Reaction plane detector (RXN/MPC/BBC) performance and hadron-hadron correlation in run7 Au+Au 200GeV

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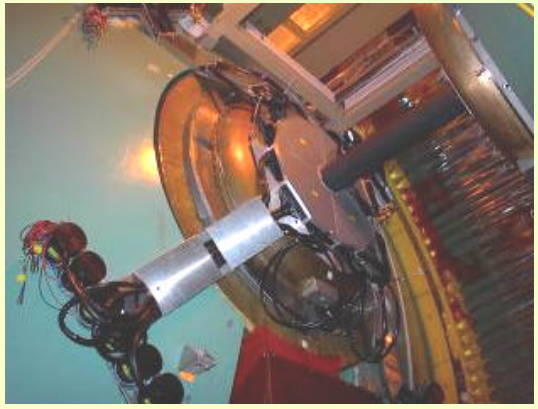
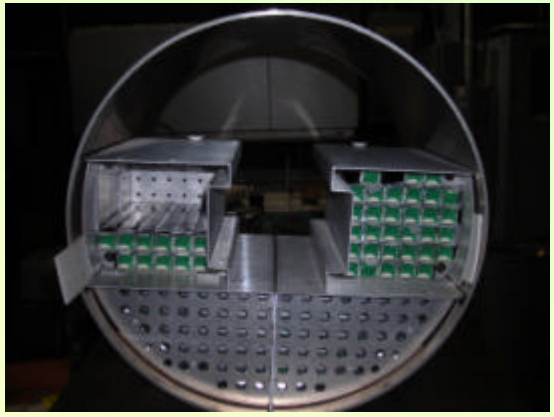
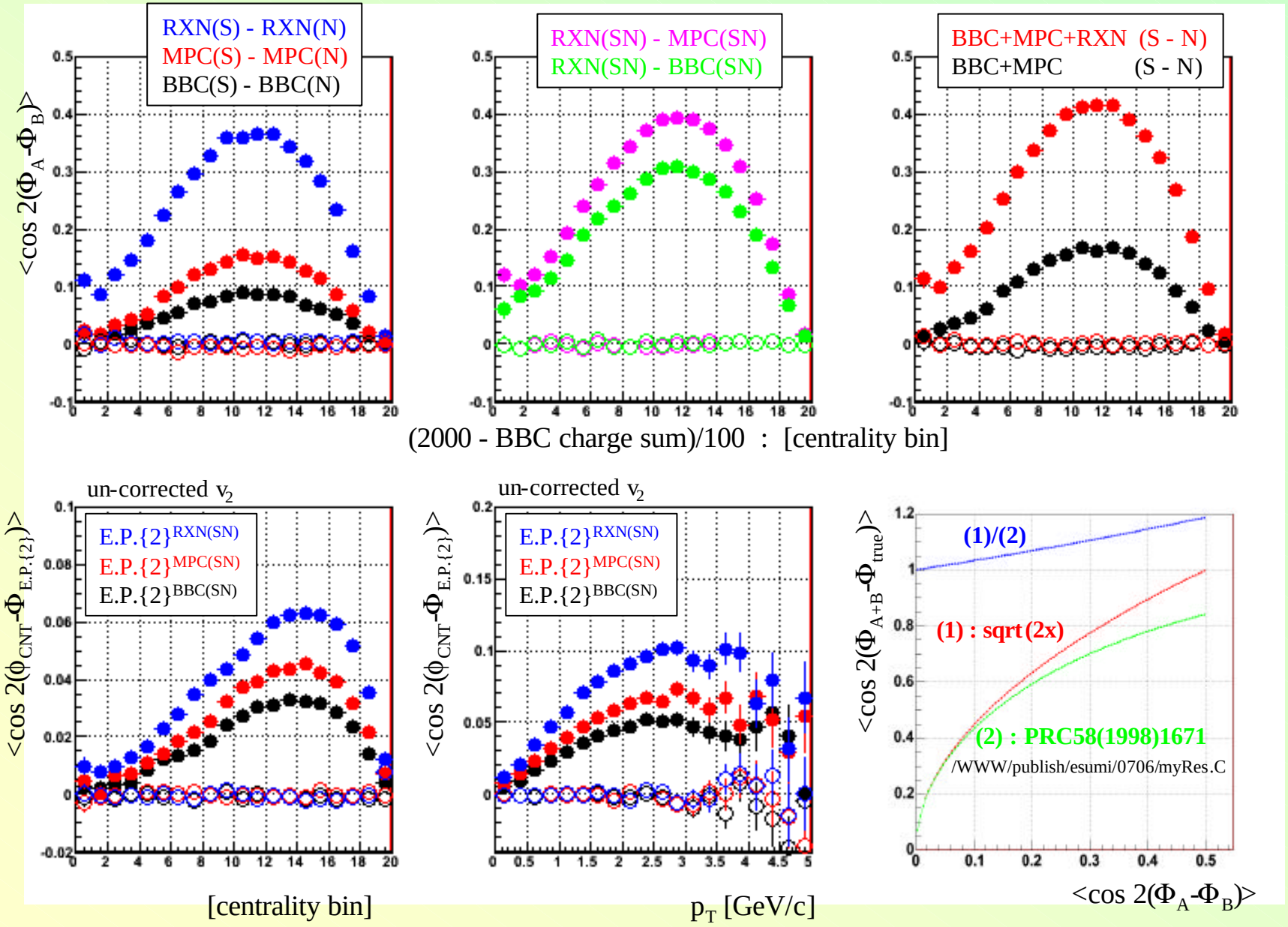
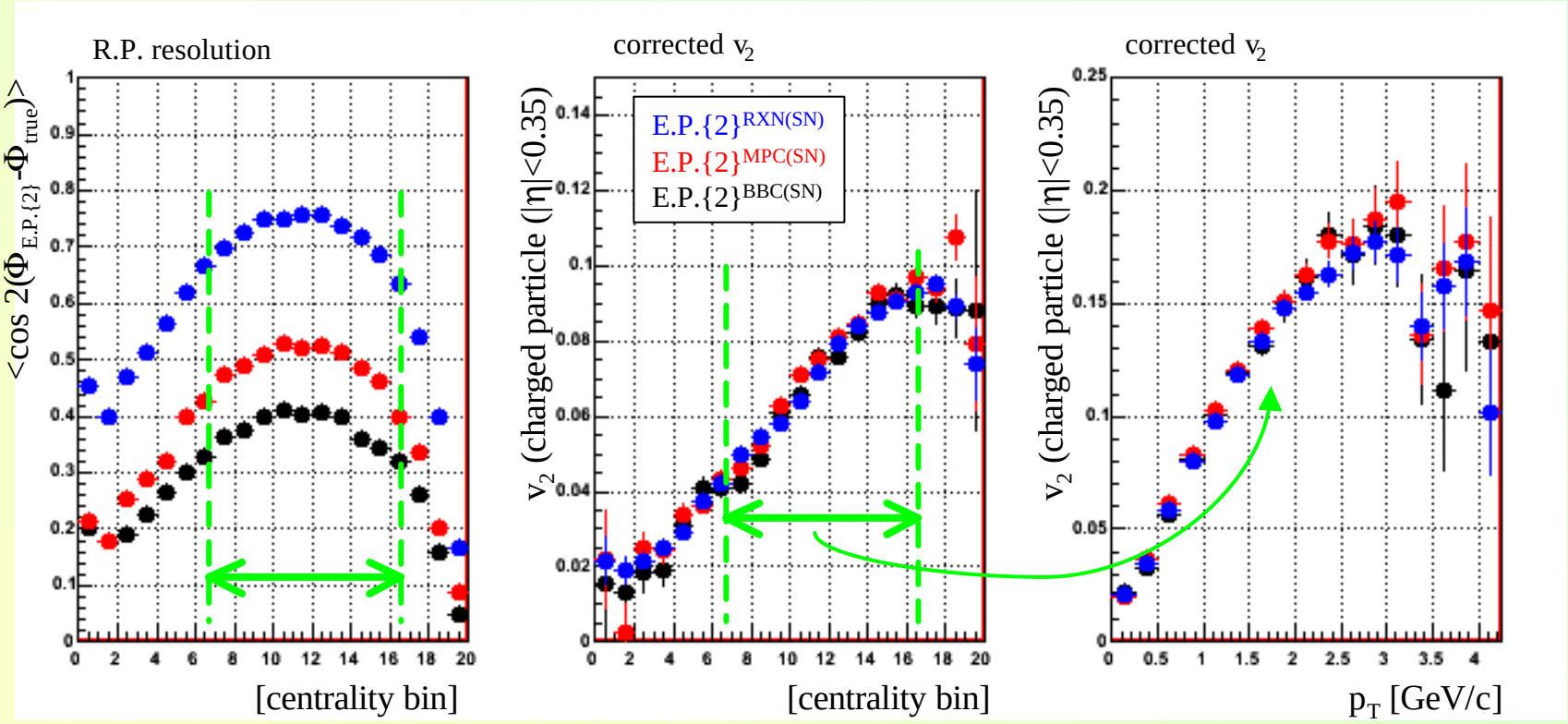




