Max-Planck-Institut für Struktur und Dynamik der Materie



Max Planck Institute for the Structure and Dynamics of Matter

Tuesday, April 19th 2016 – 16:00 CFEL Seminar room IV, O1.111 (Bldg. 99)

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Disclosing fluctuations of lattice atomic positions in non-equilibrium optical experiments

Fluctuations of the atomic positions are at the core of a large class of unusual material properties ranging from quantum para-electricity and charge density wave to, possibly, high temperature superconductivity. Their measurement in solids is the subject of an intense scientific debate focused on the research of a methodology capable of establishing a direct link between the variance of the ionic displacements and experimentally measurable observables. In this presentation I will introduce our new approach to address quantum and thermal fluctuation in complex materials. By means of non-equilibrium optical experiments performed in shot-noise limited regime we could reveal that the variance of the time dependent atomic positions and momenta is directly mapped into the quantum fluctuations of the photon number of the scattered probing light. A fully quantum description of the non-linear interactions between photonic and phononic fields pave the way for a direct measurement of fluctuation in complex systems.

References

Nat. Comm. 5, 5112 (2014) New J. Phys. 16 043004 (2014) Nat. Comm. 6, 102049(2015)

