

# Implementing the new geometry

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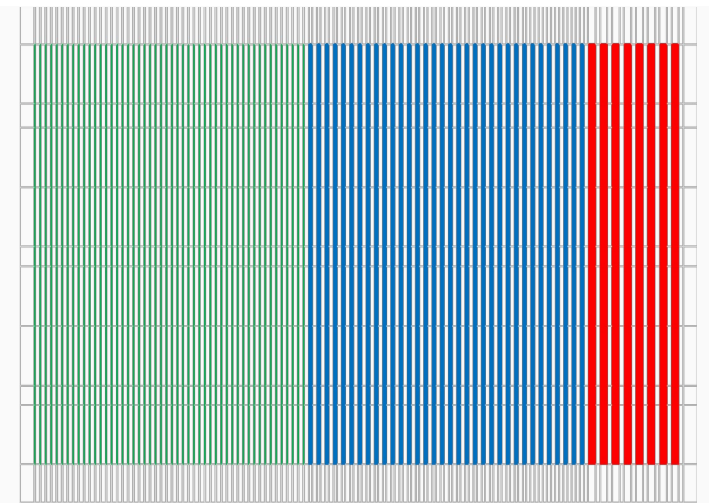
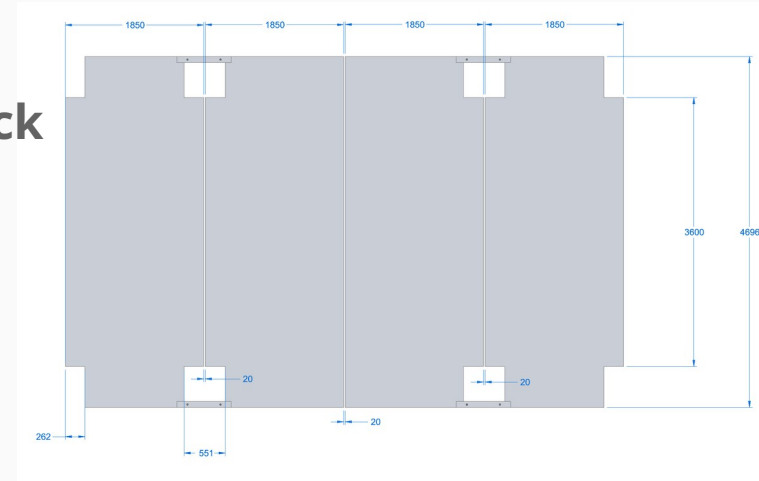


# Why a new geometry? What to use it for?

- The currently used geometry is from the **CDR** era
- Since then a **lot of things have changed** and the design was updated by the engineering group
- For the **PDR** these changes should be reflected as best as possible in the **performance studies/plots**
- Need to **implement the new geometry design** into the simulation and reconstruction

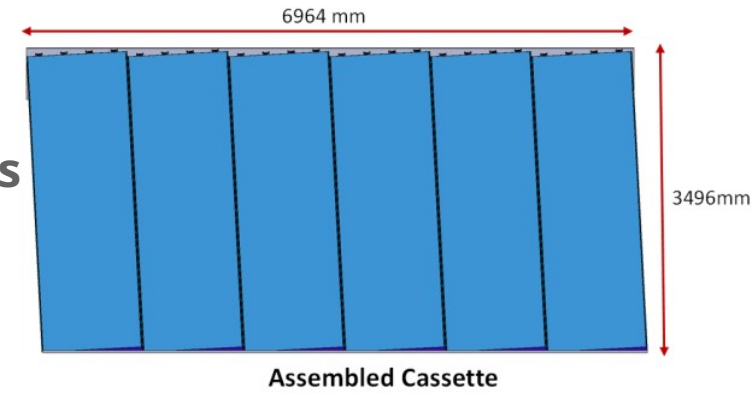
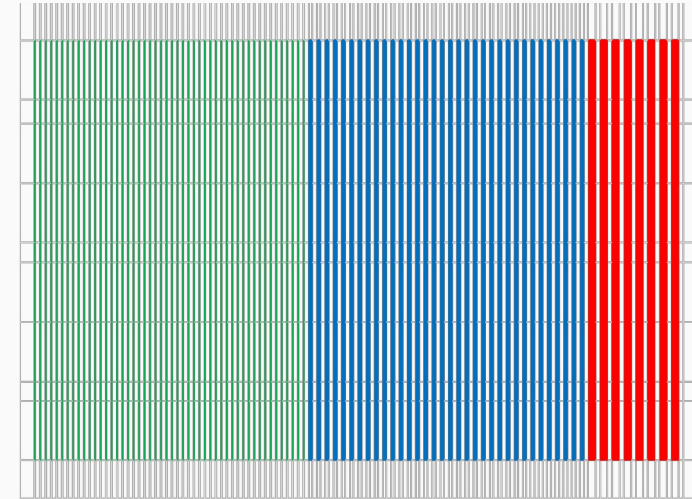
# Overview of changes

