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Sincrotrone
Trieste

Elettra: Synchrotron Light for International Research

G. Paolucci
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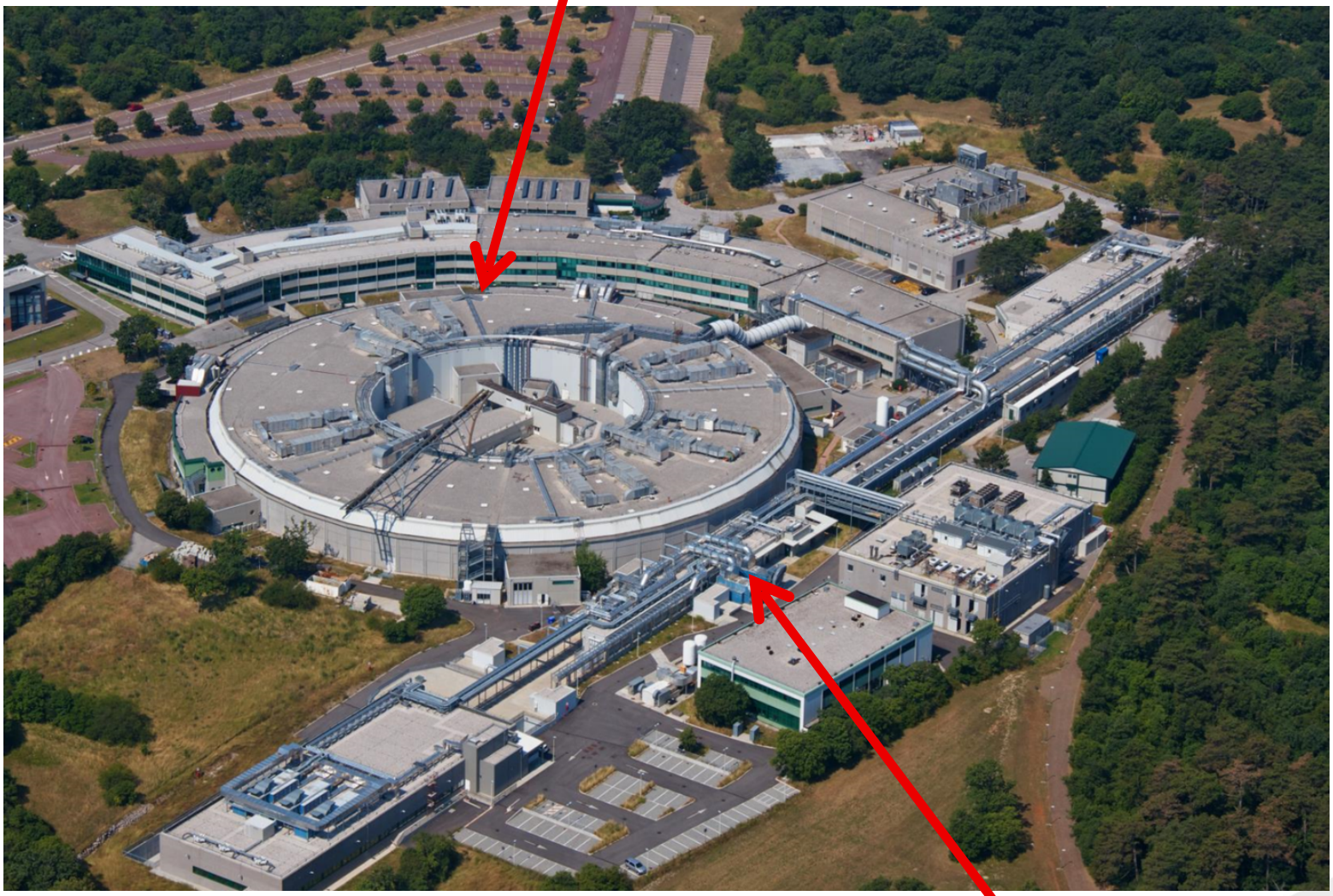
Elettra 2.0-2.4 GeV 3rd generation Synchrotron Radiation Facility



