Ilaria Carlomagno, Ph.D.

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Employment History

2026 – now **Workpackage leader,** New end-station design of the new XRF beamline, Elettra-Sincrotrone Trieste.

2022 – now **Beamline Scientist,** XRF beamline, Elettra-Sincrotrone Trieste.

2018 – 2022 **PostDoc Researcher,** XRF beamline, Elettra-Sincrotrone Trieste.

2017 – 2018 **PostDoc Researcher,** Dipartimento di Scienze, Università degli Studi Roma Tre.

2013 **3 month internship,** ID03 beamline, ESRF.

Education

2014 – 2017 **Ph.D. in joint supervision**:
Condensed matter, complex systems, and nanoscience at Università degli Studi Roma Tre and
Nanoscale and radiation physics at Université Grenoble Alpes.
Thesis title: *The origin of the peculiar magnetic response of thin Co films intercalated between Graphene and Ir(111).*
Supervisors: prof. C. Meneghini and dr. R. Felici.
Experiments carried out at: ID03 and BM23 beamlines, ESRF.
Techniques: XPS, GIXRD, XANES, EXAFS, MOKE.

2011 – 2013 **M.Sc. Condensed Matter physics [110 cum laude]**, Università degli Studi Roma Tre.
Thesis title: *Growth and Characterization of thin Co films intercalated under Gr on Ir(111).*
- *In-situ* structural and electronic characterization
- Growth of monolayer graphene via CVD
- Growth and *in-situ* characterisation of thin ferromagnetic films
- Laboratory techniques: XPS and MOKE
- Synchrotron techniques: XRR, GIXRD, XANES, EXAFS

2008 – 2011 **B.Sc. Physics [110 cum laude]**, Università degli Studi Roma Tre.
Thesis title: *Photoemission from Si core levels.*
Supervisor: dr. A. Ruocco

Research interests

- I have started my career studying the structural and magnetic properties of thin ferromagnetic films. The core of my research was carried out with several complementary synchrotron techniques such as X-ray Absorption Spectroscopy (XAS), X-Ray Reflectivity (XRR), and Grazing Incidence X-ray Diffraction (GIXD). The magnetic characterization was obtained through the Magneto Optic Kerr Effect data, performed together with X-ray Photoemission Spectroscopy (XPS) in an offline chamber, equipped with a laboratory source. After my Ph.D., I have remained in the synchrotron radiation community, exploring new techniques to study nanostructured magnetic materials. From 2018, I have joined the XRF beamline team, where I could master the Synchrotron Radiation X-Ray Fluorescence (SR-XRF) technique and its countless applications in a wide variety of fields. This new perspective has allowed me to broaden my research interest and to cooperate in multi-disciplinary environments.

Technical skills and experience

2018 - now

XRF Beamline - technical and software developments.

XAS experiments

○ **Implementation of a new XSW acquisition mode, previously unavailable at the beamline**.

In collaboration with the Elettra IT group (dr. M. Prica), we implemented the X-ray Standing Wave data collection, including a dedicated GUI. The software corrects the incidence angle of the X-rays to keep the same momentum transfer inside the material at every energy point in a XAFS spectrum. The software works in two different geometries, allowing for XSW-XAFS measurements to be collected with the polarization of the X-rays being parallel and perpendicular to the sample plane. This allows for the experimental assessment of structural anisotropy in thin films. The GUI has been used successfully in several experimental run by multiple users groups.

The very first users to take advantage of this new acquisition mode left this comment in the BEST (proposal 20215789): *Standing wave XAFS were done for the first time on this beamline. The Beamline staff was extremely helpful. Even before the start of our beamtime, necessary software was developed for doing constant q scans, which could be implemented quickly during our beamtime.*

○ Development of data pre-processing scripts for additional ROI extraction (e.g. for self-absorption correction in XAFS data collected in XSW geometry) and automatic check for the maximum deadtime reached by each element of the fluorescence detector during energy scans.

○ Development of Python scripts and Gnuplot tools for data preview and normalization.

