et al. (1987) have determined the milliarcsecond-scale structure at 5 GHz, and find a one-sided extension that points to the outer lobe.

The source has a steep spectrum below ~ 5 GHz ($\alpha = -0.6 \pm 0.03$) which appears to flatten slightly at higher frequencies. The nuclear component appears to have a flat spectrum ($\alpha = 0.03 \pm 0.06$).

2325+269 : This quasar was included here because though Potash & Wardle (1979) found it to be two-sided, Miley & Hartsuijker (1978) and Katgert-Merkelijn *et al.* (1980) found only one-sided extensions to the component coincident with the optical QSO. The images shown here (Fig. 3.38) confirm its triple structure (though the positions of the surface brightness peaks of each component are systematically displaced by 1-2 arcsec from those of Potash & Wardle (1979) at 8 GHz).

The overall spectrum of the source is steep ($\alpha = -0.83 \pm 0.02$). The outer components have surface brightness ratio of ~ 9:1 at $\lambda 6$ cm. They appear to be linked to the core by curved bridges in an overall S-shaped structure. The polarization patterns also suggest the presence of a curved jet.

3.4 Summary

Of the 42 objects observed with the VLA, for three of the objects (0717+170, 1547+309 and 2041−149) the new observations suggest that the sources have a triple structure and the optical identification is probably incorrect: the radio component coincident with the proposed identification is probably a chance coincidence. For 0615+578, and 0814+201, the optical identification has been found

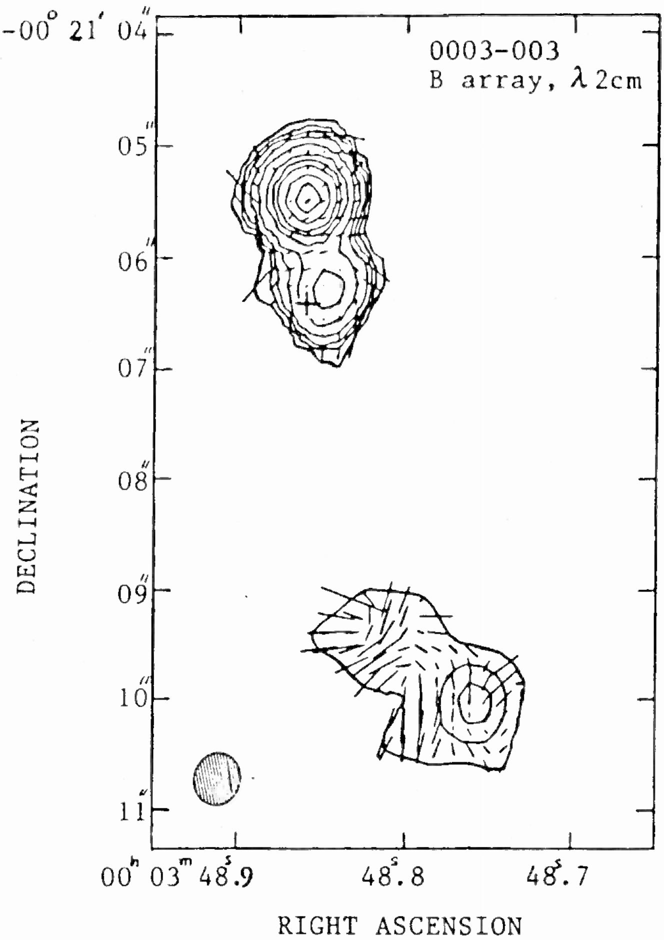


Fig. 3.1 Contour levels: 3.6 x (-1, 1, 2, 3, 5, 10, 20, 30, 40, 60, 80) mJy/beam. Polarization: 1 arcsec = 1.25 ratio.

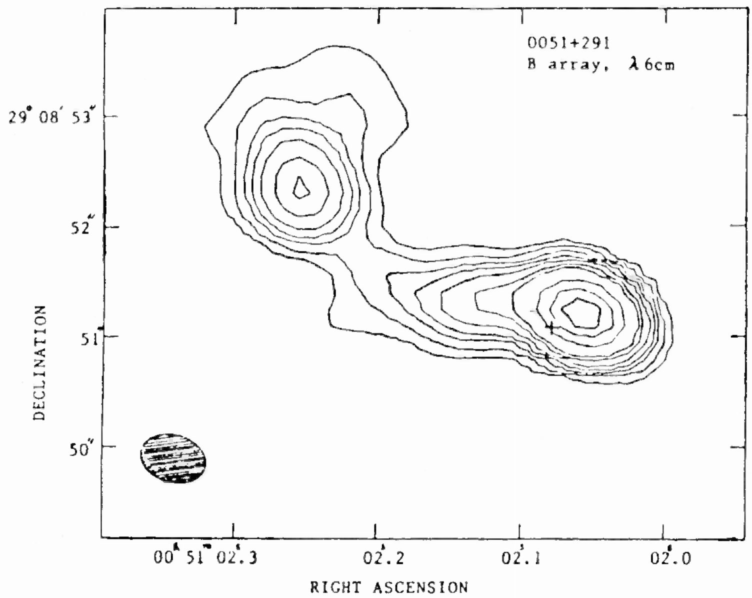


Fig. 3.2. Contour levels: 1.4 x (-1.5, 1.5, 3, 5, 7, 10, 15, 20, 40, 60, 80) mJy/beam.

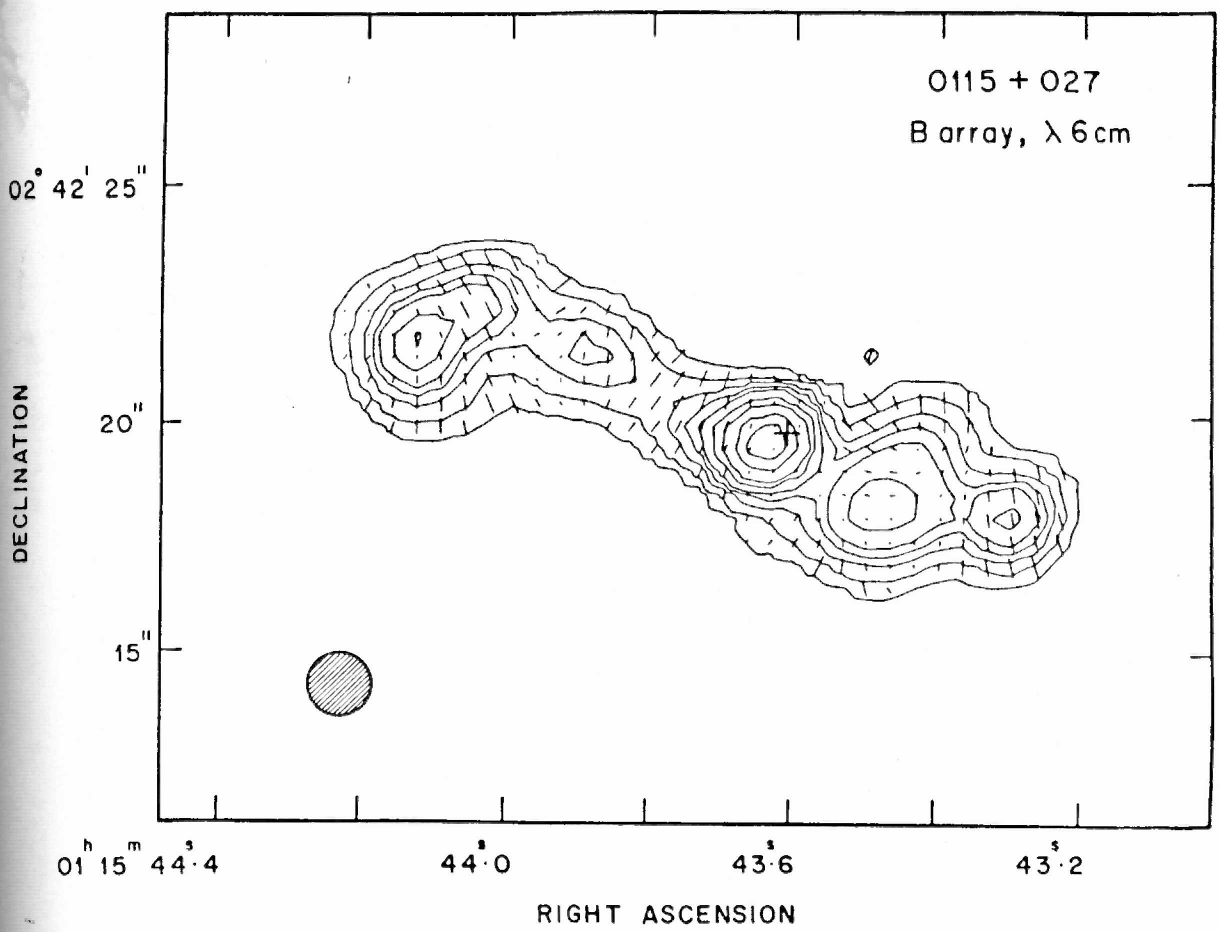


Fig. 3.3 Contour levels: 1.4 x (-2, 2, 5, 10, 15, 20, 30, 40, 60, 80)mJy/beam. Polarization: 1 arcsec = 0.468 ratio.

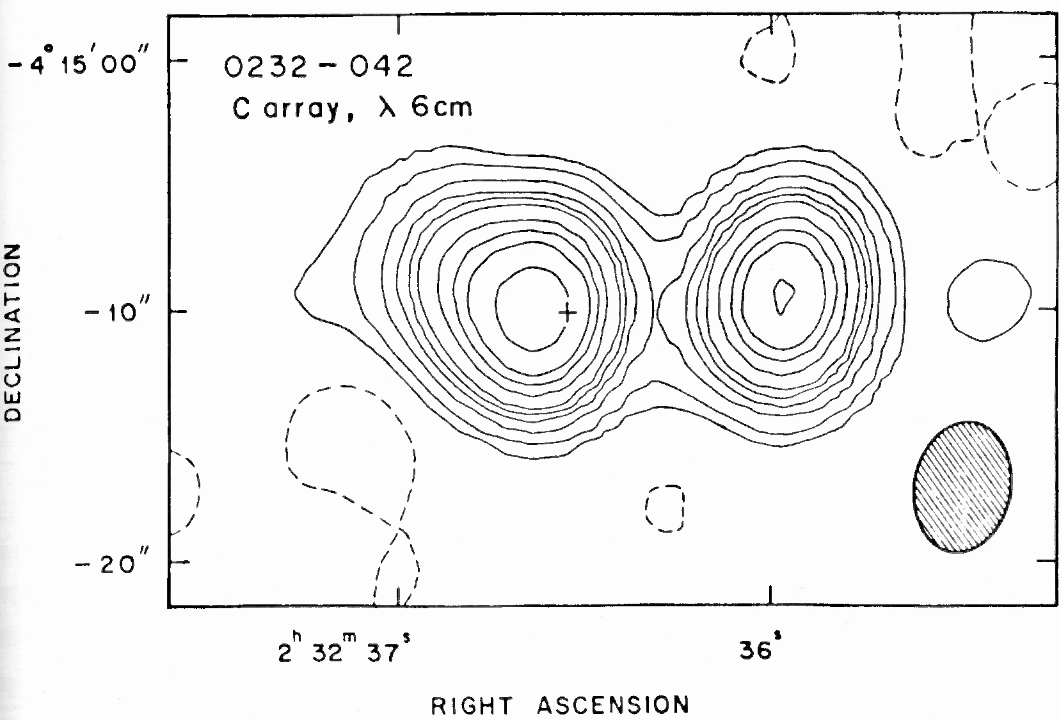


Fig. 3.4a. 230 x (-0.04, -0.02, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

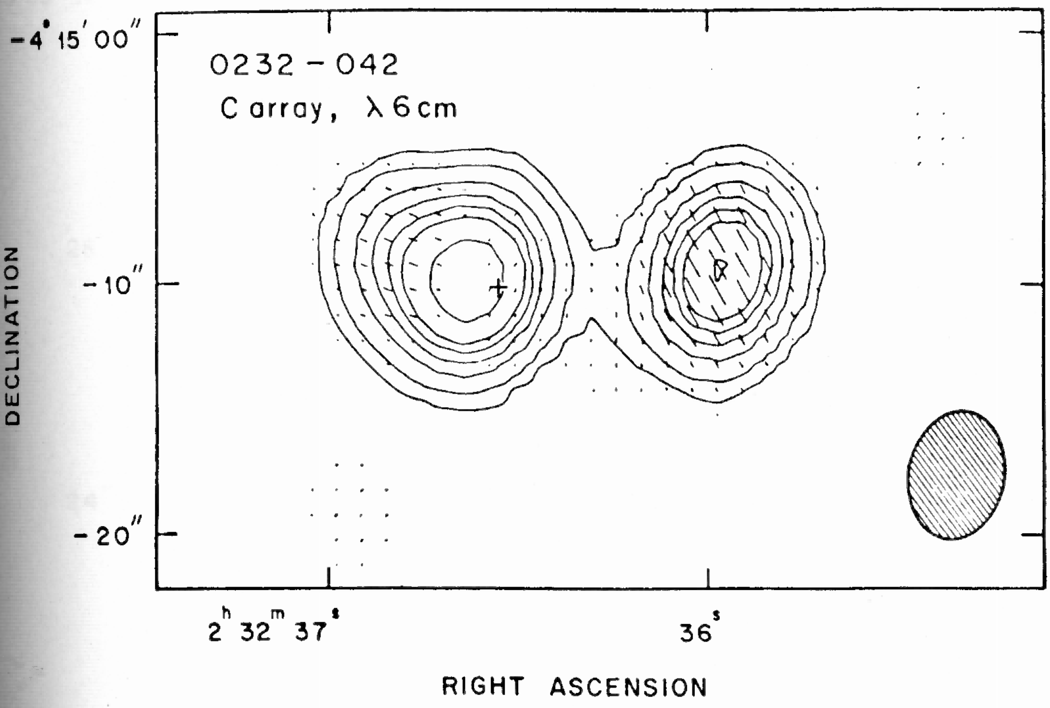


Fig. 3.4b. Contour levels: 240 x (-0.01, -0.05, 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

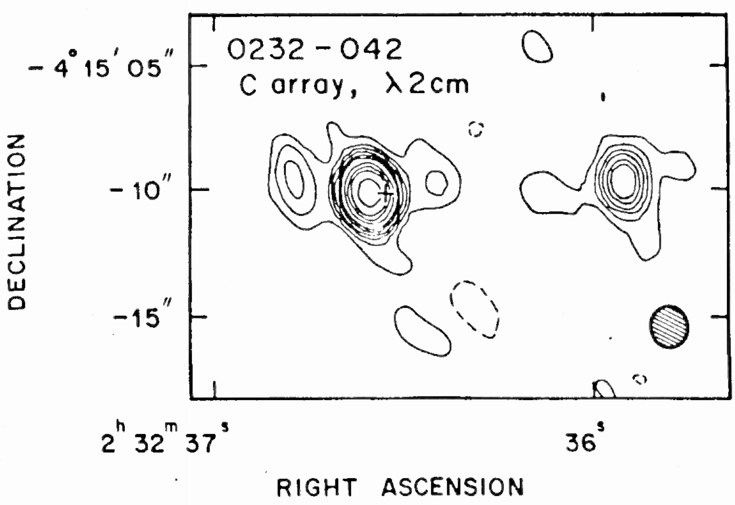


Fig. 3.4c. Contour levels: 121 x (-0.06, -0.03, 0.03, 0.06, 0.09, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

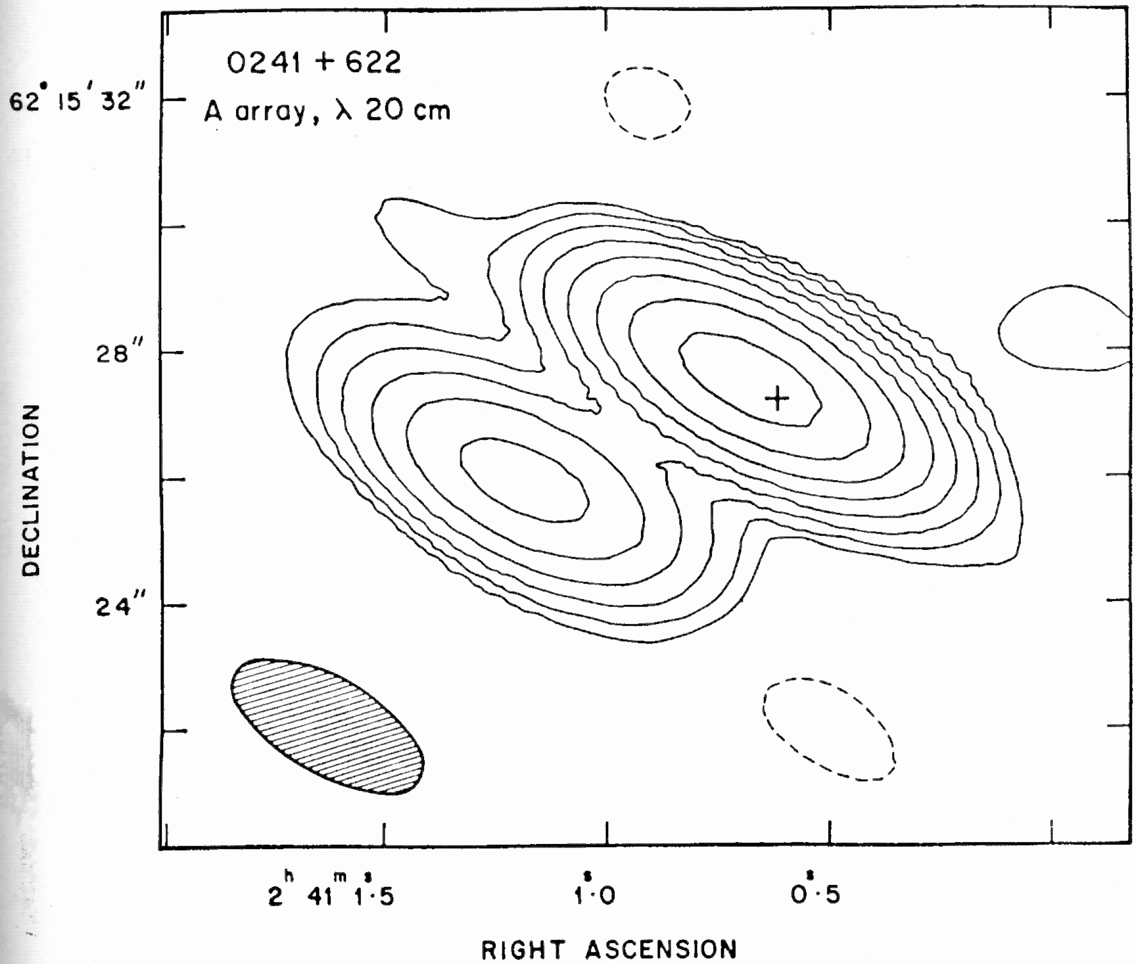


Fig.3.5a. Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048) mJy/beam. Polarization: 1 arcsec = 0.081 ratio.

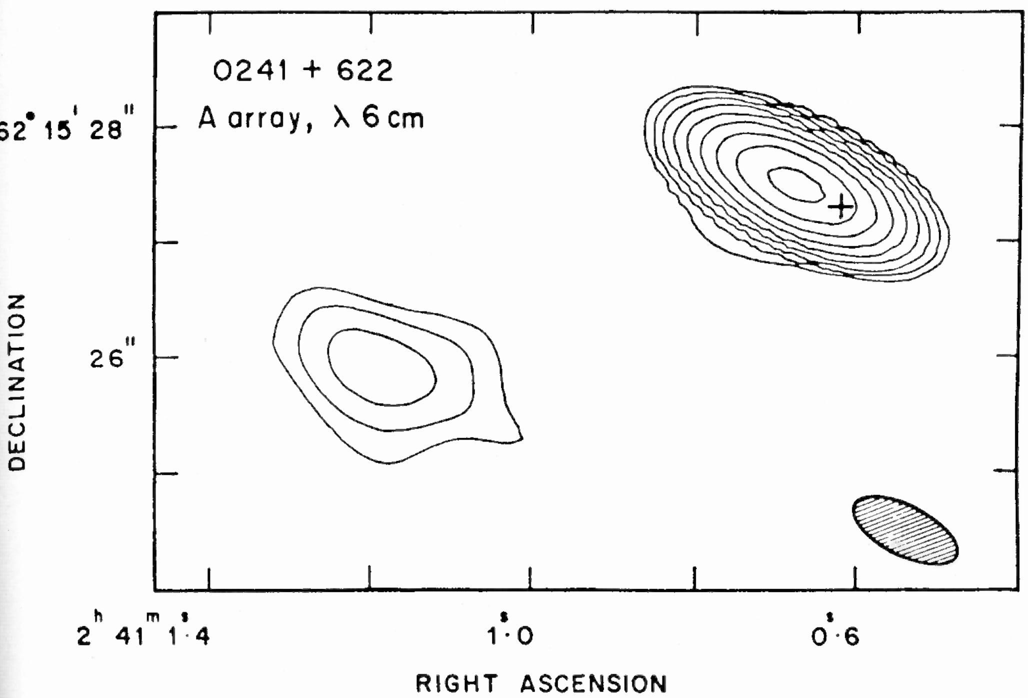


Fig.3.5b. Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048) mJy/beam. Polarization: 1 arcsec = 0.269 ratio.

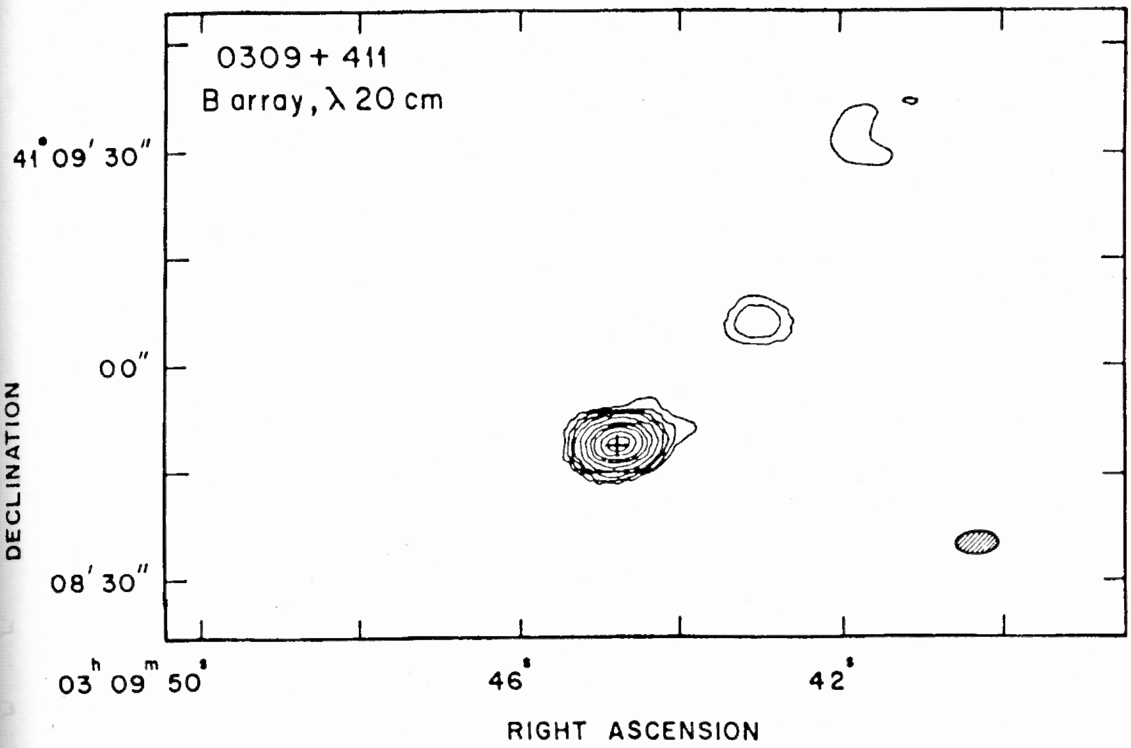


Fig. 3.6. Contour levels: 2.7 x (-0.8, 0.8, 1.5, 3, 5, 10, 20, 40, 60 80) mJy/beam.

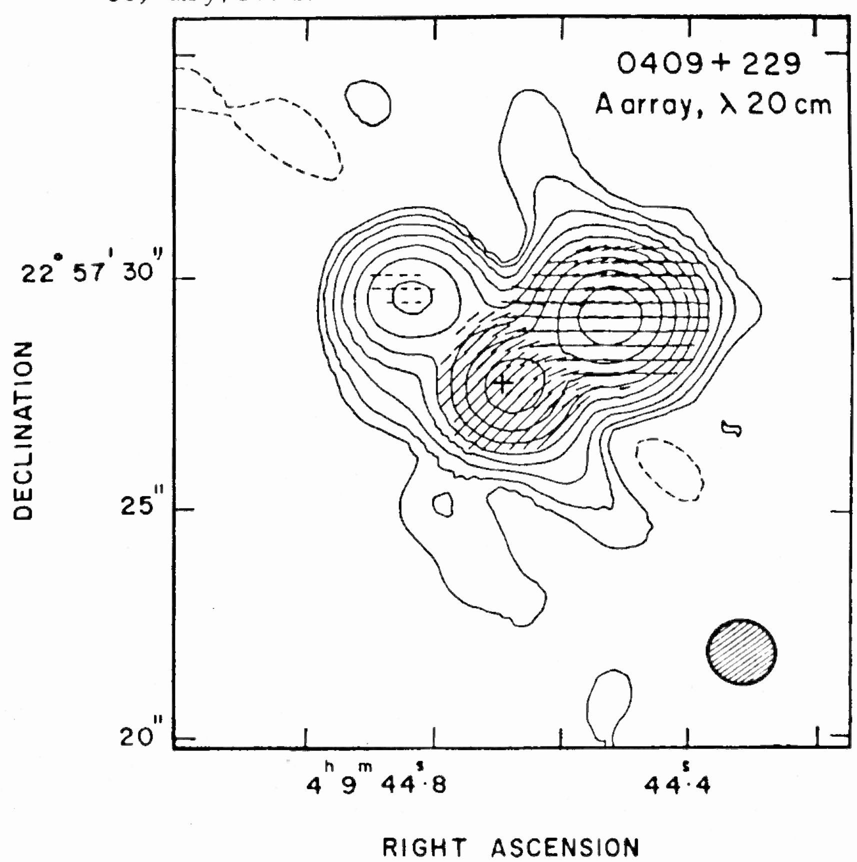


Fig. 3.7. Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048) mJy/beam. Polarization: 1 arcsec = 0.126 ratio.

