VLA, MERLIN and EVN observations of 3C264 at 1.6 GHz

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1. Observations

We observed the FR-I type radio source 3C264 (NGC 3862) simultaneously with the EVN and the MERLIN arrays at 1.6 GHz on June 3rd 1997. Eleven antennas participated in the VLBI observations: Shanghai, Urumqi, Crimea, Torun, Medicina, Noto, Effelsberg, Onsala, Westerbork, Cambridge and Lovell. The VLBI data were correlated at the MPIfR correlator in Bonn. The MERLIN array consisted of seven antennas, all located in England. The antennas in Cambridge and Jodrell Bank were observing, at the same time, as part of the EVN and MERLIN arrays, providing a common baseline which served to match the different flux density scales resulting after the independent calibration of each array. We present also a map of 3C264 at 1.6 GHz obtained from VLA observations in its A configuration carried out in September 1999.

2. Results

Figure 1 shows images of 3C264 at 1.6 GHz made with the VLA, MERLIN and the EVN, respectively, illustrating the very different scales sampled by each instrument separately:

- The VLA map shows the strong core and a wiggled jet directed towards the northeast. It confirms the existence of a weak counter-jet in the southwest direction (Lara et al. 1997), and shows a halo-like emission which surrounds both jet and counter-jet.
- The MERLIN map shows the jet up to 4.5" from the core, at the position where it starts the curvature observed with the VLA. The jet is well resolved transversally, with a width reaching 0.8" (320 pc †) at some positions.
- The EVN map shows a core-jet structure, with a length of 0.1". The jet starts at a position angle slightly different from that observed at larger scales. Several components can be distinguished in the jet, the strongest one at about 50 mas from the core.

The combination of different interferometers allows us to obtain information at angular resolutions half-way between that provided by each instrument on its own. Our maps show the detailed structure of the jet in its first arcsecond, basically confirming the different regions described by Lara et al. (1997): the jet appears very well collimated from the core up to a distance of 200 mas (80 pc). At this position there is a change of jet properties, with a strong jet widening. Further along, the jet seems to trace a perfect cone and the contours of the maps are "noisy", possibly indicating a turbulent flow. At 0.8" from the core there is a second change of properties, with a slight jet deflection and a decrease in the surface brightness.

† We assume H_0=75 km s^{-1} Mpc^{-1}; q_0=0.5

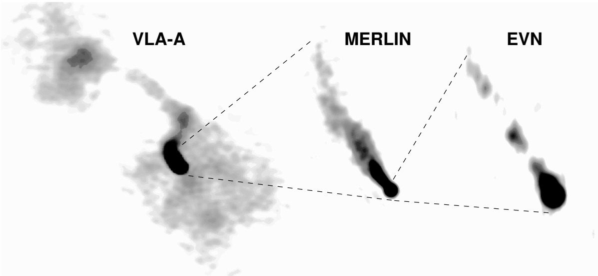

FIGURE 1. Composition of VLA (A configuration), MERLIN and EVN images of 3C264 at 1.6 GHz. Each interferometer provides an angular resolution of 1.2", 180 mas and 8 mas, respectively. The dashed lines help to identify equivalent regions in each image.

3. Discussion

The change of properties of the jet at 0.8" from the core is coincident, in position, with the radius of the optical "ring" discovered by Baum et al. 1997 from HST observations (Figure 2). Hutchings et al. (1998) found, again with the HST, that the region inside the ring on the opposite side of the jet has the same color as the galaxy spectrum outside the ring, and the same spectrum overall. They interpreted this fact as an indication that the region inside the ring is not dimmed by dust, which would redden it. They suggested that the jet, or some nuclear related process, had cleared out the central region, and perhaps swept up dust as far as the ring. The change of jet properties that we observe at radio wavelengths is consistent with some kind of interaction of the jet with the boundary defined by the ring.

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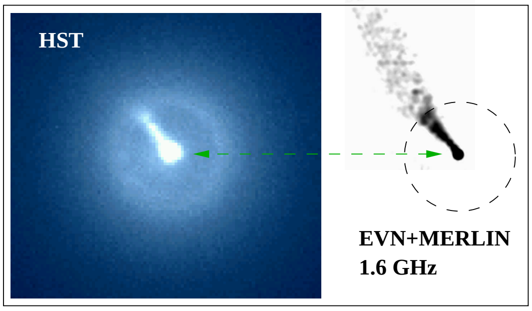

FIGURE 2. (**Left**) HST image of 3C264 showing the ring and its optical jet. (**Right**) Radio image of the jet at 1.6 GHz, with an angular resolution of 40 mas. The locus of the ring seen in the optical is plotted on the radio image from comparison.

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