- **Steel thickness** from thin&thick → **thin** (1.5 cm), **thick** (4 cm) and **double** (8 cm)
- **Gaps** in between steel is wider (50 mm), and widens the space overall **space between scintillator layers** to 65 mm (**thin**), 90 mm (**thick**), 130 mm (**double**)
- From 3 steel plates with different sizes to **4 equal sized** (1850 mm x 4770 mm) **steel plates per layer** and 20 mm gaps in between



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- From 4 modules with 48 scintillator bars to **6 modules with 32 bars**
- **Scintillator bar dimensions** change to 17 mm thick, 36 mm wide and 3.3 m (**stereo**) / 3.5 m (**horizontal**)





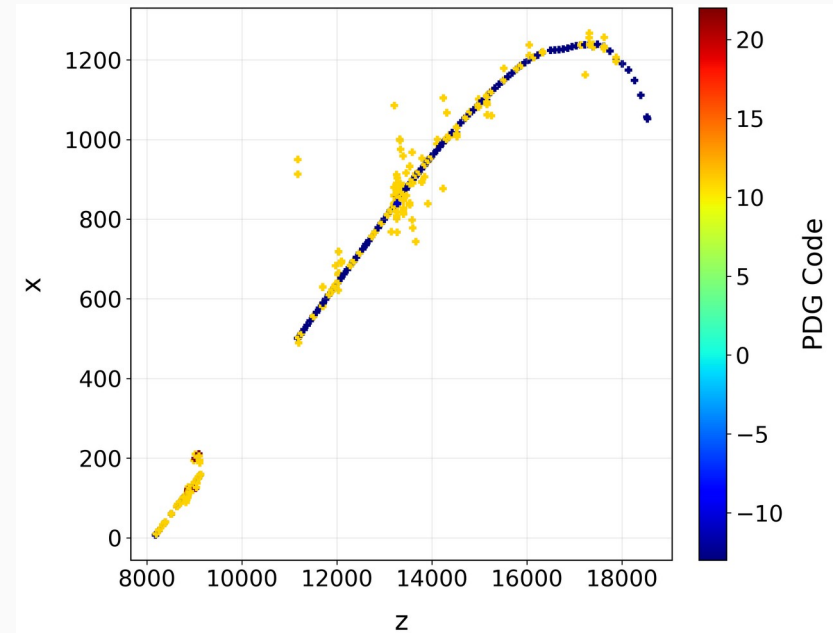
# Implementing

- These changes were implemented into the [python script](#) in dunendggd creating the gdml file for simulation
- Allows for creation of two separate geometries at the moment
  - **Stereo** UvUvUv...
  - **Hybrid** XuvXuvXuv...
  - Mat (Muether) has plans to modify the script to allow for easier changes of module orientations
- Run and passed all **overlap checks**



