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The K600 magnetic spectrometer and the CAKE silicon detector array: measurements relevant to type-I X-ray bursts and classical novae

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The K600 magnetic spectrometer and the CAKE silicon detector array form a powerful tool for coincidence measurements in many nuclear physics measurements including nuclear astrophysics. These instruments have been used, among others, in studies measuring proton decays from α -unbound states in ^{22}Mg through the $^{24}\text{Mg}(p,t)^{22}\text{Mg}$ reaction to study the $^{18}\text{Ne}(\alpha,p)^{21}\text{Na}$ cross section relevant in type-I X-ray bursts (XRBs). The thermonuclear reaction rate of $^{18}\text{Ne}(\alpha,p)^{21}\text{Na}$ is one of the important rates that affect the behaviour of the XRB lightcurve [1]. This talk will examine the $^{24}\text{Mg}(p,t)^{22}\text{Mg}$ experiment that was performed at iThemba LABS, Cape Town and discuss future experiments with the $^{28}\text{Si}(p,t)^{26}\text{Si}$ reaction to study proton decays from α -unbound states in ^{26}Si to study the cross section and thermonuclear reaction rate of $^{22}\text{Mg}(\alpha,p)^{25}\text{Al}$ and its influence on type-I XRBs [2-4]. The coincidence measurements that can be performed using the K600 and the CAKE also include reactions relevant to classical novae such as $^{21}\text{Na}(p,\gamma)^{22}\text{Mg}$ and $^{30}\text{P}(p,\gamma)^{31}\text{S}$. These experiments will also be discussed in this talk.

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