. The overall dipole length is 180 mm, as specified in the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connection near the feedpoint may be damaged.

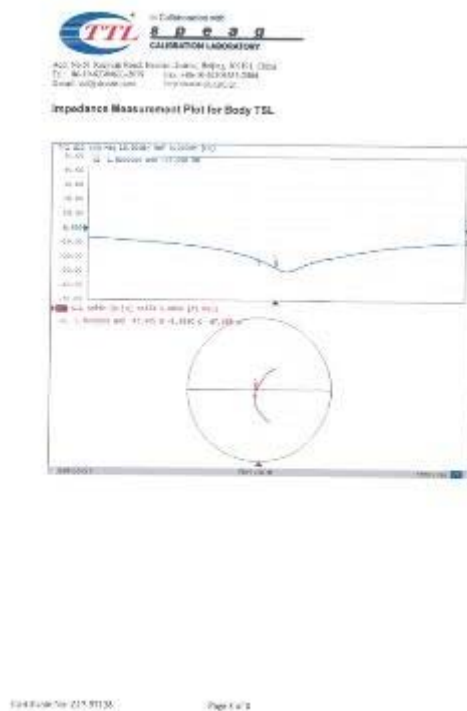
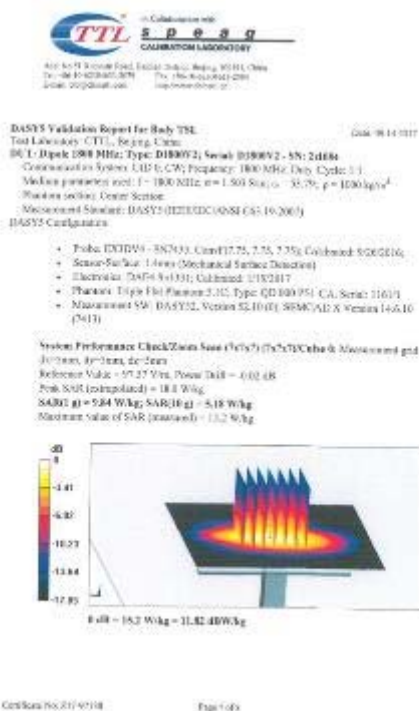
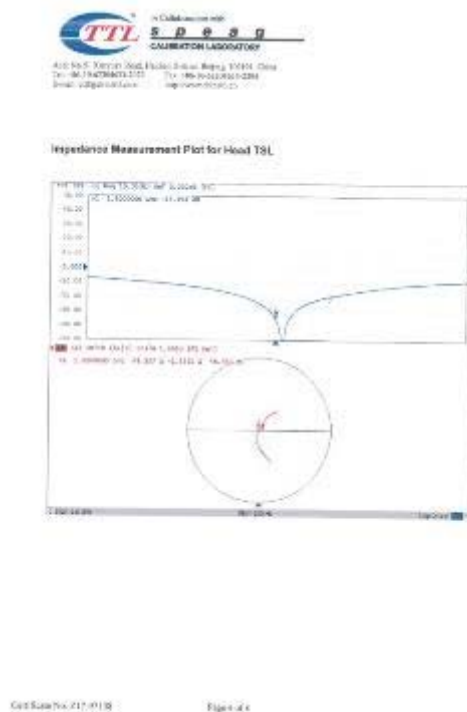
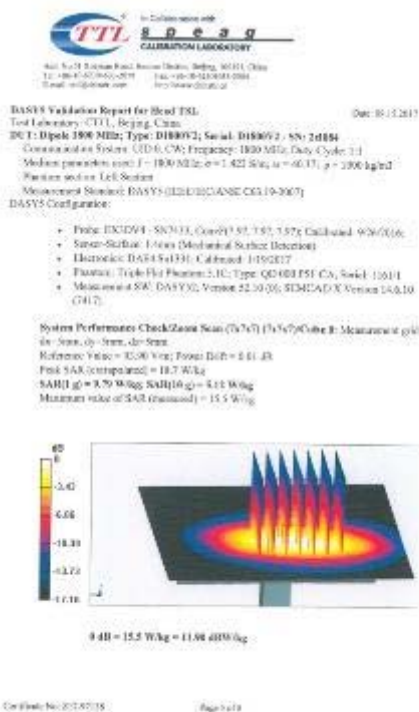
Additional EUT Data

Parameter	Value
Manufacturer	SPTA

Continue See Z17-07138

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D1800V2 Sn:2d084



D2000V2 Sn:1009

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Tel: +86-10-42304633-2079 Fax: +86-10-42304633-2504
E-mail: ctt@ttl.com.cn http://www.clttest.com

Client: **SRTC** Certificate No.: **Z18-97021**

CALIBRATION CERTIFICATE

Object: **D2000V2 - SN: 1009**

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

Calibration date: **February 1, 2018**

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(23±1)°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: NRV-D	102188	02-Mar-17 (CTTL No. J17K01254)	Mar-18
Power sensor: NRV-Z5	100569	02-Mar-17 (CTTL No. J17K01254)	Mar-18
Reference Probe: EX30V4	SN 7464	12-Sep-17 (SPEAG No. EX3-7464_Sep17)	Sep-18
DAE4	SN 1225	02-Oct-17 (SPEAG No. DAE4-1525_Oct17)	Oct-18

Secondary Standards	ID #	Cal Date/Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator: E4438C	MY49271430	23-Jan-18 (CTTL No. J18K00960)	Jan-19
Network Analyser: E5071C	MY48110673	24-Jan-18 (CTTL No. J18K00961)	Jan-19

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

Issued: February 4, 2018

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Certificate No: Z18-97021

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Client: **SRTC** Certificate No.: **Z18-97021**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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
- 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 2018
- 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 300MHz to 6GHz)", March 2010
- KD8865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- 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%.

