PAUL SCHERRER INSTITUT

PSI

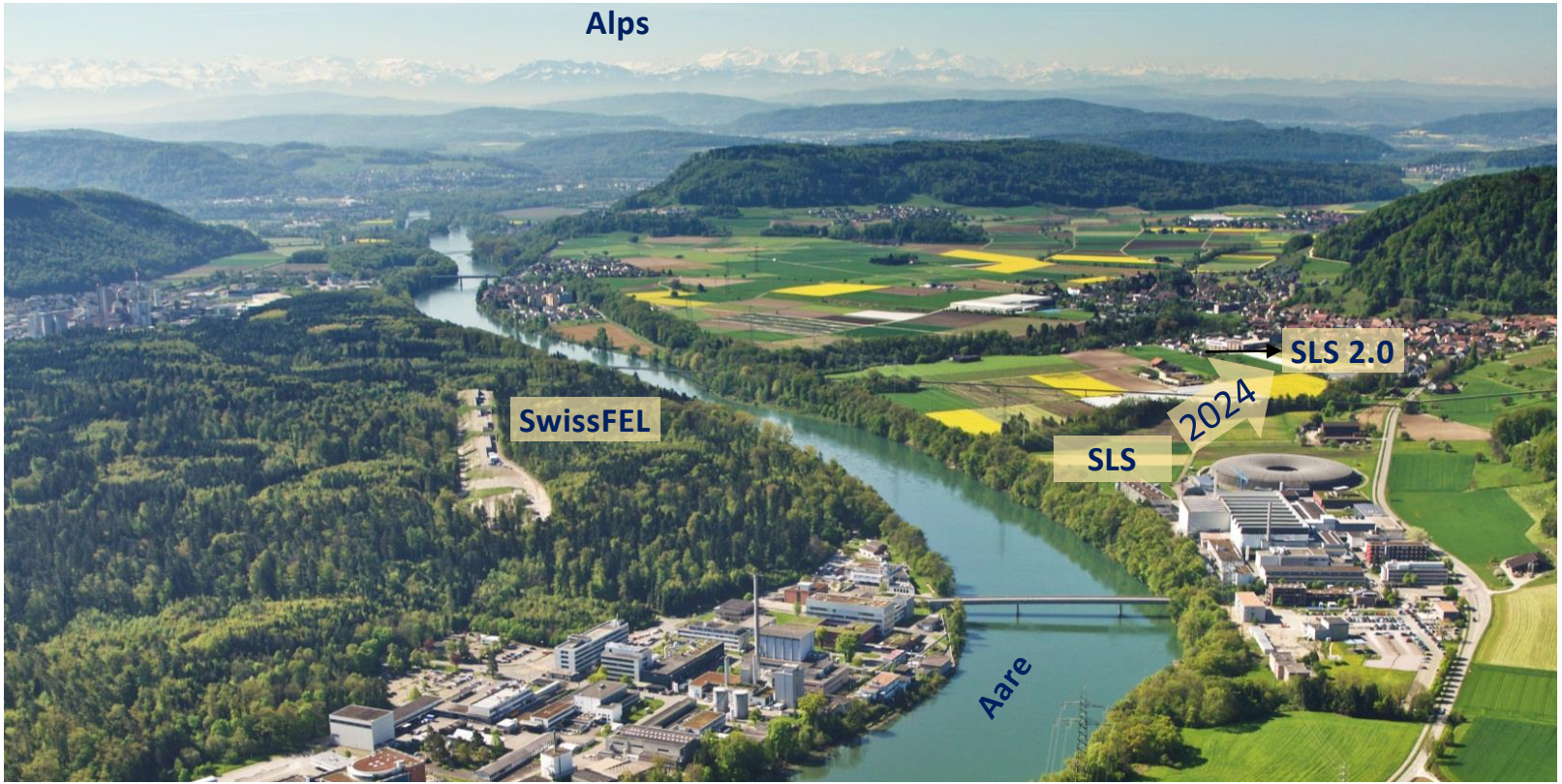

Hans-H. Braun :: Paul Scherrer Institut

# Introduction SLS2.0 Tour

LEAPS

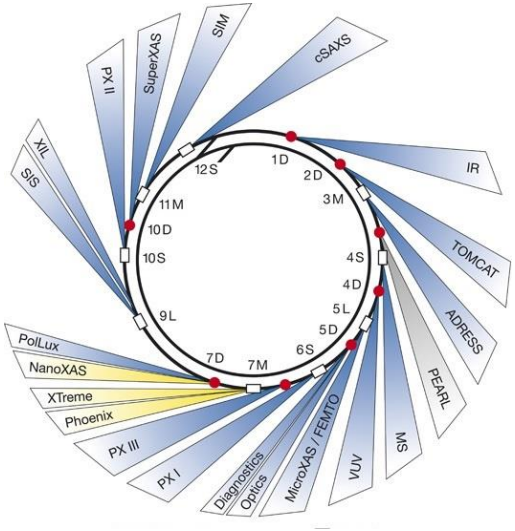
5th LEAPS plenary meeting, PSI, Okt. 26-28, 2022

