

A REPORT FROM ISBA25, ACCELERATOR SCHOOL IN SHANGHAI, CHINA

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Abstract

ISBA25 (The 8th International School on Beam dynamics and Accelerator technology) was held from September 1st to 10th 2025 in Shanghai, China. This is the 8th school of the ISBA series, which is an international accelerator school for graduate students and young researchers who are new to the accelerator field. The school curriculum is composed of fundamental topics (e.g., beam dynamics and RF theory), applications (e.g., medical accelerators), and the latest topics (e.g., AI for accelerators). More than 90 students from around the world participated and spent meaningful days, including hands-on training for accelerator design, student presentations, a laboratory tour of SARI, and an excursion. The school is reported.

INTRODUCTION

The 8th International School on Beam Dynamics and Accelerator Technology (ISBA25) was held over 10 days from September 1 to 10, 2025, at the Shanghai Advanced Research Institute (SARI) of Chinese Academy of Sciences in Shanghai, China. This school series has been held as a part of the IINAS-NX project since 2018, and ISBA25 was co-hosted by Hiroshima University and SARI. Participants included 91 individuals, primarily graduate students and young researchers from around the world. With 135 applicants, the competition rate was 1.5, making it highly selective. Participants came from: China (57), Japan (13), South Korea (10), Thailand (5), India (3), Turkey (2), and France (1). A group Photo is shown in Photo 1.

Shanghai is China's largest city, located at the mouth of the Yangtze River in eastern China. It is now the central city of the Yangtze River Delta economic zone, accounting for 10% of China's total population and 22.3% of its GDP. The total population within the basin reaches about 450 million. Historically, it has served as a central transportation route in Central China, where waterborne trade has long flourished.

CURRICULUM OF ISBA25

The diverse range of accelerator uses from the fundamental science to many applications has led to a growing demand for accelerator physicists and engineers from both academia and industry. However, opportunities to learn the fundamentals of accelerators—such as beam dynamics, accelerator design, and key technologies—remain extremely limited. ISBA25 was planned to address this need, aiming to serve as an entry point for graduate students and young researchers

worldwide, particularly from the Asian region, to advance into more sophisticated accelerator research.

For this purpose, the ISBA25 curriculum offered a comprehensive, well-balanced, and forward-looking education in beam dynamics and accelerator technology. By integrating rigorous theoretical lectures, extensive hands-on training, exposure to real facilities, and emerging topics such as AI, the school successfully equipped participants with both fundamental understanding and practical skills. ISBA25 thus made a significant contribution to the training of the next generation of accelerator scientists and engineers in an international and collaborative environment. Detailed information, including lecture materials, is available on the ISBA25 website [1].

Hands-on Training

Hands-on training was held in ISBA25. Students selected one of three themes (ELEGANT, ASTRA, and GENESIS). Starting with software installation, they practiced with basic examples before forming teams to tackle a theme assigned by the tutors. Students gained hands-on experience in accelerator design using the software. Teams of 4-5 students tackled this practical exercise. In such exercises, significant differences in student achievement typically arise due to computer skills and prior simulation study experience. However, by having them work in teams, peer learning among students helps level the outcomes. Interestingly, the skills of the tutors also improved. Photo 2 shows a snapshot in the hands-on training session. The students concentrated on the discussion. Another major benefit of the session is the promotion of communication among students. Communication between students is not only crucial for the school's operation, but also an essential quality students should cultivate as future researchers. This is because accelerator research and operation require organizational efforts, and demonstrating individuality within an organization is a necessary condition for success as a future researcher. The outcomes of this training were presented by each group on the final day. The lecturers evaluated these presentations, and the top five groups were awarded. The awarded groups and members are as follows. We extend our heartfelt congratulations. Photo 3 is a snapshot of the presentation in the summary session.

Student Session

In the evening, student sessions were held over four nights. In this session, the students presented their studies in their home institute. The purpose of this student session is for students to gain mutual understanding of the research conducted

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Figure 1: The group Photo of ISBA25 in the main auditorium.



Figure 2: A snapshot in the hands-on training session. The students concentrated on the discussion.

by their peers, fellow researchers, and graduate students. Additionally, by observing the student session, instructors can learn about the circumstances in each country and research institute, as well as the academic and research backgrounds of each student. This information contributes to the continuous improvement of the school. The presentations were graded by lecturers, and the top five students were awarded. The awarded students are; Narui Yang, Kotaro Nishi, Ki Moon Nam, Pitchayapak Kitisri, and Wangxuan Li

Laboratory Tour

We had the laboratory tour in SARI. SARI operates and constructs the following accelerators; Shanghai Synchrotron Radiation Facility (SSRF), Shanghai Soft X-ray Free-Electron Laser Facility (SXFEL), and Shanghai High-Repetition-Rate X-ray Free-Electron Laser and Extreme Light Facility (SHINE). These facilities provide an interdisciplinary, comprehensive, and multifunctional large-scale

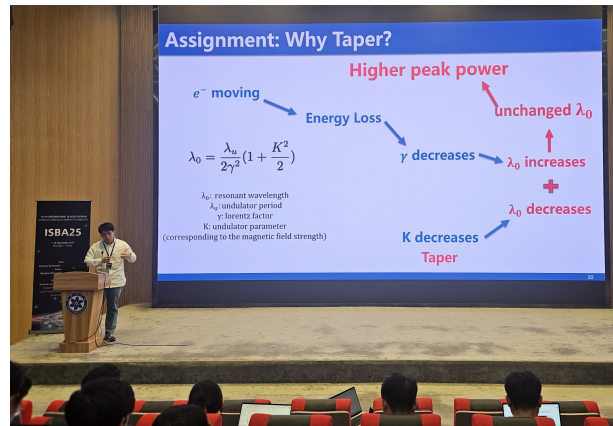


Figure 3: A snapshot in the summary session of hands-on training.

