Amendment to Analysis Note at 54.4 GeV Net-proton Cumulants

Contents

I. AMENDMENT TO ANALYSIS

In the net-proton cumulants analysis in $\sqrt{s_{NN}} = 54.4$ GeV Au+Au collisions, a bad event cut was missing. The analysis is redone with this cut as shown in Fig. 1 A new bad runs list (81 bad runs in total) is also determined and used in analysis. The bad run selection procedure is done using a STAR official bad run code at https://github.com/star-bnl/star-sw/tree/main/StRoot/PWGTools/BadRunQA. The 81 new bad runs can be seen in Tab I.

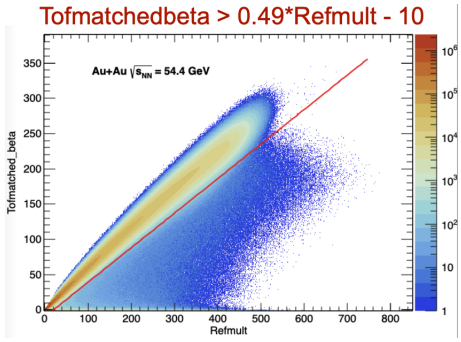

FIG. 1: The correlation distribution between tofmatchedbeta and RefMult where tofmatchedbeta is defined as number of primary tracks with $|\eta| < 0.5$, dca < 3.0cm, nHitsFit > 10, and TOF $\beta > 0.1$.

II. BAD RUN SELECTION

In this section, various variables are used to select bad runs.

18153052	18153057	18154004	18154005	18154006	18154009	18154037	18154038
18154039	18154040	18154041	18154049	18154050	18154051	18154052	18154057
18154058	18154059	18154060	18154061	18154065	18155024	18155025	18155026
18155029	18155038	18156031	18157003	18157024	18157061	18158020	18158021
18160015	18160016	18160042	18161021	18162002	18164044	18165004	18166054
18167014	18167015	18167016	18167017	18167018	18167020	18167027	18167045
18167046	18167047	18168013	18168015	18168019	18168048	18169008	18169009
18169020	18169021	18169022	18169029	18169030	18169035	18169036	18171002
18171003	18171004	18171005	18171006	18171007	18171008	18171009	18171031
18171032	18171033	18171034	18171035	18171036	18171037	18171038	18171044
18172014							

TABLE I: New bad runs list.

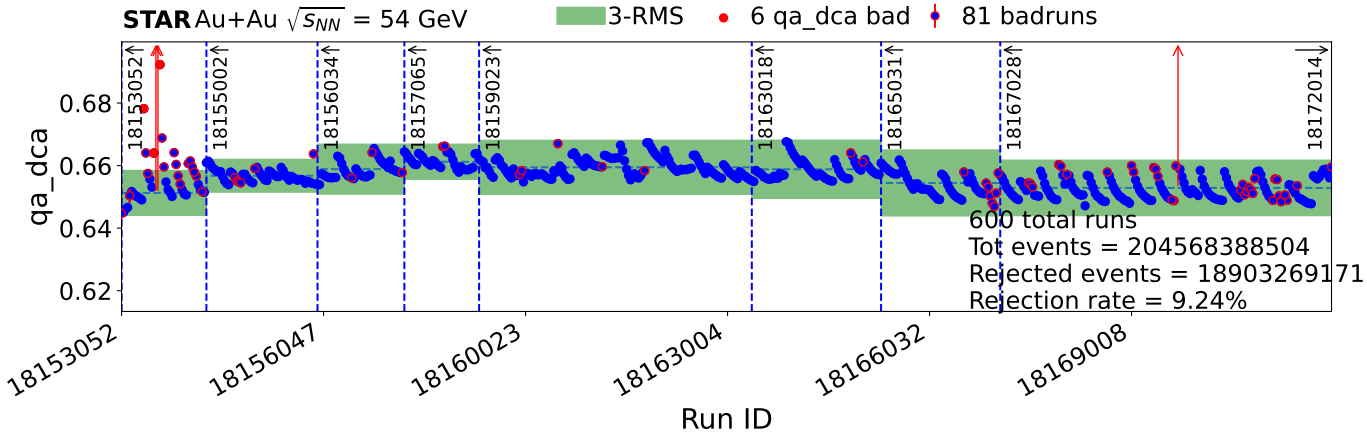

FIG. 2: Track variable DCA.

