Where's the beam?

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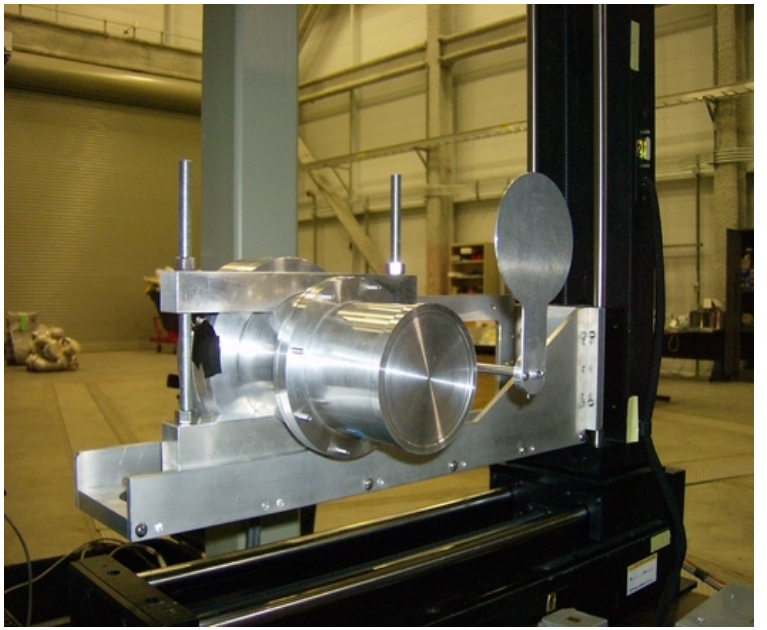
Beam Profile Studies

- Boron Monitor (the mysterious M3) was the workhorse of these measurements

- A cylindrical replica of a CsI detector
  - Boron disk out front → captures neutrons
  - Lithium flag can be moved in/out for bg measurements
  - downside: sensitive to gammas and neutrons

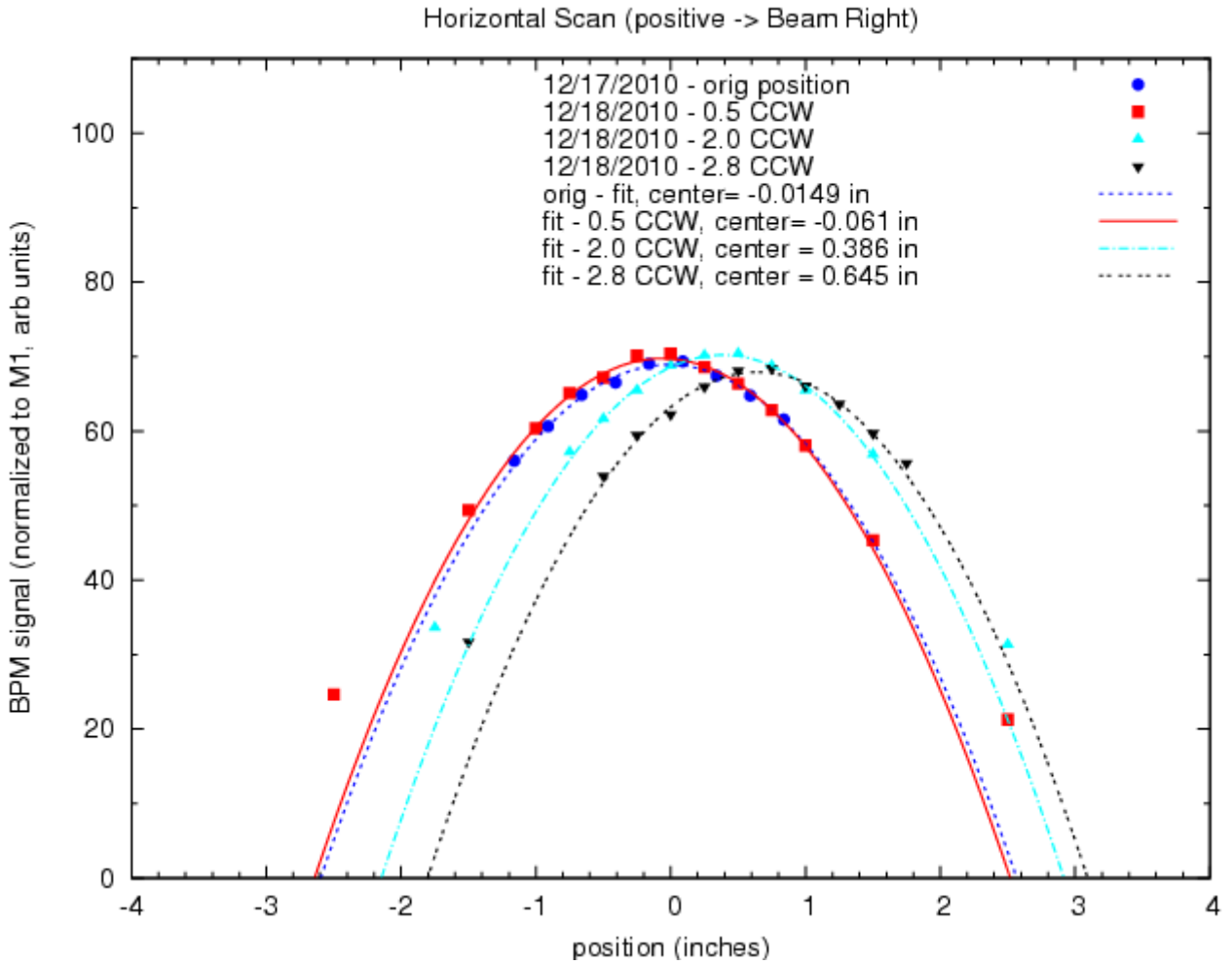
- Mounted on an x-y stage behind the detector array (neurons through air inside array)

