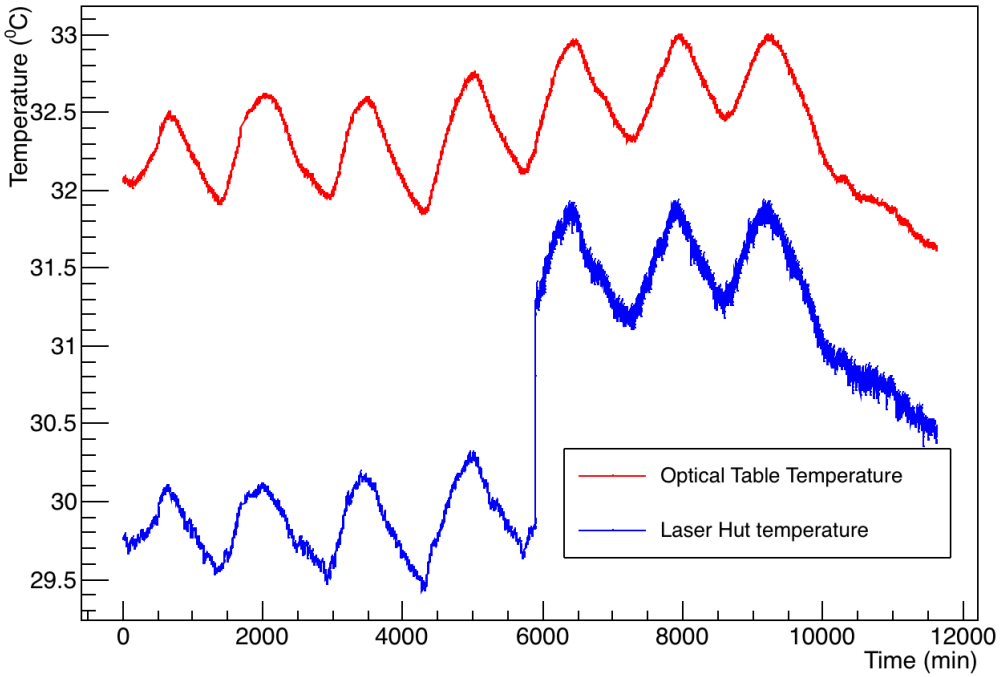
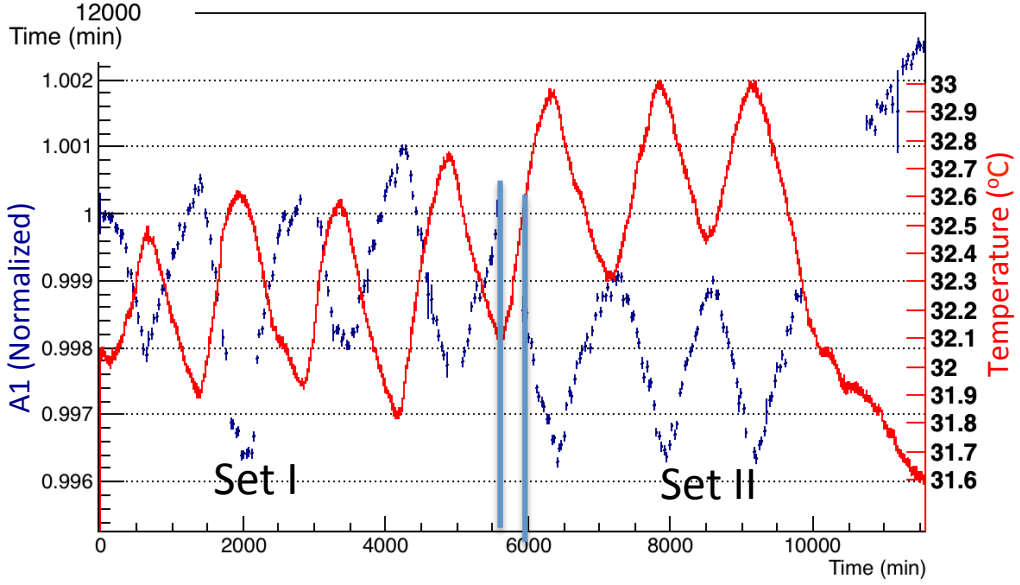
Analysis of 9 days dataset – 4^{th} to 12^{th} May

- Expect channels 0 to 22 to be similar (new PMTs), tested by overlapping channels 6 and 7
- Repeated the above for old and new PMTs connected to calo 18 – ch 8 (new) and ch 28 (old)
- A study of channel 8 (new PMT) and 28 (old PMT) connected to calo 18.
- Displayed A1 and A2 on the same plot and A2:A1 separately
- Just mentioned max. range of variation of A1 and A2 (straight line fit did not make sense especially for channel 8).
- Fitted A2:A1 with a straight line as before.
- Finally found an abrupt change in temperature data, so split this dataset into two parts of about 4.5 days each

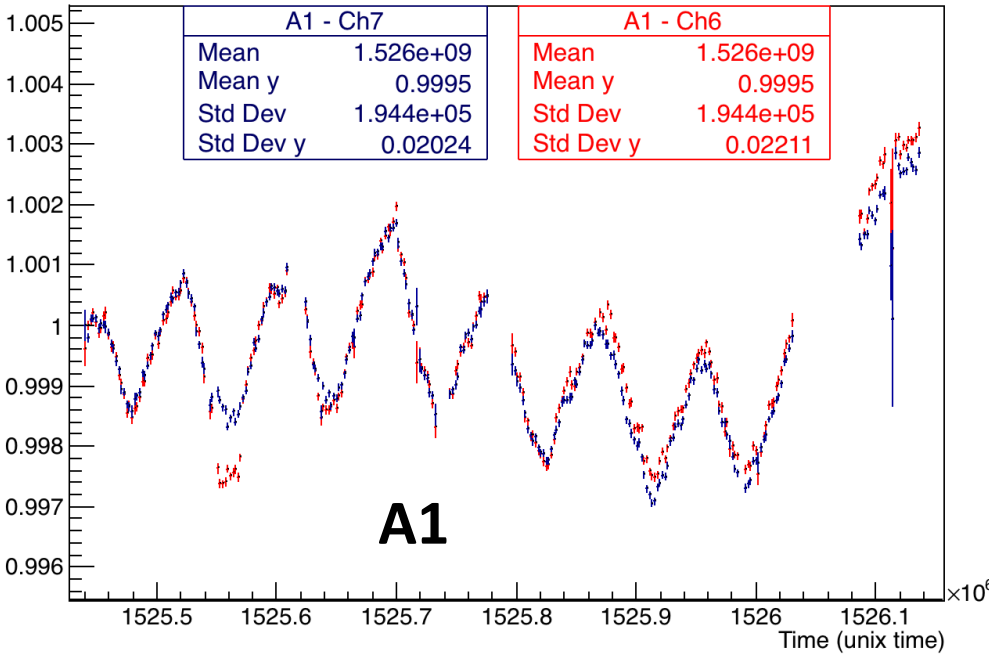
Temperature Plots - A1 with optical table temperature

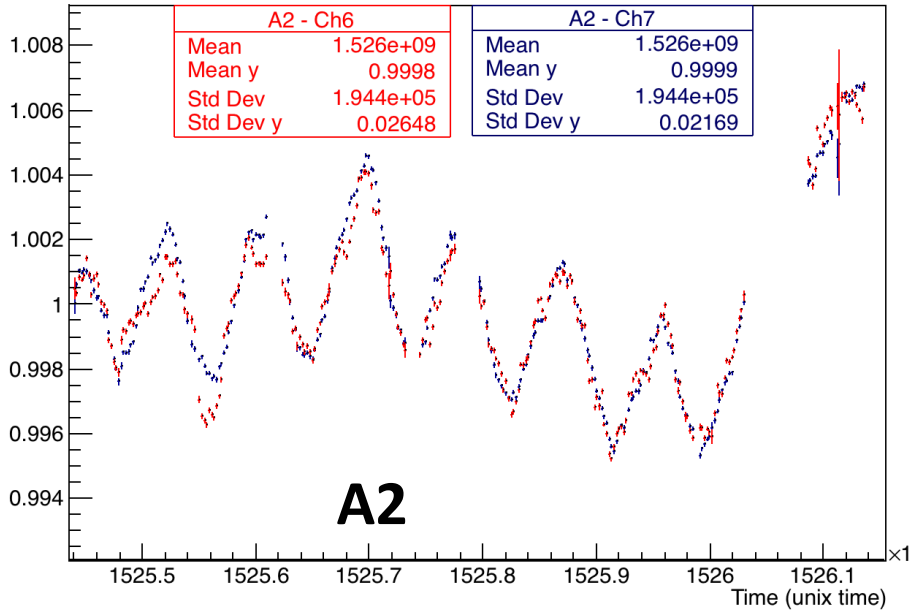


Something changed abruptly in the laser hall temperature, so used optical table temperature for analysis. Also divided the dataset in 2 sets – 0 to 5700s and 6000s to 12000s.

