Messing around with "different" centrality selections

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bulkcorr PWG meeting
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Standard centrality definitions are based on refmult cuts (Ntracks $|\eta|<0.5$)

"higher moments" analyses make a centrality selection then proceed to calculate the moments of the distributions of the E-by-E multiplicity of specific particles or multiplicity differences or ratios.

Note: these moments are not "central moments" so K,S,… moments are sensitive to the mean values of the multiplicities.

Autocorrelation between the centrality selection and the K,S moments values?

e.g. Nihar & Lizhu define "refmult2" ($0.5<|\eta|<1.0$) for centrality and then calculate the moments in the range $|\eta|<0.5$.

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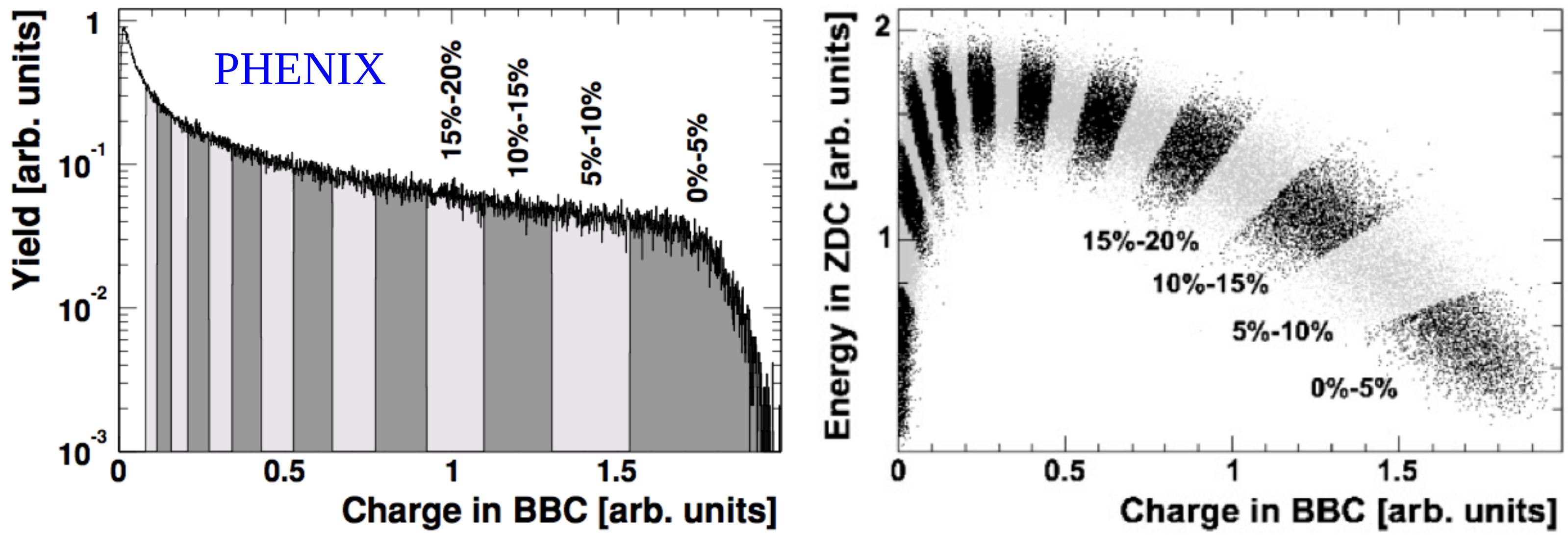


FIG. 1. Different centrality classes based on the BBC (left) and ZDC vs. BBC (right) distributions.

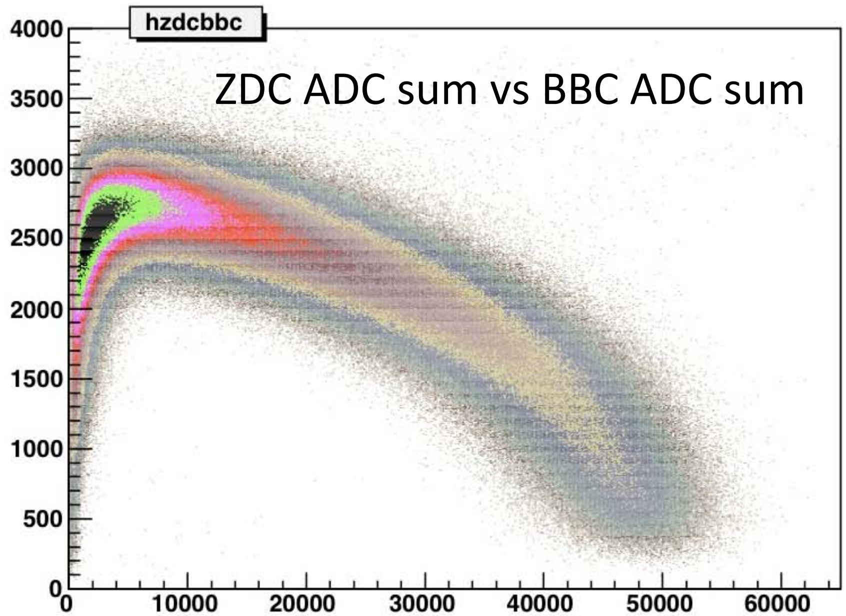
see also Thesis, A. Milov, available from PHENIX website…

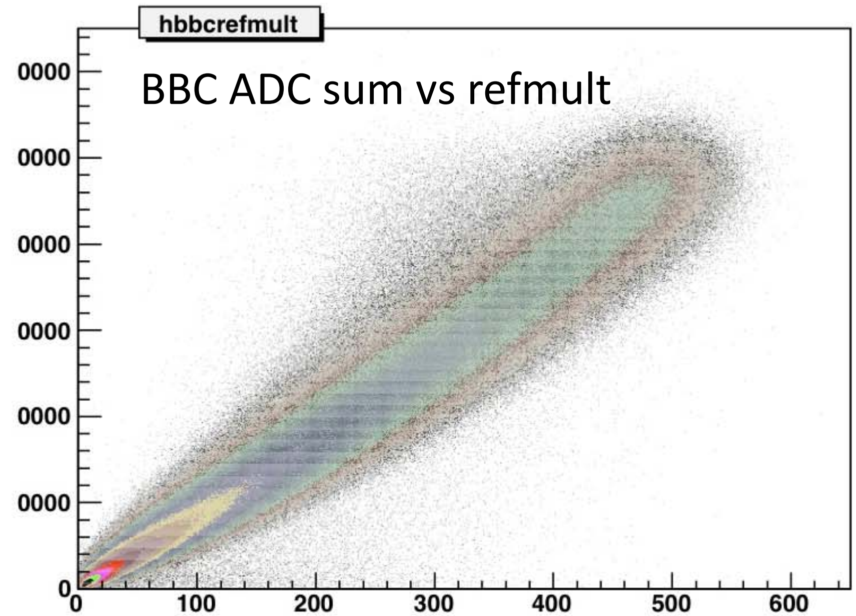
We have other variables that should carry centrality information

