X-RAY OBSERVATIONS OF ACTIVE GALACTIC NUCLEI

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ABSTRACT. HEAO 1 A2 and Einstein SSS spectral observations of Seyfert galaxies and BL Lac objects suggest that in both cases, the X-ray emission is due to relativistic particles. The five BL Lac objects have very soft spectra and at higher energies (above 10 keV) may have hard tails. Combining our X-ray data with radio, infrared, optical, and ultraviolet observations, we can fit the BL Lac spectra with the familiar synchrotron self-Compton model if we allow for relativistic beaming (Urry and Mushotzky 1982, Urry et al. 1982). We show that Doppler beaming of an underlying (Seyfert-like) source population flattens the observed luminosity function, and we emphasize that the relative numbers of BL Lacs and quasars in given spectral intervals are strong functions of selection effects, the degree of Doppler beaming, and the form of the intrinsic luminosity function.

The twenty-eight X-ray spectra of Seyfert galaxies are remarkably homogeneous: all are well-fit by power laws with mean energy spectral index $\alpha = 0.65 \pm 0.13$, where the latter number indicates the dispersion (Mushotzky et al. 1980, Mushotzky 1982). This power law, taken with the IR-optical-UV emission, suggests that Compton scattering is the dominant X-ray production mechanism. No changes in spectral form are seen on short ($10-10^4$ s) or long (0.5-1.5 yr) timescales in either the A2 (2-40 keV) or SSS (0.5-3.5 keV) data even when the intensity changes. With one major exception (NGC 6814), no variability with $\Delta I/I>0.1$ is seen for timescales of 5 seconds to 6 hours (Tennant and Mushotzky 1982). For 6 month timescales, at most one third of the galaxies are variable in intensity, and these tend to be the lower luminosity objects.

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