

Z' as a Higgs Source



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Outline

Higgs and Z'

Higgs

¿New gauge boson?

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Outcomes

Process $e^+e^- \rightarrow Z', Z^* \rightarrow hZ$

Decay $Z' \rightarrow f\bar{f}h$

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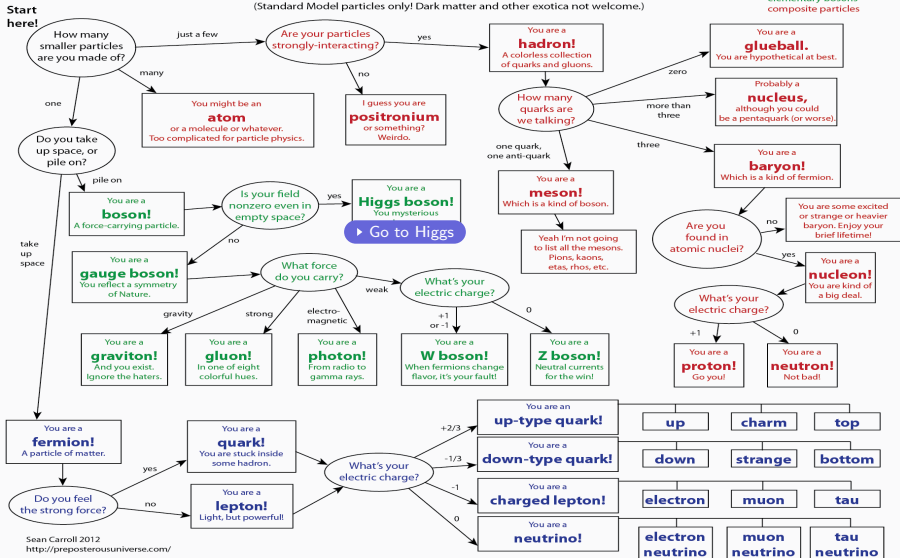
Conclusions

Higgs and Z'

What Particle Are You?

(Standard Model particles only! Dark matter and other exotica not welcome.)

Color code:
 elementary fermions
 elementary bosons
 composite particles

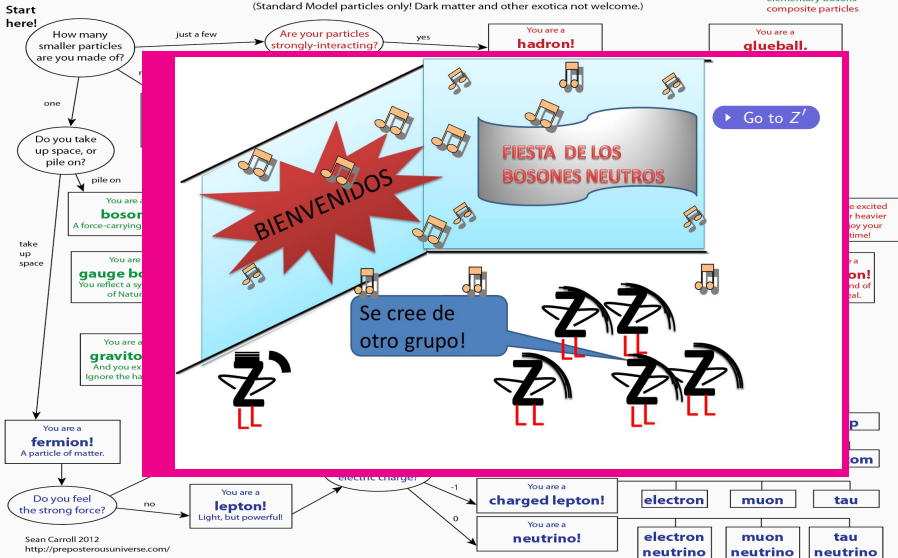


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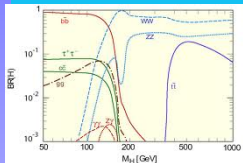
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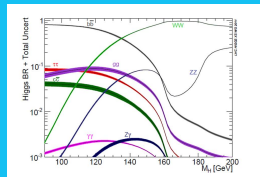
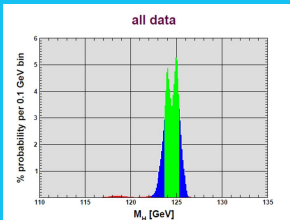
Higgs

M_H [GeV]	$H \rightarrow \gamma\gamma$	$H \rightarrow ZZ$	Γ_H [GeV]
125	$2.28 \times 10^{-3} (\pm 5\%)$	$2.64 \times 10^{-2} (\pm 4\%)$	$4.07 \times 10^{-3} (\pm 4\%)$

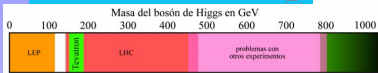
[hep-ph] 1107.5909



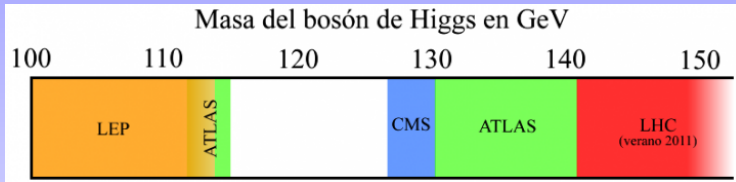
[hep-ph] 1201.0695



[hep-ph] 1107.5909



◀ Back to Z'



¿New gauge boson?

$$SU(3)_c \times SU(2)_L \times U(1)_Y$$



$$SU(3)_c \times SU(2)_L \times U(1)_Y \times U(1)'$$

- ▶ Z' is neutral singlet.



