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Light shed on black-hole masses

[Mark Peplow](#)

Orbiting matter suggests monster is 300,000 times heavier than the Sun.

How do you weigh a supermassive black hole? Simply follow any surrounding clumps of matter as they circle towards their doom.

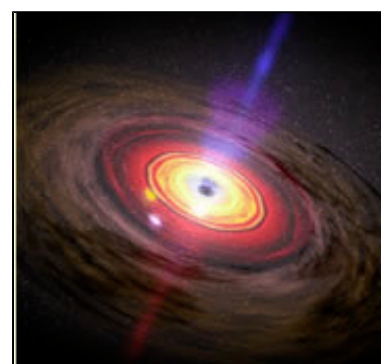
Astronomers using this technique have come up with the most accurate mass measurement so far for one such monster, which turns out to be more than 300,000 times as massive as our Sun.

"This is the first time we've been able to measure a complete orbital period for something close to a black hole," says Lance Miller, a team member from the University of Oxford, UK, who presented the results on 10 January at the American Astronomical Society conference in San Diego, California.

"We couldn't even be sure that there were hotspots around black holes before," he says of the hot matter they studied.

Super stars

Black holes are the remains of collapsed stars. When they form they are generally up to 100 times the mass of our Sun. But scientists are increasingly sure that many galaxies contain supermassive black holes at their heart, and our own galaxy was found to sport one in 2001 (see "[Huge](#)



Three blobs of fiery matter swirl inexorably towards their doom. [Click here](#) for animation.

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black hole in Milky Way").

The black hole that Miller and his colleagues studied is in the centre of a galaxy called Markarian 766, about 170 million light years away from Earth. Such a giant is thought to form when smaller black holes suck up matter or collide with each other.

Miller and his team looked at data from the European Space Agency's XMM-Newton orbiting X-ray telescope, which watched the black hole for just over a day in May 2001.

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The researchers saw three clumps of hot matter spiralling around the hole, each about the mass of our Sun. These took 27 hours to make one orbit of the black hole, at a distance of several hundred million kilometres. That's around the same as the gap between our Sun and Jupiter, which takes a leisurely 12 years to cover the same ground.

Lance Miller
Astronomer, Oxford
University, UK.

The orbit time means that these 'hotspots' must be travelling at about 32,000 kilometres per second, or more than 10% the speed of light.

Previous measurements of supermassive black holes have looked at stars orbiting more than 100 times farther away than the hotspots, and this substantially increases errors in mass measurements.

The long view

Similar hotspots may exist close to other black holes, says Jane Turner, one of the team who works at NASA's Goddard Space Flight Centre, Maryland.

But it is unusual for orbiting telescopes to collect data from one object for such a long period of time, which is why the possibility has not been explored before.

The researchers are not yet sure whether the hotspots are captured stars, or areas of intense magnetic activity within the dust cloud that surround