Progress on dijet mass spectrum analysis

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Alexander Kupčo

Institute of Physics, Academy of Sciences of the Czech Republic

Center for Particle Physics, Prague

p13.05 data sample

- stripped p13.05 thumbnails (single jet triggers)
- stripping done by QcdSkim code (no special treatement of L1L2 chunk)
- data taken with trigger version **8.30**, **9.30**, **9.31**, and **9.50**
- run selection based on MET, METx, METy, SET
  + runs with spikes in jet φ distribution were removed
- luminosity in good runs is $\mathcal{L} = 15.1\,\text{pb}^{-1}$ ($19.3\,\text{pb}^{-1}$ for all runs)
  - so far no `Reconstructed` luminosity available for p13.05 thumbnails
  - to obtain preliminary results `Recorded` luminosity was used
- p13 JES correction applied (`jetcorr v04-00-01`)

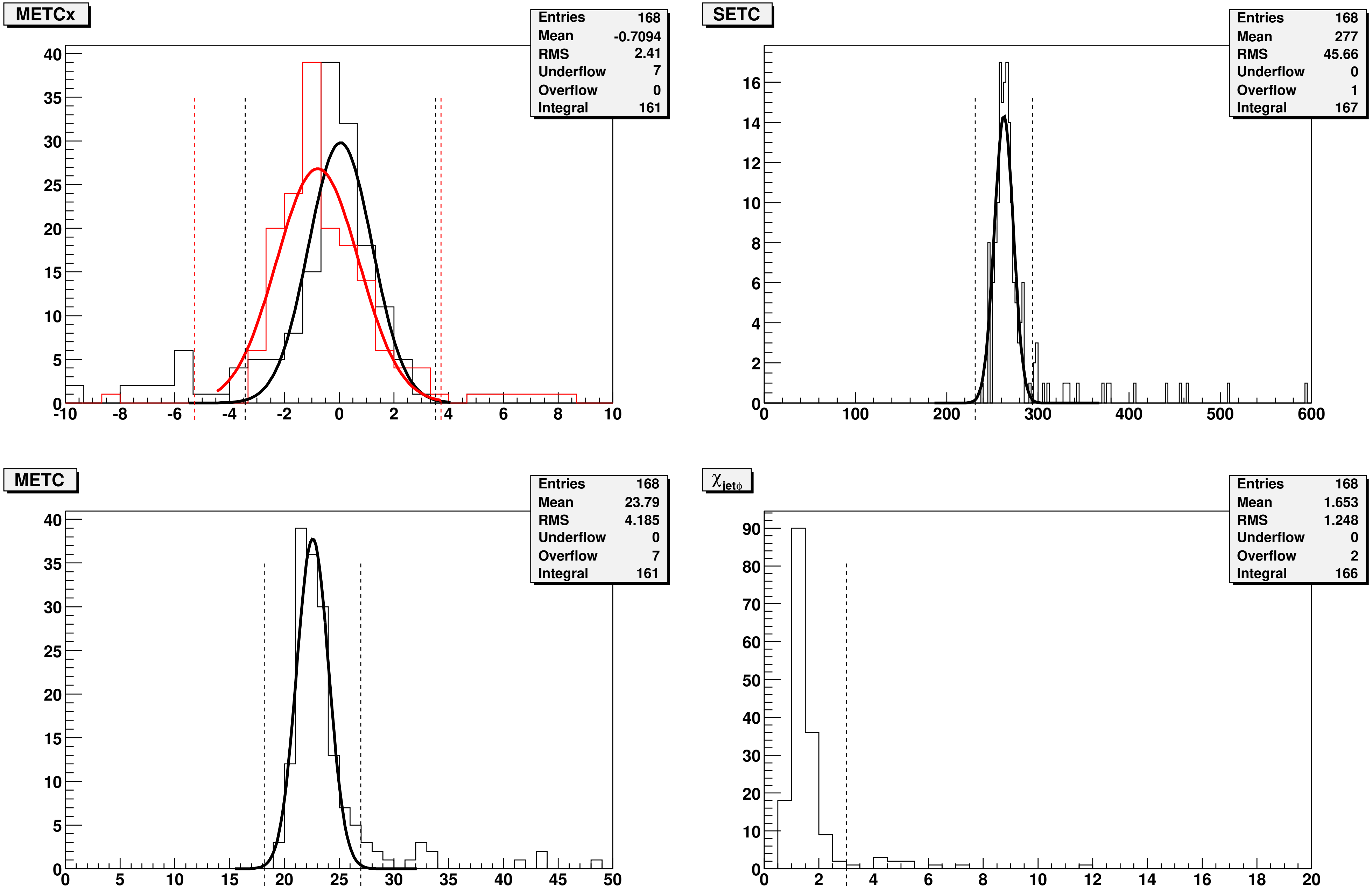
JetID criteria

- p13 jetID criteria not available yet, p10 ones were used instead of it

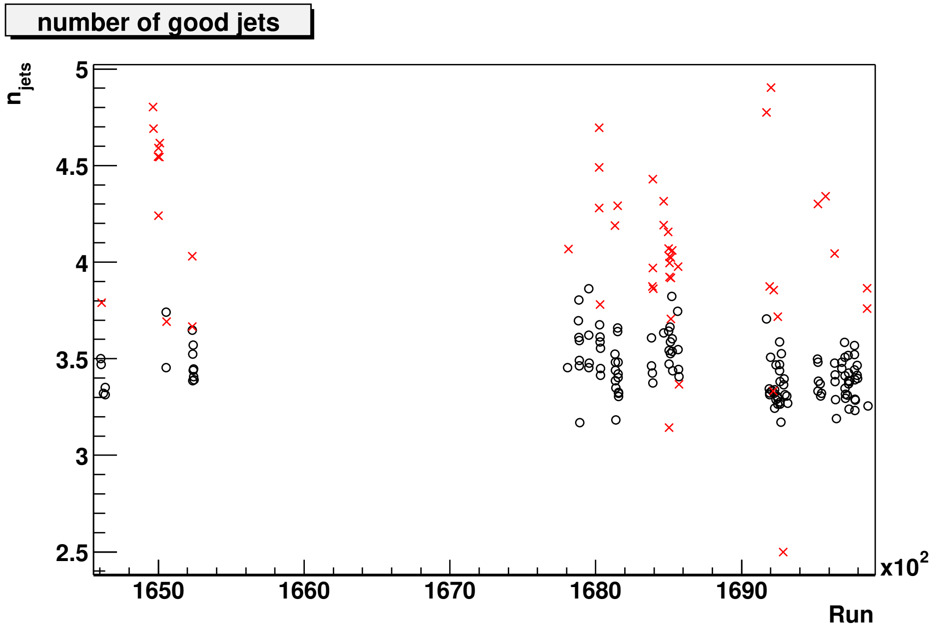
Event selection criteria

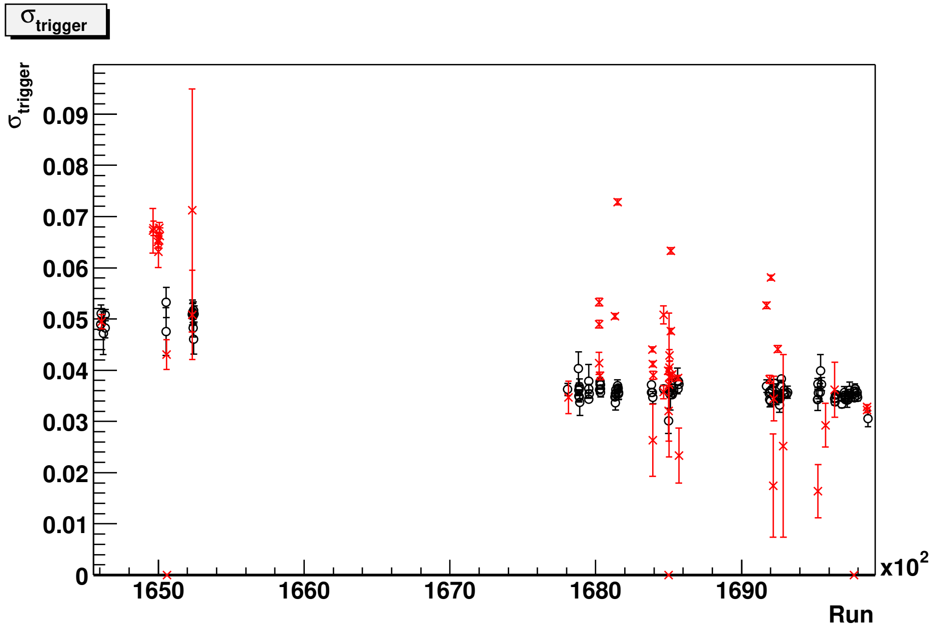
- MET $< 0.7 p_T^{1st\ jet}$ (no JES and MET corrections)
- at least 3 tracks pointing to the primary vertex and $|z_{vtx}| < 50$ cm
- the two leading jets should be good and within $|\eta| < 0.5$ region

