

Hadronic calorimeter calibration at the eta-ring level (1)

- Assume: p_T is balanced for dijet events and EM layers are calibrated
- Use p14 TMBfix2 files: QCD MC and QCD-skim data
- Re-reconstruct jets using 3 cone sizes: $R = 0.5, 0.7$ and 1.0
- No JES corrections
- Multiply p_T of cells belonging to the same **hadronic ieta-ring** ($i_{\text{layer}} > 7$)
by $\beta_{i\eta}$ calibration factor
- Calculate p_T -imbalance fraction using all cells associated with 2 jets:

$$(\text{missing cell } p_T \text{ fraction})^2 = \frac{\left(\sum_i^N p_{x,i} \right)^2 + \left(\sum_i^N p_{y,i} \right)^2}{\sum_i^N \left(p_{x,i}^2 + p_{y,i}^2 \right)}$$

- Sum p_T -imbalance fractions over the whole data set
- Find the best set of **64 $\beta_{i\eta}$** calibration factors using MINUIT
($1 \leq |i\eta| \leq 32$)

Hadronic calorimeter calibration at the eta-ring level (2)

- Available p14 QCD inclusive Monte Carlo samples (~900k events)
 - 5-10 GeV (200k) 10-20 GeV (200k) 20-40 GeV (100k)
 - 40-80 GeV (100k) 80-160 GeV (100k) 160-320 GeV (100k)
 - 320-980 GeV (100k)

[Request IDs = 15403-15409, 15487, 15488]
- Available p14 QCD-skim data (~56M, but only 10M processed for now)
 - p14.06.00 + p14.06.01 (35.6M)
 - p14.05.00 + p14.05.02 (9.4M)
 - p14.03.00 + p14.03.01 + p14.03.02 (10.8M)

Hadronic calorimeter calibration at the eta-ring level (3)

