

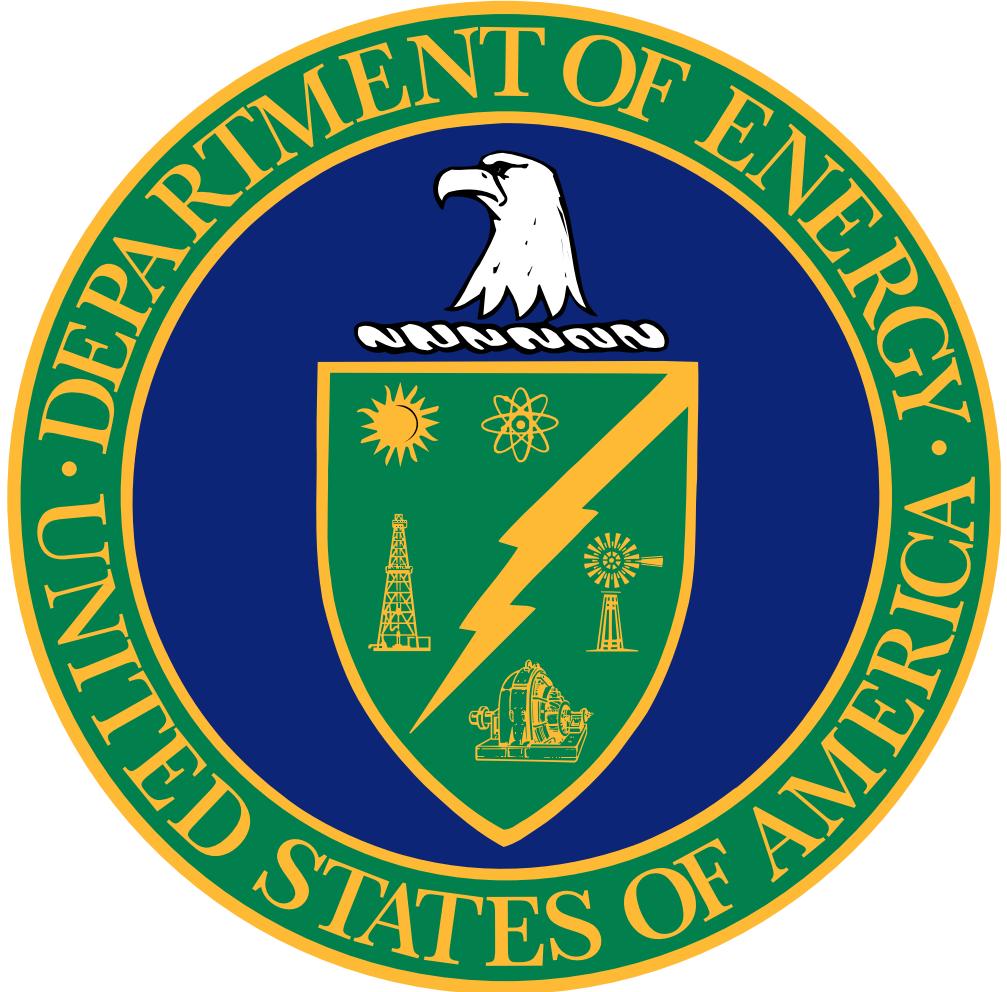
Leptogenesis from the Asymmetric Texture

Moinul Hossain Rahat

Institute for Fundamental Theory, Department of Physics, University of Florida

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C.S. Fong, MHR, S. Saad, arXiv:2103.14691 [hep-ph]



The Asymmetric Texture

- The **minimal Yukawa texture** based on $SU(5)$ GUT that explains GUT-scale mass ratios and mixings of quarks and leptons:

$$Y^{(\frac{2}{3})} \sim \text{diag}(\lambda^8, \lambda^4, 1),$$

$$Y^{(-\frac{1}{3})} \sim \begin{pmatrix} \lambda^4 & \lambda^3 & \lambda^3 \\ \lambda^3 & \lambda^2 & \lambda^2 \\ \lambda & \lambda^2 & 1 \end{pmatrix}, Y^{(-1)} \sim \begin{pmatrix} \lambda^4 & \lambda^3 & \lambda \\ \lambda^3 & -3\lambda^2 & \lambda^2 \\ \lambda^3 & \lambda^2 & 1 \end{pmatrix},$$

