Search for Contact Interactions in Jet p_T
Update

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Exotica Multijets Working Group Meeting

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Outline

1. **Updates (data, JEC)**
2. Limit Setting Procedure
3. Preliminary Expected Limits
4. Plans

Updates

1. Use full 19.71 fb^{-1} inclusive jet pT spectrum.

2. Use Winter14_V5 JEC uncertainties (Winter14_V5_DATA_UncertaintySources_AK7PF.txt)

3. Use latest JER (for $|y| < 0.5$)

$$\sigma_{p_T} / p_T = C_{Data} \sqrt{\frac{N^2}{p_T^2} + \frac{S^2}{p_T} + C^2},$$

$$C_{Data} = 1.052, N = 5.794\text{GeV}, S = 0.984\text{GeV}^{1/2}, C = 0.029$$

Many thanks to Sanmay Ganguly.

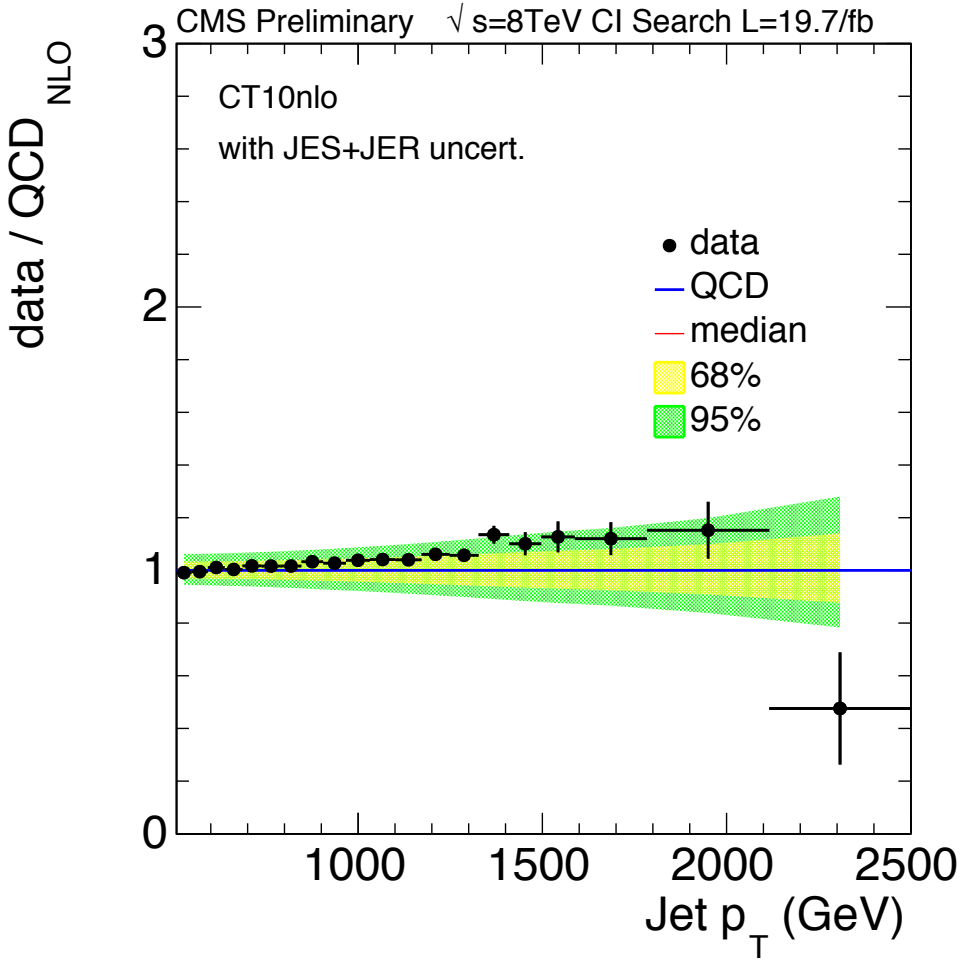
Updates

4. Multinomial likelihood adapted to NLO calculation of the CI spectra.

5. Workspace created for 8 TeV.

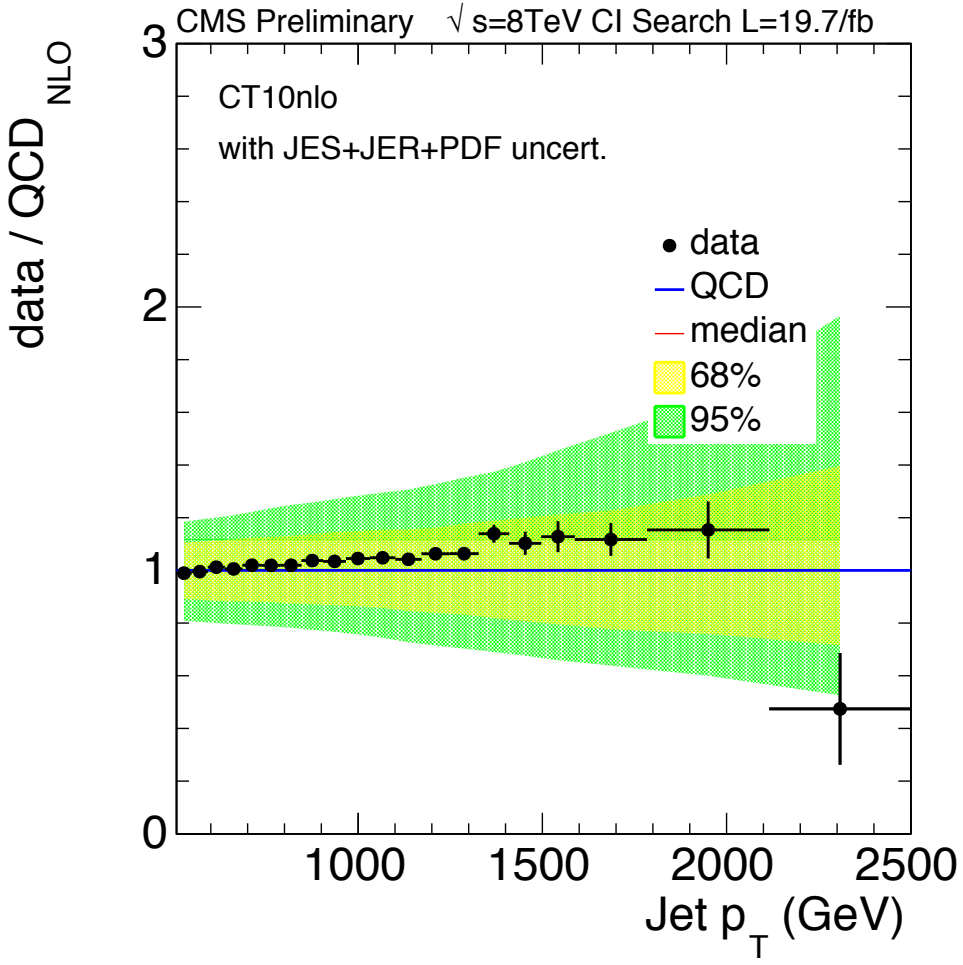
6. Workspace also created for 7 TeV data in same format in order to check likelihood calculation and limit setting procedure.