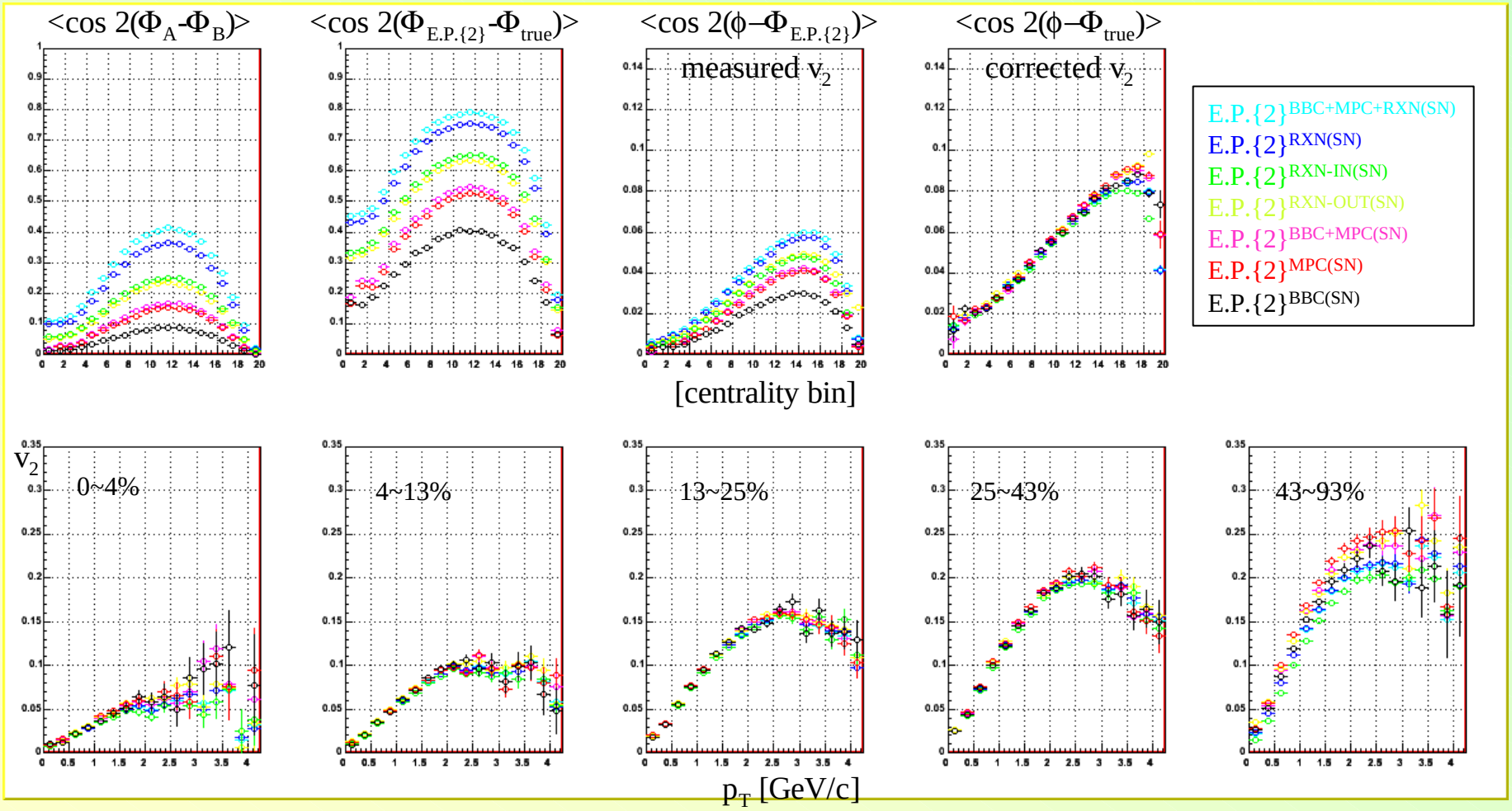
v_2 resolution



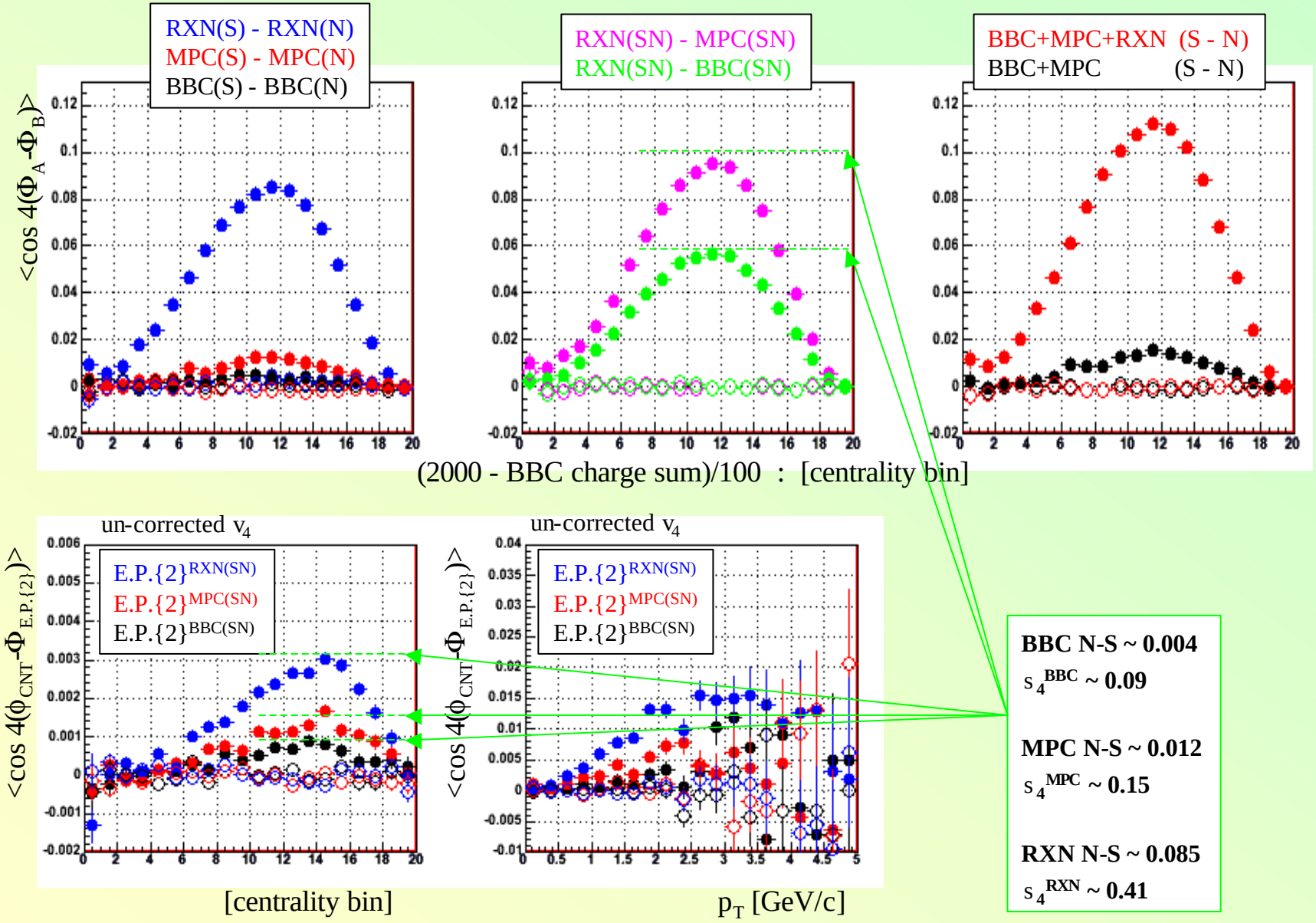
resolution correction



resolution correction, p_T/centrality dependence



v_4 resolution



BBC N-S ~ 0.004

s_4^{BBC} **~ 0.09**

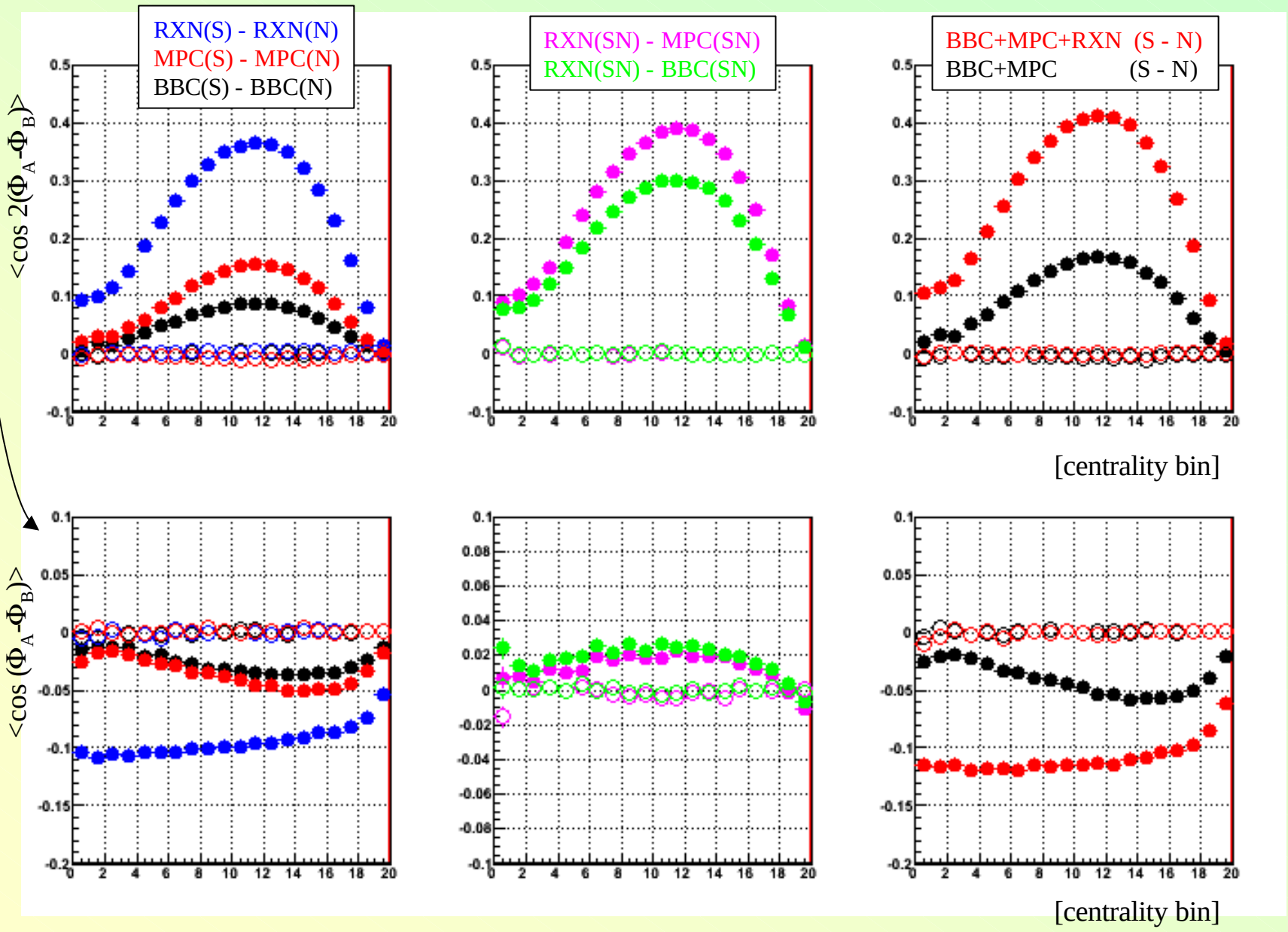
MPC N-S ~ 0.012

s_4^{MPC} **~ 0.15**

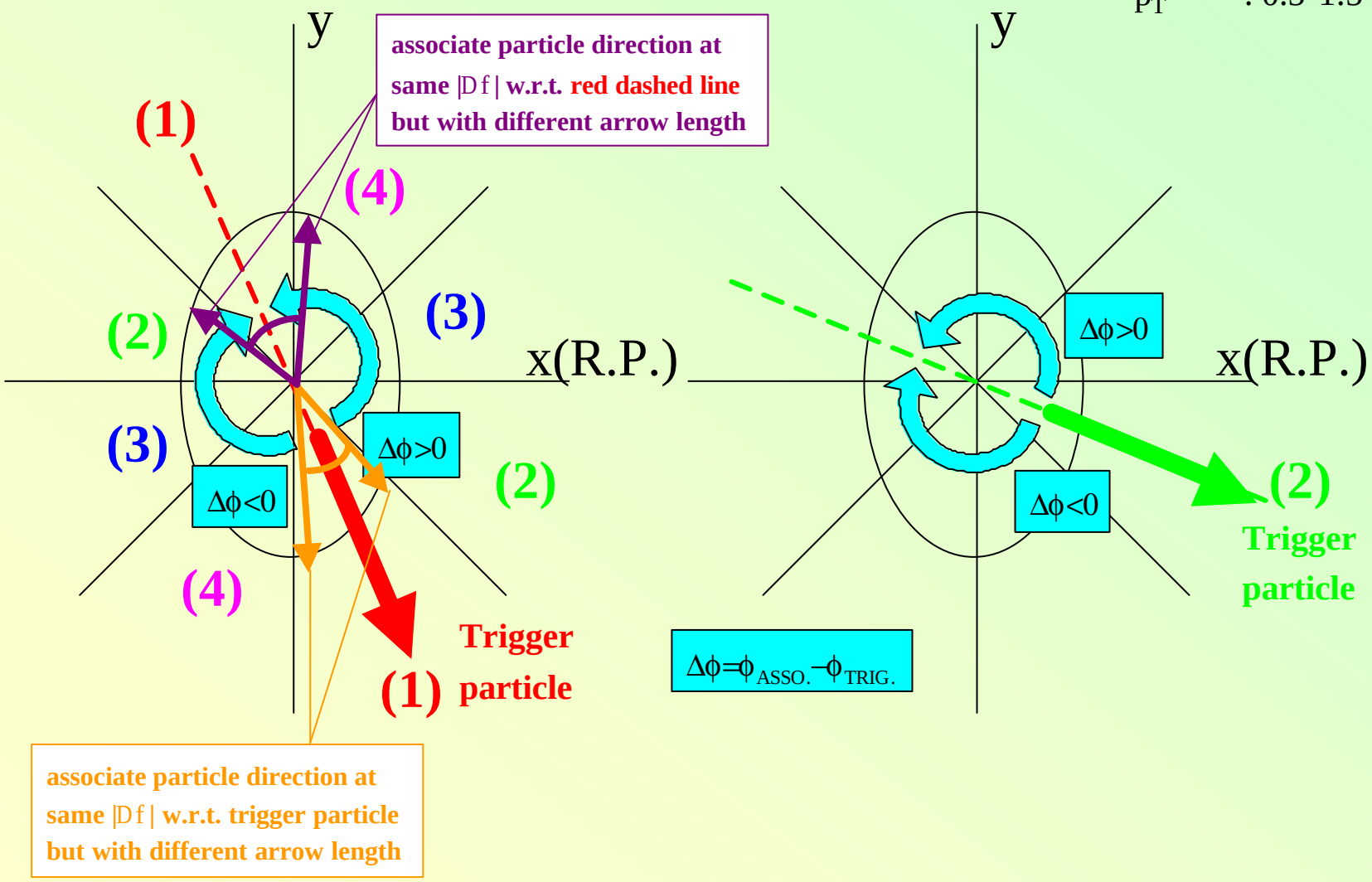
RXN N-S ~ 0.085

s_4^{RXN} **~ 0.41**

v_1 resolution

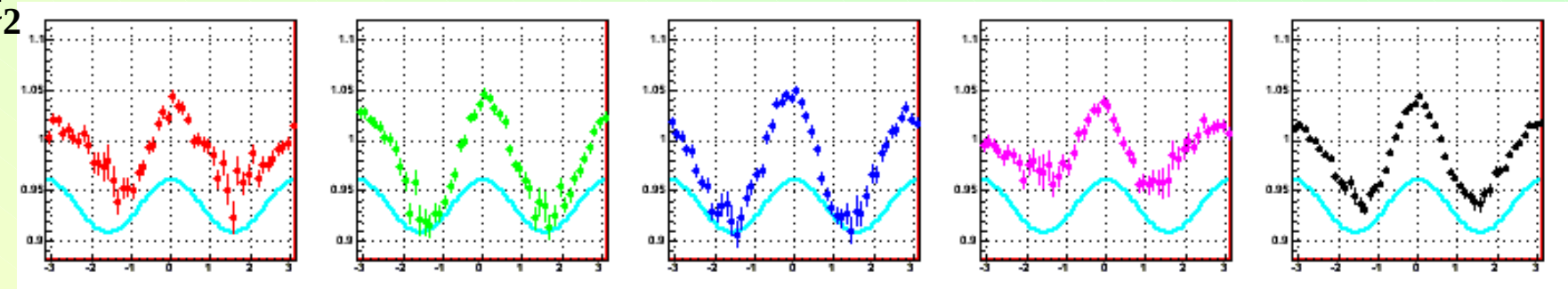


$\Phi_{R.P.}$: rxn S+N
$p_T^{TRIG.}$: 1.5-4.0 GeV/c
$p_T^{ASSO.}$: 0.5-1.5 GeV/c



(1) **(2)** **(3)** **(4)** **(all)**

c_2



$N\{1+2p_2\cos(2x)\}$

(A) event mixing with similar centrality / z vertex / reaction plane orientation

(B) trigger particle angular selection w.r.t. R.P. is same for both real and mixed pairs
trigger particle and r.p. are always from the same event in both real and mixed pairs

(C) common normalization for all (1)-(4)

$p_2 = v_2^{Trig.}\, v_2^{Asso.} / R^2 - v_2^{Trig.}\, v_2'^{Asso.}$

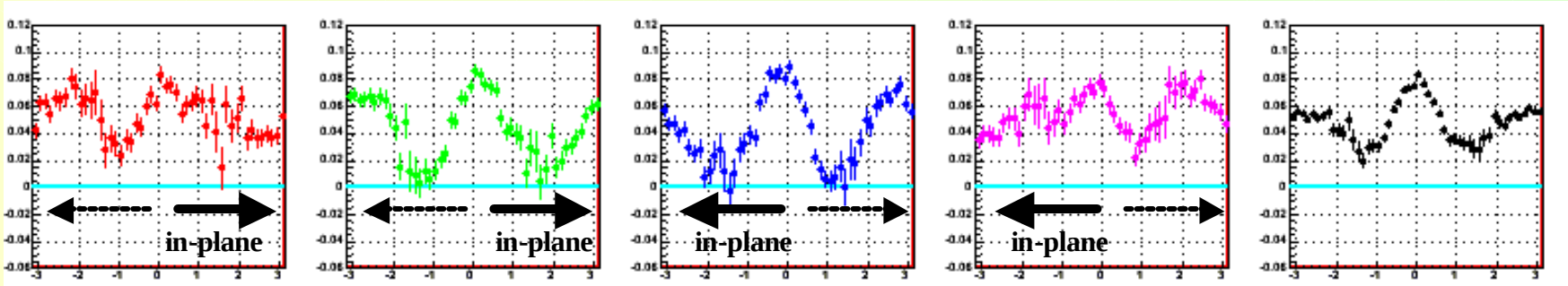
