



# EM physics validation results for Geant4 11.2ref05

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# Modifications in EM utils for11.2ref05

- **## 2024-05-04 V.Ivanchenko (emutils-V11-02-04)**
  - G4EmDataRegistry - new class to keep EM data tables
  - G4EmDataHandler - extended functionality
  - G4LossTableManager - identify master thread using std method
  - G4LossTableBuilder - more accurate use of static members and methods
  - G4VEmModel, G4VEmProcess, G4VEnergyLossProcess, G4EmTableUtil - update according to change in the data
  - G4VMscModel - move initialisation of tables for model to G4EmTableUtil
- **## 2024-05-14 V.Ivanchenko (emutils-V11-02-05)**
  - G4EmParameters, G4EmParametersMessenger - added enumerator and a new flag  
G4PositronAtRestModel, which allows selection and configuration of the model of positron annihilation at rest.
  - G4VPositronAtRestModel - new virtual interface
  - G4EmBiasingManager - cosmetic change
- **## 2024-05-20 H. Tran (emutils-V11-02-06)**
  - G4EmParameters, G4EmLowEParameters, G4EmLowEParametersMessenger - added dnachemistry time step model
- **## 2024-05-22 V.Ivanchenko (emutils-V11-02-07)**
  - G4EmUtility - simplify computation of cross section maximum for discrete processes to fix the problem of FPE if -O3 compiler option is used.
- **## 2024-05-27 V.Ivanchenko (emutils-V11-02-08)**
  - G4VEmProcess - extended info printout for e+ annihilation at rest- G4VEmProcess,  
G4VEnergyLossProcess - improved identification of model ID for atomic de-excitation (fluorescence, Auger e-, PIXE).

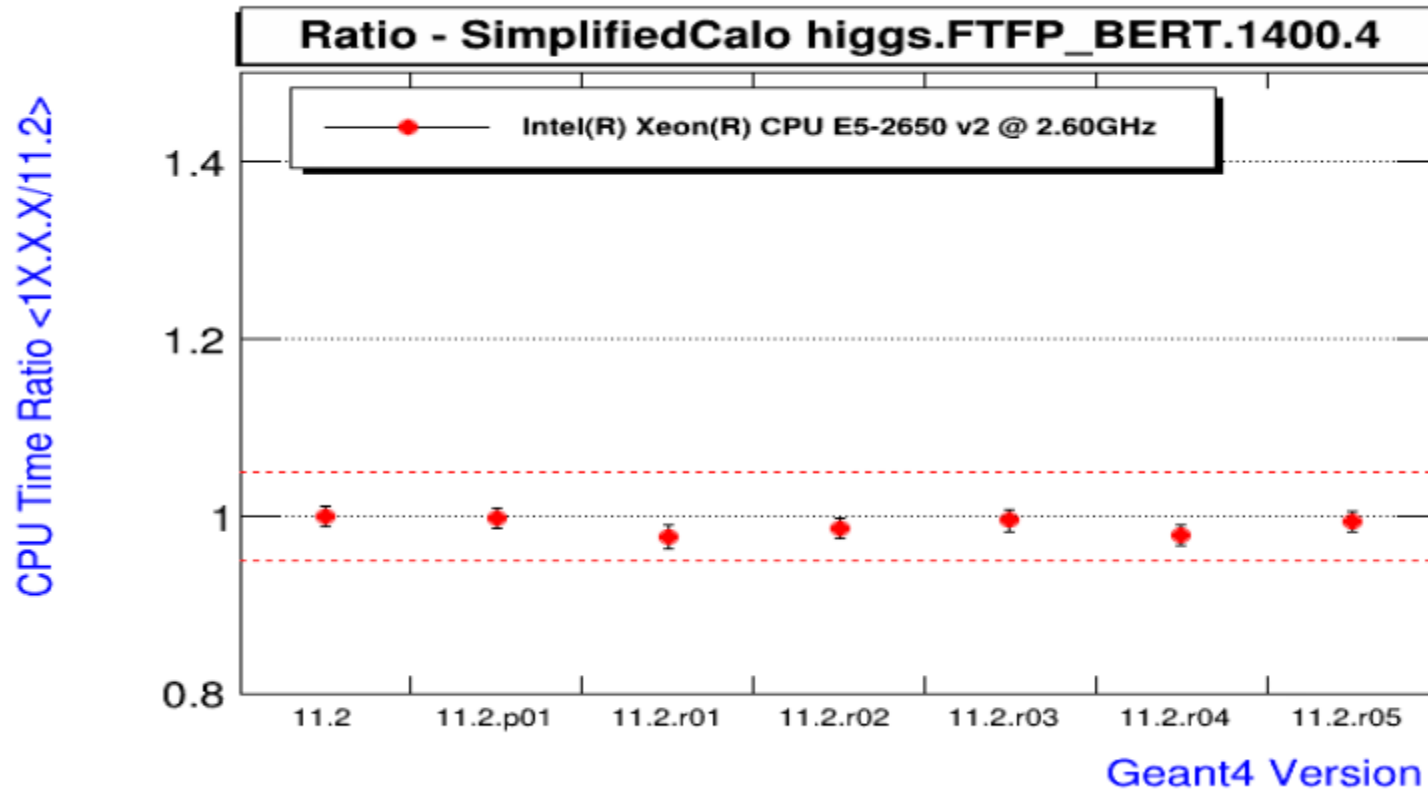
# Modifications in EM standard for 11.2ref05

