

Biomedical Ultrasonics Course: Lab Plan Session

**Advisors: Àlex Drago-González¹, Jussi Kiviluoto¹, Ona Westerlund¹,
Professor: Heikki J. Nieminen¹**

- 1. Medical Ultrasonics Laboratory (MEDUSA), Department of Neuroscience and Biomedical Engineering, Aalto University, Espoo, Finland**

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U413c

Contact: alex.dragogonzalez@aalto.fi, medusa.aalto.fi



High-speed camera

Allows us to record very fast phenomena (acoustic timescales). Match of acoustic and optical focus (G1,G2)

V1612

5x MAGNIFICATION



High-speed camera

BEFORE RECORDING VIDEOS, PIXEL SIZE HAS TO BE MEASURED

Parameter	Specification	Benefit
Sensor Resolution	1 Mpx: 1280 x 800	Widescreen format keeps object in the frame longer
Sensor Size	35.8mm x 22.4mm	Compatible with F-Mount and EOS lenses at full resolution
Pixel Size	28 Micron	High light sensitivity
Bit Depth	12 bits	4,096 gray levels for optimal image quality
Minimum Exposure	1 μ s standard, up to 265 ns with FAST option	Helps eliminate motion blur

High-speed camera

RESOLUTION					
		v2512	v2012	v1612	v1212
H	V	Max FPS	Max FPS	Max FPS	Max FPS
1280	800	25,700	22,600	16,600	12,600
1280	720	28,500	25,100	18,400	14,000
1024	800	30,500	26,900	19,700	15,000
1024	512	47,400	41,800	30,700	23,400
896	800	33,700	29,800	21,800	16,600
768	768	39,100	34,750	25,300	19,300
640	480	70,100	62,500	45,500	34,700
512	512	75,600	67,800	49,100	37,500
512	384	99,800	89,550	65,000	49,600
384	256	171,650	115,100	112,300	85,700
256	256	206,300	188,500	135,400	103,500
256	128	380,100	347,800	253,000	193,900
128	64	663,250	651,150	538,400	415,500
128	32	663,250	651,150	626,850	551,700
128	16	663,250	651,150	626,850	551,700

High-speed camera

Focuses ultrasonic waves to generate an ellipsoide of high-pressure (acoustic focus). Heat, strain, ...

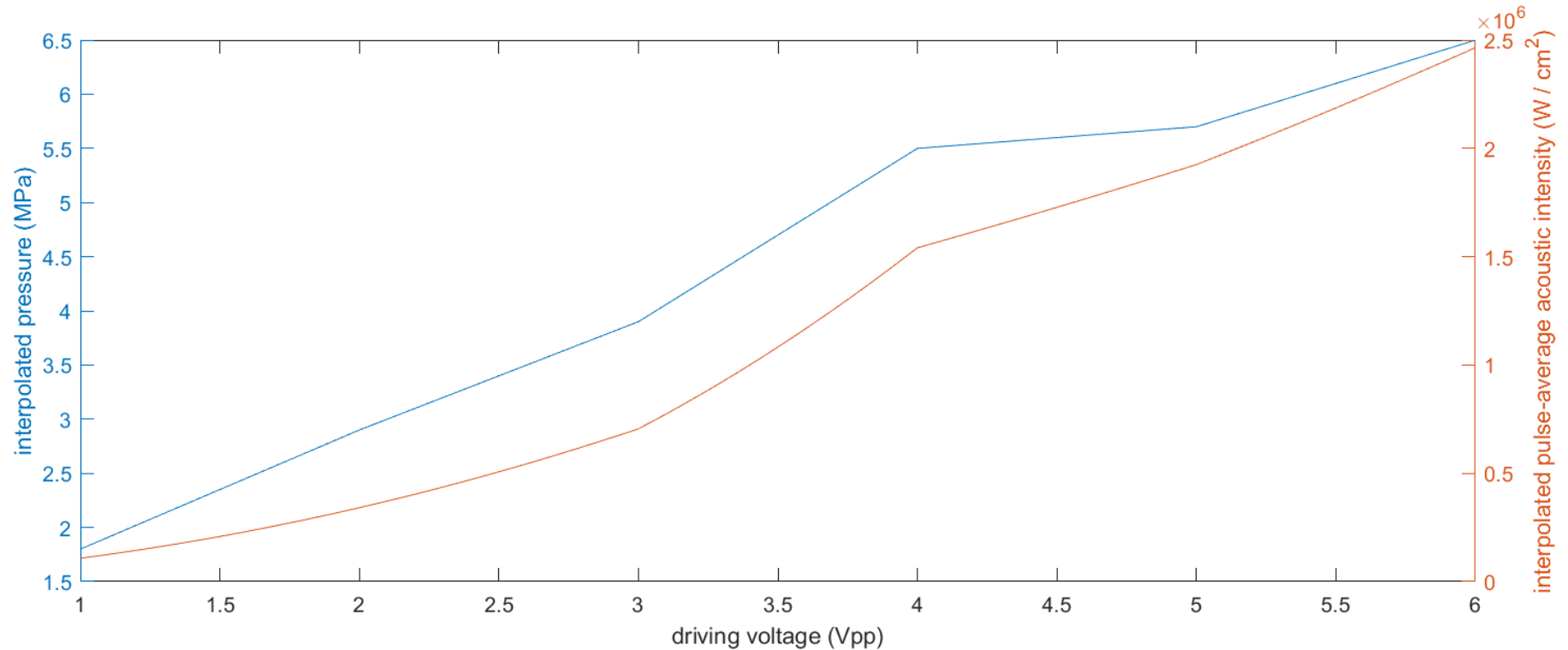
- $f = 2.5 \text{ MHz}$
- Translation stage (μm)
- Continuous & Burst mode
- $0 < V_{pp} < 6\text{V}$
- $0 < PPP < 6.5 \text{ MPa}$
- $0 < P_{Lan} < 1.6 \text{ MPa}$



