Particle Collecting Efficiency

(Weekly Report)

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Feb 17, 2017

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- Z boson signal visible particles collecting efficiency.
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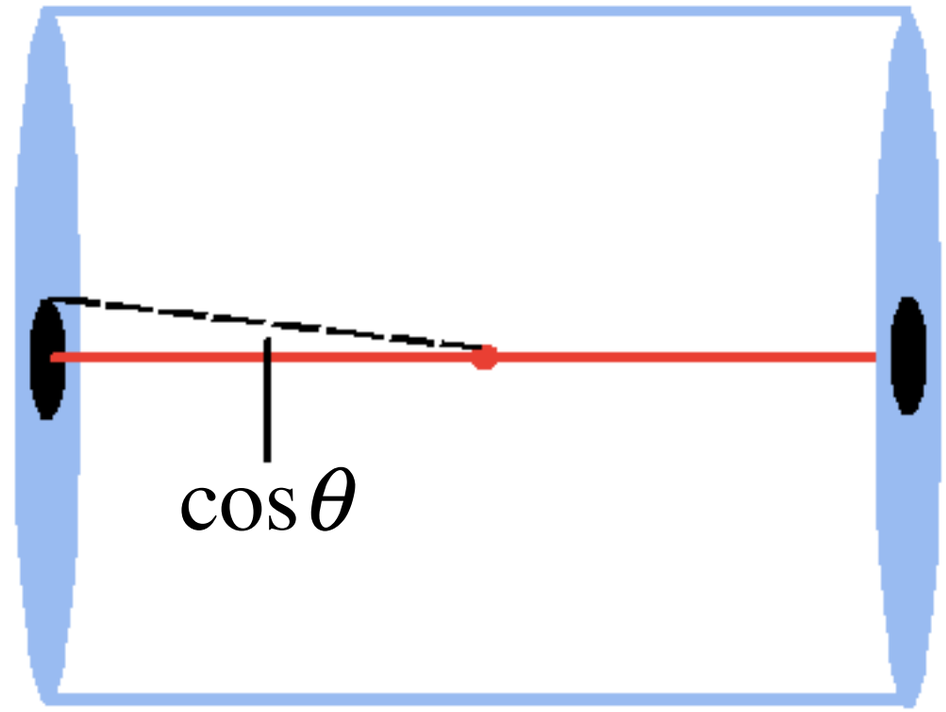
Motivation

- To learn the sensitive of our detector as function of width of beam pipe.
- Efficiency is defined as all visible particles are include in our detector divide by the fraction of event.

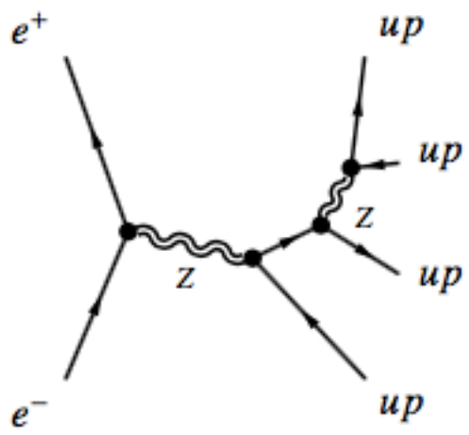


$$Efficiency = \frac{\text{The fraction of event of all of visible particles are included in detector}}{\text{The fraction of event}}$$

Event Selection

- Storage MC Trust into root file
- NParent = 0
  - For electron and positron: skip the photon
  - For parton: PID < 6
  - For lepton: PID = 11, 13, 15

ZZ_h



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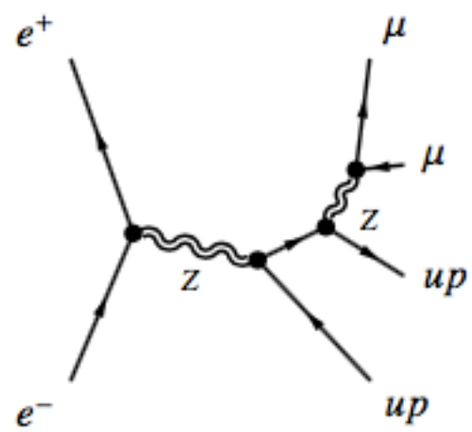

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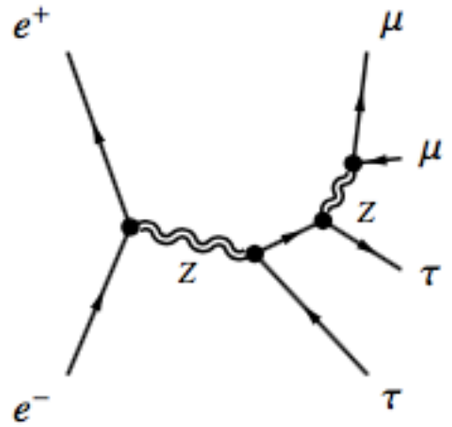
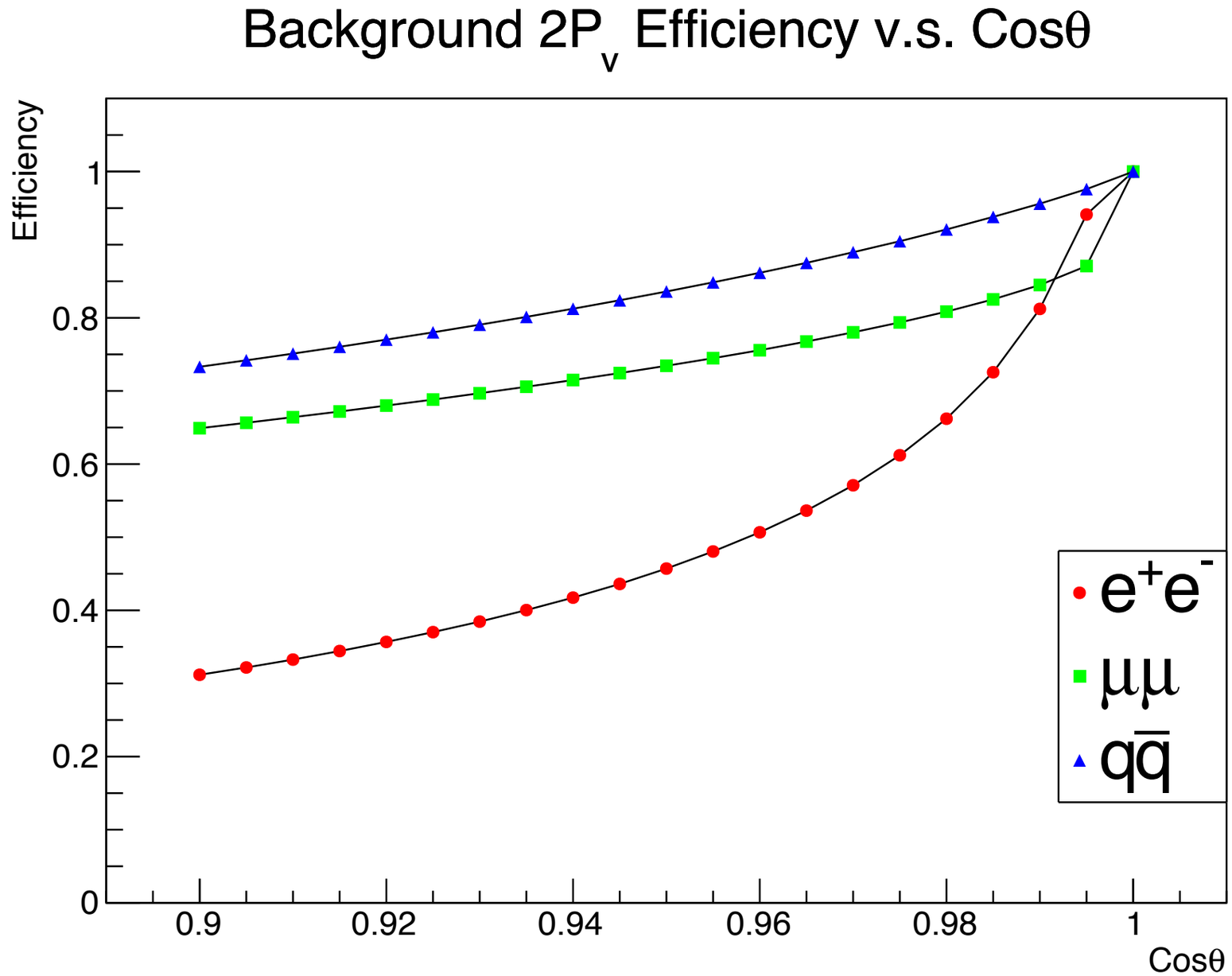


