

# **gampt** **ULTRASOUND ● SCHOOL**

**10. Workshop „Innovative Lehrmittel für das Erlernen physikalischer Konzepte“**

Natalia Pozoga, Uwe Peterson

# GAMPT – GESELLSCHAFT FÜR ANGEWANDTE MEDIZINISCHE PHYSIK UND TECHNIK

1998 Firmengründung

2003 Zappendorf

seit 2010 in Merseburg bei Halle



## Ausbildung

- Equipment für die Ausbildung an Fach- und Hochschulen



## Medizin

- Messung von Mikroblasen (BubbleCounter)
- THED - Time Harmonic Elastography (Kooperation mit Charité Berlin)



## Industrie

- Messungen dünner Schichten
- Ultraschallsonden nach Kundenspezifikation
- F&E - Entwicklung von Sensoren und Messtechnik

# GAMPT – Ultraschall in der Ausbildung



## ⇒ Didaktische Vorteile:

- **Leichtes Verständnis** durch einfache und anschauliche Objekte
- **Hohe Motivation** der Schüler und Studenten durch selbstständiges Arbeiten und Experimentieren
- **Strukturiertes Lernen** durch schrittweises Vorgehen im Experiment

A photograph of children in a classroom setting. In the foreground, a young girl with blonde hair is looking down at a small black object she is holding. To her right, another child is partially visible, looking towards the girl. In the background, another child is visible, and there is a white bottle on a table. The text 'ULTRASOUND 4 SCHOOL' is overlaid in large, bold, yellow letters.

