

Thesis Plan

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The thesis will focus both on my service work developing the monitoring for the Level-1 Trigger of the experiment and also on the Higgs to Invisible search in the VBF channel using the CMS detector at the LHC. My funding ends on the 31st of December of 2015 and this is also the 4 year deadline set by the college for delivering a thesis.

The Higgs analysis work encompasses the preparation of triggers for run I, the contribution to the analyses using Prompt and Parked run I data and preparations for run II.

The work yet to be finished includes obtaining Monte Carlo results for the Run I parked analysis cross check, finishing the tuning of the run II trigger and making a final proposal for new Monte Carlo QCD samples with VBF characteristics.

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

1 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

2 Detector \sim 15 Pages

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

3 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

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

- Description of all the relevant objects and selections.

5 Prompt data analysis \sim 10 pages

- Brief description of the analysis

6 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

7 Run II preparation \sim 20-30 pages

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