R : reaction plane resolution $\langle\cos2(\Phi_{meas.}-\Phi_{true})\rangle$

$v_2^{Trig.}$: measured trigger particle v_2

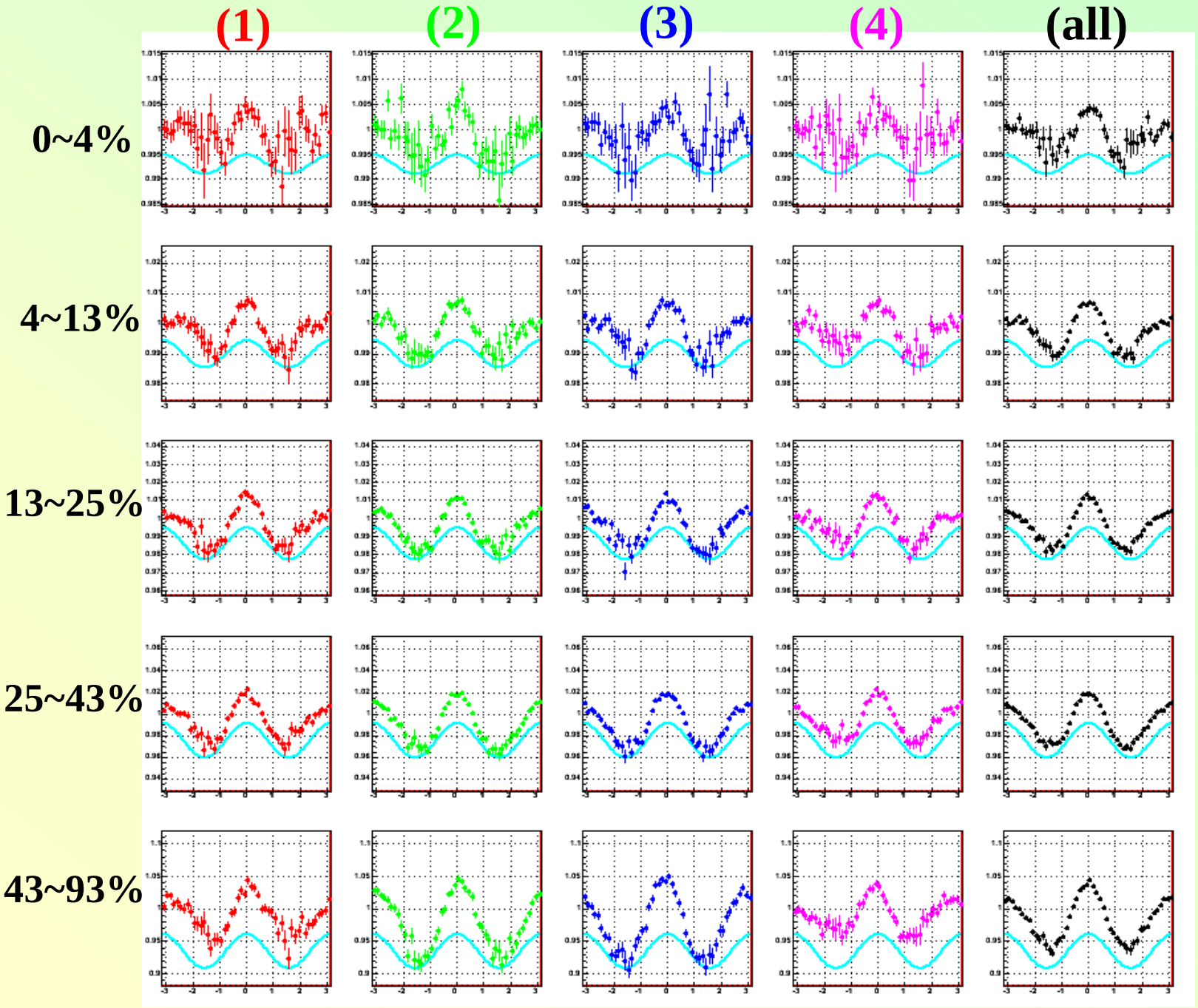
$v_2^{Asso.}$: measured associated particle v_2

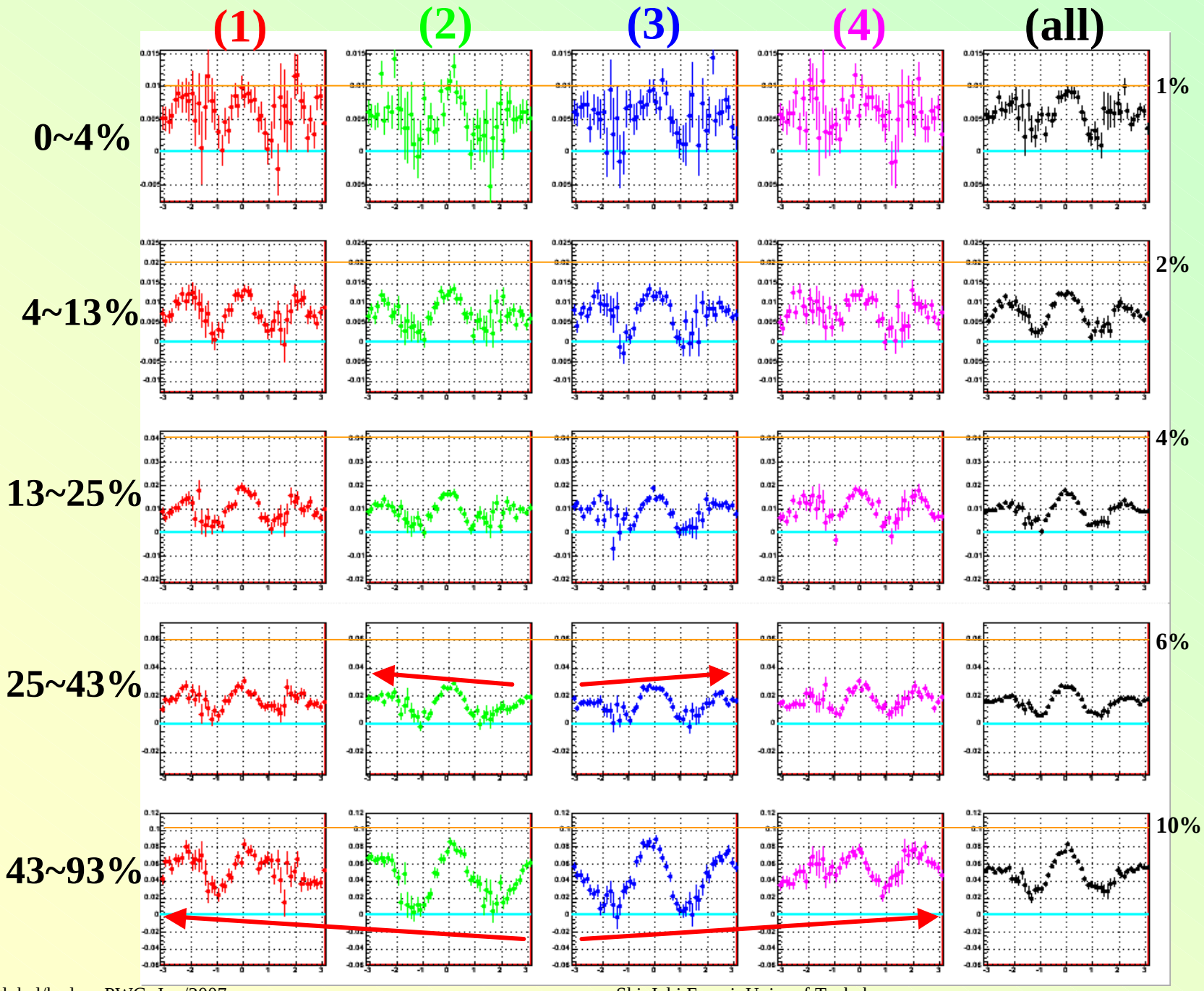
$v_2'^{Asso.}$: measured associated particle v_2 w.r.t. mixed event R.P.
(in order to consider r.p. bin width in the mixing)

After subtraction



$-\pi$ 0 $+\pi$ $\Delta f = f_{ASSO.} - f_{TRIG.}$ $-\pi$ 0 $+\pi$


(1)
(2)
(3)
(4)
(all)
0~4%
4~13%
13~25%
25~43%
43~93%


(1)
(2)
(3)
(4)
(all)
0~4%
4~13%
13~25%
25~43%
43~93%
1%
2%
4%
6%
10%

Summary

A new R.P. detector RXN gives the expected r.p. resolution

MPC (muon piston calorimeter) has better r.p. resolution than BBC

higher order flow (v_4…) , rare particle v_2 will be possible

R.P. dependent jet shape / HBT / invariant mass shape / …

Jets are the driving force of v_2 in peripheral … (same conclusion as run4)

Jets are biasing r.p. angle more in peripheral…

(Especially w.r.t. RXN, because of smaller eta gap from mid-rapidity.

