

Inelastic Branch of the Stellar Reaction $^{14}\text{O}(\alpha, p)^{17}\text{F}$

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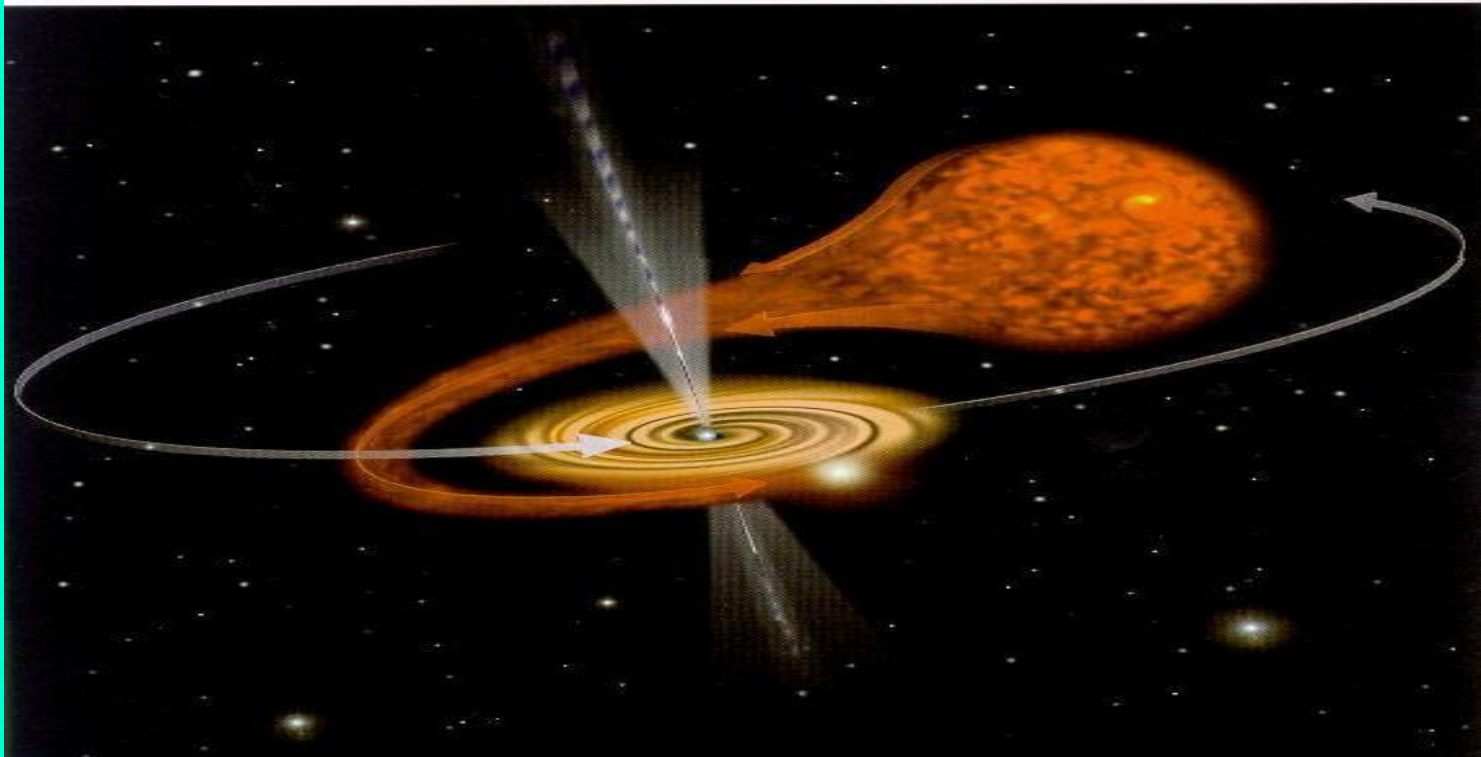
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