Geant 4

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Trajectory and Hit Visualisation

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Contents

- Enhanced trajectory drawing
- Trajectory filtering
- Hit filtering

Enhanced Trajectory Drawing

- Release 8.0
  - ➔ First release
  - ➔ Change trajectory colouring scheme through simple trajectory drawing models based on charge, particle type
- Release 8.1
  - ➔ Extend to cover default properties of trajectory
    - ✓ imode parameter becomes redundant
  - ➔ Add a couple of new models
- December release
  - ➔ Introduce attribute based model

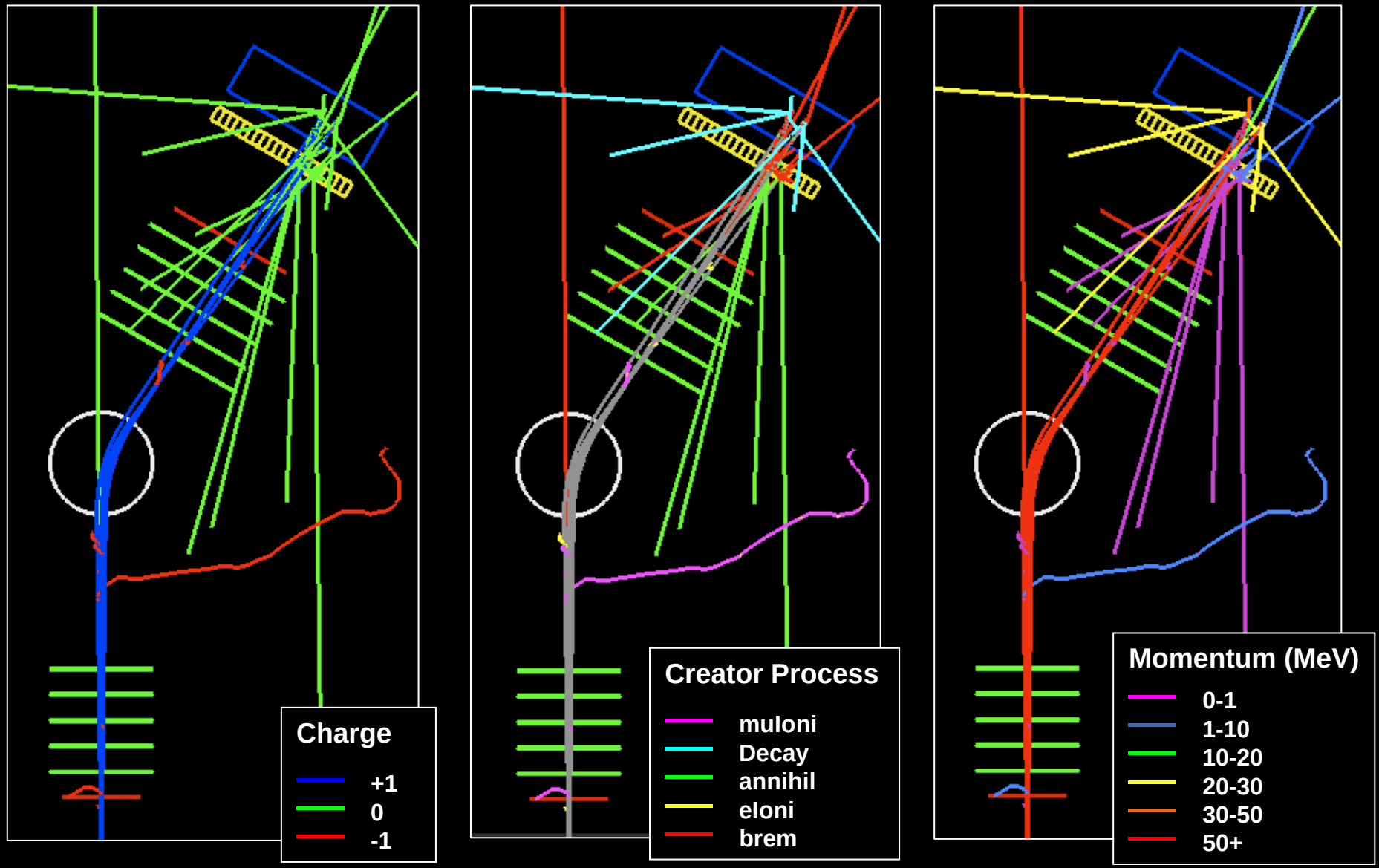
Default Trajectory Visualisation Properties