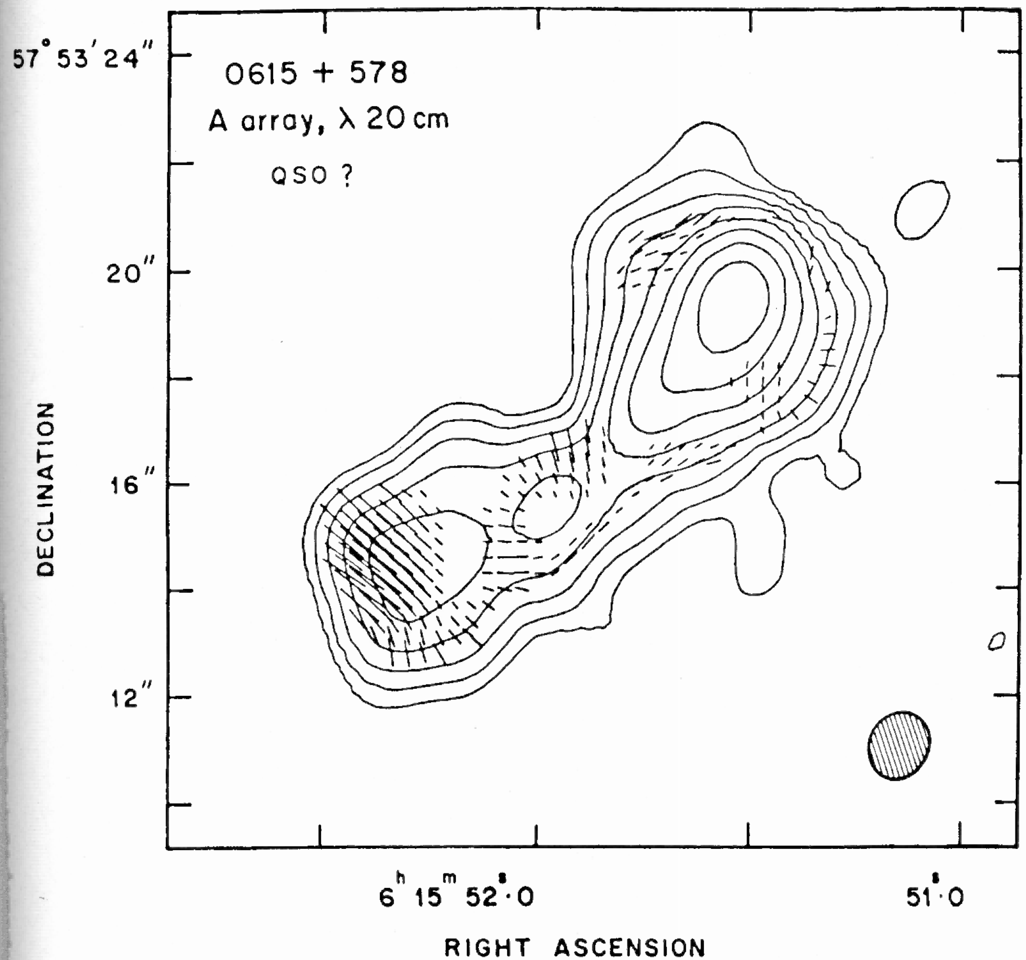


Fig.3.8a. Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256. 512, 1024, 2048) mJy/beam. Polarization: 1 arcsec=0.086 ratio.

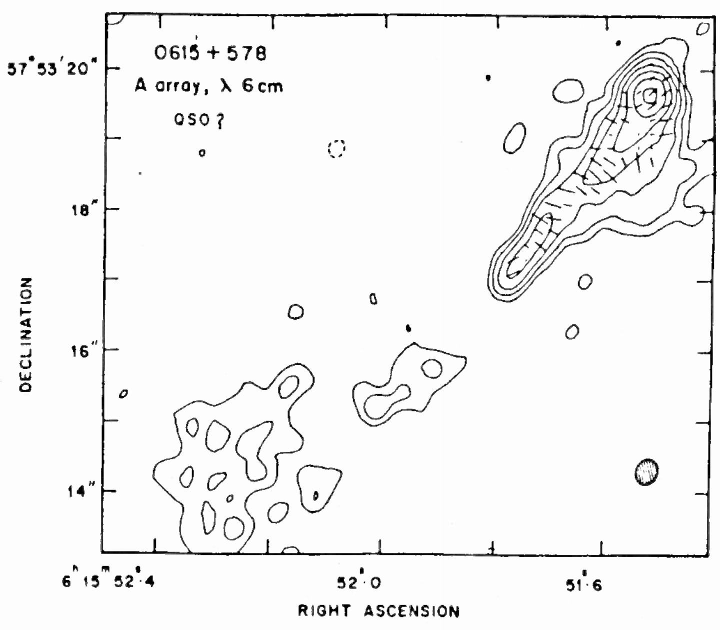


Fig.3.8b. Contour levels: 0.5 x.(-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048) mJy/beam. Polarization: 1 arcsec= 0.417 ratio.

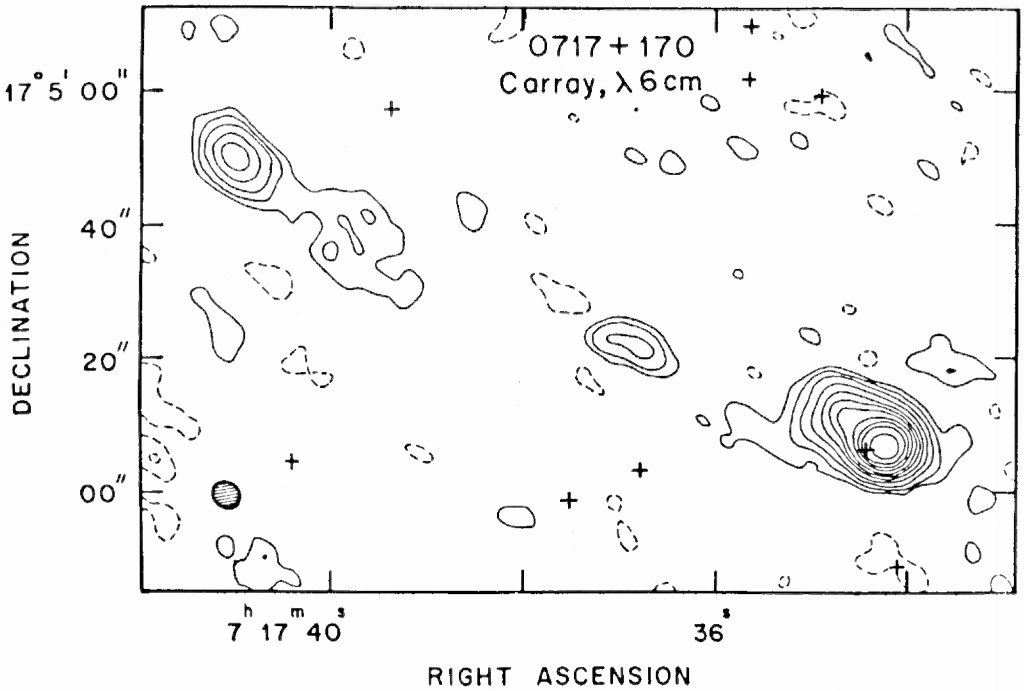


Fig.3.9a. Contour levels: 101 x (-0.015, -0.0075, 0.0075, 0.015, 0.03, 0.06, 0.1, 0.15, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

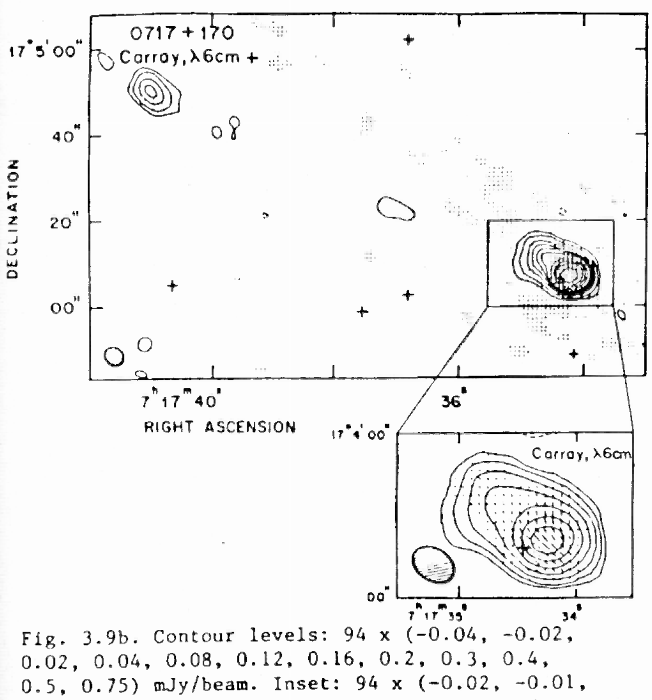


Fig. 3.9b. Contour levels: 94 x (-0.04, -0.02, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam. Inset: 94 x (-0.02, -0.01, 0.02, 0.04, 0.08, 0.16, 0.3, 0.5, 0.75)mJy/beam.

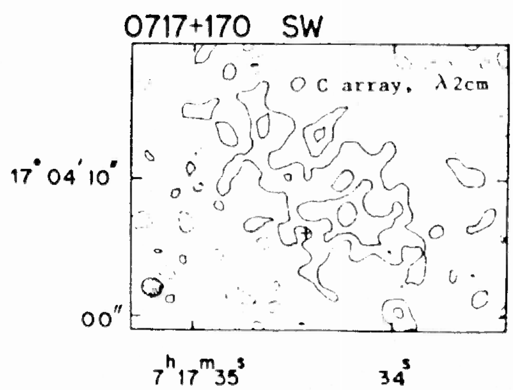


Fig. 3.9c.Contour levels: 12 x (-0.5,-0.25 0.25, 0.5, 0.75) mJy/beam.

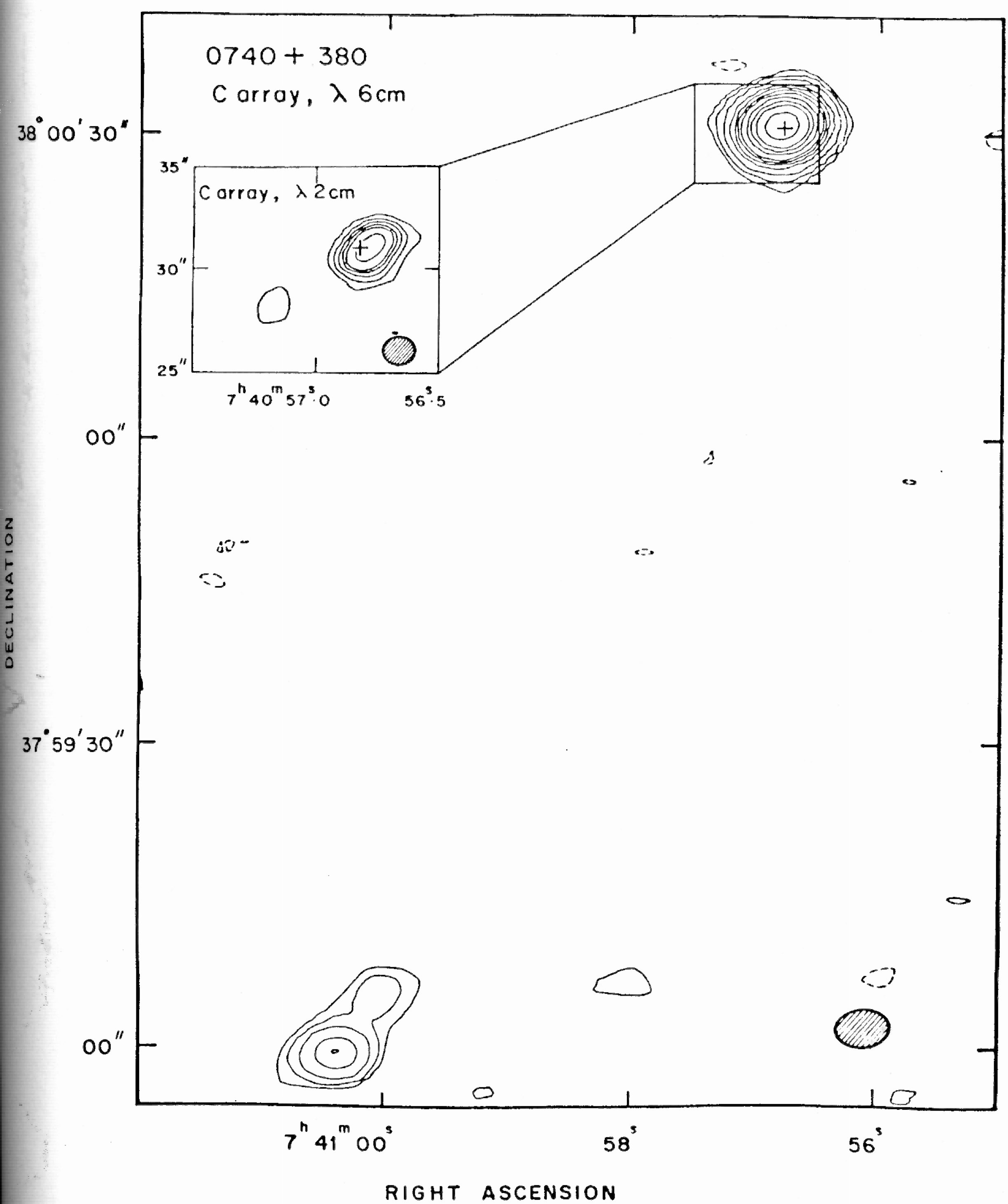


Fig.3.10. Contour levels: 210 x (-0.02, -0.01, 0.01, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam. Inset: 29 x (-0.2, -0.1, 0.1, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

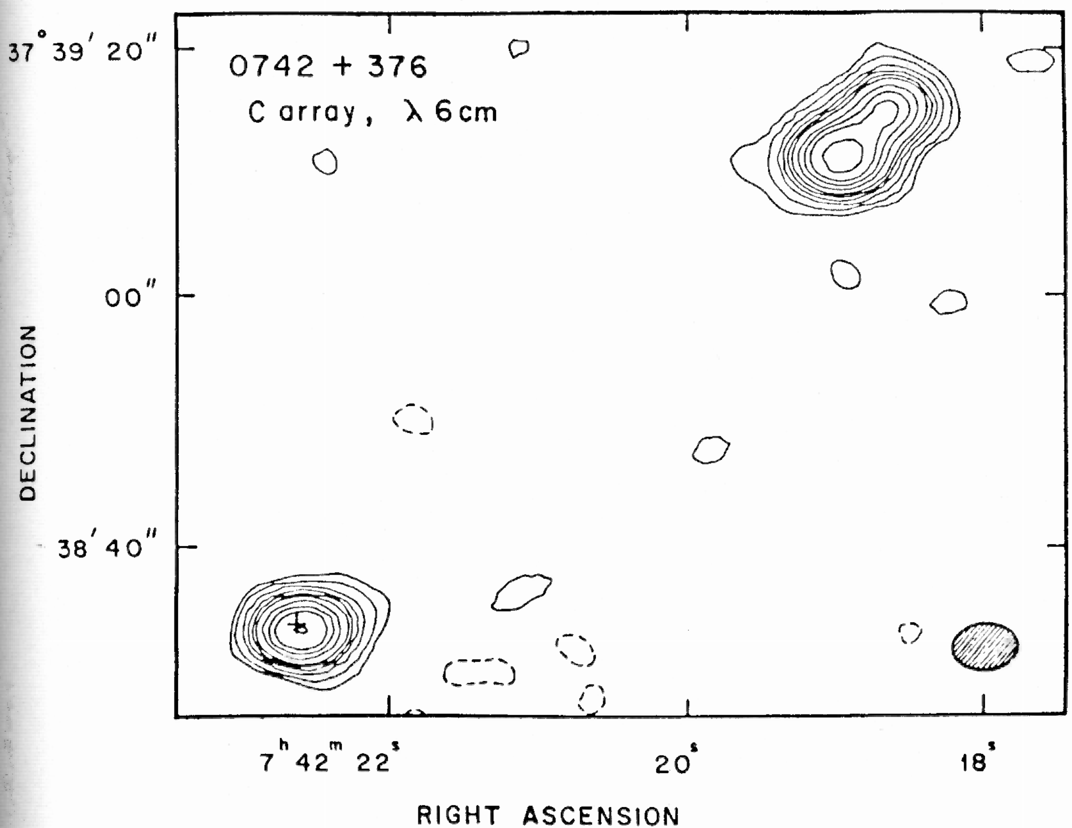


Fig.3.11a. Contour levels: 76 x (-0.04, -0.02, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

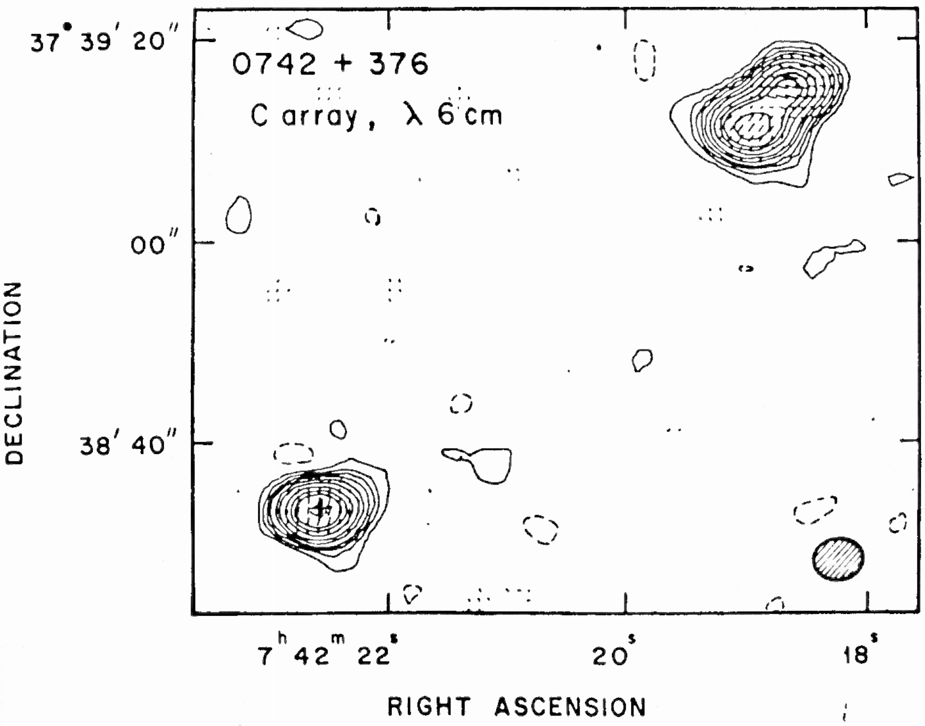


Fig.3.11b. Contour levels: 72 x (-0.05, -0.025, 0.025, 0.05, 0.075, 0.1, 0.15, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

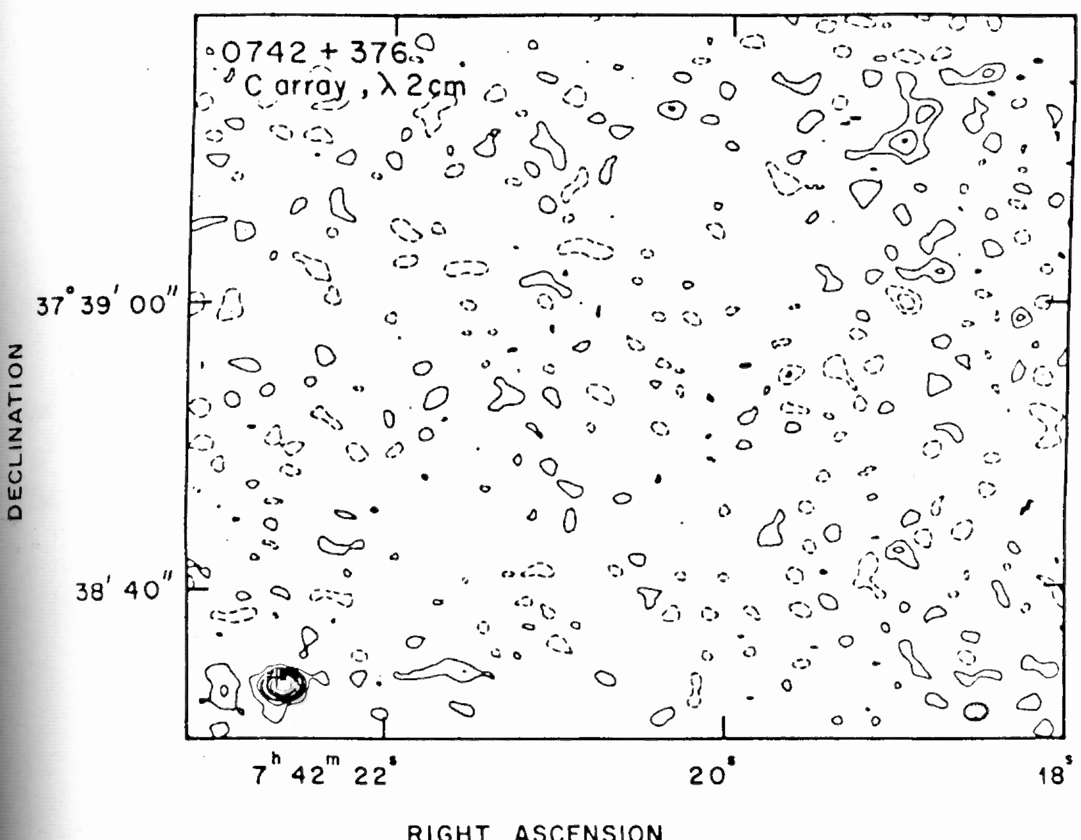


Fig. 3.11c. Contour levels: 47 x (-0.1, -0.05, 0.05, 0.1, 0.15, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

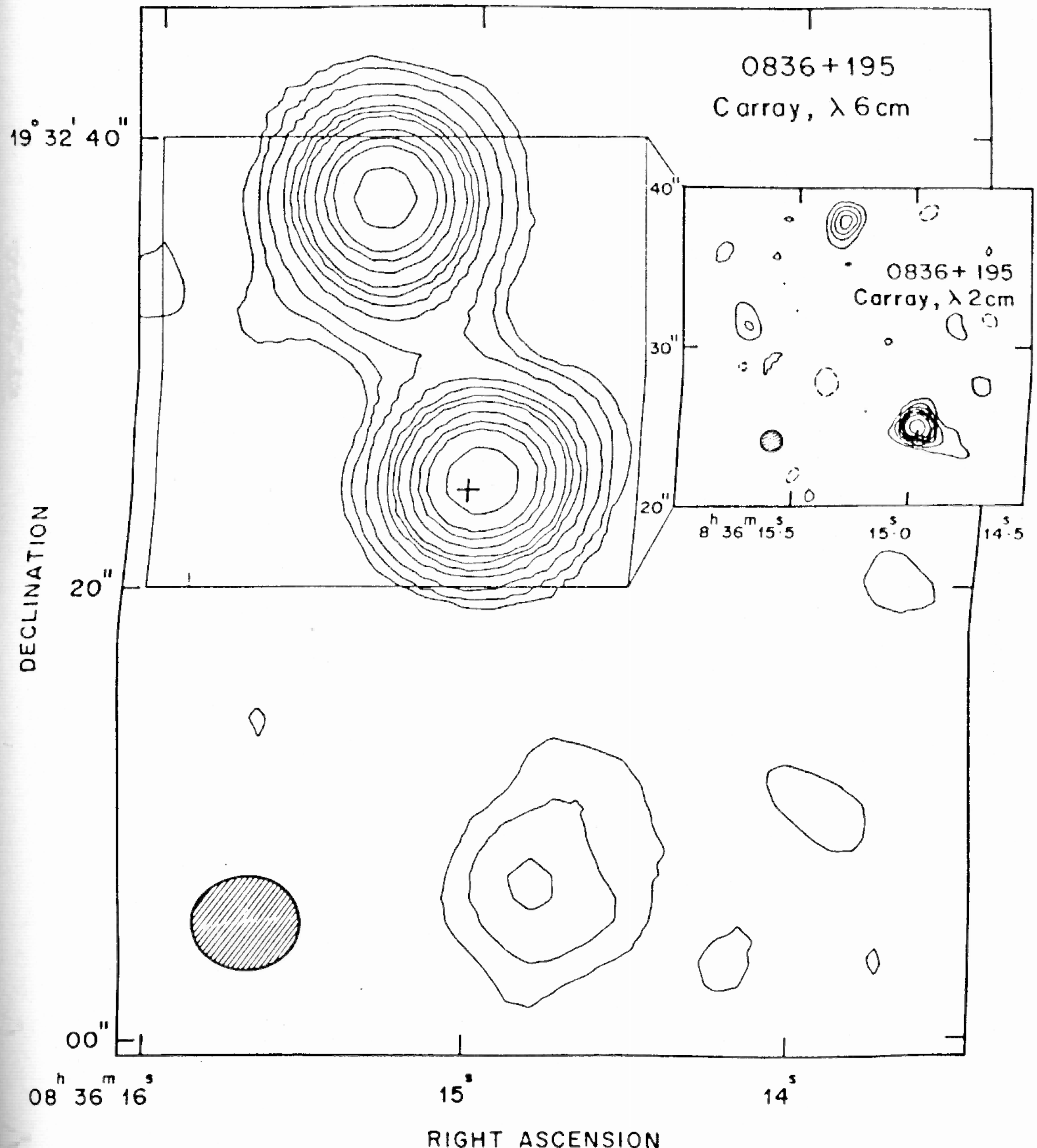


Fig.3.12a. Contour levels: 71 x (-0.02, -0.01, 0.01, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam. Inset: 28 x (-0.15, -0.075, 0.075, 0.15, 0.225, 0.3, 0.4, 0.5, 0.75) mJy/beam.

