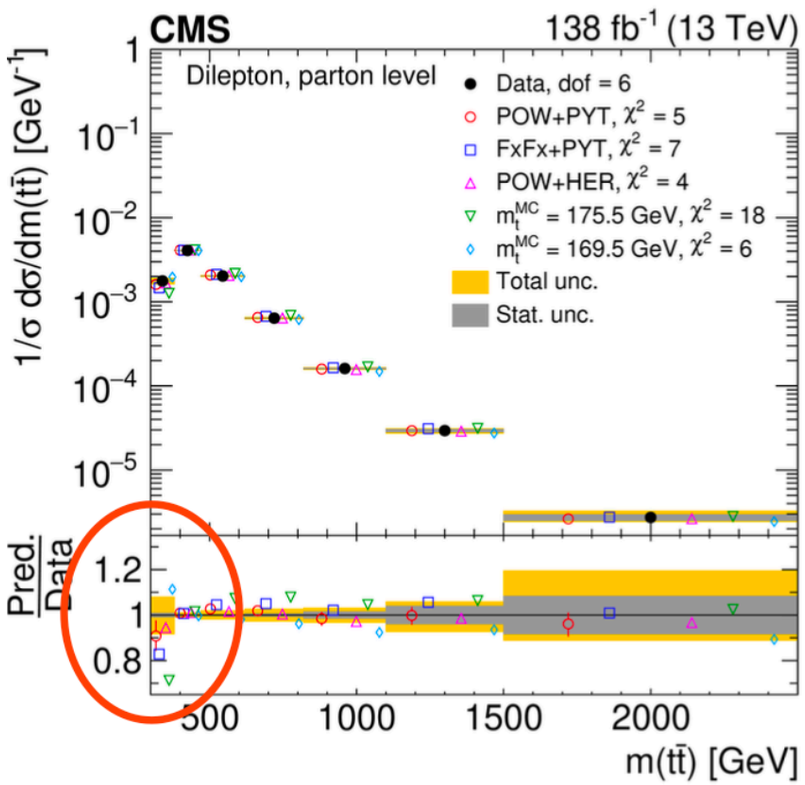
Toponium discussion

Toponium: mass spectrum from CMS

Recap: $t\bar{t}$ differential measurements

CMS ℓℓ - m_{tt}

CMS-PAS-TOP-20-006



