

Finland:
Population 5.5 million



Finnish Synchrotron Radiation Users' Organization

Founded 2008 as a registered organization
Activities include:

National Research Infrastructure Roadmap

- Includes ESRF-European synchrotron and MAX-IV
- Several beamlines built at ESRF and MAX-IV by Finnish scientists

Research activities

- ~ 250 members in FSRUO
- Main centers: **Helsinki, Oulu, Turku, Tampere, Jyväskylä**
- Main research fields: materials research, physics, biophysics, crystallography, medical research

Annual meetings and conferences

- Annual "Synchrotron Light Finland" workshop
- Schools and Marie Curie fellowshipp programmes in materials research

Publicity activities

- Organisation webpage www.fsruo.fi and Twitter account @FSRUO
- International Year of Light and International Year of Crystallography

1160 km



Finland is a part of the Eurozone (dark blue) and European union (dark + light blue)

What is FSRUO?

Fsruo



The purpose of the organization is to present and promote interdisciplinary research based on use of synchrotron radiation and free electron lasers.

In order to do that, FSRUO:

- Organises meetings, workshops, courses and expert visits
- Coordinates and promotes development of infrastructures and data acquisition related to use of synchrotron radiation
- Coordinates communication with Finnish government and funding bodies related to topics about large scale infrastructures and related research strategies
- Represents Finland in European Synchrotron and FEL User Organisation ESUO and participates to FIMAX steering group

FIMAX

Fsruo



- FSRUO chair participates to steering committee of FIMAX which is a consortium of **Finnish Universities and research organizations with a collaboration agreement with MAX IV Laboratory.**
- FIMAX contributes to MAX IV by providing expertise, support, equipment, personnel and operation funds.
- FIMAX partnership with MAX IV is mainly funded by Academy of Finland (**1.75 M€ 2022-2026**).
- In return MAX IV gives FIMAX the possibility of placing their staff and equipment at the facility, as well as Guaranteed Access Time (GAT). GAT is based on the financial contribution.
- The basis for GAT allocation is set by FIMAX Steering Group and the scientific quality of the proposals are evaluated in the MAX IV PACs.

Fsruo

Governance

- FSRUO is a registered organization in Finland => has a legal status
- A board member has a term of 3 years, two consecutive terms maximum

Kirsi
Svedström
University of
Helsinki



Lauri
Palmolahti
Tampere
University



Edwin Kukk
University of Turku



Heikki Takala
University of
Jyväskylä



René Bes,
secretary
University of Helsinki



Nønne Prisle,
vice-chair
University of Oulu

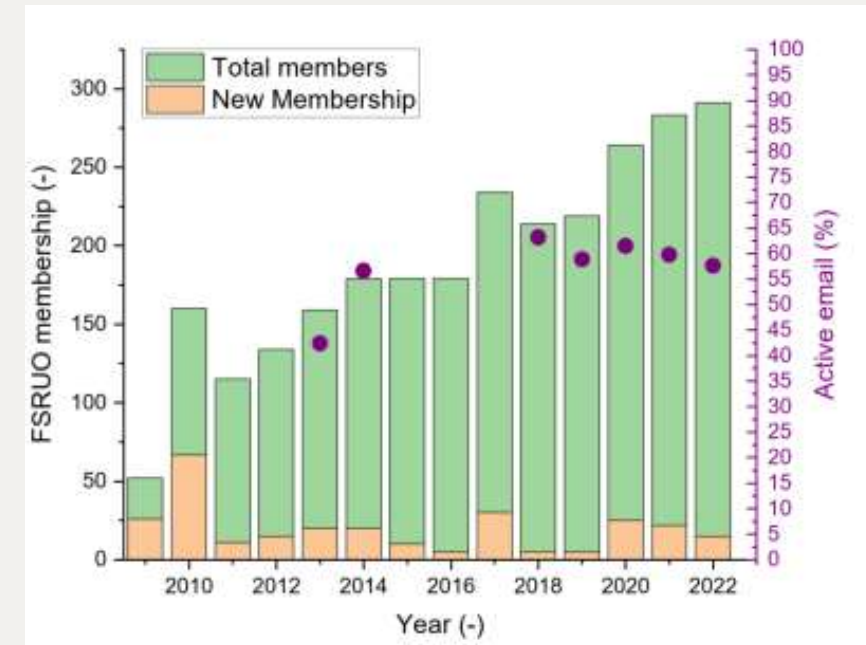


Minna
Patanen, chair
University of Oulu



FSRUO members

- We have about 250 members and the number is growing
- No membership fee
- Despite of not having a synchrotron or FEL facility in Finland, researchers affiliated with Finnish universities and research institutes are very active users of synchrotron and FEL facilities
- Companies are encouraged to participate
- <https://www.fsrUo.fi/>
 - (web site is now going down and moved to a new platform, does not work properly: SORRY)



