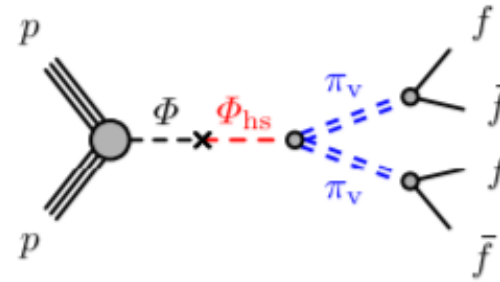


CERN Summer Student Presentation #1

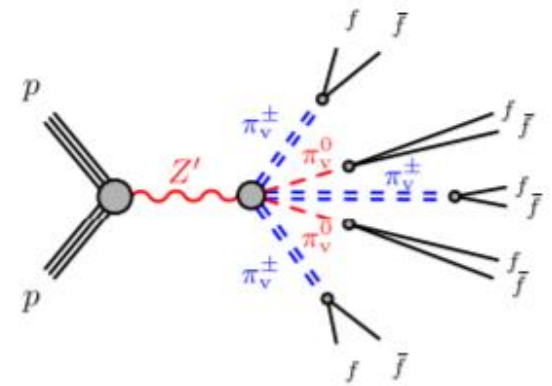
David Aguillard

Experiment: ATLAS

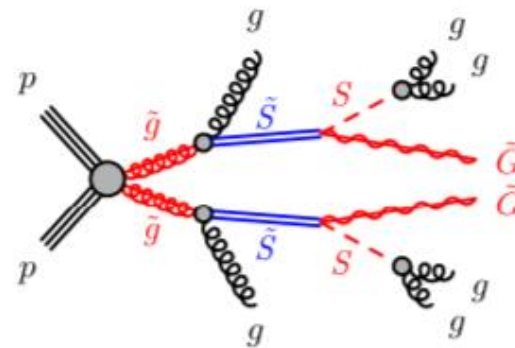
- Long-Lived Particles (LLP's)
- New Physics:
 - a) Scalar Boson
 - b) Hidden Sector
 - c) Stealth SUSY



(a)



(b)