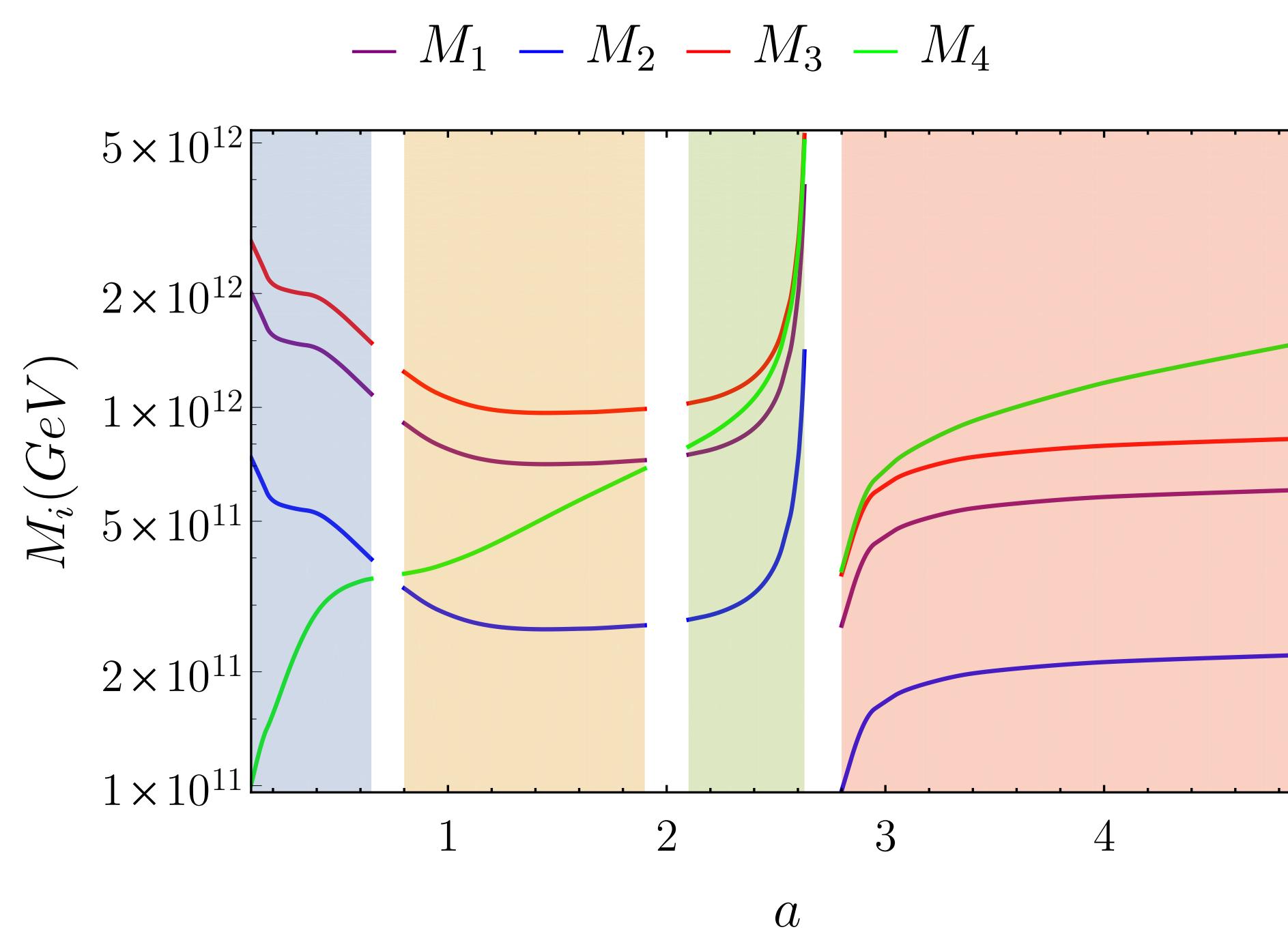
$$\mathcal{U}_{\text{Seesaw}} = \text{diag}(1, 1, e^{i\delta}) \mathcal{U}_{\text{TBM}},$$

$\lambda \simeq 0.23$ is the Wolfenstein parameter and $\cos \delta = 0.2$.

- The origin of the texture is traced back to an $SU(5) \times T_{13}$ model.
- Requires **four** right-handed neutrinos and predicts **normal ordering** of neutrino masses: $|m_{\nu_1}| = 27.6, |m_{\nu_2}| = 28.9, |m_{\nu_3}| = 57.8$ meV
- The only source of CP violation, the TBM phase, yields δ_{CP} consistent with PDG.

