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One-dimensional detector for diffraction experiments at a synchrotron radiation beam

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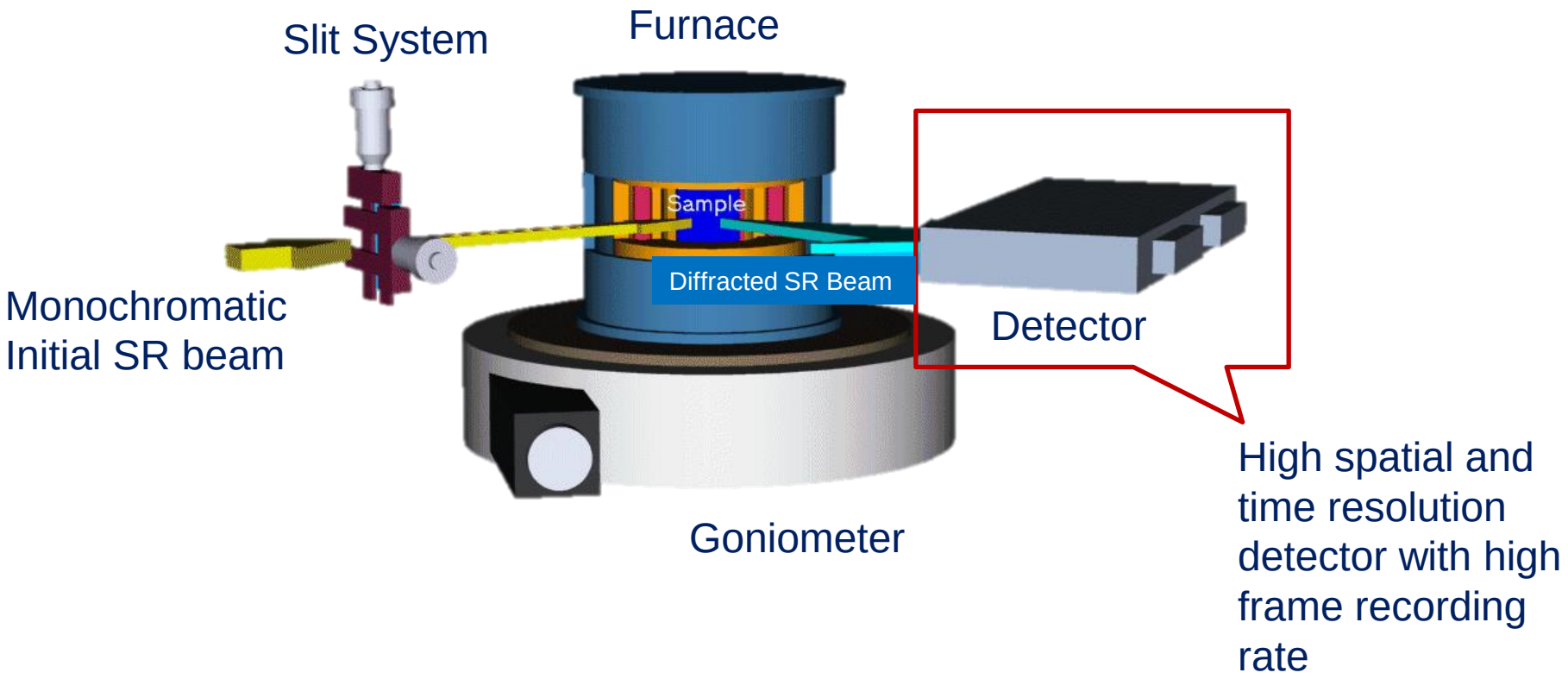
Content

