
Polarization of 21cm Radiation from the Epoch of Reionization

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Babich & Loeb, submitted to Ap.J.
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Intrinsic vs. Secondary Polarization

- Zeeman Effect (Cooray & Furlanetto, astro-ph/0408314)



Intrinsic vs. Secondary Polarization

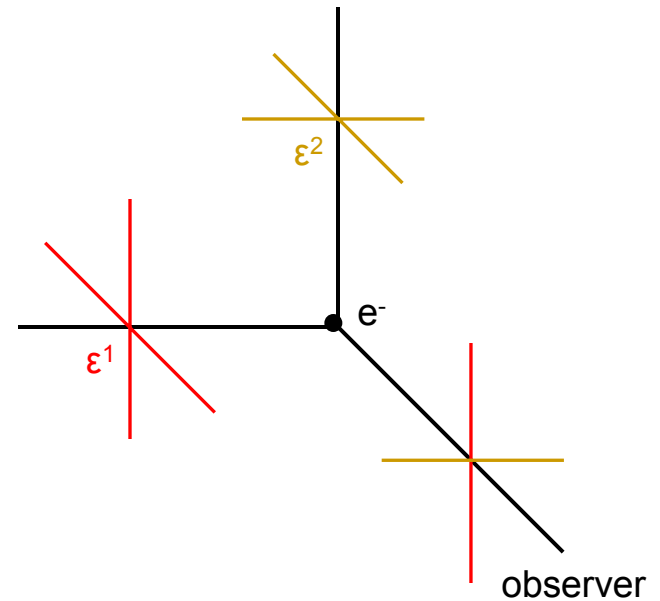
- Zeeman Effect (Cooray & Furlanetto, astro-ph/0408314)
 - Anisotropic Wouthuysen-Field Effect
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Intrinsic vs. Secondary Polarization

- Zeeman Effect (Cooray & Furlanetto, astro-ph/0408314)
 - Anisotropic Wouthuysen-Field Effect
 - Thomson Scattering
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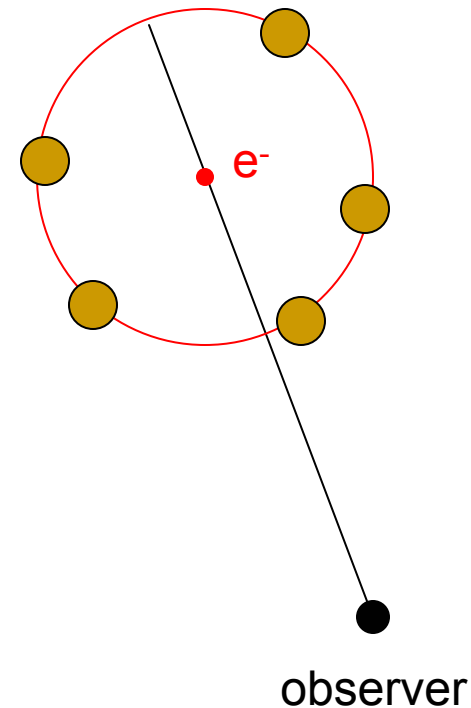
Thomson Scattering

- Quadrupole \rightarrow Polarization
- Free Streaming of Perturbations Produces Incident Quadrupole
- Density Inhomogeneities & Poisson Fluctuations
- E and B Type Polarization

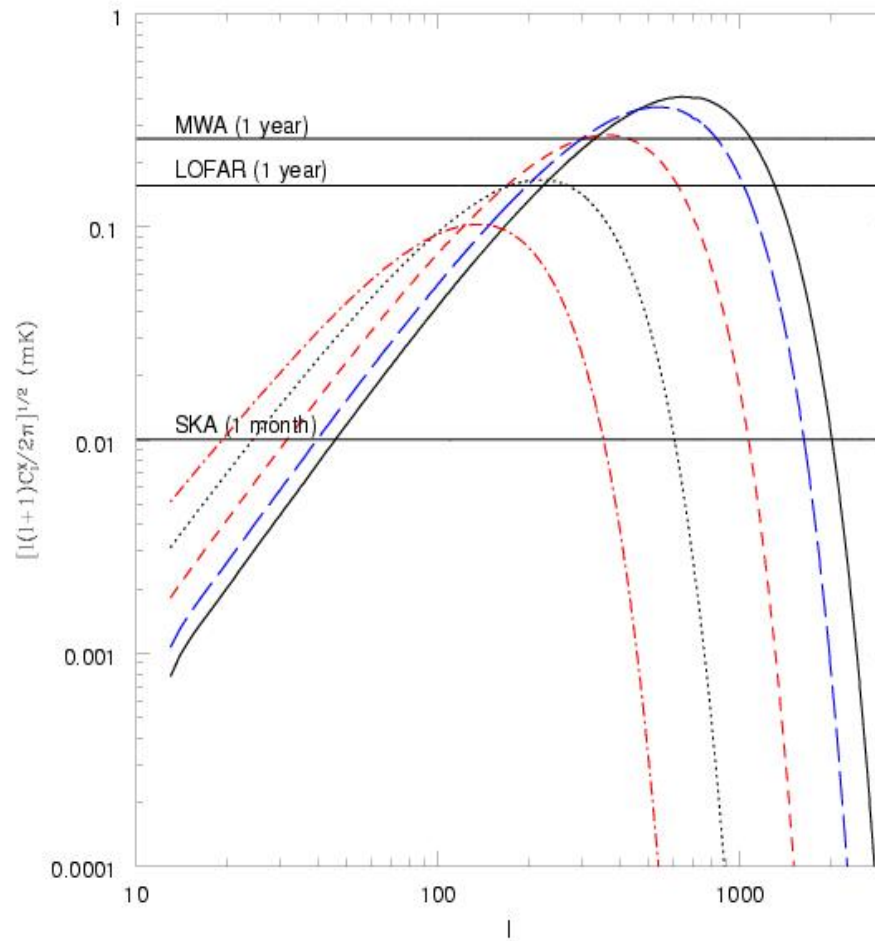


Correlation of Perturbations - Poisson Fluctuations

- HII Regions are Discrete, Induced Correlations $\sim (n_{\text{Bubble}})^{-1/2}$
- End of Reionization $1/n_{\text{Bubble}} \sim V_{\text{Bubble}}$
- Bubble Size Set By Analytic Arguments (Wyithe & Loeb, astro-ph/0409412)



TE Cross Correlation



Applications

- Independent Determination of Thomson Scattering Optical Depth
 - Foregrounds Should Produce Both E and B Type Polarization
 - Consistency Test For Foreground/Systematic Removal Techniques
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Conclusions

- Thomson Scattering Produces Largest Effect
 - Poisson Fluctuations of HII Regions
 - $TE \sim 0.1 - 0.3 \text{ mK}$ ($z \sim 6 - 20$)
 - Systematic & Foreground Checks
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