RoI For Track-Based Trigger for Disappearing Tracks

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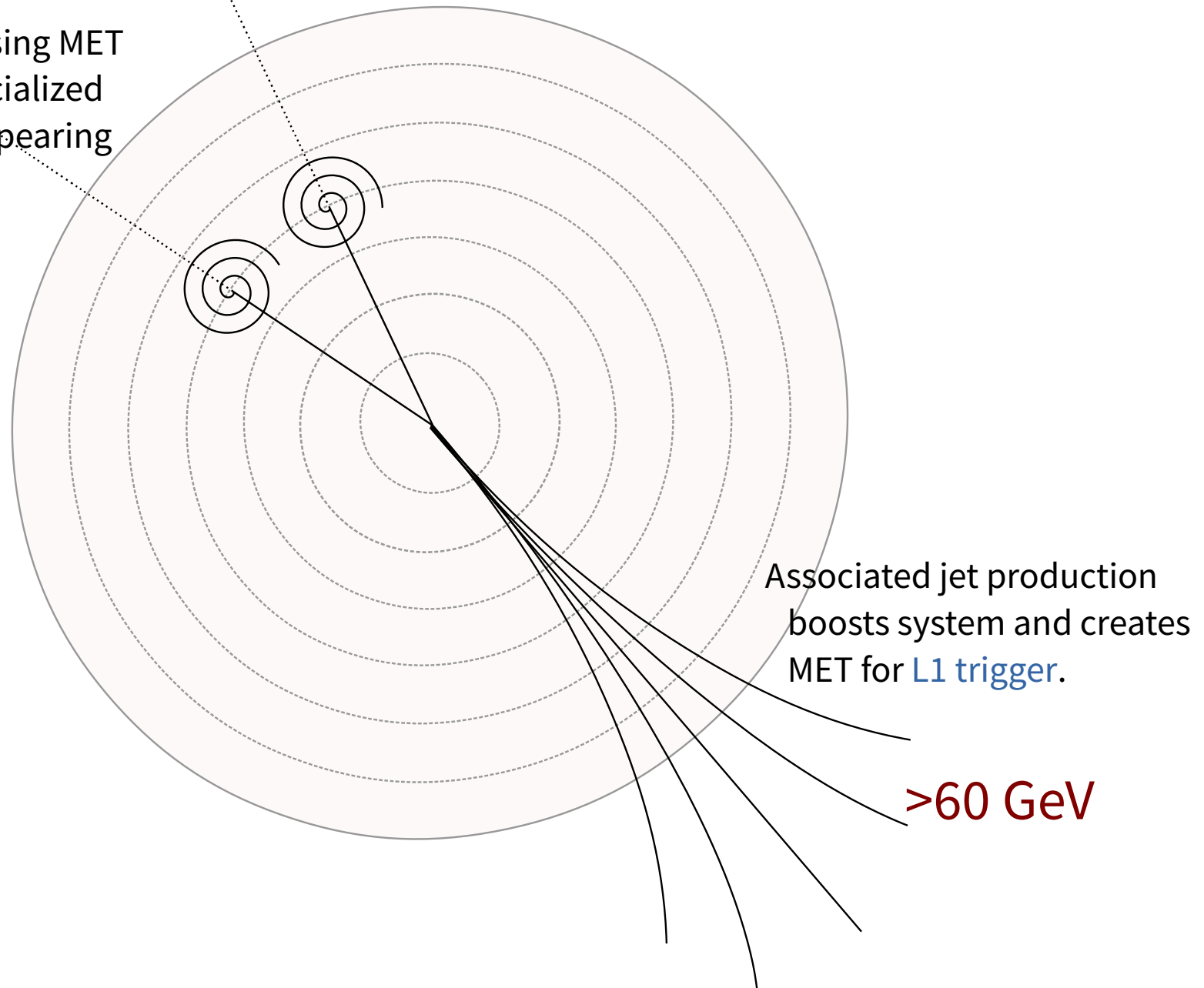
July 13, 2018
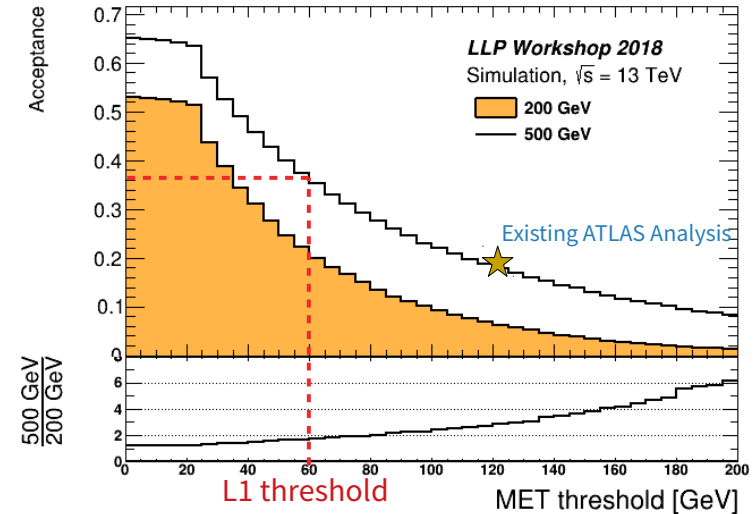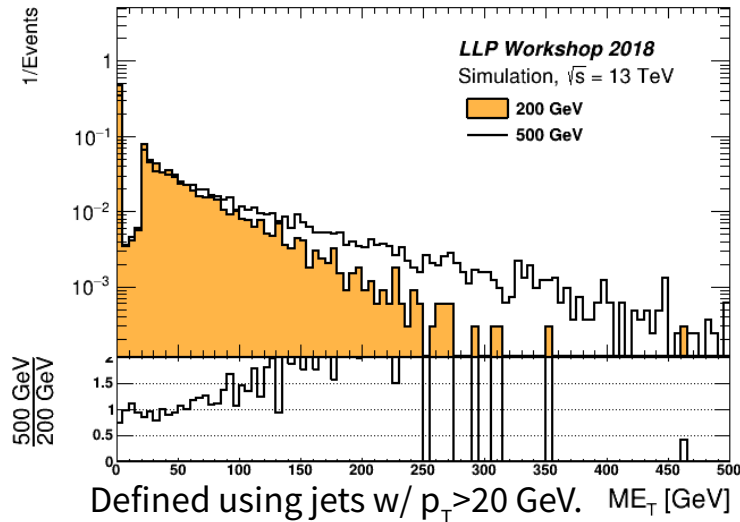
BERKELEY LAB
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LLP Workshop 2018