FERMI 1.5 GeV seeded Free Electron Laser Facility

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Applications

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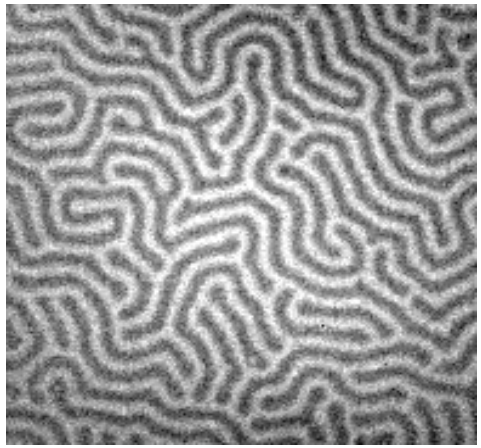
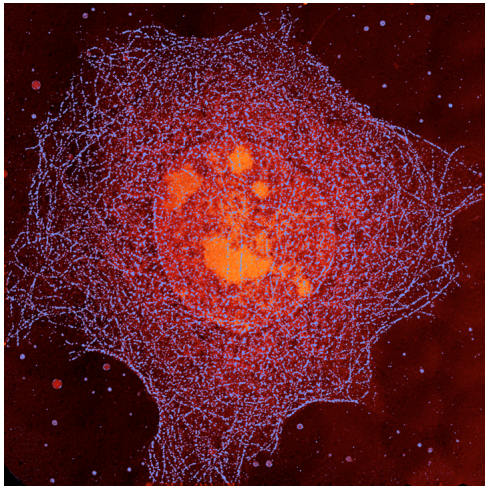
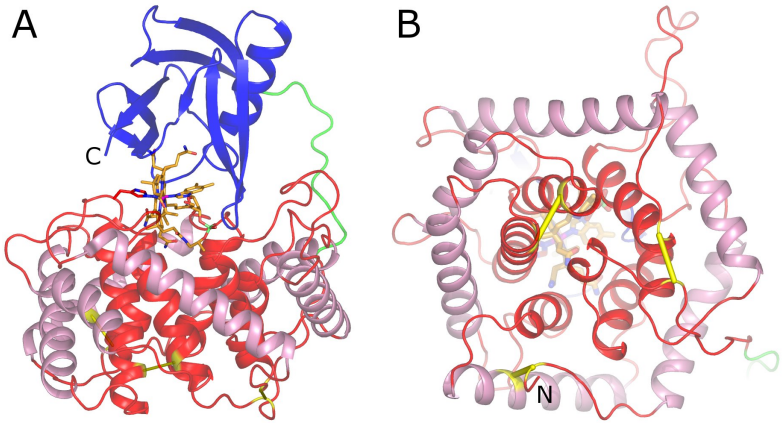
FeGd
Multilayer



