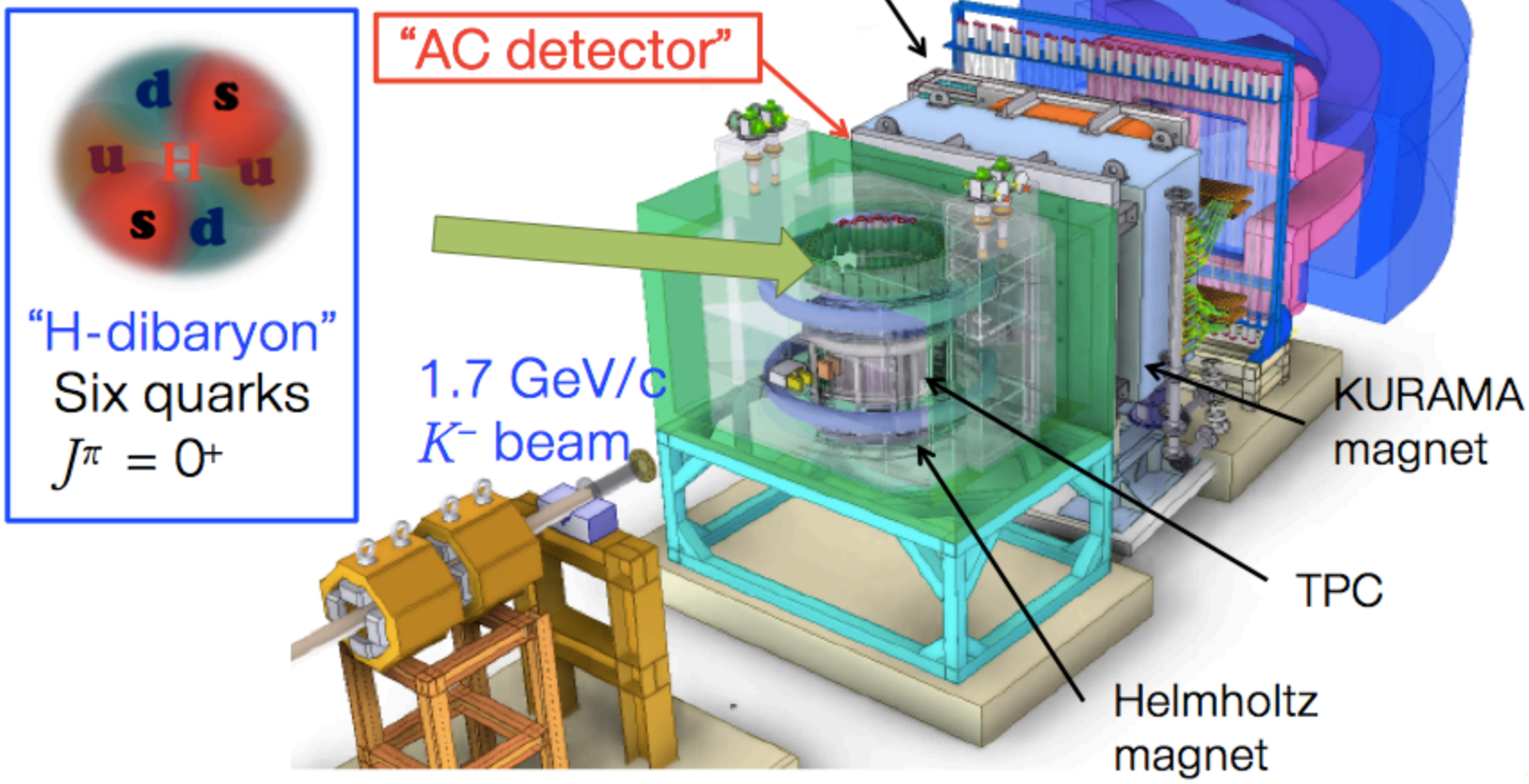
Development of Forward Aerogel Cherenkov Detector

