CAD -> Geant4 Converter Update

Carl Vuosalo

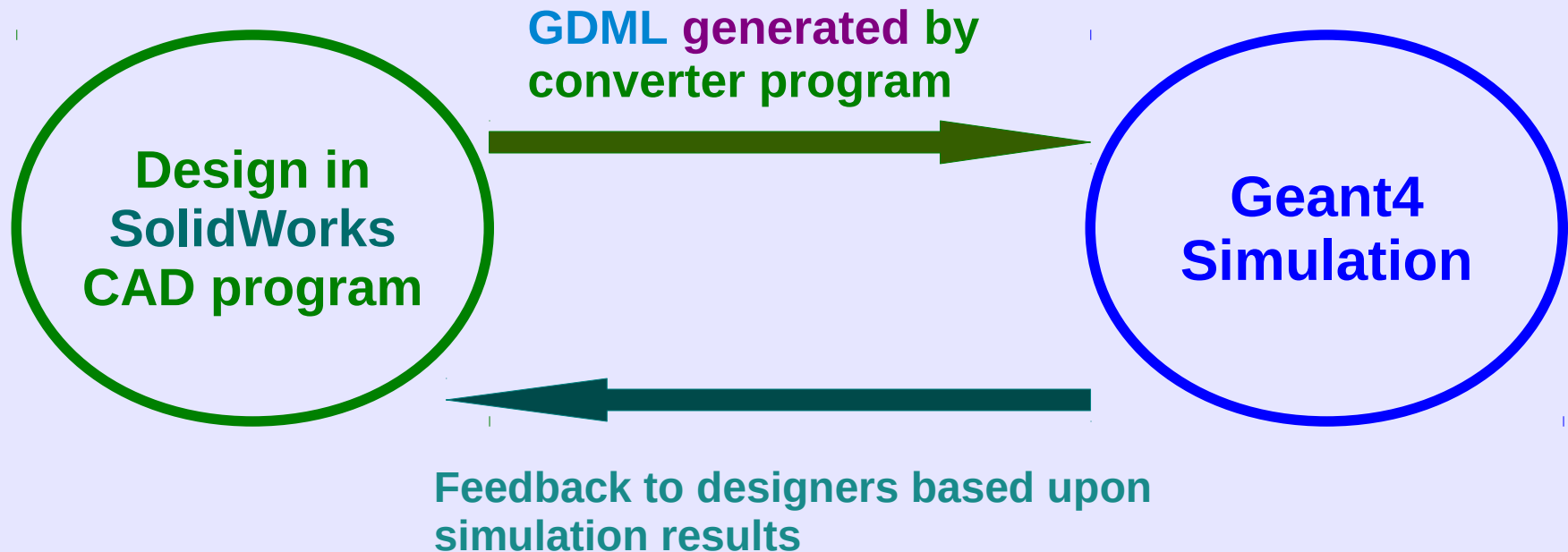### University of Wisconsin-Madison

SolidWorks -> Geant4 Converter

- Goal to have fully automated process of transferring design from SolidWorks into Geant4
  - Facilitate iterative design and simulation
  - Ensure accuracy of design description in Geant4

GDML generated by converter program

Design in SolidWorks CAD program

Geant4 Simulation

Feedback to designers based upon simulation results

CAD-to-Geant4 Converter

- Program to automatically convert design in SolidWorks CAD program to GDML format for loading into Geant4

- C++ program developed with Visual Studio and using the SolidWorks Application Programming Interface

