Tuesday March 5th At 4:00pm

Measurements of Fusion Reactions with ^{16}C for Understanding X-ray Superbursts

Abstract:

Type-I X-ray bursts occur repeatedly in binary star systems with an accreting neutron star. When accretion onto the neutron star's envelope causes it to become hot and dense enough, thermonuclear runaway ensues, creating heavy elements via the ap- and rp-processes. Occasionally, some of these systems undergo superbursts, which are type-I X-ray bursts that are 1,000 times brighter and longer-lived than the usual X-ray burst. Superbursts likely ignite deeper in the neutron star's ocean via runaway ^{12}C burning. For such burning to occur, another heat source, in addition to accretion, is required. This could come from neutron-rich light nuclei fusing in the ocean and outer crust of the neutron star. To better understand such fusion, past studies have made measurements of the fusion of neutron-rich ions (^{20}O and ^{15}C) with ^{12}C target nuclei. For the first time, we attempted measurements of the total fusion cross-section for the ^{16}C+^{12}C and ^{16}C+^{13}C systems near the Coulomb barrier using the MUlti Sampling Ionization Chamber (MUSIC) detector. This experiment was performed at the ATLAS facility at Argonne National Laboratory using a ^{16}C beam produced in-flight and separated by the new RAISOR system. The preliminary results from this experiment will be presented and compared with theoretical S-factor calculations.

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Refreshments will be served at 3:45pm