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Inference of total DT fusion neutron yield from prompt gamma-ray measurements at the National Ignition Facility J.A. CHURCH, Lawrence Livermore Natl Lab, H.W. HERRMANN, Los Alamos Natl Lab, W. STOEFFL, J.A. CAGGIANO, C. CERJAN, D. SAYRE, Lawrence Livermore Natl Lab — Prompt D-T fusion gamma-rays measured at the National Ignition Facility (NIF) with the Gamma-ray Reaction History detector (GRH) have been used recently to infer the total DT fusion neutron yield of inertial confinement fusion (ICF) implosions. DT fusion produces energetic gamma-rays (16.75 MeV) with a small branching ratio of approximately (4.2 +/- 2.0)e-5 γ/n. While the large error bar precludes use of the branching ratio for an accurate yield determination, the gamma-rays themselves provide the most unperturbed measure of fusion burn and can be used for such a purpose. A cross-calibration for the DT fusion gamma-ray to neutron signal is obtained via low areal density exploding pusher implosions which have mostly unperturbed neutron and gamma-ray signals. The calibration is then used to infer total DT neutron yield from gamma-ray measurements on high areal-density, cryogenically layered implosions in which neutrons are heavily down-scattered (up to 30%). Furthermore, the difference between the gamma-ray inferred total DT yield and the primary neutron yield (unscattered neutrons) can be used to estimate the total down-scatter fraction. Error analysis and comparison of yield values will be presented. This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344, LLNL-ABS-657694.

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