COMPARISON OF RADIO AND OPTICAL POLARIZATION IN EXTENDED EXTRAGALACTIC RADIO SOURCES

I. Observations

H.-J. RÖSER, K. MEISENHEIMER
Max-Planck-Institut für Astronomie
Königstuhl 17, D-6900 Heidelberg 1
Federal Republic of Germany

ABSTRACT: We presented new observations in various wavebands of those extragalactic radio sources for which the emission of optical synchrotron light is established by polarimetric investigations (jets of M 87 and 3C 273, hot spots in the lobes of 3C 20, 3C 33 and Pictor A). In addition to optical spectral index and polarization maps, we collected flux measurements at radio, millimetre, and near-infrared frequencies. Our observations result in accurate synchrotron spectra between 10^9 and 10^{15} Hz. For some sources a detailed comparison between radio and optical polarization is possible.

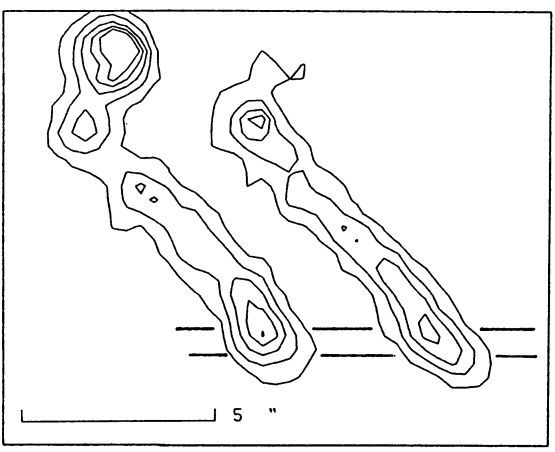

Fig. 1. New polarimetric data of the jet of 3C 273 taken with the 2.2 m telescope on La Silla through a Savart plate (image separation 20″) under seeing conditions of about 1.″0 FWHM through a broad R-filter. North is up, east to the left; the bright knot above the left jet image is an instrumental artefact. A comparison of the two polarized images with the electric vectors aligned || and ⊥ to the jet clearly demonstrates detection of the highly polarized optical counterpart of the radio hot spot at the outer end.

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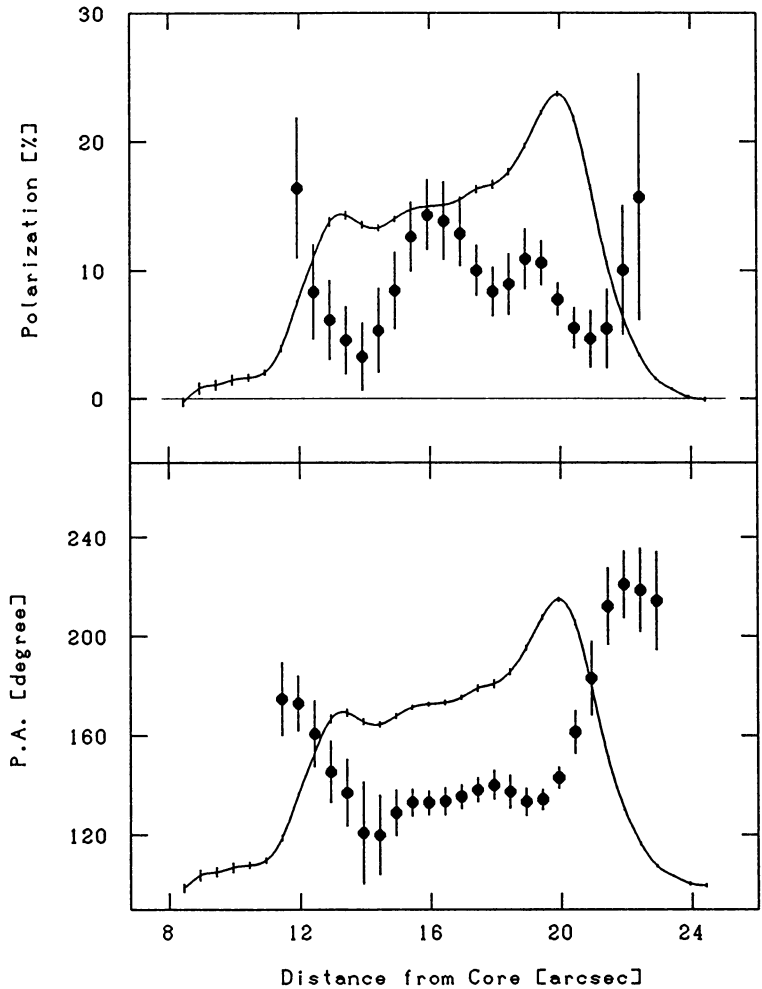

Fig. 2. Fractional amount and position angle of optical polarization along the ridge line of the jet of the quasar 3C 273. The analysis is based on a set of 15 CCD frames an example of which is shown in Fig. 1. In order to enable a direct comparison with a recent paper by Scarrott and Rolph (1989: *Mon. Not. R. astr. Soc.* **238**, 349) we smoothed our result to an effective resolution of 1.″9 FWHM. In both panels the thin line represents the run of total intensity (arbitrary scale) as derived from the mean over the 15 × 2 jet images, tickmarks give the 1-σ errors (inwards of 12″ the signal deteriorates due to the complicated background behaviour). The polarimetric detection of the optical counterpart to the radio hot spot is most evident in the flip of position angle from the optical knot at r = 20.″0 from the core (P.A. = 135°) towards the position of the radio hot spot at r = 21.″3 (P.A. = 225°). A similar behaviour is observed at radio frequencies (*e.g.* Flatters, Conway (1985): *Nature* **314**, 425). Inwards of the optical knot the polarization remains high until 15″from the core where a sharp drop to P $\lesssim$ 5 % indicates the presence of an additional unpolarized optical component (see also Röser, Meisenheimer (1986), *Astron. Astrophys.* **154**, 15).

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