

# Recent measurements of key nuclear astrophysics reaction rates

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With the advent of satellite missions capable of identifying gamma emission from short lived radionuclides in explosive astrophysical sites, there is renewed interest in determining the rates of the key nuclear reactions which provide the energy generation and element production in these exotic sites. In many cases the large uncertainties in the reaction rates limit the modeling of novae, X-ray bursters or supernovae, so that the underlying hydrodynamic development and other physics processes cannot be explored. Most of the key reactions for which we need accurate rates involve short lived nuclei, but the development of high quality beams on the new generation of radioactive beam facilities is enabling us to make direct measurements. Where the yields are too low, or where the beams have yet to be developed, we still have to rely on model calculations of the reaction rates and so experiments with stable beams are often required to pin down information in the states in the nuclei.

I will illustrate recent progress with some of our recent data on the  ${}^3\text{He}+{}^4\text{He}$  rate (Big Bang and stellar nucleosynthesis), the  ${}^{17}\text{O}(\alpha, n)$  reaction which determines the role of  ${}^{16}\text{O}$  as a neutron poison in the  $s$ -process in low metallicity stars, several reactions relevant for the production and destruction of  ${}^{18}\text{F}$  impacting on the detectability of  ${}^{18}\text{F}$  gamma emission from novae and plans for measurements of the key reactions in X-ray bursters which result in breakout from the Hot-CNO cycle into the  $ap$ - and  $rp$ -processes.