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UV TO SOFT X-RAY CONTINUUM CHARACTERISTICS OF BRIGHT QUASARS 3C 273 AND 1E1821+643

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We study the ultraviolet (UV) and the soft X-ray properties of the continuum radiation from two bright quasars 3C 273 ($z = 0.158$, $l = 290°$, $b = 64°$) and 1E1821+643 ($z = 0.297$, $l = 94°$, $b = 27°$).

As a first step in our studying of the UV/soft X-ray continuum, we construct the broad band continuum of 3C 273 and 1E1821+643 using the UV spectra observed with the Hopkins Ultraviolet Telescope (*HUT*), the Faint Object Spectrograph of the Hubble Space Telescope (*HST/FOS*) and the soft X-ray spectra observed with the *ROSAT*.

HUT observations of 3C 273 and 1E1821+643 were made on December 1990 during the Astro-1 Mission (Davidsen et al. 1992). *HST/FOS* observations of 3C 273 and 1E1821+643 were made in 1991 as a part of the *HST* key projects (Bahcall et al. 1993). We use the archival data of the *HST/FOS* observations which were obtained through the approved *HST* cycle 3 proposal. The *ROSAT* X-ray observations of 3C 273 were made by Staubert et al. (1992) nearly simultaneously with the *HUT* observations. The soft X-ray data for the *ROSAT* observations of 1E1821+643 were taken from Kolman et al. (1993).

We then empirically characterize the shape of the UV continuum of 3C 273 and 1E1821+643. We model the continuum as a power-law curve and all the identified emission and absorption features in the observed spectrum as Gaussian profiles. We use the program SPECFIT (Kriss 1994) to fit the observed spectrum. SPECFIT runs in IRAF and determines best-fit parameters by simplex or Marquardt non-linear minimization of χ^2.

As shown in Fig. 1a (the dot-dashed curve represents the best-fit continuum), the *HUT* spectrum of 3C 273 shows a distinct break in the continuum slope just longward of the redshifted Lyman edge (marked as L.E.). The continuum shape of 3C 273 is empirically well characterized by a broken power law in F_λ. This continuum break may be a signature of the Lyman edge in the thermal spectrum of an accretion disk (Lee 1995).

The combined *HUT* and *HST/FOS* spectrum of 1E1821+643 (Fig. 1b), however, does not show any distinct features in the continuum around the redshifted Lyman edge. The shape of the continuum with weak break in the spectrum of the 1E1821+643 (see the best-fit continuum shown as the dot-dashed curve) simply represents a smooth turnover of the spectrum.

Finally, we try to find any relationship between the UV and the soft X-ray continuum. As shown in Fig. 2 (a), we find that a simple extension of the best-fit UV continuum of 3C 273 (dotted curve) can not connect the UV to the soft X-ray continuum. We find that the Comptonization of the UV spectrum by a surrounding hot corona (solid curve) can explain the UV and the soft X-ray continuum of 3C 273 simultaneously. The strong soft X-ray excess in the spectrum of 1E1821+643, however, cannot be modelled simultaneously with the UV spectrum in any ways, which suggests that the UV and the soft X-ray are distinct components formed through different radiation process.

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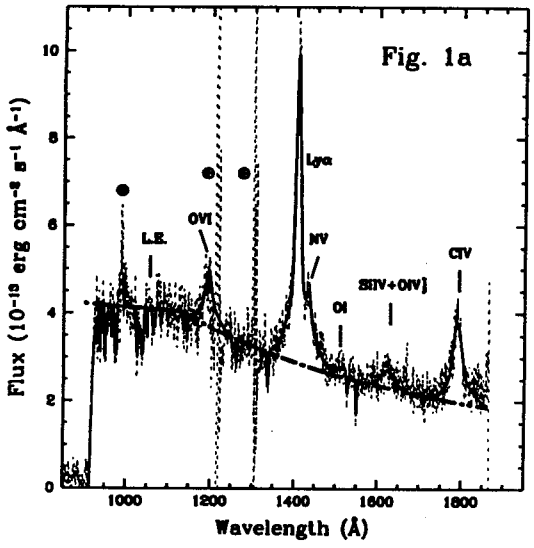