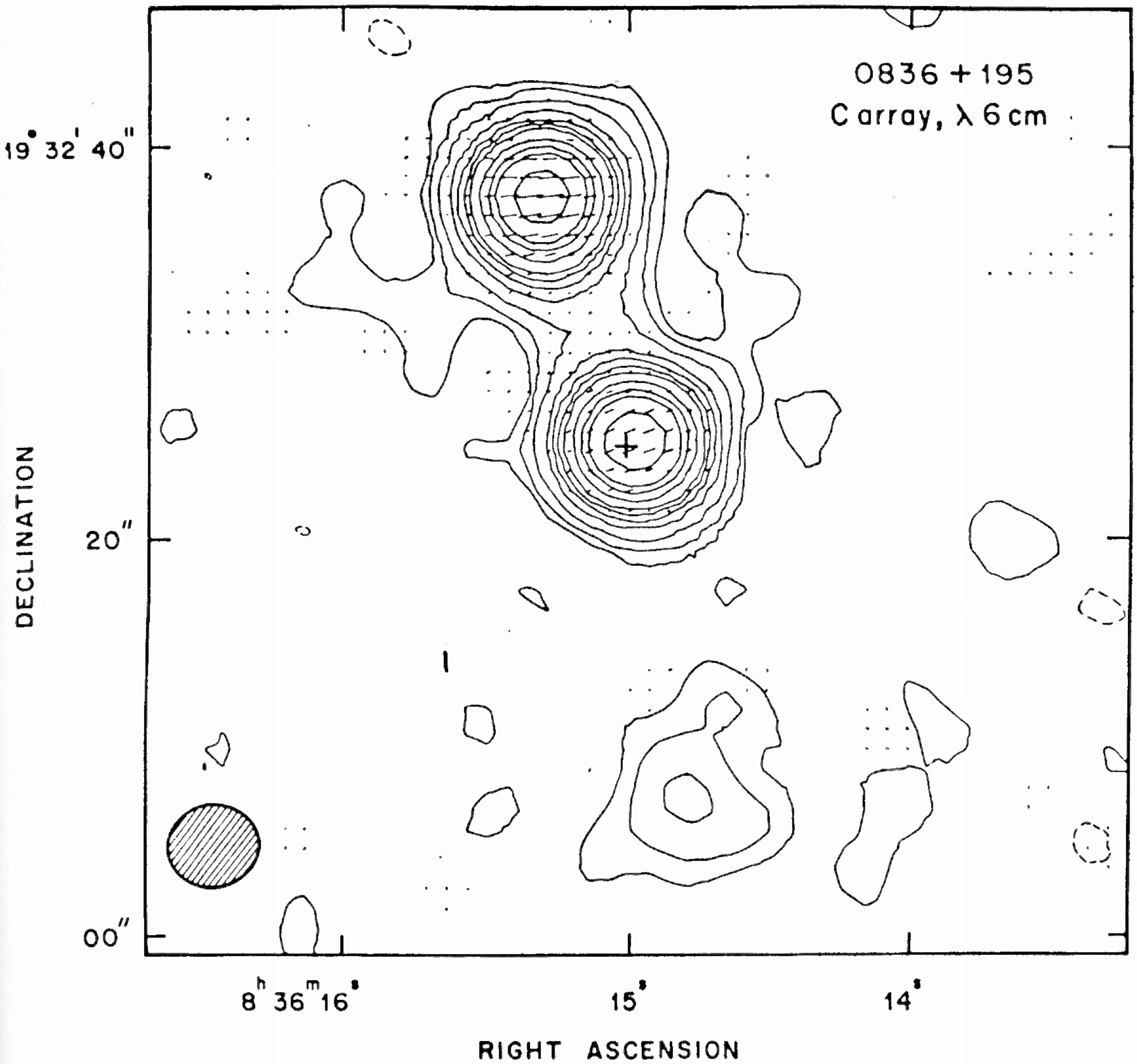


Fig.3.12b. Contour levels: 72 x (-0.02, -0.01, 0.01, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

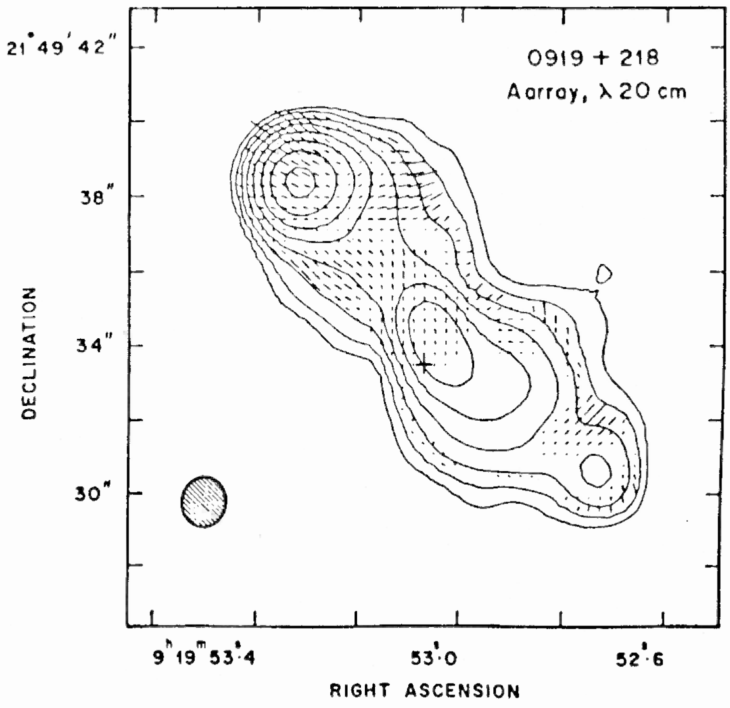


Fig.3.13a. Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 512, 1024, 2048) mJy/beam. Polarization: 1 arcsec = 0.245 ratio.

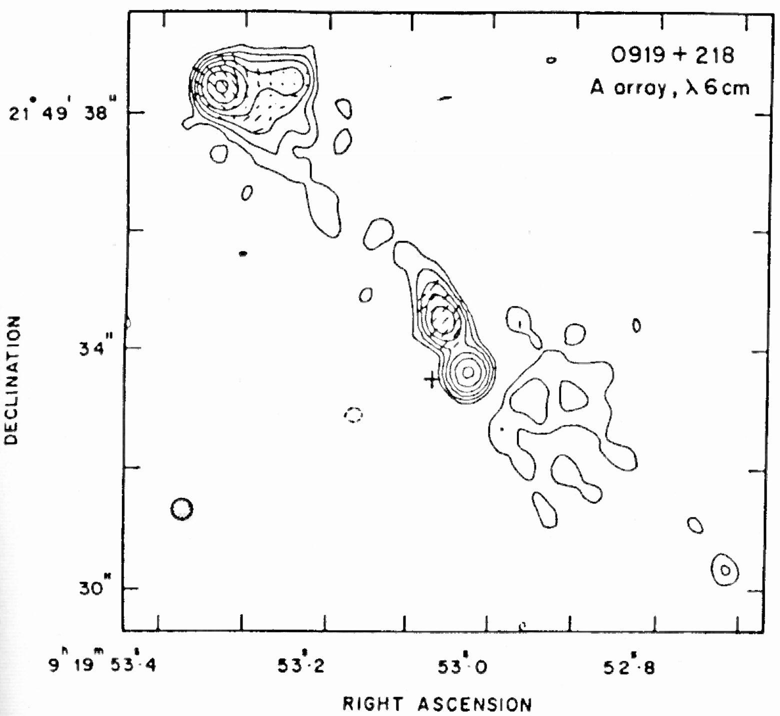


Fig.3.13b. Contour levels: 0.5 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048) mJy/beam. Polarization: 1 arcsec = 1.34 ratio.

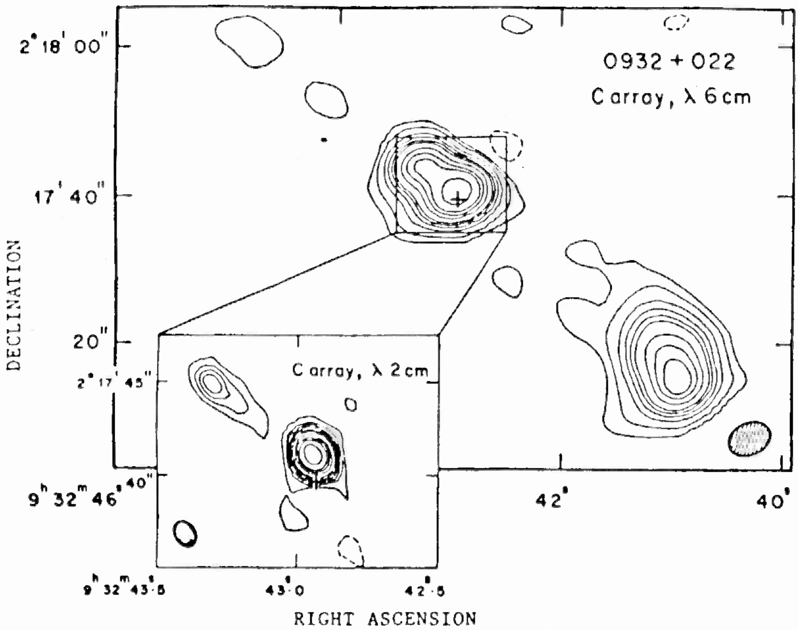


Fig.3.14a. Contour levels: 82 x (-0.04, -0.02, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam. Inset: 72 x -0.06, -0.03, 0.03, 0.06, 0.09, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

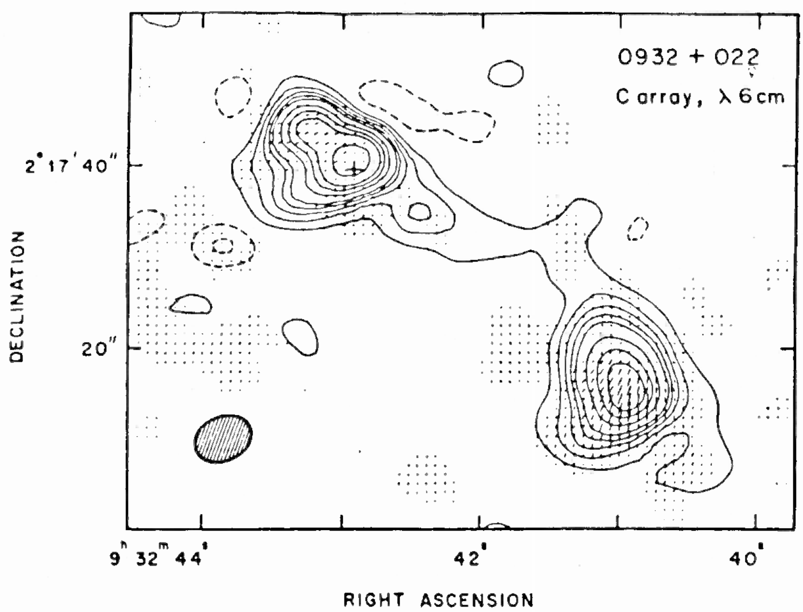
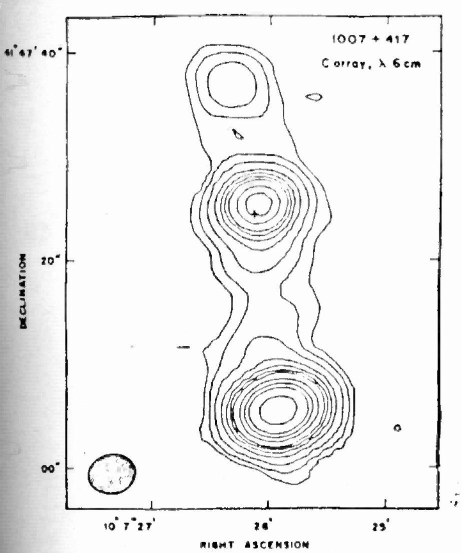


Fig.3.14b. Contour levels: 72 x (-0.08, -0.04, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.



3.15a. Contour levels: 304 x (-0.02, -0.01, 0.01, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

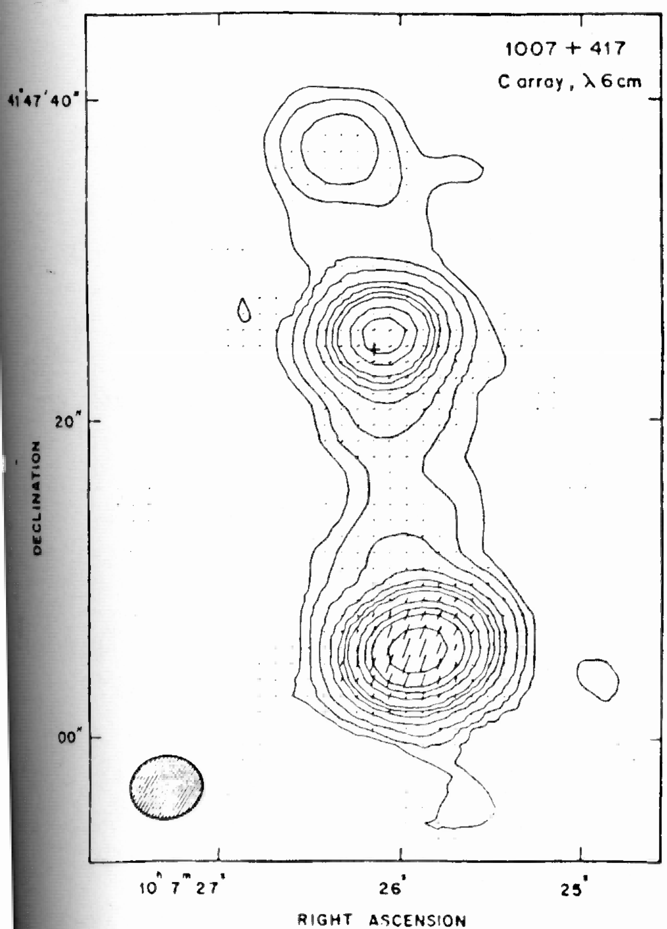


Fig. 3.15b. Contour levels: 302 x (-0.02, -0.01, 0.01, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5,0.75) mJy/beam.

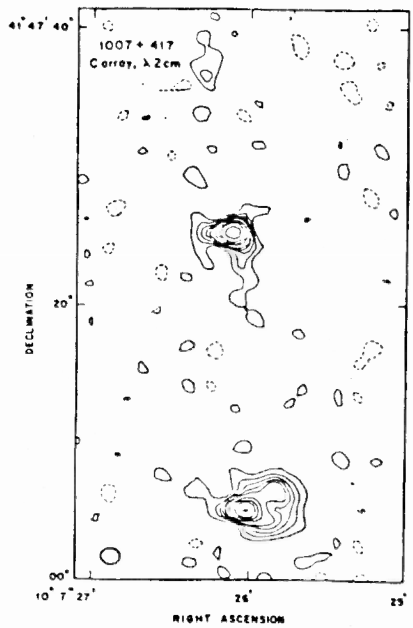


Fig. 3.15c. Contour levels: 67 x (-0.08, -0.04, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

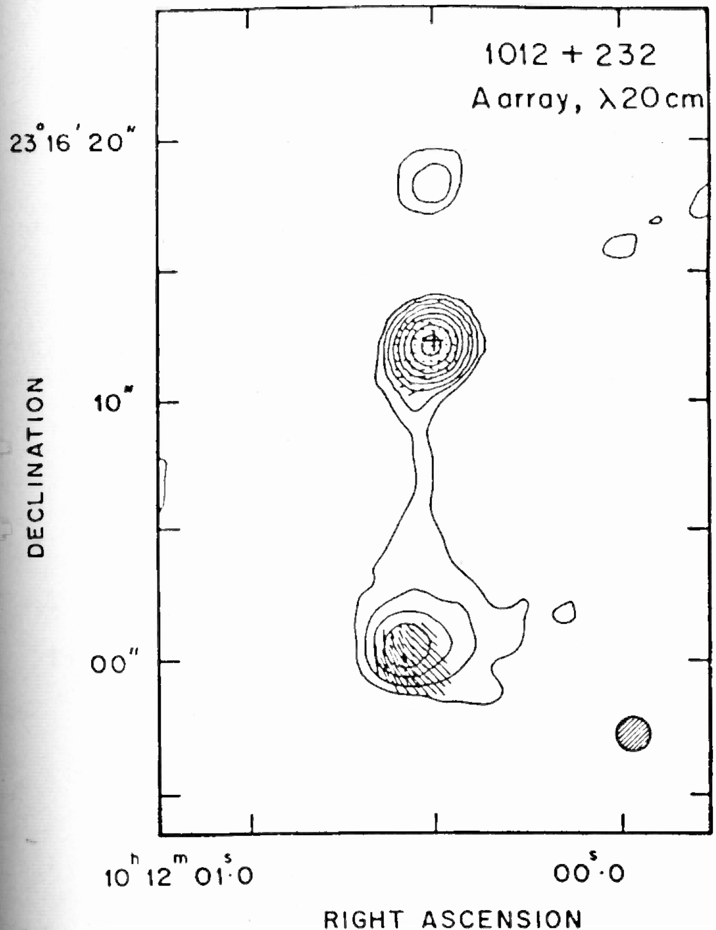


Fig.3.16a. Contour levels: 2 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048) mJy/beam. Polarization: 1 arcsec = 0.242 ratio.

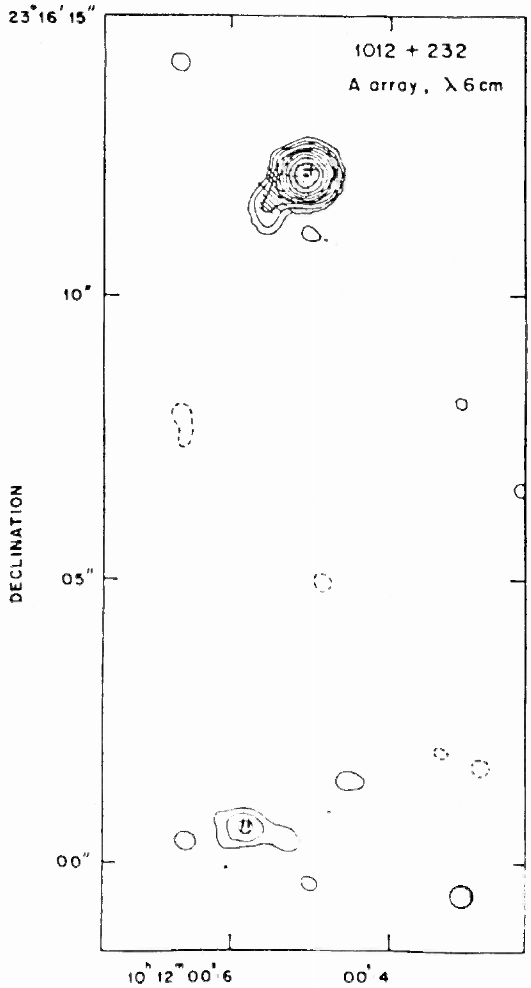


Fig.3.16b. Contour levels: 2 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512) mJy/beam. Polarization: 1 arcsec = 0.343 ratio.

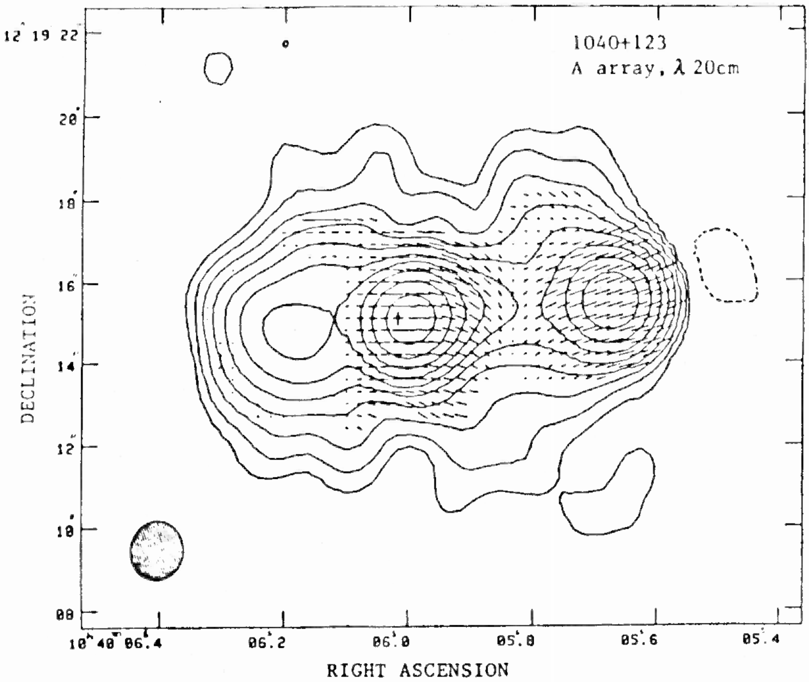


Fig.3.17a. Contour levels: 2 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512) mJy/beam. Polarization: 1 arcsec = 0.321 ratio.

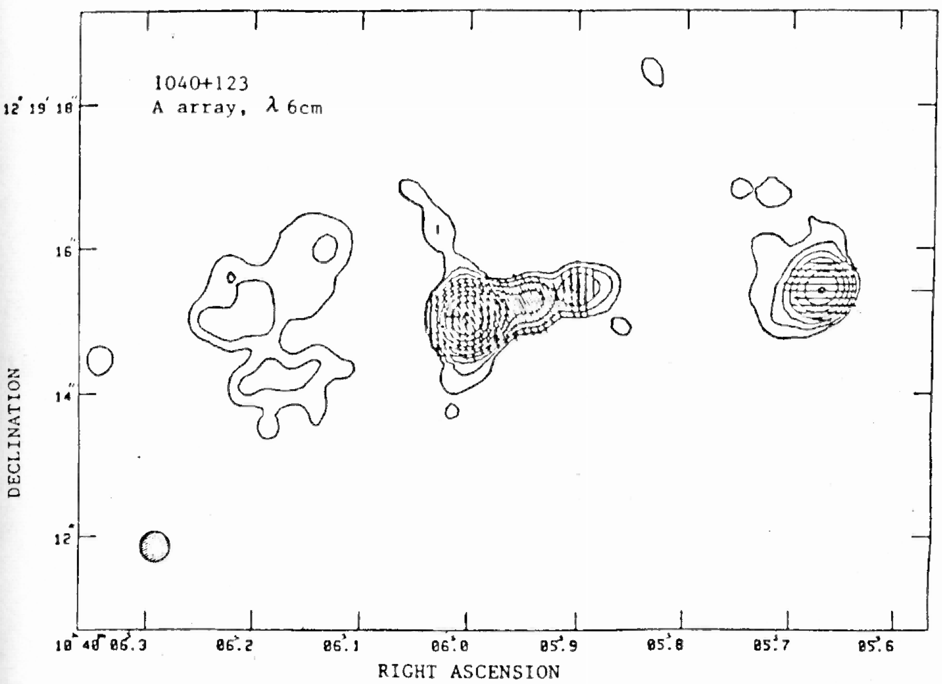


Fig.3.17b. Contour levels: 2 x (-4,-2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512) mJy/beam. Polarization: 1 arcsec = 0.967 ratio.

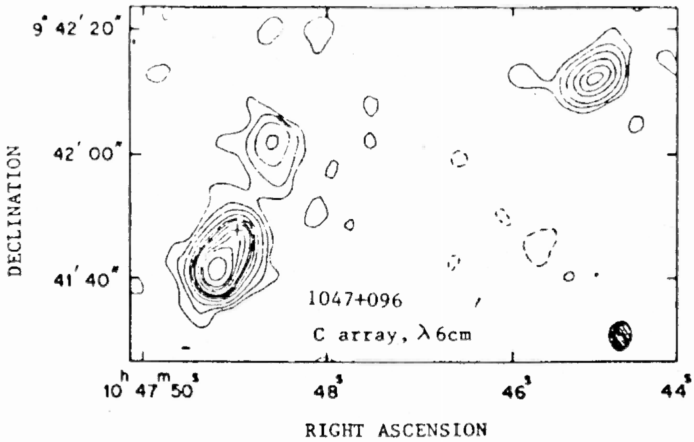


Fig.3.18a. Contour levels: 59 x (-0.02, -0.01, 0.01, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

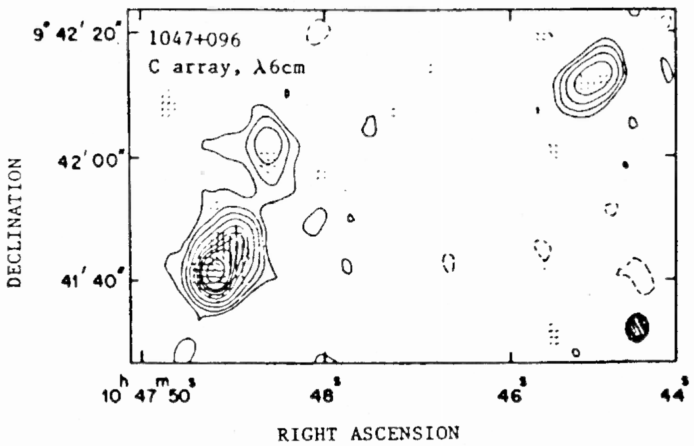


Fig.3.18b. Contour levels: 58 x (-0.025, -0.0125, 0.0125, 0.025, 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

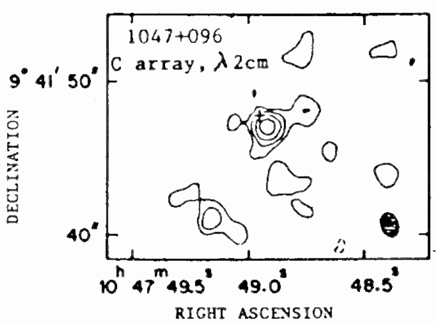


Fig.3.18c. Contour levels: 16 x (-0.3, -0.15, 0.15, 0.3, 0.5, 0.75) mJy/beam.

