CHASING THE NLSP

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Contents

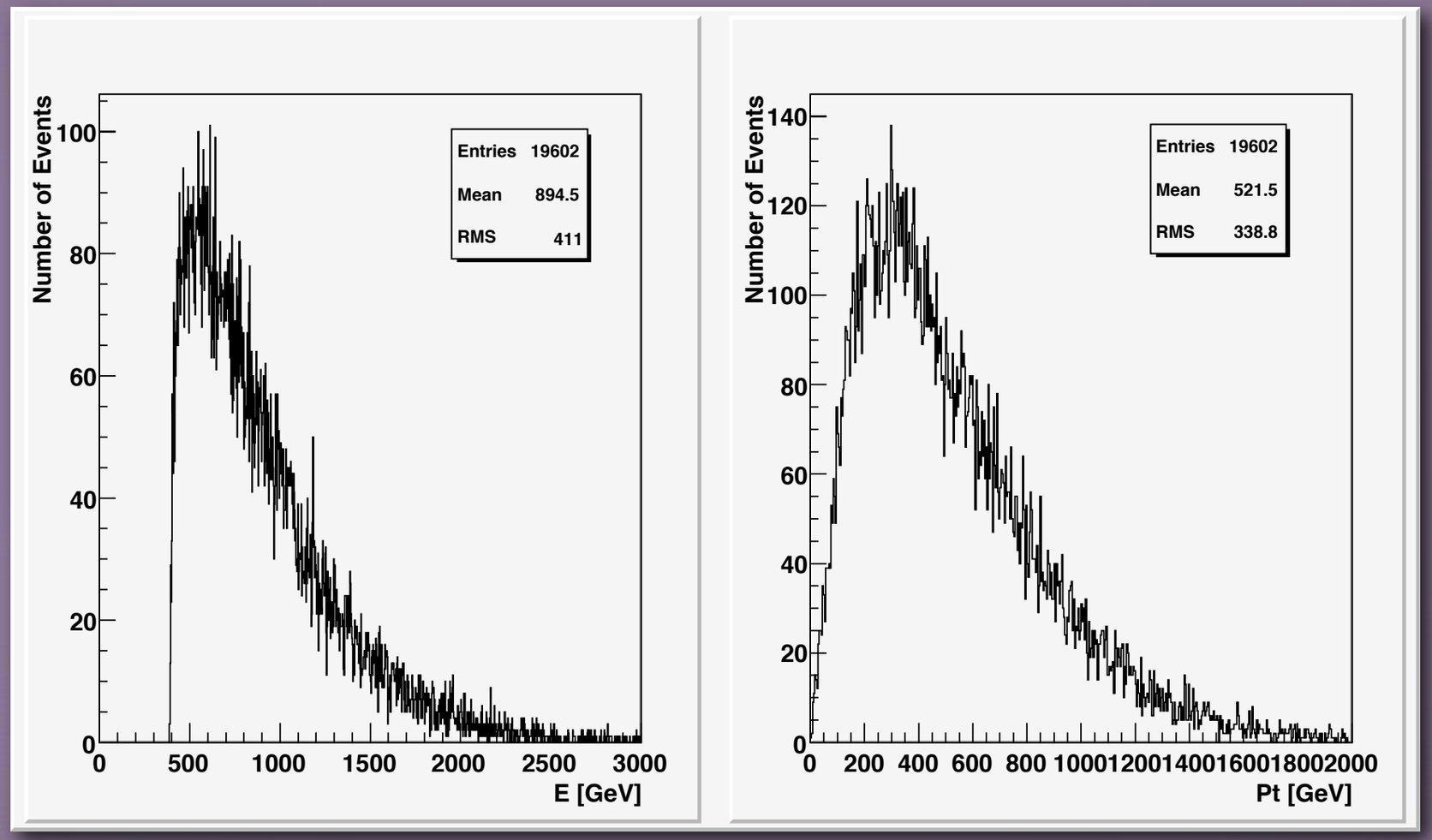
Introduction

- The axino and the gravitino are well-motivated candidates for the LSP (lightest supersymmetric particle)
- In either case, a charged slepton could be the NLSP (next to lightest supersymmetric particle)
- We assume that the lighter *stau* is the NLSP

