

SUPERMASSIVE BLACK HOLE AT CENTER OF MILKY WAY IS LOW-SPINNING: STUDY

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Washington: New research has revealed that the supermassive black hole at the center of the Milky Way galaxy is not spinning much, providing more evidence that it is unlikely to have a jet.

The research, by scientists at the Center for Astrophysics | Harvard & Smithsonian (CfA), and the Center for Interdisciplinary Exploration and Research in Astrophysics (CIERA) at Northwestern University has been published in the *Astrophysical Journal Letters*.

Supermassive black holes like Sgr A* -- the monstrous black hole at the center of the Milky Way galaxy -- are characterized by just two numbers: mass and spin, but have a critical influence on the formation and evolution of galaxies.

"Black holes release a huge amount of energy that removes gas from galaxies and therefore shapes their star formation history," said Dr. Avi Loeb, Frank B. Baird Jr. Professor of Science at Harvard and CfA astronomer, and co-author on the research.

While scientists know that the mass of central black holes has a critical influence on their host galaxy, measuring the impact of their spin isn't easy.

"The effect of black hole spin on the orbits of nearby stars is subtle and difficult to measure directly," said Loeb.

To get a better understanding of how Sgr A* has impacted the formation and evolution of the Milky Way, Loeb and Dr. Giacomo Fragione, of CIERA, studied instead the stellar orbits and spatial distribution of S-stars -- the closest stars orbiting Sgr A* and traveling at a speed of up to a few percent of the speed of light -- to constrain, or place limits on the spin of the black hole.

"We concluded that the supermassive black hole in the center of our galaxy is spinning slowly. This can have major implications for the detectability of activity in the center of our galaxy and the future observations of the Event Horizon Telescope," said Fragione.

The S-stars appear to be organized into two preferred planes. Loeb and Fragione showed that if Sgr A* had a significant spin, the preferred orbital planes of the stars at birth would become misaligned by the present time.

"For our study we used the recently discovered S-stars to show that the spin of the black hole Sgr A* must be smaller than 10 percent of its maximal value, corresponding to a black hole spinning at the speed of light. Otherwise, the common orbital planes of these stars would not stay aligned during their lifetime, as seen today," said Loeb.

The results of the research also point to another important detail about Sgr A*: it is unlikely to have a jet.

"Jets are thought to be powered by spinning black holes, which act as giant flywheels," said Loeb, with Fragione adding that, "Indeed there is no evidence of jet activity in Sgr A*. Upcoming analysis of data from the Event Horizon Telescope will shed more light on this issue."

The find was published just days before the announcement of the 2020 Nobel Prize in Physics, which was awarded in part to scientists Reinhard Genzel and Andrea Ghez for their groundbreaking research which demonstrated that Sgr A* is a black hole.

"Genzel and Ghez monitored the motion of stars around it," said Loeb. "They measured its mass but not its spin. We have derived the first tight limit on Sgr A*'s spin," adding that the find wouldn't be possible without Genzel and Ghez's original Nobel Prize-winning work.

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