We also performed high-angular resolution ($\simeq$0.1″) observations at 1.3 cm and 7 m with the Very Large Array (VLA). At 1.3 cm, the emission seems to be tracing the innermost part of the large scale radio jet, while at 7 mm, the emission shows a quadrupolar morphology (see Figure 1). A similar morphology has been observed in other radio jets of low-mass stars at wavelengths where comparable contributions of free-free emission from the radio jet and thermal dust emission from a perpendicular disk are present (e.g., HL Tau: Carrasco-González et al. 2009). Therefore, we interpret the morphology of the 7 mm emission as the result of a combination of free-free emission from an ionized jet (in the N-S direction) and thermal dust emission from a perpendicular circumstellar disk (in the E-W direction).

We modeled the 7 mm emission, using physically self-consistent α-disk models (D'Alessio et al. 2006). We found that, in order to simultaneously reproduce the size and flux density of the 7 mm emission, a central protostar with a minimum mass of 10 $M_\odot$ is required. From the modeling, we also estimated an accretion rate of 5–10$\times10^{-5}$ $M_\odot$ yr^{-1}.

2. DISCOVERY OF SYNCHROTRON EMISSION FROM THE PROTOSTELLAR JET

Supersonic jets are observed to emerge from a wide variety of astrophysical systems, from young stellar objects to active galactic nuclei (AGNs). Observation of linearly polarized synchrotron emission from relativistic electrons of AGN jets reveal the properties of the magnetic field in these jets, showing that it plays an important role in their origin, collimation, and propagation at large distances (e.g., Lyutikov et al. 2005). Theoretical models of jets from YSOs also require a magnetic field as a key ingredient in the jet formation (e.g., Shu et al. 1994). However, YSO jets are dominated by emission from thermal electrons (e.g, Anglada 1996), which is not sensitive to the magnetic field. Interestingly, negative spectral indices have been reported in a few jets from YSOs, suggesting that a non-thermal synchrotron emission component from relativistic electrons could be present. In this case, the acceleration of particles would be most likely produced where the fast thermal jet impacts on the surrounding medium and a strong shock wave is formed by a Fermi mechanism.

We performed high-sensitive VLA observations at 6 cm of the HH 80-81 jet where negative spectral indices in some of the knots of the radio jet have been previously reported (Martí et al. 1993). We found that the emission of the knots located

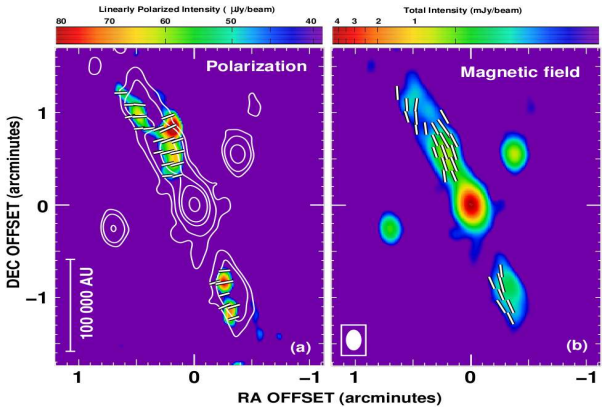

Fig. 2. (a) Superposition of the 6 cm VLA contour map over the linearly polarized continuum intensity image. Polarization direction is shown as white bars. Contour levels are 40, 100, 400, 850, and 3300 μJy beam^{-1}. (b) The apparent magnetic field direction (white bars) is superposed with the total continuum intensity image (color scale). Adapted from Carrasco-González et al. (2010).

$\sim$0.5 pc from the driving source is linearly polarized (see Figure 2a), clearly indicating the presence of non-thermal synchrotron emission in this jet, and implying the presence of relativistic electrons and a magnetic field.

The direction of the apparent magnetic field (perpendicular to the polarization vectors) is very well aligned with the direction of the HH 80-81 radio jet (see Figure 2b). The degree of linear polarization increases as a function of the distance from the jet axis. These characteristics of the synchrotron emission are very similar to those observed in AGN jets, and are indicative of a large-scale helical magnetic field.

We acknowledge partial support from MICINN, Junta de Andalucia, DGAPA and Conacyt.

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