

# Minutes of the 88th Machine-Time Committee Meeting

Date and time: May 26, 2015; 15:00–16:50

Place: RIBF Bldg., Room 203

Attendees: Sakai<sup>a</sup>(Chair), En'yo<sup>a,†</sup>, Fukunishi<sup>a</sup>, Kamigaito<sup>a</sup>, Kubo<sup>a</sup>, Miyatake<sup>c</sup>, Okuno<sup>a</sup>, Sakurai<sup>a</sup>, Shimoura<sup>b</sup>, Ueno<sup>a</sup>, Uesaka<sup>a</sup>, Wakasugi<sup>a</sup>, Yamaguchi<sup>b</sup>, Imai<sup>d,†</sup>, K. Yoshida<sup>a,†</sup>, Otsu<sup>a,†</sup>, Tanaka<sup>a,†</sup>, A. Yoshida<sup>a,†</sup>, Hasebe<sup>a,†</sup>, Takeda<sup>a,†</sup>, Nishimura<sup>a,†</sup>, Schury<sup>a,†</sup>, H.Sato<sup>a,†</sup>, Sonoda<sup>a,†</sup>, Shiomitsu<sup>a,†</sup>, Lynch<sup>e,†</sup>, Yoneda<sup>a</sup>

Absent: Abe<sup>a</sup>, Kase<sup>a</sup>, Morimoto<sup>a</sup>, Uwamino<sup>a</sup>, Haba<sup>a,†</sup>, Morita<sup>a,†</sup>, Motobayashi<sup>a,†</sup>, Kishimoto<sup>a,†</sup>

<sup>a</sup>RNC / <sup>b</sup>CNS / <sup>c</sup>KEK / <sup>d</sup>RIBF-UEC / <sup>e</sup>MSU / <sup>†</sup>Observer

(in random order)

## Reports

### 1. Current Status of the Machine Time Operation (Yoneda)

The current status of the machine time operation was reported. After the last MT committee meeting, the SEASTAR experiment with <sup>238</sup>U, and the polarized deuteron experiment were performed. The experiments with <sup>78</sup>Kr have started from this week. Due to some machine troubles etc., the MT schedule was changed as follows:

	(before change)	(after change)
NP1312-RIBF118R1-01 (P.Doornenbal, A. Obertelli)	4/27 21:00 – 5/6 21:00	4/27 21:00 – 5/8 21:00
MS-EXP15-01(Inabe)	5/6 21:00 – 5/7 9:00	(cancelled)
NP1106-RIBF65-02(Sekiguchi)	5/11 9:00 – 5/15 9:00	5/12 9:00 – 5/16 21:00

### 2. Changes of the Machine Time Schedule of Low-Energy Facility (Yoneda)

The changes of the MT schedule of the low-energy facility were reported. The RILAC standalone experiment NP1406-LINAC10R1-04(Y.Wakabayashi, <sup>82</sup>Kr, GARIS) originally scheduled to go until 9pm, May 9, was extended by half a day, until 9am, May 10, due to a machine trouble. The experiment NP1406-RRC33-02(K.Imamura, <sup>87</sup>Rb@66MeV/u, RIPS) originally scheduled on September 5-8, was cancelled according to a request from the experiment group.

### 3. Report on the RIBF accelerator operation (Fukunishi)

A status report was made concerning the beam provided to the SRC-BigRIPS experiments. Following the temporary suspension of MT during the open campus, the beam intensity of <sup>238</sup>U was 39.5pA at maximum, and 37.1 on average. The beam availability was 99.8%. The large intensity was achieved due to the replacement of injection buncher with the cavity-type previously used, and the improvement of the transmission through the gas stripper. As for the acceleration of the polarized deuteron beam, the magnetic field at SRC was lower than the designed range (design: 4.5Tm – 8Tm, d@190MeV/u 4.15Tm), and there was a concern regarding the beam, but eventually the single-turn extraction was achieved in sufficient quality, with mixture from different turns of about 0.15%. The availability was over 100%

