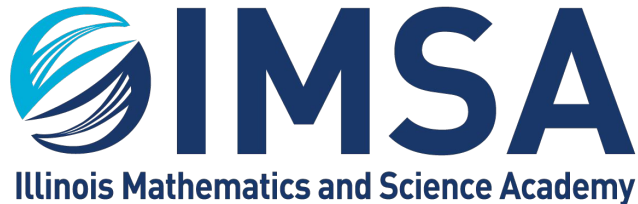


Analyzing ISR Jet Tagging Efficiency

Emily Sallenback and Bert Cao

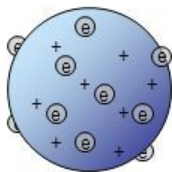
Under the direction of Dr. Zhenbin Wu and Dr. Richard Cavanaugh



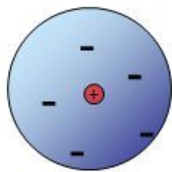
Models of the Atom



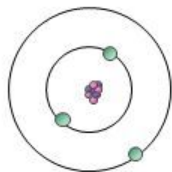
**Greek model
(400 B.C.)**



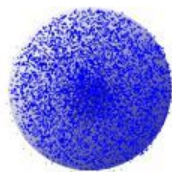
**Thomson's plum-pudding
model (1897)**



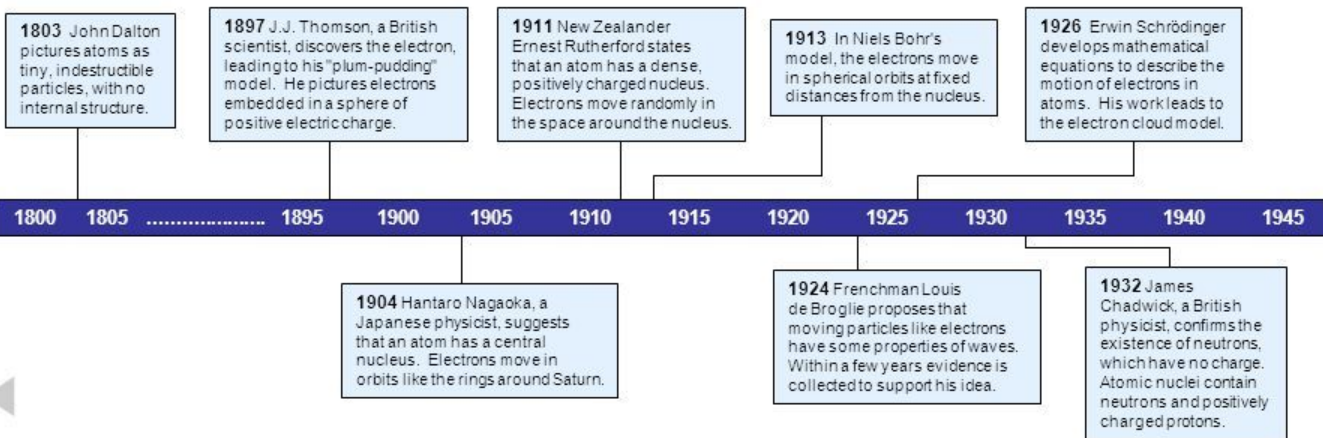
**Rutherford's model
(1909)**

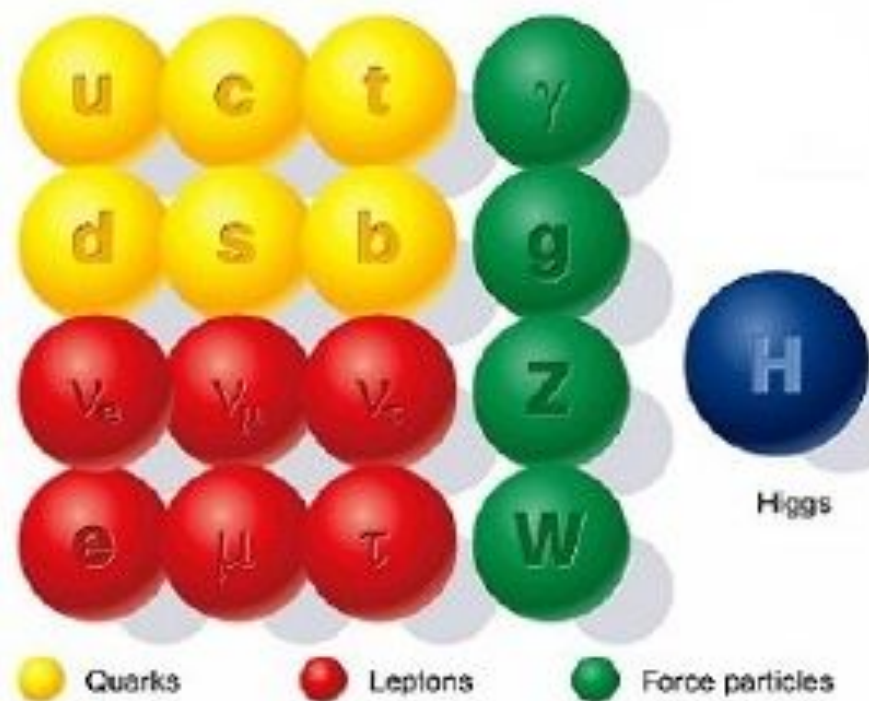


**Bohr's model
(1913)**

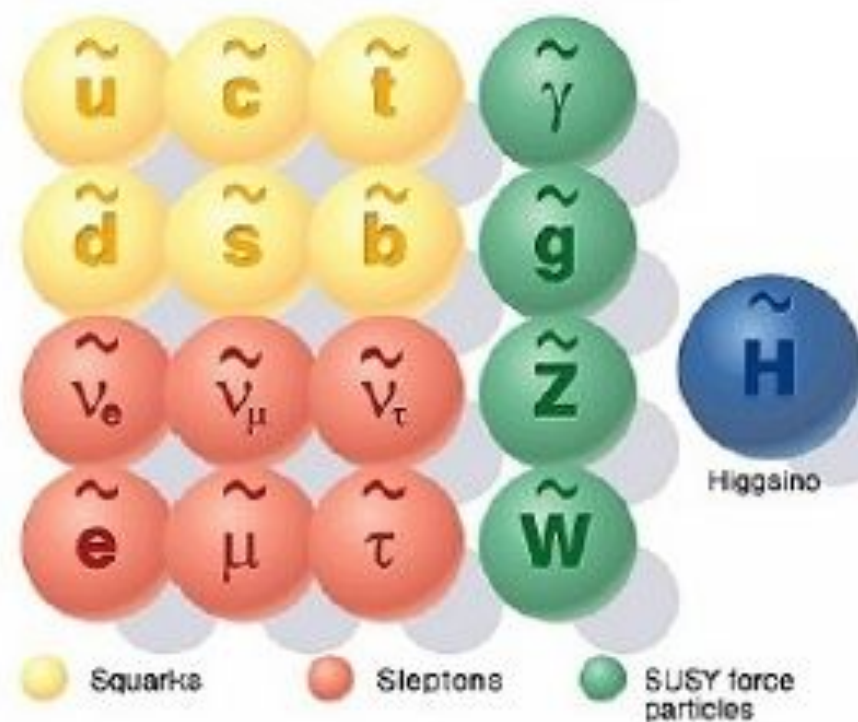


**Charge-cloud model
(present)**





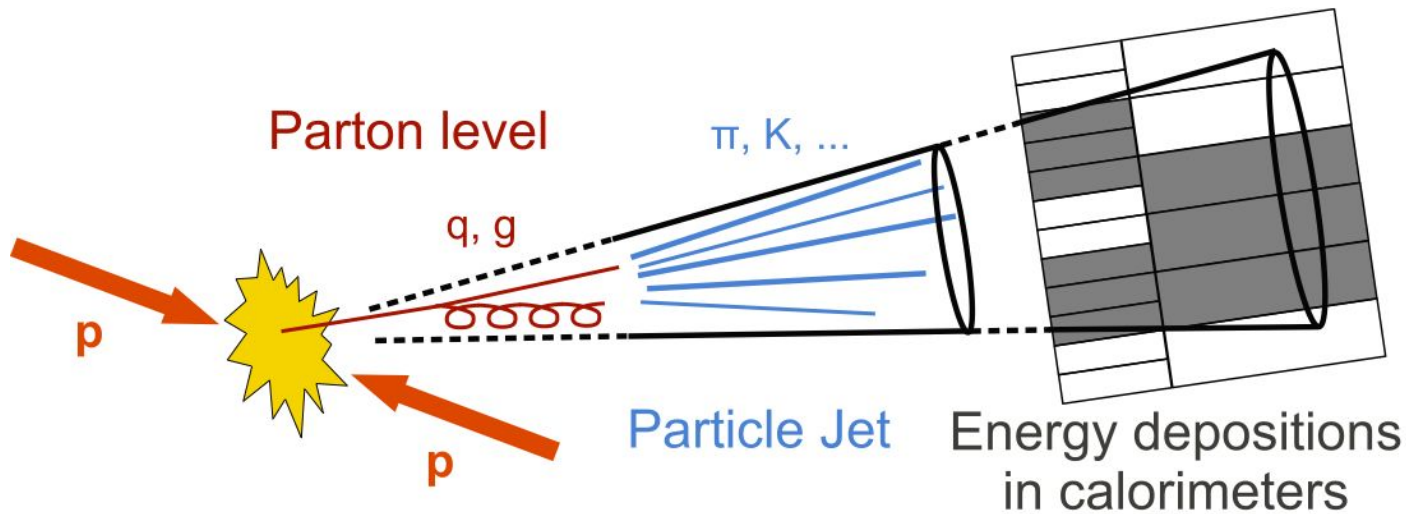
Standard particles



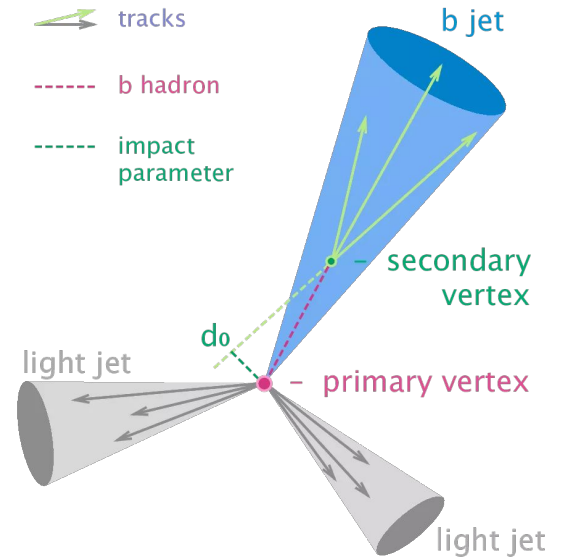
SUSY particles

What are Jets?

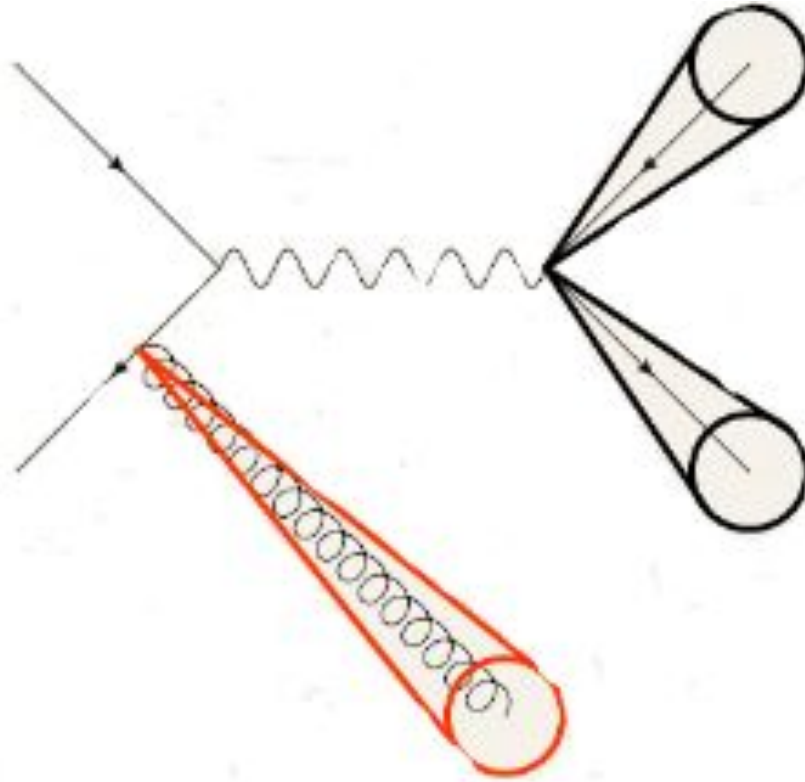
The **hadronization** of gluons and quarks



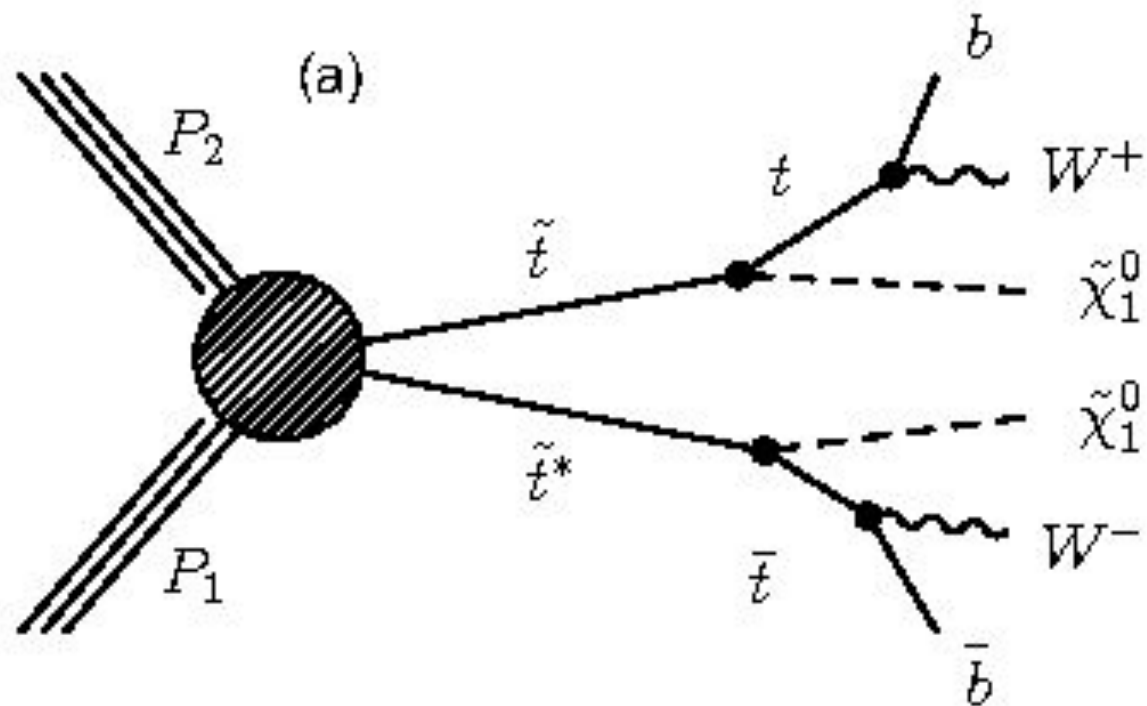
What are Jets?



