TopTriggerStudies at DESY Zeuthen in a Nutshell

Overview

- Why 'in a Nutshell'?
- Who are we? → People
- Why TopPhysics!? → Introduction to TopPhysics
- Why (Top)Triggers!? → Introduction to Triggers
- Where do we wanna go? → Goals
- What are the tools? → Analysis Framework (SFrame, Ganga)
- Where did we get so far? → First Results (preliminary)
- What are the next steps? → Outlook (near and far future)

Top Trigger Studies at DESY Zeuthen in a Nutshell

Why 'in a Nutshell'?

- People have been busy or on holidays

Top Trigger Studies at DESY Zeuthen in a Nutshell

Who are we?

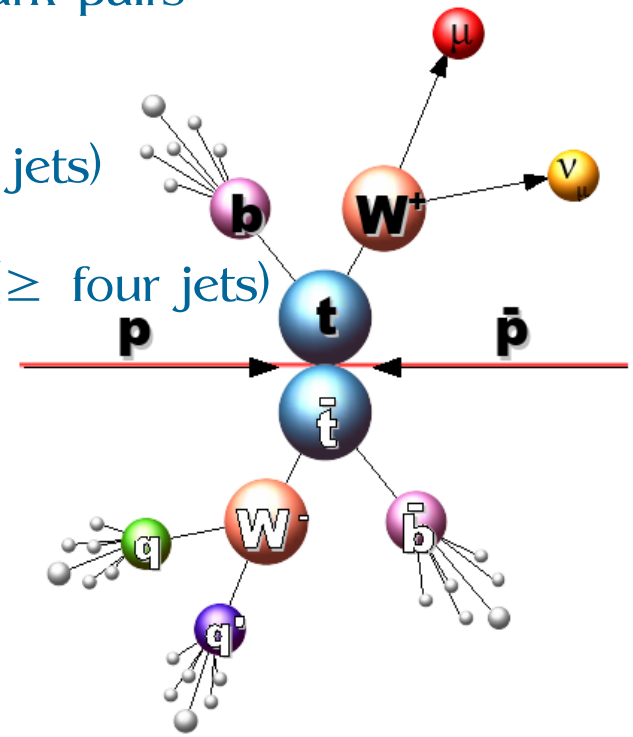
- Clemens
  - Forward jets in ttbar and single-top events
- Marcello
  - SFrame Ganga implementation
- Oliver
  - Missing Et triggers in ttbar events
- Sascha (me)
  - Jet triggers and trigger overlap (➞ monitoring triggers) in ttbar events

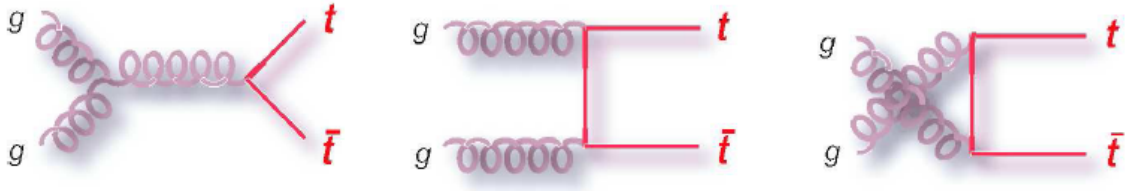
Why Top Physics!?

- Why is it so interesting?
  - ➡ LHC is going to be a 'top factory' allowing precision (mass, cross-section, Vtb) and other measurements (detector commissioning with early data)
  - ➡ together with W mass the top mass allows an estimate of the Higgs mass

- What's so special about it?
  - ➡ tops decay into W bosons and b quarks
  - ➡ W bosons decay into lepton-neutrino or quark-antiquark pairs
  - ➡ leaves three main top signatures
    - ➡ fully-leptonic decays (~4.5%, dilepton events)
      two leptons, two neutrinos, two b quarks (≥ two jets)
    - ➡ semi-leptonic decays (~30%)
      a leptona neutrino, two b quarks, a q-qbar pair (≥ four jets)
    - ➡ fully-hadronic decays (~44%)
      two b quarks, two q-qbar pairs (≥ six jets)

lepton = electron or muon





Why (Top)Trigger!?