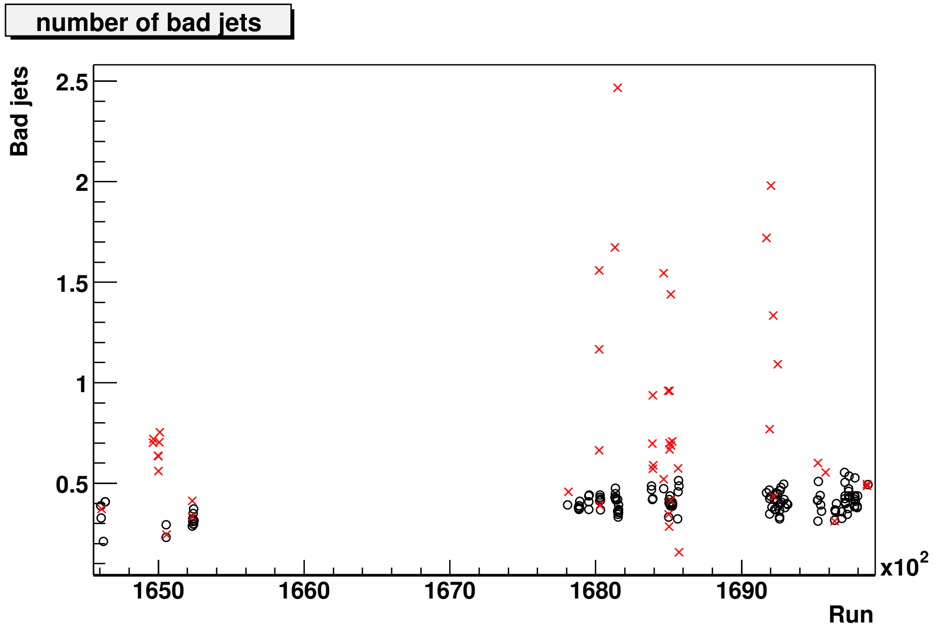
Run selection variables

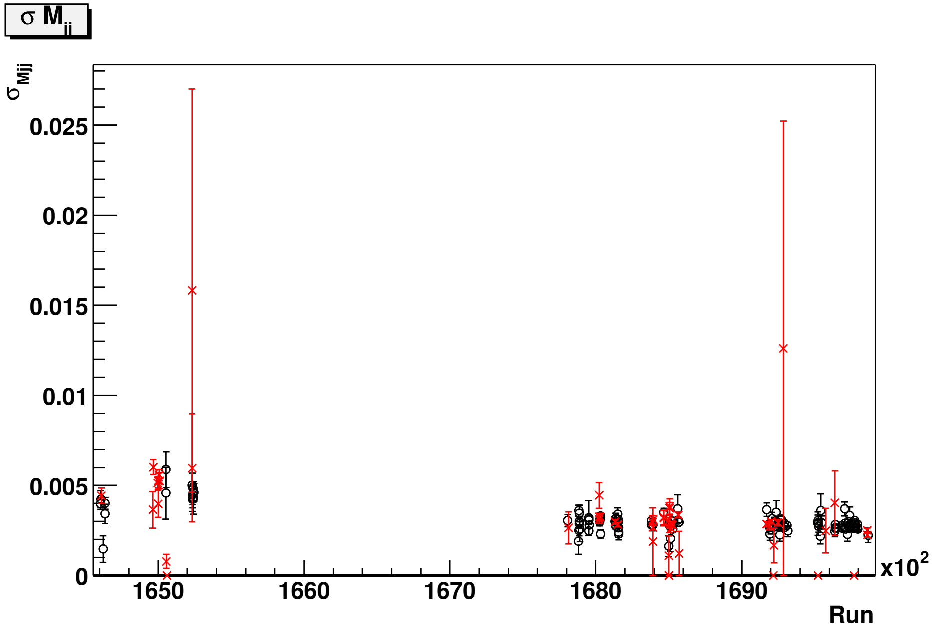


Run selection check

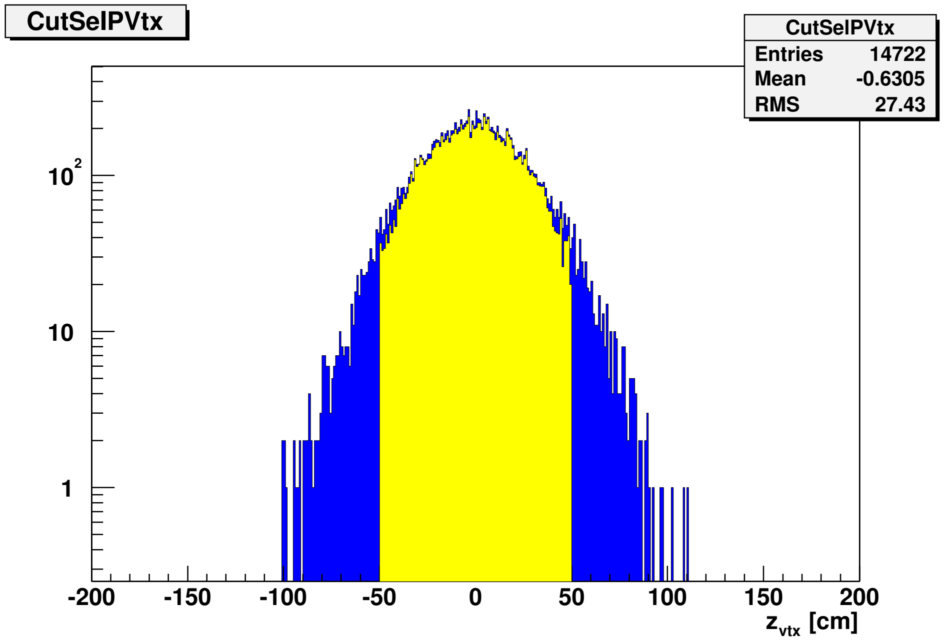








Vertex cut efficiency



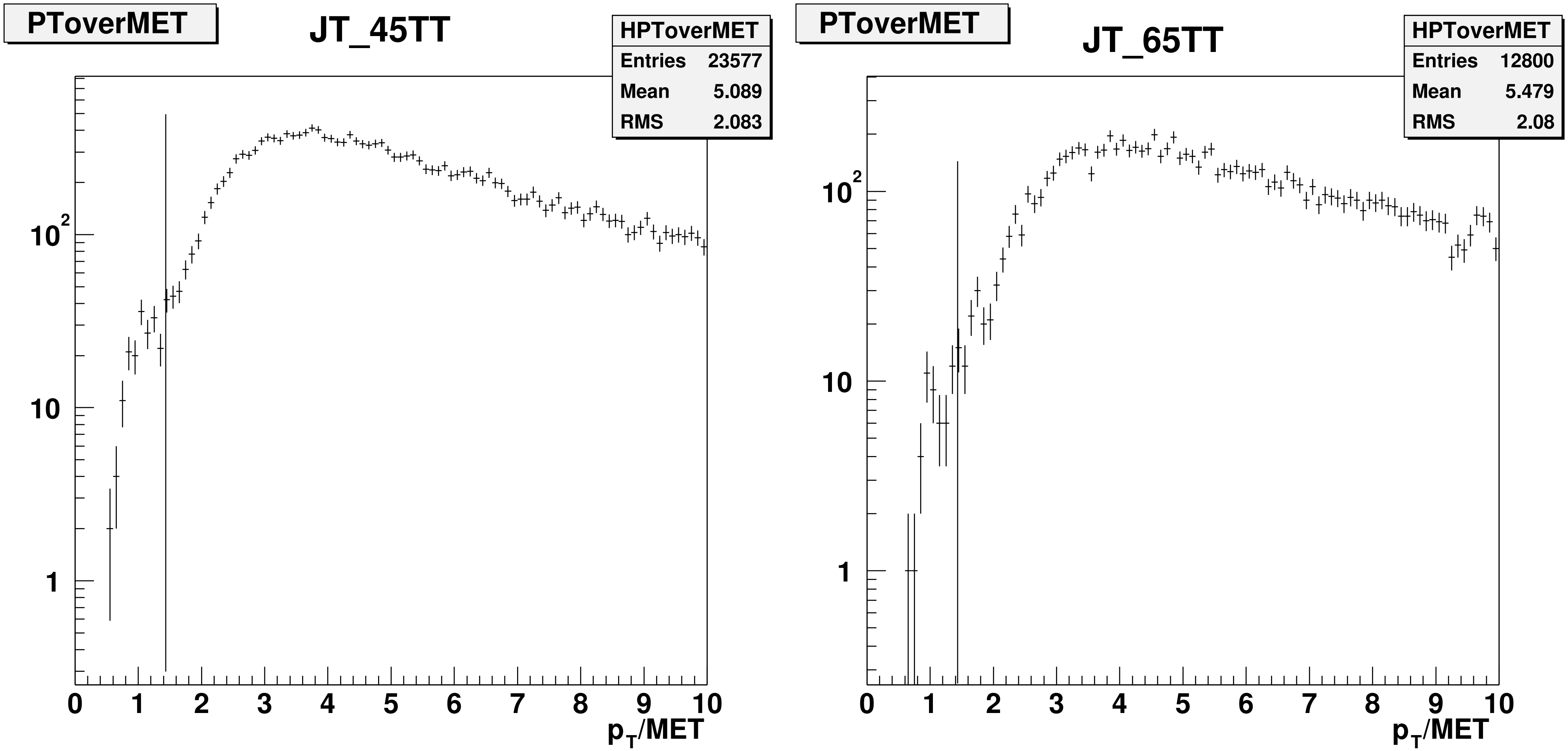
$$\varepsilon = \frac{N_{good}}{N_{all}}, \qquad \Delta\varepsilon = \sqrt{\frac{\varepsilon\,(1-\varepsilon)}{N_{all}}}$$

- N_{all} all dijet events (with dijet mass above some threshold) that satisfy all selection criteria except the vertex one

trigger	M_{jj}^{cut}	ε	$\Delta\varepsilon$
JT_25TT_NG	75 GeV	0.830	0.003
JT_45TT	130 GeV	0.838	0.002
JT_65TT	170 GeV	0.846	0.002
JT_95TT	240 GeV	0.841	0.004

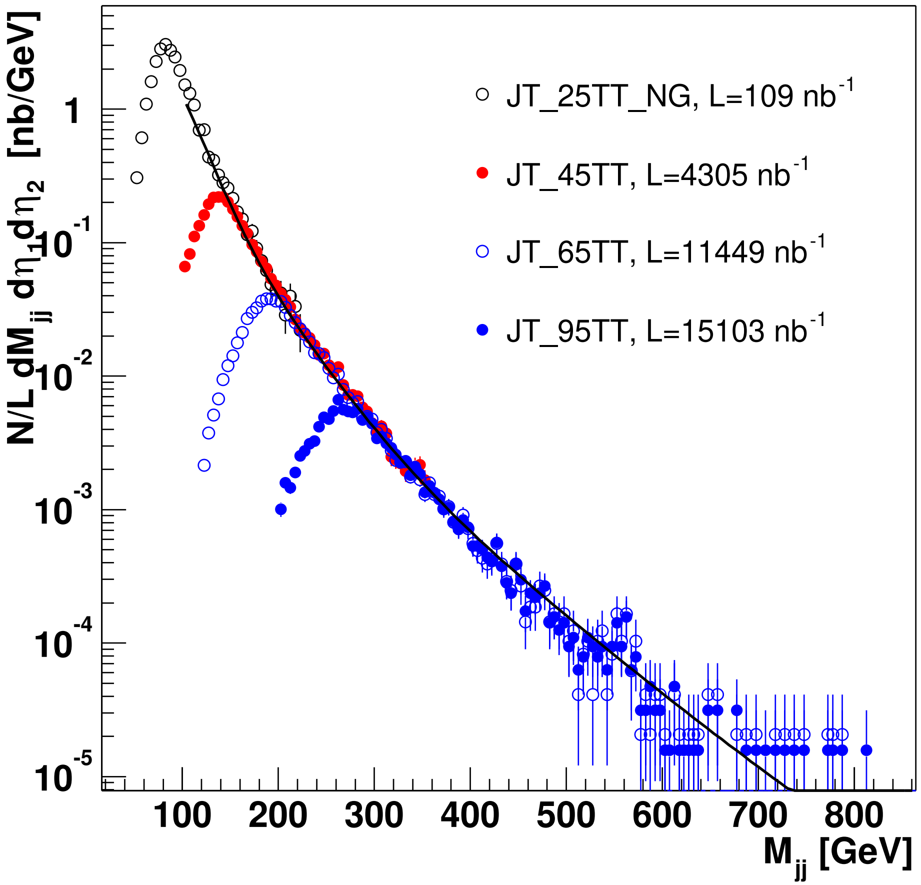
- very weak dependence on trigger and dijet mass