Original Idea

In HLT, define an RoI using MET as guide and run specialized tracking to find disappearing tracks.

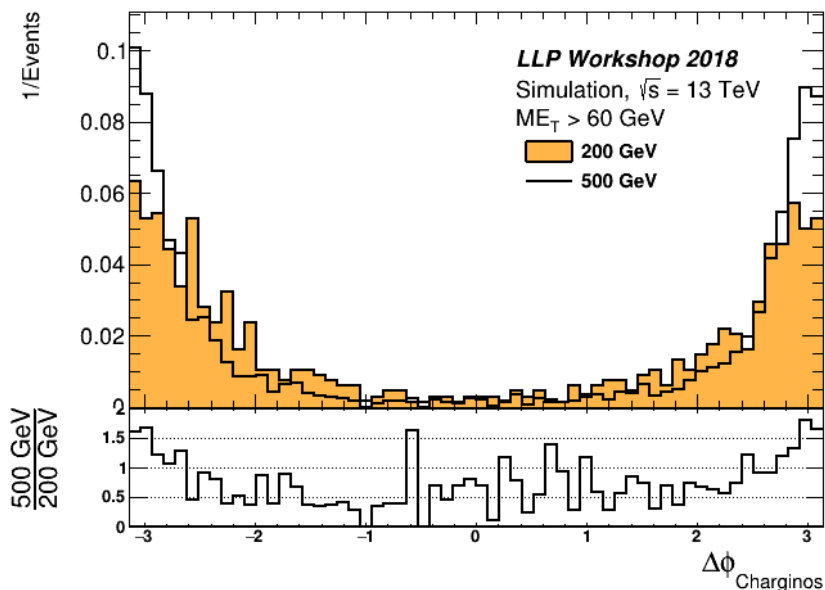Associated jet production boosts system and creates MET for L1 trigger.

