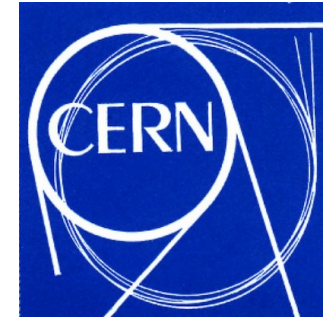


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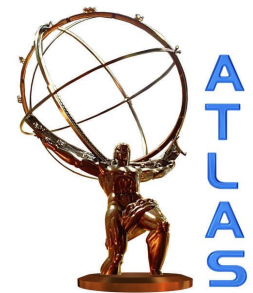
saclay



# Four top events at the LHC from top-philic new physics

→ "reference: 1005.1229 (chapter 12)

→ paper in preparation"



# Four-top production in the SM



Cross Section at 14 TeV ~ 7.5 fb

- ➡ The SM 4 top final state is sensitive to new physics at TeV scale due to the small cross section
- ➡ in particular, well-motivated models where new heavy resonances have a preference for the top quark

# The effective theory :

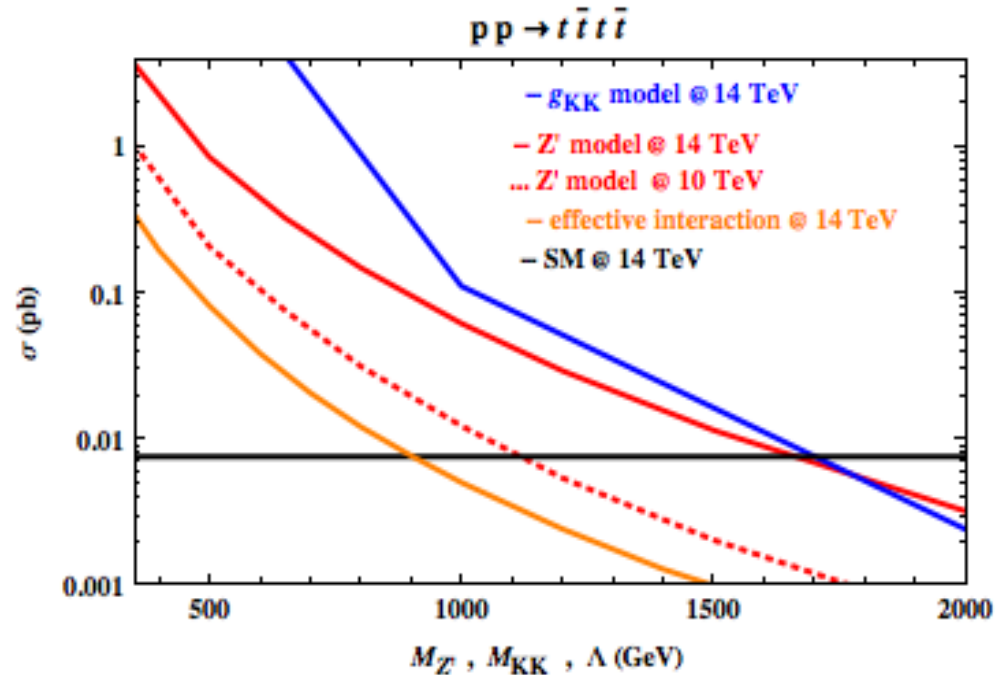
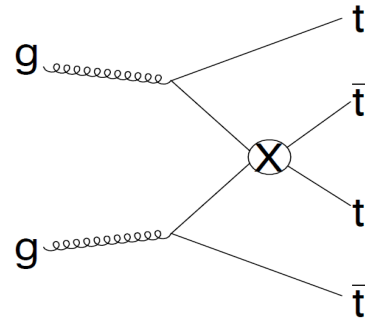
- At a low effective theory approach, after integrating out heavy resonances, we are left with higher dimensional operators such as :

$$\frac{1}{\Lambda^2} (\bar{t}_R \gamma^\mu t_R) (\bar{t}_R \gamma_\mu t_R)$$

cutoff  $\rightarrow$

[Pomarol-Serra'08]

leading to :

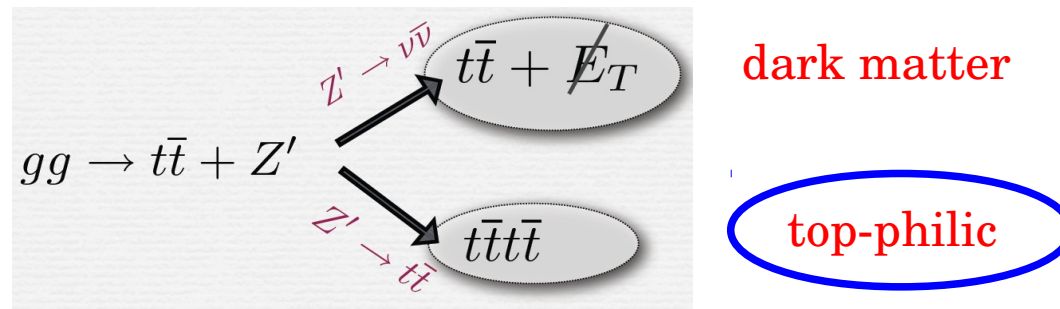


# Four-top events from a top-philic and dark matter-philic $Z'$ [0912.0004]

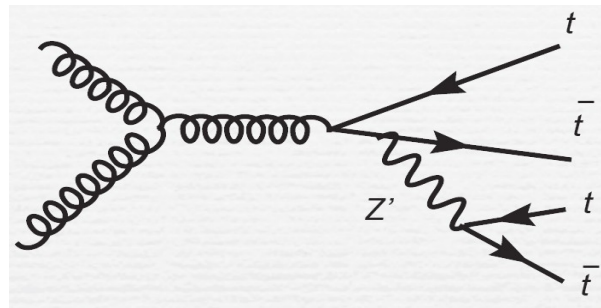
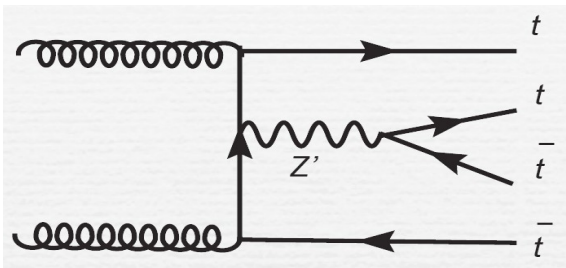
★  $Z'$  has suppressed couplings to light fermions but enhanced couplings to the most massive states of the SM such as the top quark (and Dark Matter)

