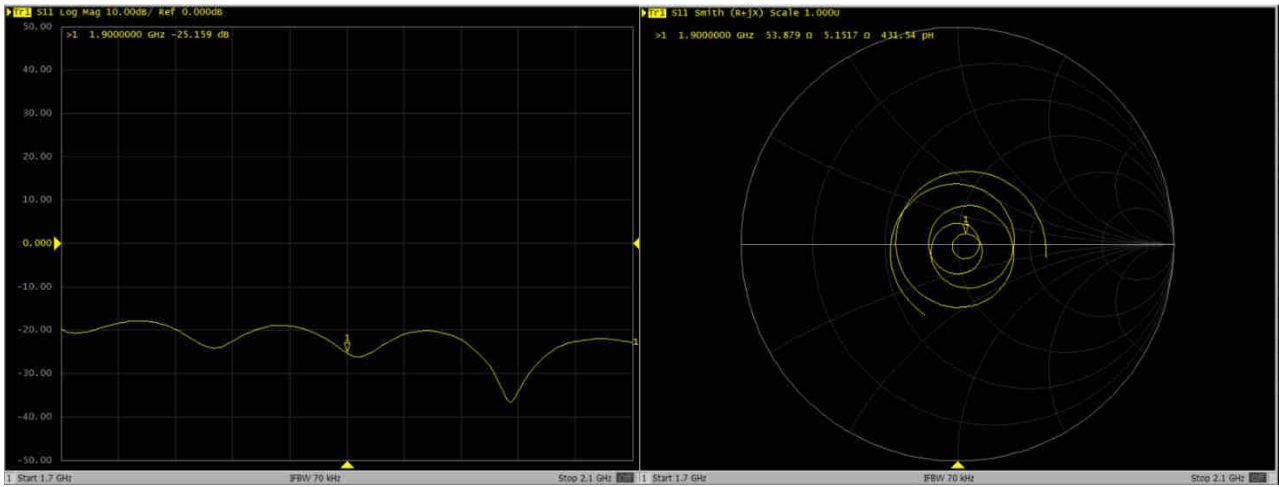
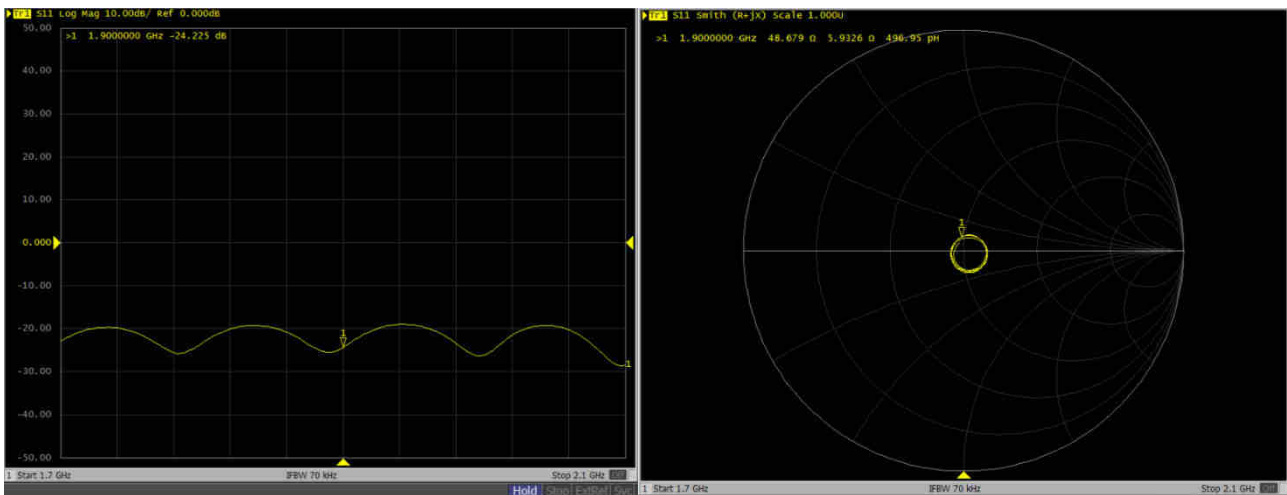


Dipole Verification Data> D1900V2, serial no. 5d182

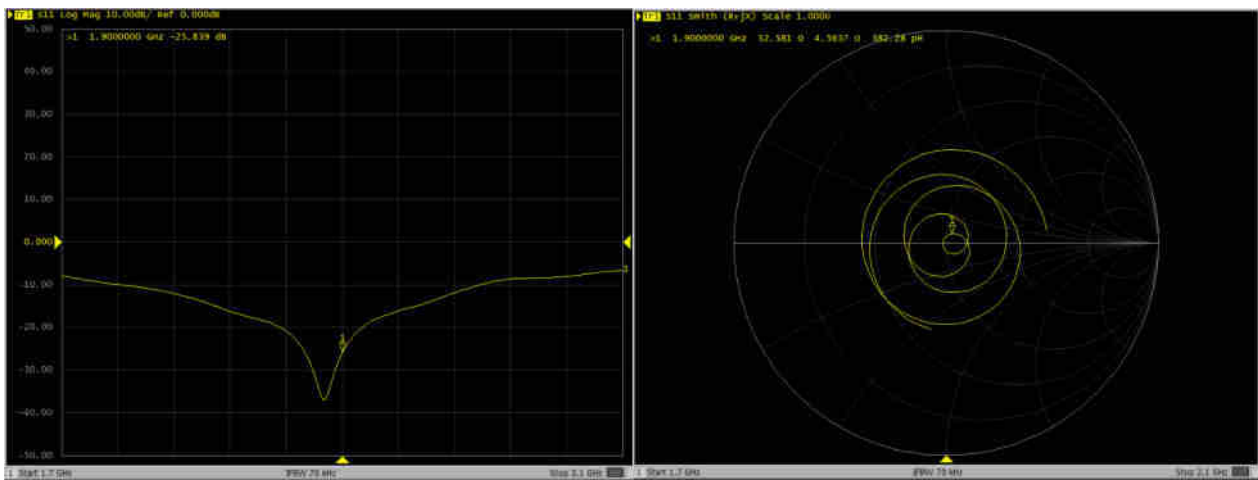
1900MHz – Head---2019.11.25



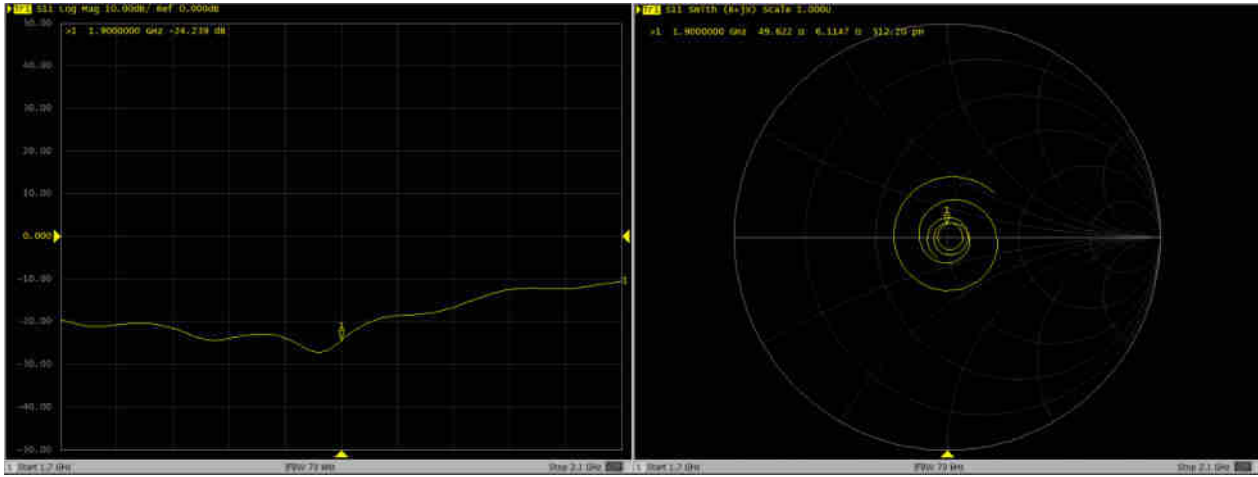
1900MHz – Body---2019.11.25



1900MHz – Head---2020.11.25



1900MHz – Body----2020.11.25





Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client **Sporton**

Certificate No: D2450V2-924_Sep20

CALIBRATION CERTIFICATE

Object: **D2450V2 - SN:924**

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

Calibration date: **September 02, 2020**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: BH9394 (20k)	31-Mar-20 (No. 217-03105)	Apr-21
Type-N mismatch combination	SN: 310982 / 06327	31-Mar-20 (No. 217-03104)	Apr-21
Reference Probe EX3DV4	SN: 7349	29-Jun-20 (No. EX3-7349_Jun20)	Jun-21
DAE4	SN: 601	27-Dec-19 (No. DAE4-601_Dec19)	Dec-20

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-19)	In house check: Oct-20

Calibrated by: **Jeffrey Katzman** Name: Jeffrey Katzman Function: Laboratory Technician

Approved by: **Katja Pokovic** Name: Katja Pokovic Function: Technical Manager

Signature

Issued: September 2, 2020

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: SCS 0108

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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 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
- 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 2010
- KDB 865664, "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%.

Measurement Conditions

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

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	38.9 \pm 6 %	1.84 mho/m \pm 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	51.4 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.04 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.0 W/kg \pm 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.9 Ω + 7.2 j Ω
Return Loss	-22.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.155 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
-----------------	-------

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:924

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.84$ S/m; $\epsilon_r = 38.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.74, 7.74, 7.74) @ 2450 MHz; Calibrated: 29.06.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD.000.P50 AA; Serial: 1001
- DASY52.52.10.4(1527); SEMCAD X 14.6.14(7483)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 115.2 V/m; Power Drift = -0.05 dB

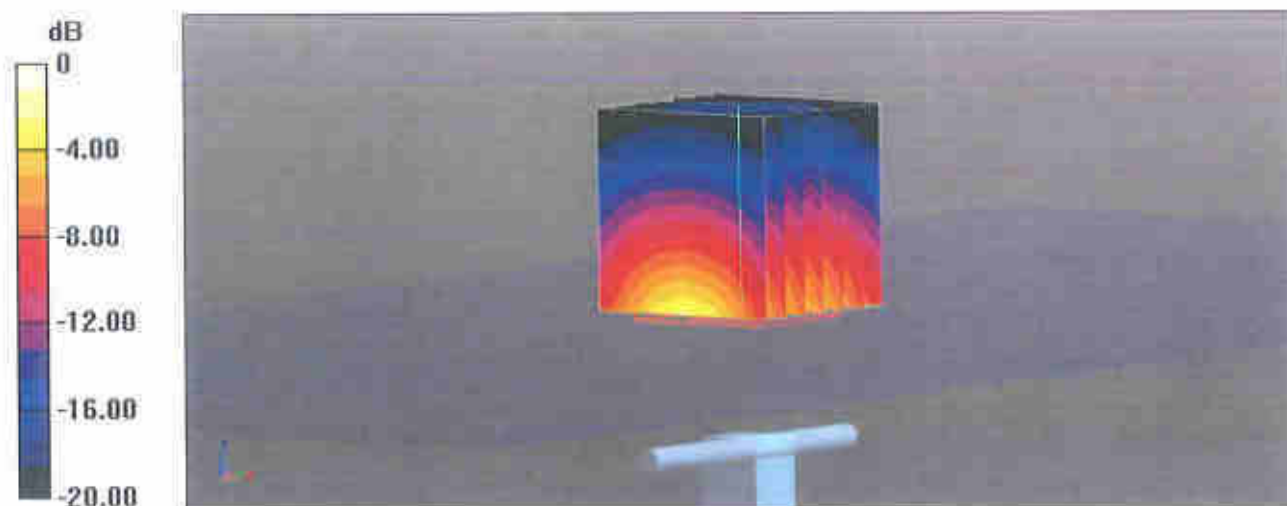
Peak SAR (extrapolated) = 25.4 W/kg

SAR(1 g) = 13.0 W/kg; SAR(10 g) = 6.04 W/kg

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

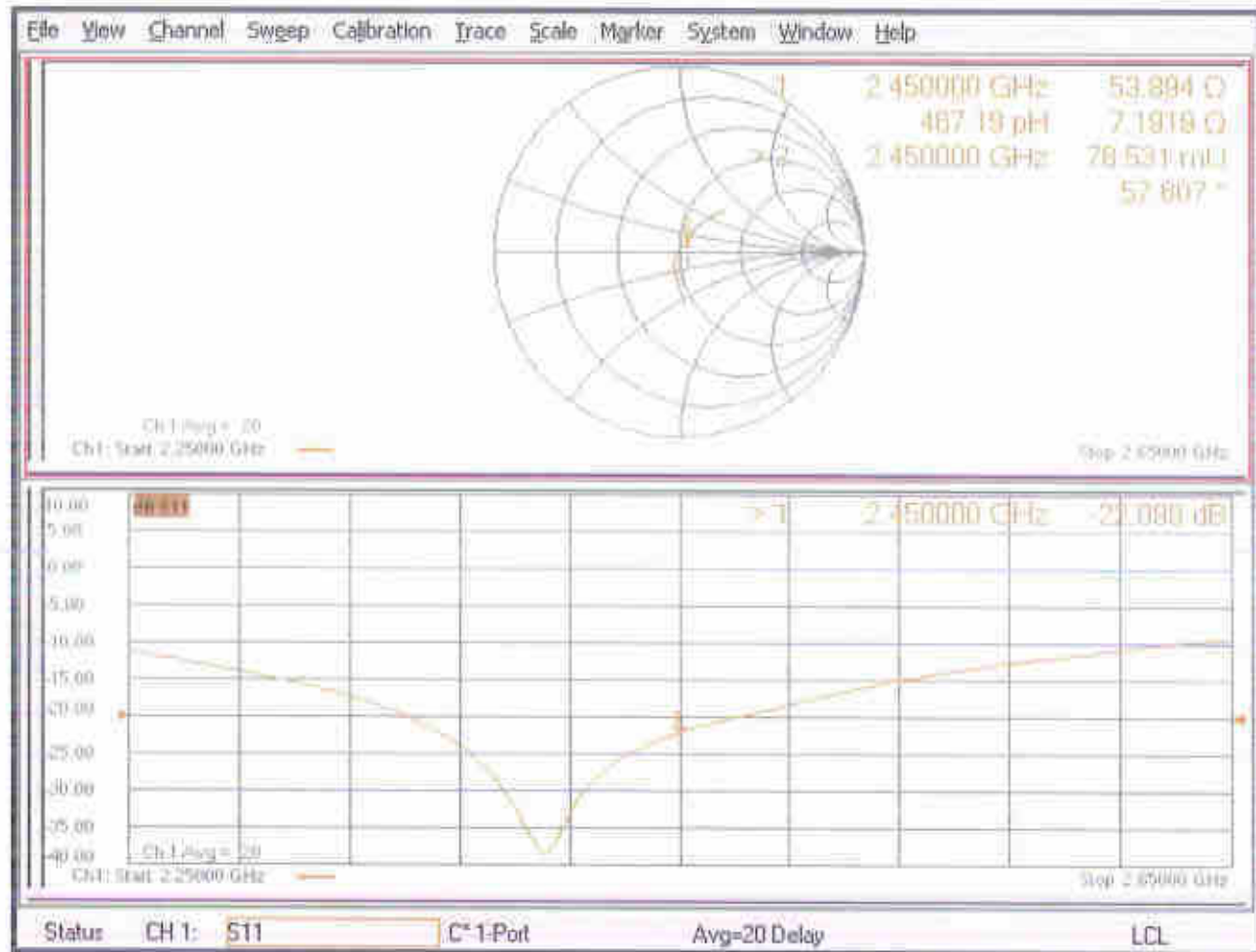
Ratio of SAR at M2 to SAR at M1 = 51%

Maximum value of SAR (measured) = 21.2 W/kg



0 dB = 21.2 W/kg = 13.26 dBW/kg

Impedance Measurement Plot for Head TSL





Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Client **Sporton**

Certificate No: **Z18-60537**

CALIBRATION CERTIFICATE

Object **D2600V2 - SN: 1070**

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

Calibration date: **December 7, 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(22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102196	07-Mar-18 (CTTL, No.J18X01510)	Mar-19
Power sensor NRV-Z5	100596	07-Mar-18 (CTTL, No.J18X01510)	Mar-19
Reference Probe EX3DV4	SN 7514	27-Aug-18(SPEAG,No.EX3-7514_Aug18)	Aug-19
DAE4	SN 1555	20-Aug-18(SPEAG,No.DAE4-1555_Aug18)	Aug-19
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	23-Jan-18 (CTTL, No.J18X00560)	Jan-19
Network Analyzer E5071C	MY46110673	24-Jan-18 (CTTL, No.J18X00561)	Jan-19

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

Issued: December 10, 2018

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



In Collaboration with

s p e a g

CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China

Tel: +86-10-62304633-2079

Fax: +86-10-62304633-2504

E-mail: cttl@chinattl.com

http://www.chinattl.cn

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM _{x,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 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, 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%.



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
 Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
 E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	52.10.2.1495
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.1 ± 6 %	1.93 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	58.1 mW / g ± 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.50 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	26.1 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	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.0 ± 6 %	2.18 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.8 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	54.6 mW / g ± 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.18 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	24.6 mW / g ± 18.7 % (k=2)



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix(Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.6Ω- 6.33jΩ
Return Loss	- 23.7dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.8Ω- 5.36jΩ
Return Loss	- 22.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.015 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
-----------------	-------



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL

Date: 12.06.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1070

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

Medium parameters used: $f = 2600$ MHz; $\sigma = 1.926$ S/m; $\epsilon_r = 39.1$; $\rho = 1000$ kg/m³

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(6.92, 6.92, 6.92) @ 2600 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

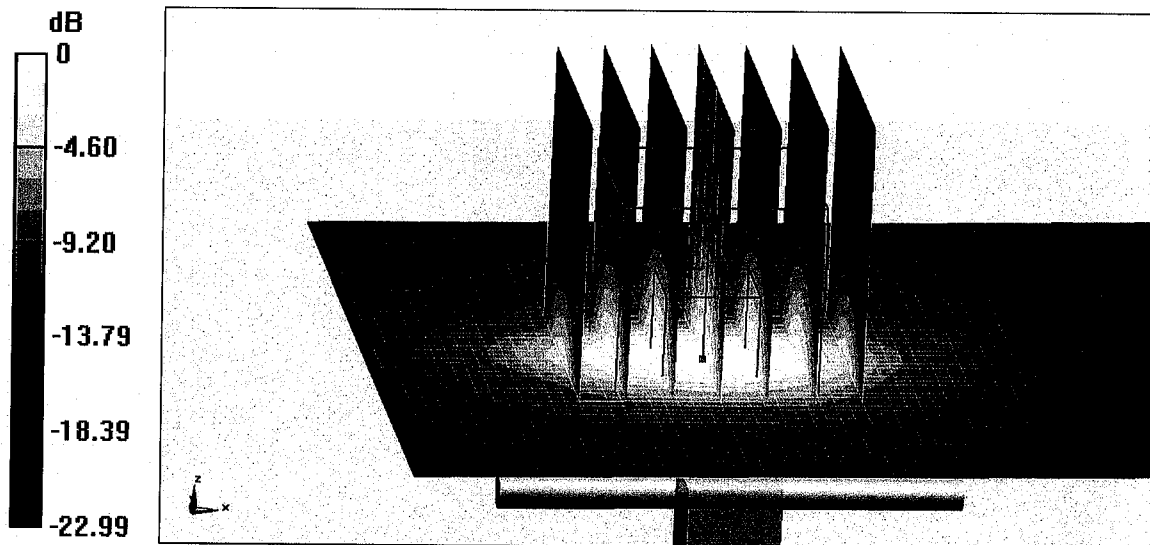
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.07 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 31.1 W/kg

SAR(1 g) = 14.4 W/kg; SAR(10 g) = 6.5 W/kg

Maximum value of SAR (measured) = 24.7 W/kg

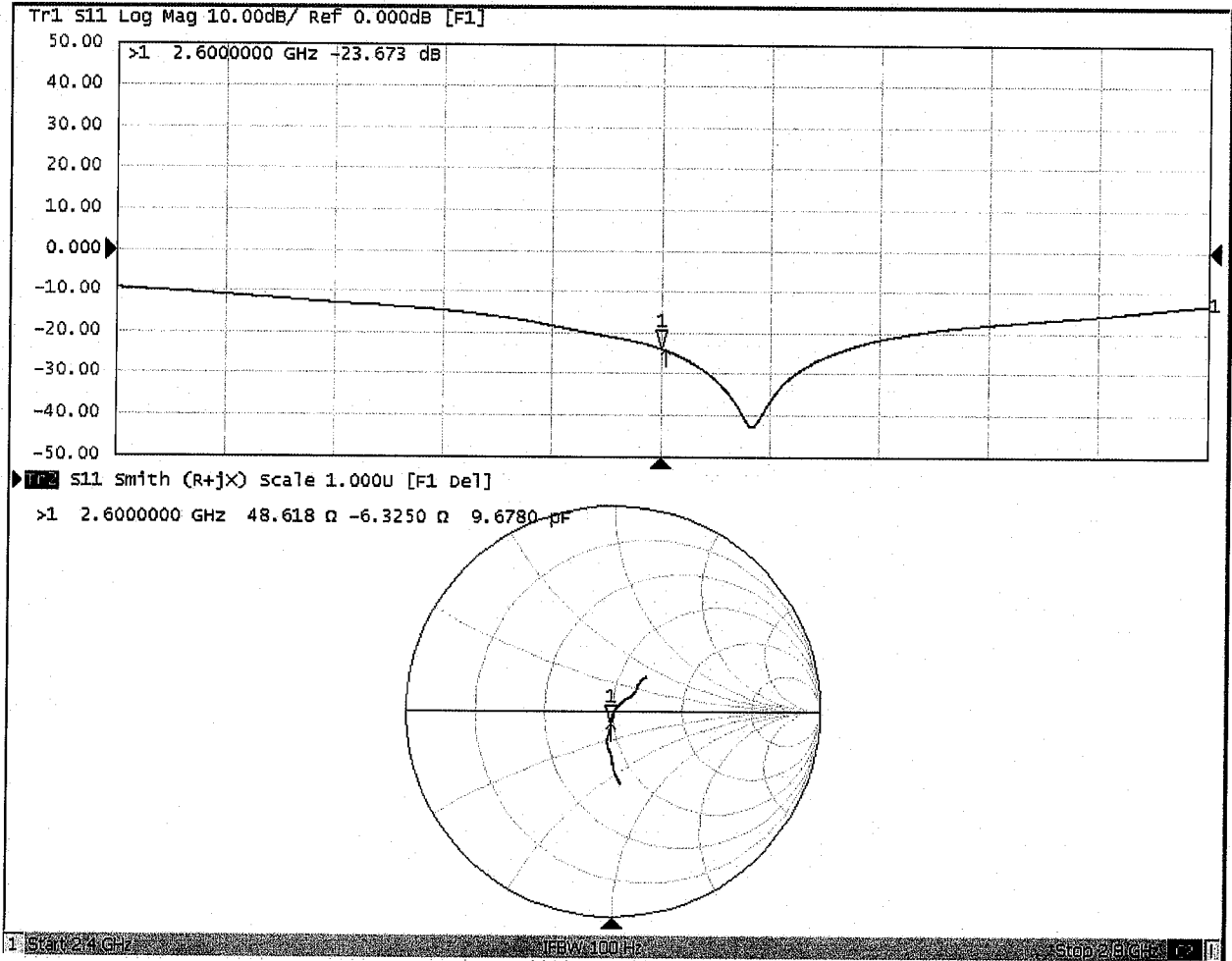


0 dB = 24.7 W/kg = 13.93 dBW/kg



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL





Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Body TSL

Date: 12.06.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1070

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

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.181$ S/m; $\epsilon_r = 51.03$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(7.06, 7.06, 7.06) @ 2600 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

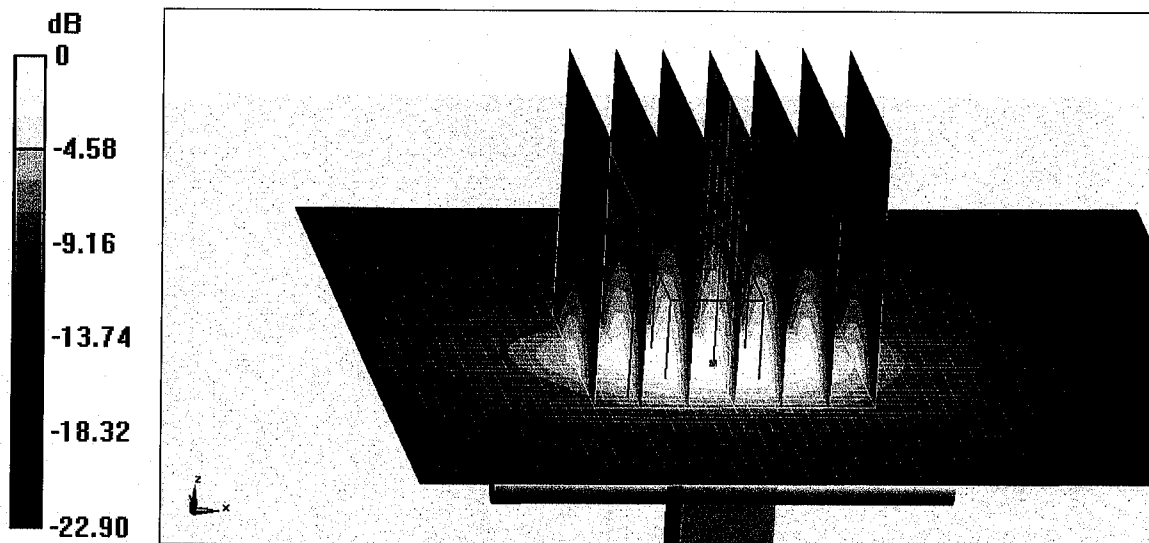
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.90 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 29.5 W/kg

SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.18 W/kg

Maximum value of SAR (measured) = 23.6 W/kg

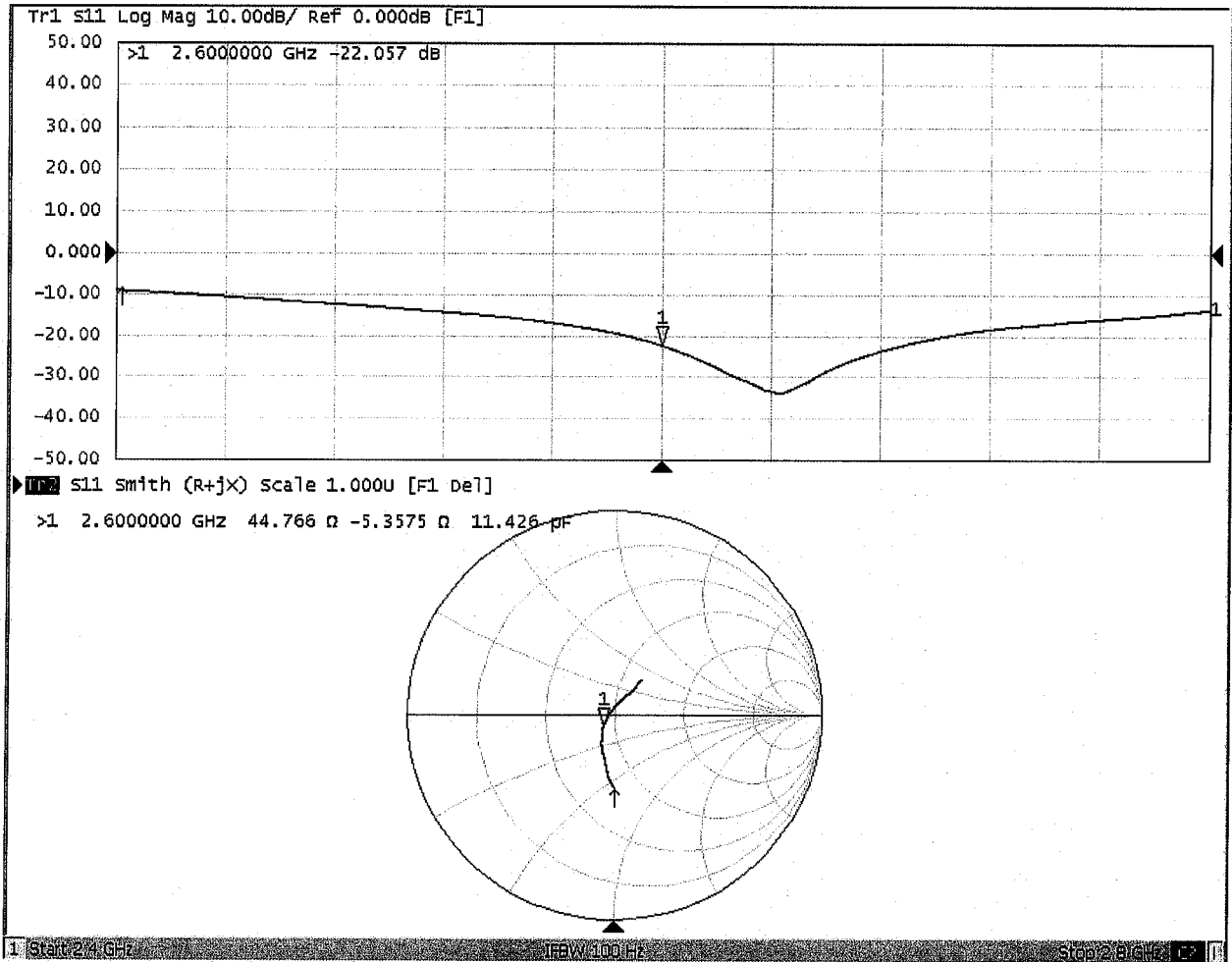


0 dB = 23.6 W/kg = 13.73 dBW/kg



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Body TSL





D2600V2, Serial No. 1070 Extended Dipole Calibrations

Referring to KDB 865664 D01 v01r02, if dipoles are verified in return loss ($< -20\text{dB}$, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