Certificate No: Z18-97021

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E-mail: ctt@ttl.com.cn http://www.clttest.com

Measurement Conditions

SAR test configuration, as far as not given on page 1

DASY Version	DASY52	52.10.0.1448
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	2000 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 mS/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.9 ± 0.5	1.42 mS/m ± 0.5 %
Head TSL temperature change during test	<1.0 °C	—	—

SAR result with Head TSL

SAR averaged over 1 cm² (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.2 mW/g
SAR for nominal Head TSL parameters	normalized to 1W	40.3 mW/g ± 18.3 % (k=2)
SAR averaged over 10 cm² (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.17 mW/g
SAR for nominal Head TSL parameters	normalized to 1W	20.4 mW/g ± 18.7 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mS/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.8 ± 0.5	1.58 mS/m ± 0.5 %
Body TSL temperature change during test	<1.0 °C	—	—

SAR result with Body TSL

SAR averaged over 1 cm² (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 mW/g
SAR for nominal Body TSL parameters	normalized to 1W	40.3 mW/g ± 18.4 % (k=2)
SAR averaged over 10 cm² (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.18 mW/g
SAR for nominal Body TSL parameters	normalized to 1W	20.4 mW/g ± 18.7 % (k=2)

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.60 - 2.05j
Return Loss	-33.6dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.30 - 1.63j
Return Loss	-27.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.047 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 central 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

Certificate No: Z18-97021

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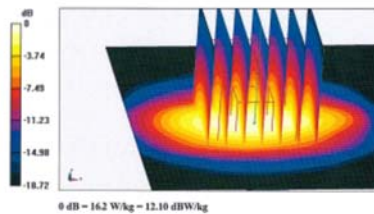
D2000V2 Sn:1009



DASY5 Validation Report for Head TSL Date: 02.01.2018
Test Laboratory: CTTI, Beijing, China
DUT: Dipole 2000 MHz; Type: D2000V2; Serial: D2000V2 - SN: 1009
Communication System: UTD 0, CW; Frequency: 2000 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2000$ MHz; $\alpha = 1.416$ S/m; $\sigma = 38.89$; $\rho = 1000$ kg/m³
Phantom section: Left Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(8.39, 8.39, 8.39); Calibrated: 9/12/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA64 Sn1525; Calibrated: 10/2/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)Cube 0; Measurement grid:
 $d_x=5$ mm, $d_y=5$ mm, $d_z=5$ mm
Reference Value = 95.48 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 19.7 W/kg
SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.17 W/kg
Maximum value of SAR (measured) = 16.2 W/kg

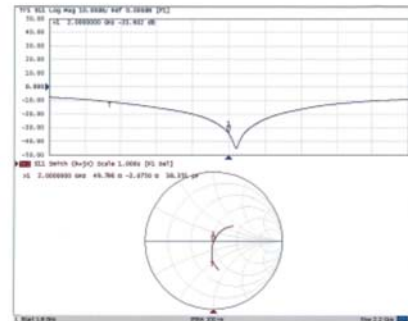


Certificate No: Z18-97021

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Impedance Measurement Plot for Head TSL



Certificate No: Z18-97021

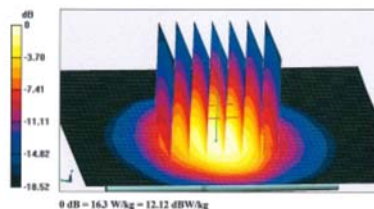
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DASY5 Validation Report for Body TSL Date: 02.01.2018
Test Laboratory: CTTI, Beijing, China
DUT: Dipole 2000 MHz; Type: D2000V2; Serial: D2000V2 - SN: 1009
Communication System: UTD 0, CW; Frequency: 2000 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2000$ MHz; $\alpha = 1.564$ S/m; $\sigma = 51.80$; $\rho = 1000$ kg/m³
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(8.24, 8.24, 8.24); Calibrated: 9/12/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA64 Sn1525; Calibrated: 10/2/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)Cube 0; Measurement grid:
 $d_x=5$ mm, $d_y=5$ mm, $d_z=5$ mm
Reference Value = 93.84 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 19.7 W/kg
SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.18 W/kg
Maximum value of SAR (measured) = 16.3 W/kg

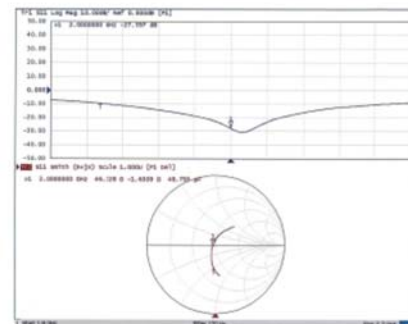


Certificate No: Z18-97021

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Impedance Measurement Plot for Body TSL



Certificate No: Z18-97021

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D2450V2 Sn:738






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 Add: No.1, Xuesen Road, Beijing, P.R.China, 101318, China
 Tel: +86-10-61040171
 E-mail: ttt@ttd.com.cn
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C=China R=RUSSIA Certificate No: 217-89146

CALIBRATION CERTIFICATE

Client: DONGYI IN 730

Calibration Procedure(s): PP-217-003.01
 Calibration Procedure for Space vacuum test

Calibration date: September 15, 2017

This calibration Certificate documents the conformity to national standards, which realize the physical units of measurement(s). The measurement(s) and the uncertainties with calibration 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(23±1) and humidity<65%.

Calibration Equipment used(MEET) critical for calibrating:

Primary Standards	EC	Cert Number(Calibrated by Certificate No.)	Scheduled Date
Power Meter: NRVC	130196	23-Mar-17 JCTC No. J17010146	Mar-18
Power sensor: NRVA25	130508	23-Mar-17 JCTC No. J17010146	Mar-18
Reference Probe D2XDA	SN 2433	26-Sep-16(PPSCAGN) 033 And Sep16	Jan-17
DMA	SN 1931	15-Jan-17(JCTC) SPSCAGN J17-07015	Jan-18

Secondary Standards	EC	Cert Date(Calibrated by Certificate No.)	Subsequent Calibration
Signal Generator R4480	NR4807 6430	13-Jan-17 JCTC No. J17000026	Jan-18
Reference Resistor R057110	NR481-10075	13-Jan-17 JCTC No. J17000026	Jan-18

Calibrated by:	Name	Position	Signature
	Zhang Jiao	S&T Test Engineer	
Reviewed by:	Yu Zhenping	S&T Test Engineer	
Approved by:	Qi Jueyuan	S&T Project Manager	

Issued: September 21, 2017

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Certificate No: 217-89146 Page: 1/1

