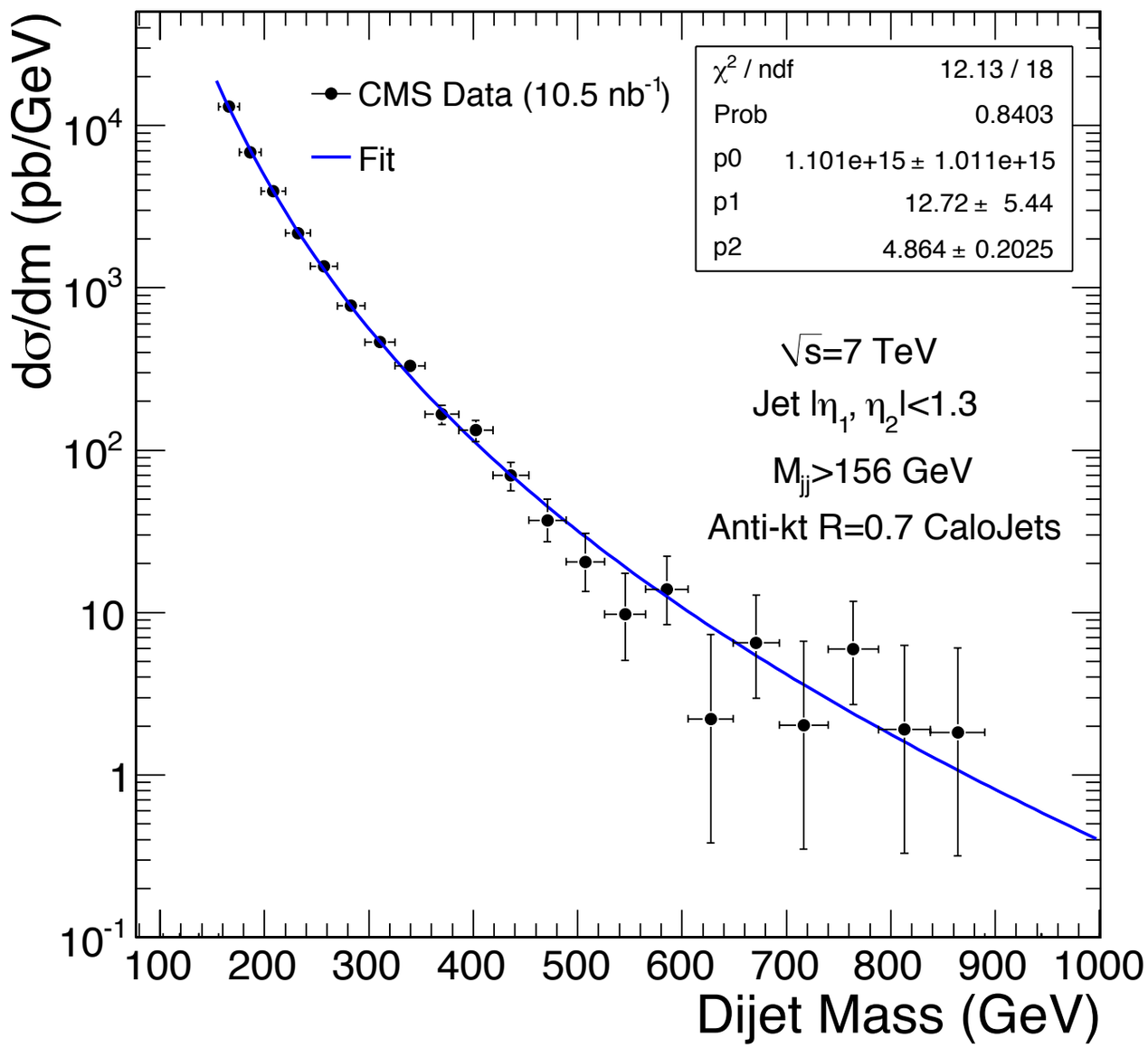
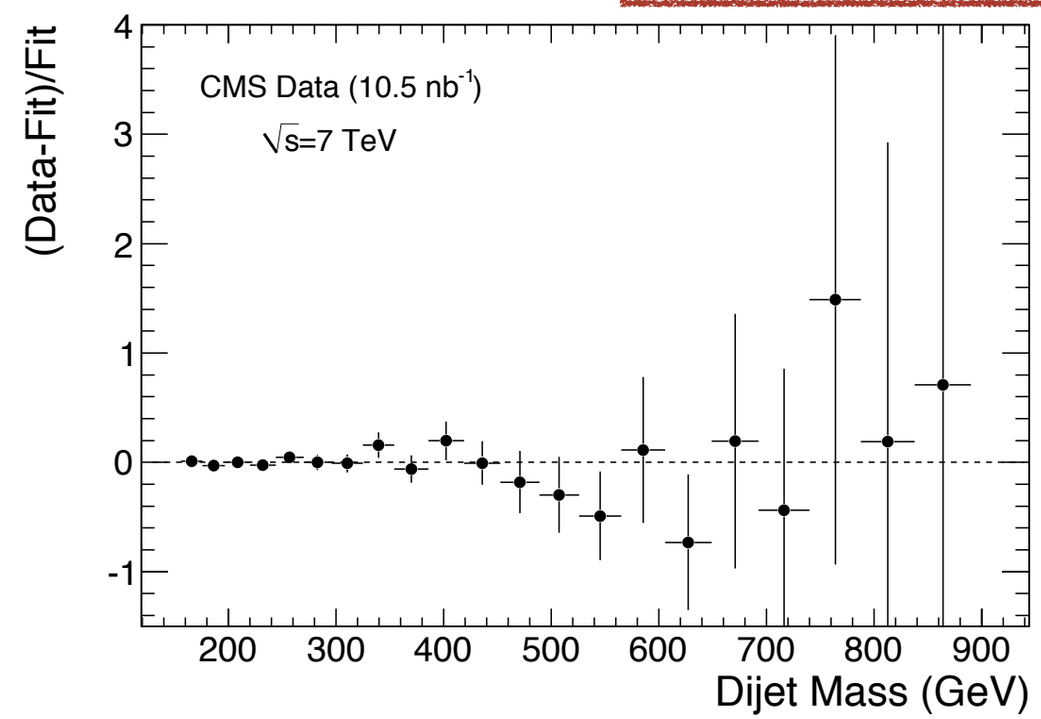
