

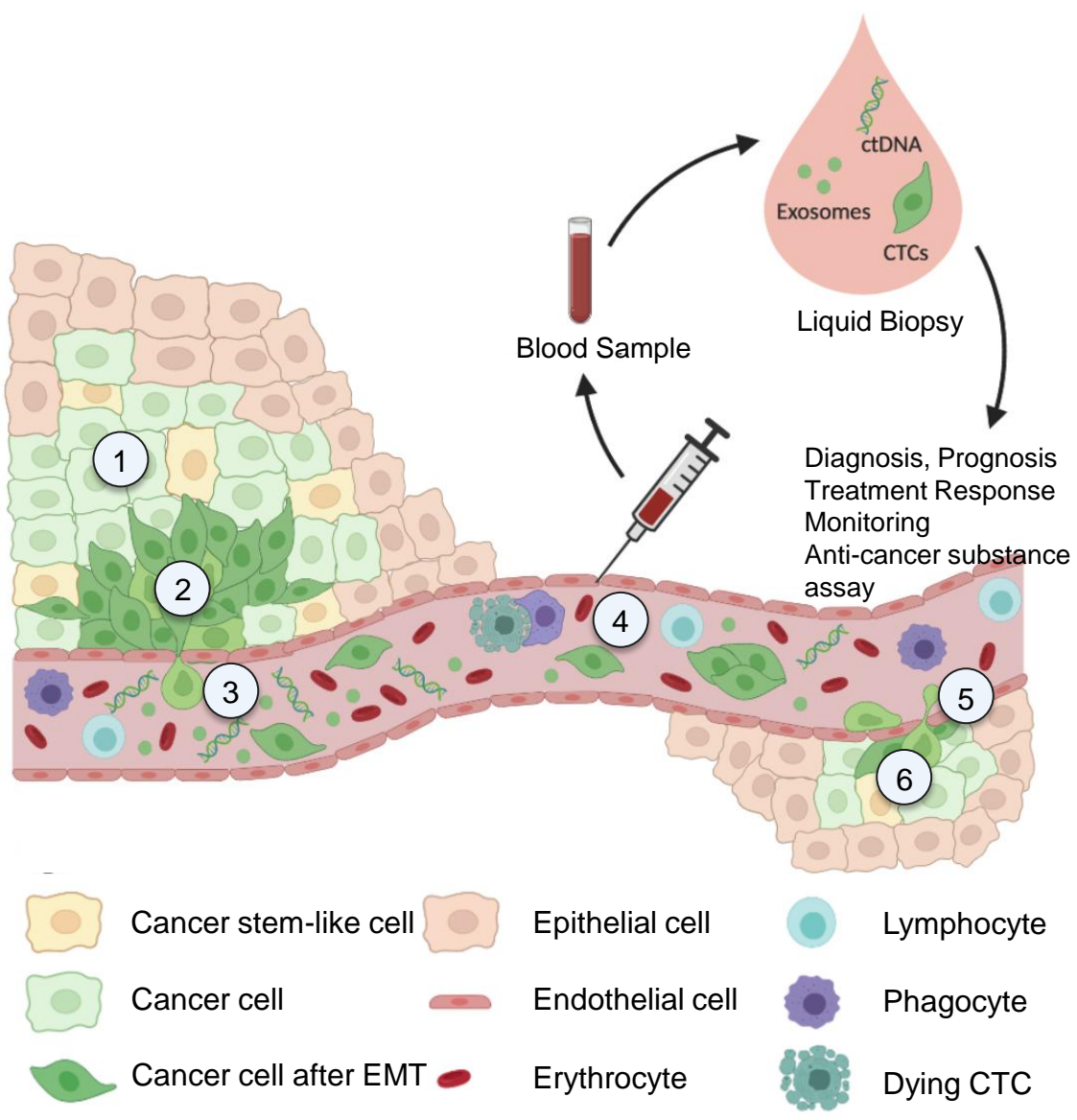
Micro-perforated membrane for label-free cell capture and integrated electrical detection operating in whole blood

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Dissemination of Circulating Tumor Biomarkers in Blood

