LOW SCALE LEPTOGENESIS AND DARK MATTER

A. CAPUTO

BASED ON

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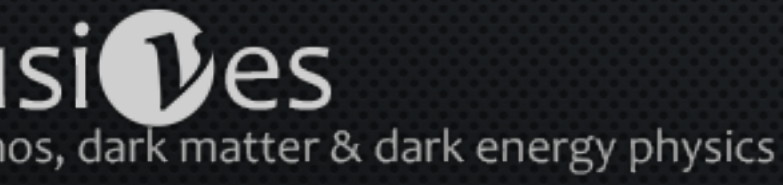
Invisible18 Workshop

September 2018, KIT



MODEL AND MOTIVATIONS

- Observed neutrino masses 

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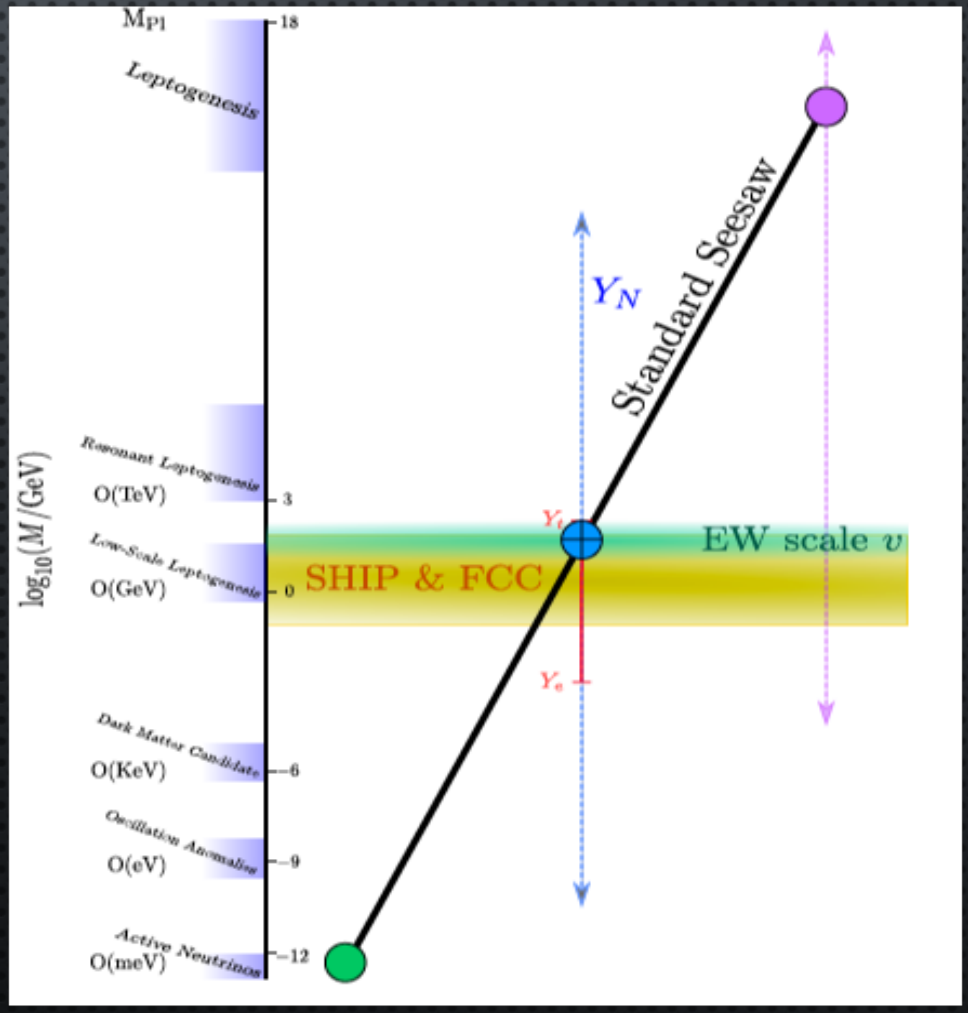
- $\mathcal{L}_{seesaw} = \mathcal{L}_{SM} - \sum_{\alpha,i} \overline{L_\alpha}\, Y^{\alpha,i} \tilde{\phi} N_i - \sum_{i,j=1}^{2} \frac{1}{2} \overline{N_i^C}\, M_N^{i,j} N_i + h.c$

P. Minkowski(1977), M. Gell-Mann, P. Ramond and R. Slansky (1979), T. Yanagida (1979), R.N. Mohapatra and G. Senjanovic (1980)

