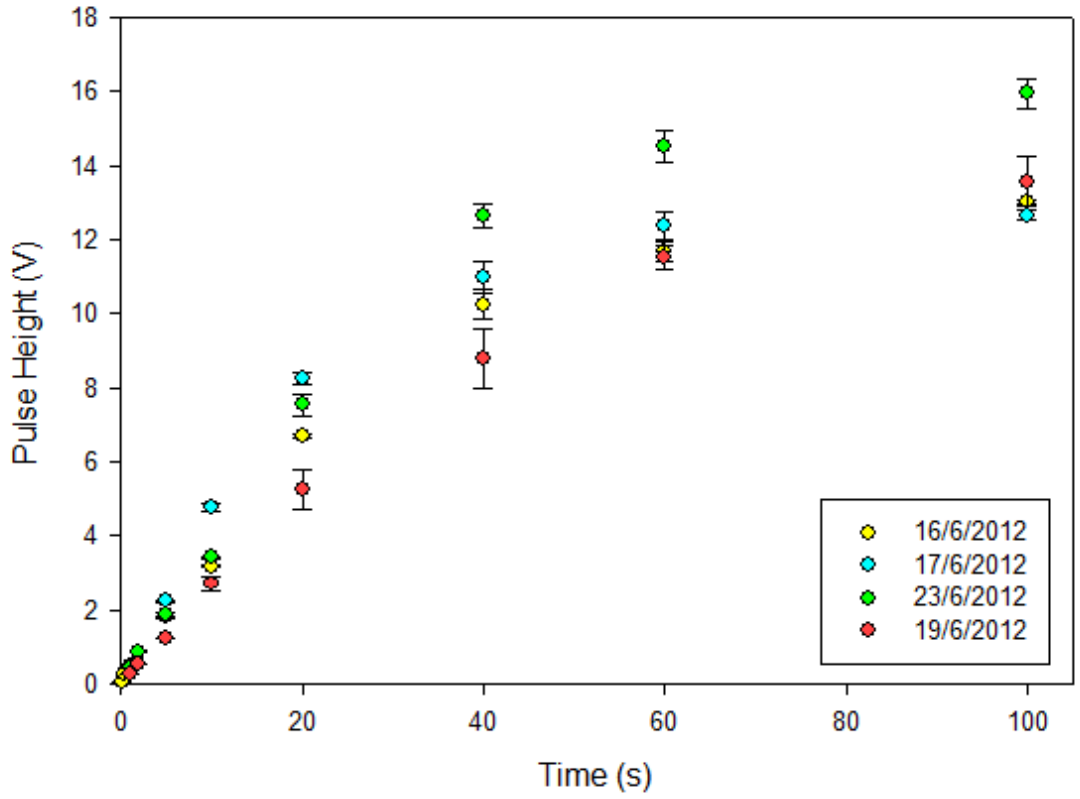
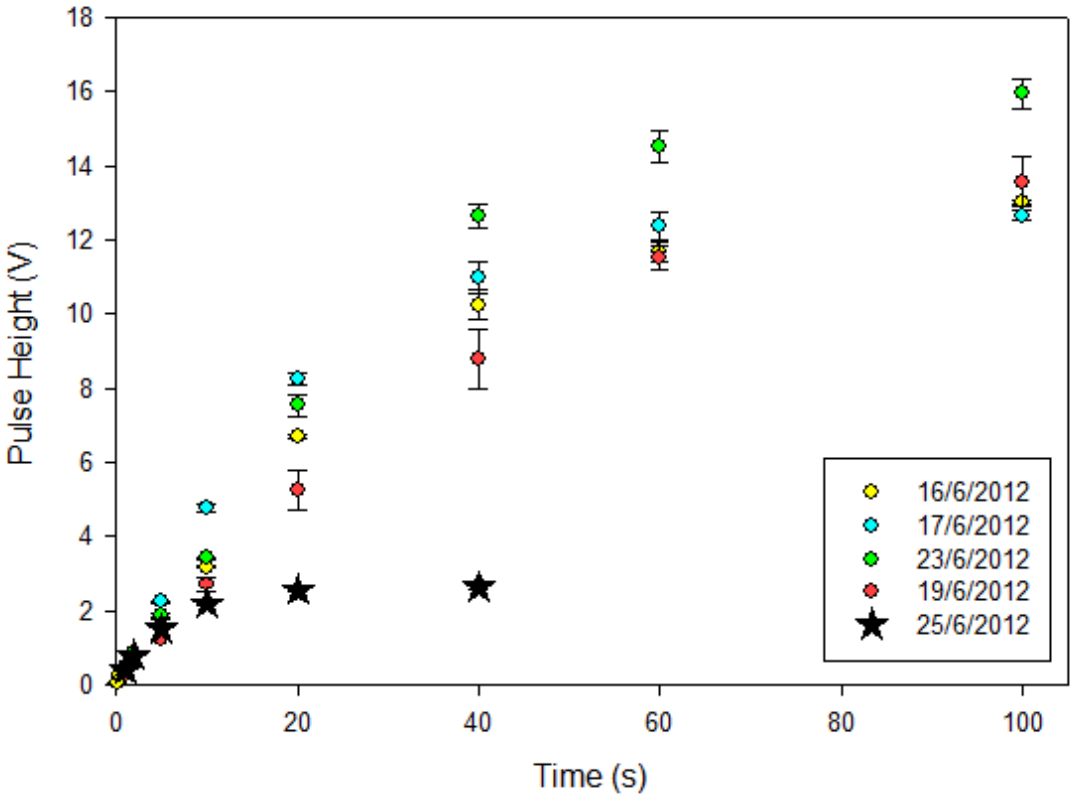
Dear All,

Now the progress has slowed a little, I'm going to try to give a weekly summary and update you of interesting/important information as I find things out. If you would ever like any more information please feel free to email me and I'm happy to provide it.

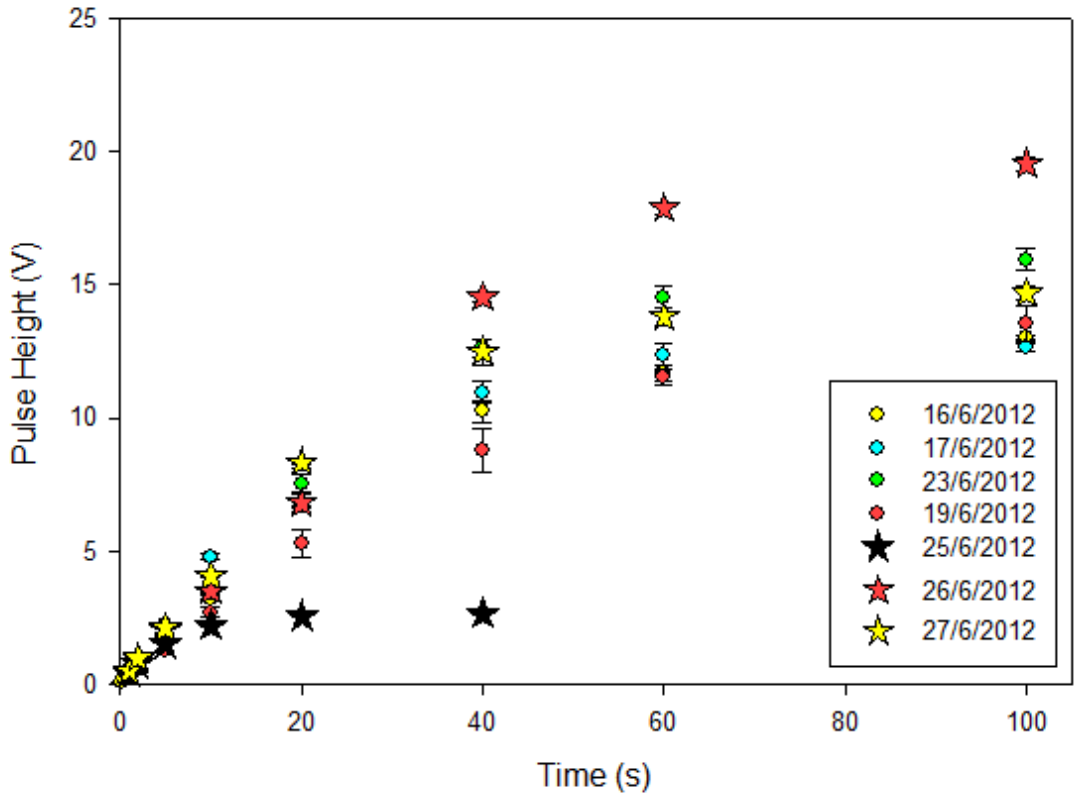
My key goal for the positron trap is to have both reproducibility and stability so that positrons can be reliably transferred from the positron accumulator to the cusp trap. After, a few good days of results from the 18th to the 23rd (see plot below)



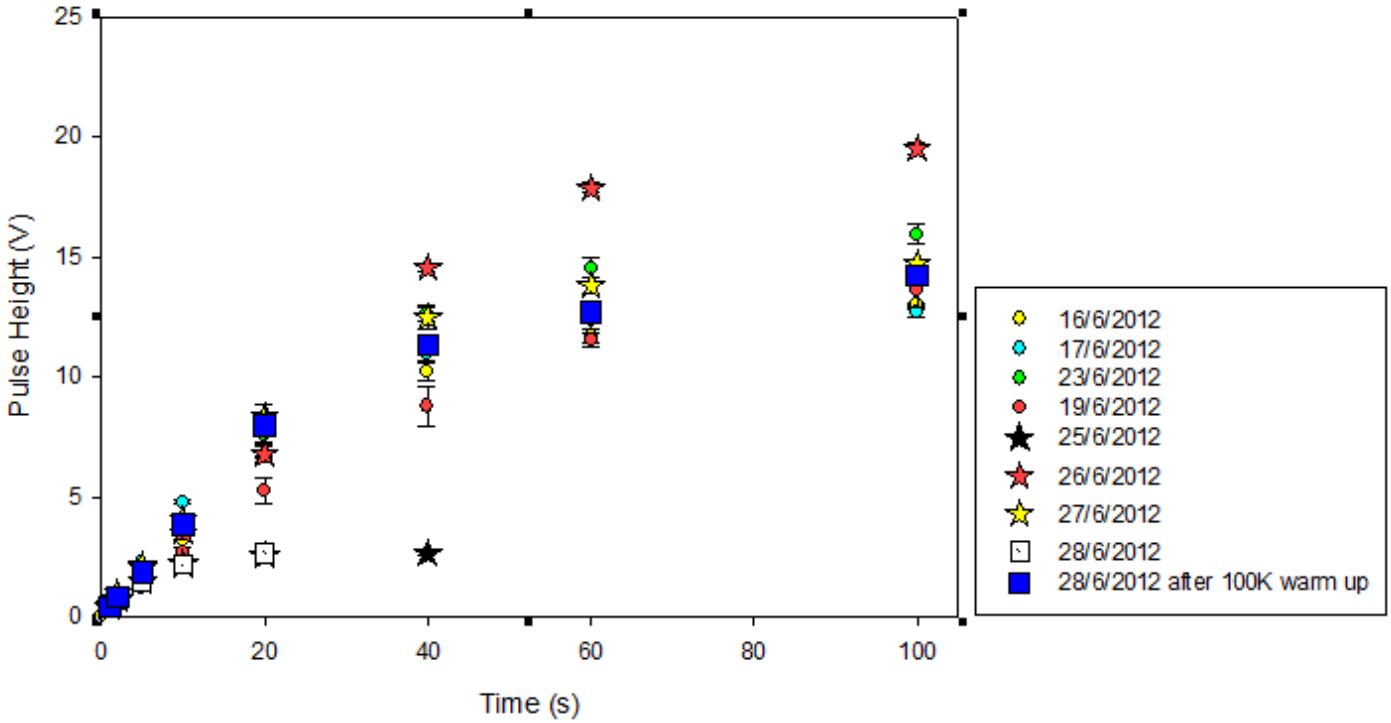
a significant reduction in the trapping efficiency was observed (shown below as black stars)



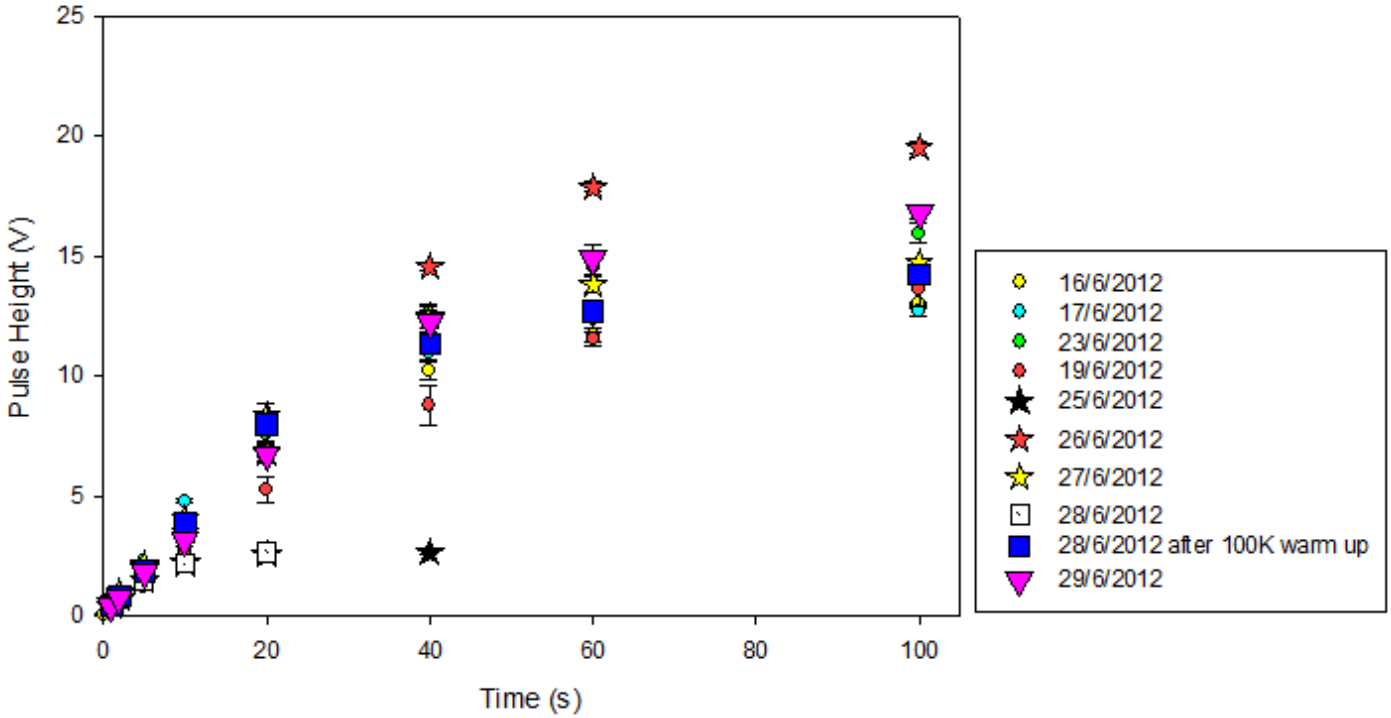
Previously, it has been observed that over time the cold head of the RGS moderator system appears to build up some contamination. This contamination, most likely N2 from the buffer gas system has a interesting effect on the positrons produced. On the 25th the cold head was heated to 100K the results of the 26th and 27 again reproduced the original results (shown below as red and yellow stars respectively)



However, on the morning of the 28th, again the signal was low (shown in hollow black squares in the plot below), so immediately, I tried heating the cold head to 100K and grew a new moderator. After this process again the typical curve was reproduced (shown as blue squares below).



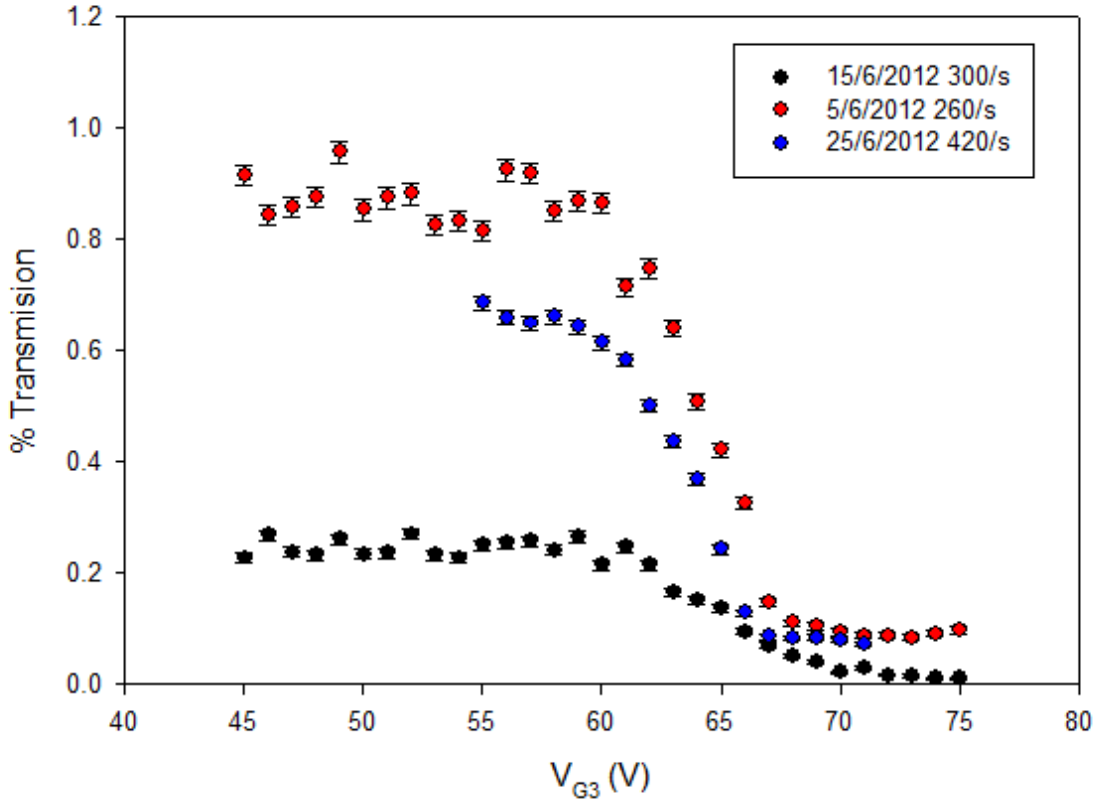
Today, again the signal was low after warming the cold head to 30K but after a 100K warm up the signal returned to typical values (pink triangles in the plot below)



So to summaries the above, the signal has been almost constant since the 16/6/2012 however, the moderator must be warmed to 100K to prevent the build up of contaminants.

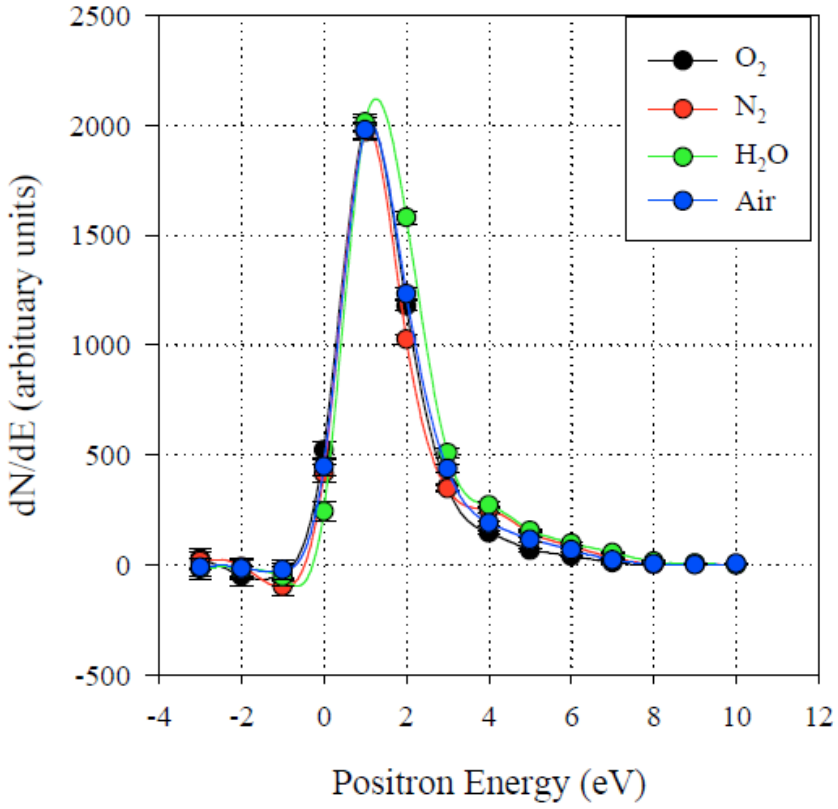
Something that is interesting about this is that the DC beam count rate does not reduce as quickly as the trapping efficiency. This effect is not at present fully understood, however, now that preliminary investigations have been performed it does not appear at present to represent a problem for the long term stability of the positron trap. I will change the moderator dumping procedure to heat to 100K rather than 30K, in real terms this adds an extra ~20 minutes to the process.