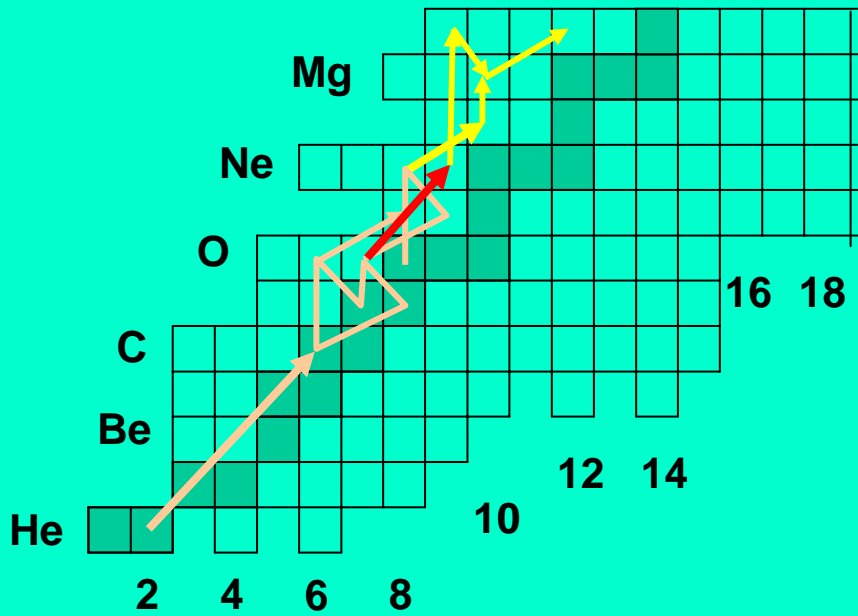
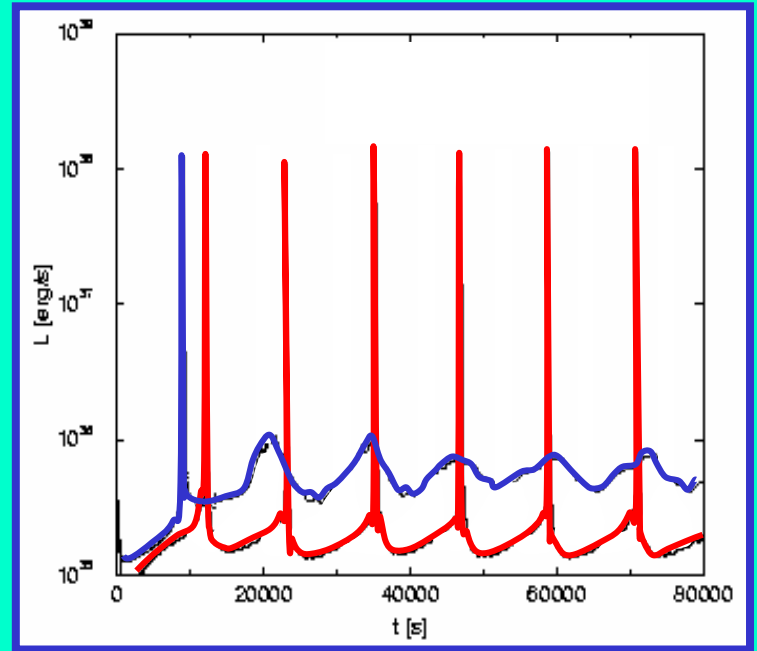
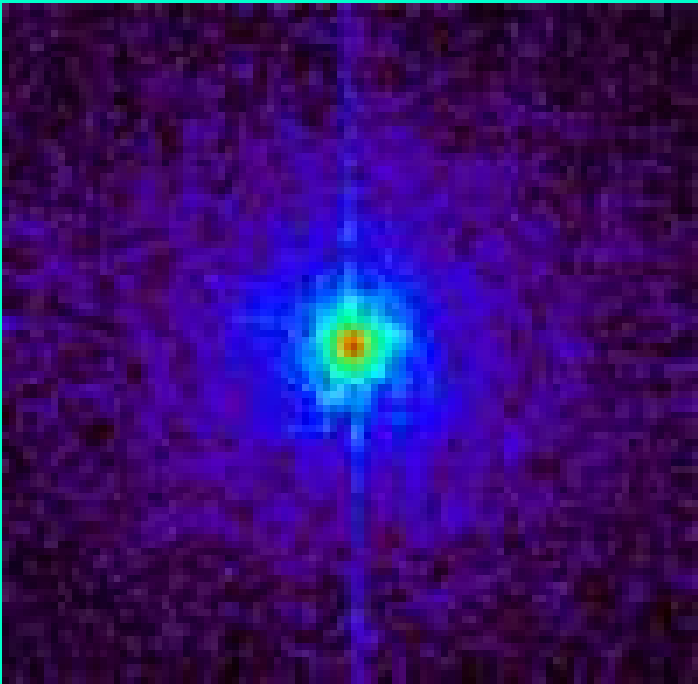
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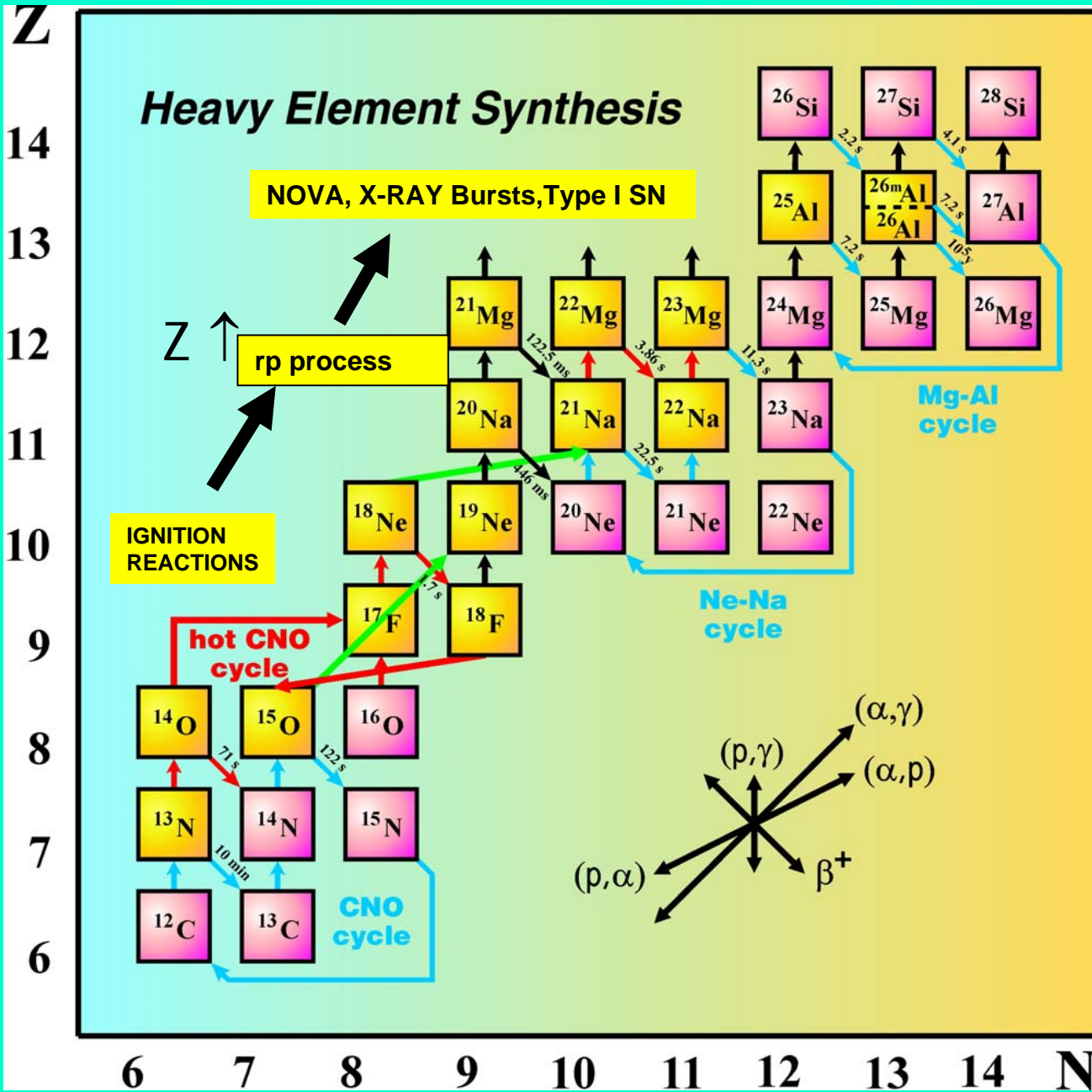
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$^{14}\text{O}(\alpha, p)^{17}\text{F}$ reaction one of the two most important reactions associated with X-ray burster scenarios