Minho Kim

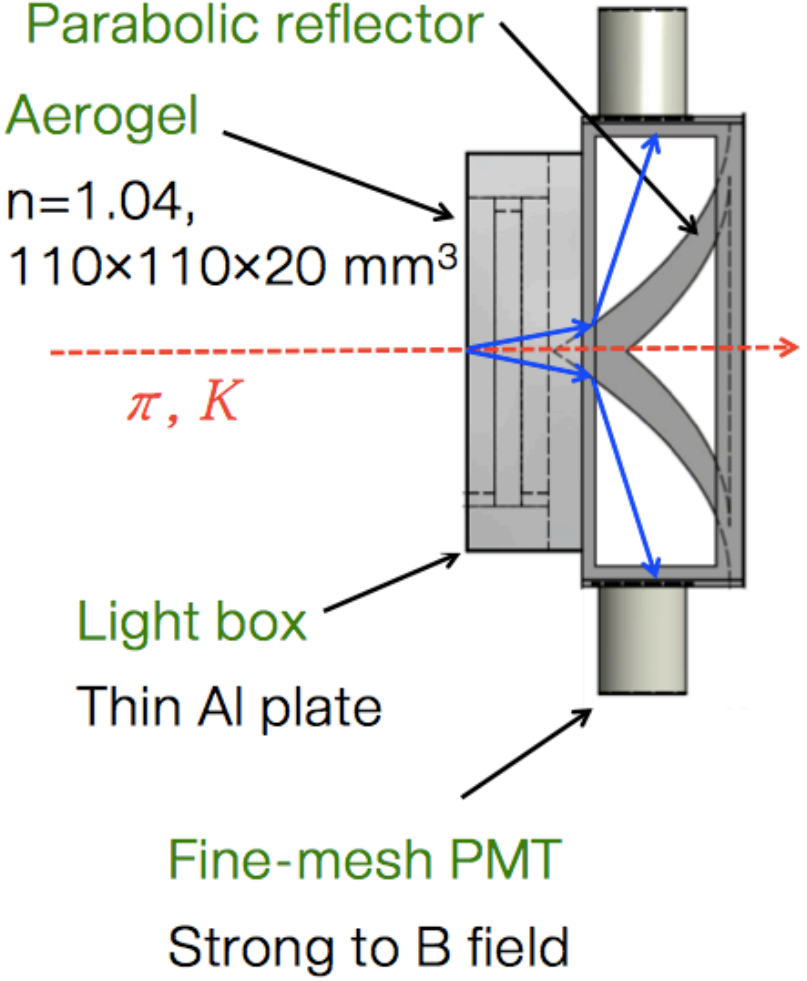
H-dibaryon Search Experiment, E42

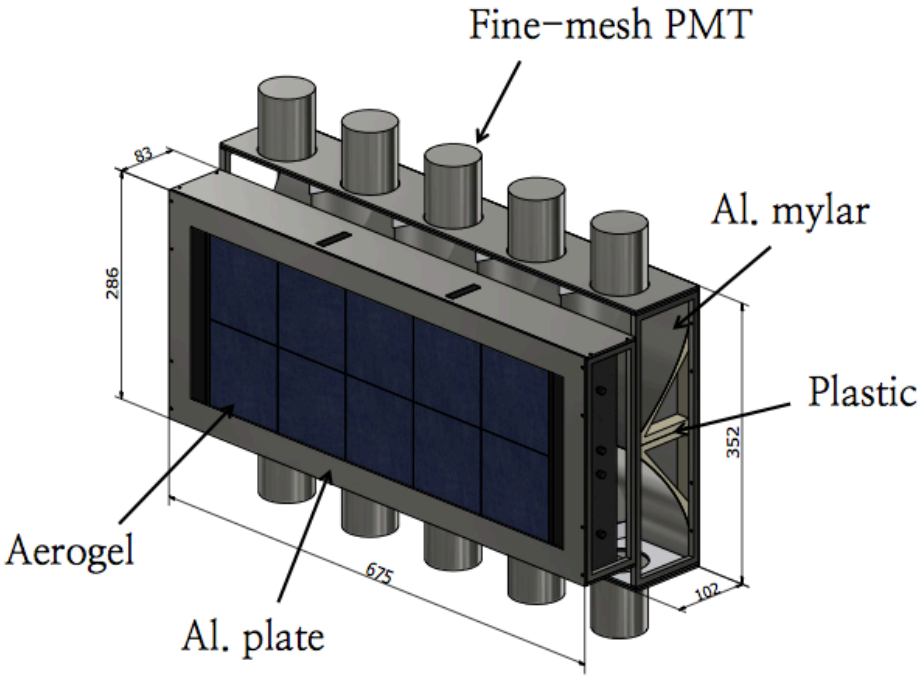
Signal : $p(K^-, K^+)\Xi^-$

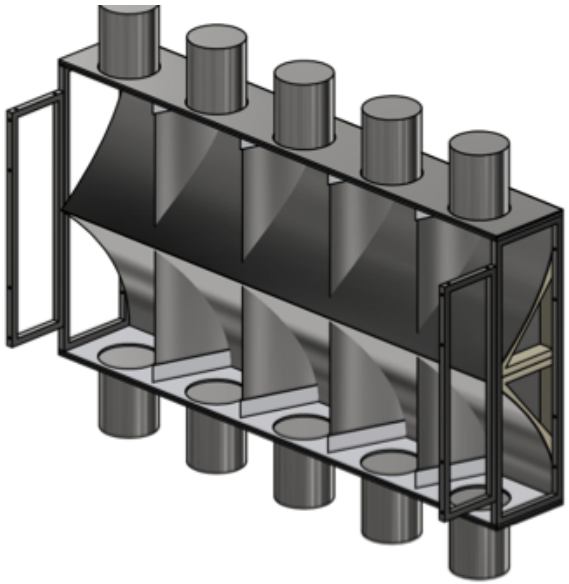
Background: $p(K^-, \pi^+)\Sigma^-$, and so on



Forward Aerogel Cherenkov Detector (FAC)

