J/ψ efficiency correction

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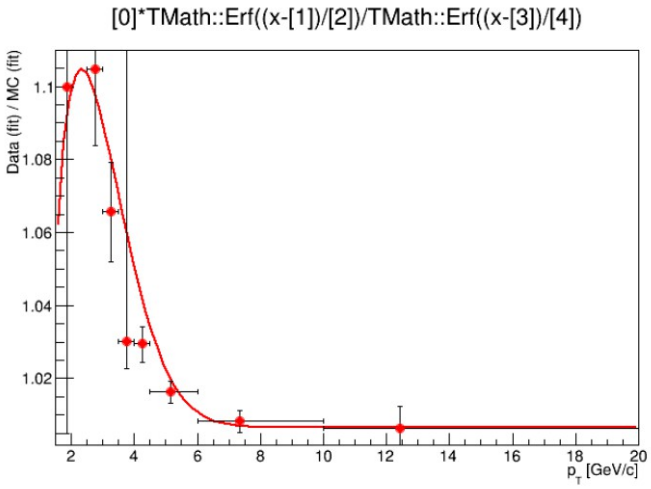
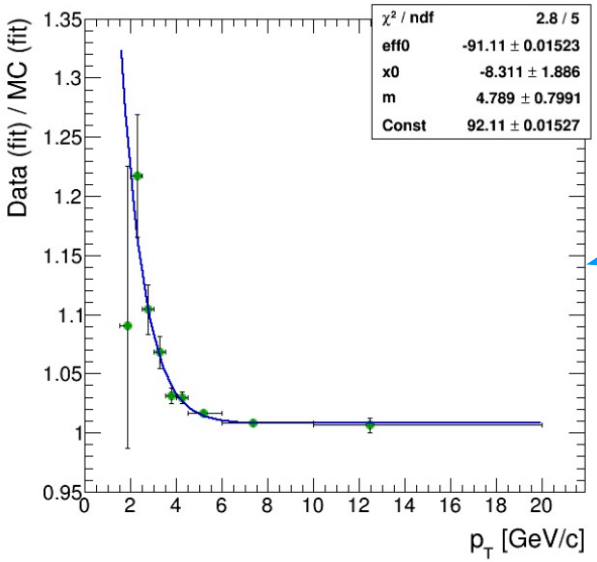
Single muon efficiency weighting RD/MC

