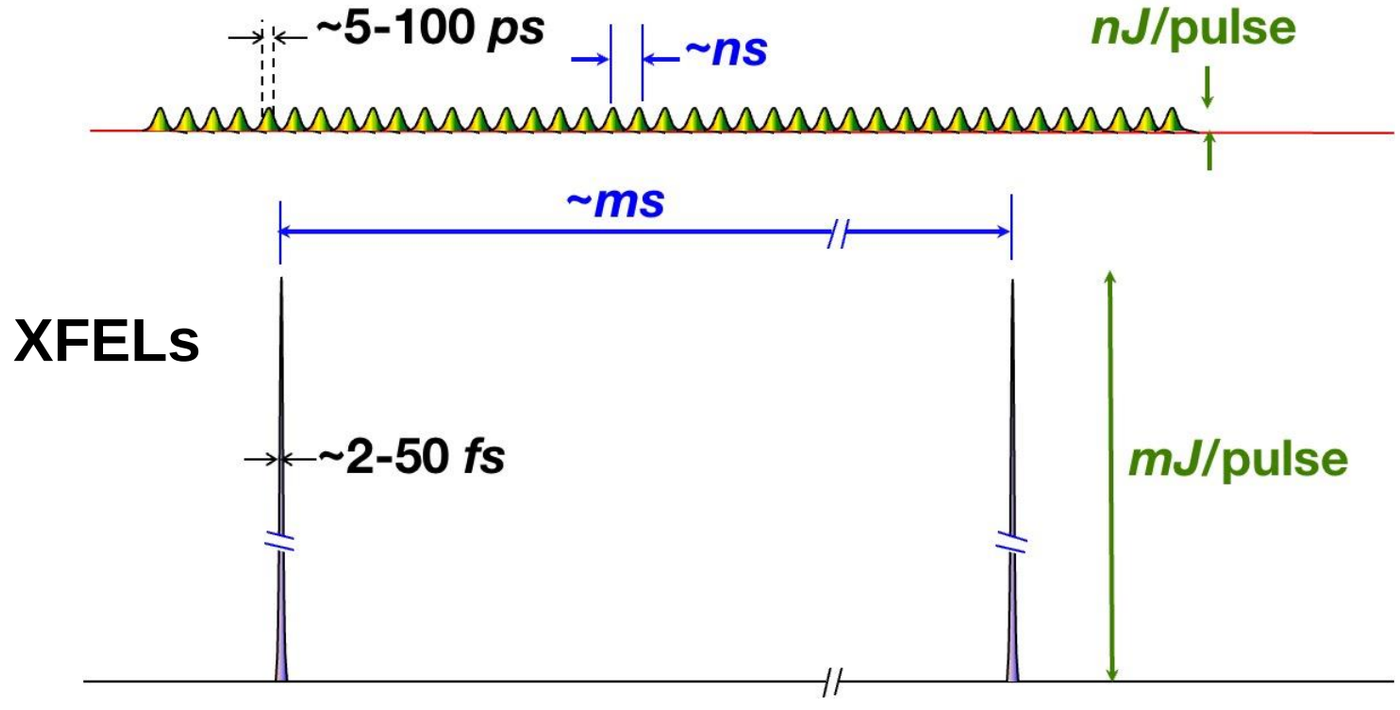
Comments on the SAC meeting

- We are grateful to the SAC members for having an interest and finding the time to evaluate our project and provide feedback
- We hope that the SAC will be able to provide a written assessment of our project to help us keeping it on track
- Each block of presentations is followed by a session for discussions but ad-hoc questions and discussions are welcome
- The SAC is welcome to adjust the format of the meeting and request additional information
- **We ask the SAC to comment on**
  - Feasibility to achieve the scientific objectives.
  - Soundness of the technical approach. Potential risks and challenges.
  - Alternative solutions that worth being investigated.

