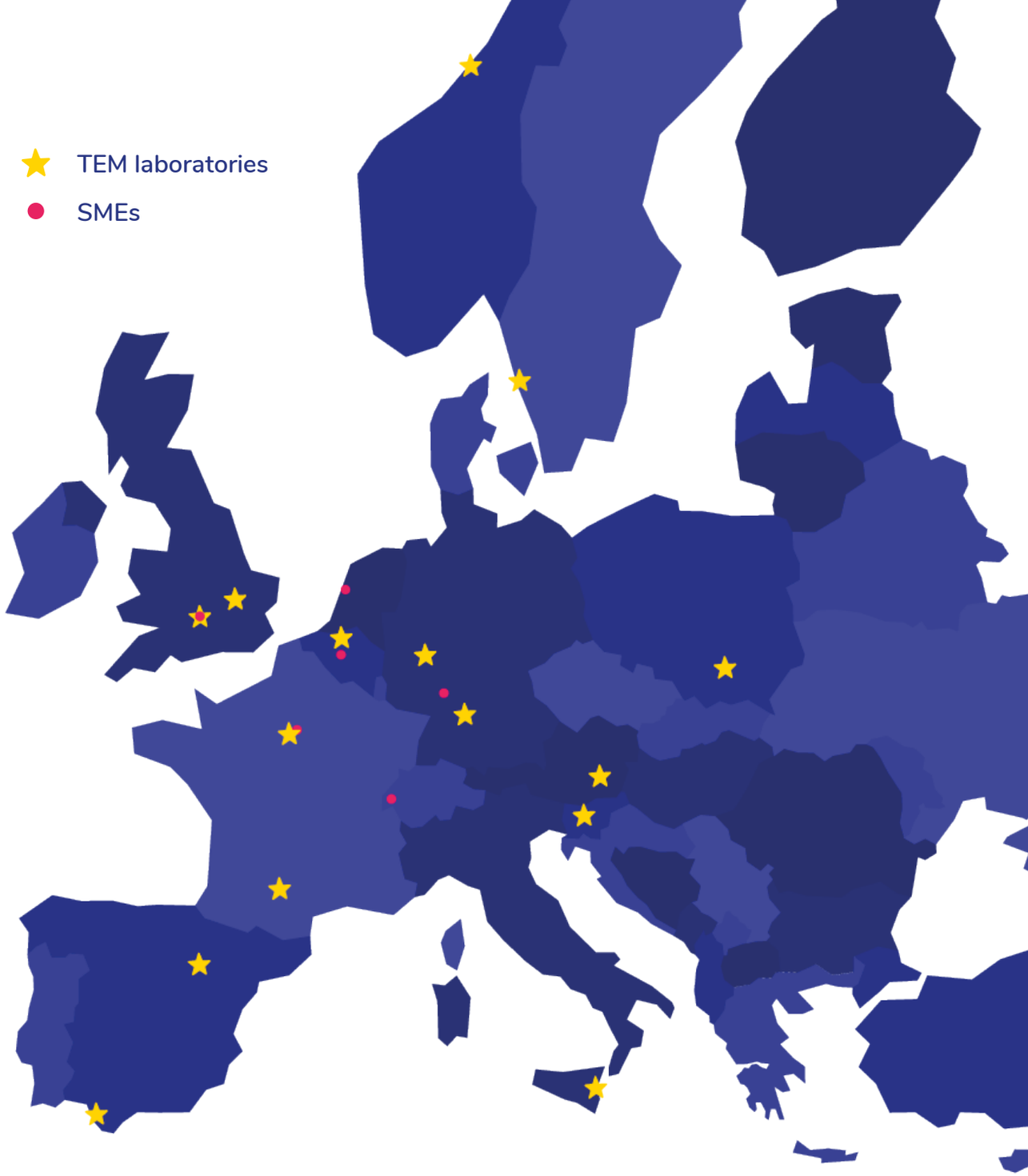
esteem3

EUROPEAN NETWORK FOR
ELECTRON MICROSCOPY

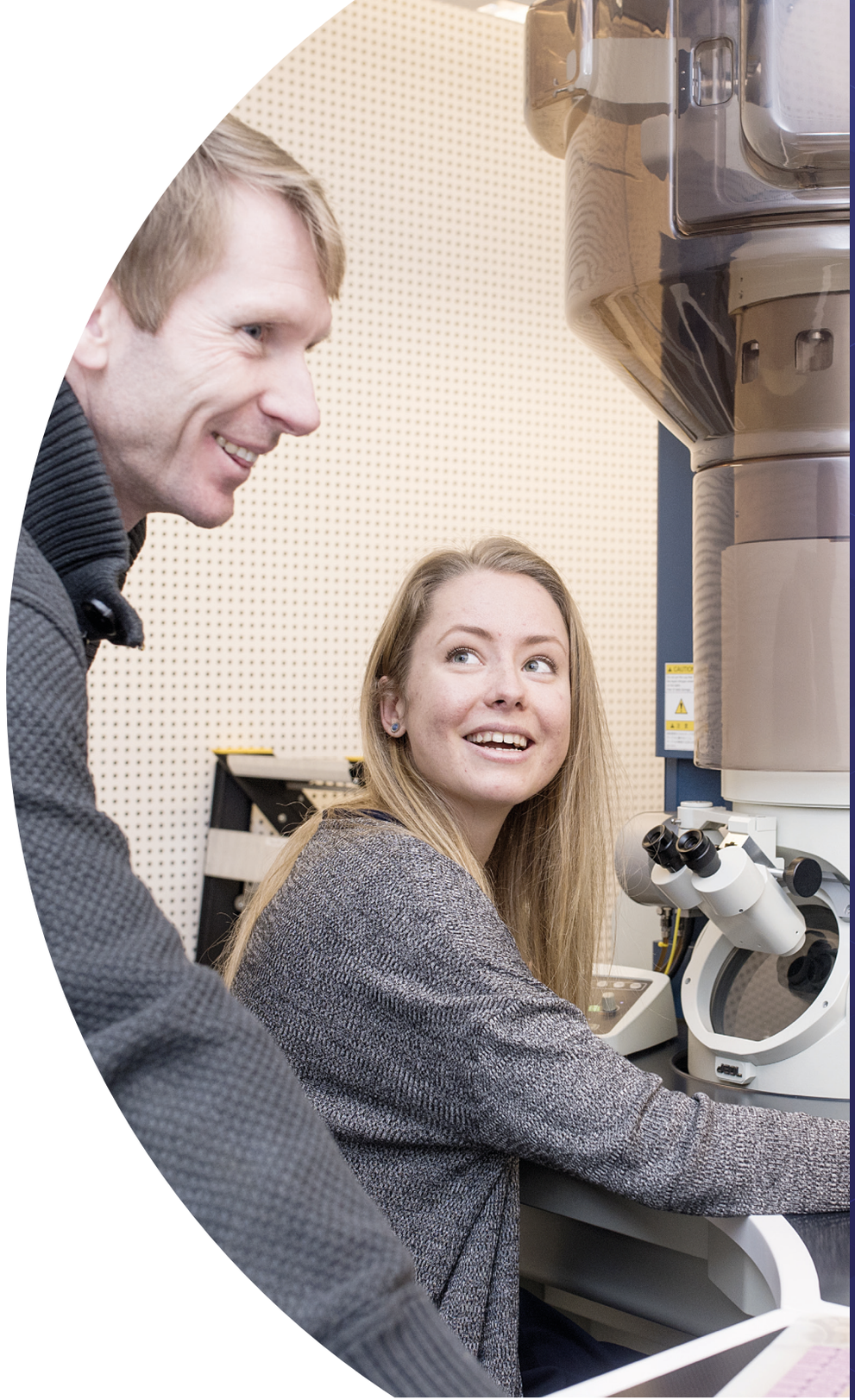
www.esteem3.eu



ESTEEM3 offers free Transnational Access to advanced installations in Transmission Electron Microscopy

ESTEEM3 brings together the leading European laboratories equipped with the most advanced Transmission Electron Microscopy (TEM) installations and thereby aims to be the key European multi-site research and user infrastructure platform for advanced electron microscopy characterisation.