High Scale Leptogenesis

Flavored leptogenesis is successful in non-resonant regime.



Key Findings

Nonresonant Leptogenesis

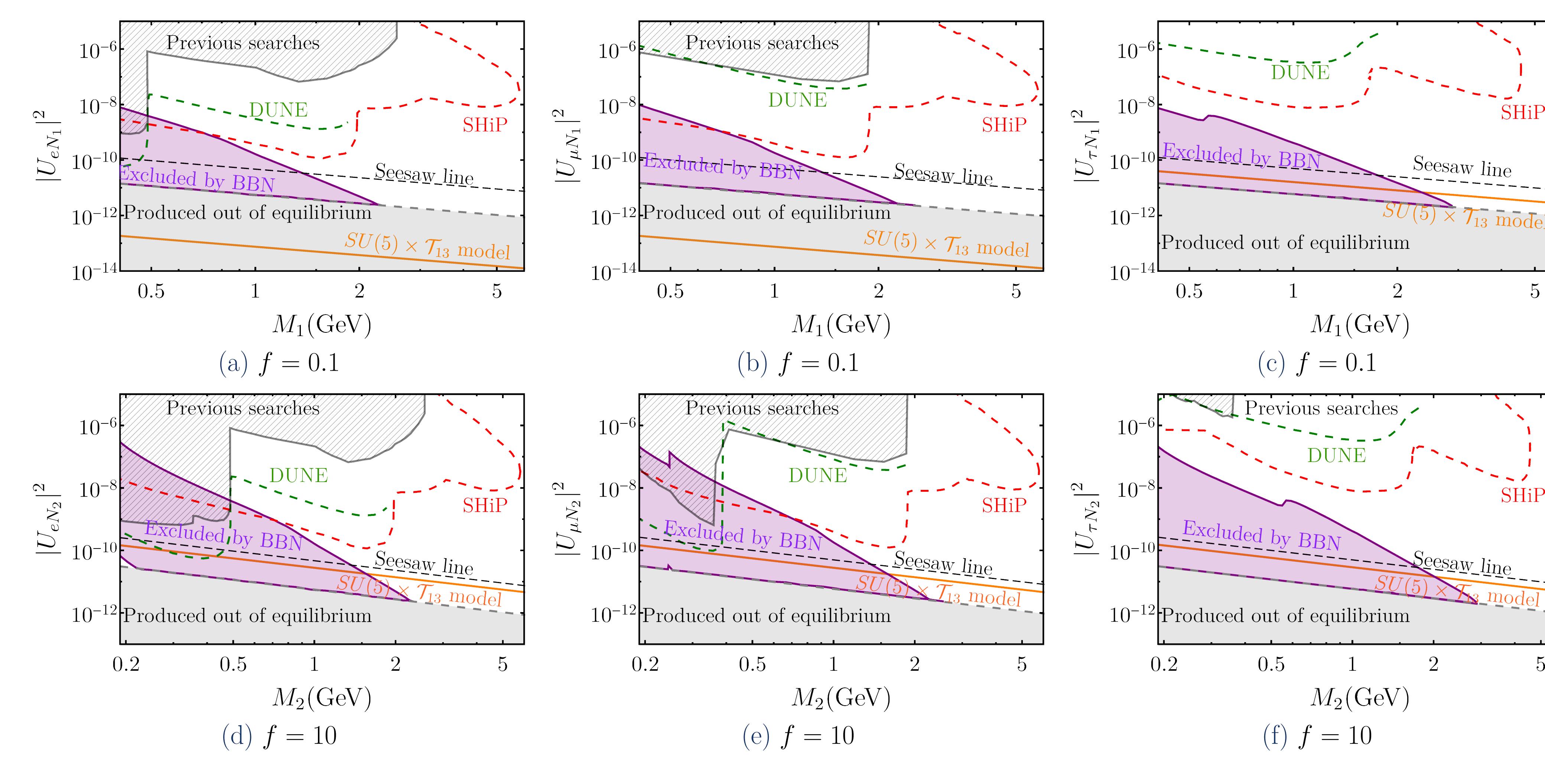
- No unflavored leptogenesis, flavored leptogenesis requires right-handed neutrino masses $\mathcal{O}(10^{11-12})$ GeV
- Dirac CP phase consistent with global fits $1.27\pi < \delta_{CP} < 1.35\pi$, yields positive baryon asymmetry for all heavy neutrino mass orderings

Resonant Leptogenesis

- Nontrivial upper bound on right-handed neutrino mass because of washout by lighter neutrinos
- Minimum right-handed neutrino mass $\mathcal{O}(1)$ GeV, mixing parameters close to the sensitivity of DUNE

Experimental Constraints on Active-Sterile Mixing

Low-scale right-handed neutrino masses in resonant leptogenesis are sensitive to search for heavy neutral leptons in DUNE.

