On MC status @CEPC

Wednesday working meeting

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GeneratorStatus()

- This label is from generator level
  - 1= stable. 2=unstable;
  - 0= undefined -> all particles from Geant4 are labelled here!
- People use GeneratorStatus()==1 to judge if particle is stable
  - Not correct. Do not use this.
  - It can decay or convert. And the new particles not included.
  - Alternative: daughters_size() ==0

SimulatorStatus(): int_32: 8 bit record

- Better choice to use
  - isCreatedInSimulation()
  - isDecayedInTracker()
- 4 of 8 not ready yet.

VertexIsNotEndpointOfParent,
HasLeftDetector, stopped, overlayed

```
// define the bit positions for the simulation flag
static const int BITEndpoint = 31;
static const int BITCreatedInSimulation = 30;
static const int BITBackscatter = 29 ;
static const int BITVertexIsNotEndpointOfParent = 28 ;
static const int BITDecayedInTracker = 27 ;
static const int BITDecayedInCalorimeter = 26 ;
static const int BITLeftDetector = 25 ;
static const int BITStopped = 24 ;
static const int BITOverlay = 23 ;
/// return energy computed from momentum and mass
double getEnergy() const { return sqrt( getMomentum()[0]*getMomentum()[0]+getMomentum()[1]*getMomentum()[1]+
getMomentum()[2]*getMomentum()[2] + getMass()*getMass()  )  ;}

/// True if the particle has been created by the simulation program (rather than the generator).
bool isCreatedInSimulation() const { return ( getSimulatorStatus() & ( 0x1 << BITCreatedInSimulation ))  ; }
/// True if the particle is the result of a backscatter from a calorimeter shower.
bool isBackscatter() const { return ( getSimulatorStatus() & ( 0x1 << BITBackscatter )) ; }
/// True if the particle's vertex is not the endpoint of the  parent particle.
bool vertexIsNotEndpointOfParent() const { return ( getSimulatorStatus() & ( 0x1 << BITVertexIsNotEndpointOfParent )) ; }
/// True if the particle has interacted in a tracking region.
bool isDecayedInTracker() const { return ( getSimulatorStatus() & ( 0x1 << BITDecayedInTracker )) ; }
/// True if the particle has interacted in a calorimeter region.
bool isDecayedInCalorimeter() const { return ( getSimulatorStatus() & ( 0x1 << BITDecayedInCalorimeter )) ; }
/// True if the particle has left the world volume undecayed.
bool hasLeftDetector() const { return ( getSimulatorStatus() & ( 0x1 << BITLeftDetector )) ; }
/// True if the particle has been stopped by the simulation program.
bool isStopped() const { return ( getSimulatorStatus() & ( 0x1 << BITStopped )) ; }
/// True if the particle has been overlayed by the simulation (or digitization)  program.
bool isOverlay() const { return ( getSimulatorStatus() & ( 0x1 << BITOverlay )) ; }
```

Defined in edm4hep/MCParticle.h
Implemented in Simulation/DetSimAna/src/Edm4hepWriterAnaElemTool.cpp

MC Truthlink

- EDM4hep::MCRecoTrackParticleAssociation CompleteTracksParticleAssociation
- Match Tracks & MCParticles. Example: FinalPIDSvc/src/PIDDumpAlg.cpp
  - Size=CompleteTracks
  - Match method: max weight of simhit.
  - PFO link not ready yet. Ecal hit link not ready; Hcal hit link ready.
- Currently particles generated in simulation not included in link.
  - Plan to change logic in next update. @Lin.

“Truth jet”

- 3 types:
  - “Quark Jet”. Use b/c/d quark 4 momentum to identify truth flavor.
    - Including neutrino.
  - “Gen Jet”. Use “GeneratorStatus=1” particles to clustering. Previous used;
    - ~20 charged tracks in one H->bb jet.
  - “Truth Jet”. Use “daughters_size() ==0” particles to clustering. More reasonable?
    - ~10 extra electrons in one jet.
    - Total energy no big shift. (photon->electron pair). Under further check.