Coherent Synchrotron Edge Radiation and Applications at ANKA

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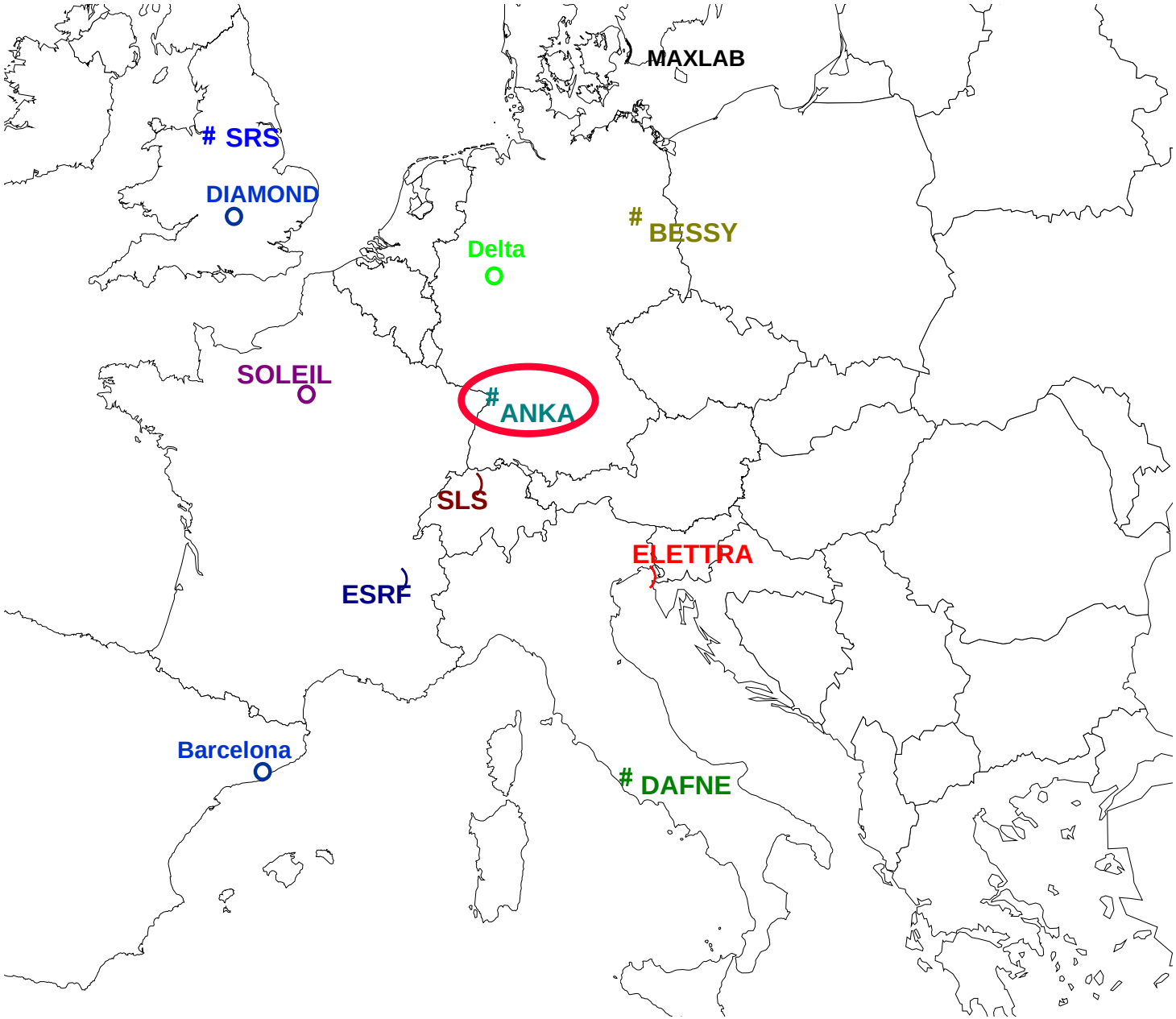
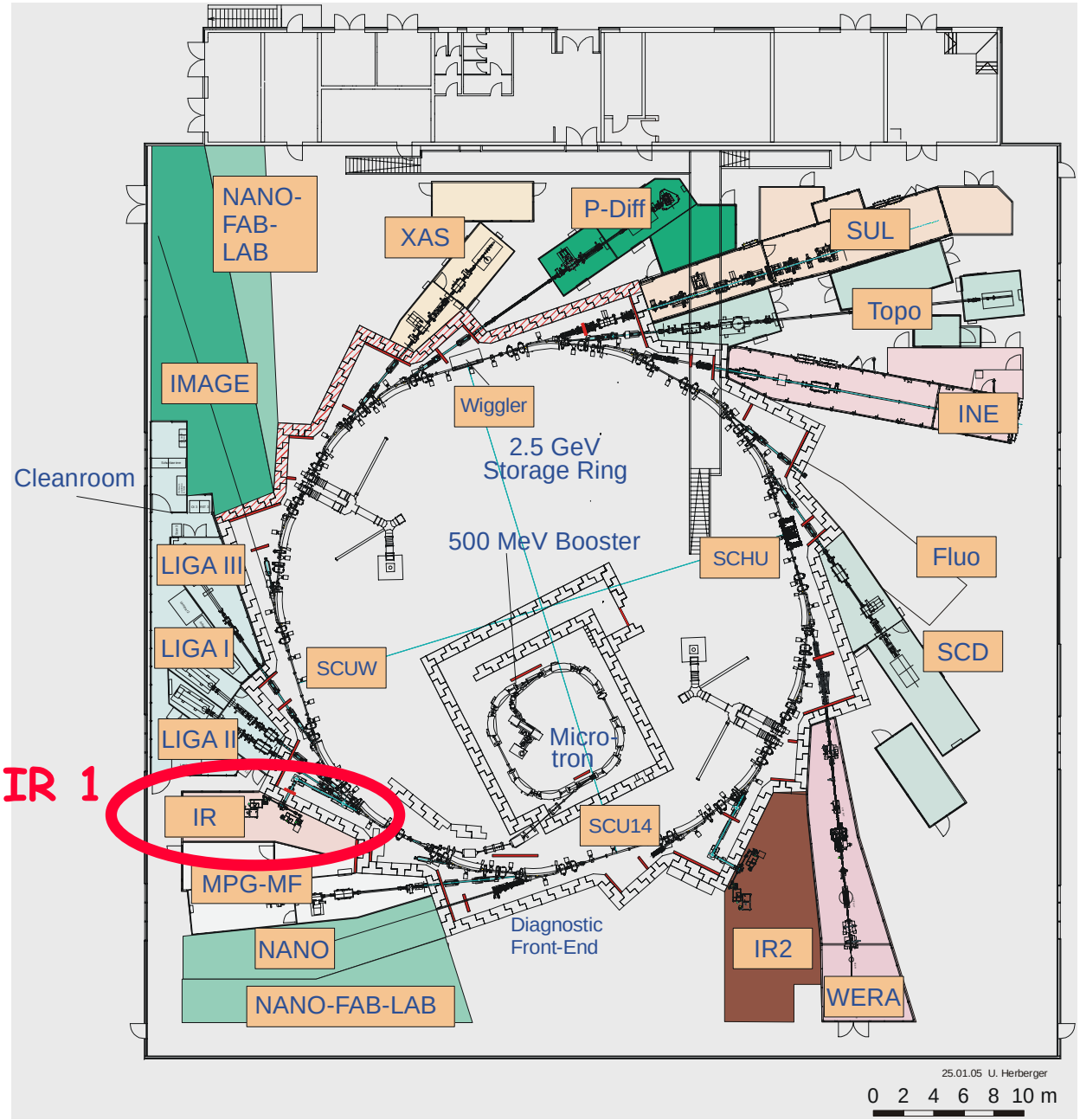
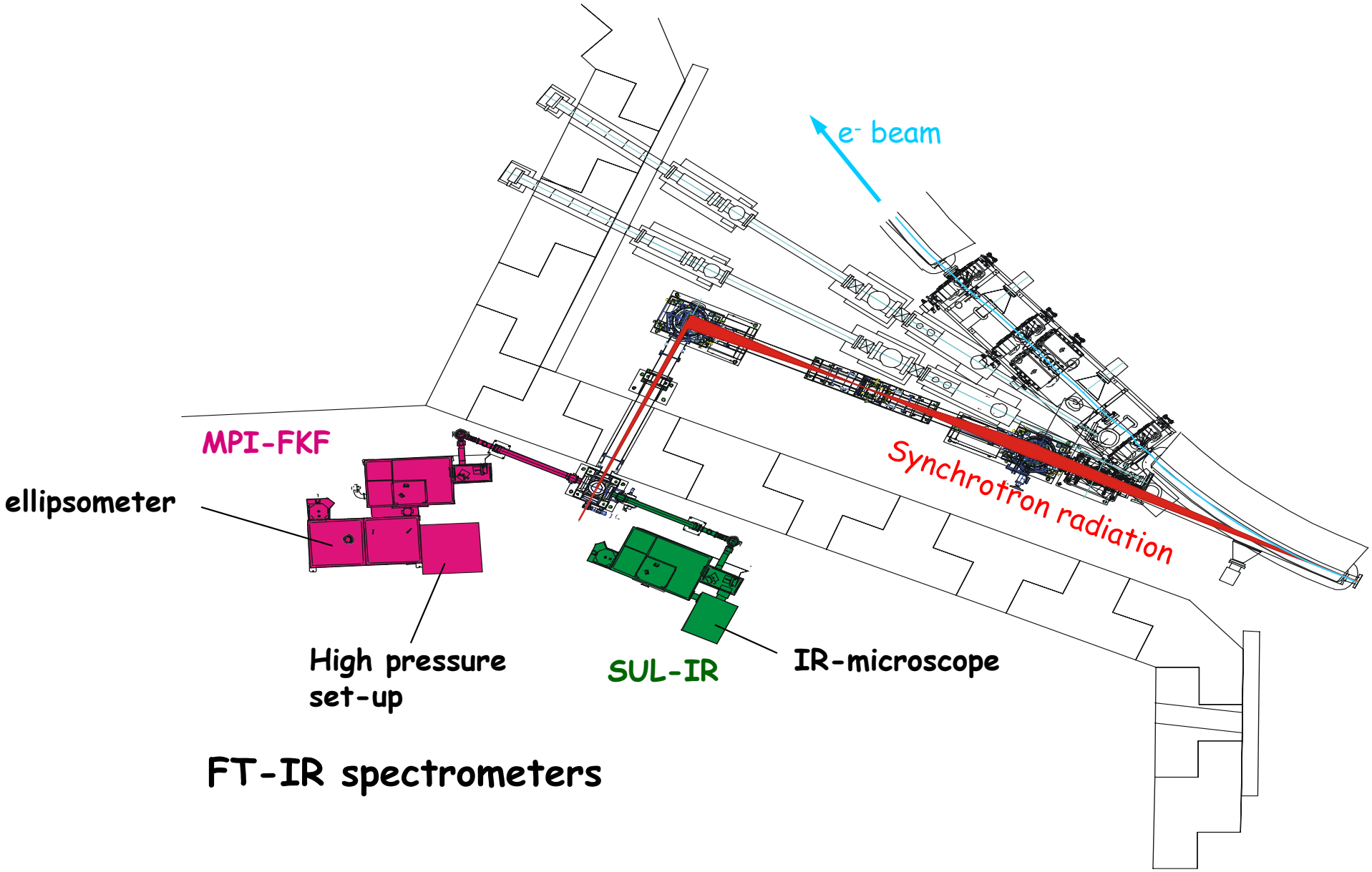
Where is ANKA?



