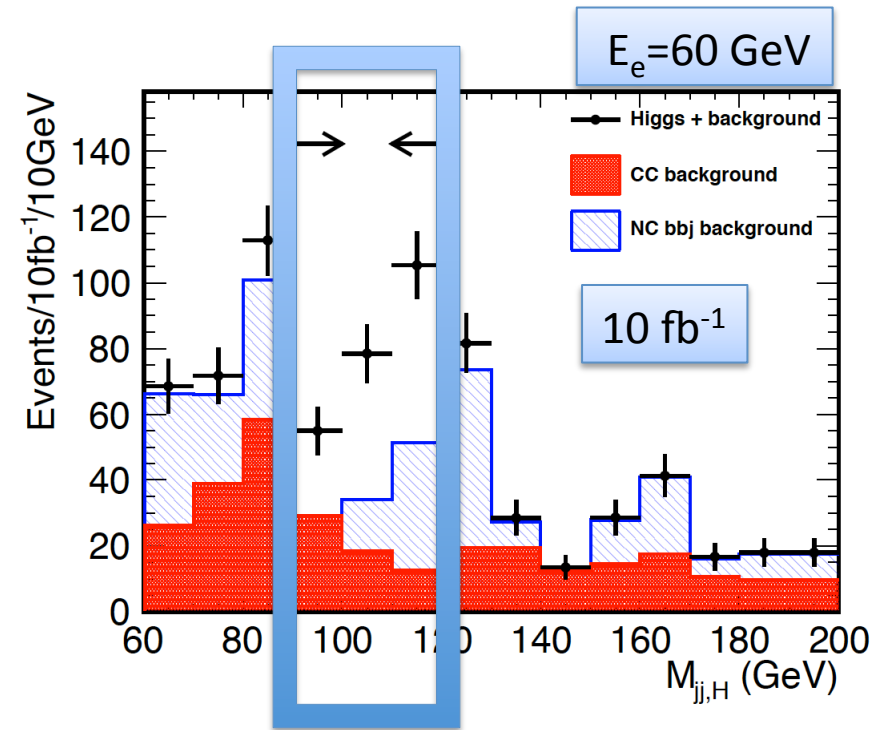


Hbb studies

Uta Klein



LheC Higgs Meeting, April 22, 2014



	$E_e = 150$ GeV (10 fb ⁻¹)	$E_e = 60$ GeV (100 fb ⁻¹)
$H \rightarrow b\bar{b}$ signal	84.6	248 439
S/N	1.79*	1.05 0.89
S/√N	12.3	16.1

*Note: A parton-level study delivered S/N of 4.7.

- NC background : electron rejection only for $\eta_{\text{electron}} < 3$; and generation for $\eta < 5$
- follow here mainly the CDR analysis strategy (see also M Tanaka talks)
- NEW : my (blue) numbers but for bbj only and $M_H=125$ GeV



Samples : using $kt=0.9$ & 100 fb^{-1}

**NOTE : This MG5 2.1.0 version had a bug in the invariant mass cuts!
background cross sections too high. The E_{miss} cut was also NOT applied!**

Also the Hbb signal cross section is too high \rightarrow needs to rescaled to $BR=0.577$

- Issue since long : how to generate very low Q^2 samples == PHP?
 - \rightarrow “brute force” :to generate a “pseudo-PHP sample” : use MG5 and generate very low Q^2 events with electron-eta in the range of 5 to 10, and a high bb mass
 - \rightarrow generate ONLY bbj in final state
 - \rightarrow gives us some distributions, but uncertain normalisation!
 - 527 k events (**34.8 pb**, renormalise each event with 6.6)
- 90-130 GeV MH Events with 2 b-jets 72 event : normed 474.255
- \rightarrow CC background : use only bb produced samples currently
 - 160 k events (**266 fb**, renormalise each event with 0.166)
- 90-130 GeV MH Events with 2 b-jets 111 events : normed 18.4221
- \rightarrow Signal Hbb : 109 k events (**90.52 fb**, renormalise with 0.083)
- 90-130 GeV MH Events with 2 b-jets 5291 events : normed 438.917

