

# N10: Galactic center

20 NOV 2013 1

## DM HALO MODEL

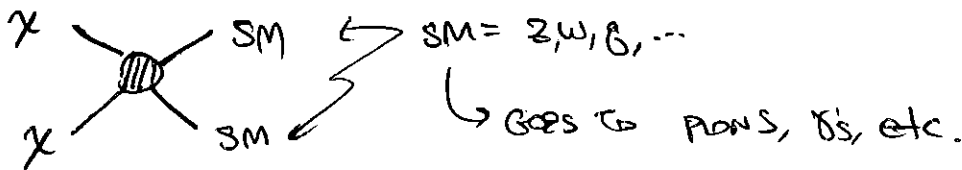
generalized NFW:

$$\rho(r) = \frac{\rho_s}{(r/r_s)^\alpha (1+(r/r_s)^\beta)^{(B-2)/2}}$$

CANONICAL NFW:  $\alpha = \beta = 1.0$ ,  $\frac{B}{\beta} = 3.0$  (PIECEWISE POWER LAW)  
 ↑ CAN PLAY W/  $\gamma$  TO FIT DATA

## WIMP ANNIHILATION

THERMALLY PRODUCED WIMP SHOULD ANNIHILATE TO  $\gamma$  RAYS



## TYPES OF $\gamma$ RAYS

- CONTINUUM SPECTRUM
  - SHARPER SPECTRUM FROM INTERNAL BREM (INTERNAL CHARGED P.)
  - OR DM DIR ANN TO  $\gamma$ 'S  $\rightarrow$  135 GeV LINE
- ↗ ALSO NOZZLE

## GALACTIC CENTER

$$\Phi = \left(\frac{1}{2}\right) \frac{\langle \sigma v \rangle}{4\pi m_{DM}^2} \sum_f \frac{dN_f}{dE_f} R_f \int_{\cos} P^2 dl$$

↑ for MAJORANA  
 ↑ LINE OF SIGHT  
 ASTRA

SO LOOK FOR DM @ CENTER OF GALAXY

STATISTICS:

$$2(\log L - \log L_0) \rightarrow \chi^2$$

↑ likelihood

ROUGHLY:  $\sqrt{2\Delta L} \sim \sigma$

Now let's look @ SPECIFIC PAPERS.

(H10.0006)

1012.5839 (Bojarisky et al.)

CONS. W/ SYS ERROR  
 ↙  
 2 DIFF Q's  
 ↘

↳ GC can be explained by point sources  
(CONTRARY TO GOODENOUGH HOPPER)

but: if you put in DM, has high significance  
 ↑ it detects new source

H10.0006: HOPPER/LINDEN

- 2 yr Fermi catalog of sources
- TAKE GC EMISSION & SUBTRACT POINT SOURCE MODEL  
 & SUBTRACT MODEL OF EMISSION FROM GALACTIC PLANE
- haven't subtracted BLACK HOLE

↑  
 CAN THIS EXPLAIN LEFTOVER EMISSION?  
 A: NO.

↳ inconsistent spectrally  
 & morphologically  
 ↑ BH = POINT SOURCE

- if DM DM, wants  $\sigma \sim 1.2 - 1.4$   
 ↳ 10 GeV WIMP → ls  
 30 GeV WIMP → ps

┌ accounts for spec & morph.

- milli sec PULSARS: NOT VIABLE EXPLANATION  
 ↳ by comparison to spectrum of known pulsars

sets limits on OV : question assumptions

questionable : POINT SOURCES DEGENERATE w/ GC  
ARE LEFT IN (not subtracted)

MODEL OF GALACTIC PLANE GAS  
(DIDN'T USE, eg. CALPROP)

1207.6047 : KeV  $\rightarrow$  MAMPJ

$\hookrightarrow$  vary all point sources

use correct galactic diffuse model

SCAN OVER SOME  $\gamma$  RAY SOURCES

TABLE I: WANTS  $\gamma = 1.2$

$\sigma$  LIMIT MUCH WEAKER COMPARED TO HOOPER + LINDEN

1306.5725 : Chris Gordon + @. MACIAS

similar to KeV  $\rightarrow$  MAMPJ

Fig 2: shows degeneracy w/ point source

CALCULATES SPECTRUM OF EXTENDED EMISSION