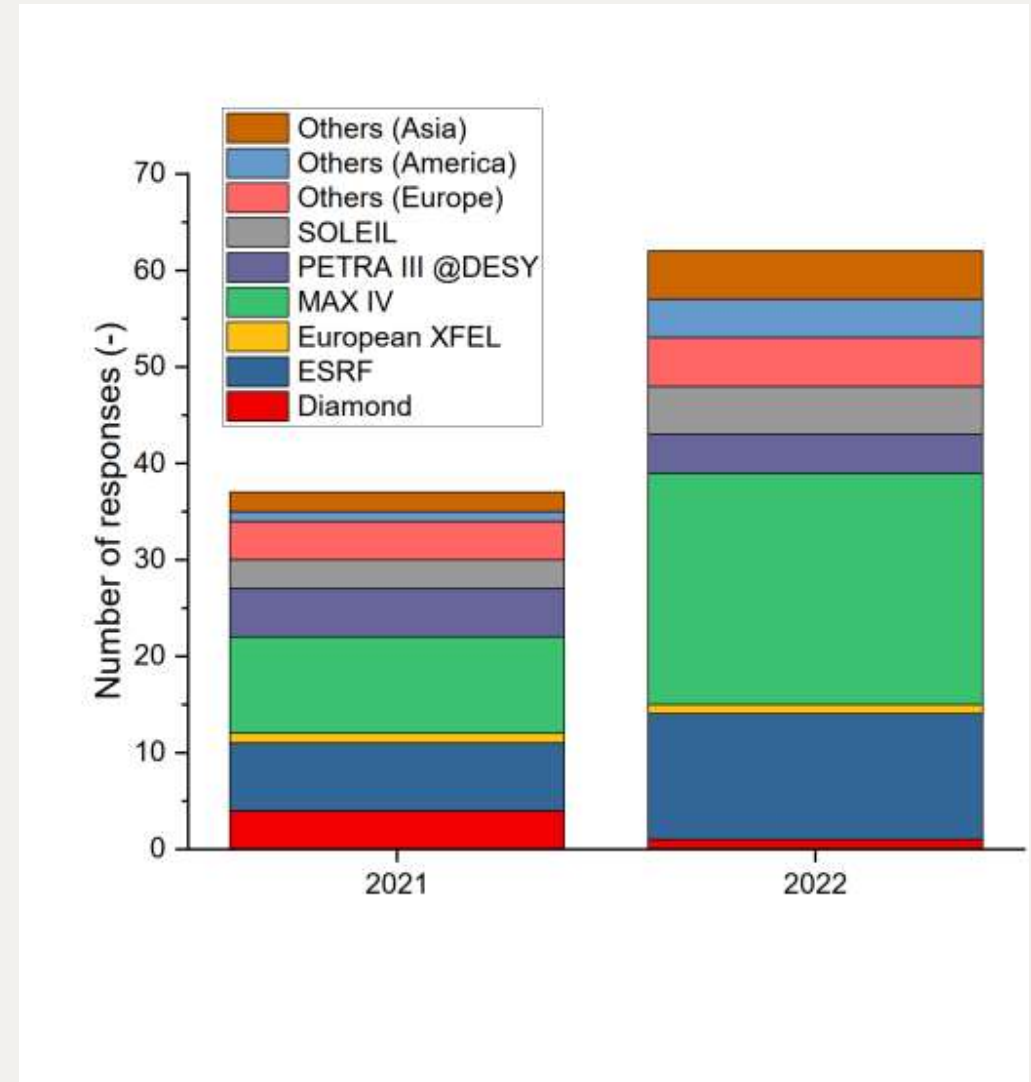
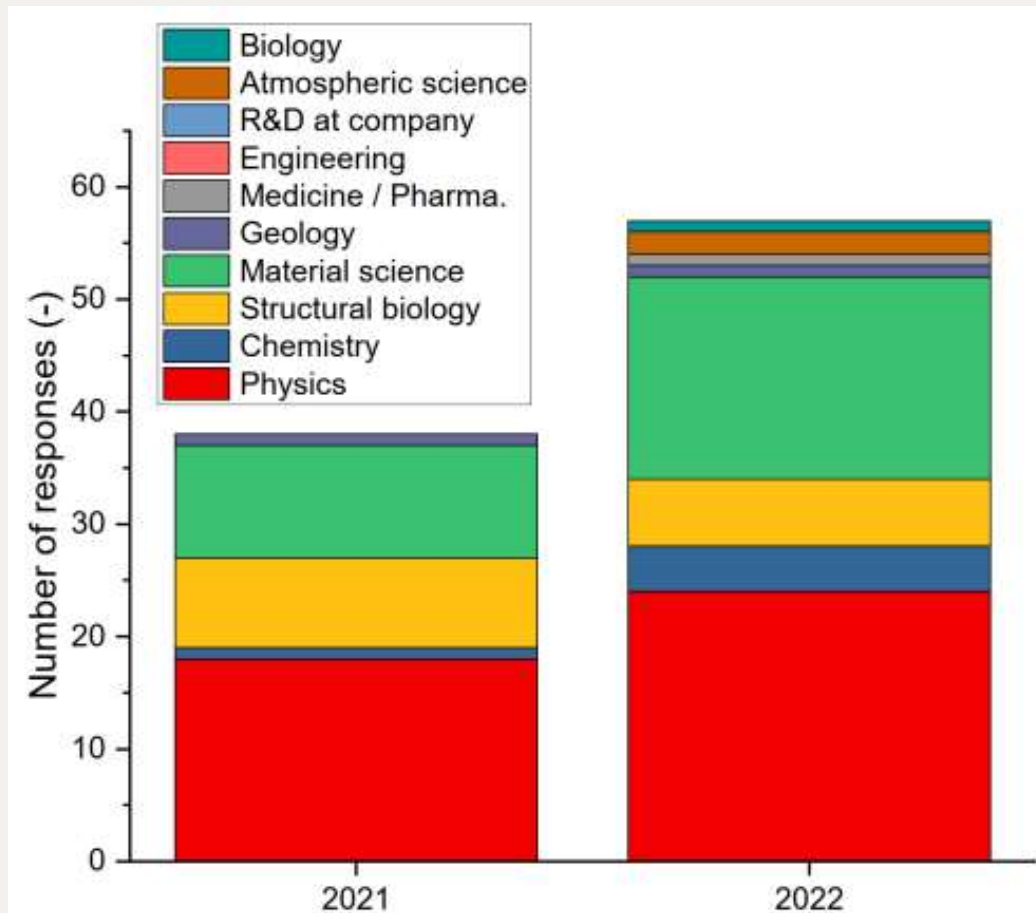
National memberships

