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Unresolved sources naturally contribute to PeV γ -ray diffuse emission observed by Tibet AS γ

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The Tibet AS γ experiment provided the first measurement of the total diffuse gamma-ray emission from the Galactic disk in the sub-PeV energy range.

Based on analysis of the TeV sources included in the HGPS catalogue, we predict the expected contribution of unresolved pulsar-powered sources in the two angular windows of the Galactic plane observed by Tibet AS γ . We show that the sum of this additional diffuse component due to unresolved sources and the truly diffuse emission, produced by the interaction of Cosmic Rays (CRs) with the interstellar medium, well saturates the Tibet data, without the need to introduce a progressive hardening of the cosmic-ray spectrum toward the Galactic centre.

We also investigate the typical age of these sources and we show that a relevant contribution is provided by relatively young PWNe with age ranging between $t \sim (7 - 33)$ kyr, depending on the sky region considered. Finally, we estimate that CTA will be able to detect about 280 (140) pulsar-powered sources in the whole Galaxy for a typical source size is 10 pc (40 pc).

Collaboration name

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