Summer Research on Inclusive Jet and Dijet Cross Section at CERN

Yu-Dai Tsai

ATLAS Collaboration, CERN
Advisors: Tancredi Carli & Bogdan Malaescu

7/13/2012

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- Will spend the next academic year in UC Berkeley and try apply for PhD in the US and in Europe (CERN!!!).

Research Interests & Experiences

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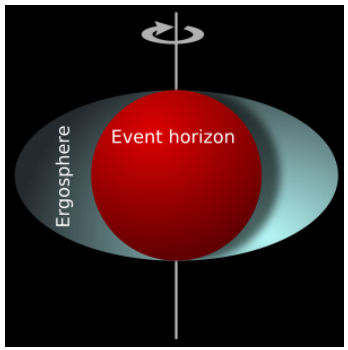

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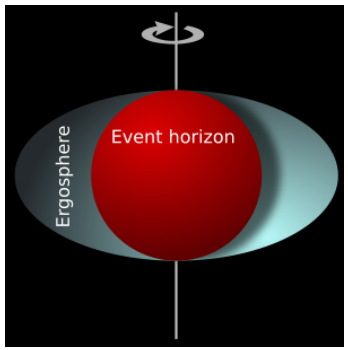

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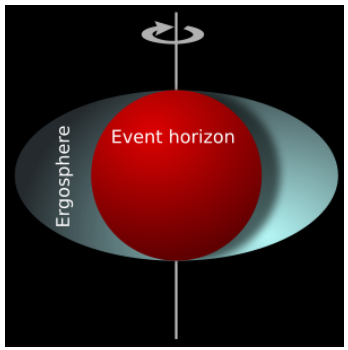

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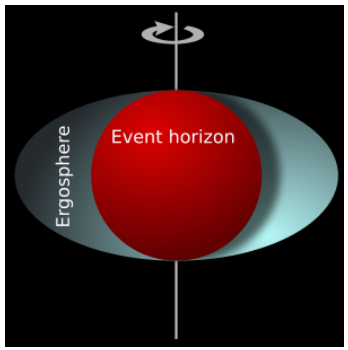

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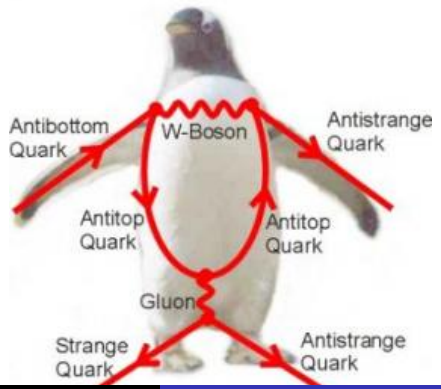

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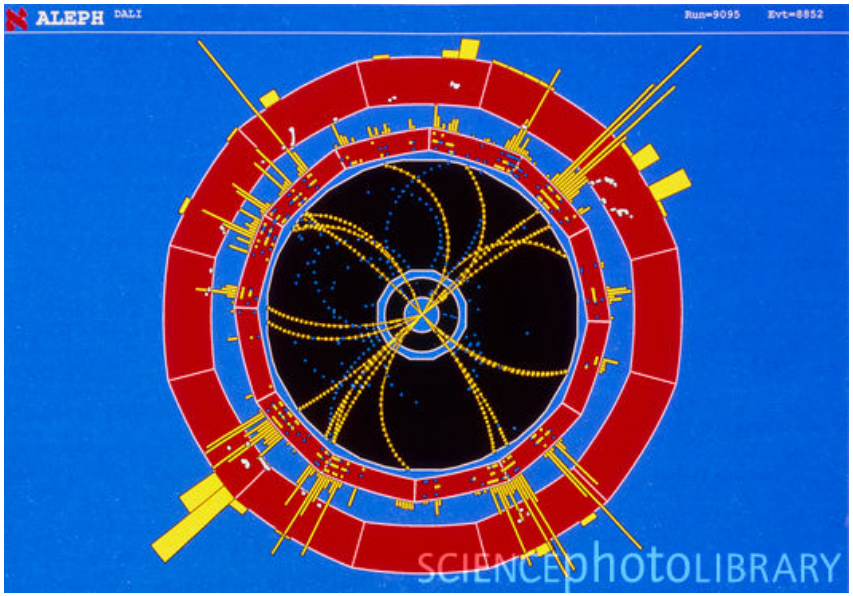

