Toy with LHCb results

Stefano Lacaprara,

stefano.lacaprara@pd.infn.it

INFN Padova

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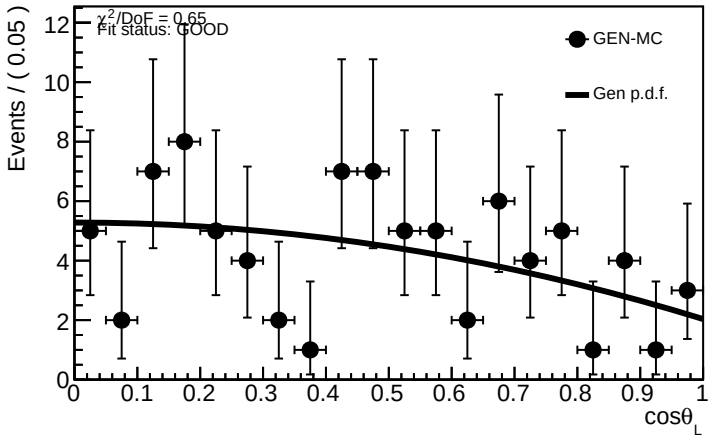
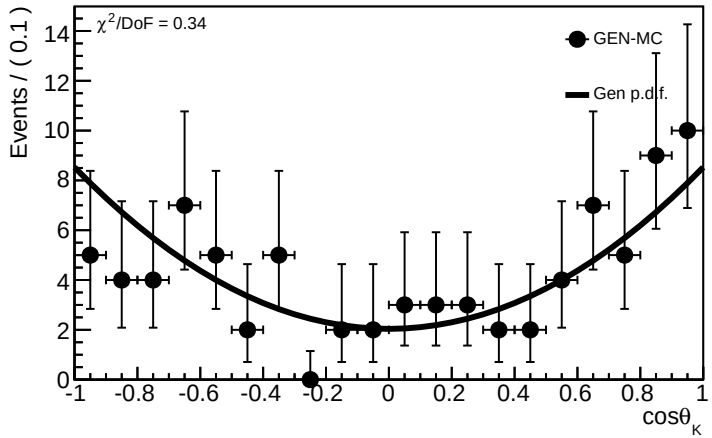
LHCb-values injection test

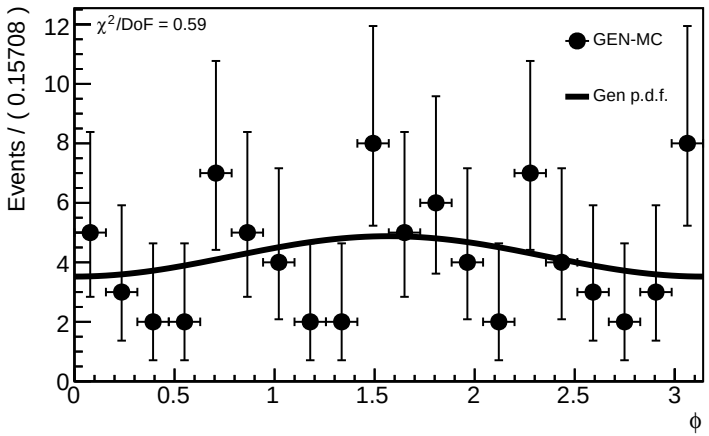
- Issue: try to perform an injecton test with LHCb physical parameters to check for any bias in our analysis
- How: generate TOY MC from `pdf` using LHCb parameters as input and try to fit those toys
  1. GEN-level (w/o eff)
  2. RECO-level (w/ eff)
  3. RECO-level cocktail (w/ eff and background)
- Status
  - Generation is working, for all three cases
  - perform fit for (1) Done
  - working on (2) and (3).
- Only fit with good results are considered.

LHCb-values Toy MC Bin 0 GEN-level fit

Fit example for one toy

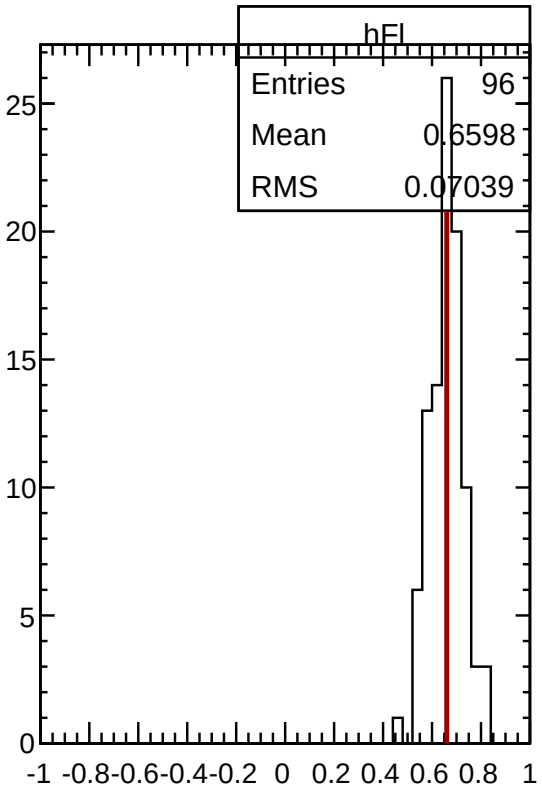




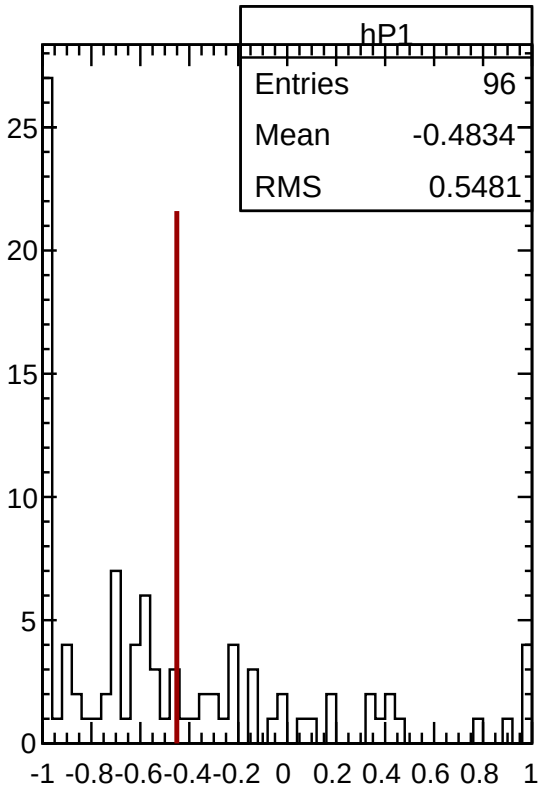


Fit results for all toys Bin 0: GEN-level fit

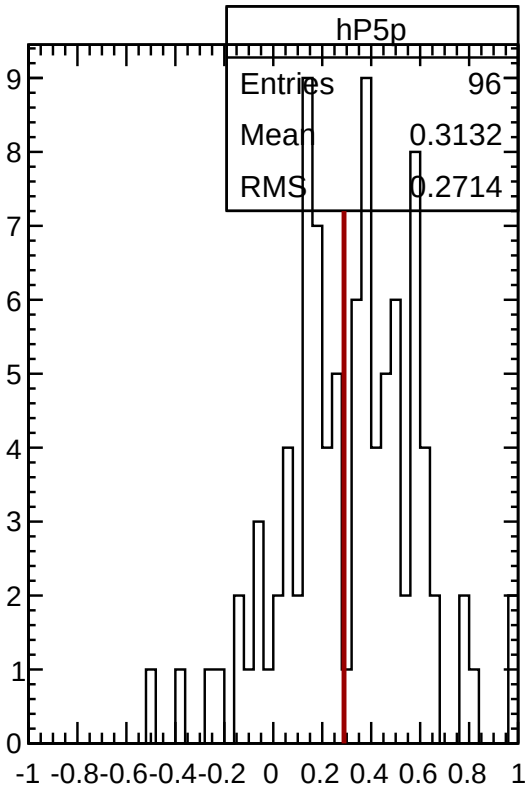
Fit 100 Toy MC with random initial value



F_L^{in}=0.660



P_1^{in}=-0.451

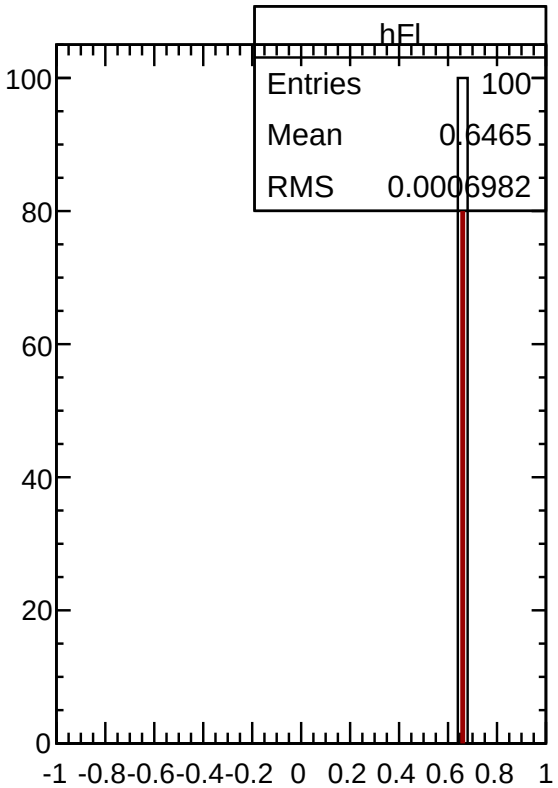


P'^{in}_5=0.289

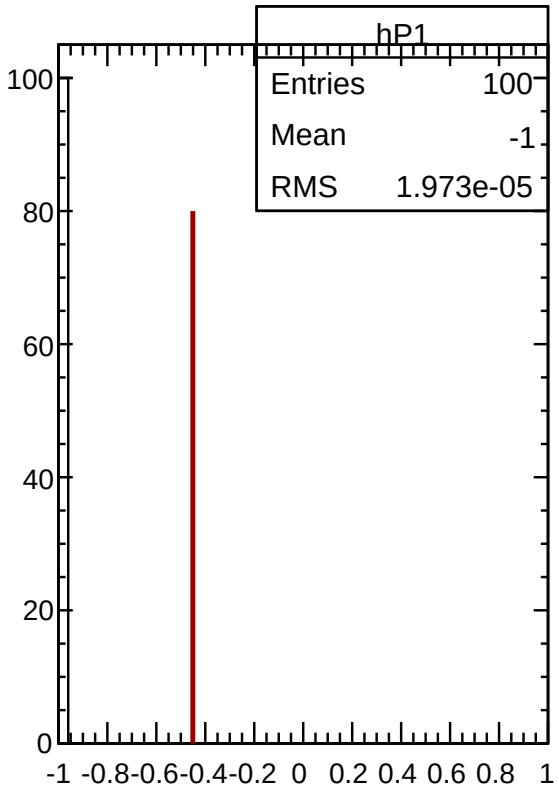
Red line is input value

Fit results for all toys Bin 0: GEN-level fit

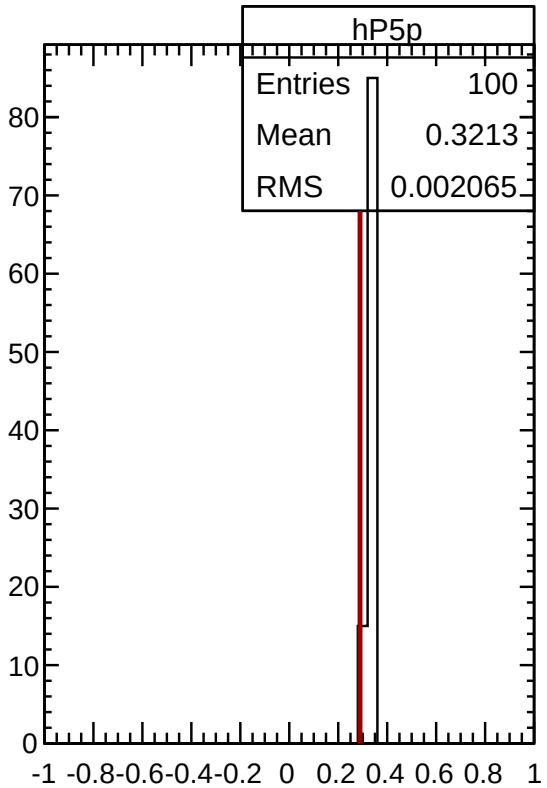
Scan initial values for a given toy MC



F_L^{in}=0.660



P_1^{in}=-0.451

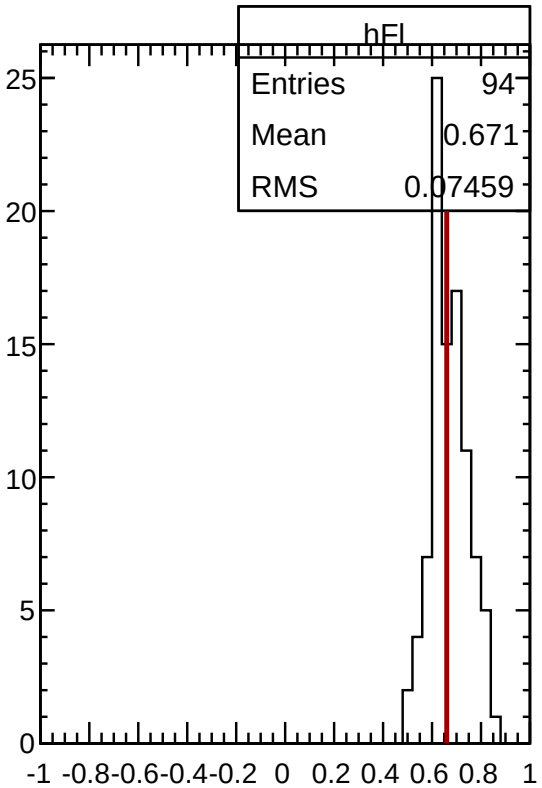


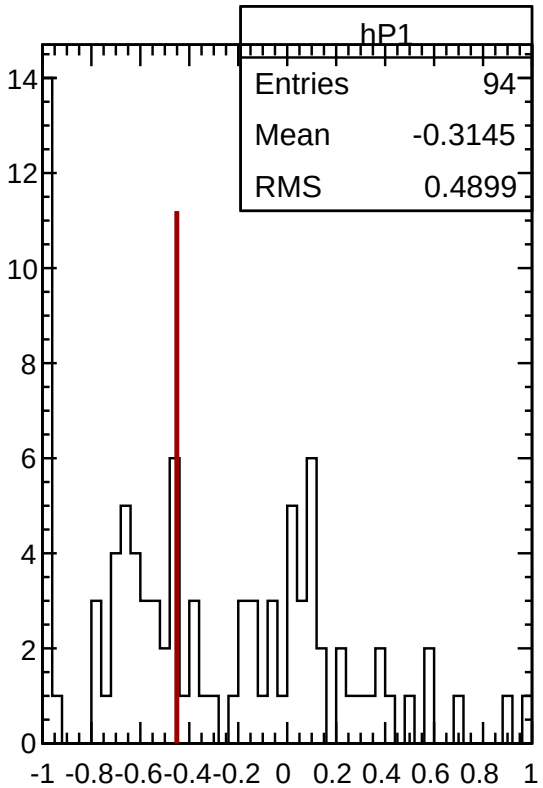
P'^{in}_5=0.289

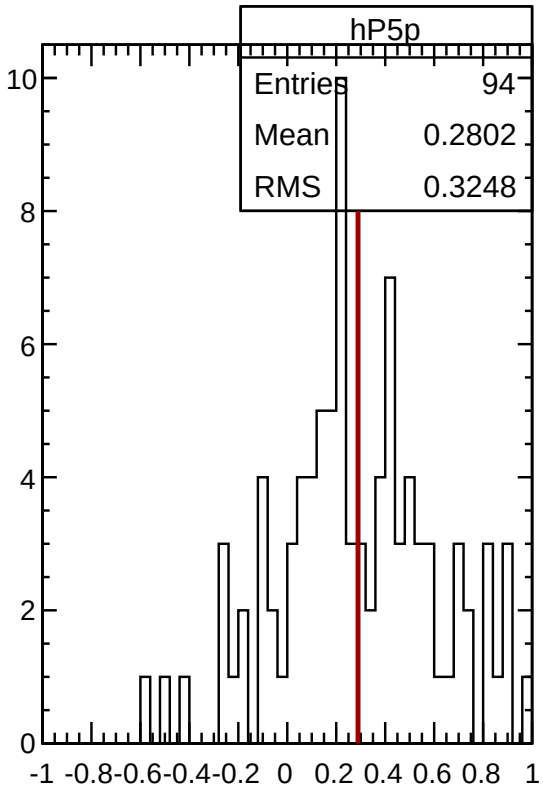
Red line is input value

Fit results for all toys Bin 0: RECO-level fit

Fit 100 Toy MC with random initial value



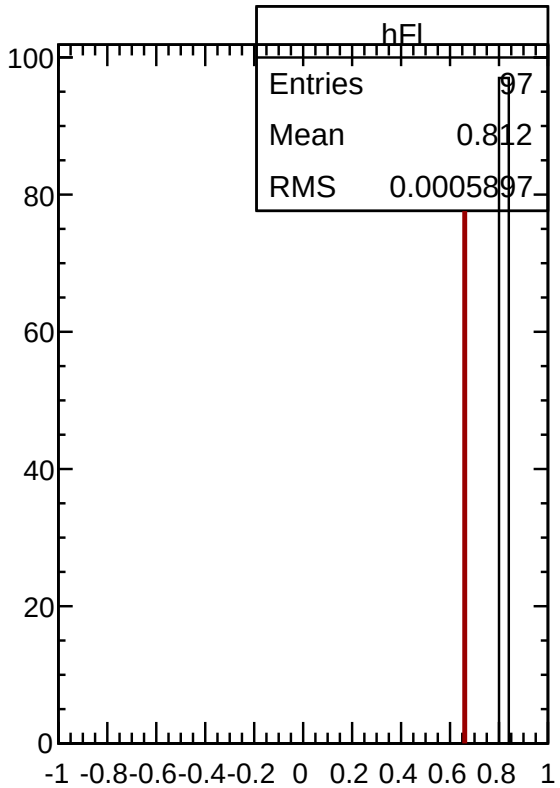




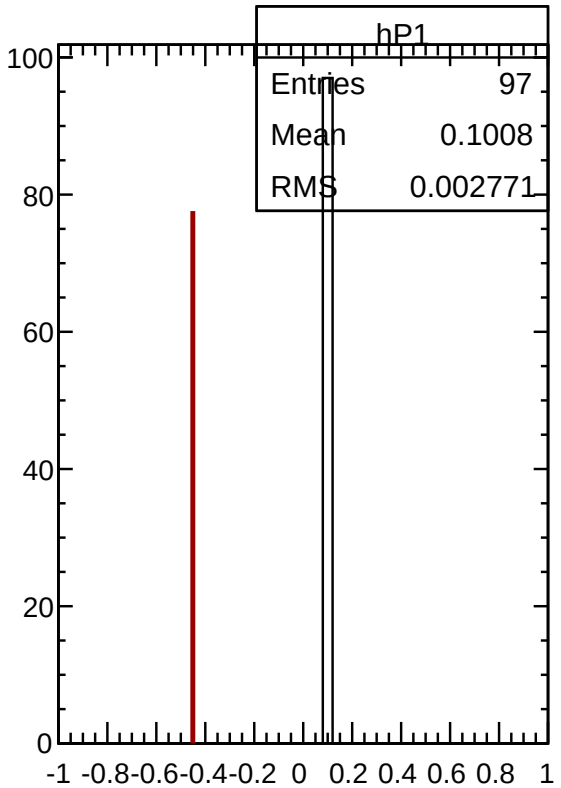
Red line is input value

Fit results for all toys Bin 0: RECO-level fit

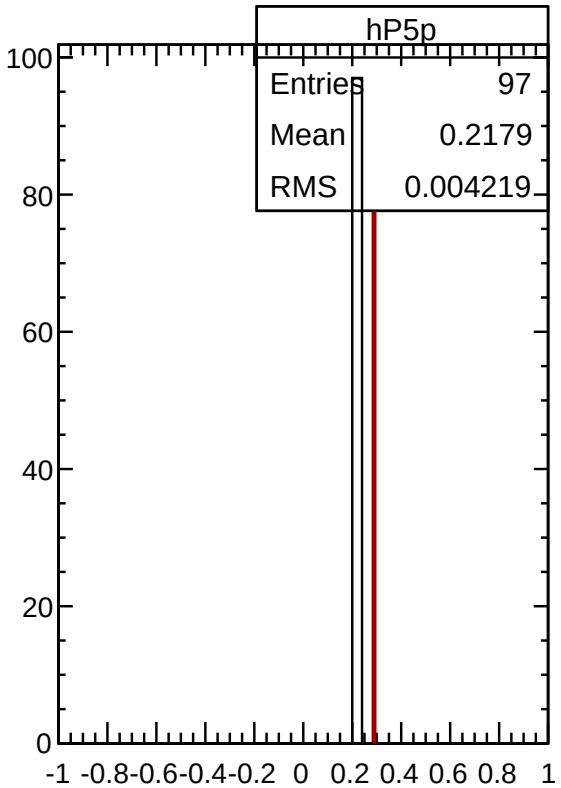
Scan initial values for a given toy MC



F_L^{in}=0.660



P_1^{in}=-0.451

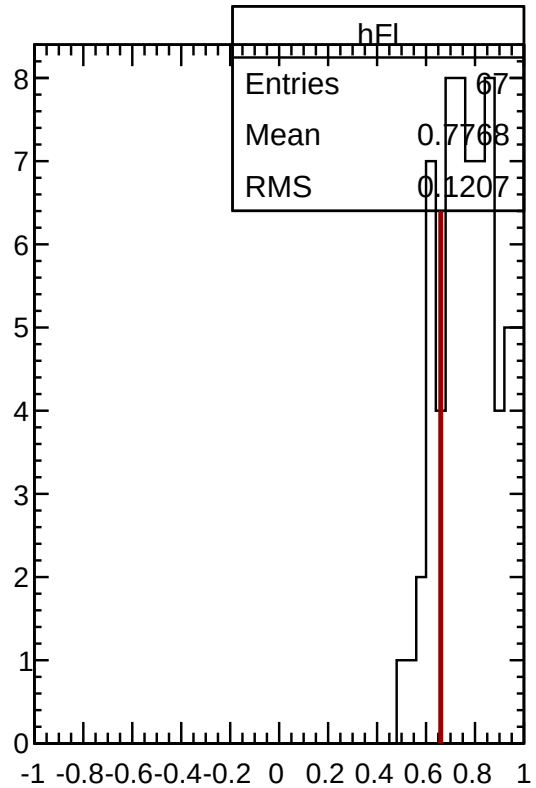


P'^{in}_5=0.289

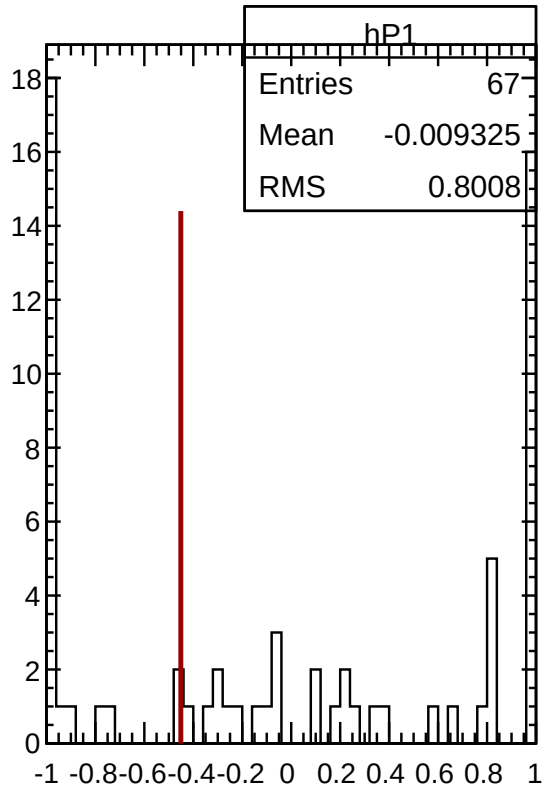
Red line is input value

Fit results for all toys Bin 0: cocktail fit

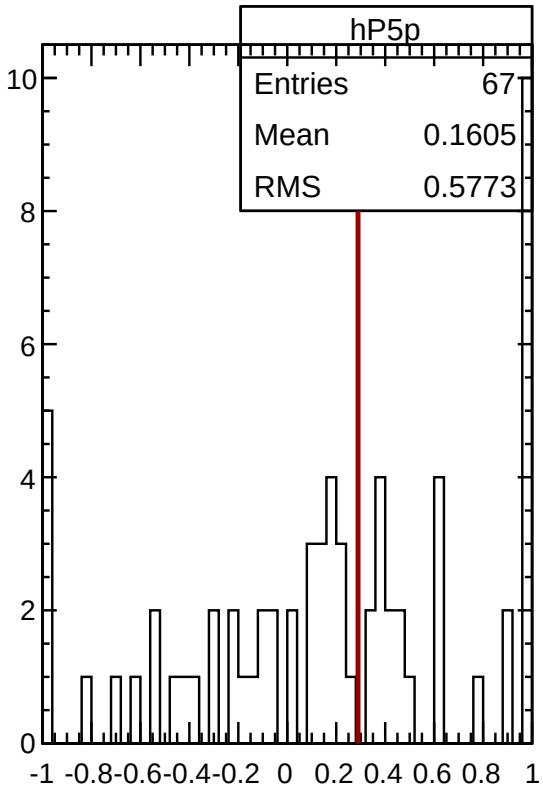
Fit 100 Toy MC with random initial value



