Ambiguities in photoproduction of $\eta\pi$

Considering unpolarized intensity, S and D waves, positive reflectivity and m=0,1.
Four equivalent solutions solutions.

$$a_2 = S + \sqrt{5}D_0$$

$$v_{1,2} = \frac{1}{2a_2}\left(\sqrt{30}D_1 \pm \sqrt{\Delta}\right)$$

$$\Delta = 30D_1^2 - 8(S^2 + \sqrt{5}D_0 S - 5D_0^2)$$

2

1st solution

$$S_0(v_1, v_2) = \frac{a_2}{6}(2 + v_1 v_2)$$

$$D_0(v_1, v_2) = \frac{a_2}{3\sqrt{5}}(2 - \frac{v_1 v_2}{2})$$

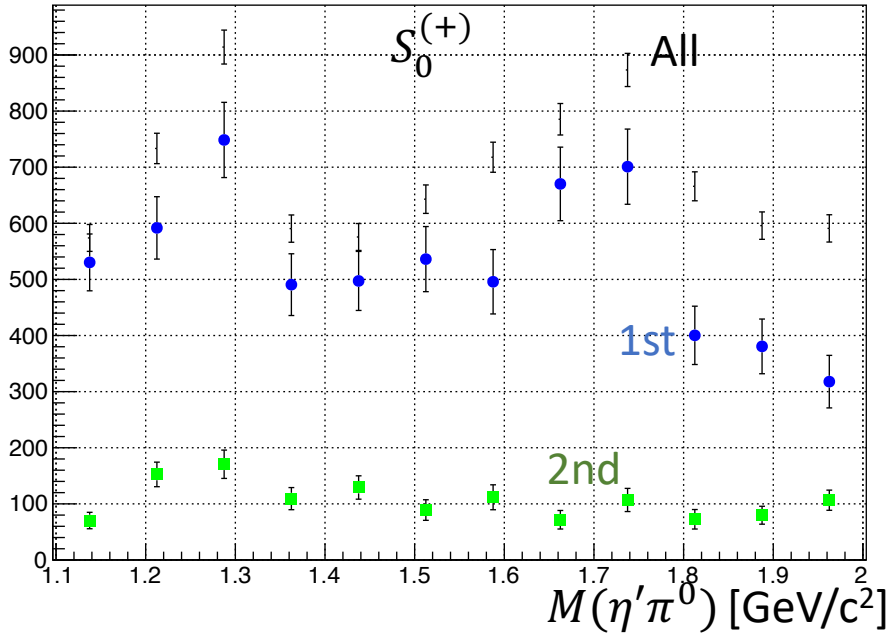
$$D_1(v_1, v_2) = \frac{a_2}{\sqrt{30}}(v_1 + v_2)$$

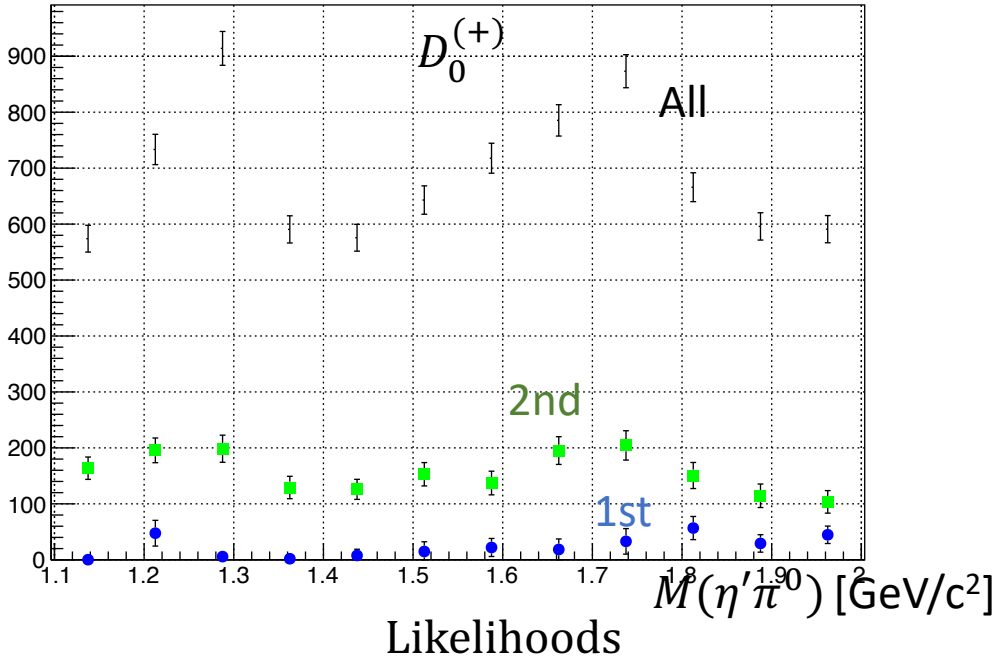
2nd solution
independent of 1st solution

