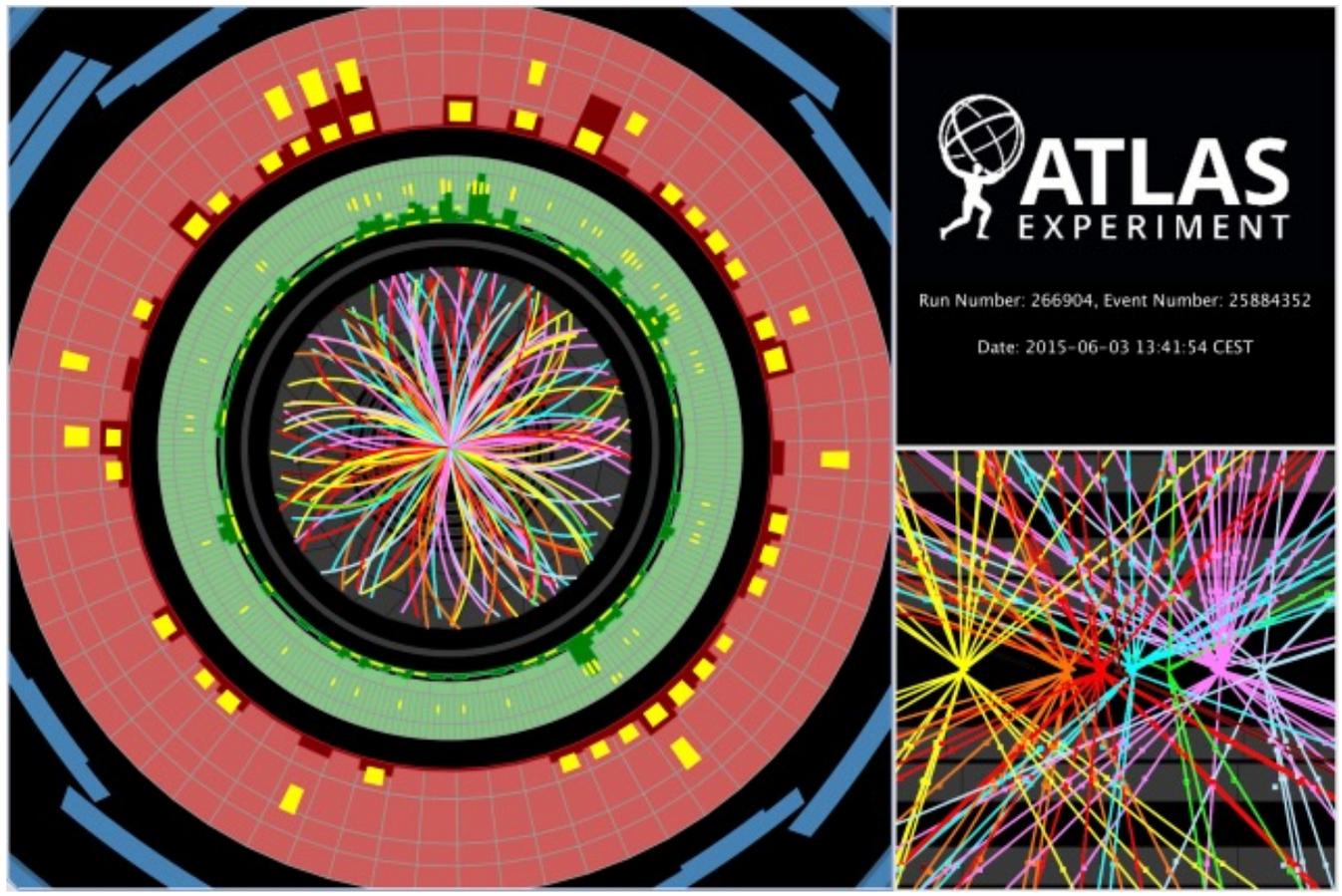
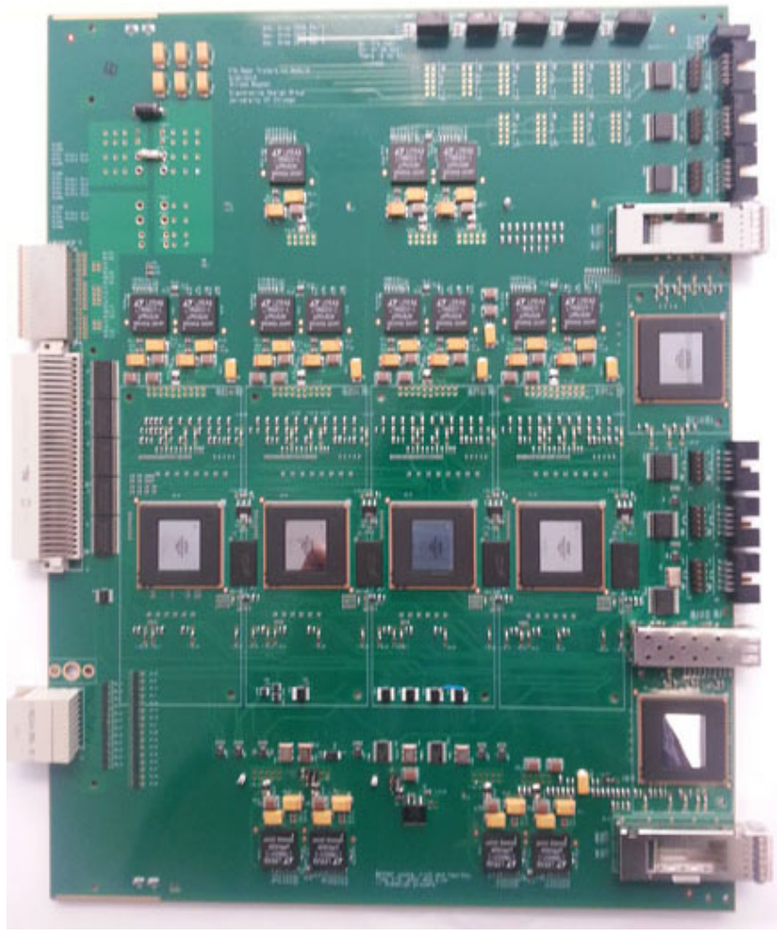
AUX Card Testing for the FTK Trigger at the ATLAS Detector at CERN