# PSI with Accelerator based Photon Sources, Aare river and Alps

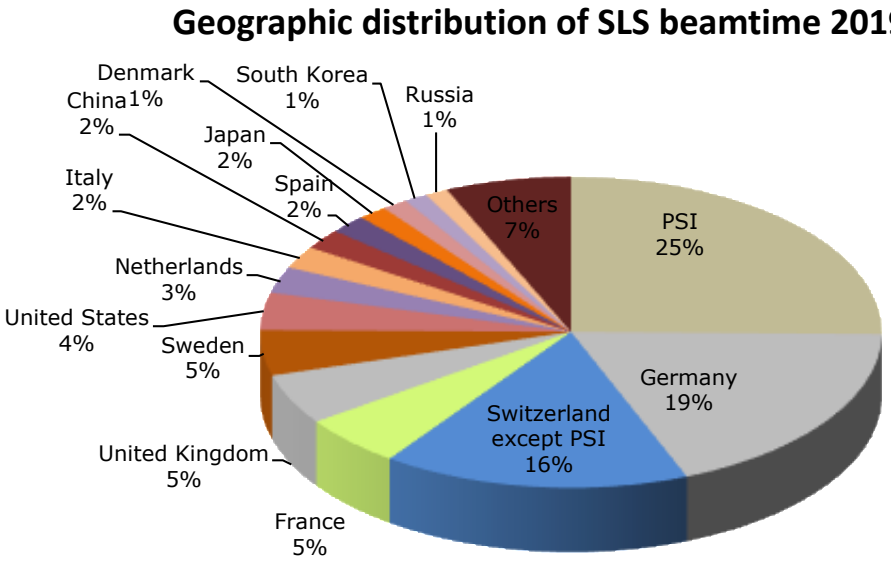


**Swiss Light Source, SLS**

For more than 20 years very successful operating as a user facility with presently 19 user beamlines

