
Decay Process

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Geant4 Users Workshop @ SLAC

Feb. 19th, 2002

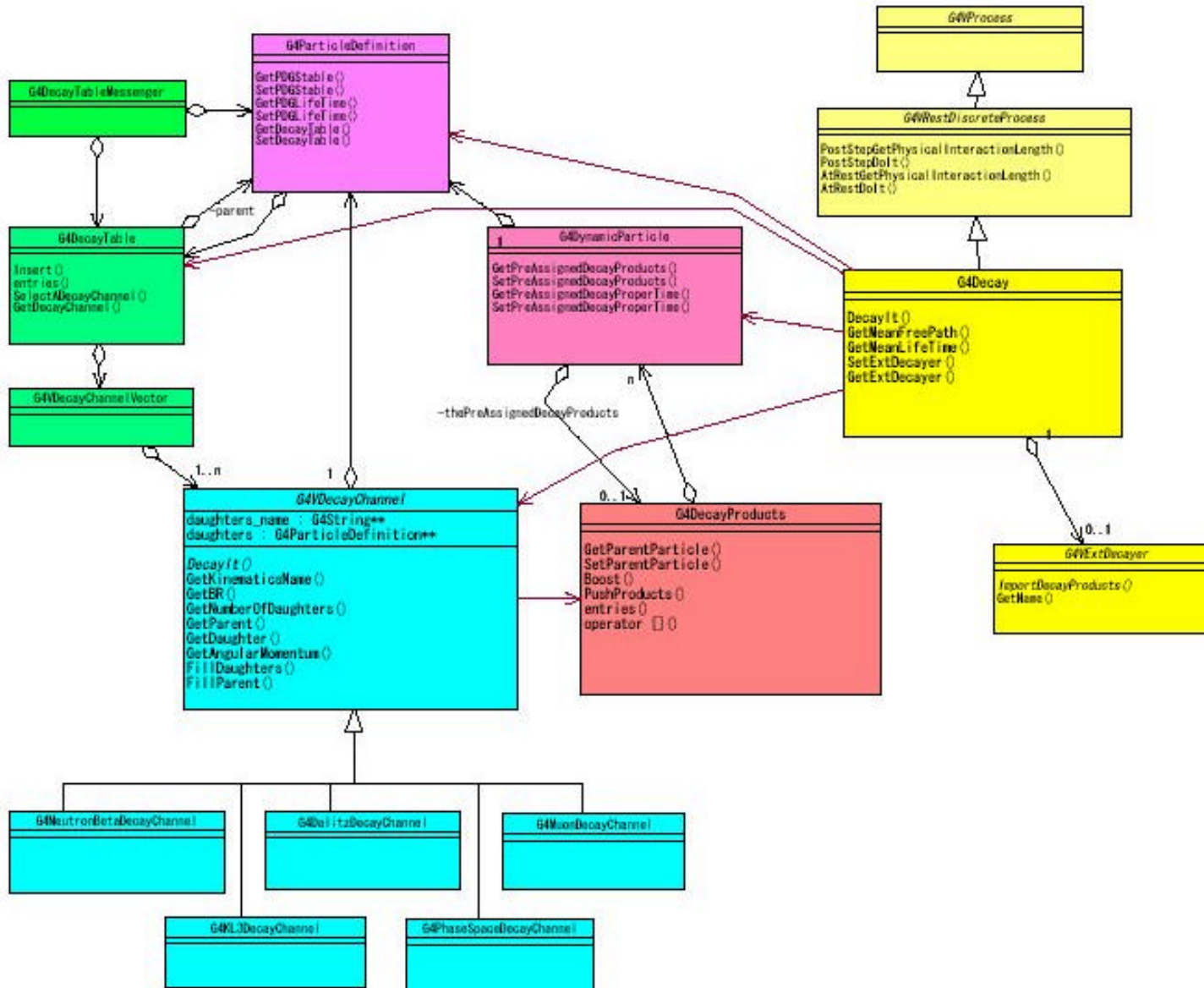
Decay process

- **G4Decay** Class is a process which manages
 - **Decay at Rest**
 - AtRestDoIt
 - mean life time = τ
 - **Decay in Flight**
 - PostStepDoIt
 - mean free path = $c\tau \beta\gamma$
- Decay mode is given by **Decay Table** Information
 - **G4DecayTable** is a list of **G4VDecayChannel**.
 - **G4VDecayChannel** describes each decay mode.
 - Branching Ratio
 - Daughter Particle List
 - Decay Kinematics given by **DecayIt** method