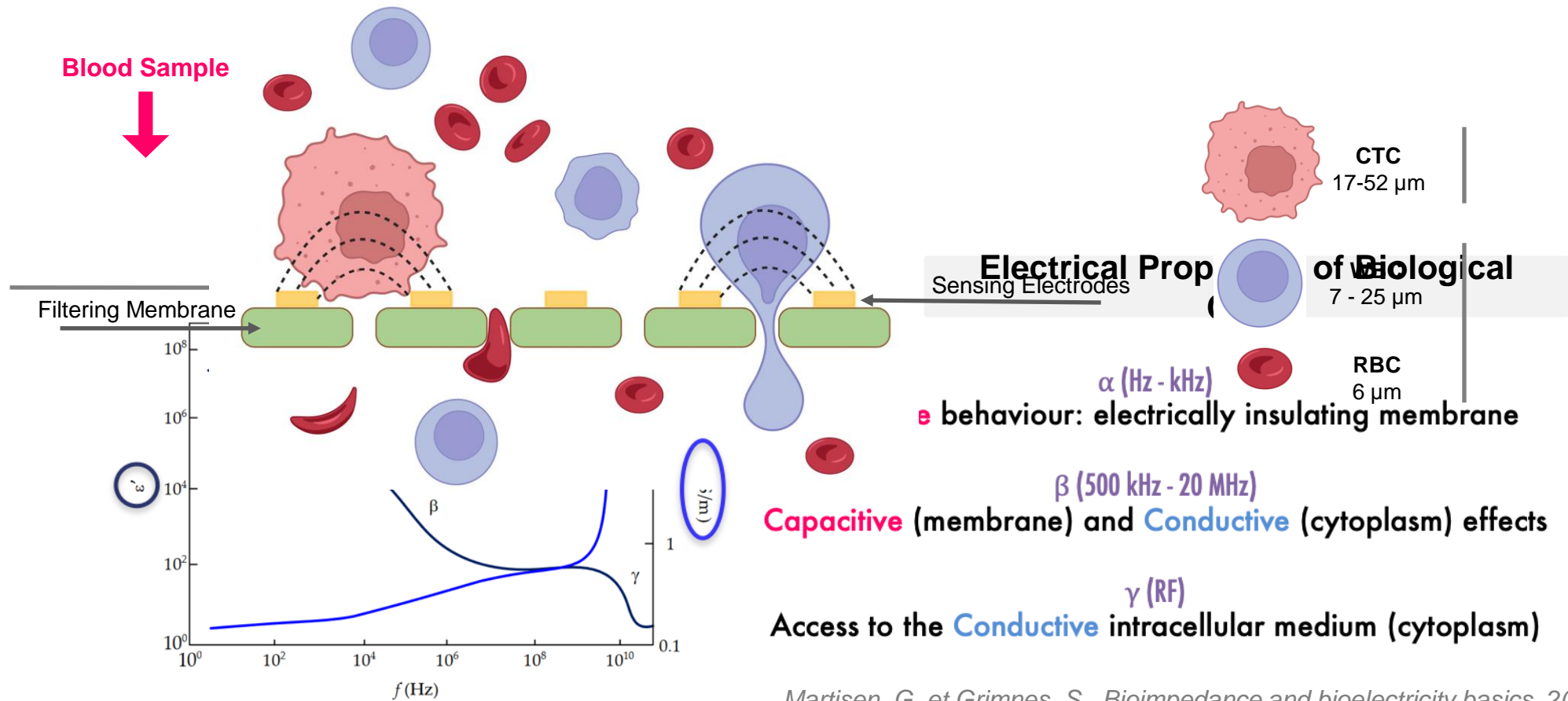


- ① Primary tumor formation and growth
- ② Epithelial to mesenchymal transition (EMT)
- ③ Intravasation
- ④ Spread of CTCs
- ⑤ Extravasation
- ⑥ Mesenchymal to epithelial transition (MET)
Secondary tumor formation and growth

	Cancer stem-like cell		Epithelial cell		Lymphocyte
	Cancer cell		Endothelial cell		Phagocyte
	Cancer cell after EMT		Erythrocyte		Dying CTC

