Update on jet smearing — p_T dependent resolution fit

UHH CMS SUSY Meeting

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für Bildung
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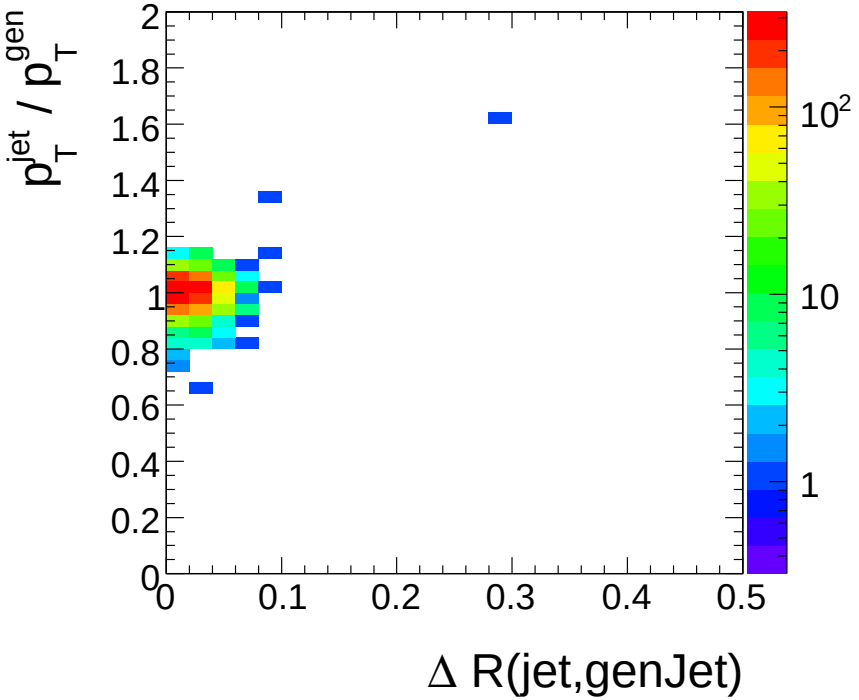
Summer08 QCDDijets $1000 < \hat{p}_T < 2200$ GeV

- Similar to CMS AN-2008/031
  - 3 jets leading in calo p_T
  - $|\eta^{1,2}| < 0.8$
  - $p_T^3 / p_T^{\text{dijet}} < 0.1$ or $p_T^3 < 2$ GeV
  - $|\Delta\phi^{1,2}| > 2.7$
  - $0.07 < p_T^{\text{had}} / p_T^{\text{jet}} < 0.95$
  - Jet - GenJet matching
    $\Delta R < 0.1$
- Additionally
  - $1000 < p_T^{\text{dijet}} < 2000$ GeV



Resolution parameterisation

$$P(r, p_T^{\text{true}}) = c_i \cdot G(r; \mu(p_T^{\text{true}}), \sigma(p_T^{\text{true}})) + (1 - c_i) \cdot S(r; \mathbf{b}_{i,j})$$

