



# DIRC Online Calibration: Preliminary Studies

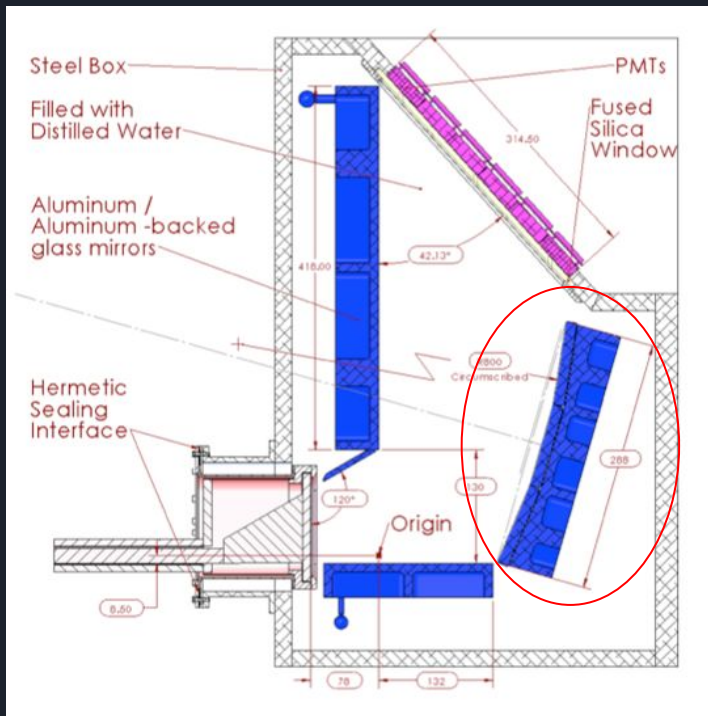
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DIRC meeting 8/29/2017



# General Idea



## Motivation:

- Investigate possibility of doing online calibration with a pure sample of  $\pi$  to determine miscalibration.

## Method:

- Generate the PDF (FastDIRC) in both spatial position on the PMT plane and in time for each particle.
- Build likelihood of measuring a  $\pi$  given that it's a true  $\pi$ .
- Find global point of minimum of the log-likelihood with ML.

## main parameters

- $\theta_x, \theta_y, \theta_z$
- $y_{off}, z_{off}$



# Case with Offsets on Mirror Angles

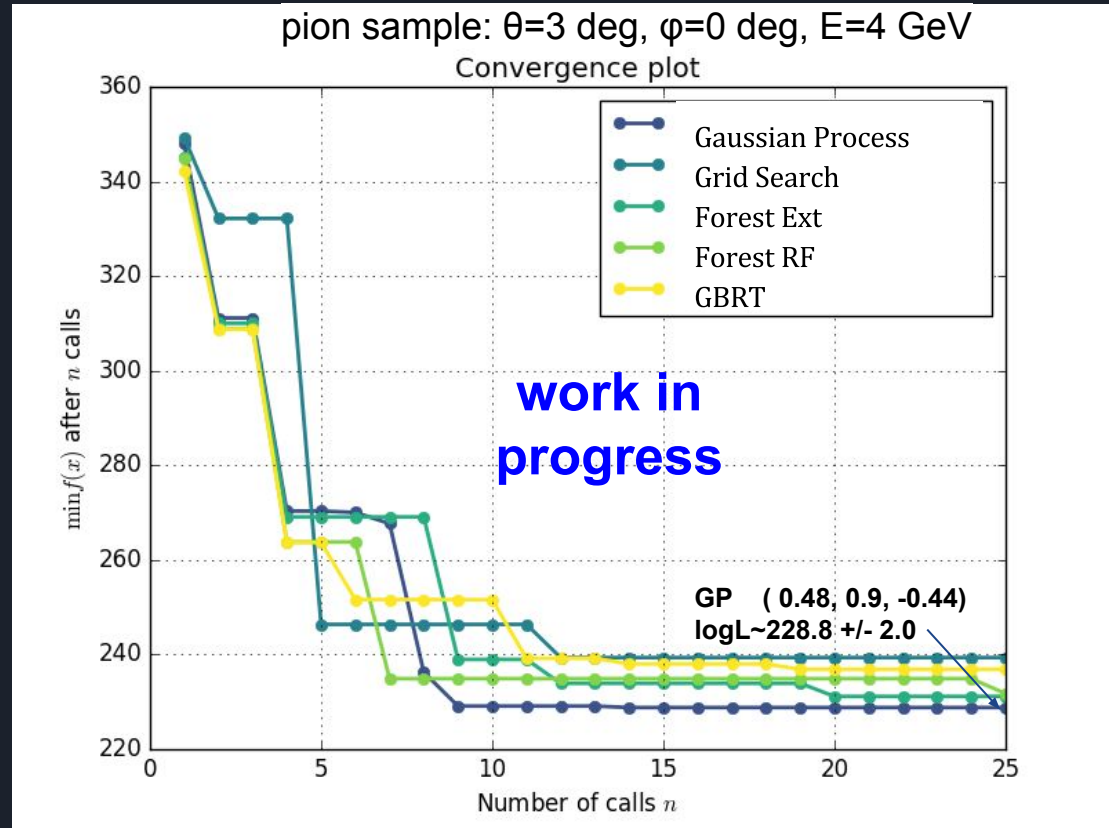
3 parameters: main angles of 3-seg mirror