XRF experiments

○ Development of scripts for XRF maps pre-processing for maps reshaping and normalisation. The code features the automatic detection of incomplete map collection (e.g. beam dumps) and subsequent dataset correction with automatic restoration of the rectangular size required by PyMCA software.

○ Development of a script for automatic correlation calculation between pairs of elements in XRF maps

○ Development of scripts to convert h5 to txt and csv format ensuring compatibility with data analysis programs (Orange, Origin, Gnuplot)

○ Support in data collection and data analysis for quantification of trace elements in ancient artefacts, identification and correlation of elements in biological tissues and environmental samples.

XRR experiments

In collaboration with the Elettra IT group (dr. M. Prica), we implemented the X-ray Reflectivity data collection, including a dedicated GUI.

User support in proposal design, data acquisition and analysis.

General

○ I developed a code to optimize monochromator parameters to ensure the best possible energy calibration over the whole energy range of the beamline (in use since 2018)

○ Constantly fine-tuning the beamline scripts to improve the beamline automation for optics optimisation and reliable data collection.

○ Constantly updating the beamline webpage, making sure that the latest hardware and software upgrades are available for users, including:

– available standards and reference compounds;
– optics motion guides (monochromator system at XRF);
– manuals for authored code;
– manuals for workflows (EXAFS, XRR, XSW scan);
– manuals for UHVC alignment and venting;
– manuals for remote control of the beamline via VUO;
– manuals for data access from VUO.

Technical skills and experience (continued)

2023 - now

New μXRF Beamline design.
Directly involved in the organisation of the dedicated Workshop, held in Elettra in September 2023.
Directly involved in the writing of the call for tender for the new beamline optical design. I have been travelling to other similar beamlines (ID21 at ESRF, BAMline at BESSY, P06 at Petra III) to see the solutions that have already been chosen to implement μXRF and μXANES techniques.
In July 2024, I have carried out an experimental session at the beamline I18 (Diamond Light Source). During this beamtime (of which I was main proposer, SP35863-1), I have used the instrumentation already available for a user community similar to the one that will benefit of the new μXRF beamline at Elettra 2.0.

2020 - now

Others.
Detector assembling and testing in collaboration with the Elettra electronics group (dr. R.H. Menk)
- position-sensitive X-ray detector system currently available at the XRF beamline
- 2D detector for XANES measurements in transmission geometry on samples with μm-inhomogeneities

2014 - 2016

Development of a MOKE setup at the ID03 beamline, ESRF.
During my period at the ESRF, I was in charge of the development, installation, and testing of a new Magneto Optic Kerr Effect (MOKE) setup compatible with the offline UHV chamber available at the ID03 beamline.

2013 - now

Synchrotron Radiation.
Since my M.Sc. thesis, I have been using synchrotron radiation techniques for nanoscale characterization of the magnetic and structural properties of materials. I have been involved in 20+ experiments proposal-evaluated beamtimes (many as main proposer). Some proposal were part of CERIC-ERIC or NFFA projects. Facilities I have worked in include: Alba, Diamond, Elettra, ESRF, Petra III.

Ultra-High Vacuum equipment.
Experience in preparation and *in-situ* characterization of thin ferromagnetic films in UHV environments and related skills.
- Management of UHV environment (including baking procedures, filaments replacements, gas line management, now)
- Growth of monolayer graphene via Chemical Vapour Deposition (CVD)
- Growth of thin ferromagnetic film via electron bombardment
- *In-situ* characterization of thin ferromagnetic films
- Thermally-induced intercalation of the thin film under graphene
- Angle-resolved XPS, MOKE, XRR

Workshop/Conference organisation

- SILS conference 2025
  part of the scientific committee of the annual meeting of the Italian Society of Synchrotron radiation - Cagliari, IT
- Training Workshop on Synchrotron Technologies and Techniques and their Applications 2025
  Annual training workshop jointly organised by IAEA and Elettra
- Training school for applications of synchrotron light in cultural heritage studies
  Training school jointly organised with the Heritage-Malta facility to support and foster heritage studies exploiting synchrotron techniques
- SILS conference 2024
  Annual meeting of the Italian Society of Synchrotron radiation - Rende, IT
- Training Workshop on Synchrotron Technologies and Techniques and their Applications 2024
  Annual training workshop jointly organised by IAEA and Elettra
- Training Workshop on Synchrotron Technologies and Techniques and their Applications 2023
  Annual training workshop jointly organised by IAEA and Elettra
- μXRF Workshop 2023
  This workshop aimed at gathering together key users and colleagues from other facilities to present and discuss the upgrade plan of the XRF beamline for Elettra 2.0.

