HIGH RESOLUTION OBSERVATIONS OF THE QUASAR 3C147

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We report here preliminary results of observations of the quasar 3C147 which were made at 6 cm with a resolution of about 1 milliarcsecond using a VLB interferometer system with four antennas in the USA and one in Europe. Our observations are shown in Figure 1 along with previously published maps on larger size scales. VLA observations made at 2 cm wavelength (Fig. 1a) show an extended feature lying about 0.5 arcseconds (3.5 kpc) to the northeast of a bright core (Readhead et al. 1980), while VLBI observations made at 18, 50, and 91 cm (Readhead and Wilkinson 1980, Wilkinson et al. 1977, and Simon et al. 1980) show a jet-like feature extending about 0.2 arcsec (1 kpc) in the opposite direction (Fig. 1b). The 18 cm VLB observations also indicated the presence of a smaller elongated feature extending only 3 milliarcseconds (20 pc) again toward the northeast (Fig. 1c). We have observed 3C147 in March 1978 and again in April 1981 with a resolution of 0.7 and 1.5 milliarcsec respectively. The 1981 data (Fig. 1d) clearly show the double structure of the core as well as a lower surface brightness feature which can also be seen in the 18 cm map. Our 1978 data (Fig. 1e) has better resolution and shows considerable structure in the milliarcsec component, but due to the absence of phase information in these data, the details are not reliable and the orientation is uncertain by 180°. The orientation is, however, specified by reference to the 1981 data.

Thus, on a scale of 5 milliarcsec, there is a jet-like feature which points in the same direction as a larger feature 100 times further distant. But there is also an extension pointing 0.3 arcseconds in the opposite direction! This "triply" asymmetric structure observed in 3C147 is not easy to interpret in terms of simple symmetric beaming models where the apparent asymmetric appearance is caused by the differential Doppler beaming of the approaching and receding components. This model requires that the approaching side appear stronger on all angular scales where the beaming is effective, so it may be concluded that at least to some extent there is an intrinsic asymmetry in 3C147. The observed asymmetry may reflect different external conditions affecting the radio emission from the relativistic beams or the alternation with time in the direction of a one-sided jet.

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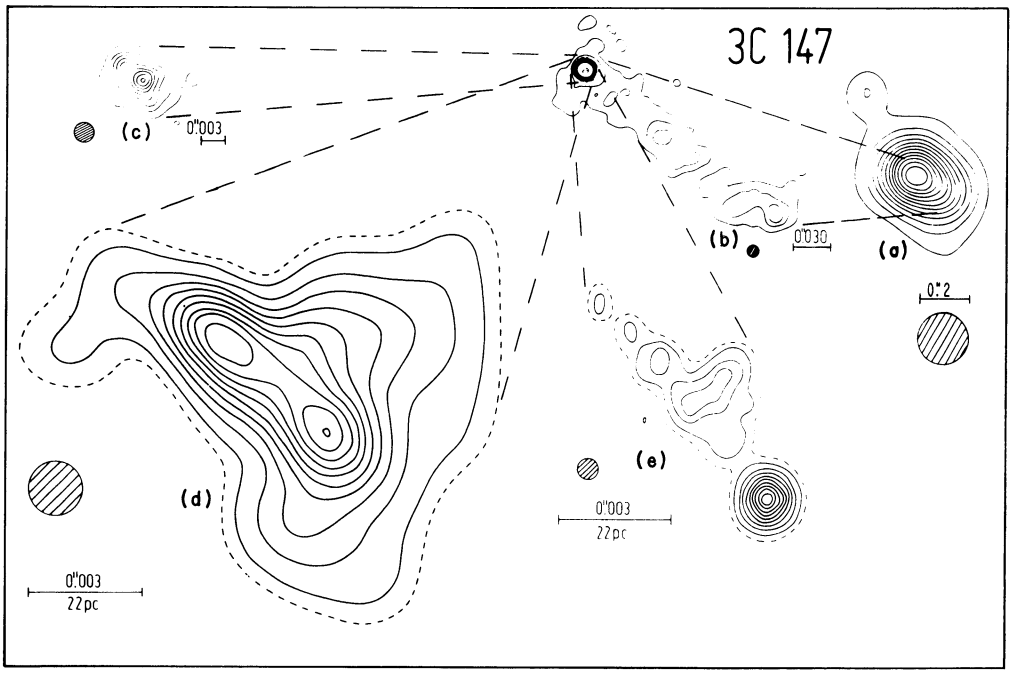

Figure 1. Structure of 3C147. HPBW is shown as shaded circles. a) Observations made with the VLA at 15 GHz. Contour resolution values are 4, 12, 20, ..., 92% of the peak value (2.1 x 10^5 K) (Readhead et al. 1979). b) Observations made at 1.67 GHz with 5 element VLBI networks. Contour interval 2, 6, 10, 14, ..., 114 x 10^6 K (Readhead and Wilkinson 1980). c) High resolution VLBI observations at 1.67 GHz. Contours 4, 12, 20, ..., 60 x 10^9 K (Readhead and Wilkinson). d) 5 GHz observations. Contour levels 10, 20, 30, ..., 100 x 10^8 K. e) 5 GHz high resolution observations, based on amplitude data only. Contour levels 25, 50, 75, ..., 250 x 10^8 K.

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