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## EXECUTIVE SUMMARY

# ASSESSING THE SIGNATURES IMPRINTED BY STAR-FORMING GALAXIES IN THE COSMIC $\gamma$ -RAY BACKGROUND

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This work assesses the contribution of star-forming galaxies to the extra-galactic gamma-ray background. It introduces a simple template model for the emitted gamma-ray spectrum from a single star-forming galaxy, defined by a small number of physically motivated parameters, and applies to this to a population of galaxies to estimate their contribution to the gamma-ray background. The impact of cosmic ray containment in their host environment is shown to strongly modify the resulting gamma-ray background spectrum. We show how information about the redshift distribution of star-forming galaxies is imprinted into the gamma-ray background, which can be accessed through gamma-ray background anisotropies. These offer a new method that can be used to study cosmic ray activity in star-forming galaxies over cosmic time, and offers a means to probe the role of cosmic rays in galaxy evolution.