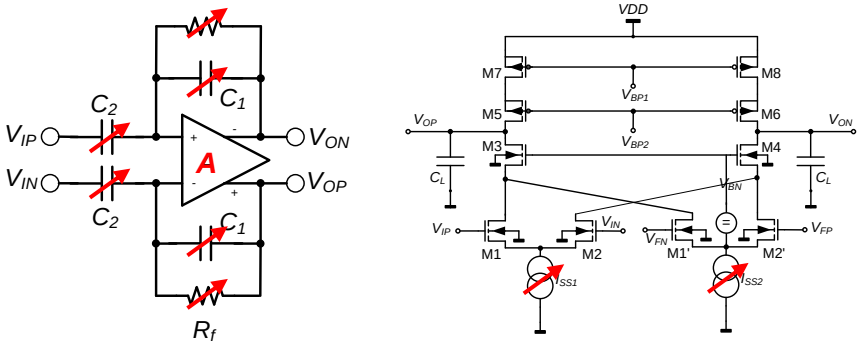
Master Thesis

– Developing Neural Recorders –
Multi-Purpose Architectures for Rapid Prototyping

Within the research project “Developing Neural Recorders”, we will develop implantable recorders to meet the various demands of today’s established spectrum of neural activity observations. For the recordable signal bandwidths, these demands range from mHz in non-invasive systems up to some kHz in invasive approaches. For example, the δ-waves of EEG measurements represent the averaged electrical activity of a large cluster of neurons in a frequency band around 0.1 Hz, whereas a directly measured action potential of one single neuron contains frequency components even above 10 kHz. Due to the different distances between neurons and electrodes, the signal amplitudes thereby vary between 10 µV in case of a peripheral and 500 µV for a central nervous measurement.

The focus of this thesis will thus be put on the evaluation of highly tunable CMOS architectures for neural recorders.



Mainly three concepts have to be developed and evaluated by simulations on transistor-level with CADENCE. First, the variation in signal amplitude demands for a variable gain. Second, the varying signal-to-noise ratios (SNR) of in-vivo experiments require an adaptable dynamic range. Third, the different frequency bands necessitate a tunable bandwidth.

What we expect:
Interests in the design of electronic circuits, willingness to familiarize with a highly interdisciplinary topic and the needed design tools, well documented work, and teamwork.

What we offer:
Intensive supervision of the thesis, nice work environment in a teamwork, latest simulation software tools, electronic design automation tools, excellent lab equipment, and free space for own ideas.

Starting Date: As soon as possible

Contact Person:
Matthias Kuhl
Tel.: 0761 / 203 - 67560
Email: kuhl@imtek.de

Prof. Dr.-Ing. Y. Manoli
Fritz Huettinger Chair of Microelectronics
Department of Microsystems Engineering
University of Freiburg, Germany