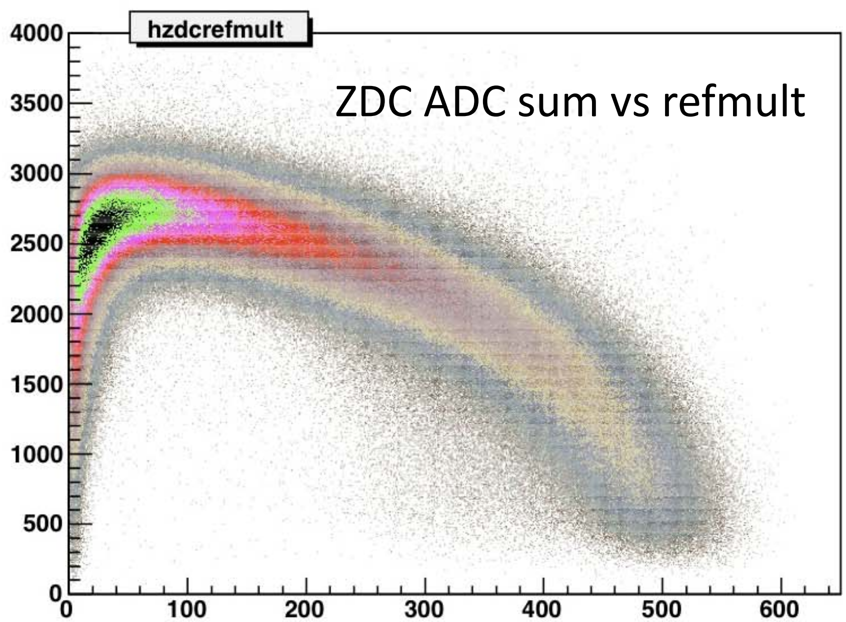
FTPC Ntracks, BBC SumADC, ZDC SumADC, VPD SumADC or SumToT, etc…

But not all of these variables are non-zero for all root-s values….

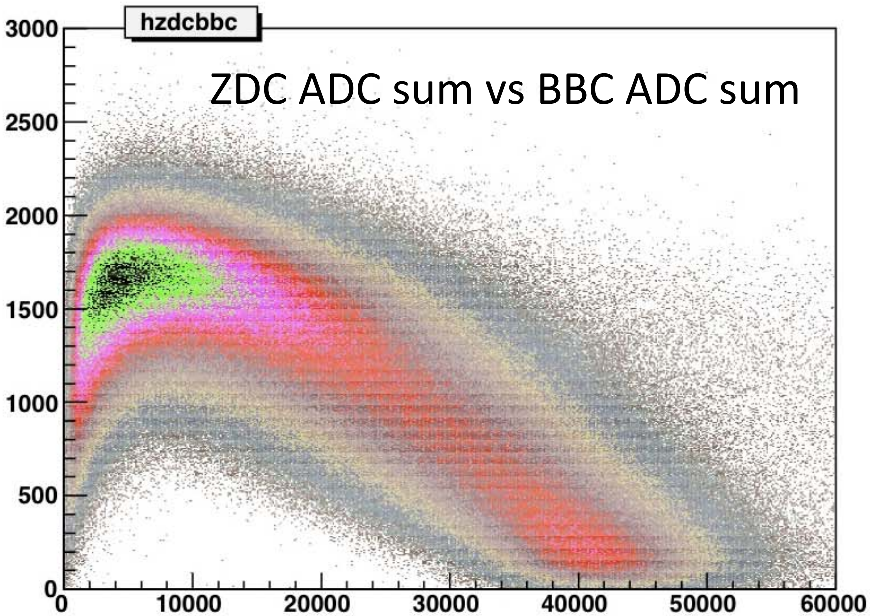
Would still be interesting to compare the moments values when using different centrality definitions (at least at the root-s values where these different definitions are possible)….

