

Preliminary studies on Higgstralum with hadronic final topologies

ILD software & analysis meeting
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Overview, preliminary results

- Inspired in previous analysis done by our group¹
- Wanting to apply the knowledge we have got from the test-beams data analysis.
- We have started to work in the possible improvements of the ILCSoft reconstruction algorithms.
- Our goal is to asses the energy reconstruction if we include the incident angle of the jet on the detector surface as an input variable.
- We have got promissing results from the CERN 2015 SDHCAL test-beam (a note is being written).
- Higgstralum signal events with $Z \rightarrow$ hadronic identification and recoil-mass performance are for the moment our test variables.

¹<https://www.theses.fr/2019LYSE1013>

Signal samples

- We have started with the latest MC-2020 MonteCarlo production.
- For the moment only **o1** samples are available.[1] (see backup slides)
- Our detector Model would be ILD-l5-o2 with the SDHCAL
- In order to make progress we have started to check our workflows with the o1 simulation.
- o2 signal samples have been requested

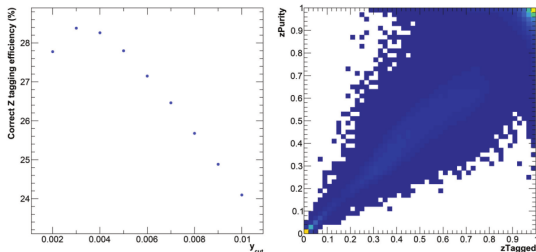
[1]/ilc/prod/ilc/mc-2020/ild/dst-merged/250-SetA/higgs/ILD_l5_o1_v02/v02-02/.

Z identification (with SDHCAL, previous results)

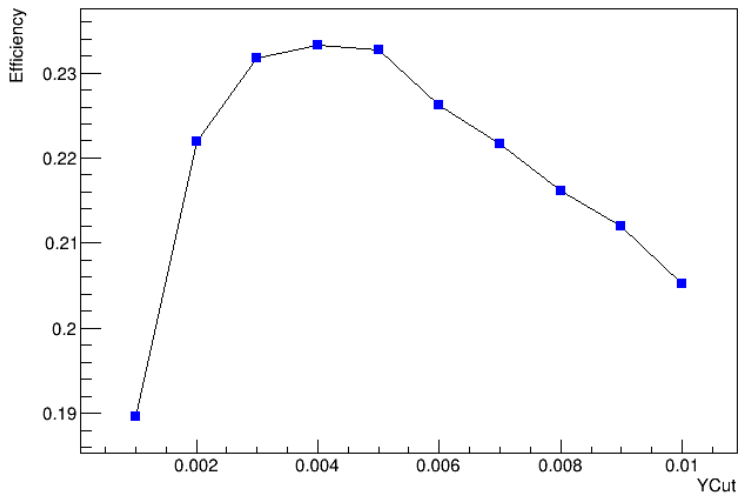
- Two variables are defined in order to identify correctly jets associated to a Z boson.

$$Z_{tag} = \frac{E_Z^{j1,j2}}{E_Z^{total}} \quad Z_{purity} = \frac{E_Z^{j1,j2}}{E^{j1,j2}}$$

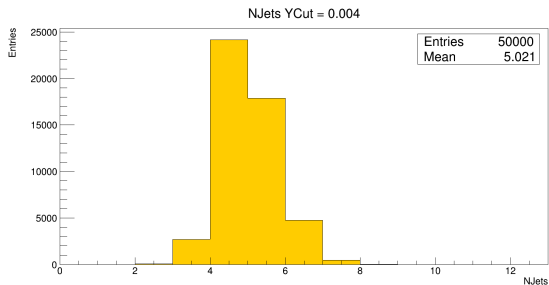
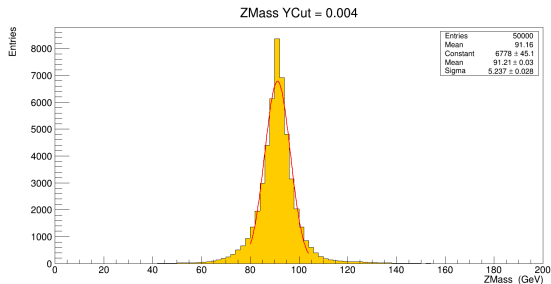
- We run all over the possible jet combinatorial possibilities.
- And we choose the pair that give us the best values Z_{tag} and $Z_{purity} \approx 1$.
- The algorithm used in this study was *fast jet* and a parameter optimization, y_{cut} , has to be done in order to maximize the Z tag efficiency.



Z identification with o1(AHCAL) MC-2020 results



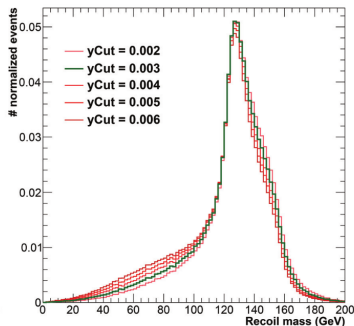
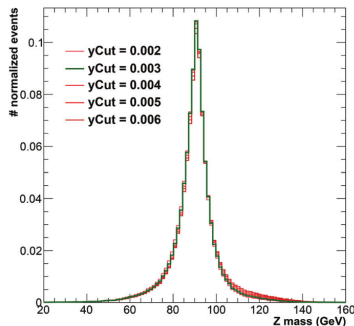
Z identification with o1(AHCAL) MC-2020 results



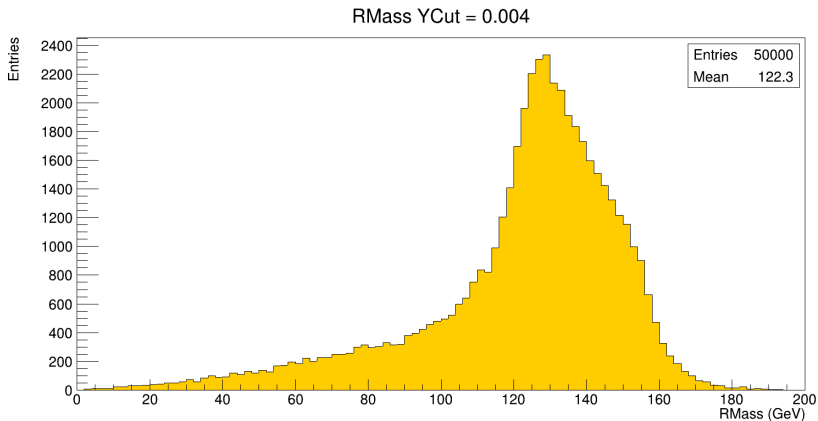
Recoil Mass

$$m_{rec}^2 = [\sqrt{s} - E_Z]^2 - \vec{p}_Z^2 \quad (1)$$

- The link with the MC-truth objects has been done....
- The cuts...
- Previously obtained results with ILCXXX in 2019



Recoil mass of MC-2020 results



Conclusions

- Our goal is to take this analysis to the very end. Background simulation and cross section measurements with its correspondent uncertainties.
- Timing is also a variable that we would like to consider.

Backup

Backup



o2 crash reproduced

aca el output que obtenemos del bash script que nos ha enviado Akiya