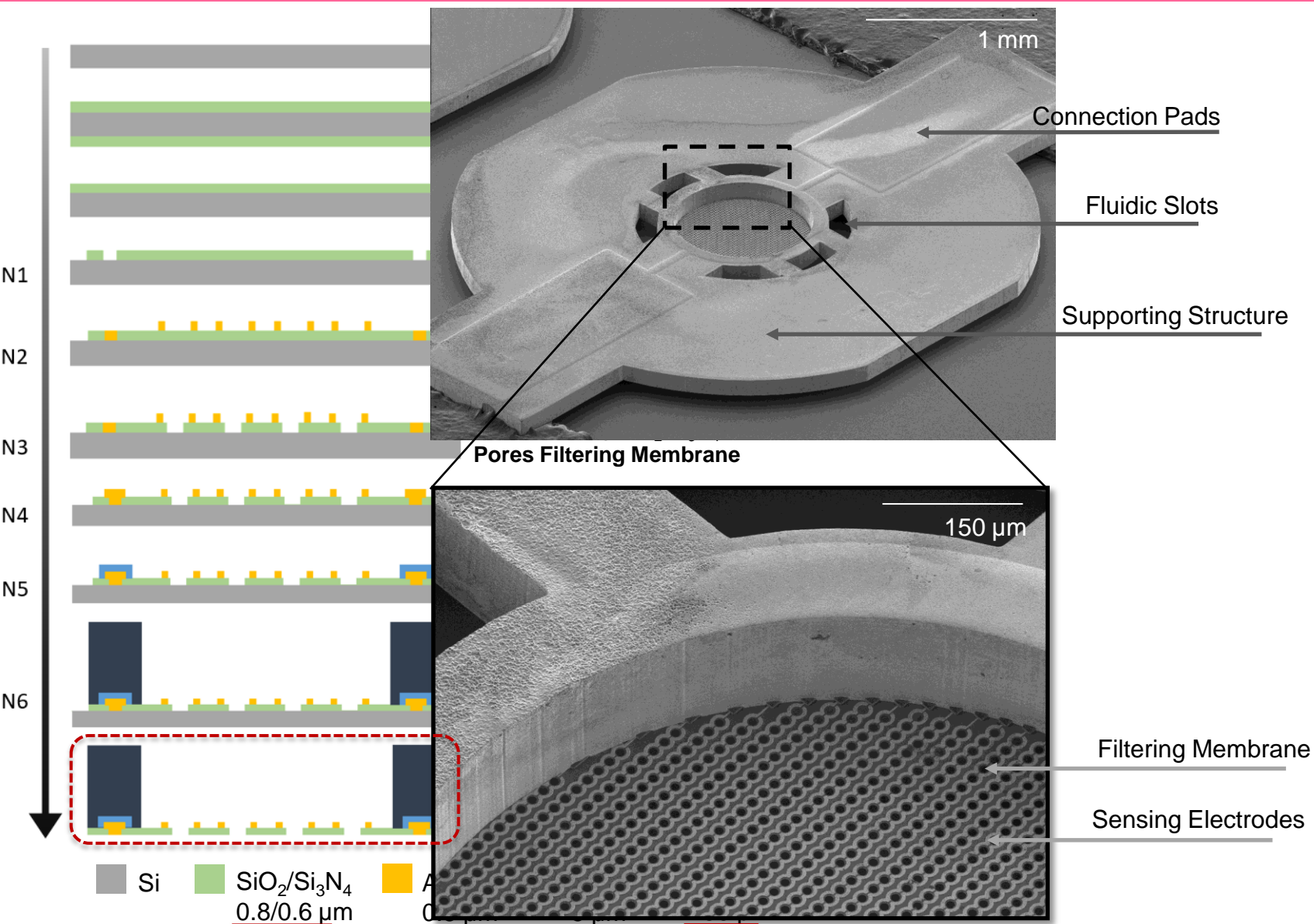
Adapted from Melzer and al., 2017

Combination of Cell Capture and Cell Detection



Martisen, G. et Grimnes, S., *Bioimpedance and bioelectricity basics*, 2008

