

CONDENSED MATTER SEMINAR

Thursday 7 February at 2.15pm

“Ultrafast electron and crystal-structure dynamics in condensed matter”

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It will be shown how (resonant) X-ray diffraction with ultrashort x-ray pulses can be used to study ultrafast electron - and structural dynamics in real time. Results on how we can trigger an electronic phase transition in a correlated electron system (manganites) with fs 800 nm pulses and how the electronic and crystal structural react to it in real time are presented. [1,2] This will be compared to the case of exciting directly a midIR active phonon mode. [3] In the second part we look into the case of a pure structural phase transitions (in SrTiO₃ [4] and EuTiO₃) and how we can trigger it with an above band gap excitation. Will the atoms start moving when the lattice get warm or can we drive the transition faster? This will be compared to exciting the polar soft mode of SrTiO₃ with phase stable low cycle THz pulses. A strong driving field allows tan upconversion of phonons (excite phonon with higher energies). [5] Finally I will give a first glance on a successful experiment at the brand new SwissFEL facility at PSI that addresses the question: How fast can we localize an electron in a solid?

- [1] P. Beaud et al., Nature Mater. 13, 923 (2014).
- [2] V. Esposito et al., Phys. Rev. B 97, 014312 (2018).
- [3] V. Esposito et al. Phys. Rev. Lett. 118, 247601 (2017)
- [4] M. Porer et al., Phys. Rev. Lett. 121, 055701 (2018).
- [5] M. Kozina et al., arXiv:1807.10788

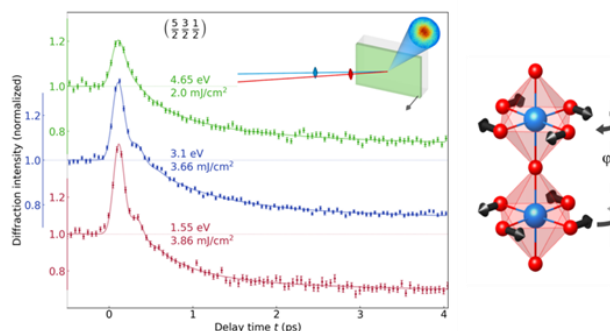


Figure 1 Time traces of x-ray diffraction intensities describing the octahedral rotation in a perovskite triggered by a laser excitation.

Host: Prof Paolo Radaelli/Prof Andrew Boothroyd
Audrey Wood Seminar Room, Clarendon Laboratory