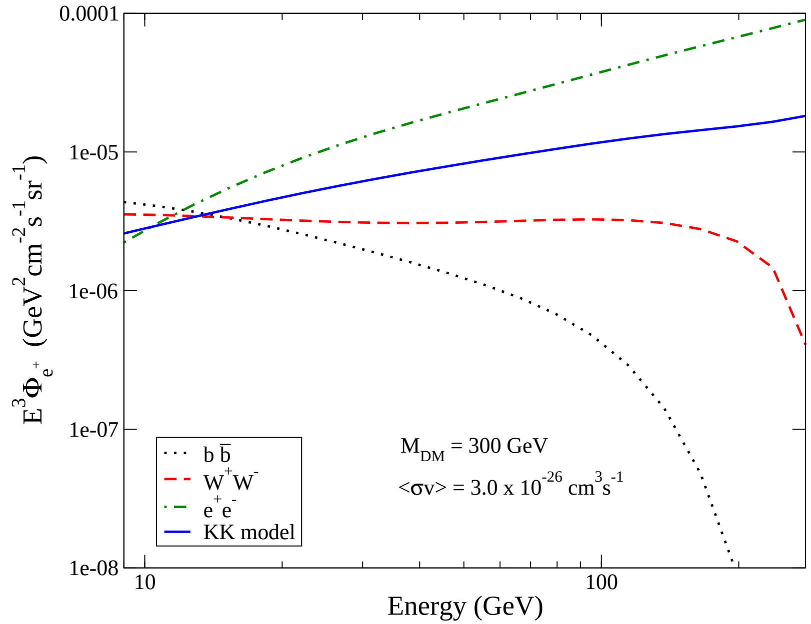
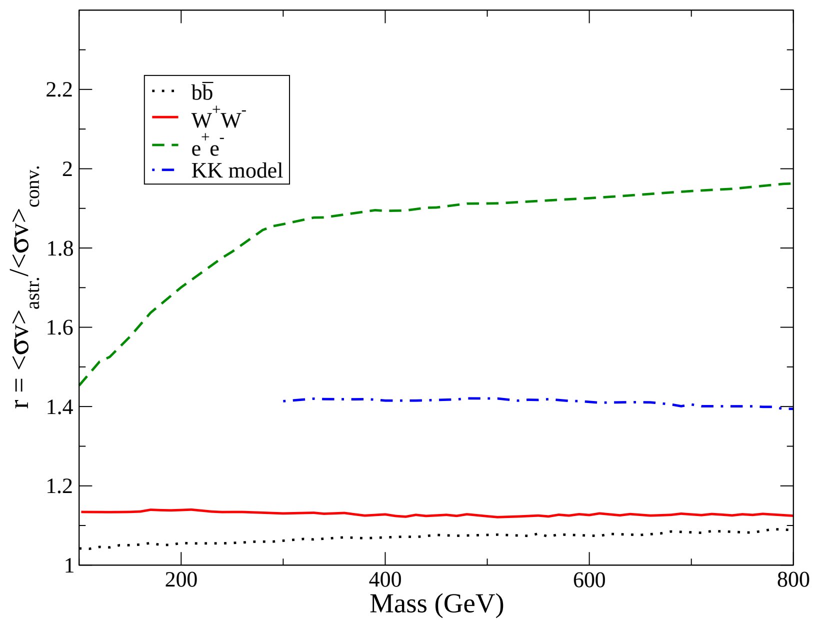
Pamela and Fermi data: A new background for future dm searches?

