Implement barrel homogeneous EMCal

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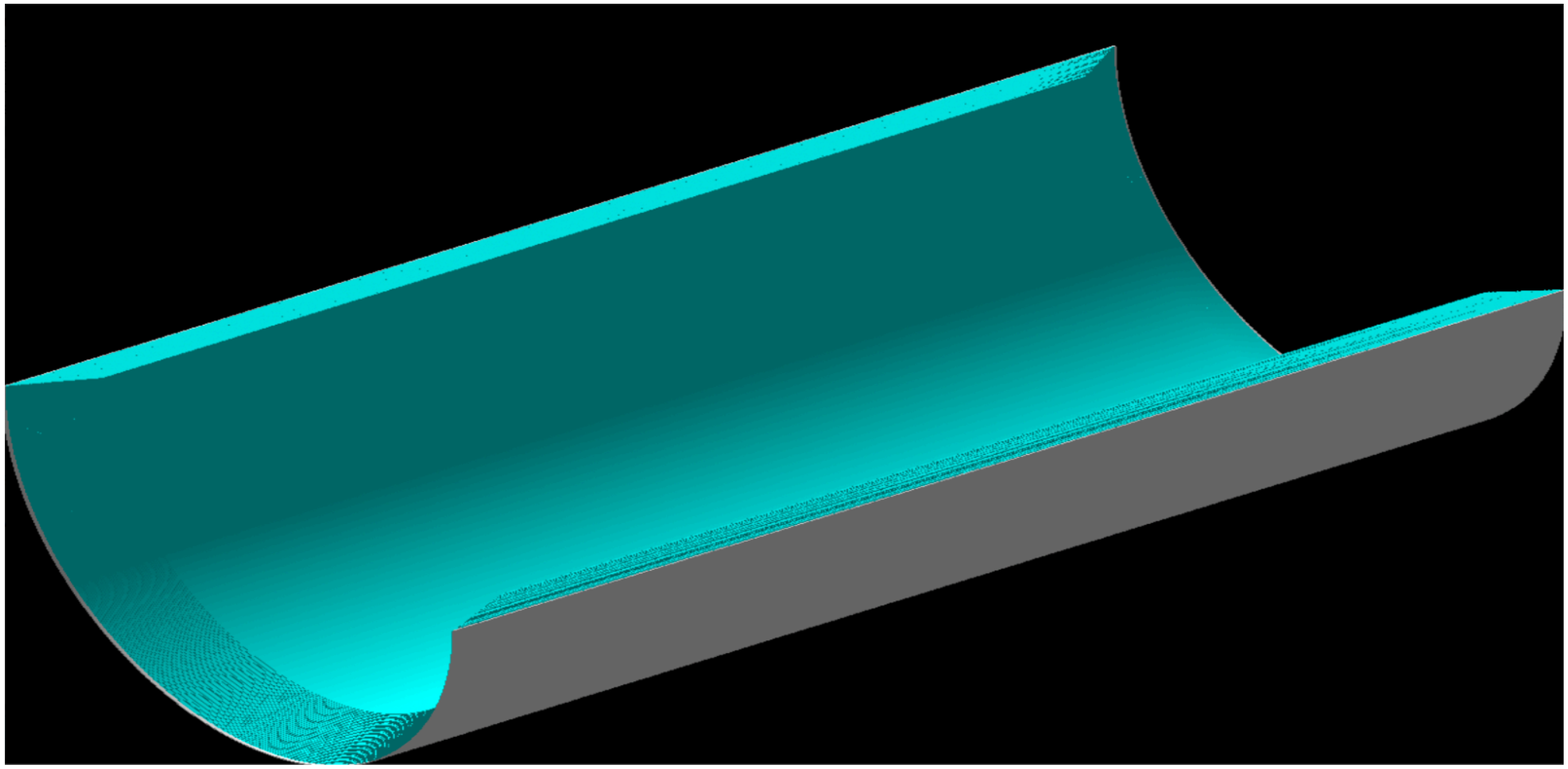
What do we have?



