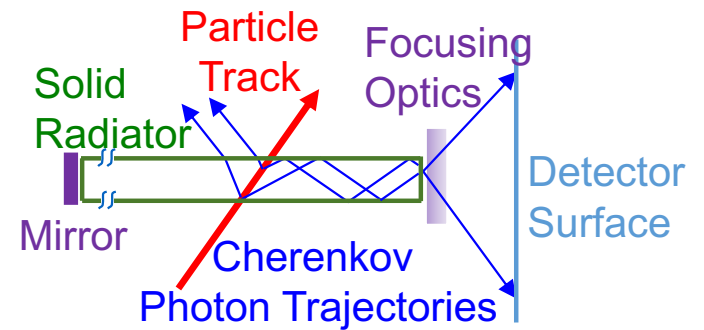


# DIRC@EIC Summary

## High Performance DIRC simulations

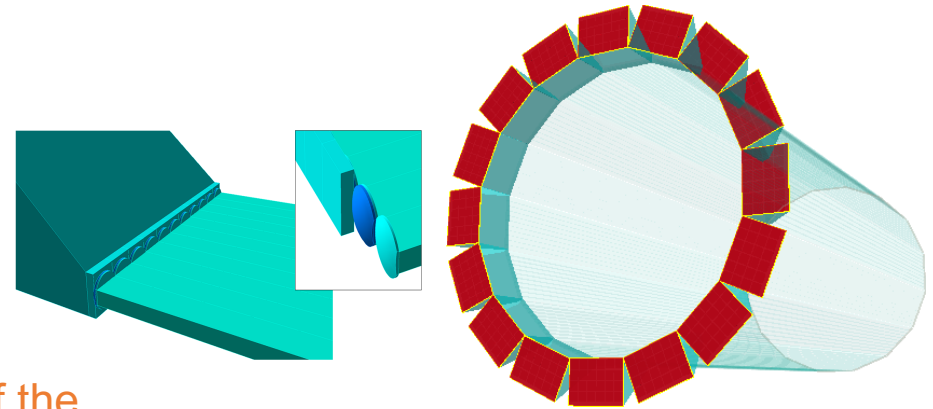
- Simulation of more realistic DIRC@EIC design with 3-layer lens still shows  $3\sigma$  separation capability:  
 $p/K@10\text{GeV}/c$ ,  $\pi/K@6\text{GeV}/c$ , and  $e/\pi@1.8\text{GeV}/c$ .



## High performance DIRC in Geant 4

## Experimental tests of 3-layer lens prototypes:

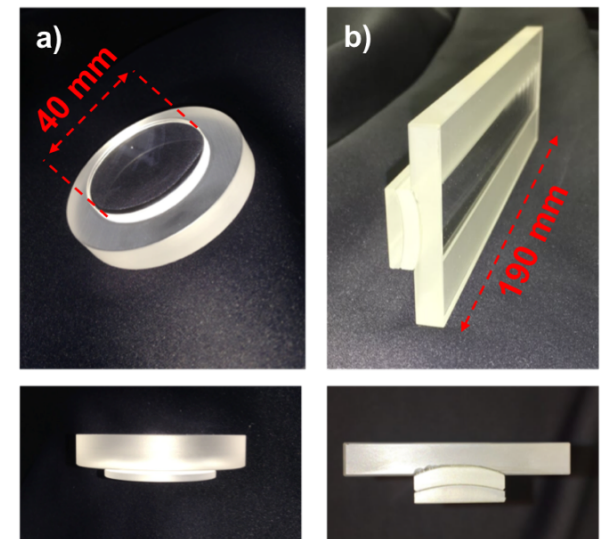
- Finished 3D mapping of focal plane.
- Performance in prototype placed in particle beam.  
(synergy with PANDA Barrel DIRC group)
- Paper on prototype program and test bench tests of the 3-layer lens properties in preparation.



