Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	48.6 Ω - 6.8 jΩ
Return Loss	- 23.0 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	49.0 Ω - 4.2 jΩ
Return Loss	- 27.1 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	56.2 Ω - 0.7 jΩ
Return Loss	- 24.6 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	55.9 Ω - 1.7 jΩ
Return Loss	- 24.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 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
Manufactured on	June 06, 2013

DASY5 Validation Report for Head TSL

Date: 24.09.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1160

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.57 S/m; ε_r = 36.4; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 4.68 S/m; ε_r = 36.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.03 S/m; ε_r = 35.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.26 S/m; ε_r = 35.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

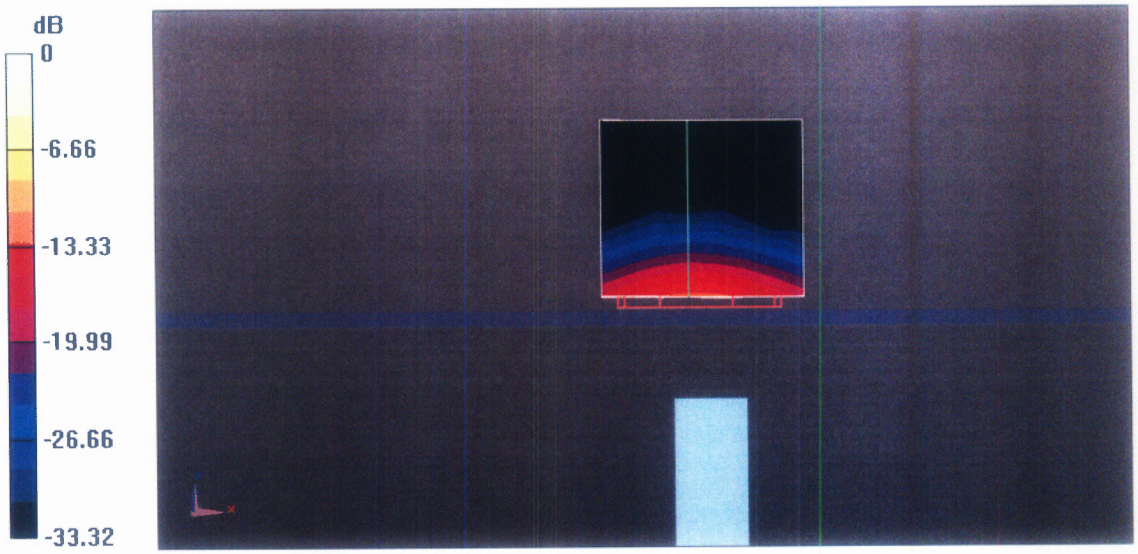
- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51); Calibrated: 30.12.2014, ConvF(5.21, 5.21, 5.21); Calibrated: 30.12.2014, ConvF(4.92, 4.92, 4.92); Calibrated: 30.12.2014, ConvF(4.9, 4.9, 4.9); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- 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 = 64.41 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 29.3 W/kg
SAR(1 g) = 8.06 W/kg; SAR(10 g) = 2.31 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 = 65.31 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 31.1 W/kg
SAR(1 g) = 8.26 W/kg; SAR(10 g) = 2.39 W/kg
Maximum value of SAR (measured) = 19.4 W/kg

