Jet transverse momentum and dijet mass resolutions in p13.05.00

JES Group Meeting, January 15, 2003

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p13.05 data sample

- stripped p13.05 thumbnails (single jet triggers)
- data taken with trigger version **9.30**, **9.31**, and **9.50**
- run selection based on MET, METx, METy, SET

  + runs with spikes in jet φ distribution were removed
- corresponding luminosity is about $10\,\mathrm{pb}^{-1}$
- p13 JES correction applied (`jetcorr v04-00-01`)

JetID criteria

- p13 jetID criteria not available yet
- used p10 ones
  - $0.05 <$ EMF < 0.95
  - CHF < 0.4
  - HotF < 10
  - n90 > 1

Event selection

- jets found with RunII cone algorithm with $R = 0.7$
- just 2 jets in the event, back-to-back ($\Phi > 175^\circ$), $|\eta_{1,2}^{jet}| < 0.5$
- both jets satisfy the standard jet quality cuts
- $MET < 0.7\, p_T^{leading\ jet}$
- at least three tracks associated to the primary vertex
- cut on primary vertex position, $|vtx_z| < 50\,\mathrm{cm}$

Soft radiation correction

- the additional third jet was allowed to be found with p_T (before JES) smaller than some cut $(10,\ 12,\ 15,\ 20\,\mathrm{GeV})$
- the third jet must also satisfy jet quality cuts
- reason why the cut is made on uncorrected jets is due to consistency with the two-jet sample where cut $8\,\mathrm{GeV}$ is applied on all jets during reconstruction