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THE UNIVERSITY OF CHICAGO

URM Mini Workshop

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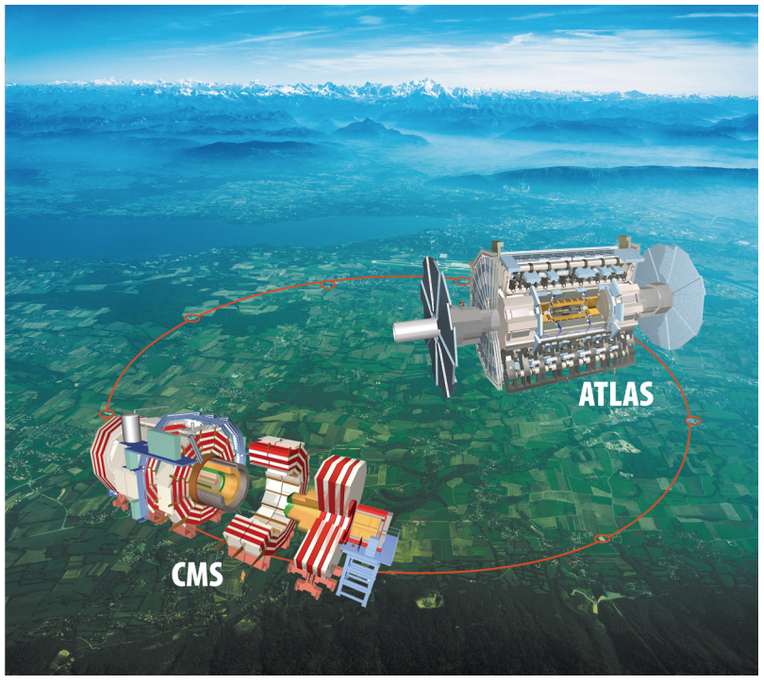
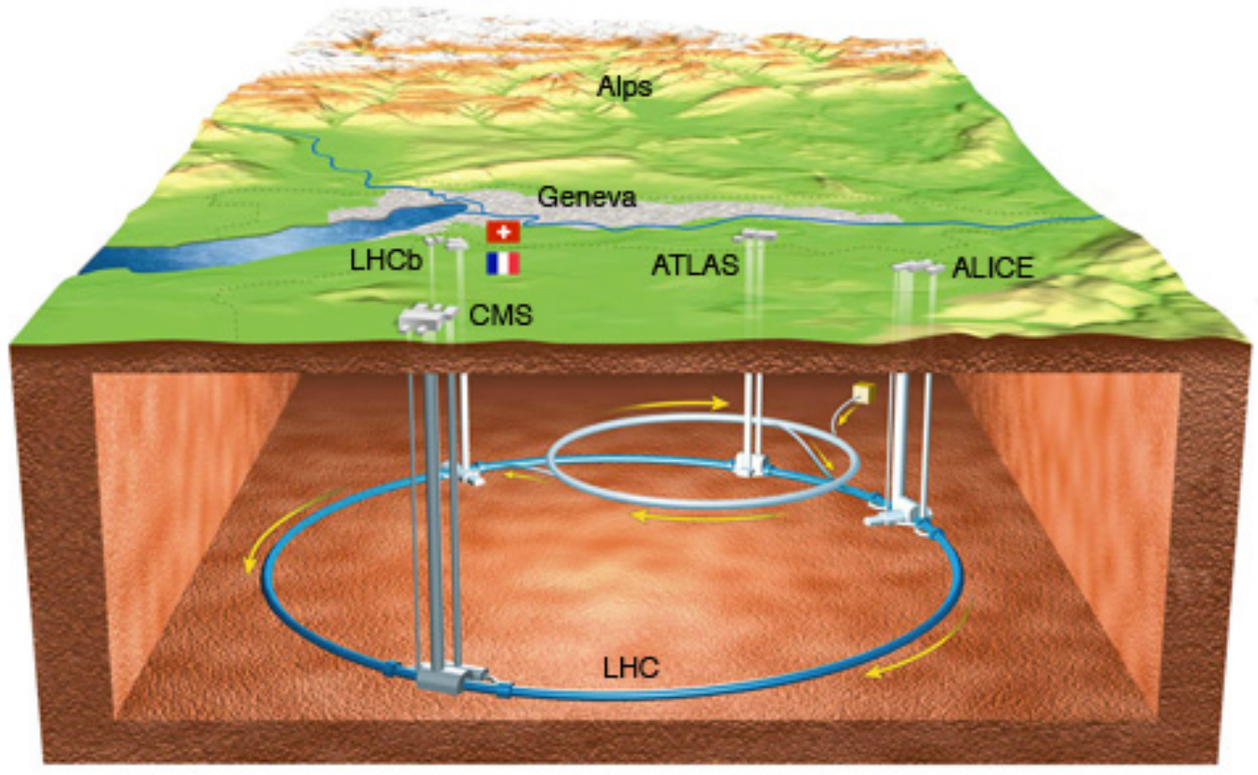
ATLAS

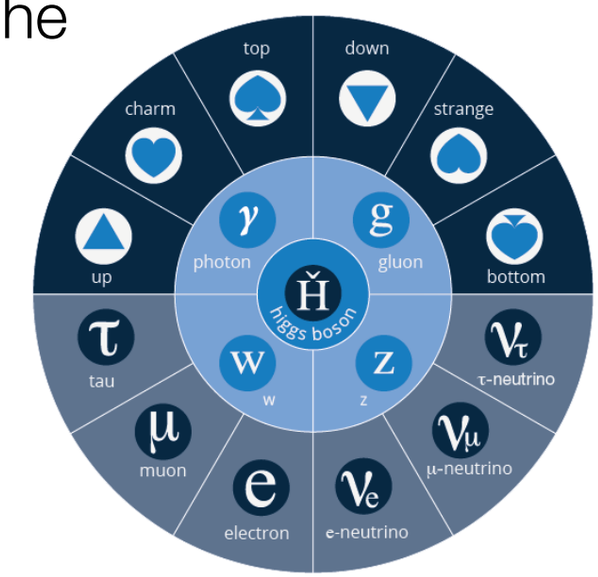
- One of the two general-purpose detectors at the Large Hadron Collider (LHC)
- Collaboration comprises ~5000 scientists from ~180 institutions around the world
- Its primary focus is to improve our understanding of the fundamental constituents of matter