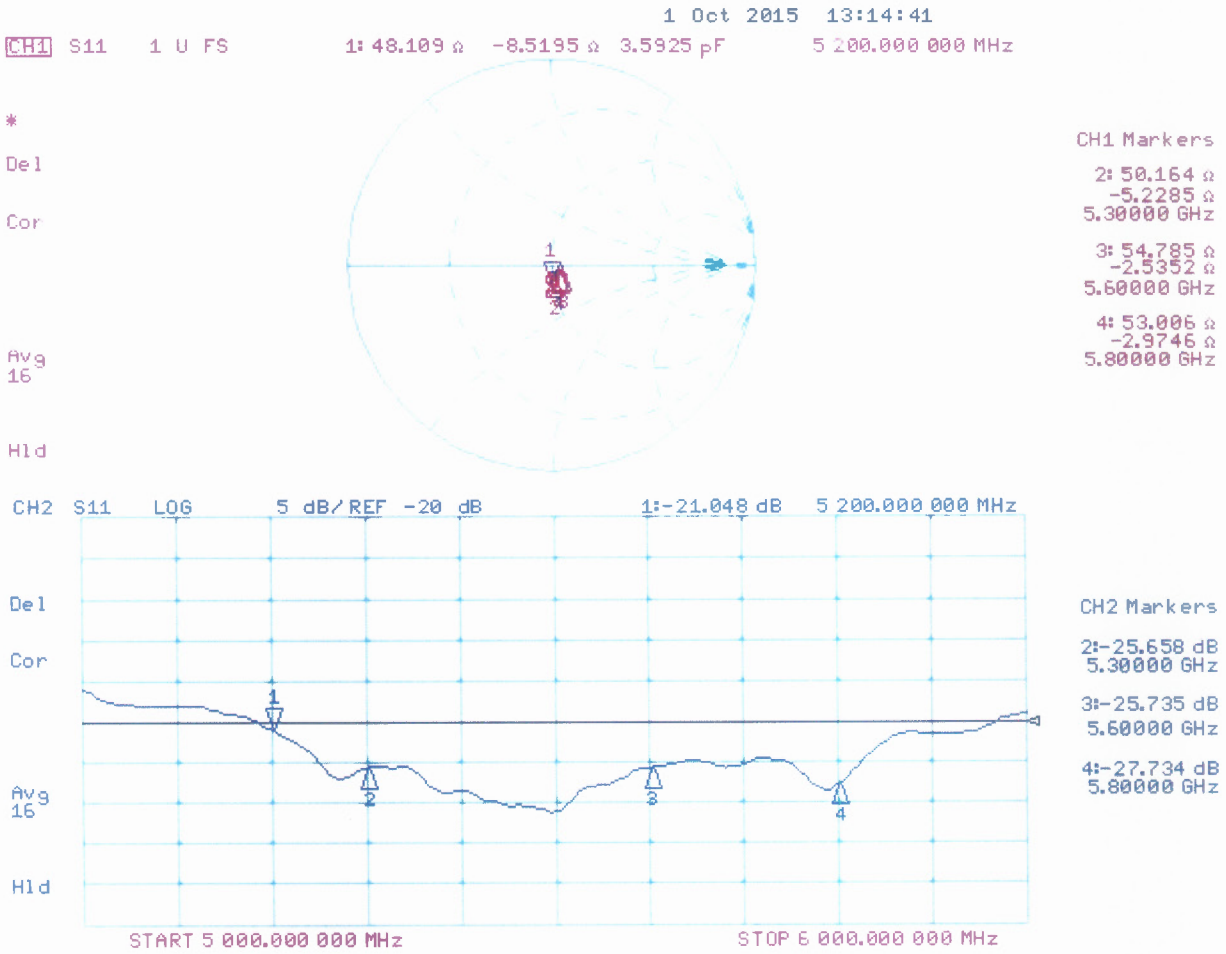
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.34 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 34.7 W/kg
SAR(1 g) = 8.69 W/kg; SAR(10 g) = 2.47 W/kg
Maximum value of SAR (measured) = 21.0 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 = 62.41 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 34.5 W/kg
SAR(1 g) = 8.2 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (measured) = 20.5 W/kg



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 05.10.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1160

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.35 S/m; ε_r = 47.9; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 5.49 S/m; ε_r = 47.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.99 S/m; ε_r = 46.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.27 S/m; ε_r = 46.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

