Revisiting Sneutrino Dark Matter in Natural SUSY Scenarios

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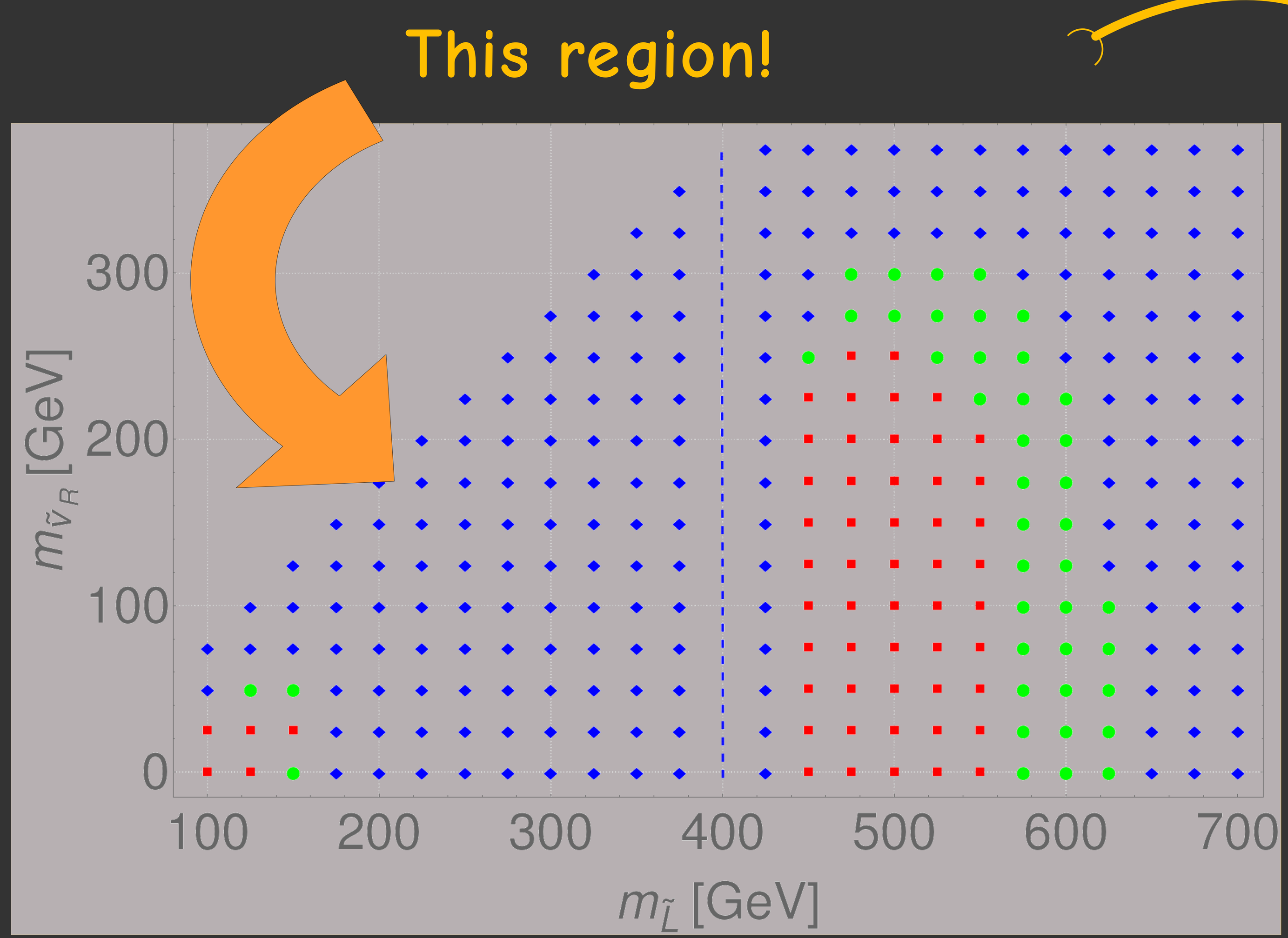
In [1] we studied natural supersymmetric scenarios with light right-handed neutrino superfields, and considered the possibility of having either a neutrino or a sneutrino as a dark matter candidate. In this poster, we present the results for non-thermal sneutrino dark matter, generated with MicroMegas [2].

