

Unconventional ElectroWeak Symmetry Breaking and the LHC

GUIDO MARANDELLA

Postdoc in the theory group since Sep. 2004

THE LARGE HADRON COLLIDER

- It should reveal the mysteries of the TeV scale
- What breaks the ElectroWeak Symmetry ?
- Is there a Higgs boson ? What is it ?
- What makes the EW scale stable under quantum corrections?
- What informations can we really extract if some New Physics event is observed ?

MY RESEARCH ACTIVITY

(past year)

- C. Csaki (Cornell U.), G. M., Y. Shirman (LANL, now UC Irvine) and A. Strumia (Pisa U.), **The Super-little Higgs**, Phys. Rev. D73, 035006 (2006), arXiv:hep-ph/0510294
- G. Cacciapaglia (Cornell U., now UC Davis) , C. Csaki (Cornell U.), G. M., and A. Strumia (Pisa University), **The minimal set of electroweak precision parameters**, Phys. Rev. D74, 033011 (2006) , arXiv:hep-ph/0604111
- G. Cacciapaglia (Cornell U., now UC Davis) , C. Csaki (Cornell U.), G. M., and J. Terning (UC Davis), **A New custodian for a realistic Higgsless model**, arXiv:hep-ph/0607146, submitted to Phys. Rev. D

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- G. Cacciapaglia (Cornell U., now UC Davis), C. Csaki (Cornell U.), G. M., and A. Strumia **Talk by Cacciapaglia** **Set of electroweak precision parameters**, Phys. Rev. D74, 033011 (2006), arXiv:hep-ph/0604111
- G. Cacciapaglia (Cornell U., now UC Davis), C. Csaki (Cornell U.), G. M., and J. Terning (UC Davis), **A New custodian for a realistic Higgsless model**, arXiv:hep-ph/0607146, submitted to Phys. Rev. D

MY RESEARCH ACTIVITY

(present and future)

- G. Cacciapaglia (UC Davis) , C. Csaki (Cornell U.), G. M., and J. Terning (UC Davis), **The gauge-phobic Higgs**, to appear soon
- H.C. Cheng, J. Gunion, G.M., B. McElrath (UC Davis), **Optimal observables for events with missing energy**
- G. Cacciapaglia (UC Davis) , C. Csaki (Cornell U.), G. M., and J. Terning (UC Davis), **Flavor physics in Higgsless models** and **One loop calculation of the T-parameter in Higgsless models**
- G. Cacciapaglia (UC Davis) , C. Csaki (Cornell U.), G. M., and A. Strumia (Pisa U.), **Positivity of the W parameter in Little Higgs models with T-parity**

MY RESEARCH ACTIVITY

(present and future)

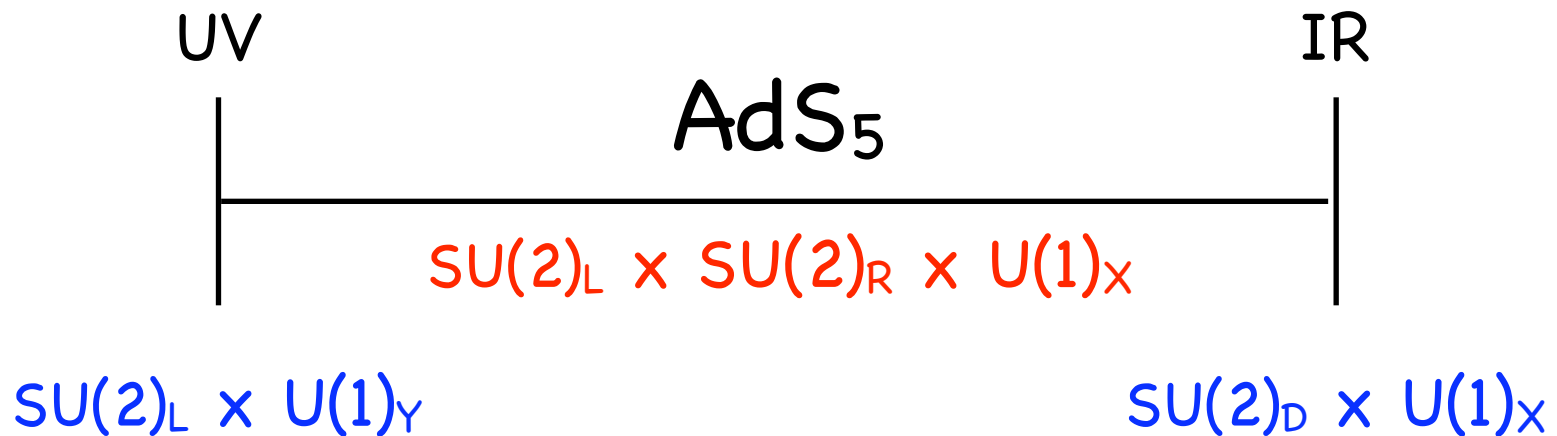
- G. Cacciapaglia (UC Davis) , C. Csaki (Cornell U.), G. M., and J. Terning (UC Davis), **The gauge-phobic Higgs**, to appear soon