(105.6%), with the start of beam delivery earlier than the scheduled.  $^{78}\text{Kr}$  was accelerated with RILAC2 injection for the first time. The magnetic field in RRC was low, and there was some concern as to the stability, but eventually the acceleration went smoothly without any problem. The large intensity 342pA, more than 10 times larger than the former  $^{78}\text{Kr}$  beam, was achieved, due to a huge advantage gained from omitting the charge stripper between RRC and fRC. It was pointed out that the radiation damage should be taken into consideration carefully since the beam loss is larger than other operations previously performed.

#### **4. Report on the Second Charge Stripper for $^{238}\text{U}$ Acceleration (Hasebe)**

A report was made concerning the second charge stripper used for the  $^{238}\text{U}$  acceleration. A new carbon foil was introduced, which was different from the foils previously used. Two foils were glued into one 70um foil, and used as the rotating stripper foil. The charge distribution was peaked at 86+ and 87+ almost equally, and the thickness was also so uniform that the beam spread before IRC was smaller than before. The beryllium foils used up until now has been terribly deformed after irradiation due to heat, but the new carbon foil has a good heat conductance, and the temperature rise at the axis of rotation was as low as 4.3 degrees. The same type of carbon foils is being used for the  $^{78}\text{Kr}$  acceleration.

#### **5. Report on BigRIPS Machine Study (Takeda)**

A report was made concerning the BigRIPS machine study. The new ion optics was attempted for the improvement of the isotope separation capability in BigRIPS. In the standard ion optics previously used, there were cases in which the separation capability in the first stage and second stage were cancelled. The capability is expected to become additive when the polarization of magnification between F2 and F3 is inverted. This mode was tested with beam, and the resulting ion optics was almost as expected. Still, the beam profile was different from the simulation, and the  $(\alpha|x)$  term also too large. The machine study will be continued to establish an ion optics with a good isotope separation.

#### **6. Report on Parasite Machine Study (Nishimura)**

A report was made concerning the parasite machine study for the detector tests. A stack of strip silicon detectors AIDA in which the radioactive isotopes are to be implanted when their beta decay is measured, a prototype detector for beta-delayed neutron detector BRIKEN, and a detector for beta-delayed particle emission with pulse shape discrimination capability NiGIRI, were placed and at the periphery of F11, where EURICA is located, and their performances were checked. When AIDA was last tested, it was found that the noise level was too high to detect beta-ray signals, but after the improvement of cables and power suppliers, the energy resolution of 100keV and the threshold level of about 160keV were confirmed.

#### **7. Status of PAC Meetings (Yoneda)**

- 16th NP-PAC: (12/3 - 5)

The call for proposals will be issued in September, with the deadline of proposal submission late in October.

- 12th ML-PAC:(to be held in July):

The schedule is under consideration, based on the backlog of experiments using the low-energy facility and status of RAL experiments.

- 4th In-PAC: nothing has been finalized about the next PAC.

## **Topics discussed**

### **1. Approval of Minutes of Previous Meeting (Sakai)**

### **2. Request for Additional MT Allocation (Schury)**

There was a request for additional MT allocation for the RILAC standalone experiment NP1306-LINAC07(spokesperson:P.Schury). NP1306-LINAC07 aims at producing fusion-evaporation nuclei at GARIS, and guiding the nuclei to MR-TOF to measure their nuclear masses. The first attempts were made twice in April (2 days and 4 days) with the  $^{40}\text{Ar}$  beam, but the goal was not achieved due to a part of ion trap which did not work as designed. After the experiments, the ion trap was improved, and the performance was checked with off-line tests. We hope to have additional opportunities for the experiment before summer since the experimental setup at RILAC2 must be disassembled for the superheavy element search experiments in autumn. One-day experiment with  $^{40}\text{Ar}$  late in June and two-day experiment with  $^{48}\text{Ca}$  have been requested.

