



Project nr. FP7-280555

THE PROJECT NEWSLETTER

Contents:

NEWS

The GO FAST Project

GO FAST Second Project meeting, Sub-group meeting, First Review meeting.

Project publications, GO FAST

Dissemination activities, Upcoming events

PROJECT STATUS

PROJECT PARTNERS



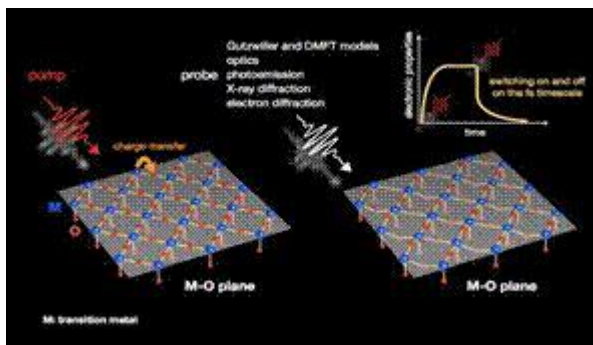
The GO FAST project is funded by the EU Commission within the VII Framework Programme for Research and Technological Development



GO FAST Project

“Governing ultrafast the conductivity of correlated materials”

The **ambitious aim of the GOFAST project** is to develop a joint theoretical-experimental effort to develop and test, for the first time, realistic non-equilibrium models for the ultrafast interaction of femtosecond light pulses with correlated electrons in transition metal oxides. The final goal is to achieve the ultrafast (<100 fs) control of the physical properties of these systems by photoinducing non-thermal final states with novel functionalities.



Schematics of the main concept of the project: the combination of advanced modelling and time-resolved experimental techniques will allow us to identify and test the best strategies to optically control the physical properties of transition-metal oxides on the femtosecond timescale. These results will pave the way towards the development of novel ultrafast metal-oxides based switches, capable of operating at THz frequencies and potentially scalable to the nanosize.

Start date:	01 April 2012
End date:	31 March 2015
Duration:	36 months
Project total costs:	€ 2,208,107.70
Total Funding:	€ 1,673,200.00

NEWS

Second Project Meeting

The **GO FAST 8th month meeting** took place in Paris (CNRS hosting Institution) on November 26th and 27th, 2012.

The meeting was focused on a presentation made by each partner on partners contributions and the achievements on the basis of the Annual Action Plan (Deliverable 5.1).

A Round Table at the end of the second day meeting was focused on the expectations of the Exploitation Board members and their foreseen involvement within the project.

		
Michele Fabrizio (SISSA), Project Coordinator	From the left side: Enrico Varesi (Micron Technology s.r.l.), Cristina Modolo (ILO, Elettra), Claudio Giannetti (UNICATT).	Uwe Bovensiepen (UDE)



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<i>Daniele Fausti (ELETTRA)</i>	<i>Marino Marsi (CNRS)</i>	<i>From the left side: Daniele Fausti (ELETTRA), Massimo Capone (SISSA), Uwe Bovensiepen (UDE), Matthias Lezius (Menlo Systems GmbH)</i>

All partners and the Exploitation Board Members participated to the meeting. The PTA (Dr Richard Gerald James Ball) took part at the meeting.

Sub-Grups Meetings

Preparatory meeting to WP4 “Optical manipulation of the superconducting-normal state phase transition”
9-10 October 2012 Duisburg, Germany. Hosting partner: UDE, organized by UNICATT.

List of Participants:

Claudio Giannetti (Università Cattolica del Sacro Cuore, UNICATT – IT)
Uwe Bovensiepen (Universitaet Duisburg-Essen, UDE – DE)
Klaus Sokolowski Tinten (Universitaet Duisburg-Essen, UDE – DE)
Ping Zhou (Universitaet Duisburg-Essen, UDE – DE)
Massimo Capone (Scuola Internazionale Superiore di Studi Avanzati, SISSA – IT)
Daniele Fausti (Sincrotrone Trieste, ELETTRA – IT)
Rostislav Mikhailovskiy (Radboud University, host – IT)
Manuel Ligges (Universitaet Duisburg-Essen, UDE – DE)
Simon Freutel (Universitaet Duisburg-Essen, UDE – DE)
Isabella Avigo (Universitaet Duisburg-Essen, UDE – DE)

First Review Meeting – M12

The **first Review meeting** will take place in Brescia (Italy) on April 15th and 16th.