F_L^{in}=0.660



P_1^{in}=-0.451

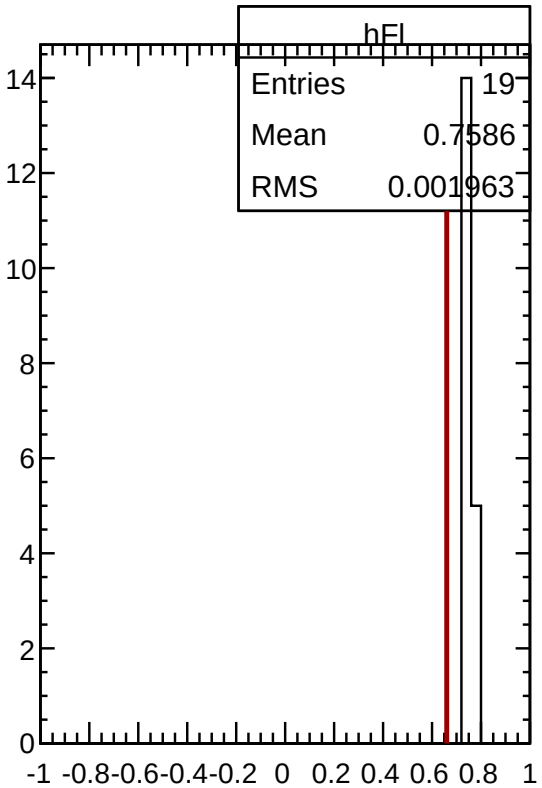


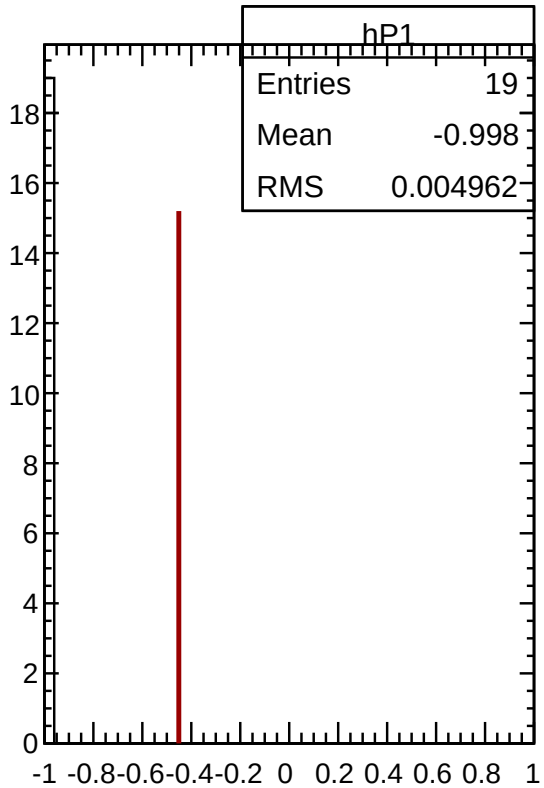
P'^{in}_5=0.289

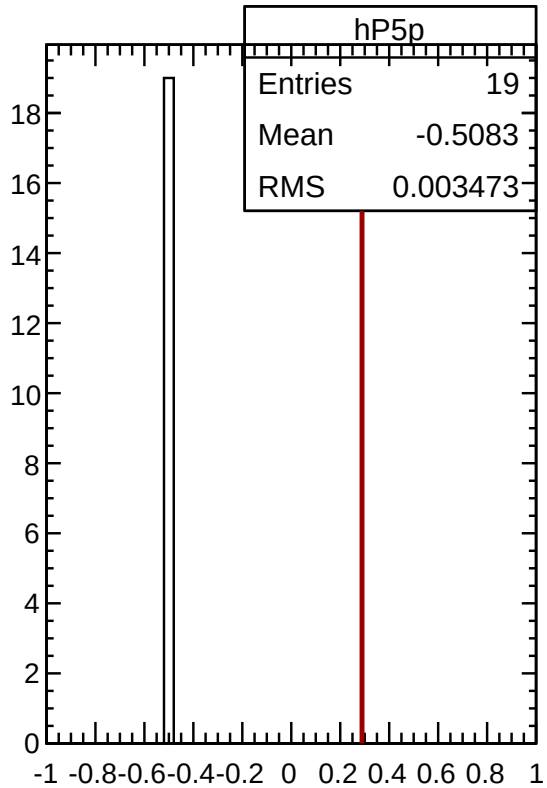
Red line is input value

Fit results for all toys Bin 0: cocktail fit

Scan initial values for a given toy MC



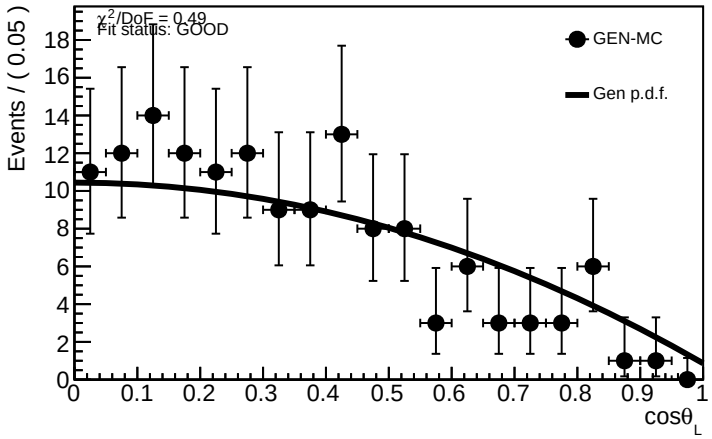


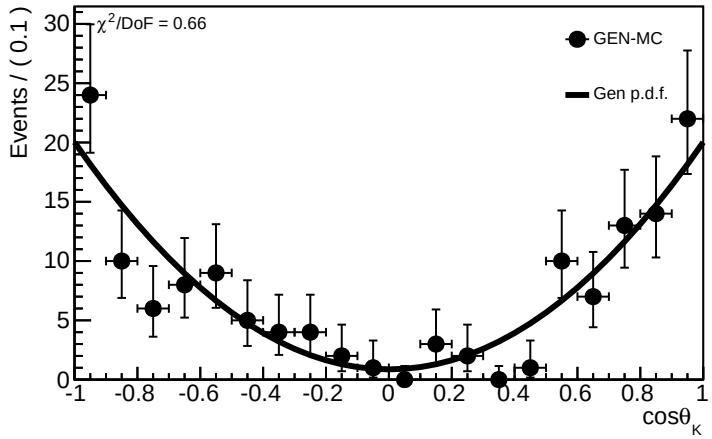


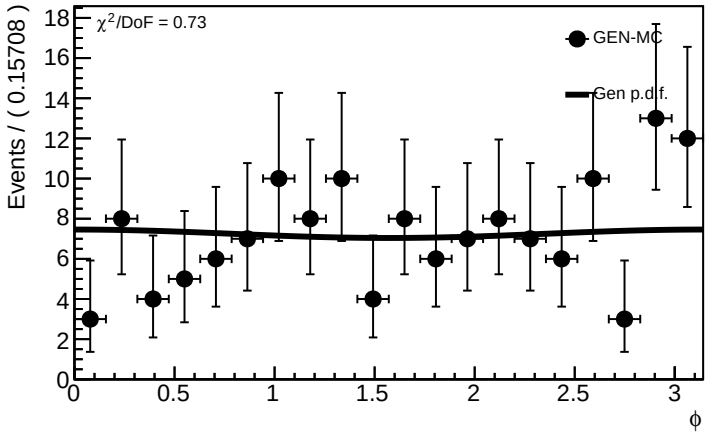
Red line is input value

LHCb-values Toy MC Bin 1 GEN-level fit

Fit example for one toy

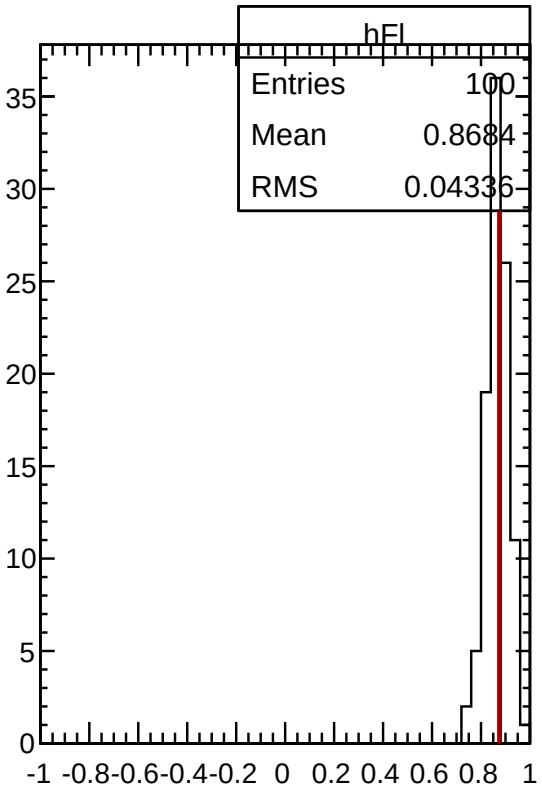




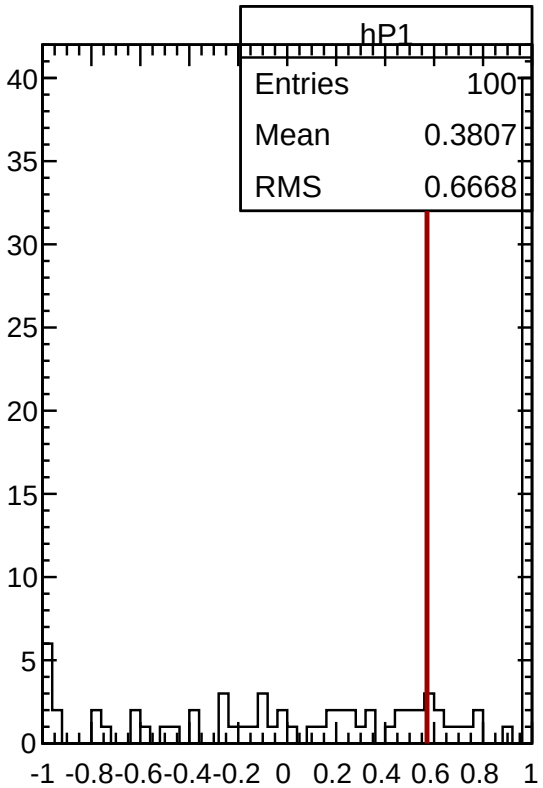


Fit results for all toys Bin 1: GEN-level fit

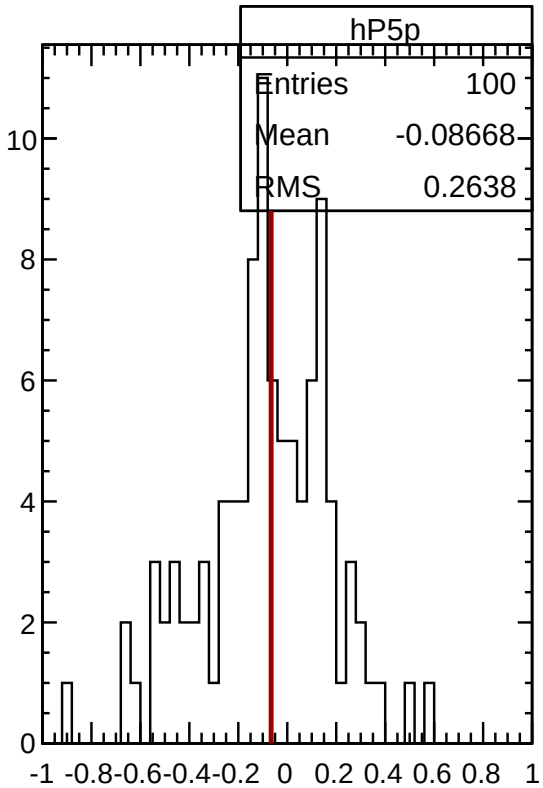
Fit 100 Toy MC with random initial value



F_L^{in}=0.876



P_1^{in}=0.571

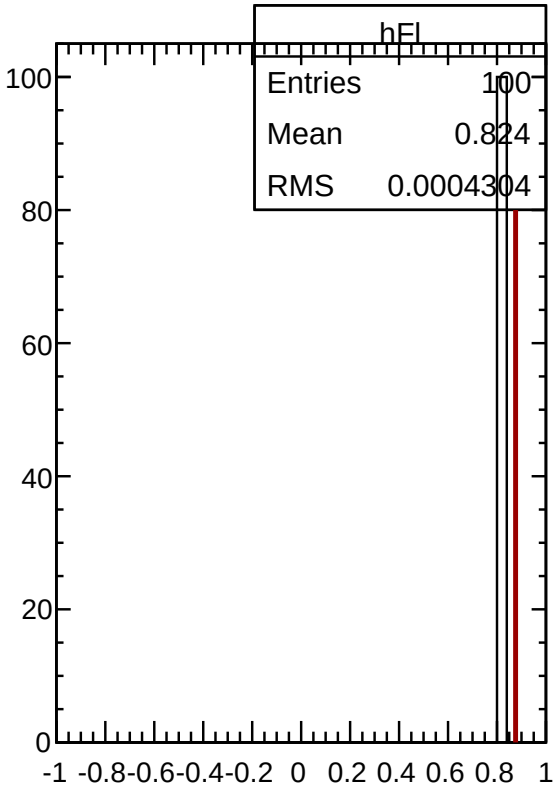


P'^{in}_5=-0.066

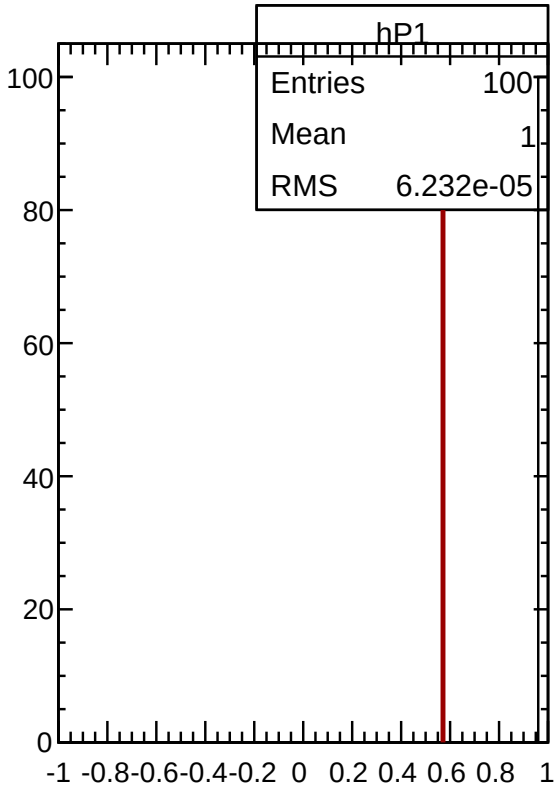
Red line is input value

Fit results for all toys Bin 1: GEN-level fit

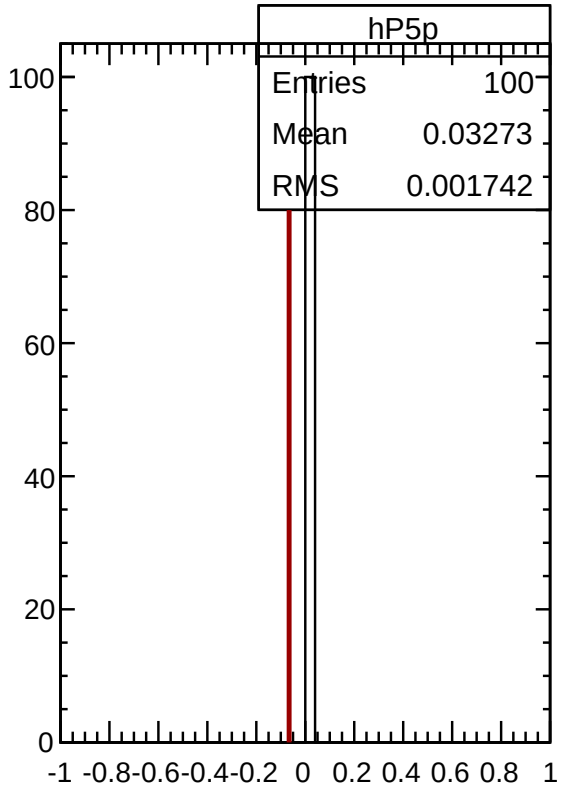
Scan initial values for a given toy MC



F_L^{in}=0.876



P_1^{in}=0.571

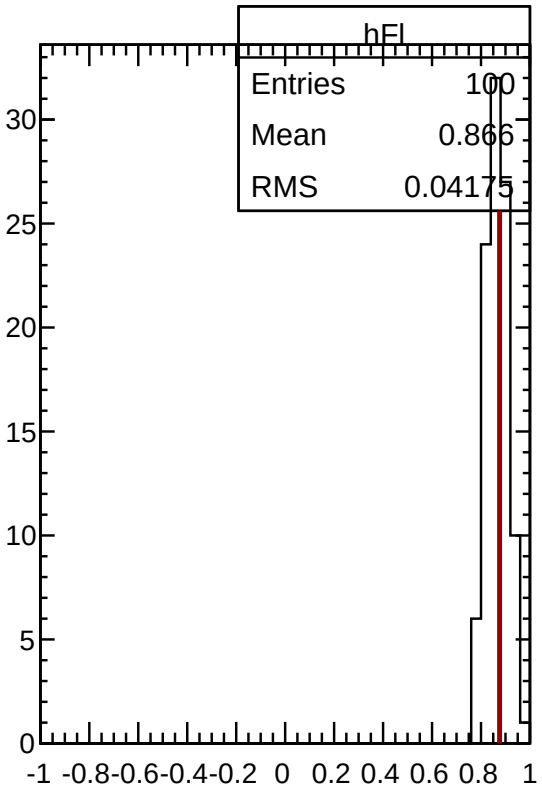


P'^{in}_5=-0.066

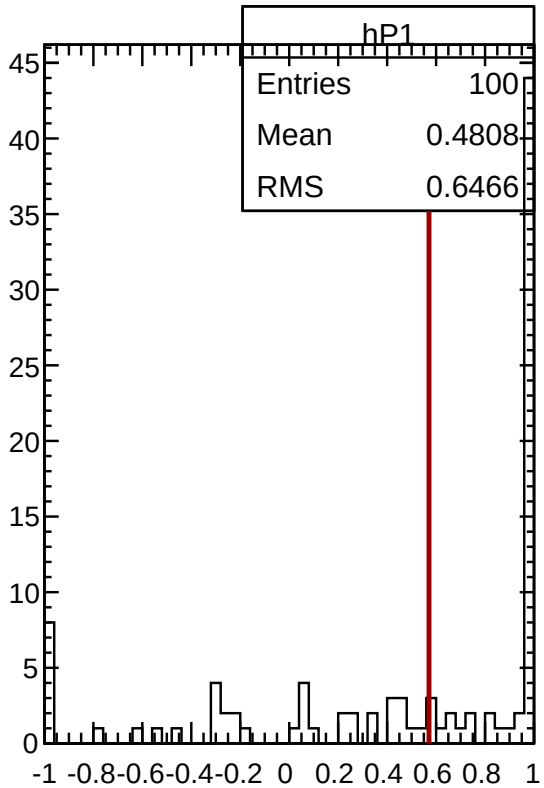
Red line is input value

Fit results for all toys Bin 1: RECO-level fit

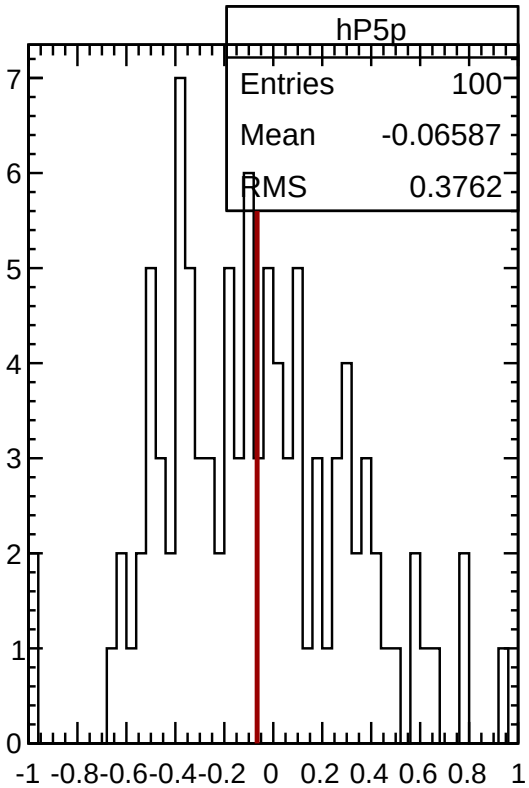
Fit 100 Toy MC with random initial value