- Collisions every 25ns (far beyond capabilities of data recording or analysis)
  ➡ events of interest need to be selected

- Two types of triggers
  - non-prescaled triggers
    ➡ inclusive triggers used for physics purposes
    (no calibration, monitoring or other technical triggers)
  - prescaled trigger
    ➡ triggers providing important monitoring and calibration data
    or trigger efficiency determinations
    - prescaled physics: extending cross sections measurements to smaller pT
    - calibration triggers: help in selecting particles with already well known properties for detector calibration purposes.
    - monitoring triggers: help to control basic experimental properties e.g. vertex position or luminosity
- ATLAS trigger system
  - Level 1: identify High PT objects (muons, em clusters, taus and jets)
  - Level 2: select Electrons, Muons, Jets, B-Physics Events, b-jets
  - EventFilter: full event is available

Where do we wanna go?

- Calculate trigger efficiencies for mentioned triggers
  - ➡ obtain event rates, cross-sections
  - ➡ eventually tune trigger configuration
- Find suitable monitoring triggers
  - ➡ calculate trigger efficiencies from data
- Physics study undecided, yet

What are the tools?

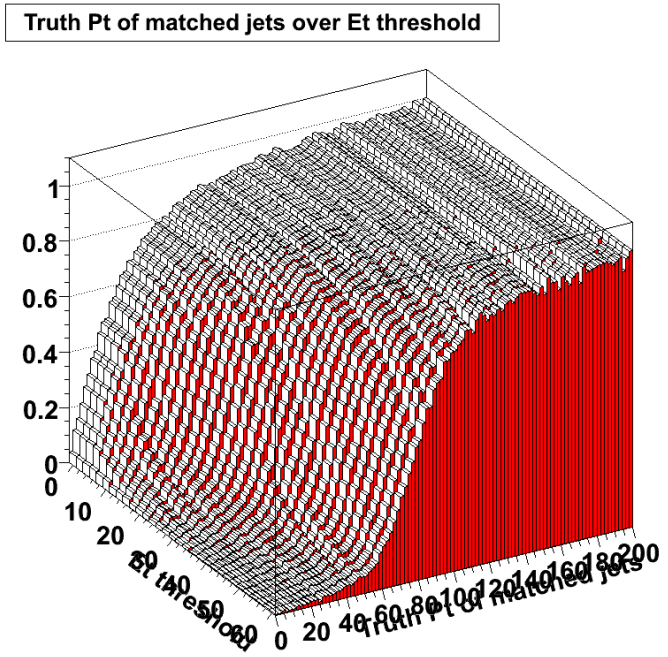
- Data Sets
  - commonly produced TopView1213 Ntuples
    - ➡ time and workload savings, due to not doing private production
    - ➡ comparable results
  - available on Castor and through DQ2
  - contain 'all' available trigger information

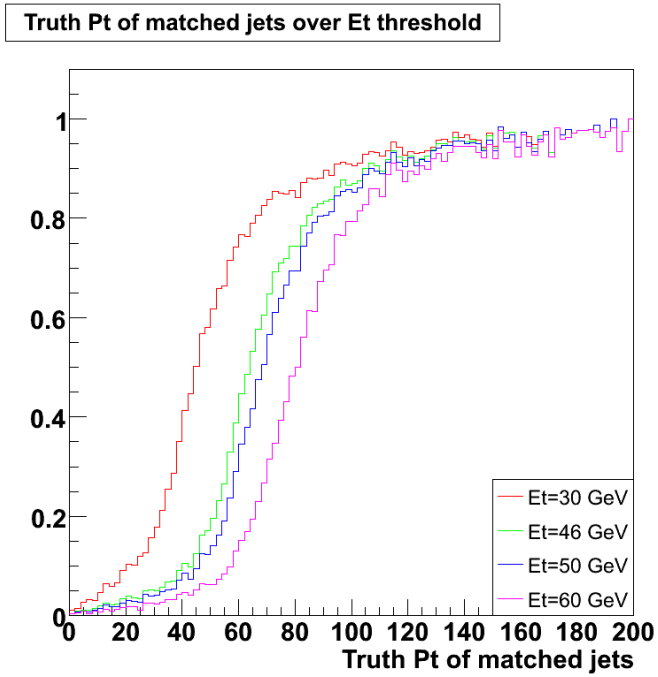
- Analysis Framework SFrame
  - standalone analysis software
    - ➡ no long Athena tail needed
  - modular and adjustable structure

