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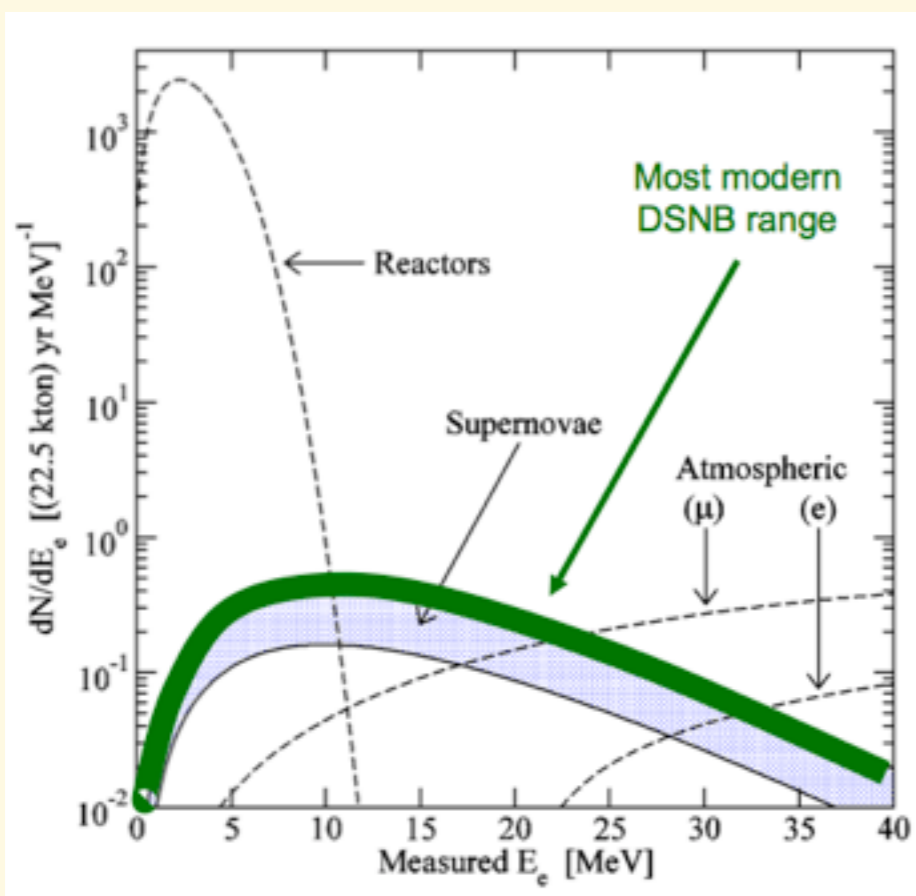
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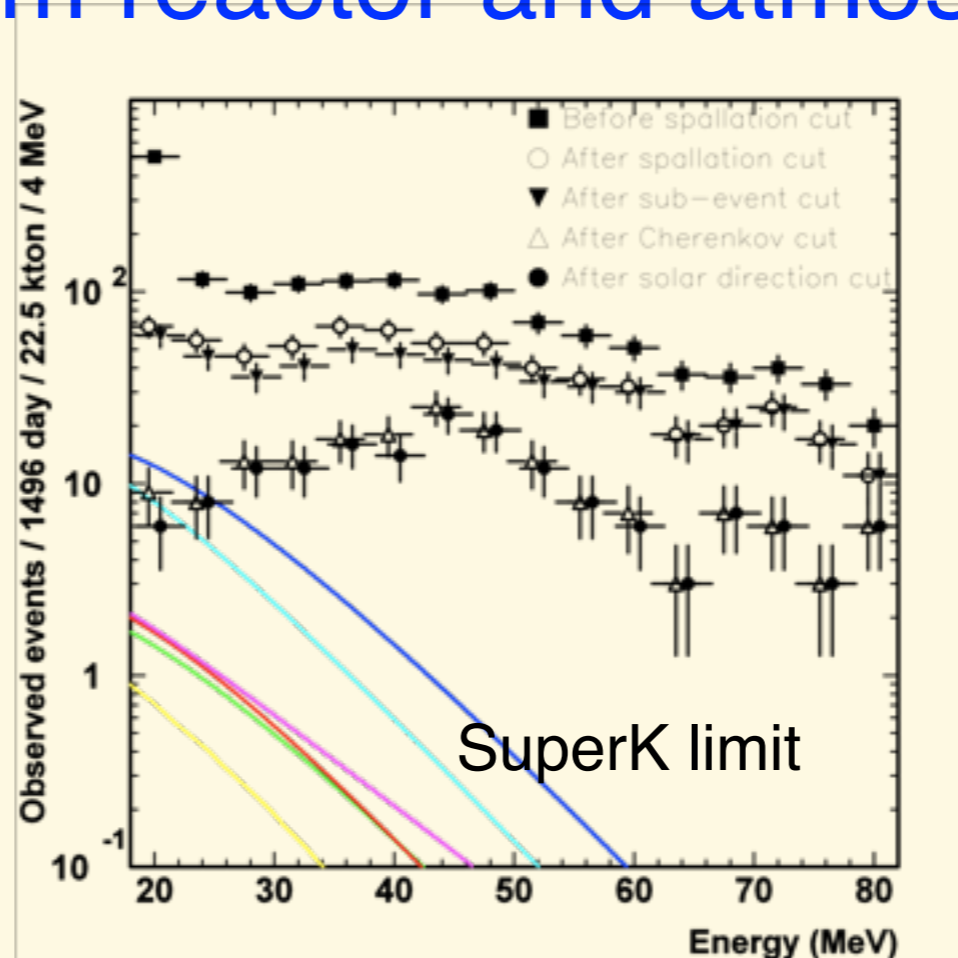
