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# 4<sup>th</sup> Generation Searches at the ATLAS Experiment

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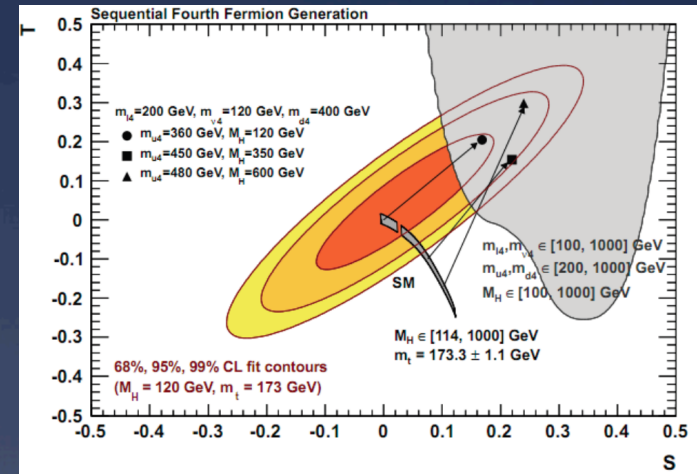
# Why Search for 4<sup>th</sup> Generation?

- \* Known facts:
  - \* Open questions in Standard Model
  - \* Number of generations not fixed within SM
  - \* Fit to EW precision data allows for additional generations

- \* Further insight in unexplained phenomena due to 4<sup>th</sup> Gen:

- \* Baryon asymmetry
- \* Fermion mass hierarchy
- \* Top-pair forward-background asymmetry
- \* Dark matter (providing candidates)

[http://gfitter.desy.de/Oblique\\_Parameters/](http://gfitter.desy.de/Oblique_Parameters/)



EW fit in space of Peskin-Takeuchi parameters with prediction from the 4<sup>th</sup> generation model

- \* Impact of the 4<sup>th</sup> Gen:

- \* Current interpretation of the precision measurements
- \* New physics models including the Higgs boson predictions.

- \* Presented direct searches for pair production of the sequential 4<sup>th</sup> generation quarks:  $t'$  and  $b'$

- \* Data:  $1\text{fb}^{-1}$  ATLAS pp-collision data at 7TeV taken during 2011

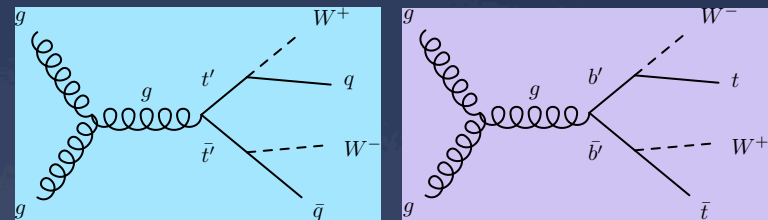
- \* Model dependent searches. Assumptions\*:

- \*  $m_{t'} - m_{b'} < m_W$
- \*  $m_{b'} > m_t + m_W$

- \* Hence the decay modes:

- \*  $t' \rightarrow qW$ ,  $q = (b, s, d)$
- \*  $b' \rightarrow tW \rightarrow bWW$

with BR=100%



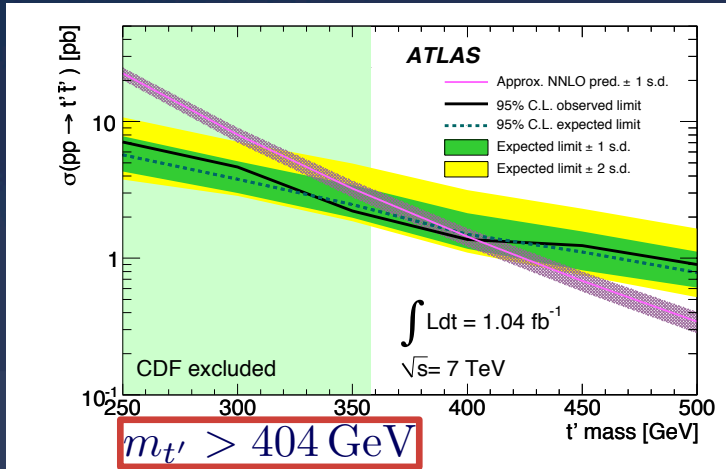
- \* Considered final state topologies:

- \*  $t'$ : lepton+jets, opposite-sign dilepton

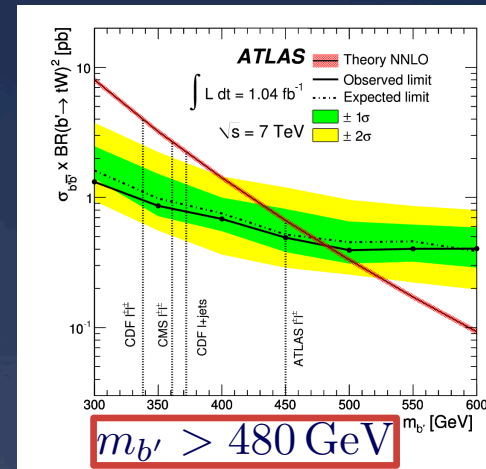
- \*  $b'$ : lepton+jets, same-sign dilepton

\* Assumptions deduced from consistency with EW precision data

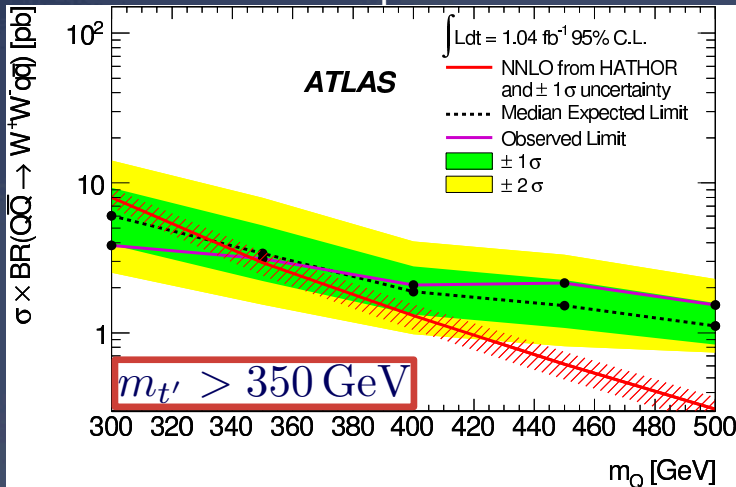
## $t'$ lepton+jets



## $b'$ lepton+jets



## $t'$ dilepton



## $b'$ dilepton

