Jet trigger turn-on points
New dijet mass and $\Delta\phi$ plots
Calorimeter north/south asymmetry

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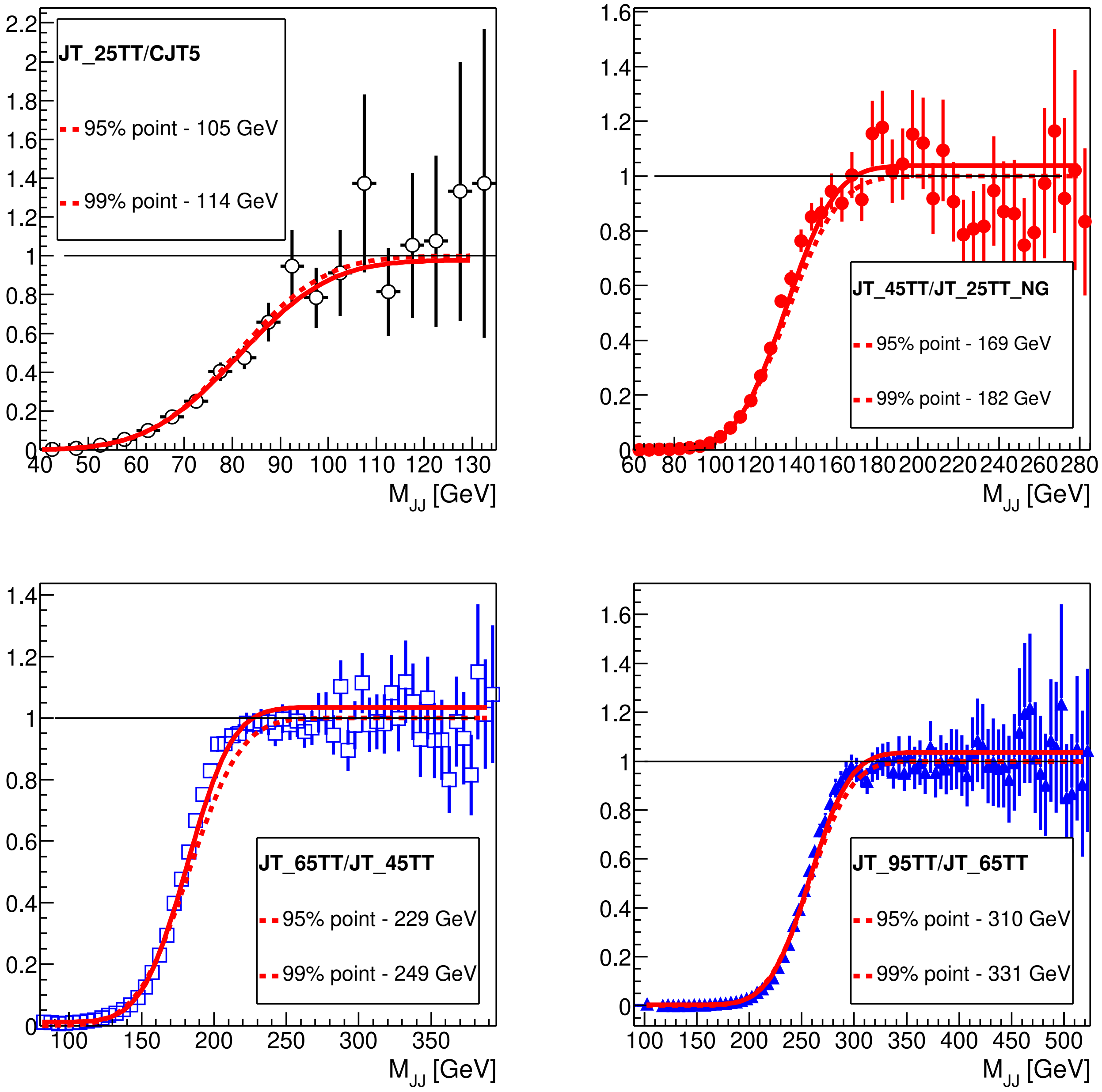
Data sample

- stripped p13.05, p13.06 and r13.06 thumbnails
- run selection used in the note probably biases the sample
  - the two highest dijet mass events (both from r13.06) belong to bad runs
  - the two runs are almost good (one has slighly higher MET than the limit, the other slightly higher SET)
  - both runs are runs with high instantaneous luminosity
  - higher luminosity $\Rightarrow$ higher mean number of interactions per bunch crossing
  - this may explain why those two runs were rejected
- the official Jet/MET good run list used + rejection of runs with the low track multiplicity
- $\mathcal{L} = 48.2\,\mathrm{pb}^{-1}$ out of $58.9\,\mathrm{pb}^{-1}$ in good runs

Jet trigger turn-on points



- Error function fit (solid line)

