The SXP instrument

EuXFEL Call10 virtual information meeting
10 November 2022

Manuel Izquierdo on behalf of the SXP group

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Mechanical Eng.

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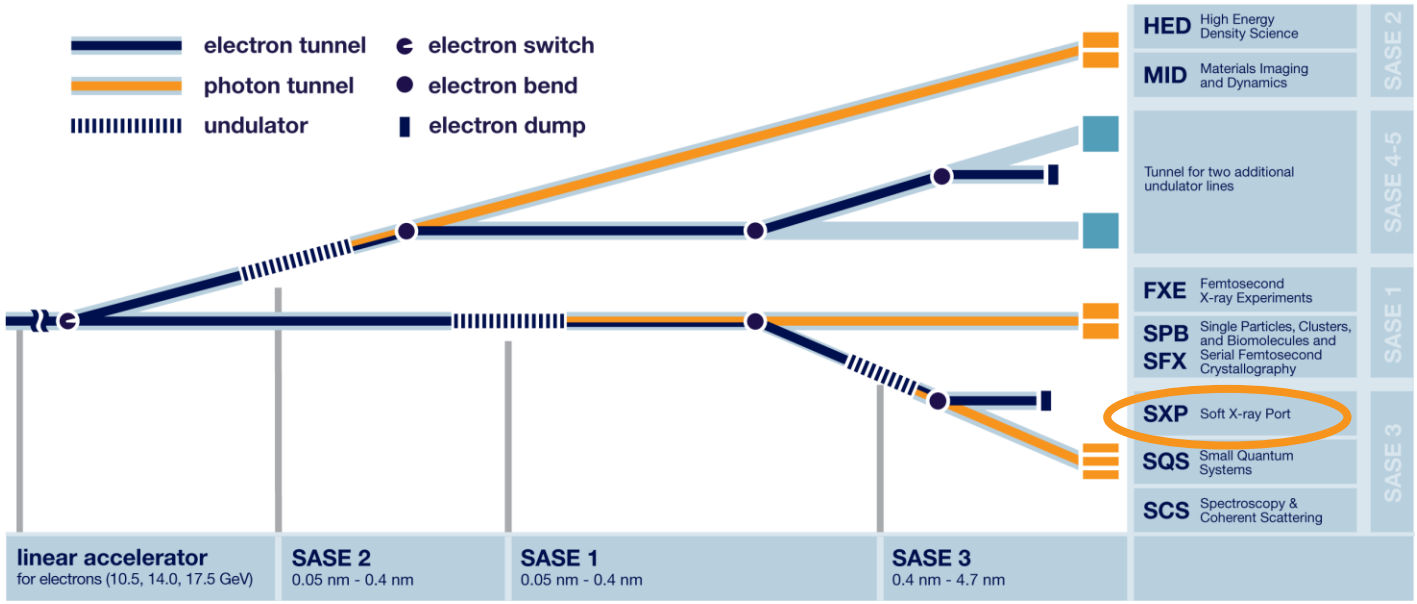
PhD

Chris Bloem
EQP

Joshua Ohnesorge
Vacuum Eng. (1/3)

Maria Peter
Adm. Assistant

The Soft X-ray Port (SXP)

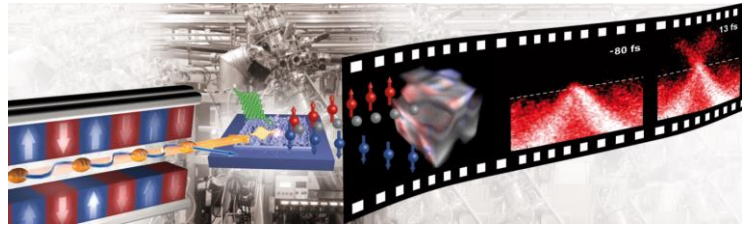


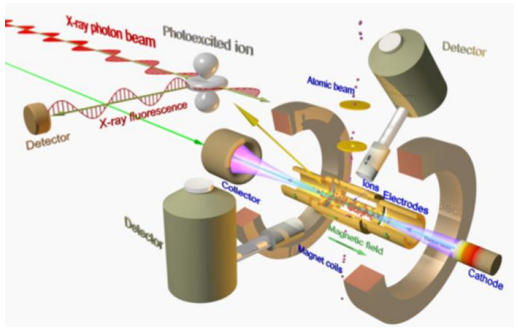
Complete Time-resolved X-ray Photoelectron spectroscopy