arXiv:0906.0736



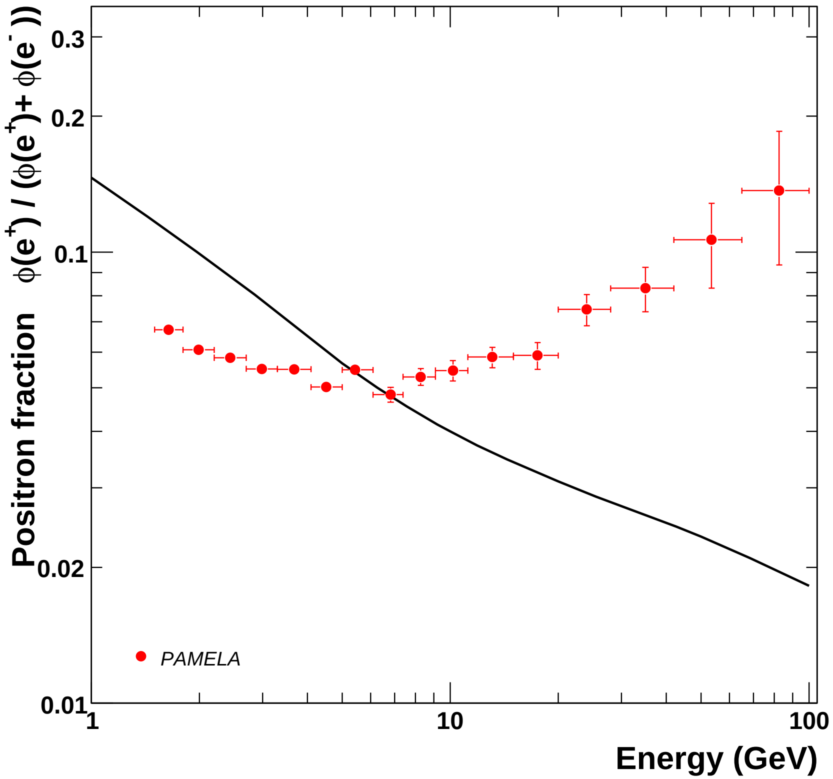


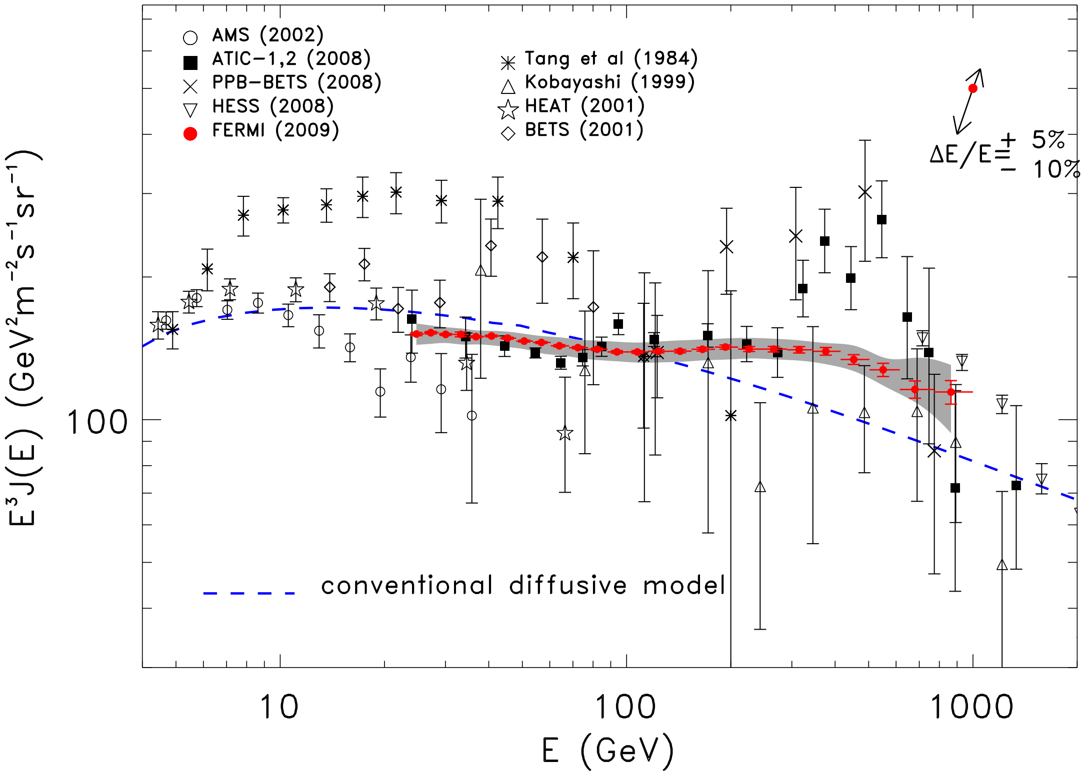
Carlos E. Yaguna

UAM and IFT

July, 2009

The positron fraction and the total electron flux were recently measured by Pamela and Fermi





