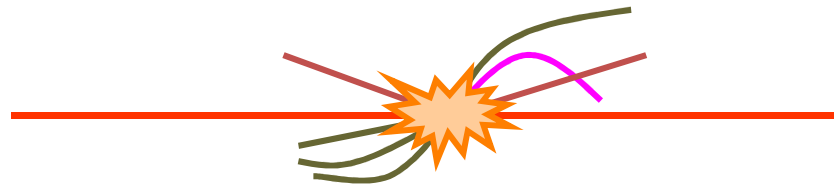


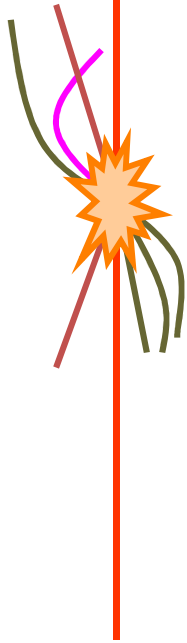
# Preparation for LHC beam: ATLAS



W. H. Bell  
Université de Genève

# Overview

- Swiss ATLAS
  - Participants
  - Hardware Contributions
- Commissioning
  - First Beam
  - Cosmic Rays
- Physics Program
  - Standard Model
  - Beyond the Standard Model
- Conclusions and Outlook



# Swiss ATLAS

## DPNC - Geneva

Prof. A. G. Clark  
Prof. A. Blondel  
Prof. M. Pohl  
Dr. L. Rosselet, Dr. X. Wu  
Dr. D. Ferrere, Dr. S. Gadomski

Dr. W. H. Bell, Dr J. Garcia Navarro  
Dr. S. Gonzalez Sevilla, Dr. A. Hamilton  
Dr M. Keil, Dr A. Lister,  
Dr B. Martin dit Latour, Dr G. Pásztor  
Dr P. Urquijo

A. A. Abdelalim, G. Alexandre,  
M. Backes, E. Berglund,  
F. Bucci, V. Dao  
C. Mora Herrera, S. Nektarijevic  
A. Robichaud-Véronneau

F. Cadoux, D. La Marra

## LHEP - Bern

Prof. A. Ereditato  
Prof. Emeritus K. Pretzl  
PD Dr. H. Beck  
PD Dr. M. Weber

Dr. S. Haug , Dr. K. Kordas  
Dr. E. Cogneras

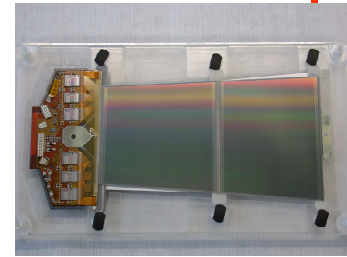
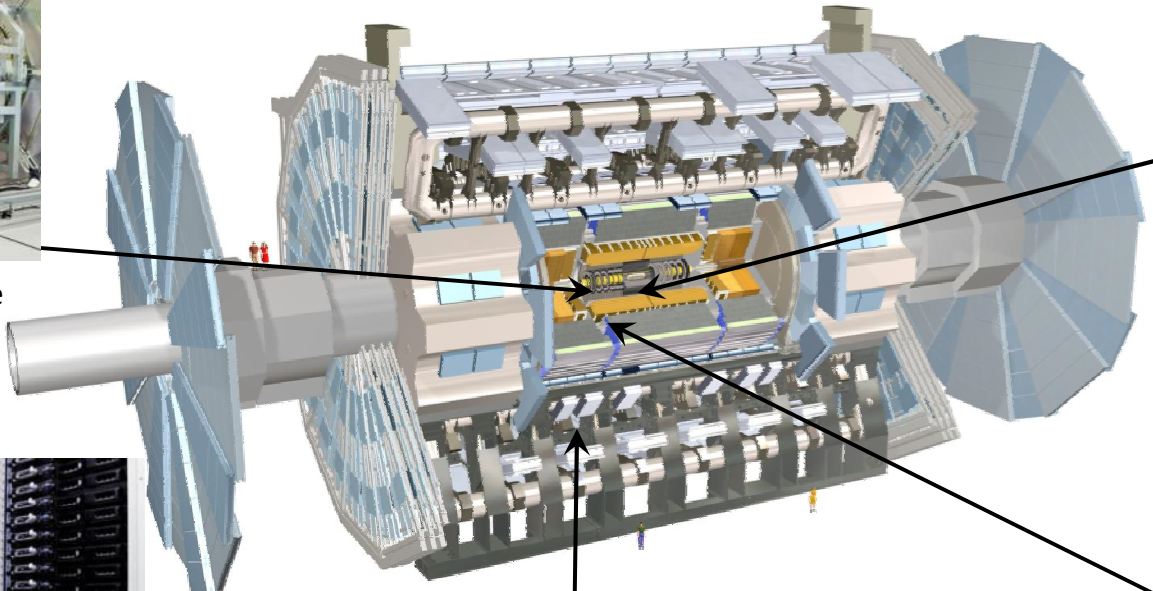
C. Topfel, C. Borer, A. Battaglia  
N. Venturi, V. Gallo  
I. Badhrees, T. Kruker  
J. Casutt, N. N., N. N.