TR-XPES

K. Rossnagel (Uni-Kiel/DESY)

G. Schönhense (Uni. Mainz)





Laboratory for Astrophysics, atomic physics, fundamental research with highly charged ions

HCI

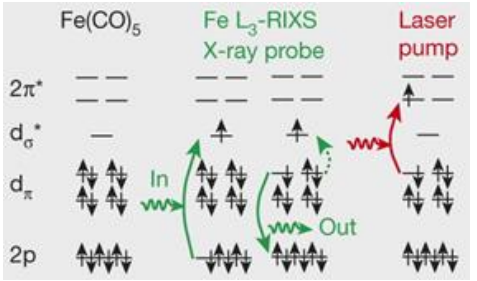
J. Crespo (MPI Heidelberg)

M. Meyer, T. Baumann (EuXFEL)

Understanding Catalysis and biochemistry by studying Chemical Bond Activation

CBA

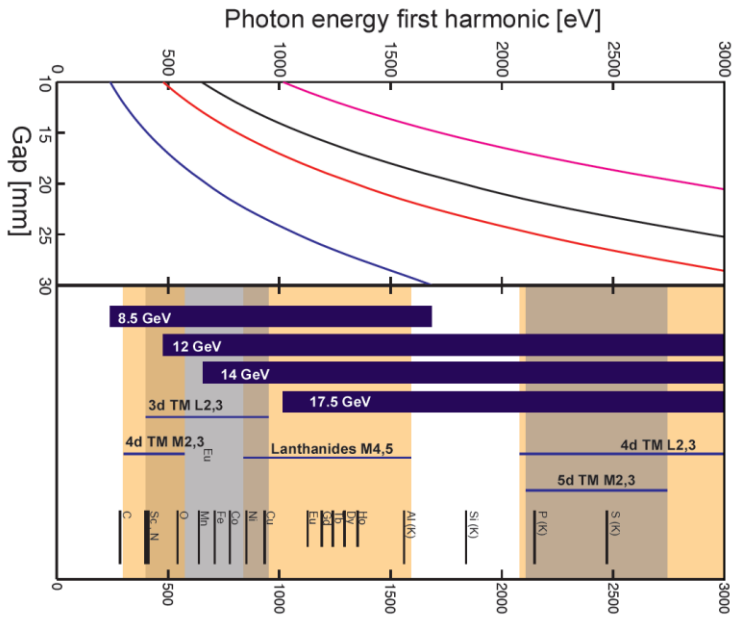
P. Wernet (Uni. Uppsala)

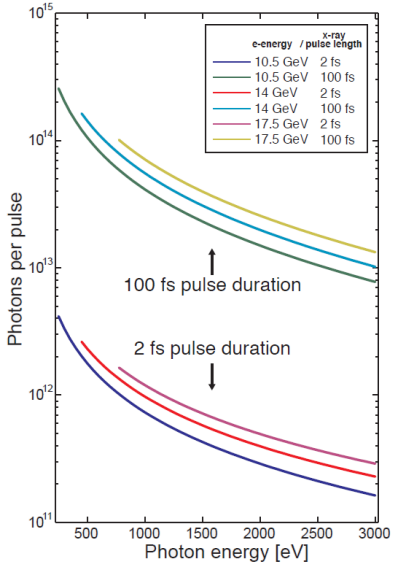


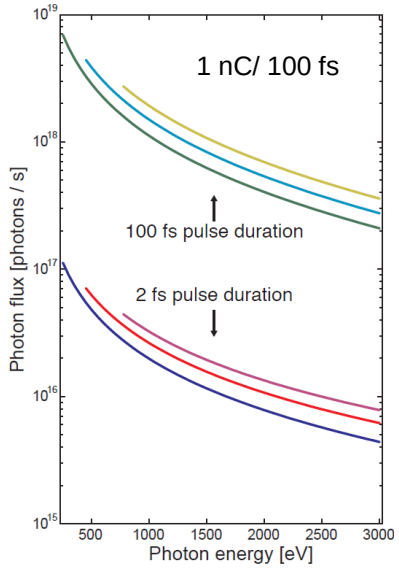
SXP in a nutshell

X-rays

- SASE 3 source (0.25 – 3 keV)
  - > 0.5 keV
  - Pulse energy up to 10 mJ
  - Pulse duration ~ 20 – 25 fs
  - 400 pulses @ 1.1 MHz
- Variable polarization
  - Linear for the moment
- Monochromatization
  - 50 l/mm RP 3000
  - 150 l/mm RP 10000





