CAD -> Geant4 Converter Update

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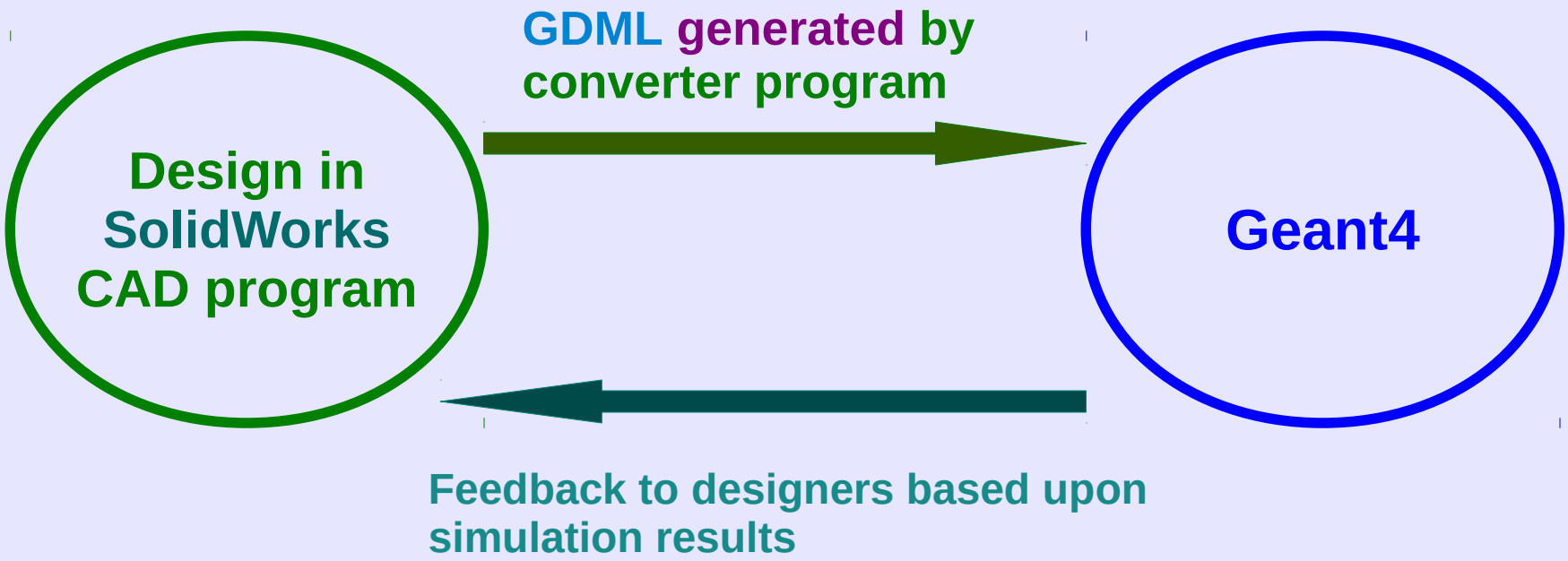
CAD-to-Geant4 Converter

