Updates

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8th **June 2022**

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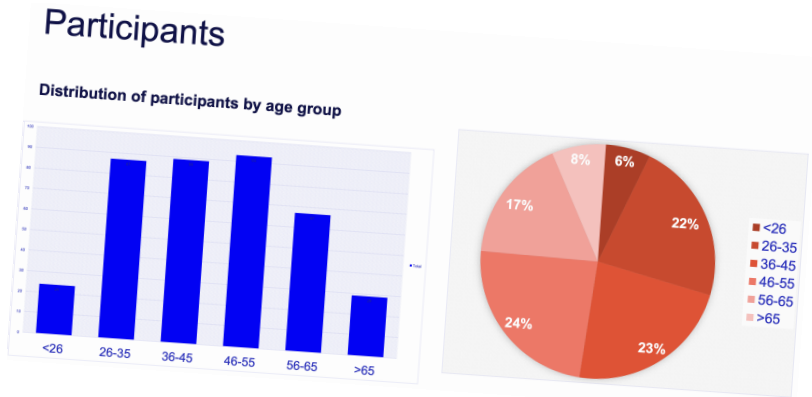
FCC week 2022 Paris

- Successful FCC week 2022 in Paris ✓ → FCC week 2023 in London!

45 sessions, 202 presentations, + 20 posters

FCC week 2022 Paris

- Successful FCC week 2022 in Paris ✓ → FCC week 2023 in London!

FCC week 2022 Paris

- Successful FCC week 2022 in Paris $\checkmark \rightarrow$ FCC week 2023 in London!

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Two indirect contributions

2) Overview of the studies: connecting some dots ◯ FCC

- Embrace top quark, Z pole and Flavour observables to operate a SMEFT analysis. Exercised first with top quark:

Very first look at simulated ttbar events

technische universität dortmund — © L. Roehrig
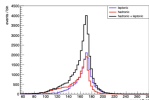
Motivation Part I
- Goal: Global fit with current and future measurements in top + flavor physics
- Intermediate steps I and II completed

I → **sensitive observables**
event simulation for different values of C_i

II → **model finding**
parameterisations as function of C_i (model)

⋯ → **global fit**
Bayesian analysis with appropriate choice of priors

→ **constraints**
on model parameters C_i

L. Röhrig | May 25, 2022 — 4 / 19

S. Monteil — Flavours @ FCC — 18
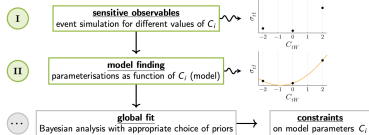
Two indirect contributions

Ongoing study
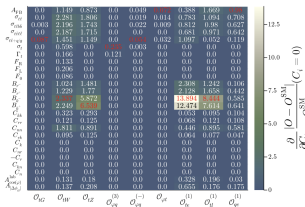
Generator-level (MadGraph)

- New study of EFT-sensitive $t\bar{t}$ observables at FCC-ee

- Global fit is final aim

- Transition to Whizard planned

- Started to look at reconstructed observables with Delphes samples

Cornelius Grunwald
Laetitia Guerry
Kevin Kröninger
Romain Madar
Stéphane Monteil
Lars Röhrig

...besides that

- Paris was a great experience! (...especially the gala dinner @Théâtre du Merveilleux)

Back to physics

- Used the inclusive clustering for jet clustering
- Reconstructed masses too less energetic due to energy loss in the process of incl. clustering
- Performed overlap removal to remove jets that had same kinematics as lepton (in the semilep. channel)
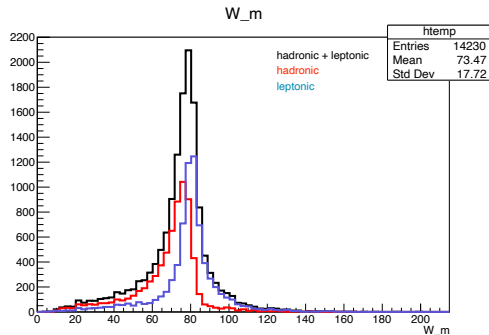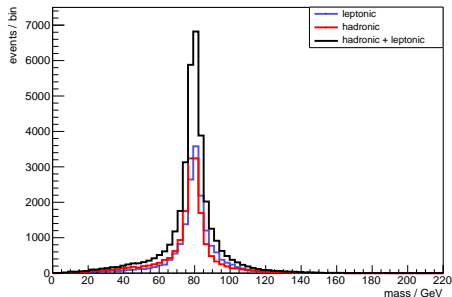
FCC performance meeting status (16.05.2022)

