

CURRICULUM VITAE ET STUDIORUM

GIAN MARCO PIERANTOZZI

CURRENT POSITION

from 07/11/17 to 06/11/23 Consiglio Nazionale delle Ricerche (CNR)
Istituto Officina Materiali (IOM), Trieste

Fellowship

Analysis of electronic and magnetic properties of low-dimensionality systems (epitaxial oxides, metal-organic interfaces, supported nanoparticles), based on measurements of photoemission with electron analyzers and of spin polarization also time resolved in pump-probe mode
SPRINT-NFFA project
Bando IOM AR 011/2017 TS (Protocollo n. 2598 del 09/08/2017)

PREVIOUS POSITIONS

from 22/02/17 to 22/10/17 Università degli Studi Roma Tre, Roma

Fellowship

Characterisation of a Multichannel electron analyser and its application to the study of metal-organic interfaces
at LASEC (LABoratorio di Spettroscopie Elettroniche e di Correlazione)
Rep. n. 23 - Prot. 233 del 27/01/2017 - Dipartimento di Scienze

EDUCATION

2014-2016 Università degli Studi Roma Tre, Roma

PhD

Scienze della Materia, Nanotecnologie e Sistemi Complessi (XXIX ciclo)
Thesis: *Electronic structure and morphology of CuPc thick films and monolayers on Al(100) and Au(110) surfaces*
at LASEC (LABoratorio di Spettroscopie Elettroniche e di Correlazione)
Supervisor: Prof. Alessandro Ruocco

2007-2013 Università degli Studi La Sapienza, Roma

Graduate Studies

Master degree in *Physics*
Thesis: *X-ray Absorption Spectroscopy at High Pressures on two Iron-based Superconductors*
at HPS (High Pressure Spectroscopy) group
Supervisors: Prof. Paolo Postorino and Prof. Nuarang Lal Saini

2002-2007 Liceo Classico Francesco Stabili, Ascoli Piceno

High School

High School specializing in Classical Studies

PUBLICATIONS

M. Bendele, C. Marini, B. Joseph, **G. M. Pierantozzi**, A. S. Caporale, A. Bianconi, E. Pomjakushina, K. Conder, A. Krzton-Maziopa, T. Irifune, T. Shinmei, S. Pascarelli, P. Dore, N. L. Saini, and P. Postorino
Interplay of electronic and lattice degrees of freedom in $A_{1-x}Fe_{2-y}Se_2$ superconductors under pressure, Physical Review B **88**, 180506(R) (2013)
 DOI: 10.1103/PhysRevB.88.180506

G. M. Pierantozzi, M. Sbroscia and A. Ruocco
Templating effect of the substrate on the structure of Cu-phthalocyanine thin film, Surface Science **669**, 176 (2018)
 DOI: 10.1016/j.susc.2017.12.003

A. Bellissimo, **G. M. Pierantozzi**, A. Ruocco, G. Stefani, O. Y. Ridzel, V. Atauskas, W. S. M. Werner and M. Taborelli
Secondary electron generation mechanism in carbon allotropes at low impact electron energies, Journal of Electron Spectroscopies and Related Phenomena **241**, 146883 (2019)
 DOI: 10.1016/j.elspec.2019.07.004

R. Cucini, T. Pincelli, G. Panaccione, D. Kopic, F. Frassetto, P. Miotti, **G. M. Pierantozzi**, S. Peli, A. Fondacaro, A. De Luisa, A. De Vita, P. Carrara, D. Krizmancic, D. T. Payne, F. Salvador, A. Sterzi, L. Poletto, F. Parmigiani, G. Rossi and F. Cilento
Coherent narrowband light source for ultrafast photoelectron spectroscopy in the 17-31 eV photon energy range, Structural dynamics **7**, 014303 (2020)
 DOI: 10.1063/1.5131216