F_L^{in}=0.876



P_1^{in}=0.571

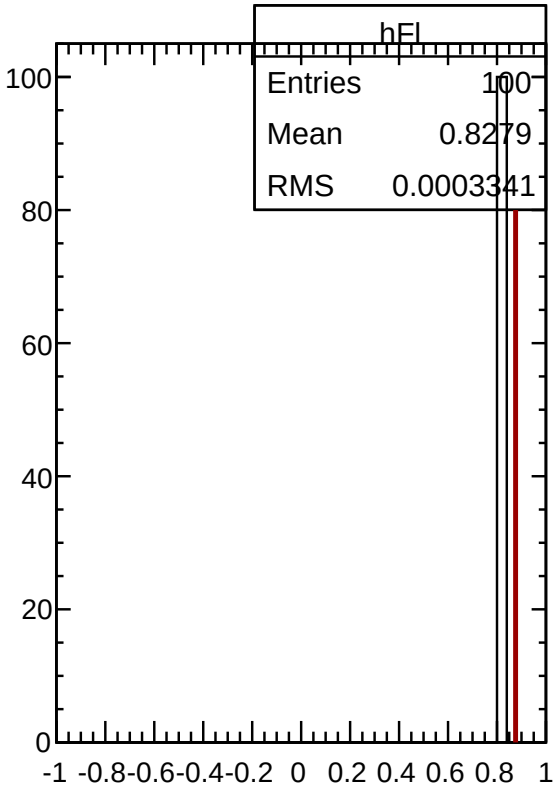


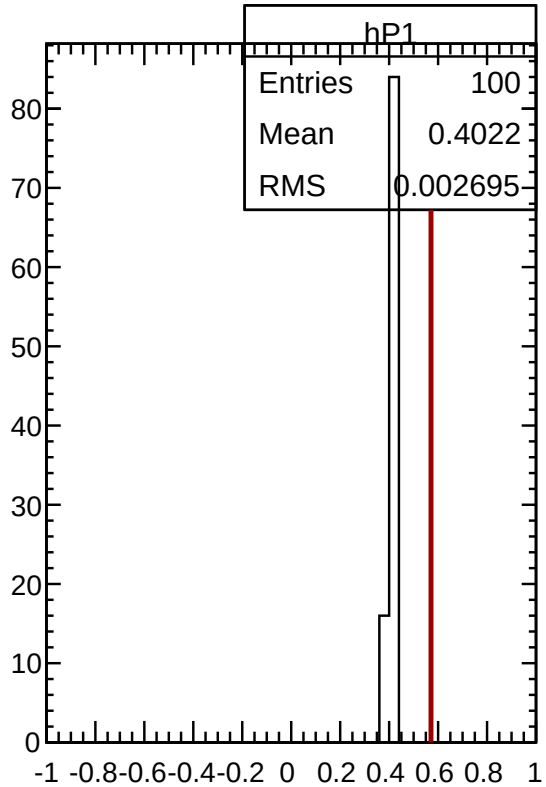
P'^{in}_5=-0.066

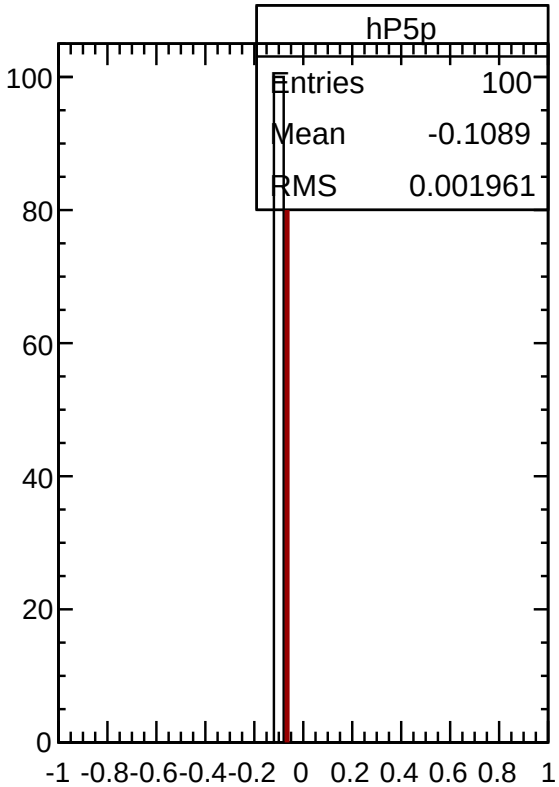
Red line is input value

Fit results for all toys Bin 1: RECO-level fit

Scan initial values for a given toy MC



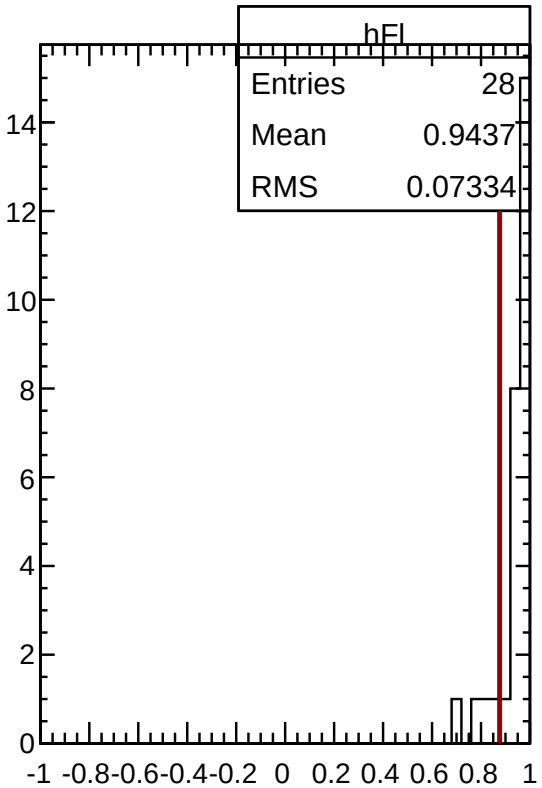




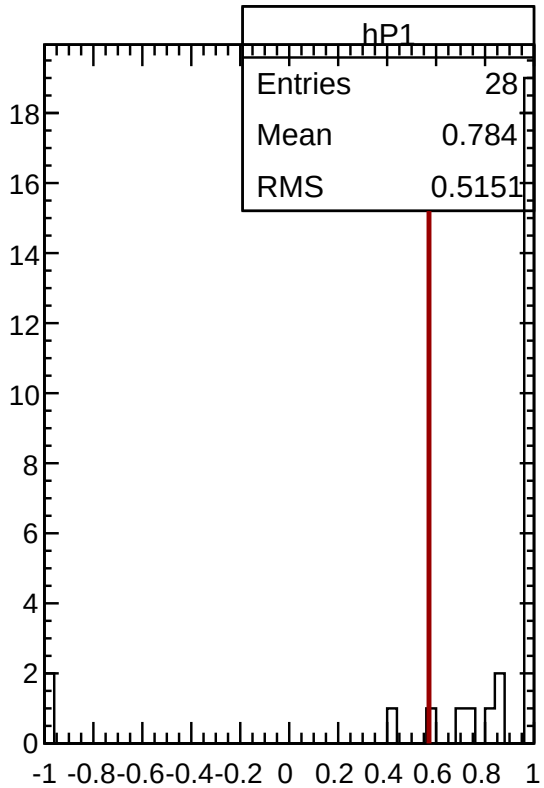
Red line is input value

Fit results for all toys Bin 1: cocktail fit

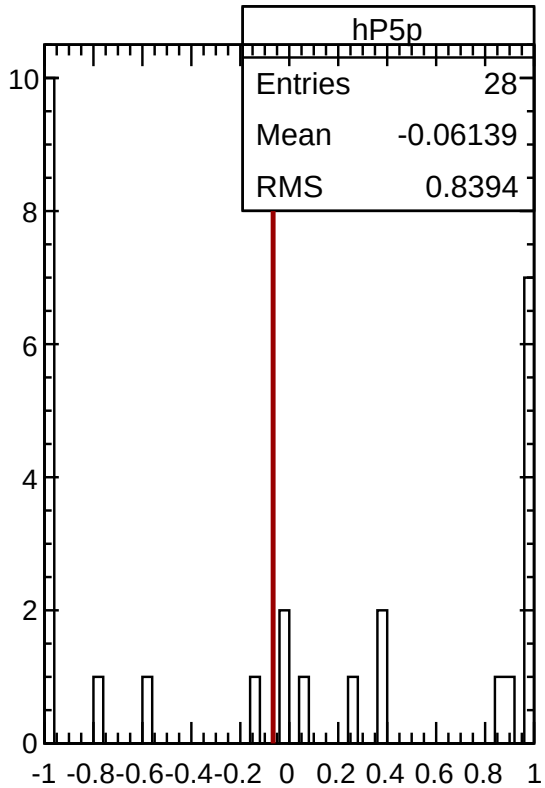
Fit 100 Toy MC with random initial value



F_L^{in}=0.876



P_1^{in}=0.571

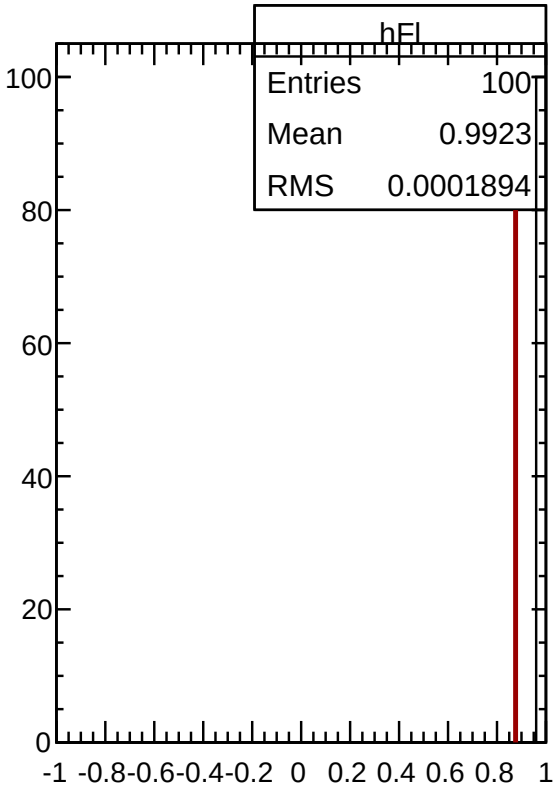


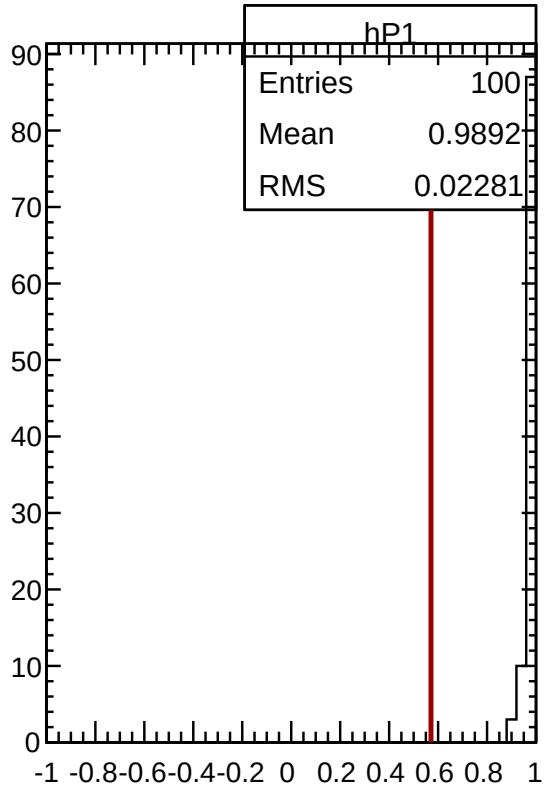
P'^{in}_5=-0.066

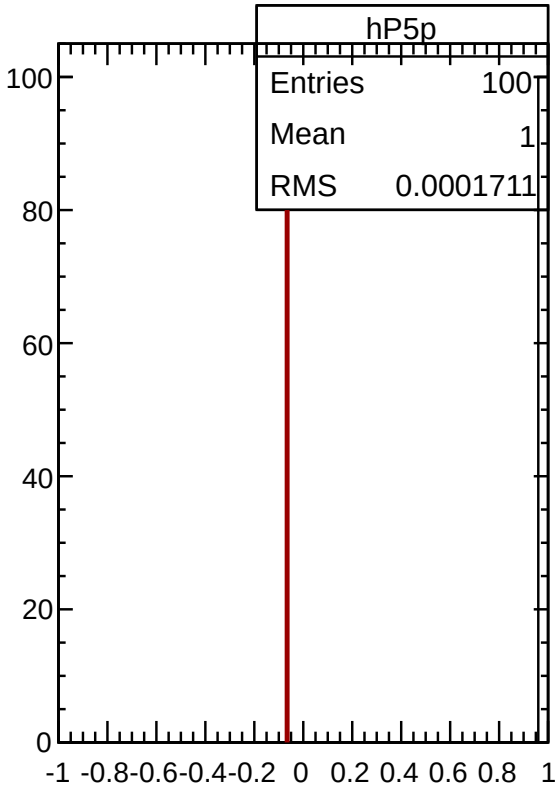
Red line is input value

Fit results for all toys Bin 1: cocktail fit

Scan initial values for a given toy MC



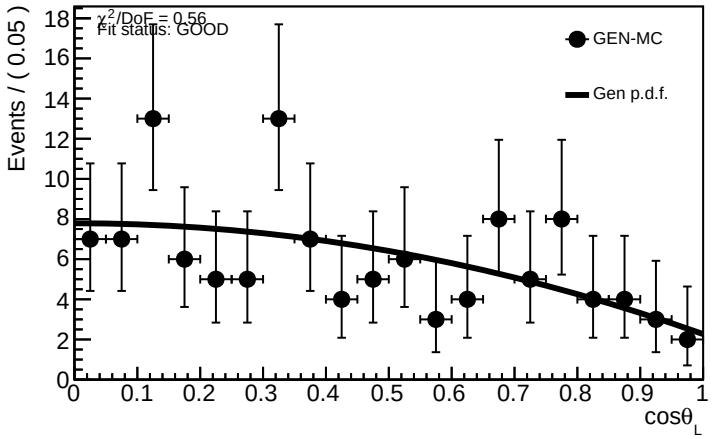


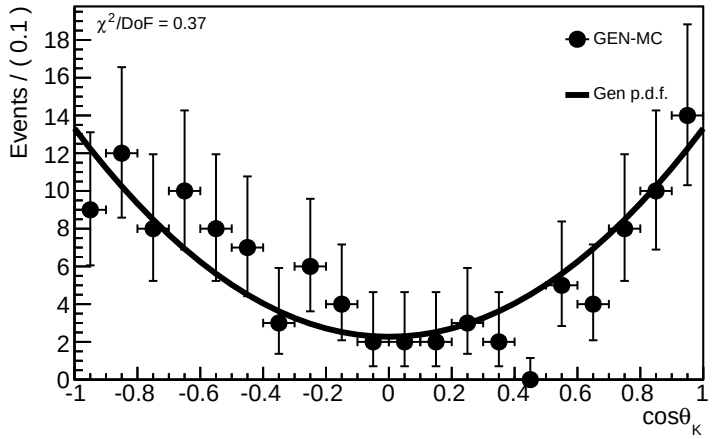


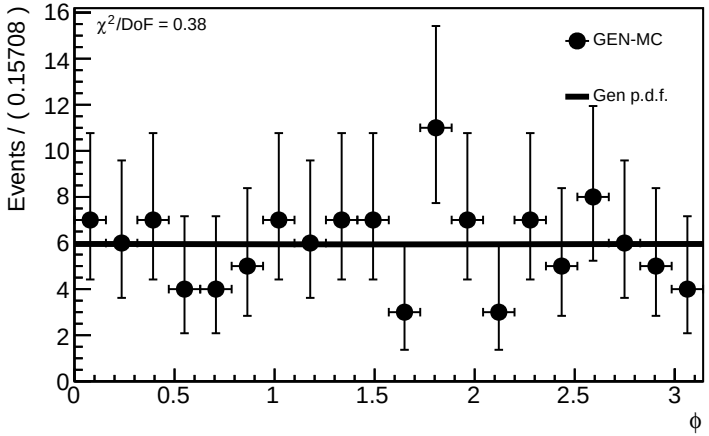
Red line is input value

LHCb-values Toy MC Bin 2 GEN-level fit

Fit example for one toy

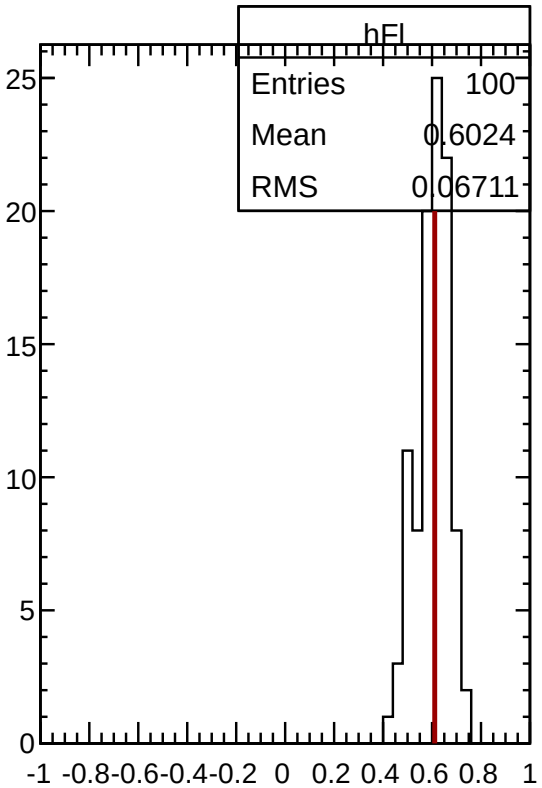




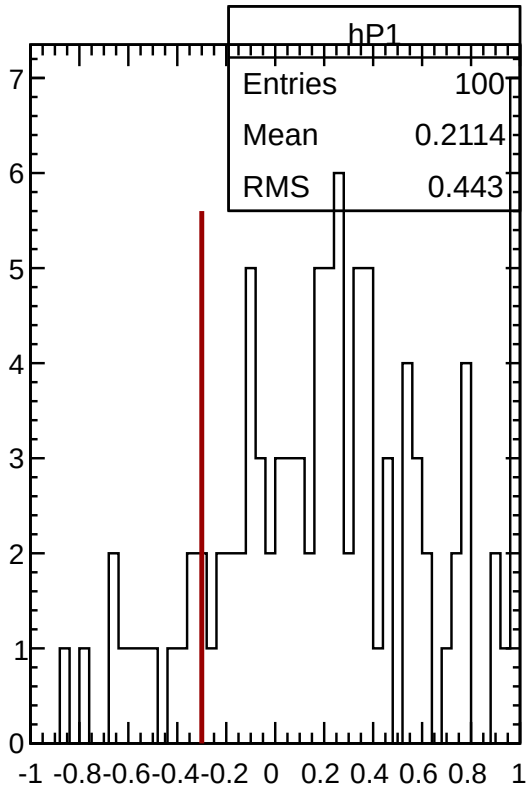


Fit results for all toys Bin 2: GEN-level fit

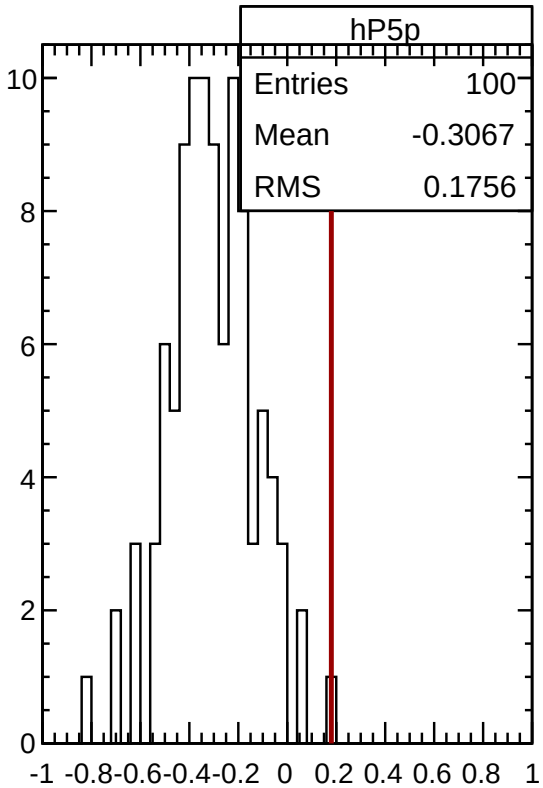
Fit 100 Toy MC with random initial value