- Did a series of measurements to center the flux out of SMP and study the non-cold neutron background – overview assembled from elog entries

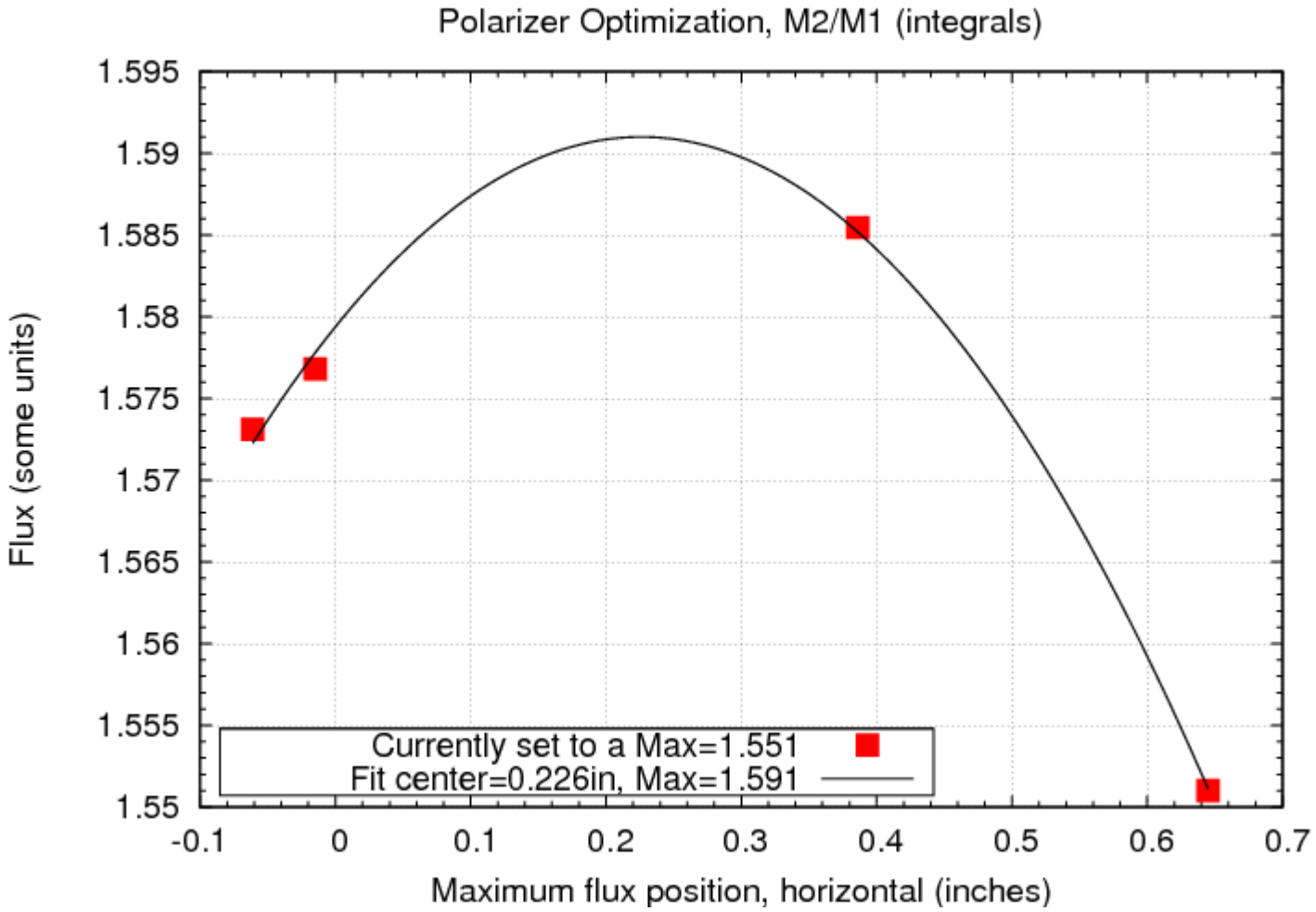


Picture it: SNS, 2010

- Installed SMP