- 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

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

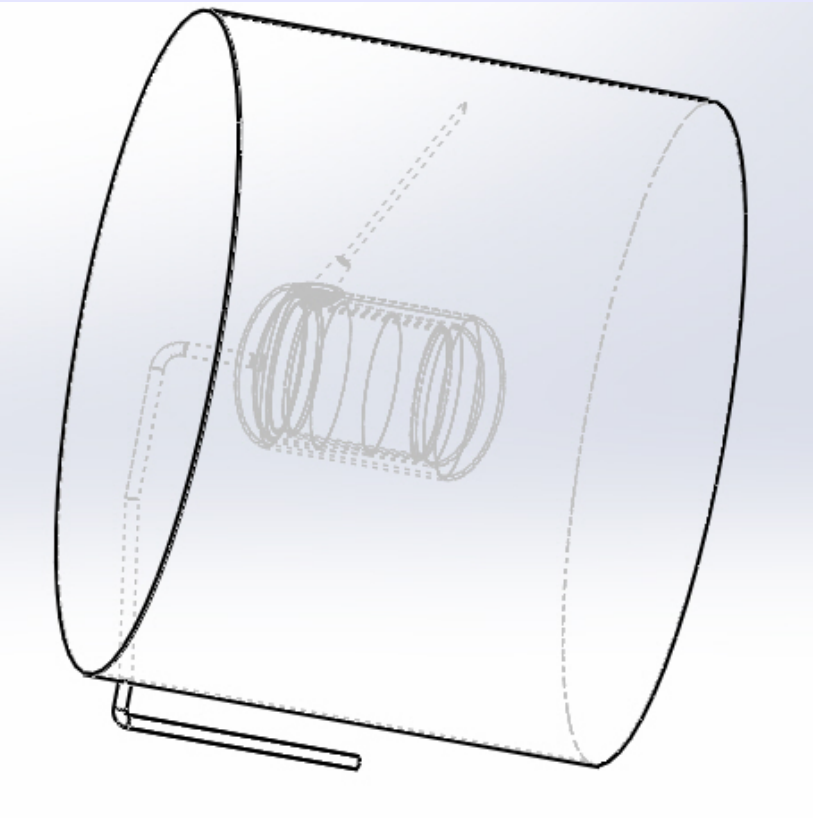


Development Plan

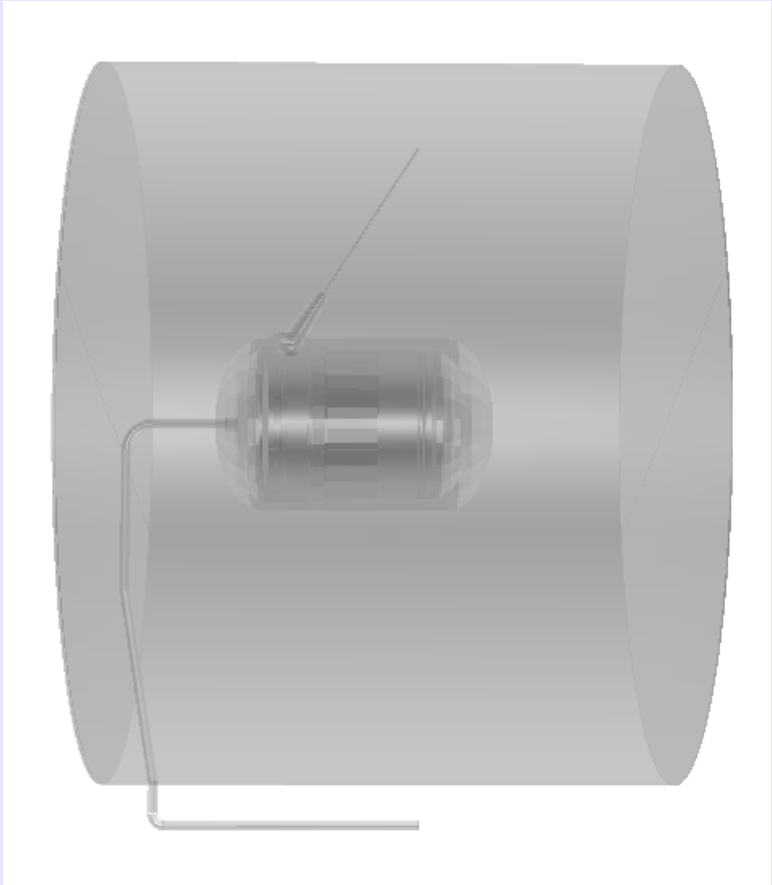
- Converter produces standard GDML solids, not tessellated shapes
- SolidWorks feature set very rich and complex
  - →Single part-time developer (myself) cannot implement in converter program support for all complex features in reasonable amount of time
- Worked with LZ engineers to create simplified set of SolidWorks features that must be supported
- Program can now convert all features of simplified designs