>60 GeV

Kinematics Out of The Box

Defined using jets w/ p_T>20 GeV.

- **Need to keep ME$_T$ low as possible.**

  - motivation for this study

- **O(100 GeV) chargino p_T without any boost**

  - keep this in mind for following slides

- **Higher mass → higher energy**

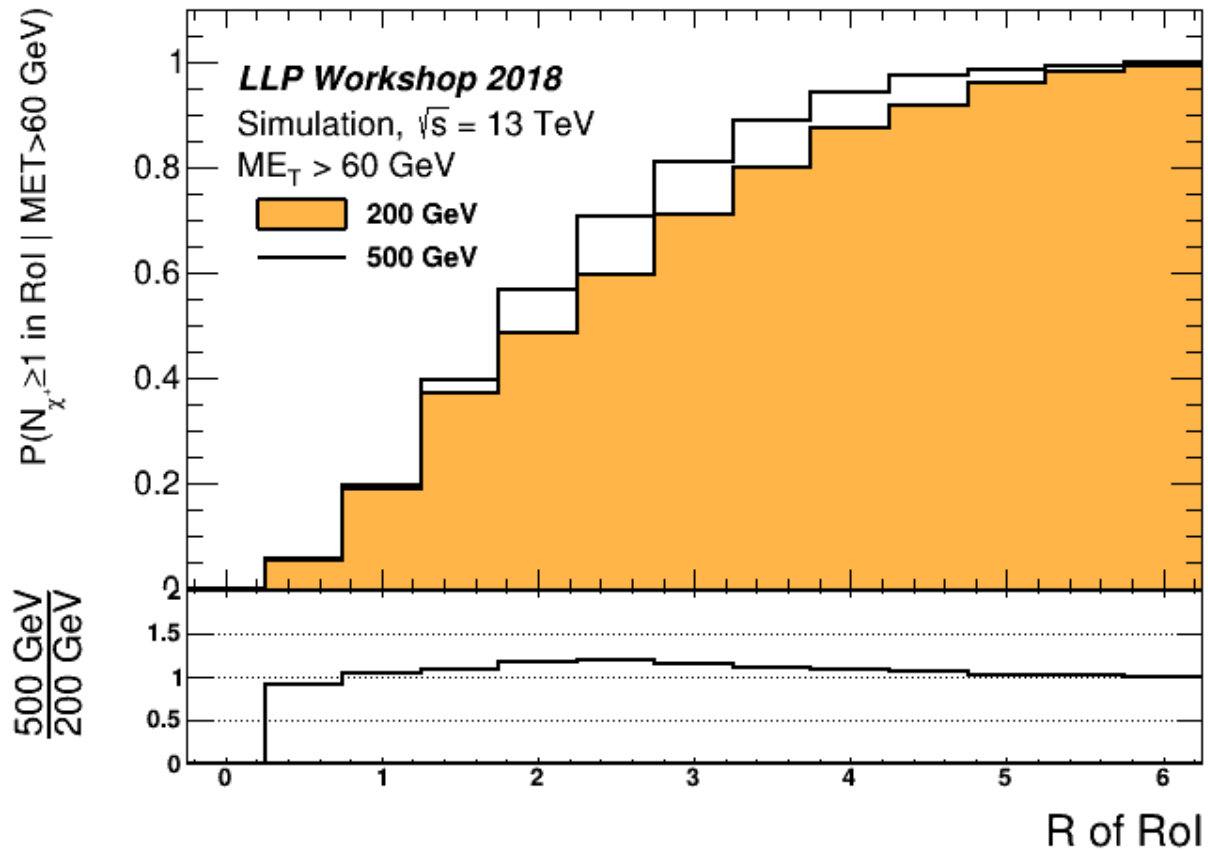 - PDF magic
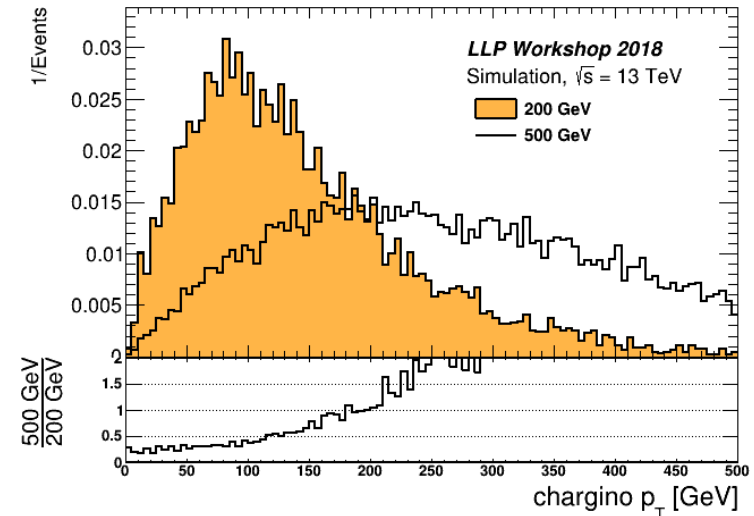
Angular Distributions After $ME_T > 60$ GeV Cut