Initial State Radiation (ISR) Jets

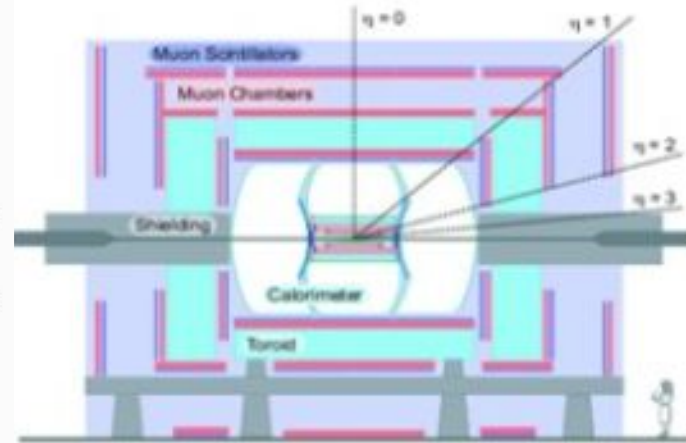
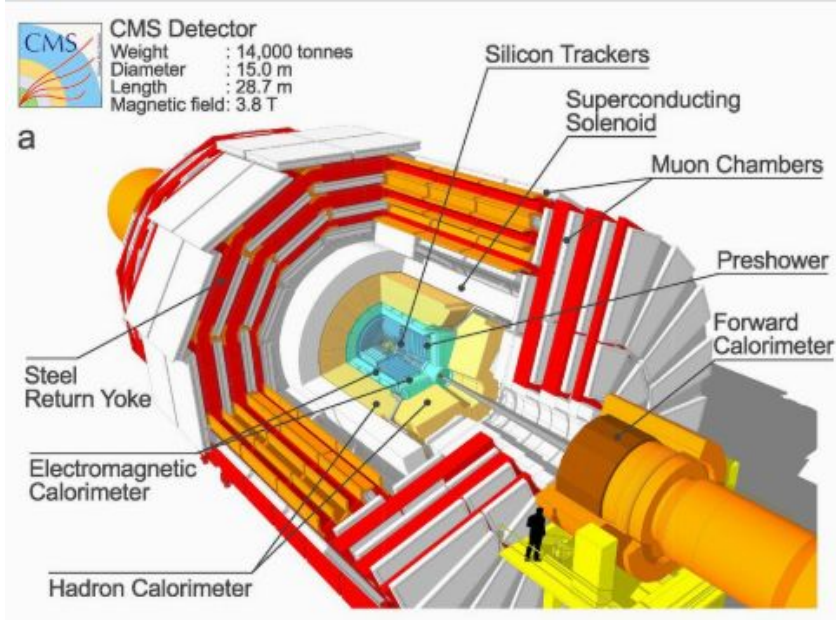


T2tt Signal



Collider Detectors

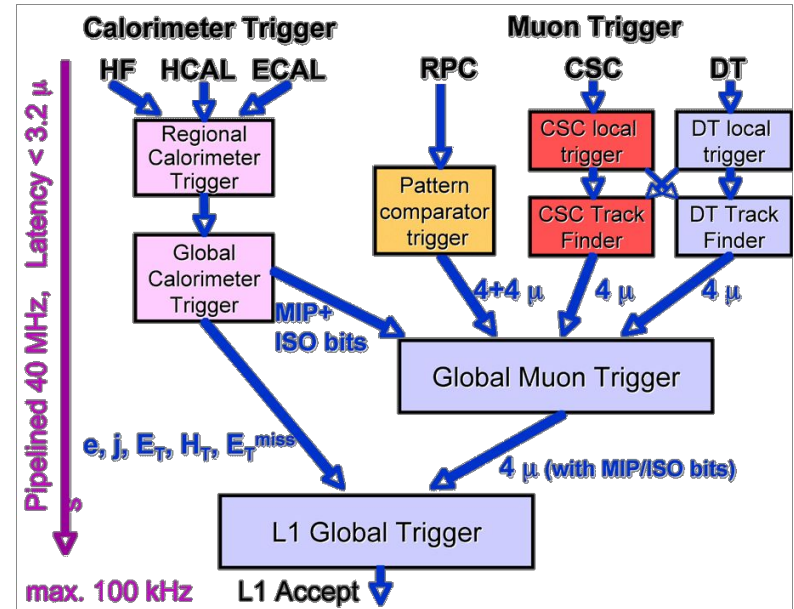
Large Hadron Collider Detectors: ATLAS, CMS, ALICE, LHCb