ATLAS eμ - $m_{e\mu}$

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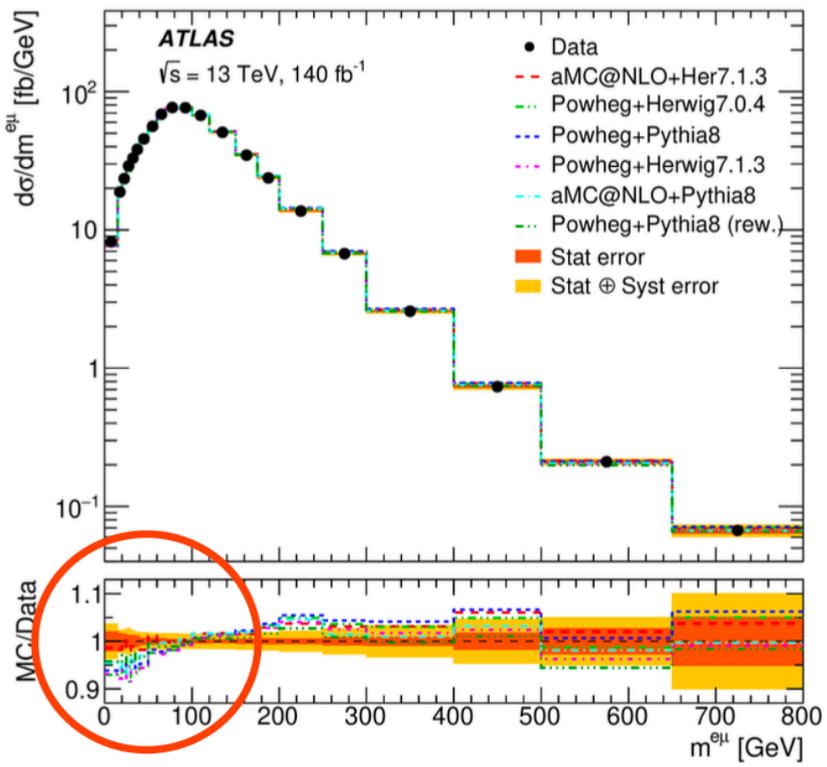
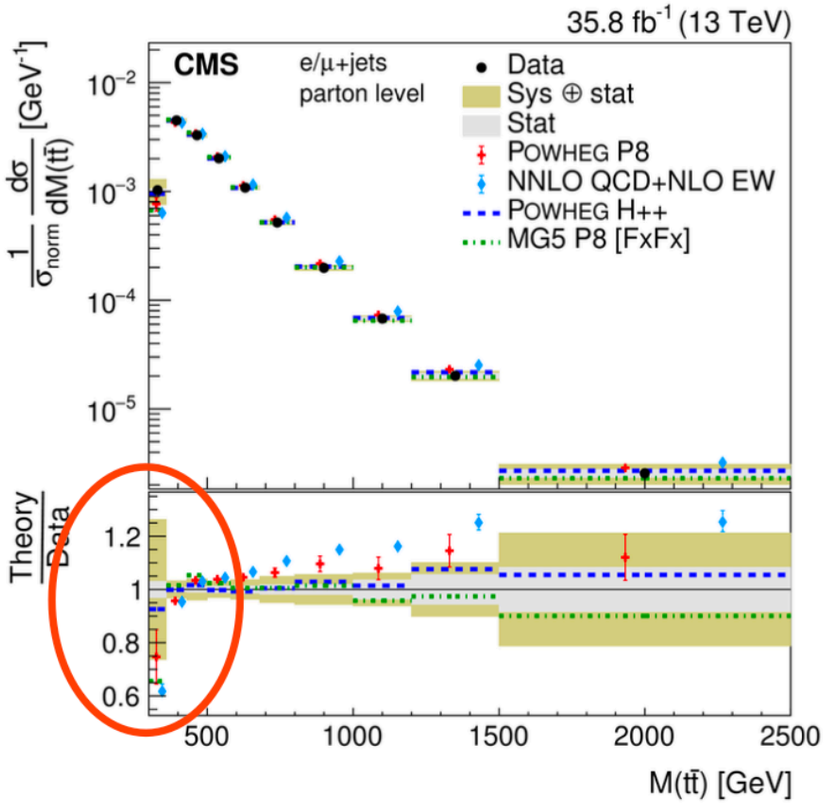