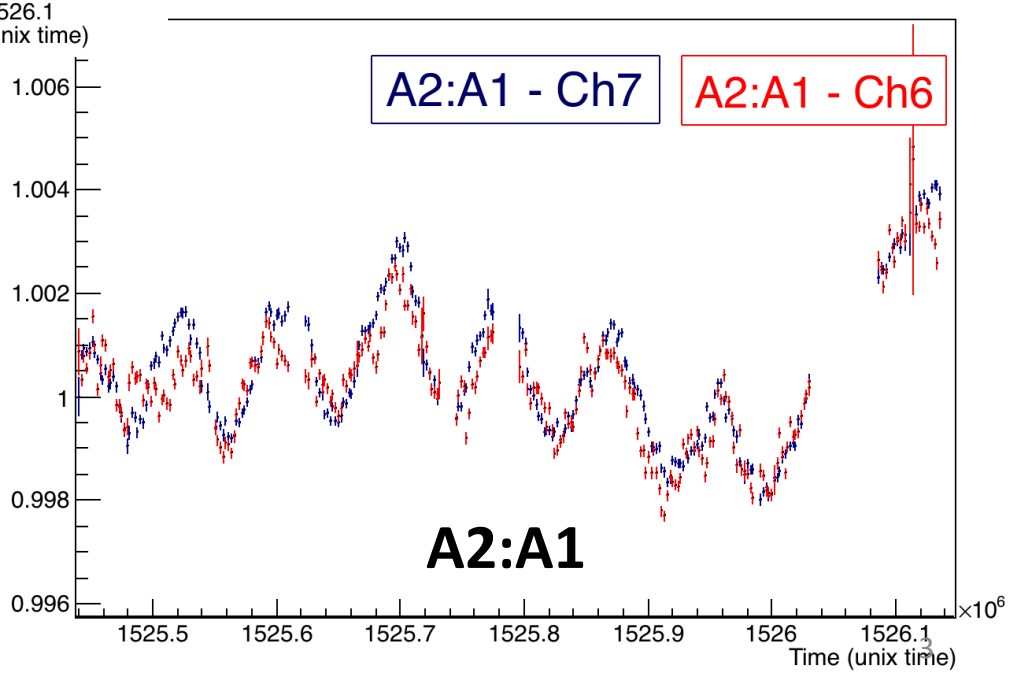


Channels 6 and 7 - comparison

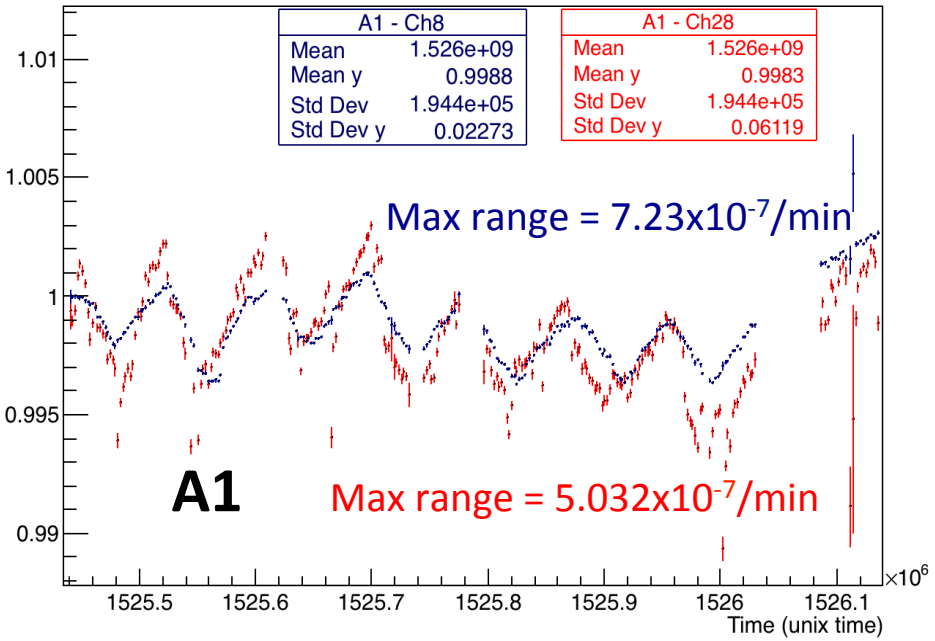


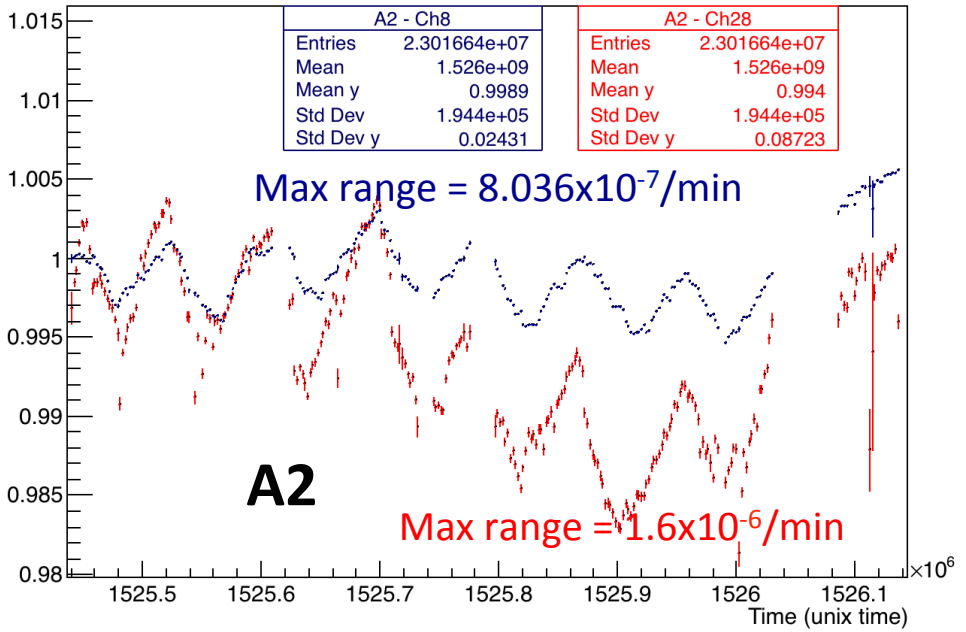


Purpose − expected that all new PMTs show similar behaviour (these are comparable). Checked channel 6 and 7. Normalized with the mean of first 9 bins.

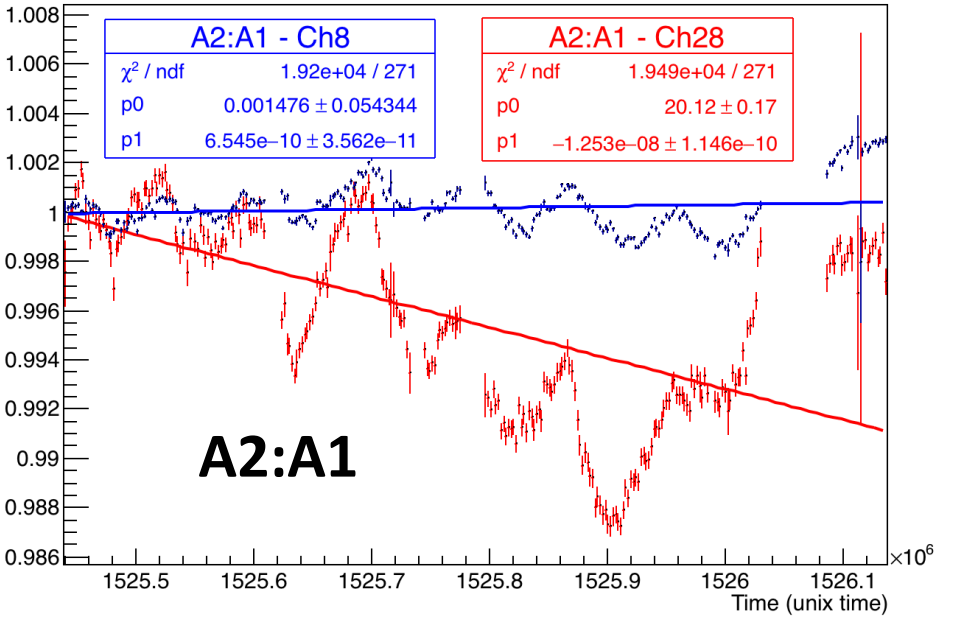


Calo 18 – Channels 28 and 8 - comparison

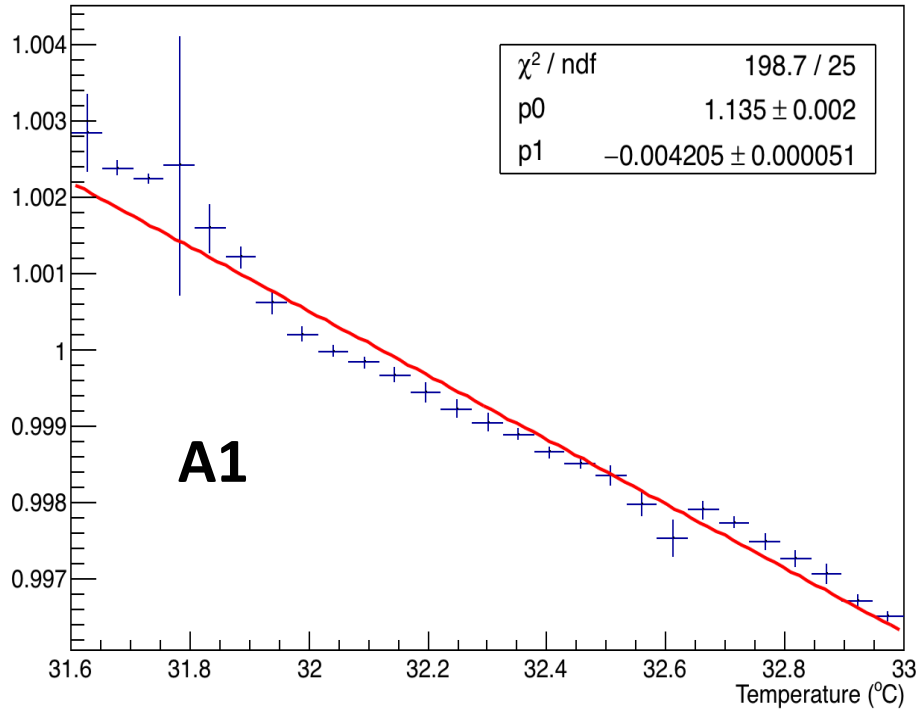


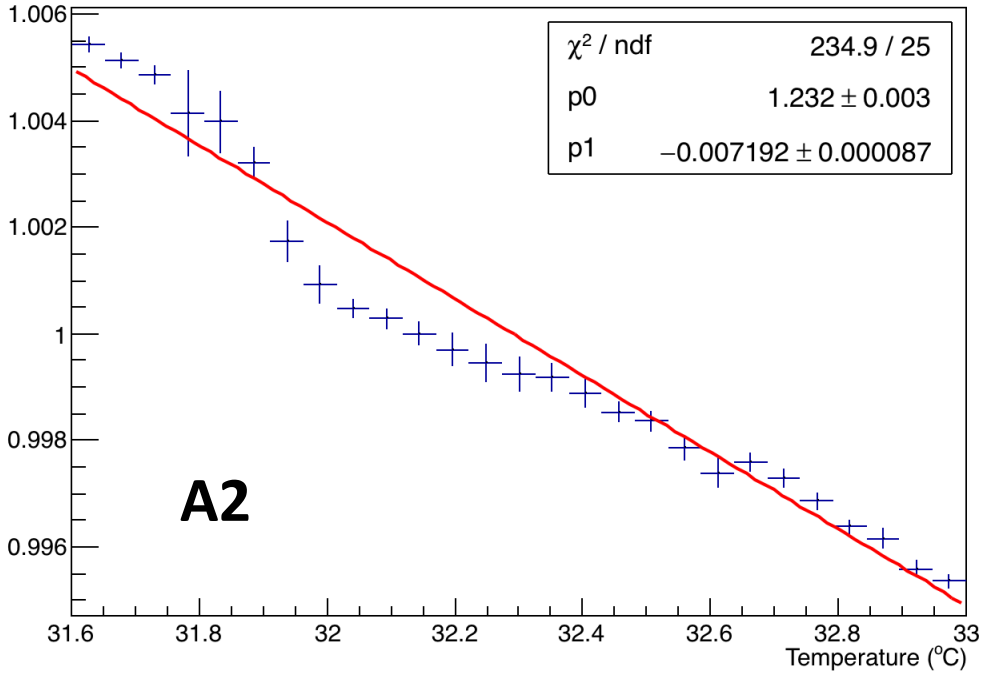


Should show different behaviour (as the PMTs are different and old PMTs use a PMMA return fibre and Silica forward fiber whereas the new one uses only Silica). This is evident here.

