

PWA Challenge

Florida International University 2020

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Generated ($p\eta\pi^0$) events with AmpTools

Generated amplitudes are

- S0/a0 (980 MeV)
- P1/ π_1 (1400 MeV) (**exotic**)
- D1/a2 (1320 MeV)
- G1/a4 (1.995)

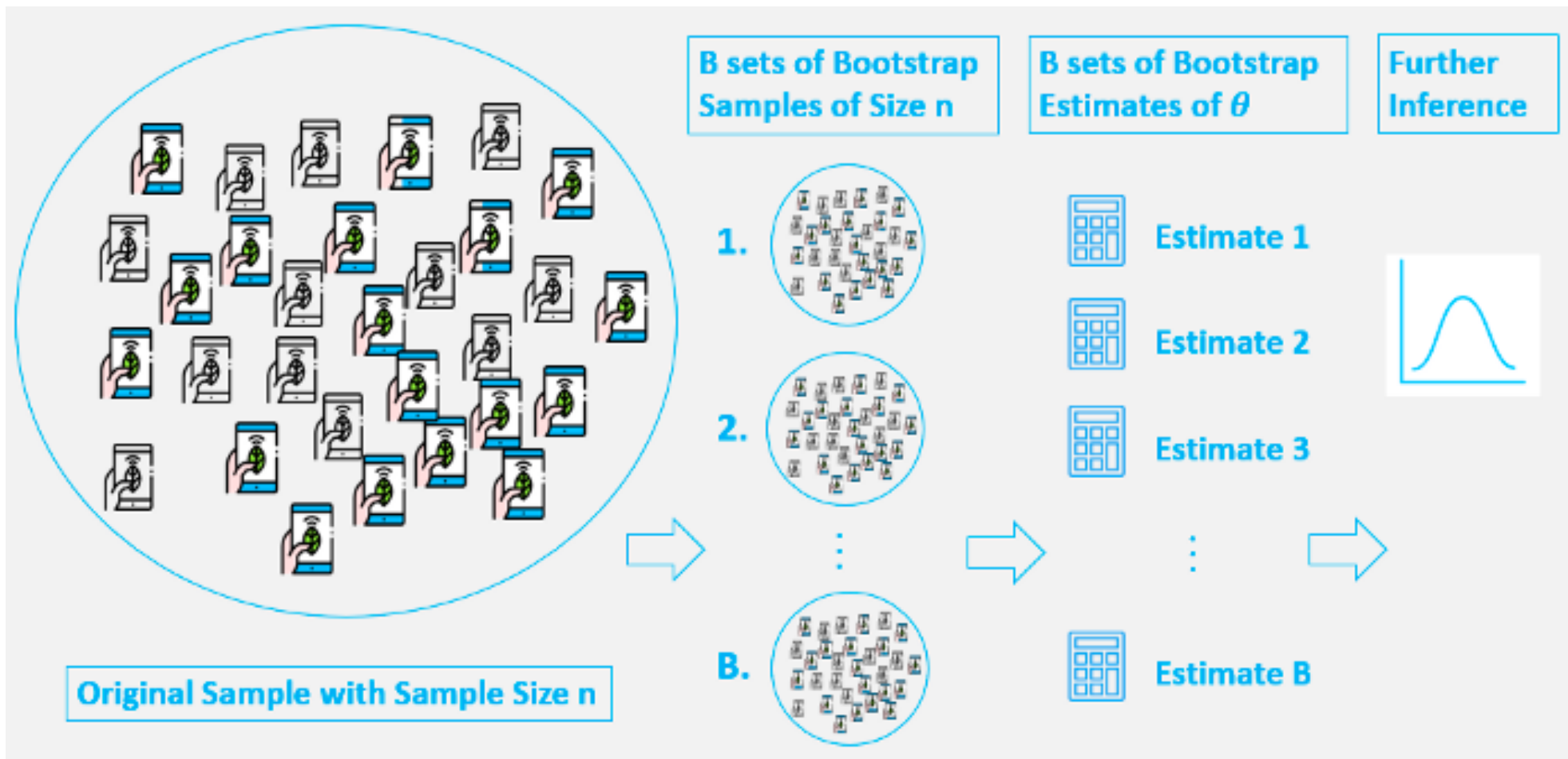
J-Spin

M-absolute value of spin projection along z axis

ϵ -reflectivity

J	M	ϵ	Real	Imaginary	BW Mass	BW Width
0	0	-1	2000	0	0.98	0.075
1	1	+1	60	140	1.354	0.330
2	1	+1	1000	0	1.318	0.111
4	1	+1	0	20	1.995	0.257