 TTL Calibration Laboratory 4801 W. 11th Street, Suite 200 Tulsa, OK 74117-0200 Tel: (918) 438-1177 Fax: (918) 438-1178 Email: info@ttnet.com	In Collaboration with:  Seattle Division, 1800 W. Clinton Everett Division, 1200 W. 1st Tel: (206) 461-2200 Email: info@speaq.com
Geometry: TSL Core? _____ N/A _____	(Please include request for notations in TSL / NO NOTES on not applicable or not measured)
Calibration is Performed According to the Following Standards:	
① IEEE Std 1492-2015, "IEEE Recommended Practice for Determining the Peak Antenna Factor of Single-Port Antennas (SAR) in the Near-Field from Measured Data" ② Communications Division, "Validation of SAR" (TSL), June 2015 ③ 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 960MHz)", July 2012 ④ IEC 62220-2, "Procedure to measure the Specific Absorption Rate (SAR) for wireless communication devices used close proximity to the human body (frequency range of 300MHz to 960MHz)", March 2010 ⑤ KDB999994, "SAR Measurement Requirements for 100 MHz to 6 GHz"	
Additional Documentation:	
a) DAS145 System Handbook	
Methods Applied and Interpretation of Parameters:	
① Measurement Condition: Further details are available from the Validation Report at the end of the report. All figures stated in the certificate are valid at the frequency indicated. ② Antenna Positioning with TSL: The dipole is mounted with the aperture position located 20 cm exactly below the center marking of the flat surface section, with the arms oriented parallel to the body axis. ③ Feed Point Impedance and Return Loss: These parameters are measured with the dipole connected under the load fixed shunt resistor. The impedance is transformed from the measurement at the SMA connector to the feed point. The Return Loss results are reflected against the input impedance. ④ Reaction Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required. ⑤ SAR measured: SAR, measured at the stated input power. ⑥ SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector. ⑦ SAR for defined TSL parameters: The measured TSL parameters are used to calculate the normal 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%.	

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Add: P-23, Kirti Nagar Post, Sector 15, Noida, Uttar Pradesh Tel: +91 88240 40000/8999 Fax: +91 88240 40001 Email: info@ttdl.com, info@spacecal.com Website: www.ttdl.com					
Measurement Conditions GSE system resolution: 30, 36 or 48 mV (see page 1)					
DSE version	G40V2		52 (13.0 mA)		
Compliance	Advanced Compliance				
Phase	Total Test Phases = 12				
Distance Output Center - TSL	50 mV		with Space		
Zero Bias Resolution	30, 36, 48 + 1 mV				
Frequency	2000 MHz < 1 MHz				
Head TSL parameters The following parameters are not fully specified in the table					
Temperature	Temperature	Permeability	Conductivity		
Averaged Head TSL parameters	23.0 °C	50.2	1.83 mW/g		
Averaged Head TSL parameters	(23.0 ± 0.2) °C	50.2 ± 4.0	1.70 mW/g ± 0.5		
Head TSL temperature change during test	± 0.2 °C	—	—		
SAR result with Head TSL					
SAR averaged over 10 cm ³ (1 g) of Head TSL	Condition				
SAR measured	320 mW input power		13.1 mW/g		
SAR to normal Head TSL parameters	normalized to 10		52.4 mW/g ± 18.8 % (in)		
SAR averaged over 10 cm ³ (1 g) of Head TSL	Condition				
SAR measured	260 mW input power		8.13 mW/g		
SAR to normal Head TSL parameters	normalized to 10		54.8 mW/g ± 16.7 % (in)		
Body TSL parameters The following parameters are not fully specified in the table					
Temperature	Temperature	Permeability	Conductivity		
Averaged Body TSL parameters	19.0 °C	50.2	1.98 mW/g		
Averaged Body TSL parameters	(19.0 ± 0.2) °C	50.2 ± 4.0	1.95 mW/g ± 0.5		
Body TSL temperature change during test	± 0.2 °C	—	—		
SAR result with Body TSL					
SAR averaged over 10 cm ³ (1 g) of Body TSL	Condition				
SAR measured	320 mW input power		13.1 mW/g		
SAR to normal Body TSL parameters	normalized to 10		52.4 mW/g ± 18.8 % (in)		
SAR averaged over 10 cm ³ (1 g) of Body TSL	Condition				
SAR measured	260 mW input power		8.16 mW/g		
SAR to normal Body TSL parameters	normalized to 10		54.5 mW/g ± 16.7 % (in)		

Doc: ESE-100-213-213-00

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1000 West 11 Avenue Road, Suite 100, Fargo, ND 58103, USA
 Tel: 701-782-7343 / 7347
 E-mail: info@ttnl.com http://www.ttnl.com

Appendix (Additional assessments outside the scope of CNAS L667)

Antenna Parameters with Head T81

Is an antenna transformer to feed point	01.00 ± 0.00%
Return Loss	24 dB

Antenna Parameters with Body T8L

Impedance, normalized to load point	17.50 ± 0.25Ω
Return Loss	~20 dB

General Antenna Parameters and Design

DACNET Entry (see document)	1.288 W
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After long term use with "NOVA" related power, only a slight warping of the dipole wire (see footprint can be "NOVA" test)

The dipole is made of standard wire type 304L stainless steel. 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 dipole, shield wire, are added to the dipole wires in order to improve shielding against radio frequency interference. As explained in the "Measurement Conditions" paragraph, the SWR data are not affected by the change. The shield wire length is still according to the standard.

No insulation layer must be applied to the dipole arms, because they may form or create additional connections near the feedpoint if they are damaged.

