

Open questions concerning Dark Matter searches



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http://www.ymambrini.com/My_World/Physics.html

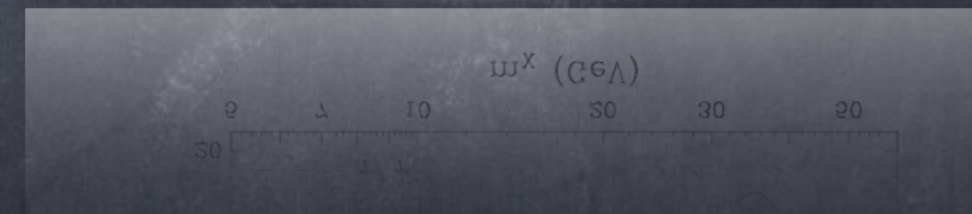
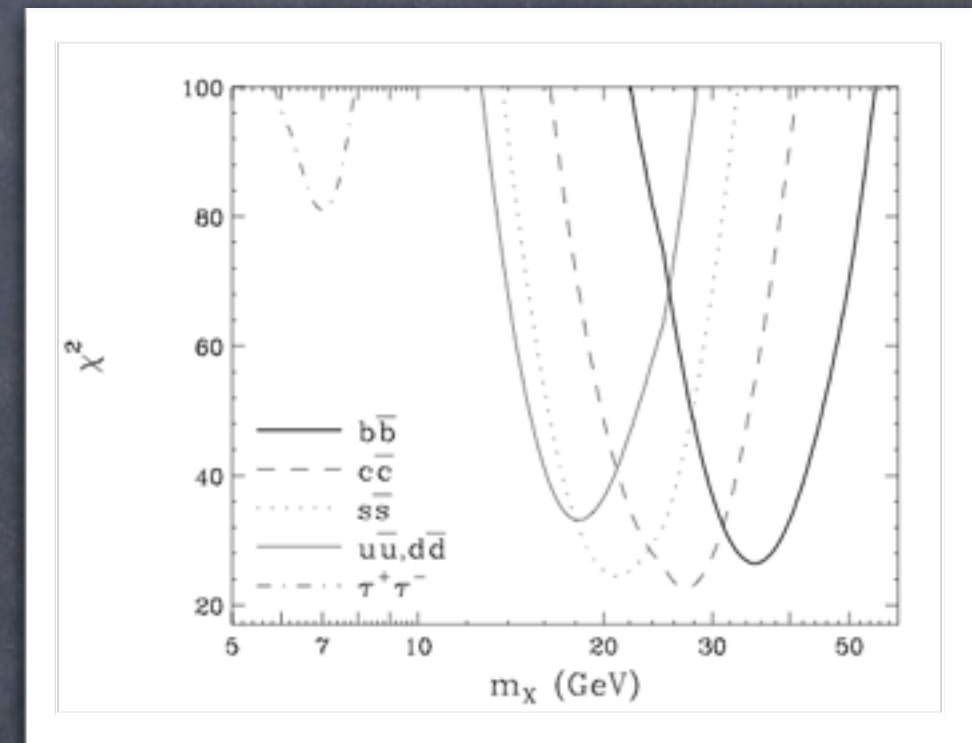
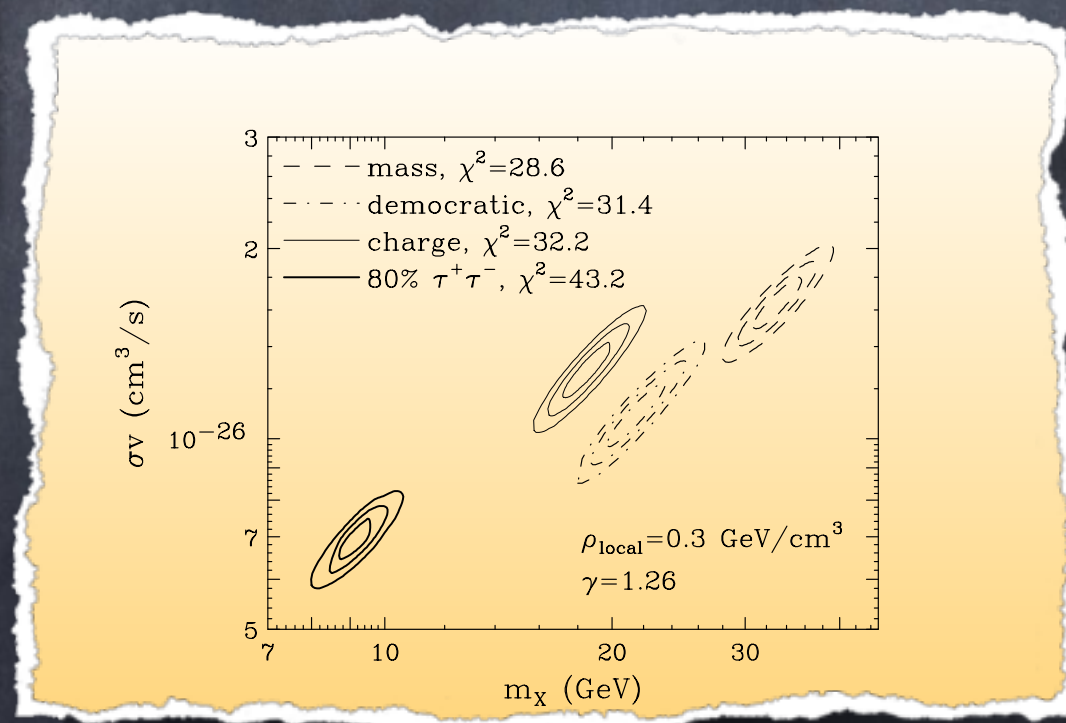
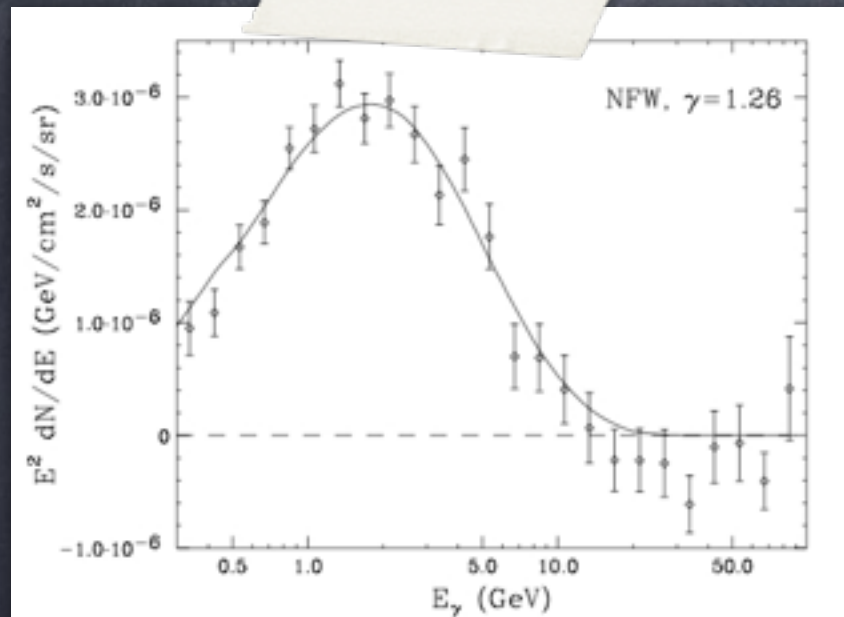