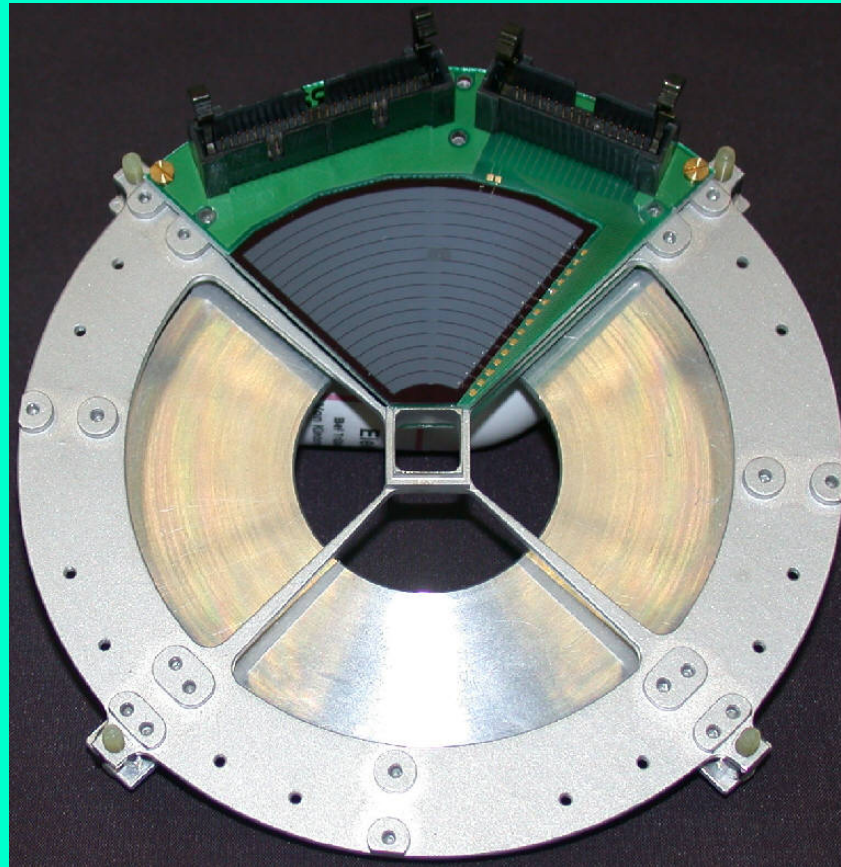


- $^{14}\text{O}(\alpha, p)^{17}\text{F}$ reaction rate at ignition temperature ~ 0.4 GK dominated by properties of a single 1^- resonance at 6.15 MeV in compound system ^{18}Ne
- after several studies, including time reverse reaction studies of $^{17}\text{F}(p, \alpha)^{14}\text{O}$ key unknown/uncertainty is branching ratio to first excited state in ^{17}F – proton halo state
- Inelastic component may dominate reaction rate since transition favoured on angular momentum considerations

