Particle detection system for SHE synthesis at DGFRS-II

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Synthesis of SHE using fixed target experiment followed by separation of Nuclear Reaction Products



s=50 fb, $h_t=0.3 \text{ mg/cm}^2$, $\varepsilon_{coll}=0.6$, $I_{beam}=3 \text{ pmA} \rightarrow \approx 1 \text{ event per month}$

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SHE Factory New Dubna gas-filled recoil separator DGFRS-II



Simulated yields of Fl isotopes (A.G. Popeko) DQ_hQ_v set-up $Q_vDQ_hQ_vD$ set-up

Reaction	Transmission
²⁴⁴ Pu(⁴⁸ Ca,3n) ²⁸⁹ Fl	60 %
²⁴⁴ Pu(⁵⁸ Fe,4n) ²⁹⁸ 120	75 %





What is ion beam energy right before it hits the target material?



Energy of ions in beam?

ion beam



Main TOF application



Features

Several tests of the input signals like:

- ✓ amplitude window test
- \checkmark signal duration test
- \checkmark signal symmetry test
- ✓ Gaussian peak fit -> residuum test
- ✓ Energy in range test

Otherwise sound alarm is triggered.

-> Software drops the calculated data until the signals return into the range. Only then the averaging and logging will be resumed.

Program allow to check the signals in pseudo real time. Visual inspection is available, you can check the values and do the diagnostics of the TOF DAQ.

Remote monitoring of app using Web browser



TOF GNS2 k221



Other products

Detector chamber at DGFRS-II

consists of double-sided silicon strip detector + side detectors + TOF







DSSSD In the space resolution ≈1mm2 DSSSD In the space resolution strip side detectors system syste





Spectrometer based on XIA PIXIE-16 and ADP-16 Tekhinvest



- Detector signals
- Technological signals
- 12TB usable space on NAS with RAID-10
- Two different DAQ systems in parallel

First spectrometer

- 17 x 16 channel XIA PIXIE-16 100MSaS/14bit (272 individual channels)
- CompactPCI/PXI
- Dual MXI link to PC
- Expected 20-40keV FWHM

Second spectrometer

- ADP-16 Tekhinvest CAMAC based
- Multiplexed inputs (16->1)
- Real time correlations for search

time-energy-position recoil-alpha links (ER- α) to measure under beam-stop conditions

PIXIE-16 based spectrometer DAQ PXI online monitoring



SW by: A.V. Podshibiakin

ADP-16 CAMAC based spectrometer & method of "active correlations" goal: to provide a background free condition for DAQ



Yu.Tsyganov & A.Polyakov// Appl. Rad. &Isotopes v.47 No.4(1996)451-454

Moreover modern versions are: Yu.Tsyganov et al. NIM A525(2004)213; A513(2003)413; A558(2006)329

First experiments at SHE Factory

^{nat}Yb+⁴⁸Ca and ¹⁷⁰Er+⁵⁰Ti test reactions

Cross section ~10⁸ pb

Adjustment of optical elements Q_v , D, Q_h , Q_v , DImage size on detector

Transmission

Dispersion

Test of digital and analog data acquisition systems

Digital and analog electronics, in parallel





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First experiments at SHE Factory

Aims of the experiments:

- 1. Test of functionalities of all the systems of new accelerator
- 2. and new gas-filled recoil separator
- 3. Accumulate additional statistics for the chosen reactions

Chosen reactions: ⁴⁸Ca+²⁴³Am and ⁴⁸Ca+²⁴²Pu

- 1. Enough material to prepare the targets
- 2. Relatively large cross sections and, thus, optimum candidates for spectroscopic experiments
- 3. Well-studied in previous experiments. Good for testing of the accelerator complex





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First experiments at SHE Factory





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