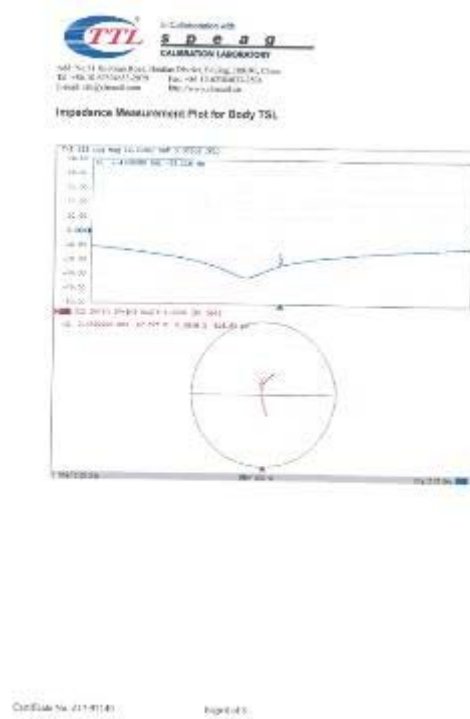
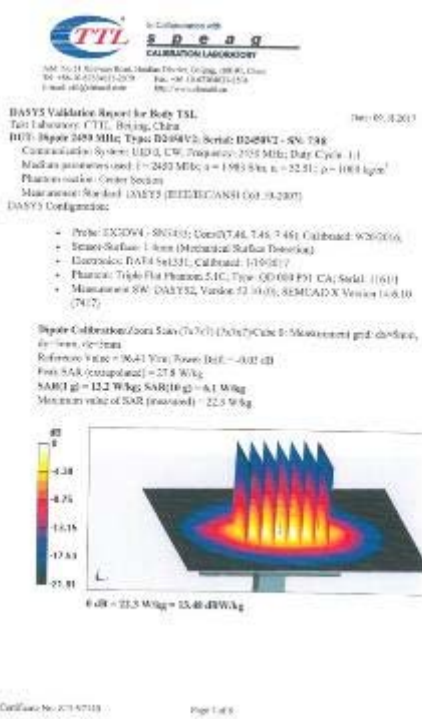
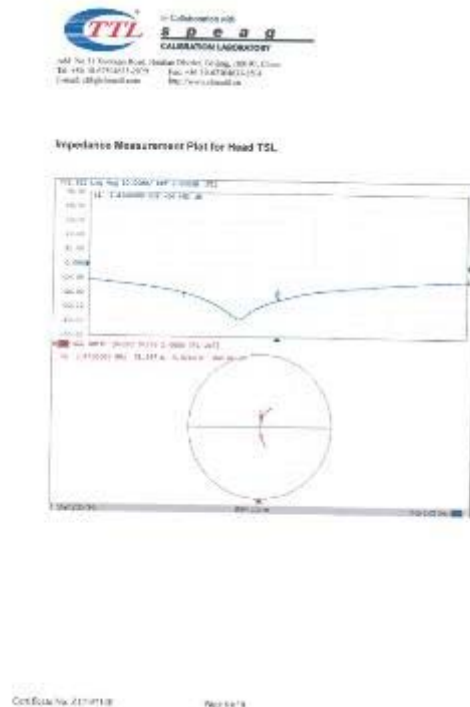
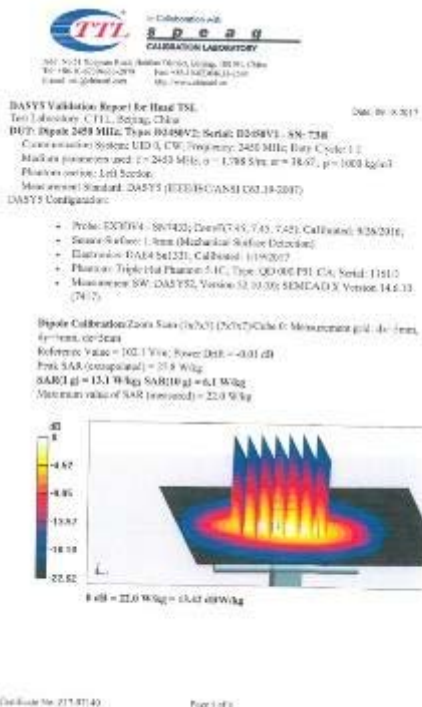
Additional EUT Data

Manufactured to	EN623
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Certificate No:21167431

Page:01/01

D2450V2 Sn:738



D5GHzV2 Sn:1079

 In Collaboration with T T L s p e c i a l C A L I B R A T I O N U N D E R T A K E ATTN: Mr. Sushil Sarda, Head, Quality Policy, ISO/IEC Clause 7.15.4, ISO/IEC 17025:2005 Email: sardas@tntl.com www.tntlcalibration.com		  中國認可 國家認證 機構 校準 CALIBRATION CNAS-1870	
Client:		SRTC	
		Certificate No: ZIT-07193	
CALIBRATION CERTIFICATE			
Client:		DGG-INDIA, NEW DELHI	
Calibration Procedure(s):		FF-TS-003.01	
		Calculations performed for dipole calibration job.	
Calibration date:		September 25, 2017	
This Calibration Certificate documents the traceability to national standards, which realize the physical units or measurements by SI. The measurement and the uncertainty with confidence probability are given in the following pages and are part of the certificate.			
All calibrations have been conducted in the closest laboratory facility environment temperature controlled and humidity 50%.			
Calibration Equipment used (MUTU) used for calibration:			
Primary Standards	ID#	Calibrated/Validated by Certificate No. /	Scheduled Calibration
Punch Force MIP-2	102-196	09-Jun-17 (CTTL No.) ZIT001254)	Mar-18
Punch force sensor NPM-231	100556	09-Jun-17 (CTTL No.) ZIT001254)	Mar-18
Reference Probe CACOM 1505A	CM-3640	15-Jan-17 (CTTL SPQA No.) Z16-07251)	Jan-18
	CM-1331	16-Jan-17 (CTTL SPQA No.) Z17-07215)	Jan-18
Secondary Standards	ID#	Re-Calibrated/Validated by Certificate No. /	Scheduled Calibration
Signal Generator G4380	MIR0171403	15-Jan-17 (CTTL No.) ZIT001255)	Jun-18
Reference voltage DSG 6110	MIR0170875	15-Jan-17 (CTTL No.) ZIT001255)	Jun-18
Calculated by:	Name	Position	Signature
	Zhao Jing	Senior Test Engineer	
Reviewed by:	Yu Zongping	NAN Test Engineer	
Approved by:	Qi Dianyan	SAR Project Leader	
Validated September 24, 2017 This calibration certificate shall not be reproduced except in full without written approval of the authority.			

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Tel: 619-591-2200
Fax: 619-591-2201
Email: ttl@ttl.com

10/1/2004

Glossary:
TSL: **Test** is a measuring liquid
Conf: **Conf** is only in TSL, 7 NORMs, it
RA: **RA** is not applicable or not measured

Calibration is Performed According to the Following Standards:
a) IEEE Std 1550-2011, "IEEE Recommended Practice for Determining the Peak Spatial Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2011
b) ETSI 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body mounted wireless communications devices-Part 1: Devices used next to the ear (frequency range of 200MHz to 6GHz)", July 2011
c) ETSI 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) FCC 95-006, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:
a) DAS445 System Handbook

Methods Applied and Interpretation of Parameters:
a) **Measurement Conditions:** Further details are available from the Validation Report at the end of the test. All figures stated in the certificate are at the frequency indicated.
b) **Antenna Placement:** Only TSL. The dipole is placed with the dipole in position in two point exactly below the center marking of a flat phantom section, with the same side not parallel to the body axis.
c) **Feed Point Orientation:** and Polarization: These parameters are measured with the dipole positioned under the head flat phantom. The impedance stand is reformed from the measurement at the SMA connector to the feed point. The Return Loss ensure low reflected power. No uncertainty required.
d) **Electrical Field:** Only one delay between the SMA connector and the antenna feed point. No uncertainty required.
e) **SAR measured:** SAR measured in the dipole antenna input power.
f) **SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
g) **SAR for received TSL parameters:** The measured TSL parameters are used to calculate the normal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement calculated by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

