THERMONUCLEAR REACTION RATE OF $^{17}O(p,\gamma)^{18}F$—A HIGH-CURRENT, LOW-ENERGY STUDY AT SEA LEVEL

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Classical novae are thought to be the dominant source of ^{17}O in our Galaxy. These energetic events produce ^{18}F that, as it decays to ^{18}O, drives the ejection of nuclear "ash" into the interstellar medium. The importance of the non-resonant component of the $^{17}O(p,\gamma)^{18}F$ reaction is well established, and numerous studies have been performed to analyze this reaction. However, the temperature regime relevant to explosive hydrogen burning during classical novae corresponds to very low proton bombarding energies. At these low energies, the Coulomb barrier suppresses the reaction yield in the laboratory, and environmental backgrounds dominate the detected signal making it difficult to differentiate the direct capture γ-cascade from background. At the Laboratory for Experimental Nuclear Astrophysics (LENA), our electron cyclotron resonance (ECR) ion source produces intense, low-energy proton beam ($\approx$ 2.0 mA at the target), and these high currents boost the reaction yield. The LENA facility also has a coincidence detector setup that reduces environmental background contributions and boosts signal-to-noise. The sensitivity afforded by $\gamma\gamma$ –coincidence and high beam current allowed us to probe the $^{17}O(p,\gamma)^{18}F$ reaction within the classical nova Gamow window. Improved $^{17}O(p,\gamma)^{18}F$ direct capture reaction rates are currently being determined, and our progress will be reported.