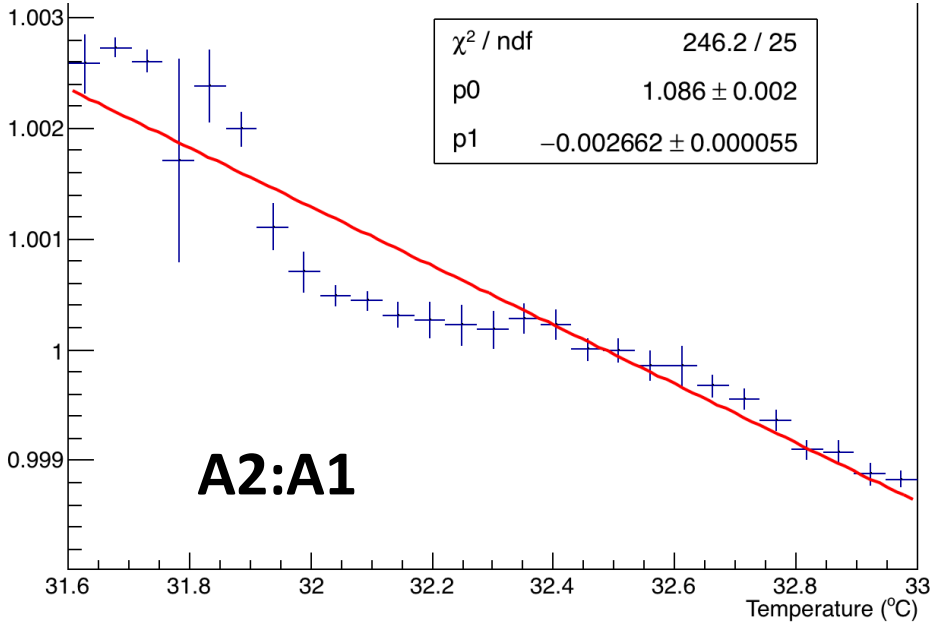


Temperature studies of channel 8 – Linear fit

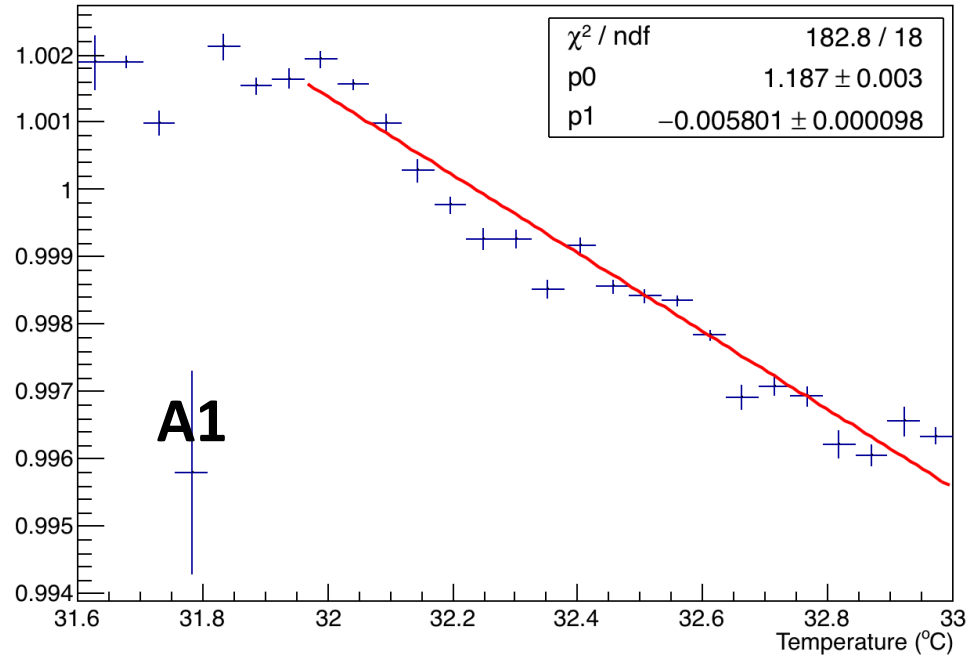


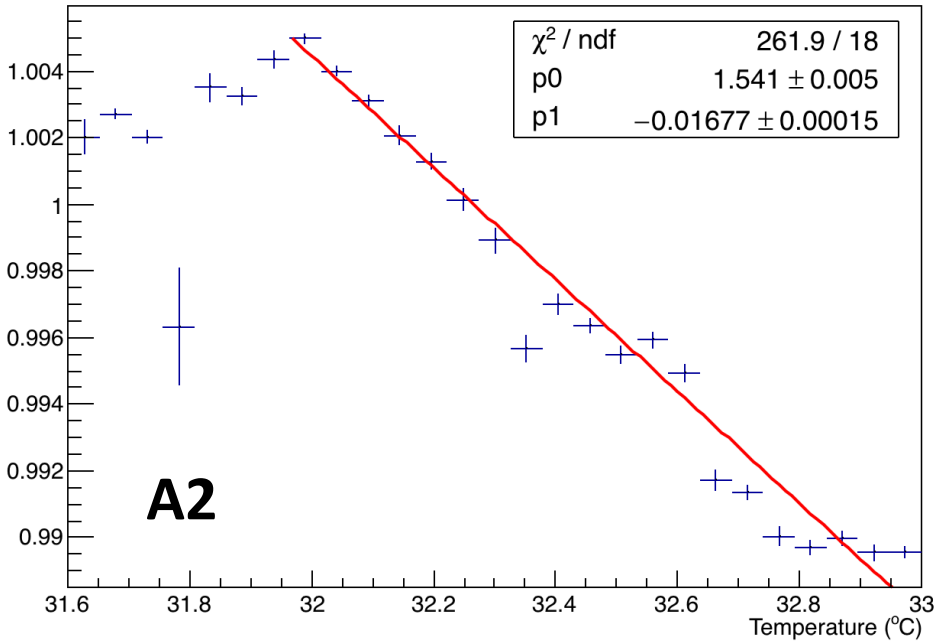


New PMT – Silica fiber both forward and return directions

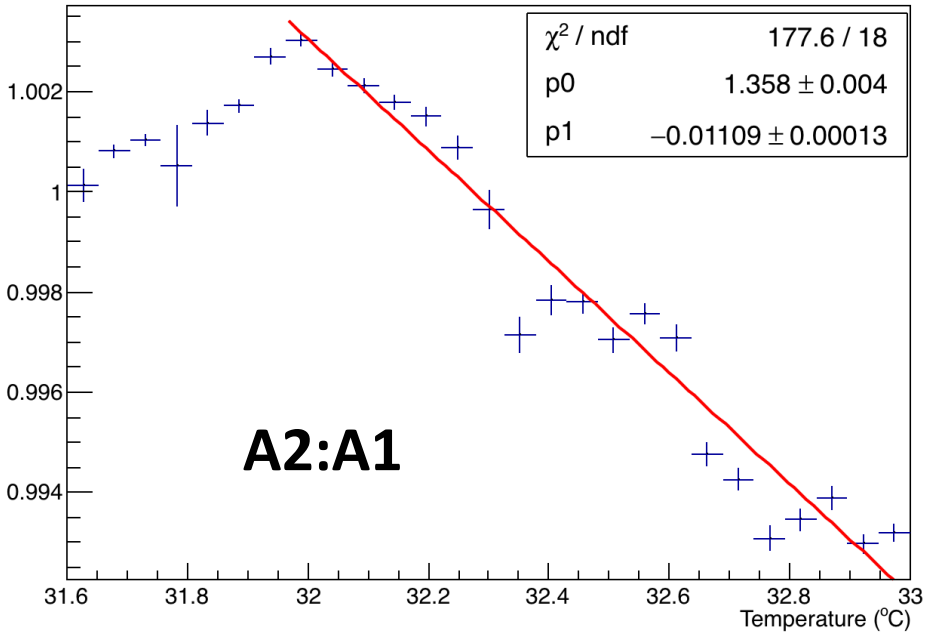


Temperature studies of channel 28 − Linear fit

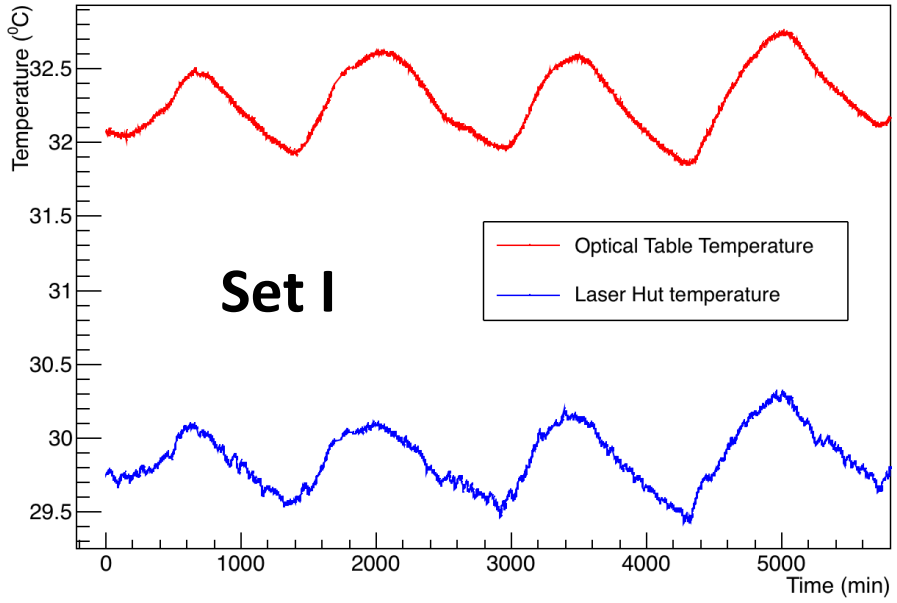


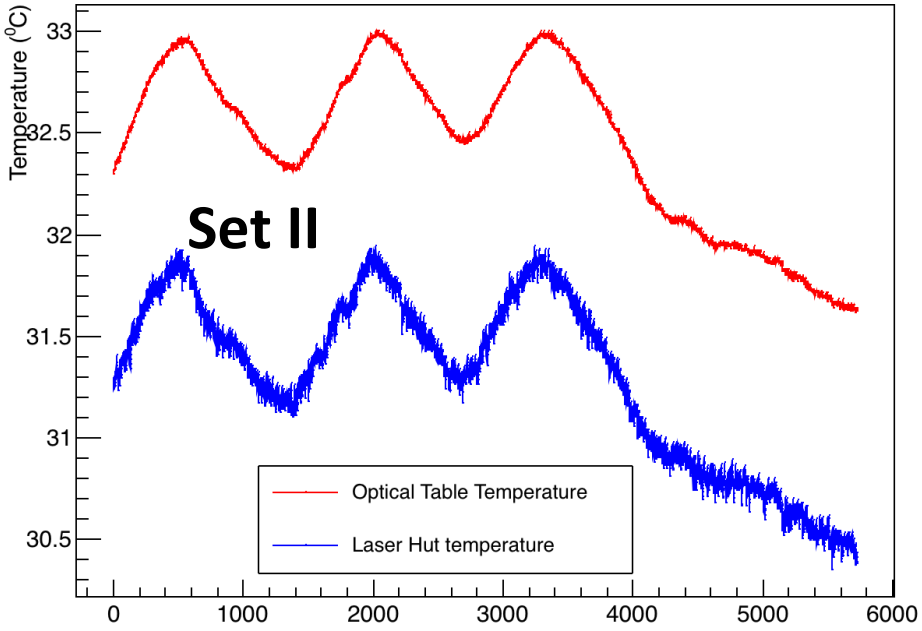


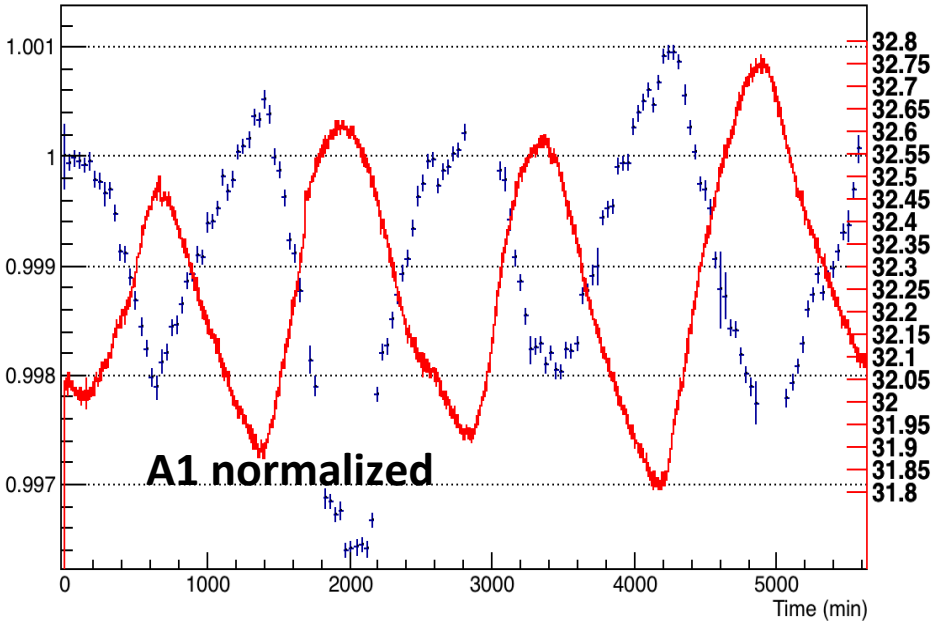
Old PMT − PMMA fiber in the return direction. Thus A2 = Silica forward + PMMA return

