



FARICH as forward PID in SuperB detector

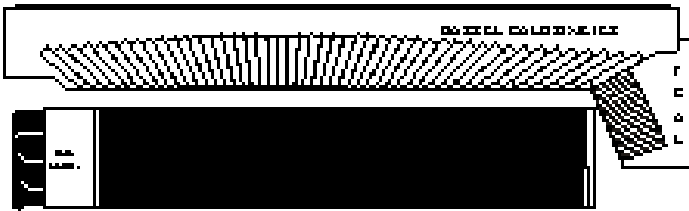
E.A.Kravchenko

Budker INP, Novosibirsk,
Russia

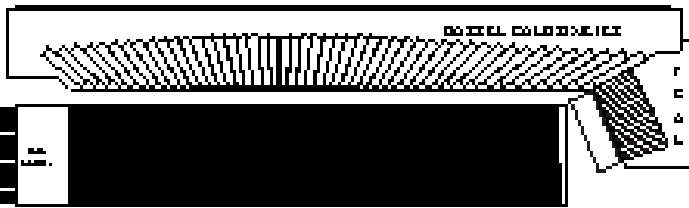
Outline

- FARICH with LSO EMC shifted 10 cm back (problems)
- FARICH with 'standard' end cap EMC and shorter Drift Chamber:
 - Space
 - FARICH parameters
 - Impact on the DC (momentum resolution, dE/dx)
- FARICH FastSIM description (plans)

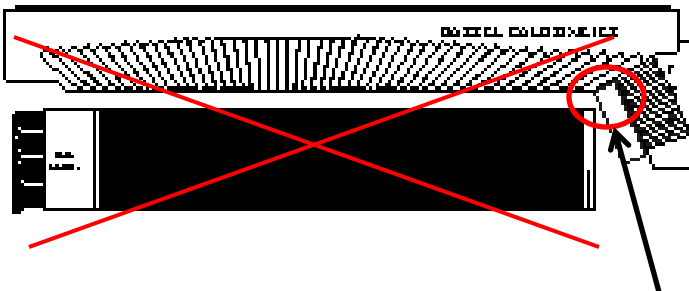
FARICH with LSO EMC moved 10 back



LYSO no PID



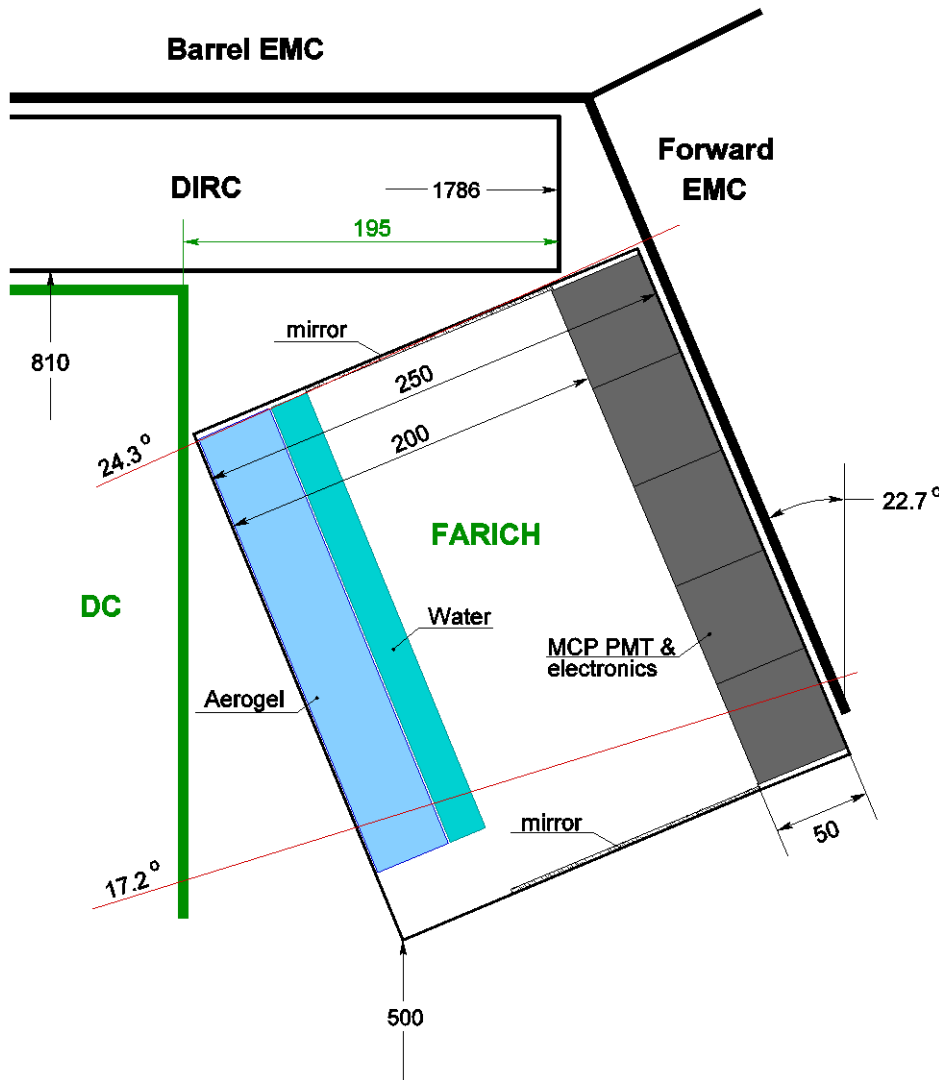
LYSO 10cm PID



LYSO moved back, 10cm PID

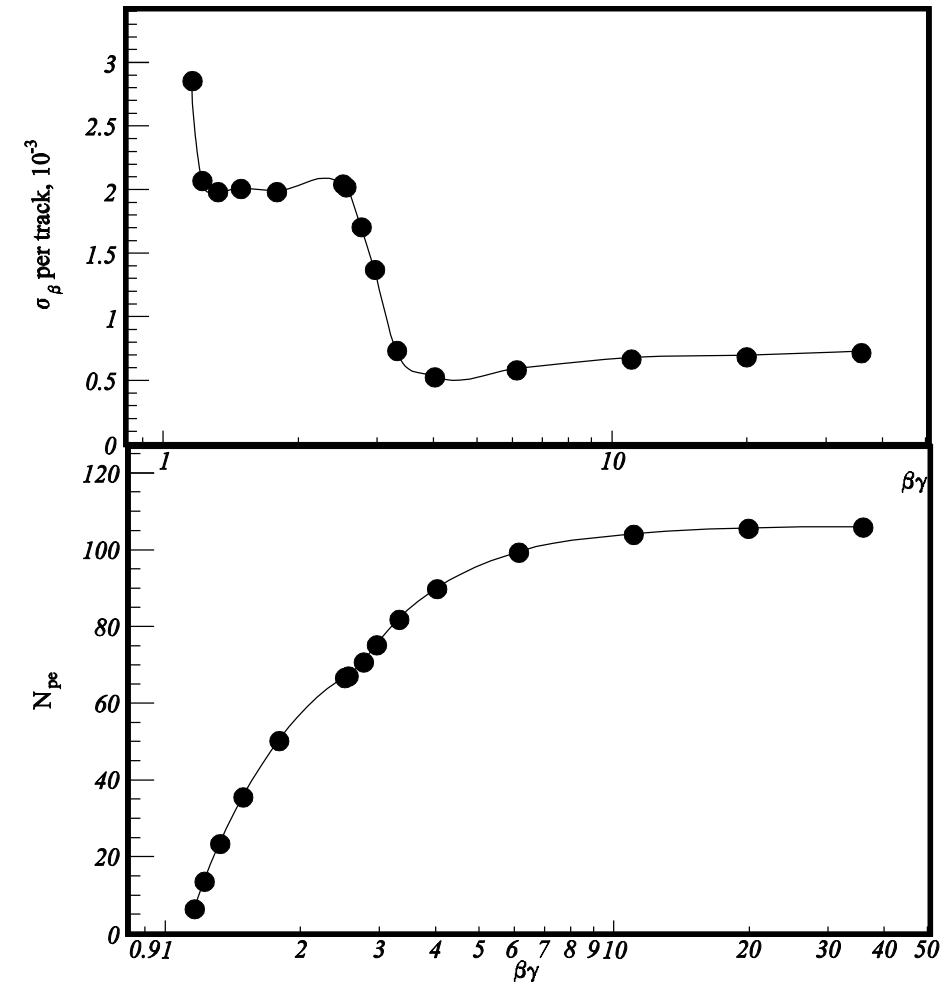
- Simple shift of EMC back by 10cm form a “pocket” at the corner which strongly destroy energy resolution
- Possible solution could be the prolongation of the barrel part
→ technically very difficult and expensive.

FARICH with shorter DC



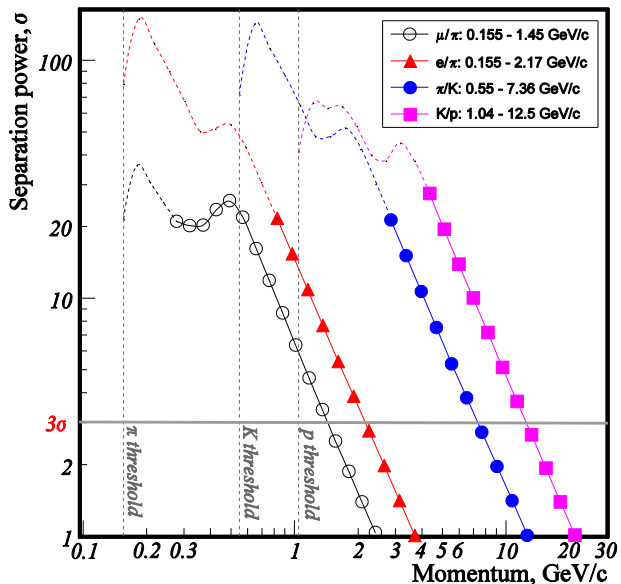
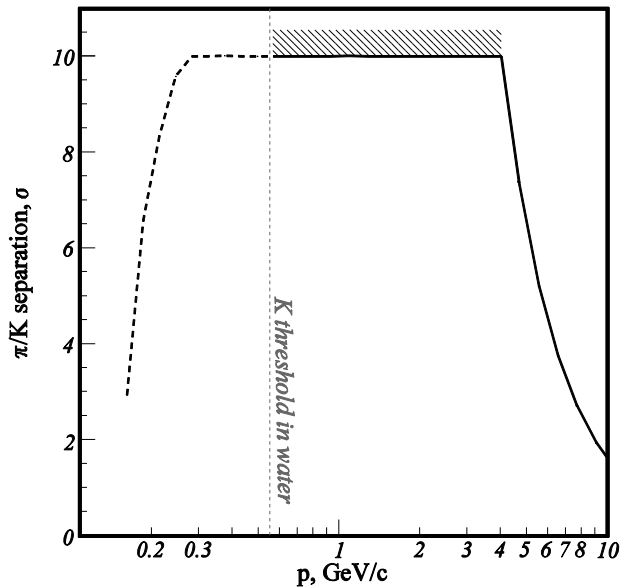
- Expansion gap 200 mm
- Burle MCP PMT with 3.2x3.2 mm pixels (16x16 matrix), photoelectron collection efficiency 70%, geometrical factor 85%
- 3-layer focusing aerogel, $n_{\max}=1.07$, total thickness 30 mm
- Number of PMTs - 450
- Number of channels – 115000
- Amount of material, (X_0) = 3.5%(aerogel)+ 2.5%(water)+ 14%(MCP PMT)+8% (support, electronics, cables) ~ 28%

FARICH expected performance, MC results



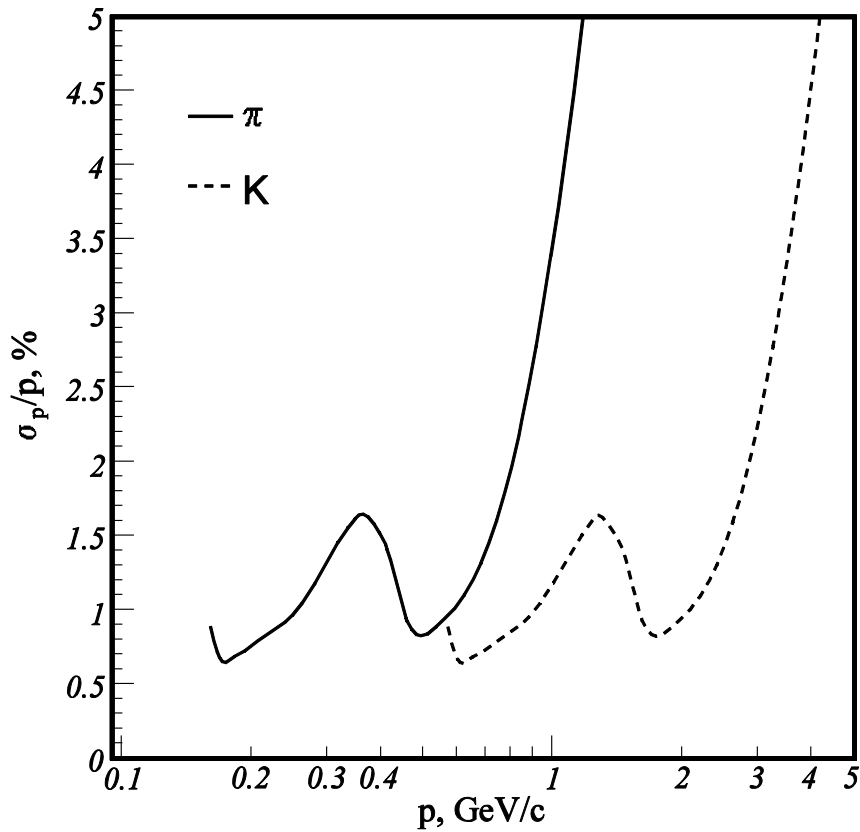
$$N_{pe} = 80 \text{ (water)} + 20 \text{ (aerogel)}$$

FARICH expected performance



- Excellent PID → π/K separation from 0.6 to 8 GeV/c, μ/π separation from 0.15 to 1.4 GeV/c
- Very good overlap with dE/dx PID (even in the case of ‘shorter’ DC)
- 4 times smaller number of channels comparing with previous 100 mm expansion gap option

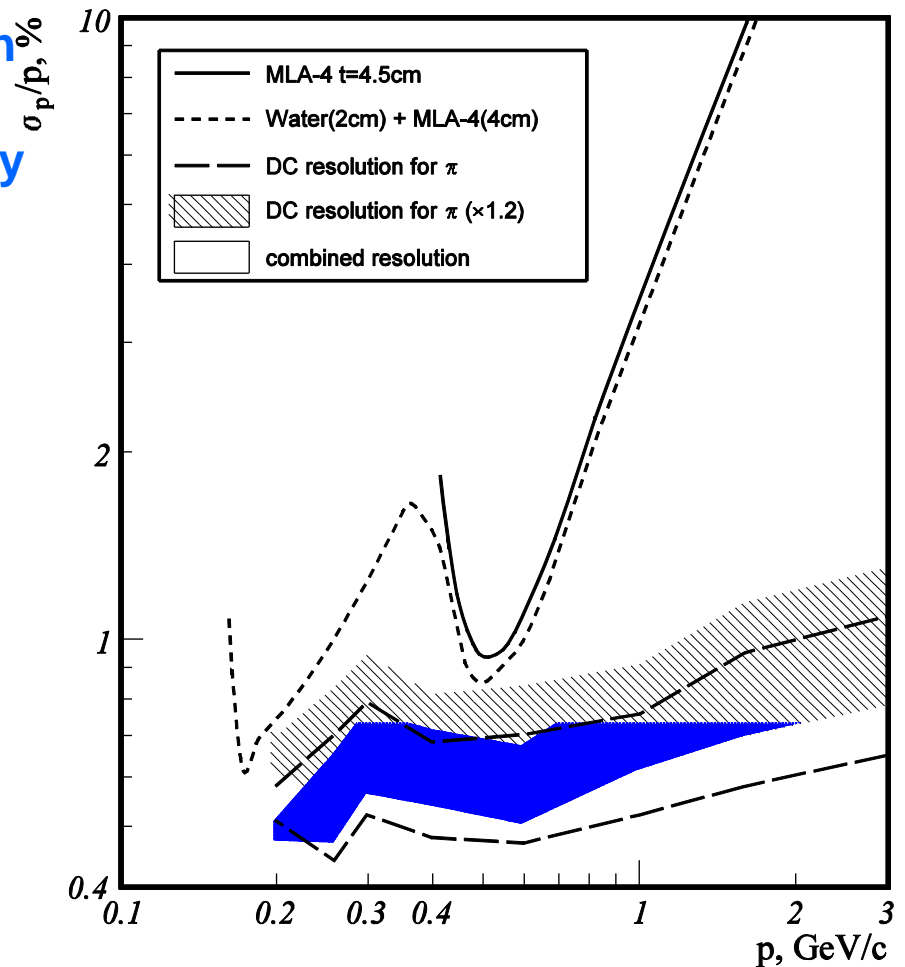
FARICH momentum resolution



$$\sigma P/P = \gamma^2 \cdot \sigma \beta / \beta$$

FARICH momentum resolution

- Data for the DC momentum resolution are from the FastSim (decays are switched off!) need to be independently clarified
- Combined momentum resolution of 'shorter' DC + FARICH is almost the same as for 'standard' DC (correct MC must be done)



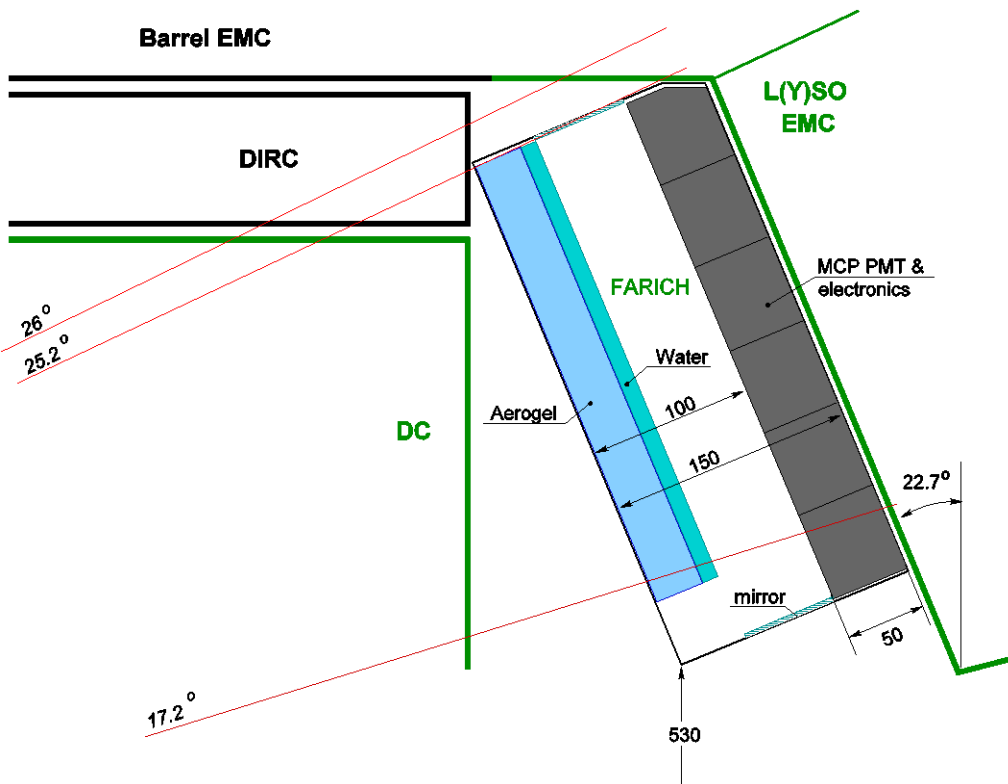
FARICH FastSim

- The 'first' version of FARICH FastSim (100 mm expansion gap FARICH assuming shifted back EMC endcap) was almost ready in May but not committed. Is there any need in it?
- The new description in FastSIM of FARICH with 200mm expansion gap could be ready at the end of September:
 - Need 'short' DC FastSIM?
 - Need additional procedure of combined momentum measurement using DC and FARICH



Backup slides

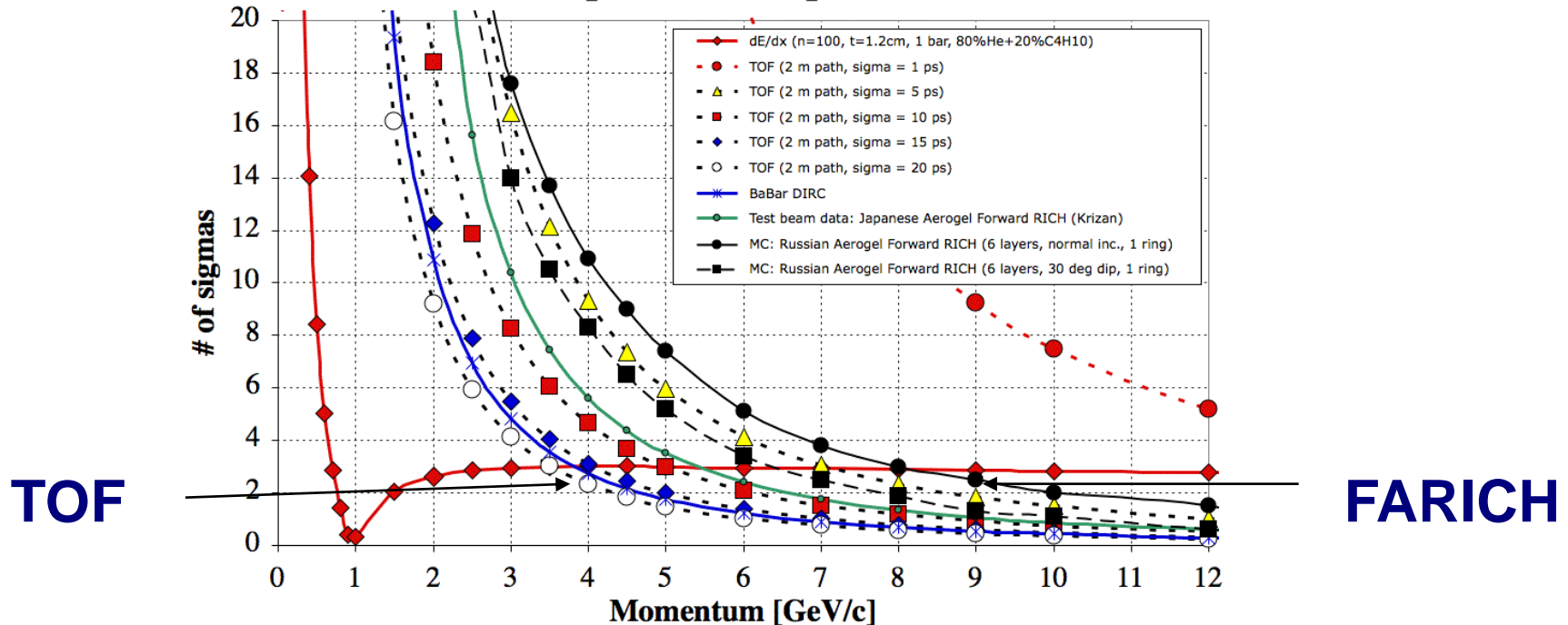
FARICH for the SuperB detector (MCP PMT)



- 100 expansion gap
- Burle MCP PMT with 1.6x1.6 mm pixels (32x32 matrix), photoelectron collection efficiency 70%, geometrical factor 85%
- 3-layer focusing aerogel, $n_{\max}=1.07$, total thickness 30 mm
- Number of PMTs - 550
- Number of channels – 550000
- Amount of material, (X_0) = 3.5%(aerogel)+ 2.5%(water)+ 14%(MCP PMT)+8% (support, electronics, cables) ~ 28%

Forward TOF and FARICH comparison

Expected π/K separation



Pro

- Much better $\pi/K, \mu/\pi, e/\pi$ identification
- Momentum measurement improvement in the forward
- Better background endurance

Contra

- 15 cm of additional space
- 10 times more channels
- Price (?)

The amount of material is almost the same