- Used exclusive clustering to exactly $N_{\text{jets}} = 4$ with $k_\perp$ algorithm
- Removed the isolated lepton and the MissingET from clustering
- Light-jets mass distribution much more centered around m_W + more events remain


Inclusive

Exclusive

$\rightarrow$ Proposal from community: Switch to $ee - k_\perp$ algorithm (just slight improvements)

- Implement the MC-truth for all objects in the semileptonic channel
- Ran into some technical issues, that were discussed and kindly solved by the community (mostly E. Perez)
- Performed resolution studies to all final-state objects:
  1. Lepton (e- and μ-channel separately)
  2. Neutrino/MET
  3. Jets (light- and b-jets separately)

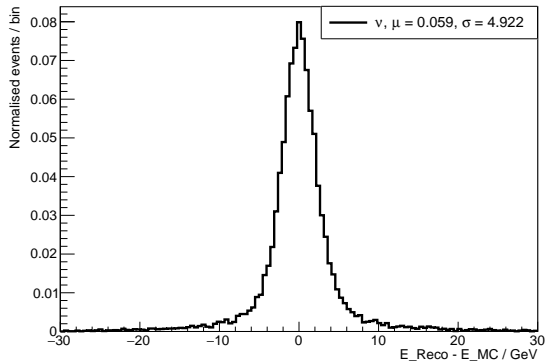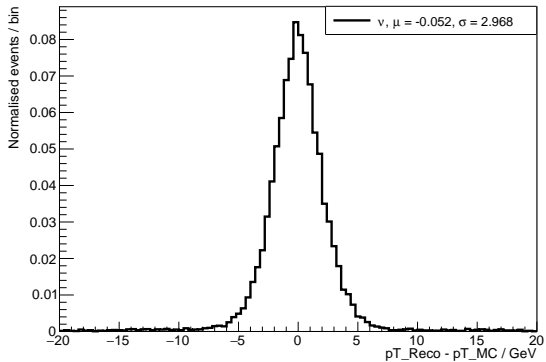## Resolution and reconstruction efficiency — Lepton kinematics

E_ℓ.
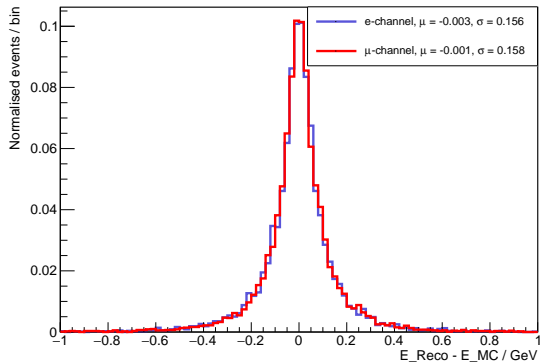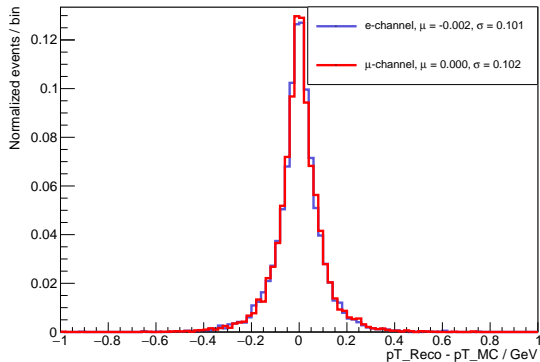
$p_{\mathrm{T},\ell}$.

$\rightarrow \Delta\phi_\ell$ and $\Delta\eta_\ell$ in $\mathcal{O}(10^{-5} - 10^{-6})$

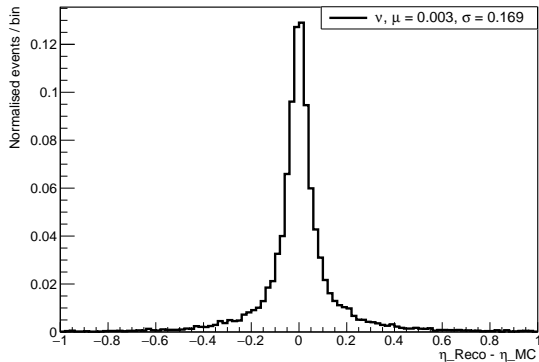## Resolution and reconstruction efficiency — Neutrino kinematics

E_ν.