19.7fb^{-1} Data / QCD – CT10nlo



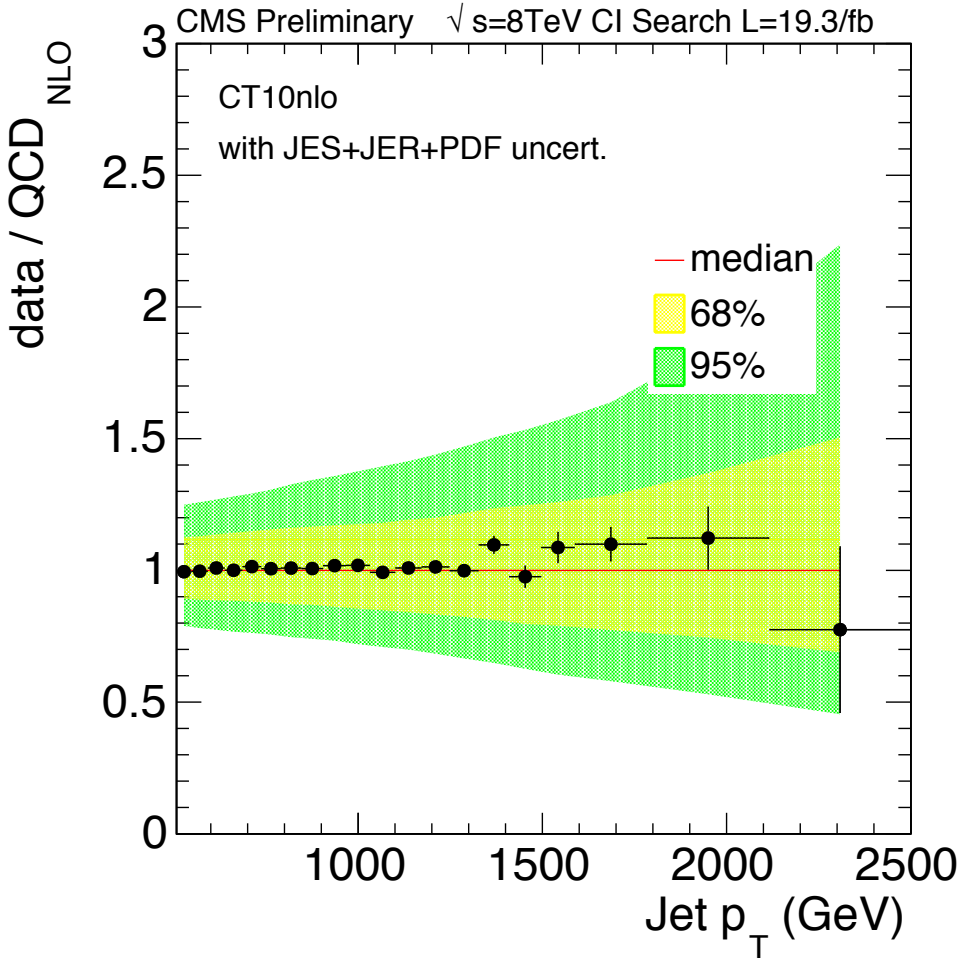
JES + JER uncertainties

19.7fb^{-1} Data / QCD – CT10nlo



JES + JER + PDF uncertainties

19.3fb^{-1} Data / QCD – CT10nlo



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1. Updates (data, JEC)

2. **Limit Setting Procedure**

3. Preliminary Expected Limits

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Limit Setting Procedure

1. Use likelihood ($D = N_1, \ldots, N_{20}$)

$$p(D \mid \lambda, \kappa) = \int multinomial(D \mid \lambda, \nu, \kappa)\pi(\nu)d\nu$$