CMS ℓ+jets - m_{tt}

PRD 97 (2018) 112003

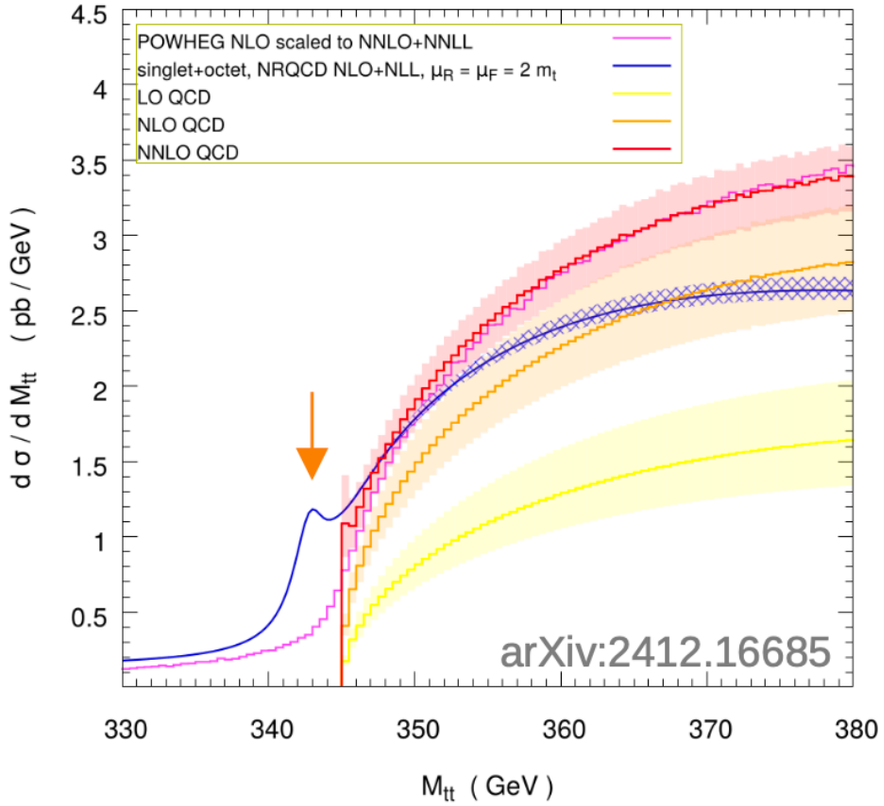


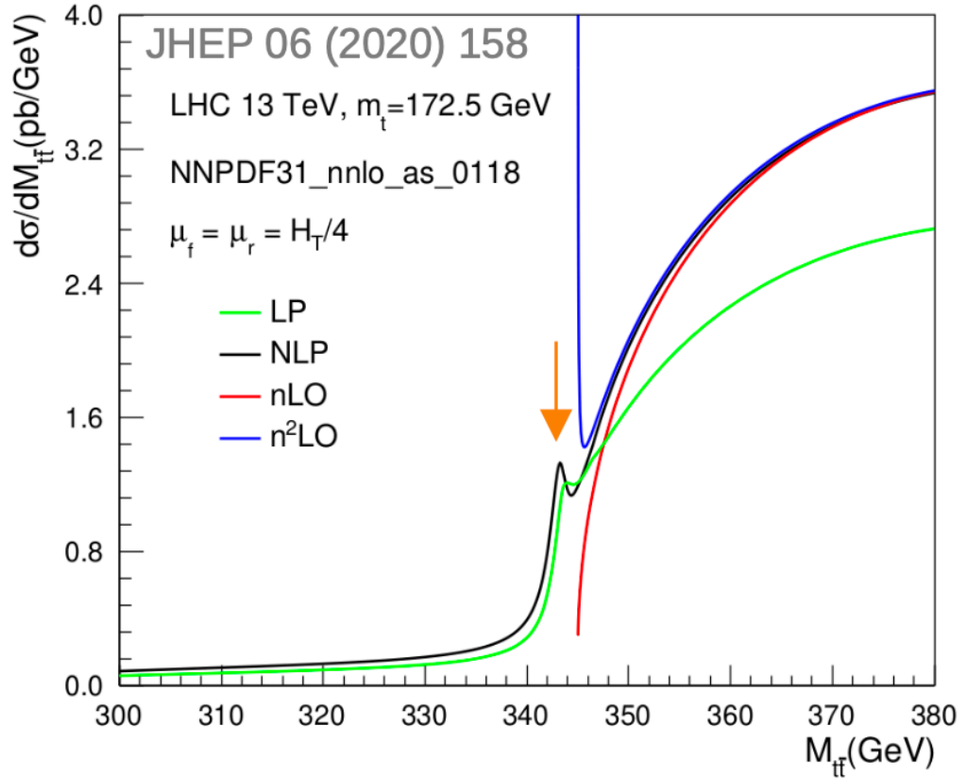
→ good description by theory except for excess in data in threshold region

Toponium: mass spectrum from CMS

$t\bar{t}$ bound states

- SM predicts $t\bar{t}$ (quasi-)bound states below the $t\bar{t}$ threshold





- So far not observed!
- Dominant component: pseudoscalar – can we search for it?

