Changing Water Properties with Lasers, Magnets, Geometry and Conscious Intention

Robert M. Haralick, Loren Zanier and Michael Hobson

Help from

Jim Caffrey Guangmin Haralick

were essential for some of the experiments.

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Purpose Of Experiments

- To see the extent of differences in instrument readings on different kinds of water
- To see if exposing water to
 - Lasers: Different Wavelengths
 - Magnets: Circumferentially, Axially, and Radially polarized

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- Copper Geometric Shapes
- Conscious Intention

Is there anything there to further explore?

- Vector Network Analyzer
- Impedance Analyzer
- Spectrometer

Vector Network Analyzer: Tektronix TTR506A



- Frequency Range
- 300KHz 6 GHz
- Flat Plate Capacitor Dielectric Probe



Faraday Cage



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Vector Network Analyzer

Measures the complex value of the reflection coefficient

- The coaxial cable and wires that connect the VNA to the capacitor act as a transmission line
- The capacitor has inductance and resistance
- The complex impedance of the capacitor changes as a function of frequency
- Also changes as a function of the water permittivity and permeability
- The VNA sends a sinuosoid with phasor V⁺
- The capacitor end of the transmission line sends back a sinuosoid phasor $V^- = \Gamma V^+$
- If V⁻ ≠ 0 the result is a standing wave on the transmission line

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$$\Gamma = \frac{Z_0 - Z_R}{Z_0 + Z_R}$$

Kinds of VNA Measurements

Magnitude and Phase

Γ(ω) = |Γ(ω)|e^{jθ(ω)}

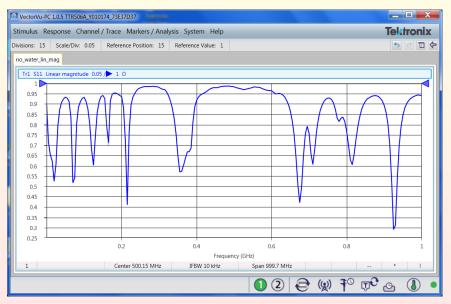
Real and Imaginary

Γ(ω) = Real(Γ(ω)) + j Imaginary(Γ(ω))

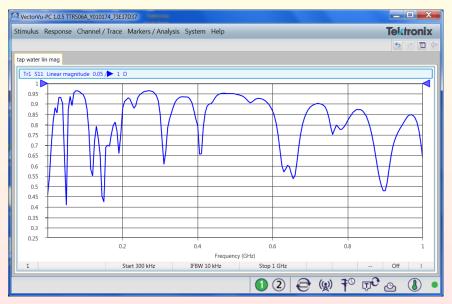
Group Delay

T_G(ω) = -^{∂θ(ω)}/_{∂ω}

No Water Linear Magnitude



Tap Water Linear Magnitude



Boyce Water Smacker

Micro Structures Water

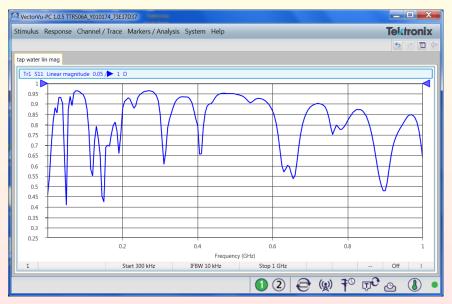


Boyce Water Linear Magnitude

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boyce_1 lin mag				
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Tap Water Linear Magnitude



Circumferentially Polarized



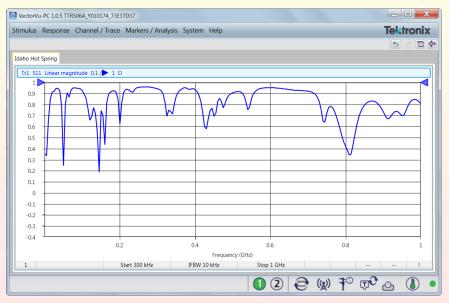
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Idaho Hot Spring Linear Magnitude