- Default trajectory visualisation properties can be set through a G4VisTrajContext object
  - ➔ Line colour, visibility
  - ➔ Step/auxiliary point visibility, polymarker type, fill style, colour
- Attached to trajectory model
- Configurable through interactive commands
- Replaces imode functionality

Attribute Based Trajectory Drawing

- New model accesses information about each trajectory through existing HepRep style attributes
- Access to additional information on
  - Creator process name & type (G4RichTrajectory)
  - Next volume name (G4RichTrajectory)
  - Initial volume name
  - Magnitude of momentum
  - Number of trajectory points
  - User defined attributes
  - ...
- Configure visualisation properties for each single value/interval of given attribute - point size, line colour, etc

Example A01, five events, drawByAttribute model



Sample Macro Commands

```
/vis/modeling/trajectories/create/drawByAttribute
/vis/modeling/trajectories/drawByAttribute-0/verbose true
/vis/modeling/trajectories/drawByAttribute-0/setAttribute CPN
/vis/modeling/trajectories/drawByAttribute-0/addValue brem_key  eBrem
/vis/modeling/trajectories/drawByAttribute-0/addValue annihil_key annihil
/vis/modeling/trajectories/drawByAttribute-0/addValue decay_key Decay
/vis/modeling/trajectories/drawByAttribute-0/addValue muIon_key muIoni
/vis/modeling/trajectories/drawByAttribute-0/addValue eIon_key  eIoni

/vis/modeling/trajectories/drawByAttribute-0/brem_key/setLineColour     red
/vis/modeling/trajectories/drawByAttribute-0/annihil_key/setLineColour  green
/vis/modeling/trajectories/drawByAttribute-0/decay_key/setLineColour    cyan
/vis/modeling/trajectories/drawByAttribute-0/eIon_key/setLineColour     yellow
/vis/modeling/trajectories/drawByAttribute-0/muIon_key/setLineColour magenta
```

Creator process name attribute

Select relevant attribute values

Configure visualisation parameters

December Release Summary

- G4TrajectoryDrawByCharge
- G4TrajectoryDrawByParticleID
- G4TrajectoryDrawByOriginVolume
  - ➔ Logical or physical volume
- G4TrajectoryGenericDrawer
  - ➔ Trajectory visualised using default properties
- G4TrajectoryDrawByAttribute
  - ➔ Uses HepRep style attributes (G4AttDef)