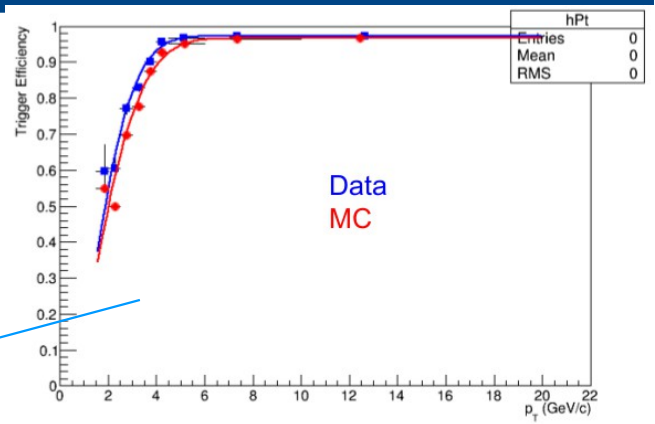
- TnP weighting

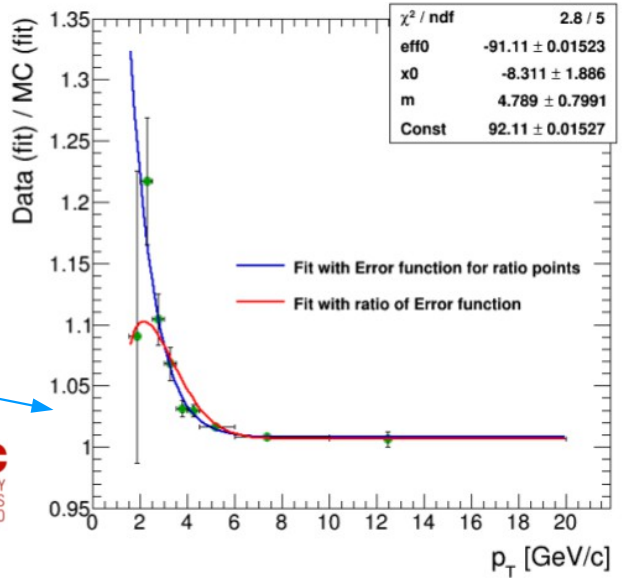


take ratio of fData/fMC
using fit functions



Get the ratio point by point
and then fit Error function

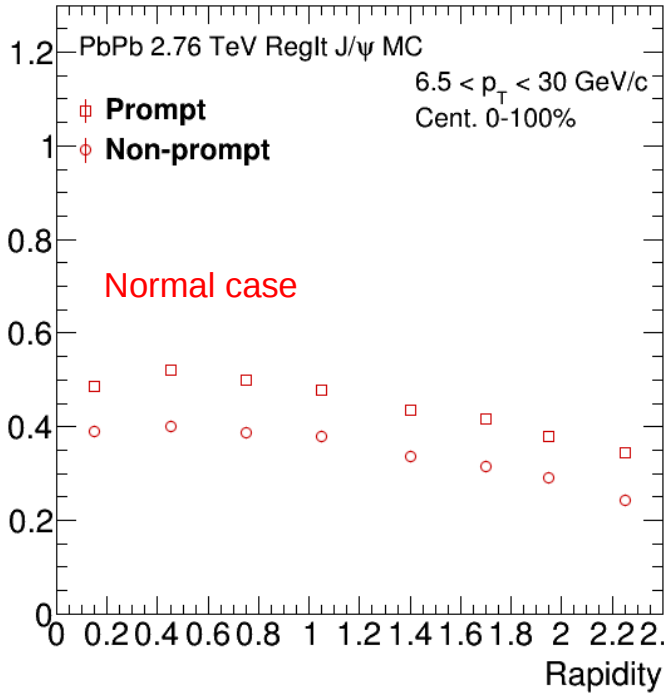


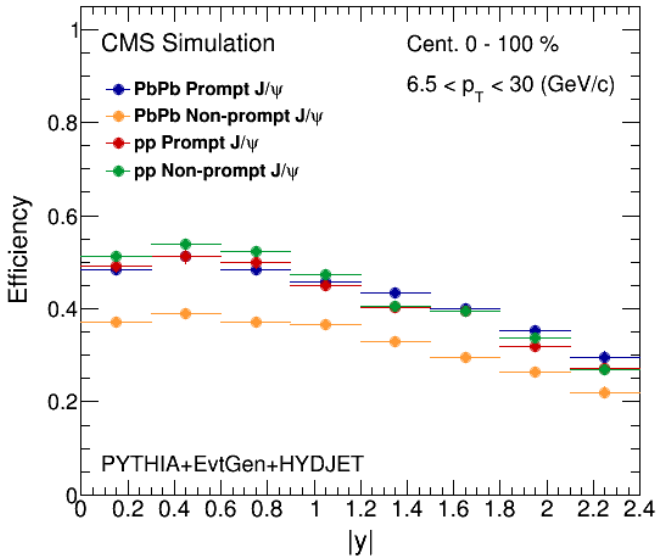


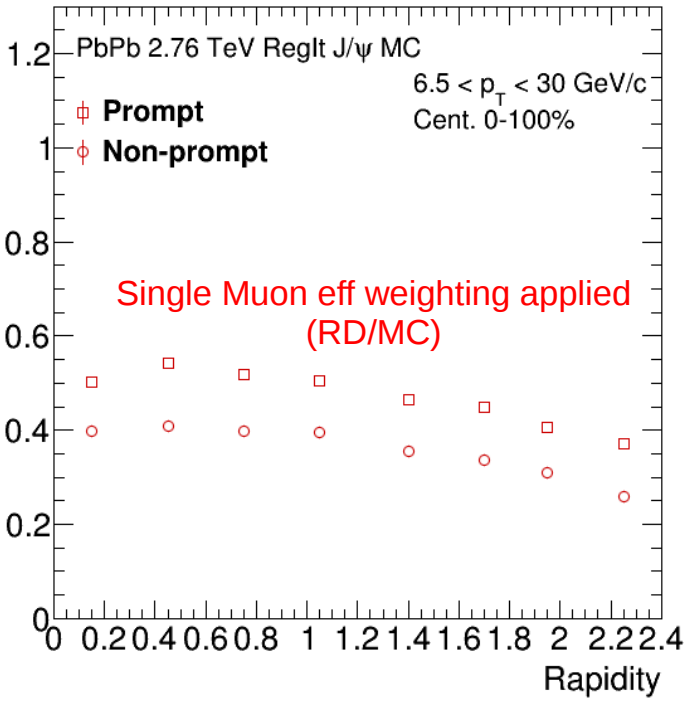
comparison is at next slide

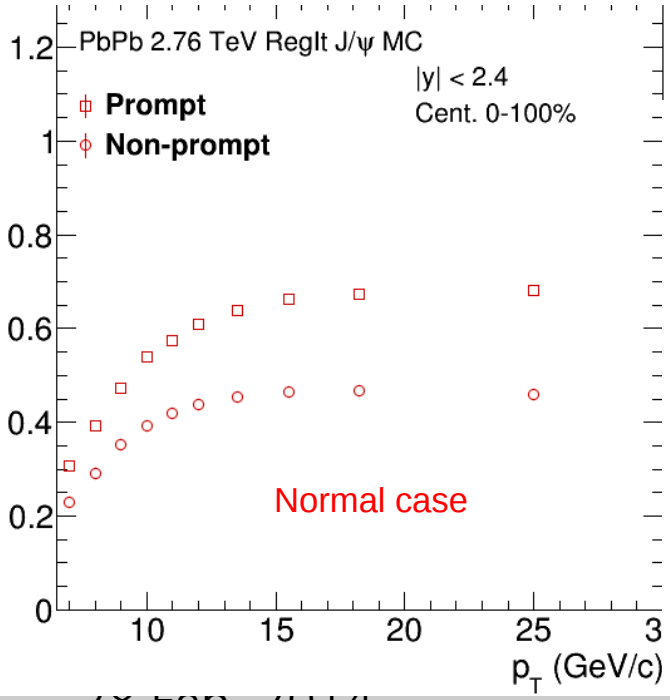
- Single muon efficiency obtained from tag and probe, on real data and MC
- Get efficiency ratio between those 2 datasets and apply them as a weight of each dimuons
  - Dimuon eff_{final} = Dimu $eff_{initial}$ * $mu1_{weight}$ * $mu2_{weight}$

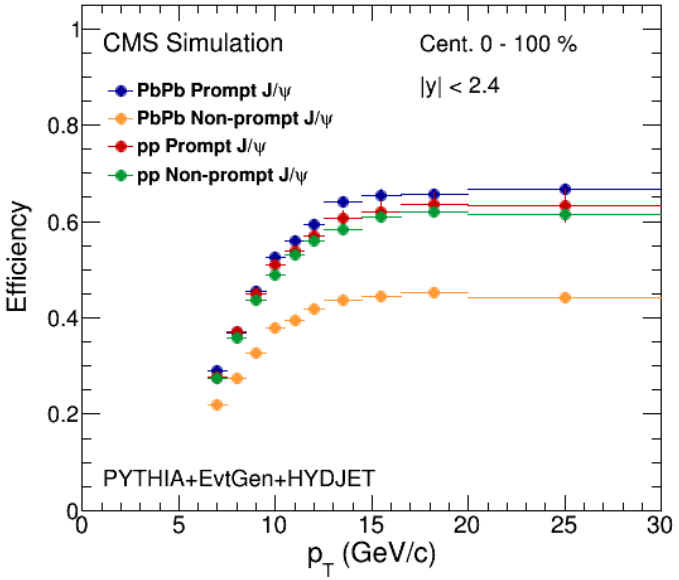
Efficiency cross-check (PbPb)