- About 3000 lines of code currently

- Takes one SolidWorks file and produces GDML output file
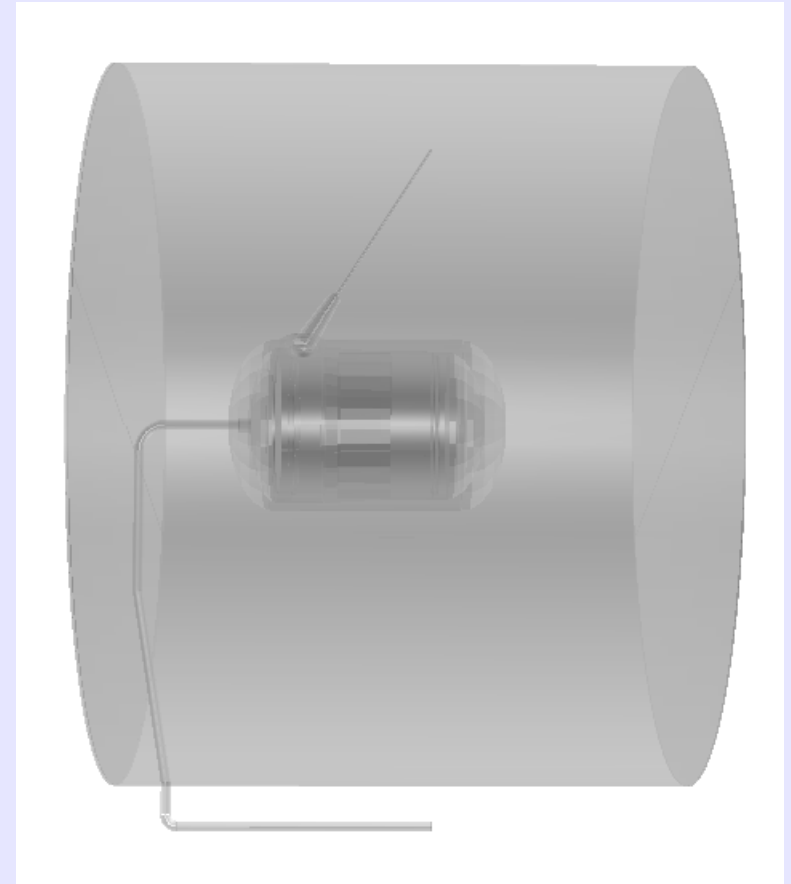
- Developed for LUX-Zeplin experiment