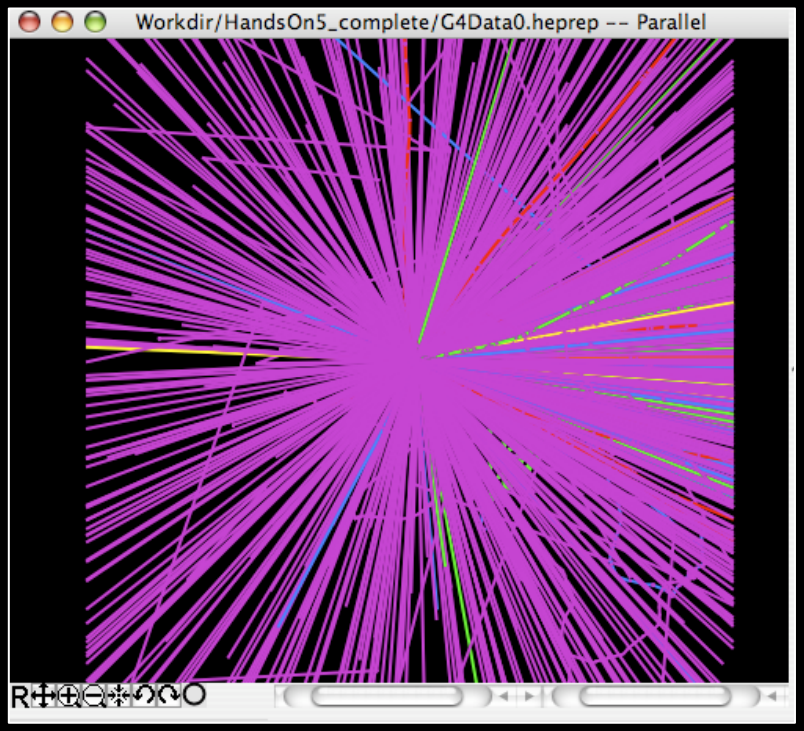
Trajectory Filtering

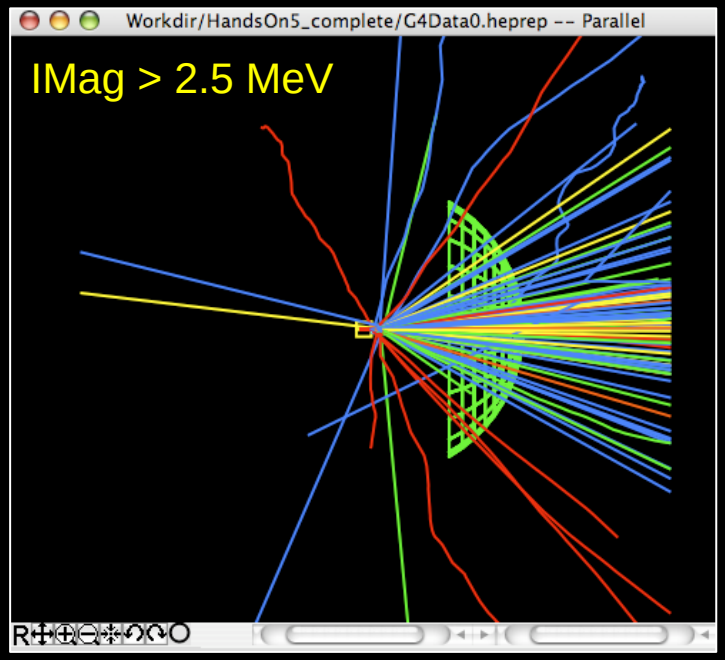
- Display user defined subset of trajectories
  - ➔ Problems with large graphics files, busy events
- Two modes of operation
  - ➔ Rejected trajectories drawn but marked invisible
  - ➔ Rejected trajectories not drawn at all
- Similar structure to enhanced trajectory drawing
  - ➔ Set of simple filter models
  - ➔ Similar Interactive creation/configuration structure
- Chain multiple filters