C. Bigi, Z. Tang, **G. M. Pierantozzi**, P. Orgiani, P. K. Das, J. Fuji, I. Vobornik, T. Pincelli, A. Troglia, T. L. Lee, R. Ciancio, G. Drazic, A. Verdini, A. Regoutz, P. D. C. King, D. Biswas, G. Rossi, G. Panaccione and A. Selloni
Distinct behavior of localized and delocalized carriers in anatase TiO_2 (001) during reaction with O_2 , Physical Review Materials **4**, 025801 (2020)
 DOI: 10.1103/PhysRevMaterials.4.025801

M. Sygletou, S. Benedetti, M. Ferrera, **G. M. Pierantozzi**, R. Cucini, G. Della Valle, P. Carrara, A. De Vita, A. di Bona, P. Torelli, D. Catone, G. Panaccione, M. Canepa and F. Bisio
Quantitative ultrafast electron-temperature dynamics in photo-excited Au nanoparticles, Small **17**, 2100050 (2021)
 DOI: 10.1002/sml.202100050

G. M. Pierantozzi, G. Vinai, A. Yu. Petrov, A. De Vita, F. Motti, V. Polewczyk, D. Mondal, T. Pincelli, R. Cucini, C. Bigi, I. Vobornik, J. Fujii, P. Torelli, F. Offi, G. Rossi, G. Panaccione and F. Borgatti
Evidence of Robust Half-Metallicity in Strained Manganite Films, Journal of Physical Chemistry C **125**, 144430 (2021)
 DOI: 10.1021/acs.jpcc.1c02323

F. Offi, K. Yamauchi, S. Picozzi, V. Lollobrigida, A. Verna, C. Schlueter, T.-L. Lee, A. Regoutz, D. J. Payne, A. Petrov, G. Vinai, **G. M. Pierantozzi**, T. Pincelli, G. Panaccione and F. Borgatti
Identification of hidden orbital contributions in the $La_{0.65}Sr_{0.35}MnO_3$ valence band, Physical Review Materials **5**, 104403 (2021)
 DOI: 10.1103/PhysRevMaterials.5.104403

G. M. Pierantozzi, A. De Vita, C. Bigi, X. Gui, H.-J. Tien, D. Mondal, F. Mazzola, J. Fujii, I. Vobornik, G. Vinai, A. Sala, C. Africh, T.-L. Lee, G. Rossi, T.-R. Chang, W. Xei, R. J. Cava and G. Panaccione
Evidence of magnetism-induced topological protection in the axion insulator candidate

EuSn₂P₂, Proceedings of the National Academy of Science **119**, e2116575119 (2022)
DOI: 10.1073/pnas.2116575119

J. S. Pelli Cresi, E. Spurio, L. Di Mario, P. O'Keeffe, S. Turchini, S. Benedetti, **G. M. Pierantozzi**, A. De Vita, R. Cucini, D. Catone and P. Luches
Lifetime of photogenerated positive charges in hybrid cerium oxide-based materials from space and mirror charge effects in time-resolved photoemission spectroscopy, Journal of Physical Chemistry C **126**, 11174 (2022)
DOI: 10.1021/acs.jpcc.2c02148

A. De Vita, T. T. P. Nguyen, R. Sant, **G. M. Pierantozzi**, D. Amoroso, C. Bigi, V. Polewczyk, G. Vinai, L. T. Nguyen, T. Kong, J. Fujii, I. Vobornik, N. B. Brookes, G. Rossi, R. J. Cava, F. Mazzola, K. Yamauchi, S. Picozzi and G. Panaccione
Influence of Orbital Character on the Ground State Electronic Properties in the van der Waals Transition Metal Iodides VI₃ and CrI₃ spectroscopy, Nano Letters **22**, 7034 (2022)
DOI:10.1021/acs.nanolett.2c01922

