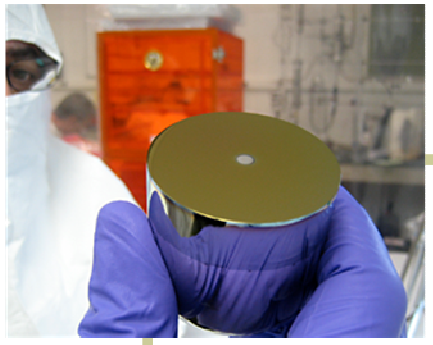
# Implications of CoGeNT's New Results For Dark Matter

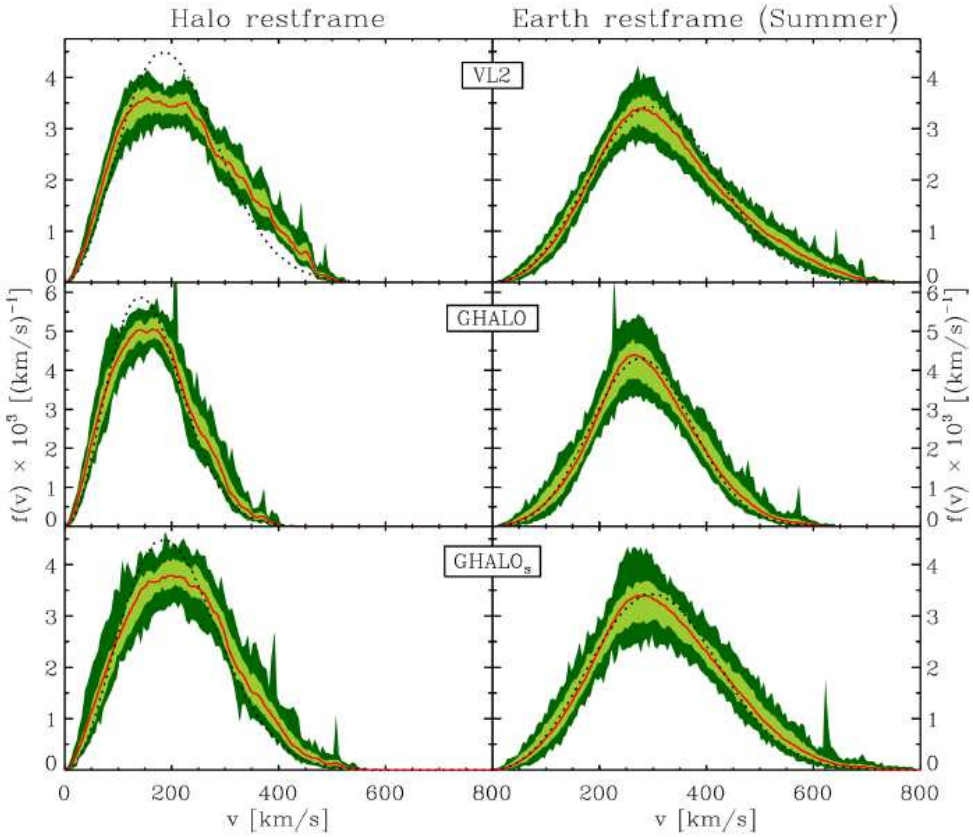


Chris Kelso
University of Chicago
DESY Theory Workshop
Sep. 28, 2011

# Outline

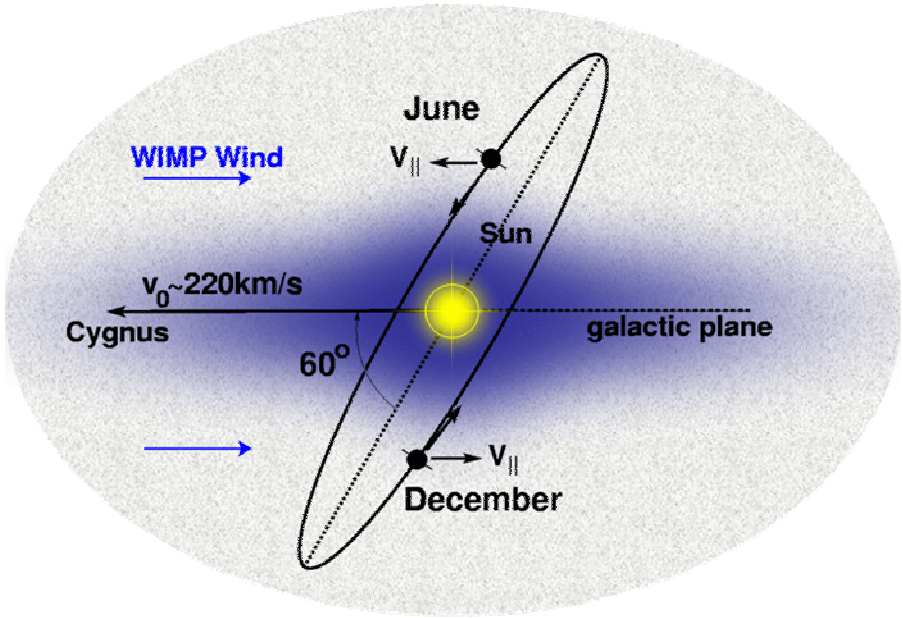
- Some background information to set the stage
- First 15 months of CoGeNT data
- TAUP updates
- Conclusions and Outlook

