Job opportunities from beamline division of High Energy Photon Source (HEPS)

Yi Zhang

2026/02

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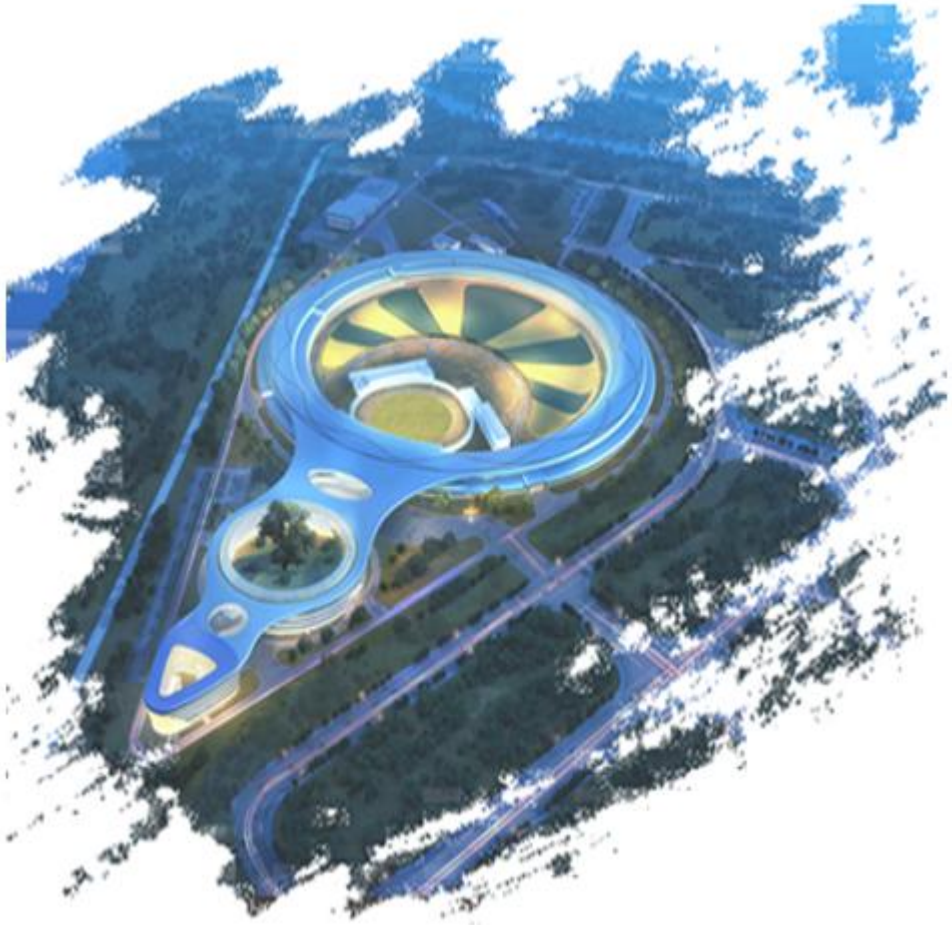
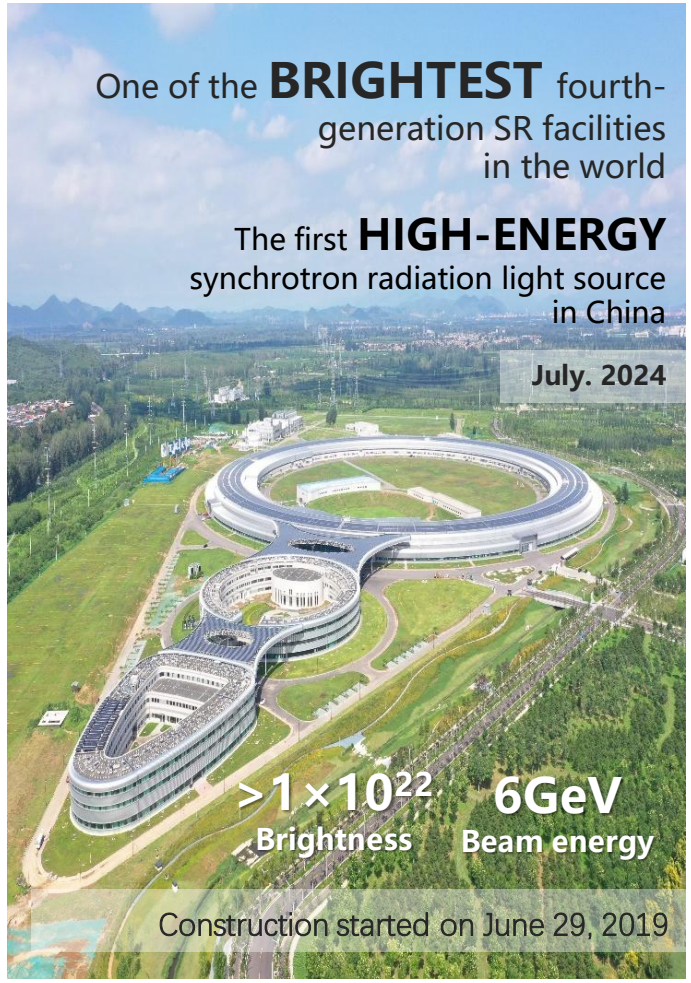



Choose HEPS for your achievement

Why Choose HEPS?

- ✓ World-class Flagship light source
- ✓ More than 60 new beamlines capacity (Phase II beamlines coming), More opportunities
- ✓ Your ideas and pursuit supported by strong in-house R&D teams in Insertion device, X-ray optics, Opto-mechanics, Detectors, Software and AI for Sciences
- ✓ Access to junior collaborators and Support for Postdocs recruitment
- ✓ Surrounded by other large facilities in extreme condition, biomedical, Nanoscience, Energy etc.
- ✓ International working environment. HEPS belongs to Institute of High Energy Physics (IHEP). IHEP is a world-class, large scale and multidisciplinary institution



Progress Released

SR News: regularly

Nature News, May 2024

Science, Oct. 2024

Physicsworld Mar. 2025

SRN2019

News and Views

Groundbreaking Ceremony at Source in Beijing

On June 29, 2019, a sunny morning in Beijing, more than 300 participants, including officials as well as the engineers and beamline scientists, witnessed the groundbreaking at the High Energy Photon Source (HEPS), a greenfield high-energy (6 GeV) ultralow emittance synchrotron facility. The light source is

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SRN2022

News and Views

HEPS Is Standing Out

20

SRN2023

Facility Update

Update on HEPS Progress

Ping He, Jianshe Cao, Guoping Lin, Ming Li, Yuhui Dong, Weimin Pan, and Ye Tao
Institute of High Energy Physics, Chinese Academy of Sciences, Beijing, China

The High Energy Photon Source (HEPS) is a greenfield 4th-generation light source. Its storage ring energy is 6 GeV and its ring circumference is 1,360 m. One year after the HEPS complex buildings were constructed (Figure 1), we report here considerable progress, despite the COVID pandemic's impact on supply chain and on-site personnel leading to unanticipated delays.

Another major milestone is the successful completion of a mock-up of a standard cell of the HEPS storage ring (Figure 3). All of the magnets in this cell are now installed and aligned, all of the vacuum chambers have been connected together and inserted into the magnets. The mock-up assembly allowed the design and installation team to identify many necessary corrections, which have been integrated into the production process [2].

As a necessary measure for the coming beam commissioning, a high-level application framework based on Python, named Python accelerator physics application set (Pyapas), was proposed and has been developed [3]. By December 2022, the high-level applications for the injector had been developed, while and others are still ongoing.

Production of the "main series" of components for the HEPS accelerator is in good shape. Storage ring magnets are being tested in batches. All of the sextupoles and octupoles have been measured with a rotating coil system and met their specifications. Over 30% of the longitudinal gradient dipoles have been measured, and the integral field is tuned to less than 1E-4 deviation. About 18% of the quadrupoles and dipole-quadrupole combined magnets have been measured. The effect of corrector coils to the quadrupole field has been thoroughly studied. Over 50% fast corrector magnets have been tested and the bandwidth measured to be 4 kHz.

The manufacture of the more than 2,000 power supplies to power the main magnets and correctors has been completed and testing

Accelerator status

The year of 2022 witnessed completion of several milestones in accelerator progress. In- on and high-power conditioning of the [1] were completed in the autumn e 2). Almost 95% of the booster accelera- inponents (magnet, girder, and vacuum er) have been put into the booster tunnel.

1: Bird's eye view of HEPS complex buildings in the summer of 2022.

