

# The Top, the Dark and the Wiggly

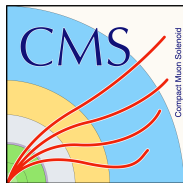
A Pas de Deux in Searches for New Phenomena

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Matter & Universe day 2021



# Motivation



The standard model Higgs sector is economical...

# Motivation



...but there are certainly richer possibilities.



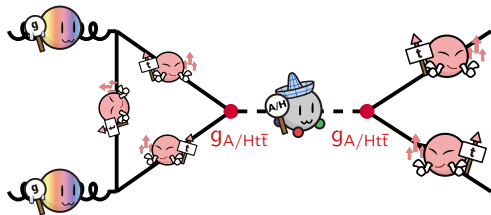
# Motivation



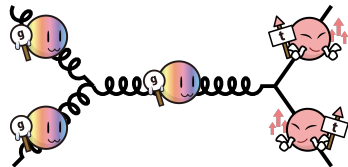
Dark matter. Who knows?



# Overview

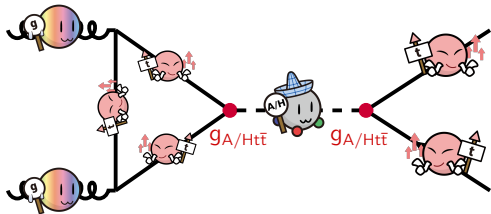


Signal: gluon fusion  $A/H \rightarrow t\bar{t}$

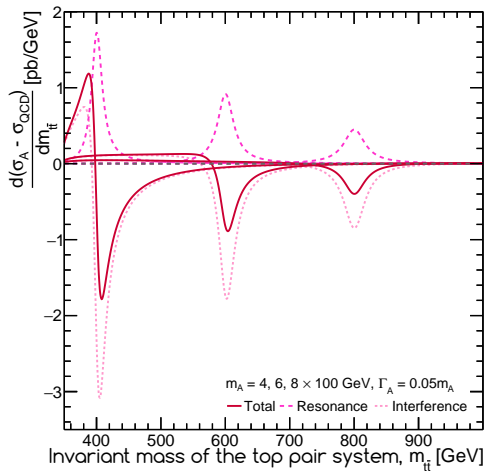


Major background: QCD-induced  $t\bar{t}$

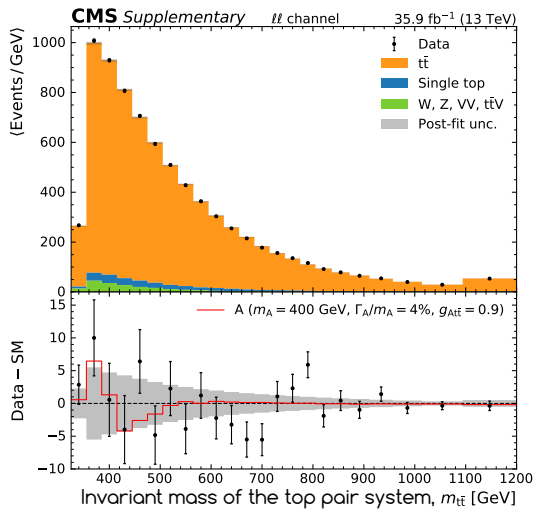
# Overview



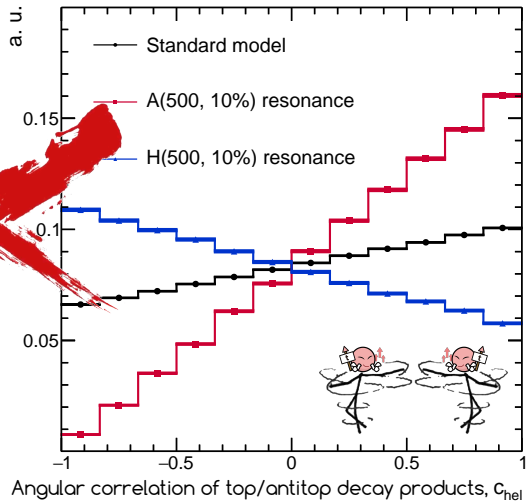
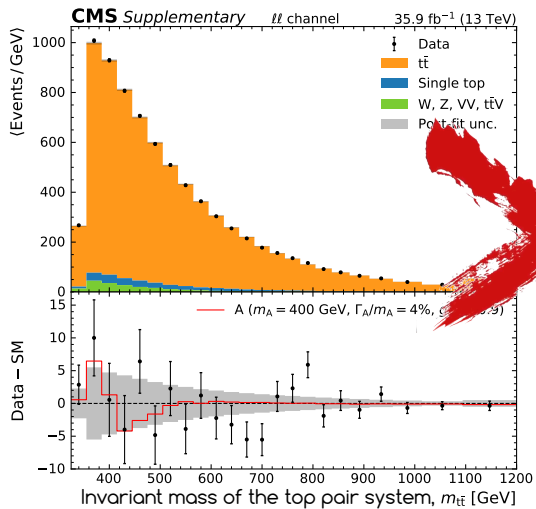
Interference  $\Rightarrow$