1. Gaussian G to describe central part
   - Mean μ from linear fit on mean response of L2L3 corrected jets

     $$\mu(p_T^{\text{true}}) = 1.005 - 6 \cdot 10^{-6} \cdot p_T^{\text{true}}$$

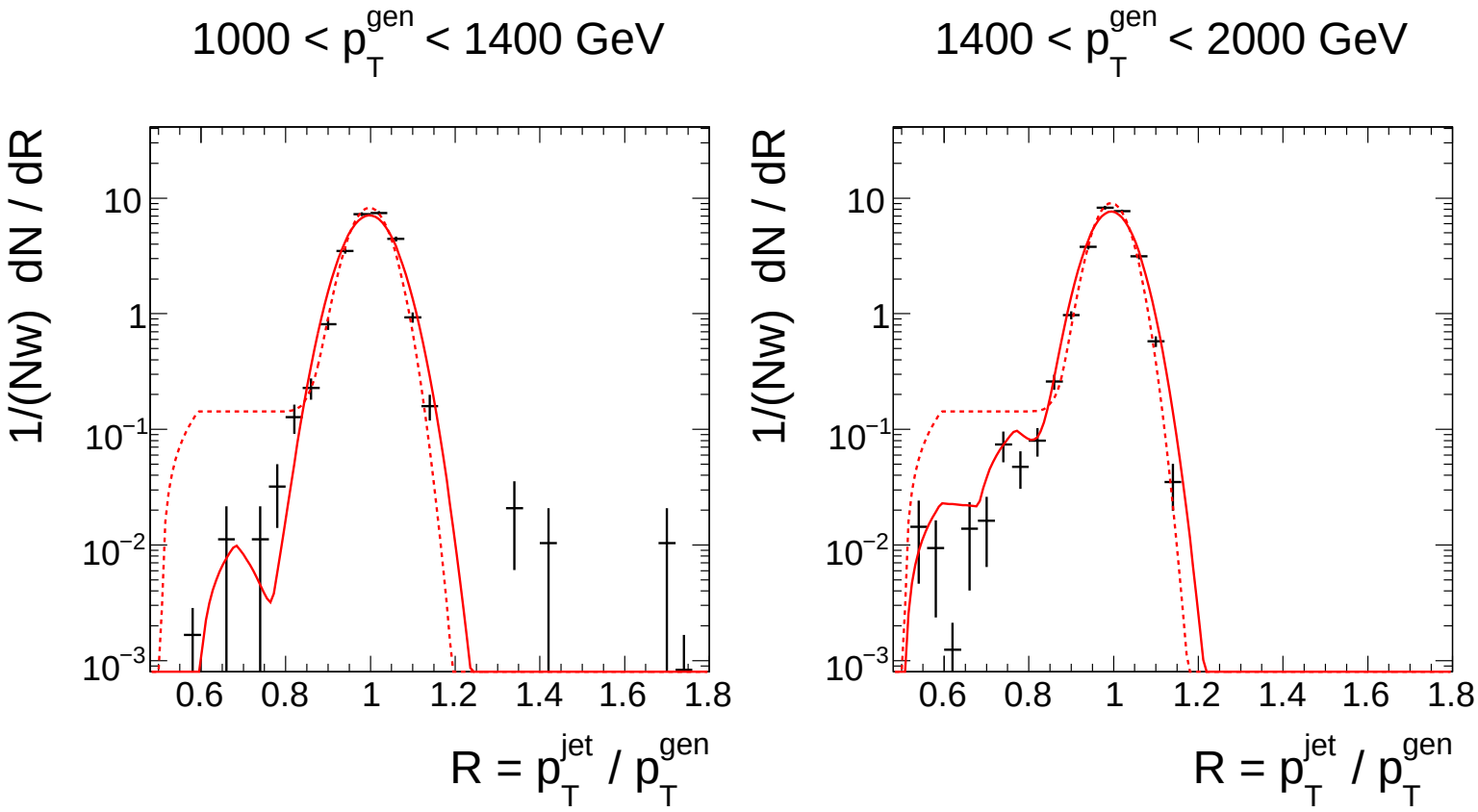
   - Width σ parameterised as

     $$\frac{\sigma}{p_T^{\text{true}}} = \sqrt{\frac{a_1^2}{(p_T^{\text{true}})^2} + \frac{a_2^2}{p_T^{\text{true}}} + a_3^2},$$

     where the a_i are fitted (so far, $a_1 = 0$)
2. Interpolated step function S to describe tails
   - N_j bins between $r_{\text{min}} < r < r_{\text{max}}$
   - N_i different step functions for different p_T^{true}
   - In total $N_{i,j} = N_i \cdot N_j$ parameters