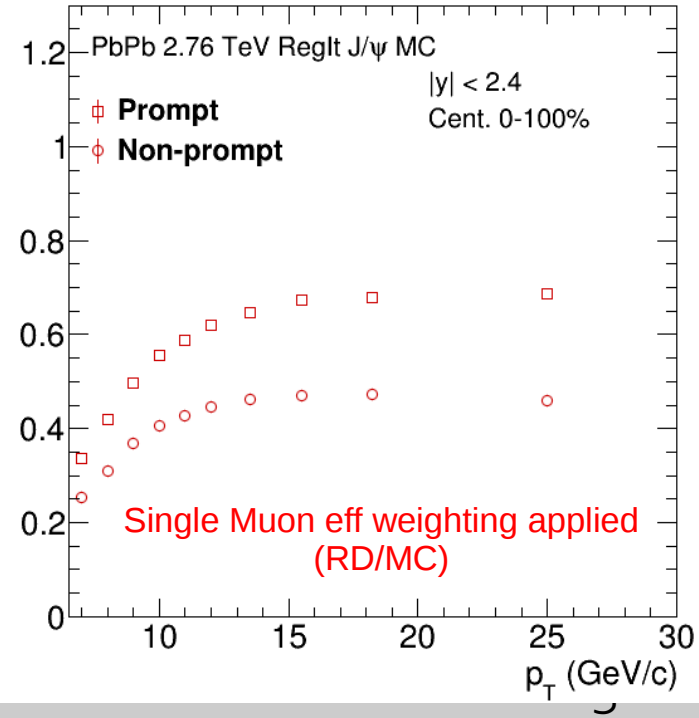




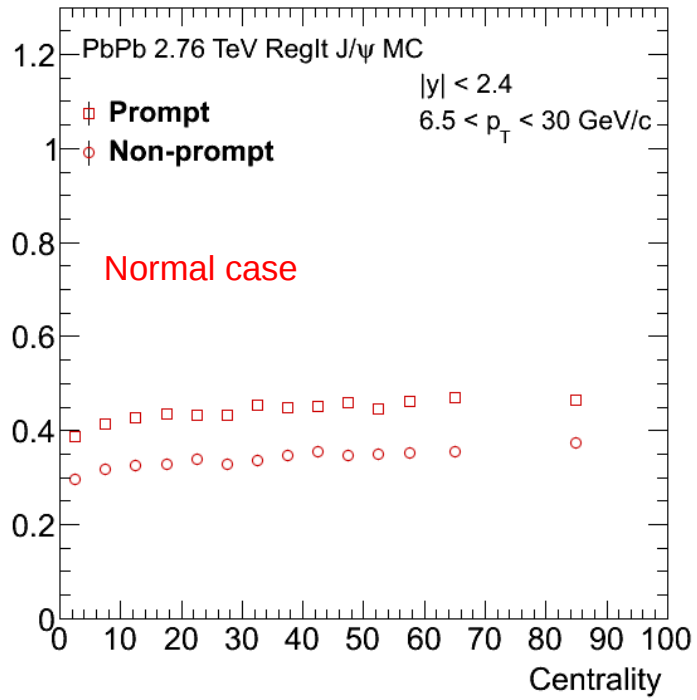


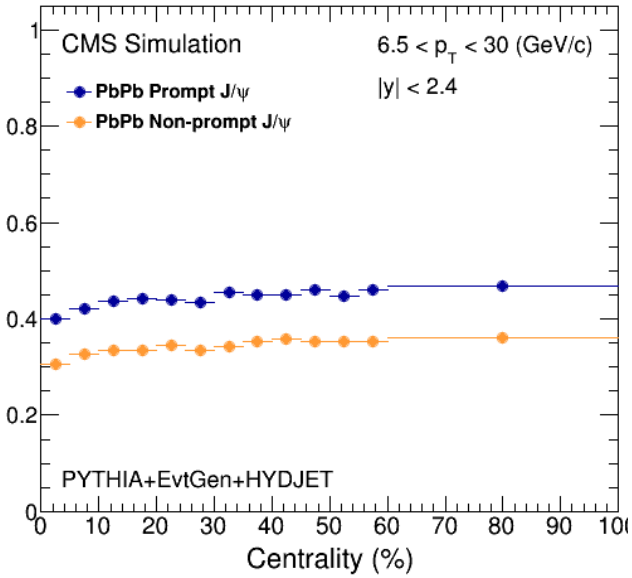


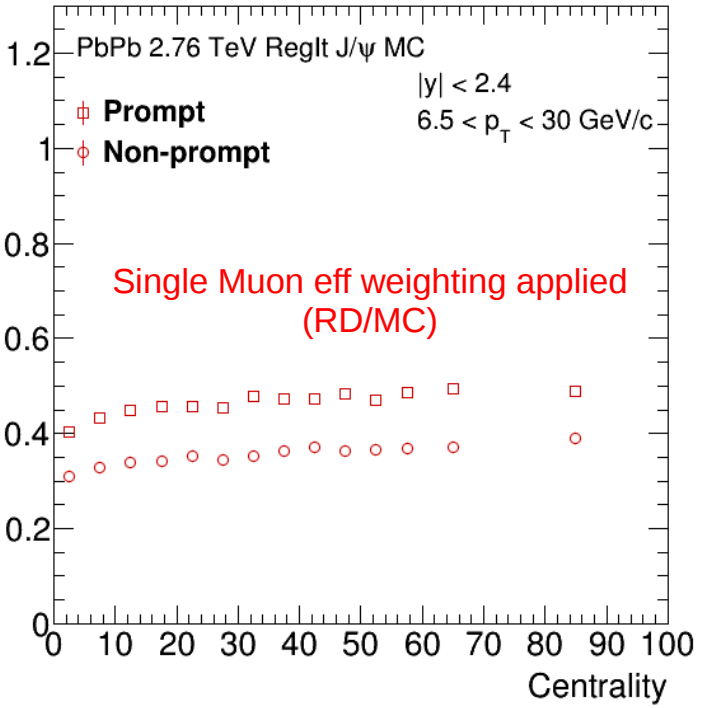


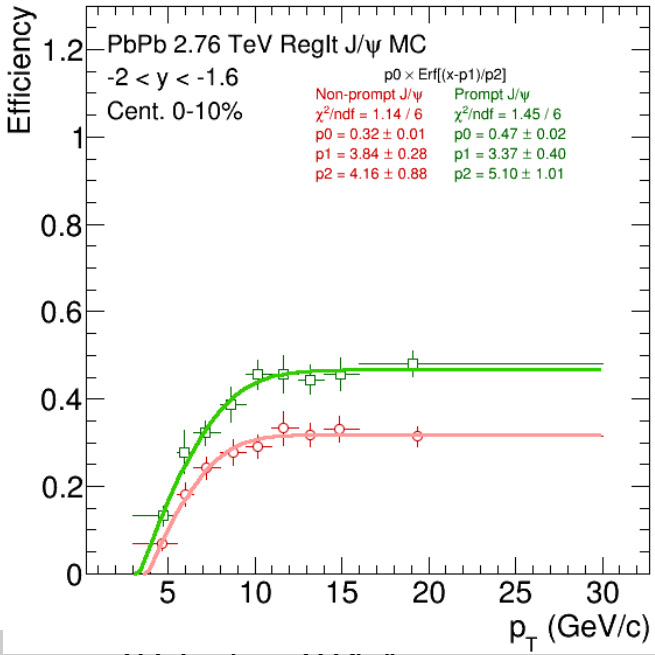


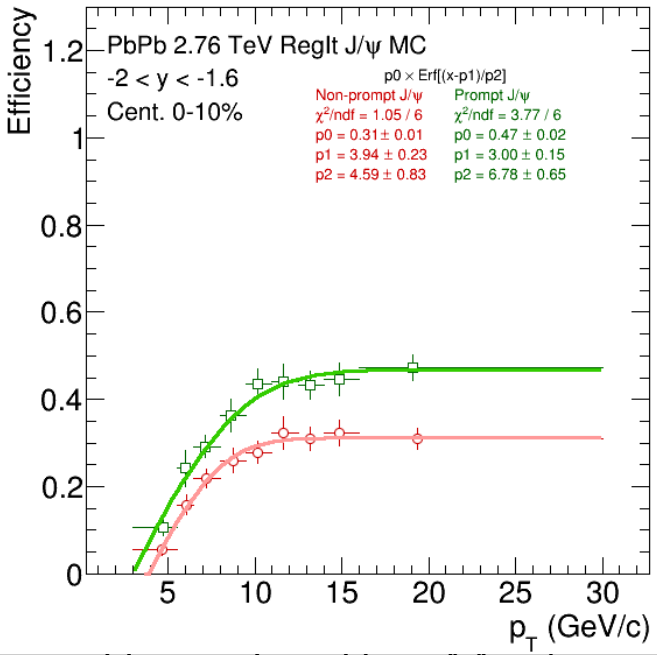
Efficiency cross-check





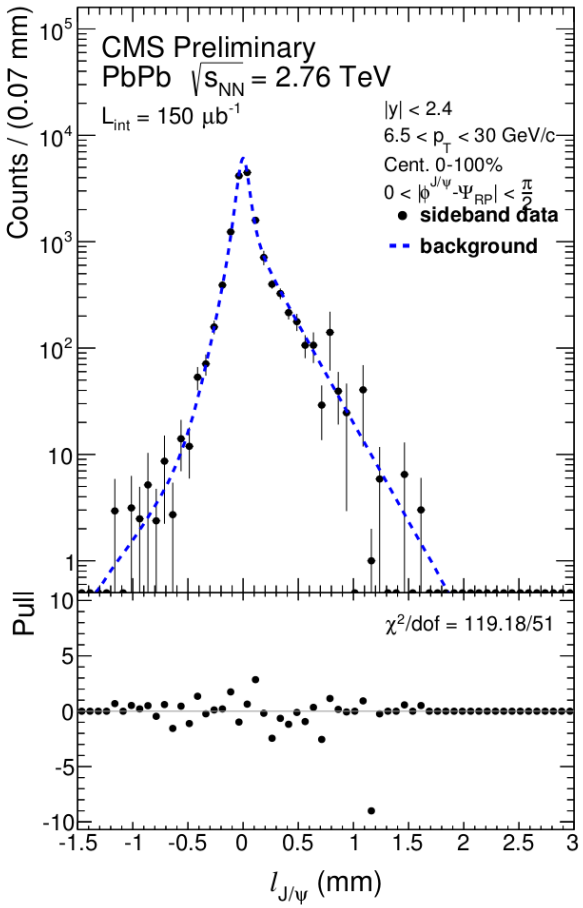


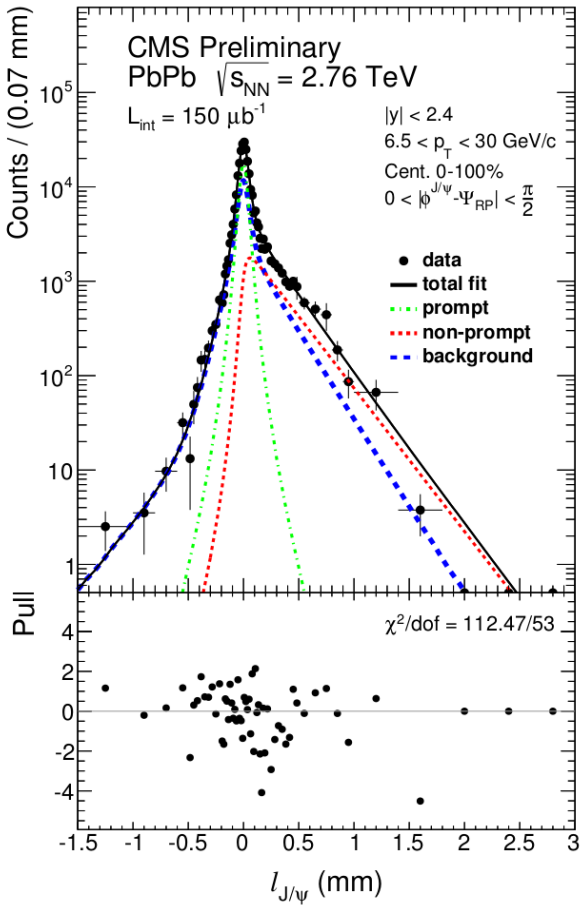




- Single muon eff weighted cases have higher efficiency
  - Restricting par[1] <= 3.0 in a couple of forward rapidity regions for pT efficiency curves