## Alternative materials for 3-layer

- Sapphire and  $\text{PbF}_2$  are very attractive candidates to replace NLaK33 glass as material for middle layer.
- Two vendors are willing to build prototypes using new materials.
- Preliminary simulation studies as well as first radiation hardness measurements are very encouraging.
- Detailed radiation hardness tests and simulations are in progress.

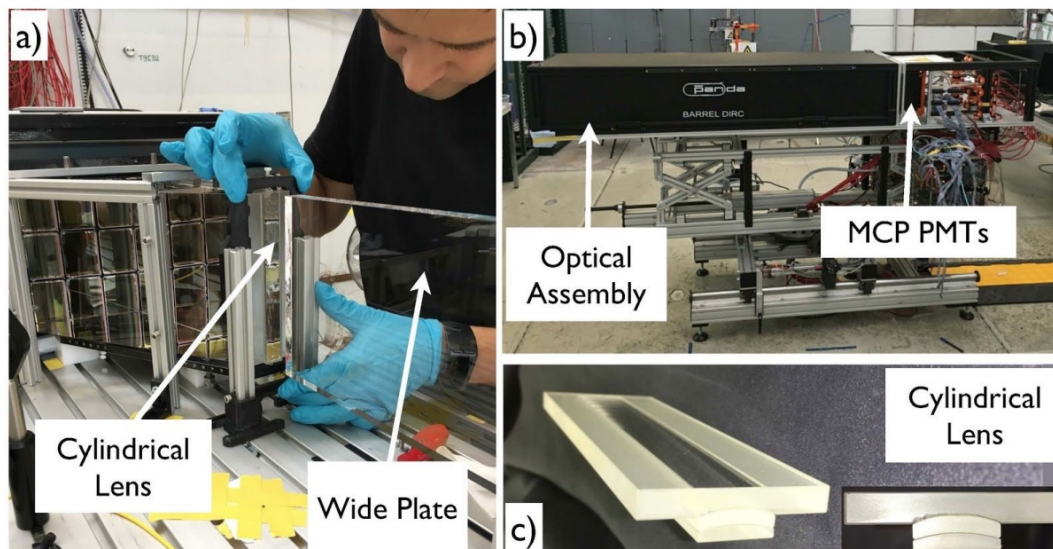
## Spherical and cylindrical 3-layer lens prototypes



# 3-layer Lens

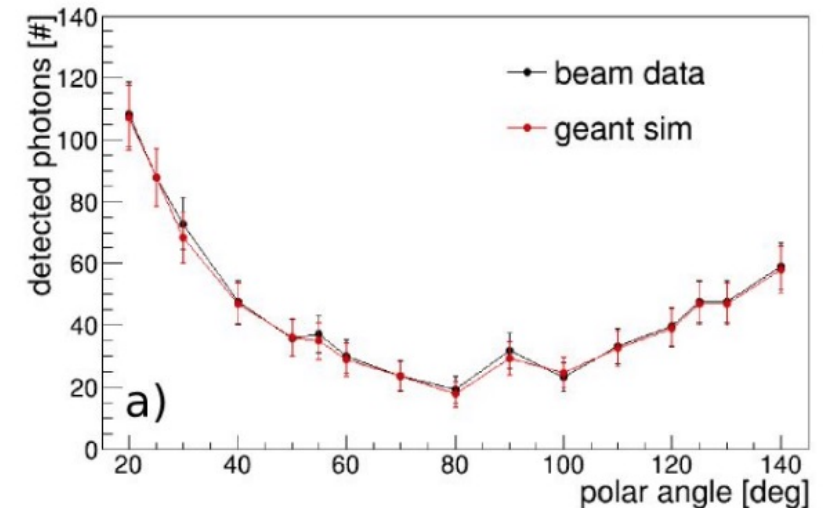
## PANDA Barrel DIRC prototype at CERN PS

- Larger pixels, slower electronics than EIC DIRC:  
→ prototype goal:  $3\sigma$   $\pi/K$  separation @ 3.5 GeV/c
- CERN 2017 focused on validation of the PID performance of:
  - narrow bar+3-layer cylindrical lens
  - wide radiator plate with 3-layer cylindrical lens.
- 2018 test beam in August will focus more on wide plate geometry with cylindrical 3-layer lens.
- Preparation for future DIRC@EIC prototype program in progress.

