

# OUTFLOW IN THE SEYFERT GALAXY NGC 7319

K. AOKI AND G. KOSUGI

*National Astronomical Observatory of Japan  
2-21-1, Osawa, Mitaka, Tokyo 181-8588 Japan*

M. YOSHIDA

*Okayama Astrophysical Observatory  
Kamogata-cho, Asakuchi-gun, Okayama 719-02 Japan*

H. OHTANI

*Department of Astronomy, Kyoto University  
Sakyo-ku, Kyoto 606-01 Japan*

AND

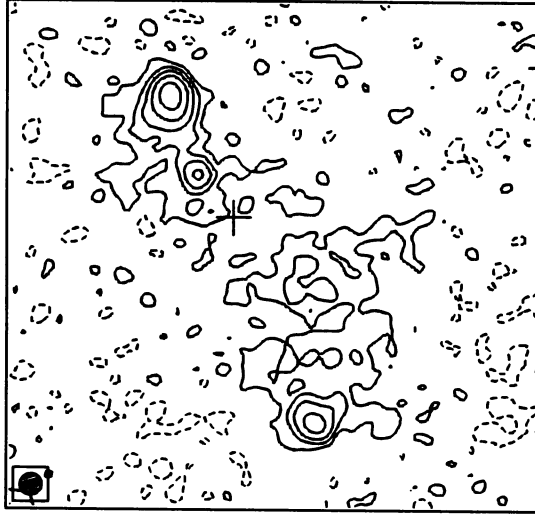
A.S. WILSON

*Department of Astronomy, University of Maryland  
College Park, MD 20742 U.S.A.*

## 1. Introduction

Aoki et al. (1996) found outflowing gas in the Seyfert galaxy NGC 7319. The velocity of the outflow comes up to  $500 \text{ km s}^{-1}$  and its extent is 4 kpc. This outflow is one of the largest outflowing phenomenon that have ever been found in Seyfert galaxies. The radio emission found by van der Hulst & Rots (1981) aligns the outflowing gas. It suggests the radio emission has relation to the outflow. We have made higher resolution radio imaging of NGC 7319 with VLA<sup>1</sup> to study in detail relation of radio emission to outflowing gas. These radio images have been compared to *Hubble Space Telescope* (HST) archival broad-band WFPC2 image. The systemic velocity  $6740 \text{ km s}^{-1}$  (Aoki et al. 1996) gives a distance of 90 Mpc for NGC 7319 assuming a Hubble constant  $H_0=75 \text{ km s}^{-1} \text{ Mpc}^{-1}$ . Thus  $1''$  corresponds to 450 pc.

<sup>1</sup>The National Radio Astronomy Observatory is a facility of the National Science Foundation operated under cooperative agreement by Associated Universities, Inc.



*Figure 1.* The contour map of the 3.6 cm naturally weighted image of NGC 7319. The cross indicates the optical nucleus (Clements 1983). The F.O.V. is  $6.''5 \times 6.''5$ .

## 2. Results

The VLA observations of NGC 7319 were made in the ‘A’ configuration at 20, 6 and 3.6 cm on 1996 November 4. Three compact components are clearly visible in the radio map (Fig. 1). The double or triple structure like NGC 7319 are found in many Seyfert galaxy (Ulvestad & Wilson 1984a, 1984b, 1989). The extent of radio emission is larger than  $4''$  (2 kpc), so the size of radio emission in NGC 7319 is large one among nearby Seyferts.

We have compared our radio image to F606W image in HST archive, and found a triangular structure in F606W image at the position of the southern radio component. This structure may be a emission-line region collisional-excited by shock which a radio jet has induced. High-resolution narrow-band imaging will be needed to confirm this.

We thank AOC staffs, especially G. Taylor for their kind helps during observations and data processing.

## References

- Aoki, K., Ohtani, H., Yoshida, M., & Kosugi, G. 1996, *AJ*, 111, 140  
 Clements, E. D. 1983, *MNRAS*, 204, 811  
 van der Hulst, J. M., & Rots, A. H. 1981, *AJ*, 86, 1775  
 Ulvestad, J. S. & Wilson, A. S. 1984a, *ApJ*, 278, 544  
 Ulvestad, J. S. & Wilson, A. S. 1984b, *ApJ*, 285, 439  
 Ulvestad, J. S. & Wilson, A. S. 1989, *ApJ*, 343, 659