An excess in the e^+ fraction was reported by Pamela

Fermi measured the total $e^+ + e^-$ flux

Additional sources of high energy positrons are required to explain the data

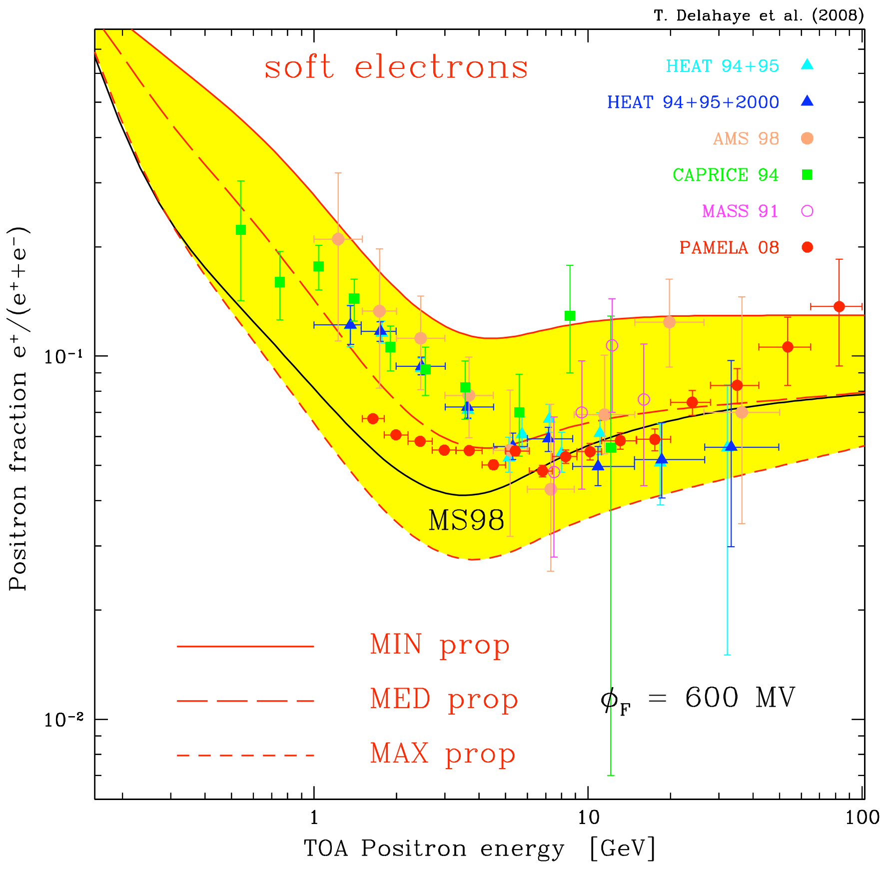
CR models cannot explain Pamela and Fermi