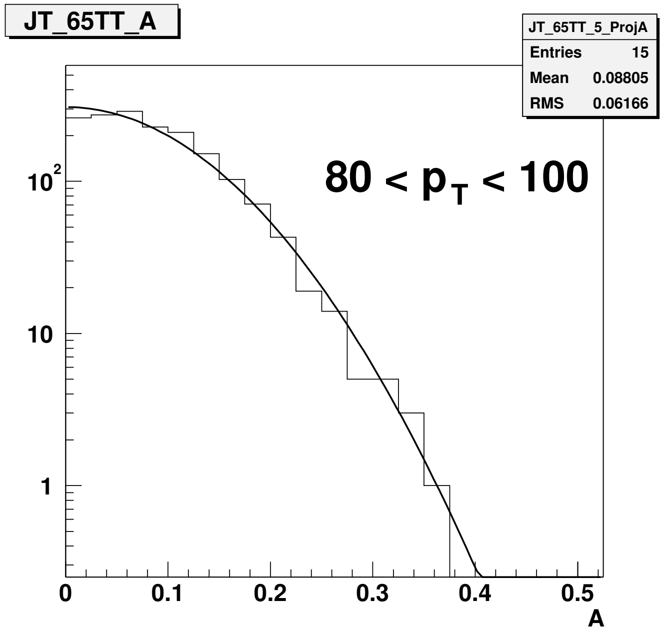
Method

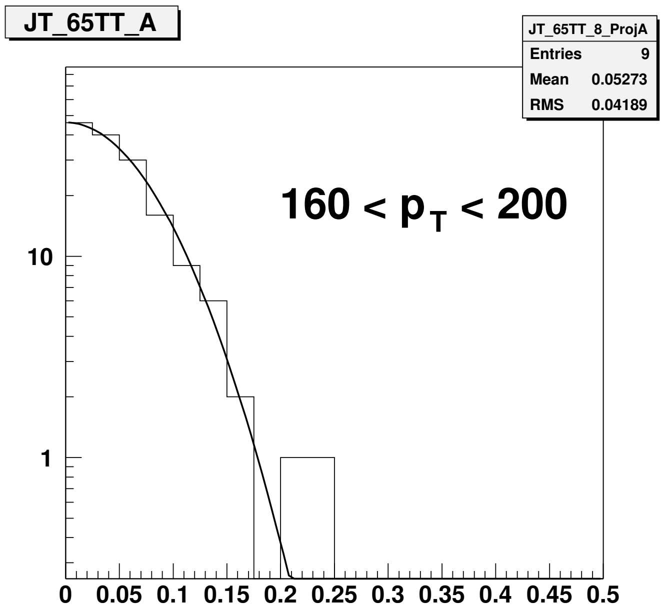
- asymmetry variable A

$$A = \frac{p_T^{jet1} - p_T^{jet2}}{p_T^{jet1} + p_T^{jet2}}$$

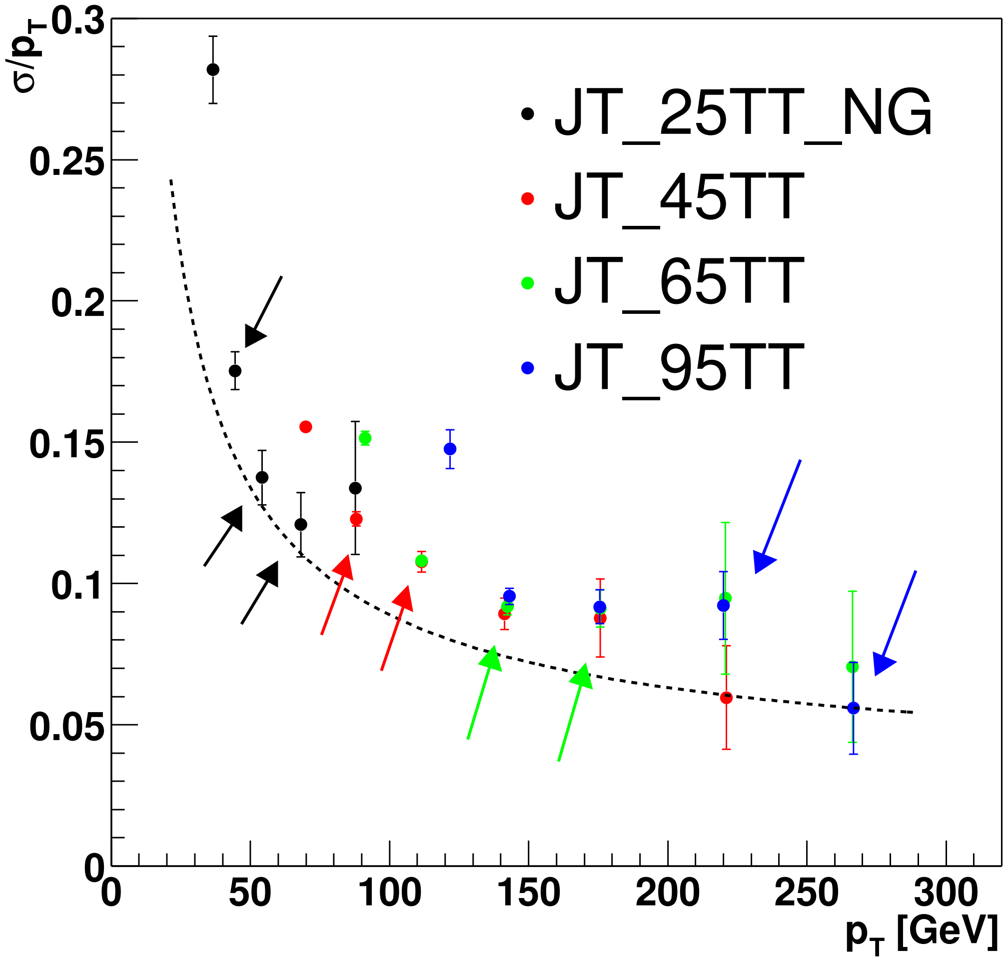
- jet resolution

$$\frac{\sigma_{p_T}}{p_T} = \sqrt{2}\,\sigma_A$$