Bootstrapping



1. A sample from population with sample size n .

2. Draw a Bootstrap Sample from the original sample data with replacement with size n

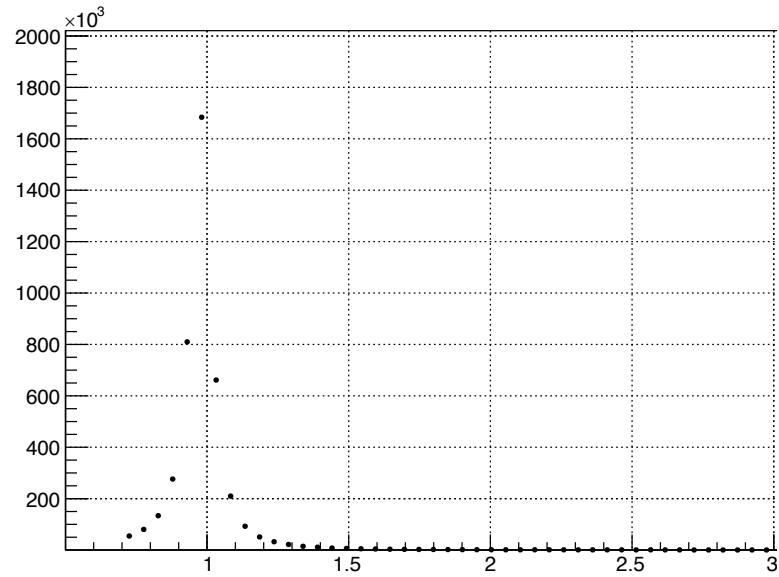
3. Evaluate ϑ for each Bootstrap Sample, and there will be totally B estimates of ϑ .

4. Construct a sampling distribution with these B Bootstrap statistics and use it to make further statistical inference, such as:

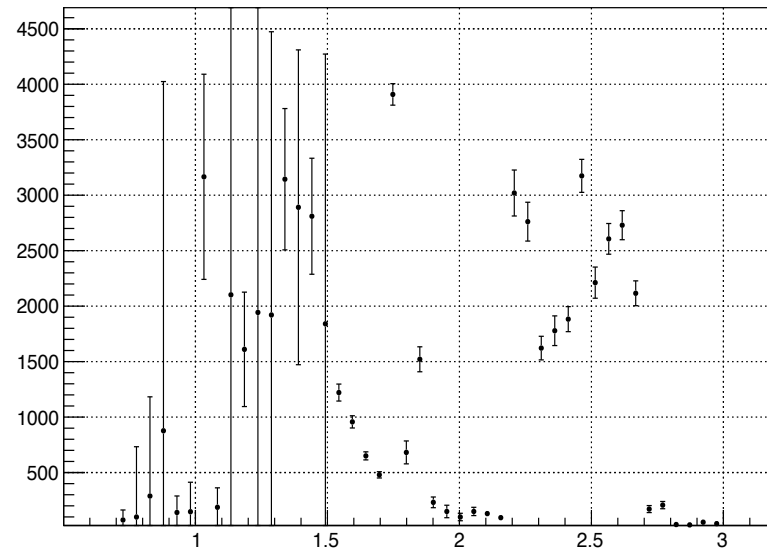
- Estimating the standard error of statistic for ϑ .

Uncertainties from AMPTOOLS (MINUIT) for intensities from fitting in different M and t bins