Hosting Institution: **UNICATT**.



Project Publications

The following publications have been produced by the project partners:



The Out-of-Equilibrium Time-Dependent Gutzwiller Approximation

Date: 10/04/2012

Author: Michele Fabrizio

Lattice and surface effects in the out-of-equilibrium dynamics of the Hubbard model

10/05/2012

Authors: Patrice André, M. Schirò and Michele Fabrizio

Linear ramps of interaction in the fermionic Hubbard model

15/08/2012

Authors: Matteo Sandri, Marco Schirò and Michele Fabrizio

Dynamical quantum phase transitions and broken-symmetry edges in the many-body eigenvalue spectrum

Date: 09/10/2012

Authors: Giacomo Mazza, Michele Fabrizio

Relaxation dynamics of disordered spin chains: Localization and the Existence of a stationary state

Date: 20/12/2012

Authors: S. Ziraldo, A. Silva and G.E. Santoro

Relaxation and thermalization after a quantum quench: Why localization is important

Date: 21/02/2013

Authors: S. Ziraldo, G.E. Santoro

Periodic steady state regime and interference in a periodically driven quantum system

Date: 17/12/2012

Authors: A. Russomanno, A. Silva and G.E. Santoro

Competition between the Pseudogap and Superconducting States of $\text{Bi}_2\text{Sr}_2\text{Ca}_{0.92}\text{Y}_{0.08}\text{Cu}_2\text{O}_{8+\delta}$ Single Crystals Revealed by Ultrafast Broadband Optical Reflectivity

Date: 31/01/2013

Authors: G. Coslovich, C. Giannetti, F. Cilento, S. Dal Conte, T. Abebaw, D. Bossini, G. Ferrini, H. Eisaki, M. Greven, A. Damascelli, F. Parmigiani

In search for the pairing glue in cuprates by non-equilibrium optical spectroscopy

Date: 12/03/2013

Authors: F. Cilento, S. Dal Conte, G. Coslovich, F. Banfi, G. Ferrini, H. Eisaki, M. Greven, A. Damascelli, D. van der Marel, F. Parmigiani, C. Giannetti

GO FAST Dissemination Activities

The GO FAST project has been mentioned by the partners in their local websites:

ELETTRA Trieste: <http://www.elettra.trieste.it/comunicazione/news/go-fast-project.html>

UNICATT: <http://www.cattolicanews.it/studi-e-ricerche-il-progetto-go-fast-disegna-il-futuro-dell-elettronica>

An **Interview to Claudio Giannetti** (UNICATT) describing the project activities and goals has been published in the UNICATT website:

Link:

<http://www.cattolicanews.it/studi-e-ricerche-il-progetto-go-fast-disegna-il-futuro-dell-elettronica?>



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GO FAST Exploitation Board

Menlo Systems GmbH (Germany) a spin-off from the renowned Max-Planck-Institute for Quantum Optics, has been subcontracted by ELETTRA as an Exploitation Board Member.



www.menlosystems.com

Upcoming events

Claudio Giannetti (UNICATT) is a co-organizer of the **NGSCES 2013 Conference**, "The New Generation in Strongly Correlated Electron Systems 2013" - Sestri Levante, 1-5 luglio 2013.





The Abdus Salam
**International Centre
for Theoretical Physics**
www.ictp.it



**Conference on:
ULTRAFAST DYNAMICS OF
CORRELATED MATERIALS**

14 - 18 October 2013
Miramare, Trieste, Italy

This conference brings together leading experimentalists and theorists interested in the various issues arising in correlated systems under out of equilibrium conditions. In particular the activity will cover topics such as

- CORRELATED MATERIALS OUT OF EQUILIBRIUM
- NEW TRENDS IN TIME-RESOLVED SPECTROSCOPIES
- OPTICAL CONTROL OF ELECTRONIC PHASES
- ARTIFICIAL TRANSIENT STATES
- NON-EQUILIBRIUM PHYSICS IN COLD ATOMS

The location and the atmosphere of the conference will encourage the exchange of ideas and perspectives on this emerging field.