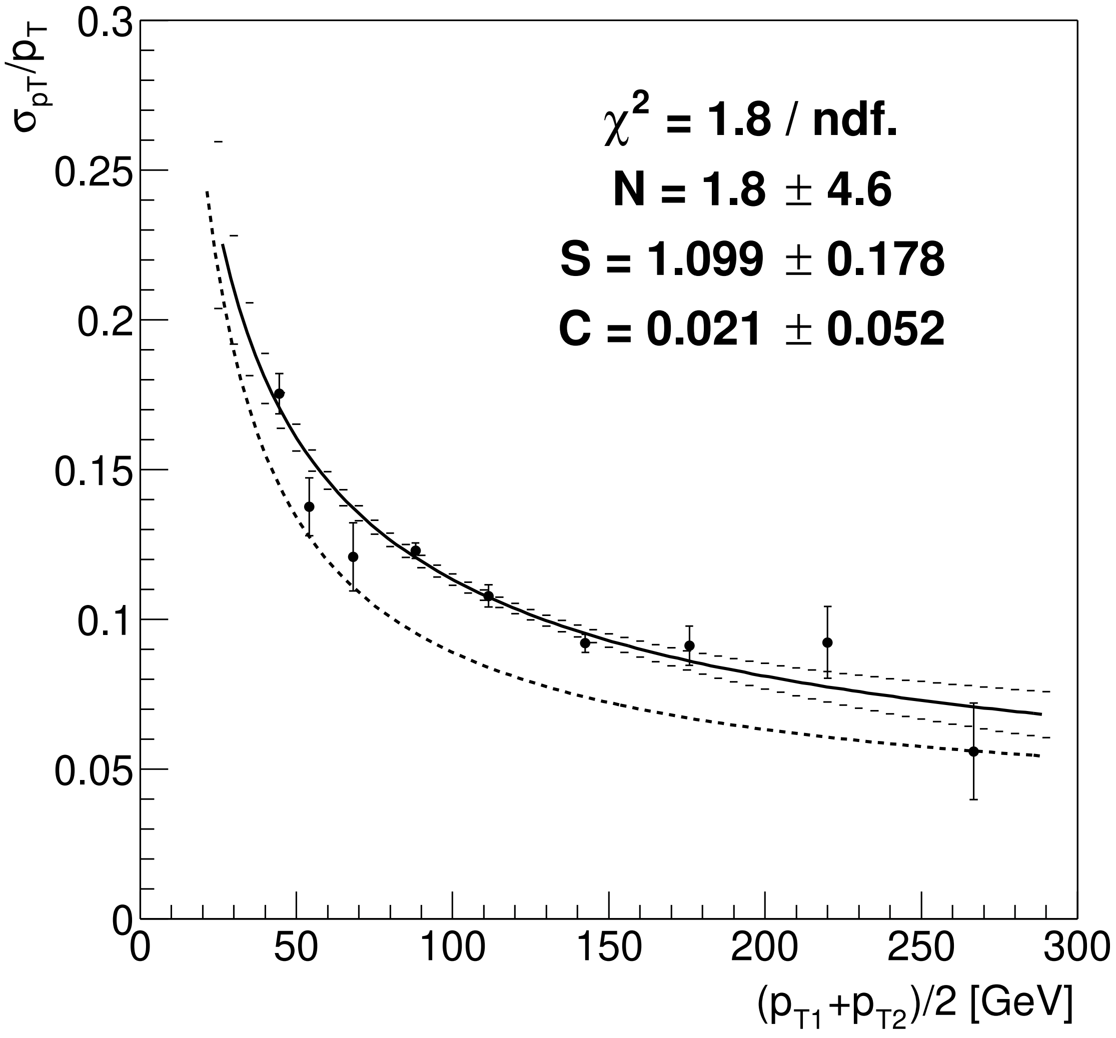


jet resolutions by trigger



- arrows show from which trigger the data point was chosen in givet p_T bin
- selection based on quality of Gaussian fit on asymmetry plot
- the dashed line shows corresponding RunI curve