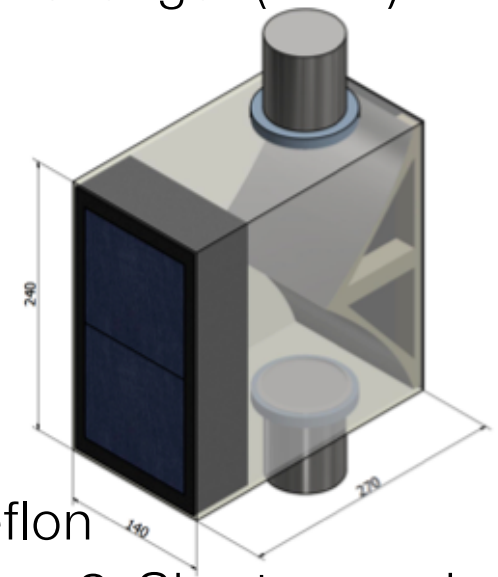


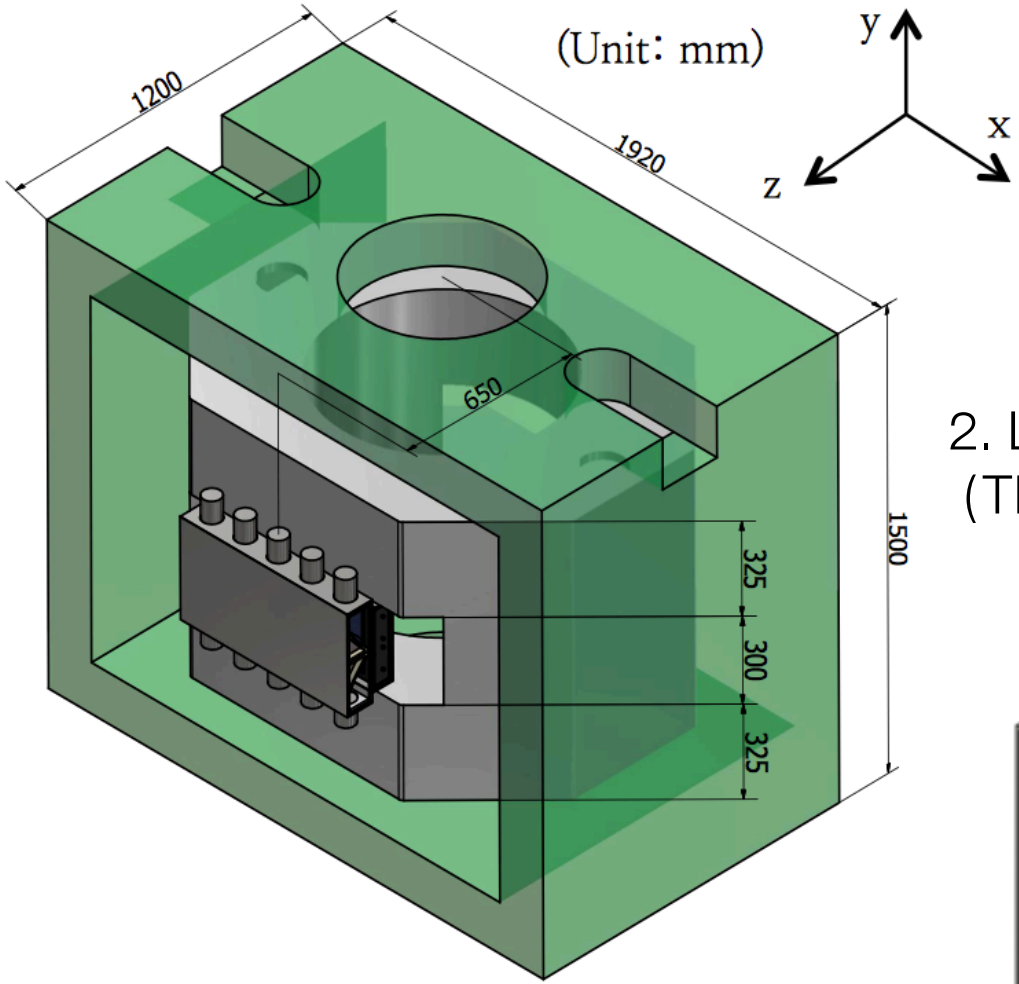




Performance Test at LEPS

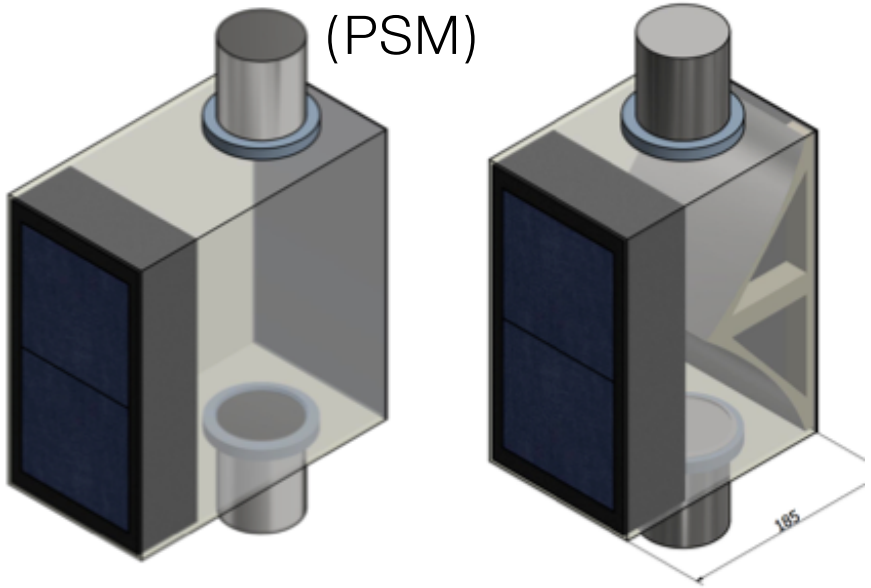
1. Parabolic longer (PLM)





