

# Evidence for a Peierls phase-transition in a three-dimensional multiple charge-density-waves solid.

*Tuesday, 24 July 2012 20:00 (2 hours)*

B. Mansart

Laboratory for Ultrafast Microscopy and Electron Scattering, ICMP, Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland

and

Laboratory of Ultrafast Spectroscopy, ISIC, Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland

M. Cottet

Laboratory for Ultrafast Microscopy and Electron Scattering, ICMP, Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland

T.J. Penfold

Laboratory of Ultrafast Spectroscopy, ISIC, Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland

and

Laboratory of Computational Chemistry and Biochemistry, ISIC, Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland

and

SwissFEL, PSI, CH-5232 Villigen, Switzerland

S.B. Dugdale

H. H. Wills Physics Laboratory, University of Bristol, Tyndall Avenue, Bristol BS8 1TL, United Kingdom

R. Tediosi

Département de Physique de la matière Condensée, Université de Genève, CH-1211 Genève 4, Switzerland

M. Chergui

Laboratory of Ultrafast Spectroscopy, ISIC, Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland

F. Carbone

Laboratory for Ultrafast Microscopy and Electron Scattering, ICMP, Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland

We studied the ultrafast photoinduced charge-density-wave (CDW) to metal phase transition in a complex solid, namely Lu<sub>5</sub>Ir<sub>4</sub>Si<sub>10</sub>. After melting the charge ordering using infrared laser pulses, the consequent charge redistribution is probed with fs time resolution through the spectral weight analysis of the transient optical response over a broad energy range.

The time-dependent spectral weight reveals a signature of the CDW melting and the time-scale of this photo-induced phase transition. This new kind of analysis allows us to show that the charge order remains preserved until the lattice distorts sufficiently to induce the phase transition.

These results are completed by ab-initio modeling of the electronic band structure, identifying the orbitals involved in the CDW and the electronic transitions leading to the photo-induced melting of the charge order. This allows us to reveal the Peierls origin of multiple CDW in this three-dimensional solid.

**Primary author:** MANSART, Barbara (Ecole Polytechnique Fédérale de Lausanne)

**Presenter:** MANSART, Barbara (Ecole Polytechnique Fédérale de Lausanne)

**Session Classification:** Poster Session 2

**Track Classification:** Photoinduced Studies