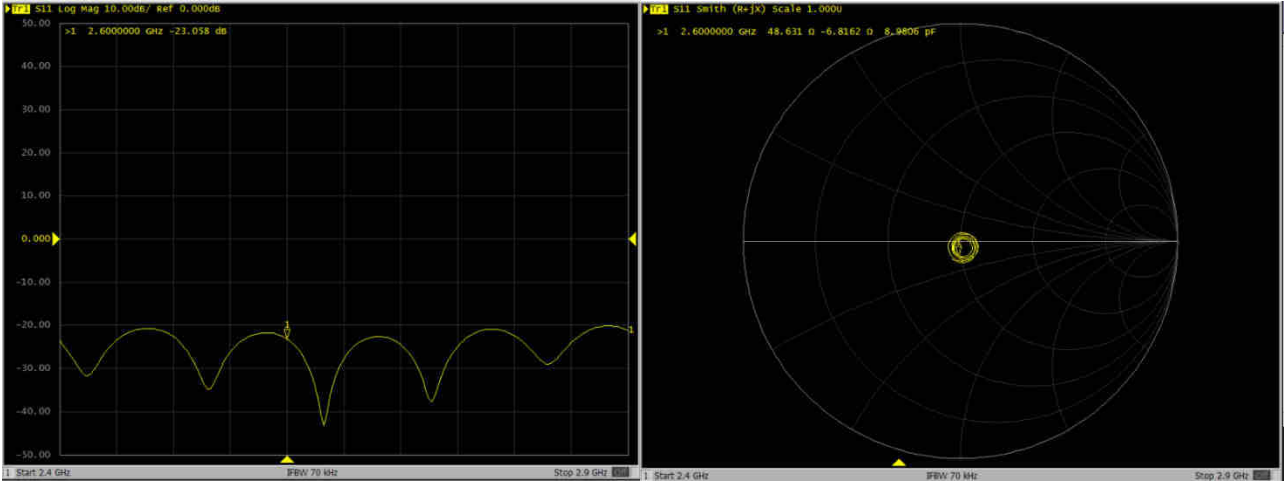
D2600V2 – serial no. 1070												
	2600 Head						2600 Body					
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2018.12.7	-23.7		48.6		-6.33		-22.1		44.8		-5.36	
2019.11.25	-23.1	2.5	48.6	0	-6.82	-0.49	-22.0	0.5	45.3	0.5	-4.65	0.71
2020.11.25	-23.5	0.8	48.8	0.2	-5.93	0.4	-22.0	0.5	44.5	-0.3	-5.04	0.32

<Justification of the extended calibration>

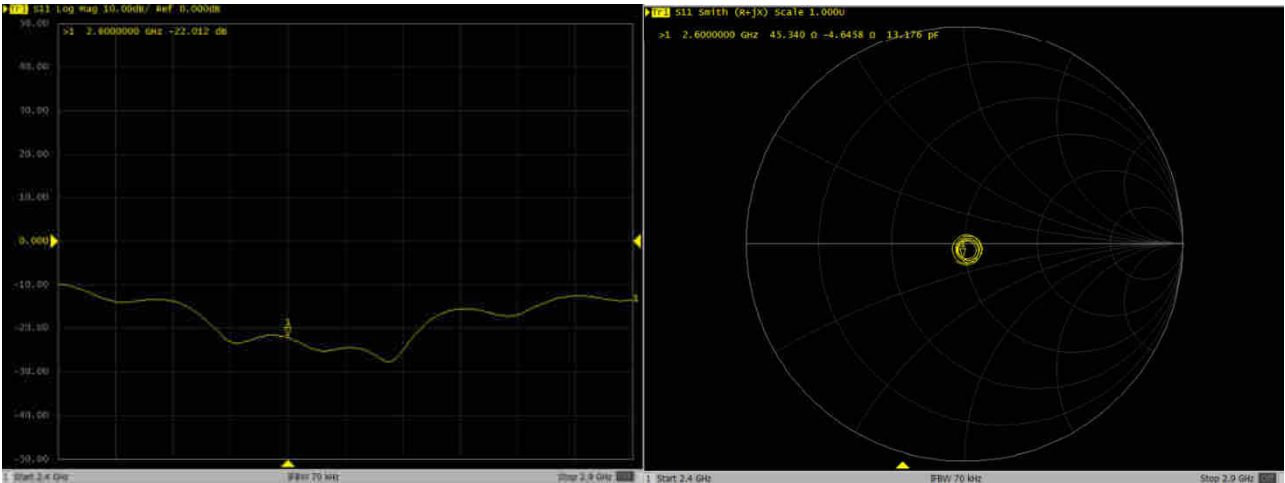
The return loss is $< -20\text{dB}$, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

Dipole Verification Data> D2600V2, serial no. 1070

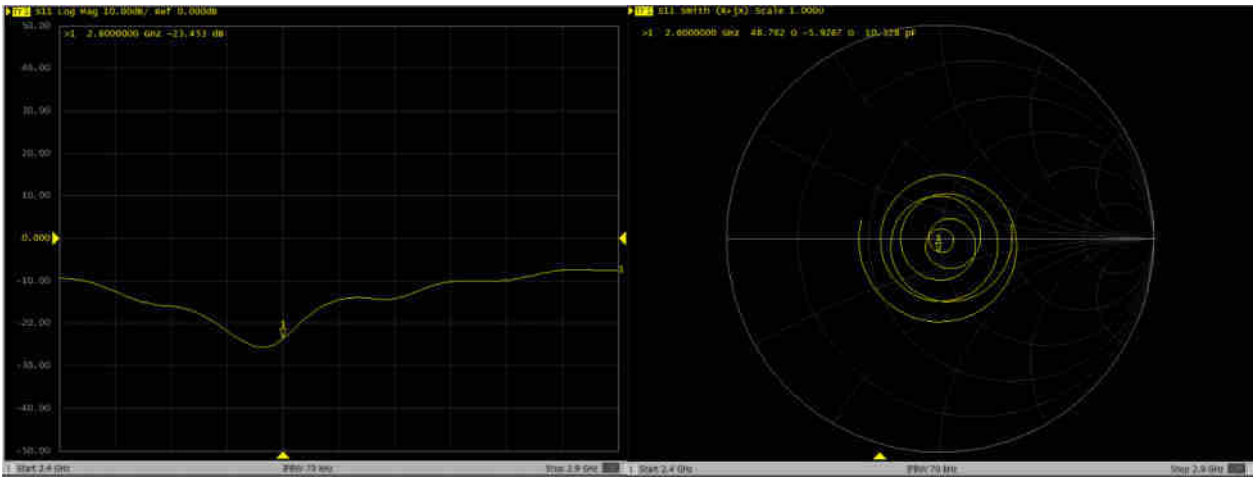
2600MHz – Head---2019.11.25



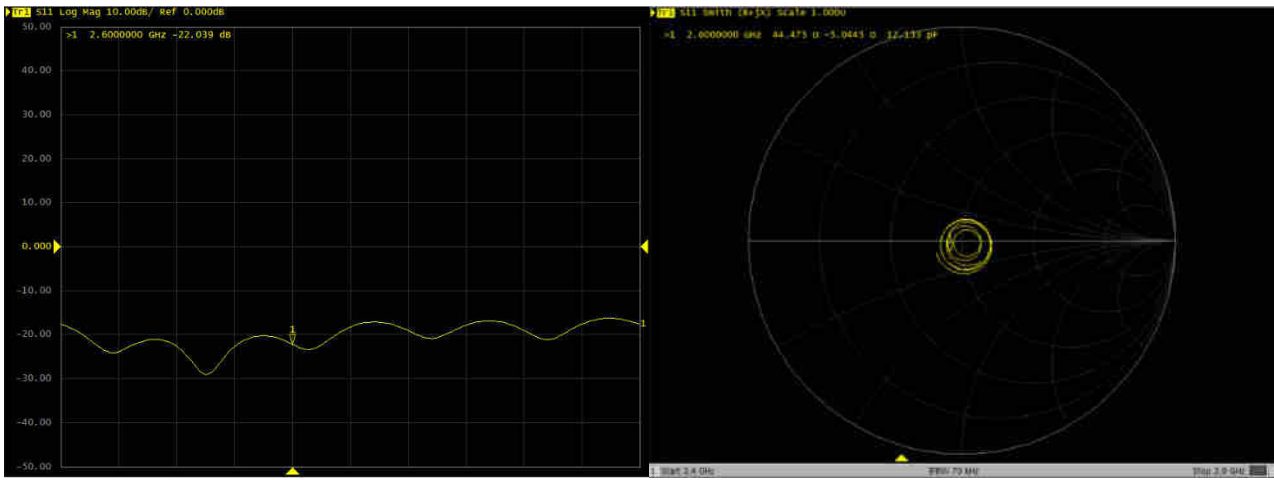
2600MHz – Body---2019.11.25



2600MHz – Head---2020.11.25



2600MHz – Body----2020.11.25





In Collaboration with
s p e a g
 CALIBRATION LABORATORY



中国认可
 国际互认
 校准
 CALIBRATION
 CNAS L0570

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
 Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
 E-mail: cttl@chinattl.com http://www.chinattl.cn

Client **Sporton**

Certificate No: **Z18-60259**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN: 1167**

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

Calibration date: **August 03, 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(22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	102083	01-Nov-17 (CTTL, No.J17X08756)	Oct-18
Power sensor NRP-Z91	100542	01-Nov-17 (CTTL, No.J17X08756)	Oct-18
ReferenceProbe EX3DV4	SN 7464	12-Sep-17(SPEAG,No.EX3-7464_Sep17)	Sep-18
DAE4	SN 1524	13-Sep-17(SPEAG,No.DAE4-1524_Sep17)	Sep-18
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	23-Jan-18 (CTTL, No.J18X00560)	Jan-19
NetworkAnalyzerE5071C	MY46110673	24-Jan-18 (CTTL, No.J18X00561)	Jan-19

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

Issued: August 6, 2018

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



Glossary:

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

Calibration is Performed According to the Following Standards:

- 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 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, 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%.



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
 Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
 E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	52.10.1.1476
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.9 ± 6 %	4.82 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.69 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	77.0 mW / g ± 24.4 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.20 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	22.0 mW / g ± 24.2 % (k=2)



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
 Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
 E-mail: cttl@chinattl.com http://www.chinattl.cn

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.1 ± 6 %	5.18 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.09 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	80.8 mW / g ± 24.4 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.32 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	23.2 mW / g ± 24.2 % (k=2)

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.9 ± 6 %	5.37 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.70 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	76.9 mW / g ± 24.4 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.17 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	21.6 mW / g ± 24.2 % (k=2)



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
 Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
 E-mail: cttl@chinattl.com http://www.chinattl.cn

Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.4 ± 6 %	5.32 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.46 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	74.4 mW / g ± 24.4 % (k=2)
SAR averaged over 10 cm³ (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.10 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	20.9 mW / g ± 24.2 % (k=2)

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.7 ± 6 %	5.79 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.73 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	77.1 mW / g ± 24.4 % (k=2)
SAR averaged over 10 cm³ (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.16 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	21.5 mW / g ± 24.2 % (k=2)



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
 Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
 E-mail: cttl@chinattl.com http://www.chinattl.cn

Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.5 ± 6 %	5.93 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.43 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	74.3 mW /g ± 24.4 % (k=2)
SAR averaged over 10 cm³ (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.08 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	20.8 mW /g ± 24.2 % (k=2)



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	50.3 Ω - 9.42j Ω
Return Loss	- 20.6dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	58.1 Ω - 7.15j Ω
Return Loss	- 20.0dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	53.5 Ω - 7.66j Ω
Return Loss	- 21.8dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	49.5 Ω - 7.40j Ω
Return Loss	- 22.6dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	58.0 Ω - 6.37j Ω
Return Loss	- 20.5dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	54.5 Ω - 7.07j Ω
Return Loss	- 21.9dB



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

General Antenna Parameters and Design

Electrical Delay (one direction)	1.065 ns
----------------------------------	----------

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

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

Additional EUT Data

Manufactured by	SPEAG
-----------------	-------



In Collaboration with

s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL

Date: 07.27.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1167

Communication System: CW; Frequency: 5250 MHz, Frequency: 5600 MHz,
Frequency: 5750 MHz,

Medium parameters used: $f = 5250$ MHz; $\sigma = 4.822$ S/m; $\epsilon_r = 35.92$; $\rho = 1000$ kg/m³,
Medium parameters used: $f = 5600$ MHz; $\sigma = 5.184$ S/m; $\epsilon_r = 35.14$; $\rho = 1000$ kg/m³,
Medium parameters used: $f = 5750$ MHz; $\sigma = 5.365$ S/m; $\epsilon_r = 34.88$; $\rho = 1000$ kg/m³,

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(5.68, 5.68, 5.68) @ 5250 MHz; Calibrated: 9/12/2017, ConvF(4.98, 4.98, 4.98) @ 5600 MHz; Calibrated: 9/12/2017, ConvF(5.04, 5.04, 5.04) @ 5750 MHz; Calibrated: 9/12/2017,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1524; Calibrated: 9/13/2017
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Dipole Calibration /Pin=100mW, d=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.09 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 32.4 W/kg
SAR(1 g) = 7.69 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 18.0 W/kg

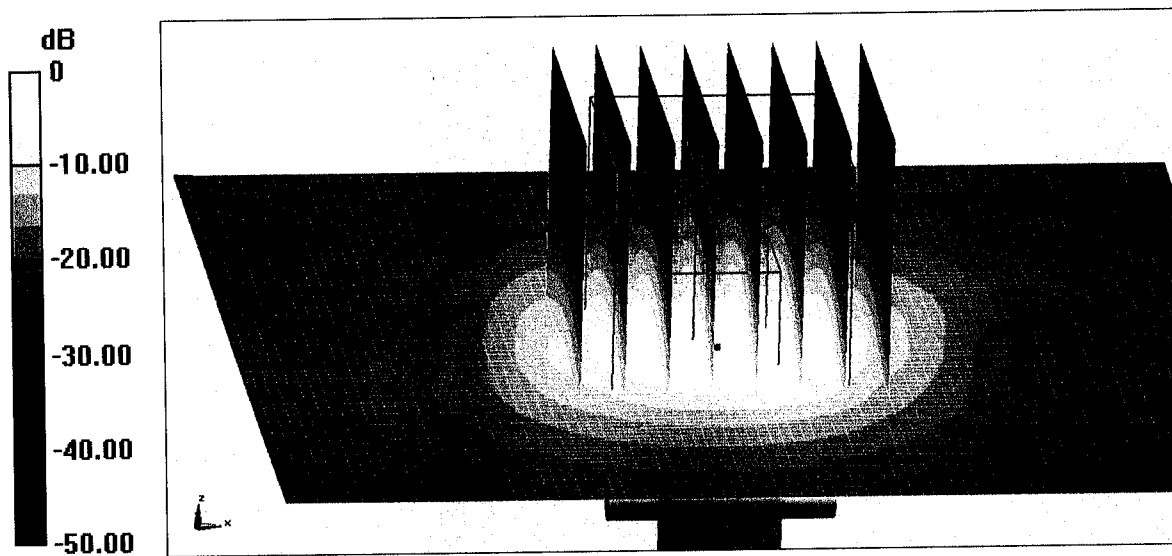
Dipole Calibration /Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.53 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 36.2 W/kg
SAR(1 g) = 8.09 W/kg; SAR(10 g) = 2.32 W/kg
Maximum value of SAR (measured) = 19.7 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.79 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 36.2 W/kg
SAR(1 g) = 7.7 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 19.0 W/kg



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn



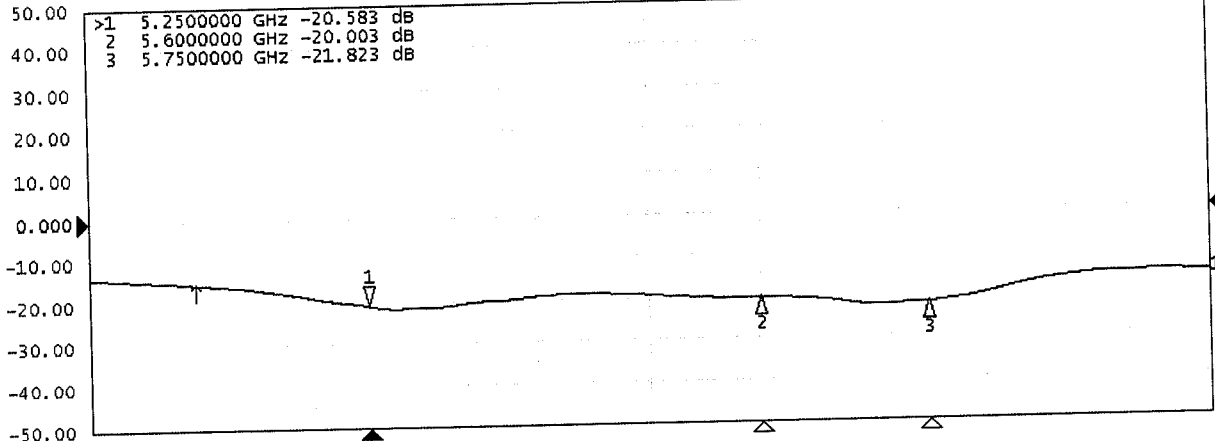
0 dB = 19.0 W/kg = 12.79 dBW/kg



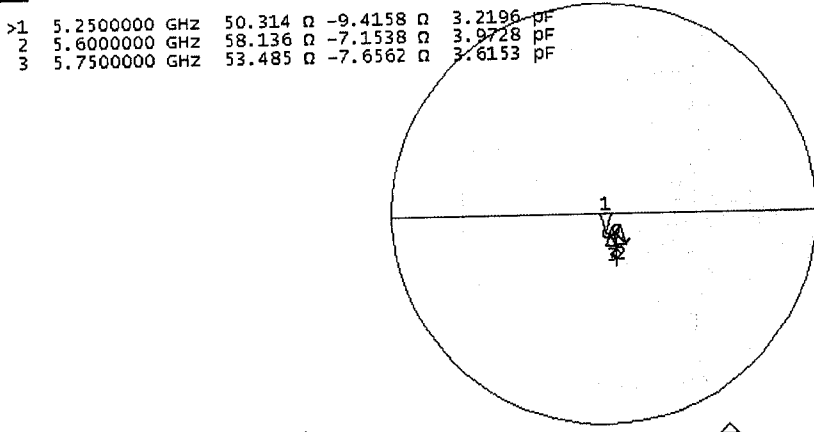
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL

Tr1 S11 Log Mag 10.00dB/ Ref 0.000dB [F1]



Tr2 S11 Smith (R+jX) scale 1.000U [F1 Del]





Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Body TSL

Date: 08.02.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1167

Communication System: CW; Frequency: 5250 MHz, Frequency: 5600 MHz,
Frequency: 5750 MHz,

Medium parameters used: $f = 5250$ MHz; $\sigma = 5.316$ S/m; $\epsilon_r = 48.42$; $\rho = 1000$ kg/m³,
Medium parameters used: $f = 5600$ MHz; $\sigma = 5.789$ S/m; $\epsilon_r = 47.7$; $\rho = 1000$ kg/m³,
Medium parameters used: $f = 5750$ MHz; $\sigma = 5.926$ S/m; $\epsilon_r = 48.45$; $\rho = 1000$ kg/m³,

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(5.29, 5.29, 5.29) @ 5250 MHz; Calibrated: 9/12/2017, ConvF(4.5, 4.5, 4.5) @ 5600 MHz; Calibrated: 9/12/2017, ConvF(4.59, 4.59, 4.59) @ 5750 MHz; Calibrated: 9/12/2017,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1524; Calibrated: 9/13/2017
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

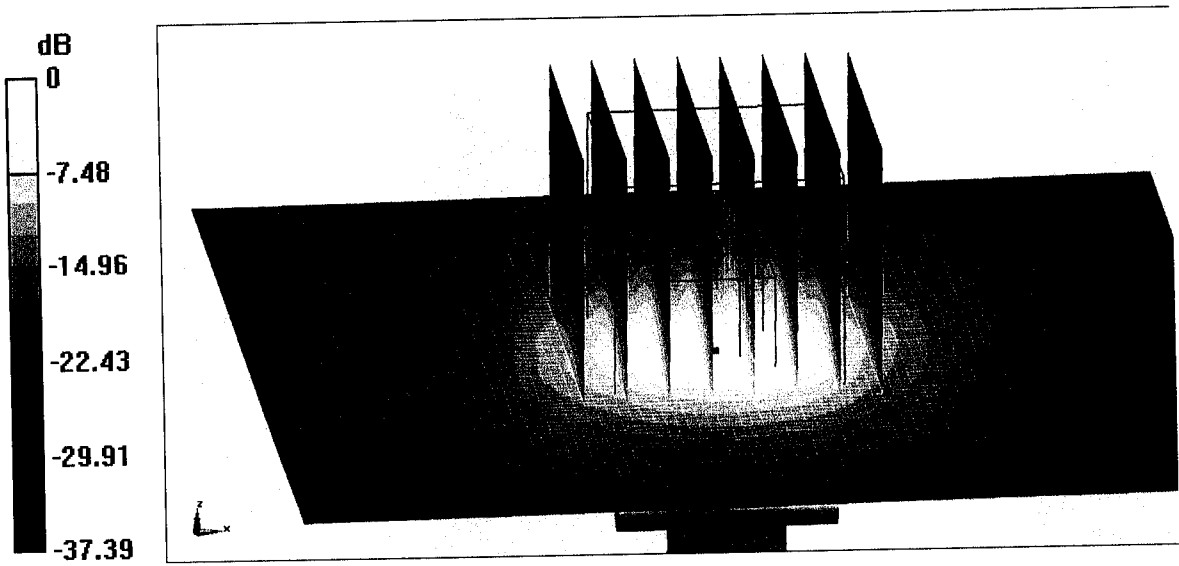
Dipole Calibration /Pin=100mW, d=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.14 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 31.9 W/kg
SAR(1 g) = 7.46 W/kg; SAR(10 g) = 2.1 W/kg
Maximum value of SAR (measured) = 17.6 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.32 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 36.3 W/kg
SAR(1 g) = 7.73 W/kg; SAR(10 g) = 2.16 W/kg
Maximum value of SAR (measured) = 19.1 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.99 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 35.2 W/kg
SAR(1 g) = 7.43 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 18.0 W/kg



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn



0 dB = 18.0 W/kg = 12.55 dBW/kg

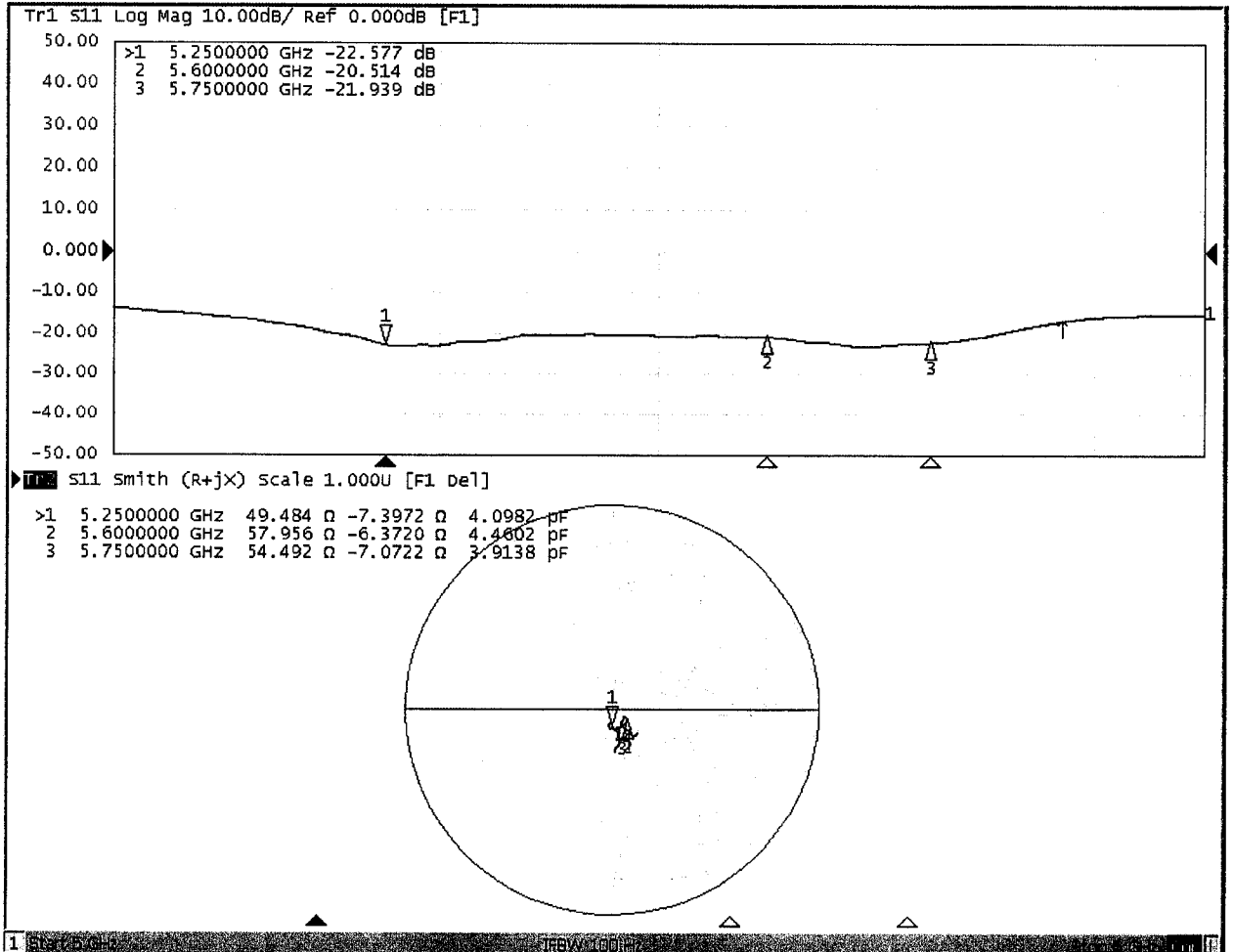


In Collaboration with

s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Body TSL





D5GHzV3, Serial No. 1167 Extended Dipole Calibrations

Referring to KDB 865664 D01 v01r02, if dipoles are verified in return loss ($< -20\text{dB}$, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

5250MHz

D5GHzV3 – serial no. 1167												
	5250 Head						5250 Body					
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2018.08.03	-20.6		50.3		-9.42		-22.6		49.5		-7.40	
2019.10.30	-20.3	1.5	50.9	0.6	-9.72	-0.3	-22.4	0.9	48.2	-1.3	-7.25	0.15
2020.10.30	-20.7	-0.05	50.19	-0.11	-9.09	0.33	-23.1	-2.2	50.2	0.7	-7.03	0.37

5600MHz

D5GHzV3 – serial no. 1167												
	5600 Head						5600 Body					
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2018.08.03	-20.0		58.1		-7.15		-20.5		58.0		-6.37	
2019.10.30	-20.1	-0.5	57.4	-0.7	-7.63	-0.48	-20.4	0.5	57.7	-0.3	-6.87	-0.5
2020.10.30	-19.99	0.05	58.2	0.1	-7.13	0.02	-20.1	1.95	58.9	0.9	-5.96	0.41

5750MHz

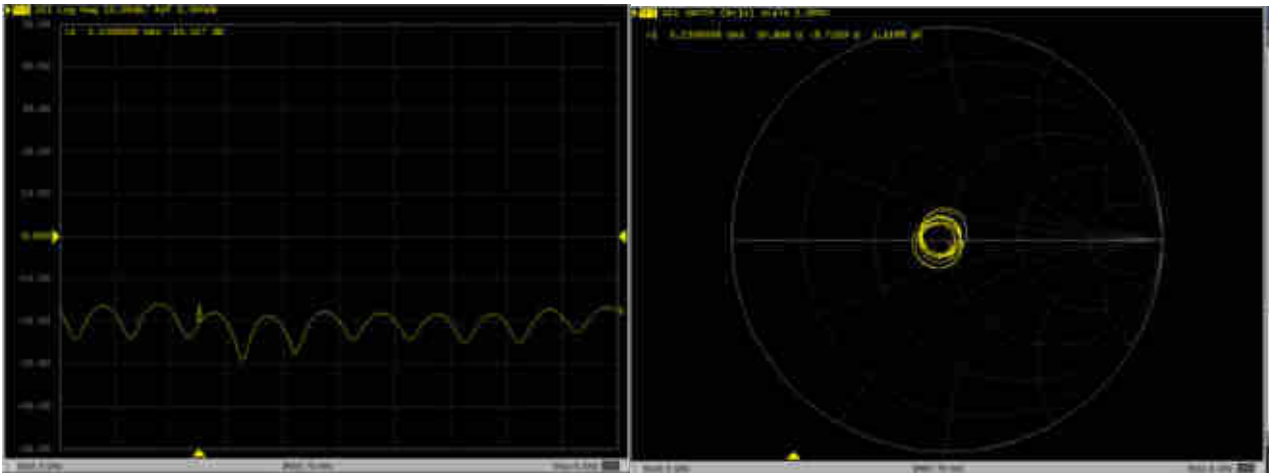
D5GHzV3 – serial no. 1167												
	5750 Head						5750 Body					
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2018.08.03	-21.8		53.5		-7.66		-21.9		54.5		-7.07	
2019.10.30	-21.1	3.2	53.0	-0.5	-8.58	-0.92	-21.6	1.4	55.2	0.7	-7.04	0.03
2020.10.30	-21.9	0.05	53.2	-0.3	-7.35	0.31	-21.6	1.4	54.2	-0.3	-7.60	-0.53

<Justification of the extended calibration>

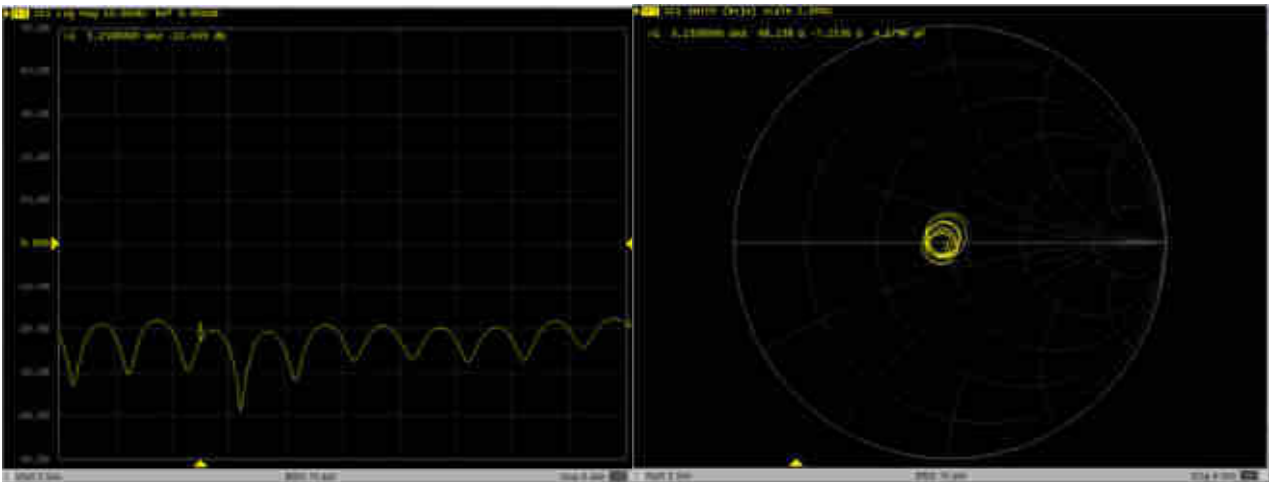
The return loss is $< -20\text{dB}$, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

