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SIMULATION OF THE DART IMPACT: EFFECTS OF IMPACT CONDITIONS AND TARGET PROPERTIES

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Keywords: *Planetary Defense, Kinetic Impactor, Deflection, DART*

ABSTRACT

In 2022, NASA's DART mission will execute a measurable deflection of the ~160 m moonlet at the binary near-Earth asteroid Didymos when its 500 kg spacecraft impacts the targeted body at 6 km/s. As the first demonstration of asteroid deflection technology, DART will provide an unprecedented opportunity to compare shock physics code calculations against a large-scale impact experiment under the conditions of interest for planetary defense. Pre-impact calculations must account for a wide array of possible impact conditions and target properties, in order to bound the potential outcomes. Here we investigate how impact geometry (target shape and impact angle) and the equation of state, porosity, strength, and damage models used to represent the target asteroid affect the details of the cratering event and the efficacy of the deflection. Additional relevant work on this topic examines internal structure variations, e.g. "rubble pile" representations of the target (see contributions from Graninger et al. and Owen, this session), and the use of a detailed shape model for the DART spacecraft impactor (Owen, this session).

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. LLNL-ABS-763363

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