Investigations of multi-particle exit channels of levels in light nuclei

J.J. MANFREDI, R.J. CHARITY, J.M. ELSON, R. SHANE, L.G. SOBOTKA, Washington University, Z. CHAJECKI, D. COUPLAND, H. IWASAKI, M. KILBURN, J. LEE, W.G. LYNCH, A. SANETULLAEV, M.B. TSANG, J. WINKELBAUER, M. YOUNGS, National Superconducting Cyclotron Laboratory and Michigan State University, S.T. MARLEY, D.V. SHETTY, A.H. WUOSMAA, Western Michigan University, T.K. GHOSH, Variable Energy Cyclotron Centre, M.E. HOWARD, Rutgers University, HIRA COLLABORATION — The HiRA array was used to study the many-particle exit channels produced from the interactions of an \( E/A = 70 \text{ MeV} \) \(^9\)C beam with a \(^9\)Be target. Correlations between these particles were studied to analyze the decays, particularly whether they occur in one prompt step or sequentially through long-lived intermediates. The five-body decay of \(^8\)C is found to occur in two steps of two proton decay through a \(^6\)Be ground-state. In the first step, the correlations between the protons clearly show the enhanced diproton character of the decay, and the second step was found to be consistent with the independently measured \(^6\)Be two-proton decay. A new mass and uncertainty for \(^8\)C were deduced from these data and used in a refit of the \( A = 8 \) data to the isobaric multiplet mass equation (IMME). The fit indicates the need for terms beyond quadratic meaning that isospin symmetry is clearly broken for the \( A = 8 \) multiplet.