

Dark Matter annihilation

Fermi-LAT (R. Caputo, UCSC)

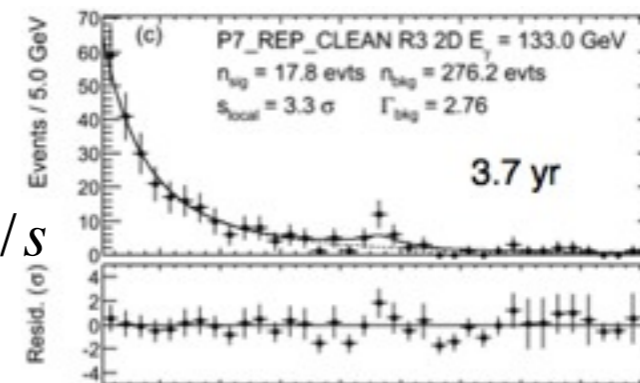


Signal?

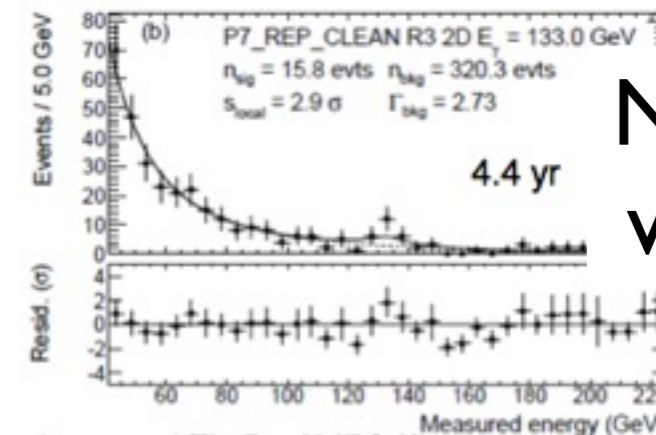
Monochromatic line
 $10^{-30} \text{ cm}^3/\text{s}$ (loops)



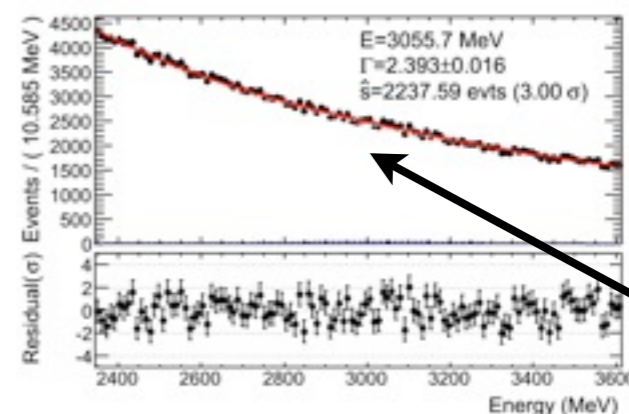
Seems to be behaving statistically...



Ackerman et al (The Fermi LAT Col.) PRD 88, 082002 (2013)



New search with Pass 8

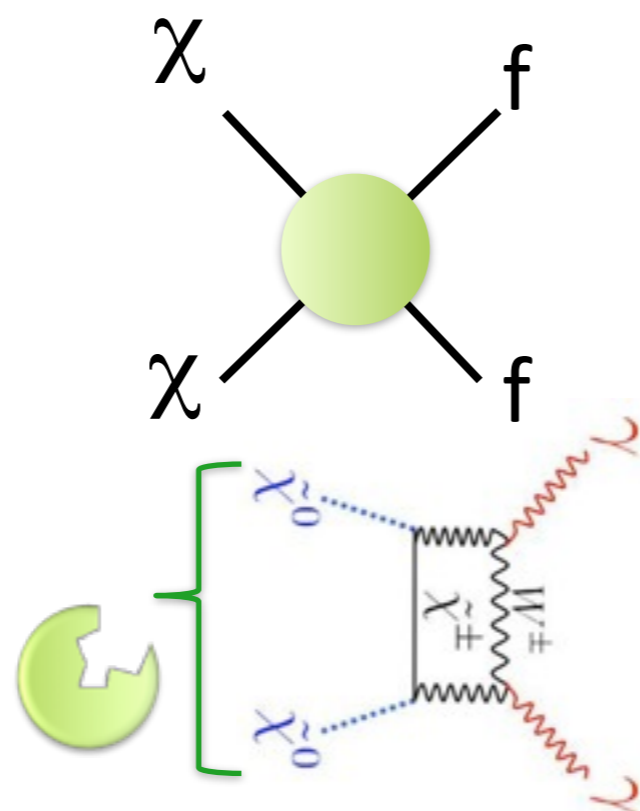


"no signal" region

WIMP miracle!

