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Fast neutron induced reactions on carbon with a diamond detector at LANSCE

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The Modular Neutron Array (MoNA) Collaboration primarily studies neutron-rich nuclei near the neutron drip line with a large area neutron detector array of plastic scintillators. Fast neutrons up to 200 MeV will be produced from the decay of these unbound systems during experiments conducted at the Facility for Rare Isotope Beams (FRIB). Using the four momenta of the decay products, the reconstructed decay energies are analyzed and interpreted by comparisons to detailed Monte Carlo simulations. To simulate the neutron interactions within the plastic scintillators, cross sections are needed for reactions on hydrogen and carbon. Currently, there are missing or sparse data in the energy range of interest for many relevant reactions on carbon. The MoNA collaboration performed a dedicated experiment to measure cross sections of these reactions at the Los Alamos Neutron Science Center (LANSCE), where a white neutron beam is produced with energies up to 800 MeV. Two diamond detectors were installed on the 15L flight path 90 m away from the spallation target at LANSCE and used as both targets and detectors. A wall of MoNA detectors were set up 2 m downstream to detect the scattered neutrons. Results of various inelastic n+^{12}C reaction cross sections and scattered neutron angular distributions will be presented.

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