

## TWO-PARTICLE CORRELATION FUNCTIONS FOR THE 200-MeV $^3\text{He} + \text{Ag}$ REACTION

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Particle-particle correlations at small relative momenta have been frequently employed to investigate the temperature, source size and time evolution associated with the emission of complex fragments from highly excited nuclear matter.<sup>1,2</sup> In the present study we have applied the particle-particle correlation technique to the 200-MeV  $^3\text{He} + \text{Ag}$  system, where inclusive studies indicate that complex fragments emitted at forward angles arise from fast, non-equilibrium processes, whereas those emitted at backward angles appear to have their origin in the decay of an equilibrated compound nucleus.<sup>3</sup>

Measurements were performed in the IUCF 152-cm scattering chamber with a 2 mm diameter, halo-free  $^3\text{He}$  beam incident on a high-purity Ag target of thickness  $700 \mu\text{g}/\text{cm}^2$ . Isotopically resolved hydrogen and helium ions, as well as Z-identified intermediate mass fragments were detected by a close-packed array of thirteen position-sensitive telescopes.<sup>4</sup> Two settings of the array were employed, one centered at  $42^\circ$  in the laboratory and the other at a backward angle. Each telescope consisted of an x-y position-sensitive proportional counter, a planar silicon-surface-barrier detector and a 5-mm lithium drifted silicon detector.

The two-particle coincidence yield,  $Y_{12}(\vec{p}_1, \vec{p}_2)$ , for ejectile laboratory momenta  $\vec{p}_1$  and  $\vec{p}_2$ , contains contributions from the sequential decay of particle-unstable excited states as well as from the coincident emission of non-resonant particles. For particle pairs of relative momentum  $q$ , the correlation function,  $R(q)$ , is defined in terms of the coincidence yield and the single particle yields,  $Y_1(\vec{p}_1)$  and  $Y_2(\vec{p}_2)$ :

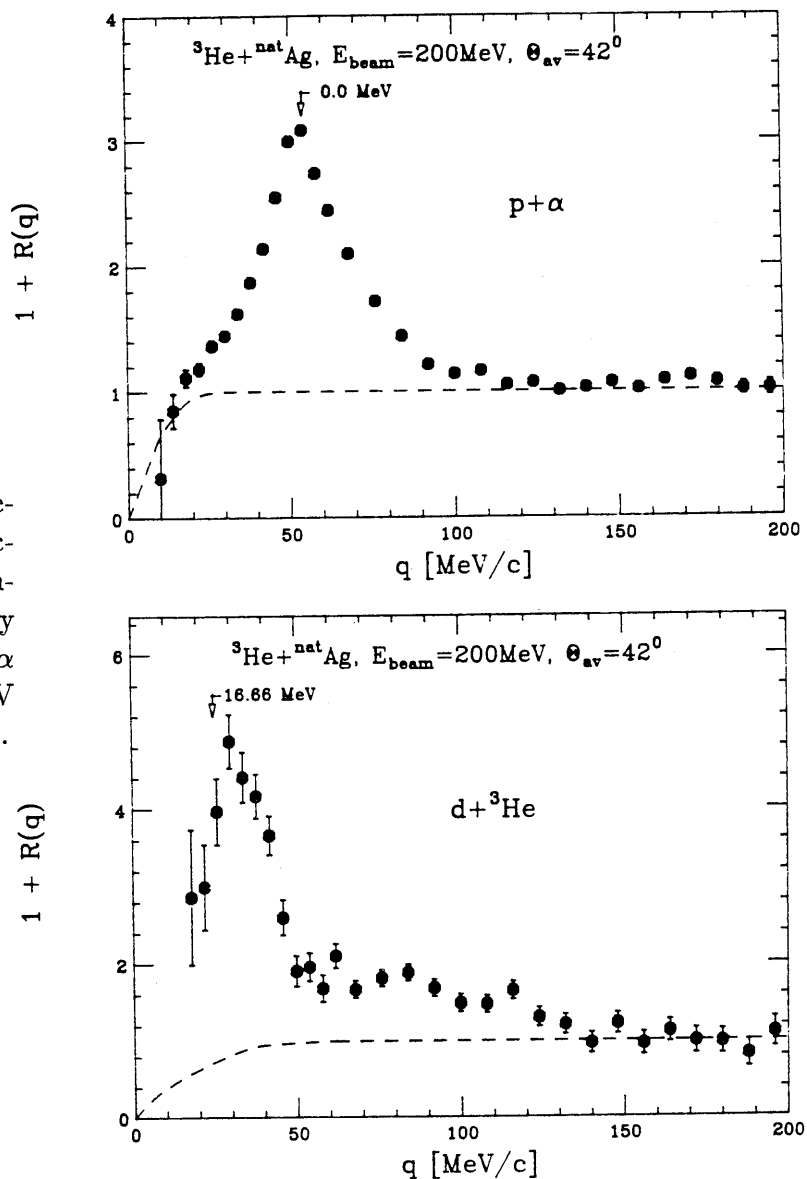
$$\Sigma Y_{12}(\vec{p}_1, \vec{p}_2) = C_{12} [1 + R(q)] \Sigma Y_1(\vec{p}_1) Y_2(\vec{p}_2).$$

The normalization constant,  $C_{12}$  is determined by the requirement that  $R(q) = 0$  for large relative momenta.

Correlation functions for  $^5\text{Li}$  decay with the array at  $42^\circ$  are shown in Fig. 1. Strong correlations for decay of the ground state ( $p + \alpha$ ) and the 16.66 MeV excited state ( $d + ^3\text{He}$ ) are evident. These correlations are among the strongest ever observed in intermediate-energy nuclear reactions, being up to a factor of two greater than those found in most heavy-ion-induced reactions.

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2. J. Pochodzalla, *et al.*, Phys. Rev. **C23**, 1695 (1987).
3. K. Kwiatkowski, *et al.*, Phys. Lett. **B171**, 41 (1986).
4. T. Murakami, *et al.*, Nucl. Instr. Meth. Phys. Res. **A275**, 122 (1989).

Figure 1. Particle-particle correlation function,  $R(q)$ , as a function of relative laboratory momentum  $q$  of the pair for  ${}^5\text{Li}^*$  decay from: (top) ground state to  $p + \alpha$  channel, and (bottom) 16.6 MeV excited state to  $D + {}^3\text{He}$  channel.



### ANALYZING POWERS FOR COMPLEX FRAGMENTS FORMED IN THE 200 MeV $\bar{p} + \text{Ag}$ REACTION

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Studies of proton-induced reactions at 161 MeV<sup>1</sup> and 200-500 MeV<sup>2</sup> indicate that intermediate mass fragments (IMF:  $3 \leq Z \leq 15$ ) formed in these reactions originate primarily from a fast non-equilibrium mechanism. Previous studies with polarized beams<sup>3</sup> have shown zero analyzing powers for IMFs emitted at angles larger than 60 degrees, indicating that direct processes cannot account for these fragments. To investigate the possibility that