- **Charginos are back to back**
  - Boost does not do much
  - Cannot define a single RoI to catch both tracks
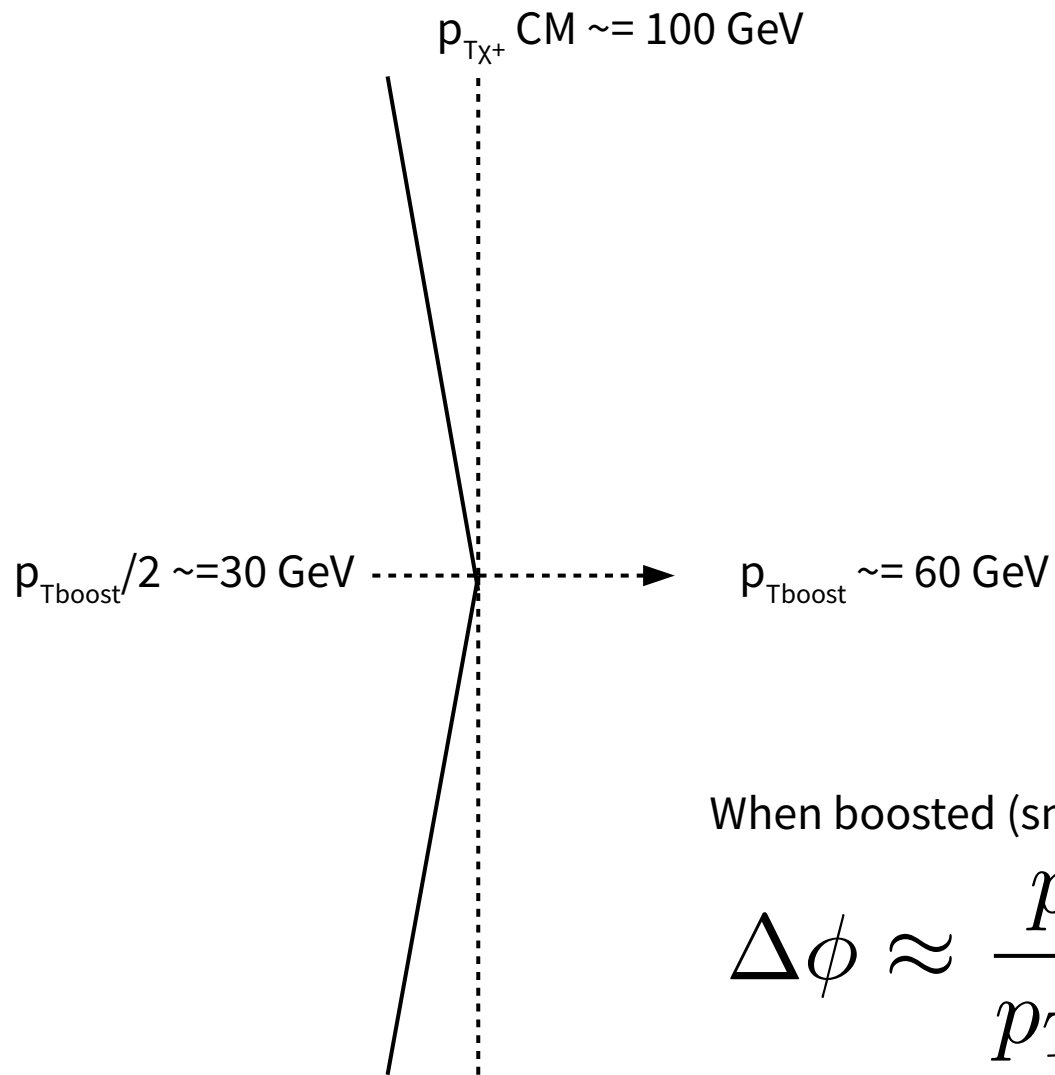   - Problem is looking for χ^+,χ^0 production
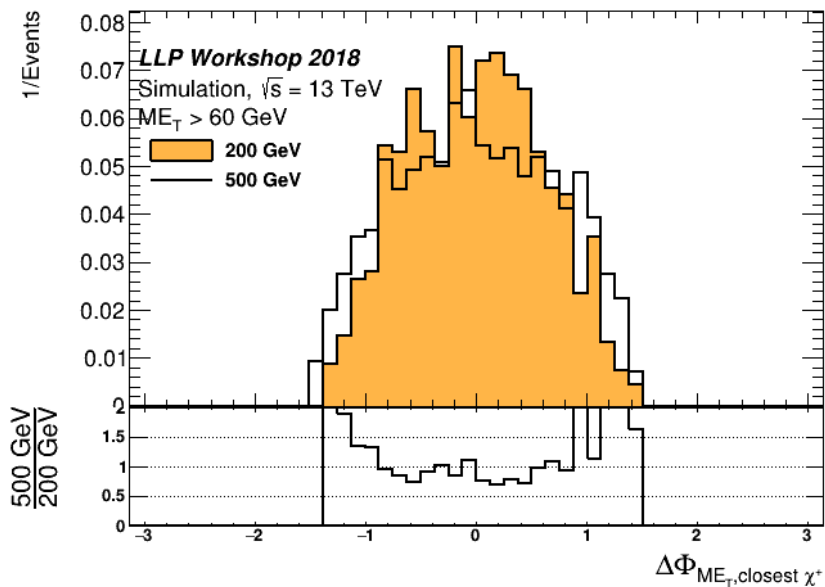
- **ME_T and closest chargino directions are not correlated**
  - A different "algorithm" won't help