16 Vol. 36, No. 1, 2023, *Synchrotron Radiation News*

SRN2025

HEPS Update in 2024.pdf

Technical Report

HEPS Update in 2024

Ping He, Jianshe Cao, Ming Li, Yuhui Li, Yuhui Dong, Weimin Pan, and Ye Tao
Institute of High Energy Physics, Chinese Academy of Sciences, Beijing, China

Year 2024 witnessed two key milestones of the High Energy Photon Source (HEPS) project: the beam stored in a storage ring and the first X-ray light emitted from an insertion device, respectively. As a green field 4th generation 6 GeV lightsource (Figure 1), commissioning of the accelerator and Phase I beamlines will be completed in 2025 and HEPS will be gradually open to pilot users at the same time.

Accelerator status

The HEPS storage ring incorporates 1,776 advanced magnets, comprising 26 different types, designed to precisely steer and focus the electron beam into a more concentrated form. These magnets were integrated into 288 modules, with each magnet's center aligned to an exceptional precision of 30 microns. The complete installation of all magnets into the storage ring tunnel was accomplished this year (Figure 2).

All magnet power supplies are situated within the Power Supply hall. The high-precision current-stable power supplies demonstrate exceptional performance metrics, including long-term stability of 10 ppm, accuracy of 50 ppm, and repeatability of 20 ppm. Testing of the wide-bandwidth, high-precision fast corrector power supplies has yielded impressive results, featuring a 75-microsecond small-signal step response and 20 ppm current ripple.

Approximately 1,500 vacuum chambers have been successfully installed and sealed for the storage ring. Of these, 918 pieces have been treated with NEG film coating, covering a total length of 1,200 meters and providing distributed pumping capabilities. The HEPS vacuum team successfully completed the NEG coating for the 1,200 mm long antechamber, which features a narrow slit of 6 mm. This achievement was made possible through comprehensive measures, including the use of segmented solenoid magnetic fields, enhanced magnetic field strength in the end solenoids, and fine tuning of discharge parameters.

Regarding the magnet support girders, all 288 units have been installed and tested, demonstrating promising performance; the first Eigen frequency exceeds 70 Hz (Figure 3), and the motion resolution achieves 1 μm precision. Additionally, the initial set of three collimators has been positioned with verified performance showing motion accuracy of approximately 20 μm.

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nature

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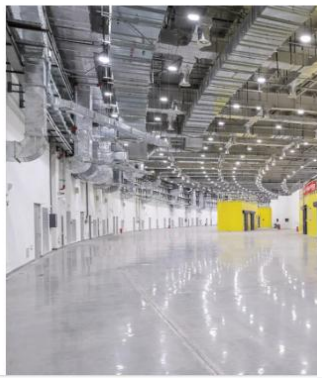
NEWS | 13 May 2024

World's brightest in Asia to build n synchrotron

The US$665-million High Energy Photon among only a handful of countries that h sources.

By Gemma Conroy



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PROJECTS AND FACILITIES | FEATURE

China's High Energy Photon Source prep world

25 Mar 2025 Robert P Crease

Robert P Crease visits the High Energy Photon Source ne it opens later this year – the most advanced fourth-generat

Leading light The High Energy Photon Source (HEPS), due to sta be the world's most advanced synchrotron light source of its type.

I'm standing next to Yang Fugui in front of the High Energy Beijing's Huairou District about 50 km north of the centre o HEPS isn't just another synchrotron light source. It will, wh the world's most advanced facility of its type. Construction 2019 and for Yang – a physicist who is in charge of designi we're at a critical point.

"This machine has many applications, but now is the time t science," says Yang, who is a research fellow at the Institu (IHEP) of the Chinese Academy of Sciences (CAS), which With the ring completed, optimizing the beamlines will be v new research areas.

READ MORE

China's next big thing: a new fourth-generation synchrotron facility in Beijing

From the air – Google will show you ph giant magnifying glass lying in a grass and from my perspective it resembles walled silver sports stadium, surrounde and fountains.

I was previously in Beijing in 2019 at th was broken when the site was literally told, the HEPS would take six-and-a-half years to build. We continues to run as planned, the facility will come online in

Lighting up the world

There are more than 50 synchrotron radiation sources arou intense, coherent beams of electromagnetic radiation used from condensed-matter physics to biology. Three significar one after the other, have created natural divisions among s them to be classed by their generation.

Science

BACK TO SCIENCEINSIDER

SCIENCEINSIDER | ASIA/PACIFIC

China poised to turn on one of world's most powerful sources of x-ray light

Beams from $657 million next-generation synchrotron will reveal atomic-scale structure of proteins and materials

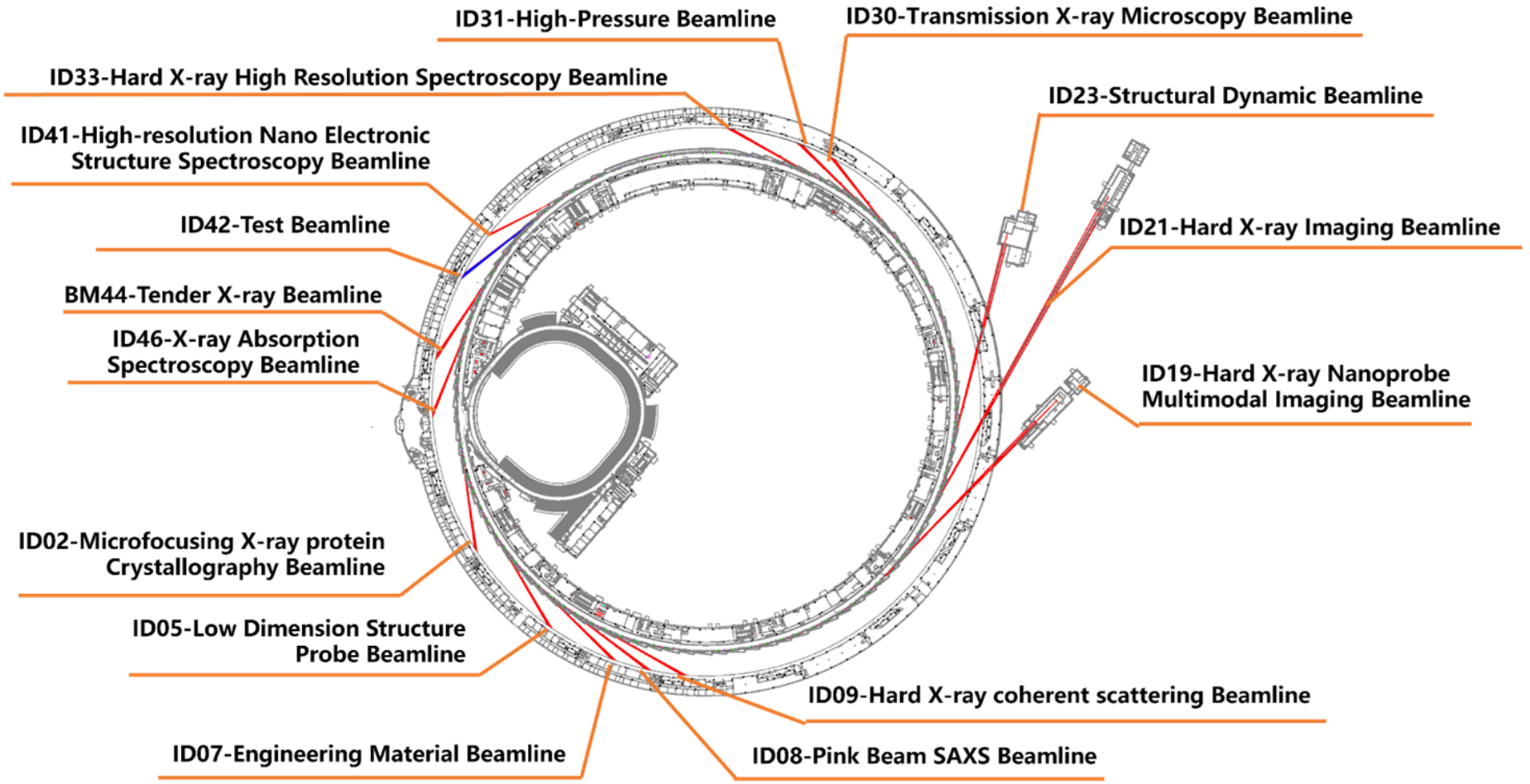
22 NOV 2024 · 5:30 PM ET · BY RICHARD STONE

China's High Energy Photon Source is days away from funneling bright x-rays into experimental beamlines. INSTITUTE OF HIGH ENERGY PHYSICS/CHINESE ACADEMY OF SCIENCES

