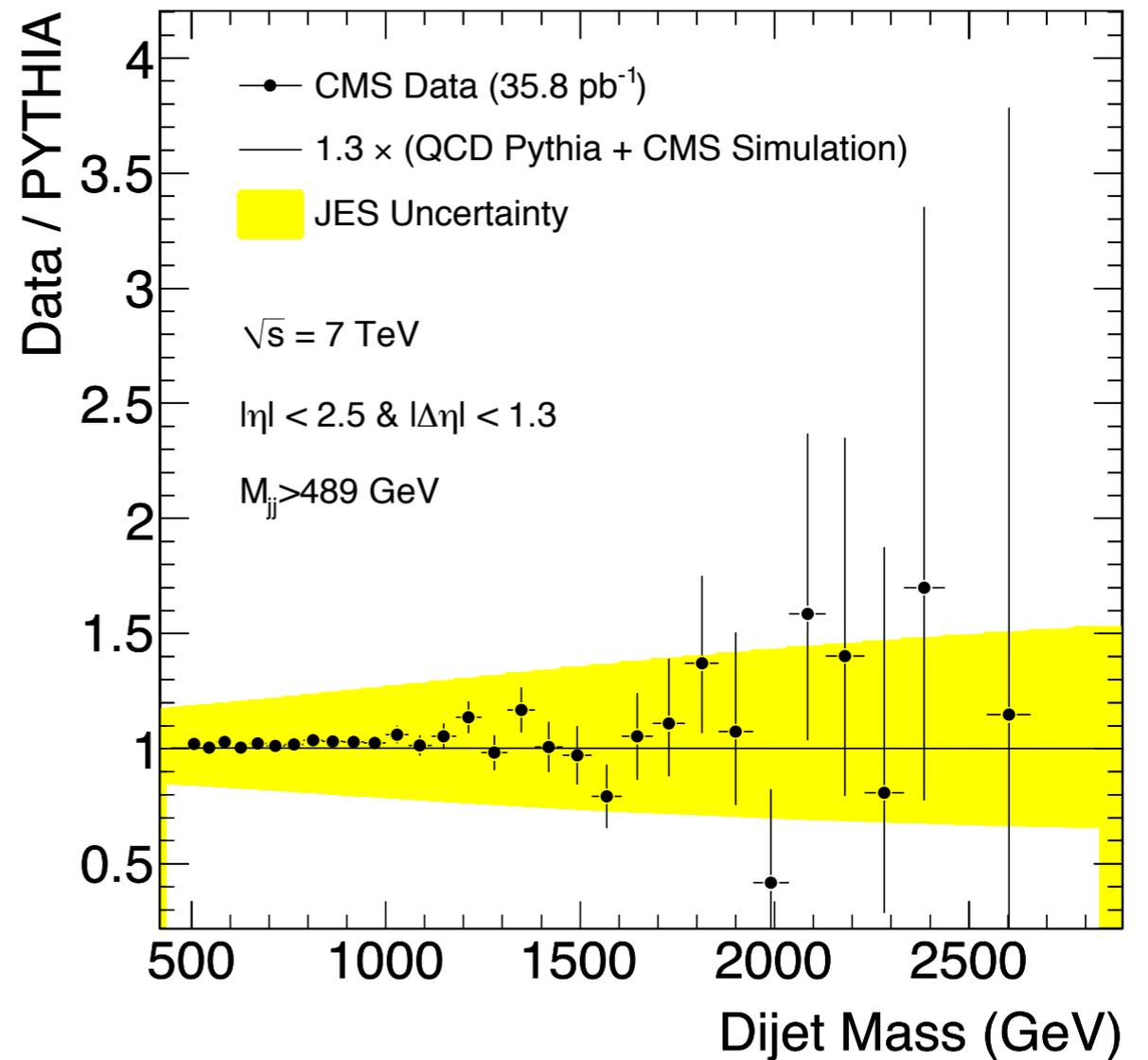
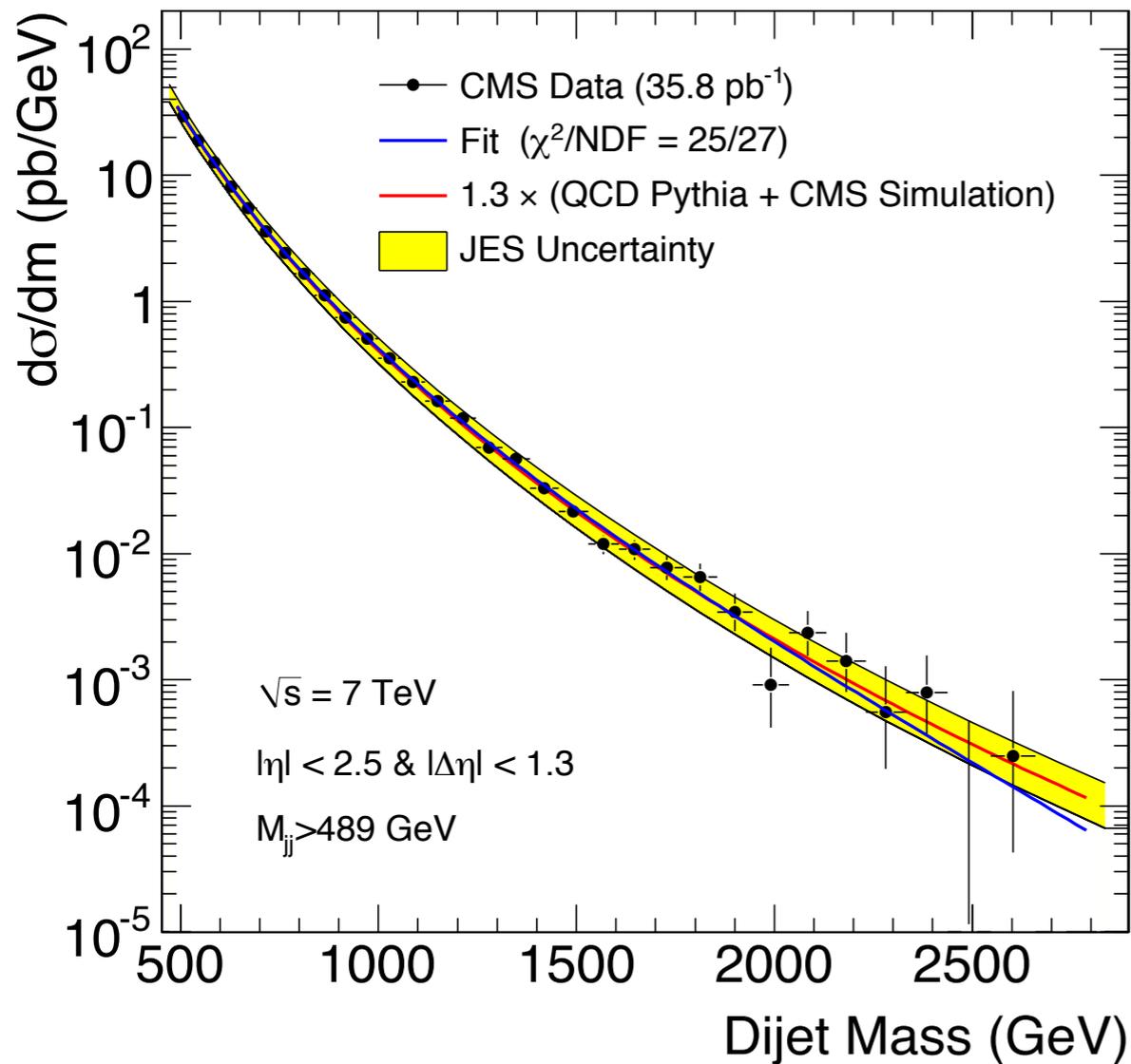




