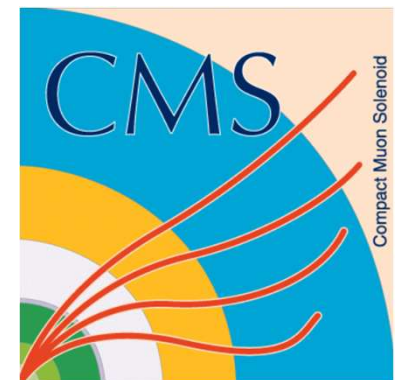# Radiation Field Simulation in GIF ++

Nicola Ferrara, INFN and Politecnico of Bari

Gabriella Pugliese INFN and Politecnico of Bari

Giuseppe Iaselli, INFN and Politecnico of Bari

Dayron Ramos, INFN and Polytecnic of Bari

Geant4 GIF++ simulation code

Source: Pfeiffer Dorothea Software developed in GEANT4-10.0 to simulate GIF++ radiation background [ref]

➢Software upgrade in the framework of the new DRD1 «collaboration».

➢Main steps:

1. Transition from GEANT4-10.0 to GEANT4-11.0

2. Description of the new bunker geometry

[ref] https://gif-irrad.web.cern.ch/documents/1-s2.0-S0168900217306113-main.pdf
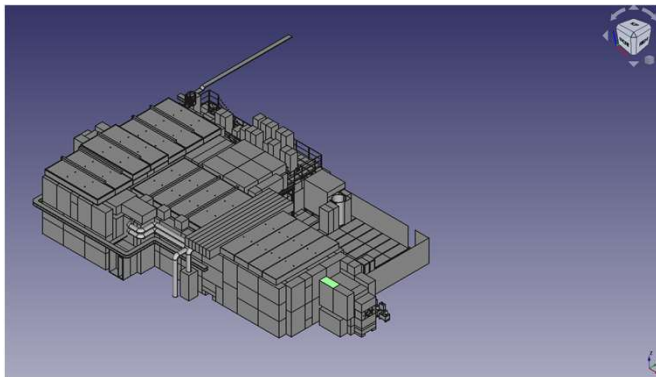
Transition from GEANT4-10.0 to GEANT4-10.7 (1)

➢New GEANT4 version: geant4-10-07-patch-03 [MT]

➢Change of one class in the GIF++ project ()

Issue: in class GIF++UserScoreWriter,

the typedef MeshScoreMap becomes defined in G4VScoringMesh

Solutions: Geant4 upgrades to G4VScoringMesh::MeshScoreMap

Transition from GEANT4-10.0 to GEANT4-10.7 (2)

Other Changes:

MeshScoreMap fSMap = fScoringMesh->GetScoreMap();

G4VScoringMesh::MeshScoreMap fSMap = fScoringMesh->GetScoreMap();

std::map<G4int, G4double*> * score = msMapItr->second->GetMap();

std::map<G4int, G4StatDouble *> &score = *(msMapItr->second->GetMap());

std::map<G4int, G4double*>::iterator value = score->find(idx);

std::map<G4int, G4StatDouble *>::iterator value = score.find(idx);

