ÓBUDAI EGYETEM
ÓBUDA UNIVERSITY

Integrated MEMS force sensors in medical technologies

PhD Report – 3rd semester

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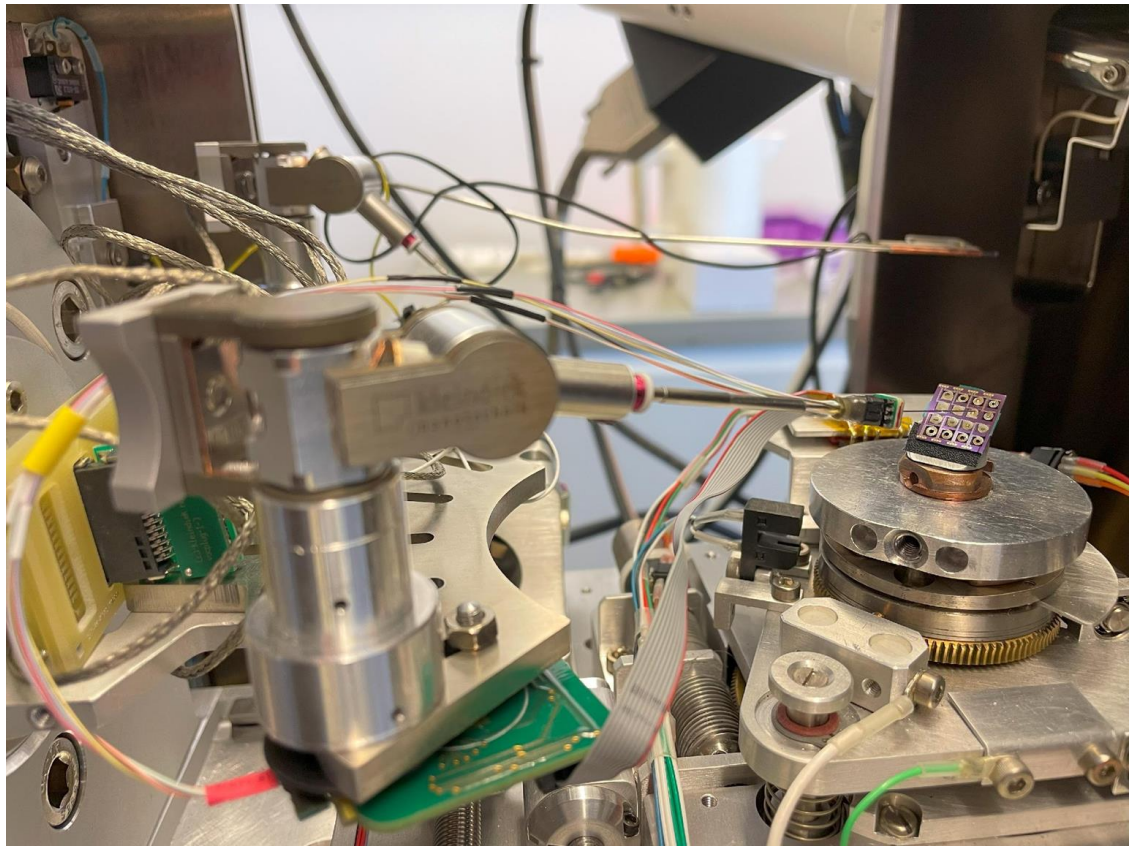
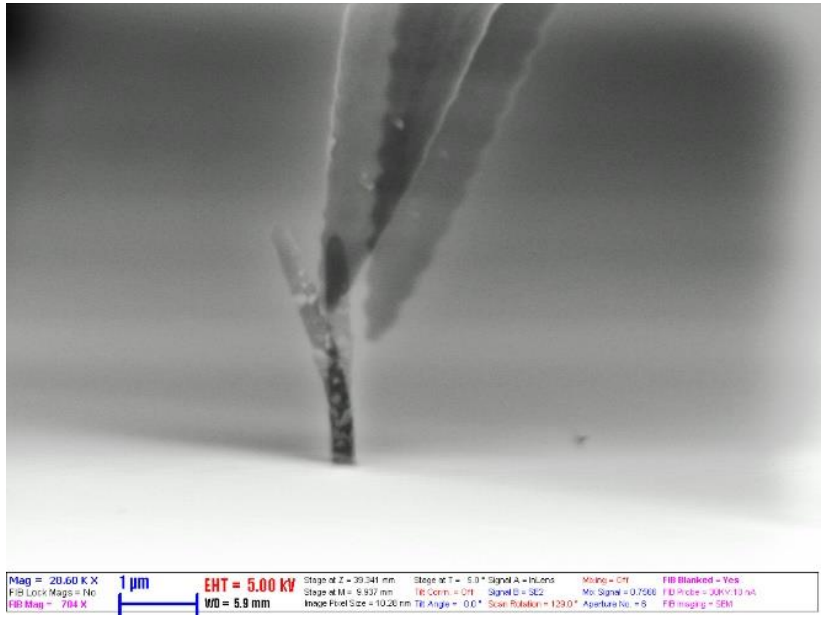
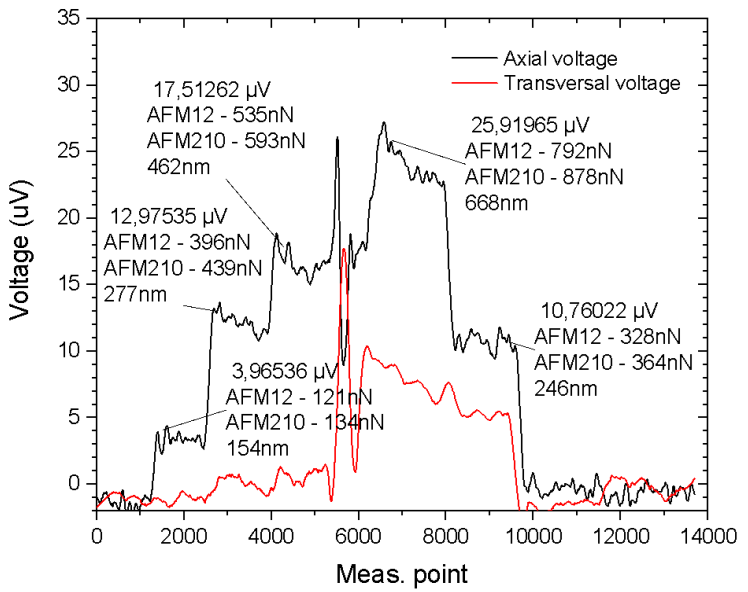
In-situ nanomechanical test in SEM