- Observed neutrino masses



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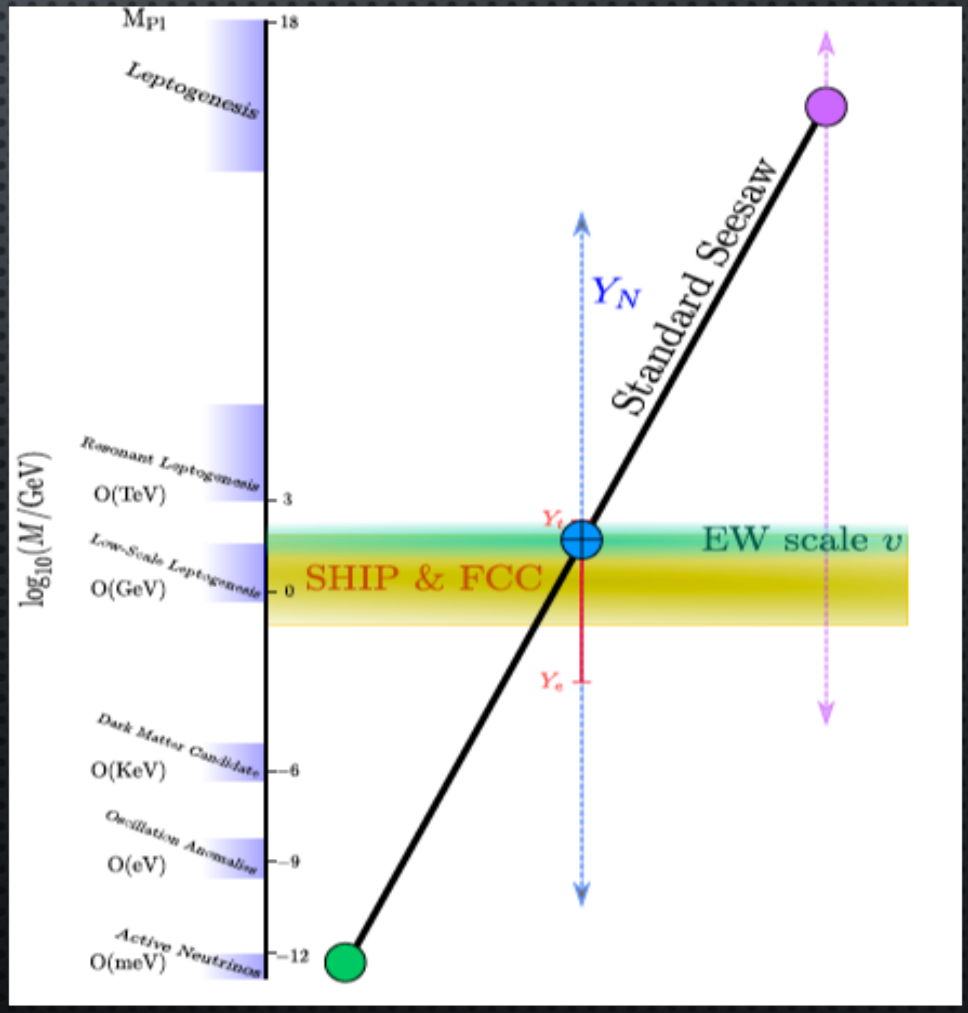
- Observed neutrino masses

- Explain Matter-Antimatter asymmetry via neutrino oscillations if $M_N \in [1, 10^2] GeV$

