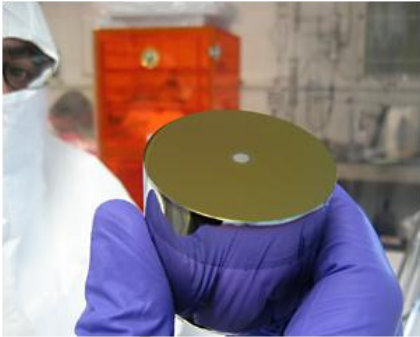
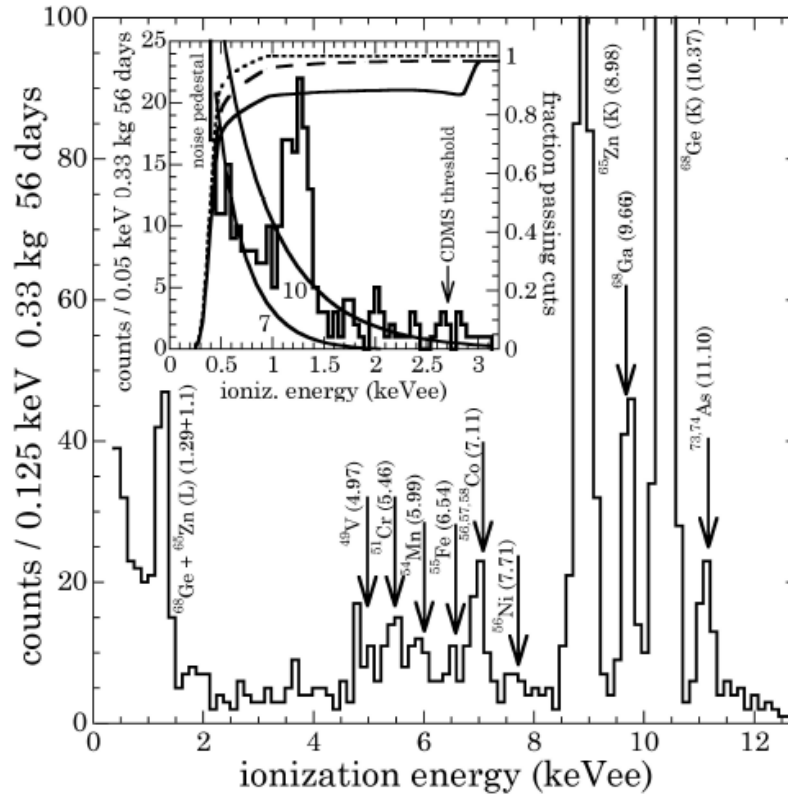


