TECHNISCHE UNIVERSITÄT DRESDEN

TOHOKU UNIVERSITY

High Energy Accelerator Experiments Group

STUDY OF CHARGED HIGGS BOSONS SEARCH AT THE ILC FOR A COLLISION ENERGY OF 1 TEV

Presented by Christian Drews

Academic advisors: Professor Hitoshi Yamamoto (Tohoku Uni.)
Professor Arno Straessner (TU Dresden)

Overview

- $m_{H^\pm}$ = 350 GeV
- e^+e^- -> H^+H^- -> tb tb -> Wbb Wbb $\xrightarrow{W \to 2 \text{ jets}}$ 8 jets (hadronic)

Analysis Strategy – Beam Background

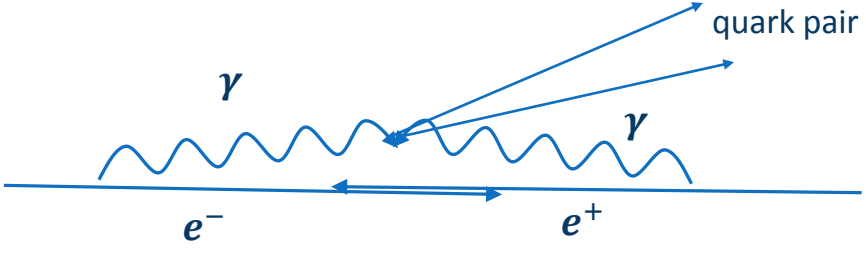
In average 1.7 beam background events per bunch crossing

Has major influence on jet clustering

Use kt-algorithm from fastjet package to reduce backgrond

- R: Generalized radius of jets
- Vary R to optimal mass resolution

Use Satoru Jetfinder for clustering



Fastjet Finder – kt Algorithm (beam background removal)

- Calculate the distance between to all tracks

$$d_{ij} = \min(p_{Ti}^2, p_{Tj}^2)\frac{\Delta R_{ij}}{R}$$

with $\Delta R_{ij} = (\eta_i - \eta_j)^2 + (\phi_i - \phi_j)^2$

η pseudo rapidity, ϕ azimuth

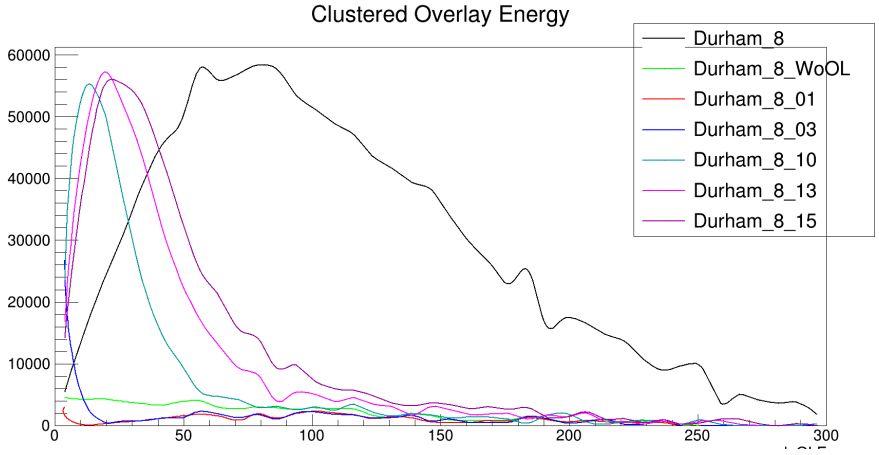
- Find smallest d_{ij}
- If $d_{ij} < d_{iB} = p_{Ti}^2$ merge tracks, if not remove Track (B: Beam)
  - Remove particles that are closer to the beam than to the closest track
- Continue to step one until there are only the requested number of jets