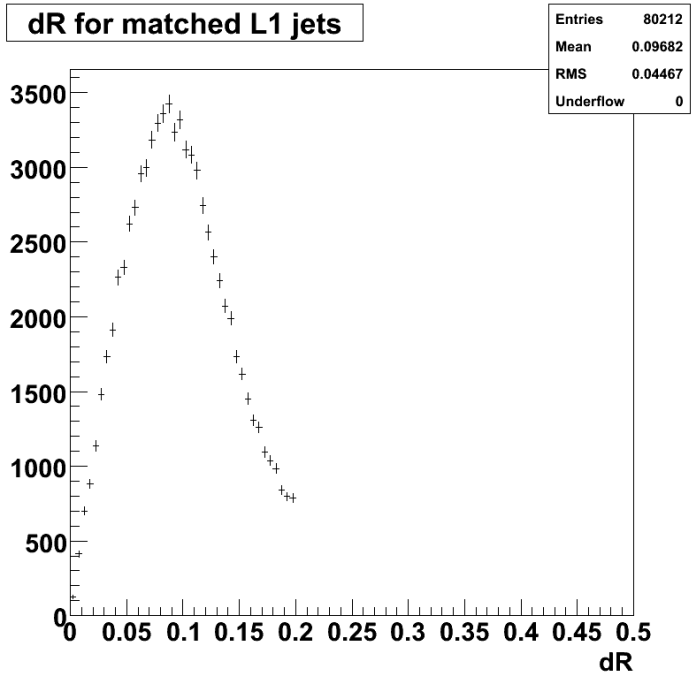
- Ganga PlugIn SFrameApp
  - adds the Grid advantages to those of SFrame
    - ➡ no local datasets needed
    - ➡ 'fast' analysis of large samples

Where did we get so far?

- Jet triggers (Level One)

