Contribution ID: **293** Type: **Parallel talk**

Searching for WIMP signals with galaxies - gamma rays cross correlations: optimal weights in the angular power spectrum

Monday 28 August 2023 14:45 (15 minutes)

Although one of the two namesakes of the LCDM cosmological model, the hypothesis of cold dark matter existence still chiefly relies on its gravitational effects, whilst both direct and indirect detection via non-gravitational signatures have not yet been achieved.
Weakly interacting massive particles (WIMP) are a candidate cold relic with a mass of 1-1000 GeV: they might then annihilate or decay in γ photons and contribute to the unresolved gamma ray background (UGRB) detected by experiments such as Fermi –LAT. Even if dominated by an isotropic shot noise component, such emission should be more tightly tracing the LSS compared to astrophysical sources also present in the UGRB. The angular cross-correlation power spectrum with galaxies might enhance such anisotropy, with an indirect detection thus translating into measuring a residual signal after substraction of the astrophysical contribution. Typical signal shapes and amplitudes can be defined in terms of multipoles, redshift, energy and mass range of the probed halos and gauged to sensitivity and resolution of present and future instruments. Within this general framework, we present a weighting scheme of the galaxy tracer which proved effective in enhancing the anisotropic contribution of other shot noise –dominated LSS tracers, such as cosmic rays and gravitational waves, and assess its efficiency in terms of signal to noise ratio and constraining power on the WIMP mass and its annihilation or decay cross sections.

Submitted on behalf of a Collaboration?

No

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Session Classification: Cosmology and Particle Physics

Track Classification: Cosmology and Particle Physics