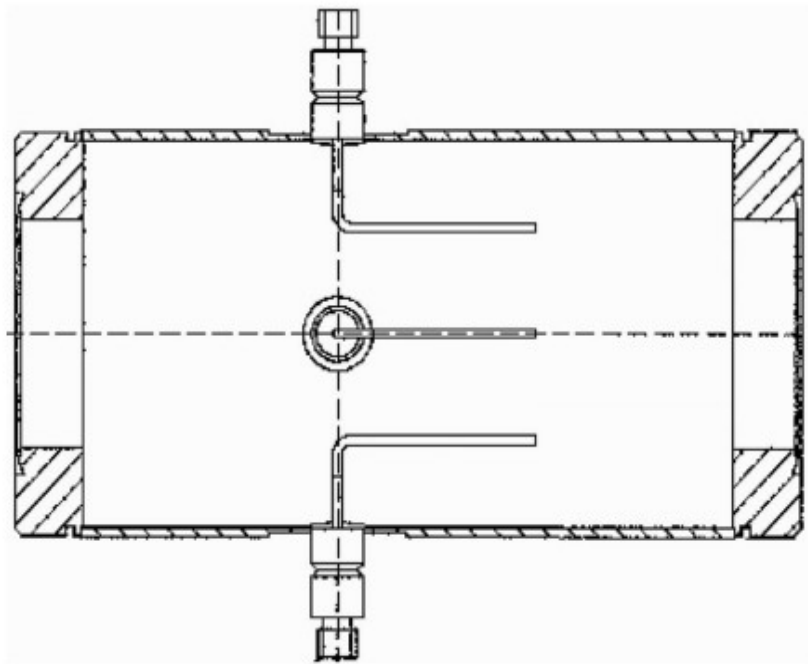
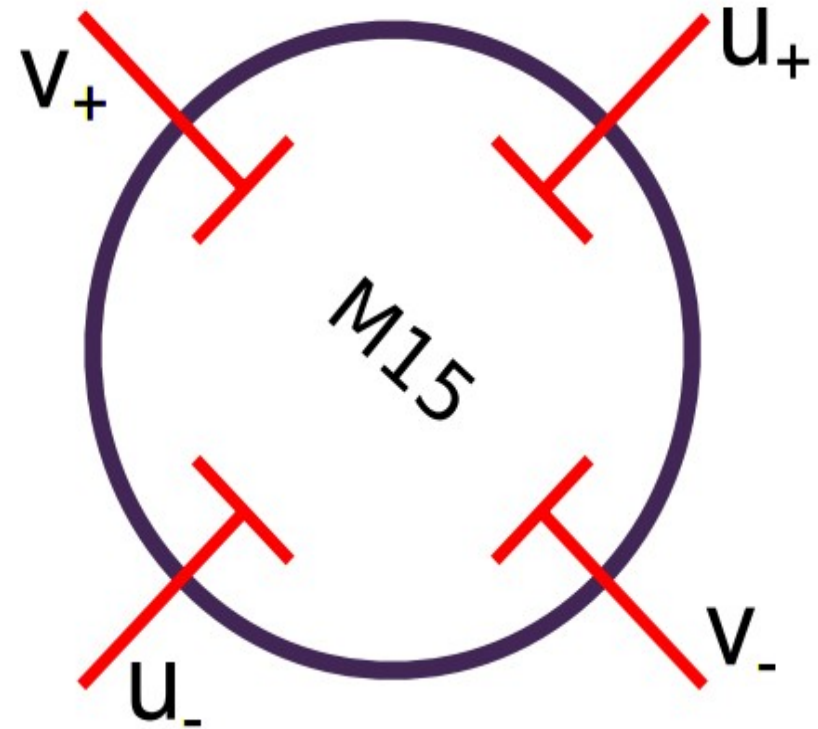


BPM calibration review and results



(a) BPM design diagram, from JLab instrumentation group



(b) BPM chamber which contains 4 antennas

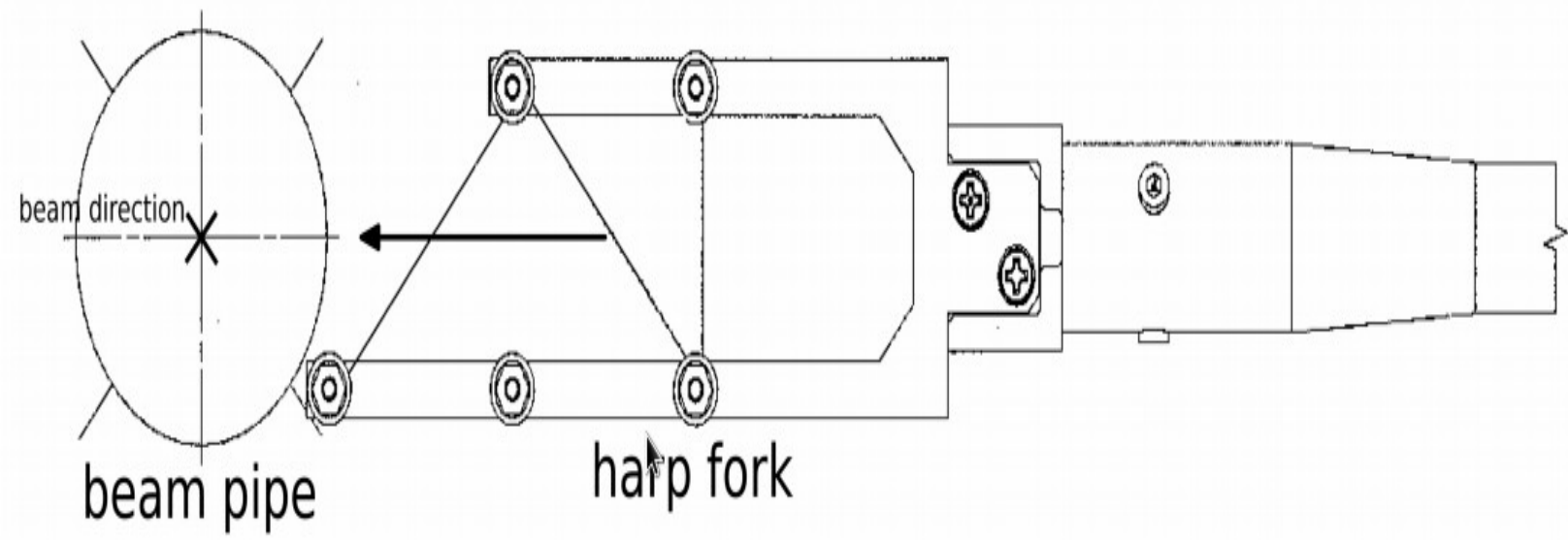


Figure 3: Harp diagram

BPM and HARP

$$\begin{pmatrix} x \\ y \end{pmatrix}_{\text{Lab}} = \begin{pmatrix} C(0,0) & C(0,1) \\ C(1,0) & C(1,1) \end{pmatrix} \times \begin{pmatrix} x \\ y \end{pmatrix}_{\text{BPM}} + \begin{pmatrix} \text{Offset}(0) \\ \text{Offset}(1) \end{pmatrix}$$

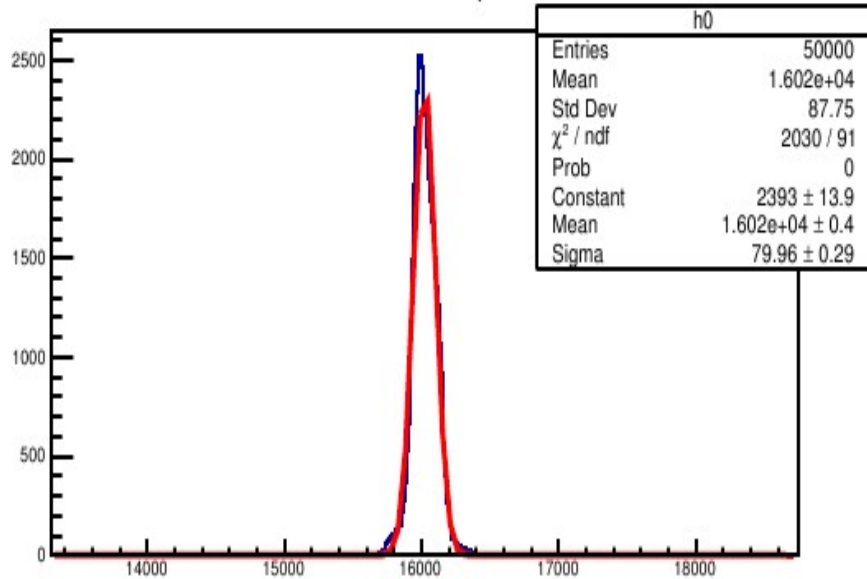
- BPM is not an absolute measurement of position.
- Calibrate the BPM using the absolute position of the Harps
- Need to convert the harp results to absolute position and transform to correct coordinate system.

BPM calibration

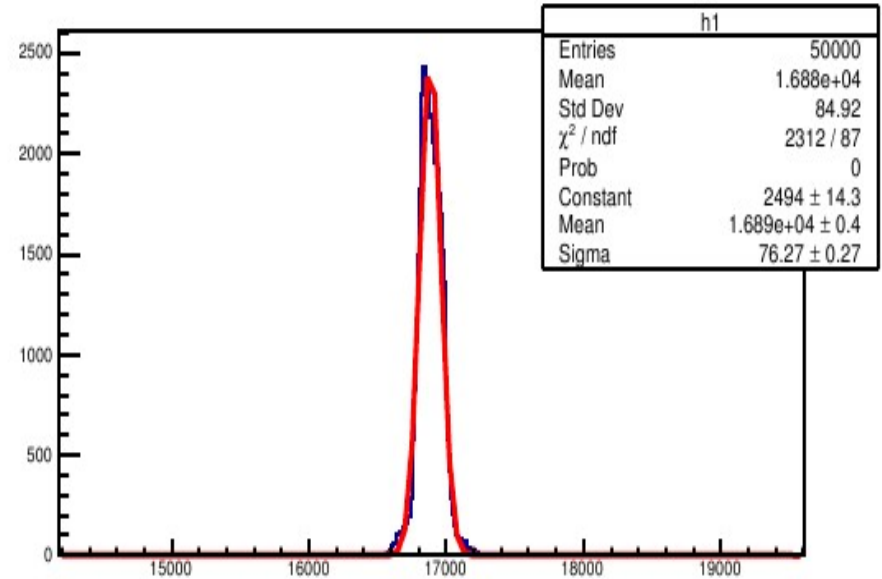
- Pedestals
 - Left arm 758
 - Fadcs
 - Fbus adcs
 - Right arm 90558
 - Fadcs
 - Fbus adcs
- Harp scans for a bulleye's scan
 - https://wiki.jlab.org/tegwiki/index.php/BPM_Calibration

- Left arm 758 fadcs pedestals

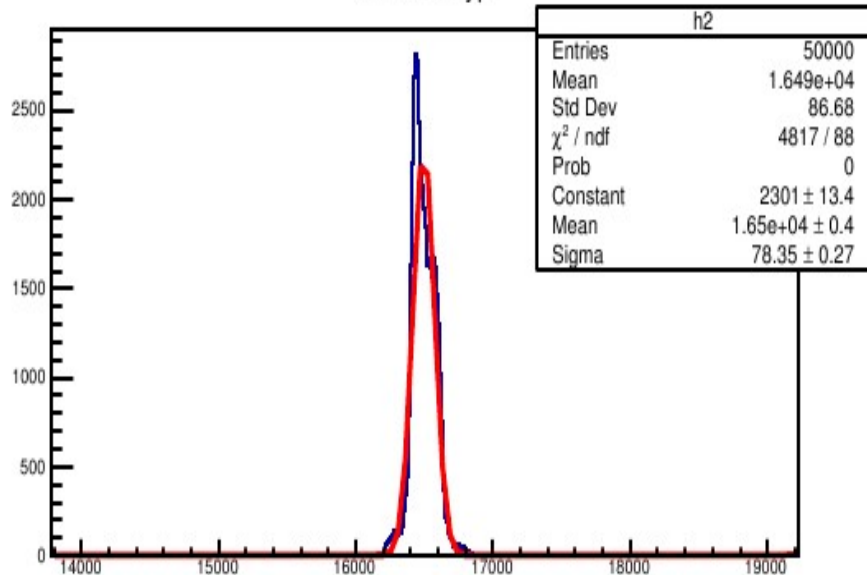
BPMA 1 - xp



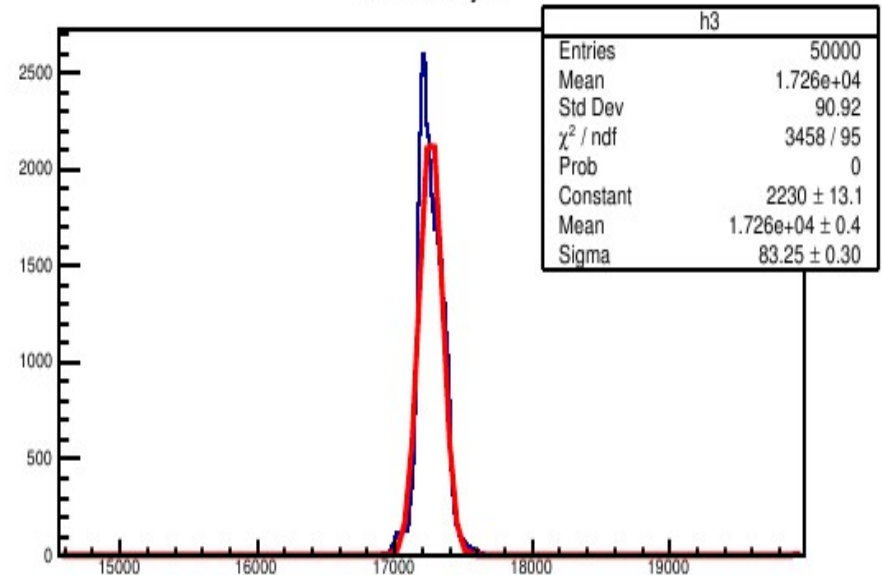
BPMA 2 - xm



BPMA 3 - yp

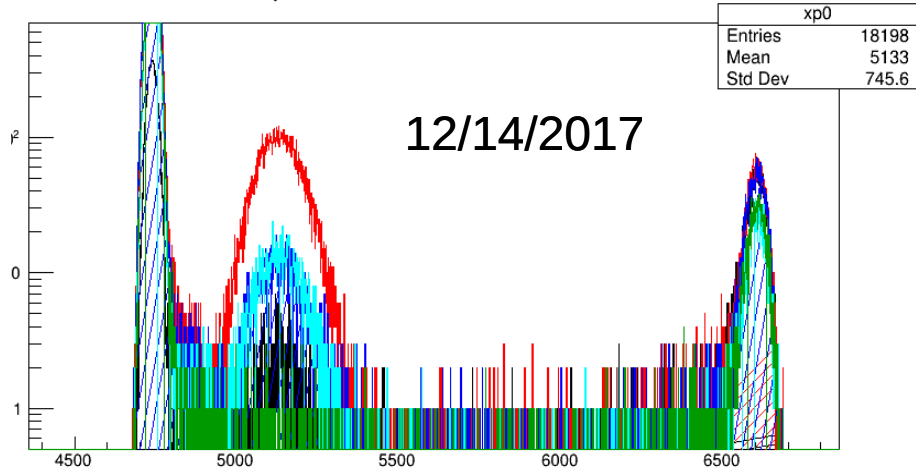


BPMA 4 - ym

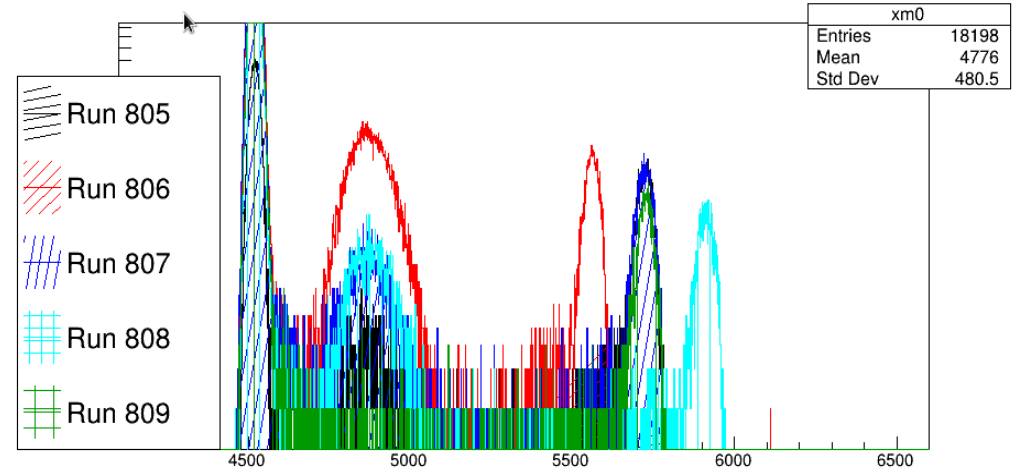


Issues:

