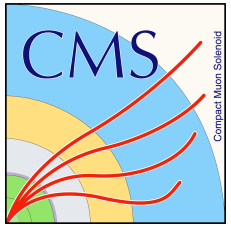
Weekly Report
NTUA
29/11/2019

George Bakas



Status Report

- Analysis:
  - Response matrices
    - Nbins reco ~ 2Nbins parton/particle

  - R_{yield} used as a transfer factor from SR_A to SR defined as: $R_{yield} = \frac{N_{SR}}{N_{SR_A}}$
    - Check if this quantity is stable in all Regions (0, 1, 2 btag) for every year
    - How to measure R_{yield} because our CR is contaminated

  - Unfolding Techniques
    - For equal bins → simple response matrix inversion
    - For unequal bins? → Minimum of global correlation

Signal Extraction

Measured dist from data

Fitted number of QCD events in SR_A

QCD shape taken from Data (CR)

$$S(x_{reco}) = D(x_{reco}) - C_{bkg}^{yield} N_{QCD}^{fit} C_{QCD}^{shape}(x_{reco}) Q(x_{reco}) - B(x_{reco})$$

Fiducial Yield

Transfer factor from SR_A to SR

QCD shape correction factor

Subdominant bkg shape and contribution (MC)

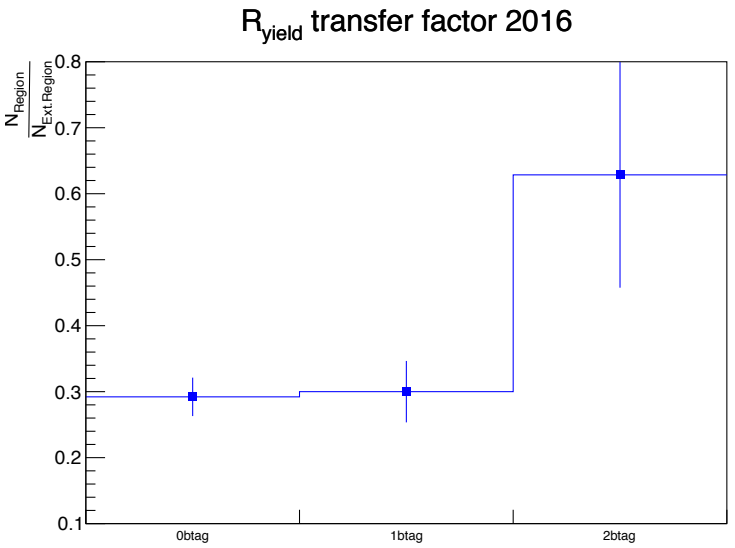
- Where x_{reco} is the respected variable of interest (ttbar mass,pt, rapidity, leading and subleading jetPt and |jetY|)
- We deploy a simultaneous fit in 3 regions (0,1,2 btag) because we do not have a pure Control Region.
  - Our data CR is ttbar contaminated

$$D(m^t)^{(i)} = N_{tt}^{(i)} T^{(i)}(m^t, k_{MassScale}, k_{MassResolution}) + N_{bkg}^{(i)} B(m^t)(1 + k_1 x) + N_{sub}^{(i)} O^{(i)}(m^t)$$

