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Journal Club

Identification of the New Isotope ^{244}Md
J.L. Pore et al., PRL124 (2020) 252502

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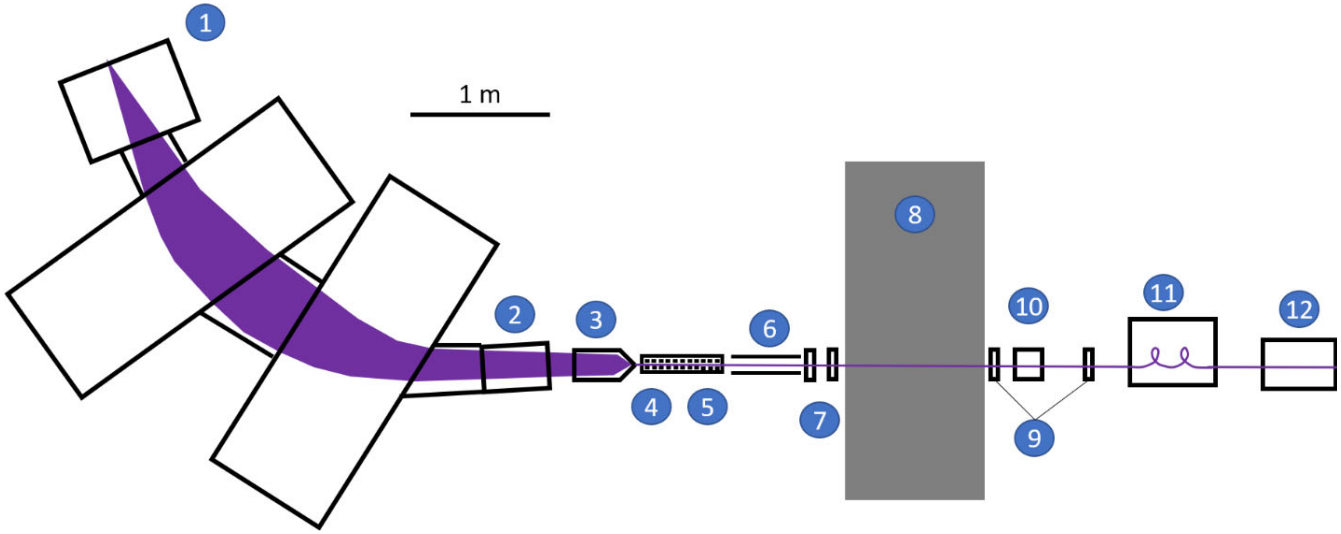
Motivation

- Increasing the known data on isotopes in the Z$\sim$100 region.

Setup



BGS (Berkley Gas-filled Separator) + FIONA (For the Identification Of Nuclide A)
Mass number identification resolving power of 250 at FW-tenth-M

Reaction

$$^{209}\mathbf{Bi}(\,^{40}\mathbf{Ar}, \mathbf{5\,n})\,^{244}\mathbf{Md}$$

$^{40}Ar^{9+}$ at 220 MeV and 15 eμA

0.5 mg/cm^2 ^{209}Bi target.

- Calibration:

$$^{209}\mathrm{Bi}(\,^{40}\mathrm{Ar}, 2\,\mathrm{n})\,^{247}\mathrm{Md}$$
$$^{165}\mathrm{Ho}(\,^{40}\mathrm{Ar}, 4\text{-}6\,\mathrm{n})\,^{199-201}\mathrm{Md}$$

- Rescaling:

$$\left[\frac{(A/q)_{new}}{(A/q)_{cal}}\right]_{244} = 0.6162 \qquad \left[\frac{(A/q)_{new}}{(A/q)_{cal}}\right]_{245} = 0.6187$$

Controversy

"In such studies, several neighboring isotopes of a given element can be created simultaneously from the different exit channels of a single nuclear reaction. It is not uncommon for neighboring isotopes to have similar decay properties, which can make it a challenge to assign decay properties to a specific isotope."

"the energy and correlation time of the first α in this event are different than decays assigned to ^{244}Md in events 3, 4, 5, and 6 [...]. Therefore, the first α is tentatively assigned as the decay of a longer-lived isomeric state in ^{244}Md. Such states have been observed in the neighboring neutron-deficient Md isotopes."

Remarks

F.P. Heßberger et al. PRL 126 (2021) 182501

The findings in the paper conflict with those in Khuyagbaatar et al. PRL 125 (2020) 142504. Additionally, the data is similar to that published for ^{245m}Md.