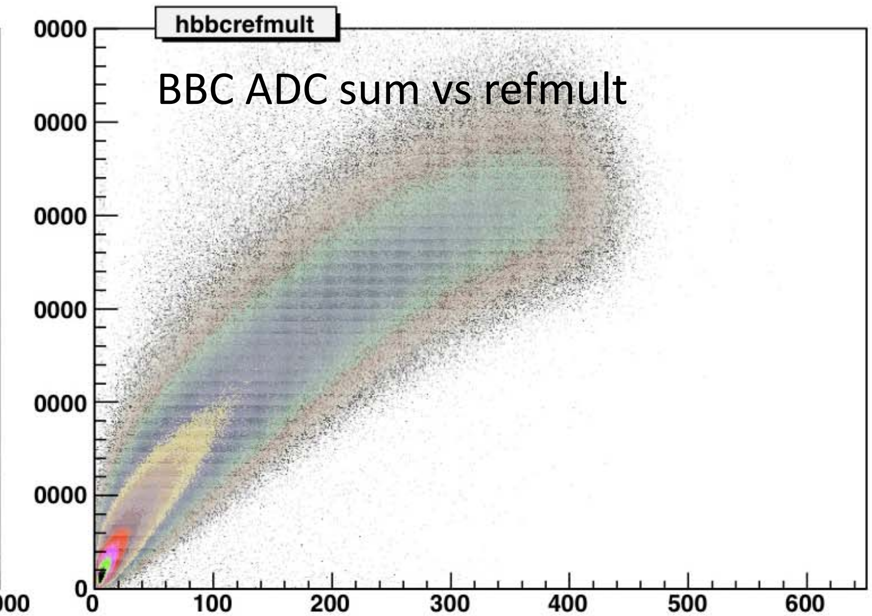


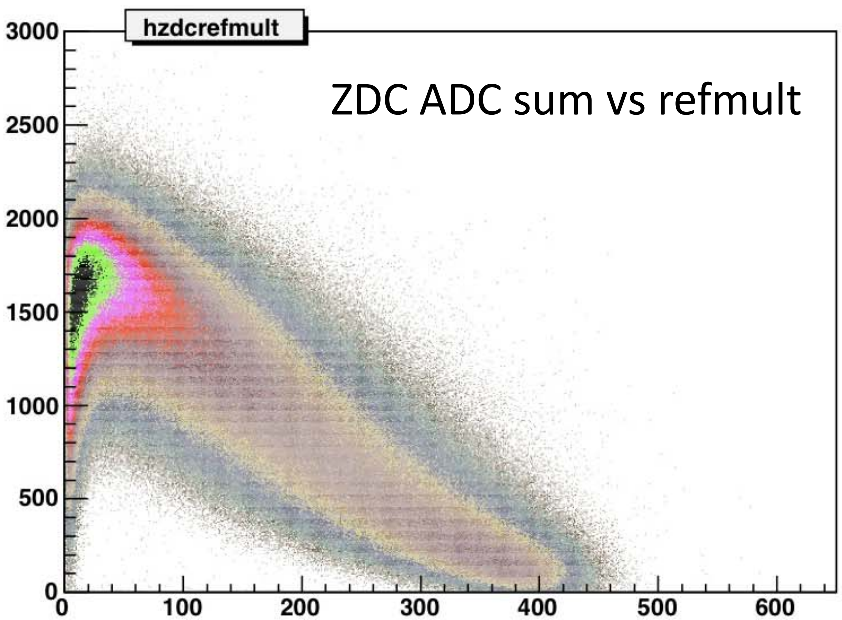




Au+Au, 200 GeV, Run-10

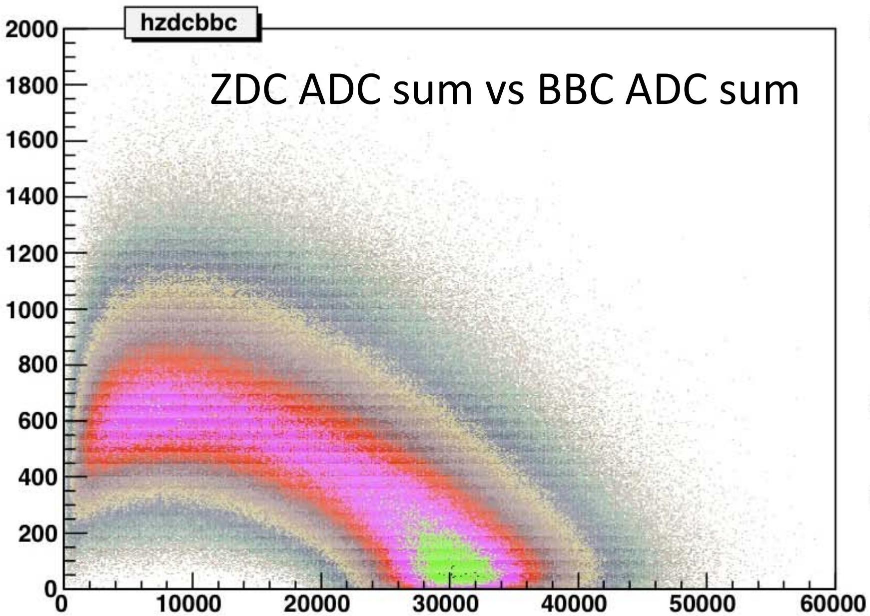


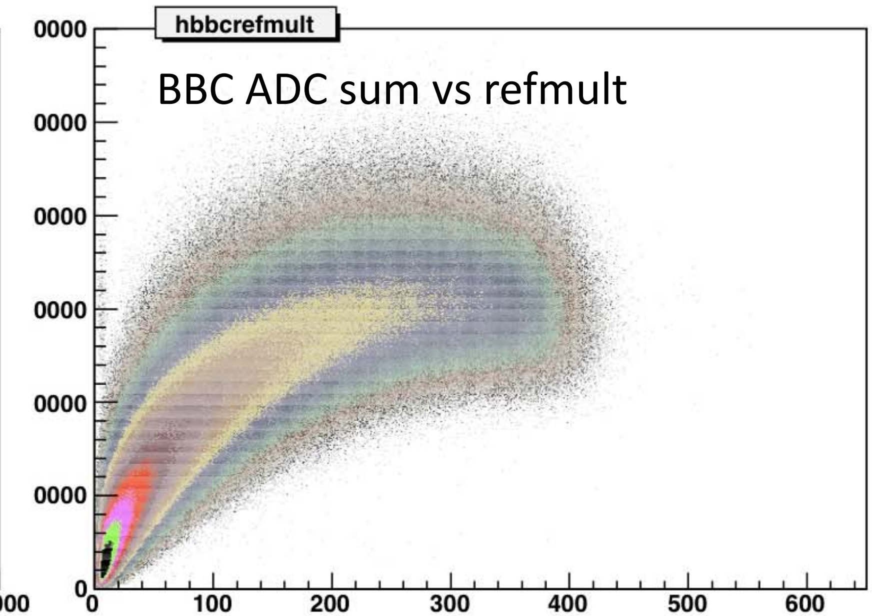


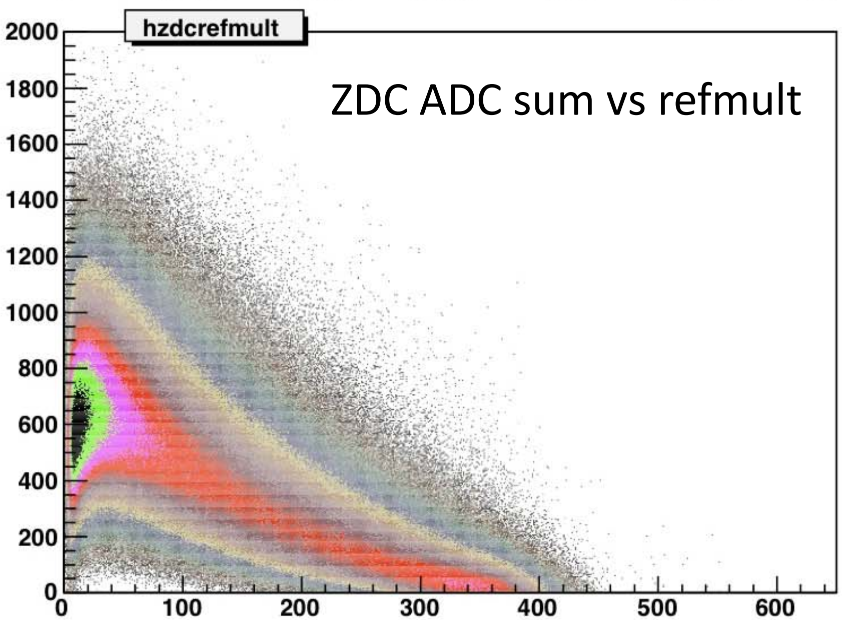


Au+Au, 62.4 GeV, Run-10

BBC gain change in the middle
of the data-taking… …to correct:
if (runid<11089075) bbcsumadc *= 2.1







Au+Au, 39 GeV, Run-10

Algorithm:

1. determine “ridge curve” of each distribution graphically
2. find x_{max} and y_{max} from the curve, and do everything in $(x/x_{max}, y/y_{max})$ space
3. for every point on the curve, calculate the running path-length along the curve
4. for every point in the scaled space, locate closest point on the curve and assign this point in the space to this point on the curve
5. for every point on the curve, add up the number of events from every point in the space assigned to this point on the curve
6. “dN_{evt}/dS” is then integrated to produce percentages (0-5%, 5-10%, etc) which defines S-value cuts (in similarity to refmult cut windows)
7. fill a 2D of the original space where the Z-value is the centrality bin (1-16)
8. use this 2D in another pass through the data to look up centrality bin number for any given value of (x, y)

