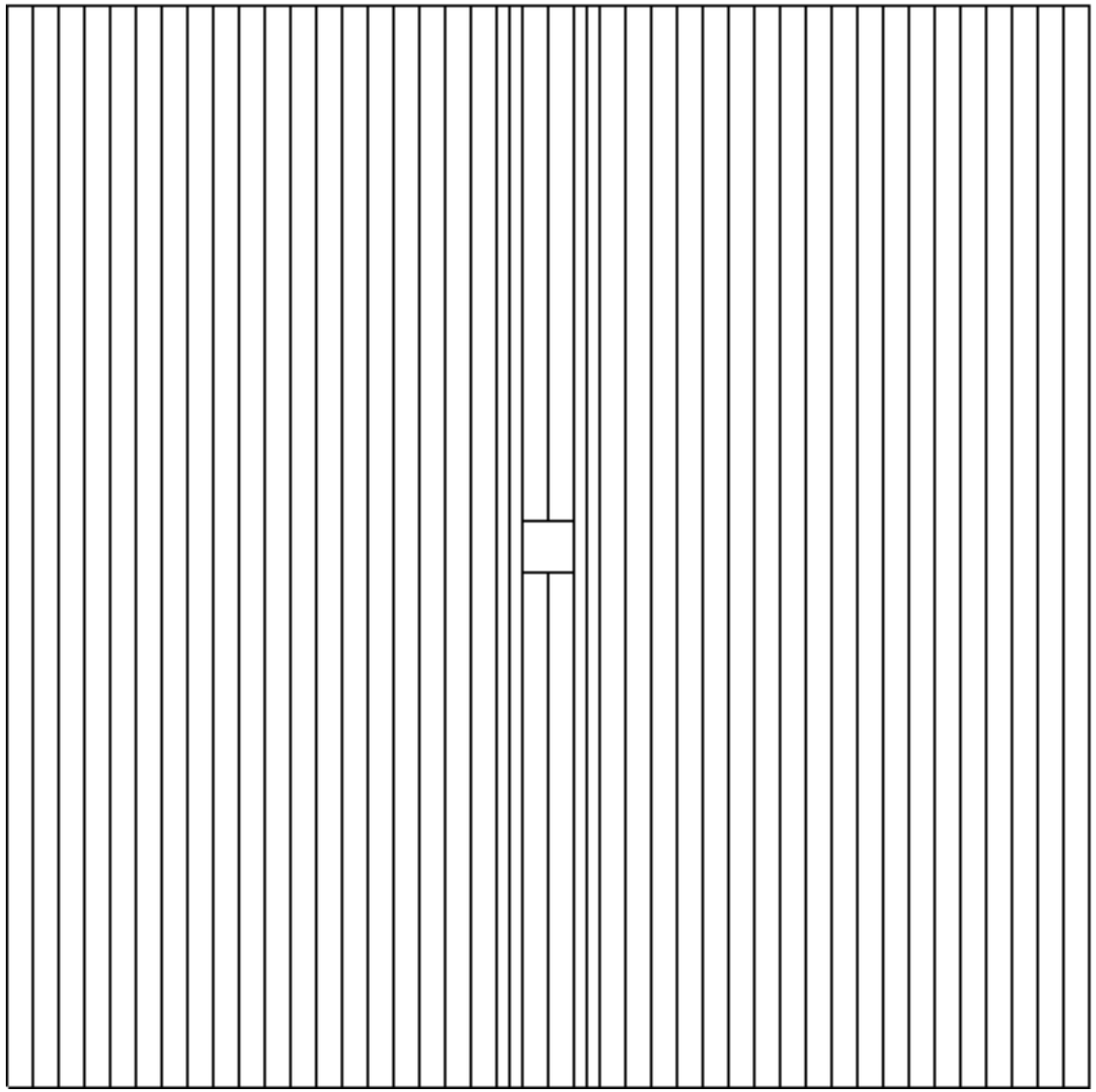
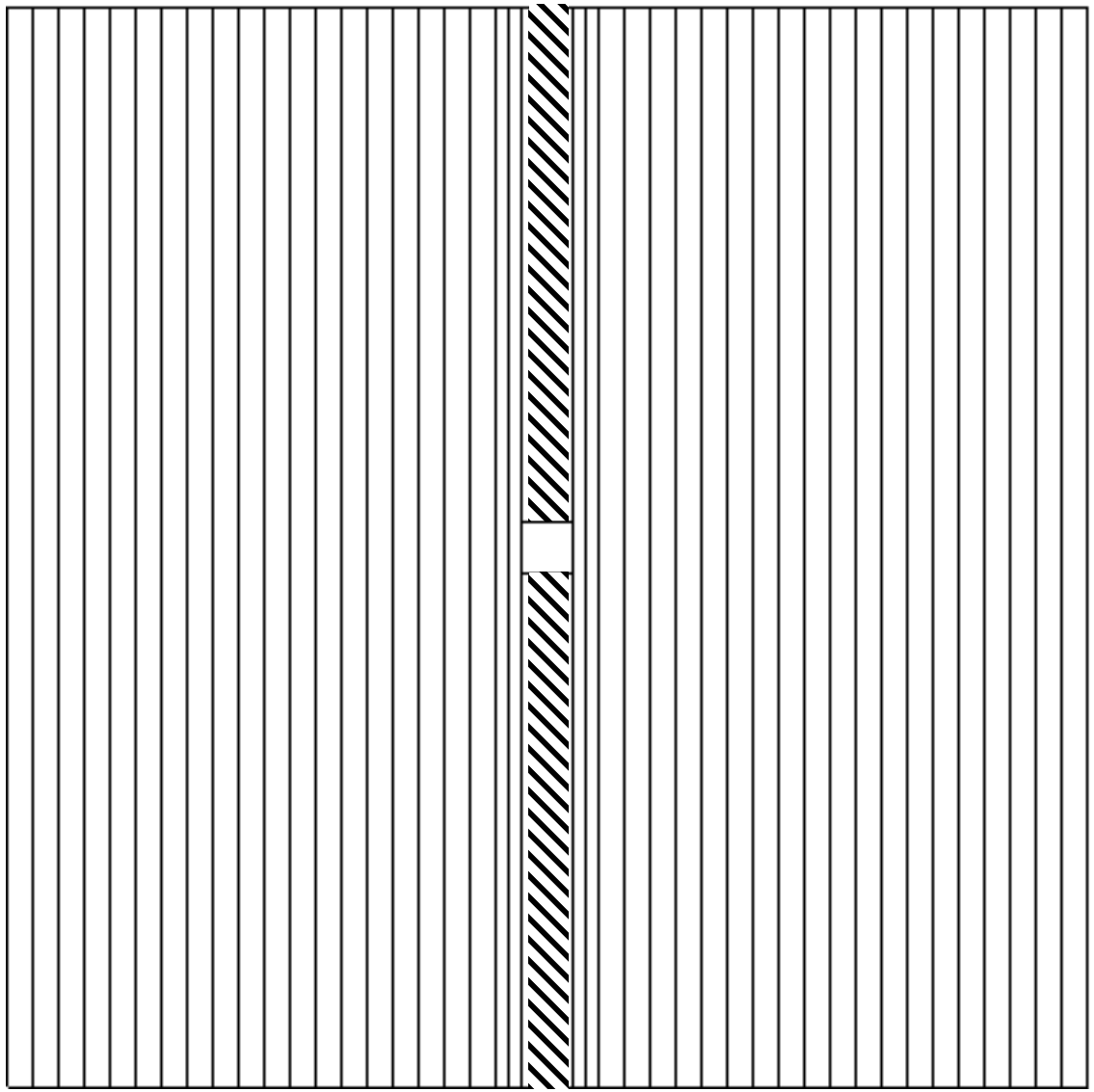