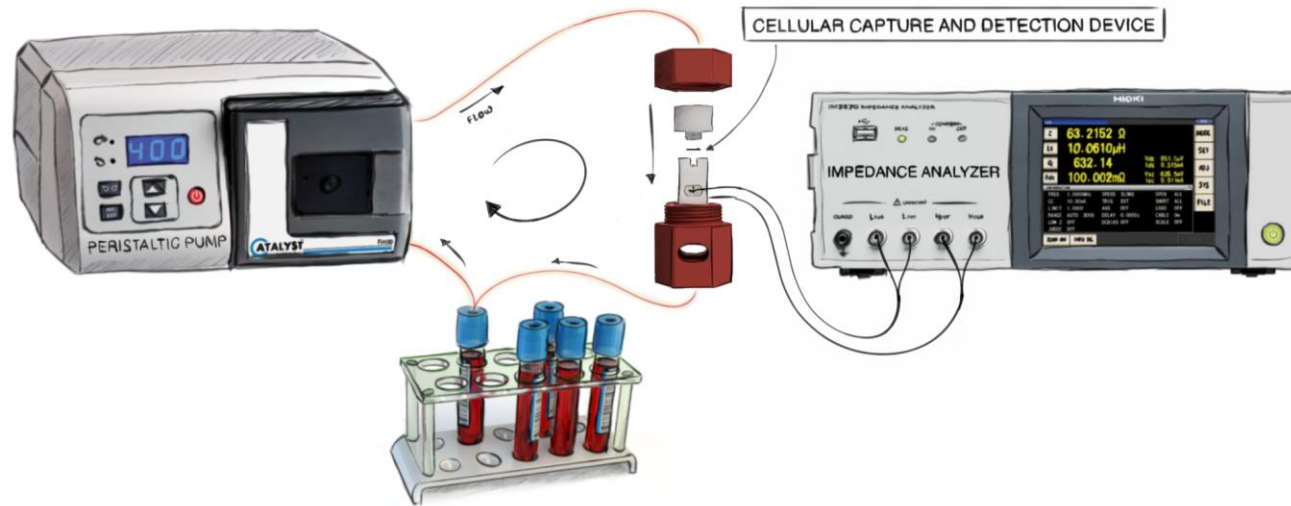
Microdevices Fabrication Process



E. Bou « Micro-dispositifs pour la biopsie liquide : vers la capture et détection intégrées de biomarqueurs cellulaires tumoraux ».

