



Software tutorial preparation and follow-up

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Software tutorial program

MC/Simulation Framework Tutorial: Muon Collider

September 30, 2020
US/Eastern timezone

- Overview
- Timetable**
- Registration

Timetable

< Wed 30/09 >

Print PDF Full screen Detailed view Filter

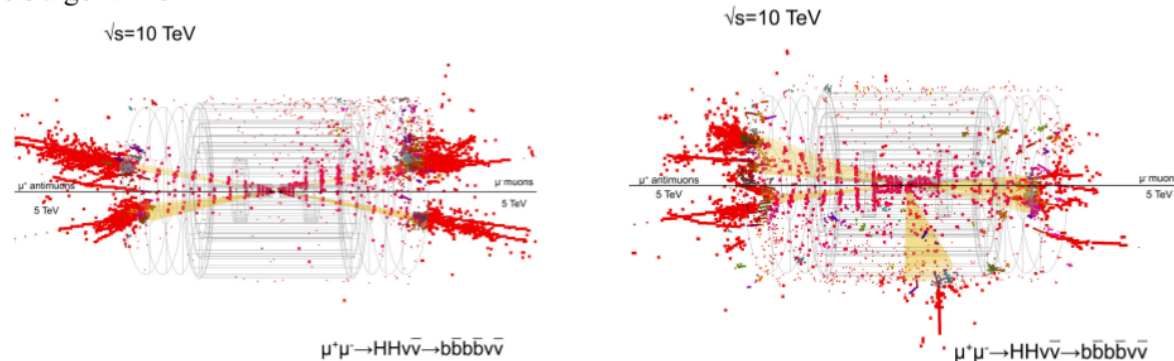
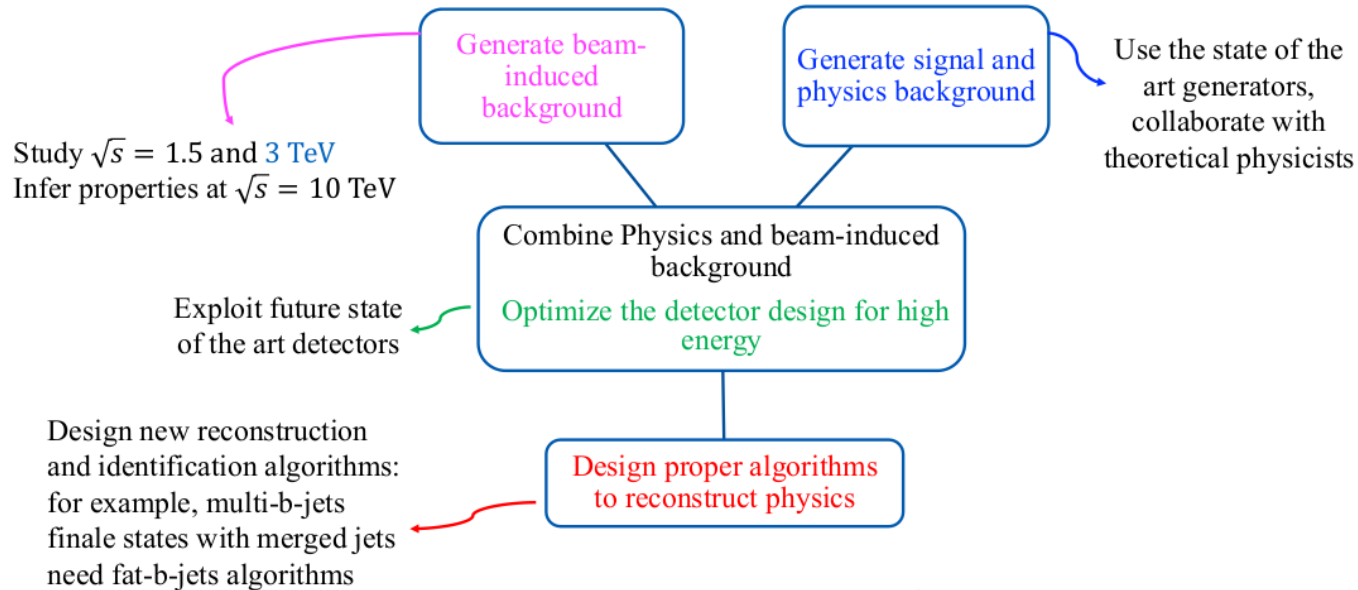
11:00	Introduction to Muon Collider physics, detector and beam-induced background	<i>Donatella Lucchesi et al.</i>	11:00 - 11:15
	Description of the simulation package	<i>Mr Nazar Bartosik et al.</i>	11:15 - 11:30
	Simulation, reconstruction and characterization of HH->4bjets - Hands On	<i>Laura Buonincontri et al.</i>	11:30 - 12:10
12:00	Simulation, reconstruction and characterization of BIB - Hands On	<i>Massimo Casarsa et al.</i>	12:10 - 12:50
	Signal+BIB event production and characterization	<i>Lorenzo Sestini et al.</i>	12:50 - 13:30
13:00	Questions and Answers		13:30 - 14:00
14:00			