# Generating first simulation data

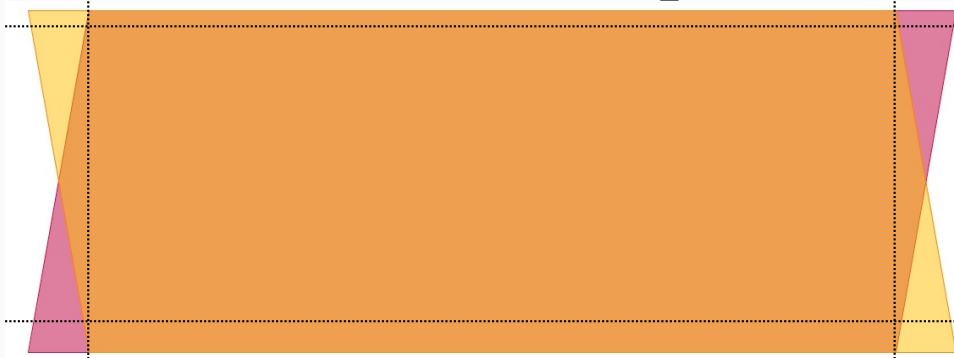
- Magnus ran a **muon gun** for **O(5000) events** with both geometries allowing for testing of the reconstruction
  - Flat energies from **500 – 5000 MeV** starting a **meter back from end face of ND-LAr**
  - He checked g4 energy hits to make sure they make it to TMS





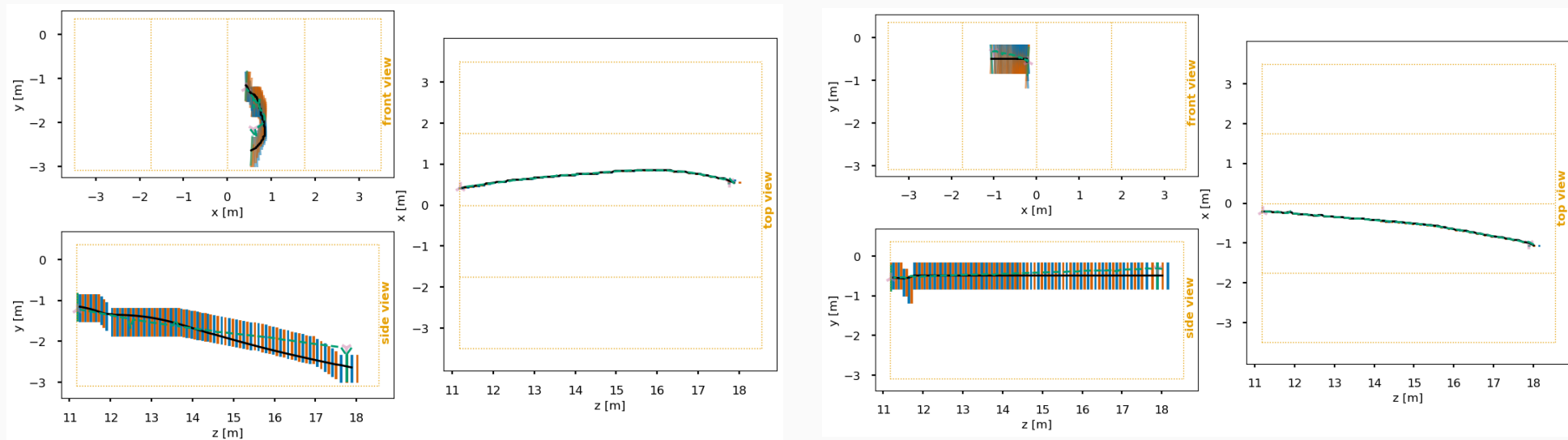
# Adapting the reconstruction

- The geometry changes need to be reflected in the **reconstruction**
  - Branch 166-new-geometry-needs-changes-to-reconstruction
  - Many steps still rely on absolute values instead of referring to the underlying geometry file
- Made changes to **TMS\_Constants.h** tried to fix all hardcoded values I could find
- Also adapted the **fiducial volume** in config/TMS\_Default\_Config.toml



# Running the reconstruction

- Run the generated events through the reconstruction
- Adapted the `draw_spill_3D_projections.py` script to these changes for plotting