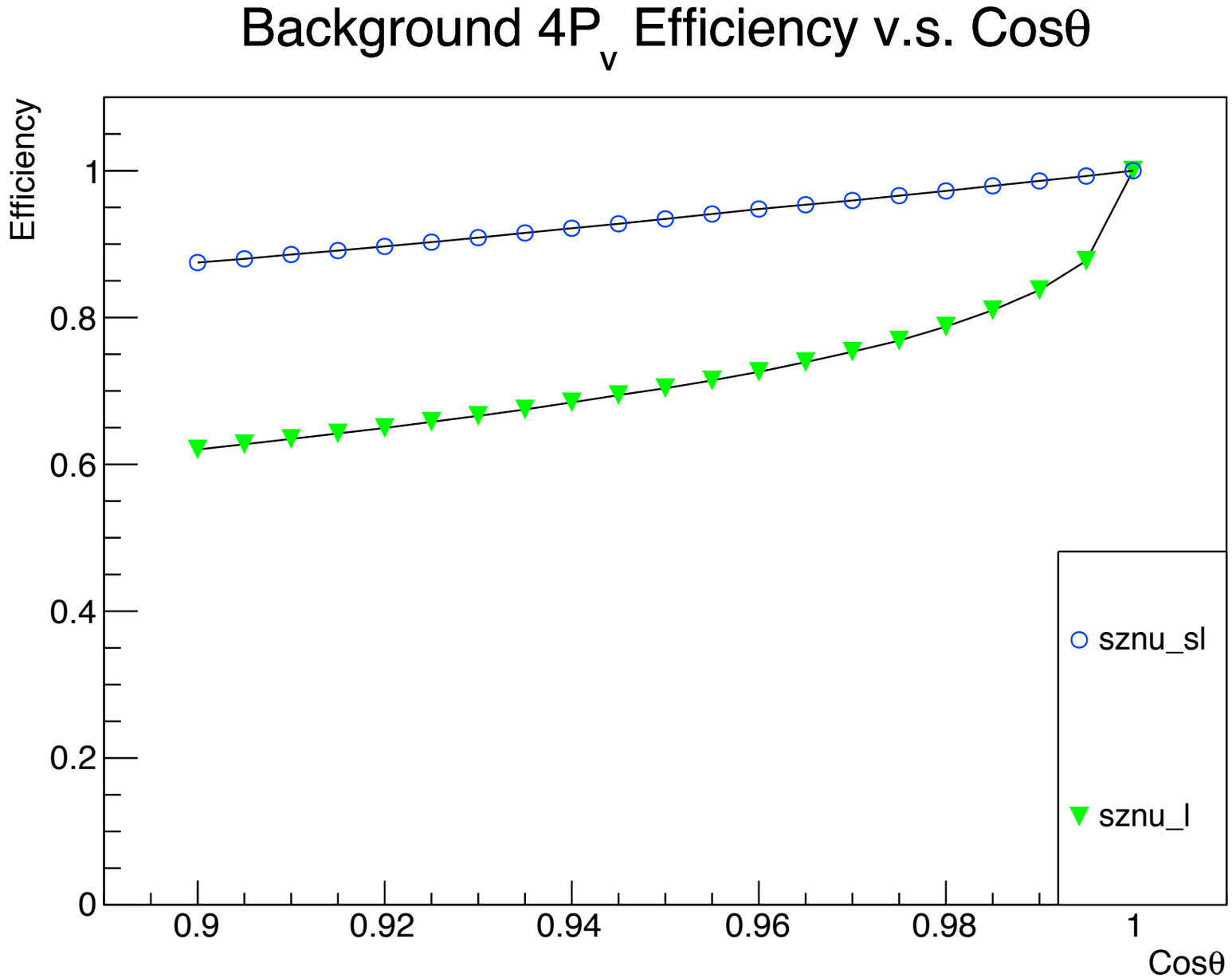
2 Visible Particles Collecting Efficiency

