β decay properties of deformed ^{104,104m}Nb and its contribution to nuclear data

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Town Hall Meeting on Nuclear Structure, Reactions and Astrophysics, Nov 14-16, 2022, ANL

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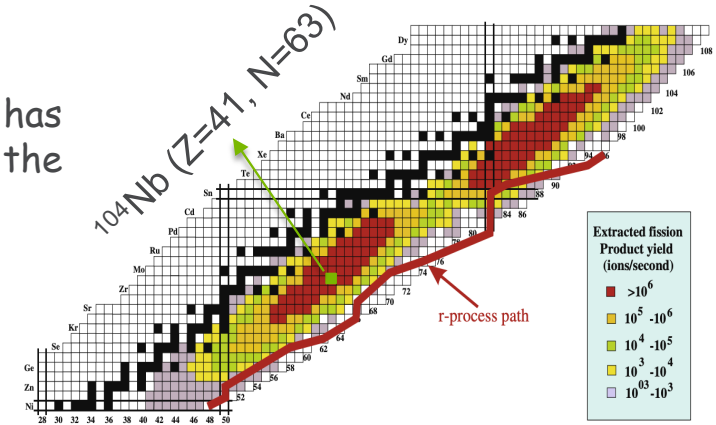
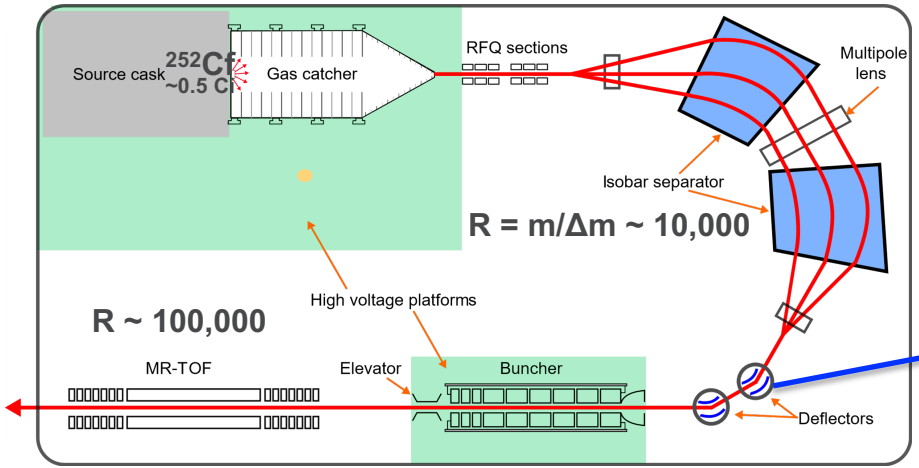
Motivations & Decay Spectroscopy tools@ ANL

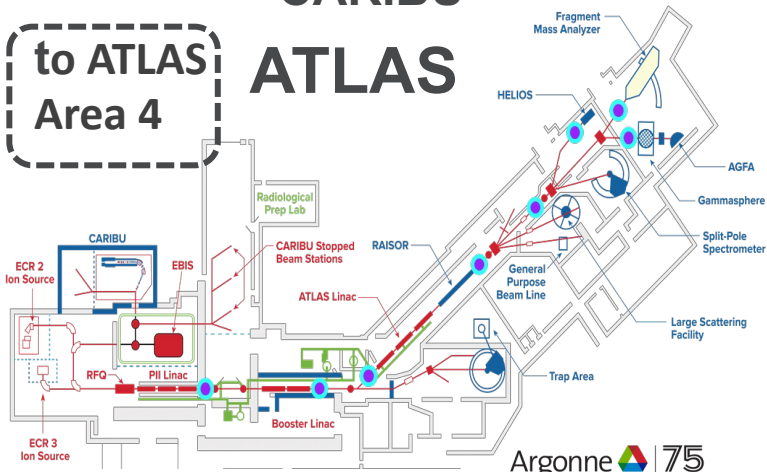
- The difficulty in accessing the nuclei in neutron rich A~100 has not allowed sufficient information which is important for the understanding of astrophysical r process scenario.
- The β-decay properties are important to predict the reactor antineutrino spectra.