Invisible Workshop, July 17th 2014

Galactic center signal? « Hooperon »

T. Daylan, D. P. Finkbeiner, D. Hooper, T. Linden, S. K. N. Portillo, N. L. Rodd, and T. R. Slatyer, [1403.6503]

30 GeV dark matter mass from GC $b\bar{b}$ final state, NFW-like profile

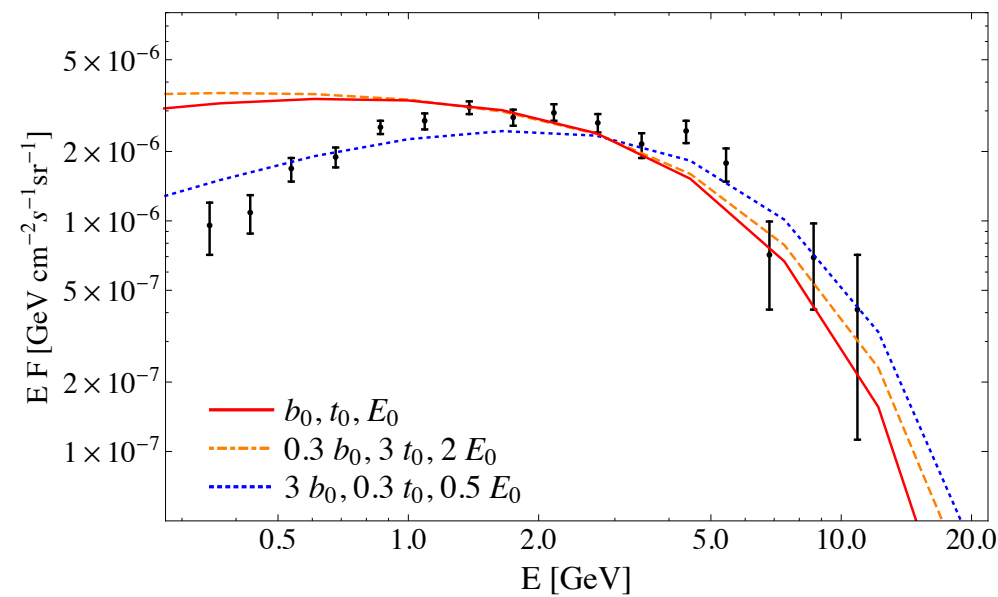


Alternatives explanation to the « hooperon »

Galactic Center gamma-ray “excess” from an active past of the Galactic Centre?

Jovana Petrović,¹ Pasquale Dario Serpico,² and Gabrijela Zaharijaš³

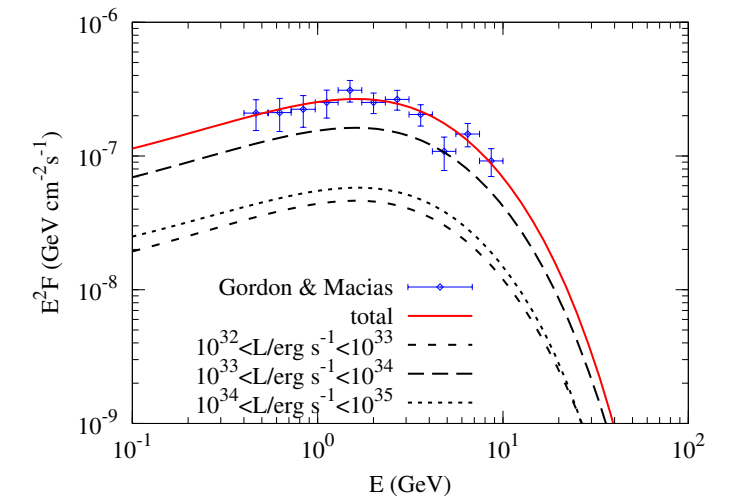
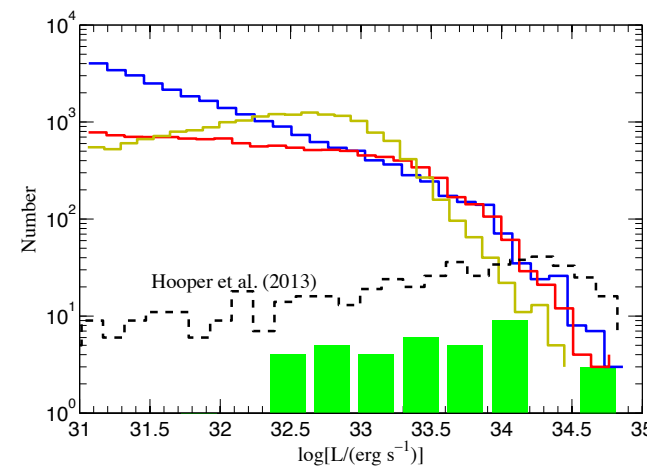
Several groups have recently claimed evidence for unaccounted gamma-ray excesses over diffuse backgrounds at few GeV in Fermi-LAT data in a region around the Galactic Center, consistent with a dark matter annihilation origin. We demonstrate that the main spectral and angular features of this “excess” can be reproduced if they are mostly due to inverse Compton emission from high-energy electrons injected in a burst event of $\sim 10^{52} \div 10^{53}$ erg roughly $\mathcal{O}(10^6)$ years ago. We consider this example as a proof of principle that time-dependent phenomena need to be understood



