# Top Studies in Milano - next steps, plans

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## Outline

- Readdiness to perform the estimation of the W+jets background with the W/Z ratio on data

  I will discuss this by using walkthrough questions as a guide

- New people and activities starting in Milano

## Goals with a few $pb^{-1}$

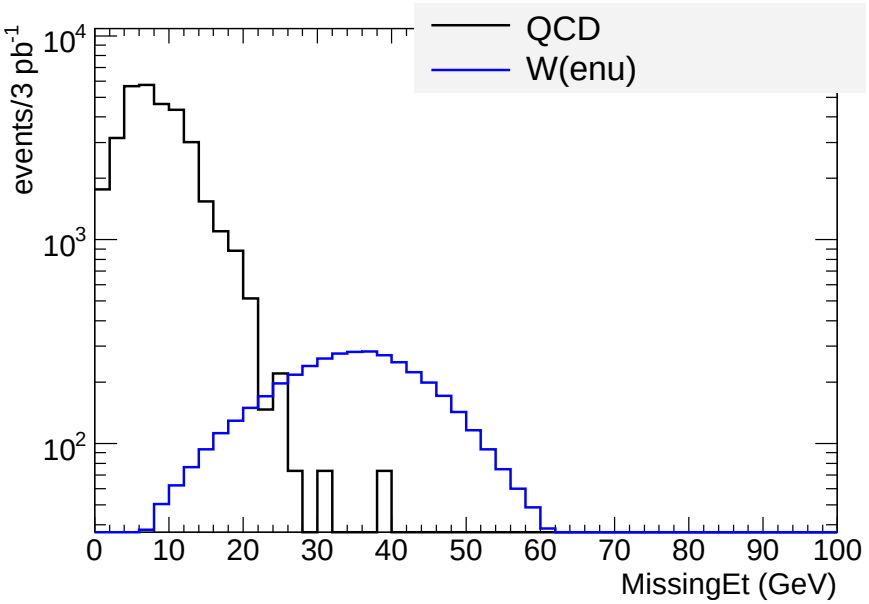
**Minimum goals/high priority:**

- understand jet to electron fake rates
- measure the W/Z ratio at low jet multeplicity

**Optional:**

- first look at Z+jets at high jet multeplicity, estimate W+jet background in signal region (limits and/or estimate with loose cuts)

# Possible results with 5 $pb^{-1}$ at 7 TeV




**W(e$\nu$)+1jets control region**: 5048 events observed, estimated background $1101 \pm 8(stat.) \pm 550(\text{syst.})$ events