Uncorrected jet p_T resolution



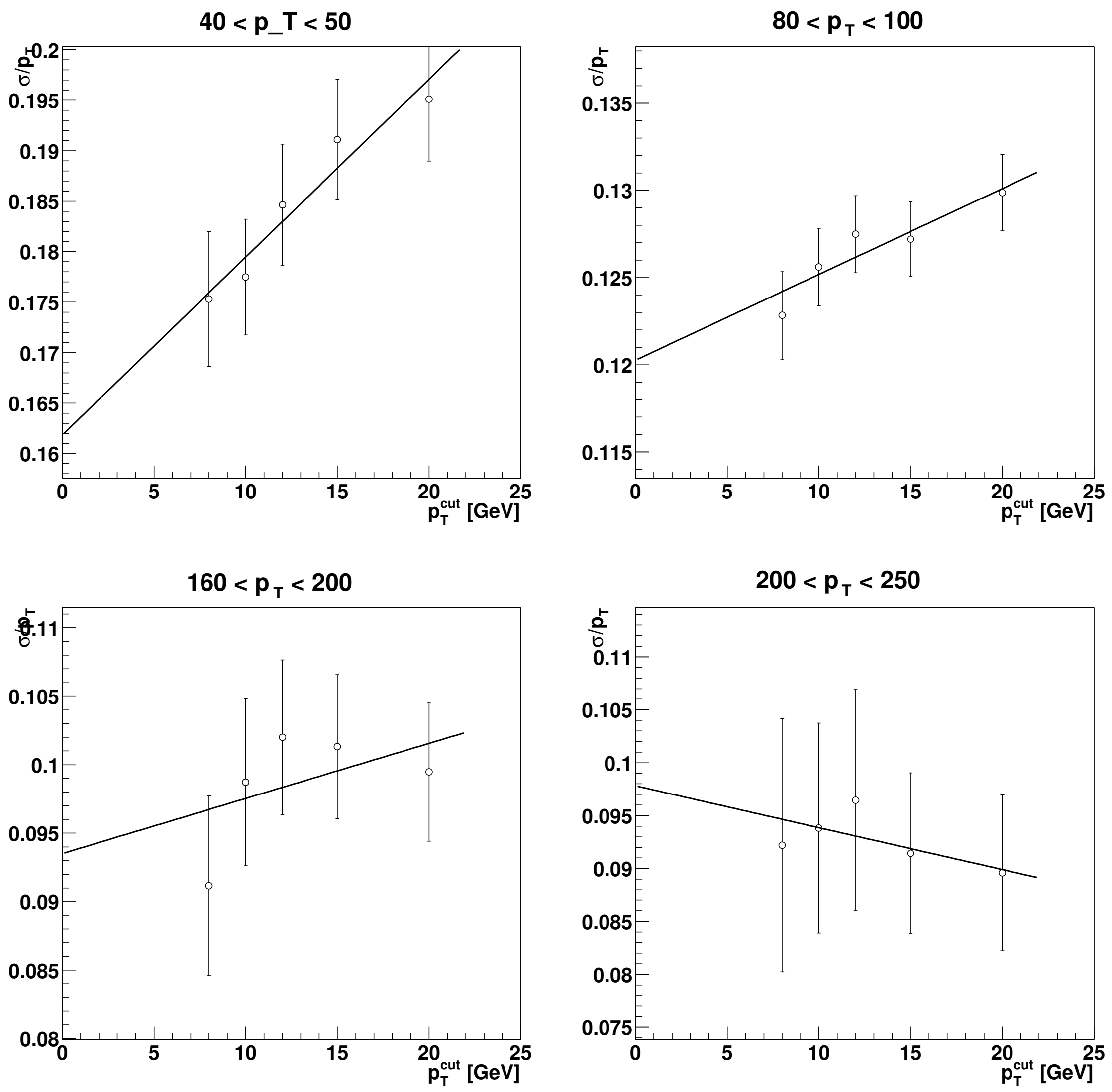
Fitted function

$$\frac{\sigma_{p_T}}{p_T} = \sqrt{\frac{N^2}{p_T^2} + \frac{S^2}{p_T} + C^2}$$

Correlation matrix

	N	S	C
N	1.000	-0.965	0.891
S	-0.965	1.000	-0.972
C	0.891	-0.972	1.000

Soft radiation correction

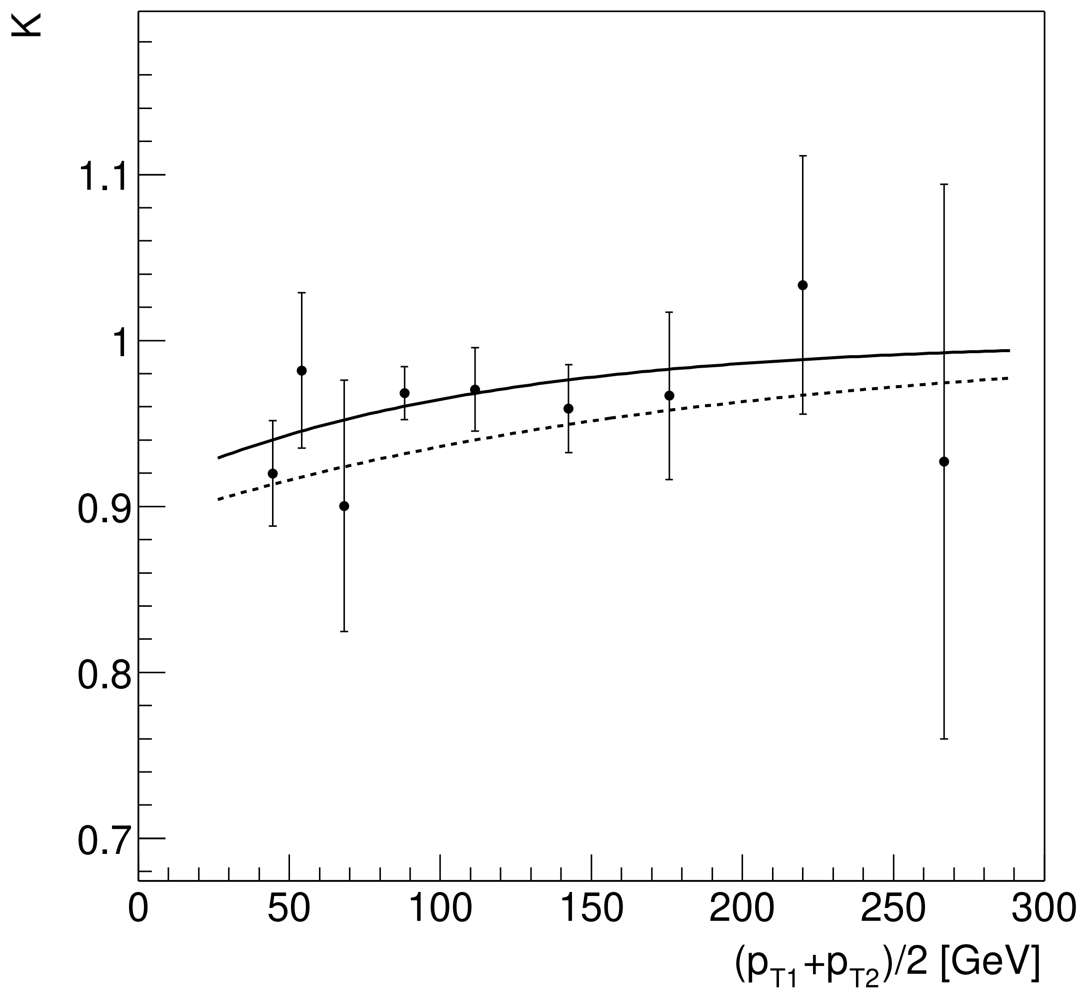


- soft radiation correction is relatively well measured in low p_T bins
- for the highest p_T bins the measurement is pure and the correction can even increase the jet resolution
- RunI solution - smooth the correction using fit