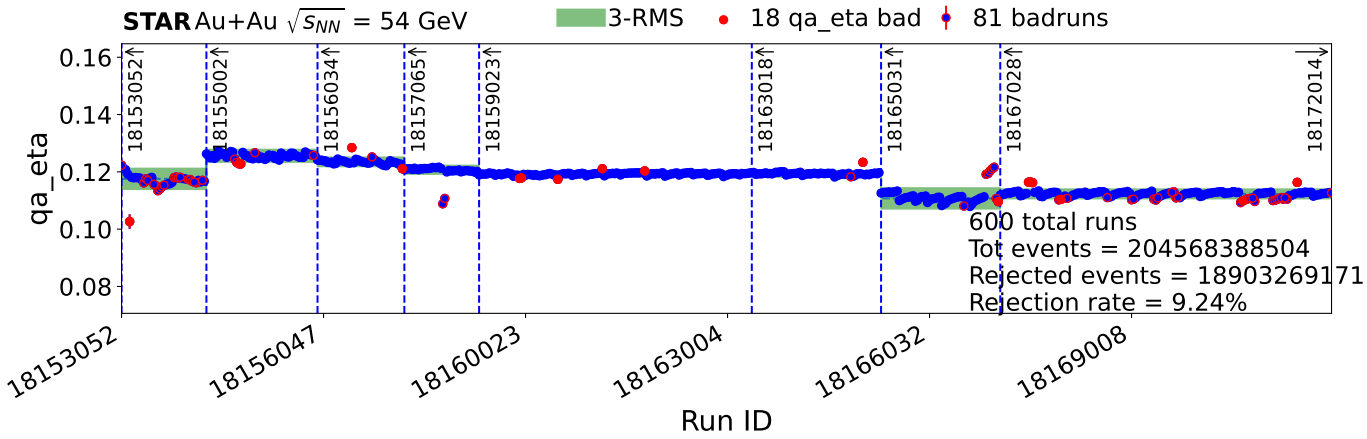

FIG. 3: Track variable η.

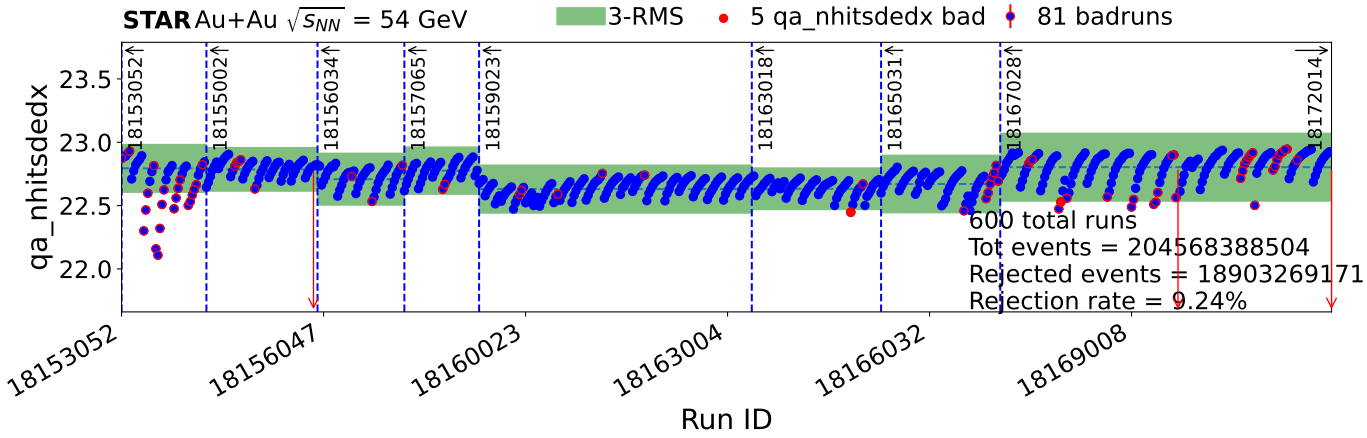

FIG. 4: Track variable nHitsdEdx.

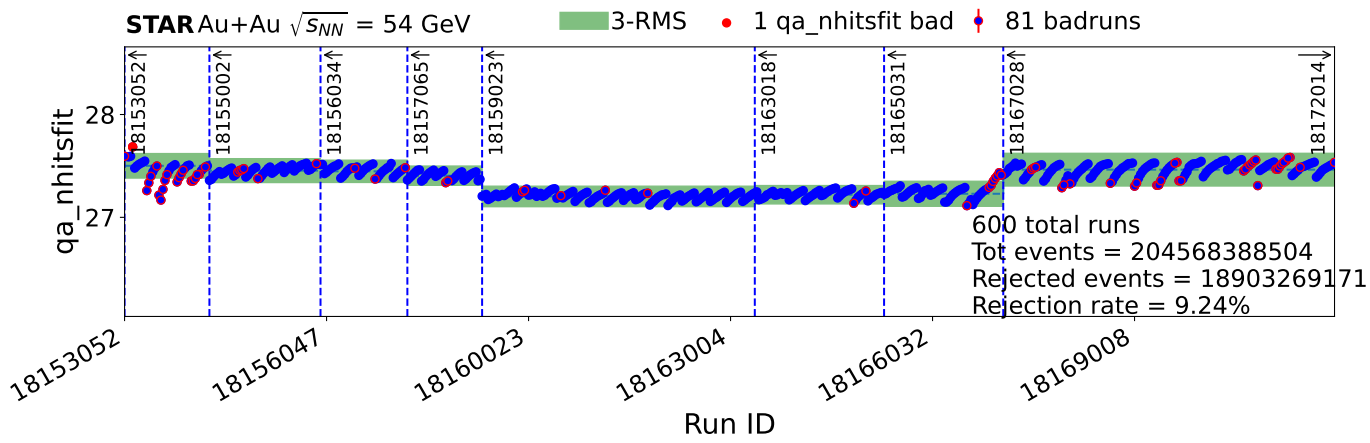

FIG. 5: Track variable nHitsFit.