This new positron source could be related to

Dark Matter

Astrophysical processes

Before Fermi



Additional sources of high energy positrons are required to explain the data

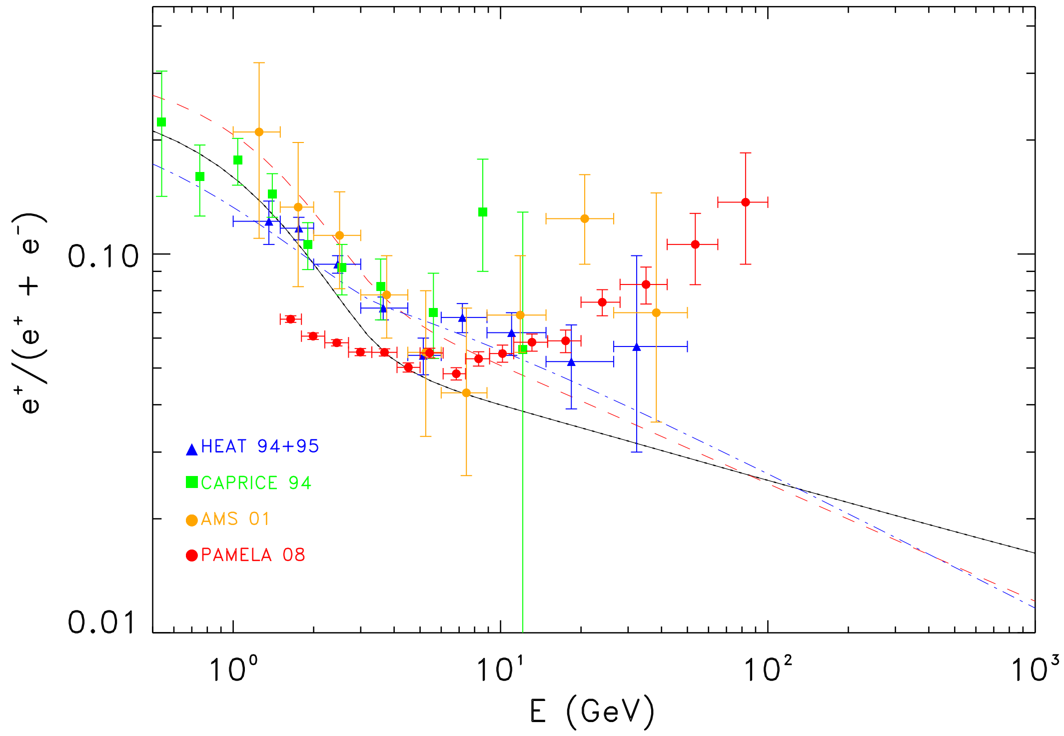
CR models cannot explain Pamela and Fermi

This new positron source could be related to

Dark Matter

Astrophysical processes

After Fermi



The dark matter interpretation of the data has several problems

Large annihilation rates and unusual final states

Boost factors or non-thermal dm

Leptonic channels are favored

Vanilla DM models cannot explain the data

Neither SUSY candidates,

nor LKP, nor scalars, etc.

Viable models have to be carefully arranged

MultiTeV masses

Final states: $\mu^+\mu^-$, $\tau^+\tau^-$,4μ

DM models that can explain Pamela and Fermi are tightly constrained by experimental data