A Novel Compact Coherent X-Ray Source Enabling New Science Opportunities

Today
X-ray Free Electron Lasers and Synchrotrons

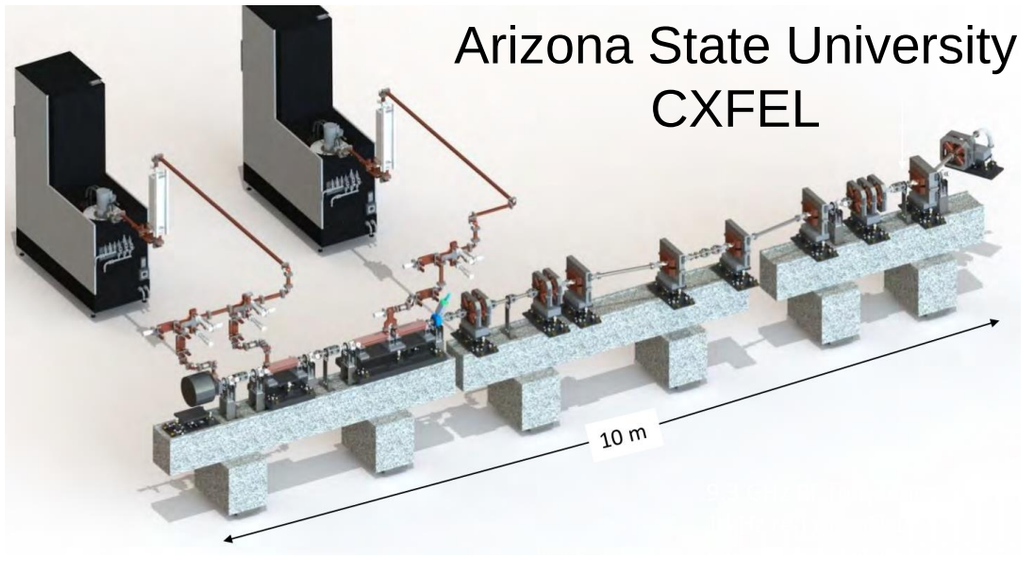
Synchrotrons



comparable average power

cost: ~2000 M€

Future
Compact Coherent X-ray Sources



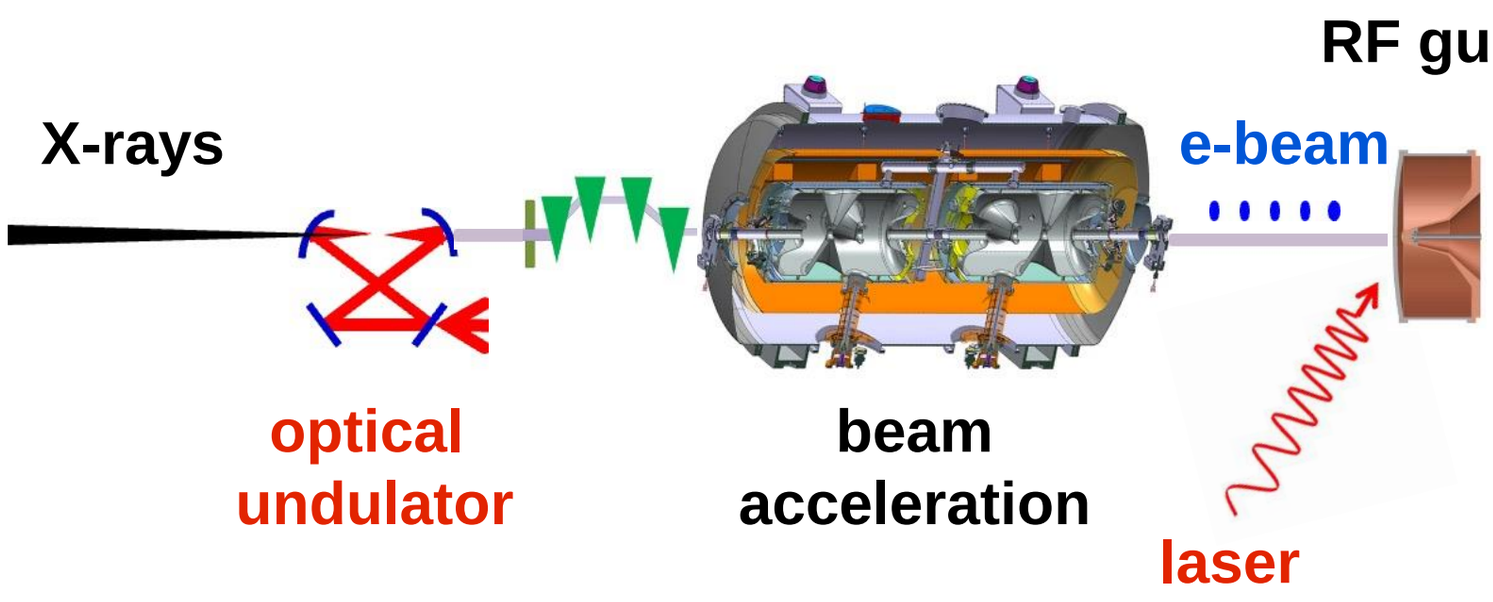
…can uniquely combine synchrotron repetition rates with XFEL pulse durations