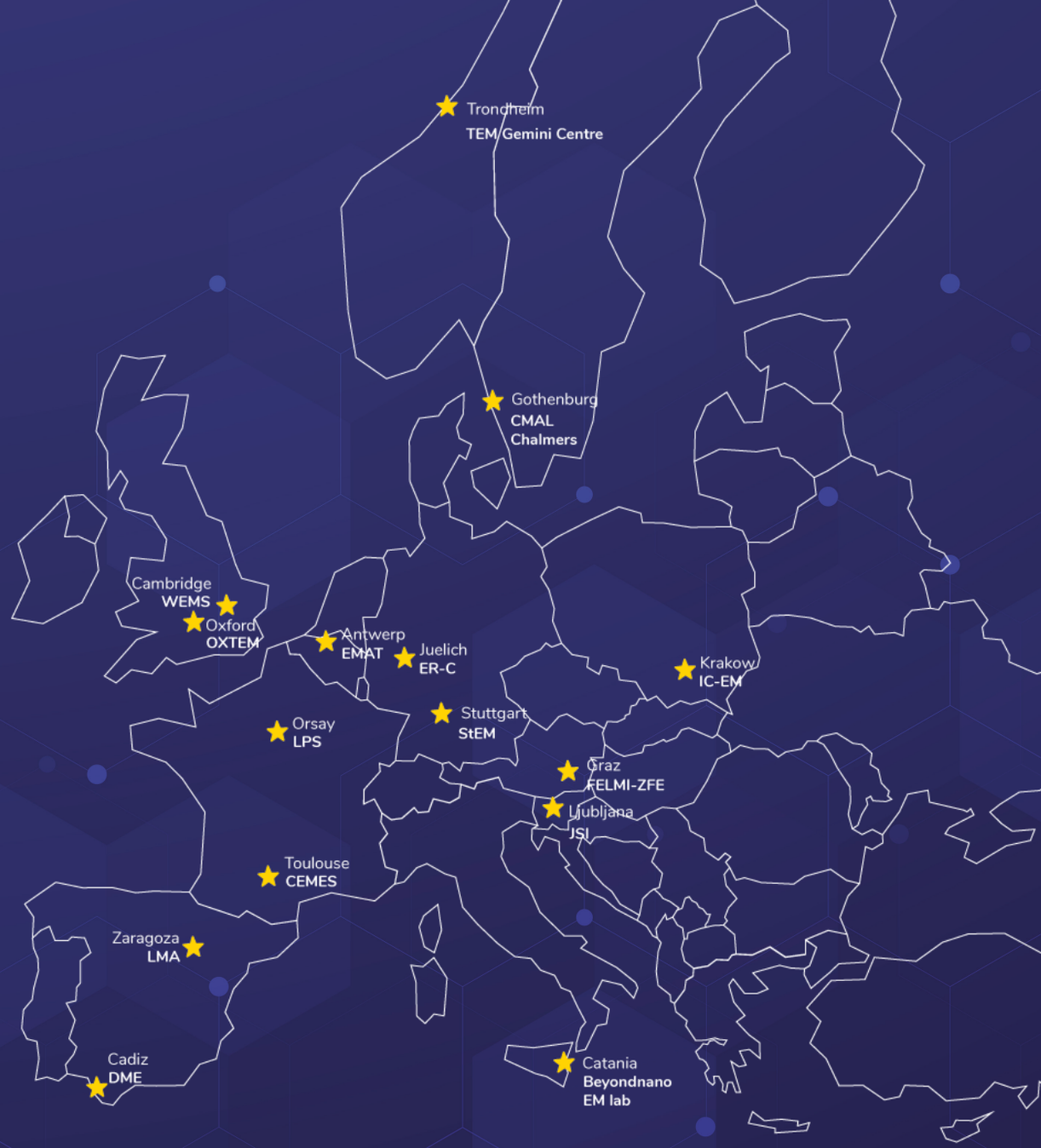
The project aims at **facilitating access to the state-of-the-art TEM instruments for academia and industry**, supporting the wider user community, integrating access procedures and disseminating best practice. European and international researchers are provided with ultrahigh resolution electron microscopy instrumentation at the forefront of technology with world-class facilities so that challenging materials characterisation problems can be solved at unprecedented spatial and energy resolution, thereby creating a research venue, where researchers from various disciplines are able to interact and develop collaborations.



Transnational Access to the ESTEEM3 installations

Transnational Access (TA) to ESTEEM3 facilities is granted after submission of a specific research project proposal. TA applicants must request access by submitting on the ESTEEM3 website (esteem3.eu) a description of the work that they wish to carry out. TA projects are then evaluated as they arise by the Transnational Access Proposal Evaluation Committee (TAPEC), which is composed of renowned scientists in microscopy and materials science.

- **International** user teams (where all or the majority of users works in non-EU countries) can be supported.
- Users belonging to **European SMEs** can benefit from the TA scheme without having to disseminate their research findings
- Access may be made available to external users, either in person or through the provision of samples.