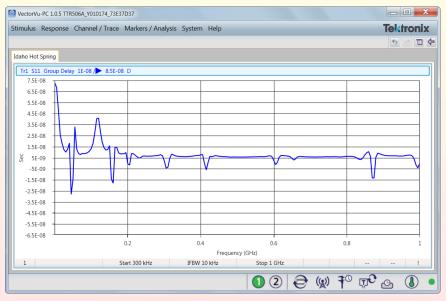
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Idaho Hot Spring	
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Idaho Hot Spring Circumferential Linear Magnitude



Idaho Hot Spring Delay

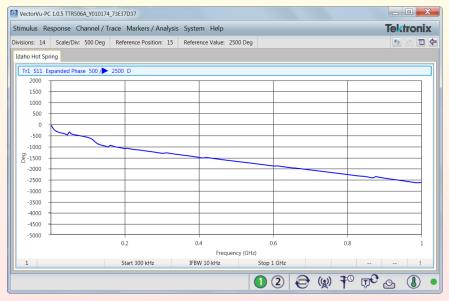


Idaho Hot Spring Circumferential Delay

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0.2 0.4 0.6 0.8 1 Frequency (GHz)				
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Idaho Hot Spring Phase

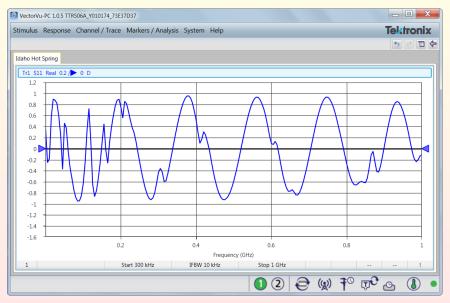


Idaho Hot Spring Circumferential Phase

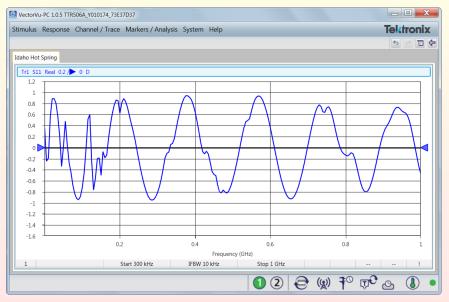
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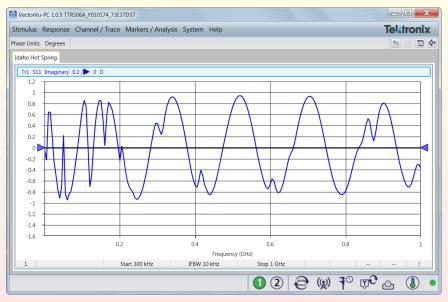
Idaho Hot Spring Real



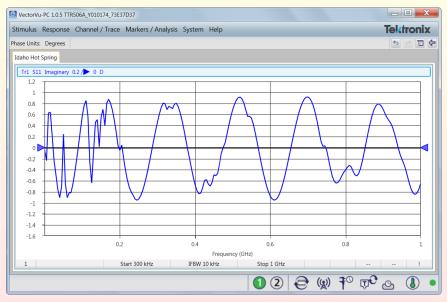
Idaho Hot Spring Circumferential Real



Idaho Hot Spring Imaginary



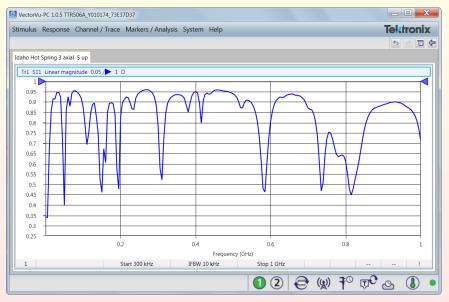
Idaho Hot Spring Circumferential Imaginary



