VLBI OBSERVATIONS OF 3C298+

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The quasar 3C298 (1416+06) has a complex radio-frequency spectrum, with a spectral bend below 100 MHz and a steep slope of -1.2 in the range 150 MHz - 3 GHz. At higher frequencies the spectrum flattens with some evidence of variability.

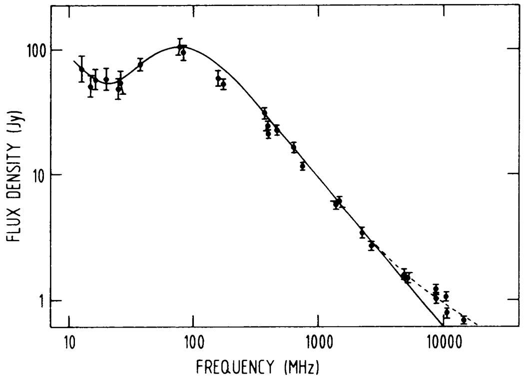

Fig. 1: Integrated radio spectrum of 3C298. The dashed line shows the sum of a straight spectrum of slope -1.2 and a flat spectrum component of 0.45 Jy.

Two VLBI experiments were performed: EVN+Crimea at 18 cm in April 1982 and US Network+Effelsberg in April 1983. The hybrid map constructed from the 18 cm observations is shown in Fig. 2. The overall extent of the structure is approximately 1.6 arcsec, corresponding to 5 kpc for $z = 1.44$ ($H_o = 75$, $q_o = 0.05$). The overall double structure was mapped by Anderson and Donaldson (1967), but our position angle differs from their value of 78 degrees, suggesting that one of the outer components has resolved structure not centered on the compact hotspots detected here.

Using the naming scheme of Fig. 2 the components A/B and E seem to be the outer hotspots of the source, probably responsible for the low-frequency turnover in the spectrum around 100 MHz. Results on the 2500 km Effelsberg-Crimea baseline at 18 cm show an unresolved 0.35 Jy source and

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a 0.2 Jy component of approximately 12 mas. The spacing of these components identifies them as D and E of Fig. 2.

The low declination and the configuration of interferometers at 6 cm give high resolution only along a line corresponding approximately to the major axis of the outer structure. A fit of a single gaussian component to the visibilities obtained gives a flux density of 0.45 Jy and size along the source axis of 0.7 mas for the 6 cm core. The core size perpendicular to the source axis is less than 1.5 mas.

The high-frequency flattening of the integrated spectrum can be explained by the combination of a flat-spectrum component (presumably D) with a component of slope -1.2. The dashed portion of the fit in Fig. 1 shows a model with a 0.4 Jy flat-spectrum component.

In morphology and radio spectrum 3C298 shows similarities both to the class of compact double sources (Phillips and Mutel 1982) and that of large classical double radio sources, and is intermediate in physical size between these two types. The asymmetrical placing of the core relative to the outer components could have several explanations. The most obvious is projection effects due to a small angle between source axis and line of sight, which would enhance any small distortions present, and incidentally enhance the brightness of the core by relativistic beaming. It is also possible that the core illuminates first one outer component and then the other, so that all the components A-C and E could be blobs produced by sudden outbursts, the blobs then move outwards and evolve. However, the present small size of the core suggests continuous activity.

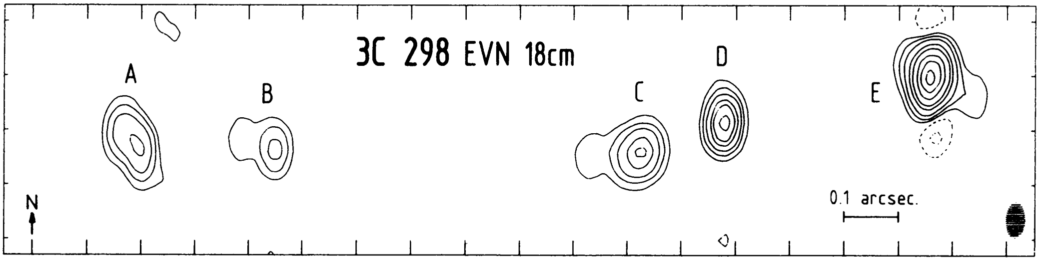

Fig. 2: Hybrid map of 3C298 at 18 cm. Contours at -5, -2, 2, 5, 10, 20, 30, 50, 70 and 90% of the peak of 0.65 Jy. A restoring beam of 65 x 35 mas has been used.

REFERENCES

Anderson, B., Donaldson, W.: 1967, Monthly Notices Roy. Astron. Soc. 137, 81

Phillips, R.B., Mutel, R.L.: 1982, Astron. Astrophys. 106, 21