

Abstract Submitted  
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**Implementation of collisions on GPU architecture in the Vorpall code**<sup>1</sup> JARROD LEDDY, SERGEY AVERKIN, BEN COWAN, SCOTT SIDES, Tech-X Corp, GREG WERNER, University of Colorado Boulder, JOHN CARY, Tech-X Corp — The Vorpall code contains a variety of collision operators allowing for the simulation of plasmas containing multiple charge species interacting with neutrals, background gas, and EM fields. These existing algorithms have been improved and reimplemented to take advantage of the massive parallelization allowed by GPU architecture. The use of GPUs is most effective when algorithms are single-instruction multiple-data, so particle collisions are an ideal candidate for this parallelization technique due to their nature as a series of independent processes with the same underlying operation. This refactoring required data memory reorganization and careful consideration of device/host data allocation to minimize memory access and data communication per operation. Successful implementation has resulted in an order of magnitude increase in simulation speed for a test-case involving multiple binary collisions using the null collision method.

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Jarrold Leddy  
Tech-X Corp

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