# Simulations of the Velocity Distribution of Dark Matter in Our Galaxy



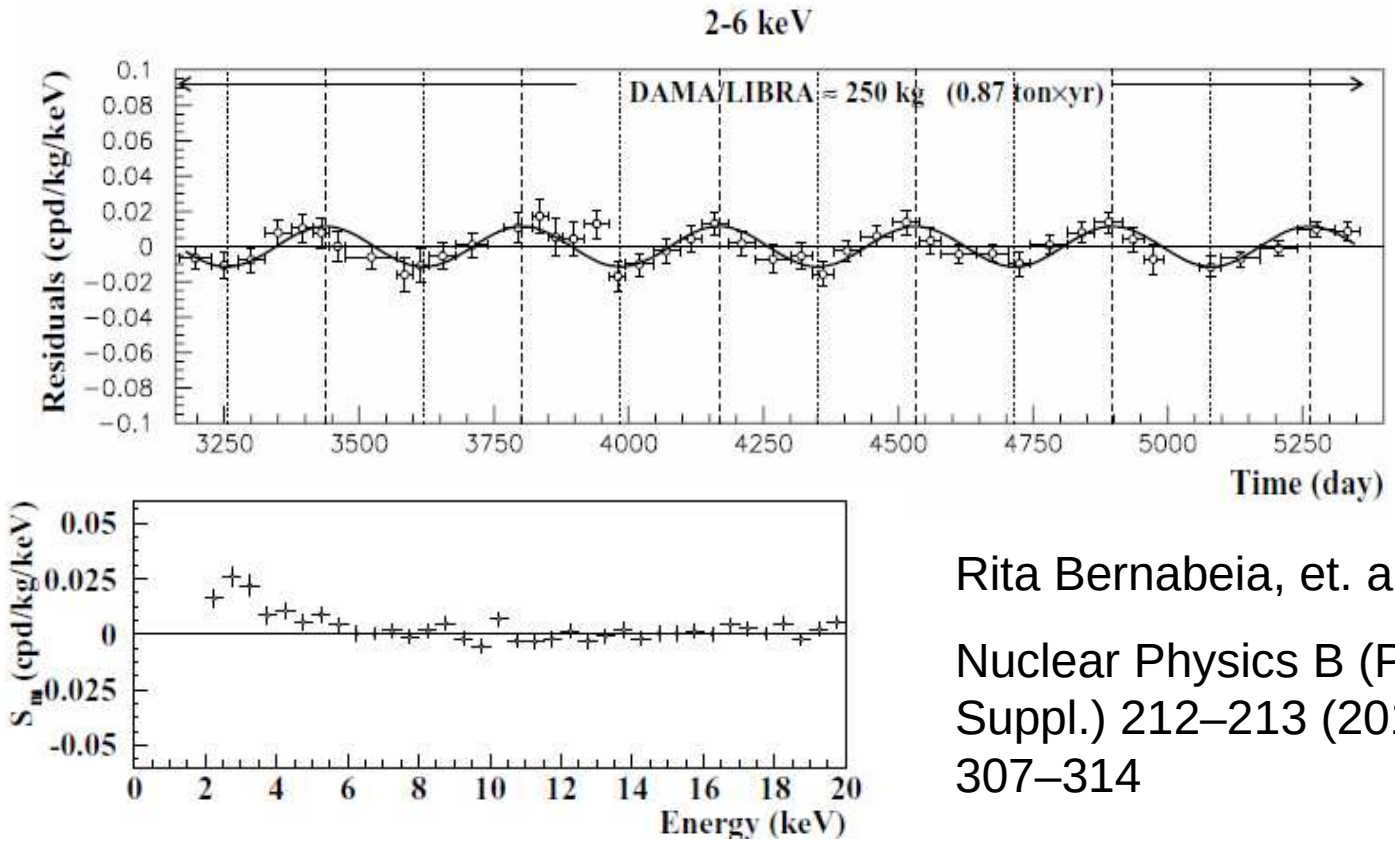

Michael Kuhlen, Neal Weiner, Jurg Diemand, Piero Madau, Ben Moore, Doug Potter, Joachim Stadel, Marcel Zemp: **JCAP 1002 (2010) 030**

# Dark Matter Should Have Annual Modulation




http://www.hep.shef.ac.uk/research/dm/intro.php