Schematic presentation of CARIBU

Accessible region in CARIBU



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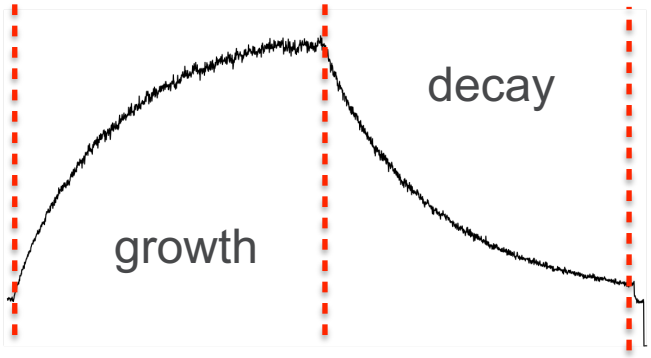
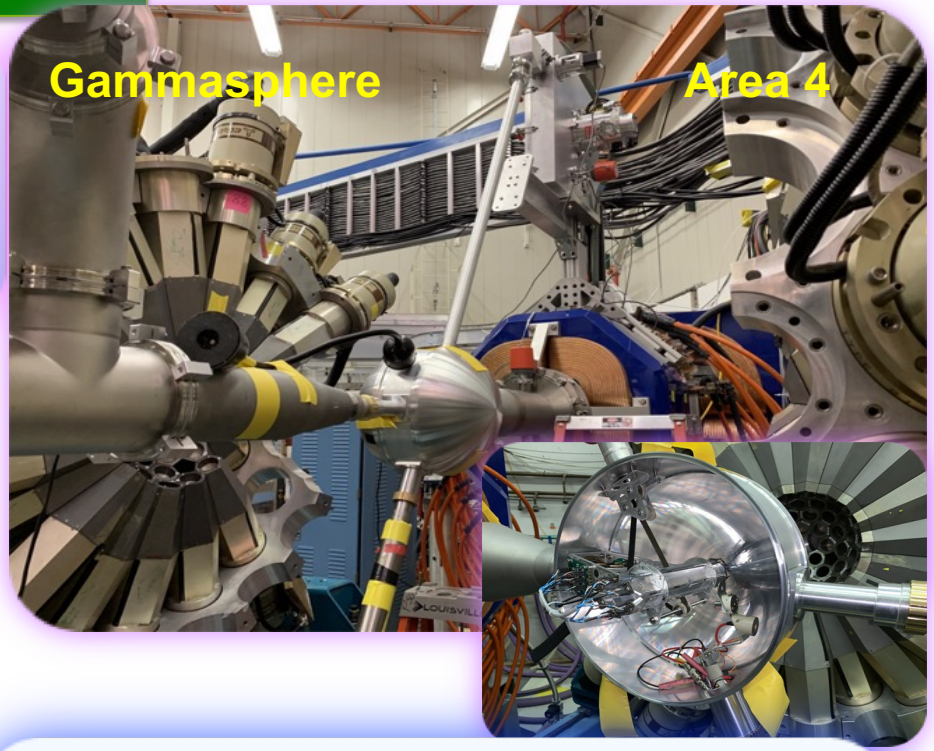
New β-decay station @ ANL

- direct implantation on the tape
- control the growth & decay times
  - selectivity by $T_{1/2}$
- β-γ-γ(t) coincidences





- **HEART** - HExagonal ARray for Triggering
  - ✓ 6 EJ-204 plastic scint. & 12 SiPM
  - ✓ ε_β~75% from β-γ singles & coin.
- powerful γ-γ-β-t coincidence device

