

STORY OF THE DISCOVERY OF A MASSIVE BLACK HOLE IN NGC4258

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1. Finding of the high velocity masers in NGC4258 in May 1992

In the Autumn of 1991, Nakai et al.(1993)¹ began monitoring observations of water mega masers including NGC4258 using Nobeyama 45 m telescope. The 45 m telescope was equipped with wide band cooled HEMT receiver (22 GHz) and wide band spectrometers (AOS). Nakai used 8 AOSs which covered 4480 km/sec in velocity. It was from the wide-band system that the high velocity maser components were detected unexpectedly which locate ± 1000 km/sec from the known features of the NGC4258 (Claussen et al. 1984). The finding was in May 1992 when busy Nakai got time checking the data deeply, half year had passed since the beginning of the observations.

2. The KNIFE Observation of NGC4258 in June 1992

Hearing of the discovery, M.Morimoto strongly suggested to perform KNIFE observations of the masers in NGC4258, and that twice for certain acquisition of the data. The KNIFE is the acronym of Kashima Nobeyama Interferometer composed of Nobeyama 45 m and Kashima 34 m of the Communication Research Laboratory (CRL). T. Iwata and H. Takaba explained the importance of the discovery in CRL and got observing time of the Kashima 34 m telescope. KNIFE used K4 recording system for VLBI data acquisition. Quick fringe check and correlation processing of the data were done with New Advanced One-unit Correlator(NAOCO) designed by N.Kawaguchi and T.Sasao. S.Kameno and K.Matsumoto did the check of the data at once within the observations and found fringe of NGC4258, namely the observa-

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tion were done well contrary to M.Morimoto's worry. Although the hardware of NAOCO was being tested and the software was still under development at that time, the correlation processing was done in July 1992 using temporary ASCII form as correlation outputs. K.Fujisawa and M.Miyoshi analyzed the correlation data with primitive software (not with AIPS!). We noticed the frequency setting of video channels were shifted about 1.2 MHz from expected velocity of maser emissions. This was caused by momentary bug in velocity calculation in 45 m software. $v_{LSR} = 1440$ km/sec emission was fortunately detected and relative fringe rate analysis found the emission was within 50 mas (=1 pc) from the main features. It became clear that the high velocity emissions are from the active core of the galaxy.

3. The oldest map of the high velocity masers in NGC4258

The Figure shows the position difference between the main features and high velocity (=+1440 km/sec in LSR). Though the synthesized beam size of the KNIFE was about 10 mas, the separation of 8 mas between them is clear using CLEAN. Without the misfortune concerning velocity setting, KNIFE observation in 1992 would have found the Keplarian motion of the disk around the Black Hole in NGC4258 (Miyoshi et al. 1995) .

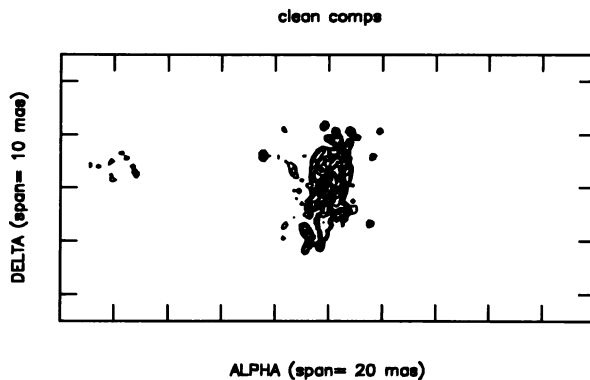


Figure 1. The main feature ($v_{LSR}=450-520$ km/sec) locates at the center, one of the high velocity components ($v_{LSR}=1440$ km/sec) is at the left in the figure.

References

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