Simple Design for Conversion

SolidWorks Design



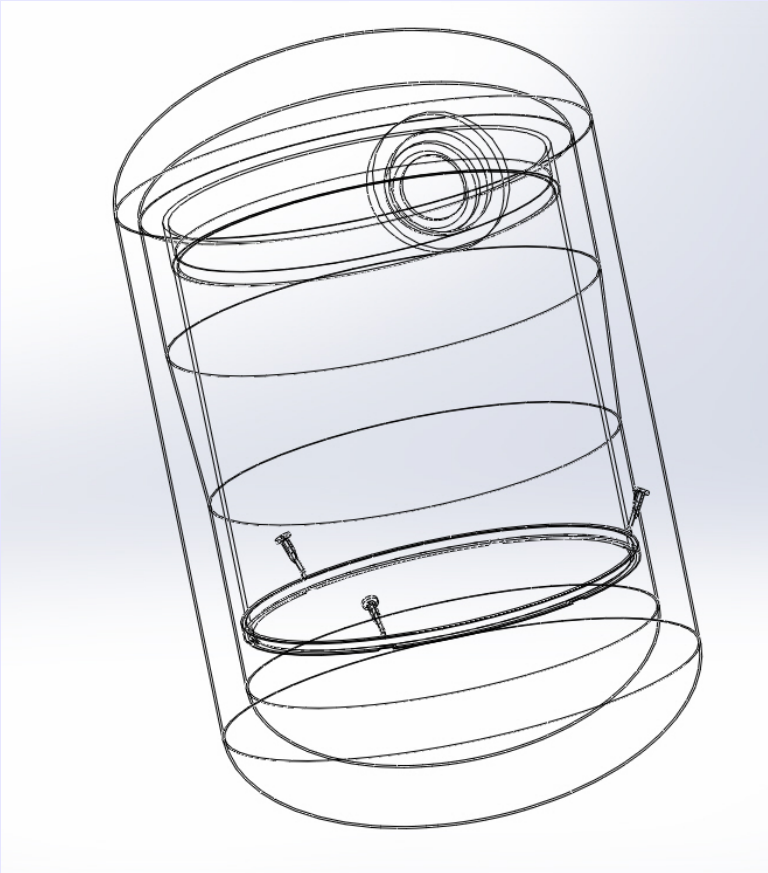
Same Design in Geant4



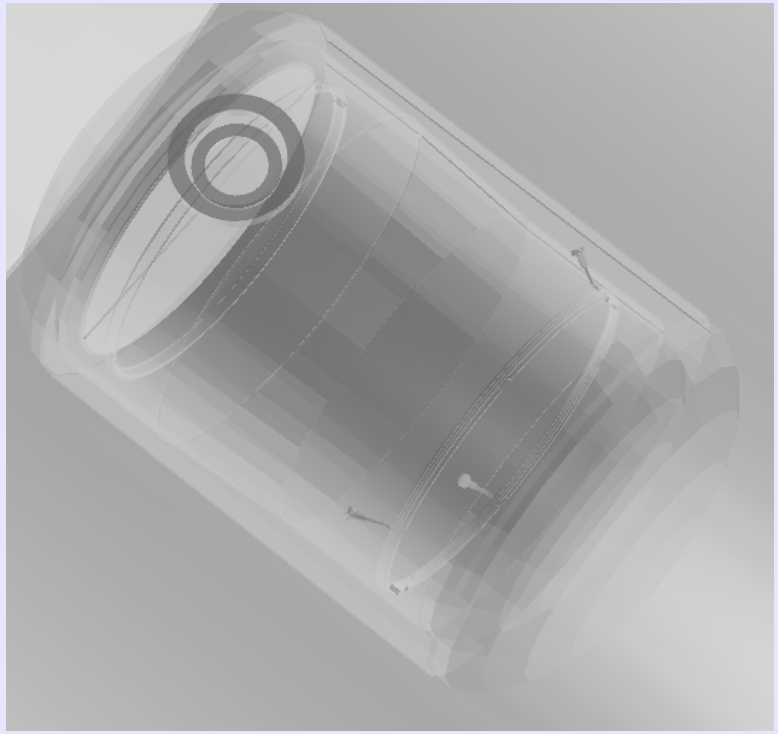
• Provides example of simplified SolidWorks feature set that must be supported by converter – full conversion now successful