- Finland's membership in ESRF-The European Synchrotron, has a legal statute in Finland, and Finland is a founding member
- Finland's participation in ESRF is via NordSync – a syndicate of four North European countries together with Sweden, Denmark and Norway (totaling to about 5% contribution of ESRF)
- Finland has a national membership through 2022-2026 in MAX-IV via our Research Council of Finland infrastructure membership programme (must be re-applied in 5 year intervals)



Represented fields and facility use

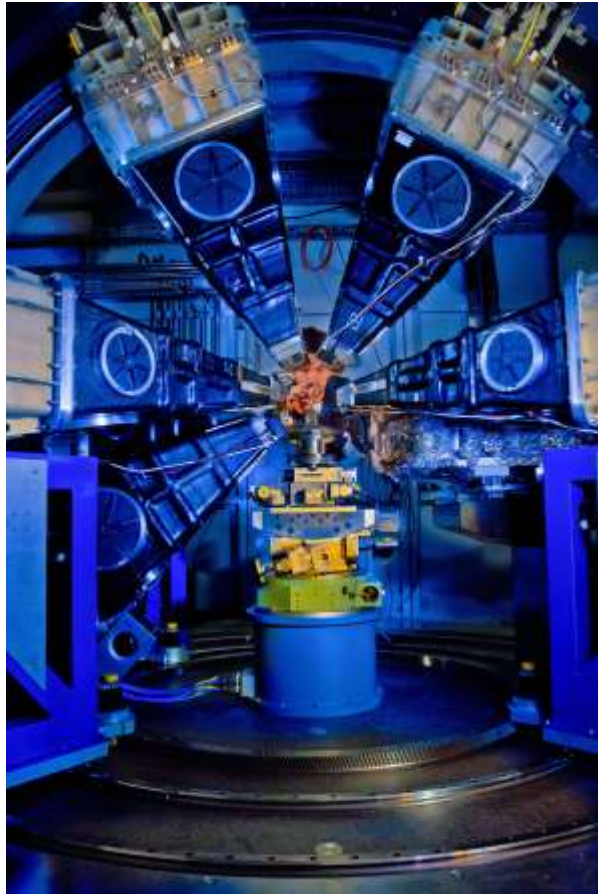
Based on survey to users, not necessarily 100% accurate



