EVOLUTION OF THE MILLIARCSECOND POLARIZATION STRUCTURE OF THE SUPERLUMINAL QUASAR 3C345

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ABSTRACT. The $\lambda 6$ cm milliarcsecond polarization structure of 3C345 has been determined at three epochs between December 1981 and March 1984. The knots C2, C3, and C4 all showed changes as they moved away from the core, which remained virtually unpolarized.

1. INTRODUCTION

We have embarked on a program to study the the structure and evolution of the polarization of 3C345 (and other sources) at milliarcsecond resolution. A first epoch (1981.92) map of 3C345 was presented by Wardle *et al.* 1986. Here we show *preliminary* maps made from data taken in December 1983 and March 1984, and give the first report of the evolution of the milliarcsecond polarization structure.

2. OBSERVATIONS AND DATA PROCESSING

Polarization-sensitive $\lambda 6$ cm observations were carried out in December 1983 and March 1984 with the Bonn (1984 only), Haystack, Green Bank, Fort Davis, and Owens Valley antennas and the phased-up VLA, using the Mark III data recording system. Maps of the total and polarized intensity were made as described by Roberts *et al.* (1984) and Wardle *et al.* (1986).

3. RESULTS

Maps of the I and P distributions of 3C345 in December 1983 and March 1984 are shown in Figures 1 and 2. The total intensity maps are in good agreement with those of Biretta, Moore, and Cohen (1986). The evolution of the polarization of the core and knots of 3C345, derived from summing CLEAN components or by model fitting, is summarized in Table 1. The polarization of the core of 3C345 is very small ($\lesssim 1\%$) at each epoch, requiring a very efficient depolarization mechanism (if the radiation is from the synchrotron process in an ordered magnetic field). The knots are moderately polarized, and as they move away from the core their electric vectors are seen to change. This may be due to changing orientation of the magnetic field, a changing Faraday rotation, or changing relativistic aberration. Additional observations of 3C345 at $\lambda\lambda$ 2.8 and 6 cm, which can decide among these possibilities, are being reduced.

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REFERENCES

Biretta, J. A., Moore, R. L., and Cohen, M. H. 1986, *Astrophys. J.*, **308**, 93–109.

Roberts, D. H., *et al.*, 1984, in *VLBI and Compact Radio Sources*, ed. R. Fanti, K. Kellermann, and G. Setti (Dordrecht: Reidel), 35–38.

Wardle, J. F. C., Roberts, D. H., Potash, R. I., and Rogers, A. E. E. 1986, *Astrophys. J. (Letters)*, **304**, L1–L4.

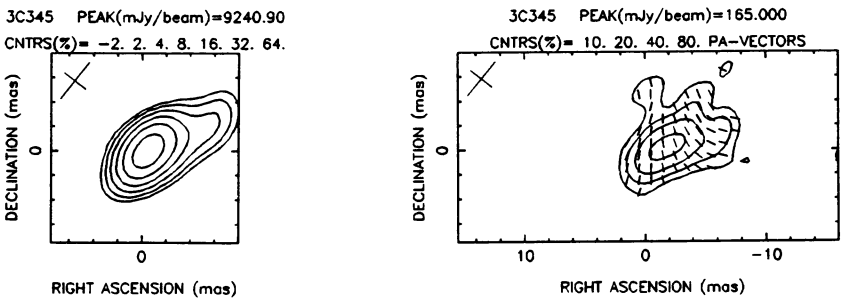

Figure 1: 3C345, epoch 1983.93 (one tick mark is 2 mas). (a) Total intensity. (b) Polarized intensity, with contours of polarized flux and electric vector position angles indicated by the line segments.

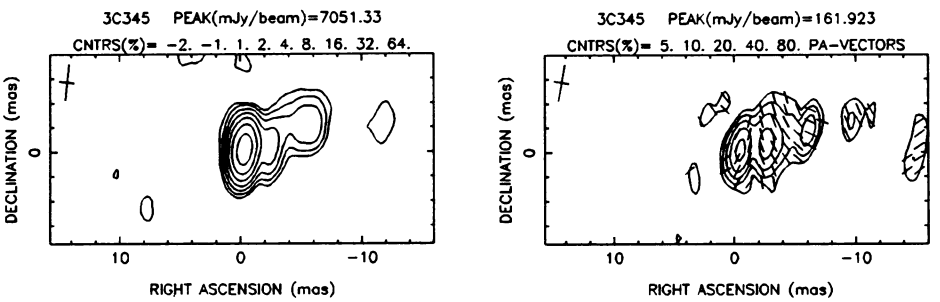

Figure 2: 3C345, epoch 1984.23. Same parts as Figure 1.

Table 1: Evolution of the Polarization of the Components of 3C345

	1981.92		1983.93		1984.23	
Component	$m(\%)$	$\chi(\mathrm{deg})$	$m(\%)$	$\chi(\mathrm{deg})$	$m(\%)$	$\chi(\mathrm{deg})$
D	< 1	...	$\sim 1^a$	??	$\sim 1^b$	-72
C4	...	...	...	...	4.	-19
C3	11.	$+22.$	13.	$+34.$	14.	$+28.$
C2	6.	$+83.$	9.	$+74.$	6.	$+61.$

[a] Due in part to C4.

[b] Due in part to C5.