			
Add: No. 1, Vengal Rao Road, Madhav Nagar, 1st Stage, 5th Cross, 560 025 (KARNATAKA) INDIA Tel: 0822-2246411 Fax: 0822-2246422 E-mail: ttdigital@rediffmail.com		Tel: 0822-2246422 Fax: 0822-2246422 E-mail: info@ttdigital.com	
Measurement Conditions SPAT: 100% humidity, unless otherwise specified on page 1			
DA37 version	DAK102	72.150.1440	
Preparation	Aluminum Preparation		
Condition	100% RH, 23°C, 50% RH		
Distance Electrode Center - TSL	13 mm		
Electrode Head Resistance	50.0 $\pm$ 0.1 m Ω , 10 $\pm$ 0.1 m Ω	Graded Ratio = 1.4 (2' direction)	
Frequency	500.0 MHz $\pm$ 1 kHz 500.0 MHz $\pm$ 1 kHz 500.0 MHz $\pm$ 1 kHz 500.0 MHz $\pm$ 1 kHz 500.0 MHz $\pm$ 1 kHz		

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Head TSL parameters at 5300 MHz The following parameters are ± 250 MHz and ± 10 mV			
	Temperature	Repeatability	Conductivity
Nominal Head TSL parameters	22.0 °C	± 0.5	± 0.5 mS/cm
Measured Head TSL parameters	22.0 ± 0.2 °C	± 0.3 ± 0.5	± 0.5 mS/cm ± 0.5
Head TSL temperature change during test	-0.1 °C		
SAR result with Head TSL at 5300 MHz			
SAR averaged over 1 cm ³ of Head TSL	Condition		
SAR input power	100 mW input power		0.13 mW/g
SAR for normal Head TSL parameters	normalized to 1W		91.3 mW/g ± 24.8 % (std)
SAR averaged over 18 cm ³ of Head TSL	Condition		
SAR input power	100 mW input power		0.32 mW/g
SAR for normal Head TSL parameters	normalized to 1W		153.6 mW/g ± 24.2 % (std)
Head TSL parameters at 16000 MHz The following parameters are ± 250 MHz and ± 10 mV			
	Temperature	Repeatability	Conductivity
Nominal Head TSL parameters	22.0 °C	± 0.5	± 0.5 mS/cm
Measured Head TSL parameters	22.0 ± 0.2 °C	± 0.3 ± 0.5	± 0.5 mS/cm ± 0.5
Head TSL temperature change during test	-0.1 °C		
SAR result with Head TSL at 5500 MHz			
SAR averaged over 1 cm ³ of Head TSL	Condition		
SAR input power	100 mW input power		0.54 mW/g
SAR for normal Head TSL parameters	normalized to 1W		63.6 mW/g ± 24.4 % (std)
SAR averaged over 18 cm ³ of Head TSL	Condition		
SAR input power	100 mW input power		0.31 mW/g
SAR for normal Head TSL parameters	normalized to 1W		32.8 mW/g ± 24.7 % (std)

D5GHzV2 Sn:1079

TTL Calibration Laboratory

Address: No. 3, Xueyuan Road, Haidian District, Beijing 100191, China
Tel: +86-10-57996183 Fax: +86-10-57996388
E-mail: srtc@china.com.cn

Head TSL parameters at 5990 MHz
The following parameters and calculation were applied:

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.5	0.07 mS/m
Measured Head TSL parameters	22.0 ± 0.2 °C	39.7 ± 0.5	0.07 mS/m ± 0.5
Head TSL temperature change during test	± 0.2 °C	—	—

SAR result with Head TSL at 5990 MHz

	Condition	
SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	8.18 mW/g
SAR measured	100 mW input power	7.55 mW/g
SAR for nominal Head TSL parameters	normalized to 1W	81.8 mW/g ± 0.4 % (p=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	—
SAR measured	100 mW input power	2.38 mW/g
SAR for nominal Head TSL parameters	normalized to 1W	23.8 mW/g ± 0.4 % (p=2)

Head TSL parameters at 5990 MHz
The following parameters and calculation were applied:

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.5	0.07 mS/m
Measured Head TSL parameters	22.0 ± 0.2 °C	39.7 ± 0.5	0.07 mS/m ± 0.5
Head TSL temperature change during test	± 0.2 °C	—	—

SAR result with Head TSL at 5990 MHz

	Condition	
SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	7.55 mW/g
SAR measured	100 mW input power	7.55 mW/g
SAR for nominal Head TSL parameters	normalized to 1W	75.5 mW/g ± 0.4 % (p=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	—
SAR measured	100 mW input power	2.38 mW/g
SAR for nominal Head TSL parameters	normalized to 1W	23.8 mW/g ± 0.4 % (p=2)

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Page 1 of 1

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Tel: +86-10-57996183 Fax: +86-10-57996388
E-mail: srtc@china.com.cn

Body TSL parameters at 5990 MHz
The following parameters and calculation were applied:

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	40.0	0.30 mS/m
Measured Body TSL parameters	22.0 ± 0.2 °C	40.2 ± 0.5	0.30 mS/m ± 0.5
Body TSL temperature change during test	± 0.2 °C	—	—

SAR result with Body TSL at 5990 MHz

	Condition	
SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	7.52 mW/g
SAR measured	100 mW input power	7.52 mW/g
SAR for nominal Body TSL parameters	normalized to 1W	75.2 mW/g ± 0.4 % (p=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	—
SAR measured	100 mW input power	2.37 mW/g
SAR for nominal Body TSL parameters	normalized to 1W	23.7 mW/g ± 0.4 % (p=2)

Body TSL parameters at 5990 MHz
The following parameters and calculation were applied:

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	40.0	0.30 mS/m
Measured Body TSL parameters	22.0 ± 0.2 °C	40.2 ± 0.5	0.30 mS/m ± 0.5
Body TSL temperature change during test	± 0.2 °C	—	—

SAR result with Body TSL at 5990 MHz

	Condition	
SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	7.52 mW/g
SAR measured	100 mW input power	7.52 mW/g
SAR for nominal Body TSL parameters	normalized to 1W	75.2 mW/g ± 0.4 % (p=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	—
SAR measured	100 mW input power	2.37 mW/g
SAR for nominal Body TSL parameters	normalized to 1W	23.7 mW/g ± 0.4 % (p=2)

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Tel: +86-10-57996183 Fax: +86-10-57996388
E-mail: srtc@china.com.cn

Body TSL parameters at 5990 MHz
The following parameters and calculation were applied:

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	40.0	0.30 mS/m
Measured Body TSL parameters	22.0 ± 0.2 °C	40.2 ± 0.5	0.30 mS/m ± 0.5
Body TSL temperature change during test	± 0.2 °C	—	—