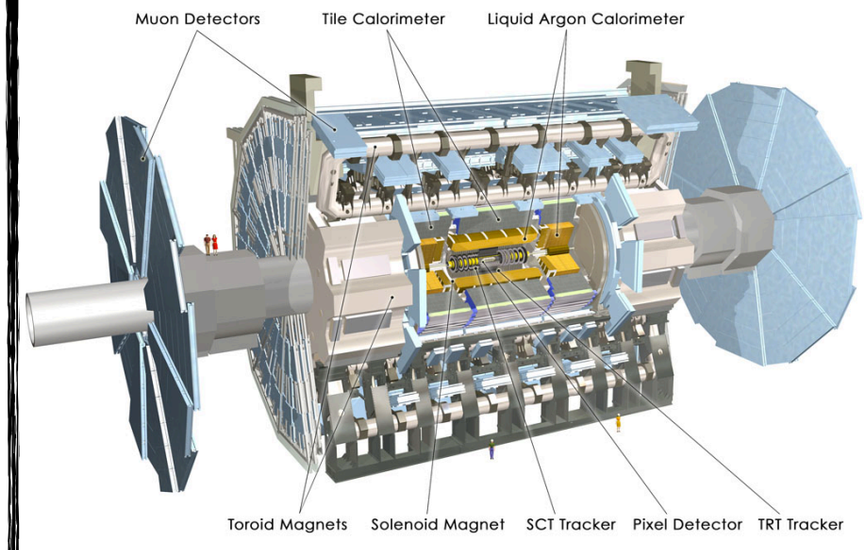


ATLAS

- Designed to record particles produced from pp collisions in the LHC at unprecedented energies.



- The yield in the detector is close to 1 billion collisions per second
  - Storing that amount of information is not feasible
  - For this we use a trigger system, whose main purpose is to cut down the number of events per second. A challenge is doing so very quickly.
  - We wish to sift through the events and find only the ones that can teach us about physics



Tracking

- What is tracking and why track? Recording of electrical signals triggered by particles as they move through the device - reveals path in detector

- Recorded patterns are then reconstructed by a computer program

- What does it tell us? Allows us to identify particles and, in turn, characterize events

- Limited information on tracking - we want more

  - FTK - hardware system of 7 unique electronic boards

  - Transposing combinatoric problem to a yes/no

(like playing connect the dots)