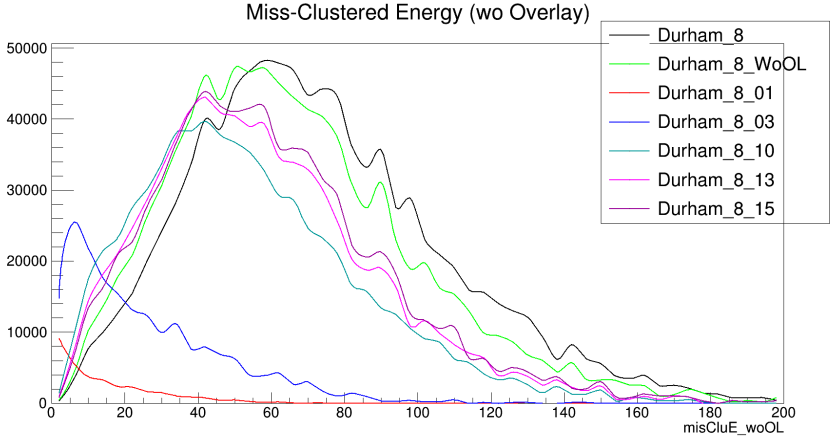
Choose R for kt algorithm

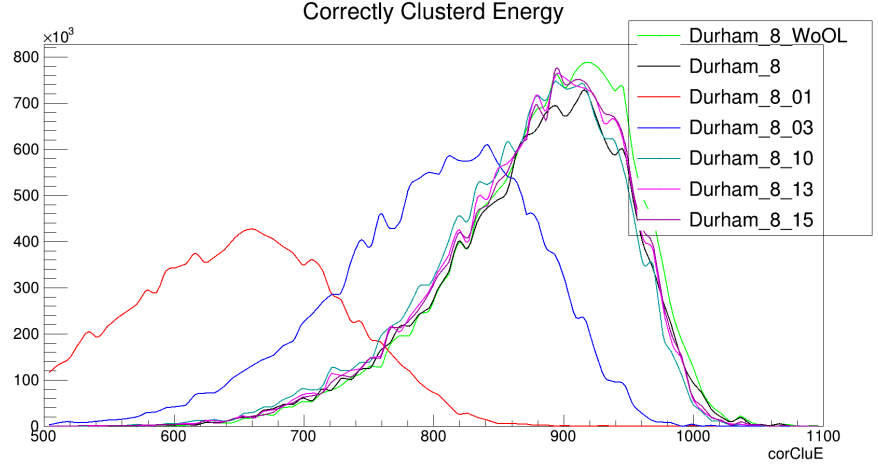
Durham_8: w/o correction

Durham_8_WoOL: overlay removed by generator information

Durham_8_13: R = 1.3

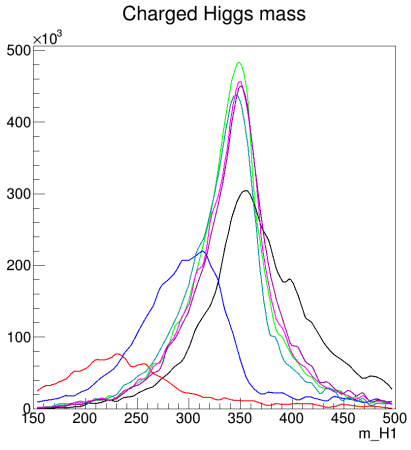


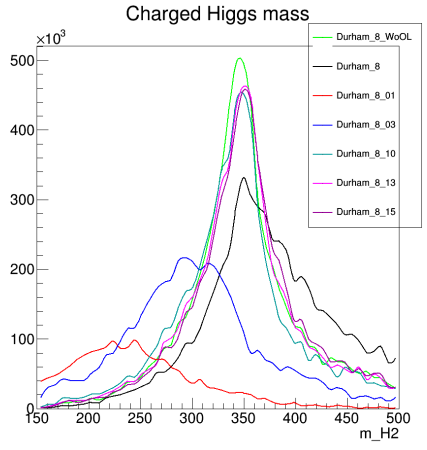


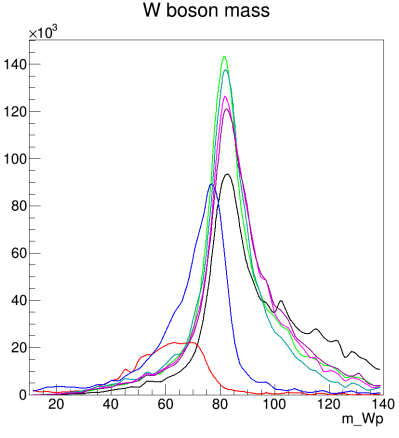


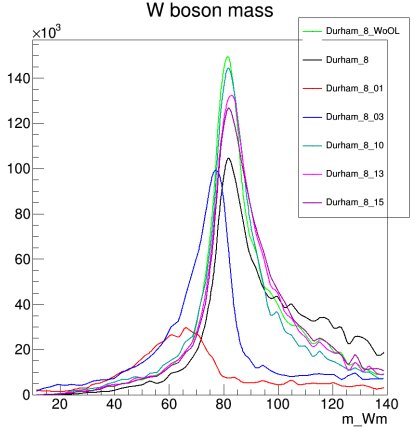
