

# Chapter 1

## Spill data structure

spill:

- mc
  - *array item*
    - \* virtual\_hits: Virtual hits store information on all particles as they cross a user-defined plane in space, time or proper time
    - \* tracks: Stores information on stepping information, initial and final position of the track. Enabled by 'keep\_tracks' datacard
    - \* hits: Stores information on interactions of particles with sensitive detectors
    - \* primary: Describes the initial particle that is used as an input into the Monte Carlo simulation

spill/mc/array item/virtual\_hits:

- *array item*
  - track\_id: Identifier for the track that made the hit
  - path\_length: Total path length travelled of the particle that made the hit [mm]
  - b\_field: Magnetic field at the position and time that the hit was recorded [kT]
    - \* y
    - \* x
    - \* z
  - e\_field: Electric field at the position and time that the hit was recorded [MV/mm]
    - \* y
    - \* x
    - \* z
  - charge: charge of the particle that made the hit [ $e^+$  charge]

- `particle_id`: Identifies the particle type according to the PDG indexing system (<http://hepdata.cedar.ac.uk/lbl/2011/reviews/rpp2011-rev-naming-scheme-hadrons.pdf>)
- `station_id`: ID for the virtual plane that registered this hit. See Mice-Modules docs for options on how stations are numbered.
- `mass`: mass of the particle that made the hit [MeV/c<sup>2</sup>]
- `momentum`: Momentum of the track that made the hit [MeV/c]
  - \* `y`
  - \* `x`
  - \* `z`
- `time`: particle time for the track that made the hit [ns]
- `position`: Position of the hit [mm]
  - \* `y`
  - \* `x`
  - \* `z`
- `proper_time`: Relativistic proper time of the particle that made the hit [ns]

`spill/mc/array item/tracks`:

- `initial_momentum`: Initial momentum of the track [MeV/c]
  - `y`
  - `x`
  - `z`
- `initial_position`: Initial position of the track [mm]
  - `y`
  - `x`
  - `z`
- `particle_id`
- `steps`: Stores information on each step in the tracking. Enabled by 'keep\_steps' datacard
- `parent_track_id`
- `track_id`
- `final_momentum`: Final momentum of the track [MeV/c]
  - `y`
  - `x`
  - `z`
- `final_position`: Final position of the track [mm]

- y
- x
- z

*spill/mc/array item/hits:*

*spill/mc/array item/primary:*

- position

- y
- x
- z

- energy

- particle\_id

- momentum

- y
- x
- z

- time

*spill/mc/array item/tracks/steps:*

- *array item*

- energy\_deposited: Energy deposited by the track on the previous step [MeV]
- path\_length: Distance travelled by the particle when it made the step [mm]
- energy: Energy of the track [MeV]
- momentum: Momentum of the track that made the step [MeV/c]
  - \* y
  - \* x
  - \* z
- time: Time of the track in lab frame when it made the step [ns]
- position: Position of the step [mm]
  - \* y
  - \* x
  - \* z
- proper\_time: Proper time of track when it made the step [ns]