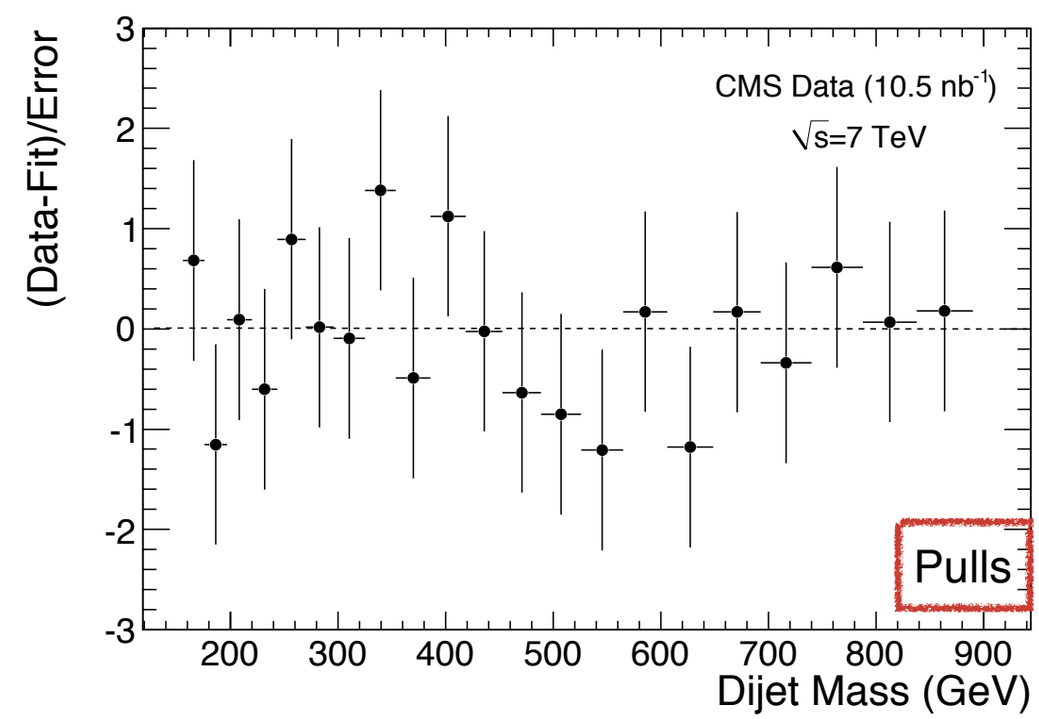
Dijet Mass and Fit