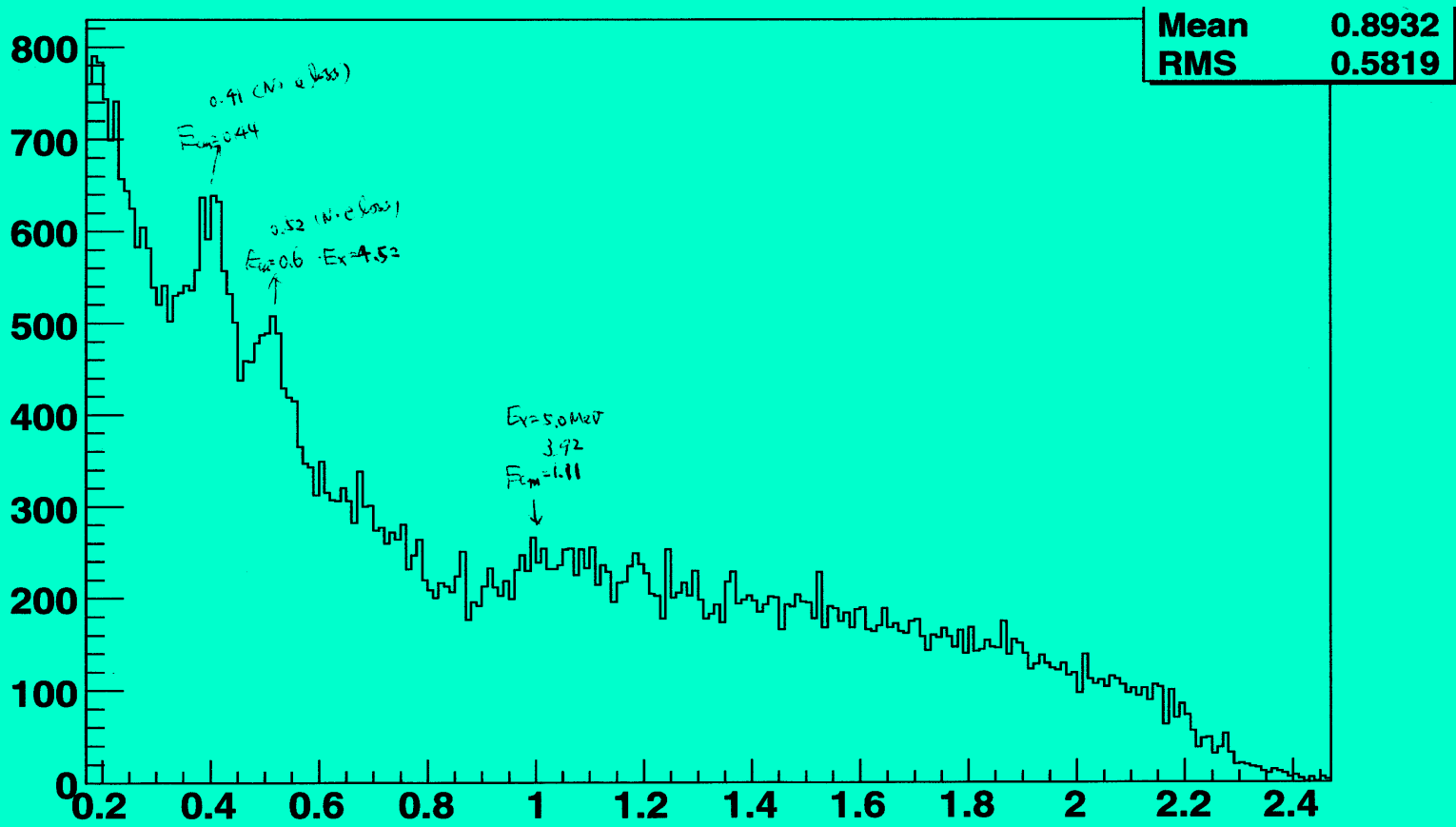
Study of $^{17}\text{F}(p,p')^{17}\text{F}$ reaction

- Use proton capture to feed 1^- resonance
as $\Gamma_p \gg \Gamma_\alpha$
- beam energy of 2.2 MeV/u chosen to feed resonance just inside surface of thick $(\text{CH}_2)_n$ target.
- Use CD (with thin De+E) +miniball to observe inelastically scattered protons in coincidence with 495 keV γ -rays from de-excitation of state in ^{17}F