Dipole Verification Data> D5GHzV3, serial no. 1167

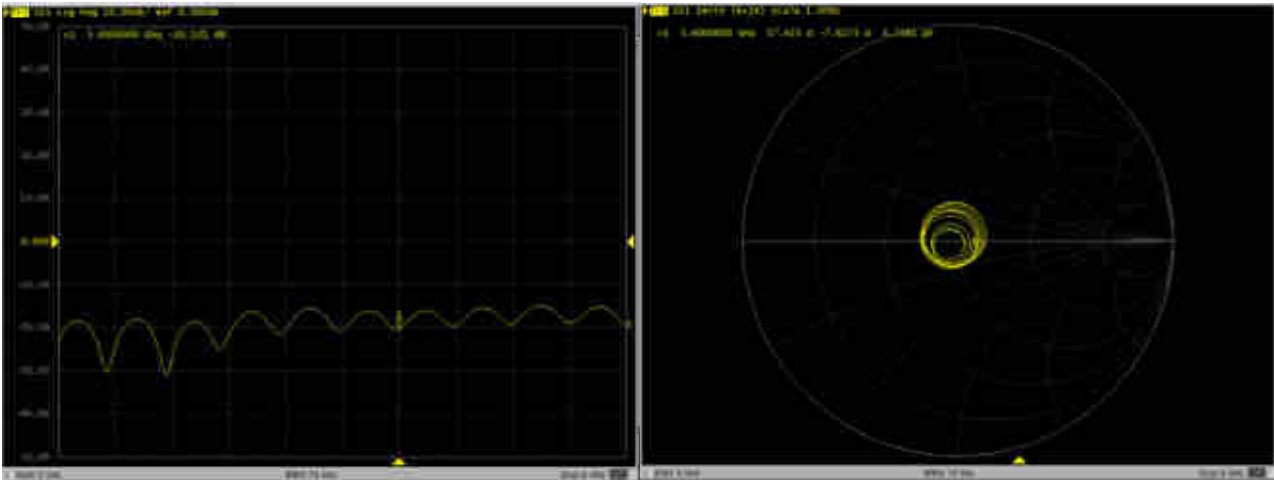
5250MHz – Head----2019.10.30



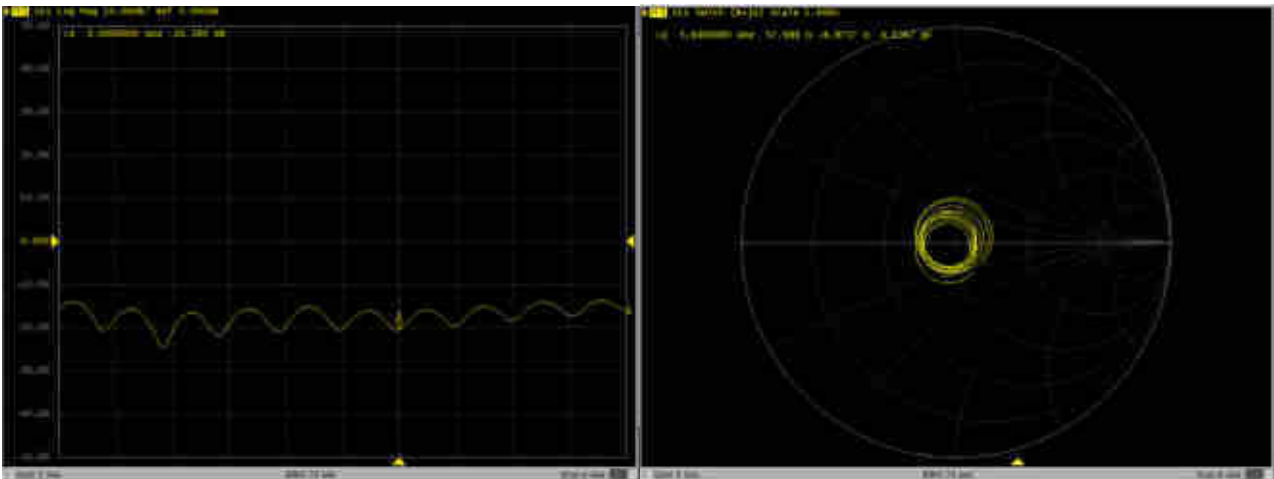
5250MHz – Body----2019.10.30



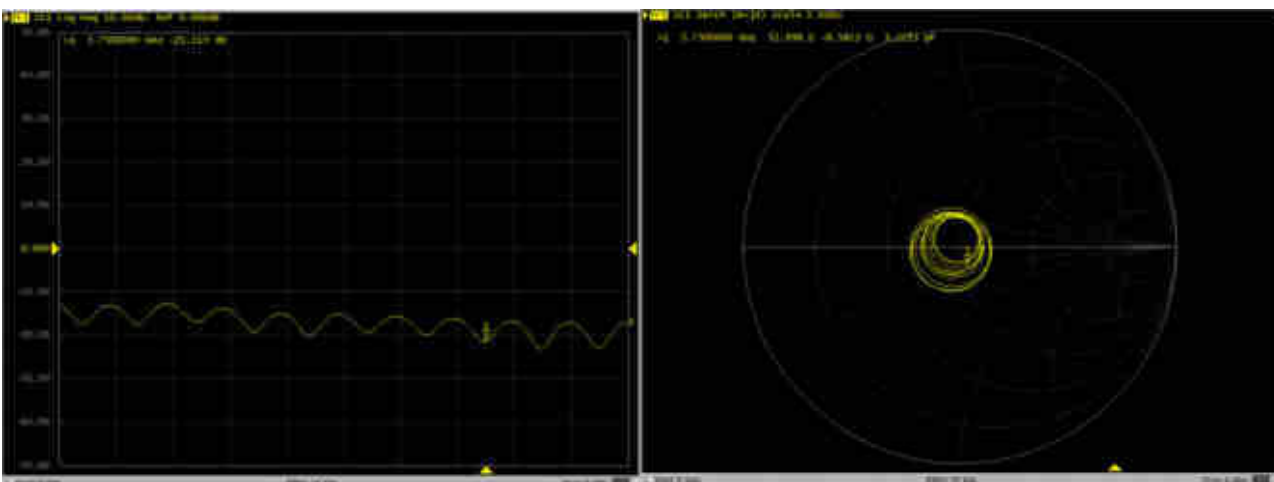
5600MHz – Head----2019.10.30



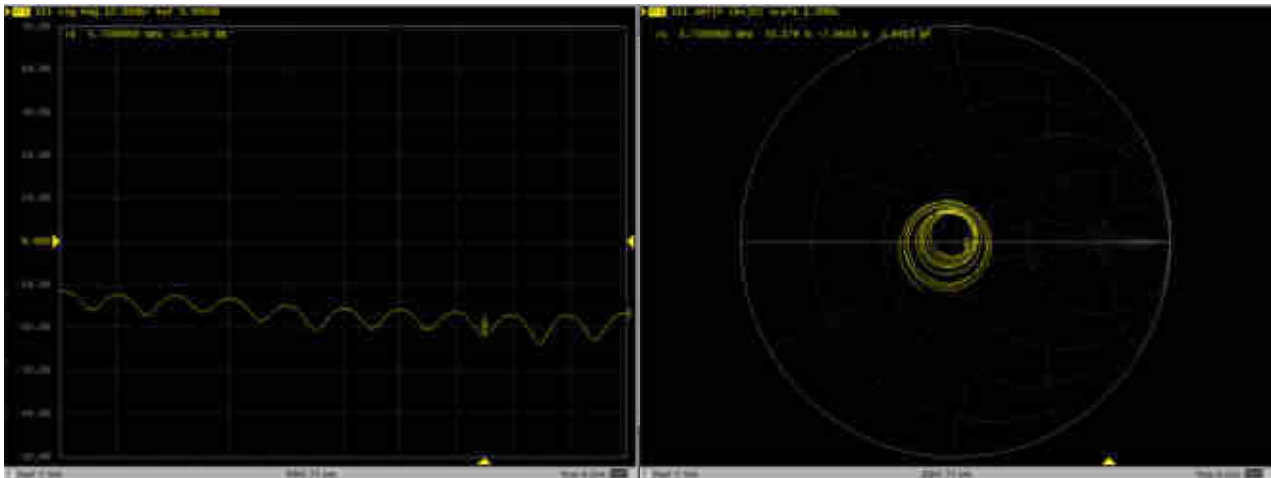
5600MHz – Body----2019.10.30



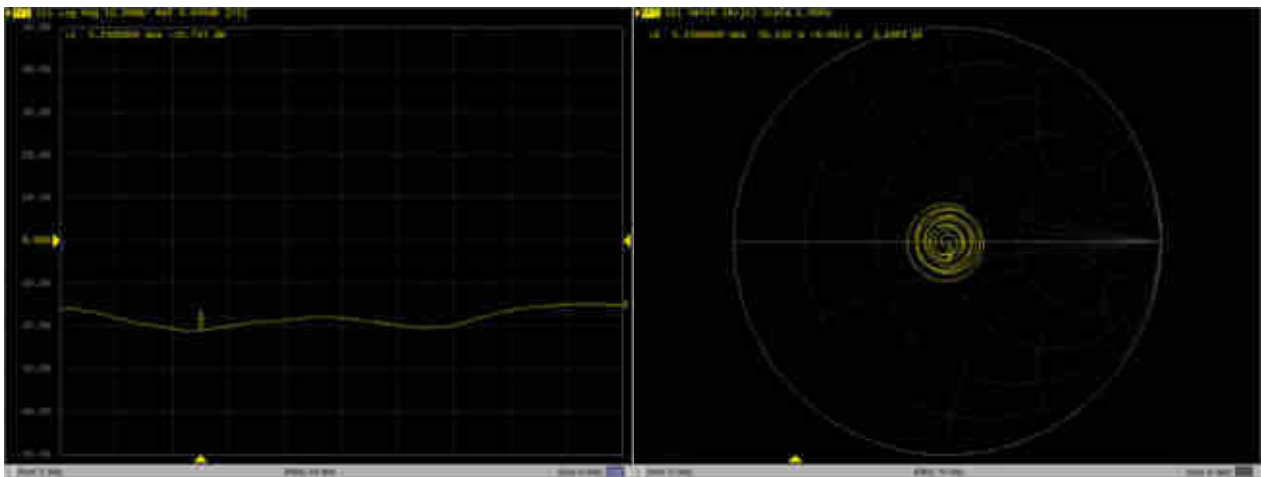
5750MHz – Head----2019.10.30



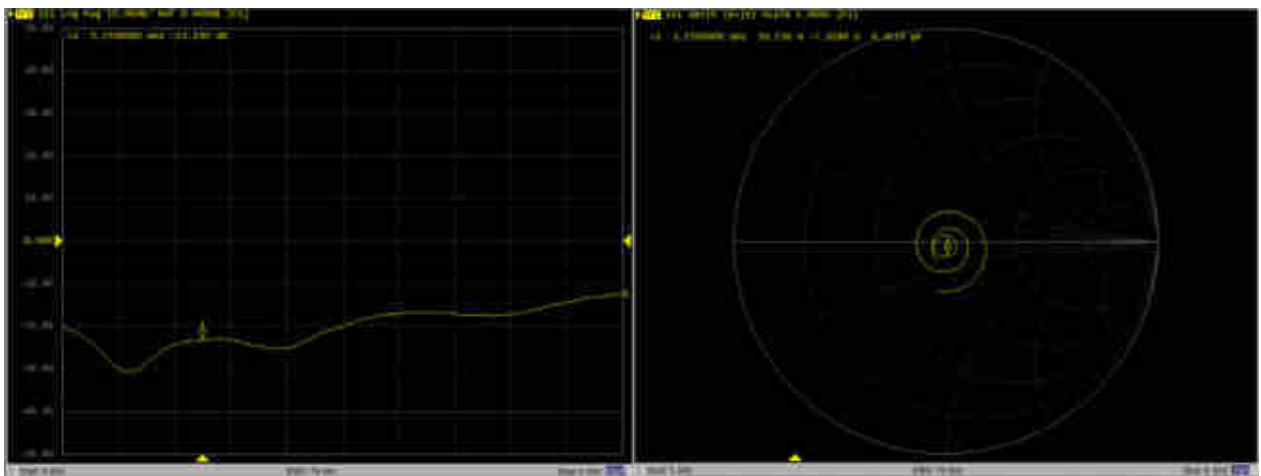
5750MHz – Body----2019.10.30



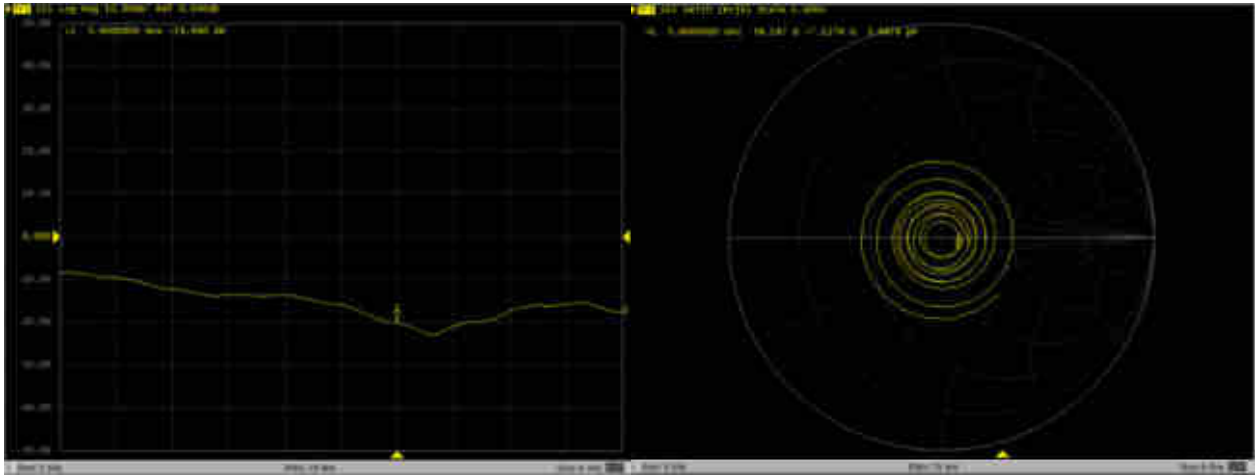
5250MHz – Head----2020.10.30



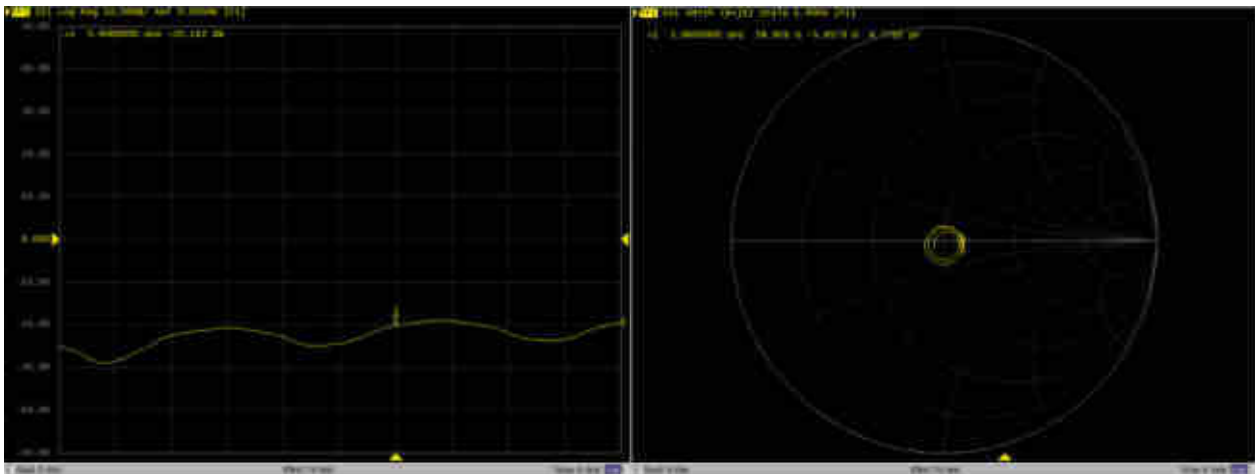
5250MHz – Body----2020.10.30



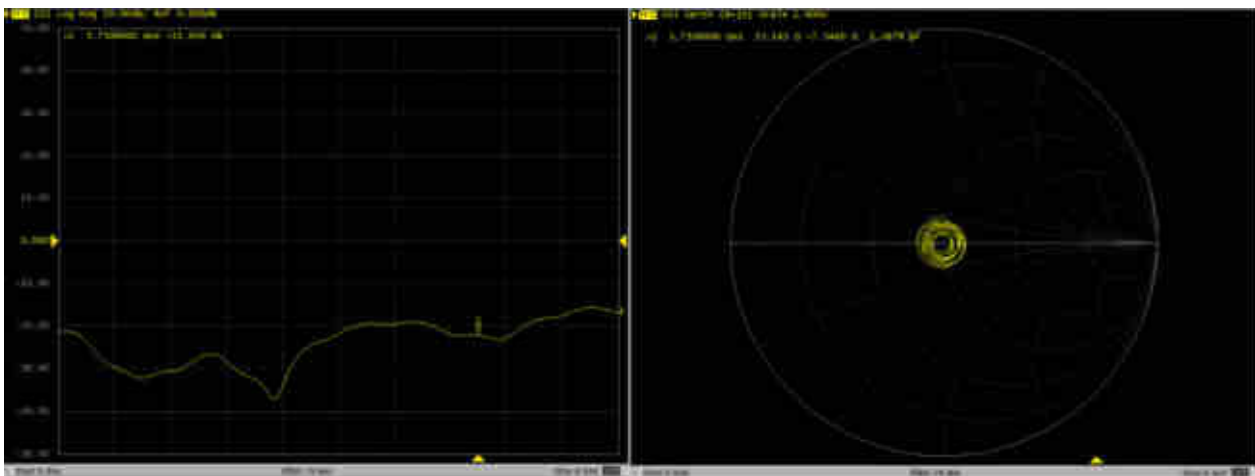
5600MHz – Head----2020.10.30



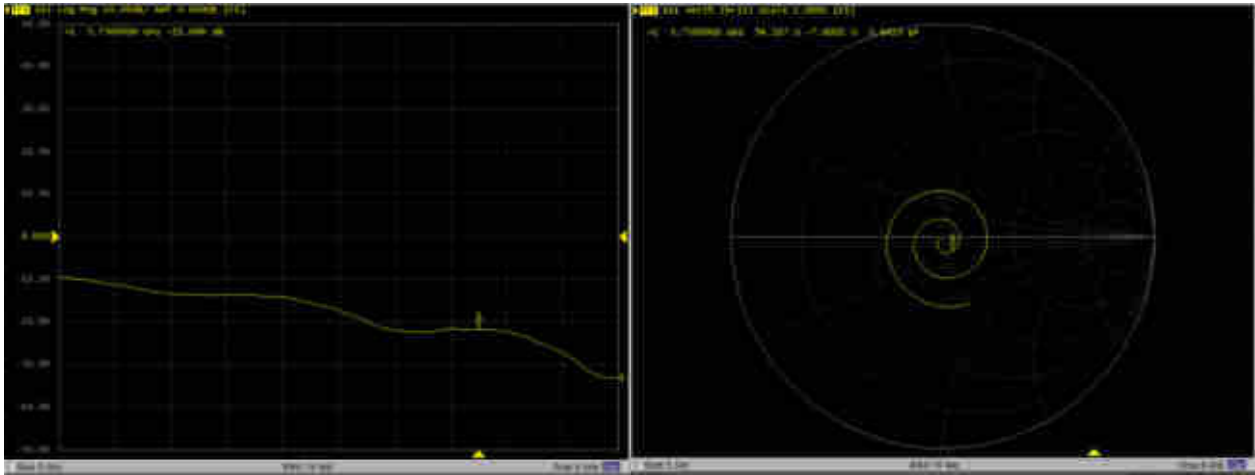
5600MHz – Body----2020.10.30



5750MHz – Head----2020.10.30



5750MHz – Body----2020.10.30





IMPORTANT NOTICE

USAGE OF THE DAE4

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

Battery Exchange: The battery cover of the DAE4 unit is fixed using a screw, over tightening the screw may cause the threads inside the DAE to wear out.

Shipping of the DAE: Before shipping the DAE to SPEAG for calibration, remove the batteries and pack the DAE in an antistatic bag. This antistatic bag shall then be packed into a larger box or container which protects the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, the customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

DASY Configuration Files: Since the exact values of the DAE input resistances, as measured during the calibration procedure of a DAE unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file.

Important Note:

Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.

Important Note:

Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.

Important Note:

To prevent damage of the DAE probe connector pins, use great care when installing the probe to the DAE. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE.



Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client **Sporton**

Certificate No: DAE4-1210_Jul20

CALIBRATION CERTIFICATE

Object: DAE4 - SD 000 D04 BM - SN: 1210

Calibration procedure(s): QA CAL-06.v30
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: July 27, 2020

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

All calibrations have been conducted in the closed laboratory facility; environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	03-Sep-19 (No:25949)	Sep-20
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	09-Jan-20 (in house check)	In house check: Jan-21
Calibrator Box V2.1	SE UMS 008 AA 1002	09-Jan-20 (in house check)	In house check: Jan-21

Calibrated by: Name: Adrian Gehring, Function: Laboratory Technician

Approved by: Sven Kühn, Deputy Manager

Signature

Issued: July 27, 2020

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



Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Glossary

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 following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
 - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
 - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
 - *Input Offset Measurement:* Output voltage and statistical results over a large number of zero voltage measurements.
 - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - *Input resistance:* Typical value for information; DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
 - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 μ V, full range = -100...+300 mV

Low Range: 1LSB = 61 nV, full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.162 \pm 0.02% (k=2)	404.982 \pm 0.02% (k=2)	405.090 \pm 0.02% (k=2)
Low Range	3.99951 \pm 1.50% (k=2)	3.99092 \pm 1.50% (k=2)	3.95059 \pm 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	346.0 $^{\circ}$ \pm 1 $^{\circ}$
---	-------------------------------------

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	199996.55	0.86	0.00
Channel X + Input	20003.46	1.82	0.01
Channel X - Input	-19999.22	2.95	-0.01
Channel Y + Input	199995.01	-0.81	-0.00
Channel Y + Input	20000.50	-0.99	-0.00
Channel Y - Input	-20001.74	0.48	-0.00
Channel Z + Input	199993.65	-2.05	-0.00
Channel Z + Input	20000.87	-0.52	-0.00
Channel Z - Input	-20002.17	0.12	-0.00

Low Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	2001.48	0.71	0.04
Channel X + Input	202.17	0.99	0.49
Channel X - Input	-198.74	-0.08	0.04
Channel Y + Input	2001.11	0.41	0.02
Channel Y + Input	200.90	-0.24	-0.12
Channel Y - Input	-199.54	-0.82	0.42
Channel Z + Input	2000.50	-0.11	-0.01
Channel Z + Input	200.24	-0.82	-0.41
Channel Z - Input	-199.89	-1.02	0.52

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-6.78	-8.90
	-200	10.13	8.29
Channel Y	200	-8.84	-9.15
	-200	8.75	8.46
Channel Z	200	12.20	12.07
	-200	-14.74	-14.25

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	2.65	-4.04
Channel Y	200	8.36	-	2.84
Channel Z	200	9.58	7.02	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSC)	Low Range (LSB)
Channel X	15961	15923
Channel Y	15952	15701
Channel Z	15867	16022

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	-0.08	-1.17	1.37	0.42
Channel Y	-0.23	-1.47	0.68	0.40
Channel Z	0.14	-0.59	1.76	0.36

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9



In Collaboration with
s p e a g
CALIBRATION LABORATORY



中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com [Http://www.chinattl.cn](http://www.chinattl.cn)

Certificate No: Z19-60436

Client : **Sporton**

CALIBRATION CERTIFICATE

Object: DAE4 - SN: 1437

Calibration Procedure(s): FF-Z11-002-01
Calibration Procedure for the Data Acquisition Electronics (DAEx)

Calibration date: November 19, 2019

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Process Calibrator 753	1971018	24-Jun-19 (CTTL, No.J19X05126)	Jun-20

	Name	Function
Calibrated by:	Yu Zongying	SAR Test Engineer
Reviewed by:	Zhao Jing	SAR Test Engineer
Approved by:	Qi Dianyuan	SAR Project Leader

Signature

Issued: November 21, 2019

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



In Collaboration with

s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.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.



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
 Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
 E-mail: cttl@chinattl.com Http://www.chinattl.cn

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 μ V, 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	404.110 \pm 0.15% (k=2)	403.634 \pm 0.15% (k=2)	404.056 \pm 0.15% (k=2)
Low Range	3.95185 \pm 0.7% (k=2)	3.93955 \pm 0.7% (k=2)	3.90561 \pm 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	65 $^{\circ}$ \pm 1 $^{\circ}$
---	----------------------------------



Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Auden**

Certificate No: **DAE3-528_Mar20**

CALIBRATION CERTIFICATE

Object: **DAE3 - SD 000 D03 AA - SN: 528**

Calibration procedure(s): **QA CAL-06.v30
Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **March 16, 2020**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	03-Sep-19 (No:25949)	Sep-20
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS-053 AA 1001	09-Jan-20 (in house check)	In house check: Jan-21
Calibrator Box V2.1	SE UMS 006 AA 1002	09-Jan-20 (in house check)	In house check: Jan-21

Calibrated by:	Name Eric Hainfeld	Function Laboratory Technician	Signature
Approved by:	Name Sven Kühn	Function Deputy Manager	Signature

Issued: March 16, 2020

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



Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary

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 following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
 - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
 - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
 - *Input Offset Measurement:* Output voltage and statistical results over a large number of zero voltage measurements.
 - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
 - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 μ V, 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	404.513 \pm 0.02% (k=2)	404.615 \pm 0.02% (k=2)	404.537 \pm 0.02% (k=2)
Low Range	3.97109 \pm 1.50% (k=2)	3.95930 \pm 1.50% (k=2)	3.96568 \pm 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	50.0 ^o \pm 1 ^o
---	--

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	200037.58	3.28	0.00
Channel X + Input	20009.65	3.92	0.02
Channel X - Input	-20001.89	3.62	-0.02
Channel Y + Input	200037.90	3.50	0.00
Channel Y + Input	20005.83	0.31	0.00
Channel Y - Input	-20005.73	-0.03	0.00
Channel Z + Input	200033.51	-0.62	-0.00
Channel Z + Input	20006.48	0.89	0.00
Channel Z - Input	-20006.01	-0.27	0.00

Low Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	2001.68	0.24	0.01
Channel X + Input	201.09	-0.22	-0.11
Channel X - Input	-198.93	-0.12	0.06
Channel Y + Input	2001.70	0.49	0.02
Channel Y + Input	200.70	-0.24	-0.12
Channel Y - Input	-199.76	-0.76	0.38
Channel Z + Input	2001.03	-0.04	-0.00
Channel Z + Input	201.25	0.40	0.20
Channel Z - Input	-199.29	-0.32	0.16

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	9.59	7.82
	- 200	-7.34	-8.76
Channel Y	200	14.74	14.93
	- 200	-16.81	-17.15
Channel Z	200	-3.39	-3.82
	- 200	3.03	3.16

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	3.19	-1.66
Channel Y	200	6.79	-	4.73
Channel Z	200	7.16	5.28	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15972	16183
Channel Y	15900	16376
Channel Z	16167	15841

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	1.19	0.18	2.38	0.46
Channel Y	0.15	-1.39	1.24	0.47
Channel Z	0.36	-1.22	1.42	0.42

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9



Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Sporton**

Certificate No: **EX3-7576_Jan20**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:7576**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-14.v5, QA CAL-23.v5, QA CAL-25.v7
Calibration procedure for dosimetric E-field probes**

Calibration date: **January 22, 2020**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&E critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-19 (No. 217-02894)	Apr-20
DAE4	SN: 660	27-Dec-19 (No. DAE4-660_Dec19)	Dec-20
Reference Probe ES3DV2	SN: 3013	31-Dec-19 (No. ES3-3013_Dec19)	Dec-20
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-16)	In house check: Jun-20
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-16)	In house check: Jun-20
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-16)	In house check: Jun-20
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-18)	In house check: Jun-20
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-19)	In house check: Oct-20

Calibrated by:	Name Jeton Kasrati	Function Laboratory Technician	Signature
Approved by:	Name Katja Pokovic	Function Technical Manager	Signature
			Issued: January 25, 2020
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: SCS 0108

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
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 φ	φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\theta = 0$ 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:

- 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 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
- 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 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E^2 -field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * frequency_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. 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 with CW signal (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}; D_{x,y,z}; VR_{x,y,z}; A, B, C, D** 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 $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, 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 ± 50 MHz to ± 100 MHz.
- 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 (no uncertainty required).

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7576

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.48	0.63	0.63	$\pm 10.1\%$
DCP (mV) ^B	103.8	99.8	103.6	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Max dev.	Unc (k=2) ^E
0	CW	X	0.0	0.0	1.0	0.00	164.4	$\pm 2.7\%$	$\pm 4.7\%$
		Y	0.0	0.0	1.0		161.8		
		Z	0.0	0.0	1.0		164.7		

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 Norm X,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 5).