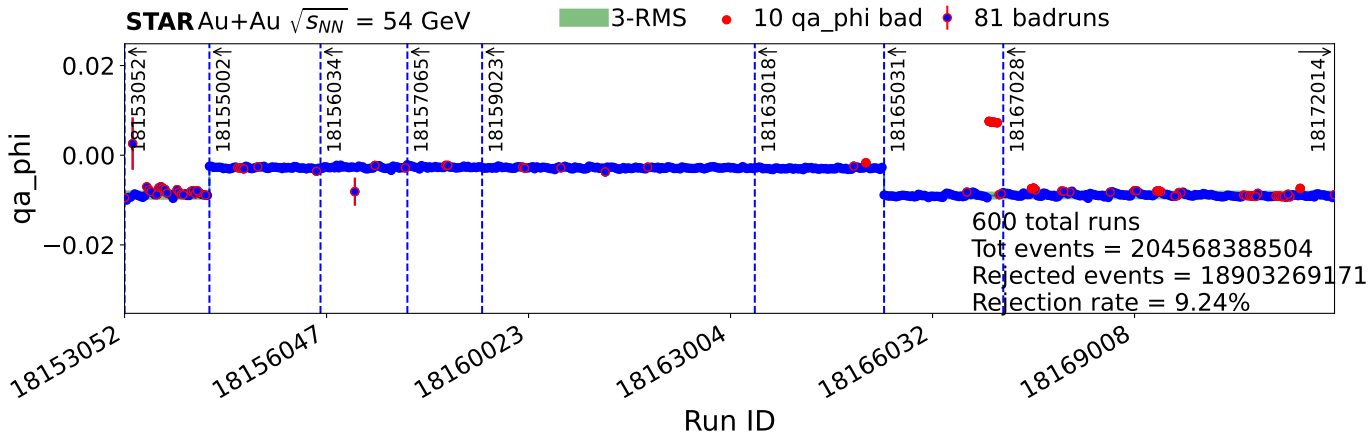

FIG. 6: Track variable ϕ.

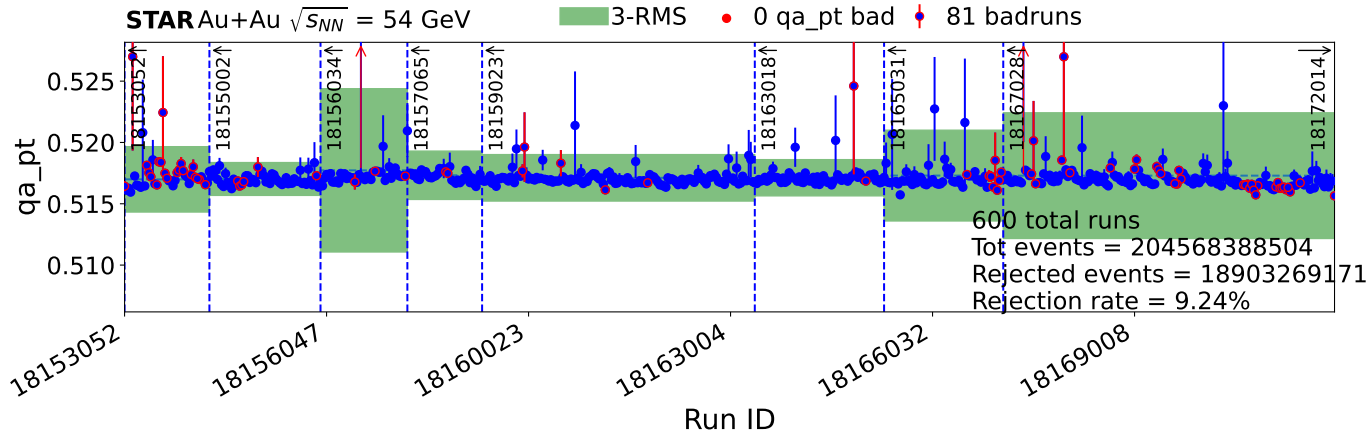

FIG. 7: Track variable p_{T}.

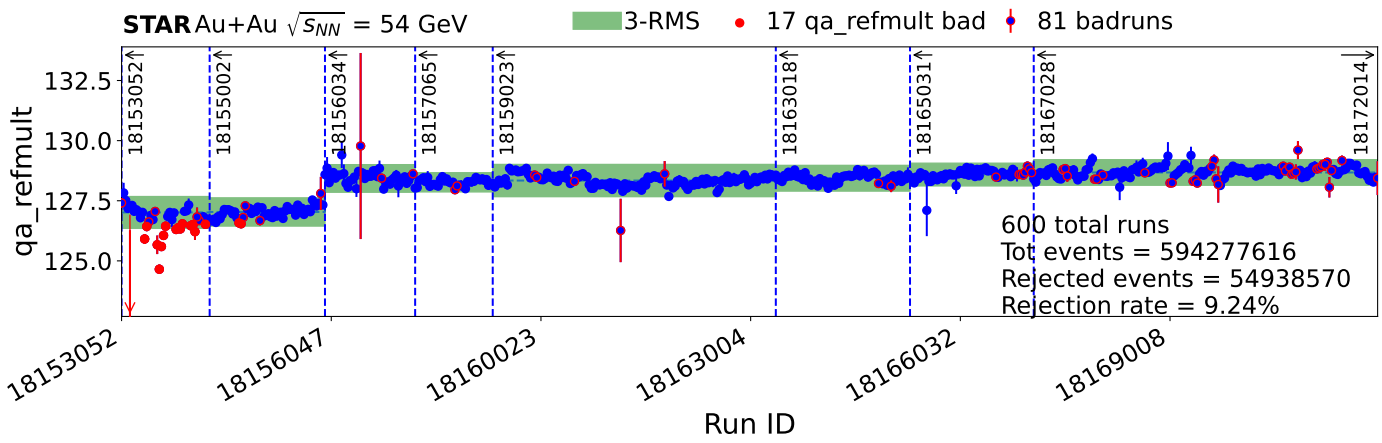

FIG. 8: Event variable refmult.