~20 M€

Why FREIA at UU ?

Unique infrastructure & competence ideally suited for this project

FREIA, a unique cryogenic facility in Sweden funded by KAW



V. Goryashko, et al. (FREIA)

UPPSALA
UNIVERSITET

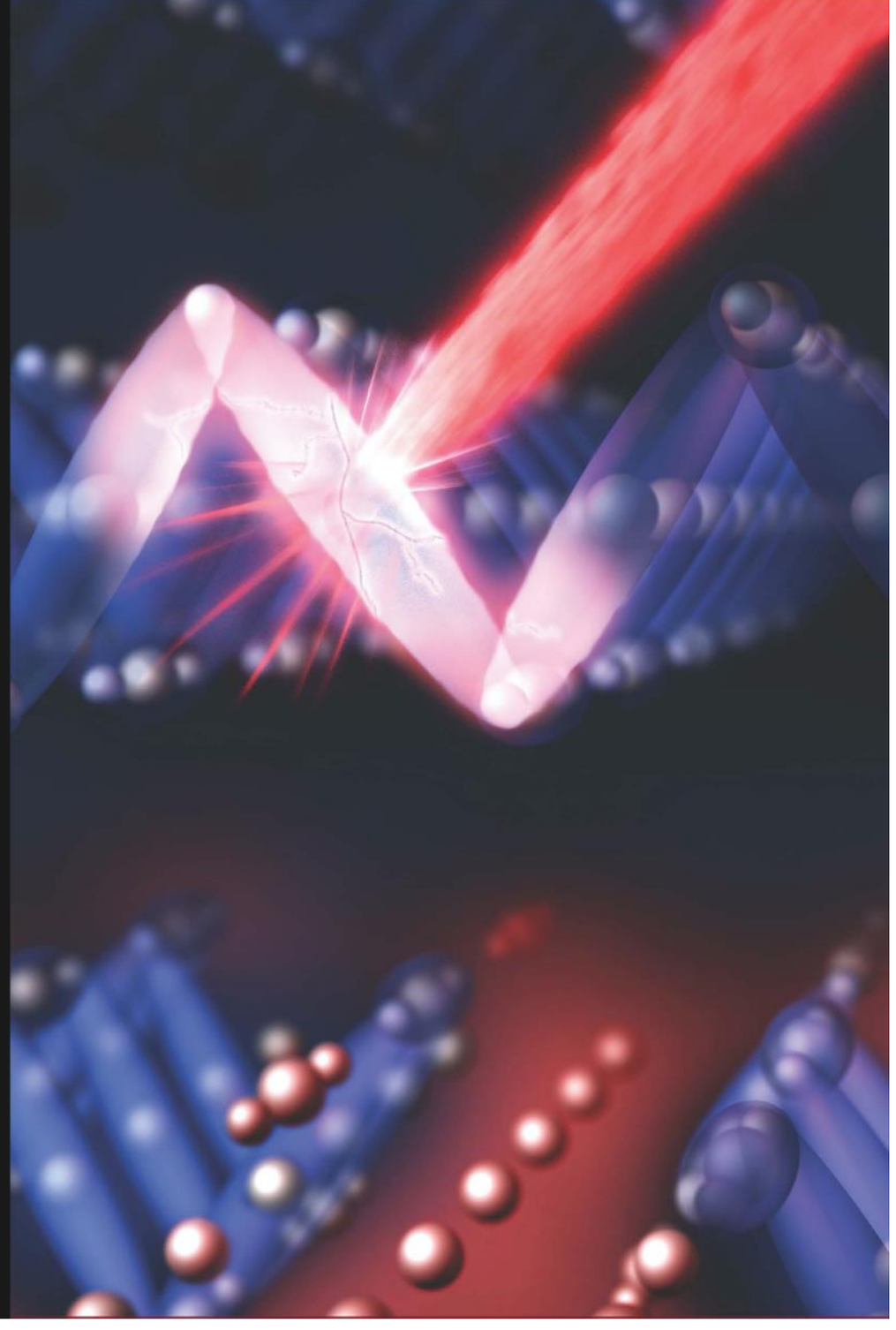
28-29 Oct 2019, Häggsalen, Ångström Laboratory