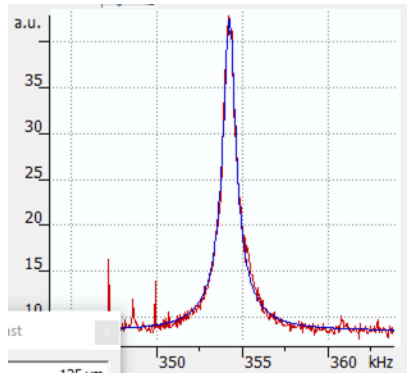


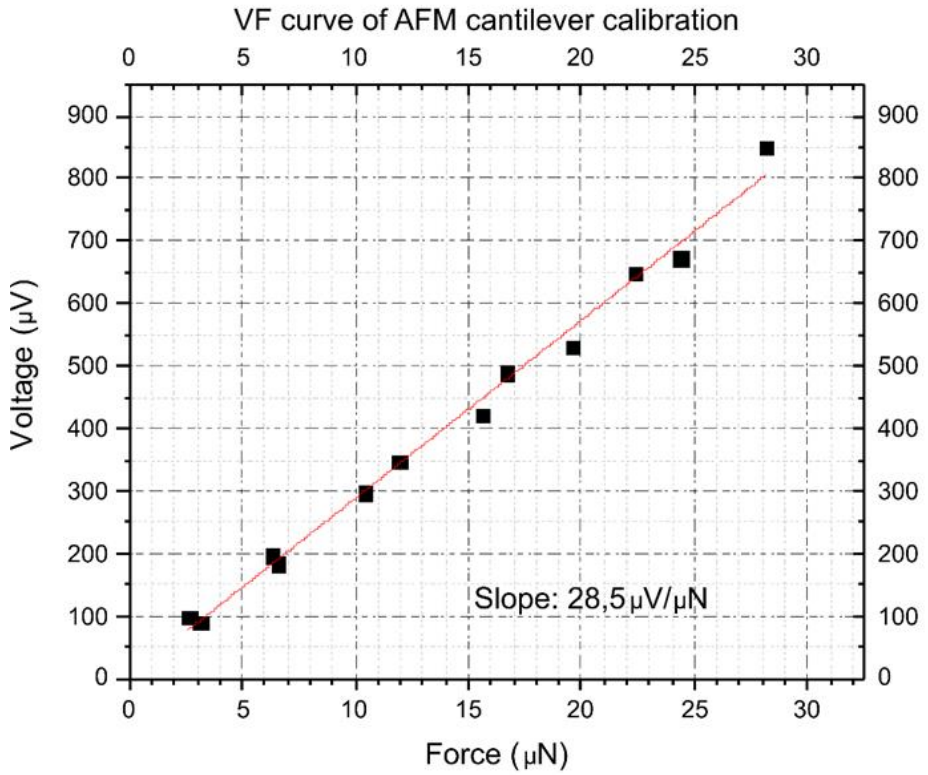


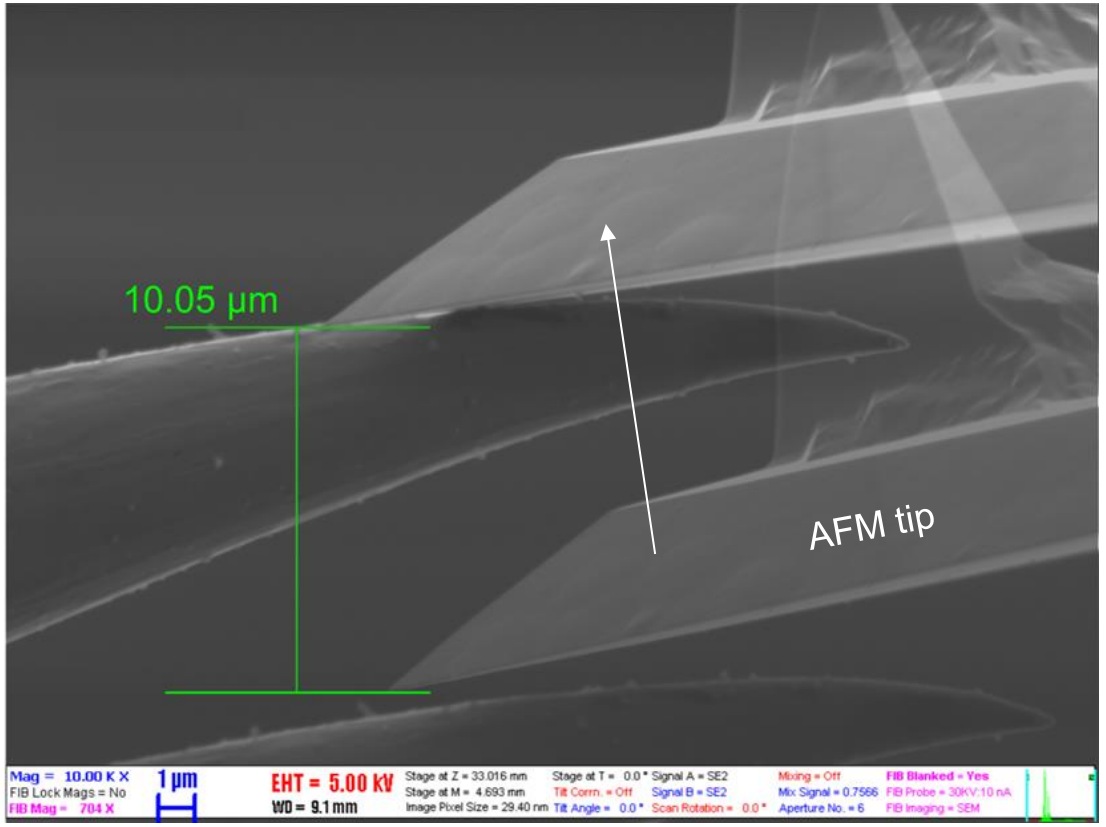


In-situ nanomechanical test in SEM

Calibration with AFM probe → AFM self calibration via Sader method →







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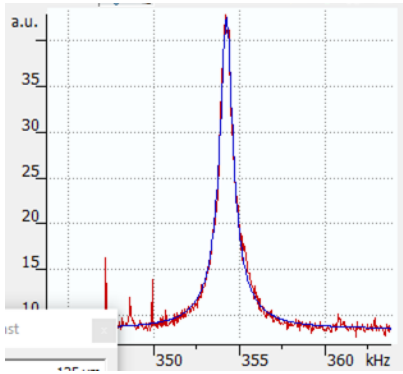