Simple Design for Conversion

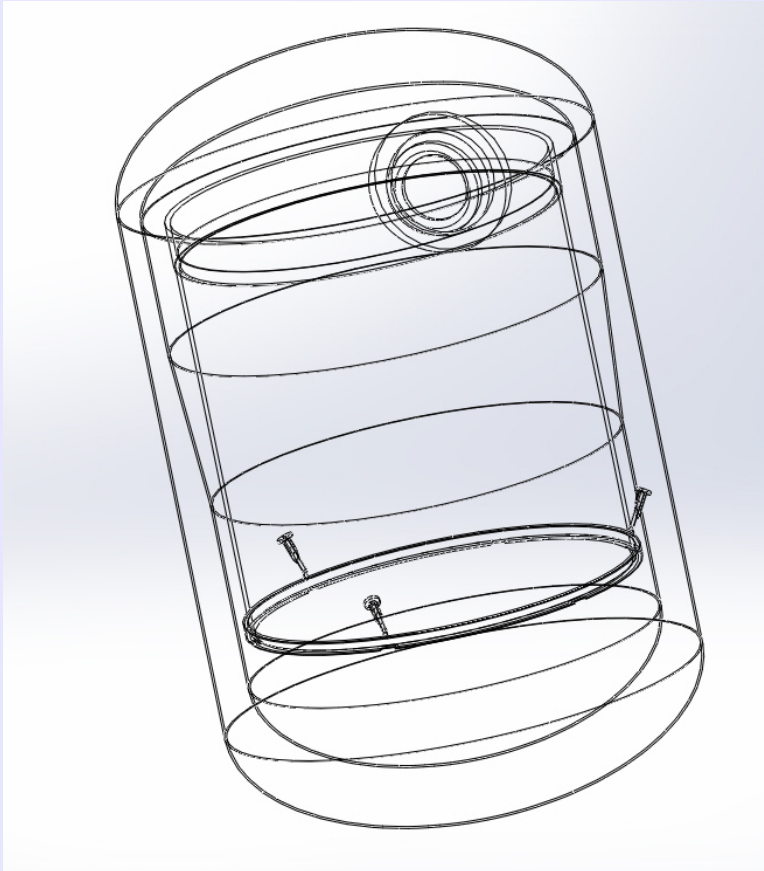SolidWorks Design
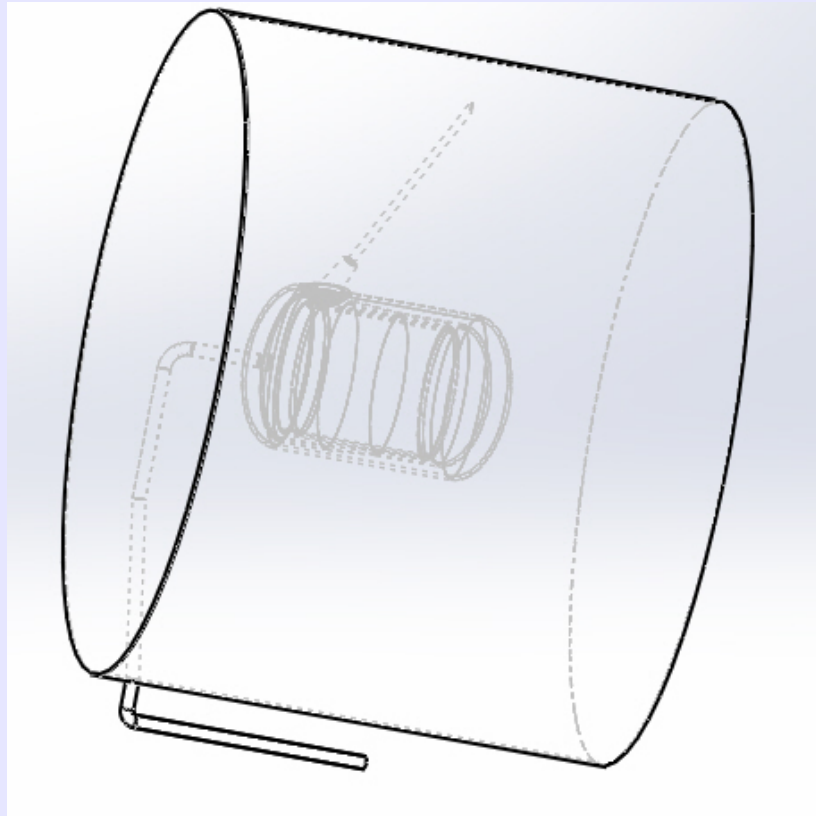
Same Design in Geant4

