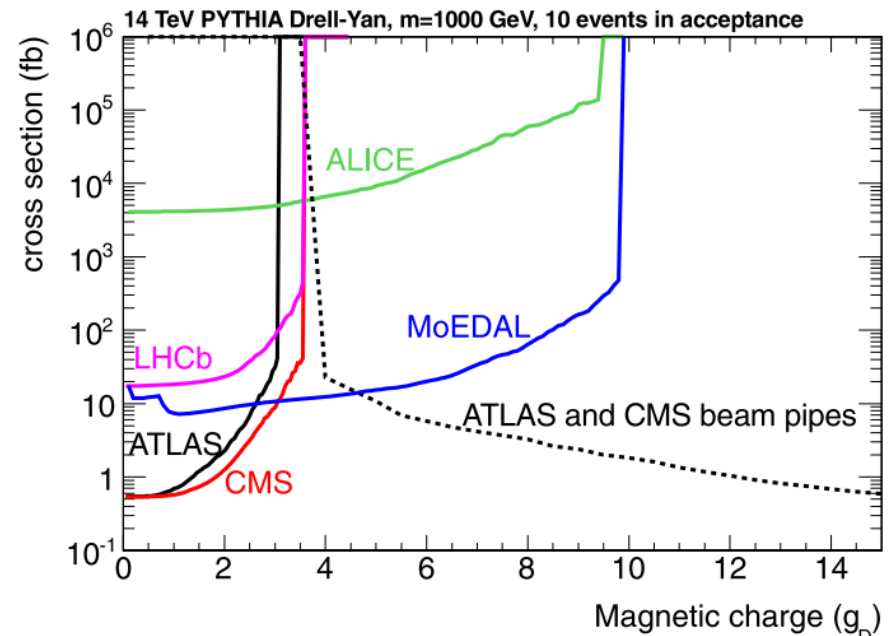


Searches for Magnetic Monopoles

Akshay Katre
PhD Student
University of Geneva

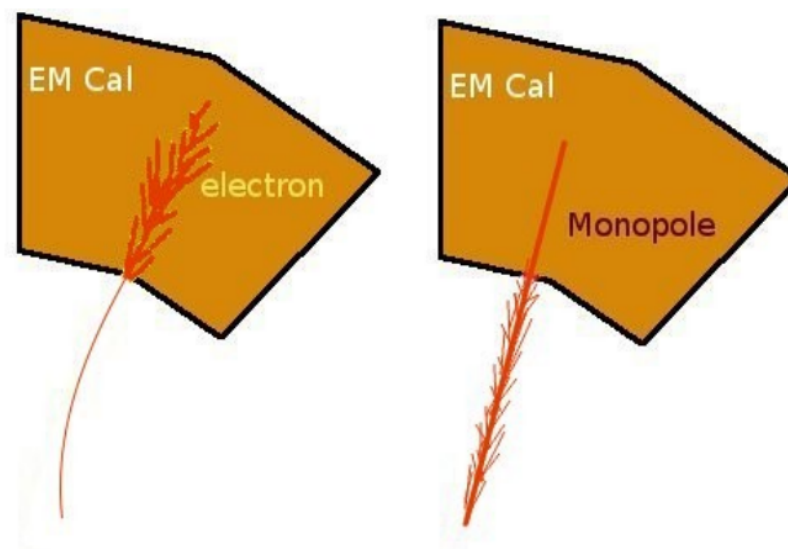
Motivation

- Hypothesized particles with unit magnetic charge
- Their existence would help explain charge quantization
- Symmetry in the Maxwell equations
- Earlier last year, we published [this paper](#) which summarizes the potential of each of the detectors at the LHC to find Highly Ionizing Particles (HIPs)



What are we looking for at ATLAS

- The high magnetic charge implies very high ionization energy loss for monopoles passing through matter, thousands of times larger than electrons or muons
- Hence large energy deposition in tracker and EM calorimeter, narrow clusters, lots of delta-electrons
- Monopoles bend in R-Z plane, which makes tracking not practical

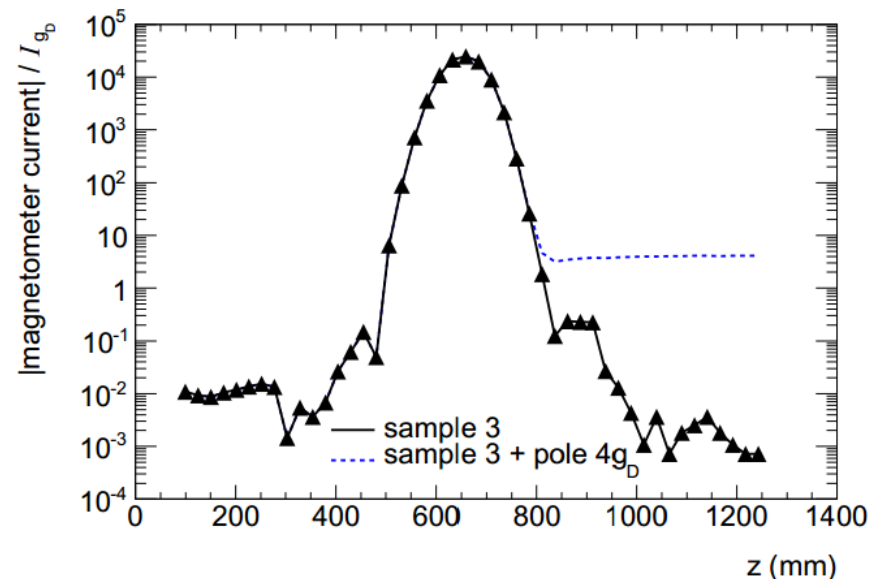


Dedicated monopole trigger at ATLAS

- Based on the expected signature of monopoles, a new High Level trigger was developed
- Past monopole searches seeded from existing High Level electron triggers – only high energy or low charge
- The new High Level Trigger uses the high ionization hits from the Transition Radiation Tracker (TRT) in a narrow road
- Makes trigger more efficient and maintains low rate
- Collected data with new trigger from October – December 2012 and will analyze this data in the coming year

Beyond ATLAS

- Searches for monopoles trapped in detector material using a superconducting magnetometer
- Monopole searches in CMS Beam pipe material was passed through the magnetometer at ETH Zurich
- Details [here](#)



Magnetic Monopole Trapper (MMT)

a new subdetector of the MoEDAL experiment
LHC beam pipe; interaction point → (x)



Deployed in September 2012 at LHC interaction point 8
First dedicated monopole trapping experiment at the LHC

Plans ahead

- Analyze ATLAS data and publish new results with searches for different charges – would be the first such search at colliders
- The MMT is currently “collecting data” and we plan to pass the cylinders inside the sub-detector through the magnetometer
- One of the long term plans is to put to request for the ATLAS and CMS beam pipes after the shutdown to pass them through the magnetometer