Millisecond pulsar interpretation of the Galactic center gamma-ray excess

Qiang Yuan^{a,b}, Bing Zhang^b

of the Fermi-LAT data, and derive the minimum necessary number of MSPs. The model is then applied to a bulge population of MSPs. We find that the extended γ -ray excess can be well explained by the bulge MSPs without violating the detectable flux distribution of MSPs by Fermi-LAT. The spatial distribution of the bulge MSPs as implied by the distribution of low mass X-ray binaries follows a $r^{-2.4}$ profile, which is also consistent with the γ -ray excess data. We conclude that the MSP model can explain

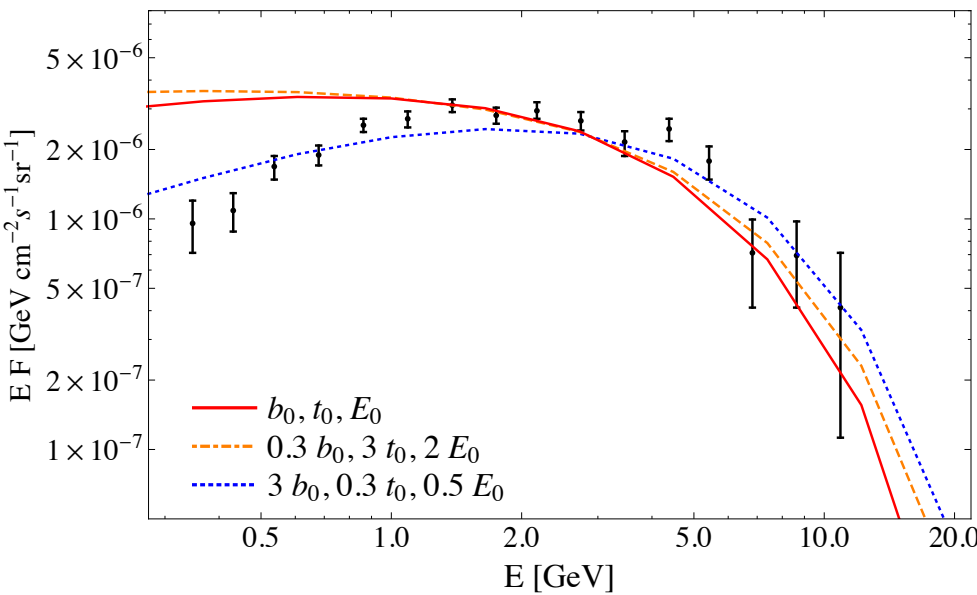


Alternatives explanation to the « hooperon »

Galactic Center gamma-ray “excess”

Jovana Petrović,¹ Pasquale

Several groups have recently examined the Galactic Center gamma-ray excess with a dark matter annihilation origin. We show that the features of this “excess” can be reproduced if they are due to high-energy electrons injected in a burst event of $\sim 10^{34}$ erg s⁻¹. We consider this example as a proof of principle that time-dependent

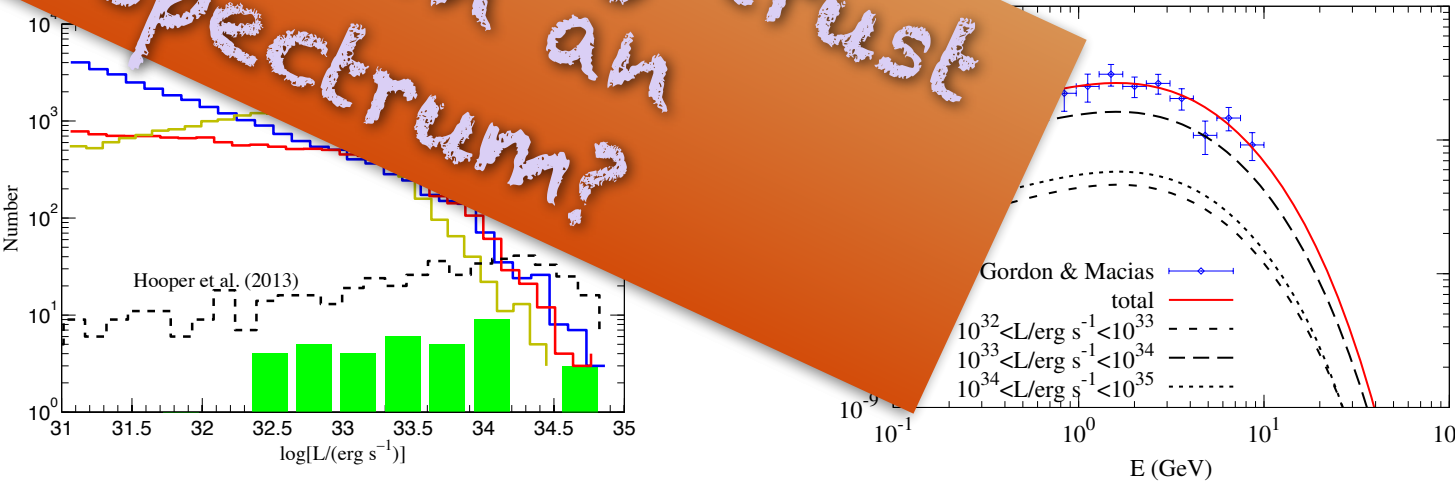


Galactic Centre?