  $a_3 + a_2 \mathrm{Erf}\,(a_0 M_{JJ} - a_1)$

- 95% and 99% turn-on points from fit with fixed

  $$a_3 = a_2 = 0.5$$

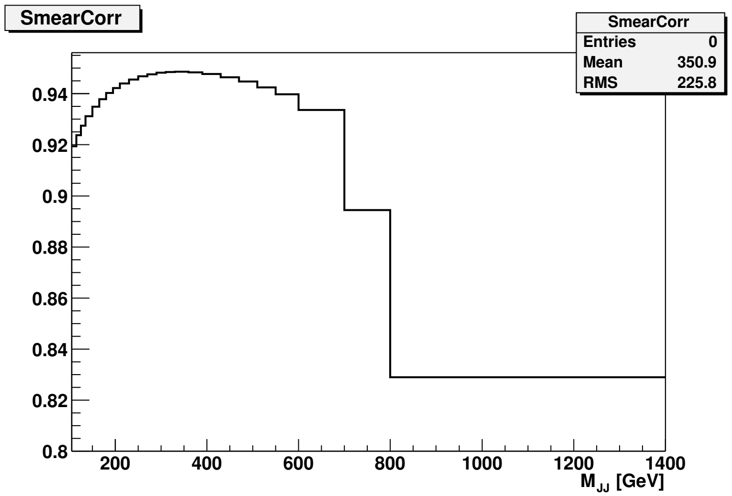
  (dashed line)

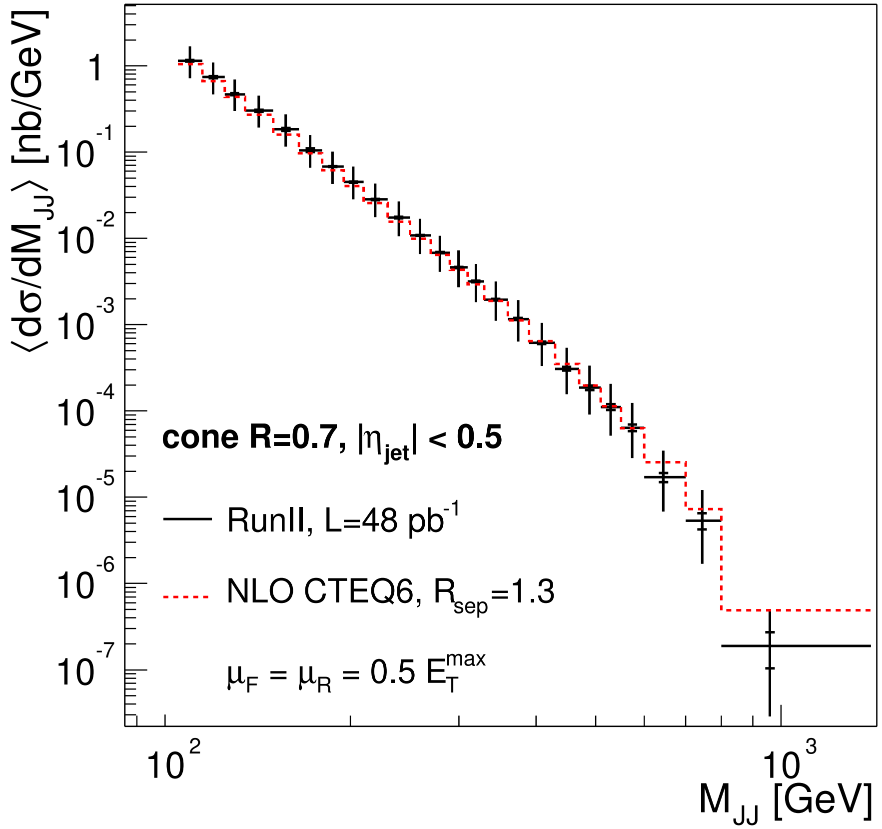
- the fits are not perfect
- What is wrong with trigger JT_45TT ?
  - efficiency ≈ 0.8 for