F_L^{in}=0.611



P_1^{in}=-0.300

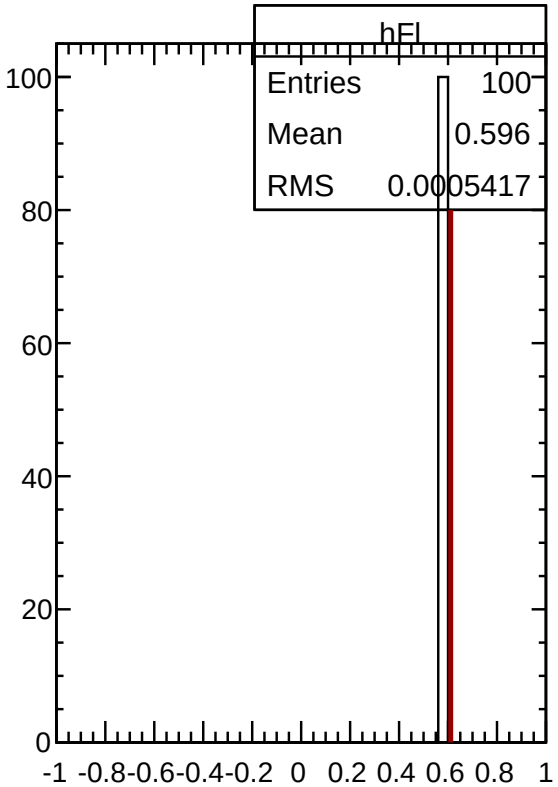


P'^{in}_5=0.180

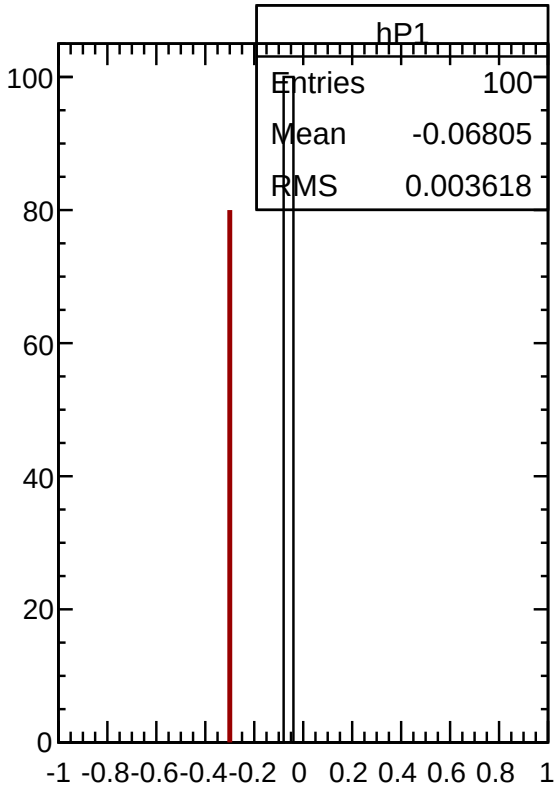
Red line is input value

Fit results for all toys Bin 2: GEN-level fit

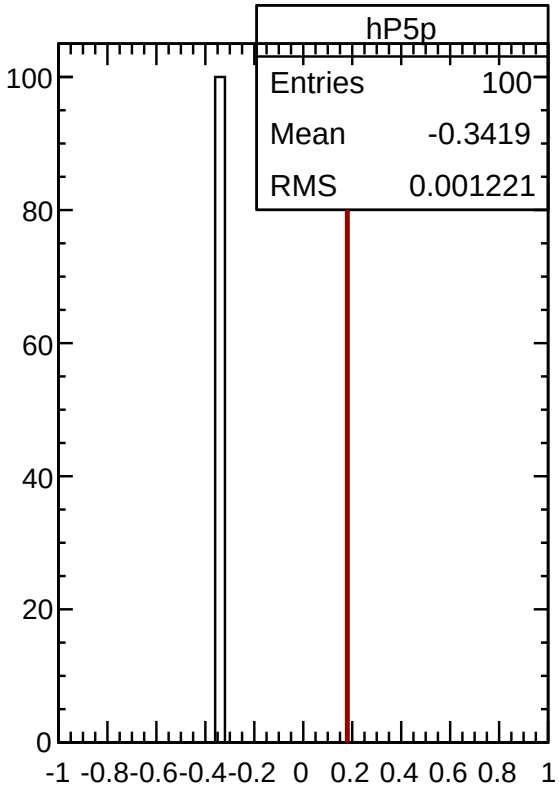
Scan initial values for a given toy MC



F_L^{in}=0.611



P_1^{in}=-0.300

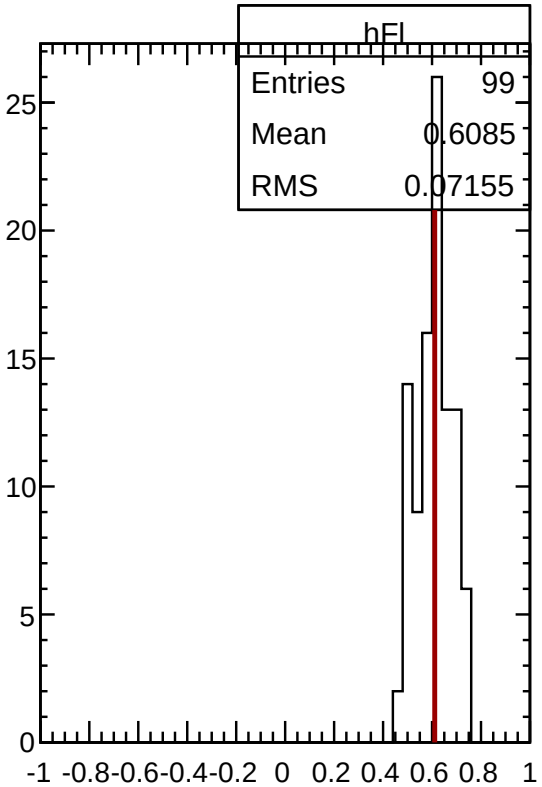


P'^{in}_5=0.180

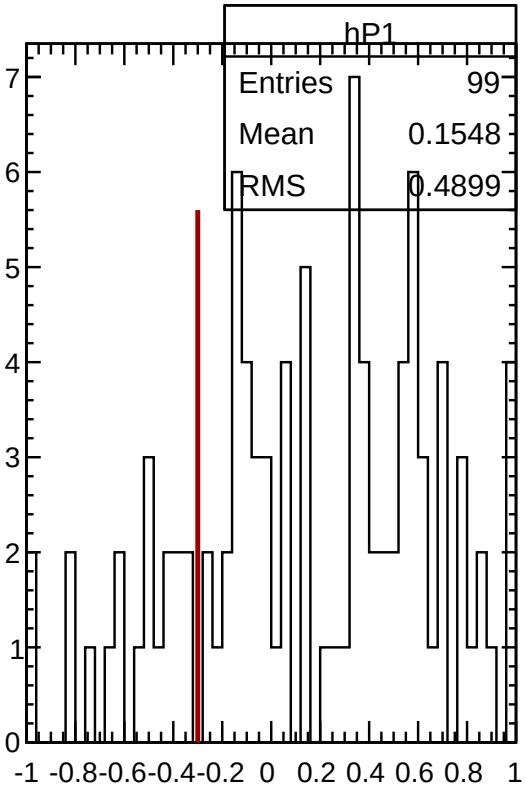
Red line is input value

Fit results for all toys Bin 2: RECO-level fit

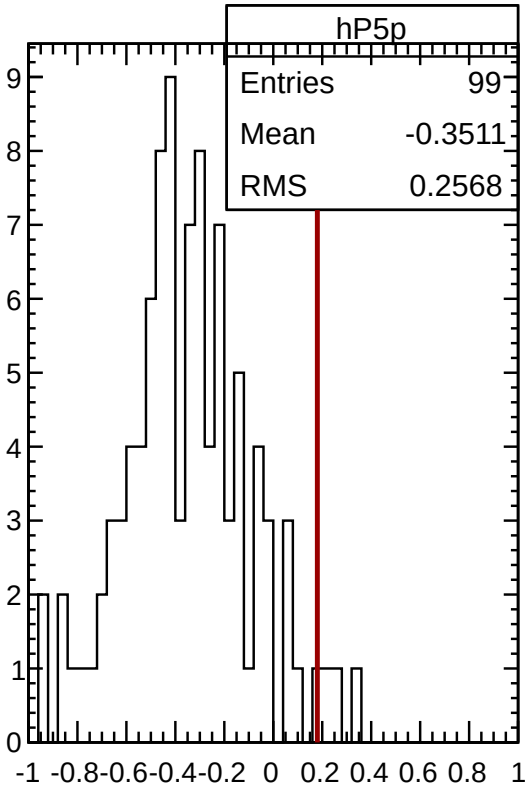
Scan initial values for a given toy MC



F_L^{in}=0.611



P_1^{in}=-0.300

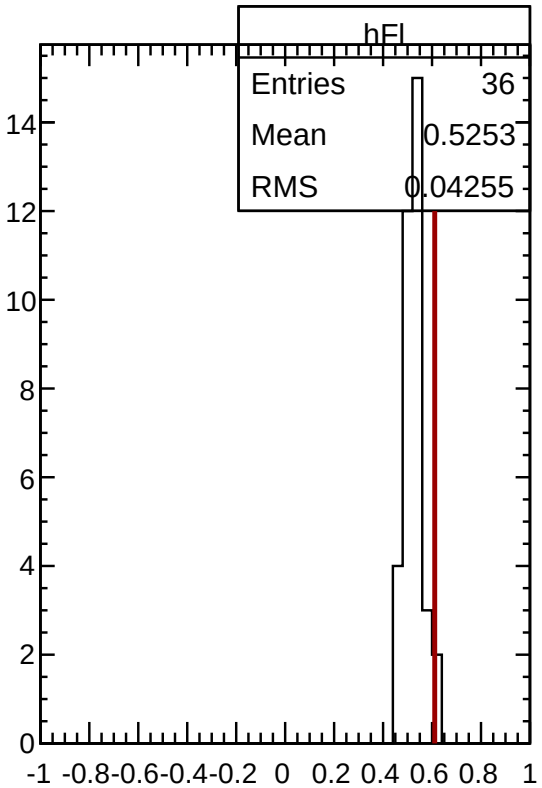


P'^{in}_5=0.180

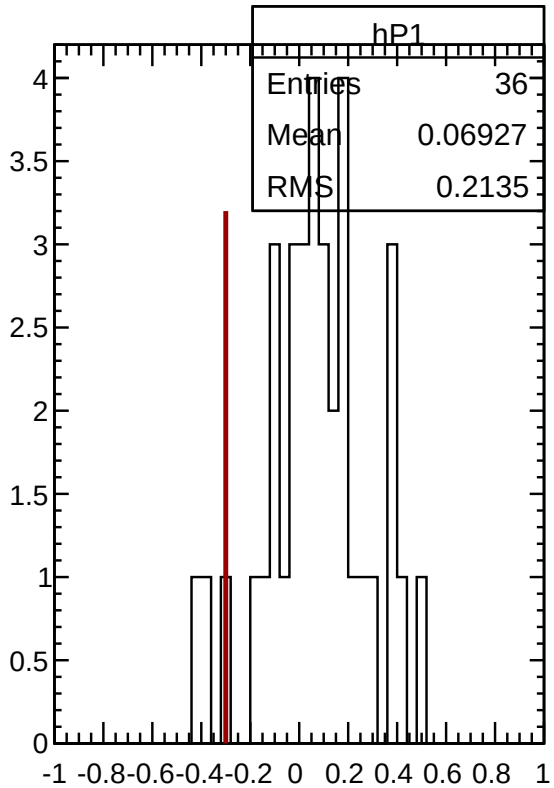
Red line is input value

Fit results for all toys Bin 2: cocktail fit

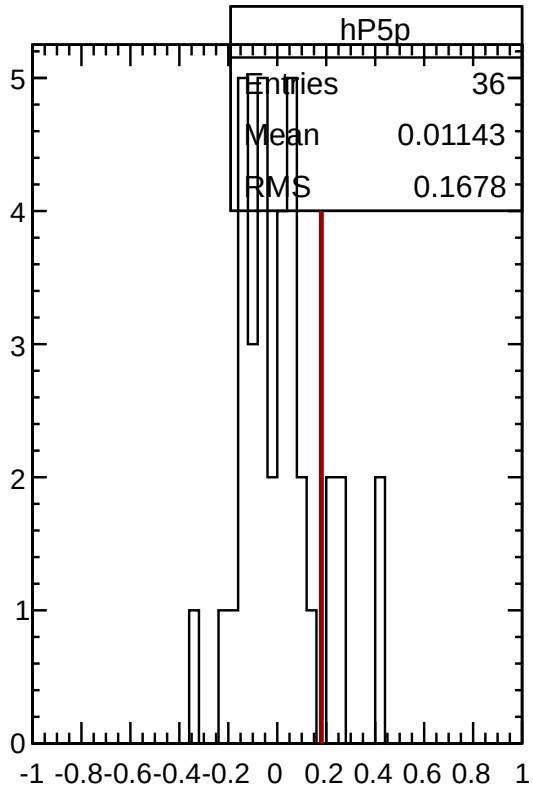
Scan initial values for a given toy MC



F_L^{in}=0.611



P_1^{in}=-0.300

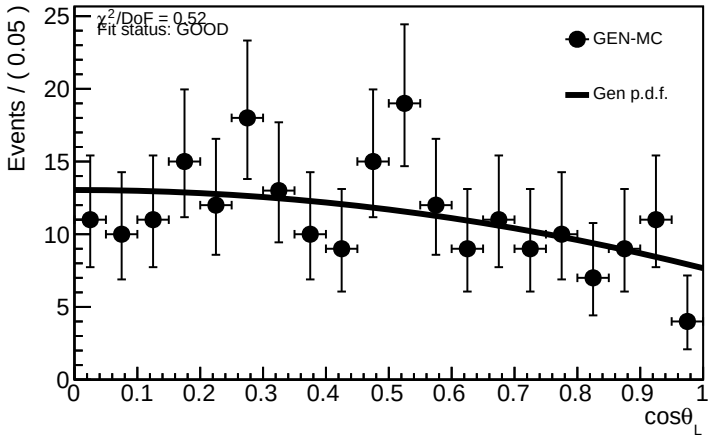


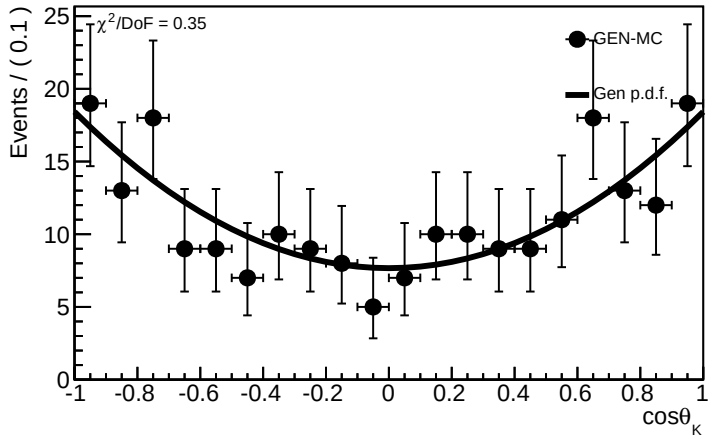
P'^{in}_5=0.180

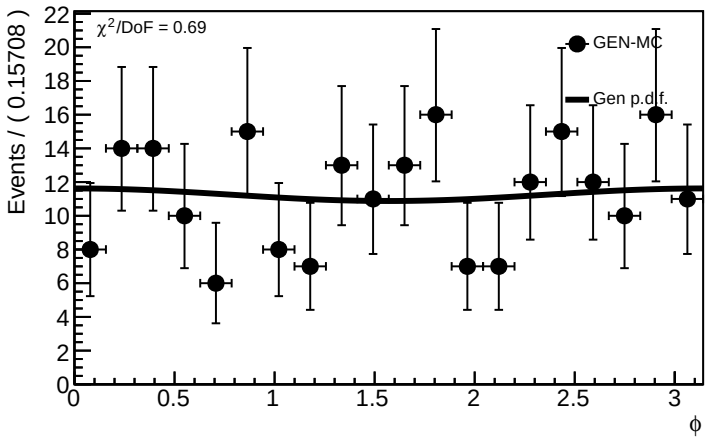
Red line is input value

LHCb-values Toy MC Bin 3 GEN-level fit

Fit example for one toy

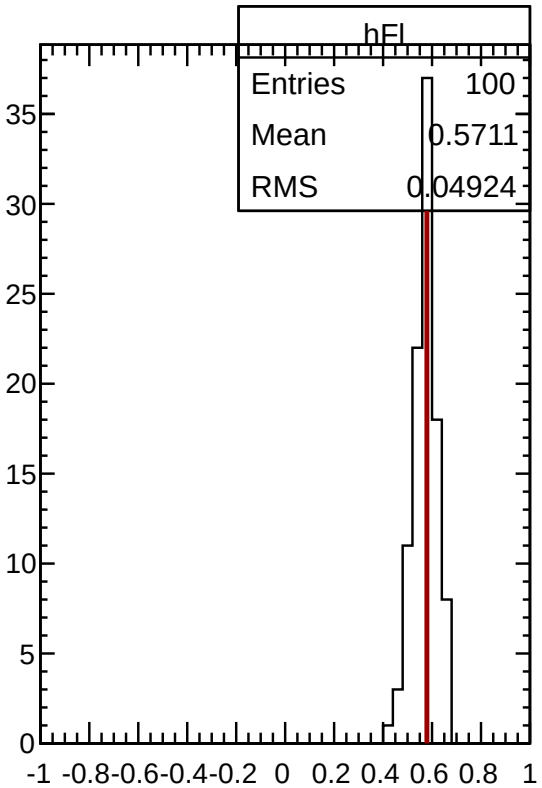


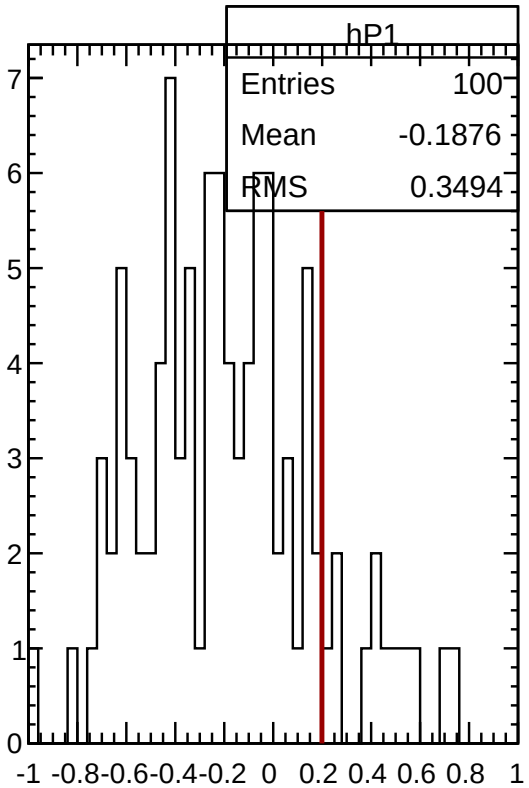


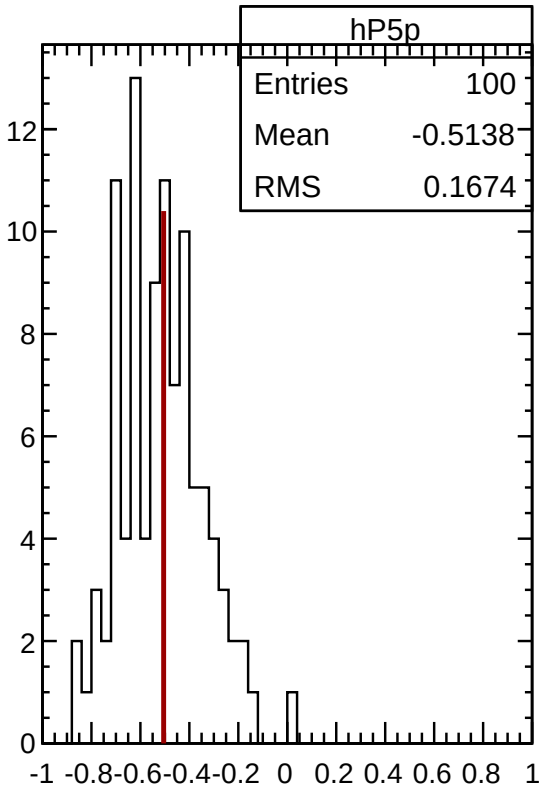


Fit results for all toys Bin 3: GEN-level fit

Fit 100 Toy MC with random initial value



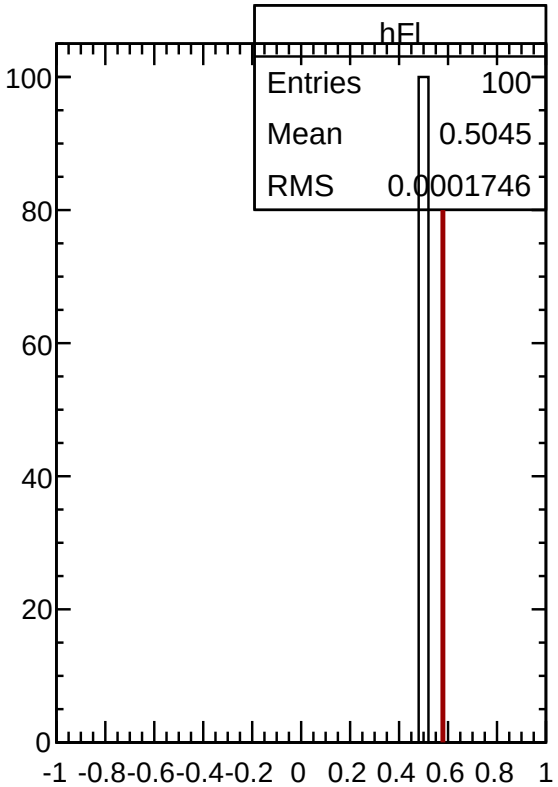




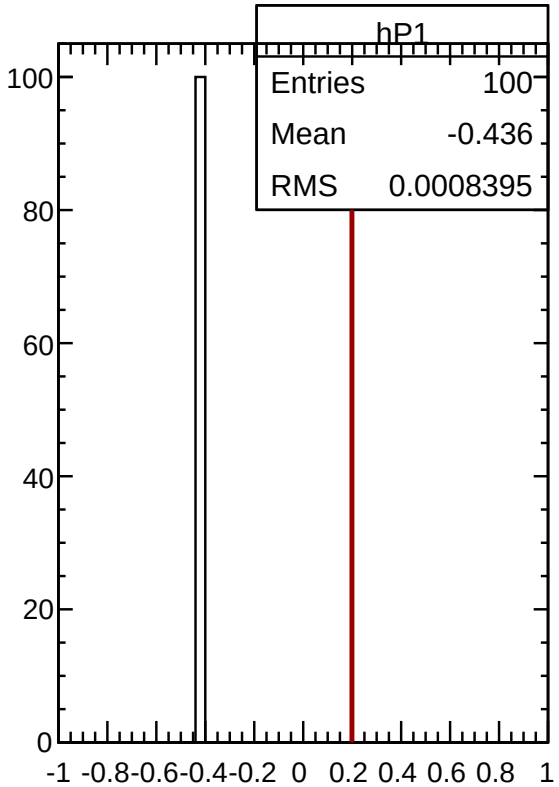
Red line is input value

Fit results for all toys Bin 3: GEN-level fit