# Dijet Mass and QCD

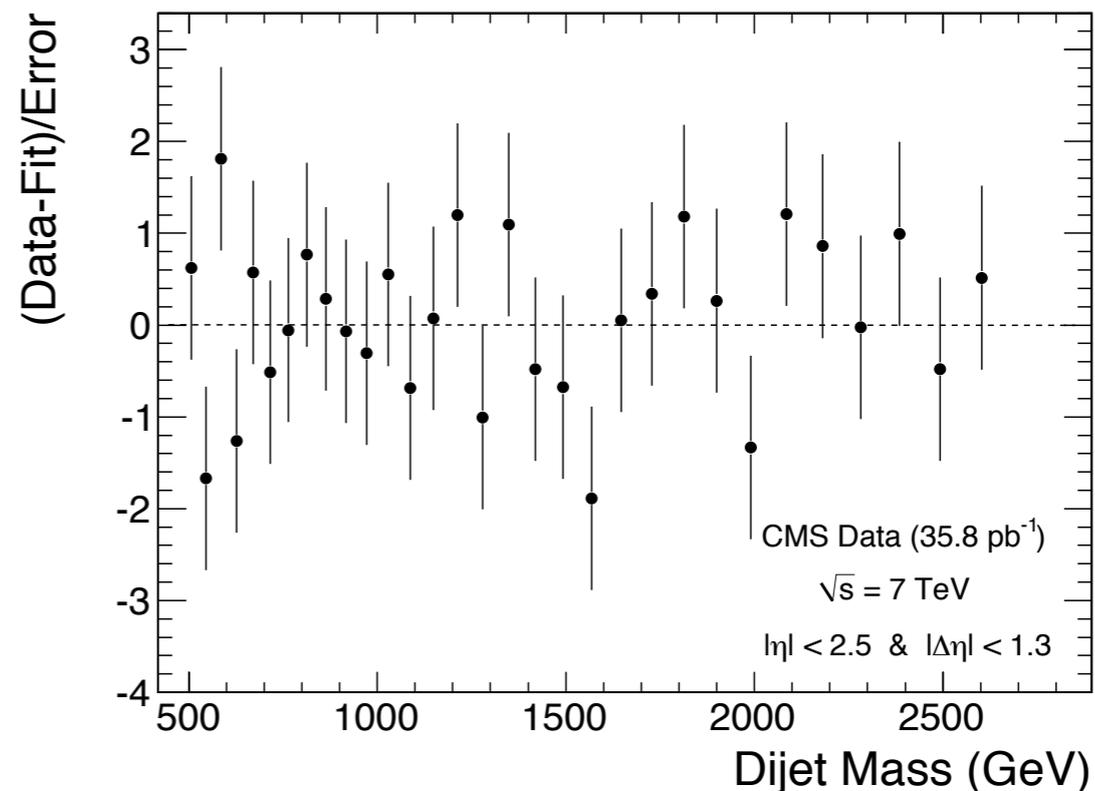
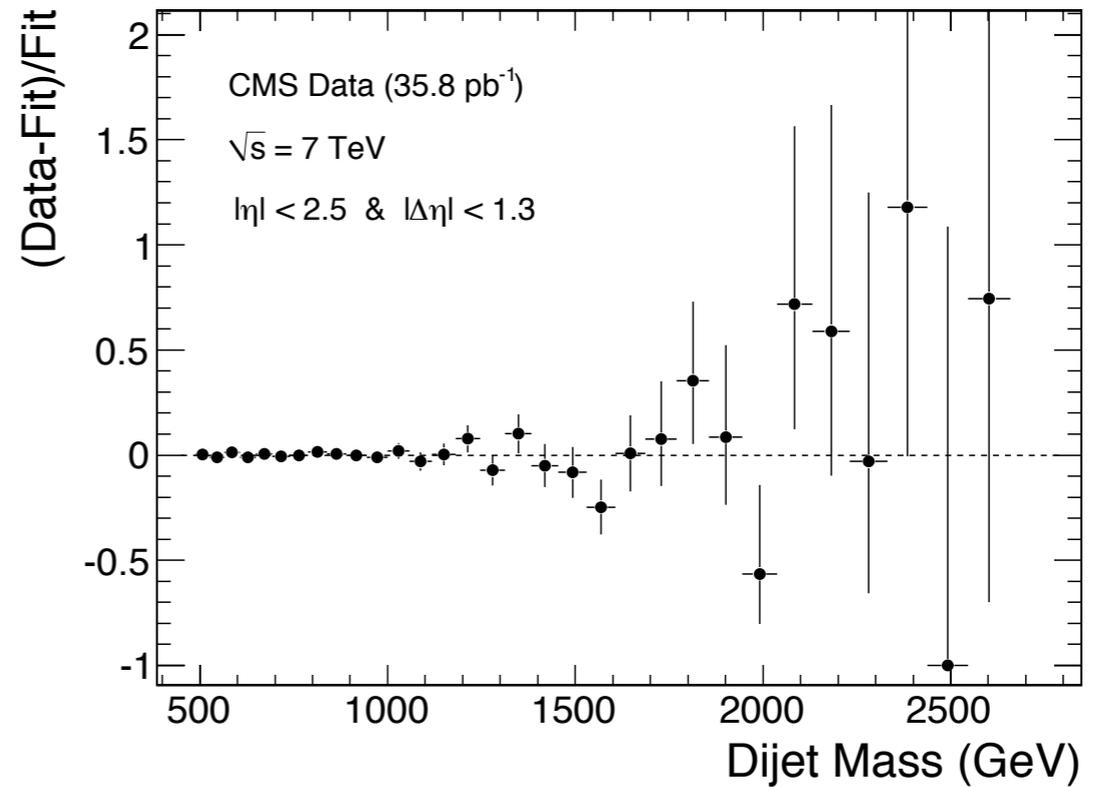