$p_{T,\nu}$.
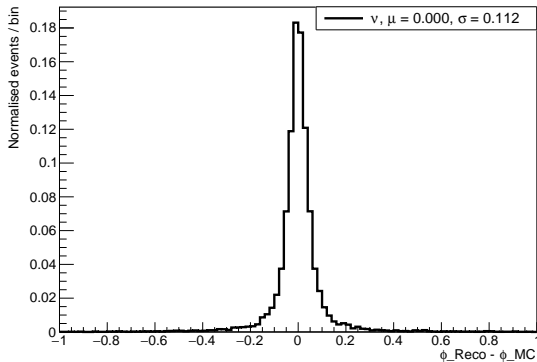
Resolution and reconstruction efficiency — Neutrino kinematics

η_ν.

ϕ_ν.

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Resolution and reconstruction efficiency — Jet kinematics

E_j.

$p_{T,j}$.

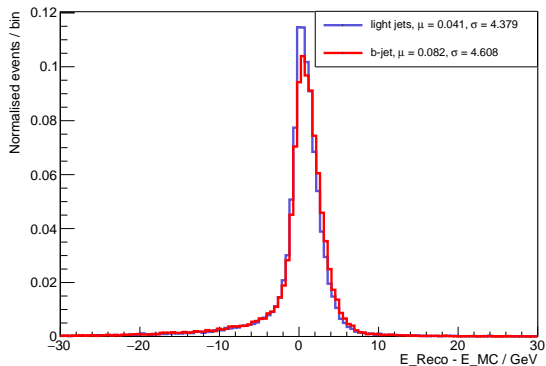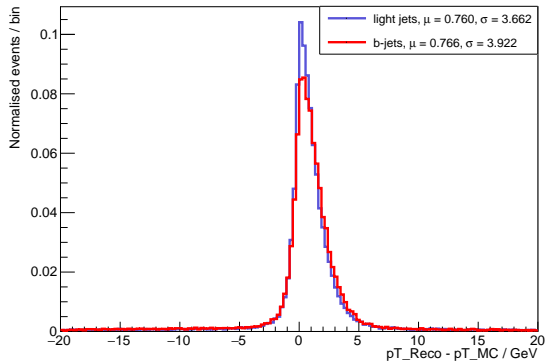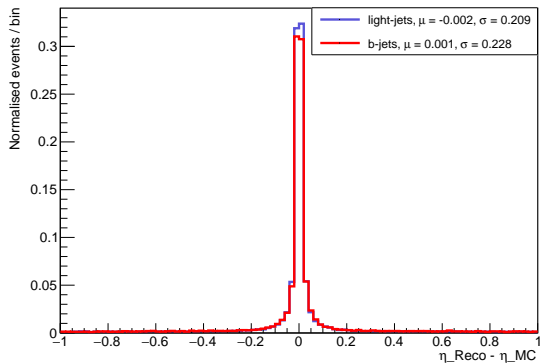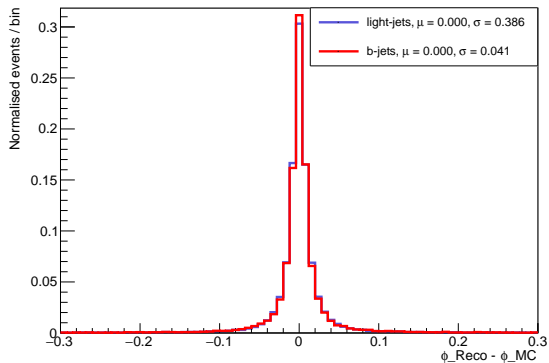## Resolution and reconstruction efficiency — Jet kinematics

η_j.