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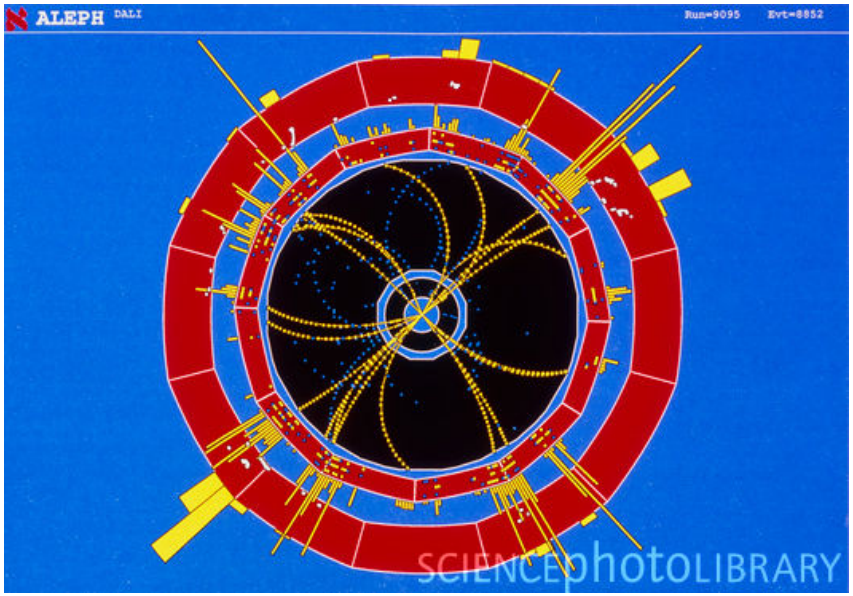
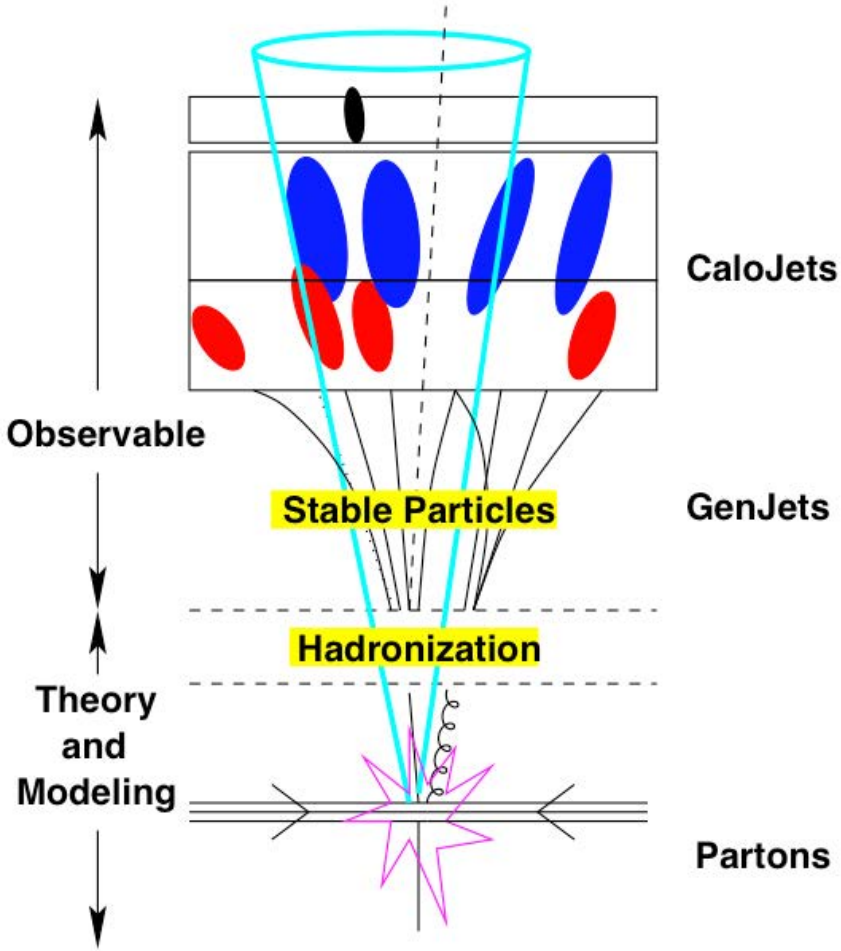