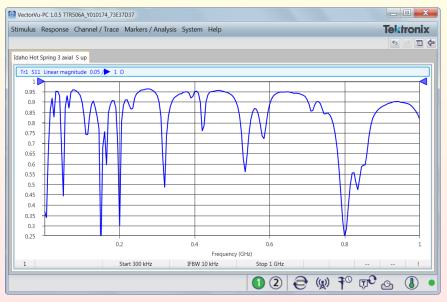
Axially Polarized



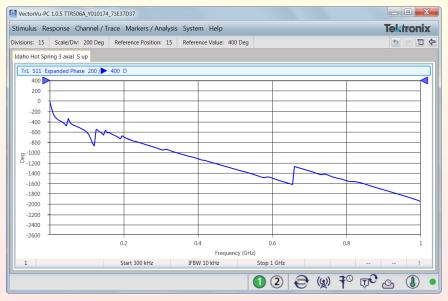
Idaho Hot Spring Linear Magnitude



Idaho Hot Spring Axial Linear Magnitude

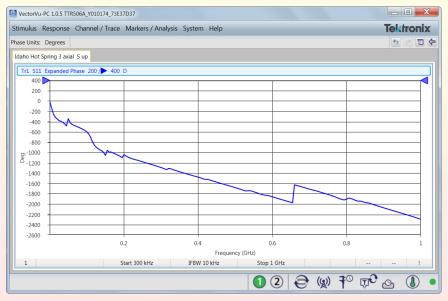


Idaho Hot Spring Extended Phase



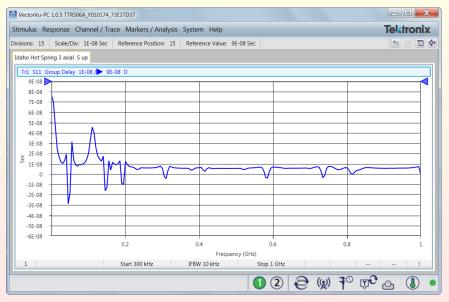
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Idaho Hot Spring Axial Extended Phase

