Bounds on Right Handed Neutrino Parameters from Observable Leptogenesis*

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*arXiv:2207.01651

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The Baryon Asymmetry (BAU) via oscillations of heavy neutral leptons (HNLs) can be **testable!**

Analytical Understanding of the Minimal Model with 2 HNLs

BAU ↔ Sakharov conditions

Weak modes are possible even if $\Gamma > H$ ==> relevant region for SHiP & FCC-ee!

Weak (flavour) Washout	Damped Oscillations in Strong Washout	Weak LNV Washout (Majorana character)
$\Gamma_\alpha^{slow} = \epsilon_\alpha \Gamma \lesssim H$	$\Gamma_{osc}^{slow} \simeq P_{osc}\Gamma \lesssim H$	$\Gamma_M^{slow} = \left(\frac{M}{T_{EW}}\right)^2 \Gamma \lesssim H$
Upper bound on U^2	**LOWER** bound on U^2	Upper bound on U^2
Mixing of light-to-heavy sector		

Perturbative solution of kinetic equation leads to e.g. $Y_B \simeq \Delta_{LNC}^{osc(\alpha)} \chi \left(\gamma_0^2 \kappa - \frac{4\gamma_0^3 \kappa}{4\gamma_0 + 2\gamma_1 \kappa} \exp\left(- \int_0^x d\bar{x}\, \Gamma_M^{slow} \right) \right)$

