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Phenomenology of axion-photon coupling in the jets of AGNs

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An outstanding result of modern cosmology is that only a small fraction of the total matter content of the universe is made of baryonic matter, while the vast majority is constituted by dark matter (DM). However, the nature of such component is still unknown and might be a matter of long standing controversies. In principle, the nature of DM can be understood through looking for light scalar candidates of DM such as axion and axion-like particles. The axion is a pseudo-Nambu-Goldstone boson that appears after the spontaneous breaking of the Peccei-Quinn symmetry and it was introduced to solve the CP-violation problem of the strong interactions. On the other hand, there are other axion-like particles (ALPs) predicted by many extensions of the standard model of particle physics (SM) and they postulated to share the same phenomenology of the axion. The theory, together with observational and experimental bounds, predicts that such axions or more generally ALPs are very light and weakly interacting with the SM particles. Therefore, we strongly believe that ALPs are highly viable candidate for cold DM in the universe. If they really exist in nature, they are expected to couple with photons in the present of an external magnetic field through the Primakoff effect. We will examine the detectability of signals produced by ALP-photon coupling in the highly magnetized environment of the relativistic jets produced by active galactic nuclei (AGNs).

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