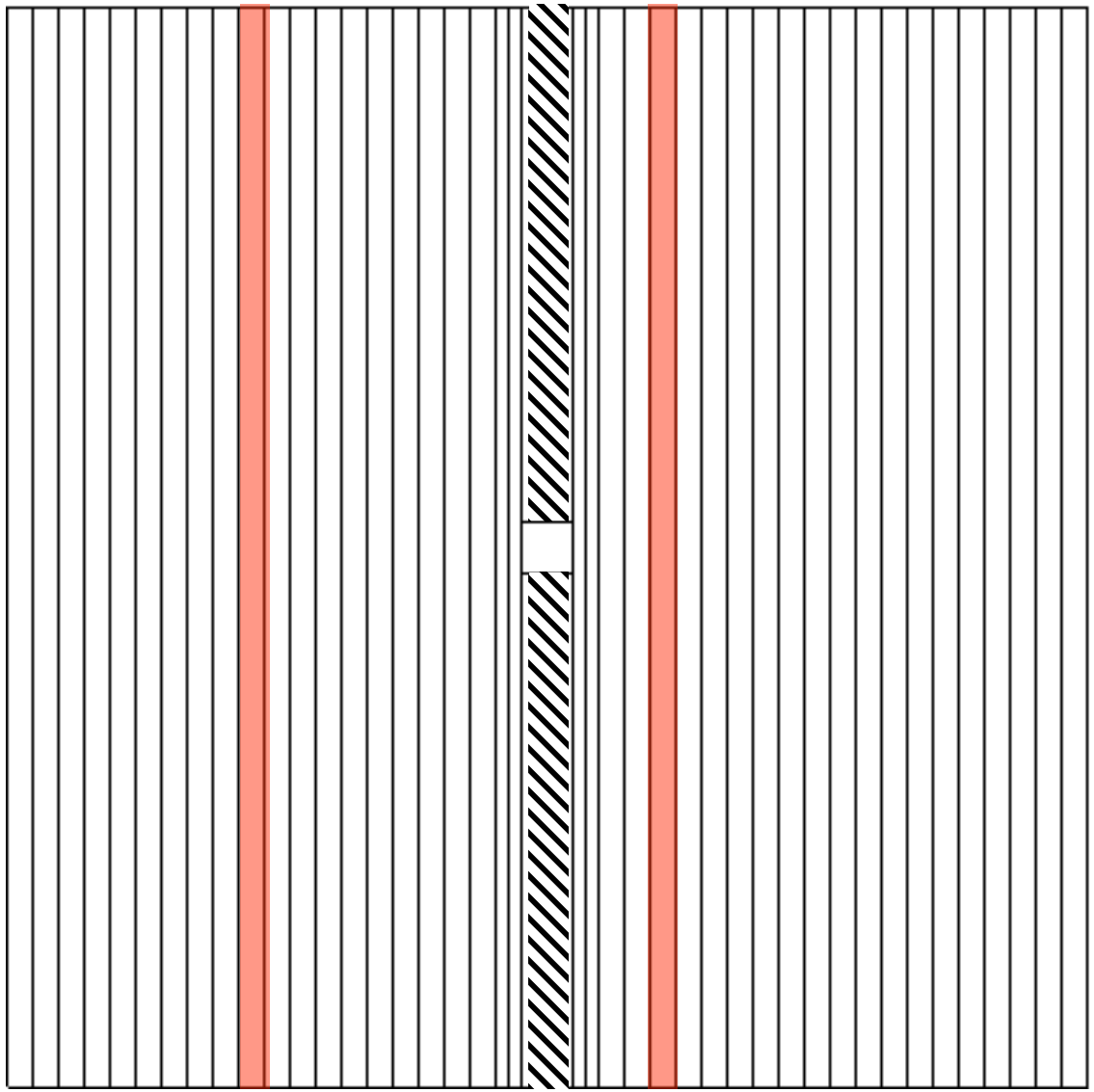
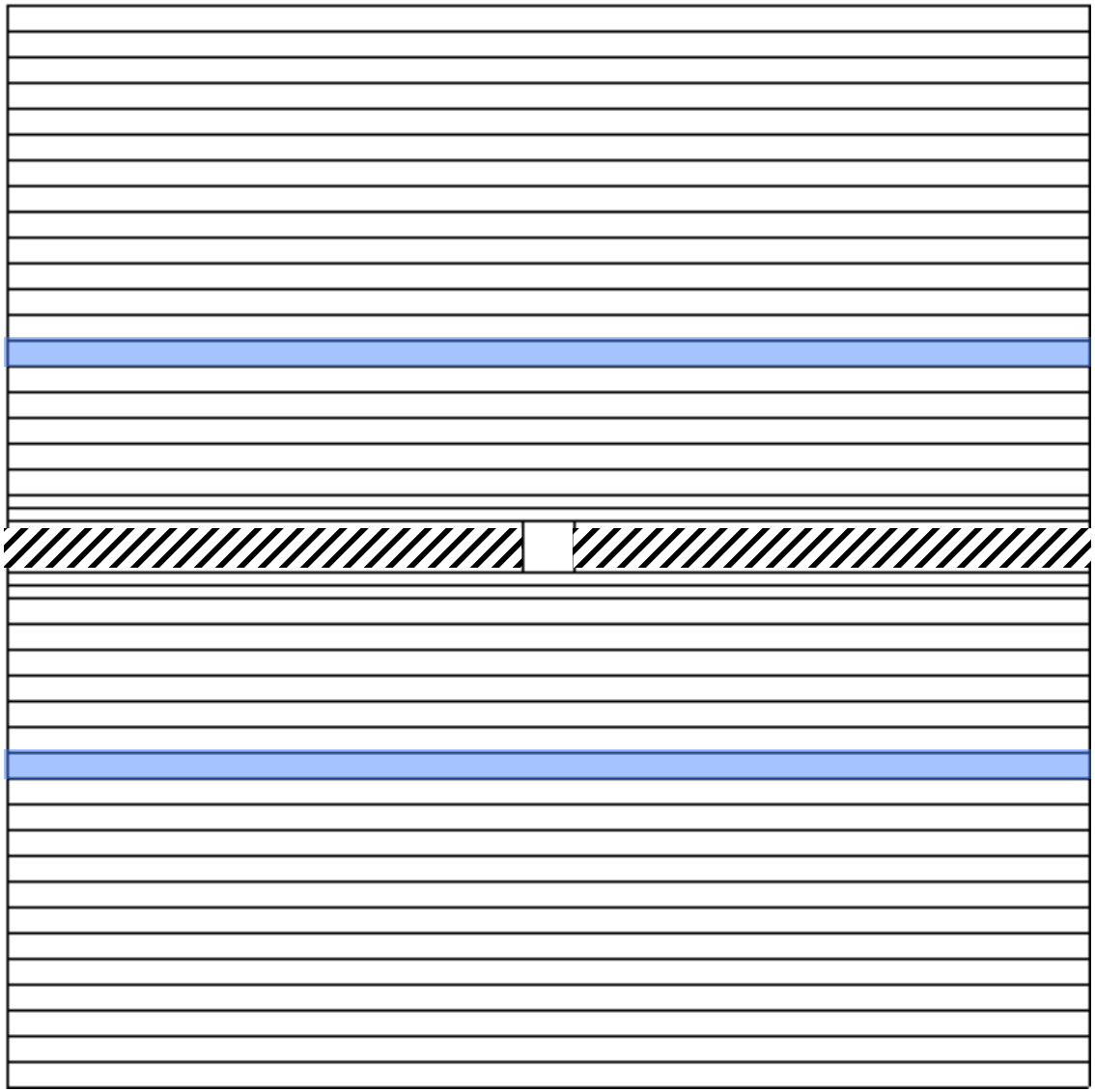