GIF++ geometry UPDATE

1. STEP file was opened with an open source FreeCAD to obtain the layout of the bunker

2. A new file GDML with FreeCAD was created and the geometry was described using a box model.

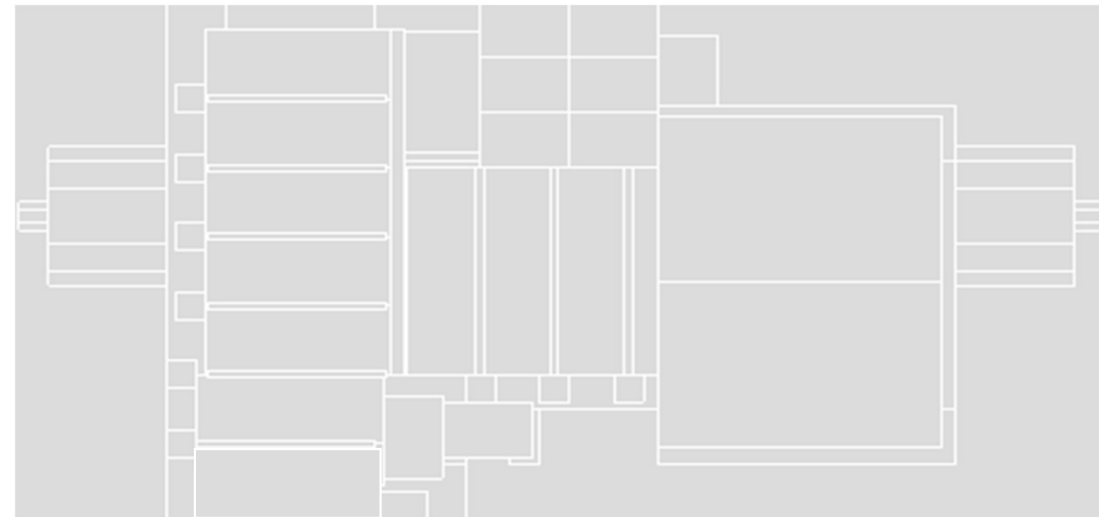Note: The format of the GDML file is not compatible with the one used by GEANT
https://gdml.web.cern.ch/GDML/

Some manipulation needed to solve the issue
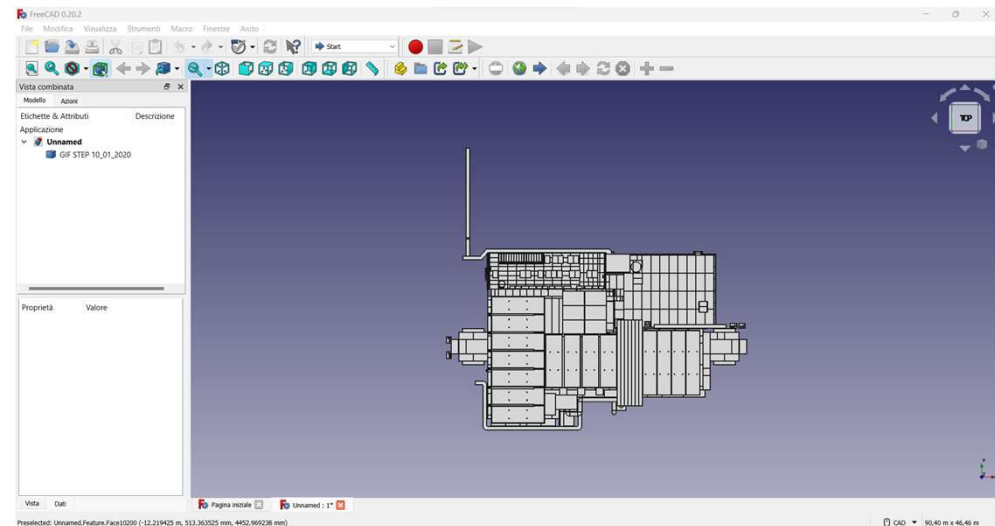
Upgrade geometry: layout