~40
participants

<https://indico.fnal.gov/event/45187/timetable/#20200930>

1 - General introduction

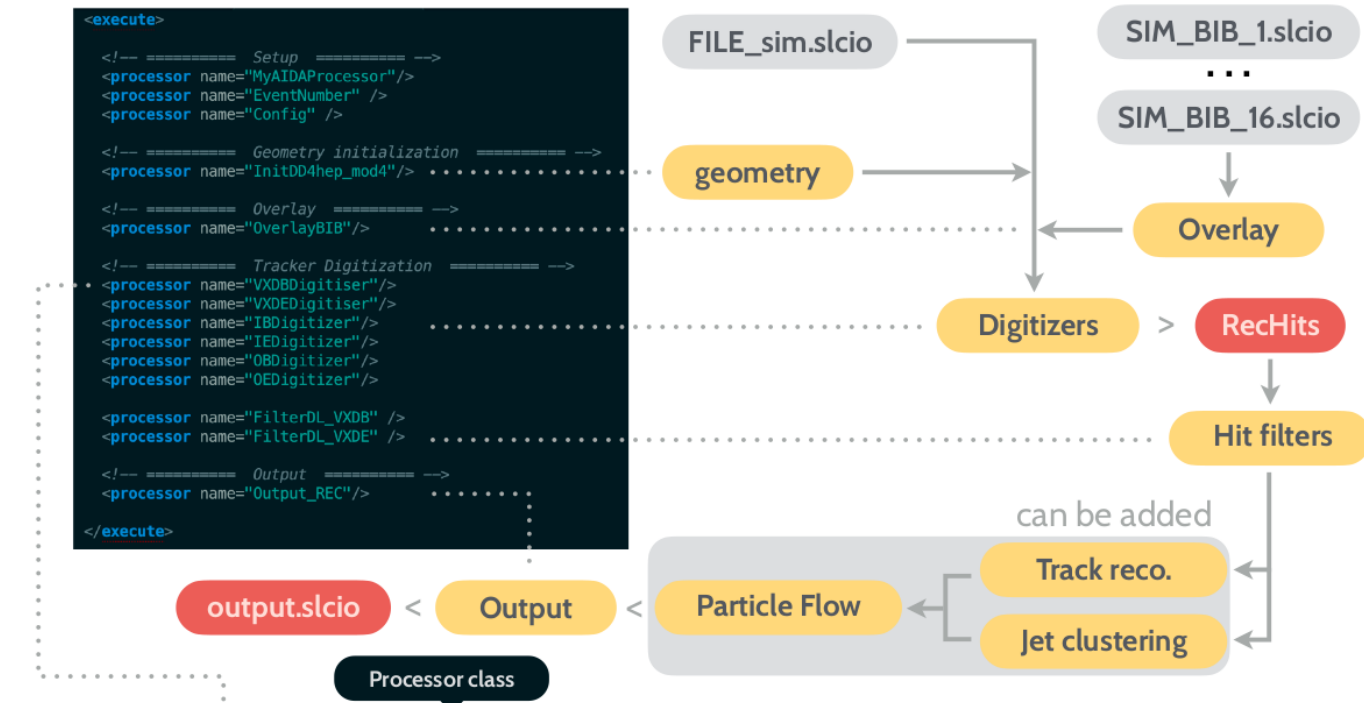
The path to high \sqrt{s}



2 – Software description

Basic Marlin workflow

A Marlin job is configured through an XML file: chain of individual processors



```

<processor name="VXDBDigitiser" type="DDPlanarDigiProcessor">
  <parameter name="SubDetectorName" type="string"> Vertex </parameter>
  <parameter name="IsStrip" type="bool">false </parameter>
  <parameter name="ResolutionU" type="float"> 0.005 </parameter>
  <parameter name="ResolutionV" type="float"> 0.005 </parameter>
  <parameter name="SimTrackHitCollectionName" type="string" lcioInType="SimTrackerHit"> VertexBarrelCollection
  <parameter name="SimTrkHitRelCollection" type="string" lcioOutType="LCRelation"> VXDBTrackerHitsRelations </par
  <parameter name="TrackerHitCollectionName" type="string" lcioOutType="TrackerHitPlane"> VXDBTrackerHits </par
  <parameter name="ResolutionT" type="FloatVec"> 0.05 </parameter>
</processor>