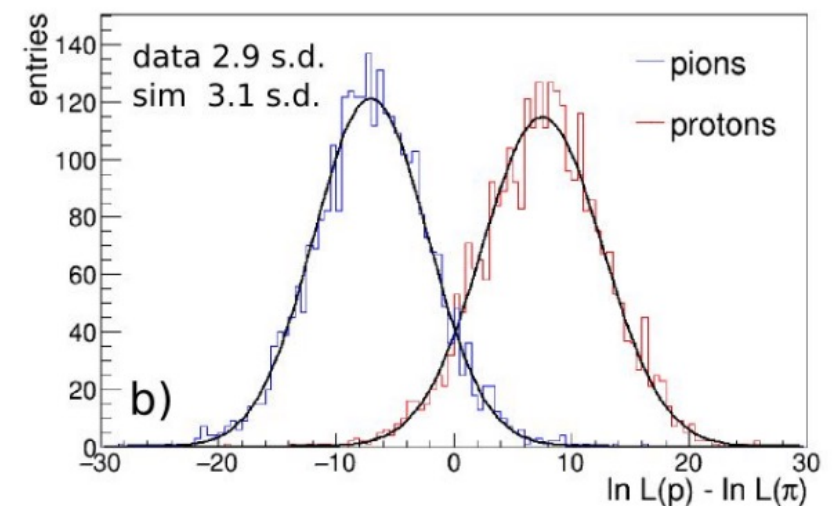


## Wide plate geometry with 3-layer cylindrical lens:

### Photon yield for 7 GeV/c tagged protons



### $\pi/p$ separation power at a momentum of 7 GeV/c and a polar angle of 25°

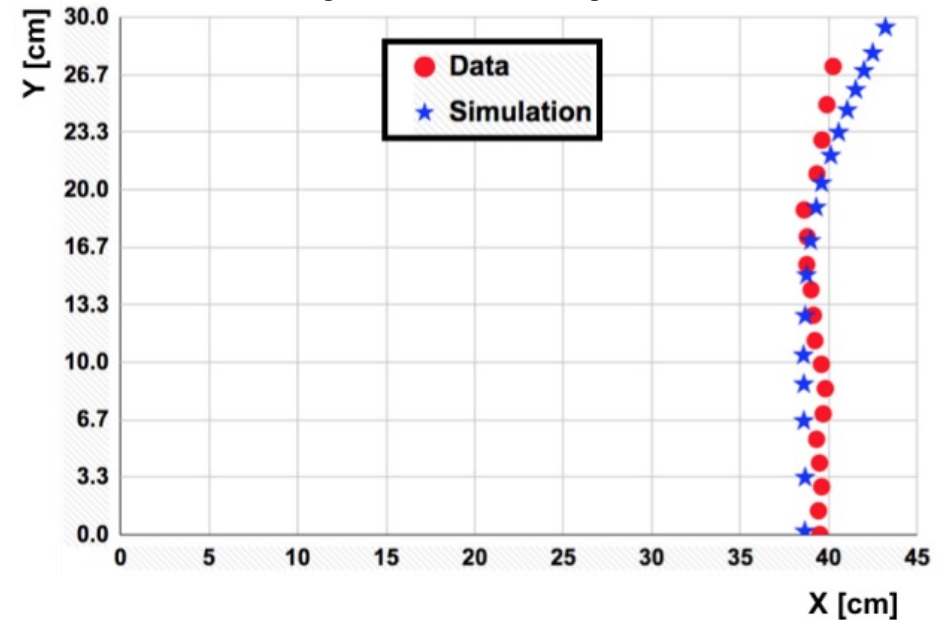


# 3-layer Lens

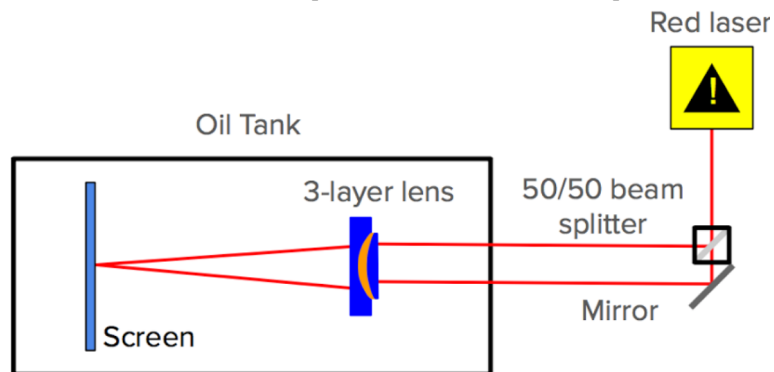
## Mapping focal plane of cylindrical 3-layer lens:

- Results of measurements confirm desired flat focal plane for centered laser beams on the lens
- Measurements with off-center laser beams planned for next year.
- Combined results for both lens prototypes planned to be published in FY19.