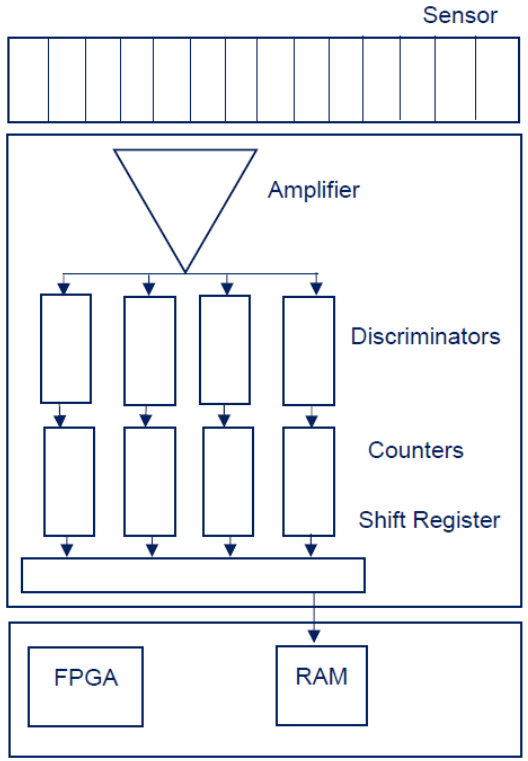
1. Experiment on small-angle X-ray scattering (SAXS);
2. Detector for time-resolved diffraction studies SOCOD;
3. Detector channel design;
4. Current status of the work

Experimental setup on small-angle X-ray scattering (SAXS)



Detector for time-resolved diffraction studies SOCOD

DETECTOR SIMPLIFIED SCHEMATIC VIEW



DETECTOR REQUIREMENTS

Angular resolution ~10^{-2}°

Spatial resolution ≤ 0.1 μm

Frame rate ≥ 10 kHz

Rate capability ~ 1MHz/ch

ENC ~100e (τ~0,3 ns)