ϕ_j.
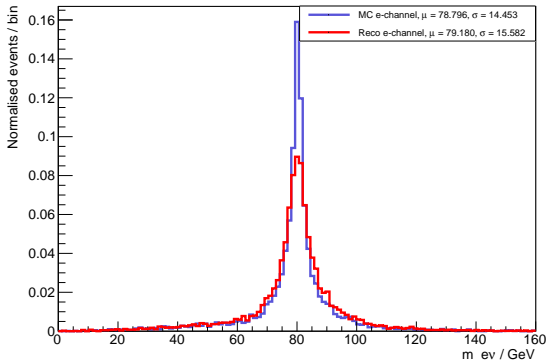
Resolution — *W*-boson mass

- Several comparisons performed: Reco vs. MC, *e*- vs. μ-channel vs. *qq*-channel

e-channel.

μ-channel.

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Resolution — *W*-boson mass

- Here: Reco vs. MC in the hadronic channel: Reco-jets still too less energetic?

qq-channel.

Difference in *qq*-channel.

Resolution — *W*-boson mass

- Here: Reco and MC in all channels

MC.

Reco.

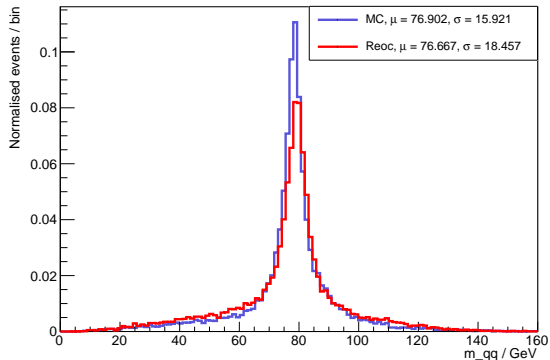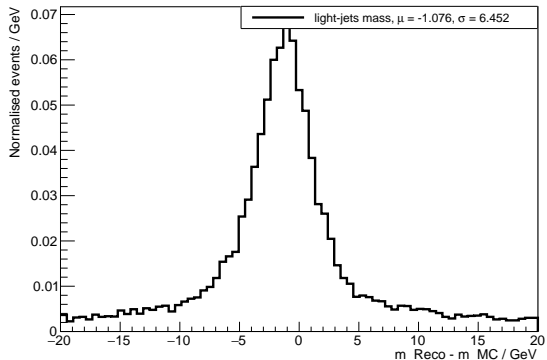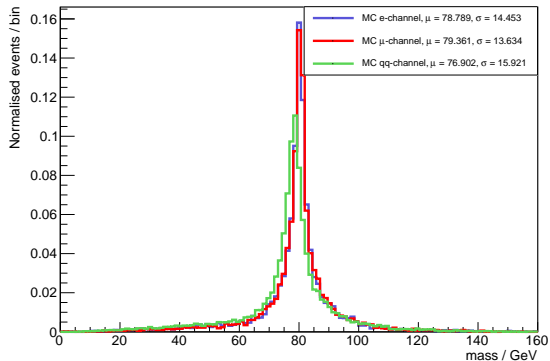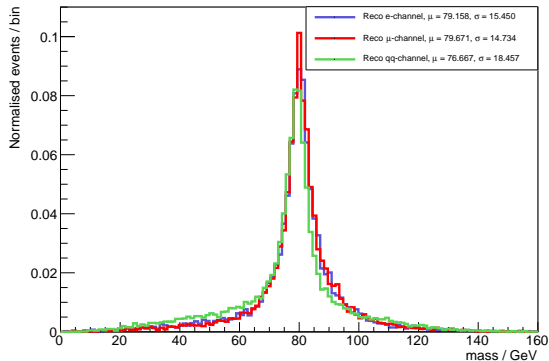## What to cluster and what not to cluster (that's the question)

- Concrete and precise definition, of what objects are used to cluster them to jets
- Slight differences in reconstructed jets and MC-jets…?

Reco
- Remove *isolated* leptons from the collection
- Neutrinos/MissingET stays in the collection (?)
- Apply an energy cut on the collection, so that $E_i > 0.5$ GeV?

MC
- Remove the associated isolated MC-lepton from the collection (checks to be done, if correct lepton is removed)
- Remove the neutrinos from the stable particle collection
- Apply an energy cut on the collection, so that $E_i > 0.5$ GeV!
  $\rightarrow$ (so far: cut can be moved such that $\mu(E_{\text{jet, Reco}} - E_{\text{jet, MC}}) \sim 0$)

Outlook

- Perform clustering based on comparison between reconstructed and MC kinematic distributions & the hadronic W boson
- Find the *real* truth W boson on quark level
- **Then**: top reconstruction with the b quark