- H.C. Cheng, J. Gu **Talk by McElrath**), **Optimal observables for**

- G. Cacciapaglia (UC Davis) , C. Csaki (Cornell U.) , G. M., and J. Terning (UC Davis), **Flav** **In preparation** **One loop calculation of the T-parameter in Higgsless models**

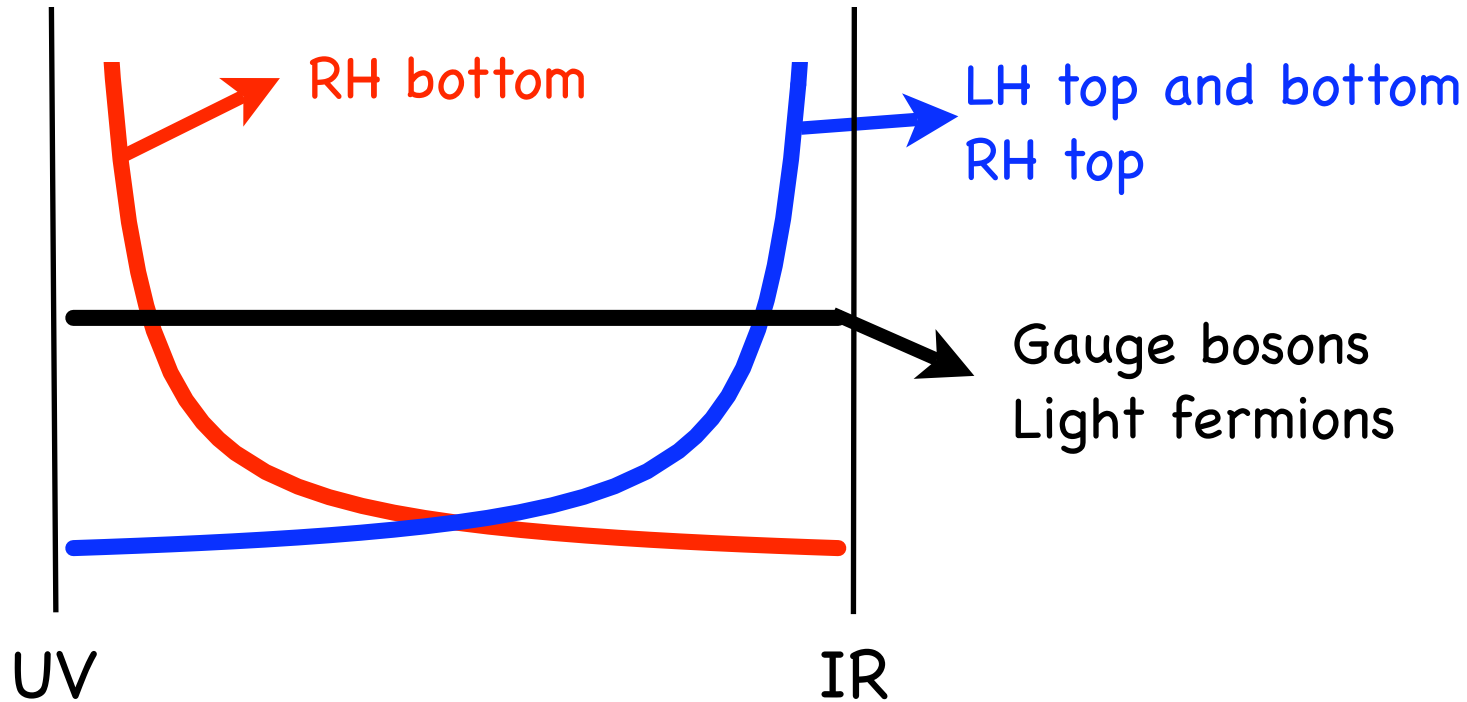
- G. Cacciapaglia (UC Davis) , C. Csaki (Cornell U.) , G. M., and A. Strumia (Pisa U.), **Positive** **In preparation** **Higgs models with T-parity**