scientific research platform for researchers across diverse fields, including physics, chemistry, life sciences, materials science, and energy science. From third-generation radiation sources to the latest continuous-wave free-electron lasers, SARI undoubtedly houses the world's most advanced collection of synchrotron radiation light source accelerators. These cutting-edge accelerator facilities have surely inspired many students. In particular, actually experiencing the equipment studied in lectures is an important opportunity for boosting motivation to learn. Photo 4 is a snapshots in the tour at SHINE.

In SHINE, the cryomodules containing the superconducting accelerator were suspended from the ceiling, with semiconductor-based high-frequency power supplies arranged below them. This scene differed greatly from the previous arrangement of klystrons and modulators, giving a distinctly futuristic impression. An autonomous robot was positioned in the injector passageway of SHINE. This is an AI patrol robot that periodically roamed the facility, report-

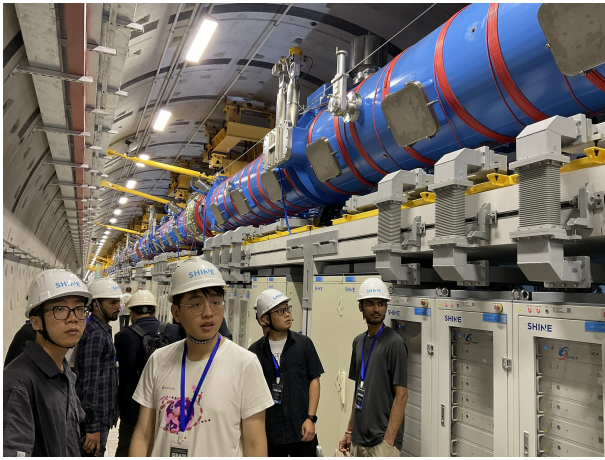


Figure 4: A snapshot in the laboratory tour at the SHINE, which is a CW FEL based on a superconducting accelerator under construction.

ing any abnormalities to the operators. It appeared a new wave was arriving here too.

Social Events

ISBA25 featured three key social events—a communication session, an excursion, and a banquet—integrated into the curriculum to foster the international exchange vital for accelerator science.

Communication Session: Held on the first day, this session used self-introductions and singing games to break the ice. By sharing their cultures and humor, students and lecturers built a friendly, interactive foundation for the school.

Excursion: Participants visited the Shanghai Museum, exploring China’s 8,000-year history through its vast collection of ceramics and artifacts. The visit highlighted the region’s technological heritage and its long-standing history of global cultural exchange.

Banquet: The program concluded with a dinner at the Shanghai Bund. The evening featured local cuisine and lively karaoke performances, including a memorable operatic duet between a student and a professor, proving that food and music are powerful tools for building professional and personal bonds.

SUMMARY AND FUTURE

The 8th International School on Beam Dynamics and Accelerator Technology (ISBA25) provided a valuable opportunity to learn the fundamentals of accelerator science, tour cutting-edge research facilities, and build international networks. Although the 10-day period was limited, participants gained extensive knowledge and experience through intensive learning and interaction. Furthermore, learning about the history and culture of the host city, Shanghai, likely helped participants understand how scientific and technological development is closely intertwined with social and cultural contexts. Cultural experiences, including visits to the Shanghai Museum, will form an important foundation for deepening mutual understanding as we advance interna-



Figure 5: The students, holding their certificates of completion, wore expressions of joy. The author (Kuriki) is on the far left.

tional scientific collaboration. We hope that all participants will utilize the knowledge and experience gained at ISBA25, leverage their international networks, and contribute to the advancement of accelerator science, particularly in the Asian region. At the closing of the school, certificates of completion were presented to each student who completed the ISBA25 program. We hope these certificates will serve as a source of great confidence as they pursue their future endeavors in accelerator research. In Photo 5, the students, holding their certificates of completion, wore expressions of joy.

ISBA26 will be held from 18 to 29 October 2026 in Higashihiroshima, Japan. The timing of IPAC will likely coincide with the application period for ISBA26. ISBA26 is an ideal opportunity, especially for graduate students and young researchers, to broaden their research horizons and expand their professional networks. Visit our web site [2] for more detail.

ACKNOWLEDGEMENT

We extend our deepest gratitude to the many individuals who supported our participation in this school. We sincerely thank the ISBA25 International Organizing Committee, KEK-IINAS Program, Shanghai Advanced Research Institute (SARI), Hiroshima University, as well as the lecturers and local staff. We also wish to express our appreciation to all participants who contributed to the study and engaged in discussions together. We intend to apply this experience to our future research activities and contribute, however modestly, to the advancement of accelerator science. ISBA25 was supported by NovAccel Co., Ltd., Sumitomo Heavy Industries, Ltd., R&K Co. Ltd., ScandiNova Co. Ltd., Metal Technology Co. Ltd., MIRAPRO Co. Ltd., the Japan Society for Accelerator Science, and KEK Accelerator lab.

REFERENCES

- [1] ISBA25 WEB page. <https://conference-indico.kek.jp/event/316/>
- [2] ISBA26 WEB page. <https://conference-indico.kek.jp/event/372/>