```
You have successfully registered the following model factories.
Registered model factories:
  generic
  drawByAttribute
  drawByCharge
  drawByOriginVolume
  drawByParticleID
  drawByEncounteredVolume

Registered models:
  None

Registered filter factories:
  attributeFilter
  chargeFilter
  originVolumeFilter
  particleFilter
  encounteredVolumeFilter

Registered filters:
  None

You have successfully registered the following user vis actions.
Run Duration User Vis Actions: none
End of Event User Vis Actions: none
End of Run User Vis Actions: none

Some /vis commands (optionally) take a string to specify colour.
"/vis/list" to see available colours.
```

```
You have successfully registered the following user vis actions.
Run Duration User Vis Actions: none
End of Event User Vis Actions: none
End of Run User Vis Actions: none

Some /vis commands (optionally) take a string to specify colour.
"/vis/list" to see available colours.
        GenericIon,                  H,               H2O,               H2O2
               H3O,                H_2,               He3,                 OH
            Ps-1s,              Ps-2s,             alpha,             alpha+
         anti_He3,         anti_alpha,      anti_deuteron, anti_doublehyperH4
anti_doublehyperdoubleneutron,       anti_hyperH4,      anti_hyperHe5,    anti_hyperalpha
   anti_hypertriton,        anti_lambda,       anti_neutron,          anti_nu_e
         anti_nu_mu,        anti_proton,        anti_triton,             carbon
    chargedgeantino,           deuteron,      doublehyperH4,doublehyperdoubleneutron
                 e+,                 e-,              e_aq,              gamma
          geantino,             helium,          hydrogen,             hyperH4
          hyperHe5,         hyperalpha,        hypertriton,               iron
             kaon+,              kaon-,            lambda,                mu+
               mu-,            neutron,          nitrogen,              nu_e
             nu_mu,             oxygen,               pi+,               pi-
               pi0,             proton,           silicon,            triton

              phot,              compt,              conv,              Rayl
```

```
              pi0,              proton,              silicon,              triton

              phot,              compt,              conv,              Rayl
               msc,              eIoni,             eBrem,         ePairProd
       CoulombScat,                msc,             eIoni,             eBrem
           annihil,        CoulombScat,               msc,          ionIoni
   nuclearStopping,                msc,            muIoni,           muBrems
        muPairProd,        CoulombScat,            muIoni,               msc
             hIoni,             hBrems,         hPairProd,       CoulombScat
             hIoni,                msc,             hIoni,            hBrems
         hPairProd,        CoulombScat,             hIoni,               msc
             hIoni,             hBrems,         hPairProd,       CoulombScat
               msc,              hIoni,       CoulombScat,             hIoni
             hIoni,                msc,           ionIoni,               msc
           ionIoni,              hIoni,             hIoni,             hIoni
             hIoni,     Transportation,e-_G4DNAElectronSolvation,DNABrownianTransportation
G4DNAElectronHoleRecombination,H2O_DNAMolecularDecay,DNABrownianTransportation,DNABrownianTransportation
DNABrownianTransportation,DNABrownianTransportation,DNABrownianTransportation

### ===  Deexcitation model UAtomDeexcitation is activated for 4 regions:
```

```
           ionIoni,              hIoni,             hIoni,             hIoni
             hIoni,     Transportation,e-_G4DNAElectronSolvation,DNABrownianTransportation
G4DNAElectronHoleRecombination,H2O_DNAMolecularDecay,DNABrownianTransportation,DNABrownianTransportation
DNABrownianTransportation,DNABrownianTransportation,DNABrownianTransportation

### ===  Deexcitation model UAtomDeexcitation is activated for 4 regions:
          DefaultRegionForTheWorld  1  0  0
          Soma  1  0  0
          Dendrites  1  0  0
          Axon  1  0  0
### ===  Auger flag: 1
### ===  Ignore cuts flag:   1
G4WT0 >              phot,              compt,              conv,              Rayl
G4WT2 >              phot,              compt,              conv,              Rayl
G4WT1 >              phot,              compt,              conv,              Rayl
G4WT0 >               msc,              eIoni,             eBrem,         ePairProd
G4WT2 >               msc,              eIoni,             eBrem,         ePairProd
G4WT1 >               msc,              eIoni,             eBrem,         ePairProd
G4WT0 >       CoulombScat,                msc,             eIoni,             eBrem
G4WT2 >       CoulombScat,                msc,             eIoni,             eBrem
G4WT1 >       CoulombScat,                msc,             eIoni,             eBrem