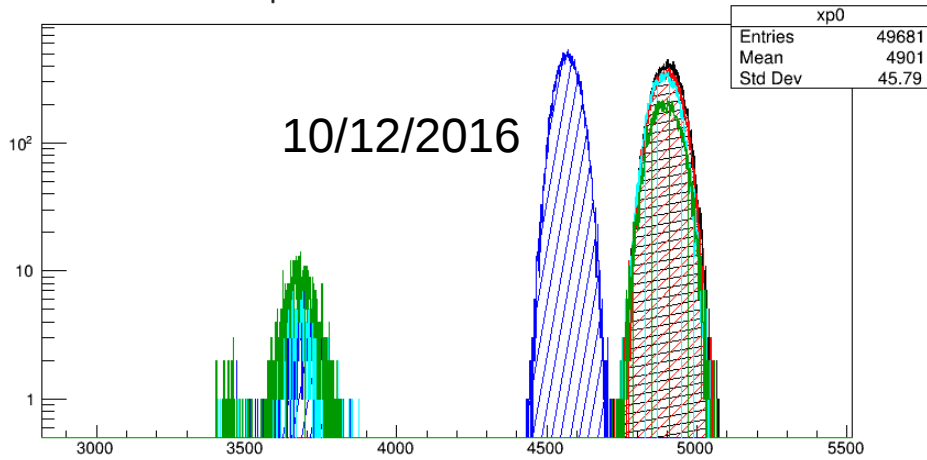
xp rawcur for BPM A: run 805



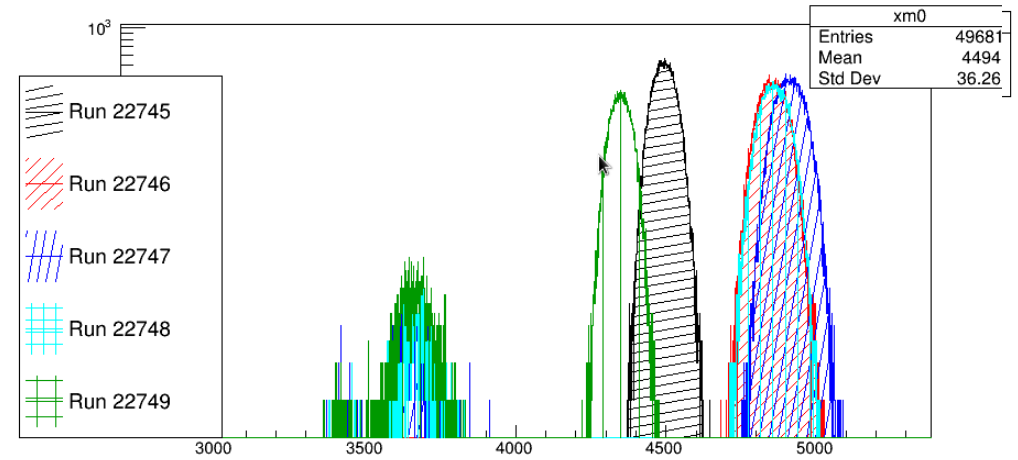
xm rawcur for BPM A: run 805



xp rawcur for BPM A: run 22745

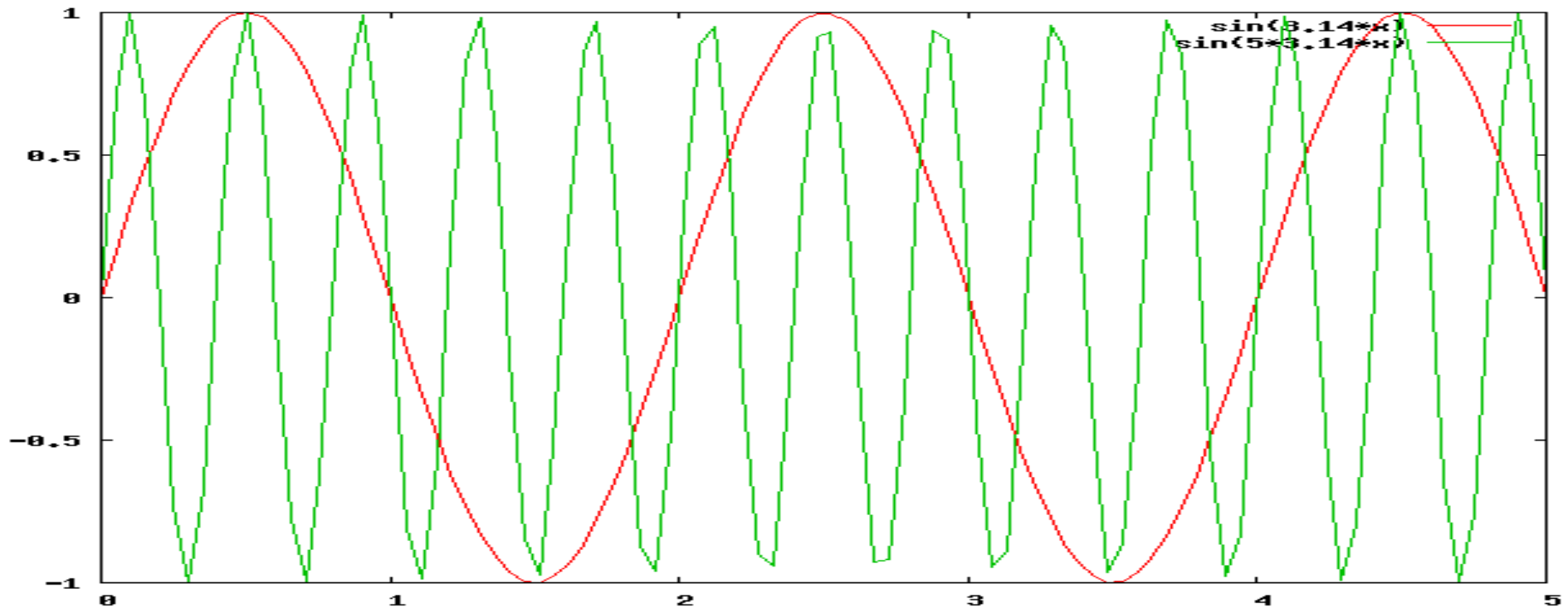


xm rawcur for BPM A: run 22745



Issues:

- Harp scan was completed with tune beam
 - Due to the differences in frequency of tune beam and our electronics, we receive multiple signals.
 - I image the timing to be something similar to this

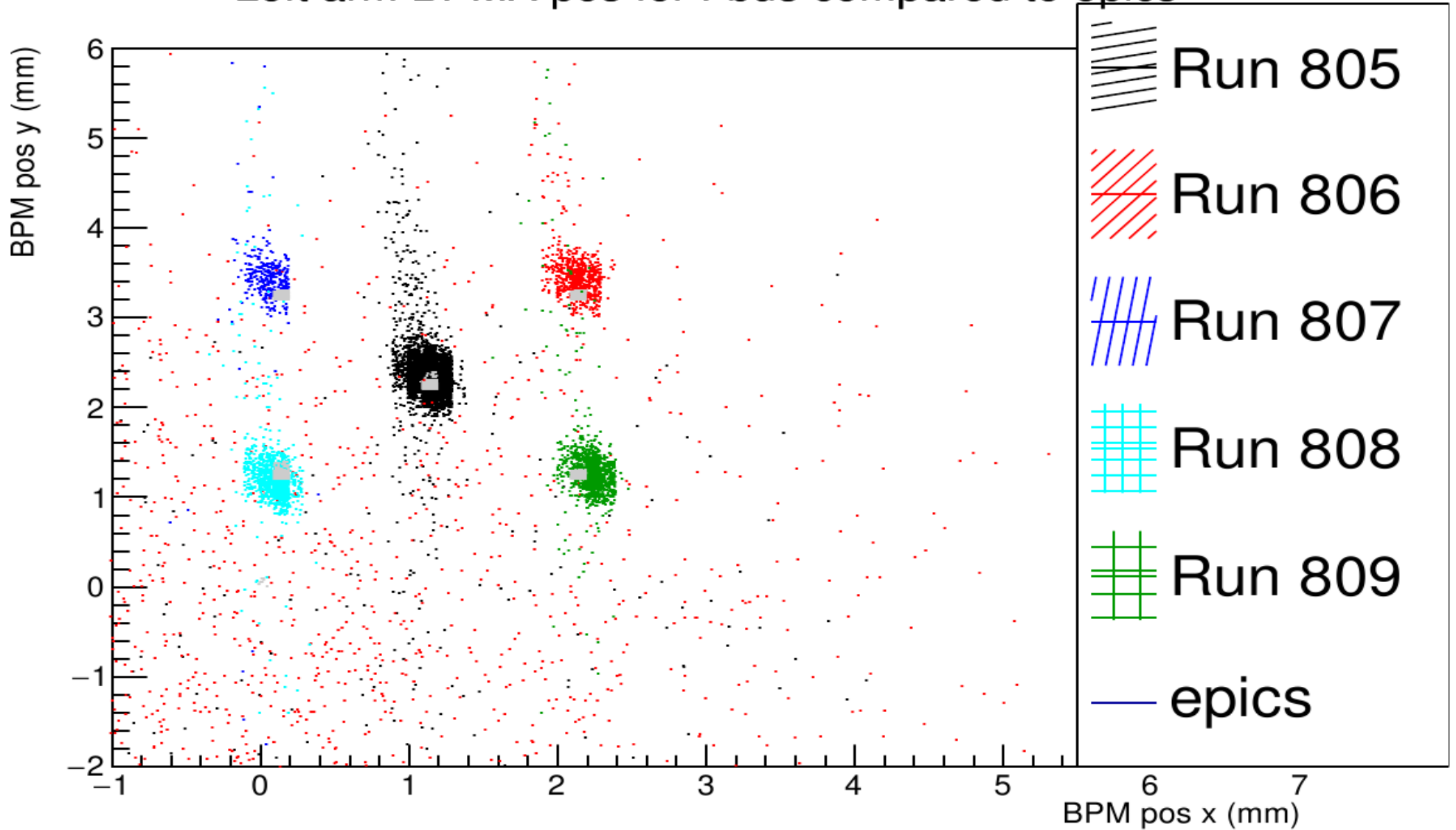


Calibration results

- 2D Plot of the x and y positions reconstructed from the Bpm signals with a Grey box of the values we expect.
- A graph of the fitted x and y position compared to their epics reference.

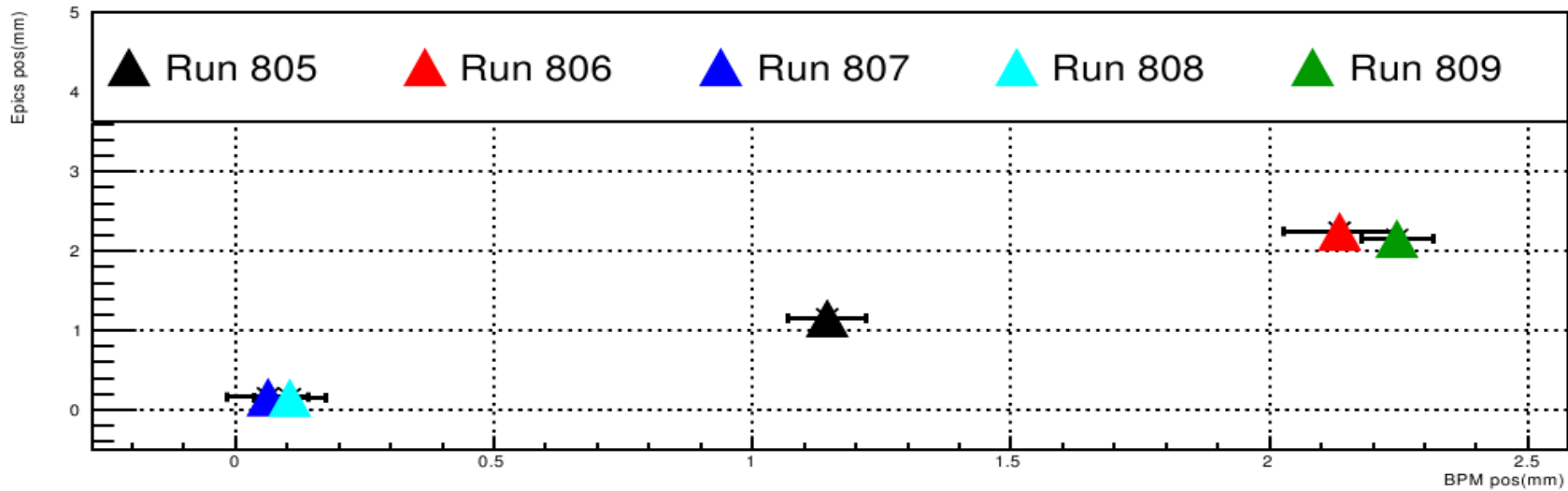
Calibration for Left Arm

Left arm BPMA pos for Fbus compared to epics

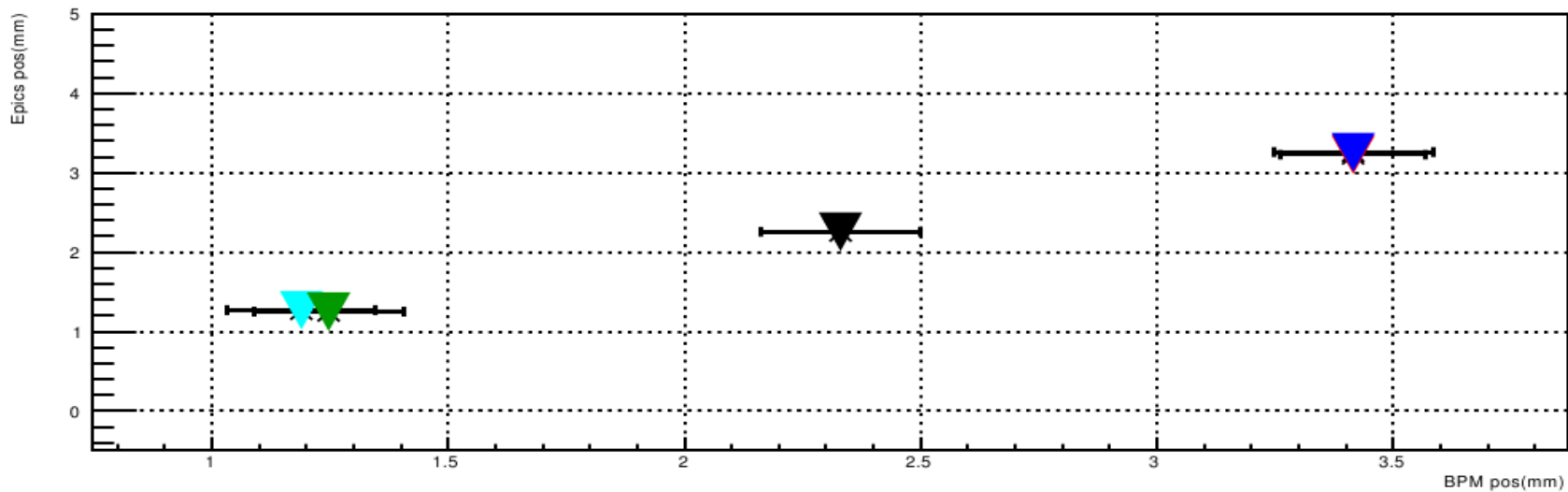


Calibration for Left Arm

Left arm Fbus BPMA vs epics for x pos



Left arm Fbus BPMA vs epics for y pos

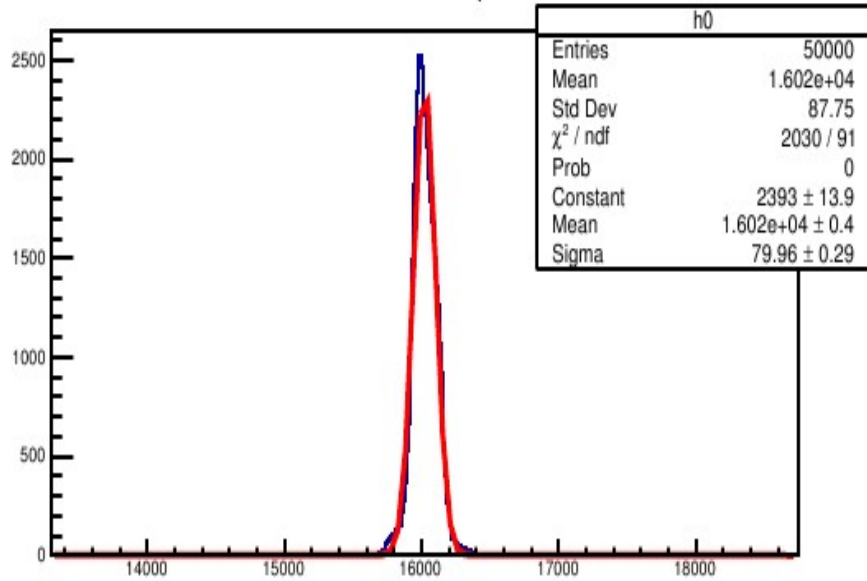


Extra data

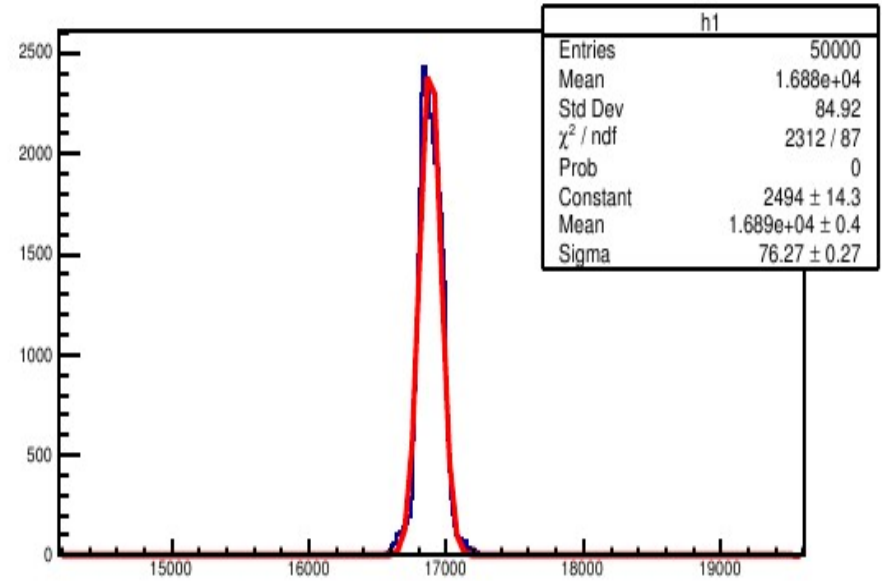
- The following slides contain:
 - the pedestal fits, for both arms and both types of adcs.
 - Calibration results from the BPMs
 - A 2d comparison of the BPMs to epics variables
 - A 1d comparison of both axes.