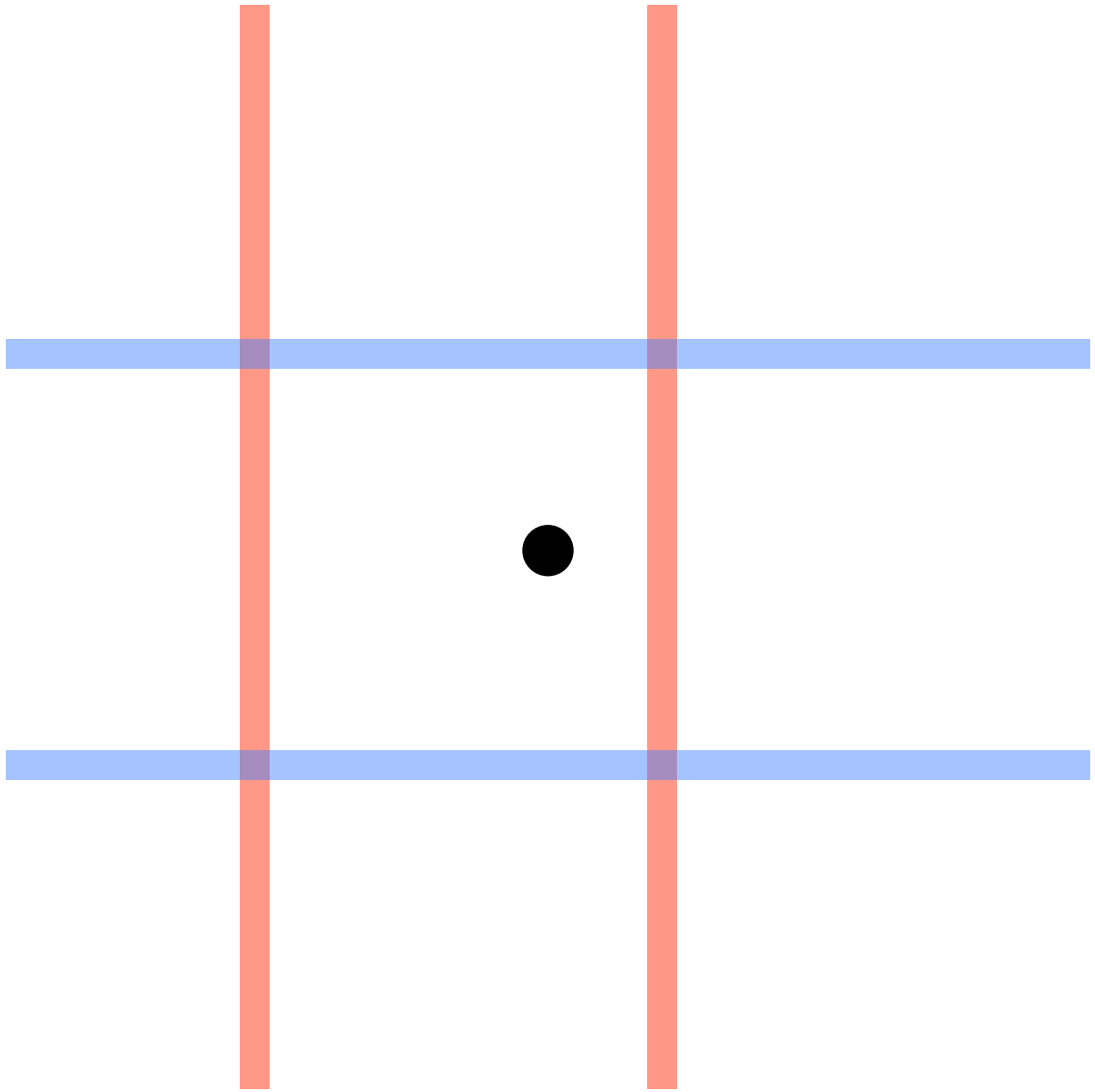
Using the TOF for Triggering the CPP Experiment