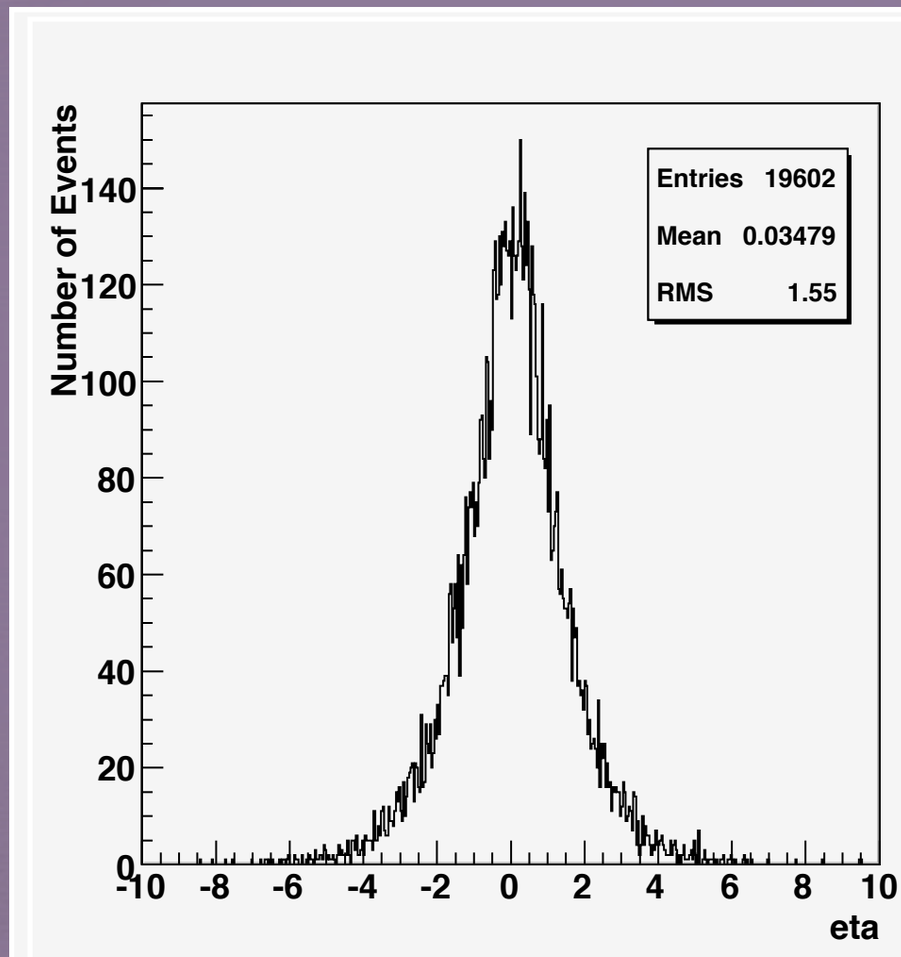
About the lighter *stau*

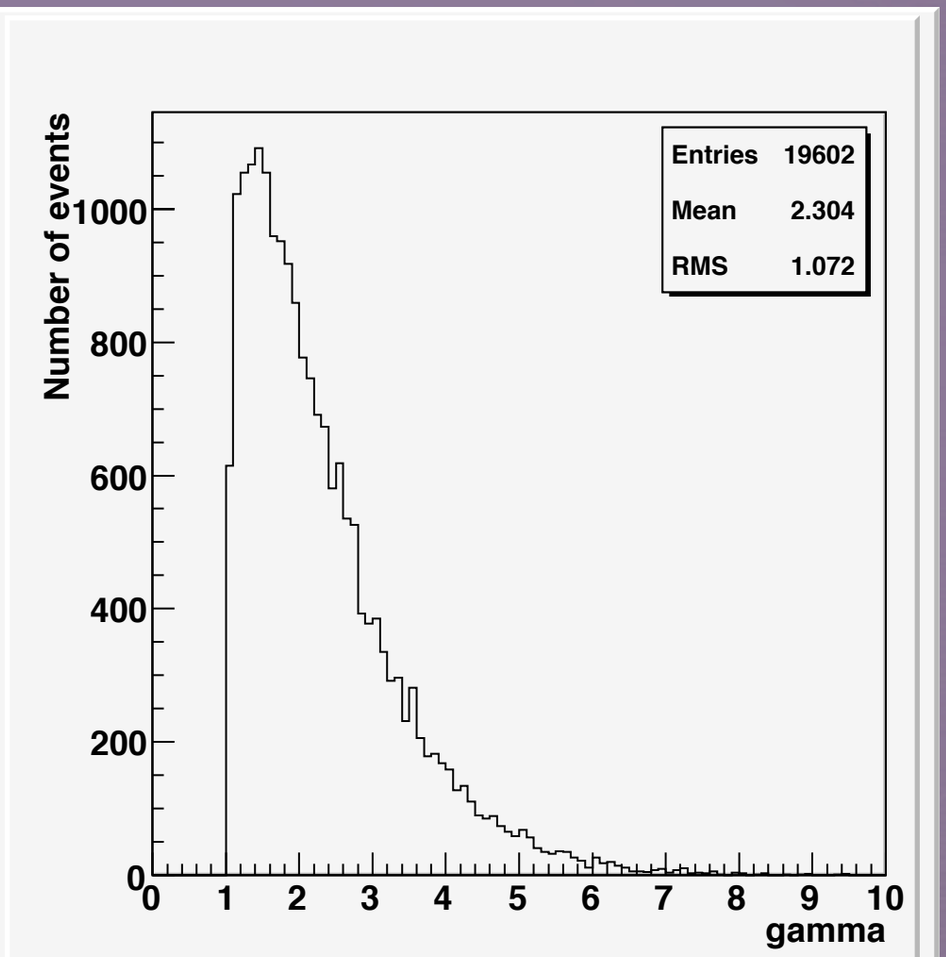
- appears as a quasi-stable particle
- its mass predicted to be about 389 GeV
- BG mostly represented by muons