15 beamlines in Phase I

14 user beamlines (3 long beamlines)+ 1 test beamline

All of the beamlines under commissioning

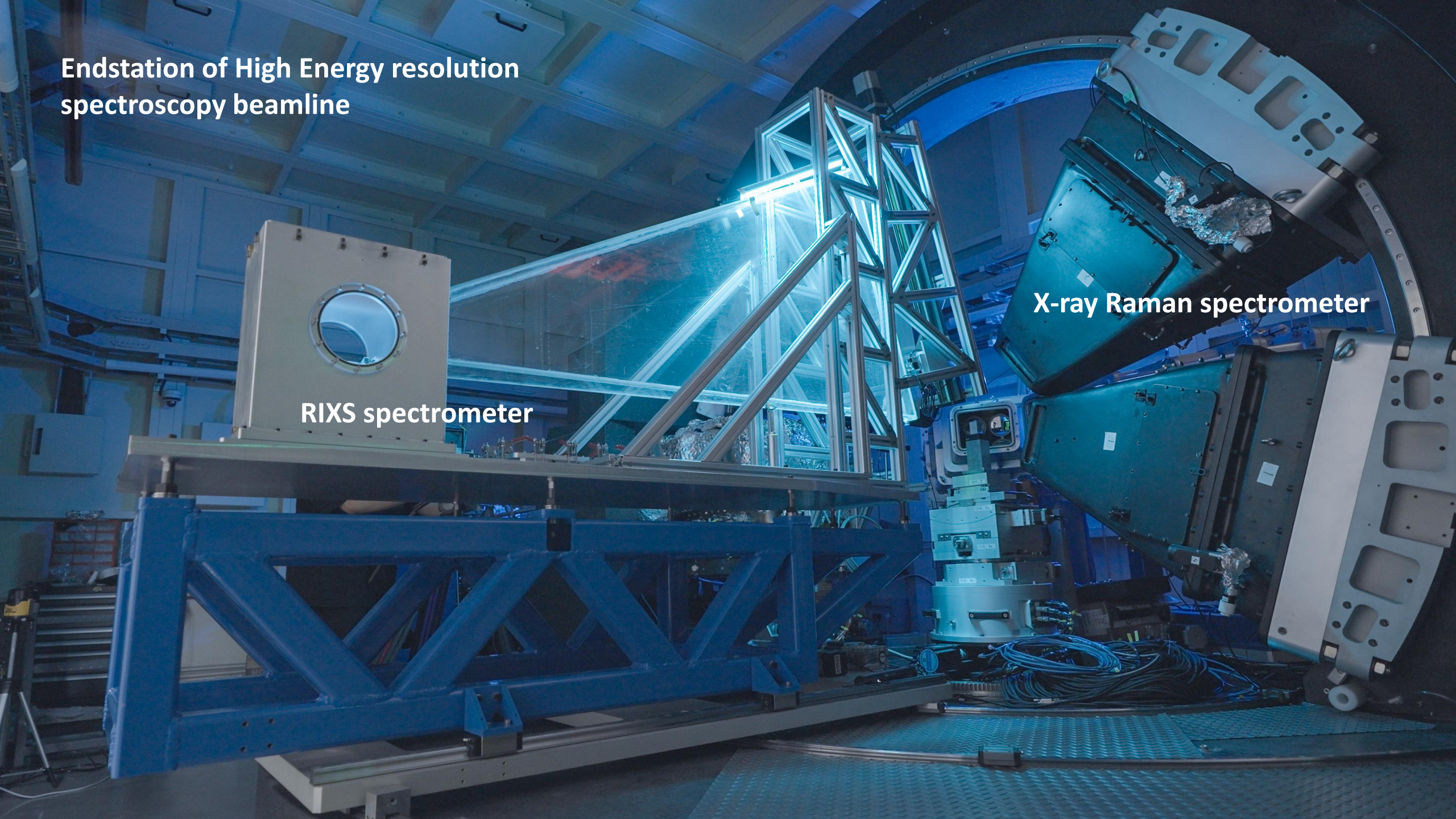


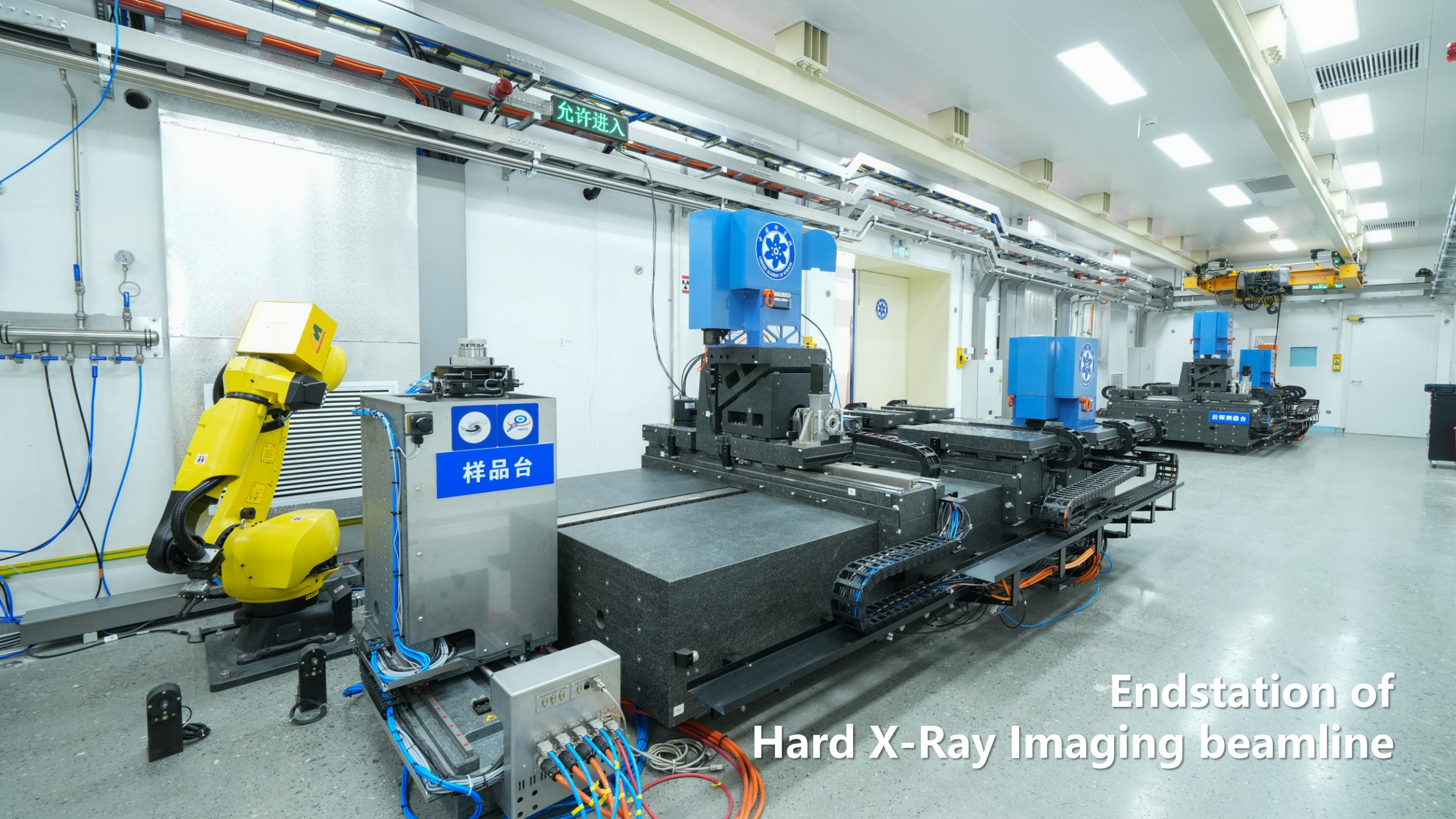
HEPS Phase I Beamlines starting to service users

	Beamlines	Features
High Energy	**Engineering Materials**	50-170keV, XRD, 3DXRD, SAXS, PDF
	Hard X-Ray Imaging	10-300keV, Phase and Diffraction contrast imaging, 200mm large spot, 350m long, Mango Wiggler
High Brightness	**NAMI-NanoProbe**	Small probe, <10nm; *In-situ* nanoprobe, <50nm; 220m long
	Structural Dynamics	15-60keV, single-shot diffraction and imaging; < 50nm projection imaging
	High Pressure	110nm focusing, diffraction and imaging
	Nano-ARPES	100-2000eV, 100nm focusing, 5meV@200eV, APPLE-KNOT U
High Coherence	Hard X-ray Coherent Scattering	CDI(<5nm resolution), sub-μs XPCS
	Low-Dimension Probe	Surface and interface scattering, surface XPCS
General beamlines	NRS&Raman	Nuclear Resonant Scattering and X-ray Raman spectroscopy
	XAFS	Routine XAFS, plus 350nm spot and quick XAFS
	Tender spectroscopy	Bending magnet, 2-10keV spectroscopy
	μ-Macromolecule	1μm spot, standard and serial crystallography
	Pink SAXS	Pink beam, lest optics
	Transmission X-ray Microscope	Full field nano imaging and spectroscopy
Test BL	Optics Test	With undulator and wiggler source for optics measurement and R&D