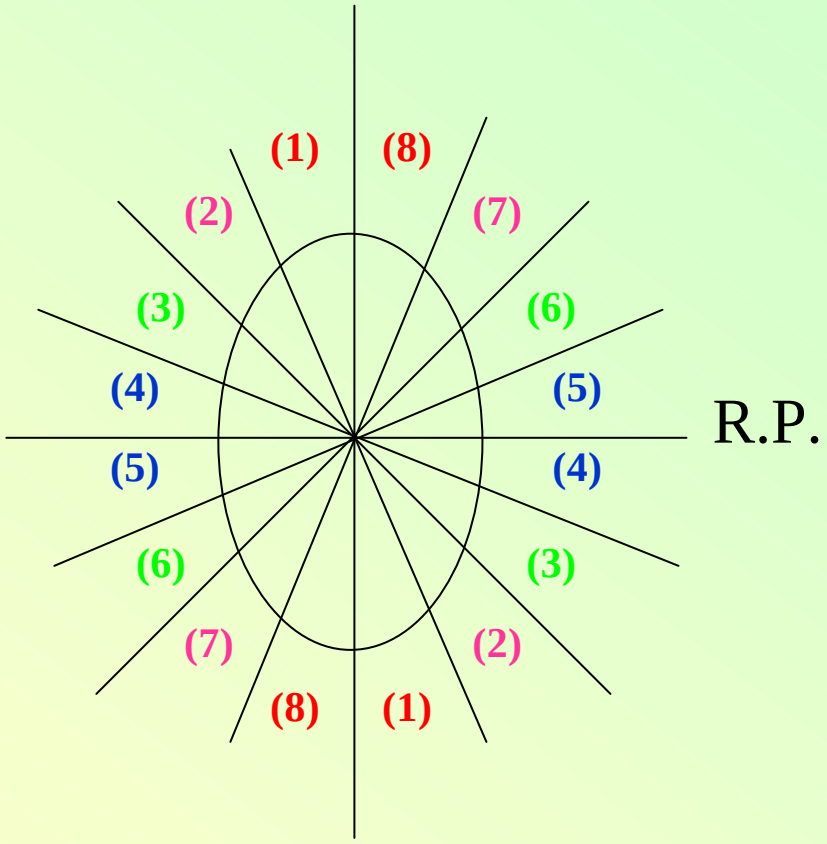
The known effects using pythia have been studied in LOI for RXN.)

Backup slides

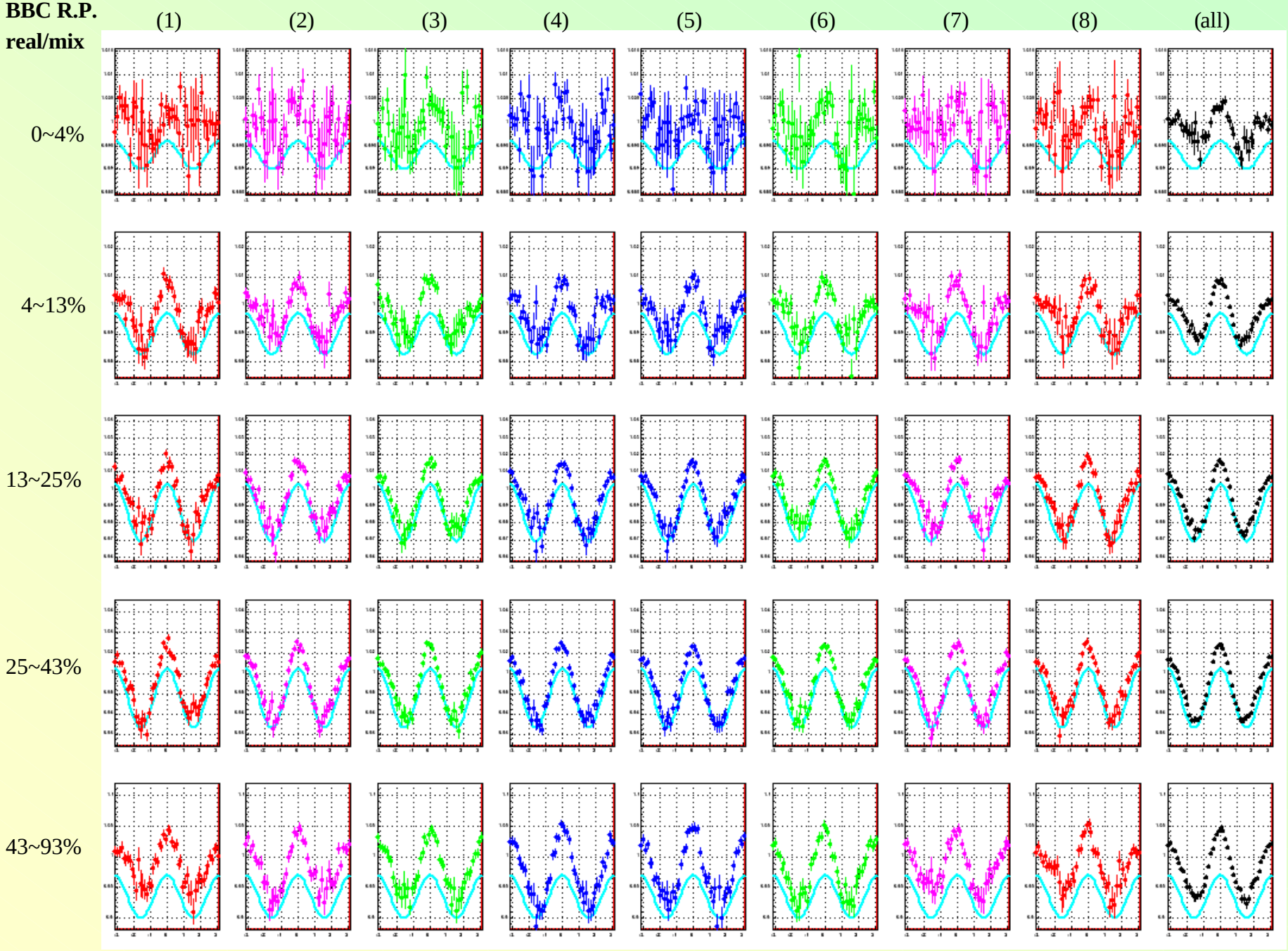
smaller bin for trigger particle angular selection

run4 jet results with bbc r.p. for comparison

comparison with parton-cascade generator AMPT

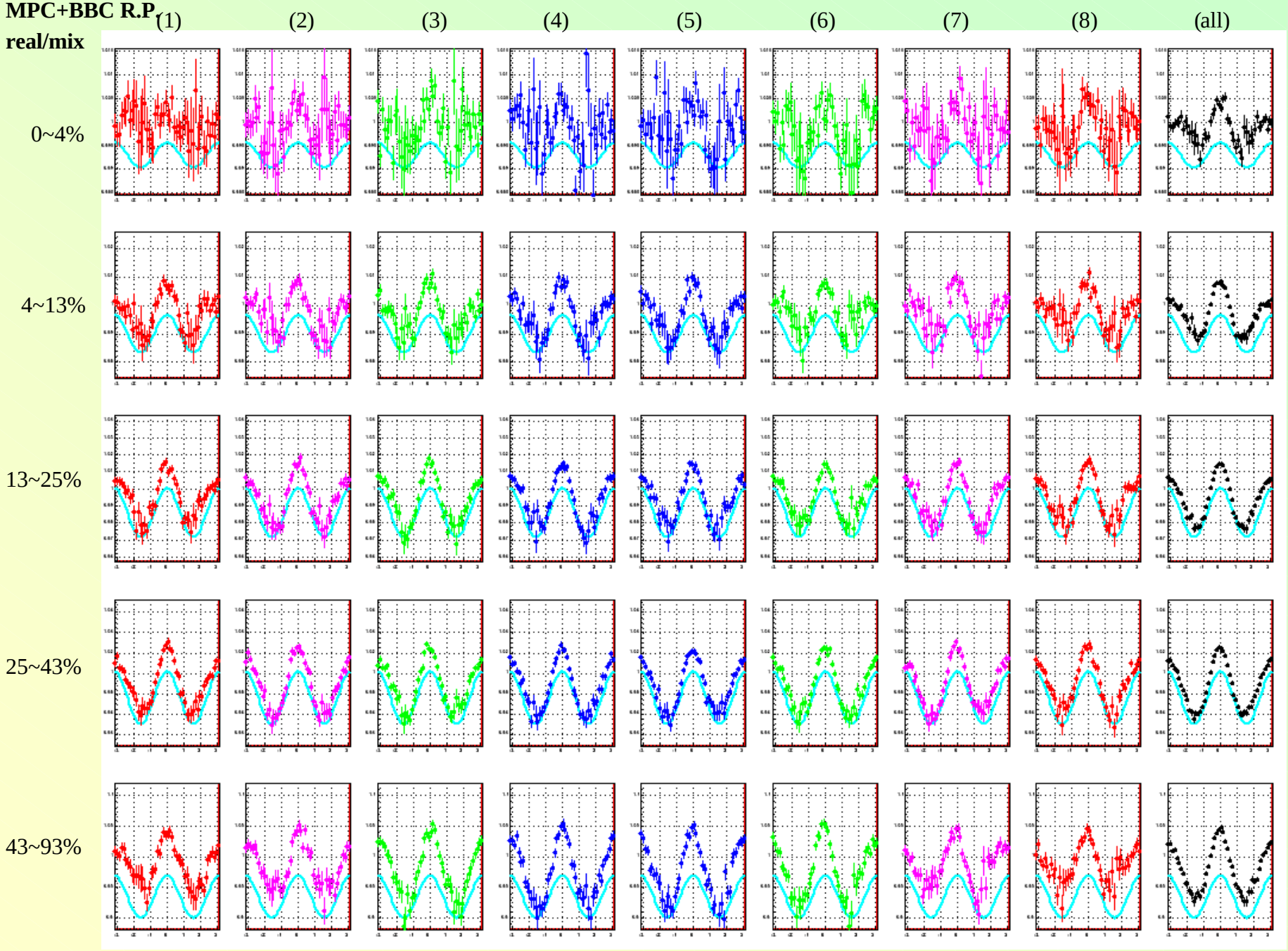

(1)
(8)
(2)
(7)
(3)
(6)
(4)
(5)
R.P.
(5)
(4)
(6)
(3)
(7)
(2)
(8)
(1)

BBC R.P. real/mix



MPC+BBC R.P

real/mix



RXN R.P.
real/mix

(1) (2) (3) (4) (5) (6) (7) (8) (all)