Each call here is based on a high purity sample of (only) 100 pions

**true**  $\langle \theta_x, \theta_y, \theta_z \rangle$ : ( 0.50, 1.0, -0.50 )

**found** ( 0.48, 0.9, -0.44 )

- larger stats
- compare other phase space
- tune hyperparameters
- rounding

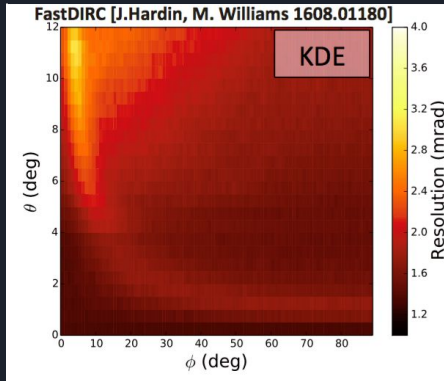




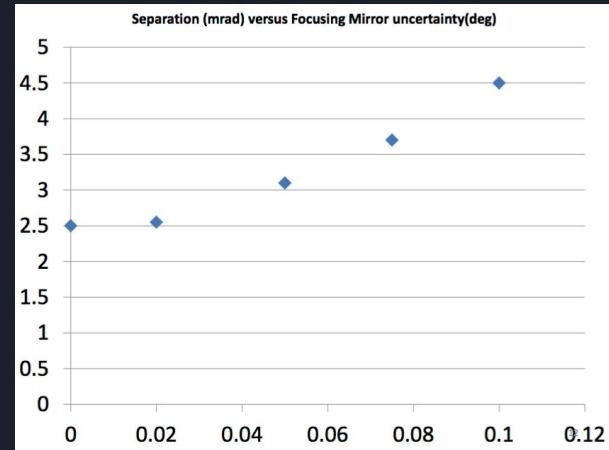
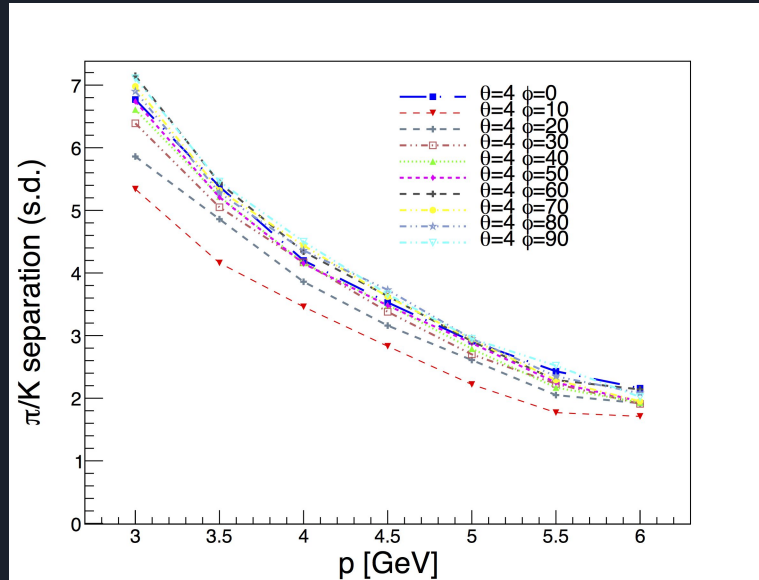
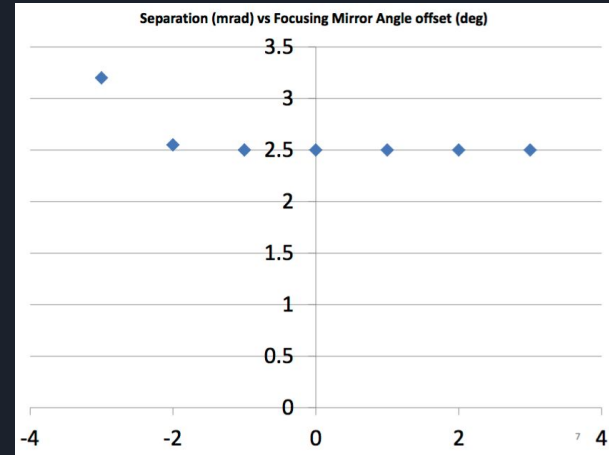
# Conclusions

- Started preliminary study on DIRC online calibration based on maximizing the likelihood.
- It seems doable with ML to determine offsets and accuracy.
- Next steps: improve/validate procedure (separation vs offsets, compare results from different conditions of the incident particle, detailed study y-z offsets, optimize hyperparameters, range, etc.).
- Enable all major physical effects in the FastDIRC simulation (e.g. tracking uncertainty).

# Backup



<https://halldweb.jlab.org/wiki/images/2/29/DIRCGeometryUncertainty080114.pdf>



@~4.5 GeV