→ no observable  $t\bar{t}$  resonances

→ instead :



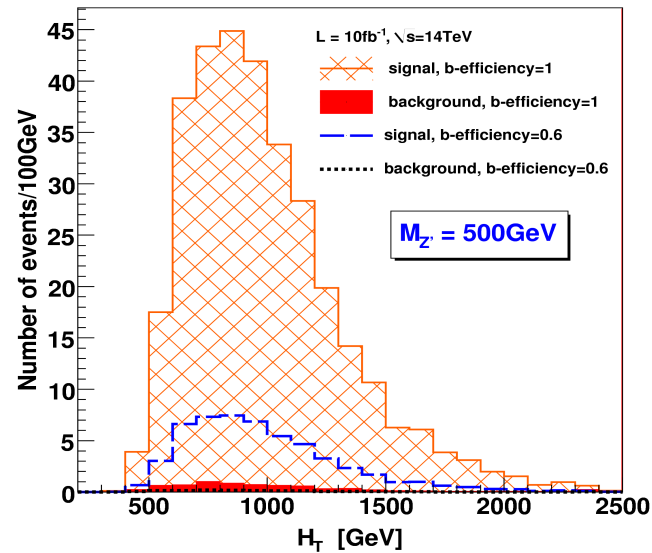
★ I present here the top-philic  $Z'$  :



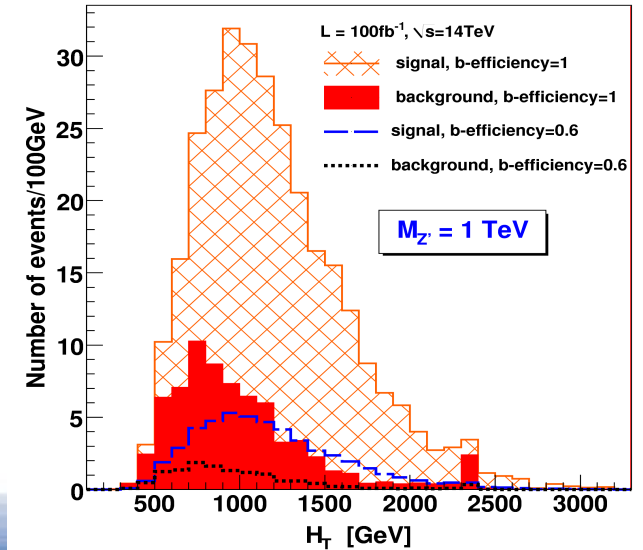
# Results for the top-philic model:

process	$\sigma$ [fb]	$\sigma \cdot BR(l\pm l\pm)$ [fb]
Signal		
$m_Z = 500\text{GeV}$	1002	42
$m_Z = 1\text{TeV}$	83	3.5
tttt	7.5	0.3
ttW+W- + 0,1,2jets	121	5.1
ttW $\pm$ + 0,1,2,3jets	595	18.4
W+W-W $\pm$ + 0,1,2 jets	603	18.7
W $\pm$ W $\pm$ + 0,1,2,3jets	340	15.5
tt + 0,1,2,3,4 jets	$1,2 \cdot 10^6$	600

Cross-section  
at 14 TeV  
before any cuts

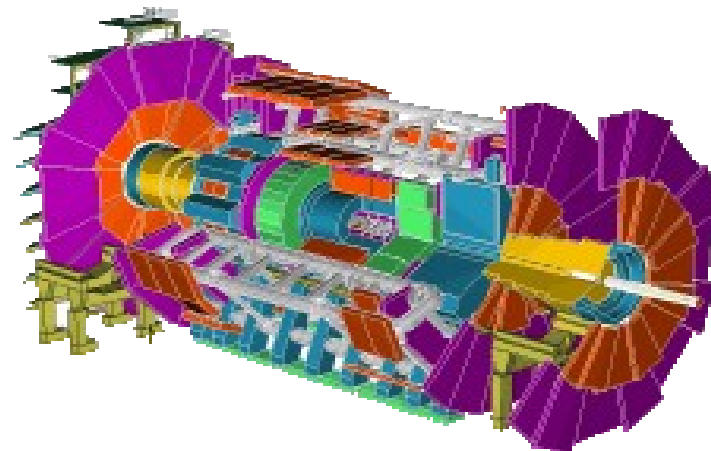


$P_t > 30 \text{ GeV}$   
nb total jets  $\geq 7$   
nb b-jets  $\geq 3$



## Study :

- ➡ So far only worked with Monte Carlo, however, eventually expect to start working on real data, even though at 7 TeV, almost no event is expected in this same-sign dilepton channel
- ➡ The goal will be to see what we can expect with the ATLAS detector at 14 TeV
- ➡ ATLAS PHD student → qualification task :  
Currently working on the calibration of crates (Tower Builder Board) which extract the signal from the different « Towers » which composed the Electromagnetic Calorimeter



***Thanks  
for  
your  
attention***