    $$210 < M_{JJ} < 260$$

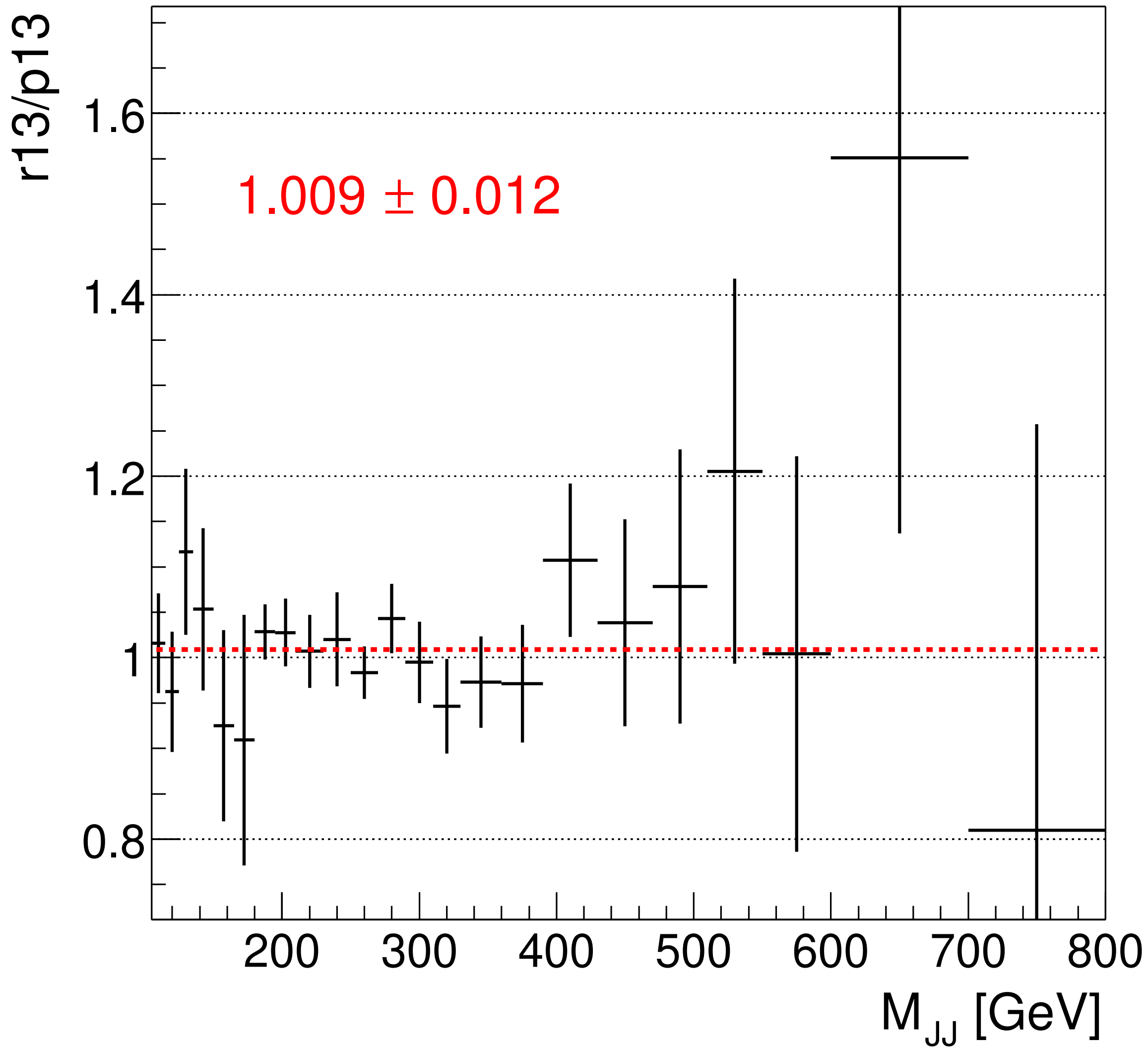
Inclusive dijet mass cross section

- 99% trigger turn-on points + one low mass bin more
  - spectrum starts at $105\,\mathrm{GeV}$
- smaller bin sizes in the high statistics region
  - "bin size $\approx$ mass resolution" rule
- unsmearing is under control in the low mass region
- new theory
  - E-scheme recombination
  - $\phi \times y$ space cone (?)
  - $|y_{jet}| < 0.5$ (not in the data)



