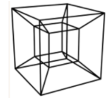


TESSERACT

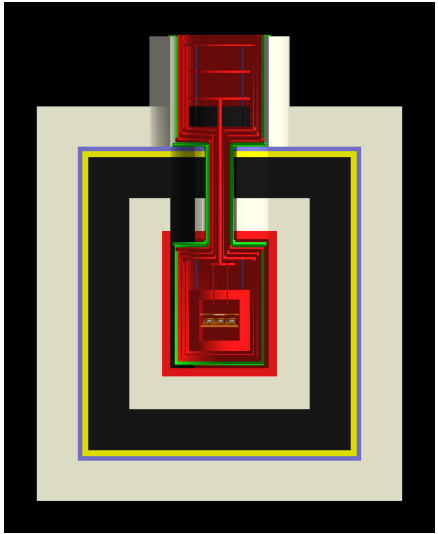
Ricochet's MiniCryoCube in Tesseract

Tesseract Simulations Meeting

Birgit Zatschler

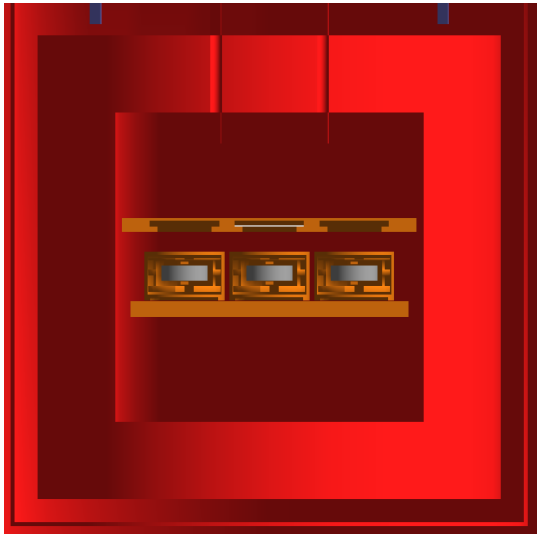
22nd March 2024

Implementation of MiniCryoCube in TesseractSim



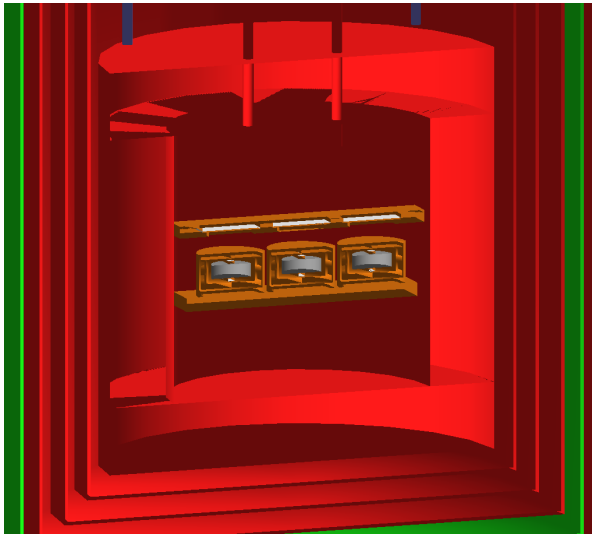
- The idea is to investigate the background from the LSM rock with a Ge target inside Tesseract.
- The LHe target inside the MC is replaced by Ricochet's MiniCryoCube.
- The macro minicryocube.mac in TesseractSim shows the geometry setup with Hybrid_V2_19_radiogenic and two example generators:
  - Gammas from K40 from the surrounding rock thrown from a surface enclosing the full Tesseract volume.
  - ^{60}Co contamination inside Cu material used by the cryo can layers.

Implementation of MiniCryoCube in TesseractSim



- The Minicryocube consists of 3 Ge Bolometers each having a radius of 15 mm and a height of 10 mm.
- Each Ge Bolometer is housed in a Cu support structure. Kapton cables are inside the Cu support and are above, below and at the side of the Bolometer.
- The Cu support structure sits on a Cu bottom plate. Above the Cu support structure is an electronic plate (Cu), electronic board (PCB), electronic cover (Cu) and connectors.

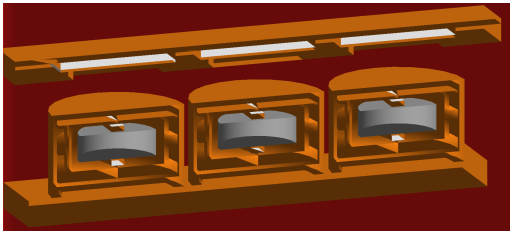
Implementation of MiniCryoCube in TesseractSim



Changes from Ricochet's original MiniCryoCube:

- The Cu bottom plate length has been reduced from originally 212.8 mm to 180 mm to fit into the MC of Tesseract.
- The Kapton density has been changed from 1.36 g/cm^3 to 1.42 g/cm^3. There is no reference for the former value. The latter is used by Geant4.

Suggestions for improvements



- There was no reference provided for the materials ”PCB” and ”ConnectorsMaterial”. It is doubtful that their densities are both 1 g/cm^3.
- Only materials can be contaminated. It would be useful to select individual components, i.e. physical volumes. This would be straight forward to implement in TesseractSim.
- When throwing from a wall, either all sides or one single side of a cube can be selected. This could be more flexible, if one wants to throw e.g. from the top and the sides. Also, throwing from a cylinder instead of a cube could be useful.
- If energy is deposited in a detector, the whole G4Event with all tracks and steps is stored. When simulating many primaries the output files get huge quickly. Only storing the hits/steps inside the detectors would be also more convenient to analyze.