Dark Matter Discussion

Aaron Pierce

http://dmtools.brown.edu/
Gaitskell,Mandic,Filippini

080513105901

DATA listed top to bottom on plot
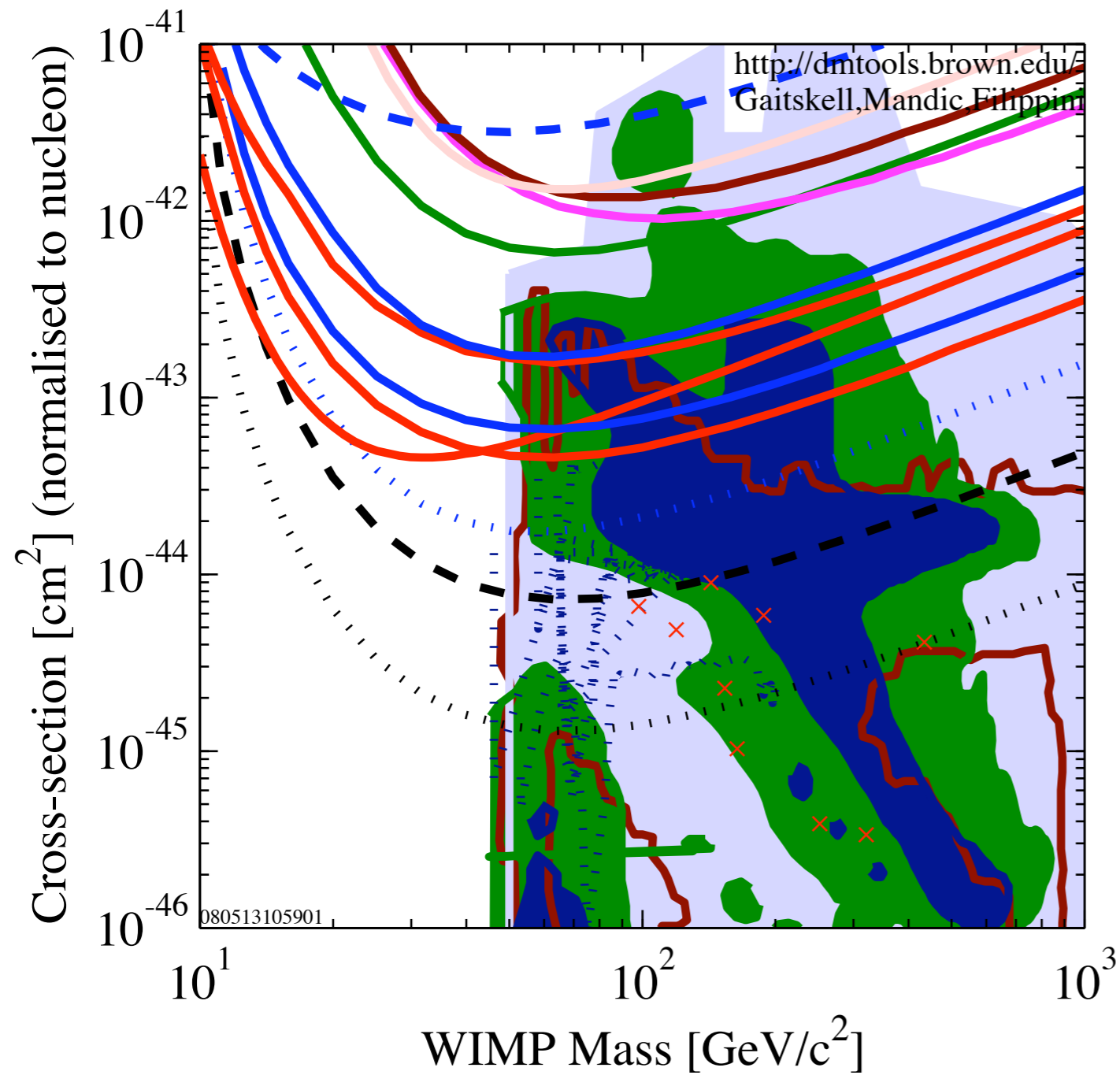CDMS (Soudan) 2005 Si (7 keV threshold)
CRESST 2004 10.7 kg-day CaWO4
Edelweiss I final limit, 62 kg-days Ge 2000+2002+2003 limit
WARP 2.3L, 96.5 kg-days 55 keV threshold
ZEPLIN II (Jan 2007) result
CDMS (Soudan) 2004 + 2005 Ge (7 keV threshold)
CDMS 2004+2005 reanalysis Ge (5 keV threshold)
CDMS 2008 Ge
CDMS: 2004+2005 (reanalysis) +2008 Ge
XENON10 2007 (Net 136 kg-d)
CDMS Soudan 2007 projected
SuperCDMS (Projected) 2-ST@Soudan
SuperCDMS (Projected) 25kg (7-ST@Snolab)
A. Pierce, Finely Tuned MSSM
Roszkowski/Ruiz de Austri/Trotta 2007, CMSSM Markov Chain Monte Carlos (
Roszkowski/Ruiz de Austri/Trotta 2007, CMSSM Markov Chain Monte Carlos (
Ellis et. al Theory region post-LEP benchmark points
Baltz and Gondolo 2003
Baltz and Gondolo, 2004, Markov Chain Monte Carlos

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What is the WIMP Mass?