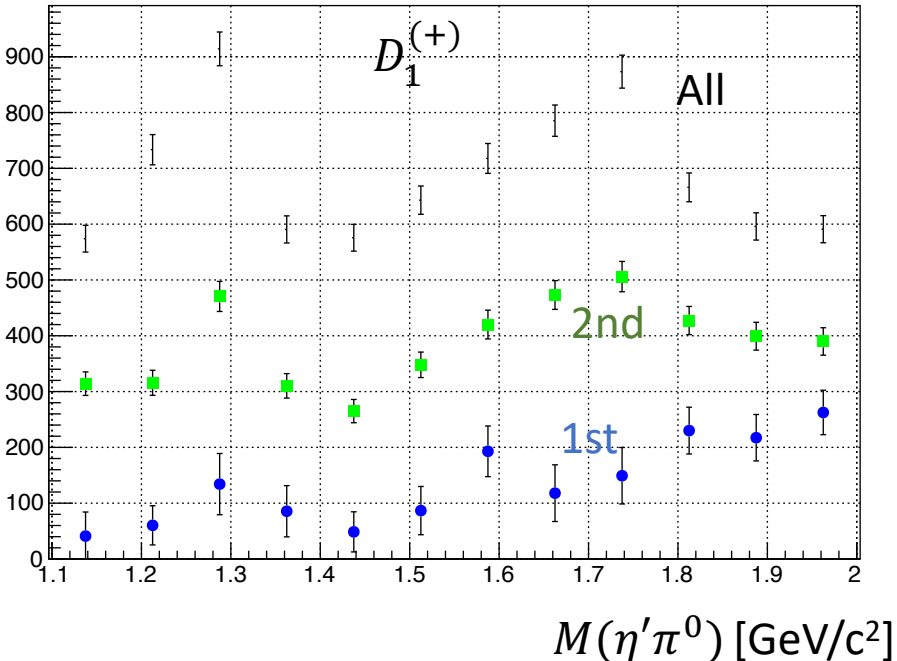
$$\{S_0(v_1, v_2^*), D_0(v_1, v_2^*), D_1(v_1, v_2^*)\}$$

Two other solutions (v_1^*, v_2) and v_1^*, v_2^* are the complex conjugates of 1st and 2nd solutions.

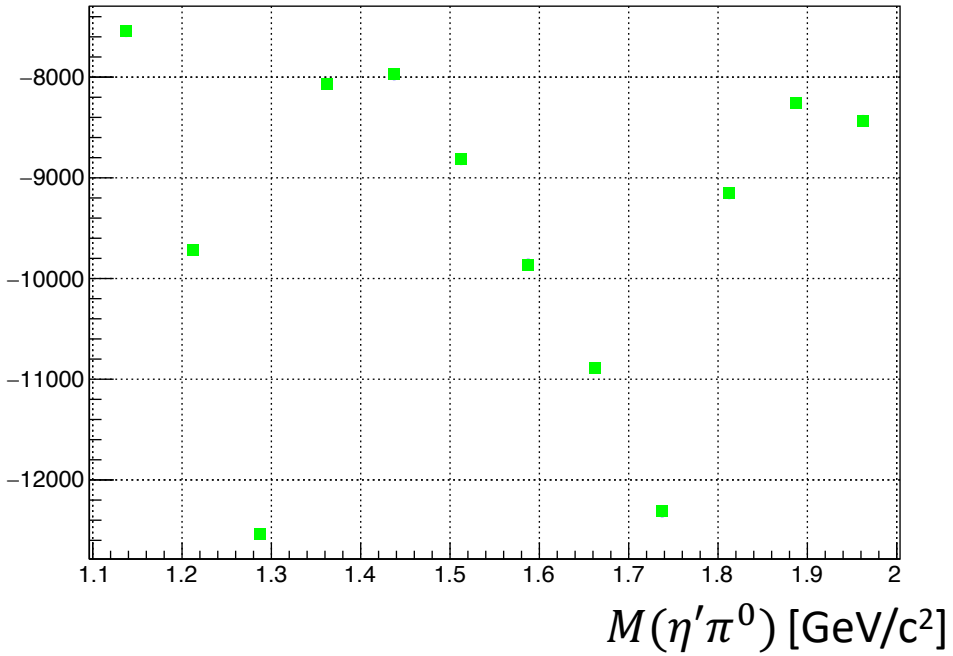
Mass independent fit, 2 fits with randomized starting parameters