- ▶ A extension $U(1)'$ is the easiest form for SM

some constraints:

- ▶ Mixing angle $|\theta'| \lesssim 10^{-3}$.
- ▶ $0.2 \text{ TeV} < M_{Z'} < 0.7 \text{ TeV}$ (Tevatron).

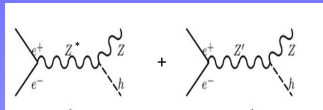
Differents talks in this meeting 2012

M. Carena, A. Daleo, B.A. Dobrescu & T.M.P. Tait.

Phys. Rev. D 70:093009. (2004).

- ▶ New gauge boson can be heavy enough or can be weakly coupling.

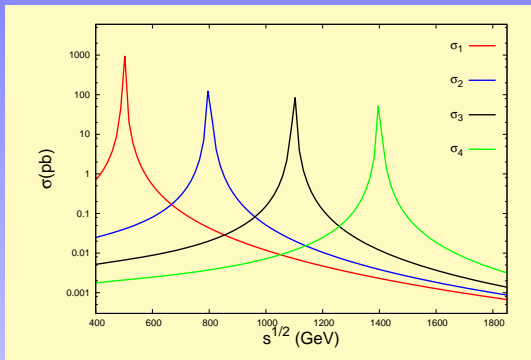
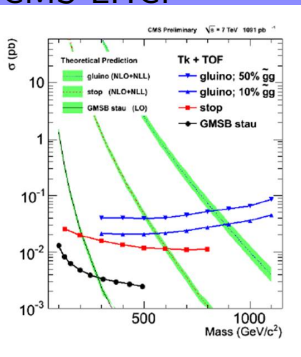
Process $e^+e^- \rightarrow Z', Z^* \rightarrow hZ$



σ_i	$M_{Z'}$ (GeV)	$\Gamma(Z' \rightarrow f\bar{f})\text{GeV}$
σ_1	500	31.420
σ_2	800	135.151
σ_3	1100	356.235
σ_4	1400	741.876

$M_h = 125\text{GeV}; \theta' = 1 \times 10^{-3}$ and $v' = 1\text{TeV}$.

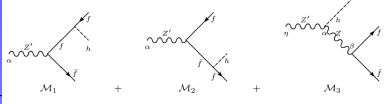
CMS-LHC.



NLC

This is a comparison, simply.

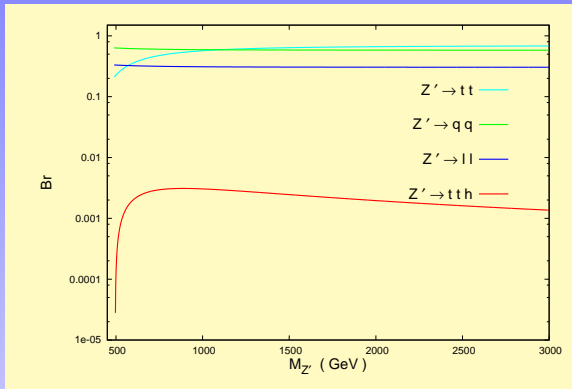
Decay $Z' \rightarrow f\bar{f}h$



M_H [GeV]	$H \rightarrow 2l2q$	$H \rightarrow 4q$	$H \rightarrow 4f$	$H \rightarrow \gamma\gamma$
125	3.7×10^{-3}	1.1×10^{-1}	2.4×10^{-1}	2.28×10^{-3}

[hep-ph] 1107.5909

We obtained for **Br**,



$\text{Br}(Z' \rightarrow f\bar{f}h) \sim \mathcal{O}(10^{-3})$ with $m_h = 125 \text{ GeV}$, $\theta' = 1 \times 10^{-3}$ and couplings SM-like.

Where qq includes $ucdsb$, and ll includes $e, \mu, \tau, \nu_{e, \mu, \tau}$, with $m_\nu \neq 0$

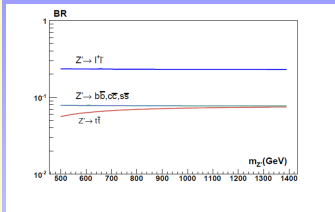


Figure 12: The decay branching ratios of the extra gauge boson Z' as function of $m_{Z'}$.

For LHC. [hep-ph] 0704.1395

Conclusions

We obtained the section cross, branching ratio for $Z' \rightarrow f\bar{f}$ y $Z' \rightarrow \bar{f}fh$ with $\theta' = 1 \times 10^{-3}$, $\alpha = \frac{\pi}{2}$, $m_h = 125$ GeV;

We obtained, $\frac{\Gamma(Z' \rightarrow t\bar{t}h)_{m_h=125 \text{ GeV}}}{\Gamma(Z' \rightarrow t\bar{t}h)_{m_h=130 \text{ GeV}}} \sim 1$.

THANK YOU



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