PhD Thesis Plan

João Pela

Imperial College London

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Introduction

Thesis topics

- Developing the monitoring for the CMS Level-1 Trigger
  - Design, implementation and update of monitoring tools
  - Data certification
  - Planning for future monitoring
- Higgs to Invisible search in the VBF channel using the CMS detector
  - Preparation of triggers for run I
  - Prompt data Run I analysis
  - Parked data Run II analysis
  - Preparations for run II

Deadline: 31st of December of 2015

- College 4 years deadline.
- FCT Funding.

Work yet to be finished

- Obtaining Monte Carlo results for the Run I parked analysis cross check (implementation of weights)
- Finishing the tuning of the run II trigger
- Making a final proposal for new Monte Carlo QCD samples with VBF characteristics

Chapter Summary

Chapters

- Theory $\sim$ 10-15 Pages
- Detector $\sim$ 15 Pages
- Technical work $\sim$ 20-30 page
- Physics Objects and Monte Carlo simulation $\sim$ 10-15 pages.
- Prompt data analysis $\sim$ 10 pages
- Parked data analysis $\sim$ 20-25 pages
- Run II preparation $\sim$ 20-30 pages

The total length of the thesis is intended to be in the range of 100-150.

Chapters I

Theory $\sim$ 10-15 Pages

- Basic Standard Model description
- Explanation of electroweak symmetry breaking
- Description of Higgs production and decay channels
- Higgs as a gateway for dark matter searches

Detector $\sim$ 15 Pages

- LHC machine overview
- The CMS detector and its components (emphasis on the trigger)
- What are the changes for run II

Chapters II

Technical work $\sim$ 20-30 page

- Development of Level-1 Trigger Data Quality Monitoring
- Data certification during run I
- Planing of run II future monitoring

Physics Objects and Monte Carlo simulation $\sim$ 10-15 pages

- Description of all the relevant objects and selections.

Chapters III

Prompt data analysis $\sim$ 10 pages

- Brief description of the analysis

Parked data analysis $\sim$ 20-25 pages

- Detailed explanation of the analysis
- Description of the cross check analysis and its results
- QCD background study using QCD VBF+MET like samples

Run II preparation $\sim$ 20-30 pages

- Trigger development and optimisation
- Study/proposal of QCD VBF-like sample for QCD background understanding/estimation

Last Notes:

Time Planning

- Currently finishing work on both QCD sample proposal and trigger tuning while writing at the same time relevant chapters of the thesis.
- Currently also writing the "Detector" chapter
- I plan to write the theory chapter just after the ESHEP summer school while simultaneously doing the remaining work on the cross check analysis.
- Remaining time will be used to write.