$$K\left(p_T\right) = 1 - e^{-a_0 - a_1 p_T}$$

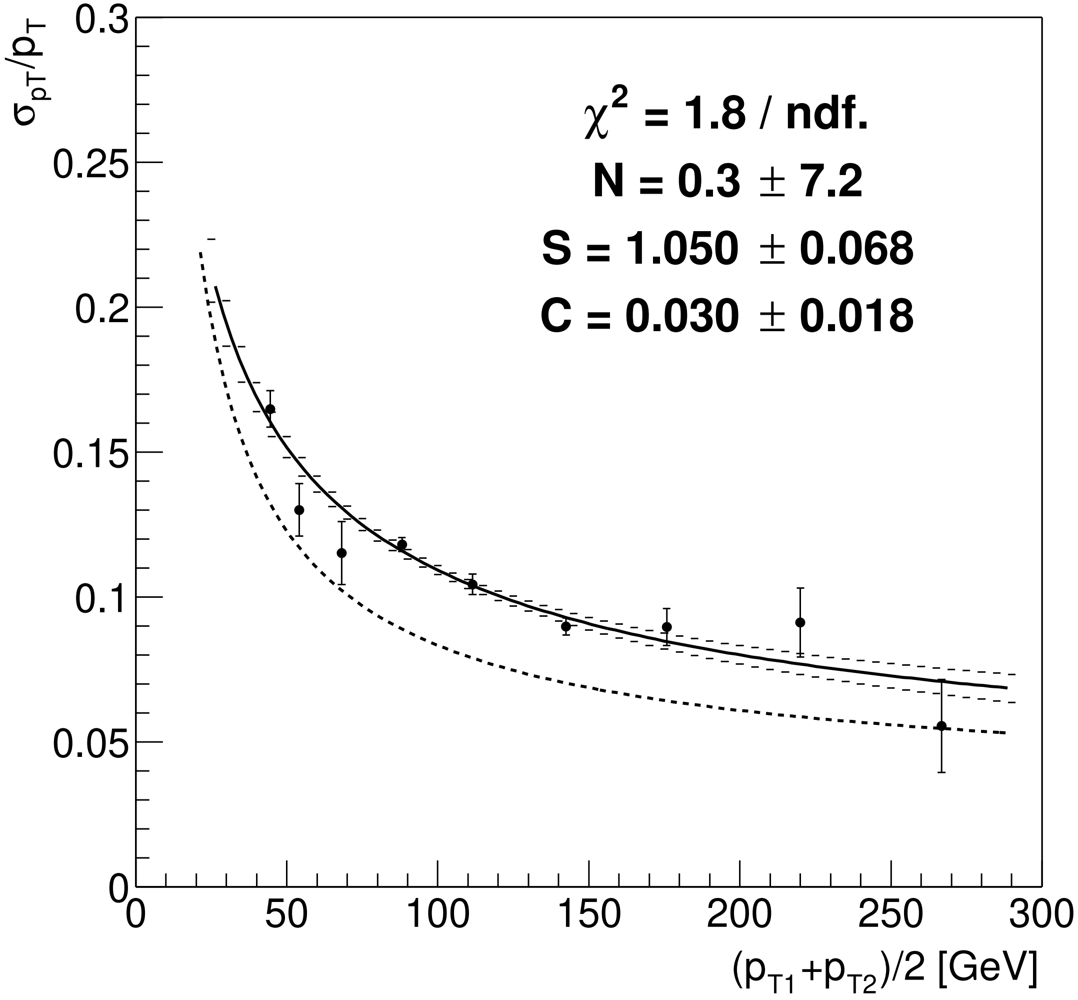
- the factor K is then applied to the measured jet resolution in pure dijet sample

Soft radiation correction - result



- solid line is fit on RunII data
- dashed line is corresponding RunI curve
- no error estimate on fit since it is hard to obtain right value of error for the soft radiation coefficient due to high correlation between the data points in the samples with different cut on the third jet