# DAMA (NaI) Claim




Rita Bernabeia, et. al.

Nuclear Physics B (Proc. Suppl.) 212–213 (2011) 307–314

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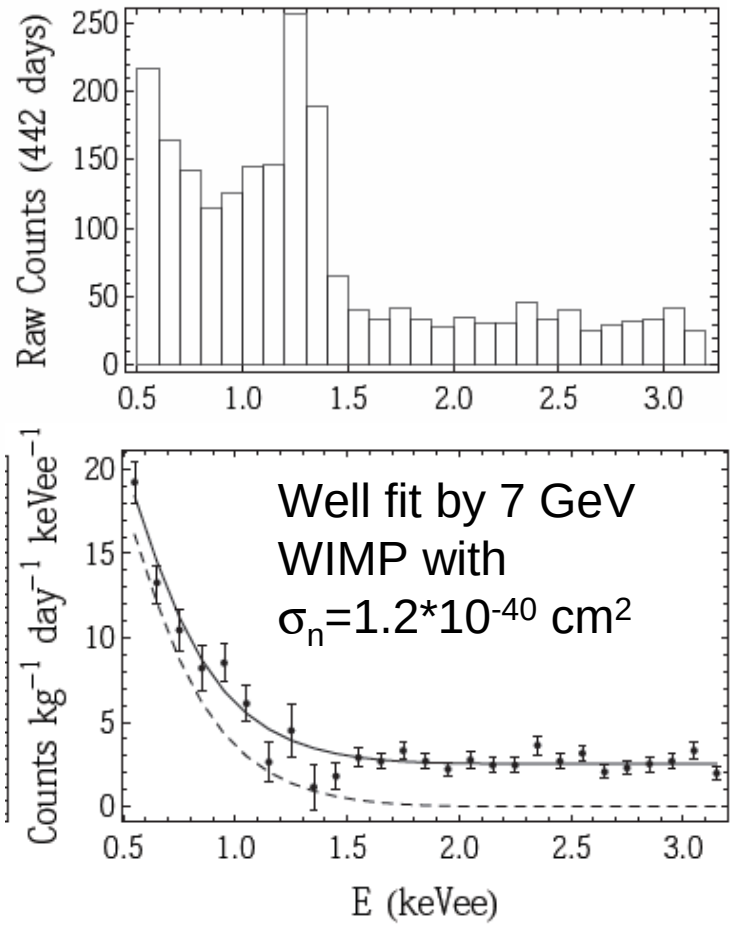
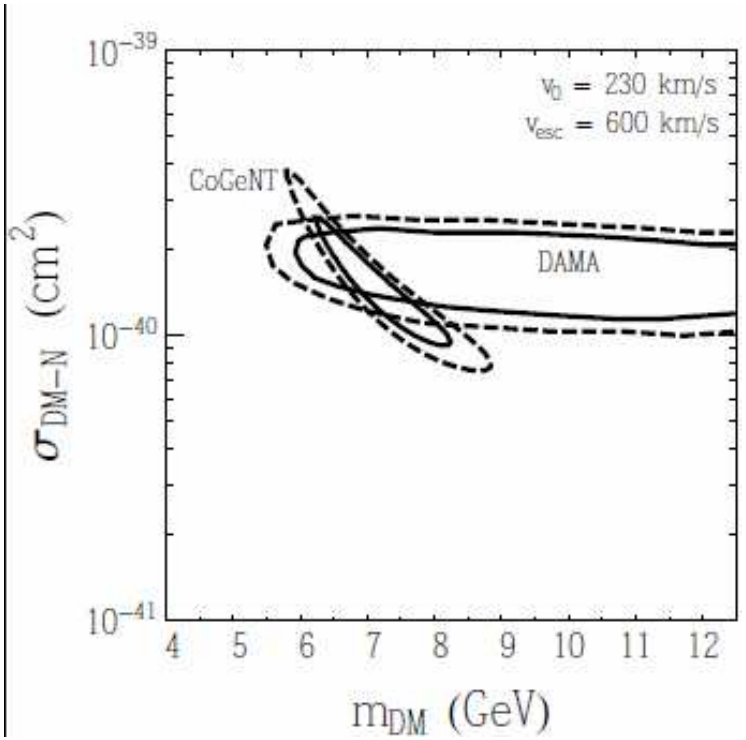
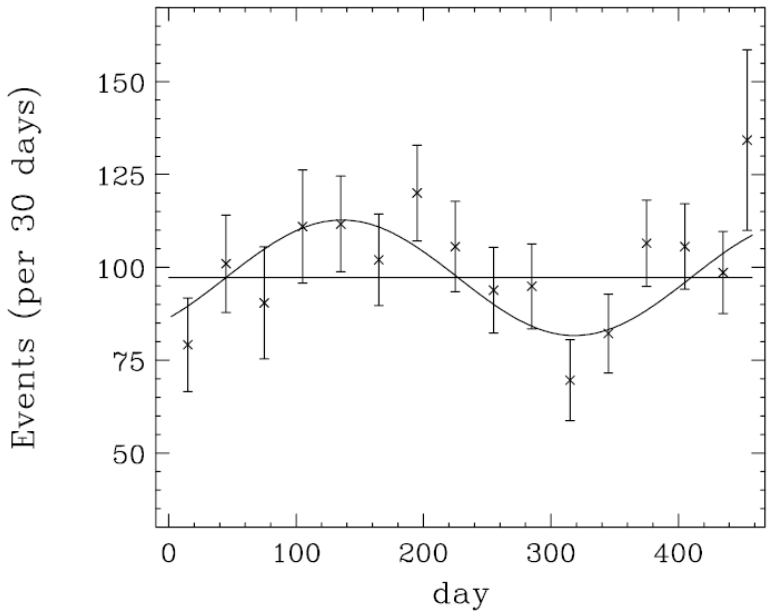
# A little more than one year of CoGeNT (Ge) data