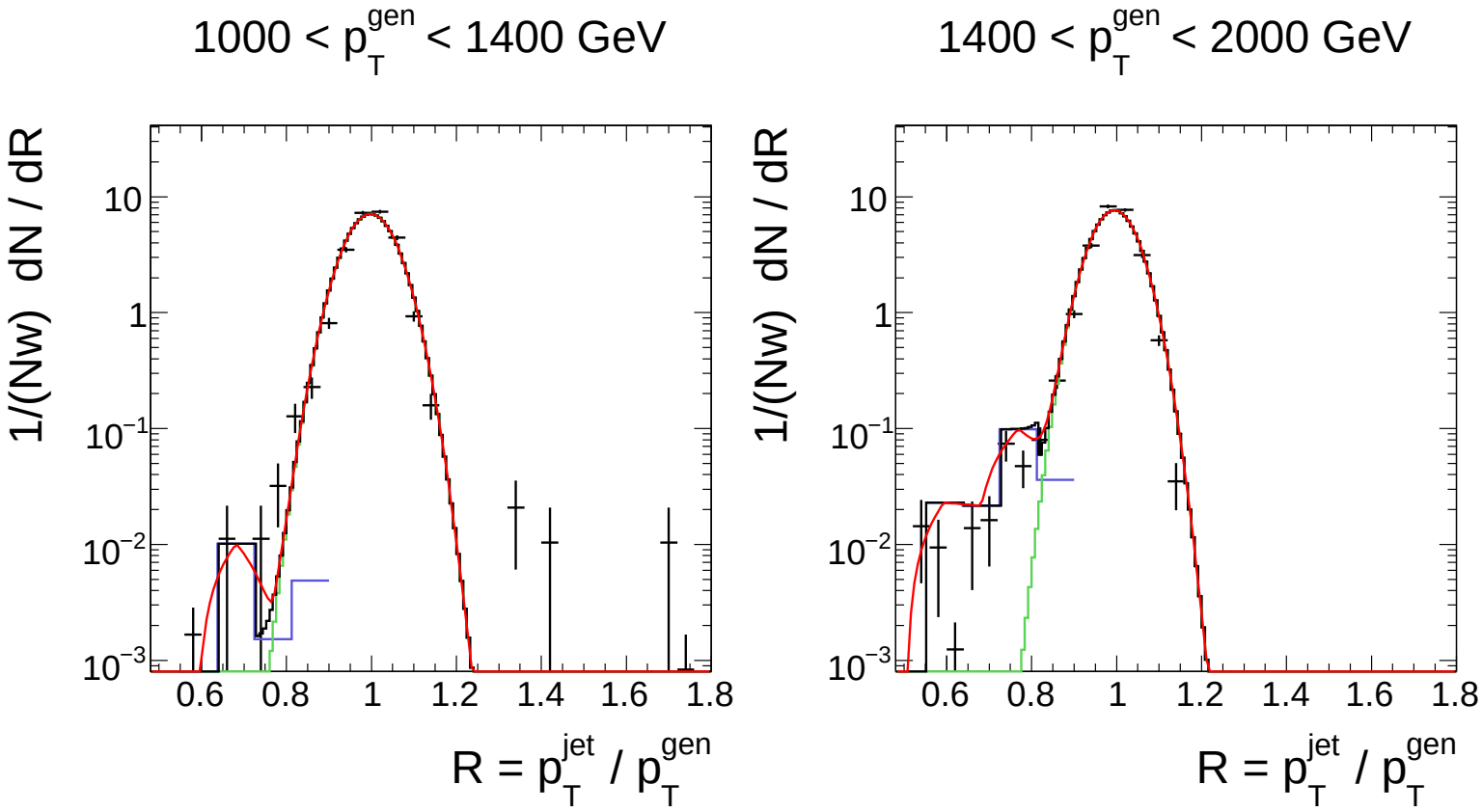
Fit results – response

- $N_i = 2$ p^{true} bins
- Integration from $1000 < p_T^{\text{true}} < 2000$ GeV
- For validation plots, $p_T^{\text{true}} = p_T^{\text{gen}}$