Simulated Results: Energy and Pt

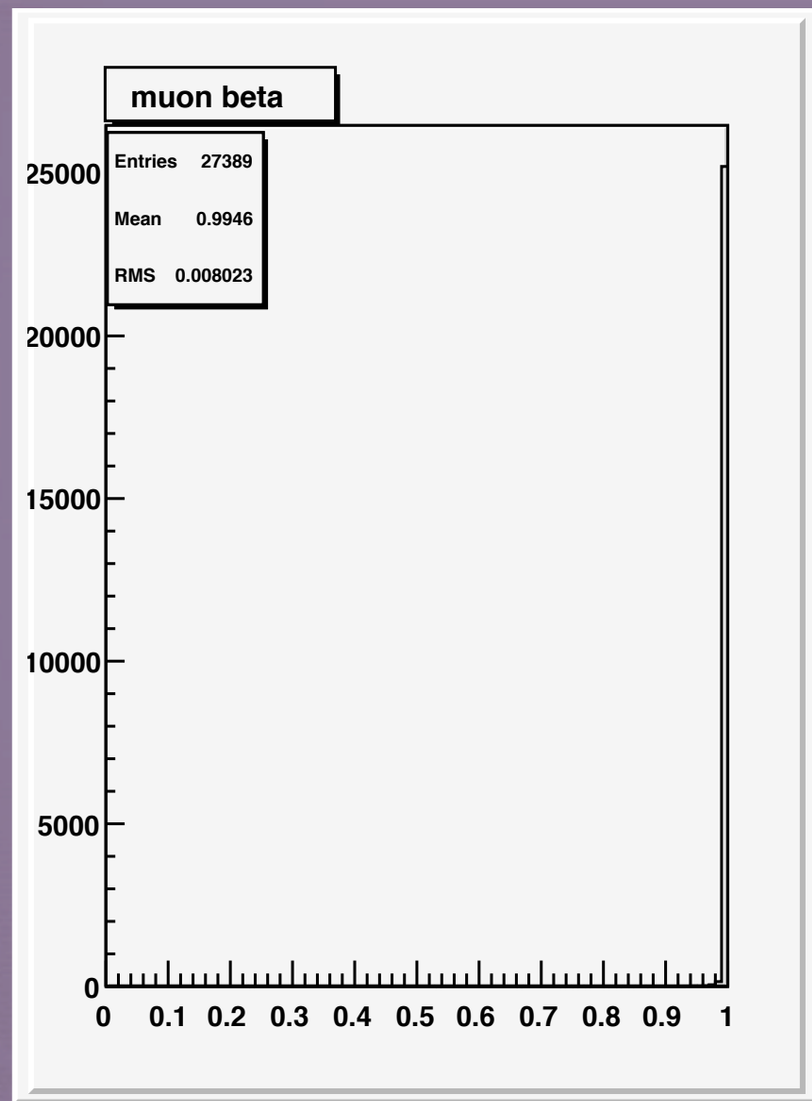


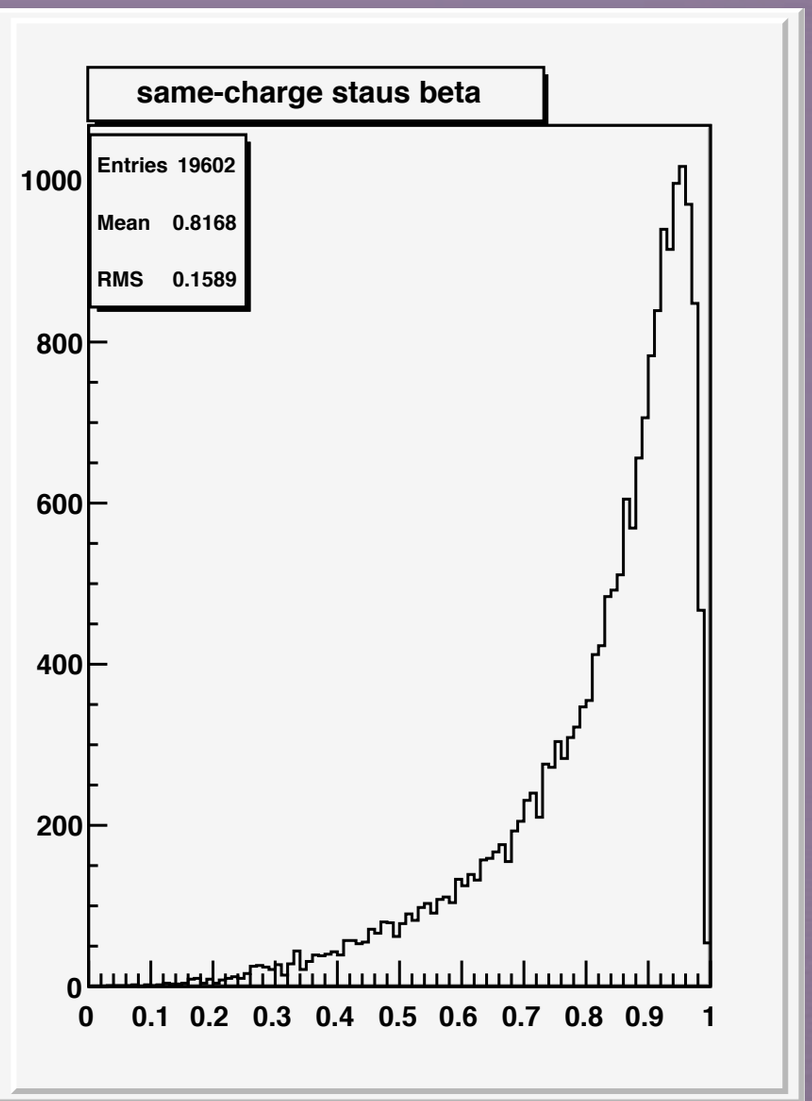
Simulated Results: Eta and Gamma



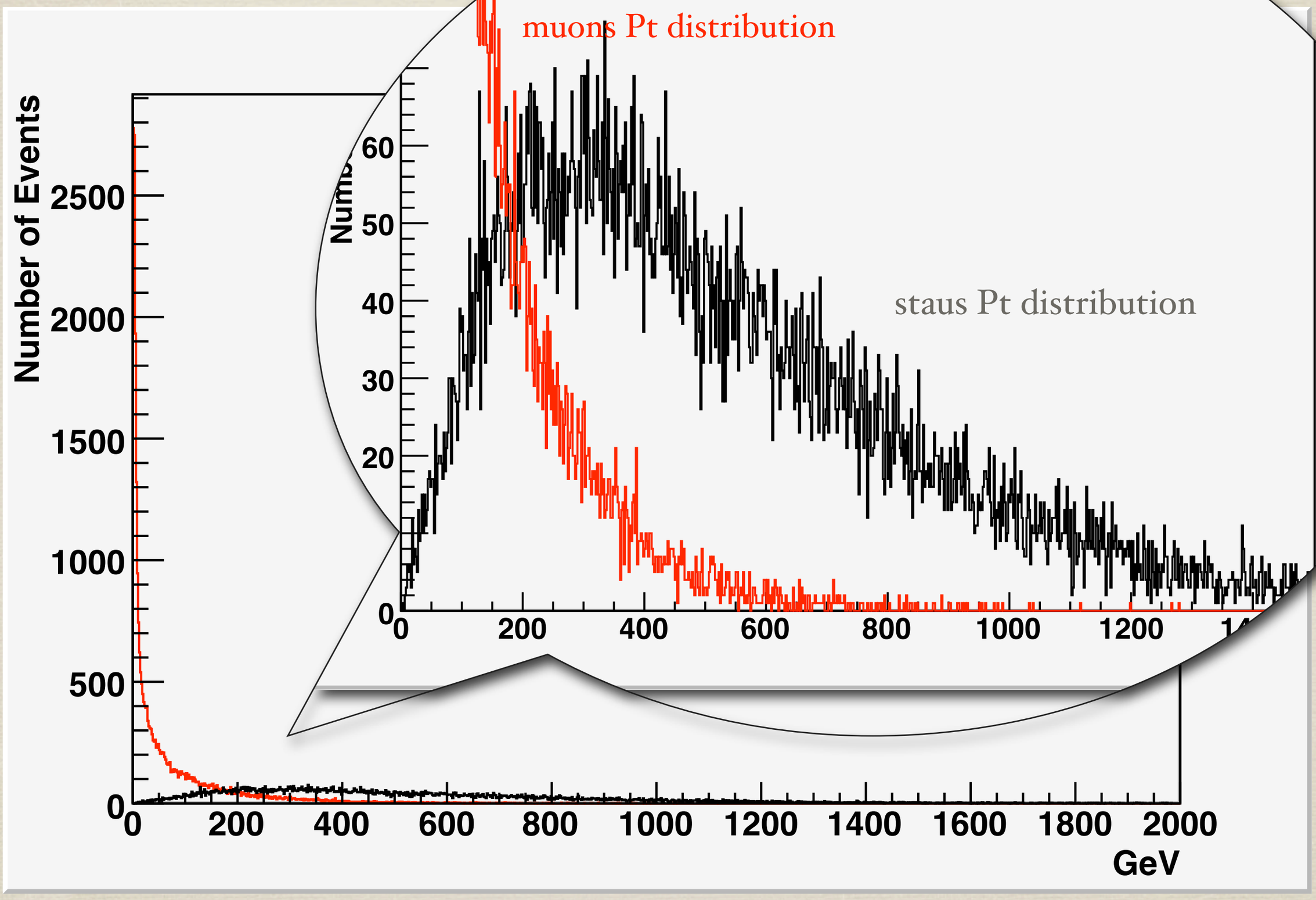


Simulated Results: Beta





μ vs $\tilde{\tau}$

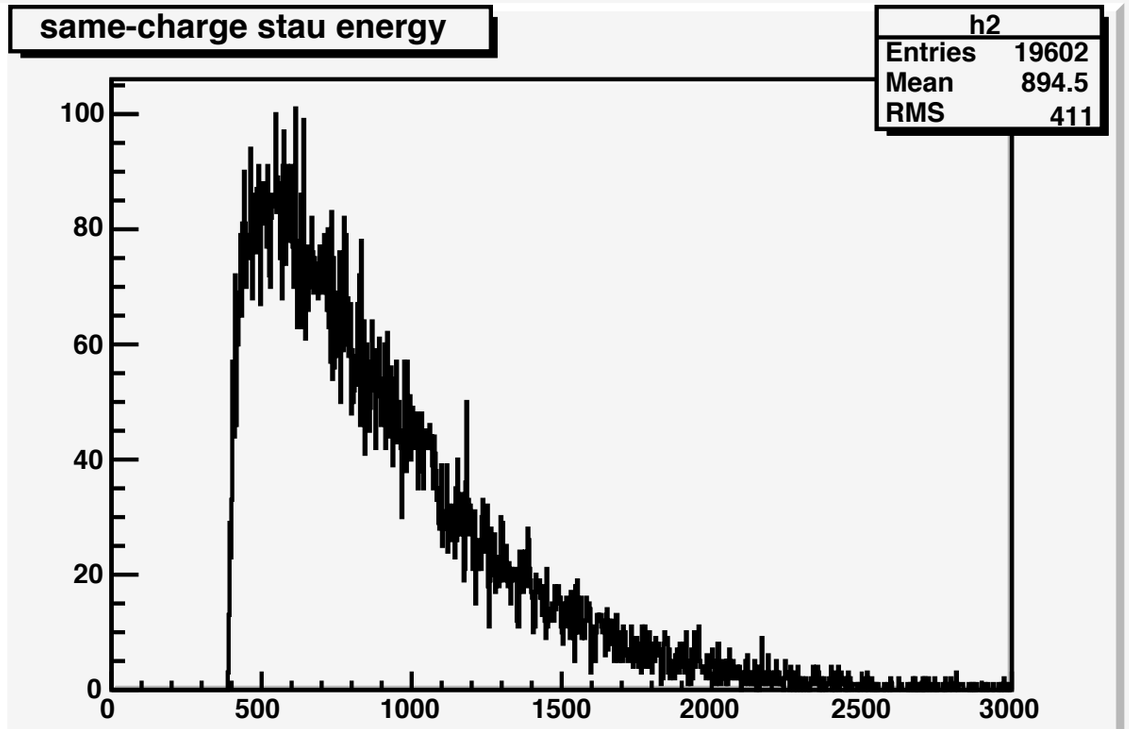


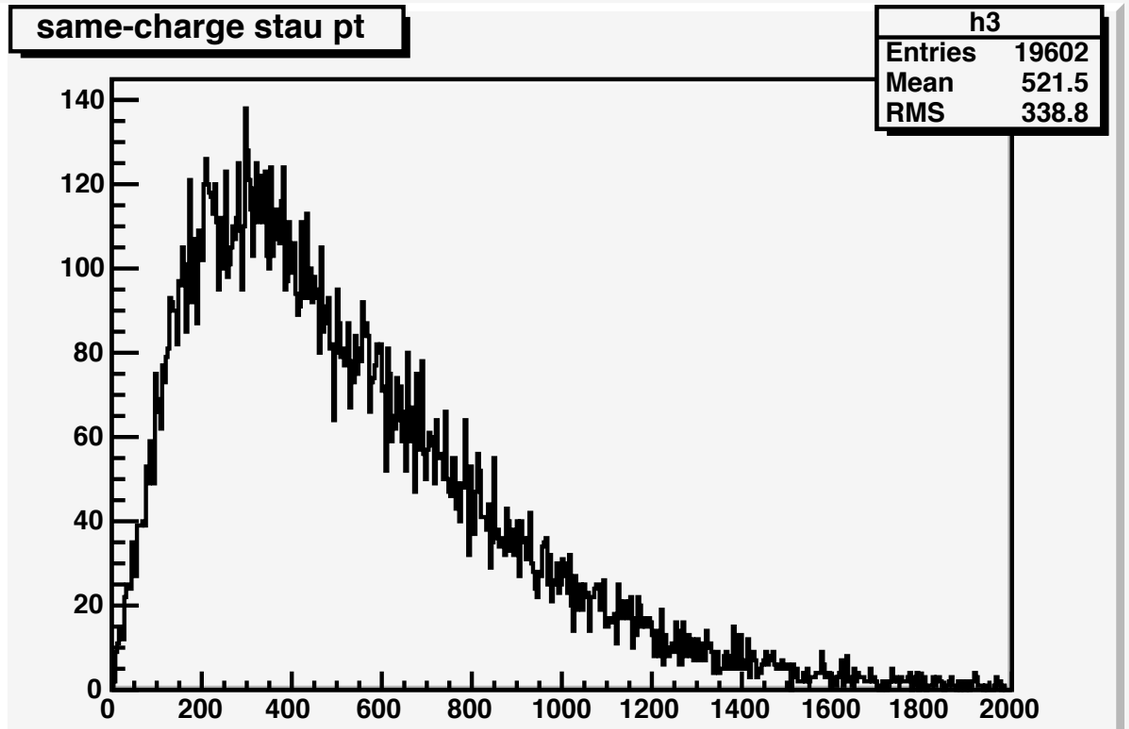
Summary

- If the *stau* represents the NLSP we must be able to detect it...or better: to recognise it!!!
- With a energy cut at ~300 GeV we get rid of the muons BG

The End

BACK SLIDES


same-charge stau energy
h2
Entries 19602
Mean 894.5
RMS 411
0 20 40 60 80 100
