Multiple proton decays of $^6$Be, $^8$C, $^8$B(IAS) and excited states in $^{10}$C

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Recent technical advances have allowed for high-order correlation experiments to be done. We have primarily focused on experiments in which the final channels are composed of only alphas and protons. Four cases we have studied are: $^6$Be, $^{10}$C*, $^8$C, and $^8$B*(IAS) via 3, 4, 5, and 3-particle correlation measurements, respectively. While the first case had been studied before, our work presents very high statistics in the full Jacobi coordinates (the coordinates needed to describe 3-body decay.) Our study of $^{10}$C excited states provides isolatable examples of: correlated 2p decay, from one state, and the decay of another which is unusually highly correlated, a “ménage a quatre.” $^8$C decay presents the only case of sequential 3-body 2p decay steps (i.e. 2p-2p.) The intermediate in this 2-step process is the first example ($^6$Be) mentioned above. Unlike the well-studied second step ($^6$Be decay), the first step in this 2p-2p process provides another example of correlated 2p emission. The decay of $^8$B(IAS), the isobaric analog of $^8$C, also decays overwhelmingly by 2p emission, in this case to $^6$Li(IAS). This IAS-to-IAS 2p decay is one for which decay to the potential 1p intermediates is energetically allowed but isospin forbidden. This represents an expansion, over that originally envisioned by Goldanski, of the conceivable nuclear territory for 2p decay.