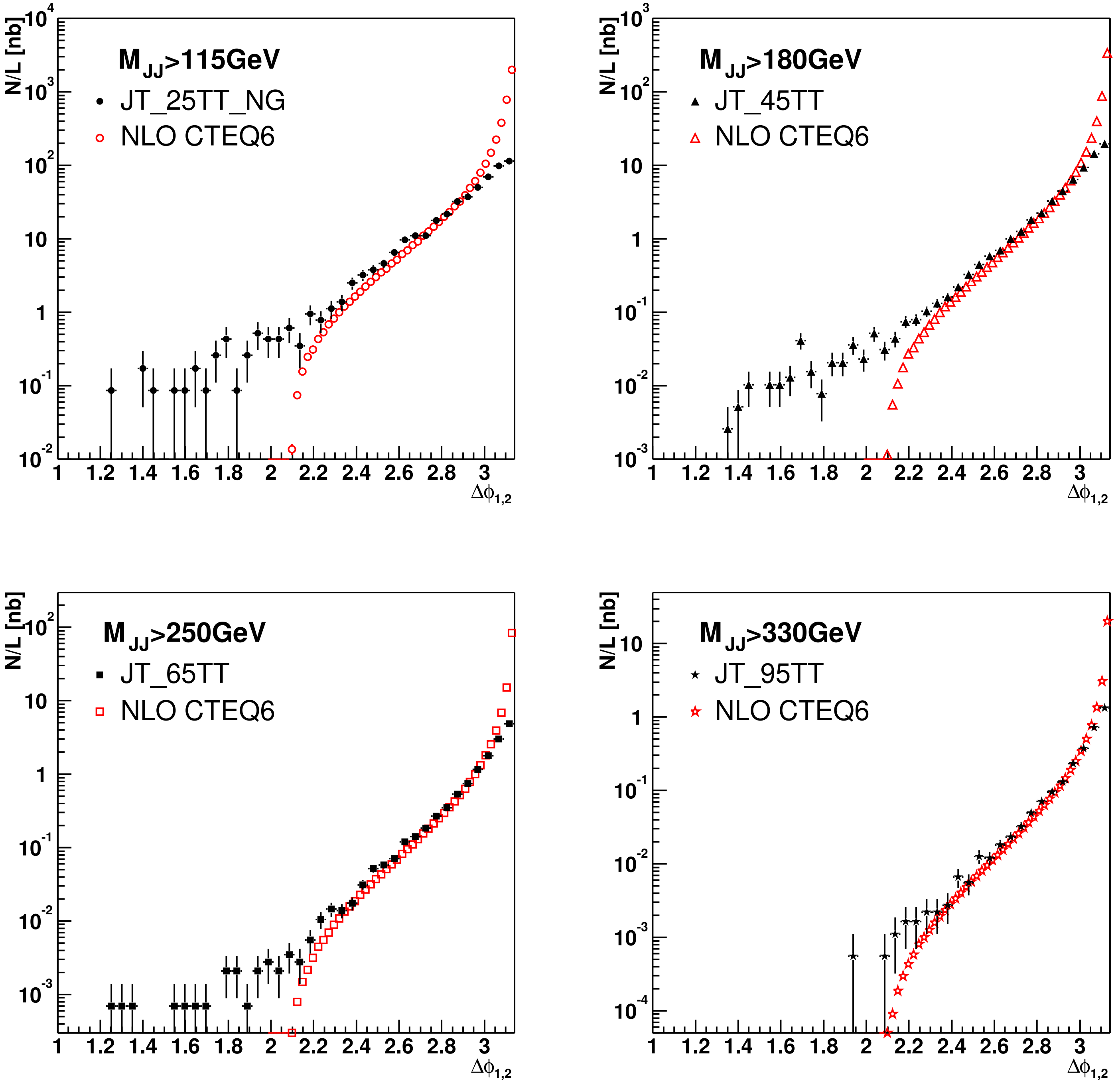


r13 versus p13

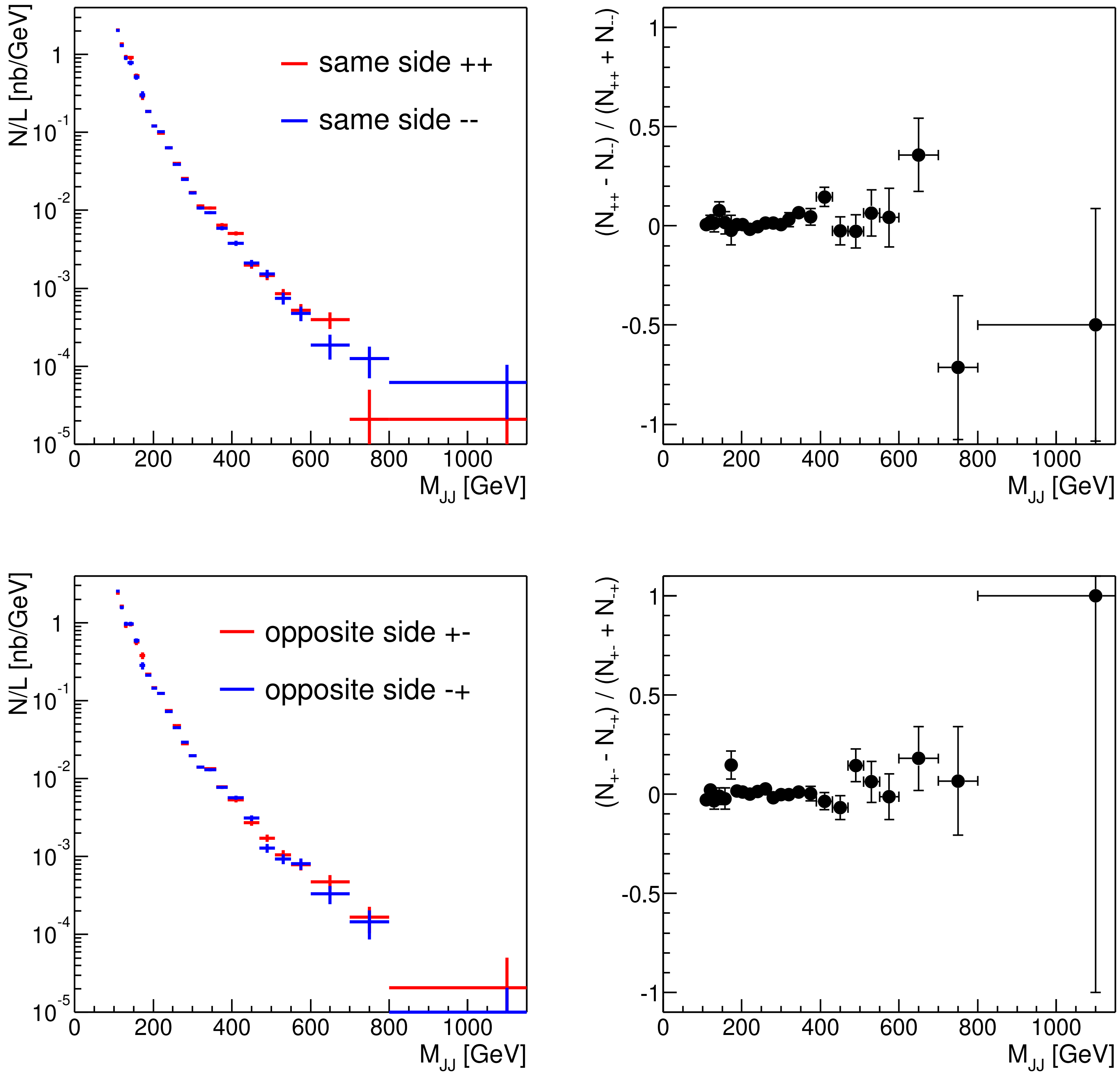


- inclusive dijet mass spectra agree quite well