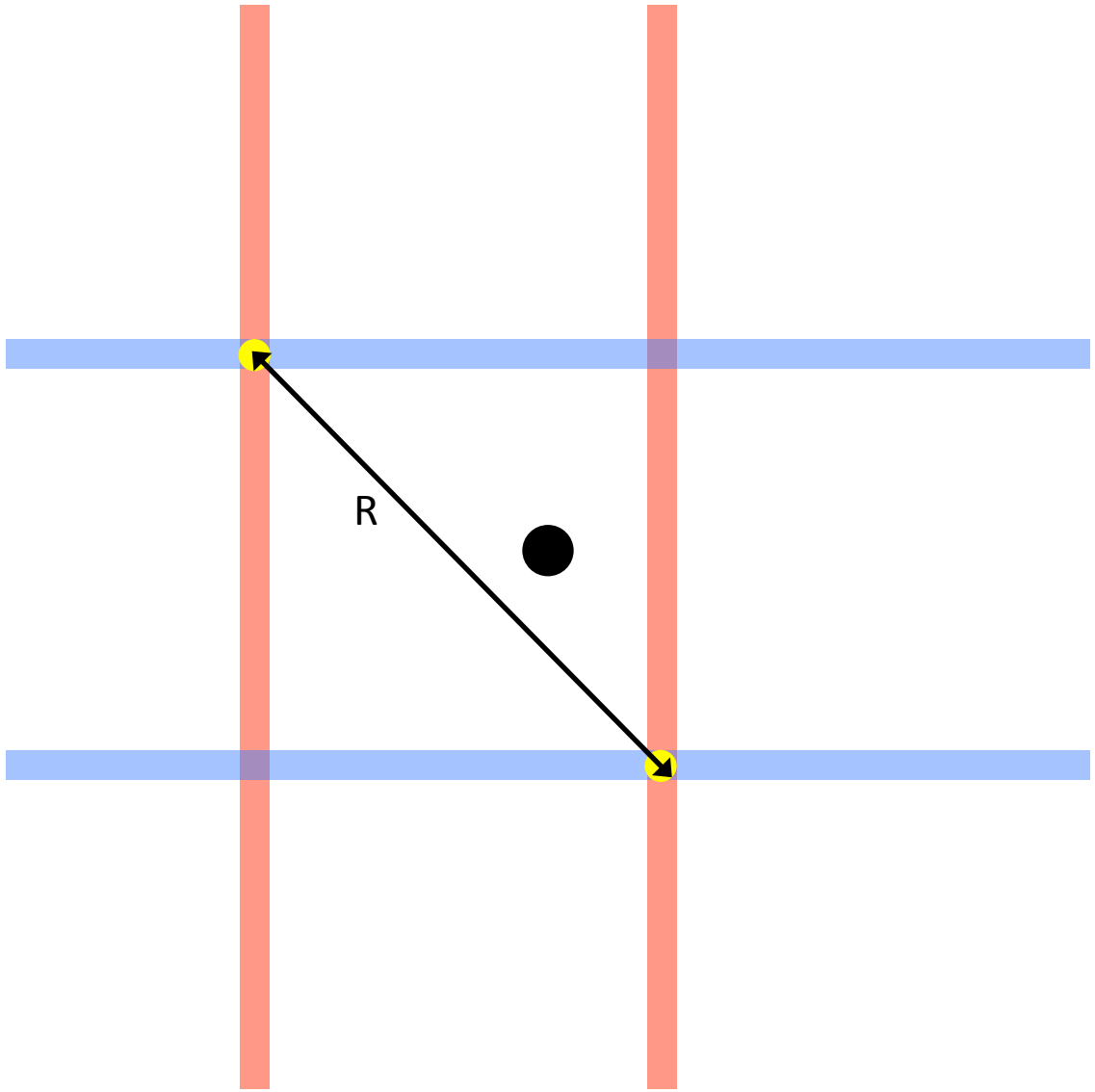


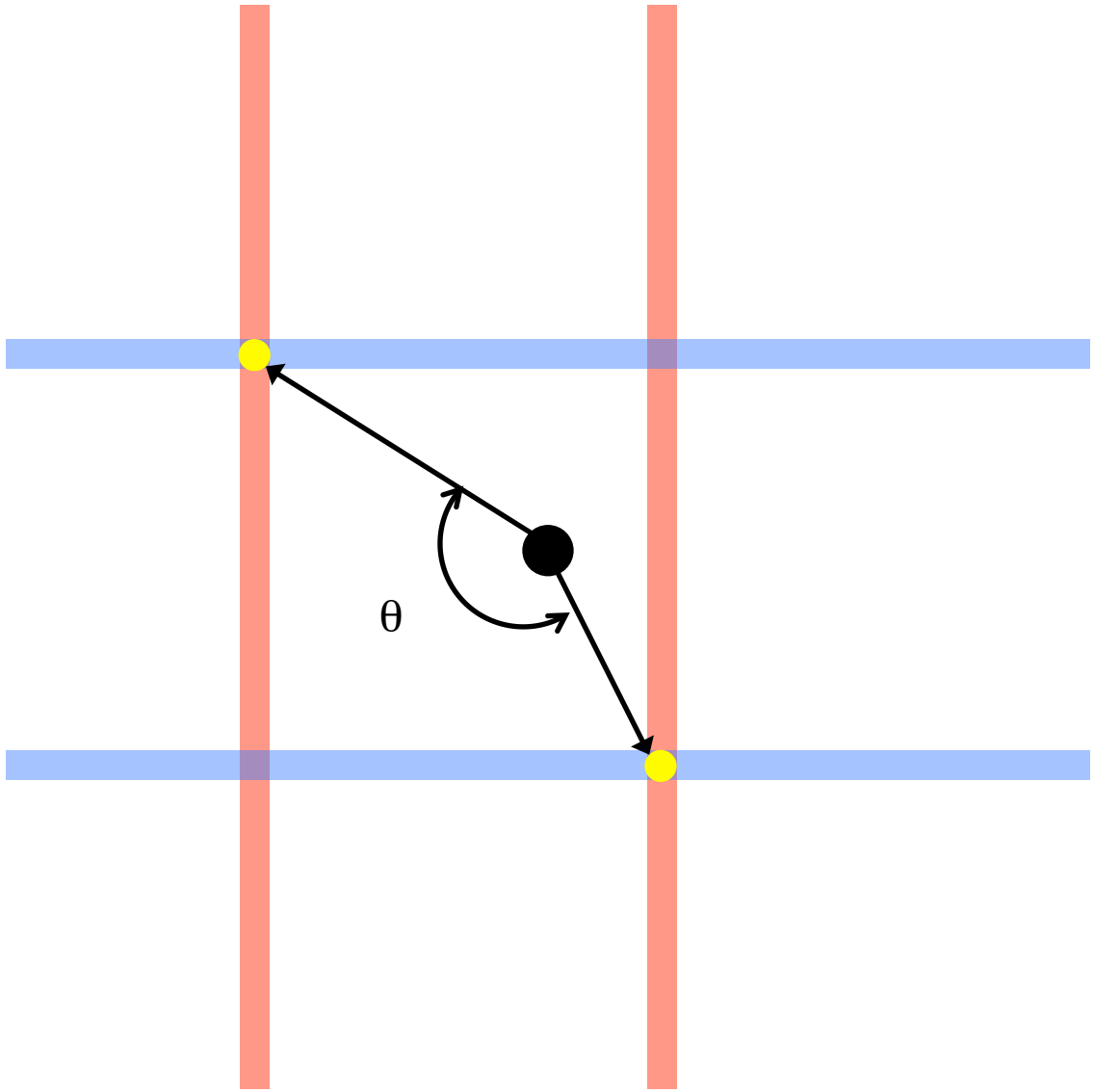


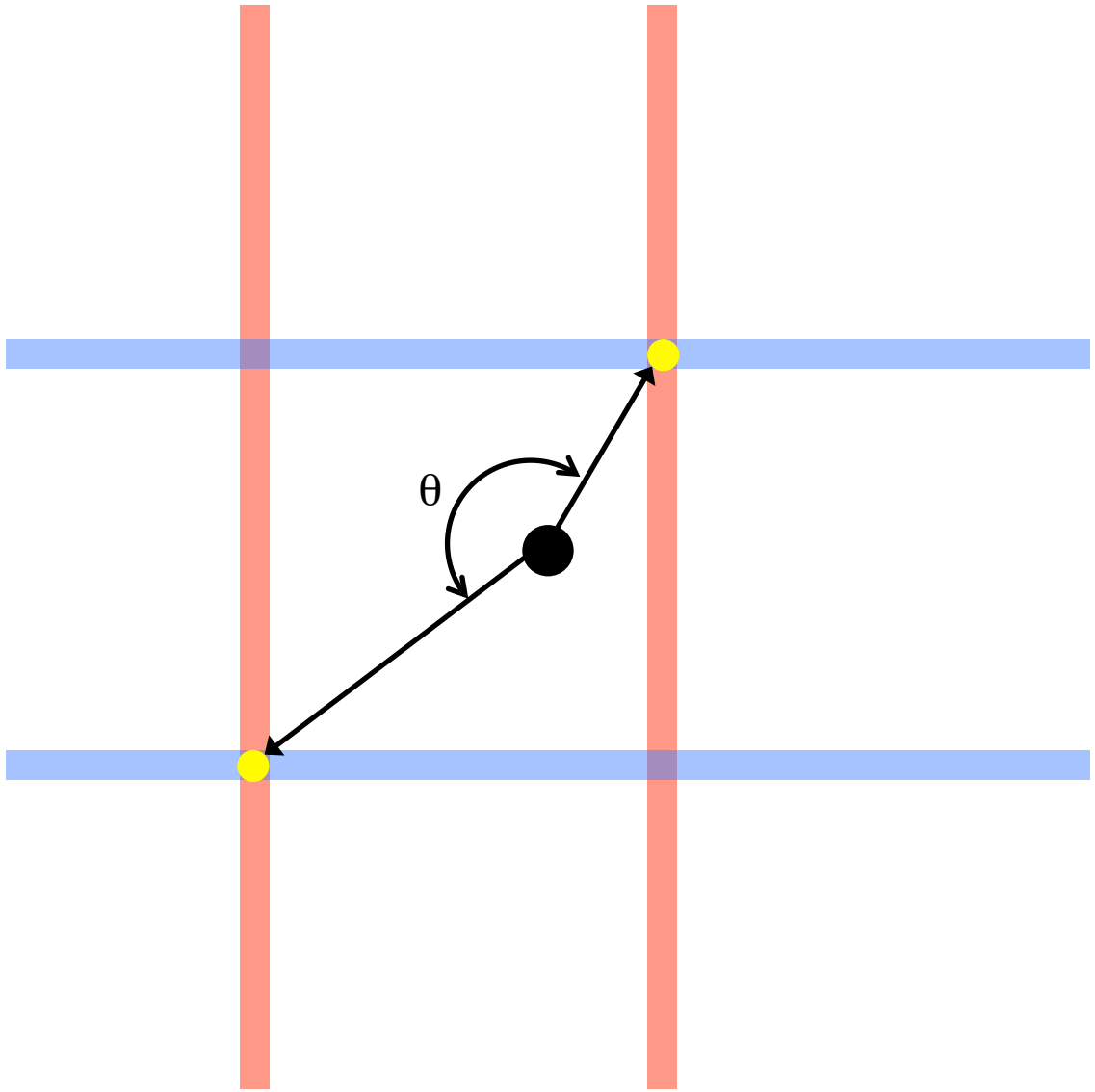


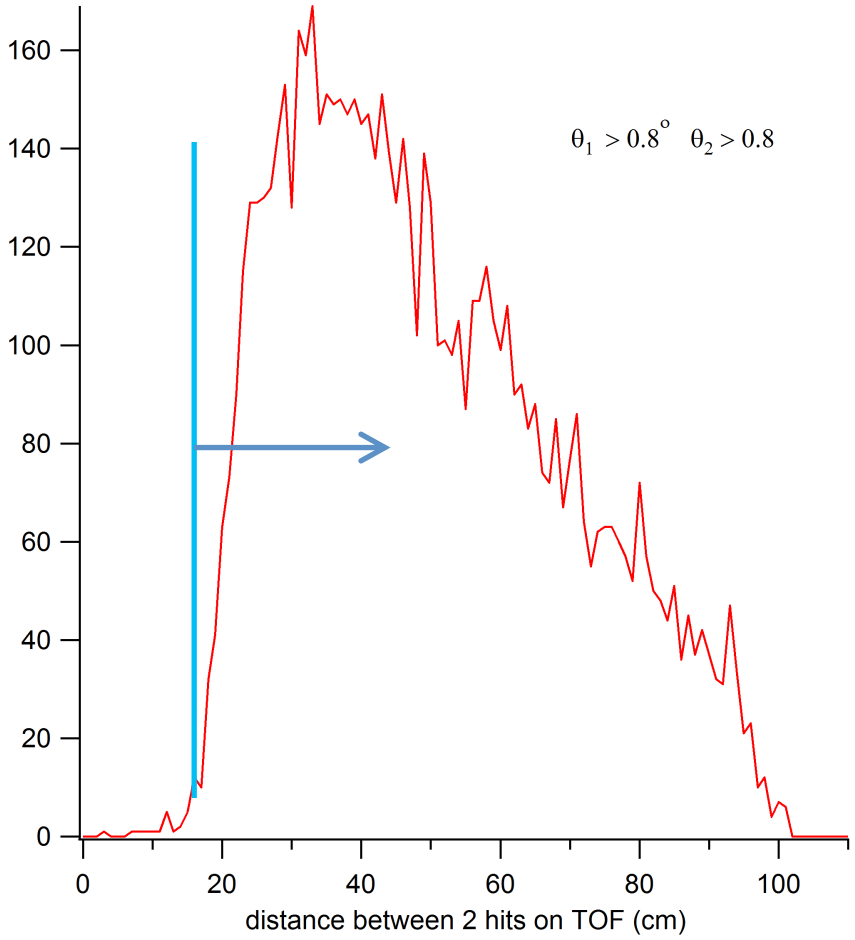


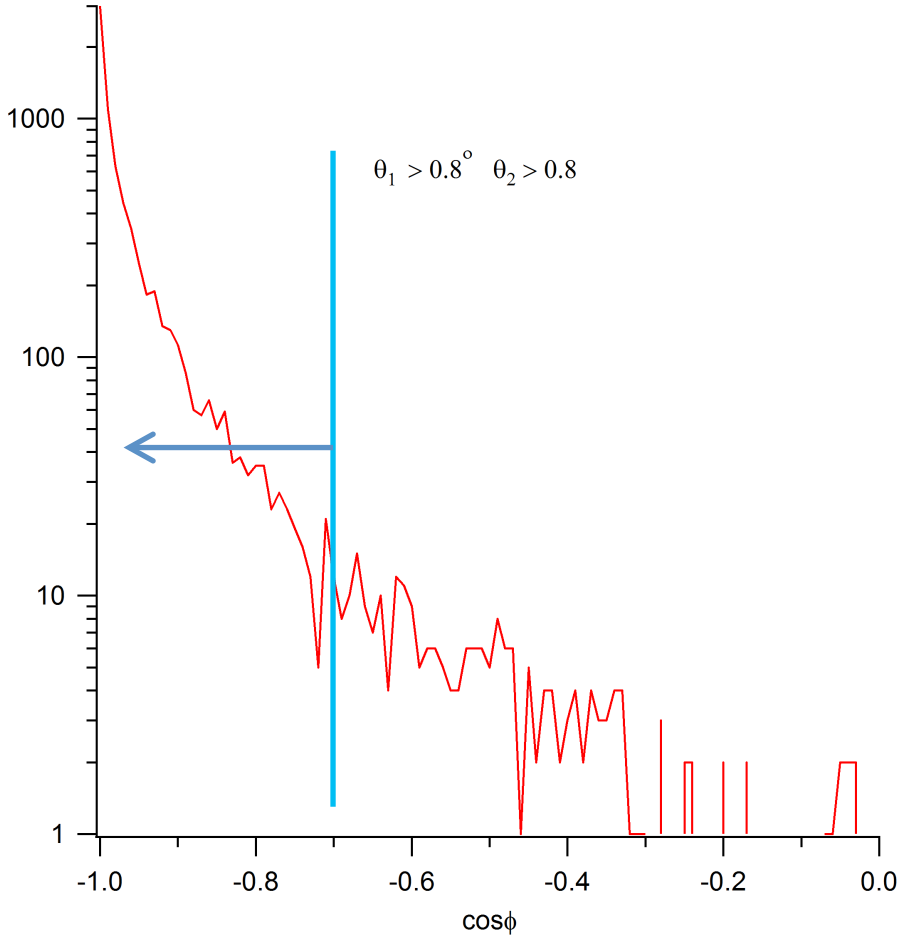



R


θ


θ


160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
distance between 2 hits on TOF (cm)
$\theta_1 > 0.8^\circ$ $\theta_2 > 0.8$


1000
100
10
1