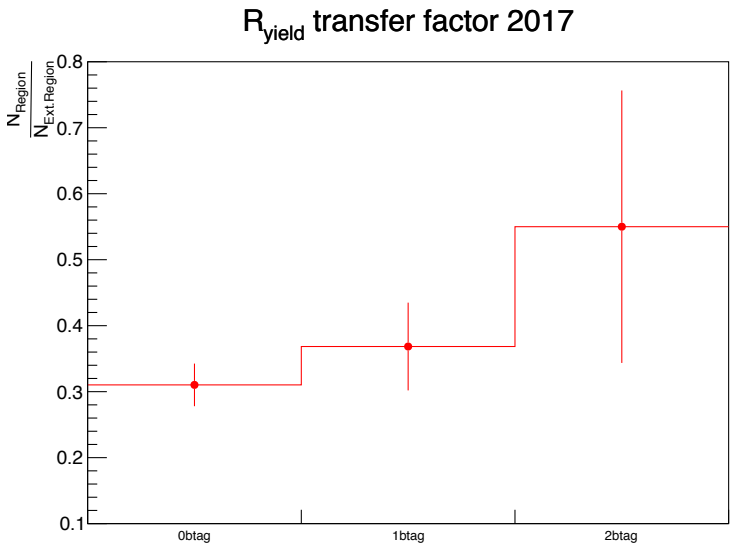
- We assume that $N_{tt}^{(0)} = (1 - e_b)^2 N_{tt}$, $N_{tt}^{(2)} = e_b^2 N_{tt}$ and $N_{tt}^{(1)} = 2(1 - e_b) e_b N_{tt}$ where e_b is the b tagging efficiency and N_{tt} is the total ttbar yield.

R_{yield} Calculation (Data)