**Z($ee + \mu\mu$)+1jets control region**: 389 events observed after sideband subtraction

**Z($ee + \mu\mu$)+4jets control region**: 3 events observed after sideband subtraction

**Estimated W+jets background to ttbar (el. channel):** $30 \pm 18$ events

**Expected number of ttbar events (el. channel):** 26 events

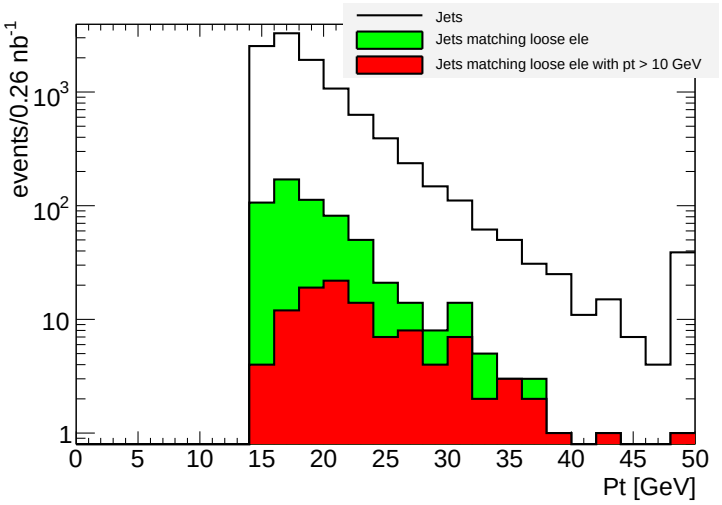
## Triggers

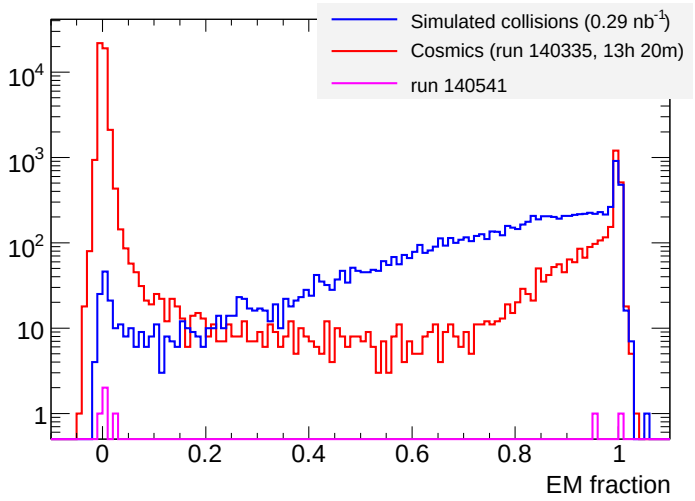
- We will use (both) the top and SM group choices for the W control sample. At $10^{31}$, this is probably going to be e10_medium (top), and e20_loose (SM).
- For the QCD control sample, we will use e20_loose (for SM selection) and g10_loose (for top selection, prescaled by 100 at $10^{31}$ but should be ok).
- For the Z control samples we will use the same single lepton trigger used for W control samples.
- We don't need to know the trigger and reconstruction efficiency accurately, as it cancels to first order in the final result. A 10% precision should be more than enough.

## DQ flags, conditions, luminosity

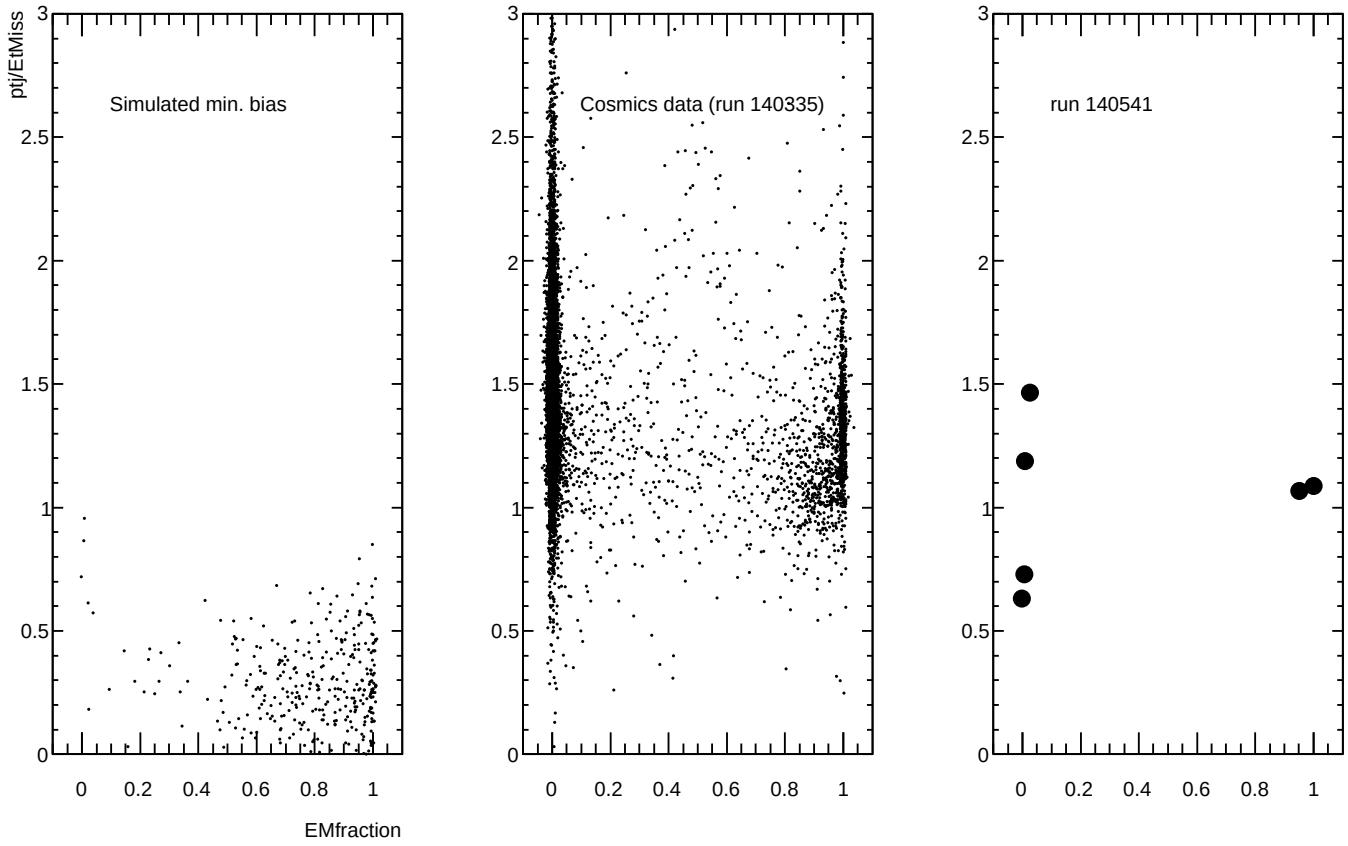
- DQ flags: follow SM and top WG choices. Hopefully the same. Needs to be implemented yet. Will be tested with first collision data.
- Calibration/alignment: probably day-0 conditions are good enough. Electron and jet energy scale are not a concern for us, same for efficiencies. QCD fake rate is our main concern, if high we may have to re-tune isEM, isolation and etmiss cuts, we will follow and contribute to the work on this (in egamma, SM and top groups).
- We need to implement the tools to compute luminosity. It will be tested with first collisions.