2. Longer teflon (TLM)

3. Shorter parabolic (PSM)

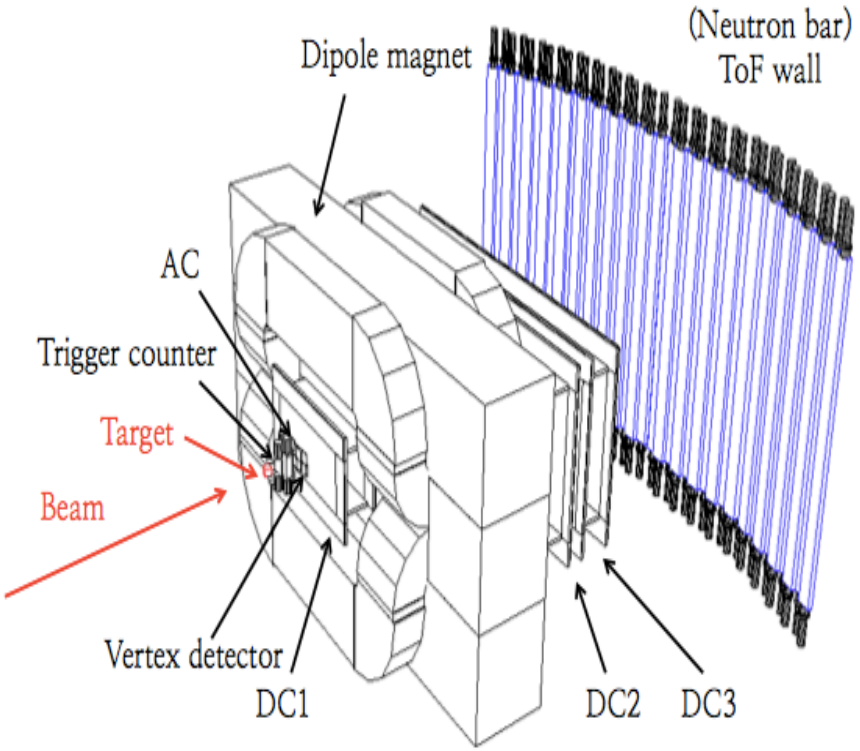


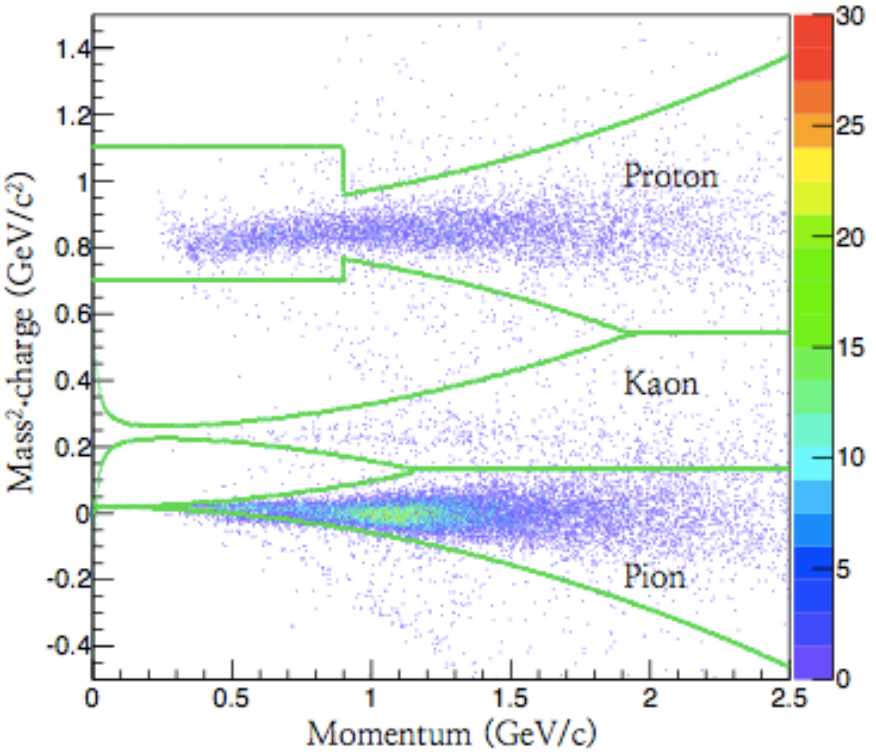
4. Mokcup

Performance Test at LEPS

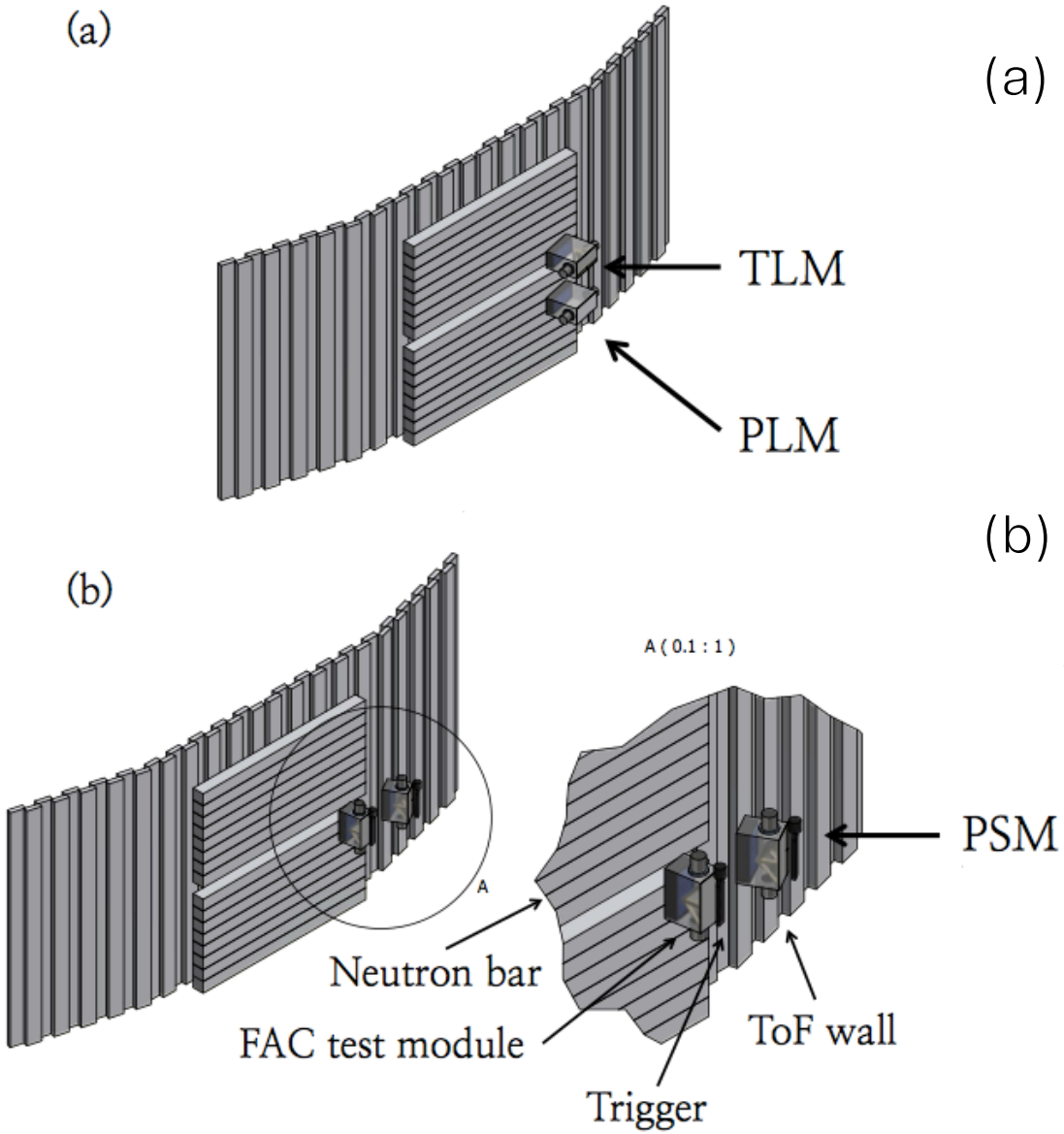
Test modules and mockup was installed behind neutron bars.

Measure pions and protons (instead of kaon).