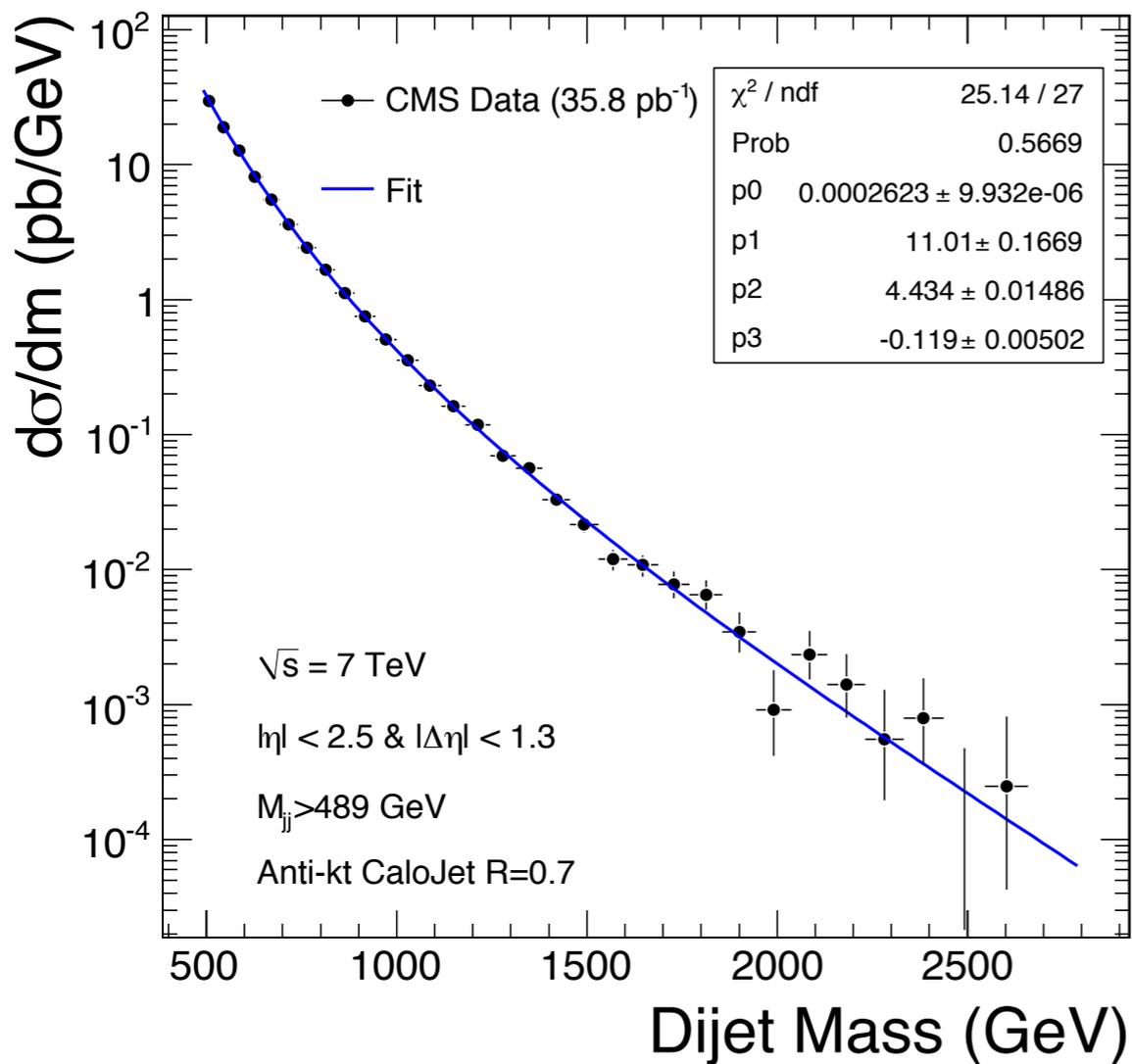
- The data is in good agreement with the full CMS simulation of QCD from PYTHIA.