Millisecond pulsar interpretation of the Galactic center gamma-ray excess

Qiang Yuan^{a,b}, Bing Zhang^b

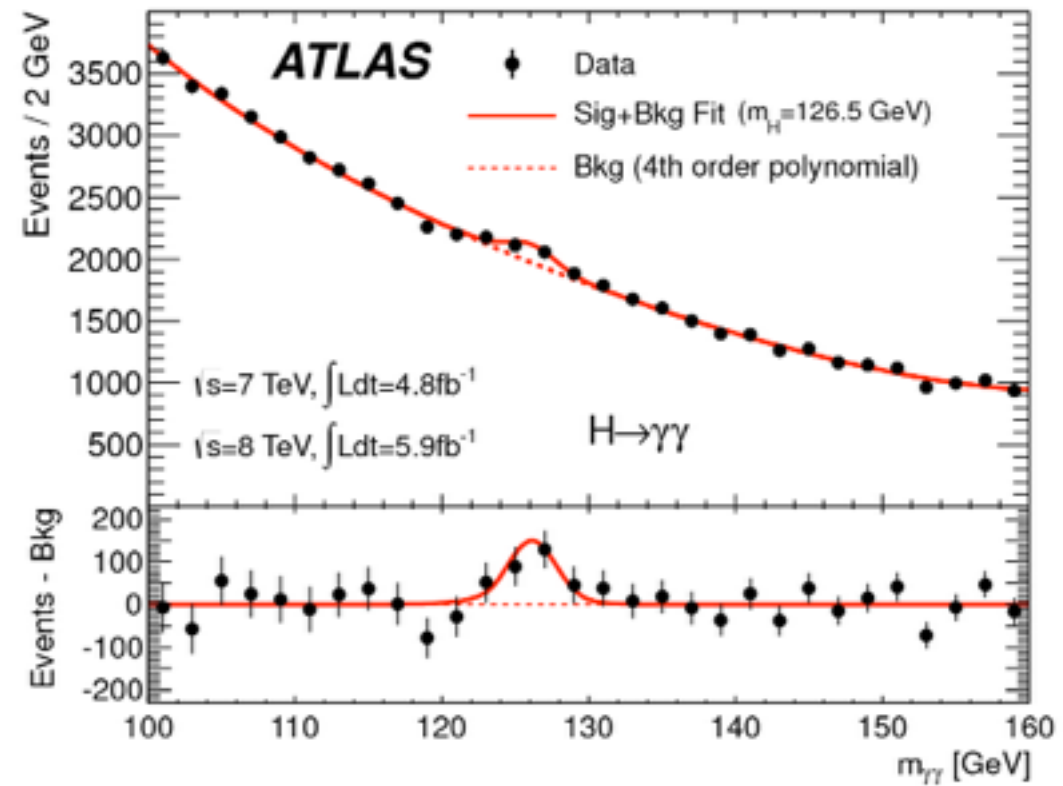
The model is then applied to a bulge population of MSPs. We find that the observed γ -ray excess can be well explained by the bulge MSPs. We show the detectable flux distribution of MSPs by Fermi-LAT. The distribution of the bulge MSPs as implied by the distribution of the MSPs shows a $r^{-2.4}$ profile, which is also consistent with the observed γ -ray excess. We conclude that the MSP model can explain



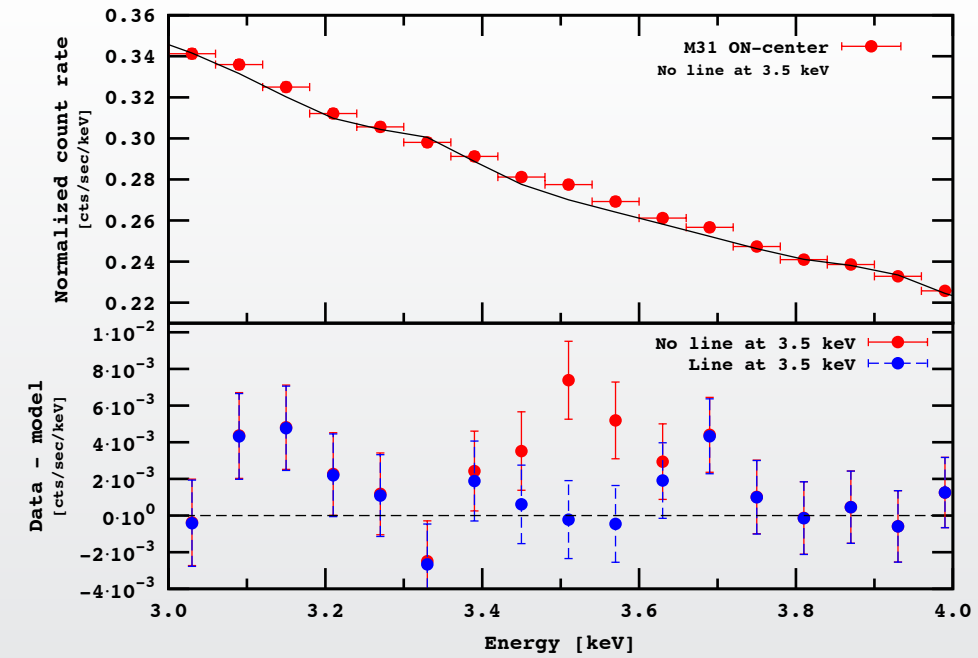
Question 1: Can we seriously trust any analysis based on an (extra)galactic spectrum?

3.5 keV line

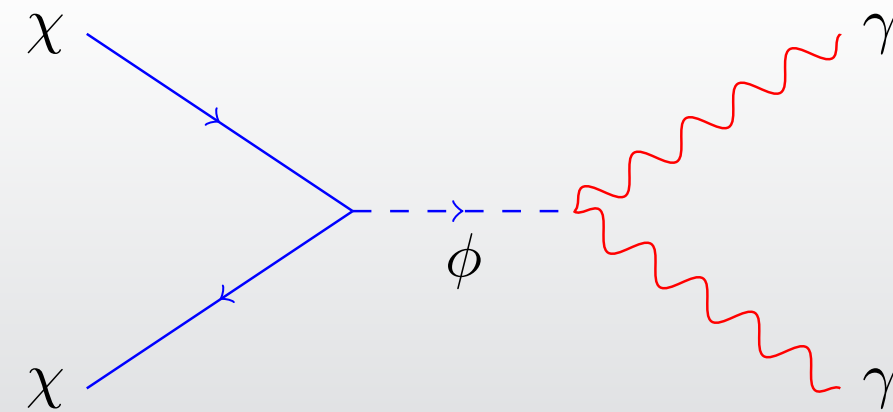
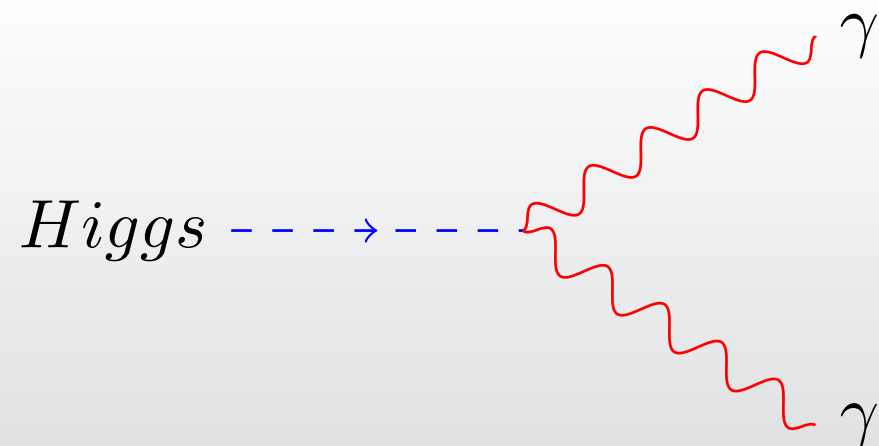
$\mathcal{LHC} \ 5 \sigma$