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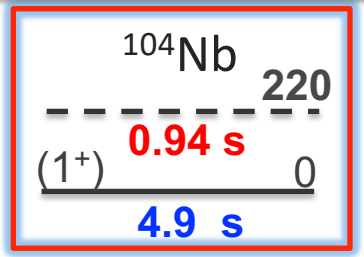
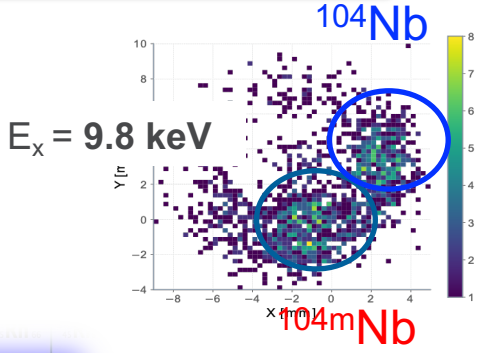
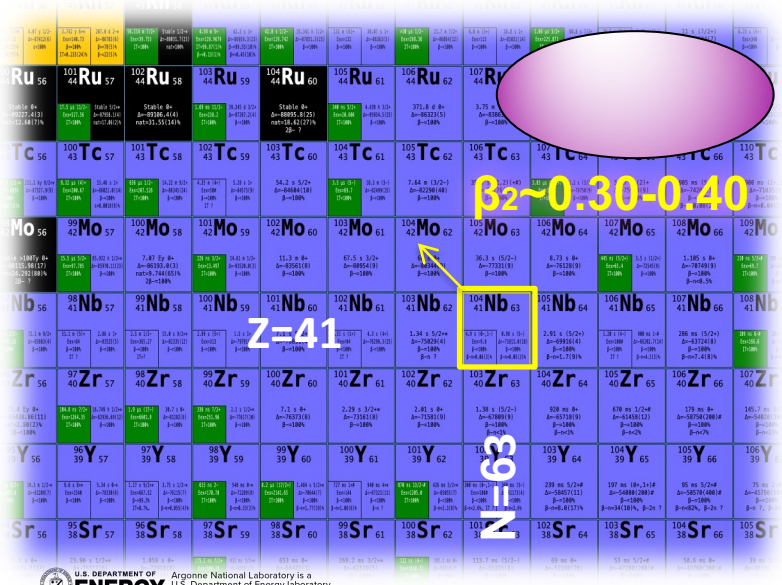
A~100 deformed region

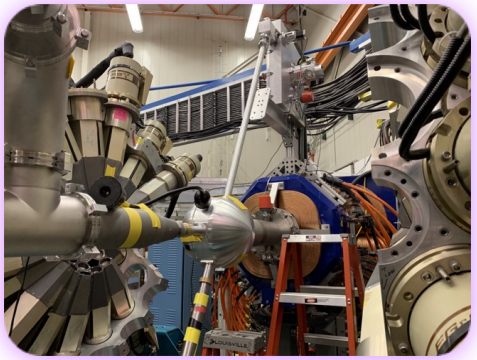


J. Blachot, NDS 108 (2007) 2035



R. Orford, PhD thesis 2021





CARIBU @Gammasphere

- The data are collected in two different tape cycle modes 10/20s and 10/40s.
- 10/40s cycle is considered to get daughter and grand-daughter decay of ^{104}Nb.

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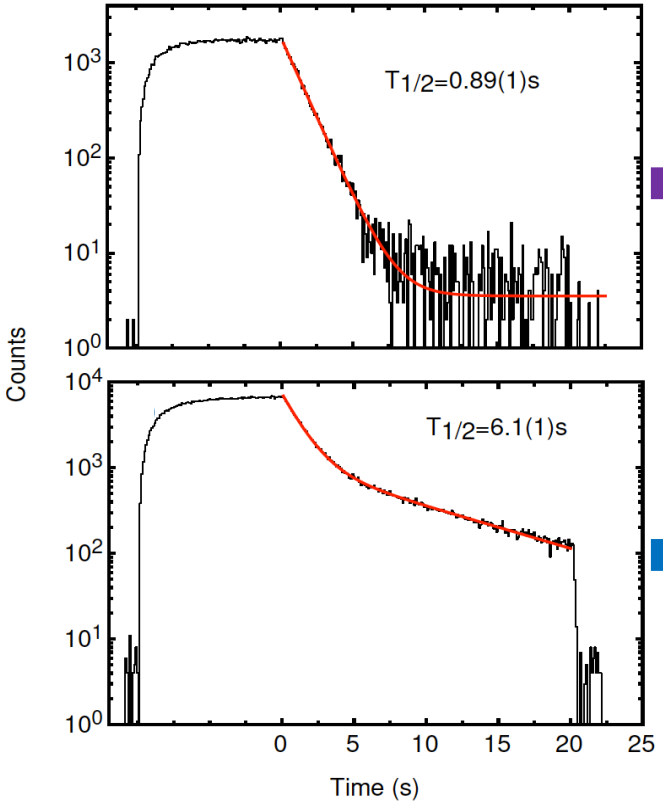
Half-life ($T_{1/2}$) values