cone : 374.995₃

generate p e- > b b~ e- j / h

12 = ptj ! minimum pt for the jets

15 = ptb ! minimum pt for the b

0 = pta ! minimum pt for the photons

0.01 = ptl ! minimum pt for the charged leptons

5.5 = etaj ! max rap for the jets

4. = etab ! max rap for the b

10 = etaa ! max rap for the photons

10 = etal ! max rap for the charged leptons

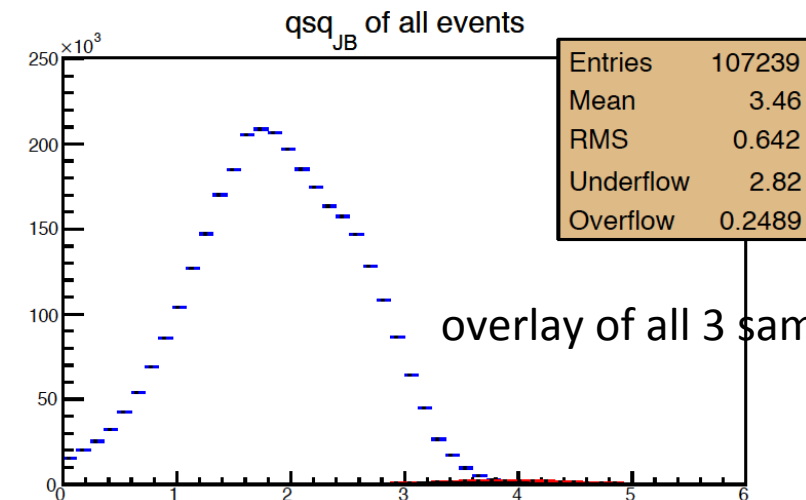
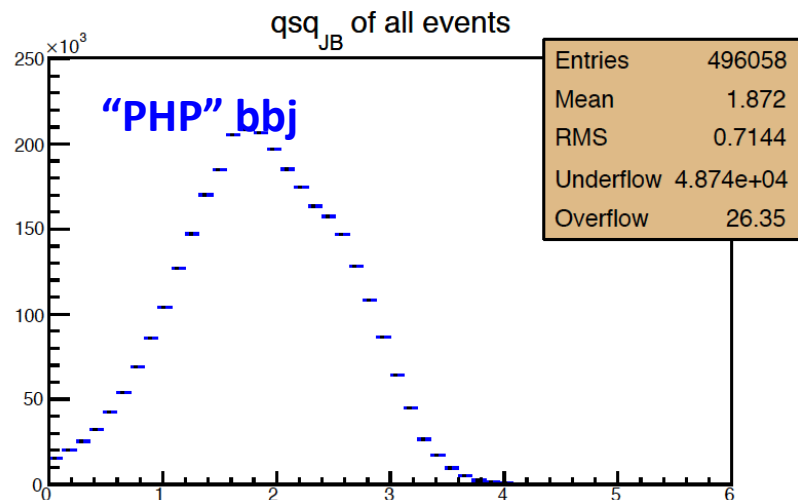
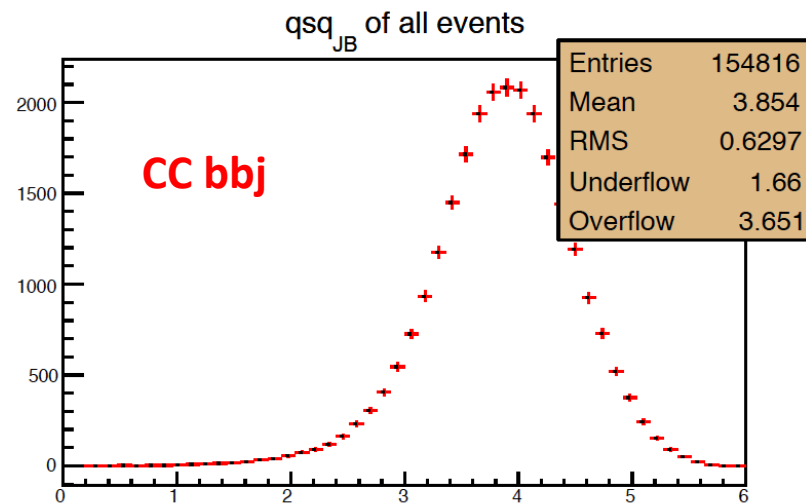
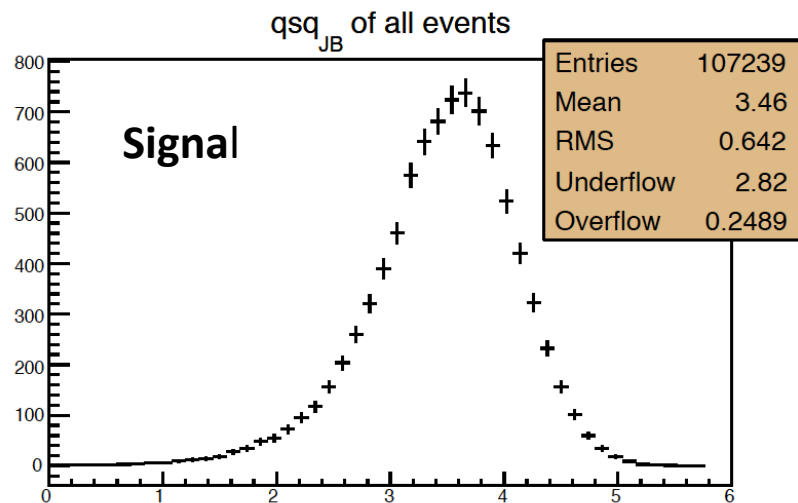
0.6 = etaonium ! max rap for the quarkonium states