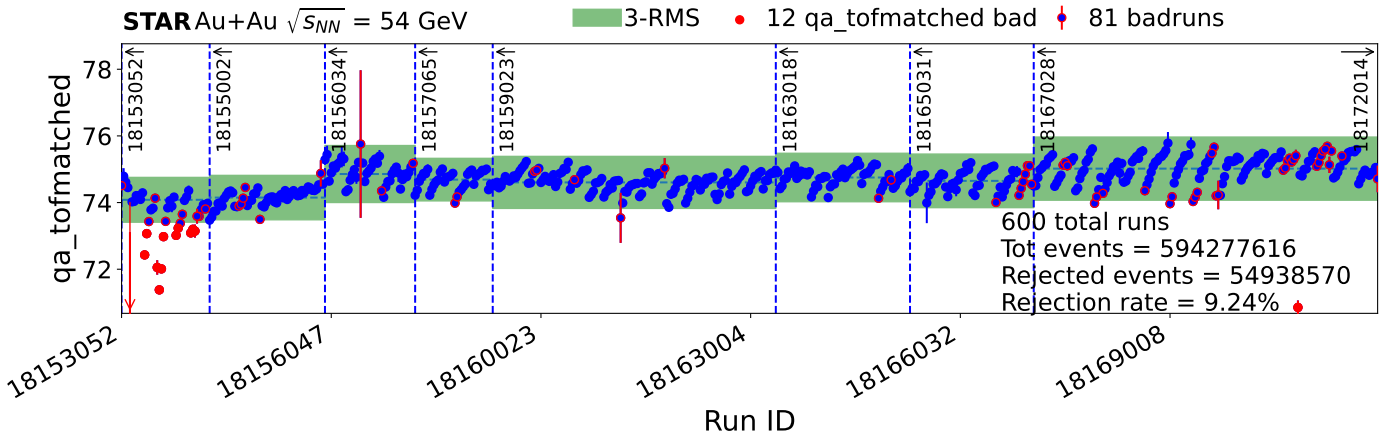

FIG. 9: Event variable tofmatched.

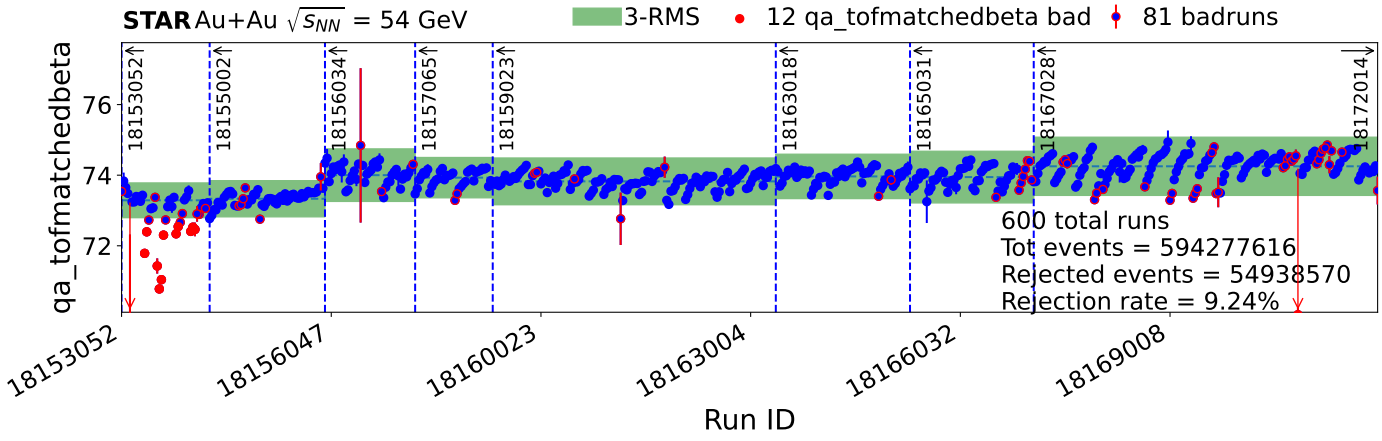

FIG. 10: Event variable tofmatchedbeta.

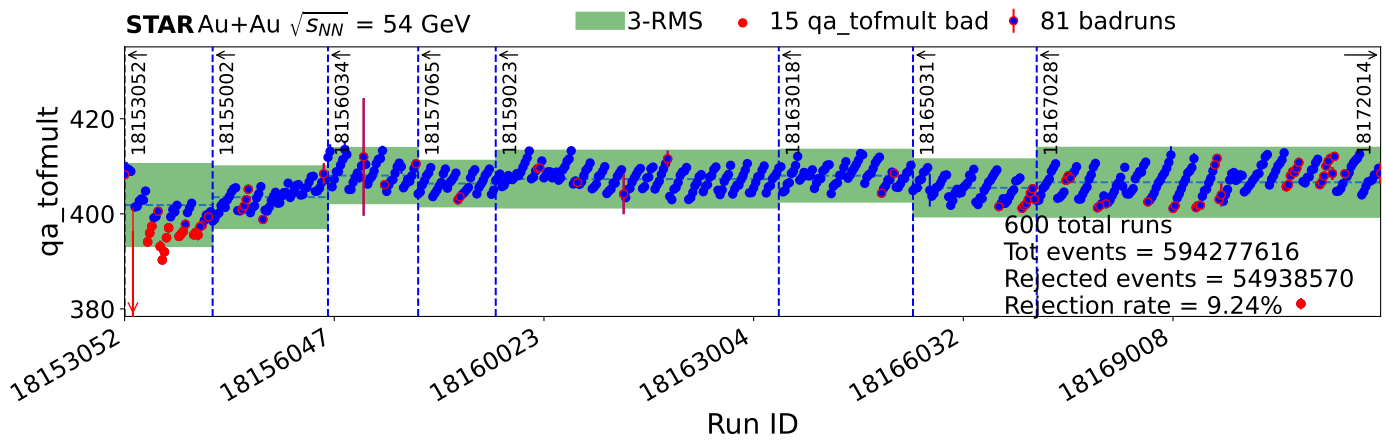

FIG. 11: Event variable tofmult.