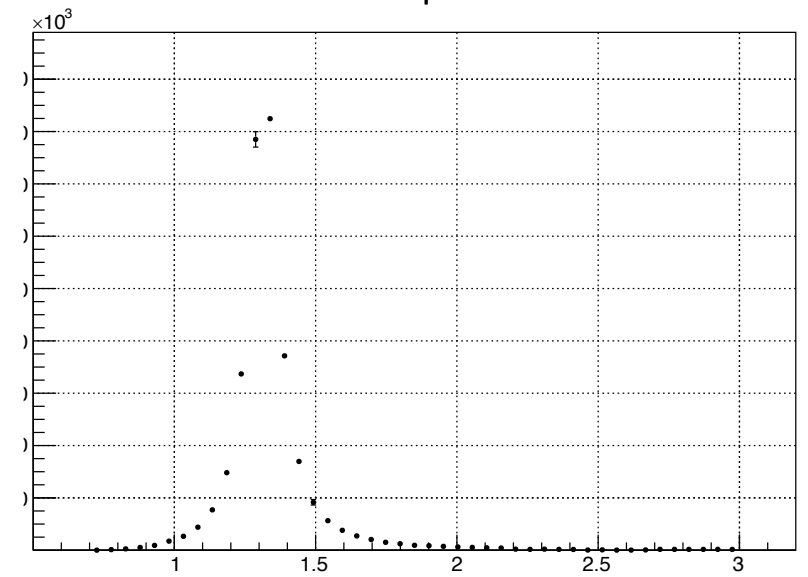
S0mi



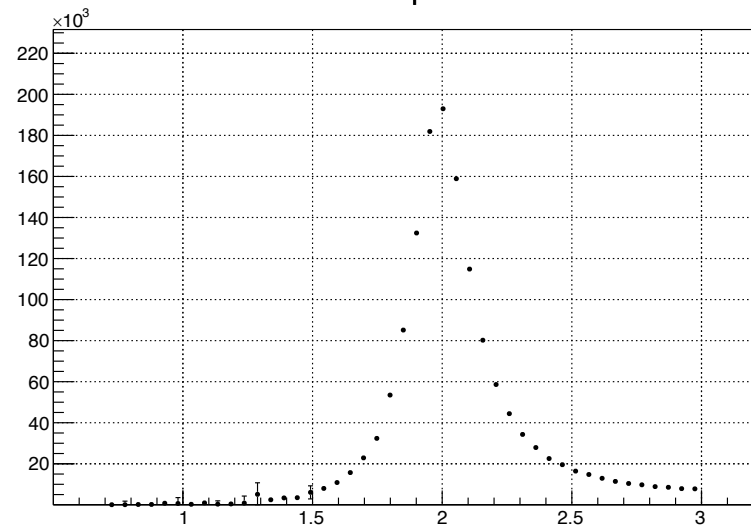
P1pl



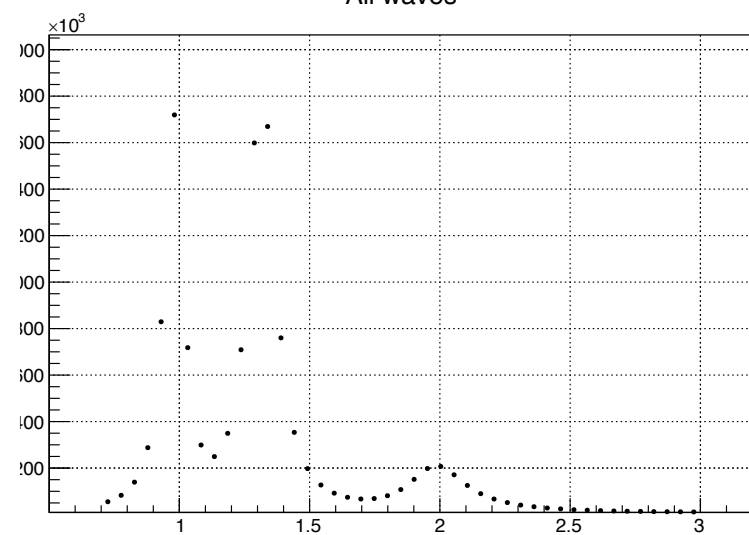
D1pl



G1pl