New calibration method

Calibration with reference weights or self weight
Uniform axis markings and inertia system

New calibration method

- Uniform axis markings and inertia system
- Calibration with reference weights or self weight
- Easy to use, ergonomic calibration system

New calibration method

Pt nanowire tests

- Platinum nanowires with 1 μm diameter and 10 μm length deposited via EBID tecnique
- 80% Pt, 20% C content
- Elastic deformation tests along x-y axis of the force sensor

Biomechanical tissue testing

Quantitative and qualitative testing of mechanical properties of tissues

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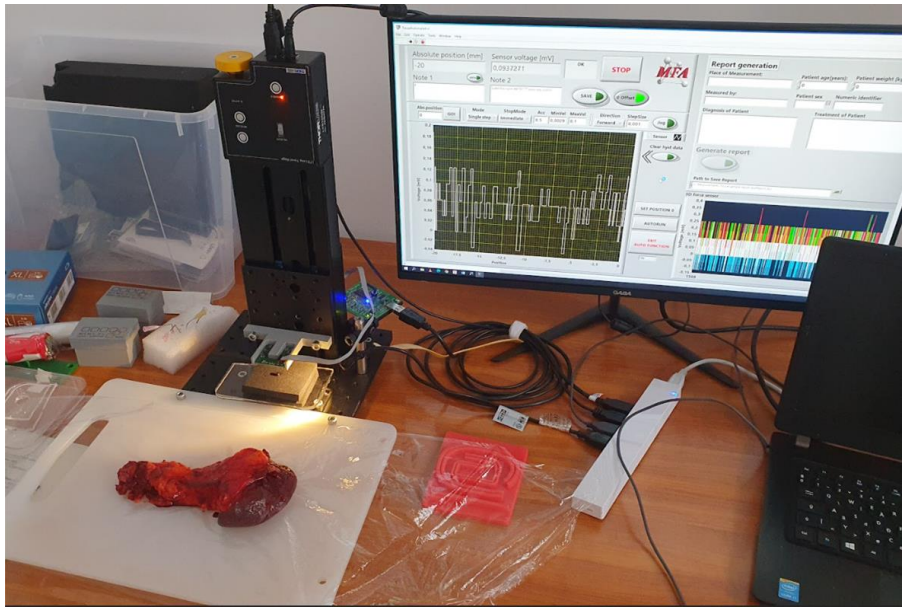

