Acknowledgements:

* Move **Annabel Shaw** from family and loved ones to the end of my list of friends given the end of our relationship.

Introduction:

* Page 23: ~~While~~ **T**he top quark**’s** ~~has the same properties as the other five quarks, its~~ mass of 173+/-0.4 GeV [21], not only places it near the electroweak …
* **~~While the top quark has the same properties as the other five quarks,~~**
  + **WHAT?**
  + **The top quark’s mass of 173.0 +/- 0.4 GeV …**

An Introduction to the Standard Model and Top Quark Physics:

* The Standard Model:
  + QED: “… Heisenberg's uncertainty principle, it***s* (or *the*)** field experiences random fluctuations.”
  + Page 27: Table 2.2 – Gauge Bosons heading -> Bosons.
  + Higgs: “Brout, Engler, Higgs,**[insert space]** Guralnik, Hagen …”
  + **Rephrase:** *Infinite minima*
  + Page 32: Higgs Mass!
* Top Physics:
  + *Page 33: Last sentence rephrase.*
  + Page 35: Reorder bullet points to emphasise greater importance of the latter point.
  + **~~Given that~~** **As** the top quark was more massive than initially assumed **~~however~~**, …
  + Top quark pair production:
    - Missing second bullet point: **·** Higher centre-of-mass energies results in smaller Bjorken *x*
  + Single top production:
    - Figure 2.5(a) – bbar is NOT from the sea! Due to charge asymmetric initial state
  + Single top production in association with a Z boson:
    - In contrast, ttZ **[insert space]** has a lower …
    - **trilepton**: when the W boson decays into a lepton and neutrino and the Z boson decays into a lepton and anti-lepton **[insert full stop].**
    - **hadronic**: both the W boson and Z boson decay into a quark and anti-quark **[insert full stop].**
    - as a result of the **t**Z and tbarZ cross sections increasing with the centre-of-mass energy at a similar rate to ttZ **[insert space]** and …
* *LHC and CMS:*
  + *LHC:*
    - *The LHC can also operate in a heavy-ion mode, where lead ions are collided at 2.76TeV per nucleon* ***which******is*** *usually* ***done*** *for one month a year.*
  + *CMS:*
    - *Silicon Microstrip Tracker (page 49): WHY smaller pitch?*
    - Silicon Microstrip Tracker (page 49): Correct z0 -> z
    - ECAL: (page 49) :more radiation hard vacuum **phototriodes** in the endcap disks
    - *Make it clear that the Phase-1 pixel has always been planned*
    - Muon Chambers, DTs (page 53): Correct z0 -> z’s
    - Level-1 Trigger: **Fix broken reference! Same as previous reference.**
* *TMTT:*
  + *The Phase-II Outer Tracker Upgrade:*
    - *… innermost layers)* ***[insert space]*** *and …*
    - *Capitalised start of bullet points*
    - *Further details on the two pT-modules can be found in* ***[correct reference ordering]***
    - ***Fix reference ordering in*** *Figure 4.2*
  + *The Track Finding Architecture:*
    - *“as previously demonstrated by the Phase-I Calorimeter Trigger Upgrade* ***[fix reference]*** *…”*
    - *“Details of the mathematics involved in the Kalman formalism is given …”* ***Think that this paragraph can be rephrased to flow better.***
* *Event Simulation and Object Reconstruction:*
  + 2nd opening paragraph: The event simulation and **object** reconstruction algorithms
    - *Object Reconstruction:*
      * *Particle Flow Algorithm*
        + Page 94: granularity detector considered (**HCAL**/ECAL).
      * *Push MET subsection onto new page?*
* *Analysis Strategy and Event Selection:*
  + *Signal Region:*
    - ***Introduce forward referencing to the event selection definitions (P110-112).***
      * ***The selection criteria for the physics objects that are Sections 6.1 and 6.2 are defined in detail in Section 6.6***
    - Page 102: “and as ***~~as~~*** passing the loose jet identification criteria “
      * What about tight jets? Unclear as no forward referencing – the cut name is PF loose, used as a “tight” jet cut.
    - The leading and sub-leading electrons pT > **35** GeV(**15** GeV) respectively and be within eta < **2.40. …** The leading and sub-leading muons pT > **26** GeV(20 GeV) respectively and be within eta < **2.40.**
    - Be clear that I mean +/- 20 GeV and not +/- 10 GeV.
    - Justify the b-jet upper limit
  + *Experimental blinding:*
    - *Stray* ***)*** *for optimised chi2 values.*
    - Figure 6.1 top/bottom -> left/right.
  + *Physics objects:*
    - *Lepton Selection:*
      * *Electrons:*
        + *Full 5x5σiηiη – add a brief summary.*
      * *Muons:*
        + *“muons must have eta <=* ***2.40*** *to ensure that a muon is fully within the …”*
  + *Background Processes:* 
    - Z+Jets and W+jets backgrounds: Rephrase title: **Vector Boson in association with multijet backgrounds**
* *Background Estimation:*
  + *Data and Simulation Samples:*
    - *Table 7.2 resize*
  + *Simulation Corrections:*
    - *APV: paragraphs 2+3 can be one paragraph*
  + *Data-driven Background Estimation:*
    - *ttbar Background:*
* *Results:*
  + *DATA IS OF GOOD QUALITY - NOT EXPECTING RESULTS TO CHANGE*
* *Conclusion:*
  + *Summary of the TMTT track finding processor studies:*
    - *“…the three* ***proposed*** *track finding…”*
  + *Rename 9.4: “Future* ***track finding processor*** *system development”*
* *References:*
  + *149 – needs making clearer*

**TO DO LIST**

* Look up examiners:
  + Dr Jonathan Michael Hays
    - `Origins of mass of fundamental particles.
    - Higgs searches
  + Professor Akram Khan
  + Dr Rajagopal Nilavalan
* What did my PhD involve?
* What does my thesis involve?
  + Succinctly describe analysis:
    - Each stage of the analysis – Z+jets backgrounds, key points!
    - It is compatible with SM (more than SM) and saw signal.
    - Order importance of why search for tZq.
* Describe design choices for CMS
  + How good is the error/B field in the tracker?
* Describe Hough Transform and Kalman Filter.
  + Difference between TMTT and offline KF.
* Describe Yukawa Coupling – coupling between scalar and dirac fields.
* Describe asymptotic freedom – unbound at small distance.
* Explain ttH and tW/WN interference
* What is isospin?
  + Quantum number related to strong interactions. Isospin symmetry is a subset of flavour symmetry. QM description is similar to spin, wrt. how it couples. It is a dimensionless quantity that is not related to any actual spin!
  + Weak isospin is the gauge symmetry of the weak force that only couples to LH fermions. Isospin in contrast couples to LH and RH particles and is a global symmetry. Weak isospin is understood as the eigenvalue of a charge operator, where the conserved quantity is T3.
* Implications of non-unitary CKM matrix!
* Describe van der Meer scans
* Describe Lund String Model
* Describe jet reco algorithms
* Describe matching algorithms (differences between MCM and FxFx)
  + Basic principles and differences!
* Why separate MC samples?
  + Statistics!
* Why does PU need correcting?
  + Minimum bias events rely on the underlying event and MC is generated before data PU profile is known.
* Concisely explain blinding
* How is hadronic punch-through measured?
* How much signal is discarded?