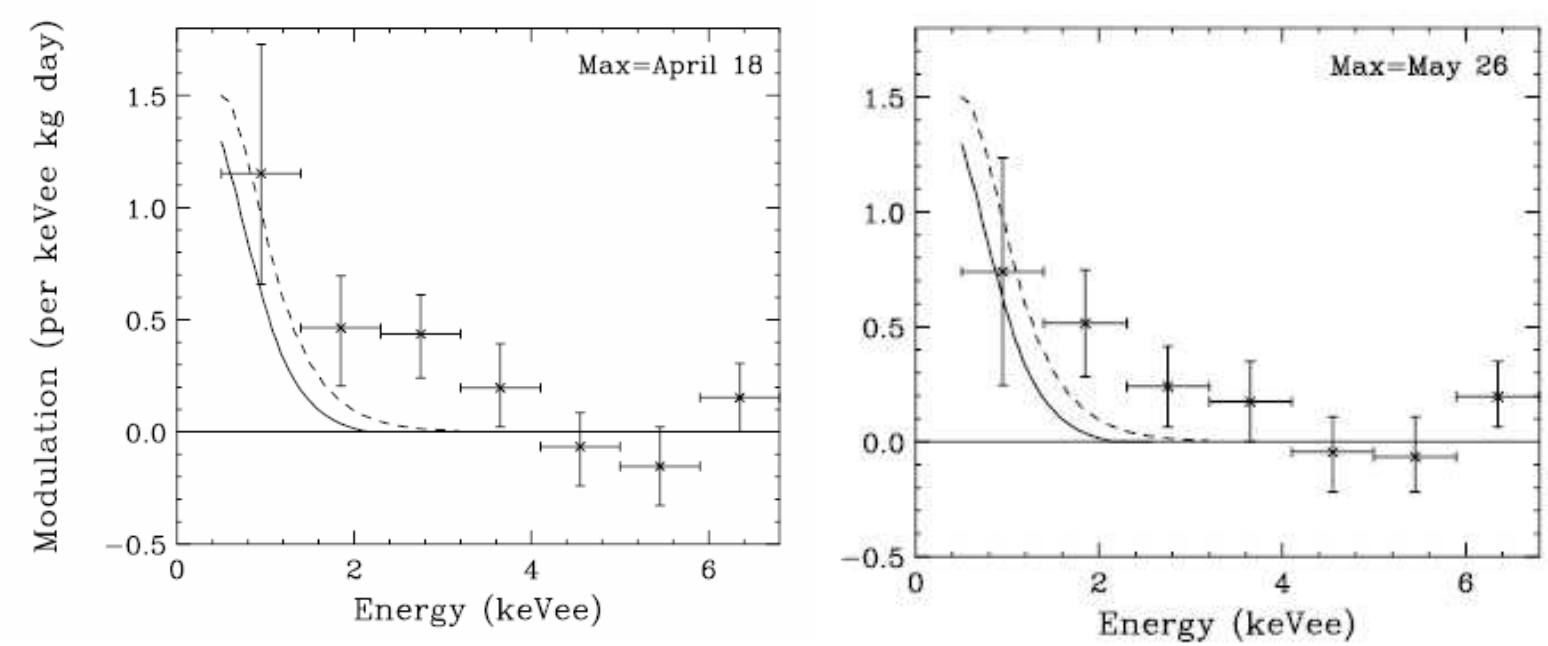

Still consistent with DAMA modulation for a large quenching factor

# Modulation in the data



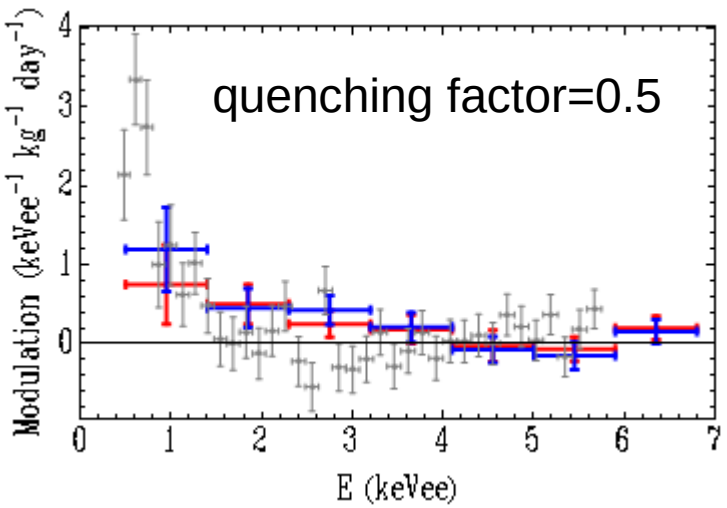

- We find modulation of 16±5% at the 2.7 sigma level
- The best fit to the peak is found to be at April 18±16 days
- DAMA peak is May 16±7 (2-4 keVee range) or May 26±7 (2-6 keVee range)
- N-body simulations of galaxy formation find 68% of models have a peak within 20 days of late May/early June

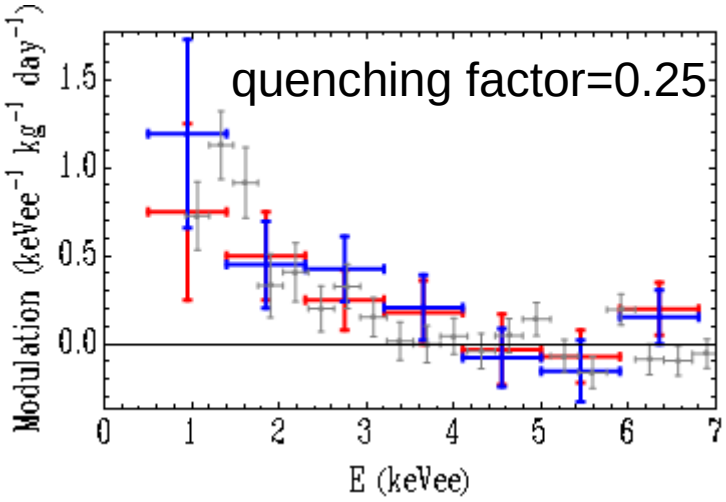
# Spectrum of Modulation




There is more modulation at higher energies than predicted in the standard halo model

# CoGeNT and DAMA modulation amplitudes are consistent




Independent of astrophysical uncertainties, the gray error bars are the what the DAMA signal would look like at the CoGeNT detector

Red error bars are the CoGeNT modulation for maximum phase May 26 (SHM).