Workshop on

Science Opportunities with Table-Top Coherent X-Ray Sources

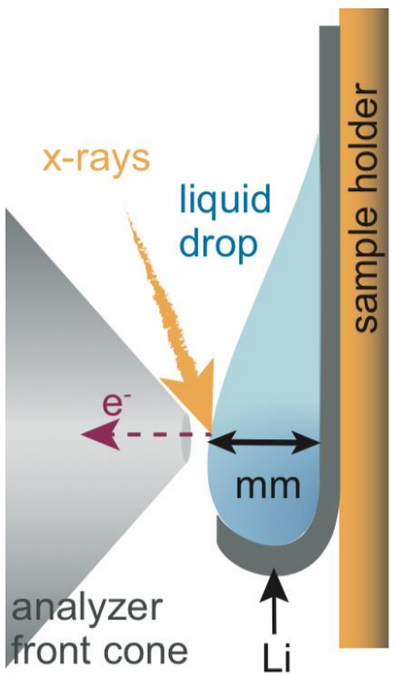
Invited speakers:
Franz Kärtner, CFEL, Hamburg
Jom Luiten, TU Eindhoven
Fulvio Parmigiani, Trieste University
Kristina Edström, Uppsala University
Laszlo Veisz, Umeå University

Photon Science Center, Uppsala University
photonscience.uu.se



Workshop program and talks are available at:
https://indico.uu.se/event/688/

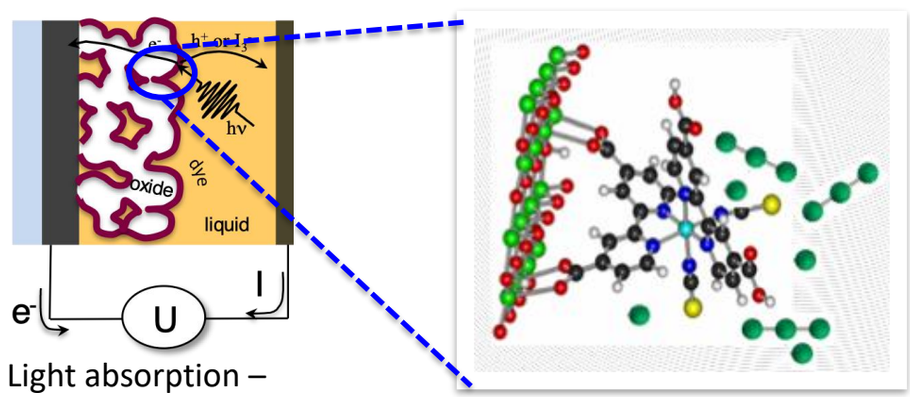
Science opportunities



X-ray photoemission provides access to bulk properties, e.g. in batteries