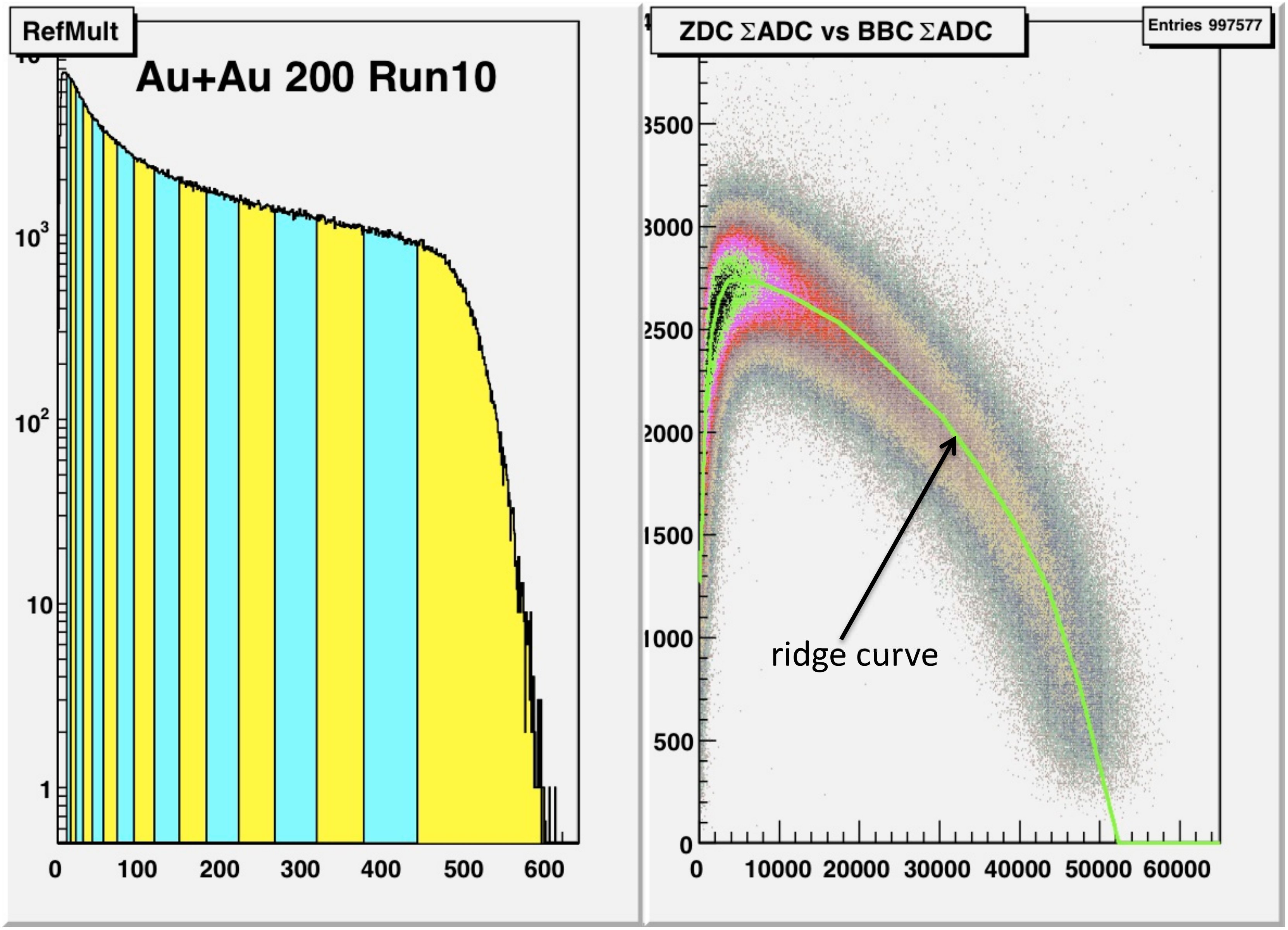
then use three different “Centrality Styles”