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
cosϕ
$\theta_1 > 0.8^\circ$ $\theta_2 > 0.8$

The accidental rate between the i^{th} and j^{th} paddles is given by:

$$Acc(x_i, x_j) = R(x_i)R(x_j)\Delta t$$

Calculate how much of the rate $Acc(x_i,x_j)$ satisfies acceptance requirements:

1. Two paddles in the front array fire, and two paddles in the back array fire
2. R > 18 cm
3. cos θ < -0.7
4. Exclude a range of central paddles from the trigger

Let $\varepsilon(x_i,x_j)$ = fraction of $Acc(x_i,x_j)$ that satisfies these requirements.

To find $\varepsilon(x_i,x_j)$, need to know the rate as a function of x and y. Postulate that:

$$Rate(x,y) = \frac{A_1}{2\pi\sigma_1^2} e^{-(x^2+y^2)/(2\sigma_1^2)} + \frac{A_2}{2\pi\sigma_2^2} e^{-(x^2+y^2)/(2\sigma_2^2)} + B$$

Then the rate in paddle x_i is given by:

$$R(x_i) = \int_{-L/2}^{L/2} Rate(x_i, y)dy = \frac{A_1}{\sigma_1\sqrt{2\pi}} e^{-x^2/(2\sigma_1^2)} + \frac{A_2}{\sigma_2\sqrt{2\pi}} e^{-x^2/(2\sigma_2^2)} + BL$$

Fit TOF data with the form above.

TOF rates with solenoid on, 3.4 mm collimator

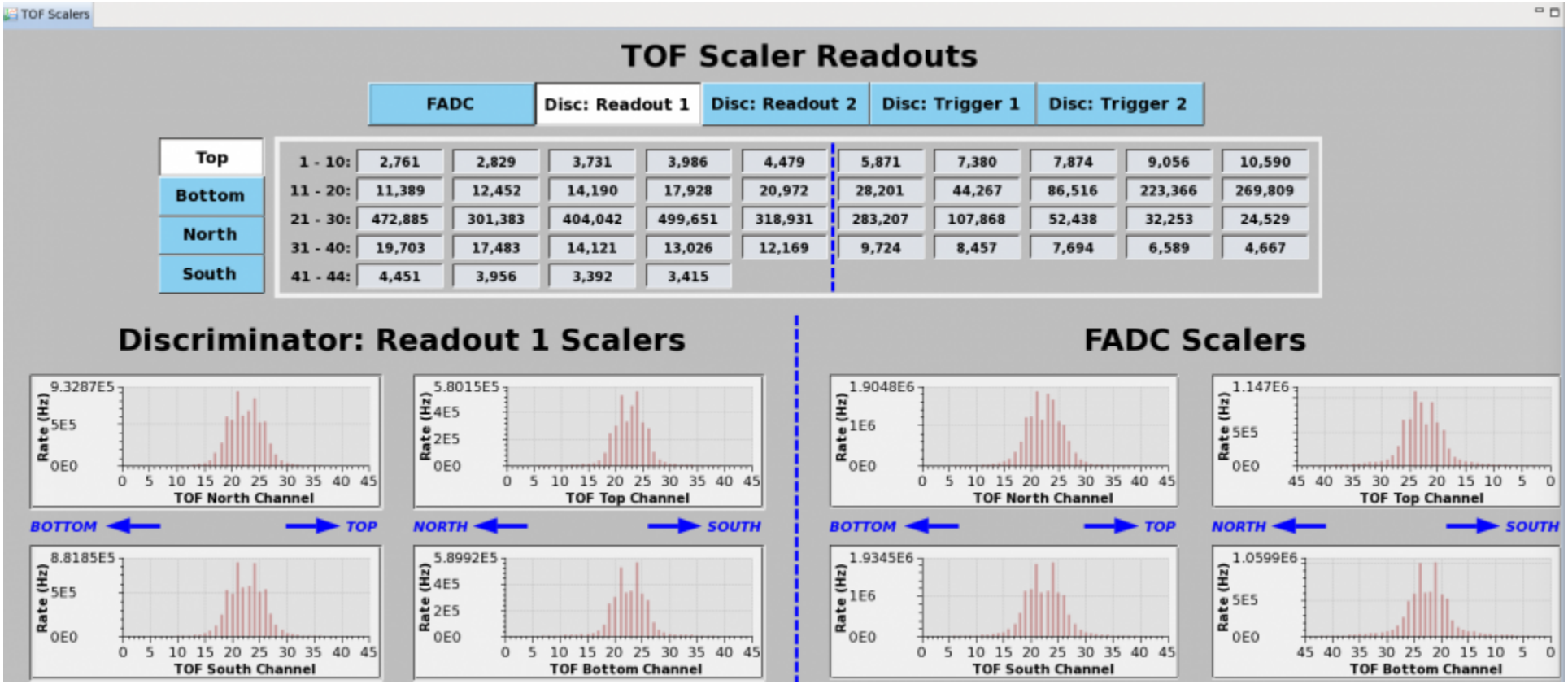
Lognumber 3393177. Submitted by elton on Tue, 03/29/2016 - 08:28.