- **## 2024-05-14 V.Ivanchenko (emstand-V11-02-04)**
  - G4SimplePositronAtRestModel, G4AllisonAtRestModel - new classes to sample positron annihilation.
  - G4eeToTwoGammaModel - cosmetic change
  - G4eplusTo2GammaOKVIModel - removed sampling at rest
  - G4eplusAnnihilation - added selection of AtRest model, implement ApplyCuts for AtRest, implement choice of positron annihilation model at rest
- **## 2024-05-23 I.Urban (emstand-V11-02-05)**
  - G4UrbanMscModel - optimized DistanceToBoundary step limitation algorithm currently used only in Opt3 EM physics
- **## 2024-05-28 V.Ivanchenko (emstand-V11-02-06)**
  - G4BetheHeitler5DModel - added checks on arguments of G4Exp in SampleSecondaries(..) method to avoid FPE problems in the case of -O3 optimization
  - G4eplusAnnihilation - use more const class members, changed model ID definition for produced tracks

# Modifications in EM dna Physics Lists for 11.2ref04

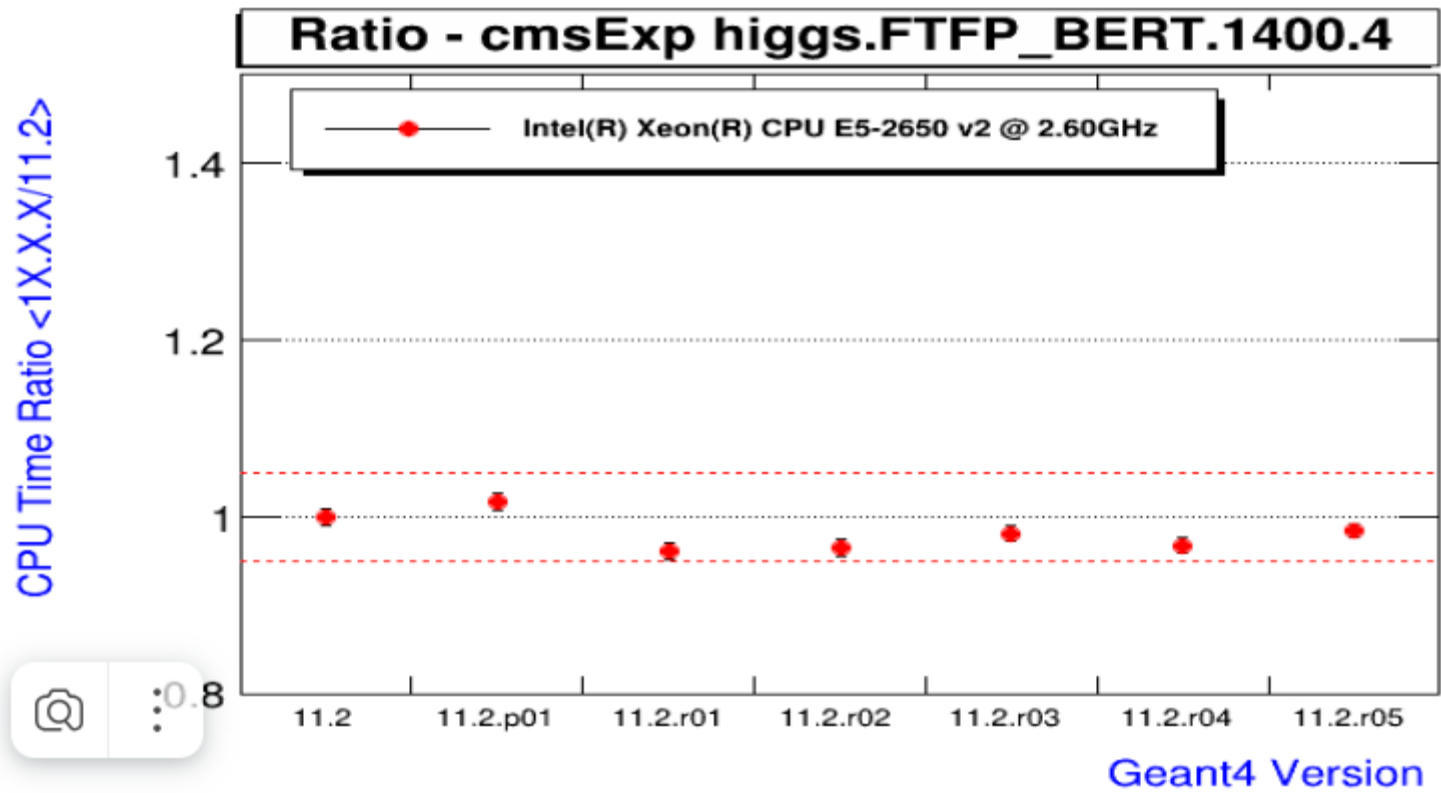
- **## 2024-04-05 Vladimir Ivanchenko (phys-ctor-em-V11-02-04)**
  - G4EmDNABuilder - added nuclear stopping process for G4GenericIon below 1 MeV/u.
  - G4EmDNAPhysics, G4EmDNAPhysicsActivator, G4EmDNAPhysics\_option2, G4EmDNAPhysics\_option4, G4EmDNAPhysics\_option6, G4EmDNAPhysics\_option8 change upper limit for DNA physics of Helium ions from 300 MeV to 400 MeV.
- **## 2024-04-04 Vladimir Ivanchenko (phys-ctor-em-V11-02-03)**
  - G4EmDNAPhysics - define default maximum kinetic energy 600 MeV instead of 300 MeV to have standard ionisation and multiple scattering always defined for DNA physics configurations. This allows avoid situations when low-energy ions path DNA region without interaction

