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PRESS NOTE

Discovery of the Closest Binary Supermassive Black Hole System in the Galaxy NGC 7674 by Dr. Preeti Kharb, Dr. Dharam Vir Lal, Scientists from NCRA-TIFR, Pune and Dr. David Merritt from RIT, USA.

Dr. Preeti Kharb and Dr. Dharam Vir Lal from NCRA-TIFR, Pune, and David Merritt from the Rochester Institute of Technology, USA, have discovered the closest ever binary supermassive black hole system in a spiral galaxy named NGC 7674, located about 400 million light years from earth. The apparent separation of the two black holes in the binary system is less than one light year. This is much less than the previous record-holder, which was a black hole binary with a separation of about 24 light years.

This discovery is very significant because this is a direct observational proof of the existence of close supermassive black hole binary systems inside galaxies, which are potential sources of gravitational waves.

Black holes are amongst most fascinating objects and even more the binary black-holes (two black holes orbiting around each other). The existence of binary black holes, roughly ten times the mass of Sun, got confirmed by the recent detection of gravitational waves by the LIGO telescope in 2015.

Astrophysicists have long predicted the existence of a second class of binaries, consisting of supermassive black holes, each having a mass upwards of one million times the mass of the Sun. Single supermassive black holes are known to be present at the centres of most galaxies, and since galaxies are observed to merge with other galaxies, it is possible to form gravitationally bound black hole pairs. In due course of time, these two supermassive black holes would coalesce via the emission of gravitational waves.

The above binary system was detected using a technique called very long baseline interferometry (VLBI), in which separate radio telescopes around the world can work together as a single large telescope, achieving an angular resolution of milli- or micro-arcseconds - roughly ten million times the angular resolution of the human eye. Using VLBI techniques, two compact sources of radio emission were detected at the centre of NGC 7674. "The two radio sources have properties that are known to be associated with massive black holes that are accreting gas," Preeti Kharb said, "implying the presence of two black holes." The combined mass of the two black holes is roughly forty million times the mass of the Sun. Kharb et al. estimate the orbital period of the binary to be about one hundred thousand years.

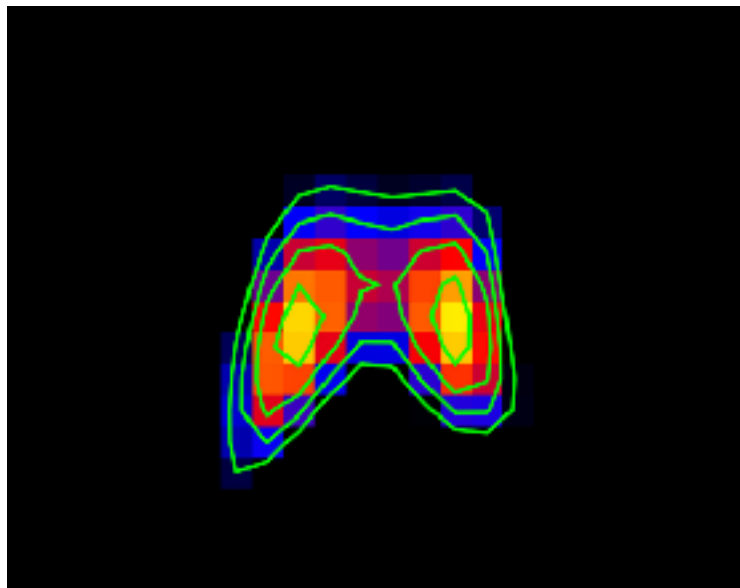
"Detection of a binary supermassive black hole in this galaxy also confirms a theoretical prediction that such binaries should be present in so-called Z-shaped radio sources," David Merritt stated. NGC 7674 is such a radio source. The name "Z-shaped" refers to the twisted morphology of the galaxy's radio emission on much larger scales. This morphology is thought to result from the combined effects of the galaxy merger followed by the formation of the massive binary.

The research paper on this unique discovery is being published in the journal Nature Astronomy, today 18th September 2017.

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The two compact radio sources separated by less than a light year at the center of the galaxy NGC7674. The two sources correspond to the location of the two active supermassive black holes which form a binary and orbit around each other.