- We fit the data with the function with 3 parameters.
- We get a good fit.



Fractional Diff. between Data and Fit

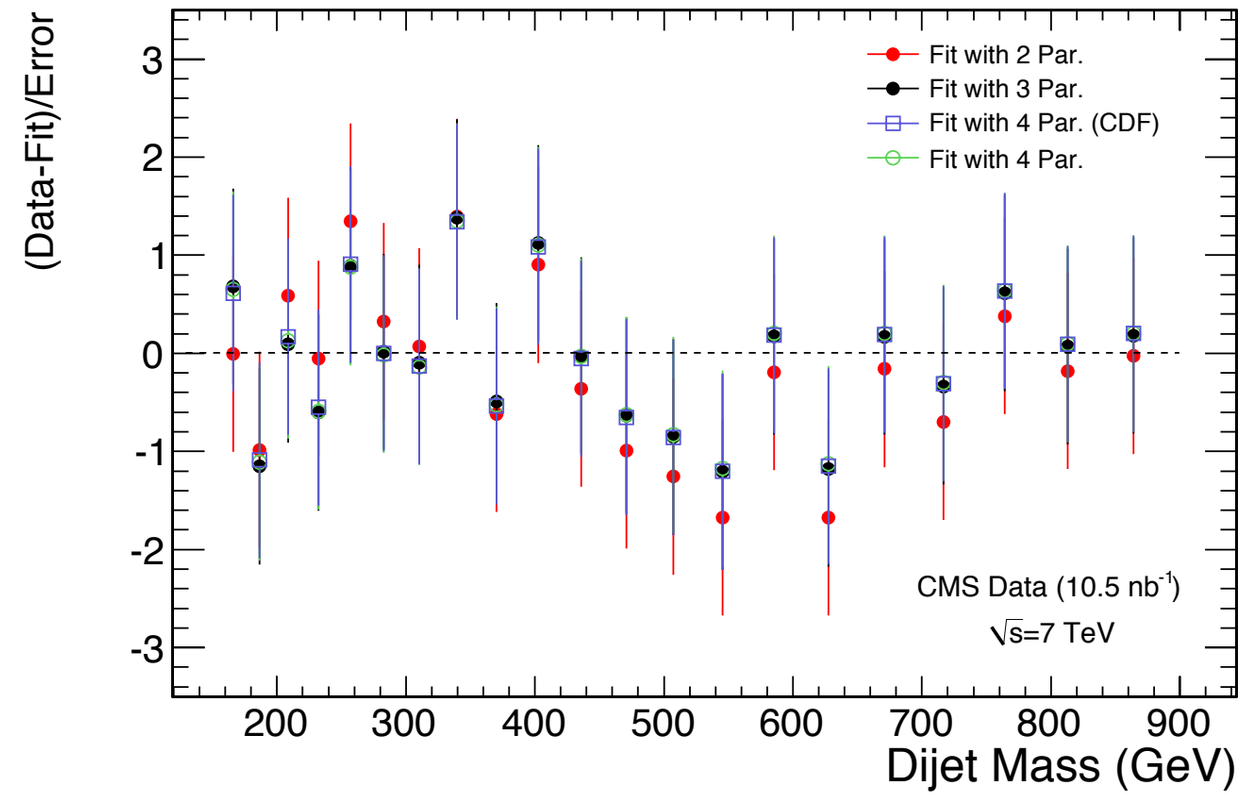


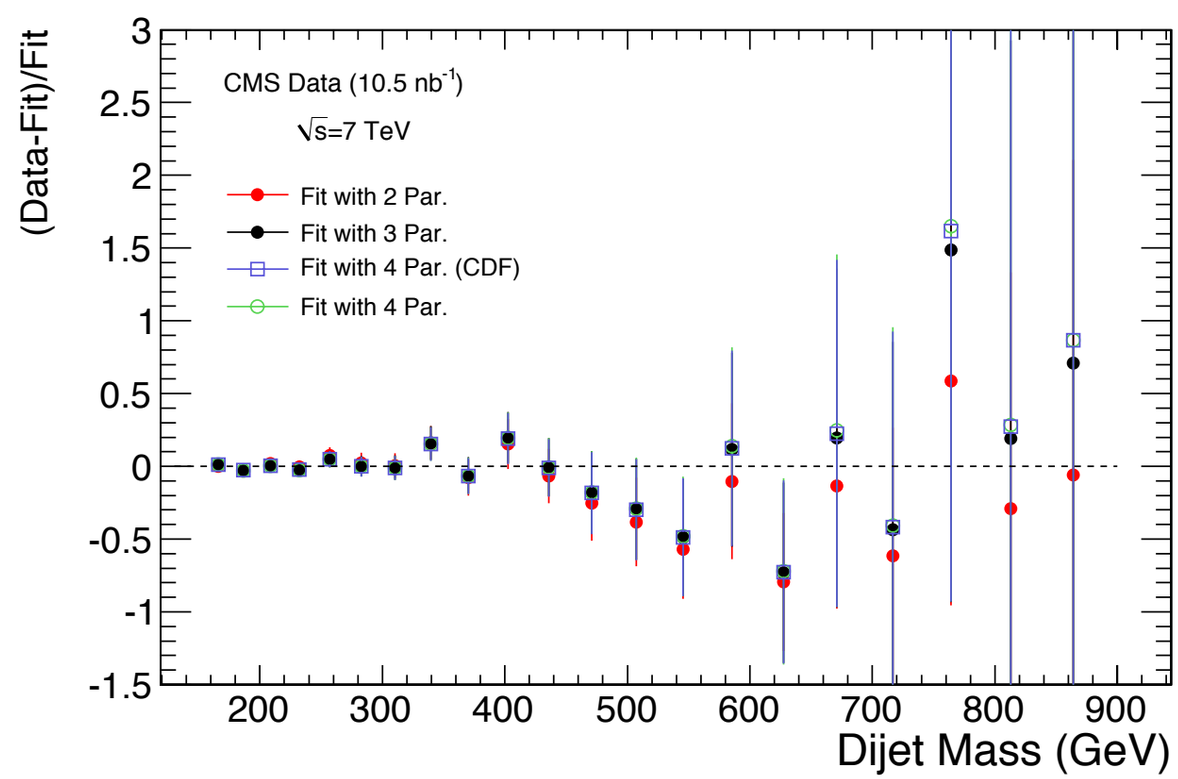


Another Fit Parametrization

- We have varied the choice of background parametrization
- We use the fit functions with 2 par., 3 Par. and 4 Par.
- 3 par. and 4 par. fits give almost the same result.

```
Chisquare/ndf for 2 par. Fit:
15.7235/19 : 0.827553
Chisquare/ndf for 3 par. Fit:
12.1326/18 : 0.674031
Chisquare/ndf for 4 par. Fit:
11.8699/17 : 0.698227
Chisquare/ndf for Another 4 par. Fit
(used by CDF): 11.9024/17 : 0.700144
```