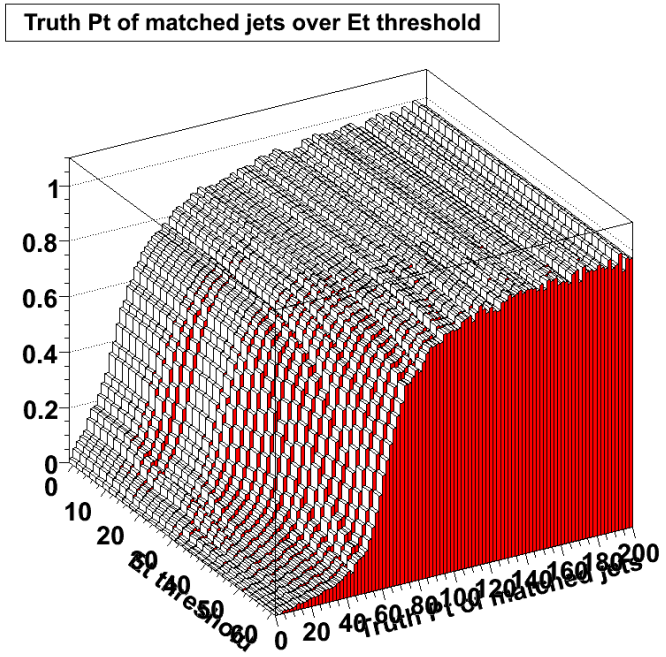


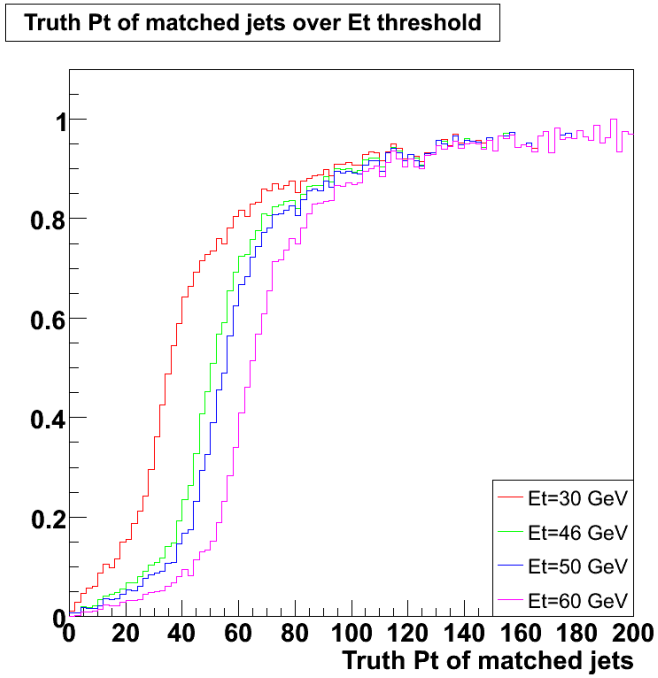


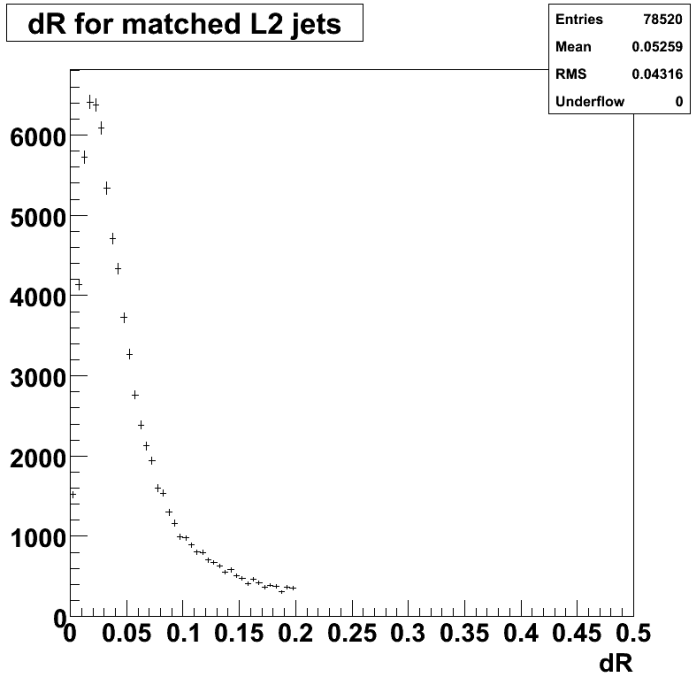


Where did we get so far?

- Jet triggers (Level Two)

