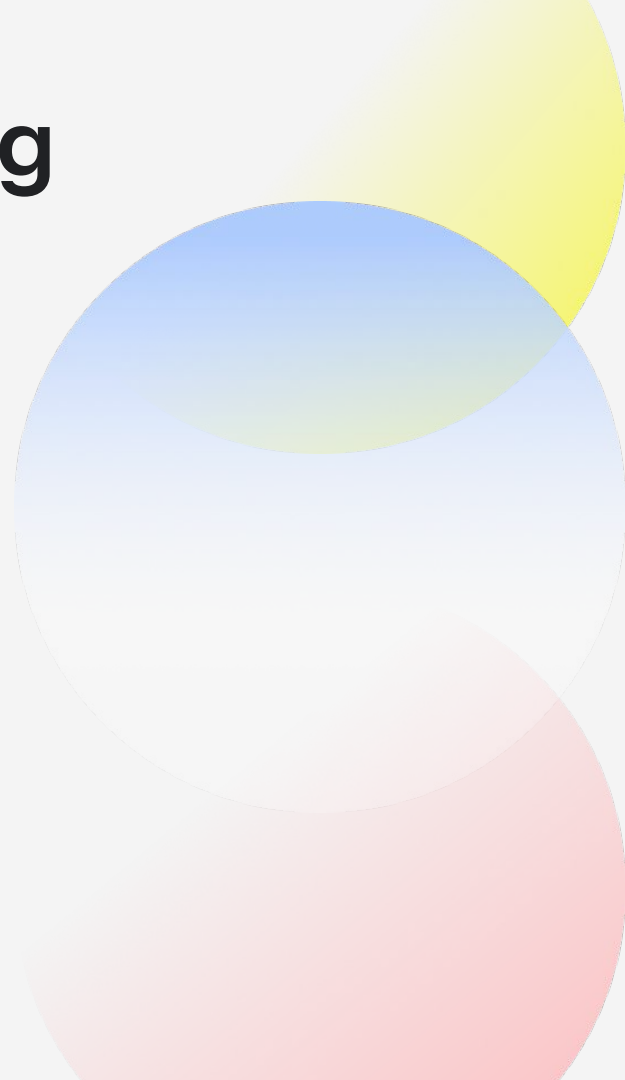


Changes to Cone Filtering when running MAIA

MAIA Meeting 09/09/2025

Mira Littmann



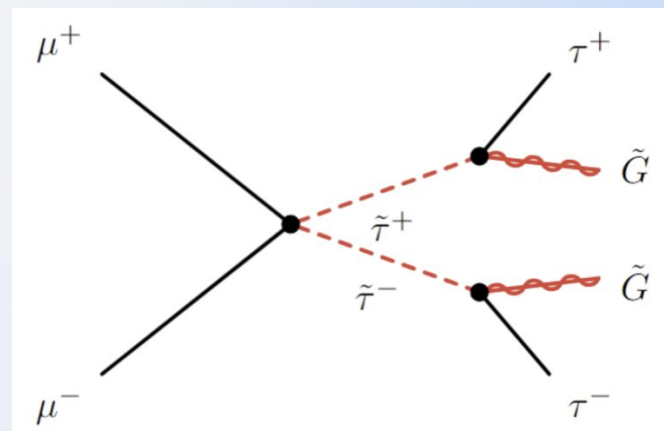
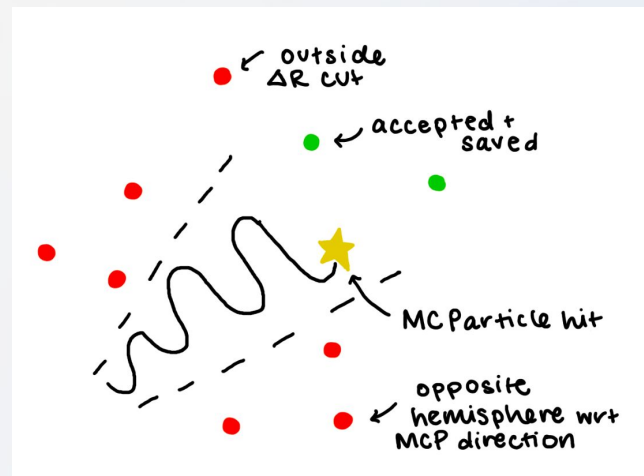
Review: Coning processor & LLP Studies