Blue error bars are the best fit maximum phase for CoGeNT (April 18).

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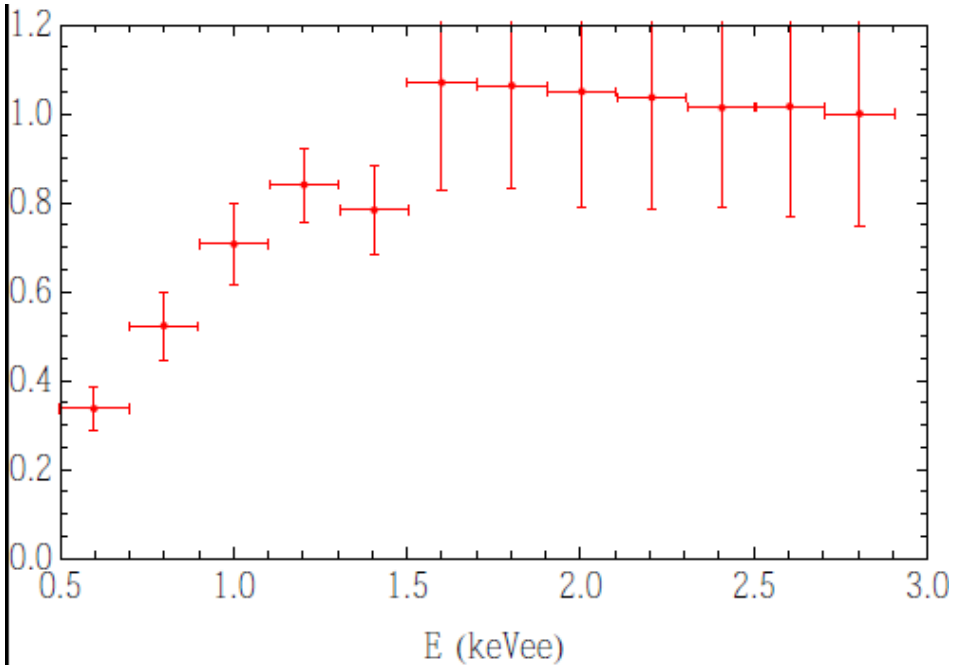
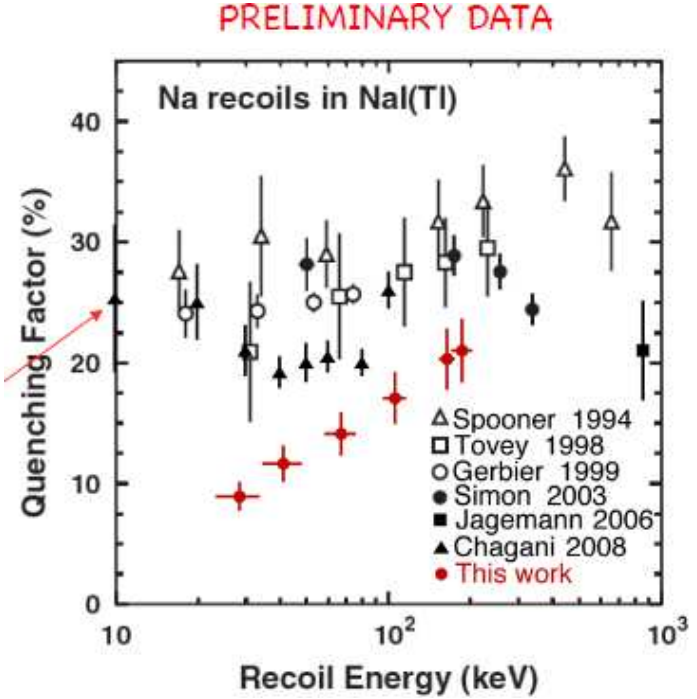
# TAUP Update: CoGeNT