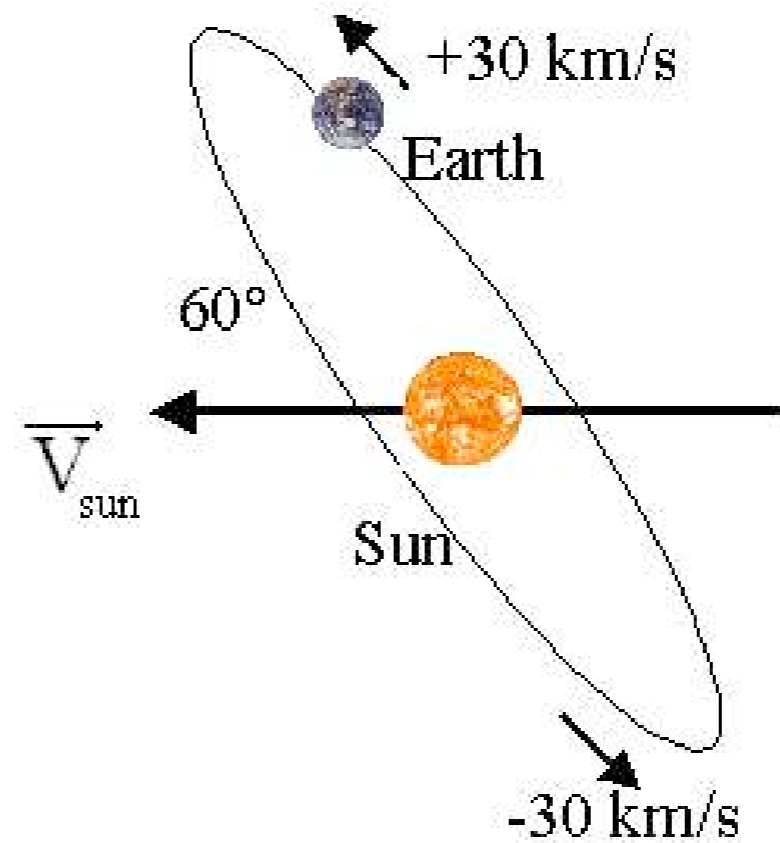| Events Detected	For 60 GeV WIMP		No upper limit for WIMPs with M >
	Lower 99% Limit	Upper 99% Limit	
10	30 GeV	none	50 GeV/c^2
100	45 GeV	101 GeV	100 GeV/c^2
1000	55 GeV	69 GeV	250 GeV/c^2

From Schnee (Determination of WIMP mass....)

Light Particles, Lots of Kinematic Edges

- Peskin/Baltz/ Battagglia/ Wizansky
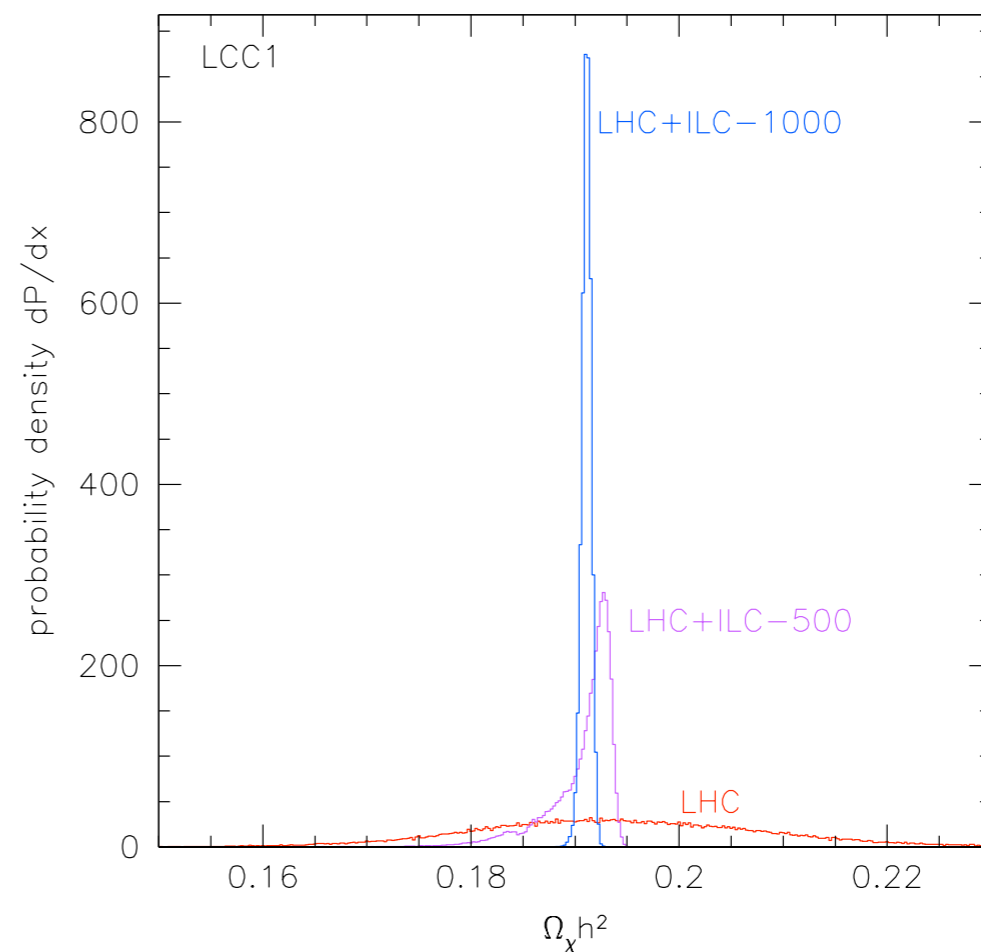
Modulation Signature

- Modulation (Drukier, et al., Freese, et al.)

