



Contribution ID: 50

Type: not specified

EDET DH80K- A DEPFET based Ultra High Speed Camera System for TEM Direct Electron Imaging

We present a camera system for high time-resolved direct electron imaging on a TEM furnished with a pulsed electron source to observe dynamic processes in real space. The sensors use an SOI detector substrate with $50\ \mu$ to $30\ \mu$ thickness. The high intensity of the electron source requires tailored DEPFET devices with inherently high signal-to-noise, high speed readout capability, and nonlinear response matching the high dynamic range, arranged in arrays of 512×512 pixels with $60 \times 60\ \mu^2$ size. Readout is done in 4-row parallel rolling-shutter mode; customized multichannel readout ASICs read a DEPFET array in $12.8\ \mu\text{s}$, corresponding to a maximum source pulse frequency of 80 kHz, and digitize the data with 8 bit. The data stream is serialized and buffered by custom ICs with sufficient memory for a burst of 100 frames. In this way, stroboscopic movies can be recorded at a time resolution of $13\ \mu\text{s}$. The subsequent DAQ components permit a burst rate of up to 100 bursts per second. All ASICs are bump bonded to the substrate of the detector array itself, which is provided with the corresponding metal track system to form an ultra-compact all-silicon-module (ASM). Each ASM, combined with individual mechanical support, electrical services and readout electronics, is an independent subsystem. The complete focal plane with its $3 \times 3\ \text{cm}^2$ area consists of four tile modules integrated on a common baseplate optimized for low background and thermal management within a customized vacuum box fitting all prevalent TEM types.

Primary authors: Dr TREIS, Johannes (MPG Semiconductor Laboratory); ANDRICEK, Laci (MPG Semiconductor Lab); DOURKI, Ibrahim (Max-Planck-Institute for Structure and Dynamics of Matter); Dr SASCHA, Epp (Max-Planck-Institute for Structure and Dynamics of Matter); GITARIC, Djordje (Max-Planck-Institute for Structure and Dynamics of Matter); KOFFMANE, Christian (MPI für Physik); KRIVOKUCA, Silvia (MPG Semiconductor Laboratory); Prof. MILLER, Dwayne (Max-Planck-Institute for Structure and Dynamics of Matter); NINKOVIC, Jelena (MPG Halbleiterlabor); PERIC, Ivan (KIT - Karlsruhe Institute of Technology (DE)); PREDIKAKA, Mitja; Dr PRINKER, Eduard (MPG Semiconductor Laboratory); RICHTER, Rainer (Halbleiterlabor der MPG); SCHALLER, Gerhard (MPG Semiconductor Laboratory); Dr SCHOPPER, Florian (MPG Semiconductor Laboratory); TAFELMAYER, Eva (MPG Semiconductor Laboratory); WASSATSCH, Andreas (MPI Physik); WESTERMEIER, Fabian (Max-Planck-Institute for Structure and Dynamics of Matter); ZIRR, Christian (MPG Semiconductor Laboratory)

Presenter: Dr TREIS, Johannes (MPG Semiconductor Laboratory)