# Strategy

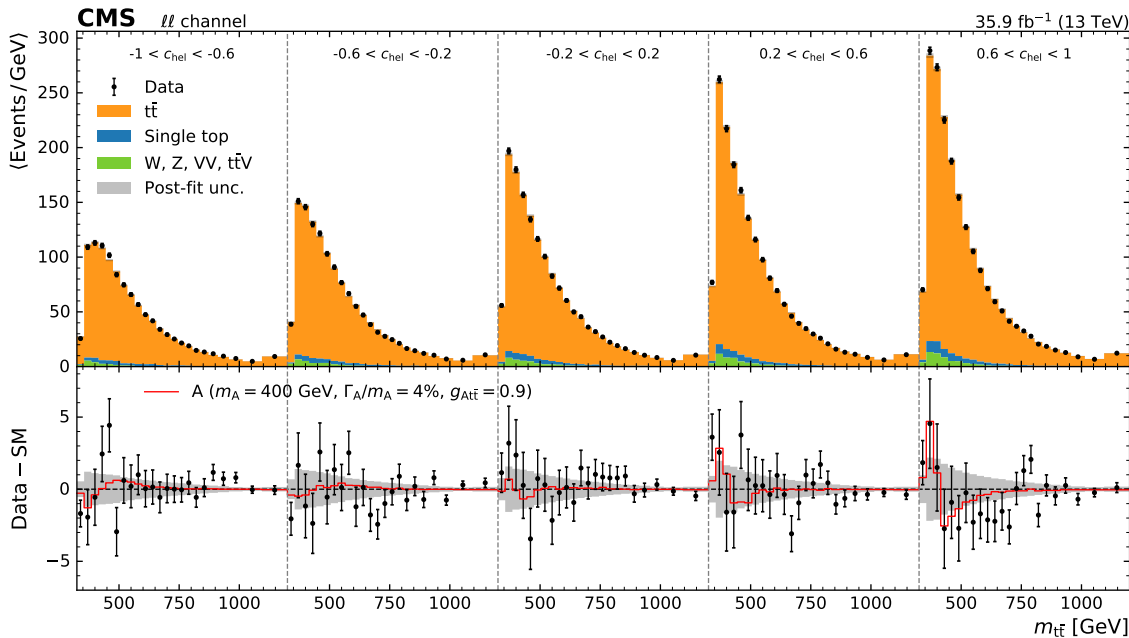


# Strategy



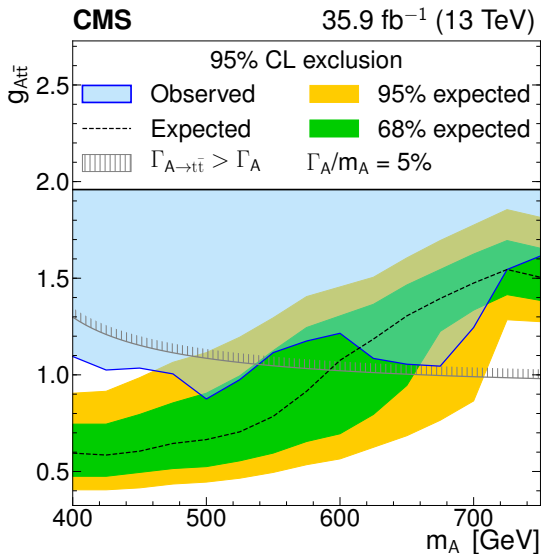
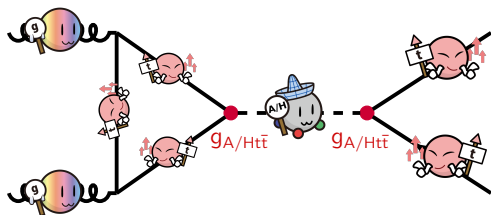


# Strategy



# Results

- Exclusion regions on  $g_{A/Ht\bar{t}}$  are set as function of  $A/H$  mass and width
- Observed exclusion is weaker than expected at low  $m_A$ , indicative of an **excess**
  - Most significant for  $A(400, 4\%)$  at  $3.5\sigma$
  - $1.9\sigma$  after look elsewhere effect



# CMS A/H $\rightarrow$ $t\bar{t}$ full Run 2

It ain't over til it's over

Coming soon in 2022



WHAT IF WE TRIED  
MORE POWER?





Thank you!