They predict large γ and radio fluxes

Additional constraints from BBN, CMB

Fermi will test the DM interpretation through IC

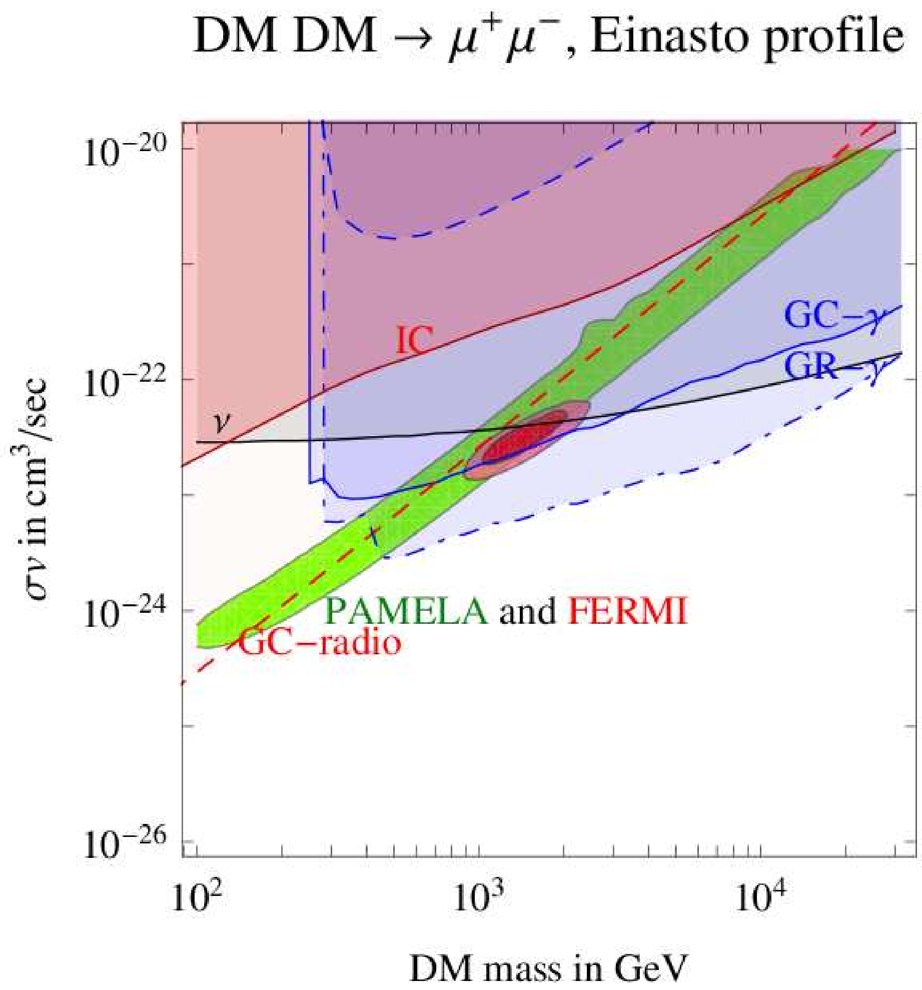


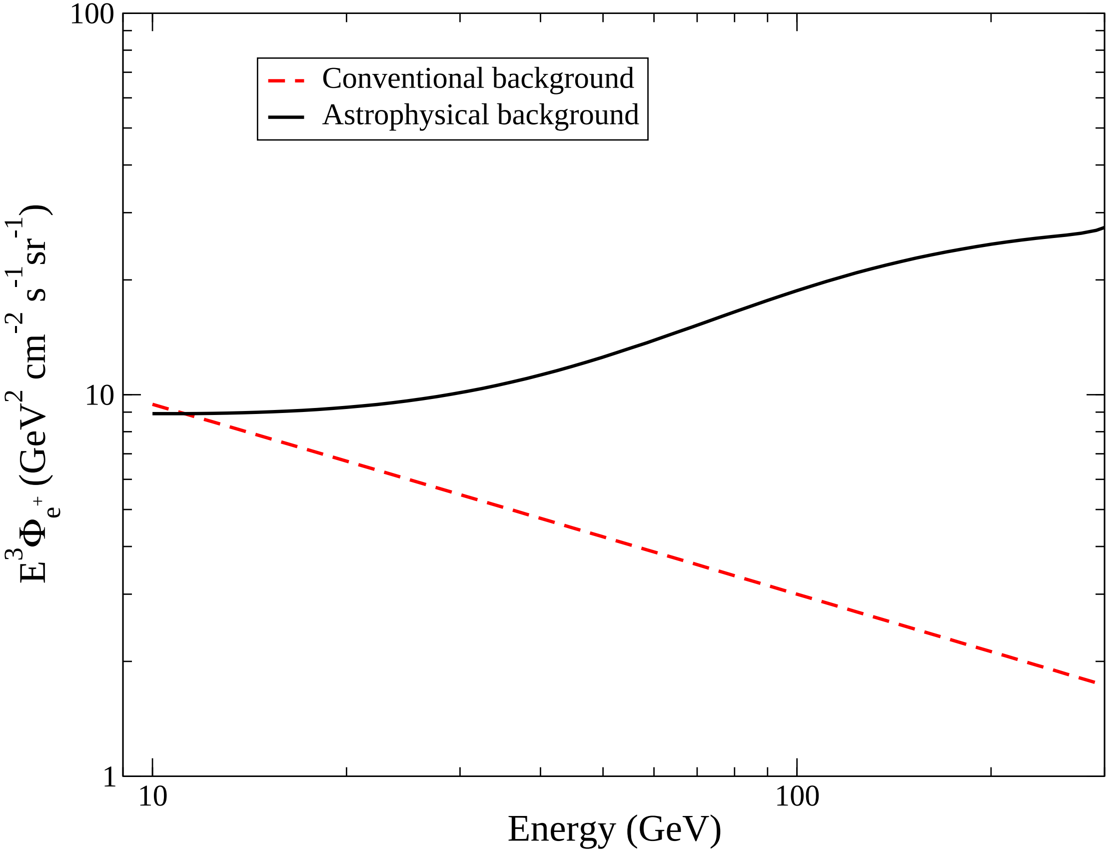
Figure from arXiv:0905.0480

If astrophysical positrons account for the data they constitute a new background to dm searches