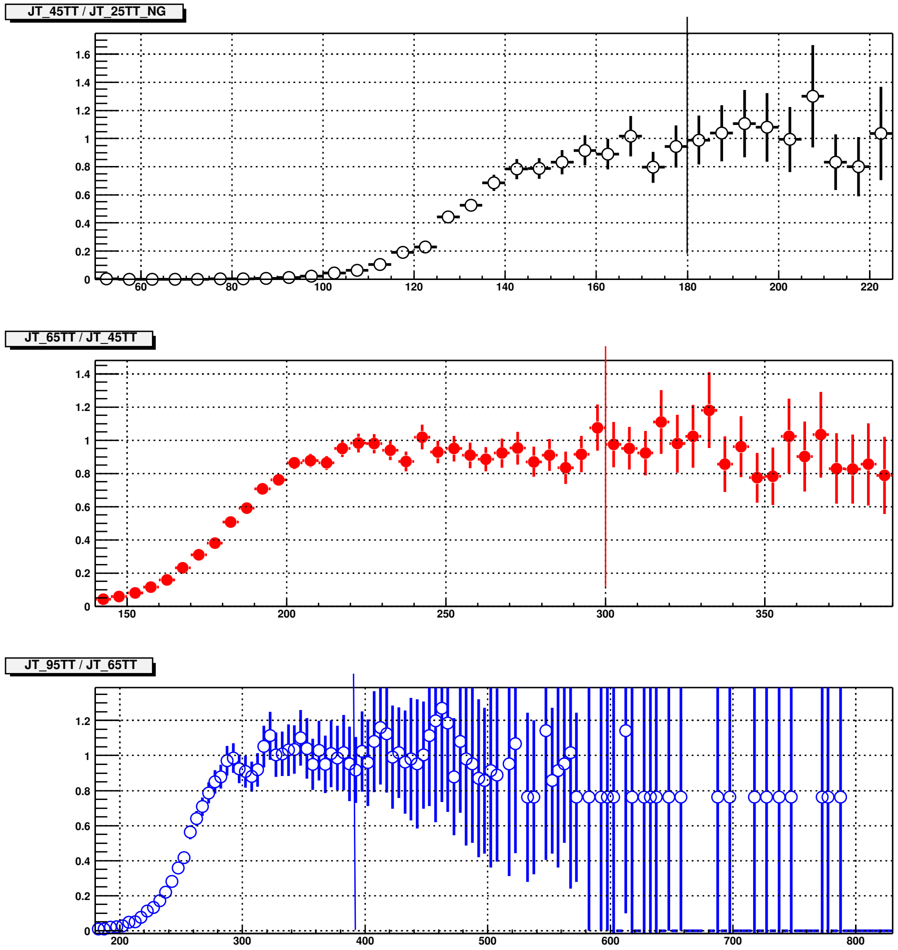
Cut on MET



- good dijet events (all selection criteria except cut on MET)
  - using p11 jetID cuts (p10 + cut on f90)

