

## DASY5 Validation Report for Head TSL

Date: 10.08.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1221**

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 4.53$  S/m;  $\epsilon_r = 35.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5300$  MHz;  $\sigma = 4.63$  S/m;  $\epsilon_r = 35.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5500$  MHz;  $\sigma = 4.82$  S/m;  $\epsilon_r = 35.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5600$  MHz;  $\sigma = 4.93$  S/m;  $\epsilon_r = 34.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5800$  MHz;  $\sigma = 5.14$  S/m;  $\epsilon_r = 34.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51); Calibrated: 30.12.2014, ConvF(5.21, 5.21, 5.21); Calibrated: 30.12.2014, ConvF(5.12, 5.12, 5.12); Calibrated: 30.12.2014, ConvF(4.92, 4.92, 4.92); Calibrated: 30.12.2014, ConvF(4.9, 4.9, 4.9); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 66.36 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 29.7 W/kg

**SAR(1 g) = 8.1 W/kg; SAR(10 g) = 2.32 W/kg**

Maximum value of SAR (measured) = 18.7 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 66.97 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 32.0 W/kg

**SAR(1 g) = 8.43 W/kg; SAR(10 g) = 2.42 W/kg**

Maximum value of SAR (measured) = 19.7 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.68 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 33.4 W/kg

**SAR(1 g) = 8.4 W/kg; SAR(10 g) = 2.4 W/kg**

Maximum value of SAR (measured) = 20.0 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.45 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 33.3 W/kg

**SAR(1 g) = 8.35 W/kg; SAR(10 g) = 2.38 W/kg**

Maximum value of SAR (measured) = 19.9 W/kg

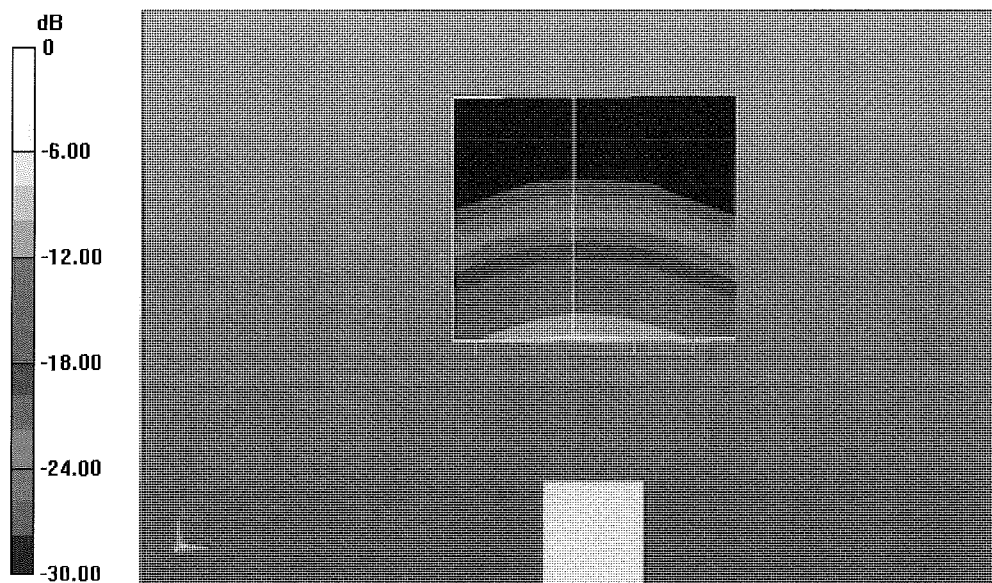
**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.09 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 33.2 W/kg

**SAR(1 g) = 8.03 W/kg; SAR(10 g) = 2.29 W/kg**

Maximum value of SAR (measured) = 19.4 W/kg



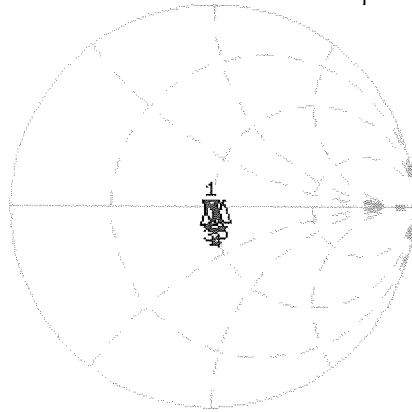
0 dB = 18.7 W/kg = 12.72 dBW/kg

# Impedance Measurement Plot for Head TSL

10 Aug 2015 14:47:18

CH1 S11 1 U FS 1: 47.934  $\Omega$  -8.0410  $\Omega$  3.8063 pF 5 200.000 000 MHz