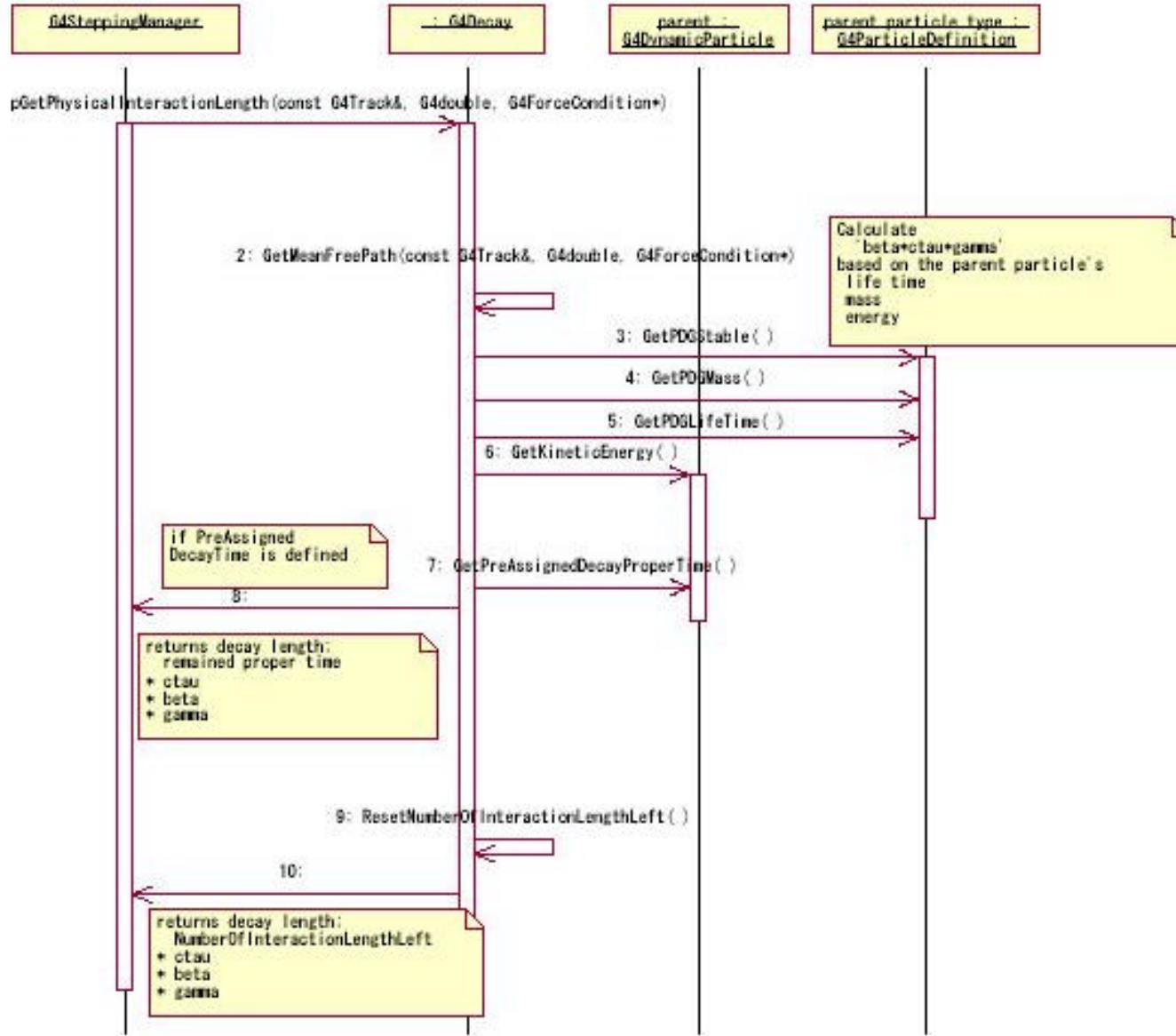
Decay Channel

- `G4VDecayChannel` is an abstract class
- Its derived classes are
 - `G4PhaseSpaceDecayChannel` : phase space
 - `G4DalitzDecayChannel` : π^0 dalitz
 - `G4MuonDecayChannel` : $\mu \rightarrow e \nu \nu$ decay
 - `G4KL3DecayChannel` : Kon semileptonic
 - `G4NeutronBetaDecayChannel` : neutron beta decay
- See '**Physics ReferenceManual**' for details of these decay modes
- Users can easily define his new decay mode