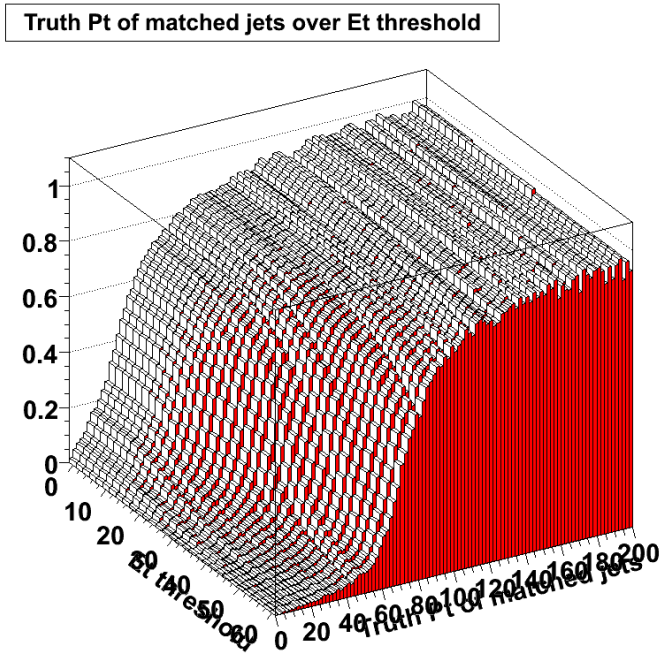


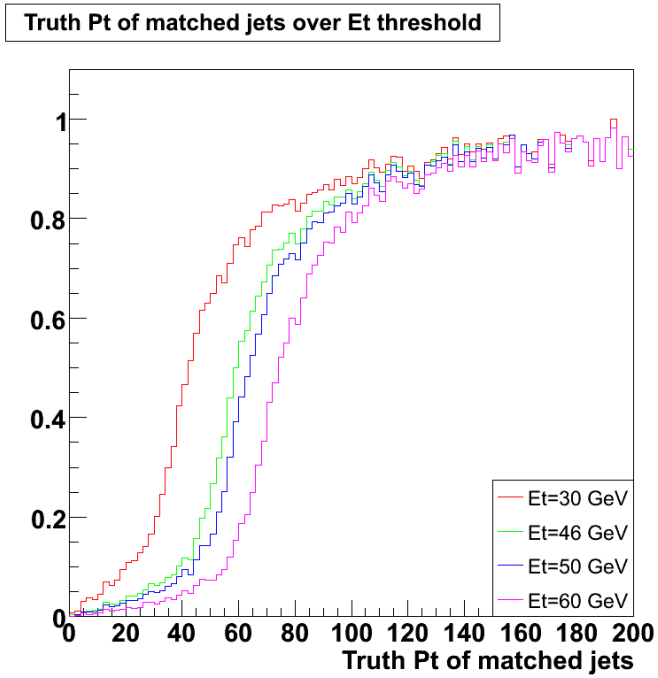


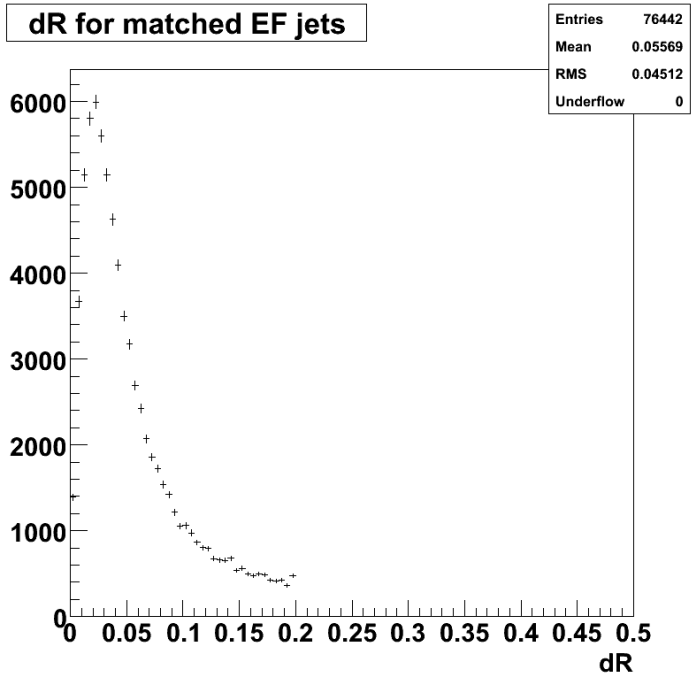


Where did we get so far?