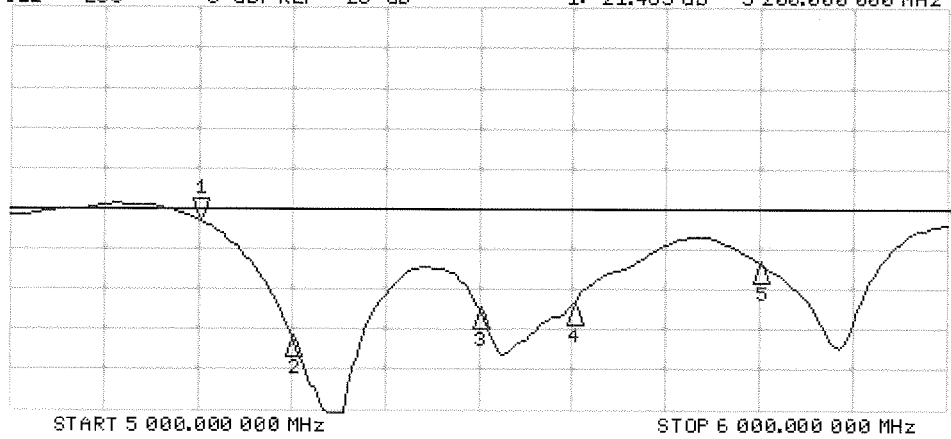
\*  
De1  
Cor  
Avg  
16  
H1d



CH1 Markers  
2: 50.922  $\Omega$   
-1.3242  $\Omega$   
5.30000 GHz  
3: 47.701  $\Omega$   
0.2051  $\Omega$   
5.50000 GHz  
4: 51.762  $\Omega$   
-1.9160  $\Omega$   
5.60000 GHz  
5: 54.166  $\Omega$   
2.3223  $\Omega$   
5.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -21.463 dB 5 200.000 000 MHz

De1  
Cor  
Avg  
16  
H1d



CH2 Markers  
2: -35.924 dB  
5.30000 GHz  
3: -32.523 dB  
5.50000 GHz  
4: -31.841 dB  
5.60000 GHz  
5: -26.788 dB  
5.80000 GHz

## DASY5 Validation Report for Body TSL

Date: 11.08.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1221**

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 5.47$  S/m;  $\epsilon_r = 47.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5300$  MHz;  $\sigma = 5.6$  S/m;  $\epsilon_r = 46.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5500$  MHz;  $\sigma = 5.86$  S/m;  $\epsilon_r = 46.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5600$  MHz;  $\sigma = 6$  S/m;  $\epsilon_r = 46.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5800$  MHz;  $\sigma = 6.28$  S/m;  $\epsilon_r = 46$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.95, 4.95, 4.95); Calibrated: 30.12.2014, ConvF(4.78, 4.78, 4.78); Calibrated: 30.12.2014, ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2014, ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2014, ConvF(4.32, 4.32, 4.32); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

### **Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:**

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.78 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 29.2 W/kg

**SAR(1 g) = 7.53 W/kg; SAR(10 g) = 2.11 W/kg**

Maximum value of SAR (measured) = 17.6 W/kg

### **Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:**

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.89 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 30.4 W/kg

**SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.15 W/kg**

Maximum value of SAR (measured) = 17.9 W/kg

### **Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:**

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 59.35 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 34.4 W/kg

**SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.27 W/kg**

Maximum value of SAR (measured) = 19.6 W/kg

**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 59.04 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 35.3 W/kg