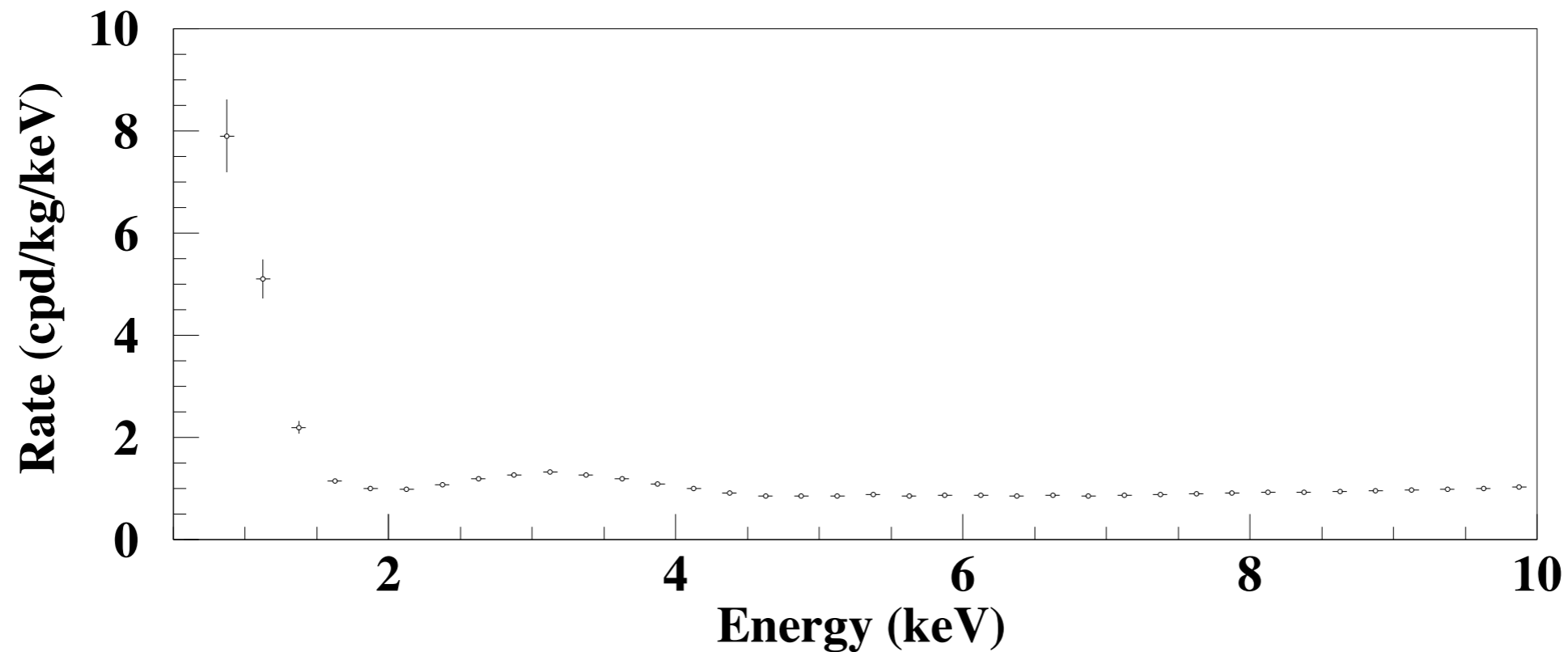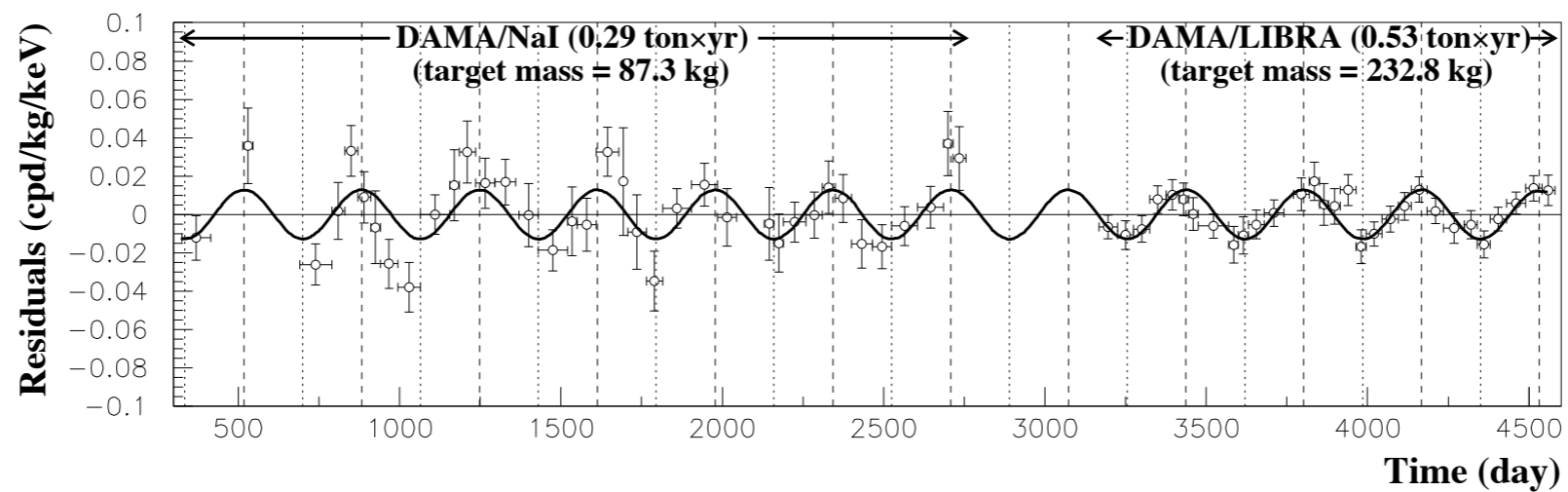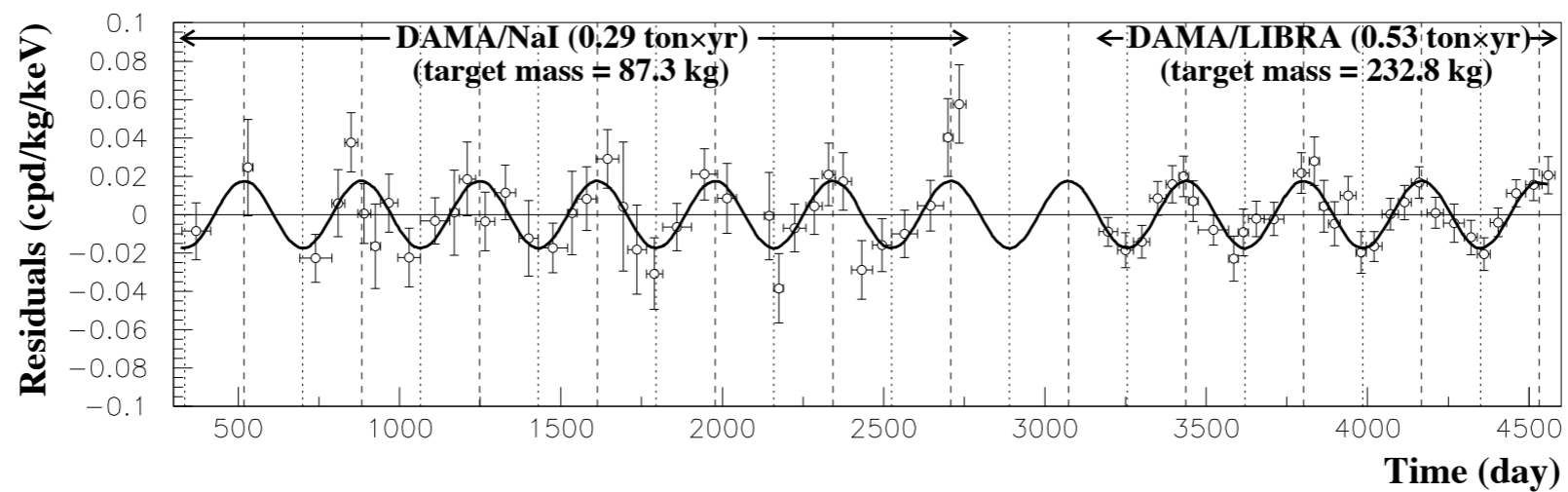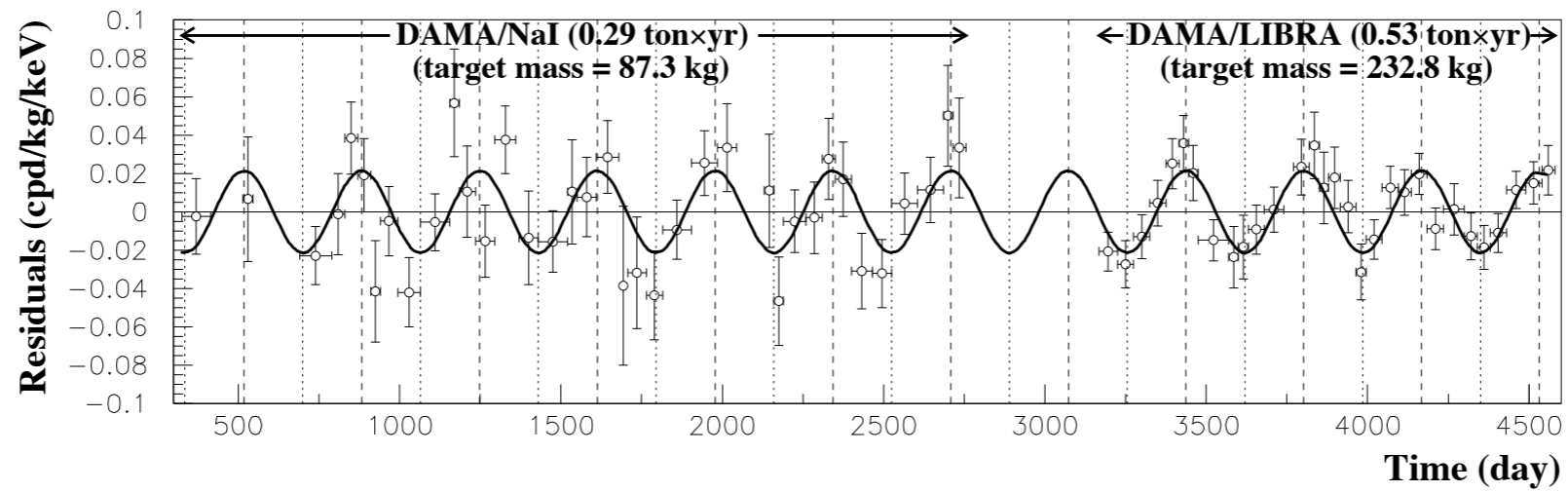