New $\Delta\phi_{1,2}$ plots



Calorimeter N/S asymmetry, η cut



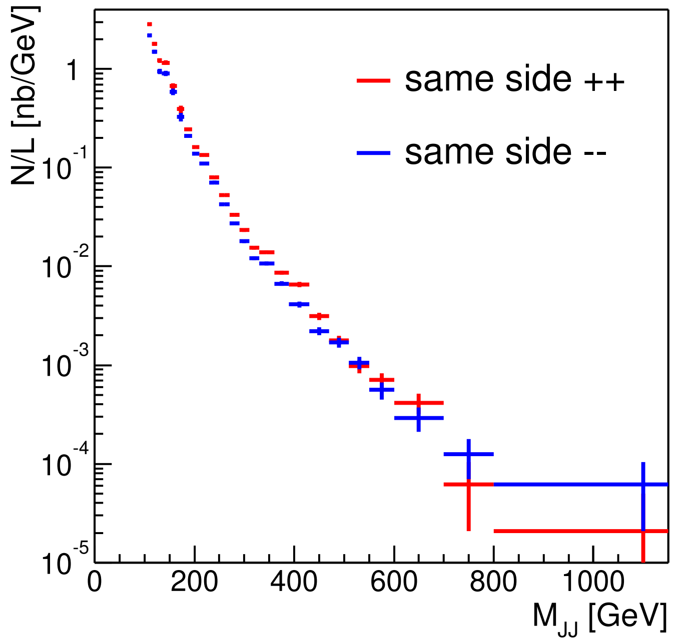
- ratios of central dijet mass sectra ($|\eta| < 0.5$)

