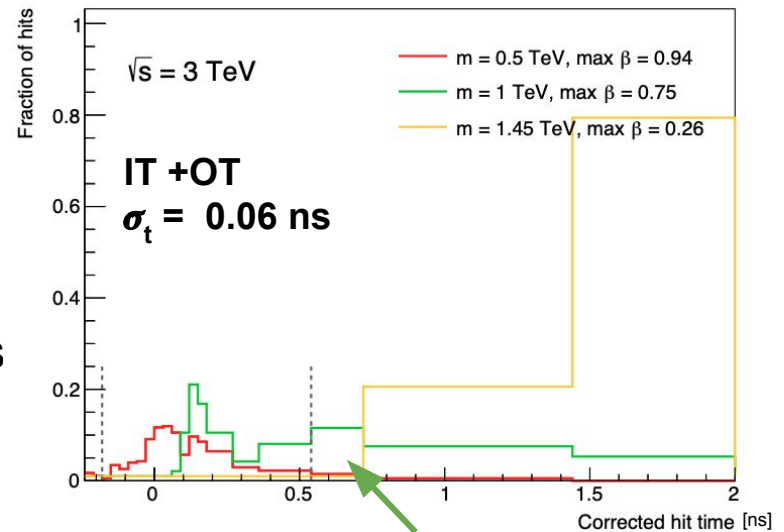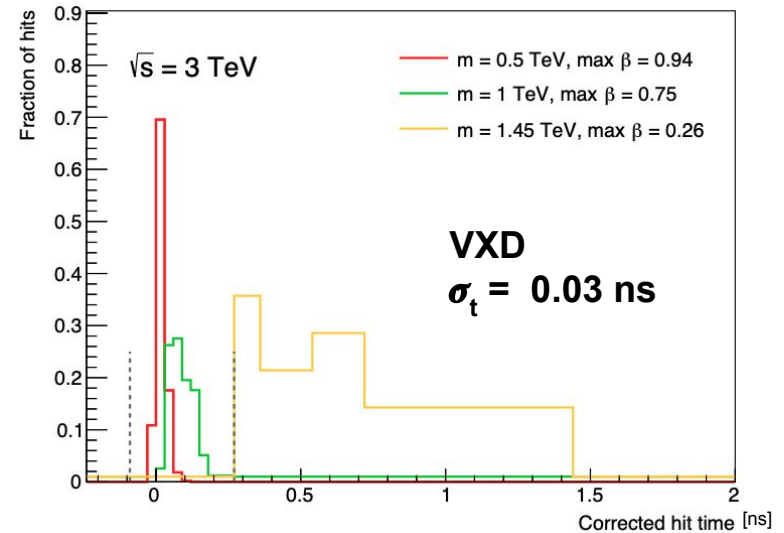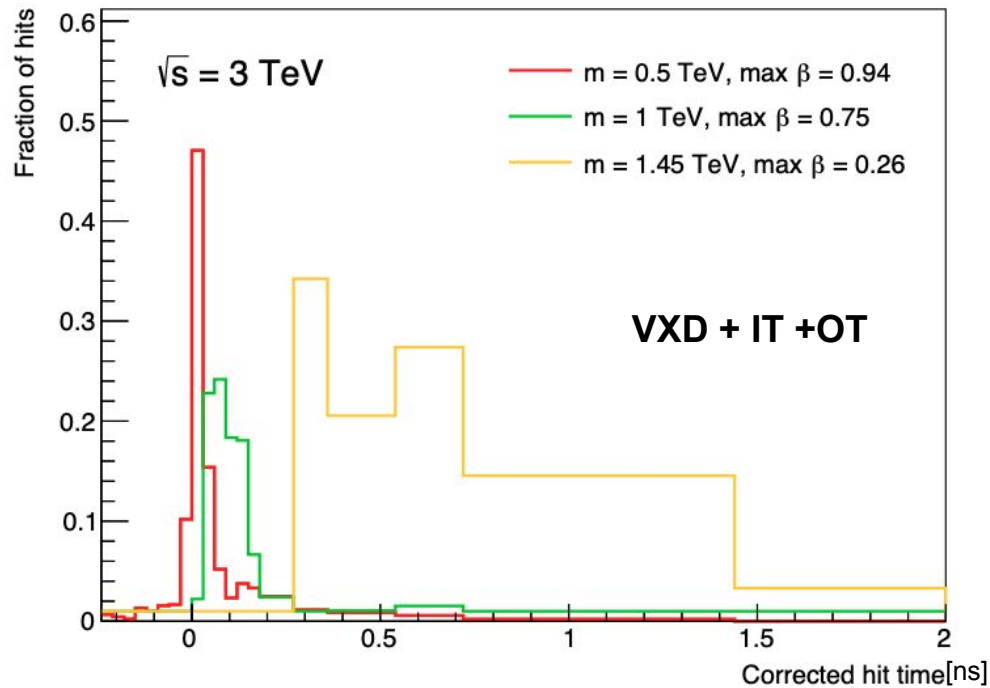# Low beta particles and timing cuts