**SAR(1 g) = 8.12 W/kg; SAR(10 g) = 2.26 W/kg**

Maximum value of SAR (measured) = 19.7 W/kg

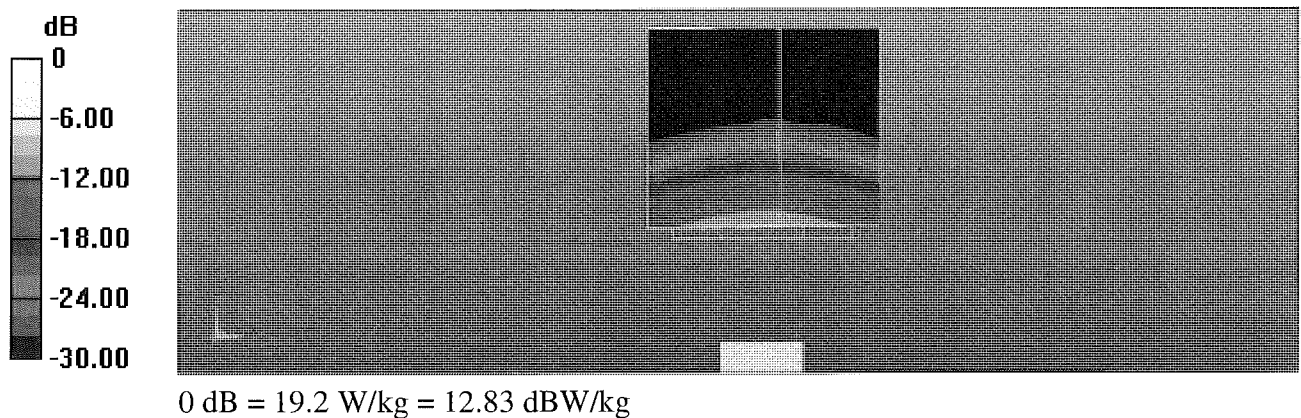
**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 56.74 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 35.5 W/kg

**SAR(1 g) = 7.83 W/kg; SAR(10 g) = 2.18 W/kg**

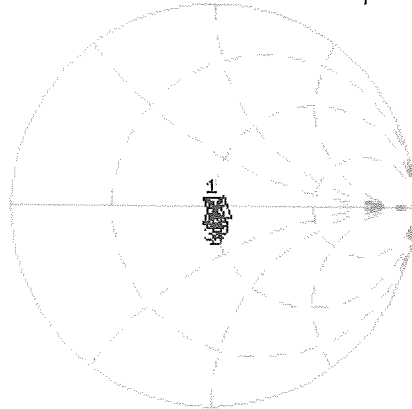
Maximum value of SAR (measured) = 19.2 W/kg



# Impedance Measurement Plot for Body TSL

CH1 S11 1 U FS 11 Aug 2015 15:23:39  
 1: 48.127  $\Omega$  -7.0684  $\Omega$  4.3301 pF 5 200.000 000 MHz

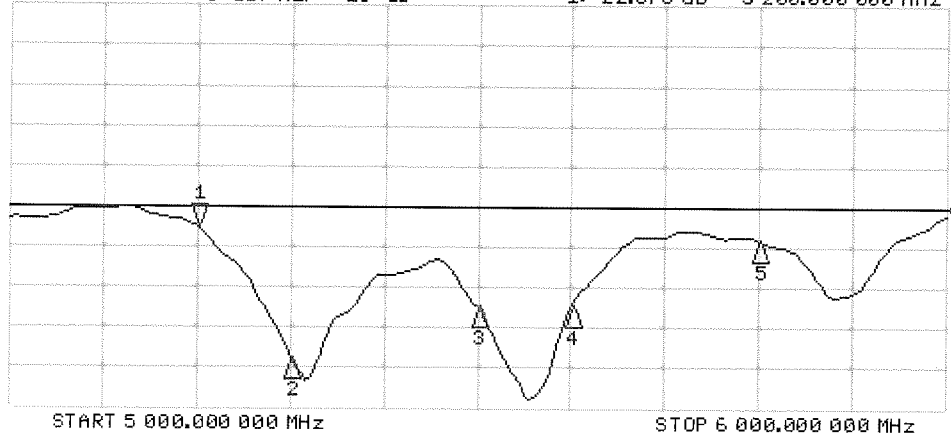
\*  
 Del  
 Cor  
 Avg  
 16  
 Hid



CH1 Markers  
 2: 50.738  $\Omega$   
 -854.56 m $\Omega$   
 5.30000 GHz  
 3: 48.025  $\Omega$   
 1.1934  $\Omega$   
 5.50000 GHz  
 4: 52.338  $\Omega$   
 -705.08 m $\Omega$   
 5.60000 GHz  
 5: 54.770  $\Omega$   
 4.3906  $\Omega$   
 5.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -22.575 dB 5 200.000 000 MHz

Cor  
 Avg  
 16  
 Hid



CH2 Markers  
 2: -38.998 dB  
 5.30000 GHz  
 3: -32.557 dB  
 5.50000 GHz  
 4: -32.437 dB  
 5.60000 GHz  
 5: -24.176 dB  
 5.80000 GHz