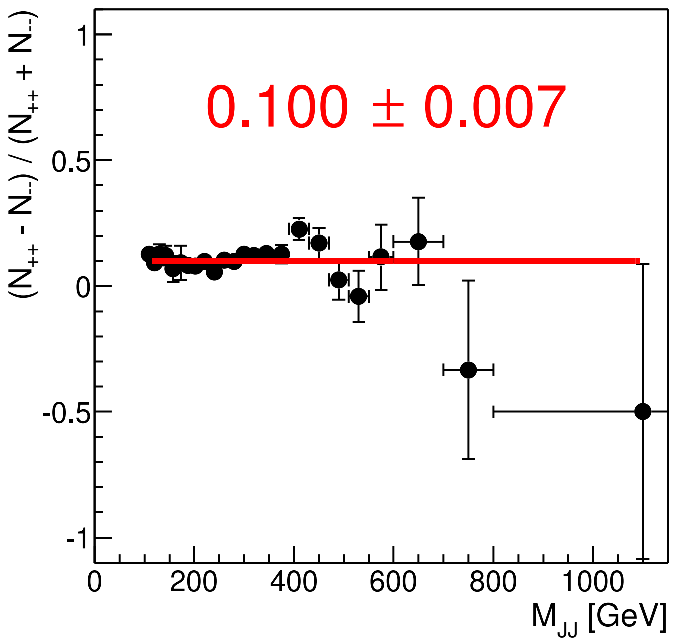
$+$ for $\eta_{jet} \geq 0$

$-$ for $\eta_{jet} \leq 0$

no apparent difference

Calorimeter N/S asymmetry, i_η cut



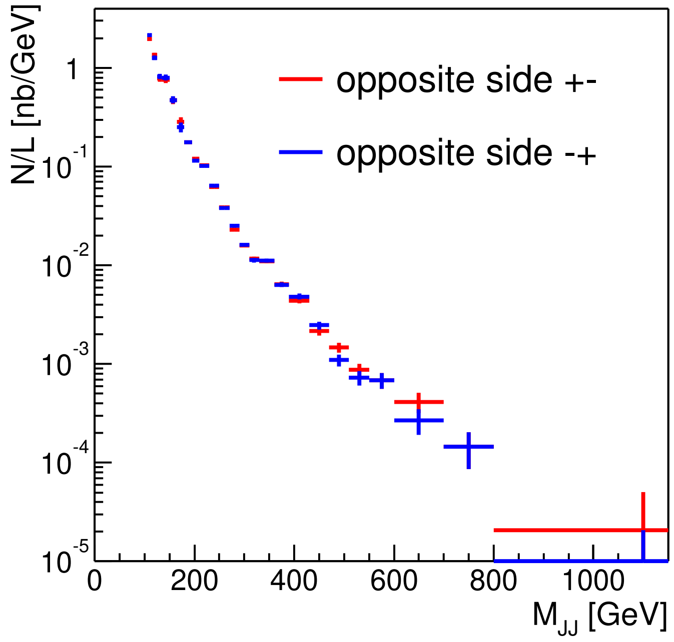


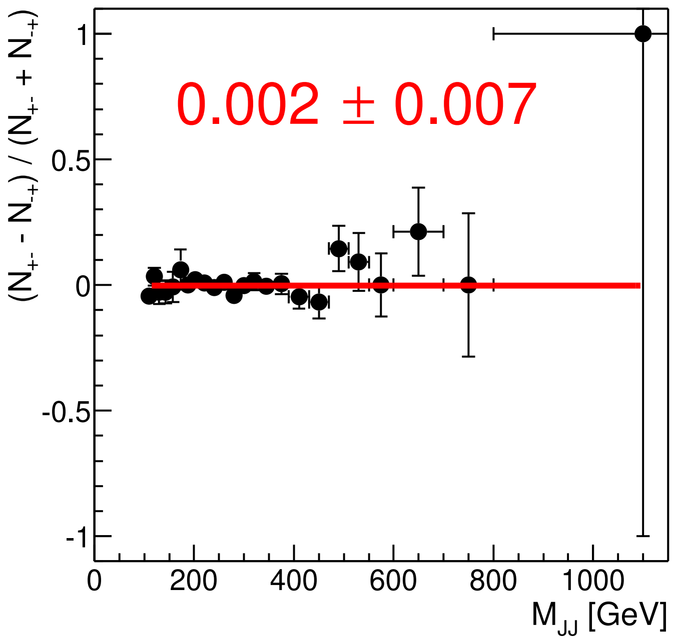
$+$ for $i_\eta \geq 0$

$-$ for $i_\eta \leq 0$

10% asymmetry in the same side case

but





no difference in the opposite side case

Why?

Calorimeter shift (?)

- no shift on primary vertex position (JT_45TT central dijets)
  - $z_{vtx} = -0.5 \pm 0.2\,\text{cm}$, $\sigma_z = 30.0\,\text{cm}$ (all)
  - $z_{vtx} = -0.3 \pm 0.2\,\text{cm}$, $\sigma_z = 25.6\,\text{cm}$ (5+ tracks)
- shift in the detector η

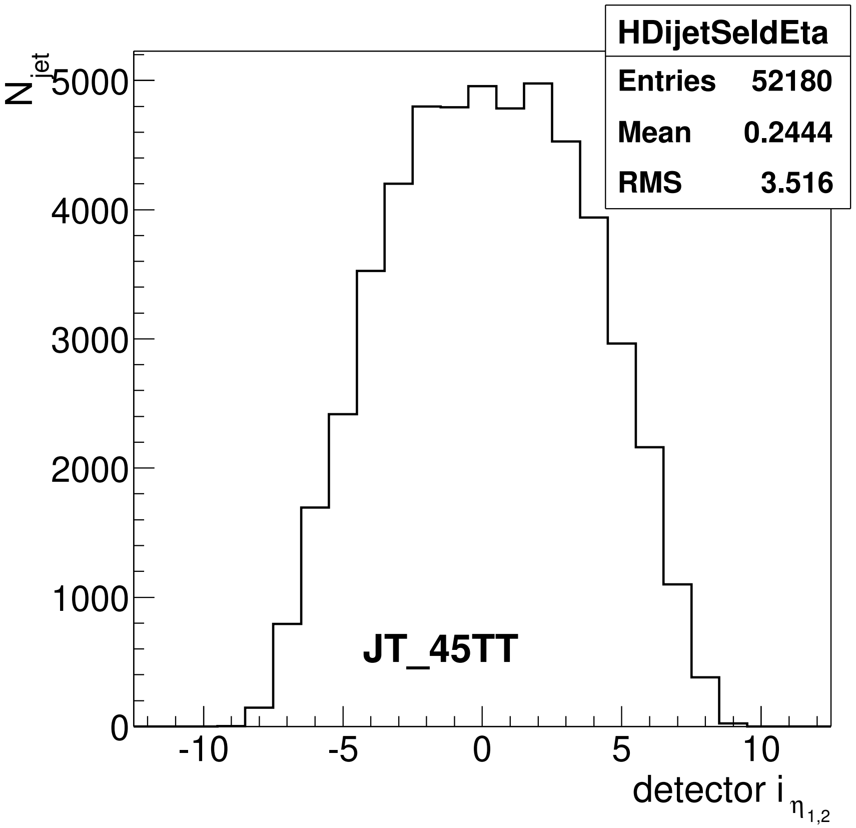
$$\langle \eta_{det} \rangle = 0.025 \pm 0.003 \quad \text{JT25}$$
$$\langle \eta_{det} \rangle = 0.024 \pm 0.002 \quad \text{JT45}$$
$$\langle \eta_{det} \rangle = 0.029 \pm 0.002 \quad \text{JT65}$$
$$\langle \eta_{det} \rangle = 0.033 \pm 0.003 \quad \text{JT95}$$