- Jet triggers (EventFilter)

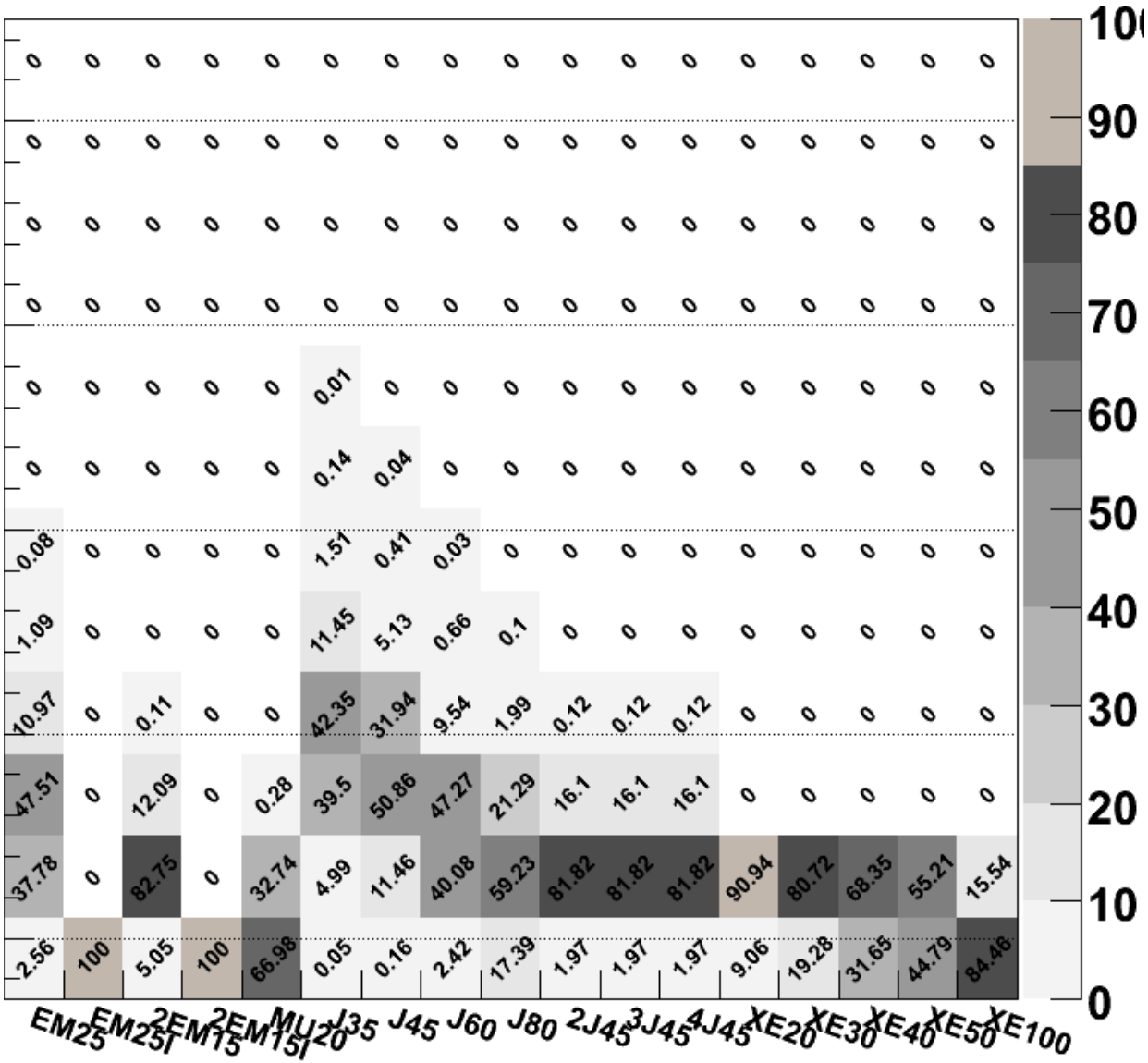






