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Precision Cross Sections Measurement of ^{56}Fe(n,nγ) at 14.1 MeV using Associated Particle Neutron Elemental Imaging Technique HAOYU WANG, DAVID KOLTICK, Purdue University — Integral production cross sections for 846.8 keV and 1238.3 keV prompt gamma rays from 14.1 MeV neutrons interactions on ^{56}Fe and are reported, using Associated Particle Neutron Elemental Imaging technique. The experimental technique involves: (1) The development of a VME standard high speed DAQ system and a MATLAB parallel cluster for offline signal analysis with full control of data flow; (2) The advantage of the <1.5 ns coincidence timing resolution between the neutron production and the gamma ray detection to reject noise; (3) A large 30% solid angle gamma ray coverage by an array of NaI(Tl) detectors. The neutron flux is measured through detecting the associated alpha-particle from the D-T fusion reaction in the neutron generator. Present cross section measurements using other techniques with limited timing resolution and solid angle coverage are in agreement at neutron energies lower than 6 MeV. At higher neutron energies reported results can disagree by more than 20%. This more accurate technique presented can distinguish between the differences in the reported results based on pulse-mode neutron source and neutron time-of-flight techniques, at higher neutron energies.

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