- Had a survey position of where “center” is
- Did horizontal and vertical beam scans
  (0 in plot below is not center - oops)

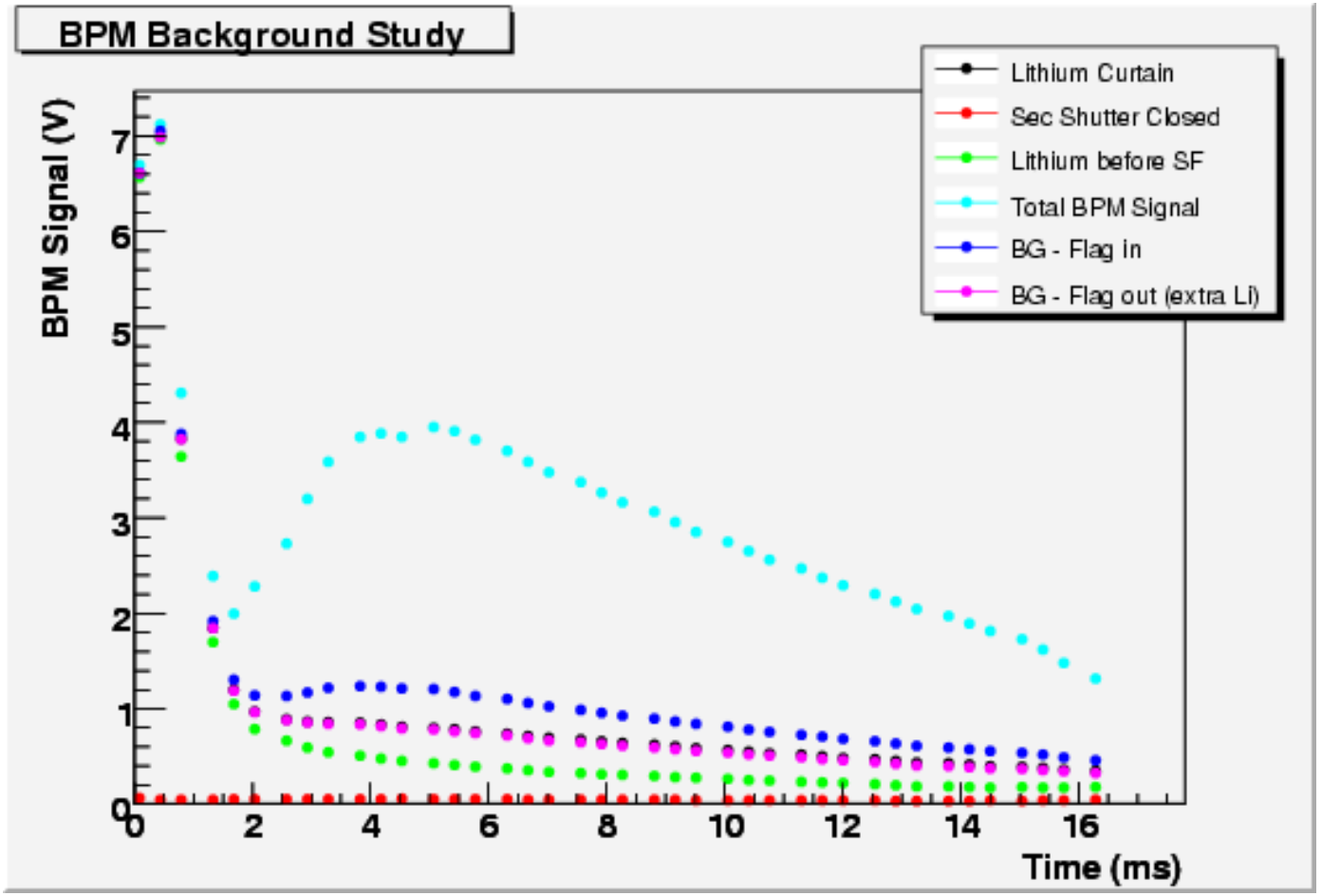


Close to maximum flux



What's the background?