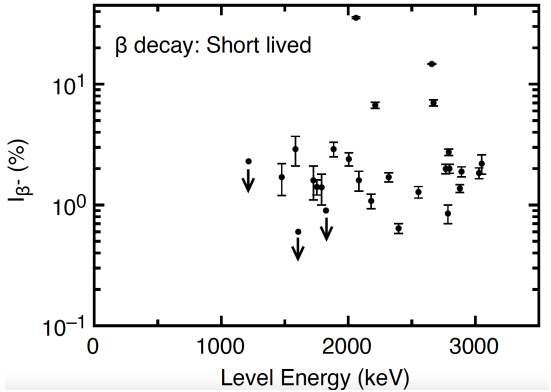


- $T_{1/2}$ value obtained using single exponential decay curve fit.
- Populate high spin levels

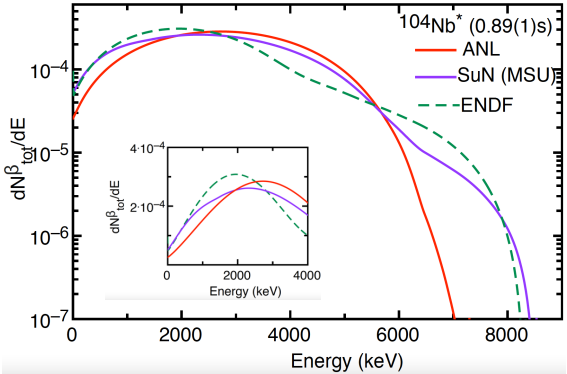
- $T_{1/2}$ value obtained using two exponential decay curve fit where the $T_{1/2}$ of short-lived state has been used as an input.
- Populate low spin levels

➢ Two comprehensive decay schemes have been established from the two β-decay states in ^{104,104m}Nb.

High spin β decay (T1/2 =0.89(1) s)

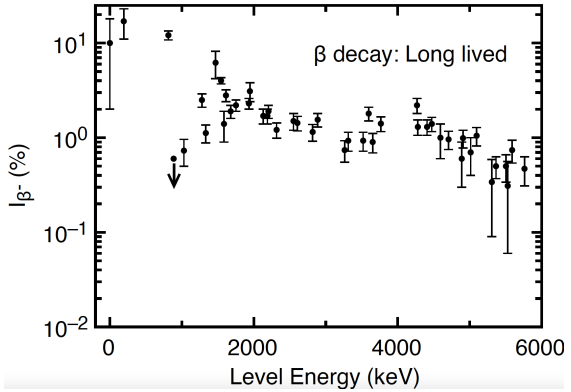


β feeding distribution ^{104m}Nb ⟶ ^{104}Mo

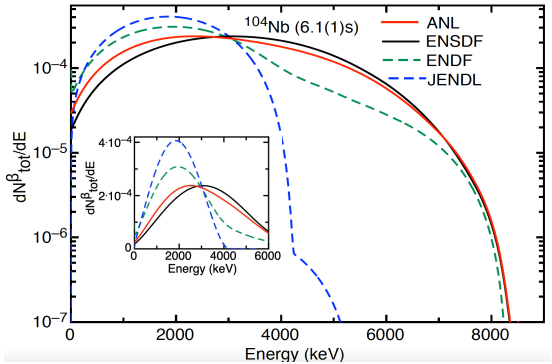


β Spectra for ^{104m}Nb ⟶ ^{104}Mo

Low spin β decay (T1/2 =6.1(1) s)



β feeding distribution ^{104}Nb ⟶ ^{104}Mo



β Spectra for ^{104}Nb ⟶ ^{104}Mo

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