# 900 GeV running




- First studies of jet → electron fake rates
- Study cuts to reject cosmics background
- Also technical test for the analysis code.




No collisions with jets in minimum bias stream. Waiting for more $\mathrm{mb}^{-1}$....

## Reconstruction issues

Stick close to SM/top choices, which means running with two different and diverging settings!

**medium electrons** but probably two different isolation baselines. $p_T$ larger than 20 GeV (SM) or 25 GeV (top). Trigger e20_loose for SM since the beginning, the top will use a lower threshold as long as possible.

**Anti-Kt jets** but probably two different overlap removal recipes

**ETmiss** cuts will probably re-tuned to control QCD, and may also diverge for W and top studies

We mat in principle contribute to object definitions and cut optimization in both SM and top groups, but with current people power we are limited to apply the (evolving) standard cuts, compute W and Z rates, and perform data-driven estimate of backgrounds. New people in Milano interested in tracking and b-tagging, with LAr people interested in photons, nobody interested in electron isolation, electron-jet overlap removal, cut optimization.

## Analysis tools/frameworks

We still have to interface our code with top reconstruction selection tools. We may suffer significant delay to fix this.

No standard W/Z+jets code exist yet. The baseline analysis has problems to deal with jets.

## Computing aspects

The chain is AOD → DPD → ntuples (400 bytes/event)

AOD → ntuples directly is possible, but will be a problem as the number of events increase (see UAT results). A preselection of interesting events, possibly in common with other groups, will make analysis easier/faster.

For QCD control sample we will probably produce our own DPDs (events with one loose electron and (e20_loose or g10_loose) passed are needed. We can prescale as luminosity increases.

For all the rest, use whatever is available and suitable (top DPD ? egamma DESD ? SM DPD ?) or produce our own. See my next talk.