• Provides example of simplified SolidWorks feature set that must be supported by converter – full conversion now successful
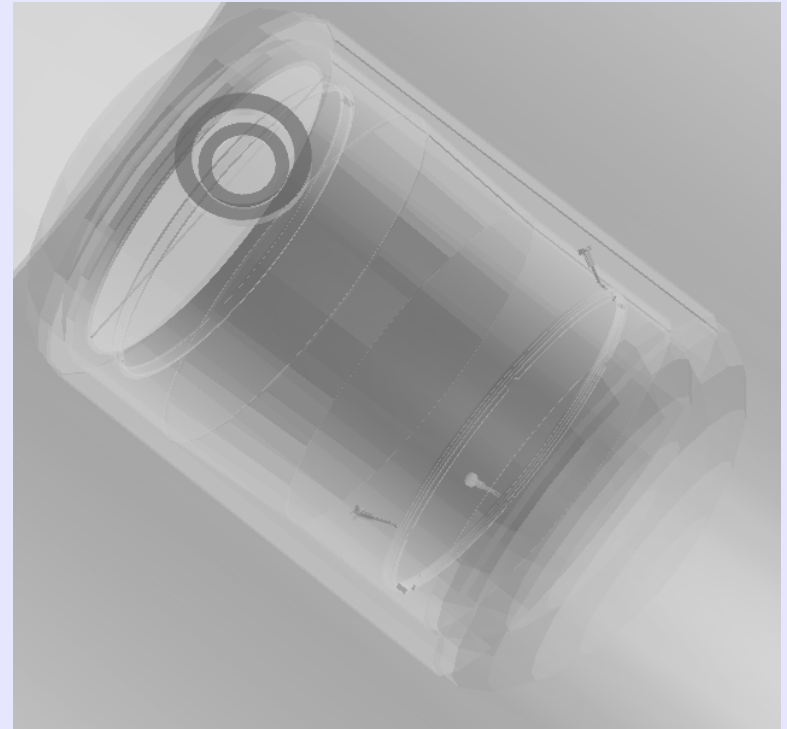
New Version of Simple Design
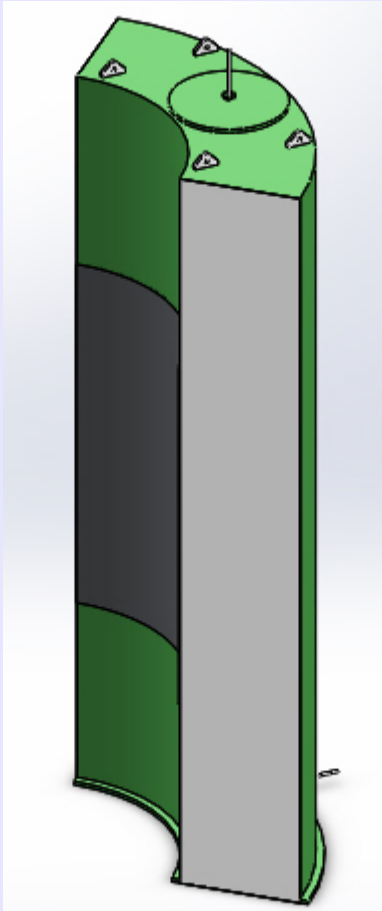
SolidWorks Design

Same Design in Geant4

- Simple design was revised to challenge the converter
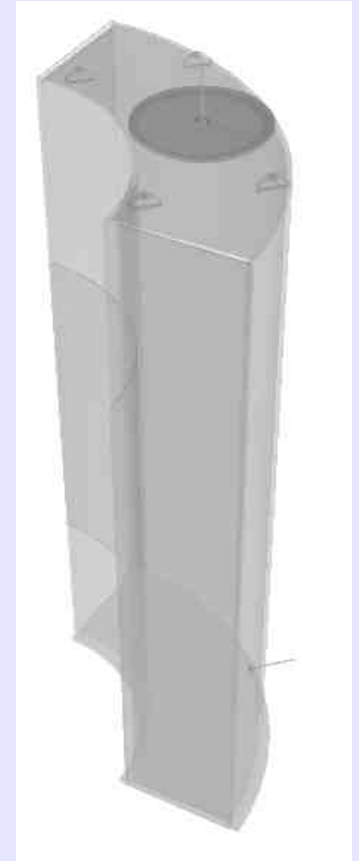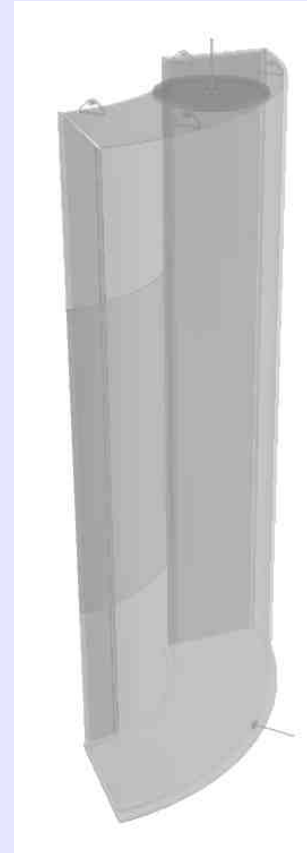- After some bug fixes, conversion successful