Beamlines in experimental hall

3 long Beamlines in Phase I


Endstation of High Energy resolution spectroscopy beamline
RIXS spectrometer
X-ray Raman spectrometer



Endstation of Hard X-Ray Imaging beamline

Strong R&D capability

In-house development of X-ray technologies: Insertion device, X-ray optics, Opto-mechanics, Detectors, Software and AI for Sciences

International Assessment of IHEP (Sept. 2023)

- The R&D for the key technologies for the HEPS beamlines covers various topics in optics, X-ray detectors, and software. The technological advances in X-ray optics manufacturing and metrology have been truly impressive over the last five years, at the level of the best centers in the world. The efforts for X-ray detector development cover some of the most advanced

PAPS

Cross the street, a supporting facility- Platerform for Advanced Photon Source, dedicated to HEPS in-house R&D development

- ✓ **Accelerator Technology**
- ✓ **X-ray Technology**

21,295 m^2 building area

Supported by Beijing Government

HEPS | HIGH ENERGY PHOTON SOURCE

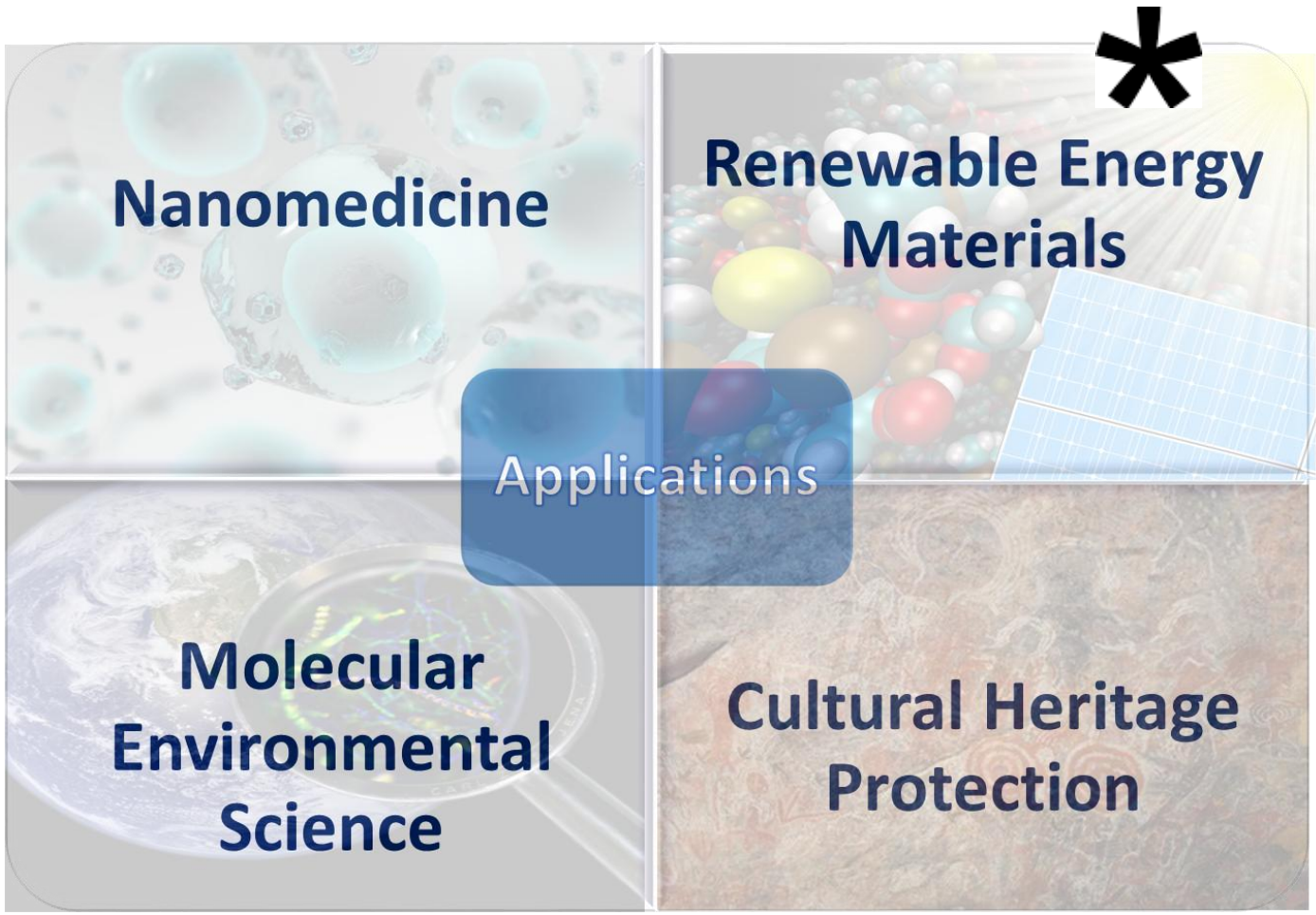
Open Positions

Join us for the commission of Phase I and building future beamlines of Phase II

applicants worldwide are welcome (including foreign nationality)

Beamline Instrumentation and Methodology

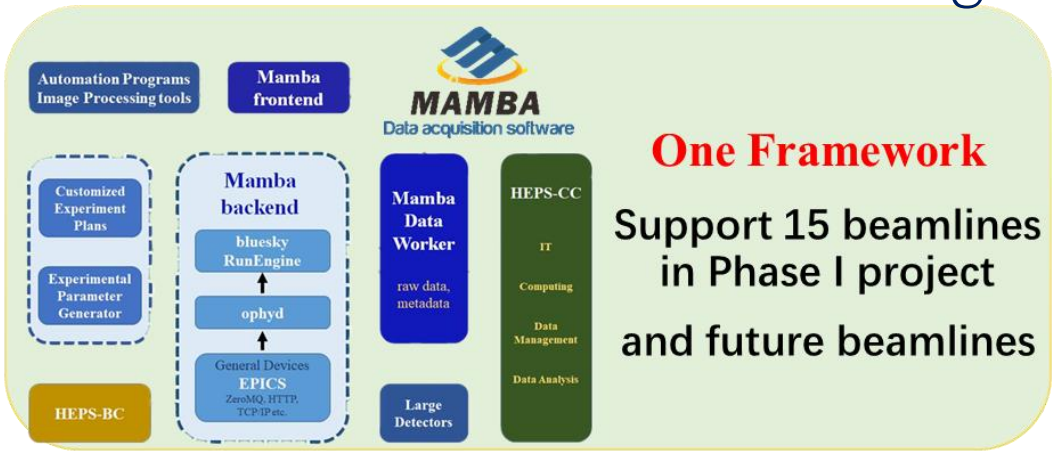
- Frontier **methodology development** in coherent imaging and scattering, inelastic scattering, high energy X-ray scattering and diffraction and imaging, nano-imaging and spectroscopy
- Cutting-edge scientific **beamline instrumentation** development
- State-of-the-art **application research**, especially exploiting features of coherence, brightness and high energy X-rays

