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1-MJ, Wetted-Foam Target-Design Performance for the NIF

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Wetted-foam, direct-drive target designs are a path to high-gain experiments on the National Ignition Facility (NIF). Wetted-foam designs[1,2] take advantage of the increased laser absorption provided by the higher-atomic-number elements in the mixture of plastic foam and deuterium–tritium (DT). The fractional absorption is expected to increase by as much as 30% relative to an "all-DT" target[3] for a ~1-MJ design, depending on the density of the foam and the specific target design. With the increased laser coupling, more fuel can be driven with the same incident laser energy, resulting in increased target gain and/or increased hydrodynamic stability. A stability analysis of a 1-MJ design performed using two-dimensional hydrodynamic simulations in the presence of expected levels of laser and target nonuniformities will be shown. For this design, the sources of nonuniformity from the laser include power imbalance between laser beams and the imprint of single-beam nonuniformities on the target. Target nonuniformities include surface finish and inner-surface DT-ice roughness. The relative impact of these sources of nonuniformity on target performance will be examined. Particular emphasis will be placed on identifying the required levels of beam smoothing with regard to smoothing by spectral dispersion. While this emphasizes symmetric illumination, the results are relevant to polar direct drive, where a direct-drive target is driven on the NIF while it is in its indirect-drive configuration.[4] This work was supported by U. S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement No. DE-FC52-92SF19460. Contributors: S. Skupsky, R. Betti, P. W. McKenty, P. B. Radha, V. N. Goncharov, D. R. Harding, J. P. Knauer, J. A. Marozas, R. L. McCrory, UR/LLE.

[1] S. Skupsky *et al.*, in *Inertial Fusion Sciences and Applications 2001*, edited by K. Tanaka, D. D. Meyerhofer, and J. Meyer-ter-Vehn (Elsevier, Paris, 2002), p. 240.
[2] D. G. Colombant *et al.*, Phys. Plasmas **7**, 2046 (2000).
[3] P. W. McKenty *et al.*, Phys. Plasmas **8**, 2315 (2001).
[4] S. Skupsky *et al.*, Phys. Plasmas **11**, 2763 (2004).