We saw a large background using the boron monitor

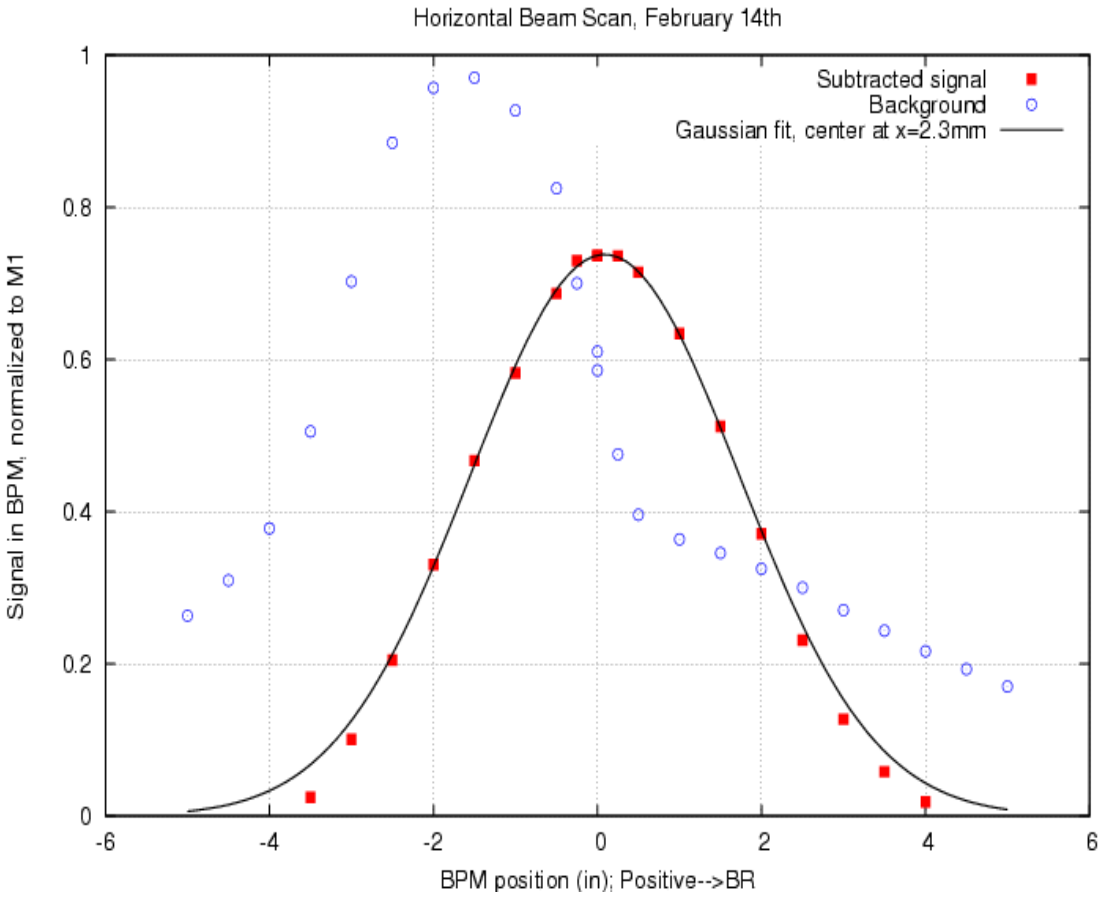


The background was also not “centered”

Tonight, we did a beam scan with the boron profile monitor (BPM) in the horizontal direction. Below is the plot showing a background subtracted signal, as well as the background signal (lithium flag in). IN both cases, the average signals were normalized to M1 to take beam fluctuations into account. The power was ramping up as we did this scan (500kW-620kW). In the vertical direction, the scanner was center at the center of the array (16757 motor steps).

In this plot, the 0 on the x-axis corresponds to the center of the detector array (the line the array was aligned to, -19152 motor steps).