The facility

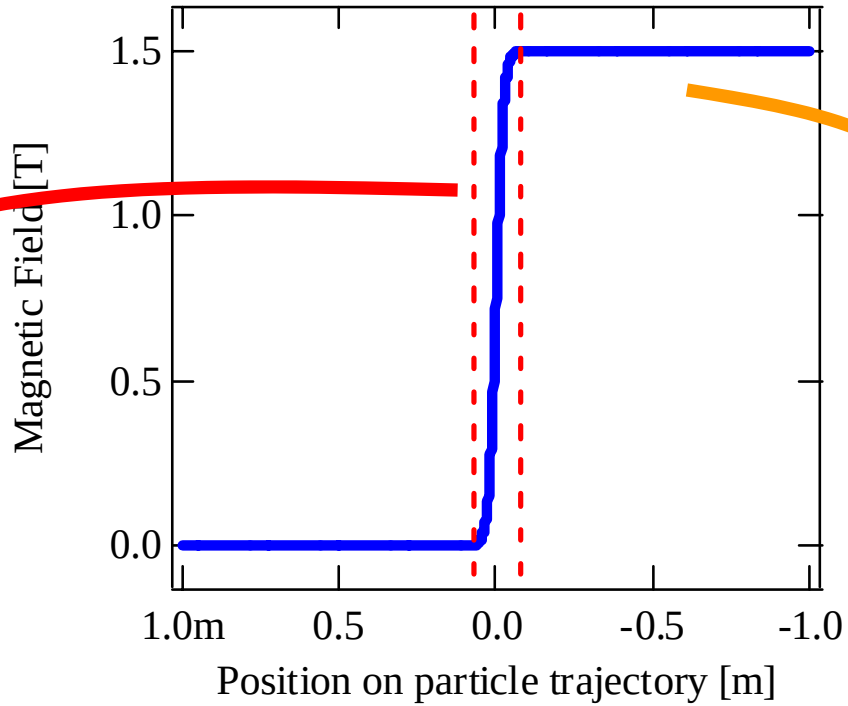


ANKA-IR beamline layout



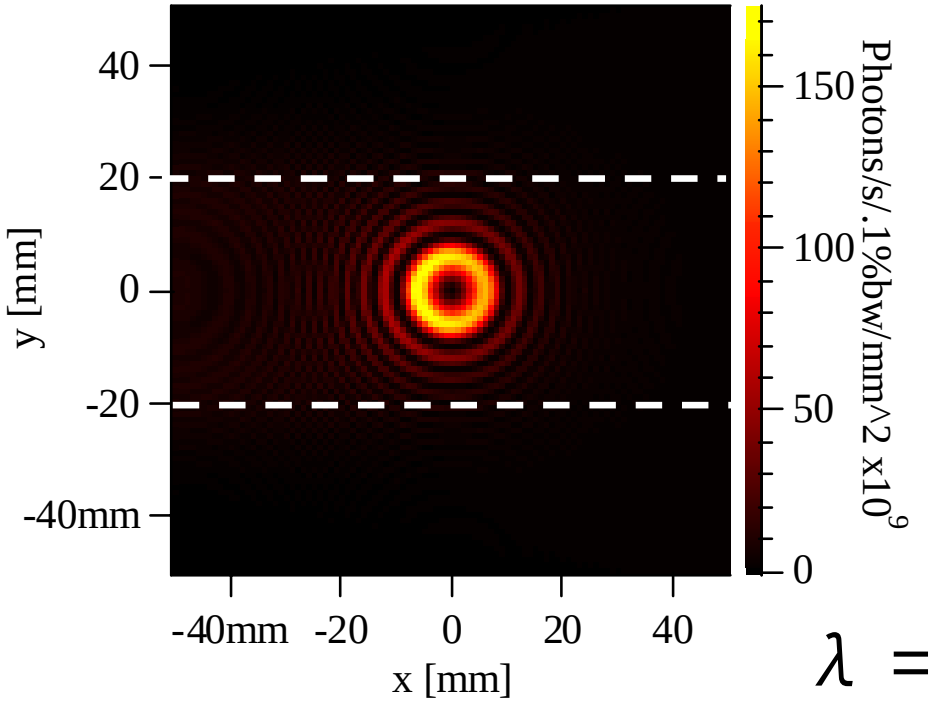
FT-IR spectrometers

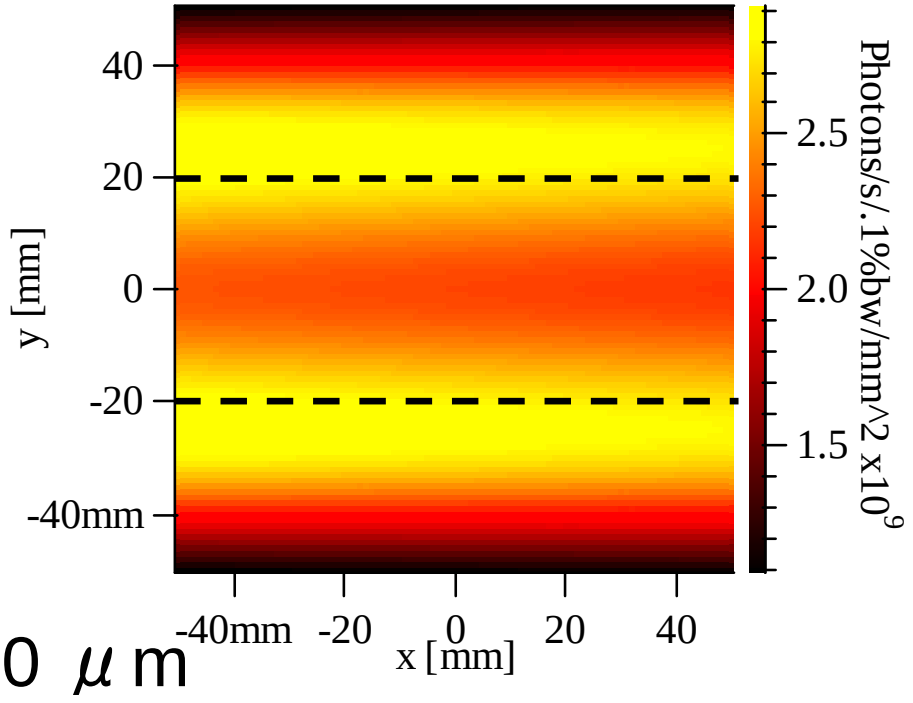
Magnetic profile
at a dipole of ANKA



Spatial distribution
from the edge at