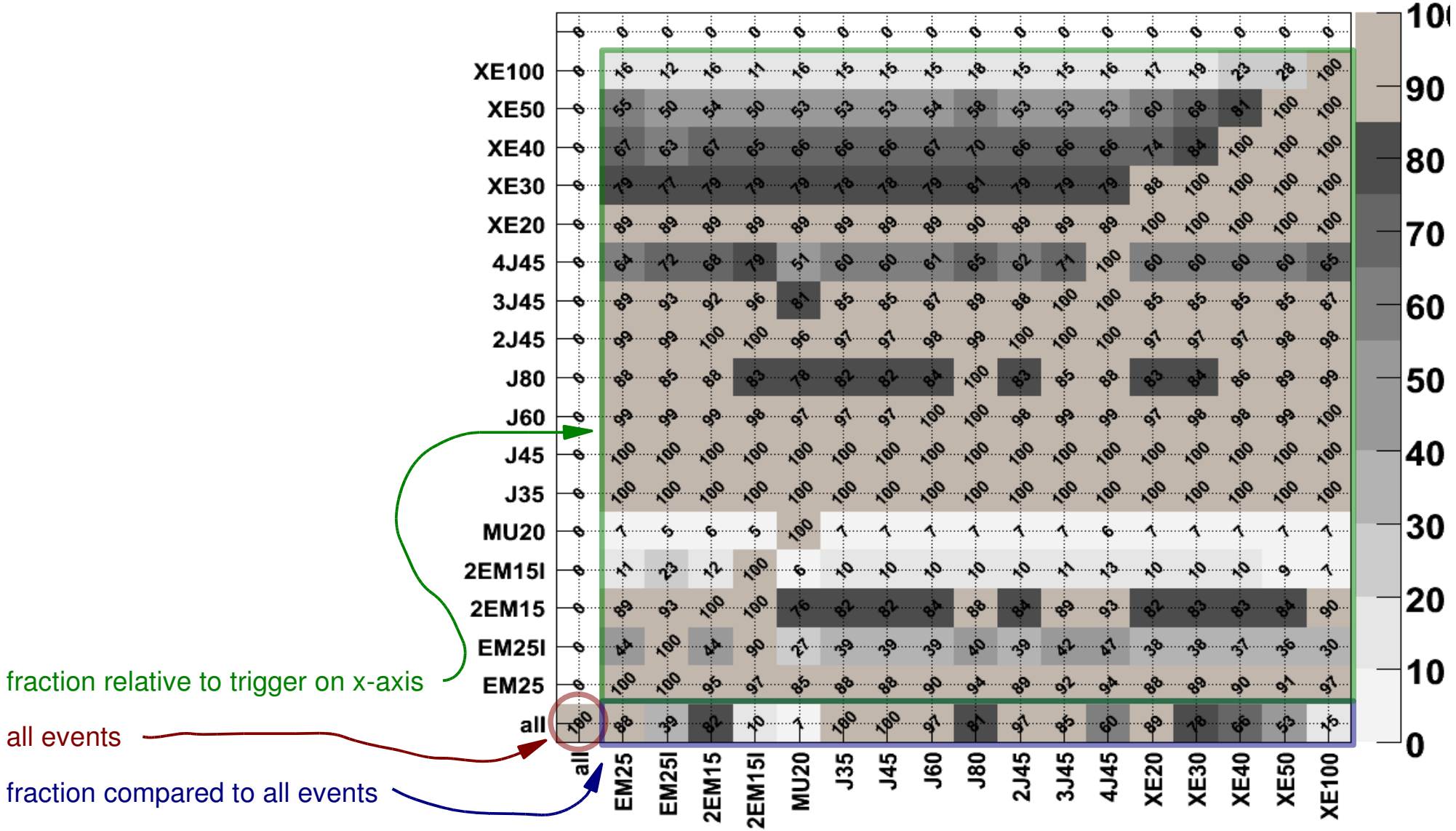
Where did we get so far?