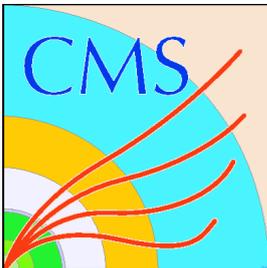


# Dijet Mass and Fit

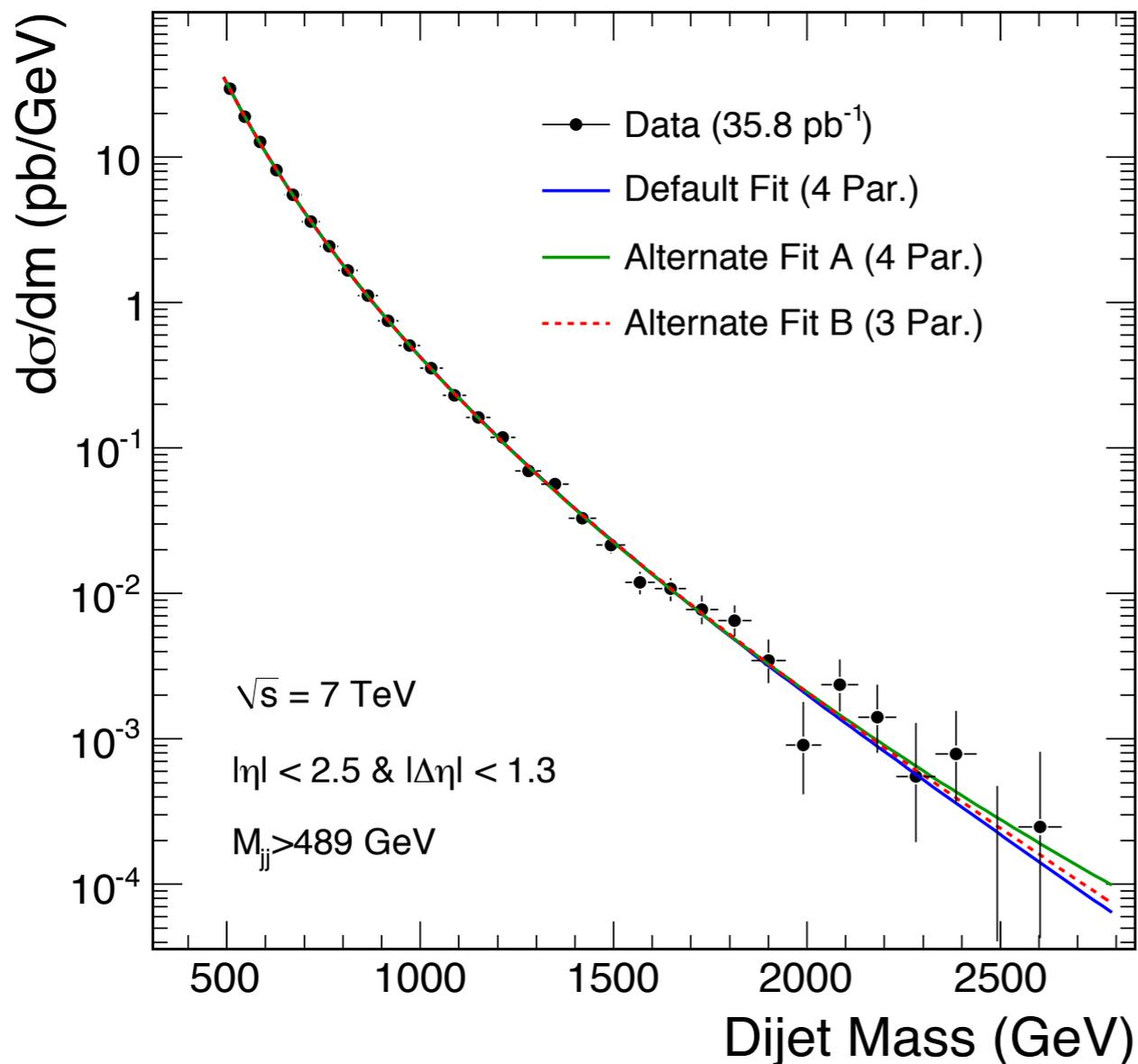
- We fit the data to a function containing 4 parameters used by CDF Run II and ATLAS.
- We get a good fit.
- No evidence for new physics



$$\frac{d\sigma}{dm} = p_0 \frac{(1-X)^{p_1}}{X^{p_2+p_3 \ln(X)}} \quad x = m_{jj} / \sqrt{s}$$



# Another Fit Parametrization



$\chi^2/\text{NDF} = 25.1/27$   
 $\chi^2/\text{NDF} = 24.1/27$   
 $\chi^2/\text{NDF} = 25.3/28$

- In addition to the default fit, two alternate functional forms are considered.
- Default 4 parameters fit gives the best results.

Default

$$\frac{P_0 \cdot (1 - m/\sqrt{s})^{p_1}}{(m/\sqrt{s})^{p_2} + p_3 \ln(m\sqrt{s})}$$

Fit A

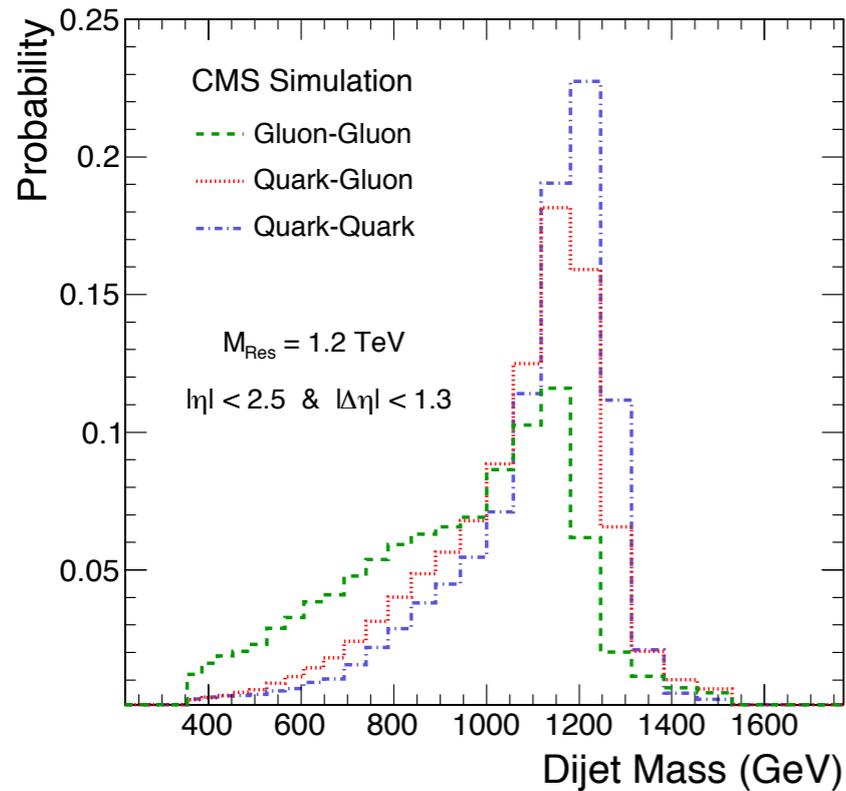
$$\frac{P_0 \cdot \left(1 - m/\sqrt{s} + P_3 \cdot (m/\sqrt{s})^2\right)^{P_1}}{m^{P_2}}$$