CASCADE: eta_t production

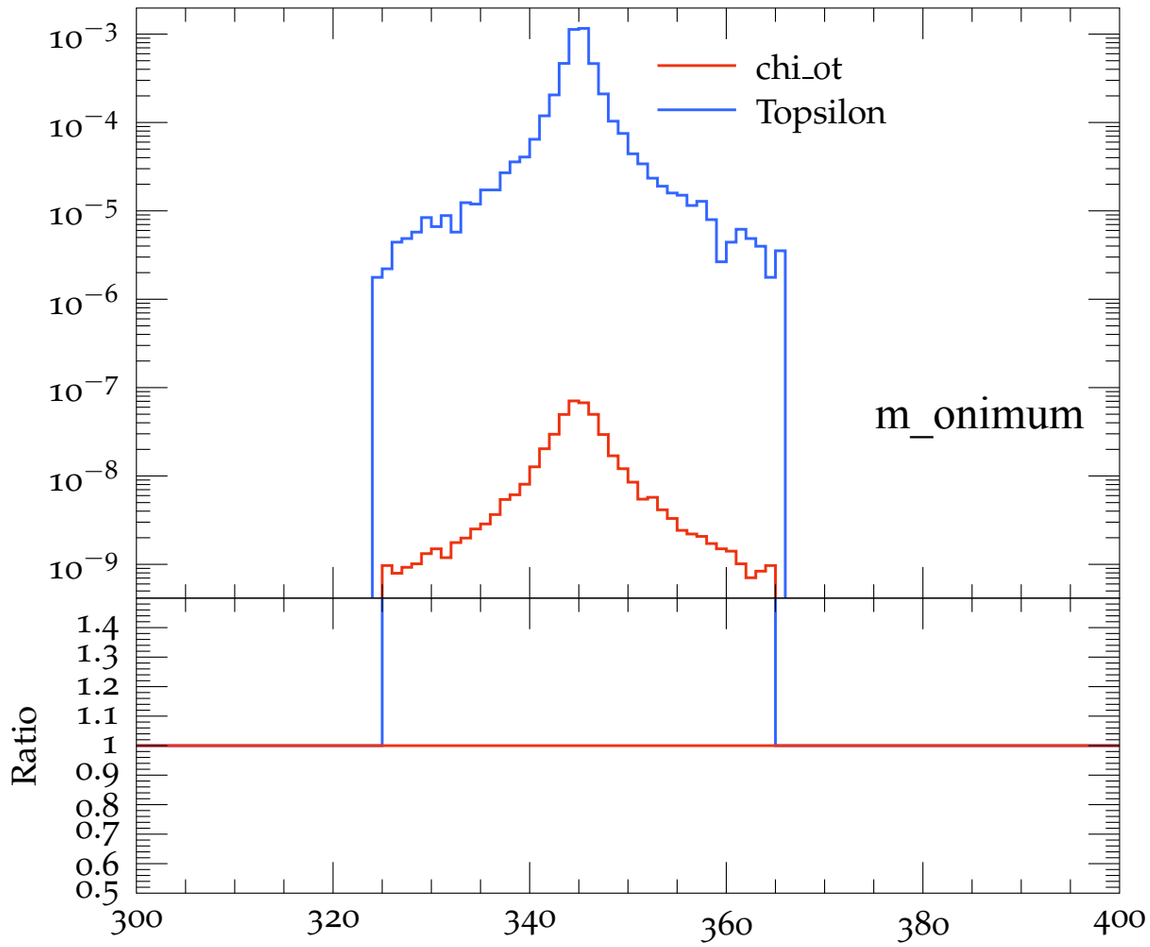
- Onium production in CASCADE:
  - define new state (in PYTHIA)
  - name mass: width: max spread:
    - 663 Topsilon 0 0 0 345. 2.00000 21.00000 0.00000E+00 1 1
    - 10661 chi_0t 0 0 0 345. 4.00000 20.00000 0.00000E+00 1 1
- ttbar via g*g* -> chi
- ttbar via g*g* -> t tbar

CASCADE: tt production

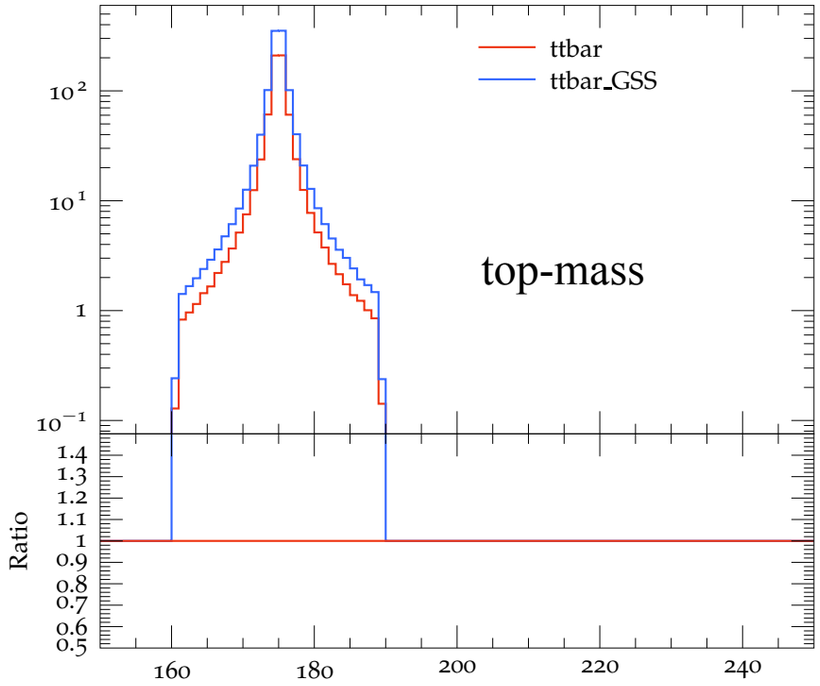
- Serguei's formulation - suppression at small m_tt
  - GSS = x/(1.-exp(-x)) with x = 2*pi*als/v
    - where als is the strong coupling constan and v is the relative velocity of the quarks v = sqrt(1 - 4*mt**2/shat).