XMM Newton 4σ



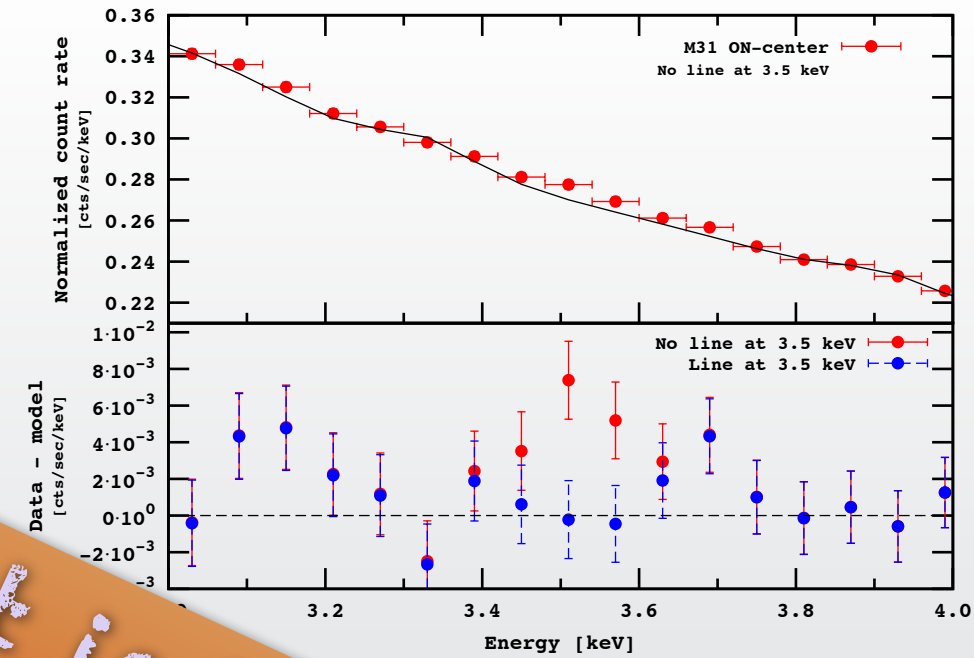
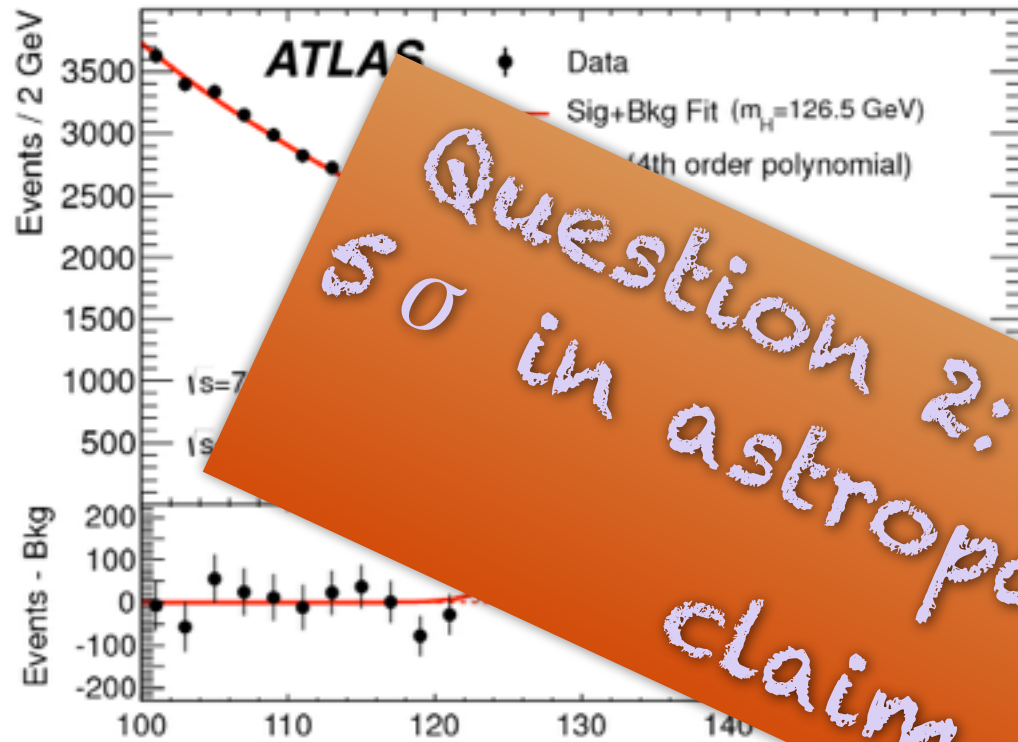
A. Boyarsky, O. Ruchayskiy, D. Iakubovskyi, J. Franse; <http://arxiv.org/abs/1402.4119>



