Gamma-ray emission from the Sagittarius Dwarf Spheroidal galaxy

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The Fermi Bubbles are giant, γ-ray emitting lobes emanating from the nucleus of the Milky Way [1, 2] discovered in ~1-100 GeV data collected by the Large Area Telescope on board the Fermi Gamma-Ray Space Telescope [3]. Previous work [4] has revealed substructure within the Fermi Bubbles that has been interpreted as a signature of collimated outflows from the Galaxy's super-massive black hole. Here we show via a spatial template analysis that much of the γ-ray emission associated to the brightest region of substructure – the so-called cocoon – is likely due to the Sagittarius dwarf spheroidal (Sgr dSph) galaxy. This large Milky Way satellite is viewed through the Fermi Bubbles from the position of the Solar System. As a tidally and ram-pressure stripped remnant, the Sgr dSph has no on-going star formation, but we nevertheless demonstrate that the dwarf's millisecond pulsar (MSP) population can plausibly supply the γ-ray signal that our analysis associates to its stellar template. The measured spectrum is naturally explained by inverse Compton scattering of cosmic microwave background photons by high-energy electron-positron pairs injected by MSPs belonging to the Sgr dSph, combined with these objects' magnetospheric emission. This finding plausibly suggests that MSPs produce significant γ-ray emission amongst old stellar populations, potentially confounding indirect dark matter searches in regions such as the Galactic Centre, the Andromeda galaxy, and other massive Milky Way dwarf spheroidals.

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