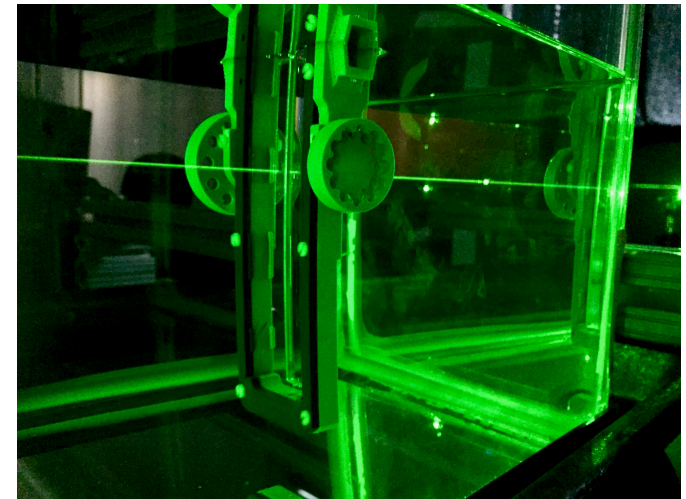
Measured and simulated focal plane of cylindrical 3-layer lens



## Laser setup at ODU to map the focal plane



L. Allison, R. Dzhygadlo, G. Kalicy, C. Schwarz

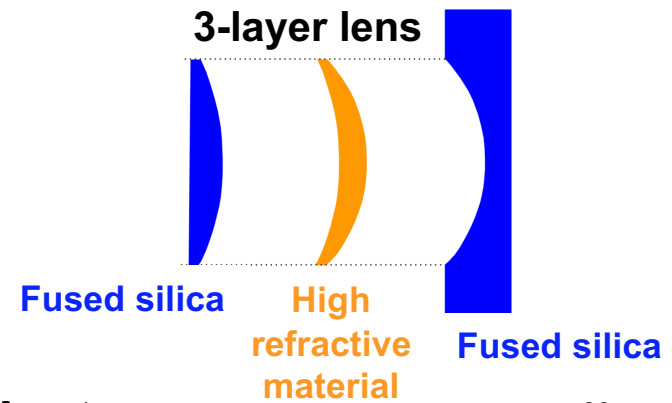




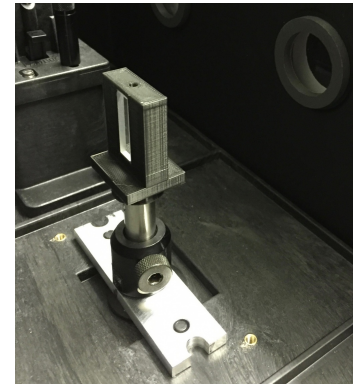
# 3-layer Lens

## Radiation hardness of 3-layer lens

- Detailed studies of 8mm NLak33 glass at CUA using X-Ray source finalized.
- First simulation studies and measurements of Sapphire and  $\text{PbF}_2$  with Co60 are very encouraging.
- Detailed studies of several materials with  $\text{Co}^{60}$ , and neutron sources planned.