Current :

An array of readouts on a cylindrical volume.

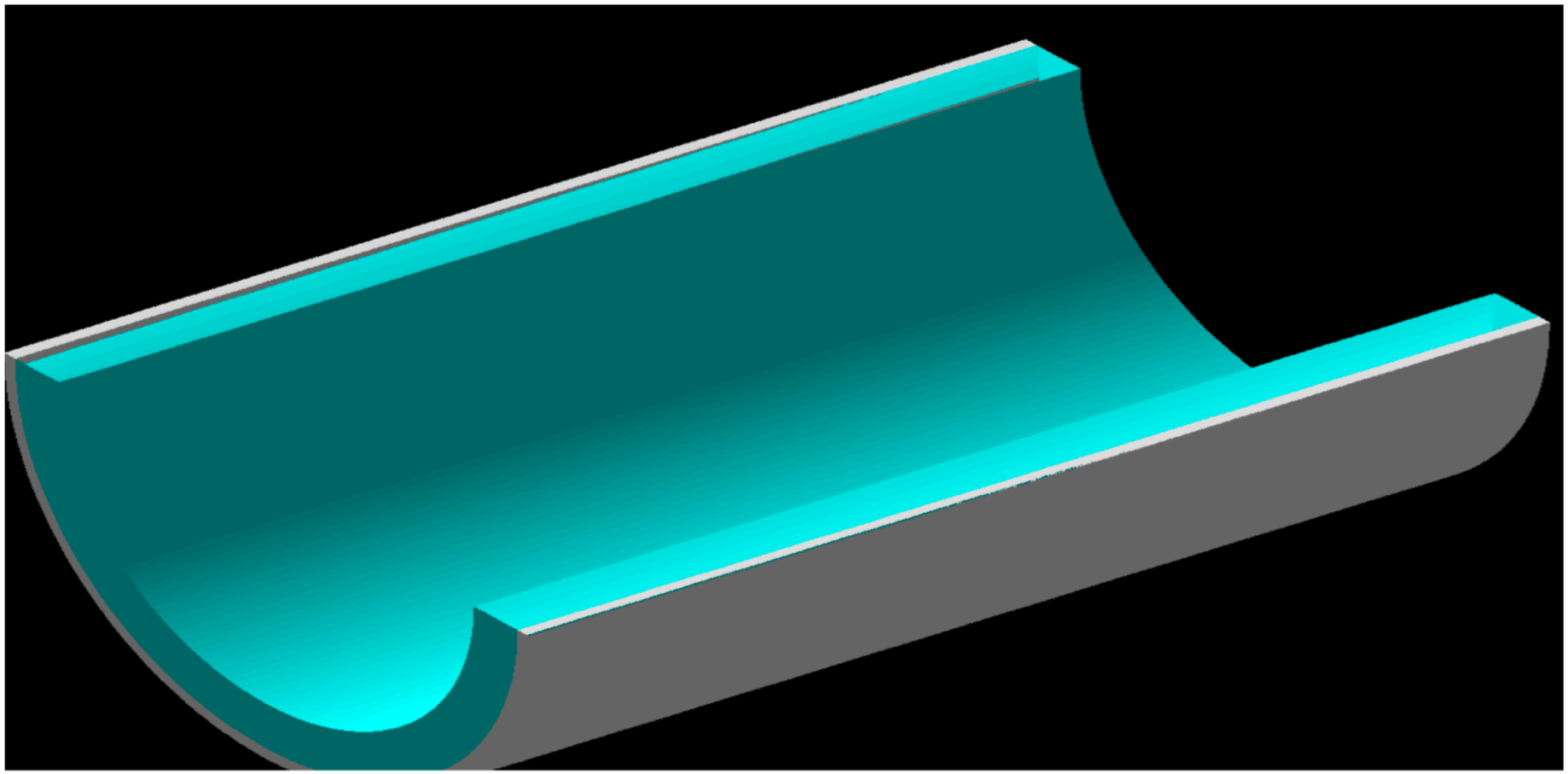
40 layers: Active + Absorver

1 Layer for electronics

There is no projectivity module-by-module

Macro:

Working on …

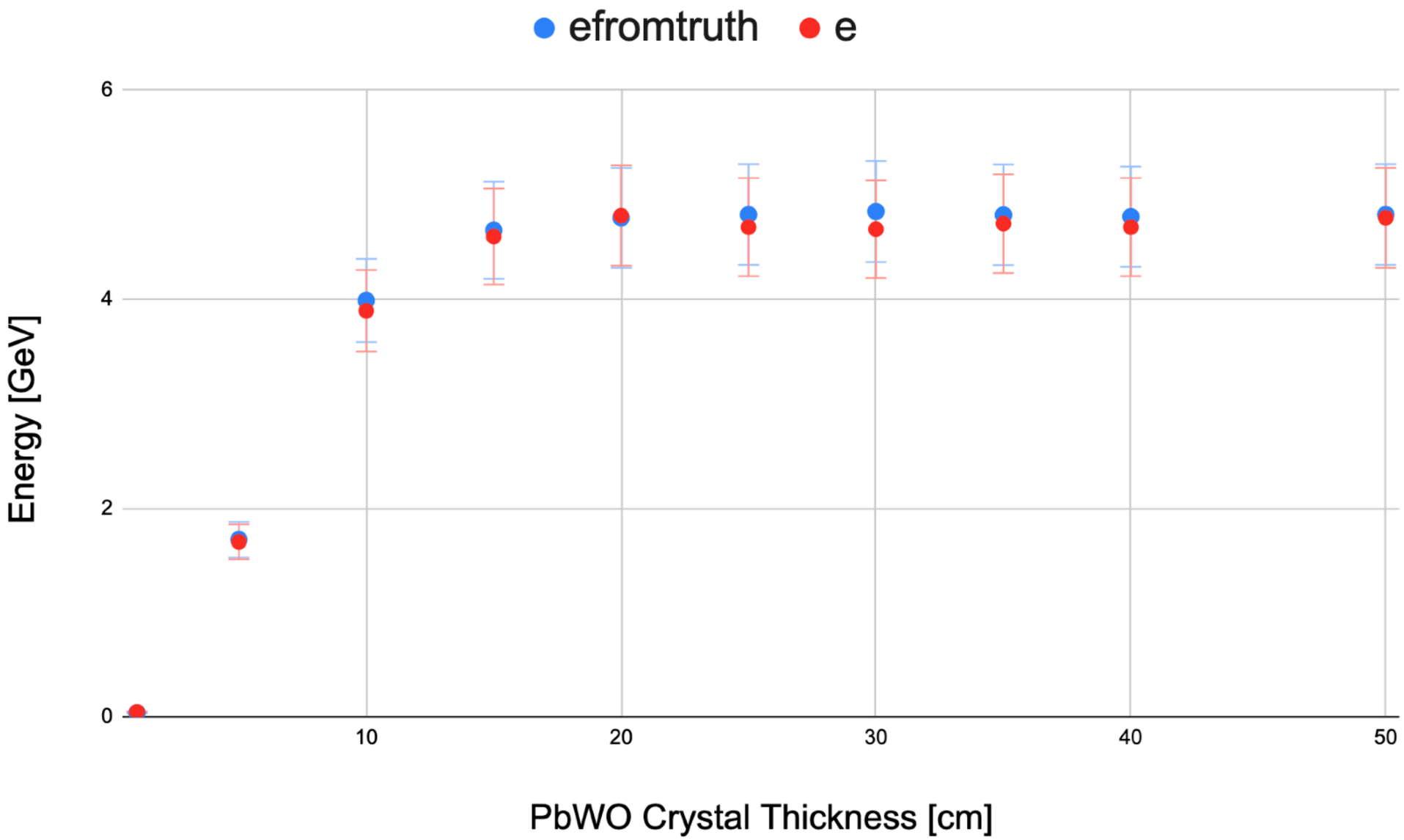


Implementing :

An array of readouts on a cylindrical volume.
A single PbWO layer of 20 cm with the same structure -> the original version.