$$\simeq \frac{1}{K}\sum_{i=1}^{K} multinomial(D \mid \lambda, \nu_i, \kappa)$$

2. Set κ values, e.g., $\kappa_1 = \pm 1$, $\kappa_2 \ldots \kappa_6 = 0$ for left-left (LL)

3. Solve

$$\int_0^{\lambda_{UP}} p(D \mid \lambda, \kappa) = 0.95$$

for upper limit on λ and hence a lower limit on $\Lambda = 1/\lambda^{1/2}$

Outline

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2. Limit Setting Procedure

3. **Preliminary Expected Limits**

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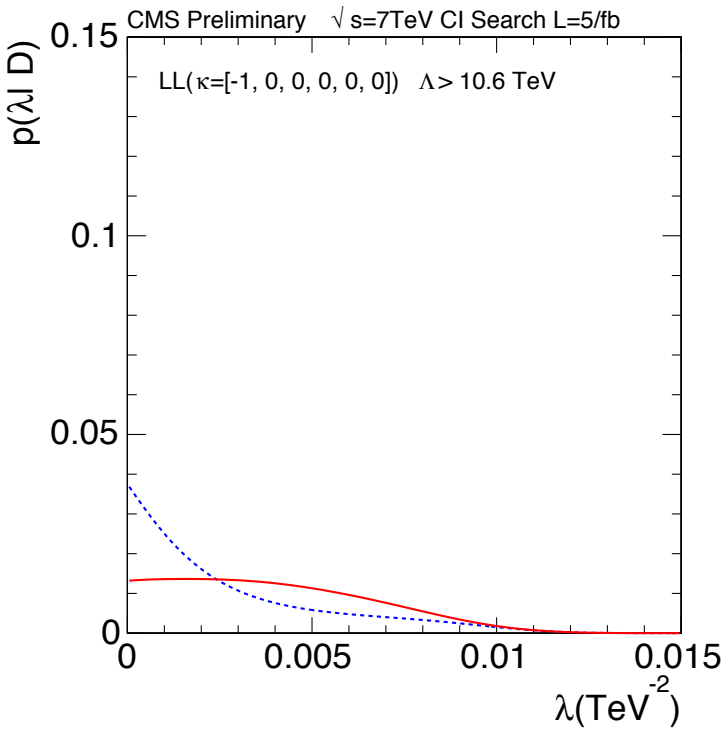
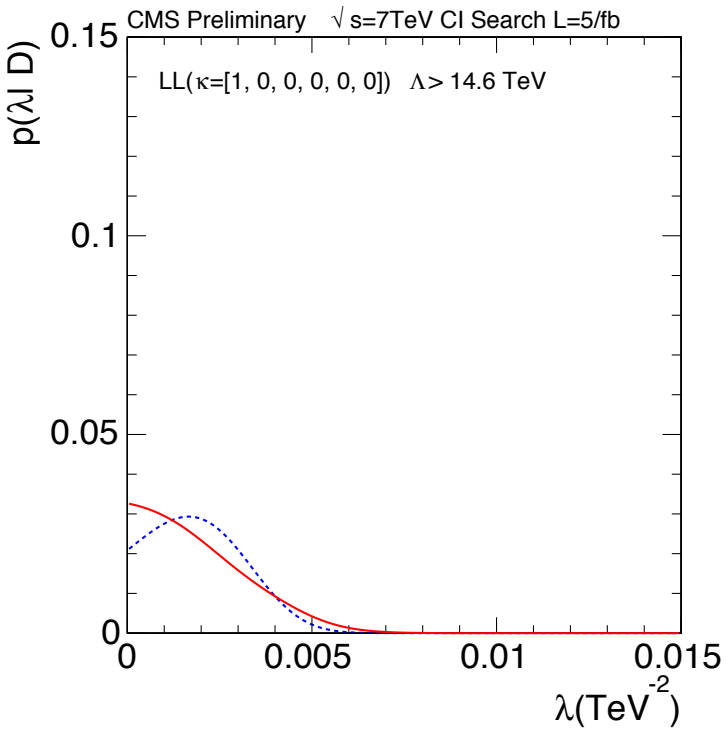
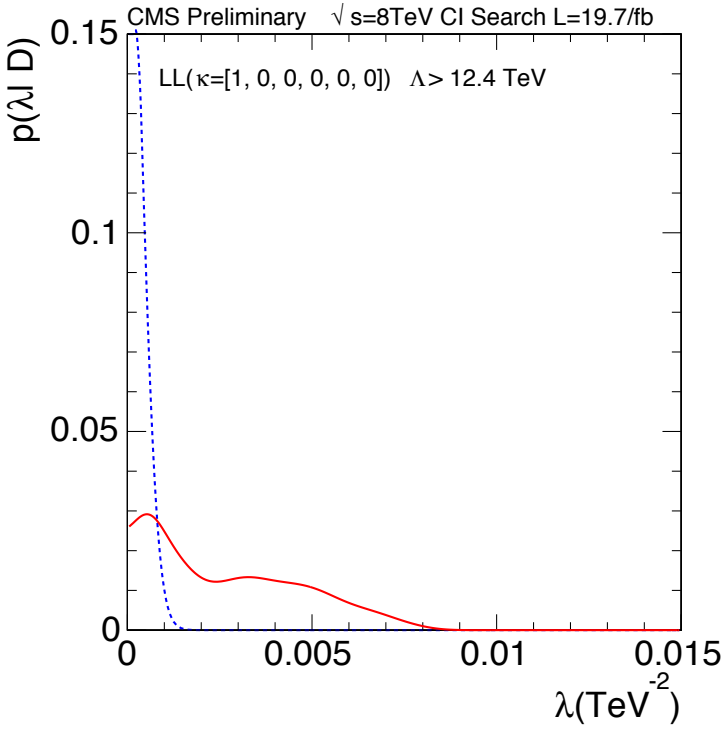
Expected Limits – 7 TeV – LL

