OBLIQUE SHOCK REFLECTION AND REFRACTION AT A GAS INTERFACE: XRAGE VS. FLASH

Abstract: The accuracy and performance of xRage (LANL) and FLASH (the University of Chicago), two Eulerian hydrodynamics codes, are compared by modeling the reflection and refraction of oblique shock waves at a gas interface. Thirty-six simulations were performed to investigate slow-fast refractions, as well as regular and irregular configurations at six distinct levels of refinement. It was found that both codes agree well with shock polar theory for regular cases and show good agreement in their shock structure for irregular cases. We observe drastic differences in the growth of instabilities at interfaces and the execution time of both codes due to their implementation differences in interface treatment and adaptive mesh refinement.

Burke Irwin '19

Senior Exercise Talks in Physics

FRIDAY, DECEMBER 7, 2018 - 12:10 PM

Hayes Hall 211/213

Lunch will be served from 11:50 am to 12:10 pm

Andrew Lesak '19

QUANTIFYING STATE-MIXING IMPACTS ON THE RYDBERG EXCITATION BLOCKADE

Abstract: Rydberg atoms, or atoms with high principal quantum number n, are ideal for studying quantum phenomenon due to their exaggerated properties relative to ground-state atoms. When exciting Rydberg atoms using a laser pulse, the highly polarizable atoms interact and the resonant frequencies of the atoms are shifted, leading to a suppression of excitation known as the "Rydberg excitation blockade." In an ideal blockade, many atoms share one excitation and a more complete blockade is achieved when neighboring atoms interact more strongly. However, stronger interactions can lead to the excitation of unwanted states, breaking the blockade. In order to implement scalable quantum computers, the Rydberg excitation blockade must be used in large samples and therefore state-mixing properties must be rigorously studied in order to minimize the negative impacts. We seek to quantify exactly how much state-mixing reduces blockade efficiency and to determine the number of interacting bodies that lead to large amounts of state-mixing. In this talk, I will discuss our on-going efforts towards studying the blockade and present preliminary results.