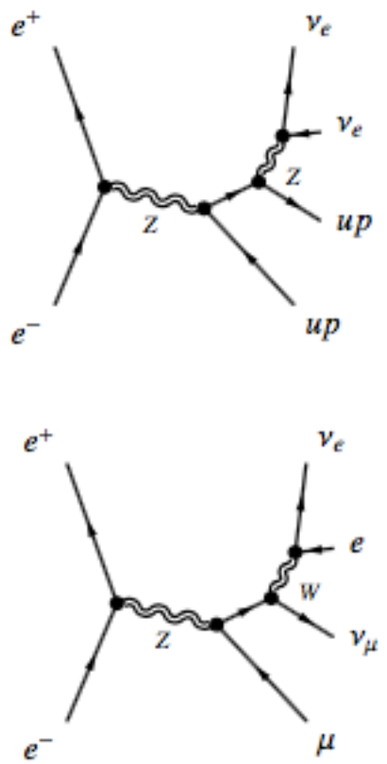
Background



4 Visible Particles Collecting Efficiency

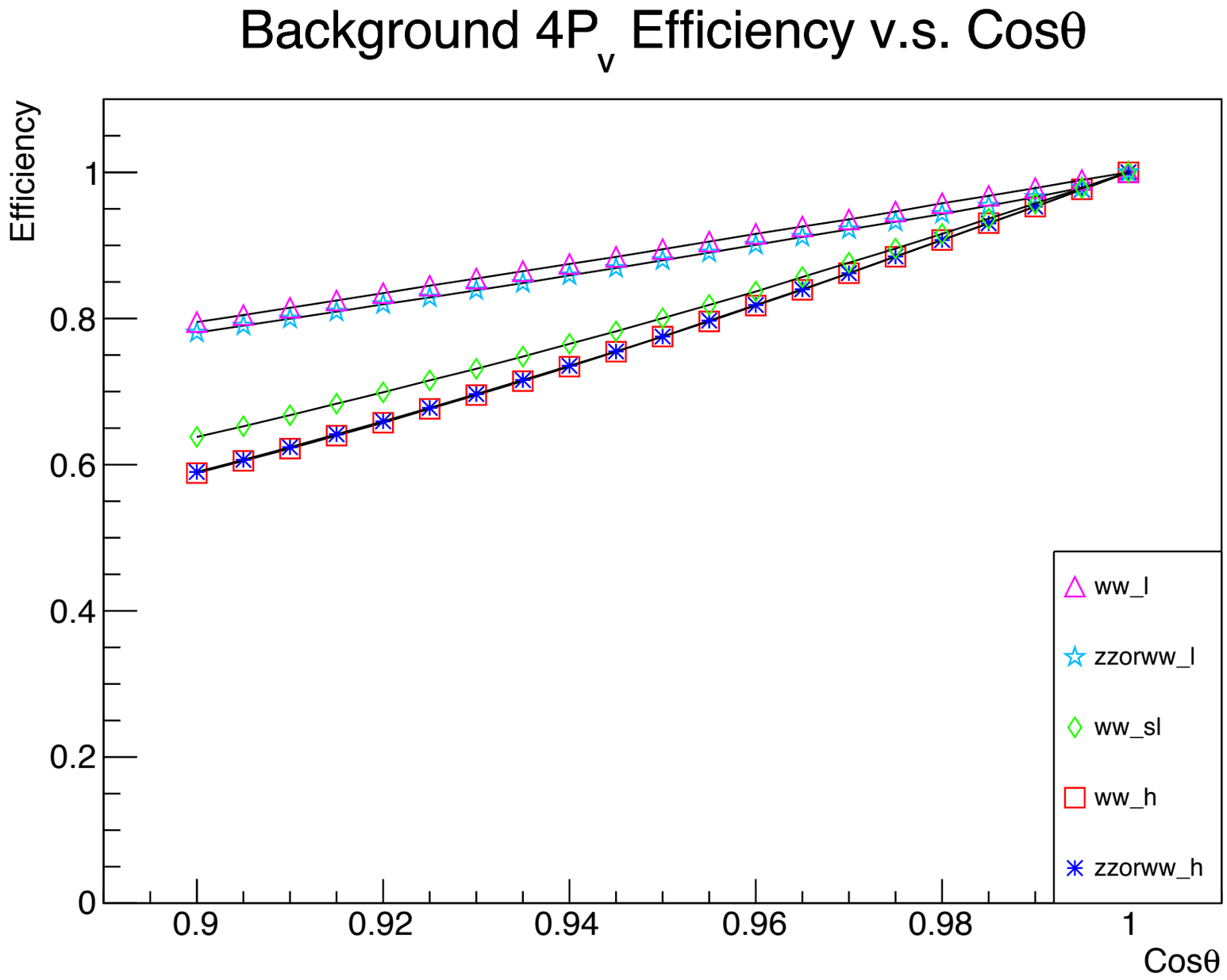
Background





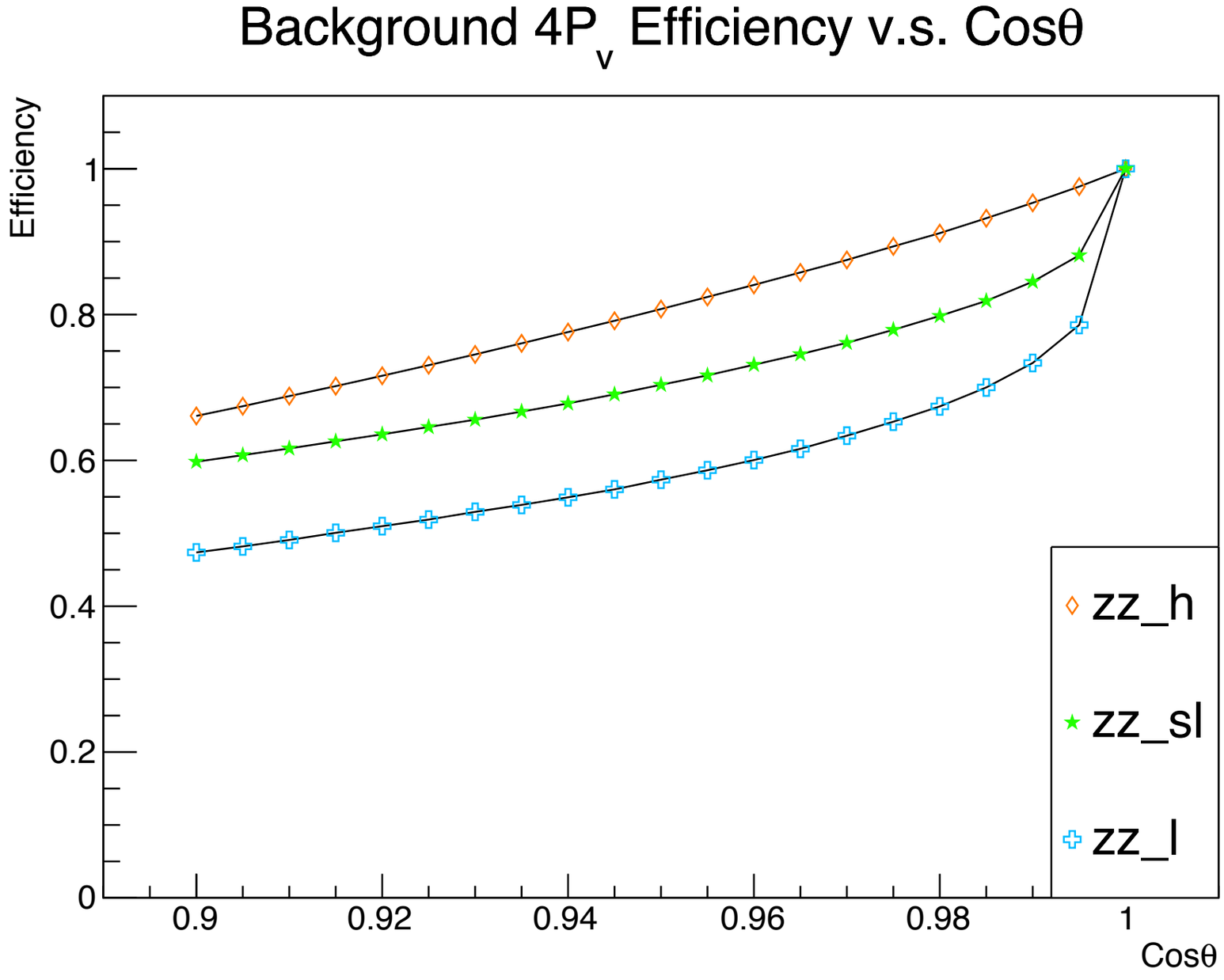
4 Visible Particles Collecting Efficiency

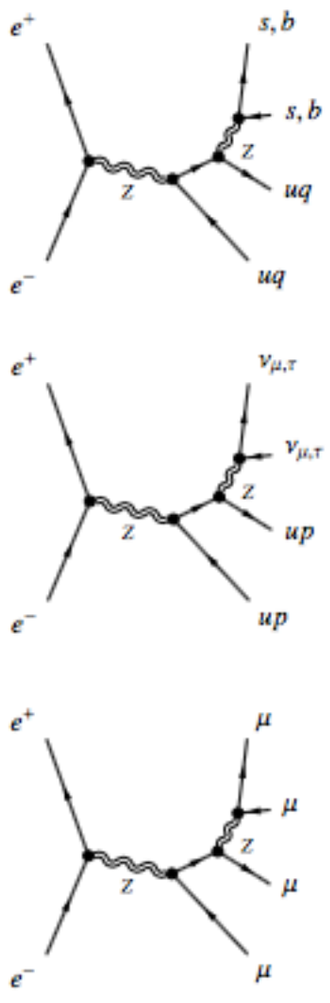
Background



4 Visible Particles Collecting Efficiency

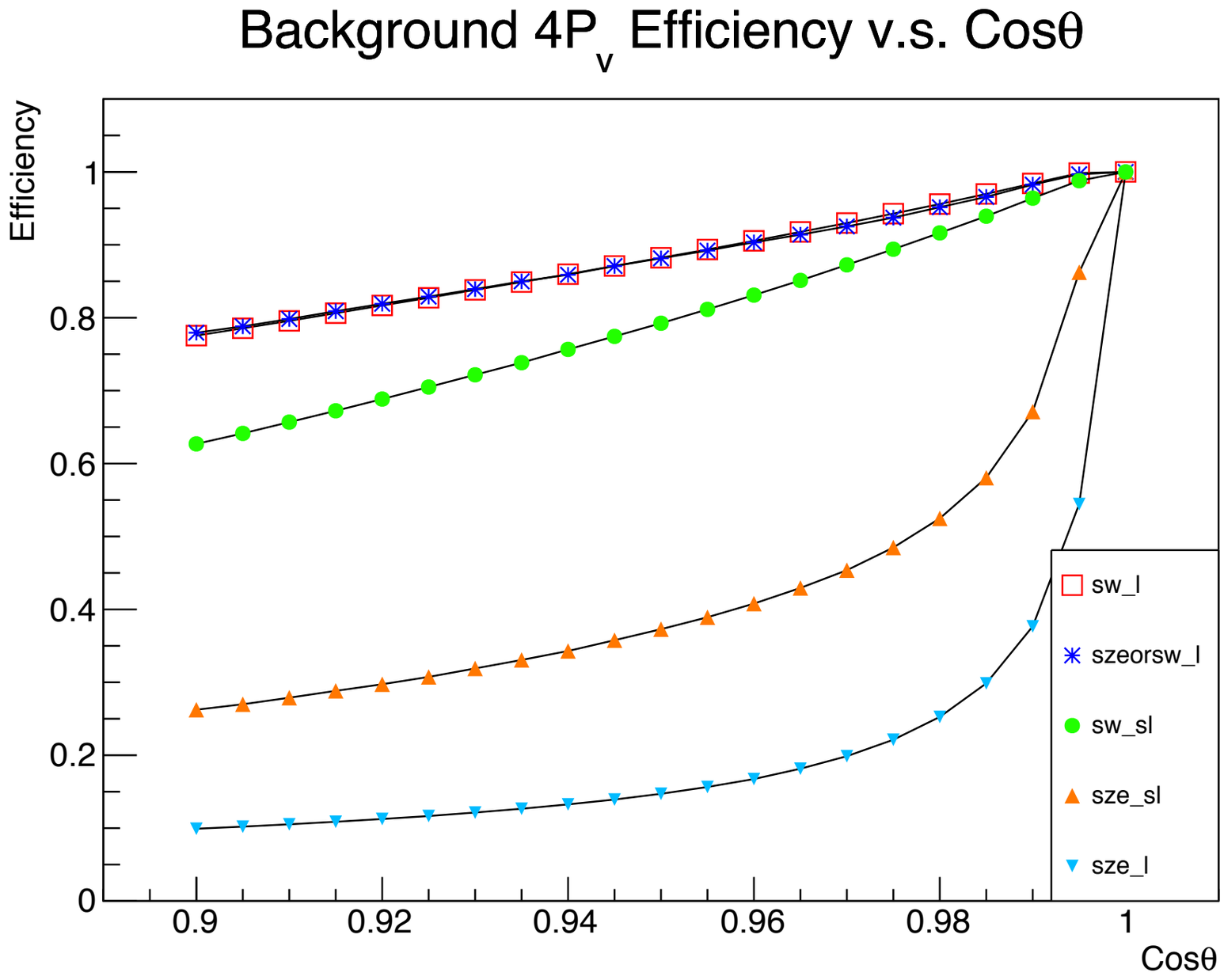
Background





4 Visible Particles Collecting Efficiency

Background



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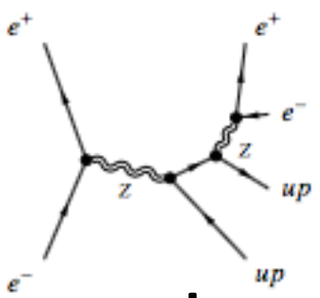

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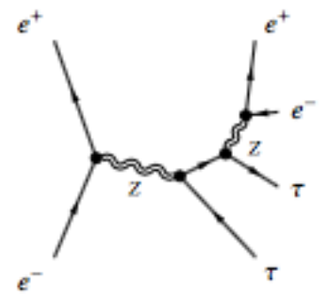