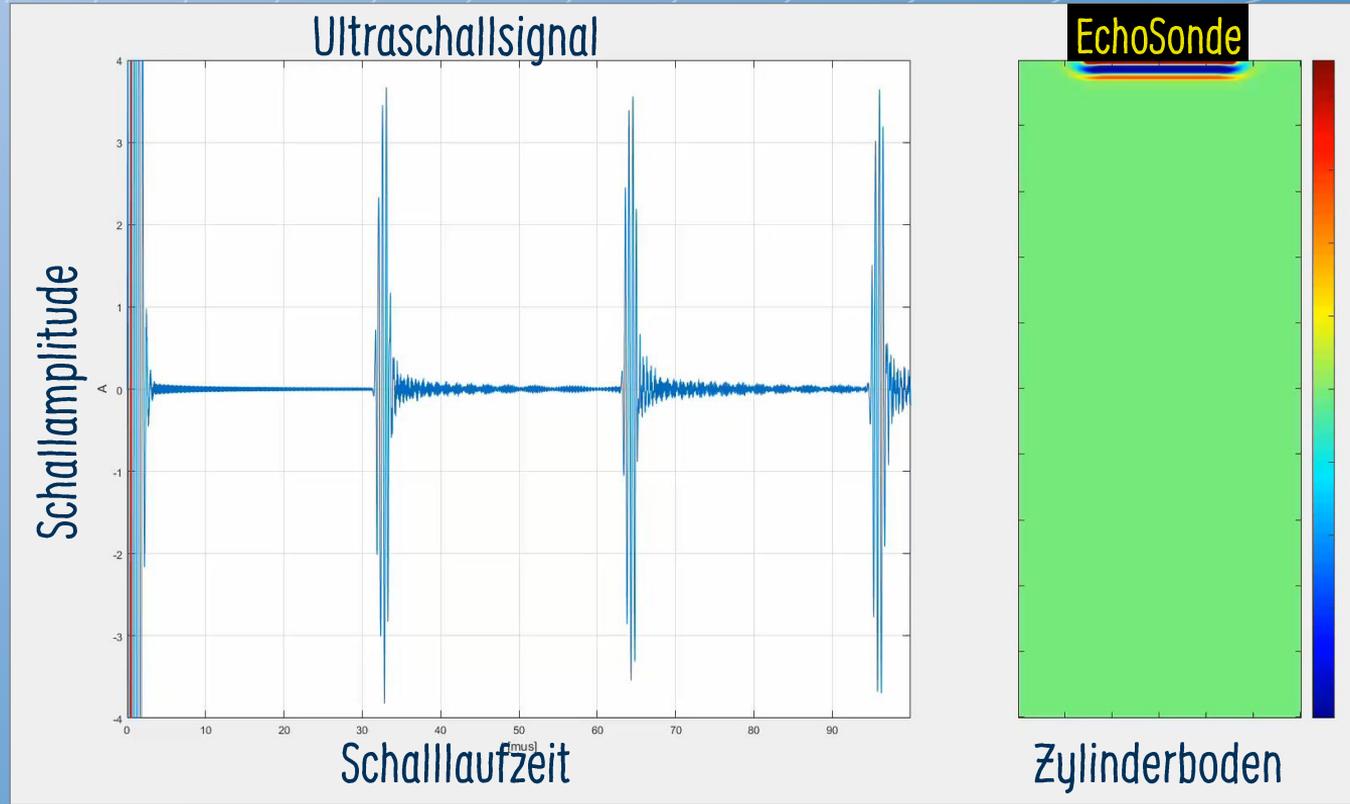
# ULTRASOUND 4 SCHOOL

Ultraschall begreifen mit dem