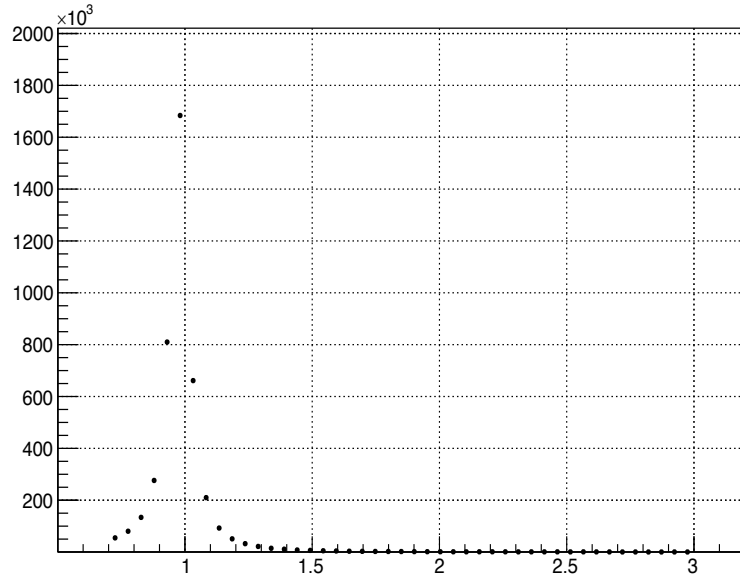


All waves

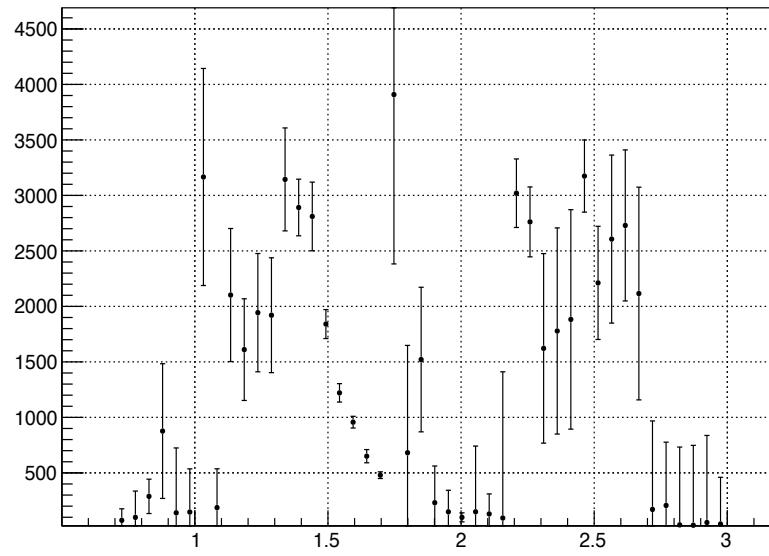


Uncertainties from Bootstrapping for intensities from fitting in different M and t bins