Fit B

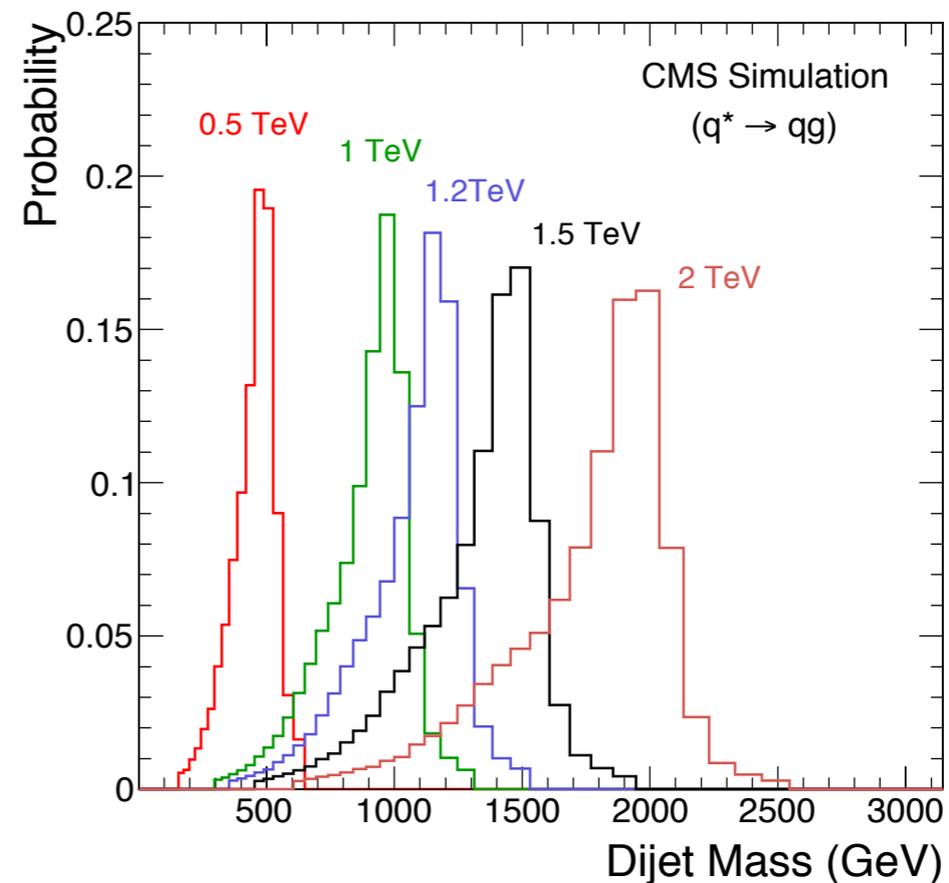
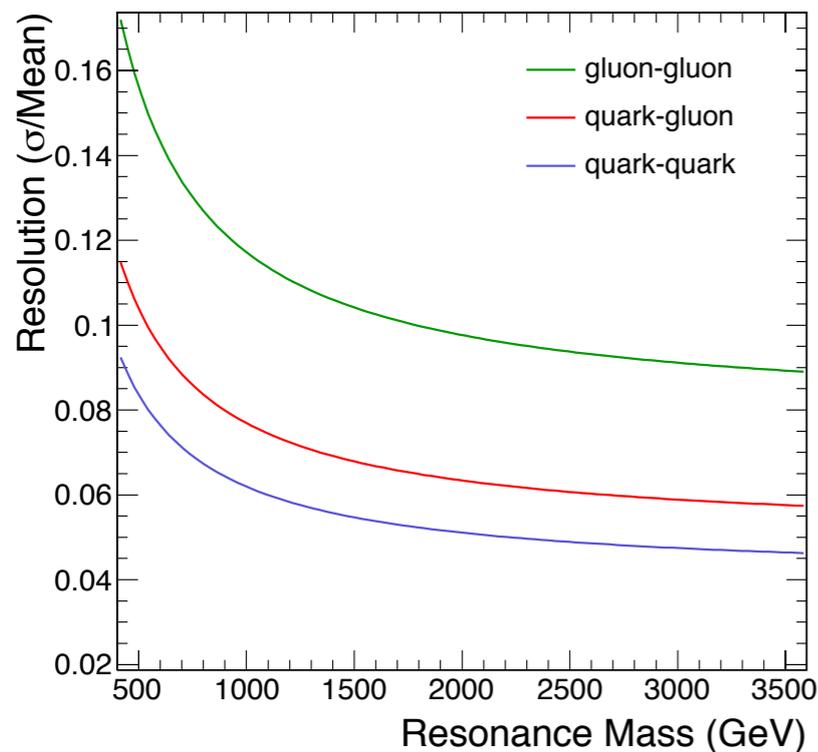
$$\frac{P_0 \cdot (1 - m/\sqrt{s})^{P_1}}{m^{P_2}}$$