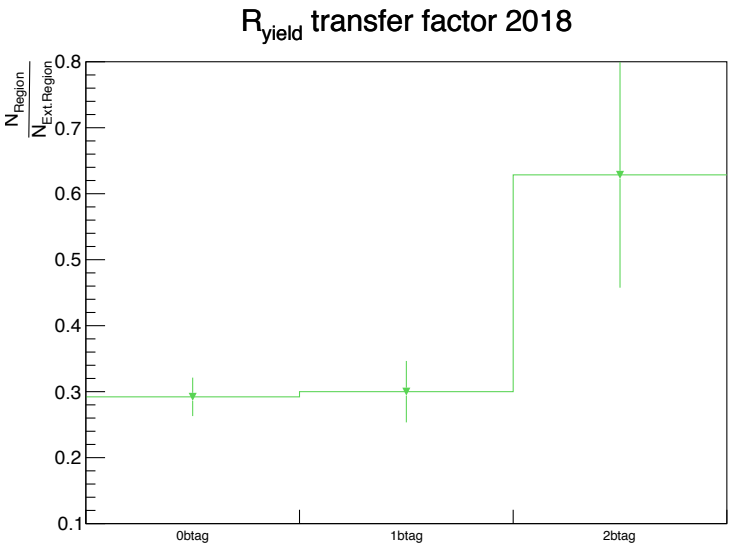
2016



2017

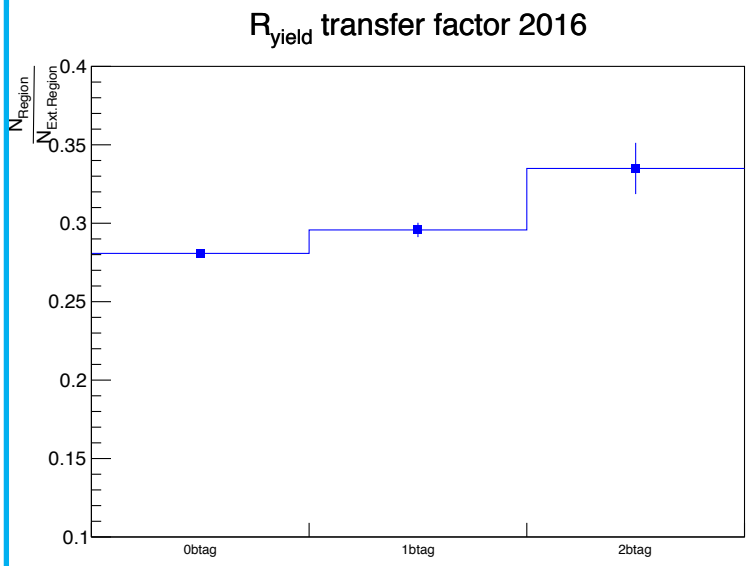


2018

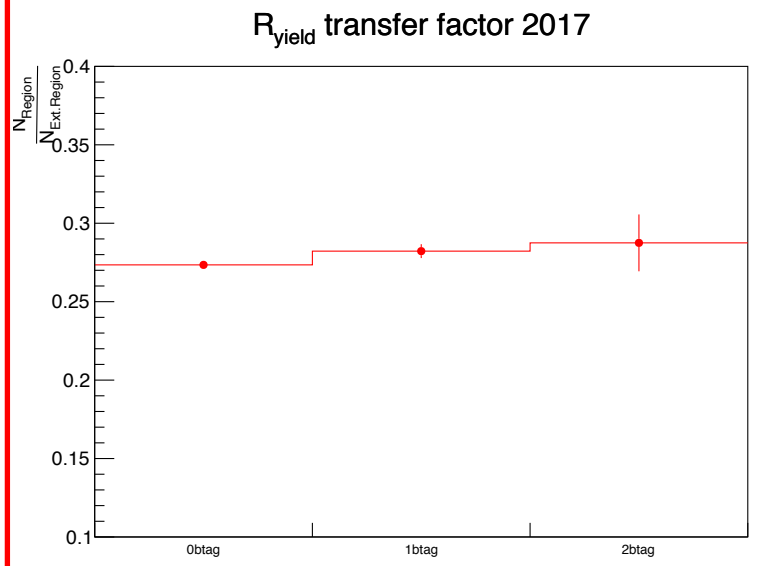


R_{yield} Calculation (MC Closure)