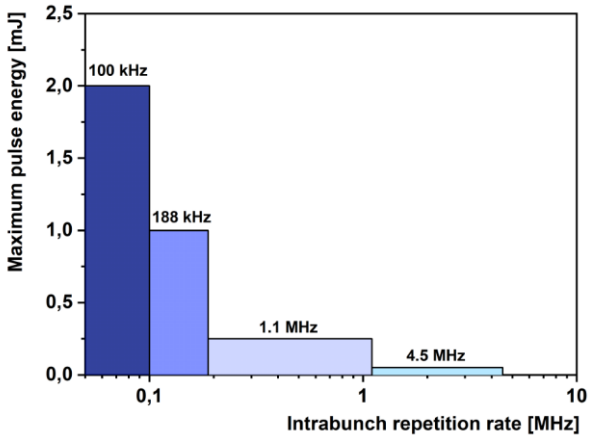


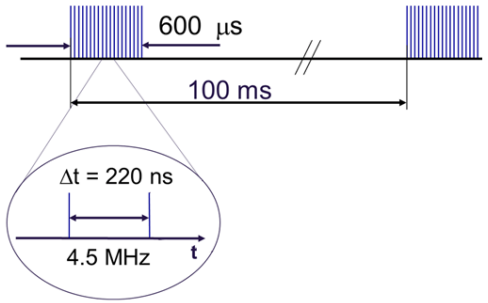
Adapted from the SCS Conceptual design report

Laser

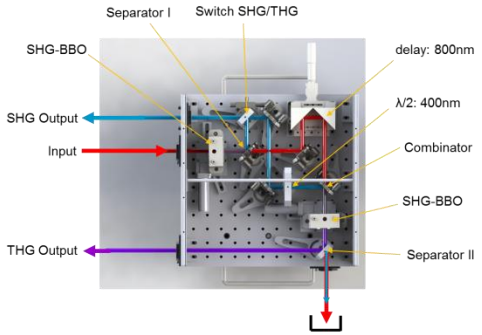
PP laser

- 800 nm = 2 mJ @ 15 – 300 fs
- 1030 nm = 40 mJ @ 1 ps – 500 ps





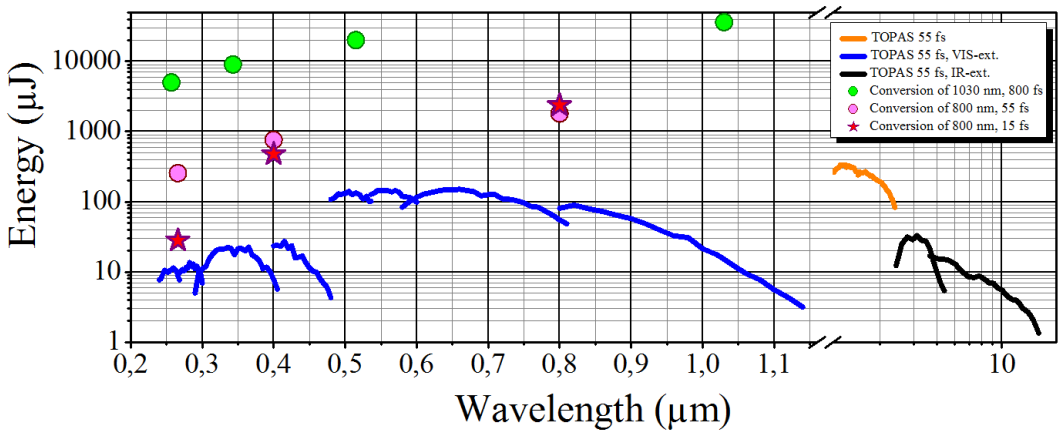
High Harmonic Generation (HHG)



Optical Parametric Amplifier (OPA)