0 500 1000 1500 2000 2500 3000


same-charge stau pt
h3
Entries 19602
Mean 521.5
RMS 338.8
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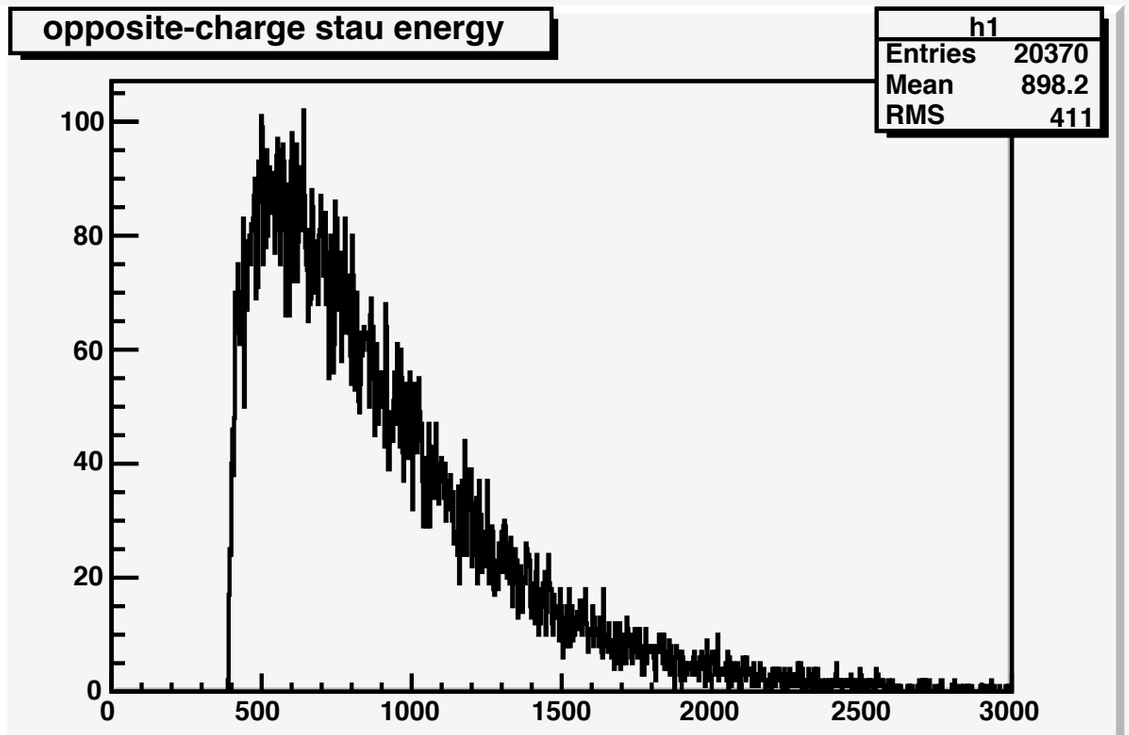
0 200 400 600 800 1000 1200 1400 1600 1800 2000


opposite-charge stau energy
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Entries 20370
Mean 898.2
RMS 411
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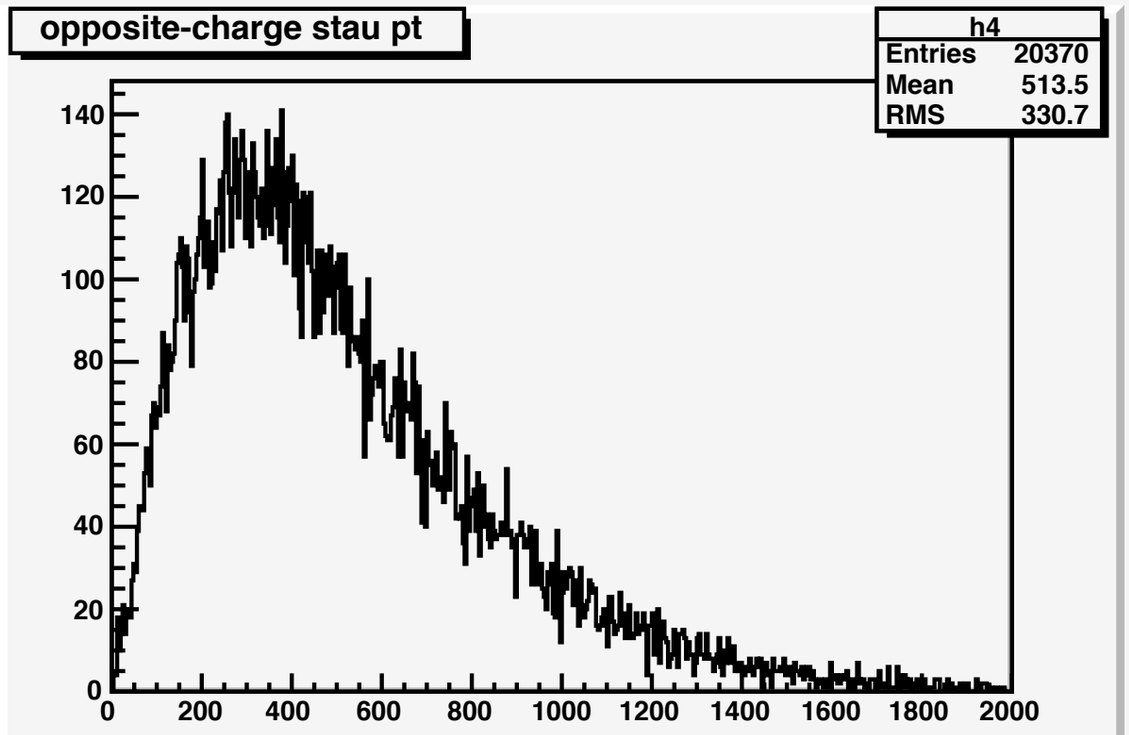

opposite-charge stau pt
h4
Entries 20370
Mean 513.5
RMS 330.7
0 20 40 60 80 100 120 140
0 200 400 600 800 1000 1200 1400 1600 1800 2000