Fabrication Process

Experimental Setup

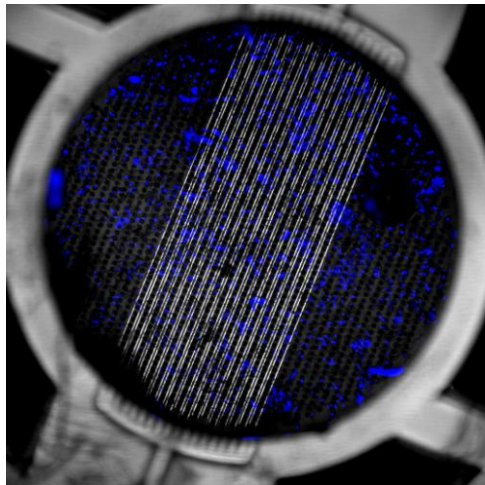


Protocol

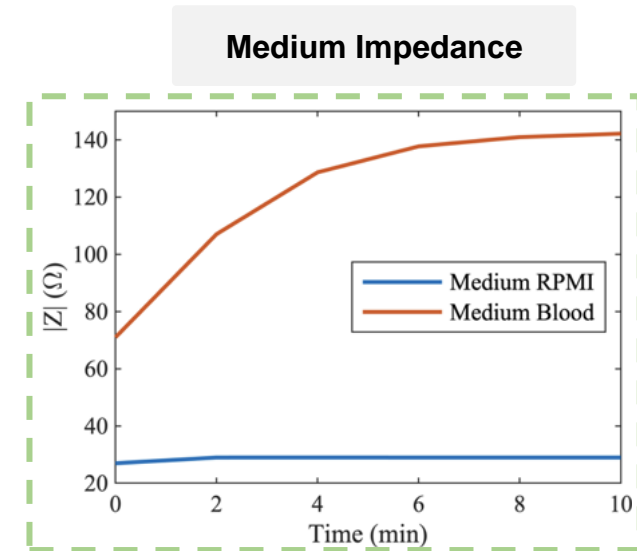
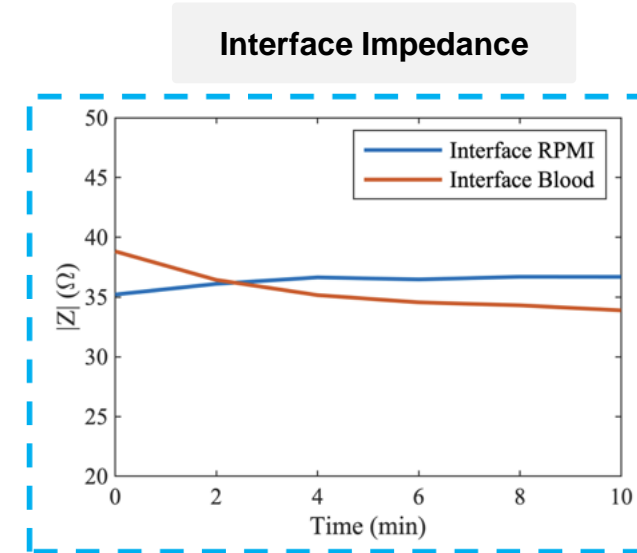
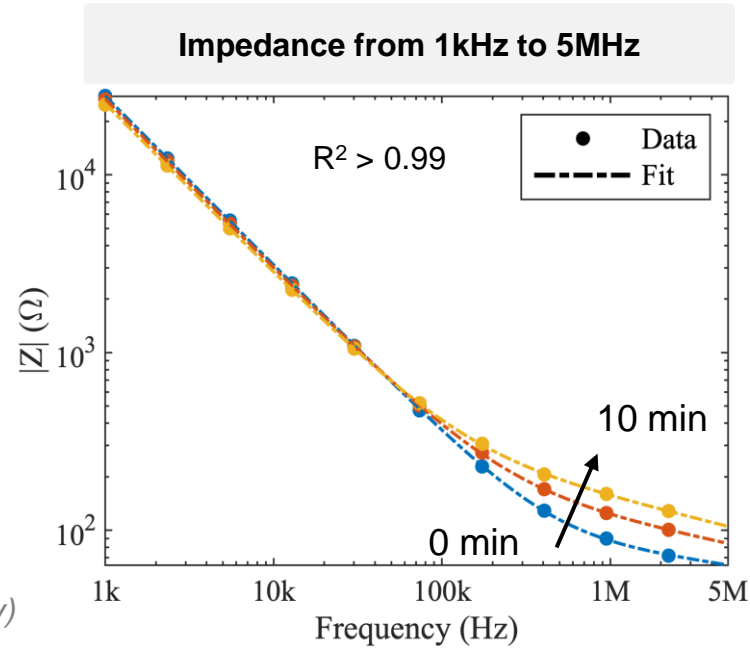
- **Pre-Processing:** Ethanol & PBS
- **Sample Processing:** 10 min in closed loop
- **Post-Processing:** Fixation and Observation

Blood (*EFS – French Blood Collection Site*)

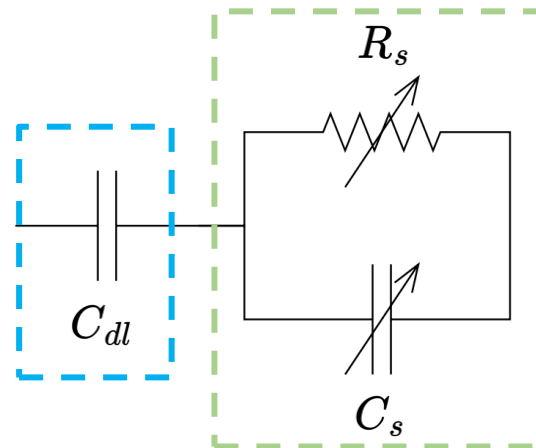
Impedance Evolution during Sample Processing



Overlay Hoechst (Blue) and BF (Grey)