1. Mass hierarchy:

$$m_{\nu_{R1}} \ll m_{\nu_{R2,3}} \sim \mathcal{O}(\mathrm{GeV})$$

$$m_{\tilde{\nu}_{R1}} \ll m_{\tilde{\nu}_{R2,3}} < m_{\tilde{L}} < m_{\tilde{h}^0} \sim \mathcal{O}(500\,\mathrm{GeV})$$

Why? We found out in [3] that this region of the parameter space is poorly probed at the LHC!



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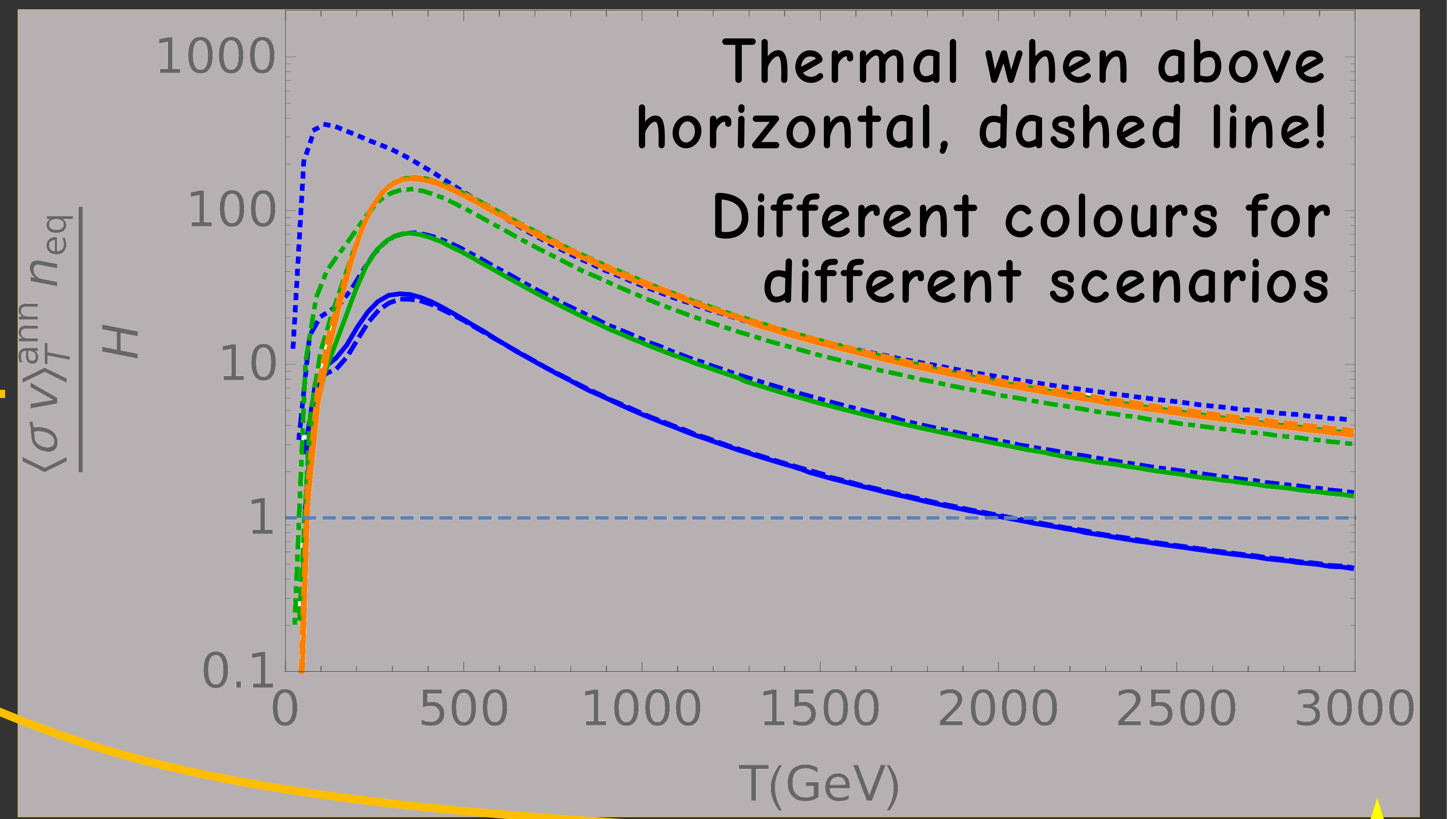
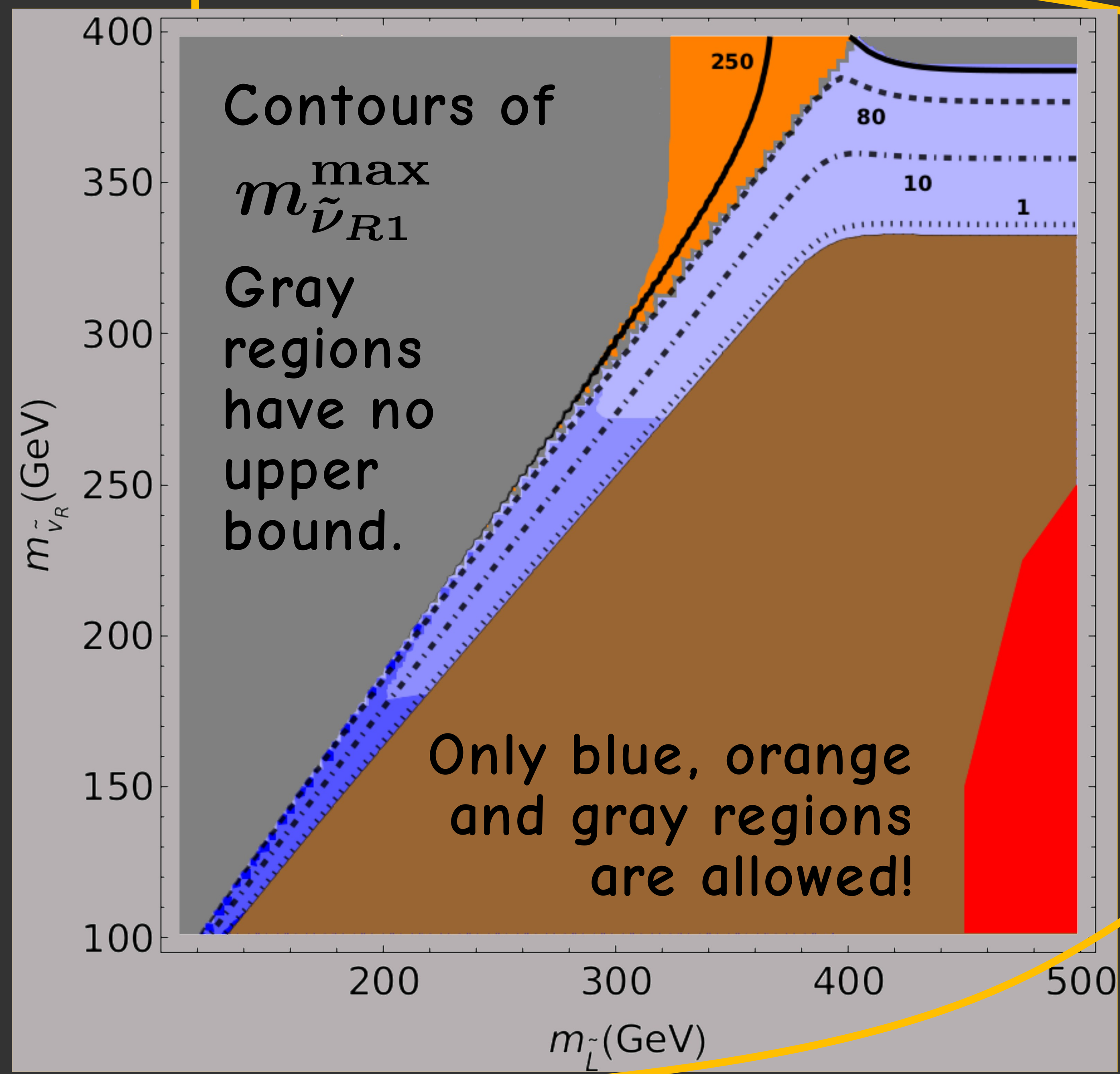
In particular, we are interested in regions where Y_ν is enhanced, hoping for correlations with observables in the heavy neutrino sector.

