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ROADRUNNER II: High speed fixed target serial crystallography

We have developed a micro-patterned sample holder for serial crystallography experiments at both synchrotron and FELs. It can be easily loaded with thousands of micro-crystals and due to the use of single crystalline silicon as substrate material and the effective removal of any excessive mother liquor very low background levels can be achieved in diffraction experiments. In combination with the specially developed ROADRUNNER goniometer we were able to collect diffraction data at an acquisition rate of 120 Hz and to collect more than 10000 indexable diffraction patterns from CPV18 crystals in less than ten minutes at the XPP instrument at LCLS and to determine the crystal structure of the BEV2 virus from data collected in less than 30 minutes.

We are currently developing an improved version, the ROADRUNNER II goniometer, which will provide further features such as automatic chip alignment, pore pattern and crystal recognition and will allow for sample exchange rates of up to 1 kHz.