Single muon weighting applied efficiency





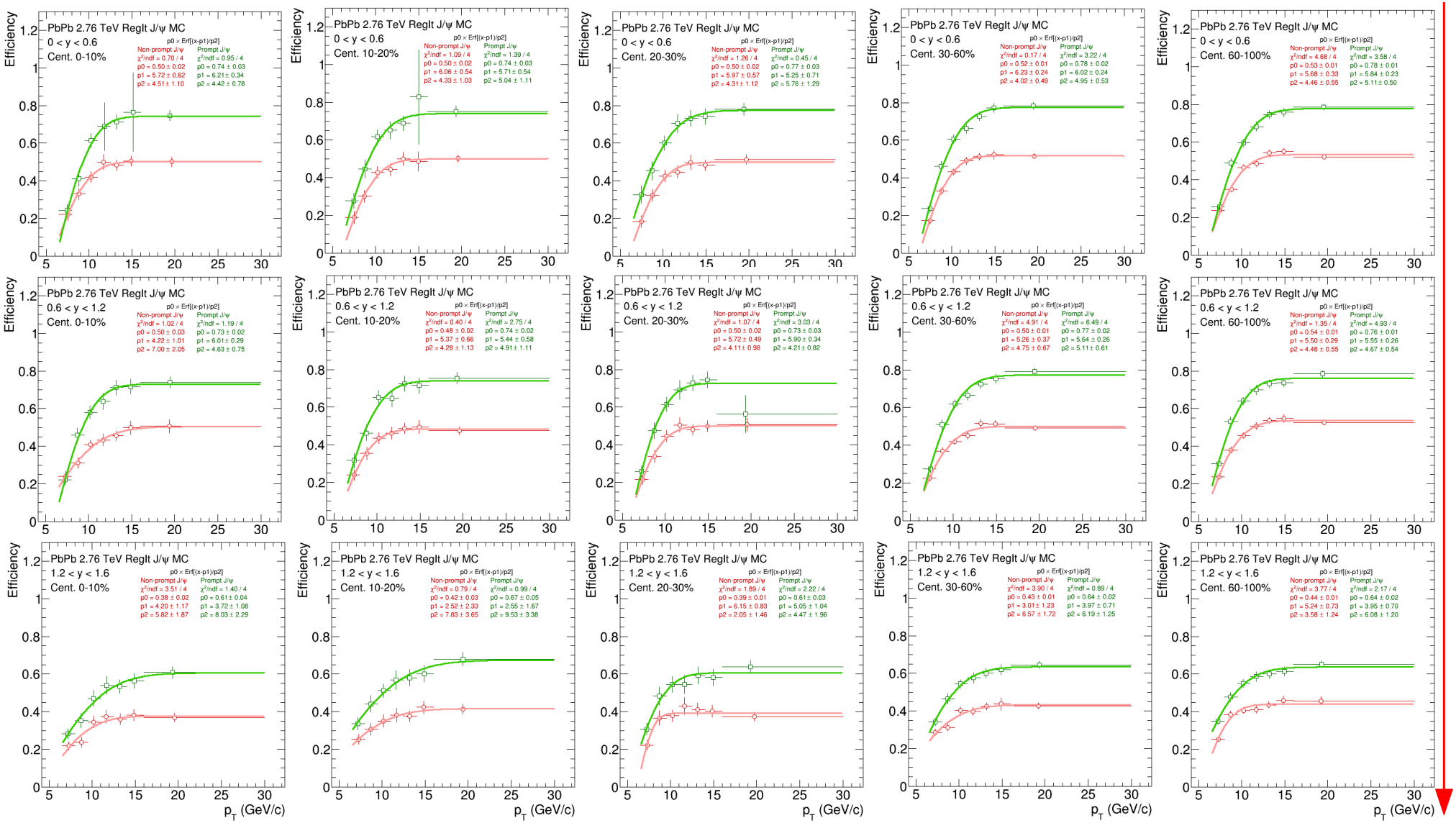
- All prompt J/psi MC pT efficiency fits have been set to have positive efficiency for detectable regions
- Single muon eff weighting RD/MC doesn't improve lifetime shape much

