ESRF	**Experiment title:** Investigation of the binding dynamics of Chitotriose to Lysozyme by pink beam serial crystallography	**Experiment number**: LS-2668
Beamline: ID09	**Date of experiment**: from: 12.07.2017 to: 18.07.2017 and from: 8.02.2018 to: 13.02.2018	**Date of report**:
Shifts: 36	**Local contact(s)**: Matteo Levantino	*Received at ESRF:*

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Report:

We originally proposed to test fixed-target sample delivery using a tape-based system with the aim to probe mixing of ligands into protein crystals and resolve binding in a time-dependent manner. However, we departed from the original plan because of the expected high background due to the kapton tape that was intended to be used for sample delivery. This would prevent measuring of weak Bragg reflections. This is especially important for mixing experiments, as it is desirable to use as small crystals as feasible, as diffusion time of ligands into the crystals correlates to crystals size. Instead we resolved to use micro-patterned silicon chips as fixed target in combination with a goniometer with a fast translation stage to allow for fast scanning through the X-ray beam. These chips provide very low background and a very suitable for serial crystallography experiments with microcrystals. In combination with the goniometer, we were able to demonstrate the feasibility to conduct fixed-target serial crystallography at synchrotrons at 1 kHz data acquisition rate. The beamtimes led to the following publication:

1 kHz fixed-target serial crystallography using a multilayer monochromator and an integrating pixel detector.

Tolstikova A(1)(2), Levantino M(3), Yefanov O(1), Hennicke V(1), Fischer P(1), Meyer J(4), Mozzanica A(5), Redford S(5), Crosas E(4), Opara NL(5)(6), Barthelmess M(1), Lieske J(1), Oberthuer D(1), Wator E(7), Mohacsi I(1), Wulff M(3), Schmitt B(5), Chapman HN(1)(2)(8), Meents A(1)(4).

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Reliable sample delivery and efficient use of limited beam time have remained bottlenecks for serial crystallography (SX). Using a high-intensity polychromatic X-ray beam in combination with a newly developed charge-integrating JUNGFRAU detector, we have applied the method of fixed-target SX to collect data at a rate of 1 kHz at a synchrotron-radiation facility. According to our data analysis for the given experimental conditions, only about 3 000 diffraction patterns are required for a high-quality diffraction dataset. With indexing rates of up to 25%, recording of such a dataset takes less than 30s.

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