PARTICIPATION

Scientists and students from all countries which are members of the United Nations, UNESCO or IAEA may attend the Conference. As it will be conducted in English, participants should have an adequate working knowledge of that language. Although the main purpose of the Centre is to help research workers from developing countries, through a programme of training activities within a framework of international cooperation, a limited number of students and post-doctoral scientists from developed countries are also welcome to attend.

As a rule, travel and subsistence expenses of the participants should be borne by the home institution. Every effort should be made by contributors to secure support for their fare (or at least part-fare). However, limited funds are available for some participants, who are nationals of, and working in, a developing country, and who are not more than 45 years old. Such support is available only for those who attend the entire activity. There is no registration fee.

HOW TO APPLY FOR PARTICIPATION

The application form should be accessed at the activity website: <http://cagm03.ictp.it/form.php/1403>

Once in the website, comprehensive instructions will guide you step-by-step, on how to fill out and submit the application form.

You may address general requests for information to:

Ms. M. Pompili (fax: 3493)
The Abdus Salam International Centre for Theoretical Physics
Strada Costiera 11 - 34137 Trieste, Italy
Telephone: +39-043-2240040 - Telefax: +39-043-22407540
E-mail: univ403@ictp.it
ICTP Home Page: <http://www.ictp.it>

co-sponsored by:




SISSA - International School for Advanced Studies;
European Commission GO FAST Project- FP7 NMP Programme

DIRECTORS:

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C. GIANNETTI (Univ. Ca' Foscari, Venezia)
M. SARDI (Univ. Pavia-Sud, Orsay)
M. MÜLLER (ICTP, Trieste)

LECTURERS:

G. BIRLOU (CEA-Saclay, Gif-sur-Yvette)
D. BOSCHETTO (I.O.A., Palaiseau)
S. BOVENBERG (Univ. of Duisburg)
S. BRAZOVSKIK (Univ. Paris-Sud, Orsay)
M. CAPONE (CNRS-CEM, Trieste)
L. CARIO (Univ. of Nantes)
A. CAVALLER (Univ. of Hamburg)
A. DAMASCHELLI (IBM, Yorktown)
J. DEMSAR (Univ. of Konstanz)
T. DEVEREAUX (Stanford University)
M. ECKSTEIN (Univ. of Hamburg)
A. GOLDMAN (Univ. of Minnesota, Minneapolis)
S. JOHNSON (ETH Zurich)
M. KOLLAR (Univ. of Augsburg)
C. KOLLATH (Univ. of Geneva)
G. KOTLIAR (Punjab State Univ., Patiala)
A. LANDARA (Univ. of California, Berkeley)
D. BRALDORF (Johannes Kepler Univ., Linz)
H.-C. NÄGERL (Univ. of Innsbruck)
T. OGA (Univ. of Tokyo)
H. OKAMOTO (Univ. of Tokyo)
J. ORENSTEIN (Univ. of California, Berkeley)
P. PARSONS (Univ. of Trieste)
S. PERFETTI (Ecole Polytechnique, Palaiseau)
M.J. ROSENBERG (Univ. Paris-Sud, Orsay)
M. SCHIRO (Provision Univ.)
J. SCHIEDMAIER (Vienna Univ. of Techn.)
L. SCHREIER (Ludwig-Maximilians- Univ. München)
A. SILVA (SISSA, Trieste)
P. WERNER (Univ. of Houston)
M. WOLF (Fritz-Haber Institut, Berlin)

DEADLINES
for requesting participation:

- **30 June 2013** (if financial support and/or visa are needed)
- **31 July 2013** (if neither financial support nor visa are needed)

Michele Fabrizio (SISSA) is one of the Directors of the **Conference on Ultrafast Dynamics of Correlated Materials** – Miramare (Trieste) 14-18 October 2013.