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7576**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	112.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7576

Calibration Parameter Determined in Head Tissue Simulating Media

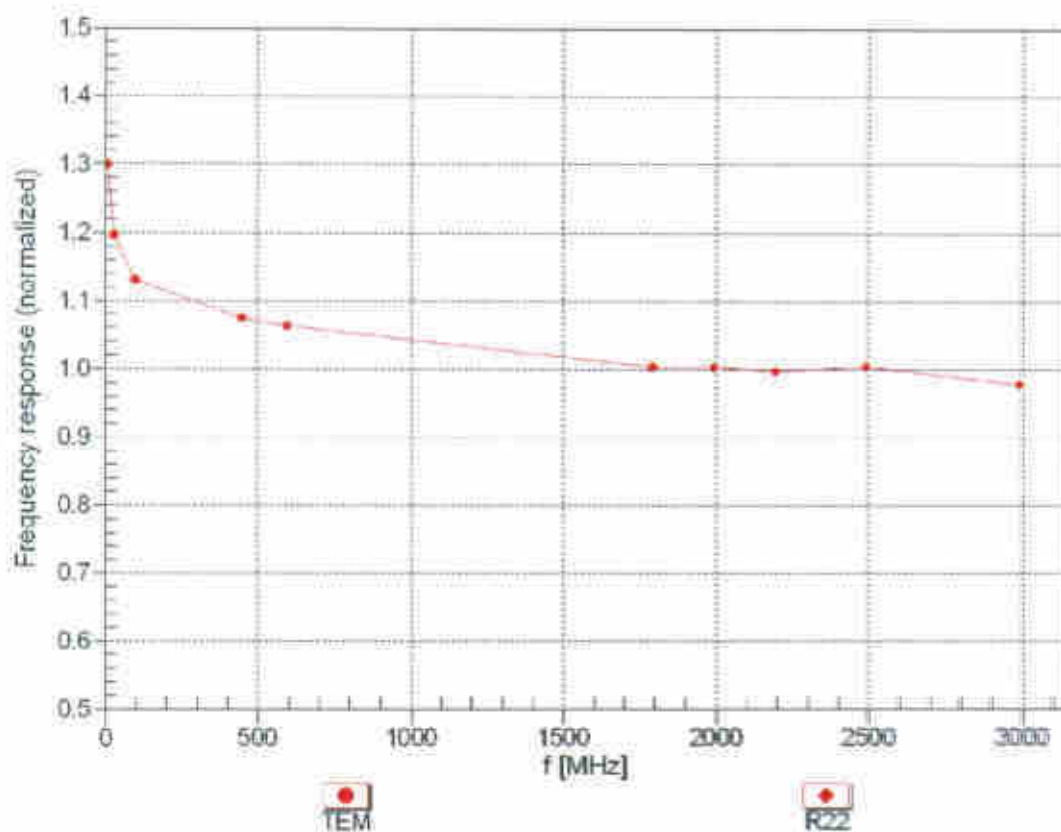
f (MHz) ^c	Relative Permittivity ^f	Conductivity (S/m) ^f	ConvF X	ConvF Y	ConvF Z	Alpha ^o	Depth (mm) ^o	Unc (k=2)
750	41.9	0.89	10.71	10.71	10.71	0.62	0.80	± 12.0 %
835	41.5	0.90	10.45	10.45	10.45	0.46	0.94	± 12.0 %
900	41.5	0.97	10.16	10.16	10.16	0.33	1.09	± 12.0 %
1750	40.1	1.37	8.88	8.88	8.88	0.42	0.86	± 12.0 %
1900	40.0	1.40	8.58	8.58	8.58	0.38	0.86	± 12.0 %
2000	40.0	1.40	8.48	8.48	8.48	0.39	0.86	± 12.0 %
2300	39.5	1.67	8.03	8.03	8.03	0.41	0.90	± 12.0 %
2450	39.2	1.80	7.76	7.76	7.76	0.44	0.90	± 12.0 %
2600	39.0	1.96	7.47	7.47	7.47	0.41	0.96	± 12.0 %
3300	38.2	2.71	7.08	7.08	7.08	0.30	1.35	± 14.0 %
3500	37.9	2.91	6.77	6.77	6.77	0.30	1.35	± 14.0 %
3700	37.7	3.12	6.74	6.74	6.74	0.30	1.35	± 14.0 %
3900	37.5	3.32	6.56	6.56	6.56	0.40	1.40	± 14.0 %
4100	37.2	3.53	6.26	6.26	6.26	0.40	1.40	± 14.0 %
4400	36.9	3.84	6.19	6.19	6.19	0.40	1.60	± 14.0 %
4600	36.7	4.04	6.06	6.06	6.06	0.40	1.60	± 14.0 %
4800	36.4	4.25	5.89	5.89	5.89	0.40	1.80	± 14.0 %
4950	36.3	4.40	5.59	5.59	5.59	0.40	1.80	± 14.0 %
5250	35.9	4.71	5.20	5.20	5.20	0.40	1.80	± 14.0 %
5600	35.5	5.07	4.62	4.62	4.62	0.40	1.80	± 14.0 %
5750	35.4	5.22	4.83	4.83	4.83	0.40	1.80	± 14.0 %

^c Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the 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. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.

^f At frequencies up to 6 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^o 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 frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

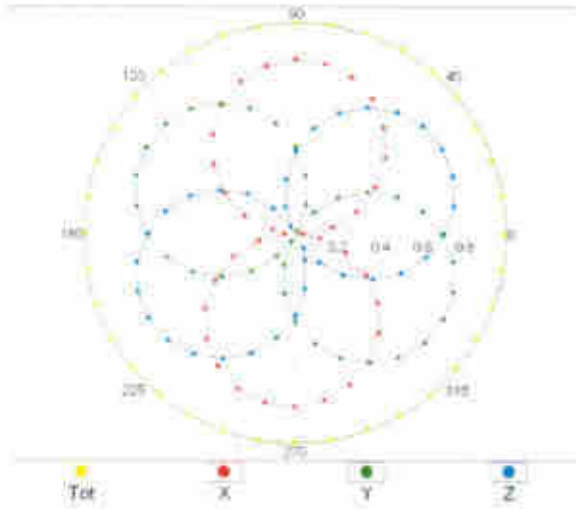
Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



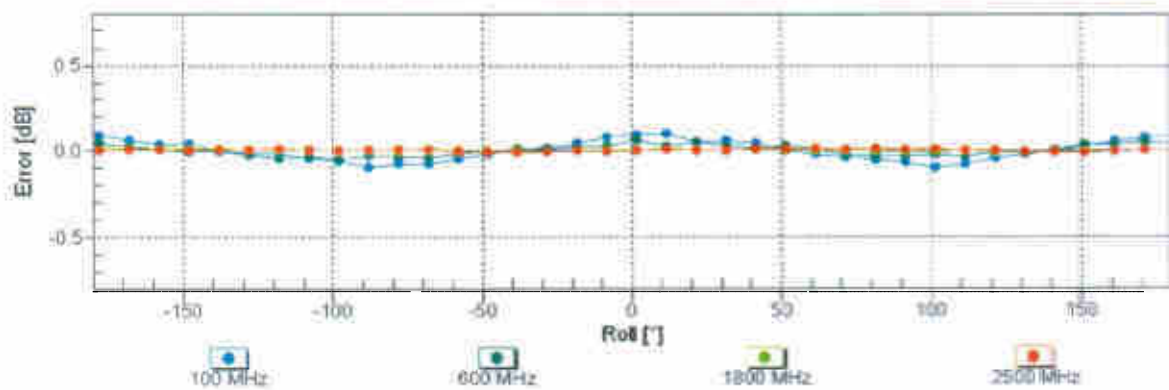
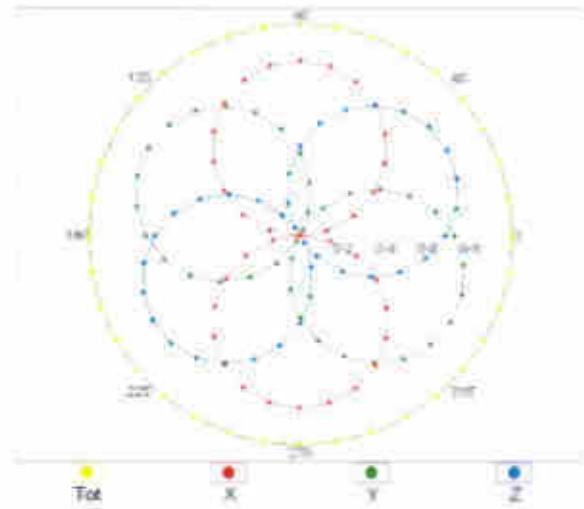
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\theta = 0^\circ$

f=600 MHz,TEM

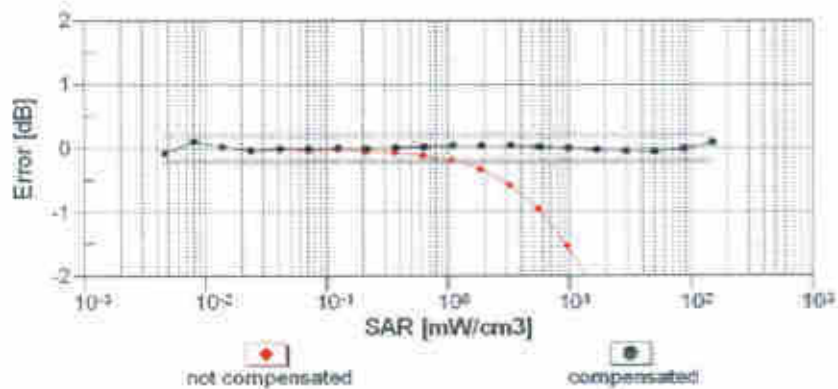
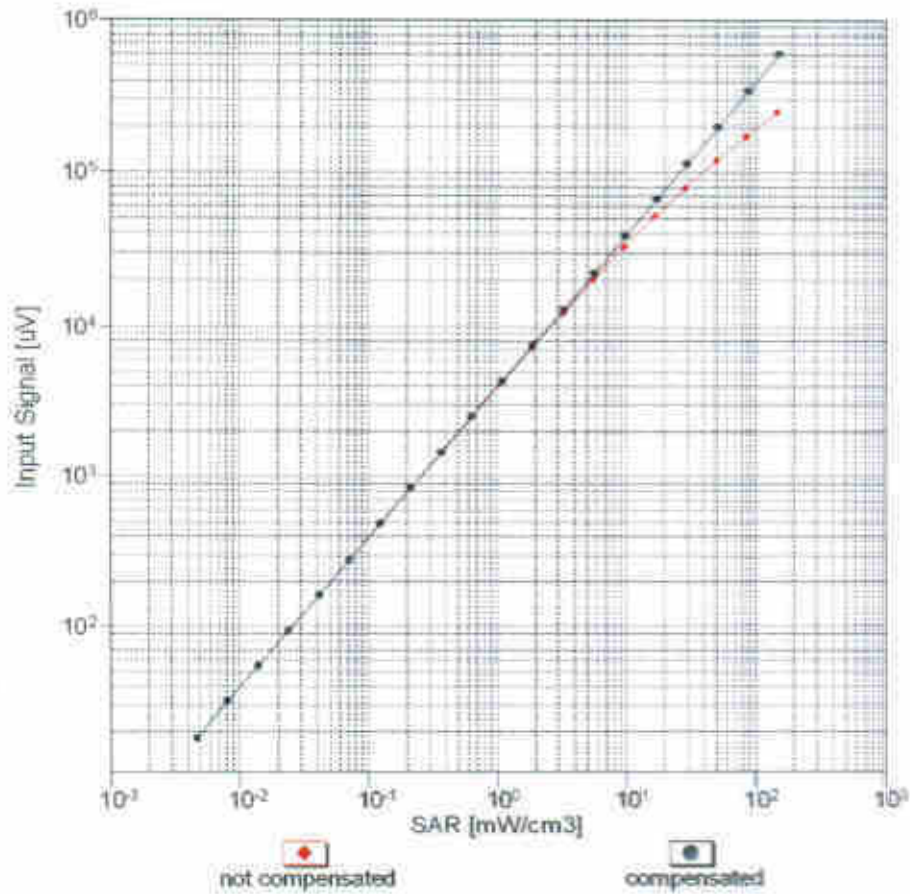


f=1800 MHz,R22



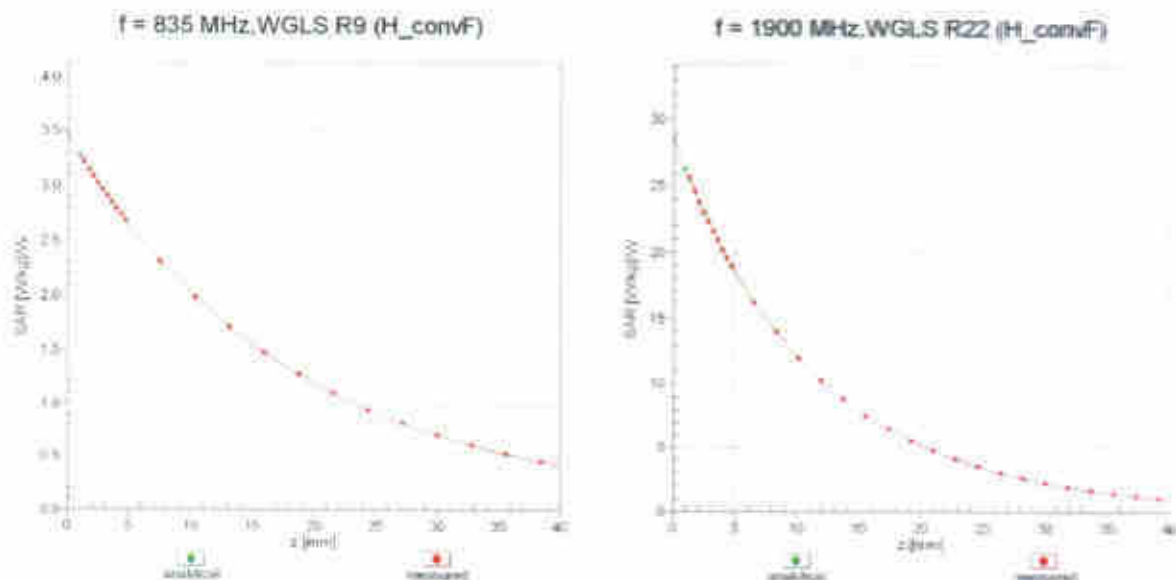
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell, $f_{\text{eval}} = 1900 \text{ MHz}$)



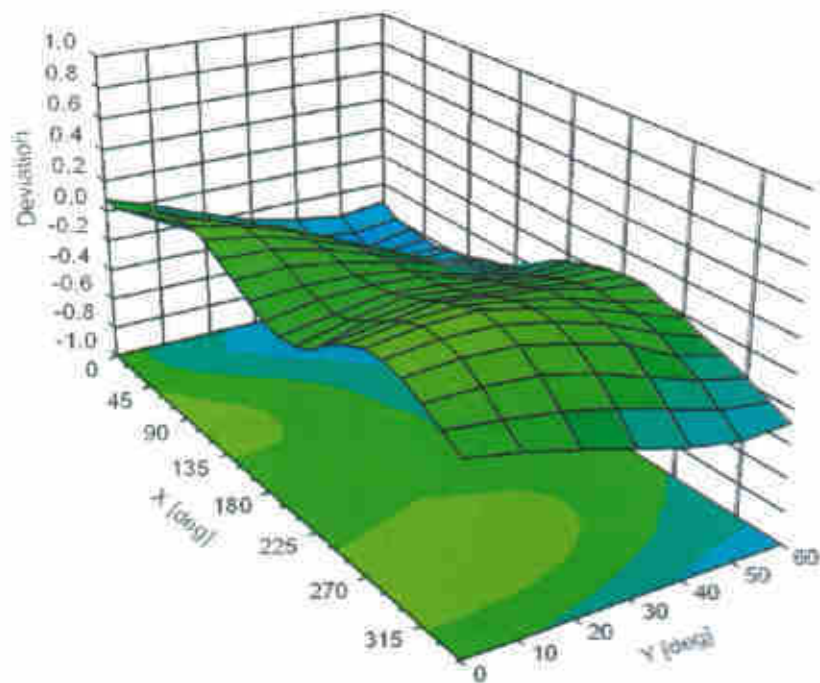
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ (k=2)

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN : 3826**

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

Calibration date: **May 20, 2020**


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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	18-Jun-19(CTTL, No.J19X05125)	Jun-20
Power sensor NRP-Z91	101547	18-Jun-19(CTTL, No.J19X05125)	Jun-20
Power sensor NRP-Z91	101548	18-Jun-19(CTTL, No.J19X05125)	Jun-20
Reference 10dBAttenuator	18N50W-10dB	10-Feb-20(CTTL, No.J20X00525)	Feb-22
Reference 20dBAttenuator	18N50W-20dB	10-Feb-20(CTTL, No.J20X00526)	Feb-22
Reference Probe EX3DV4	SN 3617	30-Jan-20(SPEAG, No.EX3-3617_Jan20/2)	Jan-21
DAE4	SN 1556	4-Feb-20(SPEAG, No.DAE4-1556_Feb20)	Feb-21

Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGenerator MG3700A	6201052605	18-Jun-19(CTTL, No.J19X05127)	Jun-20
Network Analyzer E5071C	MY46110673	10-Feb-20(CTTL, No.J20X00515)	Feb-21

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

Issued: May 22, 2020

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



In Collaboration with

s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com [Http://www.chinattl.cn](http://www.chinattl.cn)

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 Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), $\theta=0$ 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:

- 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 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
- 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 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\theta=0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: 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(f)_{x,y,z} = NORM_{x,y,z} * frequency_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. 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}; VR_{x,y,z}; A,B,C** 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 $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued 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 ± 50 MHz to ± 100 MHz.
- 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 (no uncertainty required).



DASY/EASY – Parameters of Probe: EX3DV4 – SN:3826

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc ($k=2$)
Norm($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.48	0.41	0.36	$\pm 10.0\%$
DCP(mV) ^B	100.2	99.8	103.2	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^E ($k=2$)
0	CW	X	0.0	0.0	1.0	0.00	160.2	$\pm 2.7\%$
		Y	0.0	0.0	1.0		141.6	
		Z	0.0	0.0	1.0		130.8	

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 Norm X, Y, Z do not affect the E²-field uncertainty inside TSL (see Page 4).

^B Numerical linearization parameter; uncertainty not required.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.



DASY/EASY – Parameters of Probe: EX3DV4 – SN:3826

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz] ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	41.9	0.89	9.37	9.37	9.37	0.40	0.80	±12.1%
835	41.5	0.90	9.12	9.12	9.12	0.17	1.26	±12.1%
900	41.5	0.97	9.10	9.10	9.10	0.18	1.30	±12.1%
1750	40.1	1.37	7.98	7.98	7.98	0.19	1.14	±12.1%
1900	40.0	1.40	7.67	7.67	7.67	0.22	1.14	±12.1%
2000	40.0	1.40	7.77	7.77	7.77	0.24	1.10	±12.1%
2300	39.5	1.67	7.35	7.35	7.35	0.51	0.73	±12.1%
2450	39.2	1.80	7.12	7.12	7.12	0.53	0.72	±12.1%
2600	39.0	1.96	6.94	6.94	6.94	0.45	0.85	±12.1%
3500	37.9	2.91	6.62	6.62	6.62	0.39	0.98	±13.3%
5250	35.9	4.71	5.09	5.09	5.09	0.45	1.30	±13.3%
5600	35.5	5.07	4.66	4.66	4.66	0.45	1.40	±13.3%
5750	35.4	5.22	4.68	4.68	4.68	0.45	1.40	±13.3%

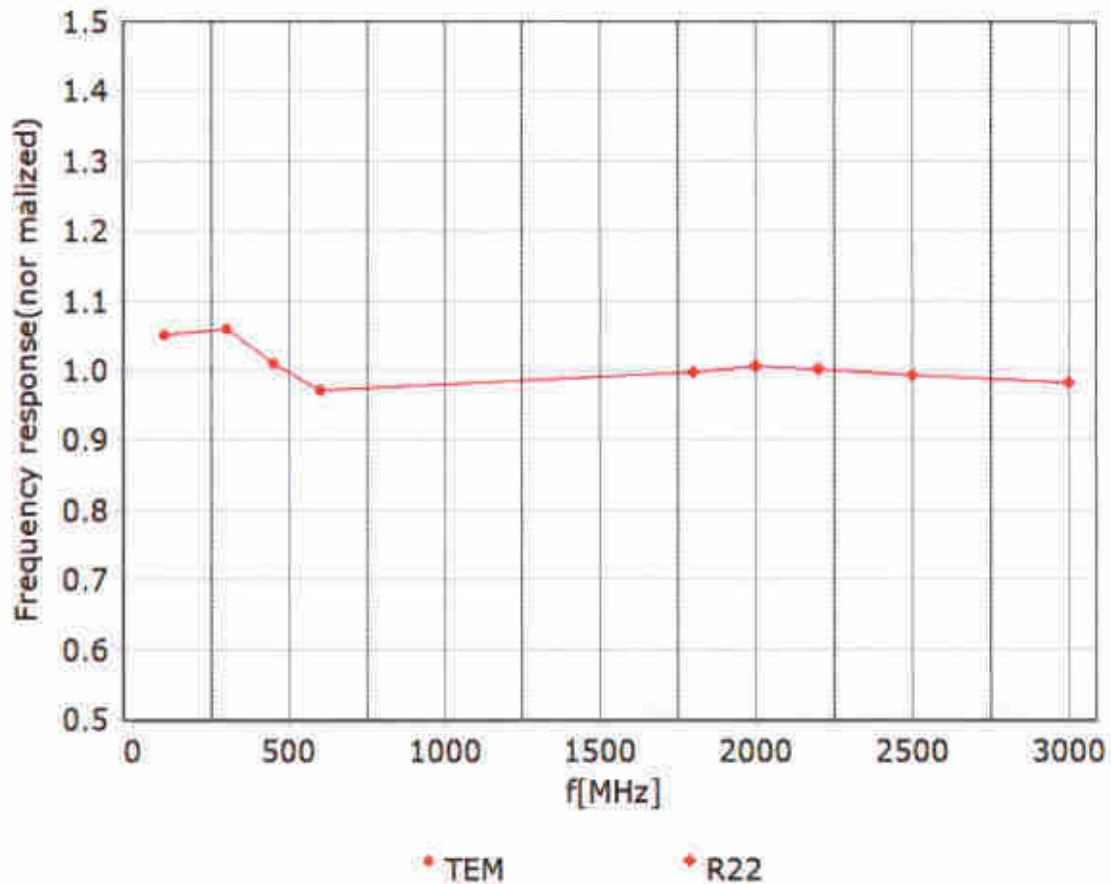
^C Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 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.

^F At frequency below 3 GHz, the validity of tissue parameters (ϵ 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 (ϵ and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G 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.



Frequency Response of E-Field (TEM-Cell: ifi110 EXX, Waveguide: R22)



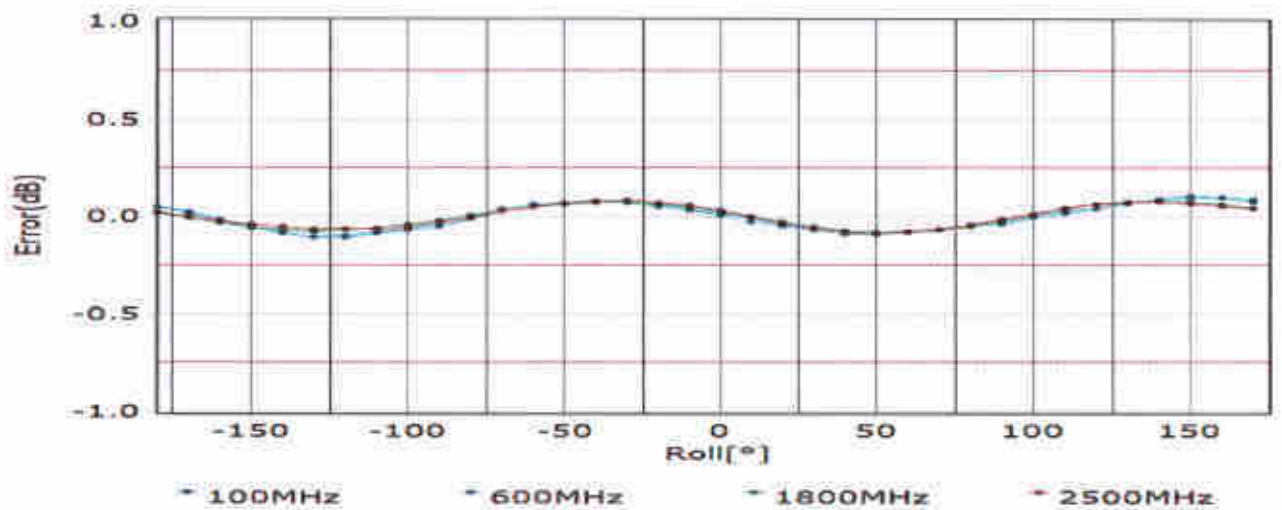
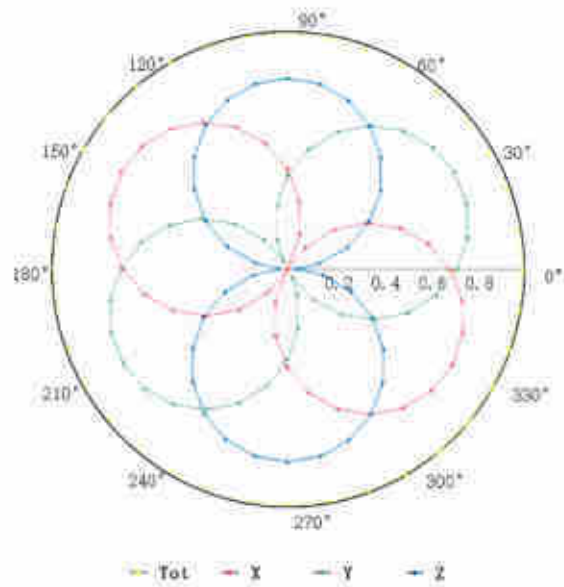
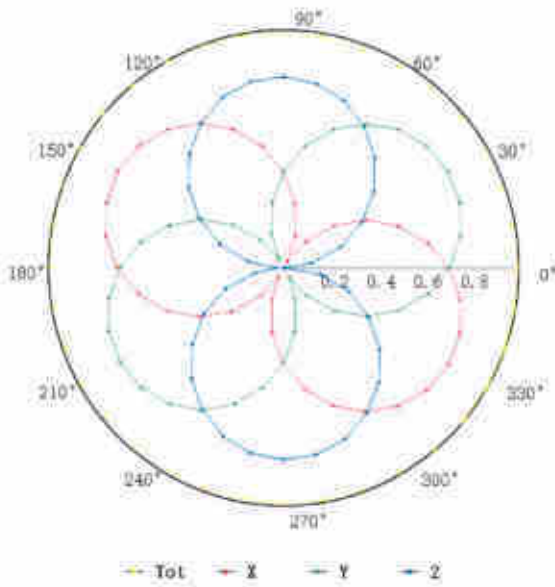
Uncertainty of Frequency Response of E-field: $\pm 7.4\%$ ($k=2$)



Receiving Pattern (Φ), $\theta=0^\circ$

f=600 MHz, TEM

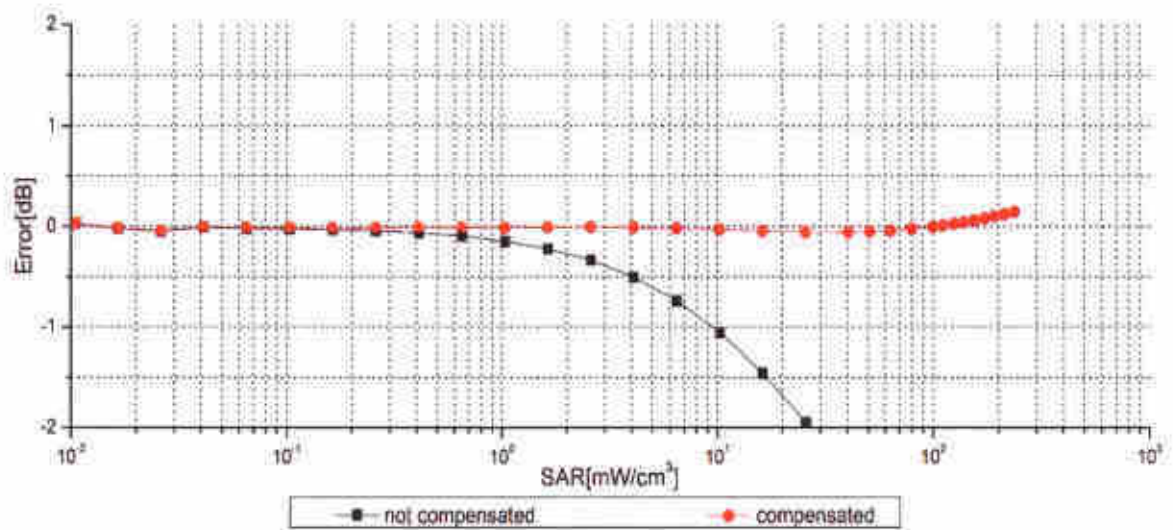
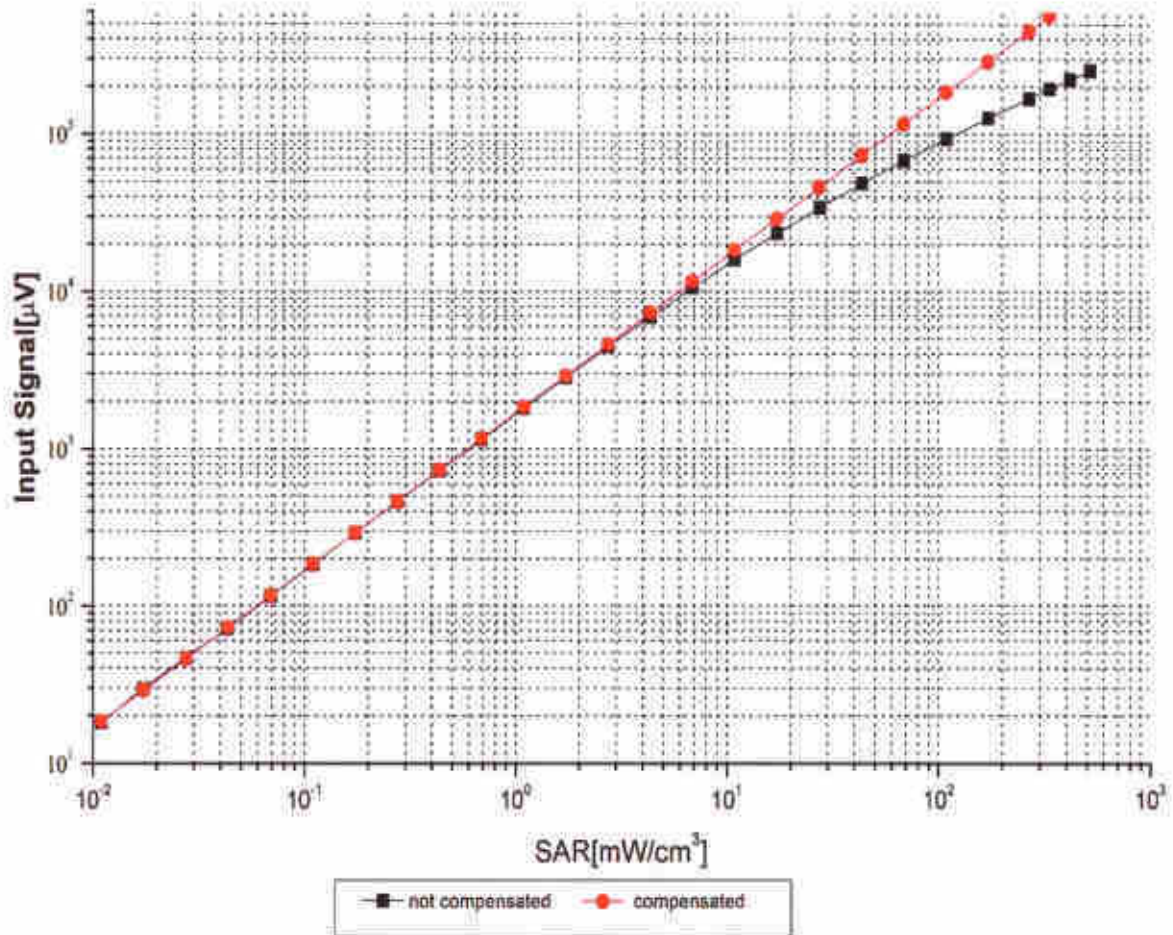
f=1800 MHz, R22



