

# MIT EOR Reading List

## Introduction

This reading list is an attempt to gather together the papers which form the backdrop for the sessions at the MIT EOR Workshop. By necessity it is an incomplete list, but is intended to give an overview of the work important to each session. Unfortunately there are almost no published papers describing the 21 cm observatories, and because these designs are actively evolving much of the information available on the web is out of date. It is hoped that more material on the experimental side will be made available at the workshop. Do not feel obligated to read all of the papers, but please look through the list and catch up on the sessions which you are most interested in. If this document is viewed in Adobe Acrobat or Reader, hyperlinks to all of the papers can be clicked to ease retrieval.

## Signatures at 21 cm of Structure Formation and the Epoch of Reionization

Chen & Miralda-Escude 2004, "The Spin-Kinetic Temperature Coupling and the Heating Rate due to Lyman Alpha Scattering before Reionization: Predictions for 21cm Emission and Absorption," *Astrophys. J.*, 602 (astro-ph/0303395) *Lyman-alpha and X-ray heating rates, showing that X-ray heating dominates.*

Wyithe & Loeb 2004, "Redshifted 21cm Signatures Around the Highest Redshift Quasars," *ApJ*, submitted (astro-ph/0401554) *How to use transverse and line-of-sight Stromgren sphere observations to measure neutral fraction.*

Zaldarriaga et al. 2004, "21 Centimeter Fluctuations from Cosmic Gas at High Redshifts," *ApJ*, 608, 622 *Introduces the power spectrum formalism.*

Morales & Hewitt 2004, "Toward Epoch of Reionization Measurements with Wide-Field LO-FAR Observations," *ApJ*, submitted (astro-ph/0312437) *Another take on the power spectra.*

Furlanetto et al. 2004, "Statistical Probes of Reionization With 21 cm Tomography," *ApJ*, in press (astro-ph/0404112) *Concrete examples of what you can do with power spectra.*

Furlanetto & Loeb 2002, "The 21 Centimeter Forest: Radio Absorption Spectra as Probes of Minihalos before Reionization," *ApJ*, 579, 1 *Minihalos and the 21 cm forest.*

Carilli et al. 2002, "H I 21 Centimeter Absorption beyond the Epoch of Reionization," *ApJ*, 577, 22 *Larger scale structure and the 21 cm forest.*

Iliev, I.T., Shapiro, P.R., Ferrara, A., Martel, H. 2002, "On the Direct Detectability of the Cosmic Dark Ages: 21 Centimeter Emission from Minihalos," *ApJ*, 572, L123 *Power spectrum signature from minihalo 21 cm emission.*

## Issues for Theoretical Predictions of the EOR Signal

Barkana & Loeb 2004, “Unusually large fluctuations in the statistics of Galaxy formation at high redshift,” ApJ in press (astro-ph/0310338) *Discusses the scatter in galaxy formation, and therefore the EOR along different lines of sight due to cosmic variance.*

Bromm & Loeb 2003, “The formation of the first low-mass stars from gas with low carbon and oxygen abundances,” Nature, 425, 812-814 *Discusses the issue of the metallicity that defines the transition from Pop-III to Pop-II starformation.*

Cen, Dong, Bode & Ostriker 2004, “Properties of Cold Dark Matter Halos at  $z>6$ ,” ApJ, submitted (astro-ph/0403352) *Studies the statistics of bias, shape and number density of dark matter halos at high redshift.*

Dijkstra, Haiman, Rees & Weinberg “Photoionization Feedback in Low-Mass Galaxies at High Redshift,” 2004 ApJ 601, 666 *Follows the accretion of gas from a photo-heated IGM into a collapsing low mass dark matter halo at high redshift.*

Furlanetto, Zaldarriaga & Hernquist 2004, “The Growth of HII Regions During Reionization”, ApJ, submitted (astro-ph/0403697) *Develops an analytic formulation for the clustering and size distribution of HII regions. Discusses inside out vs outside in modes of reionization.*

Oh & Haiman 2003, “Fossil HII Regions: Self Limiting Starformation At High Redshift,” MNRAS, 346, 456 (astro-ph/0307135) *Suggests regulation of high redshift, low mass galaxy formation through gas entropy, and finds the formation of H<sub>2</sub> to be impeded by X-rays.*

Shapiro, Iliev & Raga “Photoevaporation of cosmological minihaloes during reionization,” MNRAS, 348, 753 *Describes the effect of feedback on minihalos reionization.*

## Analysis Techniques and Foreground Removal

Shaver et al. 1999 “Can the reionization epoch be detected as a global signature in the cosmic background?” A&A, 345 *Discusses the possibility of observing a global step in the radio spectrum.*

## History of the Spin Temperature and the Neutral Fraction

*CMB results:*

Spiegel et al. 2003, “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Determination of Cosmological Parameters,” ApJS, 148 *Overview of the WMAP results.*

Kogut et al. 2003, "Wilkinson Microwave Anisotropy Probe (WMAP) First Year Observations: TE Polarization," ApJS, 148 *WMAP polarization results that imply early reionization.*

*Lyman alpha emission:*

Cen, Haiman and Mesinger 2004, "Implications of the Lyman alpha Emission Line from a Candidate  $z=10$  Galaxy," ApJL, submitted (astro-ph/0403419) *Analyzing high redshift candidate using line symmetry measurements.*

Loeb, Barkana, and Hernquist 2004, "Was the Universe Reionized at Redshift 10?," ApJ, submitted (astro-ph/0403193) *Analyzing high redshift candidate using damping wing, implying low neutral fraction.*

Santos 2004, "Probing reionization with Lyman-alpha emission lines," MNRAS, 349 (astro-ph/0308196) *Calculations of the Lyman-alpha emission from  $z>6$  galaxies, including galactic winds may affect limits from Sloan quasars.*

*Lyman alpha absorption:*

Fan et al. 2002, "Evolution of the Ionizing Background and the Epoch of Reionization from the Spectra of  $z\sim 6$  Quasars," AJ, 123 (astro-ph/0111184) *Dating the EOR using Sloan quasars.*

Songaila 2004, "The Evolution of the Intergalactic Medium Transmission to Redshift Six," (astro-ph/0402347) *Analyzing the increase in optical depth observed in quasar spectra, implications for sharp increase claimed elsewhere.*

Mesinger, Haiman and Cen 2004, "Probing the Reionization History Using the Spectra of High-Redshift Sources," ApJ, 613 (astro-ph/0401130) *Method for determining neutral fraction from a statistical sample of quasar spectra.*

Furlanetto, Herquist and Zaldarriaga 2004, "Constraining the Topology of Reionization Through Lyman-alpha Absorption," MNRAS, submitted (astro-ph/0406131) *Modeling gaps in Lyman-alpha absorption due to patchy nature of reionization.*

Gnedin 2004, "Reionization, Sloan, and WMAP: is the Picture Consistent?," ApJ, in press (astro-ph/0403699) *Model which is consistent with Sloan and WMAP.*

*Stromgren sphere:*

Wyithe and Loeb 2004, "A Large Neutral Fraction of Cosmic Hydrogen a Billion Years After the Big Bang," Nature, 427, 6977 (astro-ph/0401188) *Using spectrum to identify Stromgren sphere and determine neutral fraction at  $z=6.3$ .*

Mesinger and Haiman 2004, "Evidence for a Boundary of the Cosmological Stromgren Sphere and for Significant Neutral Hydrogen Surrounding the Quasar SDSS J1030+0524," ApJL, submitted (astro-ph/0406188) *Using edge from Stromgren sphere and 2 Lyman lines to fit spectra and determine neutral fraction.*