Link:
http://cdsagenda5.ictp.it/full_display.php?email=0&id=a12215



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PROJECT STATUS

The Annual Action Plan (deliverable D5.2) for the second year of the project has been completed.

WP 1: 17 Action Points have been reported by the project partners;

WP 2: 11 Action Points have been reported by the project partners;

WP 3: 4 Action Points have been reported by the project partners;

WP 4: 5 Action Points have been reported by the project partners.

As requested by the EU Commission, a **graph with the interconnections among project results** has been created.

MAJOR PROJECT TECHNICAL CONTRIBUTIONS:



SISSA	<p>The SISSA first year activity has been devoted to formulate and implement in numerical codes the non-equilibrium dynamics of models for correlated electron systems within the time-dependent Gutzwiller Approximation (t-GA); the time-dependent Dynamical Mean Field Theory (t-DMFT).</p> <p>Several preliminary results have been obtained and published in connection with t-GA but also in the context of some fundamental questions related to the non-equilibrium dynamics of quasi-isolated quantum systems.</p> <p>A rigorous formulation of t-DMFT has been developed in the case of a repulsive Hubbard model in the presence of a generic time-dependent electromagnetic field, in order to realistically describe pump and probe in an experiment. The method is based on the non-equilibrium Green's function (Keldysh) technique and uses as impurity solvers either the second-order perturbation theory diagrams or the iterative perturbation scheme.</p> <p>A more theoretical activity has been carried on some fundamental issues of the non-equilibrium quantum dynamics of quasi-isolated systems, issues that are important to address in order to better model real materials.</p>
UDE	<p>The work of partner 2 (UDE) during the first year of the project concentrated on WP1, with particular emphasis on the development of the required experimental techniques for time- and angle-resolved photoelectron spectroscopy (tr-ARPES) and time-resolved diffraction (electron and X-ray) on laser-excited superconductors (SCs).</p> <ol style="list-style-type: none"> 1) Spectrometer chamber for tr-ARPES 2) Time-resolved X-ray diffraction at low temperatures 3) Time-resolved electron diffraction on SCs 4) tr-ARPES studies on Bi2212
RU	<p>Major activities performed during the first year:</p> <ul style="list-style-type: none"> - Installation of an amplified laser system; - Building a setup for time-resolved THz spectroscopy in which THz-pulses are generated with the help of a non-linear crystal. Demonstration of a possibility for low temperature measurements of static and time-resolved THz spectroscopy; - Demonstration of a synchronization between FEL and the laser system; - Demonstration of time-resolved THz spectroscopy in the range 200 GHz-3THz using two complimentary techniques – table top time-domain THz spectroscopy and FEL-based THz spectroscopy. The former is the most suitable for studies of ultrafast processes, while the latter is expected to become a rather unique tool for obtaining time dependent data with a good spectral resolution; - Time-resolved optical spectroscopy with tunable profile of the pump pulse obtained through adaptive pulse shaping.



ELETTRA	<p>The activities of the first year developed along the line indicated in task 1.1: Development of theoretical and experimental techniques.</p> <p>In particular the target of Sincrotrone Trieste s.c.p.a. was to deliver optical spectroscopies capable of studying the selectivity of the excitation process. To this purpose we have developed a spectroscopic tool capable of producing light pulses in the far and mid infrared to be used in pump and probe experiments.</p> <p>Concerning the design and construction of the spectroscopic tool described in ii), a Post-doc (Dr. Fabio Novelli) have been enrolled, the source have been designed and the optomechanical elements necessary to built the OPA have been purchased.</p>
CNRS	<p>During the first year of the project, the role of partner CNRS was mainly devoted to the commissioning of the experimental setup for pump-probe angle resolved photoelectron spectroscopy, and to demonstrate its capabilities with first measurements on prototype systems and also on strongly correlated materials.</p> <p>At month 12, the instrument is indeed operational and it can be used for the experiments scheduled for the second year of the project. This is in full agreement with the proposed work schedule.</p> <p>The instrument is the FemtoARPES setup, consisting mainly of a laser source and of an ultrahigh vacuum setup for angle resolved photoelectron spectroscopy (ARPES) on solids.</p> <p>This result (operational setup) corresponds to deliverable D1.1.2 (experimental setup) due for month 12.</p> <p>In addition to this work performed in the Paris area, optical pump-probe reflectivity experiments have been performed on the test-bed material V2O3 in collaboration with the Trieste partners of Go Fast. The preliminary results will be the basis for the future experiments that will be performed in the second and third year and that will be compared with the theoretical predictions of the SISSA group.</p>
UNICATT	<p>The 1st year activities of UNICATT have been mainly focused to the development of experimental setups for time-resolved measurements of optically-excited correlated materials (deliverable D1.2).</p> <p>In particular, the following issues have been successfully tackled:</p> <ul style="list-style-type: none"> • Successful testing of the closed-cycle cryostat to perform low-temperature (down to less than 10 K) time-resolved optical measurements; • Successful testing of the broadband low-fluence time-resolved optical spectroscopy in the near-infrared/ultraviolet energy range (1-3 eV) at low temperature; • Testing of different techniques to perform low-fluence equilibrium and non-equilibrium optical spectroscopy in THz frequency range.
IN	<p>The major activities performed by the partner IN Srl are related to project management and dissemination.</p> <p>Project management:</p> <ul style="list-style-type: none"> ▪ Assistance to the Coordinator in the preparation of the Consortium Agreement; ▪ Organization of project meetings (agenda, project presentation formats, minutes); ▪ Creation and distribution among the consortium of project templates (presentation, deliverables); ▪ Reminder and check of internal deliverables deadlines; ▪ Creation and distribution of the Project Management Book (Deliverable D7.1); ▪ Daily and financial management of the project; <p>Preparation of project deliverables: D5.5 Minutes of the kick-off meeting – D7.1 Project Management Book – D6.1 Implementation of the project website – D6.2 Creation of the Logo, Brochure and Templates of the Project – D6.3 Creation of the Press Desk – D6.9 Dissemination and Exploitation Plan – D7.4 Database of activities and Financial assessment of the project intermediate.</p> <p>Project dissemination:</p> <ul style="list-style-type: none"> ▪ Creation of the GO FAST logo in cooperation with the Coordinator; ▪ Creation and distribution, with the collaboration of the project consortium, of the project brochure and poster; ▪ Creation and update of the project website (www.gofastproject.eu); ▪ Collection of project dissemination events among the participants; ▪ Collection of project publications; ▪ Creation and distribution of Internal Newsletters (Issue I and Issue II); ▪ Creation and distribution of External Newsletters (Issue I and Issue II). The External Newsletter is published on the project website, public section.



Project partners

Project Participant	
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Stichting Katholieke Universiteit Dr. Kimel A.V. E-mail: a.kimel@science.ru.nl	
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From the left: Uwe Bovensiepen (UDE), Matthias Lezius (Menlo Systems GmbH), Dmitriy Malik (RU), Claudio Giannetti (UNICATT), Massimo Capone (SISSA), Michele Fabrizio (SISSA), Ping Zhou (UDE), Enrico Varesi (Micron Tech), Daniele Fausti (ELETTRA), Richard Ball (Project PTA), Cristina Modolo (ELETTRA, ILO Office).

Project	
EXPLOITATION BOARD The Exploitation Board activities are supervised by the Industrial Liaison Office of ELETTRA (Partner nr. 4). The knowledge developed in the GO FAST project can have a strong impact on current technologies. The role of the Exploitation Board will be fundamental to provide the realistic constraints, in terms of functionalities, performances, industrial and economical interest both of the ultrafast device itself and of the laser sources necessary to achieve the ultrafast optical control of the studied correlated materials.	Micron Semiconductor Italia S.r.l. <i>Data storage devices based on transition metal oxides</i>
	Menlosystems GmbH <i>THz photoconductive antennas based on transition metal oxides</i>



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