SAR result with Body TSL at 5990 MHz

	Condition	
SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	7.52 mW/g
SAR measured	100 mW input power	7.52 mW/g
SAR for nominal Body TSL parameters	normalized to 1W	75.2 mW/g ± 0.4 % (p=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	—
SAR measured	100 mW input power	2.37 mW/g
SAR for nominal Body TSL parameters	normalized to 1W	23.7 mW/g ± 0.4 % (p=2)

Body TSL parameters at 5990 MHz
The following parameters and calculation were applied:

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	40.0	0.30 mS/m
Measured Body TSL parameters	22.0 ± 0.2 °C	40.2 ± 0.5	0.30 mS/m ± 0.5
Body TSL temperature change during test	± 0.2 °C	—	—

SAR result with Body TSL at 5990 MHz

	Condition	
SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	7.52 mW/g
SAR measured	100 mW input power	7.52 mW/g
SAR for nominal Body TSL parameters	normalized to 1W	75.2 mW/g ± 0.4 % (p=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	—
SAR measured	100 mW input power	2.37 mW/g
SAR for nominal Body TSL parameters	normalized to 1W	23.7 mW/g ± 0.4 % (p=2)

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Tel: +86-10-57996183 Fax: +86-10-57996388
E-mail: srtc@china.com.cn

Body TSL parameters at 5990 MHz
The following parameters and calculation were applied:

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	40.0	0.30 mS/m
Measured Body TSL parameters	22.0 ± 0.2 °C	40.2 ± 0.5	0.30 mS/m ± 0.5
Body TSL temperature change during test	± 0.2 °C	—	—

SAR result with Body TSL at 5990 MHz

	Condition	
SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	7.52 mW/g
SAR measured	100 mW input power	7.52 mW/g
SAR for nominal Body TSL parameters	normalized to 1W	75.2 mW/g ± 0.4 % (p=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	—
SAR measured	100 mW input power	2.37 mW/g
SAR for nominal Body TSL parameters	normalized to 1W	23.7 mW/g ± 0.4 % (p=2)

Body TSL parameters at 5990 MHz
The following parameters and calculation were applied:

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	40.0	0.30 mS/m
Measured Body TSL parameters	22.0 ± 0.2 °C	40.2 ± 0.5	0.30 mS/m ± 0.5
Body TSL temperature change during test	± 0.2 °C	—	—

SAR result with Body TSL at 5990 MHz

	Condition	
SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	7.52 mW/g
SAR measured	100 mW input power	7.52 mW/g
SAR for nominal Body TSL parameters	normalized to 1W	75.2 mW/g ± 0.4 % (p=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	—
SAR measured	100 mW input power	2.37 mW/g
SAR for nominal Body TSL parameters	normalized to 1W	23.7 mW/g ± 0.4 % (p=2)

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D5GHzV2 Sn:1079

 In Cooperation with CAIRATION LABORATORY 4027 N. 13th Street, Suite 100, Tulsa, OK 74107, USA Tel: 918-442-9999/9070 Fax: 918-442-9111/1124 Email: info@cair.com TTU: tttu@ttu.edu	
Appendix (Additional measurements outside the scope of CNAS L0573)	
Antenna Parameters with Head TSL at 6200 MHz	
Impedance, transformed to feed point	47.00 - j 7.75
Return Loss	-20.7 dB
Antenna Parameters with Head TSL at 5300 MHz	
Impedance, transformed to feed point	43.92 - j 6.620
Return Loss	-21.4 dB
Antenna Parameters with Head TSL at 2800 MHz	
Impedance, transformed to feed point	80.70 - j 2.140
Return Loss	-23.0 dB
Antenna Parameters with Head TSL at 9900 MHz	
Impedance, transformed to feed point	55.00 - j 30.0
Return Loss	-24.7 dB
Antenna Parameters with Head TSL at 5800 MHz	
Impedance, transformed to feed point	40.75 - j 9.200
Return Loss	-21.8 dB
Antenna Parameters with Body TSL at 6200 MHz	
Impedance, transformed to feed point	10.00 - j 0.10
Return Loss	-23.6 dB
Antenna Parameters with Body TSL at 9300 MHz	
Impedance, transformed to feed point	49.00 - j 8.60
Return Loss	-21.0 dB

 in Collaboration with S P E C I A L CALIBRATION LABORATORY 4-10, Seokcho 1st Avenue East, Yeoksam Station, Seongso, SO-154, Seoul TEL: +82-(0)2-3400-2070 FAX: +82-(0)2-3400-2100 E-mail: info@tttech.co.kr Website: tttech.co.kr	
Antenna Parameters with Body TSL at 5000 MHz	
Impedance (measured at feed point)	50 Ω ± 5.8% D
Return loss	-21 dB
Antenna Parameters with Body TSL at 5000 MHz	
Impedance (transformed to feed point)	50 Ω ± 2.7% D
Return Loss	-22.7 dB
Antenna Parameters with Body TSL at 6000 MHz	
Impedance (transformed to feed point)	50 Ω ± 3.0% D
Return loss	-20.0 dB
General Antenna Parameters and Design	
Feedline Delay (per direction)	1.270 ns
After long term use with NEWW radiation power, only a slight warming of the dipole near the feedpoint may be measured.	
Two cables made of shielded twisted pair cable. The center conductor of the feeding lead is directly connected to the second arm of the dipole. The antenna is mounted at an elevated for DC signals. On one side of the dipole, shield and braid are isolated to the shield area in order to improve matching when inserted according to the position as explained in the "Measurement Condition" paragraph. The SAR data are not affected by this change. This overall design length is also according to the Standard. The excessive force must be applied to the dipole arms, because they might break or the soldered connections near the feedpoint may be damaged.	
Additional EUT Data	
Manufacturer by	SPACIO

Test Case No. Z13-9-1131

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CALIBRATION LABORATORY

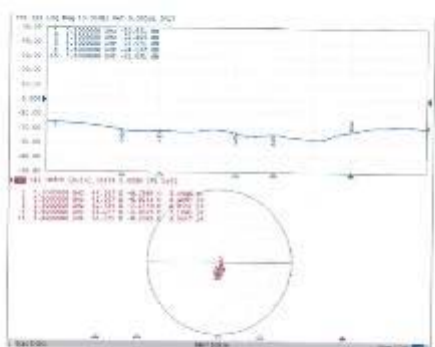
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[illegible]

D5GHzV2 Sn:1079



Impedance Measurement Plot for Head T81



Doc# 8966, No. 20140013

Figure 12-5 (b)



