



High Energy Physics - Phenomenology

A Model Independent Method to Study Dark Matter induced Leptons and Gamma rays

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(Submitted on 15 Jul 2011 (v1), last revised 4 Nov 2012 (this version, v4))

By using recent data, we directly determine the dark matter (DM) induced γ spectrum at the source from experimental measurements at the earth, without reference to specific particle physics models. The DM induced gamma rays emitted via inverse Compton scattering are then obtained in a model independent way. However the results depend on the choice of the astrophysical γ background, which is not reliably known. Nevertheless, we calculate, as an illustration, the fluxes of gamma rays from the Fornax cluster in the decaying DM scenario with various astrophysical γ backgrounds. Without any assumptions on details of the DM model, the predictions turn out to be either in disagreement with or only marginally below the upper limits measured recently by the Fermi-LAT Collaboration. In addition, these DM induced ICS gamma rays in the GeV range are shown to be almost independent of choices of cosmic ray propagation model and of DM density profile, when a given astrophysical γ background is assumed. This provides a strong constraint on decaying DM scenario as the gamma rays may be produced in other processes besides inverse Compton scattering, such as the bremsstrahlung and neutral pion decays.

Comments: 14 pages, 5 figures, Latex, to match the published version

Subjects: **High Energy Physics - Phenomenology (hep-ph)**; High Energy Astrophysical Phenomena (astro-ph.HE); Instrumentation and Methods for Astrophysics (astro-ph.IM); High Energy Physics - Theory (hep-th)

Cite as: [arXiv:1107.3024](https://arxiv.org/abs/1107.3024) [hep-ph]
(or [arXiv:1107.3024v4](https://arxiv.org/abs/1107.3024v4) [hep-ph] for this version)

Submission history

From: Liucheng Wang [[view email](#)]

[v1] Fri, 15 Jul 2011 09:42:34 GMT (120kb)

[v2] Fri, 14 Oct 2011 23:26:11 GMT (120kb)

[v3] Tue, 17 Jan 2012 21:51:38 GMT (207kb)

[v4] Sun, 4 Nov 2012 18:04:46 GMT (204kb)

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