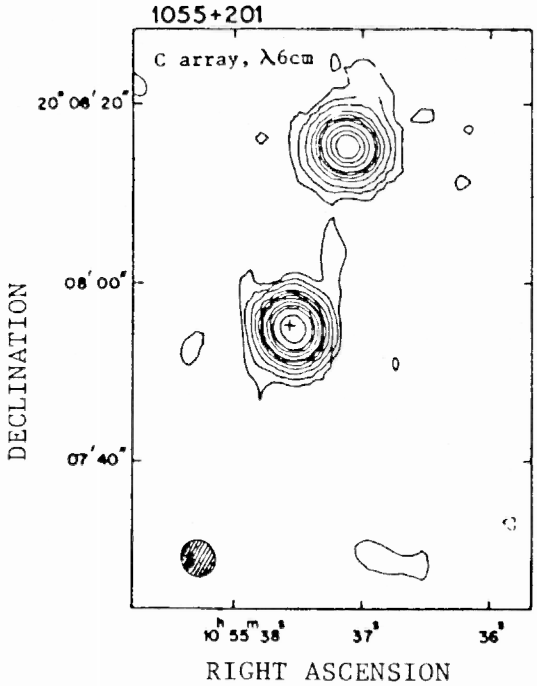


Fig.3.19a. Contour levels: 792 x (-0.02, -0.01, 0.01, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

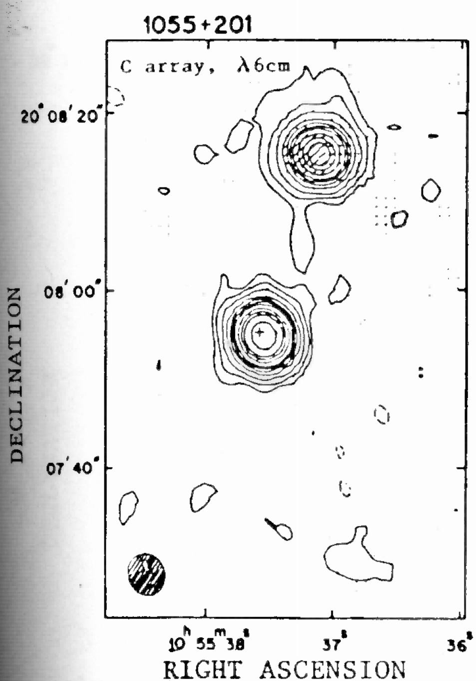


Fig. 3.19b. Contour levels: 787 x (-0.02, -0.01, 0.01, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

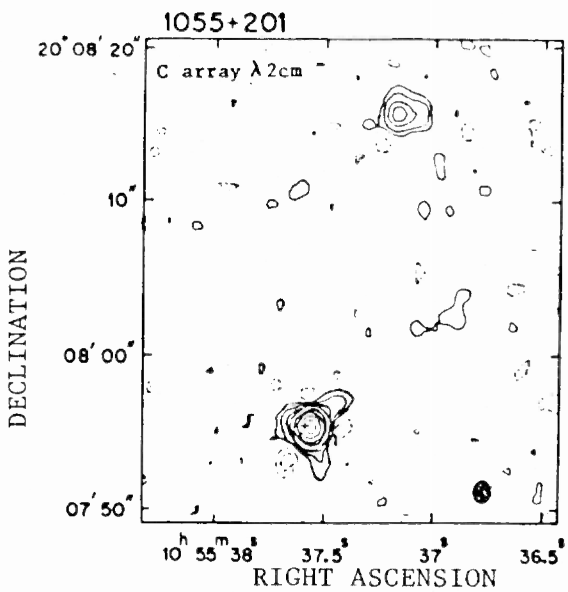


Fig. 3.19c. Contour levels: 819 x (-0.03, -0.015, .015, 0.03, 0.06, 0.09, 0.2, 0.3, 0.5, 0.75) mJy/beam.

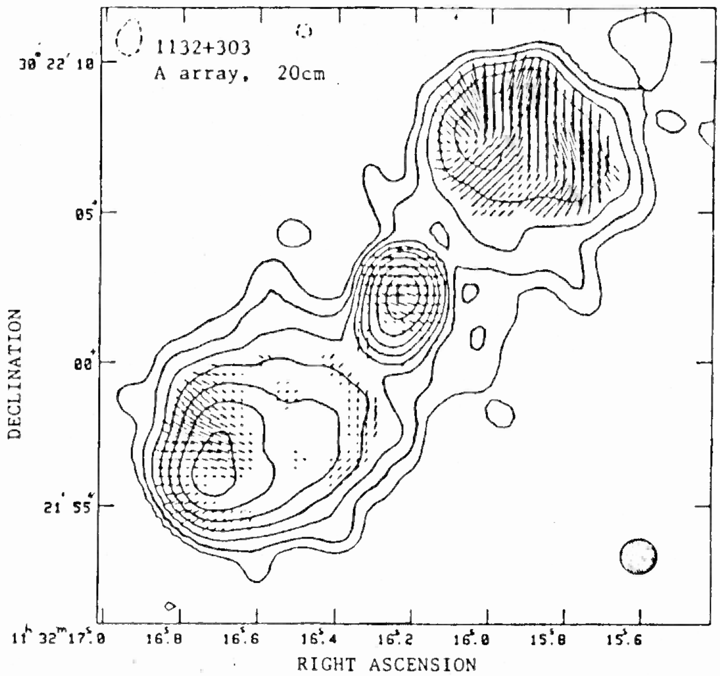


Fig. 3.20a. Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128) mJy/beam. Polarization: 1 arcsec = 0.147 ratio.

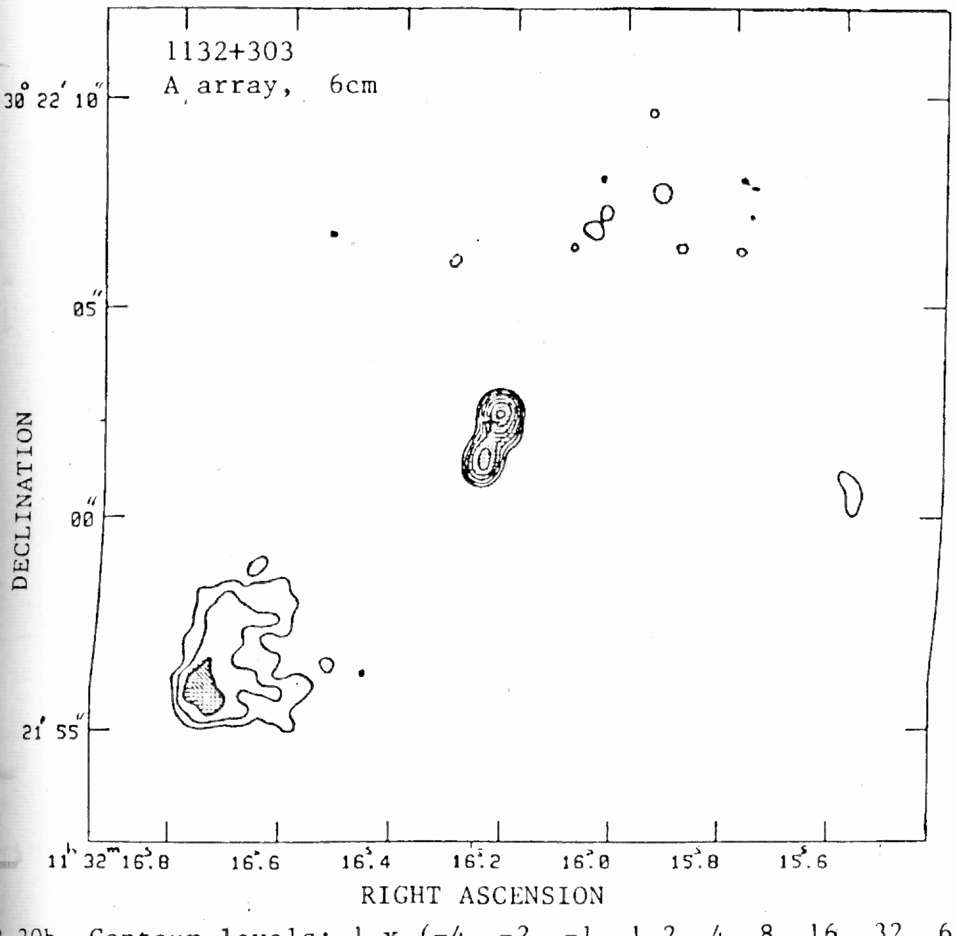


Fig. 3.20b. Contour levels: 1 x (-4, -2, -1, 1 2, 4, 8, 16, 32, 64)mJy/beam. Polarization: 1 arcsec = 0.686 ratio.

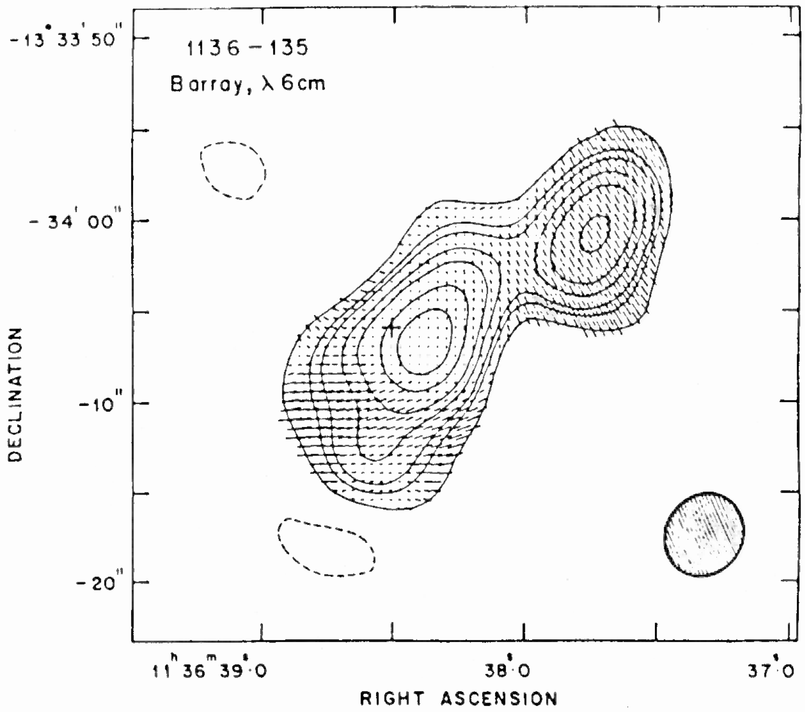


Fig.3.21a. Contour levels: 5.3 x (-7, 7, 15, 20, 30, 40, 60, 80) mJy/beam. Polarization: 1 arcsec = 0.132 ratio.

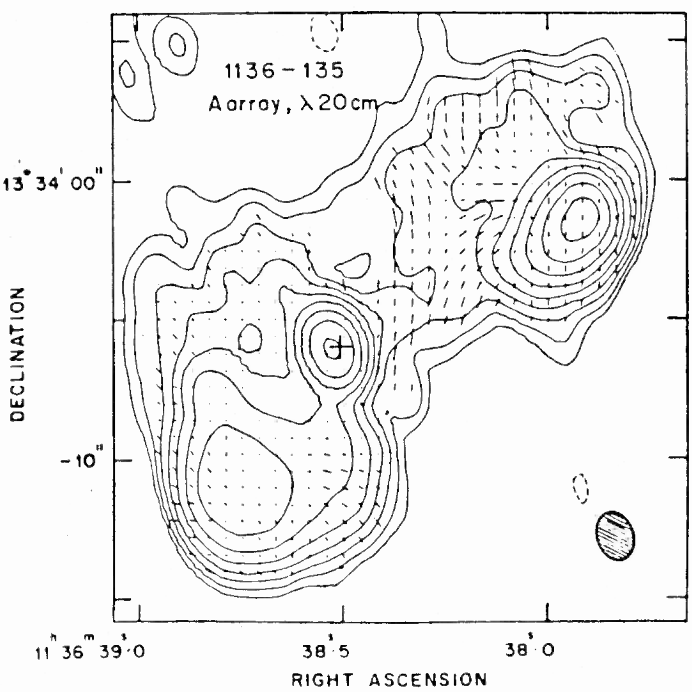


Fig.3.21b. Contour levels: 2 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512) mJy/beam. Polarization: 1 arcsec = 0.48 ratio.

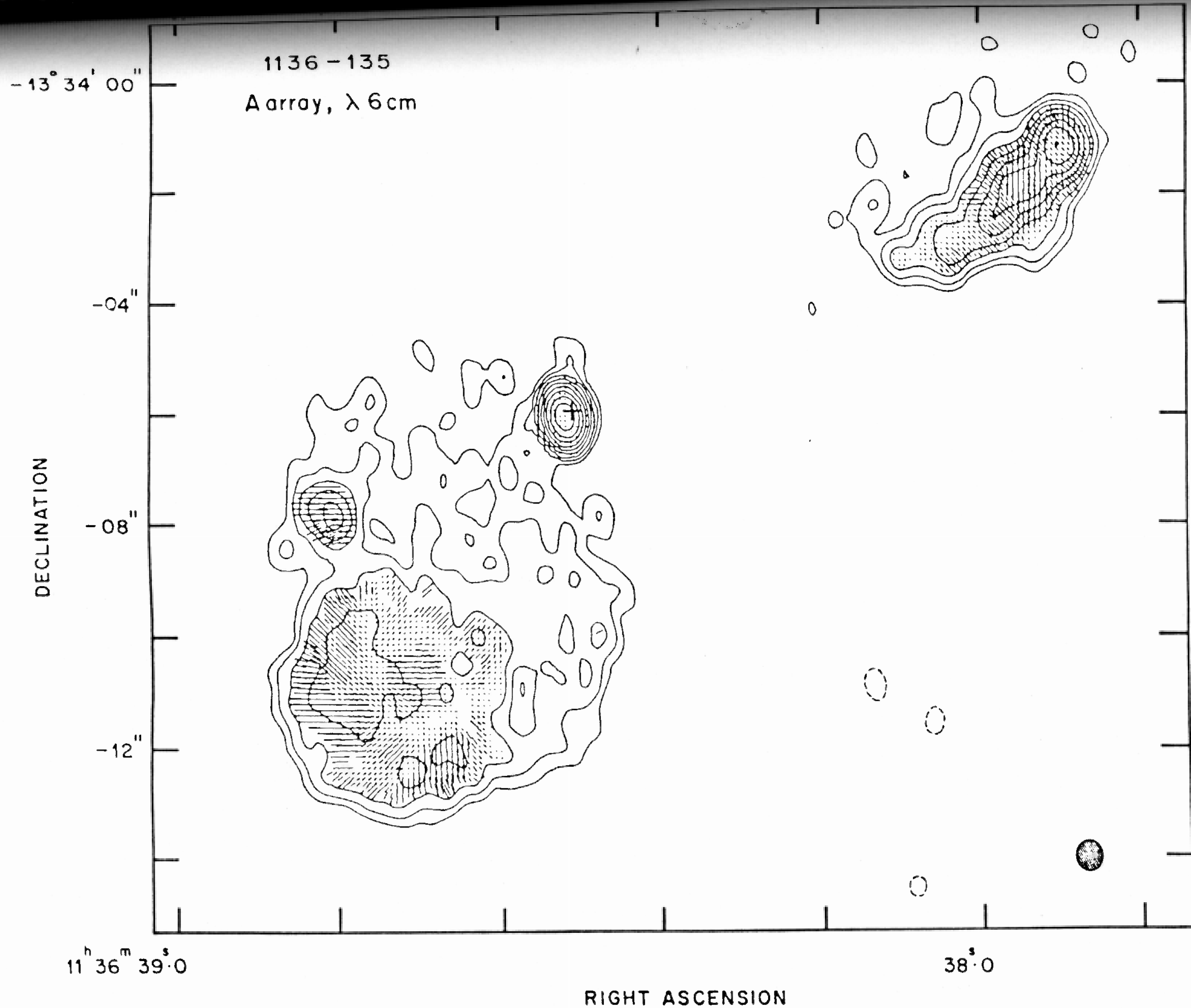


Fig.3.21c. Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256) mJy/beam.
Polarization: 1 arcsec = 1.04 ratio.

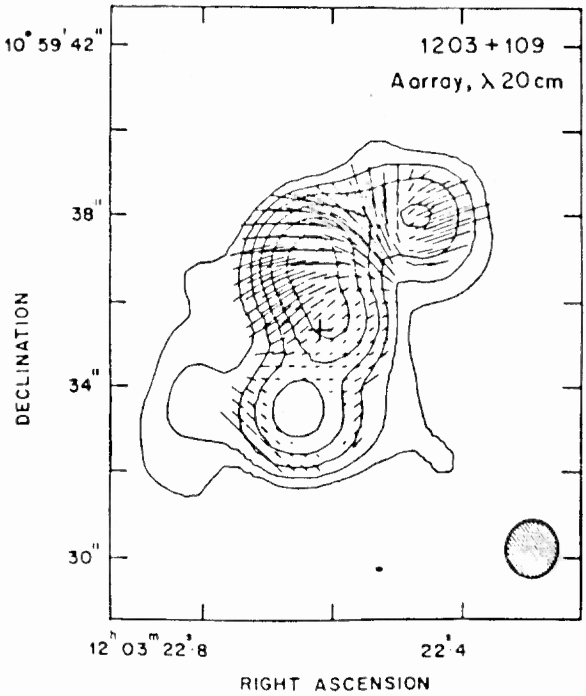


Fig.3.22a. Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64) mJy/beam. Polarization: 1 arcsec = 0.12 ratio.

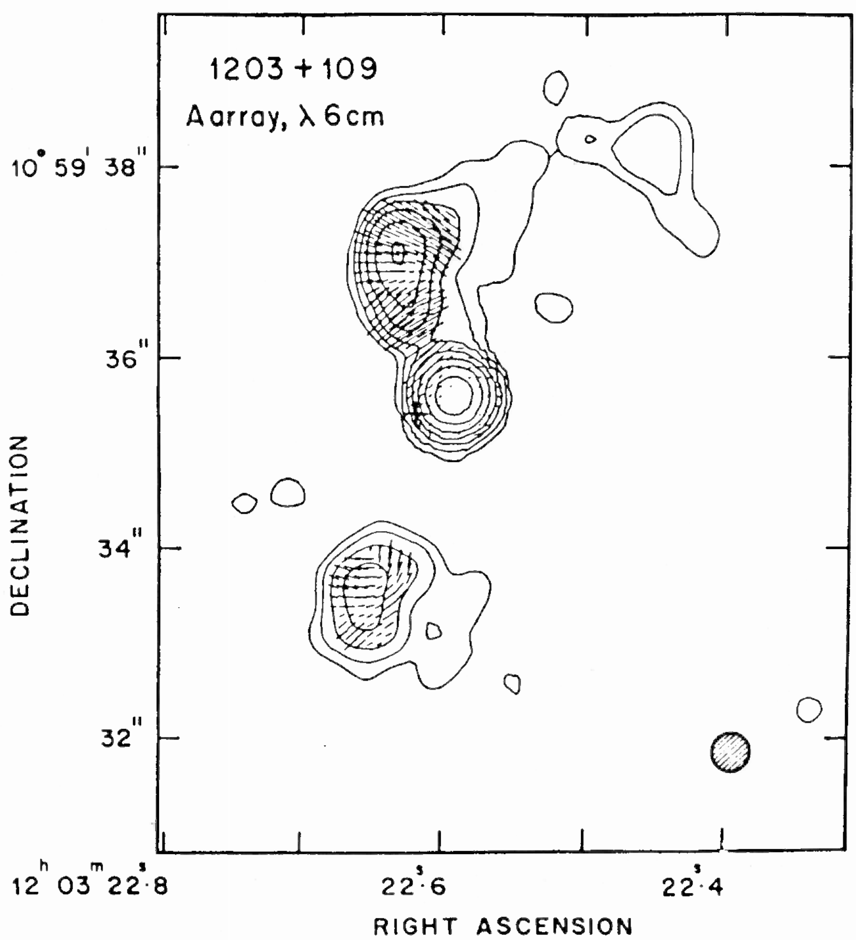


Fig.3.22b. Contour levels: 0.5 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64) mJy/beam. Polarization: 1 arcsec = 0.652 ratio.

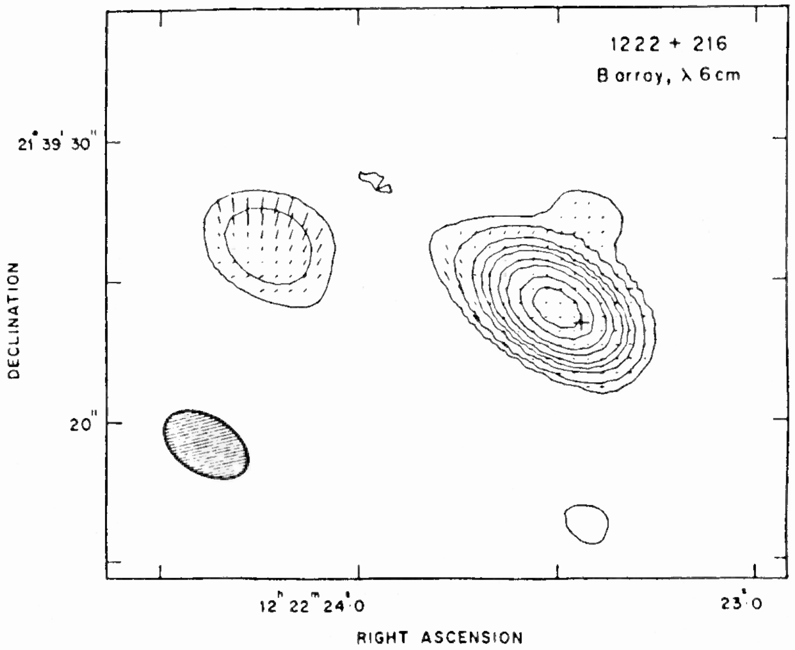


Fig.3.23a. Contour levels: 8.5 x (-2.5, 2.5, 5, 10, 15, 20, 30, 40, 60, 80) mJy/beam. Polarization: 1 arcsec = 0.246 ratio.

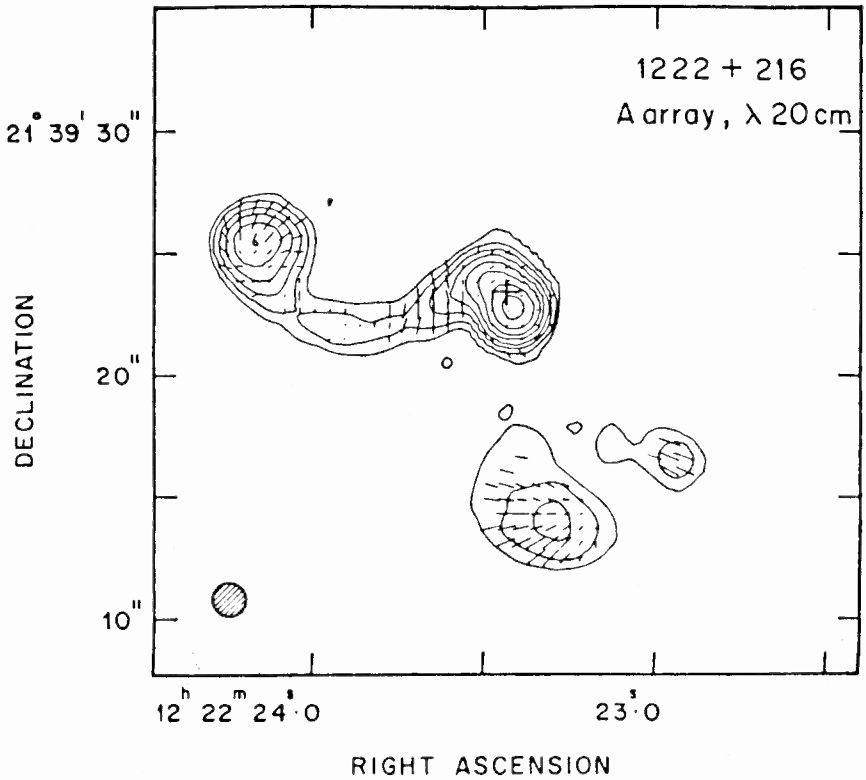


Fig.3.23b. Contour levels: 1 x (-4, -2, -1, 4, 8, 16, 32, 64, 128, 256, 512) mJy/beam. Polarization: 1 arcsec = 0.337 ratio.

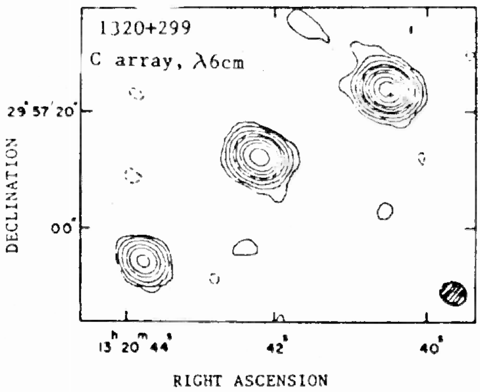


Fig. 3.24a. Contour levels: 277 x (-0.02, -0.01, 0.01, 0.02, 0.04, 0.08, 0.12, 0.2, 0.3, 0.5, 0.75) mJy/beam.

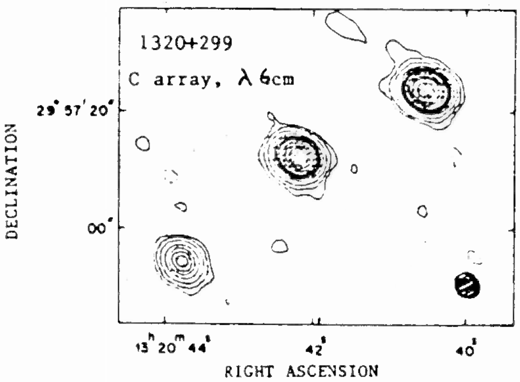


Fig. 3.24b. Contour levels: 277 x (-0.02, -0.01, 0.01. 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

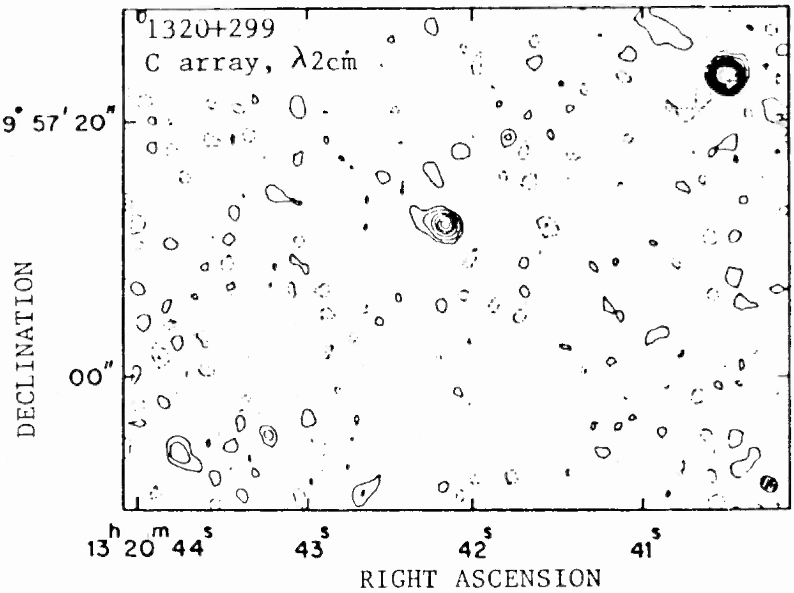


Fig. 3.24c. Contour levels: 156 x (-0.04, -0.02, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.5, 0.75) mJy/beam.