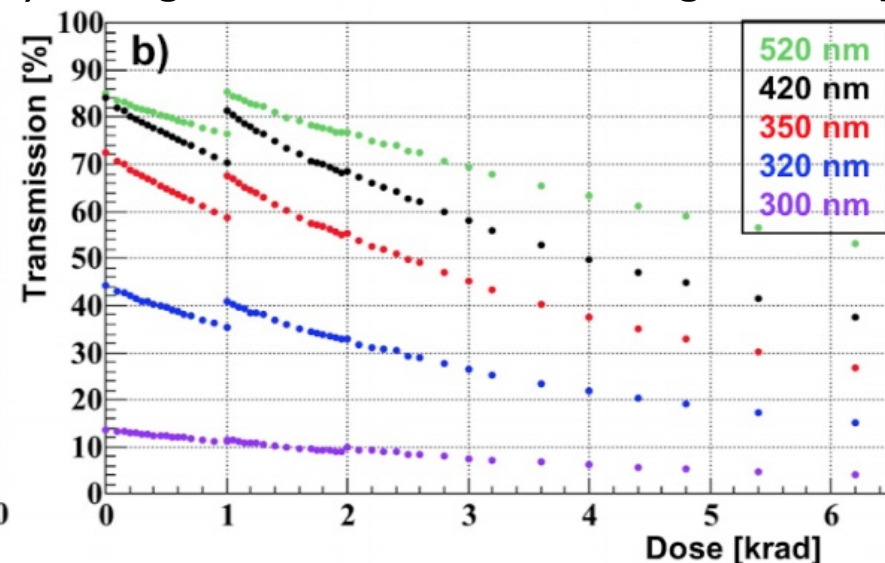
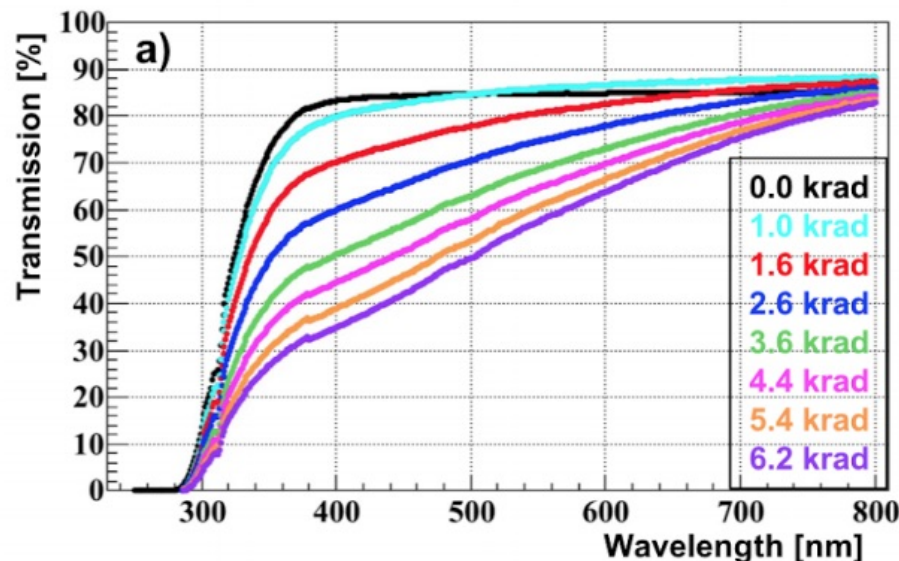
CUA setup



