THE DISTRIBUTION AND KINEMATICS OF NEUTRAL HYDROGEN IN NGC 807

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ABSTRACT. I have detected 21 cm line emission from neutral hydrogen in the giant elliptical galaxy NGC 807 at Arecibo Observatory, and I have mapped this emission with the VLA. Unlike the active and dwarf ellipticals that have been mapped thus far, NGC 807 has a fairly regular disk of gas rotating about the apparent optical minor axis. Combined with observations of active ellipticals, this observation suggests that two classes of HI-rich ellipticals may exist: ellipticals which have accreted gas and become active recently, and quiescent ellipticals which have either produced gas internally or accreted it so long ago that it has reached dynamical equilibrium.

1. INTRODUCTION

Because of the extremely low (usually undetected) 21 cm line flux of elliptical galaxies, few ellipticals have been detected or mapped at 21 cm. The maps of NGC 1052 (van Gorkom et al. 1986), NGC 4278 (Raimond et al. 1981), and NGC 5903 (Appleton et al. 1985) reveal irregular spatial distributions and kinematics, suggestive of tidal disturbance of internal gas or accretion of external gas. The first two galaxies are well-studied prototypes of the class of ellipticals with active nuclei, and the third galaxy is known to be a weak radio source. More maps must be made of both active and normal giant ellipticals, so that we can decipher and compare the evolution of the gaseous component in the two classes (or phases).

2. DATA

I have made 21 cm line observations of 66 elliptical galaxies with $m(pg) \leq 14.5$ mag at Arecibo Observatory. One of the three detected galaxies is NGC 807, a normal giant elliptical ($M(pg) = -21.8$ for $H_o = 50$ km s^{-1} Mpc^{-1}) with an inactive nucleus ($S(2380\ MHz) = 3 \pm 4$ mJy, Dressel and Condon 1978; $W_\lambda(3727A) < 1A$, O'Connell and Dressel 1978). I have observed NGC 807 for 24 hours in the D array of the VLA with 42

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km s^{-1} resolution. Using two different weighting functions for the baselines ("uniform" and "natural"), I have made surface brightness maps and isovelocity contour maps with resolutions of 0.6 and 1.0 arcmin.

3. RESULTS

NGC 807 has a double-horned 21 cm line profile indicative of a rotating disk. The width of the profile at the 20% intensity level is 510 km s^{-1}. A grid of Arecibo observations around the galaxy shows that the source is resolved by the 3.2 arcmin beam, and indicates a total HI mass of 1.4×10^{10} $M_\odot$. The VLA maps show that the HI is centrally concentrated, possibly with a central depression, and extends to at least three times the optical diameter. The apparent HI and optical axial ratios are similar, and the HI and optical position angles (Djorgovski 1986) agree to within a few degrees. The velocity field is consistent with pure rotation about the minor axis.

4. DISCUSSION

NGC 807 has the most massive and "normal" rotating gaseous disk found in an elliptical galaxy to date. Unlike the active giant ellipticals that have been mapped at 21 cm, it does not appear to have undergone tidal disturbance or accretion recently. It has no companions that could serve as likely donors of $\sim 10^{10}$ $M_\odot$ of gas. The gas was apparently produced internally or accreted so long ago that it has reached dynamical equilibrium. The rotation axis of the gas implies that the galaxy is an oblate spheroid or quasi-oblate triaxial galaxy. Maps of other "inactive" giant ellipticals are needed to show whether NGC 807 is typical of this class.

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