



Status of Geant4 Standard EM Package

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Outline

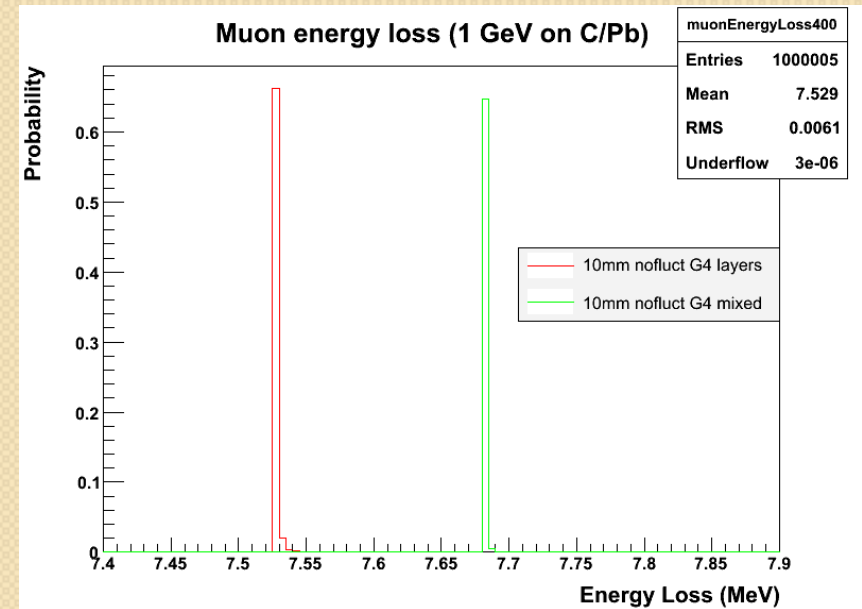
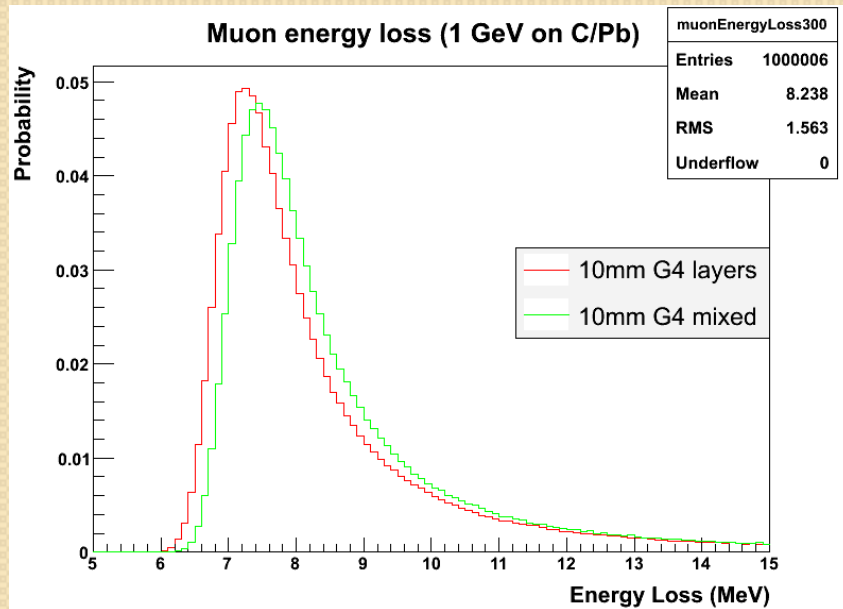
- Material sub-library update
- Draft proposal for material upgrade
- EM utils sub-library update
- Fixes and new developments for standard sub-library
- Request for upgrade of muons sub-library

Materials sub-library

- **Mean ionisation energy** of atoms now is taken directly from NIST data (3-digit values) and not anymore from ICRU'37 (2-digit values)
- **Parameterization of density effect** for simple materials is taken from new class `G4DensityEffectData` independently on material name (state is controlled)
- **ASTAR and PSTAR data** have been rechecked (T.Koi report on Oxygen)
 - Data for 6 materials were fixed
 - `G4PhysicsVector` with spline instead of old interpolation
- **G4AtomicShell** class was updated (optimized computation of binding energy by introduction of extra array)

Thin absorber compound versus two layers

No Fluctuations, no msc



Problem identified by W.Lukas
(Wolfgang.Lukas@cern.ch)

Upgrade of materials (requirements)

- Data from NIST, ICRU and other sources associated with material name but users may want to give an original name for his/her material
- There are many similar materials different only by its density and not atomic composition
- Data for gases are given for normal conditions
- It may be useful to reduce number of pre-calculated tables

Draft proposal of upgrade of materials

- **G4Material:**
 - Add fNominalMaterial pointer and access method
 - Add extra constructor which will build new material from existing material
 - Name and density new
- **G4NistManager:**
 - Add extra method to build material with given density from NIST material
- **Kernel:** updated procedure to prepare Physics Tables and material-cut-couples
- **EM-utils:** more sophisticated selection of tables and value from tables
- **EM models:** no or little modifications (only in ICRU'73 model?)

EM-utils sub-library update

- Improved initialisation – **G4EmCalculator** can be used to add models per particle type and detector region to any PhysList
 - Edition of PhysList not needed
- **G4EmCorrections**: added protection/limit on value of Barkas and Bloch corrections
 - ATLAS reported on negative dedx of an object $M=100$ GeV, $Q = -150e$
- **Fixed number of problem**:
 - ion single scattering
 - Skin=1 (msc parameter)
 - Fixes inline methods

EM-utils sub-library update

- **MinCutEnergy** computation is disabled
- Limit of energy threshold is defined only in Physics List and not more by model itself
 - Delta-electron production is affected
- User may set any low limit on his/her own risk

EM-standard sub-library update

- Bug#1115: **G4eBremsstrahlungModel** – bug in element selection
- **G4GoudsmitSaundersonMscModel** – upgrade
- **G4WentzelVIModel** – recently bug was identified, may be included in 9.4beta
- **G4eCoulombScatteringModel**, **G4CoulombScatteringModel** – fixed ion scattering
- **G4UrbanMscModel93** – randomization of step limit is added

EM-muons sub-library update

- Request from astro-physics to implement correct recoil for muon bremsstrahlung and e^+e^- pair production
- Problem of sampling momentum transfer to nucleus – adequate theoretical arguments are needed