



INVITATION

SWISSFEL SEMINAR

Date: Tuesday, 15 March 2016
Time: 13h15
Place: OSGA/EG06 (Hörsaal PSI Schulungsgebäude)

Dear Colleagues,

You are cordially invited to following SwissFEL Seminar:

**Radiation Damage and Phasing in Protein Crystallography at X-ray Free-Electron Lasers –
Dr. Karol Nass, Max-Planck-Institut, Heidelberg, Germany**

Abstract

The ultrafast radiation damage process begins with photoionization, followed by impact ionization by photo- and Auger electrons. The ionization of atoms develops with time, ultimately causing lattice disorder and Coulomb explosion of the crystal. Due to very short pulse duration, it has been proposed that diffraction can be recorded before significant structural changes occur. This has been termed “diffraction-before-destruction”. However, achieving sufficient scattering signal for measuring nanocrystals or non-crystalline single particles requires higher power densities than those used in microcrystallography experiments.

In order to explore whether undamaged crystal structures can be obtained with higher power densities at the sample, we used two colour x-ray FEL pulses (15 fs) with variable (0-100fs) time delay from the Linac Coherent Light Source (LCLS). These pulses were focused to approximately 100 nm² to study radiation damage processes in protein crystals in a time-resolved fashion.

It is expected that a significant fraction of atoms in the crystal become highly ionized during exposure to the tightly focused x-ray FEL pulse. Indications of global and specific radiation damage and observation of correlated movement of atoms in the structure will be discussed. In addition, *de novo* phasing approaches and efforts in minimizing the systematic errors will be discussed.

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Best regards,
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