# Resonance Shapes



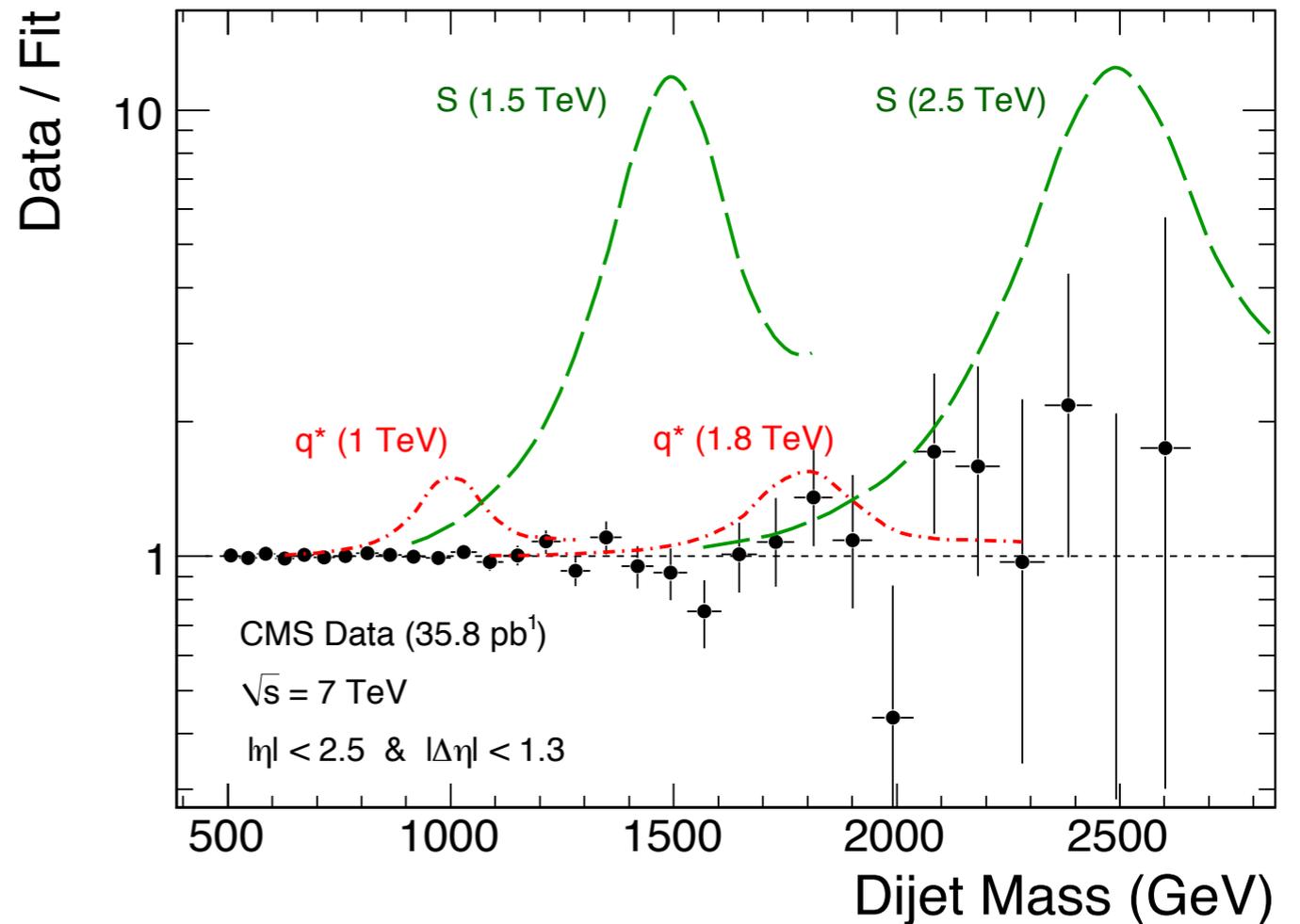
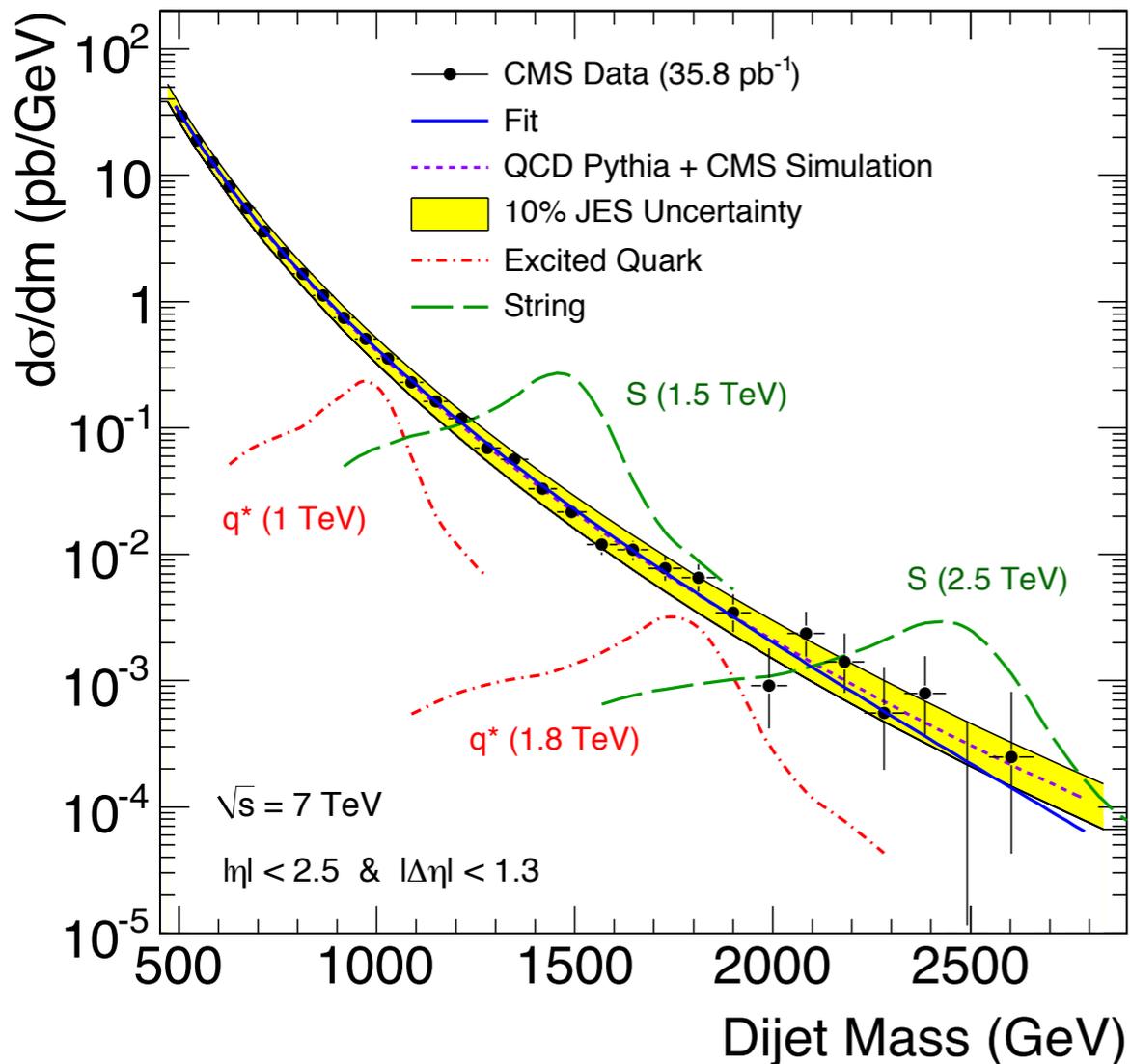
- We have simulated dijet resonances using CMS simulation + PYTHIA.
- ✓ Three types of parton pairs
  - ▶  $gg \rightarrow G \rightarrow gg$ ,  $qg \rightarrow q^* \rightarrow qg$  and  $qq \rightarrow G \rightarrow qq$
- qq, qg and gg resonances have different shape mainly due to FSR.
- ✓ The width of dijet resonance increases with number of gluons because gluons emit more radiation than quarks.
- We search for these three basic types of narrow dijet resonance in our data.