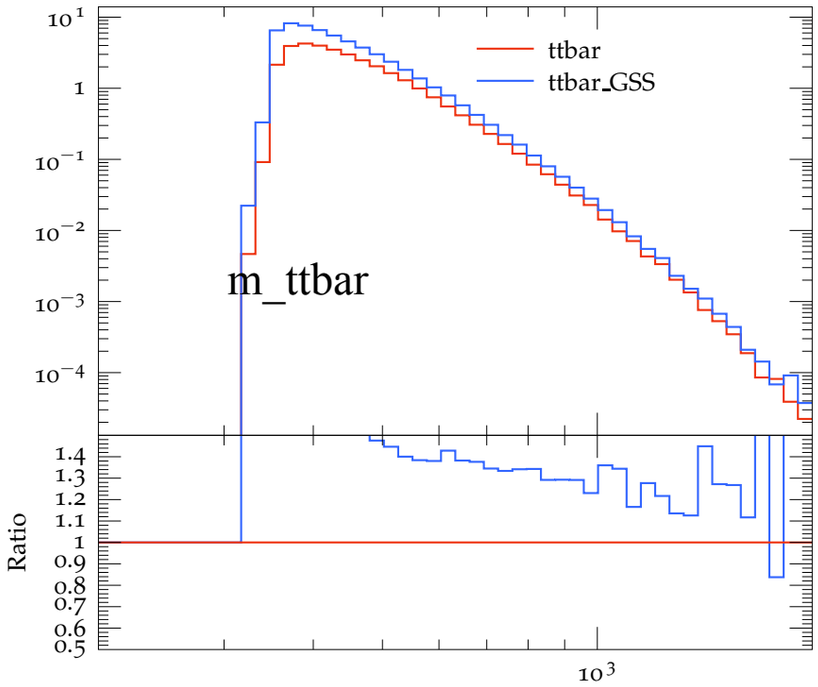
- ttbar via g*g* -> t tbar

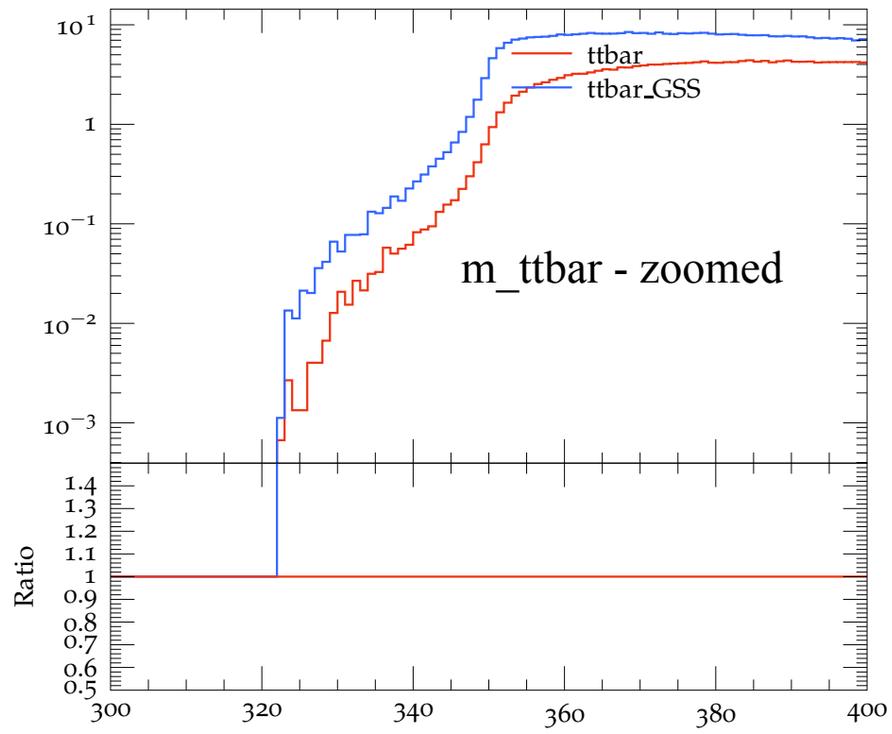
Results - Onium



Results - ttbar







CMS ℓℓ - m_{tt}

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