$$\langle \eta_{det} \rangle = 0.027$$

- average jet distance to the beam $R = 91.6\,\text{cm}$ (Run I value)

$$|\Delta z| \approx R \langle \eta_{det} \rangle = 2.5\,\text{cm}$$

shift of the calorimeter towards negative η (north?)



Calorimeter shift consequences

- dijet mass asymmetry
  - η_{jet} spectrum is falling $\Rightarrow$ more jets with positive η_{det}

$$A \approx \frac{N_+^2 - N_-^2}{N_+^2 + N_-^2} = 0.12$$

- jet η bias

$$\eta_{true} = \eta_{reco} - \langle \eta_{det} \rangle$$

  - affects dijet mass

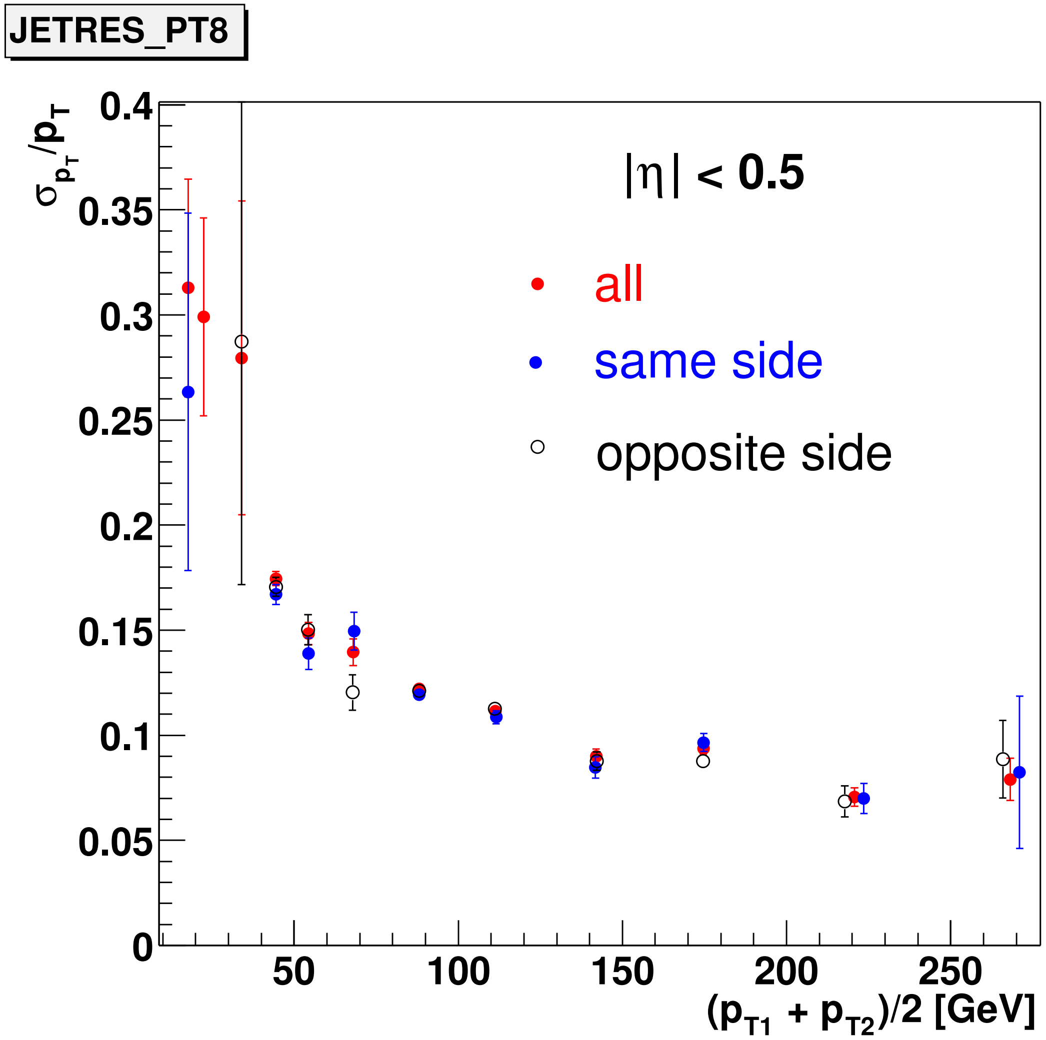
$$M_{JJ}^{true} > M_{JJ}^{reco}\,, \quad \text{for } \eta_{jet} > 0$$