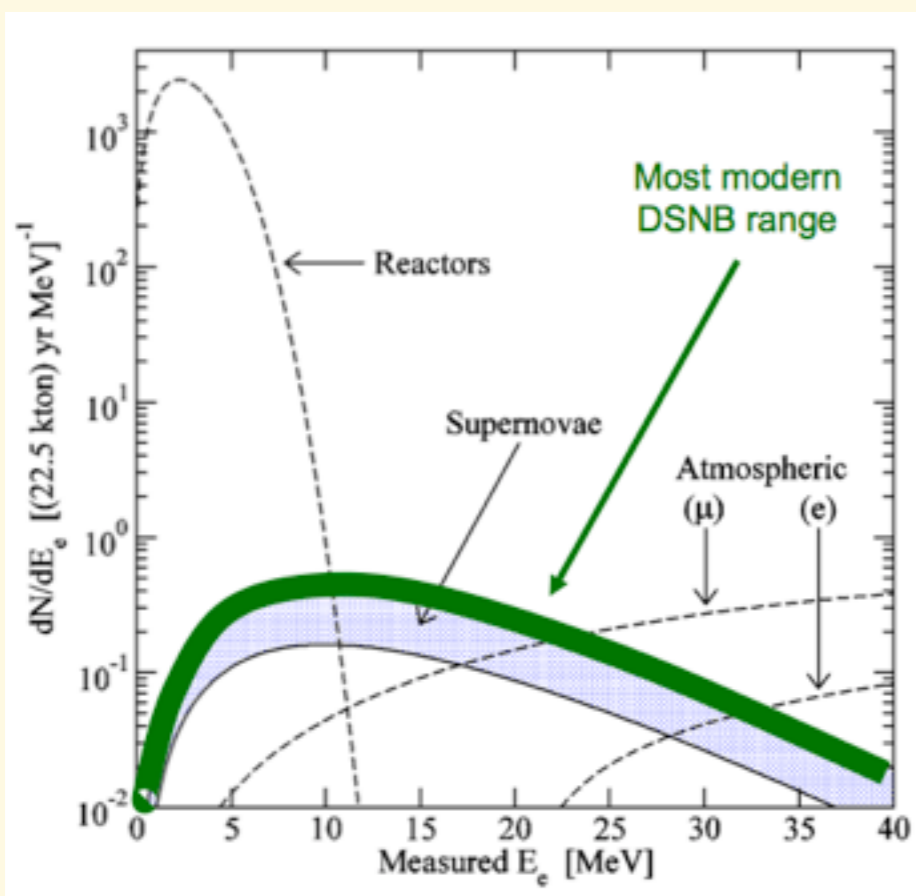
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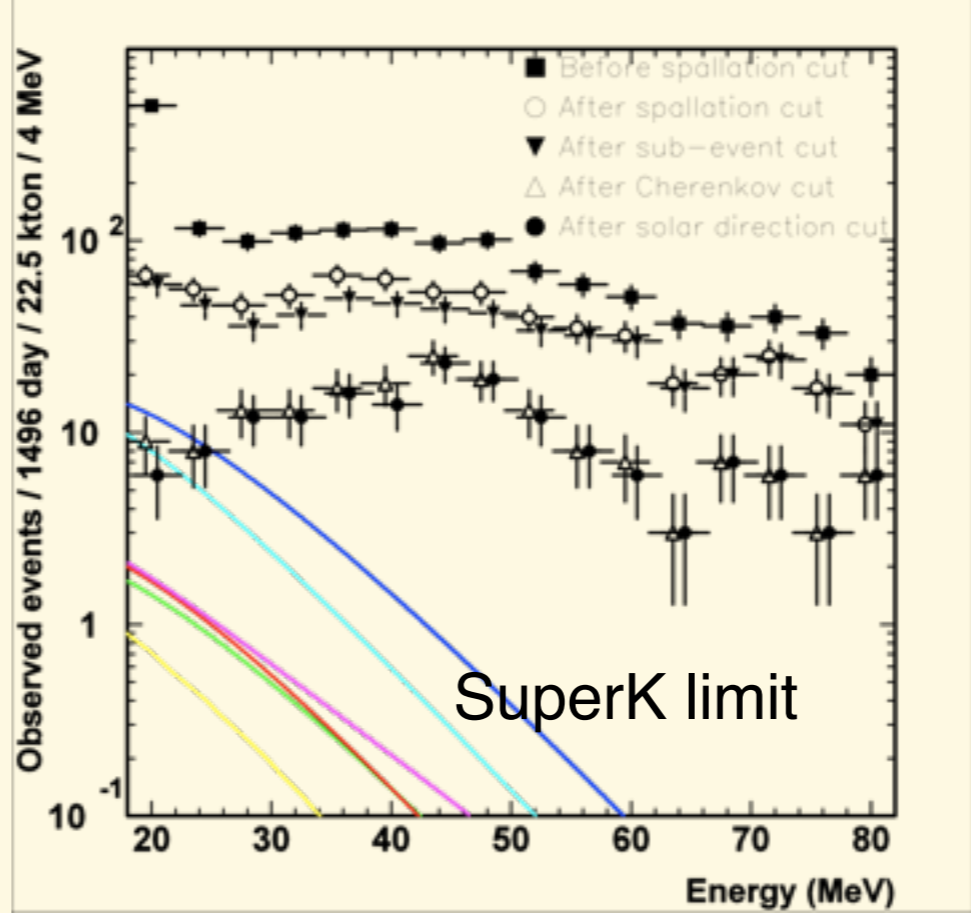
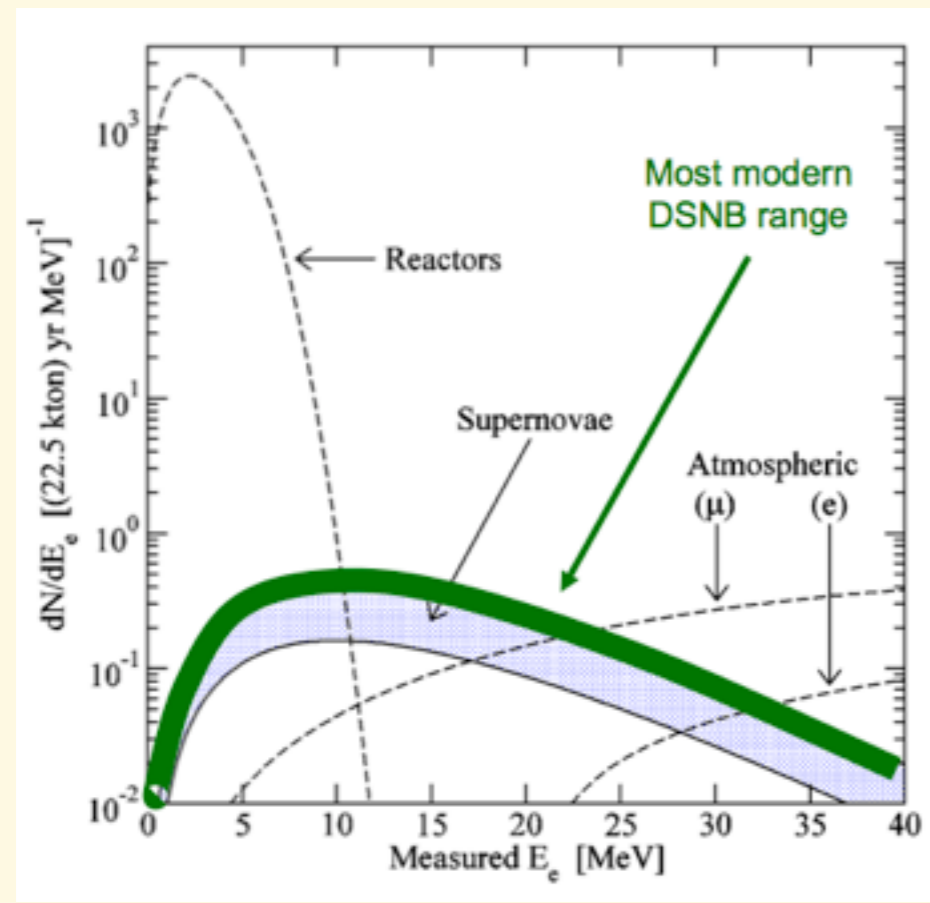