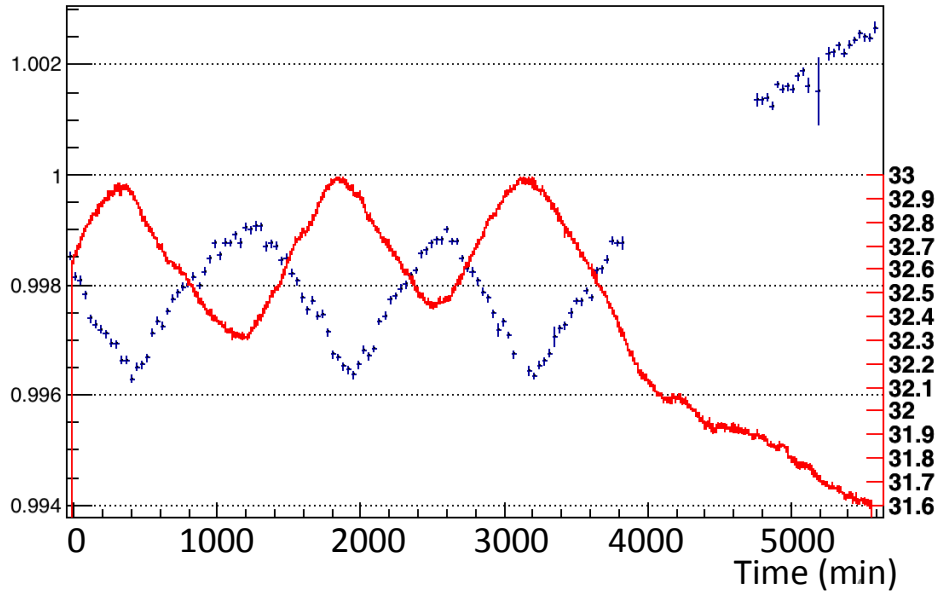


Investigation for the two sets (or parts) separately

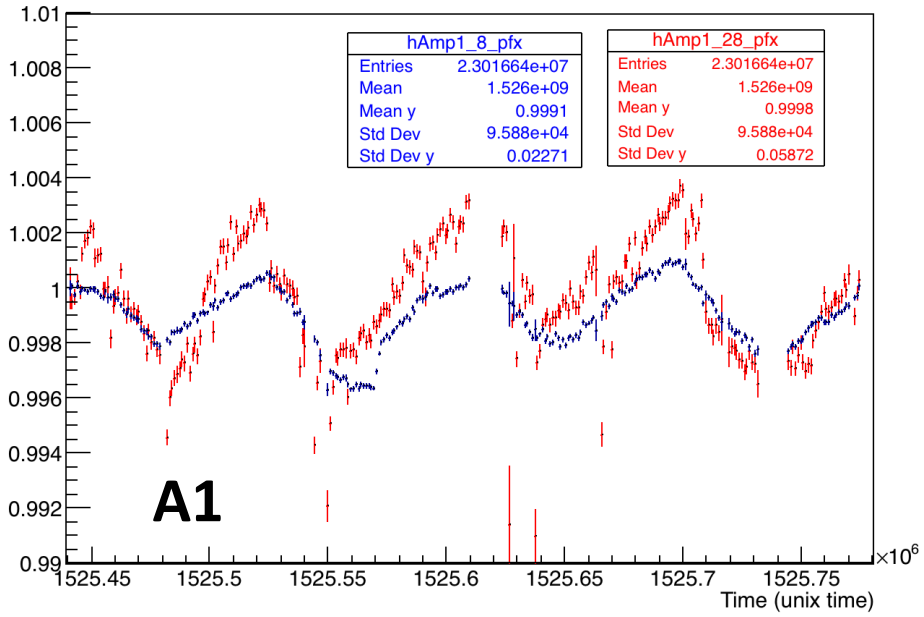


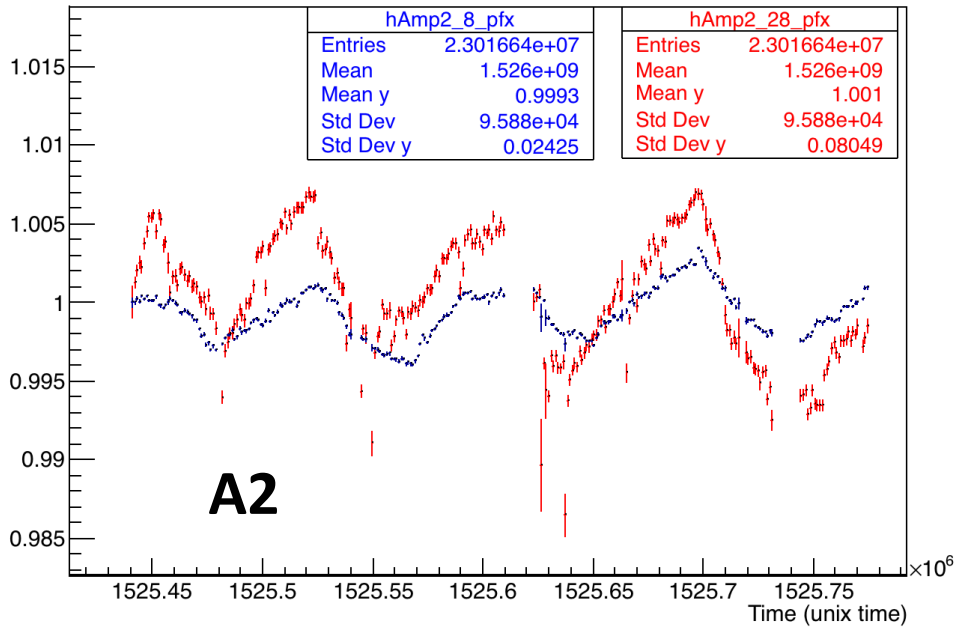




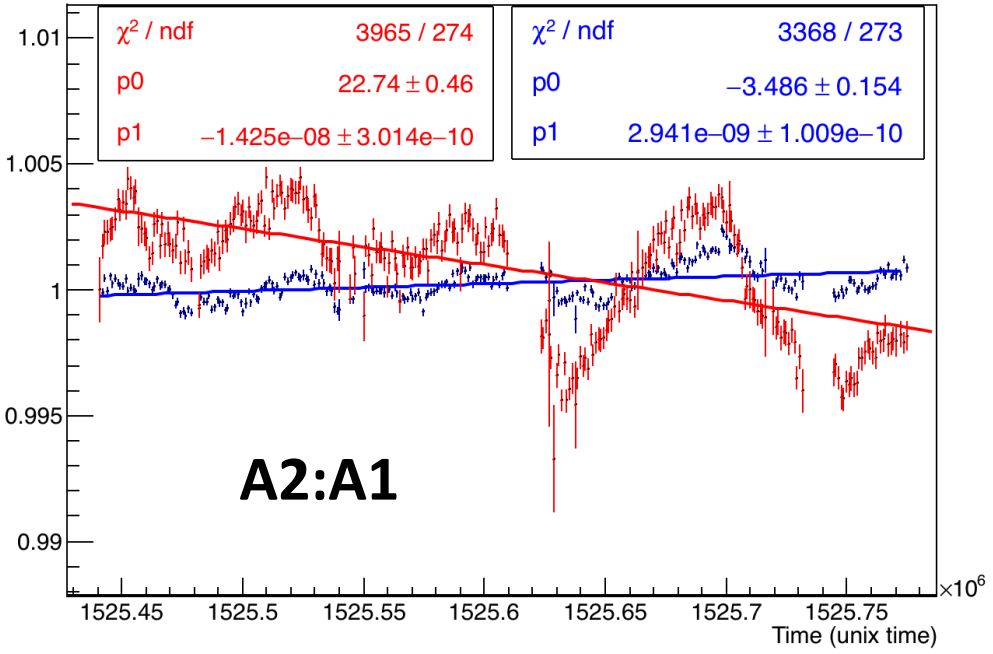


Calo 18 – Channels 28 and 8 – comparison – Set I

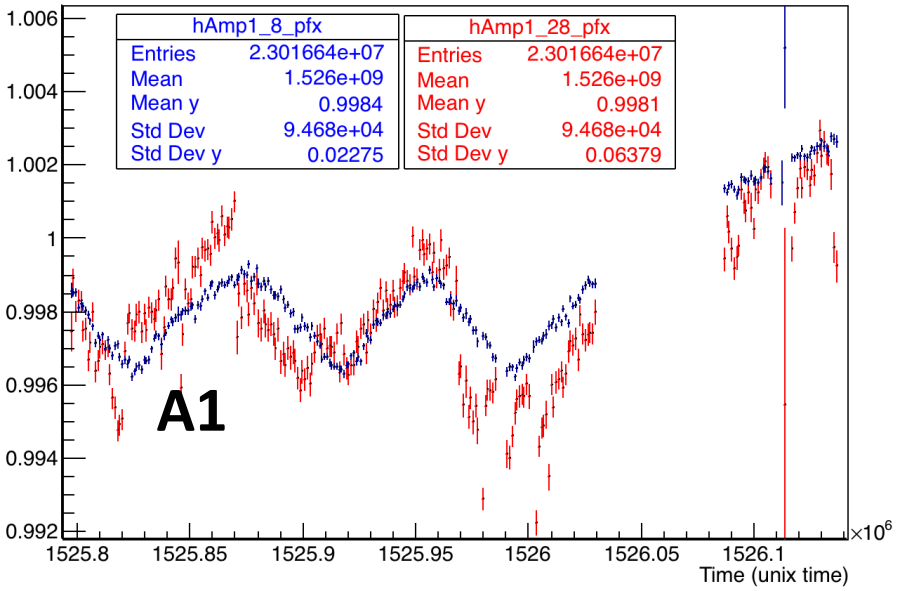


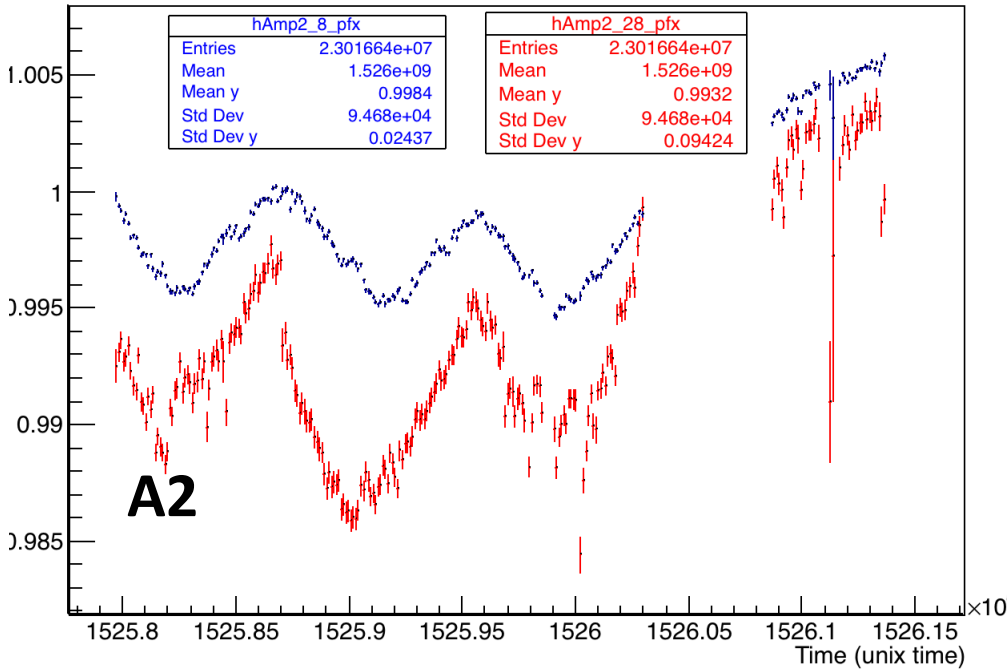


Should show different behaviour (as the PMTs are different and old PMTs use a PMMA return fibre and Silica forward fiber whereas the new one uses only Silica). This is evident here.