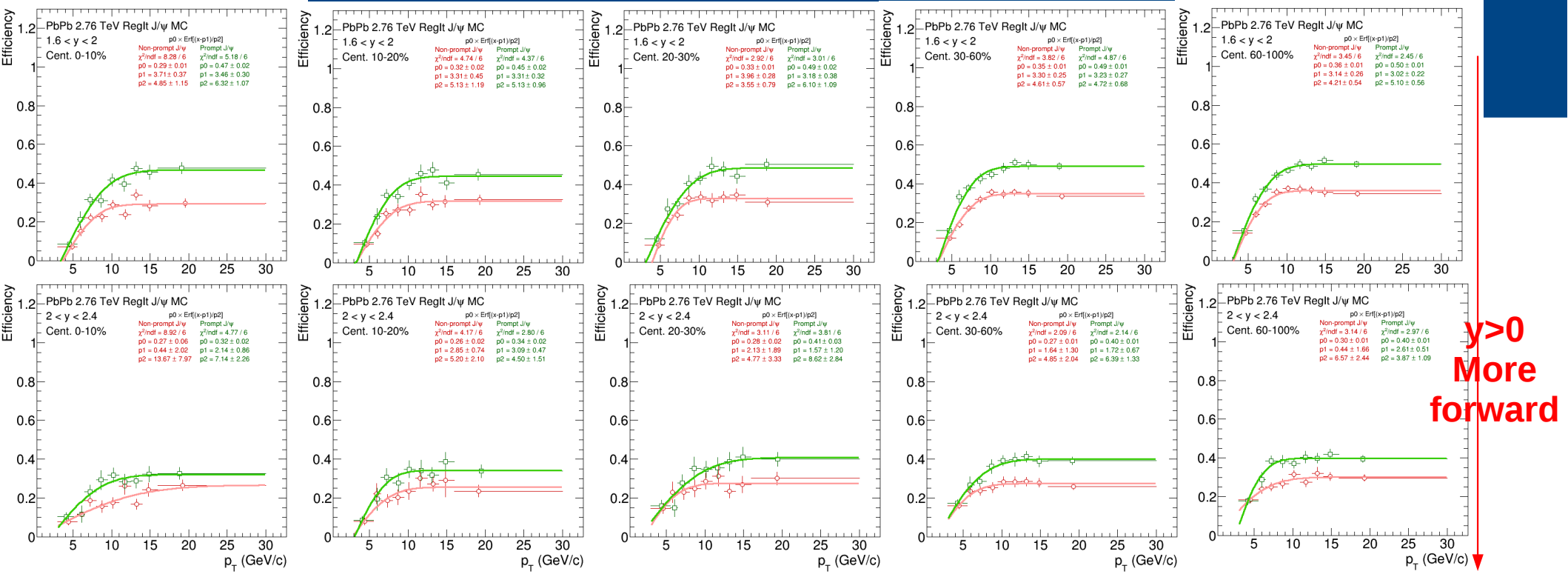
BACK UP

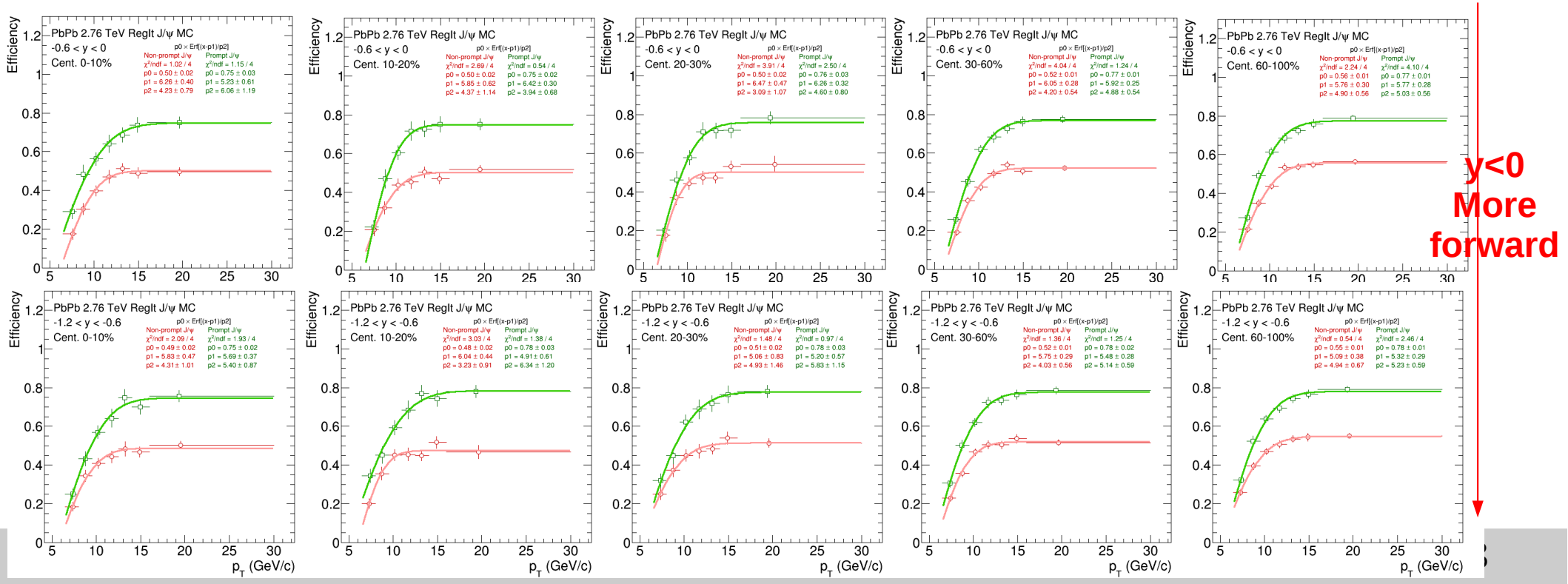
p_T efficiency

- Only PbPb prompt J/psi MC (green curves) will be used
- Function: par[0]*Tmath::Erf((x[0]-par[1])/par[2]) over <pT>

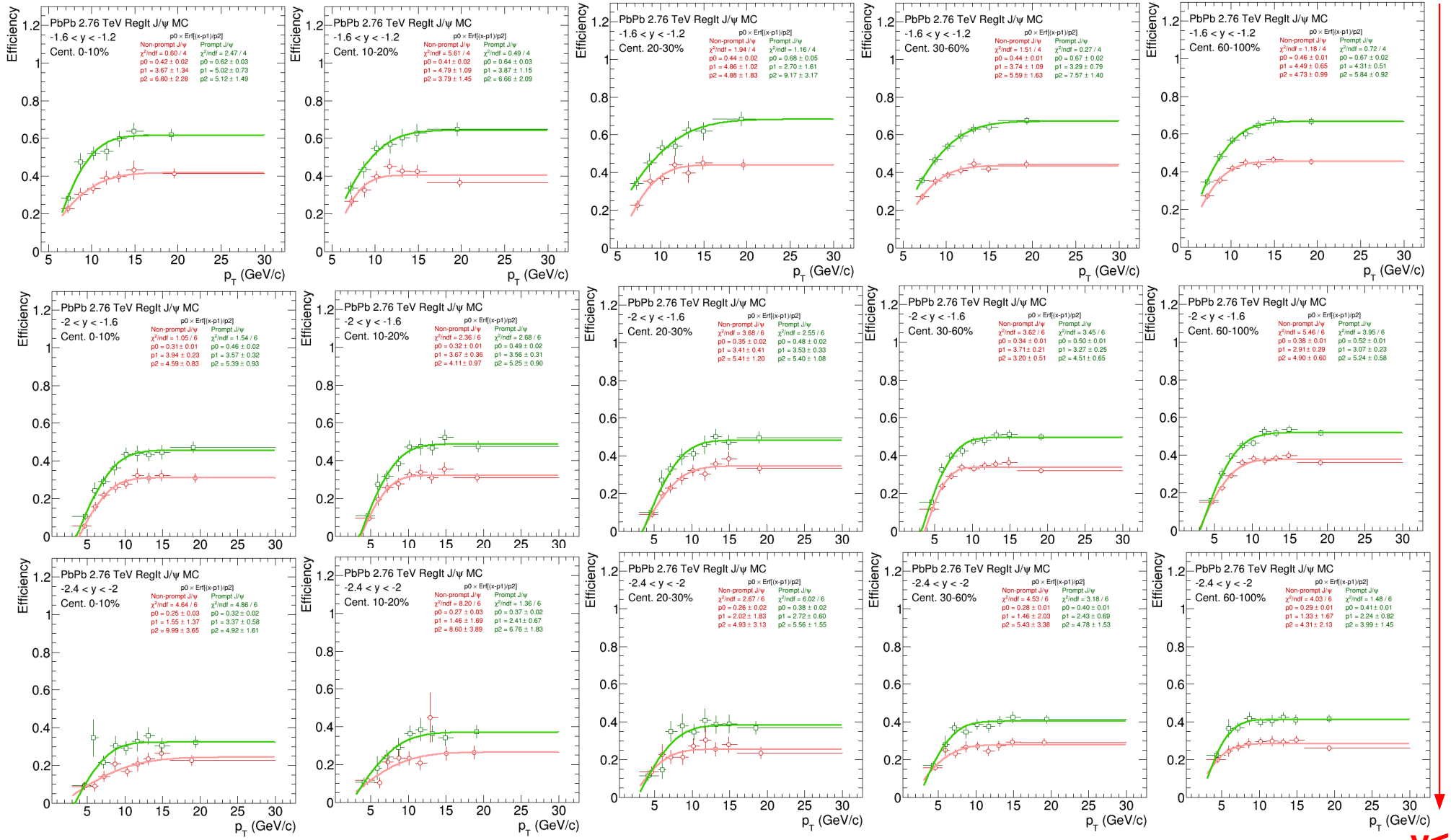
y>0 More forward




PbPb 2.76 TeV RegIt J/ψ MC
1.6 < y < 2
Cent. 0-10%
Cent. 10-20%
Cent. 20-30%
Cent. 30-60%
Cent. 60-100%
2 < y < 2.4
Efficiency
p_T (GeV/c)
y>0
More
forward


PbPb 2.76 TeV RegIt J/ψ MC
-0.6 < y < 0
Cent. 0-10%
Cent. 10-20%
Cent. 20-30%
Cent. 30-60%
Cent. 60-100%
-1.2 < y < -0.6
Efficiency
p_T (GeV/c)
y<0
More
forward