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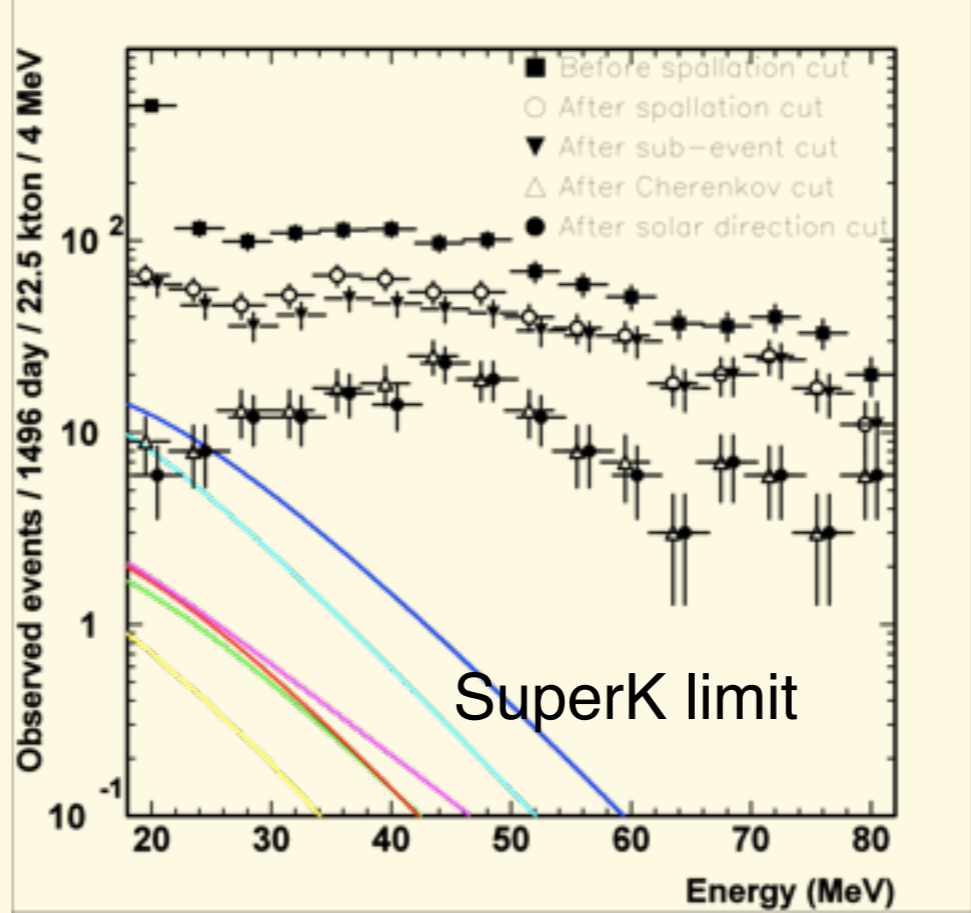
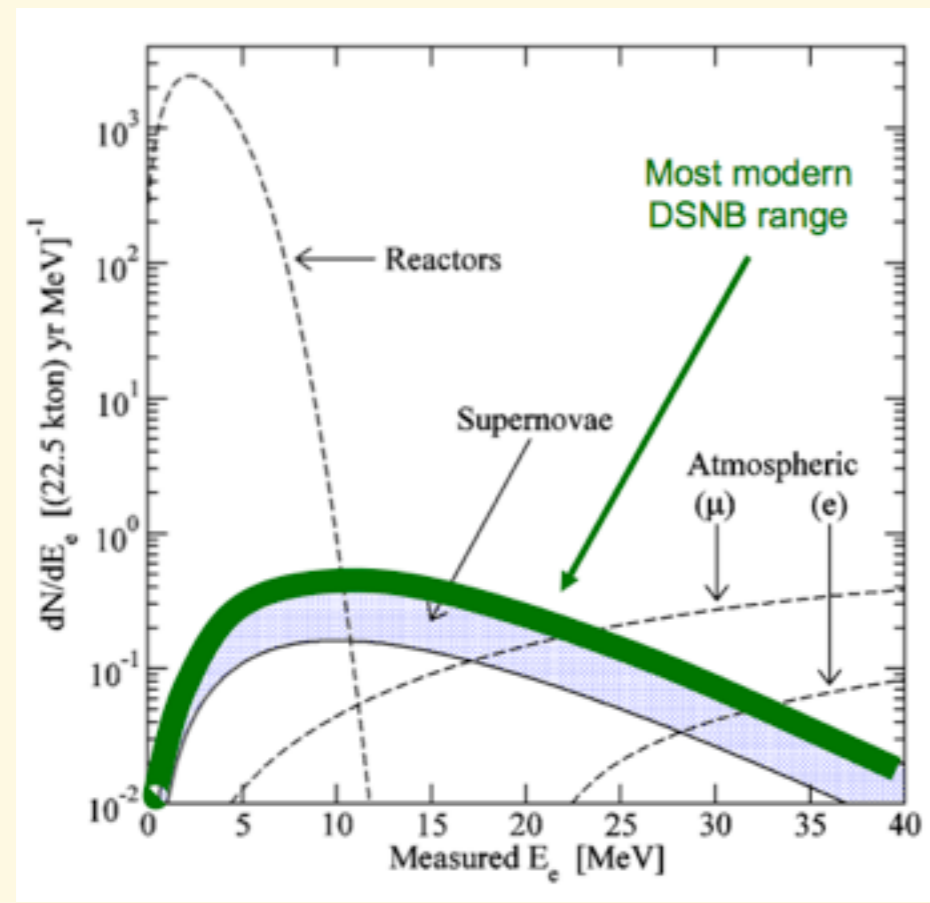
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Applications:

- SuperK
- HyperK
- DUSEL

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Searches for UHE ν 's

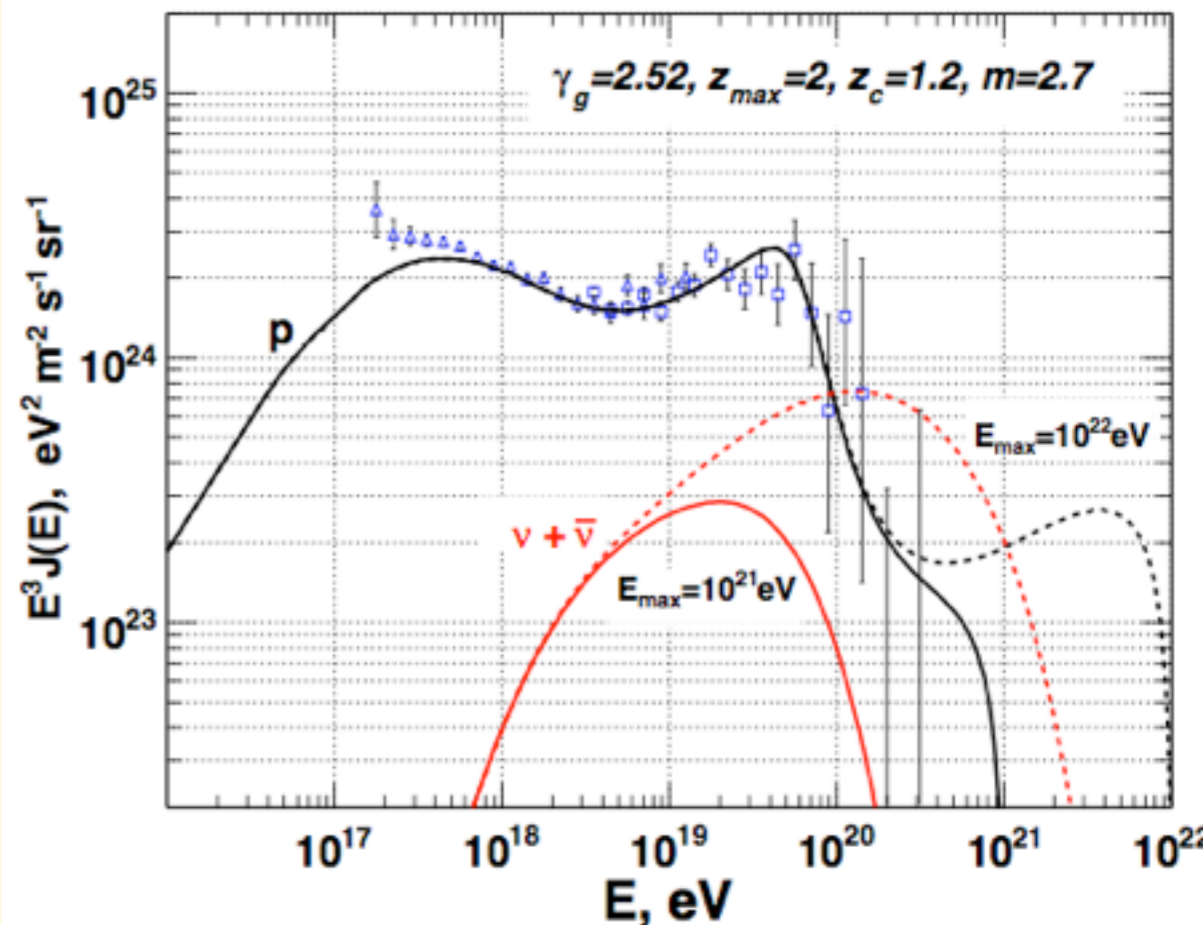
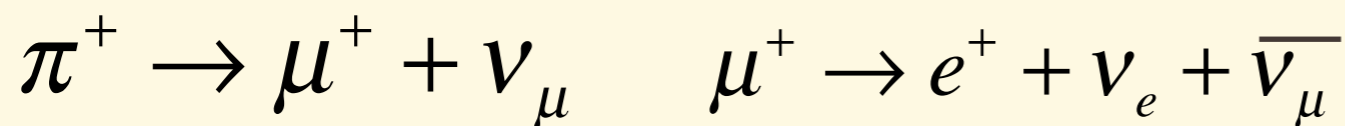




Searches for UHE ν 's



High Energy ν 's must be present because
of GZK mechanism

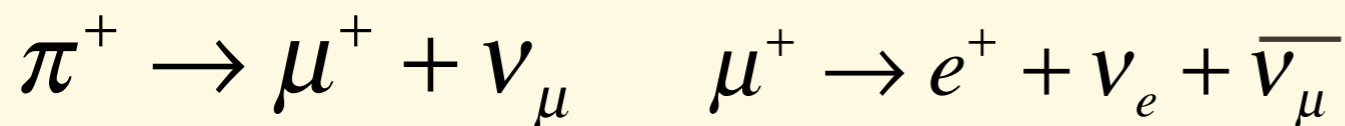
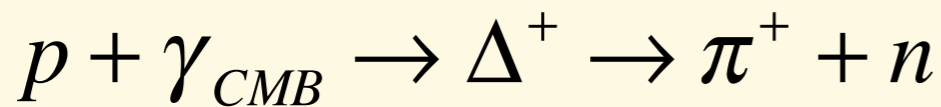