E.K.Akhmedov, V.Rubakov, A.Y. Smirnov
Asaka, Shaposhnikov



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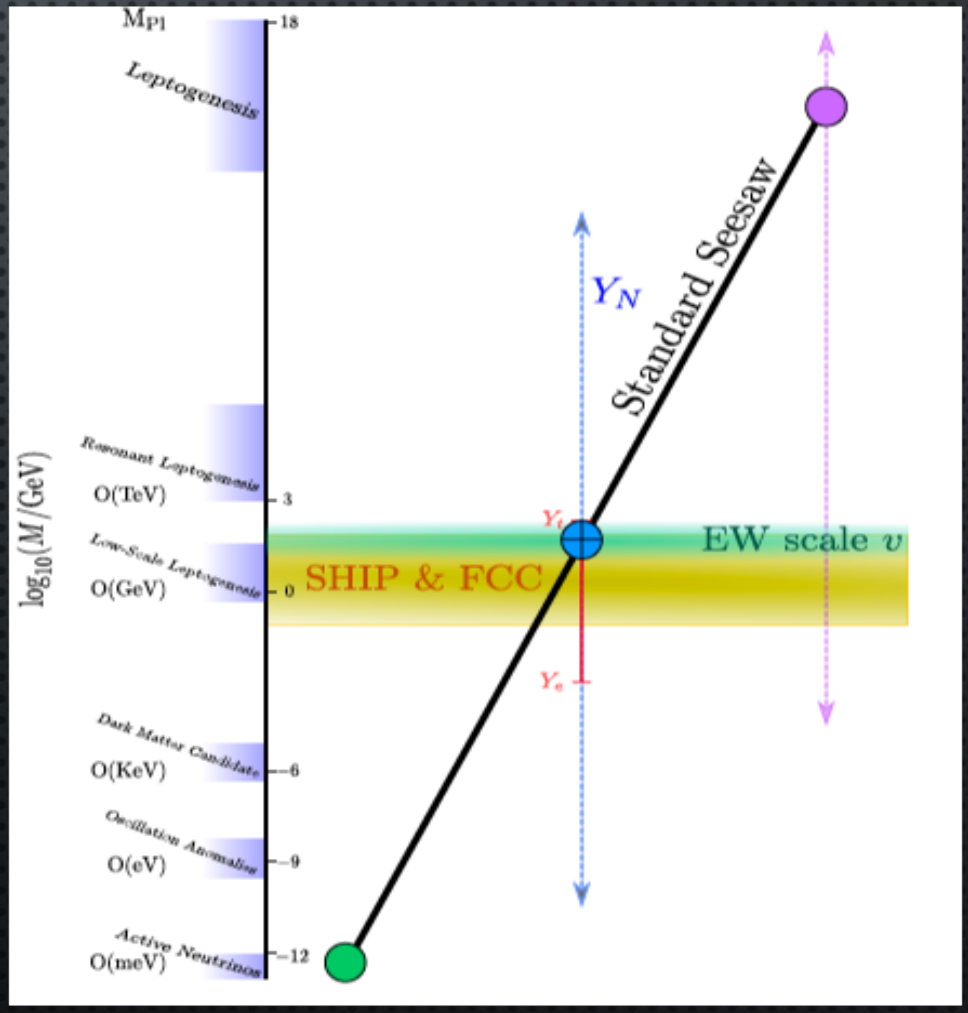
- Observed neutrino masses
- Explain Matter-Antimatter asymmetry via neutrino oscillations if $M_N \in [1, 10^2] GeV$
- Testable scenario in beam dump experiments and future colliders



The question we want to address is, can we easily extend the model to solve other issues of the SM?

In particular, can we easily add a *Dark Matter* candidate to the model?

This is not that simple because we have to make sure we do NOT spoil Leptogenesis

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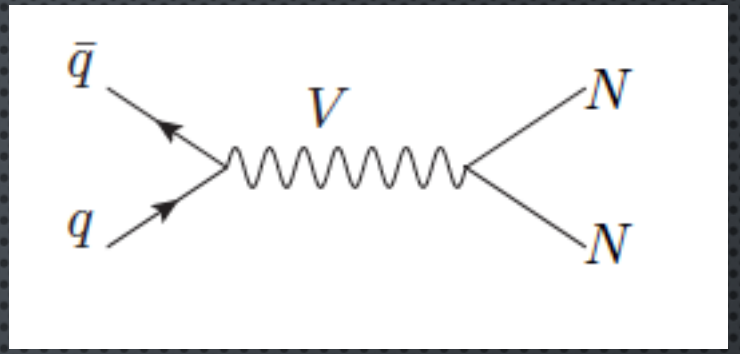
It is essential that at least one of the sterile neutrinos does not equilibrate by the time of electroweak transition

$$\Gamma(T_{EW}) < H(T_{EW})$$

B-L gauged

$$\mathcal{L} \supset g_{B-L}\left(\sum_f Q^f_{B-L} V_\mu \bar{f}\gamma^\mu f - \sum_\alpha V_\mu \overline{N_\alpha}\gamma^\mu N_\alpha\right)$$