Detector Components

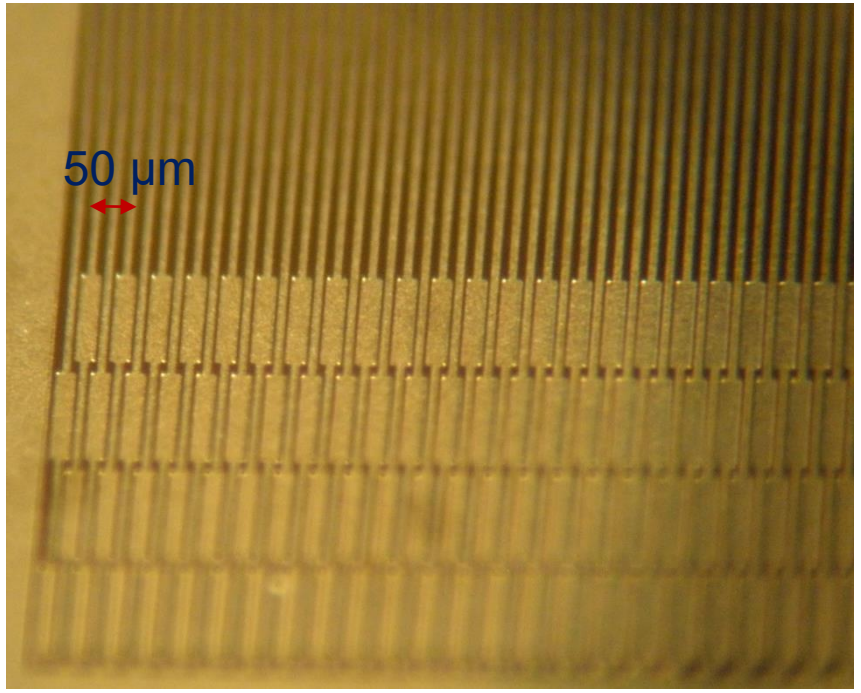
SENSORS OF SOCOD DETECTOR

50 mm

Si for energy <20 keV

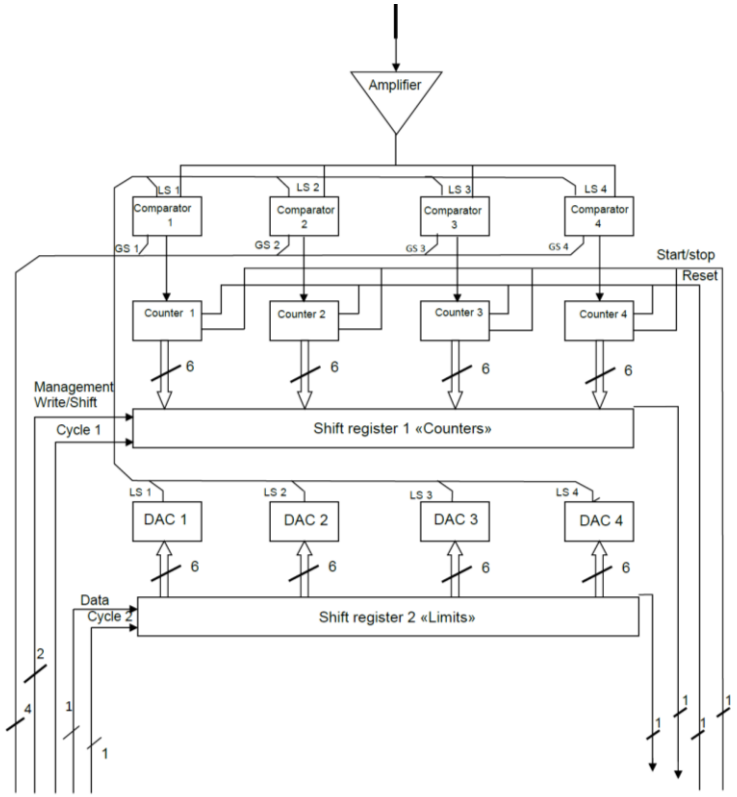
GaAs for energy >20 keV

STRUCTURE OF THE SENSOR OF SOCOD DETECTOR

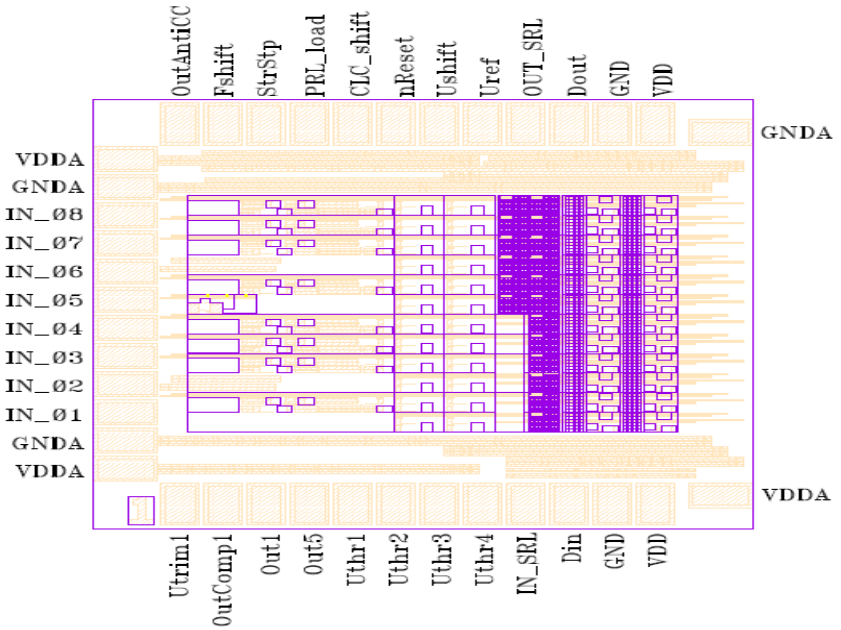


Channel design

CHANNEL SIMPLIFIED SCHEMATIC VIEW

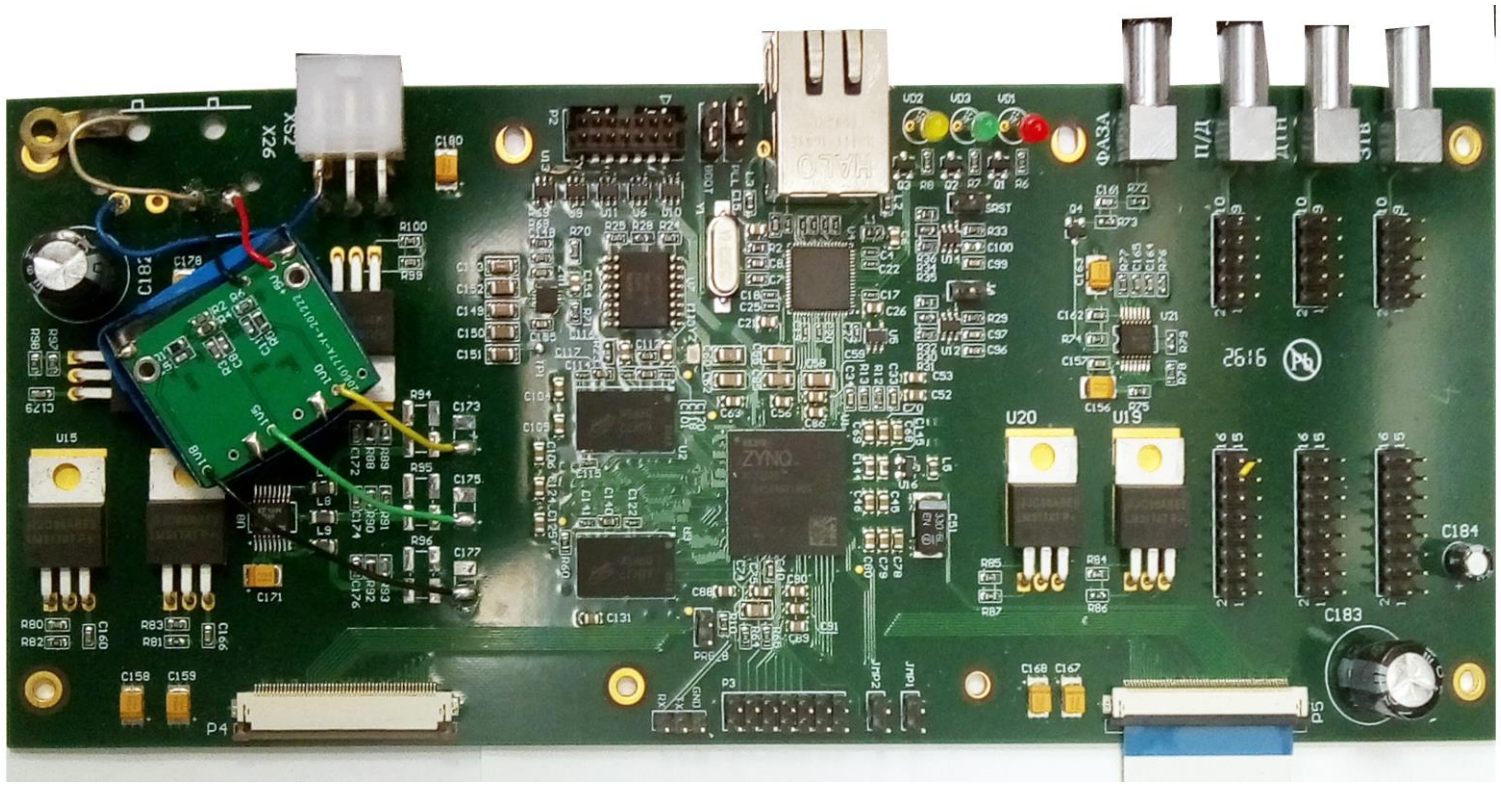


SICOD8A ASIC

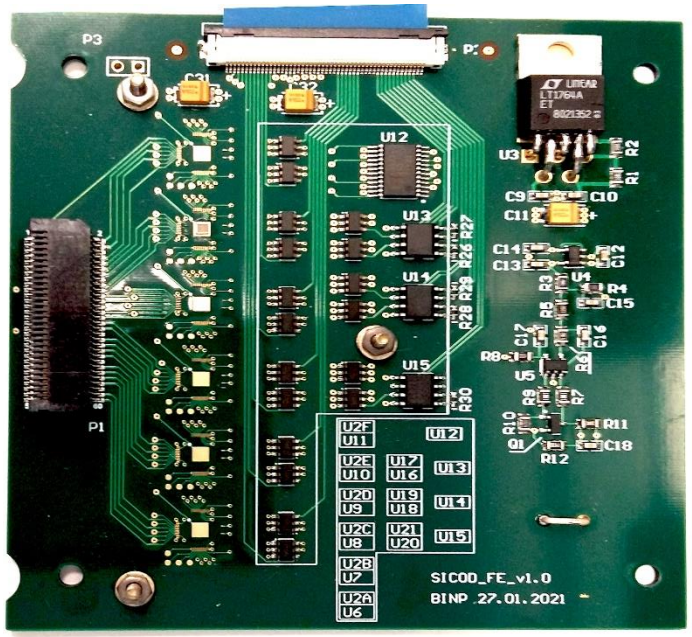


Components of detector electronics

MAIN BOARD



SICOD_FE MODULE



Current results of the work

1. The prototype of such ASIC has been developed;
2. The prototype ASIC contains 8 channels with different design options. The equivalent noise charge (ENC) is expected to be about 180 electrons;
3. At present, the front-end board with the ASICs has been assembled and is ready for testing. Development of the detector firmware and software is on the way