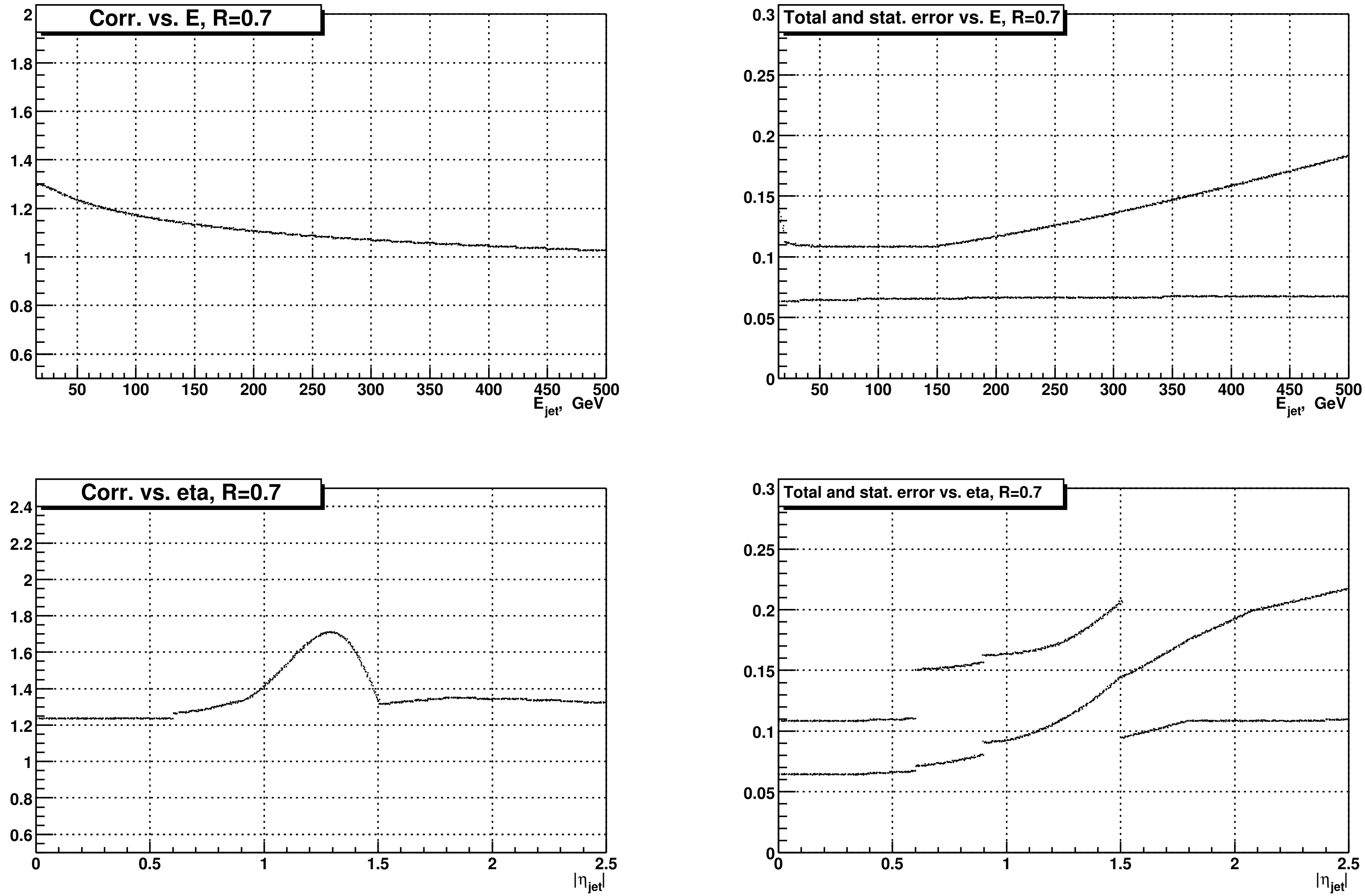
Raw dijet mass spectrum



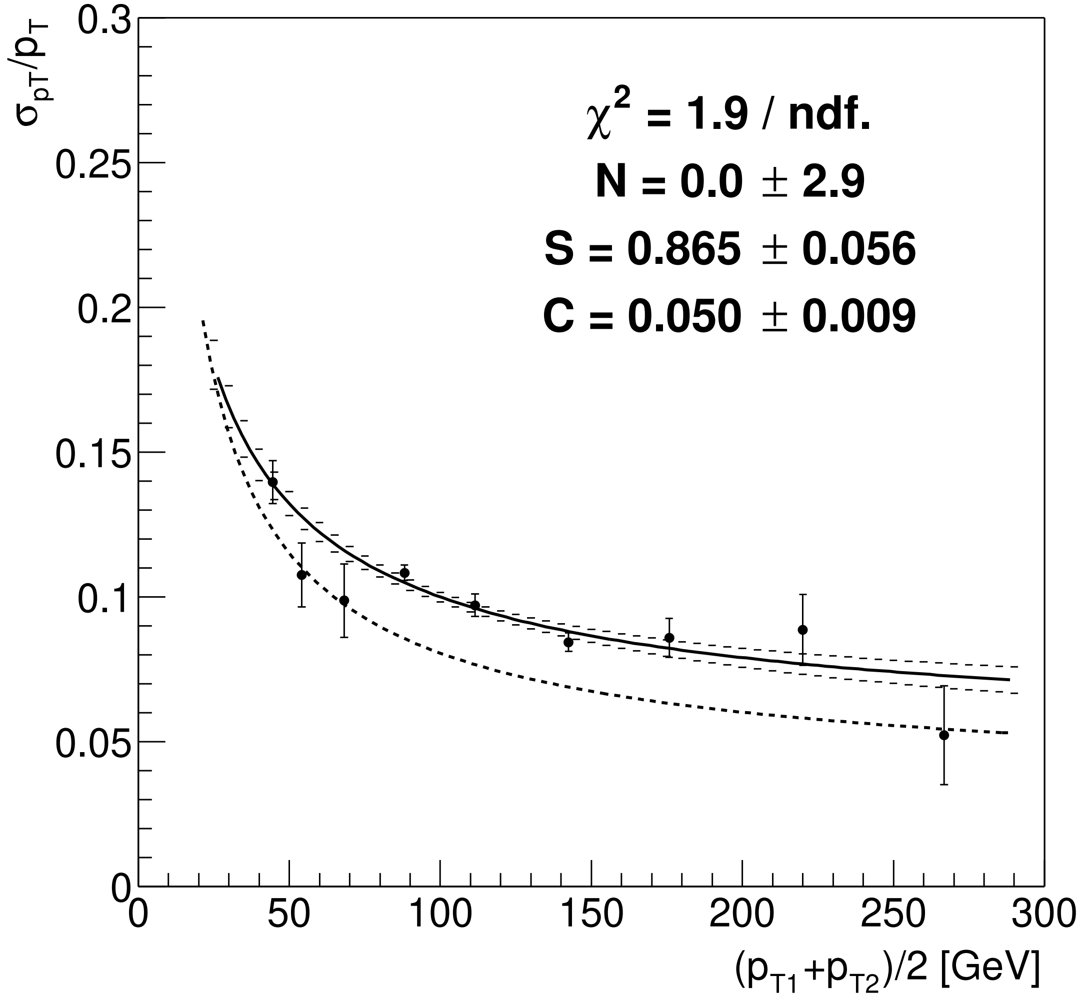


- JES correction v04-00-01
- vertex cut efficiency correction

Jet energy scale



Jet p_T resolution - final result



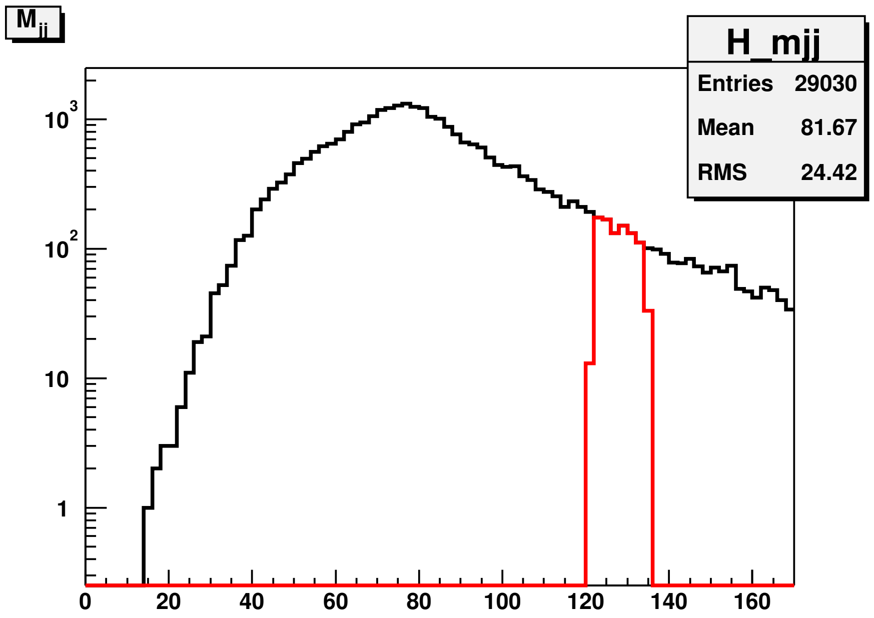