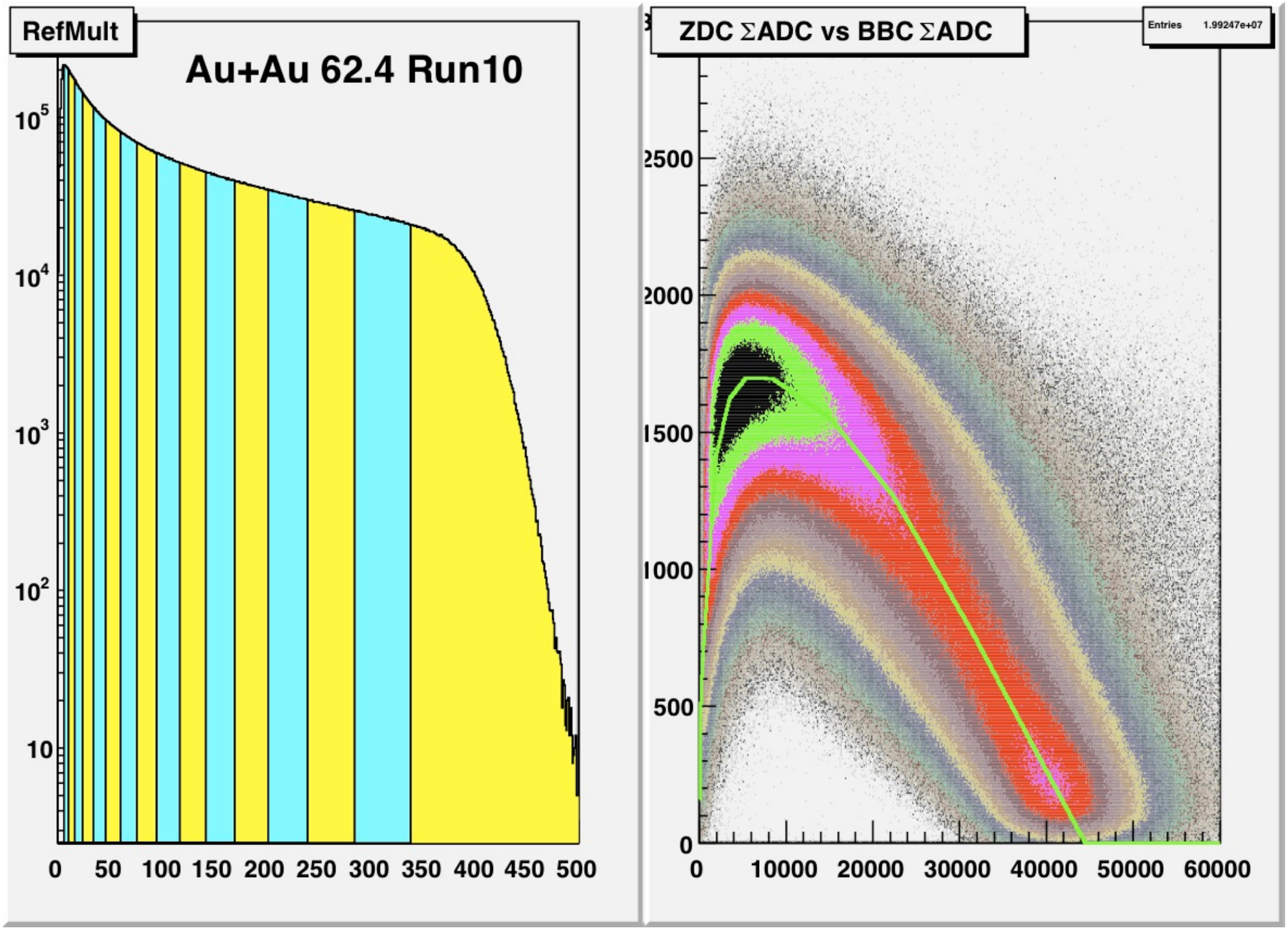
1 … 1D space is just refmult

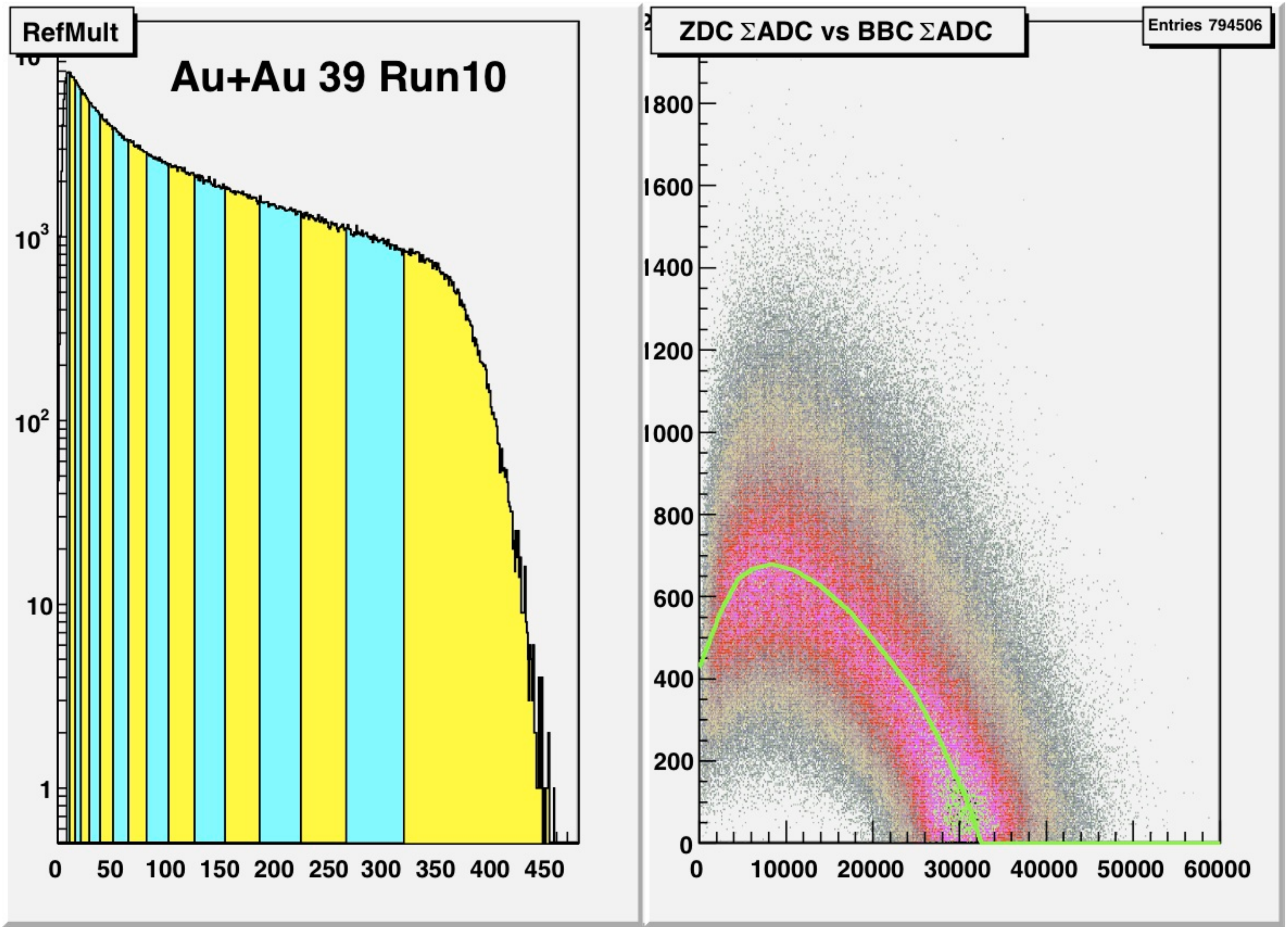
2 … 2D space is ZDC sum ADC vs BBC sum ADC