0 = etajmin ! min rap for the jets

0 = etabmin ! min rap for the b

0 = etaamin ! min rap for the photons

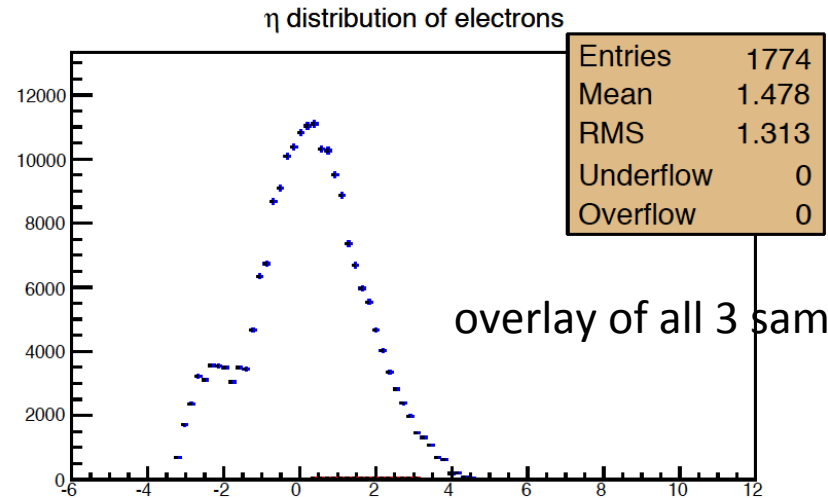
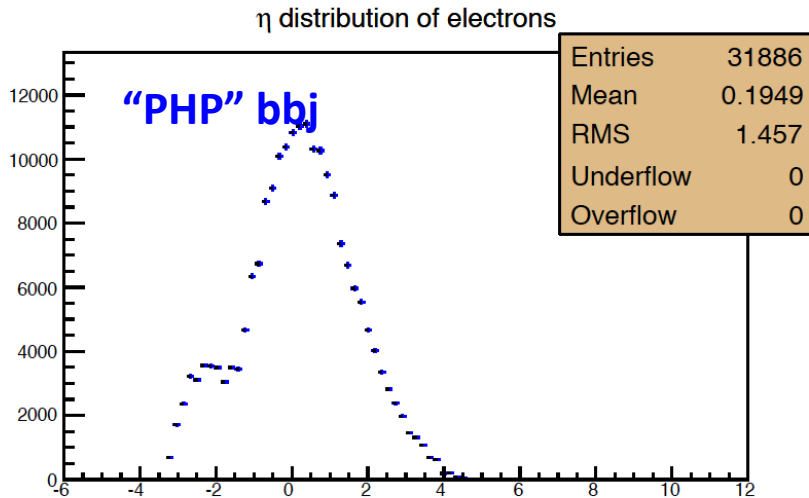
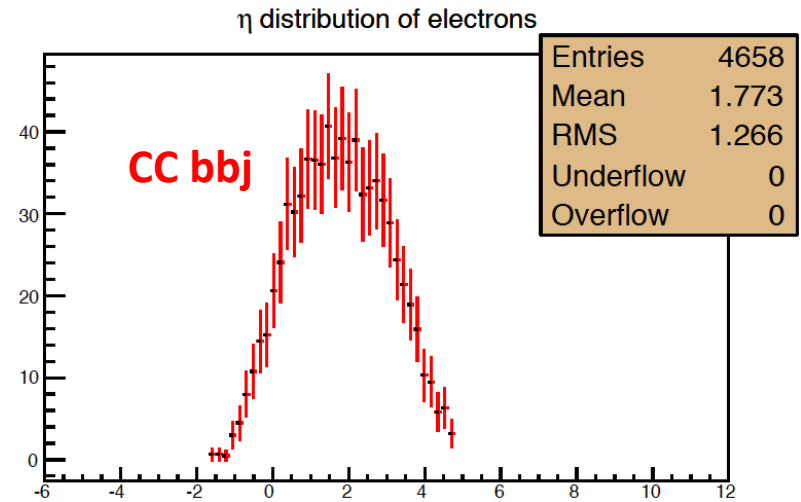
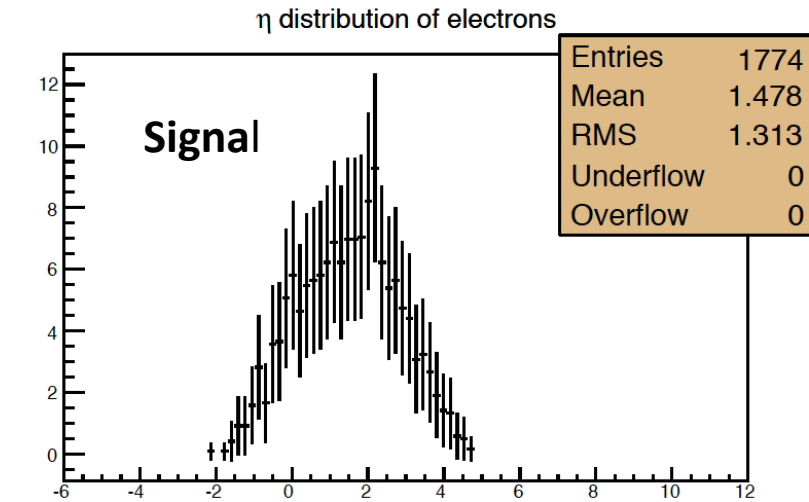
4.0 = etalmin ! main rap for the charged leptons

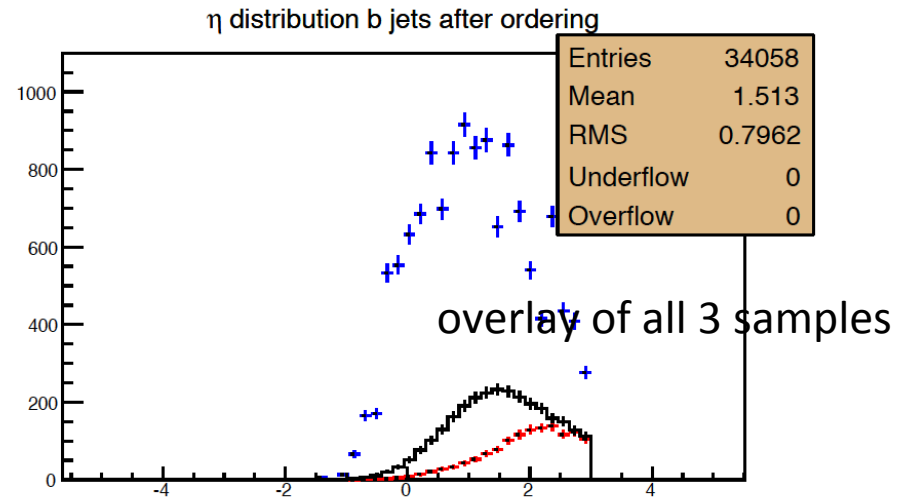
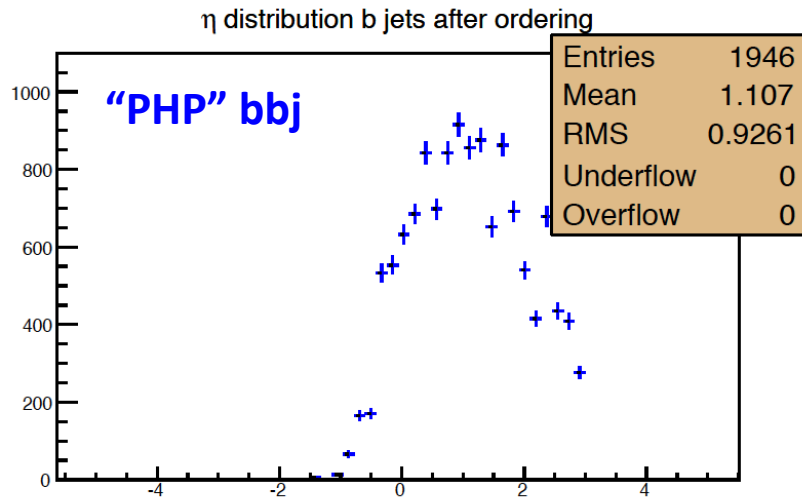
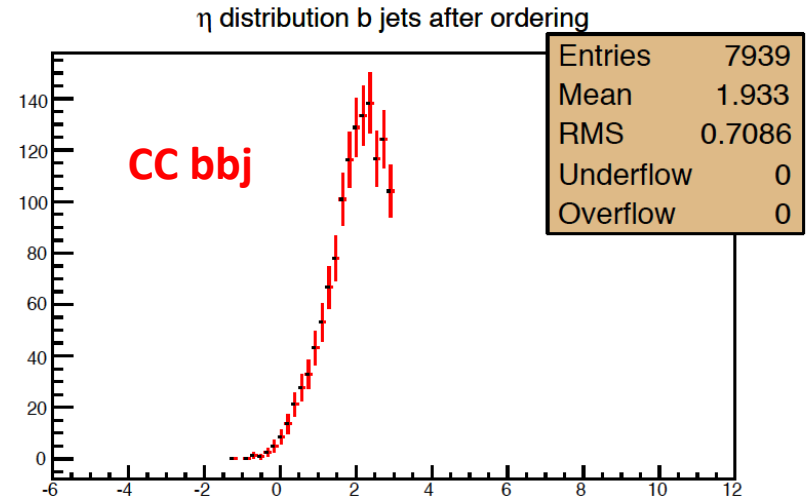
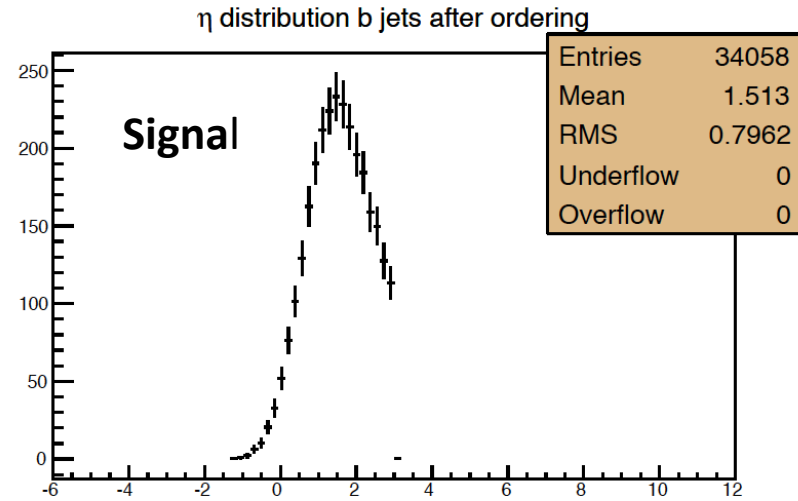