New Version of Simple Design

SolidWorks Design



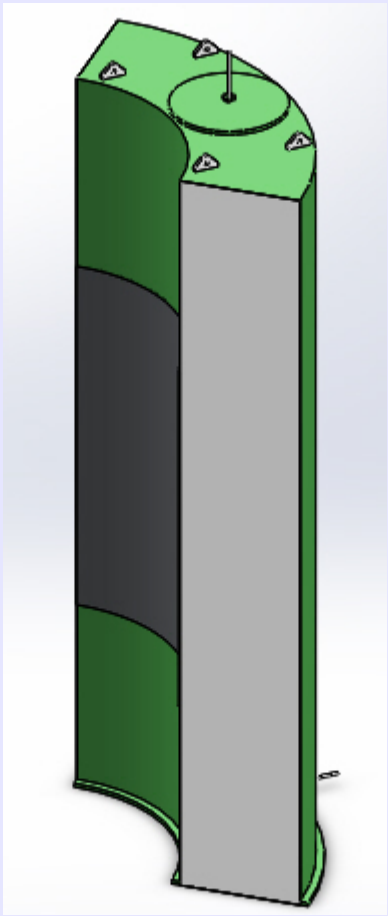
Same Design in Geant4



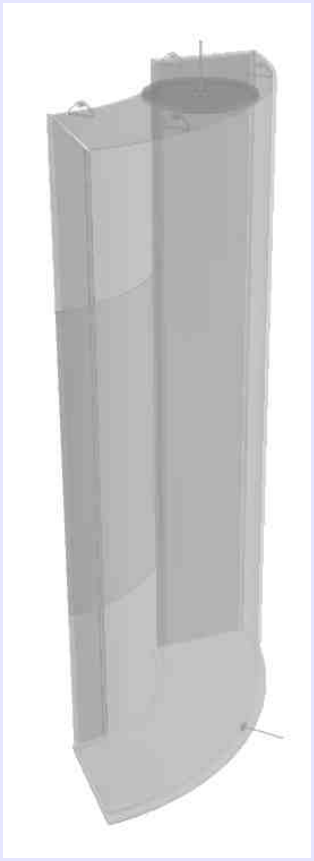
- Simple design was revised to challenge the converter
- After some bug fixes, conversion successful