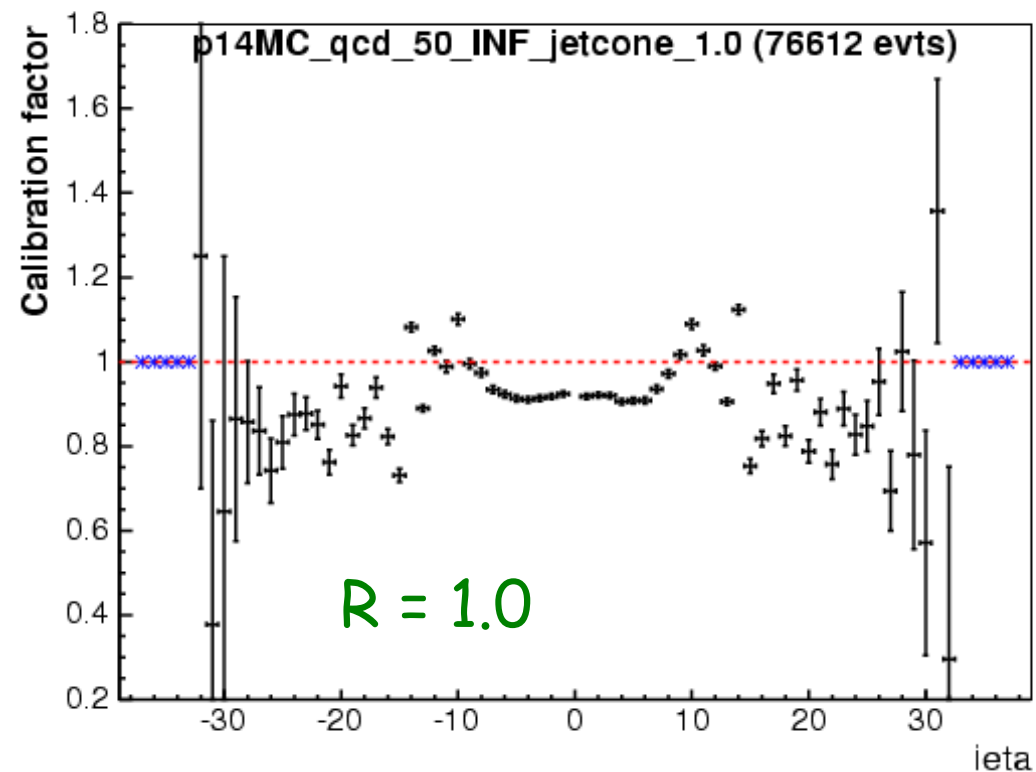
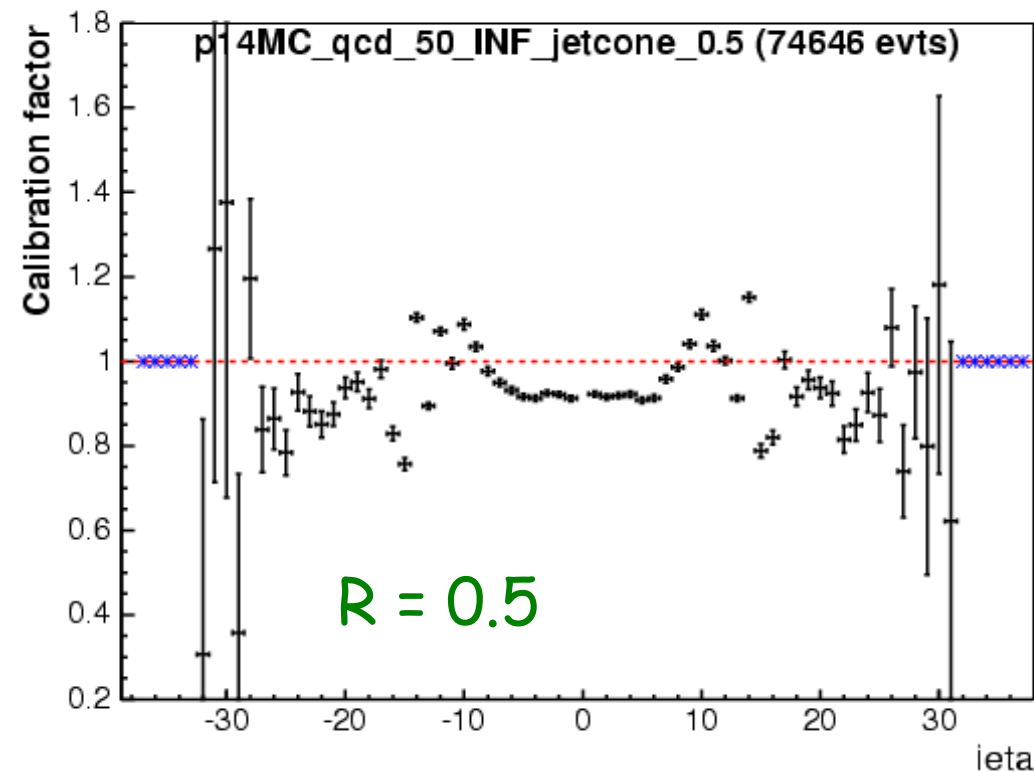
- Divide samples into several leading jet p_T bins to check whether $\beta_{i\eta}$ factors are really constant...
- Require JT_XXTT trigger fired for the real data

Highest p_T cut [GeV]	Trigger (only for data)	# of events after the cuts (R=0.7)	
		MC	DATA
$8 < p_T < 50$	JT_8TT	148k	245k
$50 < p_T < 100$	JT_25TT_NG	26k	33k
$100 < p_T < 200$	JT_45TT	24k	16k
$p_T > 50$	JT_25TT	23k	18k
$p_T > 200$	JT_95TT_NG	74k	35k
		Out of 900k	Out of 10M

- Repeat minimization for all 3 jet cone sizes

Hadronic calorimeter calibration at the eta-ring level (4)