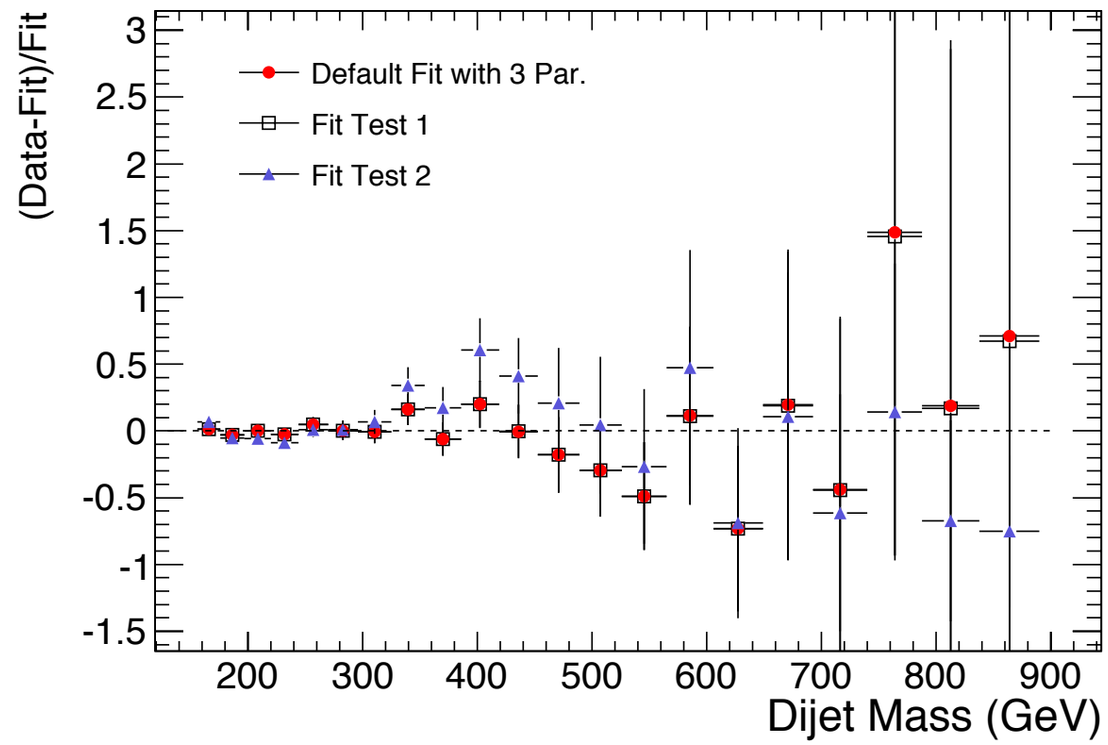


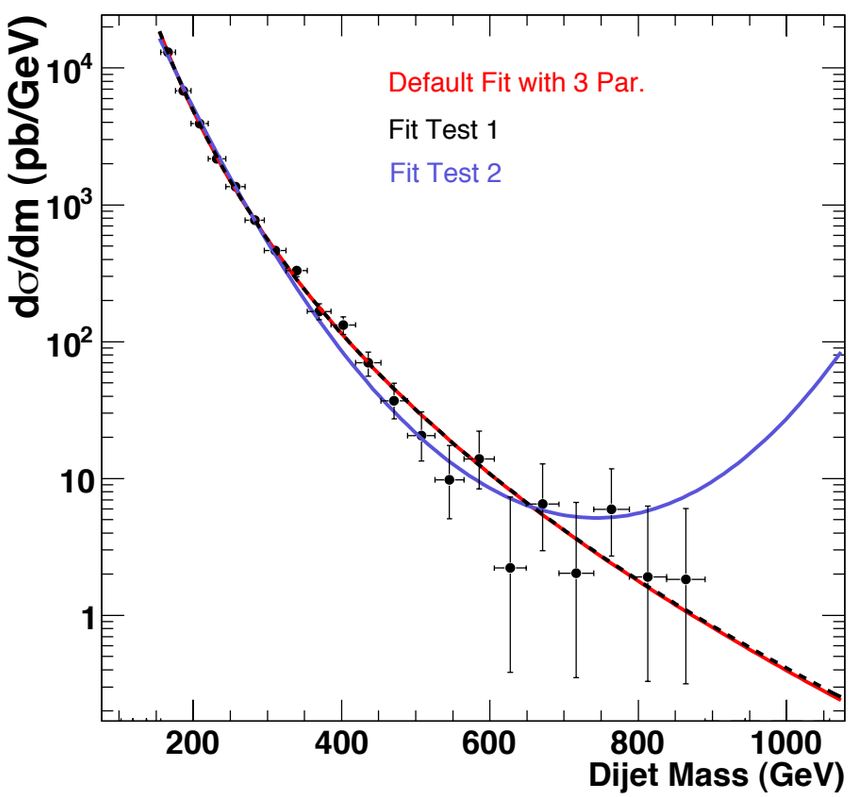
Another Fit Parametrization - II

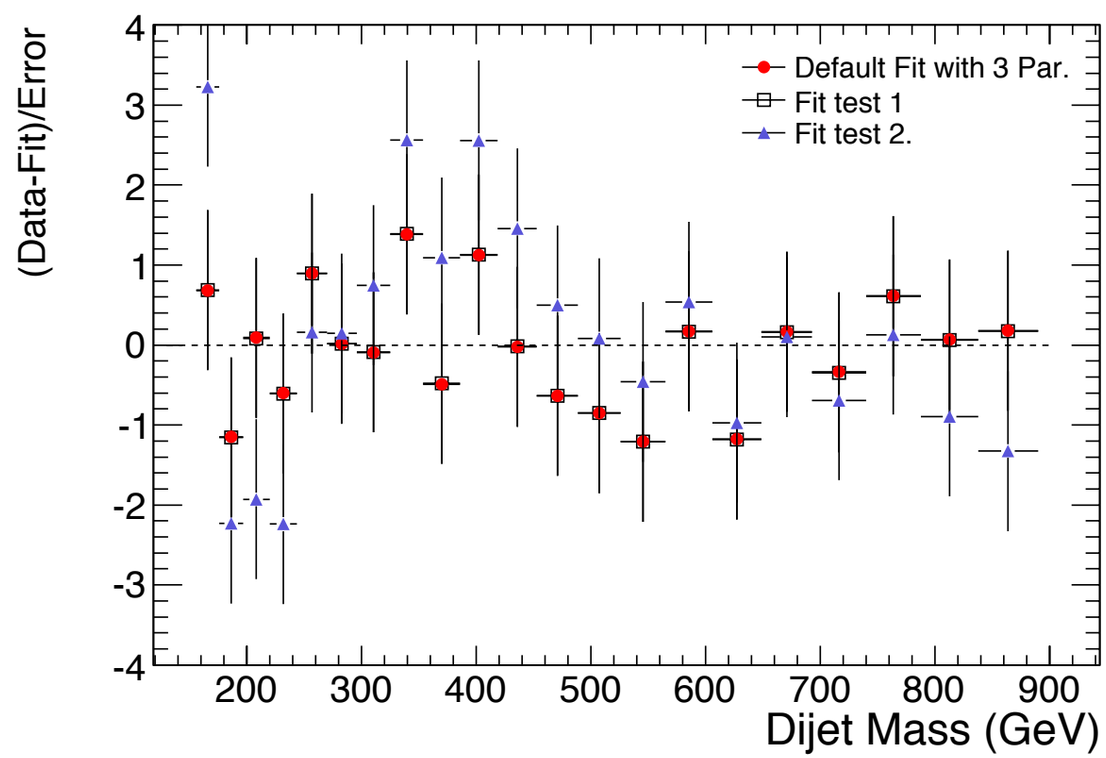
- We have also consider two different fit parametrization for background systematic.

d sigma / dm = p0 * exp(-p1*m) / m^p2 ===> Fit Test 1
d sigma / dm = p0 * (1 - m/sqrt{s})^p1 / exp(p2*m) ===> Fit Test 2

- Tail of fit function goes up for "Fit Test 2" and "Fit Test 1" gives almost the same results with default 3 parameters fit.