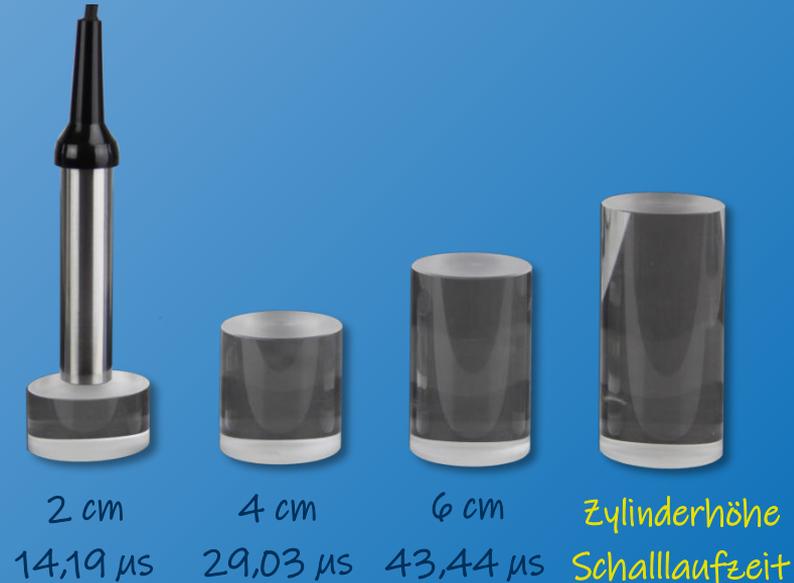
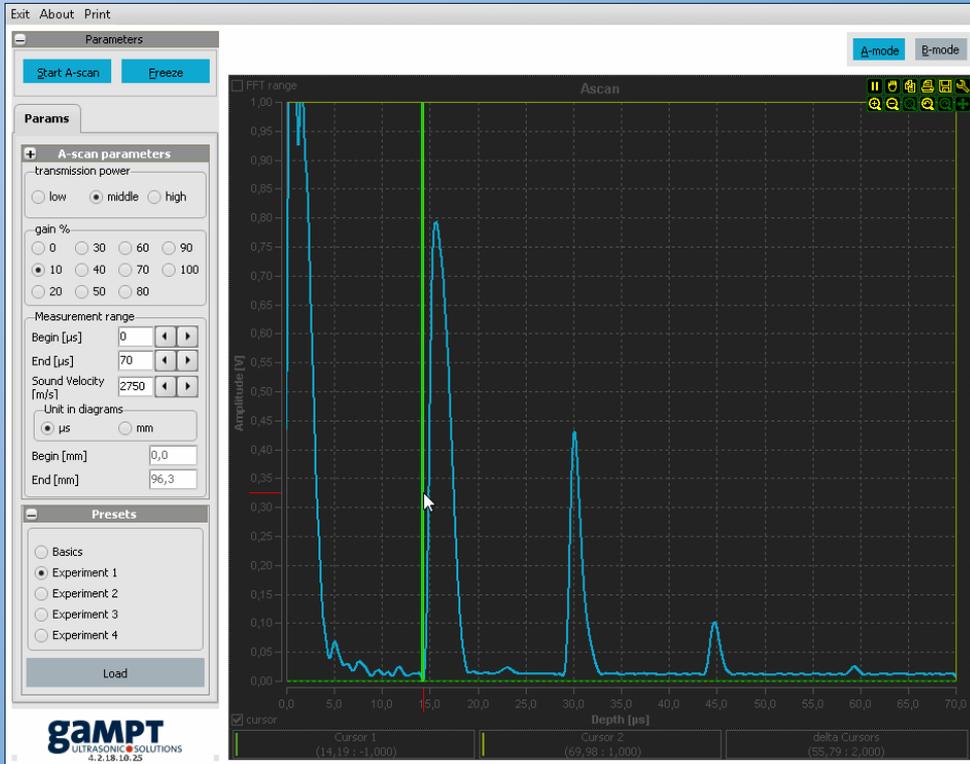
# EchoSet