overlay of all 3 samples

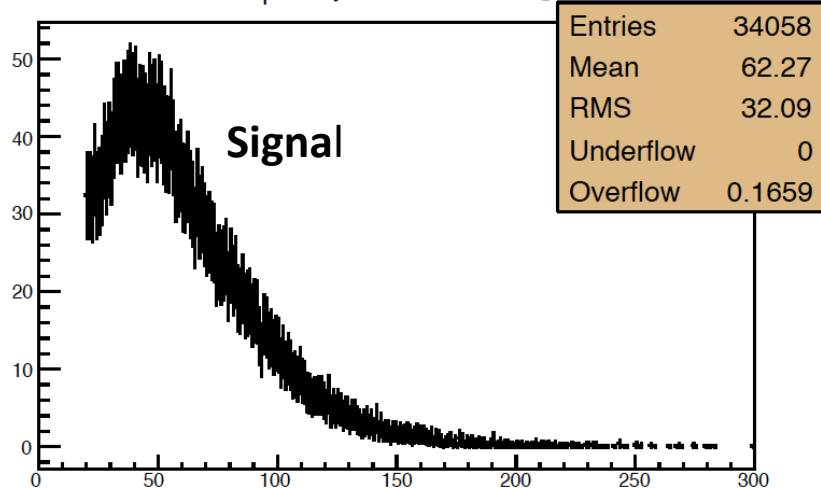
“PHP” lower Q2 but significant tails to high Q2