Fit results – response details

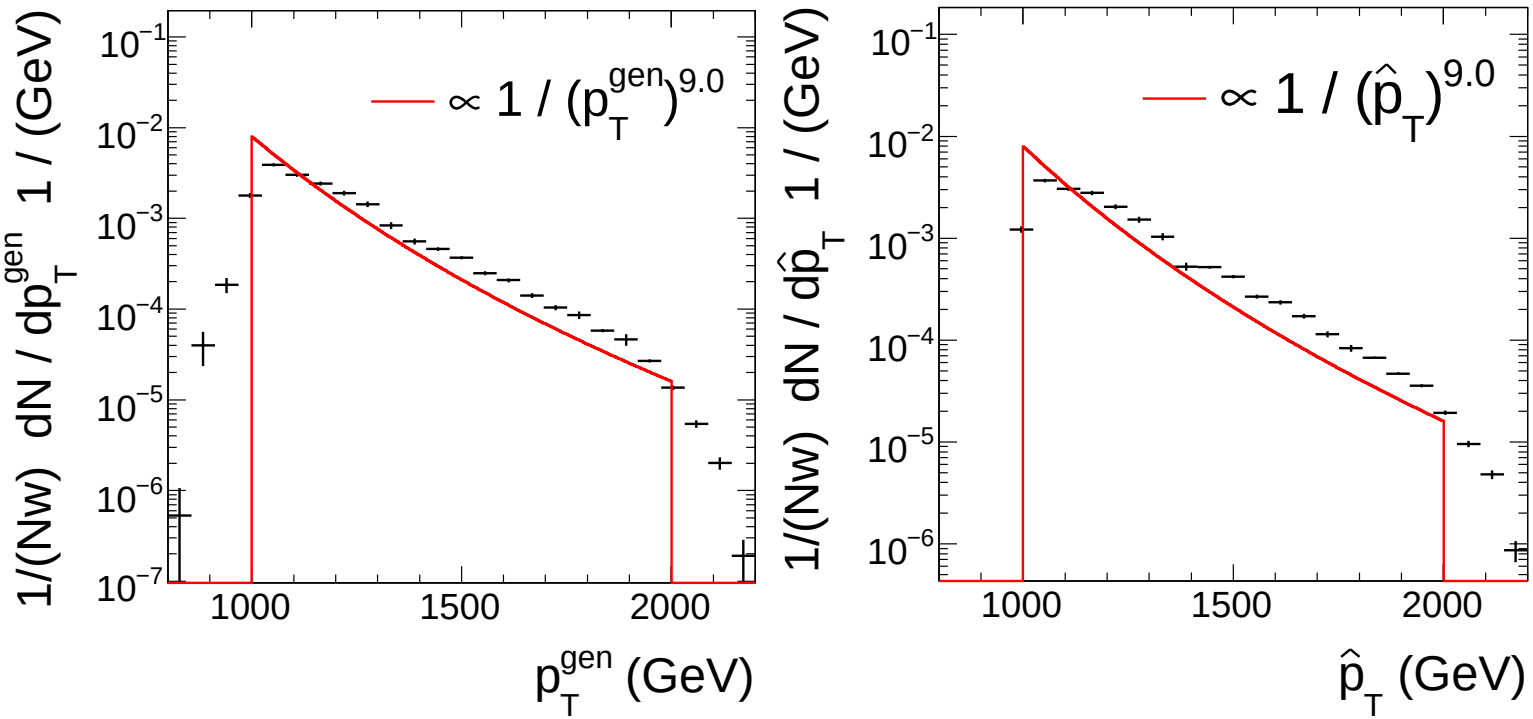
- $N_j = 4$ response bins from $0.55 < r < 0.9$



- Fitted parameters of Gaussian width: $a_2 = 1.44$ (1.11) and $a_2 = 0.04$ (0.03) (comparison to values found by V. Chetluru)

Fit results – spectrum

- p_T^{true} parameterised with a powerlaw $\propto 1/(p_T^{\text{true}})^n$
- Comparison of fitted spectrum to p_T^{gen} and $\hat{p}_T$ spectra



- Tails, as selection cuts were made on p_T^{dijet}

Fit results – fitted parameters

Index	Scale	Start value	Fitted value
0	1	1.2	1.43762
1	0.01	3	3.77514
2	1	0.95	0.998542
3	1	1	0.0326136
4	1	1	2.07797
5	1	1	0.313477
6	1	1	1
7	1	0.95	0.984292
8	1	1	0.635314
9	1	1	0.59831
10	1	1	2.7406
11	1	1	1

Summary & discussion

- Implementation of p_T dependent resolution parameterisation
  - Gaussian width parameterised with usual calorimeter resolution
  - Step function binned in p_T
- Method works with almost completely data driven event selection
- Problem in the event selection
  - Some events with large response
  - Impact on fit $\longrightarrow$ method still very instable
- As I will be on holidays from next week on $\longrightarrow$ update in hadronic SUSY meeting this Thursday?