Teaching Experience

2026 — **PhD thesis evaluator** for Science dept., Roma Tre university - "X-Ray Absorption spectroscopy on ABX_3 and $A_3BB'_2X_9$ Perovskites - $CsPbI_3$ and $Ba_3CuNb_2(Ta_2)O_9$" candidate Francesco De Angelis

2023 - now — **Teacher for Synchrorton Radiation school** organised by Graz University of Technology/Montan University Leoben.

2023 — **Invited lecturer for Advanced Spectroscopy in Chemistry (ASC) consortium winter school**, Organised by the Department of Industrial Chemistry "Toso Montanari' at Università di Bologna, Italy.

2021 - now — **Teacher for the Hercules school** coordinated by the Université Grenoble Alpes, lectures held at Elettra, Italy.

2021 — **PhD thesis evaluator** for Science dept., Roma Tre university - "Advanced characterization of complex materials: from nanomaterials to heavy complex systems" candidate Irene Schiesaro

2019 - now — **Teacher for the IAEA-Elettra Training Workshop on Synchrotron Technologies and Techniques and their Applications** organised every year at Elettra.
Directly involved in the organisation of the last three editions.
I have created and maintained the webpage collecting the educational materials and pictures.

2016 - 2018 — **Assistant professor** Data analysis for biologists
Dipartimento di Scienze, Università degli Studi Roma Tre
- Lecturer: prof. C. Meneghini

2013 - 2015 — **Assistant professor** Computational methods (C++)
Dipartimento di Matematica e Fisica, Università degli Studi Roma Tre
- Lecturer: prof. S. Bussino

2013 - 2014 — **Assistant professor** Introduction to Astrophysics
Dipartimento di Matematica e Fisica, Università degli Studi Roma Tre
- Lecturer: prof. E. Bernieri

Teaching Experience (continued)

2011 - now **Science communication**
Università degli Studi Roma Tre, ESRF, Elettra.
Participation to 10+ national/international events for science communication and official guide of the Elettra Synchrotron

Invited talks

2025 **PALSA 2025 , Saskatoon (Canada)**
Pan American Light Sources for Agriculture
Advancing Sustainable Agriculture and Food Research
Invited contribution: *Synchrotron X-ray for Archaeometry: state-of-the-art and future perspectives*

2023 **MetroArchaeo, Rome (Italy)**
International conference on archaeology and cultural heritage.
Invited contribution: *Synchrotron X-ray for Archaeometry: state-of-the-art and future perspectives*

On the edge of invisible, more than archaeometry, Gorizia (Italy)
International meeting held at the Gorizia University campus
Invited contribution: *Synchrotron radiation for cultural heritage: assessing fine details of ancient times*

2022 **Joint AIC-SILS conference, Trieste (Italy)**
International conference on synchrotron radiation and crystallography
Keynote contribution: *Combining experimental and statistical tools for a comprehensive approach to cultural heritage*

Skills

Languages English (C2), French (C1), Spanish (B2), Japanese (A2).
Coding Python, C, C++, LaTeX.
Web Dev Html.

Miscellaneous Experience

2024 - now **Member of the *Società Italiana Luce di Sincrotrone* (SILS) council**

Awards and Achievements

2018 **Best PhD Thesis**, SILS Conference, Rome, Italy.
2014 **Best Poster Award**, Graphene Conference, Genova, Italy.
Best Poster Award, Young Researchers meetings, Grenoble, France.

Research Publications

References

Available upon request