

Real and Virtual (Photons) Astrophysics; Blazing New Trails in Nuclear Astrophysics *

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Abstract

GeV beams of light ions and electrons are used for creating a high flux of real and virtual photons, with which some problems in Nuclear Astrophysics are studied. GeV 8B beams are used to study the Coulomb dissociation of 8B and thus the ${}^7Be(p, \gamma){}^8B$ reaction. This reaction is one of the major source of uncertainties in estimating the 8B solar neutrino flux and a critical input for calculating the 8B Solar neutrino flux in the Standard Solar Model. The Coulomb dissociation of 8B appears to provide a viable method for measuring the ${}^7Be(p, \gamma){}^8B$ reaction rate. GeV electron beams on the other hand, are used to create a high flux of real and virtual photons at TUNL-HI γ S and MIT-Bates, respectively, and we discuss two new proposals to study the ${}^{12}C(\alpha, \gamma){}^{16}O$ reaction with real and virtual photons. The ${}^{12}C(\alpha, \gamma){}^{16}O$ reaction is essential for understanding Type II and Type Ia supernova. It is concluded that virtual and real photons produced by GeV light ions and electron beams are useful for studying some of the most central problems in Nuclear Astrophysics.

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