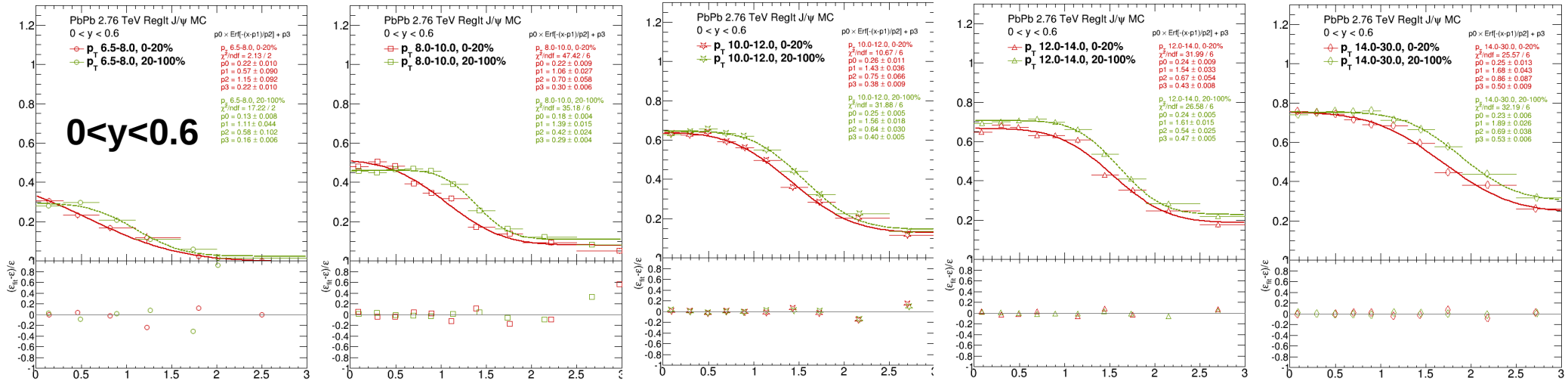
p_T efficiency



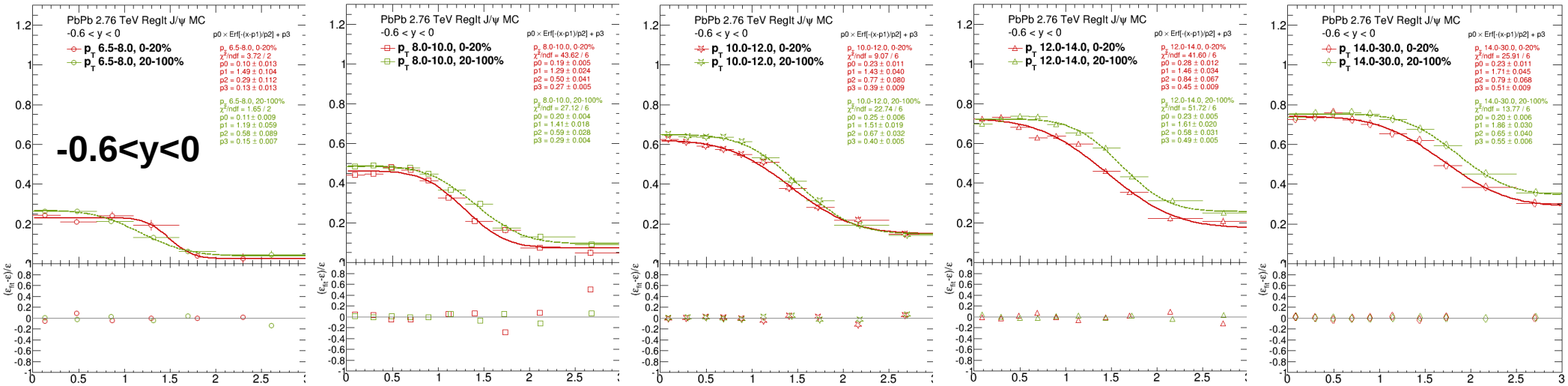
- For events with **p_T < par[1], efficiency is 0**
  → Weighting is set to 0 when RooDataSet is created

Lxy efficiency

- Only PbPb non-prompt J/psi MC is used, $<L_{xy}>$ is used
- Function: par[0]*Tmath::Erf(-(x[0]-par[1])/par[2])+par[3];
- For Lxy included 4D efficiency, will use prompt J/psi efficiency to adjust level of Lxy efficiency curves