CAD Gif++ layout
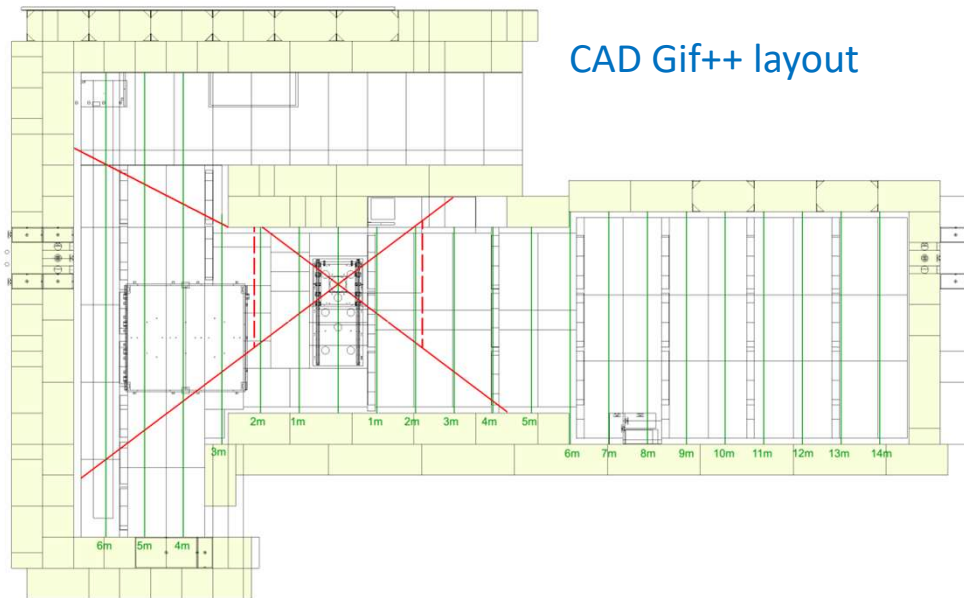
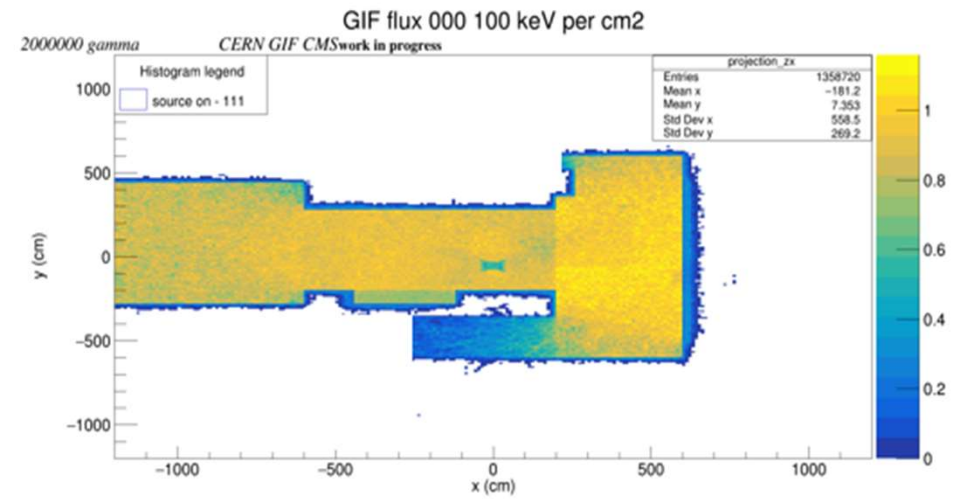GEANT gdml layout

