Analysis of ^{40}Ca(α,γ)^{44}Ti

Christof Vockenhuber

Summary of Nov 05 run

- 150 runs at 50 different energies
- most of the runs were taken at q = 14+
- different target pressures: 1, 2, 4 Torr
- 2 IC pressures: 20 Torr, 17 Torr (<1010 keV/u)
- attenuated beam run into IC
- CSB foil changed 15x, a few runs without CSB

Analysis Goals

$$Y = \frac{N_{44\text{Ti}}}{N_{40\text{Ca}} \; F_q \; \epsilon}$$
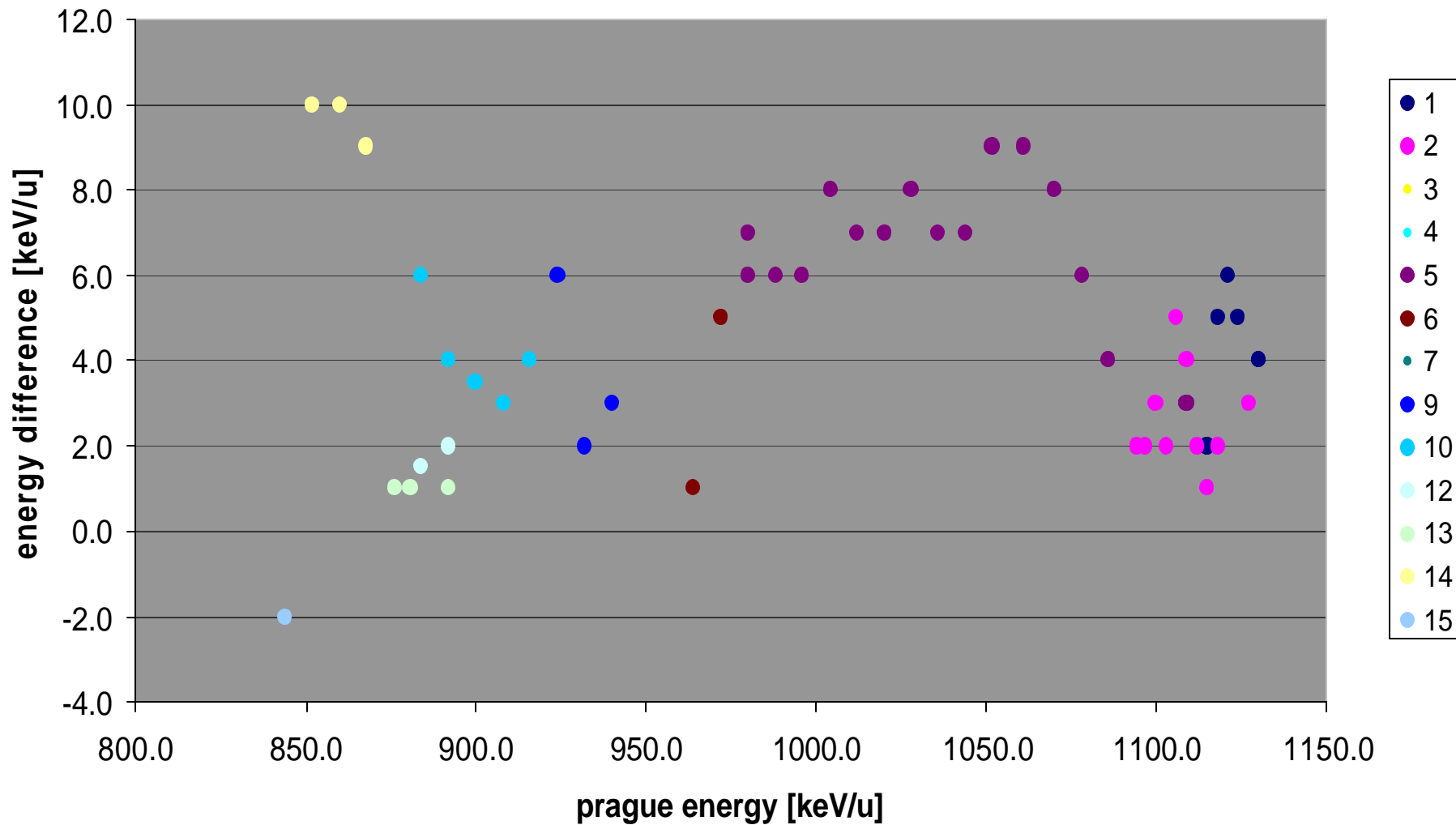
- energy scale
- [44]Ti recoil data
- [40]Ca on target
- [44]Ti Charge state distribution
- BGO γ-ray efficiency

Energy Scale

- from Prague magnet
- measured at MD1 after gas and CSB
- from run MD1 data
- from attenuated IC runs
- from leaky beam peak
- timing relative to RF

Energy difference

Energy difference recommended energy vs. Prague energy

^{44}Ti recoil data

- cuts on IC coinc. spectrum → plot TOF
- cut on TOF → plot IC spectrum
- cut on IC pulse width spectrum
- plot g0vg1 → identify outliers
  - → number of ^{44}Ti recoils