Implications of CoGeNT's New Results For Dark Matter



Chris Kelso
University of Chicago
SUSY 2011 Workshop
August 31, 2011

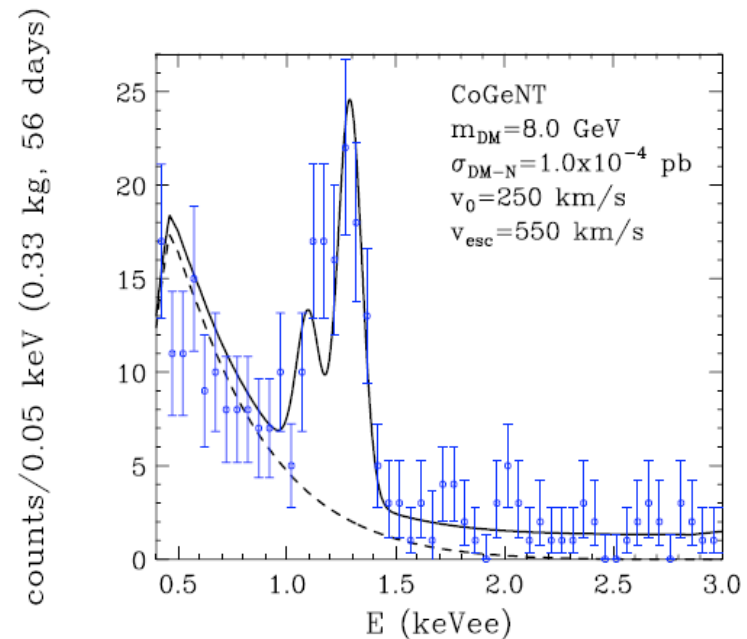
Original CoGeNT Excess



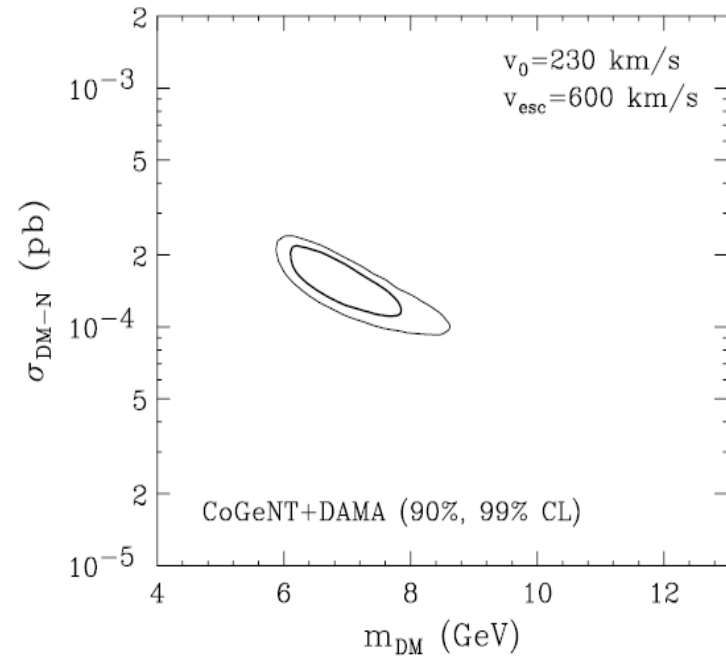
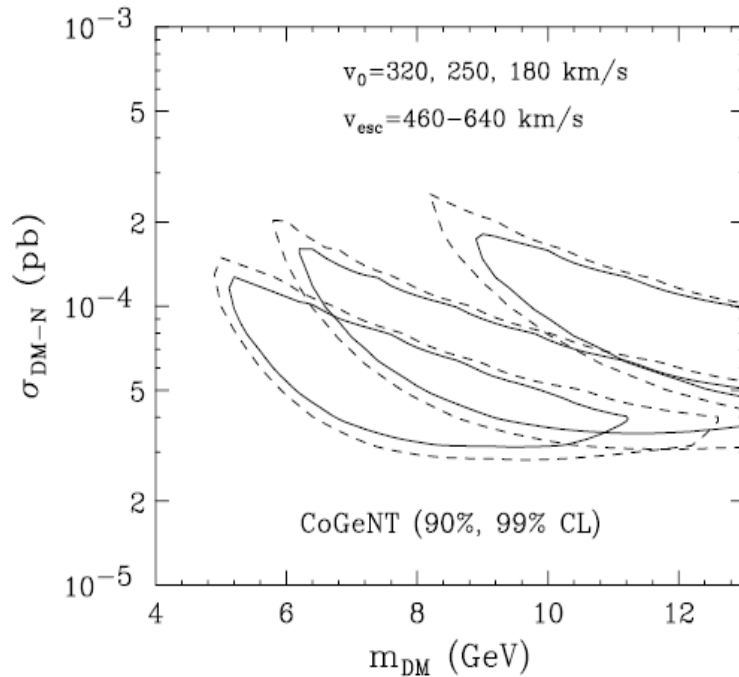
CoGeNT Collaboration: **Phys.Rev.Lett.106:131301,2011**
arXiv:1002.4703

The Dark Matter Interpretation

- Approximately 100 events above known backgrounds over 56 days of data
- Data is well fit well by elastically scattering dark matter plus backgrounds (2 L-shell peaks + constant)
- Dashed line is the dark matter signal alone