# The ATLAS Experiment



Tracker Support Structure  
Geneva



Semiconductor Tracker  
Geneva



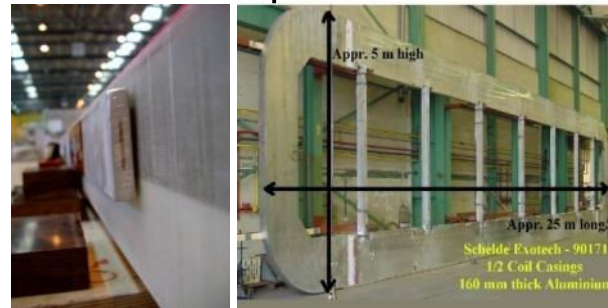
TDAQ - Trigger and Dataflow  
Bern and Geneva



Readout Electronics for Calorimeter  
Geneva

Online and Offline Software

Bern and Geneva



Superconductor and Casings for Barrel Toroid Coil  
Bern and Geneva

Physics and Computing

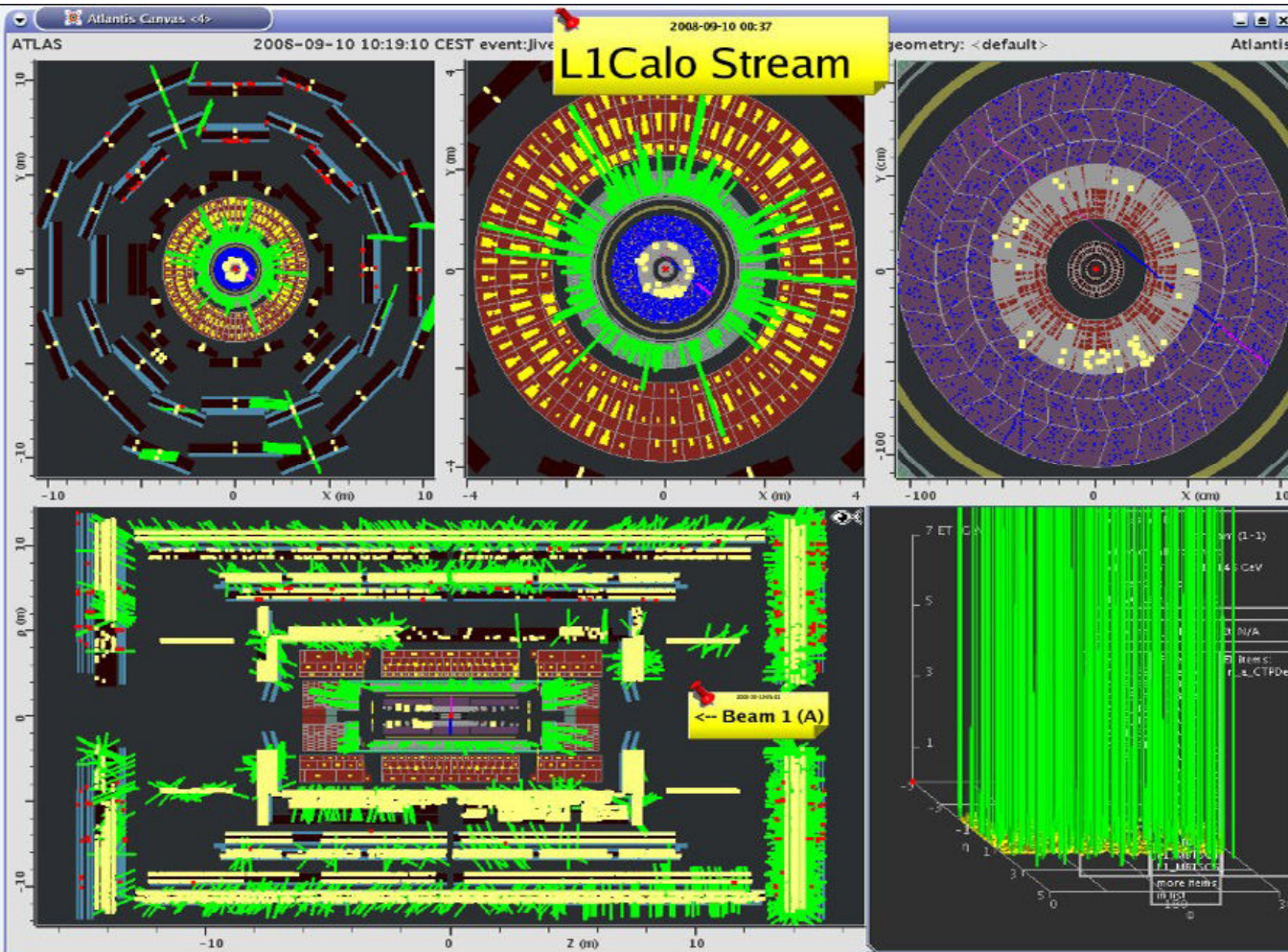
Bern and Geneva



CHIPP Plenary - 2009/08/24

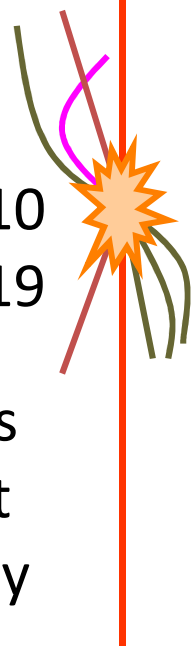