Choose R for kt algorithm

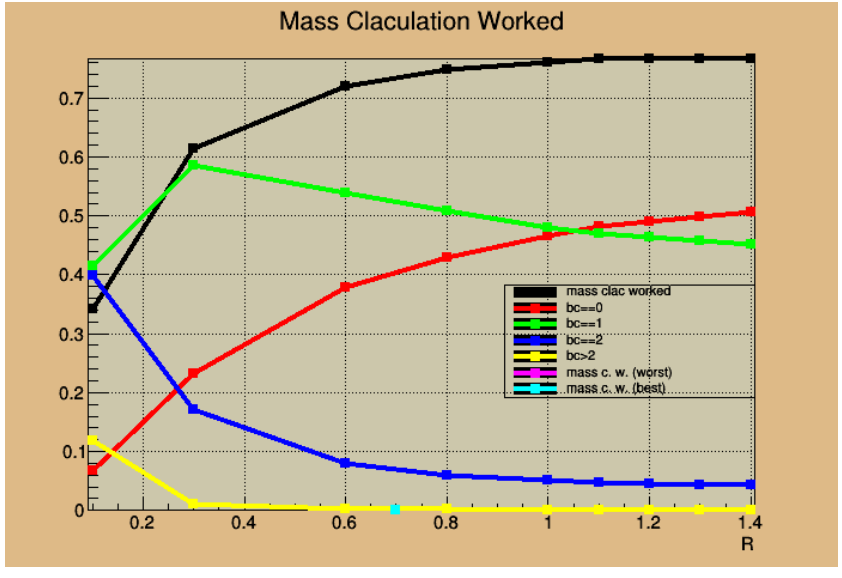
- For W mass R = 1.0 seems best
- For H mass R = 1.3 seems best
- Maybe b-jets have a wider spread
- I will continue with 1.3

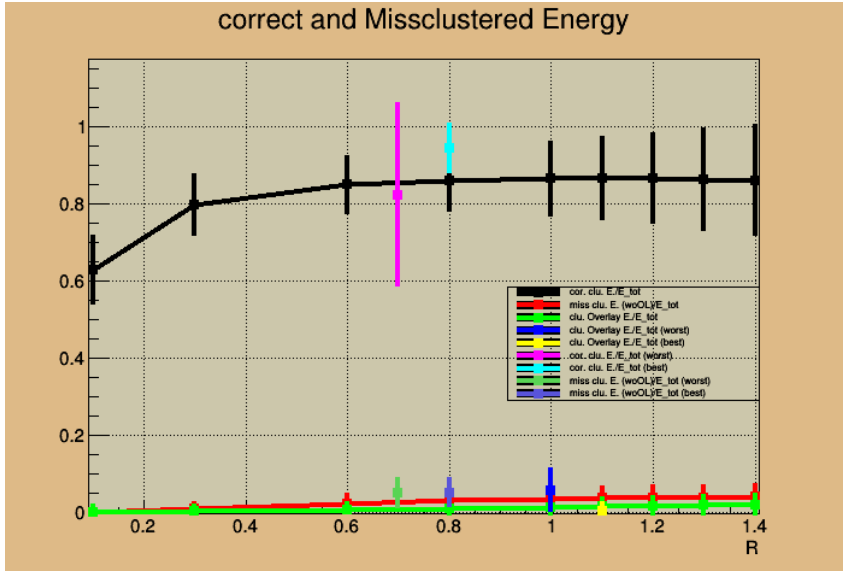









Mass Claculation Worked
mass clac worked
bc==0
bc==1
bc==2
bc>2
mass c. w. (worst)
mass c. w. (best)
R