J. Maibach, et al., Nature Comm. **10**, 3080 (2019)

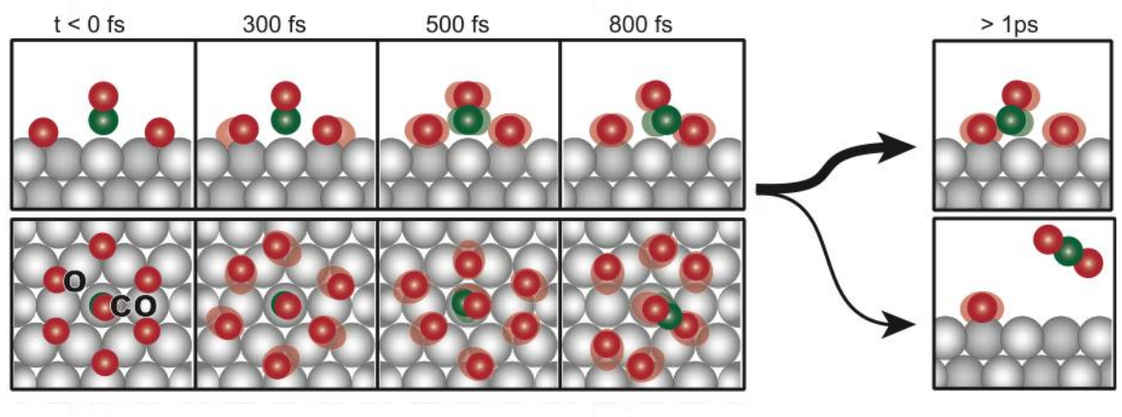
Enables probing the charge separation across buried interfaces in solar cell materials



Allows to discover novel complex functional materials

“Materials Genome” exploration of new materials

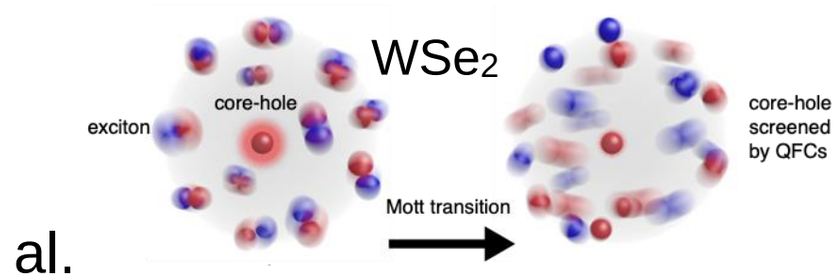
Exploring chemical reactions and catalysis at ambient conditions



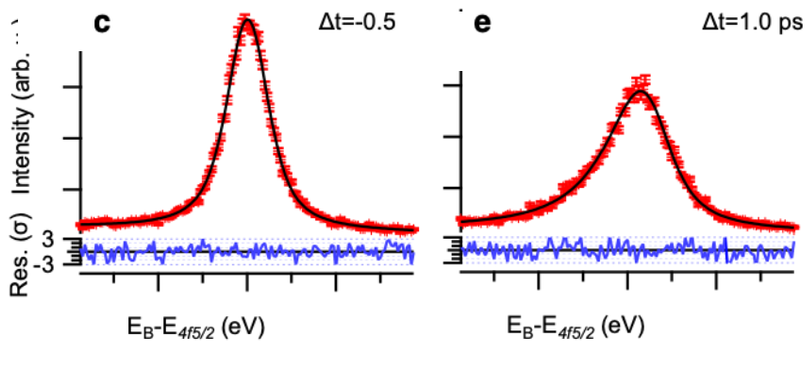
H. Öström, et al., Science **347**, 978 (2015)

Science opportunities (continued)

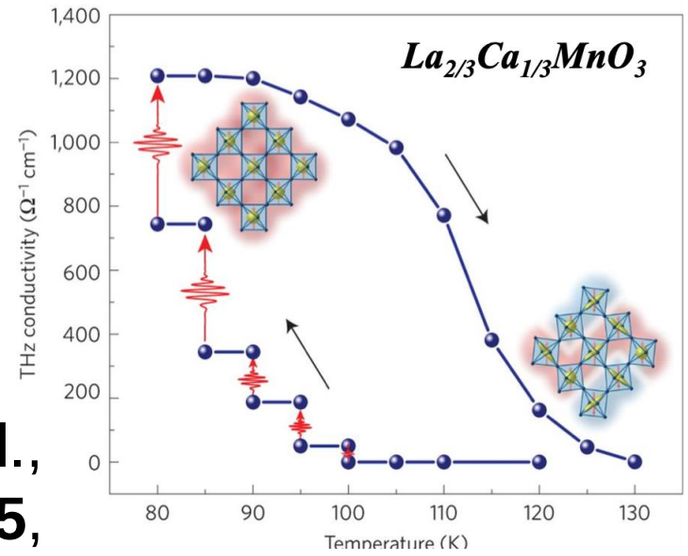
Core levels are sensitive probes of electron correlations