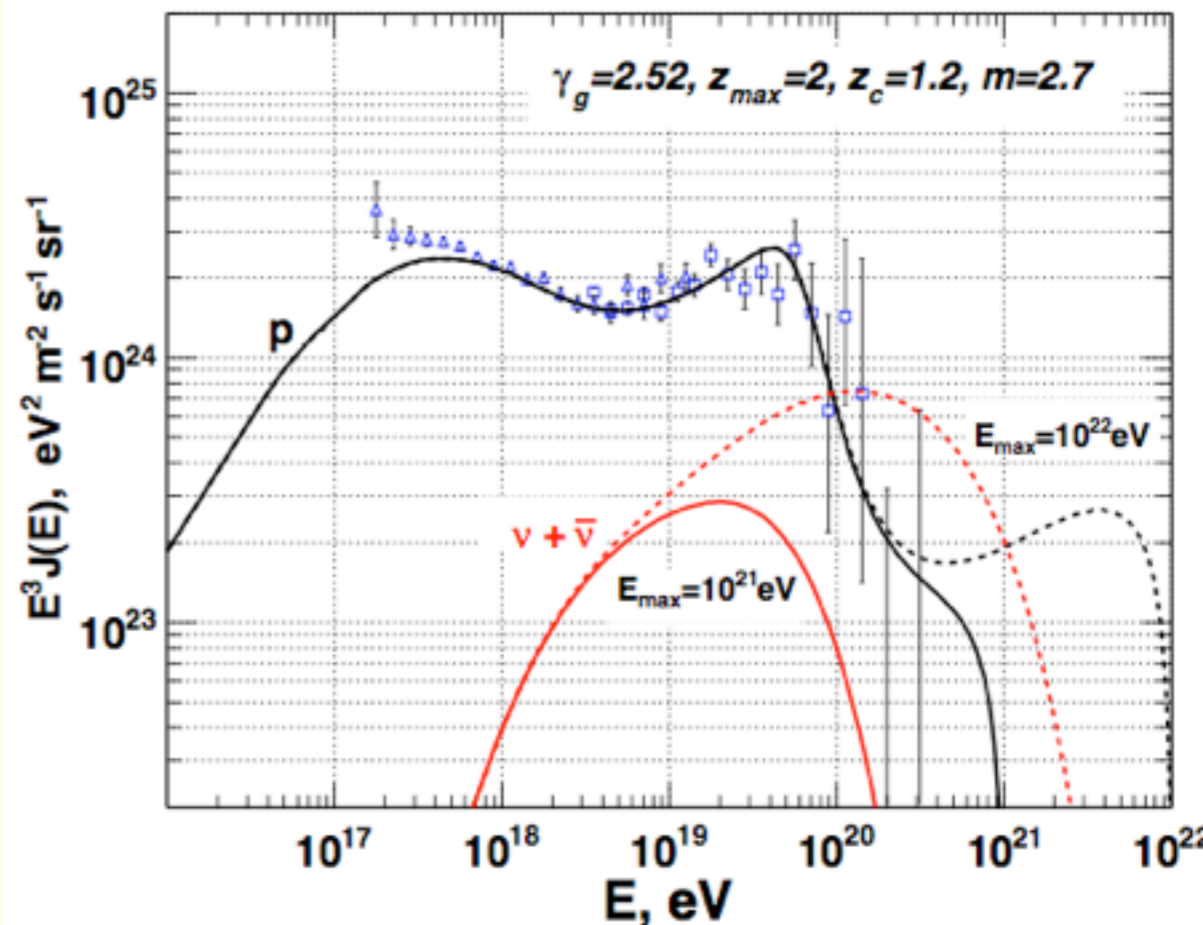
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There a number of potential high energy ν sources (AGN's, GRB's, etc) whose observation would be exciting

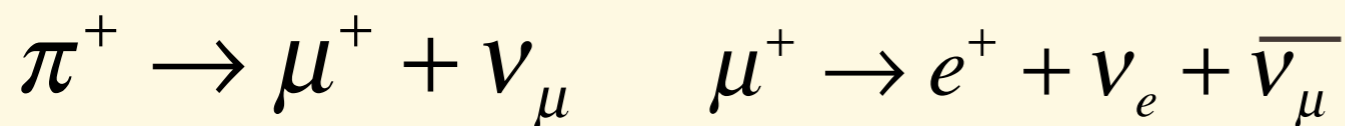
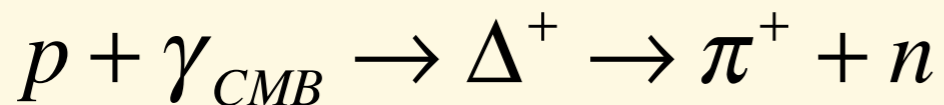




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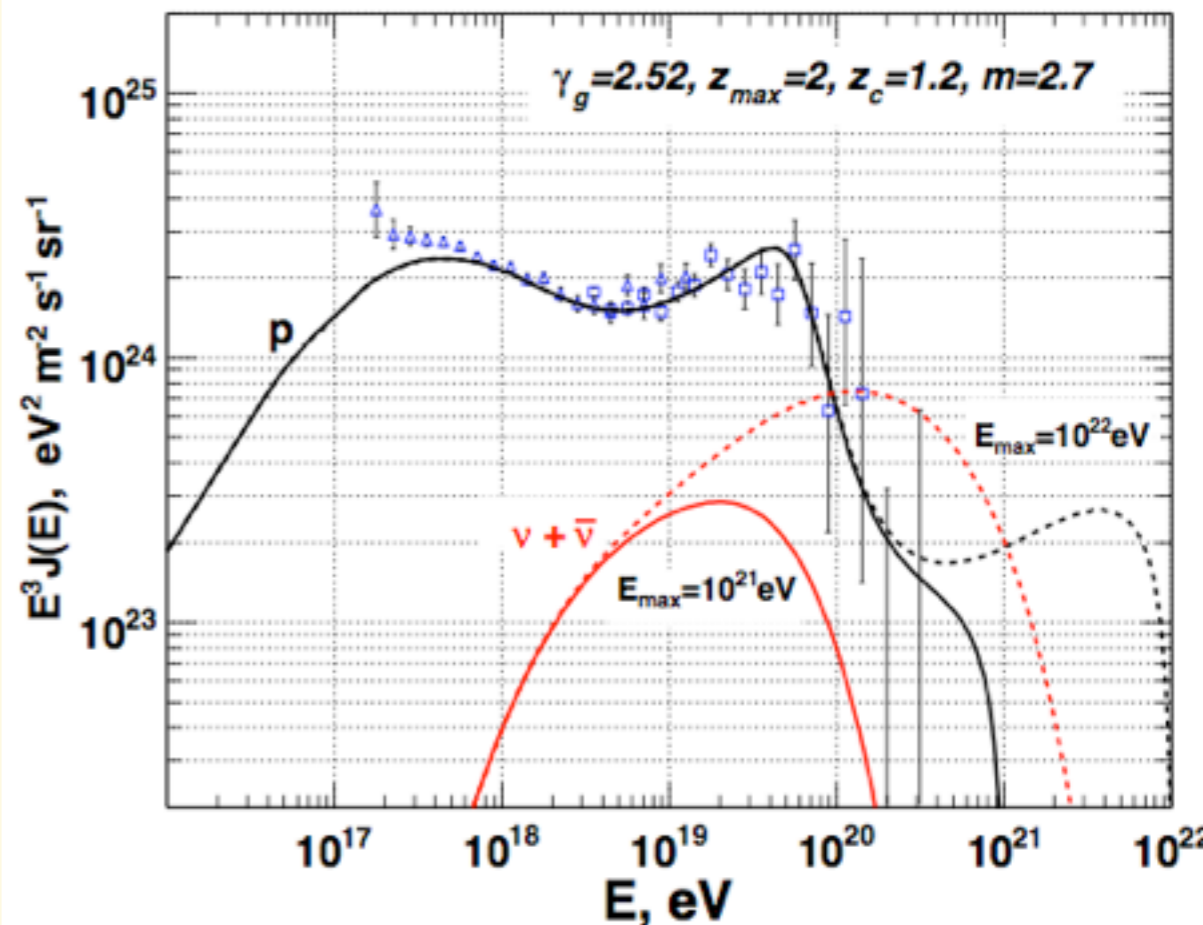
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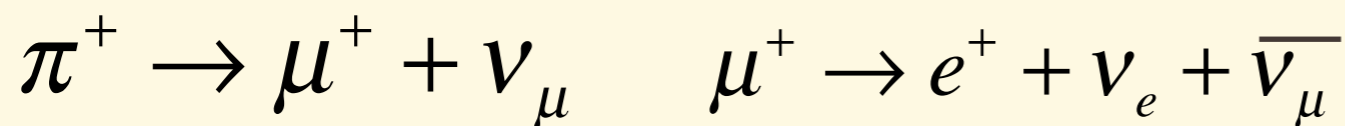
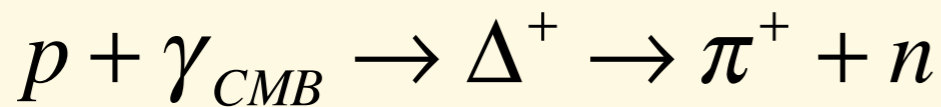