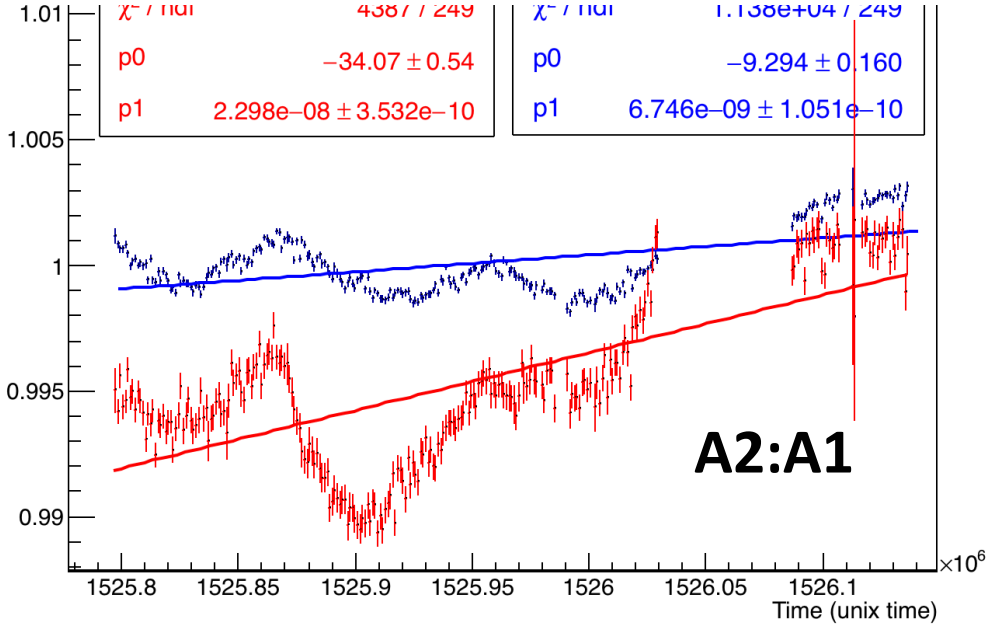


Calo 18 – Channels 28 and 8 – comparison – Set II

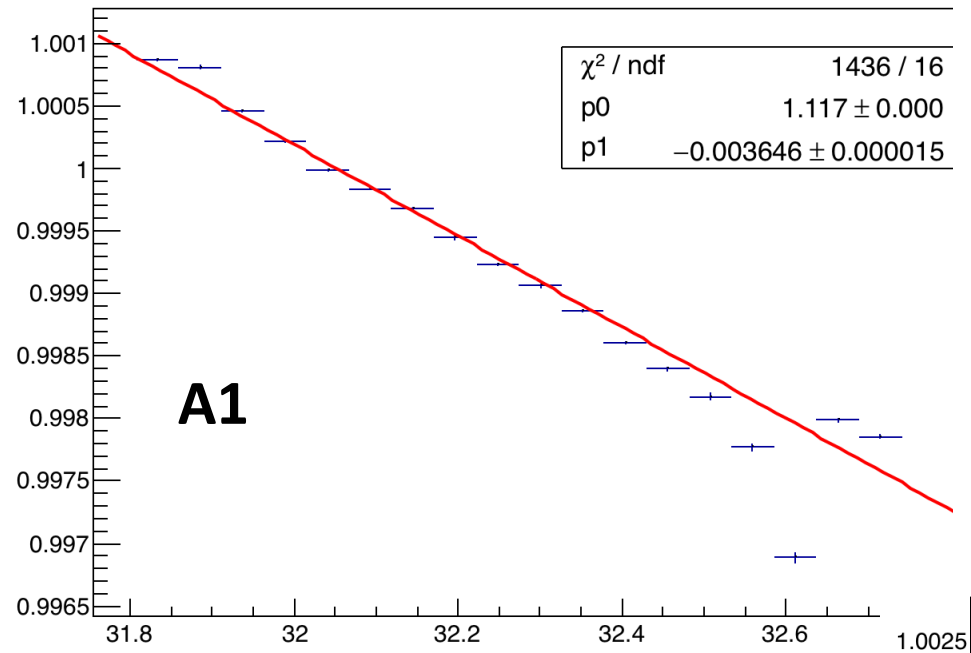


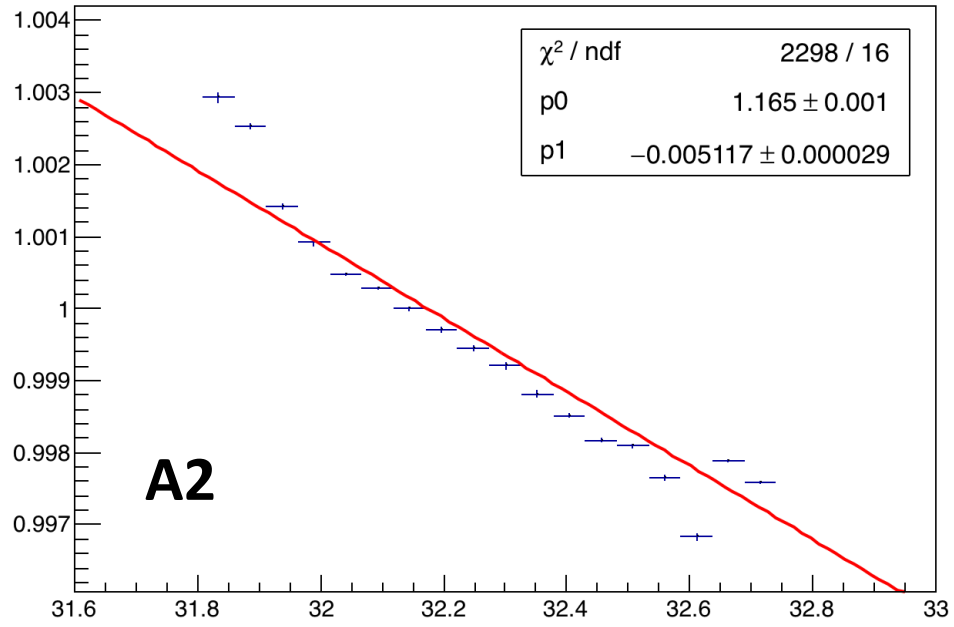


Should show different behaviour (as the PMTs are different and old PMTs use a PMMA return fibre and Silica forward fiber whereas the new one uses only Silica). This is evident here.