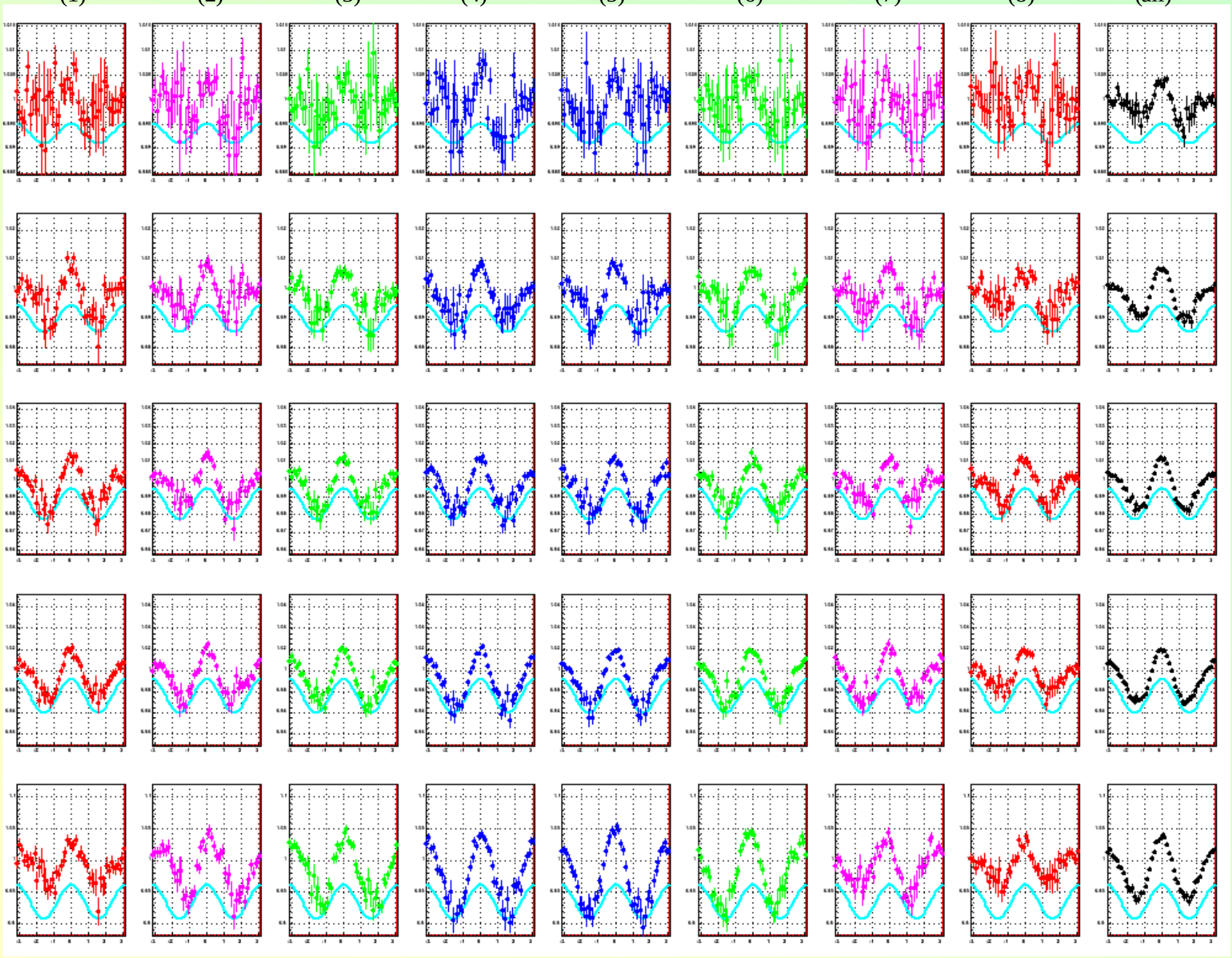
0~4%

4~13%

13~25%

25~43%

43~93%



RXN+MPC
+BBC R.P.
real/mix

(1) (2) (3) (4) (5) (6) (7) (8) (all)