Tank Design Converted

SolidWorks Design

Same Design in Geant4

- Tank design contains multiple coordinate systems and methods of placing parts
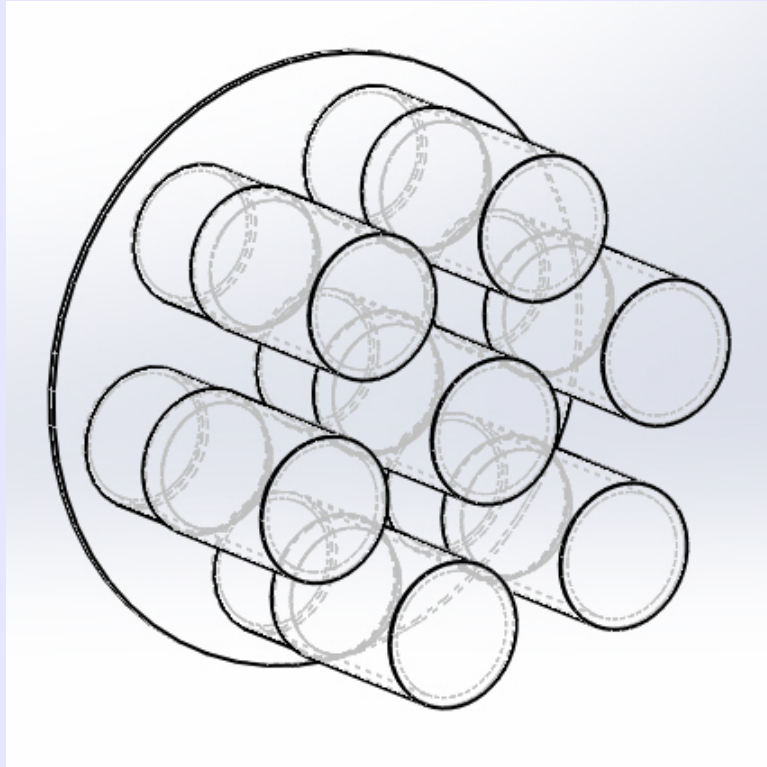
Features Supported

- Shapes:
  - Cylinder (full and partial)
  - Cone
  - Disk (full and partial)
  - Board
  - Torus
  - Half-ellipsoid with circular face
- Cylindrical holes in parts
- Multiple coordinate systems in simple configurations
- Repeated parts in linear patterns
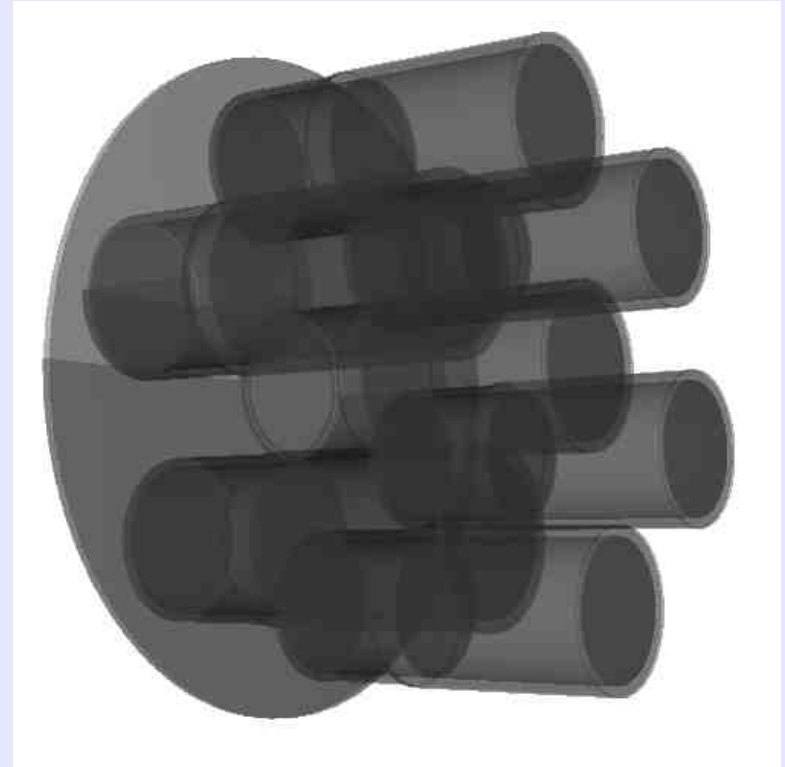- Parts assigned material properties as specified in SolidWorks