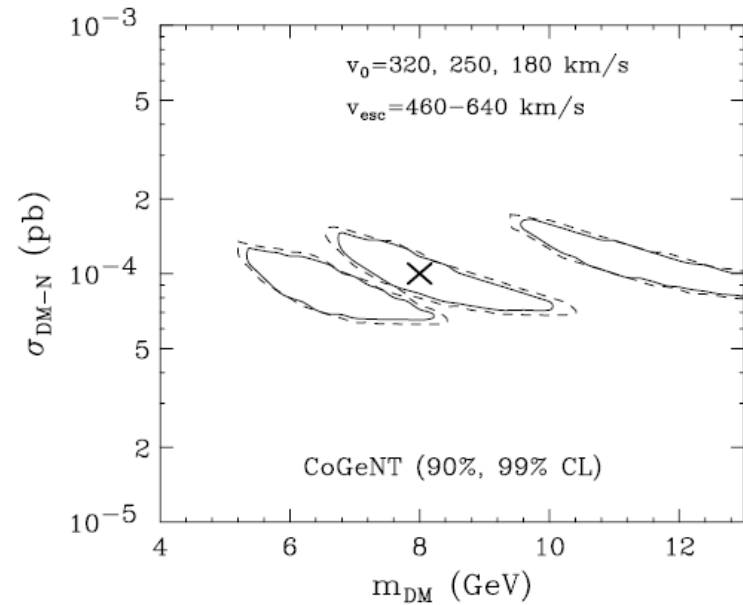
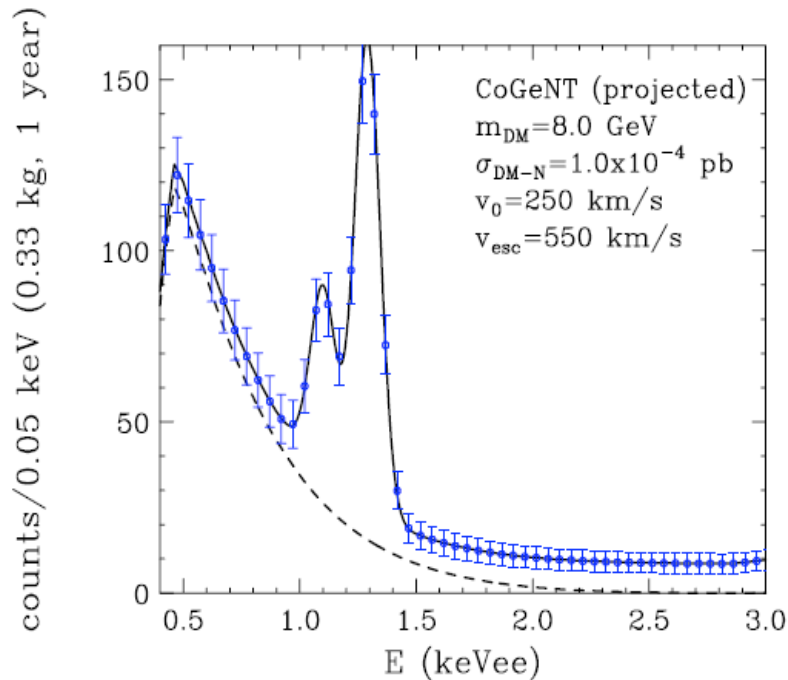
CoGeNT excess in the mass, cross-section plane



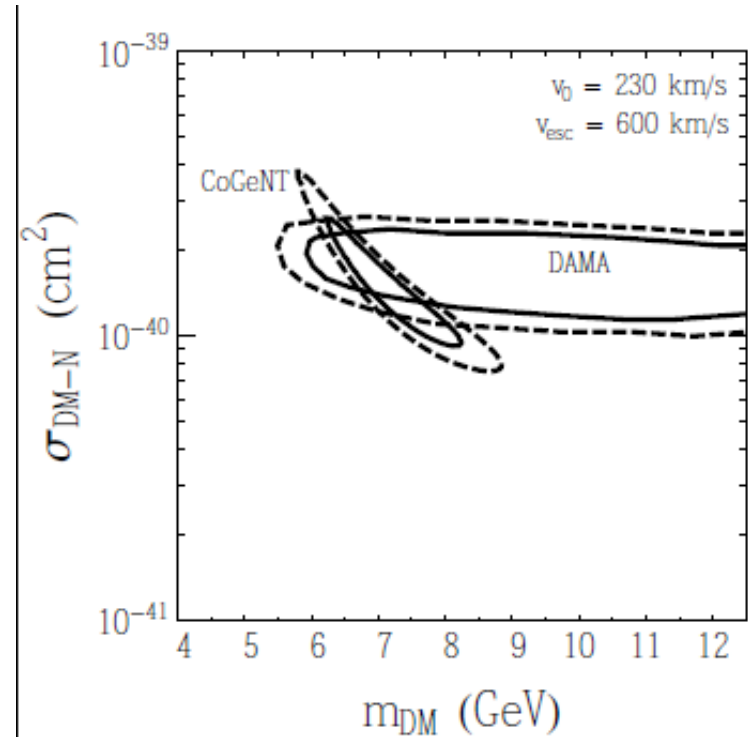
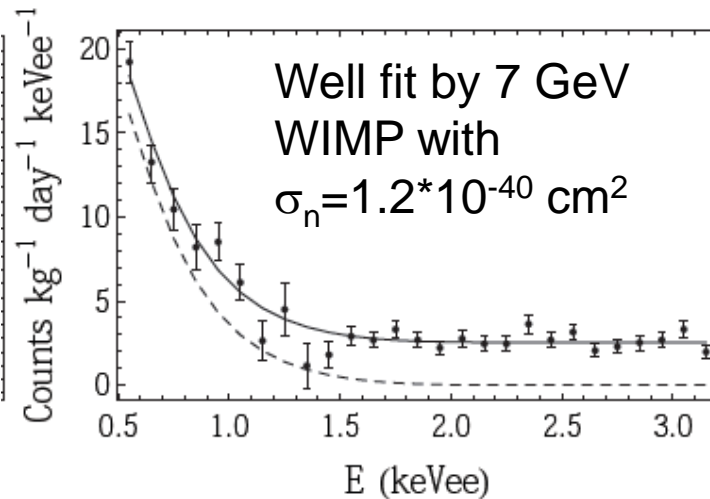
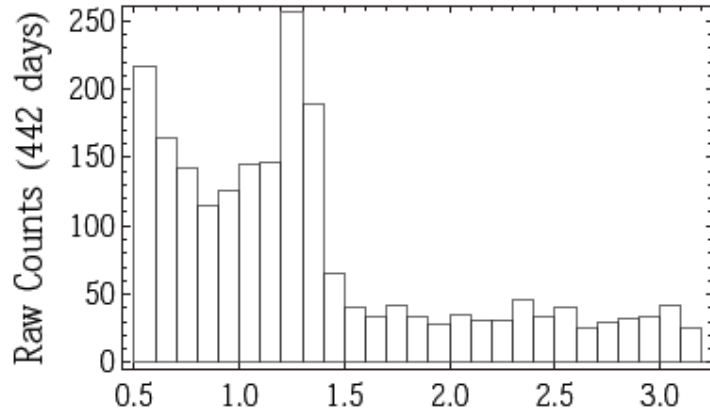
Within the standard halo model, the elastic cross section is constrained within an order of magnitude

