Promoting Scholar Exchange at Large Research Infrastructures

ZHAO Hongwei

Institute of Modern Physics
CAS

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Outline

- Large Research Infrastructures in CAS
- Policies, Programs, Grants and Funding Agencies to Promote Exchanges in China
- Experiences and Successful Collaboration Examples
- Focused Research for the Collaboration
- Suggestions to Promote Scholar Exchange at Large Research Infrastructures
- Opportunities & Challenges

Large Research Infrastructures in CAS

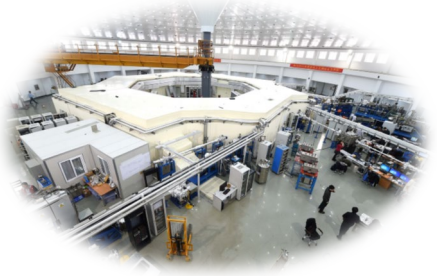
Facilities in operation (Examples)

Heavy Ion Research Facility in Lanzhou (HIRFL）

Beijing Electron Positron Collider (BEPC II)

Experimental Advanced Superconducting Tokamak (EAST)

Hefei Synchrotron Radiation Facility



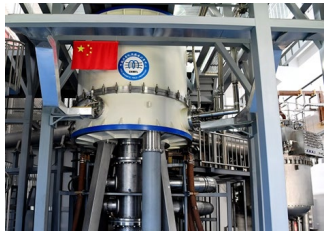
Shanghai Synchrotron Radiation Facility

ShenGuang-Ⅱ Laser Facility (SG-Ⅱ)

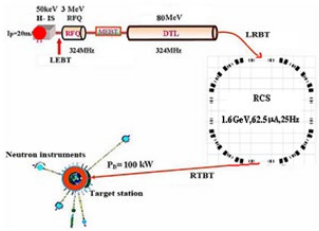
LAMOST

FAST

Steady High Magnetic Field Facility



China Spallation Neutron Source



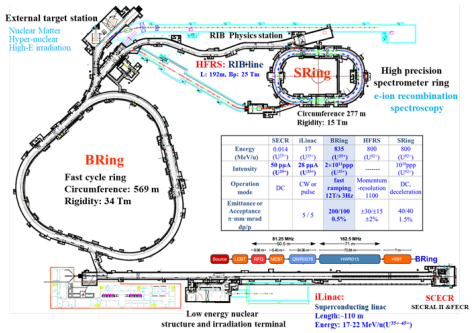
Multi-Purpose Oceanographic Research Vessel (MORV)

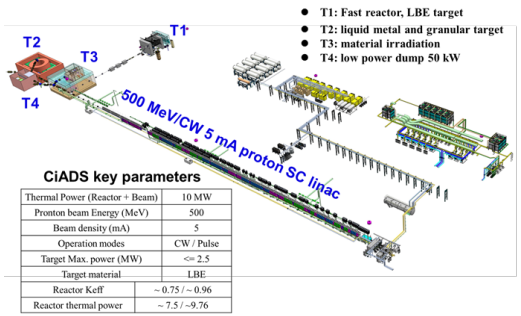
Large High Altitude Air Shower Observatory

Large Research Infrastructures in CAS

Facilities under Construction （Examples）

High Intensity heavy ion Accelerator Facility (HIAF) & China Initiative Accelerator Driven System (CiADS)

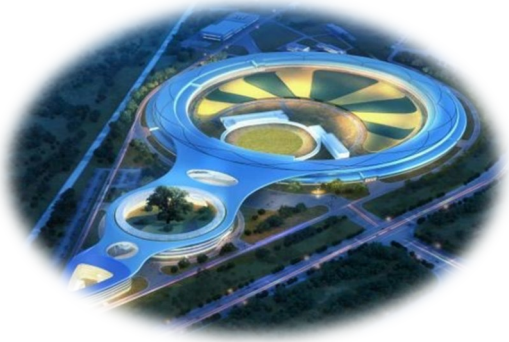




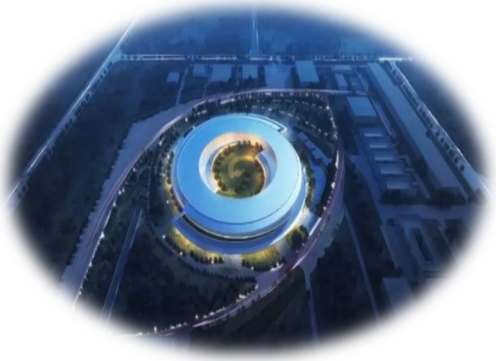
CiADS key parameters

Thermal Power (Reactor + Beam)	10 MW
Pronton beam Energy (MeV)	500
Beam density (mA)	5
Operation modes	CW / Pulse
Target Max. power (MW)	<= 2.5
Target material	LBE
Reactor Keff	~ 0.75 / ~ 0.96
Reactor thermal power	~ 7.5 / ~9.76