PARTICIPATION IN SCHOOLS, MEETINGS AND CONFERENCES

- Participation* *International School of Physics and Technology of Matter*
New frontiers in down-scaled materials and devices: realization and investigation by advanced methods
organised by CNR (Consiglio Nazionale delle Ricerche)
15-20 September 2014
Basiliani Resort Hotel - Otranto (LE), Italy
- Talk* COPPER-PHTHALOCYANINE ON Al(100): A STUDY OF PROJECTED MOLECULAR ORBITALS THROUGH AUGER-PHOTOELECTRON COINCIDENCE SPECTROSCOPY (APECS)
FisMat - Italian National Conference on Condensed Matter Physics
28 September - 2 October 2015
University of Palermo - Palermo, Italy
- Poster* AUGER SPECTROSCOPY (IN SINGLE AND COINCIDENCE MODE) AS A TOOL FOR STUDYING ELECTRONIC PROPERTIES OF CuPC FILMS
G. M. Pierantozzi, S. Vaidya, G. Di Filippo, R. Gotter, A. Ruocco, R. Bartynski and G. Stefani
ElCoGS - Electronic Correlation: from Gaseous to Solids
8 - 9 June 2017
University of Roma Tre - Roma, Italy
- Poster* A NOVEL HIGH REPETITION RATE HHG SOURCE FOR THE STUDY OF TIME-RESOLVED ELECTRONIC AND MAGNETIC STRUCTURE OF STRONGLY CORRELATED SYSTEMS
G. M. Pierantozzi, R. Cucini, T. Pincelli, A. De Vita, F. Cilento, A. Fondacaro, D. Kopic, M. Oura, K. Tamasaku, F. Parmigiani, G. Panaccione and G. Rossi
The International School on Magnetism and Synchrotron Radiation
7-12 October 2018
Mittelwahr, France
- Talk* STRAIN-INDUCED COMPETING ELECTRONIC PHASES IN La_xCa_{1-x}MnO₃ THIN FILMS
G. M. Pierantozzi, A. Petrov, G. Vinai, F. Motti, R. Cucini, A. De Vita, T. Pincelli, A. Gessini, J. Fuji, M. Oura, V. Polewczyk, F. Offi, F. Borgatti, G. Rossi and G. Panaccione
New Generation of Strongly Correlated Electron Systems (NGSCES)
2-6 September 2019
Silvi (TE), Italy

TEACHING ACTIVITY

Tutorship *Physics (Mechanics and Electromagnetism)*
for students of the degree course in Geology
at Dipartimento di Scienze, Università degli Studi Roma Tre (2015)

Physics (Mechanics and Electromagnetism)
Mathematics (Calculus and Analysis)
for students of the degree course in Optics and Optometry
at Dipartimento di Scienze, Università degli Studi Roma Tre (2016)

SCIENTIFIC ADVISORY ACTIVITY

Educational events Active participation in *European Researchers' Night 2014* and *2016*
at Università degli Studi Roma Tre

Active participation in *Occhi su Saturno 2014* and *Occhi su Giove 2016*, educational
nights open to people
at Dipartimento di Fisica, Università degli Studi Roma Tre

Membership Former member of *The Science Zone*, association promoting innovative education
and scientific activities for children, in schools and for individuals

Radio and television Participation to the radio transmission "Radar" at Radio Rai Friuli Venezia Giulia
(26/06/2021)

TECHNICAL SKILLS

Experimental experience Ultra-High Vacuum (UHV) (10^{-10} mbar) and basic tools in surface preparation
(sputtering and annealing of metal substrates, deposition of organic molecules or
elemental metallic thin film, LEED/Auger characterization)

Control of electron hemispherical analysers and optimization of electron optics; use
of Mott polarimeter for spin-resolved electron analysis and its optimization for
ultrafast experiments

Optical setups with femtosecond lasers and nonlinear crystals; optimization and
characterization (energy resolution, space charge mitigation) of a ultrafast x-ray/uv
light through High-Harmonic-Generation (HHG) in a inert gas medium

Use of standard cryogenic devices with liquid nitrogen or helium for the realization
of experiments at cold temperatures

