AVF operations in 2016

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In 2016, the total annual operation time of the K70 AVF cyclotron (denoted as AVF hereafter) was 3366 hours, as indicated in Table 1. The beam supply time was classified into four categories: “Injection to RRC,” “Injection to RRC-SRC,” “Injection to RRC-IRC-E5,” and “AVF standalone.” The total beam supply time was 2112 hours, which was increased by 62 hours compared with that in 2015. The increase in the beam supply time was mainly due to the CRIB experiments. The time supplied to CRIB was three times longer than that in 2015. “Injection to RRC-IRC-E5” was a new beam course, and the beam was supplied for the first time in January 2016. The supplied time for “AVF standalone” was 1321 hours, which was 266 hours shorter than that in 2015.

All of the beams accelerated by the AVF in 2016 are listed in Table 2. In this table, the following beams were accelerated for the first time in 2016: ^{26}Mg (6.6 MeV/u) and ^{86}Kr (3.77 MeV/u). The supplied courses were (in order of the supplied time): C03 (RI production), RRC-SRC, RRC-IRC-E5, E7A (CRIB), RRC-E5, RRC-E6, and E7B (Student experiment).

Table 1. AVF operation statistics in 2016

	2015	2016
Total operation time (h)	3282	3366
Beam tuning (AVF)	785	788
Beam tuning (others)	446	466
Injection to RRC	324	430
Injection to RRC-SRC	124	350
Injection to RRC-IRC-E5	15	11
AVF standalone	1587	1321
Beam course (AVF standalone) (h)		
E7A (CRIB)	1097	686
E7B (Student experiment)	28	73
C03 (RI production)	462	562

The total fault time was 5 hours (included in the operation time in Table 1). The main faults are listed in Table 3, in descending order of time spent for restoration.

Table 2. AVF beam list in 2016

Particle	E (MeV/u)	Course
p	12	RI production
p	14	RI production
d	7.25	RI production
d	12	RI production
α	6.5	Student experiment
α	7.25	RI production
α	12.5	RI production
^{7}Li	5	CRIB
^{7}Li	5.6	CRIB
^{12}C	7	RRC-E5
^{18}O	4.64	RRC-SRC
^{18}O	8	CRIB
^{19}F	6.768	RI production
^{20}Ne	8.2	E7B
^{22}Ne	3.97	RRC-E6
^{26}Mg	6.6	CRIB
^{40}Ar	5.2	RRC-E5
^{40}Ar	3.78	RRC-E5
^{40}Ar	3.78	RRC-IRC-E5
^{56}Fe	5.01	RRC-E5
^{84}Kr	3.97	RRC-E5
^{85}Rb	3.78	RRC-E6
^{86}Kr	3.777	RRC-E3

Table 3. AVF faults in 2016

Date	Time for restoration (h)	Matter
May 8th	3	Damage on compressed-air pipe installed in AVF-RF #1.
Nov. 21st	2	Re-filling of Li material in the ion source.

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