# FNAL Geant4 Profiling (J. Yarba)



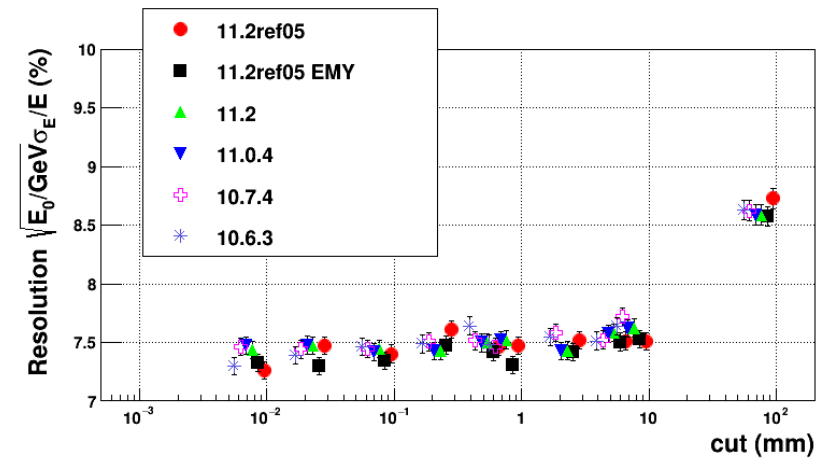
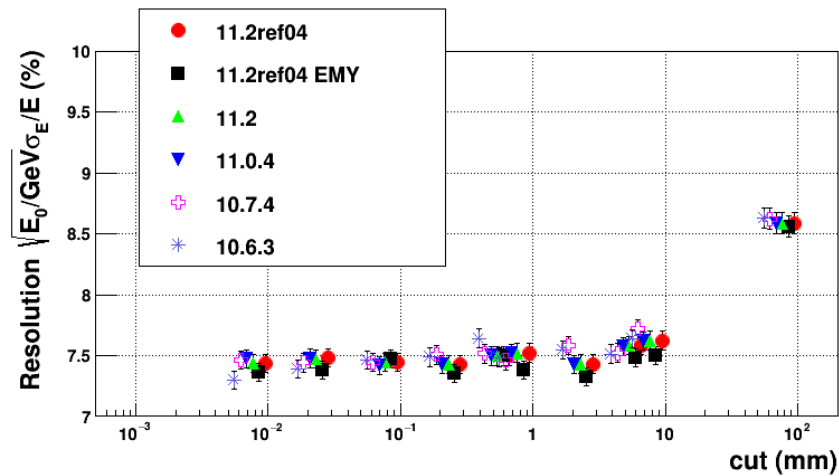
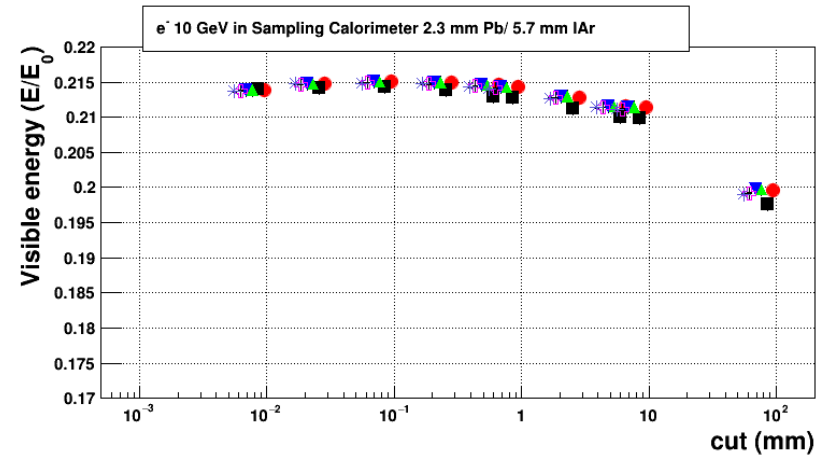
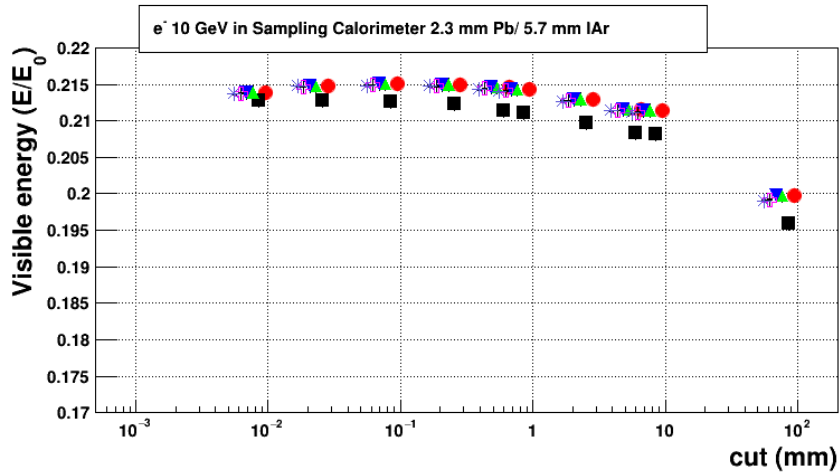
A small CPU improvement likely introduced in ref-01