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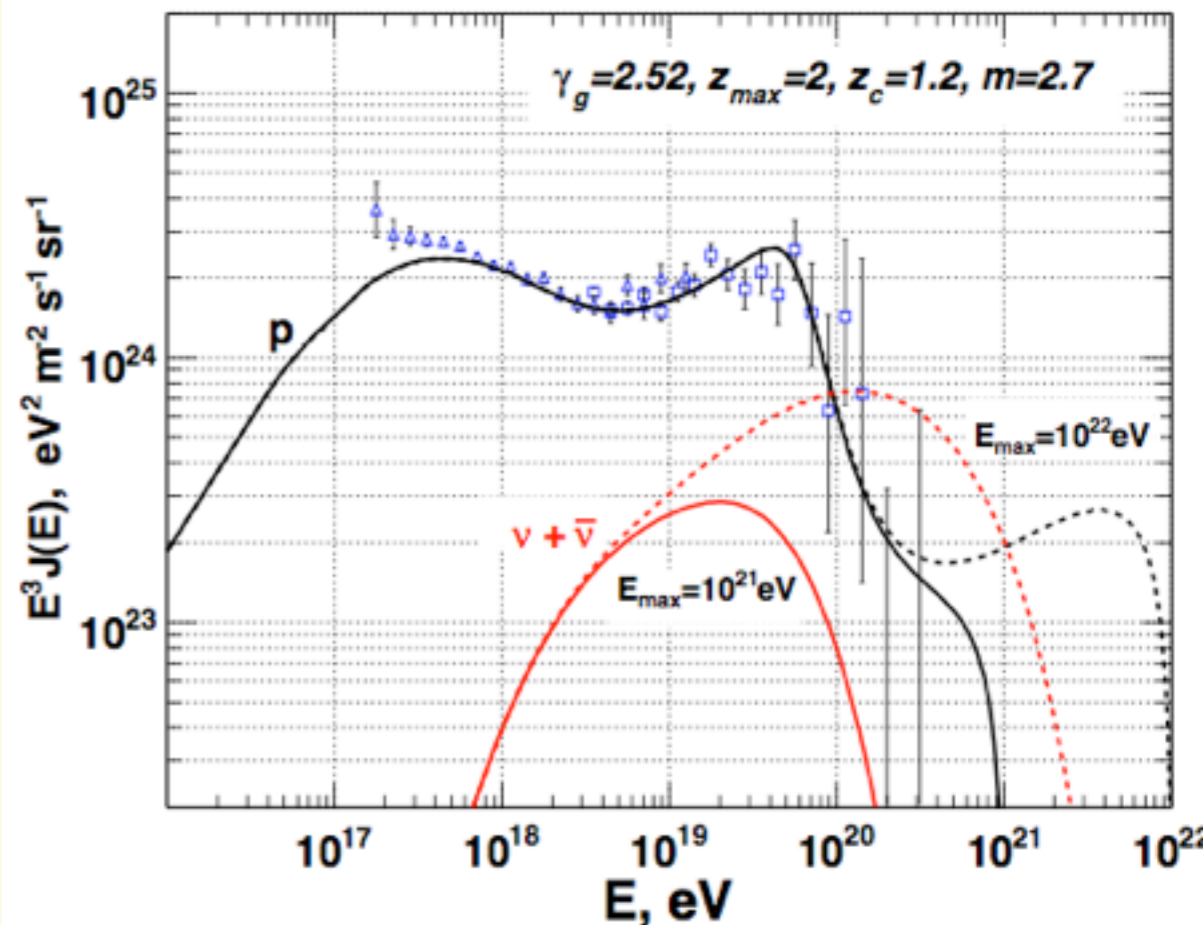


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Note: Earth stops being transparent to ν 's around 10^{16} eV





Neutrinos at the LHC





Ideas re ν mass?





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Favorite view: ν 's are Majorana particles; their mass is generated by some seesaw mechanism



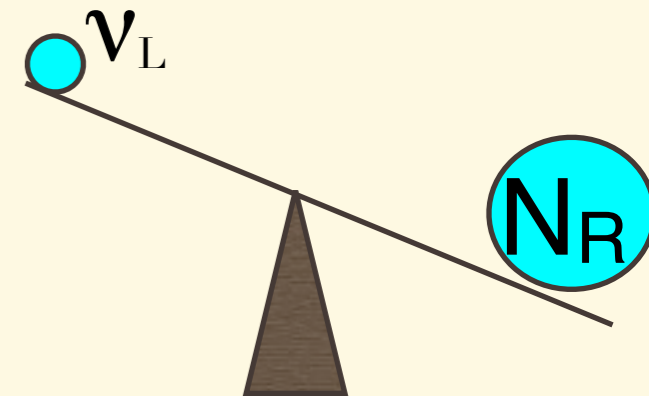
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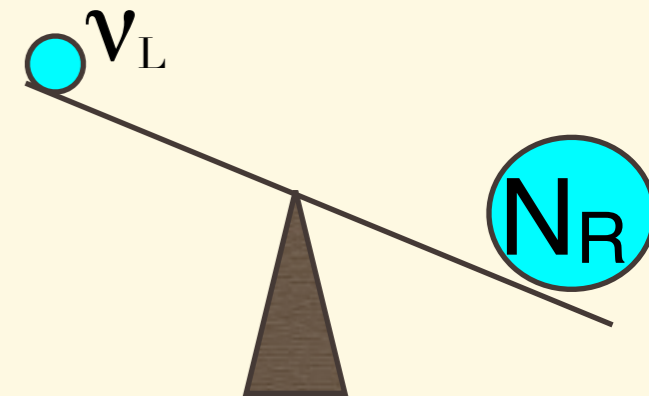
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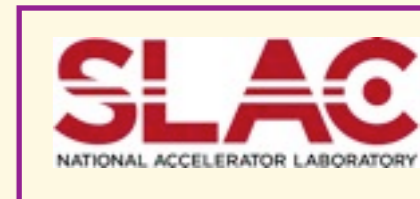
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In the original form, Y (Yukawa coupling) ~ 1 , M is the mass of heavy right handed neutrino (related to the GUT scale) and v is typical electro weak mass