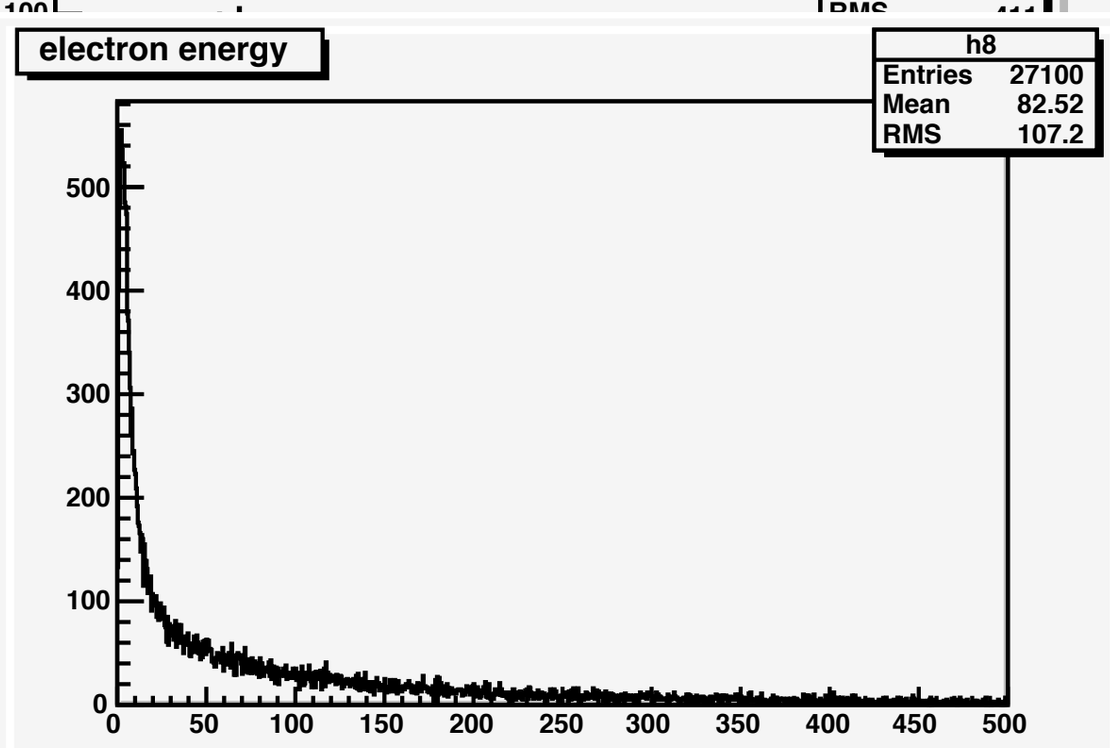
same-charge stau energy

h2
Entries 19602
Mean 894.5

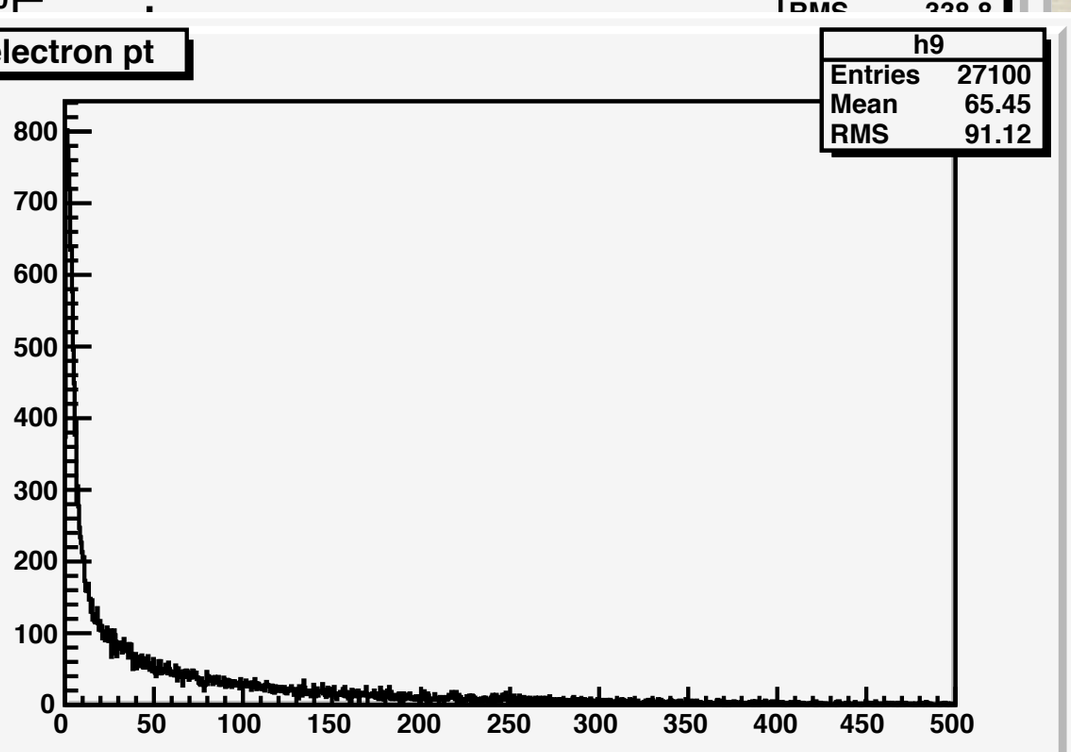
same-charge stau pt

h3
Entries 19602
Mean 521.5

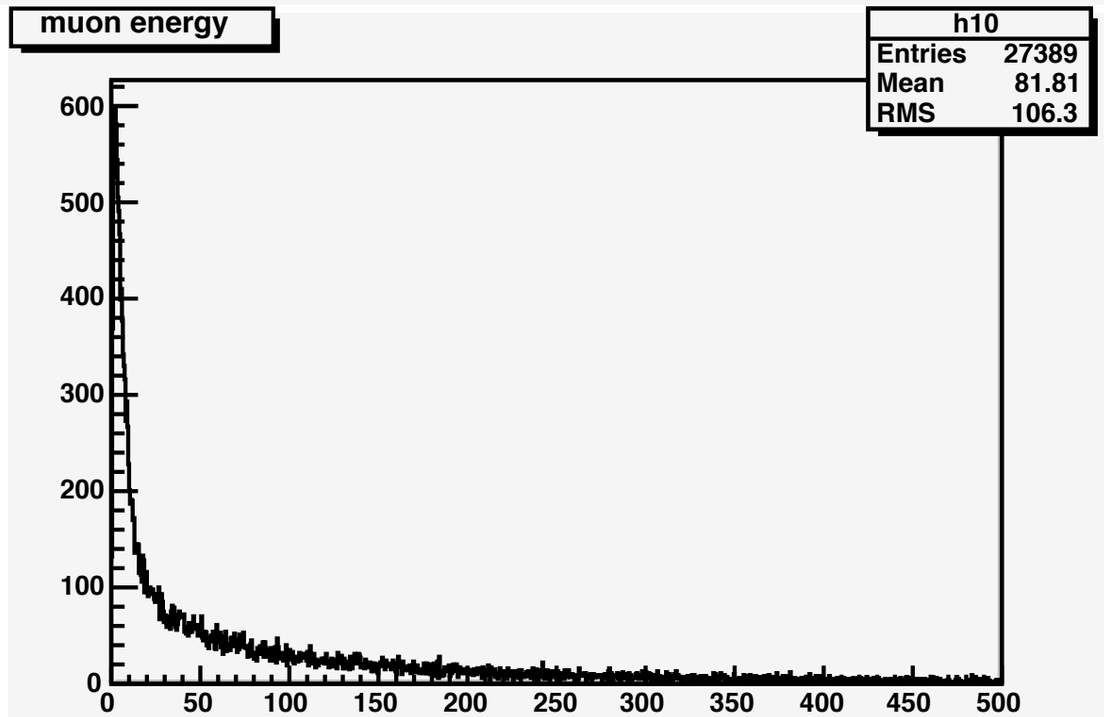
electron energy



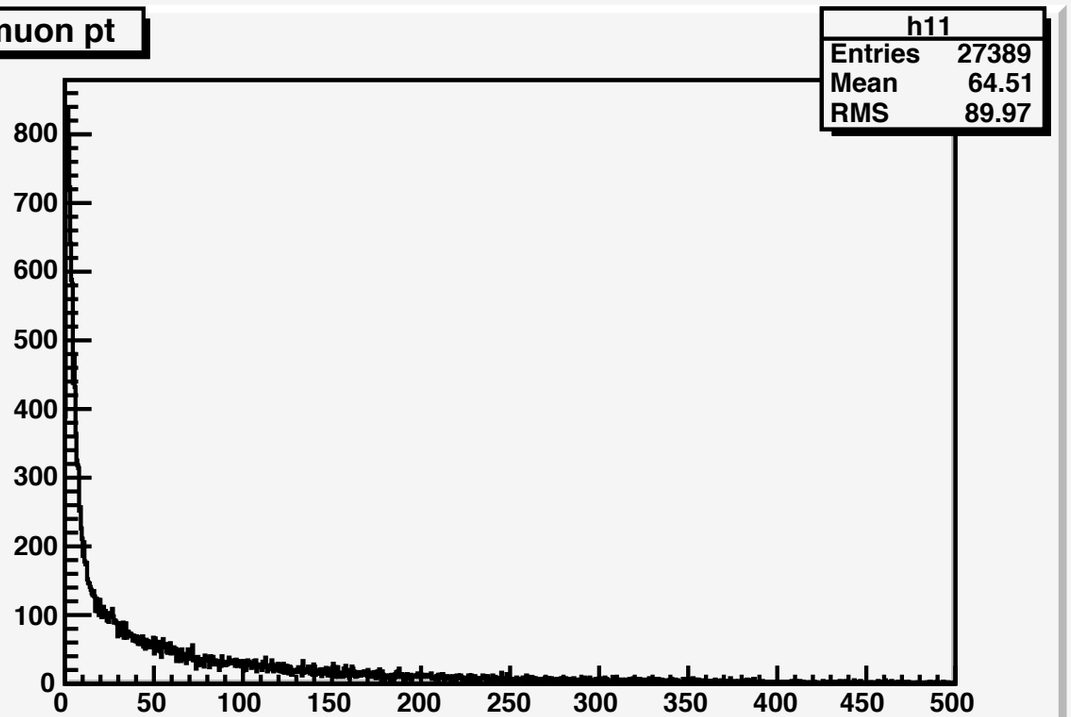
electron pt



muon energy



muon pt



same-charge stau energy

h2
Entries 19602

same-charge stau pt

h3
Entries 19602

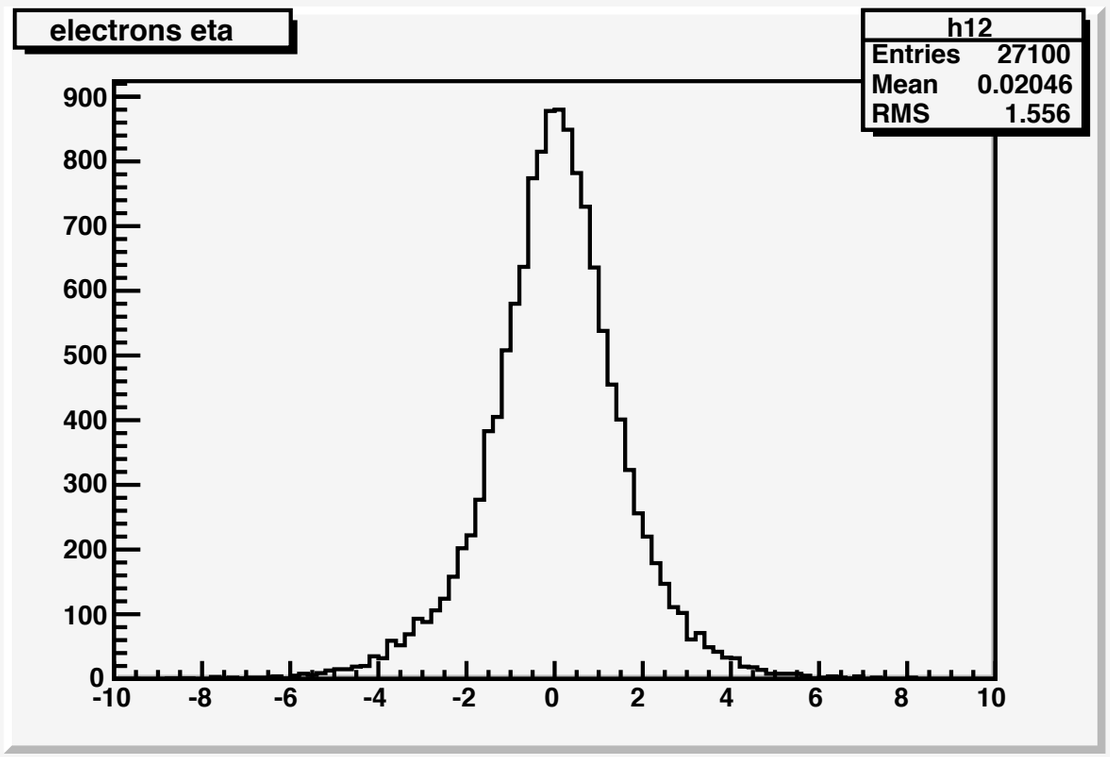
electron energy

h8
Entries 27100

