Data Analysis at AEGIS

By Alexander Ekman
CERN Summer Student Session 2018
Who am I?

- Alexander Ekman
- At home:
  - Master in Particle Physics
  - Jet Energy Scale Calibration for ATLAS
  - Lund University, Sweden
- At CERN:
  - Data Analysis
  - AEGIS, EP-SME
What is AEGIS?

- It is an Antihydrogen Experiment investigating Gravity, Interferometry, and Spectroscopy
- Currently focuses on antihydrogen production using charge exchange

AEGIS Experiment,
http://aegis.web.cern.ch/aegis/multimedia.html
What is Data Analysis?

- Processing data with the goal of retrieving information
- Estimating noise (background)
- Looking for signals
- Detector properties
- A signal is what’s left when you subtract what you expect
- Higgs Discovery

How to Make Antihydrogen

1. Trap antiprotons
2. Create positronium
3. Rydberg excite positronium
4. Add to antiprotons

Figure from: M. Doser et al. Measuring the fall of antihydrogen: the AEgIS experiment at CERN, Physics Procedia Volume 17, 2011, Pages 49-56
Cylindrical structure of scintillating fibers

Encapsulates the antiproton trap and positron converter

Antihydrogen/antiproton annihilation on trap walls will produce pions

Pions create tracks in our detector

AEGIS Experiment,
http://aegis.web.cern.ch/aegis/multimedia.html
Finding the Signal

- Positron annihilation on converter produces a gamma burst
- Large energy deposit leads to different detector effects
- Signal is found by subtracting laser off from laser on

Figure from: M. Doser et al. Measuring the fall of antihydrogen: the AEgIS experiment at CERN, Physics Procedia Volume 17, 2011, Pages 49-56
Data Analysis: Informed Decisions

- Detector properties
- Which detector is best for normalization?
What am I Actually Doing?

- Programming.
- Coding
- Compiling
- Plotting
Questions?

AEGIS Experiment,
http://aegis.web.cern.ch/aegis/multimedia.html