3m from the source

Spatial distribution
from the dipole at
3m from the source

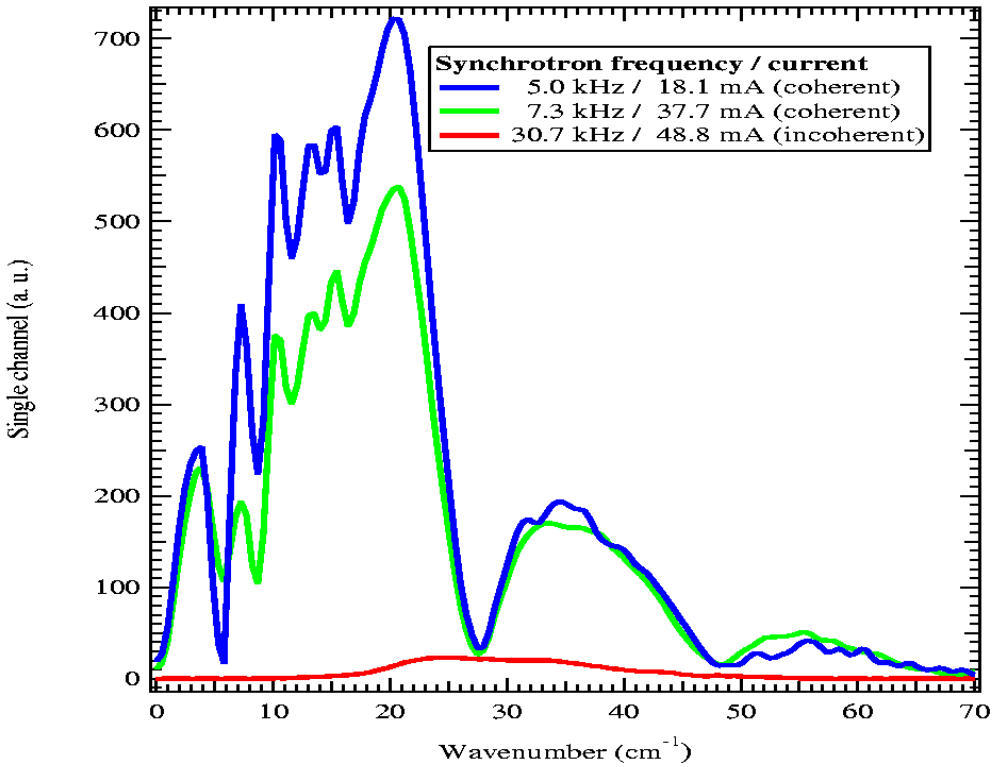


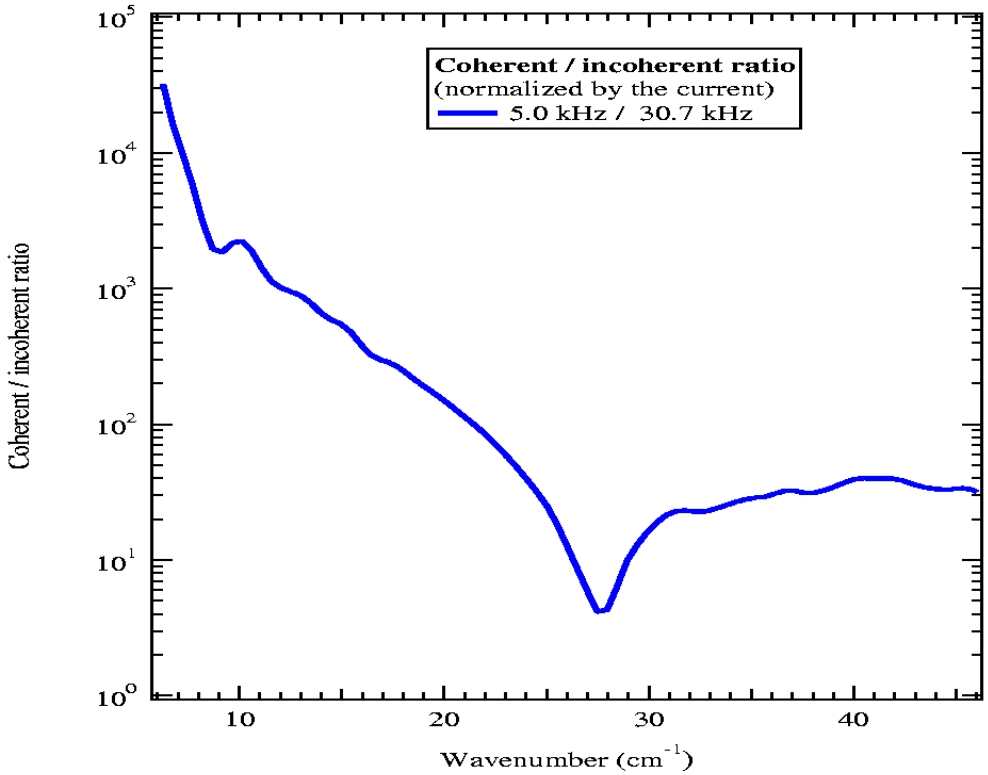


$\lambda = 100\ \mu m$

Edge radiation at ANKA-IR

Coherent Synchrotron Radiation: gain up to 10^4 (Si bolometer)