2. Thermal $\tilde{\nu}_R$?

Yes! For enhanced Y_ν, two heavy sneutrinos are in thermal equilibrium.

$$H(T) < \langle \sigma v \rangle_T \, n(T)$$





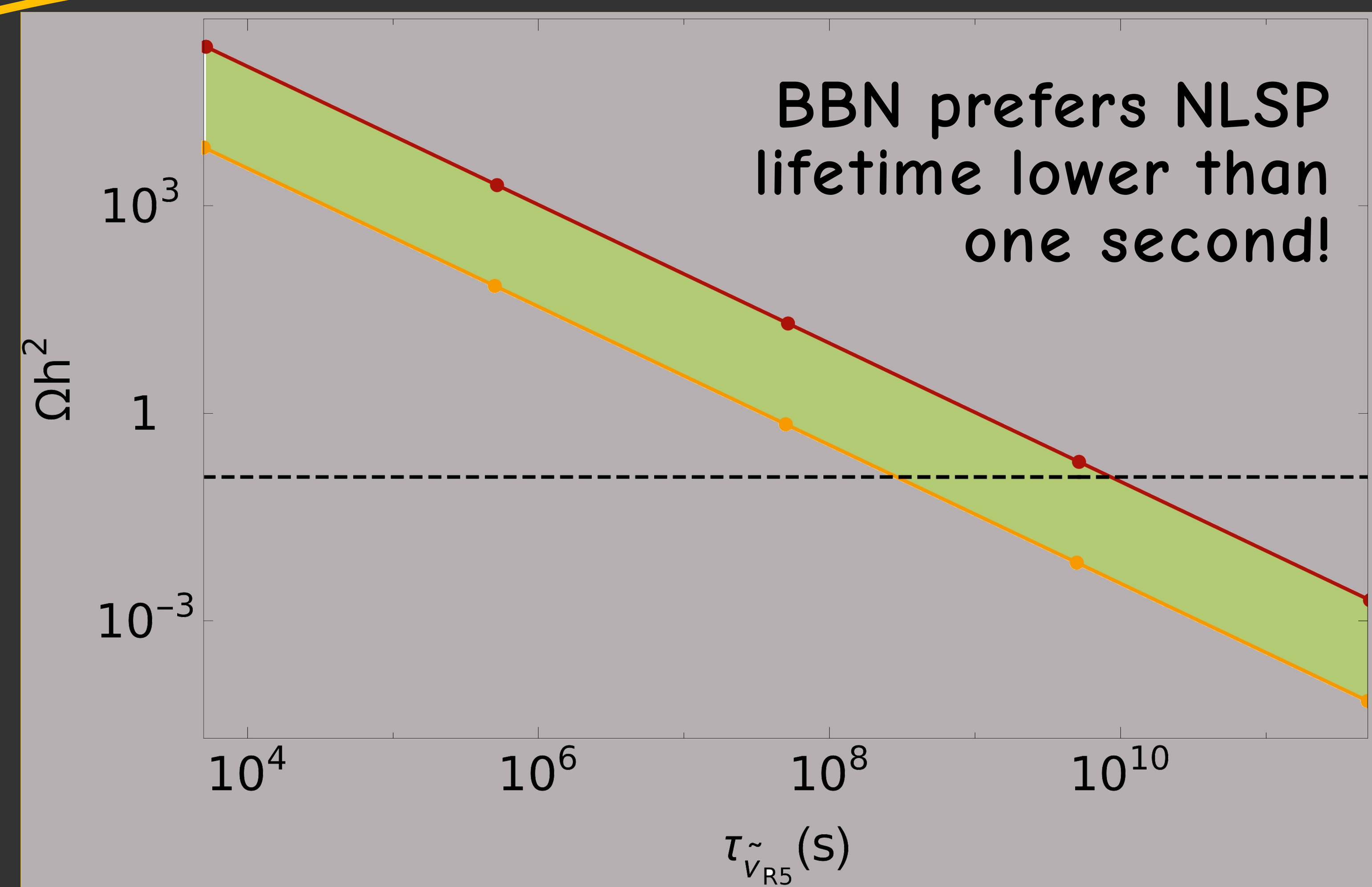
3. Upper limit for $m_{\tilde{\nu}_{R1}}$

The NLSP will decay into lightest sneutrino. Relic density is obtained by Super-WIMP mechanism.

$$(\Omega h^2)_{\tilde{\nu}_{R1}} = \frac{m_{\tilde{\nu}_{R1}}}{m_{\tilde{\nu}_{R2}}} (\Omega h^2)_{\tilde{\nu}_{R2}}$$

4. Freeze-in

Also generates dark matter, and can exceed bounds. Correlated with NLSP lifetime, so issues with BBN can arise. *Needs more work!*



References:

[1] T. Faber, Y. Liu, JJP, W. Porod, 1909.11686 [hep-ph]
[2] G. Bélanger, F. Boudjema, A. Goudelis, A. Pukhov, B. Zaldivar, 1801.03509
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