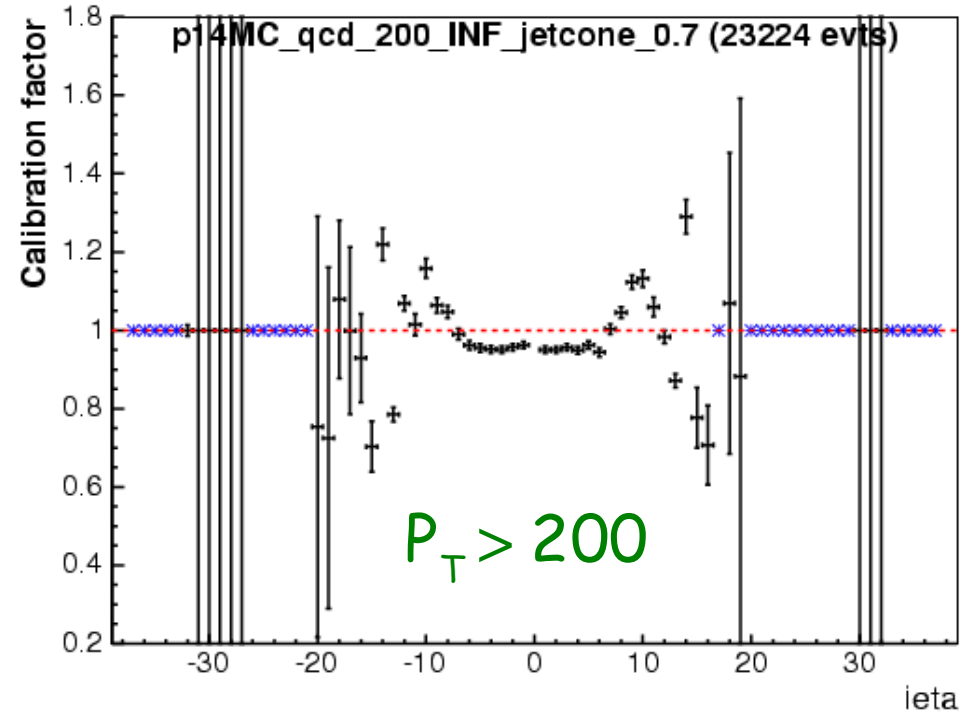
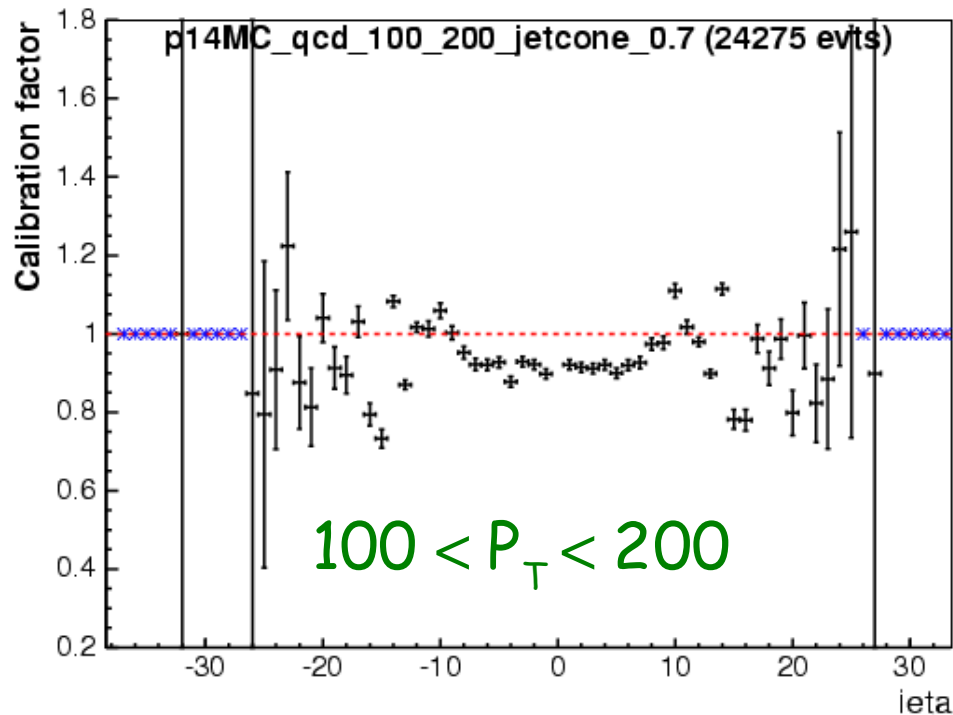
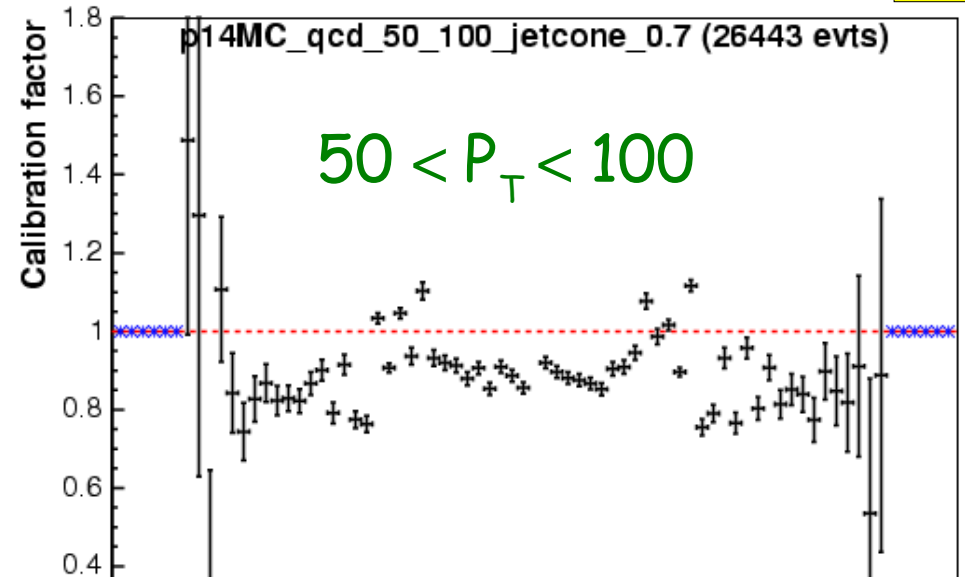