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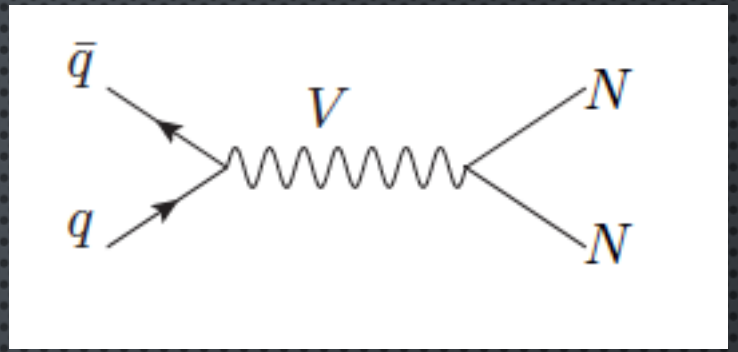
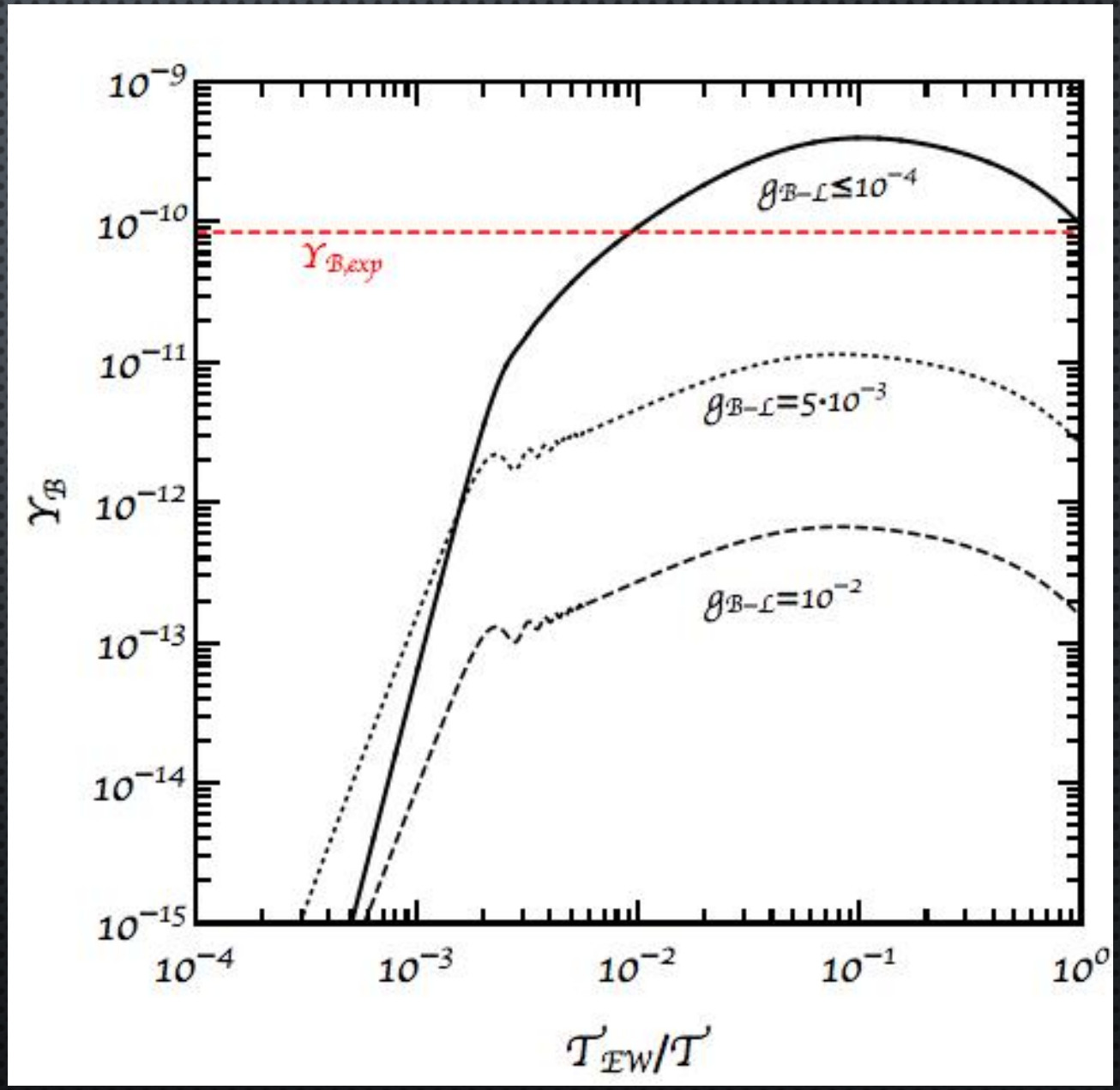


