

# Introduction to GDML geometries in REMOLL

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# What is GDML?

- Specialized XML-based language to describe experimental geometries for GEANT4 simulations
- Advantages:
  - The same geometry can be ported to any GEANT4 simulation.
  - No need to recompile simulation every time the geometry is updated.

# Structure of a Basic GDML File

The file content can be divided into 6 code blocks [[Example](#)]

- 1) Schema
- 2) Definitions
- 3) [Materials](#)
- 4) Solids
- 5) Structure
- 6) Setup

# REMOLL Geometry

```
git clone https://github.com/JeffersonLab/remoll  
cd remoll  
git checkout develop  
ls geometry
```

mollerMother.gdml : main file inside which various subsystems are referenced

mollerParallel.gdml : mirror world where detectors can be placed without interfering with material world

positions.xml : file where various subsystem positions with respect to mother is listed

materials.xml : custom material definition

# Compiling and Checking Geometry for Overlaps

```
git clone https://github.com/JeffersonLab/remoll
cd remoll
git checkout develop
mkdir build
cd build
cmake -DCMAKE_BUILD_TYPE=Release ..
make -j 4
./build/remoll macros/checkoverlap.mac
```

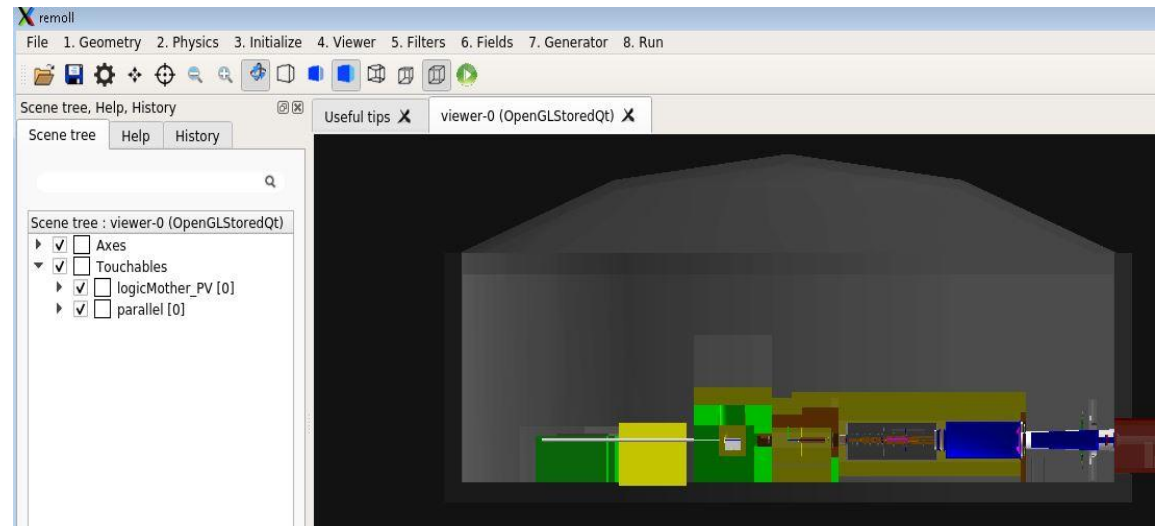
## Visualize

```
./build/remoll
```

Once GUI window opens, execute the following commands in the Session box on the bottom right corner:

```
/remoll/setgeofile geometry/mollerMother.gdml
/run/initialize
/vis/open OGL
/control/execute vis/vis.mac
```

Use the scene tree to toggle subsystem visualization on and off.



# Modifying Geometry

Go to <https://github.com/JeffersonLab/remoll>

Create a fork by clicking the fork button in the top right corner.

Under your own fork, branch off from develop.

Introduce the geometry changes you want in your new branch.

Make a PR back to develop.

N.B.:

- 1) Don't make sweeping changes in a single pull request (PR) to develop. Break them up into small self-consistent PRs with appropriate description.
- 2) If you have changes that will never make it back into develop, make them in a custom branch under your own fork and make other necessary PRs to that custom branch.

**TLDR: Use github pull requests to make geometry changes and keep the PRs small and self-consistent**

Resource for learning git:

<https://swcarpentry.github.io/git-novice/>

# Use of Parametrization

For a certain group of geometric elements, we need parametrization and replication. I prefer writing python wrappers for flexibility but parametrization and replicated volumes can be done directly in gdml as well.

Existing python wrappers:

- 1) <https://github.com/JeffersonLab/remoll-coil-generator>
- 2) <https://github.com/JeffersonLab/remoll-detector-generator>
- 3) <https://github.com/JeffersonLab/remoll-showermax-generator>

# Supplementary Resources

- 1) [Last year's talk](#)
- 2) [HEP Software Foundation Training Materials](#)



# Other Tools

- 1) Onshape: Open CAD files in step format and extract measurements. Free for students.
- 2) Pyg4ometry: Python based geometry scripting tool. Needs access to docker.