There is a region that could produce both the CoGeNT excess and the DAMA modulation

Our Prediction: CoGeNT after 1 year

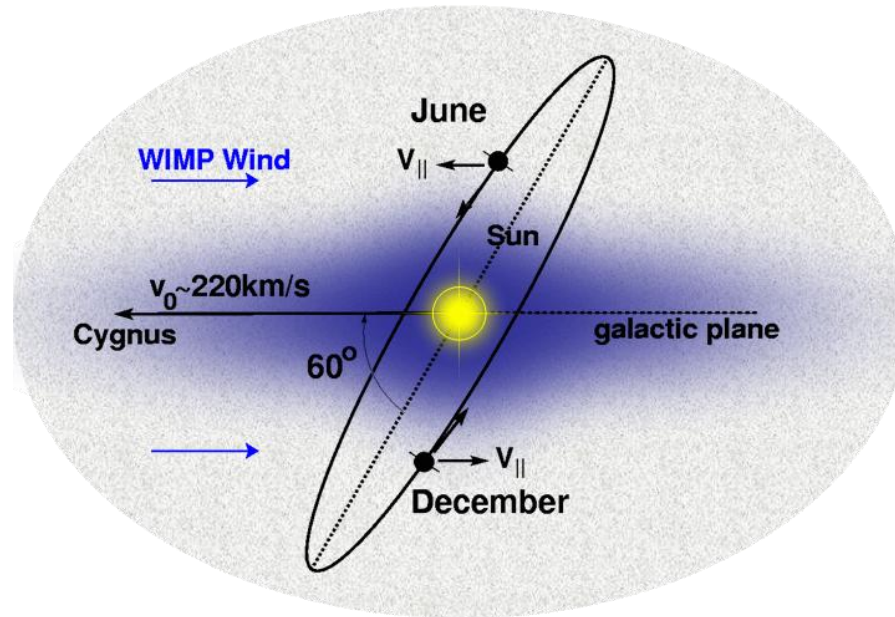


A little more than one year of CoGeNT data



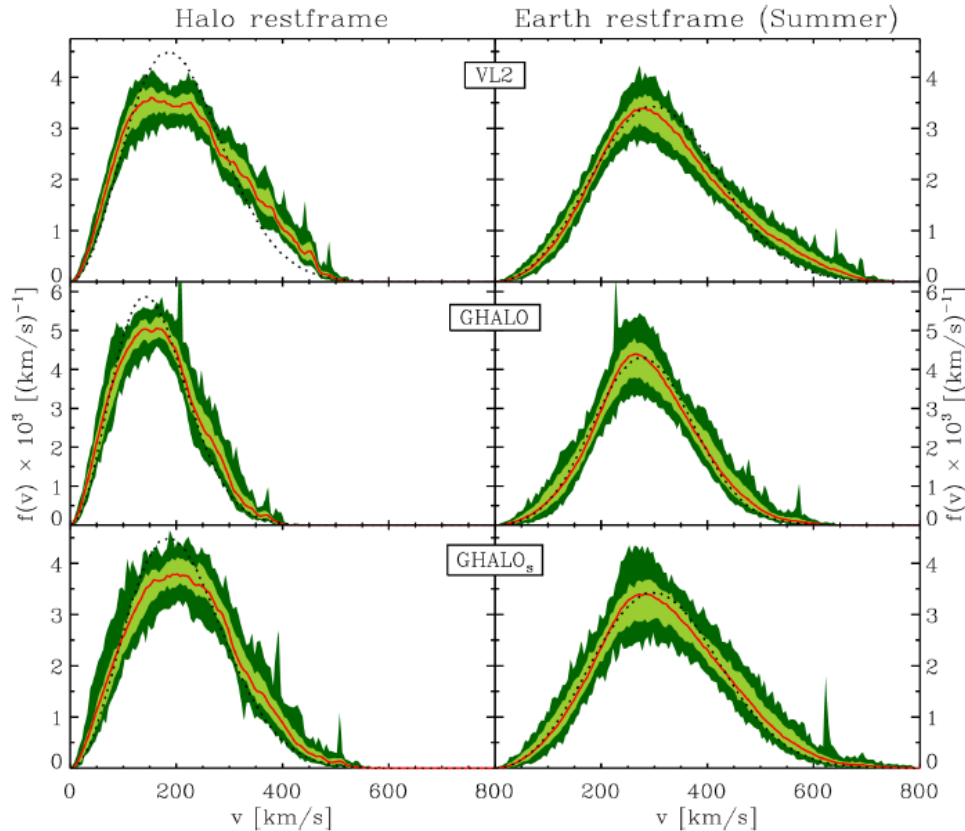
Still consistent with DAMA modulation for a large quenching factor