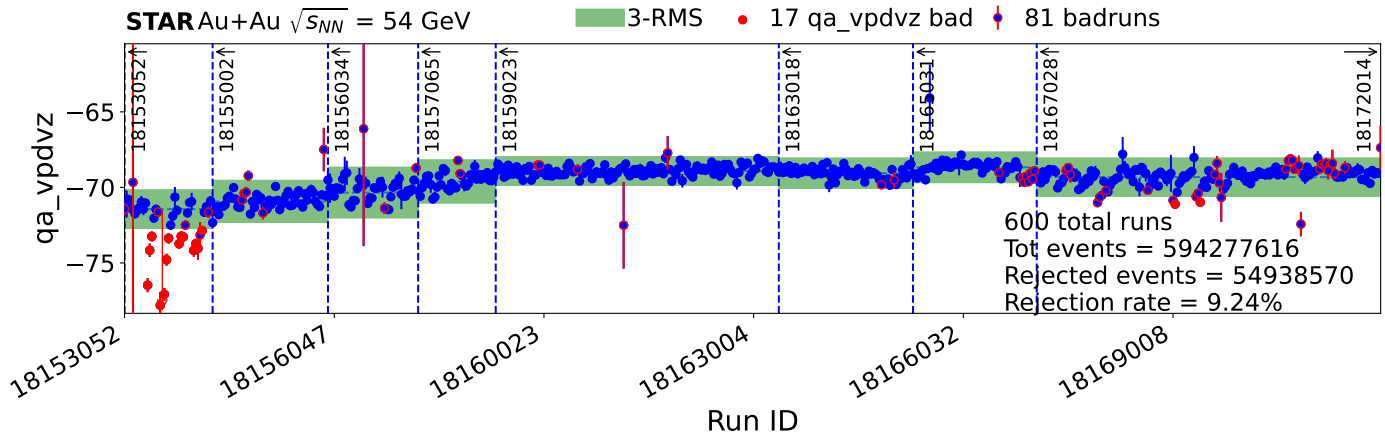

FIG. 12: Event variable VpzVz.

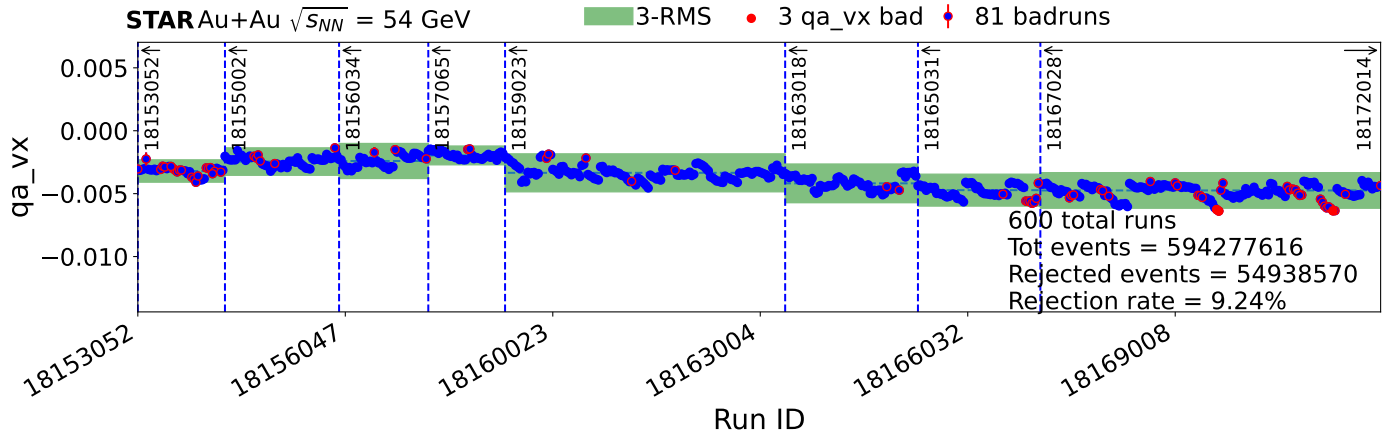

FIG. 13: Event variable Vx.