Data Collected

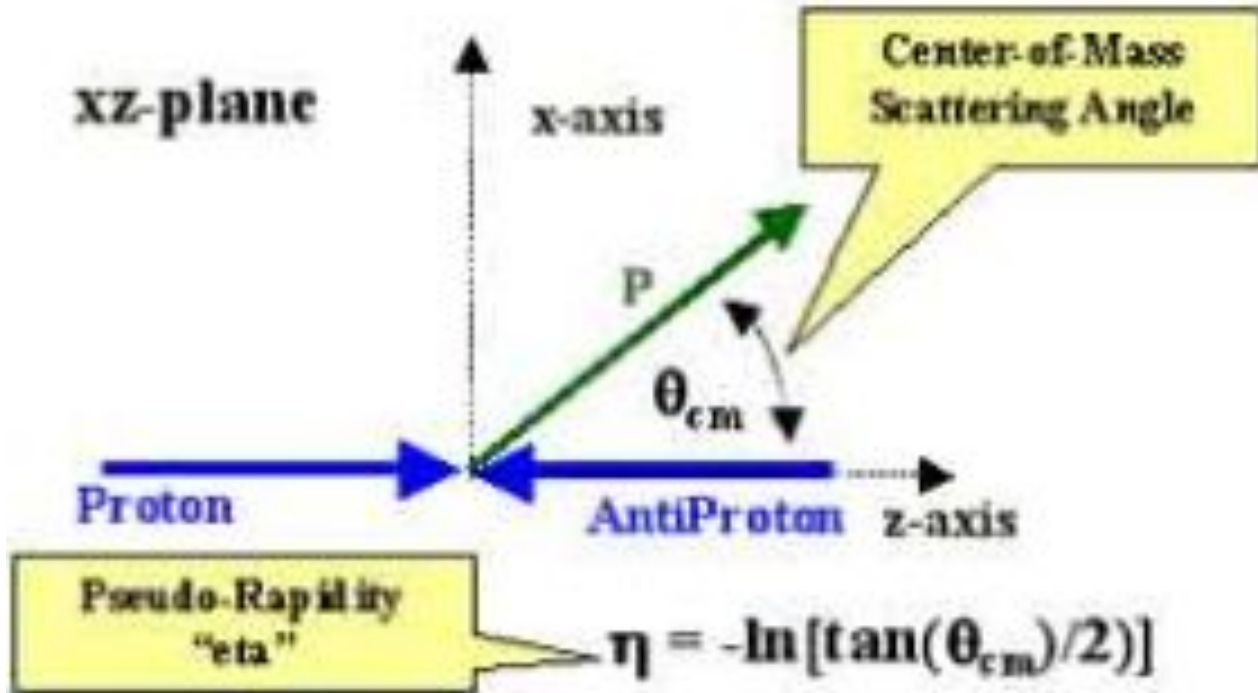
The data flow from all four experiments for Run 2 is anticipated to be about 25 GB/s (gigabyte per second)

- ALICE: 4 GB/s (Pb-Pb running)
- ATLAS: 800 MB/s – 1 GB/s
- CMS: 600 MB/s
- LHCb: 750 MB/s