Dark Matter Should Have Annual Modulation



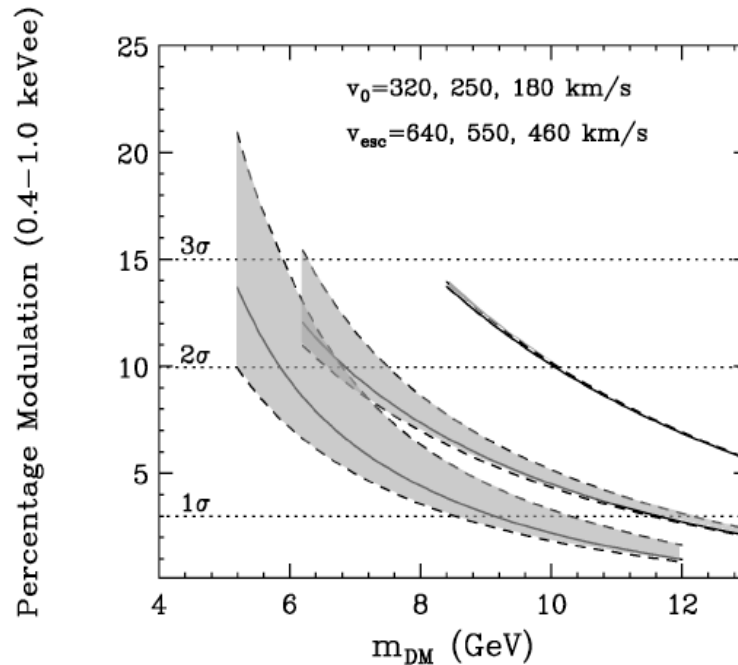
<http://www.hep.shef.ac.uk/research/dm/intro.php>

Velocity Distribution of Dark Matter



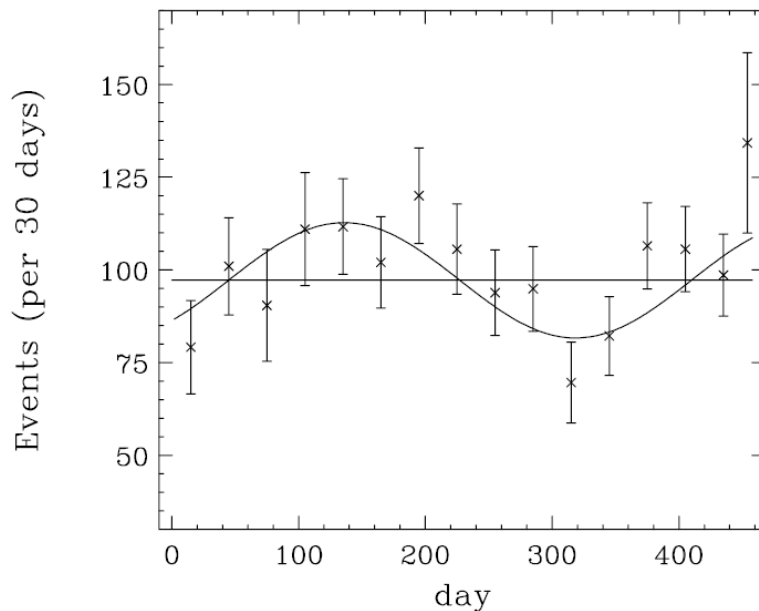
Michael Kuhlen, Neal Weiner, Jurg Diemand, Piero Madau, Ben Moore, Doug Potter, Joachim Stadel, Marcel Zemp: **JCAP 1002 (2010) 030**

