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Development of a neutron long-counter system for astrophysical (α, xn) reaction studies SUNGHOON AHN, FERNANDO MONTES, WEI JIA ONG, Michigan State University, ZACHARY MEISEL, University of Notre Dame, JESUS PERELLO, Florida International University, THE JOINT INSTITUTE FOR NUCLEAR ASTROPHYSICS - CENTER FOR THE EVOLUTION OF THE ELEMENTS COLLABORATION, NATIONAL SUPERCONDUCTING CYCLOTRON LABORATORY COLLABORATION — Recent studies on the discrepancy of $Z = 38$ - 47 abundances between metal poor stars have proposed (α, xn) reactions as the main reaction pathway for early nucleosynthesis in the wind with the condition of $(n, \gamma) - (\gamma, n)$ equilibrium and temperatures between 3.5 and 5.5 GK. Uncertainties in (α, xn) reaction rates directly affect calculated abundances with an impact that is comparable to that from astrophysical uncertainties. At present, reaction rate uncertainties are relatively large since little experimental data exists for (α, xn) cross sections involved in the nucleosynthesis calculation. We are developing a neutron detector which counts emitted neutrons from the (α, xn) reactions. The detector consists of 80 gas-filled BF_3 and ^{3}He proportional tubes oriented in rings along the beam axis embedded in a polyethylene matrix. The configuration of the tubes in the matrix is determined by both a high average neutron detection efficiency and the efficiency as a function of energy to be as constant as possible from E_n = 0.1-19.5 MeV, since neutron energy information will be lost due to neutron moderation. Details of the detector design and a status report on the device will be presented.

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