## Dipole Internal Calibration Record

NO. : SAR-D5GHz-17-1

Asset No. :	E-529	Model No. :	D5GHzV2	Cal. Date :	2017/7/4
Equipment :	Dipole	Serial No. :	1221	Next Cal. Date :	2017/12/4
Environmental condition :		Temp :	22.5 °C	R.H. :	55 %

### Standard List

1	IEEE Std 1528-2013	IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate(SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques,
2	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
3	KDB865664	SAR Measurement Requirements for 100 MHz to 6 GHz

### Equipment Information

Equipment :	Manufacturer :	Model No. :	Serial No. :	Cal.Organization :	Certificate	Cal. Date :
ENA	Keysight	E5071C	MY46524658	ETC	15-12-BAC-204-041	2016/12/6

### Originak Cal. Report

Equipment :	Manufacturer :	Model No. :	Serial No. :	Cal.Organization :	Certificate	Cal. Date :
Dipole	Speag	D5GHzV2	1221	SAS	D5GHzV2-1001-A-15	Aug. 11, 2015

### Calibration Value :

#### For Head Tissue

Frequency	Item	Originak Cal. Result	Verified on dd. Mm, yyyy	Deviation	Result	Annex
5.2G	Impedance, transformed to feed point( $\Omega$ )	47.934	48.381	-0.447	Pass	a
	Return Loss(dB)	-21.463	-21.76	3.4%	Pass	a
	SAR Value for 1g(mW/g)	80.7		100.0%	Pass	b
	SAR Value for 10g(mW/g)	23.1		100.0%	Pass	b
5.3G	Impedance, transformed to feed point	50.922	51.802	-0.88	Pass	a
	Return Loss(dB)	-35.924	-34.329	-20.2%	Pass	a
	SAR Value for 1g(mW/g)	84		100.0%	Pass	b
	SAR Value for 10g(mW/g)	24.1		100.0%	Pass	b
5.6G	Impedance, transformed to feed point	51.762	49.208	2.554	Pass	a
	Return Loss(dB)	-31.841	-32.741	9.8%	Pass	a
	SAR Value for 1g(mW/g)	83.1		100.0%	Pass	b
	SAR Value for 10g(mW/g)	23.7		100.0%	Pass	b
5.8G	Impedance, transformed to feed point	54.166	50.003	4.163	Pass	a
	Return Loss(dB)	-26.788	-25.936	-10.3%	Pass	a
	SAR Value for 1g(mW/g)	79.9		100.0%	Pass	b
	SAR Value for 10g(mW/g)	22.8		100.0%	Pass	b

#### For Body Tissue

Frequency	Item	Originak Cal. Result	Verified on dd. Mm, yyyy	Deviation	Result	Annex
5.2G	Impedance, transformed to feed point	48.127	51.004	-2.877	Pass	a
	Return Loss(dB)	-22.575	-22.651	0.9%	Pass	a
	SAR Value for 1g(mW/g)	74.7		100.0%	Pass	c
	SAR Value for 10g(mW/g)	20.9		100.0%	Pass	c
5.3G	Impedance, transformed to feed point	50.738	49.751	0.987	Pass	a
	Return Loss(dB)	-38.998	-37.579	-17.7%	Pass	a
	SAR Value for 1g(mW/g)	75.8		100.0%	Pass	c
	SAR Value for 10g(mW/g)	21.3		100.0%	Pass	c
5.6G	Impedance, transformed to feed point	52.338	48.82	3.518	Pass	a
	Return Loss(dB)	-32.437	-31.196	-15.4%	Pass	a
	SAR Value for 1g(mW/g)	80.6		100.0%	Pass	c
	SAR Value for 10g(mW/g)	22.4		100.0%	Pass	c
5.8G	Impedance, transformed to feed point	54.77	52.099	2.671	Pass	a
	Return Loss(dB)	-24.176	-25.2	11.1%	Pass	a
	SAR Value for 1g(mW/g)	77.7		100.0%	Pass	c
	SAR Value for 10g(mW/g)	21.6		100.0%	Pass	c