Experimental Setup



(a) Longer module
(PLM & TLM)

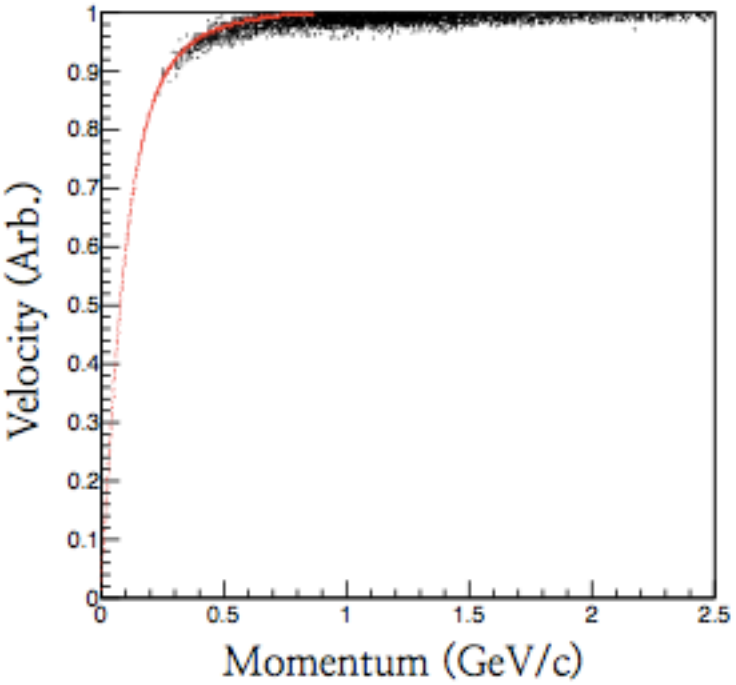
Horizontal direction.

(b) Shorter module
(PSM & Mockup)

