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Dark matter spike and gamma-ray boost around the black hole at the Galactic Center

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Nowadays, it is widely acknowledged that the Universe's matter density is predominantly composed of an enigmatic constituent known as Dark Matter (DM). This DM is thought to be composed of a novel elementary particle that is neutral, stable, and non-baryonic in nature. In dense regions of the Universe, DM may undergo self-annihilation or decay, generating a potent gamma-ray signature. (1) Dwarf galaxies, galaxy clusters and the Galactic Center are compelling candidates to harbour such sizable high energy gamma-ray signals. The adiabatic growth of a black hole in the center of some of these objects can lead to a significant enhancement of the dark matter density close to the hole and, as a consequence, a strong enhancement of the expected gamma-ray flux. (2) For instance, the center of the Milky Way harbours a supermassive black hole (SMBH), Sagittarius (Sgr) A*, and a bright gamma-ray source has been observed by both the Fermi-LAT and H.E.S.S. telescopes, in a position coincident with the SMBH. This project aims to study the creation of adiabatic spikes in the center of DM halos, and to test whether the self-annihilation "boost" effect around Sgr A* can explain the Galactic Center central gamma-ray source. The main objective of the proposed activity is to introduce the student to the context of research in Astrophysics and Astroparticle Physics, by means of the study of one of the leading topics in this field: the indirect search for dark matter.

Palavras-chave: Matéria escura. Centro galáctico. Buraco negro.

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