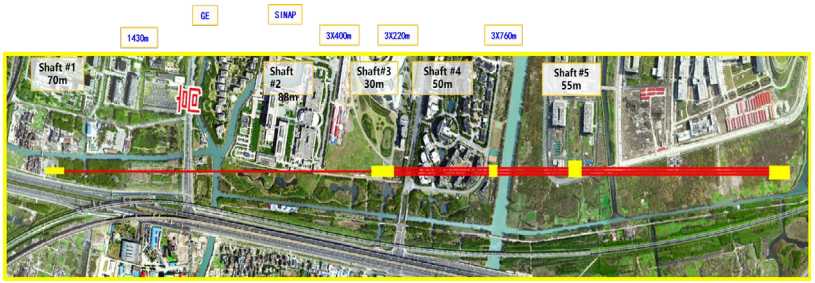
High Energy Photon Source



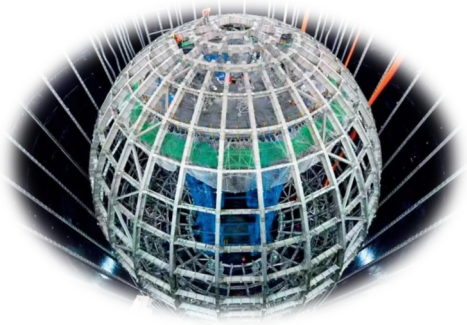
Hefei Advanced Light Facility



Shanghai HIgh repetition rate XFEL and Extreme light facility (SHINE)



Jiangmen Neutrino Lab



Policies for International Cooperation

Attract International Talents to Promote SCIENCE !

The Chinese government encourages the following collaborations

- **High-level and essential international cooperation in S&T;**
- Substantive collaborations with research institutions or universities;
- **Participating in big science projects initiated by other countries or co-sponsored by many countries;**
- **Attracting domestic and foreign governments, scientific research institutions, universities, science and technology societies, enterprises and international organizations to participate in supporting the construction, operation and management of China's big science programs.**

Programs， Grants und Funding for German Researchers

中华人民共和国科学技术部
Ministry of Science and Technology of the People's Republic of China

Senior Scientist Scholarship

- **Aim :** Well established and internationally recognized scientists or engineers;
- **Requirement:**
  - Carry out cooperative projects at cooperative institutions in China no less than 1 month;

Younger Scientist Scholarship

- **Aim**: outstanding young foreign scientists with great potential in key areas of scientific and technological innovation
- **Requirement:**
  - Carry out cooperative projects at cooperative institutions in China no less than 9 months;
  - No older than 40; Obtained a PhD degree from a foreign university.

Programs， Grants und Funding for German Researchers

中国博士后科学基金会
China Postdoctoral Science Foundation

Postdoctoral International Exchange Program

Postdoctoral Introduction Project

AIM

to support the outstanding young researchers who recently received his doctorate for 2 years postdoctoral research in China.

Requirement

1. No older than 35;
2. Graduate from first-class university
3. Obtained the PhD degree from a foreign university

aFund

200,000 RMB per year

Programs， Grants und Funding for German Researchers

中國科學院 CHINESE ACADEMY OF SCIENCES

PIFI 國際人才計劃 CAS PRESIDENT'S INTERNATIONAL FELLOWSHIP INITIATIVE

President's International Fellowship Initiative PIFI, is a specific funding program to attract talented foreigners to CAS for scientific exchanges and research cooperation. It is open to scientific research personnel from around the world.

Category A

Distinguished Scientist

AIM

- Well established and internationally recognized science masters
- To build relationships with world-class research entities

WHAT YOU'LL DO

- Conduct a lecture tour in at least two CAS branches in 1-2 weeks

WHAT WE OFFER

50,000 RMB per week

Category B

Visiting Scientist

AIM

- Assistant professor or above who has worked in a well-known university or research institution
- To deepen research cooperation with CAS

WHAT YOU'LL DO

- Carry out cooperative projects at CAS institutions for 2-9 months

WHAT WE OFFER

40,000 RMB per month for full prof.

