HIGH RESOLUTION OBSERVATIONS OF COMPACT HII REGIONS AT 230 GHZ

J. E. Wink,* ** P. G. Mezger,* R. Zylka*

* Max-Planck-Instut für Radioastronomie, 5300 Bonn, W.- Germany

** Instute de Radioastronomie Millimétrique, 38406 St. Martin d'Héres, France

Based on the idea that star formation goes on progressively in molecular clouds, we conducted a search for protostars by mapping compact HII regions at a frequency of 250 GHz. We used the IRAM 30-m radio telescope in Spain with the ^{3}He-cooled bolometer of the MPIfR (Kreysa, 1985). The beam has a full width to half power of 11″at this frequency.

We observed twenty compact HII regions usually obtaining twice the expected free-free flux density, positionally coincident with the HII region. Even fine structure within the HII regions can be traced in our maps as in the case of G75.84+0.40 near ON-2 (Fig 1). The high degree of coincidence between our 250 GHz and the 5 GHz map of Harris (1976) shows that the excess flux density we observe must come from dust mixed with the ionized gas. Part of the dust must however be accumulated in the outer parts of the HII region, since in some cases our contours are shifted outwards relative to the radio maps. This is consistant with the fact that in those cases where we have enough information to make a model fit we derive temperatures of 80± 30 K. We use for our fits longward of 80μm a modified Planck curve with a dust emissivity proportional to λ^2.

G75.84+0.40

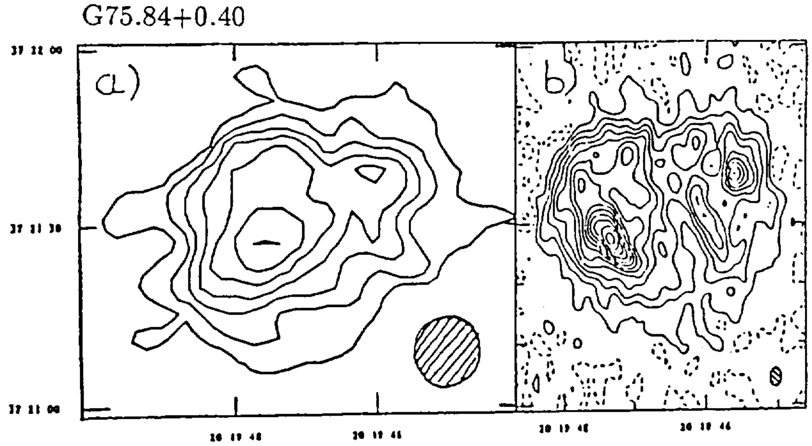

Fig. 1. a) our 250 GHz-map. Contours start at 0.28 Jy/beam and increase by 0.14 Jy/beam. b) the 5 GHz map of Harris (1976) made with the Cambridge 5-km-telescope. The respective beams are shown by the hatched ellipses.

In a few cases, we detect structures not seen before. The best example is our map of NGC2024 (Mezger *et al.* 1987). Another is in the W3A complex in Fig 2b. Components A and B are compatible with free-free emission, component D is hardly visible, component C has twice the free-free flux density and the arc below has no counterpart in ionized gas. The only other evidence for this arc is in the HCN map of Wright *et al.* (1984). The peak in the NW of component A is shifted outwards relative to the peak at 5 GHz. Perhaps the most interesting case is W3OH (Fig 3). A cross cut indicates 3 separate regions: i) the central source W3OH itself. It is unresolved, has 9.4 Jy, compared to a free-free flux density of 3.4 Jy. The major contribution must come from hot dust mixed with the ionized gas; ii) a second, resolved, much weaker source below W3OH is consistent with emission from dust outside the HII region; iii) very extended emission. This could be the dust in the diffuse molecular cloud from which W3OH formed.

REFERENCES:

Arnal, E.M., Goss, W.M., Dickel, H.R., Forster, J.R.: 1982, Mon. Not. R. Astr. Soc. **201**, 317

Harris, S.: 1976, Mon. Not. R. Astr. Soc. **174**, 1

Kreysa, E.: 1985, Proc. URSI Intern.Symp. "mm- and submm-wave Astronomy", Granada 1984, Spain, p. 153

Mezger, P.G., Chini, R., Kreysa, E., Wink, J.E., Salter, C.J.: 1988, Astron. Astrophys. **191**, 44

Wright, M.C.H., Dickel, H.R., Ho, P.T.P.: 1984, Astrophys.J. **281**, L71

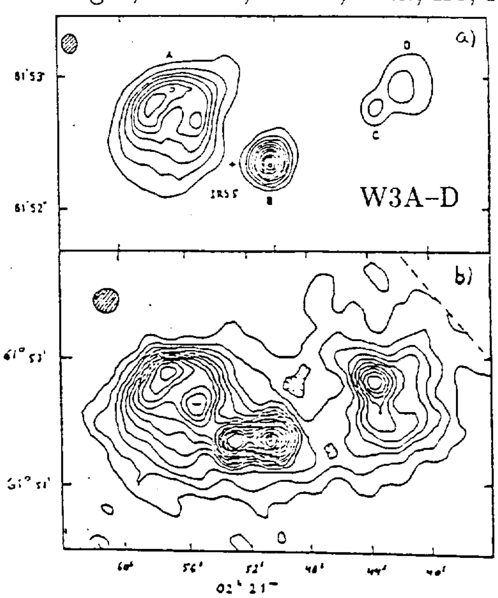

Fig. 2. b) our 250 GHz map of W3 A–D. The dashed line shows the limit of the map. Contours are in Jy/beam. They start at .233 and increment by the same amount. a) the 5 GHz map of Arnal *et al.*(1972).

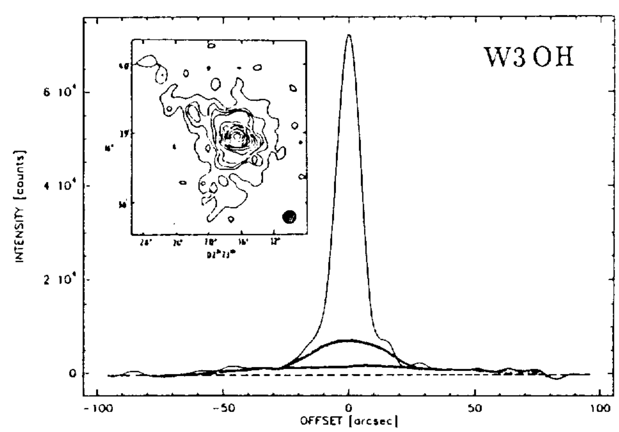

Fig. 3. the insert is our 250 GHz map of W3 OH. Contours are at .21 .42 .63 .84 1.26 1.68 2.24 2.94 3.78 4.76 5.88 7.14 8.65 10.08 Jy/beam. The curve is the average of delination- and right ascension cut through the peak. Our decomposition into three features of different widths is indicated.