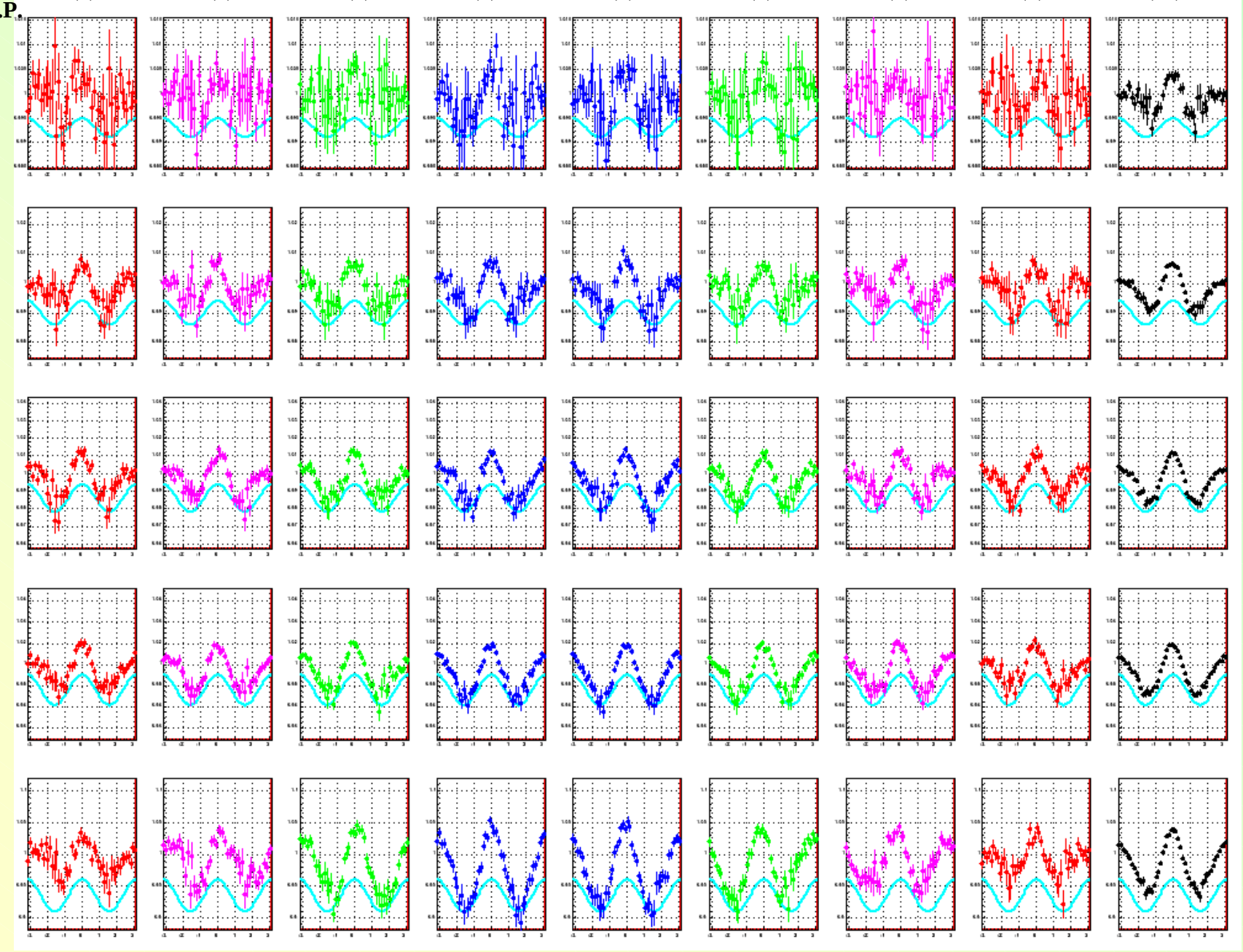
0~4%

4~13%

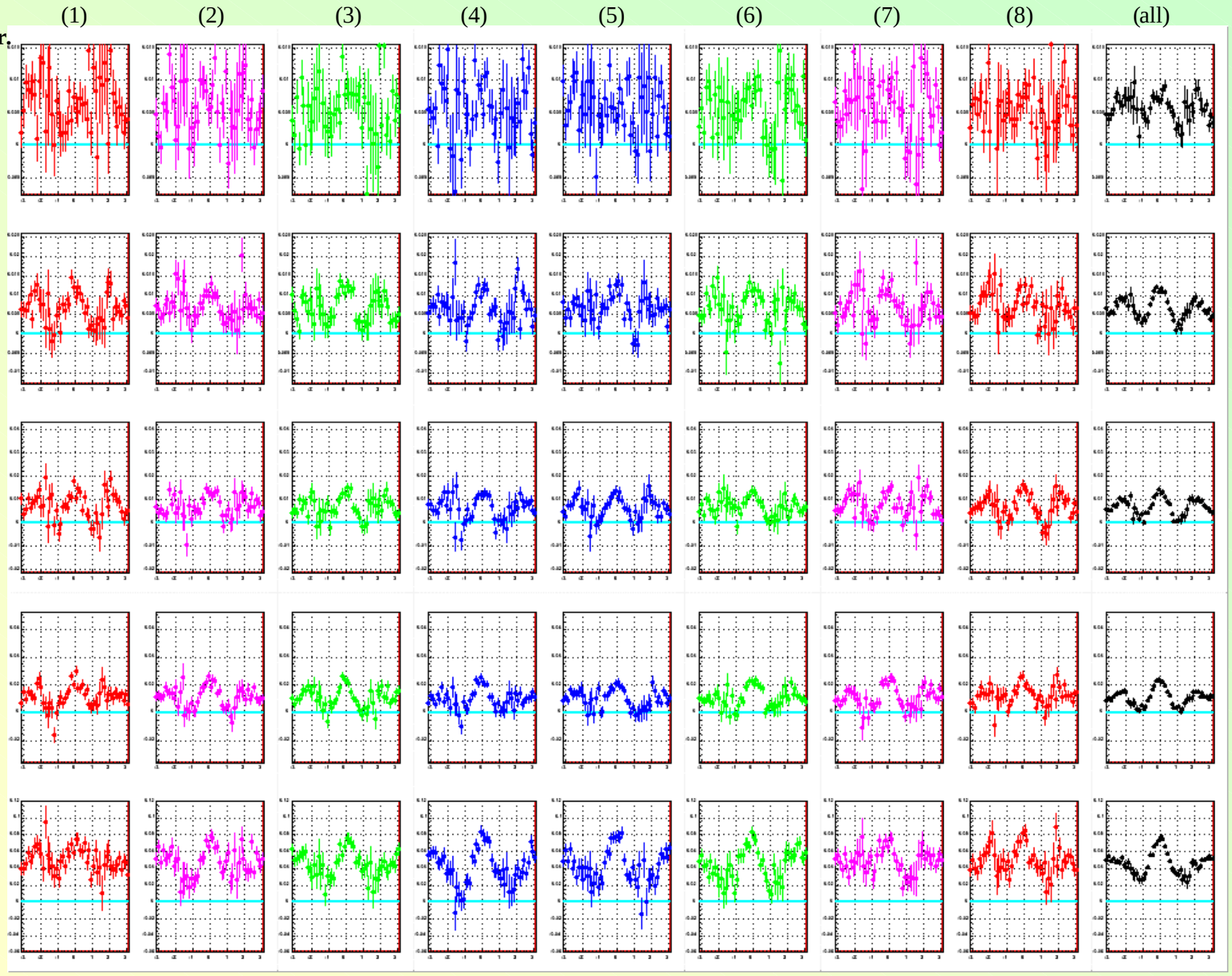
13~25%

25~43%

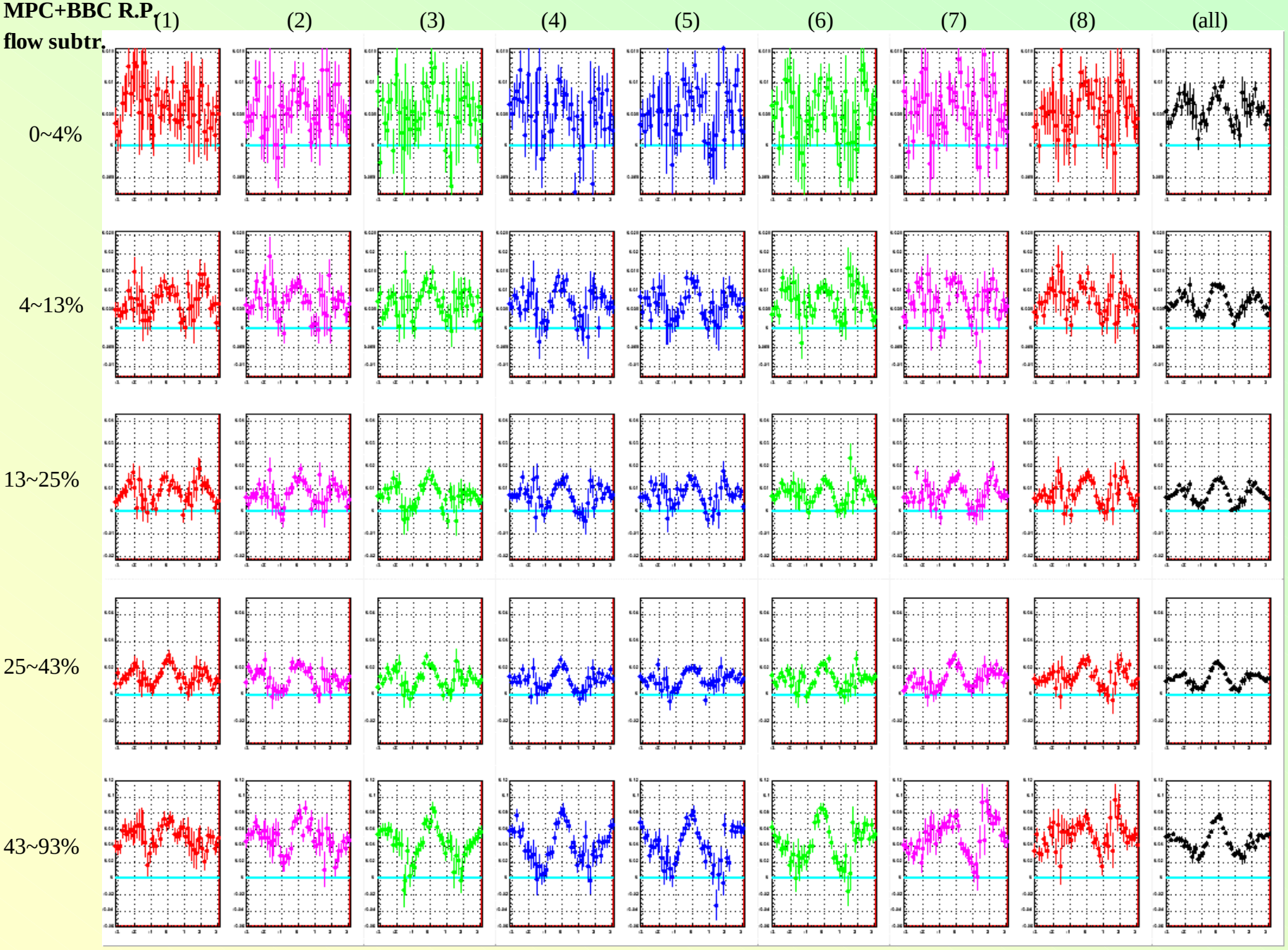
43~93%



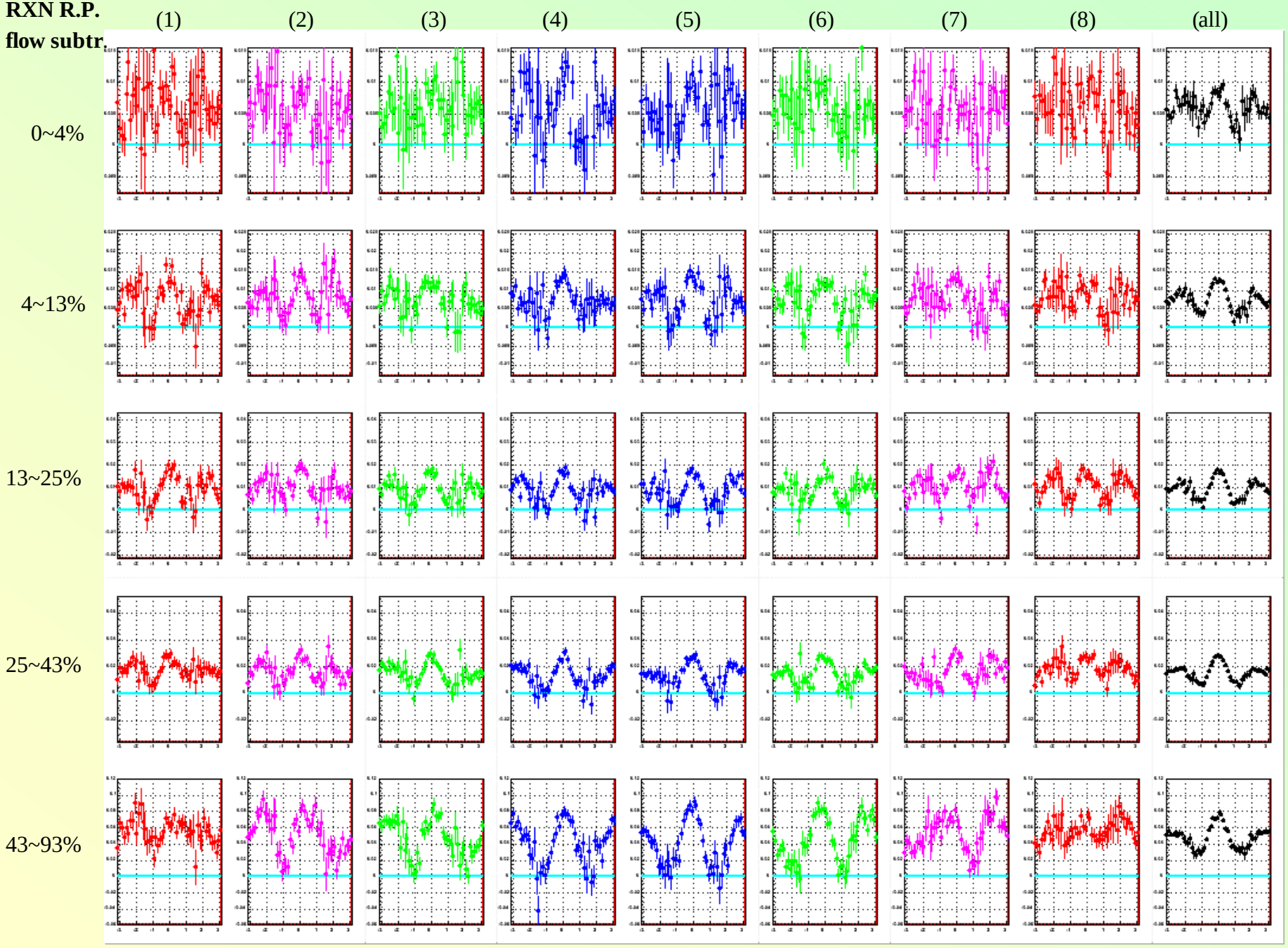
BBC R.P. flow subtr.



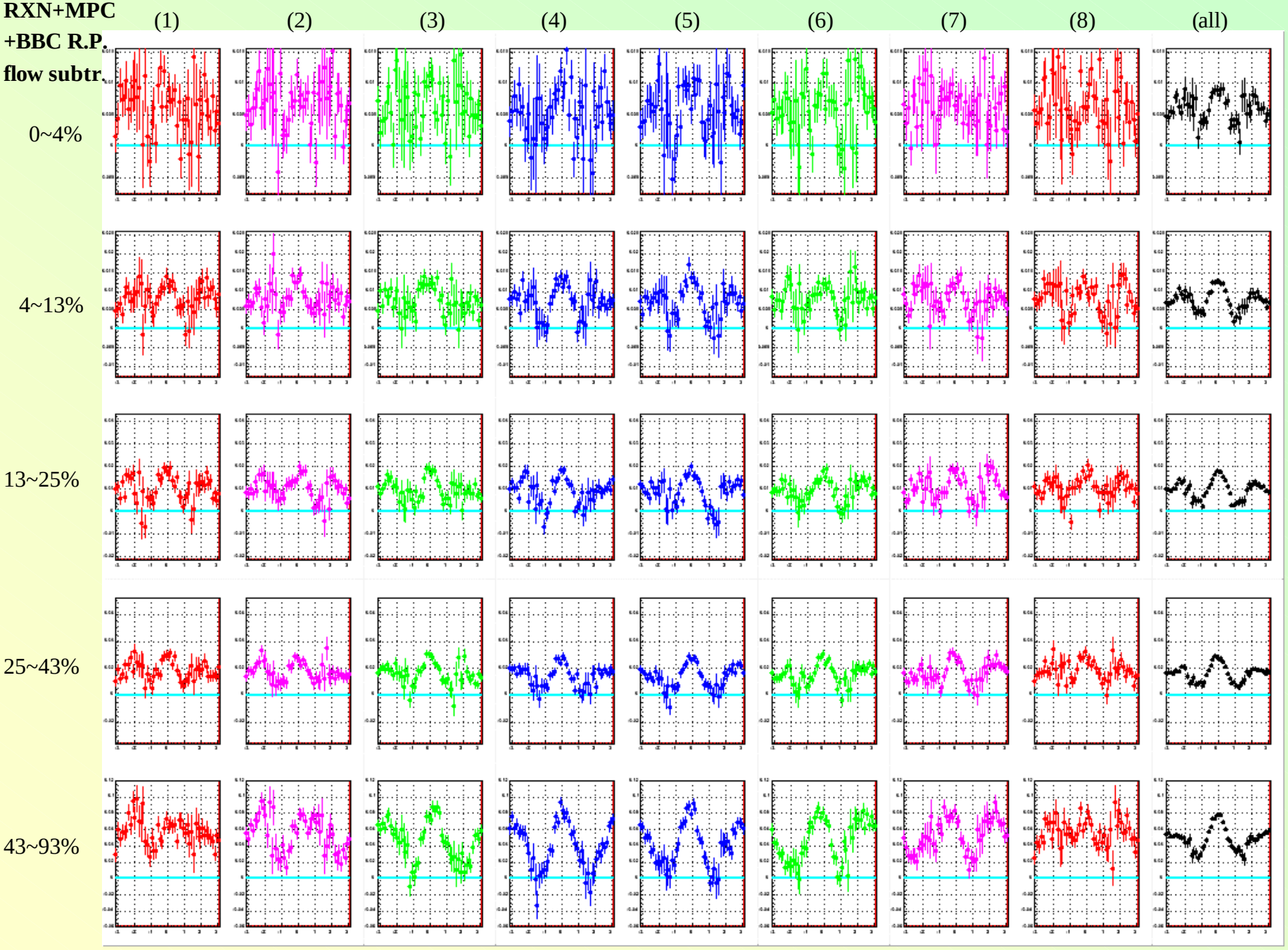
MPC+BBC R.P. flow subtr.



RXN R.P.
flow subtr.