Extended electron rejection

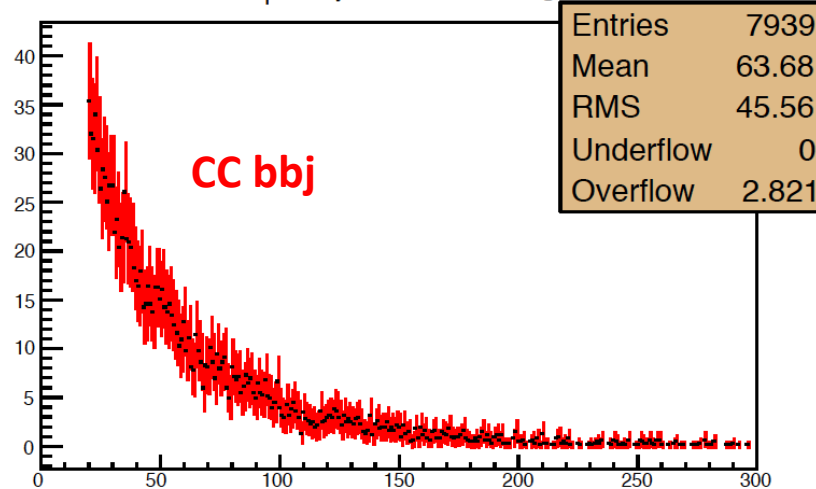




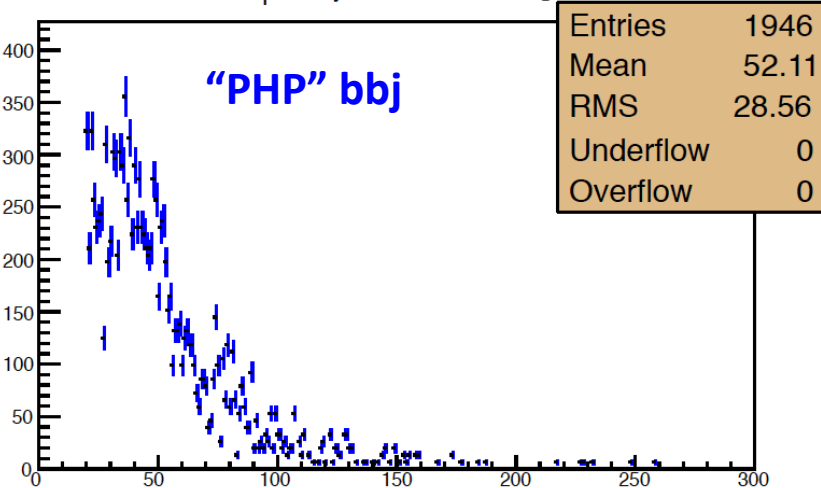
P_T of b jets after ordering



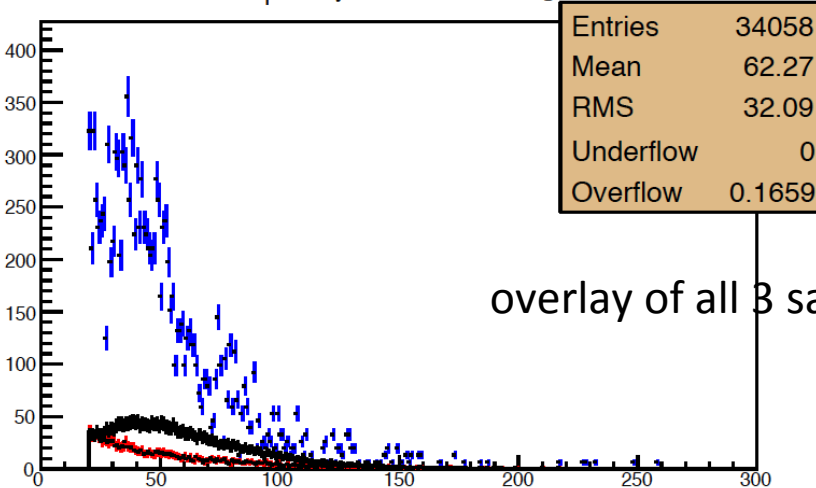
P_T of b jets after ordering



P_T of b jets after ordering

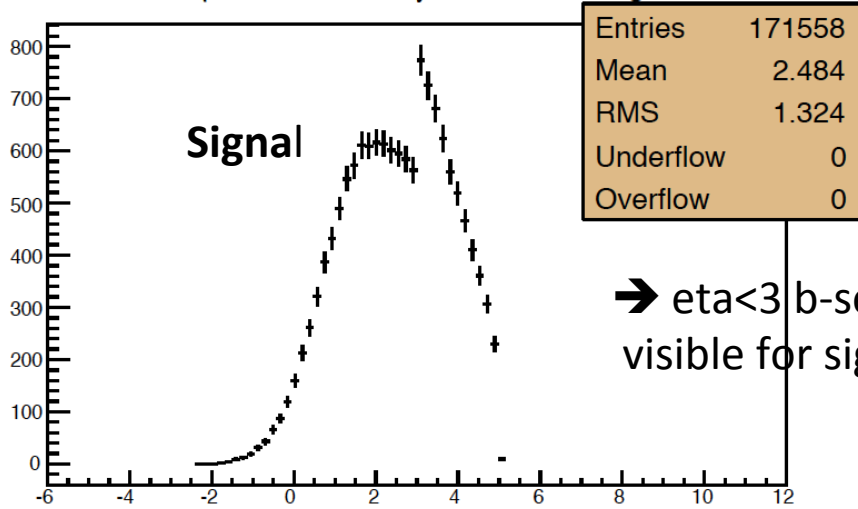


P_T of b jets after ordering

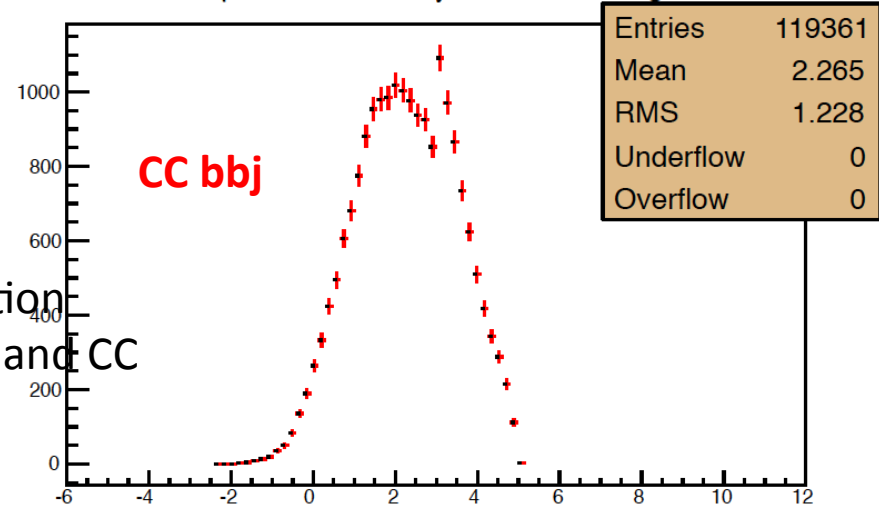


eta: Non-b tagged jets

