Chandra High Energy Grating Observations of the Fe Ka Line Core in Type 2 Seyfert Galaxies: A Comparison with Type 1 Nuclei

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We present a study of the core of the Fe Ka emission line at ~6.4 keV in a sample of type II Seyfert galaxies observed by the Chandra High Energy Grating (HEG). The sample consists of 29 observations of 10 unique sources. We present measurements of the Fe Ka line parameters with the highest spectral resolution currently available. In particular, we derive the most robust intrinsic line widths for some of the sources in the sample to date. We obtained a weighted mean FWHM of 2000 \pm 160 km/s for 8 out of 10 sources (the remaining sources had insufficient signal-to-noise). From a comparison with the optical emission-line widths obtained from spectropolarimetric observations, we found that the location of Fe Ka line-emitting material is a factor of ~0.7-11 times the size of the optical BLR. Furthermore, compared to 13 type I AGNs for which the best Fe Ka line FWHM constraints were obtained, we found no difference in the FWHM distribution or the mean FWHM, and this conclusion is independent of the central black hole mass. This result suggests that the bulk of the Fe Ka line emission may originate from a universal region at the same radius with respect to the gravitational radius, ~30,000 Rg on average. By examining the correlation between the Fe Ka luminosity and the [O IV] line luminosity, we found a marginal difference in the Fe K line flux between type I and type II AGNs, but the spread in the ratio of L(Fe) to L([O IV]) is about two orders of magnitude. Our results confirm the theoretical expectation that the Fe Ka emission-line luminosity cannot trivially be used as a proxy of the intrinsic AGN luminosity, unless a detailed comparison of the data with proper models is applied.

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