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Position Measurements of the Core in 3C 66B

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Abstract. It was argued that 3C 66B, a nearby radio galaxy, harbors a supermassive black hole binary (SMBHB). To investigate this, a 4-epoch VLBA phase referencing imaging observation was performed in 2004–2005. Here we present some preliminary results of this project. We found a large position difference compared to previous results.

Key words. Galaxies: individual(3C 66B)—techniques: interferometric.

1. Introduction

3C 66B is a radio galaxy at a red-shift of 0.0215. Sudou *et al.* (2003) carried out a 6-epoch VLBA phase referencing observation of the 3C 66A/B pair at 2.3 and 8.4 GHz. By fitting the measured positions of the core of 3C 66B with an elliptical orbit, they claimed that there is a SMBHB at the center of 3C 66B. But this model has met some controversies, like the pulsar timing constraints (Jenet *et al.* 2004).

In order to test the SMBHB model, a new series of VLBA observations was performed. We will present some results of those observations.

2. Observations, results and discussion

The observations towards 3C 66B were carried out at 2.3, 8.4 and 22 GHz at 4 epochs in 2004–2005 with the VLBA. 3C 66A and J0216+4439 were chosen as phase reference sources. The correlation was done using the NRAO VLBA correlator.

Data reduction mainly follows the standard VLBA phase referencing reduction process within the NRAO AIPS package. We also did EOP correction and tried different TEC maps when applying ionospheric correction.

Figure 1(a) displays the image of 3C 66B at 8.4 GHz referenced to 3C 66A on October 20, 2004. The core-jet morphology is consistent with the results at 2.3 and 22 GHz and other published images.

However, a large positional difference of about 0.5 mas was found in the phase referenced core positions when compared with the results from 2001–2002 data (Sudou *et al.* 2003). Jet motion or opacity change might be the reason. The positional measurements at 8.4 GHz are shown in the Fig. 1(b). The error bars shown are sizes of beam divided by signal-to-noise ratio along both right ascension and declination. Realistic errors may be significantly larger (Rioja & Porcas 2000). The

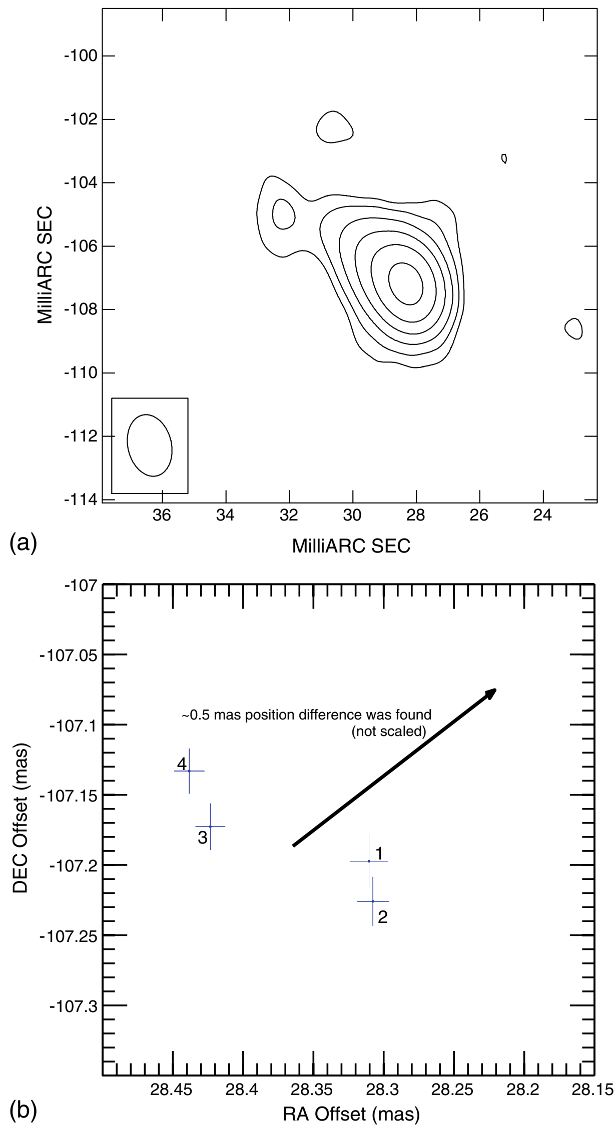

Figure 1. (**a**) Phase referenced map of 3C 66B at 8.4 GHz on October 20, 2004 with a restoring beam of 1.97 × 1.4 mas at a position angle of 13°. Contours start at 2.0 mJy/beam and increase by factors of 2. (**b**) The 4-epoch positional measurements of the core in 3C 66B at 8.4 GHz with respect to that of 3C 66A. The arrow points to the 2001–2002 results.

positional change at 8.4 GHz could be fitted with an elliptical orbit. However, this is quite uncertain because the error in these measurements is likely to be large. More detailed analysis of these results including data at 2.3 and 22 GHz is in progress.

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