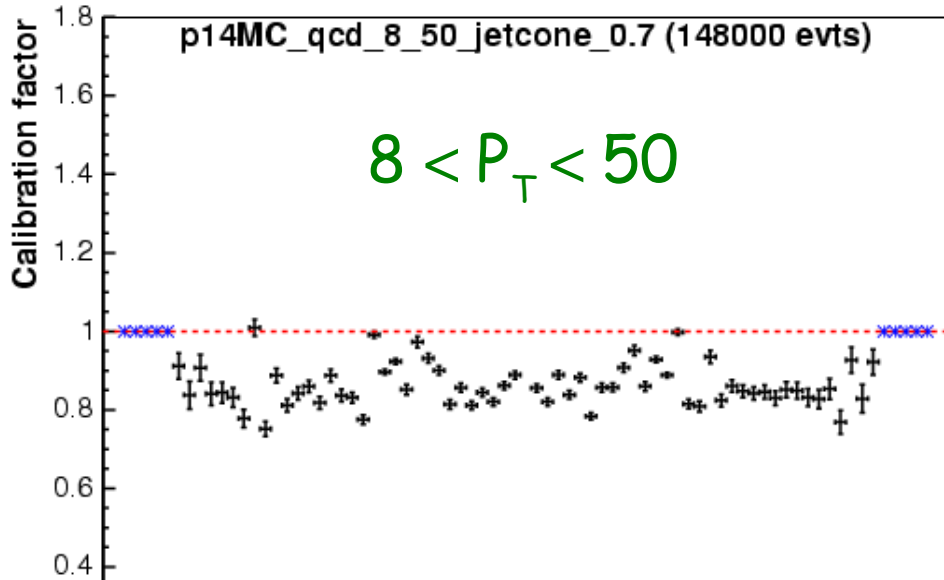
- No significant dependence of the β calibration factors on the jet cone size R