30,000 RMB per month for associate prof.

20,000 RMB per month for assistant prof.

✈ Plus round trip flight ticket subsidy

Programs， Grants und Funding for German Researchers

中國科學院 CHINESE ACADEMY OF SCIENCES

國際人才計劃 CAS PRESIDENT'S INTERNATIONAL FELLOWSHIP INITIATIVE

Category C

Special Expert

AIM

- Individuals who have extensive experience or unique skills that meet the needs of CAS institutions
- To make key contribution to CAS world-leading research programs

WHAT YOU'LL DO

- Work full-time at CAS for 2-3 years or more

WHAT WE OFFER

- up to **1million** RMB per year, depending on the contract amount agreed by the two parties.

Category D

PhD Student

alternative name:
CAS-TWAS President's Fellowship Program

AIM

- Master's holders at age < 35
- To cultivate excellent talents in science and technology, especially from developing countries

WHAT YOU'LL DO

- Take regular training courses at UCAS* and USTC** for 1 year and carry out research at CAS institutes
- Pursue PhD degree at CAS for 3 years maximum

WHAT WE OFFER

Up to **8000** RMB per month for living subsidies

Tuition waiver of up to 4 years

- *UCAS : University of Chinese Academy of Sciences
- **USTC : University of Science and Technology of China

Programs， Grants und Funding for Chinese Researchers

中国科学院 CHINESE ACADEMY OF SCIENCES

A. Mobility Program

- ✓ Preferred to support researchers with senior titles and have made an outstanding academic performance in his or her own field；
- ✓ For **2-6 M** Visiting at an international research institution

B. Visiting Scholar Program

- ✓ No older than 45;
- ✓ For **3-24 M** Visiting at an international research institution

C. Engineering & Technical Personnel Program

- ✓ No older than 45; 50 for those with senior titles;
- ✓ For **3-24 M** Visiting at an international research institution

D. Management Support Talent Program

- ✓ No older than 45; 50 for those with senior titles;
- ✓ For **3-12 M** Visiting at an international research institution

国家自然科学基金委员会
National Natural Science Foundation of China

Chinesisch-Deutsches Zentrum für Wissenschaftsförderung
中德科学中心

Mobility Program

Program

- The “Mobility Program” facilitates bilateral cooperation between a research teams in China and in Germany by funding multiple visits and small-scale workshops

Aim

- To build up an active collaboration between groups from both countries on a longer timescale to work together in small research projects

Require-ment

- Applicants must be researchers from a Chinese/German university or research institution;
- **Applicants from Germany must have completed research training by obtaining a doctorate** ;
- Applicants from China must be a PI or participant in a NSFC grant with a duration of 3 years.

Fund

- A maximum of **1.5 million RMB** per program for multiple exchange visits and workshops.

China Scholarship Council (CSC)

A. Mobility Program	✓ No older than 55; ✓ Official Staff of universities or research institutions; ✓ **Preferred to support researchers with senior titles**; ✓ For **3-6 M** Visiting at an international research institution
B. Visiting Scholar Program	✓ No older than 50; ✓ Official Staff of universities or research institutions; ✓ For **3-12 M** Visiting at an international research institution
C. Post-doctoral Research Program	✓ No older than 40; ✓ Outstanding young scientists or researchers with PhD degree ✓ For **6-24 M** Post-doctoral research at an international research institution
D. PhD/Master Program	✓ PhD Degree: **36-48 M** ✓ Joint PhD Degree: **6-24 M** ✓ Master Degree: **12-24 M**

Programs， Grants und Funding for Chinese Researchers

中国博士后科学基金会
China Postdoctoral Science Foundation

Postdoctoral International Exchange Program

A. Postdoctoral Dispatched Program

- ✓ Postdoctoral fellow ; Recent PhD graduates
- ✓ No older than 35;
- ✓ For at least **12 months** postdoctoral research abroad
- ✓ **300,000 RMB**

B. Sino-German Postdoctoral Exchange Program (DAAD)

- ✓ Postdoctoral fellow ; Recent PhD graduates;
- ✓ No older than 35;
- ✓ For **two-year** postdoctoral research at the institute of Helmholtz Association in Germany;
- ✓ **300,000RMB + 1500 EURO/month**