# First Beam Event

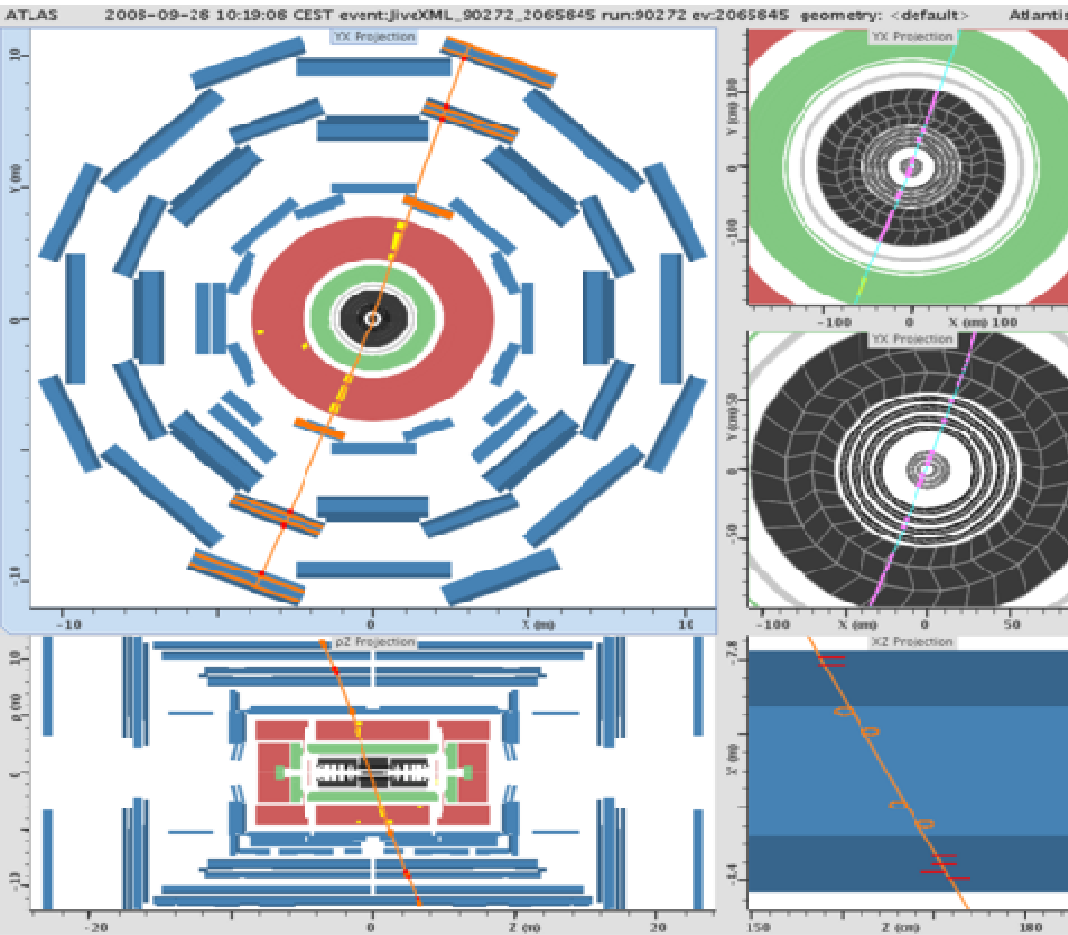


2008/09/10  
10:19

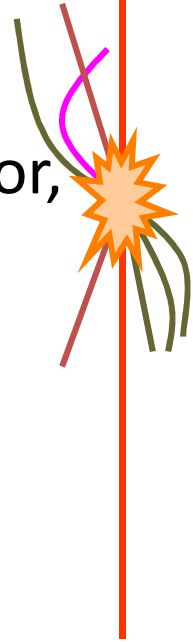
$2 \times 10^9$  protons  
at 450 GeV hit  
closed tertiary  
collimators.



# Commissioning with Cosmics



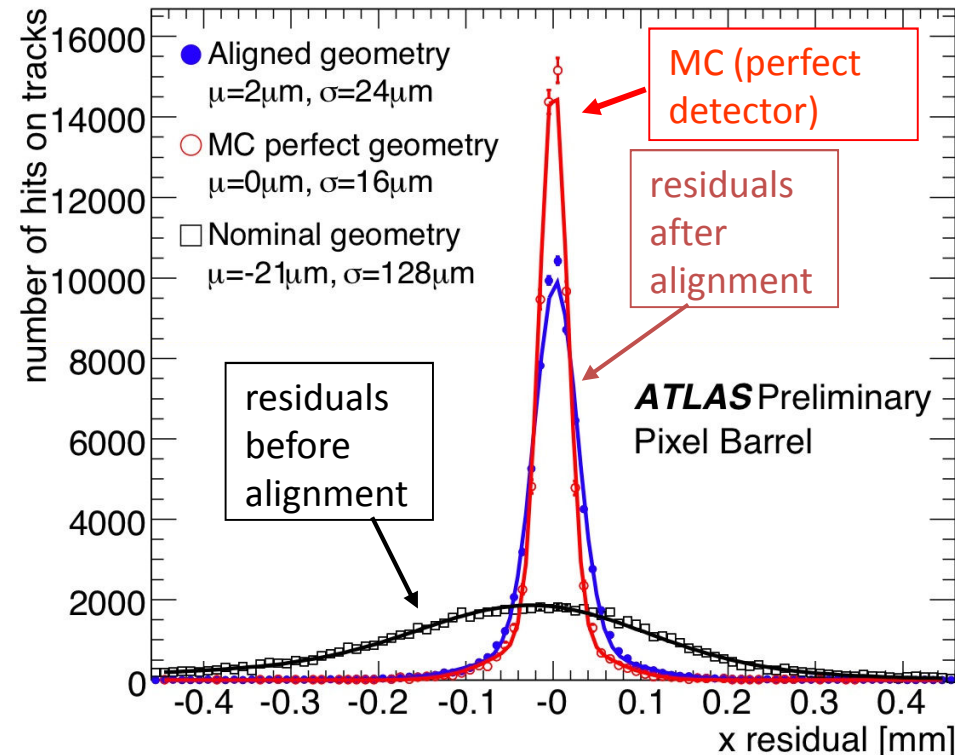
- Commission detector, hardware and software event selection.
- Calibration and alignment studies.
- 1-700Hz of cosmic muons selected
- ~ 5M cosmics selected with software track trigger.