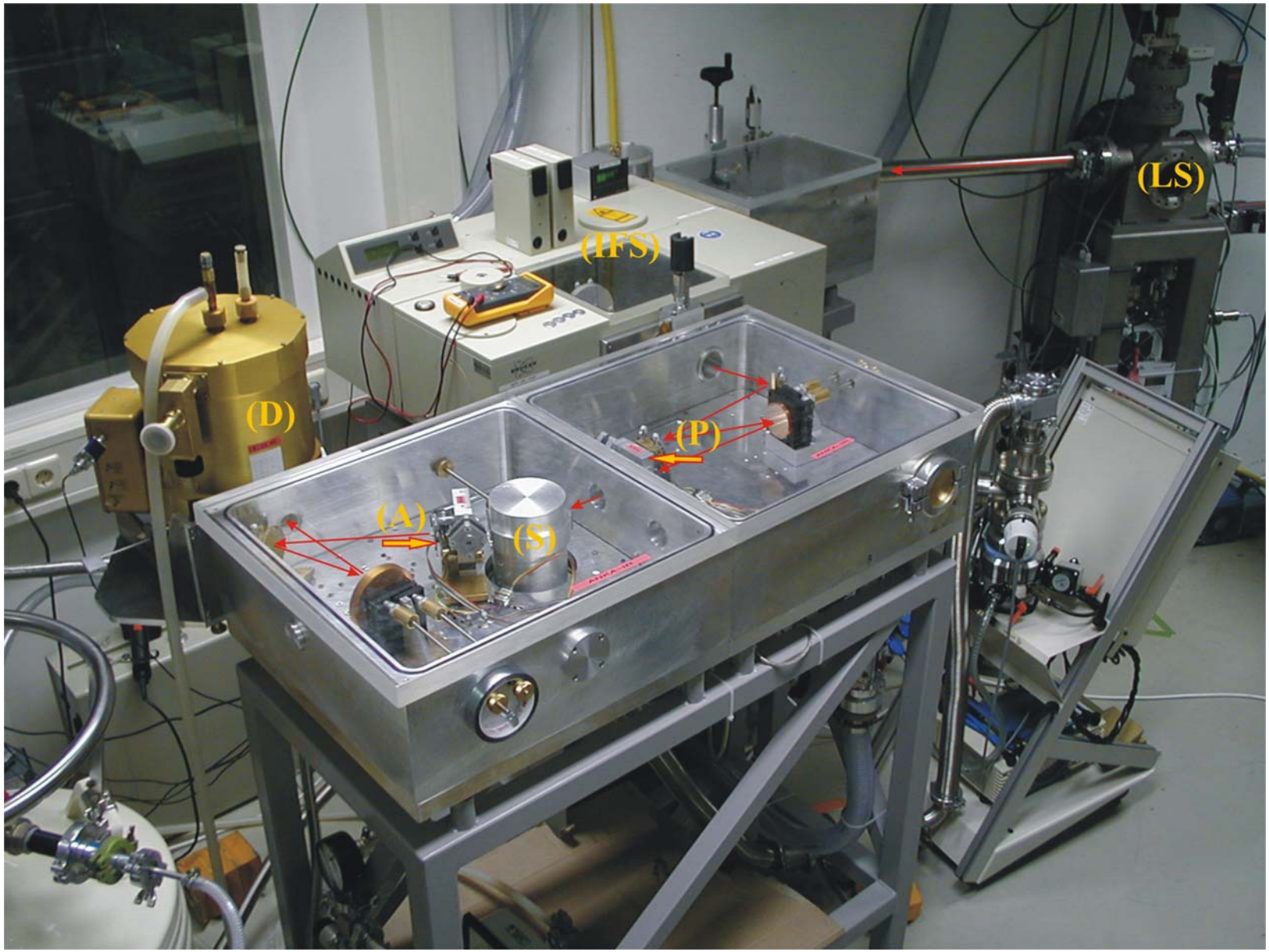




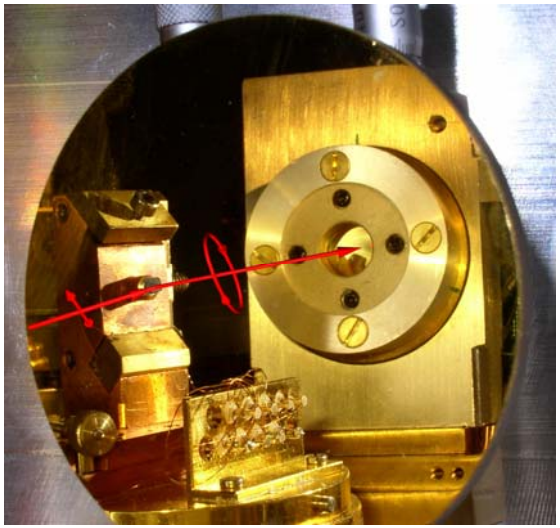
Coherent "low α" mode at ANKA

- Single user mode
  - E = 1.3 GeV
  - initial current intensity ~ 50-70 mA
  - lifetime ~ 15 hours
  - effective bunch length < 1 ps
  - spectral range ~ 5 – 50 cm^{-1}
- 6 blocks of 2 days per year

FTIR ellipsometric assembly



C. Bernhard (Fribourg Univ., Switzerland), Alexander Boris (Max Planck Inst., Stuttgart, Germany)

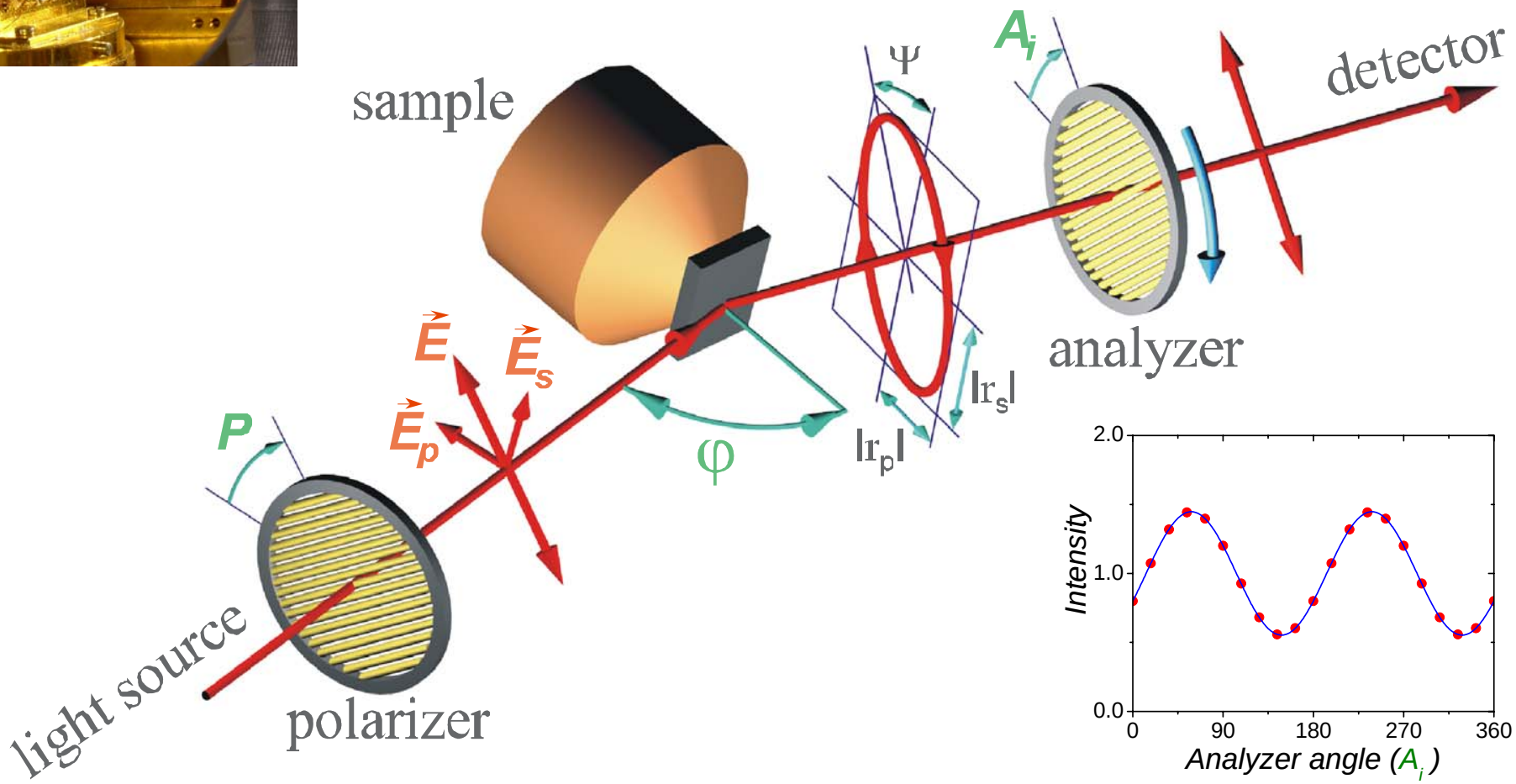


Ellipsometry principle

Elliptically polarized light

determined by:

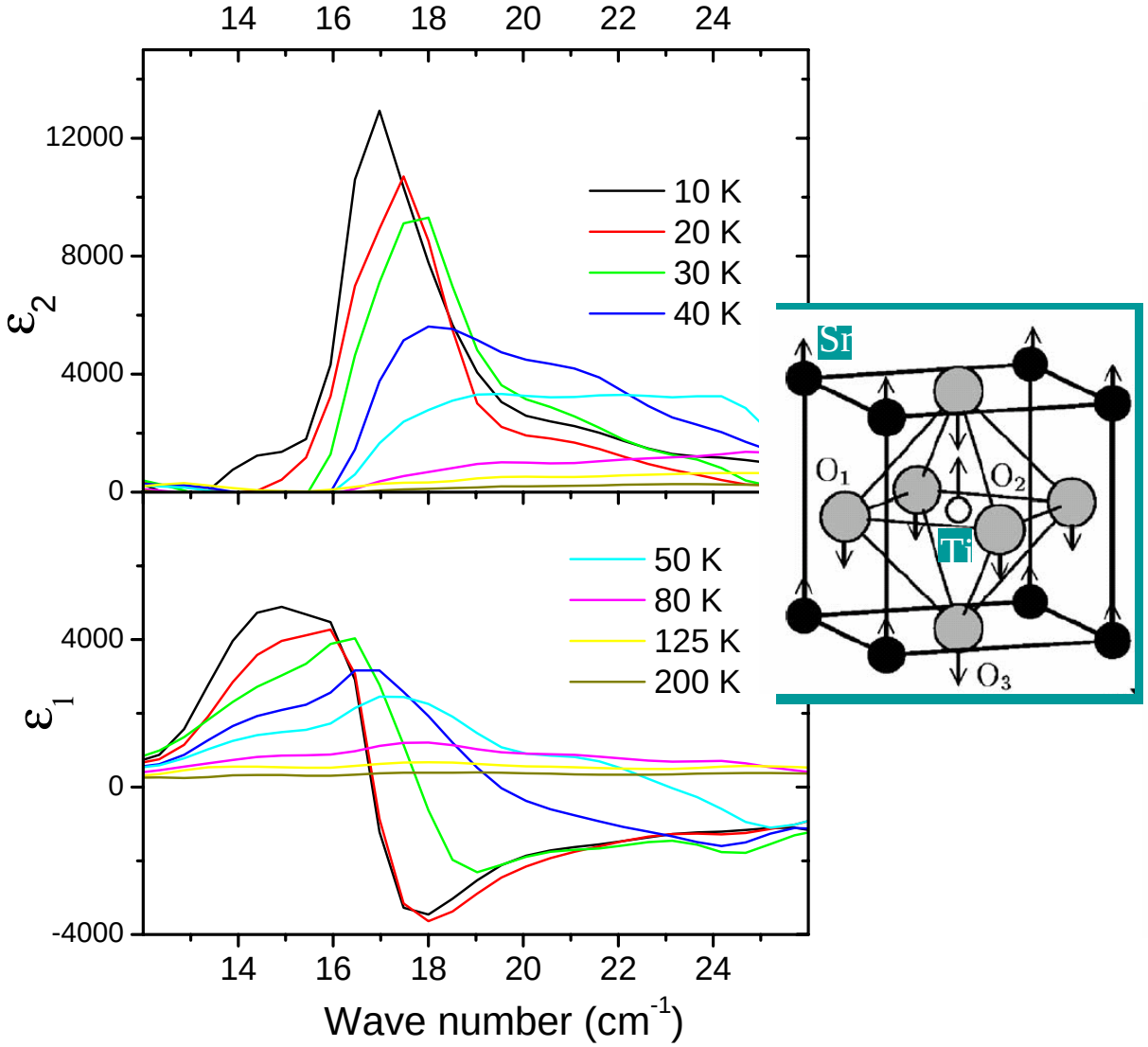
1. Relative phase shift, $\Delta = \delta_p - \delta_s$
2. Relative attenuation, $\tan \Psi = |r_p|/|r_s|$



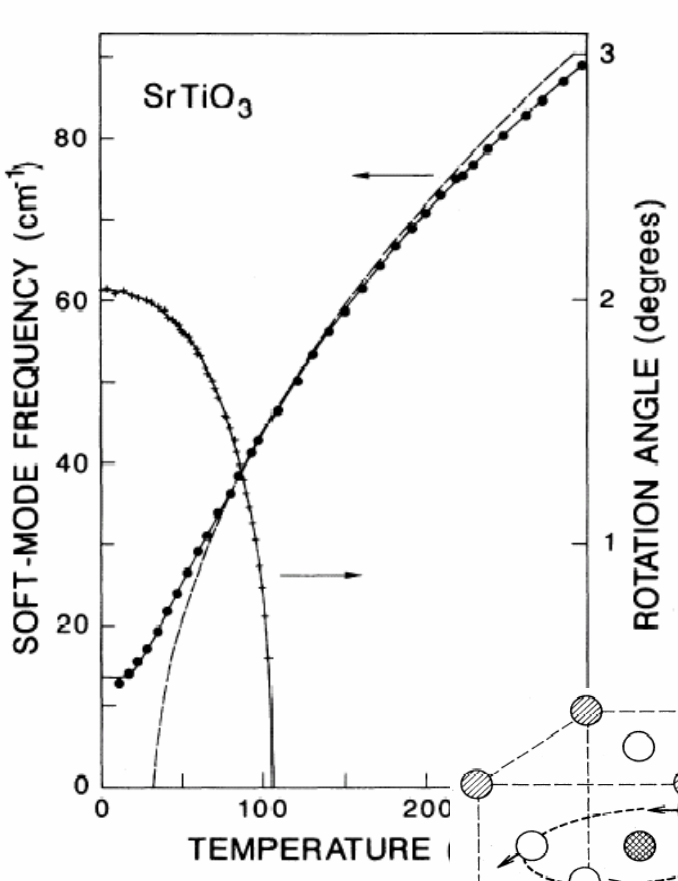
From : $I(A_i)/I_0\ a = 1 + \alpha \sin(2A_i) + \beta \cos(2A_i)$