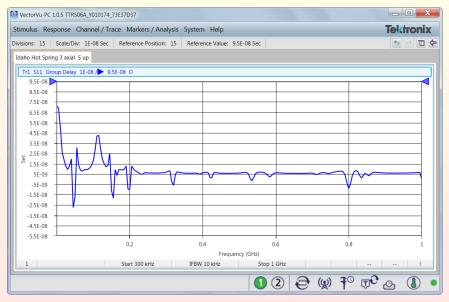


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Idaho Hot Spring Delay

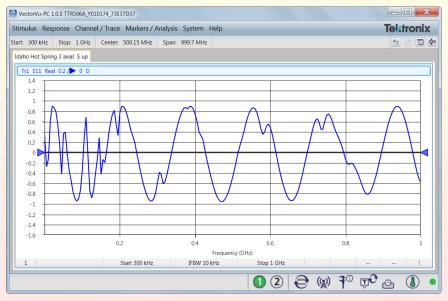


Idaho Hot Spring Axial Delay

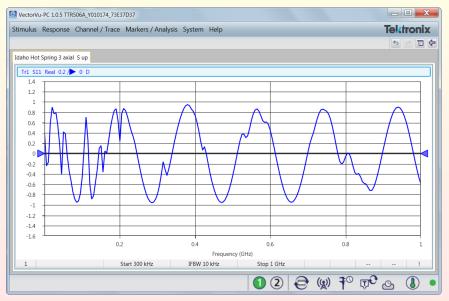


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Idaho Hot Spring Real

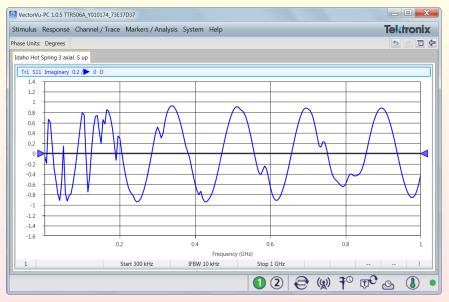


Idaho Hot Spring Axial Real

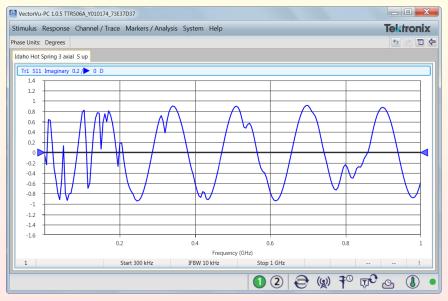


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Idaho Hot Spring Imaginary



Idaho Hot Spring Axial Imaginary

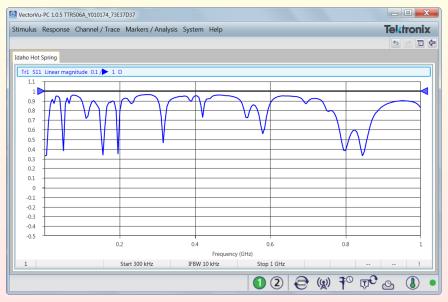


Radially Polarized South Inside



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Idaho Hot Spring Linear Magnitude

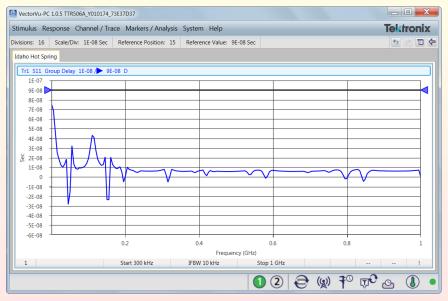


Idaho Hot Spring Radial South Linear Magnitude

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Idaho Hot Spring	
Tr1 S11 Linear magnitude 0.1 / 1 D	
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Idaho Hot Spring Delay



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Idaho Hot Spring Radial South Delay

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0.2 0.4 0.6 0.8	1
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Idaho Hot Spring Phase

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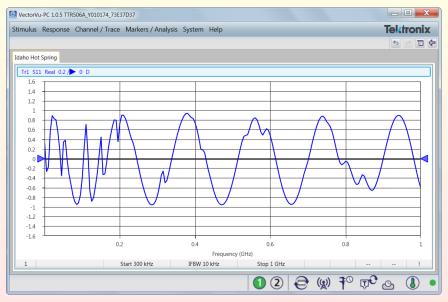
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Idaho Hot Spring Radial South Phase

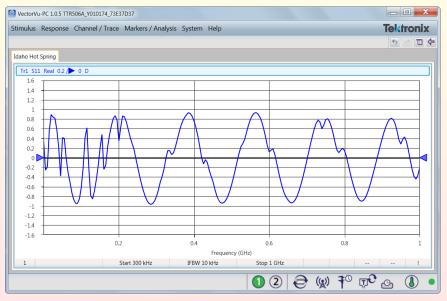
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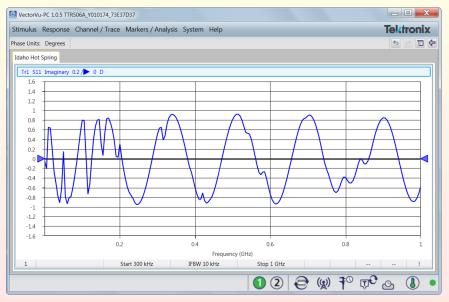
Idaho Hot Spring Real



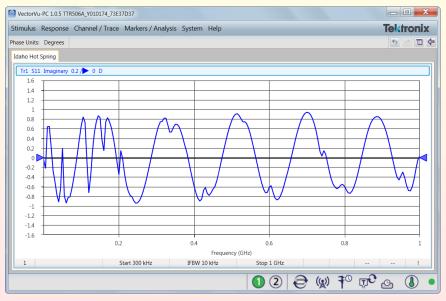
Idaho Hot Spring Radial South Real



Idaho Hot Spring Imaginary



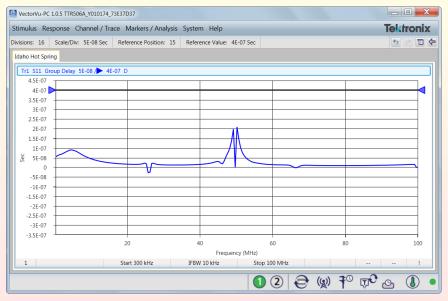
Idaho Hot Spring Radial South Imaginary



Radially Polarized North Inside



Idaho Hot Spring Delay

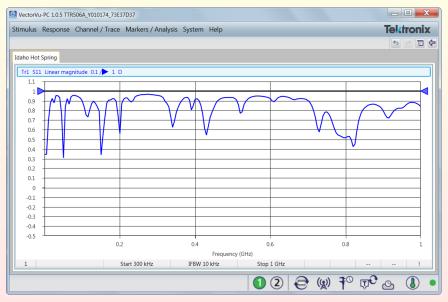


Idaho Hot Spring Radial North Delay

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Idaho Hot Spring									
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Idaho Hot Spring Linear Magnitude

