DIRC Online Calibration: Preliminary Studies

C. Fanelli

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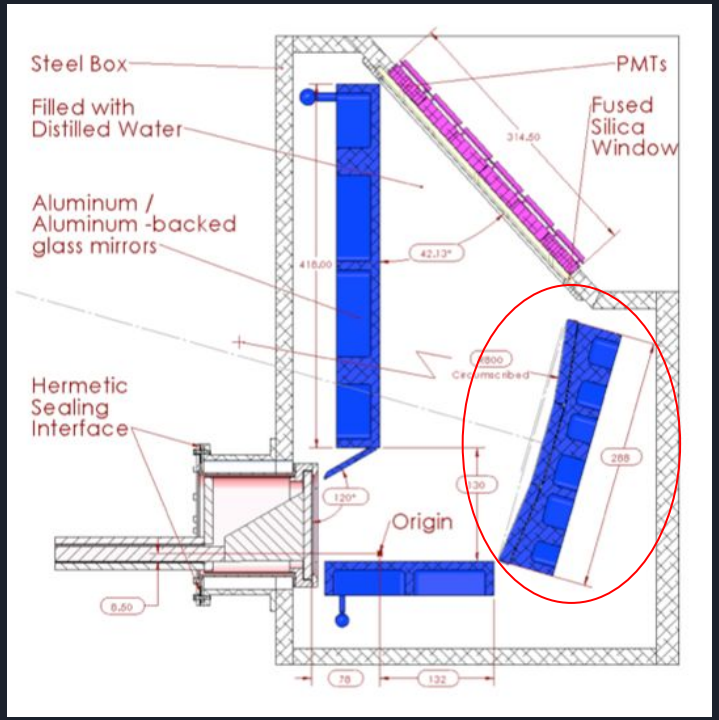
General Idea



Motivation:

- Investigate possibility of doing online calibration with a pure sample of π 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 π given that it's a true π.
- Find global point of minimum of the log-likelihood with ML.

main parameters

- θx, θy, θz
- yoff, zoff

Case with Offsets on Mirror Angles

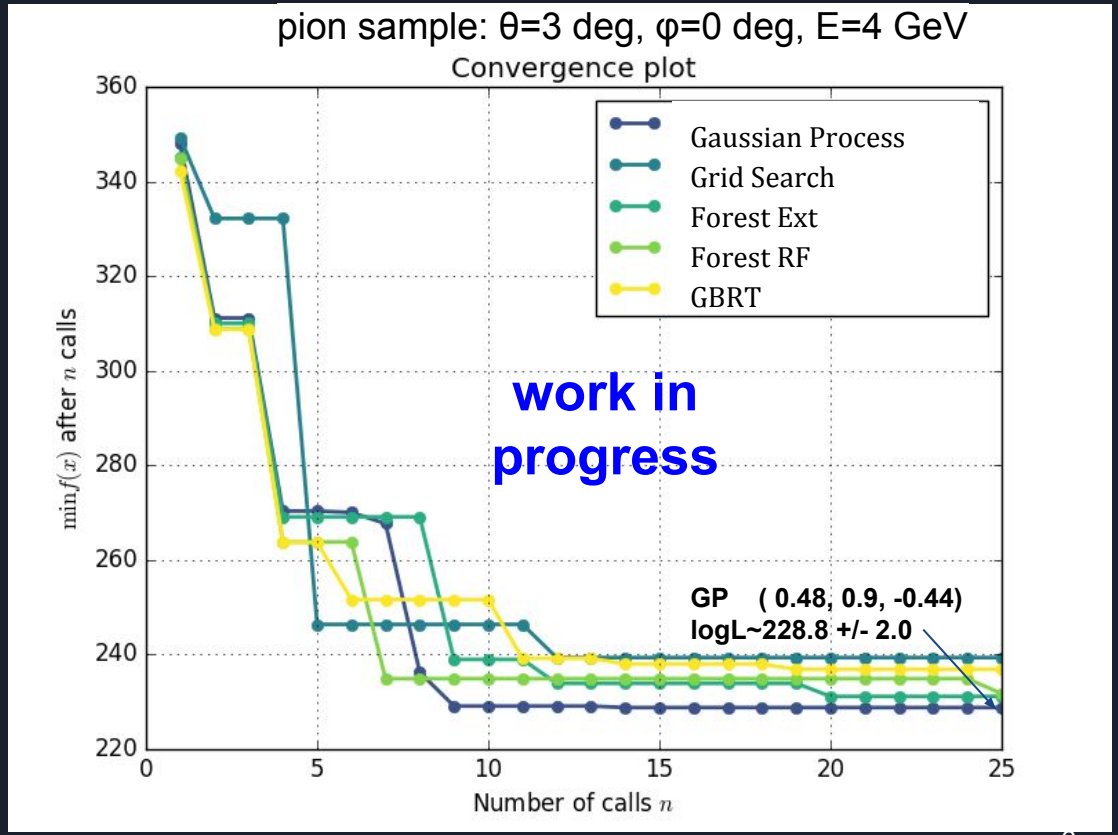
3 parameters: main angles of 3-seg mirror

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

true <θx, θy, θz>: (0.50, 1.0, -0.50) deg

found (0.48, 0.9, -0.44) deg

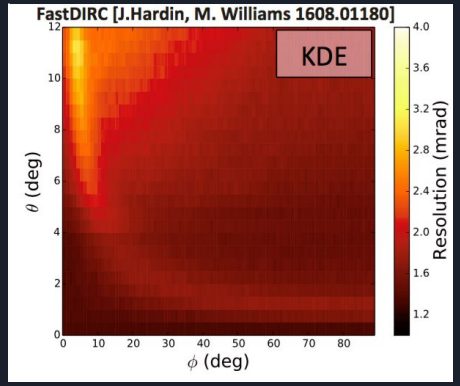
- larger stats
- compare other phase space
- tune hyperparameters
- rounding



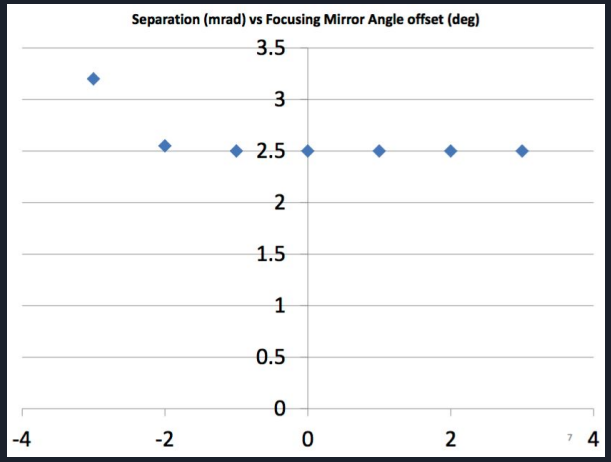
Conclusions

- 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



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