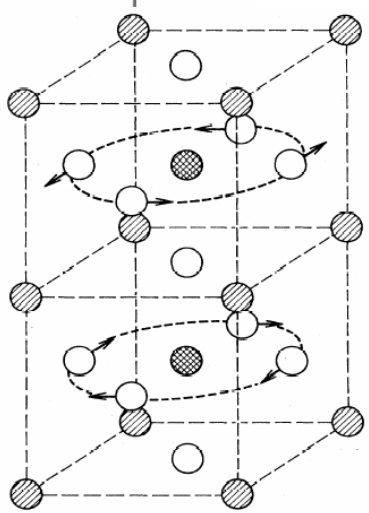
Obtain: $\varepsilon\ (\omega, \alpha, \beta, \varphi, P) = \varepsilon_1(\omega) + i\ \varepsilon_2(\omega)$

Soft mode spectroscopy: experimental studies of structural phase transitions



For review: J. F. Scott,
Rev. Mod.Phys. 46, 83–128 (1974)

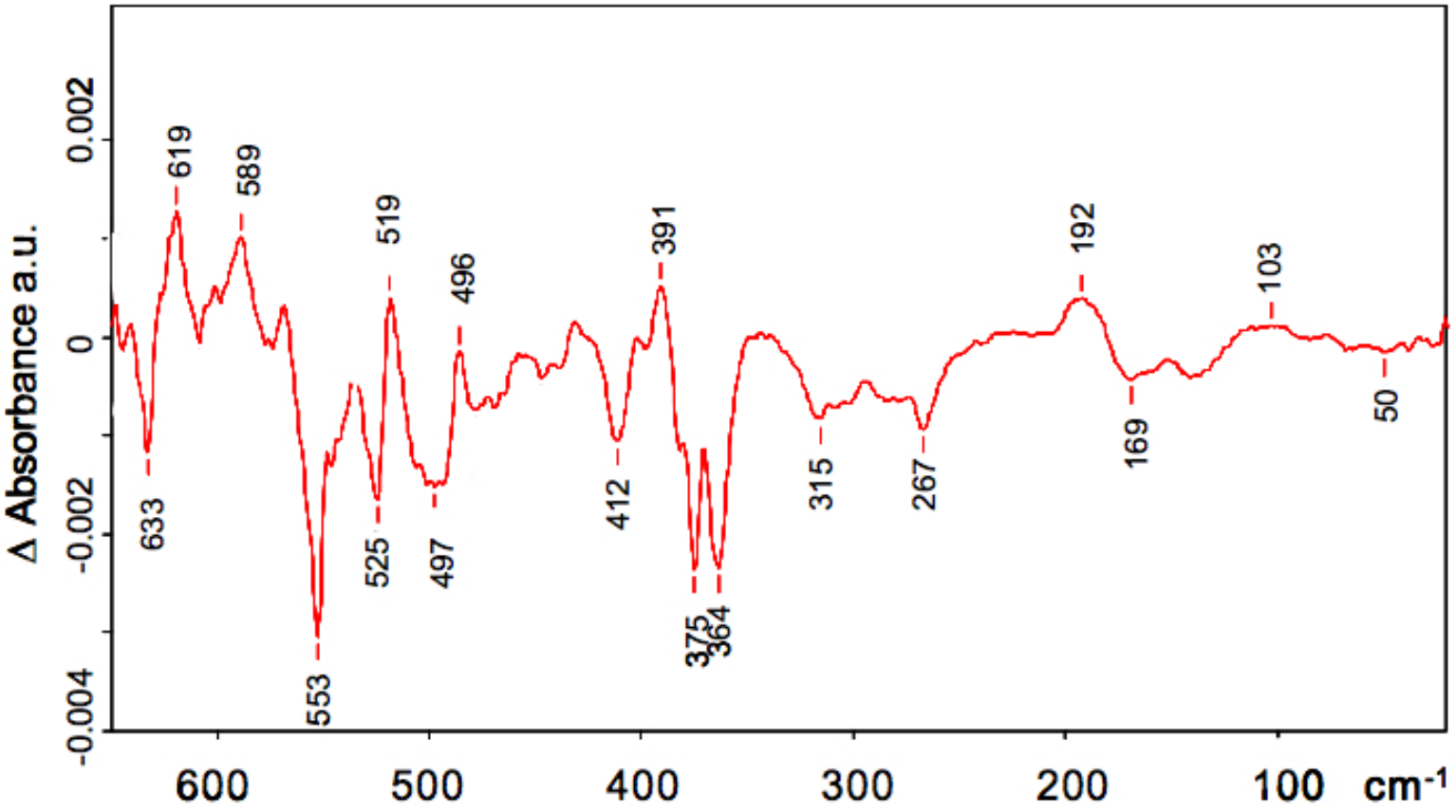




1st ellipsometric measurements using CESR (July 2005)

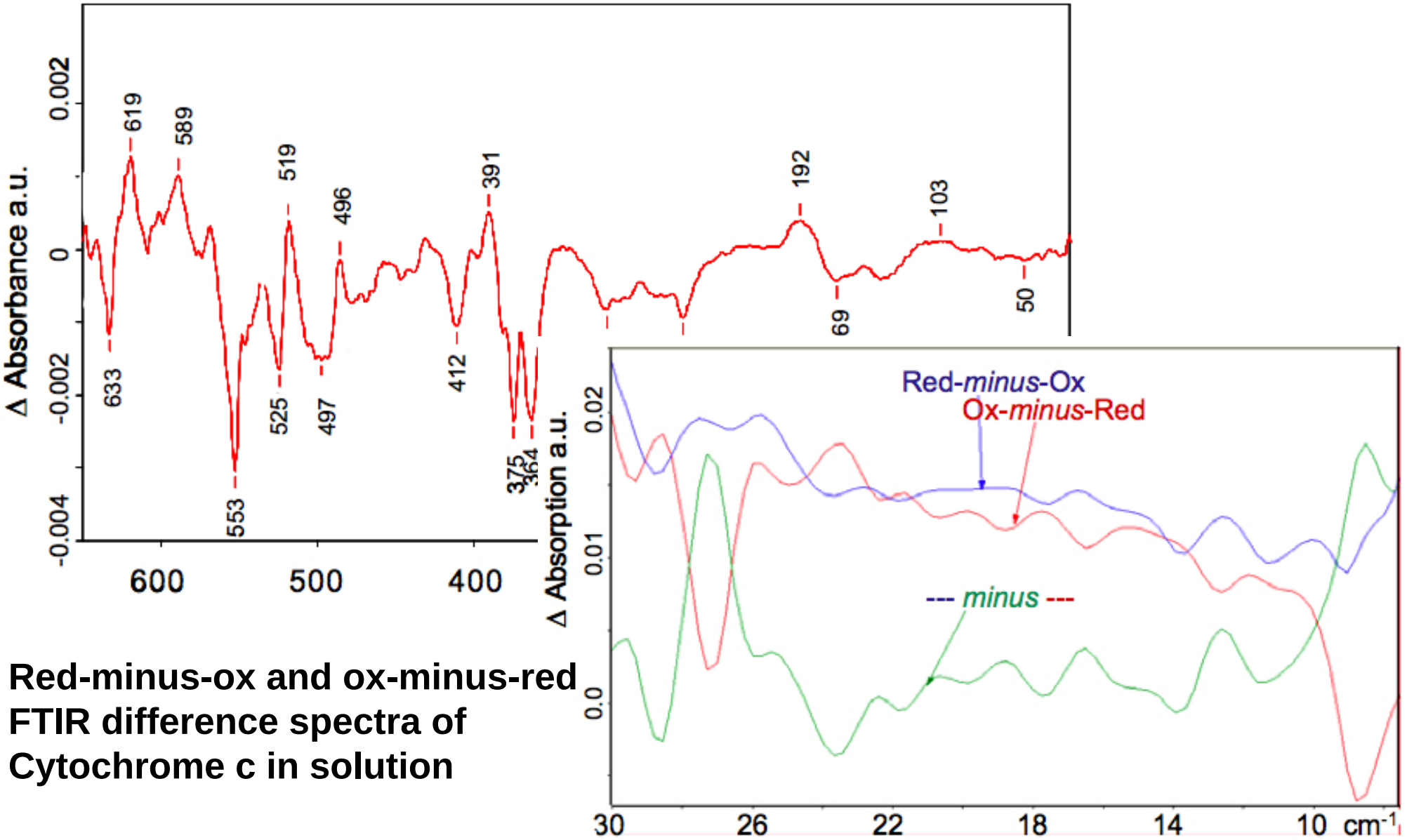
C. Bernhard, A. Boris, Y.-L. Mathis, A.-S. Müller