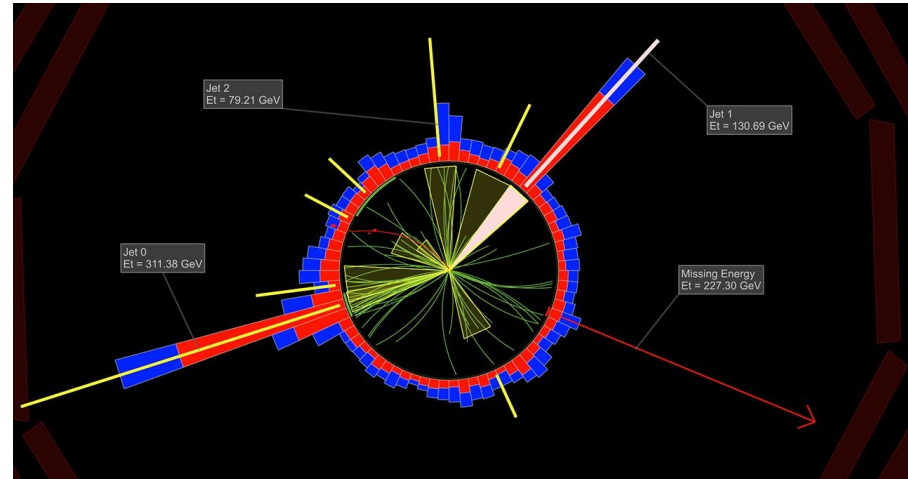
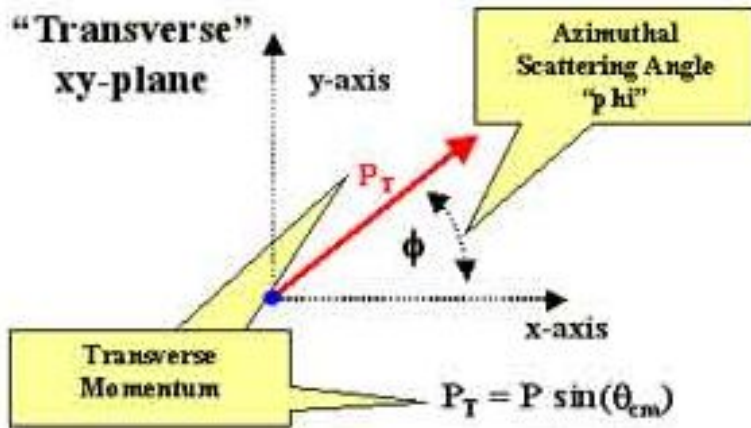
Pseudorapidity