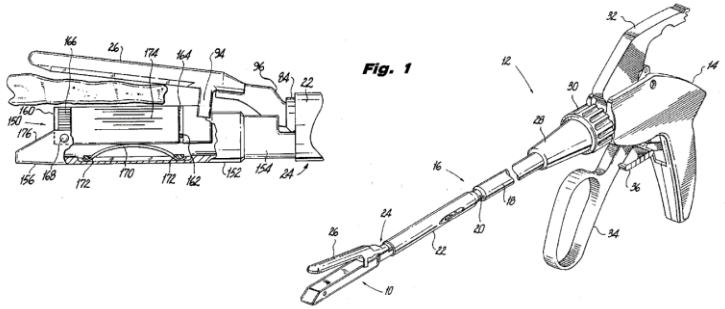

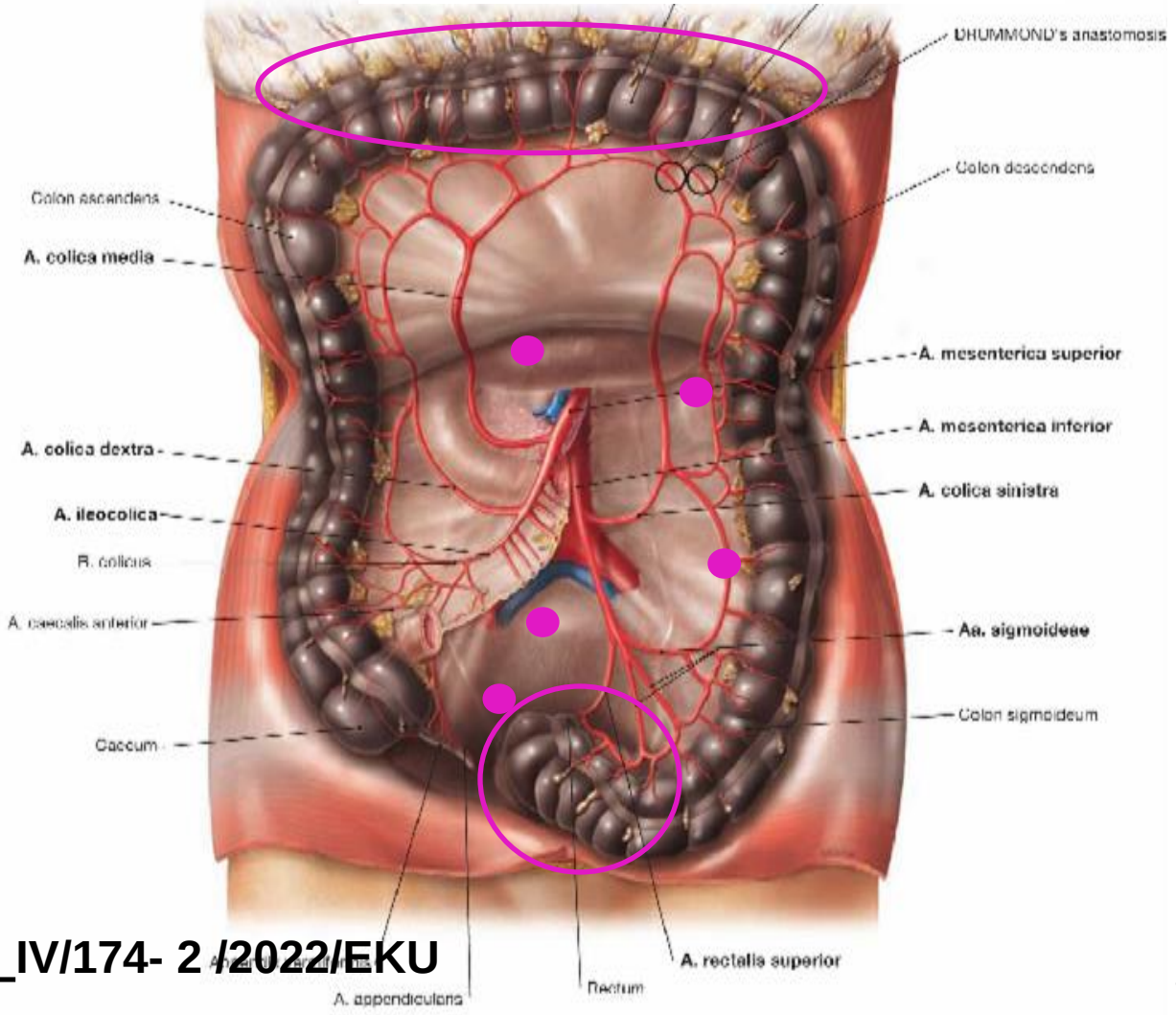

Ex-vivo measurements on surgical leftovers:

- **Different sections of the colon**

Ethical clearence number: IV/174- 2 /2022/EKU

Future plans

1. Large scale tissue measurement with both PTE and the Uzsoki Hospital
2. **Further joint publication with surgeons from the above institutes**
3. **Developement of new sensor design** for higher sensitivity measurement and better noise rejection
4. Achieving a higher level of integration of the force sensor into handheld devices → **higher TRL level for patenting**

Publications

1. J. M. Bozorádi, Z. Sz Bérces, P. Fürjes, G. Papp, Characterization of Gastric Tissue Samples with MEMS Force Sensor Based Indentation method In: Abstract book, Eurosensors XXXVI: 1-4 September 2024, Debrecen, 10.5162/EUROSENSORSXXXVI/PT4.238
2. J. Volk, J. M. Bozorádi, F. Braun, A. Nagy, L. Illés, és J. Radó, „OT4.209 - Ultra-Sensitive Force Gauge Accessory for Microscope Micromanipulators”, in Lectures, Debrecen (Hungary): AMA Service GmbH, Von-Münchhausen-Str. 49, 31515 Wunstorf, 2024, o. 81–82. doi: 10.5162/EUROSENSORSXXXVI/OT4.209.
3. Bató L., Bozorádi J. M., Fürjes P. Microfluidic device for EIS and optical monitoring of cells (2024) 10.5162/EUROSENSORSXXXVI/OT6.160

Courses completed:

1. **OATVFAM1ND Válogatott fejezetek az anyagvizsgálati módszerekből I.**
2. **OATVFAM2ND Válogatott fejezetek az anyagvizsgálati módszerekből II.**

Thank you for your attention!