THE EFFECTS OF IMPACT GEOMETRY ON CRATERING AND MOMENTUM TRANSFER. H. F. Agrusa[*1,2], D. M. Graninger[1], M. B. Syal[1] , J. M. Owen[1]. [1]Lawrence Livermore National Laboratory. [2]University of Maryland, College Park.[*]agrusa1@llnl.gov

NASA's Double Asteroid Redirection Test (DART) is designed to be the first demonstration of a kinetic impactor for planetary defense against a small body impact hazard. The target is the satellite of the binary asteroid 65803 Didymos.

A primary goal of the mission is to measure the change in the system's orbital period in order to infer the momentum transfer coefficient, β. Beta is traditionally defined as the scalar quantity $\beta = 1 + p_{ejecta}/p_{impactor}$, where $p_{impactor}$ is the spacecraft's momentum and p_{ejecta} is the momentum of the ejecta along the spacecraft's momentum vector. However, a sizeable amount of momentum may be transferred in other directions due to the impact angle, spacecraft attitude, and local topography.

In this work, we use Spheral, an Adaptive Smoothed Particle Hydrodynamics (ASPH) code to simulate the DART impact for various impact angles and spacecraft attitudes. Using a realistic model of the DART spacecraft, we measure the momentum transfer coefficient in three dimensions, the shape of the ejecta curtain, and the shape of the resulting crater. This study will be used to place constraints on β given the uncertainties in DART's geometry relative to the surface at impact.

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-973951