

## RILAC operation

E. Ikezawa,<sup>\*1</sup> T. Ohki,<sup>\*2</sup> M. Kase,<sup>\*1</sup> T. Nakagawa,<sup>\*1</sup> N. Sakamoto,<sup>\*1</sup> H. Okuno,<sup>\*1</sup> N. Fukunishi,<sup>\*1</sup>  
 M. Komiyama,<sup>\*1</sup> A. Uchiyama,<sup>\*1</sup> T. Maie,<sup>\*1</sup> M. Nagase,<sup>\*1</sup> M. Fujimaki,<sup>\*1</sup> T. Watanabe,<sup>\*1</sup> H. Hasebe,<sup>\*1</sup>  
 H. Imao,<sup>\*1</sup> K. Ozeki,<sup>\*1</sup> K. Suda,<sup>\*1</sup> Y. Higurashi,<sup>\*1</sup> K. Yamada,<sup>\*1</sup> Y. Watanabe,<sup>\*1</sup> S. Watanabe,<sup>\*1</sup> M. Kidera,<sup>\*1</sup>  
 T. Nagatomo,<sup>\*1</sup> H. Yamauchi,<sup>\*2</sup> K. Oyamada,<sup>\*2</sup> M. Tamura,<sup>\*2</sup> A. Yusa,<sup>\*2</sup> K. Kaneko,<sup>\*2</sup> and O. Kamigaito<sup>\*1</sup>

The RIKEN heavy-ion linac (RILAC) has operated steadily throughout the reporting period and has supplied various ion beams for different experiments. Some statistics regarding the RILAC operation from January 1 to December 31, 2016 are presented in Table 1. The total beam service time of the RILAC accounted for 89.7% of its operation time. The two operation modes of the RILAC, the standalone mode and the injection mode, in which the beam is injected into the RIKEN Ring Cyclotron (RRC), accounted for 77.5% and 22.5% of the total beam service time of the RILAC, respectively. For experiments, a 2.675-MeV/nucleon <sup>48</sup>Ca-ion beam accelerated by the RILAC was injected into the RRC from November 12 to December 6. Table 2 lists the beam service times in the standalone mode of the RILAC allotted to the e2 and e3 beam courses in target room no. 1 in 2016. The e2 beam course was used in experiments with the GARIS2. The e3 beam course was used in experiments with the GARIS. Table 3 lists the operation time of the 18-GHz ECR ion source in 2016.

We performed the following improvements and overhauls during the reporting period.

- 1) In the RF systems, DC high-voltage power supplies were subjected to annual inspection. The major components with mechanical parts were subjected to simple inspection.
- 2) The water pumps for the RFQ, RILAC, and CSM were subjected to annual inspection. All cooling towers were subjected to monthly inspection and annual cleaning.
- 3) All the turbomolecular pumps were subjected to annual inspection. Cryogenic pumps used for the RILAC no. 3, RILAC no. 4, RILAC no. 6, CSM A5, and CSM A6 cavities were overhauled.

Table 1. Statistics of RILAC operation from January 1 to December 31, 2016.

Operation time of RILAC	4127.8 h
Mechanical problems	64.9 h
Standalone RILAC	2868.0 h
Injection into RRC	834.3 h
Total beam service time of RILAC	3702.3 h

\*1 RIKEN Nishina Center

\*2 SHI Accelerator Service Ltd.

We faced the following mechanical problems during the reporting period.

- 1) Water was found to have splashed in the end drift tube of the CSM A3-A6 cavities because of leakage from each cooling pipe. We repaired the pipes with a repair material as a stopgap measure. In addition, the faulty part of the end drift tube of the CSM A4 cavity was replaced.
- 2) A section of the air-pressure pipe for the contact fingers of the rf shorting plate in the RILAC no. 4 and the RILAC no. 6 cavities had a vacuum leak because of a deteriorated O-ring. We replaced it with a new one.

Table 2. Beam service time of the standalone RILAC allotted to each beam course in target room no. 1 in 2016.

Beam course	Total time (h)	%
e2	1674.6	59.2
e3	1154.6	40.8
Total	2829.2	100.0

Table 3. Operation time of the 18-GHz ECR ion source in 2016.

Ion	Mass	Charge state	Total time (h)
He	4	2	24.0
O	18	5,6	300.9
Ne	22	7	528.0
Na	23	7	416.2
Mg	24	7	129.2
Ar	36	10	216.6
Ar	40	9,11	207.2
Ca	40	10	192.0
Ca	48	10,11	1959.9
Ti	50	11	329.7
V	51	11	216.0
Ni	58	13	120.0
Kr	86	18	84.6
Au	197	26	24.0
U	238	35	82.1
Total			4830.4