# DAMA/LIBRA Counts
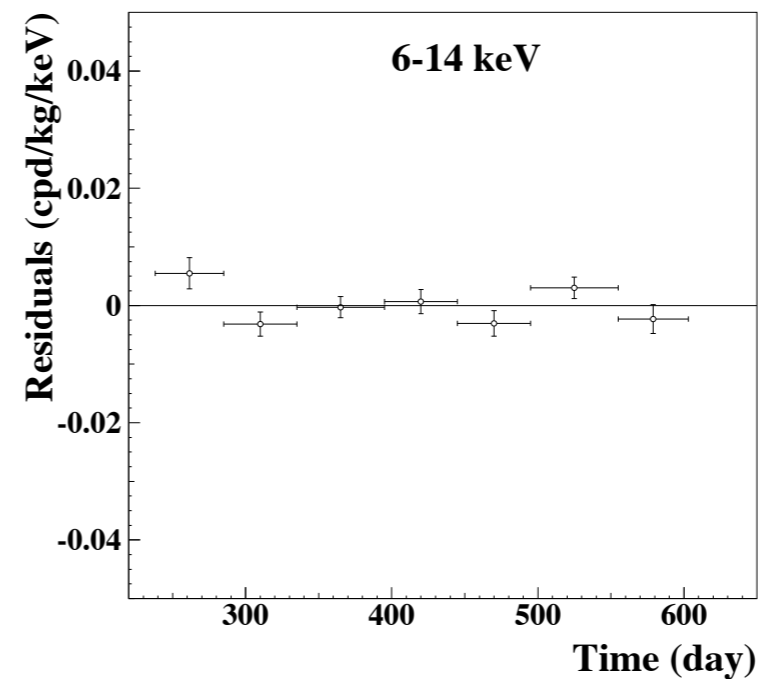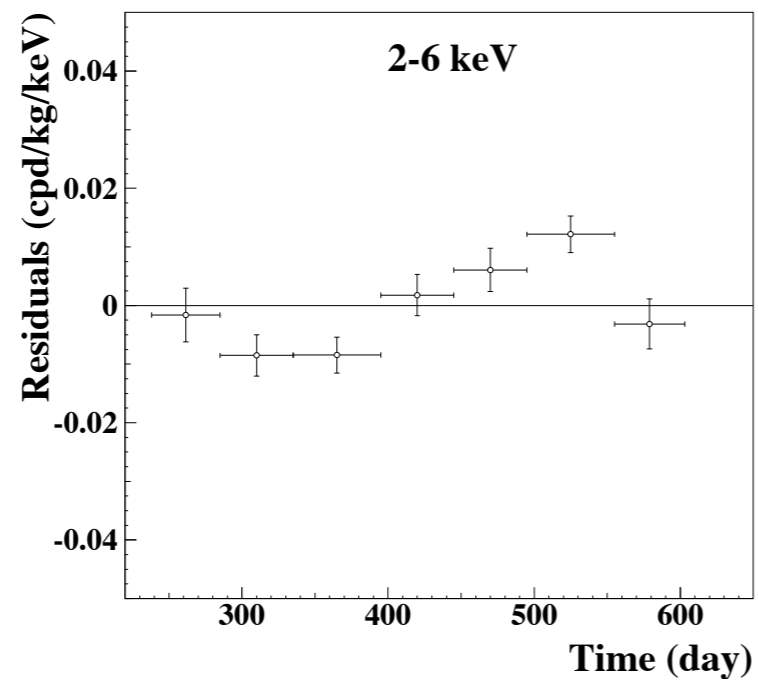
All DAMA/LIBRA from 0804.2741

