Nicholas Wardle – Thesis Plan

Title : **Observation of a new particle in the search for the Standard Model Higgs boson at the CMS detector.**

Chapter 3: Higgs decay to two photons

~ 3 weeks (28th Nov – 18 Dec)

Section 3.1 Object identification ~ 6-8 pages

- PAS+notes subsection on photon id and vertexing
- MC/data comparisons
- Event selection

Section 3.2: Signal Extraction ~ 35-40 pages

3.2.1: Analysis Strategy

- Overview of search strategy
- sideband mva analysis/ sliding window search

3.2.2: Signal modelling

describing systematics and how they are included into the model.
Describe relevant measurements from Z's (mostly taken from AN)

3.2.3: Background Modelling

Datafits to sidebands , systematic studies on background normalization and shape (linear, 2nd order pol . . .

Section 3.3 : Search Results ~ 10 pages

3.3.1 Statistical Interpretation of the Data

3.3.2 Results from 2011 dataset

Section 3.3: 8TeV Results ~ 5 pages

- updates to ICHEP (including analysis changes)
- include "baseline mva" analysis results ?

Chapter 2: The CMS Detector

~ 2 weeks (4th Jan – 14th Jan)

Section 2.1: Detector Components

- General description about detector and components **~ 5 pages**

2.1.1: Electromagnetic Calorimeter ~ 3 pages

2.1.2: L1 Trigger ~ 4-5 pages

- L1 JEC Internal note documented already

Chapter 4: Higgs Combinations and Properties

~ 3 Weeks (14th Jan– 4th Feb)

Section 4.1: Combined Searches ~ 10 pages

- Description of other channels (very brief, taken from PASes)
- Diagnostics (could just reference Analysis Note)

Section 4.2 Combined Higgs Discovery ~ 5 pages

- 2011+2012 (ICHEP) Higgs combination results

- sub-combinations , LEE ….

Section 4.3 Properties **~ 5 pages**

- SM compatibility (Feldman cousins)
- Simple kVkF fits? Could include as a look ahead for couplings

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Chapter 1: Theory and Motivations

~ 2 weeks (4th Feb – 18th Feb)

Section 1.1: The Standard Model

- Local Gauge theory + SM Lagrangian ~ **5 pages**

Section 1.2: The SM Higgs

1.2.1: The Higgs Mechanism ~ 5 pages
1.2.2: Constraints and previous searches ~ 3 pages
1.2.3: Higgs Production at the LHC ~ 2-3 pages

Chapter 0: Introduction

~ 1 week (18th-End Feb)

- Preamble
- Declaration of work, list of figures/tables

Chapter 5: Conclusions **~ 2 pages**

~ days (whenever fits)