Dynamical Inverse Seesaw

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12th June 2017

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Introduction

- Neutrino masses in the Inverse Seesaw

$$m_\nu \sim v^2 Y_\nu M_N^{-1} \mu (M_N^T)^{-1} Y_\nu^T \ ,$$

  where Y_ν, M_N and μ are matrices and μ breaks Lepton number explicitly by 2 units

  $\Rightarrow$ explain small neutrino masses via the small $B - L$ breaking parameter

- With TeV-scale right-handed neutrinos we need $\mu \sim \mathcal{O}(\text{keV})$

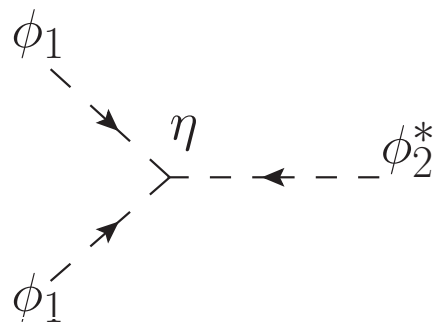
Dynamical Inverse Seesaw:

- Promote μ to a dynamical quantity by gauging $B - L$
- $B - L$ then spontaneously broken by

Particle	ϕ_1	ϕ_2
$U(1)_{B-L}$ charge	$+1$	$+2$

- Seesaw in the scalar sector: $m_{\phi_1} \sim m_{\phi_2} \sim \mathcal{O}$ (TeV), $\langle \phi_1 \rangle \gtrsim$ TeV and induced vev

$\langle \phi_2 \rangle \sim \frac{\eta}{\sqrt{2}} \frac{\langle \phi_1 \rangle}{m^2_{\phi_2}} \sim \mathcal{O}$(keV) via



The model

- The Inverse Seesaw requires a chiral pattern in the neutrino sector
- Need to introduce extra fermion singlets with non-trivial $B - L$ charges to cancel the $U(1)$ $B - L$ anomalies

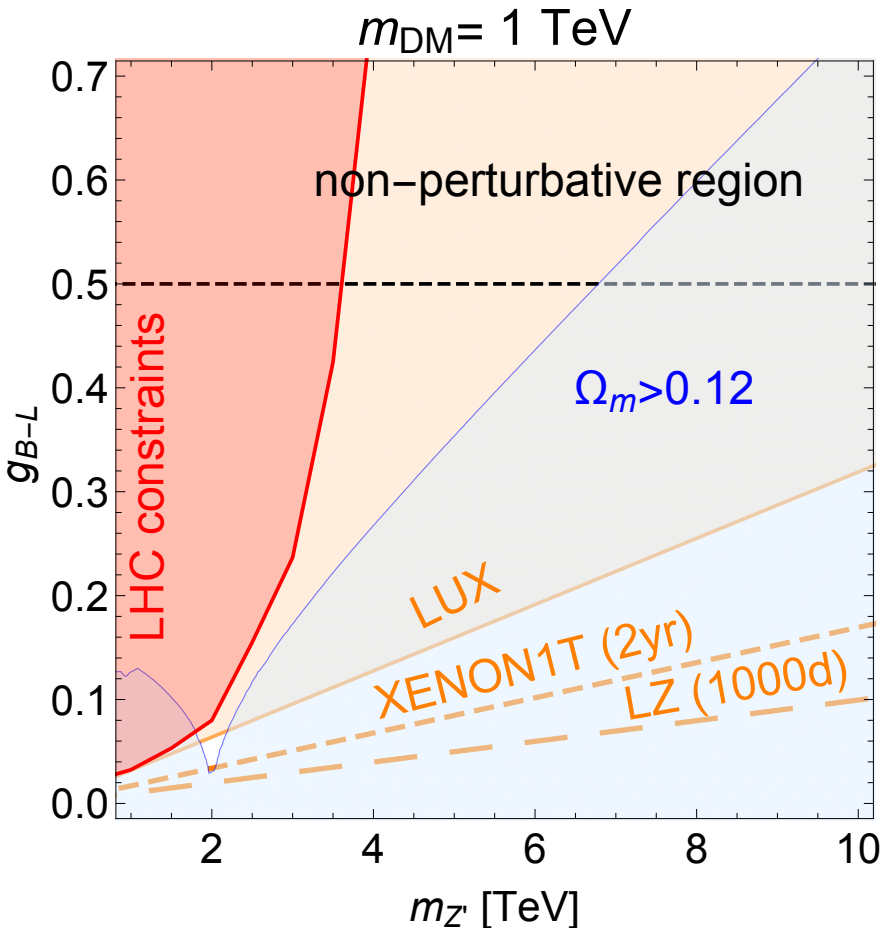
		ISS		DM candidate		massless f.
Particle	ν_L	N_R	N'_R	χ_R	χ_L	ω_R
$U(1)_{B-L}$ charge	-1	-1	$+1$	$+5$	$+4$	-4
Multiplicity	3	3	3	1	1	1

