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Beta-Delayed Charged-Particle Emmission From 20Mg

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One of the most important nuclear reactions in astrophysics is the 15O(α,γ)19Ne(p,γ)20Na reaction, which provides a possible breakout pathway from the hot CNO cycle in stars. Studying this reaction directly in the laboratory is challenging, instead, an indirect study using β-decay proton and α decays of 20Mg was recently performed at TRIUMF. The experiment used the Gamma-Ray Infrastructure for Fundamental Investigations of Nuclei (GRIFFIN) gamma-ray spectrometer and, for the first time, the Regina Cube for Multiple Particles (RCMP), a newly developed silicon detector array designed to detect low-energy protons and alpha particles. This setup enables the most sensitive search to date for rare decay branches and gamma-ray transitions from astrophysically important states. My thesis focuses on calibrating the RCMP array and analyzing this new high-statistics dataset to constrain the properties of resonances that play a key role in stellar nucleosynthesis.

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