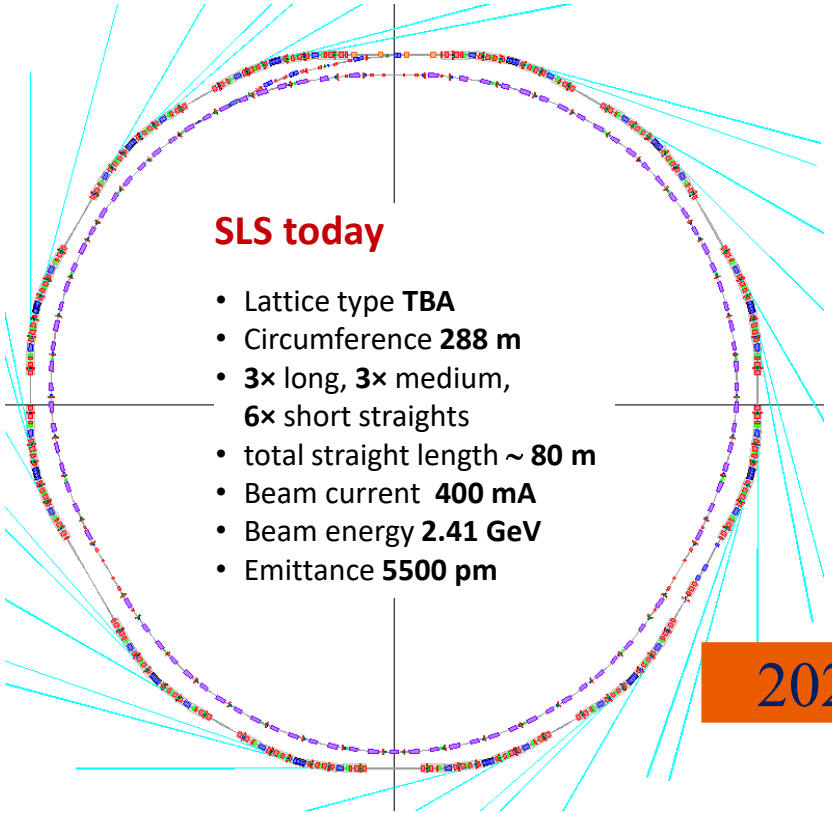


# Geographic distribution of SLS users




(*) others: 19 countries with less than 1.0%

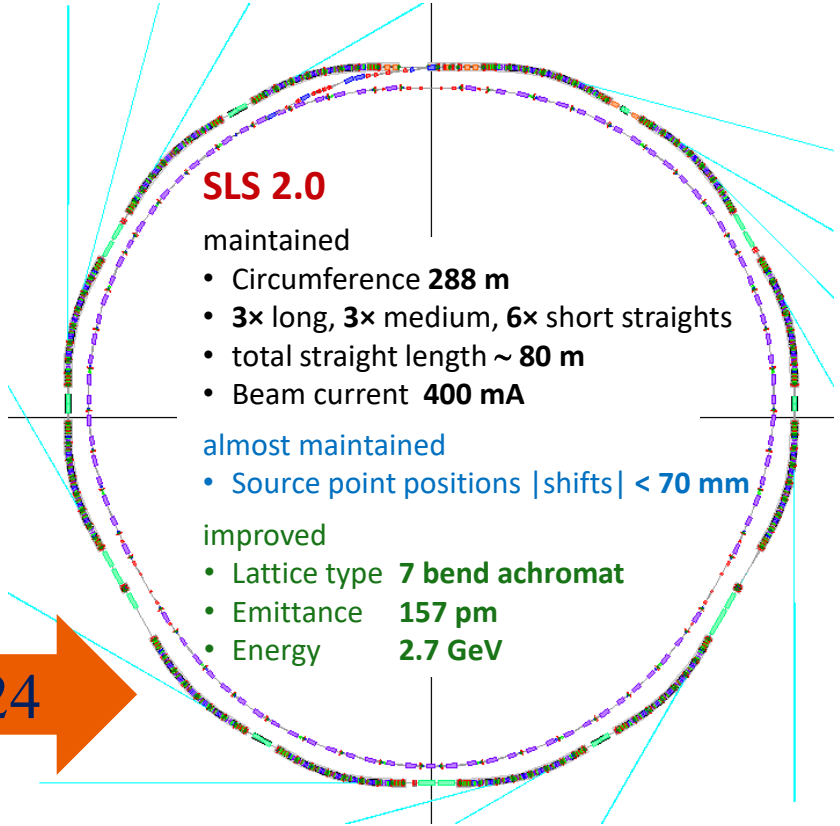
# SLS → SLS 2.0



## SLS today

- Lattice type **TBA**
- Circumference **288 m**
- **3×** long, **3×** medium, **6×** short straights
- total straight length ~ **80 m**
- Beam current **400 mA**
- Beam energy **2.41 GeV**
- Emittance **5500 pm**

2024



## SLS 2.0

maintained

- Circumference **288 m**
- **3×** long, **3×** medium, **6×** short straights
- total straight length ~ **80 m**
- Beam current **400 mA**