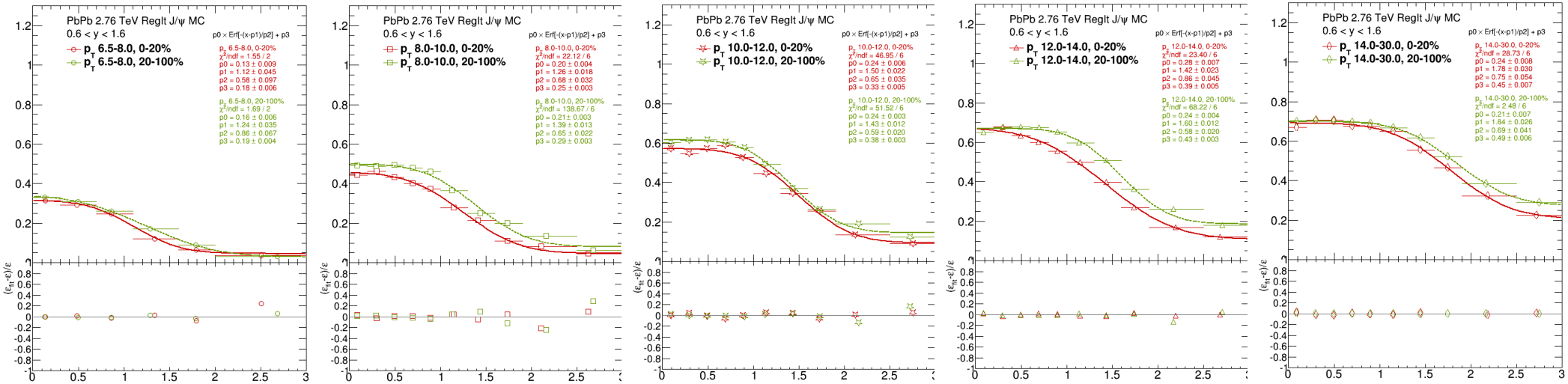


Higher p_T regions



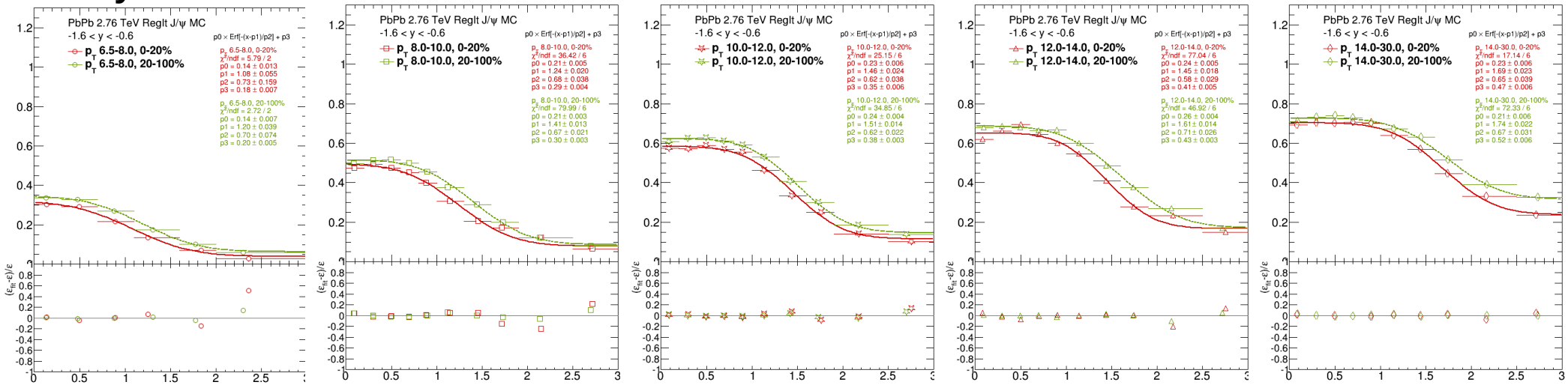
Lxy efficiency

0.6<y<1.6



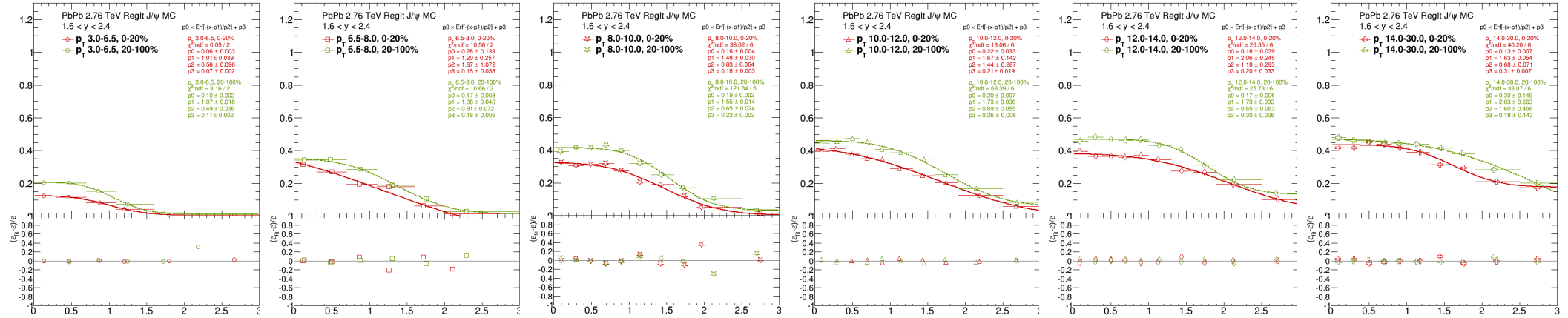
Higher p_T regions

-1.6<y<-0.6



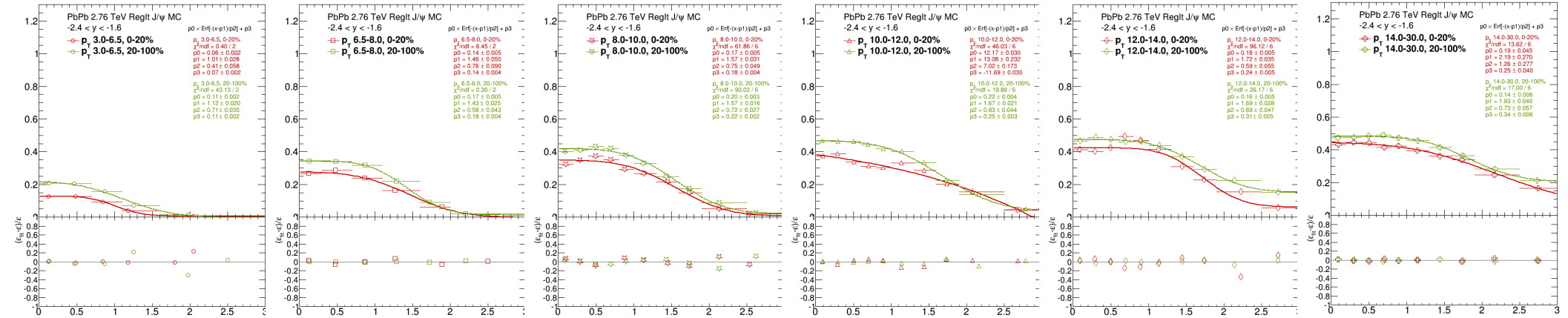
Lxy efficiency

1.6<y<2.4



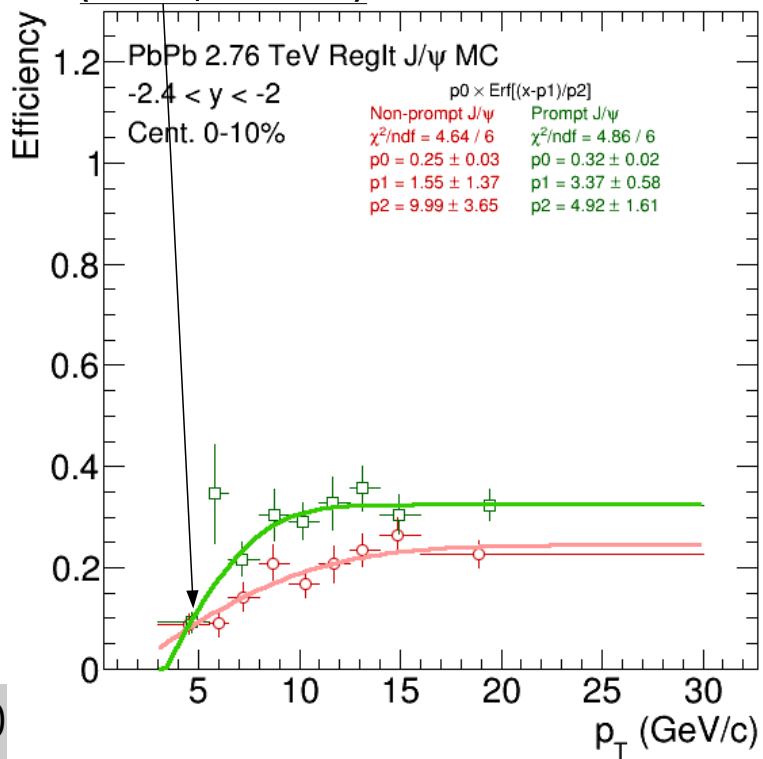
Higher p_T regions

-2.4<y<-1.6



p_T efficiency

- Count 0 efficiency events after applying all selection criteria
- Significant number of events have 0 efficiency with prompt J/psi MC!
- Solution)
  - Only for the region between 3 and par[1], perform a 1st poly straight line fit with (3,0) and the left most point?
  - Ex) Straight line between (3,0) and (4.69, 0.092)

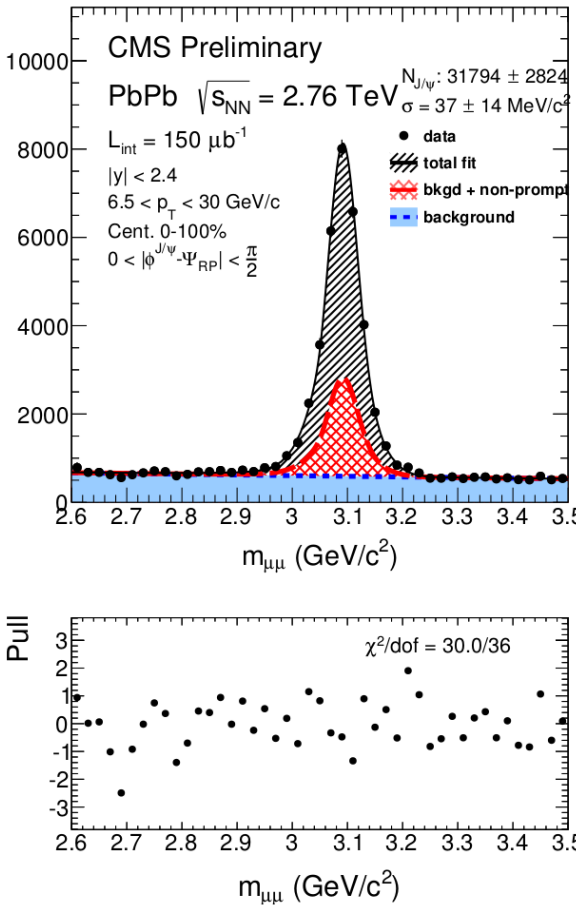


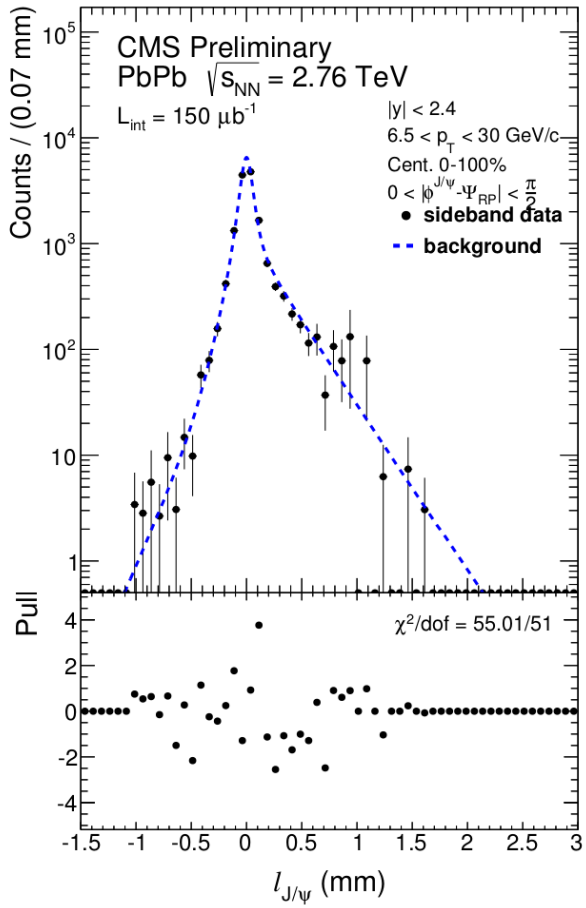
	A	B	C	D
1	Rapidity	pT (GeV/c)	centrality	Entries
2	-2.4 < y < -2.0	2-4	0-10%	1188
3	-2.4 < y < -2.0	2-4	10-20%	0
4	-2.4 < y < -2.0	2-4	20-30%	286
5	-2.4 < y < -2.0	2-4	30-60%	0
6	-2.4 < y < -2.0	2-4	60-100%	0
7	-2.0 < y < -1.6	2-4	0-10%	999
8	-2.0 < y < -1.6	2-4	10-20%	605
9	-2.0 < y < -1.6	2-4	20-30%	286
10	-2.0 < y < -1.6	2-4	30-60%	88
11	-2.0 < y < -1.6	2-4	60-100%	1
12	1.6 < y < 2.0	2-4	0-10%	774
13	1.6 < y < 2.0	2-4	10-20%	287
14	1.6 < y < 2.0	2-4	20-30%	82
15	1.6 < y < 2.0	2-4	30-60%	57
16	1.6 < y < 2.0	2-4	60-100%	0
17	2.0 < y < 2.4	2-4	0-10%	0
18	2.0 < y < 2.4	2-4	10-20%	185
19	2.0 < y < 2.4	2-4	20-30%	0
20	2.0 < y < 2.4	2-4	30-60%	0
21	2.0 < y < 2.4	2-4	60-100%	0