# Fit and Signal

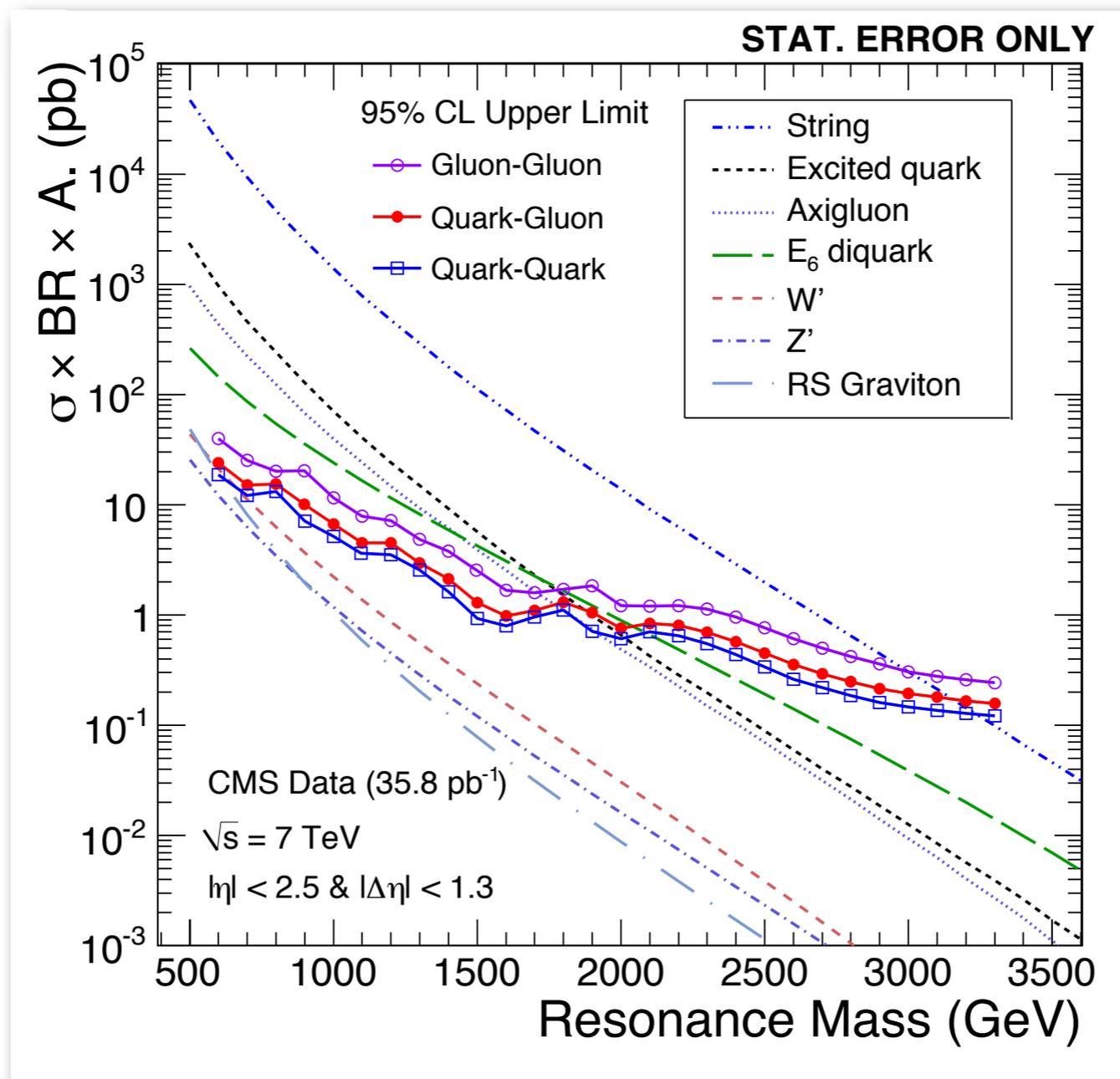
- We search for dijet resonance signal in our data.
- Excited quark signals are shown at 1 TeV and 1.8 TeV.
- String resonances are shown at 1.5 TeV and 2.5 TeV.