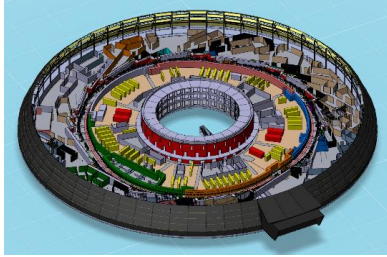
almost maintained

- Source point positions |shifts| **< 70 mm**

improved

- Lattice type **7 bend achromat**
- Emittance **157 pm**
- Energy **2.7 GeV**

# SLS 2.0, Goals and methods



**Project Goal**

Continue to provide SLS users optimum conditions for their experiments

**Methods**

New storage ring in existing building with antibend MBA lattice and new insertion devices

→ *Increased photon brilliance →higher resolution, faster measurements, larger samples*

Increase of beam energy from 2.4 GeV to 2.7 GeV, s.c. superbends and HTS undulators

→ *Increased X-ray flux*

→ *Access to shorter X-ray wavelength*

Some new beamlines, many upgraded beamlines

→ *New scientific opportunities*

New concepts for data acquisition, processing and storage

→ *Capability for increased data rate and new sophisticated analysis algorithm*

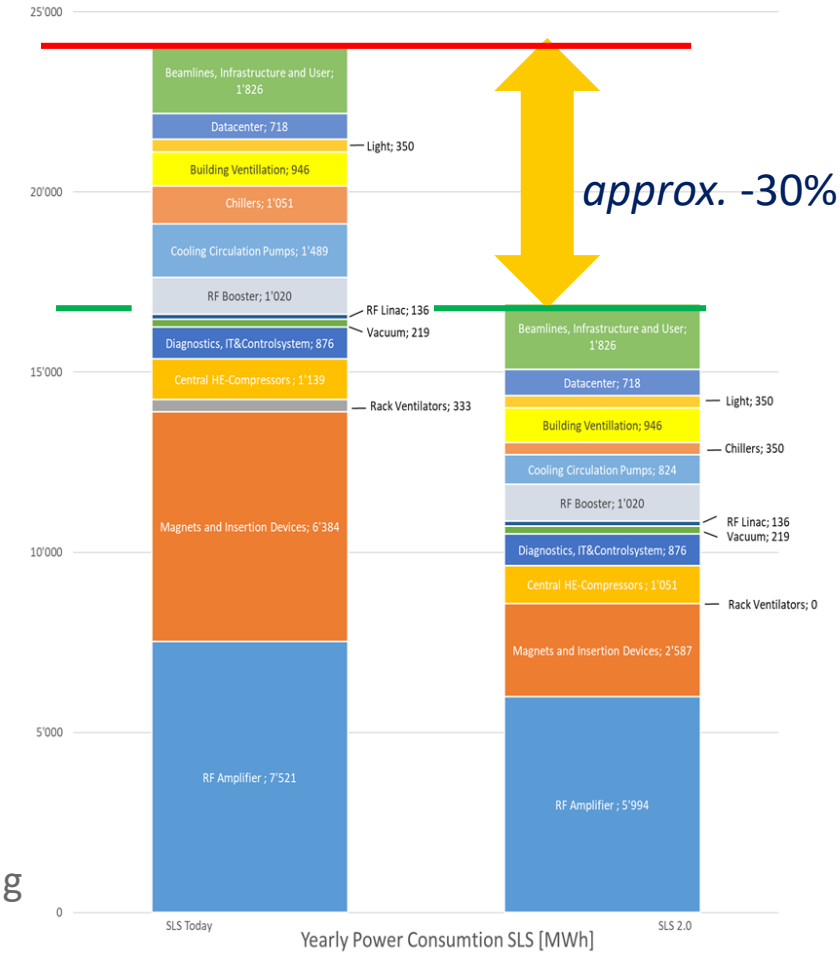
# Power economy SLS2.0 vs. SLS

More radiated X-ray power for users
Less electricity consumption

| | **SLS → SLS2.0** |
|---|---|
| $E_{e^-}$ | 2.4 GeV → 2.7 GeV |
| $P_{SR}$ | 310 kW → 365 kW |
| $W_{elec}/y$ | 24 GWh → 17 GWh |

