VLBI OBSERVATIONS OF FRI RADIO GALAXIES

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1. The Sample of Radio Galaxies

The Fanaroff-Riley type I radio galaxies (Fanaroff & Riley, 1974) presented in this paper belong to the complete sample of low-intermediate luminosity radio galaxies published in Giovannini, Feretti & Comoretto (1990). This sample includes radio galaxies with different morphologies on the arcsecond scale, such as compact sources, core-halos, FRIs and FRIIs.

We have been observing this sample at VLBI resolution in order to study the parsec-scale properties of this class of objects, and to address a number of questions, such as for example the relation between FRIs and BL-Lac objects, which are thought to be their beamed parent population; the differences and similarities between FRIs and FRIIs on the parsec-scale; the link between the point-like sources in the sample and those in the same power range, but with extended arcsecond scale morphology. The results obtained thus far are summarised in Giovannini et al., 1995.

In this paper we'll concentrate on some of the FRIs in the sample. New 5 GHz VLBI maps will be presented and discussed for the three radio galaxies 3C31, 4C35.03, 3C264. Furthermore we will introduce second epoch observations carried out for four FRIs in the sample, i.e. NGC315, B2 0836+29, 3C338 and 3C465.

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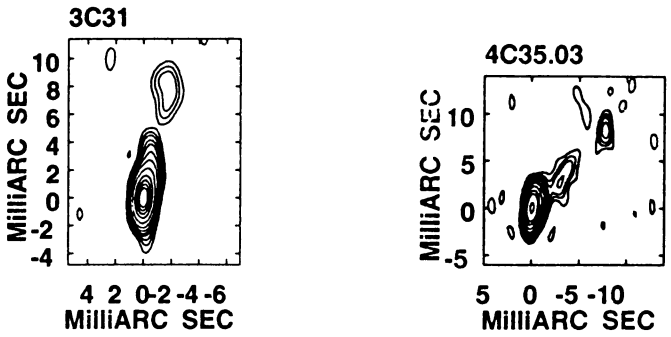

Figure 1. 5 GHz global VLBI contour map of 3C31. Restoring beam is 3.13 × 2.09 mas, in p.a. 22.3°. Peak flux 69.2 mJy/beam, levels -0.4, 0.4, 0.7, 1, 1.5, 2, 3, 5, 10, 20, 30, 40, 50 mJy/beam.

Figure 2. 5 GHz global VLBI contour map of 4C35.03. Restoring beam is 2.67 × 0.91 mas, in p.a. -4.9°. Peak flux 67.3 mJy/beam, levels -0.4, 0.4, 0.7, 1, 1.5, 2, 3, 5, 10, 20, 30, 60 mJy/beam.

2. Parsec-scale Properties of the New FRI Radio Sources

3C31, identified with the elliptical galaxy NGC383, is a classical FRI. Its arcsecond scale morphology shows an unresolved core and two asymmetric opposite jets. The 5 GHz VLBI map (Fig. 1) shows a strong component, likely to be the core of the radio emission, and a one-sided jet, aligned with the main arcsecond-scale jet. Assuming that the strongest VLBI component is the core, from our map we derive a ratio $R \gtrsim 16$ between the jet to counterjet brightness in the proximity of the core, which leads to a value $\beta cos\theta \gtrsim 0.504$ ($\beta = v/c$ and θ is the viewing angle).
4C35.03 is identified with the optical galaxy UGC 1651. The source is a classical double on the large scale while the 5 GHz VLBI map (Fig. 2) shows a strong component and a *blobby* jet, pointing towards the main large scale jet. For this source from our map we derive $R \gtrsim 7$ and $\beta cos\theta \gtrsim 0.371$.
3C264 is optically identified with NGC3862. An optical jet, in position angle $\sim 280°$ was discovered by HST observations (Crane et al., 1993). The large scale radio structure is characterised by a strong core and a distorted northern jet. The 5 GHz parsec-scale morphology (Fig. 3) shows a core and a one-sided jet aligned with the main large-scale jet (and with the optical jet). From our VLBI map we derive $R \gtrsim 28$ and $\beta cos\theta \gtrsim 0.562$.

The three FRIs presented in this paper show the same properties on the parsec-scale as most of the other FRIs in our sample (see Giovannini et al., 1994; Venturi et al., 1995). Their morphology on this scale is typically one-sided. The constraints derived for the intrinsic Lorentz factor and for

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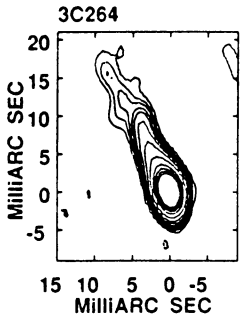

Figure 3. 5 GHz global VLBI contour map of 3C264. Restoring beam is 3.5 × 2.2 mas, in p.a. 10.8°. Peak flux 134.7 mJy/beam, levels -0.4, 0.4, 0.7, 1, 1.5, 2, 3, 5, 10, 20, 30, 40, 50 mJy/beam.

the viewing angle, obtained assuming that Doppler boosting is responsible for the parsec-scale asymmetry and taking into account the constraints imposed by the P_{core}/P_{tot} correlation (Giovannini et al., 1994) are in agreement with the idea that FRI jets start out relativistic, and that FRIs could be the unbeamed population of BLLac objects.

3. Monitoring of FRI Radio Galaxies

The high intrinsic plasma speeds derived for the FRIs in our sample (see also Giovannini et al., 1995) suggest that proper motion of components along the jets should be detectable. In order to test this issue we started a project aiming at the monitoring of the FRIs in our sample. For NGC315, B2 0836+29, 3C338 and 3C465 a 5 GHz second epoch map is already available.

A possible proper motion was found only in the nucleus of 3C338 (see Giovannini et al., this volume). This would confirm the existence of bulk relativistic motion in this source.

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