ON THE POLARIZATION OF THE RESONANTLY SCATTERED Ly α LINES

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The polarization of the resonantly or nearly resonantly scattered Ly α photons by an atomic hydrogen is calculated using the density matrix formalism in the Russell-Saunders approximation scheme. The maximum degree of polarization occurring in a 90° scattering is computed as a function of the frequency shift of the incident photon from the resonance frequency corresponding to a $1S_{1/2}\rightarrow 2P_{1/2}$ transition under the assumption that the scatterers are governed by a Maxwellian distribution.

It is demonstrated that the polarization behavior approaches that of the classical Rayleigh scattering with polarization perpendicular to the scattering plane. It is found that when the frequency deviation of the incident photons in unit of the fine structure level splitting is larger than 4 the maximum degree of polarization is nearly 1.

For smaller frequency shifts the polarization behavior is the weighted average of the two resonance scatterings over the thermal velocity distribution. Around the line center the maximum degree of polarization is 3/11, which is the weighted average of 0 corresponding to the transiton $1S_{1/2}\rightarrow 2P_{1/2}$ and 3/7 for the $1S_{1/2}\rightarrow 2P_{3/2}$ transiton. Depending on the temperature of the medium the degree of polarization deviates from 3/11 in an asymmetric way between the blue part and the red part, which is in high contrast with the symmetric flux profile.

This peculiar behavior may possess an interesting application to the scattering of Ly α photons by high column components, which can be found in active galactic nuclei(AGN). We present a brief discussion in the possible applications including the spectropolarimetry of AGN.

THE EFFECT OF LUMINOUS LENS BLENDING IN GRAVITATIONAL MICROLENSING EXPERIMENTS

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The most important uncertainty in the results of gravitational microlensing experiments comes from the difficulties of photometry caused by the blending of source stars. Recently Nemiroff(1997) pointed out that the results of microlensing experiments can also be affected