BNL  $\text{Co}^{60}$  setup



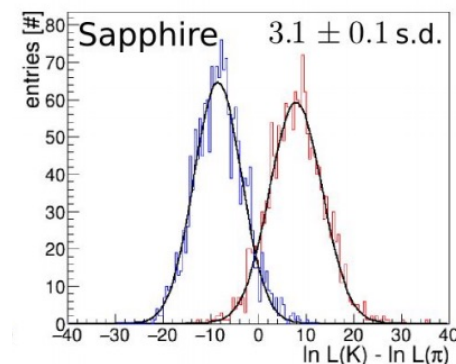
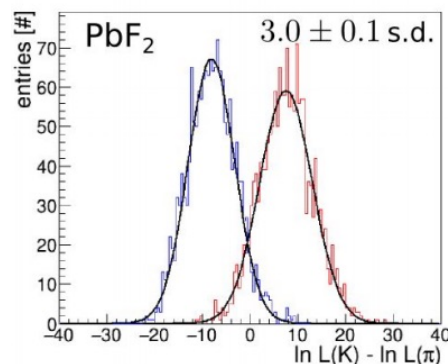
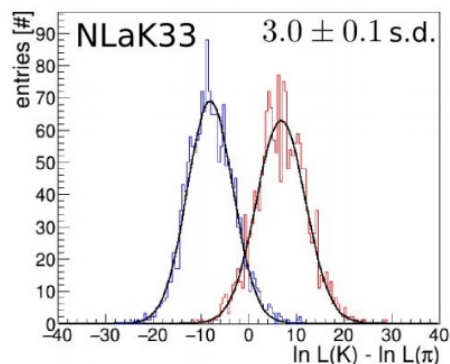
## Measured transmission (not Fresnel corrected) through the 8mm thick NLaK33 glass sample



# 3-layer Lens

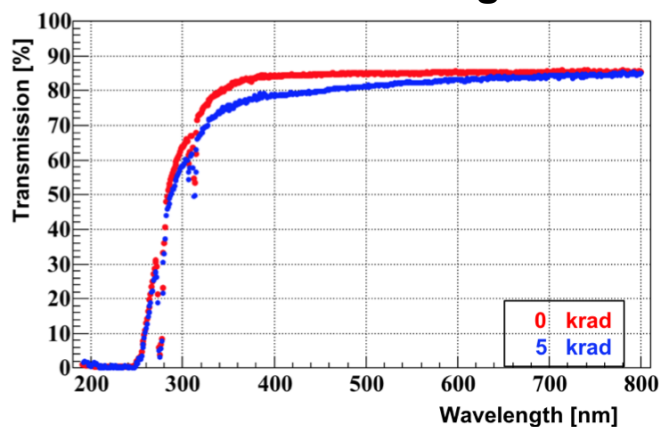
- Two vendors are willing to build 3-layer lens with Sapphire and  $\text{PbF}_2$ .

**Simulated  $\pi/K$  separation for charged pions and kaons with 6 GeV/c momentum and  $30^\circ$  polar angle, assuming a tracking resolution of 0.5 mrad.**

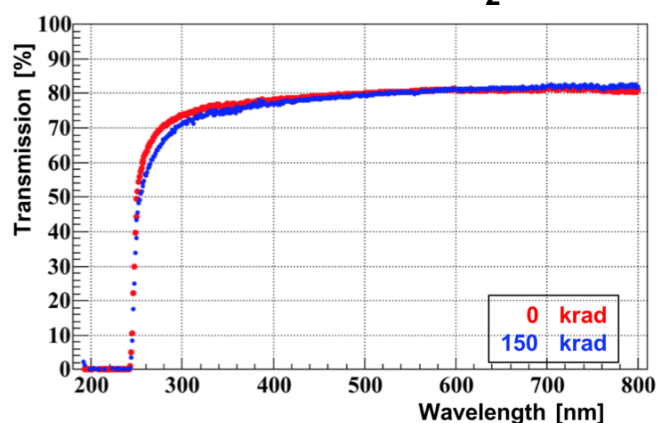


**Measured transmission (not Fresnel corrected) through samples of alternative materials before and after irradiation with  $\text{Co}^{60}$  source at BNL.**

**1mm thick NLaK33 glass**



**4mm thick  $\text{PbF}_2$**



**1mm thick Sapphire**