G4WT0 >           annihil,        CoulombScat,               msc,           ionIoni
G4WT2 >           annihil,        CoulombScat,               msc,           ionIoni
```

```
G4WT0 >              phot,              compt,              conv,              Rayl
G4WT2 >              phot,              compt,              conv,              Rayl
G4WT1 >              phot,              compt,              conv,              Rayl
G4WT0 >               msc,              eIoni,             eBrem,         ePairProd
G4WT2 >               msc,              eIoni,             eBrem,         ePairProd
G4WT1 >               msc,              eIoni,             eBrem,         ePairProd
G4WT0 >       CoulombScat,                msc,             eIoni,             eBrem
G4WT2 >       CoulombScat,                msc,             eIoni,             eBrem
G4WT1 >       CoulombScat,                msc,             eIoni,             eBrem
G4WT0 >           annihil,        CoulombScat,               msc,           ionIoni
G4WT2 >           annihil,        CoulombScat,               msc,           ionIoni
G4WT1 >           annihil,        CoulombScat,               msc,           ionIoni
G4WT0 >   nuclearStopping,                msc,            muIoni,           muBrems
G4WT2 >   nuclearStopping,                msc,            muIoni,           muBrems
G4WT1 >   nuclearStopping,                msc,            muIoni,           muBrems
G4WT0 >        muPairProd,        CoulombScat,            muIoni,               msc
G4WT2 >        muPairProd,        CoulombScat,            muIoni,               msc
G4WT1 >        muPairProd,        CoulombScat,            muIoni,               msc
G4WT0 >             hIoni,             hBrems,         hPairProd,       CoulombScat
G4WT2 >             hIoni,             hBrems,         hPairProd,       CoulombScat
G4WT1 >             hIoni,             hBrems,         hPairProd,       CoulombScat
G4WT0 >             hIoni,                msc,             hIoni,            hBrems
G4WT2 >             hIoni,                msc,             hIoni,            hBrems
G4WT1 >             hIoni,                msc,             hIoni,            hBrems
G4WT0 >         hPairProd,        CoulombScat,             hIoni,               msc
G4WT2 >         hPairProd,        CoulombScat,             hIoni,               msc
G4WT1 >         hPairProd,        CoulombScat,             hIoni,               msc
G4WT0 >             hIoni,             hBrems,         hPairProd,       CoulombScat
```

```
G4WT1 >               hIoni,             hBrems,          hPairProd,        CoulombScat
G4WT0 >               hIoni,                msc,              hIoni,             hBrems
G4WT2 >               hIoni,                msc,              hIoni,             hBrems
G4WT1 >               hIoni,                msc,              hIoni,             hBrems
G4WT0 >           hPairProd,        CoulombScat,              hIoni,                msc
G4WT2 >           hPairProd,        CoulombScat,              hIoni,                msc
G4WT1 >           hPairProd,        CoulombScat,              hIoni,                msc
G4WT2 >               hIoni,             hBrems,          hPairProd,        CoulombScat
G4WT1 >               hIoni,             hBrems,          hPairProd,        CoulombScat
G4WT0 >                 msc,              hIoni,        CoulombScat,              hIoni
G4WT2 >                 msc,              hIoni,        CoulombScat,              hIoni
G4WT1 >                 msc,              hIoni,        CoulombScat,              hIoni
G4WT0 >               hIoni,                msc,            ionIoni,                msc
G4WT2 >               hIoni,                msc,            ionIoni,                msc
G4WT1 >               hIoni,                msc,            ionIoni,                msc
G4WT0 >             ionIoni,              hIoni,              hIoni,              hIoni
G4WT2 >             ionIoni,              hIoni,              hIoni,              hIoni
G4WT1 >             ionIoni,              hIoni,              hIoni,              hIoni
G4WT0 >               hIoni,     Transportation,e-_G4DNAElectronSolvation,DNABrownianTransportation
G4WT2 >               hIoni,     Transportation,e-_G4DNAElectronSolvation,DNABrownianTransportation
G4WT0 > G4DNAElectronHoleRecombination,H2O_DNAMolecularDecay,DNABrownianTransportation,DNABrownianTrans$
G4WT1 >               hIoni,     Transportation,e-_G4DNAElectronSolvation,DNABrownianTransportation
G4WT2 > G4DNAElectronHoleRecombination,H2O_DNAMolecularDecay,DNABrownianTransportation,DNABrownianTrans$
G4WT0 > DNABrownianTransportation,DNABrownianTransportation,DNABrownianTransportation
G4WT1 > G4DNAElectronHoleRecombination,H2O_DNAMolecularDecay,DNABrownianTransportation,DNABrownianTrans$
G4WT2 > DNABrownianTransportation,DNABrownianTransportation,DNABrownianTransportation
G4WT1 > DNABrownianTransportation,DNABrownianTransportation,DNABrownianTransportation
G4VisManager: Using G4TrajectoryDrawByCharge as fallback trajectory model.
