LARGE ROTATION MEASURES IN CSS SOURCES

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1. Introduction

A majority of compact steep-spectrum (CSS) and GHz-peaked spectrum (GPS) sources show low integrated polarizations ($\lesssim 1\%$) at or below 5 GHz. To investigate whether this is mostly due to large rotation measures (RMs) arising from their being cocooned in dense gaseous envelopes we have observed 26 CSSs and GPSs at 8 and 15 GHz with the VLA A-array. The sample includes equal numbers whose hosts are galaxies and quasars.

2. Results

Preliminary data analysis reveals a number of CSS sources with high RM to add to those contained in Mantovani *et al.* (1994) and Taylor *et al.* (1992). Here we present results for 5 interesting sources.

0538+498 (3C147). For this quasar, the images (convolved to identical resolutions of $\approx 0\farcs25$) demonstrate considerable position angle (PA) rotation between X and U bands. Strong depolarization also occurs between the two bands, the ratio of the percentage polarizations at 8.1 and 14.9 GHz (DP) being ≈ 0.37. The derived RMs are -1317 ± 8 rad m^{-2} on the main component and $+264 \pm 18$ rad m^{-2} on the extension to the NNE (RM$_{rf} = -3144$ and $+630$ rad m^{-2} in the source's rest frame.) These huge RM's confirm the findings of Kato *et al.* (1987), although the large difference and opposite signs between the RM's on the different components is unexpected. Although the magnitude of the RM for the main component greatly exceeds that of the NNE component, the depolarization of both is

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similar, suggesting that much of the extra rotation occurs outside the emission regions. The magnetic-field orientation is remarkably uniform over the source, but bears no obvious relation to its structure.

0127+233 (3C43). The polarized intensity of this misaligned quasar is sufficient to give accurate RM's only for the central component, where values of < -300 rad m^{-2} (RM$_{rf} < -1800$ rad m^{-2}) are derived near its peak, with DP $\approx$ 1.0. Away for the peak, the RM's drop to smaller values. It is unclear whether this large RM towards the peak is real; there is a rapid change of the intrinsic PA around this position and spectral index or depolarization gradients along the structure could mimic a high RM at this resolution. The magnetic field in the central component follows the curvature of the source faithfully. For the low RMs likely in the lobes, the fields would lie along the E lobe, and circumferential to the N lobe.

0552+398, 1151–348 and 1634+623 (3C343). These compact sources are cases where polarization VLBI is needed to illuminate the situation further. The CSS quasar, 1151–348, although only marginally resolved, shows PA variations over both the X- and U-band images, suggesting a more-complex structure than revealed by the present resolution. The mean RM is low, but there seems to be a significant RM gradient across the image. The source shows considerable depolarization, with DP = 0.68. The CSS galaxy, 1634+628, displays an RM gradient of $\sim$500 rad m^{-2} from E to W, despite marginal resolution. Its mean RM is +650 rad m^{-2} (RM$_{rf}$ = +2570 rad m^{-2}) and the magnetic field is well aligned with VLBI imaging.

The GPS quasar, 0552+398, yields RM = +415 rad m^{-2}, (RM$_{rf}$ = +4700 rad m^{-2}). In the mid 1980's, O'Dea *et al.* (1990) derived RM = –658 rad m^{-2} between 1.4 and 4.9 GHz. During our 1991 measurements, the source was stronger than at the earlier epoch, and our measured polarization of 1.25% (DP = 1.0) is higher than obtained from 1.4 to 22 GHz by O'Dea *et al.* (0.48 – 0.8%). It is unclear whether there has been a huge change in the RM of this source over 7 years, or whether there is another explanation for the inconsistency. Considering the radio spectrum of O'Dea *et al.*, their RM was derived in the optically-thick regime, and ours in the optically-thin.

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