- Trigger Multiplicities



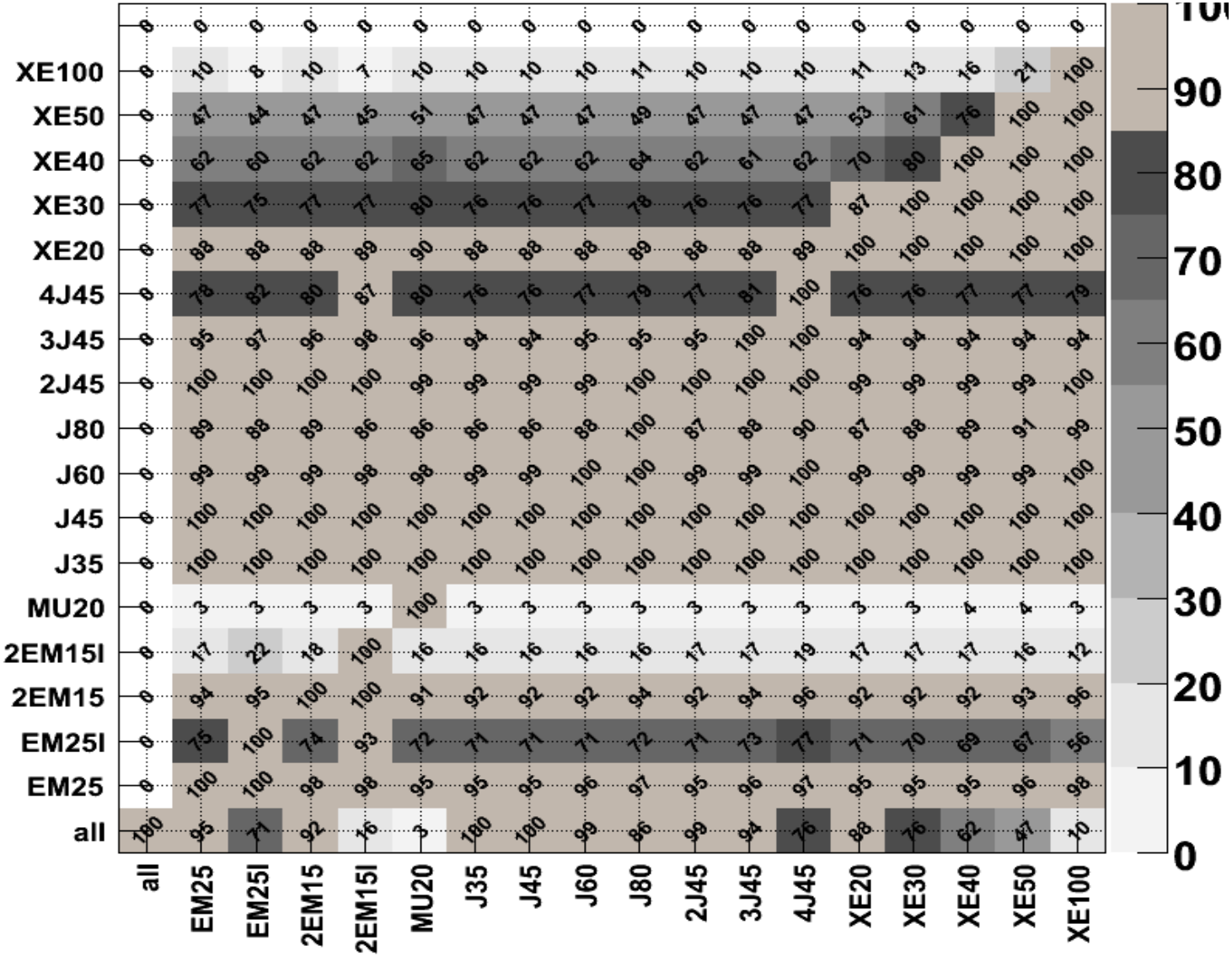
Where did we get so far?

- Trigger Overlaps



Where did we get so far?

- Trigger Overlaps



What are the next steps?

- Complete matching (truth-trigger, trigger-reco, truth-reco)
- Estimation of rates and cross-sections
- Include background data
  - ➡ W+jets
  - ➡ multijet background (QCD)