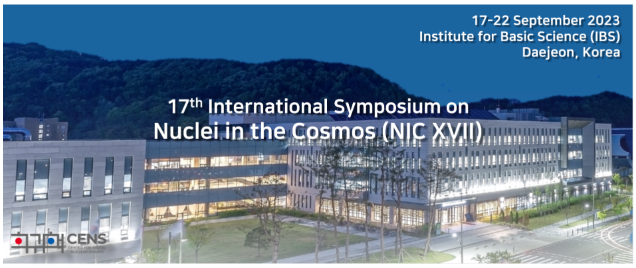

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Measuring the ^{15}O$(\alpha,\gamma)^{19}$Ne Reaction Rate in Type I X-ray Bursts using ^{20}Mg β-decay

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A neutron star can accrete hydrogen-rich material from a low-mass binary companion star. This can lead to periodic thermonuclear runaways, which manifests as a Type I X-ray bursts detected by space-based telescopes. Sensitivity studies have shown that ^{15}O$(\alpha,\gamma)^{19}$Ne carries one of the most important reaction rate uncertainties affecting the modeling of the resulting light curve. This reaction is expected to be dominated by a resonance corresponding to the 4.03 MeV excited state in ^{19}Ne. This state has a well-known lifetime, so only a finite value for the small alpha-particle branching ratio is needed to determine the reaction rate. Previous measurements have shown that this state is populated in the decay sequence of ^{20}Mg. ^{20}Mg$(\beta p\alpha)^{15}$O events through the key ^{15}O$(\alpha,\gamma)^{19}$Ne resonance yield a characteristic signature: the emission of a proton and alpha particle. To identify these coincidence events the GADGET II detection system was used at the Facility for Rare Isotope Beams during Experiment 21072. An ^{36}Ar primary beam was impinged on a ^{12}C target to create a fast beam of ^{20}Mg that fed the ^{19}Ne state of interest. We are presenting here the preliminary results from this experiment, which includes discussion of the data processing and analysis methods being used on the newly acquired data, as well as a primer on the development of convolutional neural networks for rare event identification.

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