

A DIAMANT wedding for AFRODITE : probing structure and characterizing reaction properties via charged-particle- γ correlations*

S.M.Mullins¹, B.M.Nyakó², J.Timár², G.Berek², J.Gál², G.Kalinka², J.Molnár²,
S.H.T.Murray¹, R.A.Bark¹, E.Gueorguieva¹, K.Juhász³, A.Krasznahorkay², J.J.Lawrie¹,
E.O.Lieder¹, R.M.Lieder¹, M.Lipoglavšek⁴, S.S.Ntshangase^{1,5}, P.Papka¹, J.N.Scheurer⁶,
J.F.Sharpey-Schafer^{7,8}, O.Shirinda⁷, L.Zolnai²

¹iThemba LABS, P.O.Box 722, Somerset West, 7129, South Africa

²Institute of Nuclear Research (ATOMKI), P.O.Box 51, H-4001 Debrecen, Hungary

³Dept of Information Technology, University of Debrecen, H-4032, Debrecen, Hungary

⁴Josef Stefan Institute, 1000 Ljubljana, Slovenia

⁵Dept of Physics, University of Cape Town, Cape Town 7701, South Africa

⁶CNRS-IN2P3-Universite de Bordeaux I, 33175 Gradignan Cedex, France

⁷Dept.of Physics, University of the Western Cape, Bellville 7535, South Africa

⁸Dept.of Physics & Engineering, University of Zululand, Kwazulu-Natal, South Africa

The DIAMANT CsI array [1] has been coupled with the AFRODITE HPGe spectrometer [2] at iThemba LABS under an ongoing bilateral agreement to facilitate a range of charged-particle- γ measurements. These include the search for superdeformation in ^{32}S , chiral behaviour in ^{109}Ag and the characterization of incomplete fusion reactions (IFRs).

As an example, data taken from the $^{13}\text{C} + ^{170}\text{Er}$ reaction at a bombarding energy of 80 MeV are shown in figure 1. The spectra are total projections of E_γ - E_γ correlation matrices selected by α particles detected by the standalone “Chessboard” front wall of 24 CsI crystals, constructed at ATOMKI. There is evidence for complete break-up of the beam, since Yb lines are present in the both one- α - and two- α -gated projections. The yields and feeding patterns for structures populated in Hf ($Z=72$) and Yb ($Z=70$) nuclei via IFRs will be discussed, along with those for W ($Z=74$) nuclei populated via complete fusion reactions.

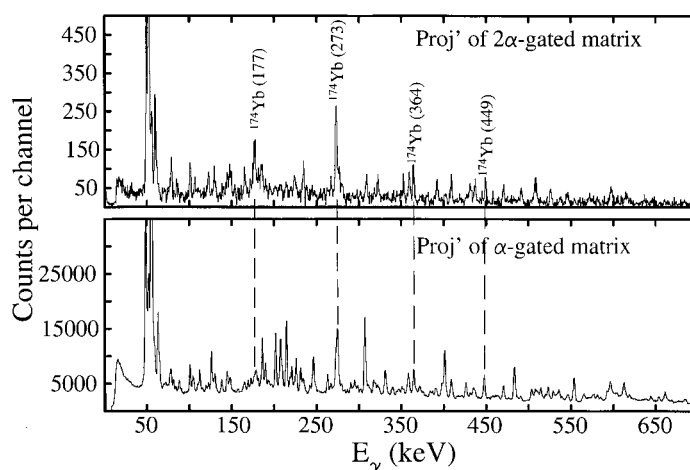


Figure 1: Projections of γ - γ matrices from AFRODITE select by one α particle (lower panel) and two α particles (upper panel) detected in the DIAMANT “Chessboard”.

* Supported by the National Research Foundation (South Africa), OTKA and Tét (Hungary).

[1] J.N.Scheurer *et al.*, Nucl. Instr. Meth. **A385**, 501 (1997).

[2] R.T.Newman *et al.*, Balkan Physics Letters, Special Issue, p.182 (1998).