CONTINUUM VLBI POLARIMETRY OF 3C454.3 AT 43 GHZ

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Polarization VLBI calibration at high frequencies has traditionally been difficult due to poor sensitivity and high antenna instrumental polarization across inhomogeneous networks. The higher observing frequency and increased spatial resolution diminishes the chances of finding ideal VLBI polarization calibrators. The advent of the Very Long Baseline Array (VLBA), which has standardized feeds with low instrumental polarization, has minimized these observational difficulties. Recent work in polarization calibration has suggested that somewhat resolved sources may be used in an iterative polarization calibration scheme (Cotton 1993). A full generalization of this method has been developed by Leppanen, Zensus and Diamond (1995) in calibrating 22 GHz polarization observations with the VLBA.

We have mapped the quasar 3C454.3 in full polarization at 7mm wavelength using data obtained with the VLBA. This strong radio source at a redshift $z = 0.859$, is an optically violent variable (OVV) and is classified as a high optical polarization ($p > 3\%$) quasar (HPQ). It has been the subject of extensive VLBI observations (Pauliny-Toth *et al.* 1987; and references therein).

The observations were conducted on December 1, 1994 using the full VLBA (except FD). The source 3C454.3 was observed for a total of four hours, and 0420-014, a candidate polarization calibrator, for approximately two hours. The data were reduced within the Astronomical Image Processing System (AIPS) maintained by NRAO, using standard polarization calibration techniques (Kemball, Diamond and Cotton 1995), and including a correction for atmospheric opacity. The source 0420-014 was used as an iterative polarization calibrator under the similarity approximation developed by Cotton (1993) discussed above.

3C454.3 has a known core-jet morphology at a dominant position angle of -65 degrees (Padrielli *et al.* 1986). There is an apparent break in the jet direction within a few milliarcseconds of the core, where the dominant

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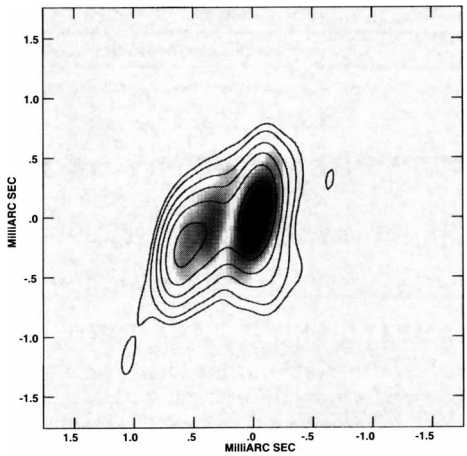

Figure 1. Fig. 1. A map of the linearly polarised intensity for 3C454.3 at 7mm, with a contour plot of total intensity superimposed. Stokes I contour levels are at (-30, -15, -7.5, -3, -1.5, 1.5, 3, 7.5, 15, 30, 60, 90) % of the peak.

projected jet position angle is ~ -95 degrees, as shown in 8 GHz and 22 GHz VLBI observations (Pauliny-Toth *et al.* 1987; Charlot 1990). The 43 GHz polarization map is presented in Fig. 1.

Integrated polarization measurements at 33.5 GHz (Flett and Henderson 1983) show variability about a mean degree of polarization $\bar{p} \sim 4.5\%$. The 43 GHz data indicate a core polarization comparable to this with roughly twice that polarization for the inner component. Previous VLBI polarimetry at 5 GHz has found that quasar cores are rarely significantly polarized above $p = 2\%$ (Cawthorne *et al.* 1993). This may be explained by spatial blending of fine-scale polarization structure in the core.

The polarization calibration method evaluated here appears to work adequately for a source of this flux density when observed with a network with low instrumental polarization, such as the VLBA. Feed D-terms were found to be of the order of a few percent uniformly across the array.

References

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