See commands in /vis/modeling/trajectories/ for other options.
### Run 0 starts.
```

```
G4WT1 > G4DNAElectronHoleRecombination,H2O_DNAMolecularDecay,DNABrownianTransportation,DNABrownianTrans$
G4WT2 > DNABrownianTransportation,DNABrownianTransportation,DNABrownianTransportation
G4WT1 > DNABrownianTransportation,DNABrownianTransportation,DNABrownianTransportation
G4VisManager: Using G4TrajectoryDrawByCharge as fallback trajectory model.
See commands in /vis/modeling/trajectories/ for other options.
### Run 0 starts.

============================================================================================
--> G4TaskRunManager::CreateAndStartWorkers() --> Creating 300 tasks with 300 events/task...
============================================================================================

G4WT0 > ### Run 0 starts on worker thread 0.
G4WT2 > ### Run 0 starts on worker thread 2.
G4WT1 > ### Run 0 starts on worker thread 1.
G4WT1 > --> Event 600 starts with initial seeds (6383967,15098958).
G4WT0 > --> Event 0 starts with initial seeds (13049039,61775110).
G4WT2 > --> Event 300 starts with initial seeds (57661392,63196147).
G4WT1 > End of tracking primary particle, its final energy is :0 eV
G4WT0 > End of tracking primary particle, its final energy is :0 eV
G4WT2 > End of tracking primary particle, its final energy is :0 eV
G4WT1 > Physics stage ends
G4WT1 > *** G4Scheduler starts processing
G4WT1 > *** G4Scheduler did not start because no track was found to be processed
G4WT1 > ____________________________________
G4WT0 > Physics stage ends
G4WT0 > *** G4Scheduler starts processing
G4WT0 > *** G4Scheduler did not start because no track was found to be processed
G4WT0 > ____________________________________
G4WT2 > Physics stage ends
G4WT2 > *** G4Scheduler starts processing
G4WT2 > *** G4Scheduler did not start because no track was found to be processed
G4WT2 > ____________________________________
G4WT1 > End of tracking primary particle, its final energy is :0 eV
G4WT0 > End of tracking primary particle, its final energy is :0 eV
```

```
G4WT2 > Physics stage ends
G4WT2 > *** G4Scheduler starts processing
G4WT2 > *** G4Scheduler did not start because no track was found to be processed
G4WT2 > ____________________________________
G4WT1 > End of tracking primary particle, its final energy is :0 eV
G4WT0 > End of tracking primary particle, its final energy is :0 eV
G4WT2 > End of tracking primary particle, its final energy is :12.533 MeV
G4WT1 > Physics stage ends
G4WT1 > *** G4Scheduler starts processing
G4WT1 > *** G4Scheduler did not start because no track was found to be processed
G4WT1 > ____________________________________
G4WT2 > Physics stage ends
G4WT2 > *** G4Scheduler starts processing
G4WT2 > *** G4Scheduler did not start because no track was found to be processed
G4WT2 > ____________________________________
G4WT0 > Physics stage ends
G4WT0 > *** G4Scheduler starts processing
G4WT0 > *** G4Scheduler did not start because no track was found to be processed
G4WT0 > ____________________________________
G4WT1 > End of tracking primary particle, its final energy is :0 eV
G4WT2 > End of tracking primary particle, its final energy is :0 eV
G4WT0 > End of tracking primary particle, its final energy is :0 eV
G4WT1 > Physics stage ends
G4WT1 > *** G4Scheduler starts processing
G4WT1 > *** G4Scheduler did not start because no track was found to be processed
```

```
G4WT0 > ____________________________________
G4WT1 > End of tracking primary particle, its final energy is :1.0636 MeV
G4WT0 > End of tracking primary particle, its final energy is :55.208 MeV
