SES08-2008-000222

Abstract for an Invited Paper
for the SES08 Meeting of
the American Physical Society

A New ECR Ion Source for Nuclear Astrophysics Studies[1]

JOHN M. CESARATTO, UNC - Chapel Hill and TUNL

The Laboratory for Experimental Nuclear Astrophysics (LENA) is a low energy facility designed to study nuclear reactions of astrophysical interest at energies which are important for nucleosysthesis. In general, these reactions have extremely small cross sections, requiring intense beams and efficient detection systems. Recently, a new, high intensity electron-cyclotron-resonance (ECR) ion source has been constructed (based on a design by Wills et al.[1]), which represents a substantial improvement in the capabilities of LENA. Beam is extracted from an ECR plasma excited at 2.45 GHz and confined by an array of permanent magnets. It has produced H^+ beams in excess of 1 mA on target over the energy range 100 - 200 keV, which greatly increases our ability to measure small cross sections. Initial measurements will focus on the ^{23}Na(p,γ)^{24}Mg reaction, which is of interest in a variety of astrophysical scenarios. The present uncertainty in the rate of this reaction is the result of an unobserved resonance expected at E_{lab} =144 keV, which should be detectable using beams from the new ECR source. In collaboration with Arthur E. Champagne and Thomas B. Clegg, University of North Carolina, Chapel Hill and TUNL.

[1] J. S. C. Wills *et al.*, Rev. Sci. Instrum. **69**, 65 (1999).

[1]Work partially supported by US DOE Grants No. DE-FG02-97ER41033 and DE-FG02-97ER41041.