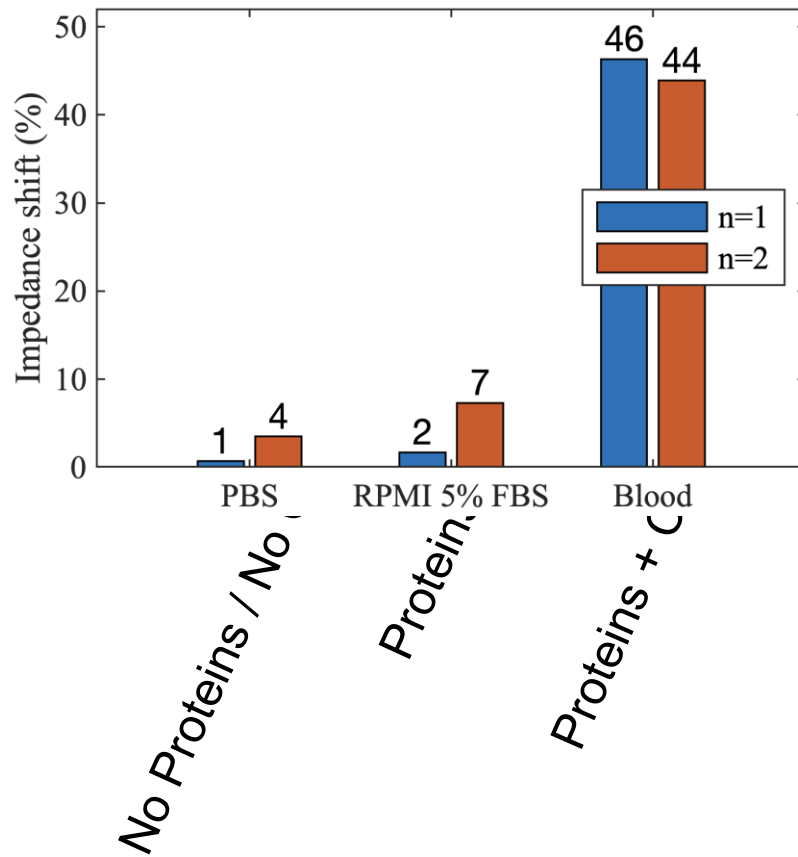


- Impedance increases during sample processing (200 kHz - 5 MHz)
- Good fit with a simple electrical model
- Stability of the Interface Impedance
- Evolution of the Medium Impedance in Blood



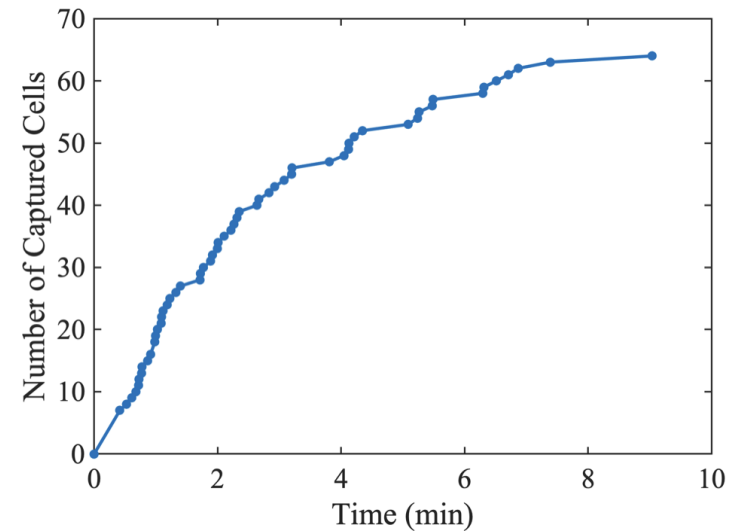
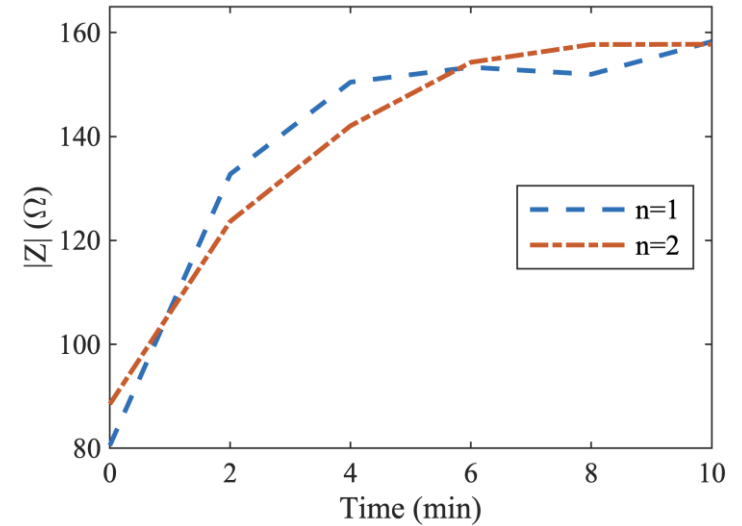
Detection of Captured Cells

