

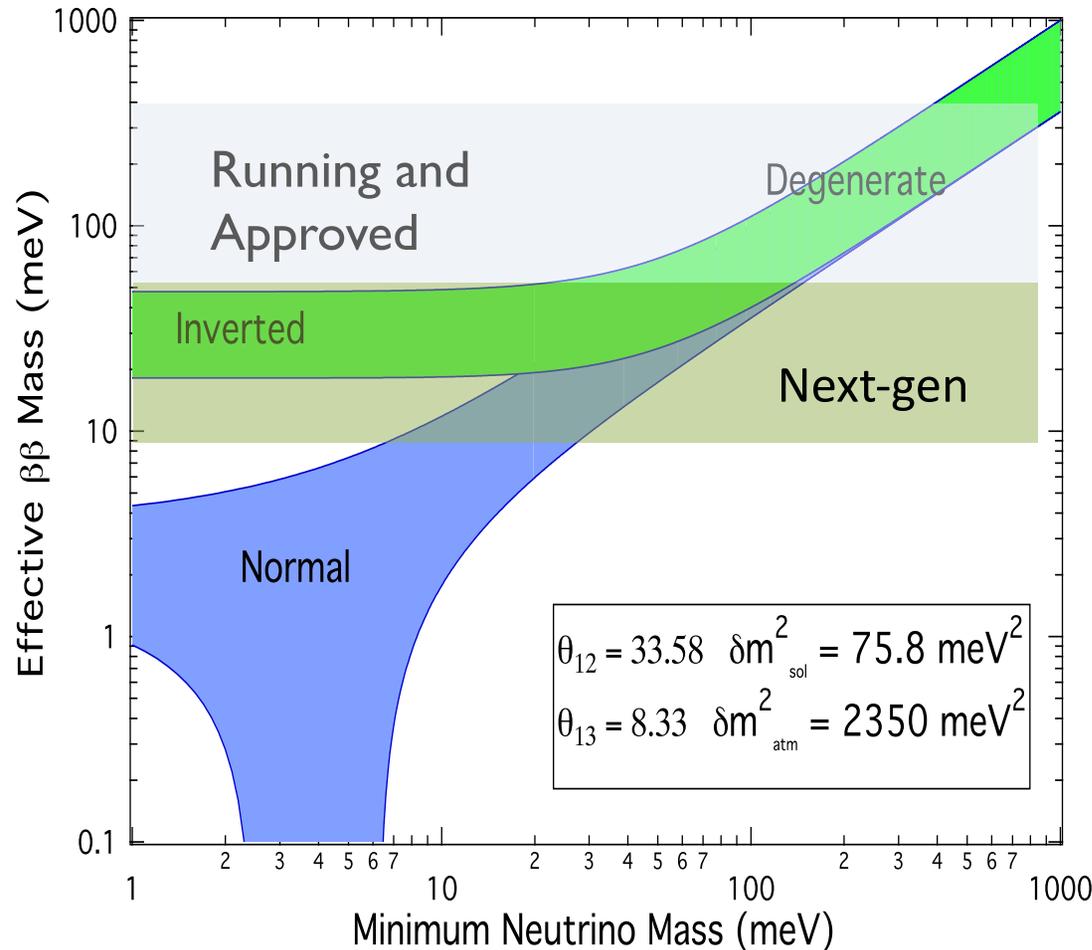
Nu2: Majorana vs. Dirac

Steve Elliott and Lisa Kaufman

Snowmass Neutrino Meeting @ SLAC

March 7, 2013

Goals for Next-Generation $0\nu\beta\beta$



- Majorana vs Dirac
- Absolute Neutrino Mass
- Lepton Number Violation

• Next-generation $\beta\beta$ experiments must cover the entire allowed region of the inverted hierarchy

• Ideas for probing the normal hierarchy exist

Several Experiments Running or Nearly Running to get down to 100 meV $m_{\beta\beta}$ -scale

- ^{136}Xe
 - EXO-200 and KamLAND-Zen currently running
 - Combined result: $m_{\beta\beta} < 120 - 250$ meV
 - NEXT to be running in 2014
- ^{76}Ge
 - GERDA running
 - MAJORANA DEMONSTRATOR coming online in the next few months
- Tellurium
 - CUORE0 online
 - CUORE online in 2015
- Selenium
 - SuperNEMO Demonstrator online in 2015
- Neodymium
 - SNO+ will come online in 2014

Several Ideas to Get US to the Inverted Hierarchy

- Several isotopes and several experiments to exploit them
 - Xenon
 - nEXO (Liquid Xe TPC)
 - NEXT (High pressure Xe Gas EL TPC)
 - KamLAND-Zen
 - Germanium
 - MAJORANA/GERDA
 - Tellurium
 - CUORE/Enriched CUORE
 - Selenium
 - SuperNEMO
 - Molybdenum
 - MOON
 - Neodymium
 - SNO+/Enriched SNO+

Theory Issues for $0\nu\beta\beta$

- Support for nuclear theory effort on matrix elements
 - Auxiliary measurements to support understanding the matrix elements
- Support for particle physics theory efforts on exchange mechanism

From Michael Salamon at DURA Meeting this week.

DOE Double Beta Decay: Comments

- DOE/Nuclear Physics is the steward for next-generation double beta decay experiments at DOE.
- DOE/HEP, however, is supporting EXO-200 for historical reasons, along with DOE/NP research and NSF support
- DOE/HEP (along with NSF) also is supporting all the R&D activities for the proposed 1-tonne scale next generation EXO, “nEXO.”
- DOE/HEP and NP will establish a joint process to determine a selection process that involves both HEP and NP communities.
- After the time of selection, DOE/NP will become the sole DOE office supporting next-generation DBD projects.

A significant amount of the **technologies** and **facilities** used for double-beta decay overlap with the dark matter community, funded by DOE HEP.