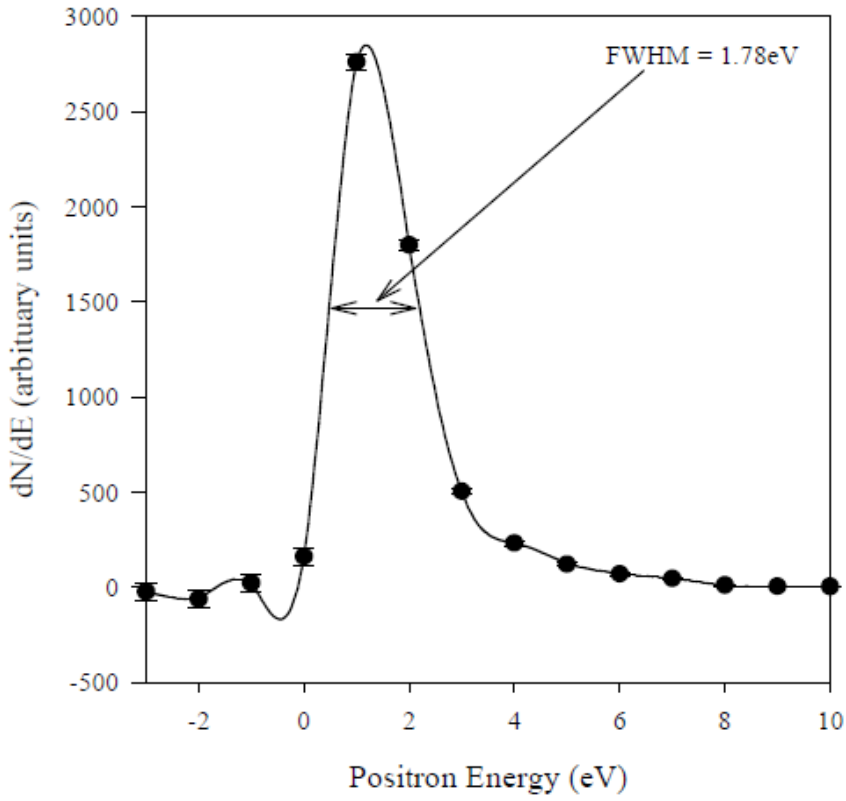
There are preliminary indications that this process may be due to a shift in the energy spread of positrons emitted from the moderator. This comes from measurements of the transmitted fraction of positrons in the DC beam. In the plot below, energy spreads (measured by retarding positrons by applying a voltage to the 3rd element of the gas cell) are shown.



The points taken on the 5/6/2012 are closest in time to the cold head being at 300K (8 days prior), the black furthest in time (18 days prior) and the blue (10 days prior). From the above plot there appears to be a trend that the transmission falls over time, however, as stated above these results are preliminary and further investigation would be required to make a definite statement about this.

I spoke with one of the Swansea (ALPHA) guys to see if they had observed something similar, although he then started talking about some work that was done at UCL about coating a solid Ar moderator with various gases. I've emailed my former colleague about the results, however, in the thesis of another former UCL positron group member I found the following plots :





On the left, the energy spreads of the Ar moderator with 'contaminant' layers as per the legend and without any contamination, by eye it doesn't appear that there is a large difference between the two measurements, although there do appear to be 'negative energy' positrons on the left hand side plot, I suspect this is a problem with reading the source potential power supply correctly

(unfortunately I don' have access to the raw data as I wasn't working on this project).

For now, back to the work of transferring positrons into the cusp trap!

Comments, questions and suggestions welcome as always very welcome

Kind regards
Dan

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