

Comparison of kinematic fit χ^2 between data and MC

Alex Barnes Stuart Fegan Daniel Lersch Sebastian Cole

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Completed steps

- Updated DEventWriter to include branches with pull information.
- Built reaction filter configuration file, but new software is not working for all reactions in Alex A.'s build. Still investigating this problem.
- Build custom action for DSelector to investigate χ^2 and pulls as they depend on kinematic variables. This is still being tested and debugged.

- Statistic package for comparisons of data set in trees or histograms.
- Perform tests such as χ^2 , Kolmogorov-Smirnov test, etc.
- New tests can be built by anyone for their needs and added as a function to this statistics package.
- Potential uses:
 - Comparison to reference plot in online and offline monitoring.
 - Single numbers on the dashboards.
 - Comparison between data and MC.

DStat example

- Tested: `./DStatTest -f rootFile1 -f rootFile2 -p hist1 -p hist2 -s Chi2Test -s KolmogorovTest`

```
ifarm1401.jlab.org> ./DStatTest -f KS_Test.root -f KS_Test2.root -p Hist_gaussA -p Hist_gaussA -s Chi2Test -s KolmogorovTest
0
0
Info in <TH1F::Chi2TestX>: There is a bin in h1 with less than 1 event.
Info in <TH1F::Chi2TestX>: There is a bin in h2 with less than 1 event.
0.225604 , 0.199518
ifarm1401.jlab.org> █
```

- Needs testing: `./DStatTest -f rootFile1 -f rootFile2 -t tree1 -t tree2 -b branch1 -b branch2 -s KolmogorovTest`

Updated kinematic fit reactions to be investigated

Reaction	Kin. fit	Mass con.
$\pi^+\pi^-$	P4 + V	-
	P4	-
	Vertex	-
K^+K^-	P4 + V	-
	P4	-
	V	-
$\pi^+\pi^-\pi^0$	P4 + V	-
	P4	-
	P4 + V	π^0
	P4	
$\pi^+\pi^-\eta$	P4 + V	η
	P4	

Reaction	Kin. fit	Mass con.
$\pi^0\pi^0\pi^0$	P4	-
	P4	π^0
	P4	$2\pi^0$
	P4	$3\pi^0$
	P4	η
	P4	π^0
$\pi^0\pi^0\eta$	P4	$2\pi^0$
	P4	$\pi^0\eta$
	P4	$2\pi^0\eta$
	P4	
$\pi^0\gamma$	P4	-
	P4	π^0