Working Thesis Outline

Acknowledgements: I clearly needed a lot of help to get this done.

Part I: Introduction and Context

1. What is reionization? Why do we care?
   A. CMB tells us that Universe is neutral at $z \sim 1080$
   → How do we know this? Easy to explain?
   B. Nearby quasar spectra tell us hydrogen is ionized today
   C. How did this happen? Interesting in its own right
   D. Timing and nature of reionization affects structure formation as well
2. Selected summary of EoR probes
   A. Lyα Forest
      → Ideal interpretations, complications with large τ
      → Gunn-Peterson trough
      → Damping wing redward of Lyα
      → Dark pixel covering fraction
   B. CMB Constraints
      → τ_e
      → kSZ
   C. Lyα Emitters (Lidz, Taylor)
      → Lyα fraction
      → Lyα clustering
   D. 21-cm Line
      → 21 cm intensity mapping
      → Power Spectrum (Lidz, Aguirre, Moore)
      → Global 21 cm
   E. Luminosity Function Measurements?
      → Photon counting to constrain reionization
      → GRBs
3. Summary of Constraints
   A. Timing
      → A good plot to show might be Figure 3 of Robertson et al. (2015)
   B. Sources
      → Could describe arguments against quasars (due to insufficient abundance)
      → and X-ray sources due to lack of presence in X-ray background
      → Robertson et al. (2013/2015) support galaxies primarily sourcing EoR
      → Could mention temperature/heating scenarios ruled out by PAPER

Part II: The Lyα Forest is Lovely, Dark, and Deep...

A. Stacking spectra to constrain $\langle x_{\rm HI} \rangle$

B. Wavelet analysis to measure IGM temperature

Part III: The 21-cm Line

A. Blindly Identifying Ionized Regions in Noisy Redshifted 21cm Observations

Part IV: Conclusions

→ Wait, um... What goes in here?

→ Briefly summarize results of work contained

→ Describe future direction, concerns that need to be addressed

→ Cite lots of stuff.

Papers to Review

Part I: -

- Furlanetto, Oh, and Briggs review
- Robertson et al. 2013/2015
- Loeb and Furlanetto Books

Part II:

Questions to Answer for Yourself

- What is the "gravitational instability" model in the context of the Lyα forest?