C. Academic Exchange Program

- ✓ To sponsor outstanding postdoctoral researchers to attend international academic conferences abroad and carry out academic exchange activities;
- ✓ on-station postdoctoral fellow;
- ✓ **20,000 RMB per person**

Experiences and Successful Collaboration Examples

Collaboration History Review between IMP and Institutions in Germany

Fields for Joint Research

- Nuclear physics
- Application of the heavy ion beams
- Accelerators and detectors

IMP Signed MoU with:

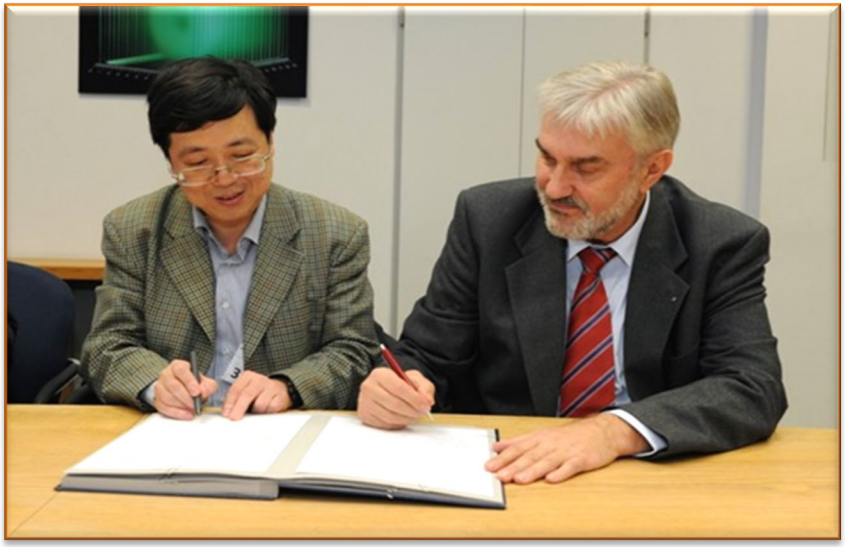
GSI Helmholtzzentrum für Schwerionenforschung GmbH

Max-Planck-Institut für Kernphysik Heidelberg

JÜLICH Forschungszentrum

Goethe Universität Frankfurt am Main

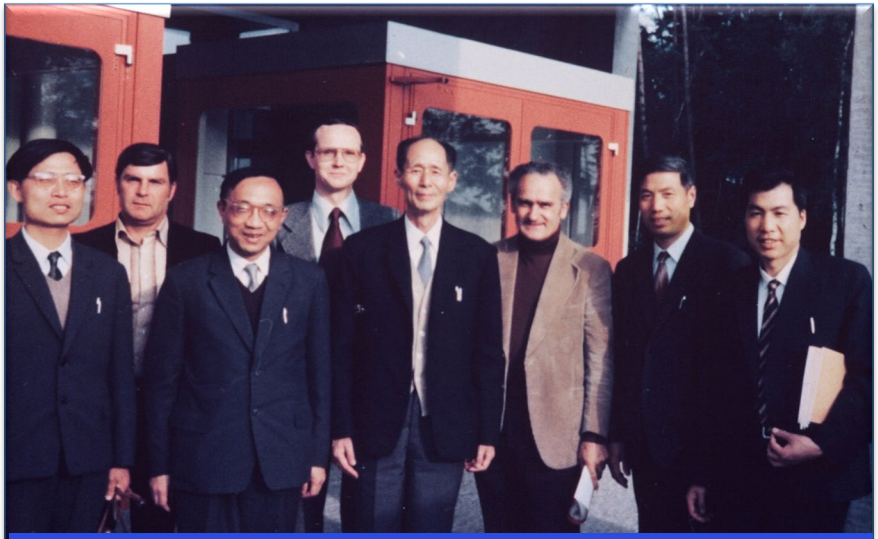
HZDR Helmholtz Zentrum Dresden Rossendorf



Collaboration Review between IMP and Institutions in Germany

The cooperation between IMP & GSI began since 1977

（40 years anniversary collaboration in Sept. 2017 ）



May 1977, the first Chinese delegation from IMP visited GSI

1978, the delegation from Max-Planck Society visited IMP

1979-1980, Humbold Fellows from IMP at GSI, also at the University of Munich and HMI/Berlin

Prof. R. Bock, former director of GSI visited IMP in 1982

Collaboration Review between IMP and Institutions in Germany

Mr. P. Fischer, former ambassador of Germany on ceremony for donation of the electronics instrument to at IMP in 1986

Prof. H. Lindenberger from HMI Visited IMP in 1987

The Delegation of BMBF of Germany visited IMP in 1998

Prof. Wei Baowen, the former director of IMP at visit to GSI

Experiences and Successful Collaboration Examples

During CSR construction 2000-2008, a lot of visitors and exchanges, many review meetings between GSI and IMP.

