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Optimization of Neutron Activation of Carbon at the NIF

S. PADALINO, D. POLSIN, M. RUSS, SUNY Geneseo, T. SANGSTER, LLE, LLE COLLABORATION — To determine the rhoR of ignition scale targets at the NIF, a carbon activation diagnostic is being developed to measure tertiary neutron yield. It has been shown theoretically that the ratio of the tertiary yield to the primary yield is directly related to rhoR and is nearly independent of hot-spot electron temperature. Due to carbon's 20.3 MeV reaction threshold, it is insensitive to 14.7 MeV primary neutrons which are measured by other means and allows for an unambiguous determination of the tertiary to primary ratio. The energy distribution of the 20 to 30 MeV DT neutrons folded with the (n,2n) cross section in this energy region determines the degree in which carbon will be activated. However, the published $^{12}\text{C}(n,2n)$ cross sections in this energy range are bifurcated. To set upper and lower limits on the sensitivity of the activation diagnostic, a finite element calculation was used to determine the limits of the method's usefulness at differing primary yields and solid angles for the NIF chamber. It was further used to verify MCNPX activation calculations. This work was funded in part by the USDOE through LLE.

- Prefer Oral Session
 Prefer Poster Session

Danae Polsin
dnp9@geneseo.edu
SUNY Geneseo

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