Figure 1: Cumulative low-energy distribution of the *single-hit* scintillation events (that is each detector has all the others as veto), as measured by the DAMA/LIBRA detectors in an exposure of 0.53 ton × yr. The energy threshold of the experiment is 2 keV and corrections for efficiencies are already applied.
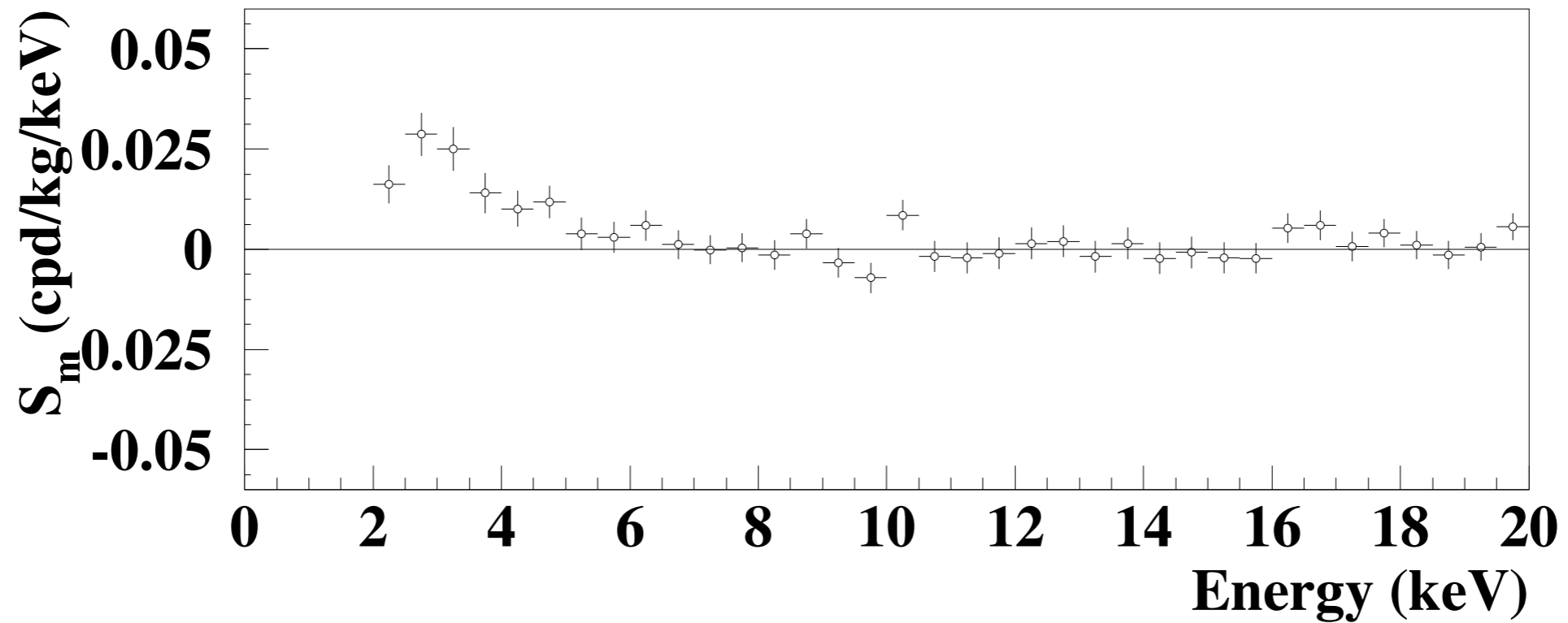
2-5 keV