Dendzik, et al. PRL (2020)

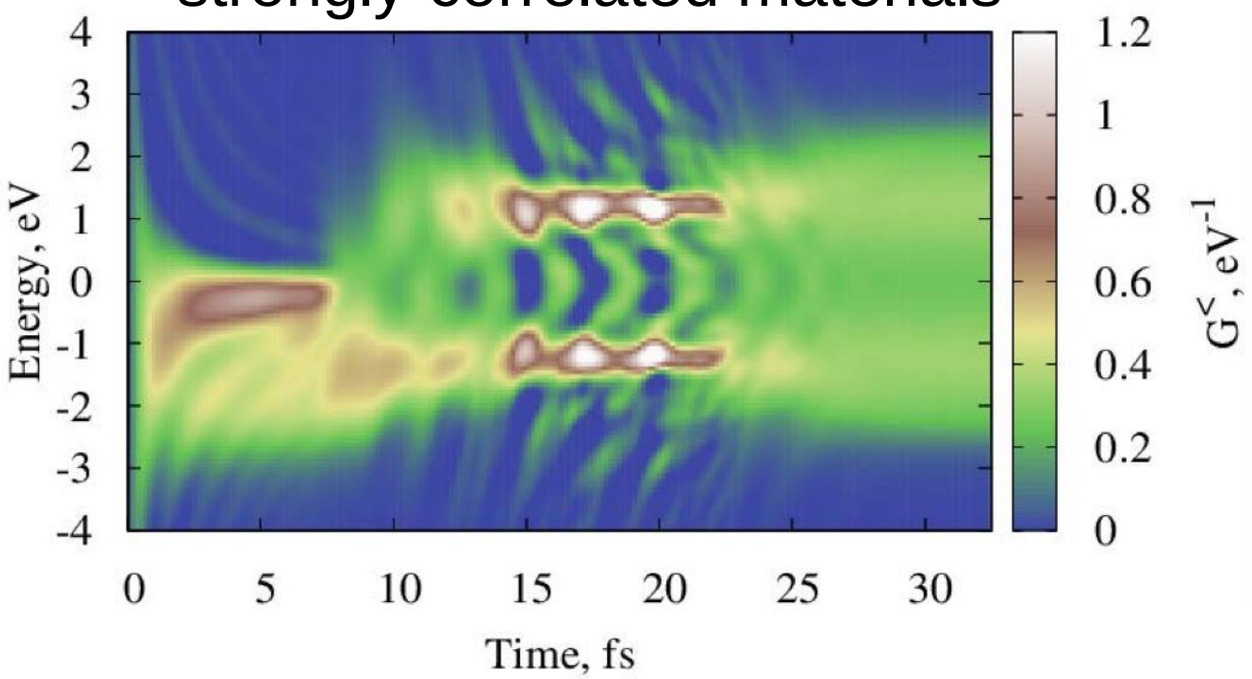


Access new non-thermal metastable states in quantum materials

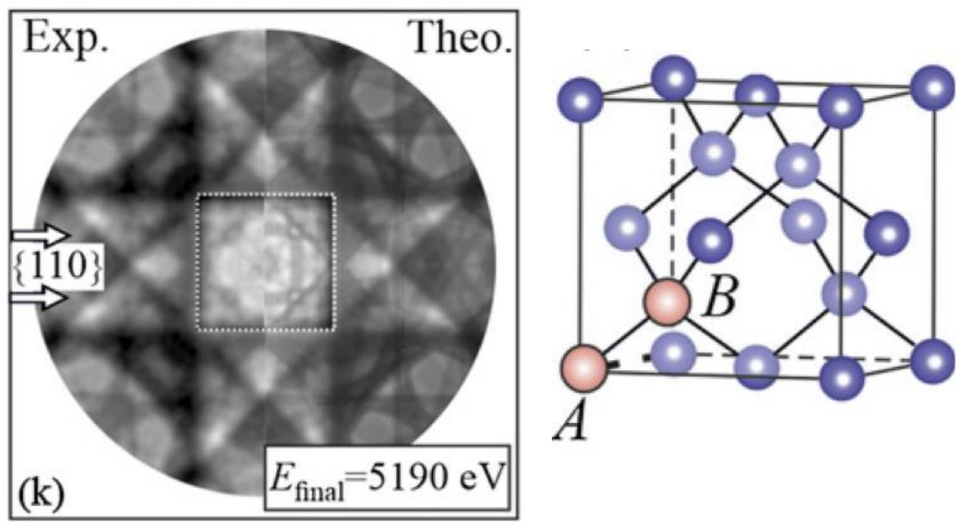


J. Zhang, et al., Nature Mat. **15**, 956 (2016)

Directly link to theory for driven strongly-correlated materials



Site-specific structural dynamics probed by photoelectron diffraction



Fedchenko et al. NJP **22**, 103002 (2020)

The Uppsala-Stockholm research environment

ERC Synergy

KAW Magnetism

UU

Photovoltaics

Batteries

Materials Synthesis & Characterisation

KAW Scholars

EU Battery Flagship

Theory of Driven Systems

Structural Dynamics of Biological Systems

Catalysis

Quantum Materials

Femtochemistry

Correlated Electron Systems

SU