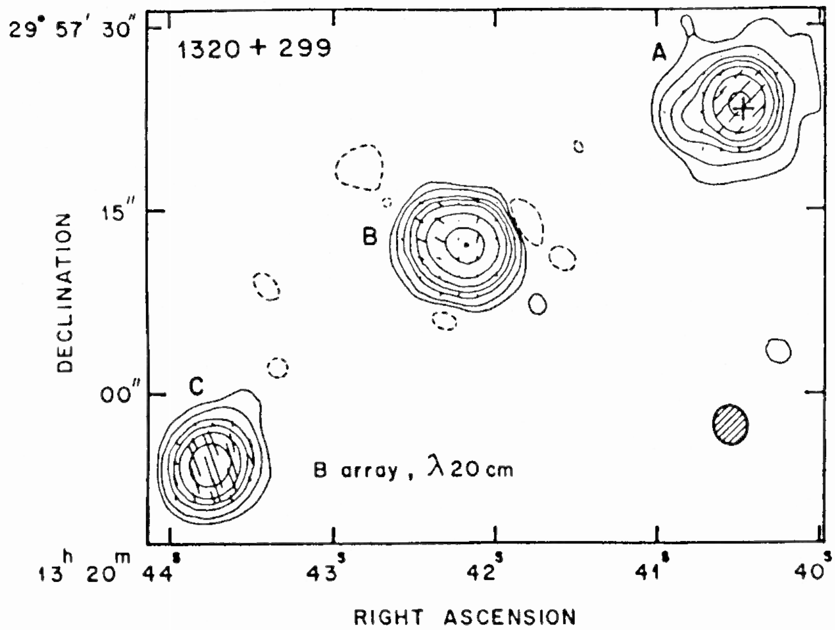


Fig. 3.24d. Contour levels: 1 x (-1, 1, 3, 10, 20, 40, 100, 300, 500) mJy/beam. Polarization: 1 arcsec = 4.5 mJy/beam.

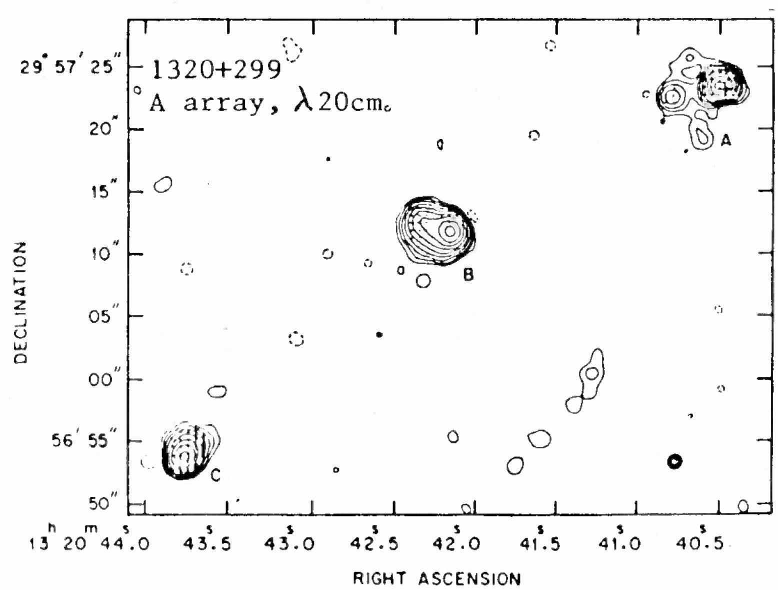


Fig. 3.24e. Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256) mJy/beam. Polarization: 1 arcsec = 0.26 ratio.

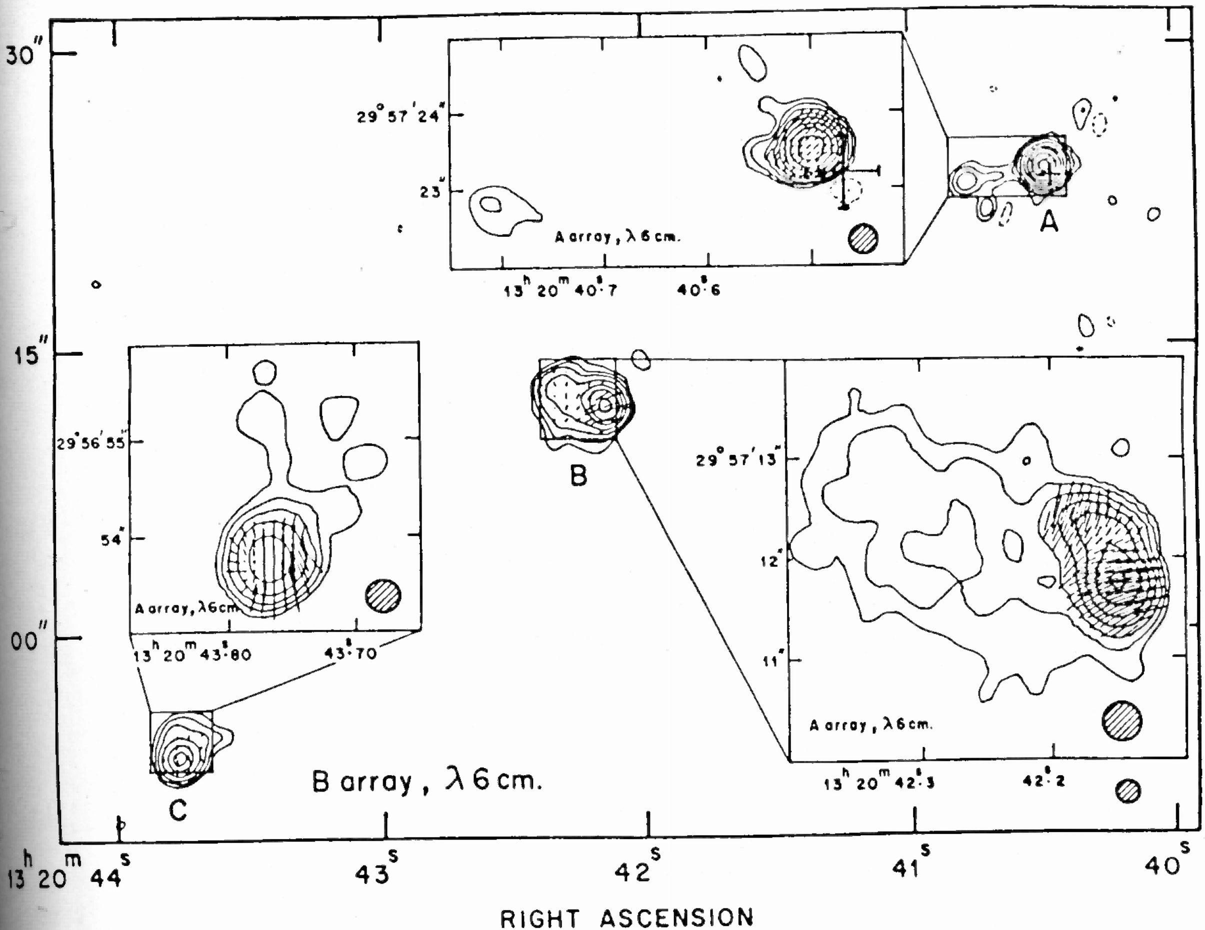


Fig. 3.24f. Contour levels: 1 x (-0.7, 0.7, 1.4, 3, 8, 20, 40, 100, 200) mJy/beam. Polarization: 1 arcsec = 9.1 mJy/beam. Insets: Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128) mJy/beam. Polarization: 1 arcsec = 0.61 ratio.

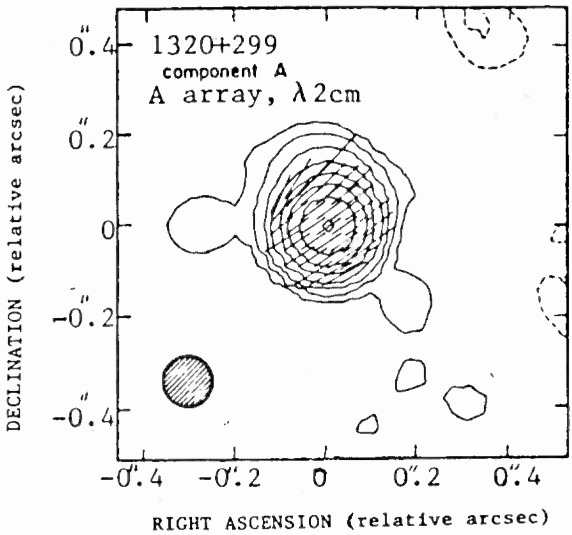


Fig. 3.24g. Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128)mJy/beam. Polarization: 1 arcsec = 0.8 ratio.

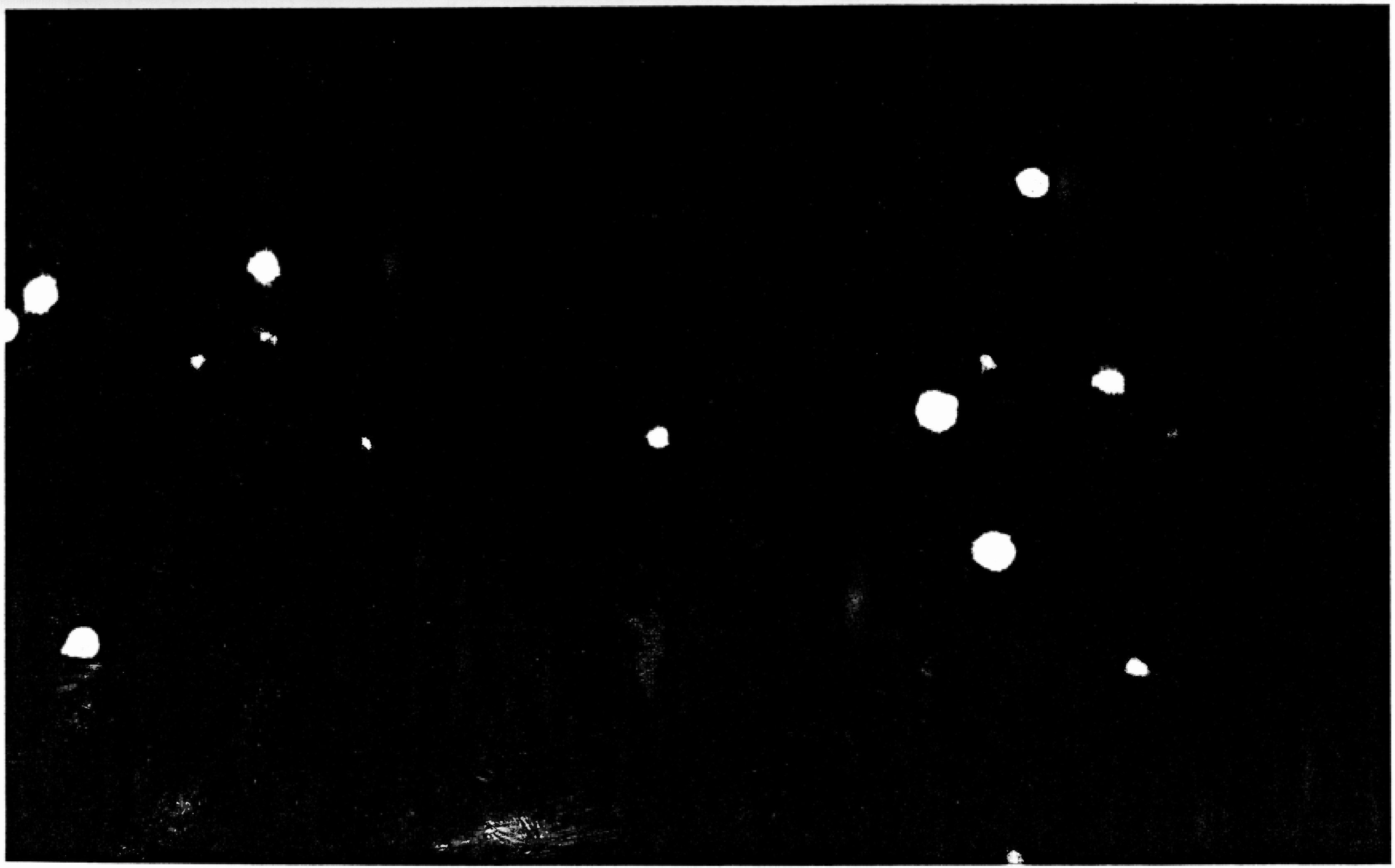


Fig. 3.24h. The R band CCD image of the field of 1320+299. Overlaid is the A-array radio image at 20cm.

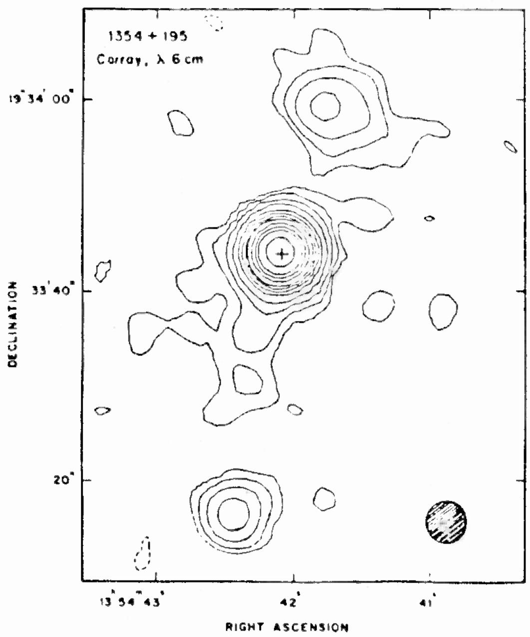


Fig.3.25a. Contour levels: 1230 x (-0.01, -0.005, 0.005, 0.01, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

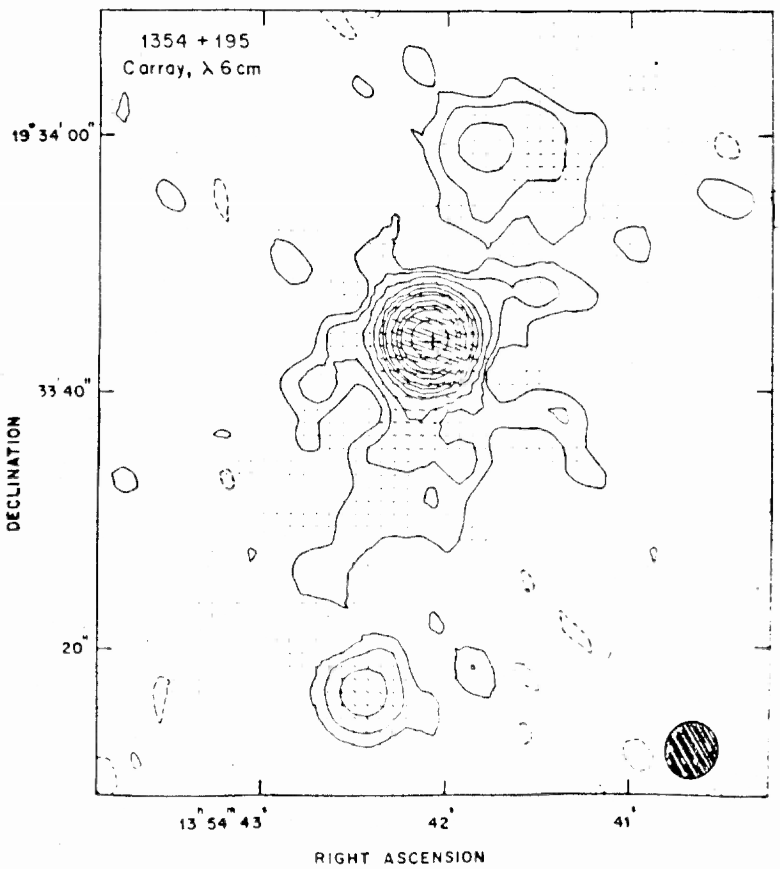


Fig.3.25b. Contour levels: 1202 x (-0.02, -0.01, 0.01, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

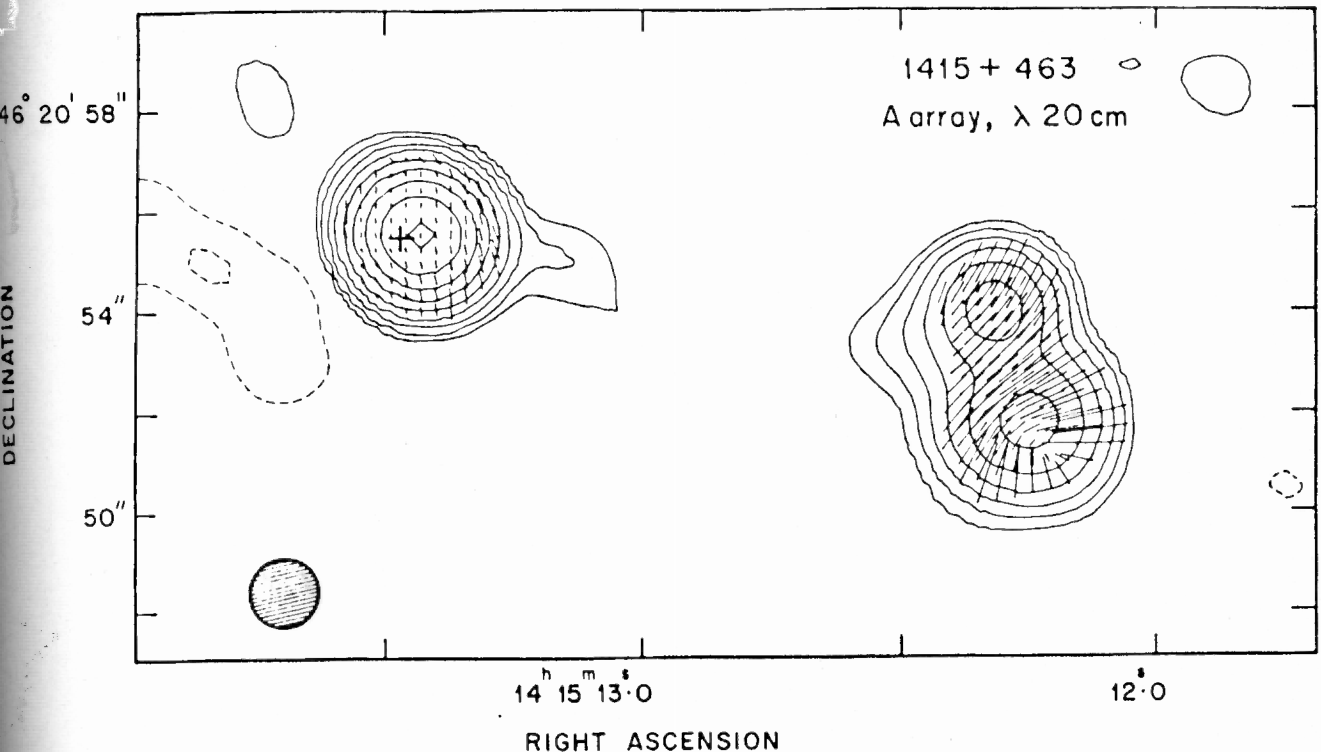


Fig.3.26a. Contour levels: 2 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256) mJy/beam. Polarization: 1 arcsec = 0.127 ratio.

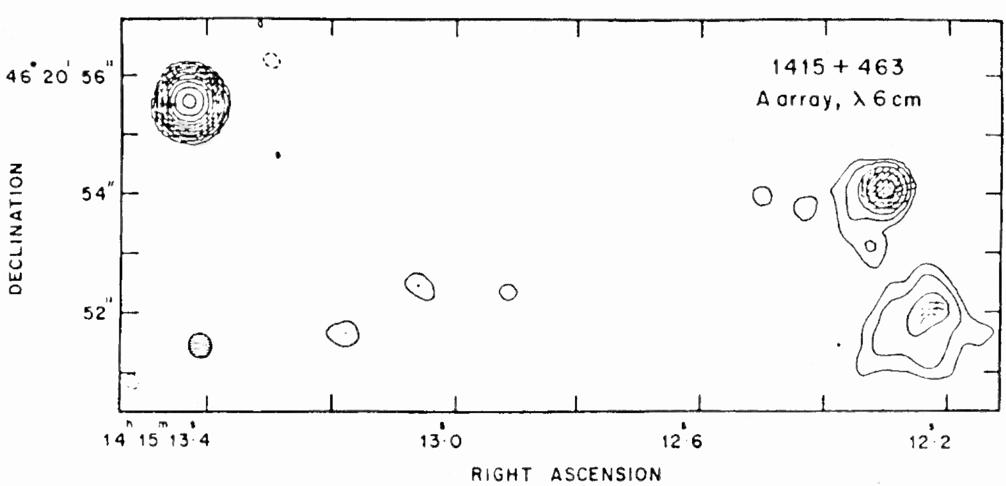


Fig.3.26b. Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512) mJy/beam. Polarization: 1 arcsec = 0.544.

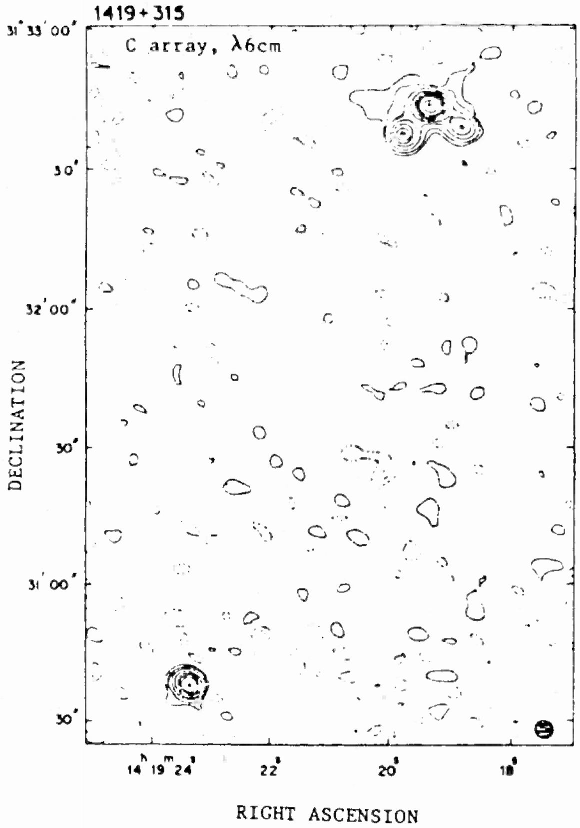


Fig. 3.27a. Contour levels: 55 x (-0.06, -0.03, 0.03, 0.06, 0.12, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

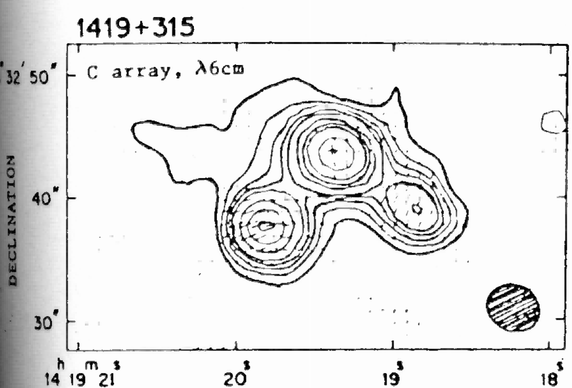


Fig. 3.27b. Contour levels: 54 x (-0.08, -0.04, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

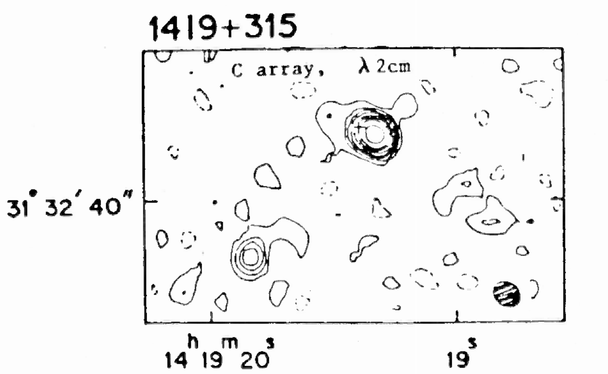


Fig. 3.27c. Contour levels: 36 x (-0.1, -0.05, 0.05, 0.1, 0.2, 0.3, 0.3, 0.4, 0.5, 0.75)mJy/beam.

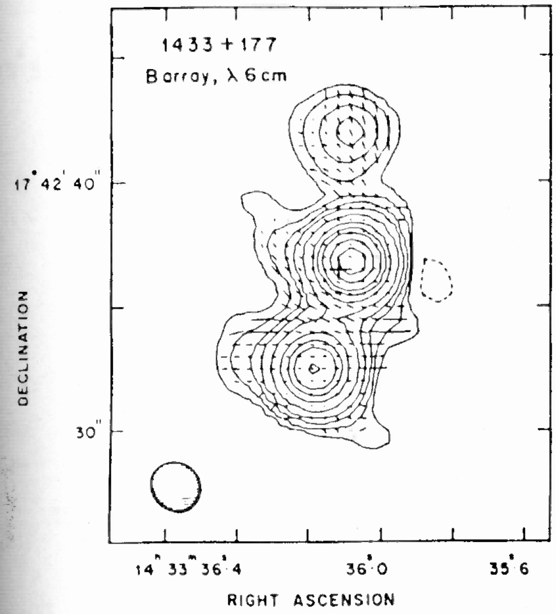


Fig.3.28a. Contour levels: 3 x (-0.7, 0.7, 1.5, 3, 5, 10, 20, 30, 40, 60, 80) mJy/beam. Polarization: 1 arcsec = 0.303 ratio.

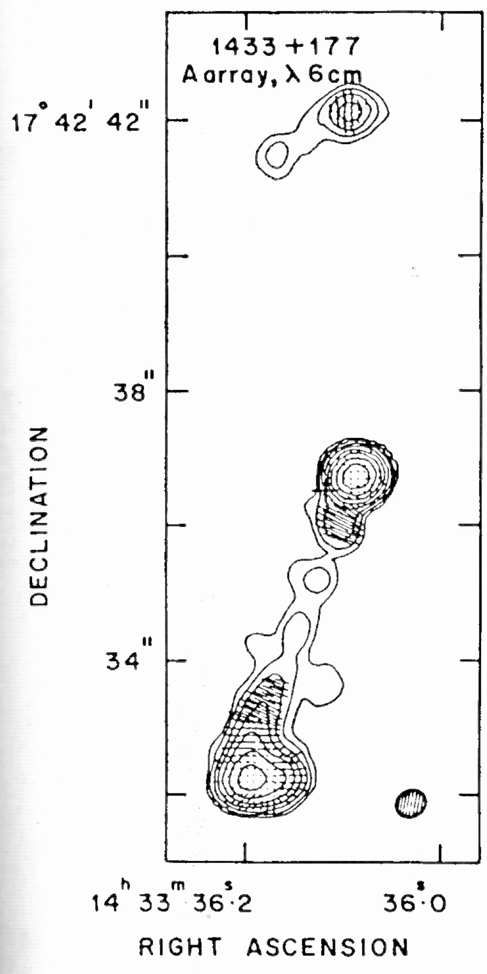


Fig.3.28b. Contour levels: 1 x -4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128) mJy/beam. Polarization: 1 arcsec = 0.919 ratio.