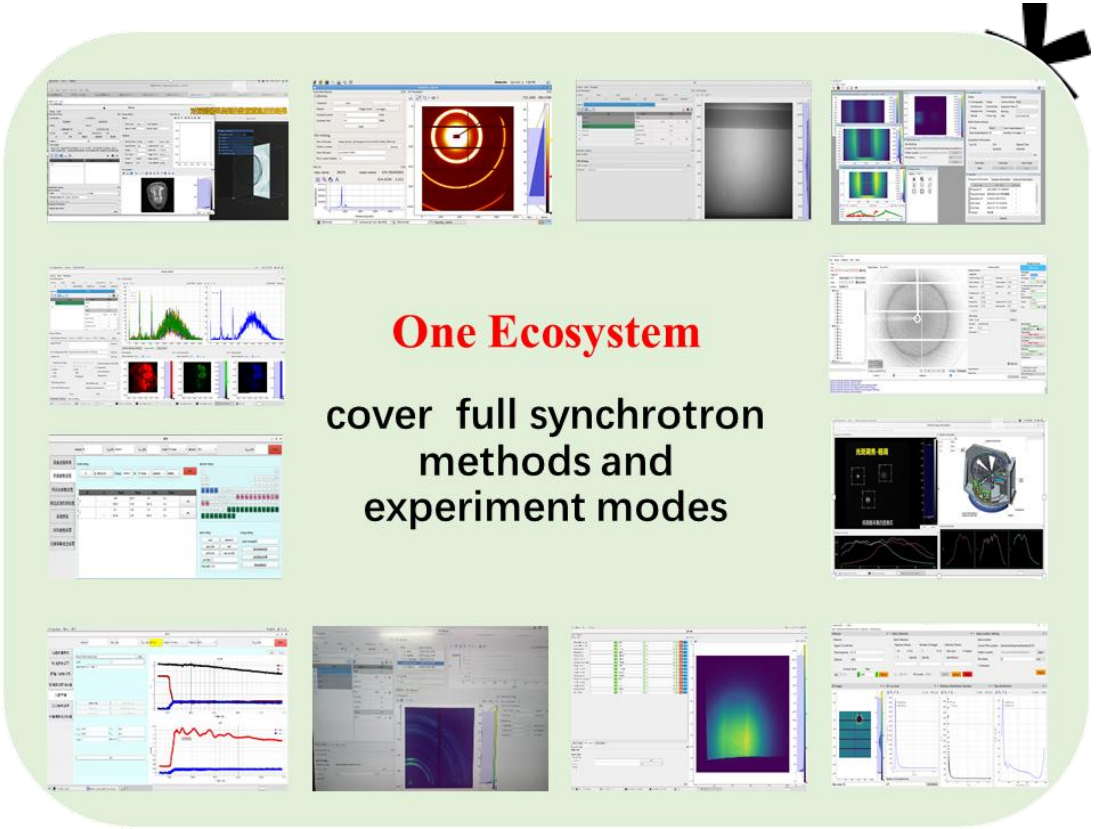


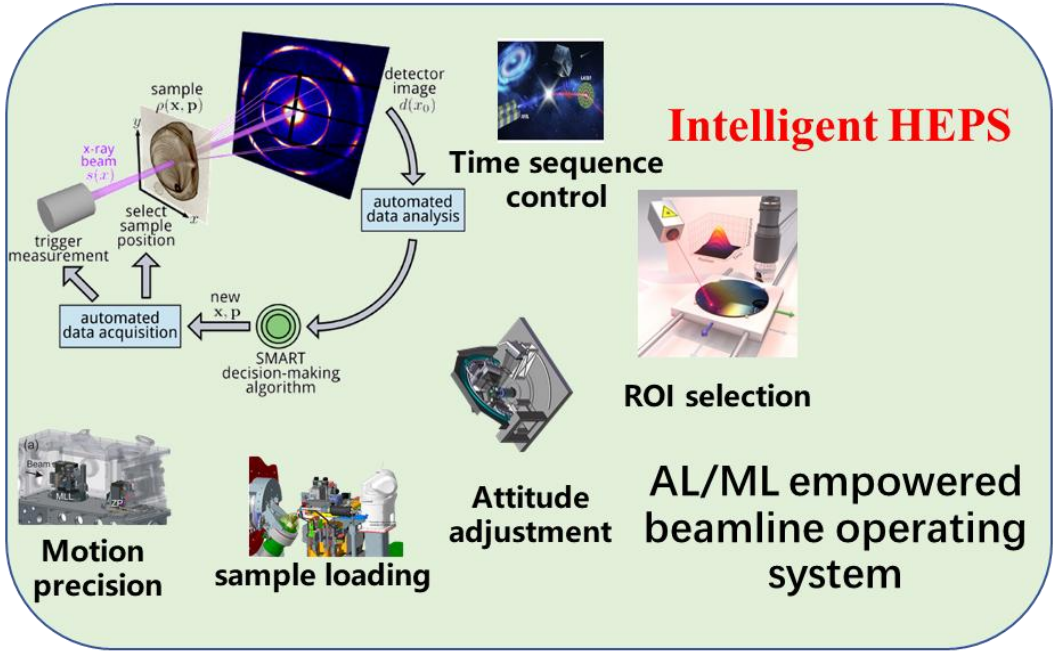
Contact： **heps.beamline@ihep.ac.cn**

Scientific software (control and data analysis)

◆ Software framework design for next generation synchrotron source







- An ambitious and challenge project
- No legacy issue

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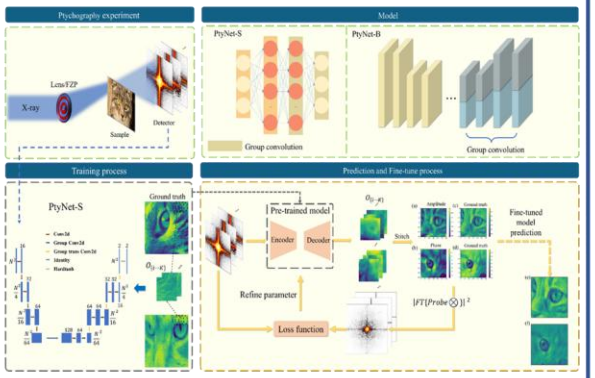
AI for synchrotron science

- **Open new opportunities in science**

Fully leverage **AI/ML and digital twin** capabilities to extract information from big data streams, steer experiments, design experiments, and use on-demand data for ML-driven discovery

Algorithm-driven methodology optimization

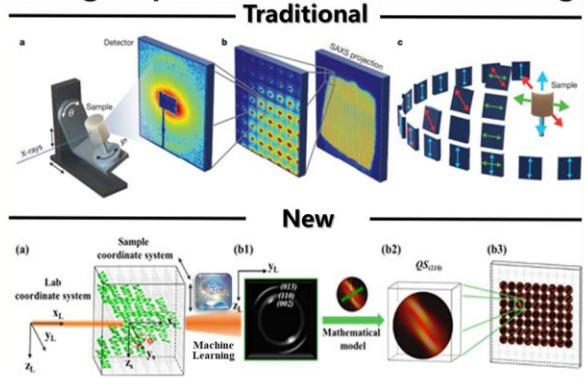
Efficient Ptychography Reconstruction Strategy Using Large Pre-trained Deep Learning Model



- Big Model training strategy enhances the phase reconstruction efficiency, high accuracy at very low overlapping rate;
- Speed up experiment acquisition significantly.

X.Y. P et al, *Cell Reports Physical Science*, second revision
X.Y. P et al, *Acta Physica Sinica*, 2023

Fast Extraction of Nanofiber Orientation from WAXD Patterns Using Supervised Machine Learning

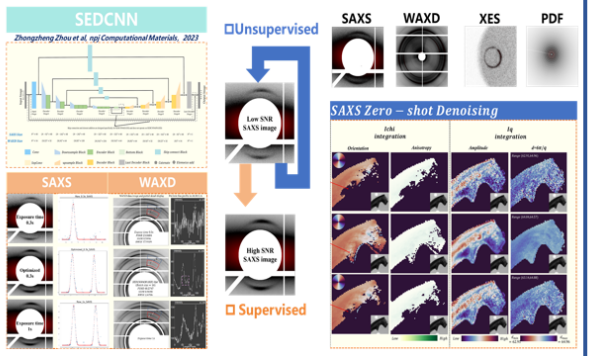


- Virtual reciprocal scanning approach for six-dimensional diffraction tensor tomography, without diffraction information loss
- Reduces acquisition time from days to within one hour

M. H. S et al, *IUCrJ*, 2023
X. Y. Zh et al, *IUCrJ*, Second Revision

Data-driven methodology optimization

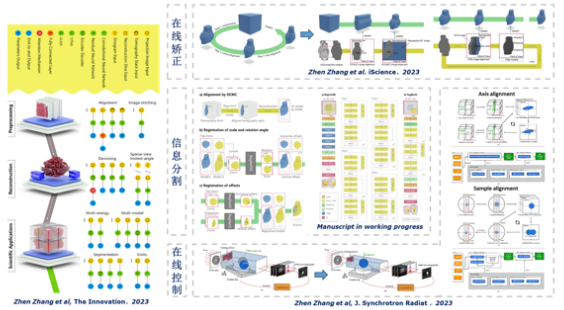
Physical Information-Embedded Unsupervised Denoising Using AI



- Minimum radiation dose, maximum information, systematic x-ray image denoise solutions for a wide range of techniques
- Achieved great performance boost under zero-shot mode

Zhongzheng Zhou et al, *npj Computational Materials*, 2023

Full-stack Synchrotron Tomography Data Processing Pipeline (STDPP)



- End-to-end AL/ML tools for a full-stack pipeline
- Dynamic correction under acquisition, push the time and spatial resolution

Z. Zhang et al, *The Innovation*, 2023
Z. Zhang et al, *iScience*, 2023

Contact： zhangyi88@ihep.ac.cn

Scientific software and computing at HEPS

Candidate requirements

- The successful candidate is expected to a PhD degree at physics, applied mathematics, computer science etc. and have *Knowledge and experience in*
- Software framework design
- Beamline automation
- Image processing
- Big data science
- Machine learning in synchrotron data analysis

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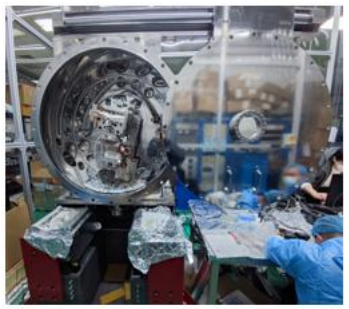
Optics and beamline engineering for HEPS