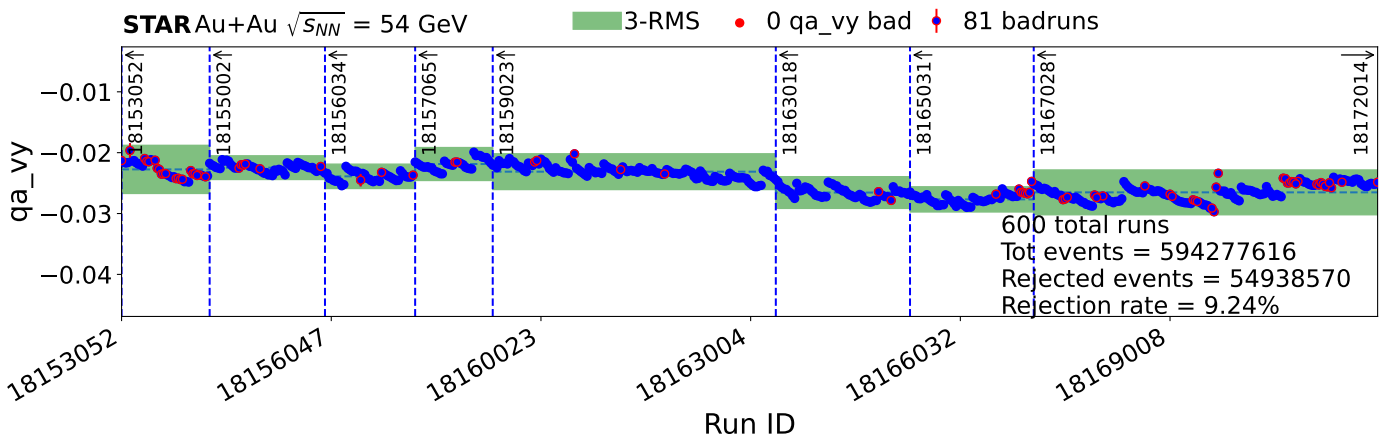

FIG. 14: Event variable Vy.

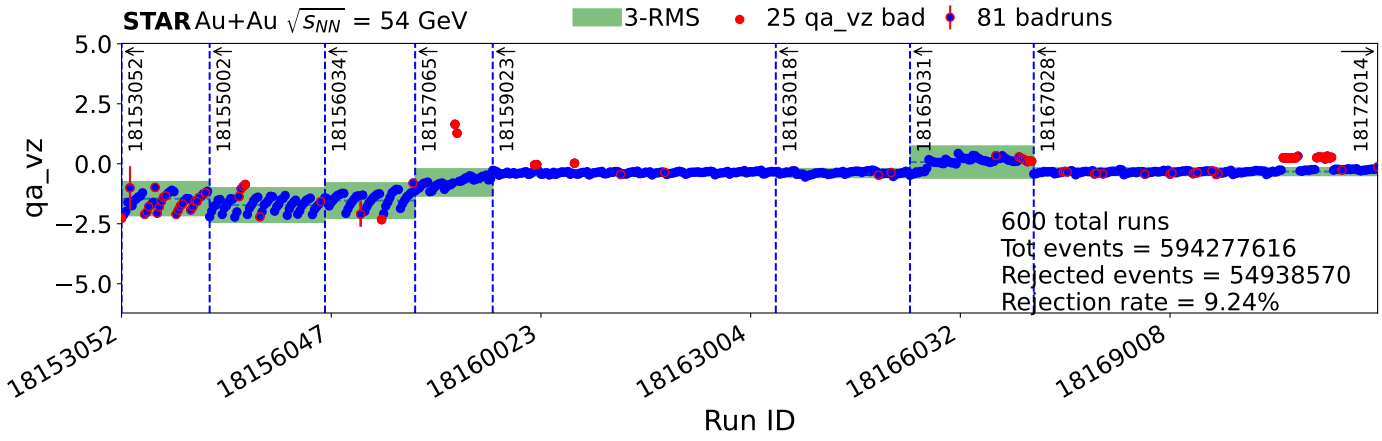

FIG. 15: Event variable Vz.

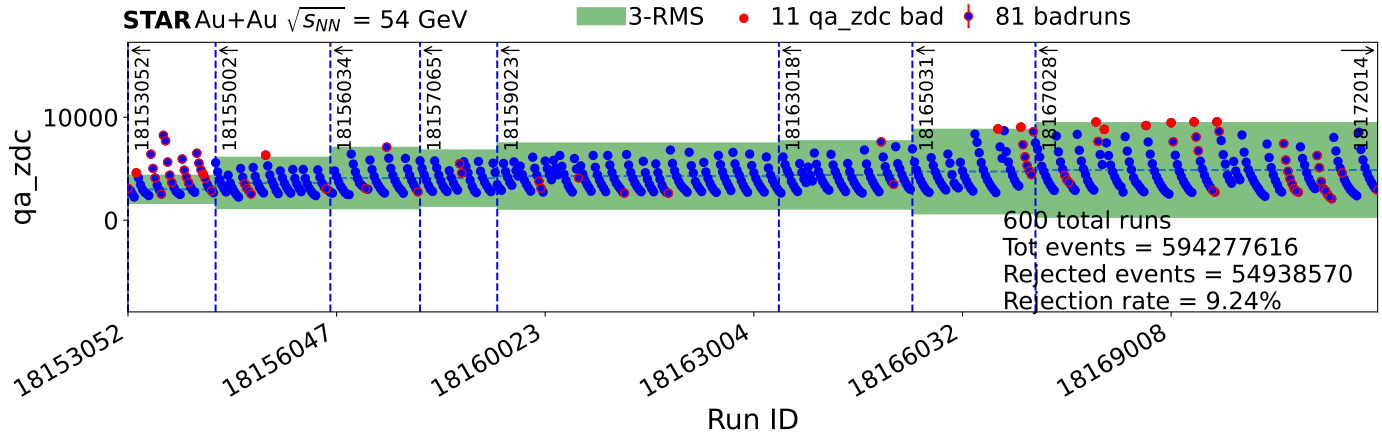

FIG. 16: Event variable ZDC.

