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Redshift of a galaxy near 4C11.50

NEAR the position of the radio source 4C11.50, Wampler *et al.*[1] have found a pair of QSOs separated by 4.8 arc s, with redshifts of 0.4359 and 1.901, respectively. Hazard *et al.*[2] have noted the presence of a 19-mag galaxy, 10 arc s west of the brighter, lower redshift QSO (4C11.50a); a plate obtained with the 224-cm telescope at Mauna Kea shows that this 'galaxy' is actually a close group of three galaxies. Several spectrograms have been obtained at 190 and 50 Å mm^{-1}, with the two brighter galaxies aligned along the slit at position angle 33°. There is a continuum break downwards to the blue at about 5,700 Å, and an emission line at 5,344.9 Å; these features can be identified with the long wavelength edge of the H and K lines, and with the [O II] λ3,727 doublet, respectively. Assuming an average wavelength of 3,727.4 Å for the [O II] doublet, the redshift is 0.4340 (not corrected for galactic rotation). The two galaxies on the slit are separated by about 2.5 arc s and are not well resolved on the spectrogram, so it is not certain to which one the redshift refers.

The redshift of 4C11.50a itself, determined from the sharp [O III] λλ4,959, 5,007 lines, is found to be 0.4358, in good agreement with the value of 0.4359 given by Wampler *et al.*[1]. The difference in radial velocity between the QSO and the galaxy, in the local rest frame of the QSO, is 376 km s^{-1}. This observation is consistent with a physical association between 4C11.50a and the galaxy, and supports a cosmological interpretation of the redshift of the QSO.

Burbidge[3] has pointed out that the sort of galaxy which observers tend to select for this sort of exercise is normally in the magnitude range which will give it a redshift similar to that of the nearby QSO. Although this may be true in a rough sense, there cannot be very much accuracy with this kind of preselection. Even if the dispersion in the magnitude of the galaxies is ignored, these magnitude estimates of faint galaxies from casual inspection of the Palomar Sky Survey prints are unlikely to have accuracies greater than ± 0.5 mag. That introduces an uncertainty of approximately ± 20% in the redshift, or ± 15,000 km s^{-1} in the relative velocity for redshifts near 0.4. 4C11.50a is the third reported case in which an intrinsically bright (on the cosmological interpretation of the redshift) QSO has a redshift within a few hundred km s^{-1} of the nearest galaxy visible on the Palomar Sky Survey prints. The other two are PKS2251 + 11 (refs 4 and 5) and 4C37.43 (ref. 6).

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ALAN STOCKTON

Institute for Astronomy,
University of Hawaii,
Honolulu, Hawaii 96822

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Search for optical pulsations from Cen X-3

THE optical system recently identified[1] with the X-ray source Cen X-3 is an obvious candidate for high frequency optical studies because it provides the possibility of observing optical effects related to the 4.842 s X-ray pulsations[2]. Observations of this object were made at Cerro Tololo using an S-20 photomultiplier with no filter and making 1-ms integrations on to magnetic tape. The data were analysed by Fourier techniques similar to those used in the HZ Her study[3]. No clear harmonic activity emerged, and the average upper limits of the optical pulsations for three sets of data were found to be 0.031%, 0.11%, and 0.14% (Table 1).

Table 1 Time series observations of Cen X-3

Date	Telescope (cm)	Starting UT	Starting Phase*	Length (min)	Upper limit (%)
January 24/25, 1974	152	0528	0.691	50	0.031
February 21/22, 1974	91	0121	0.024	400	0.11
February 22/23, 1974	91	0133	0.508	400	0.14

* See ref. 2.

There is, however, a tantalising peak at exactly the Doppler-shifted frequency of pulsation, at the 1.3 σ level. This appeared for an 8 min interval beginning at 0133 UT (phase = 0.508) on the night of February 22/23, 1974 (Table 1). This 'activity', corresponding to a fluctuation of 0.25%, should be regarded sceptically; it is reported here in recognition of the possibility that this object may, like HZ Her, display optical pulsations only rarely[3,4].

The detected optical pulsations in Her X-1 are of the same fractional order of magnitude as the observed upper limit for Cen X-3 reported here. The X-ray flux from Her X-1 (refs 5 and 6) is about 2.9 times fainter than that for Cen X-3 (refs 7 and 8). The corresponding optical flux—corrected for reddening taking A_v = 0.3 (ref. 9) and 4.3 (W. Krzeminski, personal communication) respectively—is 76 times fainter. Thus, if the pulsed optical emission in these kinds of objects is excited by the absorption of X rays, than significant optical activity at the present limit of detection would require a conversion efficiency about 26 times greater for Cen X-3 than for Her X-1. Although further observational work would increase the chances of detecting sporadic activity, a significant decrease from the present upper limit is not achievable with available instrumentation.

BARRY M. LASKER

Cerro Tololo Inter-American Observatory,
Casilla 63-D,
La Serena, Chile

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