Key savings:

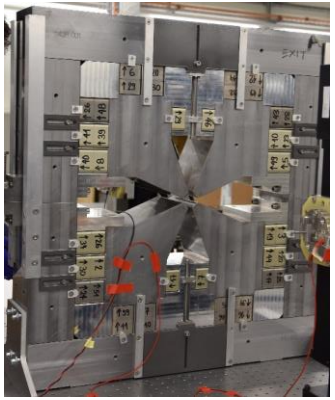
Electromagnets → permanent magnets
Klystrons → solid state amplifiers
Standard pumps → regulated pumps for cooling



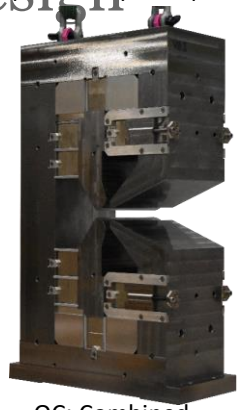
# SLS 2.0 Magnet Prototypes and Superbend design

BN: Main Dipole magnet

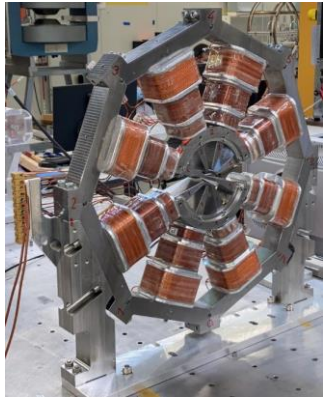
ANM: Reverse bend and quadrupole magnet

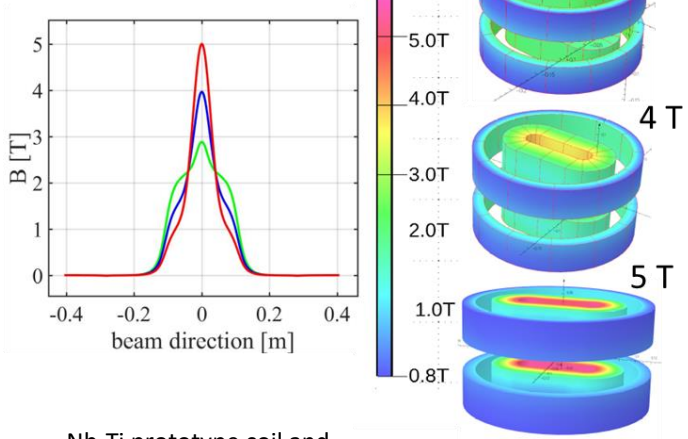


VB: Dipole and quadrupole magnet



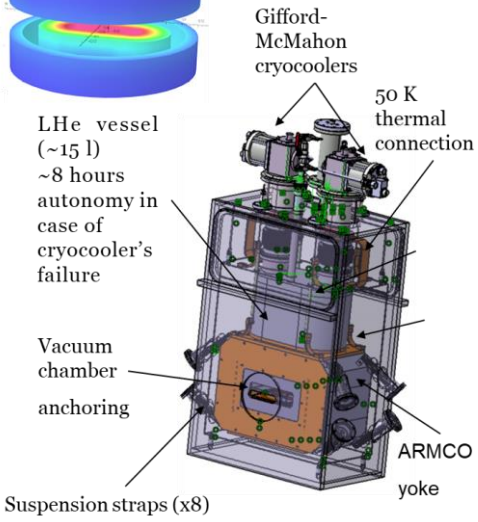
OC: Combined quadrupole, skew quadrupole and octupole magnet



