THE MILLIARCSECOND CORE OF 3C147 AT 6 CM+

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3C147 is a compact ($\lesssim$1"), steep spectrum radio source identified with a quasar at z = 0.545 (0".001 = 7.4 pc; c/H_o = 6000 Mpc and q_o = 0.5). The radio structure shown by VLBI observations at 18 cm (Readhead & Wilkinson, 1980; Simon et al., this volume), at 50 cm (Wilkinson et al., 1977), and at 90 cm (Simon et al., 1980 and 1983) shows a bright 'core' $\lesssim$0".008 (60 pc) at one end of a 'jet' $\sim$0".2 (1.5 kpc) in length oriented in p.a. $\sim -130°$. In this sense 3C147 is typical of the one-sided 'core-jet' structures commonly found in the centres of other extragalactic radio sources. However, MERLIN observations at 6 cm (Wilkinson, this vol.) and VLA observations at 2 cm (Crane & Kellermann, unpubl.; Readhead et al., 1980) show a larger elongated feature extending $\sim$0".5 (3.7 kpc) to the North East of the bright core in p.a. $\sim$25° or on the opposite side to the 0".2 jet.

Higher resolution VLBI observations made at 6 cm wavelength (Preuss et al., 1982) showed that the core itself was elongated roughly along the same direction as the jet but that the lower surface brightness features appeared to point in the opposite direction from the 0".2 VLBI jet. The extension of this core feature was also visible on high resolution 18 cm maps. We have now reobserved 3C147 at 6 cm in Dec. 1982 with an intercontinental 6 station array. The new data represent a considerable improvement in (u, v) coverage and as shown in Fig. 1, the nucleus appears very complex and is non-linear. The inner high brightness part appears somewhat S-shaped and two-sided with respect to the brightest component located in the middle. However, this bright feature is not very dominant compared with sources such as 3C273, and it is unclear where the actual core is located. The 6 cm map also shows clearly the apparent extension of 5 to 10 mas toward the north-west, which was apparent in the 18 cm and earlier 6 cm maps. On a large scale, the VLA and MERLIN maps show an extension of $\sim$0".3 in the opposite direction toward the south-east. It is not obvious how to interpret this complex structure within the framework of relativistic beam models which typically predict asymmetric structure.

Simon et al. (1983) have observed an increase in the flux density of the 327 MHz core by about a factor of 2 (1 Jy) during the period 1975 to 1981. Using causality arguments together with the measured angular size of the core and time scale of variability, as well as the low measured

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X-ray flux density, they conclude that bulk relativistic flow towards us must occur in 3C147, and they 'predict' that superluminal motion will be observed in the core structure with v/c $\sim$ 9. We have compared our new 6 cm map of the 3C147 core with those made in 1978.2 (3 stations) and 1981.3 (5 stations), and find no evidence for any relative component motion with v/c $\gtrsim$ 0.5. Furthermore, the 6 cm core flux density has not changed by more than 10% (30 mJy) in the 4.7 year span.

Relativistic flow may indeed be important in 3C147, but it is not observed as superluminal motion, possibly because the highly specialized geometric conditions required are not met. Higher resolution observations with greater dynamic range will be necessary to clarify the complex geometry of 3C147; but considering the absence of the 'predicted' superluminal motion in 3C147 in spite of the general widespread observance of this phenomenon (e.g. Cohen, this volume), it is not clear to what extent predictions of superluminal motion provide meaningful tests of theoretical models.

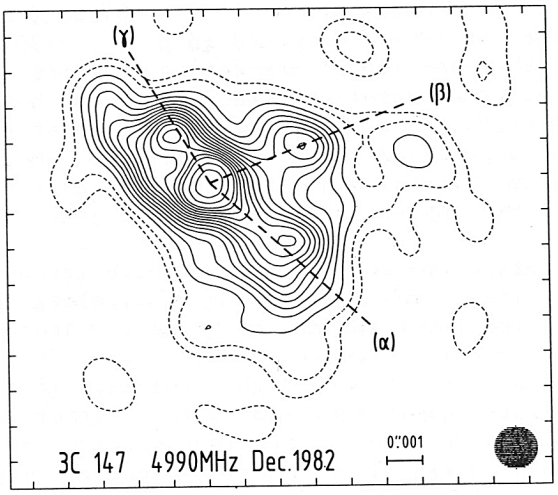

Fig. 1: Map of the core of 3C147 at 6 cm for epoch 1982.9. The restoring beam is shown as a shaded circle. Contour levels are 2, 5 (dashed), 10, 15 ... 70, 80, 90 percent of the peak brightness ($\sim 1.2 \times 10^{10}$K). The straight lines indicate the main directions of elongated features in maps on larger scales and/or at longer wavelengths. (α is the direction of the 200 milliarcsec VLBI jet ($\lambda \gtrsim 18$ cm); β is the position angle of the extension of the 18 cm core (Simon et al., this volume); γ is the direction of the MERLIN/VLA North East large scale extension.

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