G4WT2 > Physics stage ends
G4WT2 > *** G4Scheduler starts processing
G4WT2 > *** G4Scheduler did not start because no track was found to be processed
G4WT2 > ____________________________________
G4WT0 > Physics stage ends
G4WT0 > *** G4Scheduler starts processing
G4WT0 > *** G4Scheduler did not start because no track was found to be processed
G4WT0 > ____________________________________
G4WT2 > End of tracking primary particle, its final energy is :0 eV
G4WT1 > Physics stage ends
G4WT1 > *** G4Scheduler starts processing
G4WT1 > *** G4Scheduler did not start because no track was found to be processed
G4WT1 > ____________________________________
G4WT0 > End of tracking primary particle, its final energy is :0 eV
G4WT1 > End of tracking primary particle, its final energy is :32.96 MeV
G4WT0 > Physics stage ends
G4WT0 > *** G4Scheduler starts processing
```

```
G4WT2 > ____________________________________
G4WT2 > End of tracking primary particle, its final energy is :10.828 MeV
G4WT1 > Physics stage ends
G4WT1 > *** G4Scheduler starts processing
G4WT1 > *** G4Scheduler did not start because no track was found to be processed
G4WT1 > ____________________________________
G4WT1 > --> Event 1200 starts with initial seeds (81249407,57561016).
G4WT0 > Physics stage ends
G4WT0 > *** G4Scheduler starts processing
G4WT0 > *** G4Scheduler did not start because no track was found to be processed
G4WT0 > ____________________________________
```

```
G4WT0 > ____________________________________

 ======= The summary of simulation results 'neuron' ========

  Primary particle                = C12
  Kinetic energy of beam          = 134.4 A*MeV
  Particle traversals the neuron = 32887 of 90000
  Full LET of beam as formulas    = 146.4262 keV/um
  Mean LET of beam as simulation = 241.4679 +- 29.33942 keV/um
  Mean track length of beam       = 534.5323 +- 0.03439197 um
  Particle fluence                = 5862960 particles/cm^2
  Fluence dose (full)             = 1.375457 Gy
  Fluence dose ber beam           = 1.528286e-05 Gy

 List of generated physical process:
                 Rayl=    117
                compt=      8
 e-_G4DNAElectronSolvation=    625
                eBrem= 143183
                eIoni=1879882199
              ionIoni=1474784149
                  msc=-1777346616
                 phot= 110603
```

```
 List of generated particles outside neuron structure:
            e- : 1072911099  Emean =  4.279934 keV     ( 0.1239409 meV --> 24.72512 keV)       Eflow/ev
ent = 51.02209 MeV
         gamma :  112857  Emean =  975.1298 eV        ( 100.0114 eV  --> 20.67038 keV)        Eflow/ev
ent = 1.22278 keV

 Number of secondary particles inside neuron structure:
            e- : 29904913
         gamma :     235

 Number of molecular products inside neuron structure:
    time: 1 ps - 10 ps

 Total energy (MeV) deposition :
  All volume:  1.161651e+07
   Bounding slice: 1894940
      Neuron:   24150.32
        Soma:   15165.84
   Dendrites:  8984.487
        Axon:         0

 Number of compartments traversed by particle tracks :
        Soma:       96 of total: 96
    Dendrites:   17541 of total: 18280
        Axon:        0 of total: 0


 Mean energy (keV) and dose (Gy) deposition in hitting compartments :
        Soma:  157977.5 +- 188276.3 and 0 +- 0
    Dendrites: 512.1993 +- 1441.274 and 0 +- 0
        Axon:        0 +- 0 and 0 +- 0


 Mean energy (keV) deposition per event:
    Neuron:   268.3369 +- 1059.954 and 0.0004268219 +- 0.04360519


 Dendritic (or Axon) compartmental energy deposits
 at the distance from Soma have been written into *.out files:
```