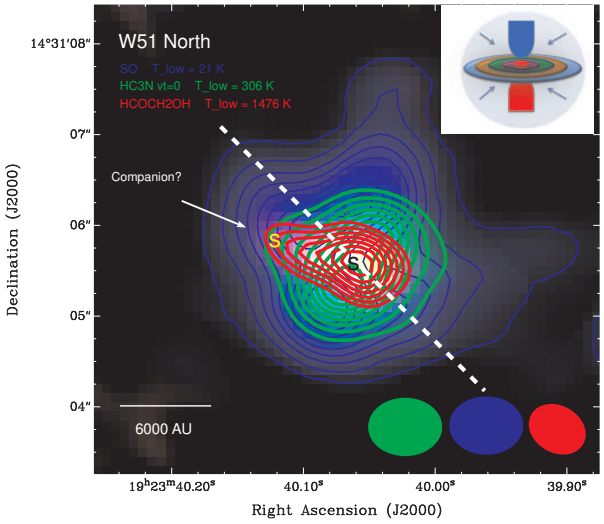

Fig. 4. Molecular emission from a circumstellar large disk around the massive protostar W51 North. SO (blue), HC_3N (green) and $HCOCH_2OH$ (red) emission. Synthesized beams are on the right bottom corner. Upper-right inset: diagram showing the molecular layers of the disk, still surrounded by an infalling envelope. A clear temperature gradient is observed across the disk.

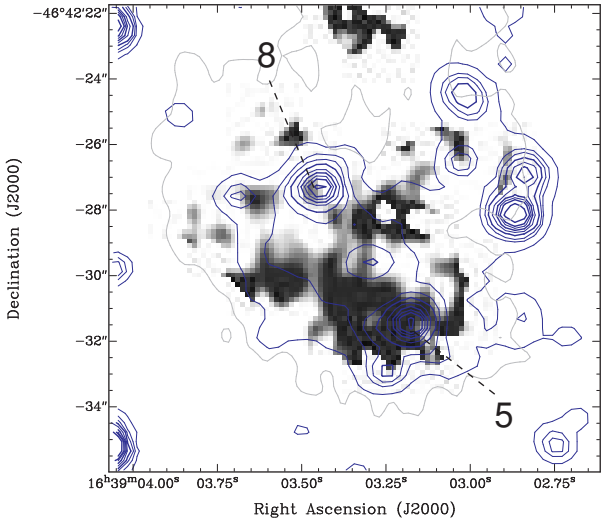

Fig. 5. Spectral index map of IRAS 16353–4635, derived for 17.3 GHz and 19.6 GHz ATCA data, in grayscale: black is −1, white is +1. NTT K_s-band emission is superimposed as blue contours from 25 to 400 Jy. Grey contour: 3σ level emission at 17.3 GHz. NTT sources 5 (low-mass protostar) and 8 (high-mass protostar) are marked (see Benaglia et al. 2010 for details).

polarized emission from the outflows in the T Tau multiple system. They derived magnetic field values of the order of several Gauss.

By looking at L1551 IRS5, Rodríguez et al. (2003) discovered at 3.5 cm binary jets, with slightly different orientations. They proposed a geometry of a binary system of protostellar objects. The complex source could be resolved by Lim & Takakuwa (2006) using 7mm - VLA + Pie Town data. They found the disks are 20 AU apart, and could modeled the disks and jets contributions.

In 2004–2005, disks around massive protostars became neatly detected in radio waves, like that of G24.78+0.08 (Beltran et al. 2004). A detailed molecular study towards W51 North by Zapata et al. (2010) considered VLA and SMA data at various molecular lines (Figure 4). The thesis that each molecule probes gas at a different temperature (and consequently radius) seems to be confirmed by observations. This allowed to propose a scenario like the one portrayed in Figure 4.

Regarding specifically high-mass protostellar objects, Garay et al. (2003) discovered the first very luminous (6.2×10^4 $L_\odot$) young stellar object with non-thermal jets: the source IRAS 16357−4247. At 2.9 kpc, it was observed from 1 to 25 GHz (Brooks et al. 2007, and references therein) radio continuum and CO. It has a core mass of 1000 $M_\odot$, and a CO outflow of 100 $M_\odot$. The proper motion of the jet knots was explained assuming precession (Rodríguez et al. 2008).

IRAS 16353–4635 is an example of a star forming region for which radio plus near IR data can be used to separate protostellar sources and classify them according to mass (Benaglia et al. 2010). Figure 5 shows a spectral index map, built using 17 and 19 GHz ATCA data, superposed with near-IR observations. Complementary NIR spectroscopy allowed to identify a low and a high-mass protostars. Analysis of radio continuum emission from 1.4 to 20 GHz suggested a possible outflow at the radio peak.

A major breakthrough in the last years was the detection of strong linearly-polarized emission from a massive protostellar jet. Carrasco-González et al. (2010) could measure from VLA-5 GHz data, polarized light up to a degree of 30%, coming from the jet of Herbig-Haro object #80.

4. THE RADIO-GAMMA CONNECTION

The high degree of linearly polarized light coming from HH 80 confirms the synchrotron nature of the radiation, produced by relativistic electrons. The clear detection of relativistic particles in young stellar objects exposes the possibility of high-energy radiation in this kind of systems. There are a bunch of mechanisms by which, both relativistic electrons and