Correlation matrix

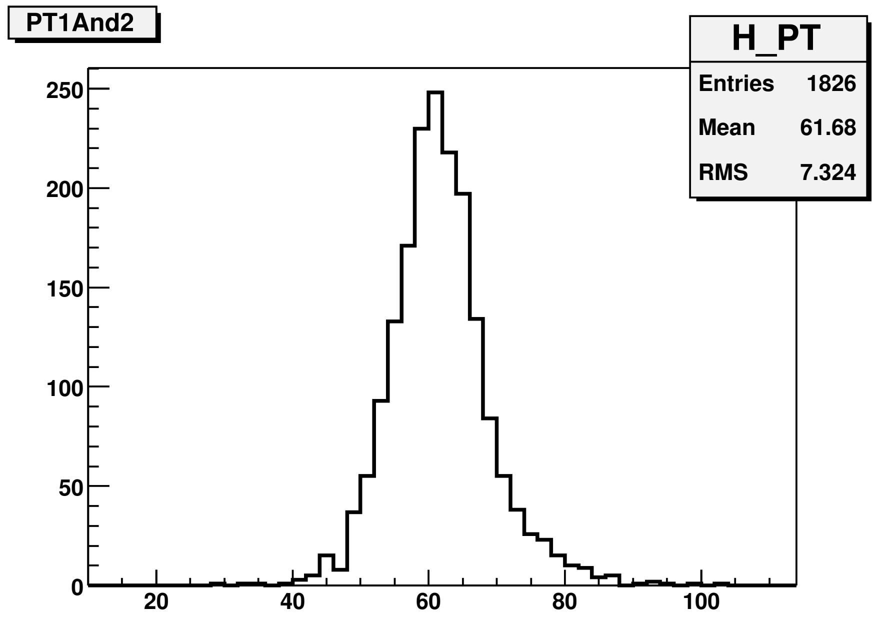
	N	S	C
N	1.000	-0.004	0.002
S	-0.004	1.000	-0.943
C	0.002	-0.943	1.000

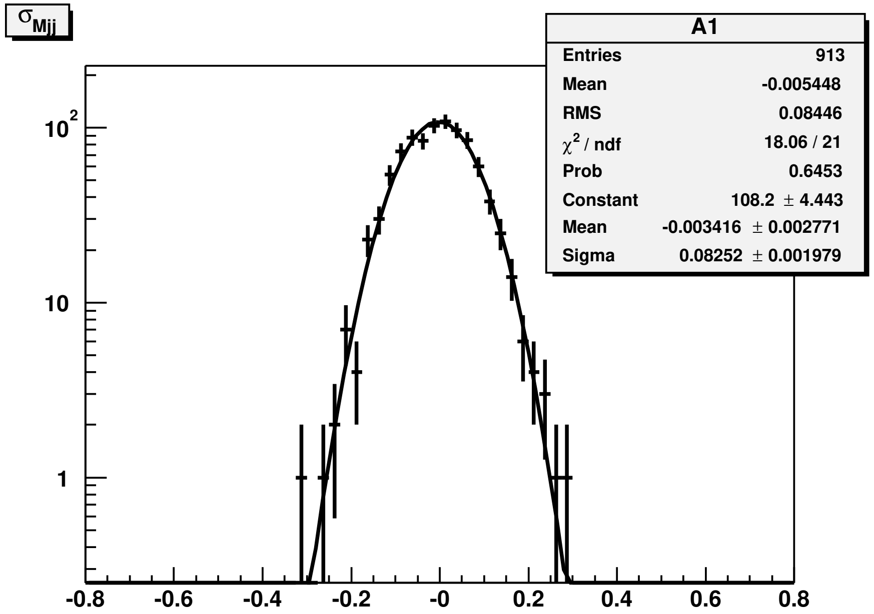
- JES correction
- soft radiation correction
- particle jet imbalance correction