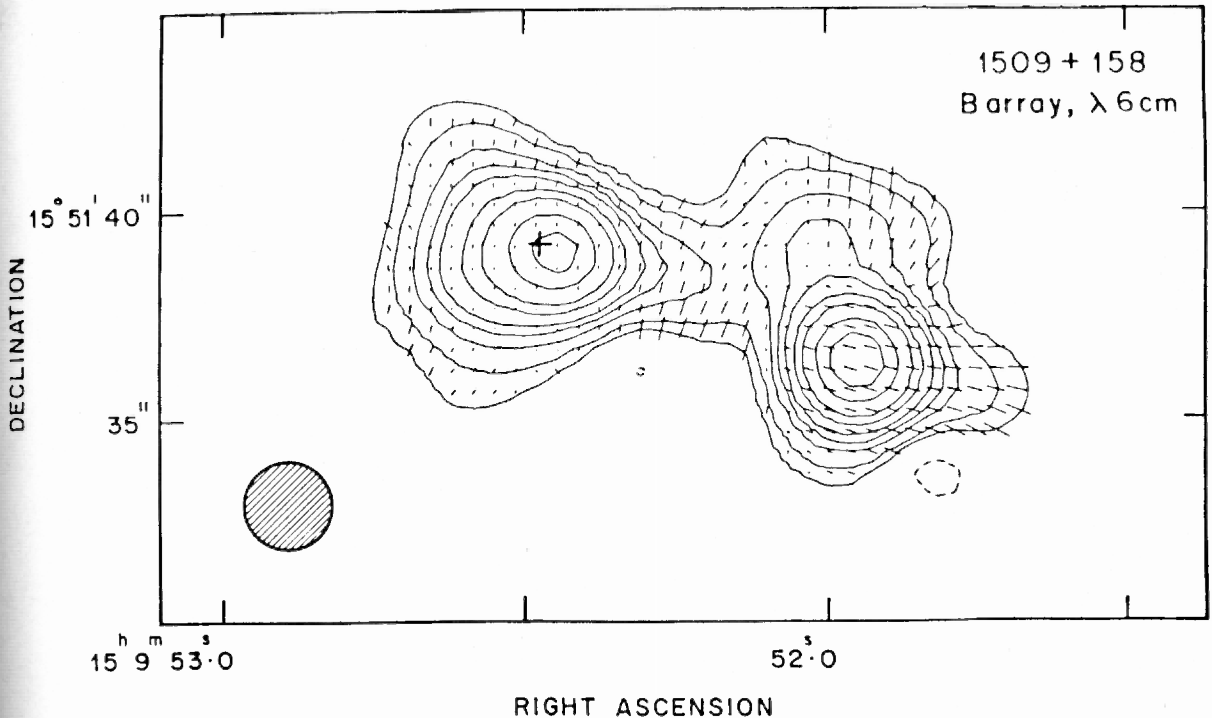


Fig. 3.29a. Contour levels: 1.3 x (-2.5, 2.5, 5, 10, 15, 20, 30, 40, 60, 80) mJy/beam. Polarization: 1 arcsec = 0.469 ratio.

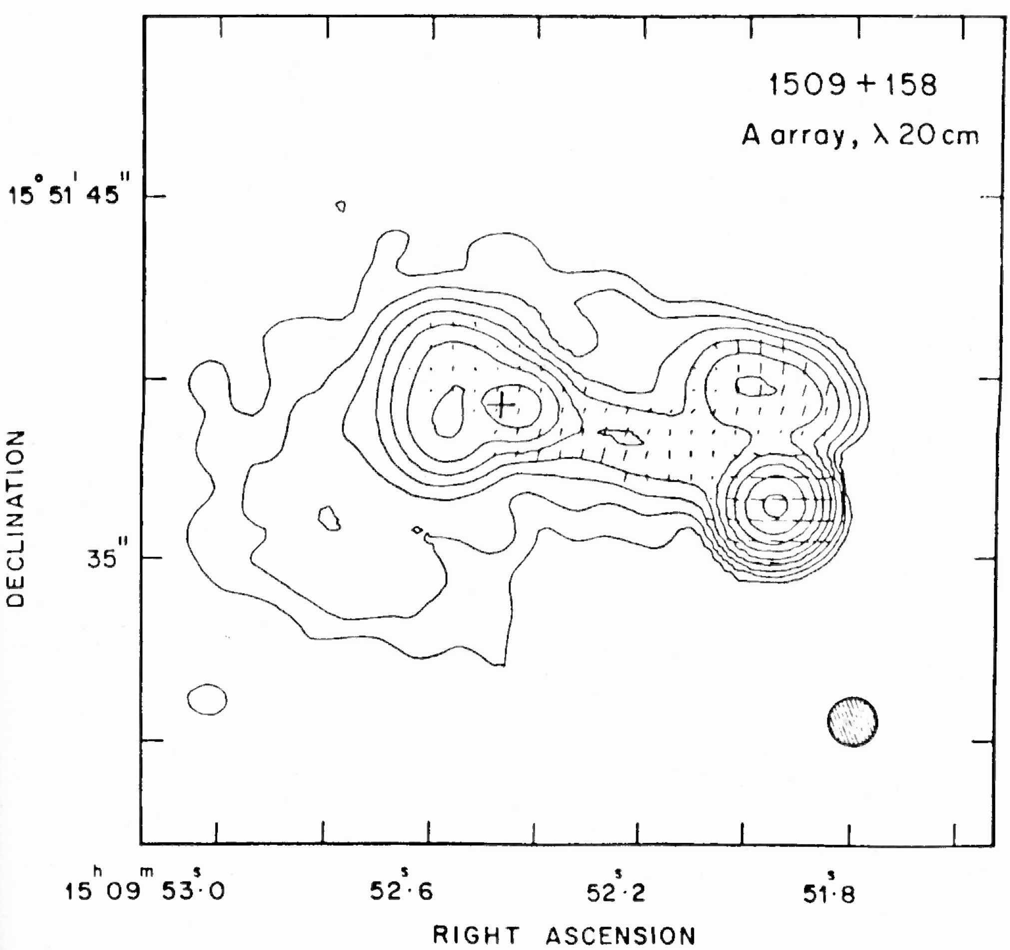


Fig. 3.29b. Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128, 256) mJy/beam.

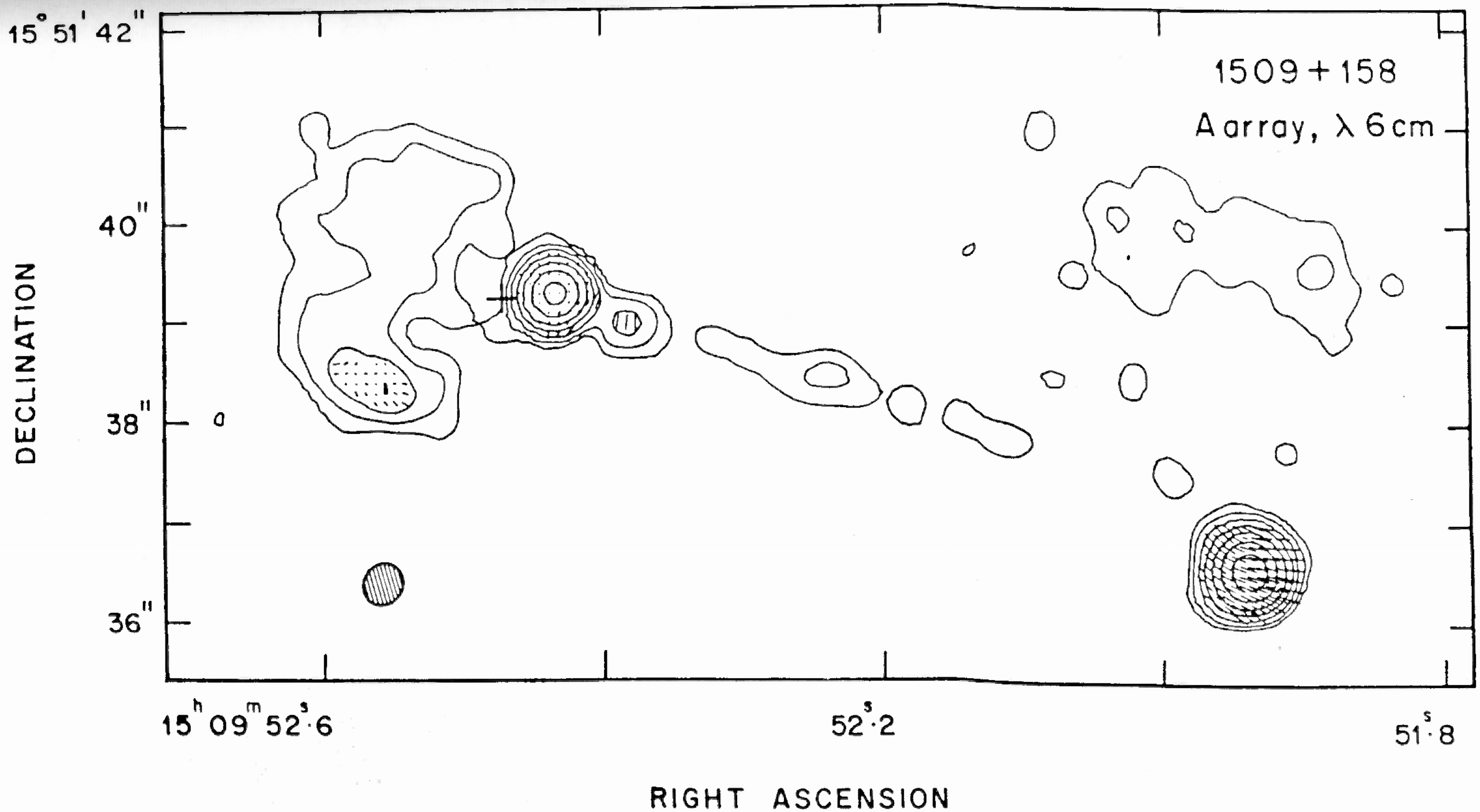


Fig. 3.29c. Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64) mJy/beam.
Polarization: 1 arcsec = 0.962 ratio.

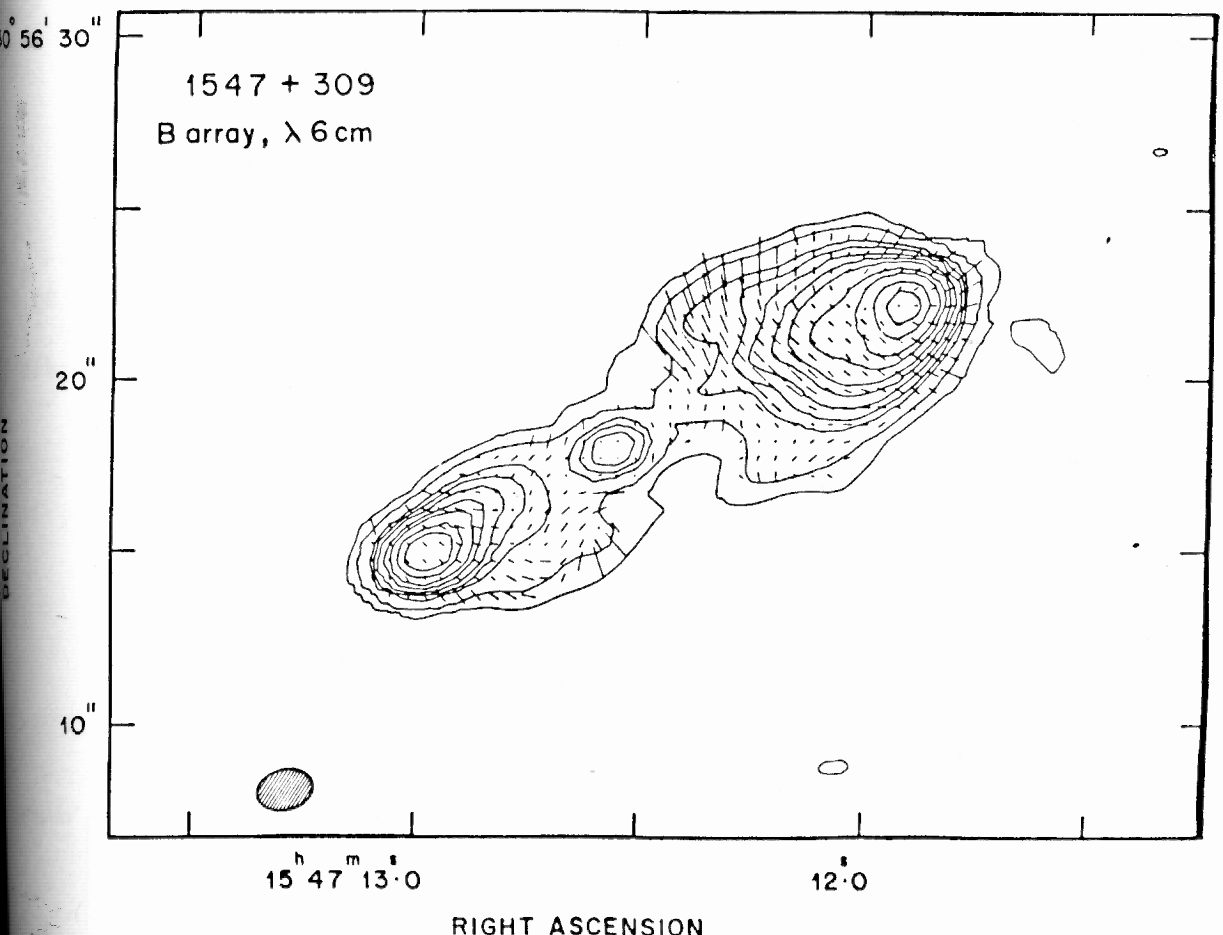


Fig. 3.30. Contour levels: 0.64 x (-0.8, 0.8, 2, 5, 7, 10, 15, 20, 30, 40, 60, 80) mJy/beam. Polarization: 1 arcsec = 0.464 ratio.

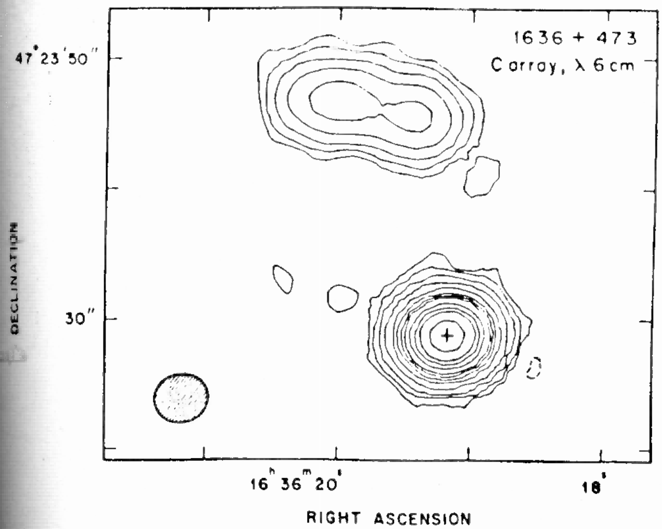


Fig. 3.31a. Contour levels: 492 x (-0.01, -0.005, 0.005, 0.01, 0.02, 0.04, 0.08, 0.12,0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

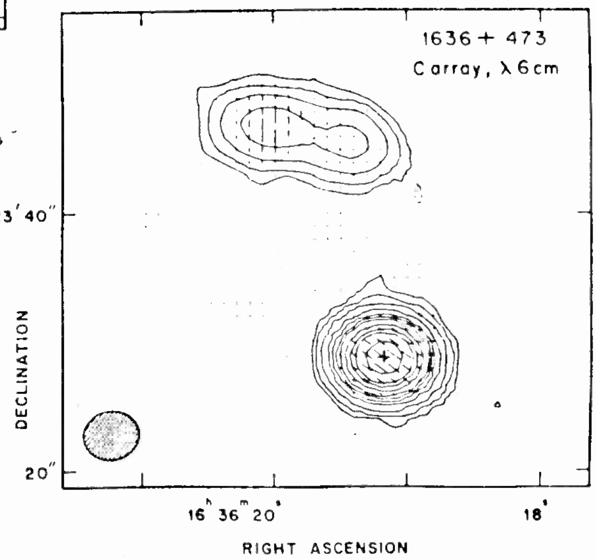


Fig. 3.31b. Contour levels: 494 x (-0.02, -0.01, 0.01, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

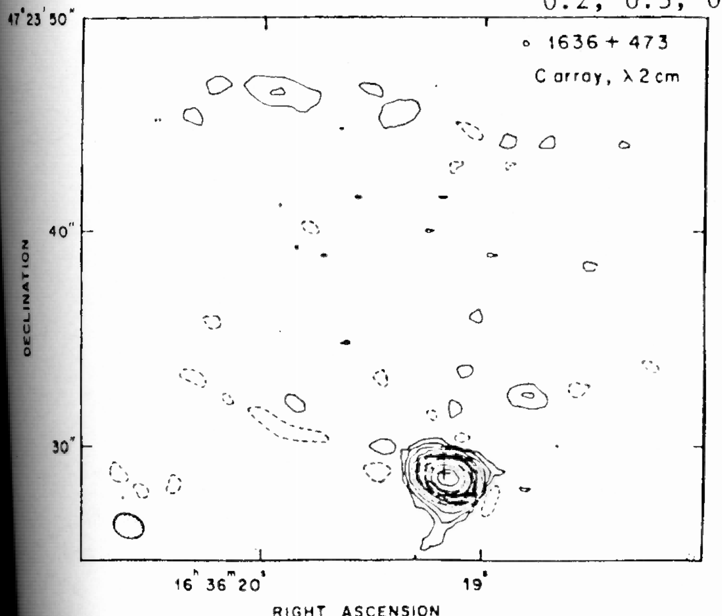


Fig. 3.31c. Contour levels: 885 x (-0.03, -0.015, -0.0075, 0.0075, 0.015, 0.03, 0.06, 0.09, 0.12, 0.15, 0.2, 0.25, 0.3, 0.4, 0.5, 0.75) mJy/beam.

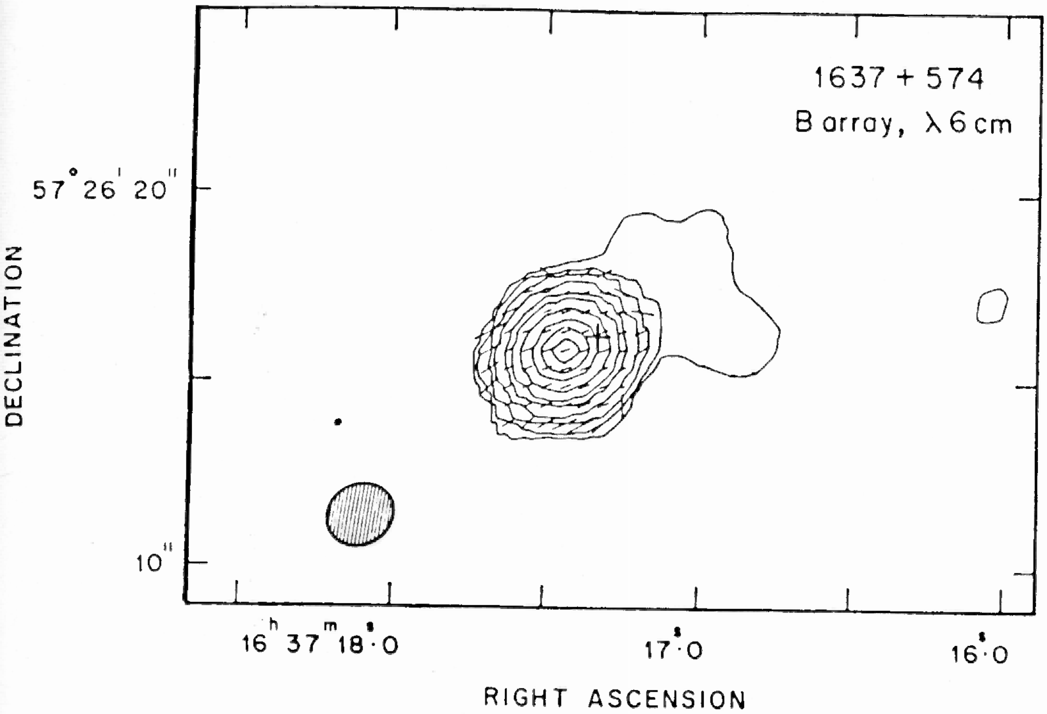


Fig.3.32. Contour levels: 1.6 x (-0.2, 0.2, 0.3, 0.7, 2, 5, 10, 20, 40, 60, 80) mJy/beam. Polarization: 1 arcsec = 0.115 ratio.

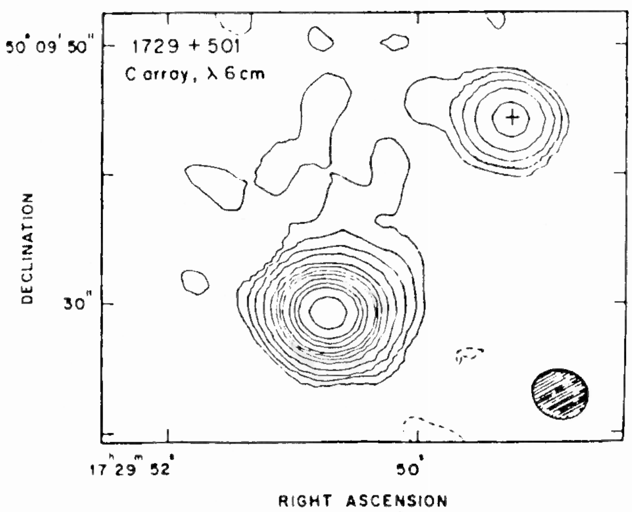


Fig.3.33a. Contour levels: 355 x (-0.01,-0.005, 0.005, 0.01, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

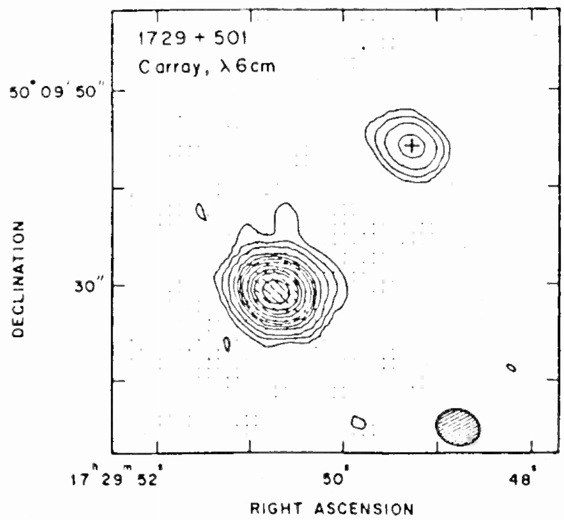


Fig.3.33b. Contour levels: 353 x (-0.02, -0.01, 0.01, 0.02, 0.04, 0.08, 0.12, 0.16, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam

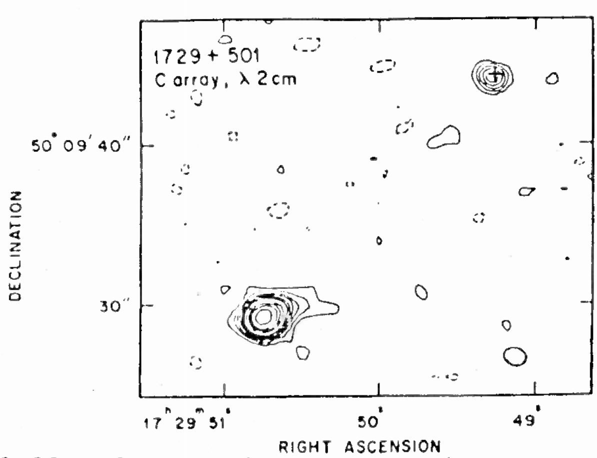


Fig.3.33c. Contour levels: 77x (-0.1, -0.05, 0.05, 0.1, 0.15, 0.2, 0.3, 0.4, 0.5, 0.75) mJy/beam.

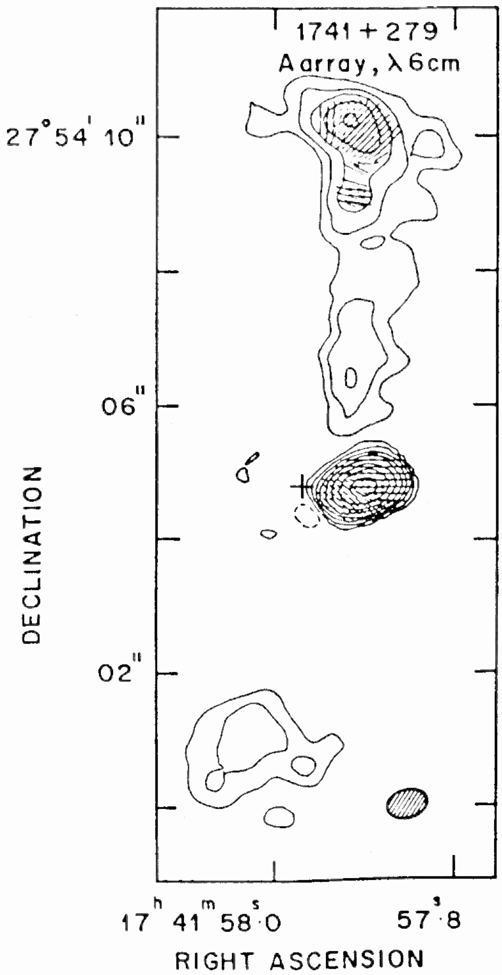


Fig.3.34. Contour levels: 1 x (-4, -2, -1, 1, 2, 4, 8, 16, 32, 64, 128) mJy/beam. Polarization: 1 arcsec = 0.479 ratio.

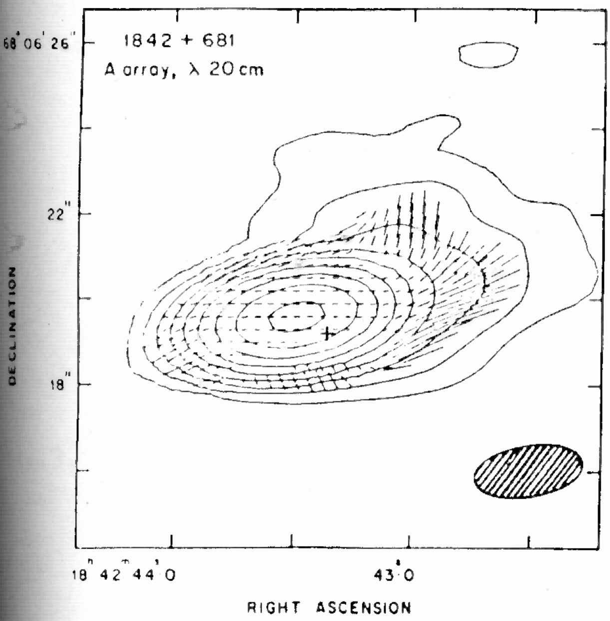


Fig. 3.35. Contour levels: 1 x (-4, -2, -1, 2, 4, 8, 16, 32, 64, 128, 256, 512) mJy/beam. Polarization: 1 arcsec = 0.11 ratio.