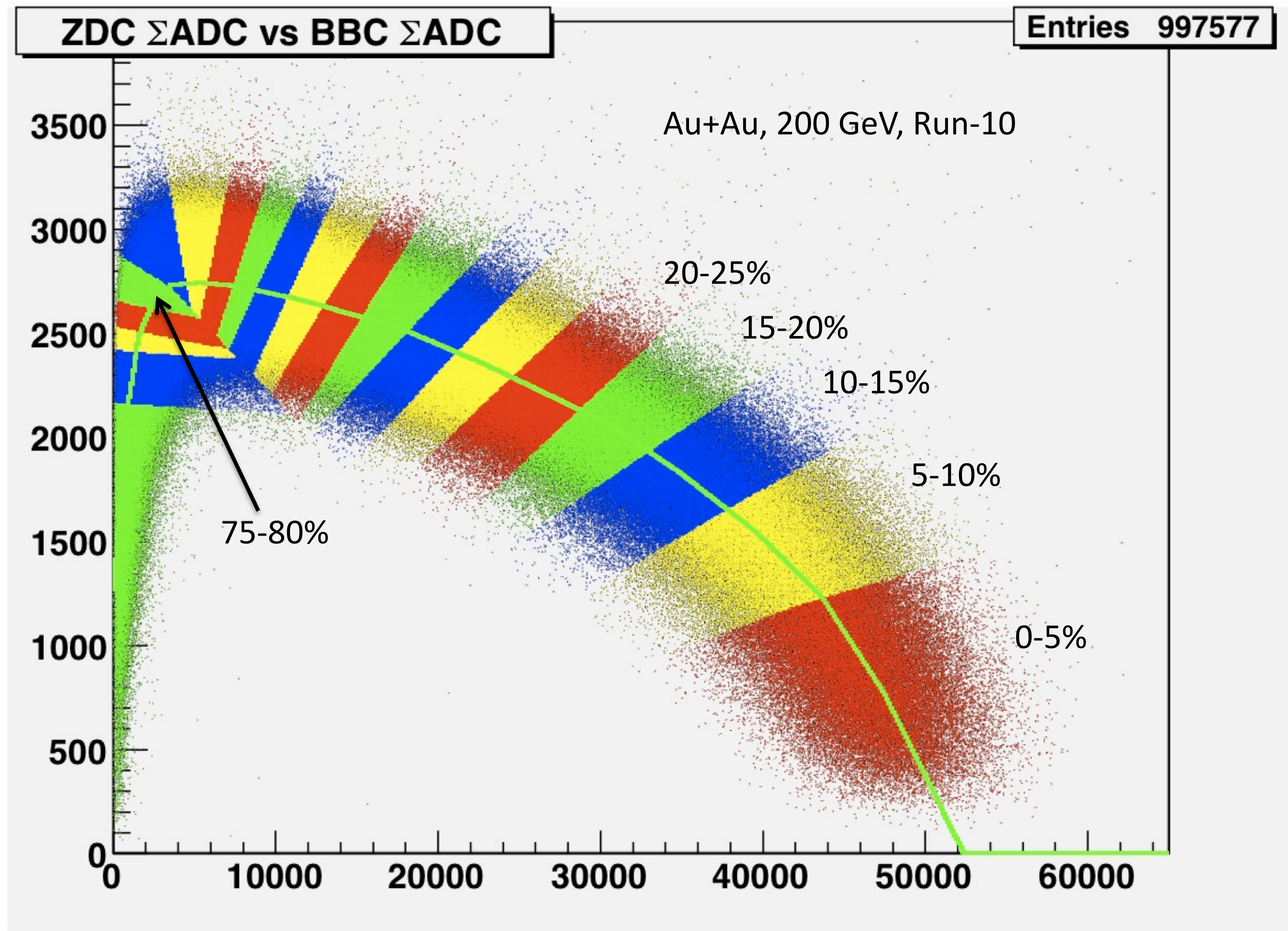
3 … 2D space is BBC sum ADC vs refmult

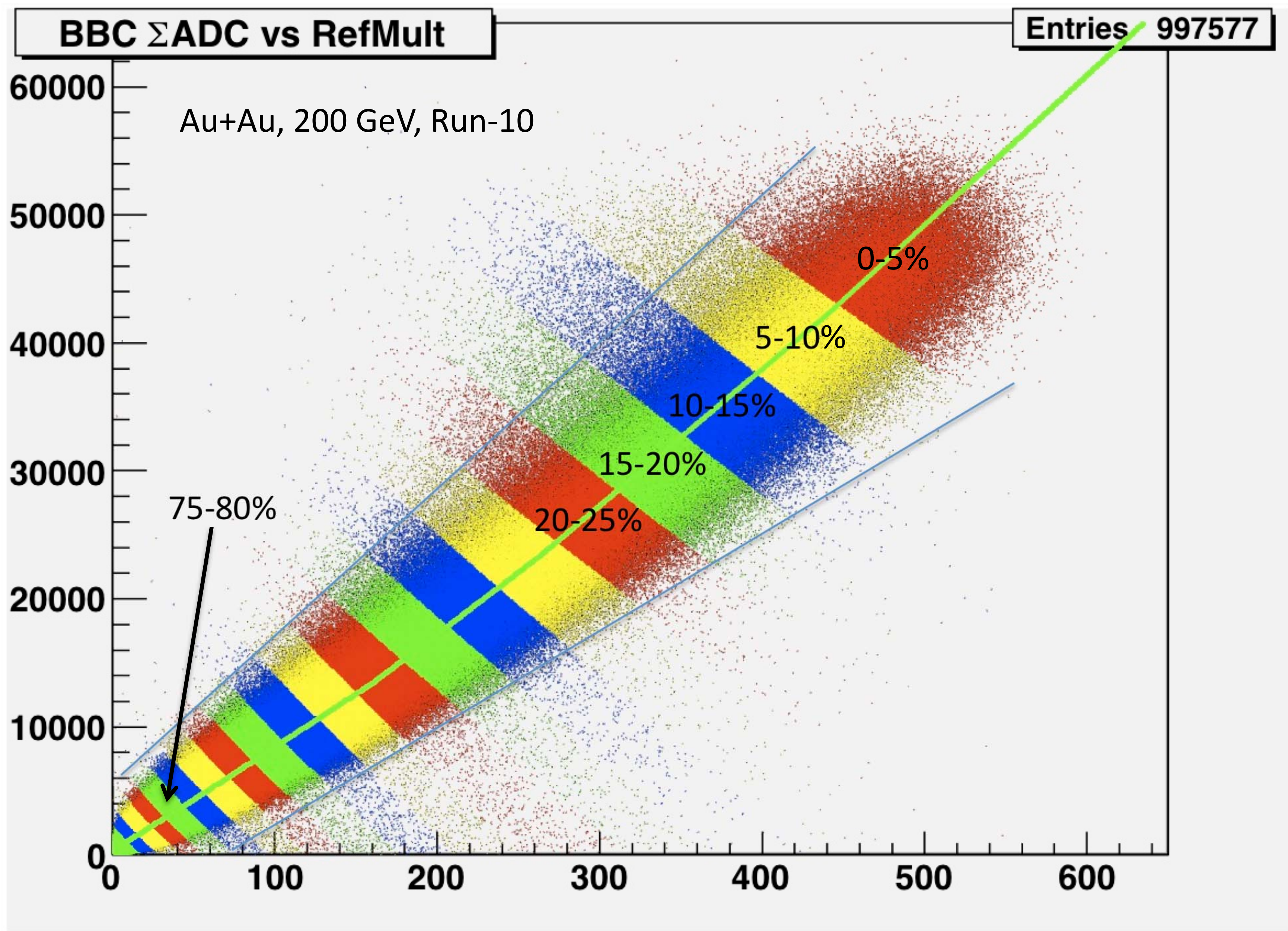
and look at the refmult distributions for styles 2 and 3….


RefMult
Au+Au 200 Run10
ZDC ΣADC vs BBC ΣADC
Entries 997577
ridge curve

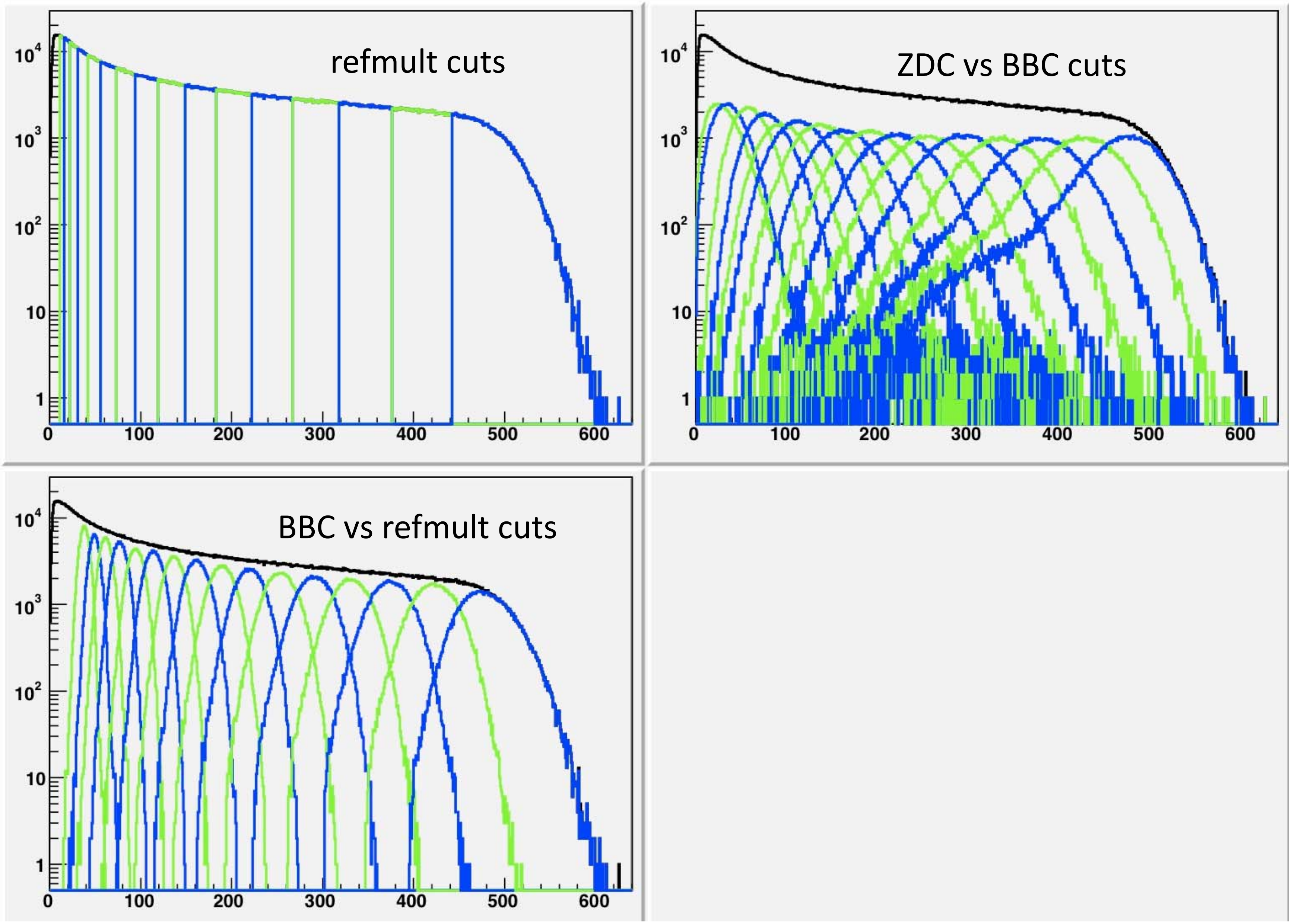

RefMult
Au+Au 62.4 Run10
ZDC ΣADC vs BBC ΣADC
Entries 1.99247e+07


RefMult
Au+Au 39 Run10
10³
10²
10
1
0 50 100 150 200 250 300 350 400 450
ZDC ΣADC vs BBC ΣADC
Entries 794506
1800
1600
1400
1200
1000
800
600
400
200
0
0 10000 20000 30000 40000 50000 60000

