Geometrical Vertex Fitter

Performs an unconstrained fit of a vertex given any number of particles.

Interface: IVertexFitter

```
StatusCode fitVertex( const ParticleVector&, Vertex& );
StatusCode fitVertex( Particle&, Particle&, Vertex& );
StatusCode fitVertex( Particle&, Particle&, Particle&,
                      Vertex&);
```

Concrete Class: UnconstVertexFitter

Equations in LHC-B/TN/95-01.

The Vertex type is set to "Decay".

Number of degrees of freedom is 2N-3.

Geometrical Vertex Fitter (cont)

Usage:

(`iMuMinus` **and** `iMuPlus` **are** `ParticleVector::iterator` **objects.)**

```
Vertex MuMuVertex;
StatusCode scMuMuVertex = vertexFitter()->
      fitVertex(*(*iMuMinus),*(*iMuPlus), MuMuVertex);
```

Or put all the input particles in one ParticleVector:

```
ParticleVector vMuComb;
vMuComb.push_back(*iMuMinus);
vMuComb.push_back(*iMuPlus);
Vertex MuMuVertex;
StatusCode scMuMuVertex = vertexFitter()->
      fitVertex(vMuComb,MuMuVertex);
```

Mass constrained Vertex Fitter

Particles are constrained to cross one point in space and their invariant mass is constrained to the PDG value of a given decaying particle.

Interface: IMassVertexFitter

```
StatusCode fitWithMass(const std::string&,
       const ParticleVector&, Vertex&, Particle&);
StatusCode fitWithMass(const std::string&,
       Particle&, Particle&, Vertex&, Particle&);
StatusCode fitWithMass(const std::string&,
       Particle&, Particle&, Particle&, Vertex&, Particle&);
```

An object Vertex and an object Particle are returned with all their parameters set.

Mass constrained Vertex Fitter (cont)

Concrete Class: LagrangeMassVertexFitter

Equations in LHCb Phys Note 98-051.

☞ For the moment works only for two or three particles.

- composite particle's 4-momentum ➜ sum of the modified daughter particles
- mass() method ➜ PDG value.
- The original parameters of the daughter particles are not modified.
- The Vertex type ➜"DecayWithMass"
- Number of degrees of freedom ➜ N

Mass constrained Vertex Fitter (cont)

Usage:

```
StatusCode scLagFit = massVertexFitter()->
        fitWithMass("J/psi(1S)", *(*iMuMinus),*(*iMuPlus),
                    jpsiVtx, jpsi);
```

Or put all the input particles in one ParticleVector as in the Geometrical Vertex Fitter

Particle Stuffer

Fills a (composite) Particle object given a particle ID and a vertex that has been previously filled by following the links to the particles that originated the vertex.

Interface - IParticleStuffer

```
StatusCode fillParticle(const Vertex&, Particle&,
                        const ParticleID& );
```

Concrete Class - ParticleStuffer

calculates the mother particle attributes by combining the ones from the products of the vertex.

- **four-momentum➜ sum of the daughter's four-momentum**
- **mass() (and its error)➜ obtained from the four-momentum.**
- **particle ID ➜ given as input**

- **PointOnTrack() (and its error) ➜ vertex position.**
- **four-momentum - point correlation error ➜ zero.**

Usage:

Assuming that `MuMuVertex` is a Vertex object that has already been filled

```
Particle candJpsi;
ParticleProperty* partProp = ppSvc->find( "J/psi(1S)" );
m_jpsiID = (*partProp).jetsetID();
ParticleID jpsiPID( m_jpsiID );
StatusCode scStuff = particleStuffer()->
        fillParticle( MuMuVertex, candJpsi, jpsiPID );
```