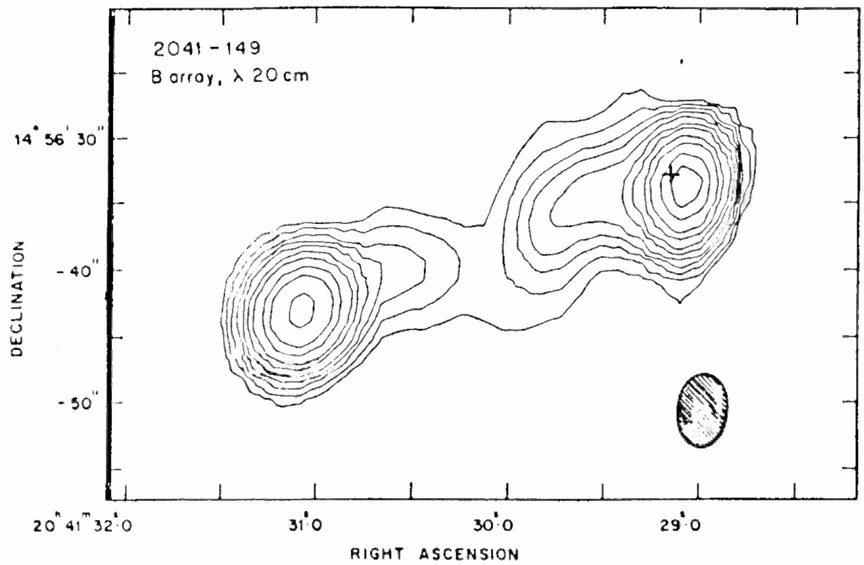


Fig.3.36a. Contour levels: 1.9 x (-1.5, 1.5, 3, 5, 7, 10, 15, 20, 30, 40, 60, 80) mJy/beam.

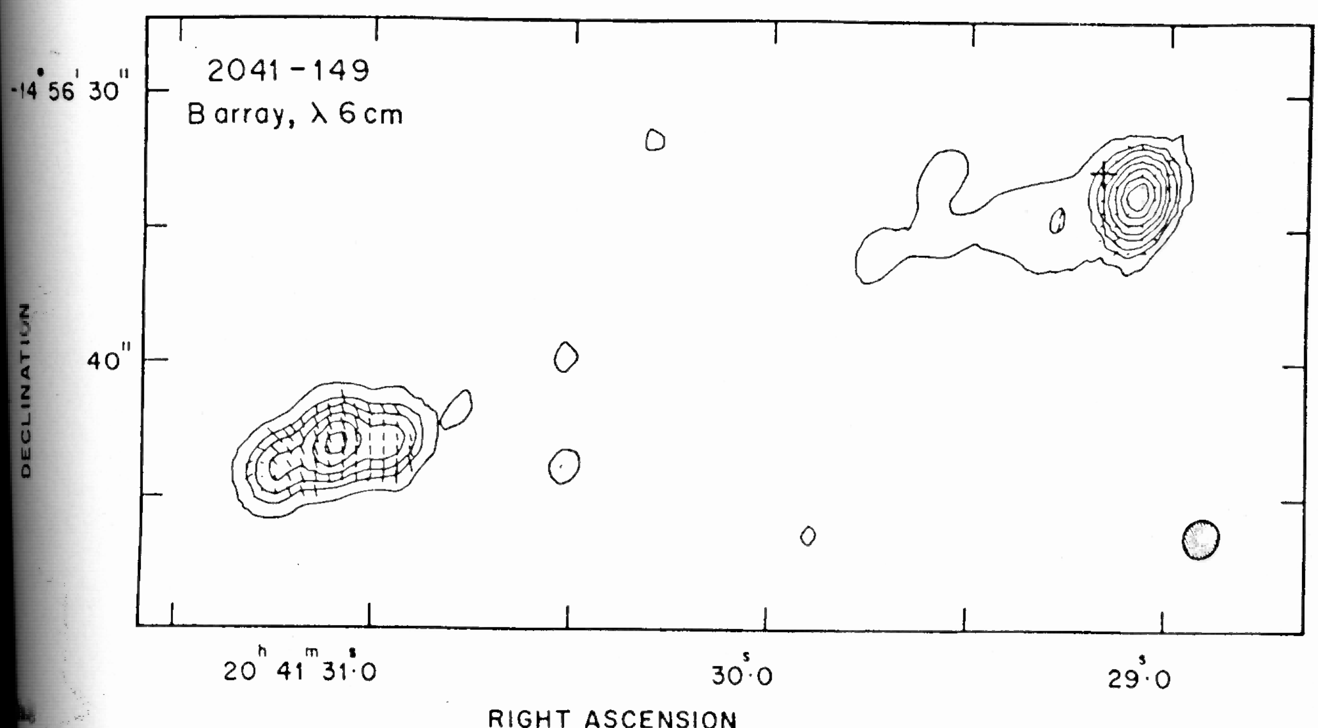


Fig.3.36b. Contour levels: 468 x (-1, 1, 4, 8, 15, 25, 40, 60, 80) mJy/beam.
Polarization: 1 arcsec = 0.41 ratio.

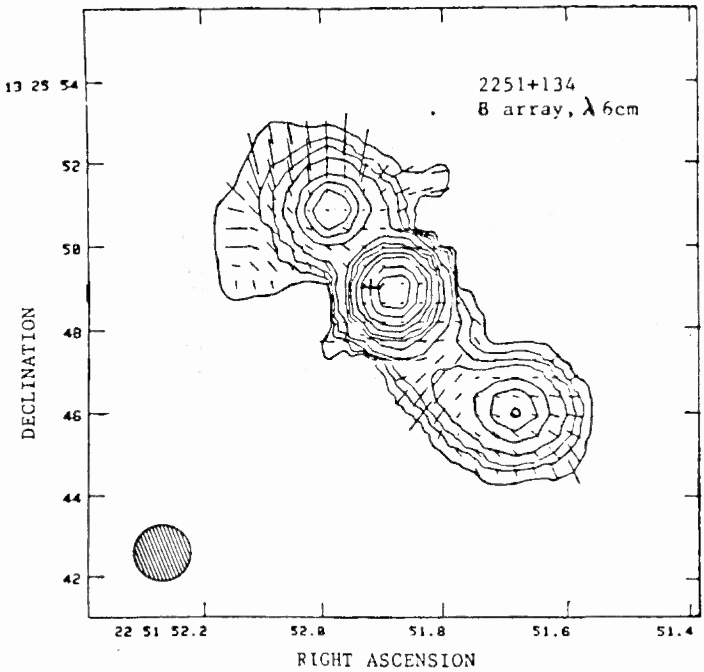


Fig. 3.37. Contour levels: 4 x (-1, 1, 2, 3, 5, 10, 15, 20, 30) mJy/beam. Polarization: 1 arcsec = 0.22 ratio.

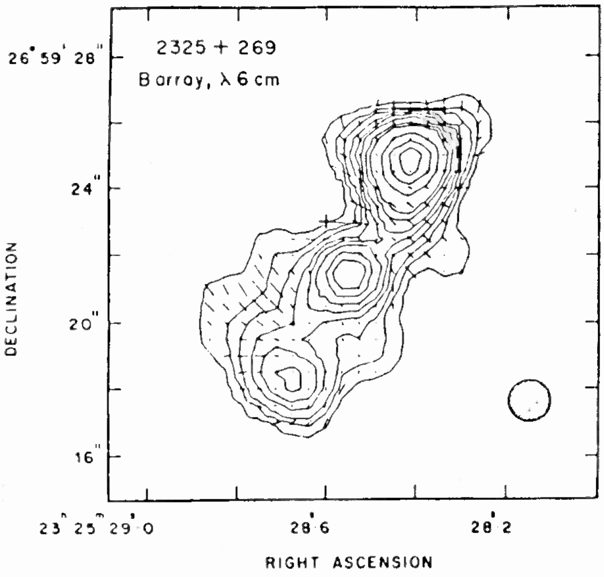
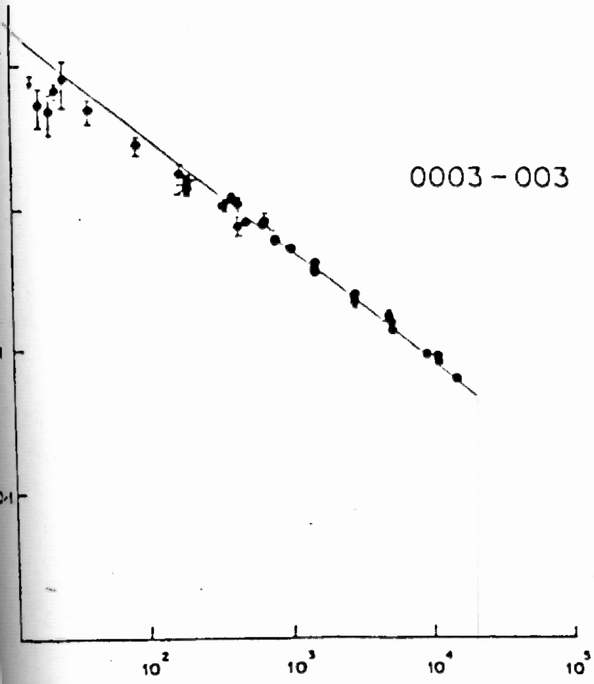


Fig.3.38. Contour levels: 1.98 x(-1, 1, 2, 3, 5, 7, 10, 15, 20, 40, 60, 80) mJy/beam. Polarization: 1 arcsec = 0.515 ratio.



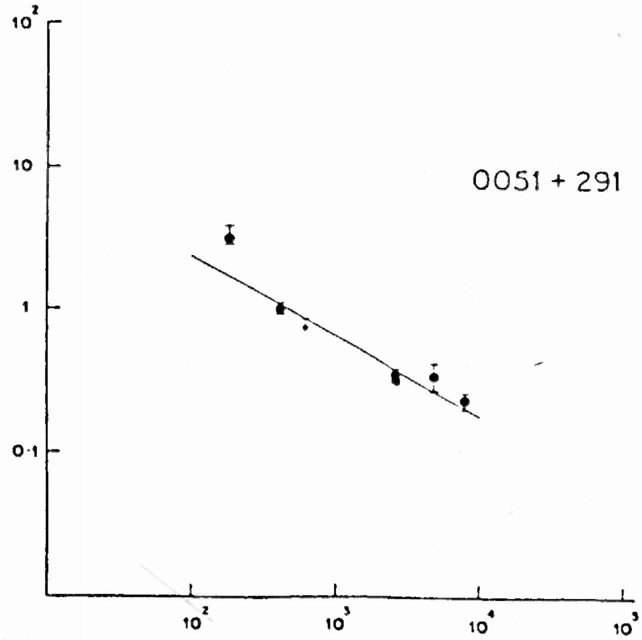


Fig. 3.39 The radio spectra of the sources along with those of their components (designated C:core, N:north, SW:south west, etc., except in the case of 1320+299:cf. description of the source, Section 3.3). Filled circles represent the flux density of the entire source; crosses represent the flux density of the core component; unfilled circles represent flux densities of the other components, except in the case of 1055+018 and 1637+574, where open circles represent simultaneously measured flux densities for the entire source. All flux densities are in Jy unless otherwise stated, and frequencies are in MHz. Solid and dashed curves represent least-squares fits to the spectra of the entire source and the components respectively.

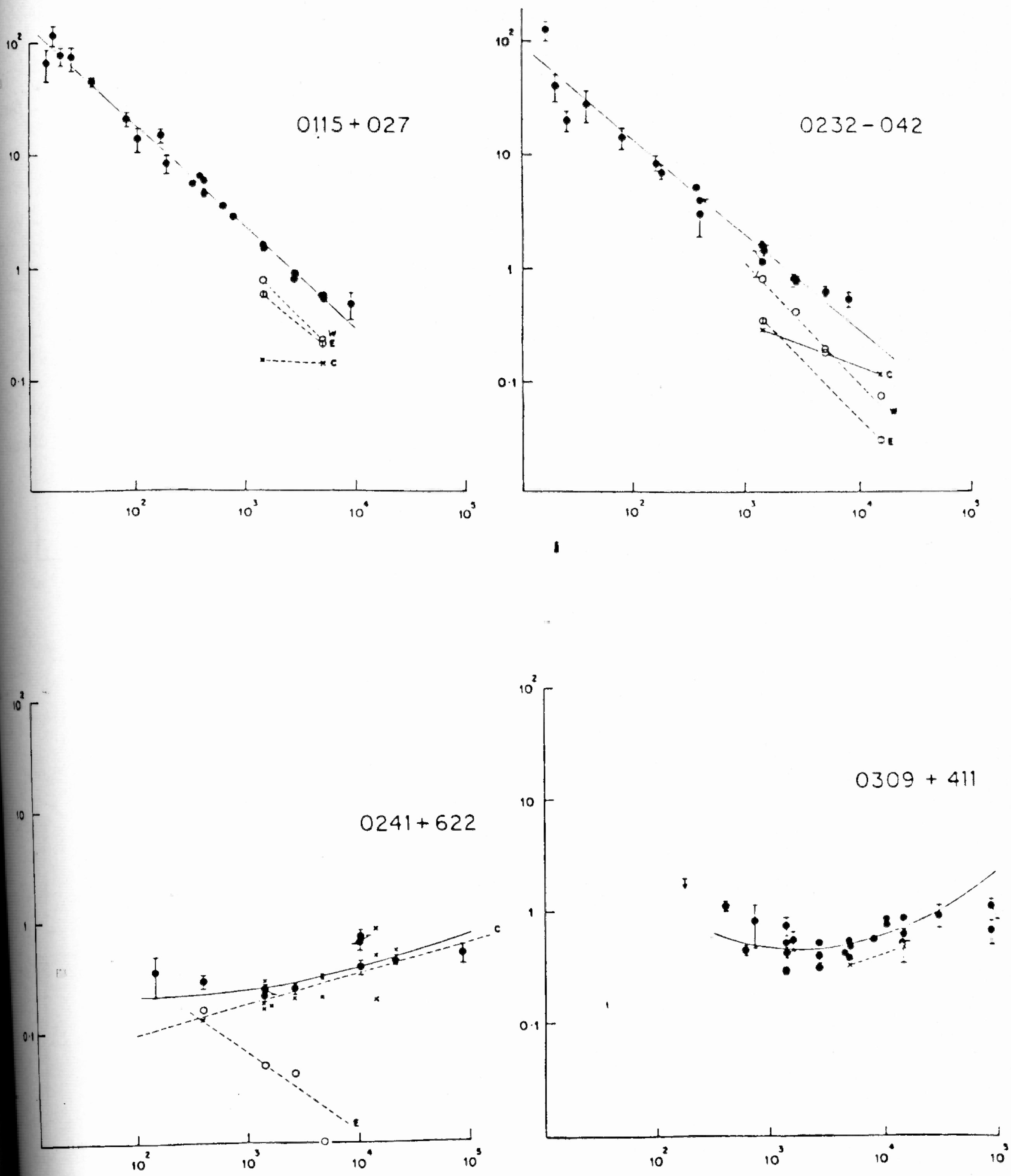


Fig. 3.39 continued.

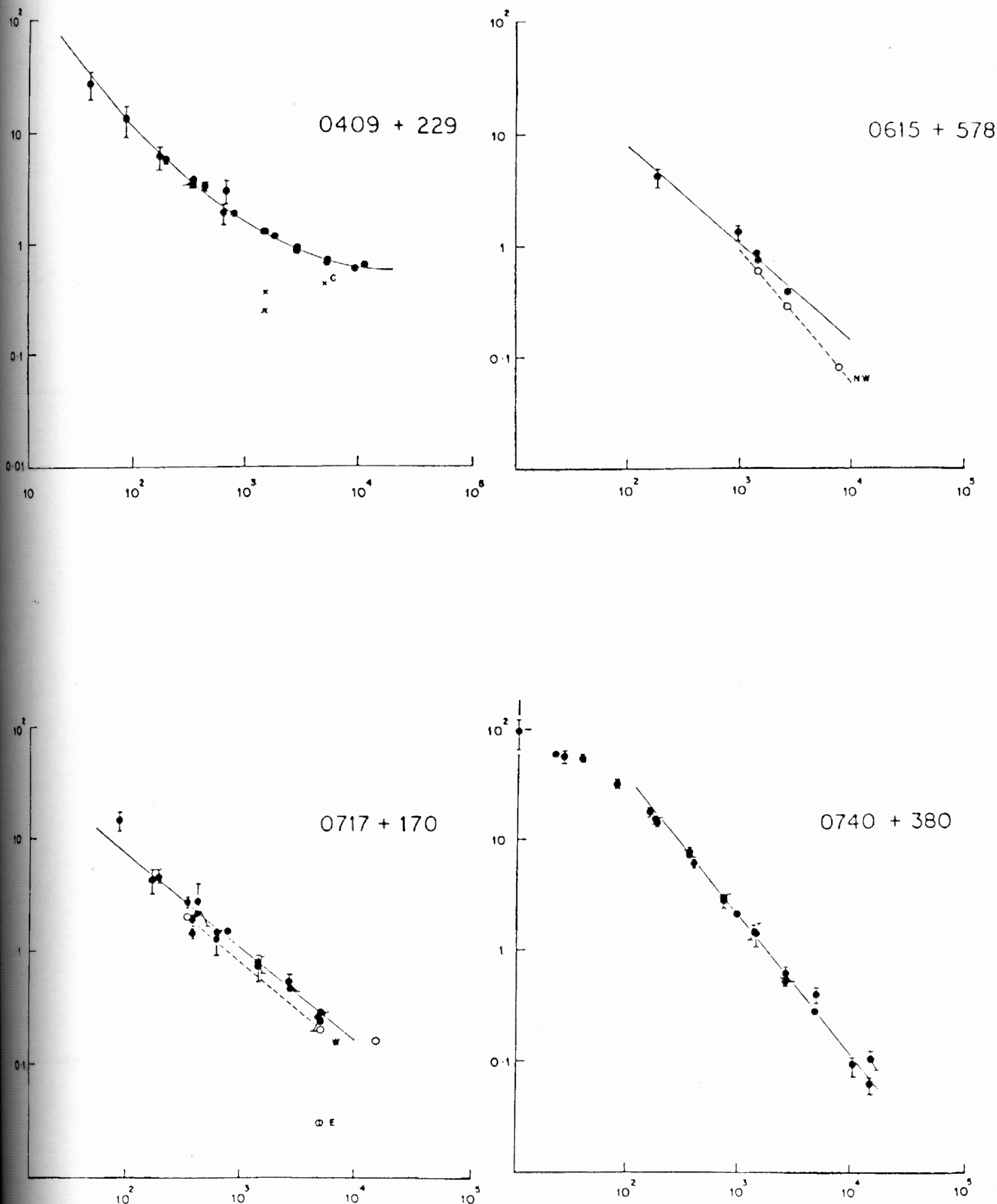


Fig. 3.39 continued.

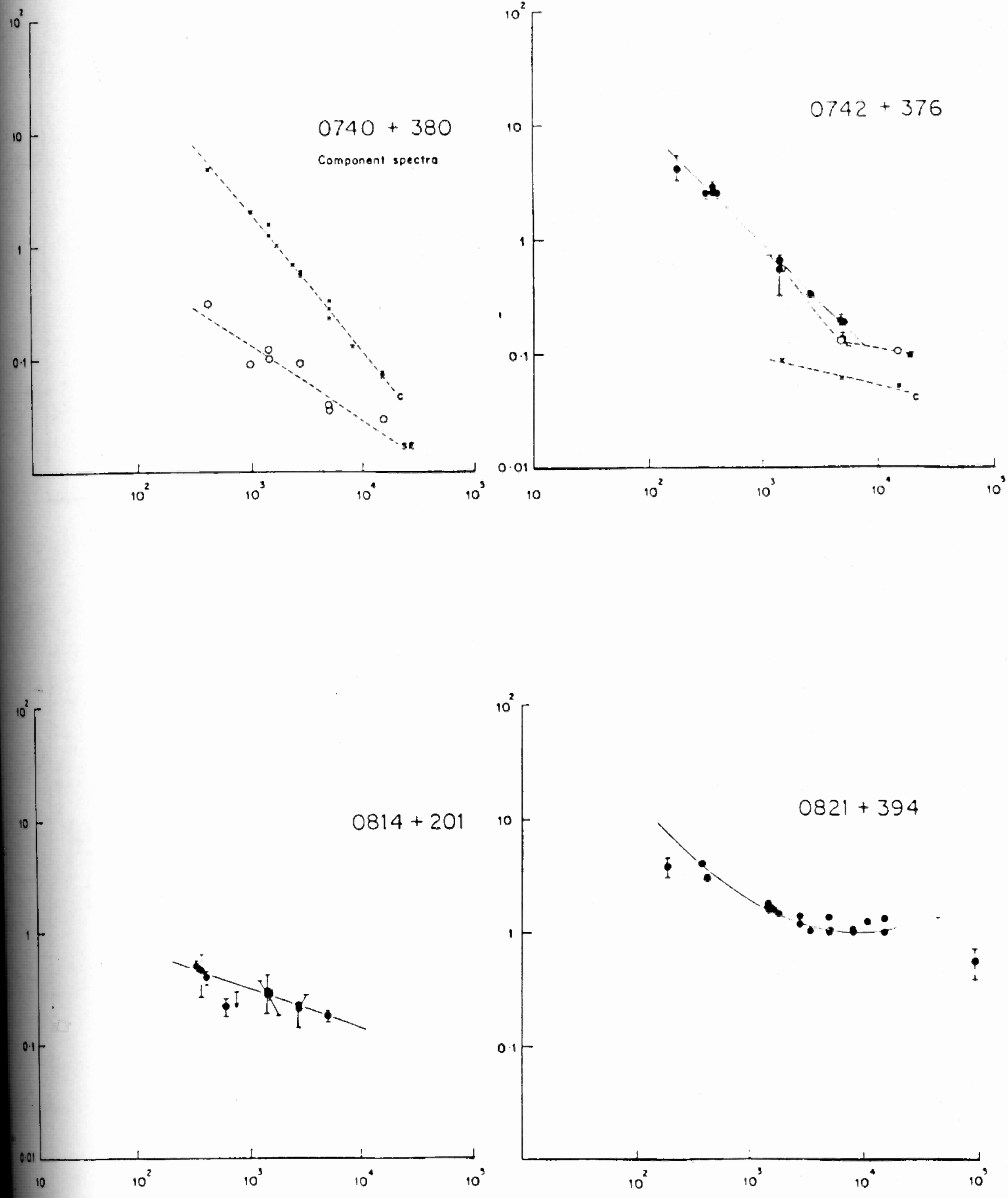


Fig. 3.39 continued.

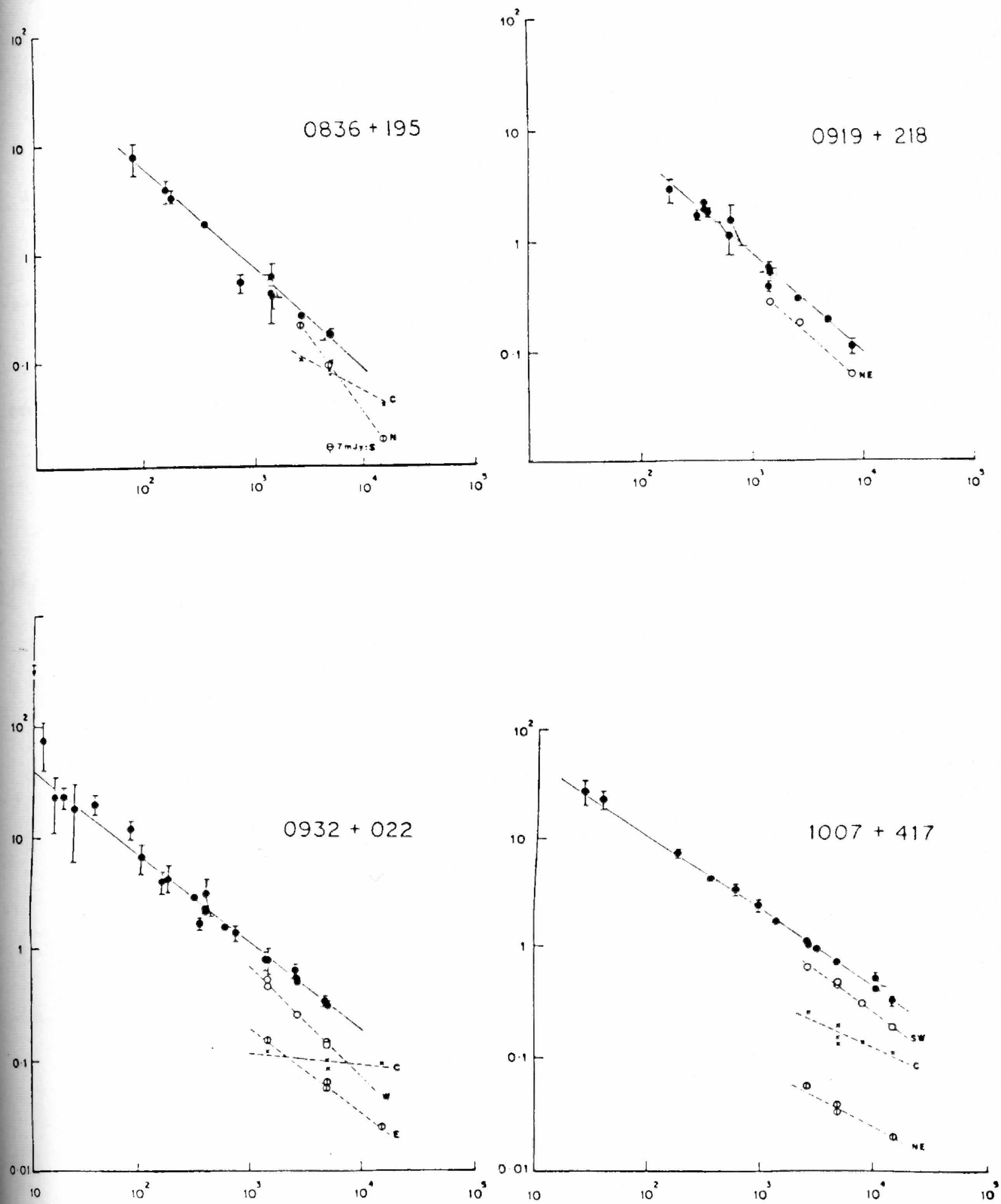


Fig. 3.39 continued.

