

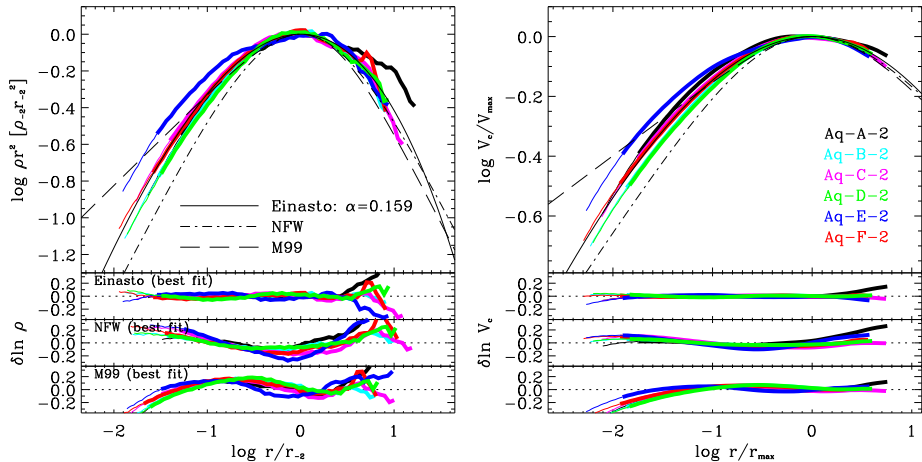
Indirect dark matter detection

Joachim Kopp

Max Planck Institut für Kernphysik, Heidelberg

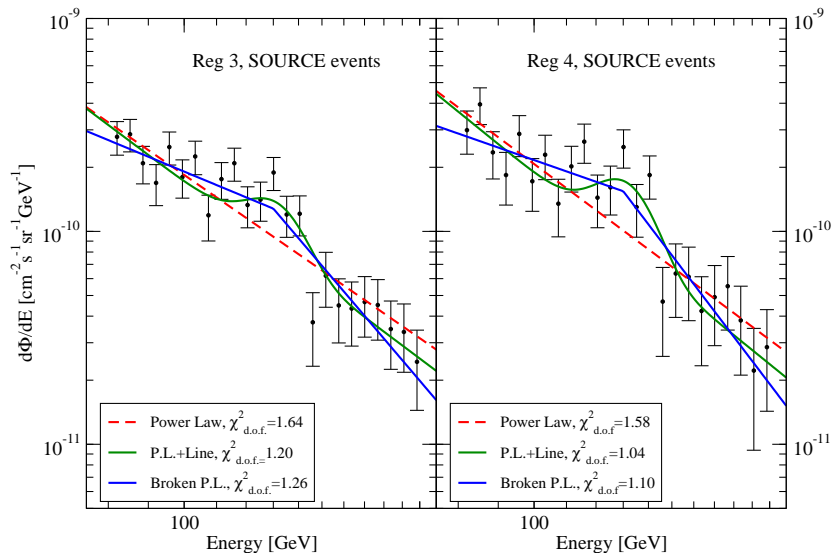
July 4, 2013

Predicted halo profiles from the Aquarius simulation



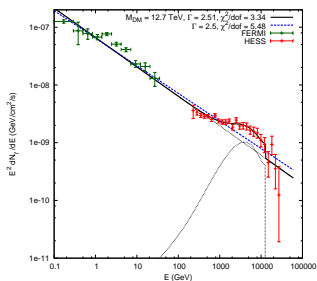
Navarro et al. arXiv:0810.1522

Gamma ray spectrum from the galactic center (1)

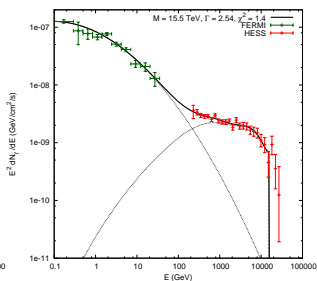


Profumo Linden arXiv:1204.6047

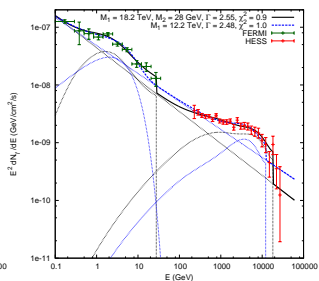
Gamma ray spectrum from the galactic center (2)



