

swiss scientific initiative in health / security / environment systems



Integrated Circuit Design for Implantable Multi-Target Biosensor ÉCOLE POLYTECHNIQUE **Integrated Systems Laboratory** FÉDÉRALE DE LAUSANNE Sara Ghoreishizadeh, Sandro Carrara, and Giovanni De micheli

Integrated system laboratory, EPFL, Switzerland

Design goals

Enough low power to be remotely powered and implantable.



- Flexible to cover a wide range of biosensors. with very different characteristics.
- Intelligent to keep the patch side implementation simple
- Enable high accuracy measurements.
- Be attached to different implantable to patch communication scheme

Architecture of the configurable Interface Electronics IC

- 1. An optimal tradeoff between features and power/area budget is implemented.
- 2. A second order sigma-delta modulator CLK (OSR 256,1kHz BW) and a digital CIC filter is designed to realize 14 bit ADC.
- 3. A 9-bit DAC is shared to provide different voltage profiles for different



- 4. A configurable multi-target platform to activate and read-out data from 7 sensing sites is designed.
- Two sensing sites are dedicated to 5. pH and temperature for calibration.
- 6. Sensor conditioning is realized in parallel to the measurements.

types of sensor control/measurement.

Temperature measurement



A Platinum Resistance Temperature Detection (Pt RTD) is designed close to the sensing area.

• A resistance difference to pulse-width converter is designed to readout the temperature sensor.

Multi-purpose readout circuit



A common circuit for Cyclic voltammetry, Chronoamperometry, and PH readout is designed.

The circuit is designed to remain stable for different sensors with different characteristics.



Reference: Sara Ghoreishizadeh, Sandro Carrara, and Giovanni De Micheli, "A configurable IC to control, readout, and calibrate an array of biosensors", submitted.

Nano-tera annual meeting, 30-31 May, Bern