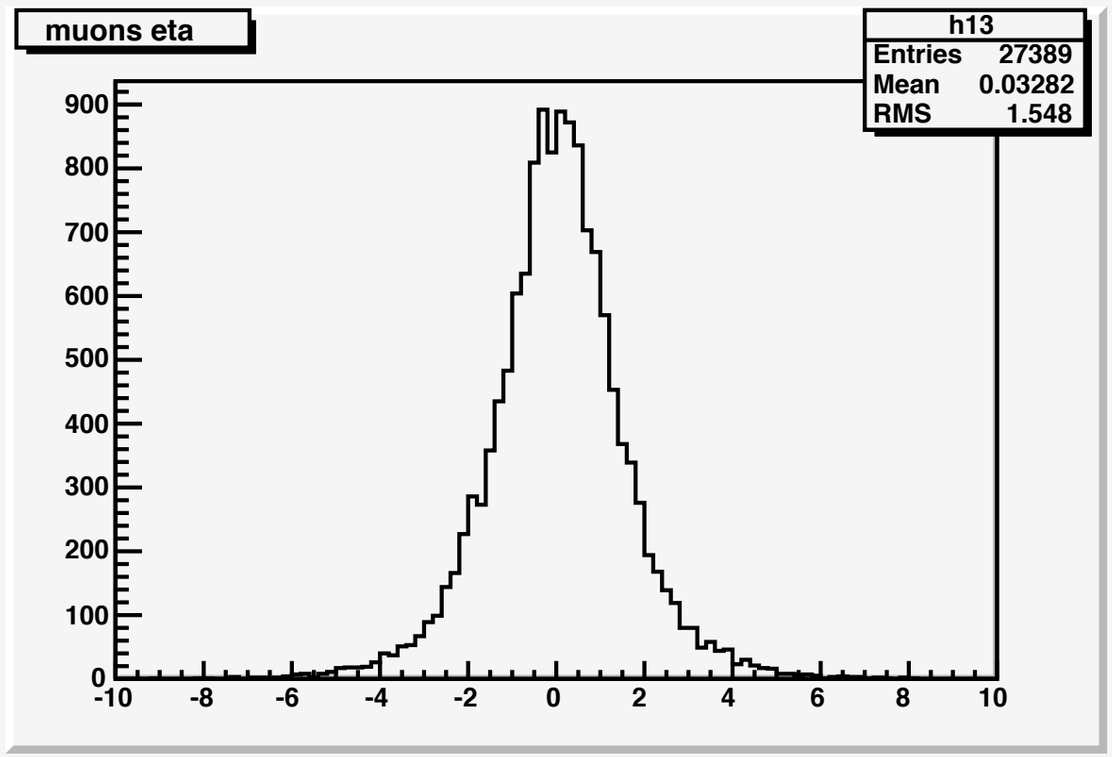
electron pt

h9
Entries 27100

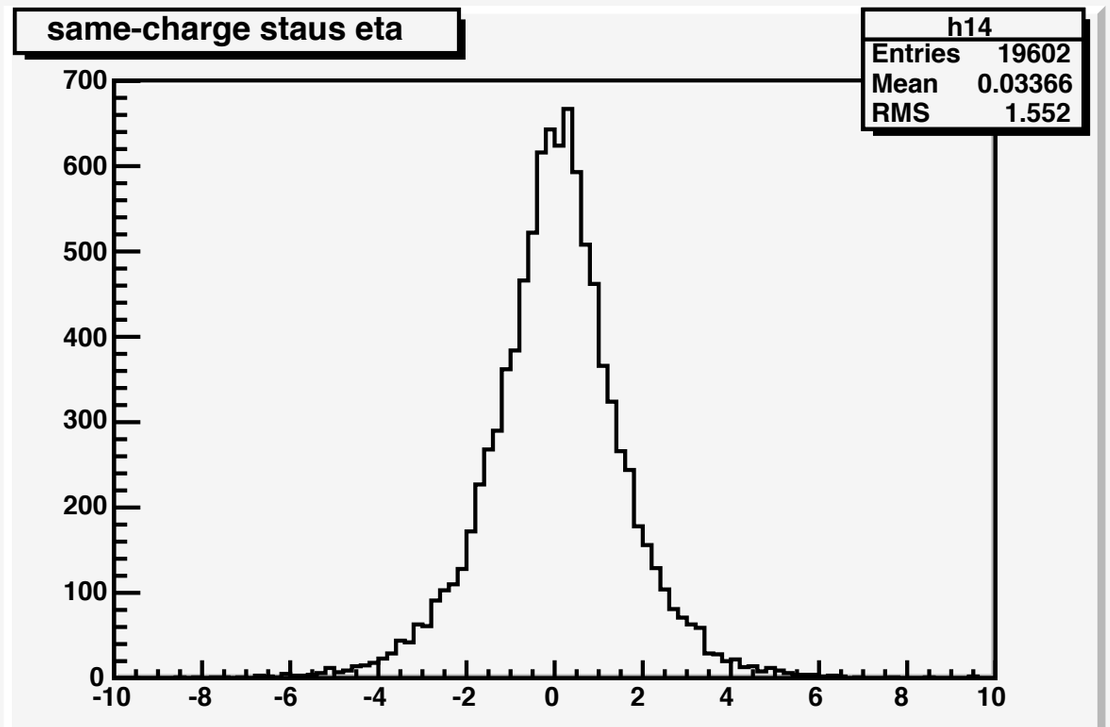
electrons eta



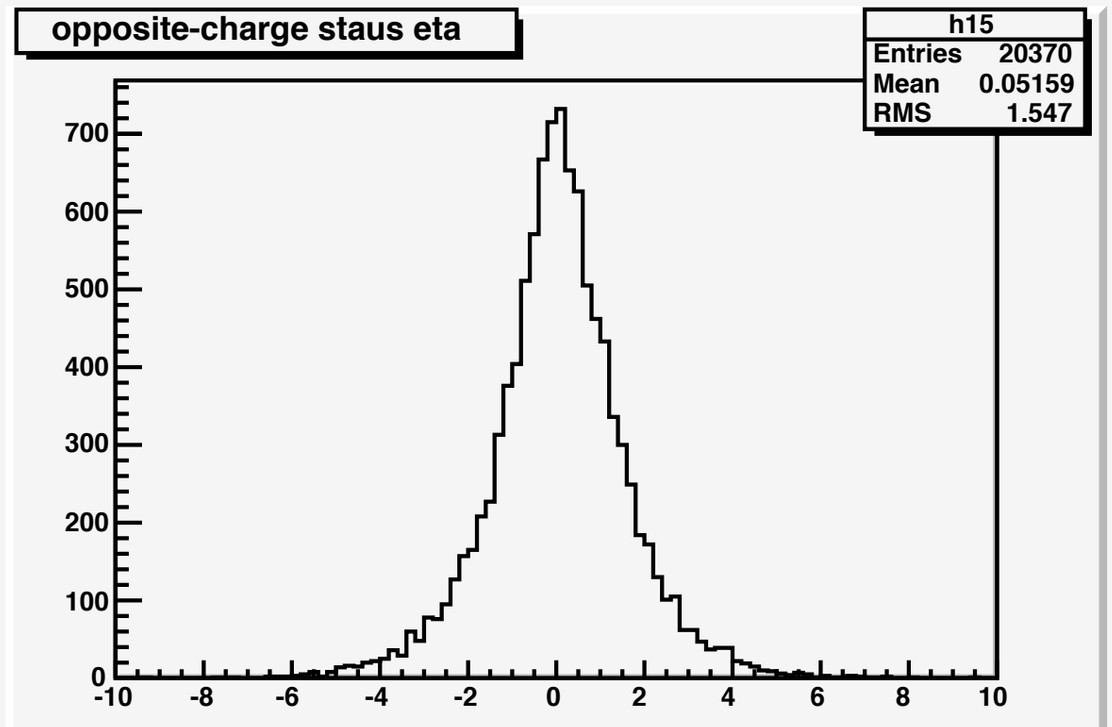
muons eta



same-charge staus eta



opposite-charge staus eta



CDM

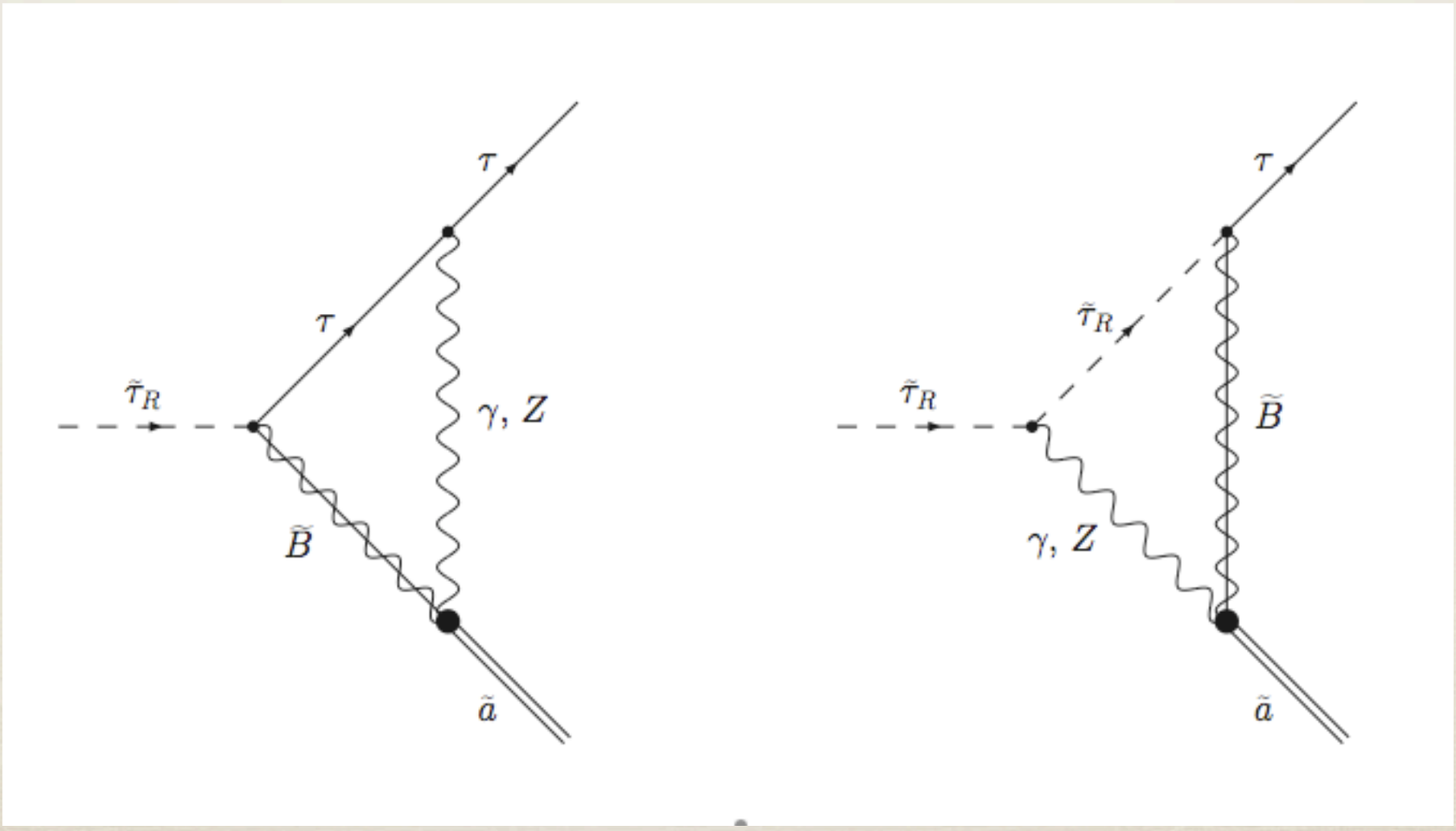
- **Cold dark matter** (or **CDM**) is a refinement of the big bang theory that contains the additional assumption that most of the matter in the universe consists of material that cannot be