- central region of calorimeter, $|\eta| < 0.5$
- event selection cuts constistent with those used in dijet mass analysis
- for more detailed information see my talk on next JES group meeting

Dijet mass resolution - method





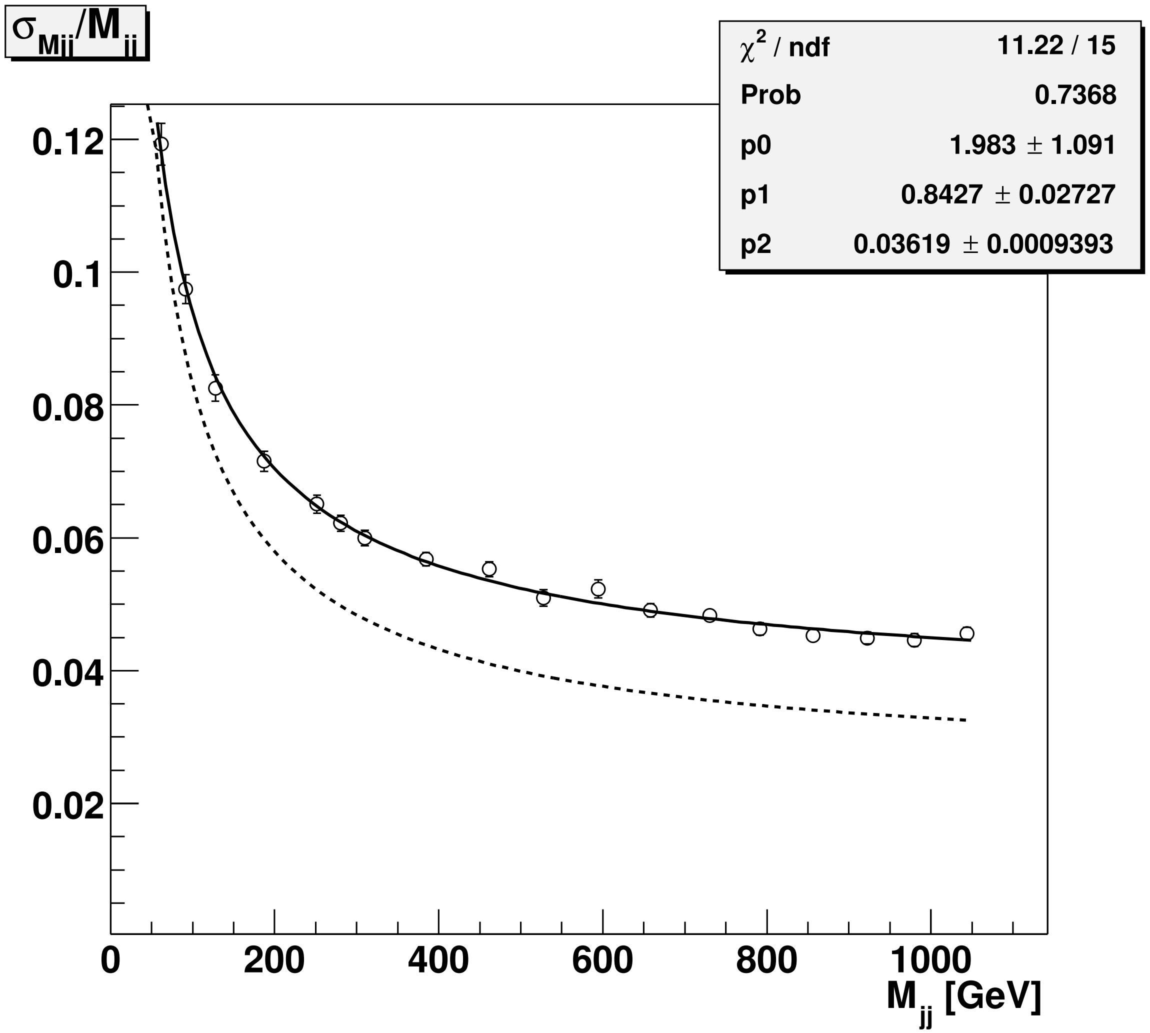


smqcd040.root

official QCD cardfiles

`np/pythia_qcd_incl.cards`

Dijet mass resolution - final result



Fitted function

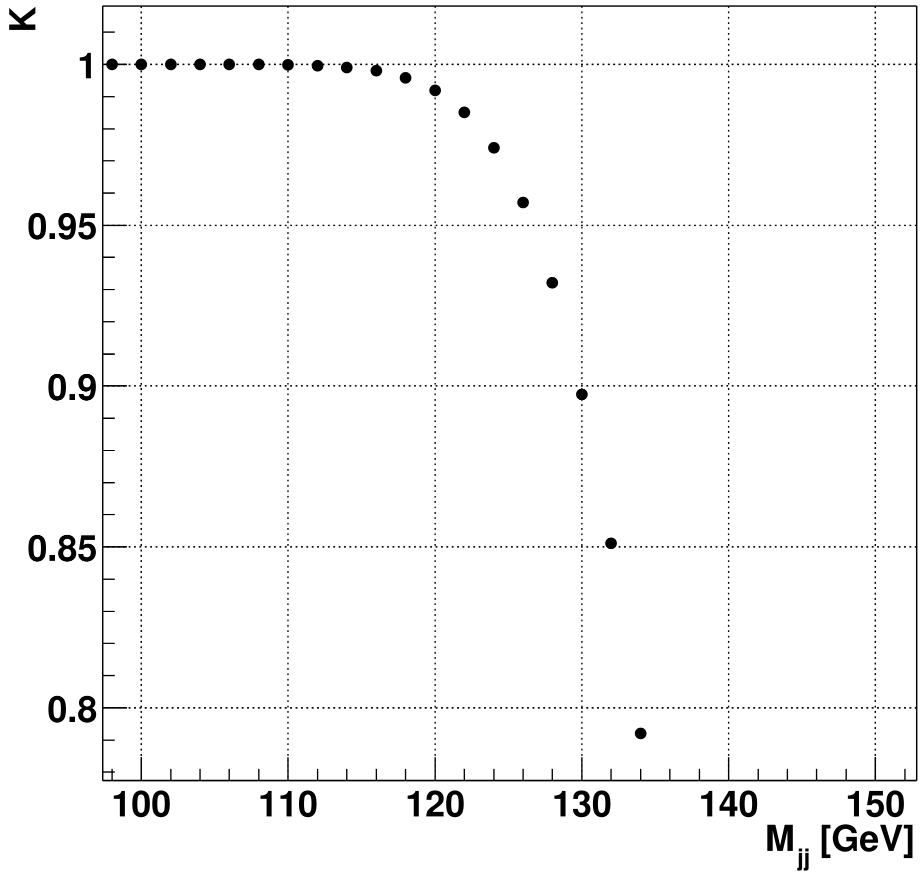
$$\frac{\sigma_{p_T}}{p_T} = \sqrt{\frac{N^2}{p_T^2} + \frac{S^2}{p_T} + C^2}$$

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

Dijet mass resolution - the lowest reliable point



$$K = \frac{\int_{M}^{150} \mathrm{d}M' f(M') G(150 - M')}{\int_{80}^{150} \mathrm{d}M' f(M') G(150 - M')}$$

- contribution smaller then 1% for masses under 120 GeV

- minimal value of p_T is about 40 GeV for the sample with dijet mass around 120 GeV
- the lowest bin in the jet p_T resolution curve starts at 40 GeV