Detector and Physics simulation meeting - 24/11/2020

Federico Meloni (DESY)

Fractions of hits vs time for low beta

$\sqrt{s} = 3$ TeV

- m = 0.5 TeV, max β = 0.94
- m = 1 TeV, max β = 0.75
- m = 1.45 TeV, max β = 0.26

VXD + IT +OT

VXD
σ_t = 0.03 ns

IT +OT
σ_t = 0.06 ns

This is the OT

- Can we remove the upper cut?
- If we there is no reason to think the detector won't be able to read these hits out, I think we should

Ideas and next steps

The "digitised" file size won't change dramatically if we keep the additional "late" hits (tested with +9 sigmas window).

TODO

- Study tracking efficiency, time vs time thresholds
- Repeat plots from previous slide considering hits from non-prompt particles (use a samples of Bs with different boosts?) - should be ok for SM
- Quantify number of elements/size of containers without upper cut

If we can't cope with reconstructing everything at once because of the number of extra hits, tracking can then be organised in time slices:

- Prompt, beta =1: all hits within 3 σ_t
  - Remove used hits from next pass?
- N additional steps with only hits compatible with slower particles: slide min t

Extras

Random Notes

Didn't debug yet

Simulation crashed in new container

EventSeeder1   INFO Get RunID: runID=0

GenerationInit   INFO +++ Initializing event 1. Within run:0 event 1.

PluginService   ERROR Factory requested: HEPMC3FileReader (N10__cxxabiv120__function_type_infoE) :boost::bad_any_cast: failed conversion using boost::any_cast

PluginService   ERROR Stub is invalid!

-------- EEEE ------- G4Exception-START -------- EEEE -------

*** G4Exception : Geant4InputAction[hepmc4]: Event 0 Error creating reader plugin.

    issued by : hepmc4 [dd4hep::sim::Geant4InputAction]

*** Geant4Action:: Failed to create file reader of type HEPMC3FileReader. Cannot open dataset /data/test_time/x1x1_500.hepmc

*** Run Must Be Aborted ***

 **** Track information is not available at this moment

 **** Step information is not available at this moment

-------- EEEE -------- G4Exception-END --------- EEEE -------

Geant4InteractionVertexSmear INFO +++ No interaction of type 4 present.

EventSeeder1   INFO At beginEvent: eventID=0, runID=0 initialSeed=1415152094, newSeed=789158083

ParticleHandler INFO +++ Event 0 Begin event action. Access event related information.

LcioOutput   WARN +++ [Event:0] No valid MC truth info present. Is a Particle handler installed ?

LcioOutput   ERROR +++ [Event:0] Exception while saving event:lcio::DataNotAvailableException: LCEventImpl::getCollection: collection not in event:MCParticle

LcioOutput   ERROR +++ [Event:0] Exception while saving event:lcio::DataNotAvailableException: LCEventImpl::getCollection: collection not in event:MCParticle

Geant4Kernel   FATAL +++ Exception while simulating:lcio::DataNotAvailableException: LCEventImpl::getCollection: collection not in event:MCParticle

Geant4Kernel   INFO ++ Terminate Geant4 and delete associated actions.

DDSim   INFO DDSim   INFO Total Time: 154.48 s (User), 1.60 s (System)

DDSim   INFO DDSim   INFO StartUp Time: 142.20 s, Event Processing: 12.28 s (0.12 s/Event)