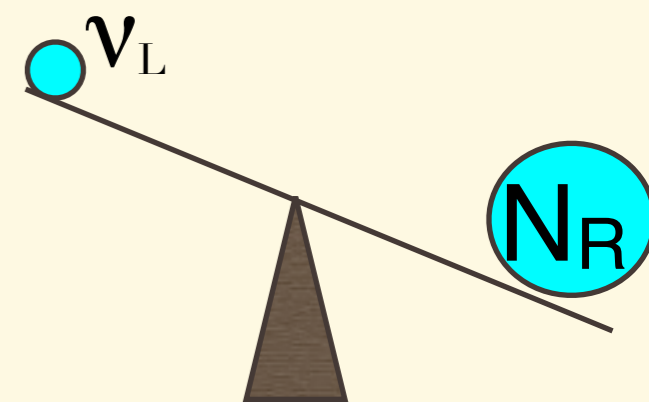
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Might be related to our existence -
LEPTOGENESIS



Other possibilities



Recently a lot of theoretical interest in exploring other models within this general scenario but with the high mass scale \sim TeV, ie observable at the LHC

Extended seesaw models have, instead of heavy new scalar, heavy scalar triplet (Type II seesaw)
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The signature would be observation of 2 like sign leptons



Practical Applications?

$v's \rightarrow \$, \pounds, \yen$



Few Typical Ideas





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Are neutrinos too esoteric to be practical?
Several ideas have been put forth in the past



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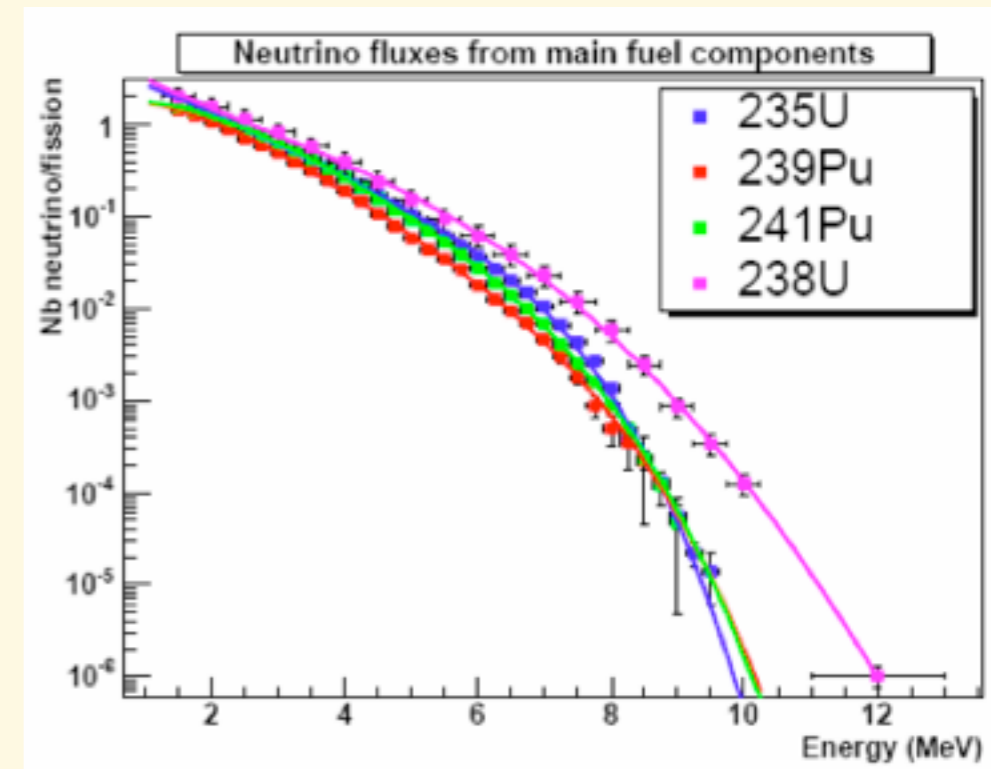


