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Low energy measurements of the 12C(a,g) reaction with a bubble chamber¹ CLAUDIO UGALDE, Argonne National lab, BRAD DIGIOVINE, KEVIN GULLIKSON, ROY HOLT, DALE HENDERSON, ERNST REHM, Argonne, ANDREW SONNENSCHEIN, Fermilab, ARTHUR CHAMPAGNE, University of north carolina, RAJARSHI RAUT, GENCHO RUSEV, ANTON TONCHEV, Duke University, NEIL STURCHIO, University of Illinois — Hydrostatic helium burning in stars is dominated be the 3α and the $12C(\alpha, \gamma)$ processes. While the former is thought to be reasonably well understood, the latter has eluded even the most sensitive laboratory measurements. This reaction not only has a strong influence on the nucleosynthesis of most elements of the periodic table, but also determines the structure and evolution of subsequent stellar burning stages and explosive scenarios. We have devised a technique for measuring the $12C(\alpha, \gamma)$ reaction with a considerable improvement in sensitivity from previous experiments. Adopting ideas from dark matter search experiments with bubble chambers, we have found that a superheated water vessel would be sensitive to α particle and 12C recoils produced from a γ ray impinging on 16O nuclei. The main advantage of the new target-detector system is a density as high as a factor of 10,000 over conventional gas targets. Also, the detector would be virtually insensitive to the γ ray beam itself, thus allowing us to detect only the products of the reaction of interest.

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Claudio Ugalde Argonne National lab

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