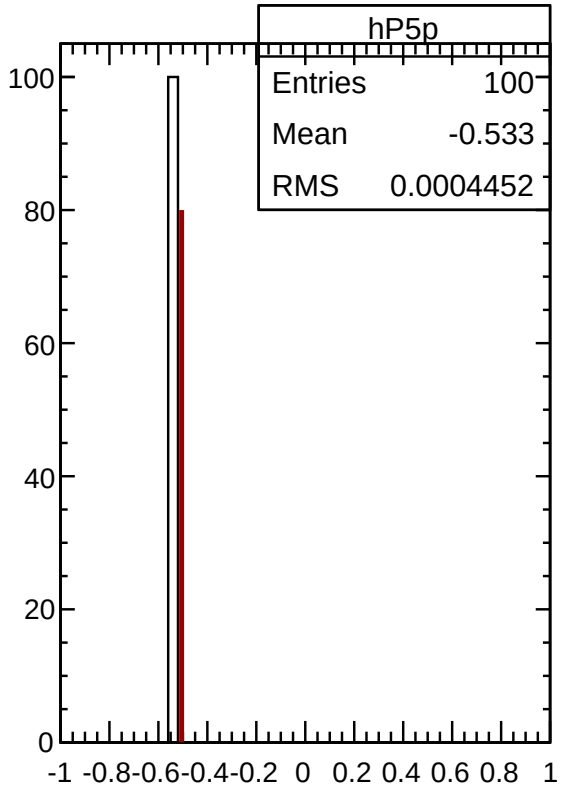
Scan initial values for a given toy MC



F_L^{in}=0.579



P_1^{in}=0.199

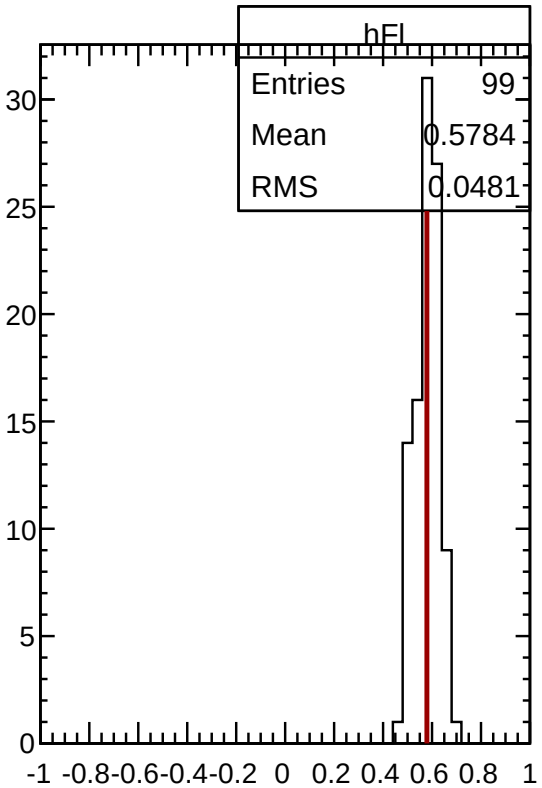


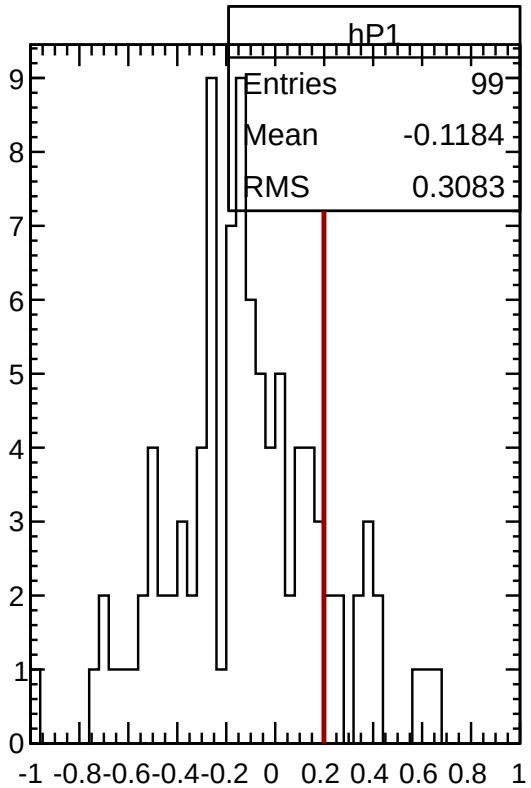
P'^{in}_5=-0.505

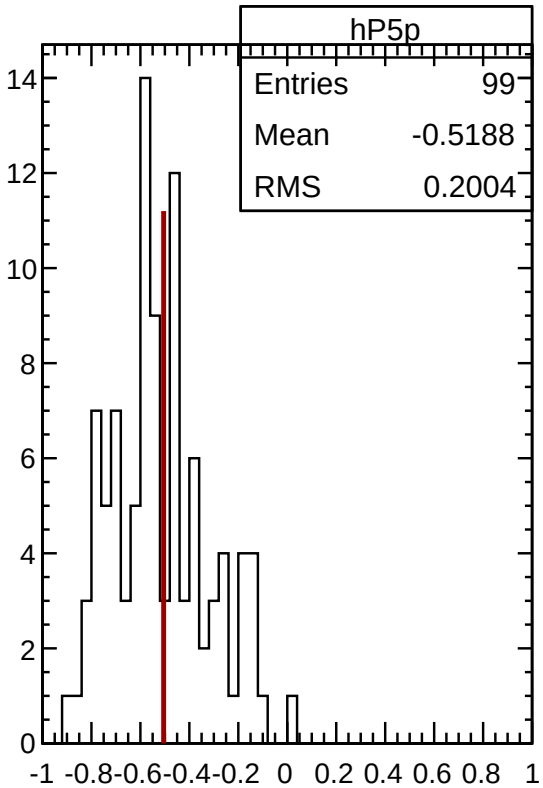
Red line is input value

Fit results for all toys Bin 3: RECO-level fit

Fit 100 Toy MC with random initial value



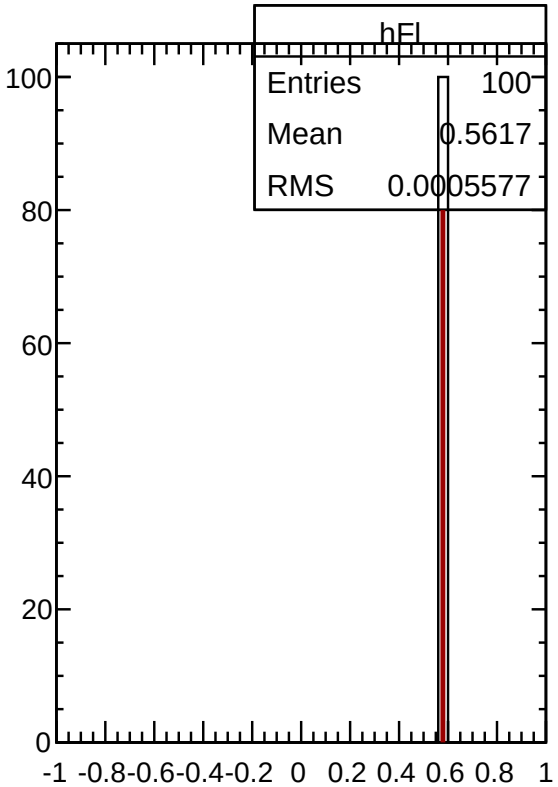


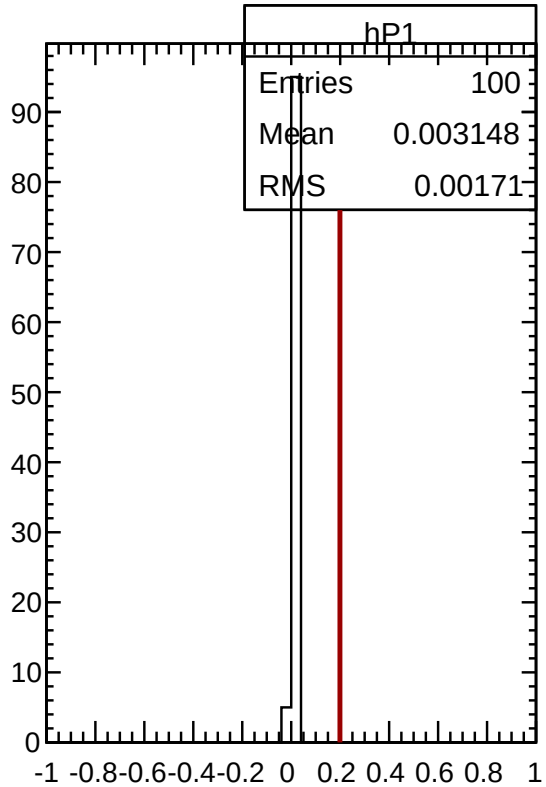


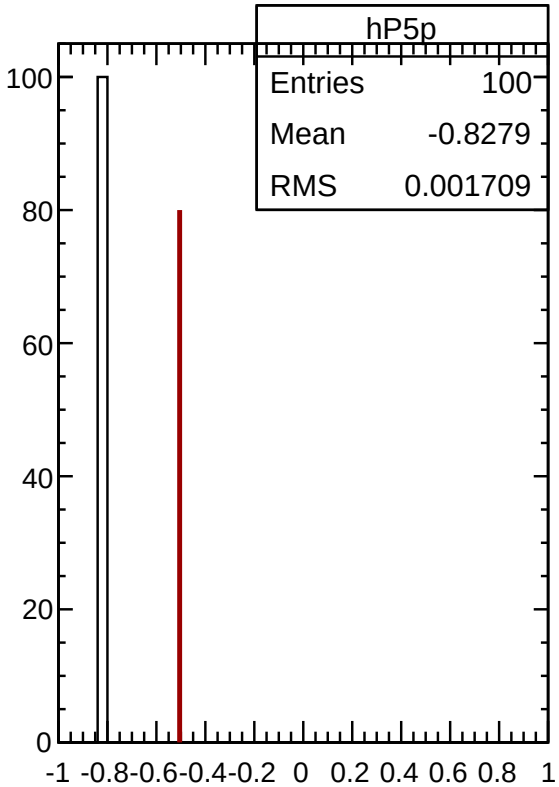
Red line is input value

Fit results for all toys Bin 3: RECO-level fit

Scan initial values for a given toy MC



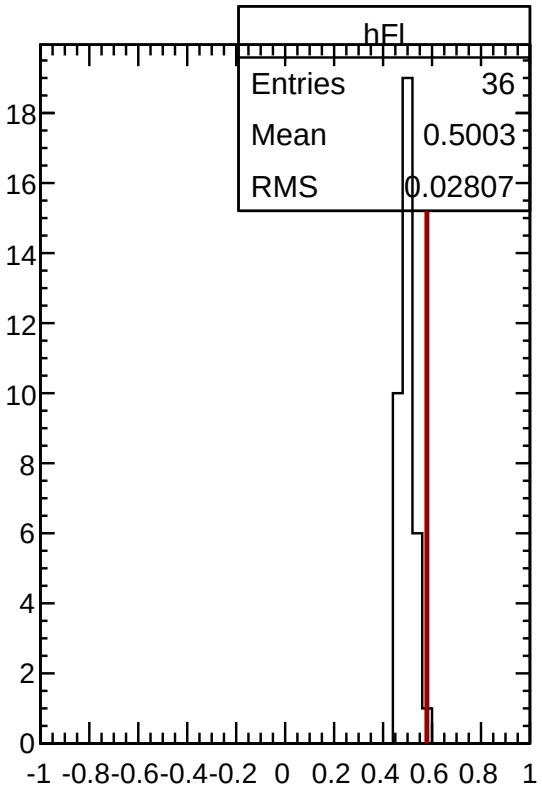


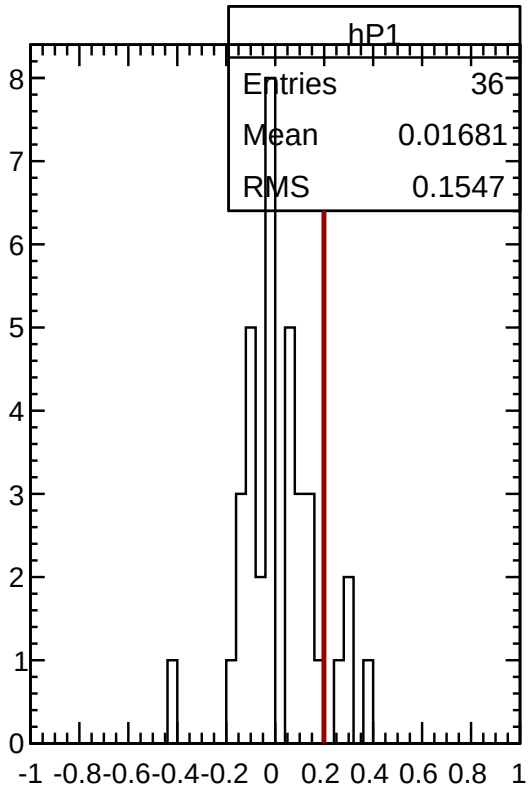


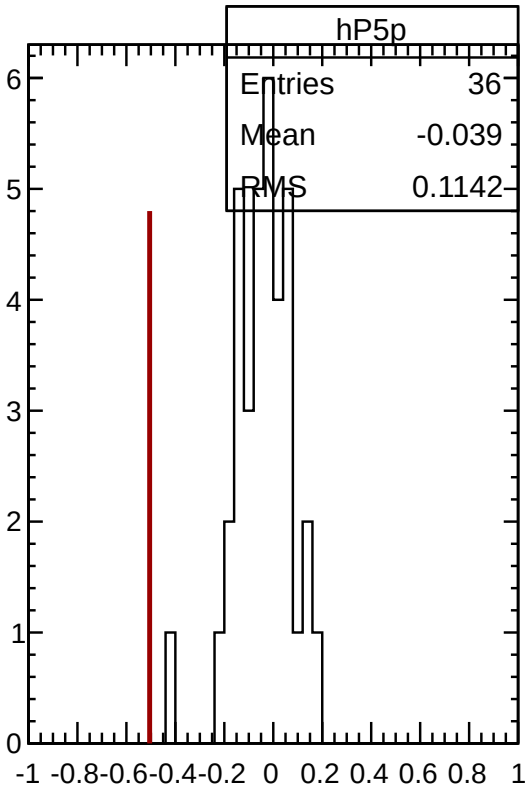
Red line is input value

Fit results for all toys Bin 3: cocktail fit

Fit 100 Toy MC with random initial value



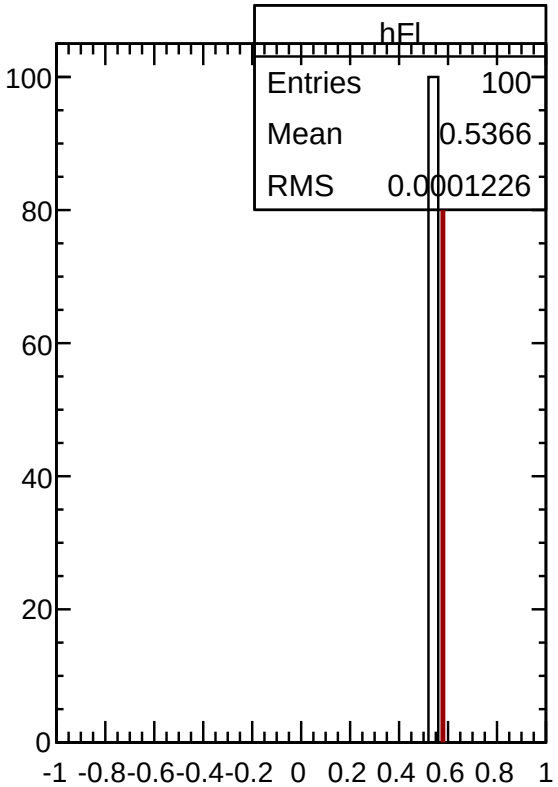




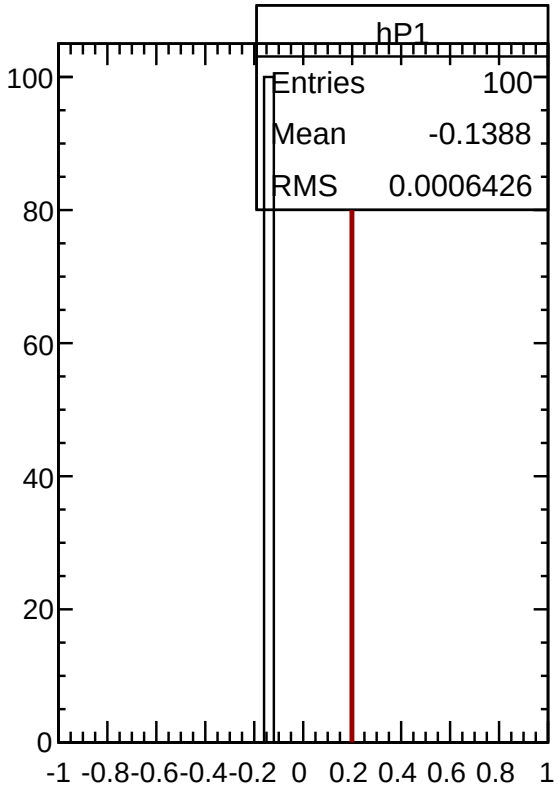
Red line is input value

Fit results for all toys Bin 3: cocktail fit

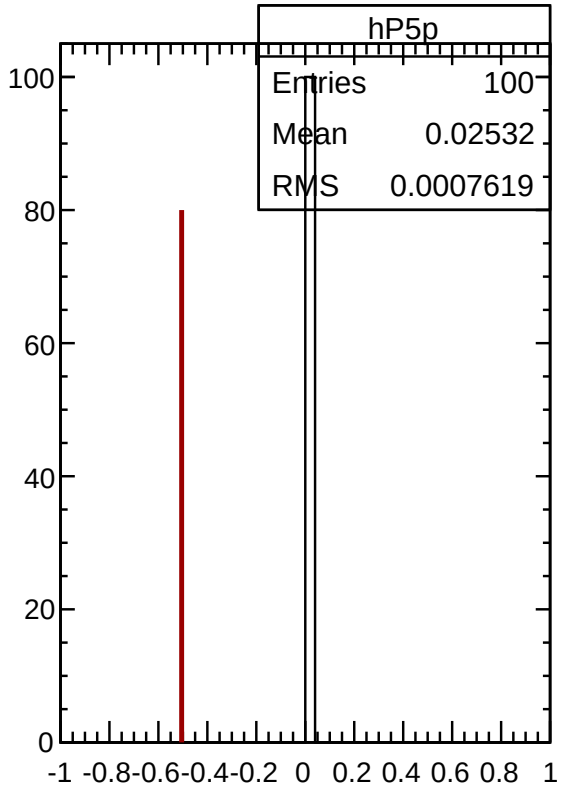
Scan initial values for a given toy MC



F_L^{in}=0.579



P_1^{in}=0.199

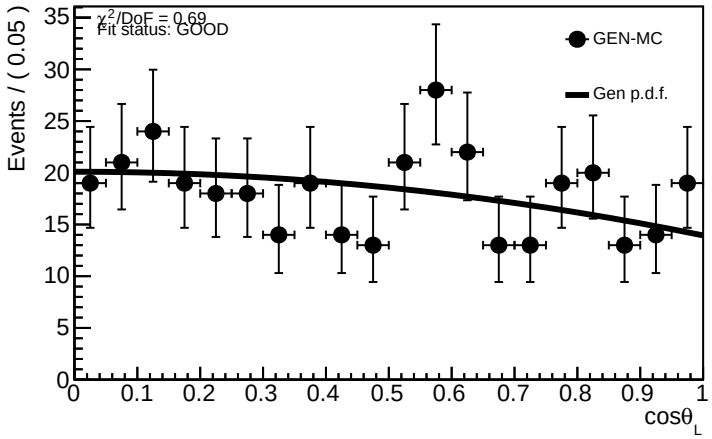


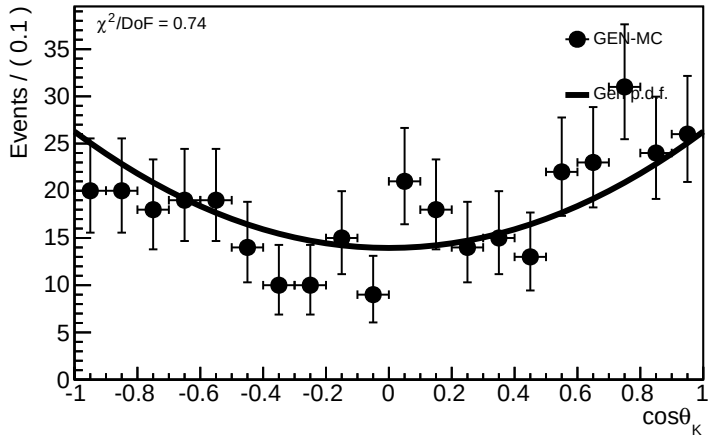
P'^{in}_5=-0.505

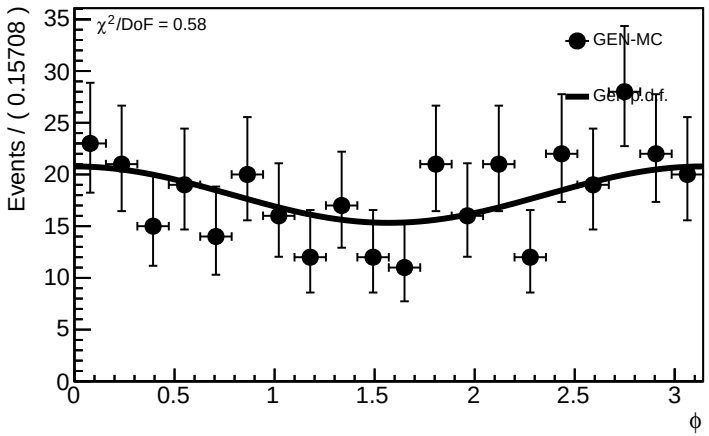
Red line is input value

LHCb-values Toy MC Bin 5 GEN-level fit

Fit example for one toy

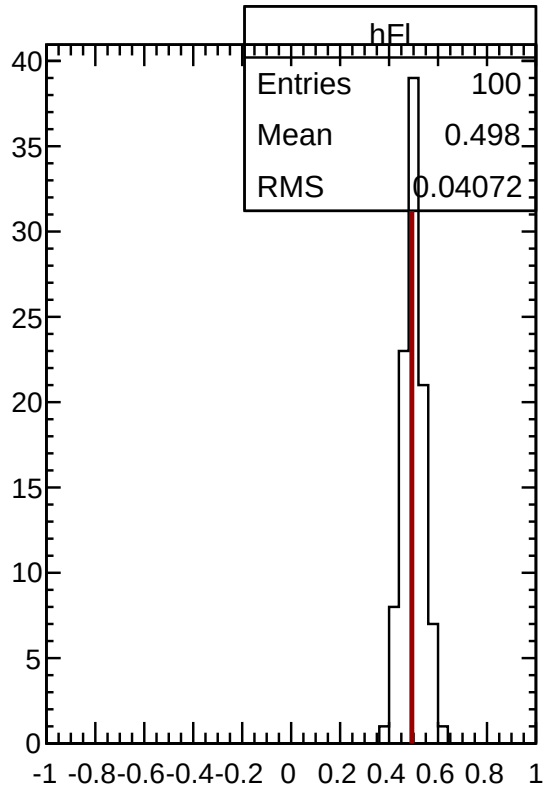


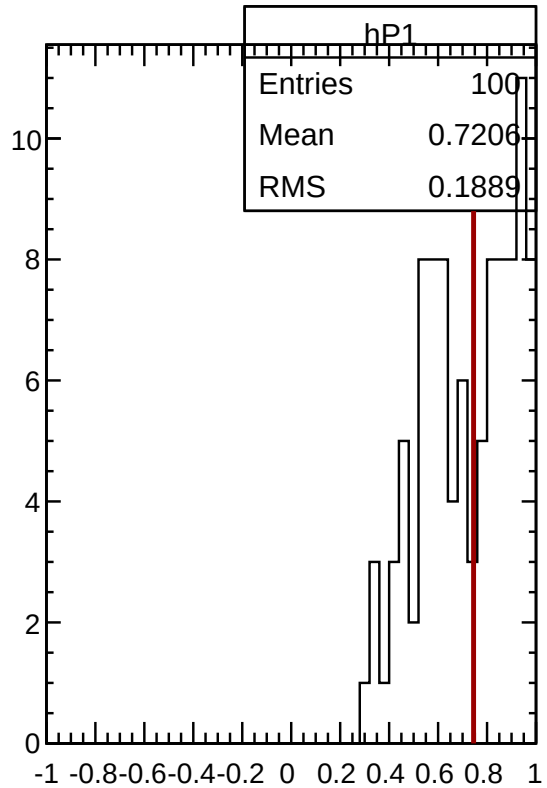


