



Be Seen!



NewScientistSpace.com

[Home](#) | [News](#) | [Solar System](#) | [Space Technology](#) | [Human Spaceflight](#) | [Astronomy](#) | [Special Reports](#)

Most distant maser may solve cosmic conundrums

18:45 14 July 2005

NewScientist.com news service

Jeff Hecht

The most distant and most powerful cosmic maser - the microwave equivalent of a laser - has been discovered around a bright, active galaxy. It offers a new tool to study these "active" galaxies and might reveal the properties of the elusive dark energy thought to accelerate the expansion of the universe.

Cosmic masers are gas clouds that emit strong signals at a narrow range of microwave wavelengths. They are excited by energetic radiation from a nearby object, then release part of the energy as microwaves. These microwaves stimulate other molecules, excited by the same source, to emit microwaves at the same frequency - amplifying the signal like a laser.

Astronomers first spotted cosmic masers in gas clouds near bright, young stars in our galaxy. Later, they found more powerful cosmic masers in thick, dusty rings of molecular gas around colossal black holes at the centres of active galaxies, called quasars. These galaxies spew intense radiation as matter falls towards their central black holes.

Violent outburst

Now, a pair of astronomers searching for masers around 47 distant quasars have found one at a distance of approximately 6.5 billion light years. That is more than 10 times farther than previous maser discoveries, and the most powerful yet seen. Its power seems to come from a violent outburst of radiation as the central black hole swallowed something up.

The object holds tantalising promise for astronomers - beginning with revealing the nature of the black hole that powers it. If the maser clouds follow orderly orbits, astronomers can measure their velocity by observing Doppler shifts in the frequency of their radiation. By observing changes in their velocity over a few years, astronomers can measure the clouds' speed and rotation. This in turn provides them with the mass of the central black hole.

It also gives them the distance at which the clouds orbit the black hole, which could be used to discover the quasar's distance more accurately - a measurement often difficult to make in astronomy.

In theory, an object's distance can be measured if you know either its brightness or its physical size. The fainter or the smaller the object, the farther it is. Normally galactic distances are measured by brightness, but cosmic masers allow distances to be measured by the angular size of the discs around quasars as well.

Turning point

And that could reveal whether space is curved. In flat space, estimates of distance should be the same whether they are based on measurements of an object's brightness or size. "But they're different if the universe is curved," says Robert Antonucci of the University of California in Santa Barbara, US. So using masers to compare the two results can provide a vital test of various cosmological models.

And the new maser's distance, at 6.5 billion light years, also suggests it can help physicists probe the nature of dark energy. The effects of dark energy appear to have kicked into high gear about 5 billion years ago - corresponding to objects about 5 billion light years away - accelerating the expansion of the universe.

So Antonucci and colleague Richard Barvainis of the National Science Foundation hope to find more masers at similar distances to probe what the universe looked like at this crucial turning point. Distant cosmic masers provide "a major new cosmological observable," Antonucci told **New Scientist**.

The maser was found with the single-dish Green Bank radio telescope in West Virginia, US. But its resolution

is not great enough to pinpoint individual maser regions, so the astronomers will use a multi-dish Very Long Baseline Interferometer to find the black hole's mass and the angular size of the disc around it.

Journal reference: *Astrophysical Journal Letters* (vol 628)

Related Articles

[Space gas beats a maser rhythm](#)

<http://www.newscientist.com/article.ns?id=mg18725075.100>

09 July 2005

[Distant galaxy's subtle sidling measured](#)

<http://www.newscientist.com/article.ns?id=dn7095>

03 March 2005

[Fabric of the final frontier](#)

<http://www.newscientist.com/article.ns?id=mg17924084.300>

16 August 2003

Weblinks

[Barvainis and Antonucci study abstract](#)

<http://www.journals.uchicago.edu/ApJ/journal/issues/ApJL/v628n2/19618/brief/19618.abstract.html>

[Robert Antonucci, UCSB](#)

<http://www.physics.ucsb.edu/~antonucci/>

[Green Bank Telescope](#)

<http://www.gb.nrao.edu/GBT/GBT.shtml>

[Close this window](#)