

Light gravitino production in association with gluinos at the LHC

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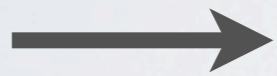
arXiv:1206.7098

The gravitino

spin 3/2 superpartner of the graviton

unbroken SUSY: massless

broken SUSY: massive via super-higgs mechanism



$$m_{3/2} \sim \frac{M_{SUSY}^2}{M_{Pl}}$$

- depending on SUSY breaking scale: wide mass range possible

- couplings $\propto \frac{1}{M_{Pl}m_{3/2}}$

→ **light** gravitino interesting for collider studies

Goal

study collider signature \longrightarrow information about gravitino mass
 \longrightarrow SUSY breaking scale

Setup: simplified SUSY model

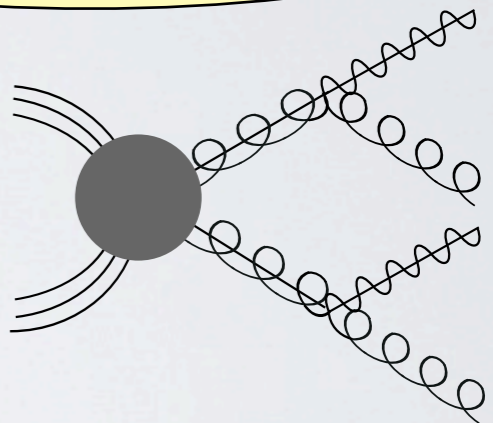
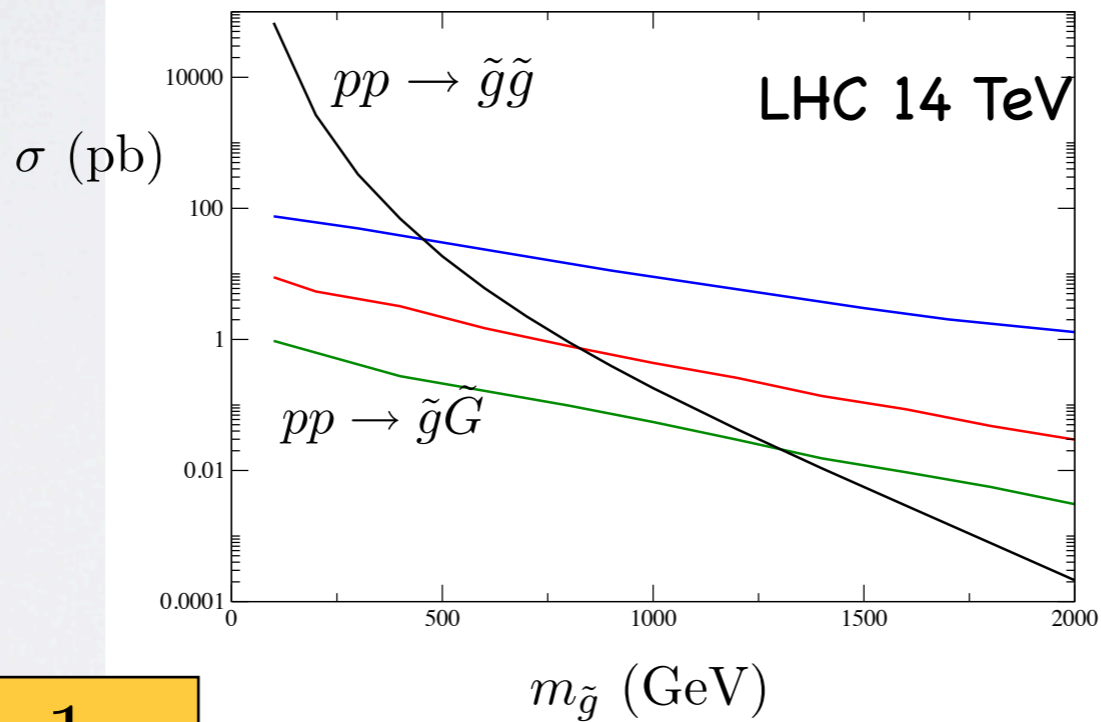
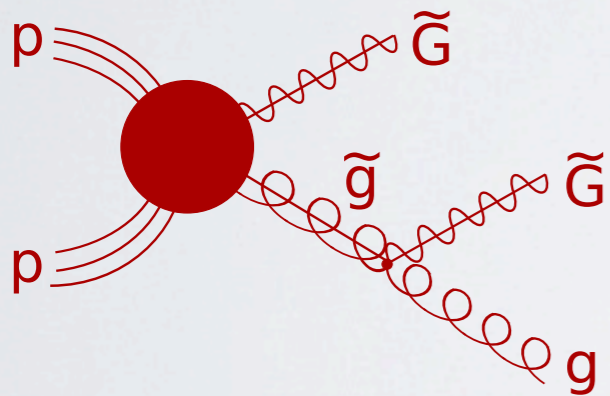
- lightest SUSY particle = gravitino, \cancel{E}_T
- next-to-lightest SUSY particle = gluino, $\tilde{g} \rightarrow \tilde{G}g$
- R-parity conservation