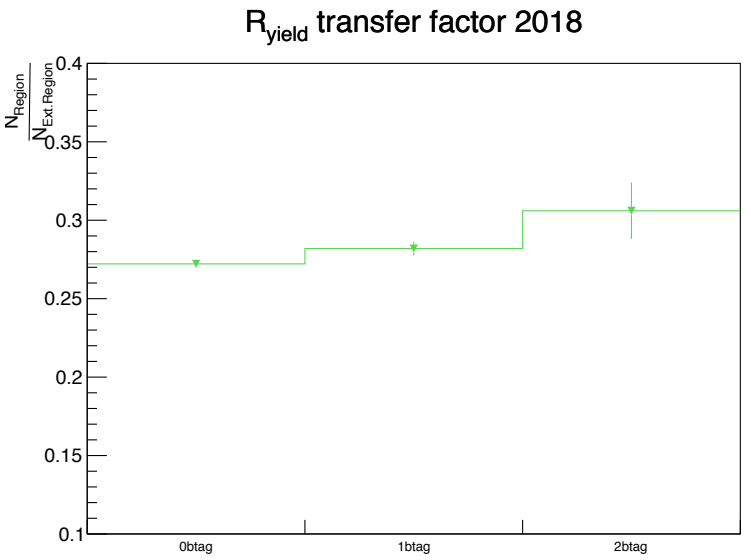
2016



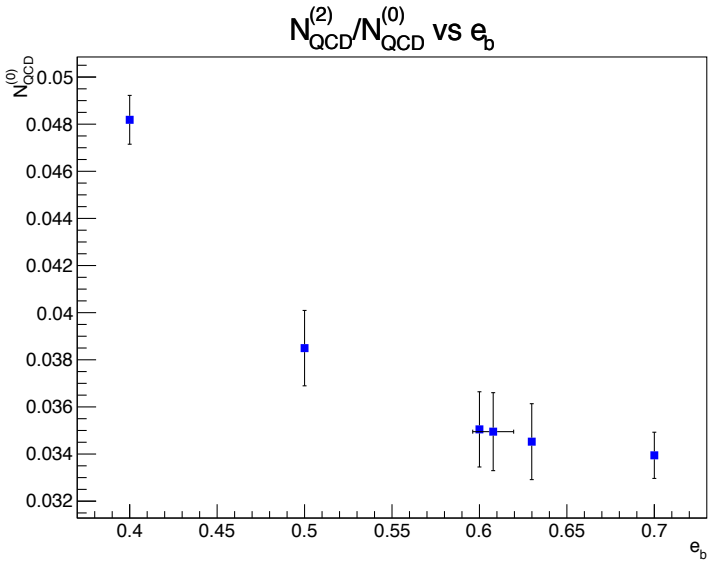
2017

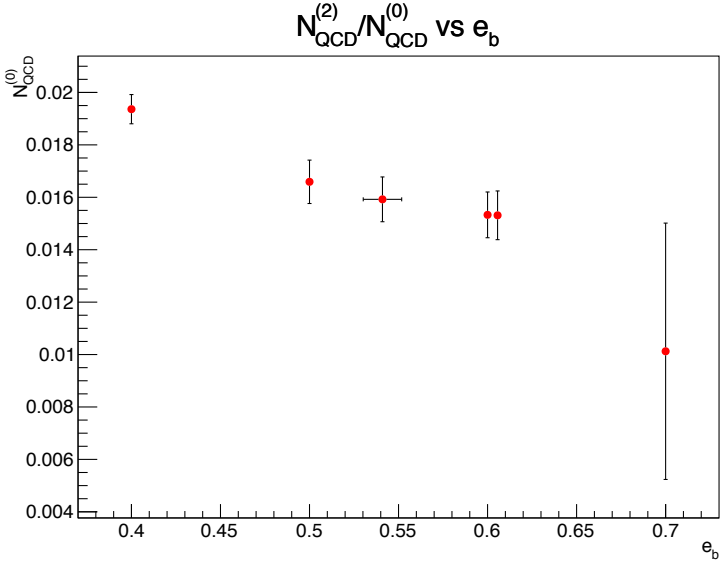


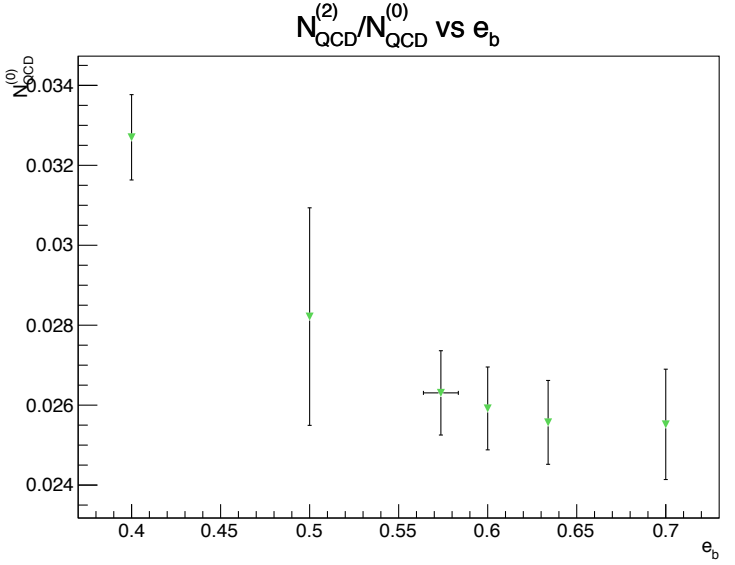
2018



NQCD (2) / NQCD (0) vs eb







We define $R_0 = \frac{D^{(0)}_{red}}{D^{(0)}_{ext}}$ and $R_1 = \frac{D^{(0)}_{red} - N^{(0)}_{TT,MC\,red}}{D^{(0)}_{ext} - N^{(0)}_{TT,MC\,ext}}$

----2016----
R0 (just data) = 0.264097
R1 (taking MC into account) = 0.262092
(R[0]-R[1])/R[0] = 0.00759071

NQCD in Reduced (SR): 846.365

----2017----
R0 (just data) = 0.270622
R1 (taking MC into account) = 0.269242
(R[0]-R[1])/R[0] = 0.00509682

NQCD in Reduced (SR): 677.041

----2018----
R0 (just data) = 0.266928
R1 (taking MC into account) = 0.265428
(R[0]-R[1])/R[0] = 0.00561997

NQCD in Reduced (SR): 1201.35

Fiducial differential xsec

2016

2017

2018