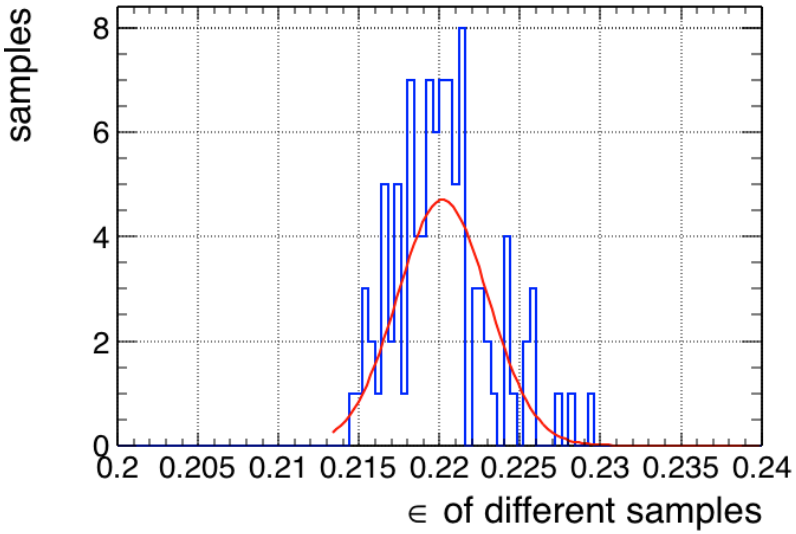
Systematic uncertainty-MC models

- considering the errors of parameters for the Amplitudes in the PWA with a Multi-Variable Gaussian function to sample 100 groups of coupling parameters
- use these 100 different Amplitudes to sample PHSP MC to obtain the selection efficiency