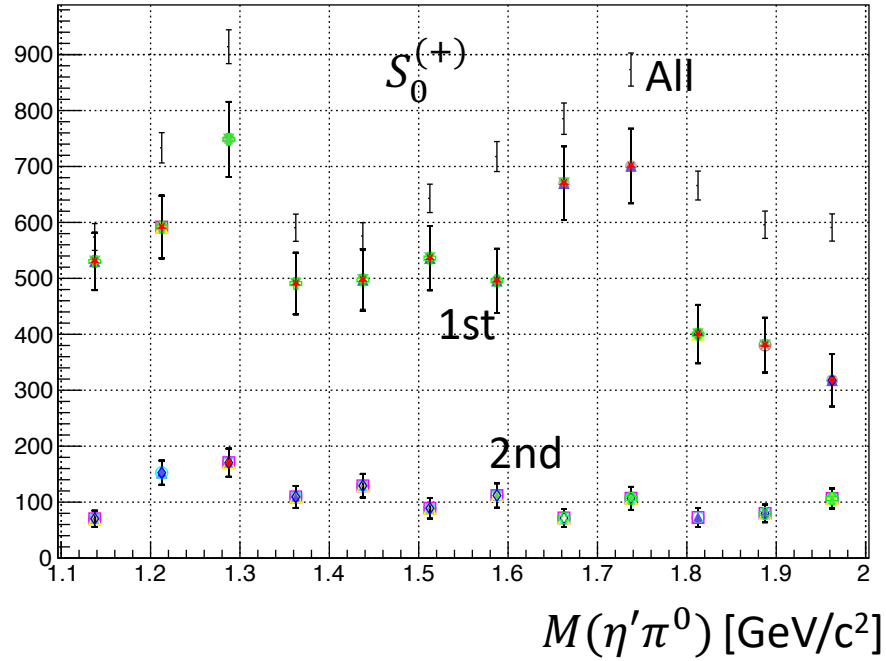


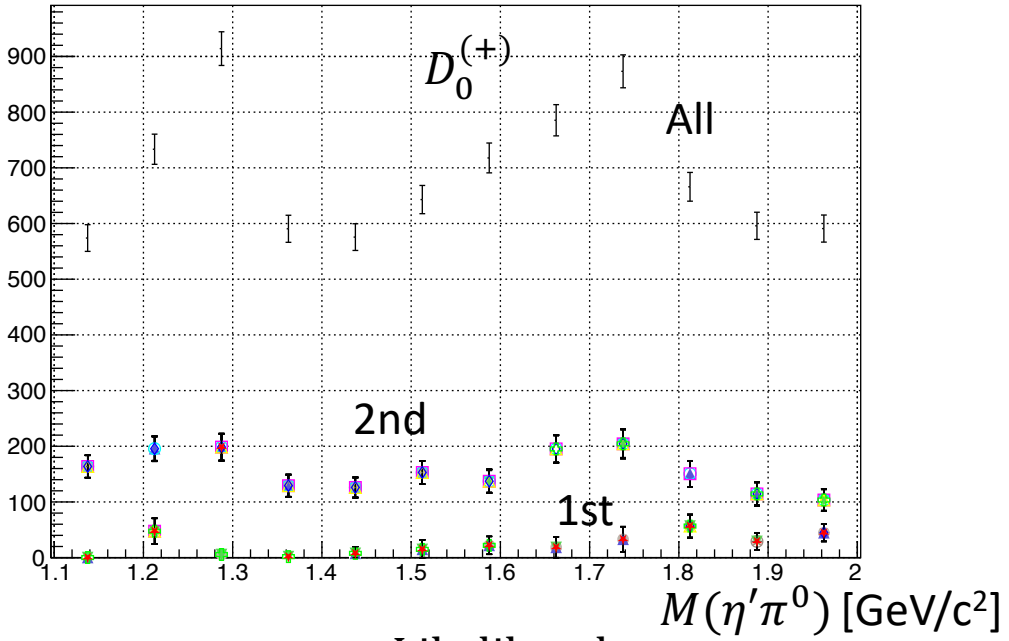


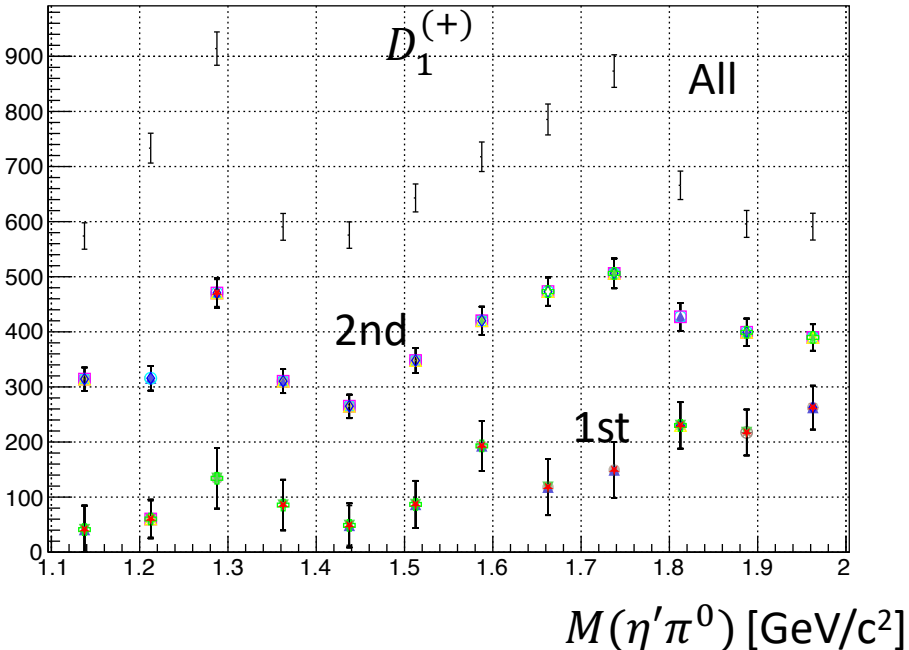
Likelihoods



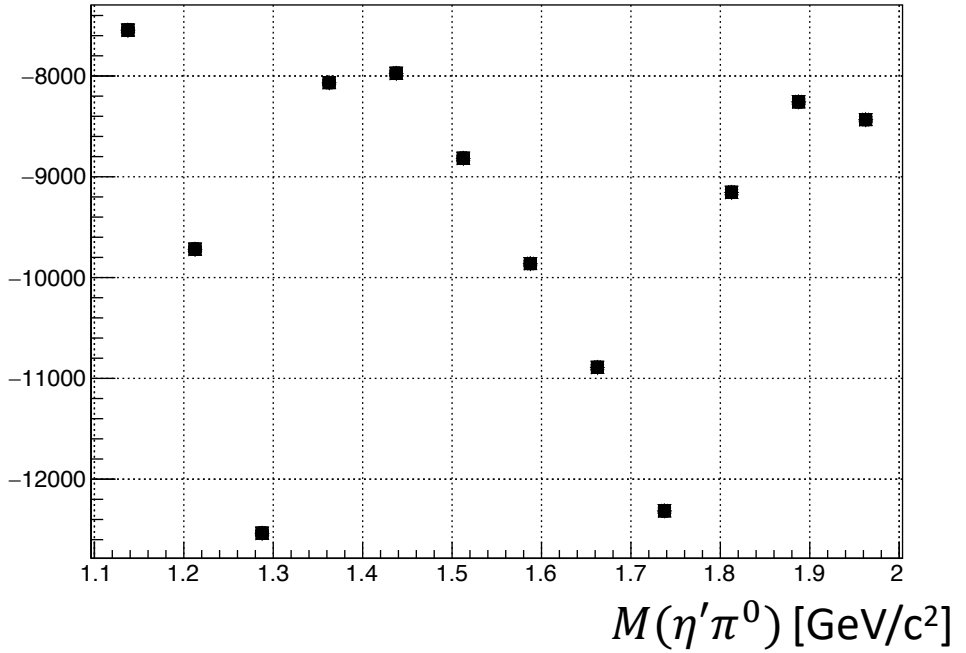
Mass independent fit, 30 fits with randomized starting parameters





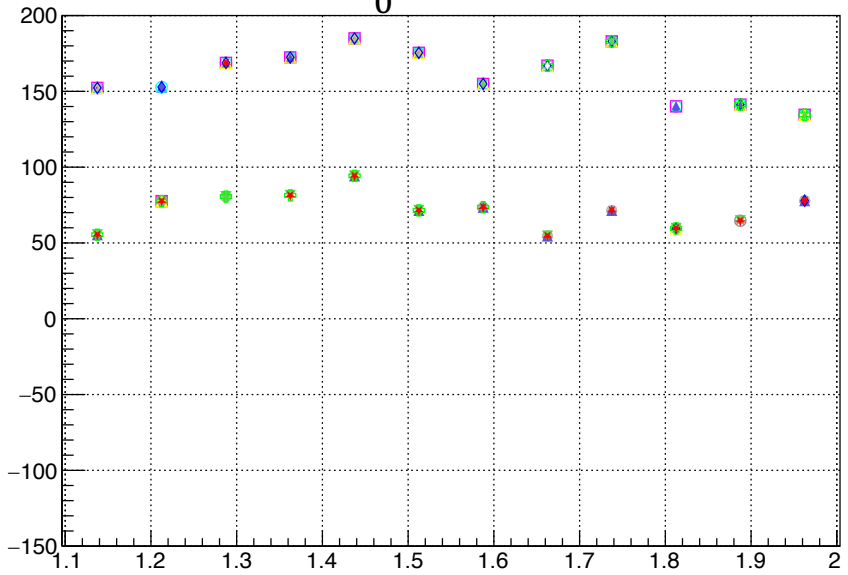


Likelihoods



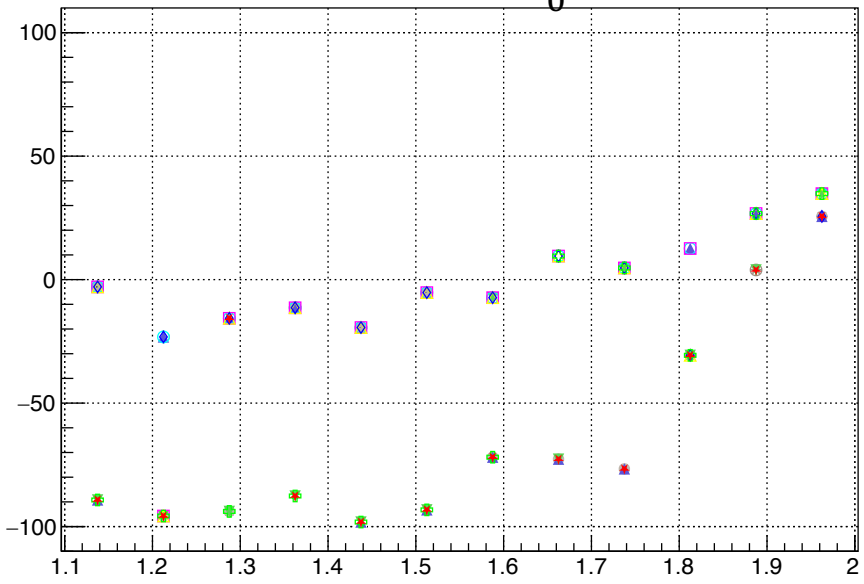
Real components of partial waves

$S_0^{(+)}$



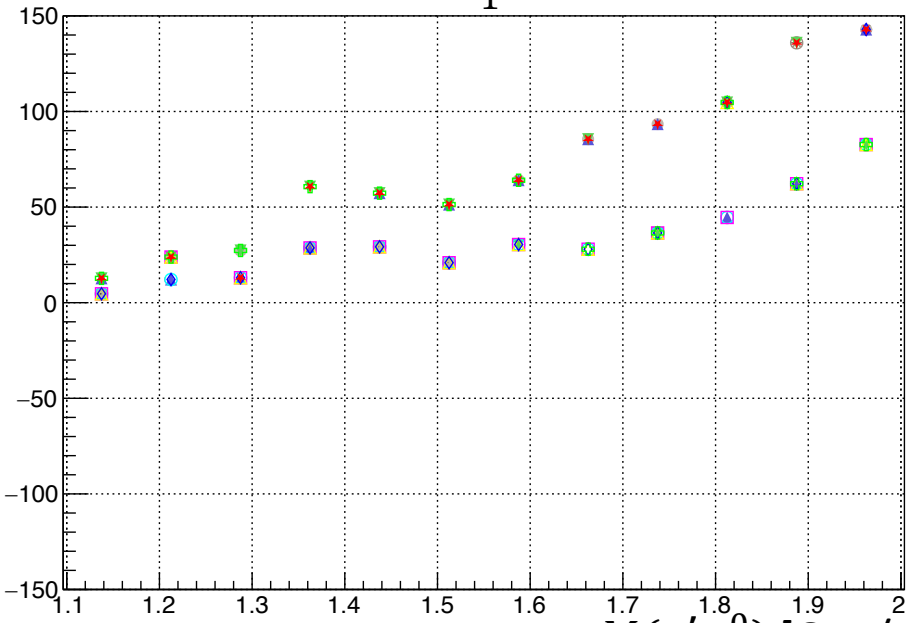
$M(\eta'\pi^0)$ [GeV/c²]

$D_0^{(+)}$



$M(\eta'\pi^0)$ [GeV/c²]

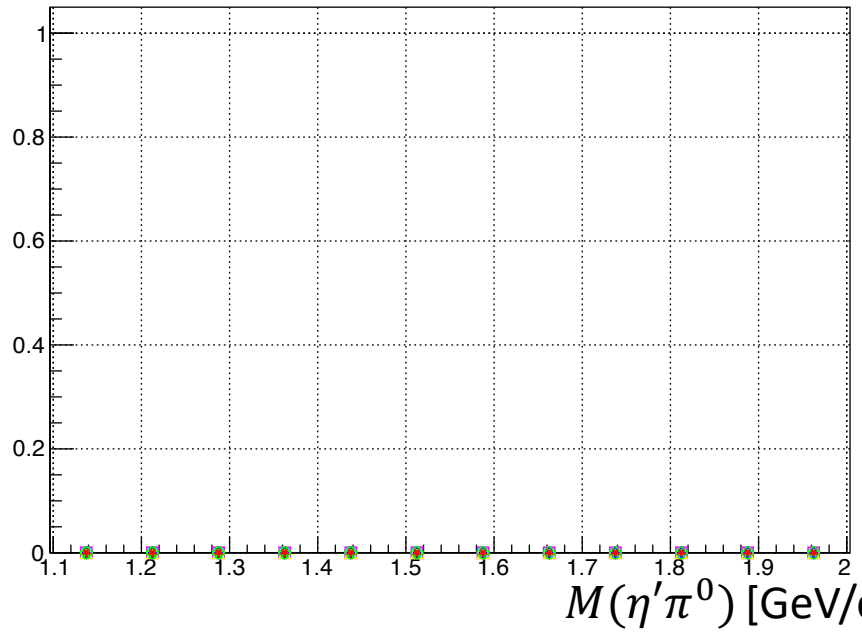
$D_1^{(+)}$



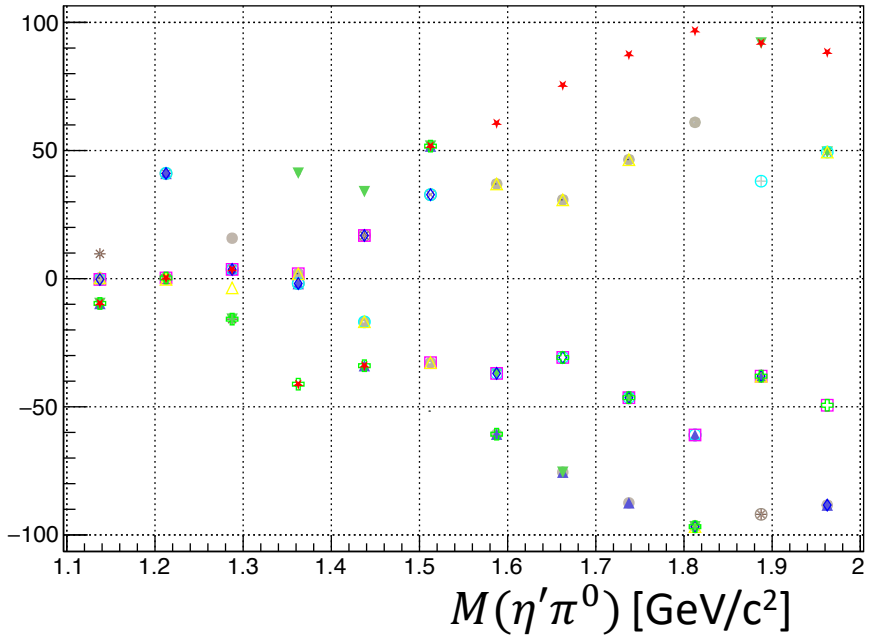
$M(\eta'\pi^0)$ [GeV/c²]

Imaginary components of partial waves

$S_0^{(+)}$



$D_0^{(+)}$



$D_1^{(+)}$