New Features for Reconstruction

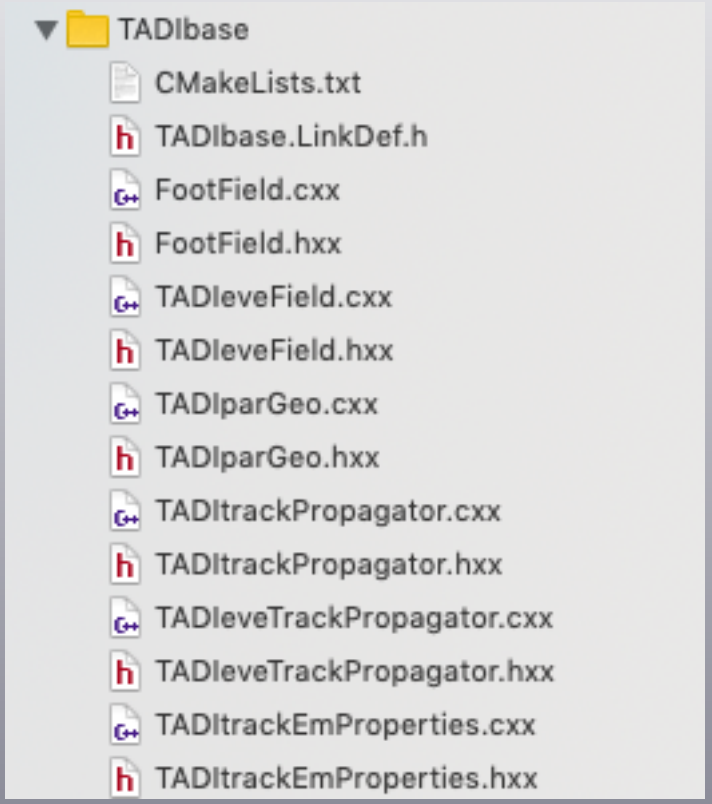
Dipole Folder

Event Display Folder

Conclusions

Dipole Folder

- TADIbase:



- Including geometry and field
- Two new classes for track propagation
- One new class for track EM properties (scattering & energy loss)

EM properties (i)

- TADItrackEmProperties: new class to compute scattering angle and energy loss

```
class TADItrackEmProperties : public TAGpara {

public:
   TADItrackEmProperties();
   virtual ~TADItrackEmProperties();

   Double_t SigmaTheta(Double_t* x, Double_t* par);
   Float_t  GetSigmaTheta(const TString& mat, Float_t x, Float_t energy, Float_t A, Float_t Z);

   Float_t  GetEnergyLoss(const TString& mat, Float_t thickness, Float_t energy, Float_t massNumber,
                          Int_t atomicNumber);
   Float_t  GetEnergyLoss(Float_t energy, Float_t massNumber, Int_t atomicNumber, Float_t WEPL);
   Float_t  GetdEdX(const TString& mat, Double_t beta,  Double_t zBeam);
   Float_t  GetPCC(Float_t energy, Float_t massNumber);
   Float_t  GetBeta(Float_t energy);
   Float_t  GetWEPL(const TString& material, Float_t thickness);

   Float_t  GetRadLength(TString name);
   Float_t  GetDensity(TString name);
   Float_t  GetA(TString name, Bool_t eff=false);
   Float_t  GetZ(TString name, Bool_t eff=false);
   Float_t  GetMeanExcitationEnergy(TString name);

   Float_t  GetA(TGeoMixture* mix);
   Float_t  GetZ(TGeoMixture* mix);
…
   ClassDef(TADItrackEmProperties,0)
};
```

- GetdEdX, inspired from Alessio's ChargeBetheBloch class

EM properties (ii)

