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4. Coulomb excitation of neutron-rich ^{44}Ar at SPIRAL

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A low-energy Coulomb excitation experiment on neutron-rich ^{44}Ar has been performed at the SPIRAL facility of GANIL. The primary question addressed by the experiment was the possible weakening of the N=28 shell closure in neutron-rich nuclei and, closely connected to that, the development of deformation and shape coexistence in this region of the nuclear chart.

A beam of ^{44}Ar was produced by fragmentation of a primary ^{48}Ca beam at 60 A MeV on the carbon production target of SPIRAL. The ^{44}Ar fragments were re-accelerated in the CIME cyclotron to 2.7 and 3.7 MeV/nucleon and Coulomb excited on ^{109}Ag and ^{208}Pb targets, respectively. The scattered projectiles and recoiling target nuclei were detected in a highly segmented double-sided silicon detector and the gamma rays were detected with the EXOGAM germanium detector array.

Apart from the first excited 2^+ state, at least one higher-lying level was populated. The level of statistics is sufficient to determine the gamma-ray yields for several ranges of scattering angles and for the two different target materials. Although the analysis is still in progress, it is anticipated that the collected data will allow extracting the transition probabilities between the observed states, as well as the static quadrupole moment of the first 2^+ state. It is anticipated to continue in this experimental program with the Coulomb excitation of ^{46}Ar.

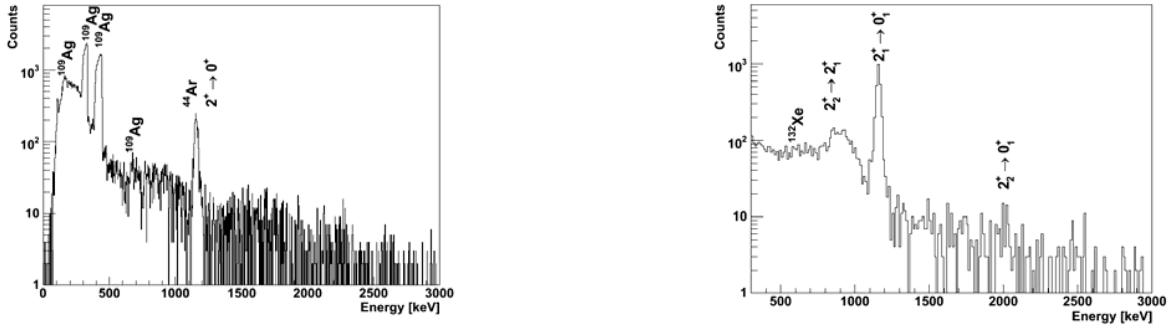

Figure 1. *Left:* Gamma-ray spectrum in coincidence with ^{44}Ar projectiles scattered on a ^{109}Ag target, corresponding to scattering angles of $35° < \theta_{cm} < 72°$. The $2^+ \rightarrow 0^+$ transition is observed together with several transitions in ^{109}Ag, which can be used for normalization. *Right:* Gamma-ray spectrum in coincidence with recoiling ^{208}Pb target nuclei, corresponding to scattering angles of $67° < \theta_{cm} < 130°$.

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5. Dynamical and Statistical Fragment Production in ^{136}Xe+^{209}Bi Reactions at E/A = 28, 40, and 62 MeV[1]

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The heavy-ion reaction scenario at low bombarding energies (below 10 MeV/nucleon) is quite well understood[1]. In this scenario the projectile and target either fuse forming a single compound nucleus, or undergo a relatively "gentle" dissipative collision. In the latter case, which is of interest in the present study, two excited remnants of the projectile and target emerge from the collision site. Subsequently, the excited compound nucleus or the projectile- (PLF) and target- (TLF) like fragments deexcite, primarily via emission of neutrons and light charged particles (LCP). With increasing bombarding energy one begins to observe the emission of intermediate-mass fragments (IMFs)[2].

In the intermediate bombarding energy range of E/A= 10-100 MeV[3] a new effective source of fragments becomes discernible in the yield distribution that moves with a velocity intermediate between the velocities of PLF and TLF[3]. This intermediate-velocity source (IVS) can be conceptually associated with the overlap region of PLF and TLF.

The present study concentrates on correlations between neutron and charged particle production in the ^{136}Xe+^{209}Bi reaction studied at three bombarding energies of E/A=28, 40, and 62 MeV. At every bombarding energy, the experimental setup included two 4π detector systems :

(i) the Washington University charged-particle detector array -Dwarf Ball/Wall[4],

[1] Talk given at the 11th International Conference on Reaction Mechanisms, Varenna 2006.