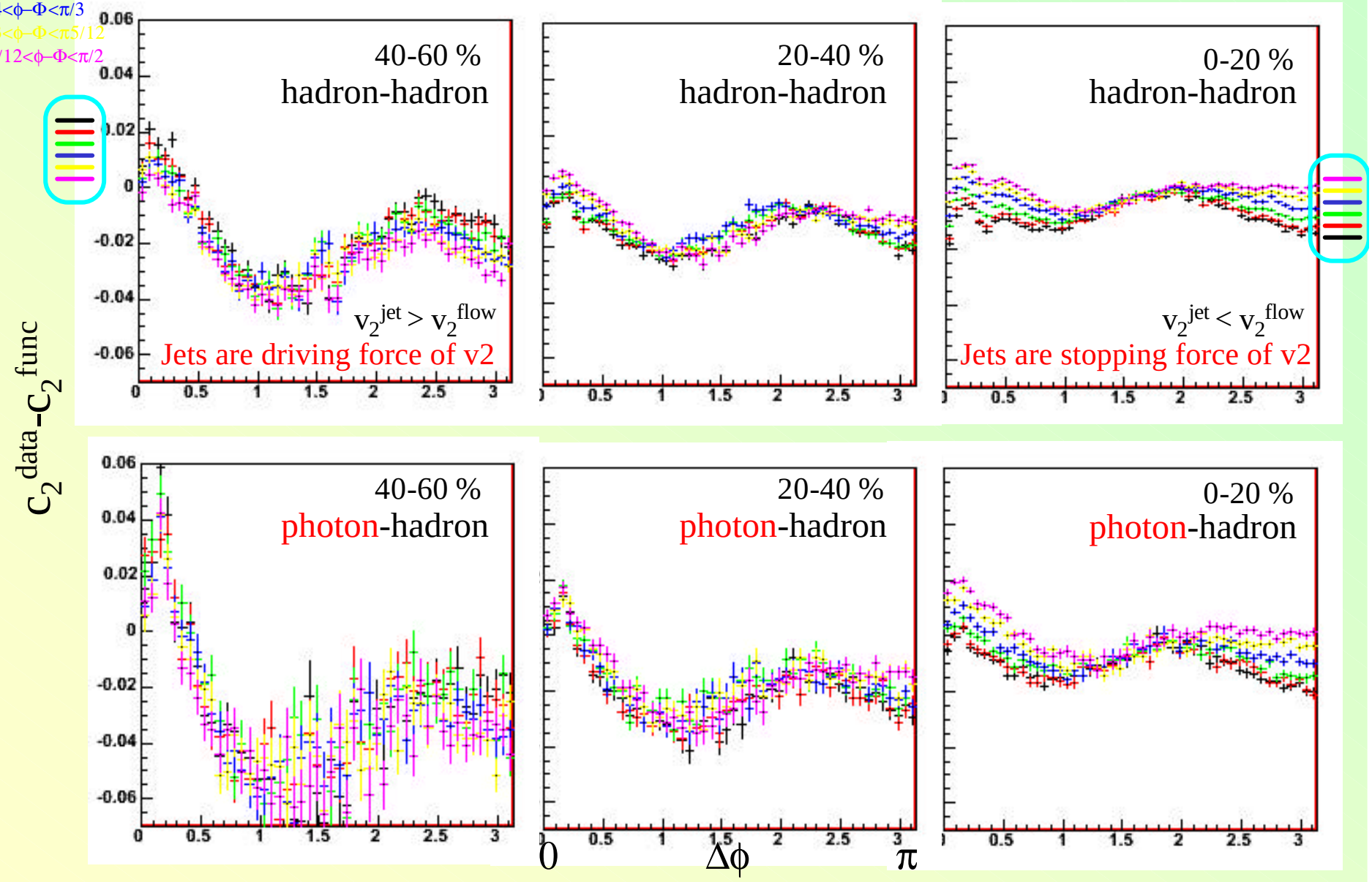
RXN+MPC +BBC R.P. flow subtr.



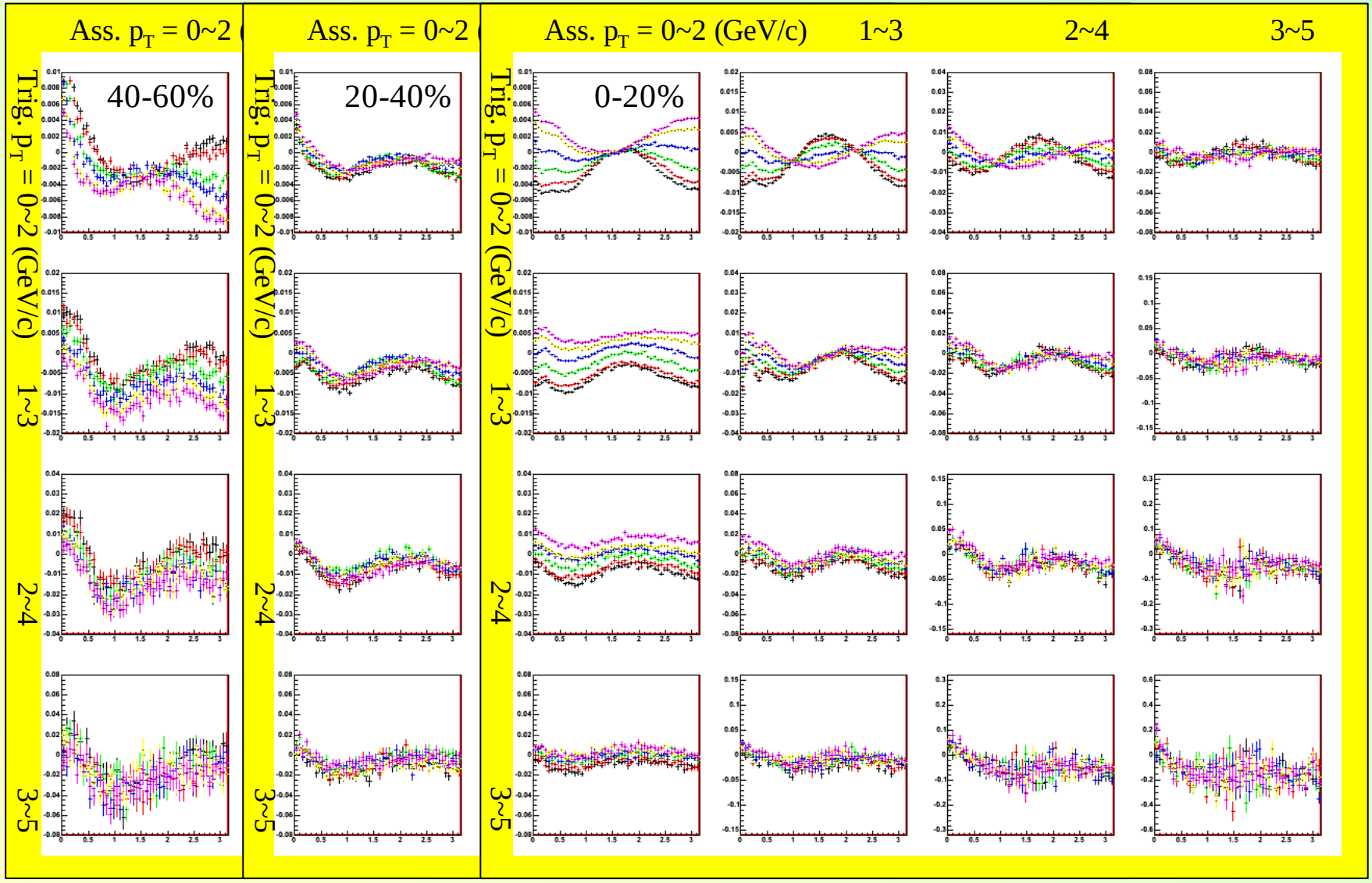
$0<\phi-\Phi<\pi/12$
$\pi/12<\phi-\Phi<\pi/6$
$\pi/6<\phi-\Phi<\pi/4$
$\pi/4<\phi-\Phi<\pi/3$
$\pi/3<\phi-\Phi<\pi5/12$
$\pi5/12<\phi-\Phi<\pi/2$

Trigger particles selected in- or out of plane ($1<p_T<3$ GeV/c)

Associated particles in all phi ($1<p_T<3$ GeV/c)



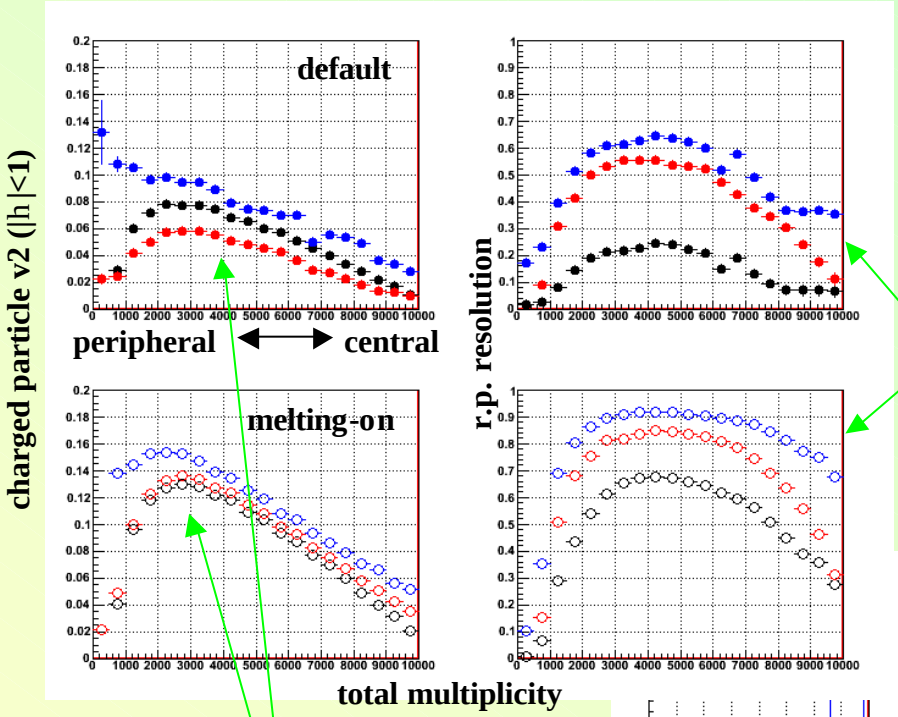
Au+Au 200GeV run4 hadron-hadron : $c_2^{data}-c_2^{func}$



AMPT 200GeV Au+Au

default option (solid symbols)

melting-on (open symbols)



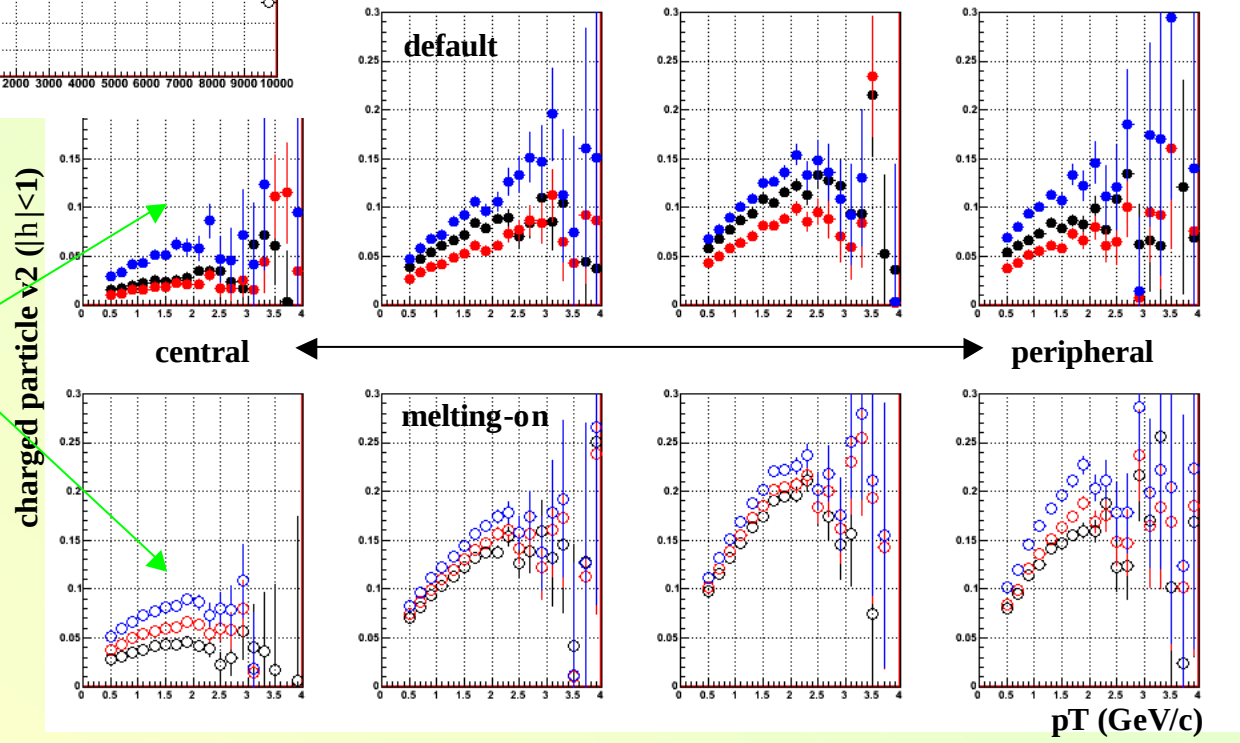
sub-event correlation

$\langle\cos2(F_A-F_B)\rangle$

true resolution

$\langle\cos2(F_{meas.}-F_{true})\rangle$

estimated r.p. resolution



black symbols :

true v2 w.r.t. true r.p.