- TAGionisMaterials: new class of ionisation properties

```
   TAGionisMaterials(TGeoMaterial* mat);
   TAGionisMaterials();
   virtual ~TAGionisMaterials();

   // Set materials
   void SetMaterial(TGeoMaterial* mat)                 { fMaterial = mat;                }

   // parameters for mean energy loss calculation:
   void      AddMeanExcitationEnergy(Double_t value); // only for root version >= 6.17
   void      SetMeanExcitationEnergy(Double_t value)   { fMeanExcitationEnergy = value;  }
   Double_t  GetMeanExcitationEnergy()           const { return fMeanExcitationEnergy;   }

   void      SetShellCorrectionVector(Double_t* value) { fShellCorrectionVector = value; }
   Double_t* GetShellCorrectionVector()          const { return fShellCorrectionVector;  }

   void      SetTaul(Double_t value)                   { fTaul = value;                  }
   Double_t  GetTaul()                           const { return fTaul;                   }


   // parameters for Birks attenuation:
   void      AddBirksFactor(Double_t value);          // only for root version >= 6.17
   void      SetBirksConstant(Double_t value)          { fBirks = value;                 }
   Double_t  GetBirksConstant()                  const { return fBirks;                  }

public:
   static const Char_t* GetMeanExcitationEnergyName()  { return fgkMeanExcitationEnergy.Data();  }
   static const Char_t* GetShellCorrectionVectorName() { return fgkShellCorrectionVector.Data(); }
   static const Char_t* GetTaulName()                  { return fgkTaul.Data();                   }
   static const Char_t* GetBirksName()                 { return fgkBirks.Data();                  }


   static const Char_t* GetMeanExcitationEnergyName(TString matName)  { return (fgkMeanExcitationEnergy+matName).Data();  }
   static const Char_t* GetShellCorrectionVectorName(TString matName) { return (fgkShellCorrectionVector+matName).Data(); }
   static const Char_t* GetTaulName(TString matName)                  { return (fgkTaul+matName).Data();                   }
   static const Char_t* GetBirksName(TString matName)                 { return (fgkBirks+matName).Data();                  }
…
```

- if everyone using root >= 6.17, simplified the class, pre-compiler option now

EM properties (iii)

- TATWdetector.map:

```
// -+-+-+-+--+-+-+-+--+-+-+-+--+-+-+-+--+-+-+-+--+-+-+-+--+-+-+-+--+-+-+-+-
// Parameters of the TW
// -+-+-+-+--+-+-+-+--+-+-+-+--+-+-+-+--+-+-+-+--+-+-+-+--+-+-+-+--+-+-+-+-
LayersN:      2
BarsN:       20
Material:  "EJ232"
Density:    1.023
Excitation: 4.8e-5
BirkFac:    0.0138
```

- TATWparGeo:

```
//_____________________________________________________________________________
void TATWparGeo::DefineMaterial()
{
   …
   // TW material
   TGeoMaterial* mat = TAGmaterials::Instance()->CreateMaterial(fBarMat, fBarDensity);
   …
#if ROOT_VERSION_CODE >= ROOT_VERSION(6,17,0)
   fIonisation->SetMaterial(mat);
   fIonisation->AddMeanExcitationEnergy(fBarIonisMat);
   fIonisation->AddBirksFactor(fBarBirkMat);
#else
   fIonisation->SetMeanExcitationEnergy(fBarIonisMat);
   fIonisation->SetBirksConstant(fBarBirkMat);
   mat->SetCerenkovProperties(ionis);
#endif
}
```

- Same for VTX, IT and TG parameters

EM properties (iv)

- Examples:
  - Scatter angle (mrad) for protons @ 160 MeV

Target	Class	Literature[1]	Diff (%)
Berylium	4.8	4.8	0
Water	6.5	6.6	1.5
Lead	17.4	17.3	0.6

  - Energy loss (MeV.cm^2/g) for carbon @ 200 MeV

Target	Class	Literature[2]	Diff (%)
Carbon	144.9	144.7	0.2
Silicon	130.7	130.6	0.1
Polyethylen	170.2	170.0	0.1