If we consider 2 ←→ 2 processes ($m_V < 2m_N$) we get

$$g_{B-L} \leq 10^{-4}$$

Just simply imposing $\Gamma_{EW}(f\bar{f} \leftrightarrow NN) < H(T_{EW})$

Solving the quantum kinetic equations for ARS mechanism actually we find a similar result



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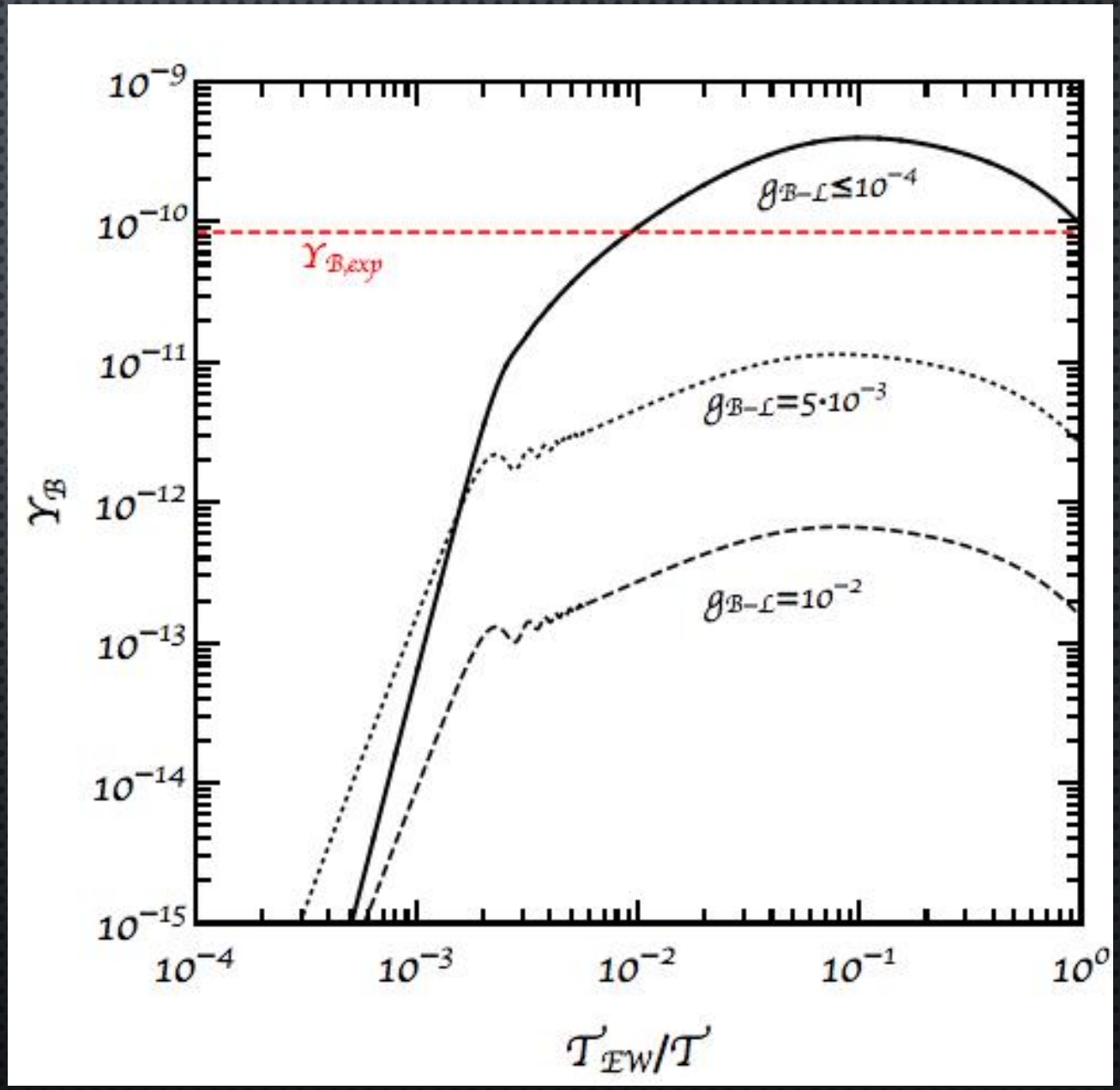
The effect of the new gauge boson is to thermalize neutrinos more, and dilute the generated asymmetry



WHAT ABOUT DARK MATTER CANDIDATES?

Come to the poster session and look at the end of the story!

Thanks for attention

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