IMP has appreciated very much for the collaboration and help from GSI

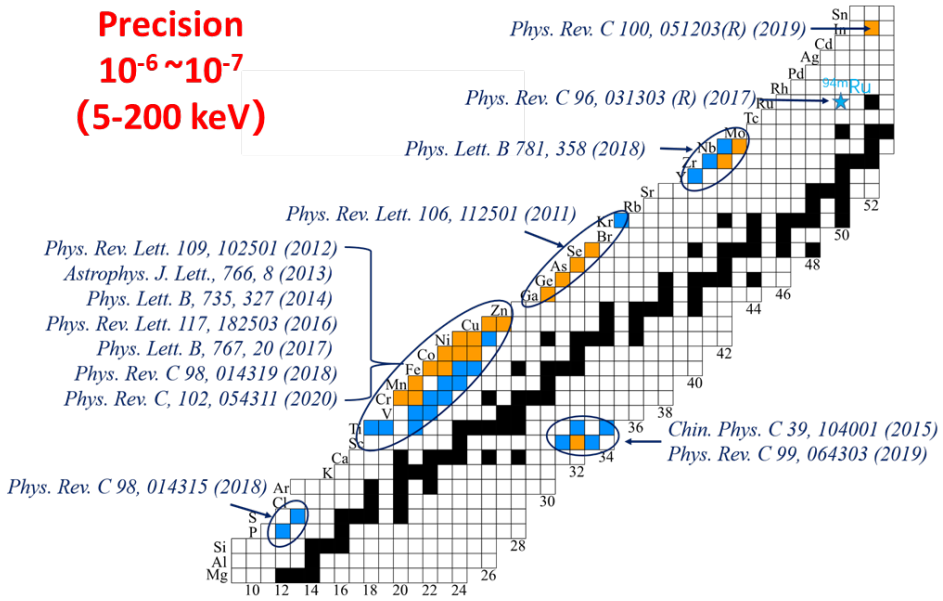
Experiences and Successful Collaboration Examples

Precision mass measurements of unstable isotopes

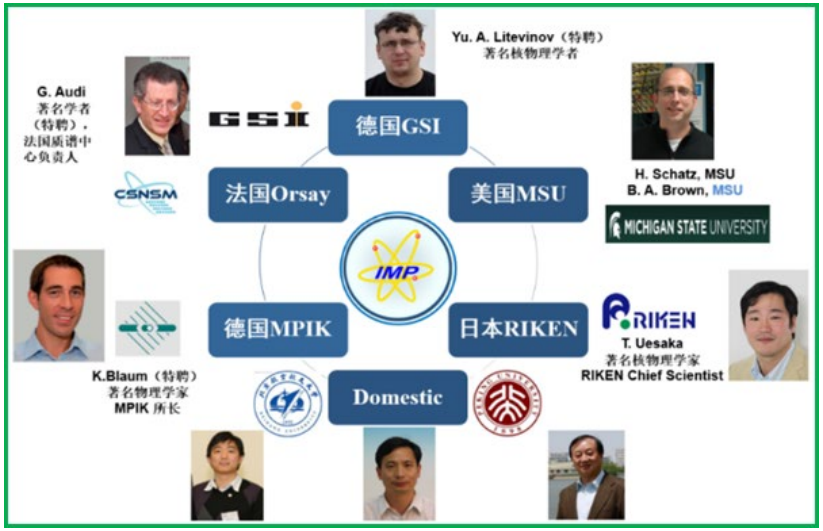
26 Measured for the first time

>50 Precision improved

Precision
10^{-6} ~10^{-7}
(5-200 keV)



International collaboration group including GSI and MPIK



Superconducting Dipole Prototype for FAIR

Superconducting dipole magnet, low temperature, power supply and measurement systems