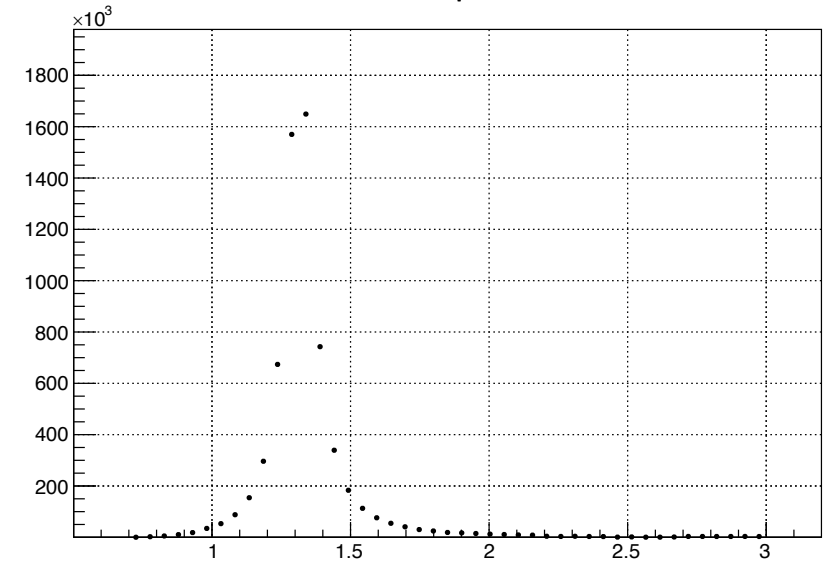
S0mi



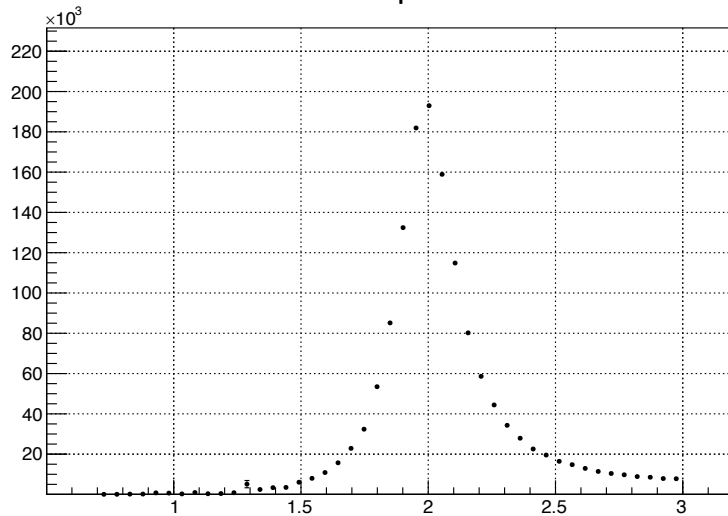
P1pl



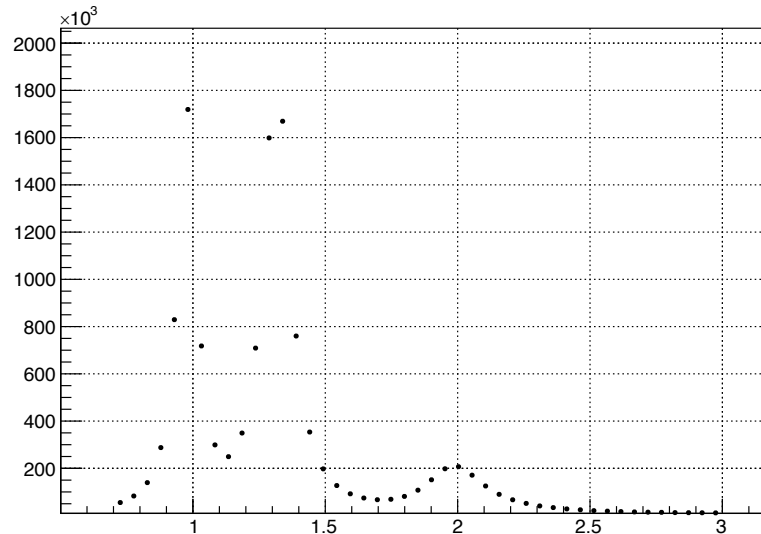
D1pl



G1pl



All waves



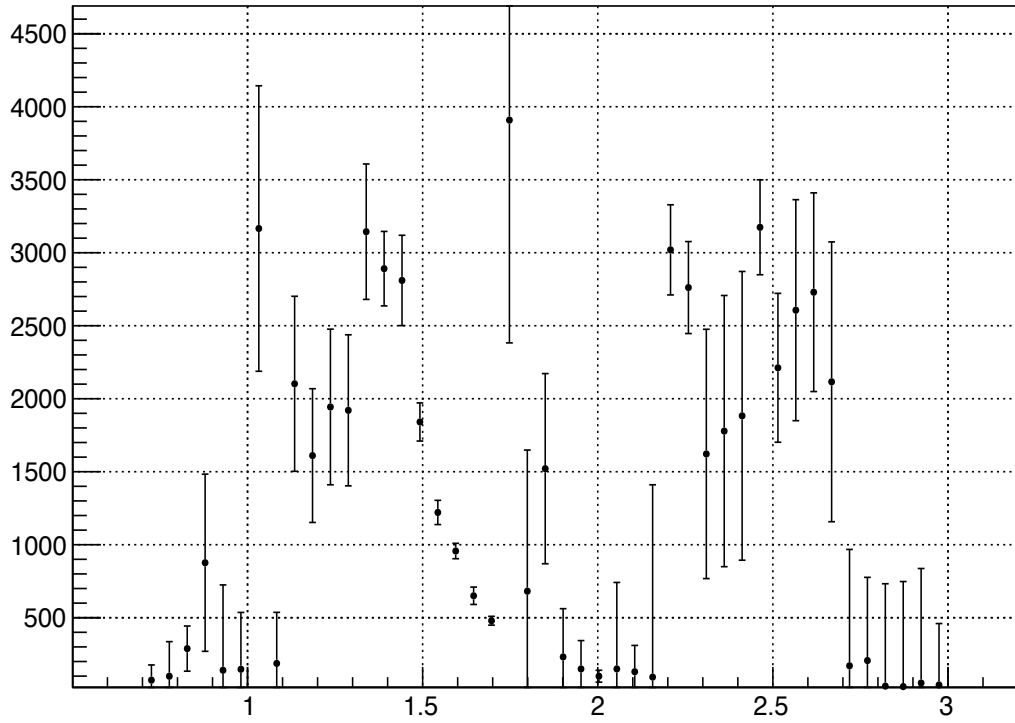
$$\sigma = \sqrt{\frac{\sum_i^B (I_i - I_{mean})^2}{B}}$$

B- number of Bootstraps (100 in this case)

Uncertainties from Bootstrapping for intensities from fitting in different M and t bins