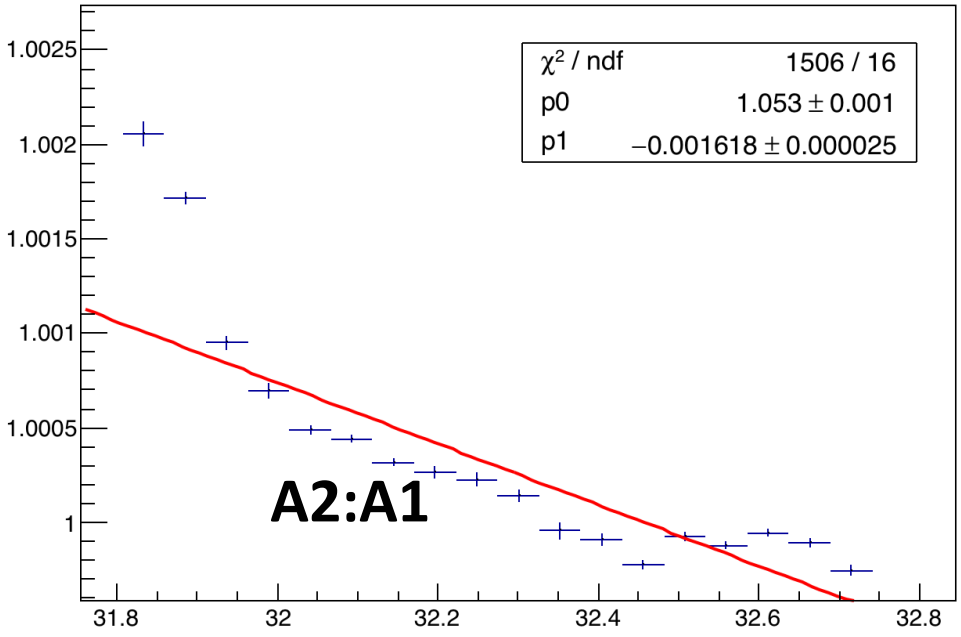


Temperature studies of channel 8 – Set 1

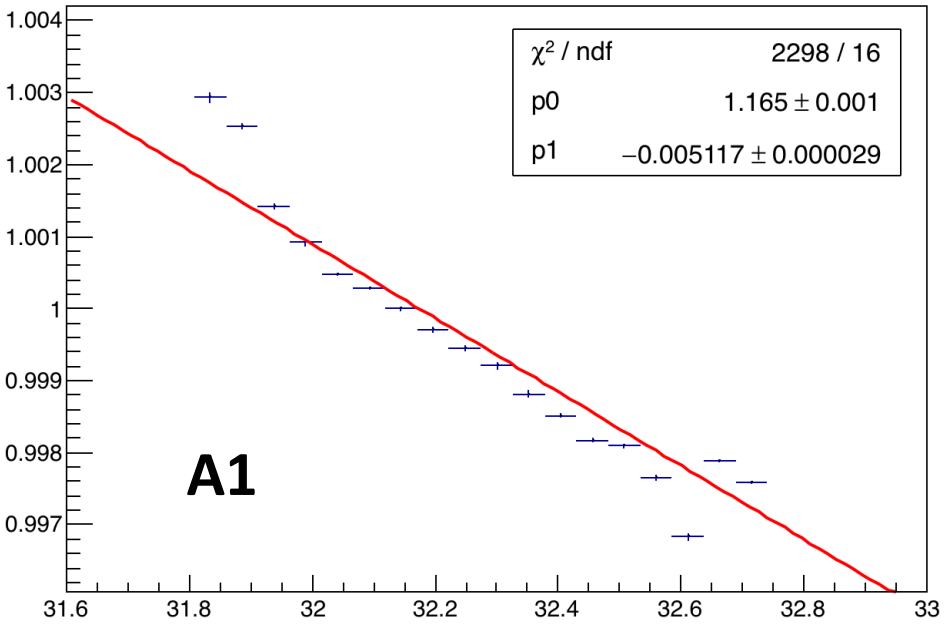


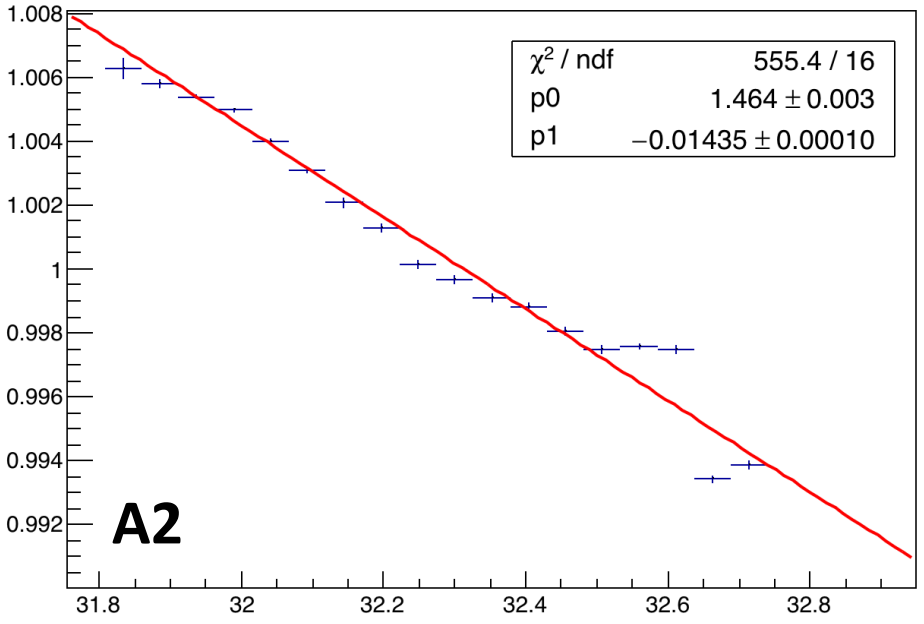


New PMT – Silica fiber both forward and return directions

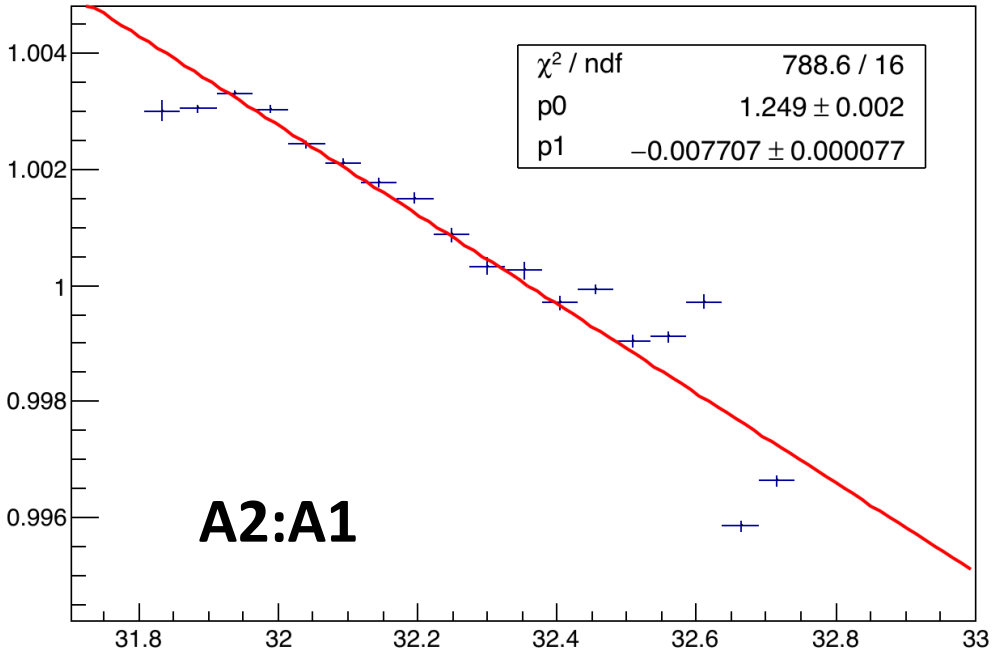


Temperature studies of channel 28 − Set I





Old PMT − PMMA fiber in the return direction. Thus A2 = Silica forward + PMMA return

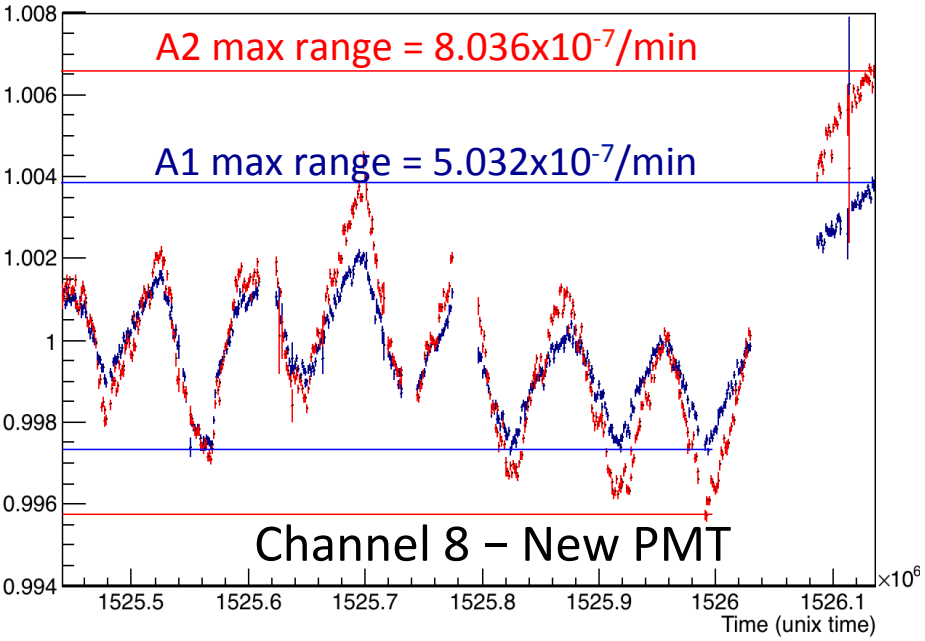


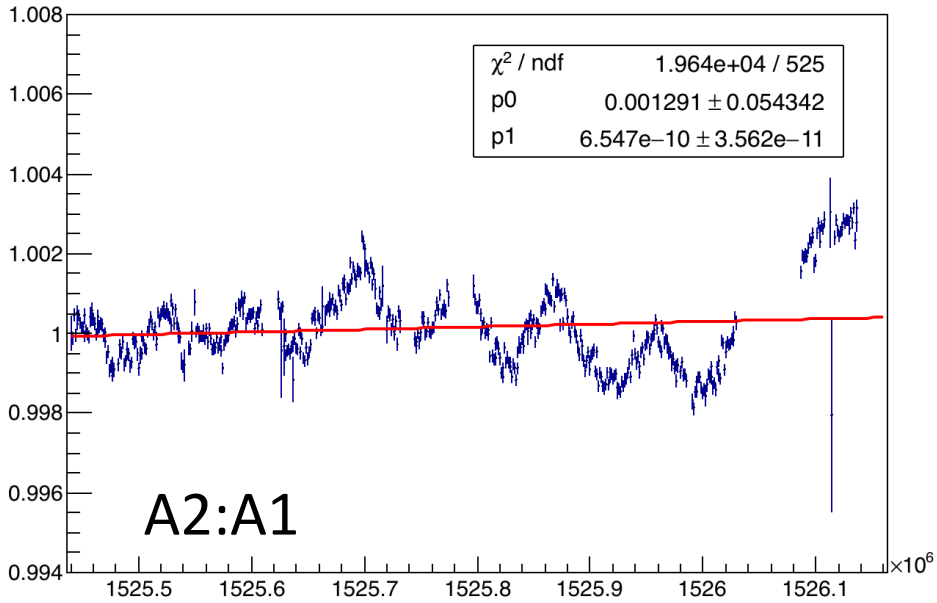
Conclusions

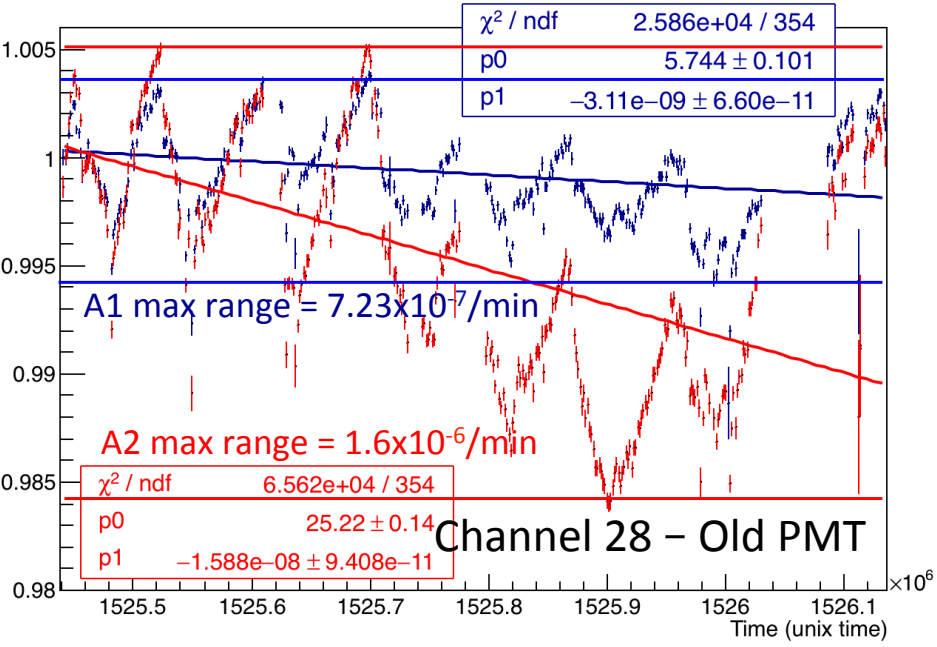
- Variation of A1 with temperature shows a negative correlation of PMT gain with temperature (as expected)
- A2:A1 is almost constant with time for the (for longer time ranges some the variation appears especially for the old PMTs)
- Channels 0 to 23 i.e. the new PMTs (refer slide 9) show a comparatively stable A2:A1 drop with temperature (it ranges from ~0.1% to 0.45%) which is much better than the old PMTs
- Old PMTs show a much larger change with temperature (probably expected) − besides the return fiber of all PMTs is a PMMA, which has shown to display a greater loss.

