DNP19-2019-000031

Abstract for an Invited Paper
for the DNP19 Meeting of
the American Physical Society

Electrodisintegration of ^{16}O: Measurement and Astrophysical implication[1]

IVICA FRISCIC, Massachusetts Institute of Technology

Radiative capture reactions play an essential role in stellar nucleosynthesis, but for some of them, the precise determination of their reaction rates at astrophysical energies proved to be extremely challenging. The most prominent example is the ^{12}C$(\alpha,\gamma)^{16}$O reaction, for which even after five decades of experimental effort the uncertainty of the reaction rate at stellar energies still did not reach the goal of $\sim$10%. By using the state-of-the-art gas jet target and the new generation of energy-recovery linear accelerators (ERLs) to achieve high luminosity, the measurement of the electrodisintegration of ^{16}O close to threshold can be utilized to determine the ^{12}C$(\alpha,\gamma)^{16}$O reaction rate with significantly increased precision. We present the formalism, which relates real- and virtual-photon-disintegration reactions and discuss some aspects of designing an optimal experiment. After the new ERLs come online, the presented approach needs to be validated experimentally, but if successful, the same procedure can be used to improve the precision of other astrophysically-important radiative capture reactions.

[1]This research was supported by the U.S. Department of Energy Office of Nuclear Physics under grant No. FG02-94ER40818.