A four-jet collision event in ALEPH, LEP (CERN)

Three Levels of Jets



From Philipp Schieferdecker (KIT)'s presentation

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- Jet mass, jet charge, and jet substructure

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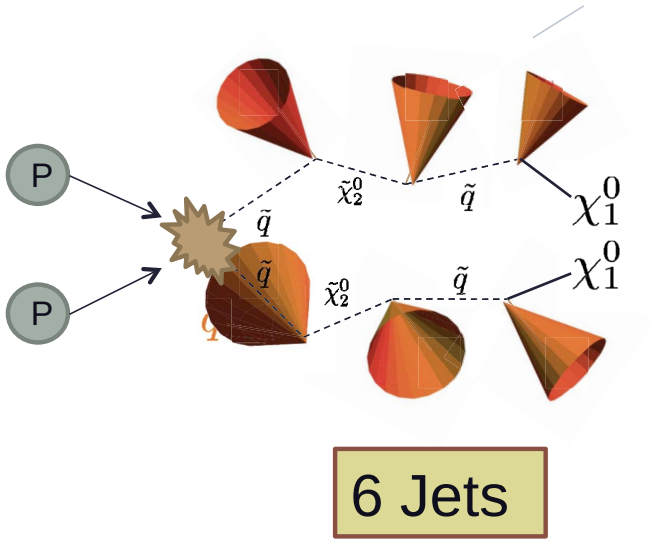
Example: Supersymmetry



