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Geant4 Low Energy EM WG

Workplan

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IN2P3

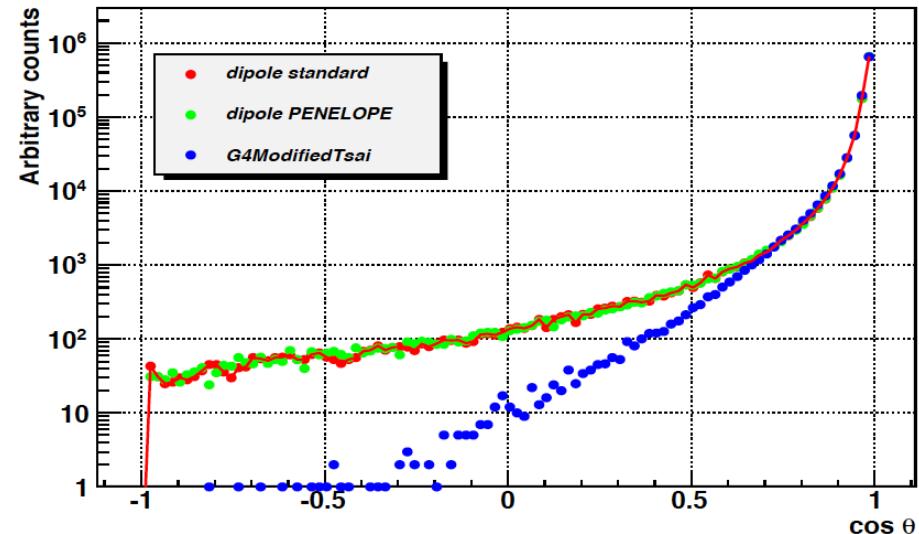
Content

- Livermore
- Penelope
 - see Luciano's talk
- Atomic deexcitation
- Geant4-DNA
- Other

Livermore

- Possible problems
 - Interpolation in electron ionisation (secondary electrons) (thanks to A. Bagulya)
 - Verification of angular generators (thanks to V. Grichine)
 - Bremsstrahlung (`G4ModifiedTsai`)
 - Rayleigh
 - Compton : emission direction of Compton electron not accurate below 2 MeV
 - Improve CPU efficiency of Rayleigh
- Upgrade 1D and 2D data table handling through Physics vectors and interpolation
 - `G4Physics2DVectorCache` and `G4Physics2DVector` (thanks to V. Ivanchenko)
 - Cf. `G4NeutronCaptureXS.hh/.cc`

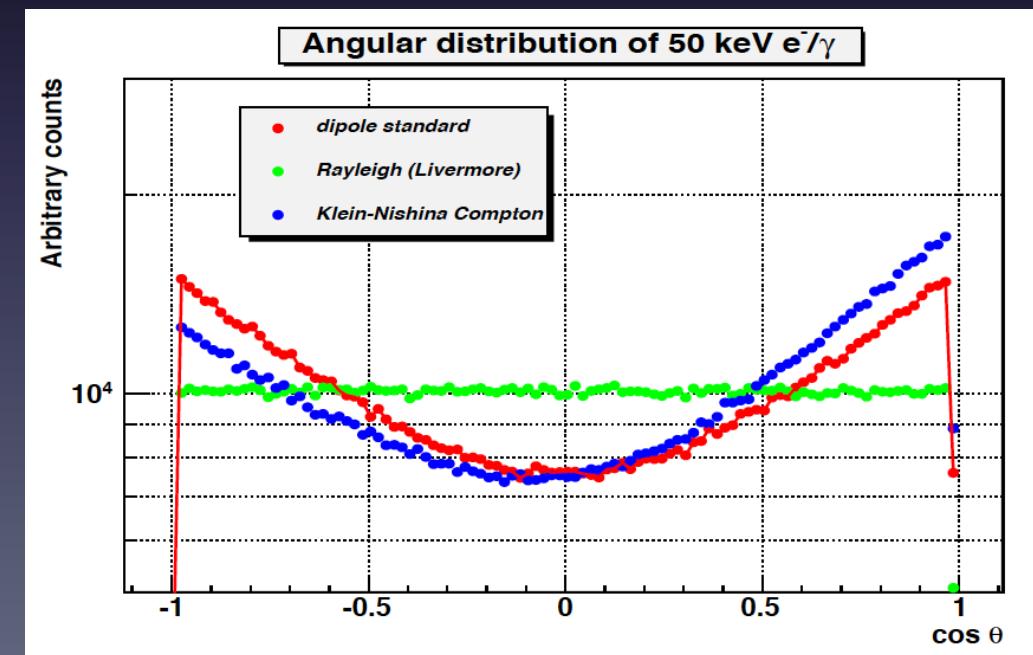
Bremsstrahlung angular distribution of 5 MeV e^-



Bremsstrahlung

Rayleigh

Angular distribution of 50 keV e^-/γ



Thanks to
V. Grichine

Atomic deexcitation

- Extension of shell ionization cross section models for PIXE to higher energies **above 10 MeV**
 - A. Taborda et al.
 - C. Champion et al.
- Addition of **M shells**
- Comparison of PIXE **xs models** against worldwide experimental database
- Validation of PIXE **simulation** using **experimental spectra**
 - Start from extended example `TestEm5` or `xray_fluorescence`

Geant4-DNA

- Physics
 - Development of alternative quantum models for liquid water and DNA bases
 - Switch to G4Ions for HZEs (C,N,O,Fe)
 - Development of excitation & fragmentation models for HZEs
- Chemistry
 - Simulation of radiolysis in nanometer size geometries
 - Delivery of user example for radiolytical yields simulation
- Verification / validation
 - Radiolytical yields
 - Direct and non-direct effects at the DNA scale

Other items

- Coverity fixes
- Change initialization of all low energy EM classes
 - see new [G4SeitlerBergerModel](#) (thanks to [V. Ivanchenko](#))
- After checks & fixes, systematic validation of photon, electron & positron models (Livermore vs Penelope vs Standard EM – option 3) against databases
 - Populate validation web repository for each monthly reference tag
- Microdosimetry models for Si
- RBE model for radiobiology

Manpower

- Livermore
 - A. Bagulya, L.Pandola, ?
- Penelope
 - L. Pandola, P. Cirrone, G. Cuttone
- Atomic deexcitation
 - A. Mantero, M. Reis, A. Taborda, J. Pires
- Geant4-DNA
 - Z. Francis, S. Incerti, M. Karamitros, H. Tran
- Other
 - RBE: P. Cirrone, F. Romano
 - Microdosimetry for Si: M. Raine
 - Initialization, coverity, validation: ?