- Left arm 758 fadcs

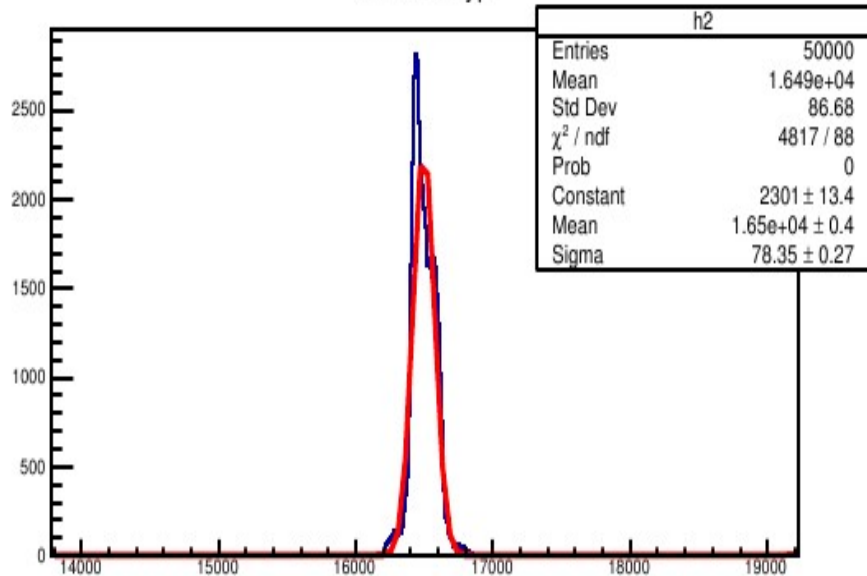
BPMA 1 - xp



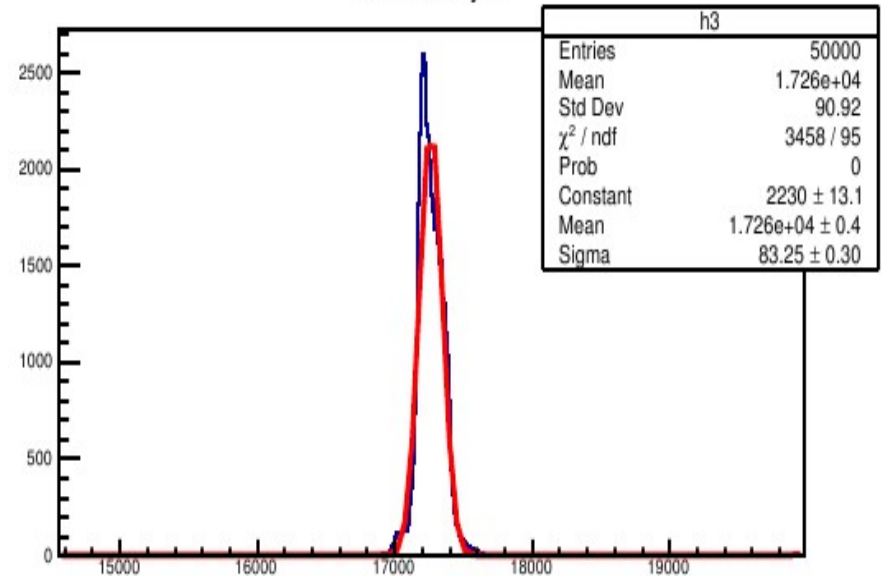
BPMA 2 - xm



BPMA 3 - yp

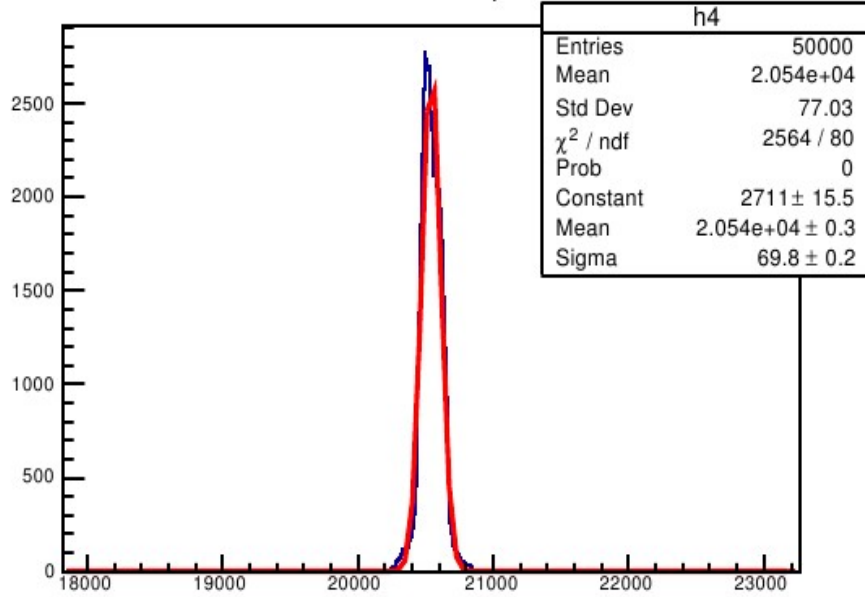


BPMA 4 - ym

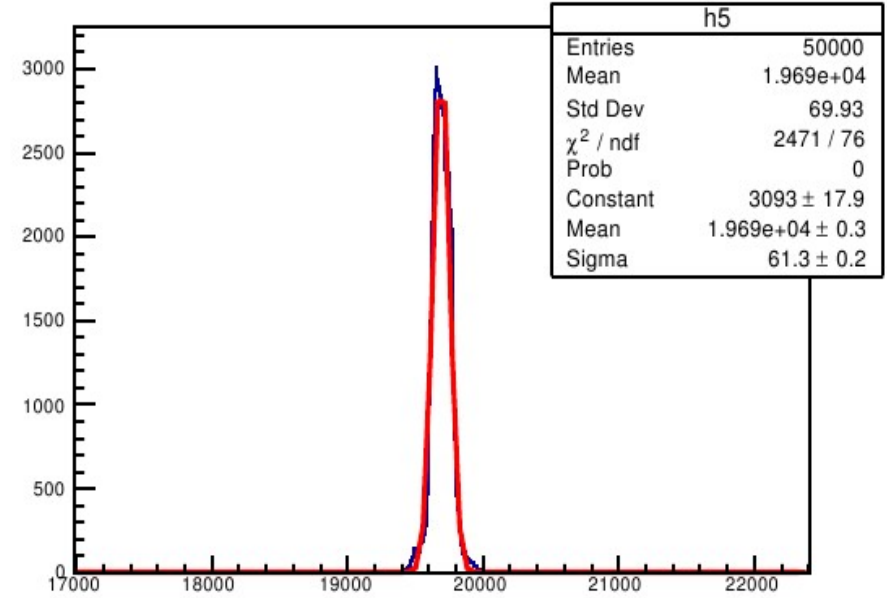


- Left arm 758 fadcs

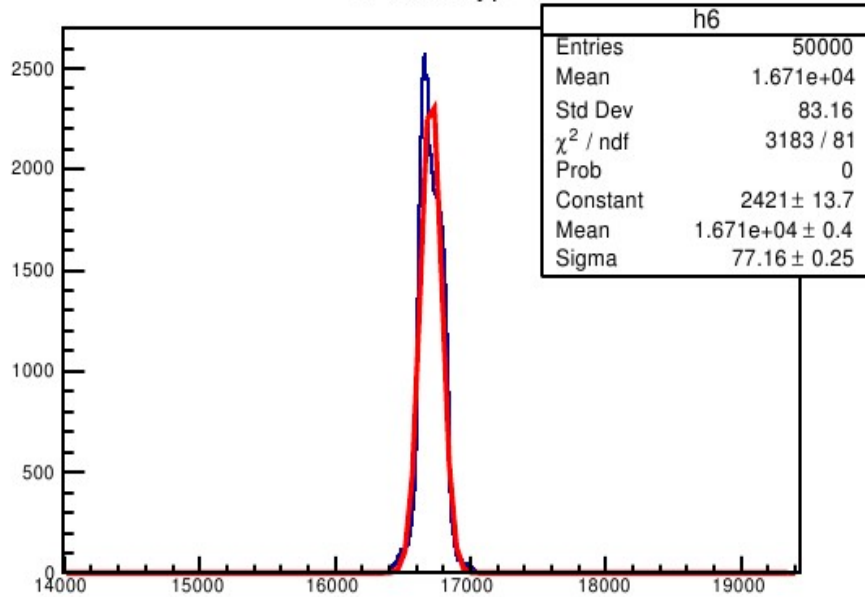
BPMB 1- xp



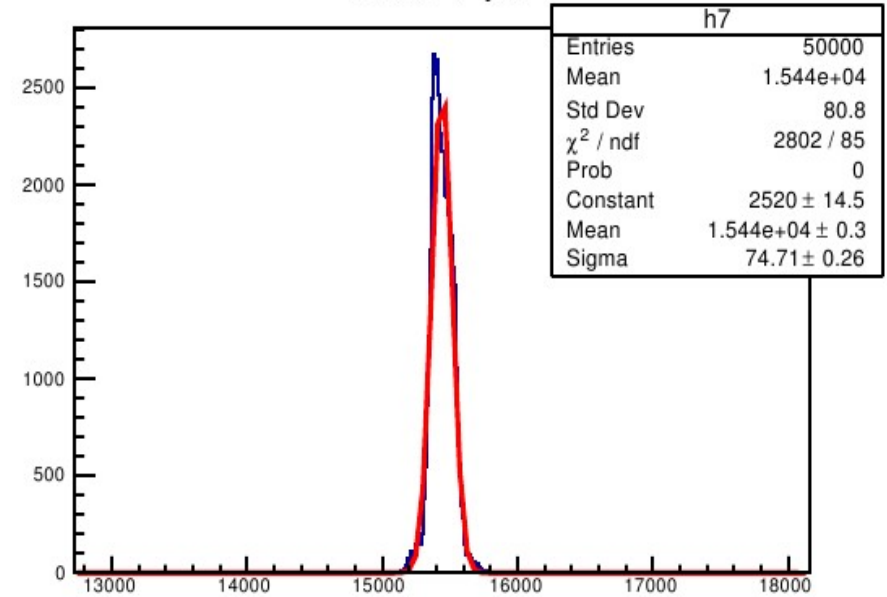
BPMB 2- xm



BPMB 3- yp

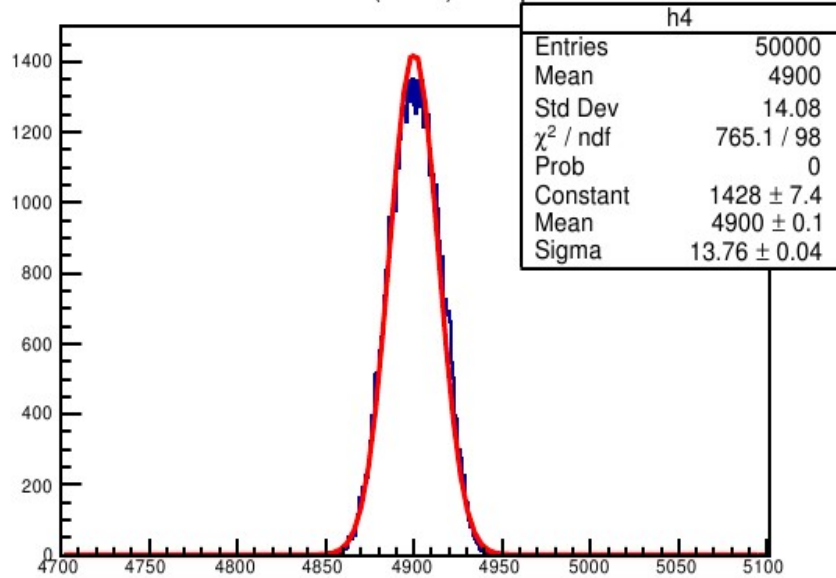


BPMB 4- ym

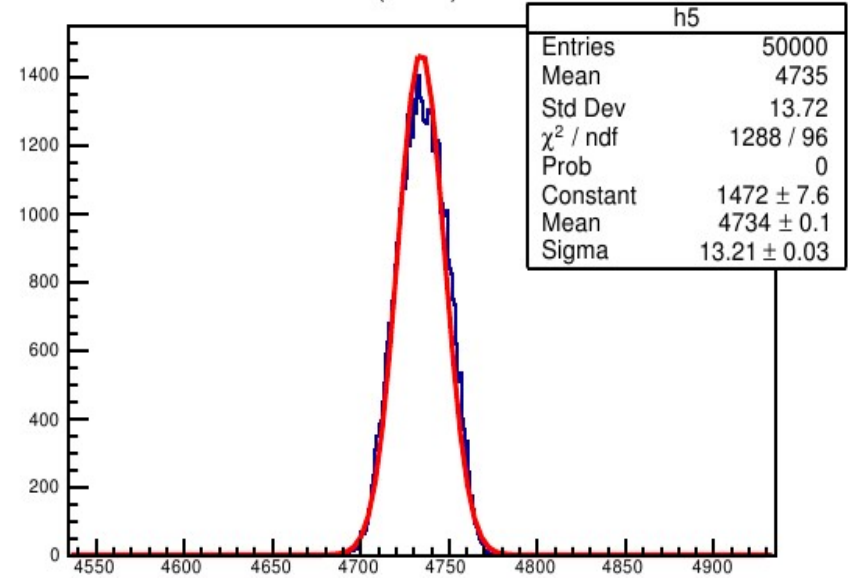


- Left arm 758

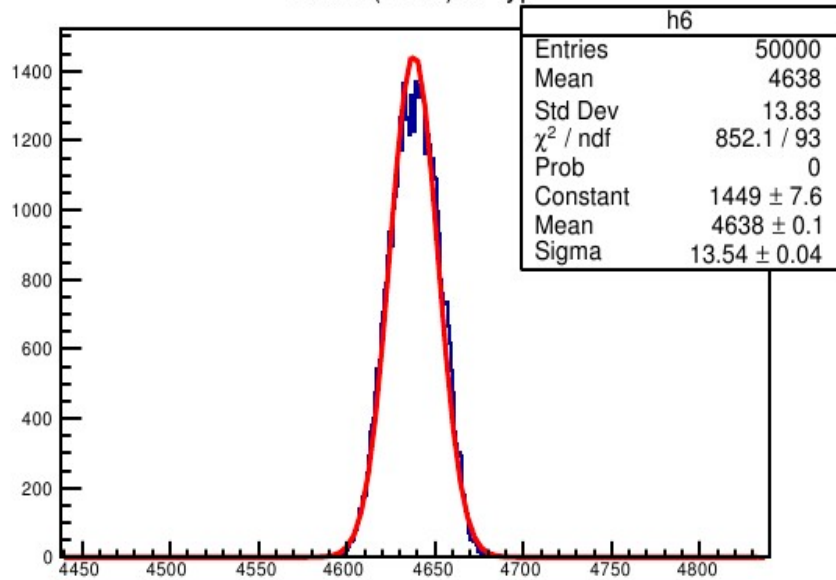
BPMB(Fbus) 1 - xp



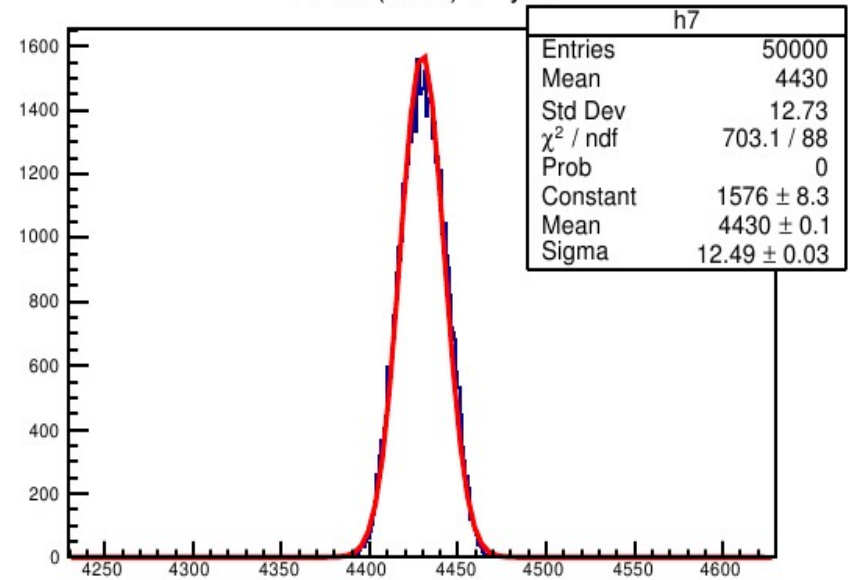
BPMB(Fbus) 2 - xm



BPMB(Fbus) 3 - yp

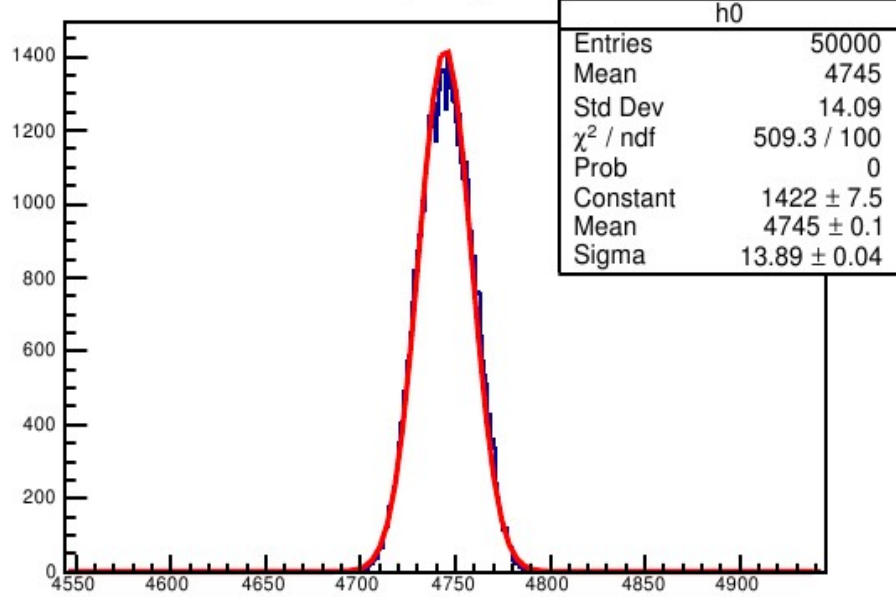


BPMB(Fbus) 4 - ym

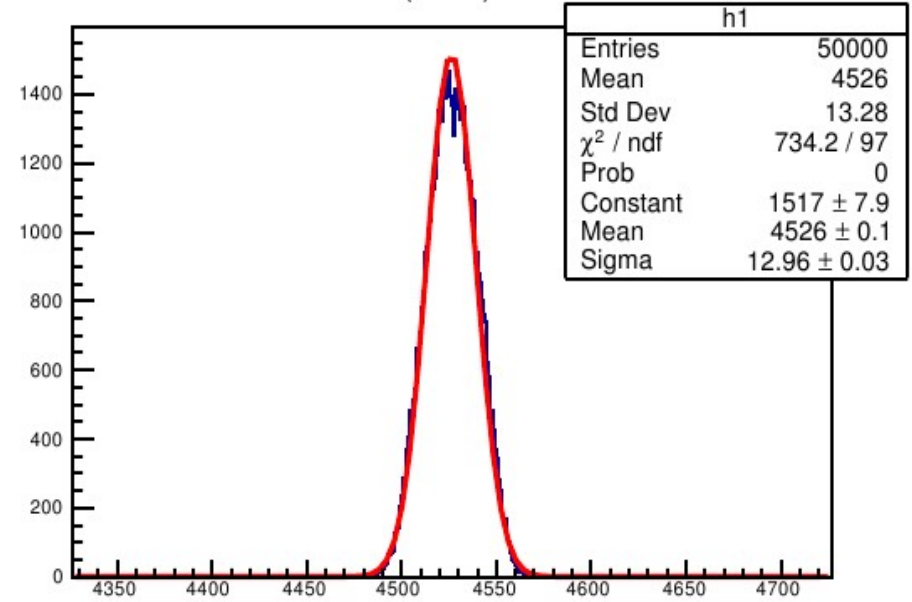