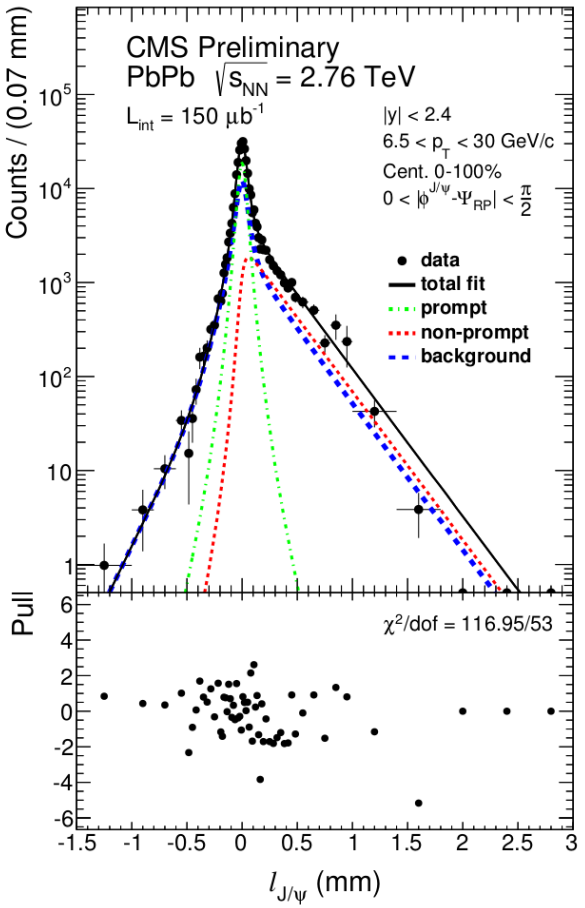
4D efficiency corrected lifetime dist.

- Analytic fits with 1 exponential slope for B + resolution function set to data
  - other settings are same as HIN-12-014, HIN-12-001
- Tail shape is recovered up to 1 mm region, but there is a drop on ~1.5 mm
  - Mainly contributed by y>0 side

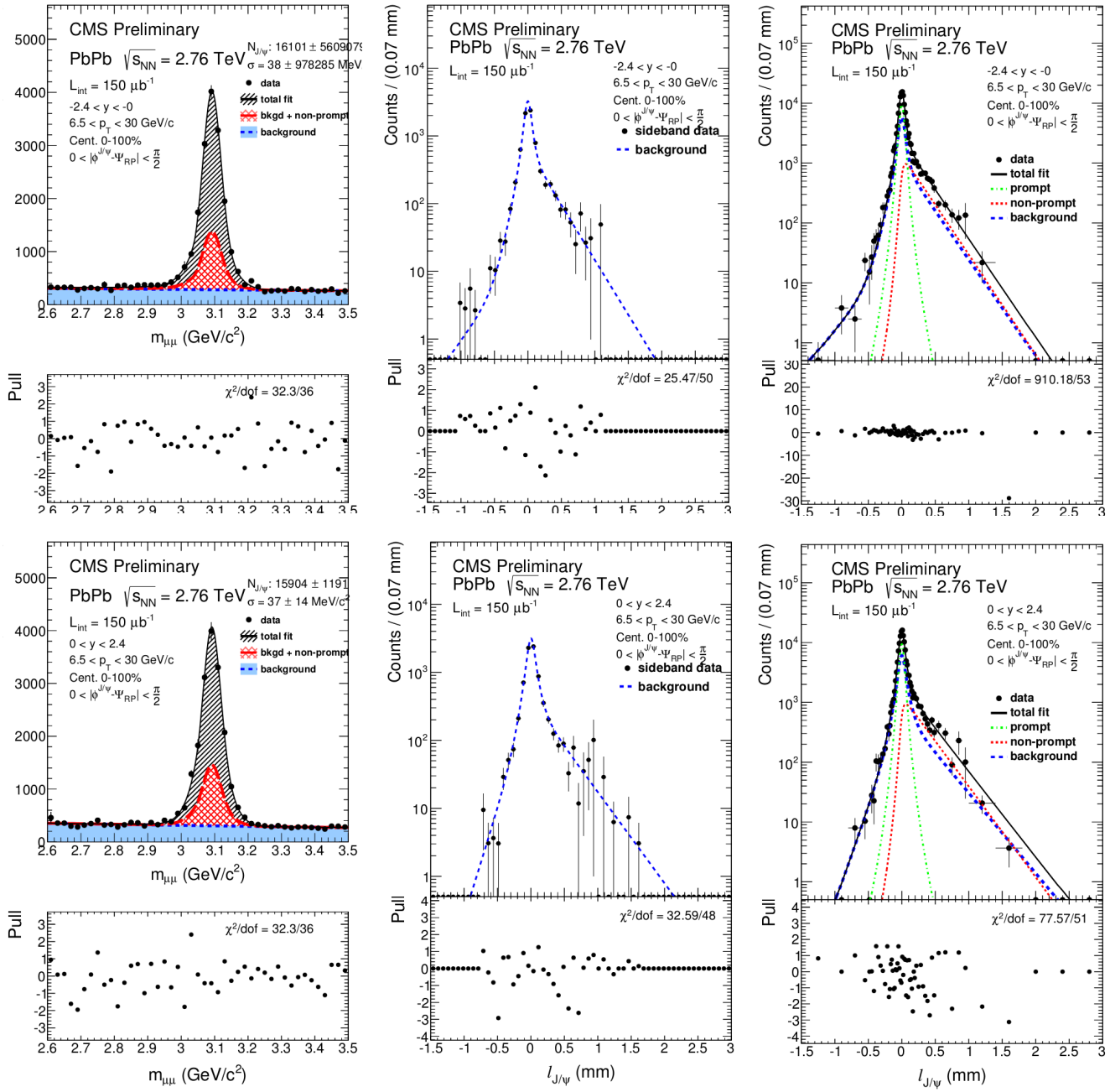
Prompt 22411.1 ± 2032.23
Non-prompt 9383.06 ± 928.94
Bfraction 0.295 ± 0.0129
Resolution 1135.17 ± 16.33







Lifetime dist. On y>0 and y<0



Minus
Prompt 11406.5 ± 3.97e+08
Non-prompt 4694.68 ± 1.64e+08
Bfraction 0.292 ± 0.0169
Resolution 1136.71 ± 25.68

- B-fraction between 2 rapidity regions are compatible (29% and 30% with ~2% error)

Plus
Prompt 11043.4 ± 882.373
Non-prompt 4860.38 ± 477.013
Bfraction 0.306 ± 0.0194
Resolution 1110.56 ± 21.90