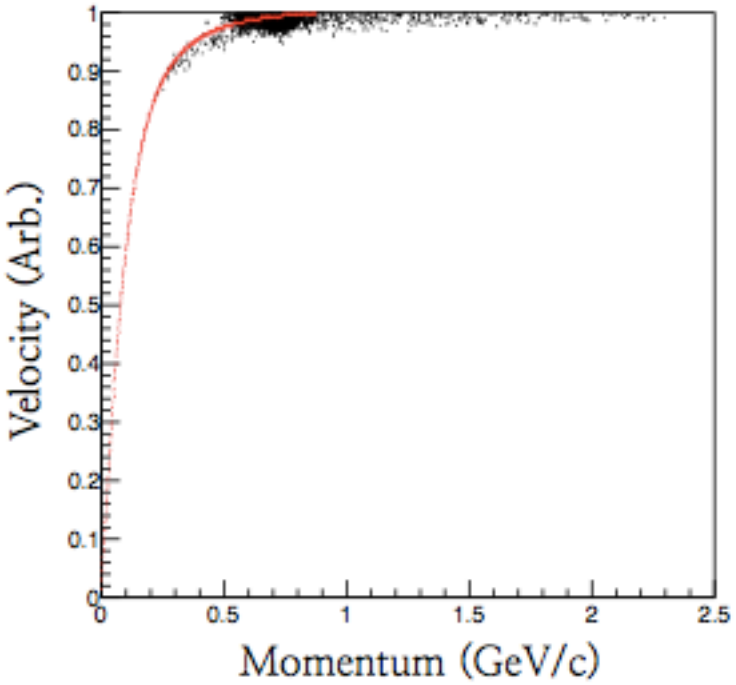
Vertical direction

Electron Background

PLM



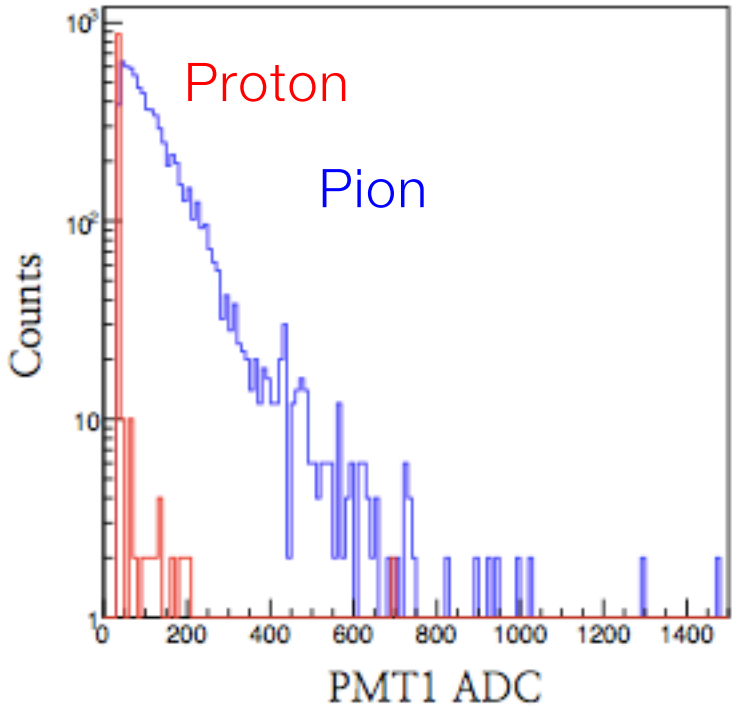
PSM

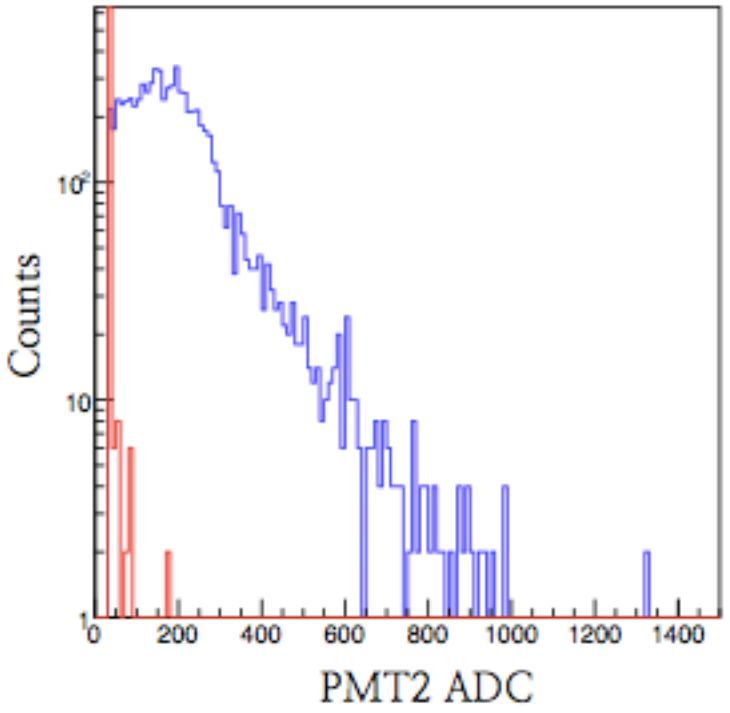


Results

PMT1 signal OR PMT2 signal: pion events

PMT1 no signal AND PMT2 no signal: proton events

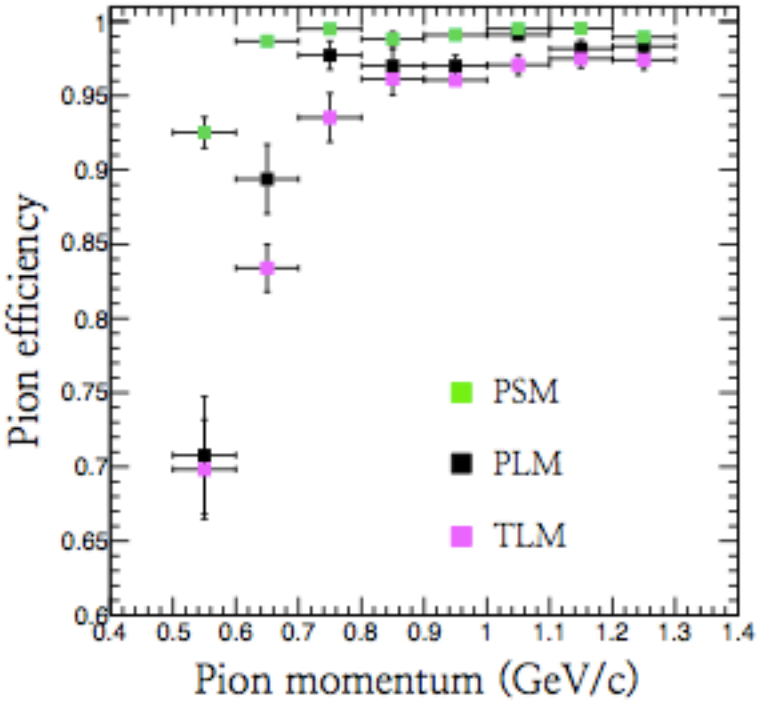


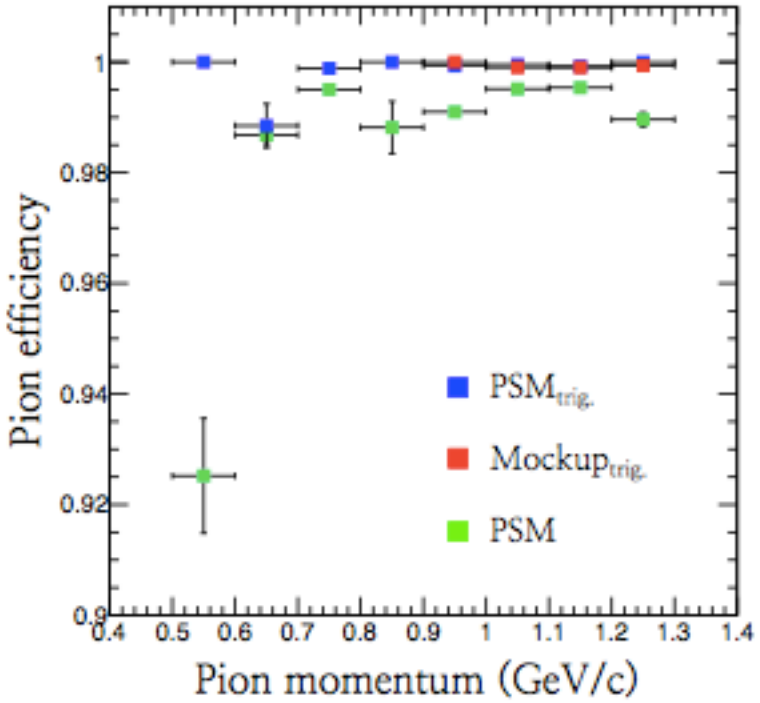


Results

Pion momentum (GeV/c)	PLM	TLM	PSM	$PSM_{trig.}$	$Mockup_{trig.}$
0.5 ~ 0.6	0.7078	0.6983	0.9252	1.0000	·