Higgs Signal Branching Ratio

2P$_v$ vvH

$$H \to b\bar{b}, c\bar{c}, gg, \tau\tau, \gamma\gamma$$

$$H \to \begin{matrix} ww \\ zz \end{matrix} \to llvv, ggvv$$

3P$_v$ vvH

$$H \to ww \to lvqq$$

4P$_v$ gg / llH

$$H \to b\bar{b}, c\bar{c}, gg, \tau\tau, \gamma\gamma$$

$$H \to \begin{matrix} ww \\ zz \end{matrix} \to llvv, ggvv$$

vvH $\quad H \to llqq$

5P$_v$ gg / llH

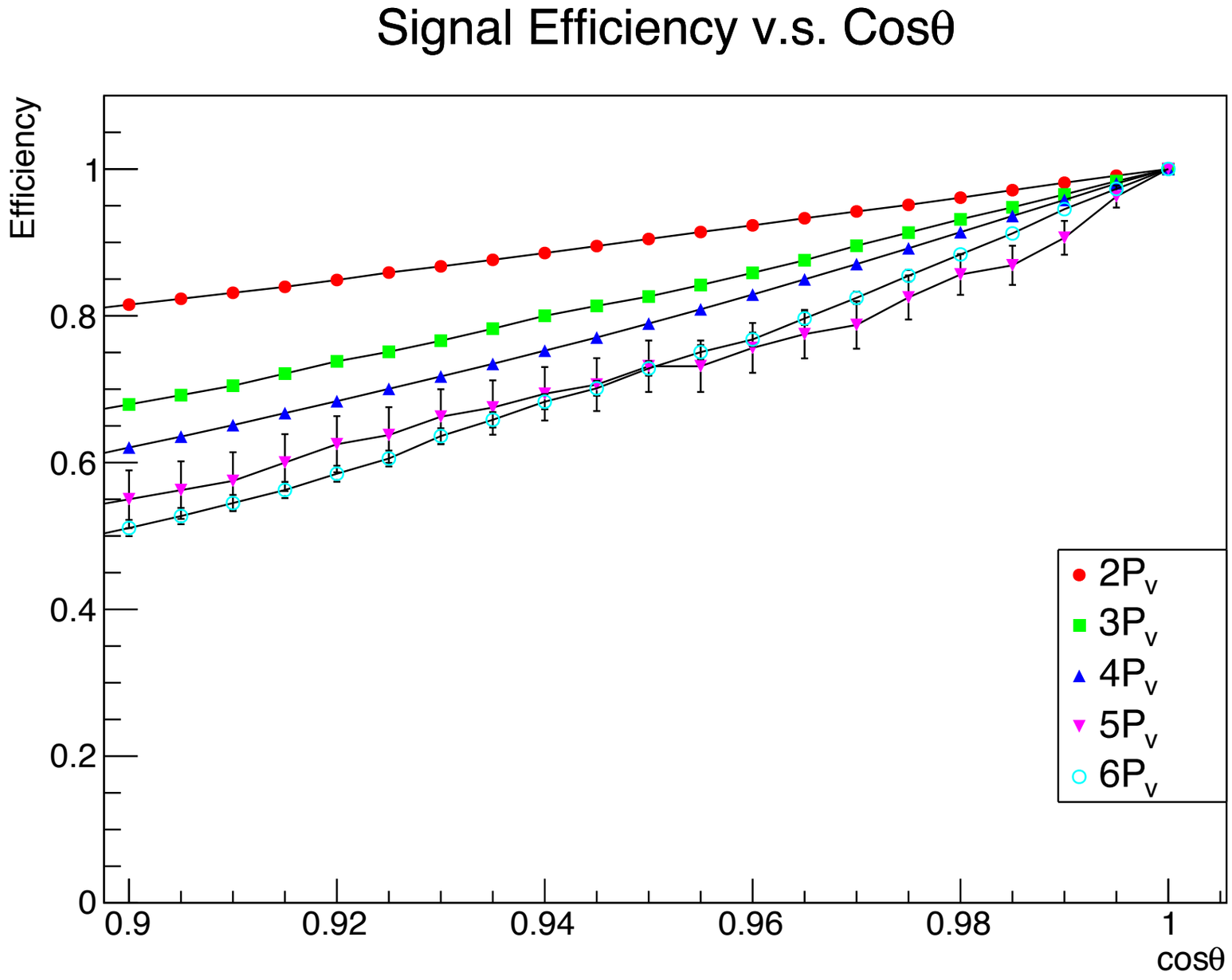
$$H \to ww \to lvqq$$

6P$_v$ gg / llH

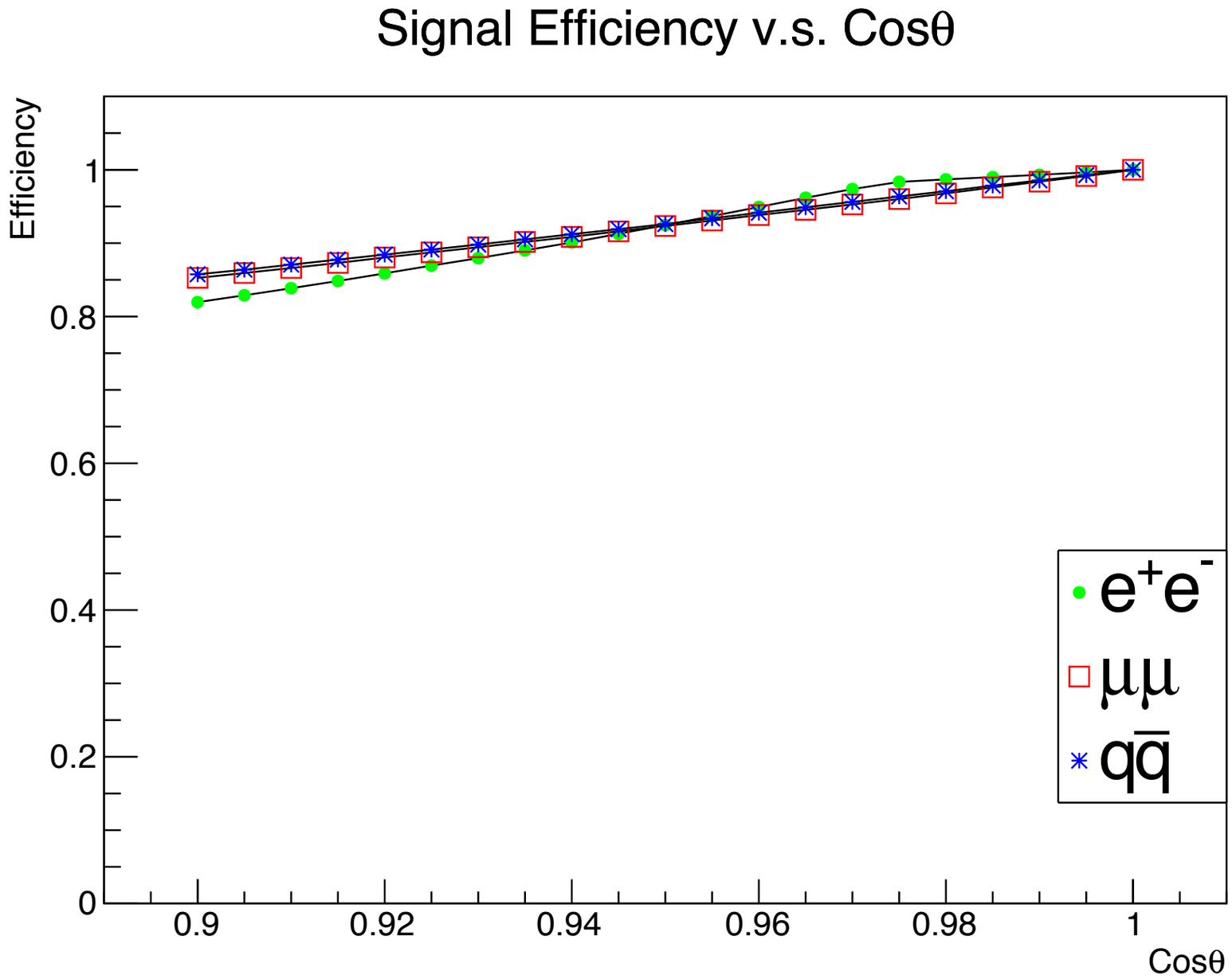
$$H \to \begin{matrix} ww \\ zz \end{matrix} \to \begin{matrix} llqq \\ 4q \\ 4l \end{matrix}$$

Category	
2P$_v$	3.3x10^{-1}
3P$_v$	7.2x10^{-4}
4P$_v$	6.4x10^{-1}
5P$_v$	8.1x10^{-4}
6P$_v$	1.1x10^{-1}

Higgs Signal Collecting Efficiency



Z boson Signal Collecting Efficiency



Summary

- If add cosθ from 0.98 to 0.9, particle collecting efficiency will decrease about 20% ~ 30% in Higgs signal region. If we want to collect the same as fraction on cosθ=0.98, it will make CEPC needs to run more 2 years. The price of CEPC run 1 years is similar the price of a detector.