η distribution fwd jets after ordering

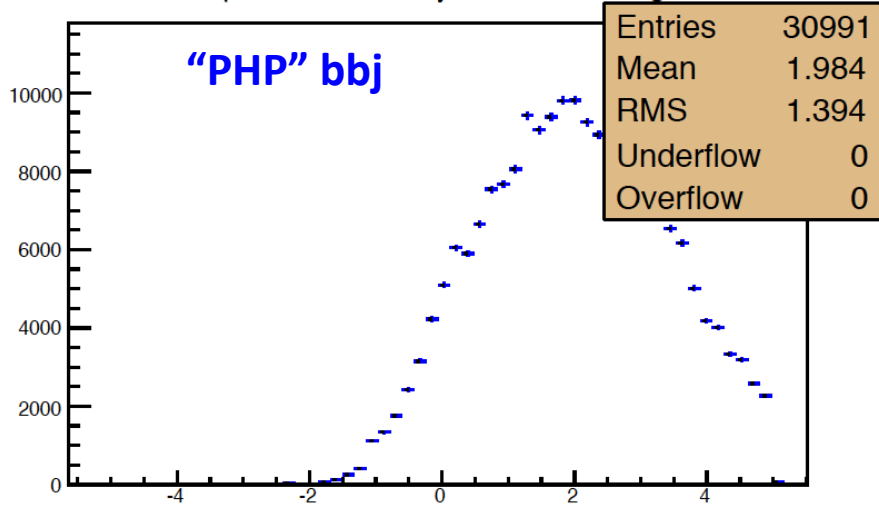


η distribution fwd jets after ordering

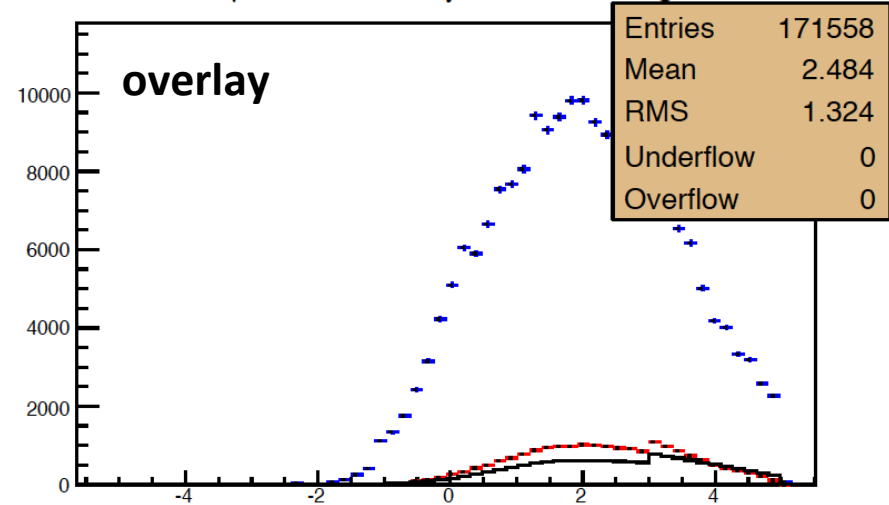


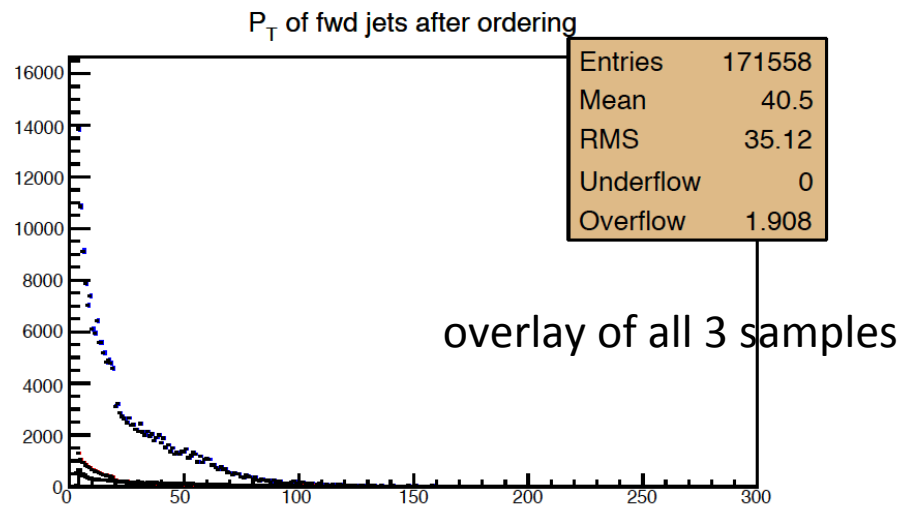
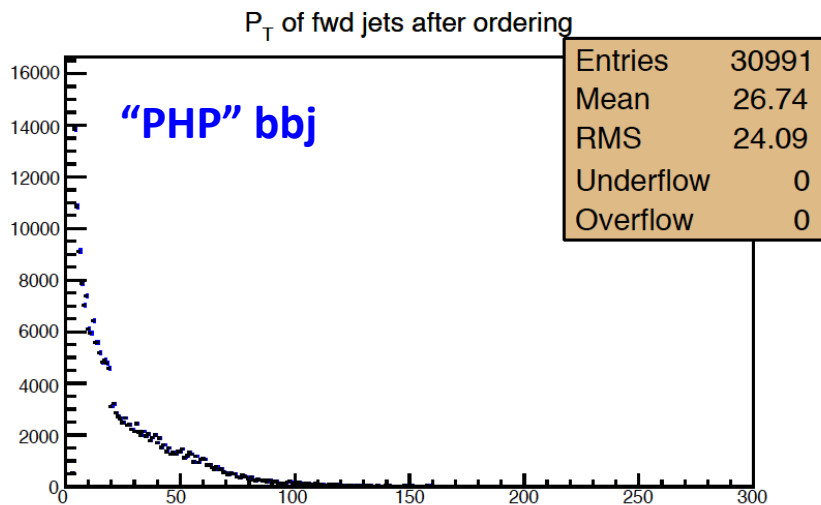
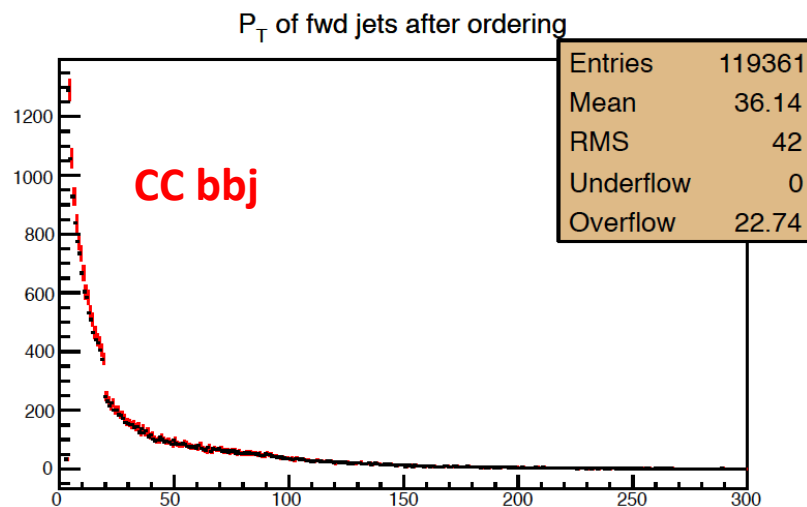
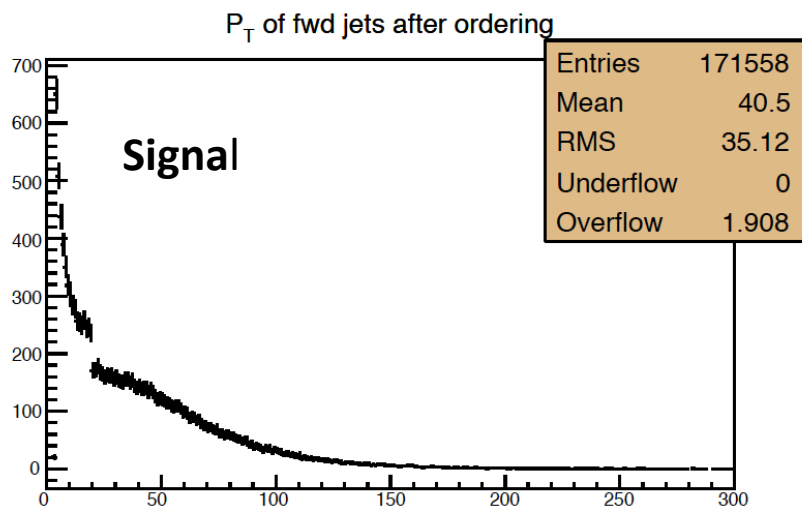
→ eta<3 b-selection
visible for signal and CC

