

# THE TOP-BESS MODEL AND A 125-GeV SCALAR

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*UMB Banská Bystrica*

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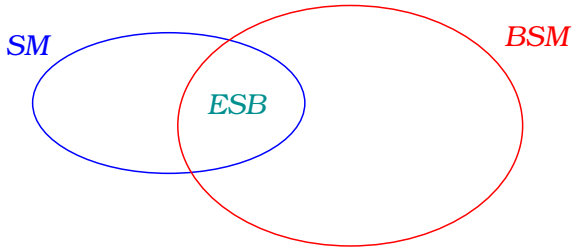
# OUTLINE

- 1 INTRODUCTION
- 2 TOP-BESS MODEL
- 3 LOW-ENERGY DATA LIMITS

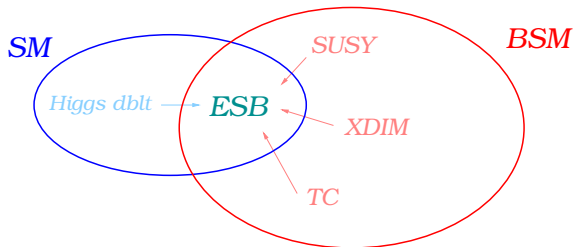
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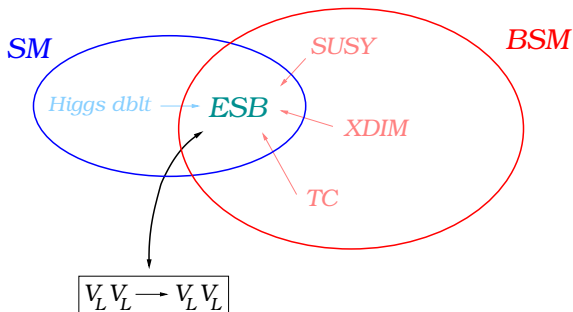
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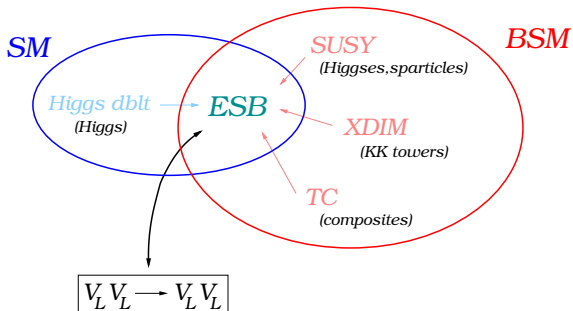
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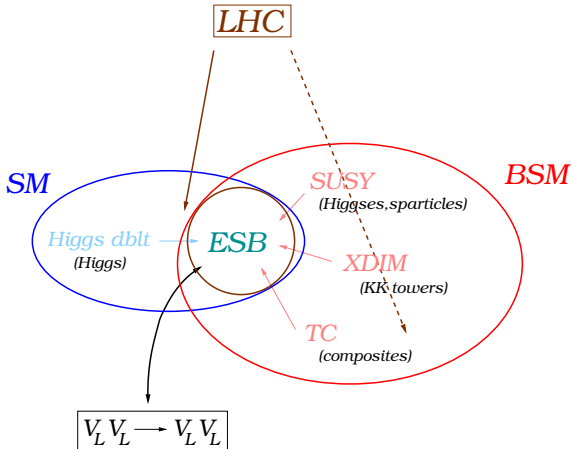
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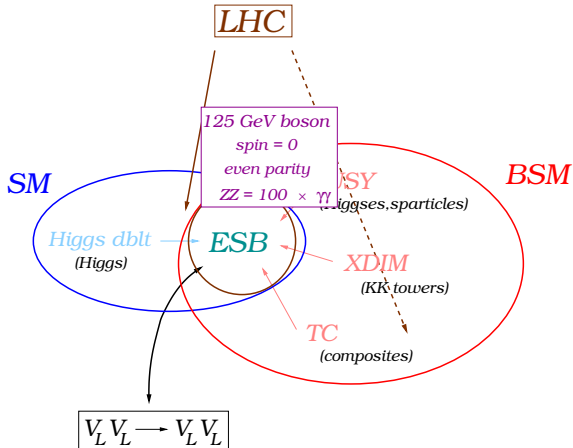