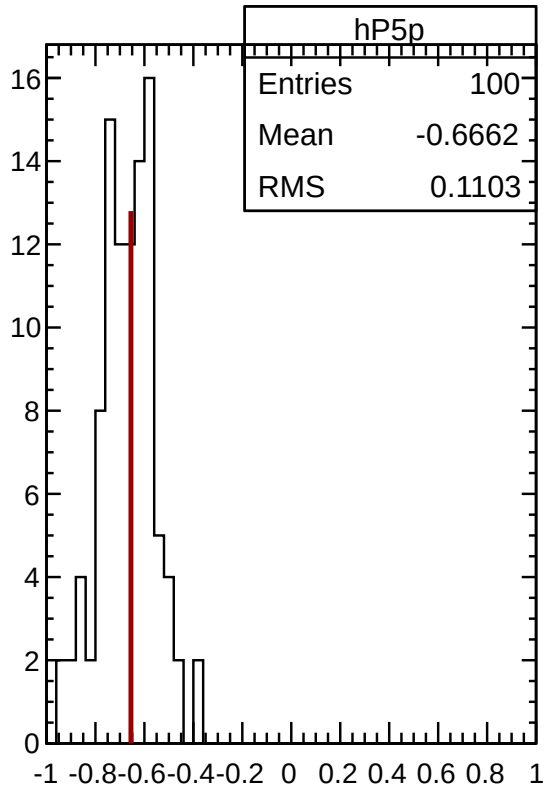


Fit results for all toys Bin 5: GEN-level fit

Fit 100 Toy MC with random initial value



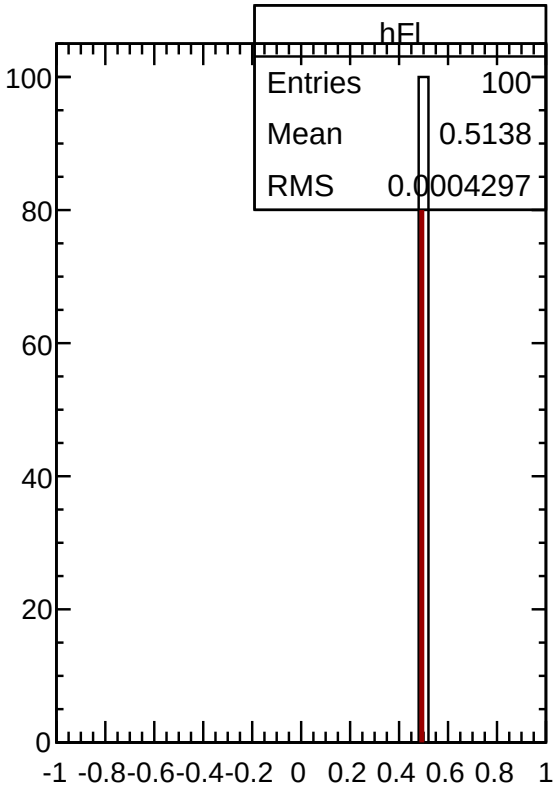




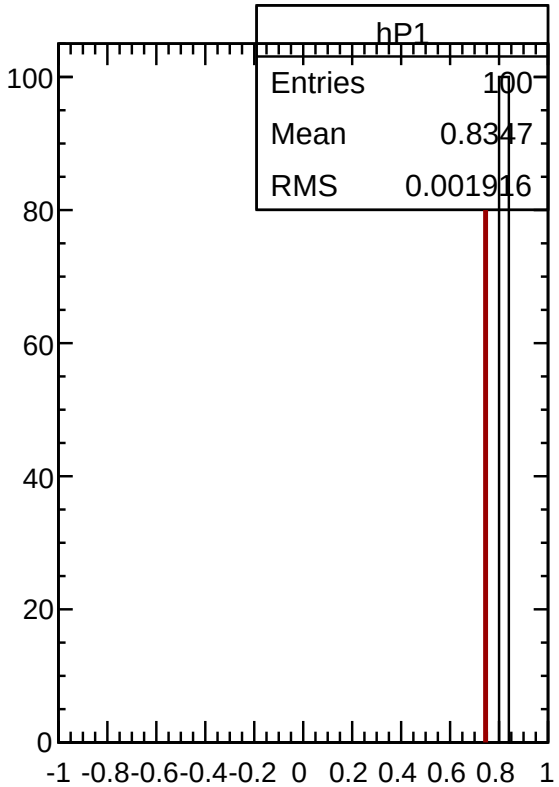
Red line is input value

Fit results for all toys Bin 5: GEN-level fit

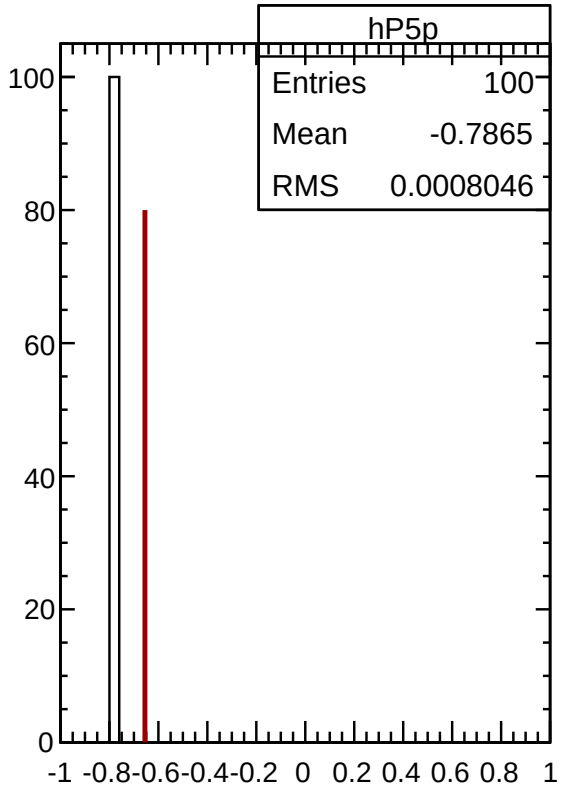
Scan initial values for a given toy MC



F_L^{in}=0.493



P_1^{in}=0.745

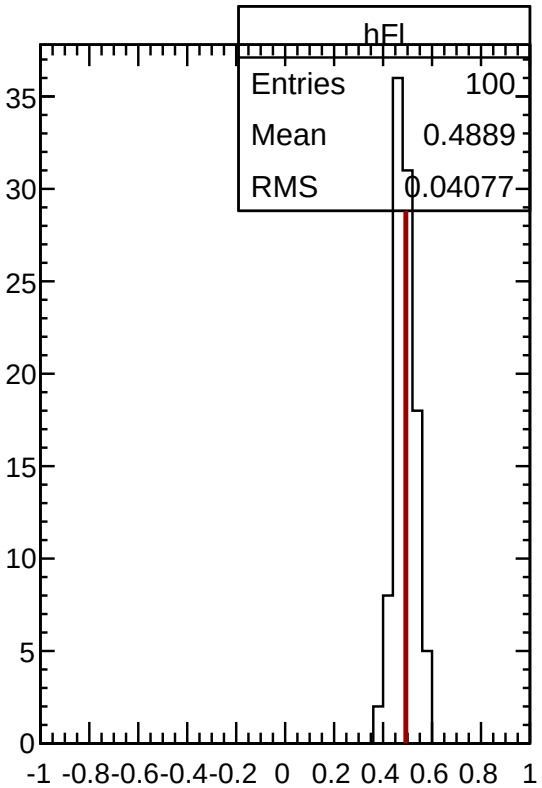


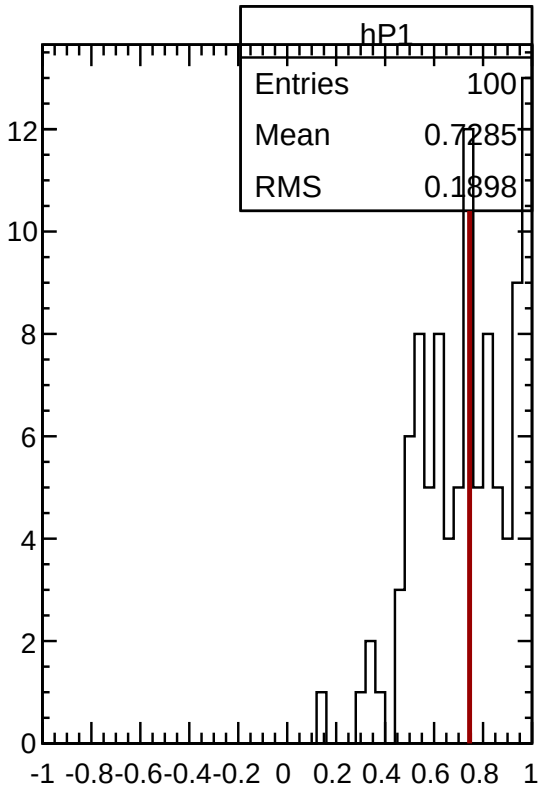
P'^{in}_5=-0.655

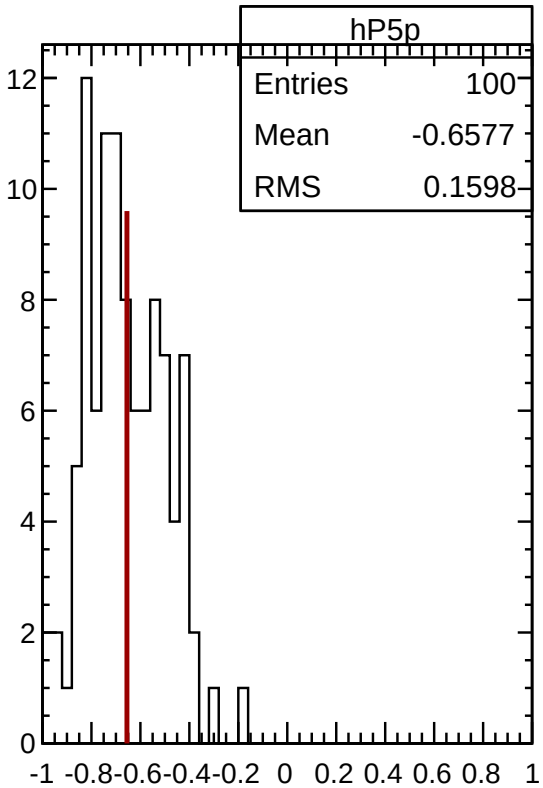
Red line is input value

Fit results for all toys Bin 5: RECO-level fit

Fit 100 Toy MC with random initial value



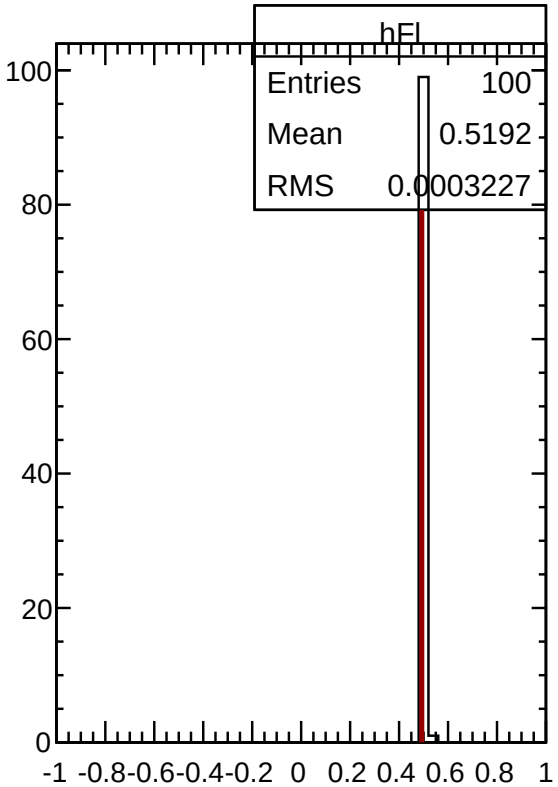




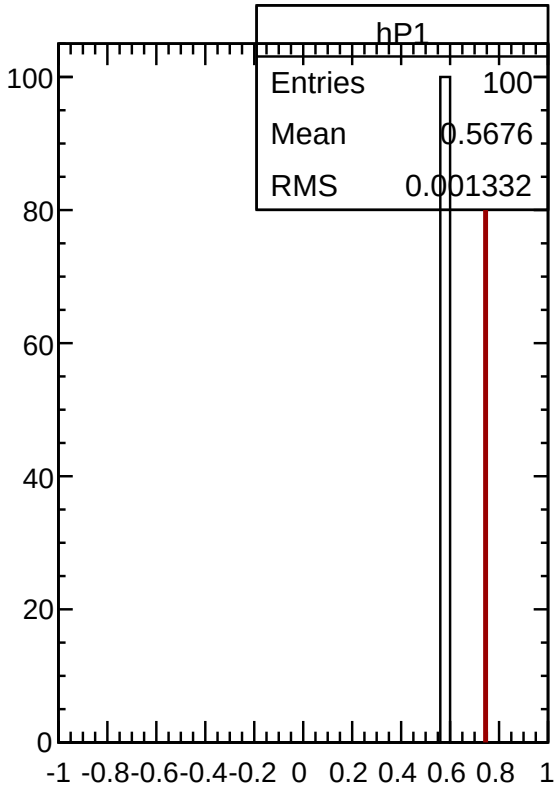
Red line is input value

Fit results for all toys Bin 5: RECO-level fit

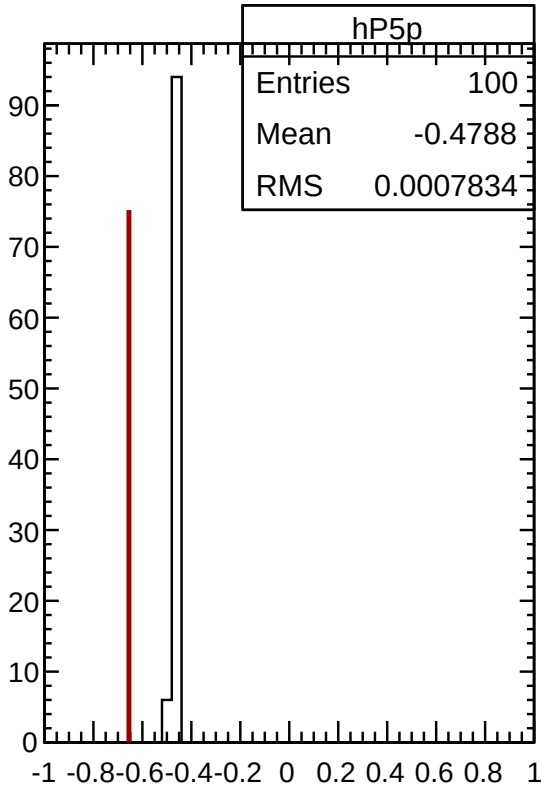
Scan initial values for a given toy MC



F_L^{in}=0.493



P_1^{in}=0.745

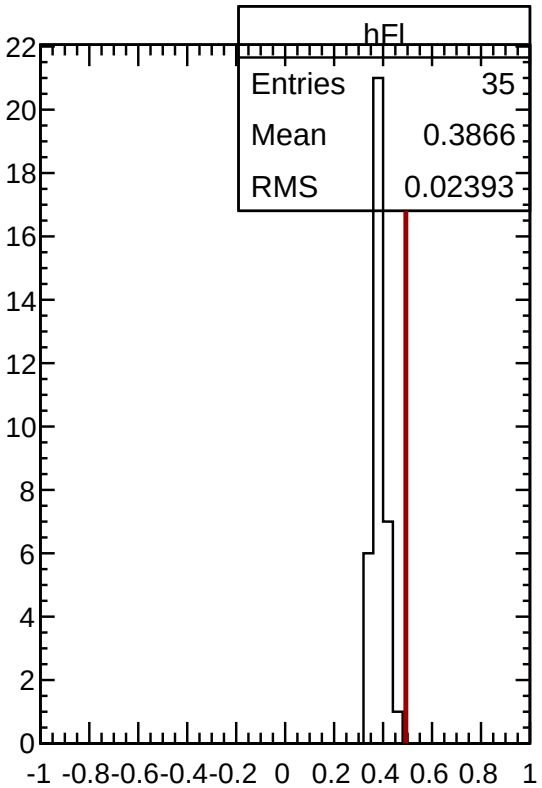


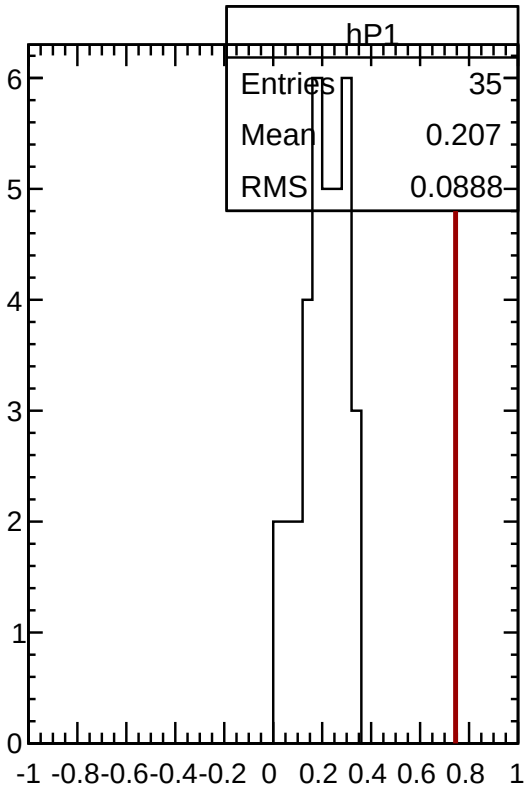
P'^{in}_5=-0.655

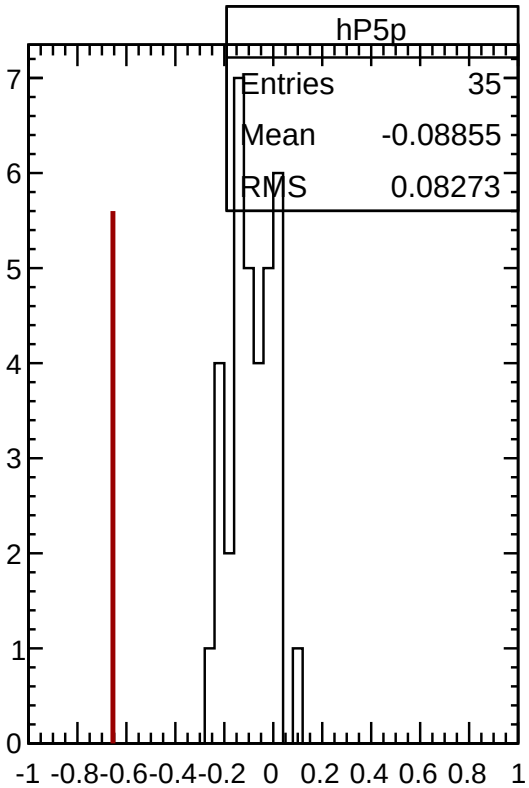
Red line is input value

Fit results for all toys Bin 5: cocktail fit

Fit 100 Toy MC with random initial value



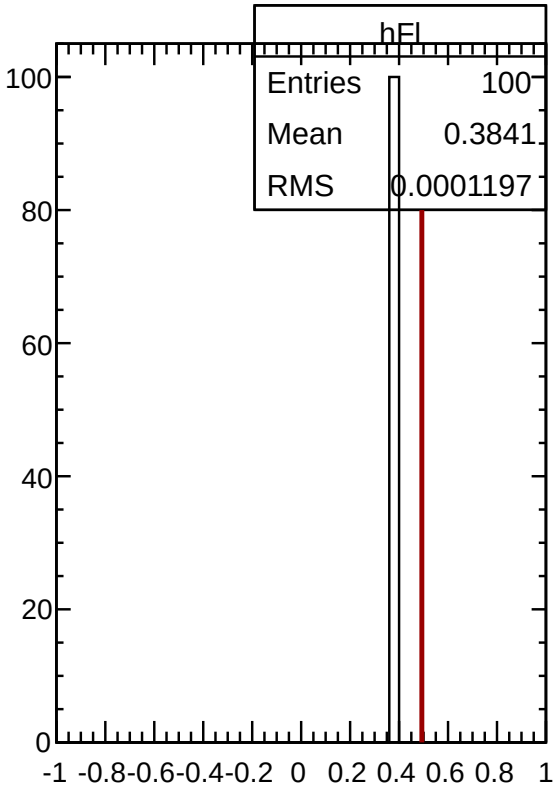




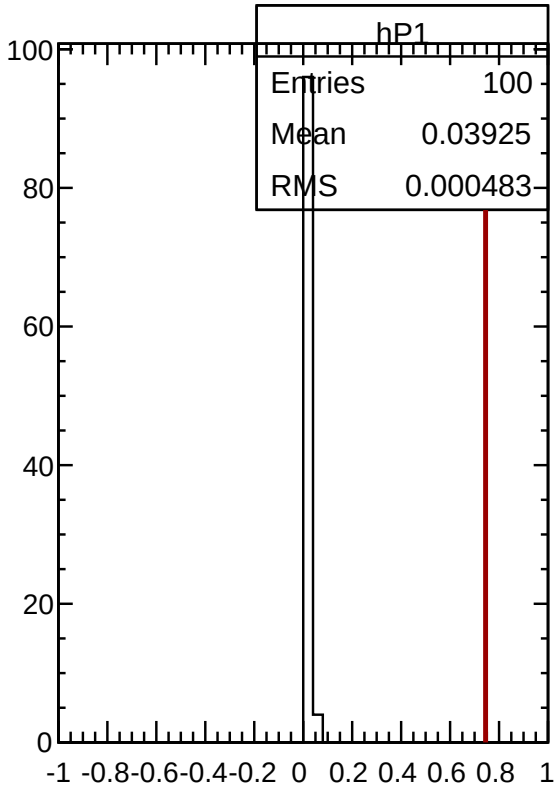
Red line is input value

Fit results for all toys Bin 5: cocktail fit

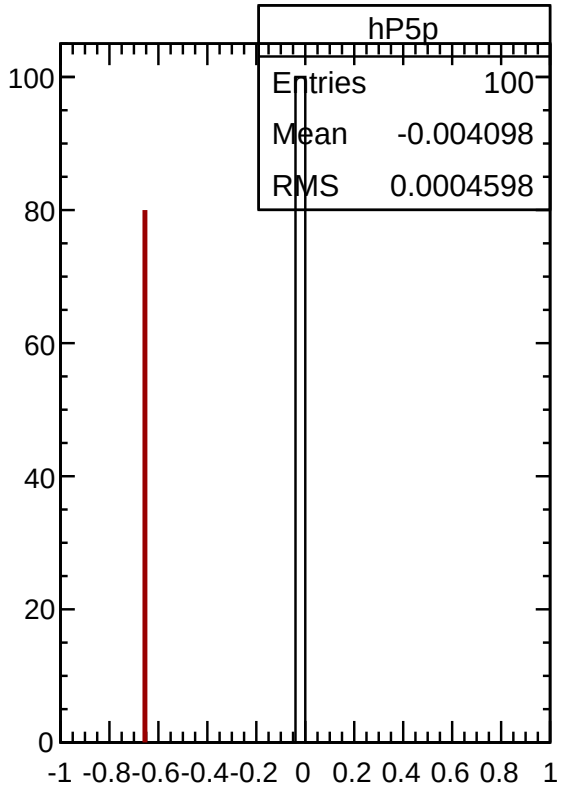
Scan initial values for a given toy MC



$F_L^{in}=0.493$



$P_1^{in}=0.745$

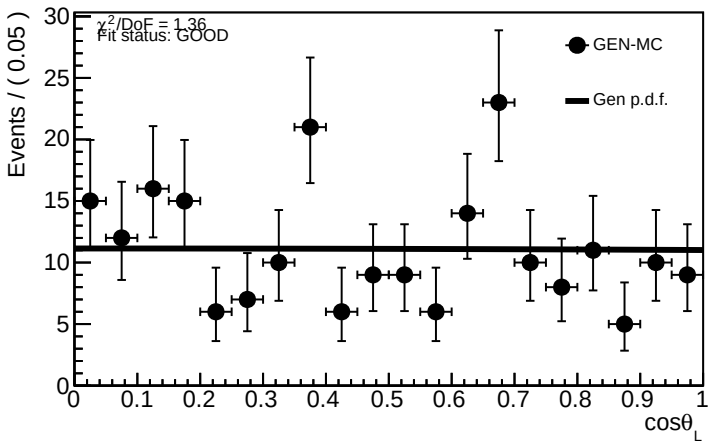