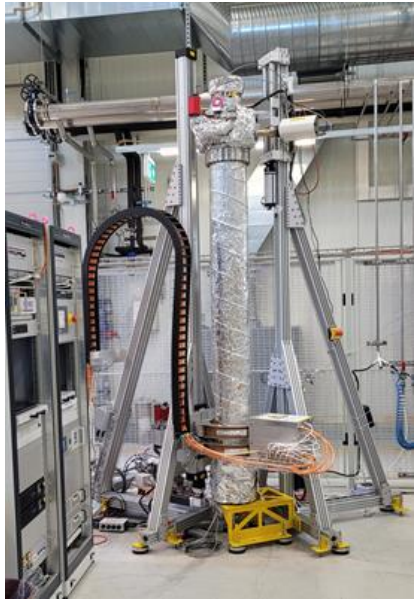


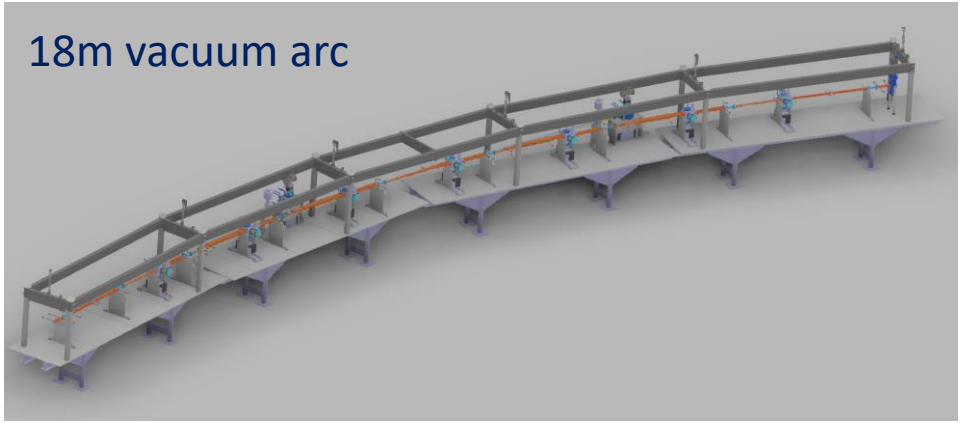

SC3-5: Nb-Ti, conduction cooled longitudinal gradient bending magnet.