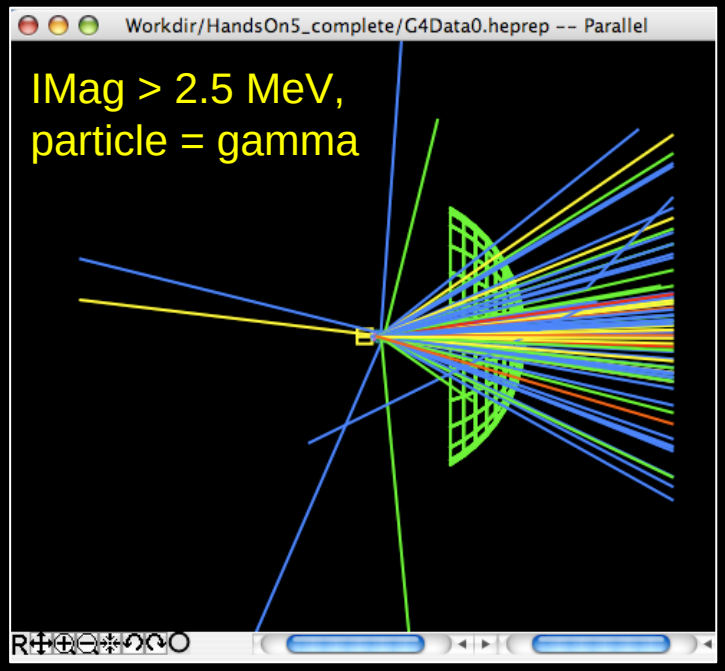
Releases

- Release 8.1
  - ➔ First release
  - ➔ Simple filters, eg, charge, particle type
- December release
  - ➔ Introduce attribute based filter model

HandsOn5, McGill tutorial, 1000 events, Attribute Filter







Momentum (MeV)

- 0-2.5
- 2.5-5
- 5-7.5
- 7.5-10
- 10-10.25
- 12.5+

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Sample Macro Commands

```
/vis/modeling/trajectories/drawByAttribute-0/setAttribute IMag
/vis/modeling/trajectories/drawByAttribute-0/addInterval interval1 0.0 keV 2.5MeV
/vis/modeling/trajectories/drawByAttribute-0/addInterval interval2 2.5 MeV 5 MeV
/vis/modeling/trajectories/drawByAttribute-0/addInterval interval3 5 MeV 7.5 MeV
/vis/modeling/trajectories/drawByAttribute-0/addInterval interval4 7.5 MeV 10 MeV
/vis/modeling/trajectories/drawByAttribute-0/addInterval interval5 10 MeV 12.5 MeV
/vis/modeling/trajectories/drawByAttribute-0/addInterval interval6 12.5 MeV 10000 MeV

/vis/modeling/trajectories/drawByAttribute-0/interval1/setLineColourRGBA 0.8 0 0.8 1
/vis/modeling/trajectories/drawByAttribute-0/interval2/setLineColourRGBA 0.23 0.41 1 1
/vis/modeling/trajectories/drawByAttribute-0/interval3/setLineColourRGBA 0 1 0 1
/vis/modeling/trajectories/drawByAttribute-0/interval4/setLineColourRGBA 1 1 0 1
/vis/modeling/trajectories/drawByAttribute-0/interval5/setLineColourRGBA 1 0.3 0 1
/vis/modeling/trajectories/drawByAttribute-0/interval6/setLineColourRGBA 1 0 0 1

/vis/filtering/trajectories/create/attributeFilter
/vis/filtering/trajectories/attributeFilter-0/setAttribute IMag
/vis/filtering/trajectories/attributeFilter-0/addInterval 2.5 MeV 1000 MeV

/vis/filtering/trajectories/create/particleFilter
/vis/filtering/trajectories/particleFilter-0/add gamma
```

Momentum filter

Momentum interval based colour scale

Configure visualisation properties

Momentum filter

Gamma filter

December Release Summary

- G4TrajectoryChargeFilter
- G4TrajectoryParticleFilter
- G4TrajectoryOriginVolumeFilter
  - ➔ Logical or physical volume
- G4TrajectoryAttributeFilter
  - ➔ Uses HepRep style attributes (G4AttDef)

Hit Filtering

- Attribute based filtering implemented generically
  - ➔ Can apply to any class which implements these methods

```
const std::map<G4String,G4AttDef>* GetAttDefs() const;
std::vector<G4AttValue>* CreateAttValues() const;
```

- Get attribute based interactive hit filtering for free
- To activate, add a filter call to G4VVisManager in Draw method of hit class

```
void MyHit::Draw() {
  …
  if (! pVVisManager->FilterHit(*this)) return;
  …
```

Summary

- Coming December release
  - ➔ Range of drawing & filtering models for trajectories
  - ➔ Attribute based filtering for hits
  - ➔ Attribute based drawing/filtering code in CVS
- See interactive help for details on command usage
- Documentation will be updated to cover recent developments