Far infrared and THz analysis of biological metal sites in proteins and related model



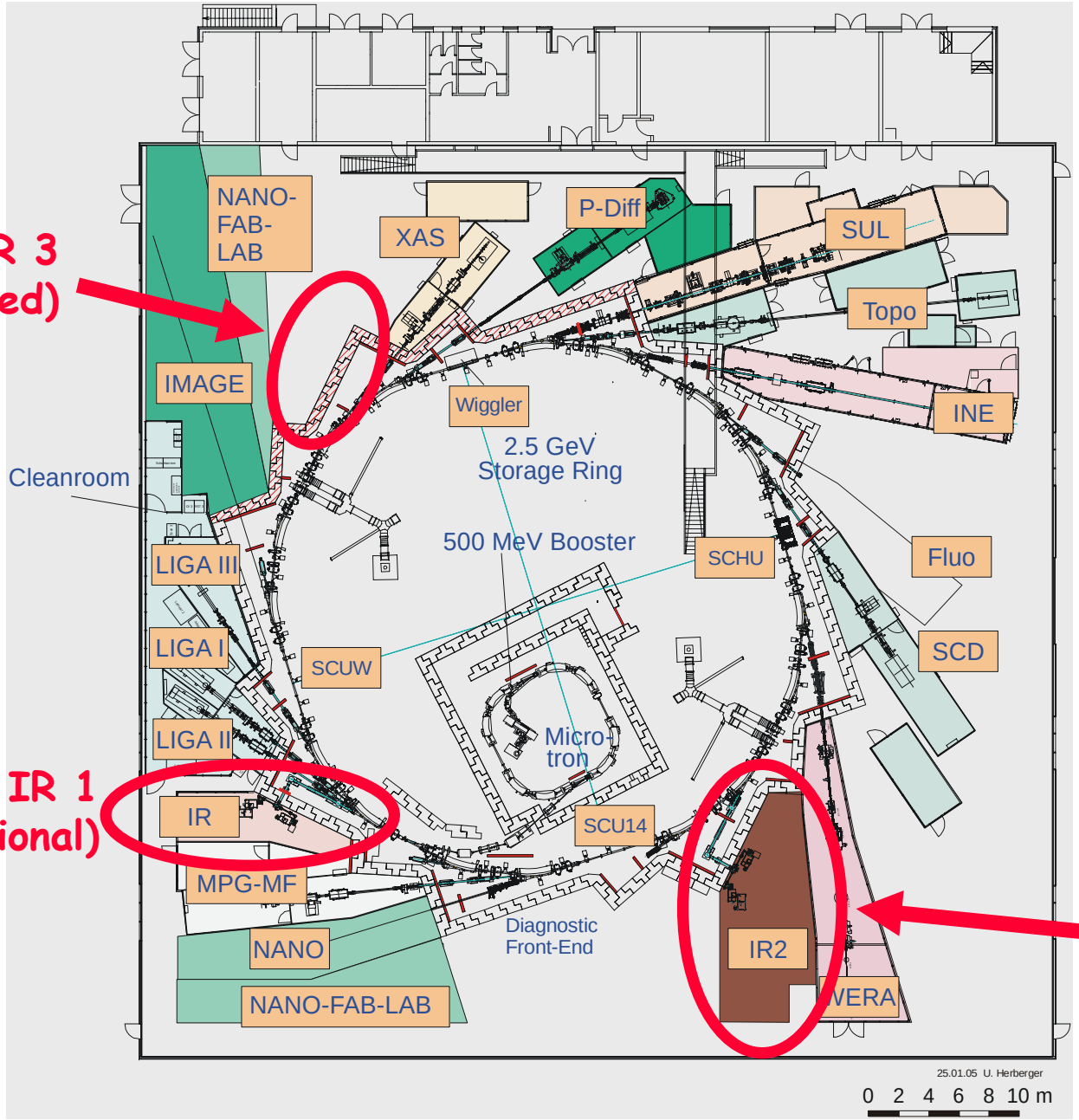
Reduced-minus-oxydized FTIR difference spectrum of Cytochrome c in solution

Far infrared and THz analysis of biological metal sites in proteins and related model



Red-minus-ox and ox-minus-red FTIR difference spectra of Cytochrome c in solution

Future infrared beamlines



Summary

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Studies are going on to improve the source understanding

First successful experiments on solid ($SrTiO_3$) and on protein (Cytochrome c)

Acknowledgments

- the accelerator group at ANKA
- Michael Süpfle, ANKA
- Christian Bernhard, University of Fribourg, Switzerland
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- Rainer Hienerwadel, Plants Genetics and Biophysics Laboratory, University of Aix-Marseille, France
- Mathieu Rouzière, SOLEIL, France