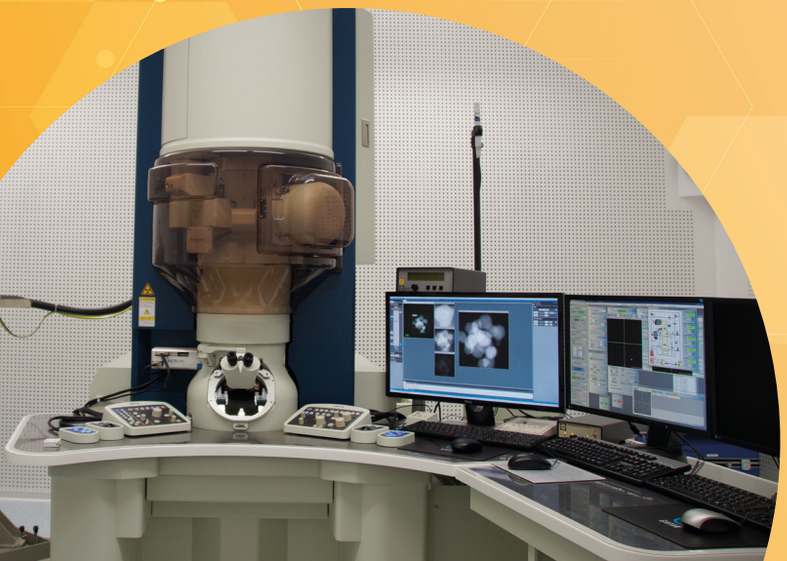


Training

ESTEEM3 supports education and training in advanced TEM through schools, advanced workshops, webinars and other contemporary, internet supported means of education.

Service provision

ESTEEM3 develops and provides sample preparation protocols and software for data analysis to academia and industry. These are freely available on our website.



Planning for ESTEEM3 schools and workshops

2019

- EMAT workshop on transmission electron microscopy (Antwerp)
- Conventional and counting EELS spectroscopy school (Catania)

2020

- TEM-UCA transmission electron microscopy of nanomaterials (Cadiz)
- The 6th Stanisław Gorczyca European school (Krakow)
- ESTEEM spectroscopy school (Graz)
- Advanced in situ electron microscopy of ICT structures (Gothenburg)

2021

- QEM: review and new advanced TEM techniques (Toulouse)
- Workshop on advanced TEM specimen preparation (Stuttgart)
- Electron diffraction for solving engineering problems (Trondheim)

2022

- European workshop on quantitative STEM imaging (Ljubljana)
- School on *in-situ* TEM (Juelich)

In addition, several webinars on specific TEM topics will be organised:

- Low-loss EELS modelling and tomography
- Preparations and considerations for in-situ microscopy of ICT structure
- In-situ techniques
- Open software for TEM image simulation
- Computer-assisted electron crystallography
- Industrial webinars

ESTEEM3 for industry

TEM provides the most powerful atomic scale characterization techniques to study and develop a wide range of materials:

- **ICT materials** such as semiconducting and magnetic materials, functional complex oxides, or photonics materials
- **Energy materials** such as electrode materials in batteries, nanocomposite solar cells, or steel and superalloys for power plants
- **Health materials** such as pharmaceutical nanoparticles
- **Transport materials** such as complex metallic alloys needed in the aeronautics, aerospace and automotive industries
- **And many others** such as polymers needed in the chemical industry, rocks and unlithified materials for geologic studies or cultural heritage materials.

Our **Industry Liaison Officers (ILOs)** are ready to help you to take advantage of the ESTEEM3 TA scheme. The ILOs can help you build your TA request and put you in contact with best TA centre to carry out your experiment. If you have any question, please do not hesitate to contact.

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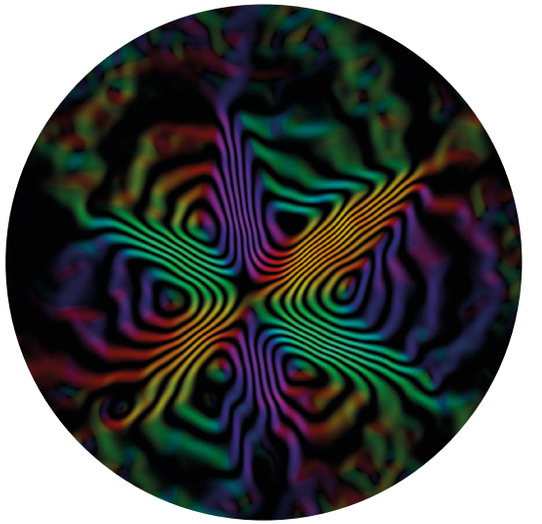
Joint Research Activities

ESTEEM3 promotes Joint Research Activities (JRA) to focus on the development of the advanced TEM methods required for the solution of key problems in materials and nanoscience. Importantly, these JRA will strengthen TA capabilities within the ESTEEM3 consortium by providing a higher level of overall service to all TA users both from academia and industry. The JRA have been selected to enable potentially disruptive scientific and technological projects that will enhance overall service provision.