The Z_{bb} coupling in Higgsless models



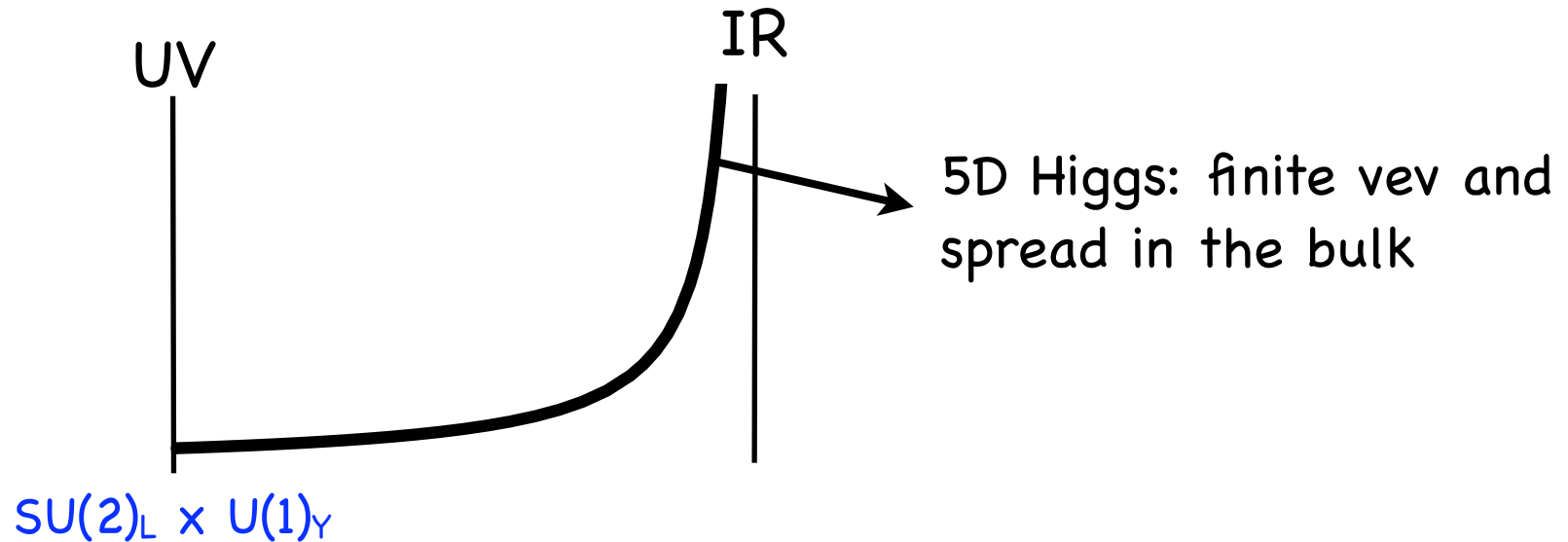
- ElectroWeak symmetry broken by Boundary Conditions: no scalars in the theory
- Troubles with EW precision data: large S-parameter. Can be solved de-localizing light fermions (i.e. make them composite)
- Third generation: top mass vs. Z_{bb} coupling