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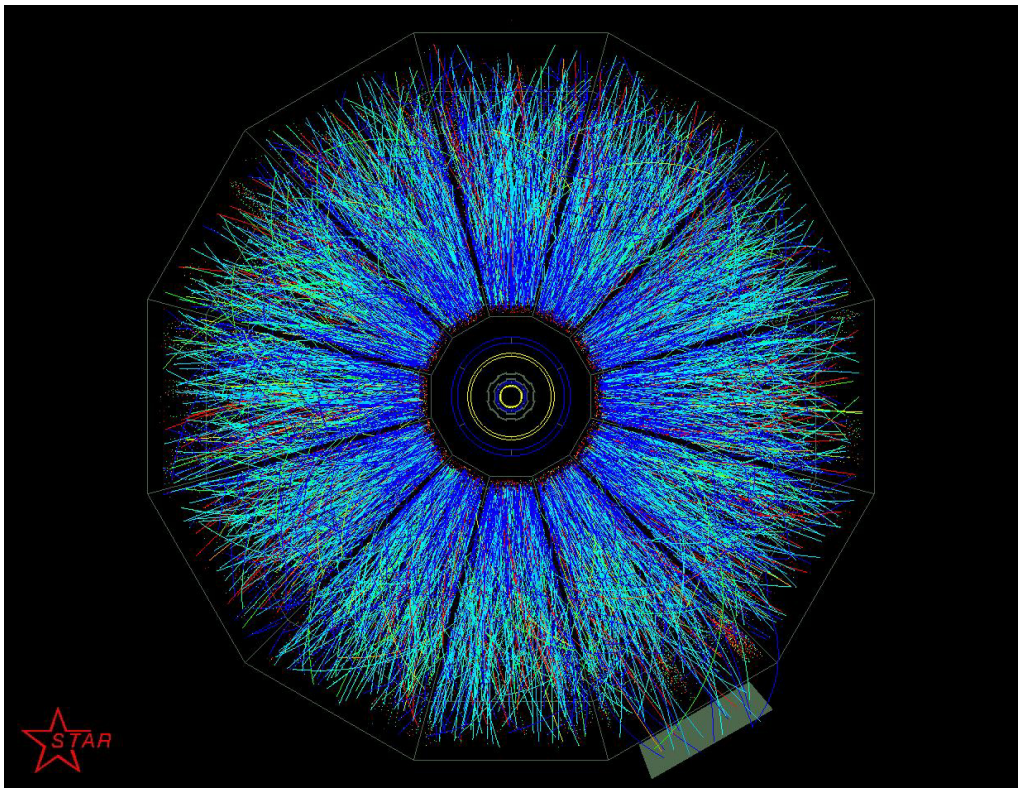
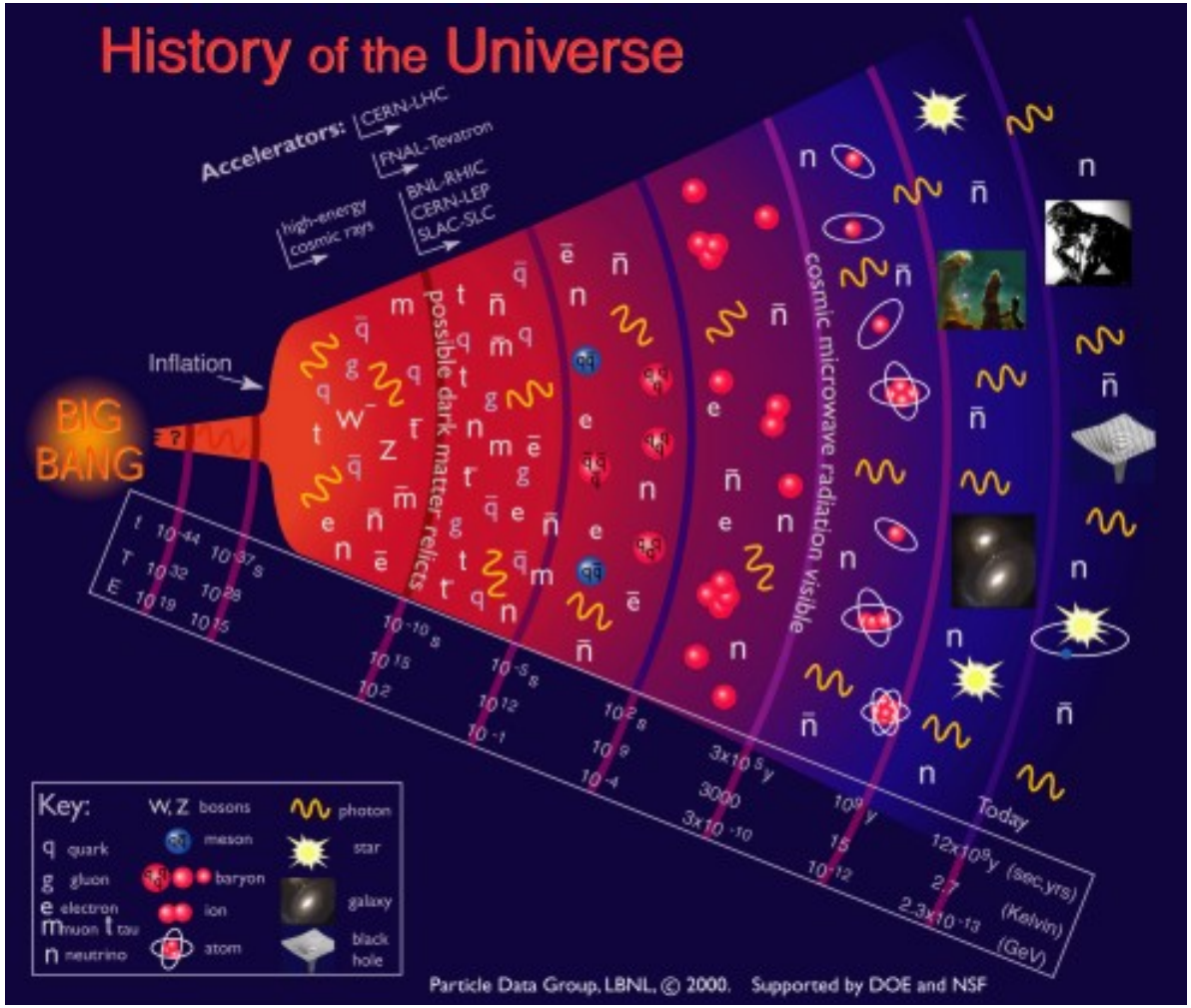


