The PreSPEC-AGATA Setup



M. Reese on behalf of the PreSPEC and AGATA collaborations

AG-Pietralla, TU-Darmstadt



Supported by the German Federal Ministry for Education and Research under grant No. 05P12RDFN8 (TP6), NuSTAR.DA, and by the LOEWE program within HIC for FAIR

26. 06. 2014 | EGAN 2014 Workshop | IKP, TU-Darmstadt , AG-Pietralla | Michael Reese | 1

Outline of Presentation



- In-beam γ-spectroscopy
- The PreSPEC-AGATA setup at GSI
- LYCCA
- Gamma spectra of ⁸⁰Kr: Fragmentation & Coulex
- Efficiency

Experimental Challenges



- 1. Beam from accelerator (or in-flight separator)
- 2. Nuclear reaction in a fixed target
- 3. Excited reaction products leave the target (flight direction changes)
- 4. Emission of Doppler-shifted γ-Radiation



- Need γ-energy in the rest frame of the emitting nucleus (Doppler-correction)
- Need the tracks of particle and γ-ray
- Spectroscopic resolution depends on accurate track reconstruction of both, γ-ray and particle!

PreSPEC-AGATA Schematic Setup





Picture from C. Domingo-Pardo et al., NIM A 694 297-312 (2012)

PreSPEC in Reality





Outgoing Particle Identification with LYCCA



Z identification with **ΔE-E** method:

- ΔE measured as energy loss in a planar Silicon-strip detector
- E measured as the energy deposition in a CsI stopper



Outgoing Particle Identification with LYCCA: Masses



Mass identification with time-of-flight (ToF) measurement:

- Time-of-flight between two fast scintillation detectors
- ToF vs. E (Csl) with condition on a single Element
- Projection along diagonal lines gives mass (or neutron number)



80Kr Secondary Fragmentation



616.6 keV 8.3 ps 80Kr 2* - 0*,

819.5 keV 0.76 ps

2*

TECHNISCHE UNIVERSITÄT DARMSTADT

⁸⁰Kr gated

⁷⁸Kr gated

956.0 keV 0.56 ps ⁹Kr 6*

4*

Gates on the most abundant even-event nuclei after secondary Be-target

First Yrast states visible •



500

400

300

200

100 0 atomic background

> 455 keV 21.6 ps 78Kr 2*, → 0*,

Coulomb Excitation of ⁸⁰Kr on Gold

TECHNISCHE UNIVERSITÄT DARMSTADT



26.06.2014 | EGAN 2014 Workshop | IKP, TU-Darmstadt, AG-Pietralla | Michael Reese | 9



TECHNISCHE

Estimate number of Expected counts (no Gamma-Ray Tracking)

- Expected number of counts
 - = $N_{part.} P_{excit.} eff_{part.} eff_{DAQ} eff_{AGATA}$ Discrepancy) = 370e6 * 5.8e-4 * 0.55 * 0.85 * 14x0.0021 = 3000
- Observed number of counts = 1000

Summary



- Challenging of in-beam γ-spectroscopy
- Overview of the PreSPEC-AGATA setup
- Doppler-corrected spectra from fragmentation and Coulex experiments
- Challenging data analysis





Thank you for your attention!