Problem Statement for GEANT4-GPU

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Description of Problem
GEANT-4 is a widely-used simulation program used to simulate particle interactions. There are currently several members of McMaster's Engineering Physics department that use the program, and are being limited by the performance of the software. This means that they cannot simulate particle interactions that take place over the course of minutes (or even seconds), and they also can't simulate large numbers of particles.

Increasing the runtime of the simulation or the number of particles would greatly increase the accuracy of their results, allowing the researchers to understand the systems they're modeling better. This is especially true when modeling complex systems, such as McMaster's nuclear reactor. Depending upon the level of success of the project, the solution could potentially benefit groups that use GEANT-4 outside of McMaster as well.

Stakeholders
The McMaster Engineering Physics Department is the main stakeholder of this project as they use GEANT-4 for their nuclear simulations. If the project is extremely successful, and if an application to CERN about GEANT-4 collaboration is voted in, CERN and other users of GEANT-4 could become stakeholders as well.

Context & Environment
'The Project' is designed on a specific-need basis. 'It' aims to alleviate research problems in the fields of nuclear engineering and quantum physics. And so, the setting in which the software will be implemented is primarily acedemic; the expected environment being Engineering and Physics labs and offices. That said, there are no restrictions limiting the solution to only scholastic uses, it is open to be used for all research centered around GEANT-4.