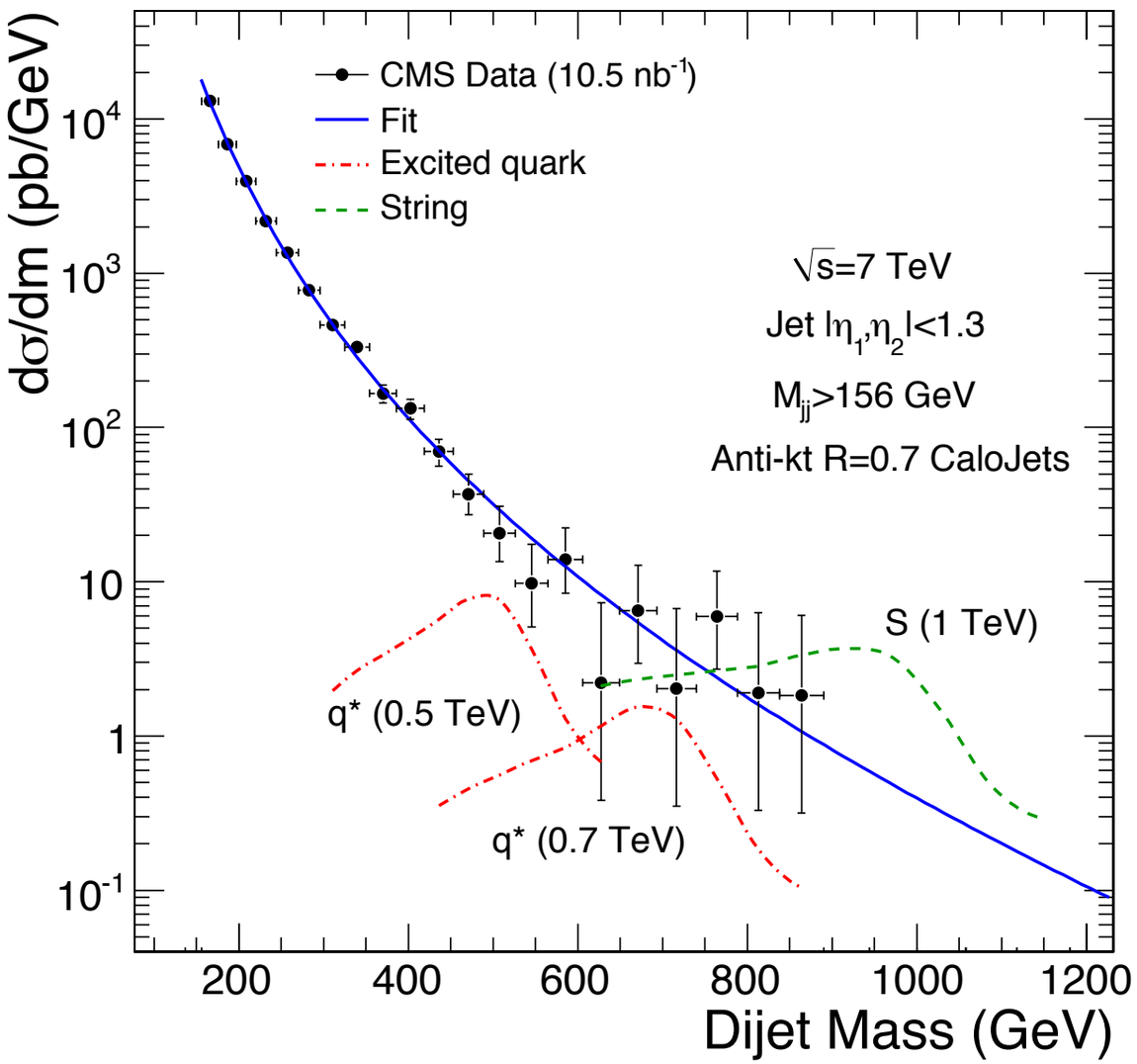


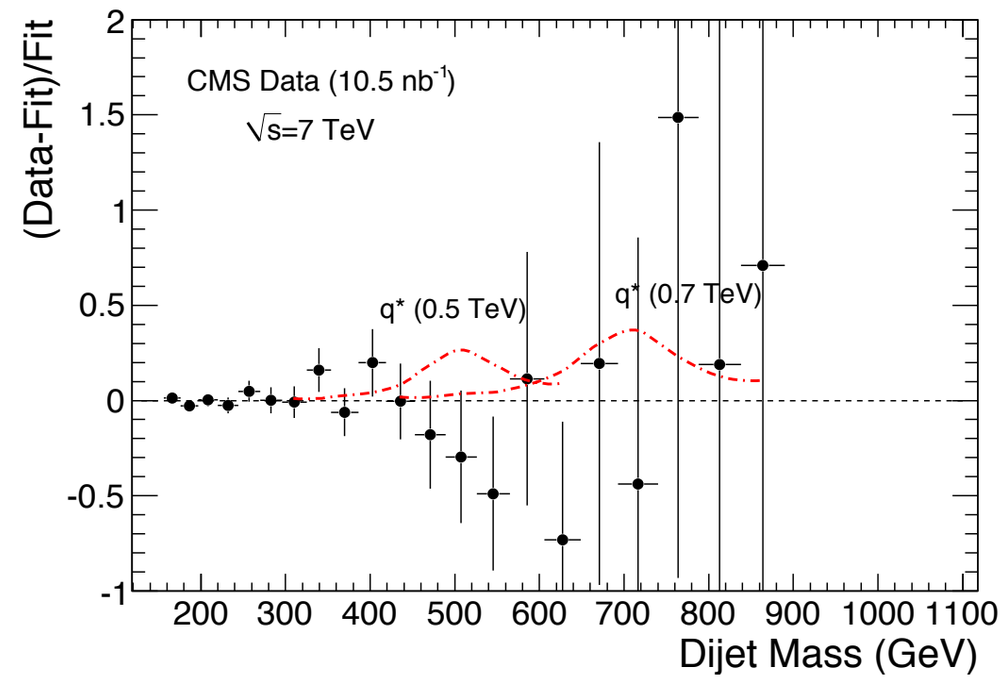


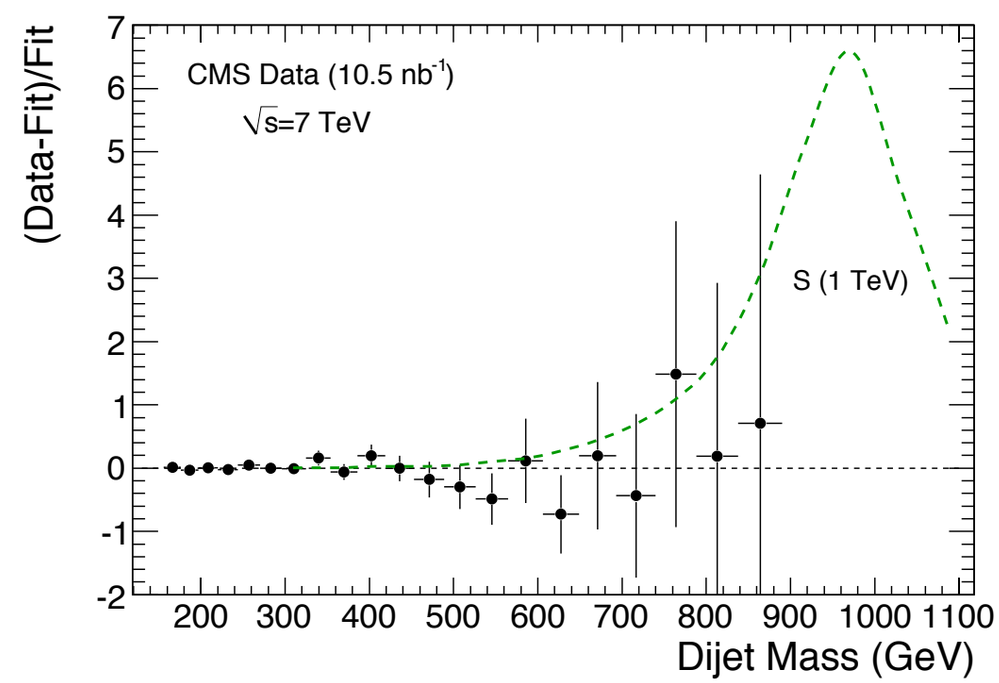


Fit and Signal

- We search for dijet resonance signal in our data.
- Excited quark signals are shown at 0.5 TeV and 0.7 TeV.
- String resonance signal is shown at 1 TeV.