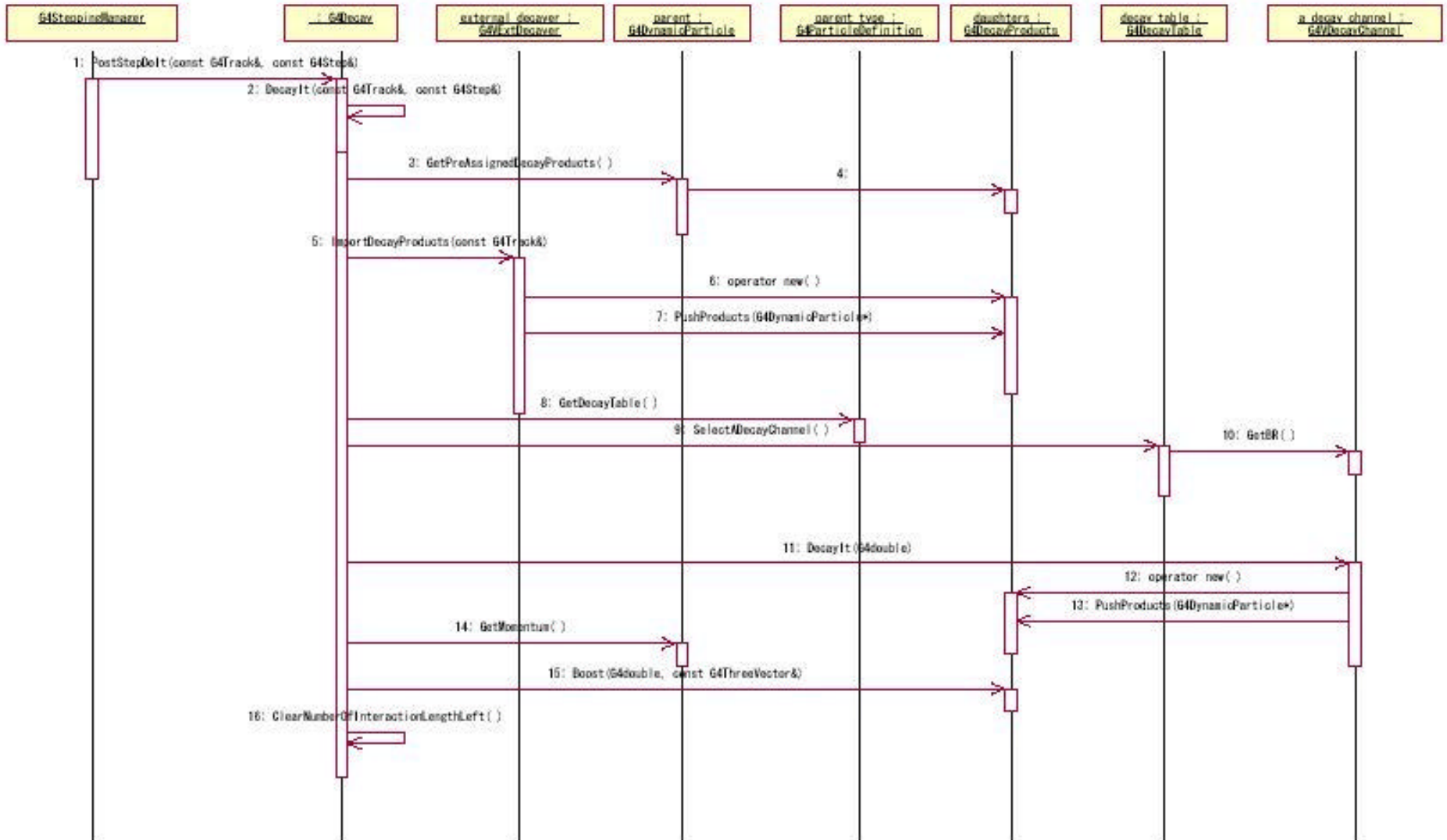
Class Diagram



G4Decay::GPIL



G4Decay::DoIt



PreAssignedDecay

- User can assign
 - Decay time
 - Decay modesto each primary track in its rest frame by using
 - `PreAssignedDecayProperTime`
 - `PreAssignedDecayProducts`in `G4DynamicParticle`
- Example: Decay by Event Generator
 - If daughter particles are written in HEPEVT format, the parent keeps these information in `PreAssignedDecayProducts`
 - Decay time can be set by using `G4PrimaryParticle::SetProperTime()`

Radioactive decay

- Long-term ($>1\mu\text{s}$) radioactive decay induced by spallation interactions can represent an important contributor to background levels in space-borne γ -ray and X-ray instruments, as the ionisation events that result often occur outside the time-scales of any veto pulse.
- The Radioactive Decay Model (RDM) treats the nuclear de-excitation following prompt photo-evaporation by simulating the production of α , β^- , β^+ , ν and anti- ν , as well as the de-excitation γ -rays.
- The model can follow *all the descendants* of the decay chain, applying, if required, *variance reduction* schemes to bias the decays to occur at user-specified times of observation.

Radioactive decay