Variable	default				
DCA	0.8	0.9	1	1.1	1.2
nHitsFit >	15	18	20	22	25
$\|n\sigma_p\|$ <	1.6	1.8	2	2.2	2.5
m^2	(0.5,1.1)	(0.55,1.15)	(0.6,1.2)	(0.65,1.25)	(0.7,1.3)
efficiency	±5%				

TABLE II: Variations of systematical sources: DCA, nHitsFit, $|n\sigma_p|$, m^2, and efficiency.

III. RESULTS

This section shows comparisons of (factorial) cumulants of net-proton, anti-proton, and proton. The new calculations are done using the 81 new bad runs list and are shown with and without the tofmatchedbeta cut. The systematical uncertainty is checked using variations as follows:

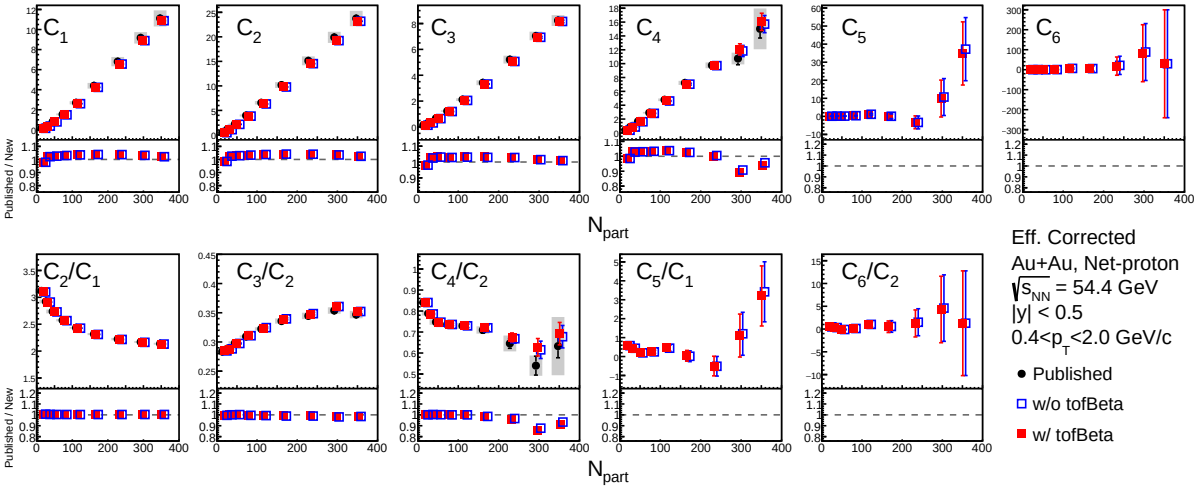

FIG. 17: Net-proton cumulants as a function of centrality.

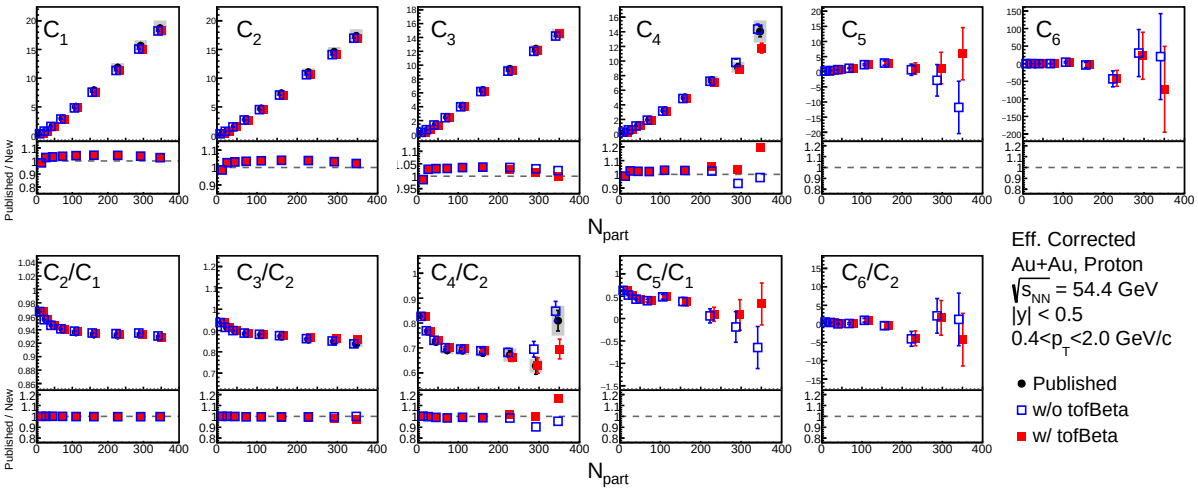

FIG. 18: Proton cumulants as a function of centrality.