- Left arm 758

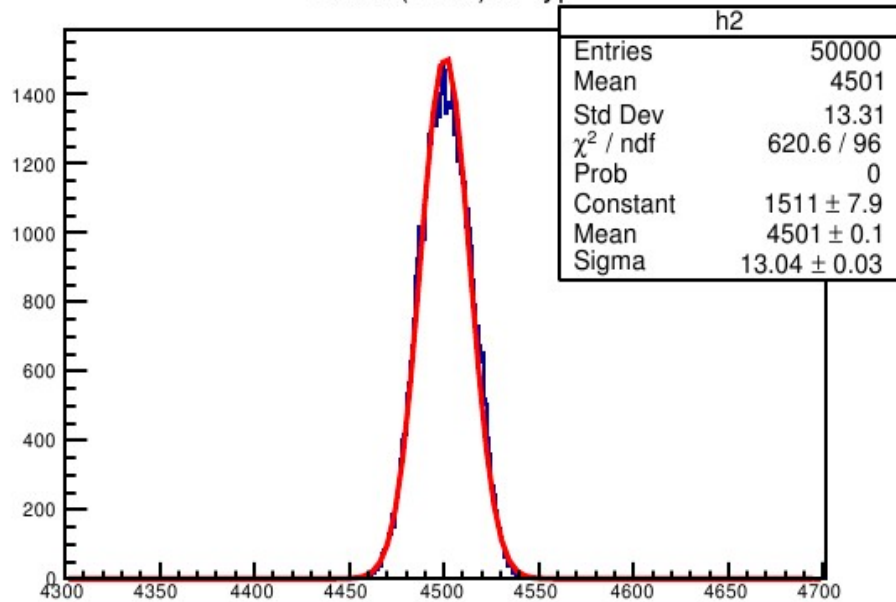
BPMA(Fbus) 1 - xp



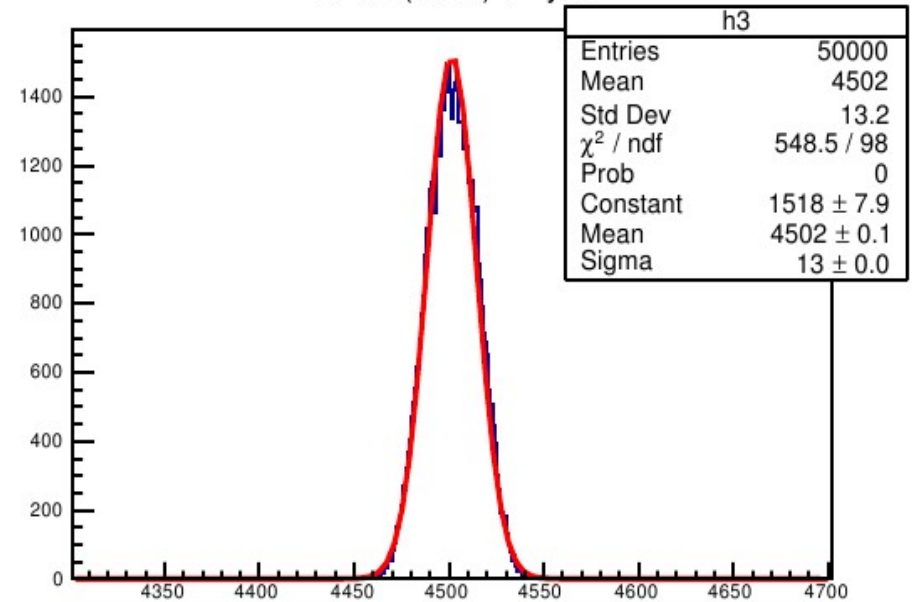
BPMA(Fbus) 2 - xm



BPMA(Fbus) 3 - yp

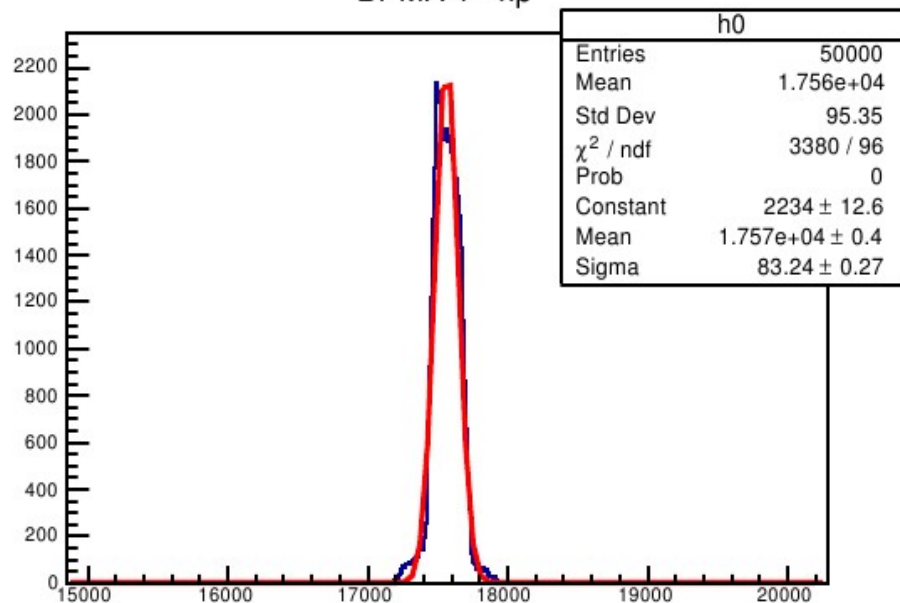


BPMA(Fbus) 4 - ym

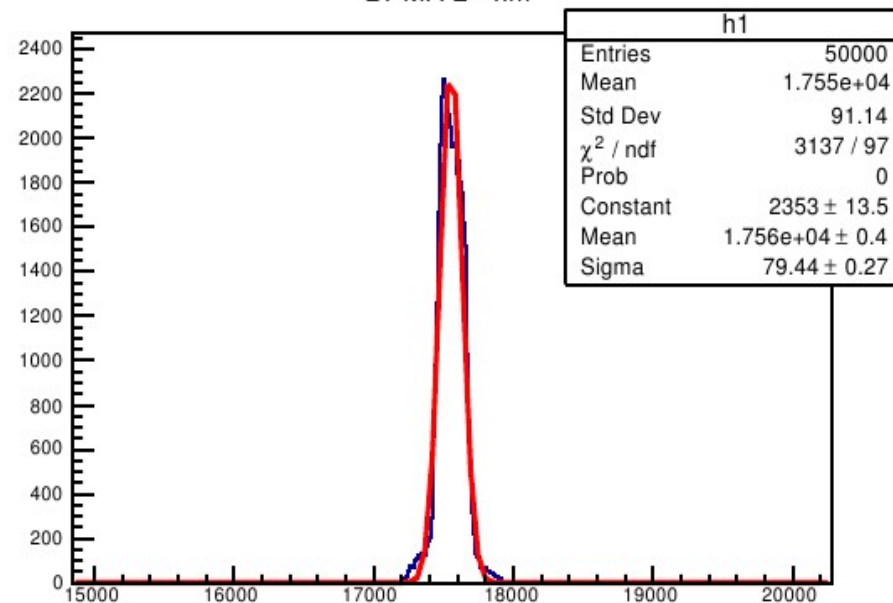


- Right arm 90558

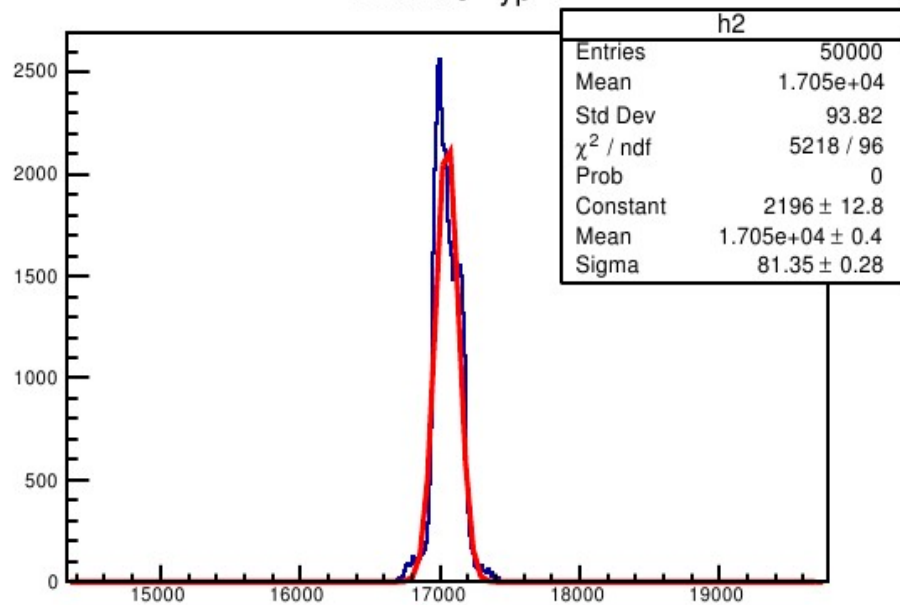
BPMA 1 - xp



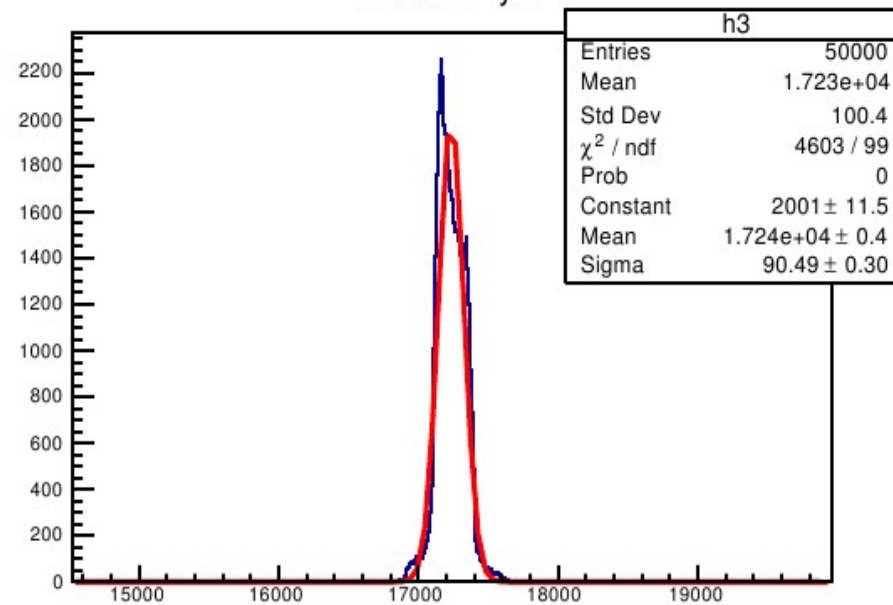
BPMA 2 - xm



BPMA 3 - yp

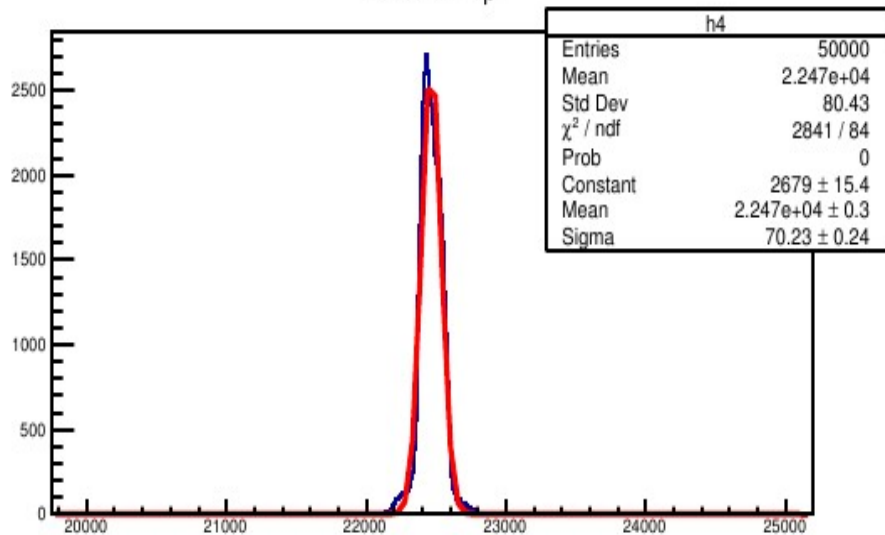


BPMA 4 - ym

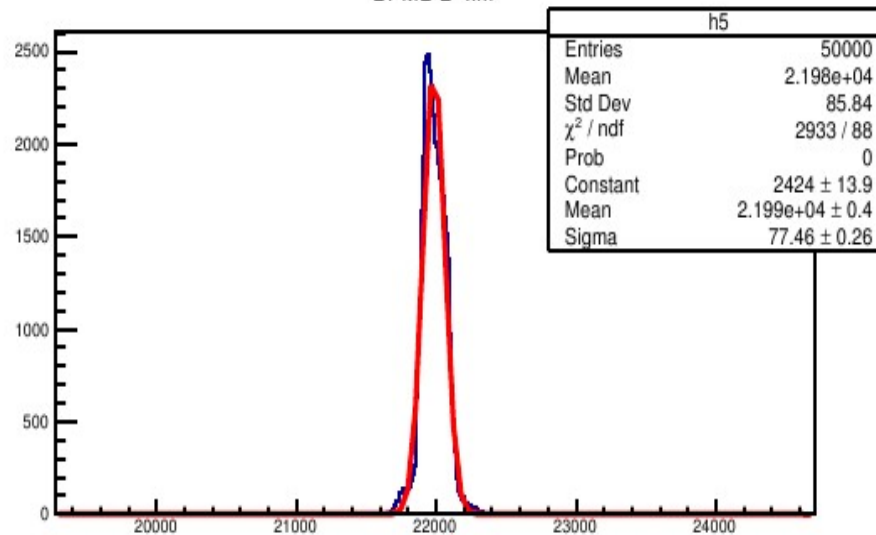


- Right arm 90558

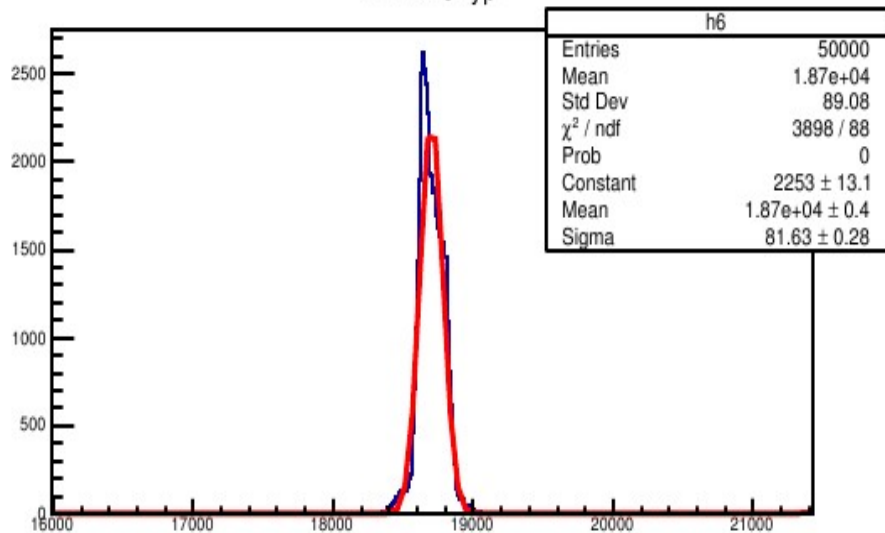
BPMB 1- xp



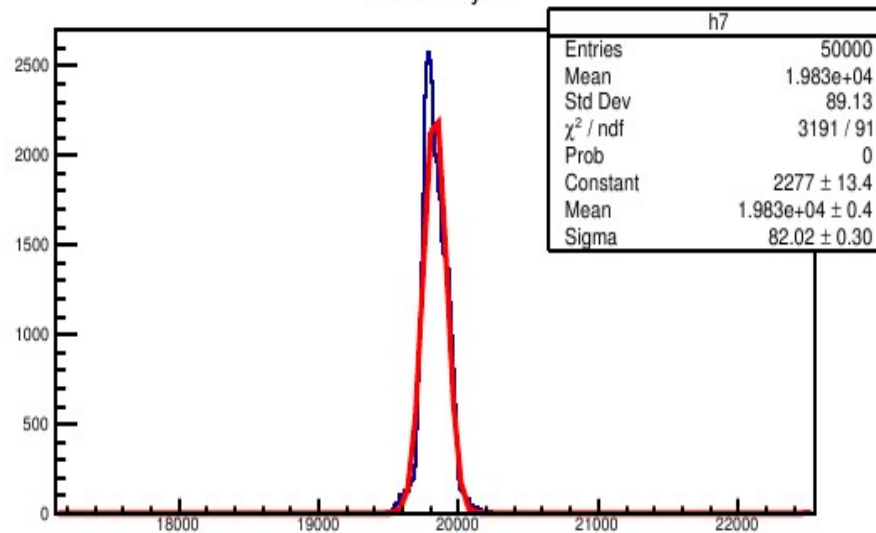
BPMB 2- xm



BPMB 3- yp

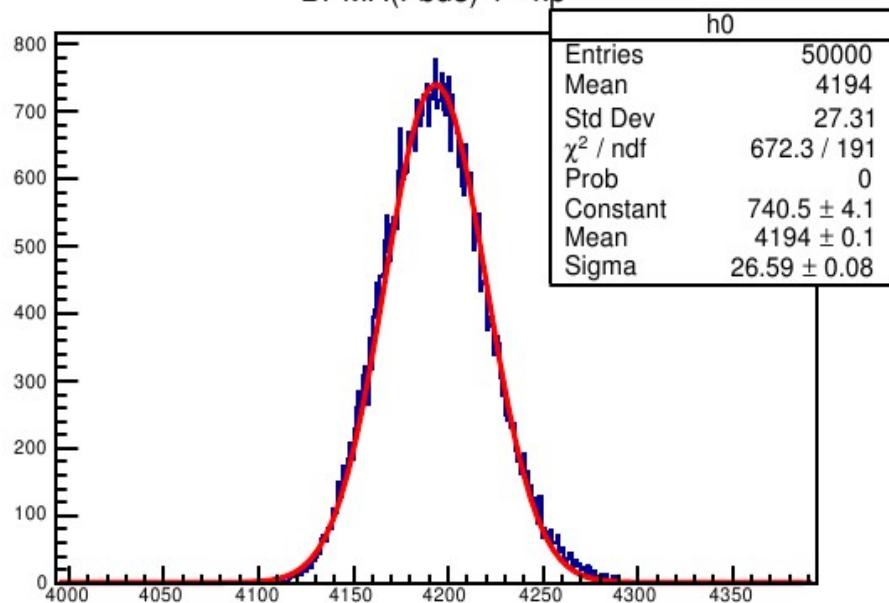


BPMB 4- ym

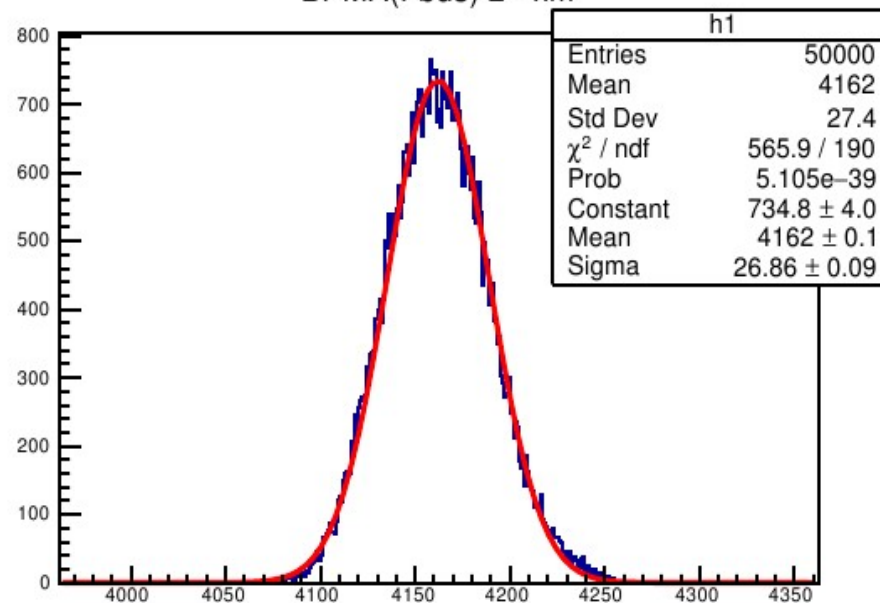


- Right arm 90558