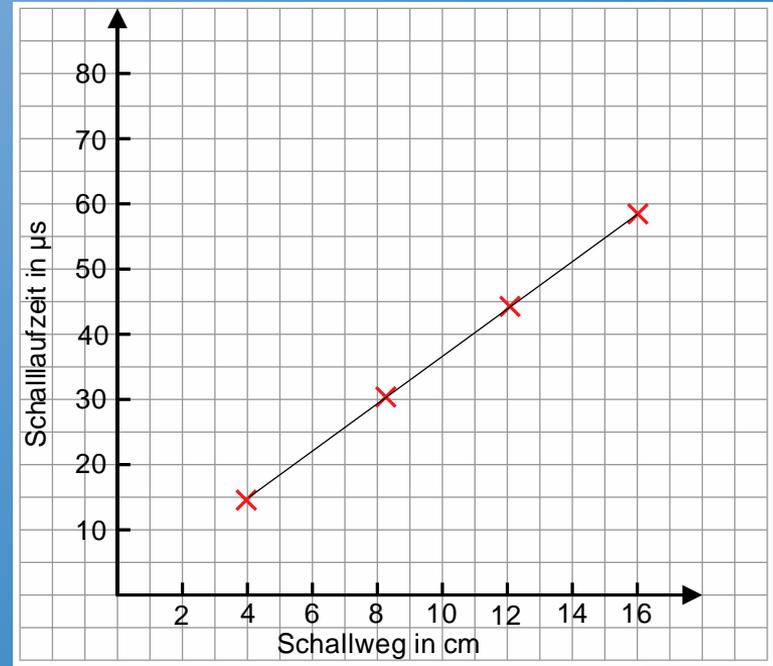
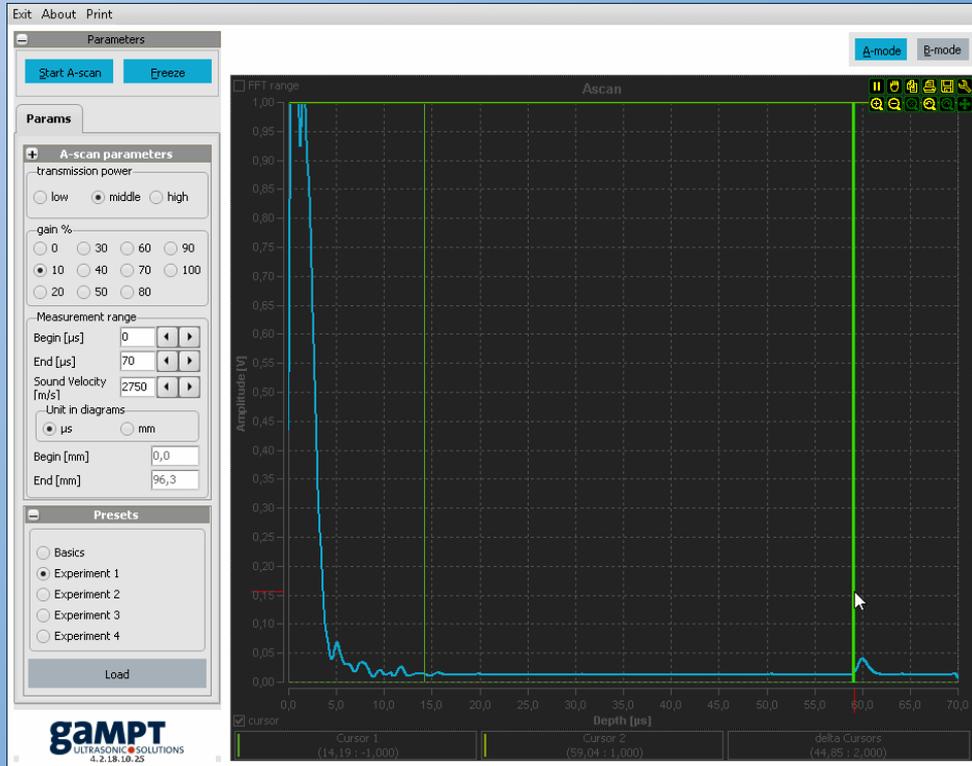
# Simulation der Fortpflanzung eines Ultraschall-Impulses in einem Zylinder