## Monte Carlo issues

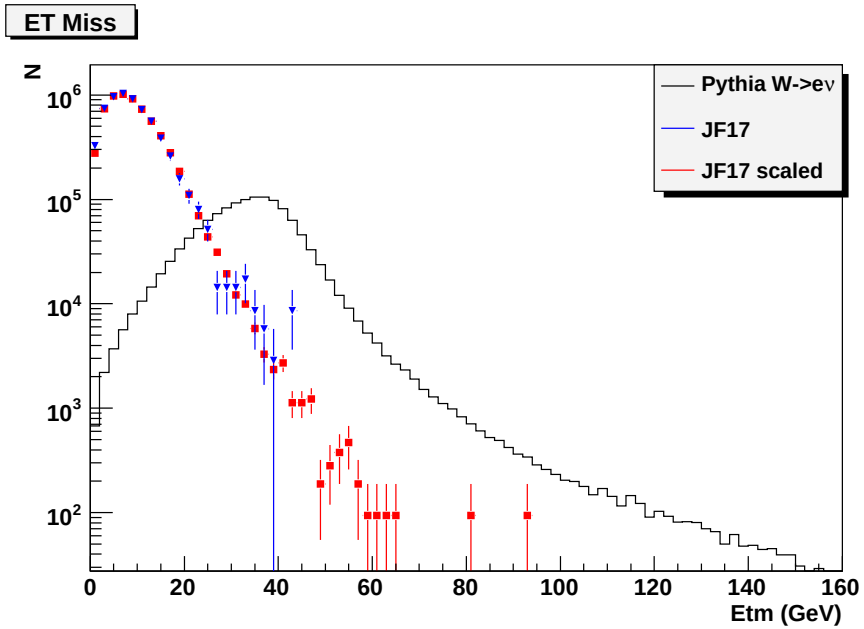
Alpgen samples with varying parameters will be used to improve assessment of systematics in CR $\rightarrow$ SR extrapolation

I am actually one of the main responsible for this production for top and SM. Had been painfull to find the time for this. In any case, alpgen 4-vector files will be ready by January 6th at the latest (I may have to spend Christmas break generating them).

PDF uncertainty on extrapolation still to be evaluated.

Other than the above (and possibly estimation of minor backgrounds to W control region, see next slide) we are completely data-driven.

# Backgrounds to our control samples - QCD




A new diploma student (Federico Meloni) is dedicated to the estimate of this background. Very promising results with release 14 (but 3 times higher QCD rates and worse estimate for release 15, under investigation).

## Other backgrounds

Estimation of Z, single top and ttbar backgrounds to W control sample: nobody is doing this. This might delay first results by weeks if not fixed somehow.

For Z one should start from our Z control sample, and using the measured lepton efficiency and MC-based fraction of events with lepton outside acceptance estimate how many events pass the W control sample selection.

The same method can be used to estimate the Z background to top candidates selection.

## People available

Already active:

- Clara Troncon
- Tommaso Lari
- Ilaria Besana (PhD student)
- Federico Meloni (diploma student)

New:

- Andrea Favareto (new PhD student)
- Simone Montesano (CERN associate starting next January)
- Vincenzo Lombardo (post-doc, just moved to ATLAS from Babar, also CERN associate starting next January)
- Alfio Lazzaro (post-doc, working on the software to transfer the measured tracking performances to Monte Carlo)

With three new people interested in top analyses, it is possible to extend the contribution of Milano.

Andrea e Vincenzo must qualify as authors, they will do so with ID tracking tasks.

All of them are interested in a contribution involving tracking and b-tagging.

## Plans

Measurement of vertexing performances (identification primary vertex, impact parameter resolution, efficiencies) with first data.

Implement the measured tracking performances in Monte Carlo (as reconstruction level corrections with McReact) and evaluate the effect on the simplest/most robust b-tagging algorithms.

Optimize the b-tagging cuts for the best top signal significance.

## Possible goals

- Cross section measurement with b-tagging (but requires all the efficiencies and background estimation under control)
- Find the W and top mass peaks in the selected sample, checking rates and shape of distributions with expectations.