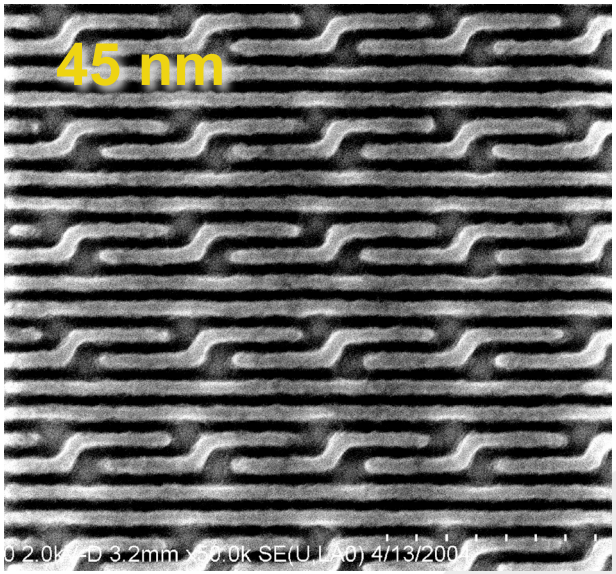
$\hbar\omega$ = 707.5 eV
Fe L_3-edge

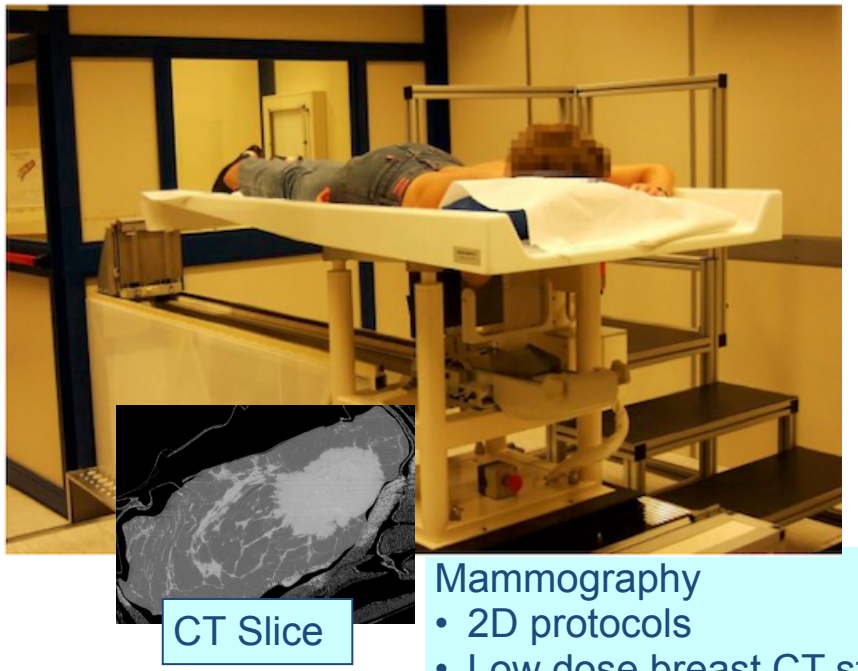


Microtubules in a mouse epithelial cell



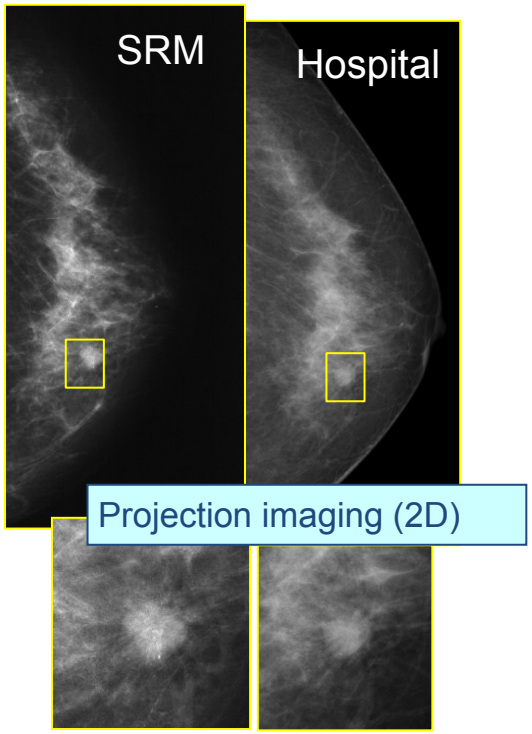
Overall structure of transcobalamin





Mammography
- 2D protocols
- Low dose breast CT studies under evaluation

High-Res X-ray absorption and phase-contrast imaging (microtomography)



Pre-clinical and clinical phase contrast imaging (2D and 3D)
✓Cell tracking techniques
✓ Study of novel contrasts agents
✓Morphological and functional imaging
✓ Dynamic CT imaging (4D)
✓In-vivo imaging on small animal models
✓ **Breast imaging**

Clinical images with SR have:
- *higher specificity,*
- *better agreement with the golden standard (biopsy),*
- *improved image quality,*
- *strong reduction of X-ray doses.*