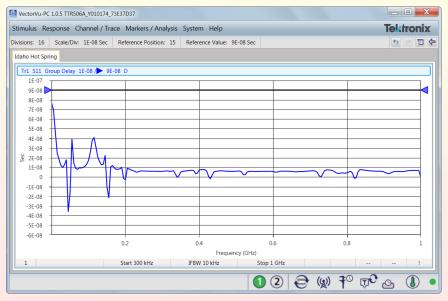


Idaho Hot Spring Radial North Linear Magnitude

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Idaho Hot Spring	
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0.2 0.4 0.6 (Frequency (GHz)	0.8 1
1 Start 300 kHz IFBW 10 kHz Stop 1 GHz	1

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Idaho Hot Spring Delay



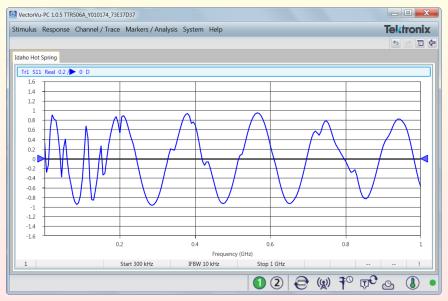
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Idaho Hot Spring Radial North Delay

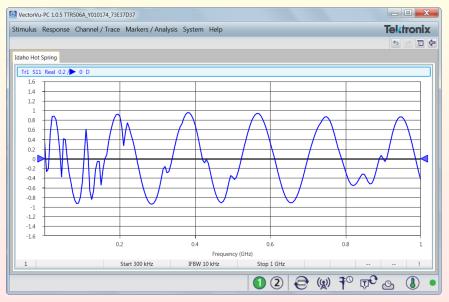
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Idaho Hot Spring				
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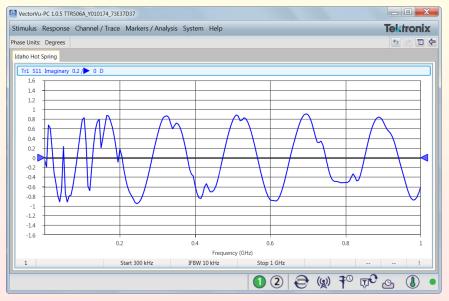
Idaho Hot Spring Real



