Research Facility Development Division
Accelerator Group
RILAC Team

1. Abstract

Our team is responsible for the operation, maintenance, and upgrade of the RIKEN heavy-ion linear accelerator (RILAC), a unique variable-frequency linac that has been in operation since 1980. RILAC was upgraded in the 1990s as part of the RI Beam Factory (RIBF) project, and made a significant contribution to the synthesis and discovery of the element 113, Nihonium. In 2019, a superconducting linac booster, SRILAC, was installed, and it will play a major role in the synthesis of heavier new elements, development of the technologies for production of medical radioisotopes, and as a powerful injector to RIBF. We successfully avoided major troubles by effectively planning and implementing maintenance and upgrades of outdated equipment within a limited budget.

2. Major Research Subjects

(1) Efficient operation, maintenance and management of the vacuum equipment in the RIBF accelerators
(2) Development of technology to operate RILAC with high intensity and high stability
(3) Construction and maintenance of the RILAC beamlines

3. Summary of Research Activity

In 2022 we have made various improvements of the whole RILAC with the cooperation of other teams of the Accelerator Group, in order to provide high-intensity beams more stably to the new element synthesis experiments being conducted at GARIS III. For example, activate the temperature control of the cooling water system of RILAC. With these efforts, the beam availability has been improved significantly.

A beamline is being prepared at the RILAC facility for mass production of ^{211}At, which has potential medical applications. Under the leadership of the RI Application Research Group and with the help of other teams of the Accelerator Group, the optical calculations, electromagnet design, radiation shielding design, and overall beamline installation were undertaken and the beamline is almost complete.

As in the past, we maintained the vacuum system of the whole accelerators at RIBF. While taking into consideration the aging of the vacuum pumps, an efficient maintenance plan was established and cost-conscious maintenance was executed.

Members

Team Leaders
Yoshihide HIGURASHI　　Osamu KAMIGAITO

Deputy Team Leader
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Research/Technical Scientists
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List of Publication & Presentations

Publication

[Proceeding]

H. Yamauchi, T. Ohki, K. Oyamada, M. Tamura, Y. Akira, K. Kaneko, T. Nishi, N. Sakamoto, M. Fujimaki, H. Imao, M. Kidera, T. Nagatomo, K. Ozeki, K. Suda, A. Uchiyama, T. Watanabe, Y. Watanabe, K. Yamada, O. Kamigaito, "Present status of RILAC," Proceedings of the 19th Annual Meeting of Particle Accelerator Society of Japan, Kyushu University, Online, Japan, October 18–21, 2022, TFP009, 1144–1147 (2022). https://www.pasj.jp/web_publish/pasj2022/proceedings/PDF/TFP0/TFP009.pdf .

Presentations

[Domestic Conferences/Workshops]

山内啓資, 西隆博, 大木智則, 小山田和幸, 田村匡史, 遊佐陽, 金子健太, 坂本成彦, 今尾浩士, 内山暁仁, 大関和貴, 須田健嗣, 長友傑, 藤巻正樹, 山田一成, 渡邉環, 渡邉裕, 上垣外修一, 「理研重イオンリニアックの現状報告」, 日本加速器学会, オンライン, 2022 年 10 月 10 日.

T. Nishi (invited), "Development of automatic optical tuning system for primary line using Gaussian process at RIKEN," ML@HEP, Tokyo, Japan, July, 2022.

T. Nishi, "Development of auto tuning system using Bayesian optimization for heavy ion optics," Workshop on Machine Learning for Accelerator and Beam Physics, RCNP, Osaka, March, 2023.

Outreach Activity

[Lecture]

T. Nishi, “AI based accelerator operation,” KEK IINAS 5th International School on Beam Dynamics and Accelerator Technology, Hiroshima, Japan, October, 2022.