Jet resolution after soft radiation correction

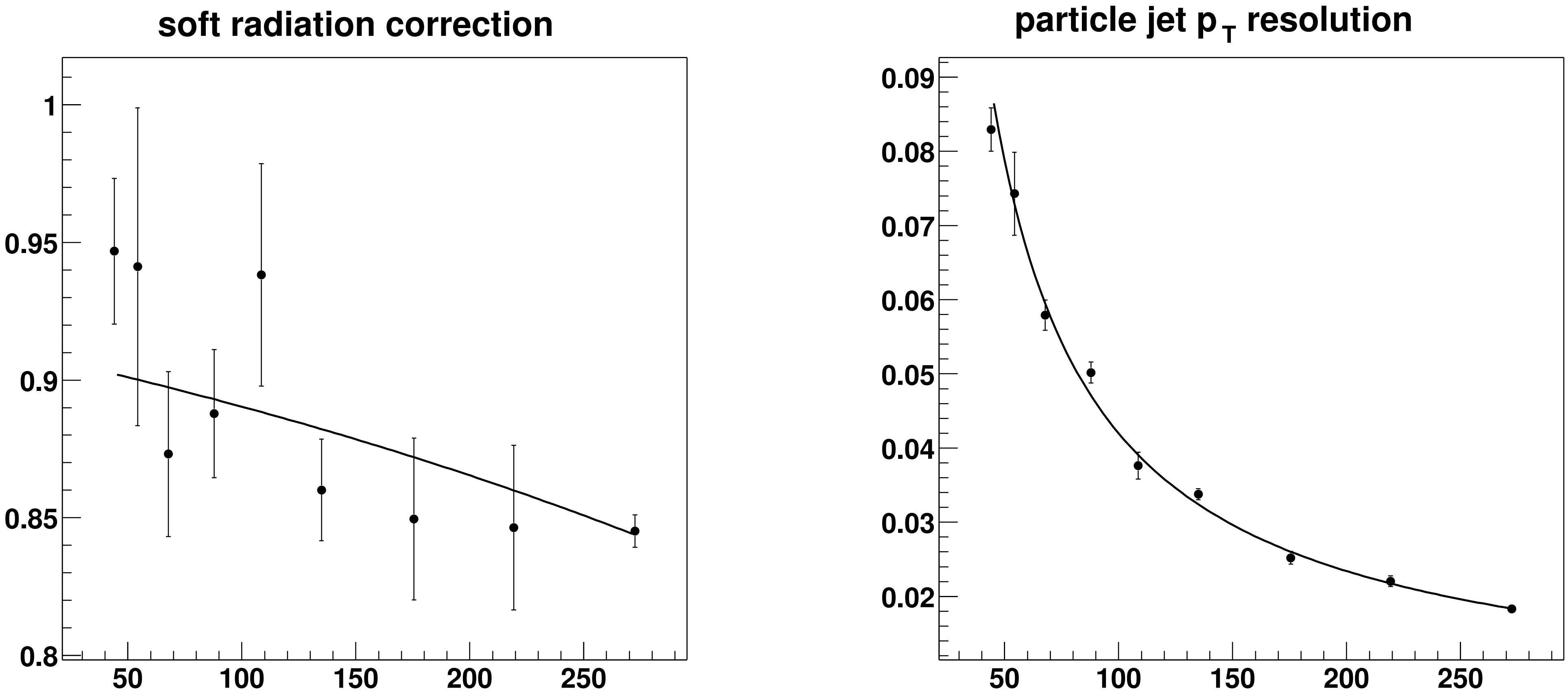


Correlation matrix

	N	S	C
N	1.000	-0.749	0.511
S	-0.749	1.000	-0.918
C	0.511	-0.918	1.000

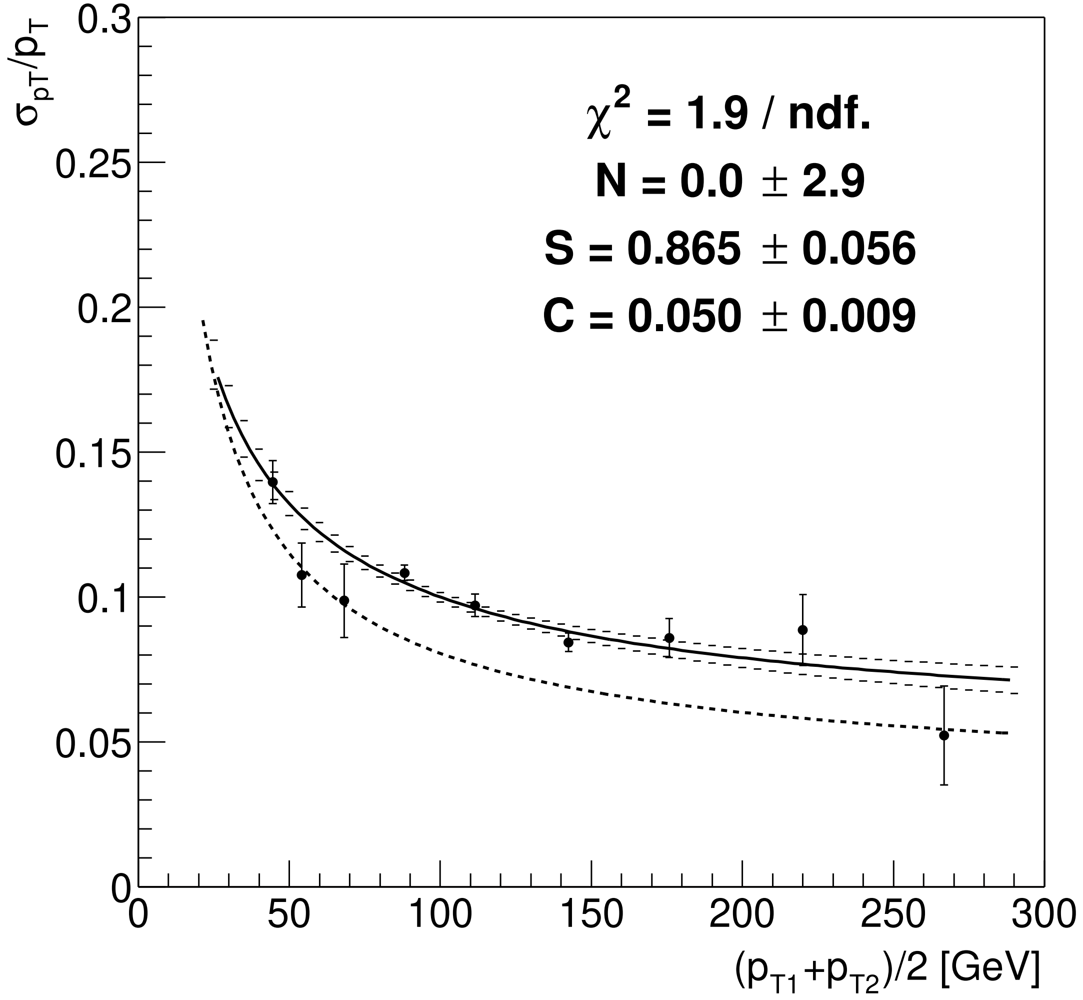
- dashed line is the corresponding RunI curve (also after soft radiation correction)