New Challenges

Same Design in Geant4

- Model of a gamma ray camera
- Developed by Connor Challinor, a mechanical engineering student at Lancaster University, UK
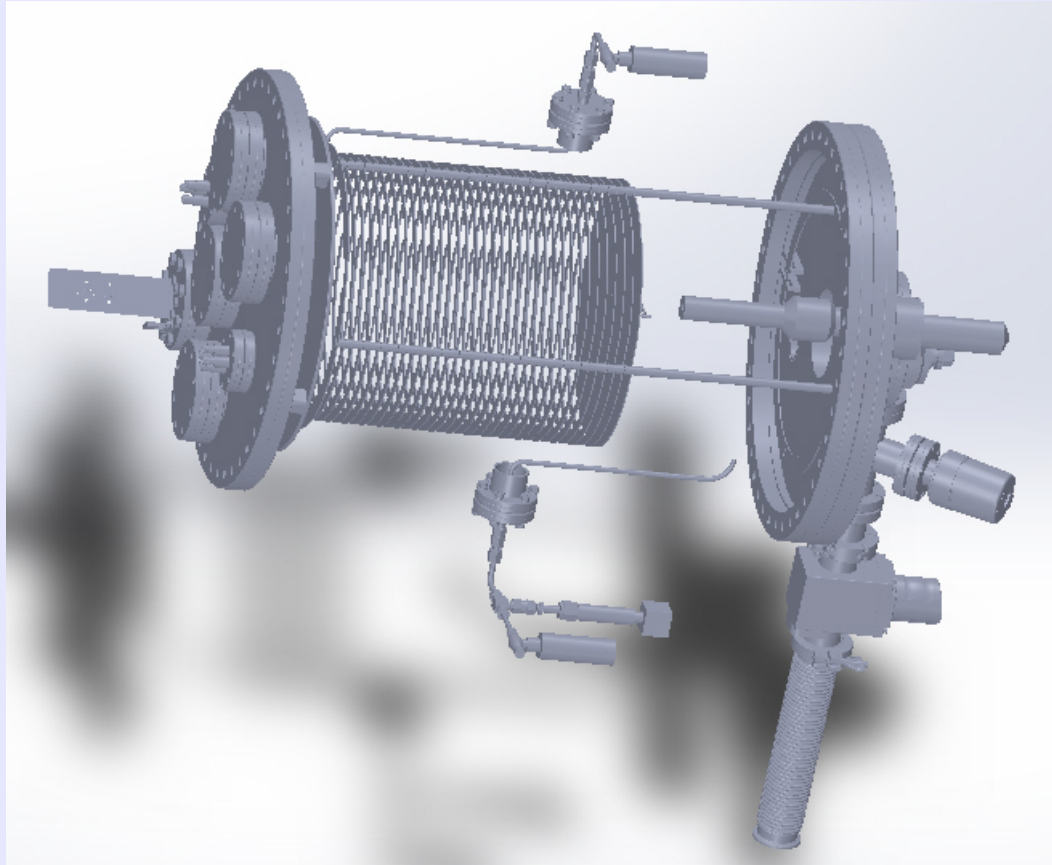
Another New Challenge

SolidWorks Design

- Model of a time projection chamber
- From Panda X-III dark matter detection experiment
- Sent by Javier Galan of Shanghai Jiao Tong University
  ➤ After I published converter paper on arXiv

Looking for Student Developers

- Converter program needs enhancement to fully convert these new models
- If you have C++ programming skills, you could help enhance the program
- There is significant interest in the physics community for this tool