The ATLAS Experiment at CERN
The Pixel Detector: 80 Million Channels and Always Something Interesting to Watch

What will be discovered with ATLAS??
When the LHC begins its 7 TeV p-p collisions in 2010

Will the Higgs boson finally be observed?
Supersymmetric particles??
Extra Dimensions???

Or Maybe....Something totally unexpected!

My research at CERN:
Slight Variations

A proton-proton collision event from December 14, 2009

The ATLAS Detector:
~15,000,000 pounds
~80 meters underground
- Identifies 100 'interesting' events out of 6 million events per second
- Comprised of many independent sub-detectors
~300 MB/s data output rate

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The Pixel Detector:
- Innermost detector of ATLAS
- ~1.2 m long, 0.35 m diameter
- ~4.4 kg weight
- 1744 Pixel Modules comprise 3 cylindrical layers and 3 endcap layers
- ~80 Million data channels
- ~10 kW power usage

The Inner Detector:
A Pixel Detector Module:
~ 6 cm long X 2 cm wide
~46,000 pixels connected to 16 'Front End' chips per module
~40 Mbit/s data output rate

Pixel Sensors:
~40 x 400 um2 x 250 um thick
- Charged particles produced in the collisions pass through the sensors, creating a measurable current.

Quantiﬁcation of the variation in the modules' thresholds over time is an important part of understanding the detector.

A mean module-level threshold can be found for each module and plotted to give an overall view of the detector.

The average module threshold dispersion was equal to charge of only 6 e- over a period of six months.

High dispersion corresponded to known module issues. This means that a module's threshold dispersion in time provides a good measure of its health.

Every pixel of the detector is tuned to register a 'hit' when the amount of charge created by a particle exceeds a certain threshold. This threshold is chosen at a balance point between pixel noise and sensitivity.

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