```

Each processor's instance has its own block with corresponding configuration parameters

3.1 - Hands-on: $\mu\mu \rightarrow H\nu\bar{\nu} \rightarrow b\bar{b}\nu\bar{\nu}$

Attività ROOT mer 18:36 HH_exercise.pdf 63%

Laura Buonincontri HH → 4bjets - Hands On

m2_canv

Invariant mass of jet pair with lowest p_T

m2	
Entries	774
Mean	102.2
Std Dev	28.34

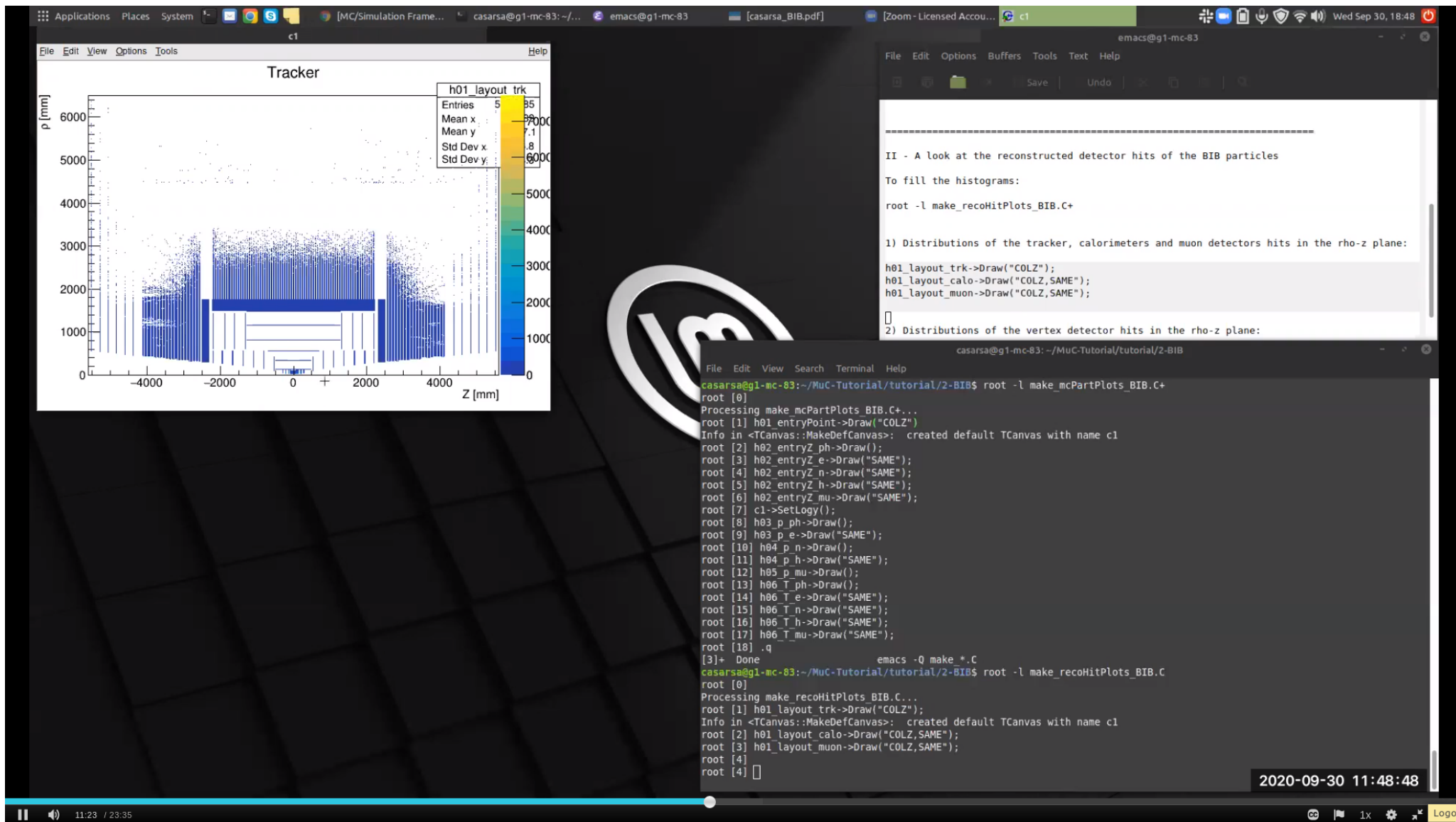
```

Visualizza Cerca Terminale Aiuto
t mass of jet pair associated to Higgs with highest
t mass of jet pair associated to Higgs with lowest p
successfully
lc-laura 1-mumuHHbbbb]$ root -l
invariant_mass.C
variant_mass(5)
e the following
f reconstructed jets
pidity of jets in the event
se momentum of jets in the event
ets in the event
f jets in the event
t mass of jet pair associated to Higgs with highest
t mass of jet pair associated to Higgs with lowest p
successfully
variant_mass(6)
e the following
f reconstructed jets
pidity of jets in the event
se momentum of jets in the event
ets in the event
f jets in the event
t mass of jet pair associated to Higgs with highest
t mass of jet pair associated to Higgs with lowest p
successfully
    
```