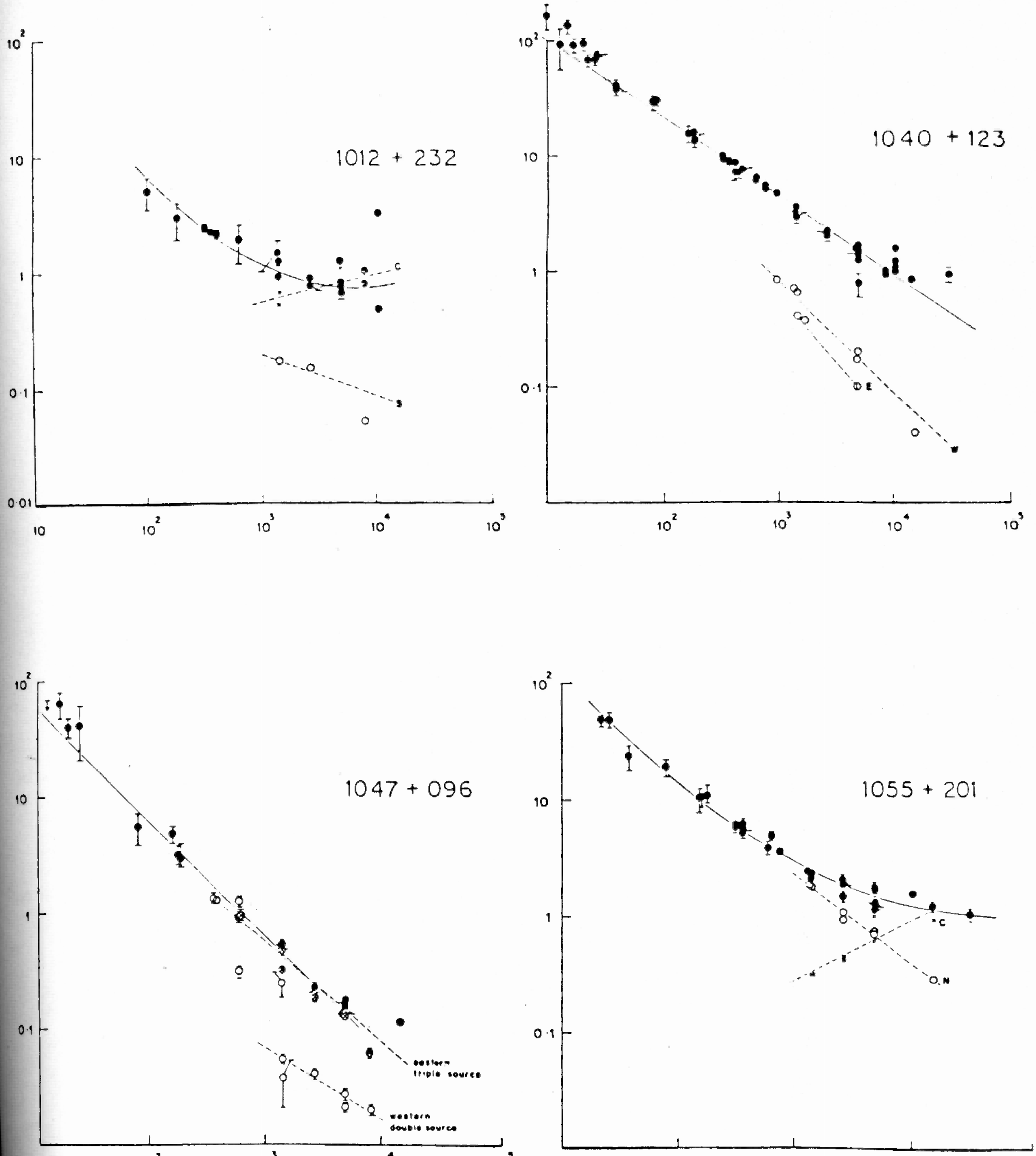


Fig. 3.39 continued.

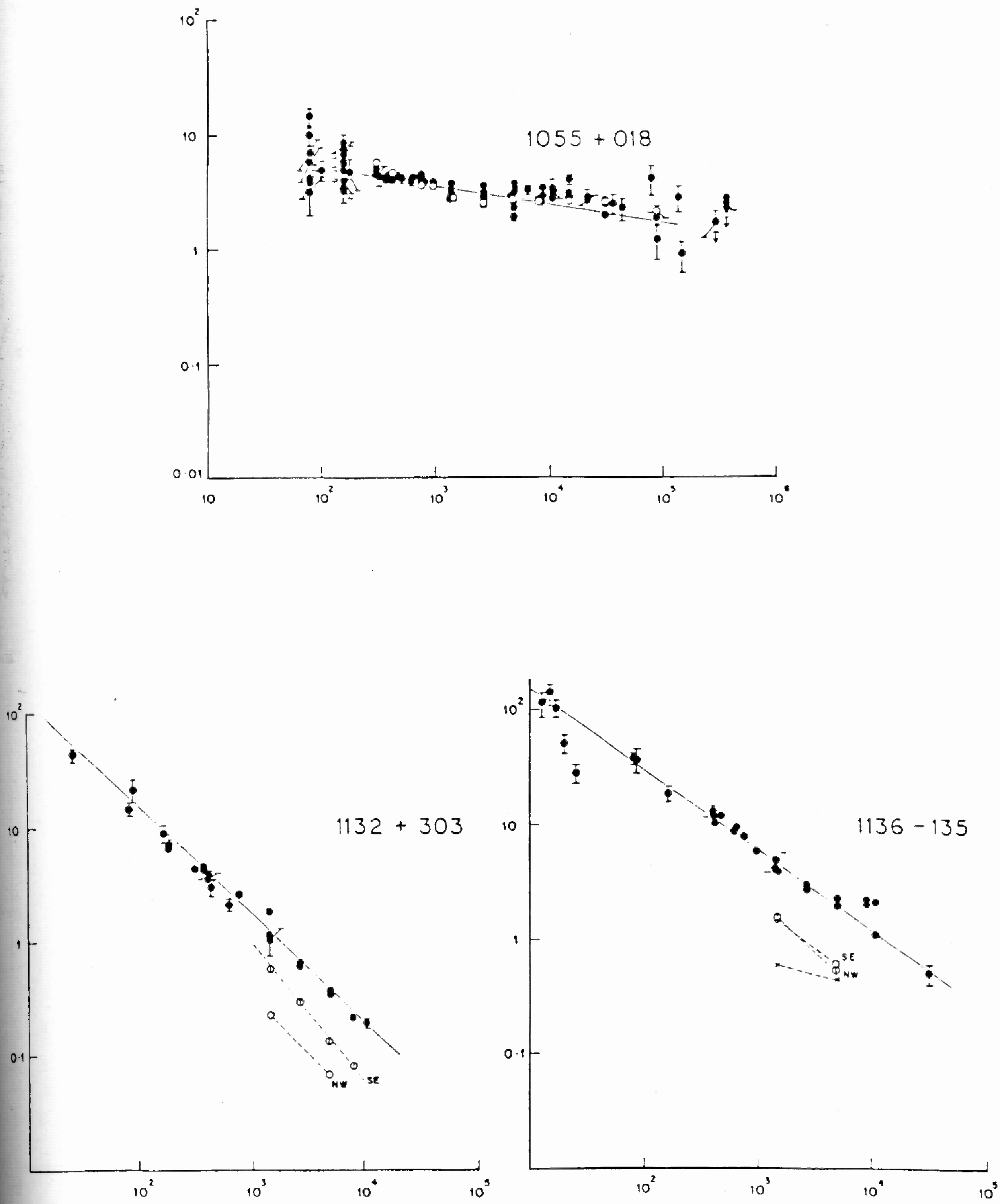


Fig. 3.39 continued

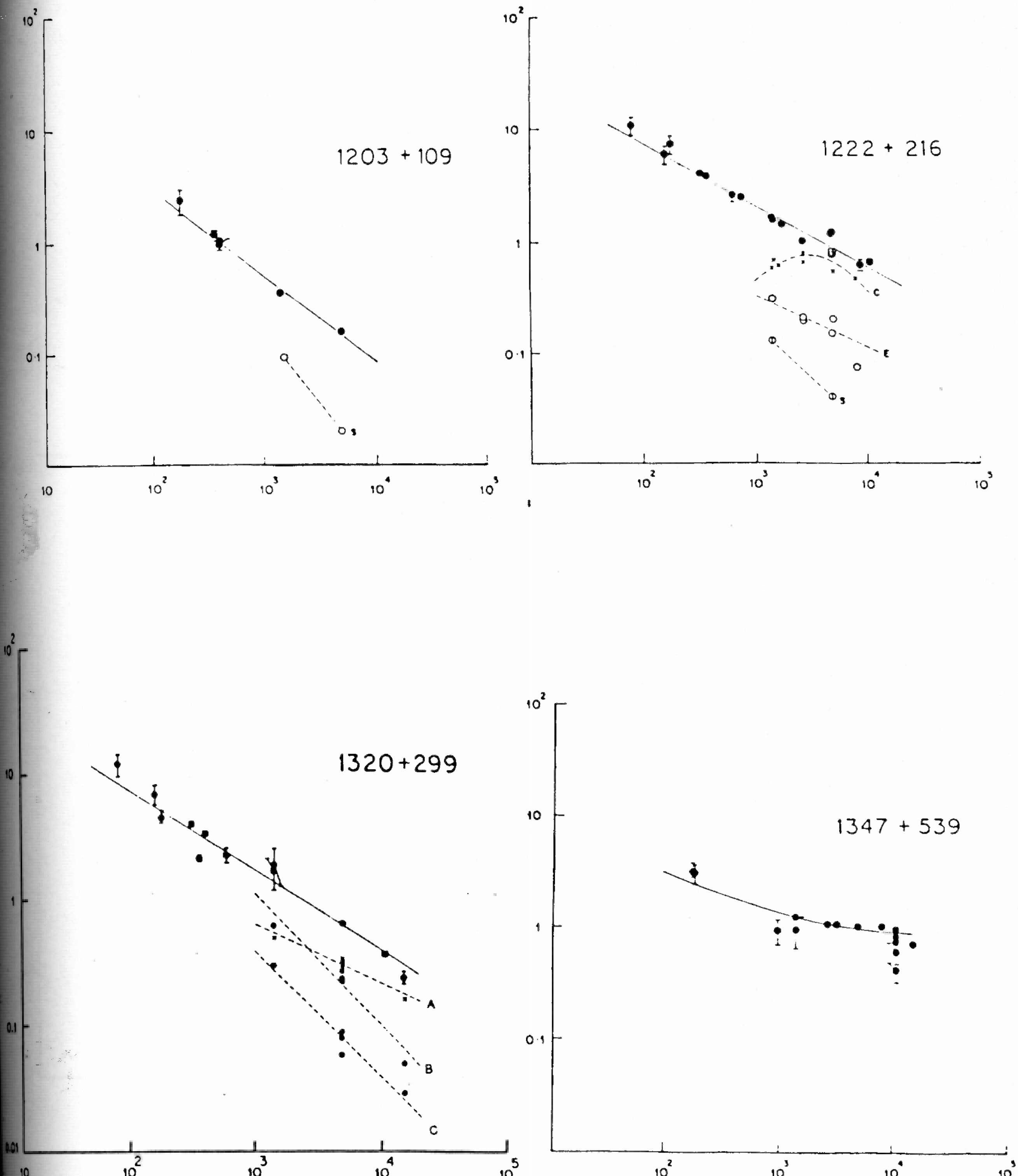


Fig. 3.39 continued.

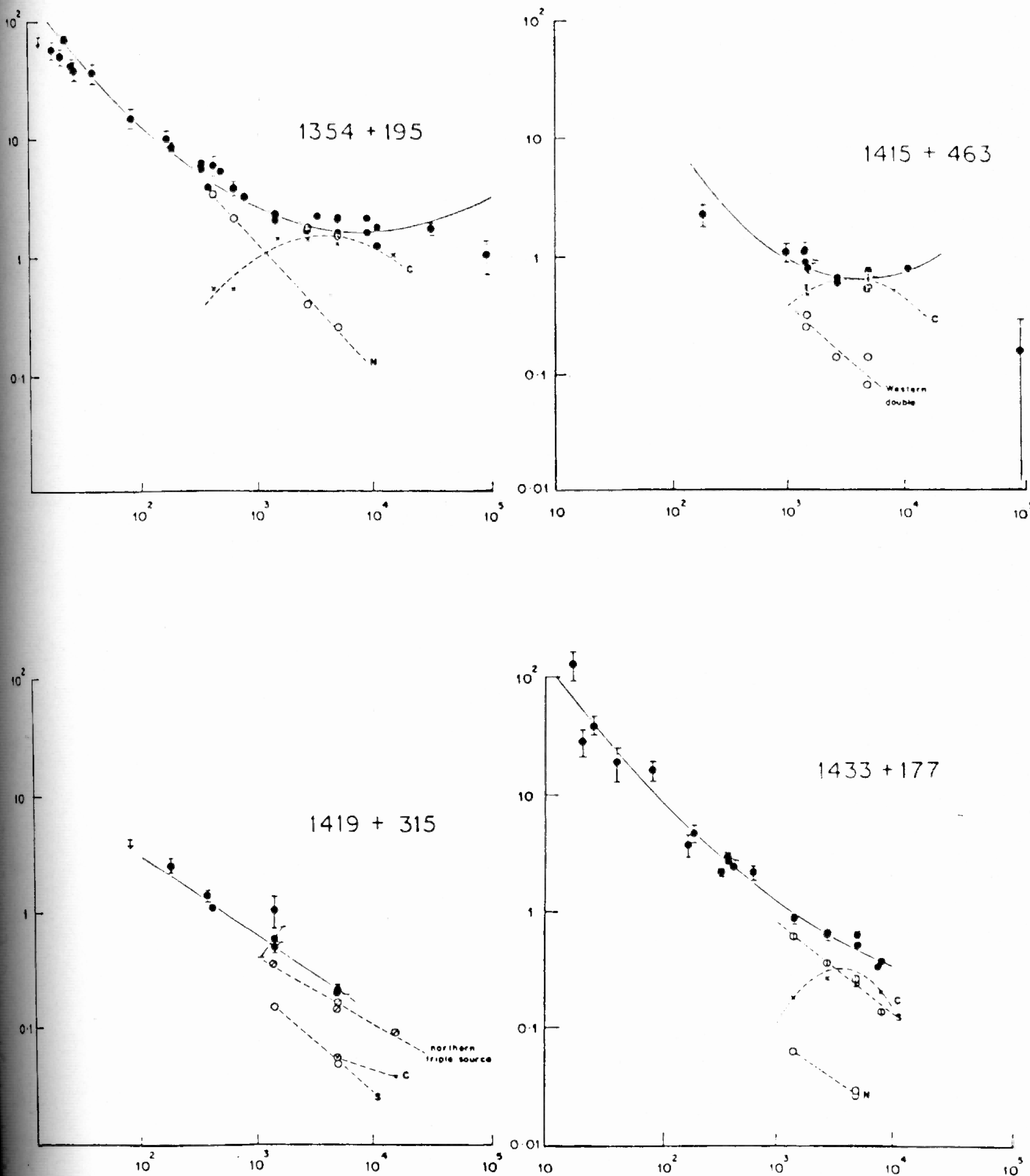


Fig. 3.39 continued.

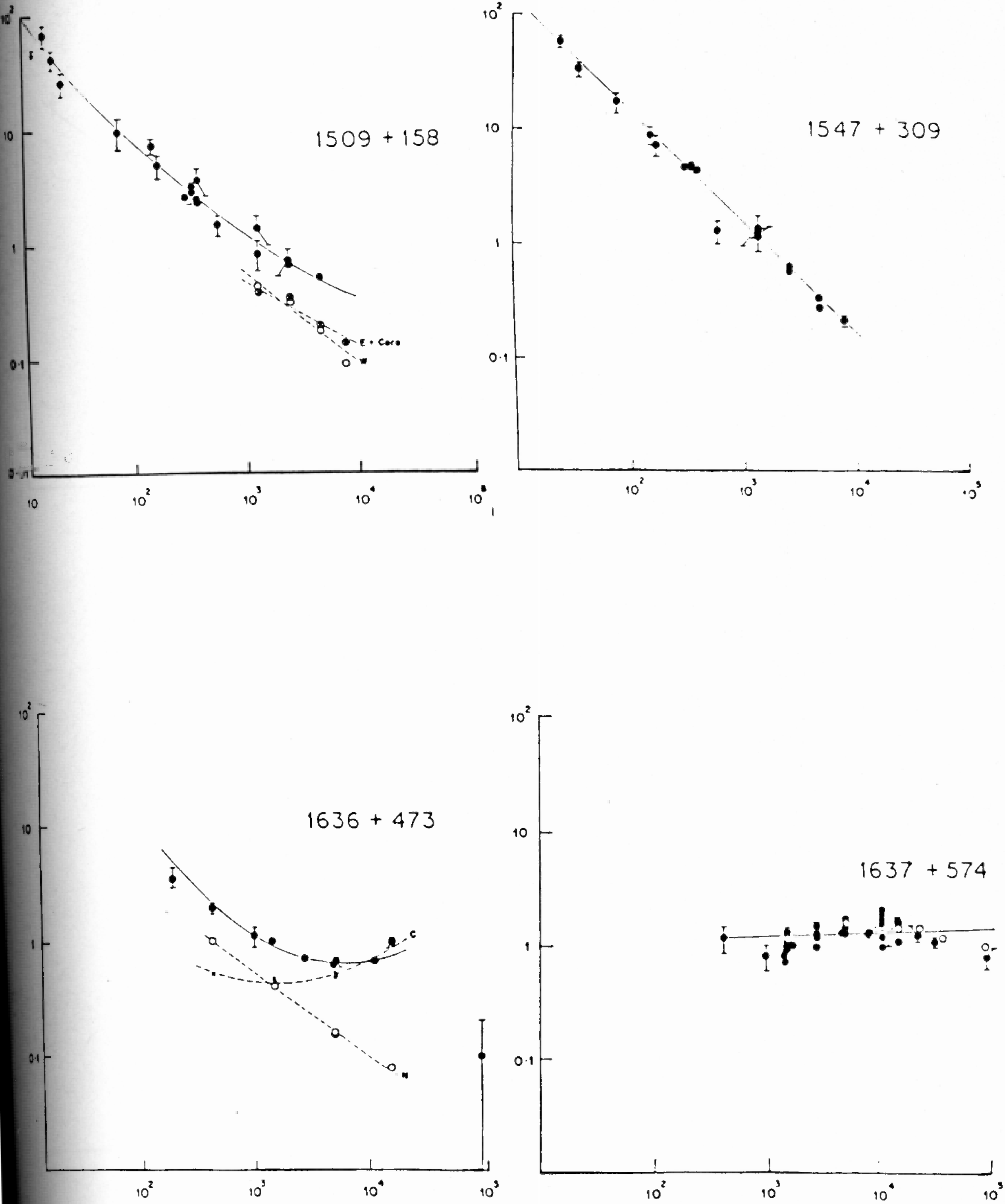


Fig. 3.39 continued.

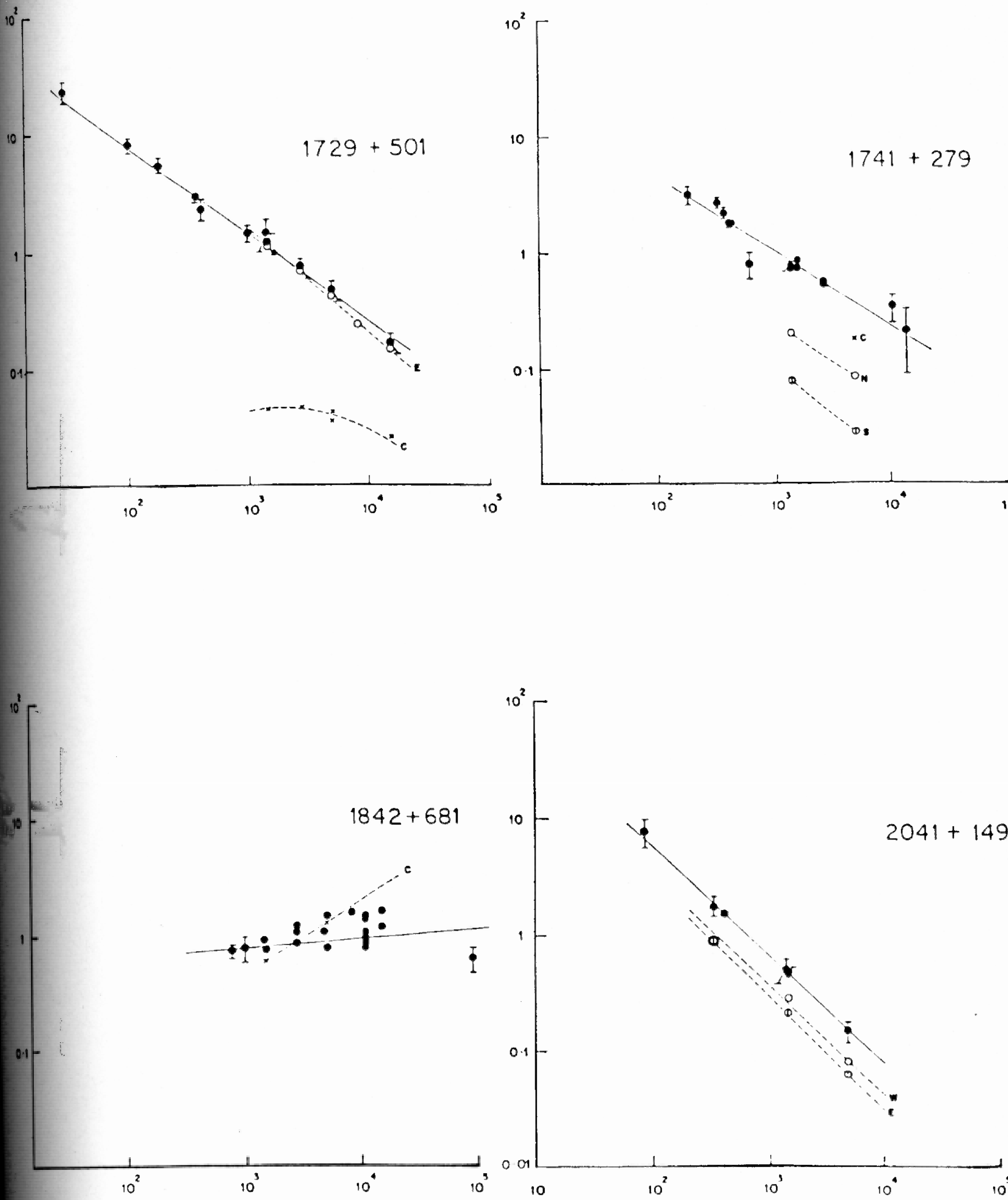
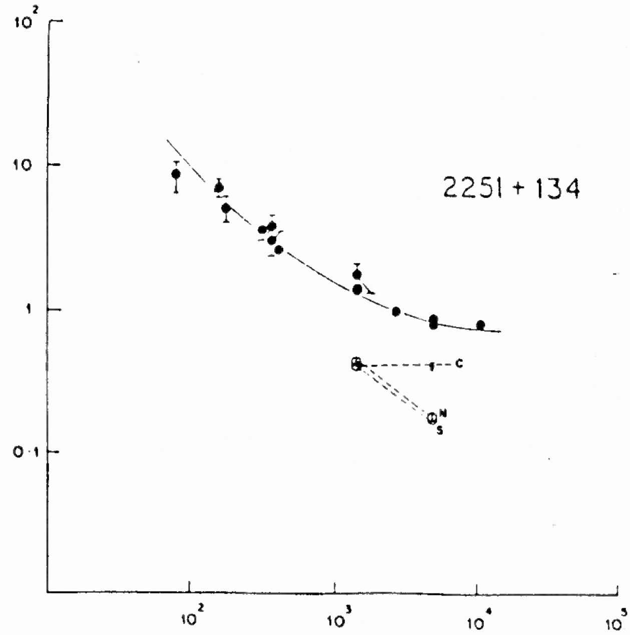


Fig. 3.39 continued.



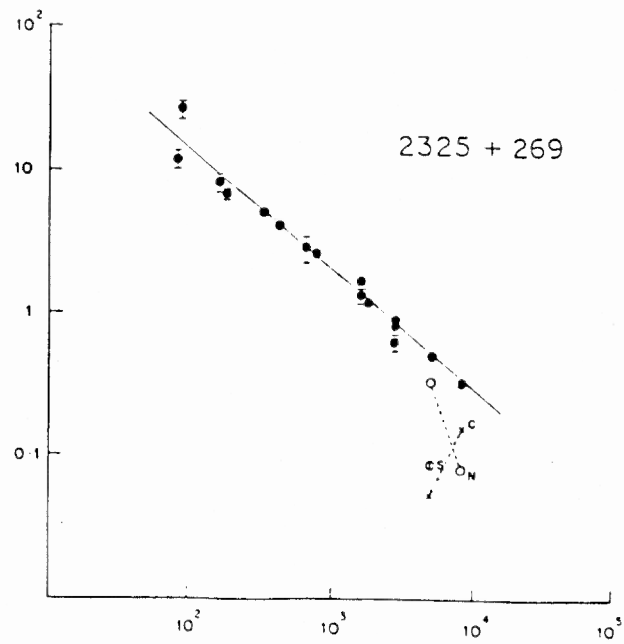


Fig. 3.39 continued.

to be wrong. Each of 0740+380, 1047+096, 1320+299 and 1419+315 is most likely to be a chance juxtaposition of two unrelated radio sources, one of which is presently unidentified. In the case of 1203+109 and 2251+134, the "outer component" of the earlier observations is probably spurious.

Of the remaining "genuinely asymmetric" objects, 11 show one-sided structure even with the high resolution and dynamic ranges obtained. (Among them, 0309+411, 1055+018 and 1055+201 have been shown to be two-sided by other authors.) Among the rest, asymmetric surface brightness ratios and separation ratios are often seen.

Radio jets between the cores and the outer components have been detected in many of the objects. The polarization E-vectors often align perpendicular to the elongation of the jet. In cases where the jet appears to bend, they appear to follow these bends. The jets are in almost every case one-sided. All these properties are consistent with what is known of quasar radio structure in general.