Prediction for CoGeNT after 1 year: Annual Modulation



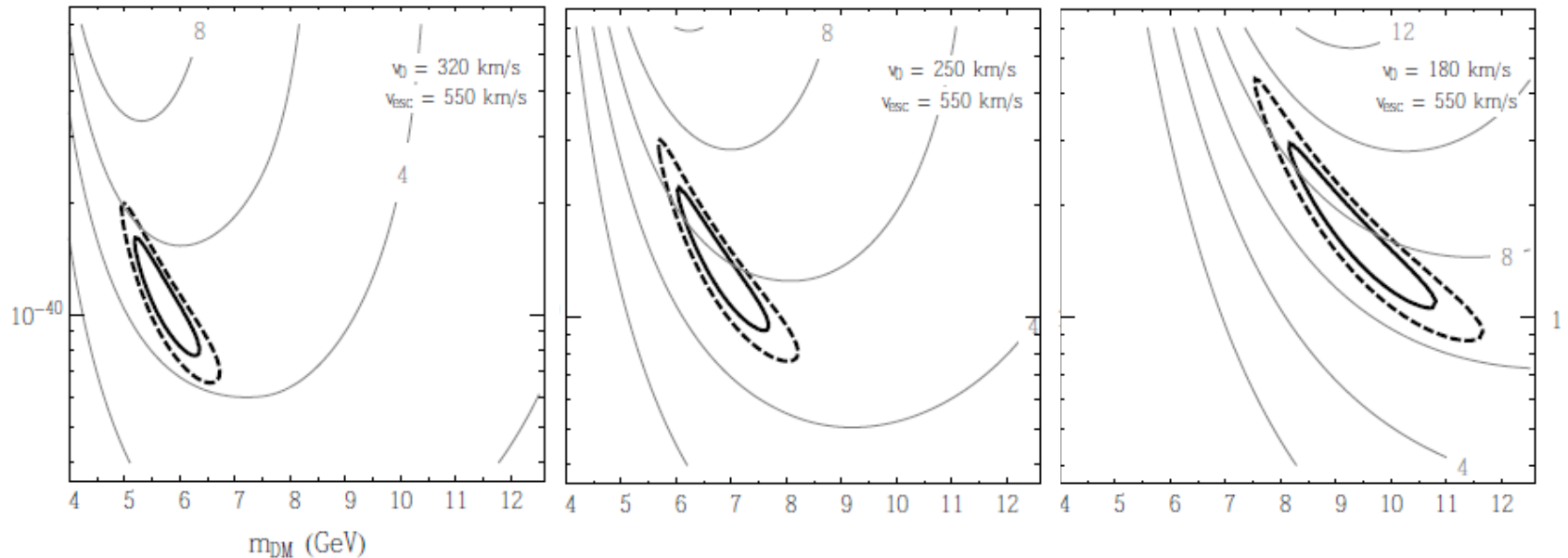
These confidence levels normalize the winter rate to 100 events in 56 days

Modulation in the data



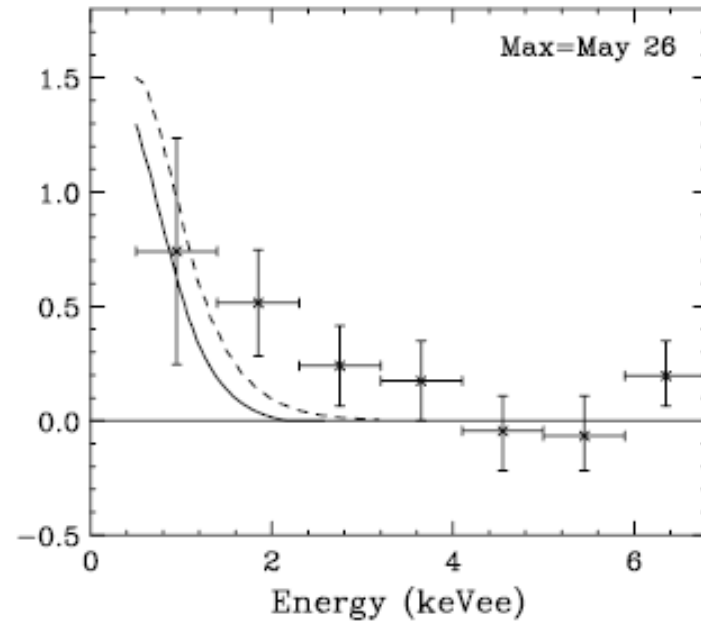
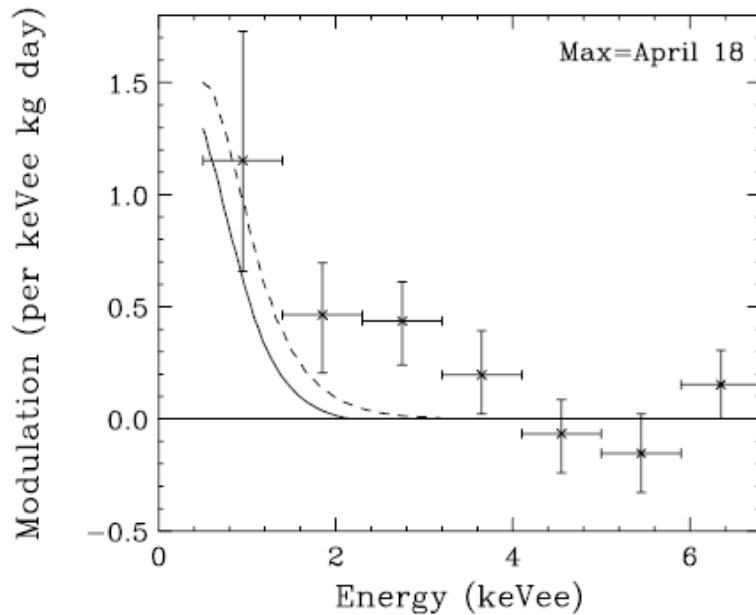
- We find modulation of $16\pm 5\%$ at the 2.7 sigma level
- The best fit to the peak is found to be at April 18 ± 16 days
- DAMA peak is May 16 ± 7 (2-4 keVee range) or May 26 ± 7 (2-6 keVee range)
- N-body simulations of galaxy formation find 68% of models have a peak within 20 days of late May/early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