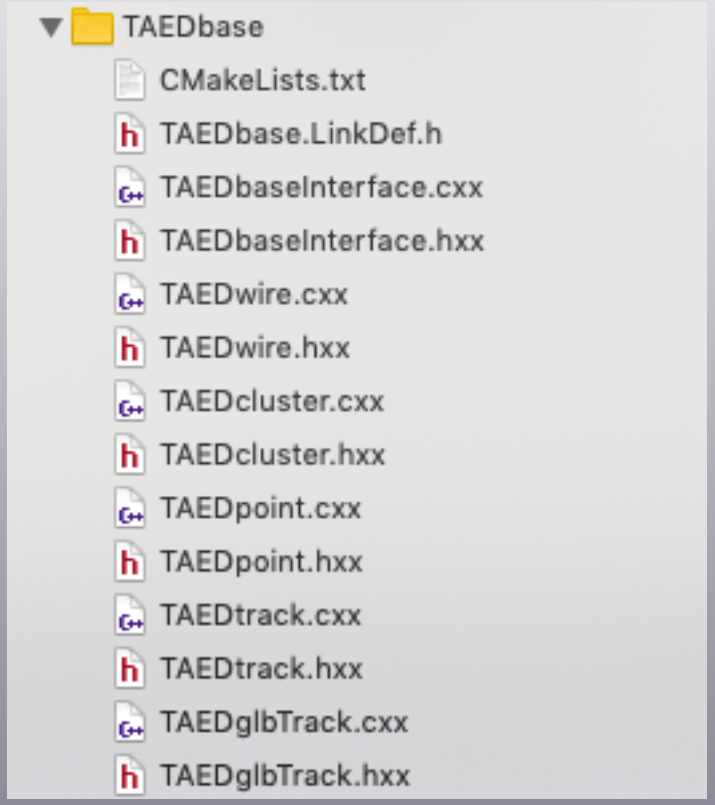
➡ Good agreement for our purpose

[1] V. Highland, N.I.M. 129 (1975)

[2] T. Hiraoka et al., Jpn. J. Med. Phys 15 (1995)

Event Display Folder

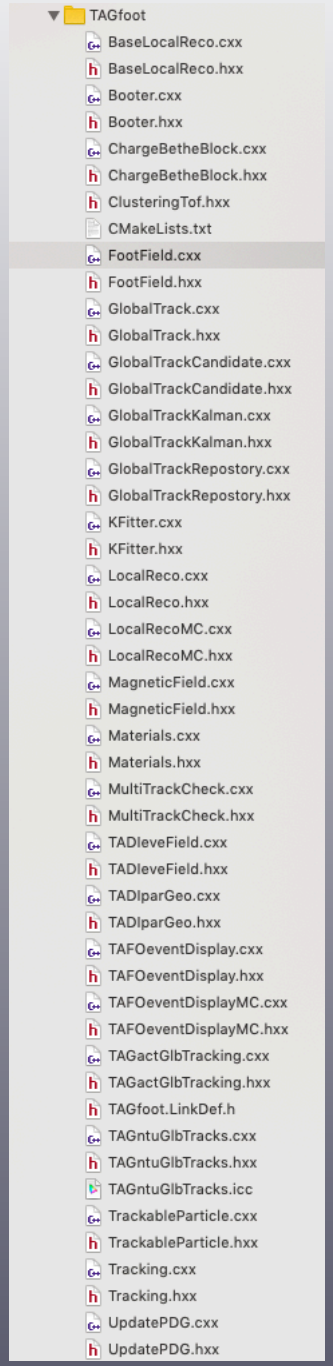
- TAEDbase:

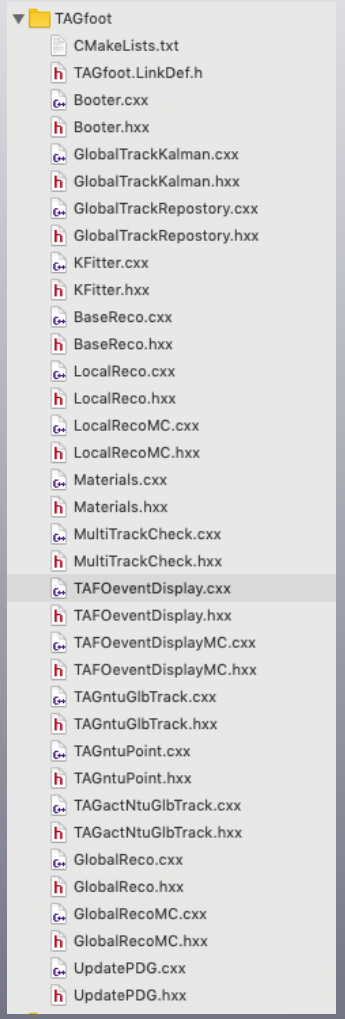


- All base classes of event display
- Main classes stayed in TAGfoot (TAFOeventDisplay & TAFOeventDisplayMC)

TAGfoot Folder

- TAGfoot:





➡ Much lighter

Conclusions

- ➡ Lightened TAGfoot folder
- ➡ New methods for track reconstruction and display