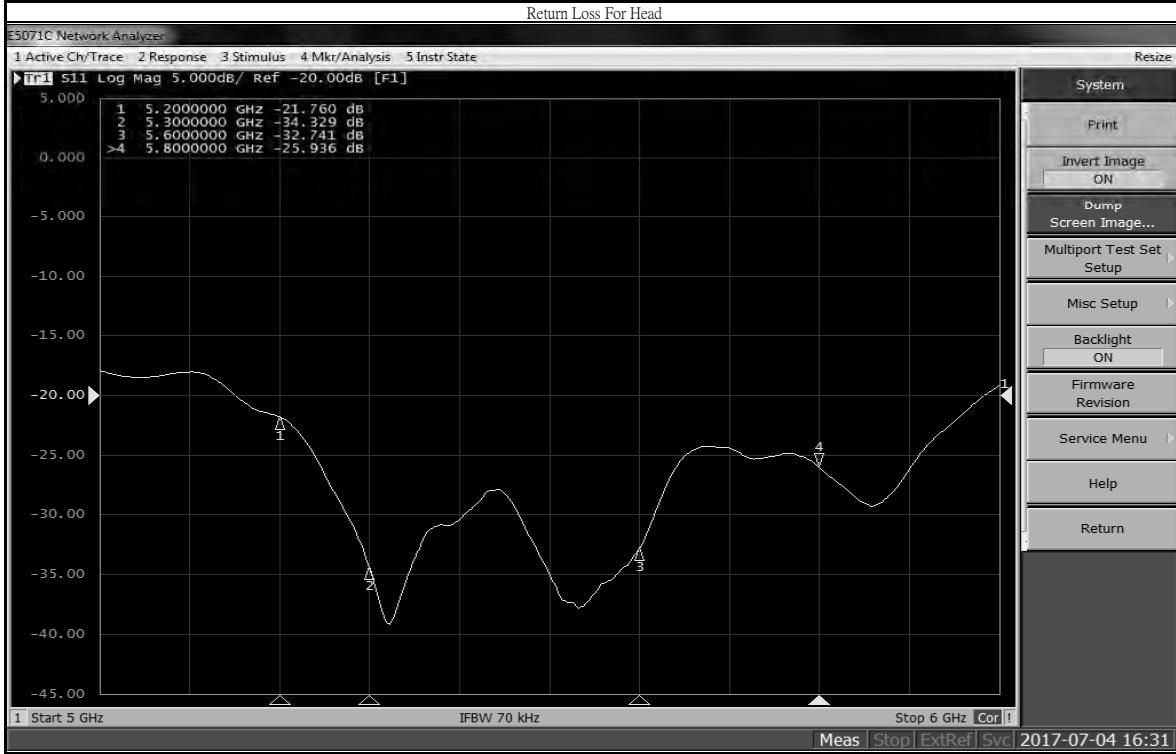
Note : SAR System Uncertainty : % , ( 95% CONFIDENCE LEVEL , Expanded uncertainty K=2 )

From NO. : E\_YYMMDD ; E=Dipole NO. ,YYMMDD=Year/Month/Date.

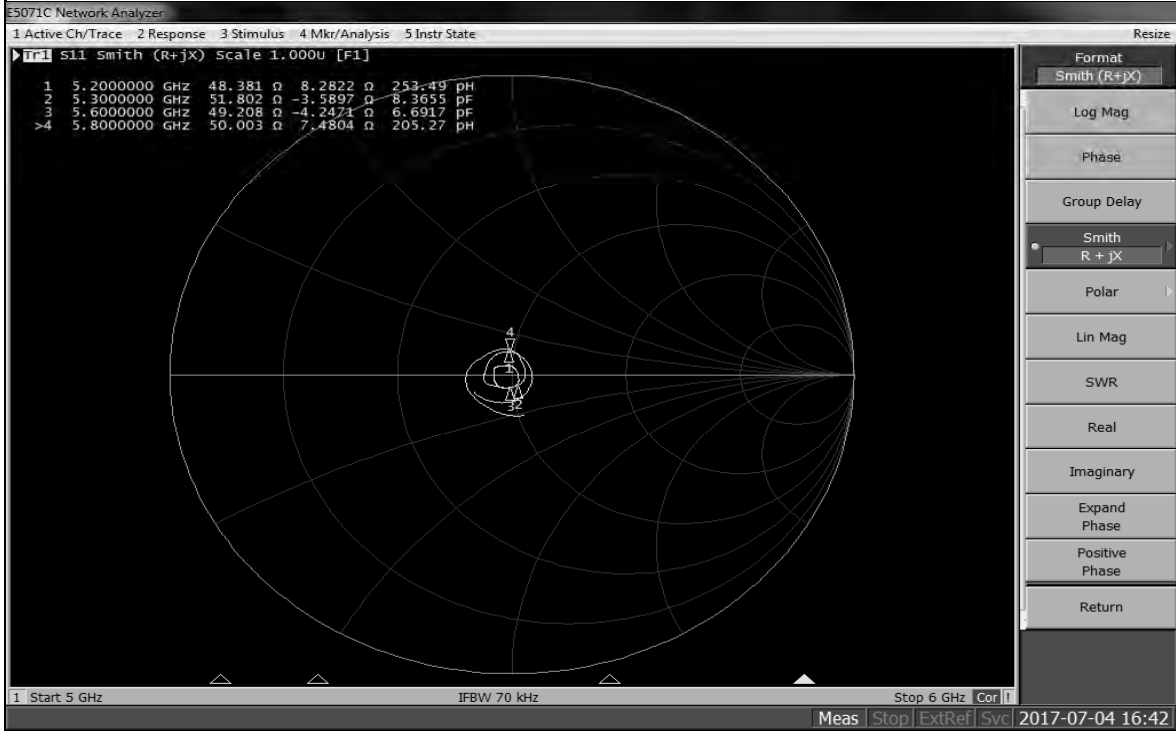
Tester :