More Modulation Than Expected



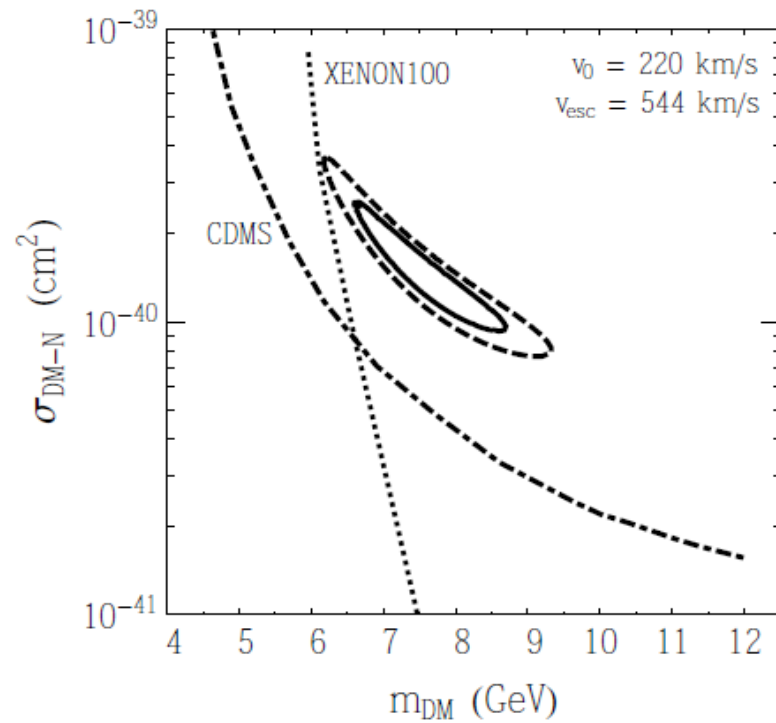
The grey contours give our prediction of the percentage modulation at CoGeNT for the given mass and cross section. The solid and dashed regions are the 90 and 99% preferred regions for the excess for the given halo parameters.

Spectrum of Modulation

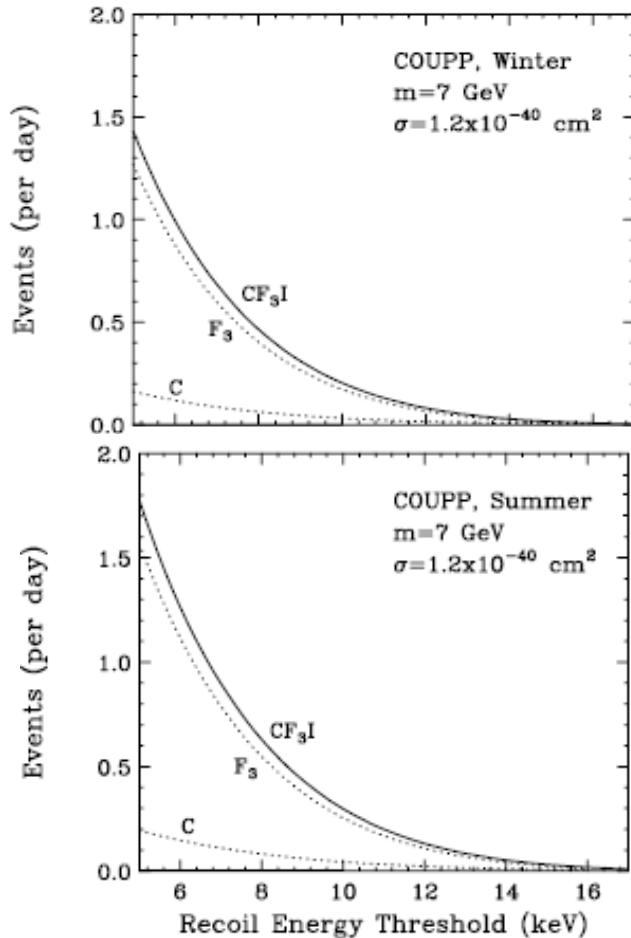


There is more modulation at higher energies than predicted in the standard halo model