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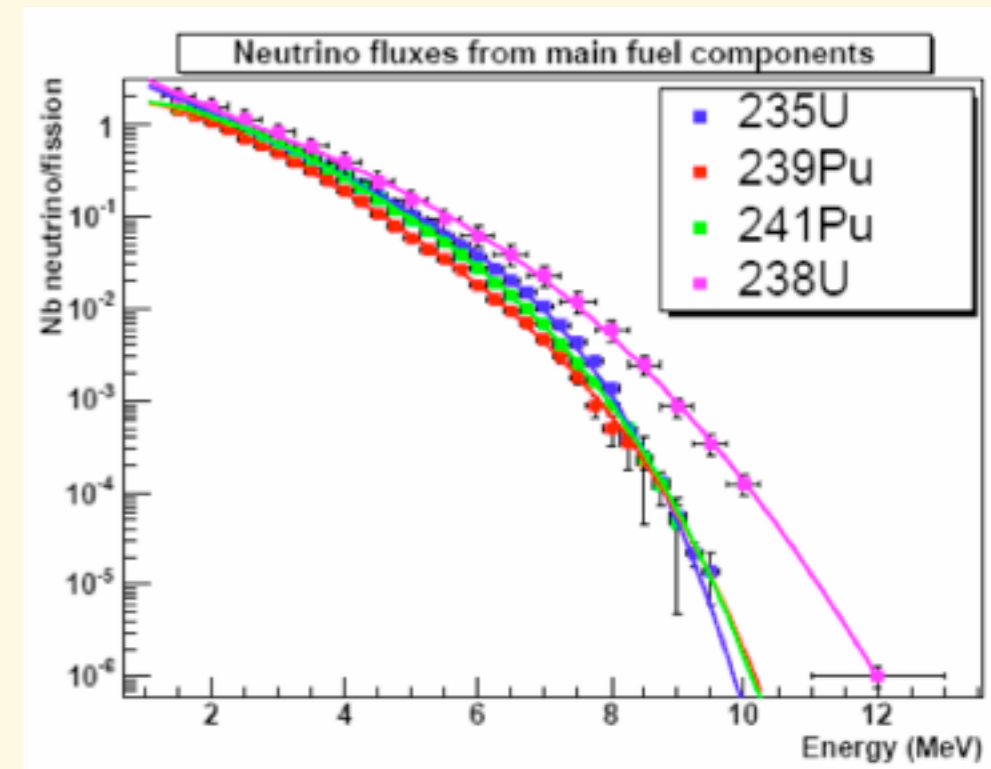
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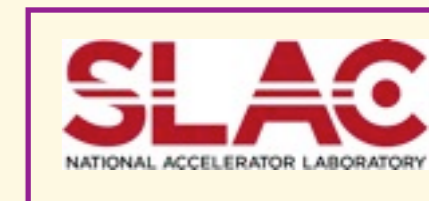
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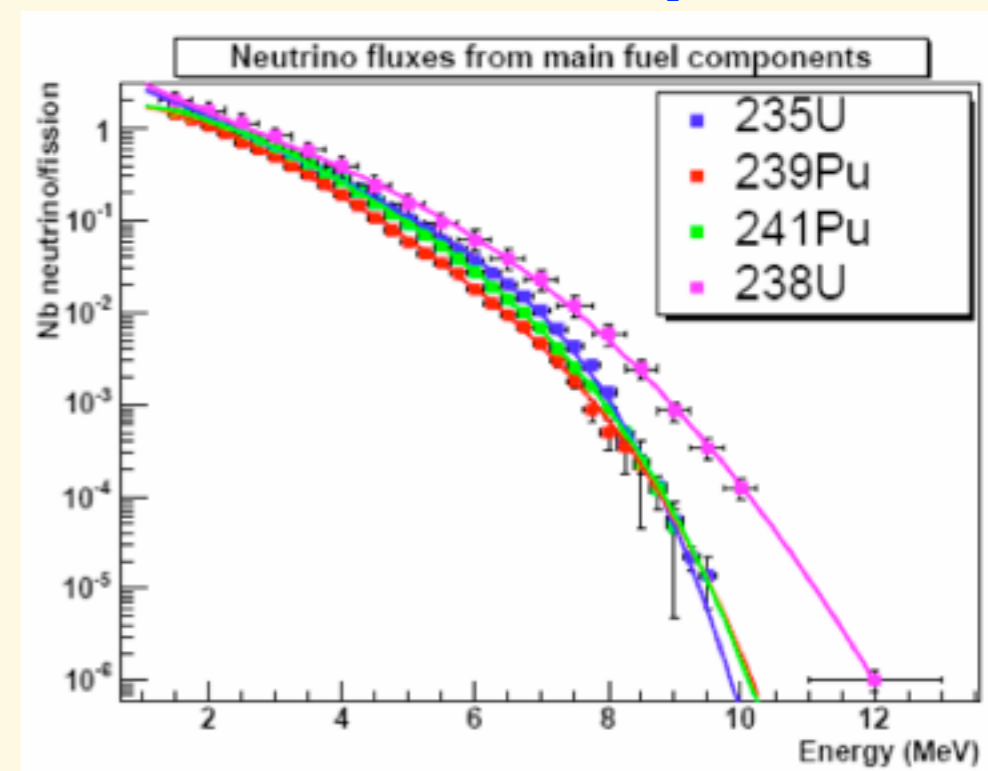
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c) Tomography of the earth, geological explorations

eg A.DeRujula, S.Glashow, R.R.Wilson and G.Charpak (1983)





ν 's and Other Sciences





- Impact on Cosmology, Astrophysics, Astronomy
 - Supernova Mechanisms
 - Early Supernova Warning
 - Solar Models
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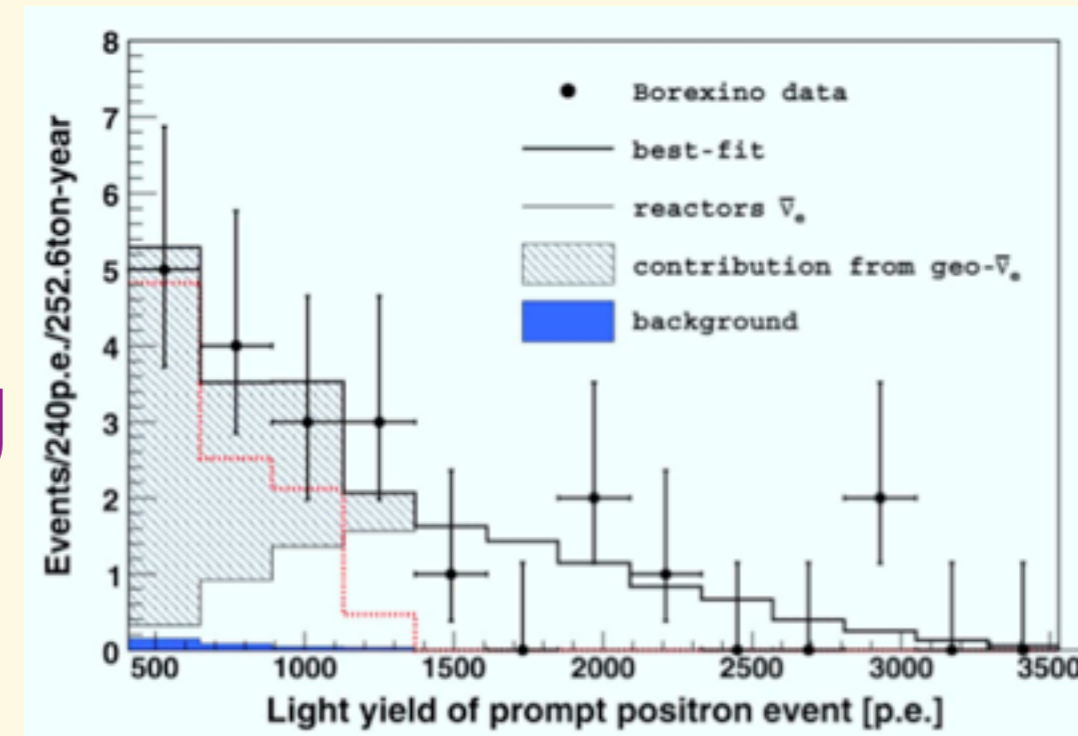


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Summary and What's Ahead in the Future



“people often overestimate what will happen in the next two years and underestimate what will happen in ten” - Bill Gates



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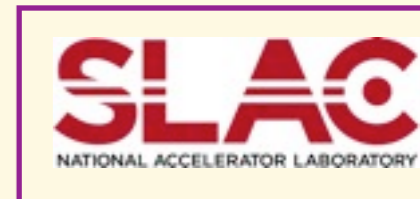
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- **Do we owe our existence to leptogenesis?**



Future Reactor Expts





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The Challenge