FTK ➡ Upgrade

Without FTK, tracking takes very long

done only for small regions

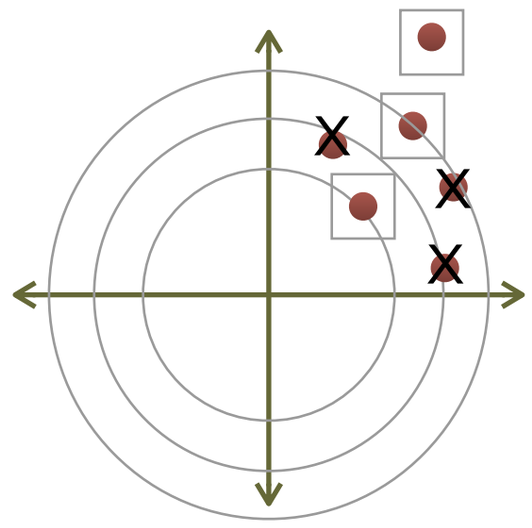
limited tracking information

With FTK, tracking would be done much faster

treats tracking as image recognition problem

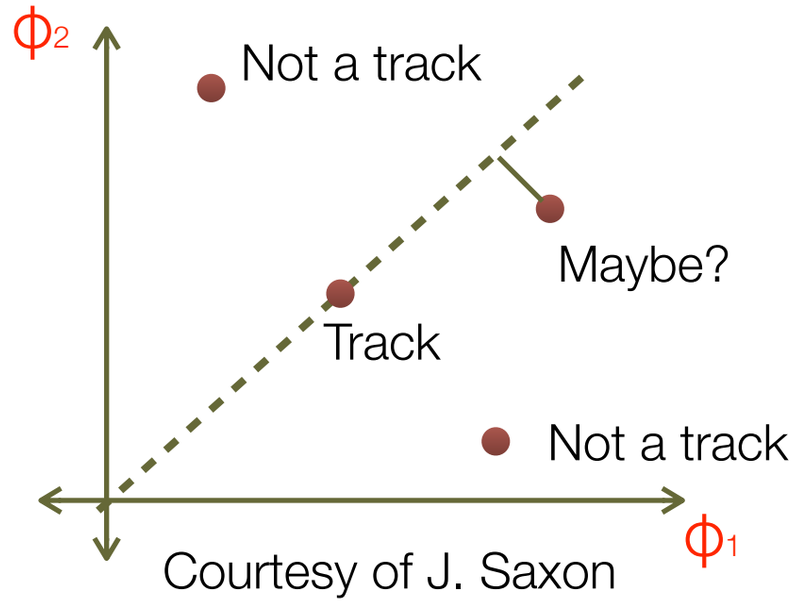
allows global tracking (much more information)