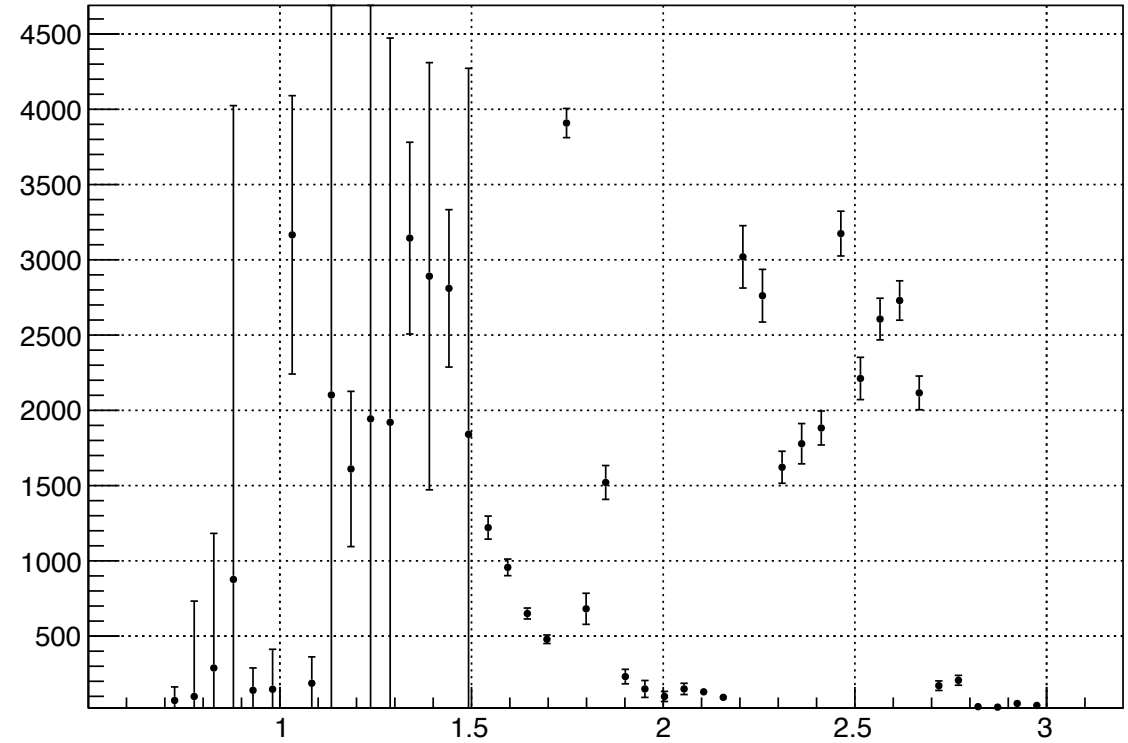
Bootstrapping

P1pl



MINUIT

P1pl



Uncertainties for intensities from fitting with a set of waves, different from the true set, in different M and t bins

S0-

Bootstrapping

P1+

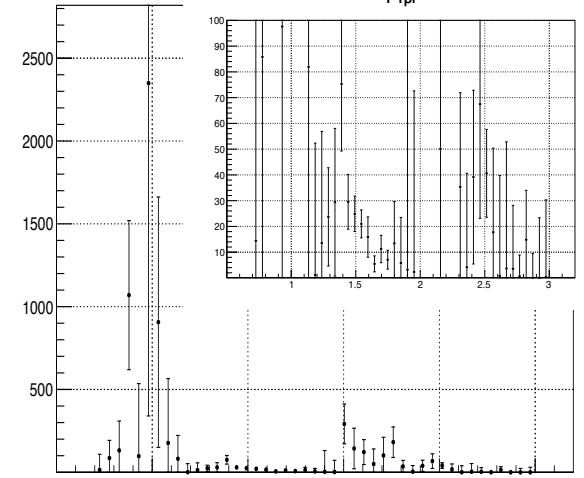
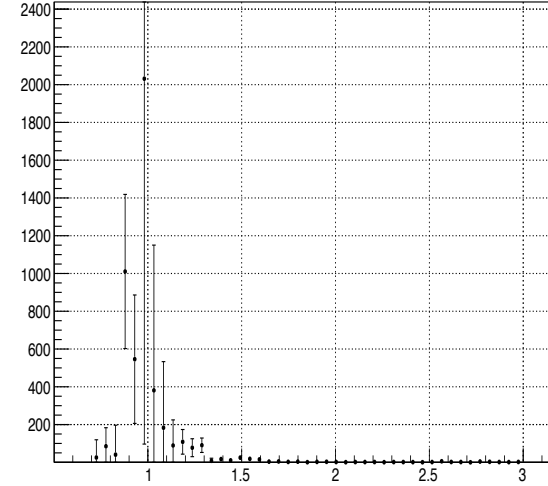
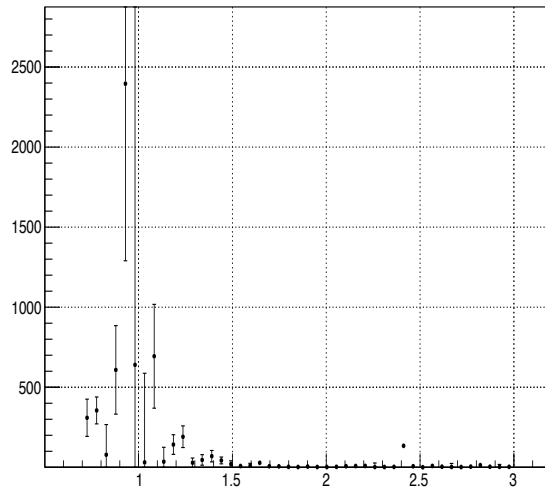
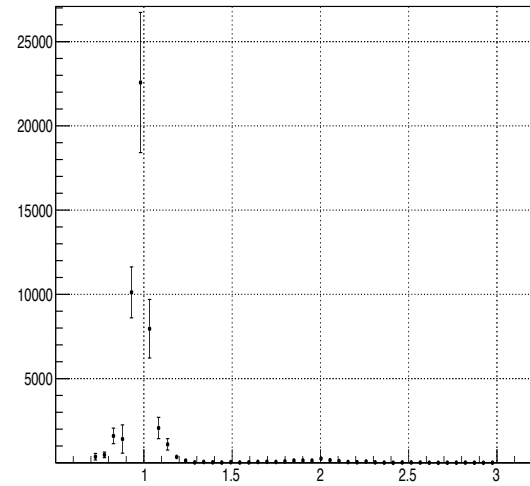
S0mi