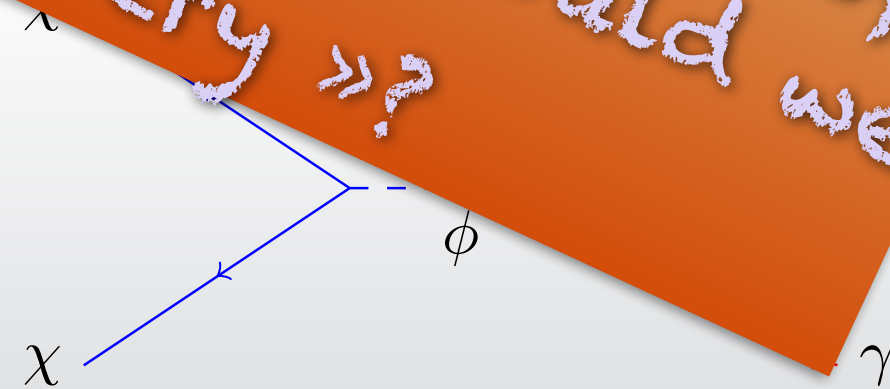
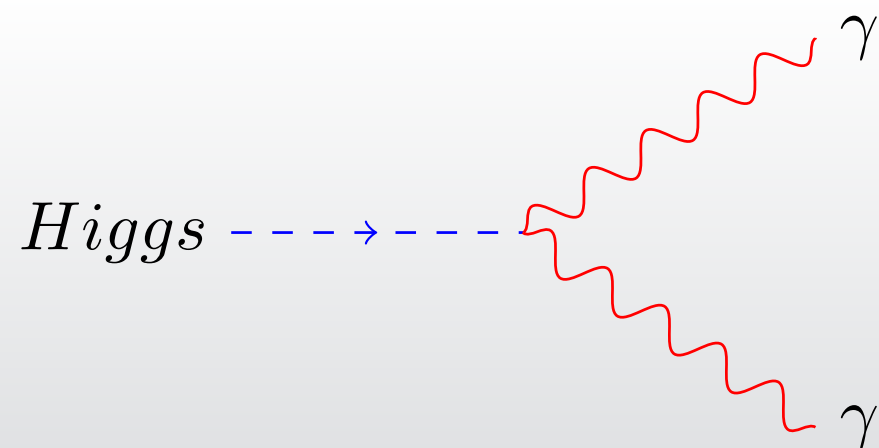
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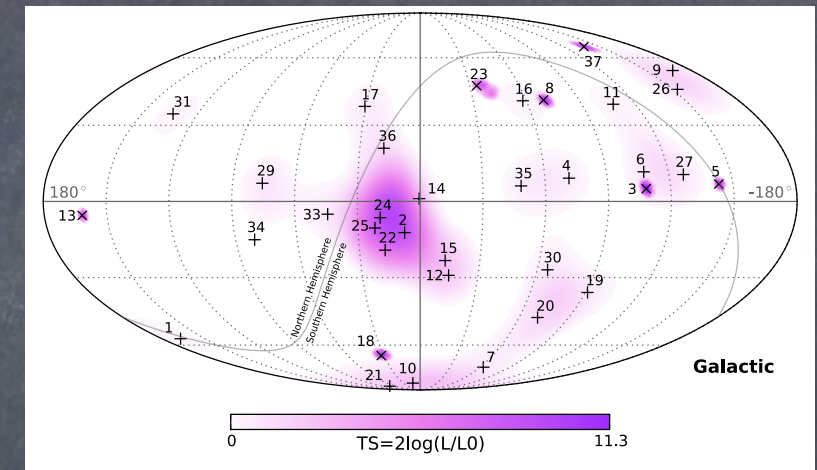
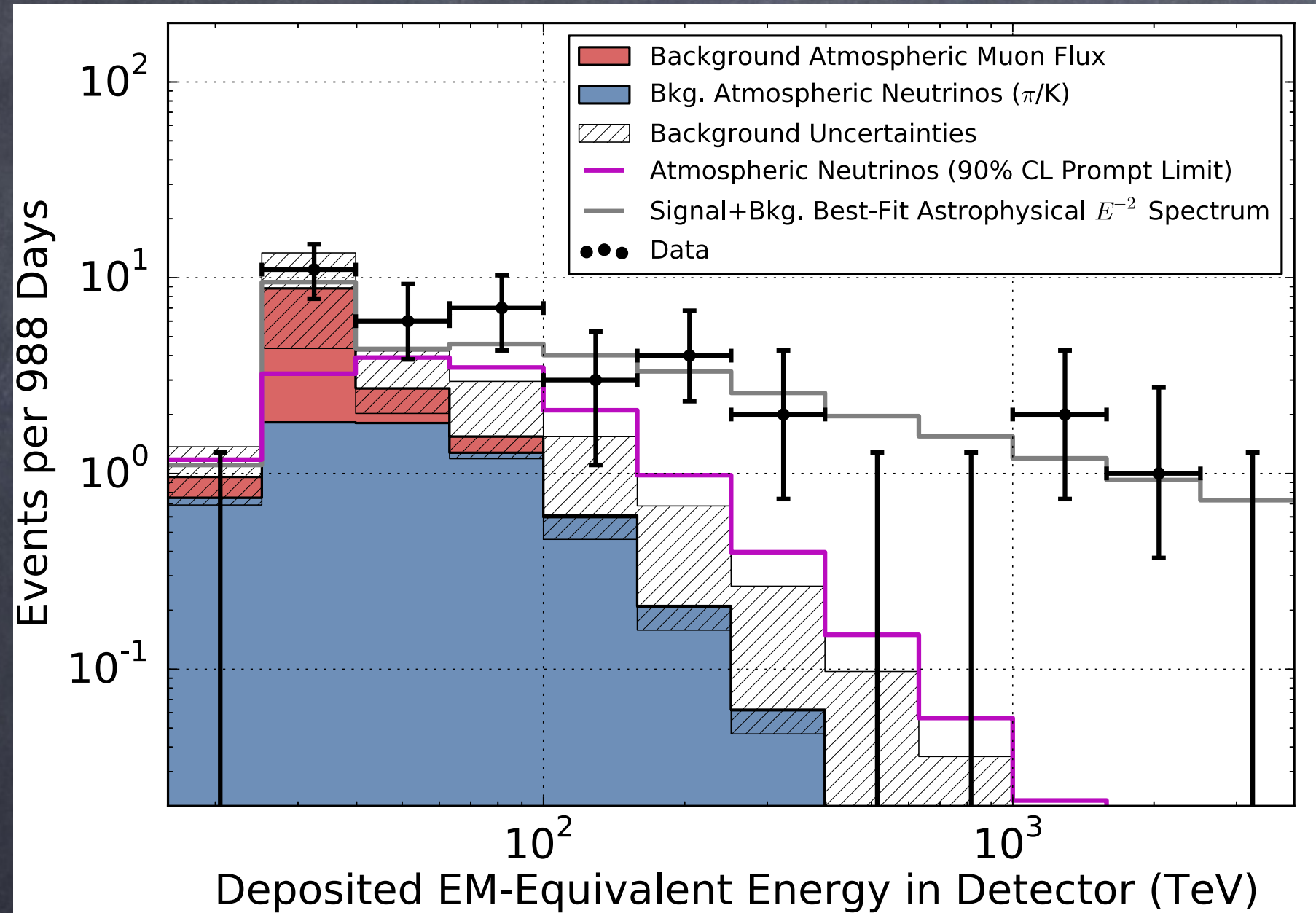
XMM Newton 4σ



Question 2: What is the meaning of 5σ in astroparticle? When should we claim « discovery »?