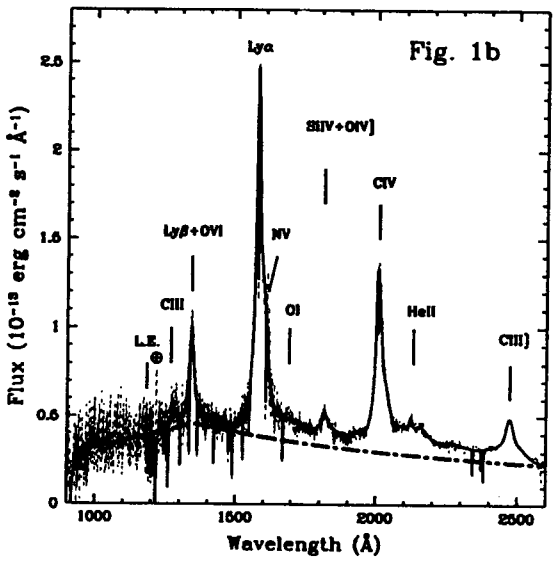

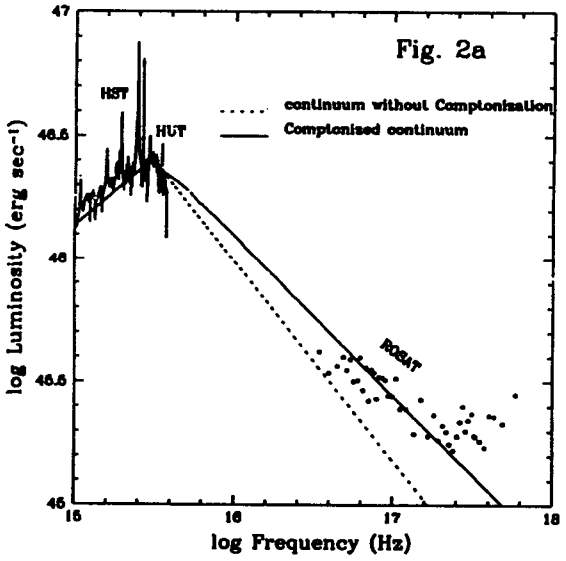

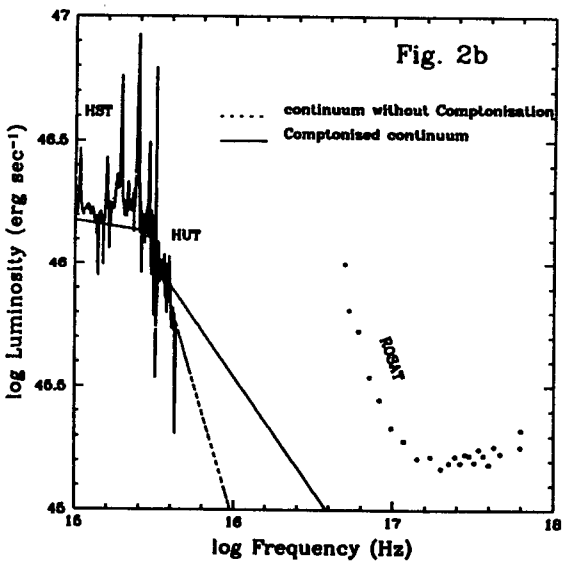

Fig. 1.— Empirical modeling of the *HUT* spectrum of 3C 273 (a) and the combined *HUT* and *HST/FOS* spectrum of 1E1821+643 (b) with a broken power-law continuum (dot-dashed curve) and Gaussian-profile emission and absorption lines. Reddening correction to the observed spectrum was made using $E_{B-V} = 0.02$ and $E_{B-V} = 0.03$ for 3C 273 and 1E1821+643 respectively.

Fig. 2.— UV/soft X-ray energy distribution and continuum models of 3C 273 (a) and 1E1821+643 (b) in the quasar rest frame.