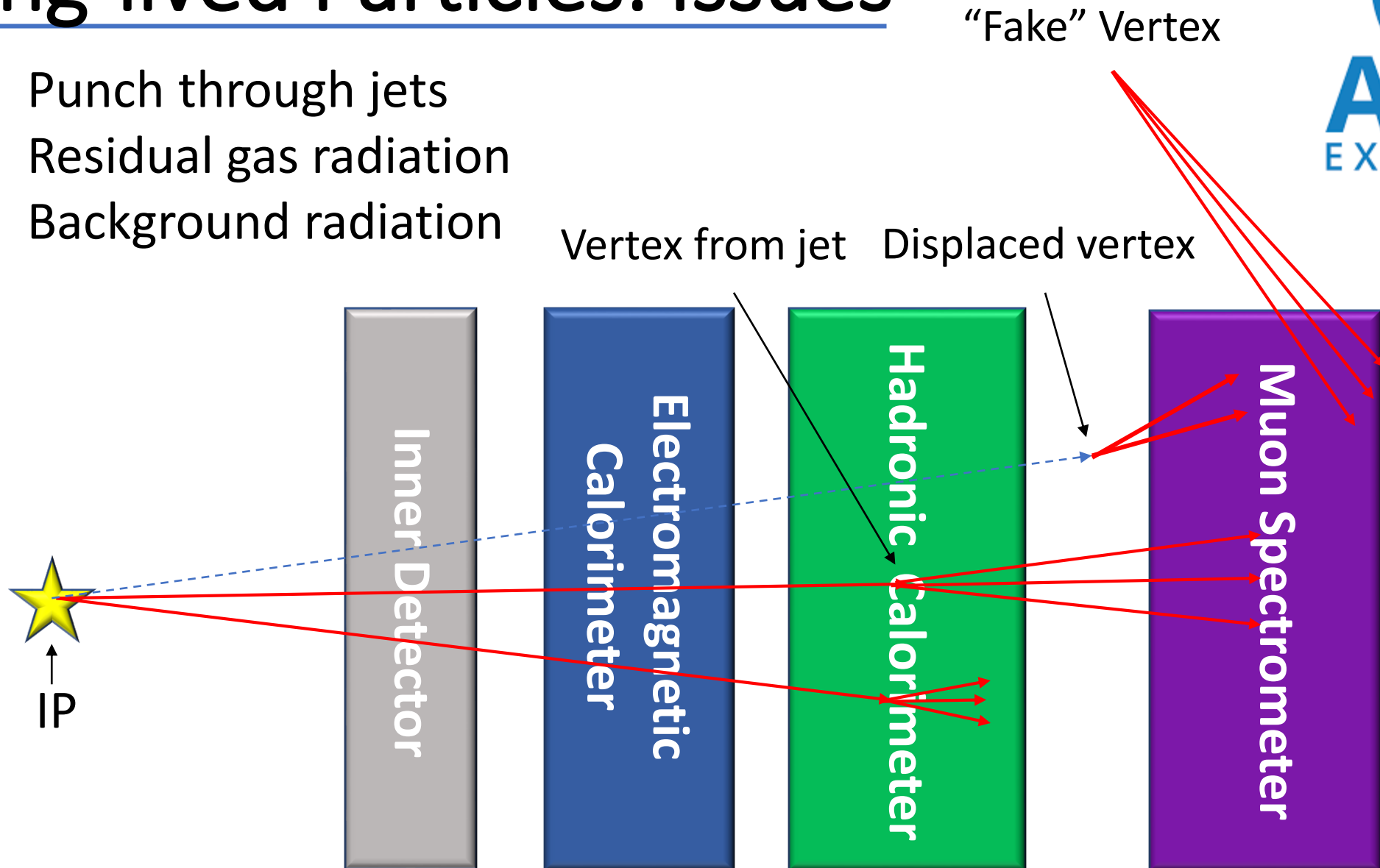


(c)

Long-lived Particles: Issues



- Punch through jets
- Residual gas radiation
- Background radiation



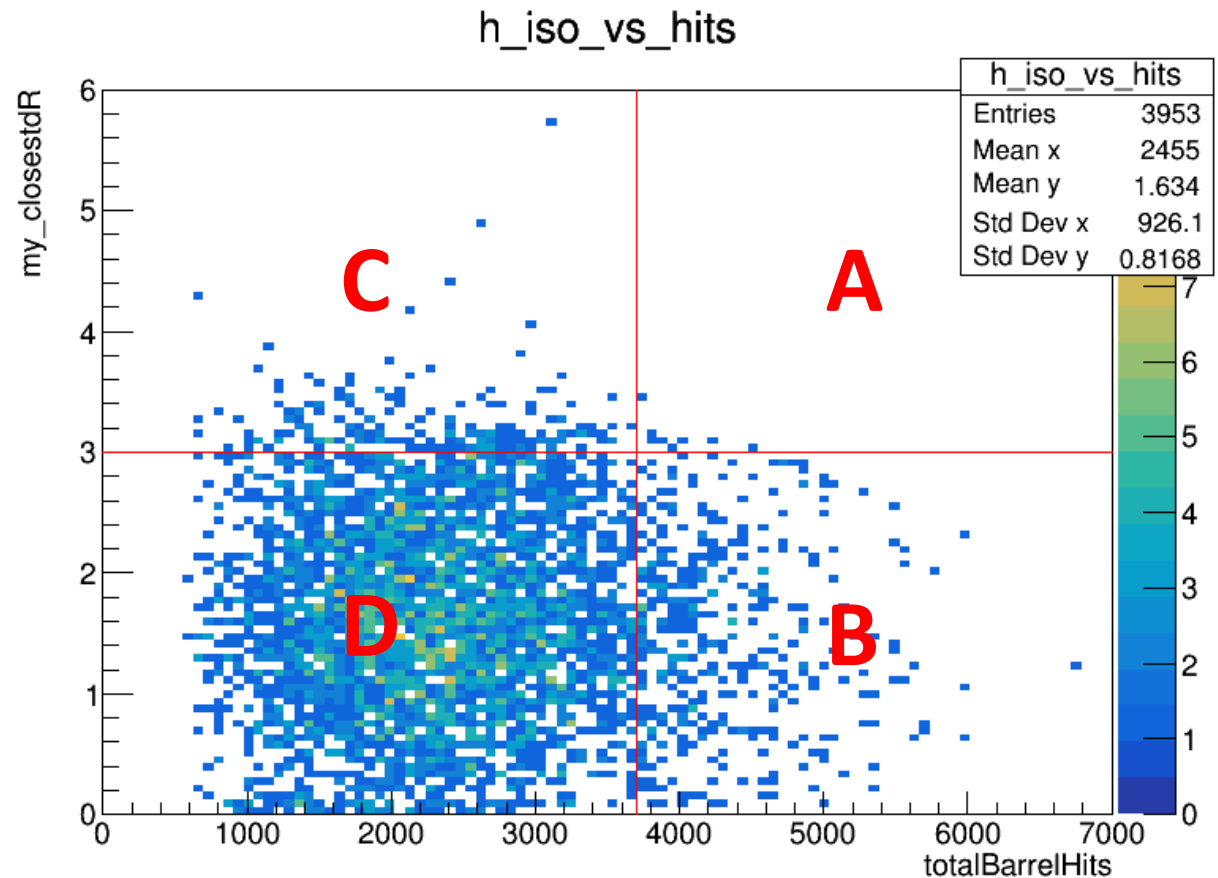
Current analysis requires two displaced vertices