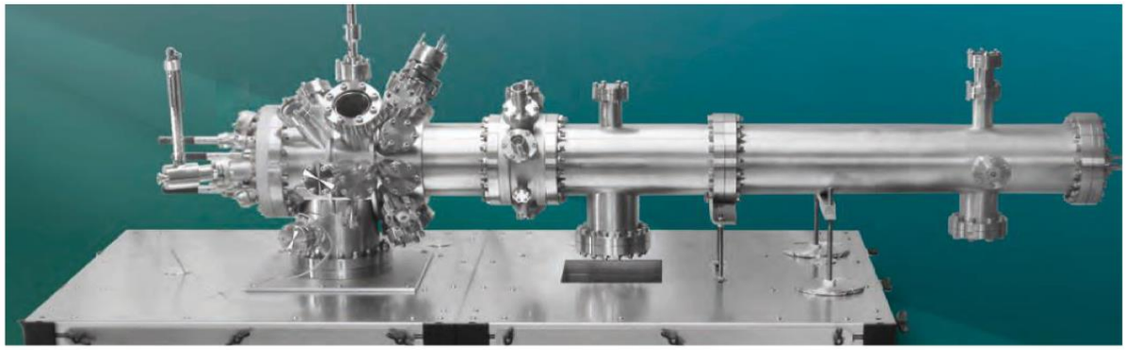
KTH

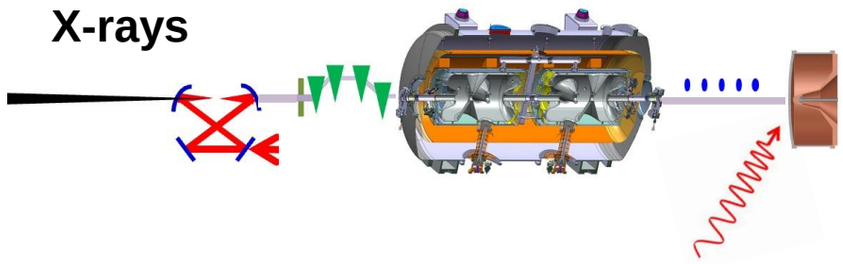
KAW Catalysis

KAW Correlated Electrons

Milestones for Engaging the Scientific Community

Momentum Microscopy & Photoelectron Diffraction Experiments (see talk by G. Schönhense)





Start

100 ps / 100 kHz rotating anode X-rays source

+2 years

Endstation R & D

+5 years

500 fs / 100 kHz Compton source

+10 years

50 fs / 100 kHz Ångström Laser

The Ångström Laser project

- **Builds on the strengths of UU's instrumentation tradition**

- **Provides the UU and national science community with a complementary world-class research facilitiy**

- **Enables novel discovery science by close integration with campus activities**

- **Aims to be a hub for education and innovation**