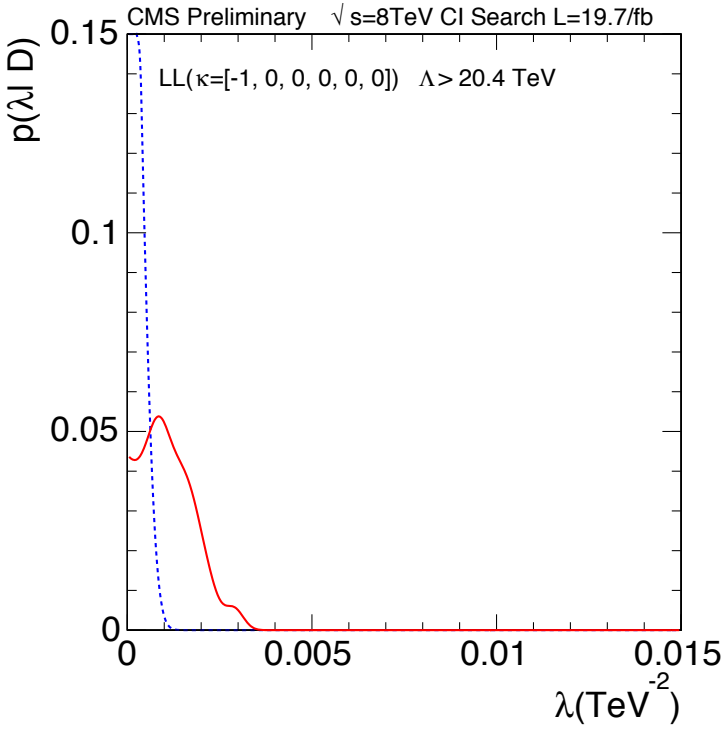




CTEQ6.6

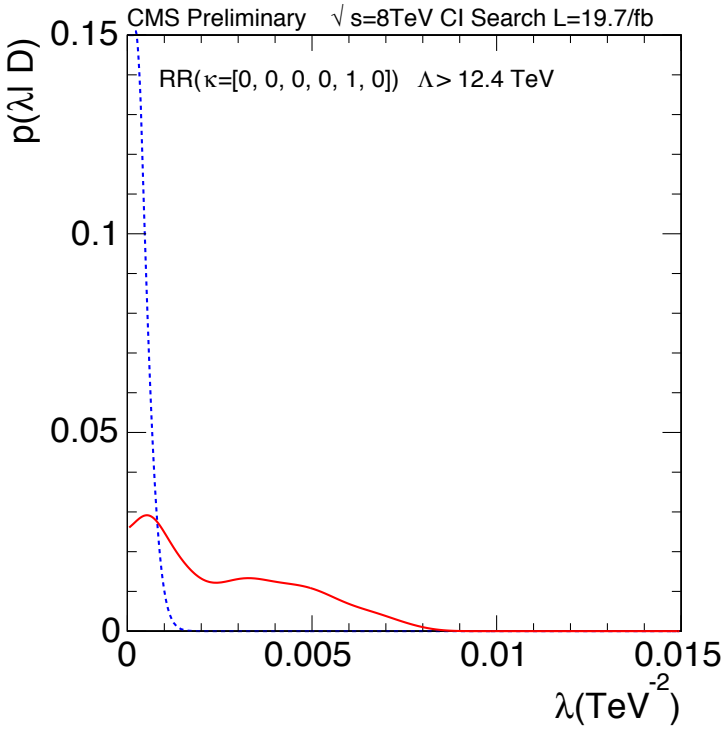
Expected Limits – 8 TeV – LL

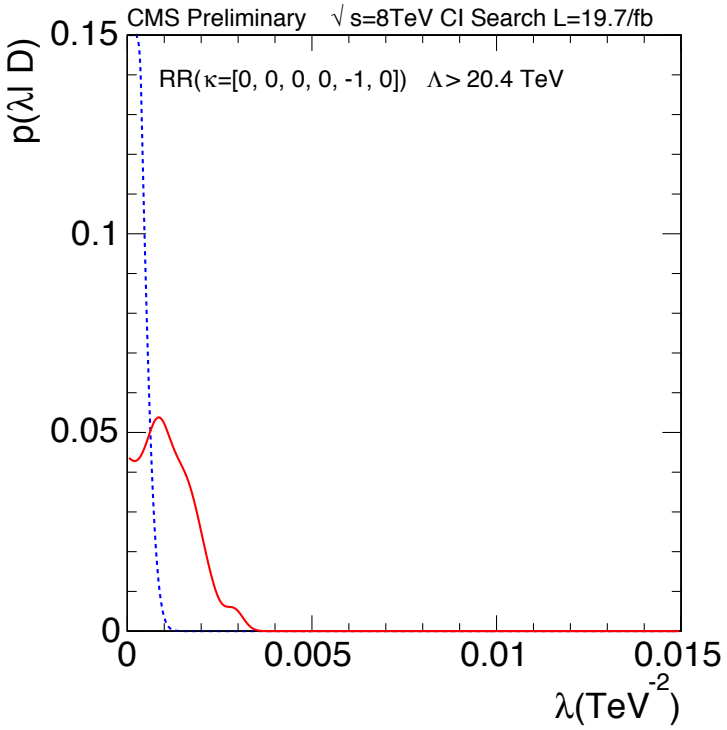




CT10

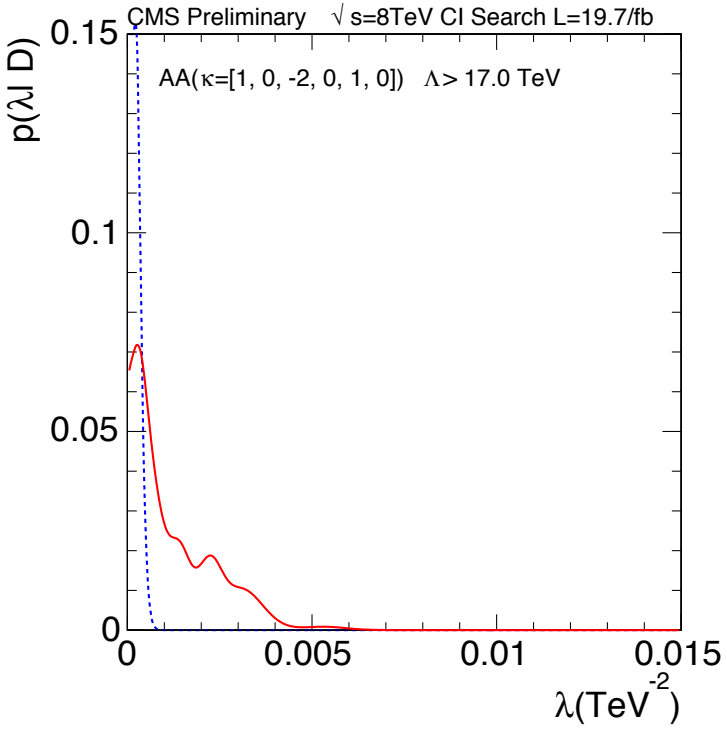
Expected Limits – 8 TeV – RR

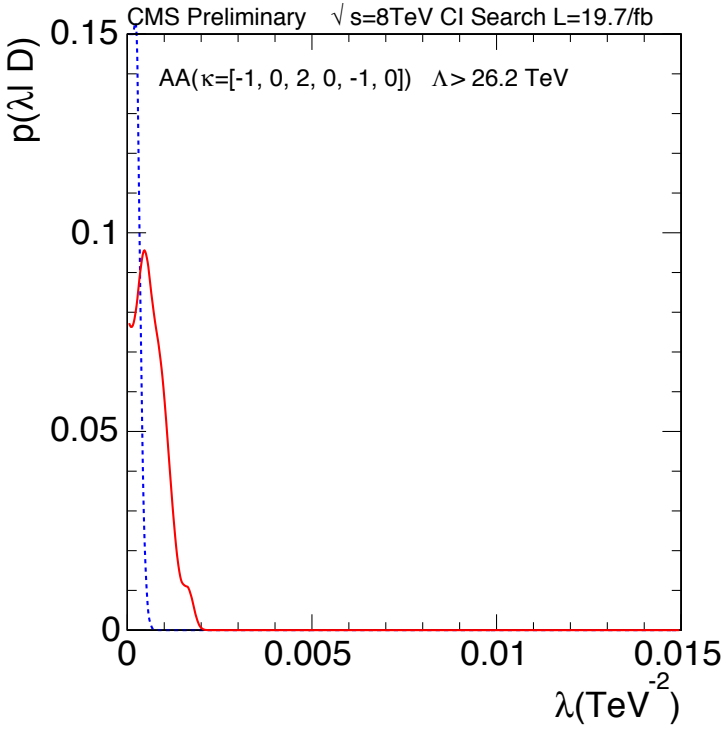




CT10

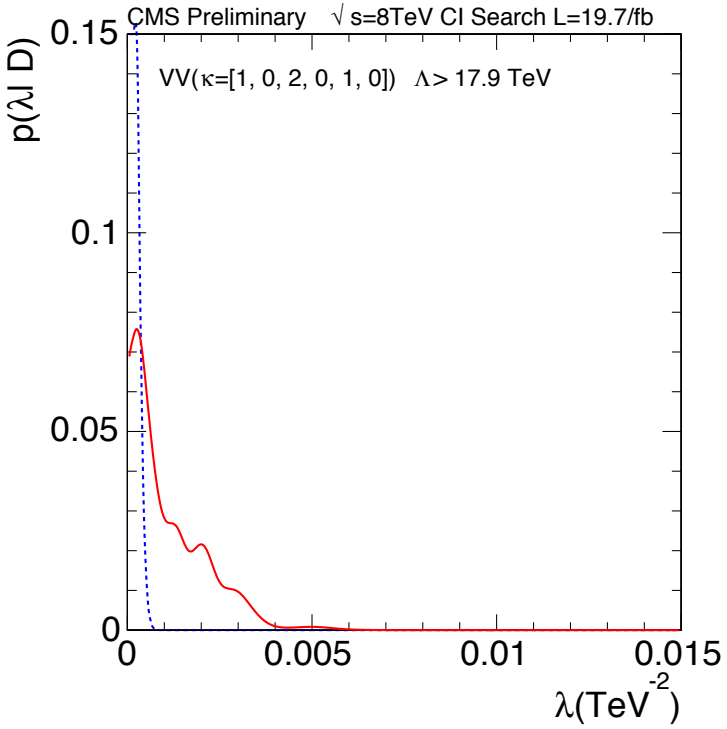