TOPAS prime
Light Conversion
http://lightcon.com/

HHG and OPA at 100 kHz mode

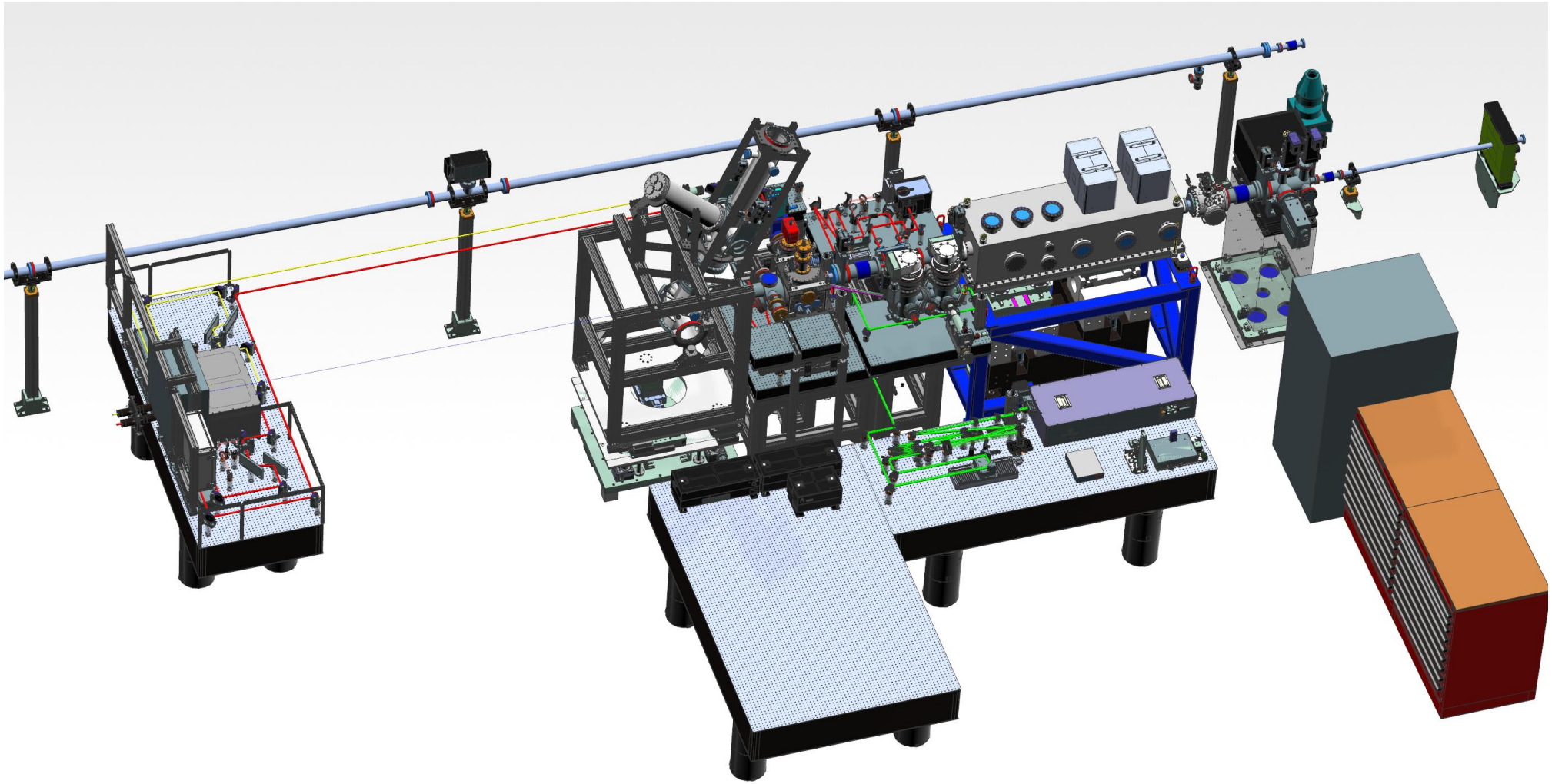


Laser Input Parameters:

- OPA
  - 800 nm = 1.8 mJ @ 55 fs
- HHG
  - 800 nm = 1.8 mJ @ 55 fs
  - 2.4 mJ @ 15 fs
  - 1030 nm = 40 mJ @ 1 ps

Pergament *et al.*, Optics Express **22**, 22202 (2014) & **24**, 29349 (2016)