η distribution fwd jets after ordering



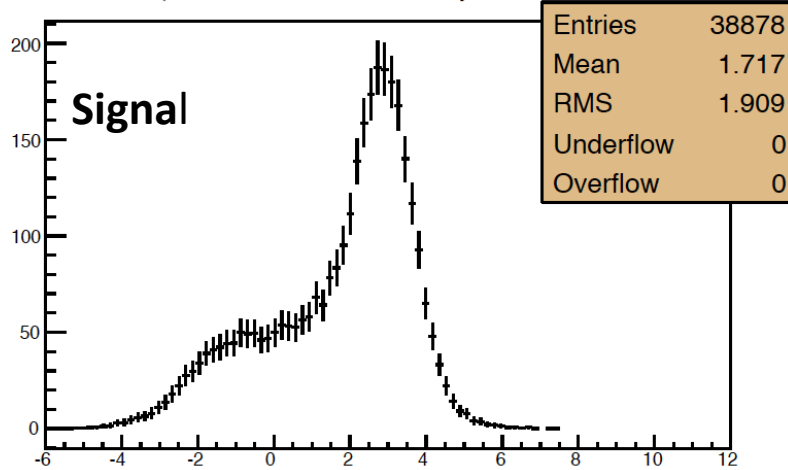
η distribution fwd jets after ordering



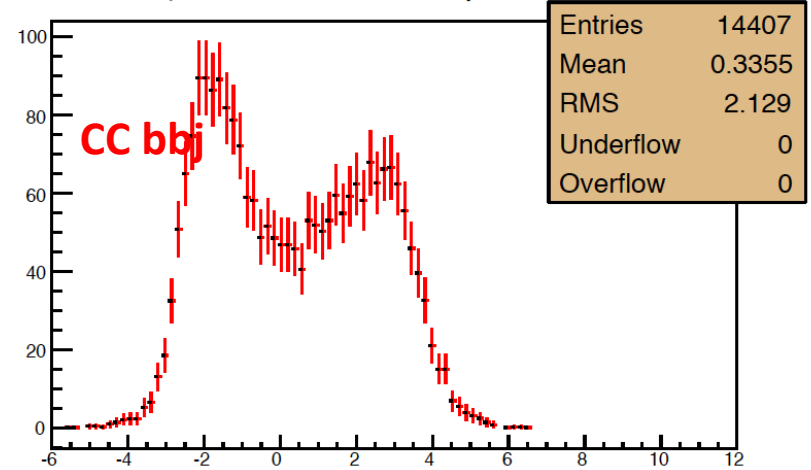


→ p_T>20 GeV for b-selection
visible for all 3 samples

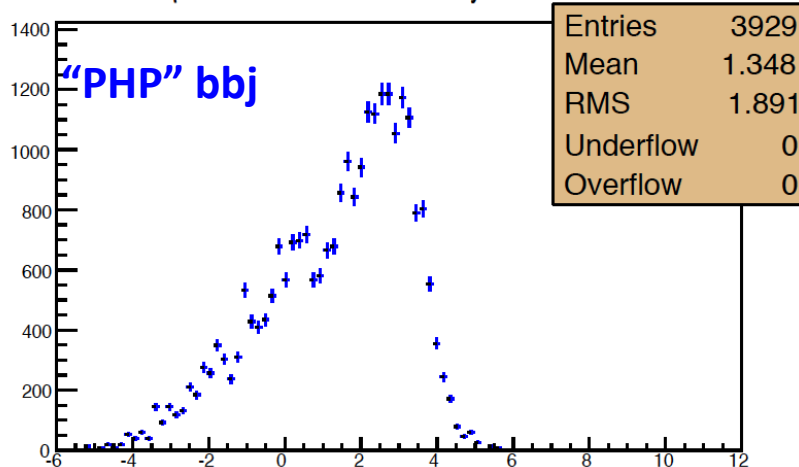
$\Delta\eta$ distribution H and FWD jets before cuts



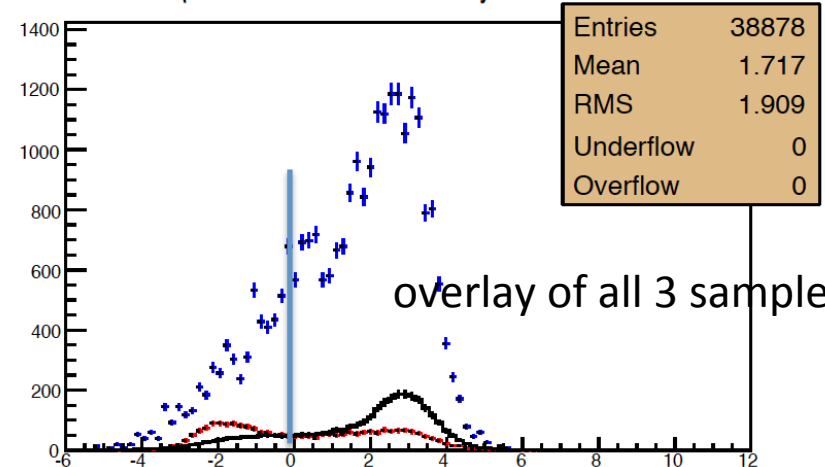
$\Delta\eta$ distribution H and FWD jets before cuts