Technical Director :

Return Loss For Head

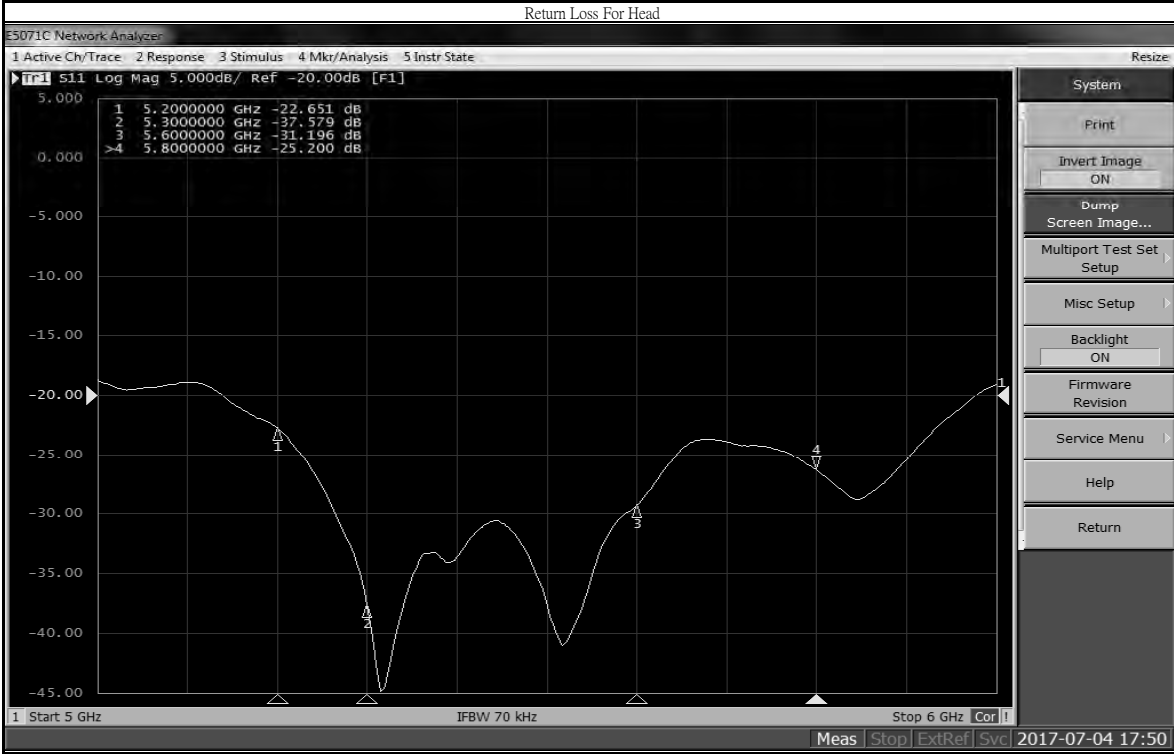


Impedance, transformed to feed point For Head





Return Loss For Head



Impedance, transformed to feed point For Head