ESTEEM3 includes 5 important European SMEs **(Attolight, CEOS, DENSsolutions, Nanomegas, and Quantum Detectors)** that are involved in key TEM technological developments supporting the project activities. The participation of these SMEs also enhances TA by ensuring that the contributing installations are able to offer state-of-the-art resources throughout the project lifetime.

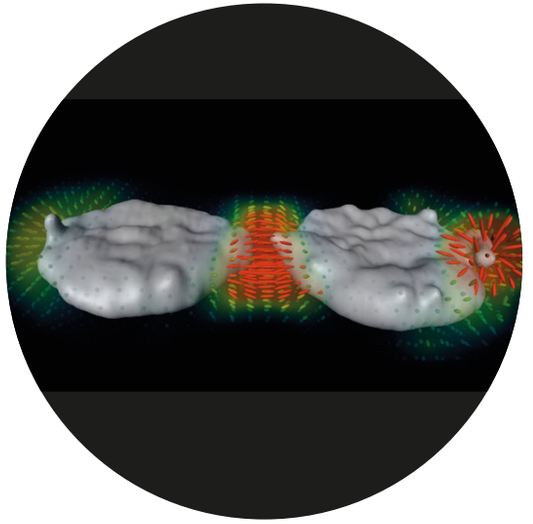


Magnetic induction of a FeCo nanostar observed by off-axis electron holography

JRA1 will push the development of TEM techniques and methodologies such as:

- Advanced electron **imaging, diffraction and metrology** methods that can deliver high-precision quantitative measurements of the materials' structure.
- **Spectroscopies** in TEM to probe electronic, chemical and optical properties of materials at and below nanometre spatial resolution.
- Advanced ***in-situ* TEM** experiments to obtain precise and quantitative information on structural and compositional changes *in operando*, at industrially relevant conditions under various external stimuli, and/or in different environments.

Credits picture JRA1 - L.-M. Lacroix and C. Gatel (CNRS-CEMES)



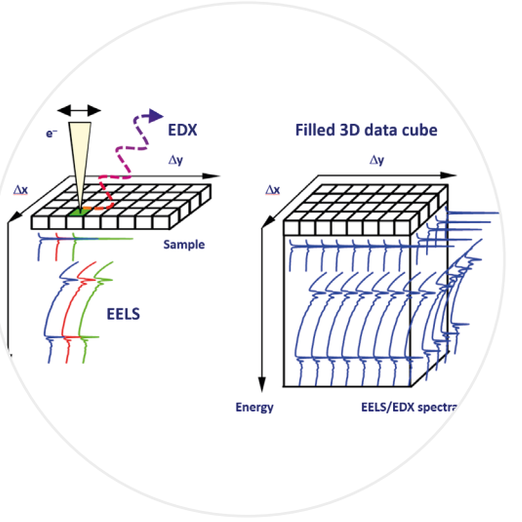
3D photonic LDOS reconstruction of two coupled Ag nano-discs

JRA2 is dedicated to the support and solution of academic and industrial TEM users' materials problems.

- Different TEM characterization and specimen preparation techniques will be implemented for the study of materials systems in **ICT, energy, health and transport.**

- This will provide information on properties and performance characteristics of novel materials and material combinations that are necessary for understanding and improving their engineering readiness for European industry.

Credits picture JRA2 - Horl, A., Haberfehlner, G., Trugler, A., Schmidt, F., Hohenester, U., & Kothleitner, G. (TU Graz)



Data processing in EELS and EDS filling up a multidimensional data cube

JRA3 is dedicated to data acquisition and analysis in TEM.

- Optimised open hardware and software will be developed.
- Routines for instrument control, data acquisition, data processing and machine learning with reduced human intervention will be developed using automated and smart workflows.
- Open software for the design and interpretation of experiments, including electron generation, propagation, scattering and detection in standard and specialized imaging modes will be investigated and all advances and progress will be directly transferred to TA users.

Credits picture JRA3 - Peter van Aken (MPG-StEM)

Max Planck Institute for Solid State Research

JÜLICH Forschungszentrum

cnrs

Universiteit Antwerpen

University of Oxford

University of Cambridge

Jožef Stefan Institute

TU Graz Graz University of Technology

Universidad Zaragoza

UCA Universidad de Cádiz

AGH

Chalmers University of Technology

NTNU Norwegian University of Science and Technology

Consiglio Nazionale delle Ricerche

attolight™

CEOS Corrected Electron Optical Systems GmbH

DENS solutions

NanoMEGAS Advanced Tools for electron diffraction

Quantum DETECTORS

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ESTEEM3 company profile

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