(a)



(b)

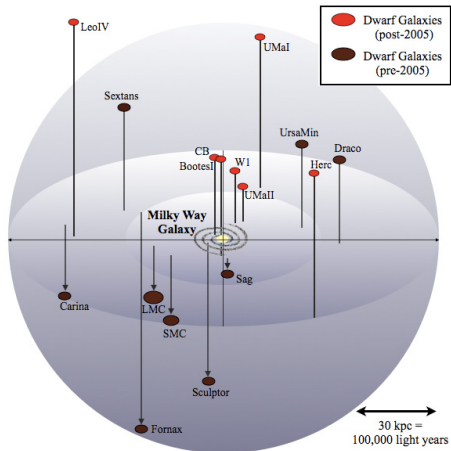


(c)

- (a) power law + DM
- (b) pulsar + DM
- (c) power law + DM + pulsar / power law + 2 DM annihilation channels

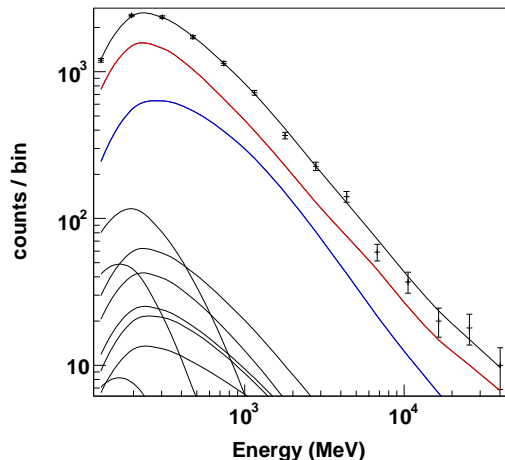
Belikov Zaharijas Silk arXiv:1207.2412

Gamma rays from dwarf galaxies



- Dwarf galaxies: cluster of $1000-10^9$ stars bound to the Milky Way
- Consist mostly of dark matter (most visible matter has been stripped away during passages through the galactic disk)
 - ▶ Low background

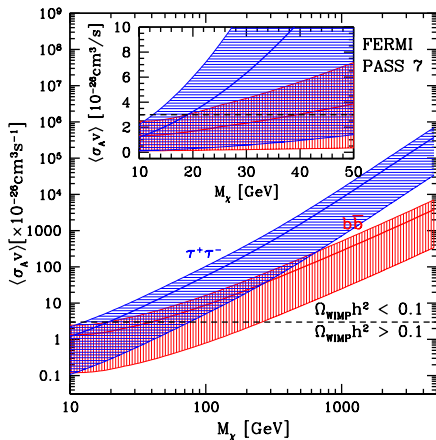
Gamma rays from dwarf galaxies



- Dwarf galaxies: cluster of $1000-10^9$ stars bound to the Milky Way
- Consist mostly of dark matter (most visible matter has been stripped away during passages through the galactic disk)
 - ▶ Low background

Fermi-LAT arXiv:1001.4531

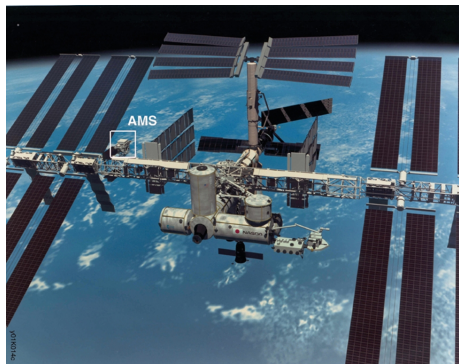
Gamma rays from dwarf galaxies



- Dwarf galaxies: cluster of $1000-10^9$ stars bound to the Milky Way
- Consist mostly of dark matter (most visible matter has been stripped away during passages through the galactic disk)
 - ▶ Low background

