

## Operation of fee-based activities by the industrial cooperation team

A. Yoshida,\*<sup>1</sup> T. Kambara,\*<sup>1</sup> H. Haba,\*<sup>1</sup> and S. Yano\*<sup>1</sup>

The fee-based activities operated by the industrial cooperation team in 2016, which are the utilization of heavy-ion beams in the industry and the distribution of radioisotopes, are summarized below.

RIKEN Nishina Center allows the use of the AVF cyclotron, RILAC, and RIKEN Ring Cyclotron (RRC) by private companies in Japan for a fee.<sup>1)</sup> In October, two fee-based beamtimes to test space-use semiconductor devices were successfully performed at the E5A beamline of RRC. A 70-MeV/A  $^{84}\text{Kr}$  beam was delivered for about 60 h and a 95-MeV/A  $^{40}\text{Ar}$  beam was delivered for about 30 h. The clients irradiated their samples in the atmosphere with a beam of uniform flux distribution and specified LET. The beamline setup was the same as before,<sup>2)</sup> and the beam handling was reported previously.<sup>3)</sup>

Since 2007, RIKEN has distributed radioisotopes (RIs) to users in Japan for a fee in collaboration with the Japan Radioisotope Association<sup>4)</sup> (JRIA). The nuclides are  $^{65}\text{Zn}$  ( $T_{1/2} = 244$  days),  $^{109}\text{Cd}$  ( $T_{1/2} = 463$  days),  $^{88}\text{Y}$  ( $T_{1/2} = 107$  days), and  $^{85}\text{Sr}$  ( $T_{1/2} = 65$  days), produced by the RI Applications Team at the AVF cyclotron. According to a material transfer agreement (MTA) drawn between JRIA and RIKEN, JRIA mediates the transaction of the RIs and distributes them to users.  $^{65}\text{Zn}$  and  $^{109}\text{Cd}$  are delivered about two weeks after the acceptance of an order.  $^{85}\text{Sr}$  and  $^{88}\text{Y}$ , which have shorter half-lives are not stocked like  $^{65}\text{Zn}$  and  $^{109}\text{Cd}$  but are produced in a scheduled beamtime after an order is accepted. Therefore they are delivered two months or more after order. Details can be found on the online ordering system J-RAM<sup>5)</sup> of JRIA.

In 2016, we delivered two shipments of  $^{109}\text{Cd}$  with a total activity of 12 MBq, five shipments of  $^{65}\text{Zn}$  with a total activity of 24 MBq, two shipments of  $^{88}\text{Y}$  with a total activity of 2 MBq, and a shipment of  $^{85}\text{Sr}$  with an activity of 1 MBq. The final recipients of the RIs were seven universities and one medical research center. The shipment of  $^{85}\text{Sr}$  was the first since April 2015 when the distribution of this radioisotope was formalized.

Figure 1 shows the yearly trends in the number of orders and the amounts of distributed RIs. Compared with 2015, the amount of distributed  $^{109}\text{Cd}$  increased by a factor of 3, that of  $^{65}\text{Zn}$  by 2.4, and that of  $^{88}\text{Y}$  by 2. Information on the RIs can be obtained from JRIA JRAM or FAX (03-5395-8055).

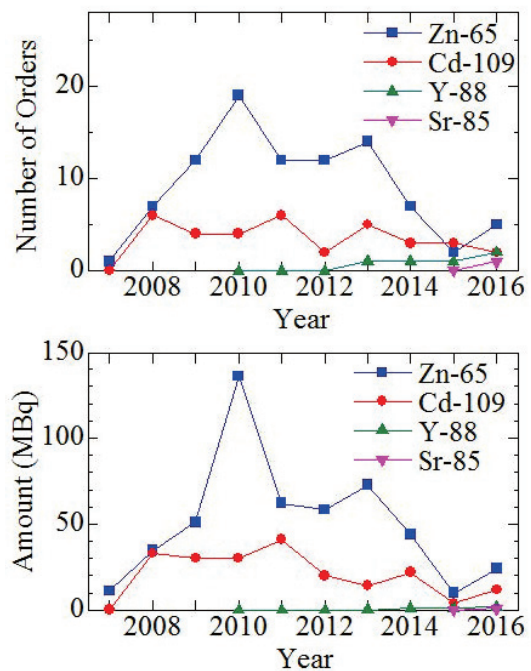


Fig. 1. Number of orders (upper) and amount (lower) of the RIs distributed yearly from 2007 to 2016. The distribution of  $^{88}\text{Y}$  started in 2010 and that of  $^{85}\text{Sr}$  in 2015.

### References

- 1) <http://ribf.riken.jp/sisetu-kyoyo/> (Japanese).
- 2) T. Kambara, A. Yoshida, RIKEN Accel. Prog. Rep. **48**, 239 (2015).
- 3) T. Kambara, A. Yoshida, RIKEN Accel. Prog. Rep. **49**, 193 (2016).
- 4) <http://www.jrias.or.jp/> (Japanese), <http://www.jrias.or.jp/e/> (English).
- 5) <https://www.j-ram.net/jram/DispatchTopPage.do> (Japanese).

\*<sup>1</sup> RIKEN Nishina Center