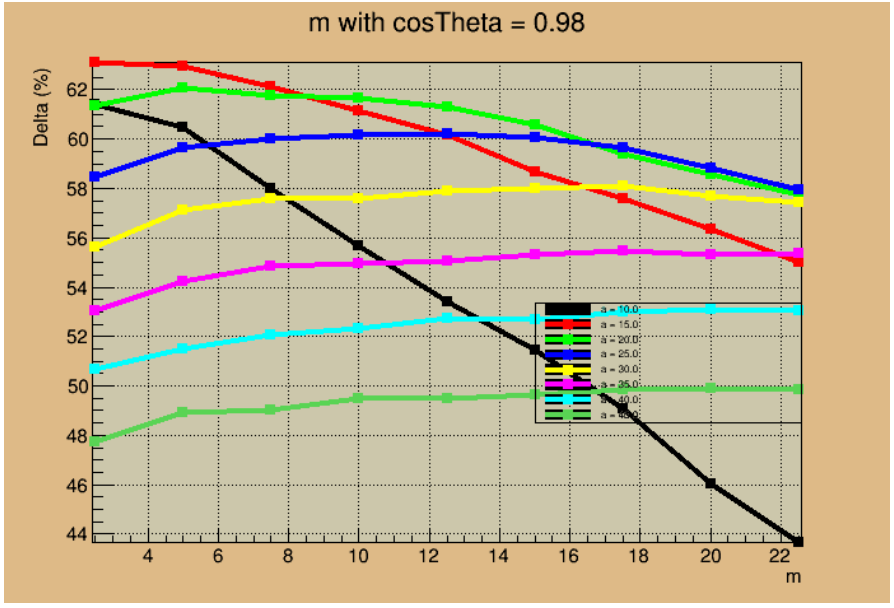

correct and Missclustered Energy
cor. clu. E./E_tot
miss clu. E. (woOL)/E_tot
clu. Overlay E./E_tot
clu. Overlay E./E_tot (worst)
clu. Overlay E./E_tot (best)
cor. clu. E./E_tot (worst)
cor. clu. E./E_tot (best)
miss clu. E. (woOL)/E_tot (worst)
miss clu. E. (woOL)/E_tot (best)
R

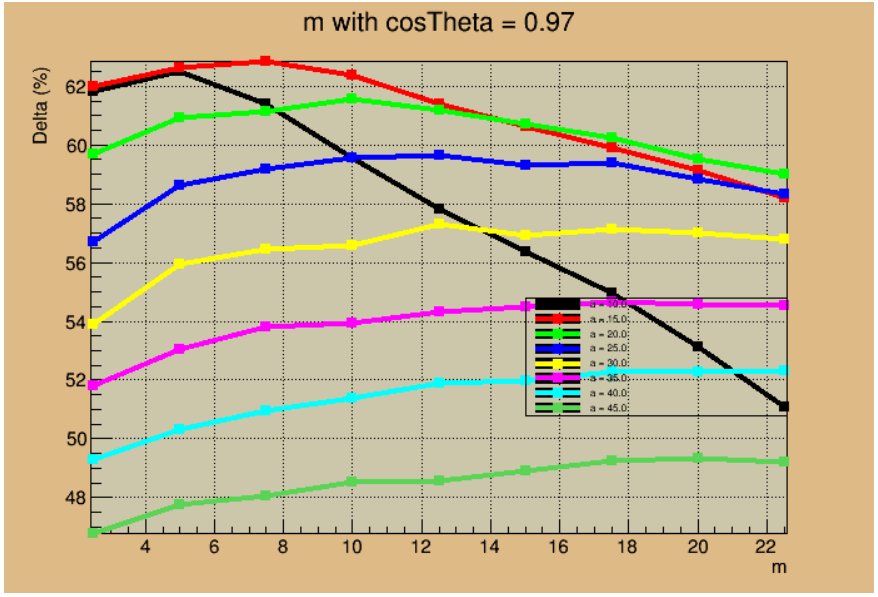
Lepton selection

- Isolatete Lepton selection
  - Pfo has charge
  - E_{cone}^2 <= m*(E_{pfo} -a)
  - m = 6 | a = 15
  - E_{cone} = Sum(E_i[cos(α(p_i,p_{pfo})) >= 0.98])
- 67.6 % correctly selected (quite good (33 % tau))
- 4.3 % false selection in hadronic channel