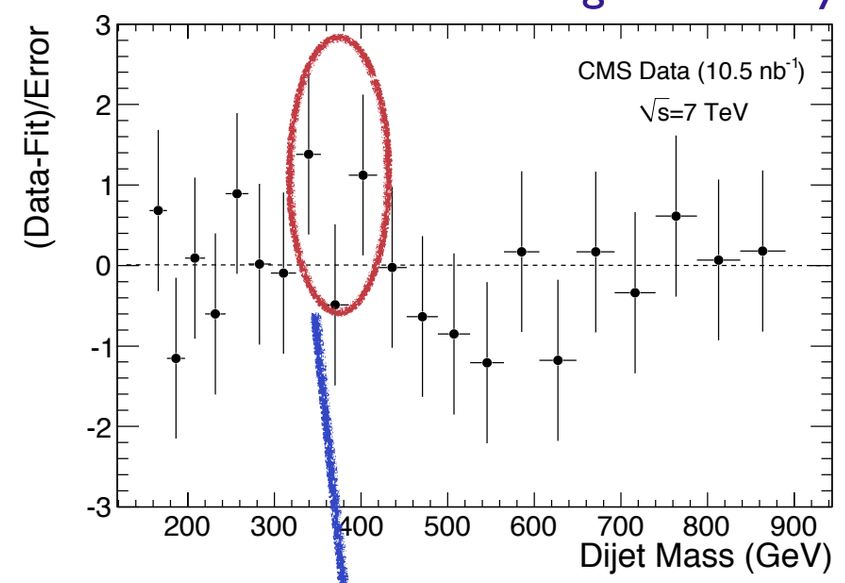




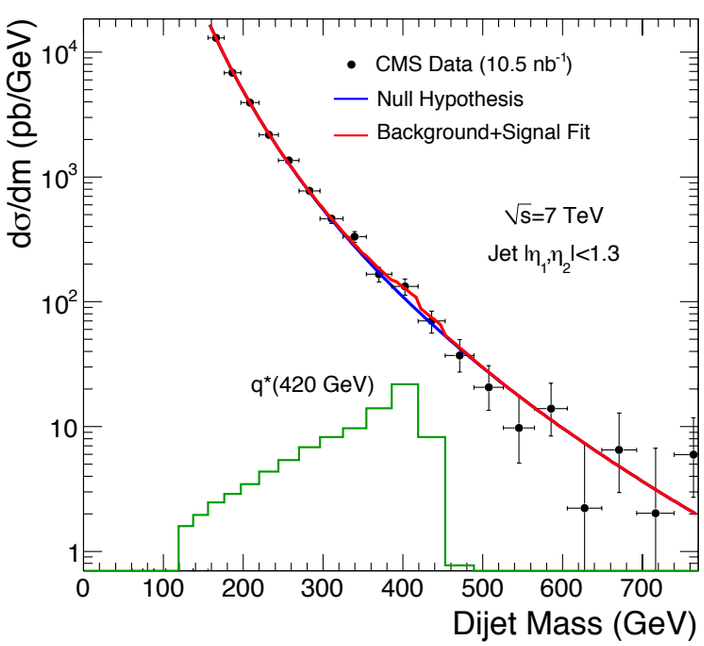
The Largest Fluctuation in Data

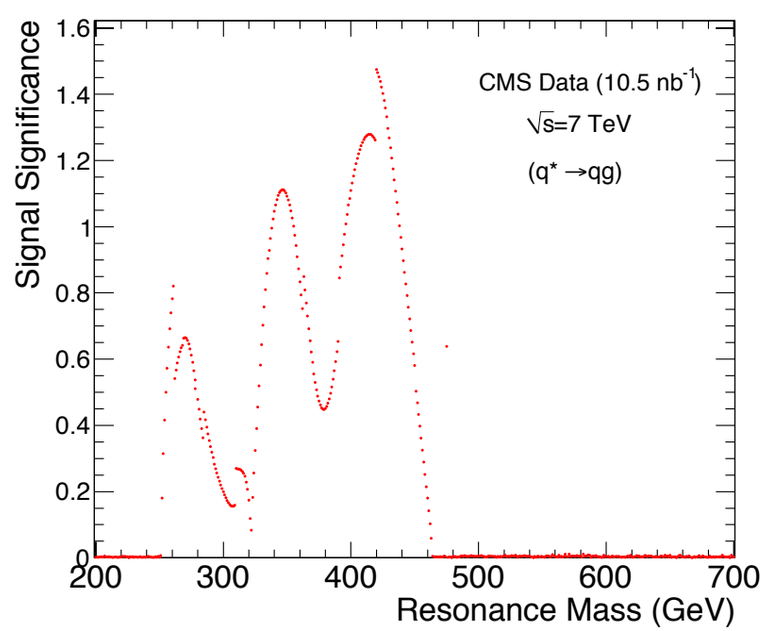
- Small fluctuation with shape of a resonance near 300 GeV and 400 GeV
- Best fit resonance (M_{jj}=420 GeV) has significance only 1.45 sigma from log likelihood ratio.