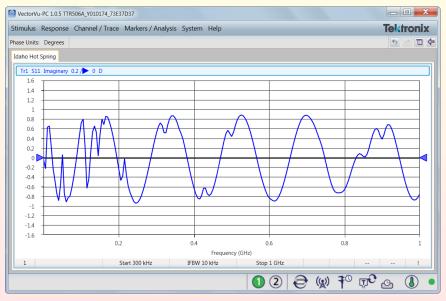
Idaho Hot Spring Radial North Real



Idaho Hot Spring Imaginary



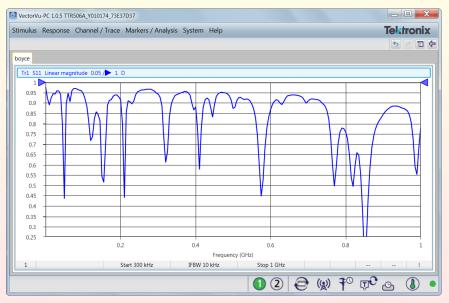
Idaho Hot Spring Radial North Imaginary



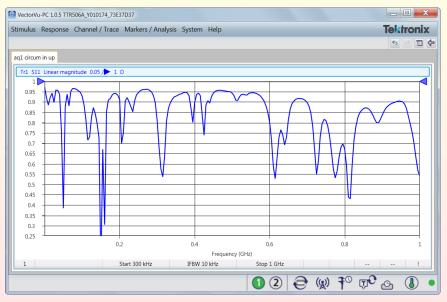
Aquacure Water



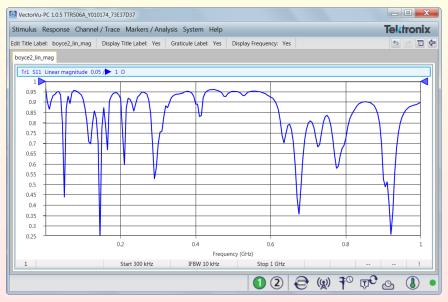
Aquacure Linear Magnitude



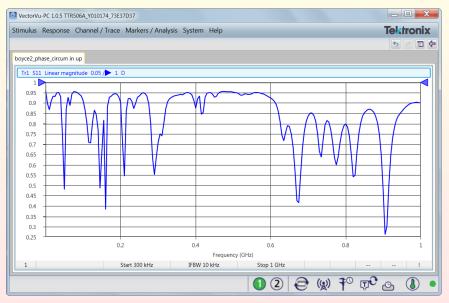
Aquacure Circum In Linear Magnitude



Boyce Linear Magnitude

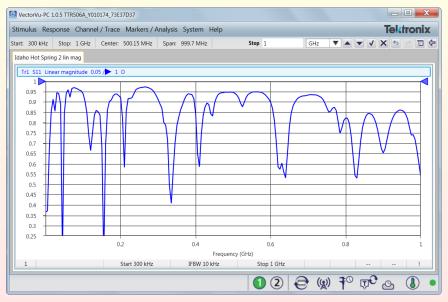


Boyce Circum In Linear Magnitude

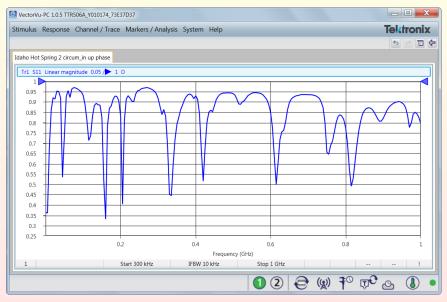


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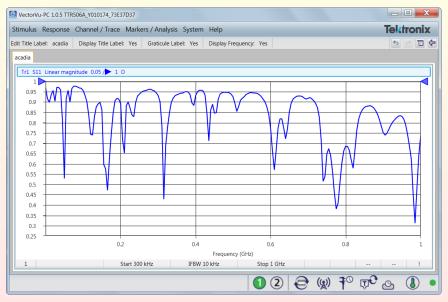
Idaho Hot Spring Linear Magnitude



Idaho Hot Spring Circum In Linear Magnitude



Acadia Linear Magnitude



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Acadia Circum In Linear Magnitude

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1 S	tart 300 kHz IFB		Stop 1 GHz	!
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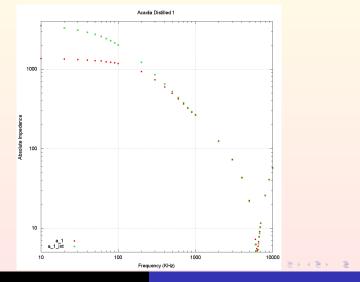
- Water is put in a Test Tube
- Use a 2 plate parallel capacitor probe (nominal .14nF in air)
- Connected to an HP 4192 Impedance Analyzer (300mv signal)
- Frequency is Scanned from 1kHz to 10,000kHz
- For each Chosen Frequency Record
 - Impedance Magnitude
 - Impedance Phase

HP 4192A



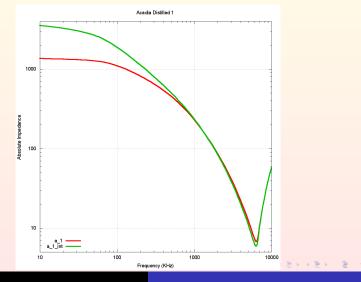
Acadia Distilled Water 1 Points Magnitude: Jim Caffrey