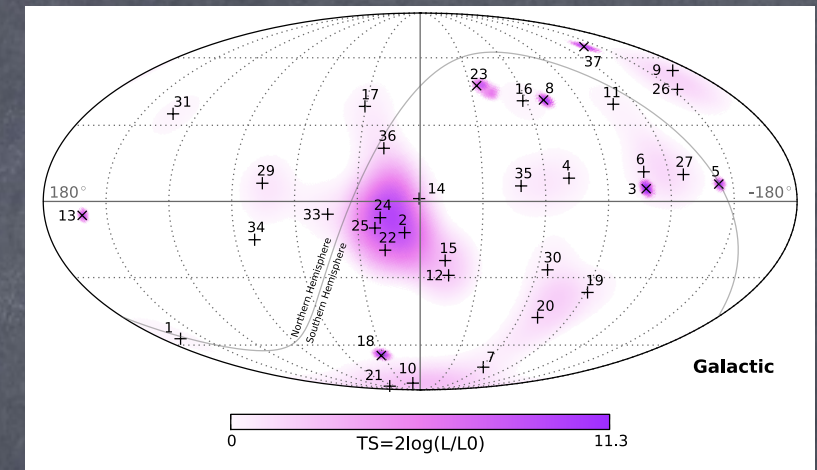
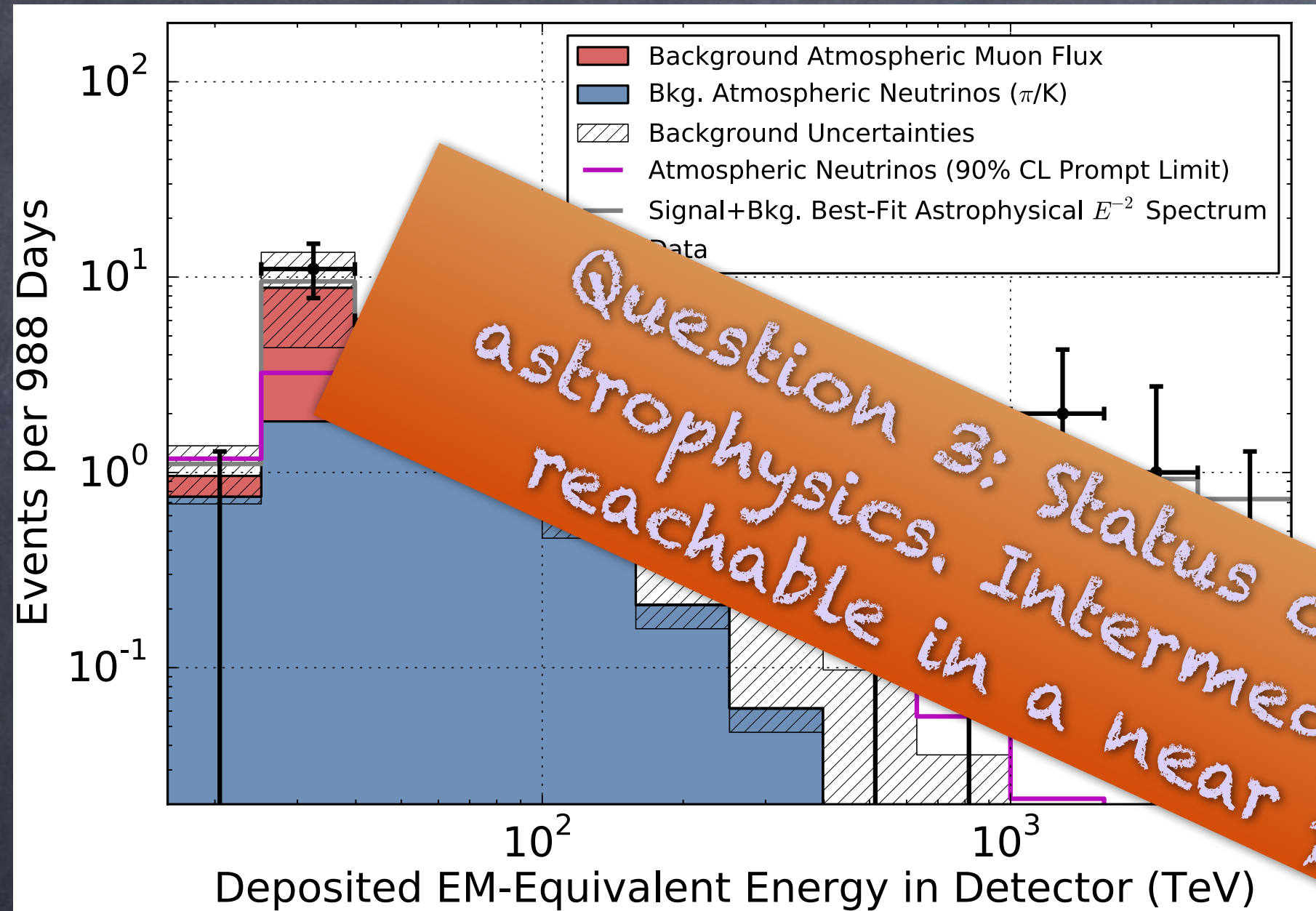


ICECUBE PeV events (2014)



3 PeV events, several TeV ones, no clear anisotropies

ICECUBE PeV events (2014)