The signal

$$pp \rightarrow \text{jets} + \cancel{E}_T$$

$$pp \rightarrow \tilde{g}\tilde{G} \rightarrow g\tilde{G}\tilde{G}$$

$$pp \rightarrow \tilde{g}\tilde{g} \rightarrow gg\tilde{G}\tilde{G}$$



$$\sigma(pp \rightarrow \tilde{g}\tilde{G}) \propto \frac{1}{m_{3/2}^2}$$

$$m_{3/2} = 1 \cdot 10^{-13} \text{ GeV}$$

$$m_{3/2} = 3 \cdot 10^{-13} \text{ GeV}$$

$$m_{3/2} = 9 \cdot 10^{-13} \text{ GeV}$$

independent of
gravitino mass

Results

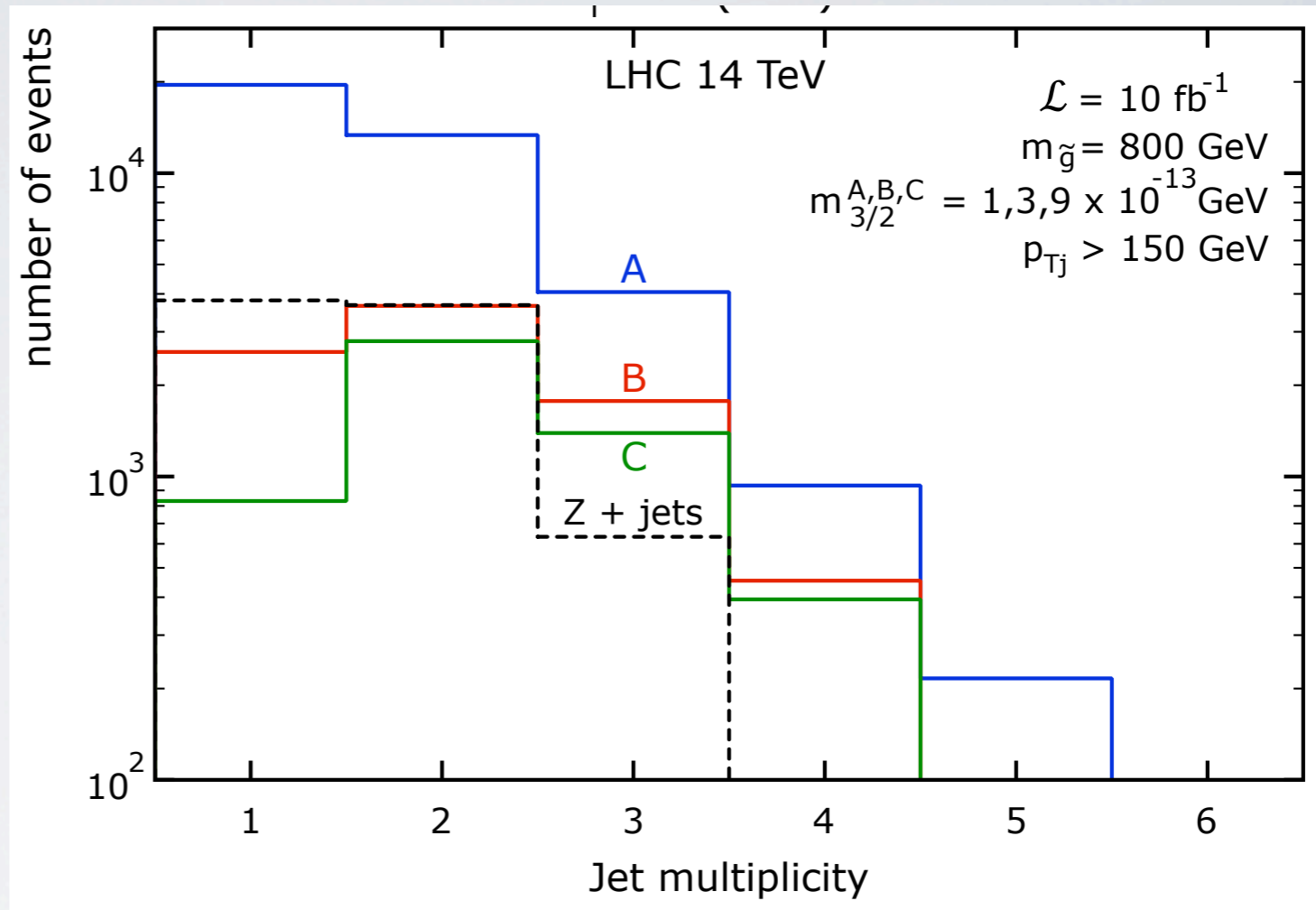
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$$pp \rightarrow \tilde{g}\tilde{G} \rightarrow g\tilde{G}\tilde{G}$$