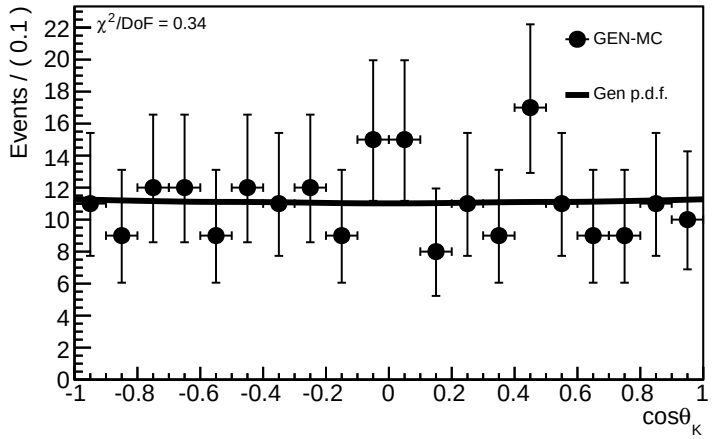
$P_5'^{in}=-0.655$

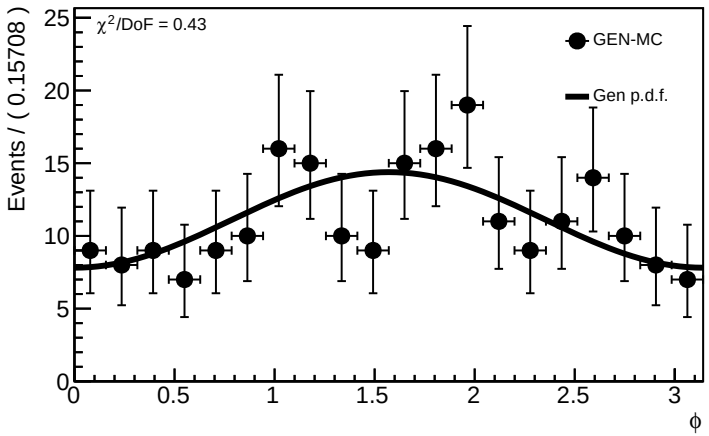
Red line is input value

LHCb-values Toy MC Bin 7 GEN-level fit

Fit example for one toy

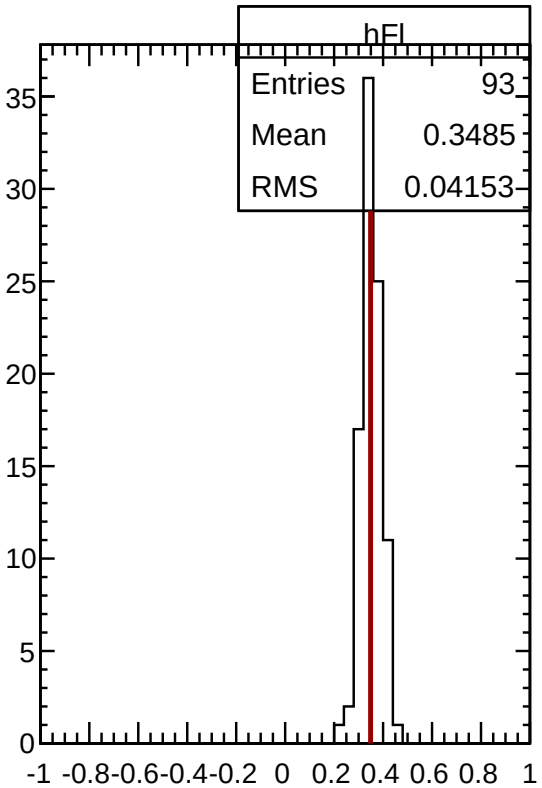


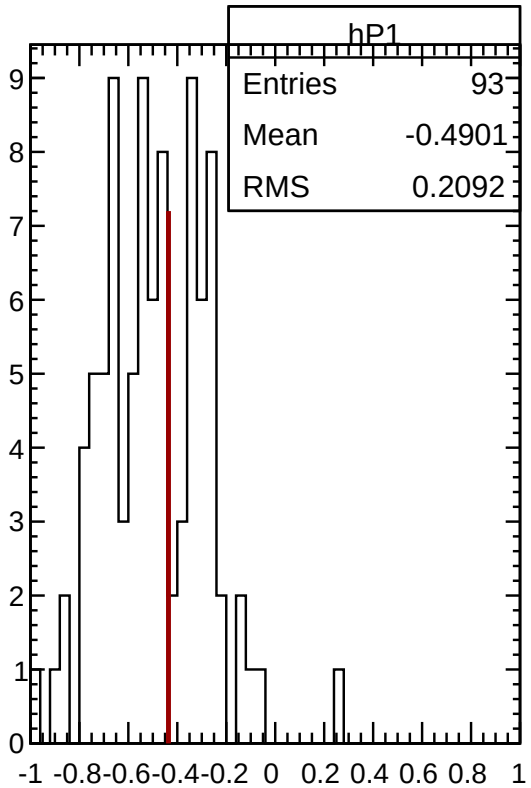


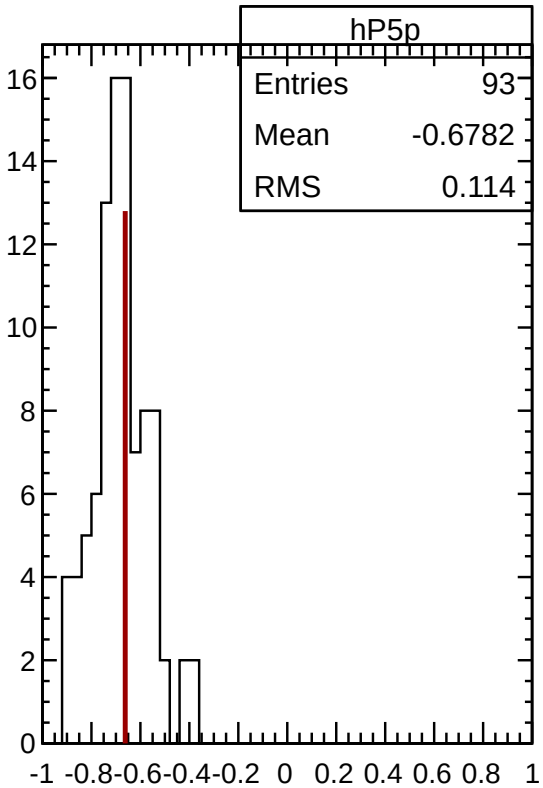


Fit results for all toys Bin 7: GEN-level fit

Fit 100 Toy MC with random initial value



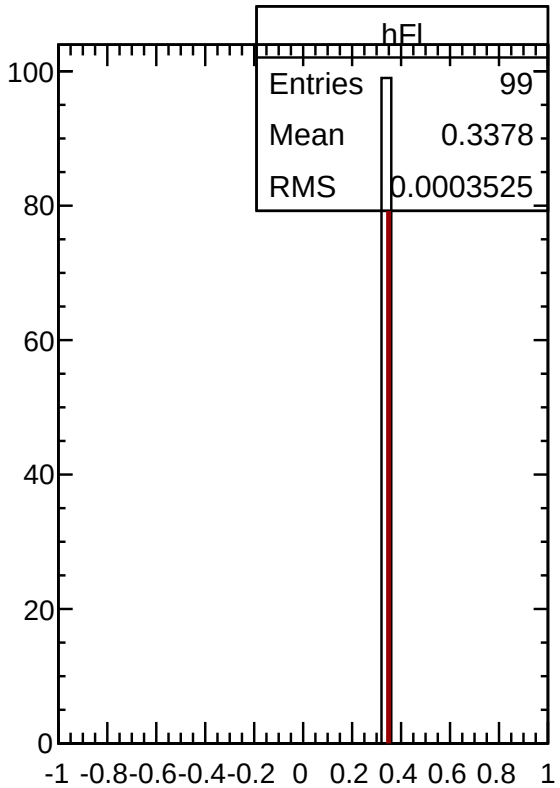




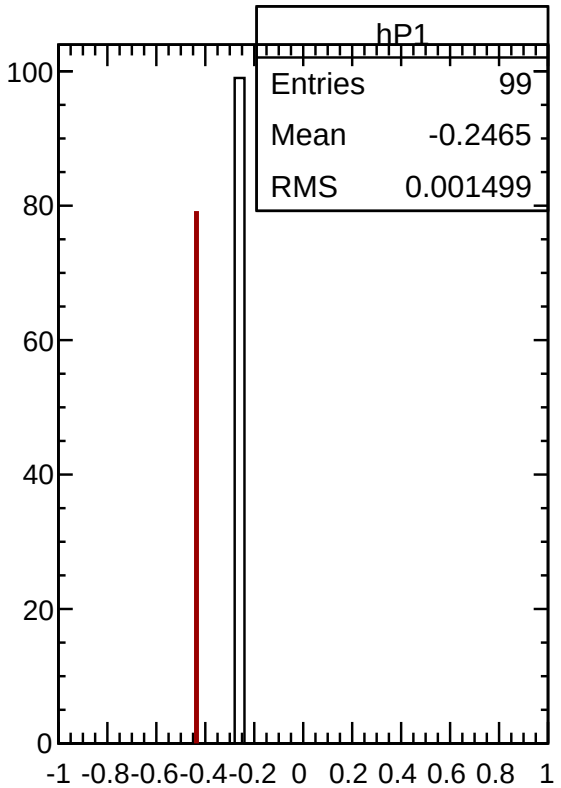
Red line is input value

Fit results for all toys Bin 7: GEN-level fit

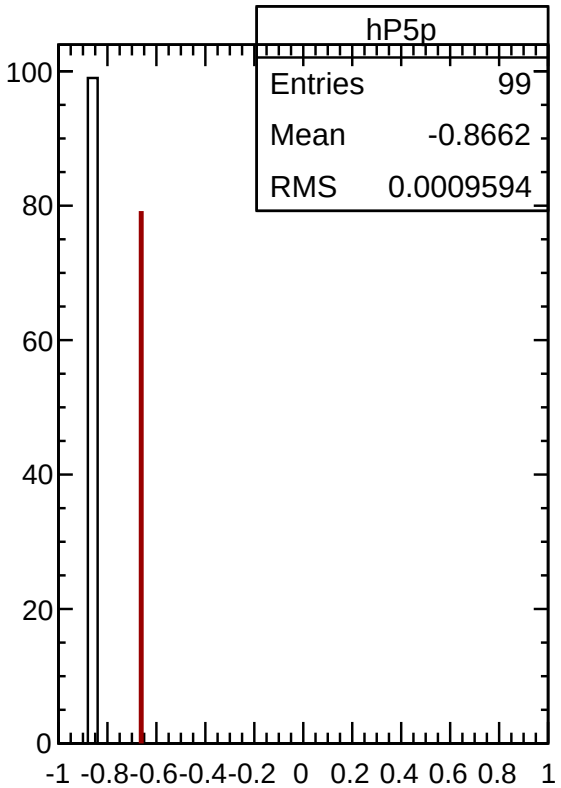
Scan initial values for a given toy MC



F_L^{in}=0.349



P_1^{in}=-0.436

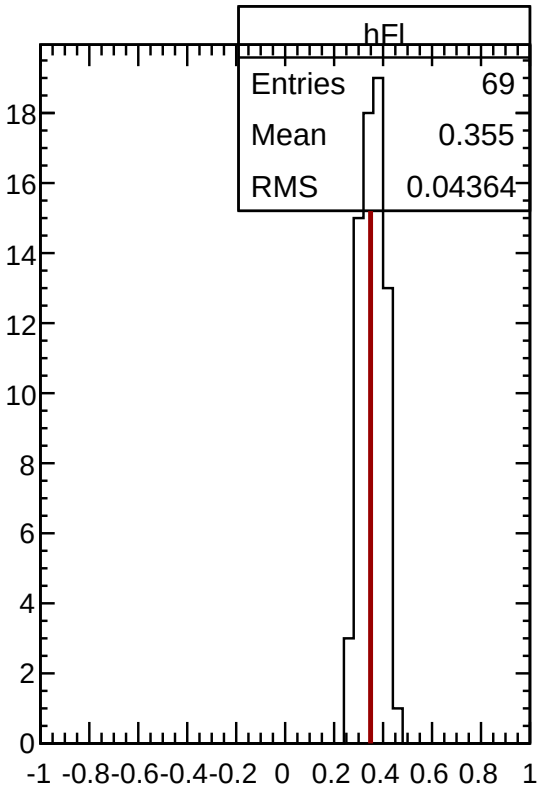


P'^{in}_5=-0.662

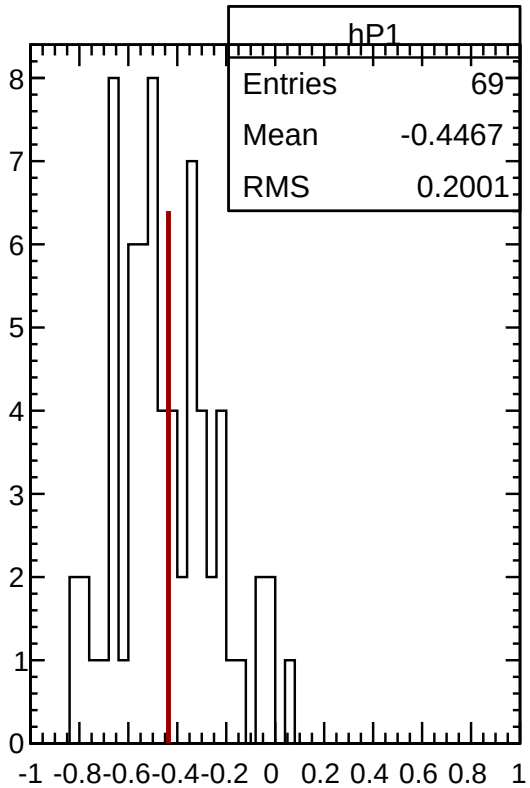
Red line is input value

Fit results for all toys Bin 7: RECO-level fit

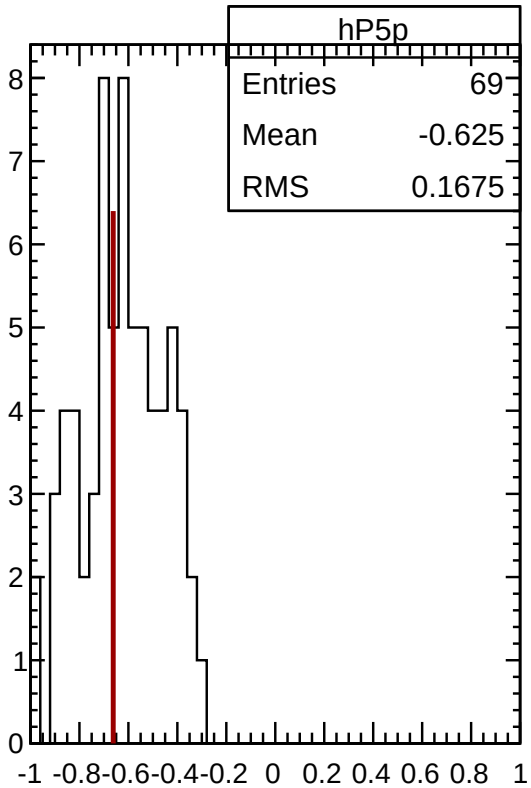
Fit 100 Toy MC with random initial value



F_L^{in}=0.349



P_1^{in}=-0.436

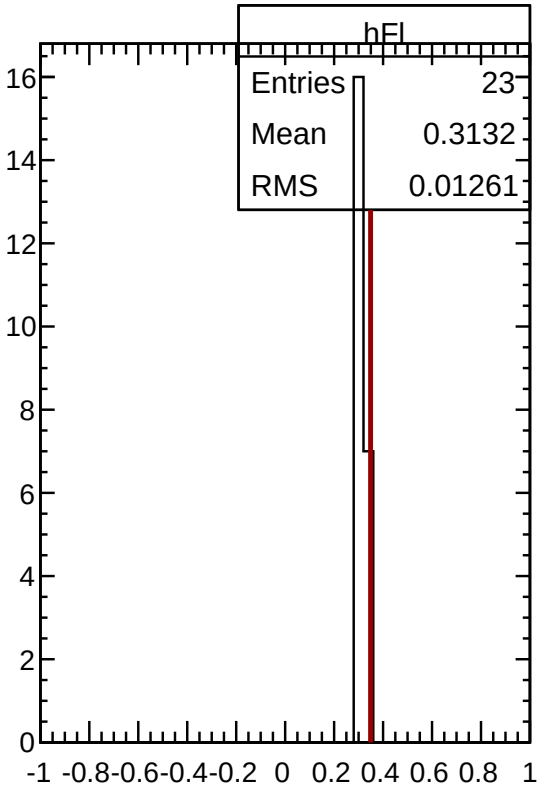


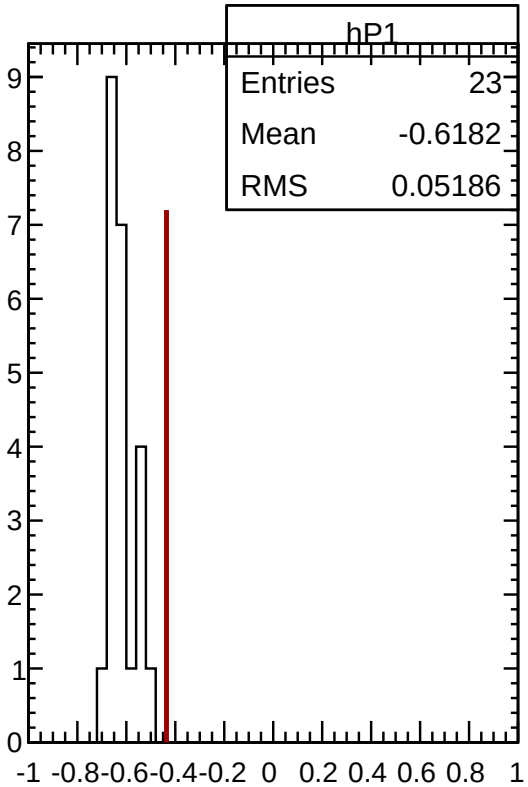
P'^{in}_5=-0.662

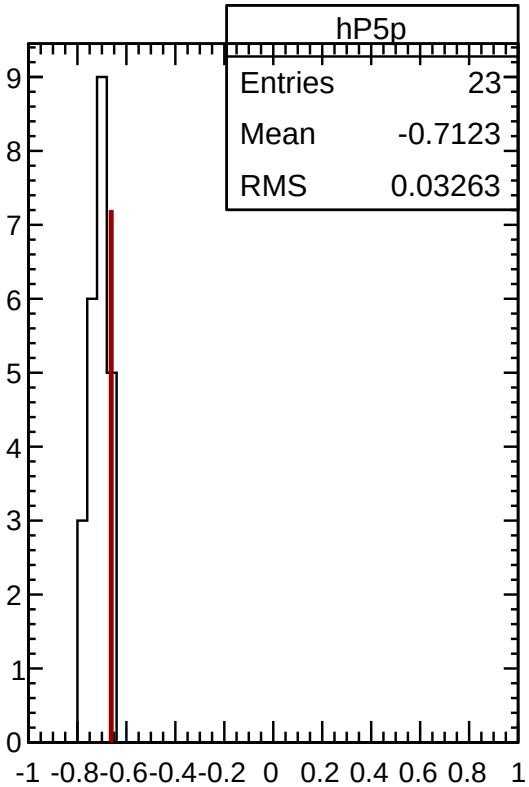
Red line is input value

Fit results for all toys Bin 7: RECO-level fit

Scan initial values for a given toy MC



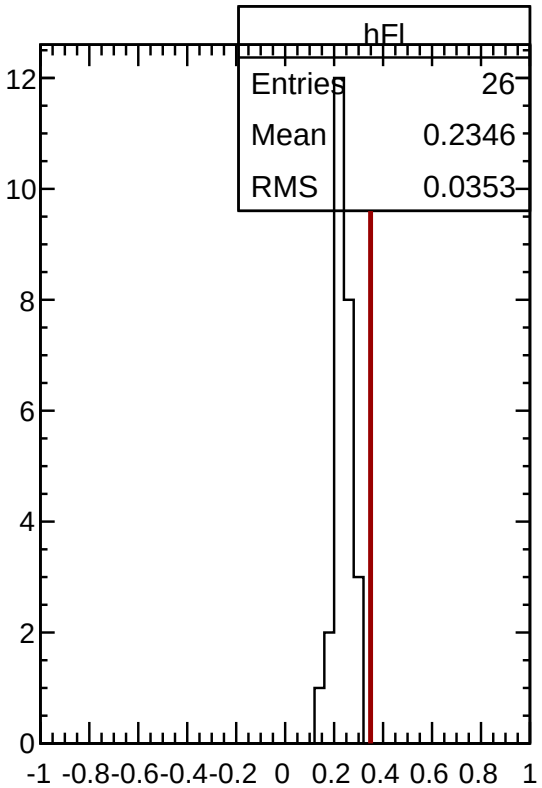




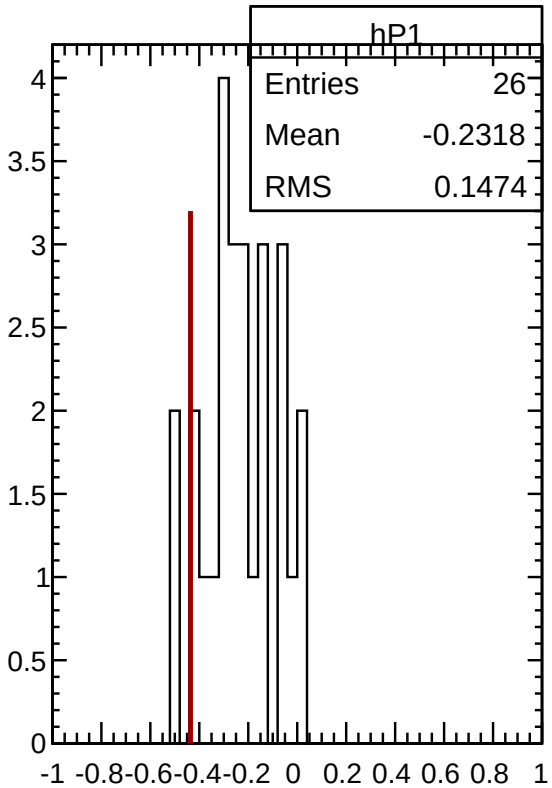
Red line is input value

Fit results for all toys Bin 7: cocktail fit

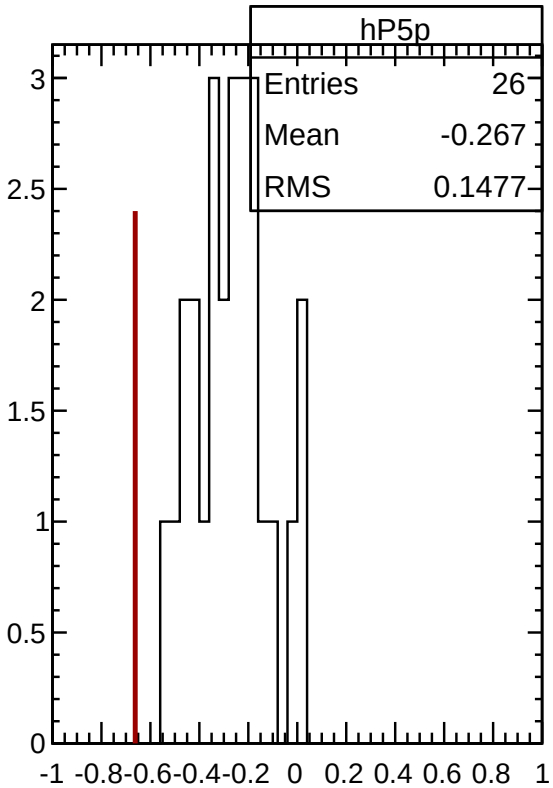
Fit 100 Toy MC with random initial value