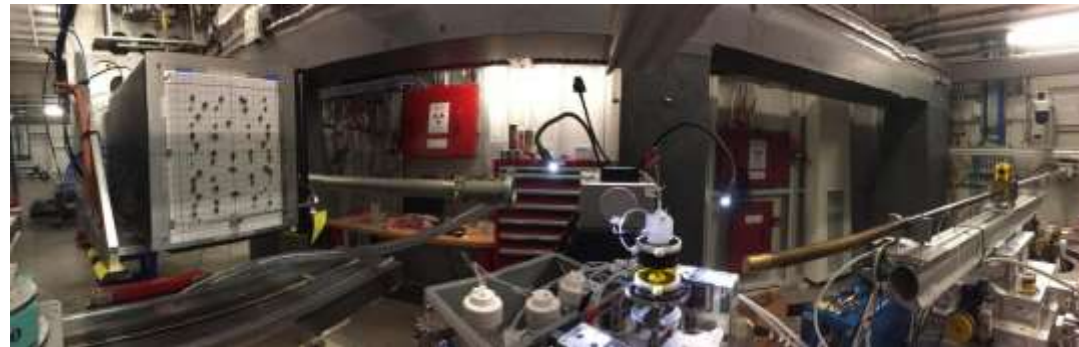
Not only synchrotron users

We have had an active role in designing and building beamlines at ESRF and MAX-IV

Has led to a pioneering role in synchrotron development also without own synchrotron and collecting synchrotron knowhow in Finland



FinEstBeaMS at MAX-IV. Antti Kivimäki et al.



ID31- High energy materials science beamline at ESRF, Veijo Honkimäki et al.



ID17 –Biomedical beamline at ESRF. Pekka Suortti et al.



ForMAX at MAX-IV Beamline dedicated to nm- to micron scale structure of materials. Kim Nygård et al. ⁸

ID20 – Inelastic scattering and spectroscopy at ESRF.