Nb-Ti prototype coil and aluminum pre-compression structure

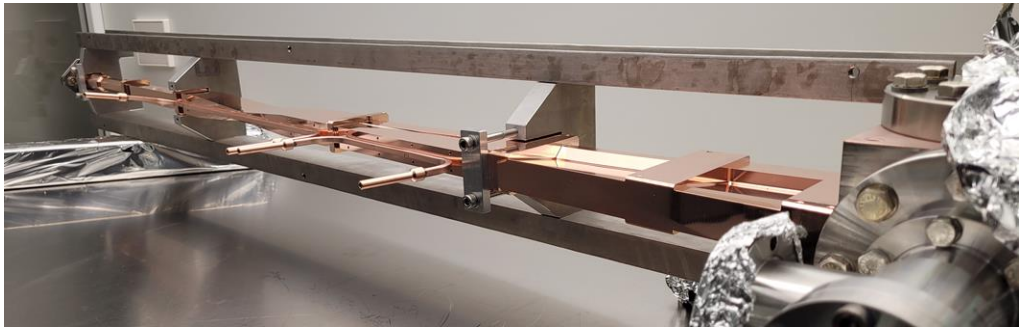


# Vacuum chambers for SLS 2.0





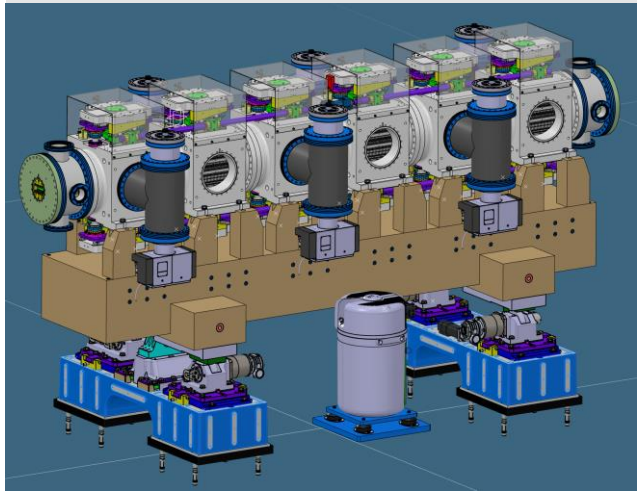

**Key technologies: Precision machining, wire erosion, UHV brazing, NEG coating, 3D modelling**



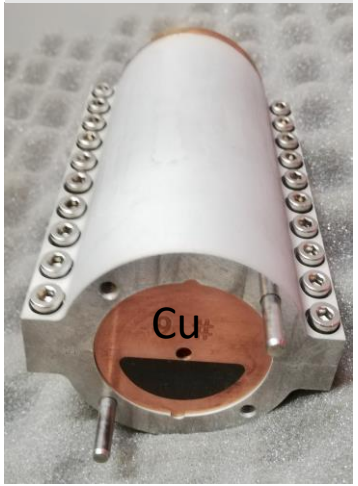
# Undulators for SLS 2.0

LEAPS INNOVATION

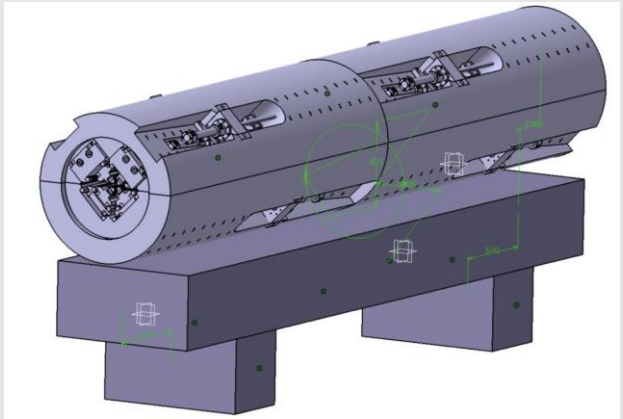
## in-vacuum undulator



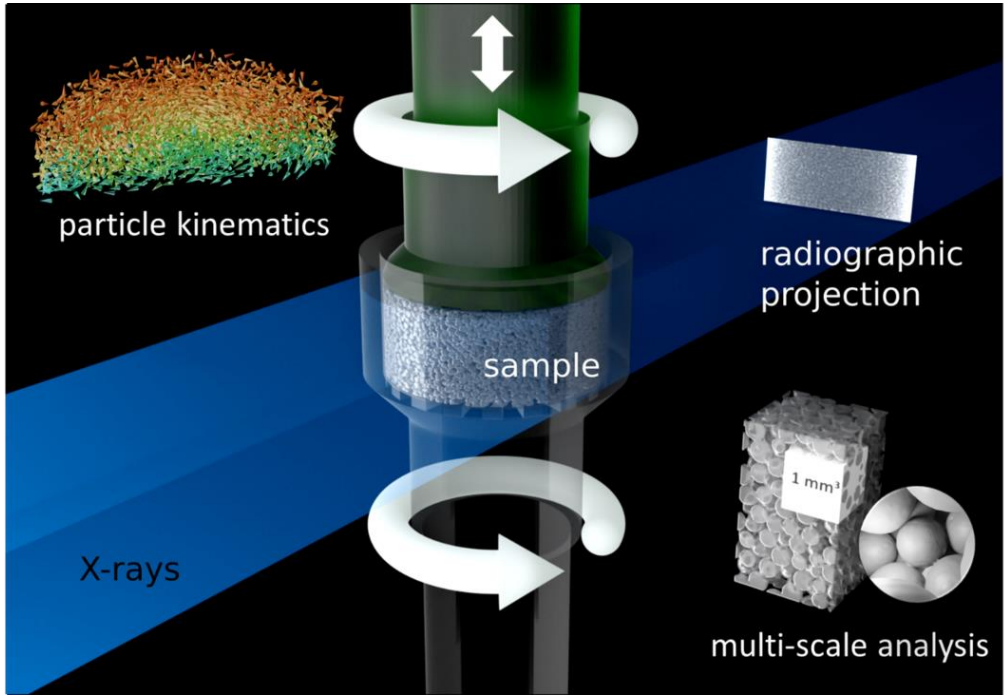
## HTS Undulator prototype




## Compact APPLE



# TomCat tomography beamline



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