11th MT ARD ST3 - (pre-meeting) UED Workshop

Report of Contributions

Contribution ID: **2** Type: **not specified**

Introduction

Wednesday 5 July 2023 09:00 (10 minutes)

Presenters: EVTUSHENKO, Pavel (HZDR / ELBE); KAMPS, Thorsten (Helmholtz-Zentrum Berlin / Humboldt-Universität Berlin)

Session Classification: UED pre-workshop

Contribution ID: **3** Type: **not specified**

REGAE: Status Update and Development Plans for UED at DESY

Wednesday 5 July 2023 09:10 (25 minutes)

The relativistic electron gun for atomic exploration –REGAE –is an operating UED facility at DESY in Hamburg. The presentation will concentrate on the accelerator physics view. An overview of the facility layout, machine parameters, and operational aspects will be given. Development plans and options for the future operation of REGAE, as well as general development trends, will be discussed.

Presenter: FLOETTMANN, Klaus (MPY (Beschleunigerphysik))

Session Classification: UED pre-workshop

Contribution ID: **4** Type: **not specified**

REGAE: DESY's machine for ultrafast electron diffraction

Wednesday 5 July 2023 09:35 (25 minutes)

Due to their strong interaction, electrons are an ideal probe for investigating matter. Compared to commonly used 12 keV X-rays, 3 MeV electrons, as used at REGAE, provide 5 orders of magnitude stronger interaction in combination with three orders of magnitude reduced radiation damage effects. This makes electrons an ideal probe for thin samples and radiation-sensitive low-Z materials, such as biomolecules, which provide only small scattering contrast in X-ray experiments.
REGAE provides electron pulses with an energy of 2 - 5 MeV and a duration down to 20 fs. Its unique ultra-low emittance makes REGAE ideally suited for time-resolved diffraction experiments of complex molecules such as proteins which require a combination of a high transversal coherence lengths in combination with a high bunch charge.
Recent upgrades of the diffraction setup at REGAE include a new sample chamber with a new goniometer and the implementation of a Jungfrau 1M integrating pixel detector for direct electron detection. In the first experiment with the new setup, we were able to determine the 3D structure of the mineral Mica at atomic resolution.
As a next step, we plan to conduct time-resolved diffraction experiments from different organic and inorganic samples, which will be briefly presented towards the end of the presentation.

Presenter: MEENTS, Alke (FS-CFEL-1-BMX (FS-CFEL-1 Fachgruppe BMX))

Session Classification: UED pre-workshop

Contribution ID: **5** Type: **not specified**

Novel approaches and innovative modalities in ultrafast electron scattering applications with accelerators

Wednesday 5 July 2023 10:00 (25 minutes)

Ultrafast electron probing modalities offer unique experimental tools to access the structural dynamics of ultrafast photoinduced processes in materials and molecules, in liquid, gas, and condensed phase systems. Here we propose to capitalize on the exceptional and versatile electron beam parameters of the SEALAB Superconducting RF (SRF) photoinjector to develop a world-wide unique facility for ultrafast electron diffraction and imaging (UED and UEI), dedicated to experiments with high sensitivity in space, energy, and time. These applications highly demand not only extreme beam quality in 6-D phase space such as a few nanometer transverse emittances and femtosecond duration but also equivalent beam stability at MHz repetition rate. The talk with rationalize on beam dynamics driven design studies for different modlalities and discuss first results from preparatory measurements.

Presenter: ALBERDI ESUAIN, Beñat (Helmholtz-Zentrum Berlin)

Session Classification: UED pre-workshop

Contribution ID: **6** Type: **not specified**

Use off the HZDR superconducting RF photogun for high-reprate MeV ultra-fast electron diffraction

Wednesday 5 July 2023 10:40 (25 minutes)

The HZDR superconducting (SC) photoinjector with a 3.5-cell, 1.3 GHz SC niobium cavity and a SC solenoid, installed in a 2 K helium cryomodule, can produuce electron beams with beam energy up to 4 MeV. This gun would allow to setup a similar simple apparatus for MeV UED as the existing SLAC system with a normal-conducting cavity but now with very flexible pulse repetition rate up to a few MHz. Starting with parameters of the existing SRF Gun II operating at ELBE, the performance of a MeV UED is estimated for different operation modes.

Presenter: TEICHERT, Jochen (HZDR)

Session Classification: UED pre-workshop

Contribution ID: **7** Type: **not specified**

On feasibility of bunch length measurements of UED beams with frequency domain techniques

Wednesday 5 July 2023 11:05 (25 minutes)

Presenter: EVTUSHENKO, Pavel (HZDR / ELBE)

Session Classification: UED pre-workshop

Contribution ID: **8** Type: **not specified**

Discussion of plans and possible collaborations

Wednesday 5 July 2023 11:30 (25 minutes)

Presenter: ALL

Session Classification: UED pre-workshop