To Do

- **The energy collection efficiency**

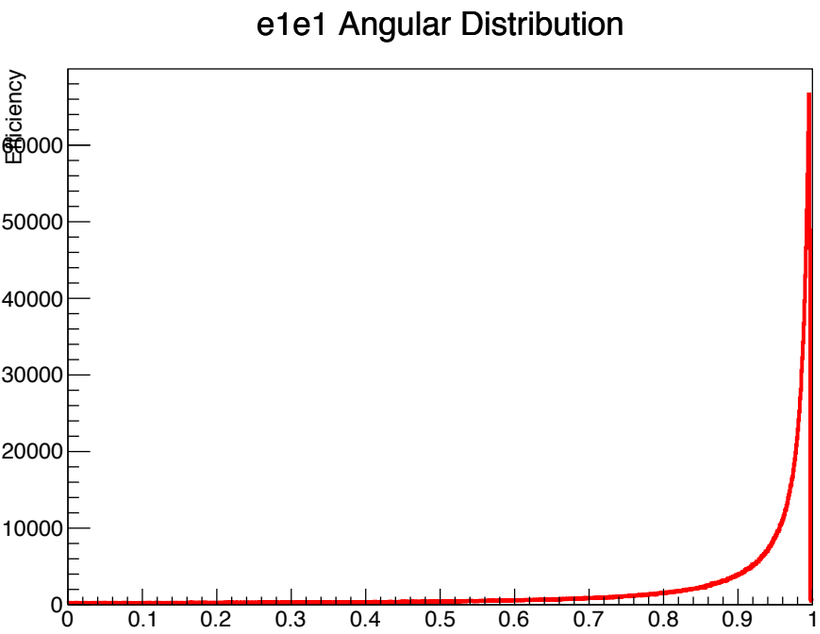
Back up

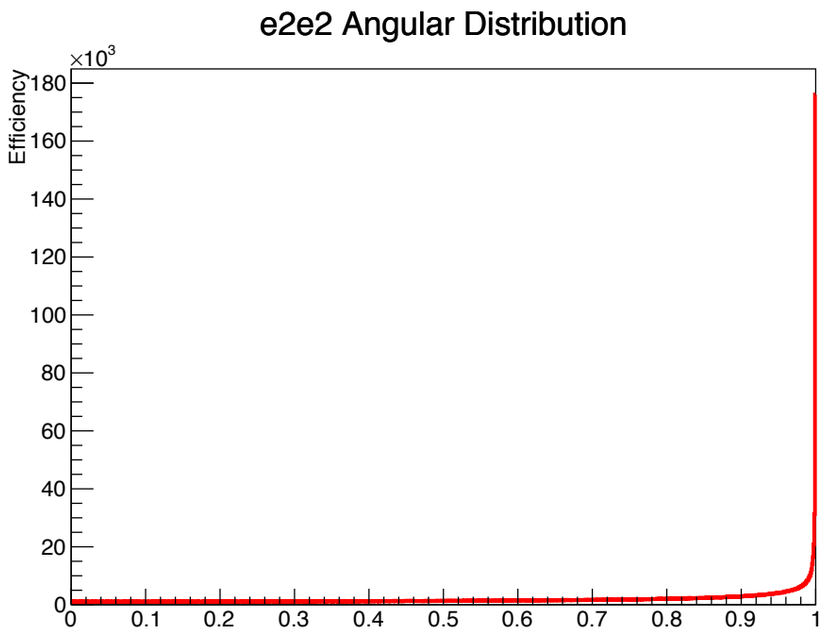
- The more precise branching ratio.
- Angular distribution for all background.
- Feynman dygram

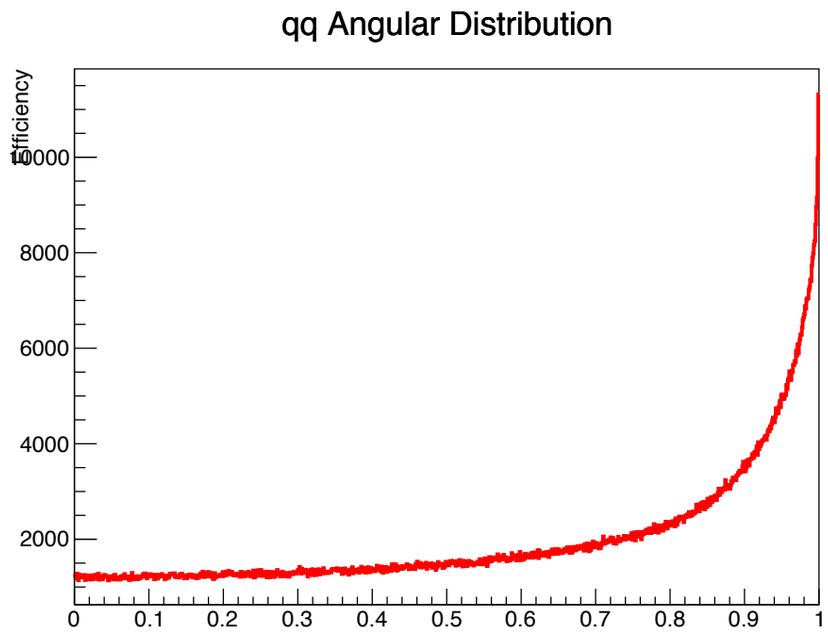
Back up

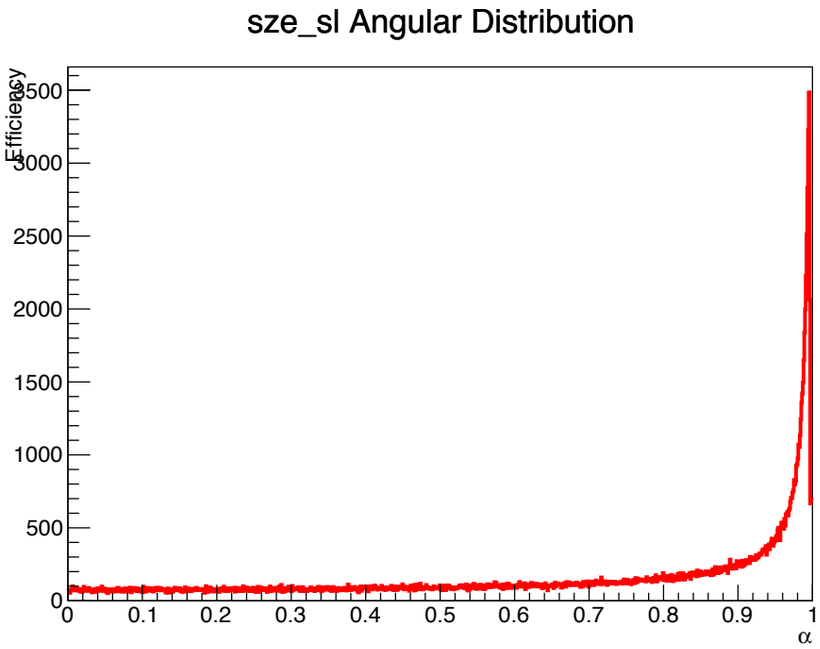
```
Processing event 1 of 100451
Processing event 1 of 99952
Processing event 1 of 196807
Processing event 1 of 171851
 2Pv : 0.339703
 3Pv : 0.000729272
 4Pv : 0.647084
 5Pv : 0.000810106
 6Pv : 0.0111675
tot: 0.999494
```

