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Laser propagation through full-scale, high-gain MagLIF gas pipes using the NIF BRADLEY POLLOCK, LLNL, ADAM SEFKOW, SNL, CLEMENT GOYON, DAVID STROZZI, SHAHAB KHAN, MORDY ROSEN, LLNL, MIKE CAMPBELL, LLE, GRANT LOGAN, KYLE PETERSON, SNL, JOHN MOODY, LLNL — The first relevant measurements of laser propagation through surrogate high-gain MagLIF gas pipe targets at full scale [1,2] have been performed at the NIF, using 30 kJ of laser drive from one quad in a 10 ns pulse at an intensity of 2e14 W/cm^2. The unmagnetized pipe is filled with 1 atm of 99%/1% neopentane/Ar, and uses an entrance window of 0.75 um polyimide and an exit window of 0.3 um of Ta backed with 5 um of polyimide. Side-on x-ray emission from the plasma is imaged through the 100 um-thick epoxy wall onto a framing camera at four times during the drive, and is in excellent agreement with pre-shot HYDRA radiation-hydrodynamics modeling. X-ray emission from the Ta exit plane is imaged onto a streak camera to determine the timing and intensity of the laser burning through the pipe, and the Ar emission from the center of the pipe is spectrally- and temporally-resolved to determine the plasma electron temperature. Backscatter is measured throughout the laser drive, and is found to be of significance only when the laser reaches the Ta exit plane and produces SBS. These first results in unmagnetized surrogate gas fills are encouraging since they demonstrate sufficient laser energy absorption and low LPI losses within high-density long-scale-length plasmas for proposed high-gain MagLIF target designs. We will discuss plans to magnetize targets filled with high-density DT gas in future experiments.
[1] S. A. Slutz and R. A. Vesey, Phys. Rev. Lett. 108, 025003 (2012). [2] A. B. Sefkow, et. al., Phys. Plasmas 21, 072711 (2014). *This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the National Nuclear Security Administration under Contract No. DE-AC04-94AL85000.*

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