$P_T > 50$ GeV, MC sample

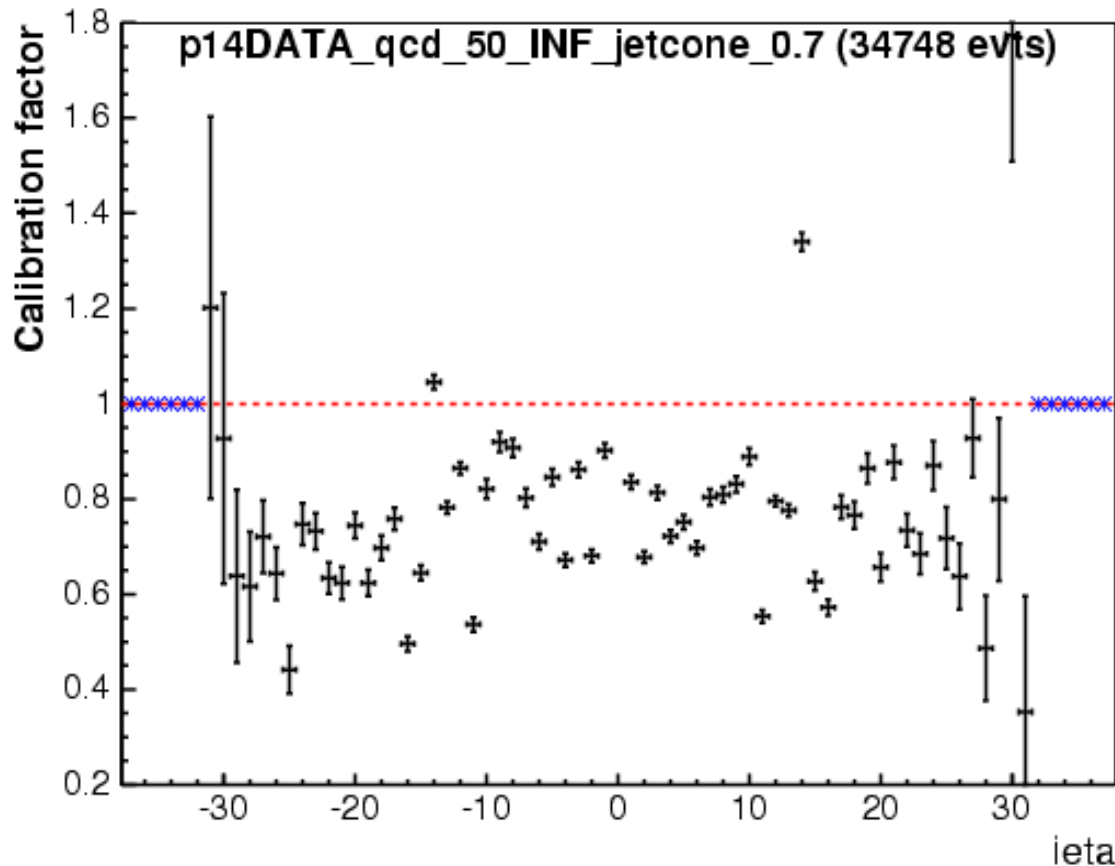
- Calibration factors seem to be pulled up at higher pT (MC, R=0.7)

(5)



Hadronic calorimeter calibration at the eta-ring level (6)

- P14 QCD-skim data: 10M events out of 56M processed so far...



$P_T > 50 \text{ GeV}$

JT_25TT_NG

$R = 0.7$

(mean $p_T = 65$, rms $p_T = 27$)

Hadronic calorimeter calibration at the eta-ring level (7)

- What's next ?
 1. Look closer at high- η regions (cuts on η and jet quality?)
 2. Use calibration constants for EM part (available!).
 3. Use inter- ϕ calibration constants for hadronic part (soon!).
 4. Look at gamma+jets data and MC, as well.
 5. Switch to p17 data and MC once they became available.