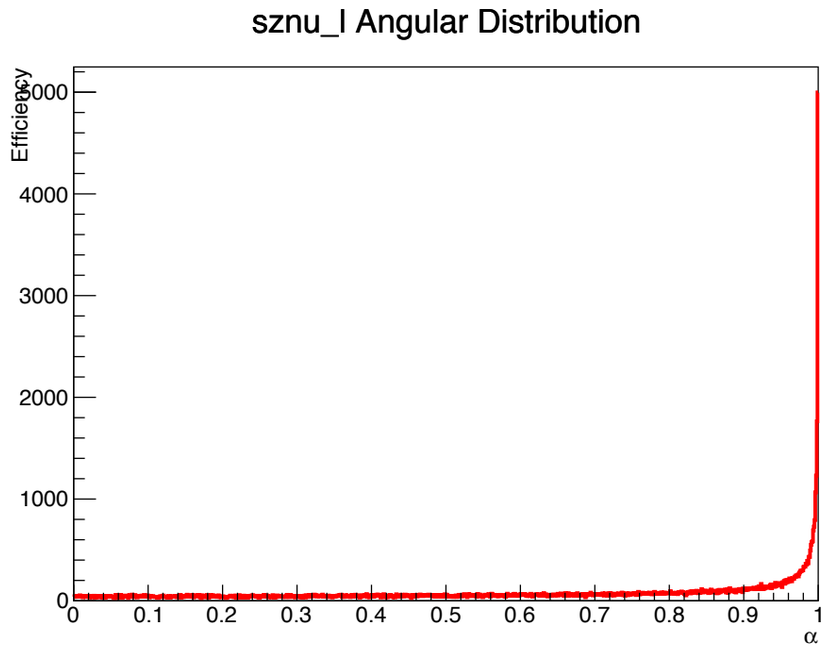
Back up

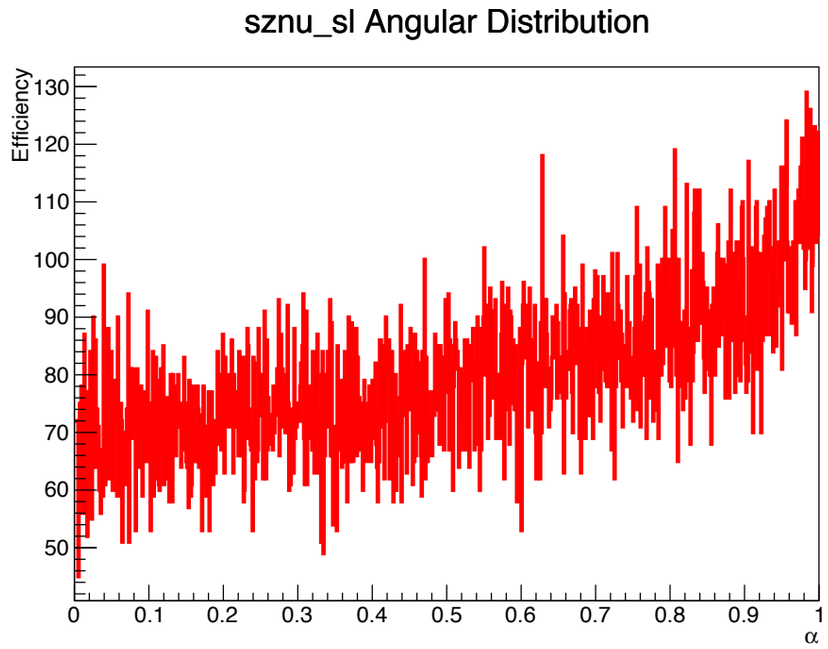

e1e1 Angular Distribution
Efficiency
α


e2e2 Angular Distribution
×10^3
Efficiency
α

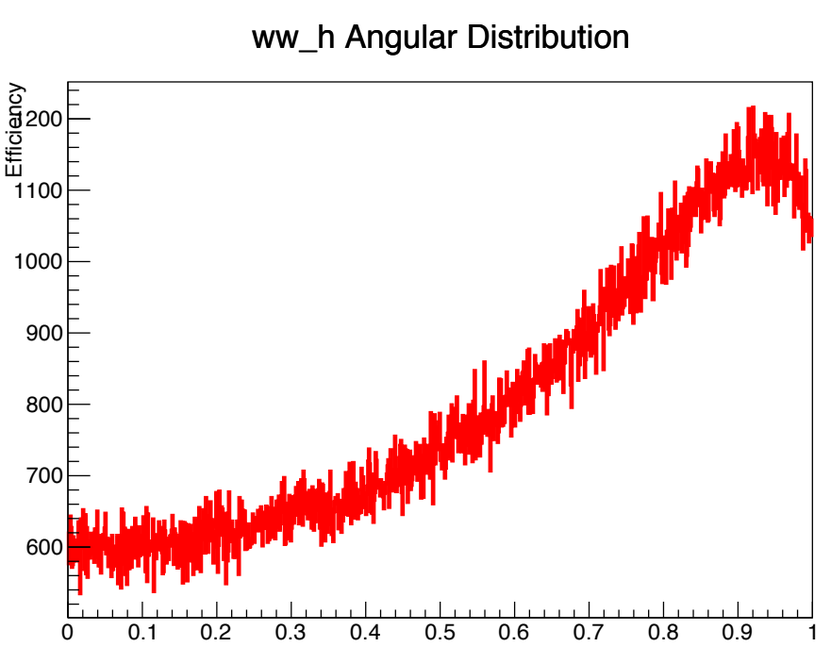

qq Angular Distribution
Efficiency
α

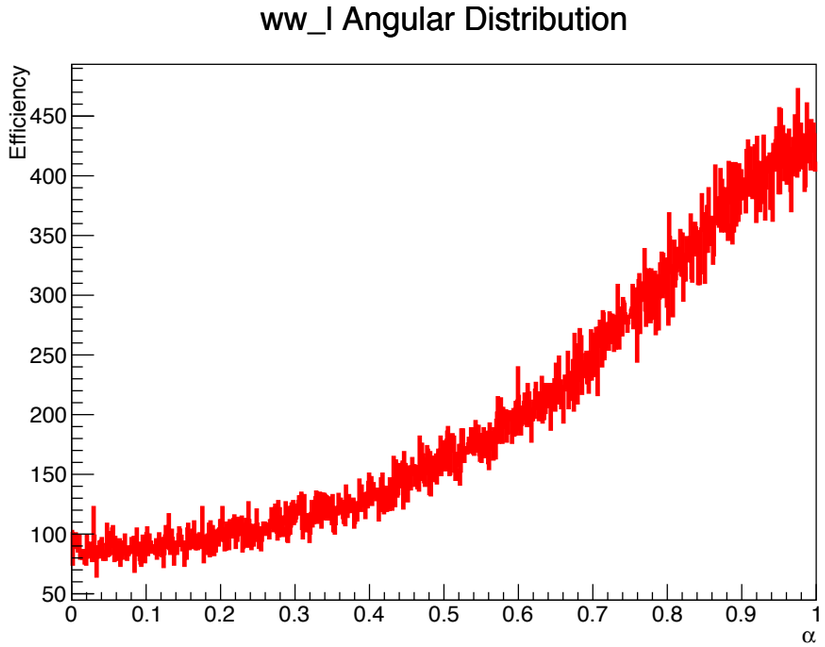

sze_sl Angular Distribution
Efficiency
α

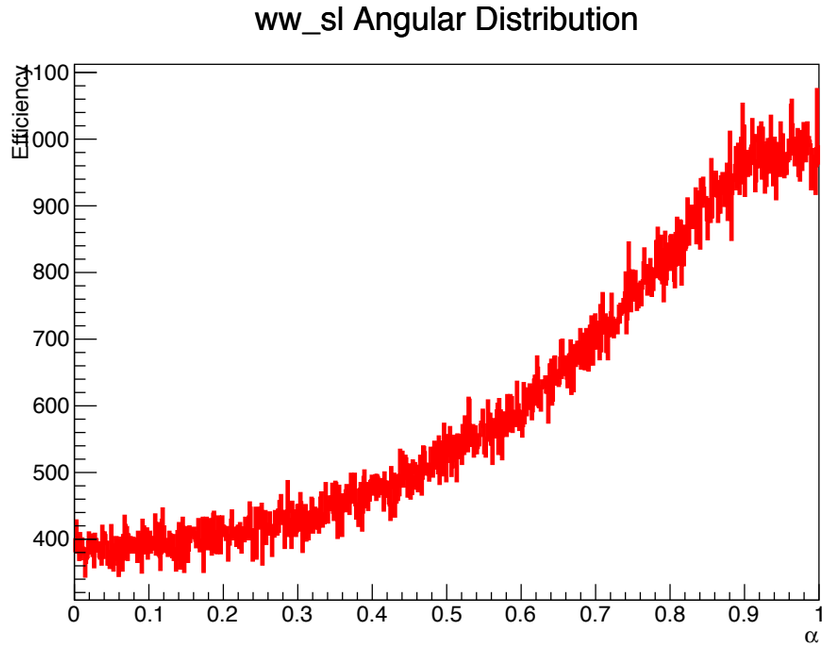

sznu_l Angular Distribution
Efficiency
α

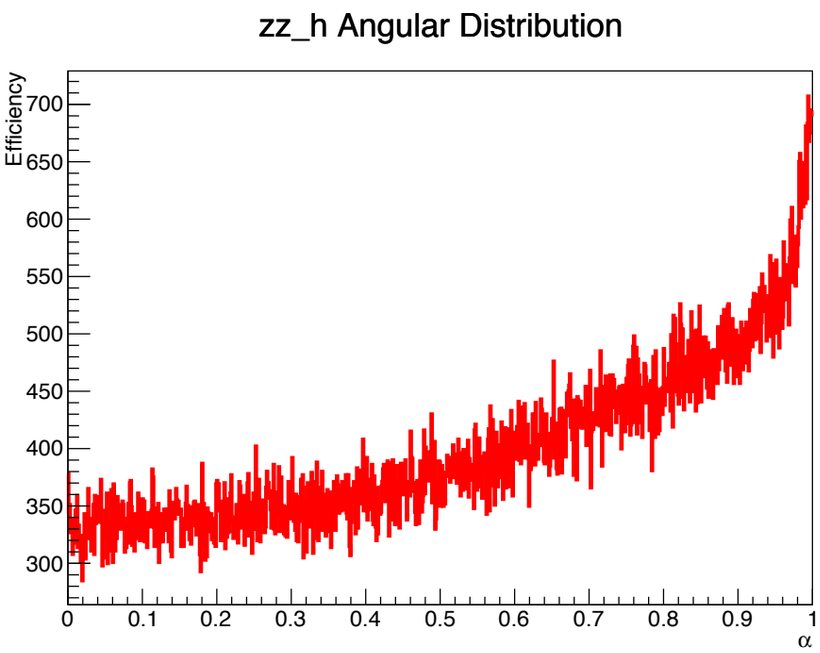

sznu_sl Angular Distribution
Efficiency
α

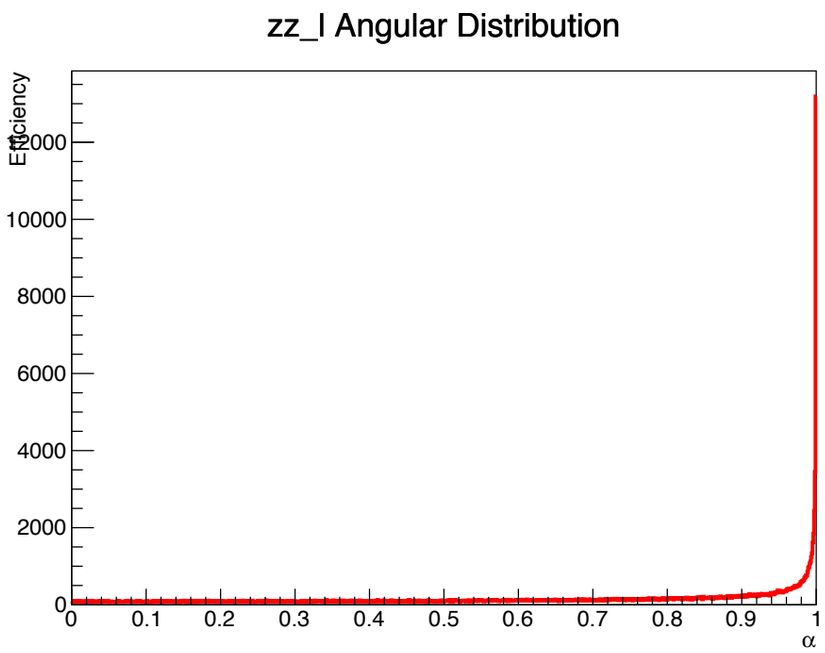
