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Determining (n,γ) cross sections using surrogate reactions NICHOLAS SCIELZO, JUTTA ESCHER, LLNL, STARS/LIBERACE COLLABORATION — Direct measurements of neutron-reaction cross sections on unstable nuclei are extremely challenging due to the difficulties associated with radioactive targets and neutron beams. Indirect methods, such as the surrogate reaction method, are currently the only feasible way to determine many of the cross sections for radioactive nuclei that are of interest to nuclear astrophysics, nuclear energy, and other applications. We have used the surrogate reaction method to determine (n,γ) cross sections for ^{153,155,157}Gd nuclei at energies up to 3 MeV through inelastic proton scattering on stable targets. The STARS/LiBerACE silicon and germanium detector arrays were used to detect γ rays in coincidence with the scattered protons to determine γ-ray exit-channel probabilities. Techniques are being explored to extract reliable cross sections at energies for which the Weisskopf-Ewing limit of the Hauser-Feshbach theory is not applicable. This measurement will provide the first determination of the (n,γ) cross section for ^{153}Gd, an s-process branch-point nucleus with a half-life of 240 days. This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

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