- Pro – Reduces Background
- Con – Some models predict LLP decay with only ONE displaced vertex

- Possible Solution: ABCD Diagrams

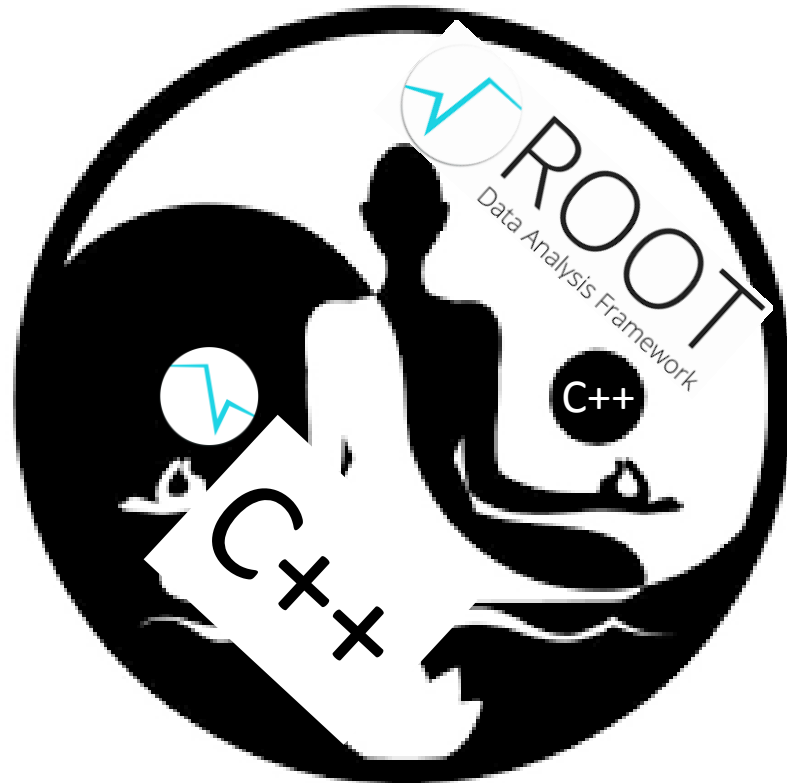
What I am working on . . .

- In Theory: ABCD Analysis
 1. Set Regions
 2. Estimate Background in **A**
 3. Unblind **A**
 4. Compare Estimation to Data
- In practice:
 - Learning code
 - Manipulating variables
 - Creating histograms



Goal: Analyzing data with smaller trees

- Current Data contains all of LHC run 2 – takes a long time to run
 - ABCD analysis involves trial and error
 - Cutting data is important at this stage – saves time
- Requires deepening my understanding of root and C++





Reference:

PHYSICAL REVIEW D 92, 012010 (2015). “Search for long-lived, weakly interacting particles that decay to displaced hadronic jets in proton - proton collisions at \sqrt{s} 8 TeV with the ATLAS detector”