Production of nuclei beams in fragment separator Combas. Mass and charge distribution for reaction $^{40}\text{Ar}(40\text{MeV/n})+^{\text{Be}}(14\text{mg/cm}^2)$

By Bocirnea Amelia-Elena

supervisors

Erdemchimeg .B
Artukh A.G.
Nuclear chart

- β-stable nuclides
- β+ unstable
- β- unstable
- p-unstable
- n-unstable
- Spontaneous fission
Cyclotron U400M

• In May 1991 a 4He beam of 30MeV/n energy was produced at the FLNR U400M cyclotron. During the years 1992-1994 a branched system of beam lines with all necessary diagnostic and control facilities was created. A number of new experimental setups were connected to these beam lines.

• Beams of exotic very neutron-rich isotopes of light elements such as 6He and 8He begin to play increasingly large part in nuclear research lately. These isotopes are possible to get only in nuclear reactions, they are radioactive and often, short-living.
COMBAS (complex fast operating analyzer spectrometer) fragment separator

I used it for:
Studying the reaction mechanisms close to the Fermi energy ($\approx 38$ MeV).
Producton of secondary beams of neutron-rich nuclei with $3 \leq Z \leq 12$

The separation and trajectory analysis of particles are carried out by three parameters: the magnetic rigidity ($B\rho$), the energy loss in the degrader ($\Delta E/\Delta X$) and the time-of-flight (ToF) of the analyzed particles.
COMBAS main scheme

CONFIGURATION | $\Delta \Omega$ (msr) | $\Delta p/p$ (%) | $Bp$ (T·m) | $R_{p/\Delta p}$ | $L$ (m)
---|---|---|---|---|---
$M_1M_2M_3M_4F_dM_5M_6M_7M_8F_a$ | 6.4 | $\pm10$ | 4.5 | 4360 | 14.5

Magnetic rigity – $Bp$
Energy losses $dE$ – aluminium degrader at the dispersive focal plane ($F_d$)
Time Of Flight (ToF) of reaction products
The program is intended to calculate the transmission and yields of fragments produced and collected in a fragment separator. It allows to simulate the production of radioactive beams, from the parameters of the reaction mechanism to the detection of products selected by the fragment separator.
Isotopes are identified by comparison between LiSE simulation and experiment data by looking for characteristic points.
40Ar(40MeV/n) + Be(14mg/sm2) mass distribution for bhro=0.88
Charge distribution for $^{40}\text{Ar}(40\text{MeV/n})+\text{Be}(14\text{mg/cm}^2)$ for bhro=0.88
Thank you for your attention!