Constraining 0v2β matrix elements using nuclear structure observables

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If observed, neutrinoless double beta decay (0v2β) will provide fundamental information on the nature of the neutrino. It will provide evidence for the Majorana nature of the neutrino as well as providing access to the neutrino mass scale. However, any extraction of the neutrino mass from the 0v2β decay rate is dependent on calculations of the nuclear matrix element. There are several methods of calculating the nuclear matrix elements including, but not limited to, the quasi-random phase approximation, the shell model and the interacting boson model. Currently the calculations agree to within a factor of 2-3, impacting on the validity of any extracted neutrino mass.

Nuclear structure observables, such as the ground state nucleon occupancies, can provide information against which the NME calculations can be benchmarked and improved. Transfer reactions, as a probe of the single particle nature of nuclear states, are ideal for extracting the nucleon occupancies. An overview of a campaign of measurements aimed at extracting nucleon occupancies for a number of 0v2β decay candidates will be presented. Focus will be given to recent measurements on the ^{100}Mo→^{100}Ru and ^{150}Nd→^{150}Sm candidate systems. This work has been carried out at a range of stable beam facilities, including laboratories at Yale, Munich and Osaka.