ADDENDUM

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Addendum: Fermi 130 GeV gamma-ray excess and dark matter annihilation in sub-haloes and in the Galactic centre

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We have updated the fits to Fermi-LAT publicly available gamma-ray data from the Galactic centre presented in ref. [1] using 218 weeks data and new improved Fermi-LAT energy resolution [2]. The new result is presented in figure 1 that shows a fit to the gamma-ray flux as a function of energy together with $2\sigma$ error band. Compared to figures 3 and 4 of ref. [1], the most important new feature is the presence of a double peak in the 130 GeV excess. While the previous Fermi-LAT energy resolution did not allow us to see the fine structure of the excess, the improved one clearly indicates for a double peak structure, confirming similar claims made in ref. [3].

The double peak at the same energies, 110 GeV and 130 GeV, is also observed in the gamma-ray excess from nearby galaxy clusters [4], suggesting that the two signals originate from the same source. The presence of double peak is a generic prediction of Dark Matter...
annihilation pattern in gauge theories, corresponding to $\gamma \gamma$ and $\gamma Z$ final states. Thus the two seemingly unrelated gamma-ray spectra, from the Galactic centre and from the galaxy clusters, favour the particle physics origin of the excess over any astrophysics origin.

We finally note that the double peak is not present in the gamma-ray spectrum from Earth Limb \[5, 6\].

References

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\[2\] Fermi-LAT collaboration, M. Ackermann et al., *The Fermi Large Area Telescope On Orbit: Event Classification, Instrument Response Functions and Calibration*, Astrophys. J. Suppl. 203 (2012) 4 [arXiv:1206.1896] [inSPIRE].

\[3\] M. Su and D.P. Finkbeiner, *Strong Evidence for Gamma-ray Line Emission from the Inner Galaxy*, arXiv:1206.1616 [inSPIRE].

\[4\] A. Hektor, M. Raidal and E. Tempel, *An evidence for indirect detection of dark matter from galaxy clusters in Fermi-LAT data*, arXiv:1207.4466 [inSPIRE].

\[5\] A. Hektor, M. Raidal and E. Tempel, *Fermi-LAT gamma-ray signal from Earth Limb, systematic detector effects and their implications for the 130 GeV gamma-ray excess*, arXiv:1209.4548 [inSPIRE].

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