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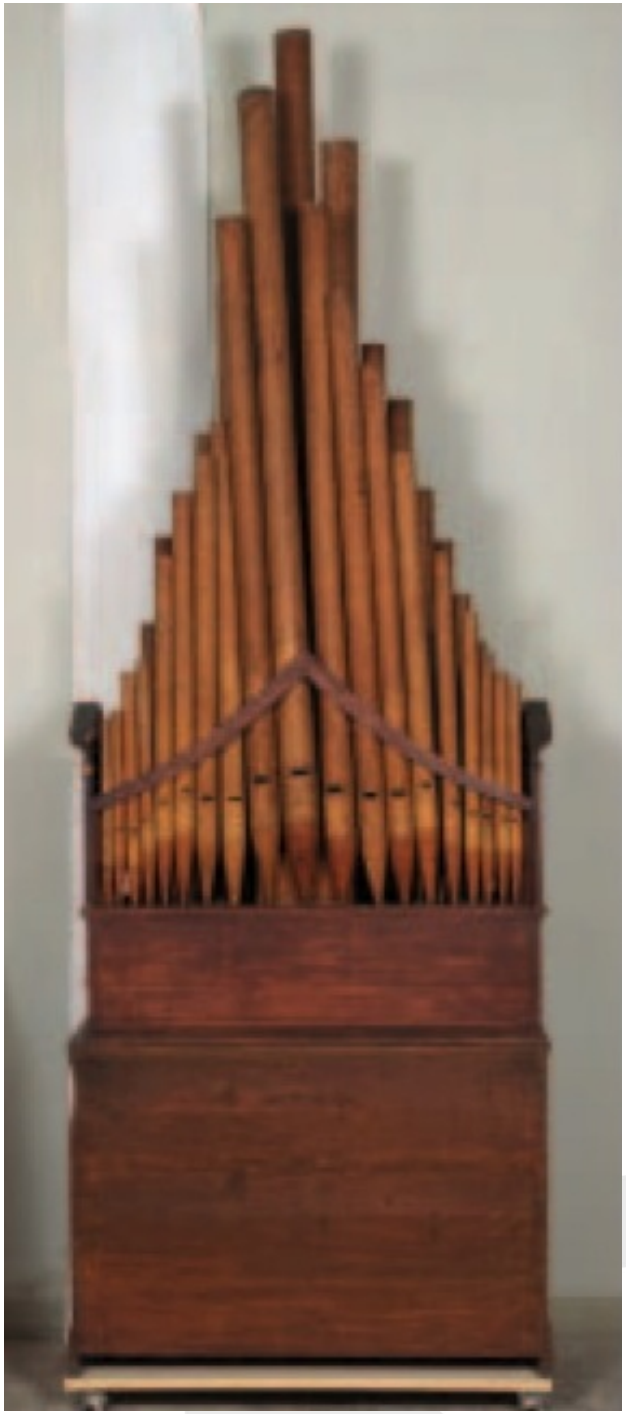