Eta = forward direction on z-axis



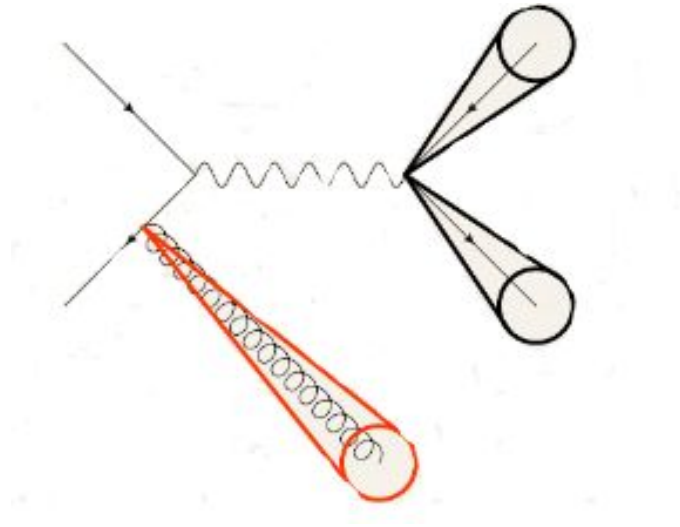
Pt and Missing Energy

Pt = Transverse momentum



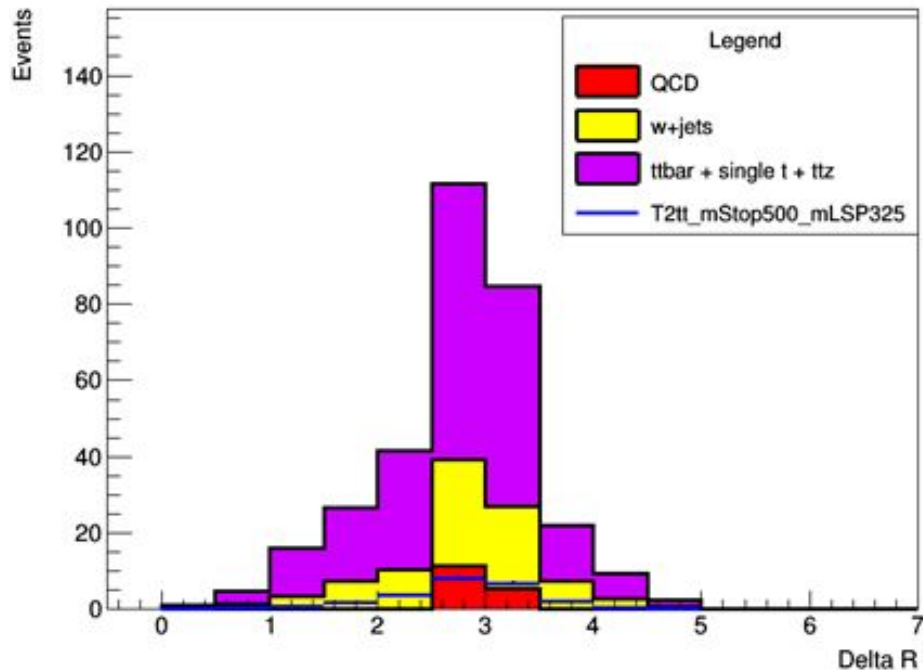
Narrow the Signal Down

- Use ISR jet data to find the signal (SUSY particles)
- Test in simulated data before applying to real data



Pseudorapidity (η)

ISR Jet Delta R when ISR Jet > 200 GeV, mtb < 175, and nTop = 1

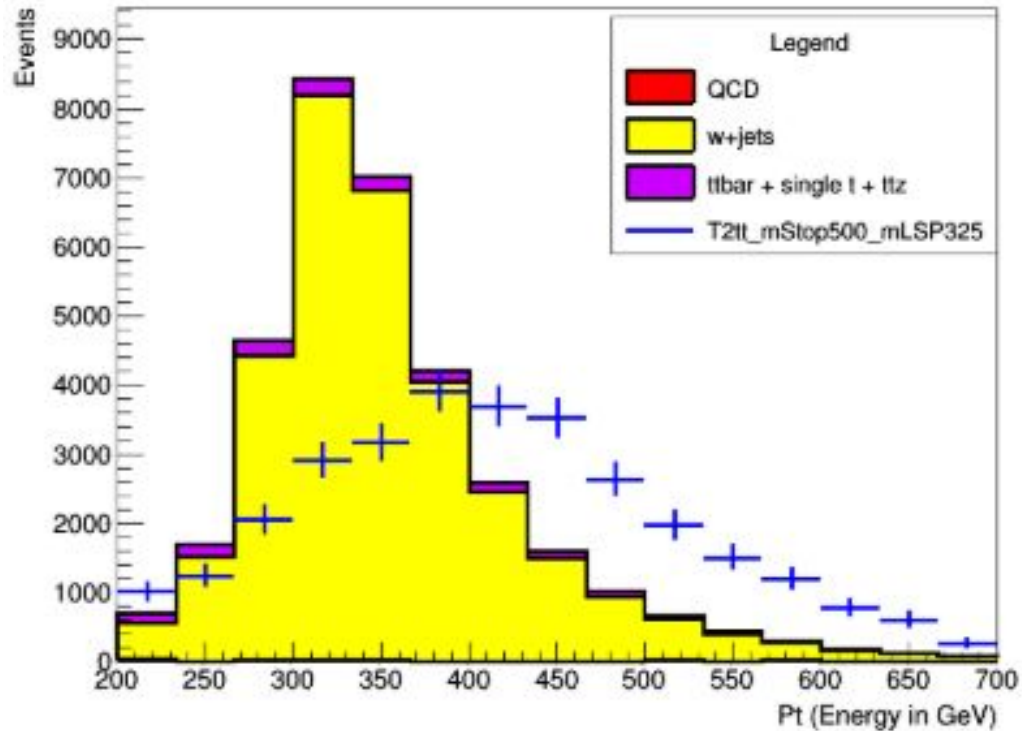


Cuts Applied:

- Baseline Cuts
- ISR Jet > 200 GeV
- mtb < 175
- nTops = 1

Not useful - background and signal have the same distribution

ISR Jet Pt



Useful - background and signal distributions are different

- Normalized by efficiency before SUSY baseline cuts were applied.
- Cuts: baseline, Pt less than 200 cut, and mtb less than 175.
- The signal was increased by a factor of 500 to make it more visible on the graph.

Future Studies

- Use ISR jet Pt value cuts (around 350 GeV) to help analyze the T2tt signal
- Further research how ISR jets can be used to make cuts.



Hay: background events
Needle: the signal
Magnifying glass: ISR jets

Thank You!