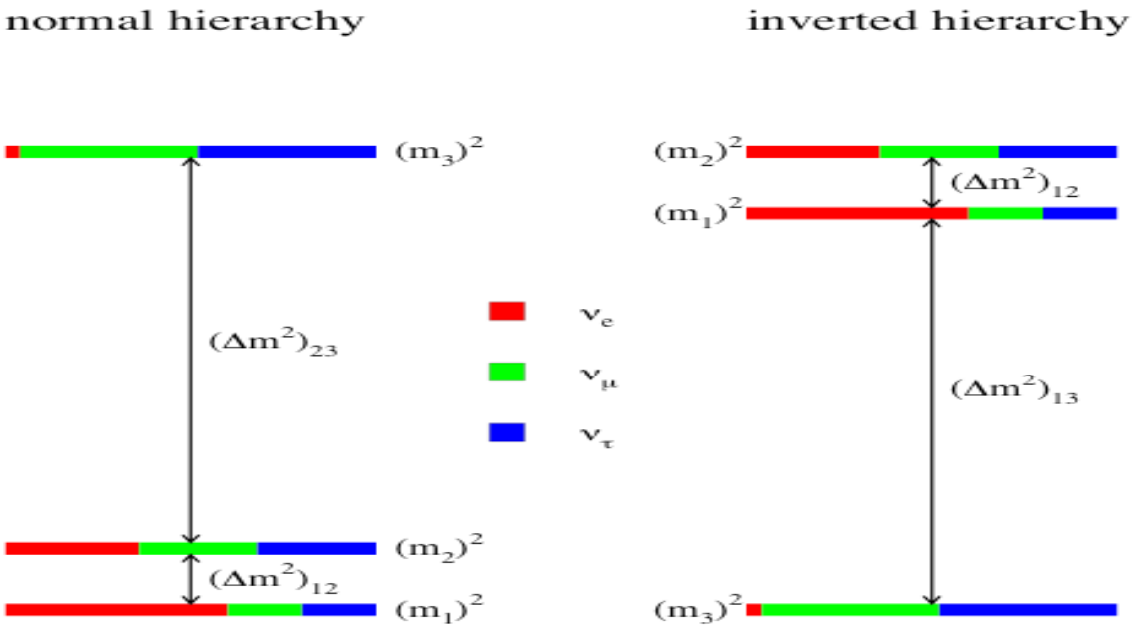
?’s

Are we right to feel so confident ?

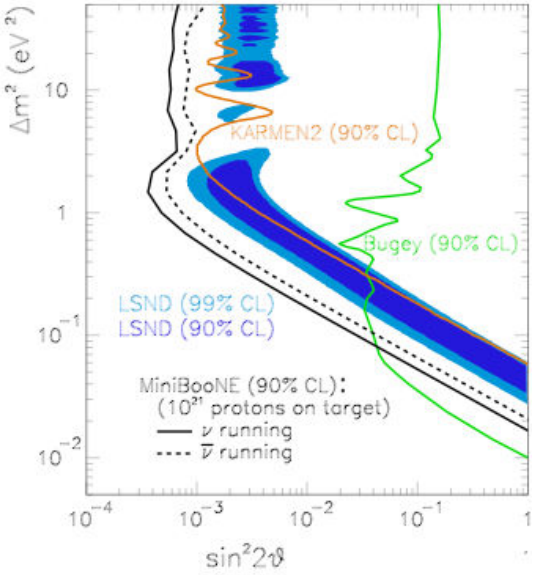
Standard 3ν scenario



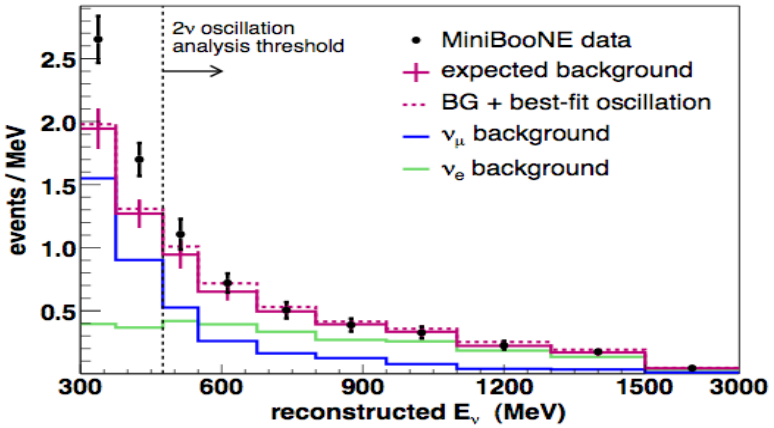
Masses	Angles	CP-phases
$m_1^2 < m_2^2, m_3^2$	$\theta_{12}, \theta_{23}, \theta_{13}$	$\delta, \alpha_1, \alpha_2$

Para ver esta película, debe disponer de QuickTime™ y de un descompresor TIFF (sin comprimir).