Q48Y6 Validation Report for Body TSL

Test Laboratory: CCTL, Beijing, China

Printed: 09.25.2017

DUT: Dipole 50Hz; Type: D604-0V2; Serial: D50HzV2 - 50c 1025

Model: $y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + b_{10}x_{10} + b_{11}x_{11} + b_{12}x_{12} + b_{13}x_{13} + b_{14}x_{14} + b_{15}x_{15} + b_{16}x_{16} + b_{17}x_{17} + b_{18}x_{18} + b_{19}x_{19} + b_{20}x_{20} + b_{21}x_{21} + b_{22}x_{22} + b_{23}x_{23} + b_{24}x_{24} + b_{25}x_{25} + b_{26}x_{26} + b_{27}x_{27} + b_{28}x_{28} + b_{29}x_{29} + b_{30}x_{30} + b_{31}x_{31} + b_{32}x_{32} + b_{33}x_{33} + b_{34}x_{34} + b_{35}x_{35} + b_{36}x_{36} + b_{37}x_{37} + b_{38}x_{38} + b_{39}x_{39} + b_{40}x_{40} + b_{41}x_{41} + b_{42}x_{42} + b_{43}x_{43} + b_{44}x_{44} + b_{45}x_{45} + b_{46}x_{46} + b_{47}x_{47} + b_{48}x_{48} + b_{49}x_{49} + b_{50}x_{50} + b_{51}x_{51} + b_{52}x_{52} + b_{53}x_{53} + b_{54}x_{54} + b_{55}x_{55} + b_{56}x_{56} + b_{57}x_{57} + b_{58}x_{58} + b_{59}x_{59} + b_{60}x_{60} + b_{61}x_{61} + b_{62}x_{62} + b_{63}x_{63} + b_{64}x_{64} + b_{65}x_{65} + b_{66}x_{66} + b_{67}x_{67} + b_{68}x_{68} + b_{69}x_{69} + b_{70}x_{70} + b_{71}x_{71} + b_{72}x_{72} + b_{73}x_{73} + b_{74}x_{74} + b_{75}x_{75} + b_{76}x_{76} + b_{77}x_{77} + b_{78}x_{78} + b_{79}x_{79} + b_{80}x_{80} + b_{81}x_{81} + b_{82}x_{82} + b_{83}x_{83} + b_{84}x_{84} + b_{85}x_{85} + b_{86}x_{86} + b_{87}x_{87} + b_{88}x_{88} + b_{89}x_{89} + b_{90}x_{90} + b_{91}x_{91} + b_{92}x_{92} + b_{93}x_{93} + b_{94}x_{94} + b_{95}x_{95} + b_{96}x_{96} + b_{97}x_{97} + b_{98}x_{98} + b_{99}x_{99} + b_{100}x_{100} + b_{101}x_{101} + b_{102}x_{102} + b_{103}x_{103} + b_{104}x_{104} + b_{105}x_{105} + b_{106}x_{106} + b_{107}x_{107} + b_{108}x_{108} + b_{109}x_{109} + b_{110}x_{110} + b_{111}x_{111} + b_{112}x_{112} + b_{113}x_{113} + b_{114}x_{114} + b_{115}x_{115} + b_{116}x_{116} + b_{117}x_{117} + b_{118}x_{118} + b_{119}x_{119} + b_{120}x_{120} + b_{121}x_{121} + b_{122}x_{122} + b_{123}x_{123} + b_{124}x_{124} + b_{125}x_{125} + b_{126}x_{126} + b_{127}x_{127} + b_{128}x_{128} + b_{129}x_{129} + b_{130}x_{130} + b_{131}x_{131} + b_{132}x_{132} + b_{133}x_{133} + b_{134}x_{134} + b_{135}x_{135} + b_{136}x_{136} + b_{137}x_{137} + b_{138}x_{138} + b_{139}x_{139} + b_{140}x_{140} + b_{141}x_{141} + b_{142}x_{142} + b_{143}x_{143} + b_{144}x_{144} + b_{145}x_{145} + b_{146}x_{146} + b_{147}x_{147} + b_{148}x_{148} + b_{149}x_{149} + b_{150}x_{150} + b_{151}x_{151} + b_{152}x_{152} + b_{153}x_{153} + b_{154}x_{154} + b_{155}x_{155} + b_{156}x_{156} + b_{157}x_{157} + b_{158}x_{158} + b_{159}x_{159} + b_{160}x_{160} + b_{161}x_{161} + b_{162}x_{162} + b_{163}x_{163} + b_{164}x_{164} + b_{165}x_{165} + b_{166}x_{166} + b_{167}x_{167} + b_{168}x_{168} + b_{169}x_{169} + b_{170}x_{170} + b_{171}x_{171} + b_{172}x_{172} + b_{173}x_{173} + b_{174}x_{174} + b_{175}x_{175} + b_{176}x_{176} + b_{177}x_{177} + b_{178}x_{178} + b_{179}x_{179} + b_{180}x_{180} + b_{181}x_{181} + b_{182}x_{182} + b_{183}x_{183} + b_{184}x_{184} + b_{185}x_{185} + b_{186}x_{186} + b_{187}x_{187} + b_{188}x_{188} + b_{189}x_{189} + b_{190}x_{190} + b_{191}x_{191} + b_{192}x_{192} + b_{193}x_{193} + b_{194}x_{194} + b_{195}x_{195} + b_{196}x_{196} + b_{197}x_{197} + b_{198}x_{198} + b_{199}x_{199} + b_{200}x_{200} + b_{201}x_{201} + b_{202}x_{202} + b_{203}x_{203} + b_{204}x_{204} + b_{205}x_{205} + b_{206}x_{206} + b_{207}x_{207} + b_{208}x_{208} + b_{209}x_{209} + b_{210}x_{210} + b_{211}x_{211} + b_{212}x_{212} + b_{213}x_{213} + b_{214}x_{214} + b_{215}x_{215} + b_{216}x_{216} + b_{217}x_{217} + b_{218}x_{218} + b_{219}x_{219} + b_{220}x_{220} + b_{221}x_{221} + b_{222}x_{222} + b_{223}x_{223} + b_{224}x_{224} + b_{225}x_{225} + b_{226}x_{226} + b_{227}x_{227} + b_{228}x_{228} + b_{229}x_{229} + b_{230}x_{230} + b_{231}x_{231} + b_{232}x_{232} + b_{233}x_{233} + b_{234}x_{234} + b_{235}x_{235} + b_{236}x_{236} + b_{237}x_{237} + b_{238}x_{238} + b_{239}x_{239} + b_{240}x_{240} + b_{241}x_{241} + b_{242}x_{242} + b_{243}x_{243} + b_{244}x_{244} + b_{245}x_{245} + b_{246}x_{246} + b_{247}x_{247} + b_{248}x_{248} + b_{249}x_{249} + b_{250}x_{250} + b_{251}x_{251} + b_{252}x_{252} + b_{253}x_{253} + b_{254}x_{254} + b_{255}x_{255} + b_{256}x_{256} + b_{257}x_{257} + b_{258}x_{258} + b_{259}x_{259} + b_{260}x_{260} + b_{261}x_{261} + b_{262}x_{262} + b_{263}x_{263} + b_{264}x_{264} + b_{265}x_{265} + b_{266}x_{266} + b_{267}x_{267} + b_{268}x_{268} + b_{269}x_{269} + b_{270}x_{270} + b_{271}x_{271} + b_{272}x_{272} + b_{273}x_{273} + b_{274}x_{274} + b_{275}x_{275} + b_{276}x_{276} + b_{277}x_{277} + b_{278}x_{278} + b_{279}x_{279} + b_{280}x_{280} + b_{281}x_{281} + b_{282}x_{282} + b_{283}x_{283} + b_{284}x_{284} + b_{285}x_{285} + b_{286}x_{286} + b_{287}x_{287} + b_{288}x_{288} + b_{289}x_{289} + b_{290}x_{290} + b_{291}x_{291} + b_{292}x_{292} + b_{293}x_{293} + b_{294}x_{294} + b_{295}x_{295} + b_{296}x_{296} + b_{297}x_{297} + b_{298}x_{298} + b_{299}x_{299} + b_{300}x_{300} + b_{301}x_{301} + b_{302}x_{302} + b_{303}x_{303} + b_{304}x_{304} + b_{305}x_{305} + b_{306}x_{306} + b_{307}x_{307} + b_{308}x_{308} + b_{309}x_{309} + b_{310}x_{310} + b_{311}x_{311} + b_{312}x_{312} + b_{313}x_{313} + b_{314}x_{314} + b_{315}x_{315} + b_{316}x_{316} + b_{317}x_{317} + b_{318}x_{318} + b_{319}x_{319} + b_{320}x_{320} + b_{321}x_{321} + b_{322}x_{322} + b_{323}x_{323} + b_{324}x_{324} + b_{325}x_{325} + b_{326}x_{326} + b_{327}x_{327} + b_{328}x_{328} + b_{329}x_{329} + b_{330}x_{330} + b_{331}x_{331} + b_{332}x_{332} + b_{33$