- Before Intention
- After 2 Minute Intention



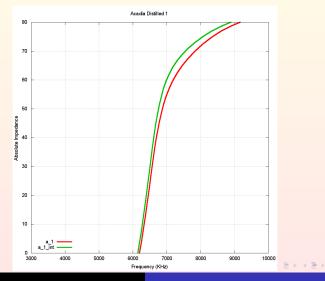
Acadia Distilled Water 1 Magnitude: Jim Caffrey

- Before Intention
- After 2 Minute Intention



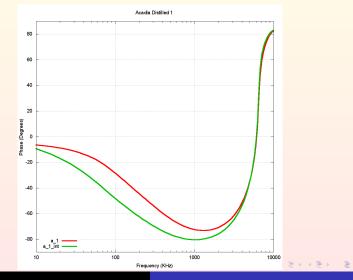
Acadia Distilled Water 1 Magnitude: Jim Caffrey

- Before Intention
- After 2 Minute Intention



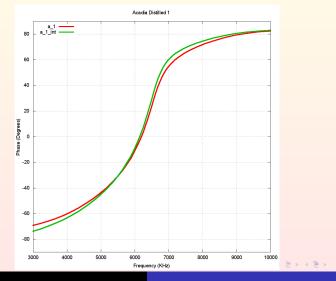
Acadia Distilled Water 1 Phase Angle: Jim Caffrey

- Before Intention
- After 2 Minute Intention



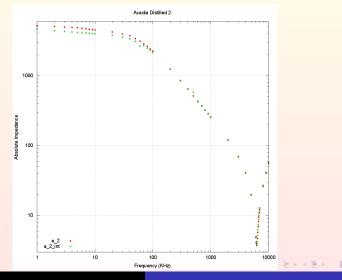
Acadia Distilled Water 1 Phase Angle: Jim Caffrey

- Before Intention
- After 2 Minute Intention



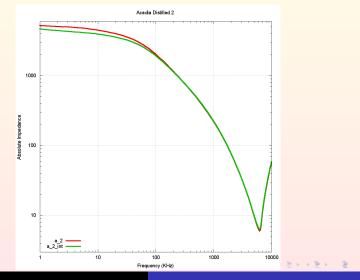
Acadia Distilled Water 2 Magnitude: Jim Caffrey

- Before Intention
- After 2 Minute Intention

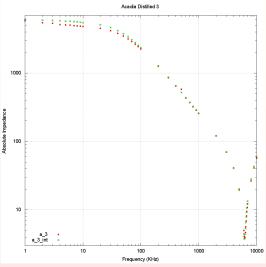


Acadia Distilled Water 2 Magnitude: Jim Caffrey

- Before Intention
- After 2 Minute Intention

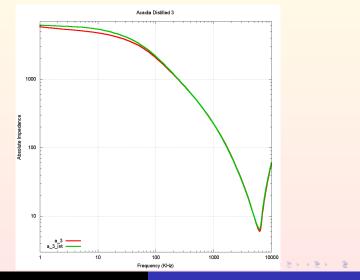


Acadia Distilled Water 3 Points Magnitude: Michael Hobson



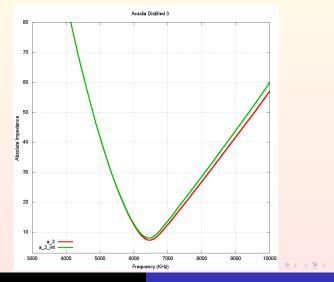
Acadia Distilled Water 3 Magnitude: Michael Hobson

- Before Intention
- After 1 Minute Intention



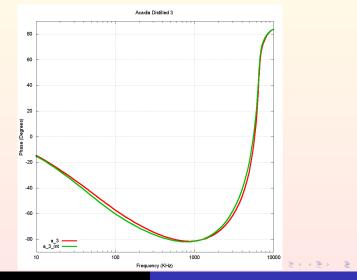
Acadia Distilled Water 3 Magnitude: M. Hobson