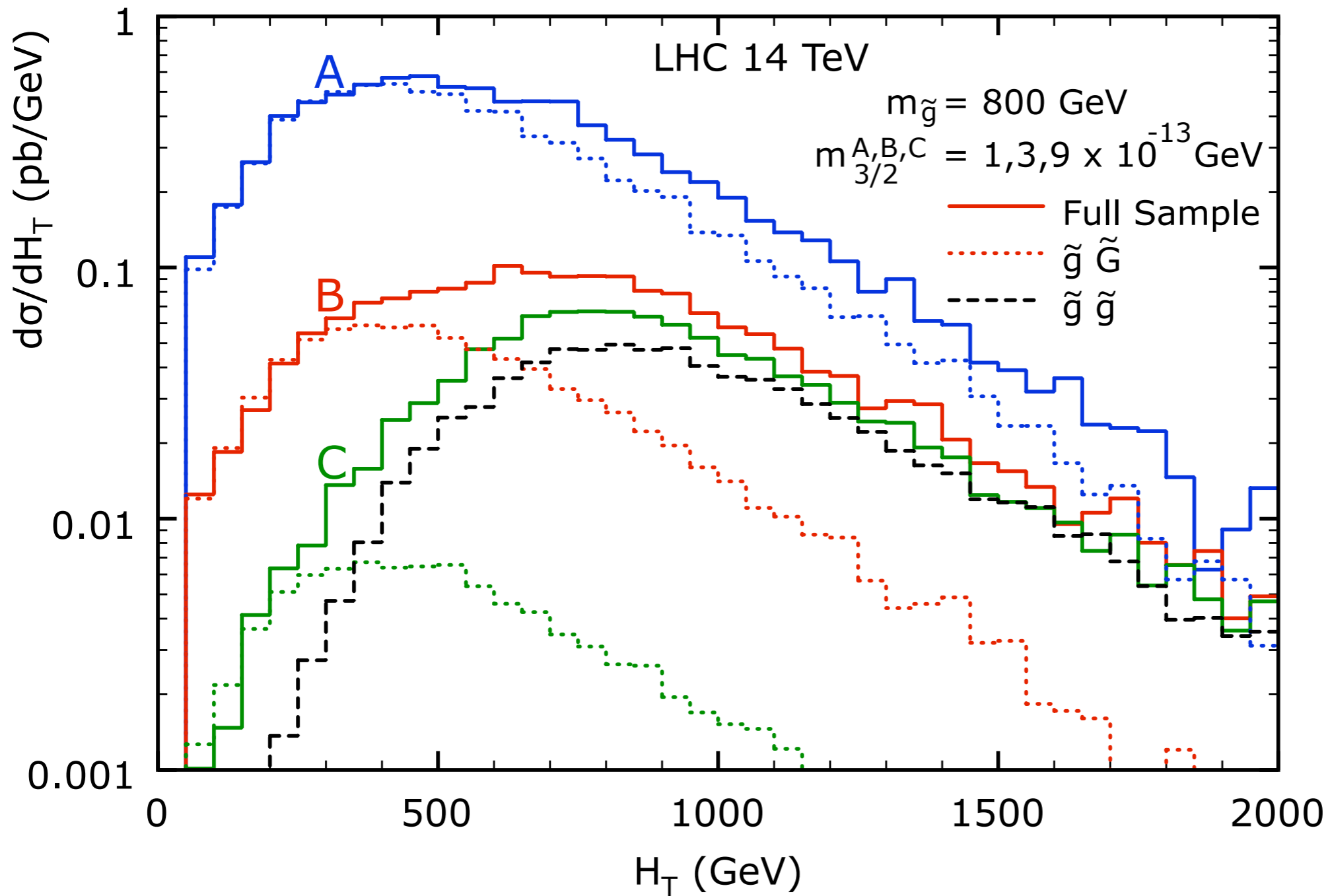
$$pp \rightarrow \tilde{g}\tilde{g} \rightarrow gg\tilde{G}\tilde{G}$$



- distributions differ for the different gravitino masses
- signal and background are of the same order



information about gravitino mass
and hence SUSY breaking scale



$m_{3/2} = 1 \cdot 10^{-13} \text{ GeV}$
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 $m_{3/2} = 9 \cdot 10^{-13} \text{ GeV}$