

The Gamma-ray Emission of Ultra-Fast Outflows

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Massive black holes at the centers of galaxies can launch powerful wide-angle winds, which if sustained over time can unbind the gas from the stellar bulges of galaxies. Propagating through the galaxy, the wind should interact with the interstellar medium creating a strong shock, similar to those observed in supernovae explosions, which is able to accelerate charged particles to high energies. Here we report the Fermi Large Area Telescope detection of gamma-ray emission from these shocks in a small sample of galaxies exhibiting ultra-fast outflows. The detection implies that energetic black-hole winds transfer $\sim 0.04\%$ of their mechanical power to gamma rays and that the gamma-ray emission may represent the onset of the wind-host interaction.

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