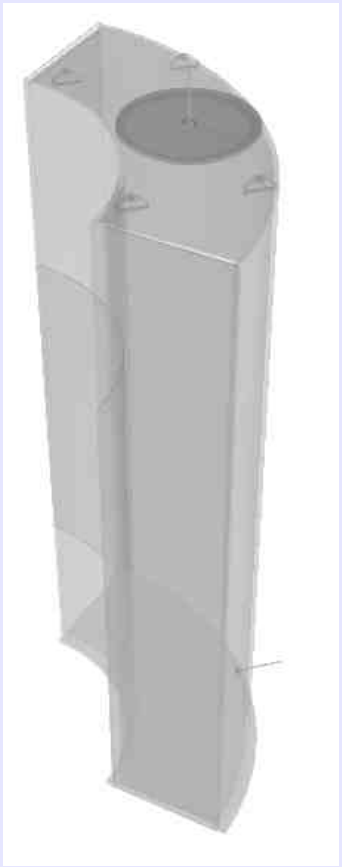
Tank Design Converted

SolidWorks Design



Same Design in Geant4





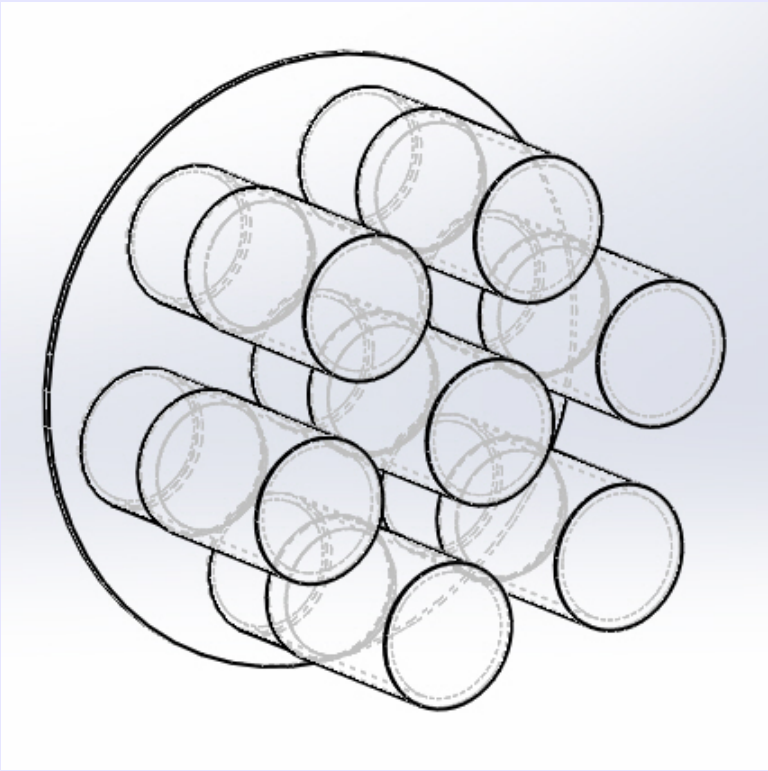
- Tank design contains multiple coordinate systems and methods of placing parts

Features Supported

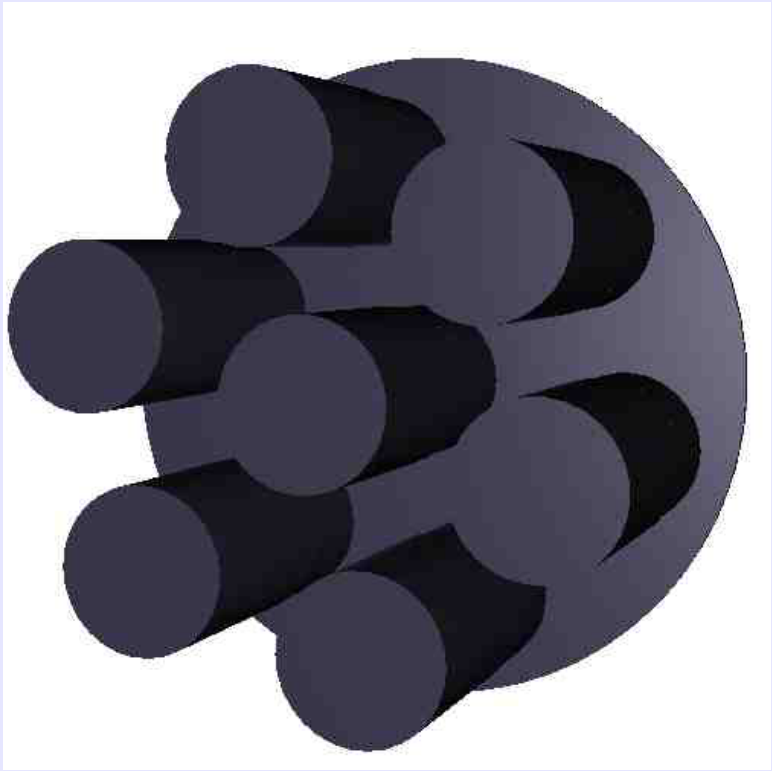
- Shapes:
  - Cylinder (full and partial)
  - Cone
  - Disk (full and partial)
  - Board
  - Torus
  - Half-ellipsoid with circular face
- Cylindrical holes in parts
- Multiple coordinate systems in simple configurations
- Repeated parts in linear patterns
- Parts assigned material properties as specified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

Newest Challenge

SolidWorks Design



Same Design in Geant4



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