STAR FORMATION IN M81

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VLA observations of the spiral galaxy M81 in the radio continuum at wavelengths of 6 and 20-cm have been used to check the predictions of the density wave theory. The non-thermal radiation from the arms has been detected and the arms are found to be broader than the predictions of the classical density wave theory. Their width does seem to agree with that predicted by models which take the clumpy nature of the interstellar medium into account. These data are also able to separate giant H II regions from the non-thermal arms. Collaborators have furnished optical Hα data on the H II regions and H I 21-cm data, from the VLA, which will be used to find and measure the location of the H II regions with respect to the spiral shock wave and to measure the visual extinction in the disk of M81.

RADIO CONTINUUM OBSERVATIONS OF THE BARRED GALAXY NGC 4314

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ABSTRACT. VLA observations have been made of the continuum emission at 20-cm from the barred spiral galaxy NGC 4314 with an angular resolution of 3.5 arcseconds that corresponds to a linear scale of approximately 156 pc at a distance to the galaxy. This resolution was sufficient to resolve the central region into several compact sources. The radiation is linearly polarized which may indicate a non-thermal origin. No emission was detected from the extended bar to a level of 130 Jy.

1. INTRODUCTION

NGC 4314 is a barred spiral galaxy being classified as SBa(rs)pec due to its peculiar hot spot nucleus (Sandage and Tammann 1981, *A Revised Shapley-Ames Catalog of Bright Galaxies*, Sersic, J.L. 1973, Publ. Astr. Soc. Pacific 85, 103, Vorontsov-Vel'yaminov, G.A., Zaitseva, G.V., and Lyuti, V.M. 1972, Soviet Astronomy J. 16, 71). Emission lines were only

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detected from the nuclear region by Burbidge and Burbidge in 1962 Astrophys. J. 135, 694). Lynds, Furelind and Rubin (1973, Astrophys. J. 182, 659) carried out studies in the red and blue regions of the optical window of this galaxy and found a red compact nuclear region of approximately five arcseconds in diameter surrounded by a concentric region of Hα emission with four H II regions identified with the bright H II regions seen in optical photographs. More recently, Benedict in 1980 made an extensive UBV surface photometry of the galaxy (Astron. J. 85, 513), while Wakamatsu and Nishida in 1980 reported high resolution spectrograms (Publ. Astr. Soc. Japan 32, 389). Dressel and Condon on the other hand, in 1978 reported a non-detection of NGC 4314 at 2380 MHz (Astrophys. J. Suppl. 36, 53) while Hummel in 1981 detected a 50 mJy source at 1.4 GHz (1981 Ph. D. Thesis University of Groningen). We have carried out observations of the continuum emission at 1.4 GHz using the B configuration of the VLA which provided us with an angular resolution of 3.5 arcseconds sufficient to analyze the total and polarized intensities of the several compact sources in the central part of the galaxy.

2. RESULTS

The preliminary results from our observations may be summarized as follows: a) the high angular resolution map at 20-cm shows that emission comes from a compact unresolved nuclear source of peak intensity 423 μJy surrounded by a broken concentric ring region with five other unresolved sources with peak fluxes in the range 530 μJy to 840 μJy, b) the two compact sources in the southern emission region might seem to correspond to knots A and B seen in optical photographs, c) 20-cm continuum emission is linearly polarized which may indicate that its origin is from the syncroton mechanism although new observations at 6-cm seem to indicate a thermal origin as well, d) the emission seems to come from the bright spiral arms seen in optical photographs and not from the dust lanes, e) a simple magnetic field structure consisting of three patterns may be thought to be prevailing in the central region of the galaxy: one in which the magnetic field may be pointing radially into the inner part of the spiral arms, another in which it lies along the tight spiral arms (the polarized intensity in this region is about 12%) and a third one in which it is in the east-west direction from a region just north of the east radio peak which might correspond to the starting point of the northern dust lane.

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