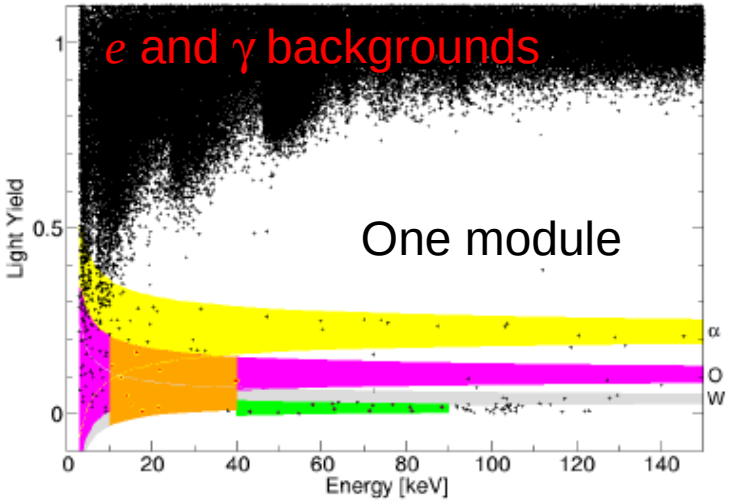

This is the fraction of the previously shown excess events that are not surface events.

