A STUDY OF SMALL ANGULAR SIZE OOTY SOURCES

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I. INTRODUCTION

Recent theoretical models of radio radiation from central cores of radio sources invoke axial relativistic beaming of the radiation and predict significant enhancement of the radiation from the central cores when viewed at small angles to the direction of the beam. Investigations of the angular diameter distributions of radio sources by Swarup (1975) has shown that the median angular size of radio sources below 4 Jy at 327 MHz is about 10 arc seconds. Hence a sample of sources, with angular sizes substantially less than the above median, chosen from the Ooty occultation survey may be expected to contain a large fraction of double sources viewed along the axis of the double structure.

II. CONCLUSIONS

I have selected an unbiased sample of 73 sources with angular size $\leq$ 4" from the Ooty survey and measured their flux densities at 5 GHz and 2.7 GHz using the 300 ft telescope of NRAO at Green Bank. In this paper I shall confine myself to the discussion of the spectral indices α computed between 327 MHz and 2.7 GHz. The statistics of the spectral index distribution and identification content of the sample are given below.

	QSO or BSO	G	NSO	Crowded or Uncertain	E.F.	Total
$\alpha \leq 0.5$	8	3	0	1	5	17 (24%)
$\alpha > 0.5$	10	2	3	9	32	56 (76%)

The percentage of flat spectra sources in the present sample is in direct contrast to the very small percentage (3.7%) of flat spectra sources found in a complete low-frequency sample of 4C sources discussed by Veron and Veron (1980). Furthermore for the 56 sources with $\alpha > 0.5$

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the median spectral index is only 0.75. This is to be contrasted with the median spectral index of 0.92 for a sample of 46 well resolved double sources from the Ooty survey studied earlier by Menon (1980). The comparatively flat spectral index of 0.75 for the present angular size limited sample implies that half of the sources with $\alpha > 0.5$ have substantial contribution from a flat spectrum central component at high frequencies. Since these sources have angular sizes 2.5 times smaller than the median angular size of sources in their flux density range they are most likely to be double sources inclined at a small angle to the line of sight. The enhancement of the intensity of the central components in such sources may be related to the above circumstance as is suggested in the models of Blandford et al. (1977) and Scheuer and Readhead (1979). VLBI observations of a similar sample of 30 few arc-second sources by Gopal-Krishna et al. (1980) also suggest that radio cores are more prominent in such a sample as compared with the cores found typically in extended doubles. Other possible interpretations are discussed by Gopal-Krishna et al. (1980) and Kus et al. (1981).

Of the 25 sources with α between 0.5 and 0.75 only 8 have definite identifications while 15 are in empty fields. This contrasts with the result that practically all extended sources with central components have optical identifications. Hence it would appear that the radio to optical luminosity ratio of the inferred compact components of the present sample are anomalous and this anomaly may be related to the question of relativistic beaming in such sources. Detailed structural studies can provide important information regarding the evolution of such sources.

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