RADIO OBSERVATIONS OF MARKARIAN 8

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Markarian 8, a clumpy irregular galaxy (Casini et al. 1979), was observed with the VLA at 20 cm (Mar. 19, 1981; 26 ant.) and 6 cm wavelengths (June 12, 1980; 18 ant.) The structure is alike at the two wavelengths, consisting of 3 distinct clumps imbedded in a diffuse envelope of about 40 arcsec extent. Figure 1 shows the 6 cm structure. At higher resolution the clumps break up into several components. The 20 cm structure is shown in Figure 2, which also compares the optical and radio morphologies. There is excellent general agreement, suggesting a common origin of emission in the clumps.

Radio continuum fluxes of the clumps were obtained by fitting gaussian models to the maps. Total fluxes were derived from low resolution (20"x20") maps. The envelope flux density is the difference between total flux and sum of the clump fluxes. Results are given in Table 1. The derived fluxes of individual clumps may be uncertain by as much as 25%. However, the sum of the clump fluxes is less uncertain, and it is clear that the spectra of the clumps are flat, suggesting thermal emission from an optically thin gas. The spectrum of the envelope is significantly steeper than that of the clumps and indicates non-thermal emission in this component.

Table 2 gives values of electron density, ionized mass and Lyman continuum flux derived for the three radio emitting clumps on the assumption of thermal emission. The last column gives the number of O stars that could produce the derived Lyman continuum flux. A distance to the galaxy of 48.5 Mpc was adopted for these calculations.

Benvenuti et al. (1980) have concluded, on the basis of optical and uv observations, that the clumps are massive HII regions containing more than 10^4 O and early B stars. The radio morphologies, spectra and fluxes, and the quantities in Table 2 derived from them, strongly support that conclusion. Markarian 8 may indeed be a galaxy in which there has been a recent extensive burst of star formation.

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Table 1
Flux Densities and Spectral Indices

Feature	Flux Density (mJy) 20 cm	6 cm	Spectral Index, α ($S \sim \nu^{-\alpha}$)
total	12.6	8.2	0.36
A	2.8	2.2	0.20
B	0.9	0.6	0.34
C	0.7	0.7	0.00
A+B+C	4.4	3.5	0.19
Envelope	8.2	4.7	0.47

Table 2
Derived Parameters

Clump	N_e (cm^{-3})	M (10^8 $M_\odot$)	L_c (10^{53} photons s^{-1})	No. (10^4 O8V stars)
A	6.6	2.0	4.6	5.4
B	5.7	0.8	1.5	1.7
C	4.7	1.3	2.7	2.2

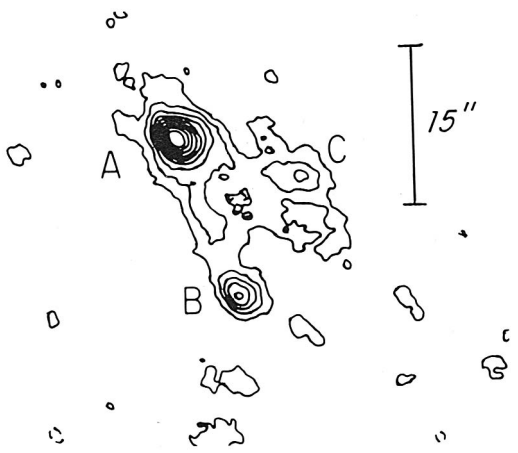

Fig. 1. 6-cm map, resolution 3".3 x 2".4 in p.a. 36°. Lowest and highest contours are 0.14 and 1.3 mJy beam area.

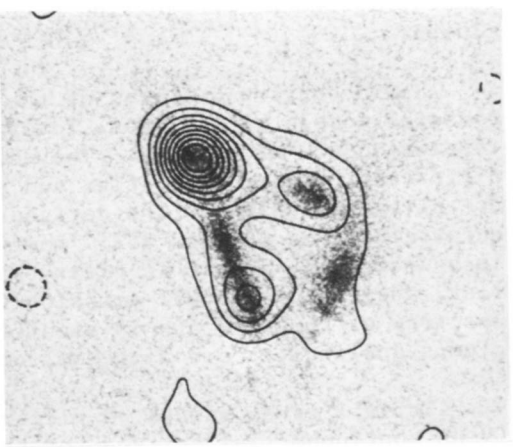

Fig. 2. 20-cm map, resolution 5"x 5", superposed on the optical image. Lowest and highest contours are 0.35 and 3.1 mJy/beam area.

References

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