FORMER DIRECTOR OF GSI, PROF. STOCKER
IMP (MARCH 2010)

Superconducting dipole magnet passed tests by experts from home and abroad

- 2005，GSI signed MoU with IMP for making a prototype of dipole magnet for FAIR.
- 2009，Superconducting dipole magnet **passed performance test.**

Experiences and Successful Collaboration Examples

International Cooperation Awards

The International Scientific and Technological Cooperation Award of the P. R. China

Dr. Norbert Angert from GSI won the Award in 2003

The Friendship Award of the Chinese Government

Dr. Norbert Angert from GSI won the Award in 2006

Gansu Dunhuang International Cooperation Prize

2004 Otto Klepper，GSI

2004 Yuri Litvinov，GSI

Focused Research for the Collaboration

1. Nuclear physics, Atomic physics
2. Applied research: Biophysics, ion therapy, material science…
3. AI Machine Learning (in research and accelerator)
4. Detector development for nuclear physics
5. Accelerator technologies

Possible Research Collaboration to promote scholar exchange

Nuclear Physics

- Largely overlapping energy domain with many common physics interests
- Vast potential for closer and more integrated **scientific and instrumentation partnership**

➢ **Super-heavy Elements** (SHIP/TASCA in GSI, SHANS/SHANS2 in IMP)

Gas cell, RFQ cooler and buncher. Multi-reflection TOF mass spectrometer ……

➢ **Radioactive Ion Beam** (FRS/SuperFRS in GSI, RIBLL/HFRS in IMP)

On-going collaborations at FAIR-SuperFRS

Tensor-force effect in nuclei. Unbound nuclei, Nuclear matter/charge radii,

Charge-exchange reactions and β decay of r-process nuclei, RIB low-energy branch ……

➢ **Heavy-Ion Storage Ring** (ESR/CR in GSI, CSRe/SRing in IMP)

Isochronous Mass Spectrometry (“Bρ-defined IMS” established in IMP)

Schottky Mass Spectrometry, Internal target (Helium gas target, Pellet target)……

Possible Research Collaboration to promote scholar exchange

Data Acquisition for PANDA@FAIR

- Trigger-less DAQ (TDAQ) is essential at future machines in high precision frontier
- IMP (Lanzhou) and IHEP (Beijing) contribute to the PANDA TDAQ (Level-1)
- Expect to continue the collaboration on TDAQ

- **IMP and IHEP** construct a prototype of Level-1 layer of PANDA TDAQ: 8 compute nodes, tracking + clustering
- **GSI** develops the forward tracking firmware and do tests: connection test between nodes and beam

CBM @ FAIR

- Participation and Contributions to CBM and its detector system
- The super-conducting dipole magnet at CBM
- Assembly and test of the new detector, such as the first tracking detector

Possible Research Collaboration to promote scholar exchange

Atomic Physics Research related to APPA @FAIR

- Laser cooling and laser spectroscopy of relativistic ion beams at heavy ion storage rings
- Dielectronic recombination spectroscopy of highly charged ions at storage rings
- High precision high electron spectrometer
- High energy atomic collision dynamics at storage rings
- Vacuum decay
- High energy density physics

Possible Research Collaboration to promote scholar exchange

Accelerator technologies

◆ **Full-energy-storage fast-cycling pulse power supply**

-**High power:** for high-energy synchrotron
-**Fast ramping rate:** avoid dynamic vacuum problem
-**Low power consumption:** reduce impact on electric gird

◆ **Magnetic Alloy Acceleration Cavity**

-**Magnetic Alloy core:** high uQf value
-**High accelerating gradient and RF voltage:** fast acceleration

Developed for HIAF. useful to FAIR

◆ **High magnetic field, fast ramping superconducting magnet**

-Magnetic field >**6T**, ramping rate >**4T/s**

◆ **Beam manipulation**

-**Ultra short high intensity ion bunch:** ~10 ns bunch length
-**Wobbler:** adjust beam shape in transfer line

Collaboration & Development for future

Suggestions to Promote Scholar Exchange

Suggestions to Promote Scholar Exchange at Large Research Infrastructures

- Scholar Exchange: Post-doc & young scientists
- CAS to Helmholtz 10 persons/year
- Helmholts to CAS 5 Persons/year

- Using beams from the both-side facilities to do experiments, such as HIRFL- CSR, SIS18-ESR.