# Software Trigger

- Responsible for PCs running online software based trigger. (Bern)
- Training collaborators to monitor online selection algorithms. (Bern)
- Debugging online software selection algorithms. (Geneva)
- Developing new software algorithms for online data selection. (Geneva)

Pixel alignment with cosmic data



Residuals: distance between fitted track and hits in the individual layers

# 2009-2010 Physics

## 1. Early measurements

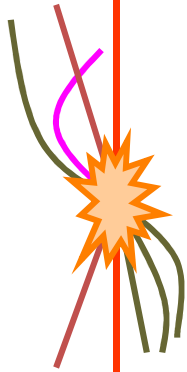
- Minimum Bias (Geneva)
- $J/\psi \rightarrow e^+e^-$  (Geneva)
- $E/\gamma$  performance (Bern/Geneva)

## 2. Medium term

- W+Jets, Top physics (Bern/Geneva)
- Direct photons (Geneva)
- Trigger studies for new physics searches (Bern/Geneva)

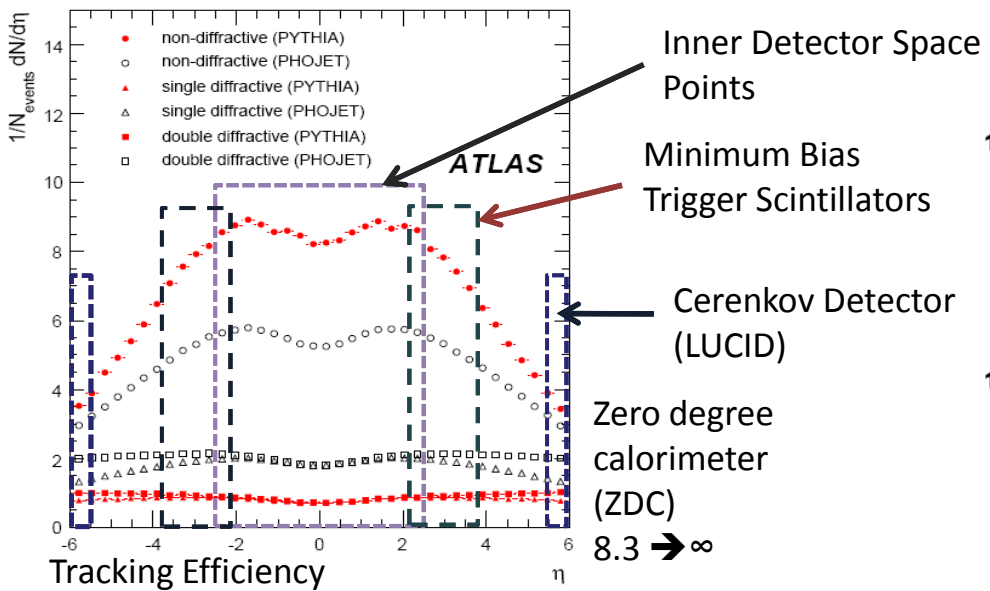
## 3. End of 2010 run - early discoveries?

- SUSY (Bern/Geneva)
- Excited Electrons (Geneva)
- Heavy Ion Physics (Geneva)

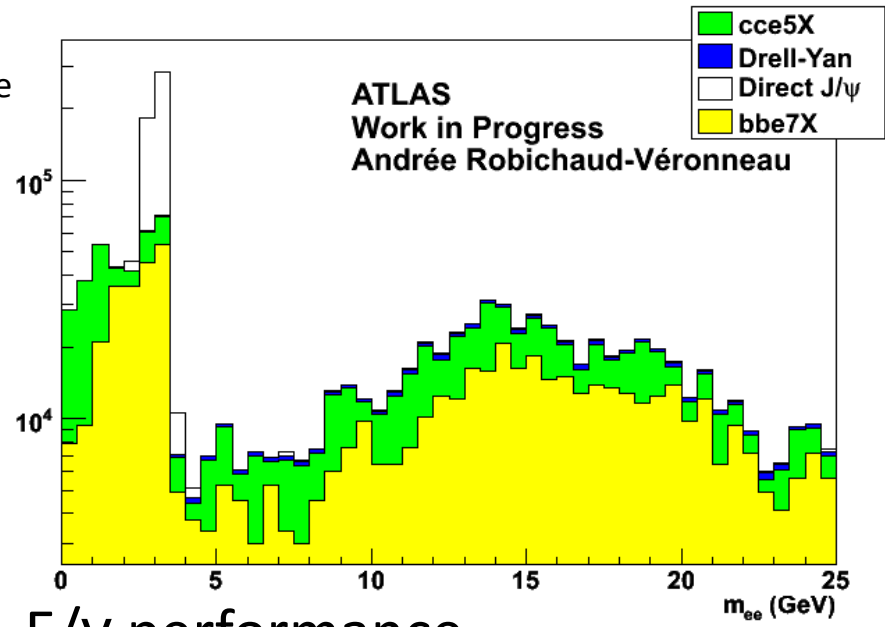
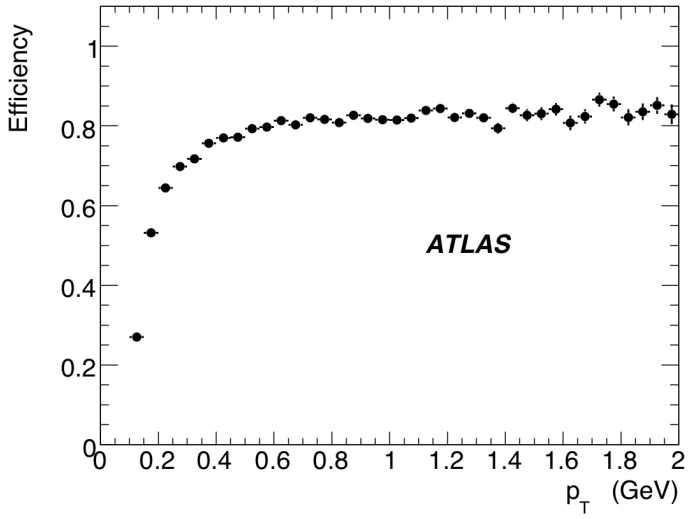