2-6 keV

DAMA/LIBRA from 0804.2741
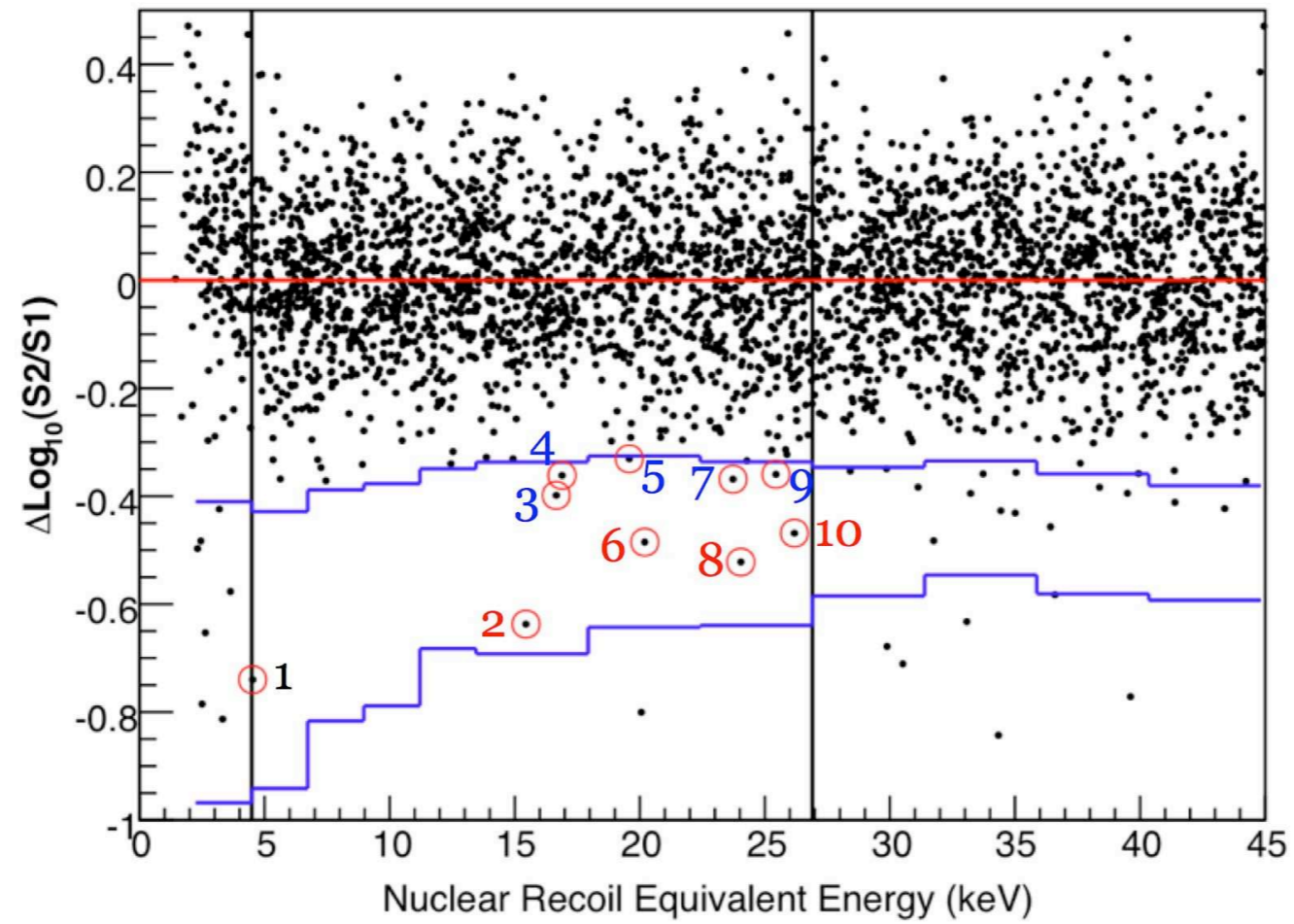
DAMA/LIBRA Data