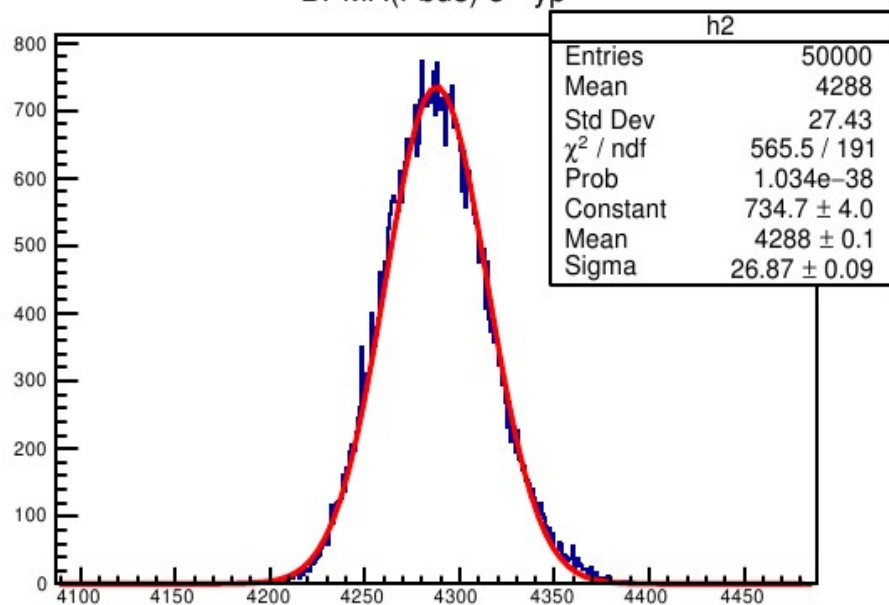
BPMA(Fbus) 1 - xp



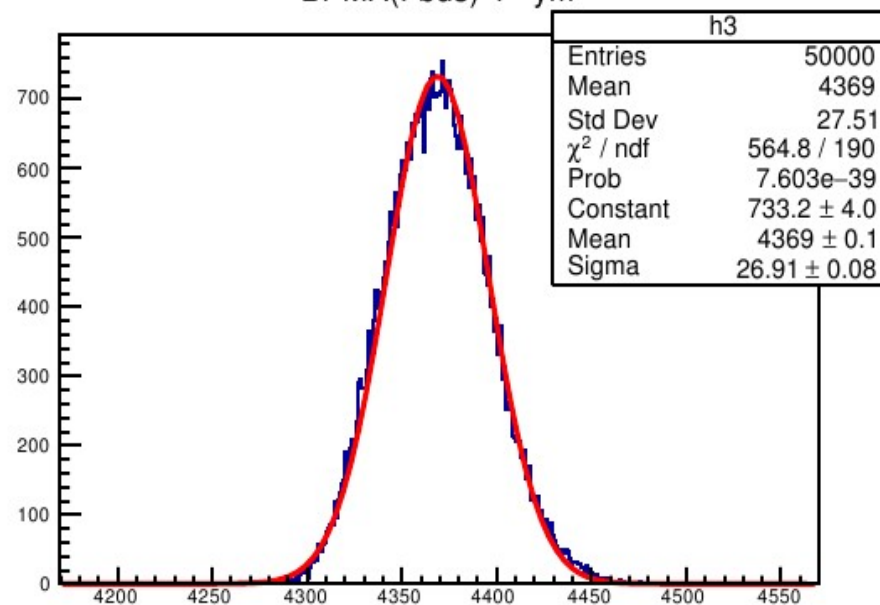
BPMA(Fbus) 2 - xm



BPMA(Fbus) 3 - yp

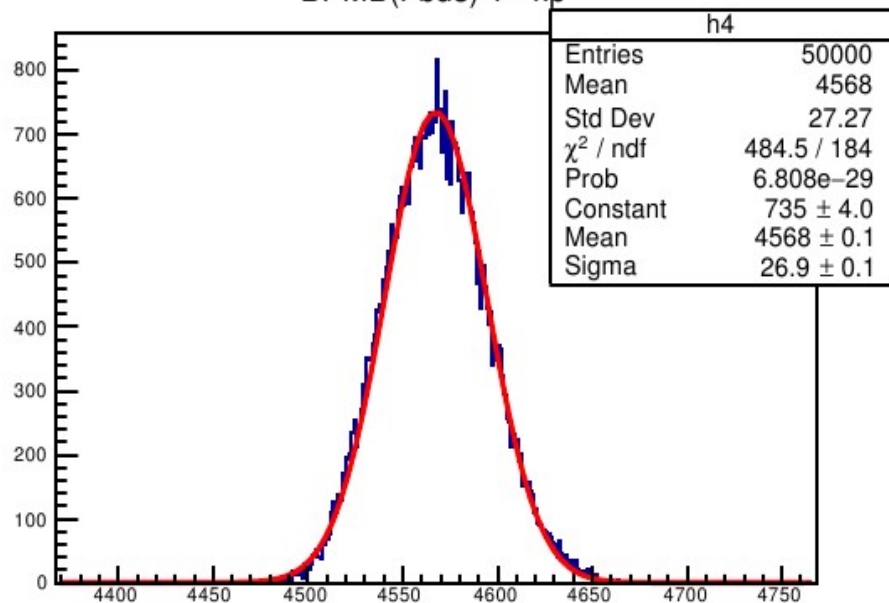


BPMA(Fbus) 4 - ym

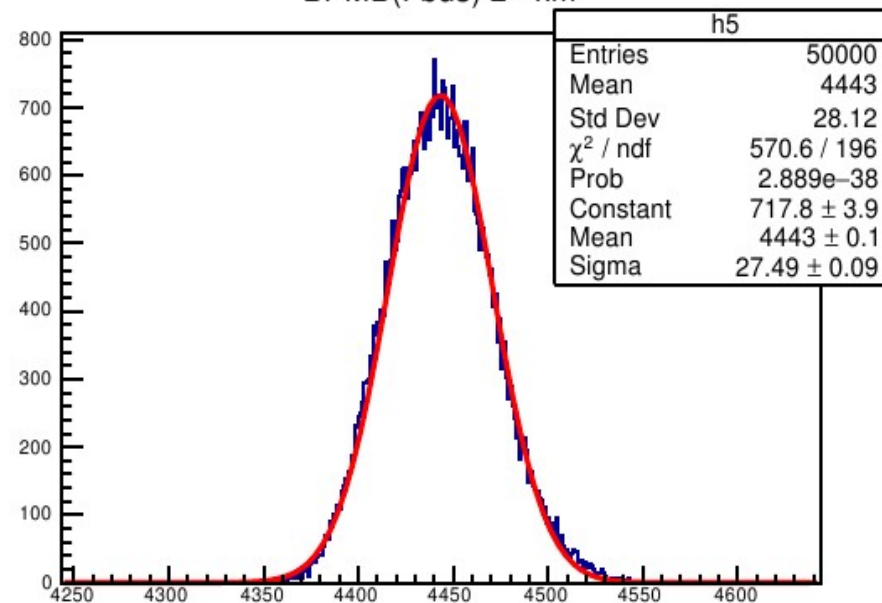


- Right arm 90558

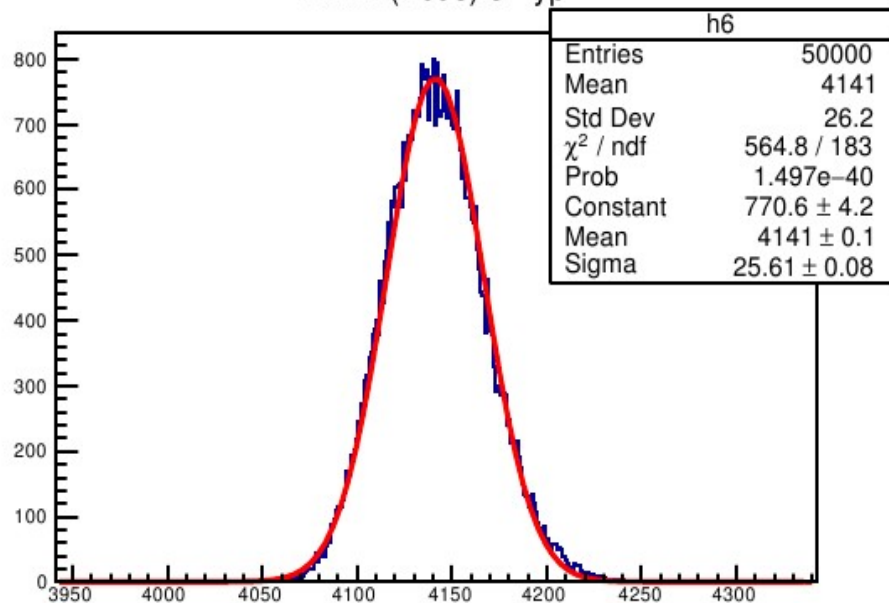
BPMB(Fbus) 1 - xp



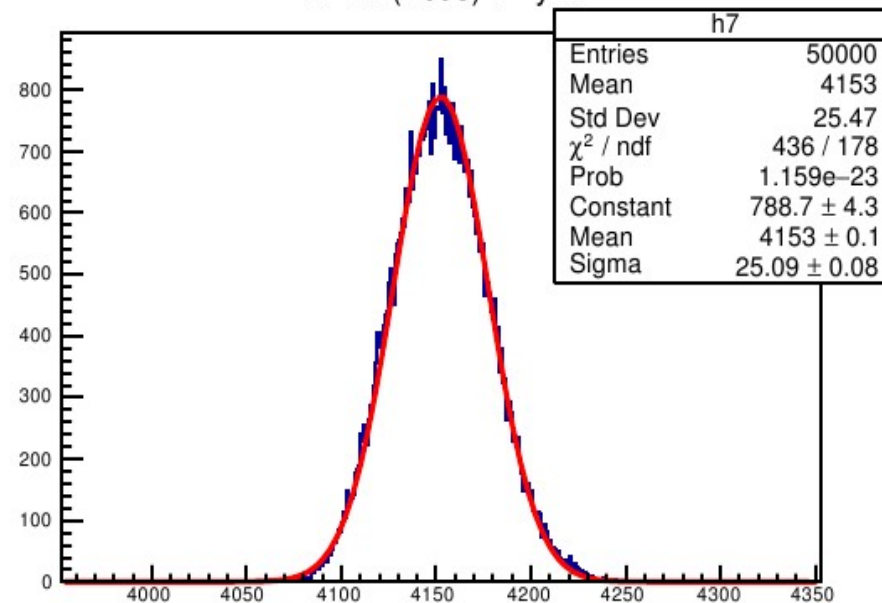
BPMB(Fbus) 2 - xm



BPMB(Fbus) 3 - yp



BPMB(Fbus) 4 - ym

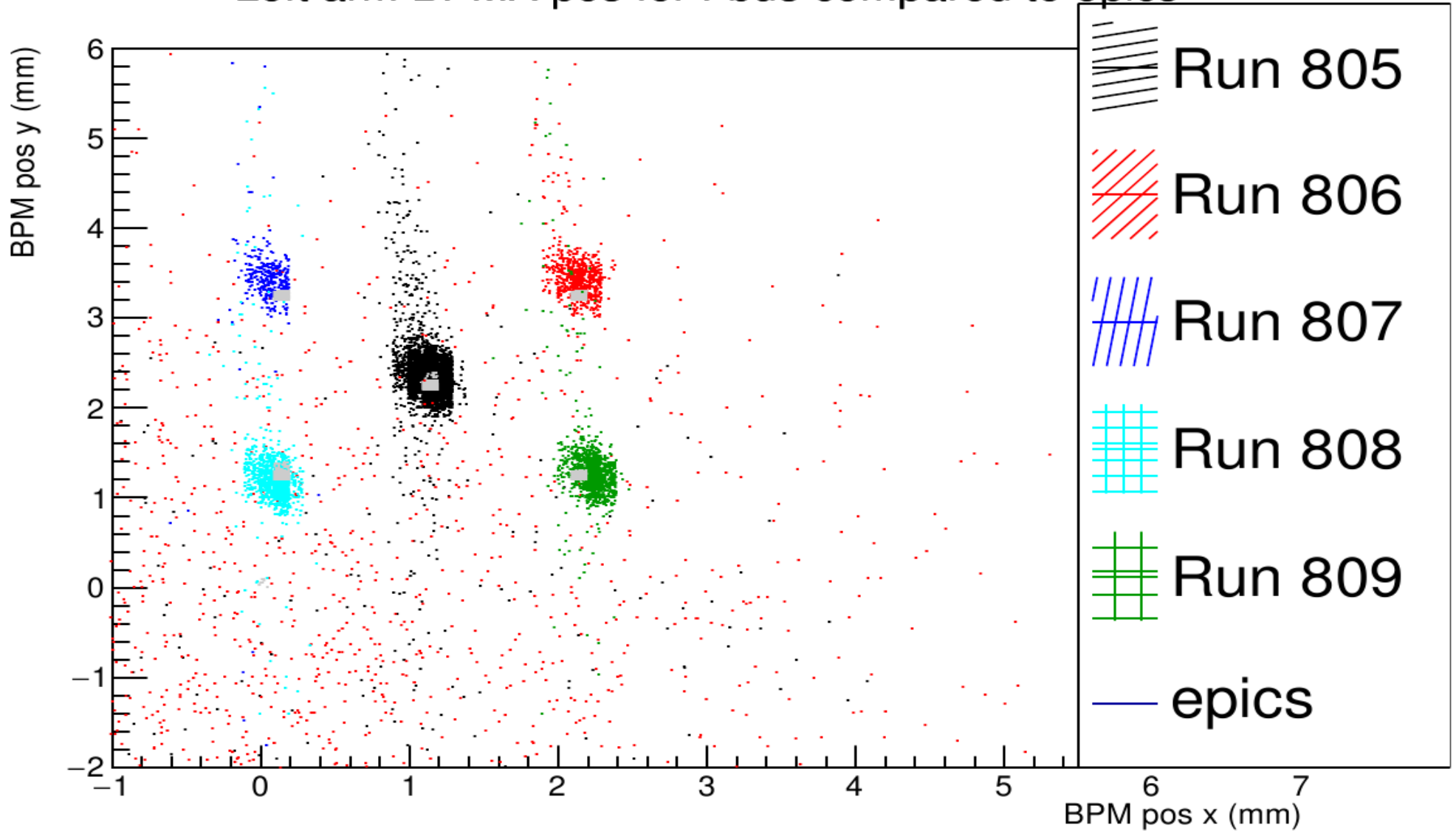


Calibration results

- 2D Plot of the x and y positions reconstructed from the Bpm signals with a Grey box of the values we expect.
- A graph of the fitted x and y position compared to their epics reference.
- This is completed for each BPM of each arm for both fadc and Fast bus.