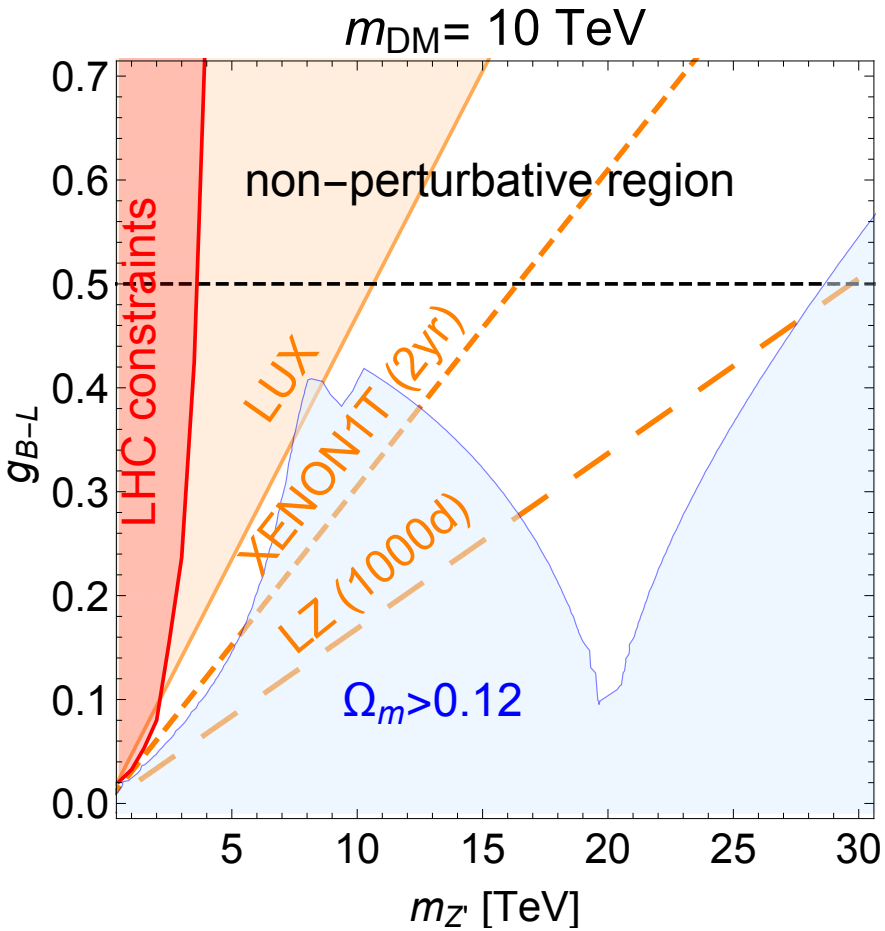
The model

Interesting phenomenlogy:

- deviations in Higgs observables
- additional Z' boson at the TeV scale
- dark sector with a DM candidate which can yield the correct relic density and passes the DM direct and indirect detection constraints
- massless fermion which contributes to $\Delta N_{\rm eff} \sim 0.03$

Preliminary results





End of the talk

Thanks for your attention!

Backup: Preliminary results