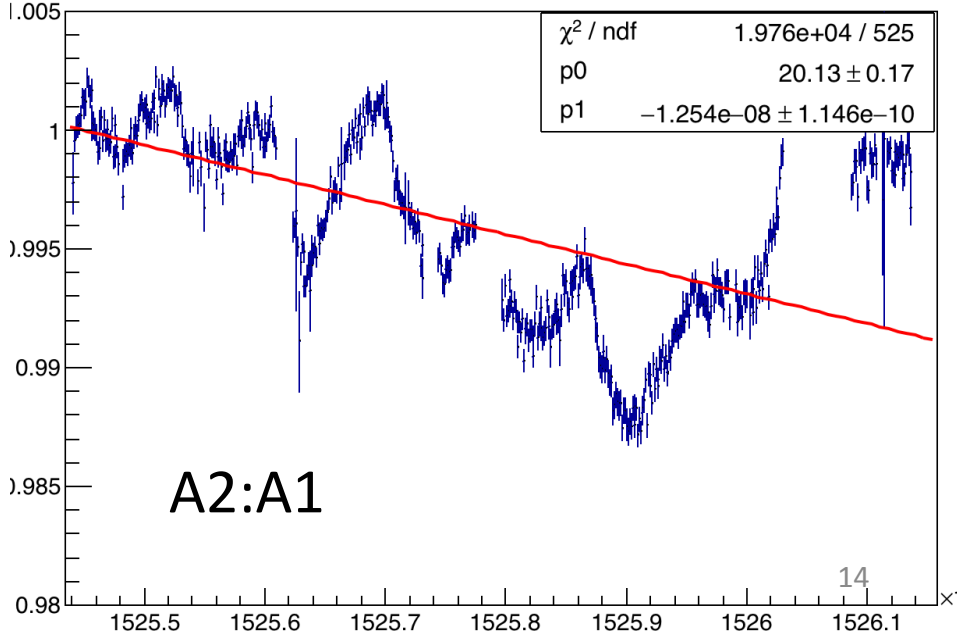
Back up slides

Calo 18 - A1 and A2 overlaid and A2:A1

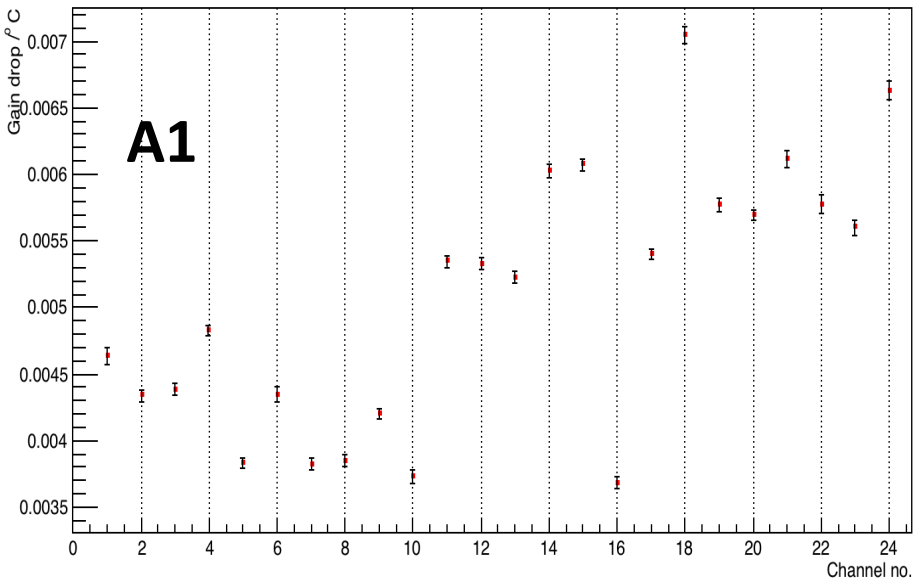


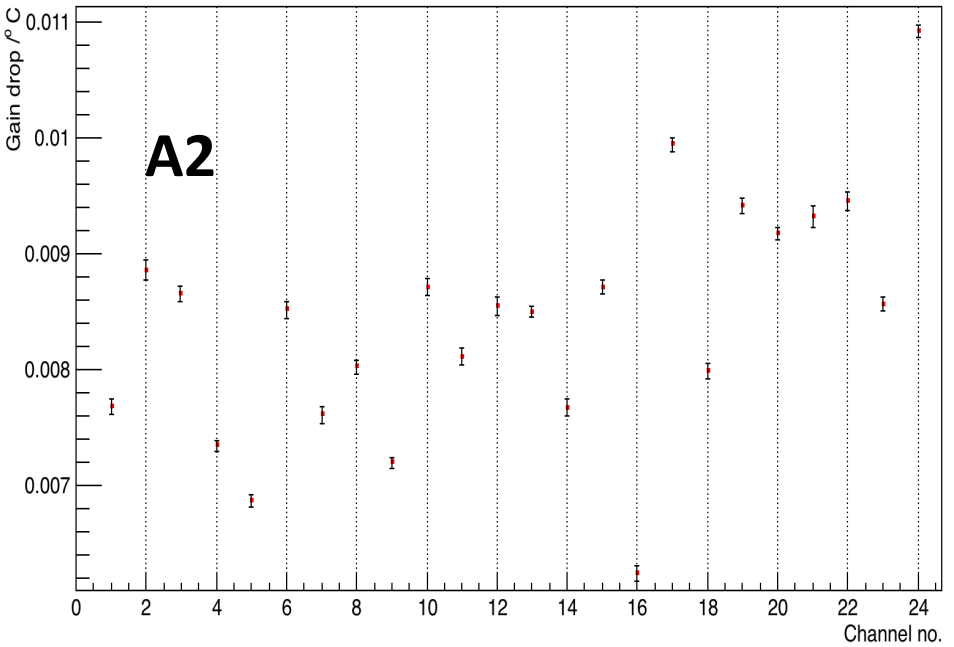




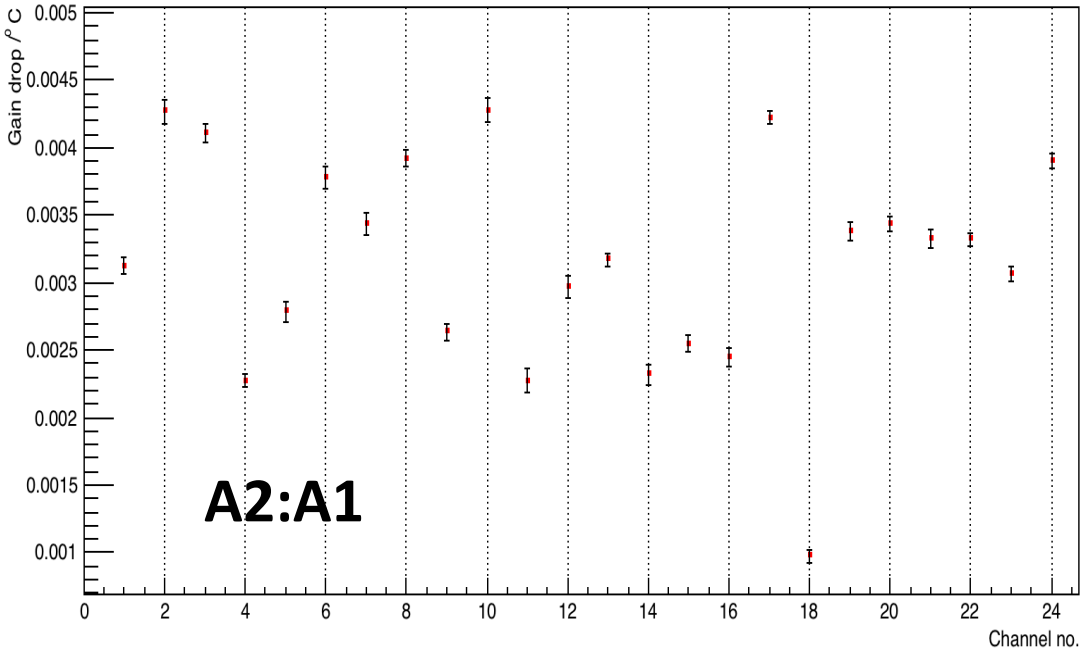


Drop in gain for rest channels – 0 to 23

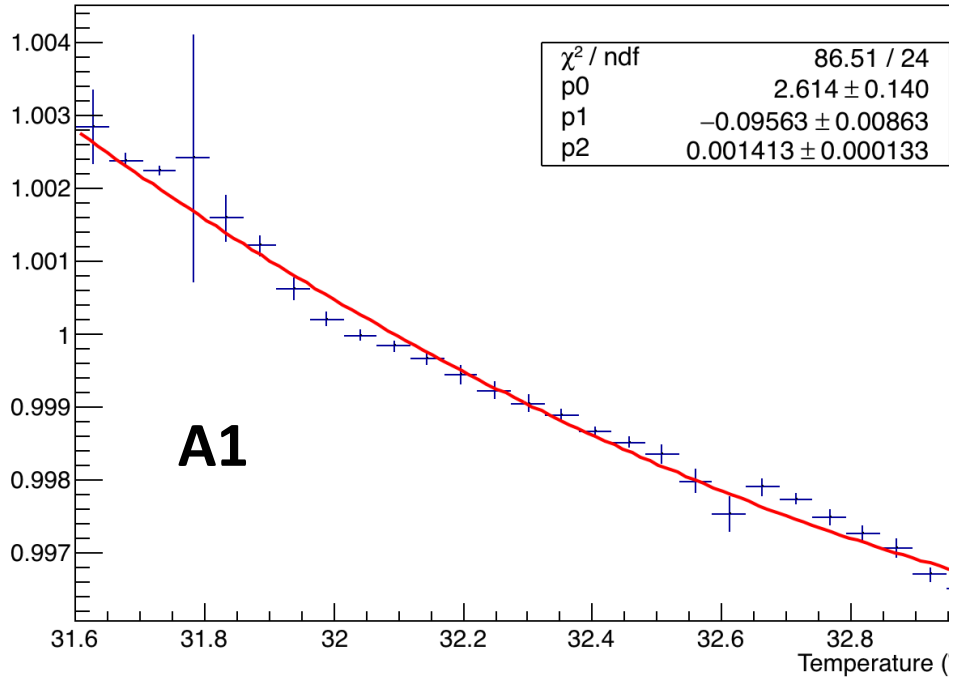


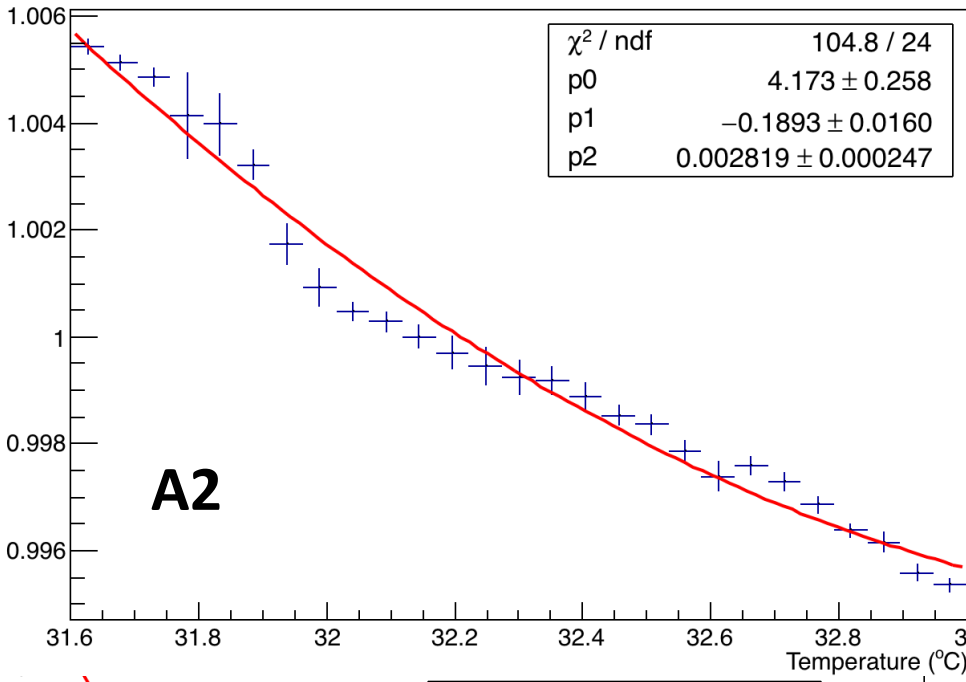


Results obtained by linear fits of each channel.