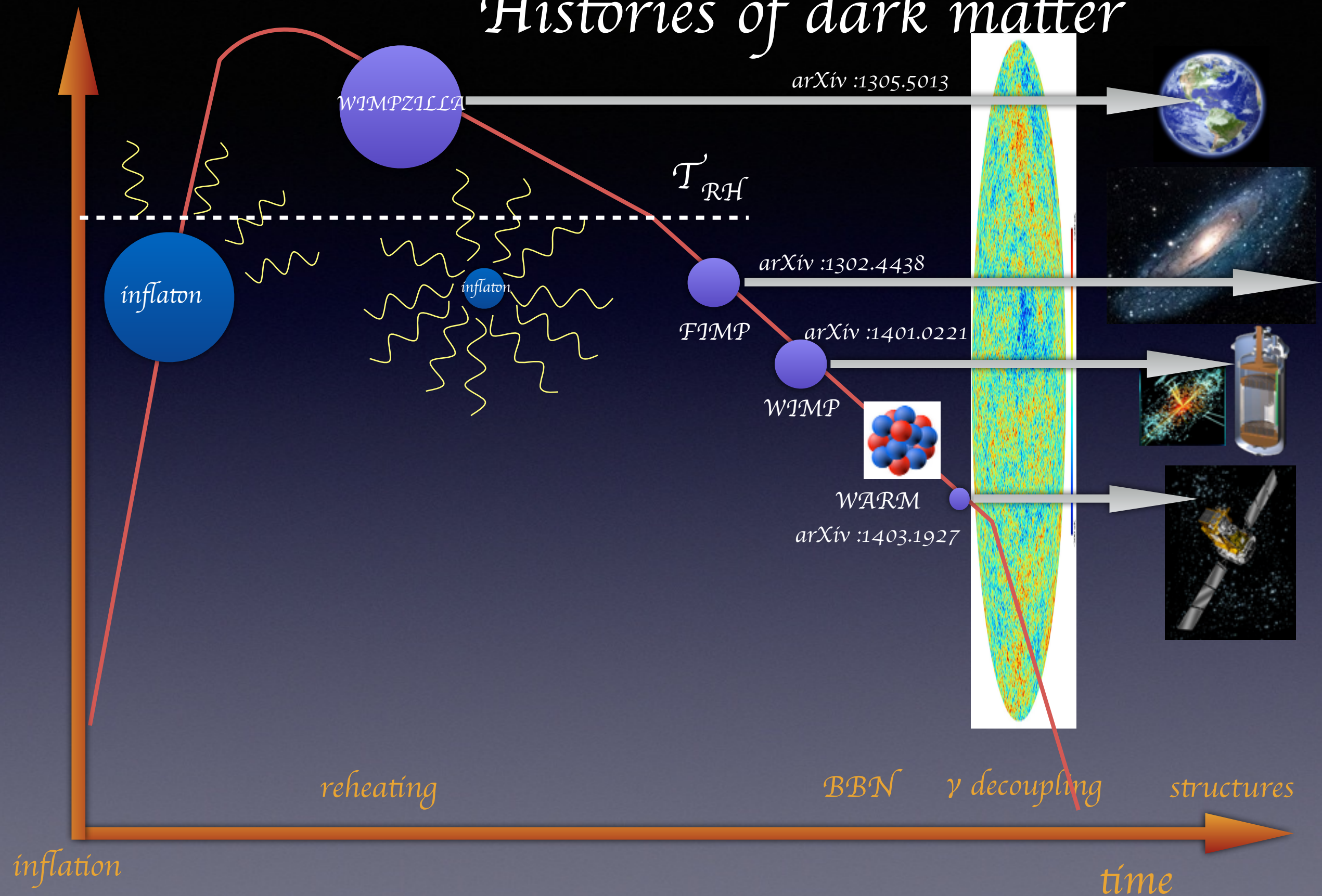


Question 3: Status of the UHE astrophysics. Intermediate scale reachable in a near future?

3 PeV events, several TeV ones, no clear anisotropies

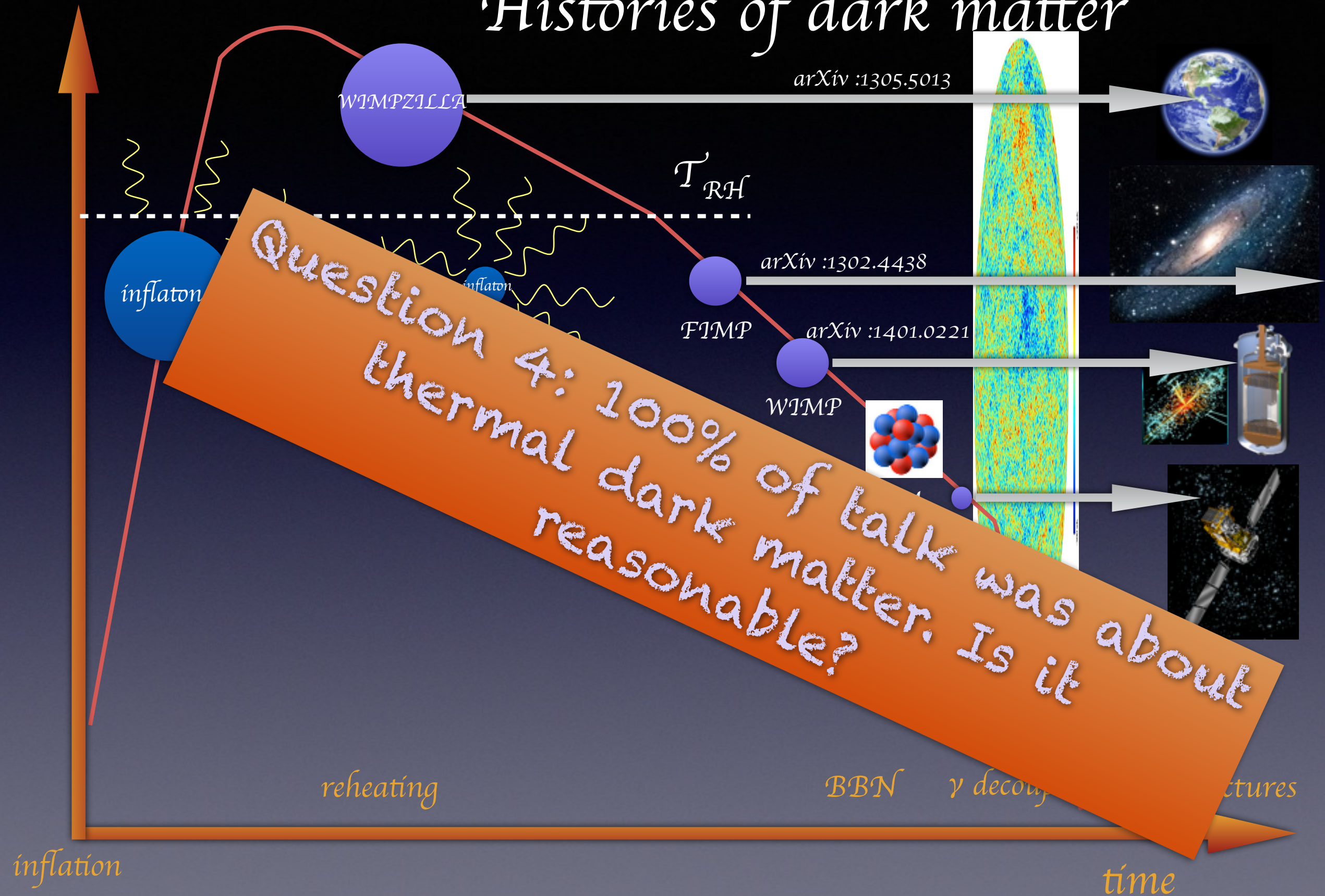
Temperature (GeV)

Histories of dark matter



Temperature (GeV)

Histories of dark matter



*Model building trying to NOT ONLY solve the issue of DM
but addresses also others SM problematics (intermediate scale,
 ν R, leptogenesis, unification, Higgs stability, anomalies...
and avoiding addoc « lepto/hadro/electro/hydro-phobic/
philic » constructions introduced to fit some data points?*

Open questions

- Question 1: Stop giving too much importance to study involving spectrum?
- Question 2: What is the meaning of « σ » in DM studies, should we take more care on the «look elsewhere effects».
- Question 3: Does DM experiments can be the first one to test intermediate scale?
- Question 4: Universe was/is non-thermal, why insisting on thermal scenarios?
- Question 5: Model building in ultraviolet completions?