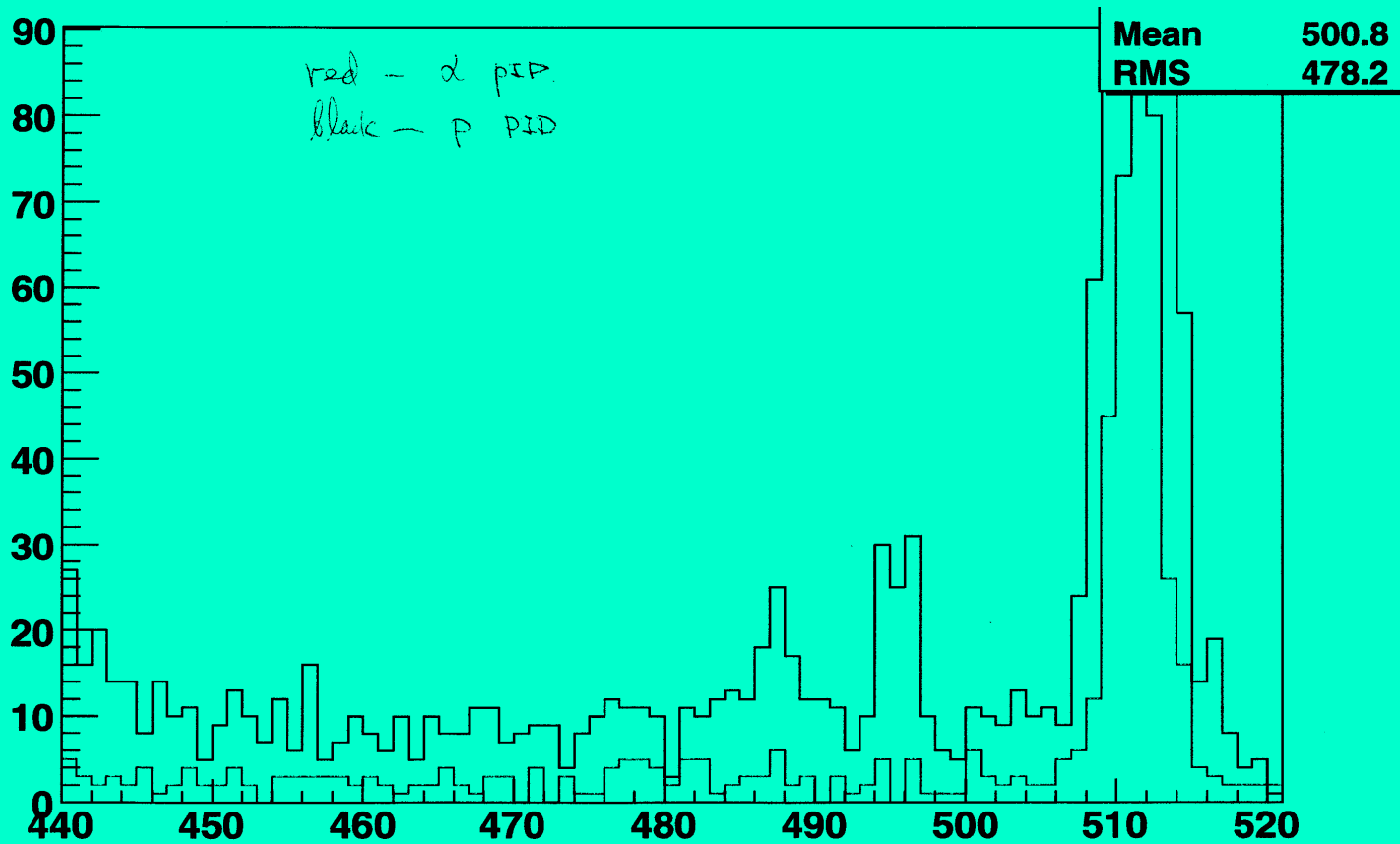
Edinburgh CD silicon detector quadrant



Inelastically scattered protons detected in CD



495 keV line observed in coincidence with protons!



Summary

- Analysis at preliminary stage, but looks very promising that inelastic branch has been observed
- Now need to make precise corrections for energy losses in target to confirm 495 keV γ -rays are associated with protons with the expected energies and angles from the key 1^- resonance

Reconstructed Ecm gated on 495 keV gamma and protons

Ecm_gamma_new	
Entries	118
Mean	1.302
RMS	0.4924