LSND anomaly:



MiniBoone anomaly:



Gallium anomaly: R = 0.88(5)

Even if not the whole story…a good parame.

θ_{13}

δ

Hierarchy

sign($\cos\theta_{23}$)

Precise ν oscillations experiments

α_1, α_2

$\beta\beta0\nu$

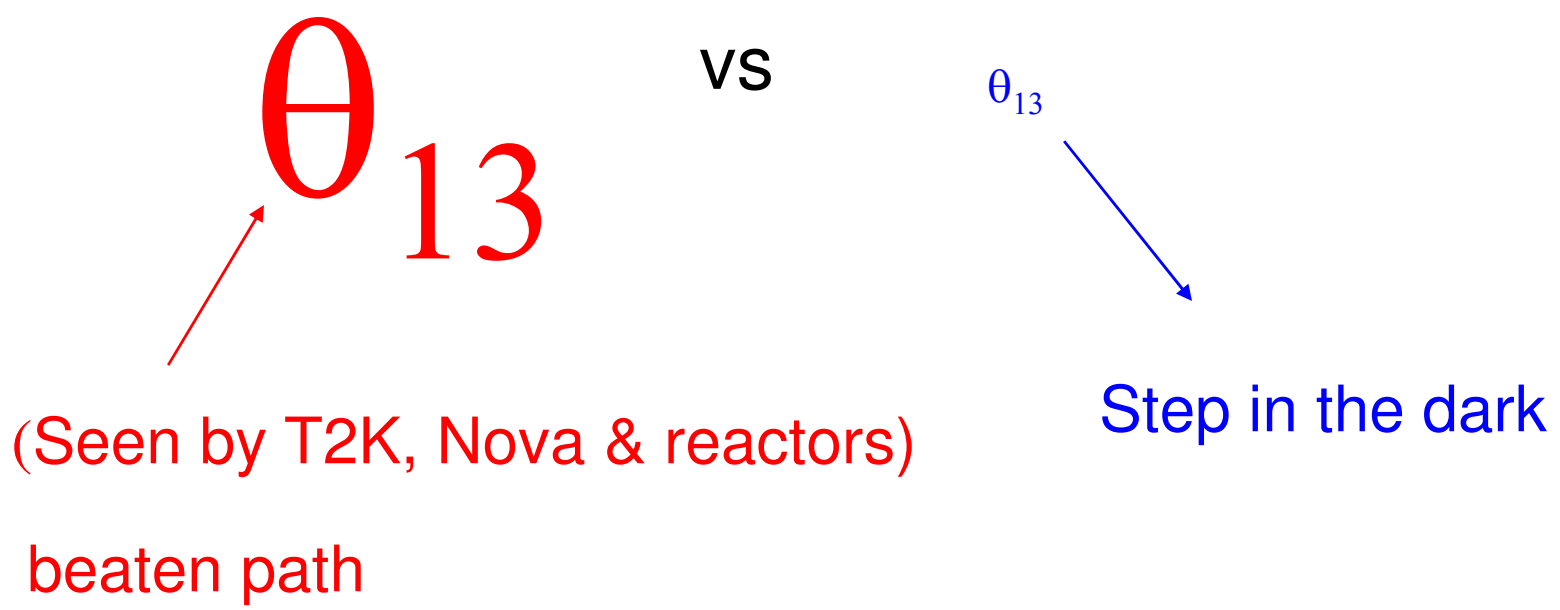
m^2_1, m^2_3

$\beta\beta0\nu$, $\beta\beta$

Cosmology

Majorana & L

$\beta\beta0\nu$


θ13
vs
θ13
(Seen by T2K, Nova & reactors)
beaten path
Step in the dark

θ_{13} ?

Discovery: CP violation + hierarchy

Would a superbeam e-g. T2HK, T2KK be enough ?
Do we need better beams ? Can we afford them ?

Less powerfull accelerators, one baseline,
better detectors: Low-energy Nufact (T. Li)
Low-γ $\beta\beta$ different ions (A. Donini)

Completely new ways ? Mossbauer neutrinos (S. Parke)

θ_{13} / from discovery to precision

Ultimate Nufact of $\beta\beta$ facilities

θ_{13} is this a no-lose game ?

