

## RILAC operation

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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, 2014, are given in Table 1. The total beam service time of the RILAC accounted for 84.5% 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 53.1% and 46.9% of the total beam service time of the RILAC, respectively. For beam experiments and machine study of the RI Beam Factory (RIBF), a 2.650-MeV/nucleon <sup>70</sup>Zn-ion beam and a 2.675-MeV/nucleon <sup>48</sup>Ca-ion beam accelerated by the RILAC were injected into the RRC from May 12 to June 7 and from November 12 to December 11 2014, respectively. Table 2 lists the beam service times in the standalone mode of the RILAC allotted to each beam course in the RILAC target rooms in 2014. The e2 beam course in target room no. 1 was used in experiments using the GARIS2. The e3 beam course in target room no. 1 was used in experiments using the GARIS. The e6 beam course in target room no. 2 was used in the analysis of trace elements. Table 3 lists the operation time of the 18-GHz ECR ion source (18G-ECRIS) in 2014.

We carried out the following improvements and overhauls during the reporting period.

- 1) In the RF systems, the DC high-voltage power supplies were subjected to annual inspection. The major components of mechanical parts were subjected to simple inspection. The contact fingers for the trimmer of CSM cavities were replaced with new ones.
- 2) Two water pumps were overhauled. The other water

pumps were subjected to simple 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 no. 1 and no. 2 cavities of RILAC and the A5 and A6 cavities of CSM were overhauled. A compressor unit of the cryogenic pump used for the no. 5 RILAC cavity was repaired.

We faced the following mechanical problems during the reporting period.

- 1) A section of the cooling pipe of an earth ring for the lower stem in the FC-RFQ cavity had a vacuum leak. We repaired the pipes with a repair material as a stopgap measure.
- 2) Water was found to have splashed in the rf power feeder of the no.1 RILAC cavity because of leakage from a cooling pipe for the coaxial conductor. We replaced it with new ones.
- 3) Water was found to have splashed in the CSM A4 cavity because of leakage from a cooling pipe of the end drift tube. We repaired the pipes with a repair material as a stopgap measure.

Table 1. Statistics of RILAC operation from January 1 to December 31, 2014.

Operation time of RILAC	2960.0 h
Mechanical problems	153.1 h
Standalone RILAC	1327.3 h
Injection into RRC	1172.6 h
Total beam service time of RILAC	2499.9 h

Table 2. Beam service time of the standalone RILAC allotted to each beam course in target rooms no. 1 and no. 2 in 2014.

Beam course	Total time (h)	%
e2	419.7	31.6
e3	878.0	66.1
e6	29.7	2.2
Total	1327.3	100.0

Table 3. Operation time of the 18G-ECRIS in 2014.

Ion	Mass	Charge state	Total time (h)
N	14	3	62.3
N	15	3	105.7
Na	23	7	504.0
Al	27	6	216.0
Ar	40	11	144.0
Ca	48	10,11	1487.6
Zn	70	15	609.2
Kr	82	18	216.0
Kr	86	18	120.0
Total			3464.7

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