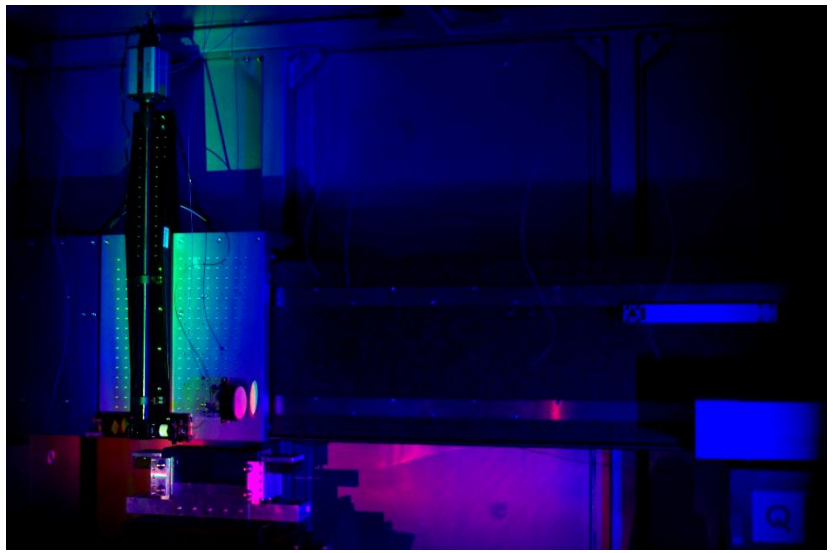
- X-ray optics
- Thermal management
- Optics metrology
- Wavefront preservation and crystal/device fabrication

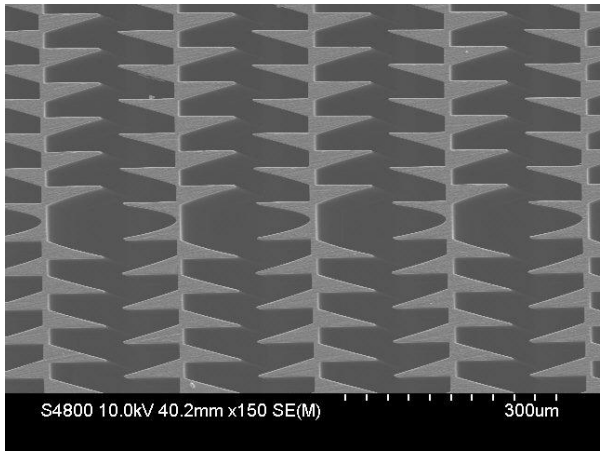

VDCM

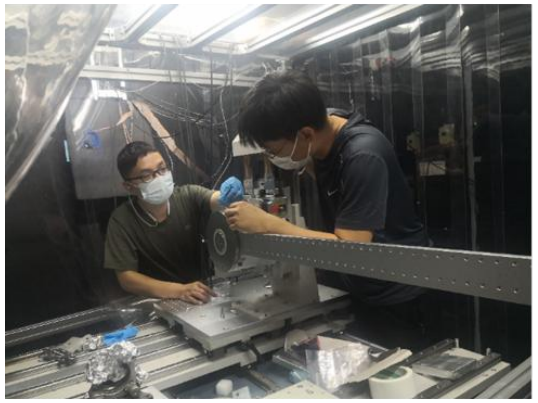

HDCM


Fast-scan DCM


HR-DCM







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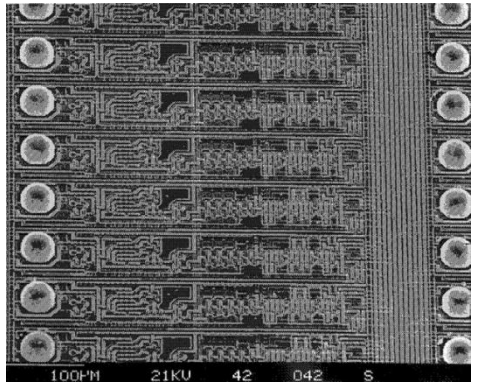
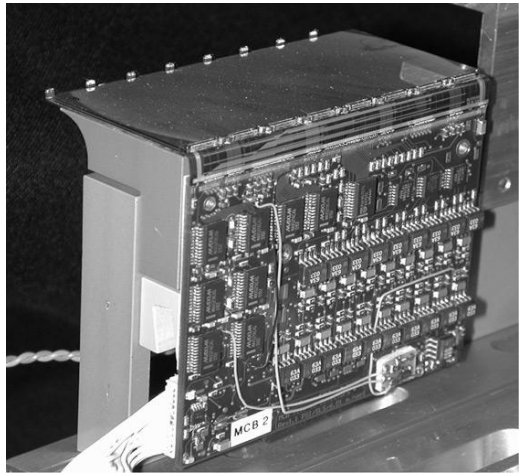
From detectors in HEP to light sources

Detectors widely used in high energy physics are also playing important roles in advance light sources, bringing new ideas and techniques to other research fields

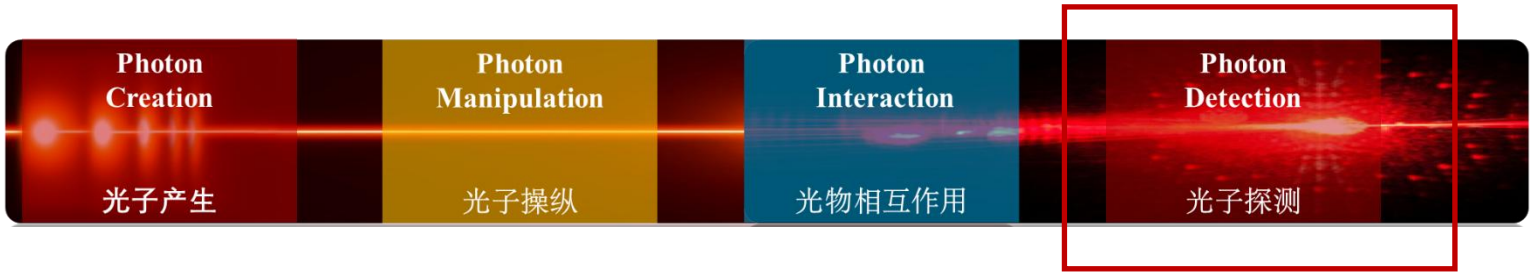


OmegaD in 1992 for WA94 experiment
The first pixel detector



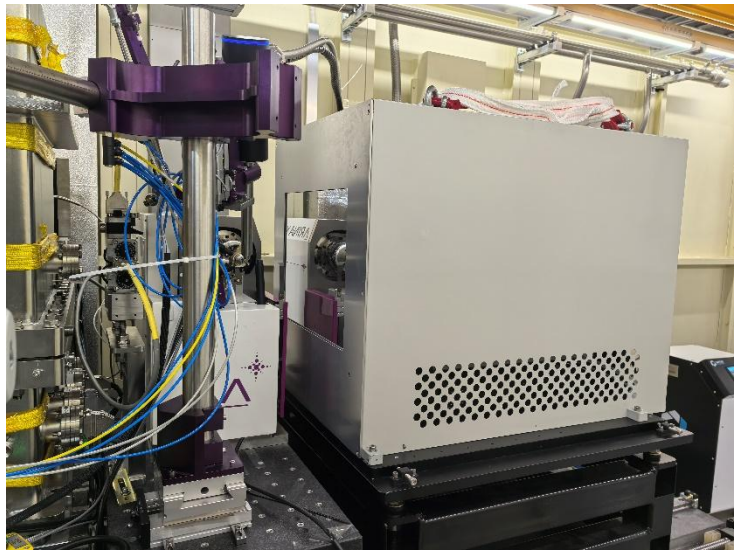
PILATUS detector (2003)
Developed by PSI for SwissLS
Same technique as CMS inner track at the same time

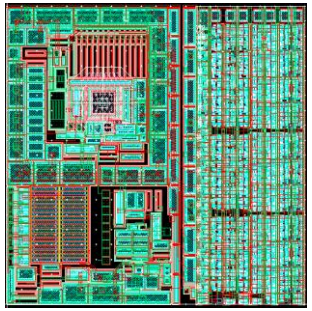
PILATUS/EIGER series, now the most important detectors in the light sources worldwide, achieved big success
Also brought an evolution for methodology of synchrotron radiation

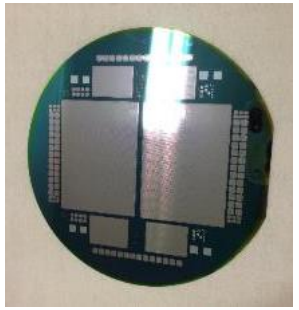


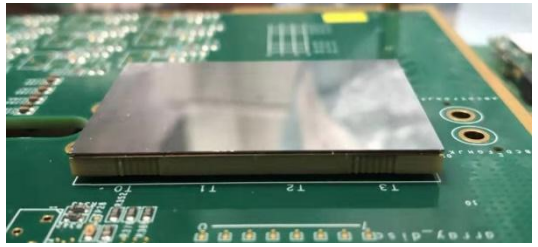
However, most detector products are from abroad
We are developing domestic detectors for our own light sources, and need your contribution