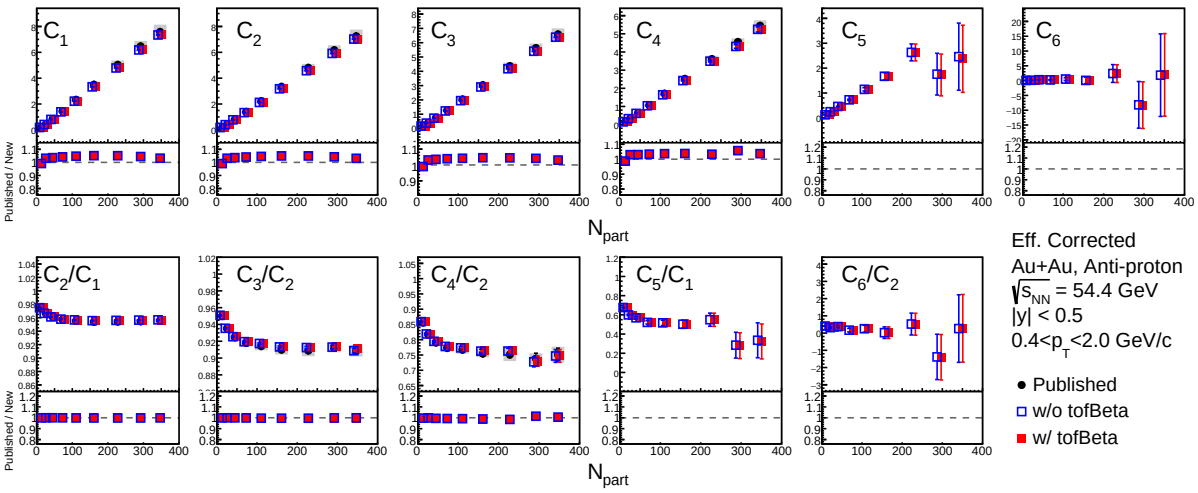

FIG. 19: Anti-proton cumulants as a function of centrality.

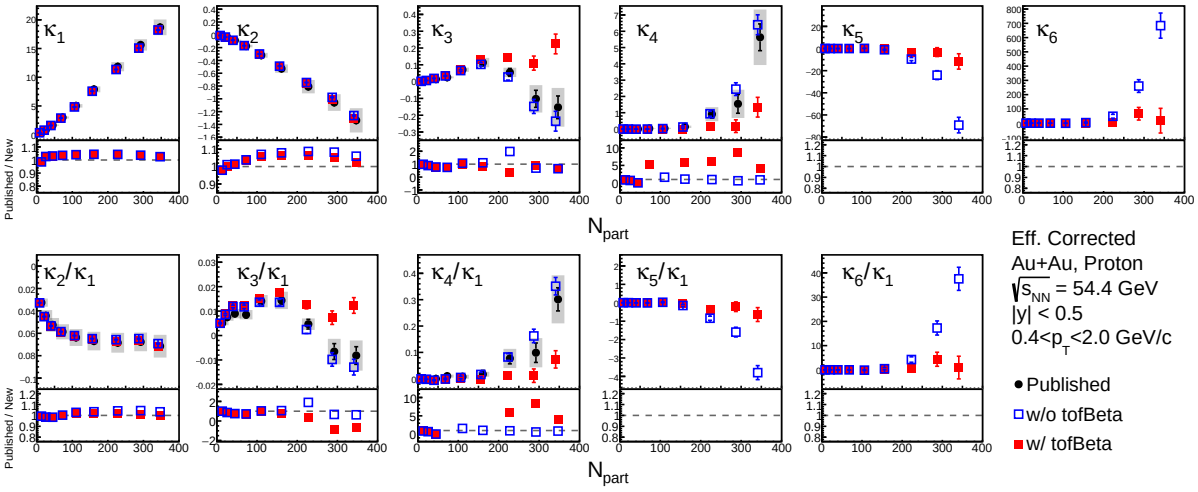

FIG. 20: Proton factorial cumulants as a function of centrality.

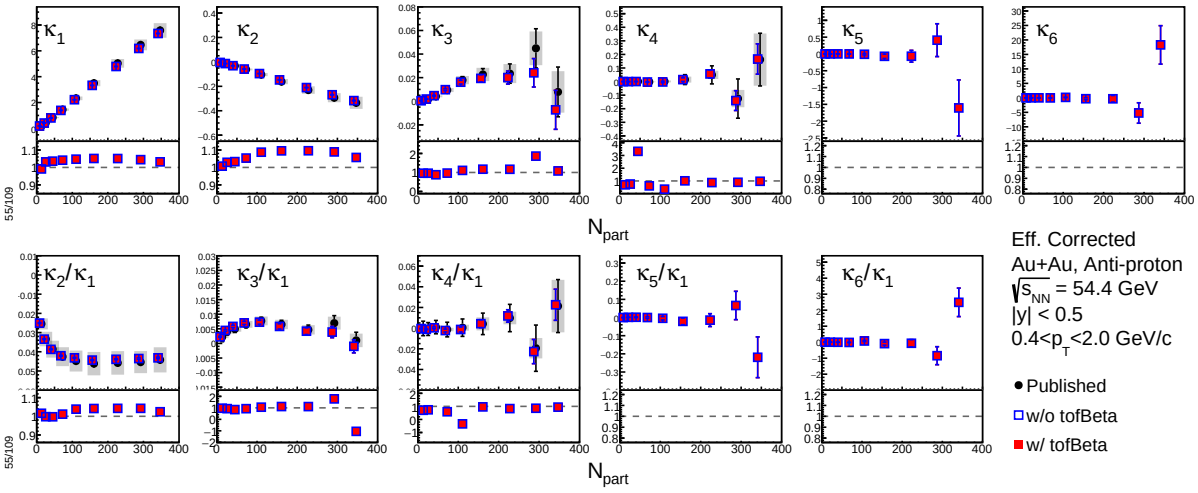

FIG. 21: Anti-proton factorial cumulants as a function of centrality.