Pulsars are natural sources of high energy positrons

The e^+ flux is mainly determined by the data

Detecting a e^+ signal from dm will be more challenging



We study the effect of this new e^+ background on the detectability of a dm positron signal

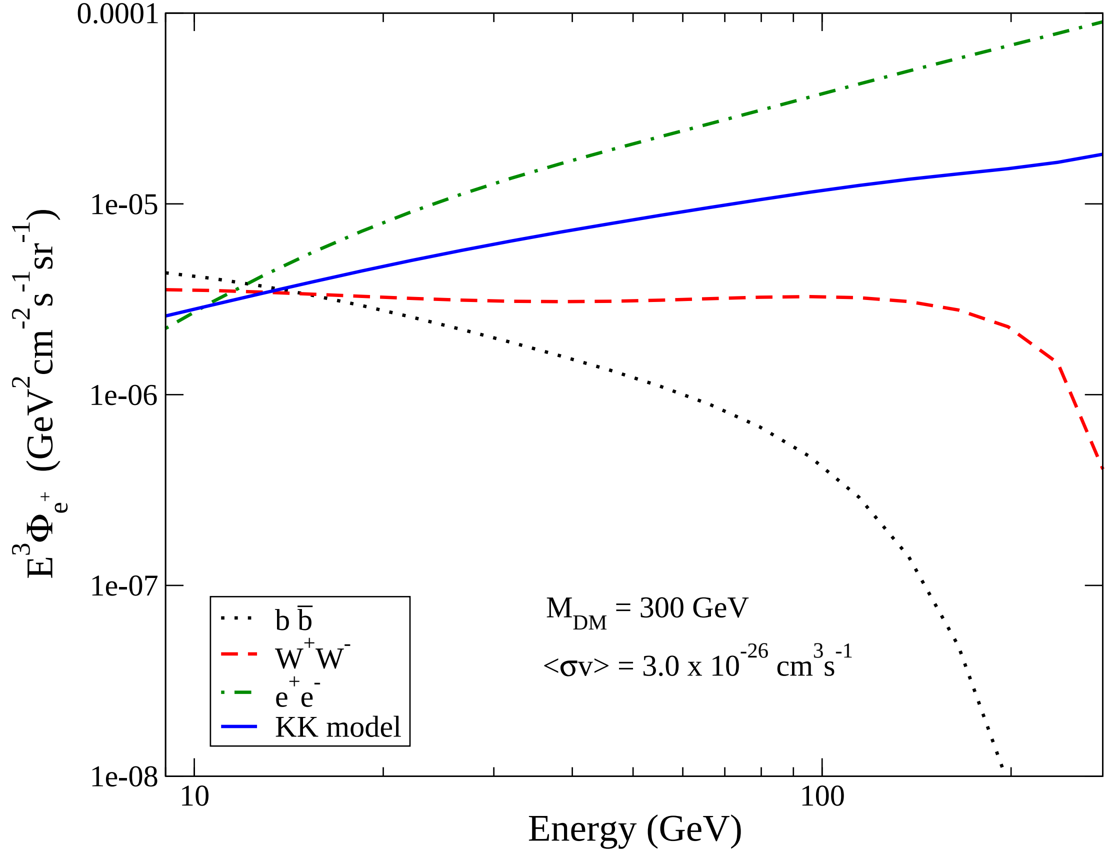
We analyze 4 dm models:

$$\chi\chi \rightarrow b\bar{b}, W^+W^-, e^+e^-$$

A typical KK model

$\langle \sigma v \rangle$ and m_χ are taken as free parameters

We consider the prospects for detection at AMS-02

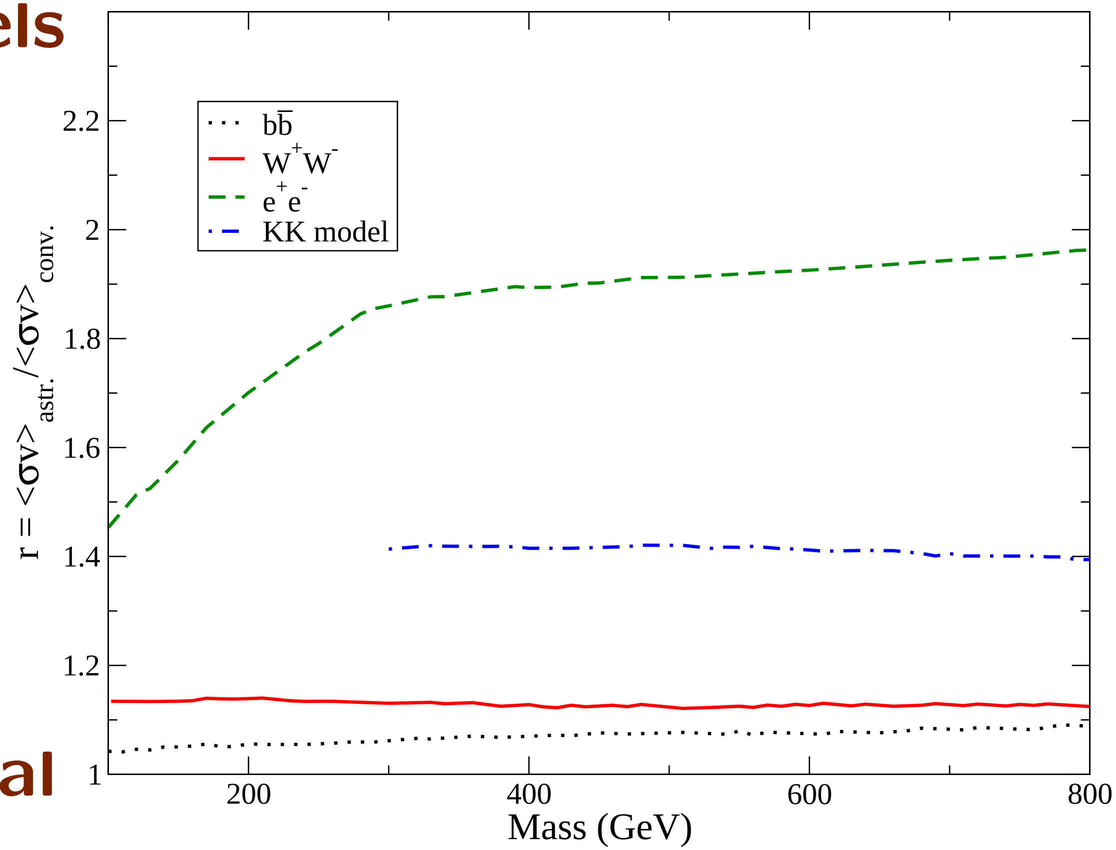


To be detectable, the dark matter signal has to be only slightly larger than previously believed

For the $b\bar{b}$ and W^+W^- models a 10% increase is needed

For the KK model $\langle \sigma v \rangle$ must be 40% larger

For the e^+e^- model the signal has to be twice as large



A positron signal from dark matter annihilations is still within the reach of future experiments

The e^+e^- model requires the smallest $\langle \sigma v \rangle$

Dm with $m_\chi \lesssim 400$ GeV is within reach

AMS-02 may reveal a dark matter positron signal