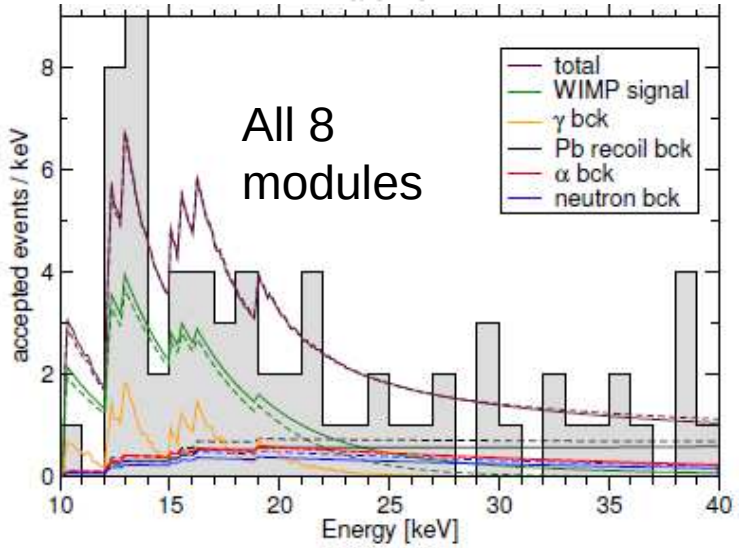


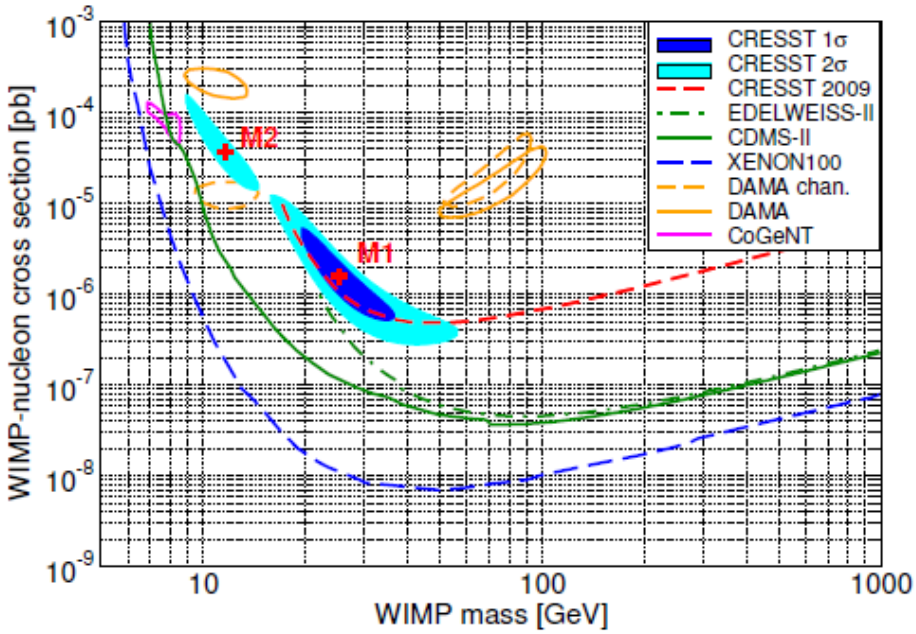

Found quite small quenching factor for Na

Also, no channeling found

# TAUP Update: CRESST ($CaWO_4$)



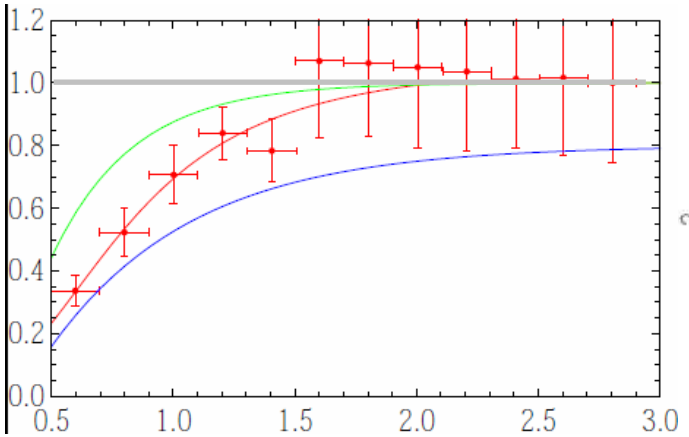



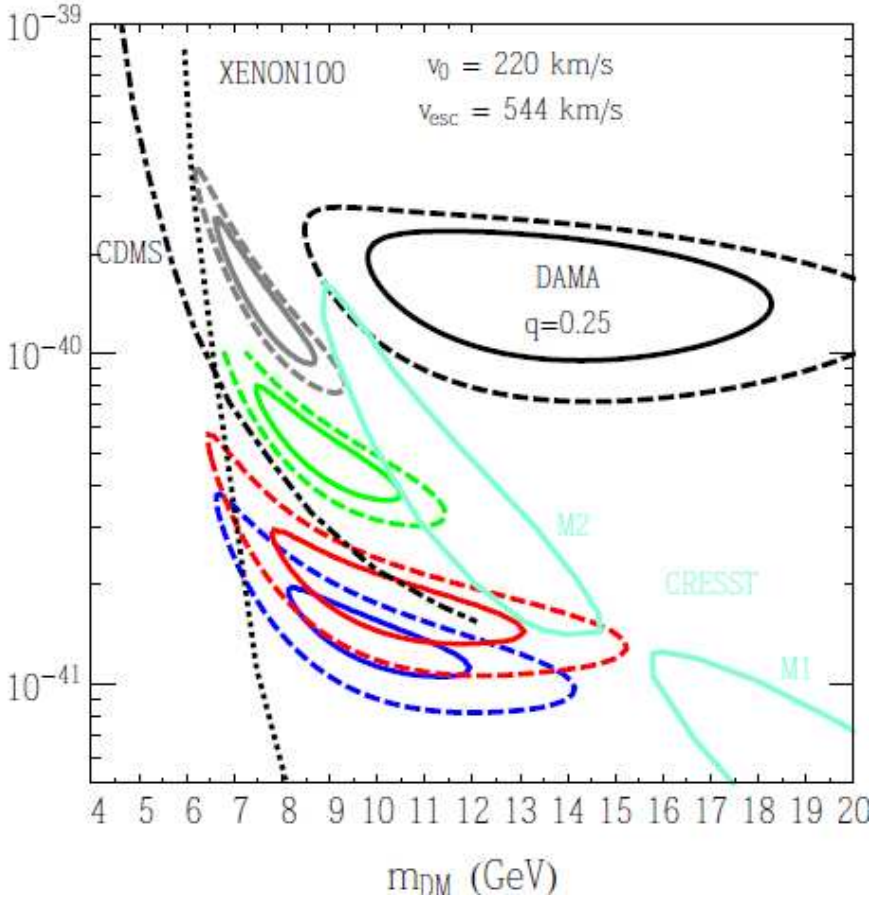




M1 rejects background only hypothesis at 4.7 σ

M2 rejects background only hypothesis at 4.3 σ

# Current Status of Direct-Detection of Low-Mass Wimps




The different colored lines for the surface event rejection at CoGeNT above produce the given contours on the right, with solid the 90% and dashed the 99% confidence region.

# Conclusions and Future Outlook

- Although many questions still exist, the dark matter interpretation of the CoGeNT excess is still viable.
- The updated overall spectrum is in the region of interest for the new CRESST results.
- The annual modulation at DAMA and CoGeNT are consistent, but much larger than expected for a simple Maxwellian Halo.  Can this be reconciled?
- CoGeNT is continuing to take data (after the fire) and we look forward to seeing if the modulation signal continues to increase in significance
- CDMS is undertaking an annual modulation analysis
- First C4 detector to be constructed soon