F_L^{in}=0.349



P_1^{in}=-0.436

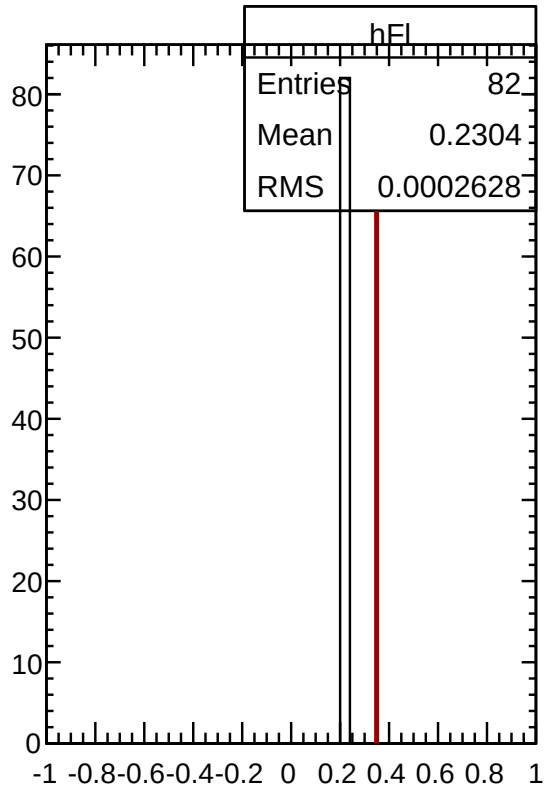


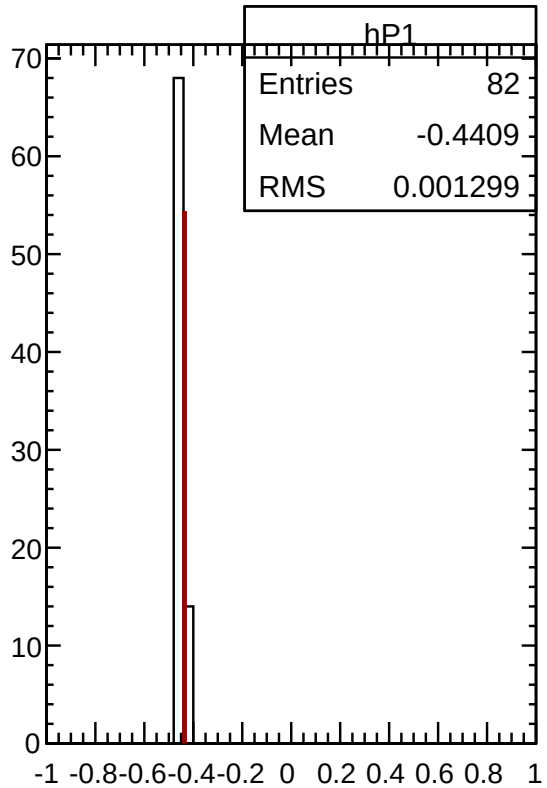
P'^{in}_5=-0.662

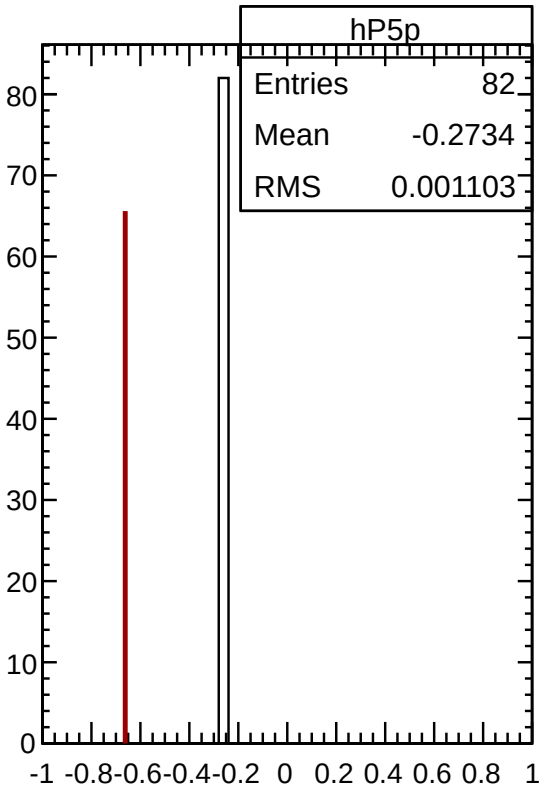
Red line is input value

Fit results for all toys Bin 7: cocktail fit

Scan initial values for a given toy MC



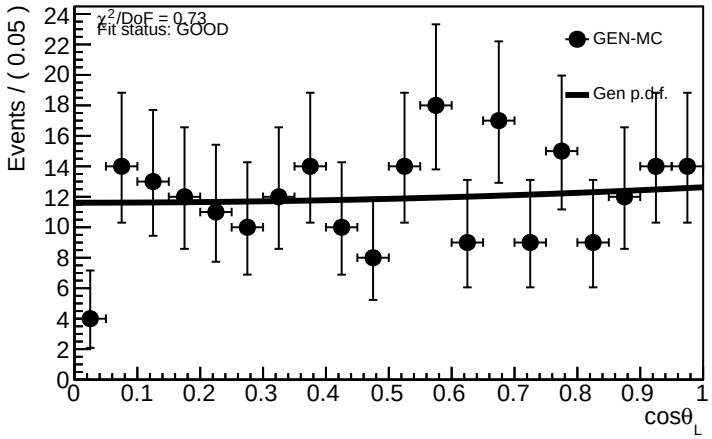


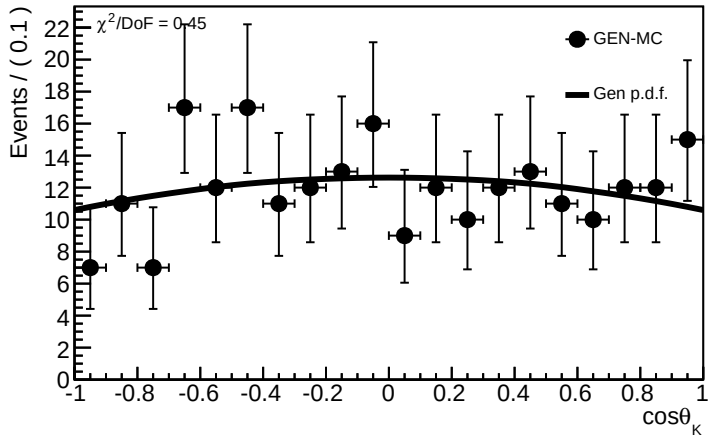


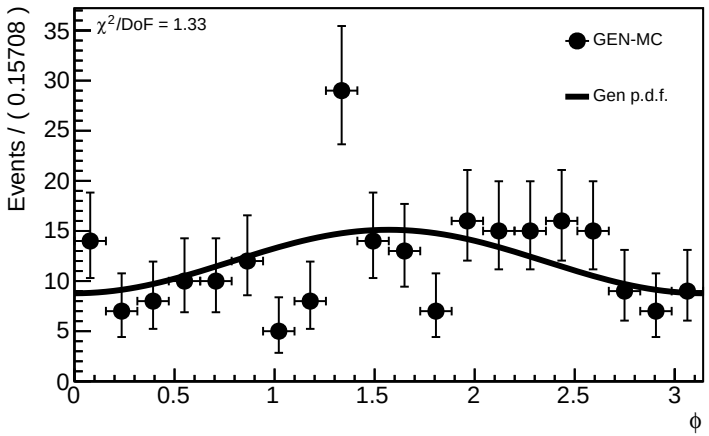
Red line is input value

LHCb-values Toy MC Bin 8 GEN-level fit

Fit example for one toy

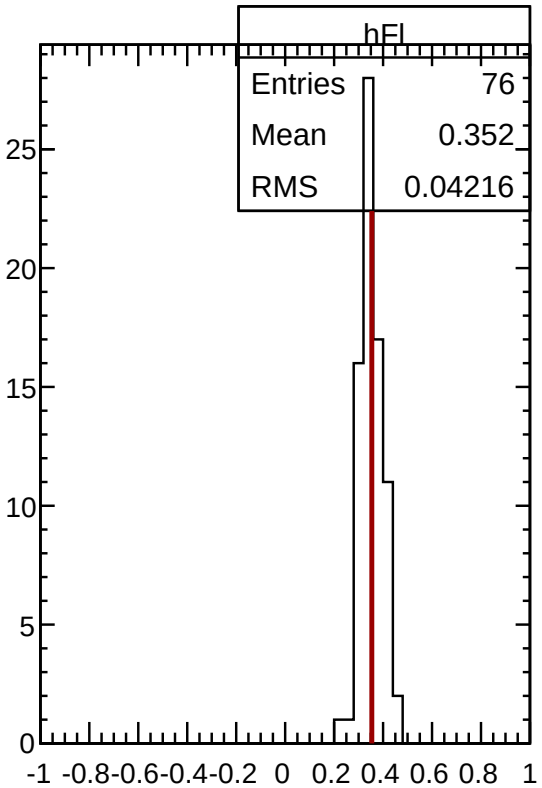


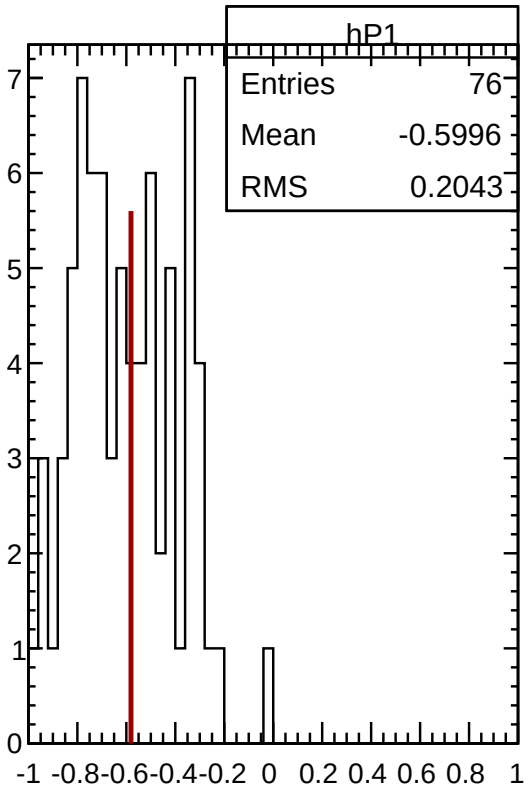


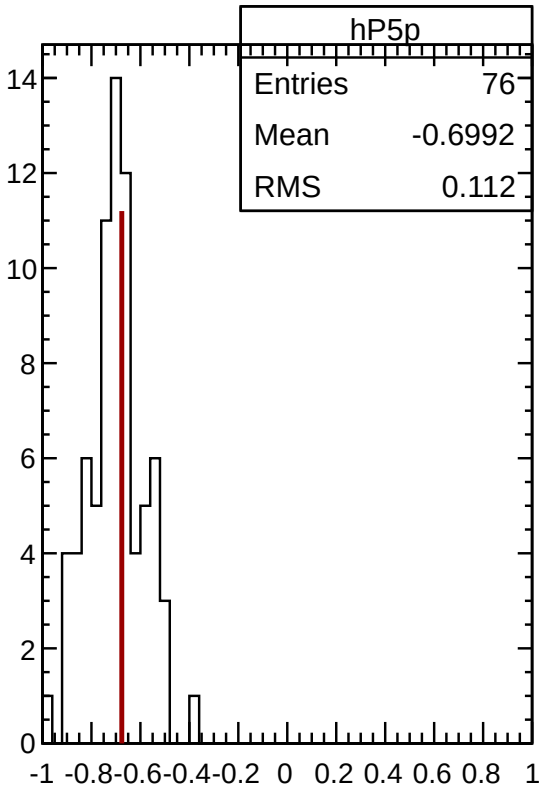


Fit results for all toys Bin 8: GEN-level fit

Fit 100 Toy MC with random initial value



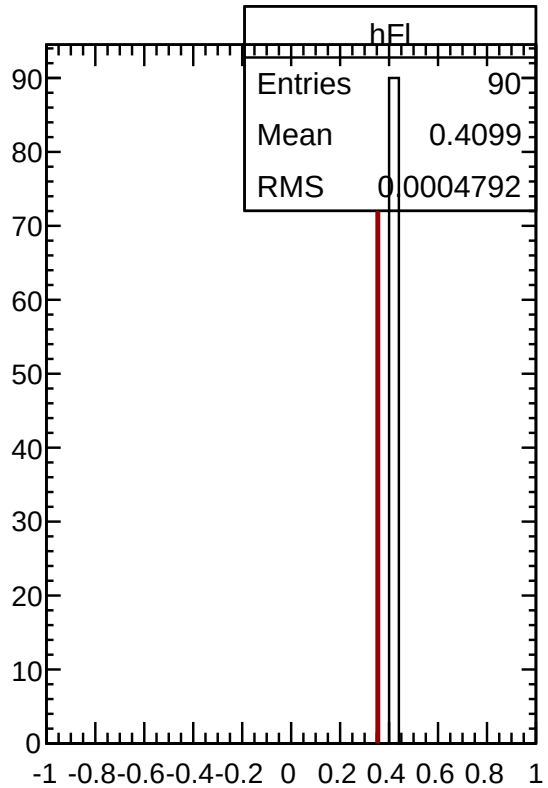


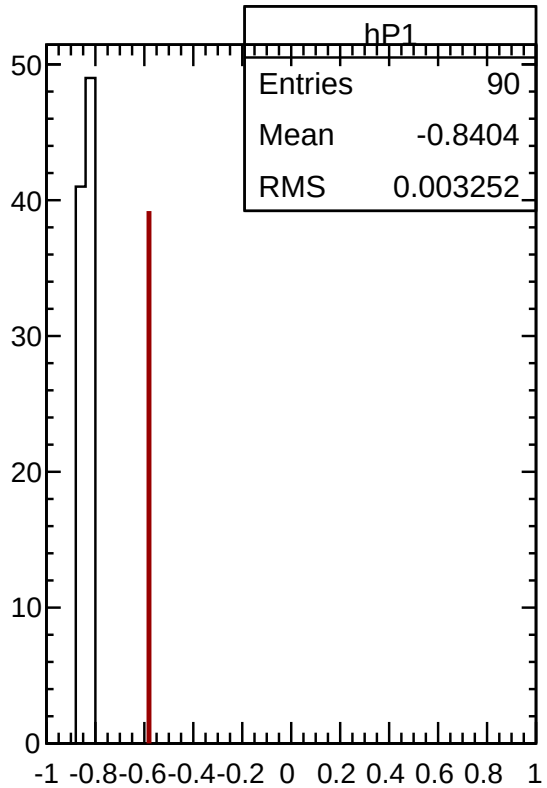


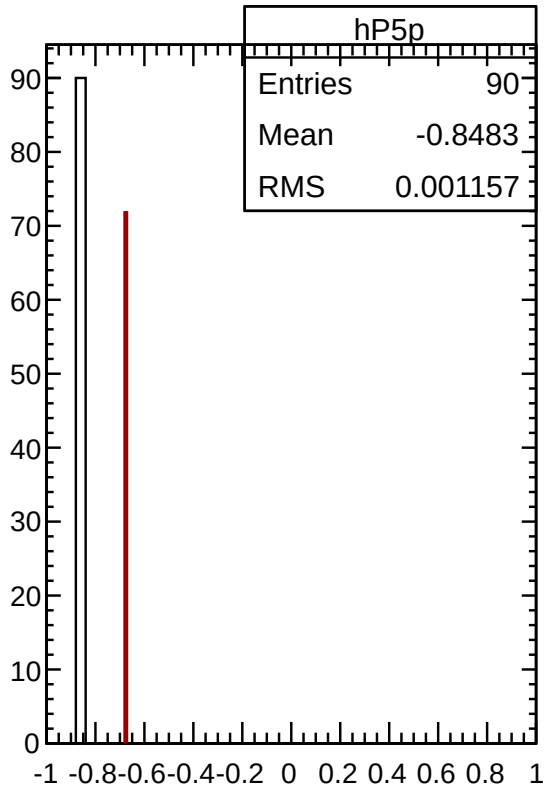
Red line is input value

Fit results for all toys Bin 8: GEN-level fit

Scan initial values for a given toy MC



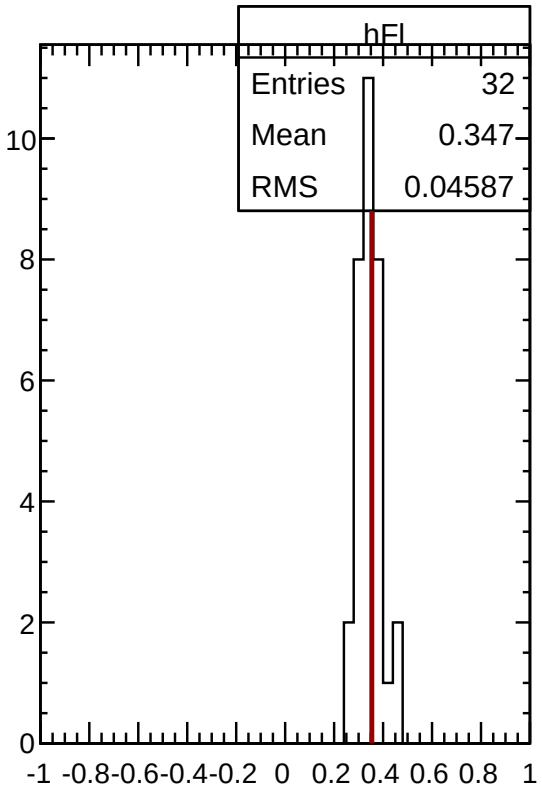


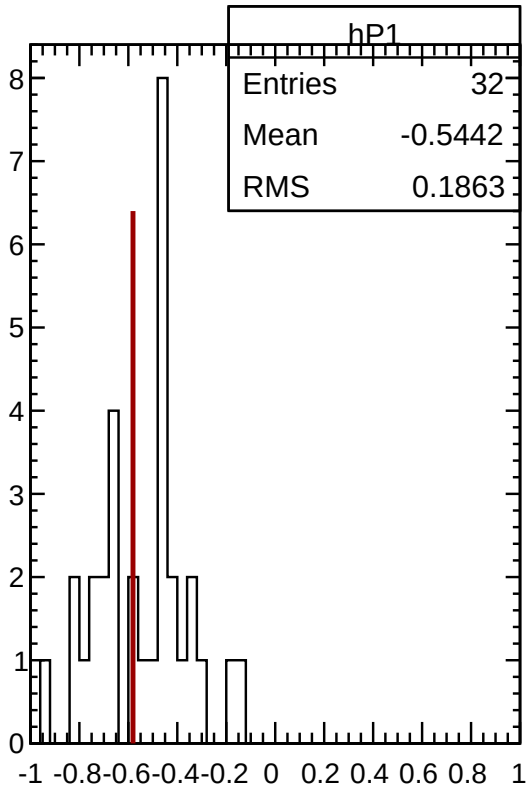


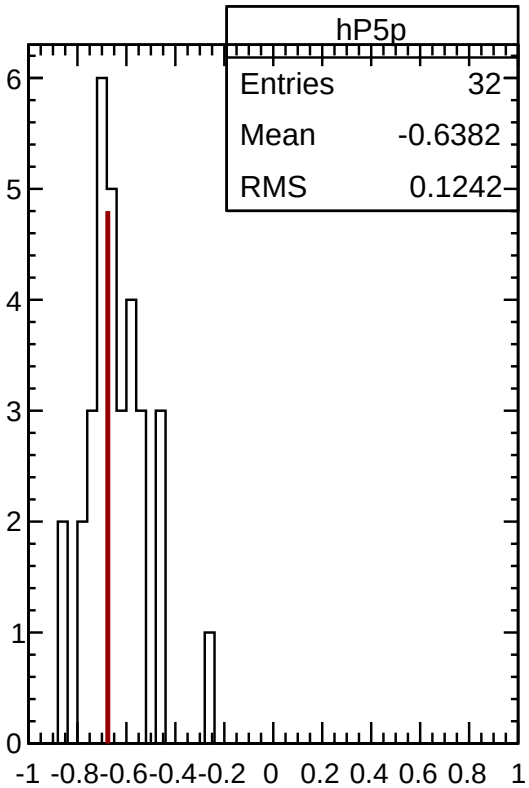
Red line is input value

Fit results for all toys Bin 8: RECO-level fit

Fit 100 Toy MC with random initial value



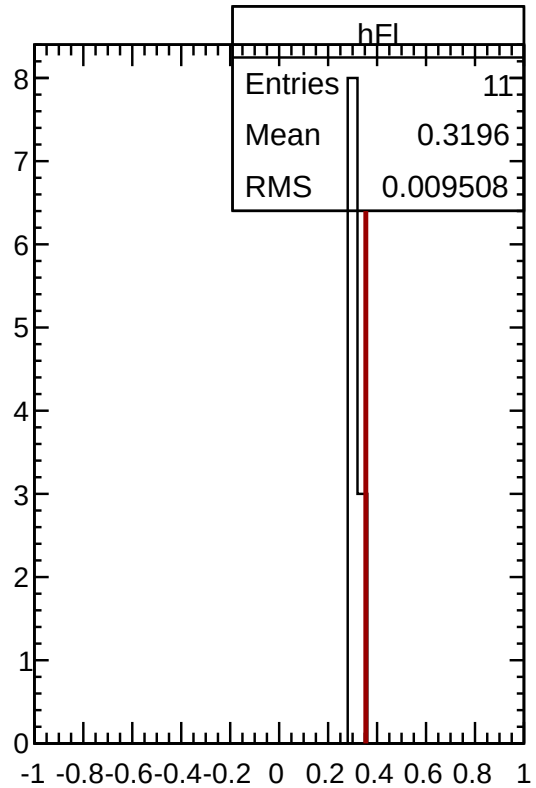


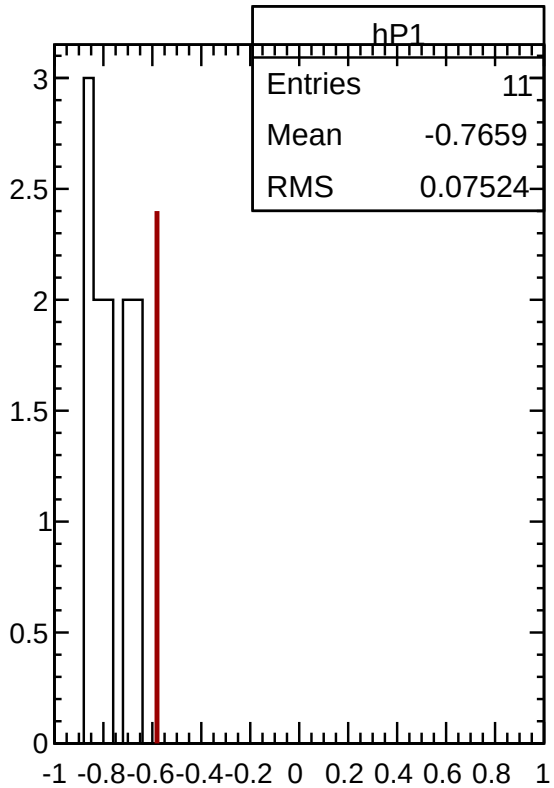


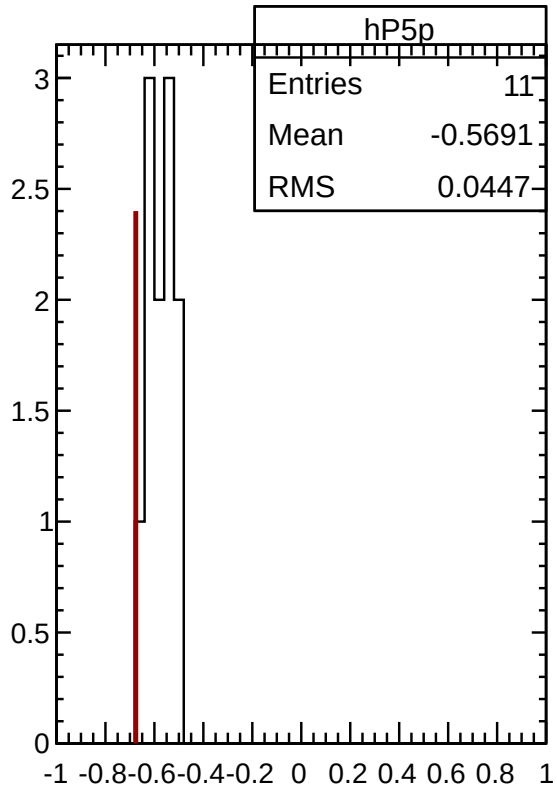
Red line is input value

Fit results for all toys Bin 8: RECO-level fit

Scan initial values for a given toy MC



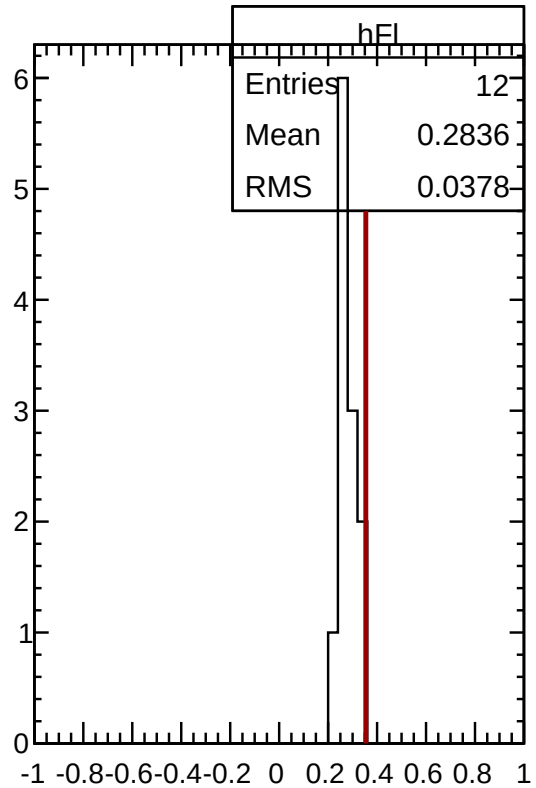


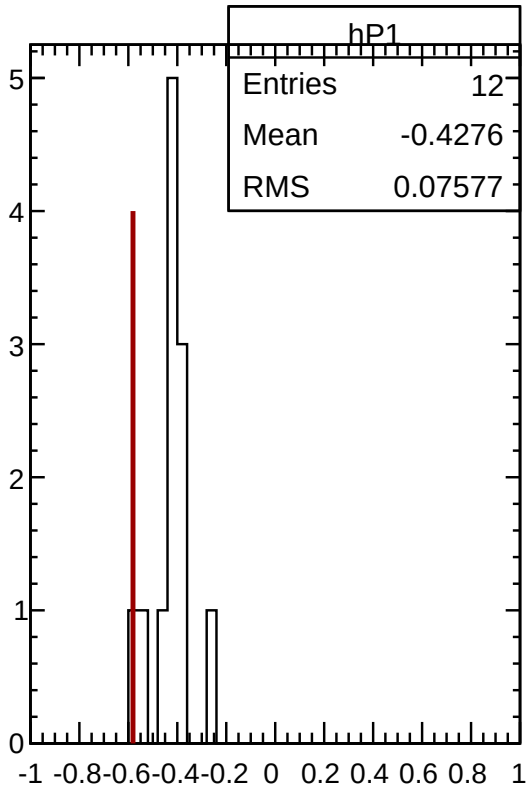


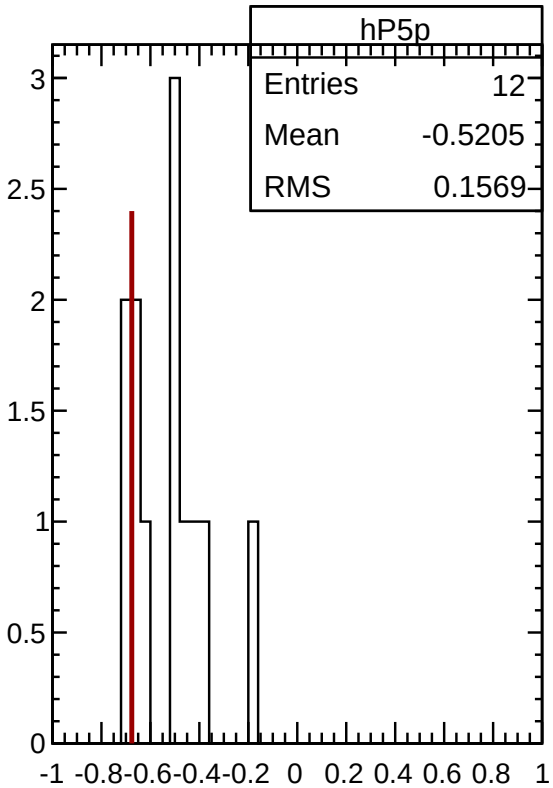
Red line is input value

Fit results for all toys Bin 8: cocktail fit

Fit 100 Toy MC with random initial value



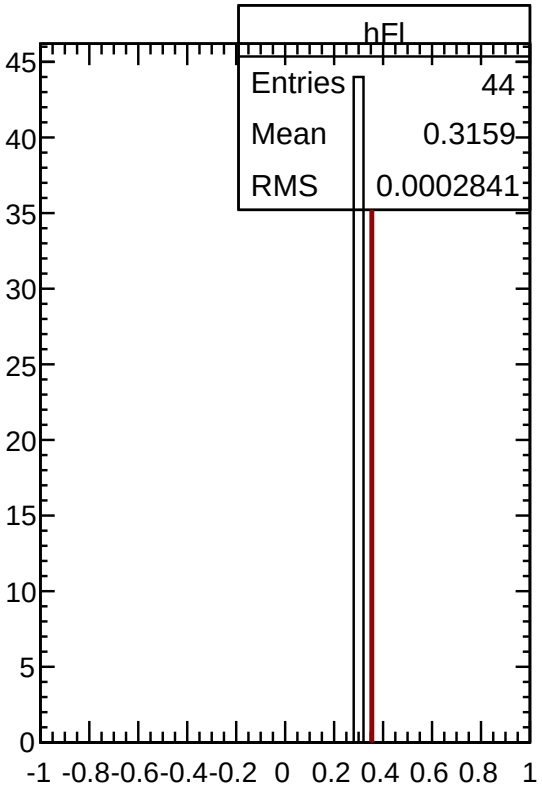




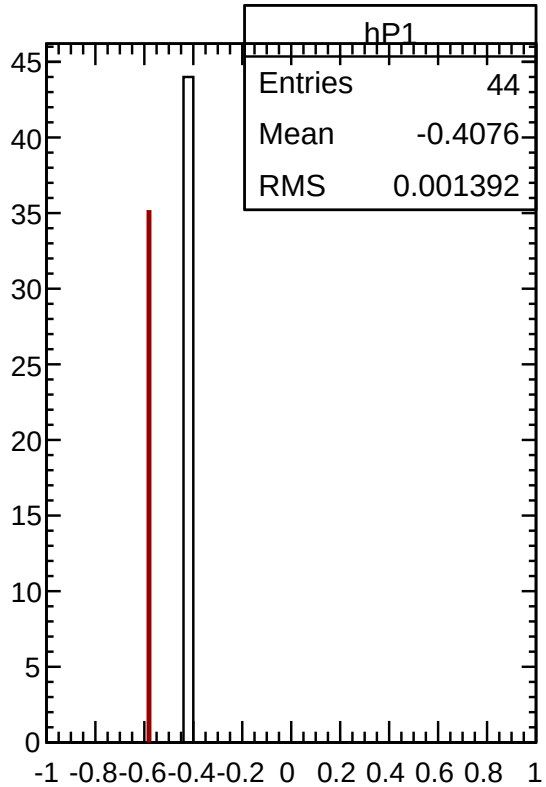
Red line is input value

Fit results for all toys Bin 8: cocktail fit

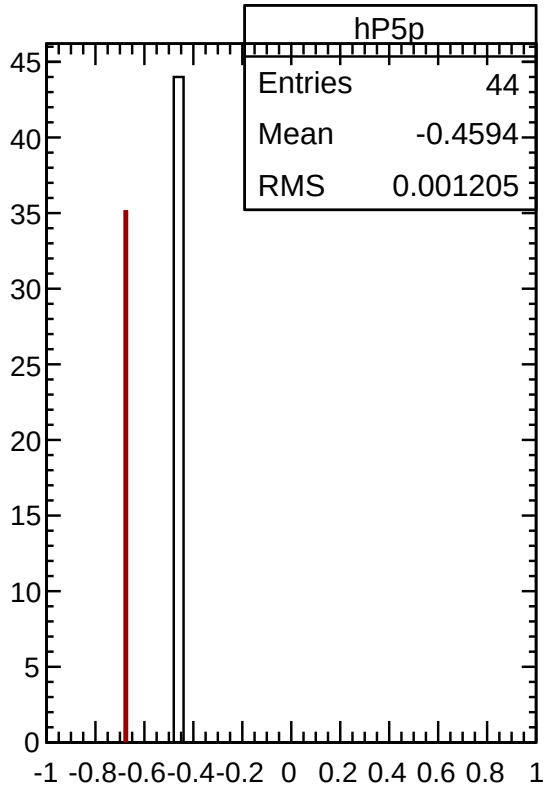
Scan initial values for a given toy MC



F_L^{in}=0.354



P_1^{in}=-0.581



$P_5'^{in}$=-0.676

Red line is input value

Additional stuff

Additional or backup slides

Intro

- Question from ARC:

Keith Could you do a MC injection test where you inject a given value of P5' (for example the LHCb central value) and show that you can fit it back?

Wolfram As already briefly mentioned after the pre-approval presentation and also requested by Keith, it would be very good to demonstrate that you can correctly reproduce a result if it is different from the input of your MC. Even if you can not simply dial a different value into your generator, it should be possible to extract subsamples from the existing reconstructed MC by properly selecting events according to the relative frequency of the generator level decay angles.

- Answer

- Answer
- Not possible to generate new MC with different parameters
  - The MC does not have the physical observables (F_L, P'_5, ...) as free parameters to be set at will. It has an angular distribution which is not easily changeable
  - that's the reason why we compare GEN-level fit with RECO-level fit in the MC, as opposed to RECO-level observables with input observables: we do not have access to input parameters.
- Two possible workaround:
  1. generate TOY MC from `pdf` using LHCb parameters as input and try to fit those toys
     - ⋆ can be done at GEN-level (w/o eff) and RECO-level (w/ eff), and w/ and w/o background (cocktail-like toys)
  2. reweight the original MC at gen level according to the LHCb `pdf` and refit the full MC with this reweight
- working on 1
  - So far, I got a toy MC distribution, with out yield, correct and mis-tag, no background (yet)
  - still checking if correct,
  - next is to perform a fit.

Bibliography I