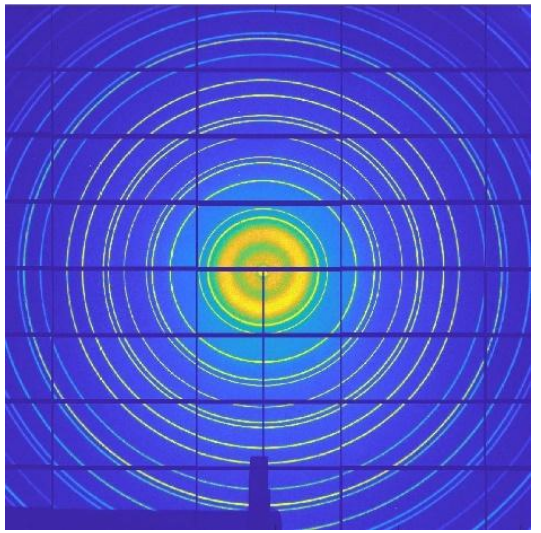
Development efforts and self-developed detectors

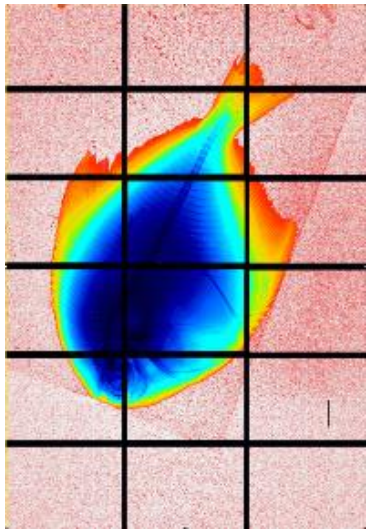






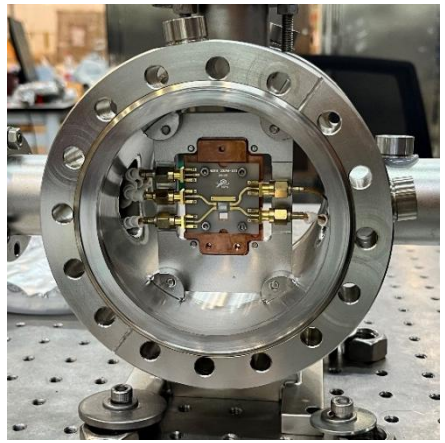




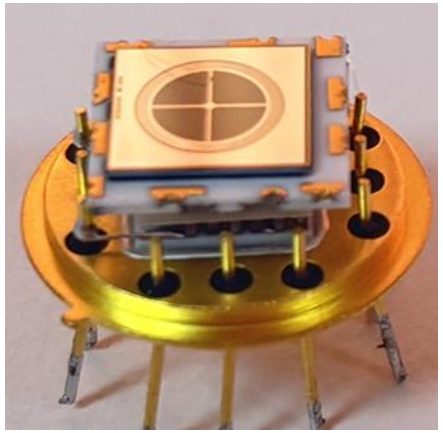


We have full detector development chain from key technology (incl. ASIC, Sensor, packaging, electronics & mechanics) to the full detector system

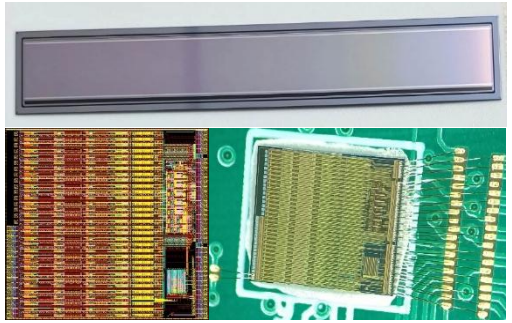
Pixel detector



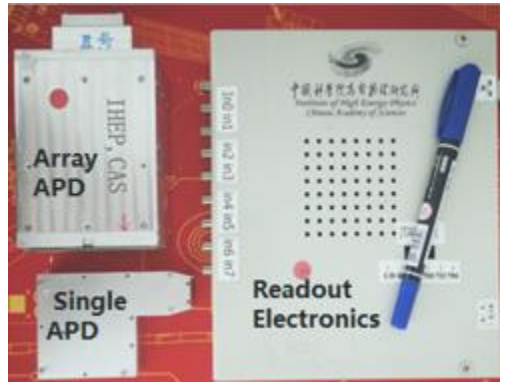
Diamond XBPM



SDD



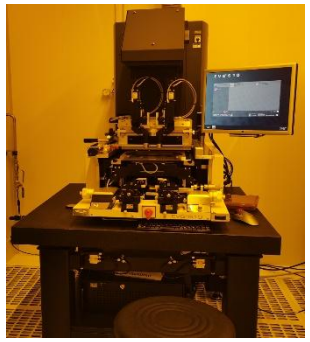
Silicon Strip



APD

Platform and opportunities


ICPCVD


Litho

ICPRIE


Mag-Sputtering


Indium Evaporation


Bump Bonding

Full set of equipment for semiconductor sensor and packaging development based on the Platform of Advanced Photon Source Technology R&D (PAPS) neighboring to HEPS

Candidate requirements:

- Advanced sensor development
- ASIC design
- Advanced packaging technology
- Readout electronics design
- DAQ
- Mechanic design
- Detector calibration

Contact:
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weiw@ihep.ac.cn

03

Life and Work
In HEPS and Huairou Science City (HSC)

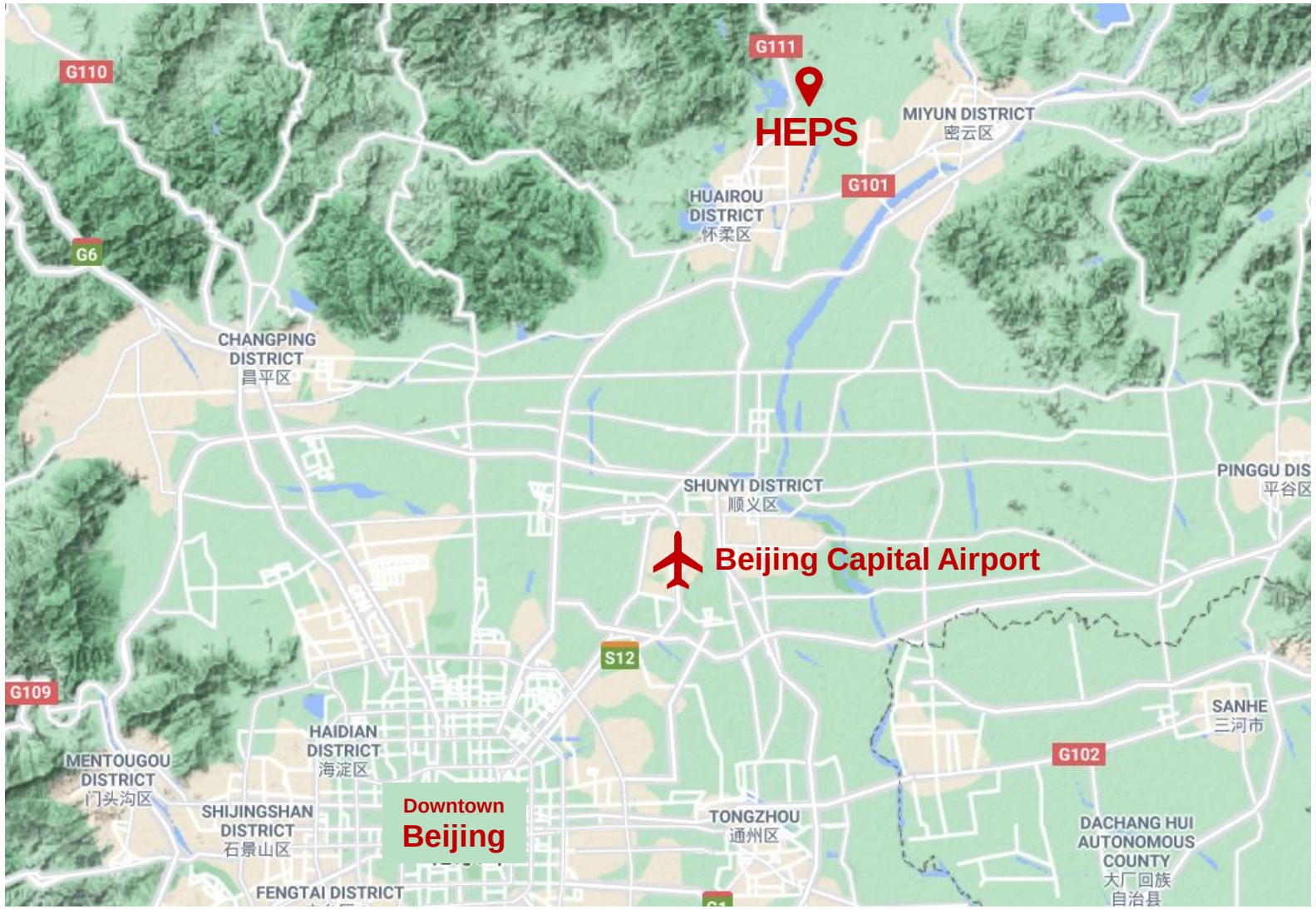
Where is HEPS?