* Credit to Dr. Maxime Fauconnier

High-speed camera

If you save PD and Vpp, you can compute PPP and P_{Lan}. *

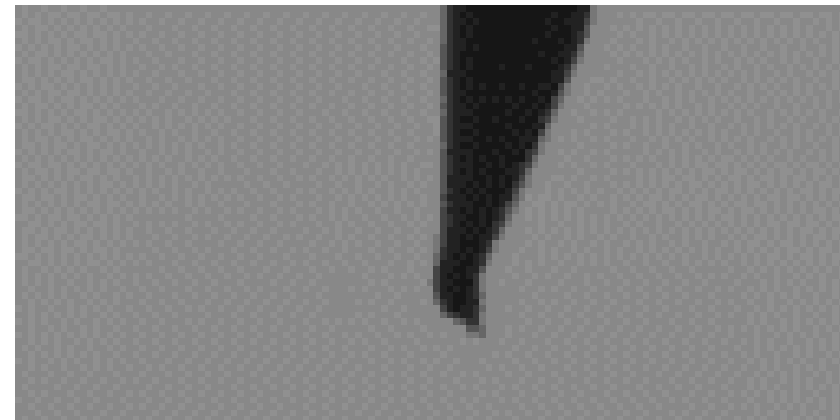


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Ultrasonically Actuated Medical Needle

- Total Acoustic Power (TAP) ~0.5 - 3 W
- Frequency Range ~28 – 36 kHz
- Displacement @ Needle Tip ~200 um peak to peak in air
- Needle Size 21G = 0.819 mm diameter

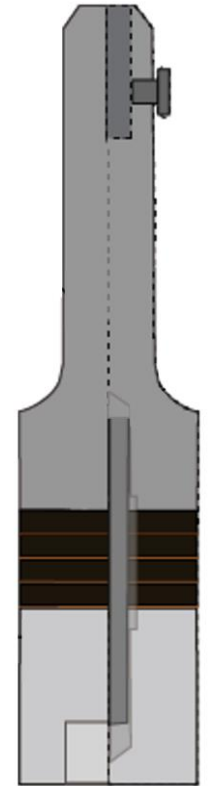


Ultrasonic knife

- Langevin type bolt-clamped transducer
- Model Honda ZO-91
- Operating frequency: 40 kHz
- Output power: 30 W



Horn
Frontmass
Backmass
Piezoring
Electrode



Discussion

Now, let's sit in our respective groups and start discussing about the experiment you want to do.

In 30 minutes, a 2 min presentation will be done in front of the advisors and professors.