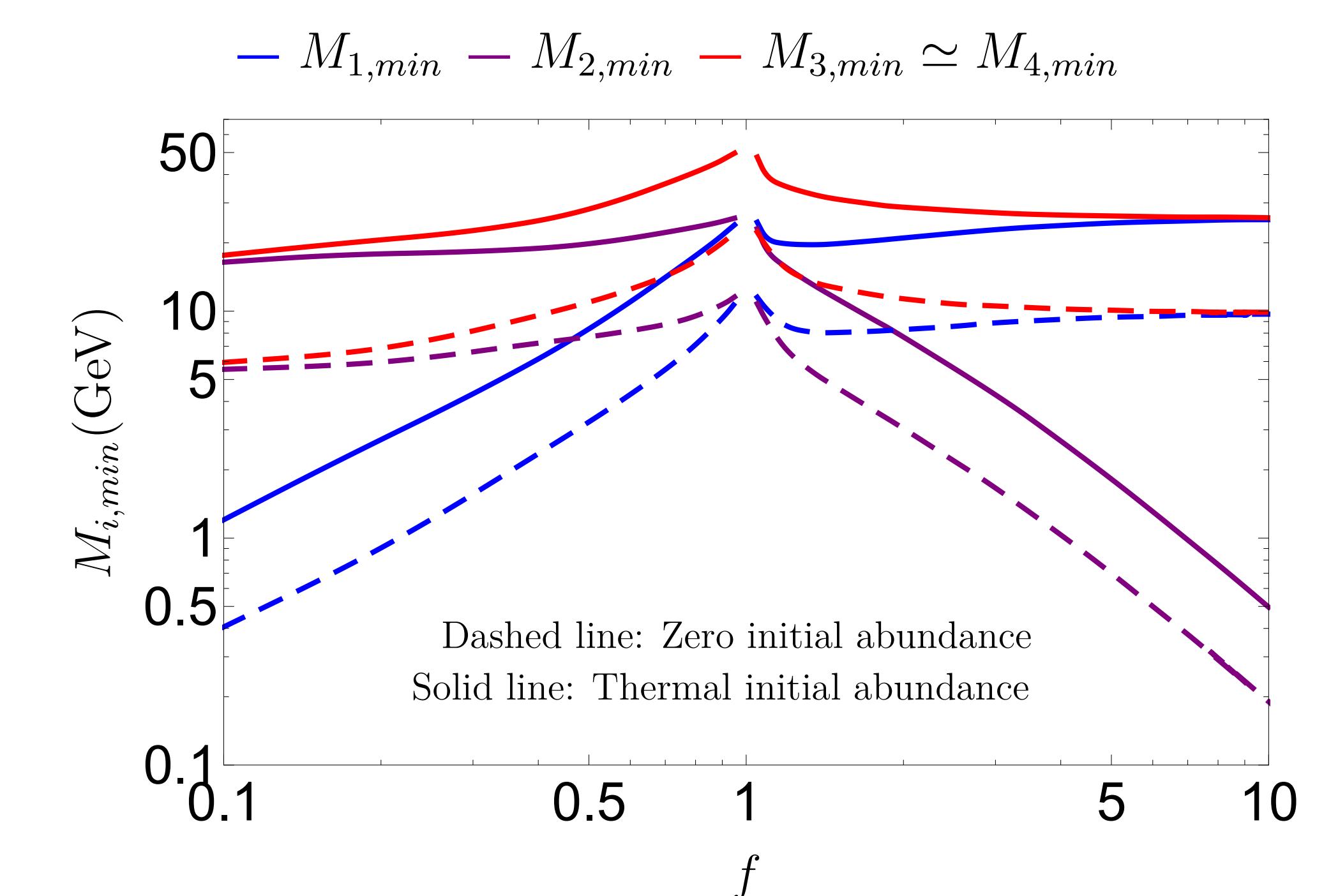


Low Scale Leptogenesis

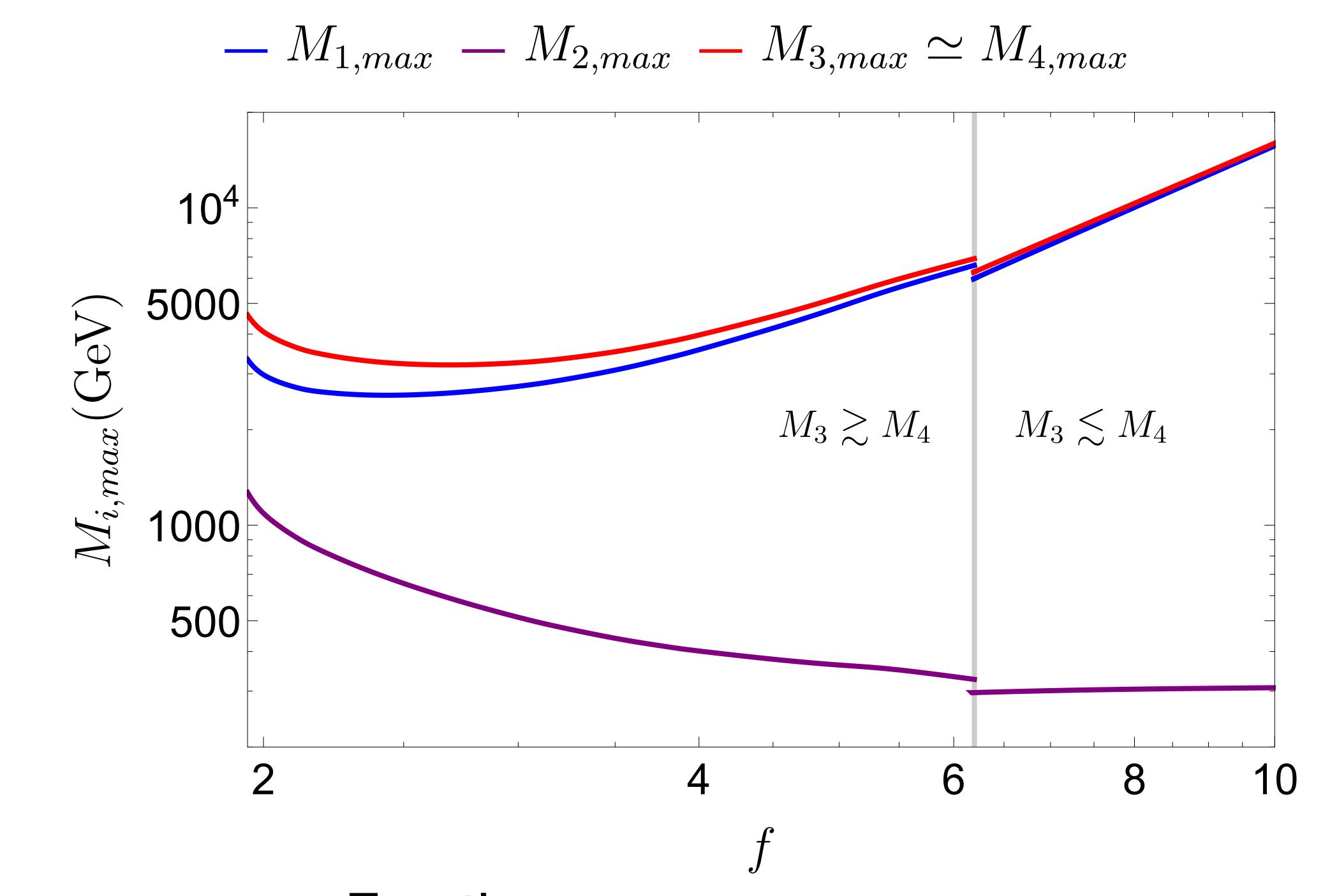
Resonant leptogenesis is viable for $M_3 \simeq M_4$ quasi-degeneracy.

Minimum Mass of Sterile Neutrinos:

Minimum mass required to generate the CMB asymmetry $\eta_B^{CMB} = (6.12 \pm 0.04) \times 10^{-10}$.



Maximum Mass of Sterile Neutrinos:
Masses of the sterile neutrinos are governed by the same parameter, asymmetry generated by the resonant pair is partially washed out by lighter sterile neutrinos.



Email: mrahat@ufl.edu