Back up

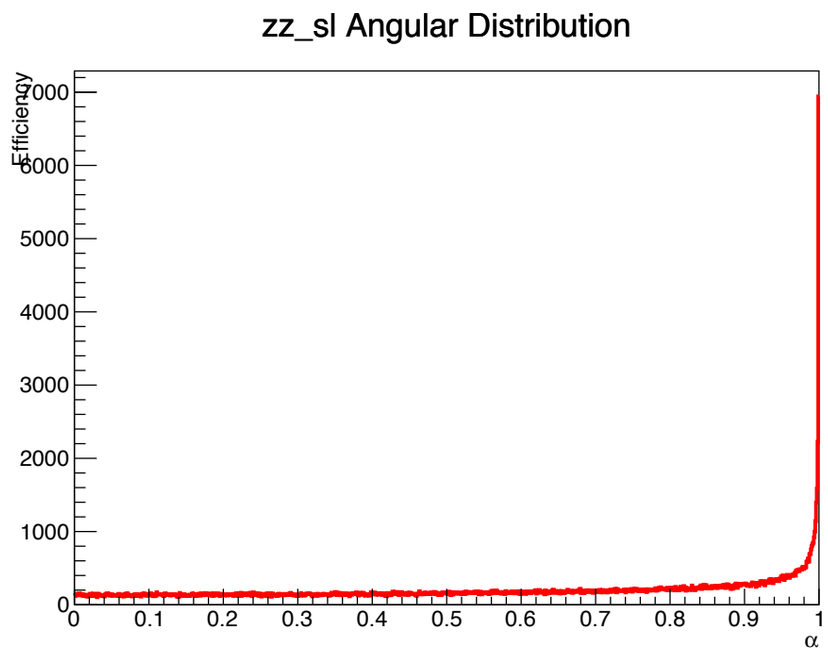

ww_h Angular Distribution
Efficiency
α


ww_l Angular Distribution
Efficiency
α

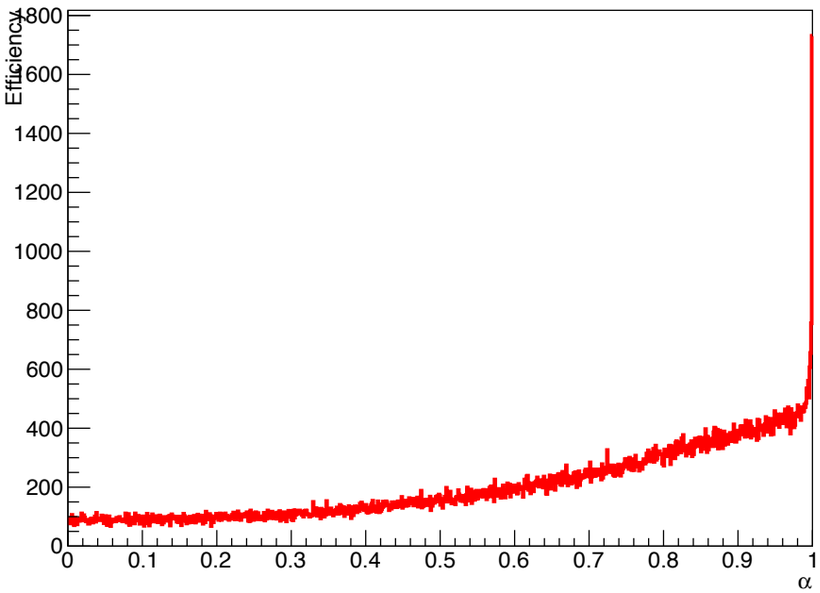

ww_sl Angular Distribution
Efficiency
α

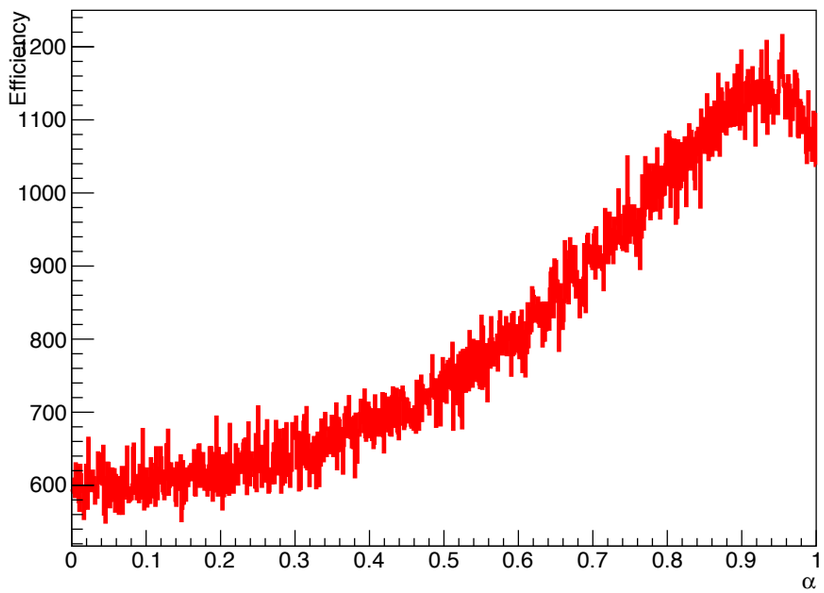

zz_h Angular Distribution
Efficiency
α

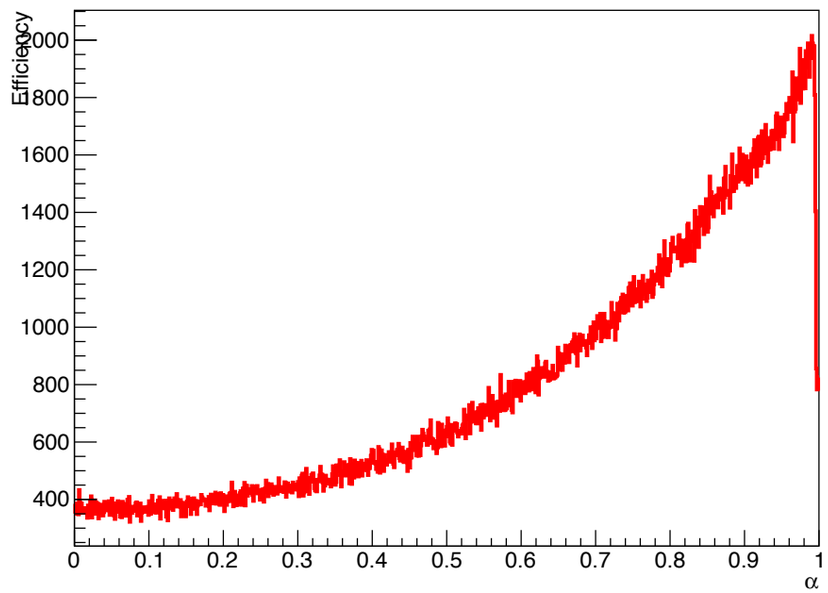

zz_l Angular Distribution
Efficiency
α

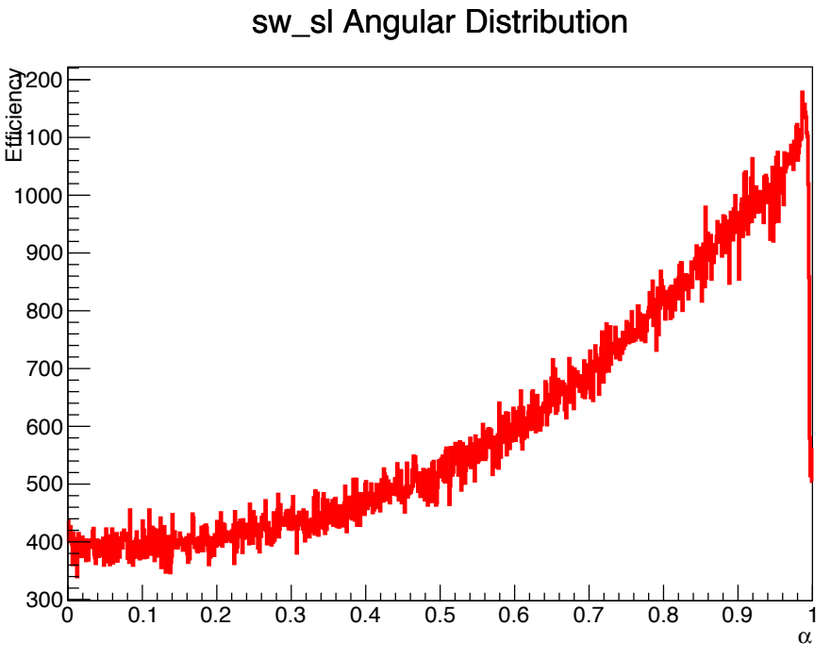

zz_sl Angular Distribution
Efficiency
α

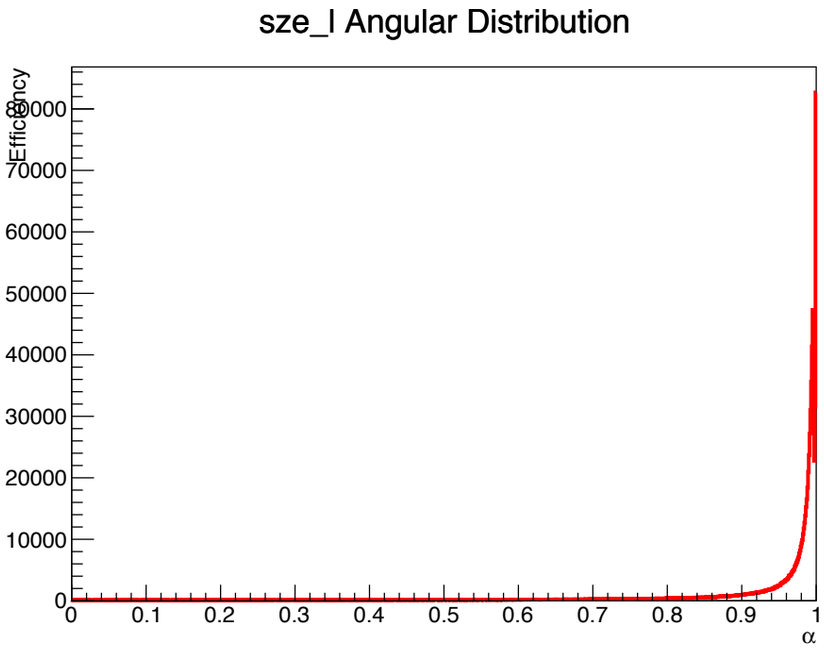
Back up

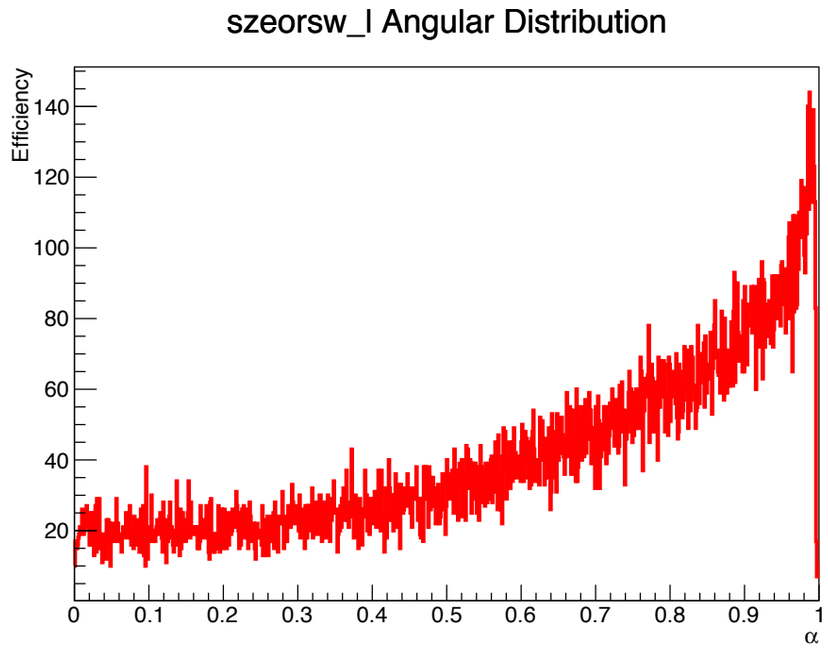