Unsmearing - method

- ansatz function

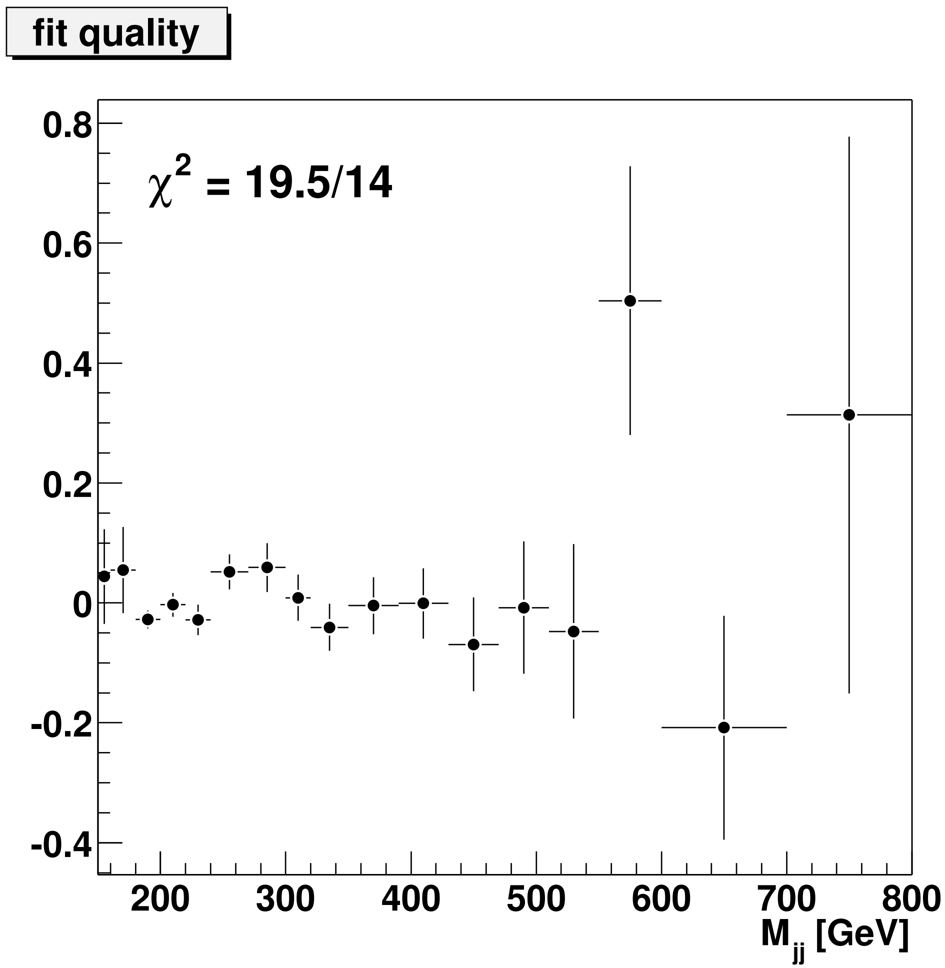
$$f = N M_{jj}^{-\alpha} \left(1 - \frac{M_{jj}}{\sqrt{s}}\right)^{-\beta}$$

- for a given set of parameters
  - convolute function f with the dijet mass resolution

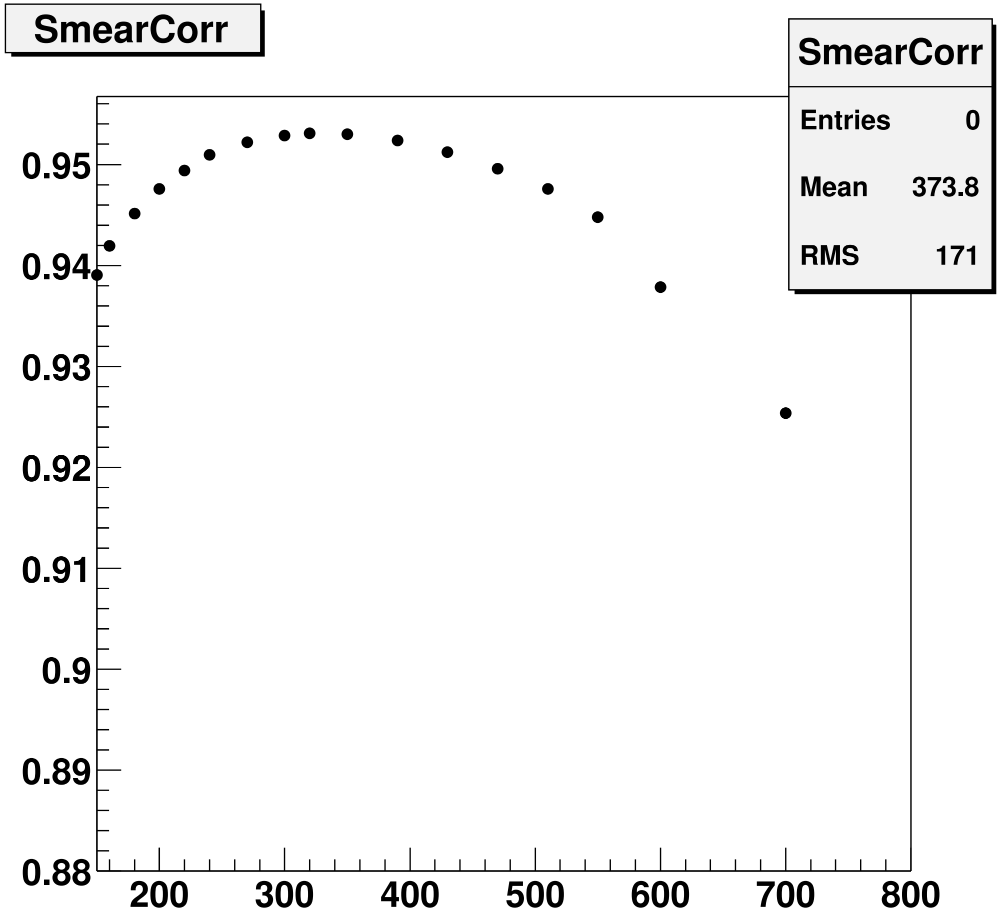
$$F(M) = \int \mathrm{d}M' f(M') G(M - M')$$

  - make prediction on dijet mass cross section for all bins
  - calculate χ^2 for the prediction
- use Minuit to find the best fit
- unsmearing correction

$$C_{bin} = \frac{\int_{bin} \mathrm{d}M\, f(M)}{\int_{bin} \mathrm{d}M\, F(M)}$$

