Abstract Submitted
for the APR17 Meeting of
The American Physical Society

Report on an improved calculation of the Beryllium-7 + proton → Boron-8 + photon cross section at stellar energies[1] X. ZHANG, University of Washington, KENNETH M. NOLLETT, San Diego State University, D. R. PHILLIPS, Ohio University — The radiative capture reaction, 7Be+p → 8B+photon, is a subject of long-standing interest for nuclear astrophysics. Its cross section needs to be known at low energies (about 20 keV in our Sun), which unfortunately is too small to be directly measured in lab. Therefore, theories are used to extrapolate the higher-energy measurements down to the low energies. The previous studies, including microscopic and phenomenological models, face difficulties with estimating theoretical uncertainties. In this talk, I will present our studies [Phys.Lett.B.751.535(2015)] based on the Halo-Effective-Field-Theory framework, which provides a systematic expansion for the reaction amplitude in terms of the low energy to the high energy scale ratio. Our next-to-leading-order formula can parameterize other existing results with sub-percent discrepancy in the relevant energy region, which is consistent with our theoretical uncertainty estimation based on the size of ignored higher order contributions. We then applied Bayesian analysis to constrain the theory parameters based on the direct capture data, and got a stringent constraint on the zero energy S factor, S(0)=21.3 0.7 (eV b). The error is less than half of the previously recommended value, S(0)=20.8 1.6 (eV b).

[1]The work is supported by the U.S. Department of Energy under grant No. DE-FG02-93ER-40756 and No. DEFG02-97ER-41014

X. Zhang
University of Washington

Date submitted: 29 Sep 2016 Electronic form version 1.4