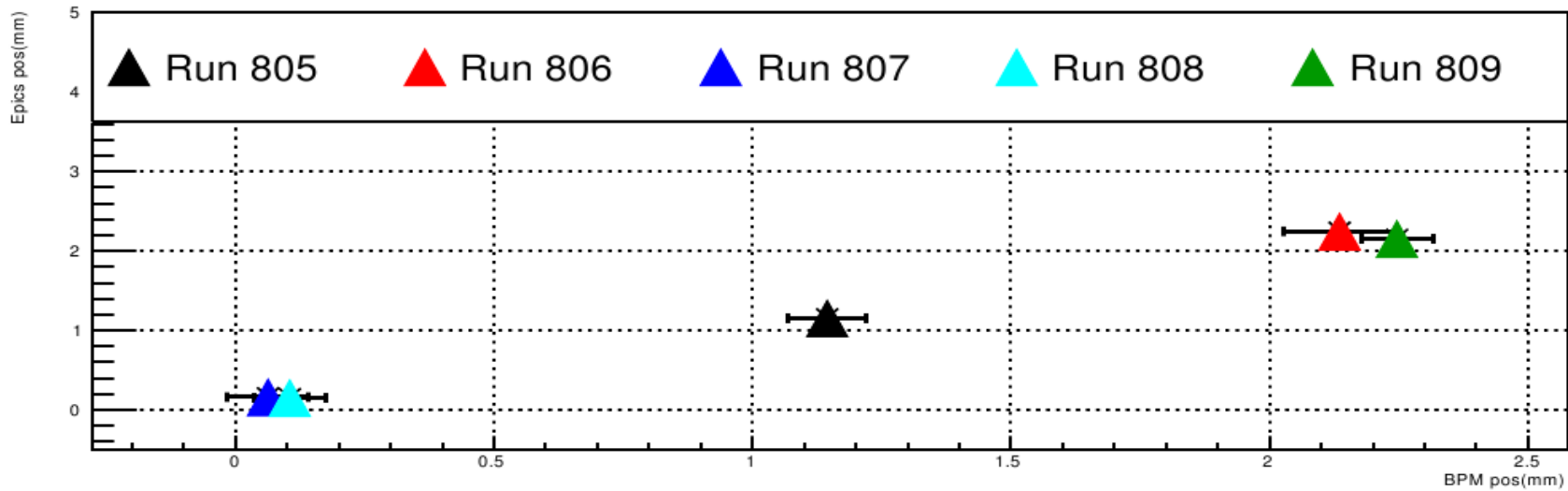
Calibration for Left Arm

Left arm BPMA pos for Fbus compared to epics

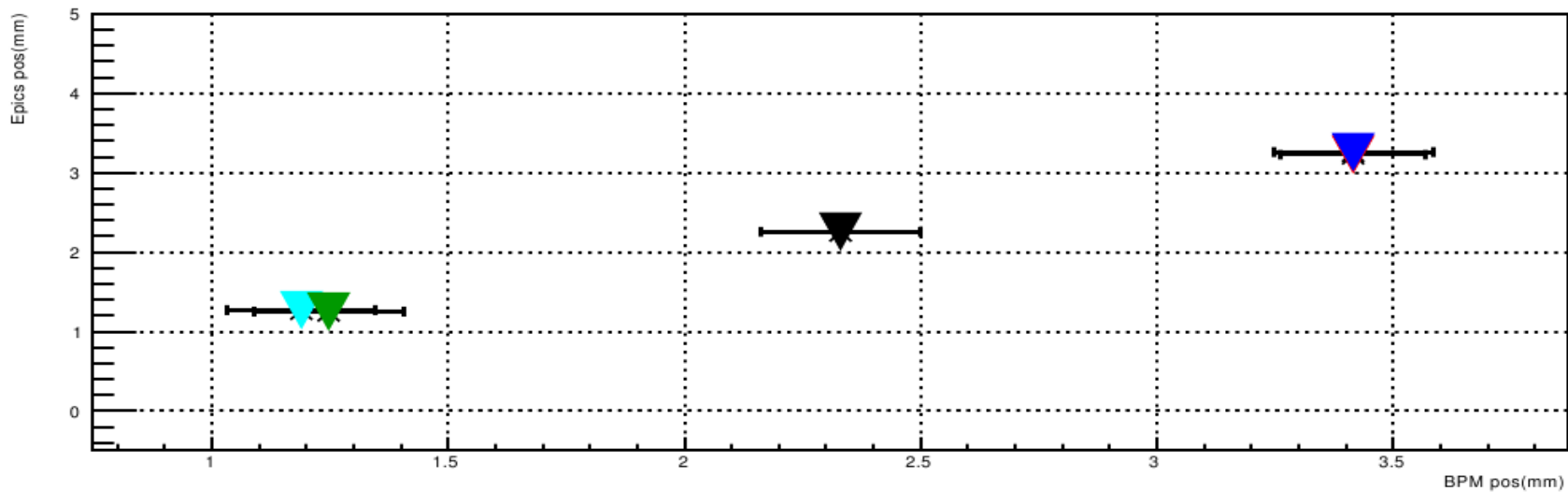


Calibration for Left Arm

Left arm Fbus BPMA vs epics for x pos

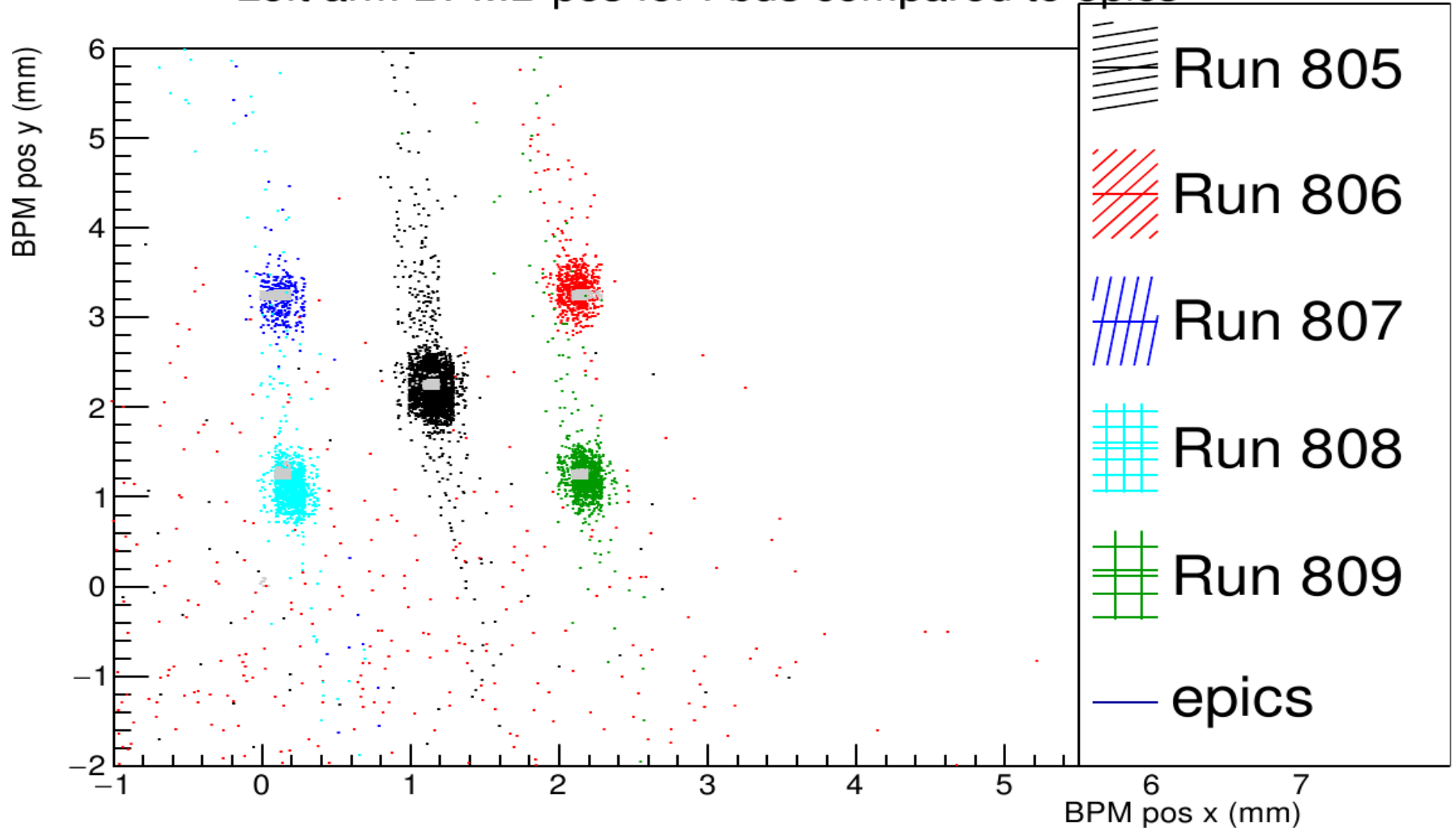


Left arm Fbus BPMA vs epics for y pos



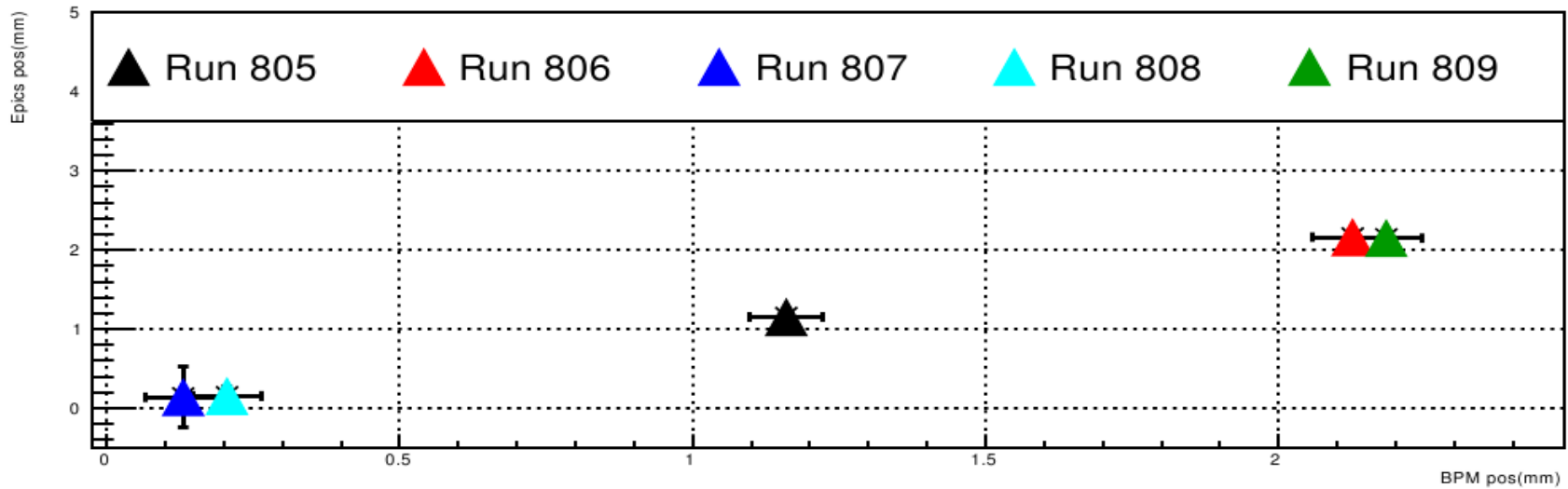
Calibration for Left Arm

Left arm BPMB pos for Fbus compared to epics

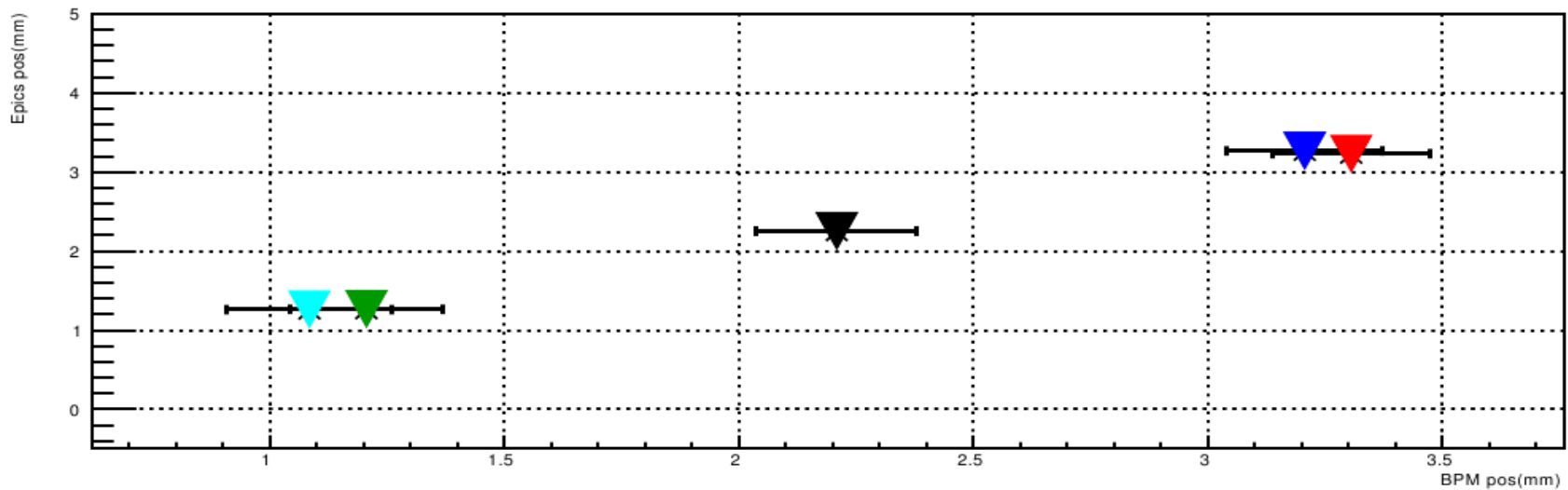


Calibration for Left Arm

Left arm Fbus BPMB vs epics for x pos

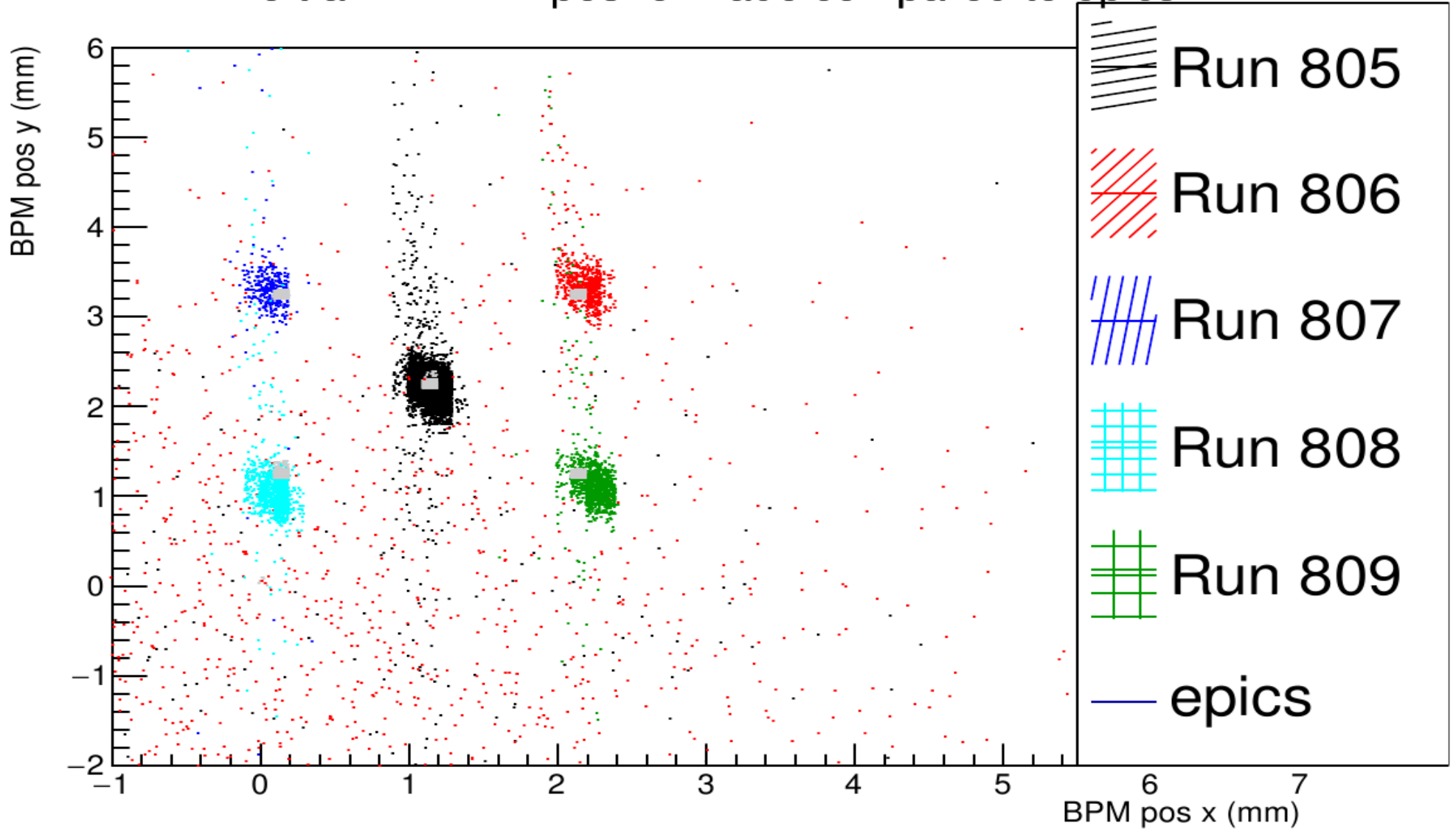


Left arm Fbus BPMB vs epics for y pos



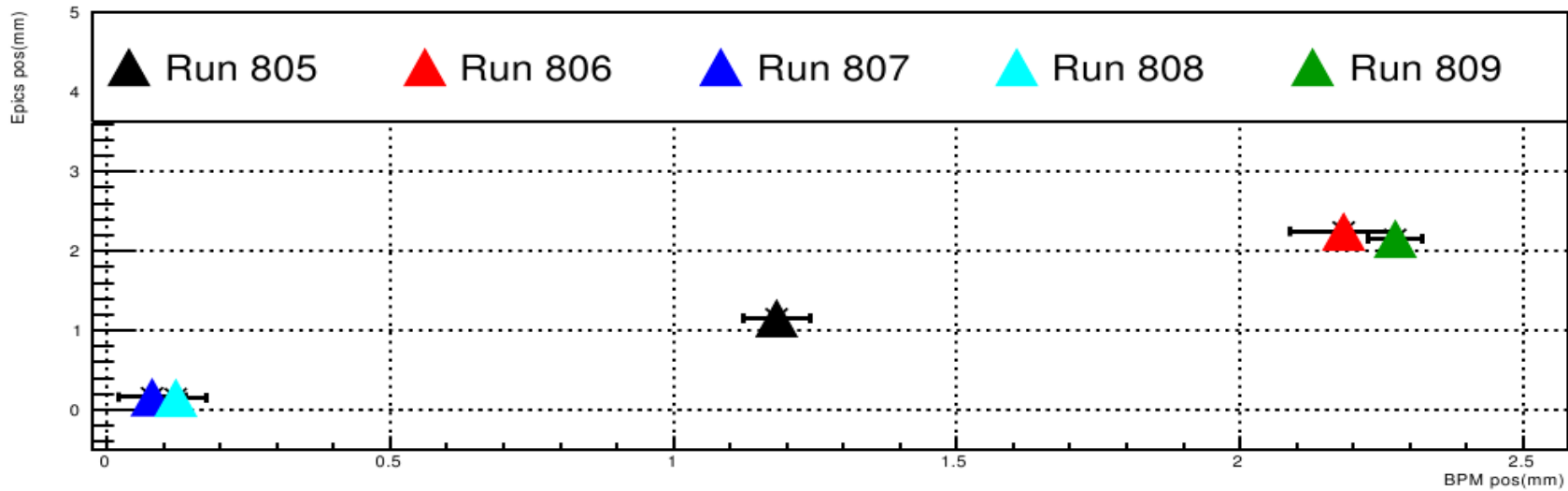
Calibration for Left Arm

Left arm BPMA pos for Fadc compared to epics

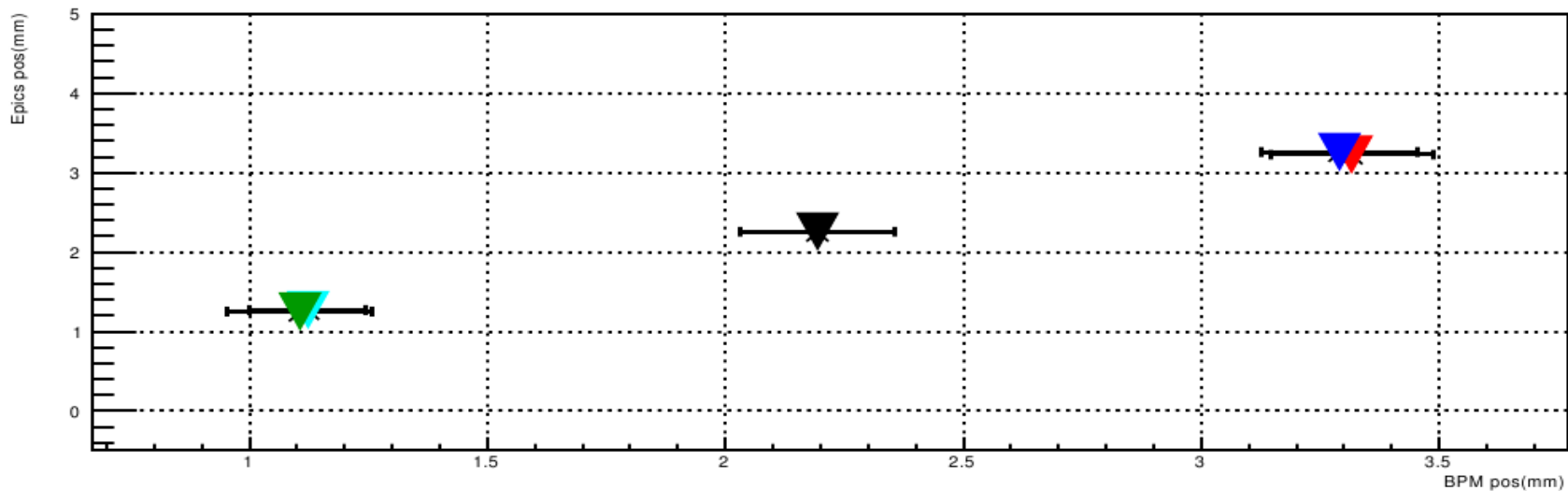


Calibration for Left Arm