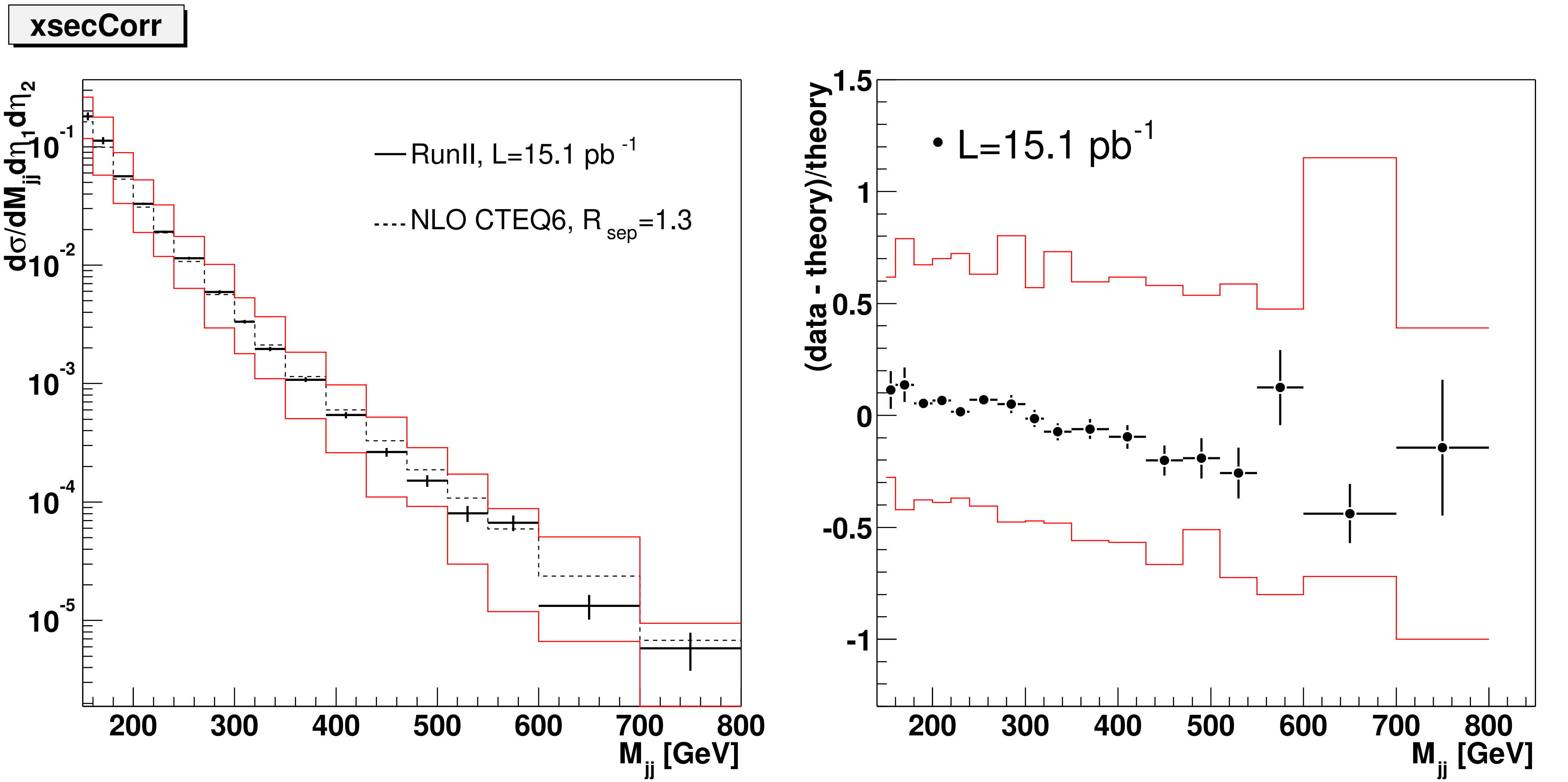


Unsmearing correction



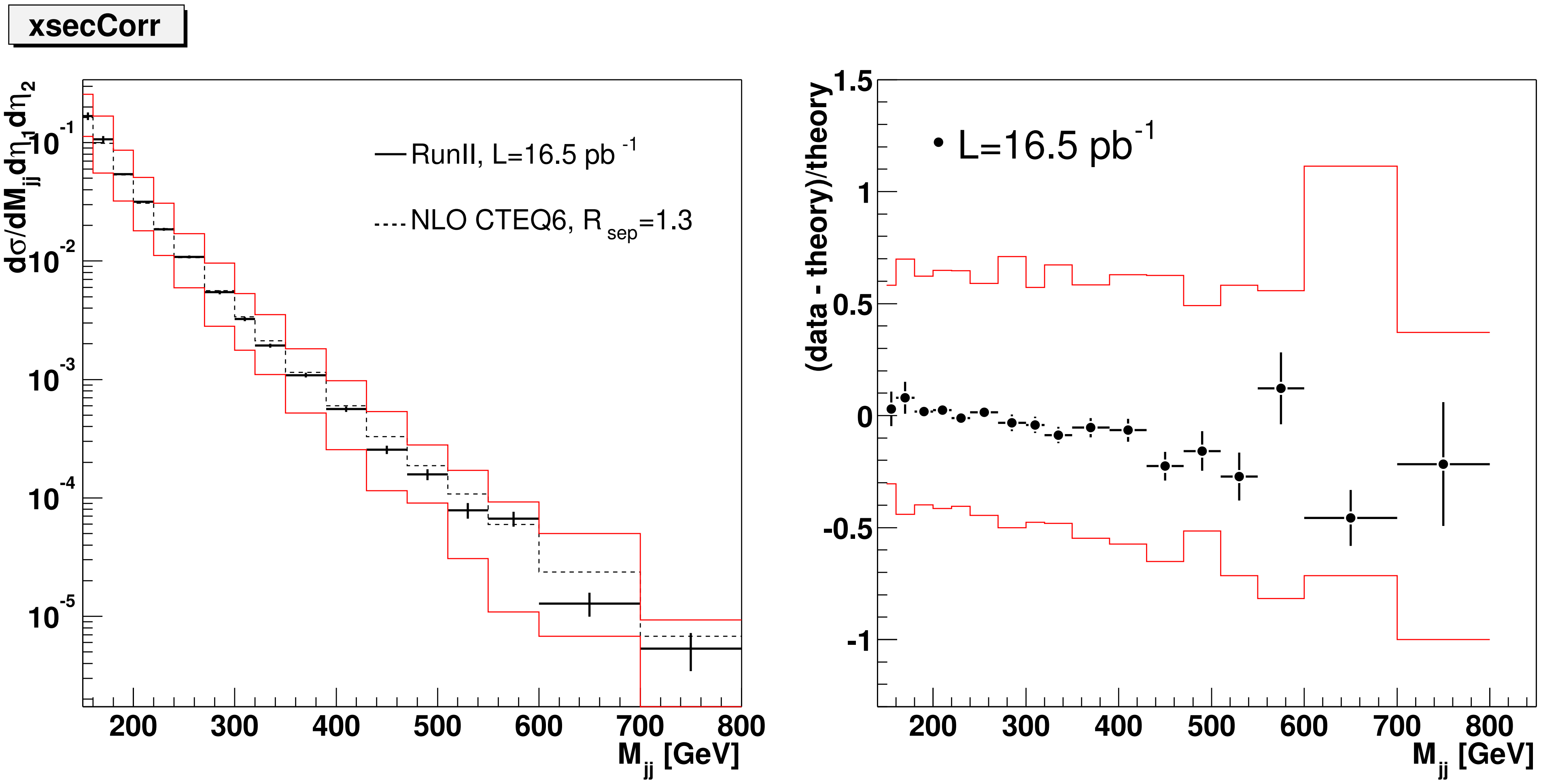
- same binning as in RunI
- slightly higher than in RunI
- the same shape
- no error estimate
  - error from dijet mass resolution
  - error conected with the selection of the ansatz function

Inclusive dijet mass cross section (p10 jetID)



- very nice agreement with the theory curve
- red lines shows the distribution for the upper and lower value of JES
  - JES errors are still large

Inclusive dijet mass cross section (p11 jetID)



- slightly bigger sample ($\mathcal{L} = 20.9\,\mathrm{pb}^{-1}$)
- almost no difference to p10 cross section

To do list

- strip the data as they come to SAM
  - so far about 64M events in p13.05 thumbnails
  - about 180M events taken between Aug 15 and Jan 13 (but also zero bias runs are taken into account)
  - may be we can expect 2 times more (about $40 - 50\,\mathrm{pb}^{-1}$)
- apply new jet ID cuts
- determine efficiencies of jetID cuts
- check that the jets in selected events looks fine
- remeasure jet p_T resolution with new jetID cuts
- check η bias with new monte carlo