



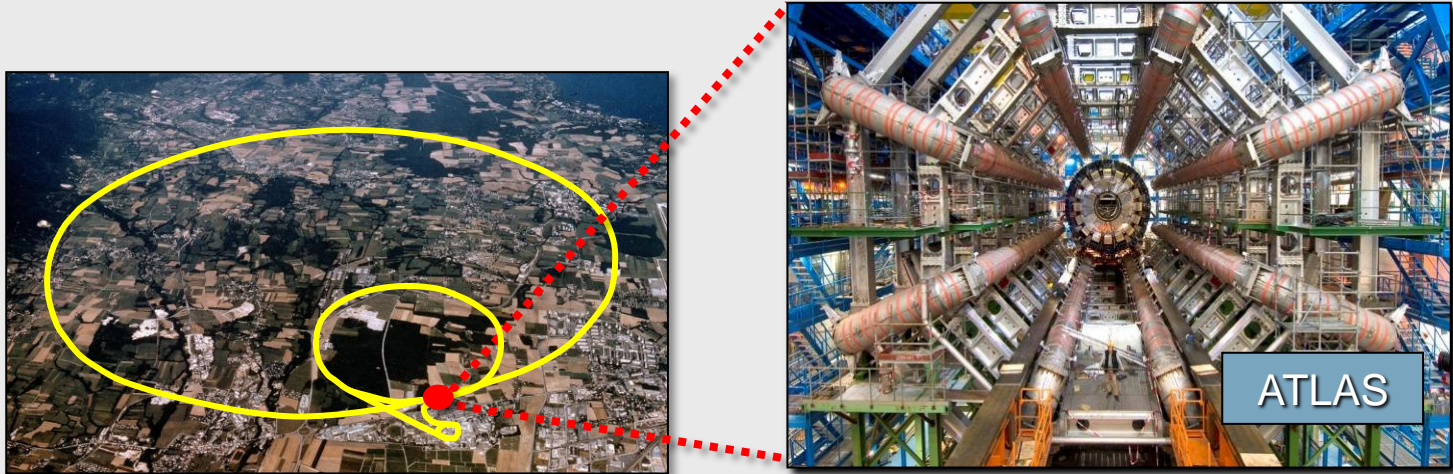
Study of Single and Diboson Z Production at the LHC

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A Toroidal LHC ApparauS

- General purpose detector
- Designed to identify particles and measure their properties
- Explores the high energy frontier for new physics



W/Z Data Analysis Group

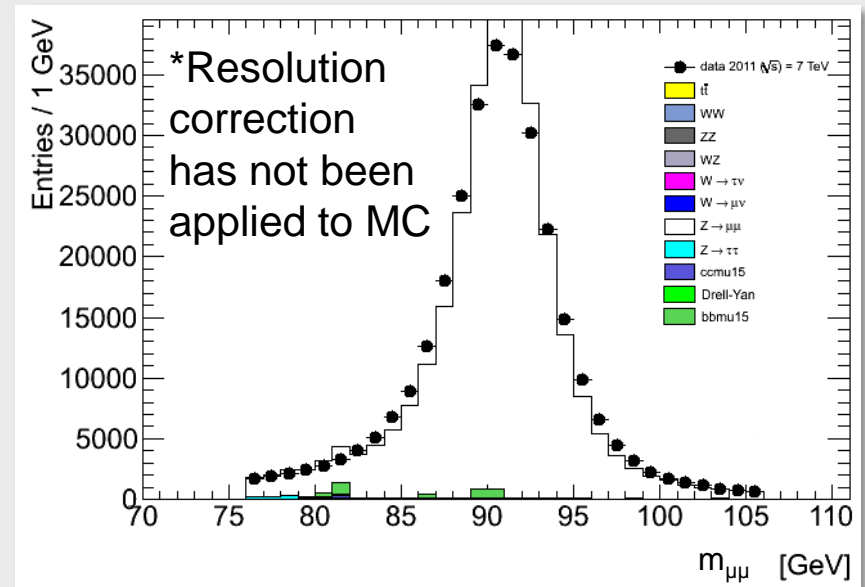
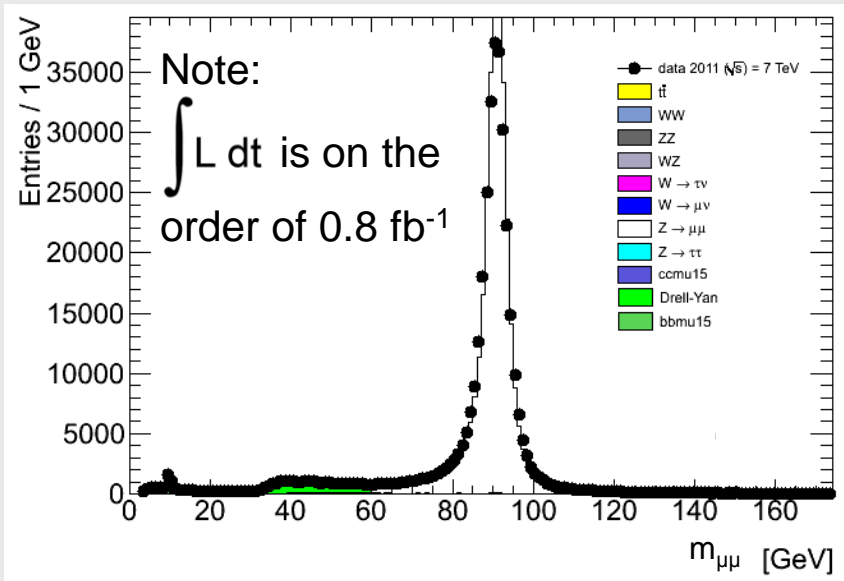
- Rigorous data analysis can easily take many months to complete
- Goal: To understand how data analysis is used in high energy physics
 - Same basic techniques apply to most particle searches (e.g., Z' or Higgs)
- First exercise: Coded simple data analysis program to reduce background noise via selection criteria
- Switched over to W/Z CERN group data analysis code