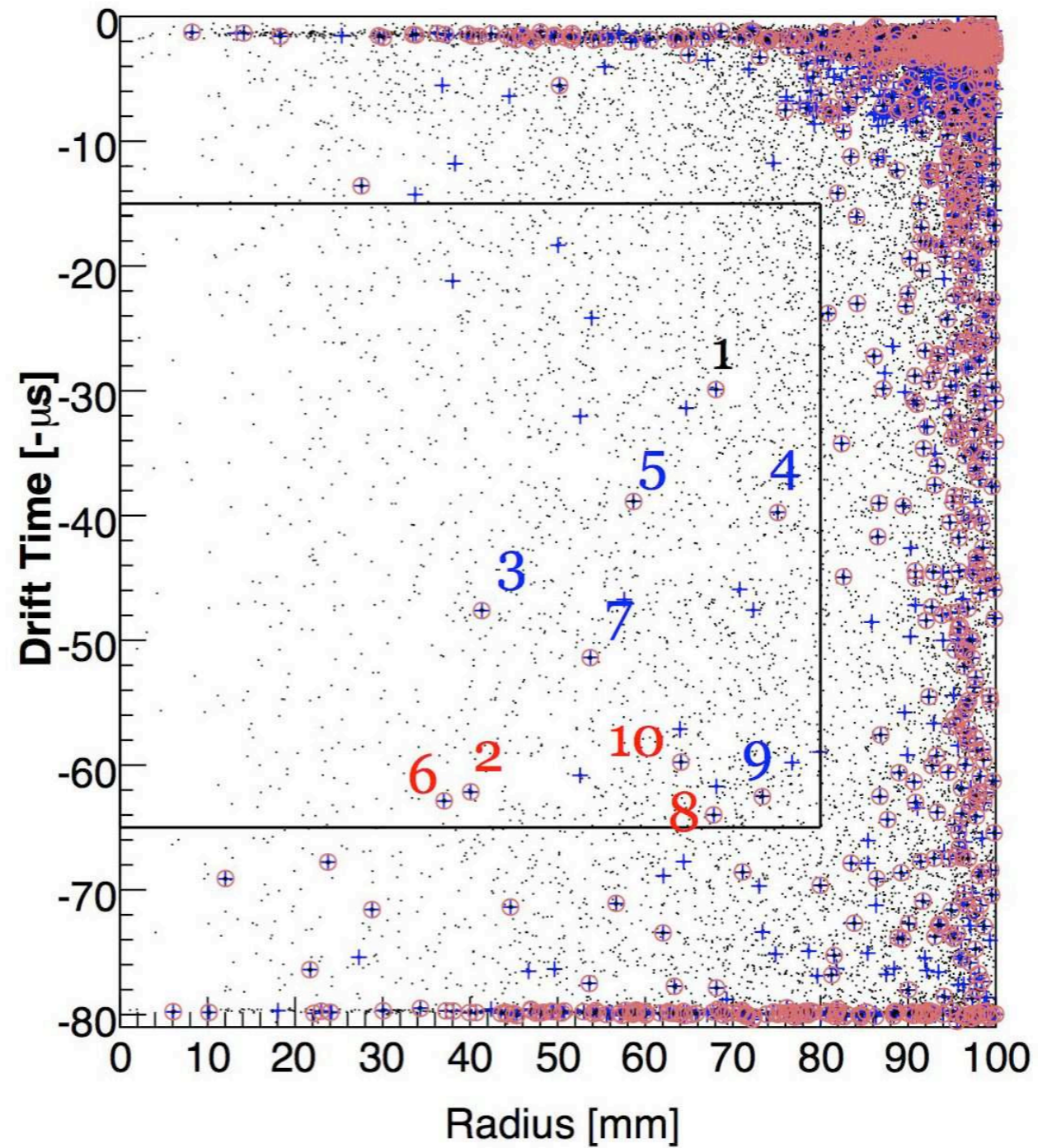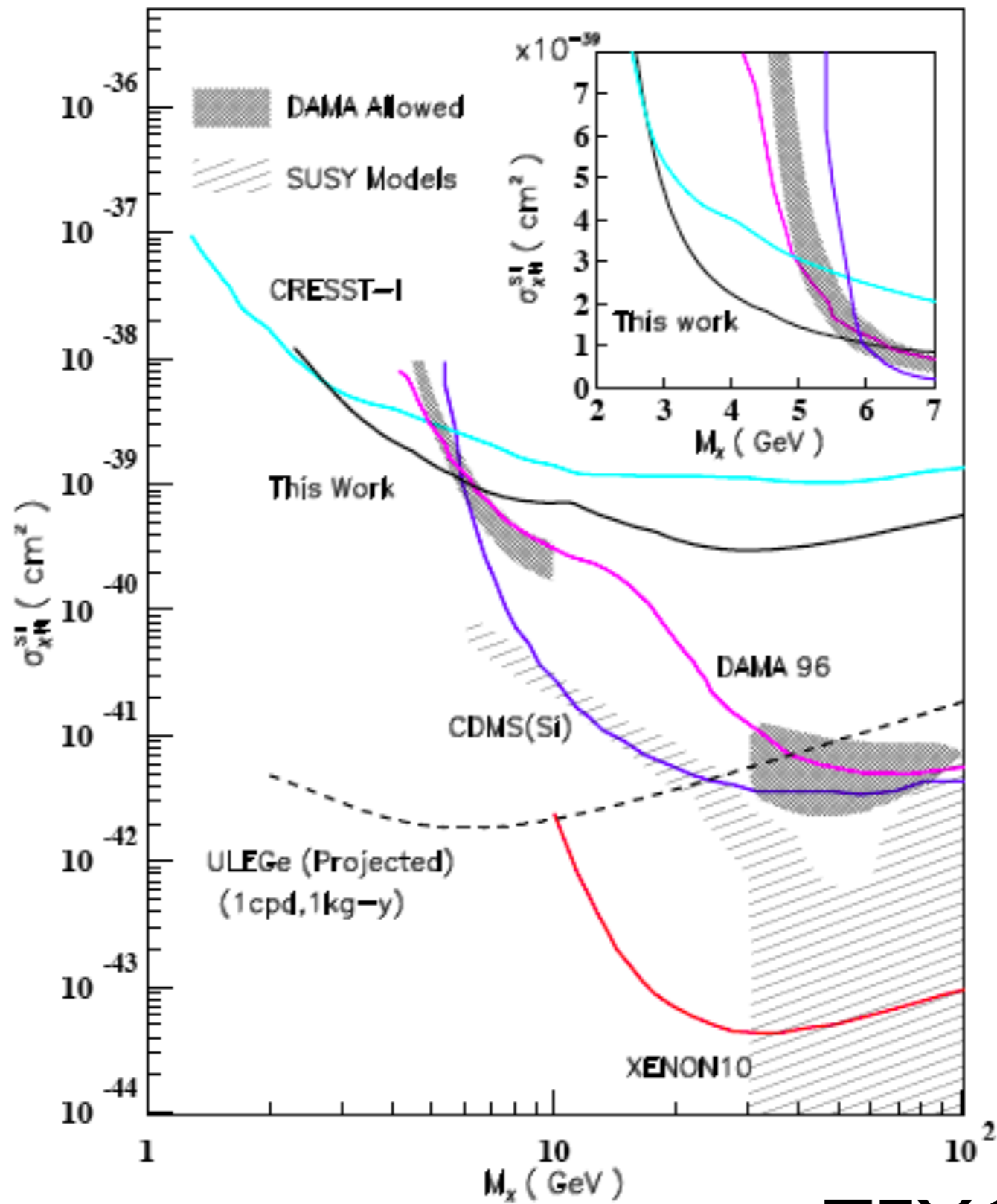DAMA/LIBRA from 0804.2741

