GO FAST

GOverning ultraFAST the conductivity of correlated material

Title:	Governing ultrafast the conductivity of correlated materials
Acronym:	GO FAST
Duration:	01/04/2012 – 31/03/2015
Total cost:	€ 2.201.442
EU contribution:	€ 1.673.200
Programme acronym:	FP7-NMP
Subprogramme area:	NMP.2011.2.1-2
Contract type:	Small or medium-scale focused research project

Partners:

Coordinator:

✓ SCUOLA SUPERIORE DI STUDI AVANZATI – ITALY

Participants:

✓ STICHTING KATHOLIEKE UNIVERSITEIT – THE NEDERLANDS

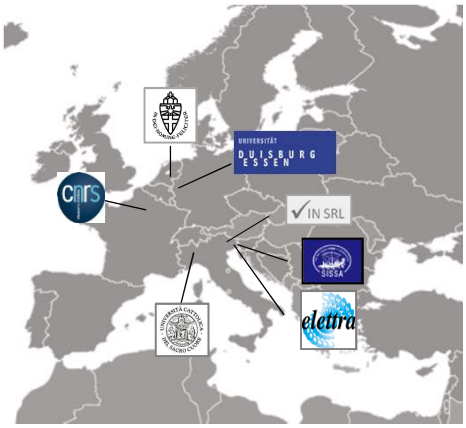
✓ UNIVERSITA' CATTOLICA DEL SACRO CUORE – ITALY

✓ IN SRL – ITALY

✓ CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE – FRANCE

✓ UNIVERSITAET DUISBURG–ESSEN – GERMANY

✓ SINCROTRONE TRIESTE SCPA – ITALY



Abstract:

The aim of this research project is to develop novel schemes to study electronic, optical and structural properties of correlated materials driven out of equilibrium, in view of achieving an ultrafast optical control of their electronic properties. In particular, we will extend the most advanced techniques for correlated systems, i.e. Dynamical Mean Field Theory (DMFT) and the Gutzwiller variational approach, to model the temporal evolution after high-energy excitations are impulsively photo-injected by ultrafast laser pulses. Realistic modelling will be achieved through validation against the outcomes of different ad-hoc time-resolved techniques. The possibility to optically switch on and off the metallic phase in a model Mott insulator (vanadium sesquioxide) and the superconducting phase in model high-temperature superconductors (cuprates) will be investigated and tested.

To achieve this ambitious goal we organized a multidisciplinary network that will be coordinated by the condensed-matter theory group at S.I.S.S.A. (Trieste), with a recognized expertise in strongly correlated systems, specifically DMFT, Gutzwiller variational technique and density functional theory, and will involve well established European experimental groups in the field of ultrafast spectroscopies, with expertise in time-resolved optical and photoemission spectroscopies, time resolved X-ray and electron diffraction. The mutual and effective collaboration between the theoretical and experimental groups is mandatory to develop and validate realistic models of the ultrafast dynamics in complex materials, where the electronic, structural and magnetic degrees of freedom are strongly intertwined.

This project is strictly relevant to the NMP.2011.2.1-2 topic (Modelling of ultrafast dynamics in materials) of the NMP-2011-SMALL-5 Work Programme.