# EchoSet Experiment 1 – Schallausbreitung im Festkörper



# EchoSet Experiment 1 – Schallausbreitung im Festkörper



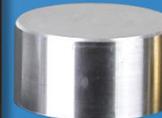
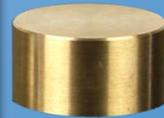
Schalllaufzeit ~ Schallweg

# EchoSet Experiment 2 – Materialabhängige Schallausbreitung



$$c = \frac{2 * h}{t}$$

*c* - Schallgeschwindigkeit  
*h* - Probenhöhe = 2 cm  
*t* - Schalllaufzeit



Material	Schallgeschwindigkeit in m/s	Material	Schallgeschwindigkeit in m/s
Aluminium	6350	Messing	4430
Kupfer	4660	Plexiglas	2760
Silber	3600	PVC	2330
Gold	3240	Polyurethan	1780
Blei	2160	Teflon	1400
Luft (20°C)	343	Wasser (20°C)	1484

# EchoSet Experiment 3 – Das handgeführte B-Bild

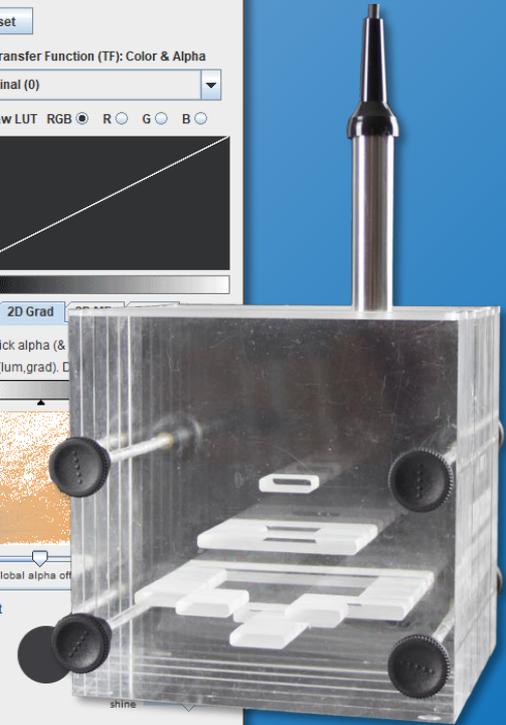
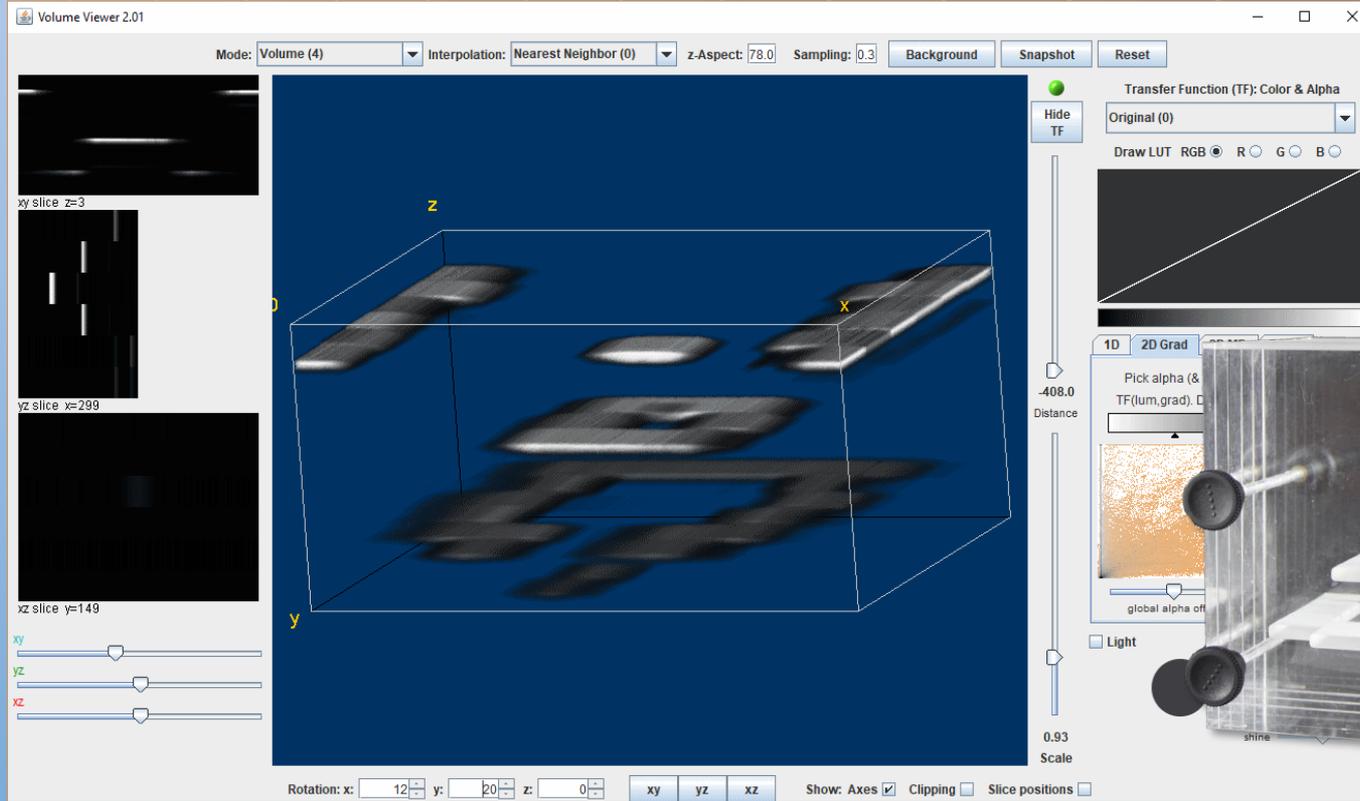
The screenshot displays the EchoSet software interface with the following components:

- Parameters Panel (Left):**
  - Buttons: Start A-scan, Freeze
  - A-scan selection: HF, HF + Amp, Amp (selected)
  - Params, USB, Draw
  - B-mode: Diagram selection (Dia 1, Dia 2, Dia 3), Scan mode (manual, Scanner), Image Levels (Show levels, Gray scale, inverted, Auto min/max), Level max (1,0), Level min (0,0), Image width (20,0), Shot numbers (0 | 365), Measurement time (12,0s), Path length (20,0)
- B-scan (Center):** A 2D image showing depth [µs] on the y-axis (0 to 70) and Time [s] on the x-axis (0 to 11). It displays multiple horizontal bright lines representing reflections from different depths over time.
- A-scan (Right):** A 1D graph showing Depth [µs] on the y-axis (0,0 to 70,0) and Amplitude [V] on the x-axis (0,00 to 0,60). It shows a series of peaks corresponding to the reflections in the B-scan. A yellow arrow points from the probe to this graph.
- Hand and Probe:** A hand is holding an ultrasound probe against a metal block with several holes. The probe is connected to the software.

# EchoSet Experiment 4 – 3D-Ultraschall



# EchoSet Experiment 4 – 3D-Ultraschall



Ultraschall zum Anfassen  
mit dem

# ImageSet

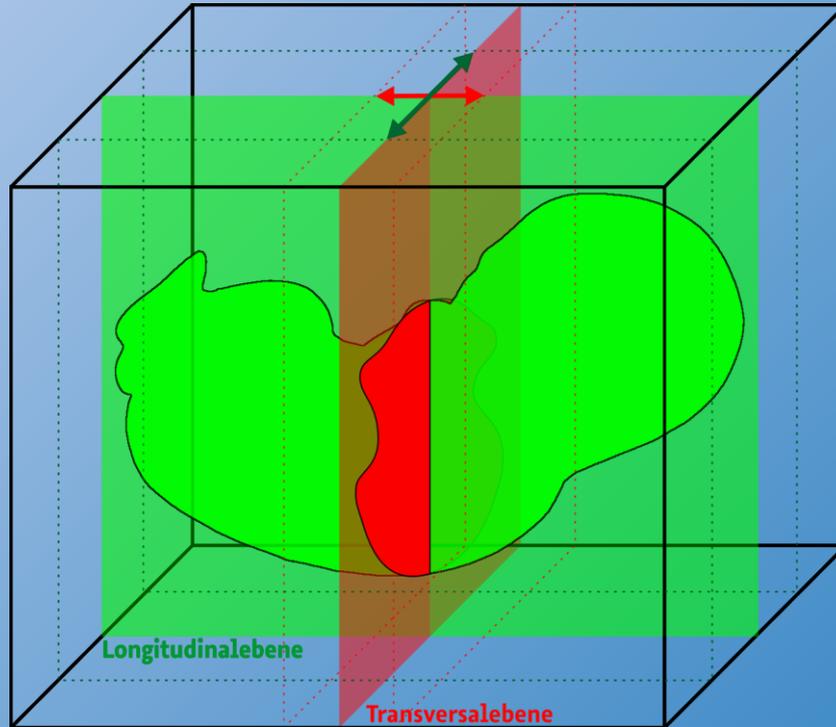


# ImageSet Demoversuch – B-Bild mit ImageSonde

The image displays a software interface for an ultrasound system. On the left, a control panel includes a 'Parameter' section with 'Reset' and 'Close' buttons, and 'Get Data' and 'Freeze' buttons. Below this are 'Imaging State' (Online/Offline), 'Scan Mode' (B/B+M), and 'Image/Palette/Cine' options (Main/TGC/M-Line). A checked 'A-Scanline' and 'M-Line Position [22]' are also visible. The main display area is split: the left side shows a B-mode image of a curved array with a green line indicating the scan line; the right side shows an A-scan waveform with a vertical axis from 0.0 to 90.0 mm. To the right of the main display is an 'Info' panel with 'Probe: CS-2R60S-3', a 'Cursor' section (Line/Ellipse), 'Lines' (1-3), 'Ellipses' (1-3), and an 'Imaging' section. A hand is holding a white ultrasound probe over a box labeled 'ImageSet ImagePhantom' with the gampt logo and website address.

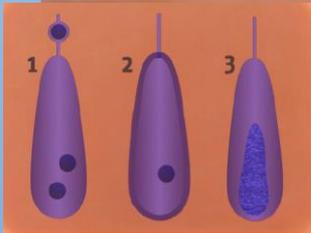
Sonogramm des konvexen Wandler-Arrays aus 64 Elementen

# Scannen in Längsrichtung und in Querrichtung



# ImageSet Demoversuch – Erweiterungen

The screenshot displays the ImageViewSchool software interface. The main window shows a B-mode ultrasound image of a heart. Two measurement lines are drawn on the image: a yellow line labeled '1' and an orange line labeled '2'. A green line is also visible, likely representing the scan line. On the right side of the image, there is a depth scale from 0.0 to 90.0 mm. The software interface includes a menu bar (Exit, Print, About, Reset), a parameter panel with 'Stop' and 'Freeze' buttons, and a control panel with 'TGC', 'A-Line', and 'Presets' tabs. The 'Main' tab is active, showing 'Frequency [MHz]' with radio buttons for 2,0, 3,0, 4,0, and 5,0 (selected), and 'Depth [mm]' with a slider set to 210. The 'Info' panel on the right shows 'Probe: C5-2R60S-3' and 'Cursor' options for 'Line' (selected) and 'Ellipse'. The 'Lines' panel shows two lines with lengths: '1 Length: 8,76 mm' and '2 Length: 7,79 mm'. The 'State' panel shows 'Imaging is frozen ...'. The logo 'gamPT ULTRASONIC SOLUTIONS 1.0.19.4.2' is visible in the bottom right corner of the software window.

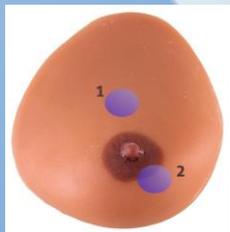


# ImageSet Demoversuch – Erweiterungen

The software interface, titled "ImageViewSchool", displays a B-mode ultrasound image of a pig kidney. A hand holds the ultrasound probe over the kidney. The software interface includes a parameter panel on the left with "Stop" and "Freeze" buttons, and a cursor panel on the right showing "Line" and "Ellipse" options. The cursor panel also displays the length of two lines: 17,13 mm and 16,96 mm. A small inset image in the bottom left shows a pig kidney with three numbered spots (1, 2, 3) corresponding to the measurement points in the ultrasound image.

# ImageSet Demoversuch – Erweiterungen

The screenshot displays the ImageViewSchool software interface. On the left, a hand holds an ultrasound probe over an orange. The software window shows a B-mode scan of the orange with two yellow lines and orange dots indicating measurements. The parameter panel on the left includes a 'Freeze' button and frequency settings (3.0, 4.0, 5.0 MHz). The main scan area shows a depth scale from 0.0 to 90.0 mm. The info panel on the right shows the probe type (C5-2R60S-3) and cursor information (Line 1: Length: 20,86 mm; Line 2: Length: 10,25 mm). The state is 'Imaging is frozen ...'.



# Vielen Dank für Ihre Aufmerksamkeit

Besuchen Sie uns an unserem Stand oder unter [www.gampt.de](http://www.gampt.de)

GAMPT mbH  
Hallesche Straße 99F  
06217 Merseburg  
Germany  
+49-3461-2786910  
info@gampt.de