PECULIAR MAGNETIC FIELD STRUCTURES IN 4C49.22 (1150+497)

CHIDI E. AKUJOR
Astrophysics Group, Department of Physics and Astronomy
University of Nigeria
Nsukka, Nigeria

ABSTRACT. We present radio polarisation observations of the quasar 4C49.22. It shows no evidence of depolarisation on the counter-jet side, while exhibiting strong variation of fractional polarisation along the jet, as well as transverse offset of maximum fractional polarisation from each knot in the jet.

1. Introduction

It has recently been shown (Laing, 1988; Garrington et al., 1988) that in powerful radio sources the jet side depolarises less rapidly at low frequencies than the counter-jet side. The observed depolarisation asymmetry may arise from differential Faraday rotation in thermal gas outside the radio source, where less depolarising material intervenes between the observer and the jet side which points towards the observer. Although counter examples to this effect are not uncommon among large sources, one of the few small radio sources which appear not to follow this trend is 4C49.22, a QSO (Z = 0.334, LAS = 15 arcsec). It, in addition, shows other peculiar characteristics. We are currently investigating the radio structure and polarisation characteristics of this quasar.

2. Results

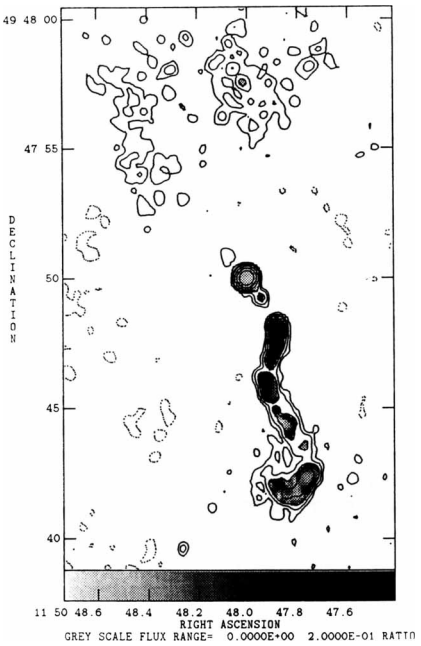
Figure 1 shows the VLA total intensity structure at 5 GHz with grey-scale plots of the degree of fractional polarisation. The main polarisation results are:

(a) The degree of fractional polarisation at 5 GHz is on the average 12.5±4% and 13±5% for the jet and counter-jet sides respectively; and 12±3% and 17.5±6% respectively at 1.5 GHz.

(b) There is considerable variation of fractional polarisation across the jet side at both bands reaching peaks of 20% and 30% at 5 GHz and 1.5 GHz, respectively.

(c) There is apparent repolarisation on the counter lobe (which appears insignificant considering the poor signal-to-noise) and midway along the jet.

R. Beck et al. (eds.), Galactic and Intergalactic Magnetic Fields, 453–454.



(d) The maximum fractional polarisation exhibits a transverse offset from the jet knots.

3. Discussion

The absence of depolarisation in 4C49.22 is unusual given that it is a luminous source with a fairly compact size. Typically, $\lambda_{1/2}$ for QSOs of similar size and luminosity is 49 cm (Tabara and Inoue, 1980), while for 4C49.22 it would appear to be around 73 cm. But since a significant fraction of the flux (about 30%) is in the core at 1.5 GHz, using relativistic beaming arguments we may infer that it is intrinsically much weaker than observed, and not expected to follow the trend, since the amount depolarisation is more for strong high redshift sources (Strom, 1973).

The variation of fractional polarisation along the jet may be related to the observed bends (Burns et al., 1984); since shock-induced perturbations associated with extreme jet curvatures can increase the degree of polarisation (Laing, 1981). At such bends complex geometry may present two or more blobs or knots with equal and opposite Faraday rotations and give rise to repolarisation as observed midway in the jet (see Laing, 1984). The offset of the peak fractional polarisation of the knots from ridgeline is reminiscent of the "twisted flux tube" model of Königl and Choudhuri (1985).

Acknowledgements. I am highly indebted to S.T. Garrington and D.J. Saikia for permission to use their data and to the conference organisers for their hospitality.

References

Burns, B.J. et al. (1984) in A.H. Bridle and J.A. Eilek (eds.), Physics of Energy Transport in EGRSs, p. 255.
Garrington, S.T. et al. (1988) Nature **331**, 147.
Königl, A. and Choudhuri, A.R. (1985), Astrophys. J. **289**, 173.
Laing, R.A. (1981) Astrophys. J. **248**, 87.
Laing, R.A. (1988) Nature **331**, 149.
Laing, R.A. (1984) in A.H. Bridle and J.A. Eilek (eds.), Physics of Energy Transport in EGRSs, p. 90.
Strom, R.G. (1973) Astron. Astrophys. **25**, 303.
Tabara, H. and Inoue, M. (1980) Astron. Astrophys. Suppl. **39**, 379.