Generating:

Simple Sample
Electrons at 5 GeV
Eta Range (-0.2,0.2)
All other detectors and magnet are off



Note: The energy measured is not 5 GeV
Probable cause: Calibration and digitalization

```
void CEMC_Towers()
{
  int verbosity = std::max(Enable::VERBOSITY, Enable::CEMC_VERBOSITY);

  Fun4AllServer *se = Fun4AllServer::instance();

  RawTowerBuilder *CemcTowerBuilder = new RawTowerBuilder("EmcRawTowerBuilder");
  CemcTowerBuilder->Detector("CEMC");
  CemcTowerBuilder->set_sim_tower_node_prefix("SIM");
  if (isfinite(CEMC_TOWER::emin))
  {
    CemcTowerBuilder->EminCut(CEMC_TOWER::emin);
  }
  CemcTowerBuilder->Verbosity(verbosity);
  se->registerSubsystem(CemcTowerBuilder);

  //const double photoelectron_per_GeV = 500;  // 500 photon per total GeV deposition
  // just set a 4% sampling fraction - already tuned by tungs/scint width ratio
  //double sampling_fraction = 4e-02;
  const double photoelectron_per_GeV = 50; // PbWO
  double sampling_fraction = 1.; //Crystal

  RawTowerDigitizer *CemcTowerDigitizer = new RawTowerDigitizer("EmcRawTowerDigitizer");
  CemcTowerDigitizer->Detector("CEMC");
  CemcTowerDigitizer->Verbosity(verbosity);
  CemcTowerDigitizer->set_digi_algorithm(G4CEMC::TowerDigi);
  CemcTowerDigitizer->set_pedstal_central_ADC(0);
  //CemcTowerDigitizer->set_pedstal_width_ADC(20);  // eRD1 test beam setting
  CemcTowerDigitizer->set_photonelec_ADC(1);      // not simulating ADC discretization error
  CemcTowerDigitizer->set_photonelec_yield_visible_GeV(photoelectron_per_GeV / sampling_fraction);
  //sCemcTowerDigitizer->set_zero_suppression_ADC(16);  // eRD1 test beam setting
  se->registerSubsystem(CemcTowerDigitizer);

  RawTowerCalibration *CemcTowerCalibration = new RawTowerCalibration("EmcRawTowerCalibration");
  CemcTowerCalibration->Detector("CEMC");
  CemcTowerCalibration->Verbosity(verbosity);
  CemcTowerCalibration->set_calib_algorithm(RawTowerCalibration::kSimple_linear_calibration);
  if (G4CEMC::TowerDigi == RawTowerDigitizer::kNo_digitization)
  {
    //  0.039 from electron sims (edep(scintillator)/edep(total)
    CemcTowerCalibration->set_calib_const_GeV_ADC(1.0 / 0.039);
  }
  else
  {
    CemcTowerCalibration->set_calib_const_GeV_ADC(1. / photoelectron_per_GeV / 0.9715);
  }
  CemcTowerCalibration->set_calib_const_GeV_ADC(1. / photoelectron_per_GeV);
  CemcTowerCalibration->set_pedstal_ADC(0);
  CemcTowerCalibration->set_variable_GeV_ADC(true);

  se->registerSubsystem(CemcTowerCalibration);

  return;
}
```

Note: There are not measured hits collected by the single cristal bcal.
Probable cause: Calibration and digitalization (?)

Example from the current CEMC.