P0mi

P1mi

P1pl

P1pl



MINUIT

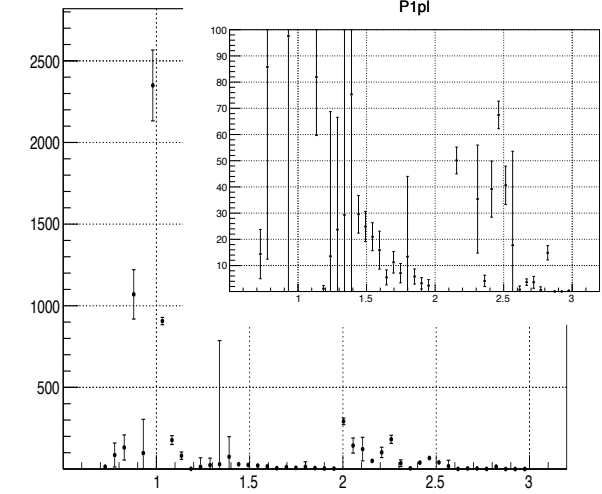
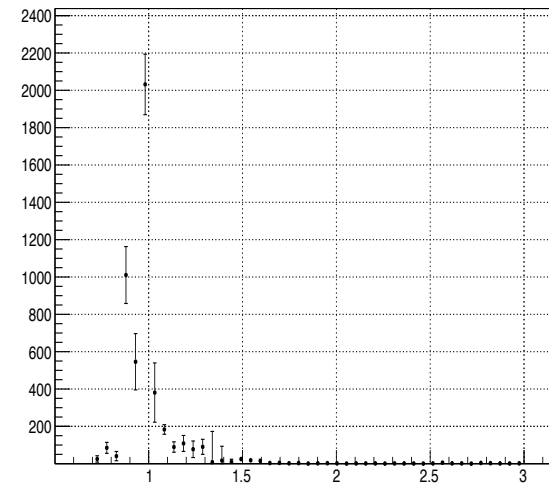
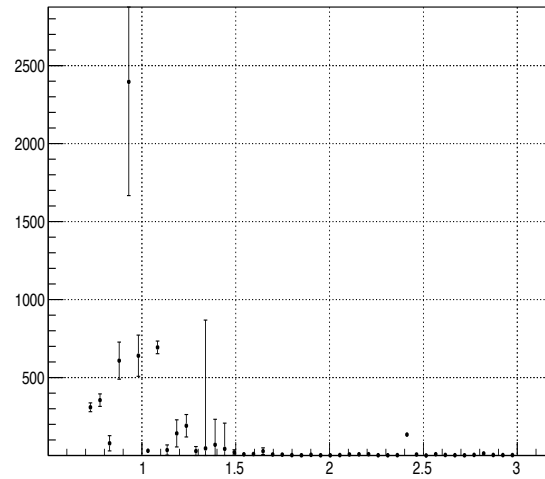
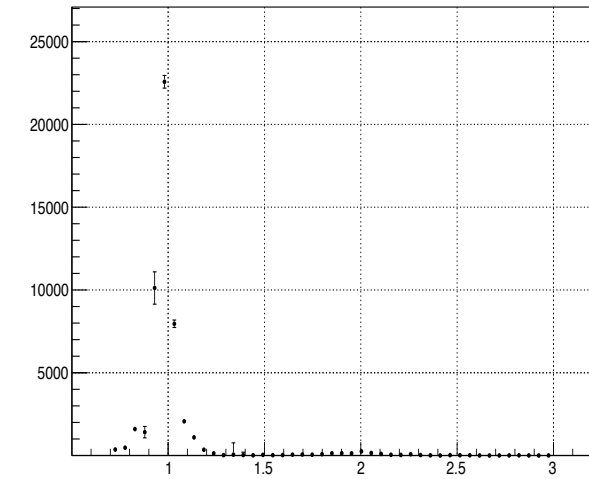
S0mi

P0mi

P1mi

P1pl

P1pl



Uncertainties for intensities from fitting with a set of waves, different from the true set, in different M and t bins

Bootstrapping

D1+

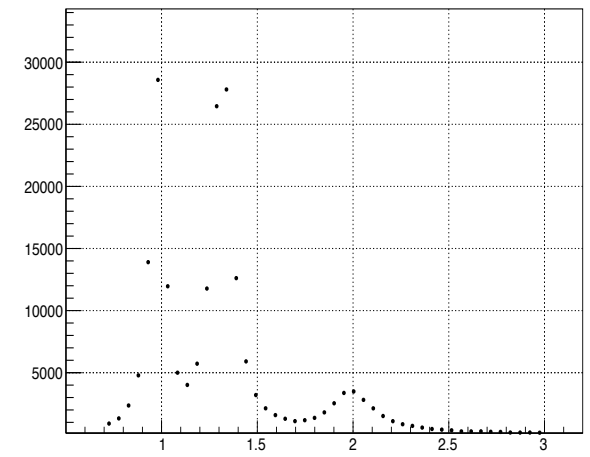
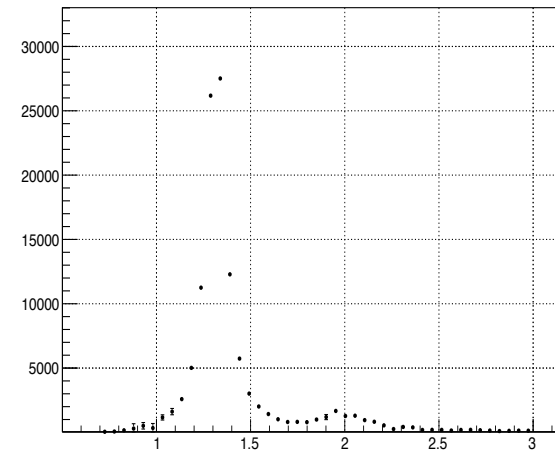
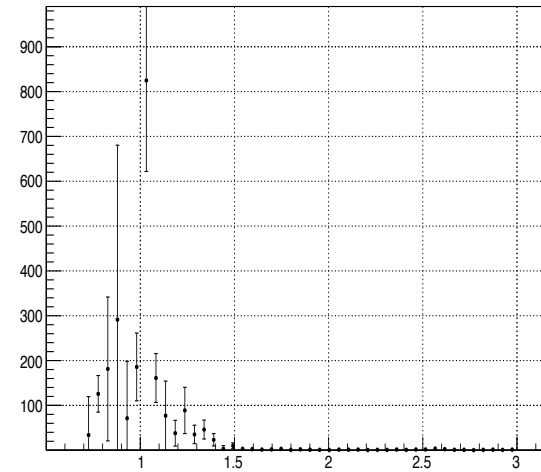
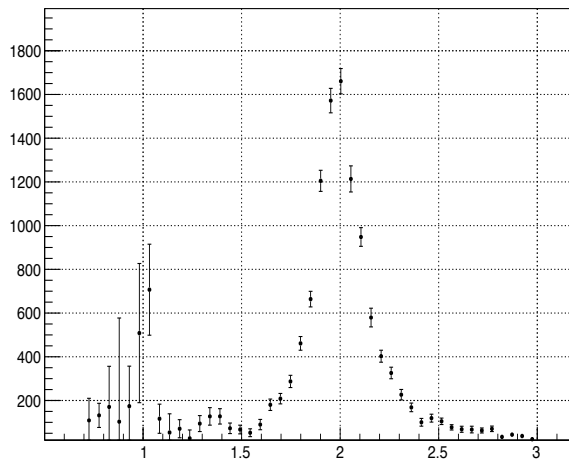
All

D0-

D1-

D1pl

All waves



MINUIT

D0-

D1-

D1pl

All waves