- CAS and Helmholts should establish some kind of Programs or Grants dedicated to financial support to the scientific collaboration not only personnel exchange, but also scientific research and technology development

- Organizing joint workshops, key technology or components design review meetings

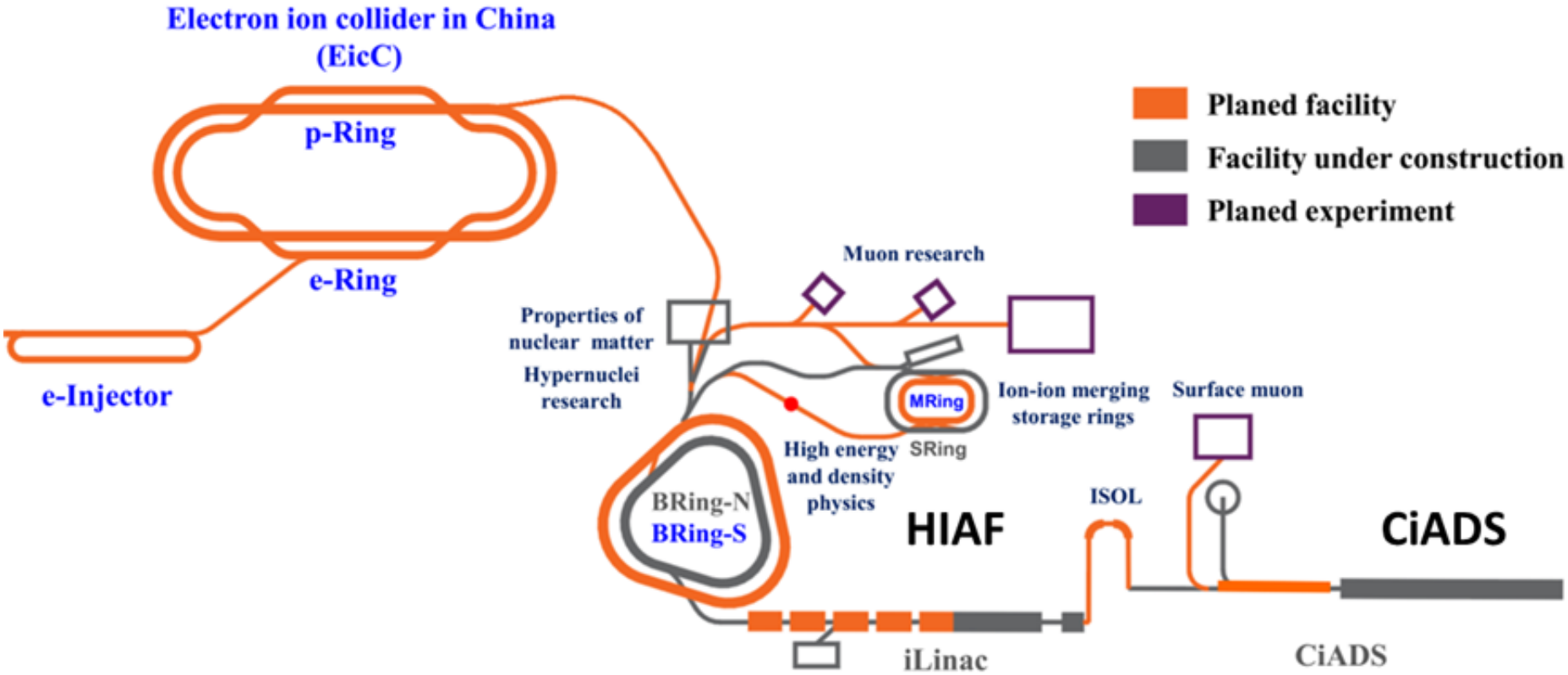
- Participate in construction of FAIR and HIAF, and jointly developing detectors and accelerator components through in-kind contribution

Future: Welcome to Participate in CNUF

China advanced NUclear physics research Facility(CNUF)

-An upgrade project for the HIAF and CiADS

- An international project and facility



Opportunities and Challenges

Opportunities:

1. Chinese government encourages the collaboration;

2. FAIR and HIAF in construction;

3. Common scientific-interested research topics.

Challenges:

1. Complicated international-politics;

2. How to achieve mutual benefit and “double-win” collaboration;

3. Scientific and technical collaboration budget


Thank you!