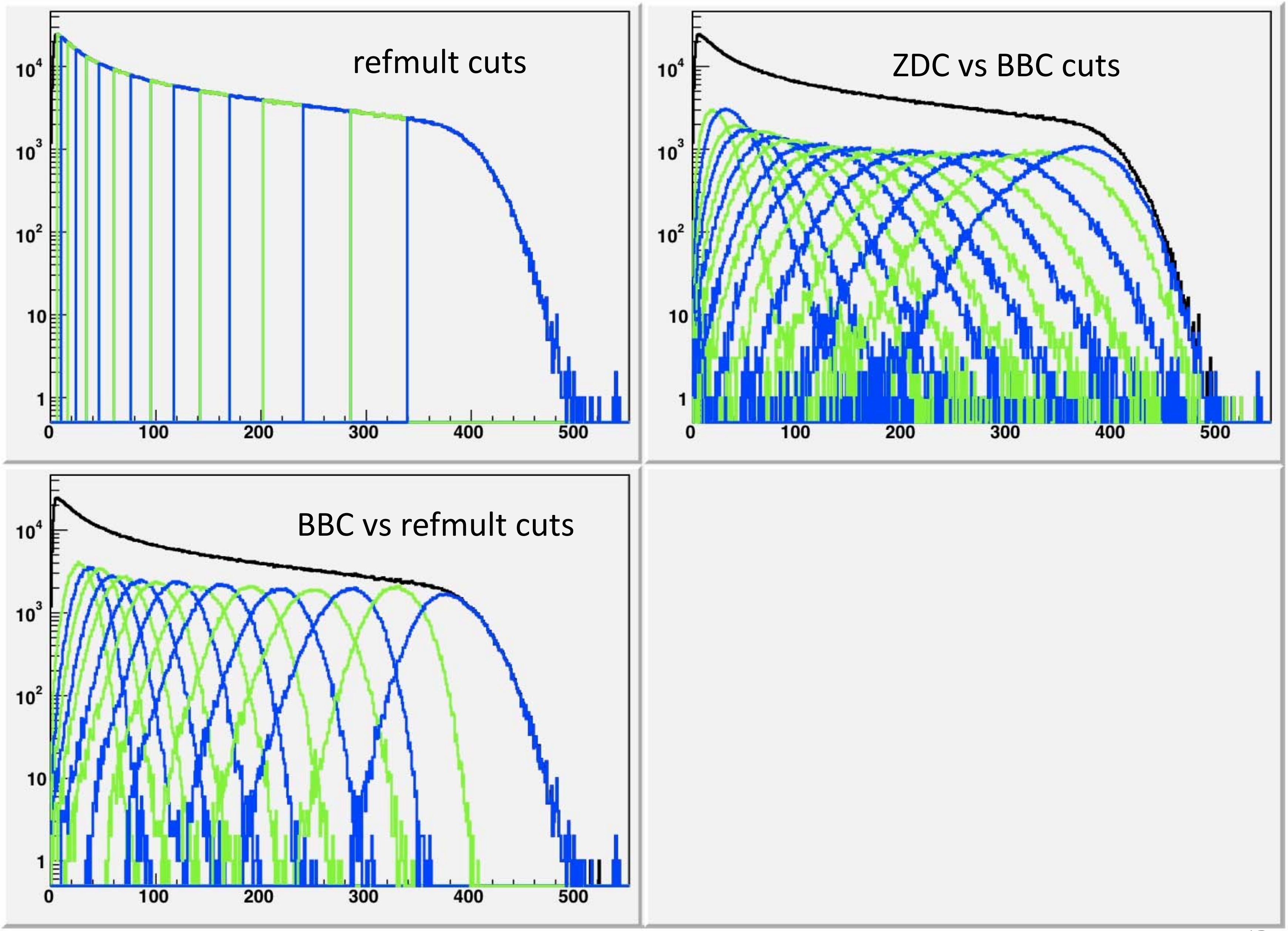

ZDC ΣADC vs BBC ΣADC
Entries 997577
Au+Au, 200 GeV, Run-10
20-25%
15-20%
10-15%
5-10%
0-5%
75-80%
3500
3000
2500
2000
1500
1000
500
0
0
10000
20000
30000
40000
50000
60000


BBC ΣADC vs RefMult
Entries 997577
Au+Au, 200 GeV, Run-10
0-5%
5-10%
10-15%
15-20%
20-25%
75-80%
60000
50000
40000
30000
20000
10000
0
0
100
200
300
400
500
600

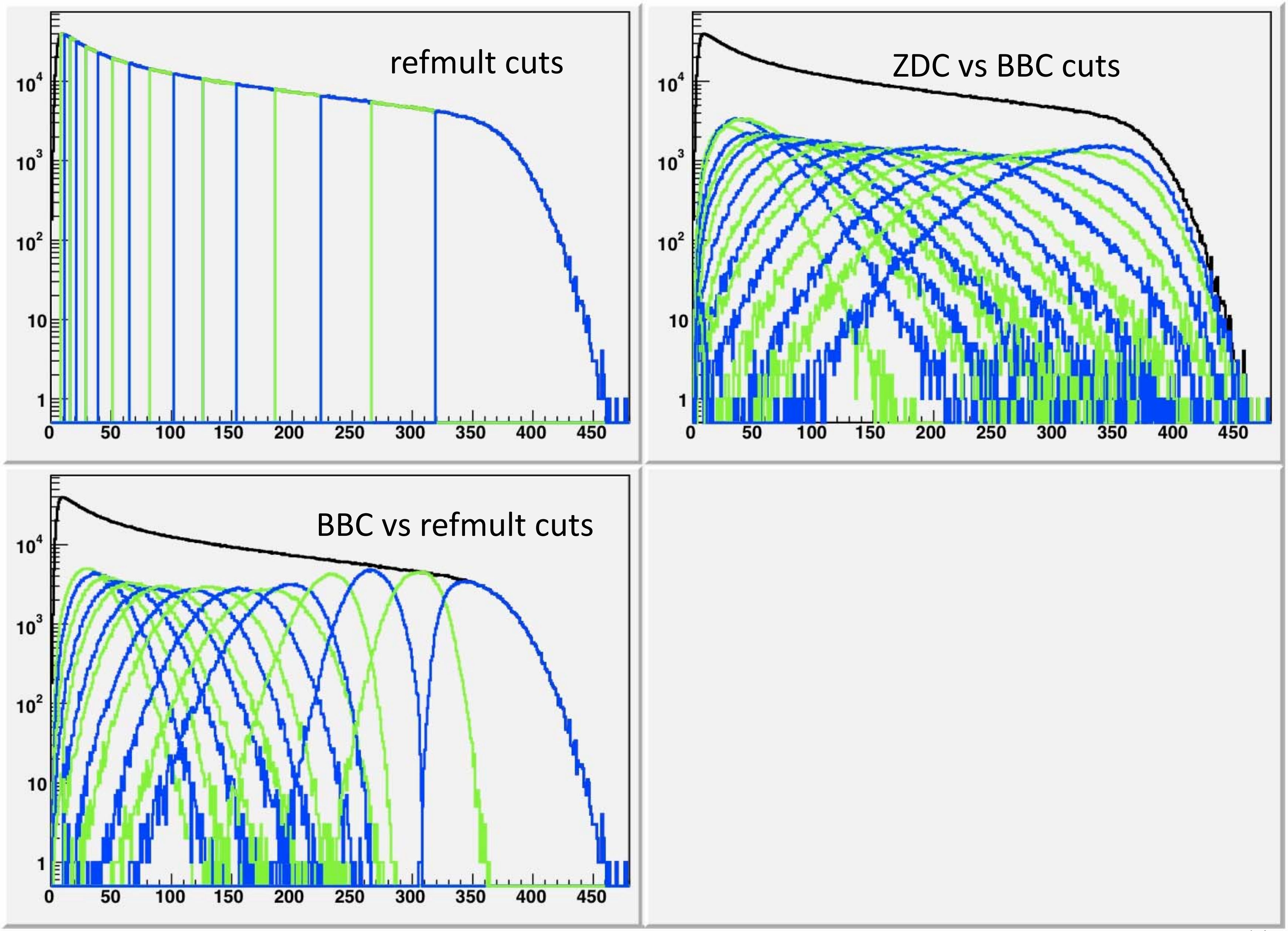
refmult distributions……. Au+Au, 200 GeV, Run-10



