

Observations of Inner-Shell Soft X-ray Absorption

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The grating spectrometers on board *XMM-Newton* and *Chandra* enable us for the first time to detect soft-X-ray absorption lines due to inner-shell excitation of gas along the line of sight. Since gas under almost any conditions absorbs X-rays, these lines are both common and prominent in many observations. We will show the most important spectral detections of these features in active galactic nuclei and in interstellar absorption of bright galactic X-ray sources. We will demonstrate the unprecedented, strict, constraints they impose on the ionization structure in the absorbing medium. Velocity and column density measurements will also be described, although those are possible only to lesser accuracy. Since there were essentially no atomic data for these features in the literature, in order to analyze the spectra, we had to embark on a tedious endeavor of calculating numerous lines. These data need urgent laboratory benchmarking in order for us to be confident when using them for the analysis of cosmic absorbers.