Huotari et al., J. Synchrotron Rad. (2017). 24, 521

<https://doi.org/10.1107/S1600577516020579>

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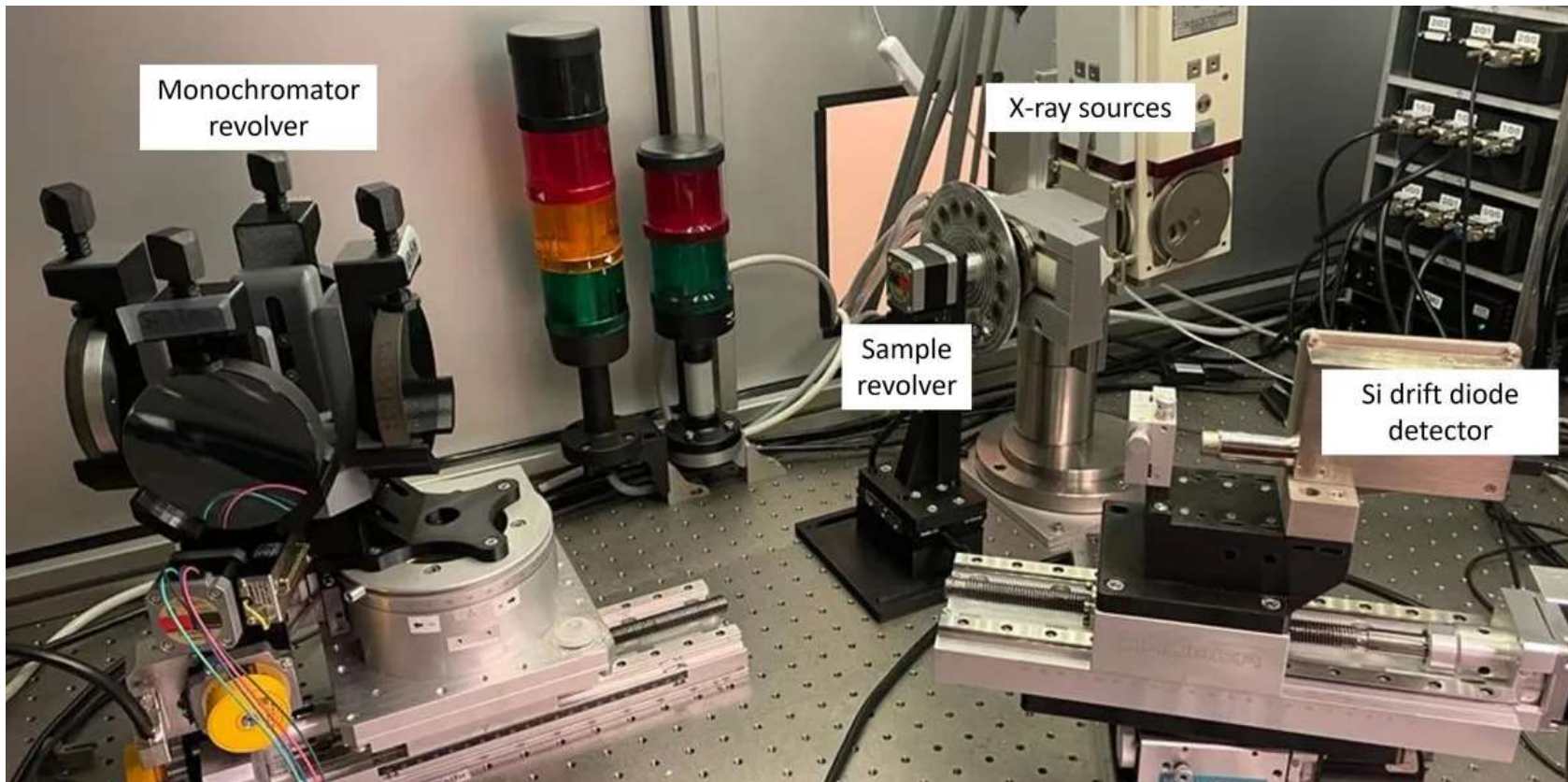
Roadmap toward synchrotron?

- It is not realistic to plan a large-scale facility currently inside Finland
- The strategy is to use collaboration with other countries (e.g., MAX-IV and Sweden)
- Compact light sources are an option
- X-ray spectroscopy, microtomography, x-ray scattering and x-ray photoelectron spectroscopy are used widely in local laboratories

