Colossal Bubbles at Milky Way's Plane --"May Be the Annihilation of Dark Matter"

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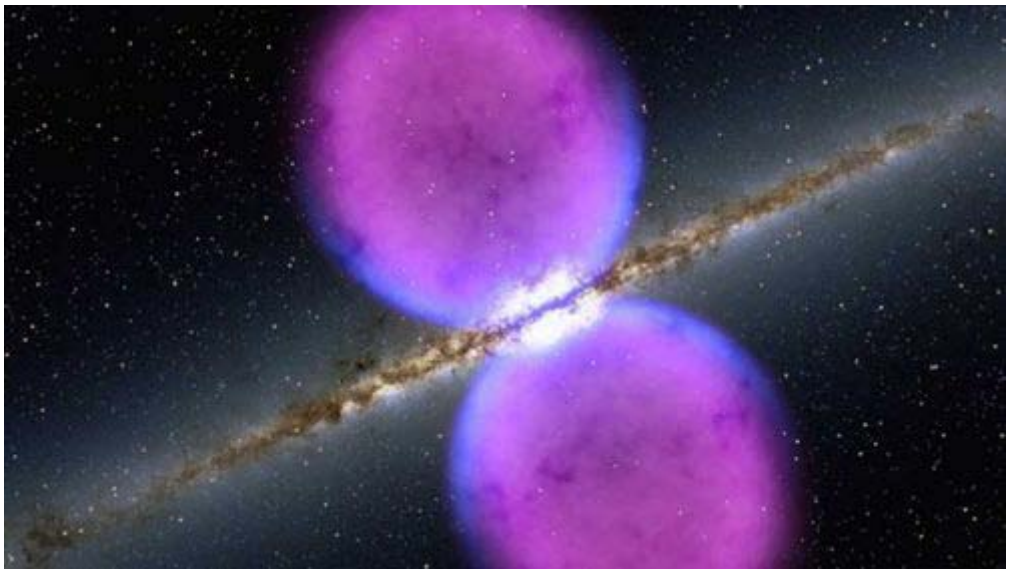

In 2011, an analysis of data from a NASA Fermi Gamma-Ray Space Telescope turned up massive, previously unseen galactic structures. A group of astrophysicists located two massive bubbles of plasma, now know as "Fermi Bubbles," each extending tens of thousands of light-years, emitting high-energy radiation above and below the plane of the galaxy. 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.

Now, more recently, in 2013, astrophysicists Dan Hooper of Fermi National Accelerator Laboratory and Tracy Slatyer at Princeton University, have published a study suggesting that a massive outflow of charged particles from Fermi bubbles, as they are known, outflows of charged particles (gamma rays) traveling at nearly a third the speed of light from the center of the Milky Way galaxy, may be partly due to collisions between dark matter particles that result in their annihilation, and the subsequent

creation of the building blocks of visible matter—charged particles that appear as two lobes or "bubbles," above and below the center of the Milky Way Galaxy.
Another 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."

According to Fulai Guo and William G. Mathews of the University of California at Santa Cruz: "The Fermi bubbles provide plausible evidence for a recent powerful AGN jet activity in our Galaxy, shedding new insights into the origin of the halo CR population and the channel through which massive black holes in disk galaxies release feedback energy during their growth."

From its orbital perch hundreds of kilometers above Earth's surface, Fermi has charted the location of gamma-ray sources with its Large Area Telescope (LAT). Where the gamma rays originate from is not always clear; the foreground of Fermi's view was clouded with emission from events such as cosmic rays striking dust in the Milky Way's disk.

"Fermi Bubbles" was coined by Richard Carrigan at the Fermi National Accelerator Laboratory in his work on the search for artifacts like Dyson spheres or Kardashev civilizations. A "Fermi bubble," according to Carrigan, would grow as the civilization creating it colonized space.

Carrigan notes that, as Carl Sagan and others have observed, that the time to colonize an individual system is small compared to the travel time between stars. A civilization could engulf its galaxy on a time scale comparable to the rotation period of the Milky Way, or every 225–250 million years, and perhaps, fewer. According to Carrigan, of the 11,224 potential sources of low range emissions identified that might be a manifestation of Dyson spheres in the Milky Way, only 16 showed strong potential.
James Annis,a member of Experimental Astrophysics Group at Fermilab, has suggested that elliptical galaxies, which exhibit little structure, might be a more likely place to look for Fermi bubbles than spiral galaxies. Annis examined existing distributions for spiral and elliptic galaxies and looked for sources below the normal trend lines where more than 75% of the visible light would have been absorbed. But no candidates were found in his sample of 137 galaxies. From this Annis inferred a very low probability of a Type III civilization appearing that would be found using this search methodology.
In 1960 Dyson suggested that an advanced civilization inhabiting a solar system might break up the planets into very small planetoids or pebbles to form a loose shell that would collect all the light coming from the star. The shell of planetoids would vastly increase the available "habitable" area and absorb all of the visible light. The stellar energy would be reradiated at a much lower temperature.

If the visible light was totally absorbed by the planetoids a pure Dyson Sphere signature would be an infrared object with luminosity equivalent to the hidden star and a blackbody distribution with a temperature corresponding to the radius of the planetoid swarm.