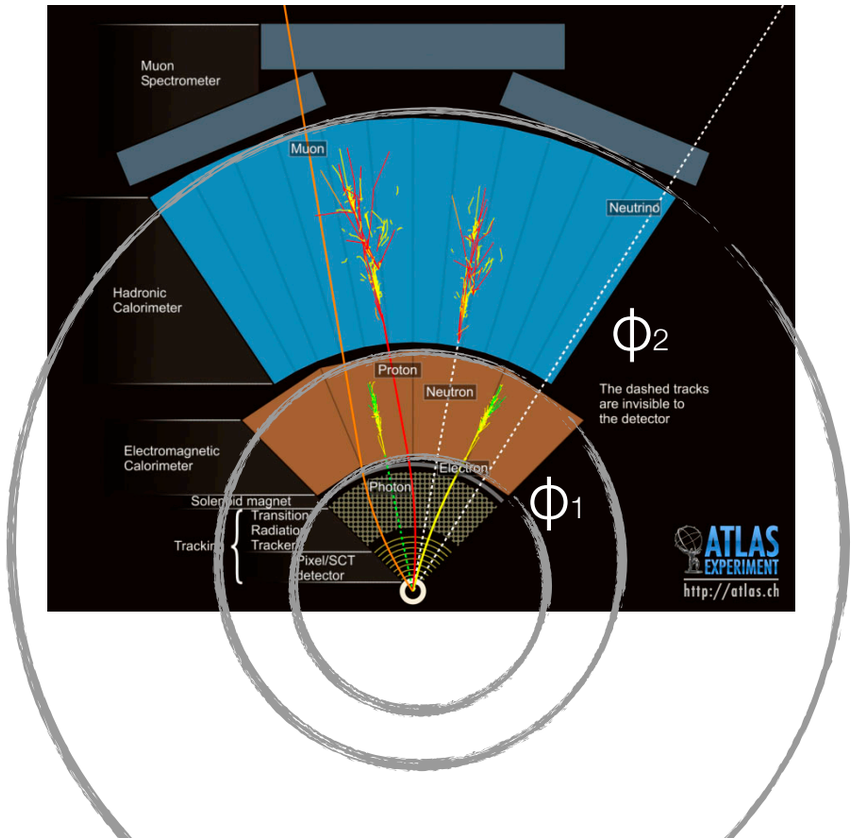
true physical path



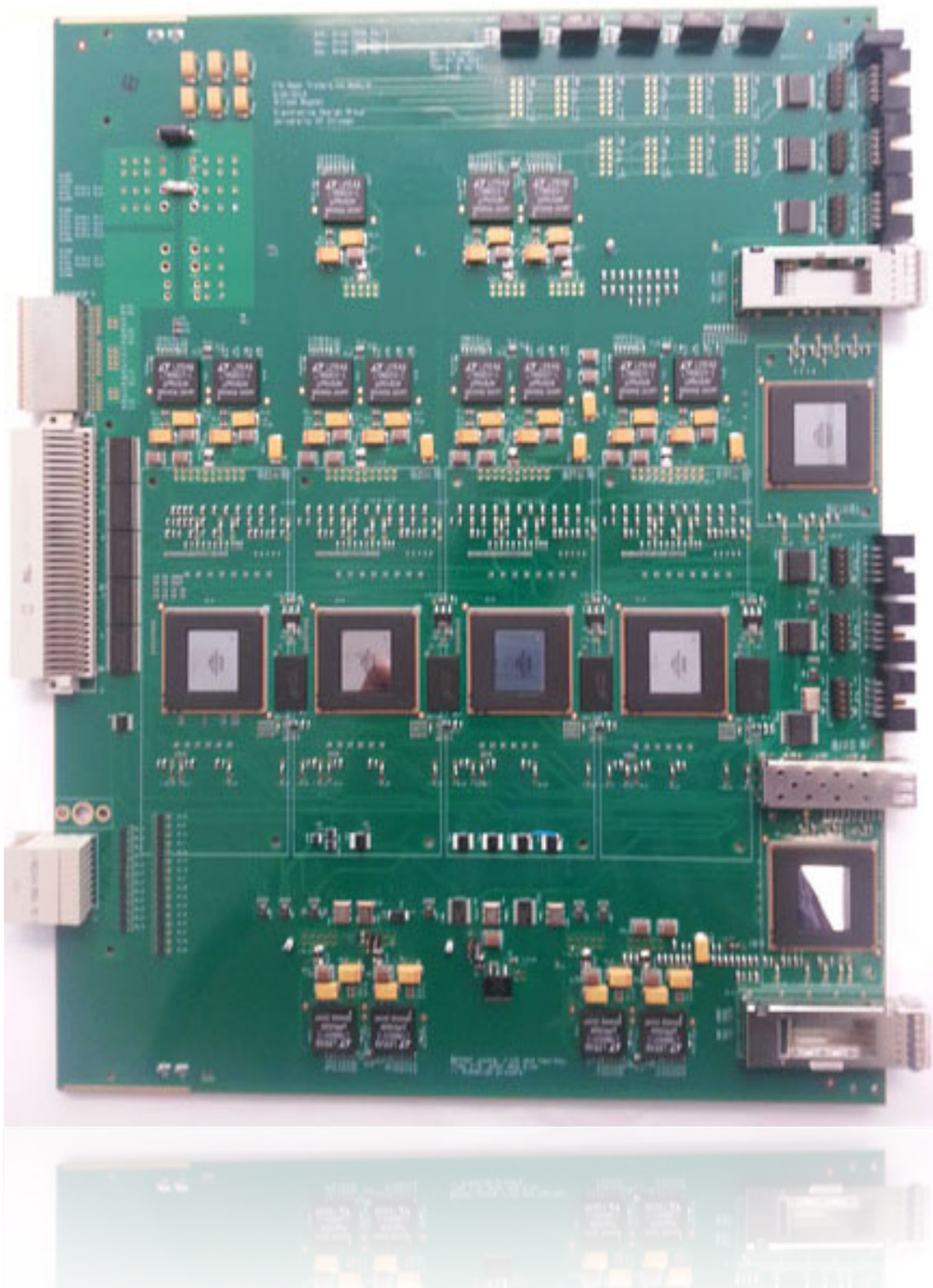
AUX Card

- Electronic board being designed and built at Uchicago
- Stores data during pattern matching (plausible candidates)
- Evaluates χ2 - linearized in small detector regions
- ‘Estimates’ missing hits





My Role



Testing newly arriving AUX Cards before they are shipped to CERN and integrated into the general monitoring system.

Testing

- Hardware inspection
- Communication elements
- Verify that each FPGA can be programmed successfully

References

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