

# Vernier Analysis Update

Run 12

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May 17, 2016

UC Riverside

Progress

# Progress

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# BBC Rate, Run 360879

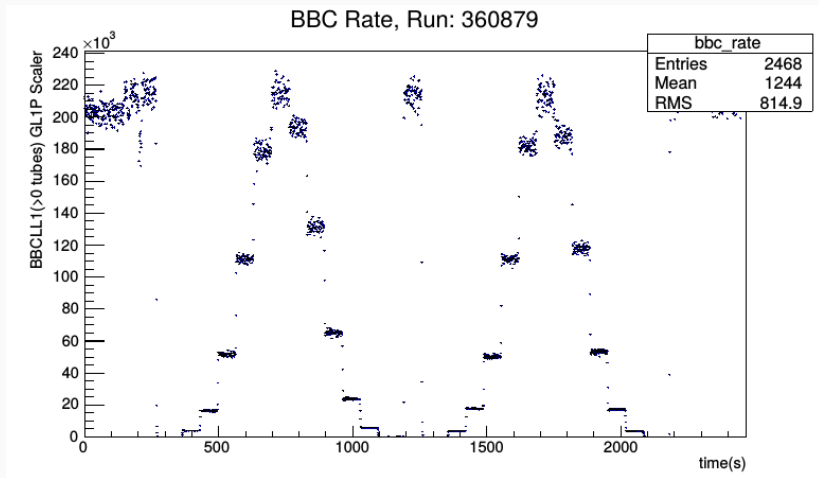


Figure 1:

# Step 1

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 85.688965
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ 0.000150
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.012142
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET -0.06
  Y_OFFSET 0
  ZDC_COUNTS 11238
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_1
Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
Z_PROFILE_SCALE_VALUE 2.0
```

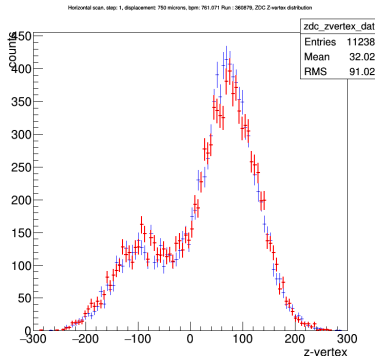


Figure 2:

# Step 2

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 85
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ 0.000195
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.028605
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET -0.045
  Y_OFFSET 0
  ZDC_COUNTS 24672
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_2
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

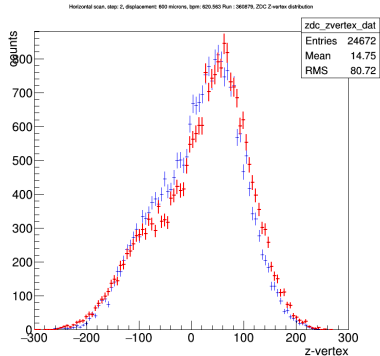


Figure 3:

# Step 3

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 85
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ 0.00024
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.103220
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET -0.032
  Y_OFFSET 0
  ZDC_COUNTS 46031
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_3
Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
Z_PROFILE_SCALE_VALUE 2.0
```

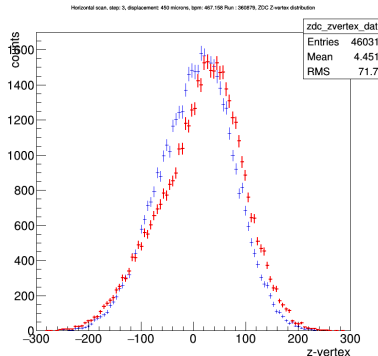


Figure 4:

# Step 4

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 85
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ 0.0004
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.193873
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET -0.01
  Y_OFFSET 0
  ZDC_COUNTS 63440
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_4
Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
Z_PROFILE_SCALE_VALUE 2.0
```

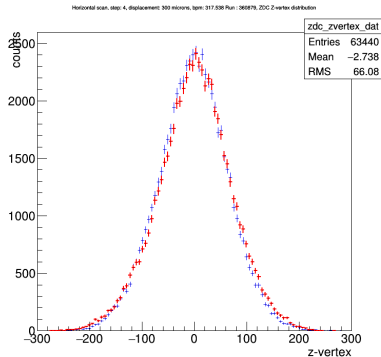


Figure 5:



# Step 5

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 89
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ 0.0005
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.414231
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET -0.005
  Y_OFFSET 0
  ZDC_COUNTS 80097
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_5
Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
Z_PROFILE_SCALE_VALUE 2.0
```

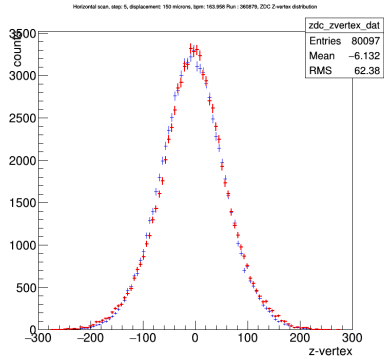


Figure 6:

# Step 6

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 82.169434
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ 0.000505
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.545801
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0.006503
  Y_OFFSET 0
  ZDC_COUNTS 82111
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_6
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

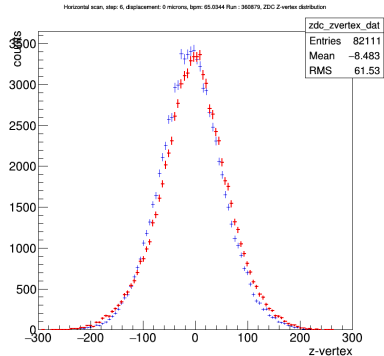


Figure 7:

# Step 7

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 85
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ -0.0005
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.201315
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0.00
  Y_OFFSET 0
  ZDC_COUNTS 71181
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_7
Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
Z_PROFILE_SCALE_VALUE 2.0
```

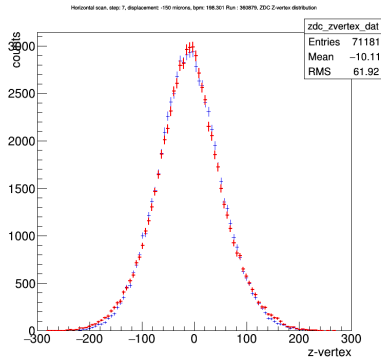


Figure 8:

# Step 8

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 85
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ -0.0005
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.201315
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0.00
  Y_OFFSET 0
  ZDC_COUNTS 71181
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_7
Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
Z_PROFILE_SCALE_VALUE 2.0
```

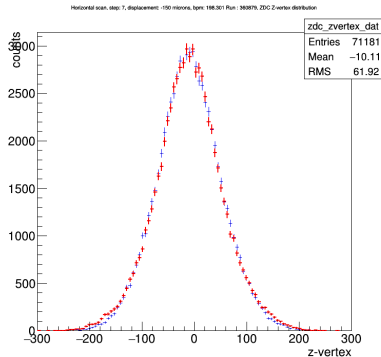


Figure 9:

# Step 9

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
    BETA_STAR 89
BUNCH_CROSSING_FREQUENCY 78213.
    CROSSING_ANGLE_XZ -0.00009
    CROSSING_ANGLE_YZ 0.
    FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
    MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.092878
    RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
    X_OFFSET 0.01
    Y_OFFSET 0
    ZDC_COUNTS 47976
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_9
Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
Z_PROFILE_SCALE_VALUE 2.0
```

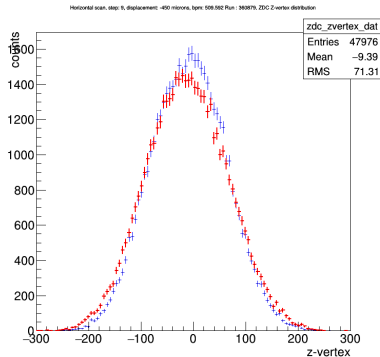


Figure 10:

# Step 10

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 85
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ 0.00007
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.019254
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0.033
  Y_OFFSET 0
  ZDC_COUNTS 30558
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_10
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

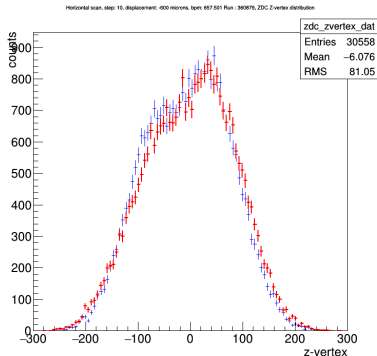


Figure 11:

# Step 11

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 87.830567
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ 0.00007
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.012922
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0.06
  Y_OFFSET 0
  ZDC_COUNTS 13626
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_11
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

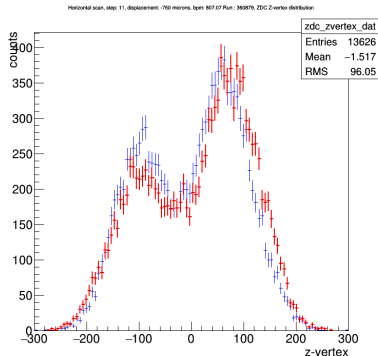


Figure 12:

## Step 12

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 77.819825
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ 0.000036
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.000681
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0.09
  Y_OFFSET 0
  ZDC_COUNTS 3368
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_12
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

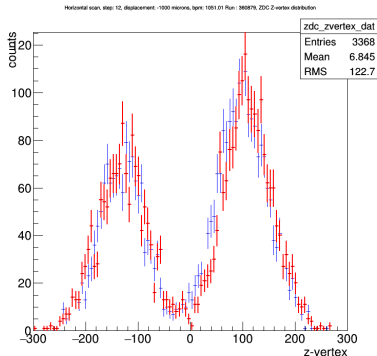


Figure 13:



# Step 13

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 76.657714
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ -0.000046
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.001298
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0
  Y_OFFSET -0.097114
  ZDC_COUNTS 3415
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_13
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

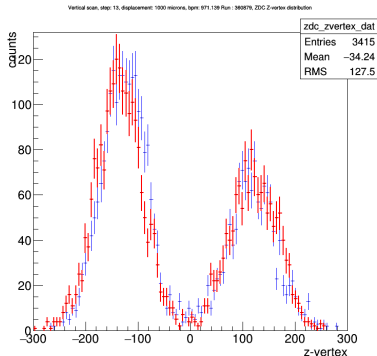


Figure 14:

# Step 14

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 84.576660
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ -0.00005
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.016914
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0
  Y_OFFSET -0.06
ZDC_COUNTS 10797
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_14
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

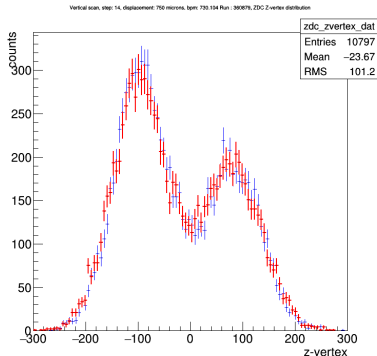


Figure 15:

# Step 15

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 87.448732
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ -0.00009
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.036174
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0
  Y_OFFSET -0.044
  ZDC_COUNTS 26040
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_15
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

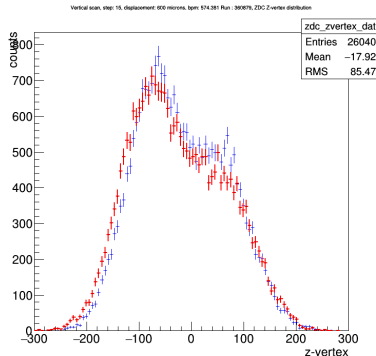


Figure 16:

# Step 16

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 91.184083
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ -0.00015
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.070320
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0
  Y_OFFSET -0.02
  ZDC_COUNTS 46238
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_16
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

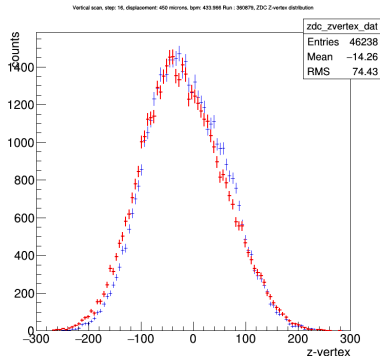


Figure 17:

# Step 17

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 89.
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ -0.00035
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.334313
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0
  Y_OFFSET -0.01
ZDC_COUNTS 70330
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_17
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

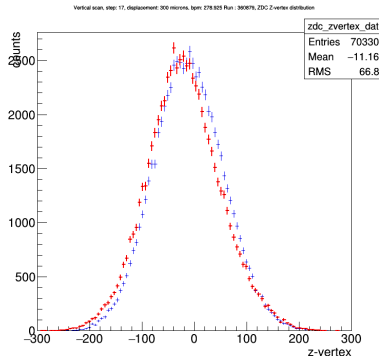


Figure 18:

# Step 18

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET 0.
BETA_STAR 86.319824
BUNCH_CROSSING_FREQUENCY 78213.
CROSSING_ANGLE_XZ -0.00045
CROSSING_ANGLE_YZ 0.
FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.419094
RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
X_OFFSET 0
Y_OFFSET -0.010900
ZDC_COUNTS 79502
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_18
Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
Z_PROFILE_SCALE_VALUE 2.0
```