Step 1: Single Z Production

- Goal: “Rediscover” single Z-boson production
 - Need to always be able to reproduce results to show that we understand our experiment
 - Z-boson is an excellent test because we know its mass and width to a very high precision
 - Used to study electron and muon reconstruction and derive calibrations
 - Used to improve our understanding of PDFs
- Implemented analysis code to run on 2011 data and simulations
 - Large amount of time spent on debugging

Step 1: Single Z Production

- Applied “cuts” to select events for the $Z^0 \rightarrow \mu^+ \mu^-$ decay channel



Invariant mass after
“base” + opposite charge
cuts

Invariant mass after
“base” + opposite charge +
invariant mass cuts

Step 2: Diboson Z Production

- Goal: Study double Z-boson production
- Need to implement a module for the $ZZ \rightarrow \ell\ell\nu\nu$ decay channel
 - Requires extra cuts on the relative transverse missing energy
- Important test on the high energy behavior of electroweak interactions
- Deviations from SM indicate new physics
- If none, we set stringent new limits on models beyond SM

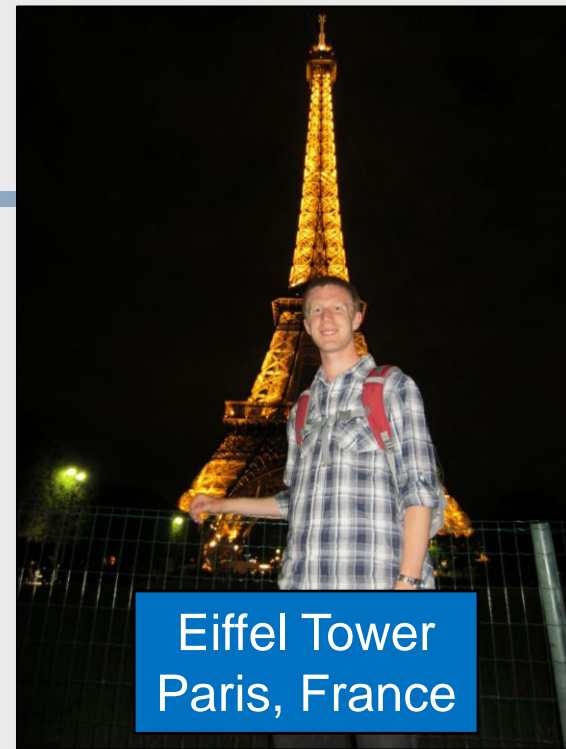
Adventures



Colosseum
Rome, Italy



Houses of Parliament
London, U.K.



Eiffel Tower
Paris, France



Mona Lisa
Paris, France



Tour de France
Paris, France