zzorww_l Angular Distribution
Efficiency
α


zzorww_h Angular Distribution
Efficiency
α


sw_l Angular Distribution
Efficiency
α

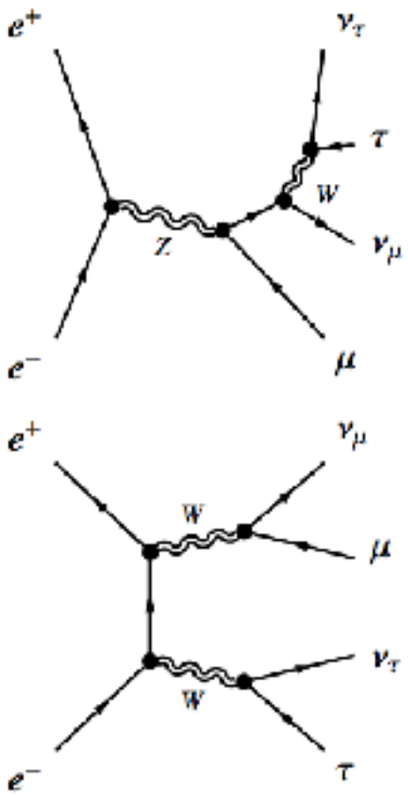

sw_sl Angular Distribution
Efficiency
α

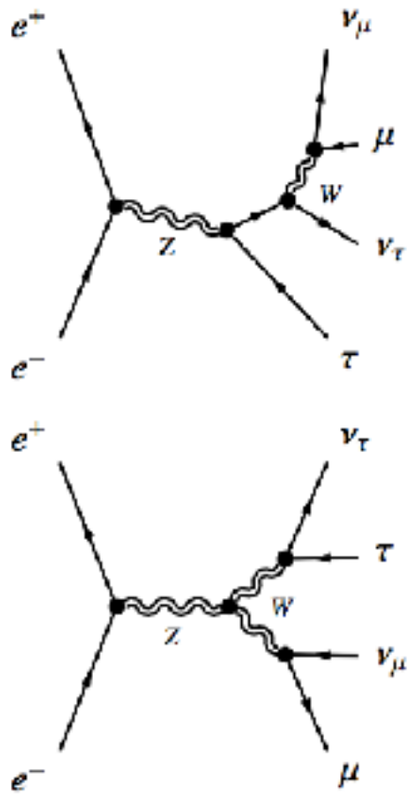

sze_l Angular Distribution
Efficiency
α


szeorsw_l Angular Distribution
Efficiency
α

ww_l & ww_sl Feynman dygram

ww_l0ll





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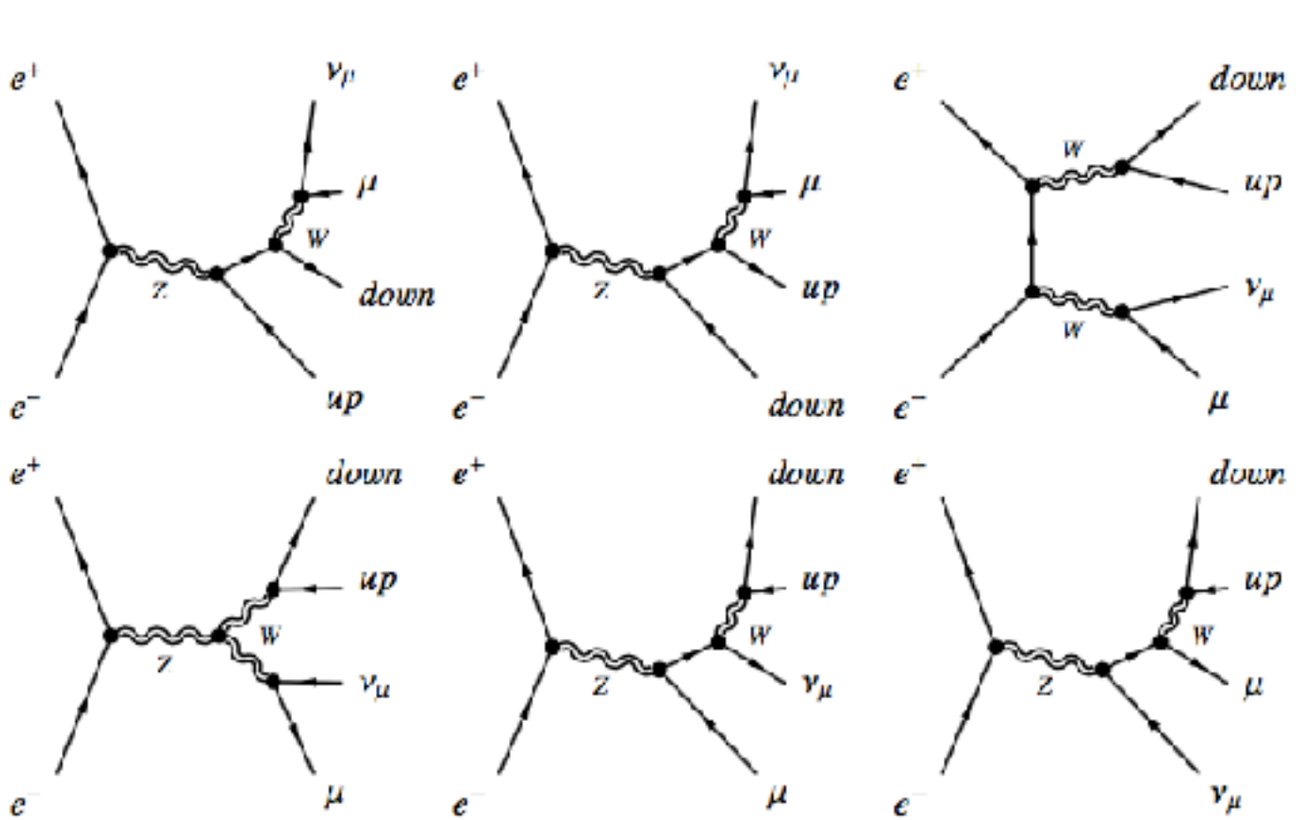

WW_h Feynman dygram

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