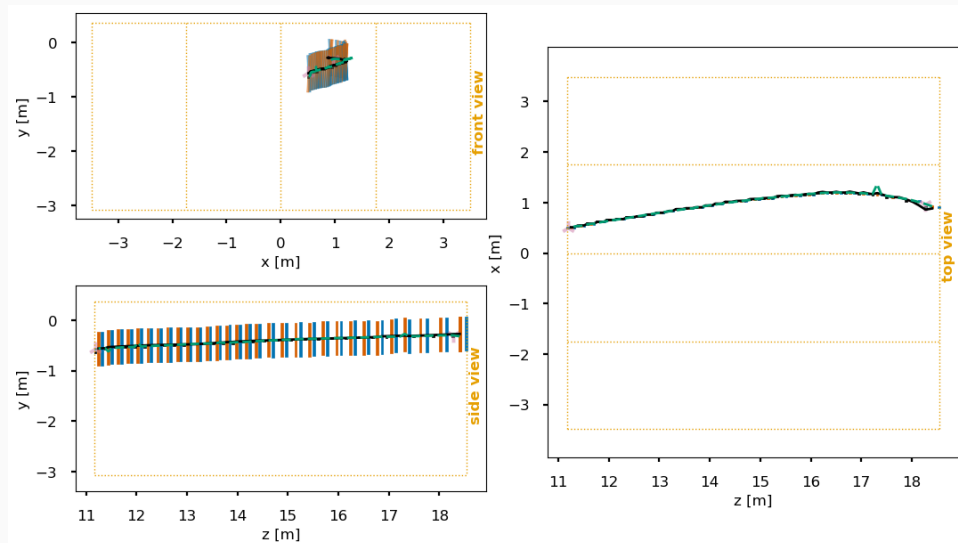


stereo

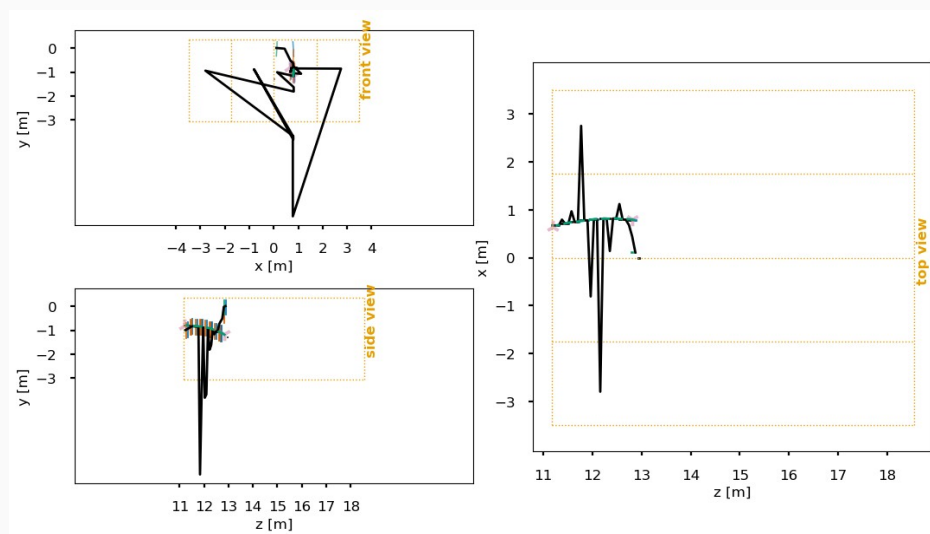


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hybrid



Kalman filter needs  
some work for hybrid

# Next steps

- Talked with Alex Booth and Michael Dolce about a **'tiny' production** with more events for performance studies/plots
- Most likely will be **10e17 events POT**
- Possible to get **exact same events for the two geometries**
  - by switching out the gdml files on the edep-sim stage while keeping the genie stage the same
- Time frame about **2 days** once everything figured out
- Then run **TMS reconstruction on data** → **happy analysing :)**



# Backup