# FNAL Geant4 Profiling (J. Yarba)

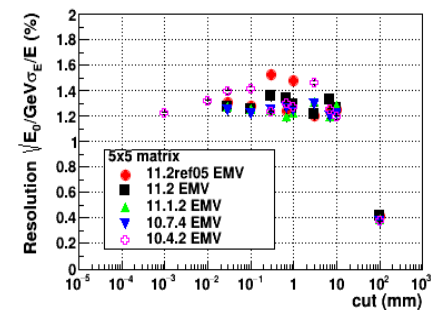
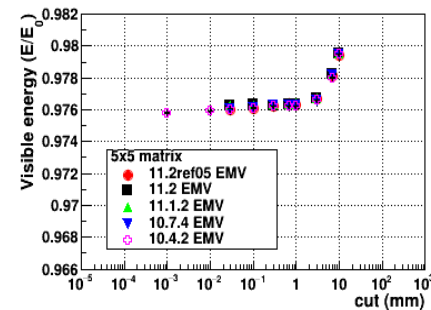
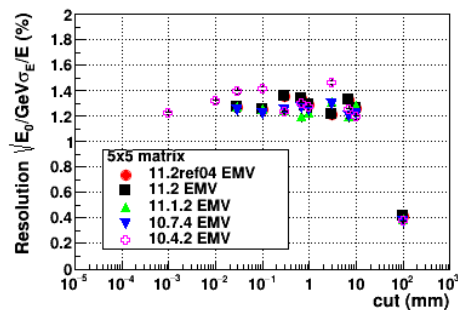
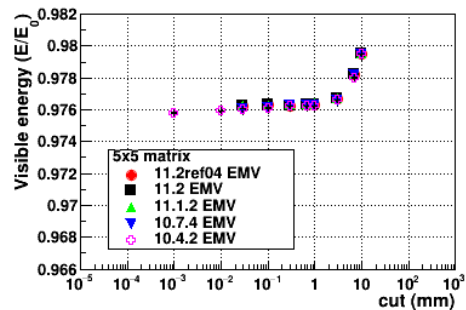
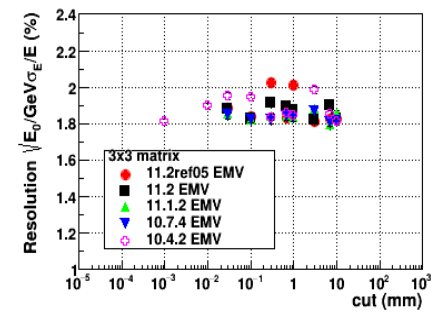
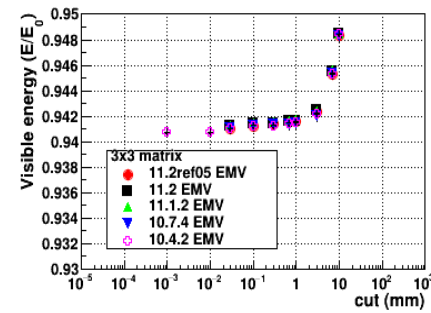
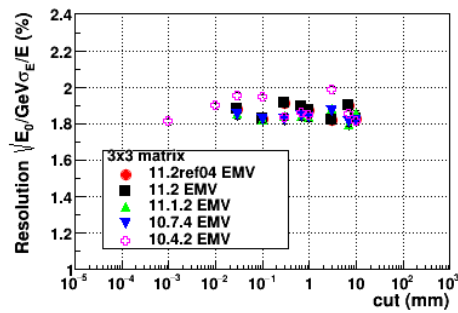
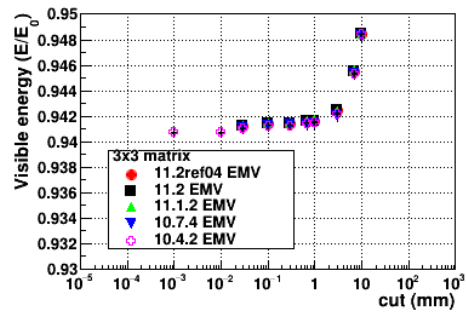
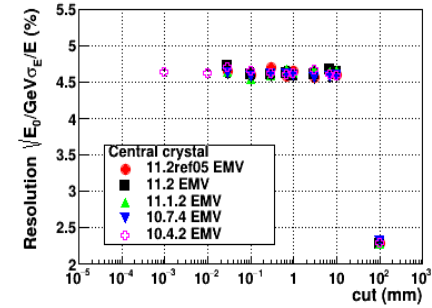