refmult distributions……. Au+Au, 62.4 GeV, Run-10

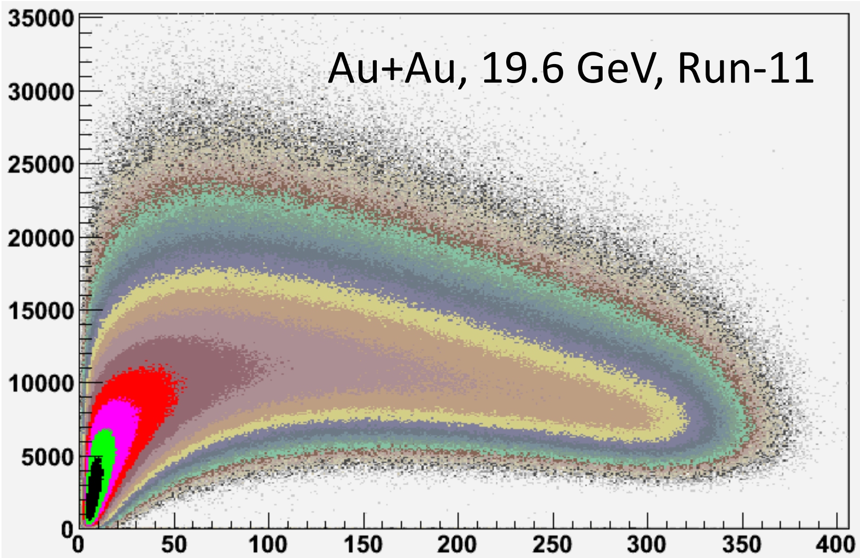


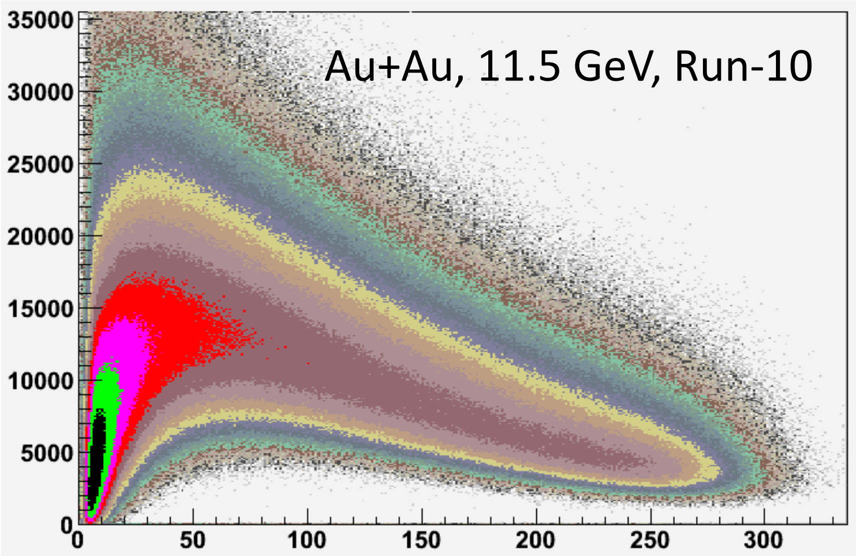
refmult distributions……. Au+Au, 39 GeV, Run-10

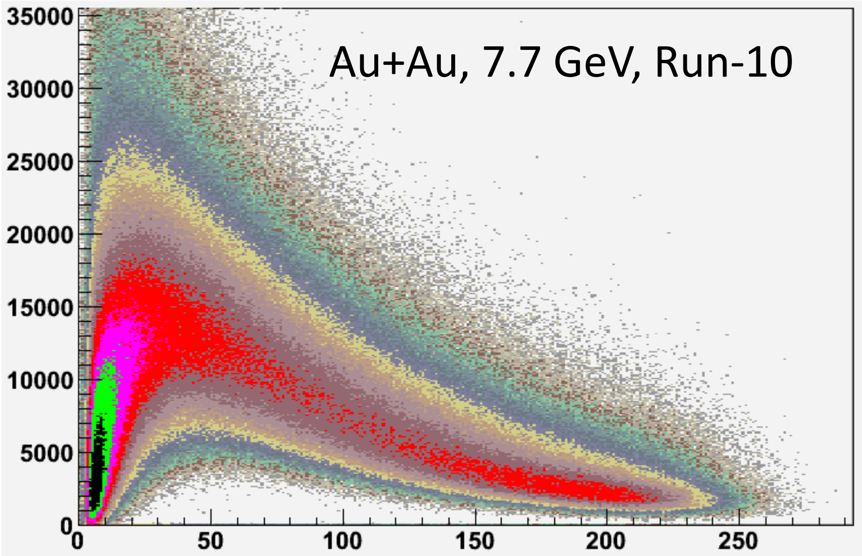


ZDC is inefficient for
19.6, 11.5, & 7.7 GeV

BBC vs refmult @ these energies:







if you want to try this in your code, on RCF get three root files:

/star/u/llope/cent/cent_16.root Au+Au, 200 GeV, Run-10
/star/u/llope/cent/cent_17.root Au+Au, 62.4 GeV, Run-10
/star/u/llope/cent/cent_18.root Au+Au, 39 GeV, Run-10

before event loop:

kCentralityStyle=2 TH2D* hcent = (TH2D*)file->Get("hcentzdcbbc_use");
kCentralityStyle=3 TH2D* hcent = (TH2D*)file->Get("hcentbbcrefmult_use");
then, hcent->SetName("hcent");

inside event loop:

if (root-s==62.4){ if (runid<11089075){ adjustedbbcadc = 2.1*bbcsumadc }}

then:

if kCentralityStyle=2 int ibxy = hcent->FindBin(adjustedbbcadcsum,zdcadcsum)
if kCentralityStyle=3 int ibxy = hcent->FindBin(refmult,bbcadcsum)

then

int kCentrality = hcent->GetBinContent(ibxy) – 4; // bin #s start at 95-100%

kCentrality<1 -> reject
kCentrality = 16 means 0-5%, & kCentrality = 1 means 75-80%