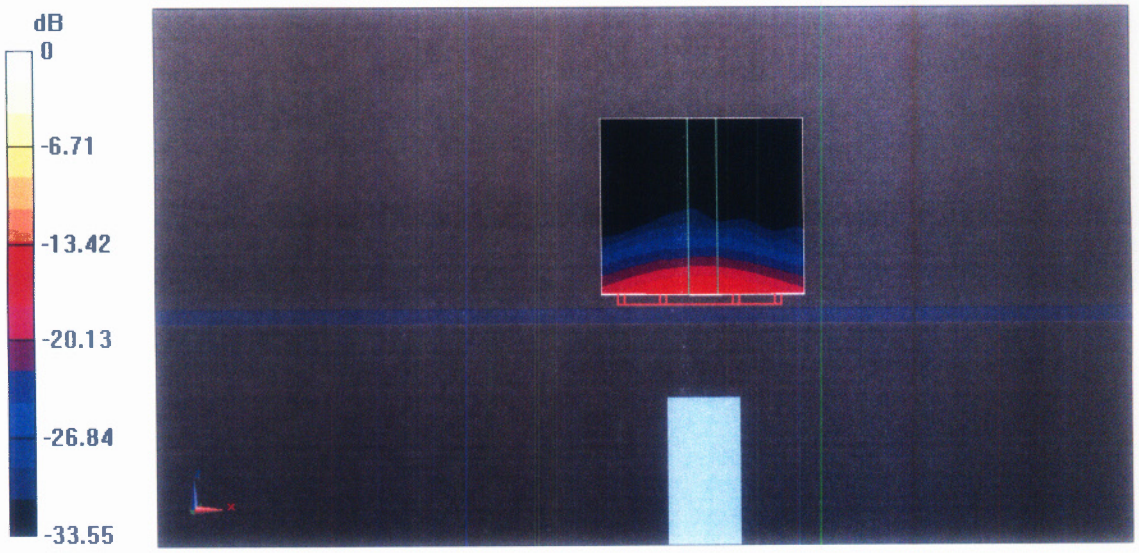
- Probe: EX3DV4 - SN3503; ConvF(4.95, 4.95, 4.95); Calibrated: 30.12.2014, ConvF(4.78, 4.78, 4.78); Calibrated: 30.12.2014; ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2014, ConvF(4.32, 4.32, 4.32); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- 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 = 67.32 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 30.4 W/kg
SAR(1 g) = 7.81 W/kg; SAR(10 g) = 2.18 W/kg
Maximum value of SAR (measured) = 18.2 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 = 67.22 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 31.6 W/kg
SAR(1 g) = 7.88 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 18.8 W/kg

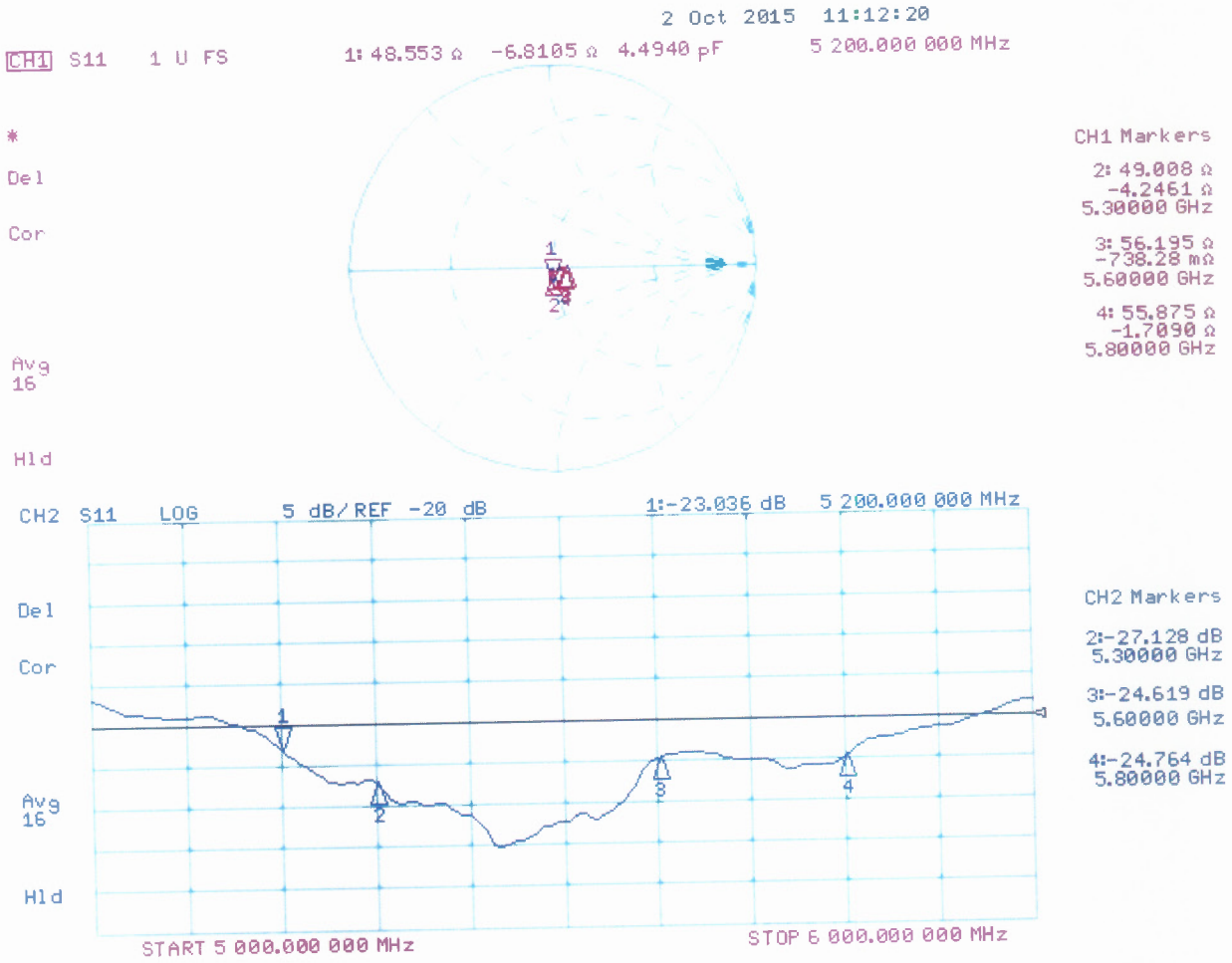
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.36 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 36.6 W/kg
SAR(1 g) = 8.2 W/kg; SAR(10 g) = 2.3 W/kg
Maximum value of SAR (measured) = 20.2 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 = 65.22 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 37.1 W/kg
SAR(1 g) = 7.88 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 19.7 W/kg