Preliminary Results

Simulated gamma: $2 \cdot 10^6$

GIF flux 000 100 keV per cm2

Flux in the range 600-662 keV
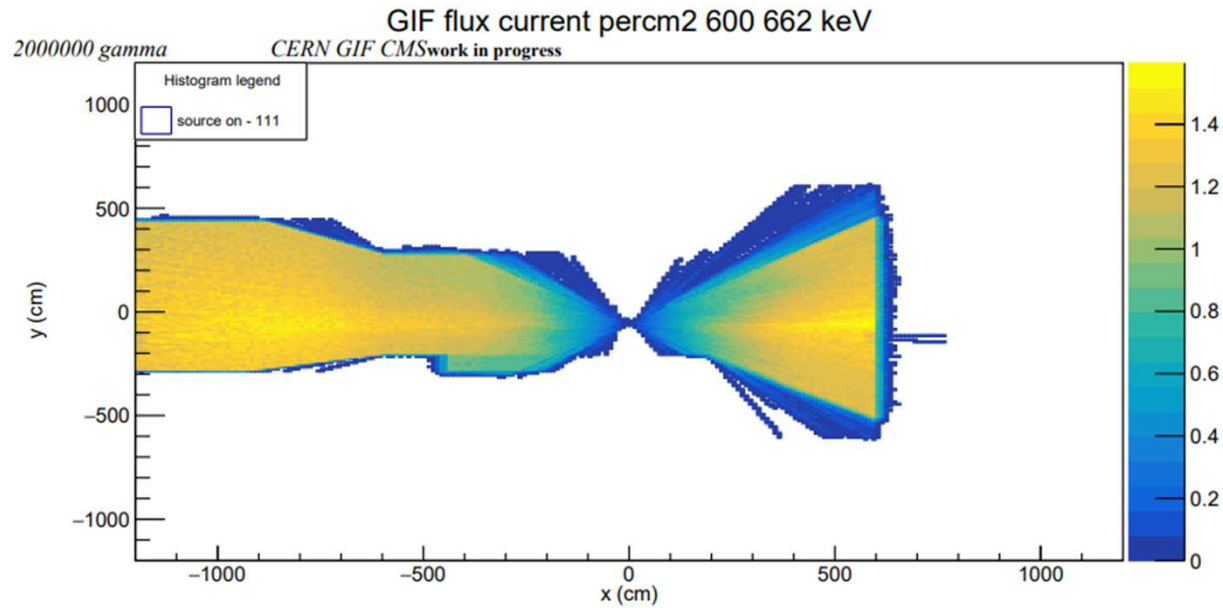
Flux in the range 0-100 keV

GIF flux current percm2 600 662 keV

Next steps

1. Start simulate filters

2. Simulation of different detectors installed inside the GIF

3. Validation of the simulation by comparing the estimated dose with some measurements done in several points inside the bunker
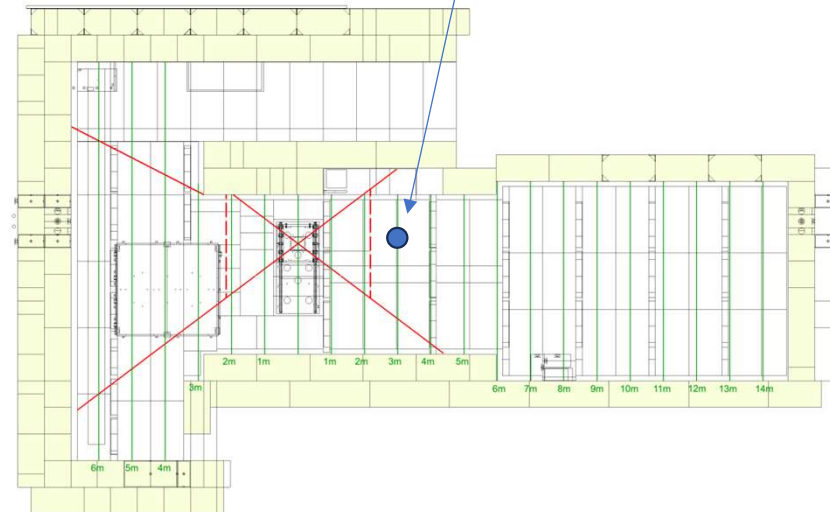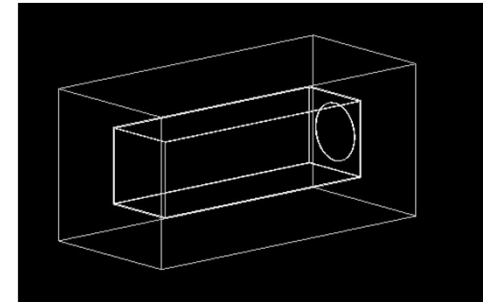
Conclusion

A first simulation of the bunker succesfully done.