Left arm Fadc BPMA vs epics for x pos

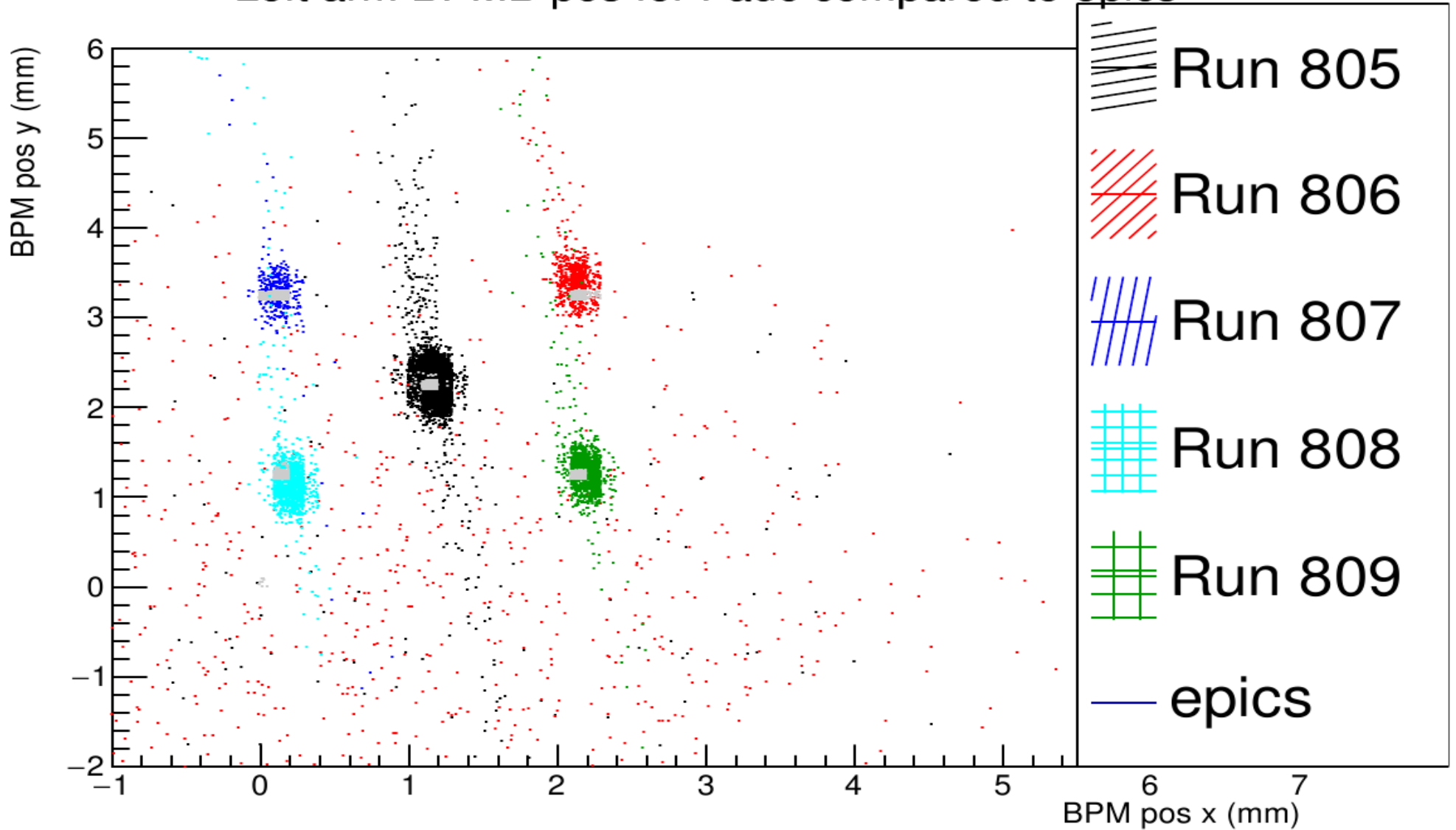


Left arm Fadc BPMA vs epics for y pos



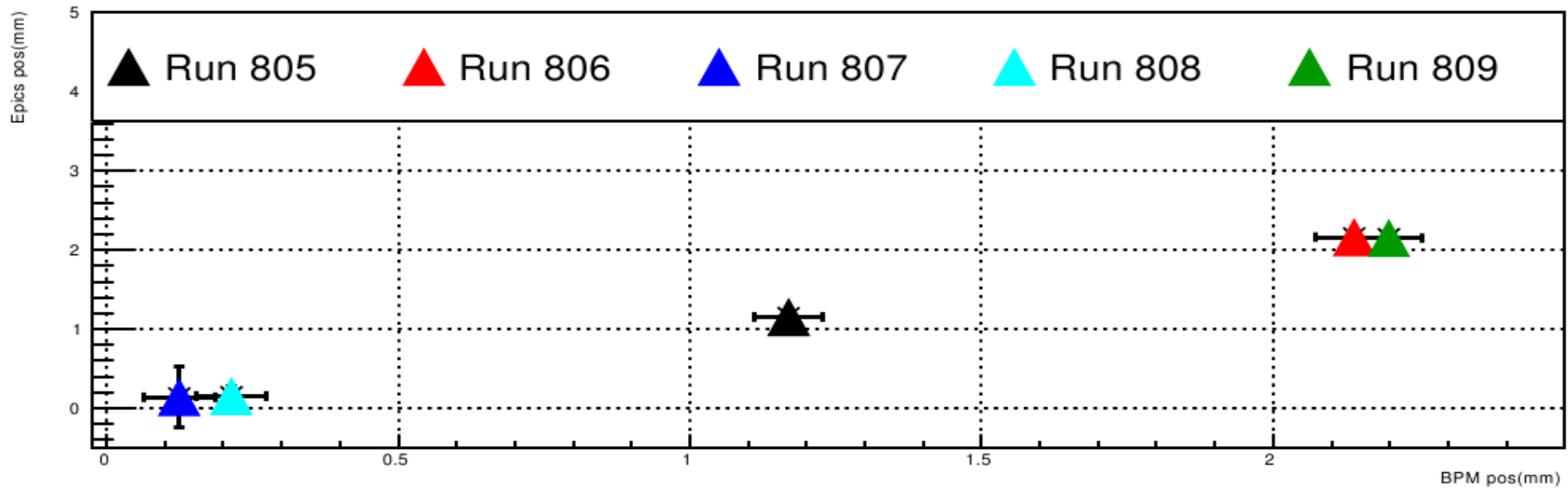
Calibration for Left Arm

Left arm BPMB pos for Fadc compared to epics

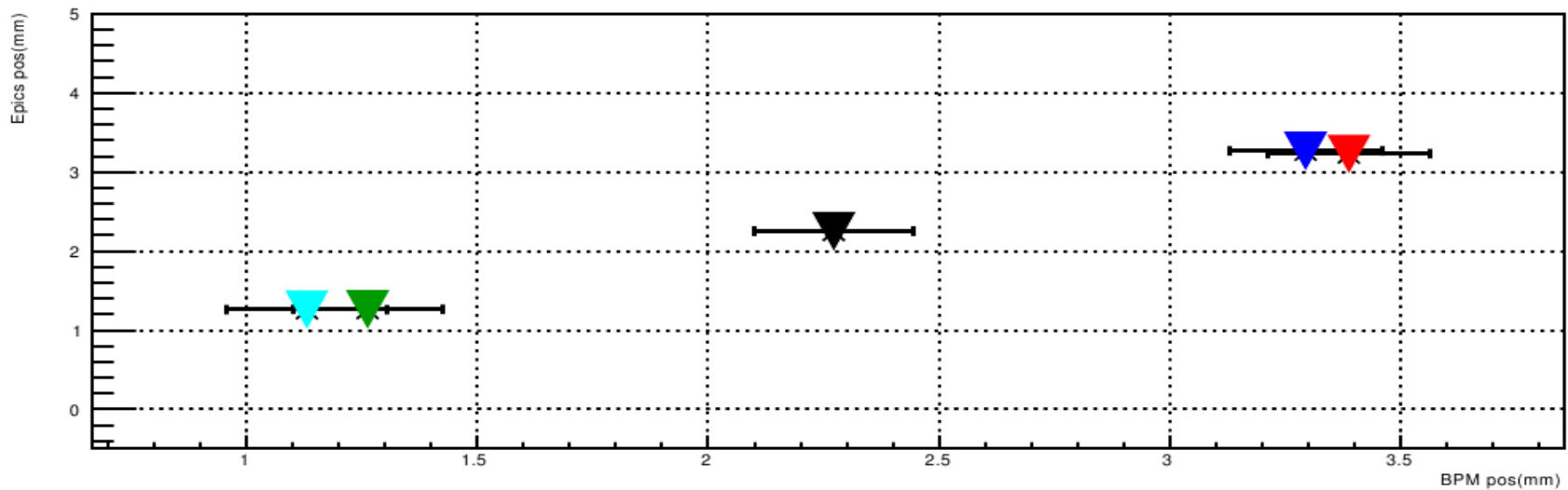


Calibration for Left Arm

Left arm Fadc BPMB vs epics for x pos

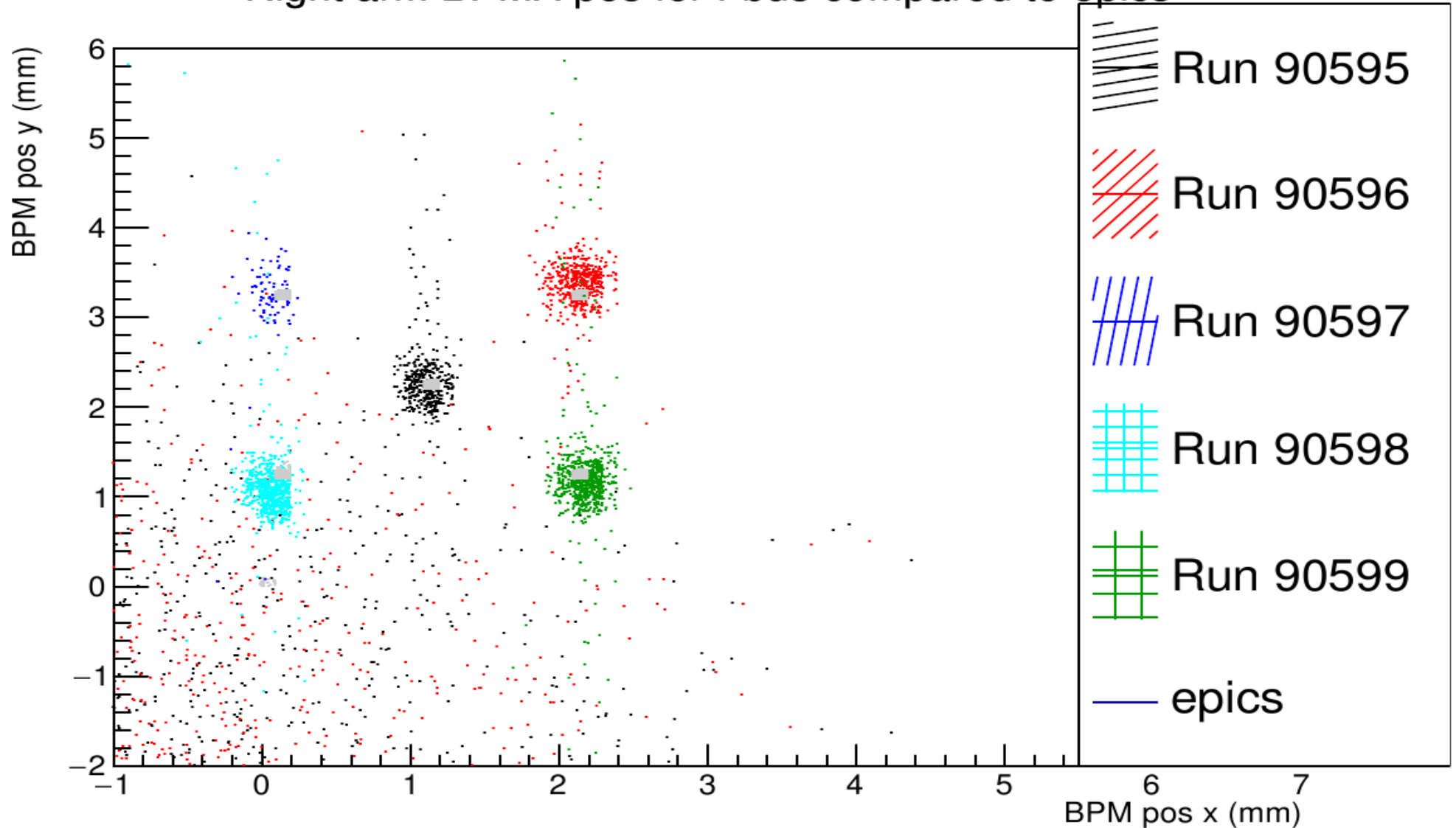


Left arm Fadc BPMB vs epics for y pos



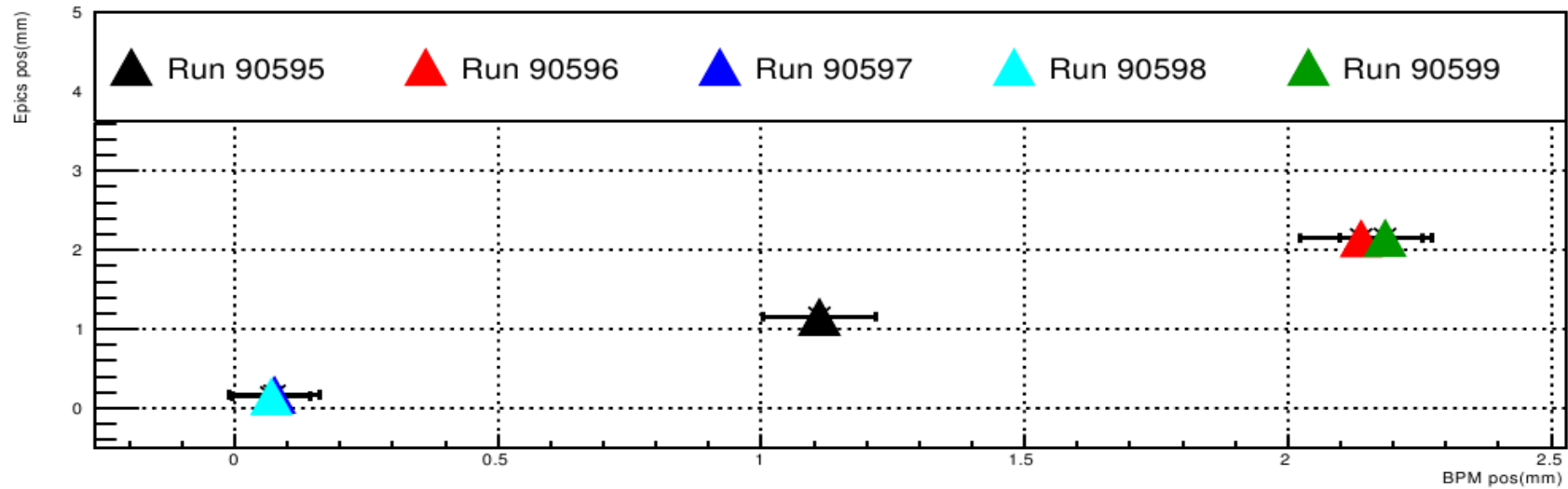
Calibration for Right Arm

Right arm BPMA pos for Fbus compared to epics

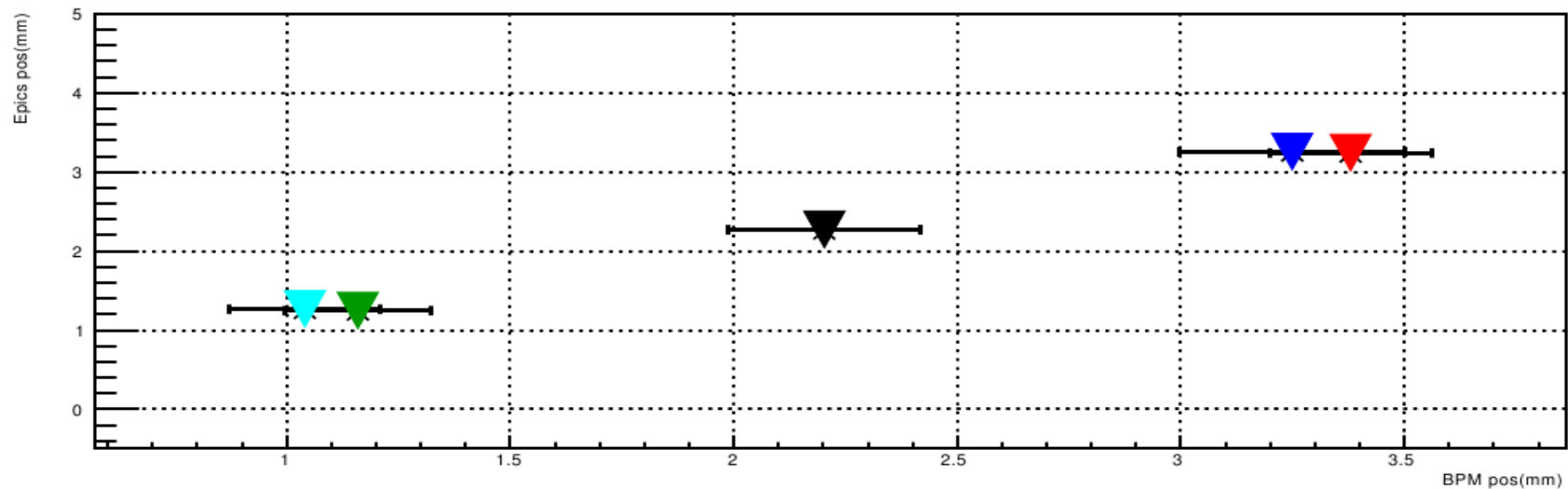


Calibration for Right Arm

Right arm Fbus BPMA vs epics for x pos

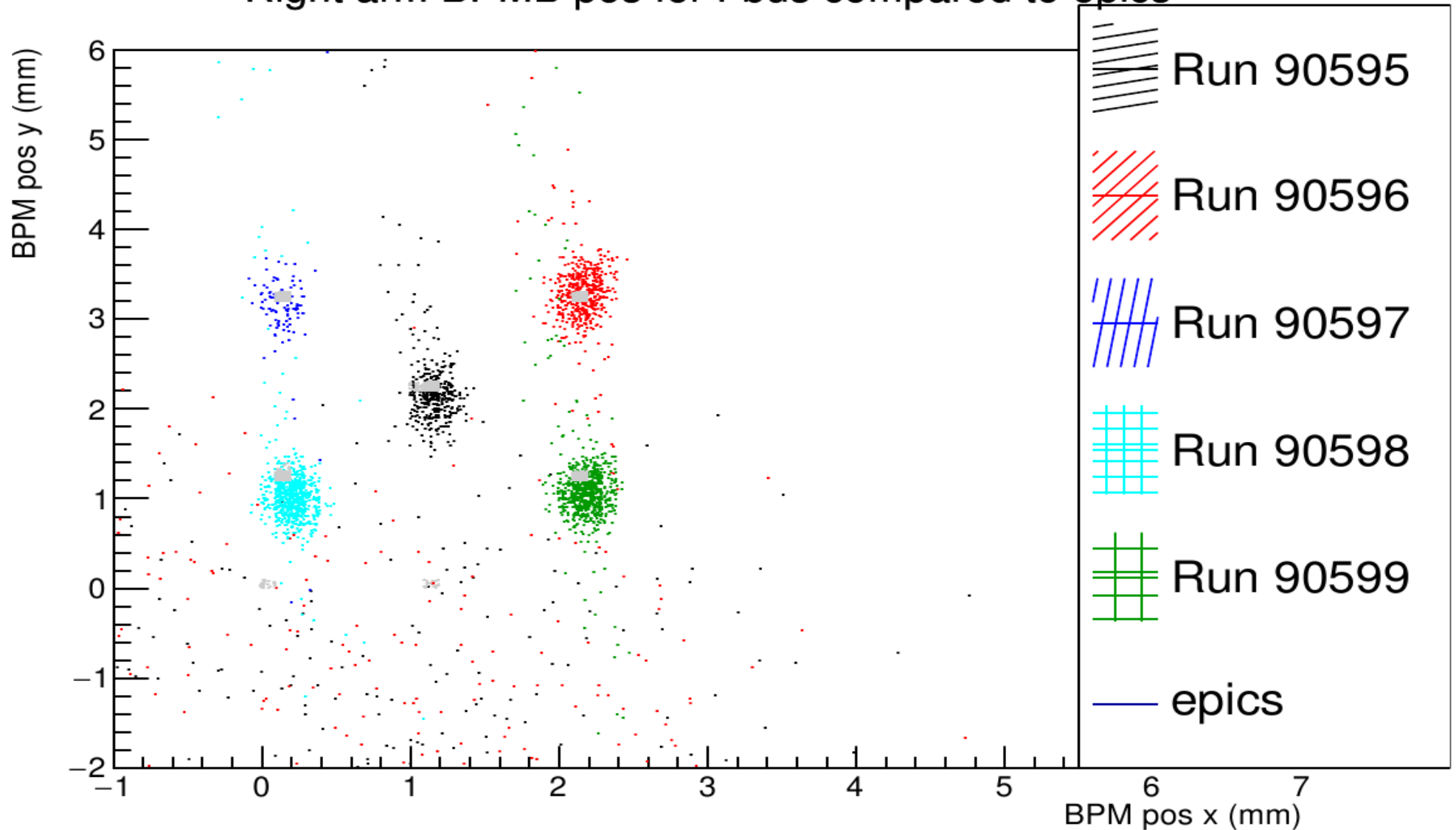


Right arm Fbus BPMA vs epics for y pos



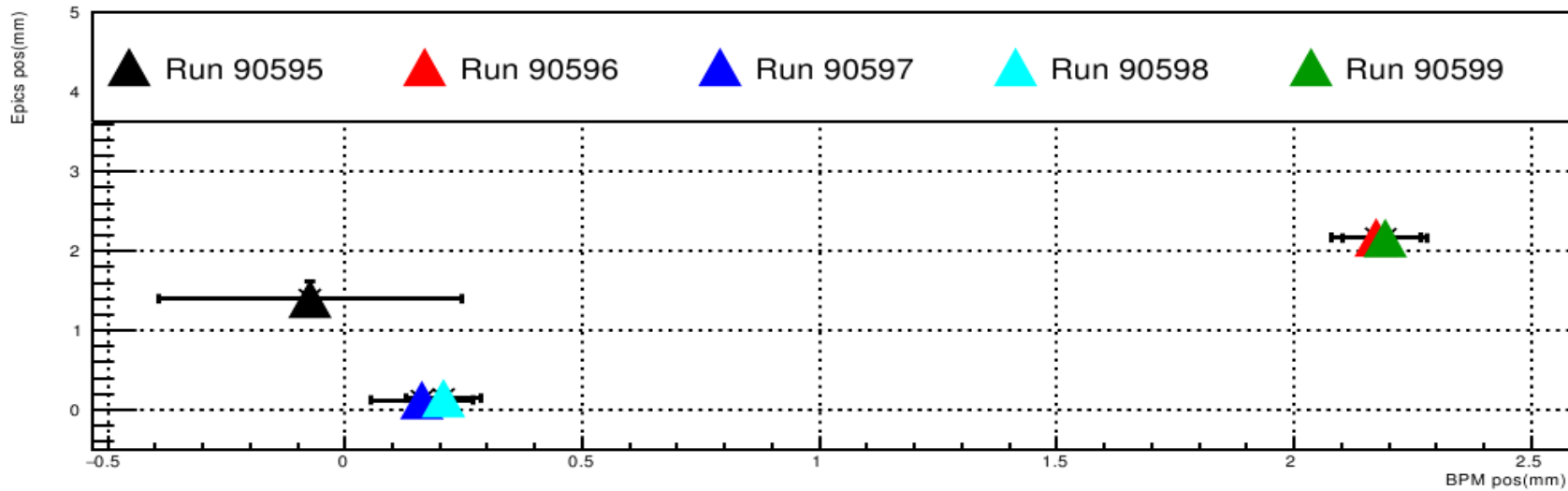