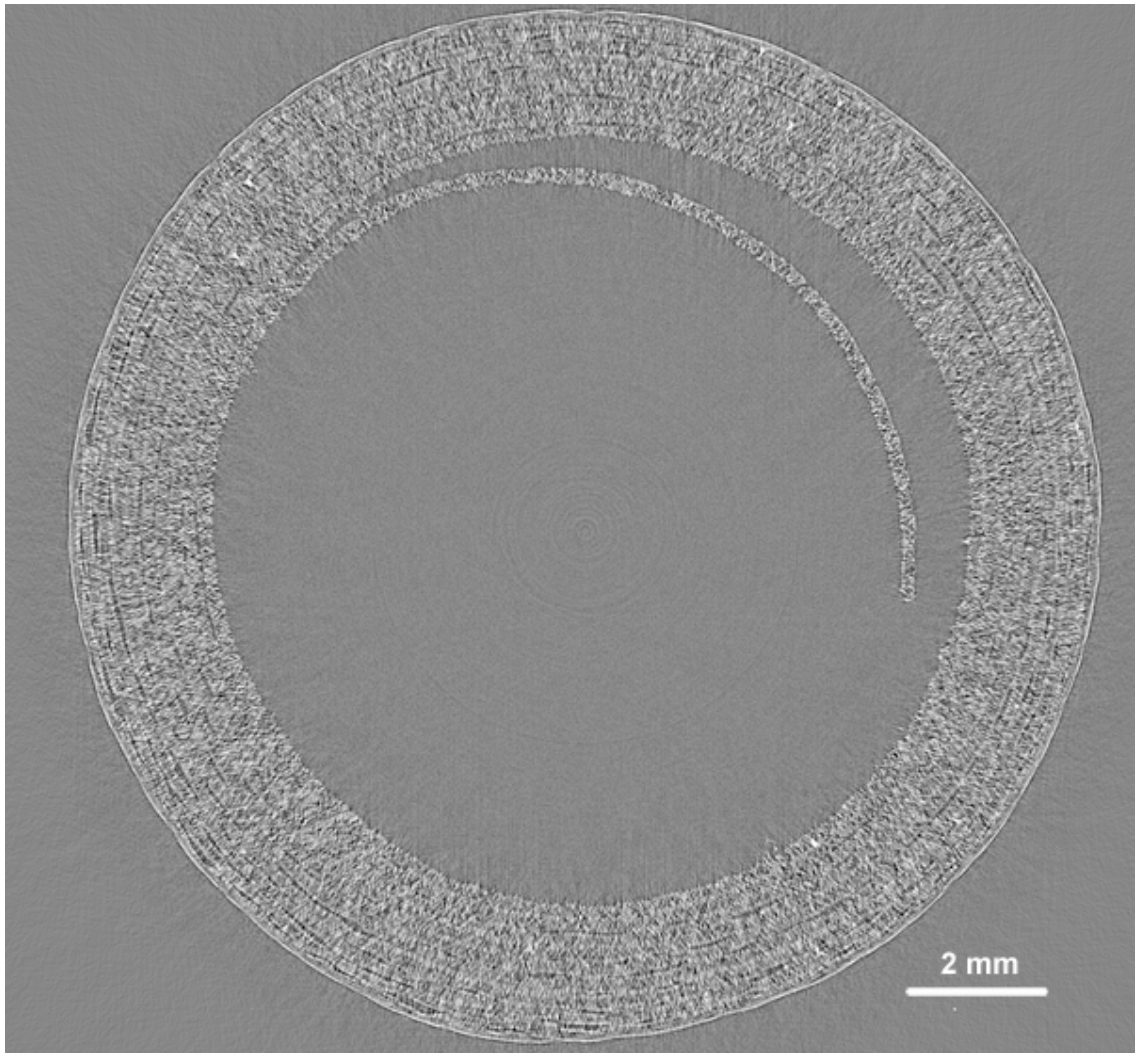
The organ by Lorenzo da Pavia

Organ by Lorenzo Gusnasco (1494)
Pipes made with rolled and glued carton.
Structural characterization of the paper pipes to define strategies for restoration, conservation and possible substitution.
Instrument of great historical and artistic relevance.



The organ by Lorenzo da Pavia



Virtual slice of a paper pipe with a spatial resolution of 9 microns

Spectromicroscopy using ptychography

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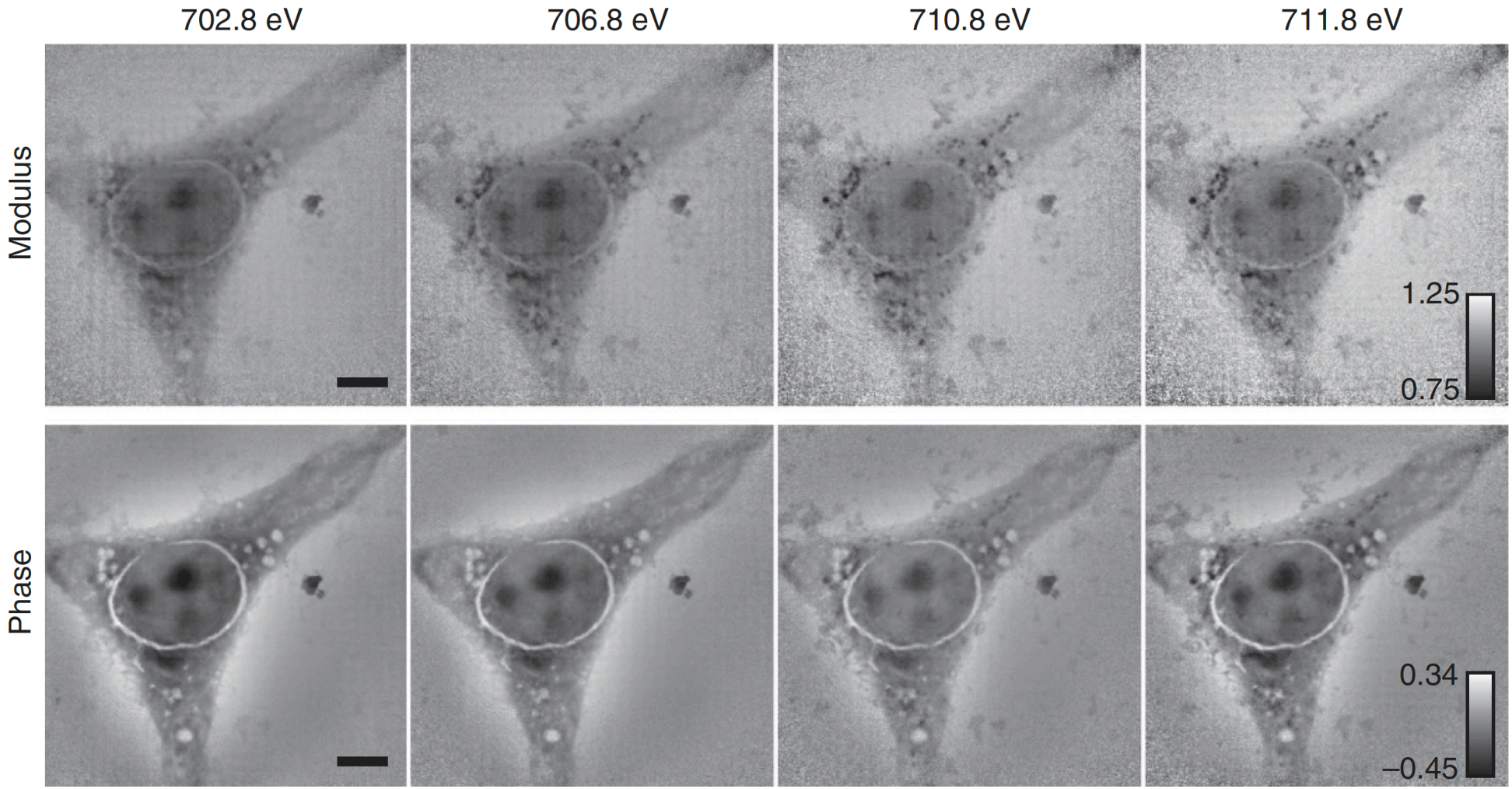
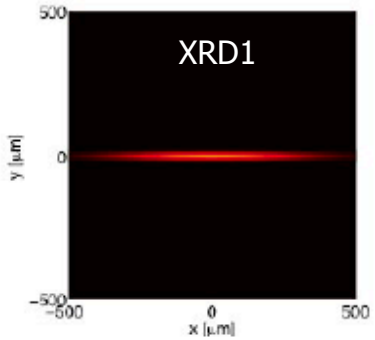
Maiden et al. DOI: 10.1038/ncomms2640



