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Improvement of a dc-to-pulse conversion efficiency of FRAC

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At the SCRIT electron scattering facility at RIKEN [1,2], we aim at realizing the world's first electron scattering experiment of unstable nuclei, after succeeding in principle verification experiment using stable nuclei ^{132}Xe [3].

In order to perform electron scattering with unstable nuclei with small production rate, it is important to accumulate and inject ions efficiently into the SCRIT device. For this purpose, it is necessary to convert a continuous ion beam from the ISOL type ion separator ERIS [4] to a pulsed beam with the pulse duration of 300~500 μs .

We developed a dc-to-pulse converter, called FRAC [5], based on RFQ linear ion trap and have attained the dc-to-pulse conversion efficiency of 5.6%.

We modified the FRAC to further improve the efficiency, and enabled cooling of the trapped ions by Xe gas of $\sim 10^{-3}$ Pa. Then an electric field gradient was applied in the longitudinal direction of FRAC.

As a result, the conversion efficiency was improved by more than 10 times compared to that before modification. Details of the modification and its latest performance will be presented.

References:

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