Owen's (1979) sample of 23 4C radio sources which coincide with Zwicky clusters of galaxies has been searched for x-ray emission using the HEAO-1 A-2 experiment. X-ray emission was detected from three of the cluster sources at the 3σ level. A fourth source was found within 17′ of the 90% confidence x-ray error box. The clusters surveyed are poor, non-Ahll clusters and one would therefore not expect them to be detectable x-ray sources. The search for x-ray emission was prompted by the knowledge of the existence of distorted radio sources in the clusters. This distortion implies a relatively dense intra-cluster medium which one might expect to produce thermal bremsstrahlung x-rays. The positive detections here lead one to question the supposed proportionality of x-ray luminosity and cluster richness.

WEDNESDAY, 30 JANUARY 1980
Session 16 (1400–1615):
SS433, Globular Clusters, Bursters and Cataclysmic Variables

16.01 The Kinematics of SS 433. B. MARGON, S.A. GRANDI, & R. DOWNES, UCLA - We have obtained image-tube scanner spectra of SS 433 on numerous nights during the period 1978 September through the present, using the Lick 3 m Shane and 0.6 m reflectors, as well as the KPNO 4 m Mayall telescope. Very substantial amounts of data have also been contributed by colleagues at UCLA, UC Berkeley, UCSD, and UCR. Combining these data with a few additional points from the Asiago, Steward, and AAT observers now yields data on 122 separate nights during the past 18 months. We find the motions of the Doppler-shifted Balmer and HeI lines to be strictly periodic, with period 164.0 ± 0.1 days; the underlying velocity curve is a remarkably pure sinusoid. The behavior during the summer of 1979 fits well the predictions of the kinematic model of Abell and Margon (Nature, 279, 701, 1979) and verifies that the actual systemic velocity of outflow of matter in SS 433 is 0.27c. There is evidence for a slow variation in the inclination of the ejected beams to the axis of the beam rotation cone, of amplitude approximately 5 degrees; the data are quite consistent with this effect being periodic, with period and phase similar to the main variation, but substantially more data will be needed to fix these parameters precisely. The "stationary" Balmer emission lines show a modulation of both their intensity and equivalent width with period 13.1 ± 0.1 days, verifying the low-amplitude radial velocity period suggested by Cramp et al. (Ap. J. Letters, in press), and thus strongly arguing that this remarkable system is a close binary with parameters not unlike other low-mass X-ray binaries such as Cygnus X-2. This work has been supported by the National Science Foundation.

16.02 Optical Observations of SS 433. R. NOYES, W. LILLY, B. MASSEL, S. BALNIA, A. STERNBERG, S. TOLONI, CFA - We have monitored the spectrum of SS 433 since April 1979 with the CFA Reticon spectrograph and among our findings we note that (1) the high-velocity components of Hα are extremely variable in intensity from night to night; (2) the radial velocities of the stationary lines of H and He I clearly show a 13-day orbital motion; (3) the central intensity of Hα, Hβ and He I lines appears to vary with a 13-day period. A typical spectrogram is shown below.

Archival photographs in the Harvard collection do not show any clear periodicity near either the 13-day or the 164-day periods reported by others. The B-magnitude does vary, however, and with a range of 2.0 magnitudes.

16.03 Disk-Driven Precession in SS433. C.L. Sarazin, W. YV. and NMAO; M.C. Begelman and S.P. Hatchett, U. Cal.—Berkeley. We show that a moderately massive disk (10^{-5} to 10^{-2}M_{⊙}) can cause the Lense-Thirring pre-