Need R=2.5 for 50% to get at least one track, aka entire detector!

p_{TX^+} CM ~= 100 GeV

$p_{Tboost}/2$ ~=30 GeV

p_{Tboost} ~= 60 GeV

When boosted (small angle):

$$\Delta\phi \approx \frac{p_{T\chi^+}}{p_{Tboost}}$$

To target Δφ=0.4, need p_{Tboost} of 250 GeV.

… use ME_T trigger at HLT …

Alternate Strategies

ATLAS

1) L1 ME_T>60 GeV trigger

2) Speed up unpacking of hits.

- Need to be smart with DAQ design, or just physicist code?

3) Subtract hits matched to "normal" tracks found by FTK

4) Run tracking on the reduced set of hits

- Smaller combinatorics problem
- Tracking can be "draw a straight line" due to high p_T of charginos

CMS

1) Use stubs to do tracking in entire detector

- **Reduced decay volume due to double-layer tracker starting at 20cm**

- **Design needs at least 4 stubs**

  - Can e reduced to 3 stubs due to high p_T of charginos

Conclusion

Pessimist

- Cannot boost chargino system enough to correlate its direction with ME_T, therefore can't guess and RoI

Optimist

- A study with a solid conclusion.

- Project for next workshop: what else can we do?

BACKUP SLIDES

Two Plots