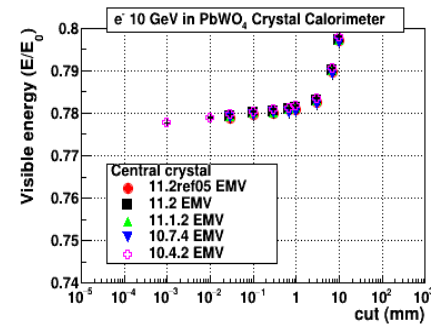
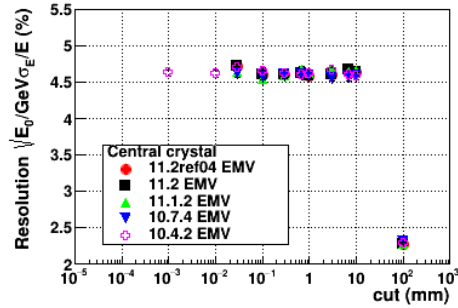
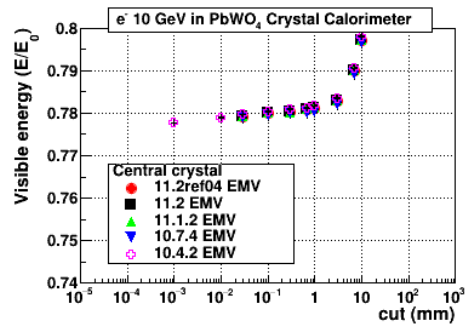


A small CPU improvement likely achieved in ref-01

# Simplified ATLAS barrel 11.2ref04/ref05



# Simplified CMS barrel 11.2ref04/ref05





# Test Results

- Testing results will be available:
  - <https://test-geant4-tools.web.cern.ch/test-geant4-tools/emtesting/>
- EM results are stable since 11.1.X