## Polarization of Rayleigh Scattered Ly $\alpha$ in Active Galactic Nuclei

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I. Abstract

Active Galactic Nuclei (AGNs) are characterized by a non-thermal continuum and many prominent emission lines. AGNs are usually classified by Type 1 and Type 2, where Type 1 AGNs exhibit both broad and narrow emission lines. In contrast Type 2 AGNs show only narrow emission lines. AGN unification model assert that all ANGs have both broad and narrow line regions with an optically thick molecular torus outside the broad line region hiding it from view of low latitude observers. Assuming the presence of high column neutral hydrogen in the molecular torus region, we propose that far UV radiation around Lya will be significantly polarized through Rayleigh scattering. Adopting a Monte Carlo technique we compute fluxes and degrees of linear polarization Rayleigh scattered Lya in a slab region and a torus region. Due to the enormous range of scattering optical thickness dependent on the wavelength we obtain a number of interesting cases where polarization flip occurs as the wavelength varies from the line center to the far wing regions. We conclude that Rayleigh scattering may induce uniquely polarized Lya distinguishable from other emission lines, which will shed much light on the unification models of AGNs.

## **II. Introduction**



Fig. 7 Total Degree of Polarization in Slab Geometry

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We predict that Type 2 AGNs may exhibit more strong polarization around Lya.