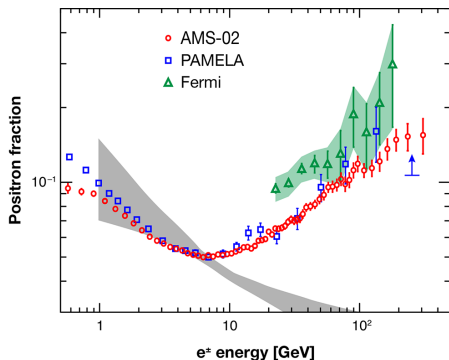
Geringer-Sameth Koushiappas arXiv:1108.2914

The cosmic ray positron fraction



- **AMS-02**: particle detector on the International Space Station
- **April 2013**: measurement of the **positron fraction**
 $\phi(e^+)/[\phi(e^+) + \phi(e^-)]$
- Pronounced **excess** of positrons
(confirms previous results by PAMELA and Fermi-LAT)
- Possible explanations
 - ▶ Pulsars
 - ▶ Dark matter
 - ▶ ???

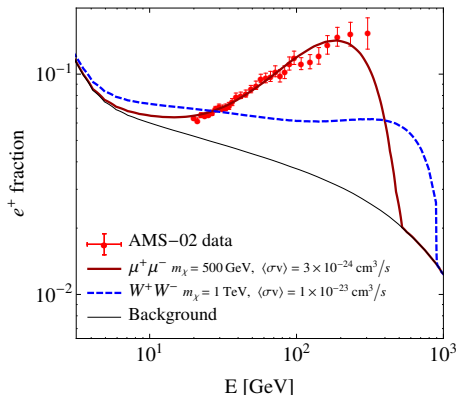
The cosmic ray positron fraction



AMS-02, 2013

- AMS-02: particle detector on the International Space Station
- April 2013: measurement of the **positron fraction**
 $\phi(e^+)/[\phi(e^+) + \phi(e^-)]$
- Pronounced **excess** of positrons
(confirms previous results by PAMELA and Fermi-LAT)
- Possible explanations
 - ▶ Pulsars
 - ▶ Dark matter
 - ▶ ???

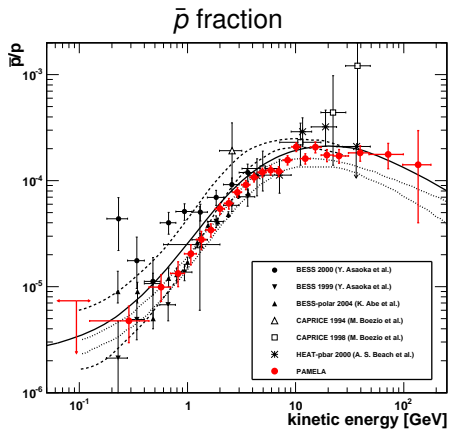
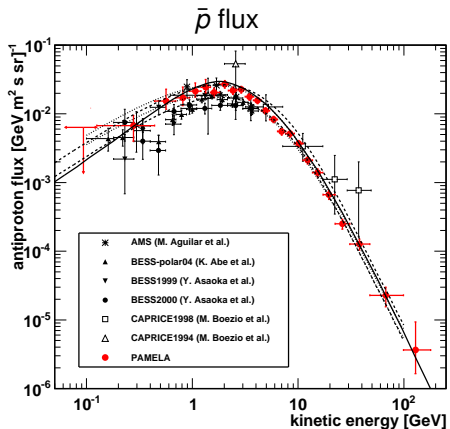
The cosmic ray positron fraction



JK arXiv:1304.1184

- AMS-02: particle detector on the International Space Station
- April 2013: measurement of the positron fraction $\phi(e^+)/[\phi(e^+) + \phi(e^-)]$
- Pronounced excess of positrons (confirms previous results by PAMELA and Fermi-LAT)
- Possible explanations
 - ▶ Pulsars
 - ▶ Dark matter
 - ▶ ???

Cosmic antiprotons



PAMELA arXiv:1007.0821

- Measurement consistent with predictions
 - ▶ Tight constraints on hadronic DM annihilation channels