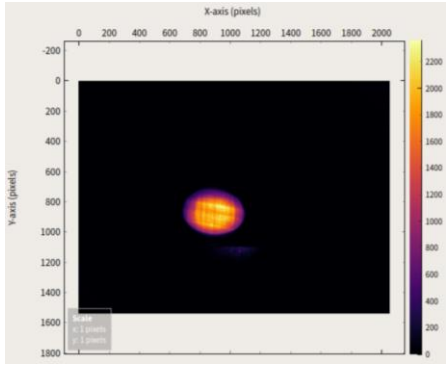
The SXP instrument



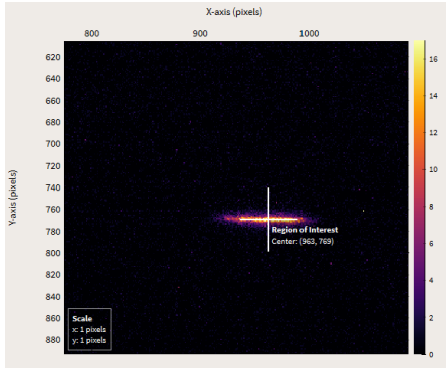
Status of the Project

Tunnel components

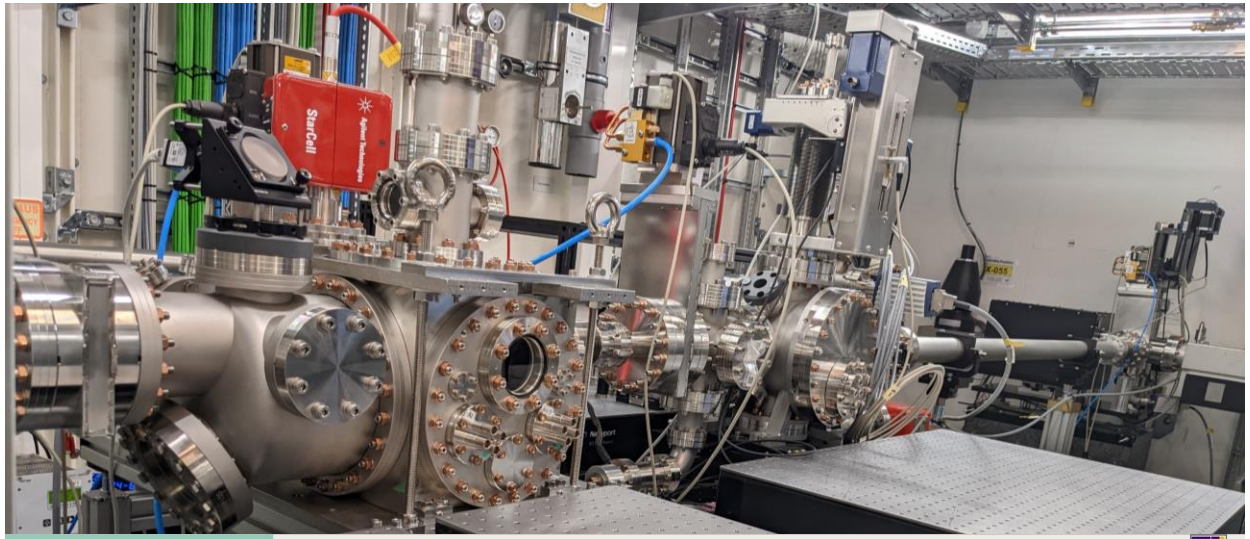
First beam SXP hutch September 8

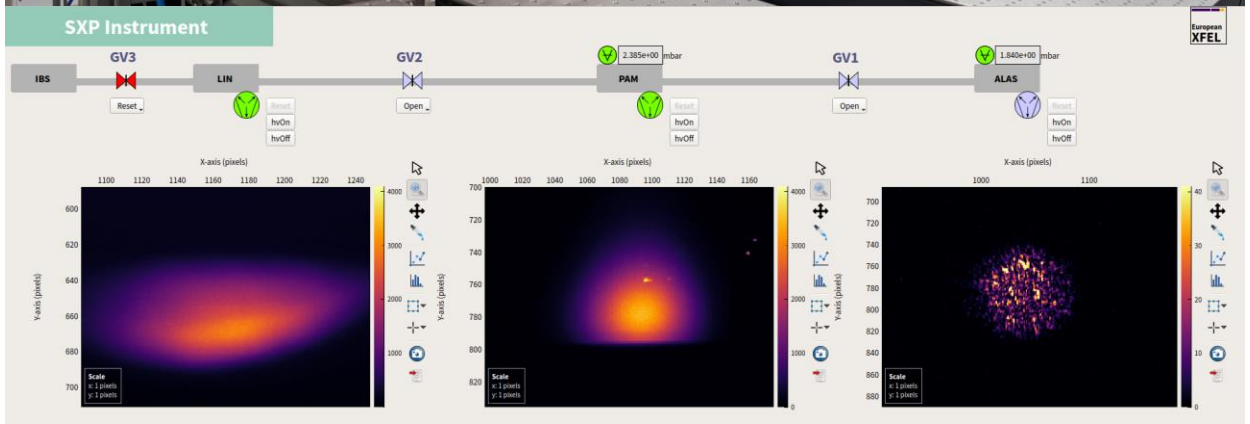


First Mono beam SXP hutch October 14

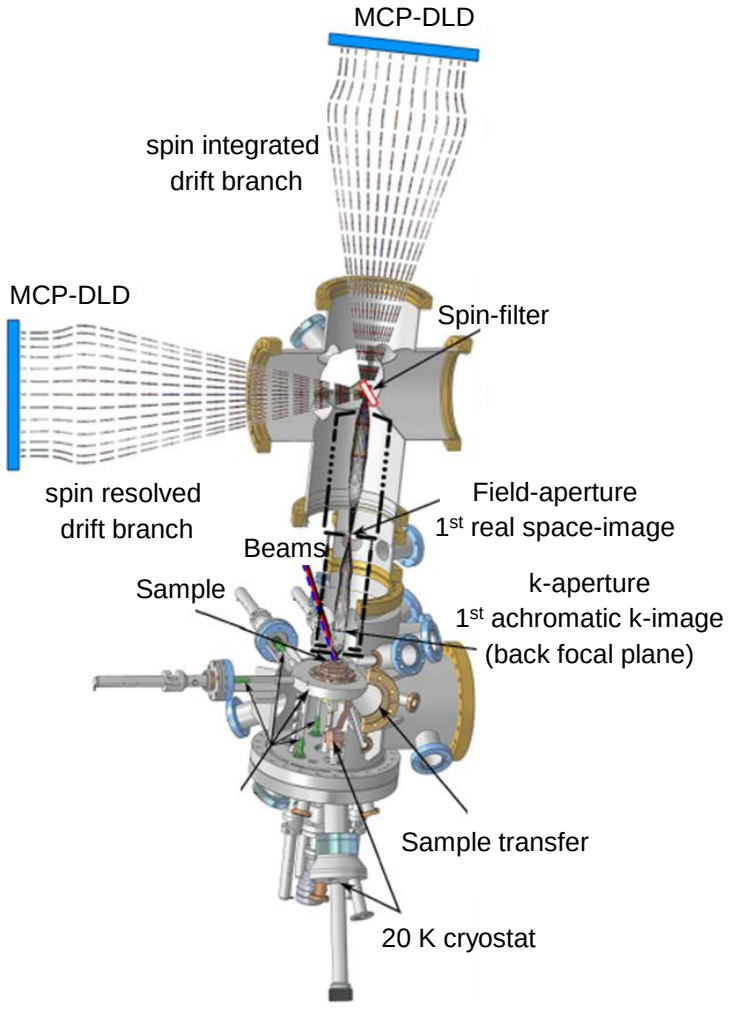


Instrument components





SXP – Time-resolved photoelectron spectroscopy standard configuration



Review of Scientific Instruments **91**, 013109 (2020)

TR-XPES station

- Momentum microscope spectrometer
  - No spin
  - Large angular cone ~ 70º
  - Delay line detector
  - ΔE ~ 130 meV
  - Δk ~ 0.06 $Å^{-1}$
- Photon energy
  - > 1 keV
  - up to 400 pulses/train 10 trains/sec
- Beam size on sample
  - 3 - 500 µm
  - default ~ 30 µm
- Omicron type mount for solid samples
- Load lock for fast sample insertion and preparation chamber

Summary

- First call for proposals for SXP
  - Community proposals will be favored
  - > 1 keV
- Dedicated Q&A session at 18:30
- Contact:
  - sxp@xfel.eu or manuel.izquierdo@xfel.eu
  - Webpage: Scientific Instrument SXP (xfel.eu) or browse for SXP XFEL

Thank you for your attention and see you later !