0 dB = 18.2 W/kg = 12.60 dBW/kg

Impedance Measurement Plot for Body TSL



Dipole Internal Calibration Record

NO. :

Asset No. :	E-436	Model No. :	D5GHzV2	Cal. Date :	2015年10月5日
Equipment :	ENA Network Analyzer	Serial No. :	1160	Next Cal. Date :	2018年10月5日
Environmental condition :		Temp :	23.8 ℃	R.H. :	59%

Standard List		
1	IEEE Std 1528-2013	IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorpiton Rate(SAR) in the Human Head from Wireless Communication Devices: Measurement Texhniques, June 2013
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 No. :	Cal. Date :
ENA Network Analyzer	Agilent	E5071C	MY46102965	NA	NA	Mar. 26, 2017

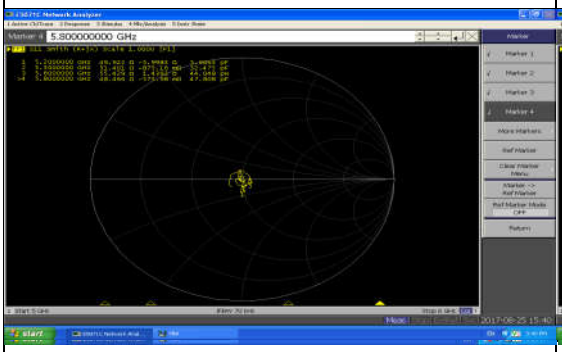
For Head Tissue

Frequency	Item	Originak Cal. Result	Verified on 2017/8/25	Deviation	Result	Annex
5.2G	Impedance, transformed to feed point(Ω)	48.1Ω-8.5jΩ	49.92Ω-6jΩ	<5Ω	Pass	
	Return Loss(dB)	-21	-21.96	-4.6%	Pass	
5.3G	Impedance, transformed to feed point	50.2Ω-5.2jΩ	51.4Ω-0.88jΩ	<5Ω	Pass	
	Return Loss(dB)	-25.7	-26.72	-4.0%	Pass	
5.6G	Impedance, transformed to feed point	54.8Ω-2.5jΩ	55.43Ω+1.44jΩ	<5Ω	Pass	
	Return Loss(dB)	-25.7	-27.61	-7.4%	Pass	
5.8G	Impedance, transformed to feed point	53.0Ω-3.0jΩ	48.47Ω-0.57jΩ	<5Ω	Pass	
	Return Loss(dB)	-27.7	-26.95	2.7%	Pass	