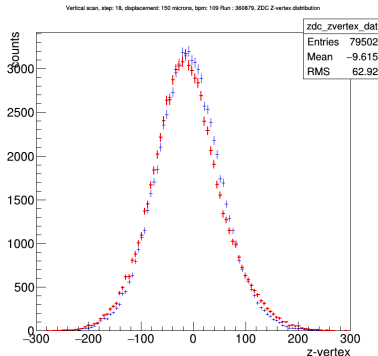


Figure 19:

# Step 19

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 88.046388
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ 0.000475
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.261758
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0
  Y_OFFSET 0.006762
  ZDC_COUNTS 85153
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_19
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

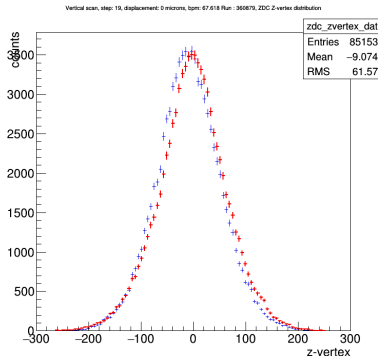


Figure 20:

## Step 20

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -30.7391
  BETA_STAR 85
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ 0.00045
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.264361
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0
  Y_OFFSET 0.02
  ZDC_COUNTS 79837
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_20
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

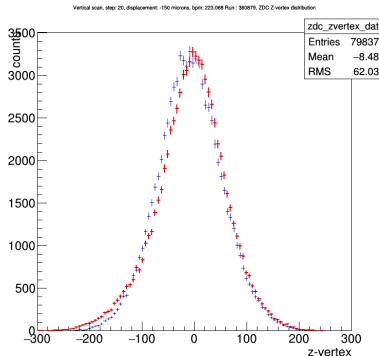


Figure 21:



# Step 21

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 80
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ -0.0003
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.179534
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0
  Y_OFFSET 0.01
  ZDC_COUNTS 61721
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_21
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

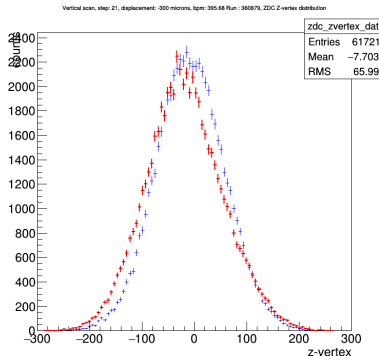


Figure 22:

## Step 22

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 85
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ -0.00005
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.042497
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0
  Y_OFFSET 0.015
  ZDC_COUNTS 45003
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_22
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

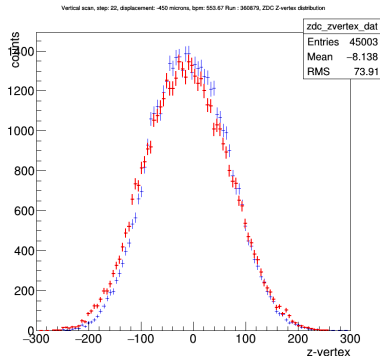


Figure 23:

## Step 23

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 95.
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ -0.0003
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.011786
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0
  Y_OFFSET 0.044
ZDC_COUNTS 24052
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_23
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

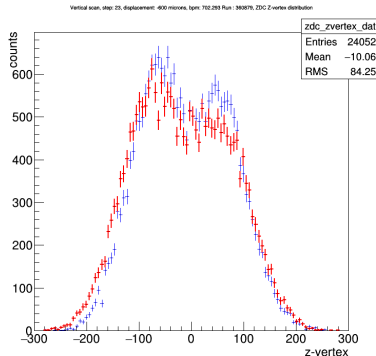


Figure 24:

## Step 24

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 85.622558
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ -0.00001
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.006142
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0
  Y_OFFSET 0.063
  ZDC_COUNTS 11023
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_24
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

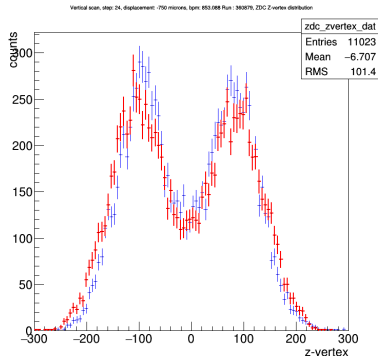


Figure 25:

# Step 25

```
AVG_NUMBER_IONS_BLUE_BEAM 119.837e9
AVG_NUMBER_IONS_YELLOW_BEAM 119.243e9
BBC_ZDC_Z_VERTEX_OFFSET -10.7391
  BETA_STAR 78.185058
BUNCH_CROSSING_FREQUENCY 78213.
  CROSSING_ANGLE_XZ -0.000008
  CROSSING_ANGLE_YZ 0.
  FILLED_BUNCHES 107
HORIZONTAL_BEAM_WIDTH 0.027369
  MAX_COLLISIONS 5
MULTIPLE_COLLISION_RATE 0.000839
  RUN_NUMBER 360879
VERTICAL_BEAM_WIDTH 0.0265107
  X_OFFSET 0
  Y_OFFSET 0.1
  ZDC_COUNTS 3130
ZDC_VERTEX_DISTRIBUTION_NAME zdc_zvtx_step_25
  Z_BUNCH_WIDTH_CENTRAL_GAUSSIAN 55.95
  Z_BUNCH_WIDTH_LEFT_GAUSSIAN 35.15
  Z_BUNCH_WIDTH_LEFT_OFFSET -70.2
  Z_BUNCH_WIDTH_RIGHT_GAUSSIAN 27.65
  Z_BUNCH_WIDTH_RIGHT_OFFSET 56.7
  Z_PROFILE_SCALE_VALUE 2.0
```

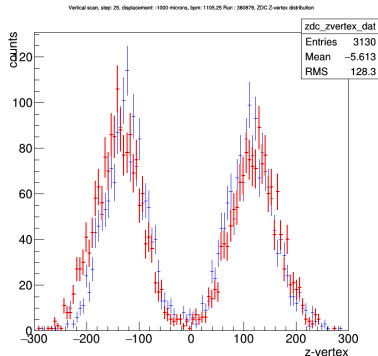


Figure 26: