4He (e,e'N_recoil)

Why do we not see in HAND a nice peak of (e,e'n_recoil) in fig 2 as we can see (e,e'p_recoil) in BB fig 1?

The TOF distribution without proton momentum/path length correction:

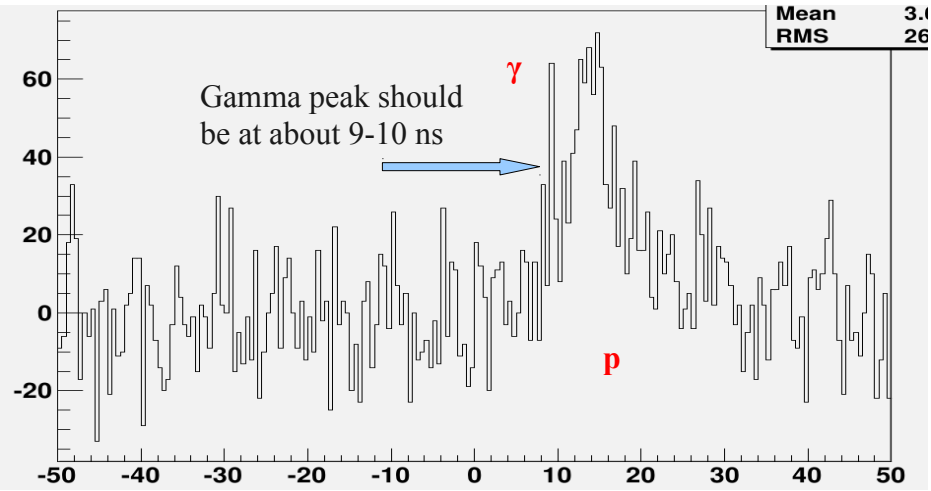

fig 1: BB (e,e'p) TOF [ns]

For HAND we have:

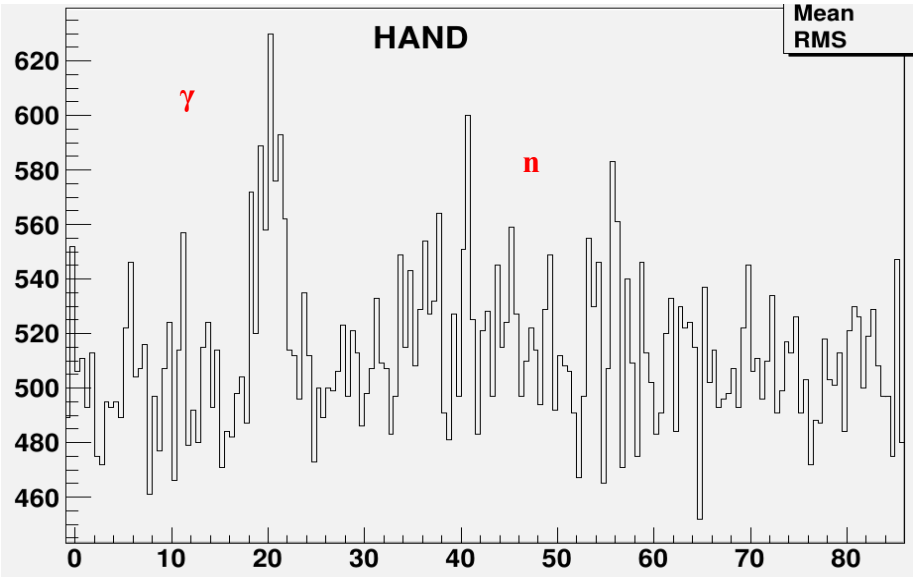

fig 2: HAND (e,e'n) TOF [ns]. Gamma peak is at 20 ns

Why we see clear gamma peak and no (e,e'n) in HAND and small gamma peak and pronounce proton peak in BigBite?

Regarding the gamma peak the reason for the small gamma peak in BB is because most of the gamma is screened by the metal part of the magnet.

In order to answer the second question, why we don't see neutrons we can compare the BB data with the background level from HAND.
The recoil peak for the protons without BG is shown in fig 3:

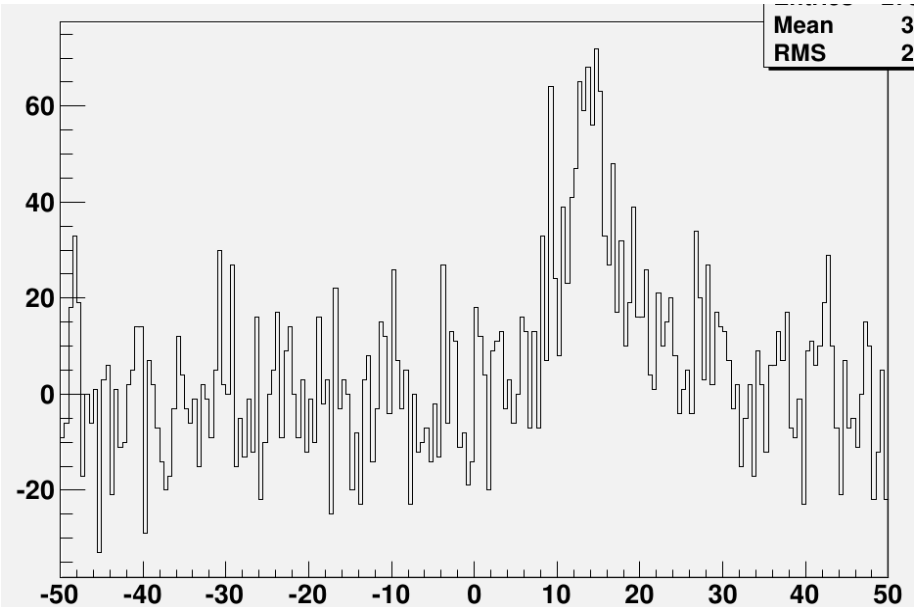

fig 3: BigBite (e,e'p) TOF [ns]

Now, if we simulate a constant background and scaling to the HAND background level:

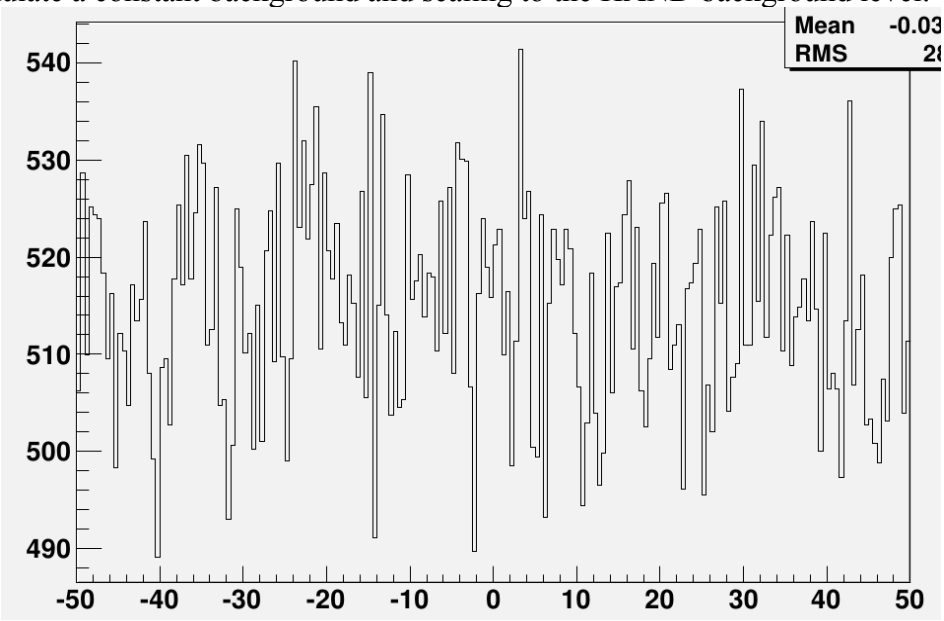

fig 4: simulated BG in BigBite

If we add the above BG to the BigBite signal multiplied by neutron detection efficiency, we will get the

expected neutron distribution, fig 5:

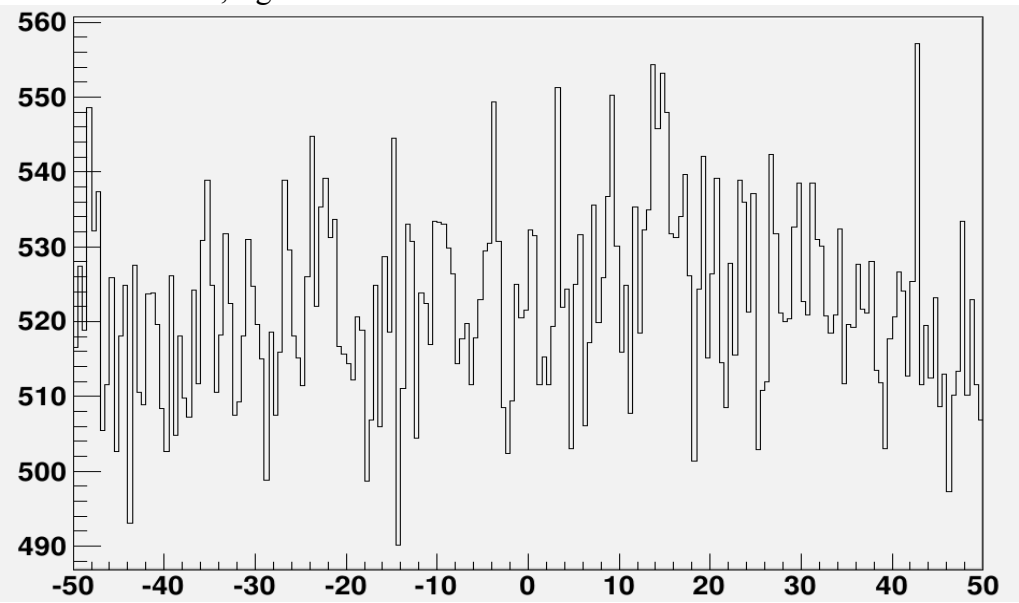

fig 5: BigBite signal with simulated BG [ns]

From comparing fig 5 to fig 1, it's clearly seen that the BG fluctuations masking the real neutrons.