μ=0.22019

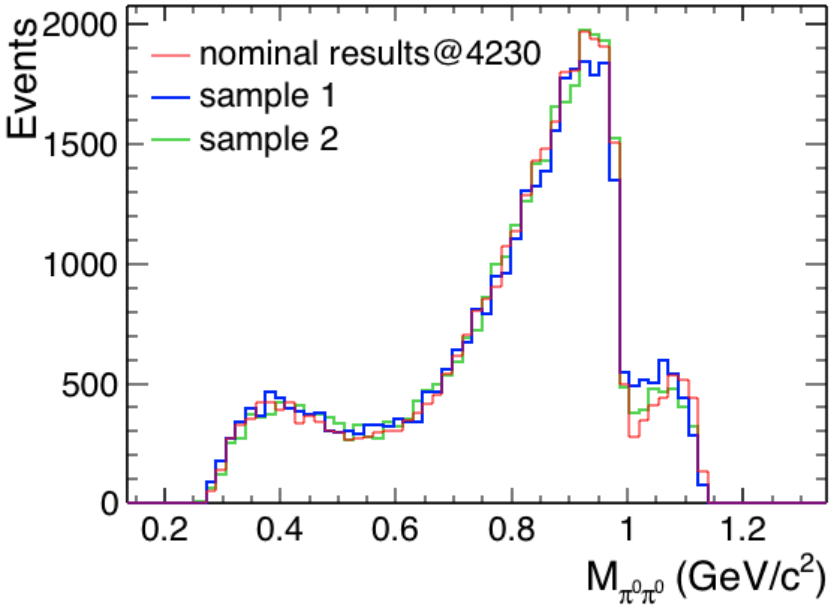
σ=0.00281

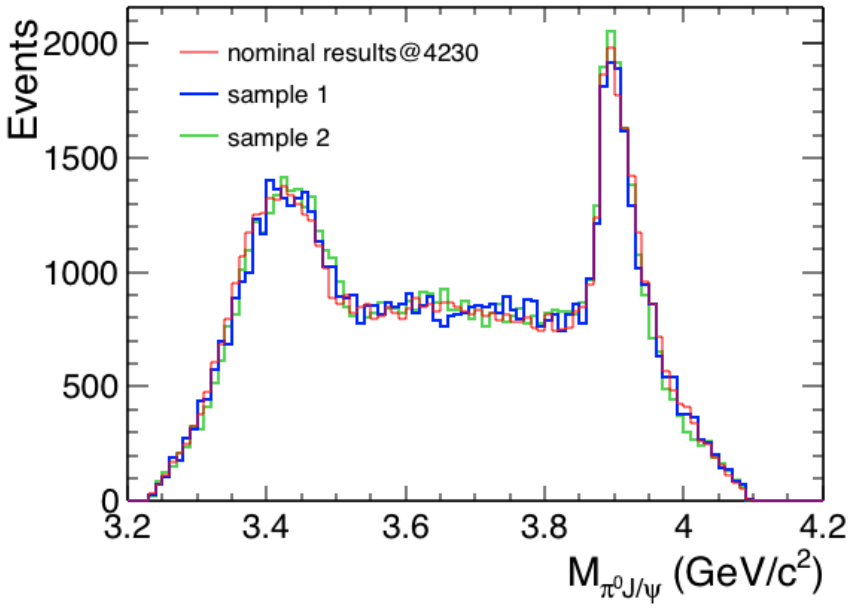
=> uncertainty as 1.3%

Systematic uncertainty-MC models

- Check the invariant mass distributions

  => consistent with nominal results



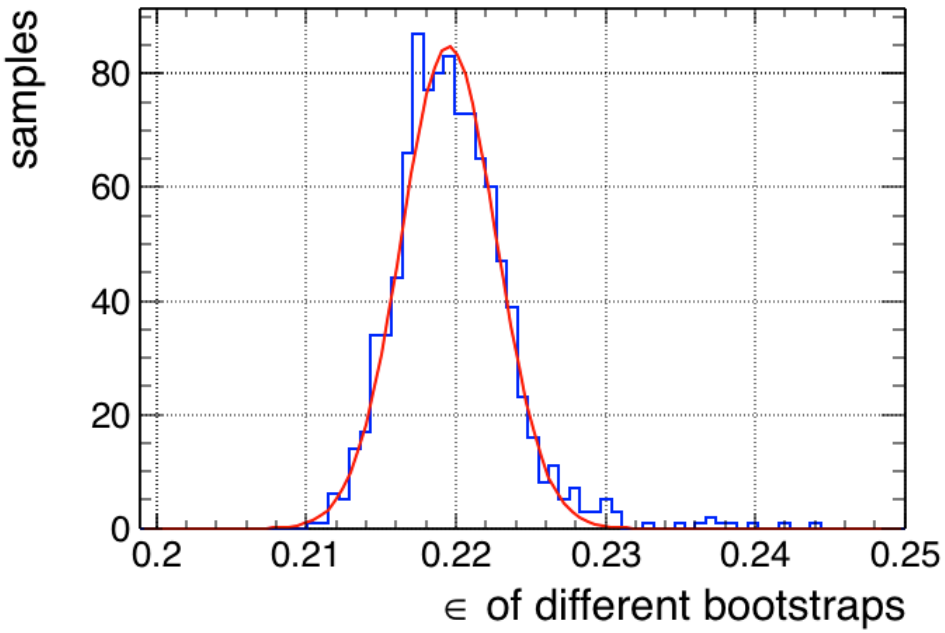


Systematic uncertainty- MC models

- Bootstrap method

Bootstrapping is any test or metric that relies on random sampling with replacement. Bootstrapping allows assigning measures of accuracy (defined in terms of bias, variance, confidence intervals, prediction error or some other such measure) to sample estimates.

It is often used as an alternative to statistical inference based on the assumption of a parametric model when that assumption is in doubt, or where parametric inference is impossible or requires complicated formulas for the calculation of standard errors



μ=0.2195

σ=0.003166

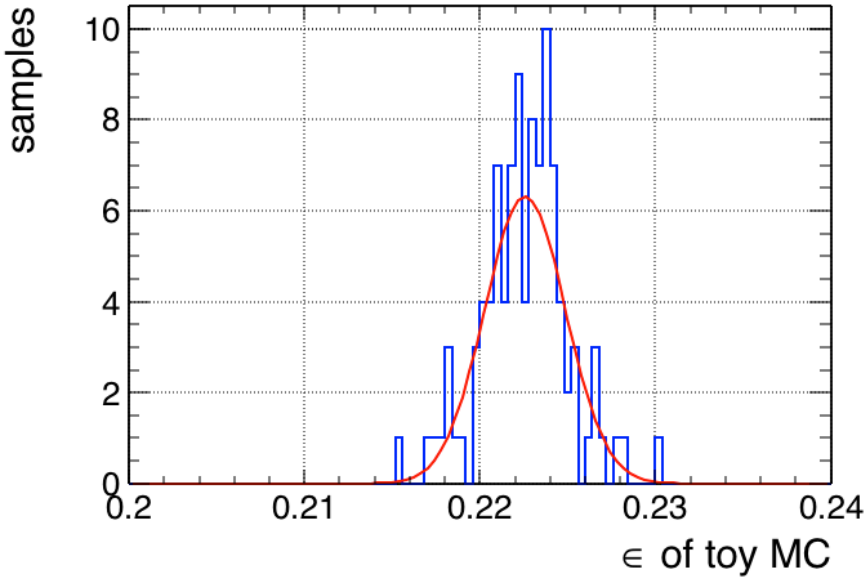
=> uncertainty as 1.4%

Nominal ε =0.2210

Systematic uncertainty- MC models

- Bootstrap method

100 toy MC samples replace data



μ=0.2226

σ=0.002305

=> uncertainty as 0.8%

Nominal ε =0.2210

Nominal results

- Nominal results

$Z_c(1^+)$	M (MeV/c^2)	g_1'	g_2'/g_1'	-ln$L$
$\pi^0\pi^0 J/\psi$(Fit-1)	3914.7± 4.2	0.075(fixed)	28.9±6.3	-30483.3
$\pi^0\pi^0 J/\psi$(Fit-2)	3915.2± 4.2	0.060±0.009	37.6±4.8	-30483.4
$\pi^+\pi^- J/\psi$	3901.5± 2.7	0.075±0.006	27.1± 2.0	...