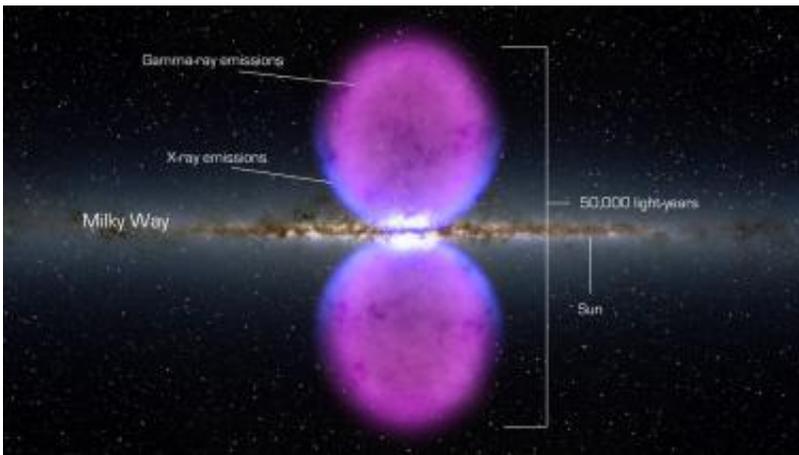


# Fermi telescope discovers new giant structure in our galaxy (w/ Video)

November 9 2010



From end to end, the newly discovered gamma-ray bubbles extend 50,000 light-years, or roughly half of the Milky Way's diameter, as shown in this illustration. Hints of the bubbles' edges were first observed in X-rays (blue) by ROSAT, a Germany-led mission operating in the 1990s. The gamma rays mapped by Fermi (magenta) extend much farther from the galaxy's plane. Credit: NASA's Goddard Space Flight Center

(PhysOrg.com) -- NASA's Fermi Gamma-ray Space Telescope has unveiled a previously unseen structure centered in the Milky Way. The feature spans 50,000 light-years and may be the remnant of an eruption from a supersized black hole at the center of our galaxy.

"What we see are two gamma-ray-emitting bubbles that extend 25,000 light-years north and south of the [galactic center](#)," said Doug Finkbeiner,

an astronomer at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., who first recognized the feature. "We don't fully understand their nature or origin."

The structure spans more than half of the visible sky, from the constellation Virgo to the constellation Grus, and it may be millions of years old. A paper about the findings has been accepted for publication in The [Astrophysical Journal](#).

Finkbeiner and Harvard graduate students Meng Su and Tracy Slatyer discovered the bubbles by processing publicly available data from Fermi's Large Area Telescope (LAT). The LAT is the most sensitive and highest-resolution gamma-ray detector ever launched. Gamma rays are the highest-energy form of light.

Other astronomers studying gamma rays hadn't detected the bubbles partly because of a fog of [gamma rays](#) that appears throughout the sky. The fog happens when particles moving near the speed of light interact with light and [interstellar gas](#) in the Milky Way. The LAT team constantly refines models to uncover new gamma-ray sources obscured by this so-called diffuse emission. By using various estimates of the fog, Finkbeiner and his colleagues were able to isolate it from the LAT data and unveil the giant bubbles.

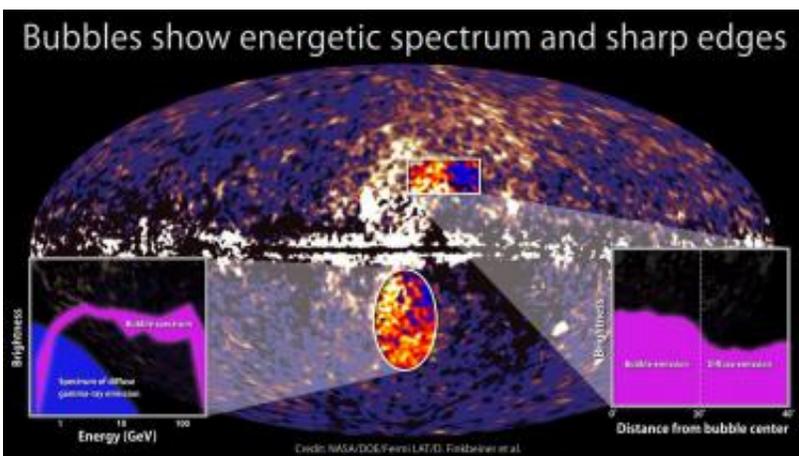
Scientists now are conducting more analyses to better understand how the never-before-seen structure was formed. The bubble emissions are much more energetic than the gamma-ray fog seen elsewhere in the Milky Way. The bubbles also appear to have well-defined edges. The structure's shape and emissions suggest it was formed as a result of a large and relatively rapid energy release - the source of which remains a mystery.

One possibility includes a particle jet from the supermassive black hole

at the galactic center. In many other galaxies, astronomers see fast particle jets powered by matter falling toward a central black hole. While there is no evidence the Milky Way's black hole has such a jet today, it may have in the past. The bubbles also may have formed as a result of gas outflows from a burst of star formation, perhaps the one that produced many massive star clusters in the Milky Way's center several million years ago.

"In other galaxies, we see that starbursts can drive enormous gas outflows," said David Spergel, a scientist at Princeton University in New Jersey. "Whatever the energy source behind these huge bubbles may be, it is connected to many deep questions in astrophysics."

Hints of the bubbles appear in earlier spacecraft data. X-ray observations from the German-led Roentgen Satellite suggested subtle evidence for bubble edges close to the galactic center, or in the same orientation as the Milky Way. NASA's Wilkinson Microwave Anisotropy Probe detected an excess of radio signals at the position of the gamma-ray bubbles.



The bubbles display a spectrum with higher peak energies than the diffuse gamma-ray glow seen throughout the sky. In addition, the bubbles display sharp

edges in Fermi LAT data. Both of these qualities suggest that the structure arose in a sudden, impulsive event. Credit: NASA/DOE/Fermi LAT/D. Finkbeiner et al.

The Fermi LAT team also revealed Tuesday the instrument's best picture of the gamma-ray sky, the result of two years of data collection.

"Fermi scans the entire sky every three hours, and as the mission continues and our exposure deepens, we see the extreme universe in progressively greater detail," said Julie McEnery, Fermi project scientist at NASA's Goddard Space Flight Center in Greenbelt, Md.

NASA's Fermi is an astrophysics and particle physics partnership, developed in collaboration with the U.S. Department of Energy, with important contributions from academic institutions and partners in France, Germany, Italy, Japan, Sweden and the United States.

"Since its launch in June 2008, Fermi repeatedly has proven itself to be a frontier facility, giving us new insights ranging from the nature of space-time to the first observations of a gamma-ray nova," said Jon Morse, Astrophysics Division director at NASA Headquarters in Washington. "These latest discoveries continue to demonstrate Fermi's outstanding performance."

Provided by NASA's Goddard Space Flight Center

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