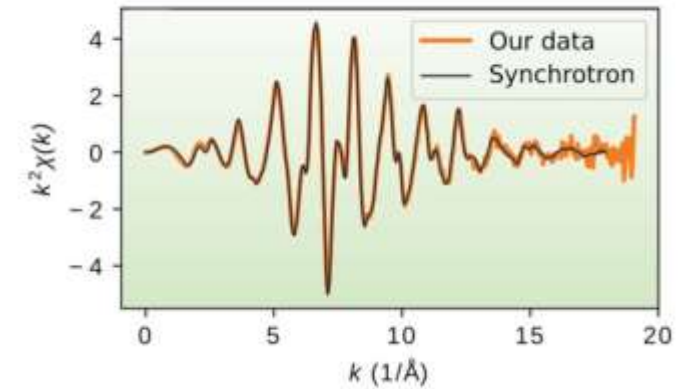
X-ray spectroscopy at home laboratory

Tool for education, and training

<https://www.helsinki.fi/en/infrastructures/center-x-ray-spectroscopy>



Extended x-ray absorption fine structure (EXAFS) from Ni



Center for X-ray spectroscopy

Dark color = tested to work

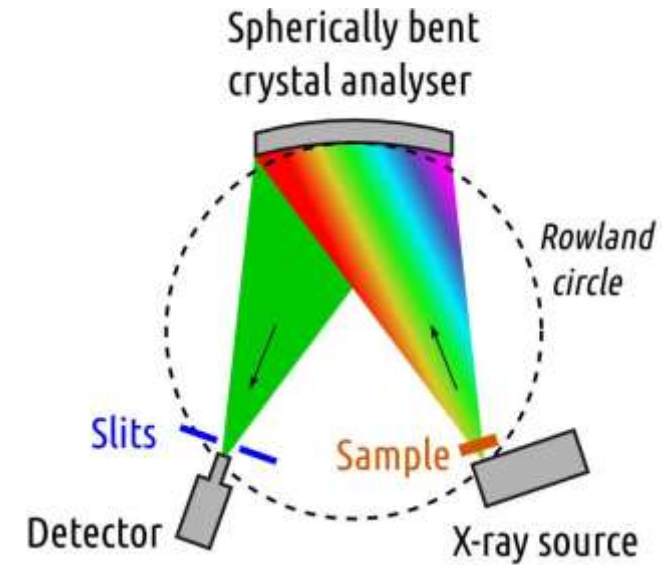
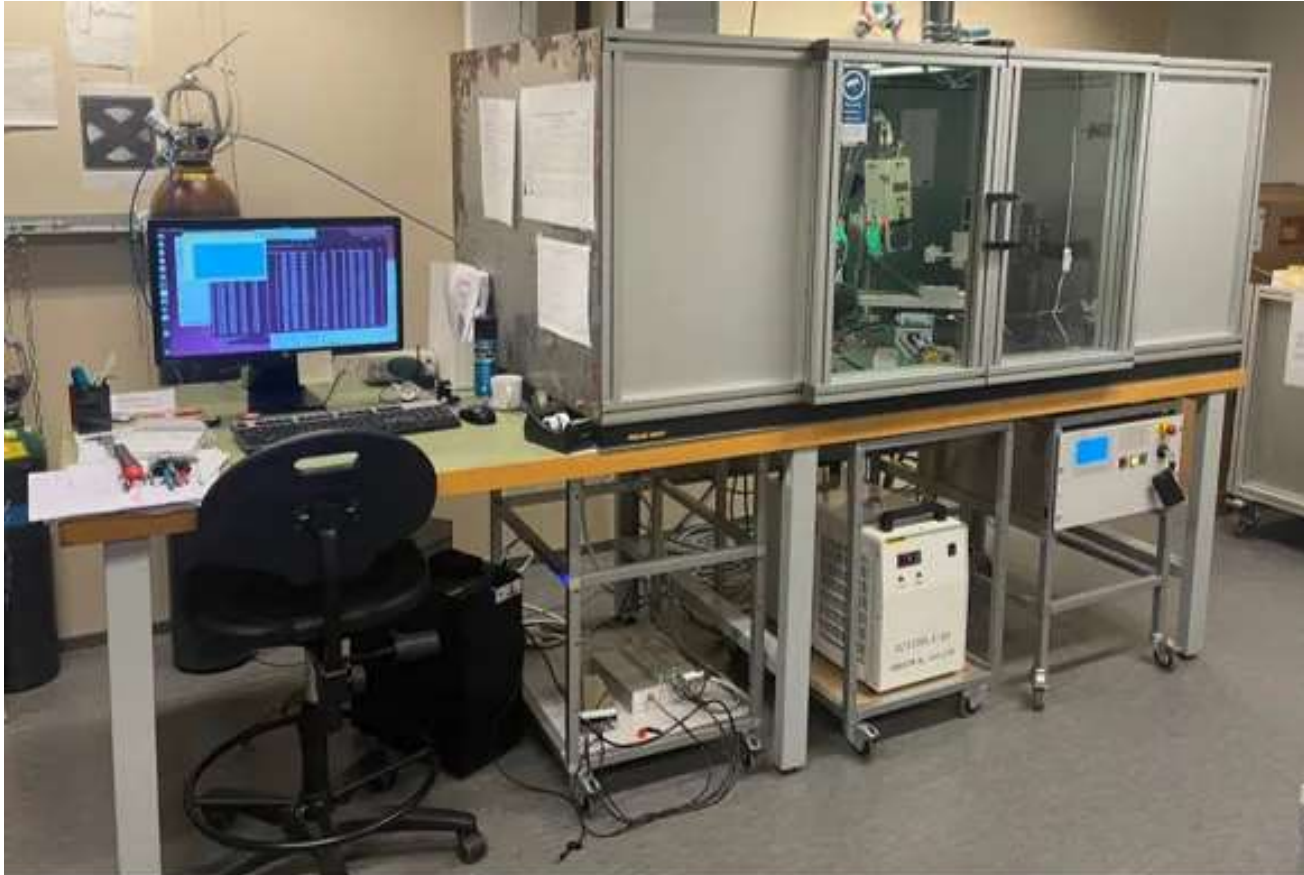
Light color = Not yet tested, but in principle possible - contact us if interested in a test measurement!