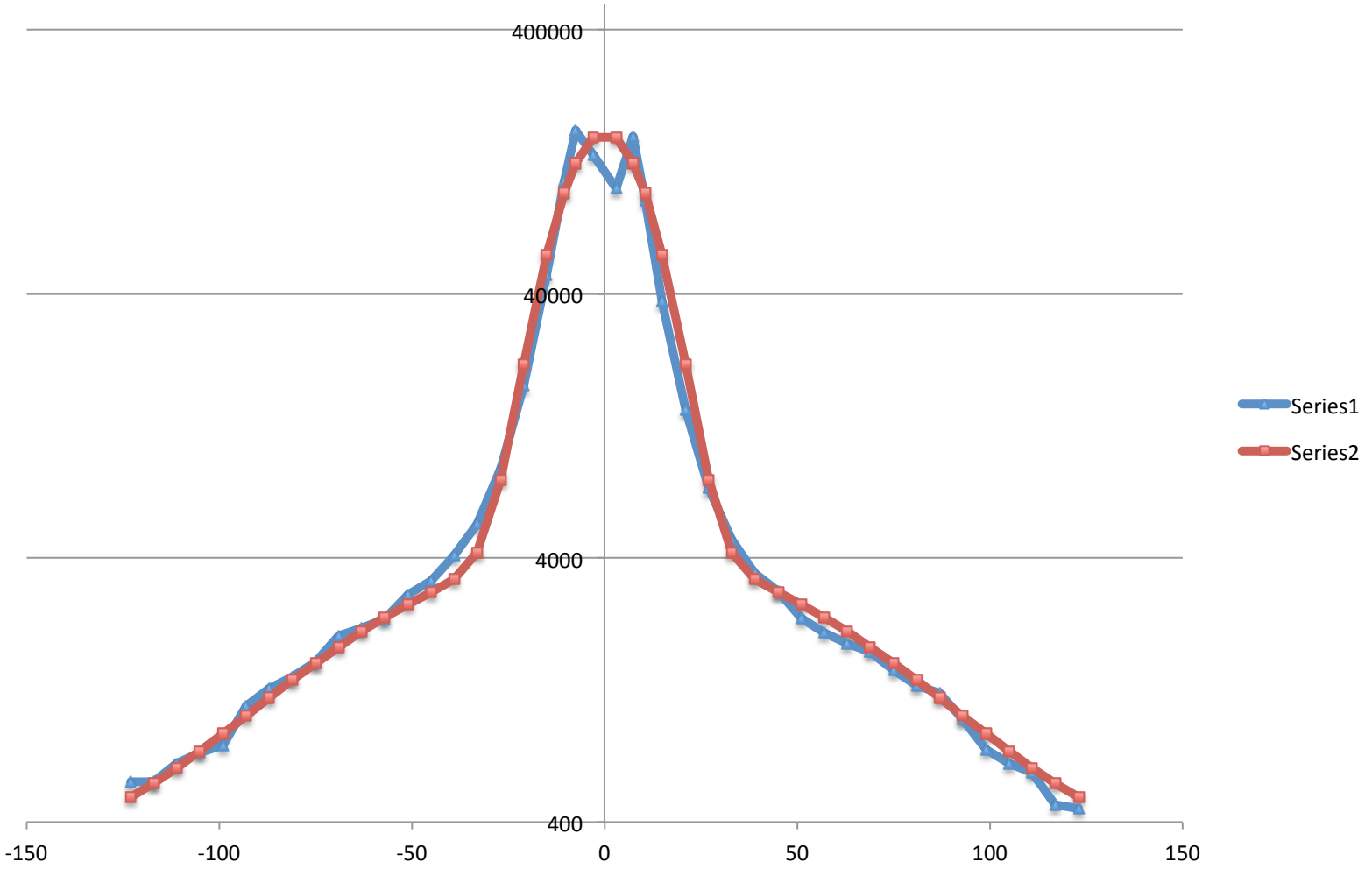
Logbooks: HDLOG HDTOF

References: 3392794 - TOF rates with solenoid off

Nominal running with amorphous radiator, 3.4 mm collimator, 200 nA beam

TOF scaler rates are about 1 MHz. We need to check the threshold and compare to trigger thresholds.




400000
40000
4000
400
-150
-100
-50
0
50
100
150
Series1
Series2

- For a given x_i, draw y from the fitted probability distribution

$$Rate(x,y) = \frac{A_1}{2\pi\sigma_1^2} e^{-(x^2+y^2)/(2\sigma_1^2)} + \frac{A_2}{2\pi\sigma_2^2} e^{-(x^2+y^2)/(2\sigma_2^2)} + B$$

- Calculate $\varepsilon(x_i,x_j)$ by testing many events

- Total rate is given by: $$Rate = \frac{1}{2}\sum_{i\neq j} Acc(x_i,x_j)\varepsilon(x_i,x_j)$$

Excluded channels	**Rate**
None	32 kHz
22 to 23 (2 central full width bars)	7.0 kHz
21 to 24 (above and 1st ½ width bars)	1.9 kHz
20 to 25 (above and 2nd ½ width bars)	700 Hz