0.6 ~ 0.7	0.8939	0.8340	0.9868	0.9885	·
0.7 ~ 0.8	0.9773	0.9353	0.9950	0.9976	·
0.8 ~ 0.9	0.9701	0.9613	0.9882	1.0000	·
0.9 ~ 1.0	0.9701	0.9605	0.9910	0.9993	1.0000
1.0 ~ 1.1	0.9911	0.9709	0.9951	0.9995	0.9990
1.1 ~ 1.2	0.9817	0.9750	0.9954	0.9992	0.9990
1.2 ~ 1.3	0.9833	0.9742	0.9896	1.0000	0.9993

Not enough statistics





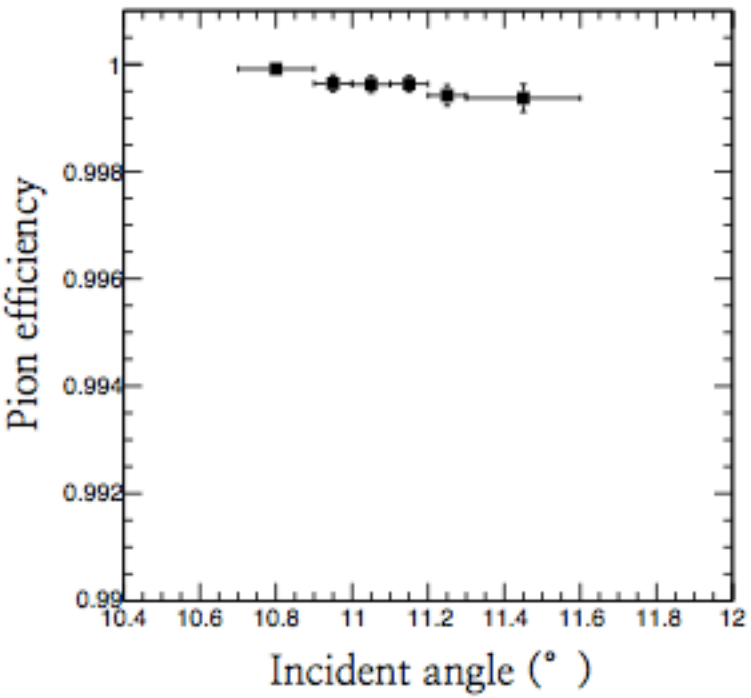
Underestimated efficiency?

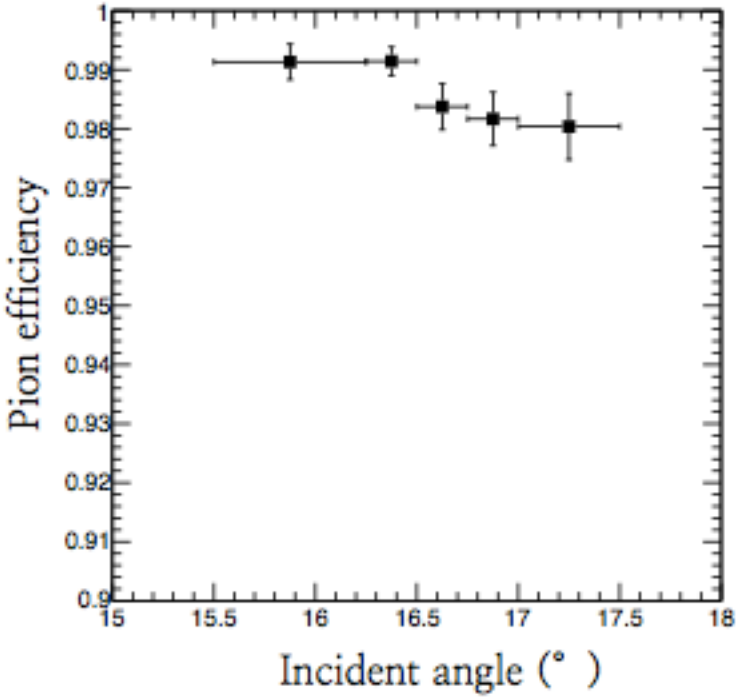
1. Pion events are selected indirectly.

   Kaon contamination or trigger scintillator noise

   0.1 % mis-selection → 10^3 order pion suppression.

2. Fine-mesh PMT noise.
3. Installation position is biased. Incident angle is bigger than 10 degree.





Summary & Plan

1. A threshold Cherenkov detector with parabolic structure has been developed.

→ 10^3 order pion suppression with 10^2 order proton misidentification

(Please see the TN for detailed contents.)

2. Planning to cross-check and complement the results with G4 simulation in Apr.