The Zbb coupling in Higgsless models



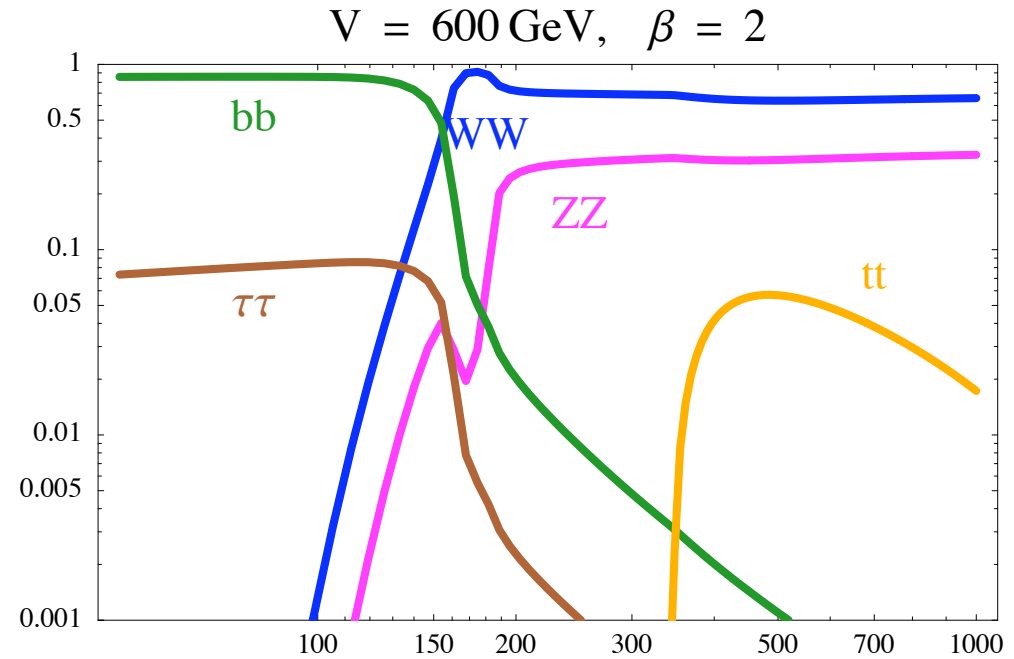
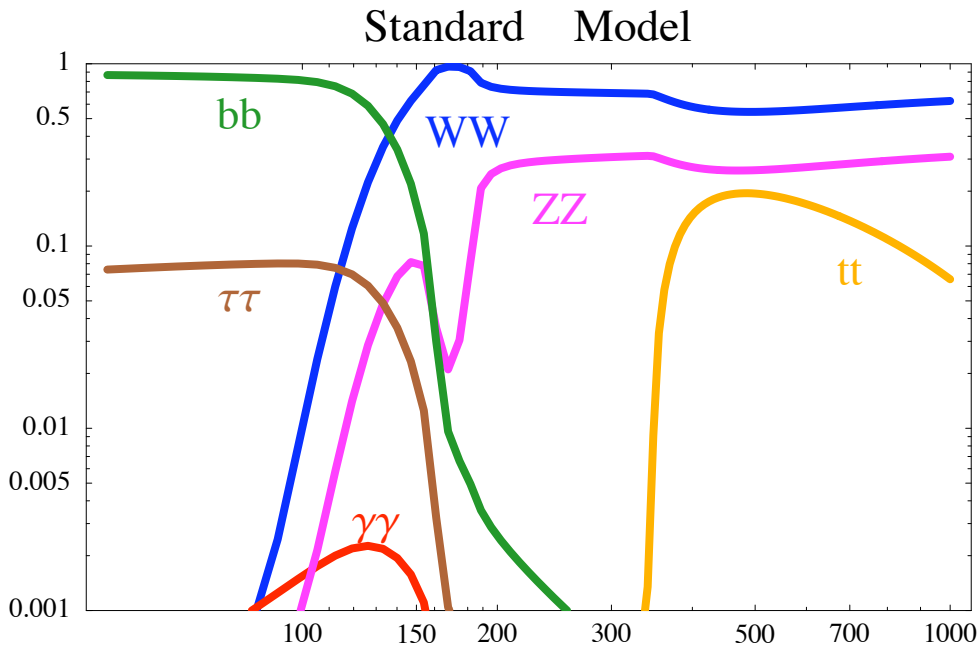
- Usually under $SU(2)_L \times SU(2)_R$
 $t_L, t_R \subset (\mathbf{2}, \mathbf{1}), \quad b_L, b_R \subset (\mathbf{1}, \mathbf{2})$
- Choose instead (Ahashe et al., 2006, Phys. Lett. B641, 62-66, 2006)
 $t_L, b_L \subset (\mathbf{2}, \mathbf{2}), \quad t_R = (\mathbf{1}, \mathbf{1}), \quad t_R \subset (\mathbf{1}, \mathbf{3})$
- Top mass and Zbb coupling ok

The gauge-phobic Higgs



- The Higgs decouples smoothly from the theory
- In intermediate regions there can be a light Higgs with suppressed couplings (top, W, Z...)

The gauge-phobic Higgs



- Unusual Higgs phenomenology
- It might be hard to see a light Higgs without the two photons channel
- Some “nightmare” scenario is possible: a lot of luminosity required to see both the Higgs and the heavy gauge bosons

Conclusions

- The LHC is going to start operating soon
- We all are excited about the possibility of discovering New Physics
- Traditional New Physics scenarios today present some troubles (LEP)
- There could be surprises: consider unconventional scenarios