Expected Limits – 8 TeV – AA

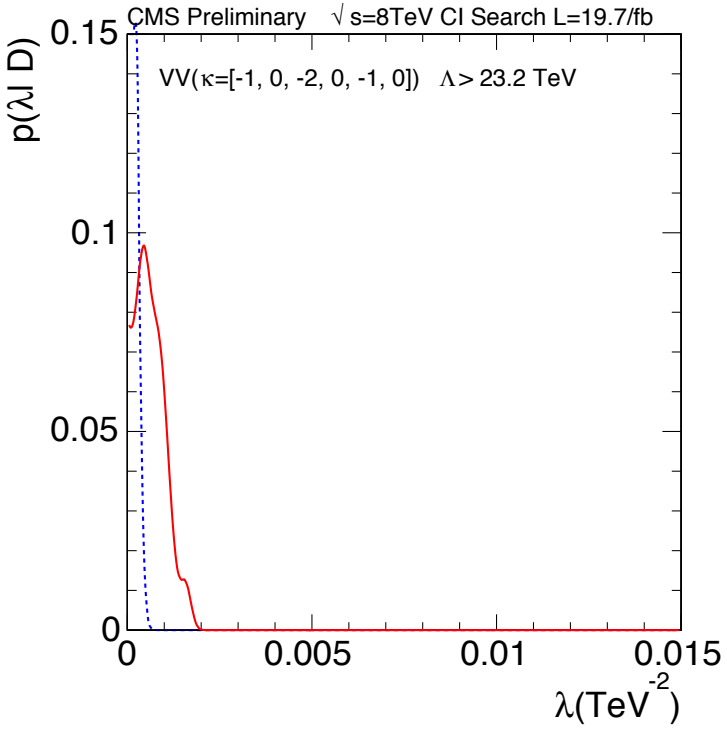




CT10

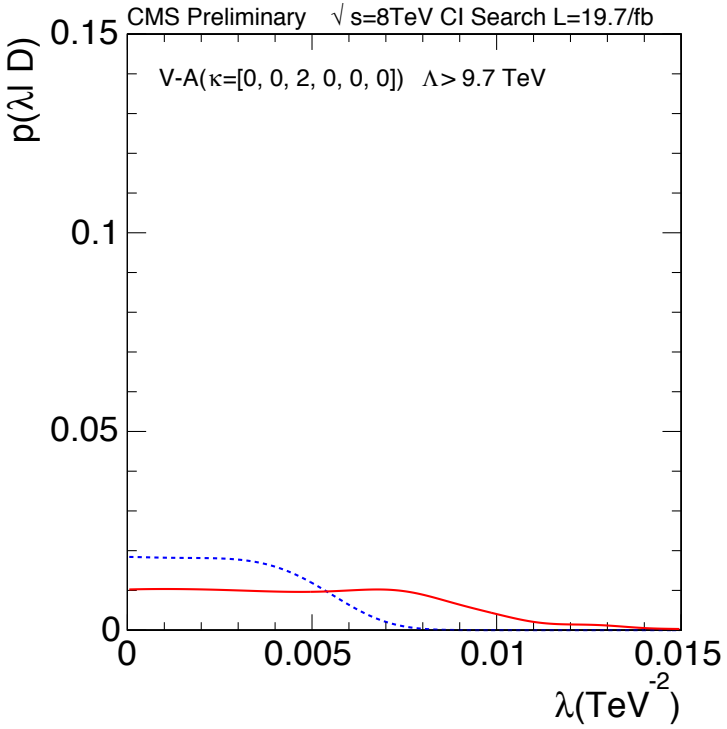
Expected Limits – 8 TeV – VV

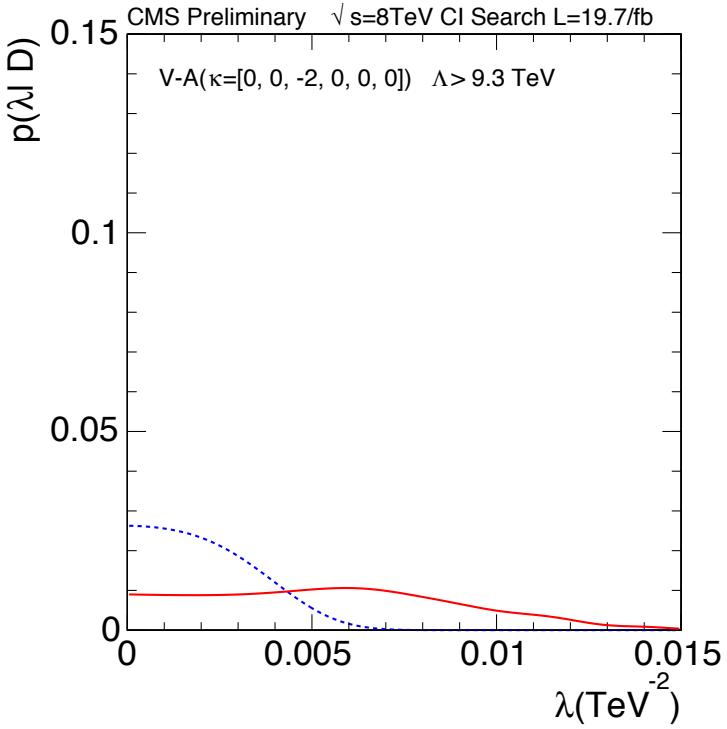




CT10

Expected Limits – 8 TeV – V-A





CT10

Plans

1. Investigate cause of “wiggles” in <likelihood>. May