red symbols :

measured v2 w.r.t.

calculated r.p. at |h|=1.7~4

blue symbols :

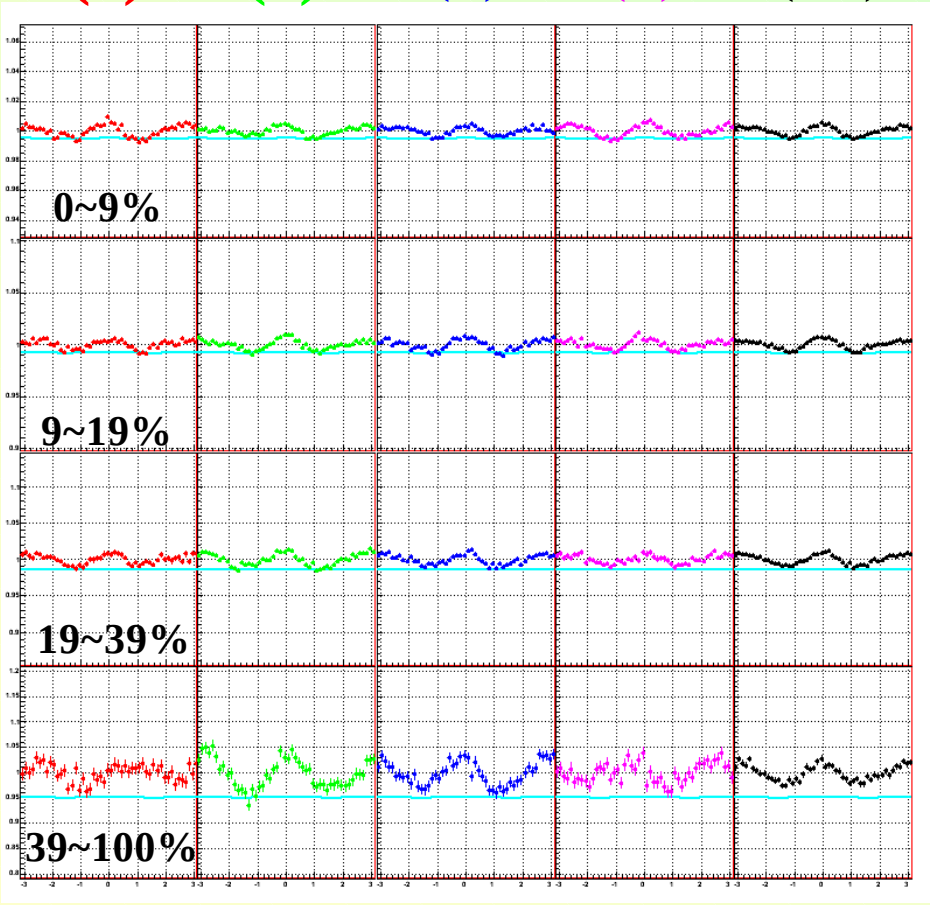
corrected v2 with

estimated r.p. resolution

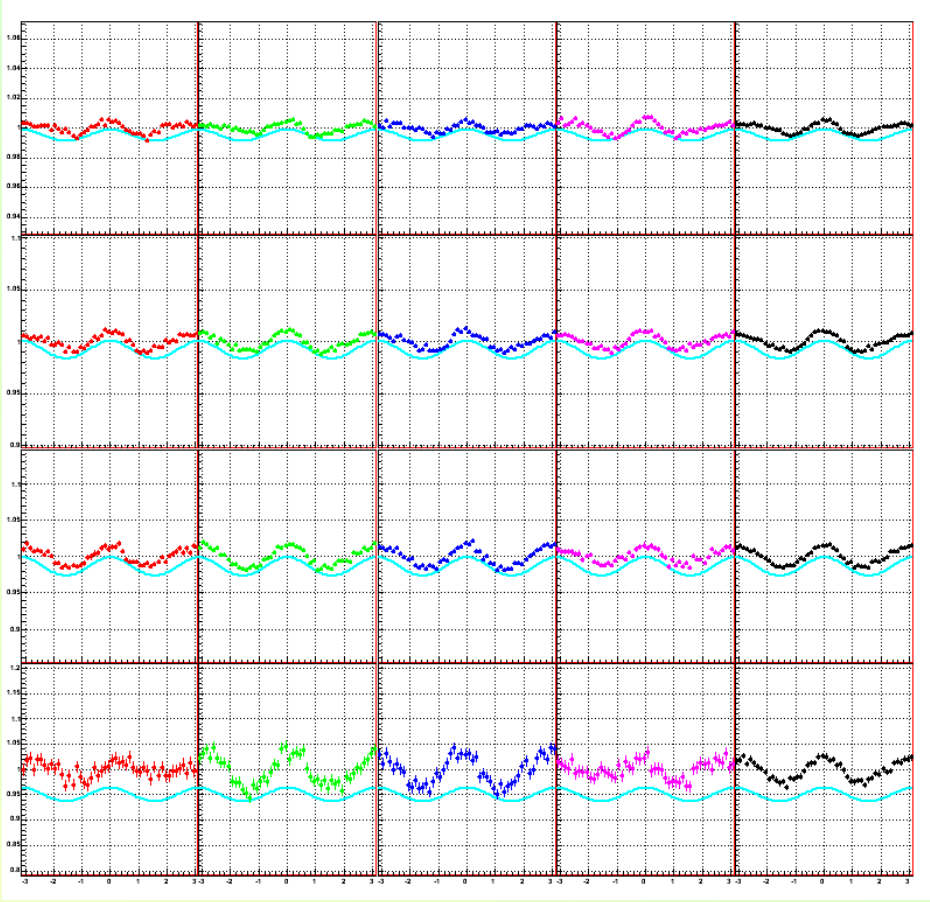
AMPT 200GeV Au+Au

default option

(1) (2) (3) (4) (all)



with true r.p.

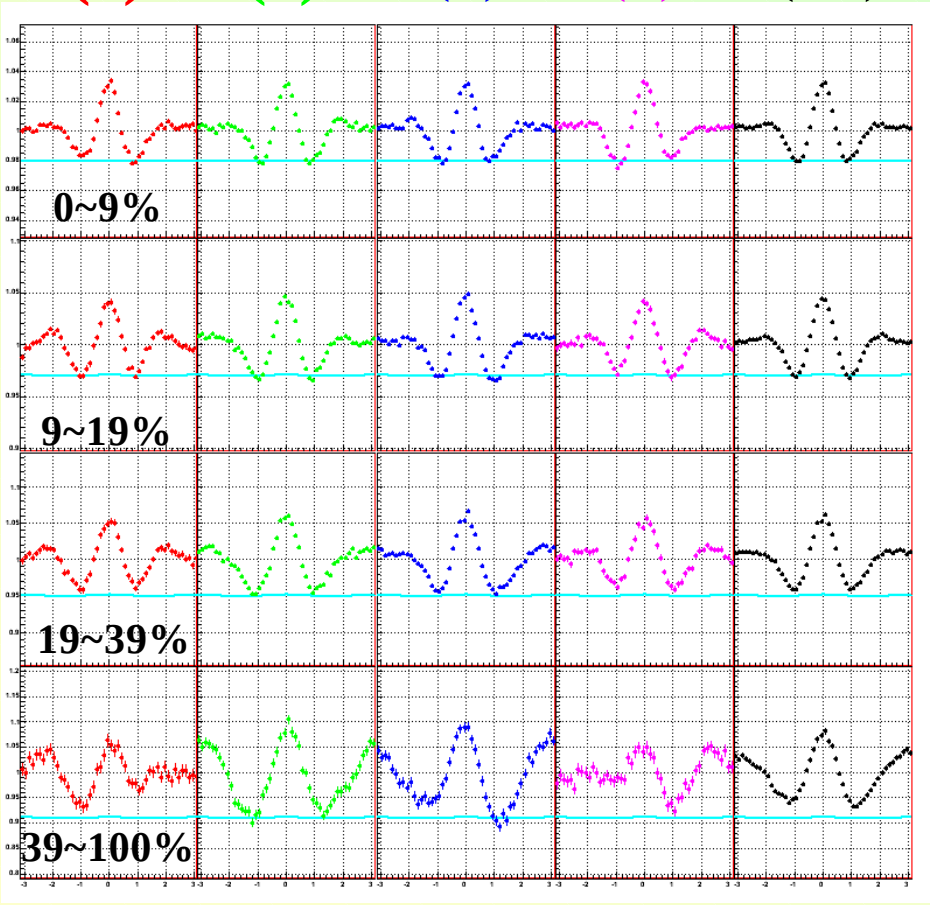


with calculated r.p.

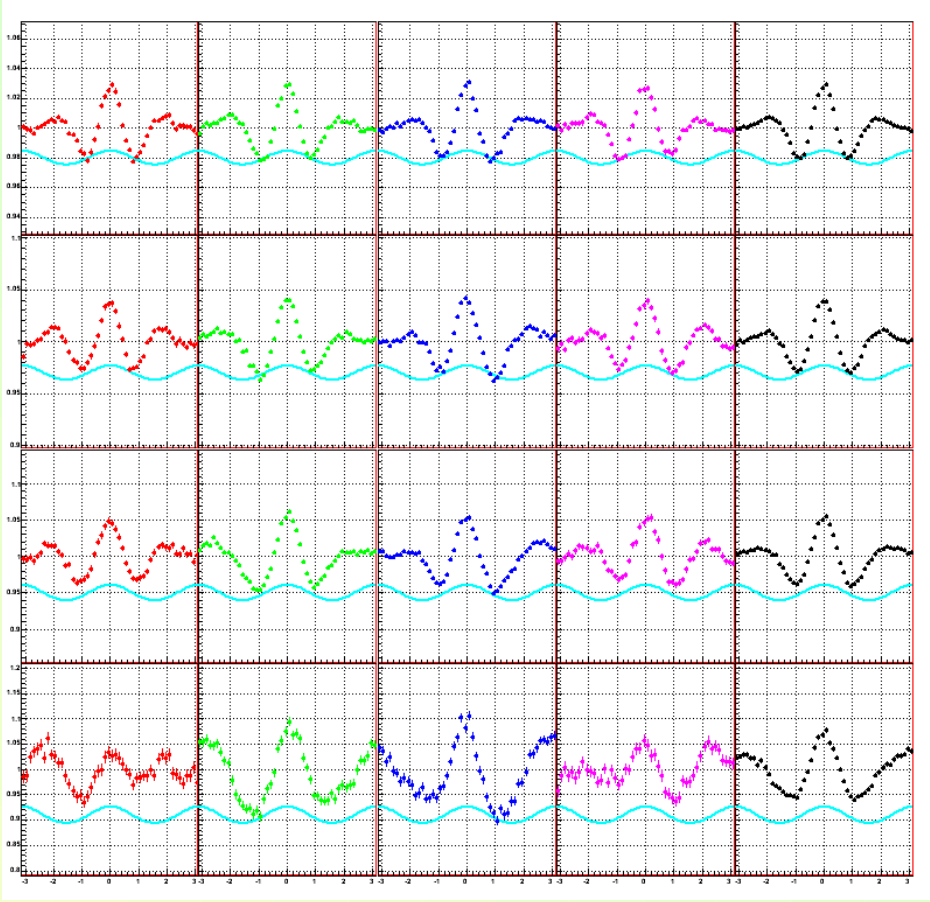
AMPT 200GeV Au+Au

melting-on

(1) (2) (3) (4) (all)



with true r.p.



with calculated r.p.