^{40}Ca on target

$$N_{40Ca} = \frac{N_{\text{He}} \; R \; E_b^2}{P}$$ $$R = \frac{I}{e \; q} \frac{\Delta t \; P}{N_{\text{He}} \; E_b^2}$$

- SB1 counts of entire run
- R-value
  - FC4 reading before the run
  - SB1 counts in first minute
  - dead time correction using ratio of presented and acquired tail triggers
  - pressure and energy

^{44}Ti Charge state distribution

- measured for 12+ …16+ at 4 and 8 Torr at a ^{40}Ca beam energy of 1.135 MeV/u
- depends slightly on target pressure
- charge state distribution depends on energy
- ^{40}Ca distribution measured at 1.13 and 0.89 MeV/u

Change of ^{40}Ca Charge state distribution
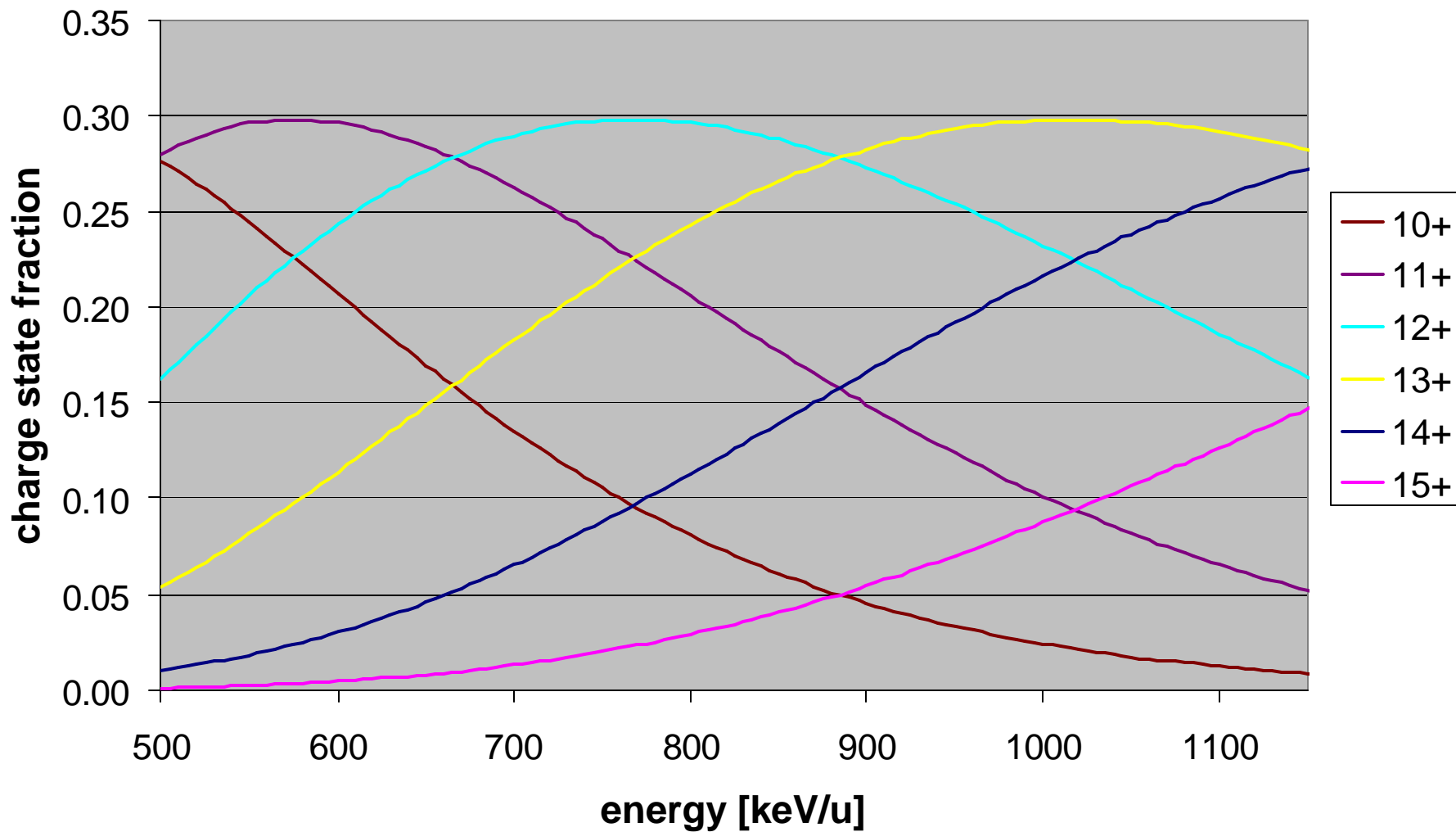
BGO γ-ray efficiency

- direct comparison between singles and coincidence spectrum
- depends on γ ray multiplicity and energies
- GEANT simulations