Uncertainty of Axial Isotropy Assessment: $\pm 1.2\%$ ($k=2$)



Dynamic Range f(SAR_{head}) (TEM cell, f = 900 MHz)

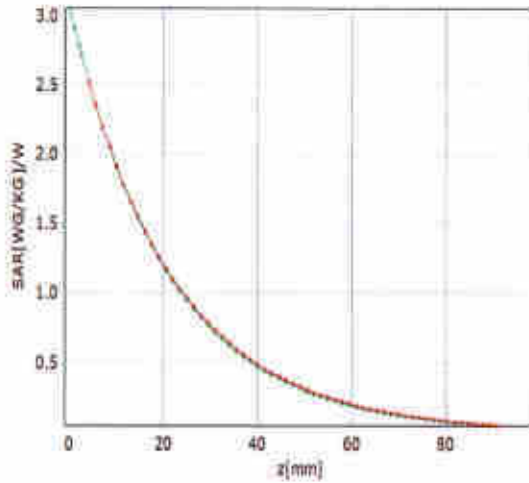


Uncertainty of Linearity Assessment: ±0.9% (k=2)

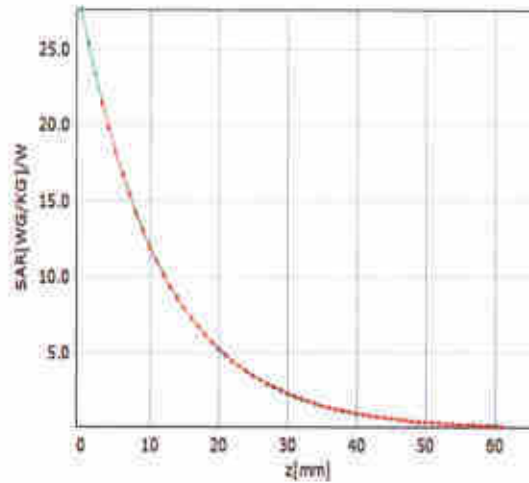
Conversion Factor Assessment

f=750 MHz,WGLS R9(H_convF)

f=1750 MHz,WGLS R22(H_convF)

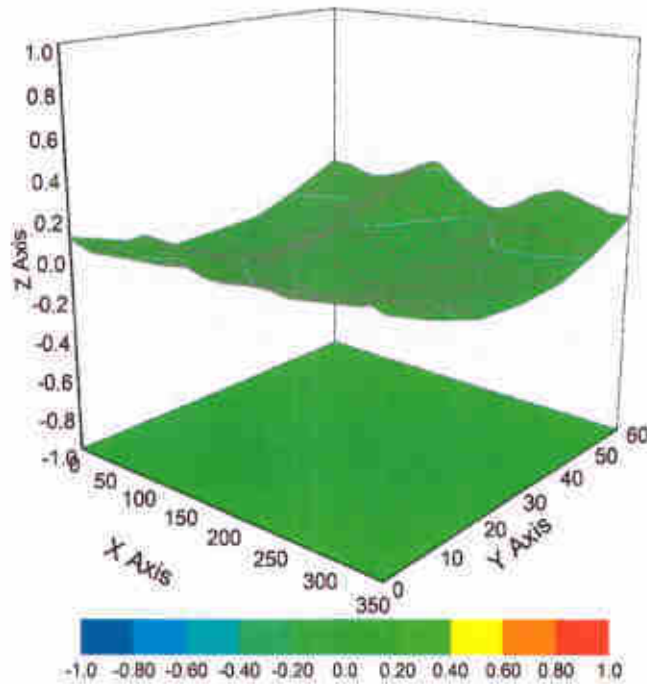


analytical measured



analytical measured

Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: $\pm 3.2\%$ ($k=2$)



DASY/EASY – Parameters of Probe: EX3DV4 – SN:3826

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	51.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
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



Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Tejet (Auden)**

Certificate No: **ES3-3241_May20**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3241**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v7
Calibration procedure for dosimetric E-field probes**

Calibration date: **May 14, 2020**

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

All calibrations have been conducted in the closed laboratory facility; environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: CC2552 (20x)	31-Mar-20 (No. 217-03106)	Apr-21
DAE4	SN: 660	27-Dec-19 (No. DAE4-660_Dec19)	Dec-20
Reference Probe ES3DV2	SN: 3013	31-Dec-19 (No. ES3-3013_Dec19)	Dec-20
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-18)	In house check: Jun-20
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-10)	In house check: Oct-20

Calibrated by:	Name Jeton Kastrati	Function Laboratory Technician	Signature
Approved by:	Name Kalja Pokovic	Function Technical Manager	Signature
			Issued: May 16, 2020
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
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 ϕ	ϕ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\theta = 0$ 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:

- 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 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
- 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 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * frequency_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. 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 with CW signal (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}; D_{x,y,z}; VR_{x,y,z}; A, B, C, D** 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 $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, 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 ± 50 MHz to ± 100 MHz.
- 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 (no uncertainty required).

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3241

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.16	0.84	1.11	$\pm 10.1 \%$
DCP (mV) ^B	103.3	108.0	103.8	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Max dev.	Unc ^C (k=2)
0	CW	X	0.0	0.0	1.0	0.00	177.6	$\pm 3.3 \%$	$\pm 4.7 \%$
		Y	0.0	0.0	1.0		168.8		
		Z	0.0	0.0	1.0		173.6		

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 Norm X,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 5).

^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.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3241

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	69
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3241

Calibration Parameter Determined in Head Tissue Simulating Media

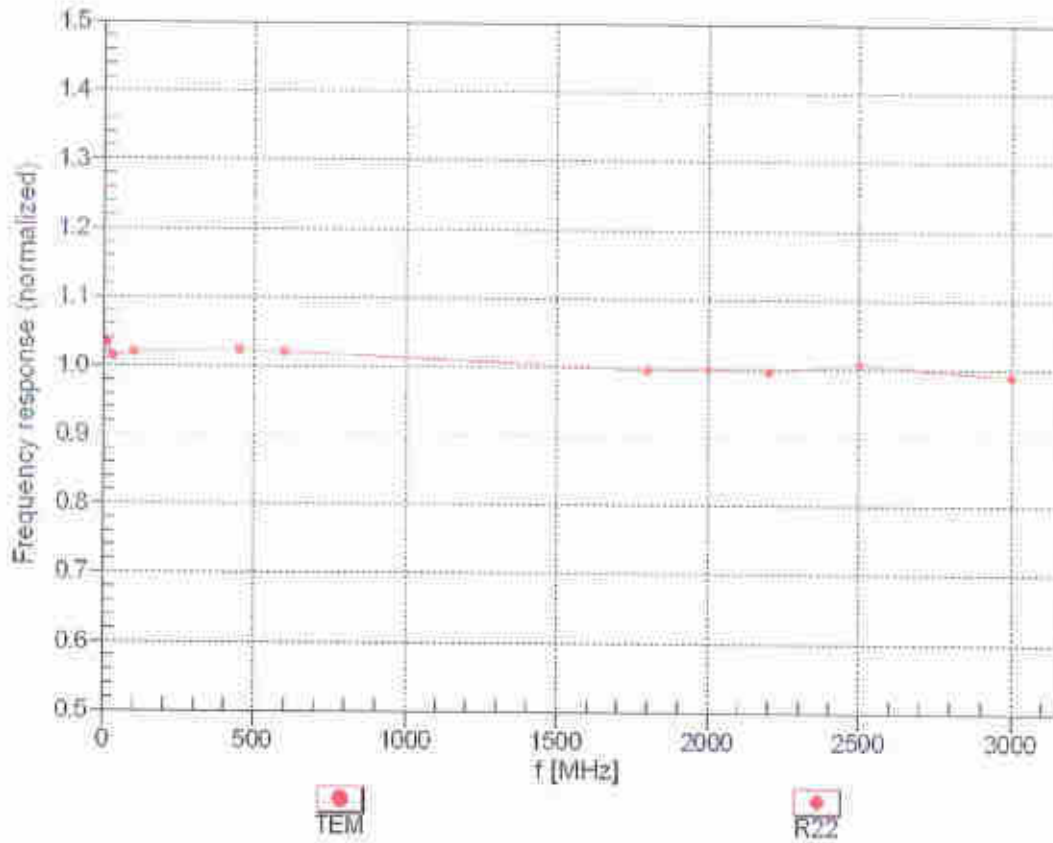
f (MHz) ^c	Relative Permittivity ^f	Conductivity (S/m) ^f	ConvF X	ConvF Y	ConvF Z	Alpha ^g	Depth (mm) ^g	Unc (k=2)
750	41.9	0.89	6.45	6.45	6.45	0.80	1.25	± 12.0 %
835	41.5	0.90	6.26	6.26	6.26	0.60	1.38	± 12.0 %
1750	40.1	1.37	5.22	5.22	5.22	0.31	1.81	± 12.0 %
1900	40.0	1.40	5.04	5.04	5.04	0.49	1.42	± 12.0 %
2000	40.0	1.40	4.99	4.99	4.99	0.47	1.43	± 12.0 %
2300	39.5	1.67	4.81	4.81	4.81	0.62	1.50	± 12.0 %
2450	39.2	1.80	4.59	4.59	4.59	0.56	1.60	± 12.0 %
2600	39.0	1.96	4.42	4.42	4.42	0.65	1.50	± 12.0 %

^c Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the 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, 160 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.

^f At frequencies below 3 GHz, the validity of tissue parameters (ϵ 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^g 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 frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

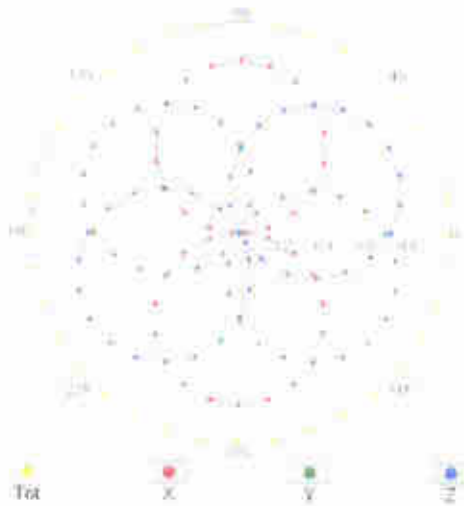
Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



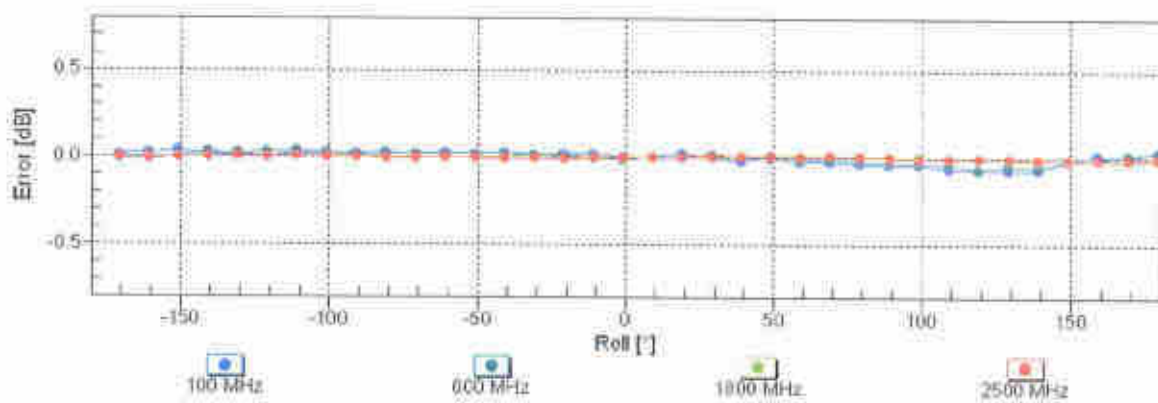
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

Receiving Pattern (ϕ), $\theta = 0^\circ$

f=600 MHz,TEM

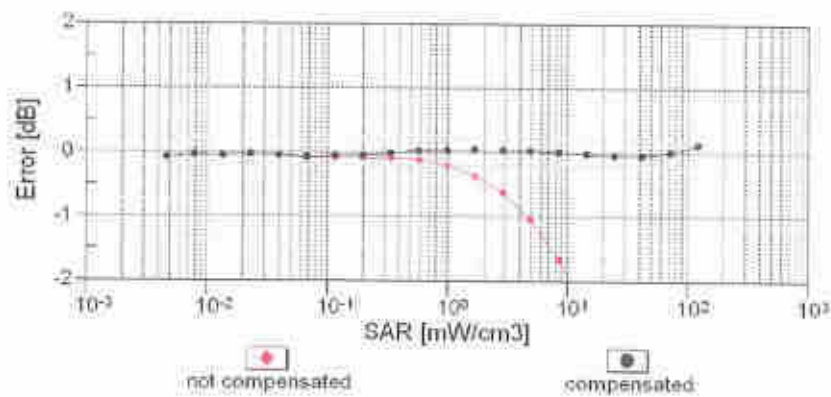
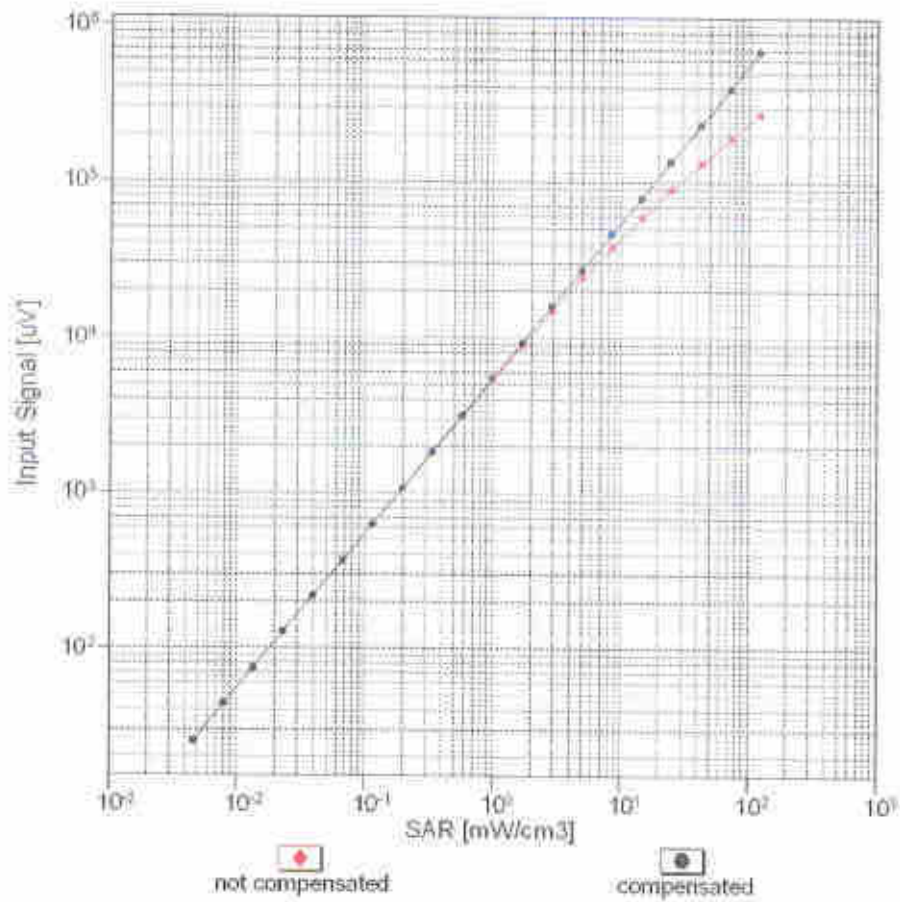


f=1800 MHz,R22



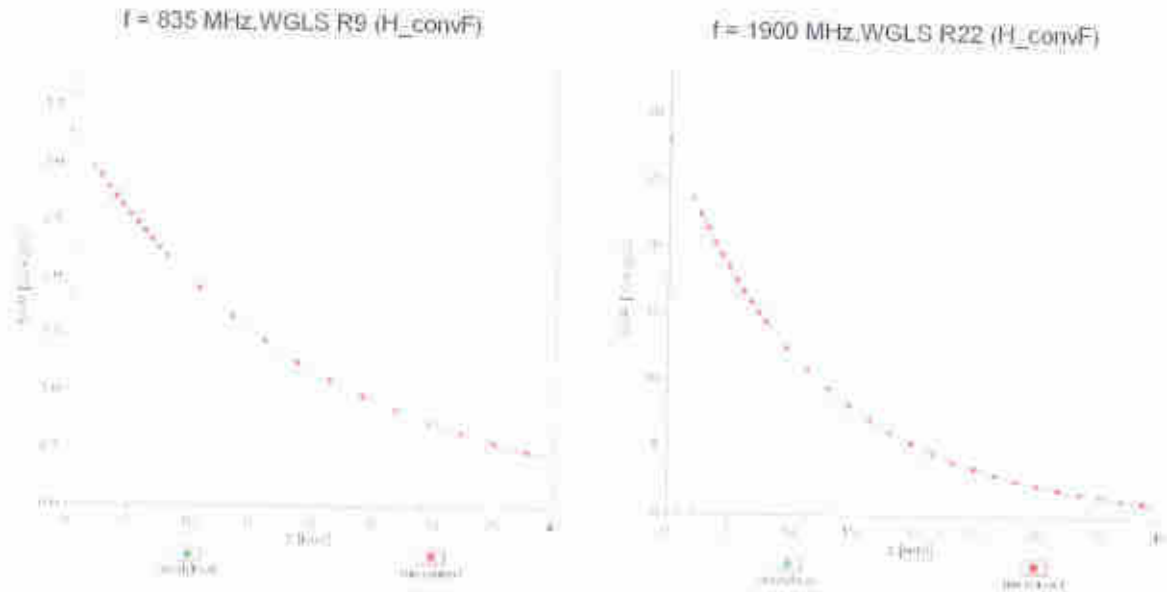
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

Dynamic Range $f(SAR_{head})$ (TEM cell, $f_{eval} = 1900$ MHz)

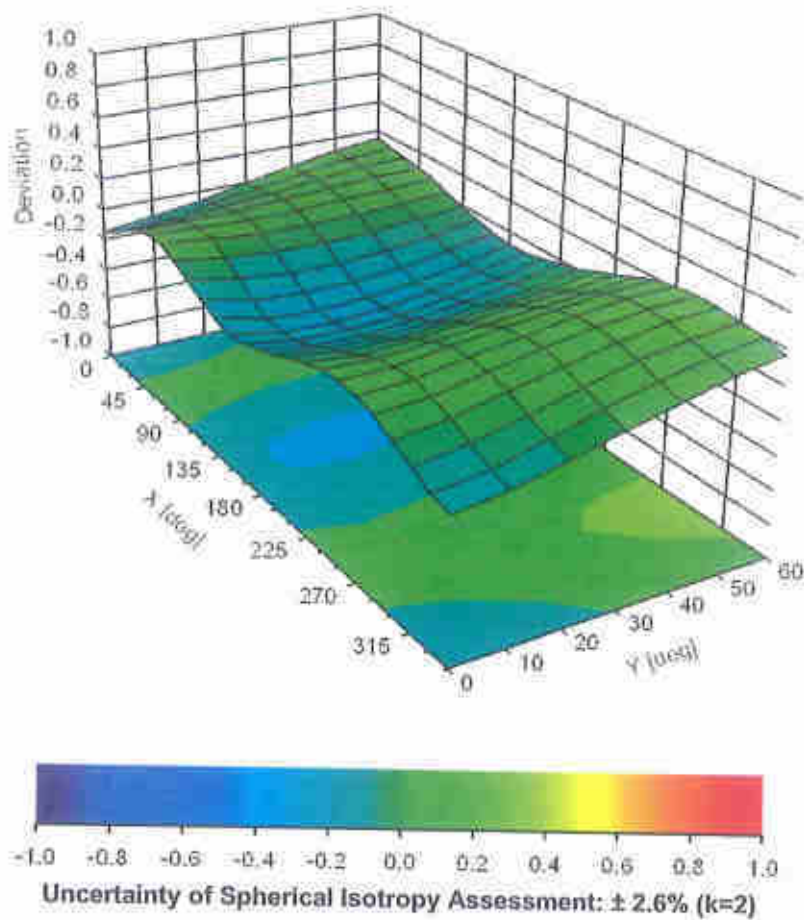


Uncertainty of Linearity Assessment: $\pm 0.6\%$ (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid Error (ϕ, θ), f = 900 MHz





Appendix E. Conducted RF Output Power Table

The detailed power table are shown as follows.



Full Power

GSM850 TX Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8	(dBm)	824.2	836.4	848.8	(dBm)
GSM 1 Tx slot	32.56	32.75	32.91	33.50	23.56	23.75	23.91	24.50
GPRS 1 Tx slot	32.55	32.52	32.85	33.50	23.55	23.52	23.85	24.50
GPRS 2 Tx slots	30.81	30.93	31.09	32.00	24.81	24.93	25.09	26.00
GPRS 3 Tx slots	28.64	28.72	28.73	30.00	24.38	24.46	24.47	25.74
GPRS 4 Tx slots	26.31	26.49	26.59	28.00	23.31	23.49	23.59	25.00
EDGE 1 Tx slot	23.71	26.49	26.10	27.00	16.71	16.68	17.10	18.00
EDGE 2 Tx slots	23.73	23.61	23.85	25.00	17.73	17.81	17.85	19.00
EDGE 3 Tx slots	21.47	21.44	21.82	23.00	17.21	17.18	17.58	18.74
EDGE 4 Tx slots	19.46	19.45	19.64	21.00	16.46	16.45	16.64	18.00

GSM1900 TX Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
	512	661	810		512	661	810	
Frequency (MHz)	1552.2	1623	1693.3	(dBm)	1552.2	1623	1693.3	(dBm)
GSM 1 Tx slot	29.42	29.43	29.41	30.50	20.42	20.43	20.41	21.50
GPRS 1 Tx slot	28.41	28.42	28.40	30.50	20.41	20.42	20.40	21.50
GPRS 2 Tx slots	28.21	28.25	28.24	29.50	22.21	22.25	22.24	23.50
GPRS 3 Tx slots	26.22	26.29	26.15	27.50	21.96	22.03	21.89	23.24
GPRS 4 Tx slots	23.94	24.03	23.97	25.50	20.94	21.03	20.97	22.50
EDGE 1 Tx slot	25.27	25.21	25.08	26.50	16.27	16.21	16.08	17.50
EDGE 2 Tx slots	24.13	24.08	24.22	25.50	16.13	16.08	16.22	19.50
EDGE 3 Tx slots	22.02	22.03	21.84	23.50	17.76	17.77	17.58	19.24
EDGE 4 Tx slots	19.84	19.82	19.63	21.50	16.84	16.82	16.63	18.50

Band TX Channel Rx Channel	WCDMA I			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)
	900	940	958		1312	1413	1513		4132	4182	4233	
Frequency (MHz)	1852.4	1860	1907.6	(dBm)	1712.4	1732.6	1752.6	(dBm)	826.4	836.4	846.8	(dBm)
3GPP Rel 99 AMR 12.2Kbps	23.08	23.15	23.21	24.00	22.88	23.01	23.00	24.00	23.07	23.11	22.92	24.00
3GPP Rel 99 RMC 12.2Kbps	23.09	23.16	23.22	24.00	22.90	23.04	23.03	24.00	23.09	23.13	22.94	24.00
3GPP Rel 6 HSDPA Subtest-1	22.20	22.25	22.30	23.00	21.87	21.84	22.00	23.00	22.24	22.03	21.96	23.00
3GPP Rel 6 HSDPA Subtest-2	22.21	22.23	22.31	23.00	21.90	22.00	22.09	23.00	22.24	22.09	21.95	23.00
3GPP Rel 6 HSDPA Subtest-3	21.85	21.71	21.78	22.50	21.40	21.46	21.57	22.50	21.74	21.59	21.54	22.50
3GPP Rel 6 HSDPA Subtest-4	21.84	21.70	21.78	22.50	21.37	21.10	21.57	22.50	21.75	21.59	21.54	22.50
3GPP Rel 6 DC-HSDPA Subtest-1	22.28	22.39	22.45	23.00	21.85	21.98	21.96	23.00	22.73	22.50	22.33	23.00
3GPP Rel 6 DC-HSDPA Subtest-2	22.24	22.38	22.43	23.00	21.88	21.95	21.94	23.00	22.72	22.48	22.32	23.00
3GPP Rel 6 DC-HSDPA Subtest-3	21.82	21.97	22.00	22.50	21.38	21.44	21.40	22.50	22.22	22.05	21.86	22.50
3GPP Rel 6 DC-HSDPA Subtest-4	21.81	21.96	22.01	22.50	21.35	21.41	21.38	22.50	22.22	22.06	21.87	22.50
3GPP Rel 6 HSUPA Subtest-1	22.13	22.36	22.41	22.50	21.88	22.04	22.16	22.50	22.17	22.05	22.00	22.50
3GPP Rel 6 HSUPA Subtest-2	20.22	20.38	20.41	20.50	19.97	19.97	20.16	20.50	20.15	20.08	19.94	20.50
3GPP Rel 6 HSUPA Subtest-3	21.23	21.30	21.43	21.50	20.97	21.02	21.26	21.50	21.17	21.06	21.01	21.50
3GPP Rel 6 HSUPA Subtest-4	20.20	20.37	20.40	20.50	20.02	20.07	20.22	20.50	20.15	20.07	20.02	20.50
3GPP Rel 6 HSUPA Subtest-5	22.20	22.40	22.40	22.50	22.00	22.10	22.20	22.50	22.20	22.10	22.00	22.50