As a result of review, and giving consideration to the scarcity of  $^{48}\text{Ca}$  ion source material and long ion-source tuning time required for  $^{48}\text{Ca}$ , two additional MT allocations with  $^{40}\text{Ar}$  (1 day + 2 days) were approved..

### **3. Requests for Accelerator Machine Study (Okuno)**

- Applicability test of the new carbon foil as the 1st charge stripper for the  $^{238}\text{U}$  acceleration

The carbon foil newly introduced as the 2nd charge stripper for the  $^{238}\text{U}$  acceleration showed high performance. To check its applicability as the 1st charge stripper, the foil of the thickness of 1.5-2um ( $300\text{um}/\text{cm}^2$ ) will be placed in the beamline and the charge distribution will be measured. Six hours of  $^{238}\text{U}$  beam time will be used.

- Ultraviolet spectroscopy from helium gas stripper

In order to examine the origin of the heat load reduction, the light emitted from the gas stripper will be analyzed in the ultraviolet region. Twelve hours of  $^{238}\text{U}$  beam will be used.

- Radiation damage test of glue used in SRC trim coil

The glue used in the SRC trim coil is expected to be damaged by radiation first among all the materials used in SRC. In order to check radiation damage of this glue, glued metal plates will be made and irradiated by a 62.5 MeV/u  $^{40}\text{Ar}$  beam in E5A. 10pA beam will be used for 1.5 days

As a result of the review, all the three accelerator machine studies were approved.

#### 4. Requests for BigRIPS Machine Study

- High-Rate Test of PPACs (H.Sato)

The tolerance of the PPACs against high-rate RI beams will be checked. In the last test, Z~50 beams of 100MeV/u and 200MeV/u at 1MHz irradiated the PPACs, and the PPACs survived for several minutes. As the next step, long-time irradiation will be made to see the change of efficiencies and images, and at the same time an electric circuit which works against sparks will be tested. 0.5 days of  $^{238}\text{U}$  beam will be used.

- New BigRIPS optics part 2 (Takeda)

Search for the new BigRIPS optics with better particle identification capability will be continued. A variety of optics modes including a smaller number of focal points will be attempted. 0.5 days of  $^{238}\text{U}$  beam will be used.

As a result of the review, both of the two BigRIPS machine studies were approved.

#### 5. Requests for PALIS Machine Study (Sonoda)

A PALIS machine study was requested. PALIS is an experimental device which is placed in front of the F2 slit in BigRIPS. PALIS catches particles which are normally thrown away in the gas cell, and extracts them for the mass measurement, laser spectroscopy etc. The setup is ready on-site, and performance tests with beam particles will be done. First the ions in the gas cell will be extracted by the gas flow, and then the ions will be transported to the quadrupole mass analyzer by differential pumping. Finally, the resonance ionization and extraction will be made for laser spectroscopy. The purpose is to confirm if these measurements can be done without disturbing the main beam in BigRIPS. As a machine study, a 3-4 hour test with main beam performed five times and additional parasite measurements are desired. The MT is expected to be performed when the ImPACT experiment is running.

As a result of the review, it was decided that 0.5 days will be added to the ImPACT experiment during which time the tests with the main beam will be performed. Further tests will be done as a parasite experiment which will not disturb the ImPACT experiment.

#### 6. FY2015 Yearly MT Plan (Sakai)

The yearly MT plan was shown by ULIC to gather opinions. The call for MT scheduling requests for the period from October to March will be issued soon, and the beam species to be delivered to SRC-BigRIPS have been decided as  $^{238}\text{U}$  and  $^{48}\text{Ca}$ . The next spring campaign for SRC-BigRIPS experiments will start on April 1.

#### 7. Next Meetings

- The next meeting will be held at 3pm on Tuesday, June 16, 2015.
- The meeting after the next will be held at 3pm on Tuesday, July 14.