HIGH-RESOLUTION STRUCTURE OF SOUTHERN COMPACT STEEP SPECTRUM SOURCES

A. TZIOUMIS[1], R. MORGANTI[1,2], C. TADHUNTER[3], R. DICKSON[3]
C. FANTI[2], D. DALLACASA[2], J. REYNOLDS[1], D. JAUNCEY[1],
R. PRESTON[4], P. MCCULLOCH[5], E. KING[5,1], S. TINGAY[6],
P. EDWARDS[7], M. COSTA[5], D. JONES[4], J. LOVELL[5], R. CLAY[7],
D. MEIER[4], D. MURPHY[4], R. GOUGH[1], R. FERRIS[1], G. WHITE[8]
AND P. JONES[8]

[1] *ATNF – CSIRO, Epping, Australia*
[2] *Istituto di Radioastronomia, Bologna, Italy*
[3] *Department of Physics, University of Sheffield, UK*
[4] *Jet Propulsion Laboratory, Caltech, Pasadena, CA, USA*
[5] *University of Tasmania, Hobart, Tasmania, Australia*
[6] *Mt. Stromlo & Siding Spring Obs., Canberra, ACT, Australia*
[7] *University of Adelaide, Adelaide, SA, Australia*
[8] *University of Western Sydney, Kingswood, NSW, Australia*

Two important factors for understanding the physical nature of compact steep spectrum (CSS) radio sources are determining the correct radio morphological classification of these objects together with their characteristics in wavebands different from the radio (Fanti et al. 1995, A&A, 302, 317). Seven CSS sources (linear dimensions < 30kpc for $H_o = 50\ \mathrm{km\,s^{-1}Mpc^{-1}}$ and $\alpha > 0.5$, $S \sim \nu^{-\alpha}$) have been found in a complete sample of strong southern radio sources. This group of CSS sources is particularly interesting because some optical and X-ray information is already available as part of a more general study of southern radio sources (Morganti et al. & Siebert et al. these Proceedings). The spectra of all the sources were presented in Tadhunter et al. (1993, MNRAS, 263, 999.) Here we present VLBI observations for three of these sources (0252-71, 1306-09 and 1814-63). The remaining four have already been imaged with VLBI (King et al. these Proceedings).

Results and Discussion: The images obtained by observations at 2.3 GHz from the Southern Hemisphere MKII VLBI network (SHEVE) are shown in Figure 1. For **1306-095** and **1814-637** less than half of the total flux

R. Ekers et al. (eds.), Extragalactic Radio Sources, 73–74.

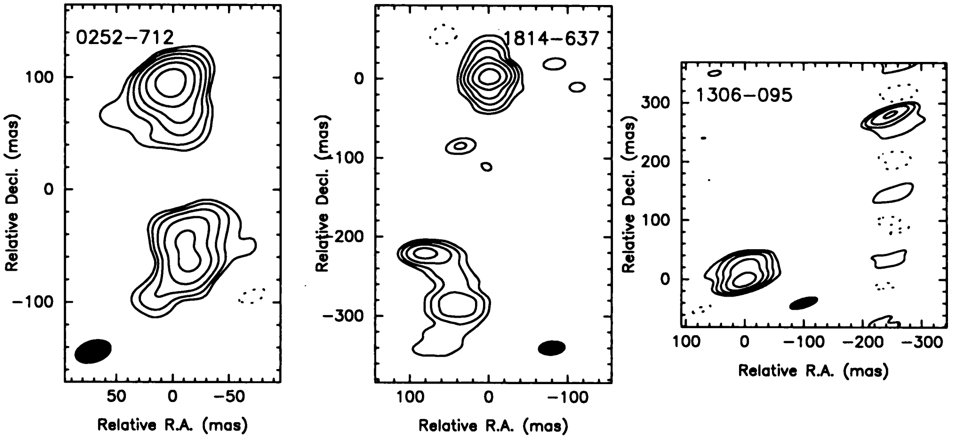

Figure 1. VLBI images at 2.3 GHz from the SHEVE network, observed on 20-22 Feb. 1993. Contour levels are at -2,2,4,8,16,32,64 % of peak flux density, except for 1306-095 where the contour levels start at 4%. The noise level in the images is 6-8 mJy. The peak flux densities detected are 1.14 Jy for 0252-712, 1.7 Jy for 1814-637 and 0.3 Jy for 1306-095.

density has been detected in the VLBI observations, implying the existence of substantial diffuse structures around these objects. In contrast, in the **0252-712** VLBI image the total flux density is detected and there is no diffuse structure.

All seven sources in our complete sample show the double-lobed radio structure typical of the majority of known CSS objects. However, radio spectral index information is still necessary for some of the objects, to investigate the possible presence of a flat-spectrum core.

The optical spectra are characterized by strong [O III]λ5007 and [O II] λ3727 lines, as observed in extended radio sources of similar power. In the cases where it could be measured (0023-26 and 1934-63), we found an electron temperature higher than in other extended radio galaxies. The optical polarization is similar to the extended objects. In some cases we found significant polarization and for 1934-63 the optical polarization axis is perpendicular to the radio axis, as predicted by the beaming/scattering model (Tadhunter et al. 1994, MNRAS, 271, 807). For the broad-line galaxy 2135-20 we have only an upper limit to the polarization, as for most of the extended broad-line radio galaxies observed (Shaw et al. 1995, MNRAS, 275, 703).