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P14 Estimation of the physical condition of the torus in active galactic nuclei by a modeling of the Compton shoulder in the reflected X-ray spectrum

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"The accretion disk and the super-massive black hole in the active galactic nucleus (AGN) are thought to be surrounded by an optically thick, dusty torus, which should have an essential role for the unification scheme of the AGN, the star formation history around the torus and the mass supply to central black hole. Observed X-ray spectra contain important information for revealing the torus structure and its physical condition because we observe not only a direct component but also a reprocessed component caused by the torus. Characteristics of the Compton shoulder, which is a Compton scattered broad structure adjacent to the emission lines, is a powerful tool to investigate the structure of the torus. Hence, developing a precise spectral model to reproduce the structure of the Compton shoulder and X-ray observations with an enough high spectral resolution are crucial.

We analyzed the spectral shape of the Compton shoulder around the neutral Fe-Kα line of the Compton-thick type Ⅱ Seyfert nucleus of the Circinus galaxy. We applied our X-ray reflection spectral model based on Monte Carlo method to Chandra High Energy Transmission Grating data, and we successfully reproduced the structure of the Compton shoulder and constrained various spectral parameters, such as a column density, inclination angle and metal abundance independently, using the spectral data only around the Fe-Kα emission line. The obtained column density and inclination angle are consistent with that of reported by previous studies. In addition, we could put a constraint on the metal abundance of the torus for the smooth and clumpy torus cases to be 1.75 (+0.19, -0.17) and 1.74 (±0.16) solar abundance, respectively, which could give useful information for the star formation history around the torus."

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