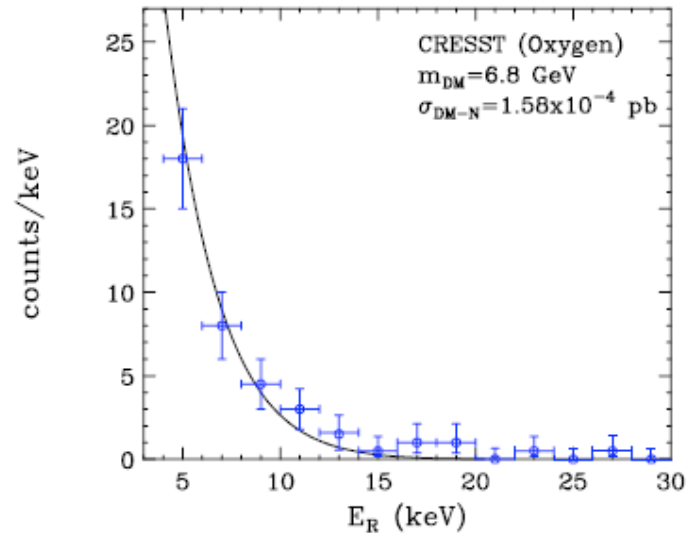
Tension with current limits



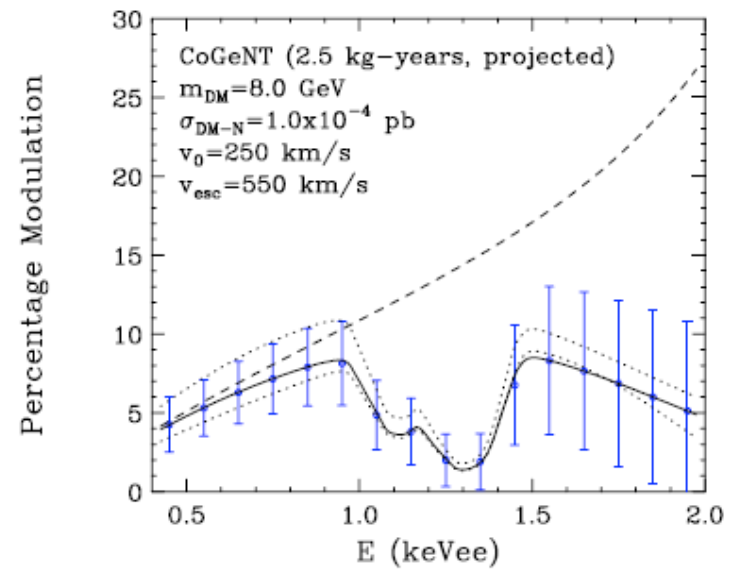
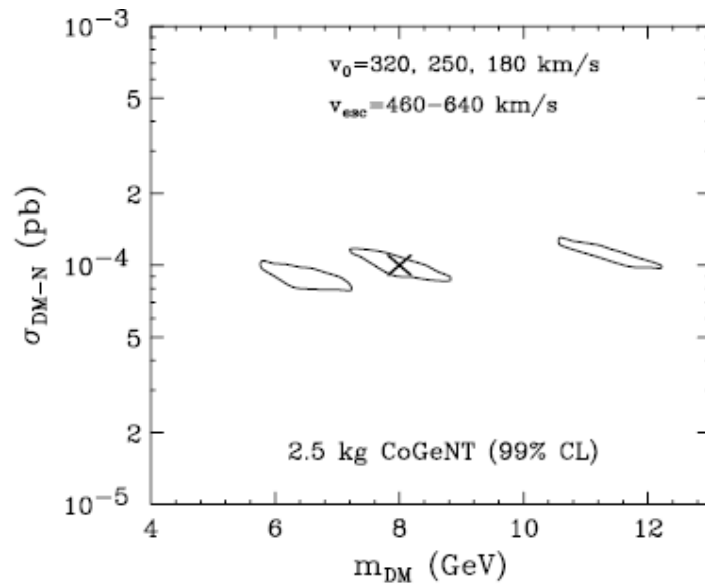
What would this particle look like at other detectors?



Preliminary CRESST results



C4 Detector



Future Outlook

- Although many questions still exist, the dark matter interpretation of the CoGeNT excess is still viable
- CoGeNT is continuing to take data and understand more about their detector. We look forward to seeing if the modulation signal continues to increase in significance
- First C4 detector to be constructed soon
- We are very excited to learn about the CRESST Results at TAUP (Sep. 6)