As you can see, the background is peaked in a different location that the beam, and has a sharp shoulder BR, which is explained in entry #114 (fast neutrons).



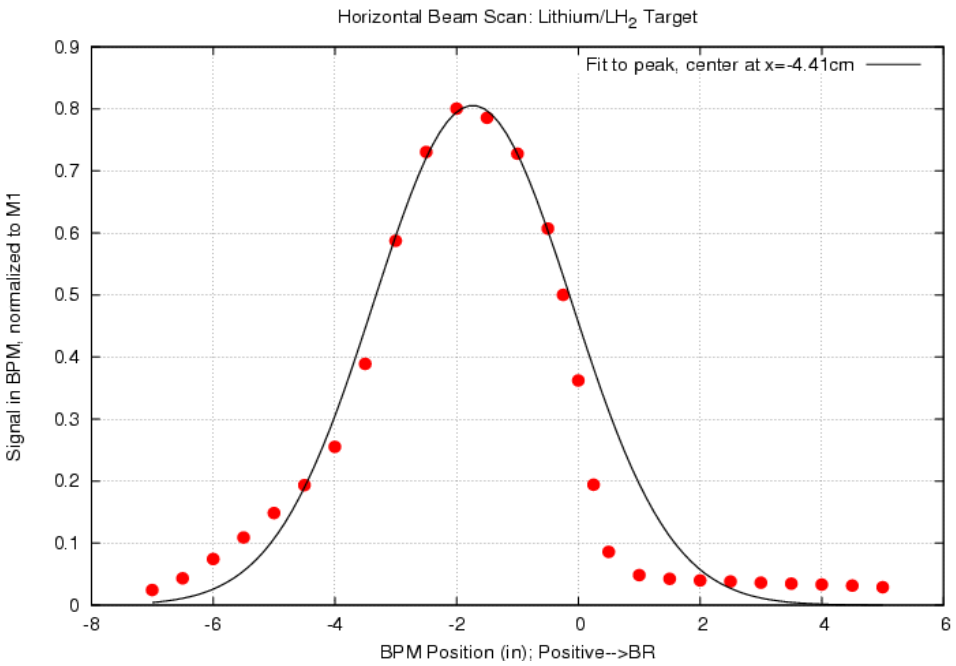
Neutrons or Gammas? (x-direction)

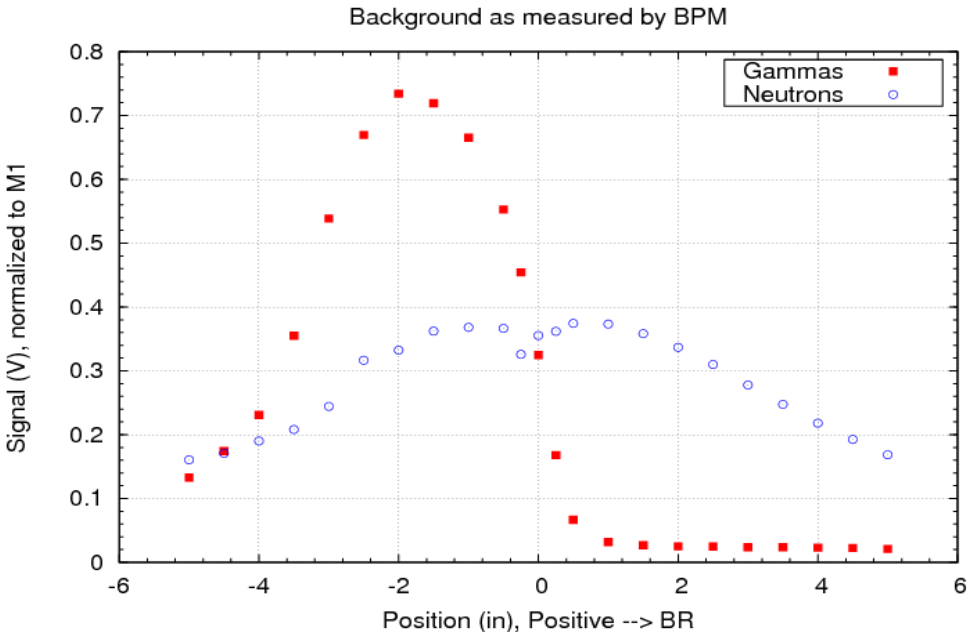
--placed a piece of lithium carbide in the beam (to absorb the cold neutrons)

--followed it by a piece of borated CH2 (5/8in, 5% Boron), to scatter out the neutrons.