Calibration for Right Arm

Right arm BPMB pos for Fbus compared to epics

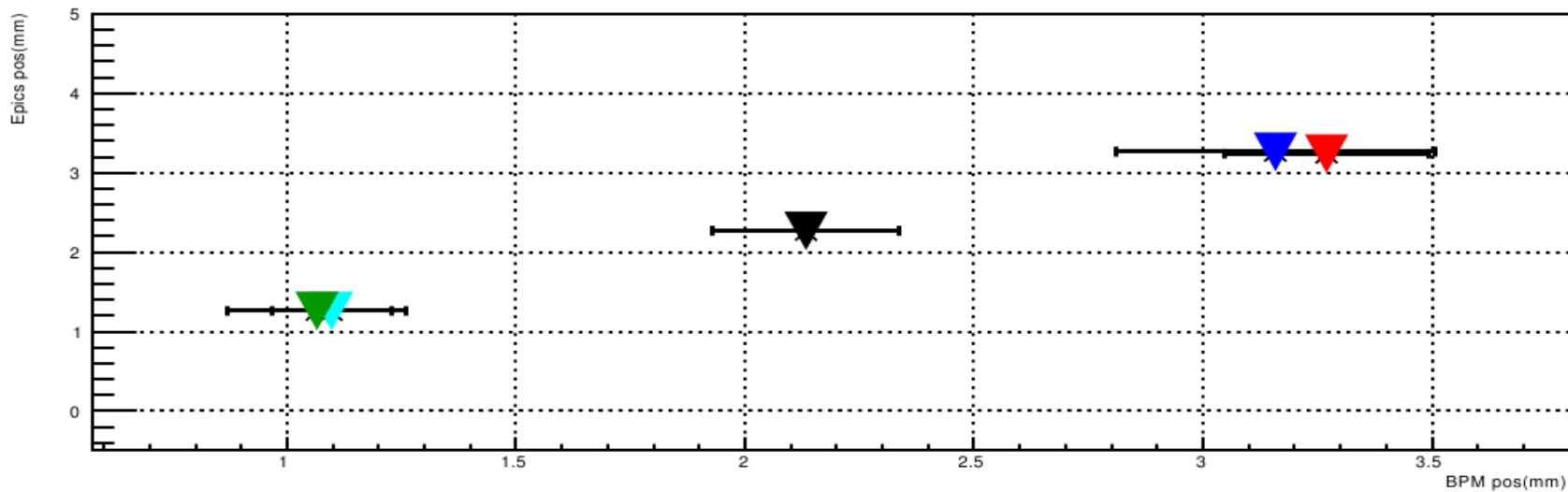


Calibration for Right Arm

Right arm Fbus BPMB vs epics for x pos

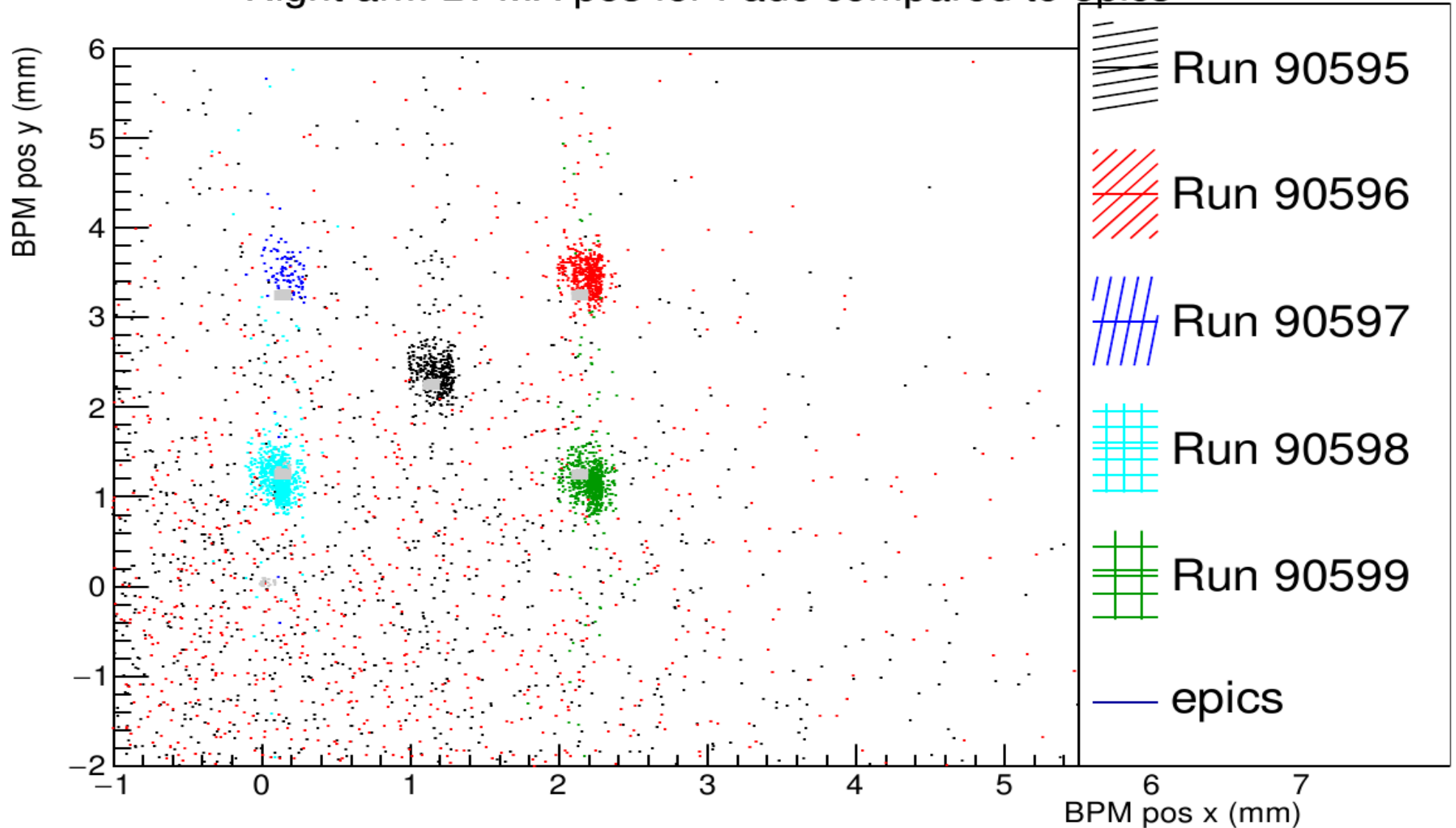


Right arm Fbus BPMB vs epics for y pos



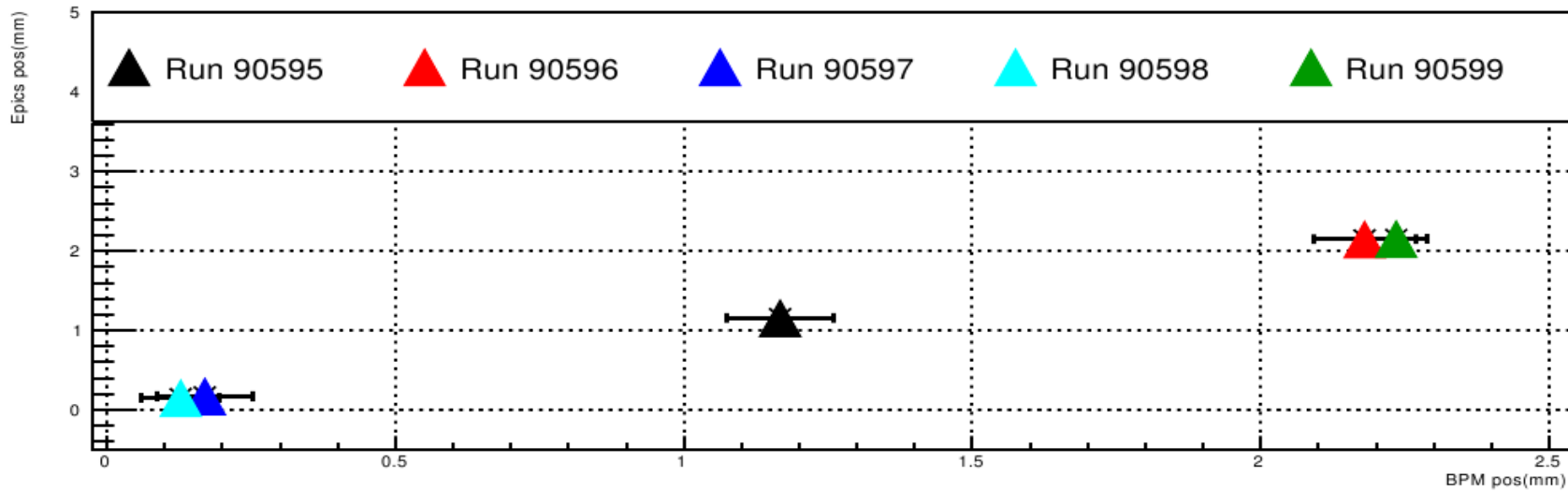
Calibration for Right Arm

Right arm BPMA pos for Fadc compared to epics

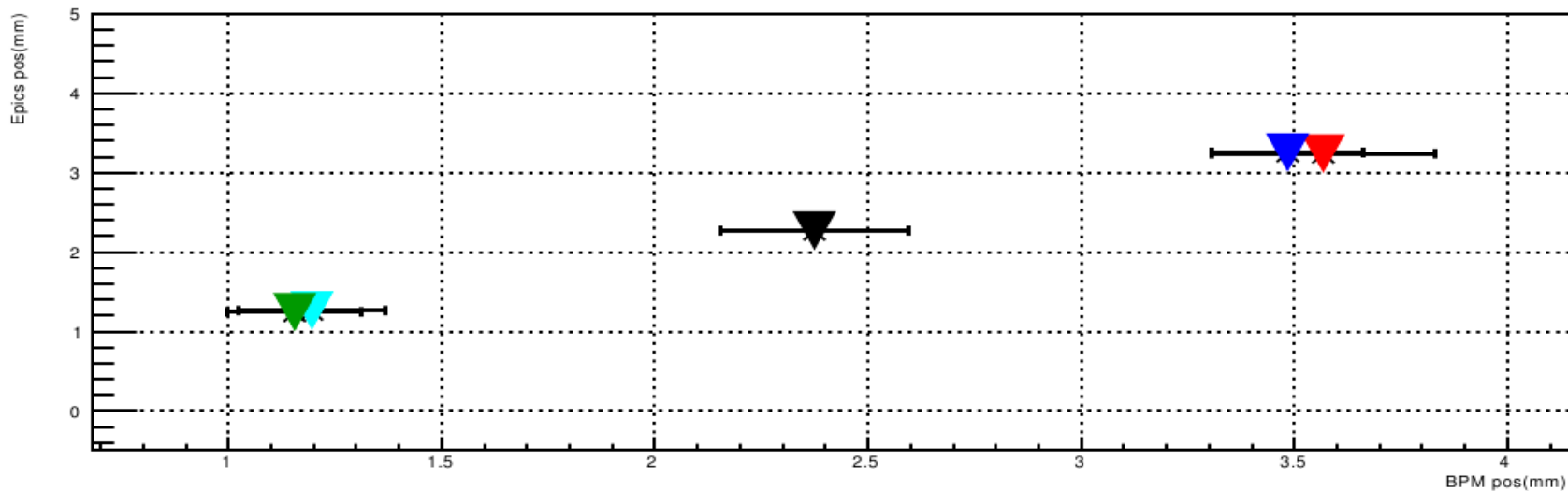


Calibration for Right Arm

Right arm Fadc BPMA vs epics for x pos

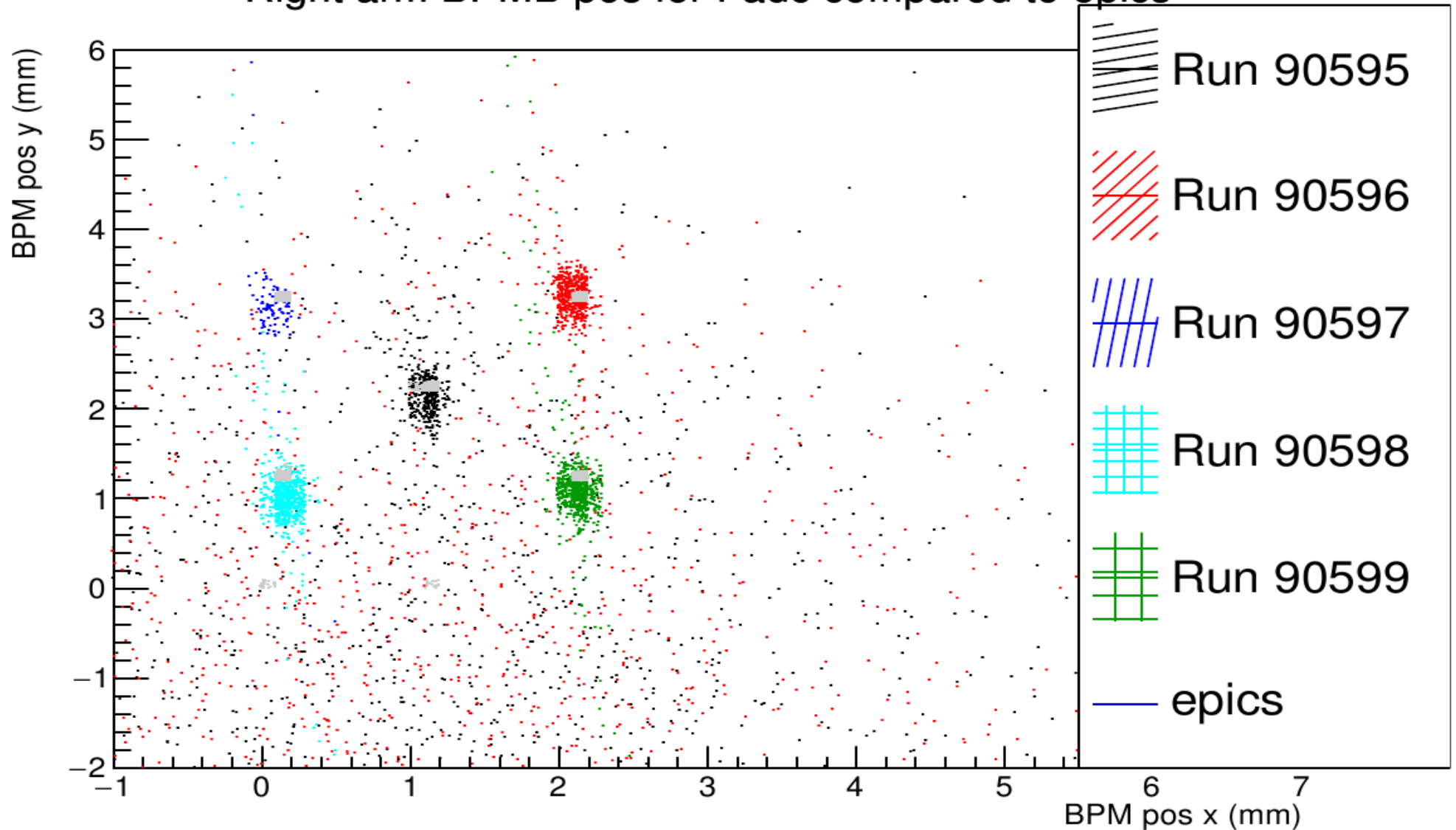


Right arm Fadc BPMA vs epics for y pos



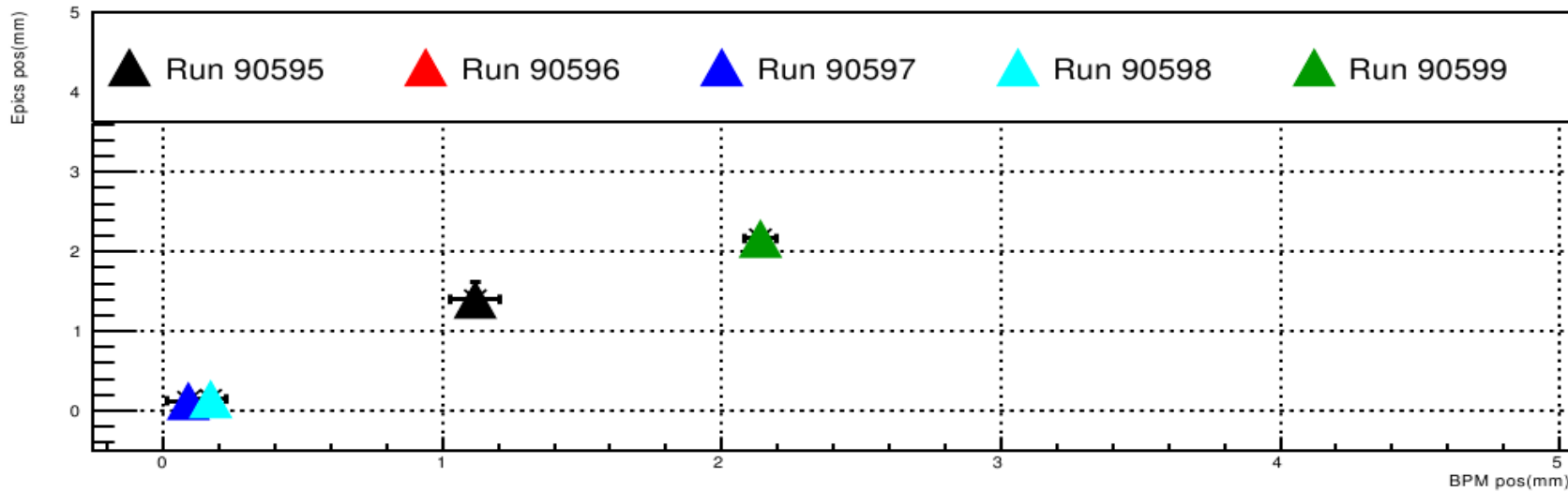
Calibration for Right Arm

Right arm BPMB pos for Fadc compared to epics



Calibration for Right Arm

Right arm Fadc BPMB vs epics for x pos



Right arm Fadc BPMB vs epics for y pos

