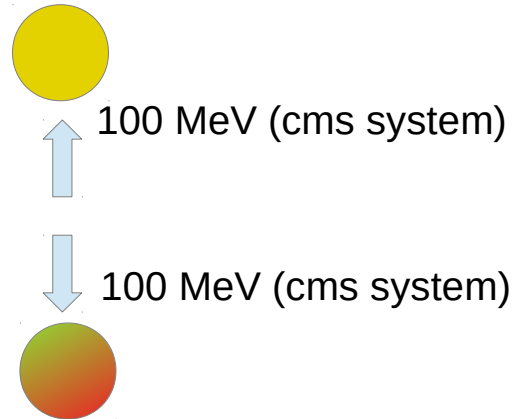


S455 Analysis $Z_1 = 50$ $Z_2 = 41/42$

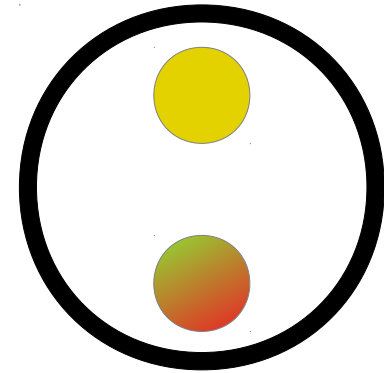
After Fission:



$$E_{Z_1/Z_2} = 637 \text{ A MeV (lab. sys)} + 100 \text{ MeV (cms. sys.)}$$

Before Fission:

U238



$$E = 637 \text{ A MeV (laboratory system)}$$

Doppler Correction

Estimating Error when not considering the 100 MeV for each Fission Product:

→ γ for fission products in the cms: $\gamma = E/m = (938+1)/938 = 1.001067 \rightarrow \beta = 0.046139$

→ relativistic addition of velocities of different systems:

x' moves with respect to x with the velocity v in x -direction.

With respect to x' , body A moves with velocity \mathbf{u}' . The velocity \mathbf{u} of A with respect to x is:

$$u_x = \frac{u'_x + v}{1 + \frac{u'_x v}{c^2}} \quad \Leftrightarrow \quad \frac{u_x}{c} = \frac{\frac{u'_x}{c} + \frac{v}{c}}{1 + \frac{u'_x}{c} \cdot \frac{v}{c}}$$

$$u_z = \frac{u'_z \sqrt{1 - \left(\frac{v}{c}\right)^2}}{1 + \frac{u'_x v}{c^2}} = u'_z \frac{1}{\gamma \left(1 + \frac{u'_x v}{c^2}\right)}$$

$$u_y = \frac{u'_y \sqrt{1 - \left(\frac{v}{c}\right)^2}}{1 + \frac{u'_x v}{c^2}} = u'_y \frac{1}{\gamma \left(1 + \frac{u'_x v}{c^2}\right)}$$

Doppler Correction in x and y

$$u_y = \frac{u'_y \sqrt{1 - \left(\frac{v}{c}\right)^2}}{1 + \frac{u'_x v}{c^2}} = u'_y \frac{1}{\gamma \left(1 + \frac{u'_x v}{c^2}\right)}$$

$$\left. \begin{aligned} \gamma &= 1.68385 \\ v &= 0.804555 \\ \beta &= u'_x = 0 \end{aligned} \right\}$$

Maximum/minimum value of $u_y = \pm 0.0274009$

$$|\mathbf{u}| = \sqrt{u_x'^2 + v^2} = 0.8050214637933256 \rightarrow \gamma = 1.68564 \text{ (vs } 1.68385\text{)}$$

Calculate E_{lab} : 0.6099599062725896

Transform it back with $\gamma = 1.68385$ to E_{cms} : 0.9989543959941344

 Error due wrong Doppler correction less than $\pm 1\%$!

Doppler correction in beam direction z

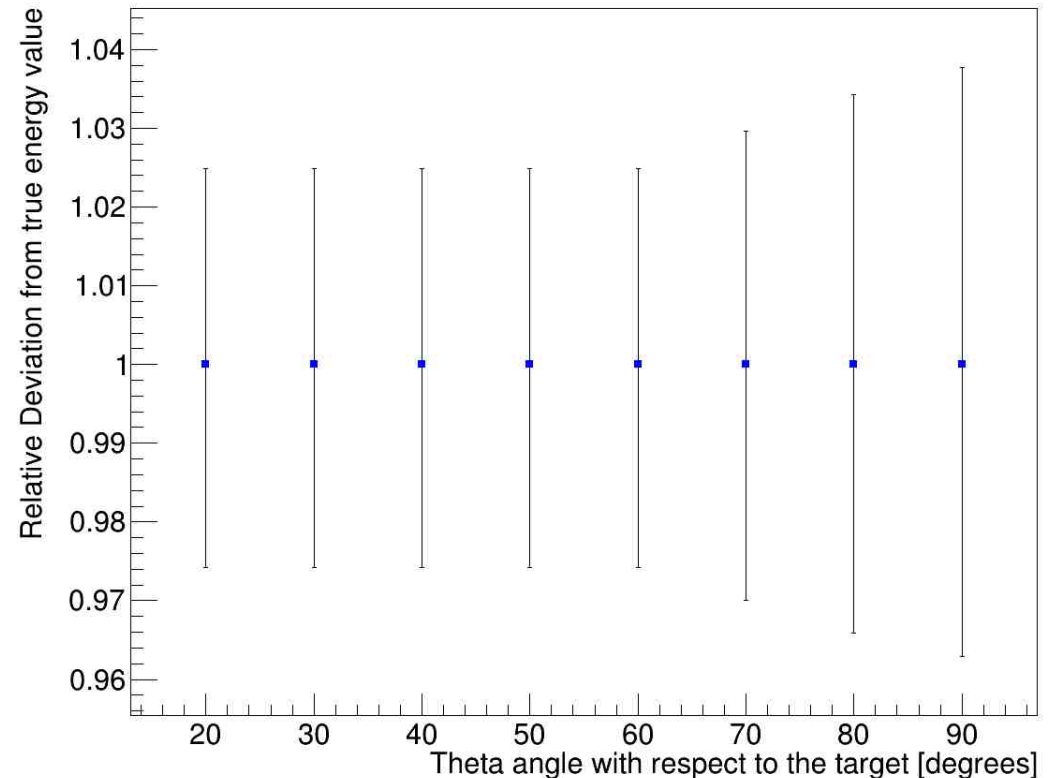
$$u_x = \frac{u'_x + v}{1 + \frac{u'_x v}{c^2}}$$

Method same as before:

- compute E_{lab} with the true γ and β
- reconstruct E_{cms} only with the information $E = 637 \text{ A MeV}$

Error less than $\pm 3 \%$

Doppler Correction without considering relative fission product momentum (100 MeV)



States we are looking for

Reaction $^{238}\text{U} \rightarrow \text{Sn} (Z=50) + \text{Nb} (Z=41) / \text{Mo} (Z=42)$

→ ^{126}Sn , 2^+ , 1140 keV

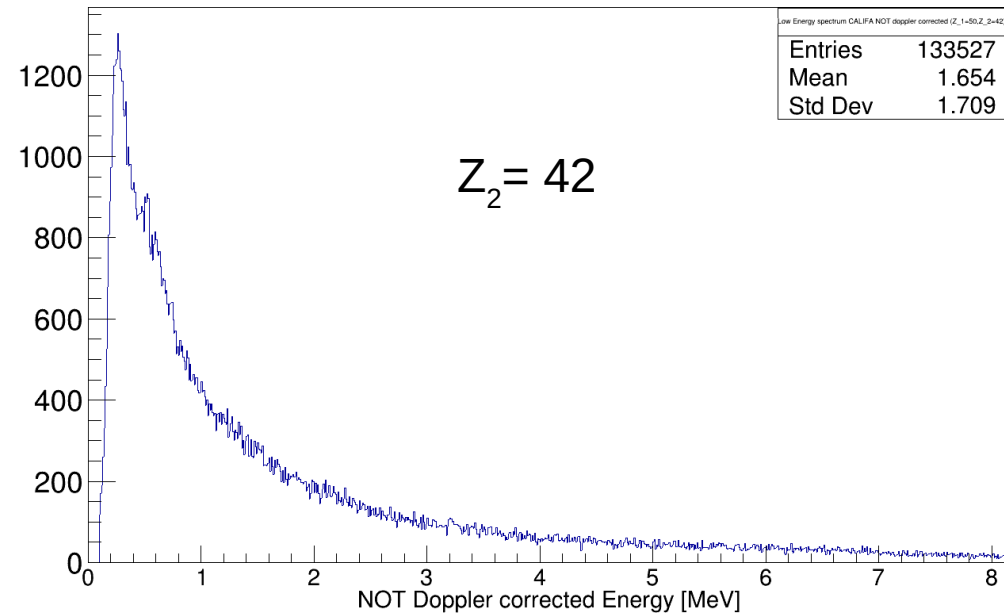
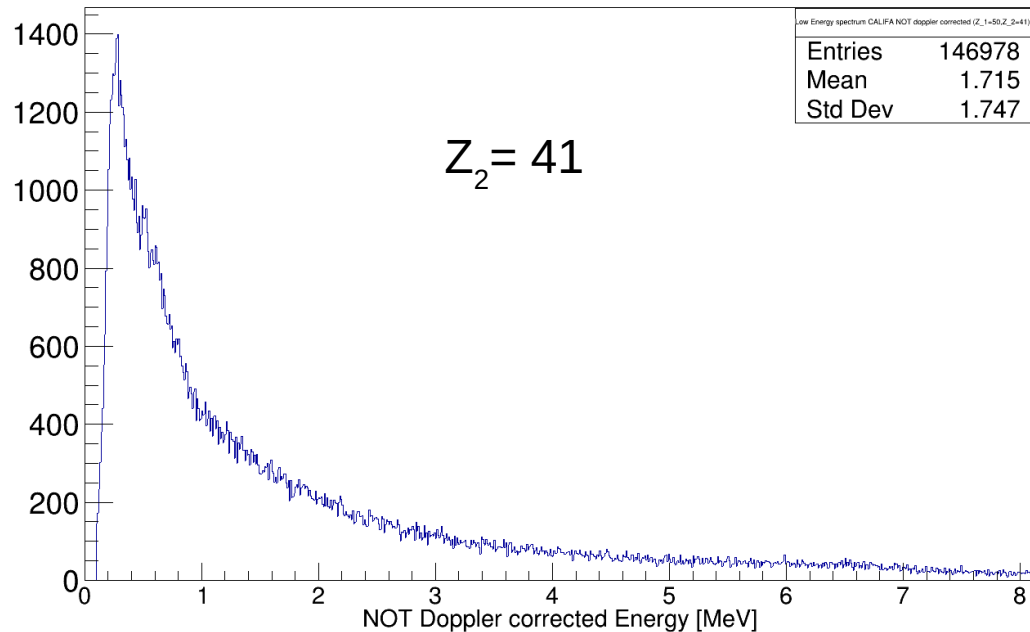
→ ^{128}Sn , 2^+ , 1169 keV

→ ^{130}Sn , 2^+ , 1221 keV

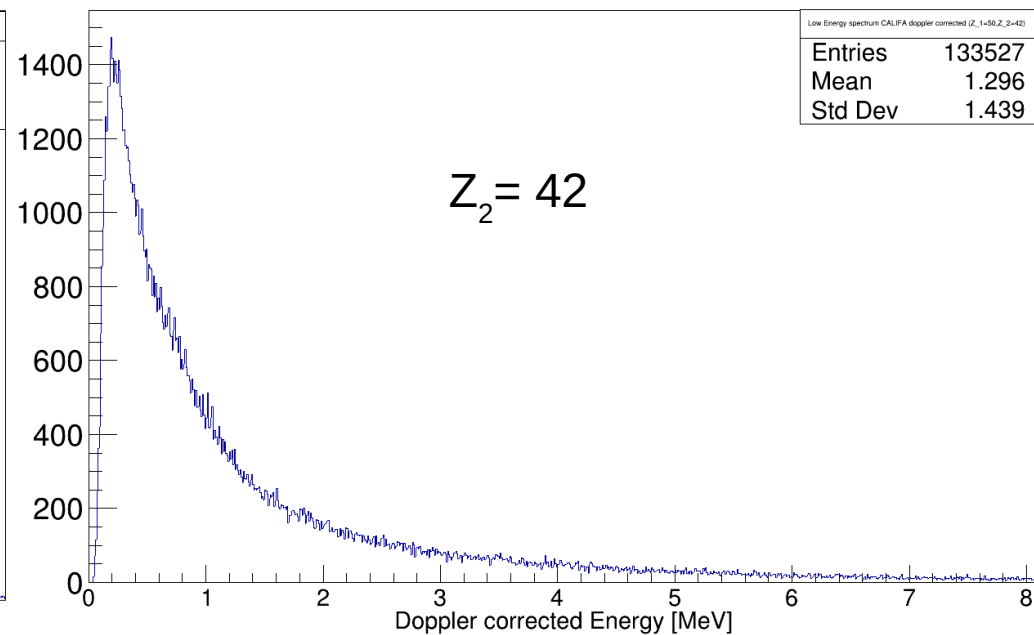
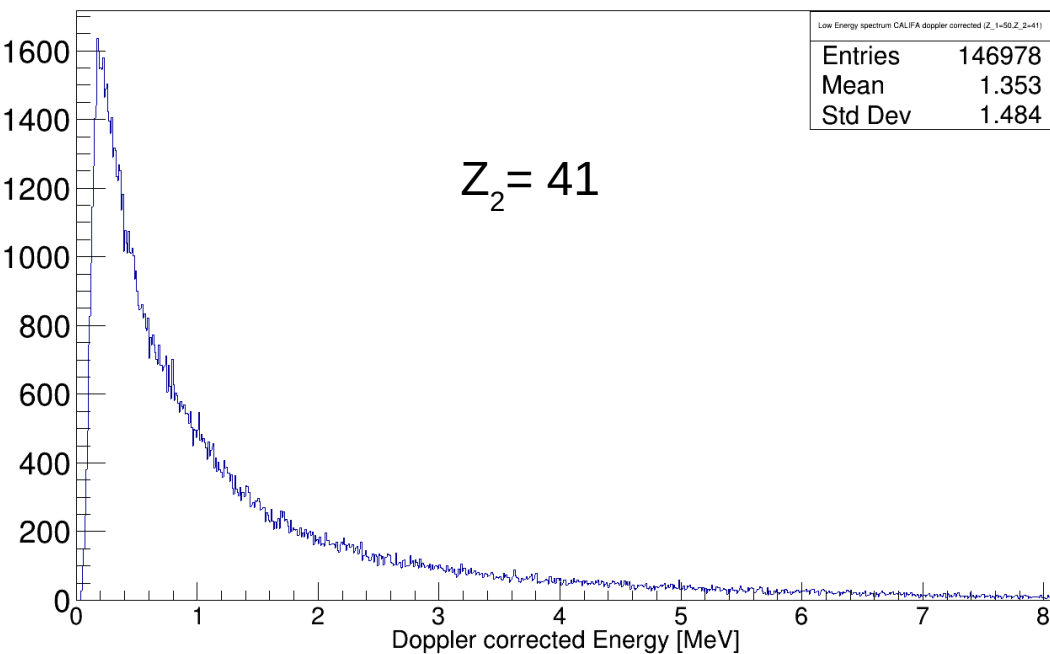
→ ^{132}Sn , 2^+ , 4041 keV

Gamma Spectrum

No Doppler Correction:

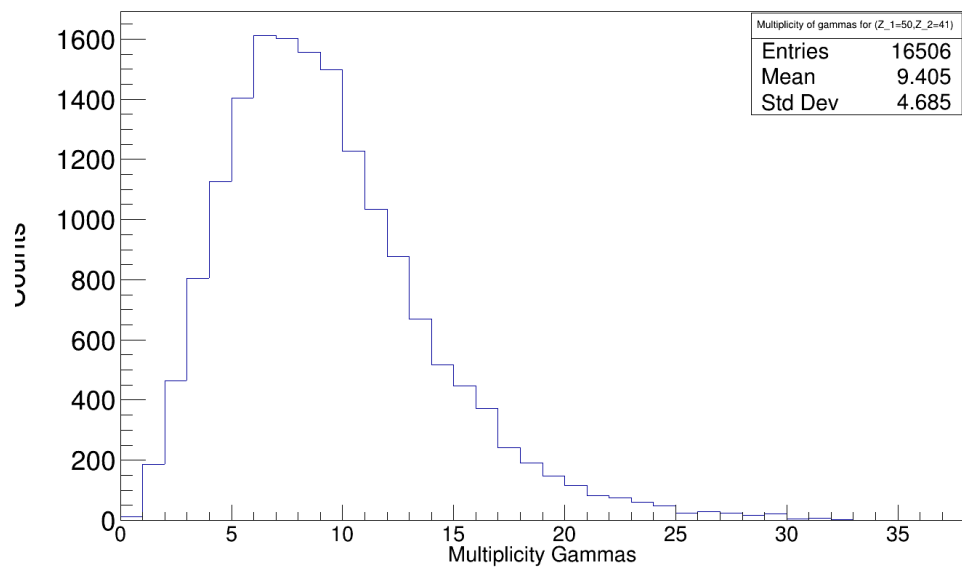


Doppler Corrected

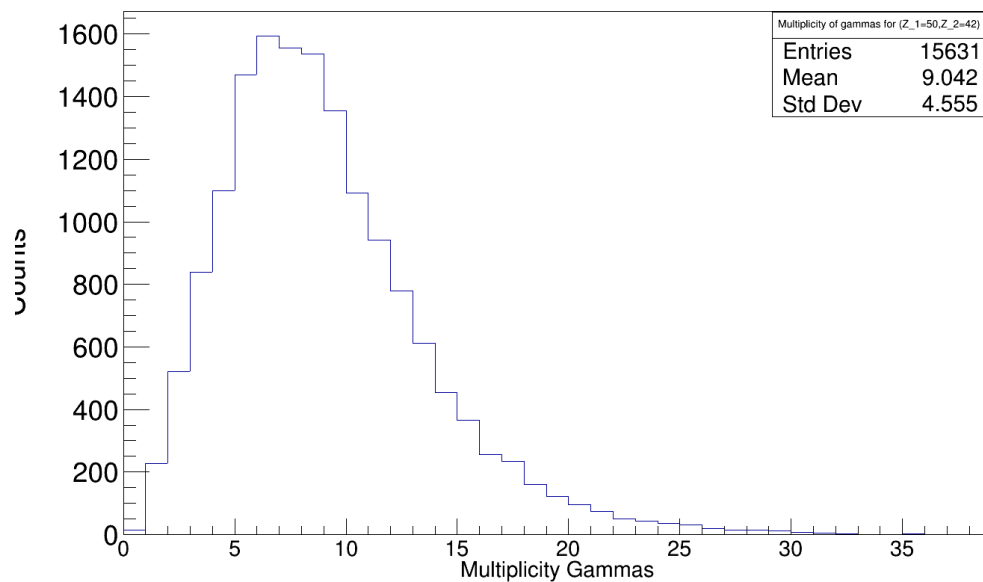


Multiplicities

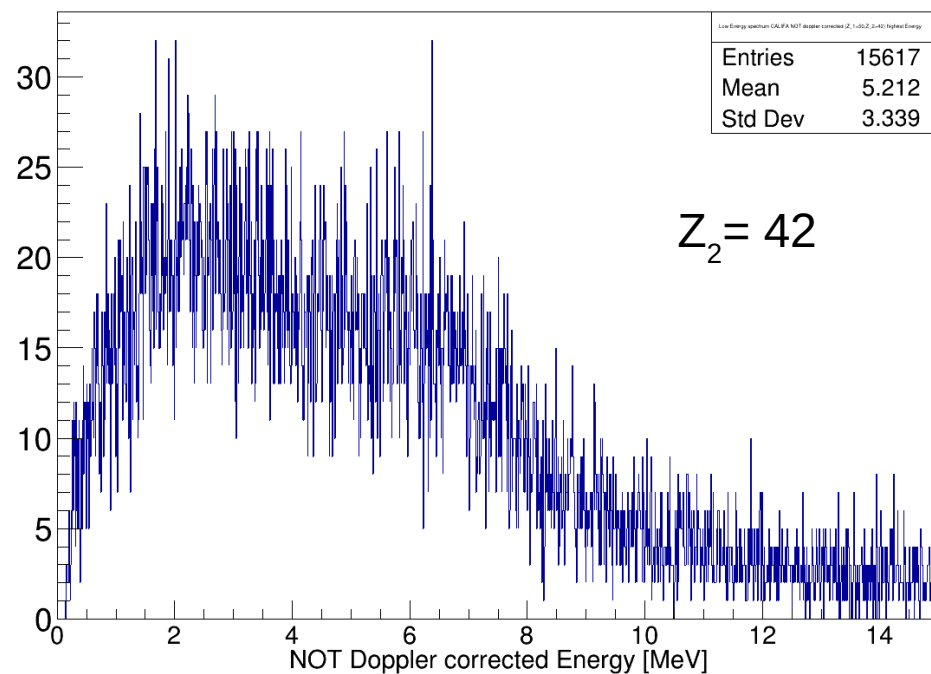
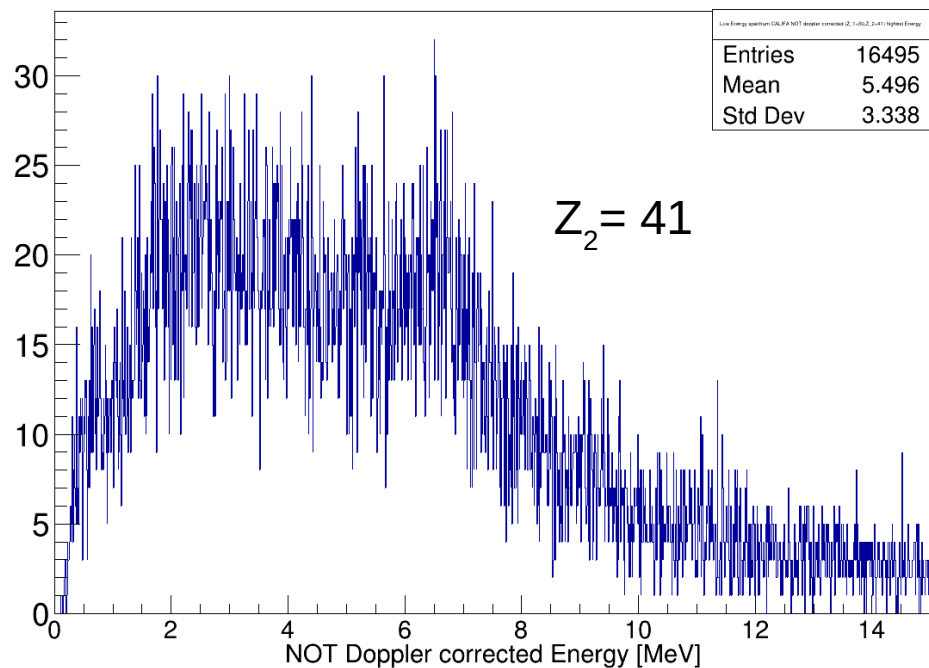
Multiplicity of gammas for ($Z_1=50, Z_2=41$)



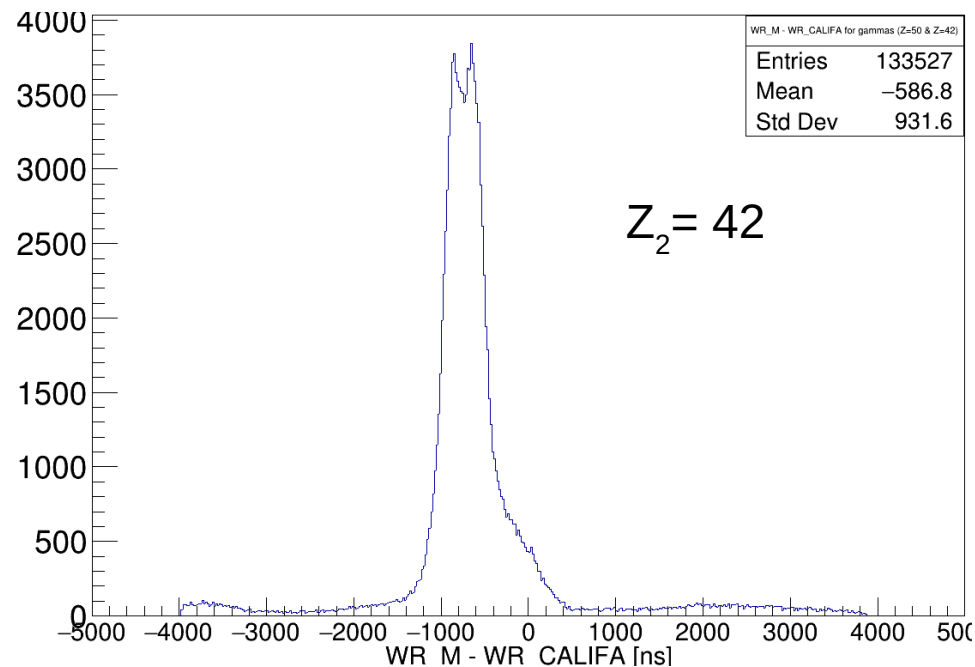
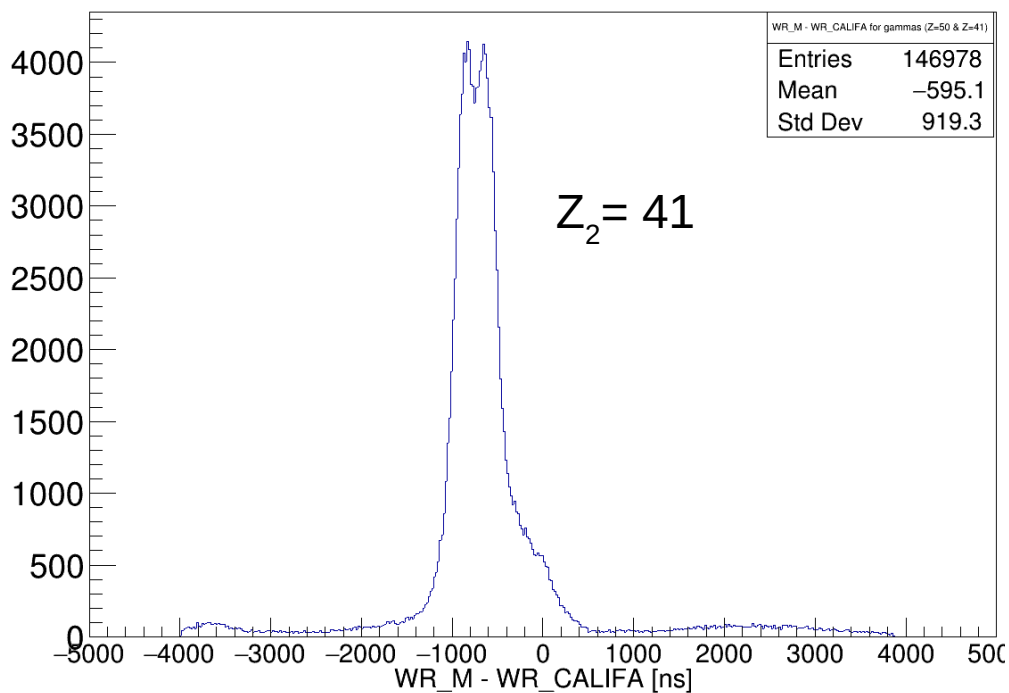
Multiplicity of gammas for ($Z_1=50, Z_2=42$)



Highest Energy Hit Spectrum

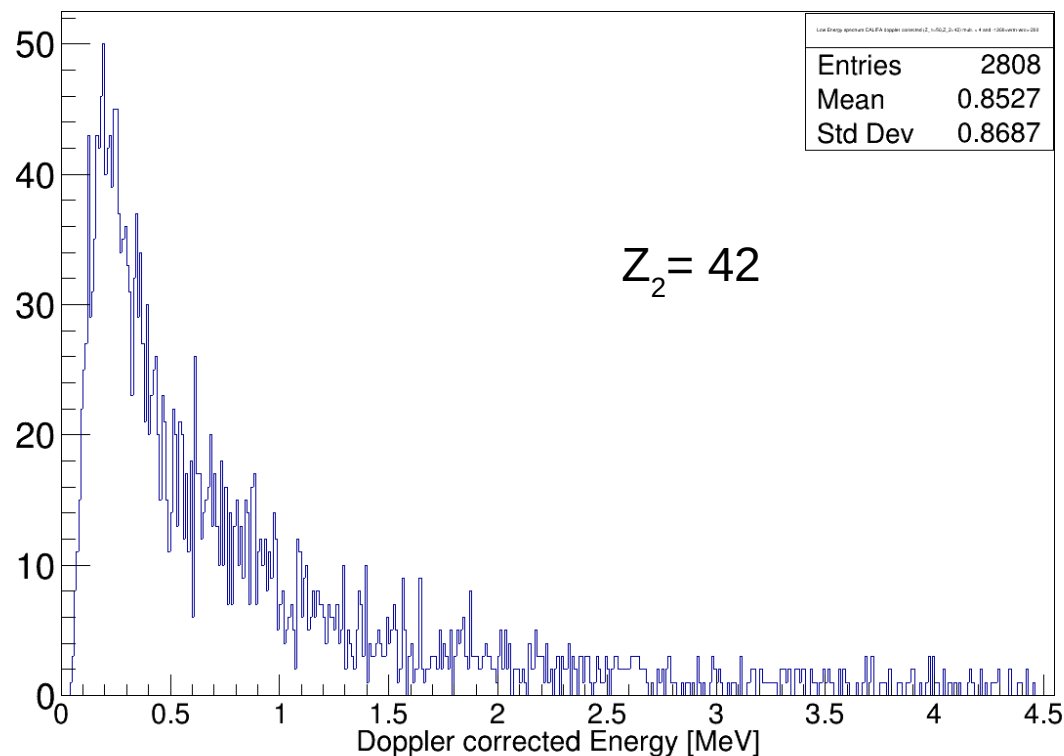
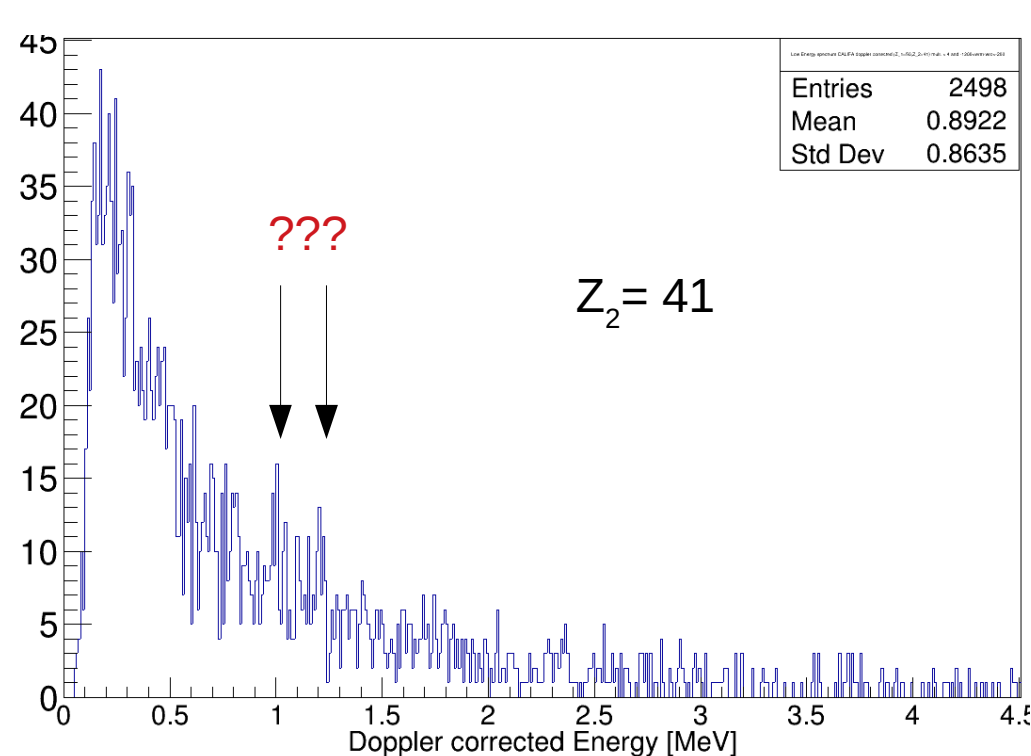


WR Master – WR CALIFA



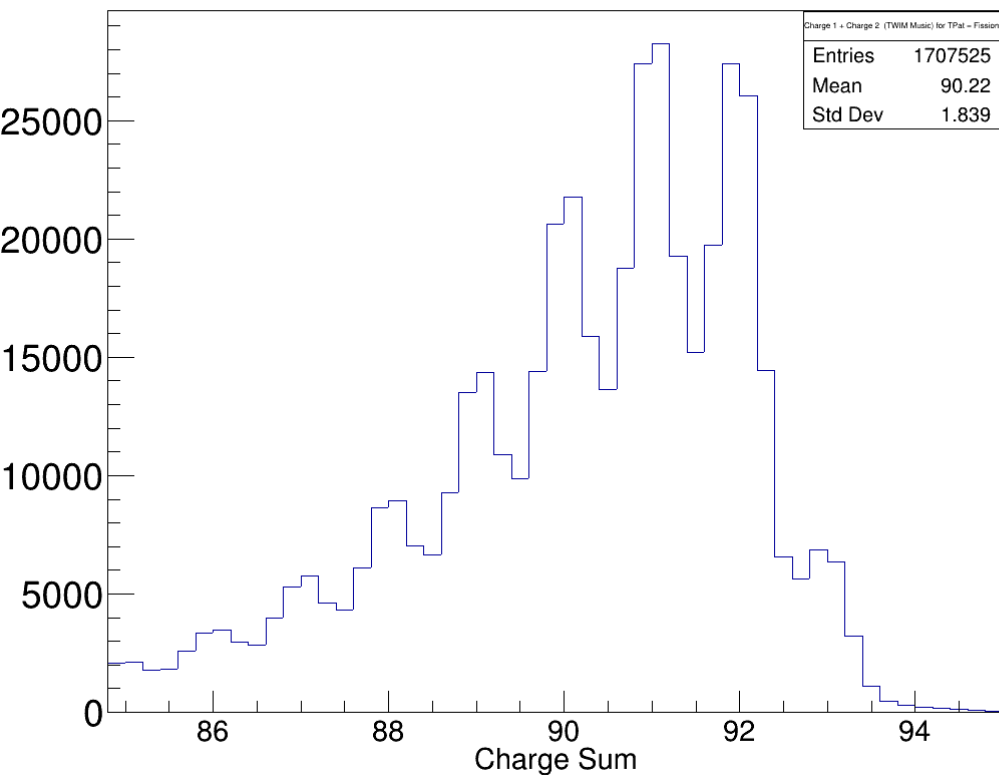
Cuts on WR and Multiplicity

$1200 < \text{WR Master} - \text{WR CALIFA} < -200$ and Multiplicity < 4

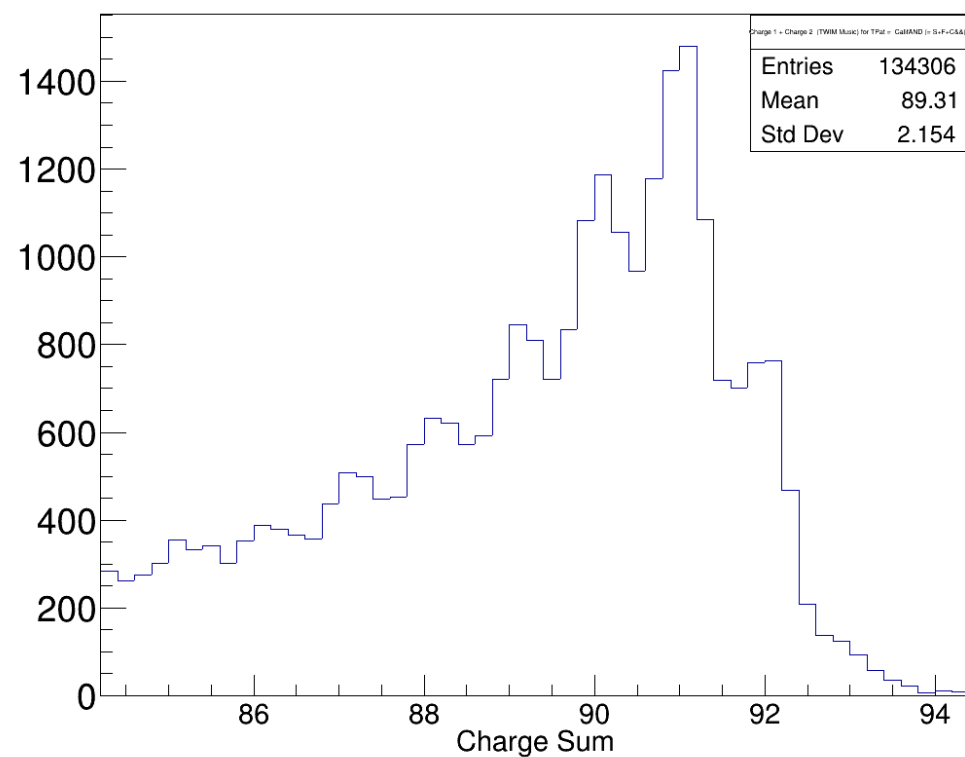


Open Questions p2p events

Tpat = Fission



Tpat = Fission && CALIFA

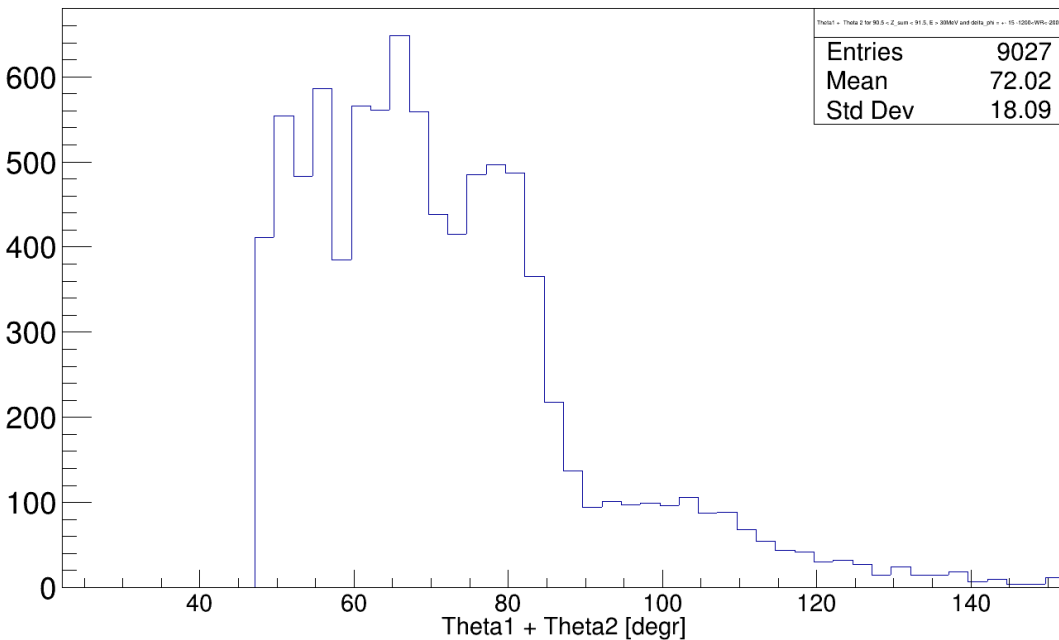


Proton Spectrum CALIFA

Restriction: $400 \text{ MeV} < E_{\text{sum}} < 700 \text{ MeV}$

Why do we see protons for $Z_{\text{sum}} = 92$??

Theta1 + Theta 2 for $90.5 < Z_{\text{sum}} < 91.5$, $E > 30 \text{ MeV}$ and $\Delta\phi = \pm 15 - 1200 < \text{WR} < -200$



Theta1 + Theta 2 for $91.5 < Z_{\text{sum}} < 92.5$, $E > 100 \text{ MeV}$ and $\Delta\phi = \pm 30 - 1200 < \text{WR} < -200$