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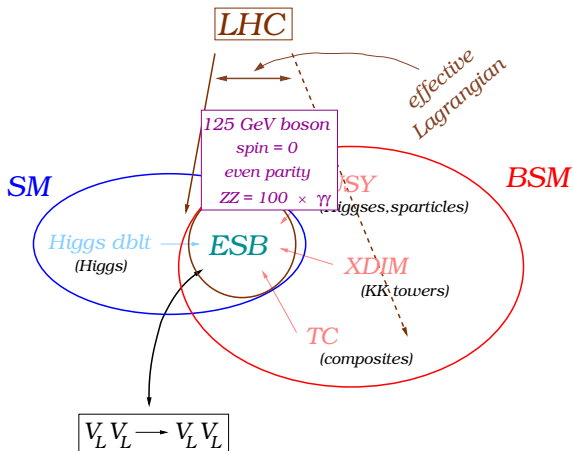




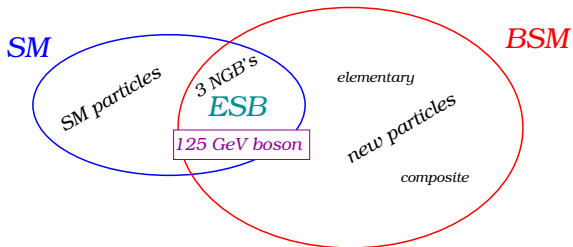
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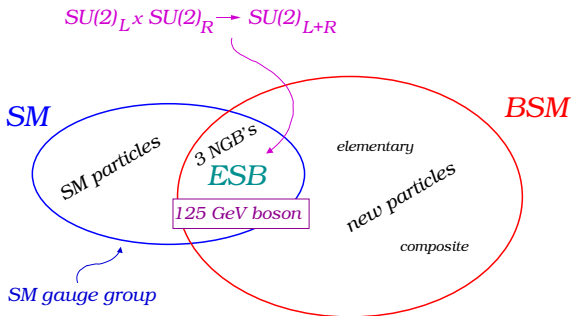
# EFFECTIVE DESCRIPTION



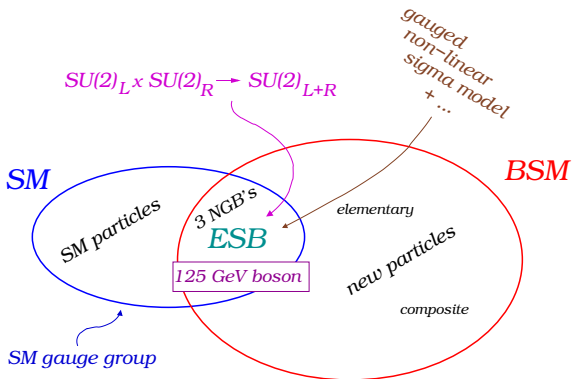
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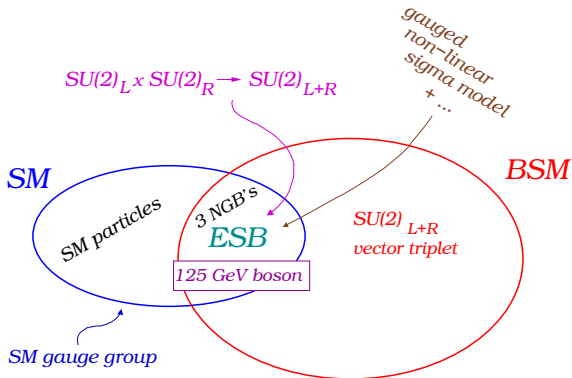
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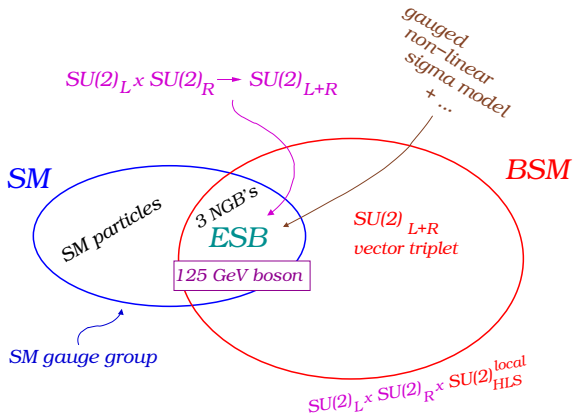
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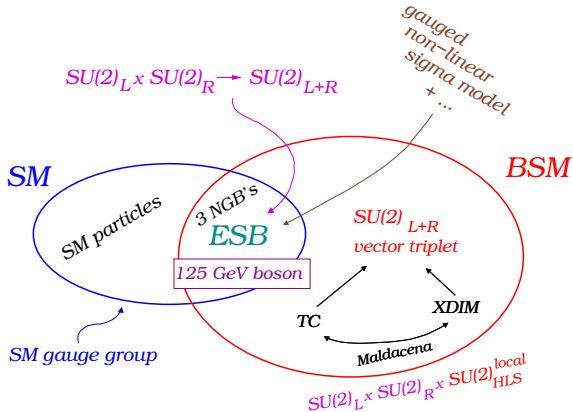
# BESS-LIKE MODELS