$\Delta\eta$ distribution H and FWD jets before cuts

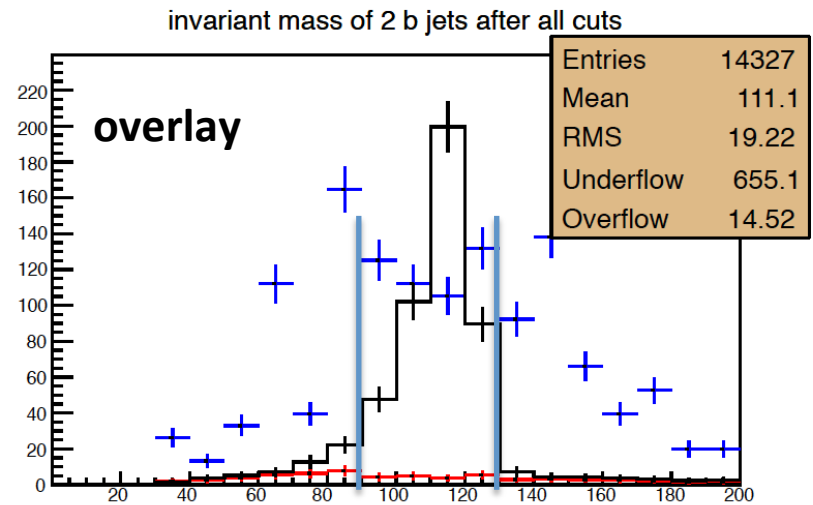
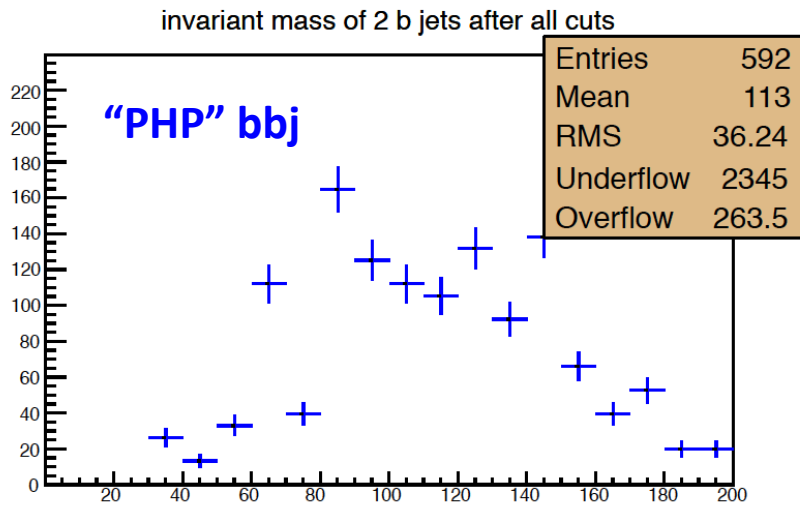
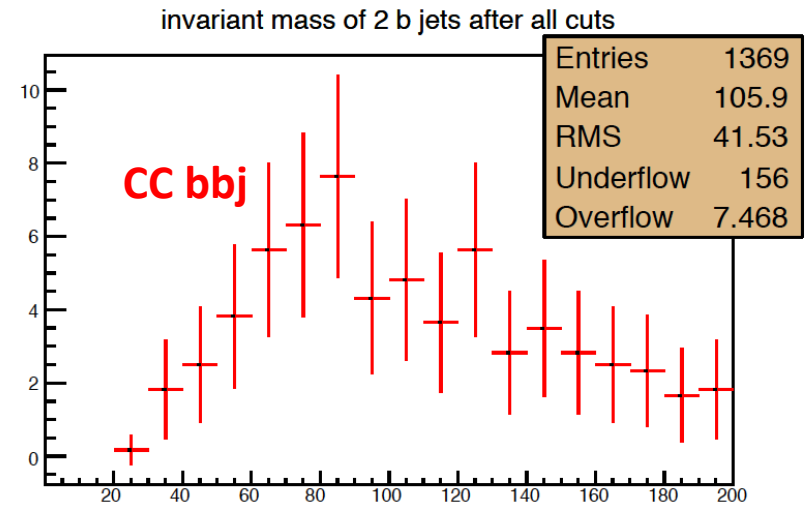
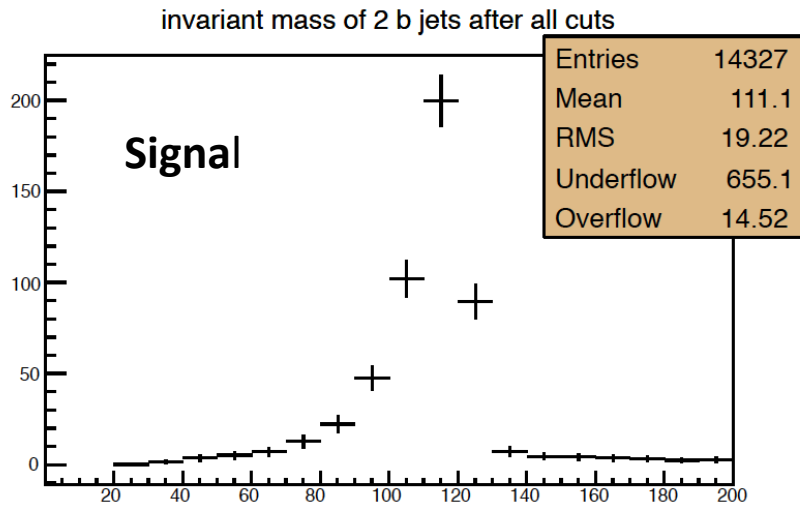


$\Delta\eta$ distribution H and FWD jets before cuts



→ select Delta eta > 0

bb mass after all cuts



→ select 90-130 GeV with $S/N \sim 1$