

Operation report on the RIKEN AVF cyclotron for 2017

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The yearly report on the operation of the RIKEN AVF cyclotron (denoted as AVF hereinafter) for the period January–December 2017, is presented.

AVF has been used not only as an injector for the RIKEN ring cyclotron RRC but also to supply various ion beams directly to three beam courses (C03 for RI production, E7A for nuclear experiment with CRIB, and E7B for general-purpose) in its stand-alone operations, as schematically shown in Fig. 1. In the machine studies performed in 2017, accelerated beams were observed with a Faraday-cup at C01.

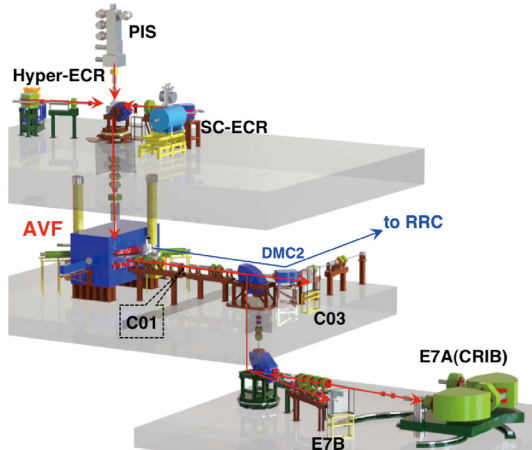


Fig. 1. Overview of the AVF cyclotron with three ion sources, three experimental courses, and beam transport line to RIKEN ring cyclotron RRC.

The yearly operation statistics and accelerated beams of AVF are summarized in Tables 1 and 2, respectively. The operation status was very fine and the total operation time was 3951 h, of which only 13 h involved temporary suspension due to the minor accelerator troubles.

For more details of AVF and RRC operations and others, refer to Refs. 1) and 2).

References

- 1) R. Koyama *et al.*, Proc. of PASJ14, Sapporo, Japan, August 2017, FSP027, pp.1390–1394.
- 2) M. Nishimura *et al.*, Proc. of PASJ14, Sapporo, Japan, August 2017, FSP028, pp.1395–1399.

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Table 1. AVF operation statistics. Statistics in 2016 are also shown.

AVF operation statistics	2016 [h]	2017 [h]
Total	3365	3951
Stand-alone operation		
Tuning of AVF	576	742
Fault of AVF	5	4
C01 machine study	0	32
C03 experiment	562	1113
E7A experiment	686	245
E7B experiment	73	597
Sub total	1897	2697
Operation as injector of RRC		
Tuning of AVF	213	141
Fault of AVF	0	9
RRC-RARF experiment	842	564
RRC-RIBF experiment	414	549
Sub total	1468	1254

Table 2. Accelerated beams of AVF in 2017.

Particle	Energy [MeV/u]	Course
Stand-alone operation		
p	12.0	C03, E7B
d	12.0	C01, C03, E7B
d	14.0	C01
α	6.50	E7B
α	7.18	C03, E7B
α	7.25	C03
α	12.5	C03, E7B
${}^7\text{Li}$	5.60	C03
${}^7\text{Li}$	6.00	C03
${}^{11}\text{B}$	7.82	C03
${}^{11}\text{B}$	9.10	C01, C03
${}^{18}\text{O}$	6.07	C03
${}^{18}\text{O}$	6.07	C03
${}^{19}\text{F}$	6.77	C03
${}^{26}\text{Mg}$	6.60	E7A
Operation as injector of RRC		
${}^{12}\text{C}$	7.00	RRC-RARF
${}^{18}\text{O}$	4.51	RRC-RIBF
${}^{22}\text{Ne}$	3.97	RRC-RARF
${}^{40}\text{Ar}$	3.75	RRC-RARF
${}^{40}\text{Ar}$	3.75	RRC-IRC-RARF
${}^{40}\text{Ar}$	5.19	RRC-RARF
${}^{56}\text{Fe}$	5.00	RRC-RARF
${}^{84}\text{Kr}$	3.97	RRC-RARF
${}^{86}\text{Kr}$	3.78	RRC-RARF