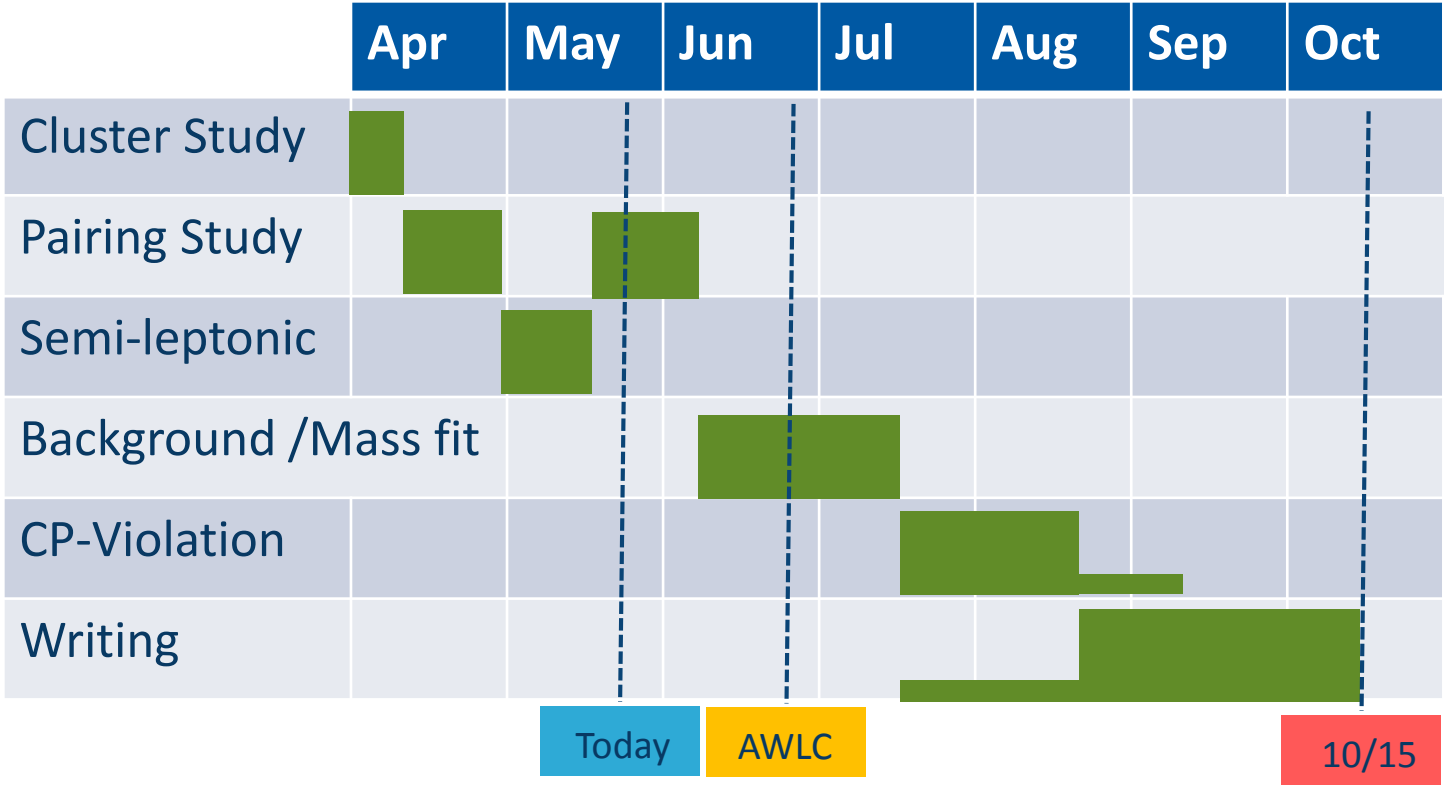
Lepton selection

- Delta = (Selection efficiency in semileptonic – false seletion in hadronic)*100
- Corrent: E_{cone}^2 <= m*(E_{pfo} -a) | m = 6 | a = 15 | cosTheta = 0.98





Schedule


Apr
May
Jun
Jul
Aug
Sep
Oct
Cluster Study
Pairing Study
Semi-leptonic
Background /Mass fit
CP-Violation
Writing
Today
AWLC
10/15

Plan

- Check Chi^2 Pairing with 3D display
- Develop extra conditions for pairing
- Include semi-leptonic mode (6 jets)
- Background study with cuts
- Goal:
    - mass fit -> mass resolution measurement
    - Detection efficiency
      -> cross section times branching ratio
- Bonus:
    - Research how to distinguish H+ and H-
    - Study of CP-violation measurement