■ K-edges

■ L-edges (L₁ unless otherwise specified)

H																	He				
Li	Be															B	C	N	O	F	Ne
Na	Mg															Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr				
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe				
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn				
Fr	Ra	Lr	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og				
		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb						
		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No						

X-ray spectroscopy at home laboratory



Note the small-scale instrument

Useful for student and scientist training,
testing of samples

For concentrated and large samples the
laboratory-scale XAS is very competitive to a
synchrotron XAS beamline

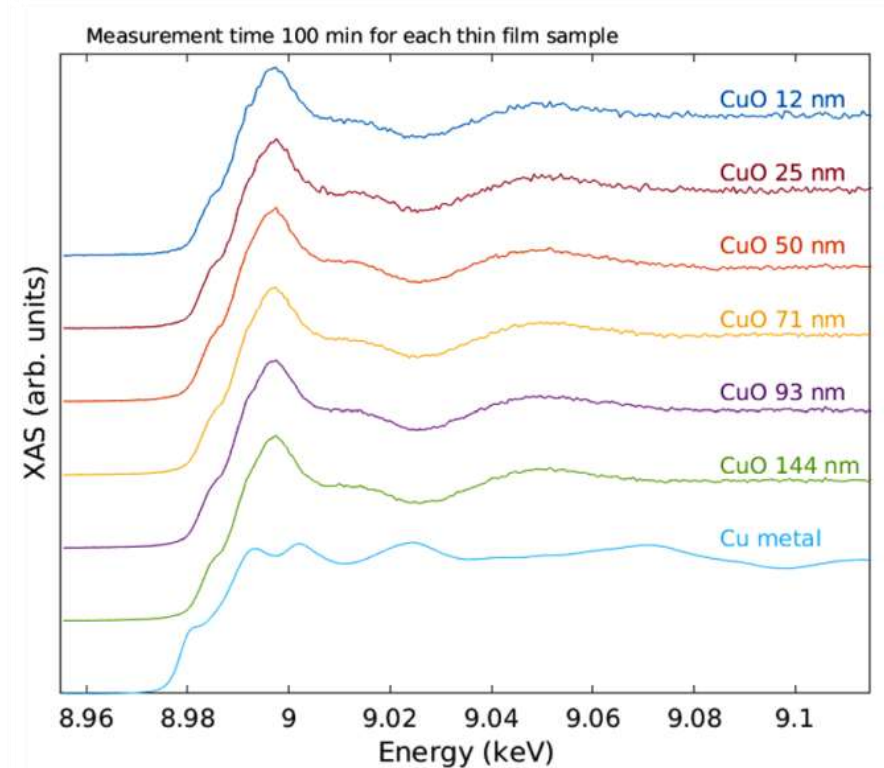
Some references to laboratory-scale spectroscopy

G. T. Seidler, D. R. Mortensen, A. J. Remesnik, J. I. Pacold, N. A. Ball, N. Barry, M. Styczinski, and O. R. Hoidn, *Rev. Sci. Instrum.* 85, 113906 (2014). <https://doi.org/10.1063/1.4901599>

C. Schlesiger, L. Anklamm, H. Stiel, W. Malzer, and B. Kanngießner, *J. Anal. At. Spectrom.* 30, 1080 (2015). <https://doi.org/10.1039/c4ja00303a>

Z. Németh, J. Szlachetko, É. G. Bajnóczi, and G. Vankó, *Rev. Sci. Instrum.* 87, 103105 (2016). <https://doi.org/10.1063/1.4964098>

A.-P. Honkanen, S. Ollikkala, T. Ahopelto, A.-J. Kallio, M. Blomberg, and S. Huotari, *Rev. Sci. Instrum.* 90, 033107 (2019). <https://doi.org/10.1063/1.5084049>



A.-J. Kallio et al., Laboratory-scale X-ray absorption spectroscopy of 3d transition metals in inorganic thin films *Dalton Transactions* (2022), **51**, 18593

Thank you and greetings from Finland!



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