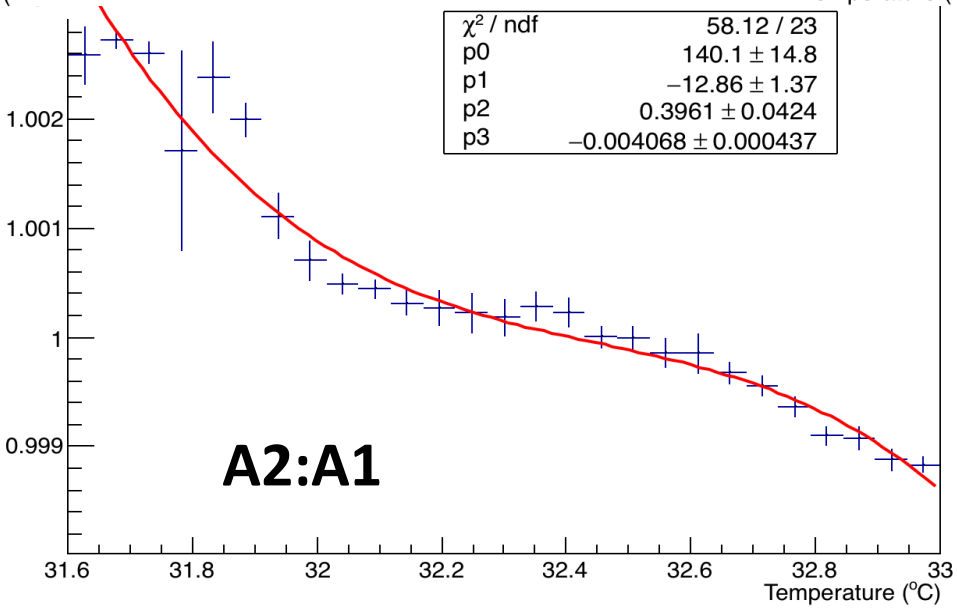


Temperature studies of channel 8

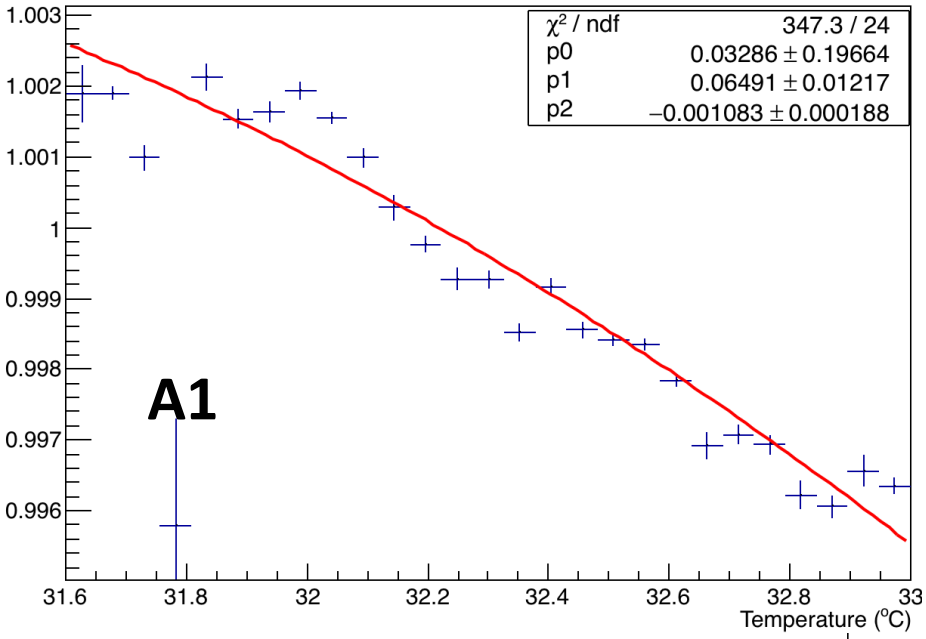


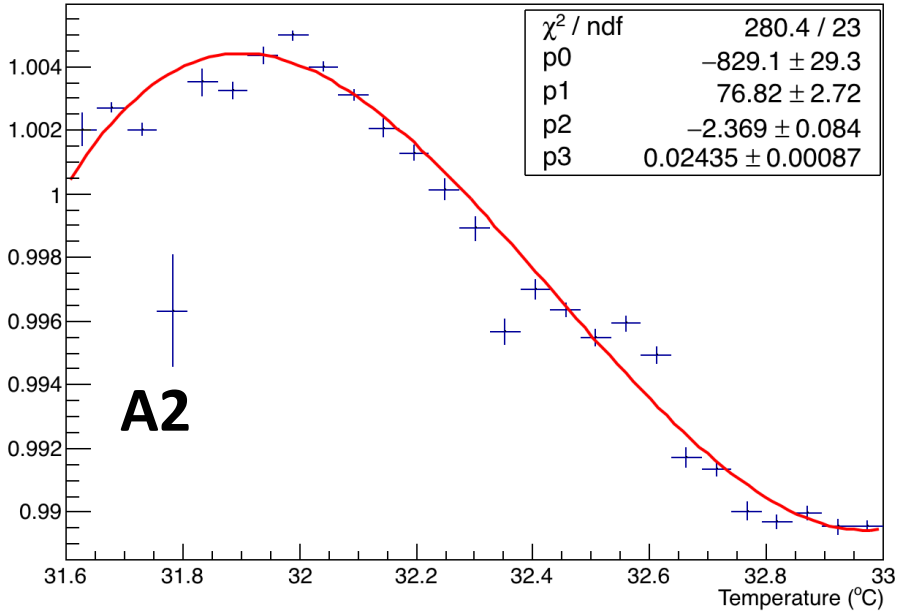


Used quadratic fit for A1 and A2 – gives better chi2. A cubic fir for A2:A1

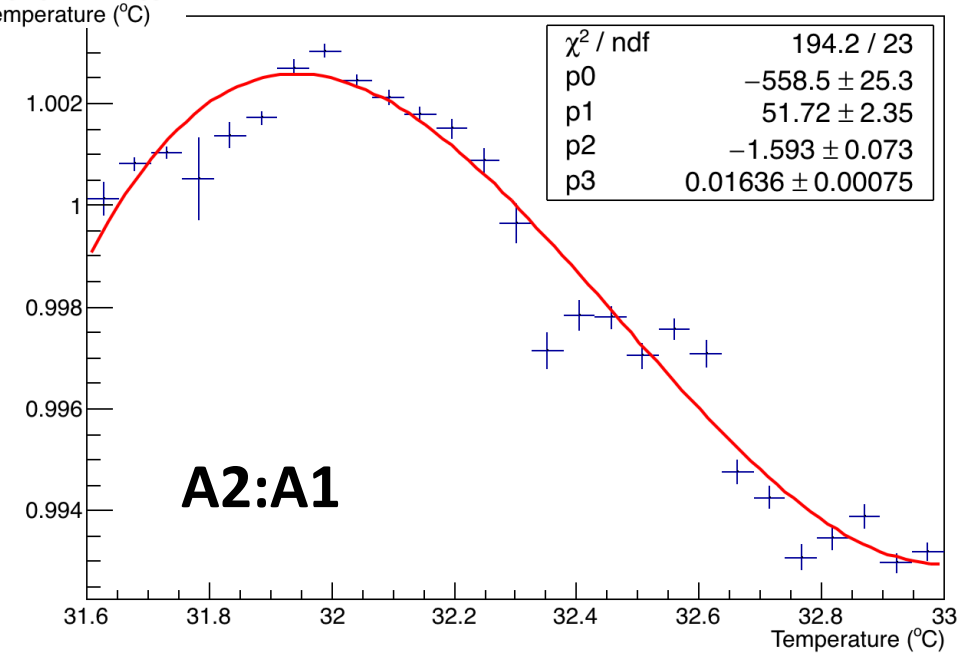


Temperature studies of channel 28

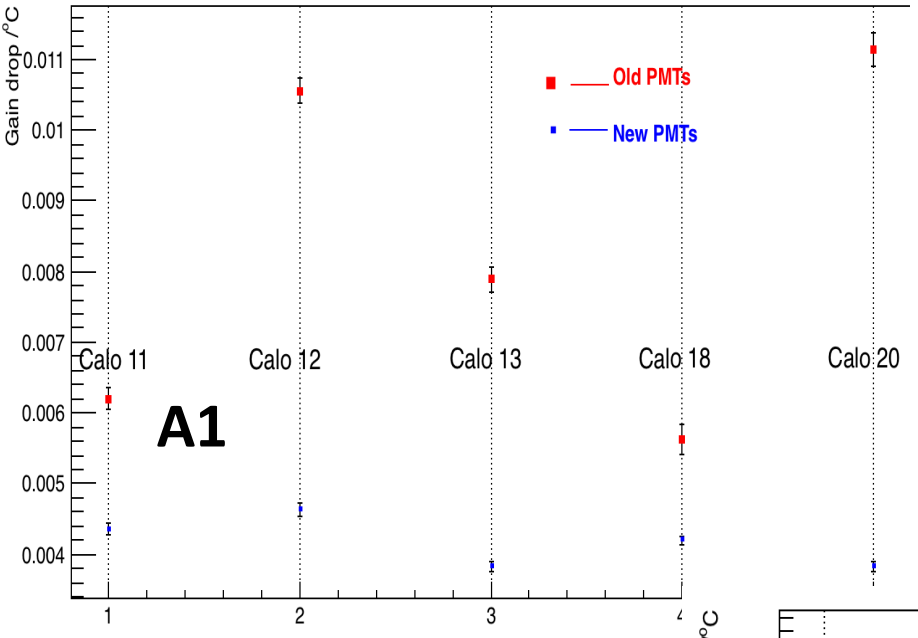


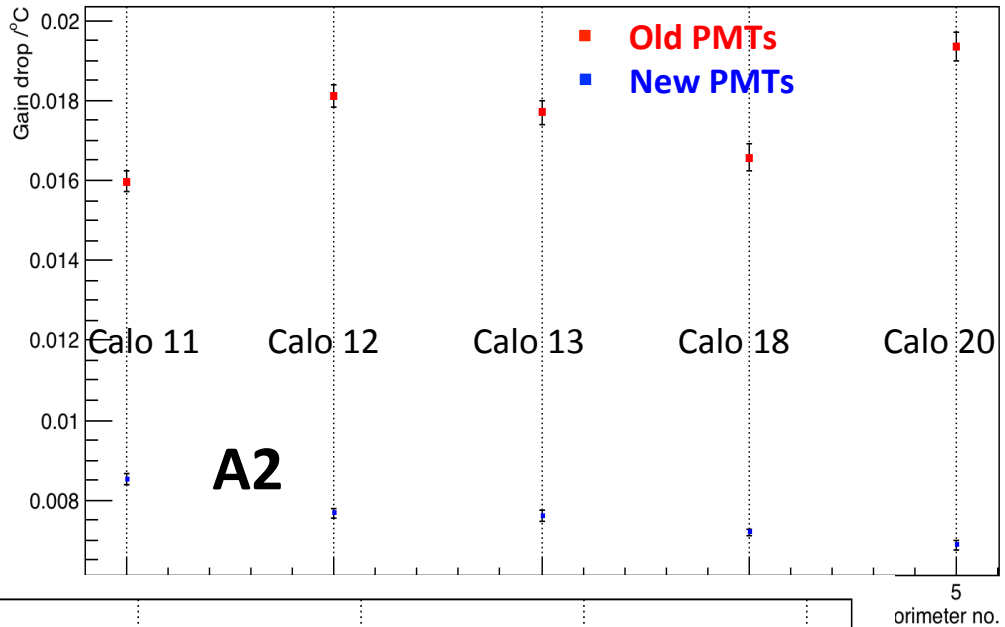


Used higher order fits – gives better chi2 than linear fit. A cubic fir for A2 and A2:A1



Comparison of Old and New PMTs – Gain drop with temp





Results obtained by linear fits of each calorimeter.