

**Polarization fine structures in the  
Thomson scattered emission lines in active galactic nuclei**

Hee-Won Lee

Dept. of Astronomy and Atmospheric Sciences,  
Kyungpook National University, Taegu, Korea

E-mail : hwlee@vega.kyungpook.ac.kr

The upper part of the accretion disk in an active galactic nucleus is believed to be highly ionized and therefore can be regarded as a plane-parallel electron-scattering atmosphere that is exposed to the broad emission line region. A line photon incident in an electron-scattering medium is transferred in a diffusive way both in real space and in frequency space, and the mean number of scatterings differs as the wavelength shifts from the line center. This leads to the broadening of the profile and polarization dependence on the wavelength shift as a function of the Thomson optical depth. We find that the Thomson-scattered emission lines have a polarization dip when the Thomson optical depth does not exceed 3. Various structures such as polarization flip are also seen. Complicating effects due to the disk rotation and broad emission line region are investigated and the polarization dip may still persist in conditions typical of active galactic nuclei. Brief discussions on observational implications are given.