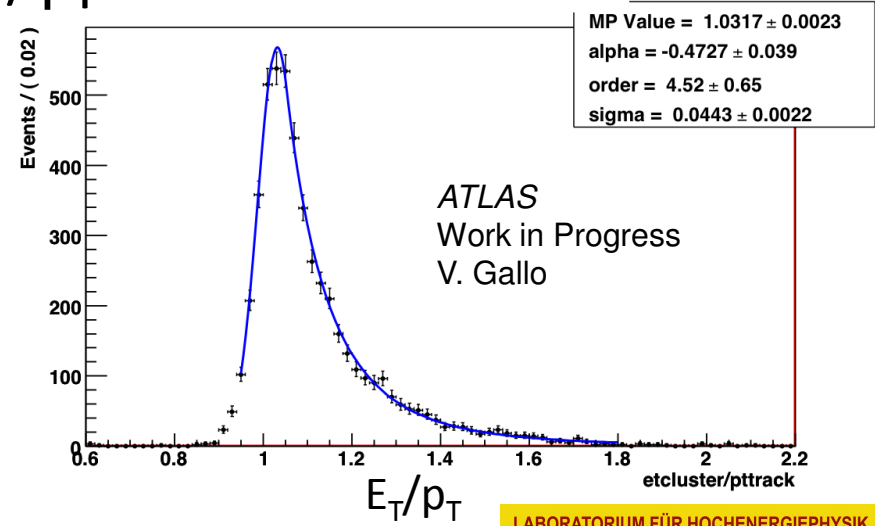
### Trigger Strategy



### Tracking Efficiency



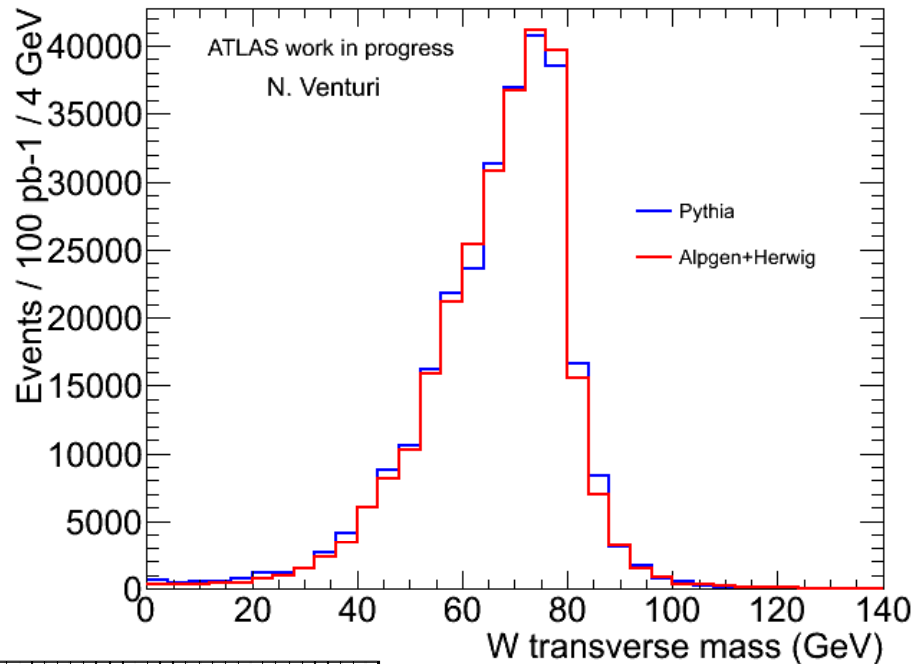
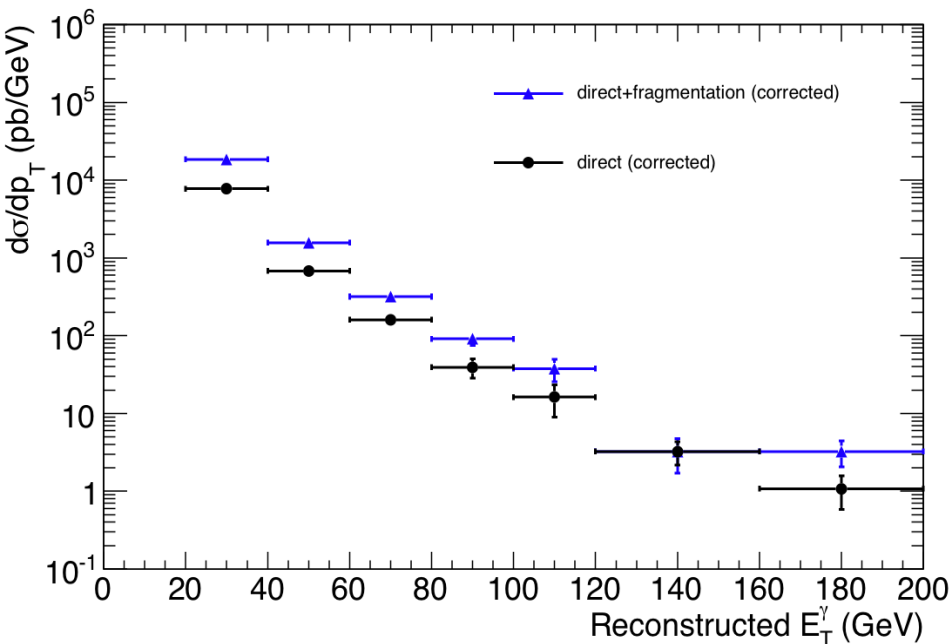
### E/γ performance