First-person management of a laboratory (SPRINT @IOM-CNR, Trieste) for
time-resolved photoemission; local contact for various external users in the
framework of NFFA-project

User-ship in many beamtimes at various synchrotrons: Elettra-Trieste,
Diamond-Didcot (UK), SPring8-(Japan), ESRF-Grenoble (France)

Basics of diamond anvil cells for high-pressure experiments (during master thesis)

*Spectroscopic and
Diffraction
Techniques*

Techniques handled with very good confidence:

- *Photoemission Spectroscopy* in various declinations:
angle-resolved (ARPES); spin resolved; time resolved (pump-and-probe); core
level analysis by means of X-ray photons (XPS); *bulk* sensitive by means of
hard x-ray photons (HAXPES)
- *Electron Energy Loss Spectroscopy* (EELS)

Other techniques exploited during my research activity:

- *X-ray Absorption Spectroscopy (XAS)*
- *X-ray Circular Magnetic Dichroism (XMCD)*
- *Two-Electron Coincidence Spectroscopy*
- *Extended Fine Structure X-Ray Absorption Spectroscopy (EXAFS)*
- *Micro-Raman Spectroscopy*

COMPUTER SKILLS

<i>Programming</i>	Writing and efficiency optimization of data acquisition softwares with <i>Labview</i> language Writing of data treatment routines with <i>Igor Pro</i> software (C-like language) Fundamentals of C language (used during bachelor thesis for model simulation)
<i>Data Analysis</i>	<i>Igor Pro, Origin</i>
<i>Editing</i>	\LaTeX , <i>Microsoft Office</i>

LANGUAGES

Mother tongue Italian

Good knowledge of written and spoken English

RESEARCH INTERESTS

The *fil rouge* of my research activity has been the use of electronic spectroscopies, mainly Photoemission in its various branches, applied to materials with strongly correlated electrons or with high optical sensitivity. A relevant part of my work has been devoted to the commissioning of new instrumentation related to electronic spectroscopies.

After a Master thesis on iron superconductors at high pressure studied by EXAFS technique, during my PhD at LASEC laboratory at University of Roma Tre I have begun to deal with electronic spectroscopies, mainly EELS and XPS, to study the interface between organic molecule films and metal substrates.

Meanwhile, I took part to the commissioning of an hemispherical electron analyzer with multi-channel plate detector, in the framework of "SIMDALEE 2" project, devoted to the investigation of secondary electron emission in metals.

In the current position at IOM-CNR, my research topic has moved back to highly correlated materials, in particular those with magnetic order. By means of experiments performed at synchrotron radiation facilities (mainly photoemission and x-ray absorption) I have

investigated various materials, together with my research group: from the family of manganites (i.e. manganese oxides), which host a competition between phases with totally different transport and magnetic properties, easily tunable by doping or strain, to innovative materials showing coexistence of topological states with magnetic order.

Such work has proceeded in parallel with my main project at IOM-CNR, i.e. the characterization and optimization of the end-station of SPRINT laboratory, in the framework of "NFFA-Trieste" project, along with the preparation of various kind of experiments with this apparatus. Such setup was born in order to study the time evolution of electronic and magnetic properties of solids after a pump excitation, and consists in a High-Harmonic-Generation (HHG) source with ultrafast pulses (100 fs) at high repetition rate (hundreds of kHz) and photon energy in the range 17-31 eV, operational since 2018. The end-station is equipped with an hemispherical analyzer and a Mott polarimeter, thus allowing the measurement of angle resolved photoemission on one side and of spin polarization of secondary electrons on the other.

I have exploited such laboratory to study the ultrafast demagnetization in a prototypical magnetic system (iron thin film), reproducing in a transient way through an optical pump the conditions for ferromagnetic phase transition; moreover, I have investigated the spin-resolved hot carrier dynamic in standard semiconductors used as spin-polarized electron sources (GaAs). More recently, my interest is focussing also on layered semiconductors with interesting excitonic properties (transition dichalcogenides).

January 18, 2023