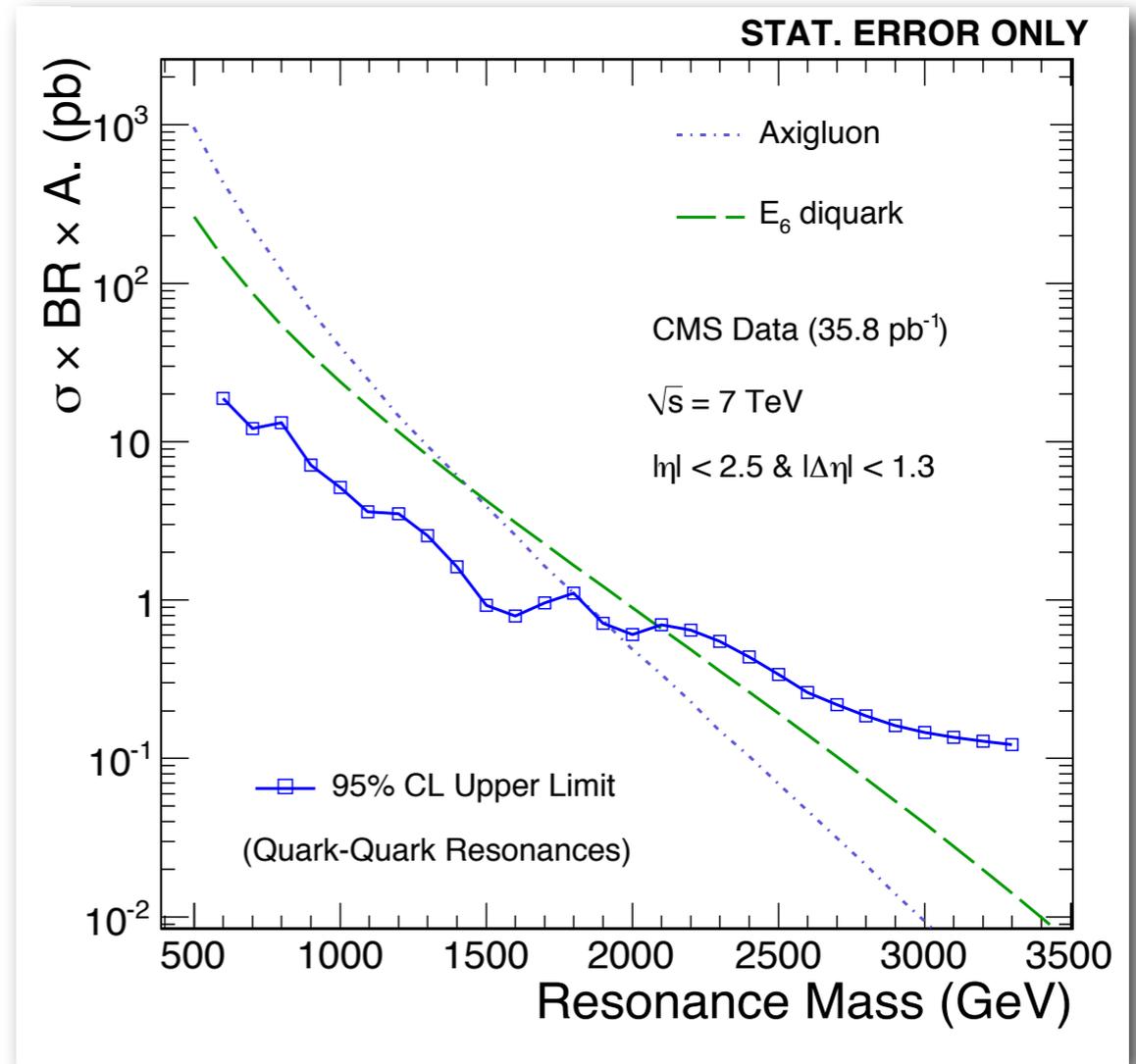
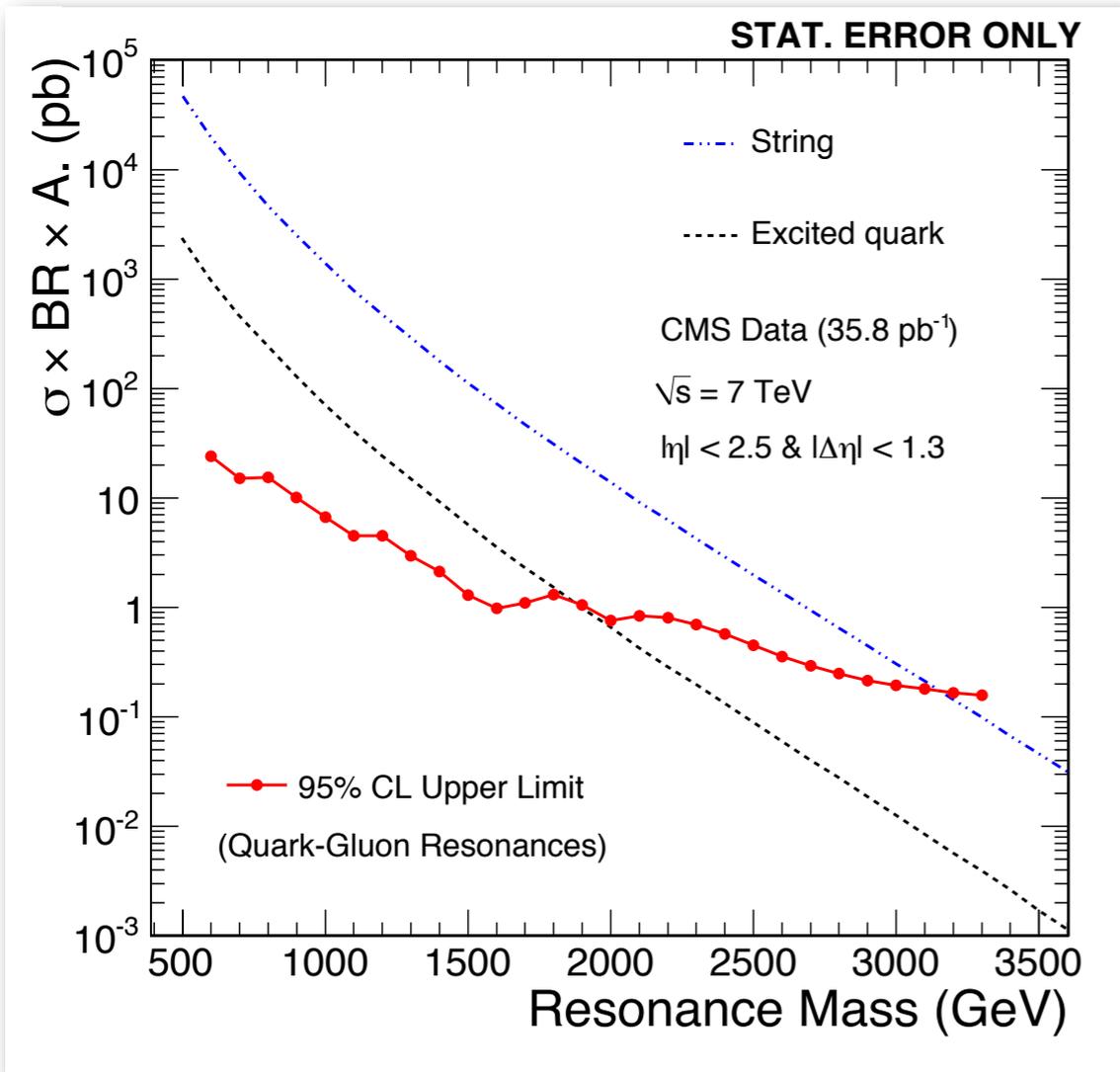
# Limits with Stat. Error Only

- 95% CL Upper limit with Stat. Error. Only compared to cross section for various model.
- ✓ Show quark-quark and quark-gluon and gluon-gluon resonances separately.
- ✓ gluon-gluon resonance has the lowest response and is the widest and gives worst limit.





# Limits with Stat. Error Only



- String  $\Rightarrow 0.60 < M(S) < 3.15 \text{ TeV}$  (expected  $M(S) < 3.10 \text{ TeV}$  including Systematics)
- Excited quark  $\Rightarrow 0.60 < M(q^*) < 1.87 \text{ TeV}$  (expected  $M(q^*) < 1.80 \text{ TeV}$  including Systematics)
- Axigluon/Coloron  $\Rightarrow 0.60 < M(A) < 1.92 \text{ TeV}$  (expected  $M(A) < 1.80 \text{ TeV}$  including Systematics)
- E6 Diquark  $\Rightarrow 0.60 < M(D) < 2.08 \text{ TeV}$  (expected  $M(D) < 2.00 \text{ TeV}$  including Systematics)