θ_{13} =0 mathematically consistent…

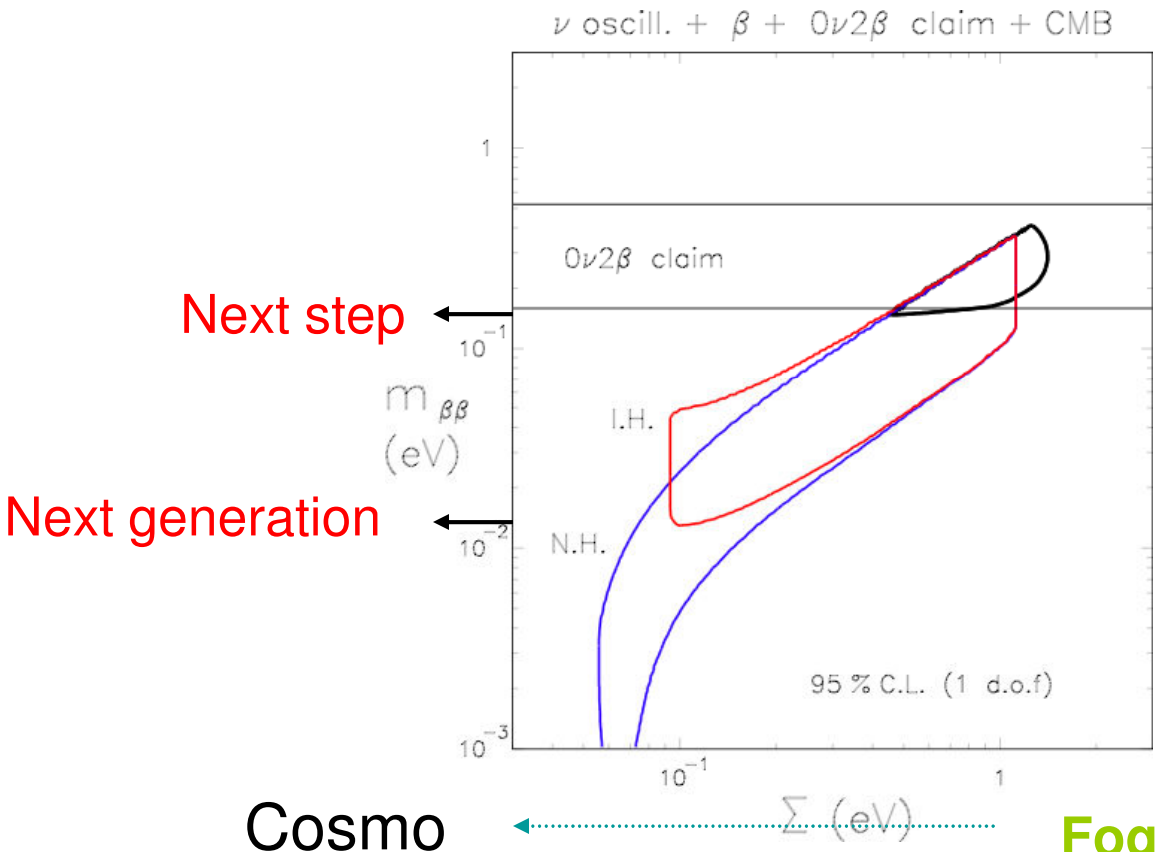
Would we learn something from bounding it below some level ?

Precision: How much more do we want beyond that needed to do the discoveries ? Theory of ν masses ?

Feed back to other areas improved by precision ?

Leptogenesis ?
Cosmo, large scale structure ?
Supernova dynamics ?

If we had to single out the most Fundamental question: Majorana nature ?



Next step

Next generation

Cosmo

Fogli, et al

$$|m_{ee}| = |c_{13}^2(m_1 c_{12}^2 + m_2 e^{i\alpha} s_{12}^2) + m_3 e^{i\beta} s_{13}^2|$$

Keep an eye on new alternatives

Neutrino mass with radioactive ions ? B. McElrath

Neutrino mass hierarchy with reactors ? S. Petcov

What we really would like to know is…

What the hell are the opposite helicity neutrino states ?

Whatever they are, they constitute a pretty dark sector of the SM …

Most popular models: large-scale seesaw ->
not much low-energy pheno beyond ν masses

Other theoretically-motivated generic possibilities with richer pheno ? B. Gavela's talk