- Before Intention
- After 1 Minute Intention



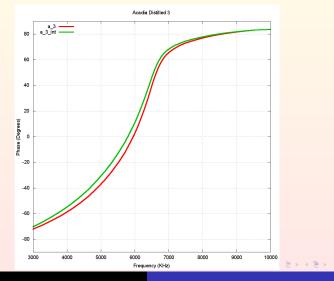
Acadia Distilled Water 3 Phase Angle: M. Hobson

- Before Intention
- After 1 Minute Intention

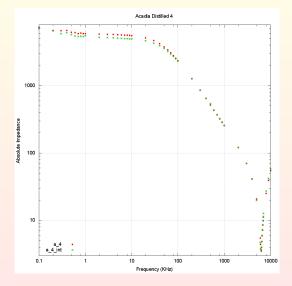


Acadia Distilled Water 3 Phase Angle: M. Hobson

- Before Intention
- After 1 Minute Intention



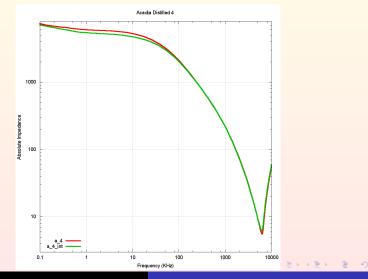
Acadia Distilled Water 4 Magnitude: Jim Caffrey



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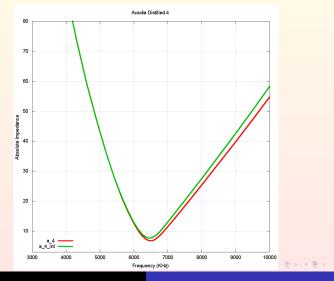
Acadia Distilled Water 4 Magnitude: Jim Caffrey

- Before Intention
- After 2 Minute Intention



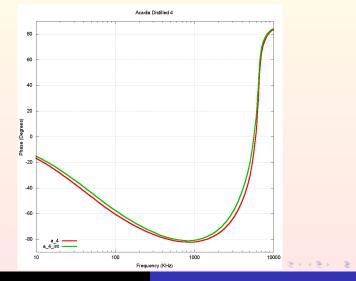
Acadia Distilled Water 4 Magnitude: Jim Caffrey

- Before Intention
- After 2 Minute Intention



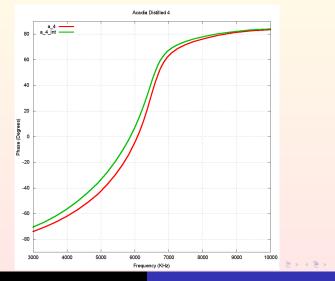
Acadia Distilled Water 4 Phase Angle: Jim Caffrey

- Before Intention
- After 2 Minute Intention



Acadia Distilled Water 4 Phase Angle: Jim Caffrey

- Before Intention
- After 2 Minute Intention



Ocean Optics Modular Light Source



- Light Source: Miniature Deuterium / Tungsten Halogen
- Wavelenth: 200-1100nm
- 5-volt DC Power Supply
- SMA Collimator for Spectrometer SMA coupling

Ocean Optics Spectrometer



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Ocean Optics Spectrometer

- Size: 8.91cm x 6.33cm x 3.44cm
- Wavelength: 180-1100nm
- Signal-to-noise ratio: 300:1
- 3648 Element CCD Array
- Dynamic range: 1300:1 for a single acquisition

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- Integration Time 3.8ms-10sec
 - Integration Time 200ms
- Average 40 transmission spectrums
- Box Filter 5

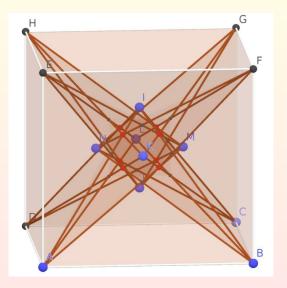
Cuvettes

BrandTech Scientific Semi-micro UV-Transparent



- Polycyclical Olefin
- 230nm-900nm
- Minimum 1.5mL
- Maximum 3.0mL
- 4.5mm x 23mm
- Light Path 10mm
- Are Grouped by Manufacturing Mold Cavity Number To Ensure The Lowest Variation In Extinction Coefficient

Copper Model



Copper Models



All copper tubes are one foot long