Planckian action: Center Section

Measurement Standard: OAR-5 (IEEE/ECAND C93.19-2007)

DASY5 Configuration

- Probe: PCDW4-S88486, Conf: [4.85, 4.85, 4.85], Calibration: [112017, Conf: [95, 95, 95.85], Calibration: [112017, Conf: [4, 10.4, 10.4, 10], Calibration: [112017, Conf: [4, 10.4, 10.4, 10], Calibration: [112017, Conf: [4.53, 4.53, 4.53], Calibration: [112017]
- Sensor: Surface, 1.4mm (Mechanical Surface Deflection)
- Electronics: IM484-01231, Calibration: 2017/01/19
- Platform: Type: Pal Phantom 5.10, Type: GD WSI 101 CA, Serial: 116163
- Measurement: WV: DASY52, Version: 82.10.05, SEMCAD X Series: 144.00 (12471)

Dipole Calibration (P=100mW, d=10mm, f=5200 MHz), Scan, dist=1.0mm (80x80Y Cube 8; Measurement grid: dist=4mm, d=4mm, dmi=4mm)
 Reference Value = 55.16 V/m; Power Det = 2.01 dB
 Peak SAR (wetopology) = 30.0 W/kg
 SAR(1 g) = 7.80 W/kg; SAR(10 g) = 2.12 W/kg
 Maximum value of SAR (measured) = 18.21 W/kg

Dipole Calibration (Pin=100mW, d=10mm, f=5300 MHz, 50ohm, 50ohm, dipole1.4mm [Ref17]Cube 0: Measurement and do=4mm, dy=4mm, dz=1.4mm
Reference Value = 23.94 dBi, Power Eff= 0.21 dB
Peak SAR (normalized) = 31 mW/kg
SAR(1 g) = 7.33 W/kg, SAR(10 g) = 2.18 W/kg
Maximal value of SAR (measured) = 18.3 W/kg

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Dipole Calibration (F₀=100MHz, d=10mm, f=8880 MHz/Zoom Resol.
 dip1=1.4mm J2875/Tube 8; Mass: 1.0000g; gnd. d=4mm, sym/rot. dia1=4mm
 Reference Value = 50.70 Vrms, Power Refl = -3.05 dB
 Peak SAR (calculated) = 33.7 W/kg
 SAR(1 g) = 8.22 W/kg; SAR(10 g) = 2.38 W/kg
 Maximum value of SAR (measured) = 14.8 W/kg

Disc Calibration (Pwr:100W, d=10mm, f=5000 MHz/Zoom Scan, dia=1.4mm, (bda/3)/Cable 0, Measurement pnt: sam40mm, d=4mm, dnt: ksq)
Reference Value = 67.75 W/m², Power Drift = 0.01 dB
Peak SAR (reduced) = 34.2 W/kg
SAR_{10g} = 8.06 W/kg; SAR_{10g} = 2.3 W/kg
Minimum value of SAR (measured) = 19.3 W/kg

Dipole Calibration (Pin=100mW, d=10mm, f=8800 MHz) Zoom 8x, d=64.4mm [8x87] Cube 3: Measurement grid, d=4mm, dy=4mm, dz=1.4mm
Reference Value = 23.20 Vm; Power [dB] = 6.05 dB
Peak SAR (adiabatic) = 22.3 mW/g
SAR(1 g) = 7.73 mW/g; SAR(10 g) = 2.17 mW/g
Maximum value of SAR (measured) = 18.3 Vm/kg

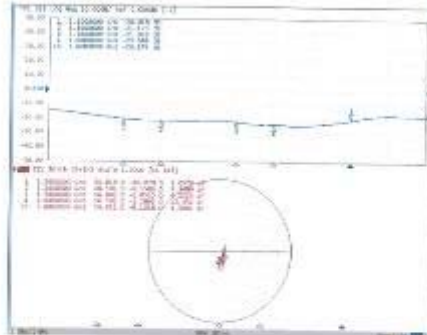


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Impedance Measurement Plot for Body TSL



Cardiac Res. 2017; 9(7): 61

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-End of the test report-