2020-09-30 11:36:21

33:41 / 34:43

3.2 – Hands-on: a look at BIB



The screenshot displays a ROOT plot titled "Tracker" showing detector hits in the rho-z plane. The vertical axis is p [mm] (0 to 6000) and the horizontal axis is Z [mm] (-4000 to 4000). A legend for "h01_layout trk" lists statistics: Entries: 5, Mean x: 7000, Mean y: 7.1, Std Dev x: .8, Std Dev y: 6000. A color scale on the right ranges from 0 to 85.

The terminal window shows the following commands and output:

```
casarsa@g1-mc-83: ~/MuC-Tutorial/tutorial/2-BIB$ root -l make_mcPartPlots_BIB.C+
root [0]
Processing make mcPartPlots BIB.C+...
root [1] h01_entryPoint->Draw("COLZ")
Info in <TCanvas::MakeDefCanvas>: created default TCanvas with name c1
root [2] h02_entryZ_ph->Draw();
root [3] h02_entryZ_e->Draw("SAME");
root [4] h02_entryZ_n->Draw("SAME");
root [5] h02_entryZ_h->Draw("SAME");
root [6] h02_entryZ_mu->Draw("SAME");
root [7] c1->SetLogy();
root [8] h03_p_ph->Draw();
root [9] h03_p_e->Draw("SAME");
root [10] h04_p_n->Draw();
root [11] h04_p_h->Draw("SAME");
root [12] h05_p_mu->Draw();
root [13] h06_T_ph->Draw();
root [14] h06_T_e->Draw("SAME");
root [15] h06_T_n->Draw("SAME");
root [16] h06_T_h->Draw("SAME");
root [17] h06_T_mu->Draw("SAME");
root [18] .q
[3]+ Done emacs -Q make *.C
casarsa@g1-mc-83: ~/MuC-Tutorial/tutorial/2-BIB$ root -l make_recoHitPlots_BIB.C
root [0]
Processing make recoHitPlots BIB.C...
root [1] h01_layout_trk->Draw("COLZ");
Info in <TCanvas::MakeDefCanvas>: created default TCanvas with name c1
root [2] h01_layout_calor->Draw("COLZ,SAME");
root [3] h01_layout_muon->Draw("COLZ,SAME");
root [4]
root [4] []
```

The video player interface at the bottom shows a timestamp of 11:23 / 23:35 and a date of 2020-09-30 11:48:48.

Summary and next steps

- The Muon Collider software tutorial received a lot of attention and had a very good attendance.
- The main target was the Snowmass community and the tutorial was set up for the Snowmass computing cluster.
- Like in our previous experience with the tutorial at Fermilab, the format proves to be very effective in quickly bringing the participants up to speed with muon collider studies.
- Next steps:
 - ▶ working on making the tutorial universal (`tutorial` page);
 - ▶ a dedicated VO (`muoncoll.infn.it`) has been created and is active;
 - ▶ a storage element is being prepared at CNAF;
 - ▶ the installation of the muon collider software on `cmvfs` at CNAF is underway.