be due to rounding errors in likelihood calculation.

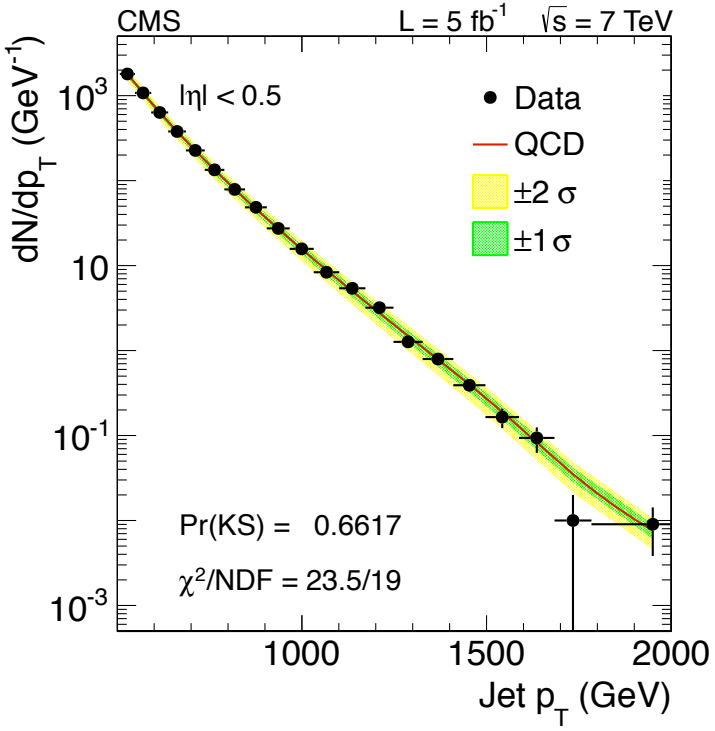
2. Include electroweak corrections (already provided by Sanmay)

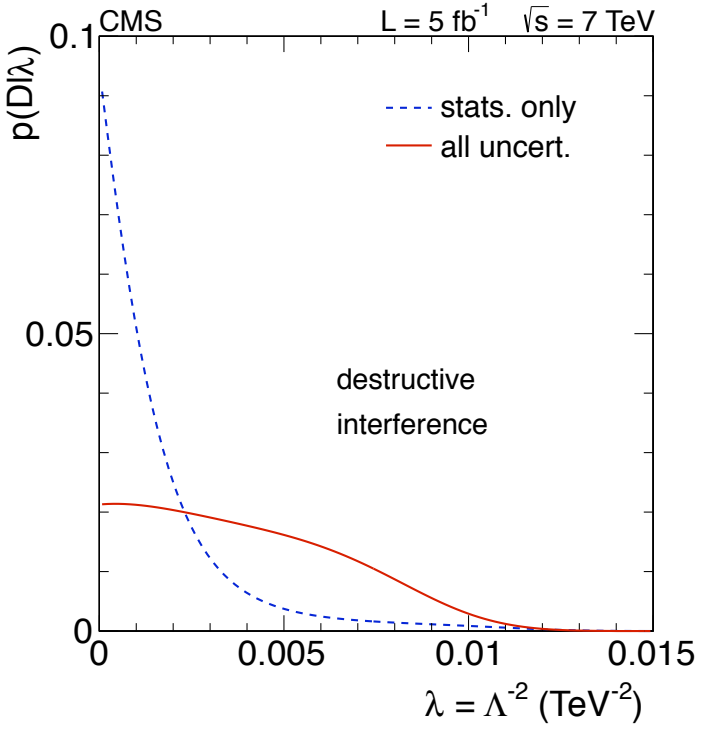
3. Compute observed limits for CT10, MSTW and NNPDF separately, and together

4. Complete analysis note

BACKUP

Contact Interaction (CI) Search @ 7 TeV





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Search for contact interactions using the inclusive jet p_T spectrum in pp collisions at $\sqrt{s} = 7$ TeV

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(CMS Collaboration)

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