observed by its electromagnetic radiation and hence is **dark** while at the same time the particles making up this matter are slow and hence are **cold**

- In the CDM theory, structure grows hierarchically, with small objects collapsing first and merging in a continuous hierarchy to form more and more massive objects

- In the hot DM paradigm, popular in the early eighties, structure does not form hierarchically, but rather forms by fragmentation, with the largest supercluster forming first in flat pancake-like sheets and subsequently fragmenting into smaller pieces like our galaxy the Milky Way

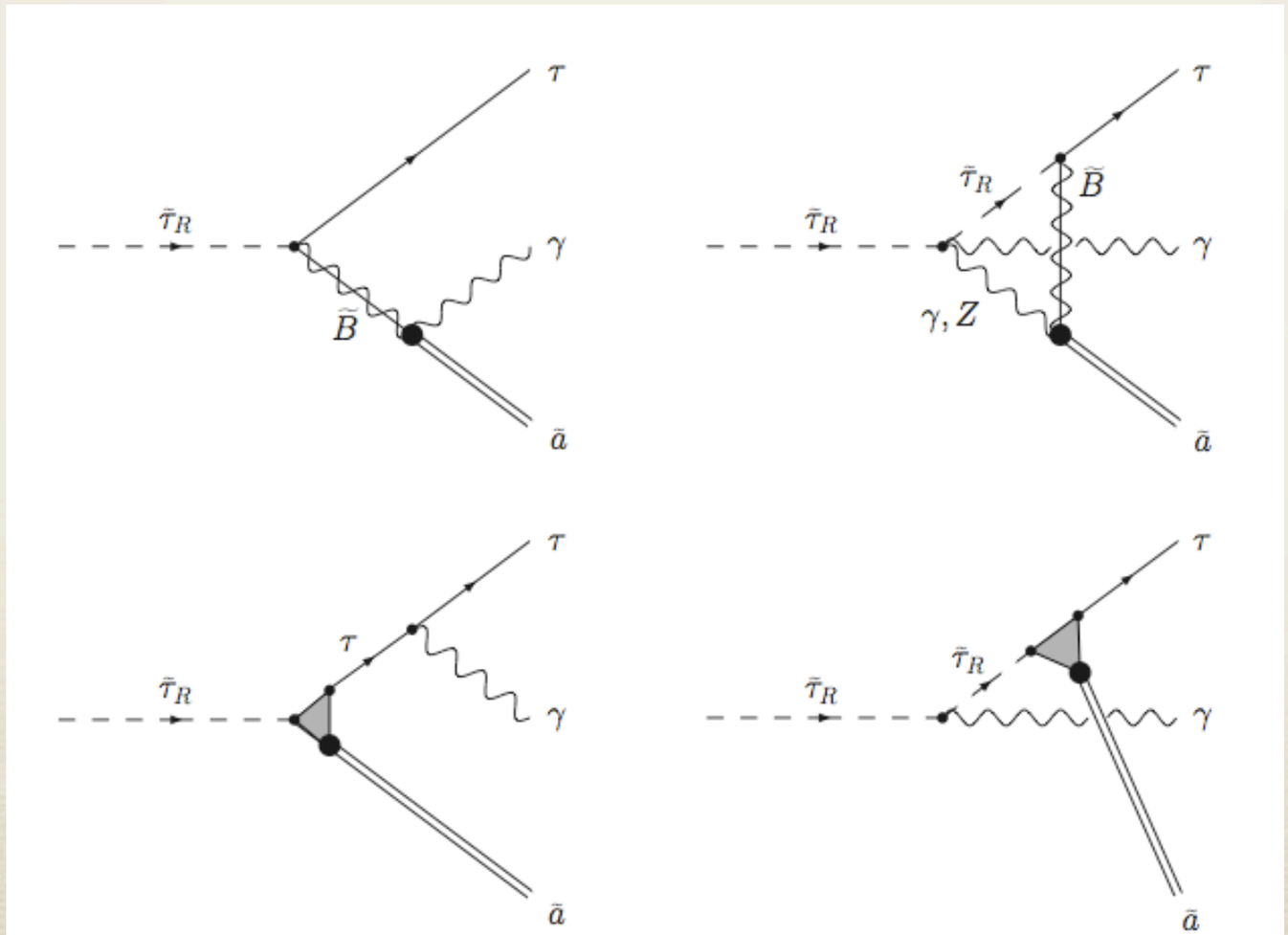
Axino LSP scenario

- two-body decay: $\tilde{\tau} \rightarrow \tau + \tilde{a}$



Axino LSP Scenario

* three-body decay: $\tilde{\tau} \to \tau + \gamma + \tilde{a}$



Gravitino LSP Scenario

- two-body decay: $\tilde{\tau} \to \tau + \tilde{G}$
- three-body decay: $\tilde{\tau} \to \tau + \gamma + \tilde{G}$