GEANT-4 GPU Port:

Design Document

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Contents

1 Introduction

1.1 Purpose

The purpose of GEANT4-GPU is to reduce the computation times of particle simulations.

1.2 Description

The project aims to improve the computation times of GEANT4 particle simulations by running simulations on the GPU. GEANT4-GPU will allow users to build GEANT4 with an enable GPU acceleration option. Our implementation will be available on Mac, Linux and Windows operating systems with NVIDIA graphics cards. GEANT4-GPU must be able to do particle simulations much faster than running the simulations on a GEANT4 build that runs entirely on the CPU.

1.3 Scope

The scope of GEANT4-GPU will be limited to Engineering Physics simulations; particularly those that make use of the NeutronHPVector class.

Revision History

All major edits to this document will be recorded in the table below.

Table 1: Revision History

Description of Changes	**Author**	**Date**
Set up sections and filled out Introduction section	Matthew	2015-12-15

2 Anticipated and unlikely changes

2.1 Likely Changes

2.2 Unlikely Changes

3 Module Hierarchy

4 Connection between requirements and design

5 Traceability matrices

6 MIS of NeutronHPDataPoint

6.1 Interface Syntax

6.2 Exported Access Programs

6.3 Interface Semantics

6.3.1 State Variables

energy : G4Double
xSec : G4Double

6.3.2 Environment Variables

There are no environment variables for this Module.

6.3.3 Assumption

6.3.4 Access Program Semantics

7 MIS of NeutronHPVector

7.1 Interface Syntax

7.2 Exported Access Programs

7.3 Interface Semantics

7.3.1 State Variables

G4NeutronHPInterPolator : theLin
totalIntegral : G4double

G4NeutronHPDataPoint * : theData
G4InterpolationManager : theManager
G4double * : theIntegral
G4int : nEntries
G4int : nPoints
G4double : label
G4NeutronInterpolator : theInt
G4int : Verbose
G4int : isFreed
G4NeutronHPHash : theHash
G4double : maxValue
vector¡G4double¿ : theBlocked
vector ¡G4double¿ : theBuffered
G4double : the15percentBorderCash
G4double : the50percentBorderCash

7.3.2 Environment Variables

There are no environment variables for this Module.

7.3.3 Assumption

7.3.4 Access Program Semantics

8 MIS of CMake Files

8.1 Interface Syntax

8.2 Exported Access Programs

8.3 Interface Semantics

8.3.1 State Variables

useCuda : Bool

8.3.2 Environment Variables

NeutronHPVectorGPU.cu : cuda file with GPU code

8.3.3 Assumption

8.3.4 Access Program Semantics