- Weak-scale cross sections
- assume coupling: $\alpha_{em} \approx 1/137$
- assume $m_\chi \approx 100 \text{ GeV}$
- $\langle \sigma v_{rel} \rangle \approx \text{few} \times 10^{-26} \text{ cm}^3/\text{s}$
- $\langle \sigma_{\chi\chi \rightarrow f\bar{f}} v_{rel} \rangle \approx 2.2 \times 10^{-26} \text{ cm}^3/\text{s}$

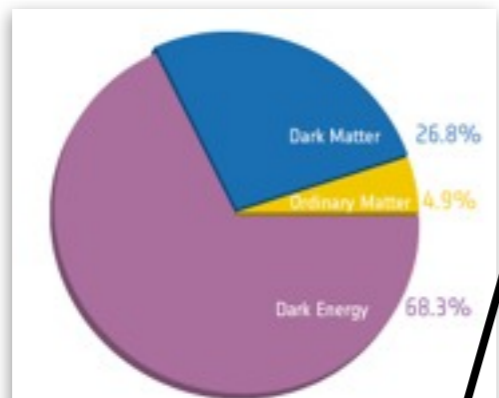
Why weak scale?
 - particle physics!



1930s- Zwicky
 The Coma Cluster
 Cluster dynamics galactic mass: $\sim 10^{10} M_{sun}$
 Galactic mass from luminosity: $\sim 10^7 M_{sun}$

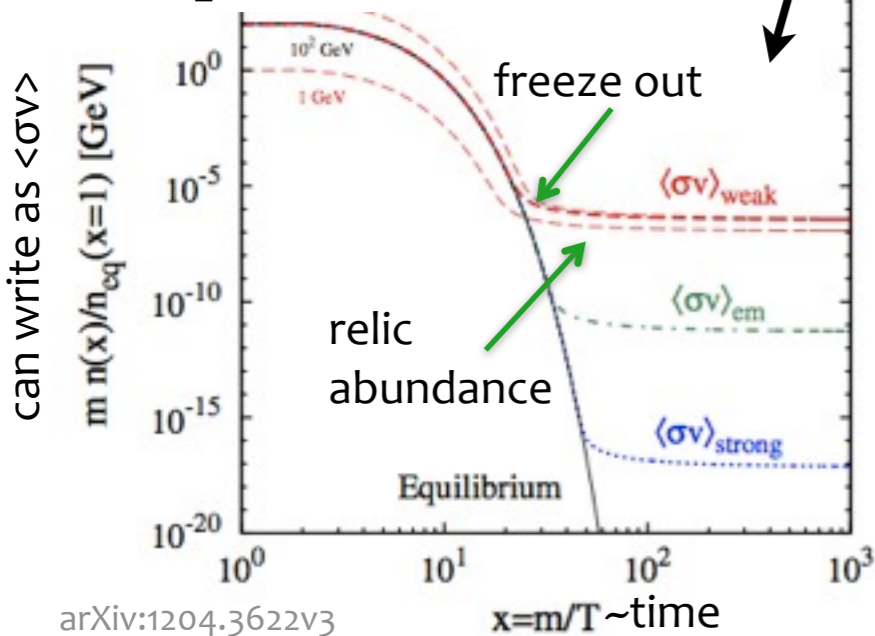
Hubble (NASA), F. Zwicky, Astrophys. J. 86, 217 (1937)

Results From Planck



<http://planck.cf.ac.uk/results/cosmic-microwave-background>

Why WIMPs?



can write as $\langle \sigma v \rangle$

arXiv:1204.3622v3