Band 2 (1900MHz Band) Part 24E										
BW (MHz)	Modulation	RB Size	RB Offset	Power Low Ch./ Freq. 1870	Power Middle Ch./ Freq. 1880	Power High Ch./ Freq. 1900	Tune-up limit (dBm)	MPR (dB)		
Channel										
Frequency (MHz)										
20	QPSK	1	0	22.52	22.65	22.37	24	0		
20	QPSK	1	49	23.03	23.09	23.01				
20	QPSK	1	99	22.59	22.51	22.56	23	1		
20	QPSK	50	0	21.86	21.90	21.86				
20	QPSK	50	24	21.84	21.83	21.84	22	2		
20	QPSK	50	50	21.76	21.84	21.86				
20	QPSK	100	0	21.86	21.89	21.88	23	1		
20	16QAM	1	0	21.78	21.57	21.47				
20	16QAM	1	49	21.56	21.69	21.68	22	2		
20	16QAM	1	99	21.55	21.58	21.61				
20	16QAM	50	0	20.75	20.69	20.67	21	3		
20	16QAM	50	24	20.78	20.77	20.52				
20	16QAM	50	50	20.71	20.55	20.80	22	2		
20	16QAM	100	0	20.79	20.72	20.78				
20	64QAM	1	0	20.72	20.24	20.73	22	2		
20	64QAM	1	49	21.07	21.05	21.13				
20	64QAM	1	99	21.07	21.08	21.13	21	3		
20	64QAM	50	0	19.88	19.78	19.85				
20	64QAM	50	24	19.80	19.83	19.95	21	3		
20	64QAM	50	50	19.72	19.74	19.81				
20	64QAM	100	0	19.83	19.72	19.86	21	3		
20	64QAM	100	0	19.83	19.72	19.86				
Channel										
Frequency (MHz)										
15	QPSK	1	0	22.47	22.79	22.81	24	0		
15	QPSK	1	37	22.75	22.63	23.07				
15	QPSK	1	74	22.63	22.78	22.78	23	1		
15	QPSK	36	0	21.68	21.79	21.87				
15	QPSK	36	20	21.64	21.74	21.85	22	2		
15	QPSK	36	39	21.75	21.83	21.75				
15	QPSK	75	0	21.67	21.84	21.83	23	1		
15	16QAM	1	0	21.63	21.38	21.70				
15	16QAM	1	37	21.48	21.56	21.73	22	2		
15	16QAM	1	74	21.43	21.33	21.61				
15	16QAM	36	0	20.67	20.57	20.71	21	3		
15	16QAM	36	20	20.61	20.73	20.68				
15	16QAM	36	39	20.68	20.63	20.79	22	2		
15	16QAM	75	0	20.61	20.73	20.81				
15	64QAM	1	0	20.77	20.76	20.78	22	2		
15	64QAM	1	37	21.08	21.18	21.33				
15	64QAM	1	74	20.69	20.68	20.75	21	3		
15	64QAM	36	0	19.83	19.75	19.91				
15	64QAM	36	20	19.77	19.84	20.02	21	3		
15	64QAM	36	39	19.86	19.82	19.92				
15	64QAM	75	0	19.56	19.58	19.77	21	3		
15	64QAM	75	0	19.56	19.58	19.77				
Channel										
Frequency (MHz)										
10	QPSK	1	0	22.41	22.59	22.46	24	0		
10	QPSK	1	25	22.51	22.66	22.95				
10	QPSK	1	49	22.33	22.44	22.46	23	1		
10	QPSK	25	0	21.56	21.72	21.75				
10	QPSK	25	12	21.56	21.72	21.75	22	2		
10	QPSK	25	25	21.57	21.69	21.68				
10	QPSK	50	0	21.59	21.67	21.78	23	1		
10	16QAM	1	0	21.53	21.54	21.68				
10	16QAM	1	25	22.24	21.71	21.89	22	2		
10	16QAM	1	49	21.95	21.84	21.58				
10	16QAM	25	0	20.65	20.54	20.64	22	2		
10	16QAM	25	12	20.59	20.62	20.80				
10	16QAM	25	25	20.54	20.46	20.66	22	2		
10	16QAM	50	0	20.55	20.57	20.67				
10	64QAM	1	0	20.61	20.62	20.74	22	2		
10	64QAM	1	25	20.68	20.63	20.99				
10	64QAM	1	49	20.63	20.63	20.67	21	3		
10	64QAM	25	0	19.79	19.90	19.91				
10	64QAM	25	12	19.63	19.89	19.88	21	3		
10	64QAM	25	25	19.73	19.64	19.85				
10	64QAM	50	0	19.53	19.63	19.67	21	3		
10	64QAM	50	0	19.53	19.63	19.67				
Channel										
Frequency (MHz)										
5	QPSK	1	0	22.22	22.40	22.34	24	0		
5	QPSK	1	12	22.49	22.80	22.75				
5	QPSK	1	24	22.08	22.23	22.21	23	1		
5	QPSK	12	0	21.58	21.73	21.69				
5	QPSK	12	7	21.57	21.73	21.66	22	2		
5	QPSK	12	13	21.51	21.65	21.66				
5	QPSK	25	0	21.56	21.61	21.69	23	1		
5	16QAM	1	0	21.42	21.52	21.47				
5	16QAM	1	12	21.36	21.48	21.55	22	2		
5	16QAM	1	24	21.38	21.52	21.56				
5	16QAM	12	0	20.35	20.60	20.66	22	2		
5	16QAM	12	7	20.57	20.63	20.68				
5	16QAM	12	13	20.32	20.60	20.65	21	3		
5	16QAM	25	0	20.32	20.78	20.83				
5	64QAM	1	0	20.45	20.54	20.66	22	2		
5	64QAM	1	12	20.50	20.95	21.01				
5	64QAM	1	24	20.40	20.45	20.54	22	2		
5	64QAM	12	0	19.70	19.43	19.83				
5	64QAM	12	7	19.67	19.70	19.79	21	3		
5	64QAM	12	13	19.50	19.72	19.77				
5	64QAM	25	0	19.32	19.80	19.95	21	3		
5	64QAM	25	0	19.32	19.80	19.95				
Channel										
Frequency (MHz)										
3	QPSK	1	0	22.20	22.43	22.53	24	0		
3	QPSK	1	8	22.58	22.49	22.66				
3	QPSK	1	14	22.48	22.49	22.42	23	1		
3	QPSK	8	0	21.61	21.74	21.72				
3	QPSK	8	4	21.53	21.72	21.75	22	2		
3	QPSK	8	7	21.62	21.65	21.70				
3	QPSK	15	0	21.63	21.73	21.68	23	1		
3	16QAM	1	0	21.30	21.40	21.41				
3	16QAM	1	8	21.37	21.46	21.51	22	2		
3	16QAM	1	14	21.33	21.36	21.42				
3	16QAM	8	0	20.67	20.58	20.83	22	2		
3	16QAM	8	4	20.62	20.67	20.60				
3	16QAM	8	7	20.60	20.79	20.63	22	2		
3	16QAM	15	0	20.54	20.65	20.39				
3	64QAM	1	0	20.60	20.64	20.66	22	2		
3	64QAM	1	8	20.52	20.51	20.65				
3	64QAM	1	14	20.58	20.72	20.59	21	3		
3	64QAM	8	0	19.70	19.71	19.68				
3	64QAM	8	4	19.57	19.61	19.63	21	3		
3	64QAM	8	7	19.57	19.64	19.70				
3	64QAM	15	0	19.56	19.75	19.86	21	3		
3	64QAM	15	0	19.56	19.75	19.86				
Channel										
Frequency (MHz)										
1.4	QPSK	1	0	22.45	22.46	22.56	24	0		
1.4	QPSK	1	3	22.65	22.49	22.68				
1.4	QPSK	3	0	22.68	22.69	22.60	23	1		
1.4	QPSK	3	1	22.67	22.74	22.62				
1.4	QPSK	3	3	22.61	22.69	22.75	23	1		
1.4	QPSK	6	0	21.57	21.81	21.69				
1.4	16QAM	1	0	21.57	21.80	21.33	23	1		
1.4	16QAM	1	3	21.67	21.83	21.73				
1.4	16QAM	1	5	21.23	21.75	21.80	22	2		
1.4	16QAM	3	0	21.65	21.70	21.73				
1.4	16QAM	3	1	21.80	21.77	21.75	22	2		
1.4	16QAM	6	0	20.70	20.73	20.67				
1.4	16QAM	6	0	20.68	20.70	20.50	22	2		
1.4	16QAM	1	0	20.89	20.96	20.94				
1.4	64QAM	1	3	20.74	21.12	21.12	22	2		
1.4	64QAM	1	5	20.56	20.92	20.99				
1.4	64QAM	3	0	20.61	20.61	20.61	21	3		
1.4	64QAM	3	1	20.70	20.73	20.78				
1.4	64QAM	3	3	20.64	20.68	20.65	21	3		
1.4	64QAM	6	0	19.50	19.58	19.60				

Band 4 (AWS Band) Part 27L (only on channel required)										
BW (MHz)	Modulation	RB Size	RB Offset	Power Low Ch./ Freq. 2020	Power Middle Ch./ Freq. 2030	Power High Ch./ Freq. 2040	Tune-up limit (dBm)	MPR (dB)		
Channel										
Frequency (MHz)										
20	QPSK	1	0	22.78	23.09	23.05	24	0		
20	QPSK	1	49	22.73	22.95	23.08				
20	QPSK	1	99	22.86	22.83	22.55	23	1		
20	QPSK	50	0	22.26	22.13	22.12				
20	QPSK	50	24</							



Band 7 (2600MHz Band) Part 27									
BW (MHz)	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)	
Channel									
Frequency (MHz)									
20	QPSK	1	0	22.86	22.91	23.01	24	0	
20	QPSK	1	49	22.90	23.29	23.19			
20	QPSK	1	99	22.74	23.04	23.13			
20	QPSK	50	0	22.09	22.37	22.35	23	1	
20	QPSK	50	24	22.04	22.28	22.20			
20	QPSK	50	50	22.07	22.35	22.34			
20	QPSK	100	0	22.03	22.37	22.38	23	1	
20	16QAM	1	0	21.87	22.07	22.14			
20	16QAM	1	49	21.90	22.15	22.22			
20	16QAM	1	99	21.52	22.06	22.22	22	2	
20	16QAM	50	0	21.03	21.29	21.19			
20	16QAM	50	24	21.06	21.28	21.21			
20	16QAM	50	50	20.92	21.39	21.30	22	2	
20	16QAM	100	0	21.03	21.25	21.30			
20	16QAM	1	0	21.03	21.13	21.27			
20	84QAM	1	49	21.69	21.48	21.57	22	2	
20	84QAM	1	99	21.05	21.49	21.57			
20	84QAM	50	0	20.12	20.29	20.22			
20	84QAM	50	24	20.20	20.31	20.25	21	3	
20	84QAM	50	50	20.10	20.29	20.36			
20	84QAM	100	0	20.19	20.36	20.42			
Channel									
Frequency (MHz)									
15	QPSK	1	0	23.16	23.09	23.28	24	0	
15	QPSK	1	37	23.10	23.18	23.21			
15	QPSK	1	74	23.07	23.18	23.25			
15	QPSK	36	0	22.13	22.37	22.26	23	1	
15	QPSK	36	20	22.12	22.34	22.34			
15	QPSK	36	39	22.15	22.37	22.36			
15	QPSK	75	0	22.13	22.35	22.28	23	1	
15	16QAM	1	0	21.97	21.87	22.08			
15	16QAM	1	37	21.93	22.15	22.71			
15	16QAM	1	74	22.02	22.14	22.22	22	2	
15	16QAM	36	0	21.05	21.23	21.14			
15	16QAM	36	20	21.06	21.29	21.26			
15	16QAM	36	39	21.12	21.26	21.28	22	2	
15	16QAM	75	0	21.10	21.33	21.21			
15	84QAM	1	0	21.17	21.18	21.57			
15	84QAM	1	37	21.44	21.74	21.73	22	2	
15	84QAM	1	74	21.10	21.63	21.68			
15	84QAM	36	0	20.28	20.46	20.36			
15	84QAM	36	20	20.21	20.55	20.48	21	3	
15	84QAM	36	39	20.21	20.39	20.55			
15	84QAM	75	0	20.02	20.54	20.22			
Channel									
Frequency (MHz)									
10	QPSK	1	0	23.28	23.06	23.20	24	0	
10	QPSK	1	25	23.19	23.28	23.25			
10	QPSK	1	49	22.78	23.10	23.25			
10	QPSK	25	0	22.18	22.39	22.34	23	1	
10	QPSK	25	12	22.20	22.35	22.36			
10	QPSK	25	25	22.14	22.30	22.35			
10	QPSK	50	0	22.08	22.40	22.37	23	1	
10	16QAM	1	0	21.85	22.08	22.25			
10	16QAM	1	25	22.23	22.44	22.51			
10	16QAM	1	49	21.97	22.34	22.20	22	2	
10	16QAM	25	0	21.13	21.51	21.20			
10	16QAM	25	12	21.00	21.20	21.24			
10	16QAM	25	25	20.94	21.16	21.59	22	2	
10	16QAM	50	0	21.02	21.28	21.21			
10	84QAM	1	0	21.20	21.20	21.36			
10	84QAM	1	25	21.36	21.68	21.79	22	2	
10	84QAM	1	49	20.96	21.50	21.71			
10	84QAM	25	0	20.05	20.48	20.53			
10	84QAM	25	12	20.35	20.56	20.53	21	3	
10	84QAM	25	25	20.00	20.39	20.58			
10	84QAM	50	0	20.02	20.30	20.37			
Channel									
Frequency (MHz)									
5	QPSK	1	0	23.19	22.89	22.84	24	0	
5	QPSK	1	12	23.09	23.28	23.23			
5	QPSK	1	24	22.74	23.17	23.22			
5	QPSK	12	0	22.17	22.34	22.28	23	1	
5	QPSK	12	7	22.17	22.32	22.36			
5	QPSK	12	13	22.12	22.34	22.30			
5	QPSK	25	0	22.13	22.30	22.31	23	1	
5	16QAM	1	0	21.78	22.16	22.11			
5	16QAM	1	12	22.01	22.19	22.19			
5	16QAM	1	24	21.82	21.80	22.03	22	2	
5	16QAM	12	0	21.01	21.34	21.16			
5	16QAM	12	7	21.08	21.30	21.24			
5	16QAM	12	13	21.08	21.26	21.26	22	2	
5	16QAM	25	0	21.19	21.28	21.40			
5	84QAM	1	0	21.28	20.78	21.10			
5	84QAM	1	12	21.40	21.61	21.63	22	2	
5	84QAM	1	24	20.97	21.12	21.41			
5	84QAM	12	0	20.25	20.47	20.16			
5	84QAM	12	7	20.26	20.46	20.41	21	3	
5	84QAM	12	13	20.21	20.39	20.41			
5	84QAM	25	0	20.00	20.52	20.45			

Band 66									
BW (MHz)	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)	
Channel									
Frequency (MHz)									
20	QPSK	1	0	22.64	22.86	22.97	24	0	
20	QPSK	1	49	23.06	23.10	23.02			
20	QPSK	1	99	22.75	22.89	23.00			
20	QPSK	50	0	22.15	22.45	22.34	23	1	
20	QPSK	50	24	22.37	22.15	22.33			
20	QPSK	50	50	22.22	22.45	22.36			
20	QPSK	100	0	22.29	22.52	22.49	23	1	
20	16QAM	1	0	21.58	22.08	21.88			
20	16QAM	1	49	21.68	21.96	21.76			
20	16QAM	1	99	21.40	21.72	21.40	22	2	
20	16QAM	50	0	21.04	21.19	21.09			
20	16QAM	50	24	21.12	21.27	21.17			
20	16QAM	50	50	21.14	21.16	21.14	22	2	
20	16QAM	100	0	21.06	21.24	21.09			
20	84QAM	1	0	20.84	21.17	21.03			
20	84QAM	1	49	20.96	21.36	21.52	22	2	
20	84QAM	1	99	21.14	21.06	21.37			
20	84QAM	50	0	20.00	20.21	20.39			
20	84QAM	50	24	20.08	20.23	20.19	21	3	
20	84QAM	50	50	20.15	20.32	20.27			
20	84QAM	100	0	20.01	20.17	20.13			
Channel									
Frequency (MHz)									
15	QPSK	1	0	22.53	22.89	22.86	24	0	
15	QPSK	1	37	22.82	22.89	22.88			
15	QPSK	1	74	22.60	22.86	22.85			
15	QPSK	36	0	21.93	22.42	22.33	23	1	
15	QPSK	36	20	21.93	22.30	22.27			
15	QPSK	36	39	22.06	22.28	22.17			
15	QPSK	75	0	21.94	22.28	22.21	23	1	
15	16QAM	1	0	21.58	21.21	21.51			
15	16QAM	1	37	21.71	21.87	21.76			
15	16QAM	1	74	22.05	21.73	21.98	22	2	
15	16QAM	36	0	20.98	21.13	21.17			
15	16QAM	36	20	20.89	21.45	21.15			
15	16QAM	36	39	21.07	21.19	21.14	22	2	
15	16QAM	75	0	20.98	21.21	21.51			
15	84QAM	1	0	20.98	21.02	20.93			
15	84QAM	1	37	21.40	21.28	21.24	22	2	
15	84QAM	1	74	20.93	21.35	21.27			
15	84QAM	36	0	19.99	20.36	20.32			
15	84QAM	36	20	20.11	20.46	20.33	21	3	
15	84QAM	36	39	20.11	20.36	20.32			
15	84QAM	75	0	19.82	20.20	20.52			
Channel									
Frequency (MHz)									
10	QPSK	1	0	22.46	22.64	22.51	24	0	
10	QPSK	1	25	22.72	22.86	22.80			
10	QPSK	1	49	22.38	22.59	22.54			
10	QPSK	25	0	22.05	22.35	22.18	23	1	
10	QPSK	25	12	21.95	22.29	22.21			
10	QPSK	25	25	21.99	22.32	22.18			
10	QPSK	50	0	21.97	22.32	22.22	23	1	
10	16QAM	1	0	21.64	22.20	21.77			
10	16QAM	1	25	21.93	22.28	21.90			
10	16QAM	1	49	21.71	22.23	21.90	22	2	
10	16QAM	25	0	21.08	21.45	21.26			
10	16QAM	25	12	20.98	21.42	21.11			
10	16QAM	25	25	21.13	21.38	21.26	22	2	
10	16QAM	50	0	21.04	21.33	21.03			
10	84QAM	1	0	20.85	21.23	21.22			
10	84QAM	1	25	21.15	21.61	21.28	22	2	



Reduced Power Mode for Handheld on

Band	WCDMA 3			Tune-up Limit (dBm)	WCDMA 4			Tune-up Limit (dBm)	
	9262	9400	9638		1312	1413	1513		
Tx Channel	9262	9400	9638		1312	1413	1513		
Rx Channel	9662	9800	9938		1324	1438	1538		
Frequency (MHz)	1924	1960	1974		1724	1724	1724		
3GPP Rel 99	AMR 12.2Kbps	21.03	21.10	21.13	22.00	20.50	20.55	20.63	21.50
3GPP Rel 99	RM-C 12.2Kbps	21.09	21.12	21.16	22.00	20.58	20.67	20.69	21.50
3GPP Rel 6	HSDPA Subtest-1	19.99	20.13	20.19	21.00	19.30	19.38	19.63	20.50
3GPP Rel 6	HSDPA Subtest-2	20.02	20.13	20.18	21.00	19.44	19.50	19.57	20.50
3GPP Rel 6	HSDPA Subtest-3	19.58	19.61	19.75	20.50	18.87	18.98	19.04	20.00
3GPP Rel 6	HSDPA Subtest-4	19.54	19.61	19.75	20.50	18.88	18.95	19.14	20.00
3GPP Rel 6	DC-HSDPA Subtest-1	19.79	19.98	20.15	21.00	19.22	19.25	19.51	20.50
3GPP Rel 6	DC-HSDPA Subtest-2	19.84	19.90	20.12	21.00	19.37	19.31	19.41	20.50
3GPP Rel 6	DC-HSDPA Subtest-3	19.34	19.42	19.56	20.50	18.80	18.75	18.97	20.00
3GPP Rel 6	DC-HSDPA Subtest-4	19.33	19.57	19.60	20.50	18.76	18.79	19.05	20.00
3GPP Rel 6	HSPA Subtest-1	20.05	20.23	20.23	20.50	19.48	19.58	19.64	20.00
3GPP Rel 6	HSPA Subtest-2	18.12	18.22	18.21	18.30	17.46	17.45	17.83	18.00
3GPP Rel 6	HSPA Subtest-3	19.18	19.28	19.27	19.50	18.42	18.54	18.59	19.00
3GPP Rel 6	HSPA Subtest-4	18.13	18.23	18.20	18.50	17.53	17.56	17.83	18.00
3GPP Rel 6	HSPA Subtest-5	20.20	20.30	20.40	20.50	19.50	19.60	19.70	20.00



Band 2 (1900MHz Band) Part 24E										
BW (MHz)	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)		
Channel										
Frequency (MHz)										
20	QPSK	1	0	21.70	21.71	21.89	22.5	0		
20	QPSK	1	49	21.88	21.78	21.51				
20	QPSK	1	99	21.53	21.43	21.14				
20	QPSK	50	0	21.55	21.68	21.74				
20	QPSK	50	24	21.58	21.88	21.78	22.5	0		
20	QPSK	50	50	21.56	21.57	21.71				
20	QPSK	100	0	21.57	21.68	21.72				
20	16QAM	1	0	21.23	21.22	21.48	21.5	1		
20	16QAM	1	49	21.26	21.30	21.39				
20	16QAM	1	99	21.10	21.02	21.38				
20	16QAM	50	0	21.00	20.78	21.06				
20	16QAM	50	24	21.03	20.98	20.90	21.5	1		
20	16QAM	50	50	20.96	20.89	20.96				
20	16QAM	100	0	21.00	20.97	21.00				
20	64QAM	1	0	20.85	20.98	20.98	21.5	1		
20	64QAM	1	49	20.89	20.97	20.96				
20	64QAM	1	99	20.84	20.86	21.01				
20	64QAM	50	0	20.00	20.03	20.02				
20	64QAM	50	24	20.05	20.05	20.09	21.5	1		
20	64QAM	50	50	20.04	20.07	20.14				
20	64QAM	100	0	19.94	20.06	20.16				
Channel										
Frequency (MHz)										
15	QPSK	1	0	21.52	21.67	21.70	22.5	0		
15	QPSK	1	37	21.68	21.75	21.70				
15	QPSK	1	74	21.48	21.53	21.60				
15	QPSK	36	0	21.52	21.53	21.68				
15	QPSK	36	20	21.58	21.80	21.65	22.5	0		
15	QPSK	36	39	21.54	21.52	21.68				
15	QPSK	75	0	21.51	21.64	21.68				
15	16QAM	1	0	21.15	21.33	21.32	21.5	1		
15	16QAM	1	37	21.33	21.20	21.35				
15	16QAM	1	74	21.12	21.23	21.43				
15	16QAM	36	0	20.84	20.92	21.00				
15	16QAM	36	20	20.87	20.90	20.98	21.5	1		
15	16QAM	36	39	20.82	20.91	20.99				
15	16QAM	75	0	20.90	20.95	21.00				
15	64QAM	1	0	20.89	20.93	21.11	21.5	1		
15	64QAM	1	37	21.01	21.00	21.03				
15	64QAM	1	74	20.90	20.87	21.07				
15	64QAM	36	0	20.07	20.07	20.20	21.5	1		
15	64QAM	36	20	20.13	20.18	20.29				
15	64QAM	36	39	20.01	20.02	20.12				
15	64QAM	75	0	20.00	19.92	20.01				
Channel										
Frequency (MHz)										
10	QPSK	1	0	21.45	21.48	21.56	22.5	0		
10	QPSK	1	25	21.62	21.61	21.62				
10	QPSK	1	49	21.29	21.45	21.67				
10	QPSK	25	0	21.43	21.64	21.77				
10	QPSK	25	12	21.48	21.88	21.73	22.5	0		
10	QPSK	25	25	21.61	21.63	21.74				
10	QPSK	50	0	21.53	21.62	21.72				
10	16QAM	1	0	21.10	21.28	21.31	21.5	1		
10	16QAM	1	25	21.39	21.24	21.41				
10	16QAM	1	49	21.05	21.26	21.48				
10	16QAM	25	0	20.86	20.95	21.00				
10	16QAM	25	12	20.98	20.92	21.11	21.5	1		
10	16QAM	25	25	21.03	20.94	21.05				
10	16QAM	50	0	20.75	20.95	21.00				
10	64QAM	1	0	20.81	20.97	21.12	21.5	1		
10	64QAM	1	25	20.83	20.88	21.02				
10	64QAM	1	49	20.92	20.92	21.07				
10	64QAM	25	0	19.76	19.78	20.14	21.5	1		
10	64QAM	25	12	19.97	20.06	20.20				
10	64QAM	25	25	19.80	19.81	20.15				
10	64QAM	50	0	19.94	20.02	20.06				
Channel										
Frequency (MHz)										
5	QPSK	1	0	21.52	21.63	21.69	22.5	0		
5	QPSK	1	12	21.67	21.72	21.80				
5	QPSK	1	24	21.33	21.45	21.66				
5	QPSK	12	0	21.33	21.65	21.86				
5	QPSK	12	7	21.40	21.63	21.81	22.5	0		
5	QPSK	12	13	21.40	21.56	21.74				
5	QPSK	25	0	21.39	21.55	21.84				
5	16QAM	1	0	21.02	21.21	21.23	21.5	1		
5	16QAM	1	12	21.02	21.21	21.23				
5	16QAM	1	24	21.14	21.16	21.13				
5	16QAM	12	0	20.57	21.06	21.02				
5	16QAM	12	7	20.85	20.92	21.17	21.5	1		
5	16QAM	12	13	20.76	20.74	20.92				
5	16QAM	25	0	20.74	20.93	21.00				
5	64QAM	1	0	20.67	20.92	20.95	21.5	1		
5	64QAM	1	12	21.12	21.33	21.30				
5	64QAM	1	24	20.75	20.80	20.97				
5	64QAM	12	0	19.93	20.05	20.26	21.5	1		
5	64QAM	12	7	19.81	20.04	20.28				
5	64QAM	12	13	19.86	19.97	20.20				
5	64QAM	25	0	19.82	19.74	20.15				
Channel										
Frequency (MHz)										
3	QPSK	1	0	21.62	21.63	21.62	22.5	0		
3	QPSK	1	8	21.57	21.70	21.79				
3	QPSK	1	14	21.49	21.57	21.61				
3	QPSK	8	0	21.42	21.67	21.84				
3	QPSK	8	4	21.39	21.63	21.48	22.5	0		
3	QPSK	8	7	21.39	21.67	21.78				
3	QPSK	15	0	21.37	21.68	21.75				
3	16QAM	1	0	21.00	21.16	21.33	21.5	1		
3	16QAM	1	8	21.02	21.19	21.45				
3	16QAM	1	14	21.03	21.11	21.42				
3	16QAM	8	0	20.70	20.76	21.04				
3	16QAM	8	4	20.69	20.90	21.24	21.5	1		
3	16QAM	8	7	20.81	21.03	21.26				
3	16QAM	15	0	20.97	20.99	21.09				
3	64QAM	1	0	20.70	20.90	21.12	21.5	1		
3	64QAM	1	8	20.67	20.85	21.05				
3	64QAM	1	14	20.71	20.92	21.13				
3	64QAM	8	0	19.70	19.88	20.19	21.5	1		
3	64QAM	8	4	19.83	19.98	20.28				
3	64QAM	8	7	19.75	19.99	20.15				
3	64QAM	15	0	19.72	19.87	20.19				
Channel										
Frequency (MHz)										
1.4	QPSK	1	0	21.47	21.44	21.58	22.5	0		
1.4	QPSK	1	3	21.55	21.50	21.59				
1.4	QPSK	1	5	21.49	21.51	21.51				
1.4	QPSK	3	0	21.56	21.53	21.79				
1.4	QPSK	3	1	21.72	21.48	21.85	22.5	0		
1.4	QPSK	3	3	21.48	21.54	21.81				
1.4	QPSK	6	0	21.48	21.64	21.79				
1.4	16QAM	1	0	21.19	21.46	21.28	21.5	1		
1.4	16QAM	1	3	21.24	21.48	21.41				
1.4	16QAM	1	5	20.98	21.41	21.32				
1.4	16QAM	3	0	21.10	21.48	21.39	21.5	1		
1.4	16QAM	3	1	21.50	21.38	21.48				
1.4	16QAM	3	3	21.41	21.47	21.41				
1.4	16QAM	6	0	20.98	21.03	21.14	21.5	1		
1.4	64QAM	1	0	21.15	21.22	21.35				
1.4	64QAM	1	3	21.32	20.96	21.10				
1.4	64QAM	1	5	21.26	20.87	21.07	21.5	1		
1.4	64QAM	3	0	20.91	20.93	20.67				
1.4	64QAM	3	1	20.85	20.86	20.90				
1.4	64QAM	3	3	20.79	20.76	21.11				
1.4	64QAM	6	0	19.64	19.85	20.02	21.5	1		