Impedance Shift for various Media

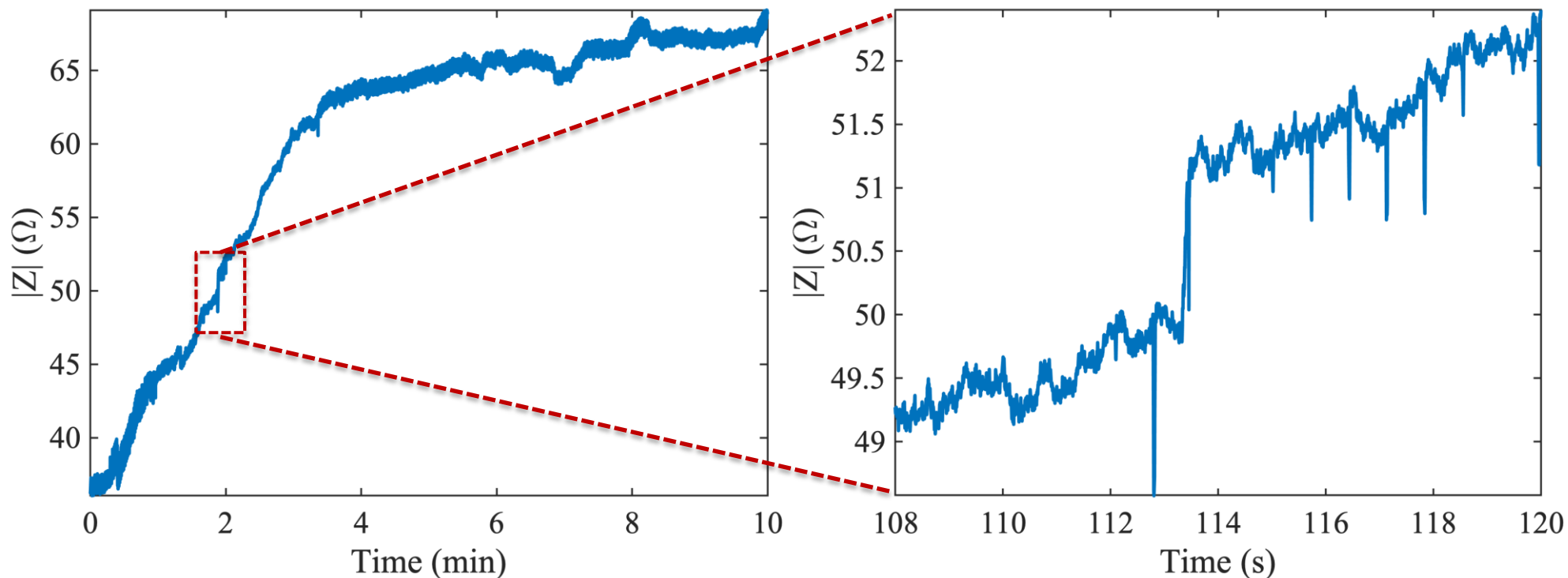


• Detection of captured cells on the filtering membrane

Capture and Detection Kinetics



Conclusion and Prospects



Detection of single cell capture events
Discrimination of CTCs based on their electrical signature

