SESSION 21 – TAPA II
Biosensors

Friday, June 18, 1:45 p.m.
Chairperson: J. Dawson, Massachusetts Institute of Technology
M. Ikeda, University of Tokyo

21.1 - 1:45 p.m.
A Digitally-Assisted Sensor Interface for Biomedical Applications, J.L. Bohorquez, M. Yip, A.P. Chandrakasan, J.L. Dawson, Massachusetts Institute of Technology, USA

A compact, low-power, digitally-assisted sensor interface for biomedical applications is presented. It exploits oversampling and digital design to reduce system area and power, while making the system more robust to interferers. Anti-aliasing is achieved using a charge-sampling filter with a sinc frequency response and programmable gain. A mixed-signal feedback loop creates a sharp, programmable notch for interference cancelation. A prototype was implemented in 0.18 um CMOS and the on-chip blocks consume a total of 255 nW - 2.5 µW from a 1.5 V supply depending on noise and bandwidth requirements.

21.2 - 2:10 p.m.
A 2.4µA Continuous-time Electrode-Skin Impedance Measurement Circuit For Motion Artifact Monitoring in ECG Acquisition Systems, S. Kim, R.F. Yazicioglu, T. Torfs, B. Dilpreet, P. Julien, C. Van Hoof, IMEC, Belgium

A continuous time electrode skin impedance monitoring system is implemented in parallel with ECG monitoring. To avoid degradation of the ECG signal quality, chopper stabilized AC current sources are adopted. Measured impedance signal is used as a reference signal input for a post processing adaptive filter removing motion artifacts in the ECG signal. The impedance measurement core is implemented in 0.5µm CMOS process and dissipates 2.4µA from a 2V.

21.3 - 2:35 p.m.
A Low Power CMOS Receiver for a Tissue Monitoring NMR Spectrometer, J. Kim, B. Hammer, R. Harjani, University of Minnesota, USA

This paper presents a low power CMOS nuclear magnetic resonance (NMR) receiver chip for monitoring of small tissue samples within the human body. We present preliminary results from a prototype spectrometer focused on the phosphorus (31-P) spectra operated in a 5 Tesla B0 magnet. The prototype, fabricated in a 130nm CMOS technology, occupies an active area of $0.215mm^2$ and consumes 4mA from a single 1.5V supply.

21.4 - 3:00 p.m.
An Activity-Dependent Brain Microstimulation SoC with Integrated 23nV/rtHz Neural Recording Front-End and 750nW Spike Discrimination Processor, M. Azin, D. Guggenmos*, S. Barbay*, R. Nudo*, P. Mohseni, Case Western Reserve University, *Kansas University Medical Center, USA

An activity-dependent intracortical microstimulation SoC in 0.35µm 2P/4M CMOS converts neural signals recorded on one electrode to electrical stimuli delivered via another electrode in real-time within a rat's cerebral cortex. The system integrates an analog recording front-end with rms input noise voltage of 2.6µV in 10.5kHz bandwidth, 5.5µW 10b SAR ADC, 750nW digital spike discrimination processor, and a charge-balanced constant-current stimulating back-end that delivers up to 94.5µA with 6b resolution when triggered by neural activity.