Band 66									
BW (MHz)	Modulation	RB Size	RB Offset	Power Low Ch. (Freq.)	Power Middle Ch. (Freq.)	Power High Ch. (Freq.)	Tune-up limit (dBm)	MPR (dB)	
Channel				132072	132322	132572			
Frequency (MHz)				1720	1745	1770			
20	QPSK	1	0	20.42	20.61	20.71			
20	QPSK	1	49	20.61	20.98	20.78	21.5	0	
20	QPSK	1	99	20.30	20.41	20.45			
20	QPSK	50	0	20.14	20.41	20.42			
20	QPSK	50	24	20.52	20.93	20.75			
20	QPSK	50	50	20.14	20.39	20.38	21.5	0	
20	QPSK	100	0	20.24	20.91	20.39			
20	16QAM	1	0	19.78	20.19	20.23			
20	16QAM	1	49	19.86	20.10	20.04	21.5	0	
20	16QAM	1	99	19.81	20.05	19.93			
20	16QAM	50	0	19.81	20.43	20.40			
20	16QAM	50	24	20.03	20.39	20.27			
20	16QAM	50	50	20.02	20.21	20.27	21.5	0	
20	16QAM	100	0	20.09	20.23	20.35			
Channel				132047	132322	132597			
Frequency (MHz)				1717.5	1745	1772.5			
15	QPSK	1	0	19.91	20.23	20.32			
15	QPSK	1	37	20.27	20.49	20.73	21.5	0	
15	QPSK	1	74	19.94	20.11	20.27			
15	QPSK	36	0	20.18	20.43	20.42			
15	QPSK	36	20	20.08	20.41	20.45			
15	QPSK	36	39	20.25	20.39	20.32	21.5	0	
15	QPSK	75	0	20.13	20.50	20.39			
15	16QAM	1	0	19.63	20.19	20.14			
15	16QAM	1	37	19.77	20.15	20.11	21.5	0	
15	16QAM	1	74	19.80	20.03	19.88			
15	16QAM	36	0	20.13	20.32	20.25			
15	16QAM	36	20	20.00	20.33	20.31			
15	16QAM	36	39	20.10	20.30	20.25	21.5	0	
15	16QAM	75	0	20.08	20.39	20.28			
15	64QAM	1	0	20.17	20.11	20.48	21.5	0	
15	64QAM	1	37	20.45	20.41	20.43			
15	64QAM	1	74	19.76	20.12	20.10			
15	64QAM	36	0	19.92	20.23	20.22			
15	64QAM	36	20	19.98	20.25	20.22			
15	64QAM	36	39	19.95	20.02	20.11	21.5	0	
15	64QAM	75	0	19.73	20.22	20.24			
Channel				132022	132322	132622			
Frequency (MHz)				1715	1745	1775			
10	QPSK	1	0	19.82	20.16	20.09			
10	QPSK	1	25	20.19	20.46	20.50	21.5	0	
10	QPSK	1	49	19.80	20.13	19.98			
10	QPSK	25	0	20.13	20.46	20.44			
10	QPSK	25	12	20.16	20.47	20.36			
10	QPSK	25	25	20.11	20.44	20.28	21.5	0	
10	QPSK	50	0	20.11	20.45	20.32			
10	16QAM	1	0	19.84	20.21	20.08			
10	16QAM	1	25	19.97	20.41	20.22	21.5	0	
10	16QAM	1	49	19.88	20.13	19.94			
10	16QAM	25	0	20.01	20.44	20.45			
10	16QAM	25	12	19.95	20.46	20.40			
10	16QAM	25	25	20.12	20.40	20.16	21.5	0	
10	16QAM	50	0	20.08	20.39	20.28			
10	64QAM	1	0	19.98	20.34	20.27			
10	64QAM	1	25	20.48	20.41	20.39	21.5	0	
10	64QAM	1	49	20.00	20.26	20.13			
10	64QAM	25	0	19.95	20.32	20.22			
10	64QAM	25	12	19.91	20.29	20.25			
10	64QAM	25	25	19.98	20.06	19.92	21.5	0	
10	64QAM	50	0	19.87	20.28	20.05			
Channel				131997	132322	132647			
Frequency (MHz)				1712.5	1745	1777.5			
5	QPSK	1	0	19.80	20.09	20.18			
5	QPSK	1	12	20.16	20.43	20.64	21.5	0	
5	QPSK	1	24	19.79	20.11	19.99			
5	QPSK	12	0	20.13	20.46	20.40			
5	QPSK	12	7	20.13	20.45	20.33			
5	QPSK	12	13	20.07	20.44	20.35	21.5	0	
5	QPSK	25	0	20.11	20.44	20.34			
5	16QAM	1	0	19.76	20.08	20.05			
5	16QAM	1	12	19.77	20.15	20.07	21.5	0	
5	16QAM	1	24	19.68	20.06	19.92			
5	16QAM	12	0	19.91	20.47	20.04			
5	16QAM	12	7	20.05	20.49	20.28			
5	16QAM	12	13	19.84	20.48	20.34	21.5	0	
5	16QAM	25	0	19.97	20.22	20.28			
5	64QAM	1	0	19.85	20.20	20.13			
5	64QAM	1	12	20.32	20.33	20.41	21.5	0	
5	64QAM	1	24	19.79	20.24	20.40			
5	64QAM	12	0	19.90	20.20	20.11			
5	64QAM	12	7	19.91	20.22	20.07			
5	64QAM	12	13	19.81	20.19	20.08	21.5	0	
5	64QAM	25	0	19.94	19.82	20.17			
Channel				131997	132322	132657			
Frequency (MHz)				1711.5	1745	1778.5			
3	QPSK	1	0	20.05	20.29	20.27			
3	QPSK	1	8	20.03	20.21	20.36	21.5	0	
3	QPSK	1	14	20.02	20.38	20.24			
3	QPSK	8	0	20.18	20.48	20.32			
3	QPSK	8	4	20.11	20.42	20.27			
3	QPSK	8	7	20.20	20.44	20.24	21.5	0	
3	QPSK	15	0	20.13	20.41	20.38			
3	16QAM	1	0	19.77	20.16	19.97			
3	16QAM	1	8	19.72	20.05	20.03	21.5	0	
3	16QAM	1	14	19.80	20.13	19.92			
3	16QAM	8	0	19.74	20.31	20.16			
3	16QAM	8	4	19.80	20.16	20.16			
3	16QAM	8	7	19.69	20.01	20.22	21.5	0	
3	16QAM	15	0	19.96	20.36	20.15			
3	64QAM	1	0	19.84	20.28	20.12			
3	64QAM	1	8	19.92	20.20	20.05	21.5	0	
3	64QAM	1	14	19.95	20.25	20.11			
3	64QAM	8	0	19.74	20.08	20.01			
3	64QAM	8	4	19.73	19.94	20.01			
3	64QAM	8	7	19.74	20.03	19.98	21.5	0	
3	64QAM	15	0	19.72	20.06	19.92			
Channel				131978	132322	132665			
Frequency (MHz)				1710.7	1745	1778.3			
1.4	QPSK	1	0	20.03	20.21	20.27			
1.4	QPSK	1	3	20.08	20.46	20.36	21.5	0	
1.4	QPSK	1	5	20.04	20.42	20.39			
1.4	QPSK	3	0	20.16	20.27	20.37			
1.4	QPSK	3	1	20.27	20.47	20.28			
1.4	QPSK	3	3	20.19	20.37	20.30			
1.4	QPSK	6	0	20.07	20.44	20.32	21.5	0	
1.4	16QAM	1	0	19.85	20.13	20.10			
1.4	16QAM	1	3	19.83	20.26	20.18			
1.4	16QAM	1	5	19.78	20.42	20.04			
1.4	16QAM	3	0	19.84	20.33	20.22			
1.4	16QAM	3	1	20.04	20.32	20.23			
1.4	16QAM	3	3	19.81	20.31	20.25			
1.4	16QAM	6	0	19.86	20.21	19.95	21.5	0	
1.4	64QAM	1	0	19.91	20.01	20.50			
1.4	64QAM	1	3	19.99	20.34	20.24			
1.4	64QAM	1	5	19.86	20.12	20.21			
1.4	64QAM	3	0	19.99	20.30	20.24	21.5	0	
1.4	64QAM	3	1	20.03	20.26	20.28			
1.4	64QAM	3	3	20.06	20.30	20.21			
1.4	64QAM	6	0	19.61	20.04	19.92	21.5	0	



Reduced Power Mode for Sensor on

GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	128	189	251		128	189	251	
TX Channel	128	189	251	32.00	22.73	22.56	22.27	23.00
Frequency (MHz)	824.2	836.4	848.8	(dBm)	824.2	836.4	848.8	(dBm)
GSM 1 Tx slot	31.73	31.56	31.57	32.00	22.68	22.51	22.51	23.00
GPRS 1 Tx slot	31.68	31.51	31.51	32.00	22.68	22.51	22.51	23.00
GPRS 2 Tx slots	29.56	29.61	29.84	30.50	23.56	23.81	23.84	24.50
GPRS 3 Tx slots	27.28	27.46	27.34	28.50	23.02	23.20	23.08	24.24
GPRS 4 Tx slots	24.95	25.21	25.27	26.50	21.95	22.21	22.27	23.50
EDGE 1 Tx slot	23.32	24.46	24.47	25.50	19.32	19.46	19.47	19.50
EDGE 2 Tx slots	22.37	22.59	22.52	23.50	18.37	18.59	18.52	17.50
EDGE 3 Tx slots	20.12	20.28	20.27	21.50	16.86	16.02	16.01	17.24
EDGE 4 Tx slots	17.88	18.01	17.95	19.50	14.88	15.01	14.95	16.50

GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	512	661	810		512	661	810	
TX Channel	512	661	810	28.50	18.81	18.70	18.79	19.50
Frequency (MHz)	1552.2	1622	1692.3	(dBm)	1552.2	1622	1692.3	(dBm)
GSM 1 Tx slot	27.89	27.75	27.86	28.50	19.89	19.75	19.86	19.50
GPRS 1 Tx slot	27.81	27.70	27.79	28.50	18.81	18.70	18.79	19.50
GPRS 2 Tx slots	26.14	26.42	26.44	27.50	20.14	20.42	20.44	21.50
GPRS 3 Tx slots	24.23	24.45	24.58	25.50	19.97	20.18	20.32	21.24
GPRS 4 Tx slots	22.18	22.24	22.41	23.50	19.18	19.24	19.41	20.50
EDGE 1 Tx slot	23.49	23.52	23.58	24.50	14.49	14.52	14.58	15.50
EDGE 2 Tx slots	22.39	22.41	22.49	23.50	16.39	16.41	16.49	17.50
EDGE 3 Tx slots	20.27	20.17	20.33	21.50	16.01	15.91	16.07	17.24
EDGE 4 Tx slots	18.13	18.09	18.14	19.50	15.13	15.09	15.14	16.50

Band	WCDMA I			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)	
	900	940	958		1312	1413	1513		4132	4182	4233		
TX Channel	900	940	958	1537	1638	1738	4367	4407	4458				
Rx Channel	962	980	998	1537	1638	1738	4367	4407	4458				
Frequency (MHz)	1852.4	1880	1907.6	1712.4	1732.6	1752.6	826.4	836.4	846.8				
3GPP Rel 99	AMR 12.2Kbps	19.86	19.50	19.97	21.00	18.01	17.92	18.03	19.00	22.31	22.28	22.16	23.00
3GPP Rel 99	AMR 12.2Kbps	19.90	20.01	20.06	21.00	18.04	18.09	17.89	19.00	22.35	22.33	22.18	23.00
3GPP Rel 6	HSDPA Subtest-1	19.08	19.22	19.29	20.00	16.93	16.93	17.03	18.00	21.44	21.27	21.17	22.00
3GPP Rel 6	HSDPA Subtest-2	19.10	19.23	19.29	20.00	16.98	17.04	17.13	18.00	21.43	21.31	21.15	22.00
3GPP Rel 6	HSDPA Subtest-3	18.83	18.71	18.76	19.50	16.47	16.52	16.60	17.50	20.83	20.83	20.84	21.50
3GPP Rel 6	HSDPA Subtest-4	18.23	18.71	18.76	19.50	16.46	16.54	16.60	17.50	20.93	20.82	20.65	21.50
3GPP Rel 6	DC-HSDPA Subtest-1	18.88	19.10	19.26	20.00	16.84	16.77	16.91	18.00	21.38	21.04	20.99	22.00
3GPP Rel 6	DC-HSDPA Subtest-2	18.88	19.09	19.24	20.00	16.79	16.92	16.97	18.00	21.38	21.13	21.09	22.00
3GPP Rel 6	DC-HSDPA Subtest-3	18.56	18.50	18.61	19.50	16.30	16.48	16.53	17.50	20.71	20.60	20.54	21.50
3GPP Rel 6	DC-HSDPA Subtest-4	18.50	18.49	18.56	19.50	16.41	16.44	16.44	17.50	20.83	20.74	20.47	21.50
3GPP Rel 6	HSUPA Subtest-1	19.11	19.23	19.31	19.50	17.01	17.05	17.05	17.50	21.35	21.19	21.17	21.50
3GPP Rel 6	HSUPA Subtest-2	17.15	17.22	17.30	17.50	15.19	15.11	15.22	15.50	19.30	19.26	19.08	19.50
3GPP Rel 6	HSUPA Subtest-3	19.20	19.28	19.35	19.50	16.06	16.10	16.23	16.50	20.26	20.24	20.07	20.50
3GPP Rel 6	HSUPA Subtest-4	17.23	17.29	17.40	17.50	15.08	15.23	15.32	15.50	19.38	19.24	19.08	19.50
3GPP Rel 6	HSUPA Subtest-5	19.30	19.30	19.40	19.50	17.10	17.10	17.20	17.50	21.30	21.20	21.20	21.50



Band 2 (1900MHz Band) Part 24E										
BW (MHz)	Modulation	RB Size	RB Offset	Power Low Ch./Freq. 1870	Power Middle Ch./Freq. 1880	Power High Ch./Freq. 1900	Tune-up limit (dBm)	MPR (dB)		
Channel										
Frequency (MHz)										
20	QPSK	1	0	21.09	20.96	21.20	22	0		
20	QPSK	1	49	21.41	21.27	21.42				
20	QPSK	1	99	20.81	20.86	21.12	22	0		
20	QPSK	50	0	21.12	21.01	21.12				
20	QPSK	50	24	21.14	21.09	21.16	22	0		
20	QPSK	50	50	21.08	21.05	21.13				
20	QPSK	100	0	21.11	21.02	21.13	22	0		
20	16QAM	1	0	20.56	20.69	20.69				
20	16QAM	1	49	20.70	20.69	20.69	22	0		
20	16QAM	1	99	20.52	20.45	20.72				
20	16QAM	50	0	20.53	20.54	20.53	22	0		
20	16QAM	50	24	20.98	20.83	20.99				
20	16QAM	50	50	20.93	20.84	20.92	22	0		
20	16QAM	100	0	20.86	20.89	21.00				
20	64QAM	1	0	20.90	20.87	21.02	22	0		
20	64QAM	1	49	21.03	21.09	21.03				
20	64QAM	1	99	20.85	20.84	21.04	21	1		
20	64QAM	50	0	20.04	20.08	20.04				
20	64QAM	50	24	19.96	19.98	20.03	21	1		
20	64QAM	50	50	19.97	19.90	20.05				
20	64QAM	100	0	20.01	19.99	20.07	Tune-up limit (dBm)	MPR (dB)		
Channel										
Frequency (MHz)										
15	QPSK	1	0	20.79	20.95	20.95	22	0		
15	QPSK	1	37	21.23	21.04	21.10				
15	QPSK	1	74	20.80	20.90	20.90	22	0		
15	QPSK	36	0	21.06	21.10	21.18				
15	QPSK	36	20	21.06	21.06	21.14	22	0		
15	QPSK	36	39	21.11	21.02	21.15				
15	QPSK	75	0	20.52	20.64	20.70	22	0		
15	16QAM	1	0	20.52	20.64	20.70				
15	16QAM	1	37	20.68	20.69	20.75	22	0		
15	16QAM	1	74	20.49	20.59	20.75				
15	16QAM	36	0	20.83	20.87	20.95	22	0		
15	16QAM	36	20	20.89	20.85	20.98				
15	16QAM	36	39	20.86	20.86	20.98	22	0		
15	16QAM	75	0	20.80	20.95	20.94				
15	64QAM	1	0	20.91	21.13	21.03	22	0		
15	64QAM	1	37	21.06	21.03	21.13				
15	64QAM	1	74	20.92	20.86	21.04	21	1		
15	64QAM	36	0	20.00	20.05	20.15				
15	64QAM	36	20	20.05	20.02	20.14	21	1		
15	64QAM	36	39	20.05	20.00	20.12				
15	64QAM	75	0	19.82	19.91	20.08	Tune-up limit (dBm)	MPR (dB)		
Channel										
Frequency (MHz)										
10	QPSK	1	0	20.78	20.88	20.88	22	0		
10	QPSK	1	25	21.14	21.23	21.01				
10	QPSK	1	49	20.86	20.98	20.94	22	0		
10	QPSK	1	74	20.86	21.08	21.08				
10	QPSK	25	12	21.03	21.08	21.15	22	0		
10	QPSK	25	25	21.07	21.07	21.22				
10	QPSK	50	0	21.07	21.08	21.13	22	0		
10	16QAM	1	0	20.66	20.66	20.88				
10	16QAM	1	25	20.75	20.81	20.91	22	0		
10	16QAM	1	49	20.62	20.76	20.91				
10	16QAM	25	0	20.81	20.81	20.96	22	0		
10	16QAM	25	12	20.96	20.97	20.93				
10	16QAM	25	25	20.79	21.11	21.02	22	0		
10	16QAM	50	0	20.80	20.86	21.08				
10	64QAM	1	0	20.81	20.90	20.95	22	0		
10	64QAM	1	25	21.13	20.98	21.22				
10	64QAM	1	49	20.82	21.08	20.98	21	1		
10	64QAM	25	0	19.98	20.07	20.22				
10	64QAM	25	12	20.00	20.13	20.22	21	1		
10	64QAM	25	25	19.88	20.07	20.10				
10	64QAM	50	0	19.90	19.88	20.03	Tune-up limit (dBm)	MPR (dB)		
Channel										
Frequency (MHz)										
5	QPSK	1	0	20.84	20.73	20.86	22	0		
5	QPSK	1	12	21.23	21.13	21.26				
5	QPSK	1	24	20.67	21.00	21.09	22	0		
5	QPSK	12	0	20.88	21.07	21.26				
5	QPSK	12	7	20.94	21.06	21.03	22	0		
5	QPSK	12	13	20.95	20.99	21.24				
5	QPSK	25	0	20.95	21.09	21.22	22	0		
5	16QAM	1	0	20.34	20.44	20.69				
5	16QAM	1	12	20.56	20.66	20.88	22	0		
5	16QAM	1	24	20.46	20.49	20.84				
5	16QAM	12	0	20.80	20.93	21.05	22	0		
5	16QAM	12	7	20.79	20.86	21.00				
5	16QAM	12	13	20.79	20.73	21.01	22	0		
5	16QAM	25	0	20.69	20.90	20.95				
5	64QAM	1	0	20.72	20.75	20.96	22	0		
5	64QAM	1	12	21.13	21.26	21.11				
5	64QAM	1	24	20.73	20.75	20.98	21	1		
5	64QAM	12	0	19.86	19.87	20.28				
5	64QAM	12	7	19.87	19.82	20.15	21	1		
5	64QAM	12	13	19.57	20.03	19.97				
5	64QAM	25	0	19.68	19.68	20.17	Tune-up limit (dBm)	MPR (dB)		
Channel										
Frequency (MHz)										
3	QPSK	1	0	20.80	20.83	21.02	22	0		
3	QPSK	1	8	20.94	21.02	21.17				
3	QPSK	1	14	20.71	21.10	21.01	22	0		
3	QPSK	8	0	21.00	21.15	21.01				
3	QPSK	8	4	20.94	21.12	21.27	22	0		
3	QPSK	8	7	20.95	21.09	21.22				
3	QPSK	15	0	20.96	21.03	21.18	22	0		
3	16QAM	1	0	20.48	20.61	20.86				
3	16QAM	1	8	20.47	20.51	20.84	22	0		
3	16QAM	1	14	20.43	20.60	20.75				
3	16QAM	8	0	20.89	20.76	21.04	22	0		
3	16QAM	8	4	20.82	20.90	21.03				
3	16QAM	8	7	20.89	21.03	21.06	22	0		
3	16QAM	15	0	20.83	20.68	21.02				
3	64QAM	1	0	20.76	20.90	21.12	22	0		
3	64QAM	1	8	20.86	20.82	21.01				
3	64QAM	1	14	20.76	20.90	21.11	21	1		
3	64QAM	8	0	19.77	19.78	20.05				
3	64QAM	8	4	19.82	19.83	20.07	21	1		
3	64QAM	8	7	19.55	19.89	20.02				
3	64QAM	15	0	19.81	19.94	20.21	Tune-up limit (dBm)	MPR (dB)		
Channel										
Frequency (MHz)										
1.4	QPSK	1	0	20.81	20.96	21.11	22	0		
1.4	QPSK	1	3	20.81	21.07	21.24				
1.4	QPSK	1	5	20.94	20.97	21.21	22	0		
1.4	QPSK	3	0	21.05	20.98	20.96				
1.4	QPSK	3	1	21.17	20.93	21.03	22	0		
1.4	QPSK	3	3	21.07	21.00	21.10				
1.4	QPSK	6	0	20.86	21.00	21.01	22	0		
1.4	16QAM	1	0	20.87	20.53	20.70				
1.4	16QAM	1	3	20.98	21.25	20.96	22	0		
1.4	16QAM	1	5	20.91	21.05	20.71				
1.4	16QAM	3	0	20.87	20.94	21.22	22	0		
1.4	16QAM	3	1	20.82	20.90	21.19				
1.4	16QAM	3	1	20.94	20.86	21.13	22	0		
1.4	16QAM	6	0	20.88	20.80	20.83				
1.4	64QAM	1	0	21.10	21.12	21.01	22	0		
1.4	64QAM	1	3	20.84	20.91	20.93				
1.4	64QAM	1	5	20.76	21.19	21.03	22	0		
1.4	64QAM	3	0	20.88	20.76	21.11				
1.4	64QAM	3	1	20.94	20.86	21.13	22	0		
1.4	64QAM	3	3	20.88	20.81	21.11				
1.4	64QAM	6	0	19.71	19.73	19.98	21	1		

Band 4 (AWS Band) Part 27L (only on channel required)										
BW (MHz)	Modulation	RB Size	RB Offset	Power Low Ch./Freq. 1720	Power Middle Ch./Freq. 1730	Power High Ch./Freq. 1745	Tune-up limit (dBm)	MPR (dB)		
Channel										
Frequency (MHz)										
20	QPSK	1	0	17.81	18.32	18.05	19	0		
20	QPSK	1	49	17.88	18.13	18.12				
20	QPSK	1	99	17.55	17.75	17.79	19	0		
20	QPSK	50	0	17.52	17.75	17.75				
20	QPSK	50	24	17.85	18.17	18.09	19	0		
20	QPSK	50	50	17.48	17.73	17.72				
20	QPSK	100	0	17.49	18.15	17.73	19	0		
20	16QAM	1</								



Band 7 (2600MHz Band) Part 27									
BW (MHz)	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)	
Channel									
Frequency (MHz)									
20	QPSK	1	0	16.12	15.88	16.11	17	0	
20	QPSK	1	49	16.32	16.34	16.21			
20	QPSK	1	99	16.11	16.00	15.97			
20	QPSK	50	0	16.15	16.23	16.18			
20	QPSK	50	24	16.19	16.26	16.16			
20	QPSK	50	50	16.12	16.22	16.12			
20	QPSK	100	0	16.16	16.23	16.19			
20	16QAM	1	0	15.69	15.65	15.75			
20	16QAM	1	49	15.75	15.81	15.74			
20	16QAM	1	99	15.55	15.71	15.64			
20	16QAM	50	0	16.12	16.07	16.10			
20	16QAM	50	24	16.09	16.11	16.02			
20	16QAM	50	50	16.01	16.09	16.10			
20	16QAM	100	0	16.06	16.12	16.08			
20	84QAM	1	0	16.05	16.01	16.17			
20	84QAM	1	49	15.95	15.98	16.00			
20	84QAM	1	99	16.29	16.02	16.07			
20	84QAM	50	0	15.99	15.97	16.12			
20	84QAM	50	24	16.06	16.22	16.02			
20	84QAM	50	50	15.99	16.11	16.04			
20	84QAM	100	0	16.05	16.25	16.12			
Channel									
Frequency (MHz)									
15	QPSK	1	0	16.19	15.99	16.24	17	0	
15	QPSK	1	37	16.31	16.32	16.24			
15	QPSK	1	74	16.15	16.09	16.04			
15	QPSK	36	0	16.22	16.31	16.21			
15	QPSK	36	20	16.23	16.25	16.25			
15	QPSK	36	39	16.22	16.29	16.24			
15	QPSK	75	0	16.21	16.30	16.18			
15	16QAM	1	0	15.75	15.67	15.76			
15	16QAM	1	37	15.77	16.22	16.05			
15	16QAM	1	74	15.89	15.75	15.70			
15	16QAM	36	0	15.97	16.09	15.98			
15	16QAM	36	20	16.04	16.10	16.02			
15	16QAM	36	39	16.13	16.06	16.03			
15	16QAM	75	0	16.10	16.08	16.08			
15	84QAM	1	0	16.18	16.01	16.09			
15	84QAM	1	37	15.85	15.86	16.00			
15	84QAM	1	74	16.00	16.06	16.03			
15	84QAM	36	0	16.21	16.20	16.14			
15	84QAM	36	20	16.25	16.32	16.15			
15	84QAM	36	39	16.22	16.21	16.19			
15	84QAM	75	0	15.98	16.06	16.31			
Channel									
Frequency (MHz)									
10	QPSK	1	0	15.91	15.84	15.92	17	0	
10	QPSK	1	25	16.32	16.31	16.25			
10	QPSK	1	49	15.95	16.18	15.96			
10	QPSK	25	0	16.19	16.30	16.24			
10	QPSK	25	12	16.19	16.30	16.28			
10	QPSK	25	25	16.19	16.33	16.23			
10	QPSK	50	0	16.17	16.30	16.28			
10	16QAM	1	0	15.74	15.80	15.70			
10	16QAM	1	25	15.85	15.97	15.84			
10	16QAM	1	49	15.78	15.98	15.87			
10	16QAM	25	0	16.25	16.08	16.03			
10	16QAM	25	12	16.18	16.07	16.04			
10	16QAM	25	25	15.96	16.01	16.27			
10	16QAM	50	0	16.13	16.20	16.07			
10	84QAM	1	0	16.04	15.98	15.96			
10	84QAM	1	25	16.00	15.85	15.81			
10	84QAM	1	49	15.96	16.05	16.04			
10	84QAM	25	0	16.21	16.32	16.17			
10	84QAM	25	12	16.18	16.28	16.16			
10	84QAM	25	25	16.16	16.27	16.06			
10	84QAM	50	0	16.01	16.09	15.96			
Channel									
Frequency (MHz)									
5	QPSK	1	0	15.72	15.69	15.76	17	0	
5	QPSK	1	12	16.30	16.31	16.29			
5	QPSK	1	24	15.71	15.83	15.75			
5	QPSK	12	0	16.25	16.29	16.19			
5	QPSK	12	7	16.12	16.26	16.22			
5	QPSK	12	13	16.13	16.31	16.14			
5	QPSK	25	0	16.16	16.29	16.17			
5	16QAM	1	0	15.87	15.82	15.58			
5	16QAM	1	12	15.77	15.91	15.77			
5	16QAM	1	24	15.87	15.66	15.77			
5	16QAM	12	0	16.11	16.14	16.02			
5	16QAM	12	7	16.01	16.14	16.00			
5	16QAM	12	13	16.03	16.11	16.02			
5	16QAM	25	0	16.06	16.29	15.65			
5	84QAM	1	0	16.03	15.89	15.79			
5	84QAM	1	12	15.41	15.95	15.96			
5	84QAM	1	24	15.83	15.94	15.84			
5	84QAM	12	0	16.20	16.16	15.83			
5	84QAM	12	7	16.14	16.02	16.04			
5	84QAM	12	13	16.10	16.16	15.84			
5	84QAM	25	0	16.19	15.87	15.95			

Band 66									
BW (MHz)	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)	
Channel									
Frequency (MHz)									
20	QPSK	1	0	17.75	17.86	17.96	19	0	
20	QPSK	1	49	17.80	18.26	18.22			
20	QPSK	1	99	17.77	17.85	17.80			
20	QPSK	50	0	17.72	17.84	17.91			
20	QPSK	50	24	17.78	18.15	17.93			
20	QPSK	50	50	17.75	17.97	17.84			
20	QPSK	100	0	17.84	18.14	17.86			
20	16QAM	1	0	17.25	17.73	17.67			
20	16QAM	1	49	17.35	17.59	17.63			
20	16QAM	1	99	17.41	17.39	17.48			
20	16QAM	50	0	17.60	17.90	17.83			
20	16QAM	50	24	17.62	17.89	17.77			
20	16QAM	50	50	17.64	17.82	17.67			
20	16QAM	100	0	17.65	17.76	17.87			
20	84QAM	1	0	17.47	17.94	17.96			
20	84QAM	1	49	17.88	17.94	17.95			
20	84QAM	1	99	17.80	17.92	17.62			
20	84QAM	50	0	17.58	17.86	17.83			
20	84QAM	50	24	17.70	17.80	17.74			
20	84QAM	50	50	17.56	17.82	17.68			
20	84QAM	100	0	17.64	17.74	17.84			
Channel									
Frequency (MHz)									
15	QPSK	1	0	17.69	18.00	18.01	19	0	
15	QPSK	1	37	17.83	17.95	17.96			
15	QPSK	1	74	17.66	17.94	17.85			
15	QPSK	36	0	17.74	18.03	17.95			
15	QPSK	36	20	17.67	18.01	18.02			
15	QPSK	36	39	17.80	18.02	17.93			
15	QPSK	75	0	17.66	17.94	17.96			
15	16QAM	1	0	17.38	18.02	17.84			
15	16QAM	1	37	17.32	17.70	17.94			
15	16QAM	1	74	17.30	17.58	17.45			
15	16QAM	36	0	17.48	17.83	17.78			
15	16QAM	36	20	17.43	17.86	17.76			
15	16QAM	36	39	17.51	17.92	17.85			
15	16QAM	75	0	17.52	17.77	17.89			
15	84QAM	1	0	17.63	17.92	17.91			
15	84QAM	1	37	18.00	17.88	17.90			
15	84QAM	1	74	17.63	17.89	17.88			
15	84QAM	36	0	17.60	17.94	17.89			
15	84QAM	36	20	17.53	17.87	17.88			
15	84QAM	36	39	17.51	17.86	17.83			
15	84QAM	75	0	17.38	17.82	17.78			
Channel									
Frequency (MHz)									
10	QPSK	1	0	17.36	17.77	17.64	19	0	
10	QPSK	1	25	17.81	18.01	17.94			
10	QPSK	1	49	17.39	17.71	17.54			
10	QPSK	25	0	17.62	17.94	18.00			
10	QPSK	25	12	17.69	17.94	17.93			
10	QPSK	25	25	17.66	17.99	17.91			
10	QPSK	50	0	17.74	17.94	17.98			
10	16QAM	1	0	17.33	17.66	17.52			
10	16QAM	1	25	17.47	17.86	17.76			
10	16QAM	1	49	17.27	17.67	17.43			
10	16QAM	25	0	17.49	18.02	17.83			
10	16QAM	25	12	17.43	17.99	17.95			
10	16QAM	25	25	17.40	17.91	17.74			
10	16QAM	50	0	17.50	17.91	17.79			
10	84QAM	1	0	17.51	17.87	17.84			
10	84QAM	1	25	17.98	17.91	17.78			
10	84QAM	1	49	17.52	17.83	17.68			
10	84QAM	25	0	17.69	17.83	17.78			
10	84QAM	25	12	17.63	17.80	17.66			
10	84QAM	25	25	17.61	17.71	17.50			
10	84QAM	50	0	17.39	18.01	17.83			
Channel									
Frequency (MHz)									
5	QPSK	1	0	17.21	17.55	17.66	19	0	
5	QPSK	1	12	17.69	17.91	17.88			
5	QPSK	1	24	17.48	17.61	17.61			
5	QPSK	12	0	17.69	17.96	17.88			
5	QPSK	12	7	17.71	17.97	17.92			
5	QPSK	12	13	17.67	17.97	17.89			
5	QPSK	25	0	17.61	18.00	17.91			
5	16QAM	1	0	17.22	17.63	17.59			
5	16QAM	1	12	17.27	17.68	17.62			
5	16QAM	1	24	17.15	17.57	17.48			
5	16QAM	12	0	17.25	17.80				



Reduced Power Mode for Hotspot on

GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	128	189	251		128	189	251	
TX Channel	128	189	251	32.00	22.73	22.56	22.27	23.00
Frequency (MHz)	824.2	836.4	848.8	(dBm)	824.2	836.4	848.8	(dBm)
GSM 1 Tx slot	31.73	31.56	31.57	32.00	22.73	22.56	22.27	23.00
GPRS 1 Tx slot	31.68	31.51	31.51	32.00	22.68	22.51	22.51	23.00
GPRS 2 Tx slots	29.56	29.61	29.84	30.50	23.56	23.81	23.84	24.50
GPRS 3 Tx slots	27.28	27.46	27.34	28.50	23.02	23.20	23.08	24.24
GPRS 4 Tx slots	24.95	25.21	25.27	26.50	21.95	22.21	22.27	23.50
EDGE 1 Tx slot	24.32	24.46	24.47	25.50	19.32	19.46	19.47	18.50
EDGE 2 Tx slots	22.37	22.59	22.52	23.50	16.37	16.59	16.52	17.50
EDGE 3 Tx slots	20.12	20.28	20.27	21.50	15.86	16.02	16.01	17.24
EDGE 4 Tx slots	17.88	18.01	17.95	19.50	14.88	15.01	14.95	16.50

GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	512	661	810		512	661	810	
TX Channel	512	661	810	27.00	17.01	17.19	17.52	18.00
Frequency (MHz)	1552.2	1622	1692.3	(dBm)	1552.2	1622	1692.3	(dBm)
GSM 1 Tx slot	28.01	28.19	28.32	27.00	17.01	17.19	17.52	18.00
GPRS 1 Tx slot	25.92	26.12	26.30	27.00	16.92	17.12	17.30	18.00
GPRS 2 Tx slots	24.87	24.90	25.00	26.00	16.87	16.90	19.00	20.00
GPRS 3 Tx slots	22.65	22.74	22.76	24.00	16.39	16.48	16.50	19.14
GPRS 4 Tx slots	20.23	20.42	20.52	22.00	17.23	17.42	17.52	19.00
EDGE 1 Tx slot	21.82	21.81	21.86	23.00	12.81	12.86	14.00	
EDGE 2 Tx slots	20.63	20.67	20.70	22.00	14.63	14.67	14.70	16.00
EDGE 3 Tx slots	18.46	18.48	18.51	20.00	14.20	14.22	14.25	15.14
EDGE 4 Tx slots	16.29	16.31	16.33	18.00	13.29	13.31	13.33	15.00

Band	WCDMA I			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)	
	900	940	958		1312	1413	1513		4132	4182	4233		
TX Channel	900	940	958	1537	1638	1738	4367	4407	4458				
Rx Channel	962	980	998	1537	1638	1738	4367	4407	4458				
Frequency (MHz)	1852.4	1880	1907.6	1712.4	1732.6	1752.6	826.4	836.4	846.8				
3GPP Rel 99	AMR 12.2Kbps	17.61	17.64	17.68	18.50	16.97	17.10	17.09	18.00	22.31	22.28	22.16	23.00
3GPP Rel 99	AMR 12.2Kbps	17.63	17.66	17.69	18.50	16.99	17.13	17.12	18.00	22.35	22.33	22.18	23.00
3GPP Rel 6	HSDPA Subtest-1	16.80	16.91	16.90	17.50	15.96	16.03	16.15	17.00	21.44	21.27	21.17	22.00
3GPP Rel 6	HSDPA Subtest-2	16.78	16.90	16.96	17.50	15.99	16.09	16.18	17.00	21.43	21.31	21.15	22.00
3GPP Rel 6	HSDPA Subtest-3	16.32	16.39	16.44	17.00	15.49	15.57	15.66	16.50	20.83	20.83	20.84	21.50
3GPP Rel 6	HSDPA Subtest-4	16.29	16.37	16.43	17.00	15.46	15.59	15.66	16.50	20.93	20.82	20.65	21.50
3GPP Rel 6	DC-HSDPA Subtest-1	16.83	16.87	16.98	17.50	15.94	16.07	16.05	17.00	21.38	21.04	20.99	22.00
3GPP Rel 6	DC-HSDPA Subtest-2	16.80	16.91	16.96	17.50	15.97	16.04	16.03	17.00	21.38	21.13	21.09	22.00
3GPP Rel 6	DC-HSDPA Subtest-3	16.28	16.33	16.37	17.00	15.47	15.53	15.49	16.50	20.71	20.60	20.54	21.50
3GPP Rel 6	DC-HSDPA Subtest-4	16.22	16.32	16.31	17.00	15.44	15.50	15.47	16.50	20.83	20.74	20.47	21.50
3GPP Rel 6	HSUPA Subtest-1	16.65	16.80	16.79	17.00	16.07	16.13	16.25	16.50	21.35	21.19	21.17	21.50
3GPP Rel 6	HSUPA Subtest-2	14.64	14.74	14.82	15.00	14.06	14.06	14.25	14.50	19.30	19.26	19.08	19.50
3GPP Rel 6	HSUPA Subtest-3	15.76	15.77	15.84	16.00	15.06	15.11	15.35	15.50	20.26	20.24	20.07	20.50
3GPP Rel 6	HSUPA Subtest-4	14.73	14.73	14.81	15.00	14.11	14.16	14.31	14.50	19.38	19.24	19.08	19.50
3GPP Rel 6	HSUPA Subtest-5	16.80	16.80	16.90	17.00	16.09	16.19	16.29	16.50	21.30	21.20	21.20	21.50



**Band 2 (1900MHz Band)
Part 24E**

BW (MHz)	Modulation	RB Size	RB Offset	Power Low Ch./ Freq. 1870	Power Middle Ch./ Freq. 1880	Power High Ch./ Freq. 1900	Tune-up limit (dBm)	MPR (dB)
Channel								
Frequency (MHz)								
20	QPSK	1	0	18.49	18.36	18.60	19.5	0
20	QPSK	1	49	18.61	18.59	18.68		
20	QPSK	1	99	18.21	18.26	18.52	19.5	0
20	QPSK	50	0	18.52	18.41	18.52		
20	QPSK	50	24	18.54	18.49	18.56	19.5	0
20	QPSK	50	50	18.48	18.45	18.53		
20	QPSK	100	0	18.51	18.42	18.54	19.5	0
20	16QAM	1	0	17.96	18.09	18.09		
20	16QAM	1	49	18.10	18.09	18.20	19.5	0
20	16QAM	1	99	17.92	17.85	18.12		
20	16QAM	50	0	18.33	18.34	18.33	19.5	0
20	16QAM	50	24	18.38	18.23	18.39		
20	16QAM	50	50	18.33	18.24	18.32	19.5	0
20	16QAM	100	0	18.26	18.29	18.40		
20	64QAM	1	0	18.30	18.27	18.43	19.5	0
20	64QAM	1	49	18.43	18.49	18.43		
20	64QAM	1	99	18.41	18.51	18.47	19.5	0
20	64QAM	50	0	18.44	18.39	18.44		
20	64QAM	50	24	18.46	18.41	18.48	19.5	0
20	64QAM	50	50	18.40	18.37	18.45		
20	64QAM	100	0	18.43	18.34	18.46	Tune-up limit (dBm)	MPR (dB)
Channel								
Frequency (MHz)								
15	QPSK	1	0	18.19	18.35	18.39	19.5	0
15	QPSK	1	37	18.63	18.44	18.50		
15	QPSK	1	74	18.20	18.30	18.39	19.5	0
15	QPSK	36	0	18.46	18.50	18.58		
15	QPSK	36	20	18.46	18.45	18.54	19.5	0
15	QPSK	36	39	18.51	18.42	18.55		
15	QPSK	75	0	18.41	18.51	18.47	19.5	0
15	16QAM	1	0	17.92	18.04	18.10		
15	16QAM	1	37	18.08	18.09	18.15	19.5	0
15	16QAM	1	74	17.89	17.99	18.15		
15	16QAM	36	0	18.23	18.27	18.35	19.5	0
15	16QAM	36	20	18.29	18.25	18.38		
15	16QAM	36	39	18.26	18.28	18.33	19.5	0
15	16QAM	75	0	18.20	18.35	18.34		
15	64QAM	1	0	18.31	18.53	18.43	19.5	0
15	64QAM	1	37	18.46	18.43	18.53		
15	64QAM	1	74	18.32	18.26	18.44	19.5	0
15	64QAM	36	0	18.38	18.42	18.50		
15	64QAM	36	20	18.38	18.37	18.46	19.5	0
15	64QAM	36	39	18.43	18.34	18.47		
15	64QAM	75	0	18.33	18.43	18.49	Tune-up limit (dBm)	MPR (dB)
Channel								
Frequency (MHz)								
10	QPSK	1	0	18.18	18.28	18.28	19.5	0
10	QPSK	1	25	18.54	18.63	18.41		
10	QPSK	1	49	18.26	18.38	18.34	19.5	0
10	QPSK	25	0	18.38	18.48	18.38		
10	QPSK	25	12	18.43	18.48	18.56	19.5	0
10	QPSK	25	25	18.47	18.47	18.62		
10	QPSK	50	0	18.47	18.48	18.53	19.5	0
10	16QAM	1	0	18.06	18.06	18.28		
10	16QAM	1	25	18.15	18.21	18.31	19.5	0
10	16QAM	1	49	18.02	18.16	18.10		
10	16QAM	25	0	18.21	18.21	18.36	19.5	0
10	16QAM	25	12	18.39	18.37	18.33		
10	16QAM	25	25	18.19	18.51	18.42	19.5	0
10	16QAM	50	0	18.20	18.26	18.48		
10	64QAM	1	0	18.21	18.30	18.35	19.5	0
10	64QAM	1	25	18.53	18.38	18.52		
10	64QAM	1	49	18.26	18.20	18.48	19.5	0
10	64QAM	25	0	18.28	18.40	18.50		
10	64QAM	25	12	18.35	18.40	18.47	19.5	0
10	64QAM	25	25	18.39	18.39	18.54		
10	64QAM	50	0	18.39	18.40	18.45	Tune-up limit (dBm)	MPR (dB)
Channel								
Frequency (MHz)								
5	QPSK	1	0	18.04	18.13	18.20	19.5	0
5	QPSK	1	12	18.63	18.53	18.68		
5	QPSK	1	24	18.07	18.40	18.49	19.5	0
5	QPSK	12	0	18.28	18.47	18.66		
5	QPSK	12	7	18.34	18.46	18.43	19.5	0
5	QPSK	12	13	18.35	18.39	18.54		
5	QPSK	25	0	18.35	18.36	18.62	19.5	0
5	16QAM	1	0	17.74	17.94	18.09		
5	16QAM	1	12	17.96	18.06	18.28	19.5	0
5	16QAM	1	24	17.86	17.89	18.24		
5	16QAM	12	0	18.20	18.33	18.45	19.5	0
5	16QAM	12	7	18.19	18.26	18.40		
5	16QAM	12	13	18.19	18.13	18.41	19.5	0
5	16QAM	25	0	18.09	18.30	18.35		
5	64QAM	1	0	18.12	18.15	18.38	19.5	0
5	64QAM	1	12	18.53	18.66	18.51		
5	64QAM	1	24	18.13	18.15	18.38	19.5	0
5	64QAM	12	0	18.20	18.39	18.58		
5	64QAM	12	7	18.26	18.38	18.35	19.5	0
5	64QAM	12	13	18.27	18.31	18.56		
5	64QAM	25	0	18.27	18.41	18.54	Tune-up limit (dBm)	MPR (dB)
Channel								
Frequency (MHz)								
3	QPSK	1	0	18.20	18.23	18.42	19.5	0
3	QPSK	1	8	18.34	18.42	18.57		
3	QPSK	1	14	18.11	18.50	18.41	19.5	0
3	QPSK	8	0	18.34	18.52	18.57		
3	QPSK	8	7	18.35	18.49	18.62	19.5	0
3	QPSK	15	0	18.36	18.43	18.58		
3	16QAM	1	0	17.88	18.01	18.26	19.5	0
3	16QAM	1	8	17.87	17.91	18.24		
3	16QAM	1	14	17.83	18.00	18.15	19.5	0
3	16QAM	8	0	18.29	18.16	18.44		
3	16QAM	8	4	18.22	18.30	18.43	19.5	0
3	16QAM	8	7	18.29	18.43	18.48		
3	16QAM	15	0	18.23	18.08	18.42	19.5	0
3	64QAM	1	0	18.16	18.30	18.52		
3	64QAM	1	8	18.02	18.22	18.41	19.5	0
3	64QAM	1	14	18.16	18.30	18.51		
3	64QAM	8	0	18.32	18.47	18.33	19.5	0
3	64QAM	8	4	18.26	18.44	18.59		
3	64QAM	8	7	18.27	18.41	18.54	19.5	0
3	64QAM	15	0	18.28	18.35	18.50		
Channel								
Frequency (MHz)								
1.4	QPSK	1	0	18.21	18.36	18.51	19.5	0
1.4	QPSK	1	3	18.21	18.47	18.64		
1.4	QPSK	3	0	18.45	18.38	18.38	19.5	0
1.4	QPSK	3	1	18.57	18.33	18.43		
1.4	QPSK	3	3	18.47	18.40	18.50	19.5	0
1.4	QPSK	6	0	18.36	18.40	18.41		
1.4	16QAM	1	0	18.27	17.93	18.10	19.5	0
1.4	16QAM	1	3	18.38	18.65	18.36		
1.4	16QAM	1	5	18.31	18.45	18.11	19.5	0
1.4	16QAM	3	0	18.27	18.34	18.62		
1.4	16QAM	3	1	18.22	18.30	18.59	19.5	0
1.4	16QAM	3	1	18.34	18.26	18.44		
1.4	16QAM	6	0	18.28	18.20	18.23	19.5	0
1.4	16QAM	1	0	18.50	18.52	18.41		
1.4	64QAM	1	3	18.24	18.31	18.33	19.5	0
1.4	64QAM	1	5	18.16	18.59	18.43		
1.4	64QAM	3	0	18.28	18.16	18.51	19.5	0
1.4	64QAM	3	1	18.34	18.26	18.39		
1.4	64QAM	3	3	18.28	18.21	18.51	19.5	0
1.4	64QAM	6	0	18.20	18.13	18.43		

**Band 4 (AWS Band)
Part 27L (only on channel required)**

BW (MHz)	Modulation	RB Size	RB Offset	Power Low Ch./ Freq. 2000	Power Middle Ch./ Freq. 2010	Power High Ch./ Freq. 2030	Tune-up limit (dBm)	MPR (dB)
Channel								
Frequency (MHz)								
20	QPSK	1	0	16.42	16.93	16.63	17.5	0
20	QPSK	1	49	16.47	16.90	16.69		
20	QPSK	1	99	16.44	16.52	16.47	17.5	0
20	QPSK	50	0	16.38	16.61	16.38		
20	QPSK	50	24	16.45	16.82	16.60	17.5	0
20	QPSK	50	50	16.42	16.64	16.51		
20	QPSK	100	0	16.51	16.69	16.53	17.5	0
20	16QAM	1	0	15.92	16.40	16.34		
20	16QAM	1	49	16.02	16.26	16.30	17.5	0
20	16QAM	1	99	16.08	16.08	16.15		
20	16QAM	50	0	16.27	16.57	16.50	17.5	0
20	16QAM	50	24	16.29	16.56	16.44		
20	16QAM	50	50	16.31	16.49	16.34	17.5	0
20	16QAM	100	0	16.32	16.43	16.54		
20	64QAM	1	0					



Band 7 (2600MHz Band) Part 27									
BW (MHz)	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)	
Channel				2510	2535	2560			
Frequency (MHz)				2510	2535	2560			
20	QPSK	1	0	15.12	14.88	15.11	16	0	
20	QPSK	1	49	15.51	15.54	15.31			
20	QPSK	1	99	15.11	15.00	14.97			
20	QPSK	50	0	15.15	15.23	15.18			
20	QPSK	50	24	15.49	15.50	15.16			
20	QPSK	50	50	15.12	15.22	15.12			
20	QPSK	100	0	15.16	15.23	15.19			
20	16QAM	1	0	14.69	14.65	14.75			
20	16QAM	1	49	14.75	14.81	14.74			
20	16QAM	1	99	14.35	14.71	14.64			
20	16QAM	50	0	15.12	15.07	15.19			
20	16QAM	50	24	15.09	15.11	15.02			
20	16QAM	50	50	15.01	15.09	15.10			
20	16QAM	100	0	15.06	15.12	15.08			
20	84QAM	1	0	15.05	15.01	15.17			
20	84QAM	1	49	14.85	14.88	15.00			
20	84QAM	1	99	15.29	15.02	15.07			
20	84QAM	50	0	14.99	14.97	15.12			
20	84QAM	50	24	15.06	15.22	15.02			
20	84QAM	50	50	14.99	15.11	15.04			
20	84QAM	100	0	15.05	15.25	15.12			
Channel				20825	21100	21375			
Frequency (MHz)				20825	21100	21375			
15	QPSK	1	0	15.19	14.99	15.24	16	0	
15	QPSK	1	37	15.31	15.32	15.24			
15	QPSK	1	74	15.15	15.09	15.04			
15	QPSK	36	0	15.22	15.31	15.21			
15	QPSK	36	20	15.23	15.25	15.25			
15	QPSK	36	39	15.22	15.29	15.24			
15	QPSK	75	0	15.21	15.30	15.18			
15	16QAM	1	0	14.75	14.67	14.76			
15	16QAM	1	37	14.77	15.22	15.05			
15	16QAM	1	74	14.69	14.75	14.70			
15	16QAM	36	0	14.97	15.09	14.98			
15	16QAM	36	20	15.04	15.10	15.02			
15	16QAM	36	39	15.13	15.06	15.03			
15	16QAM	75	0	15.10	15.08	15.08			
15	84QAM	1	0	15.18	15.01	15.09			
15	84QAM	1	37	14.85	14.86	15.00			
15	84QAM	1	74	15.00	15.06	15.03			
15	84QAM	36	0	15.21	15.20	15.14			
15	84QAM	36	20	15.25	15.32	15.15			
15	84QAM	36	39	15.22	15.21	15.19			
15	84QAM	75	0	14.98	15.06	15.31			
Channel				20800	21100	21400			
Frequency (MHz)				20800	21100	21400			
10	QPSK	1	0	14.81	14.84	14.82	16	0	
10	QPSK	1	25	15.32	15.31	15.25			
10	QPSK	1	49	14.85	15.18	14.96			
10	QPSK	25	0	15.19	15.30	15.24			
10	QPSK	25	12	15.19	15.30	15.28			
10	QPSK	25	25	15.19	15.33	15.23			
10	QPSK	50	0	15.17	15.30	15.28			
10	16QAM	1	0	14.74	14.80	14.70			
10	16QAM	1	25	14.85	14.97	14.84			
10	16QAM	1	49	14.78	14.88	14.87			
10	16QAM	25	0	15.25	15.08	15.03			
10	16QAM	25	12	15.18	15.07	15.04			
10	16QAM	25	25	14.96	15.01	15.27			
10	16QAM	50	0	15.13	15.20	15.07			
10	84QAM	1	0	15.04	14.88	14.96			
10	84QAM	1	25	15.00	14.85	14.81			
10	84QAM	1	49	14.98	15.05	15.04			
10	84QAM	25	0	15.21	15.32	15.17			
10	84QAM	25	12	15.18	15.28	15.16			
10	84QAM	25	25	15.16	15.27	15.08			
10	84QAM	50	0	15.01	15.09	14.96			
Channel				20775	21100	21425			
Frequency (MHz)				20775	21100	21425			
5	QPSK	1	0	14.72	14.69	14.76	16	0	
5	QPSK	1	12	15.30	15.31	15.29			
5	QPSK	1	24	14.71	14.83	14.75			
5	QPSK	12	0	15.25	15.29	15.19			
5	QPSK	12	7	15.12	15.26	15.22			
5	QPSK	12	13	15.13	15.31	15.14			
5	QPSK	25	0	15.16	15.29	15.17			
5	16QAM	1	0	14.87	14.82	14.88			
5	16QAM	1	24	14.87	14.66	14.77			
5	16QAM	12	0	15.11	15.14	15.02			
5	16QAM	12	7	15.01	15.14	15.00			
5	16QAM	12	13	15.03	15.11	15.02			
5	16QAM	25	0	15.06	15.29	14.85			
5	84QAM	1	0	15.03	14.89	14.79			
5	84QAM	1	12	14.81	14.95	14.96			
5	84QAM	1	24	14.83	14.94	14.84			
5	84QAM	12	0	15.20	15.16	14.83			
5	84QAM	12	7	15.14	15.02	15.04			
5	84QAM	12	13	15.10	15.16	14.84			
5	84QAM	25	0	15.19	14.87	14.85			

Band 66									
BW (MHz)	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)	
Channel				1720	1745	1770			
Frequency (MHz)				1720	1745	1770			
20	QPSK	1	0	16.50	16.61	16.71	17.5	0	
20	QPSK	1	49	16.55	17.01	16.77			
20	QPSK	1	99	16.52	16.80	16.55			
20	QPSK	50	0	16.47	16.69	16.56			
20	QPSK	50	24	16.53	16.90	16.62			
20	QPSK	50	50	16.50	16.72	16.59			
20	QPSK	100	0	16.59	16.77	16.81			
20	16QAM	1	0	16.00	16.48	16.42			
20	16QAM	1	49	16.10	16.34	16.38			
20	16QAM	1	99	16.16	16.14	16.23			
20	16QAM	50	0	16.35	16.65	16.58			
20	16QAM	50	24	16.37	16.64	16.52			
20	16QAM	50	50	16.39	16.57	16.42			
20	16QAM	100	0	16.40	16.51	16.62			
20	84QAM	1	0	16.22	16.69	16.71			
20	84QAM	1	49	16.63	16.69	16.70			
20	84QAM	1	99	16.55	16.67	16.37			
20	84QAM	50	0	16.33	16.61	16.58			
20	84QAM	50	24	16.45	16.55	16.49			
20	84QAM	50	50	16.31	16.57	16.43			
20	84QAM	100	0	16.39	16.49	16.59			
Channel				132047	132322	132597			
Frequency (MHz)				132047	132322	132597			
15	QPSK	1	0	16.44	16.75	16.76	17.5	0	
15	QPSK	1	37	16.58	16.70	16.71			
15	QPSK	1	74	16.41	16.69	16.60			
15	QPSK	36	0	16.49	16.76	16.70			
15	QPSK	36	20	16.42	16.76	16.77			
15	QPSK	36	39	16.55	16.77	16.68			
15	QPSK	75	0	16.41	16.69	16.71			
15	16QAM	1	0	16.14	16.67	16.39			
15	16QAM	1	37	16.07	16.45	16.69			
15	16QAM	1	74	16.05	16.33	16.20			
15	16QAM	36	0	16.23	16.58	16.53			
15	16QAM	36	20	16.18	16.61	16.51			
15	16QAM	36	39	16.26	16.67	16.40			
15	16QAM	75	0	16.27	16.52	16.64			
15	84QAM	1	0	16.38	16.67	16.66			
15	84QAM	1	37	16.75	16.63	16.65			
15	84QAM	1	74	16.38	16.64	16.43			
15	84QAM	36	0	16.35	16.69	16.64			
15	84QAM	36	20	16.28	16.62	16.73			
15	84QAM	36	39	16.26	16.61	16.68			
15	84QAM	75	0	16.14	16.57	16.53			
Channel				132022	132322	132622			
Frequency (MHz)				132022	132322	132622			
10	QPSK	1	0	16.11	16.52	16.			



Full Power

2.4GHz WLAN				Ant 1		
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	
802.11b 1Mbps	1	2412	18.40	19.50	99.31	
	6	2437	18.50	19.50		
	11	2462	18.50	19.50		
802.11g 6Mbps	1	2412	17.80	19.00	98.28	
	6	2437	17.60	19.00		
	11	2462	17.50	19.00		
802.11n-HT20 MCS0	1	2412	17.80	19.00	98.16	
	6	2437	17.60	19.00		
	11	2462	17.50	19.00		

5.2GHz WLAN				Ant 1		
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	
802.11a 6Mbps	36	5180	17.57	19.00	98.28	
	40	5200	17.34	19.00		
	44	5220	17.43	19.00		
	48	5240	17.29	19.00		
802.11n-HT20 MCS0	36	5180	17.33	19.00	98.16	
	40	5200	17.16	19.00		
	44	5220	17.21	19.00		
	48	5240	17.52	19.00		
802.11n-HT40 MCS0	38	5190	17.28	19.00	96.32	
	46	5230	17.40	19.00		
802.11ac-VHT20 MCS0	36	5180	17.31	19.00	98.16	
	40	5200	17.12	19.00		
	44	5220	17.20	19.00		
	48	5240	17.50	19.00		
802.11ac-VHT40 MCS0	38	5190	17.25	19.00	96.34	
	46	5230	17.38	19.00		
802.11ac-VHT80 MCS0	42	5210	16.16	18.00	92.79	

5.3GHz WLAN				Ant 1		
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	
802.11a 6Mbps	52	5280	17.66	19.00	98.28	
	56	5280	17.69	19.00		
	60	5300	17.74	19.00		
	64	5320	17.48	19.00		
802.11n-HT20 MCS0	52	5260	17.44	19.00	98.16	
	56	5280	17.51	19.00		
	60	5300	17.59	19.00		
	64	5320	17.33	19.00		
802.11n-HT40 MCS0	54	5270	17.24	19.00	96.32	
	62	5310	15.72	17.00		
802.11ac-VHT20 MCS0	52	5260	17.42	19.00	98.16	
	56	5280	17.48	19.00		
	60	5300	17.57	19.00		
	64	5320	17.31	19.00		
802.11ac-VHT40 MCS0	54	5270	17.22	19.00	96.34	
	62	5310	15.49	17.00		
802.11ac-VHT80 MCS0	58	5290	15.30	17.00	92.79	

5.5GHz WLAN				Ant 1		
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	
802.11a 6Mbps	100	5500	17.44	19.00	98.28	
	116	5580	17.56	19.00		
	124	5620	17.43	19.00		
	132	5660	17.29	19.00		
	140	5700	17.27	19.00		
	144	5720	17.56	19.00		
802.11n-HT20 MCS0	100	5500	17.29	19.00	98.16	
	116	5580	17.42	19.00		
	124	5620	17.26	19.00		
	132	5660	17.59	19.00		
	140	5700	17.50	19.00		
	144	5720	17.39	19.00		
802.11n-HT40 MCS0	102	5510	14.30	16.00	96.32	
	110	5550	17.25	19.00		
	126	5630	17.54	19.00		
	134	5670	17.21	19.00		
	142	5710	17.34	19.00		
	100	5500	17.28	19.00		98.16
116	5580	17.40	19.00			
124	5620	17.23	19.00			
132	5660	17.58	19.00			
140	5700	17.48	19.00			
144	5720	17.37	19.00			
802.11ac-VHT40 MCS0	102	5510	14.18	16.00	96.34	
	110	5550	17.21	19.00		
	126	5630	17.53	19.00		
	134	5670	17.18	19.00		
802.11ac-VHT80 MCS0	106	5530	13.10	15.00	92.79	
	122	5610	17.54	19.00		
	142	5710	17.30	19.00		
	138	5690	17.49	19.00		

5.8GHz WLAN				Ant 1		
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	
802.11a 6Mbps	149	5745	12.23	13.50	98.28	
	157	5785	12.40	13.50		
	165	5825	12.63	13.50		
802.11n-HT20 MCS0	149	5745	12.07	13.50	98.16	
	157	5785	12.24	13.50		
	165	5825	12.46	13.50		
802.11n-HT40 MCS0	151	5755	12.12	13.50	96.32	
	159	5795	12.18	13.50		
802.11ac-VHT20 MCS0	149	5745	12.00	13.50	98.16	
	157	5785	12.22	13.50		
	165	5825	12.43	13.50		
802.11ac-VHT40 MCS0	151	5755	12.09	13.50	96.34	
	159	5795	12.16	13.50		
802.11ac-VHT80 MCS0	155	5775	12.25	13.50	92.79	



Reduced Power Mode for Receiver on

5.5GHz WLAN				Ant 1		
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	
5.5GHz WLAN	802.11a 6Mbps	100	5500	15.44	17.00	98.28
		116	5580	15.56	17.00	
		124	5620	15.43	17.00	
		132	5660	15.29	17.00	
		140	5700	15.27	17.00	
		144	5720	15.56	17.00	
	802.11n-HT20 MCS0	100	5500	15.29	17.00	98.16
		116	5580	15.42	17.00	
		124	5620	15.26	17.00	
		132	5660	15.59	17.00	
		140	5700	15.50	17.00	
		144	5720	15.39	17.00	
	802.11n-HT40 MCS0	102	5510	12.30	14.00	98.32
		110	5550	15.25	17.00	
		126	5630	15.54	17.00	
		134	5670	15.21	17.00	
		142	5710	15.34	17.00	
802.11ac- VHT20 MCS0	100	5500	15.28	17.00	98.16	
	116	5580	15.40	17.00		
	124	5620	15.23	17.00		
	132	5660	15.58	17.00		
	140	5700	15.48	17.00		
	144	5720	15.37	17.00		
802.11ac- VHT40 MCS0	102	5510	12.18	14.00	98.34	
	110	5550	15.21	17.00		
	126	5630	15.53	17.00		
	134	5670	15.18	17.00		
	142	5710	15.30	17.00		
802.11ac- VHT80 MCS0	106	5530	11.10	13.00	92.79	
	122	5610	15.54	17.00		
	138	5690	15.49	17.00		



Reduced Power Mode for Sensor on

5.5GHz WLAN				Ant 1		
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	
5.5GHz WLAN	802.11a 6Mbps	100	5500	13.44	15.00	98.28
		116	5580	13.56	15.00	
		124	5620	13.43	15.00	
		132	5660	13.29	15.00	
		140	5700	13.27	15.00	
		144	5720	13.56	15.00	
	802.11n-HT20 MCS0	100	5500	13.29	15.00	98.16
		116	5580	13.42	15.00	
		124	5620	13.26	15.00	
		132	5660	13.59	15.00	
		140	5700	13.50	15.00	
		144	5720	13.39	15.00	
	802.11n-HT40 MCS0	102	5510	10.40	12.00	96.32
		110	5550	13.25	15.00	
		126	5630	13.54	15.00	
		134	5670	13.21	15.00	
		142	5710	13.34	15.00	
	802.11ac- VHT20 MCS0	100	5500	13.28	15.00	98.16
		116	5580	13.40	15.00	
		124	5620	13.23	15.00	
132		5660	13.58	15.00		
140		5700	13.48	15.00		
144		5720	13.37	15.00		
802.11ac- VHT40 MCS0	102	5510	10.28	12.00	98.34	
	110	5550	13.21	15.00		
	126	5630	13.53	15.00		
	134	5670	13.18	15.00		
	142	5710	13.30	15.00		
802.11ac- VHT80 MCS0	106	5530	9.20	11.00	92.79	
	122	5610	13.54	15.00		
	138	5690	13.49	15.00		



BT EDR

Mode	Channel	Frequency (MHz)	Average power (dBm)									Tune-up Limit
			Packet Type									
			DH1	DH3	DH5	2DH1	2DH3	2DH5	3DH1	3DH3	3DH5	
Bluetooth	CH 0	2402	10.60	10.50	10.50	8.00	7.90	7.90	8.00	7.90	7.90	12
	CH 39	2441	11.30	11.20	11.20	8.90	8.80	8.80	8.90	8.80	8.80	
	CH 78	2480	10.60	10.50	10.50	8.00	7.90	7.90	8.00	7.90	7.90	

BT LE

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
LE	CH 00	2402	5.00
	CH 19	2440	6.10
	CH 39	2480	5.80
Tune-up Limit			7.5