Reconstructed modulus and phase images of a Balb/3T3 mouse fibroblast. The data were collected at X-ray beam energies across the iron L edge, showing the variation in contrast of the $CoFe_2O_4$ nanoparticles as a function of energy. Scale bar, 5 μm.

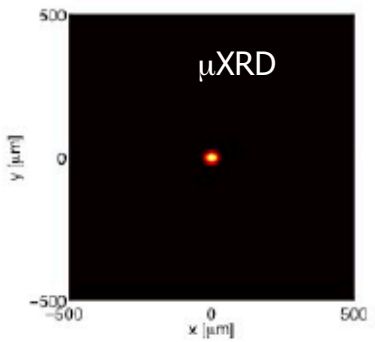
Elettra ID photon spot size



ELETTRA 2.0

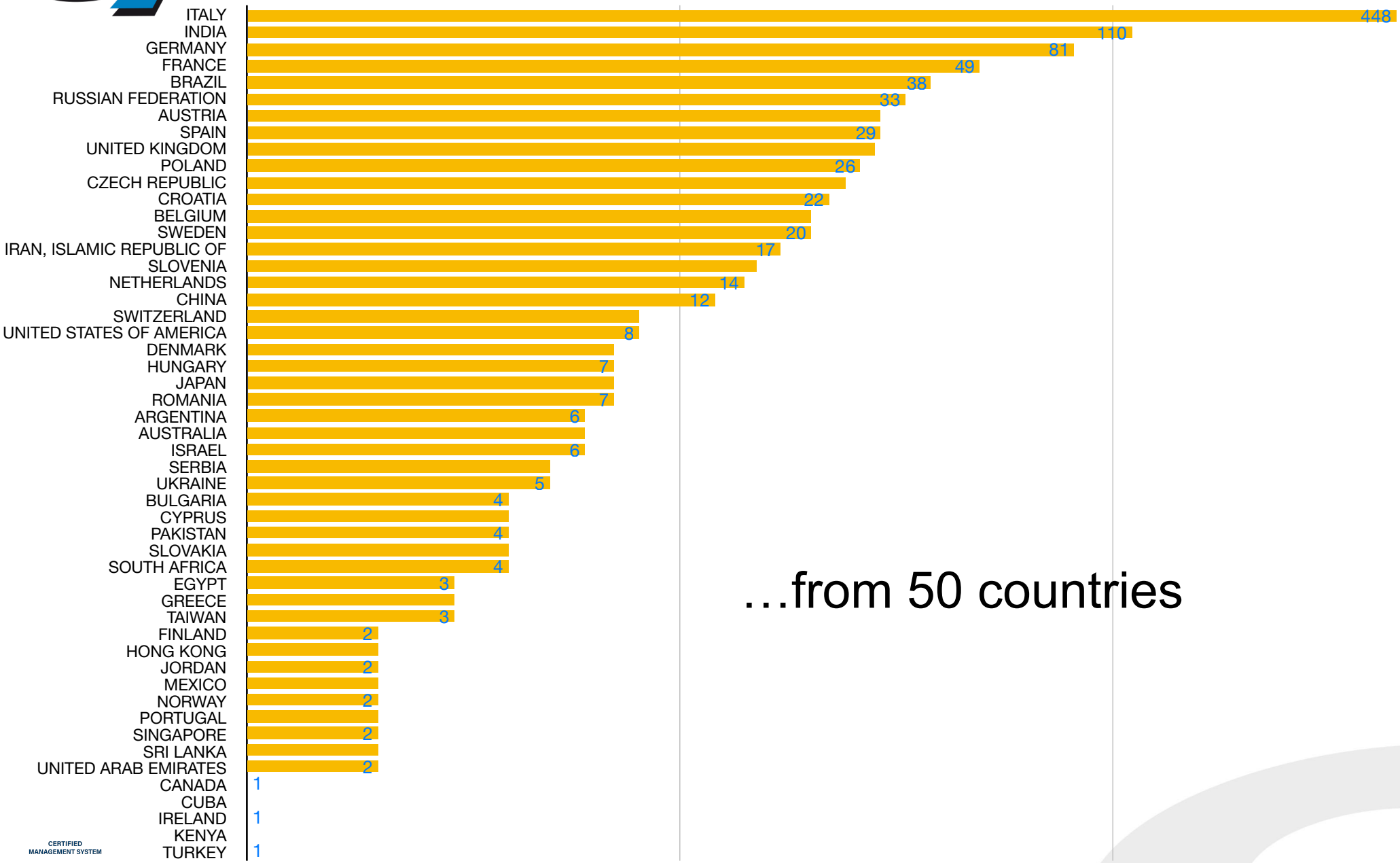
1000 TIMES BRIGHTER
50 TIMES MORE COHERENT

Elettra 2.0 ID photon spot size



Parameter	Units	Elettra	Elettra 2.0 S6BA-E
Circumference	m	259.2	259.2
Energy	GeV	**2.4**	**2.4**
Horizontal bare emittance	pm rad	10000	212
Vertical emittance @1% coupling	pm rad	100	2.1
Beam size @ ID (sx,sy)	um	286 , 16	36 , 1.5
Beam size at short ID	um	400 , 25	64, 2.2
Beam size @ Bend (at z=0)	um	272, 27	8 , 6
Bunch length (zero current, 2 MV,1s)	ps	22	5.4
Energy spread	DE/E %	0.095	0.11

Over 1100 experiments proposed in 2021…



…from 50 countries

Strategic international cooperation activities.

- Training activities within the LAAAMP (Light sources for Americas, Asia, the Middle East and Pacific) initiative.
- Partnership with the International Atomic Energy Agency (IAEA) to run a BL for fluorescence with a focus on training of scientists from developing countries.
- Partnership with the International Center for Theoretical Physics (ICTP) to support users and training of scientists from developing countries.
- Partnership with the International Center for Genetic Engineering and Biotechnology (ICGEB) to support training of scientists from developing countries in the field of life sciences, with a focus on structural biology.
- MoU for technical training and support with SESAME.
- Pilot Action for training of young scientists from the Western Balkans.

LAAAMP@Elettra

17 visits to Elettra (11 of which from Africa) have been organised from 2017 to today (with a two year stop due to COVID-19):

Benin	2
Cameroon	4
Egypt	5
Mexico	4
Thailand	2

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www.elettra.eu