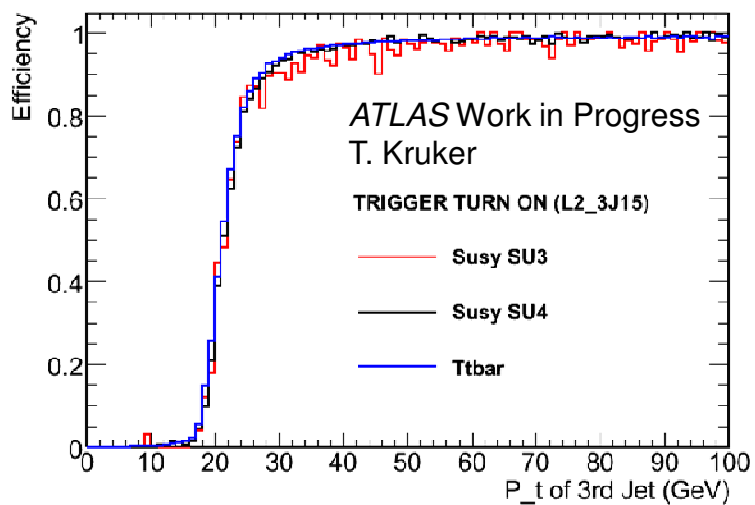
# Medium Term

Direct Photons

W+Jets



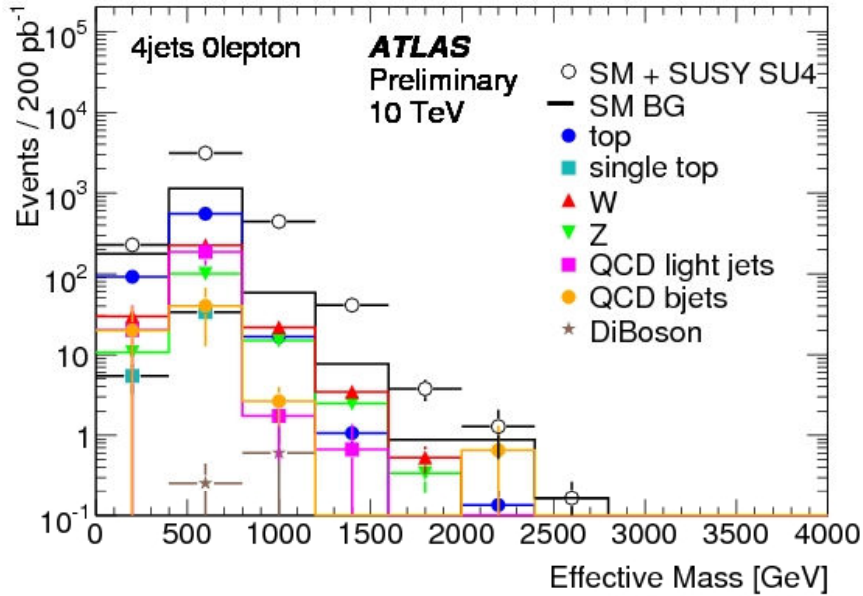
Trigger studies for SUSY Searches



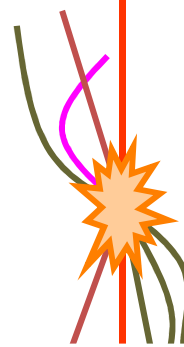
Studying (multi)-jet signatures.