  - affects jet p_T

$$p_T^{true} > p_T^{reco}\,, \quad \text{for } \eta_{jet} > 0$$

  - goes opposite in the dijet mass cross section asymmetry
  - makes jet p_T resolution worse
  - about 1.2% at $\eta = 0.5$ and 2.6% at $\eta = 2$
  - effect on the assymetry $A \approx -0.03$
  - effect on the central jet resolution $\approx \sqrt{2}\,(1/2)\,(1/2)\,1.2\% = 0.4\%$

same/opposite side jet p_T resolution



- raw resolution (no soft and particle jet imbalance corrections)
- looks like there is no apparent difference

Calorimeter E/W asymmetry, i_η cut

- E/W dijet mass calorimeter asymmetry
  - the two jets are from the opposite calorimeter sides (in detector i_η)

a) $(++/--)$

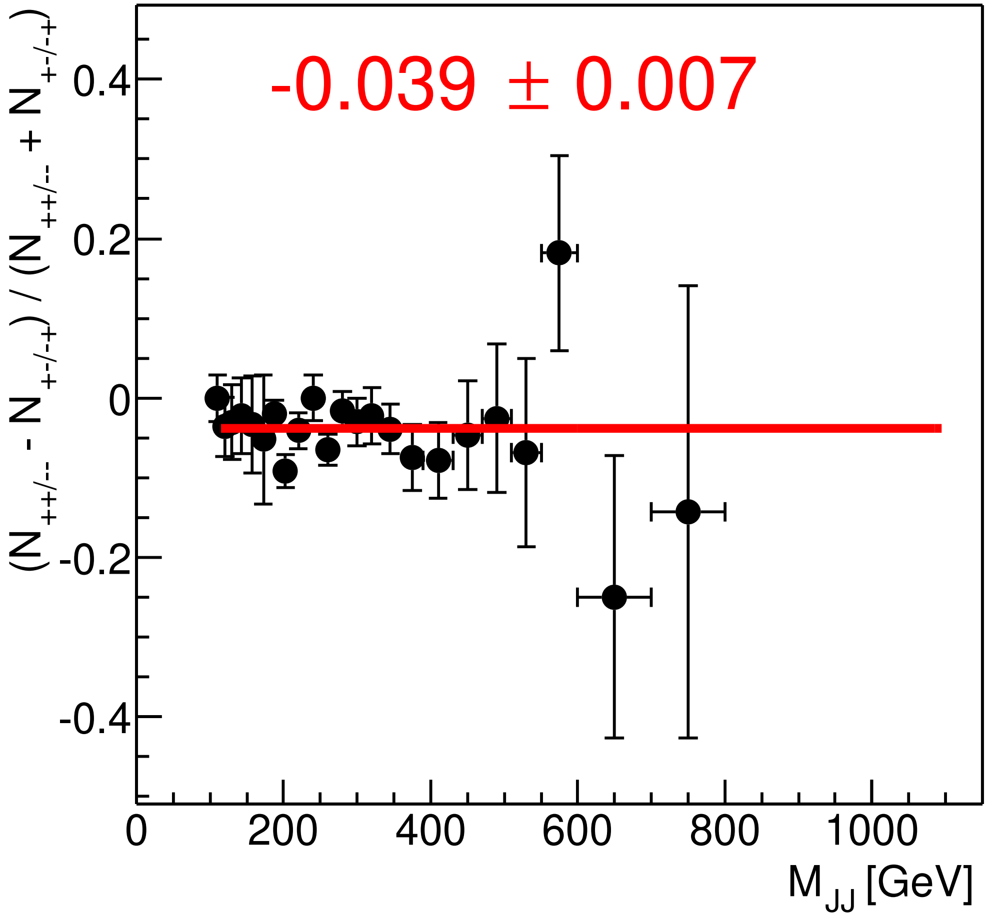
$p_x \geq 0$ for jet with $i_\eta \geq 0$

$p_x \leq 0$ for jet with $i_\eta \leq 0$

b) $(+-/-+)$

$p_x \leq 0$ for jet with $i_\eta \geq 0$

$p_x \geq 0$ for jet with $i_\eta \leq 0$



- Why 4% asymmetry?
  - not isotropic response of the calorimeter (JES as a function of ϕ)
  - calorimeter misalignment in the transverse plain (probably not the case, dijet mass cross section is not sensitive to this shift)