Why is it important? Hot QCD Matter in Early Universe



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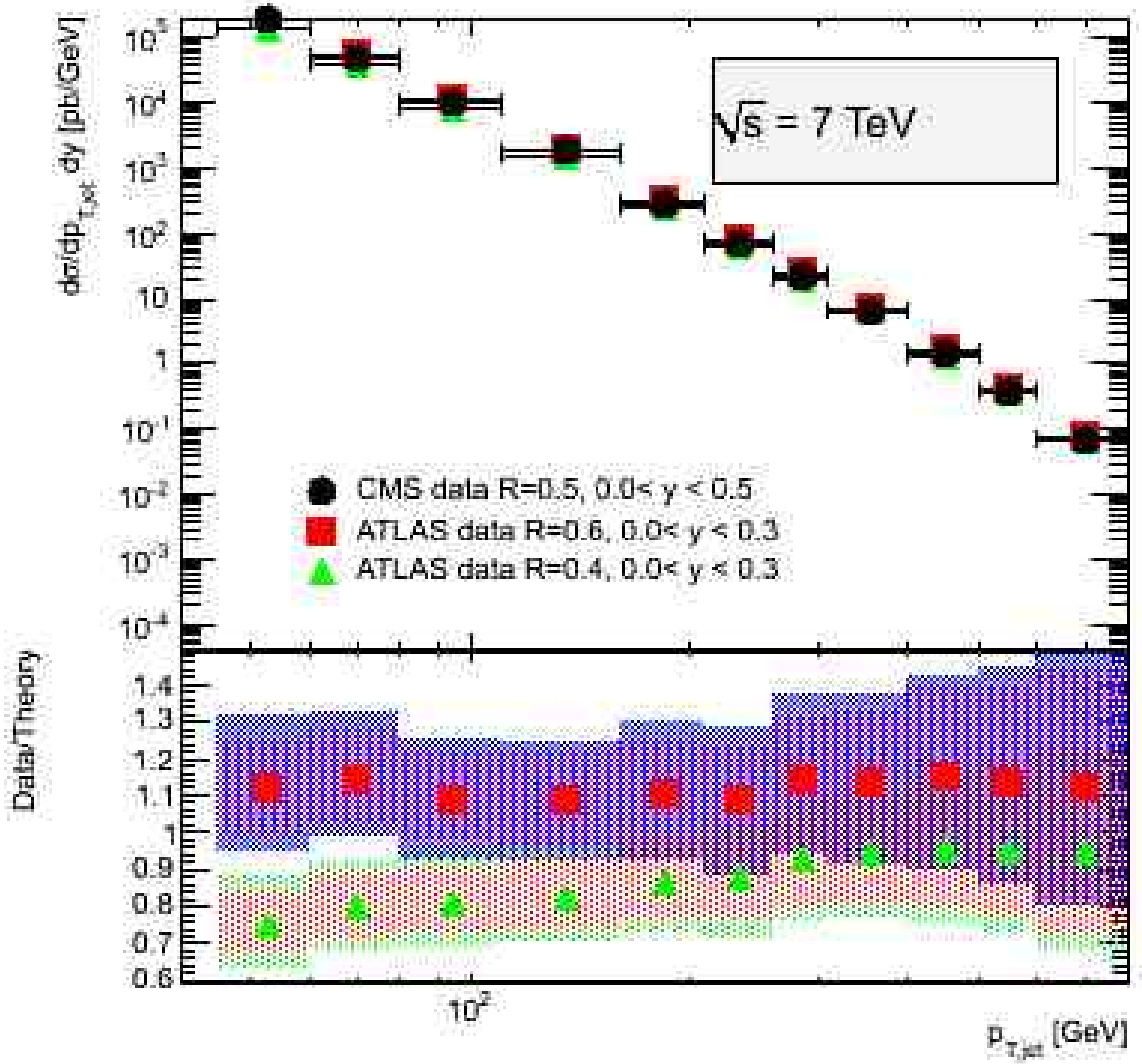
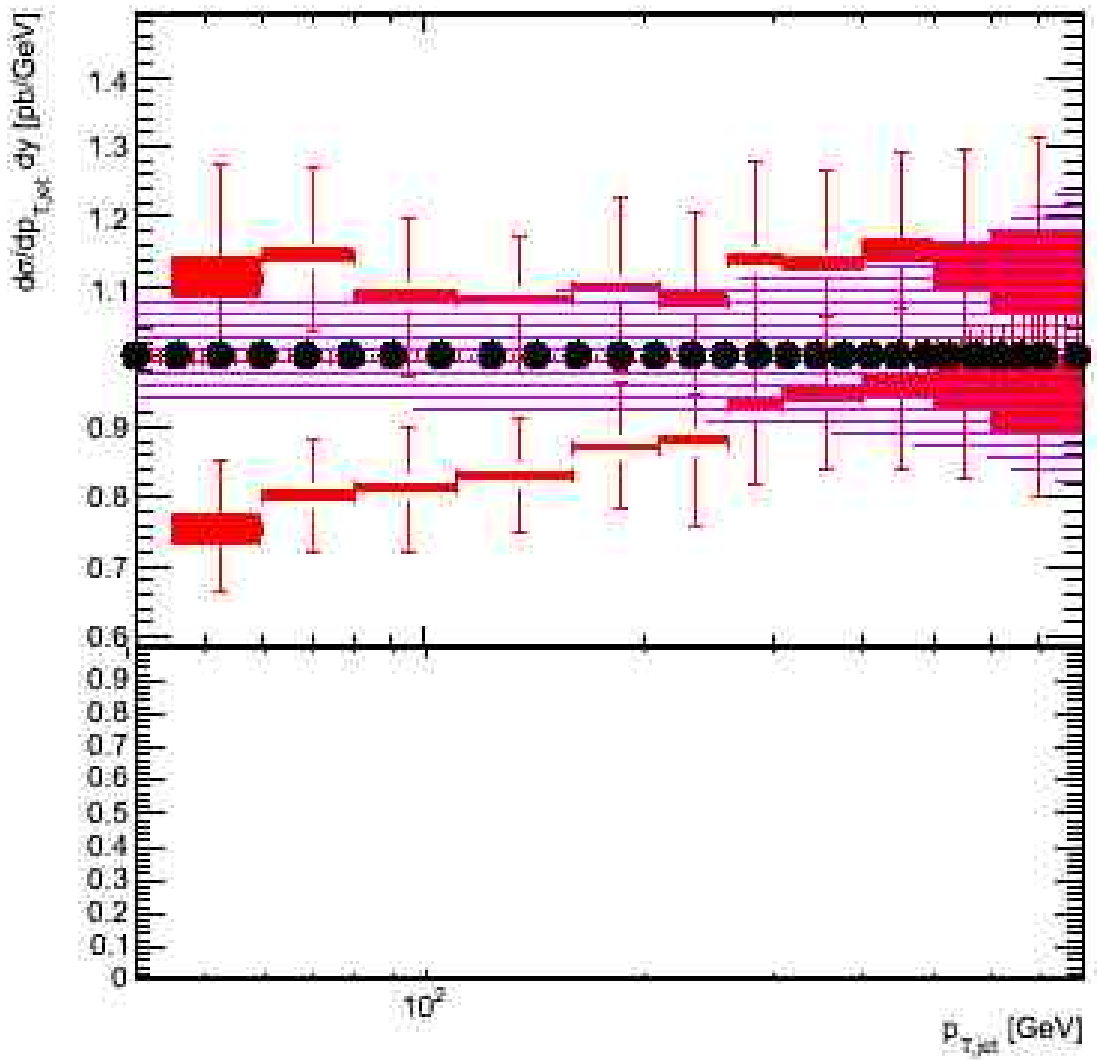
- Dijet invariant masses from 70 GeV to 5 TeV