HEPS

Huairou District, Beijing

80 km from IHEP campus

45 km from Beijing Capital Airport



HEPS | HIGH ENERGY PHOTON SOURCE

HEPS in Huairou Science City (Beijing)

- World-class original innovation area
- A new highland for strategic and forward-looking basic research
- A key area of Comprehensive National Science Center
- An eco-friendly and livable innovation demonstration zone

HEPS, SECUF (Synergized Extreme Condition User Facility), CMP Phase II (Chinese Meridian Project Phase II), EarthLab (the Earth System Numerical Simulation Facility), Multimodal Cross-Scale Biomedical Imaging Facility, HOPE (Human Organ Physiopathology Emulation System)

- **Series research platforms** in energy, environment, biology, materials, etc.

100.9 km^2 **6** large science facilities

HEPS | HIGH ENERGY PHOTON SOURCE

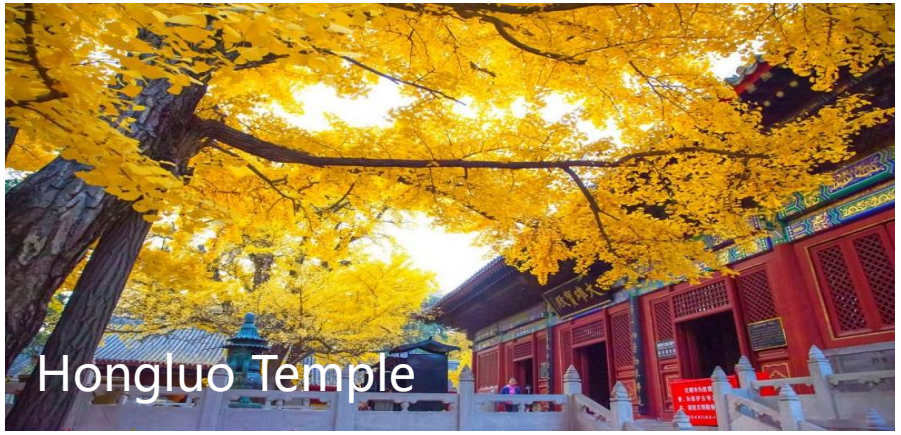
Huairou

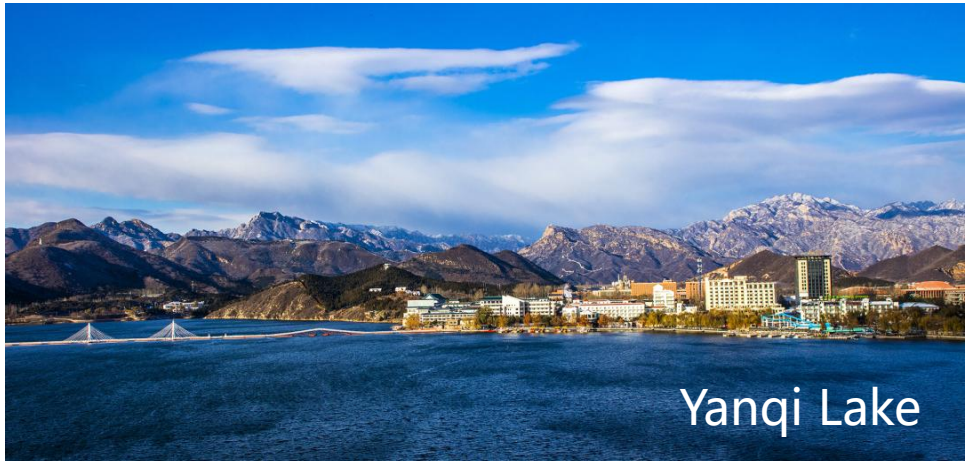
Huairou, the APEC meeting site, a pleasant place to live and work

Scenic hiking trails on Great Wall, around lakes and in mountains

Skiing – Huaibei ski resort within 10 km from HEPS

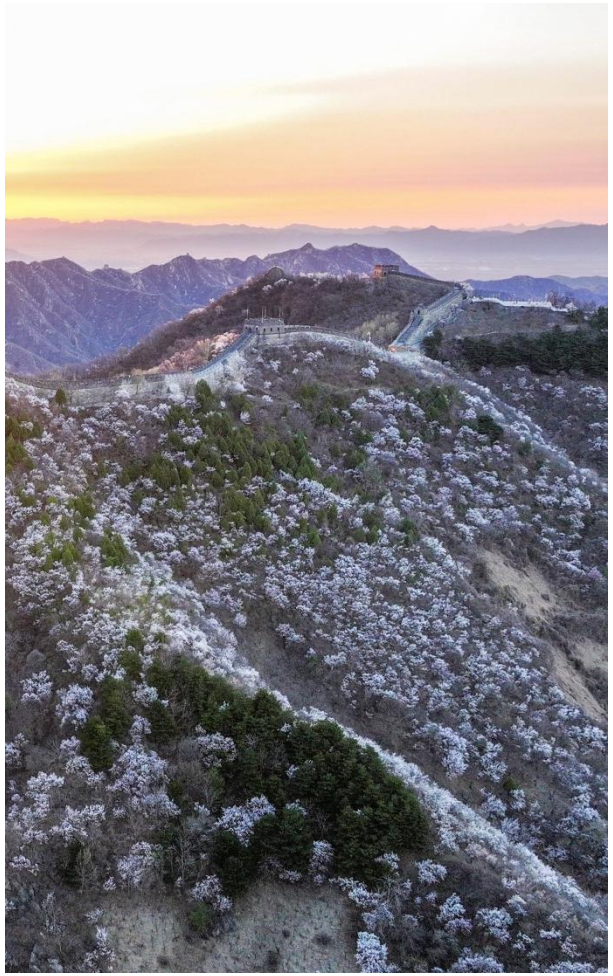

Mutianyu Great Wall

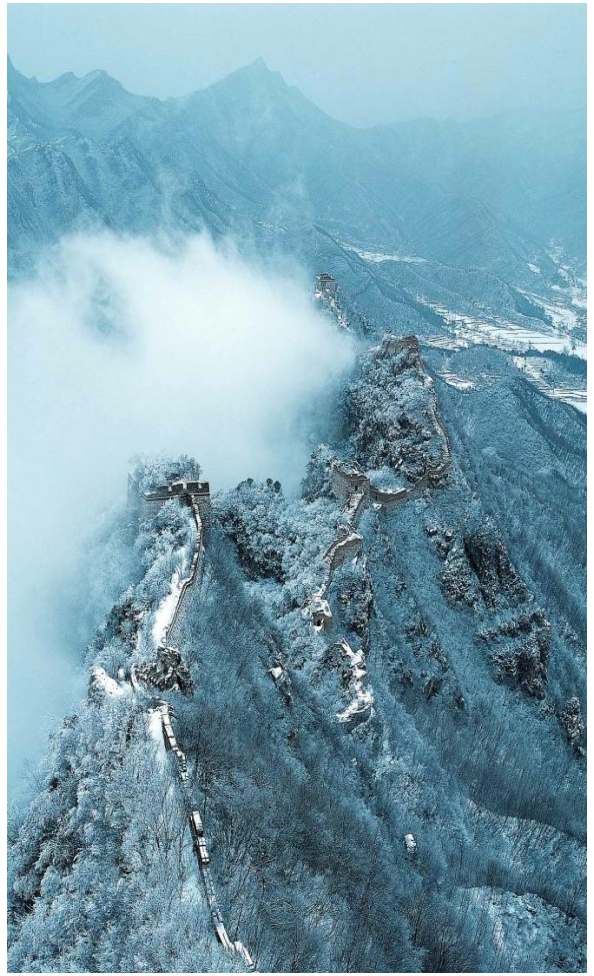

Hongluo Temple


Yanqi Lake

Huaibei Ski Resort

MUTIANYU GREAT WALL 24km to HEPS





UCAS-HEPS Joint recruitment

- Becoming an UCAS Scientist and conducting synchrotron related research
- Applications are welcome from both faculty candidates and postdoctoral researchers.
- Highly competitive salary, benefits, and institutional support provided by UCAS.

We welcome all applicants worldwide