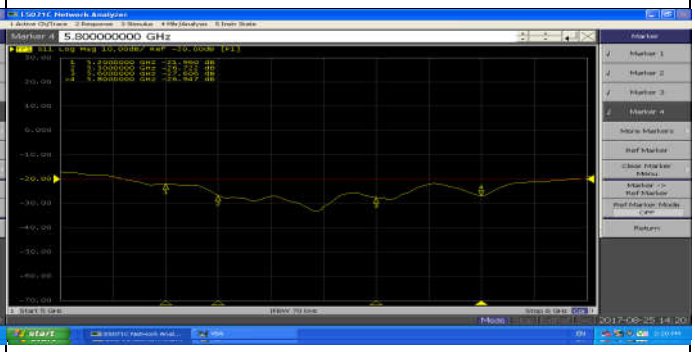
For Body Tissue

Frequency	Item	Originak Cal. Result	Verified on 2017/8/28	Deviation	Result	
5.2G	Impedance, transformed to feed point	48.6Ω-6.8jΩ	46.59Ω-3.21jΩ	<5Ω	Pass	
	Return Loss(dB)	-23	-24.18	-5.1%	Pass	
5.3G	Impedance, transformed to feed point	49Ω-4.2jΩ	47.36Ω-5.48jΩ	<5Ω	Pass	
	Return Loss(dB)	-27.1	-27.56	-1.7%	Pass	
5.6G	Impedance, transformed to feed point	56.2Ω-0.7jΩ	55.08Ω-2.67jΩ	<5Ω	Pass	
	Return Loss(dB)	-24.6	-26.41	-7.4%	Pass	
5.8G	Impedance, transformed to feed point	55.9Ω-1.7jΩ	53.16Ω+1.64jΩ	<5Ω	Pass	
	Return Loss(dB)	-24.8	-24.87	-0.3%	Pass	

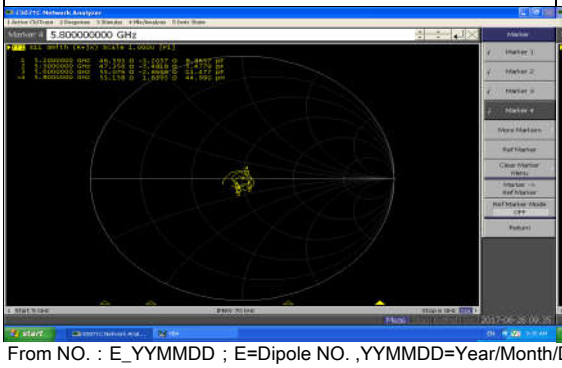
Impedance Test-Head



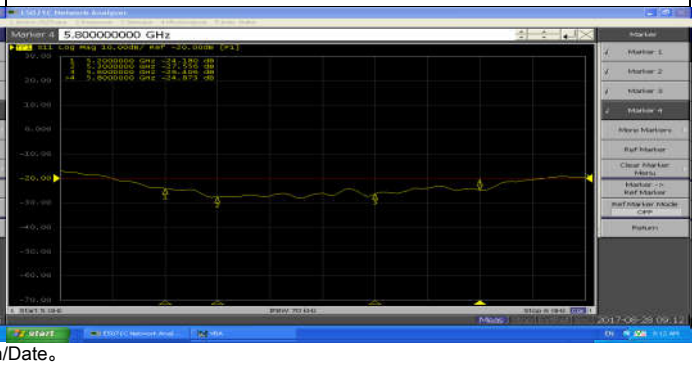
Return Loss-Head



Impedance Test-Body



Return Loss-Body



From NO. : E_YYMMDD ; E=Dipole NO. ,YYMMDD=Year/Month/Date。