Energy Dependence

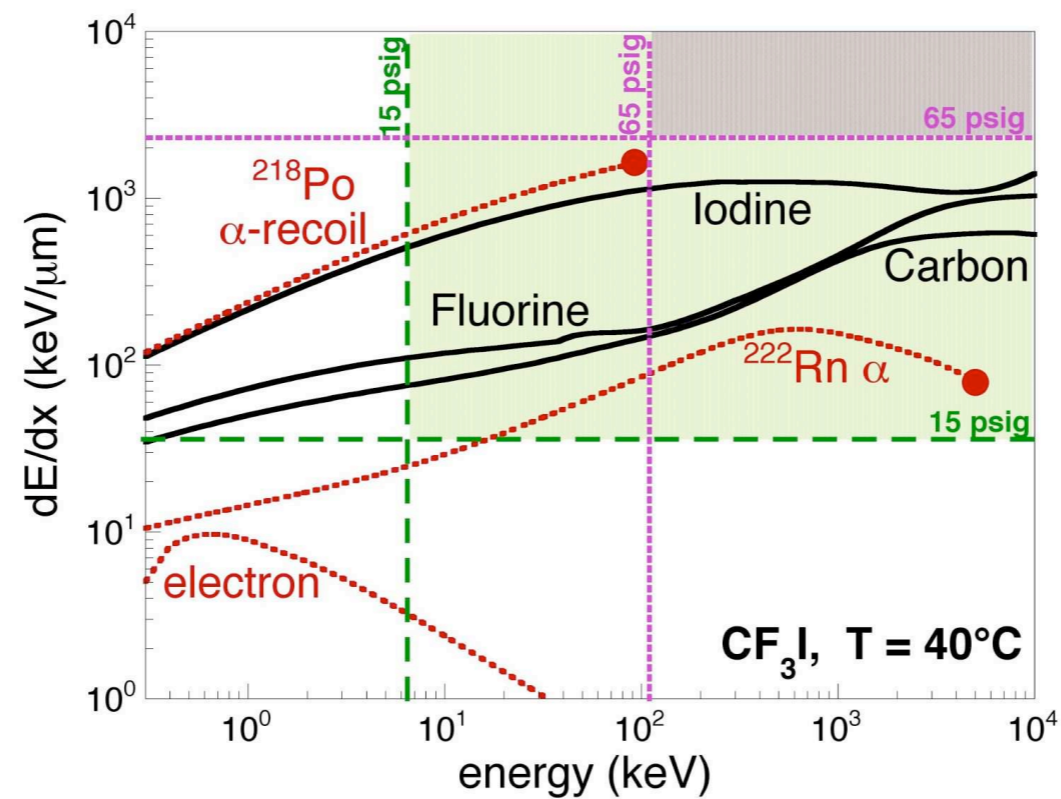DAMA/LIBRA from 0804.2741

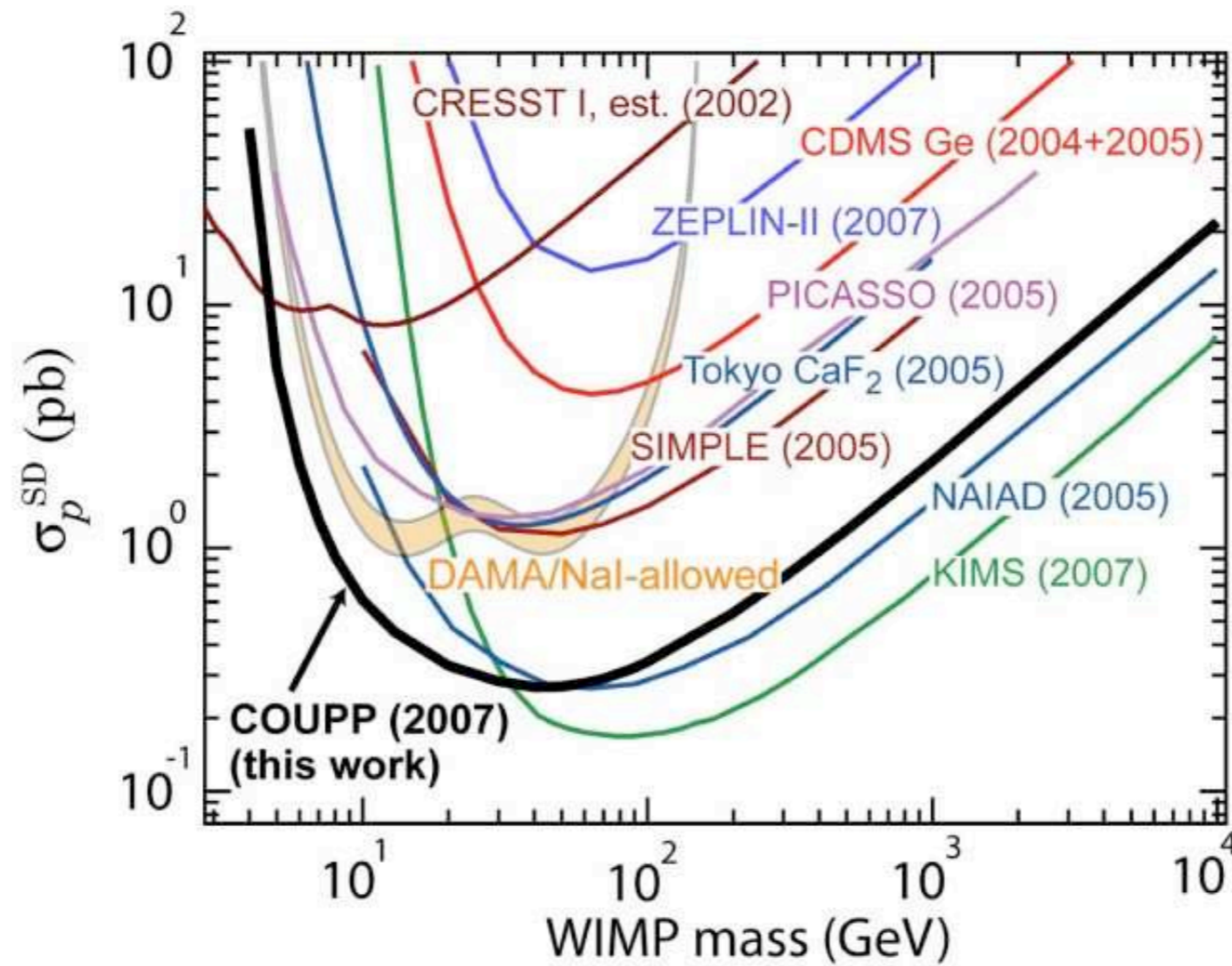# 0706.0039 XENON

0706.0039 XENON

TEXONO 0712.1645

COUPP Methodology

Bubble Chamber Bounds

Resolution?

- Need to have very different scattering from the target nuclei.

- Light Dark Matter? (Gondolo/Gelmini) Not entirely clear if this window still exists. (See TEXONO... others?)

- Inelastic Dark Matter? (Weiner/Smith) Does this window still exist?

Wish List:

- Is there missing energy at LHC?

- What is mass of missing particle (10% better?)

- What is the model of that the DM particle lives in?

- Parameters of Model? Is it a thermal relic density?