Coning:

- In order to reduce BIB contamination and computation time, only save information from hits within a specified ΔR cut
- Clone truth (sim) information for the new saved collections
- Done in digitisation/reconstruction stage

LLP studies:

- Looking at feasibility/efficiency of stau direct detection
- Just recently switched to using MAIA geometry



Change #1: Generator Status

Previously: looping through Pythia generator status “1”:
stable + final state particles

Most of my status are saved as status “22”: intermediate, and weren’t seen by the processor.

Now have new parameter that can be added to the steering file: ConeAroundStatus

Default is 1, so you shouldn’t have to change anything unless you want to.

```
VXDBarrelCone = MarlinProcessorWrapper("VXDBarrelCone")
VXDBarrelCone.OutputLevel = DEBUG
VXDBarrelCone.ProcessorType = "FilterConeHits"
VXDBarrelCone.Parameters = {
    "MCParticleCollection": ["MCParticle"],
    "TrackerHitInputCollections": ["VBTrackerHits"],
    "TrackerSimHitInputCollections": ["VertexBarrelCollection"],
    "TrackerHitInputRelations": ["VBTrackerHitsRelations"],
    "TrackerHitOutputCollections": ["VBTrackerHitsConed"],
    "TrackerSimHitOutputCollections": ["VertexBarrelCollectionConed"],
    "TrackerHitOutputRelations": ["VBTrackerHitsRelationsConed"],
    "DeltaRCut": ["0.4"],
    "ConeAroundStatus": ["22", "51", "52"],
    "FillHistograms": ["false"]
}
```

Change #2:

Fixed reco-sim truth

Previous version of the processor was losing truth information once BIB was added.

Was getting same tracks, just labelled as BIB instead of staus.

This is because the reco \leftrightarrow sim relation was being accessed through an index, not the actual hit.

But the “ihit-th” relation collection doesn’t necessarily match the “ihit-th” reco collection.

Look-up should be fixed now!

```
[ MESSAGE "VXDBarrelConer" ] [FilterConeHits] processEvent run=-1 evt=0
[FilterConeHits] processEvent reached for evt 0
input hit relations collection: 0x2fc19ad0
RECO HIT: position-25.811, -16.512, 0.870
[per-hit] VBTTrackerHits[0] candidates=1 withMC=1 nullMC=0
[align] hits[0]@0x3147f350 rel[0] from@0x2e3c2430 to@0x313235e0 from==hit? 0
input hit relations collection VBTTrackerHitsRelations at 0x2fc19ad0 has 2201 elements.
SIM HIT: position48.766, 16.263, -51.221
rel sim to mcparticle: 0
rel sim momentum: [-0.001, -0.000, -0.000]
SIZES: VBTTrackerHits hits=2201 | VBTTrackerHitsRelations rels=2201 | VertexBarrelCollection simhits=2672
input hit relations collection: 0x2d656810
RECO HIT: position-109.677, -70.121, 3.538
[per-hit] IBTTrackerHits[0] candidates=1 withMC=1 nullMC=0
[align] hits[0]@0x2d6564d0 rel[0] from@0x2d6564d0 to@0x2d6431c0 from==hit? 1
input hit relations collection IBTTrackerHitsRelations at 0x2d656810 has 4 elements.
SIM HIT: position-109.674, -70.124, 3.534
rel sim to mcparticle: 0x2d644750 PDB =2000015
rel sim momentum: [-2526.533, -1615.532, 81.420]
SIZES: IBTTrackerHits hits=4 | IBTTrackerHitsRelations rels=4 | InnerTrackerBarrelCollection simhits=7
```