# SUSY Searches

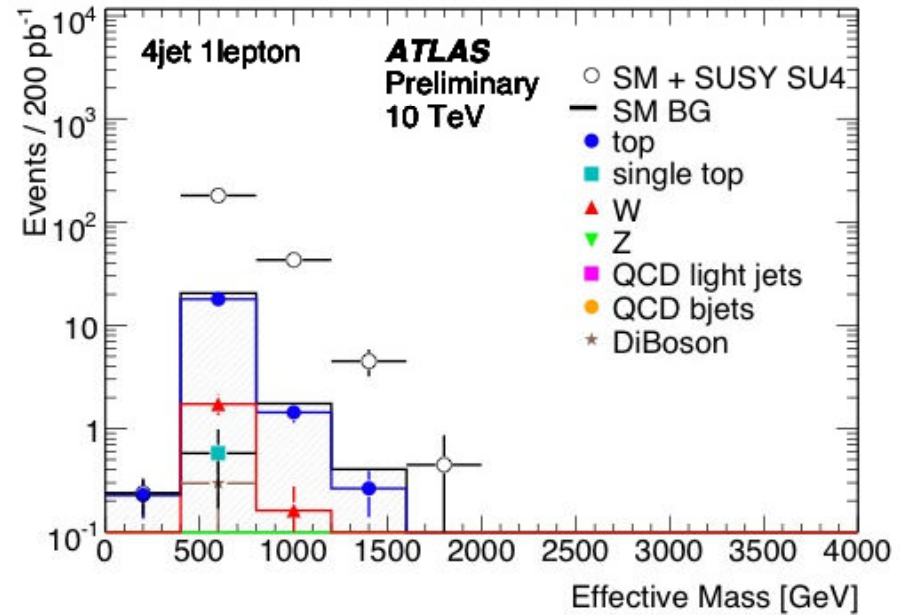
Jets +  $E_T^{\text{miss}}$



$\sqrt{s} = 10 \text{ TeV} \quad 200 \text{ pb}^{-1}$



Jets +  $E_T^{\text{miss}}$  + lepton

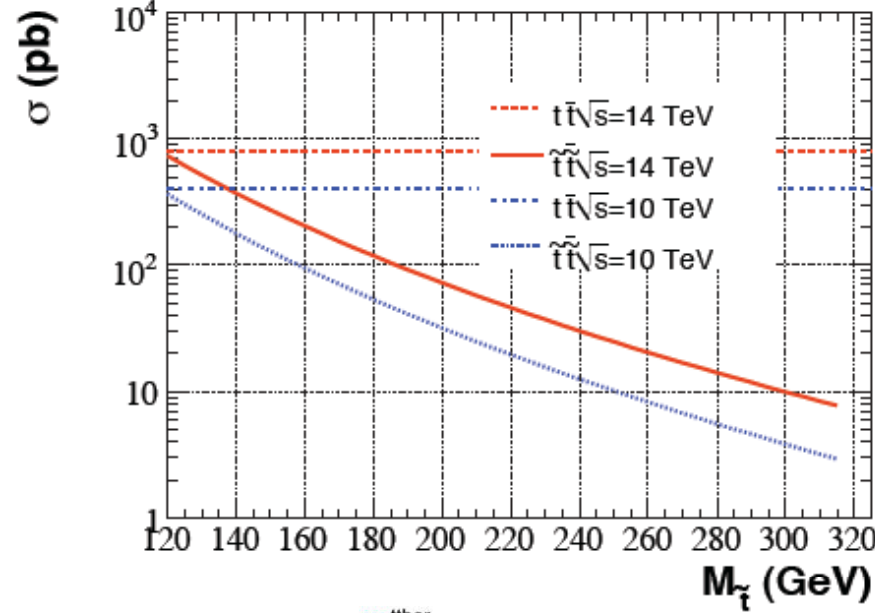
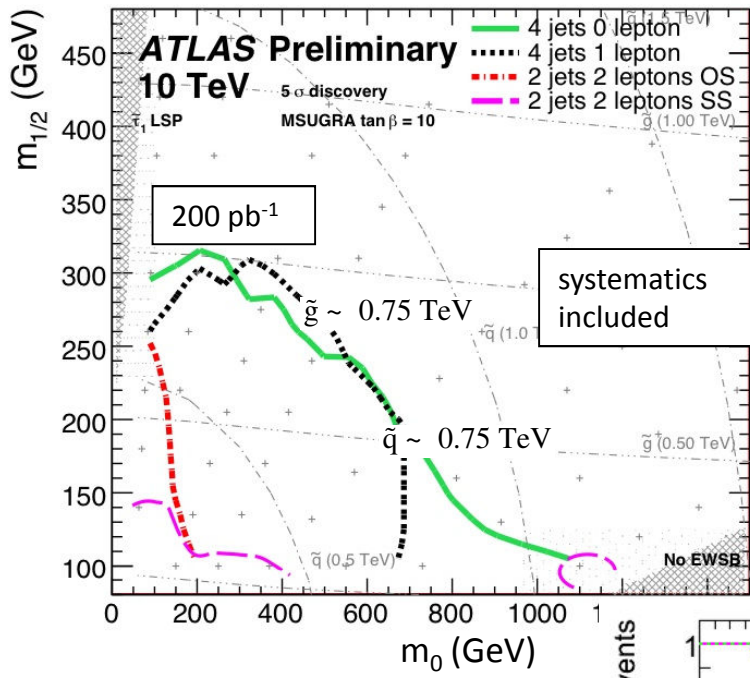


$$M_{\text{eff}} \equiv \sum_{i=1}^4 p_T^{\text{jet},i} + \sum_{i=1} p_T^{\text{lep},i} + E_T^{\text{miss}}$$