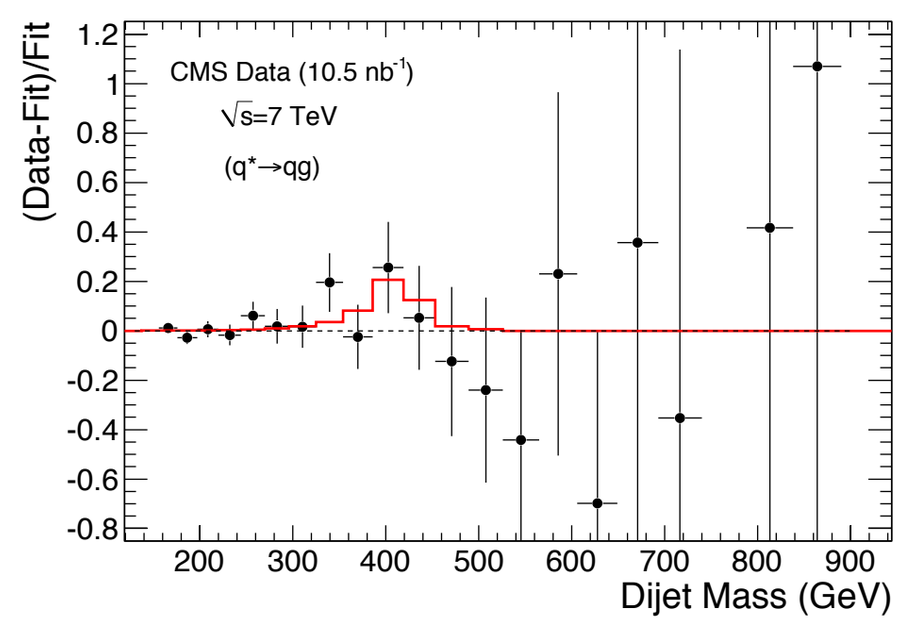
Fit to Background Only



Fit to Background+Signal

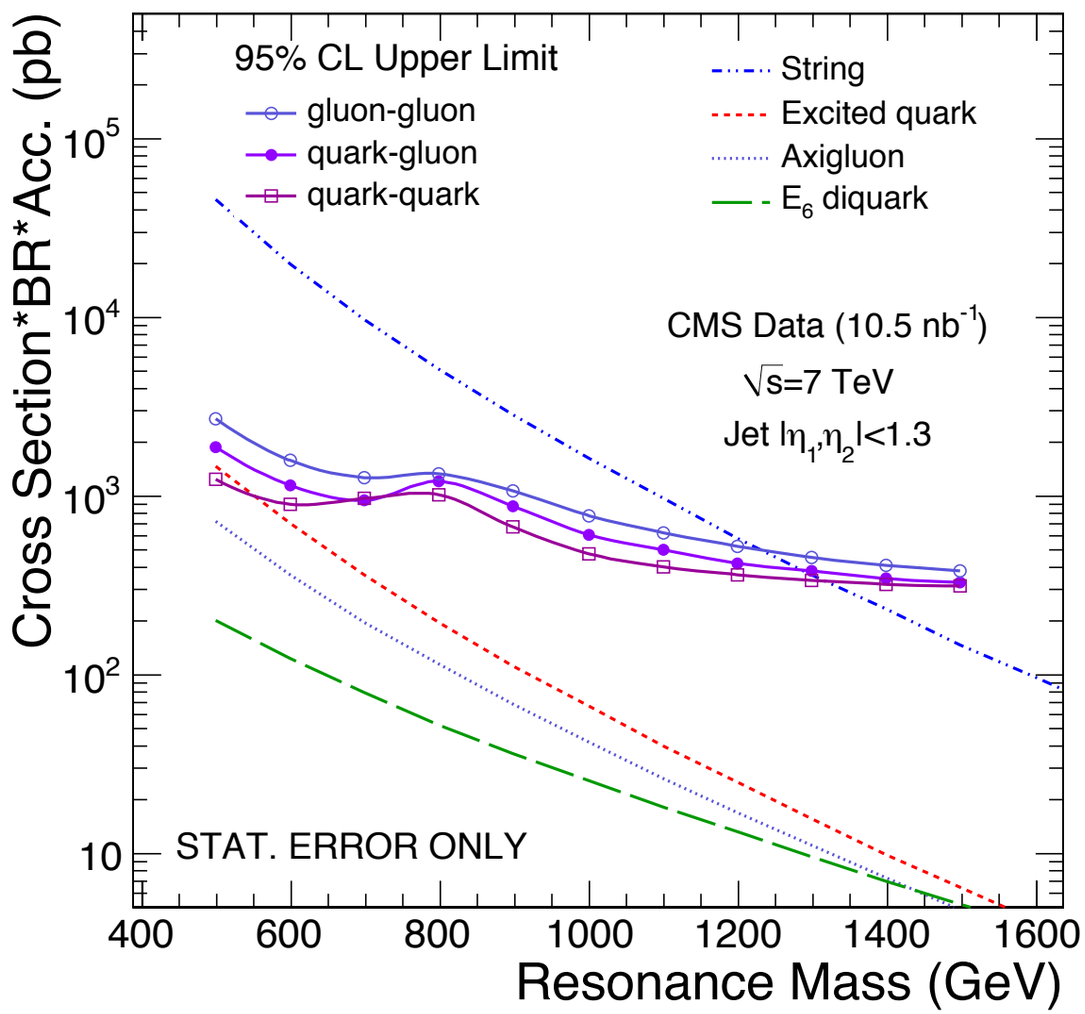






Early Limits with Stat. Error Only

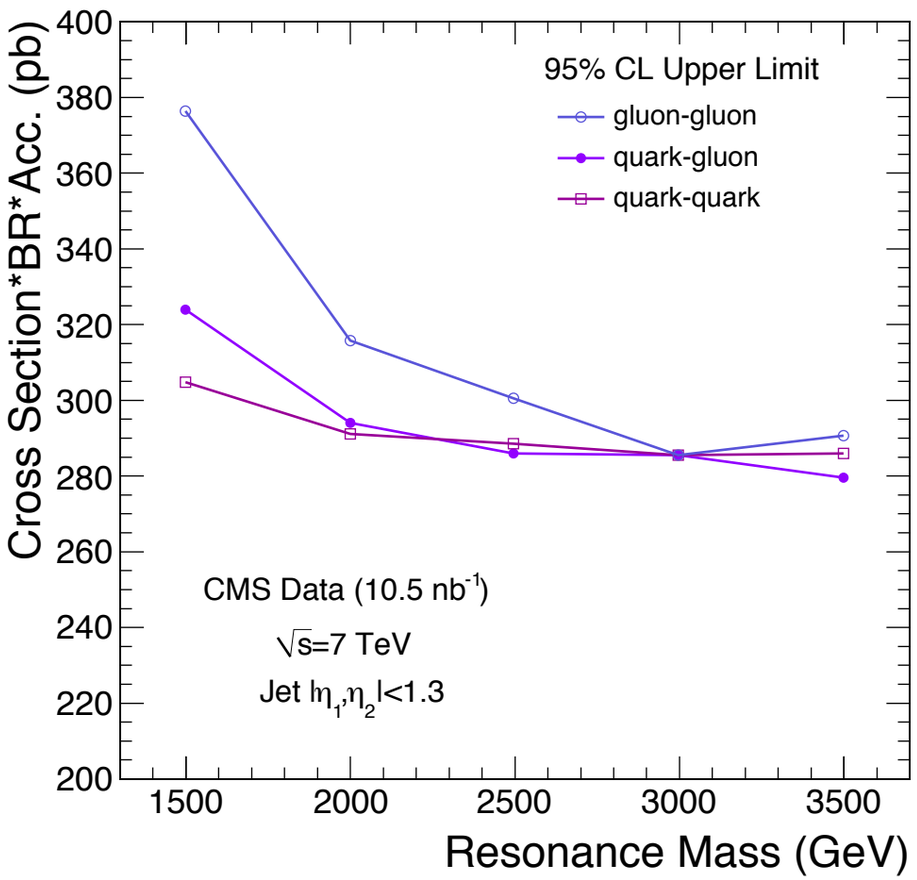
- We use a flat prior to get the posterior probability density and find limit.
- To calculate limit on new particle cross section we use a binned likelihood by the Bayesian approach.
- 95% CL Upper limit with Stat. Error. Only compared to cross section for various model.
  - ✓ Show quark-quark and quark-gluon and gluon-gluon resonances separately.
  - ✓ gluon-gluon resonance is the widest and gives worst limit.



	95% CL Upper Limit (pb)		
Mass (TeV)	quark-quark	quark-gluon	gluon-gluon
0.5	1232	1883	2662
0.6	896	1136	1565
0.7	962	944	1244
0.8	1013	1192	1304
0.9	662	864	1059
1.0	476	608	775
1.1	400	488	615
1.2	360	418	518
1.3	334	374	453
1.4	316	346	407
1.5	308	327	379

Limits at High Mass Resonance

- The stat only limit for a 3 TeV resonance, with lowest dijet mass bin starting at 900 GeV, should be EXACTLY 3 events, because there are 0 events between 900 GeV and 3.9 TeV.
- The stat only limits for qq, qg and gg resonances are identical and and equal to 3 events, for the resonance mass of 3 TeV.



	95% CL Upper Limit (pb)		
Mass (TeV)	quark-quark	quark-gluon	gluon-gluon
1.5	308	327	379
2.0	291	294	316
2.5	288	286	300
3.0	285	285	285
3.5	286	279	290

#Events at 3 TeV = (285.223 pb) * (0.0105 pb^-1) = 2.995