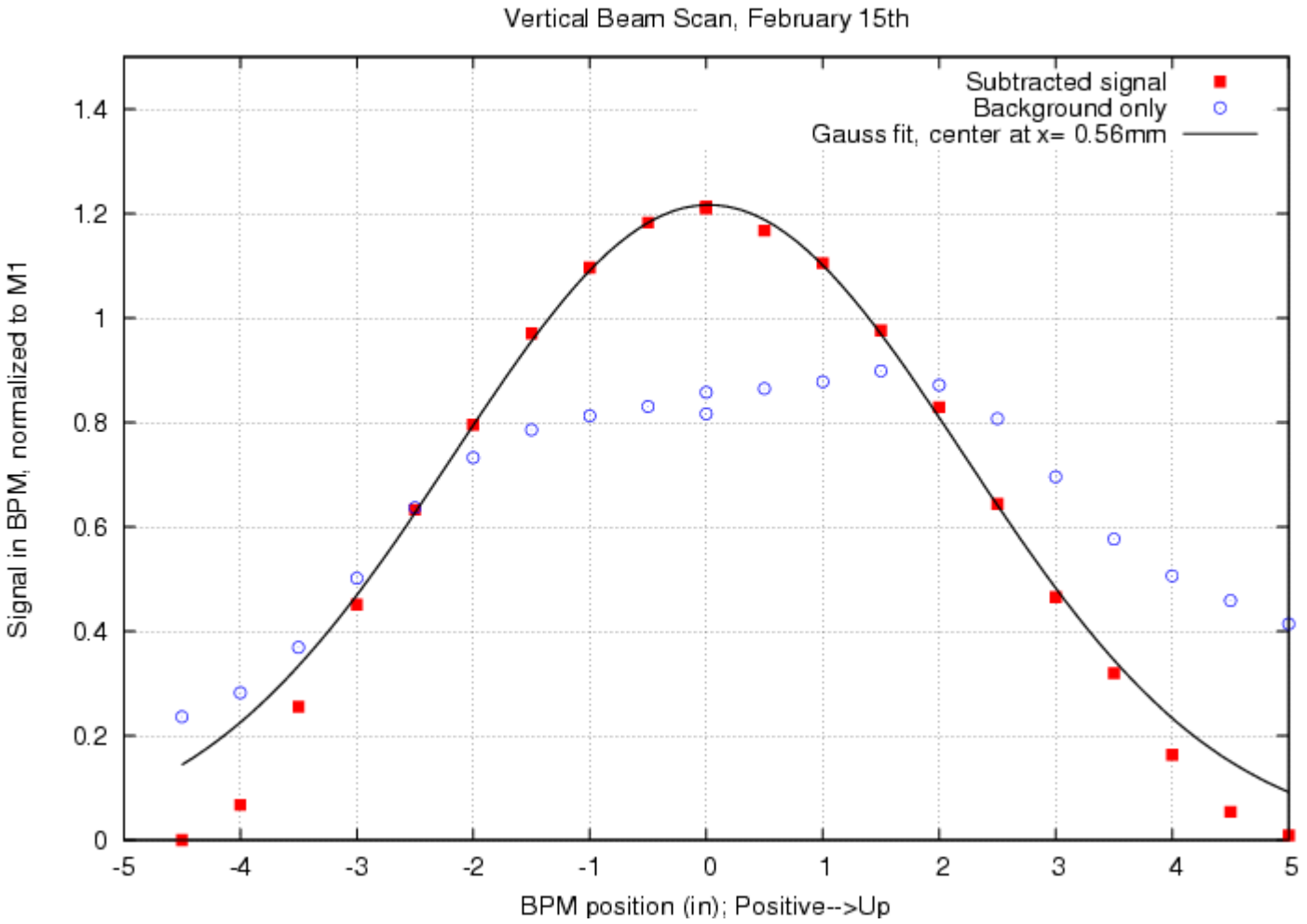
--The first plot shows the shape of the background from a scan done in the horizontal direction. This signal is overwhelmingly due to gammas. According to David's previous entry, our CH2 target transmits 3% of the neutrons and 84.1% of the gammas.

--Knowing the transmission, we can use the background scan done earlier (BPM with leaf in), and extract the gamma and neutron backgrounds separately (see the second plot).





Neutrons or Gammas? (y-direction)



TOF spectra for backgrounds