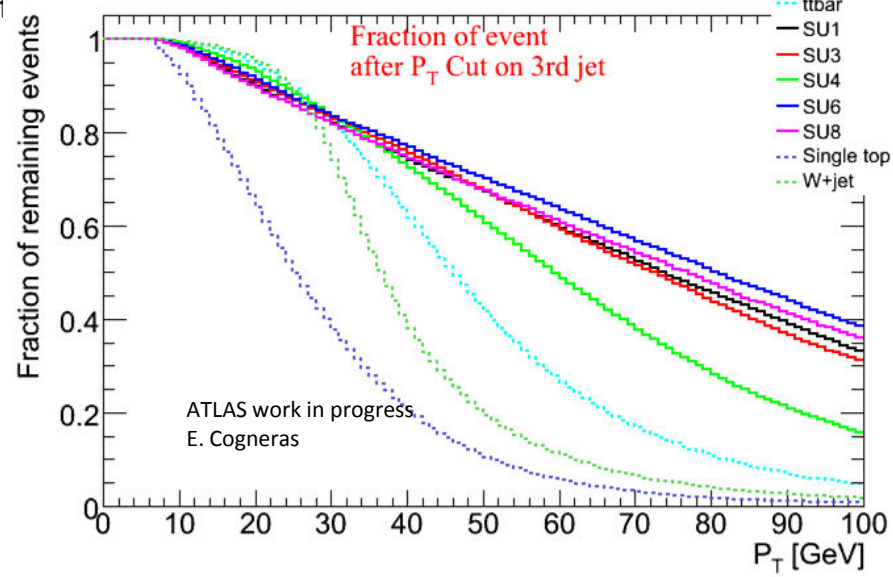
# SUSY Searches

Light Stop Cross Section

Discovery reach in the  $m_0$ - $m_{1/2}$  plane

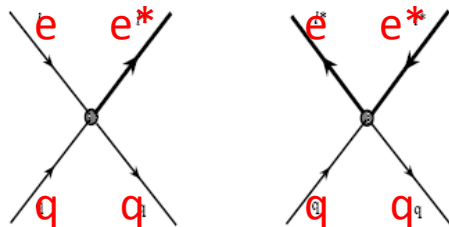
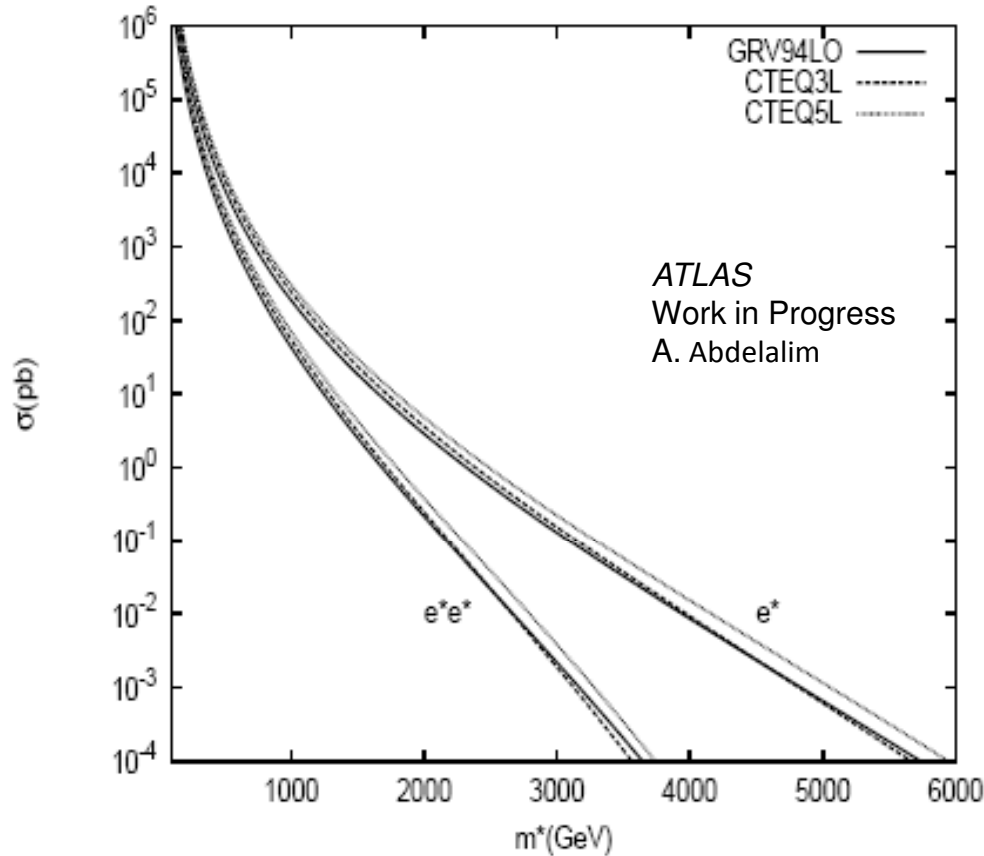


Signal selection and background rejection as a function of 3-jet threshold

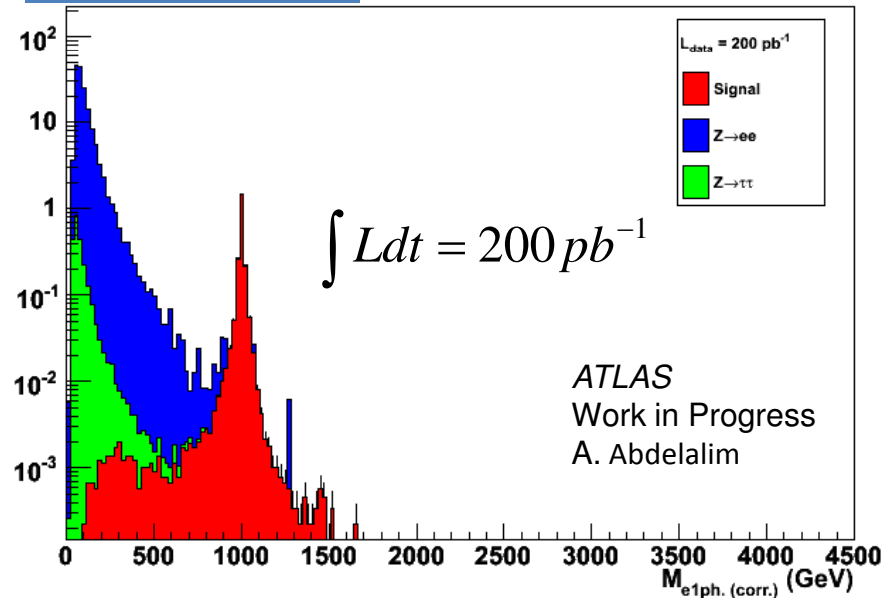


# New Physics: Excited Electrons

- Gauge Mediated decay modes:
  - $\nu + W \rightarrow 2j + E_T^{miss}$  or  $l + E_T^{miss}$
  - $e + \gamma$  : most promising channel
  - $e + Z \rightarrow e + 2j$  or  $e + 2l$



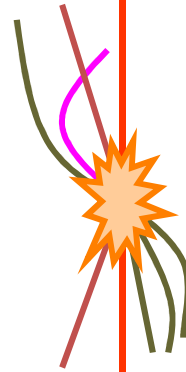
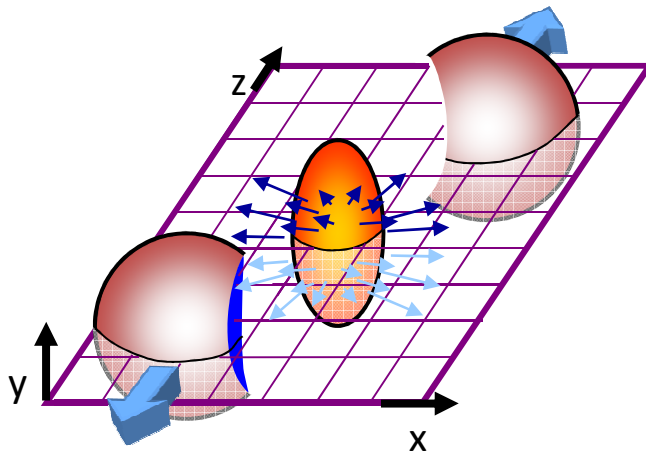
Reco.  $m_{e\gamma}$   $m_{e^*} = 1\text{TeV}, \Lambda = 5\text{TeV}$



# Heavy Ion Physics

- Global variable measurements
  - $dN/d\eta$ ,  $dE_T/d\eta$ , Elliptic Flow, Azimuthal distributions
- Jet measurement and jet quenching
- Quarkonia suppression

} Directly linked to  
Quark Gluon  
Plasma



# Conclusions & Outlook

- Detector operational
  - Selected beam splashes, beam halo from first beam
  - Large scale cosmic running with active hardware and software trigger selection
  - Preparing detector and trigger selection for physics running.
- Wide range of physics analyses for 2009/2010 data.
  - Physics commissioning, SM measurements, and BSM at end of run.
- Looking forward to first collisions!