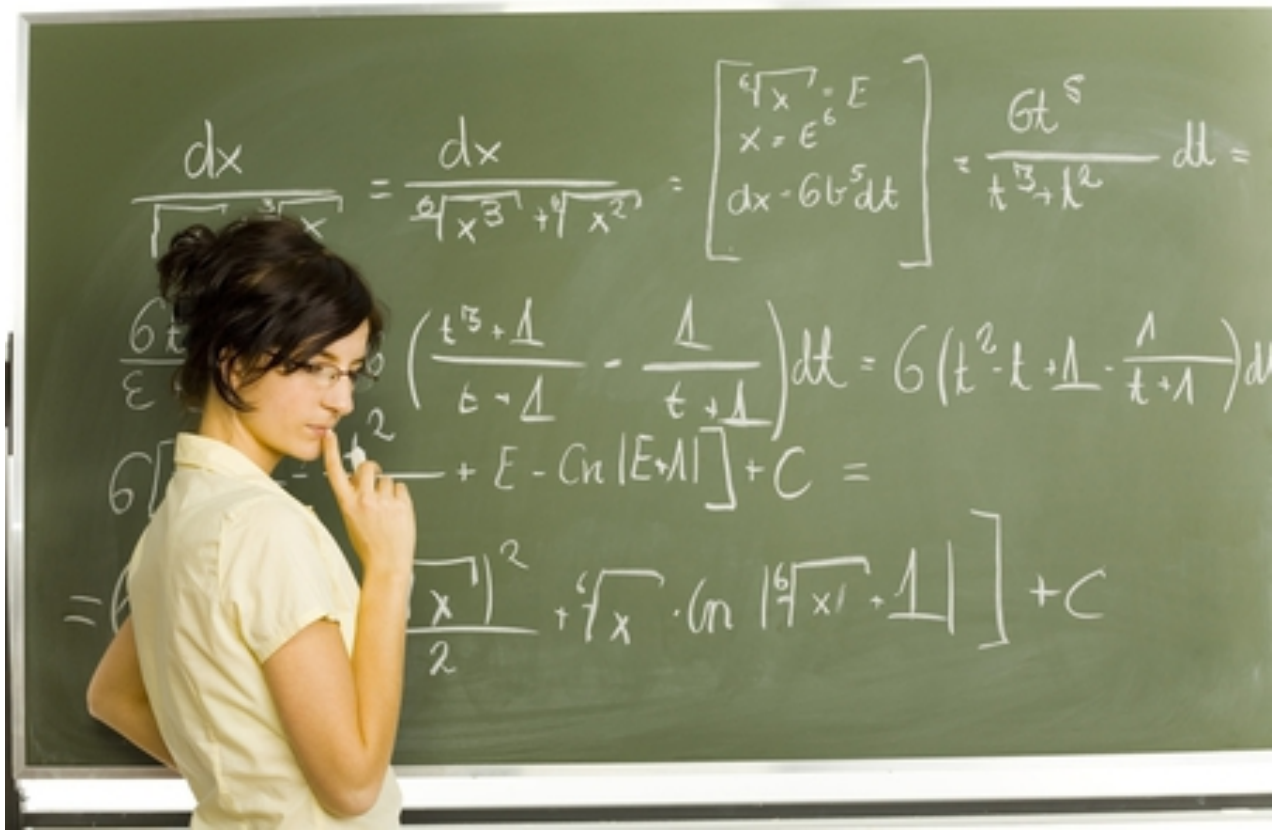
ATLAS vs CMS - cross section



ATLAS vs CMS - ratio cross section



The Applgrid Project - The Black Board Time



Sequential Clustering Algs

- Based on the following **distance measures**:
  - ★ distance **d_{ij}** between two particles i and j:

$$d_{ij} = \min\left(k_{\mathrm{T}i}^{2p}, k_{\mathrm{T}j}^{2p}\right)\frac{\Delta_{ij}}{D} \qquad \Delta_{ij}^2 = (y_i - y_j)^2 + (\phi_i - \phi_j)^2$$

  - ★ distance between any particle i and the beam (B) **d_{iB}**:

$$d_{iB} = k_{\mathrm{T}i}^{2p}$$

- Compute all distances d_{ij} and d_{iB}, find the **smallest**
  - ★ if smallest is a dij, **combine** (sum four momenta) the two particles i and j, update distances, proceed findint next smallest
  - ★ if smallest is a diB, **remove** particle i, call it a **jet**

- Repeat until all particles are clustered into jet

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- Talk to theorists: explore in order to exclude (or maybe verify)

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  Going BSM anyway!

It is OUR TIME NOW!

Let's get the party started