New resonance strength measurements for the ^{30}Si(p,γ)^{31}P reaction

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The observational evidence for multiple stellar populations within globular clusters continues to confound the astronomical community. These populations are usually interpreted as distinct generations, with the currently observed second-generation stars having formed in part from the ejecta of massive, first-generation "polluter" stars, giving rise to anomalous abundance patterns. The identity of the polluter stars as well as their mechanism of enrichment are not yet understood. A recent study ([1]) of the Mg-K abundance anomaly measured in the cluster NGC 2419 used reaction network Monte Carlo simulations to identify the stellar temperature and density conditions that may have given rise to this polluter material. In a follow up sensitivity study [2], we found several nuclear reactions that were highly influential in determining these conditions and suggested a series of experiments to reduce their rate uncertainties. We now report results for the first resonance strength experiments in this series, direct measurements of the $E_p = 432$ keV and $E_p = 499$ keV resonances in the ^{30}Si(p,γ)^{31}P reaction. We present a new recommended reaction rate and also explore its effect on the problem of polluter material parentage in NGC 2419.

References

[1] C. Iliadis *et al.*, ApJ 818, 1 (2016)

[2] J.R Dermigny & C. Iliadis, ApJ 848, 1 (2017)