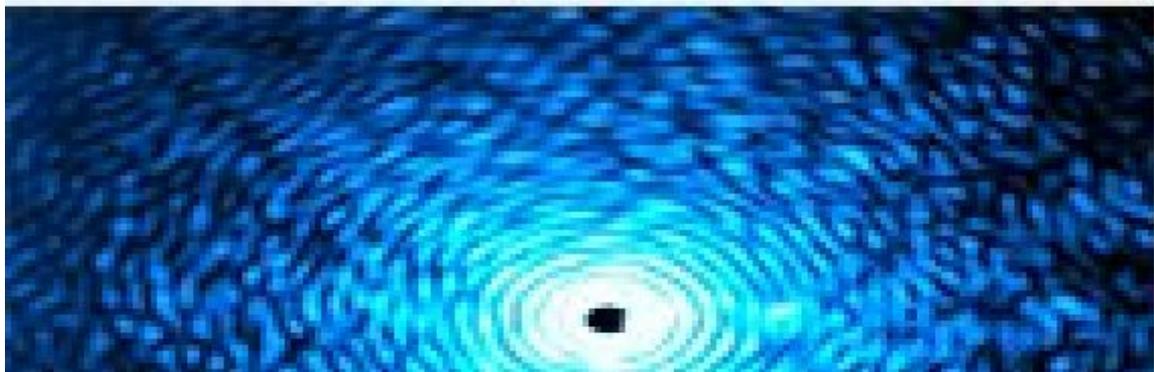


Luciana Vidas

Advisor: Prof. Dr. Simon Wall



PhD Thesis Defense LUCIANA VIDAS 'The Insulator-Metal Phase Transition in VO₂ Measured at Nanometer Length Scales and Femtosecond Time Scales'

LUCIANA VIDAS

May 02, 2019

11:00 to 12:00

ICFO Auditorium

The physics of transition-metal oxides presents a challenge to our current understanding of condensed matter physics. The main difficulty arises from a competition between electron-electron and electron-phonon interactions to dictate the properties of these complex materials. This issue is particularly apparent in vanadium dioxide, which undergoes an electronic and structural phase transition close to room temperature. Despite more than 50 years of research, the origin of the transformation is still actively debated, with contradictory interpretations often reported. The main goal of this thesis is to re-evaluate the phase transition in VO₂ with a combination of new experimental techniques, ranging from

the midinfrared to hard x-rays, that can probe the transformation at nanometer length scales and femtosecond time-scales. This allows to disentangle the roles of phase separation, laser-induced heat, and electron and phonon dynamics to the insulator-metal transition. The results from these experiments provide a unified and new picture of the nature of this process, both in and out of equilibrium, in which the electron-phonon interactions are the main driving mechanism. Furthermore, the new techniques and analysis presented here for VO₂ can be applied to the study of other controversial complex materials that exhibit remarkable properties, and answer thereby some of the key outstanding questions in condensed matter physics.

Thursday May 2, 11:00. ICFO Auditorium

Thesis Advisor: Prof Dr Simon Wall

Hosted by: Thesis Advisor: Prof Dr Simon Wall