Particle jet imbalance



- QCD MC samples generated with Pythia with different p_T cuts
- RunII cone algorithm on particle level (no d0gstar) was run by `pmcs`
- Why soft radiation correction is bigger at high p_T ? (bug, threshold effect, $\cdots$)
- The final result is about two times bigger than RunI curve

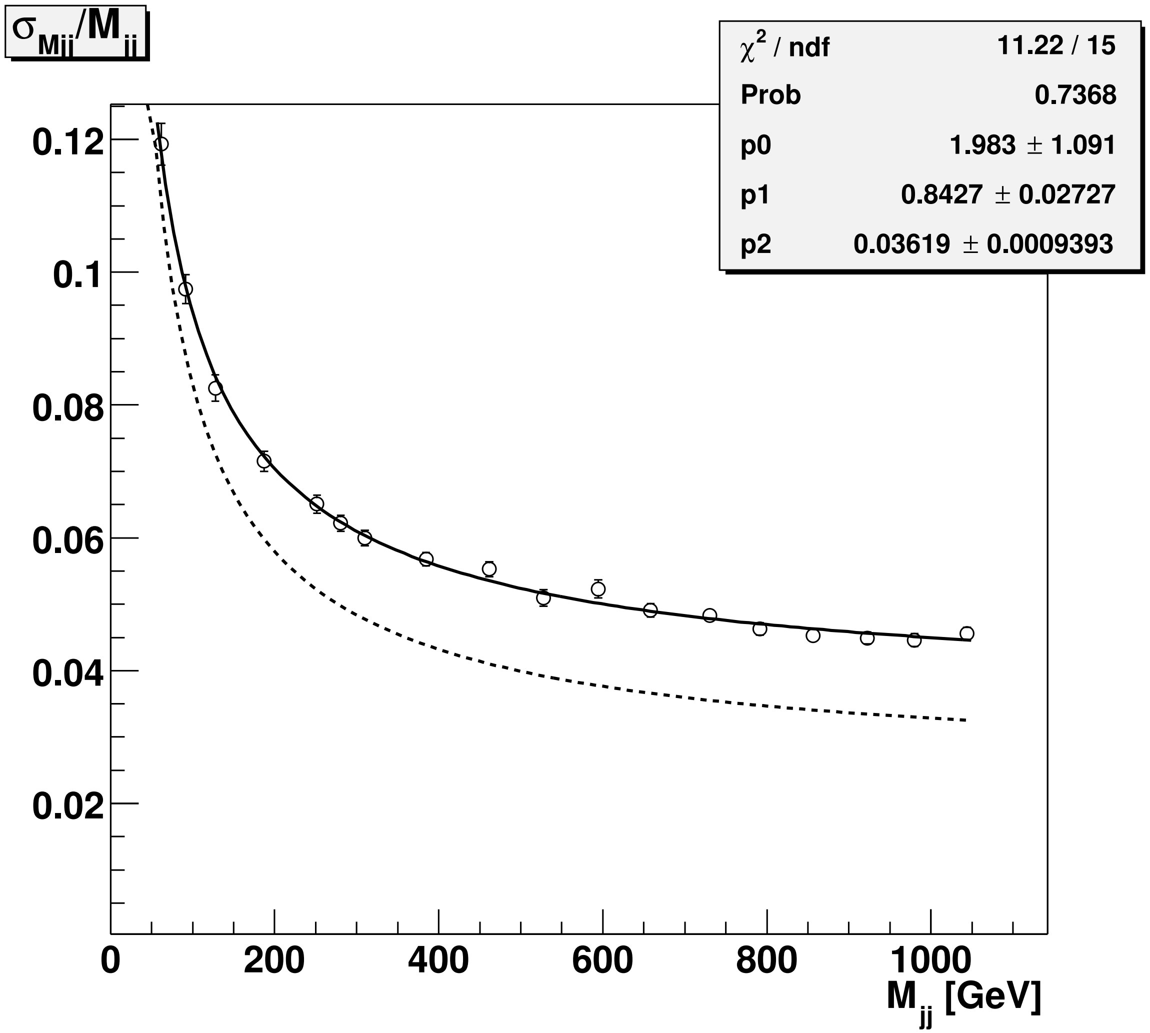
Jet p_T resolution - final result



Correlation matrix

	N	S	C
N	1.000	-0.004	0.002
S	-0.004	1.000	-0.943
C	0.002	-0.943	1.000

Dijet mass resolution



Fitted function

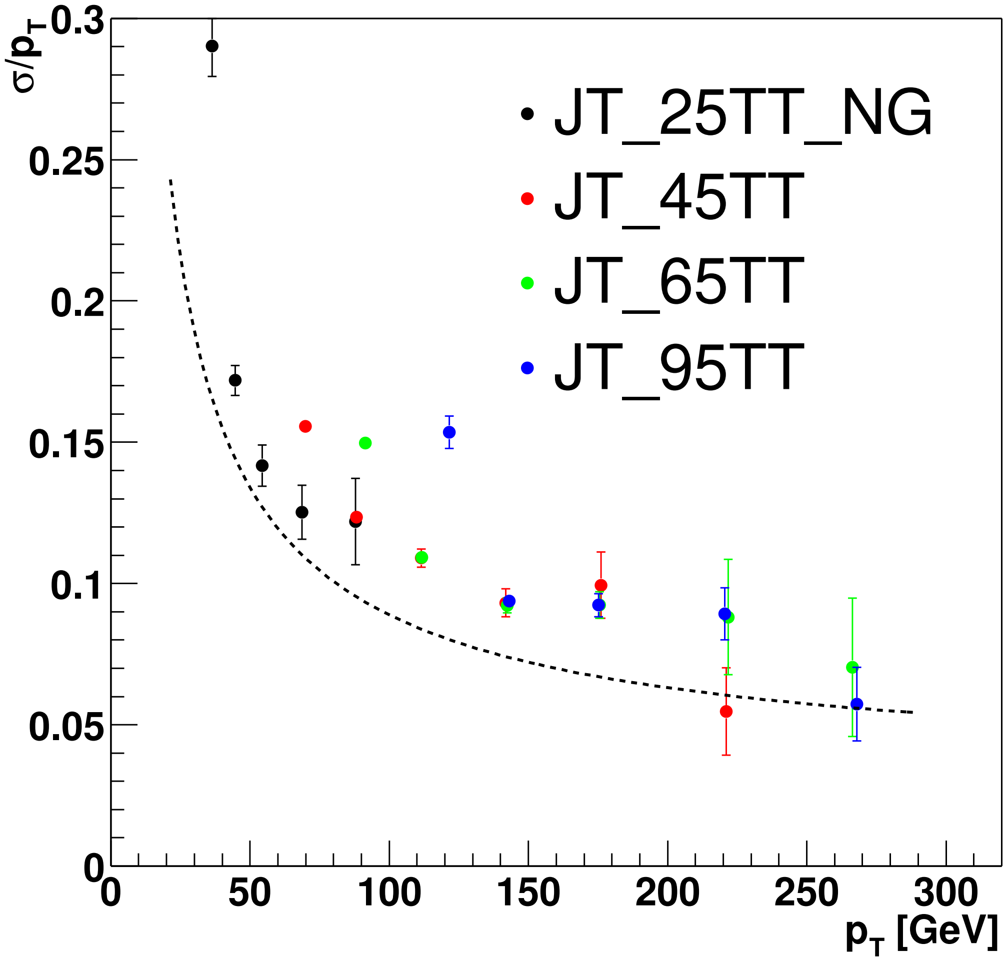
$$\frac{\sigma_{p_T}}{p_T} = \sqrt{\frac{N^2}{p_T^2} + \frac{S^2}{p_T} + C^2}$$

Correlation matrix

	N	S	C
N	1.000	-0.890	0.751
S	-0.890	1.000	-0.912
C	0.751	-0.912	1.000

- from the QCD MC sample - the particle jet energies were smeared using measured jet p_T resolution
- dashed line is for corresponding RunI curve

jet resolutions by trigger - p11 jetID cuts



- slightly bigger sample

$$\mathcal{L} \sim 16\,\text{pb}^{-1}$$

- p11 jetID cuts

$$f_{90} + 0.5\,\text{CHF} < 0.8$$

- almost no difference to the "p10" plot