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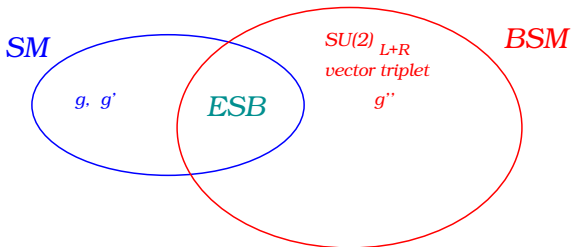
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# ORIGINAL BESS MODEL

[R.CASALBUONI *et al*, PL 155B, 95 (1985)]

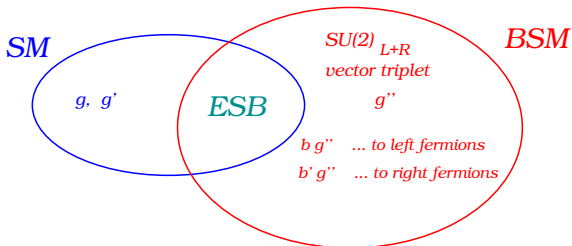
gauge cplngs  $\xrightarrow{\text{GB mixing}}$  indirect cplngs  
of the triplet to  
SM fermions  
 $\sim 1/g''$



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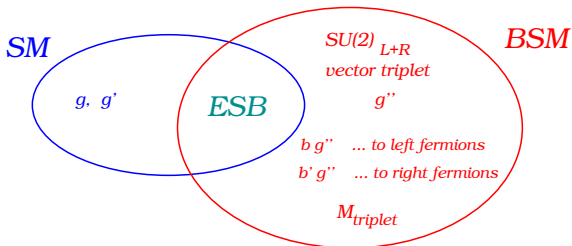


*fermion compositeness*  $\longrightarrow$  *direct cplngs of the triplet to SM fermions*

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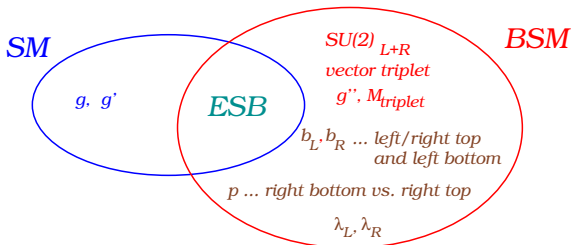


fermion compositeness  $\longrightarrow$  direct cplngs  
 of the triplet to SM fermions

# TOP-BESS MODEL

[M.G., J.JURÁŇ, I.MELO, PRD 84, 035013, (2011)]

gauge cplngs  $\xrightarrow{\text{GB mixing}}$  indirect cplngs  
 of the triplet to SM fermions  
 $\sim 1/g''$

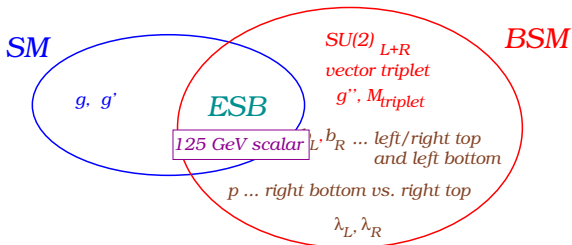


top/bottom composit.  $\longrightarrow$  direct cplngs  
 of the triplet to top/bottom quarks

# TOP-BESS + NEW SCALAR

[M.G., J.JURÁŇ, SUBMITTED TO PRD]

*gauge cplngs*  $\xrightarrow{\text{GB mixing}}$  *indirect cplngs of the triplet to SM fermions*  
 $\sim 1/g''$



*top/bottom composit.*  $\longrightarrow$  *direct cplngs of the triplet to top/bottom quarks*

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# OBSERVABLES AND PARAMETERS

## LOW-ENERGY LAGRANGIAN

$$\dots \alpha \rightarrow \infty \Rightarrow M_V \rightarrow \infty$$

free parameters:

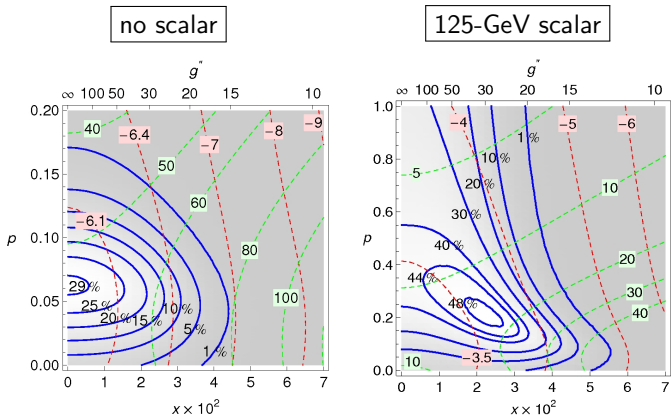
$$\begin{aligned} x &= g/g'' \\ \Delta L &= b_L - 2\lambda_L \\ \Delta R &= b_R + 2\lambda_R \\ p &= p \end{aligned}$$

## EXPERIMENT: LEP + SLC + TEVATRON

$$\begin{aligned} \epsilon_1(x, \Delta L, \Delta R) &\stackrel{exp}{=} (+5.4 \pm 1.0) \times 10^{-3} \\ \epsilon_2(x) &\stackrel{exp}{=} (-8.9 \pm 1.2) \times 10^{-3} \\ \epsilon_3(x) &\stackrel{exp}{=} (+5.34 \pm 0.94) \times 10^{-3} \\ \Gamma(Z \rightarrow \bar{b}b)(x, \Delta L, \Delta R, p) &\stackrel{exp}{=} (0.3773 \pm 0.0013) \text{ GeV} \\ B.R.(B \rightarrow X_s \gamma)(x, \Delta L, \Delta R, p) &\stackrel{exp}{=} (3.55 \pm 0.26) \times 10^{-4} \end{aligned}$$



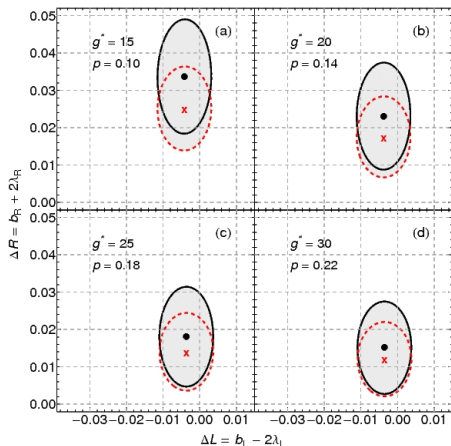
# NO SCALAR vs. 125-GeV SCALAR



$\chi^2$ :  $\Delta L$ ,  $\Delta R$  ... fitting parameters,  $x, p$  ... fixed  $\Rightarrow$  d.o.f. = 5 - 2 = 3

$M_{\text{triplet}} = 1 \text{ TeV}$

# 95% CL ALLOWED REGIONS IN $(\Delta L, \Delta R)$



$$M_{\text{triplet}} = 1 \text{ TeV}, 2 \text{ TeV}$$

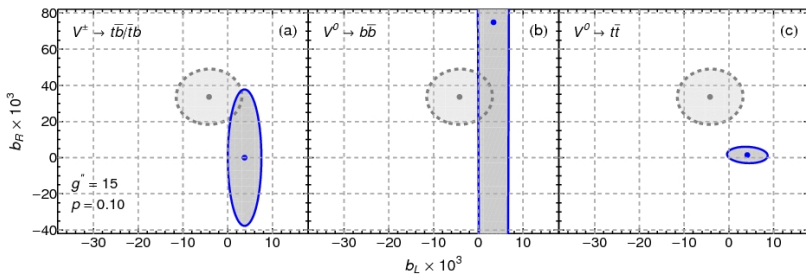
backings:

18% 42%

49% 49%

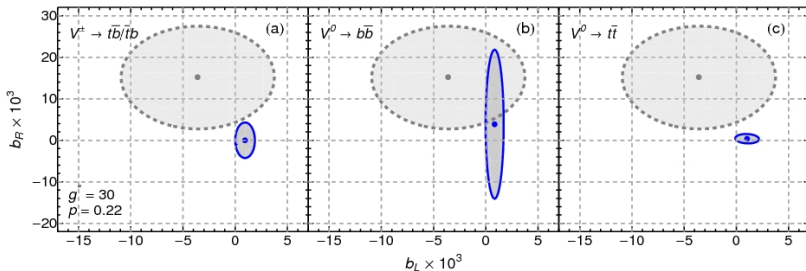
# THE DEATH VALLEYS

$$M_{\text{triplet}} = 1 \text{ TeV}, g'' = 15, p = 0.10$$



# THE DEATH VALLEYS

$$M_{\text{triplet}} = 1 \text{ TeV}, g'' = 30, p = 0.22$$



# CONCLUSIONS

- 125-GeV scalar improved LE data support for the top-BESS model
- The Death Valley regions can hide signal of the new vector resonances