HST, IUE AND ROSAT OBSERVATIONS OF HIGH Z QSOS

D. L. BAND, R. D. COHEN, P. R. BLANCO, V. T. JUNKKARINEN,
E. M. BURBIDGE and R. E. ROTHSCHILD
CASS, UC San Diego, La Jolla, CA 92093

and

G. A. REICHERT
USRA, NASA-Goddard SFC, Code 668, Greenbelt, MD 20771

Abstract. The optical through X-ray spectra of 3 QSOs between z=1.32 and 3.53 show these objects to be very similar to low z AGN.

Luminous AGN were more prevalent in the past. Their redshift moves the "big blue bump," unobservable in nearby AGN, into the observable UV. Therefore we have constructed spectra of three high z QSOs, with contemporaneous ROSAT, IUE, HST and Lick 3m telescope observations. PHL 1377 (z=1.436) and OQ 172 (z =3.530) are radio loud QSOs (RLQs) while PG1522+101 (z=1.321) is a radio quiet QSO (RQQ). These three AGN were selected because of their unusually low column depth of intervening gas: PHL 1377 and PG1522 are observable to 520Å (rest) while OQ 172 is observable down to 320Å.

The emission line spectra are typical, with fairly weak Fe II UV multiplets for two objects. The far UV spectra clearly bend towards the X-ray emission, constraining the extent of the "big blue bump," and ruling out large quasi-thermal components; our objects do not show an extra ionizing component unobservable in low z AGN.

The ROSAT spectra do not require absorption beyond the Galactic N_H, contrary to the increased absorption reported in other high redshift QSOs; this may be a consequence of the low column of intervening gas. All three spectra are fit satisfactorily by a power law with Galactic absorption. However the source with the greatest number of counts, PHL 1377, is better fit by a broken power law with a softer low energy component, as has been seen in many other AGN.

Our objects have X-ray properties similar to those of lower z RLQs and RQQs. The two RLQs have harder power law spectra. The higher z RLQ has the hardest spectrum while the lower z RLQ has the soft low-energy component, consistent with X-ray spectra hardening with increasing energy. On the other hand, the X-ray spectrum of the RLQ PG 1522 is surprisingly steep. The RLQs have $\alpha_{ro} \sim 0.5-0.7$ and $\alpha_{ox} \sim 1.3$ while the RQQ has $\alpha_{ro} < -0.15$ and $\alpha_{ox} \sim 1.8$, consistent with the trends seen in large X-ray surveys of QSOs.

With total 1μ-10 keV luminosities of $\sim 2 \times 10^{47}$ ergs-s^{-1}, these QSOs are among the most luminous AGN, but they have very different energy distributions. However the sources are by no means the brightest sources discovered.

A future publication will report these results more extensively. This research was supported by NASA grant NAG5-2059 and a SERC fellowship (PRB).

T. J.-L. Courvoisier and A. Blecha: Multi-Wavelength Continuum Emission of AGN, 318.