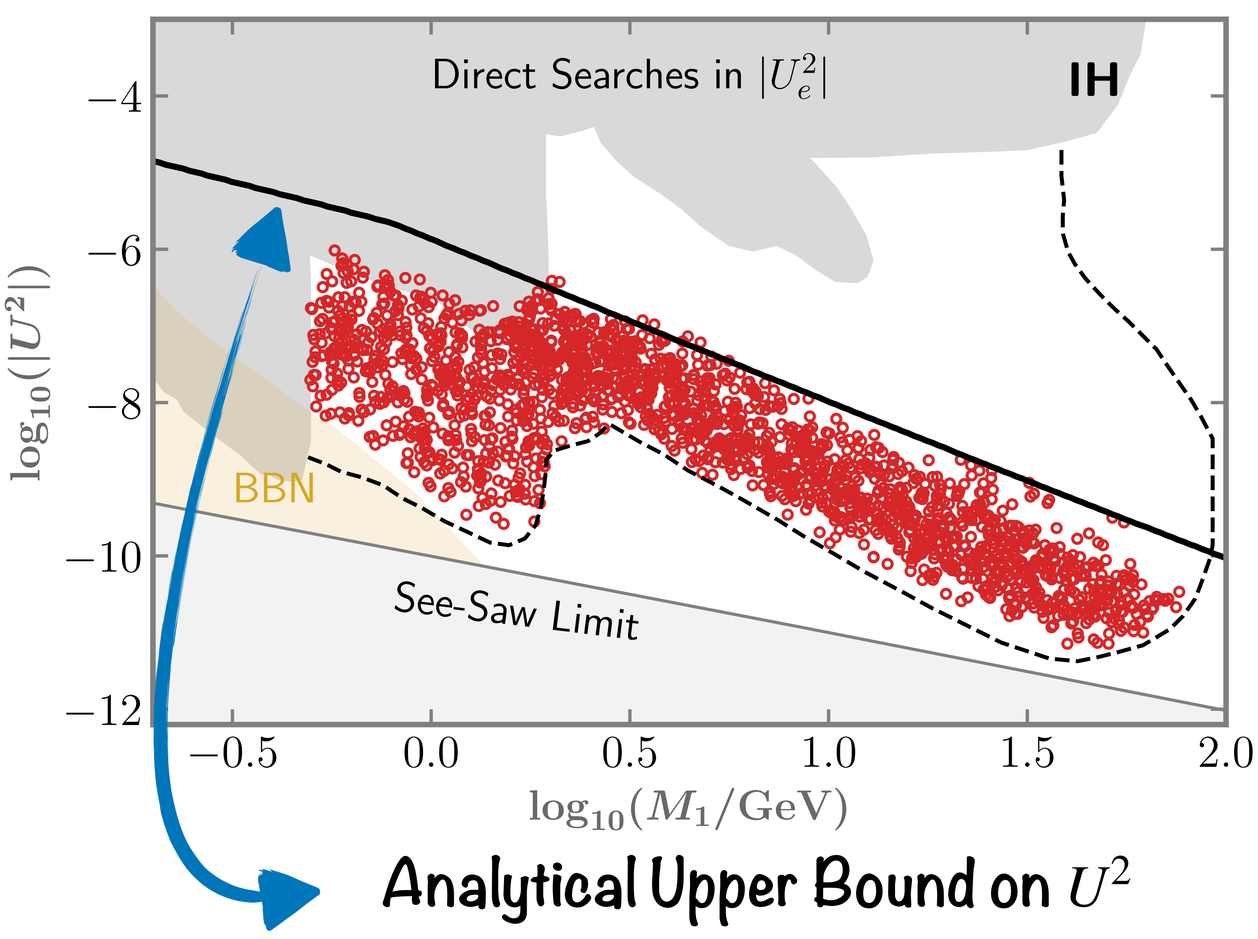
CP basis invariants

encode all Yukawa & Majorana couplings! Translation to measurable quantities, depending on the light neutrino hierarchy – for example in NH

$$\Delta_{LNC}^{osc(\alpha)} \simeq \xi / v^4 \Delta_M^{-2/3} U^2 M^3 \sqrt{\Delta m_{sol}^2}\, \sin^2(\theta_{12}) \sin\theta$$

Observable Consequences from BAU Generation

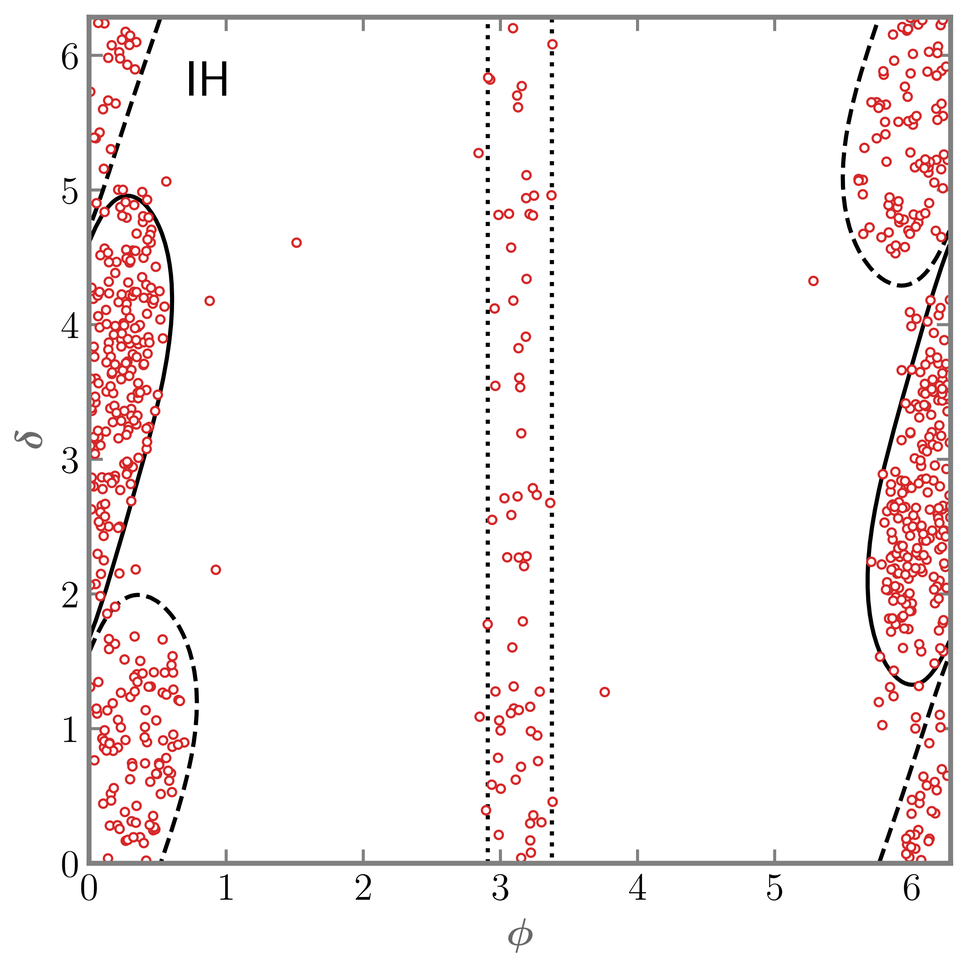
Global result for unknown ΔM



Analytical Upper Bound on U^2

Maximal mixing is achieved for highly degenerate HNLs via damped oscillations

Quasi Non-Degenerate HNLs with $\Delta M/M = 10^{-2}$



Possible detection within FCC-ee → Striking flavour composition and correlation among CP phases of the UPMNS