

Heavy Ion Physics Experiment LAB



Sep. 8, 2007

YI, JunGyu

Pusan National University



HIM
Heavy Ion Meeting
2007 - 09



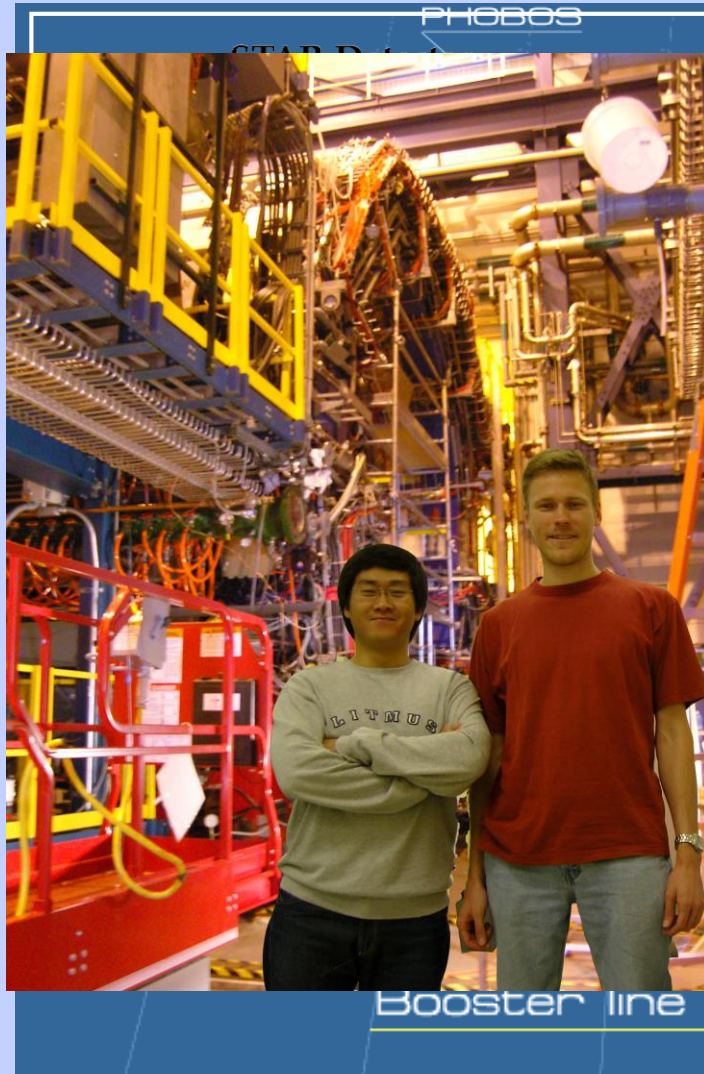
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him.phys.pusan.ac.kr/~hipex

- **STAR @ RHIC, BNL**
 - PNU Lab.@ BNL
 - Hadron Physics : pp' production in UPC
 - Heavy Ion Physics : Open Charm Production at STAR
- **NA49/NA61 @ SPS, CERN**
 - Data Analysis via KISTI
 - Λ 1520 analysis
 - Charge Transfer Fluctuation
- **CBM @ FAIR, GSI**
 - Cherenkov Detector R&D
 - Ring Image Cherenkov (**RICH**) Detector R&D
 - Band Image Cherenkov (**BICH**) Detector R&D
 - PNU Lab.@ PAL, Pohang
 - Preliminary Test : MAPMT Uniformity

STAR @ RHIC, BNL



Topics

- **Ultra Peripheral Collision**
: ρ, ρ' production Analysis
- **Heavy Ion Physics**
: **D** production Analysis
: charmed exotic
- **TOF installation**

Peoples

Dr. B.Grube

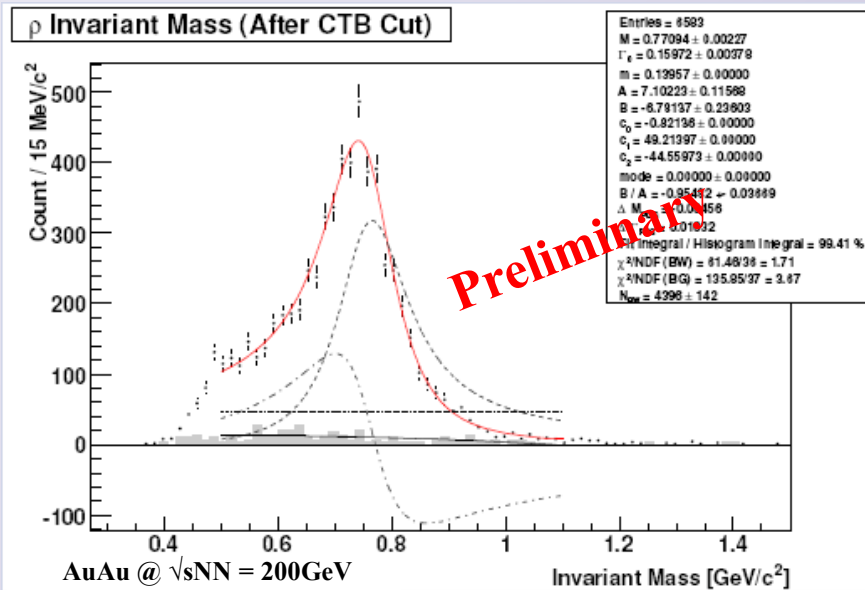
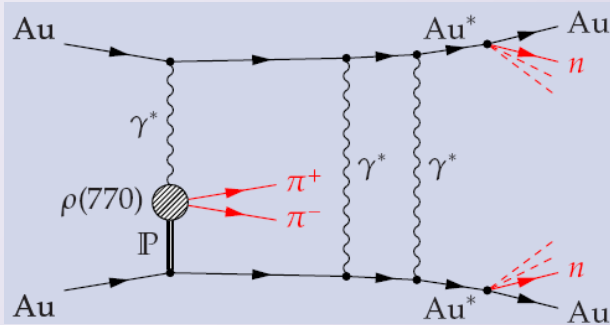
- TU München, COMPASS

K.E. Choi

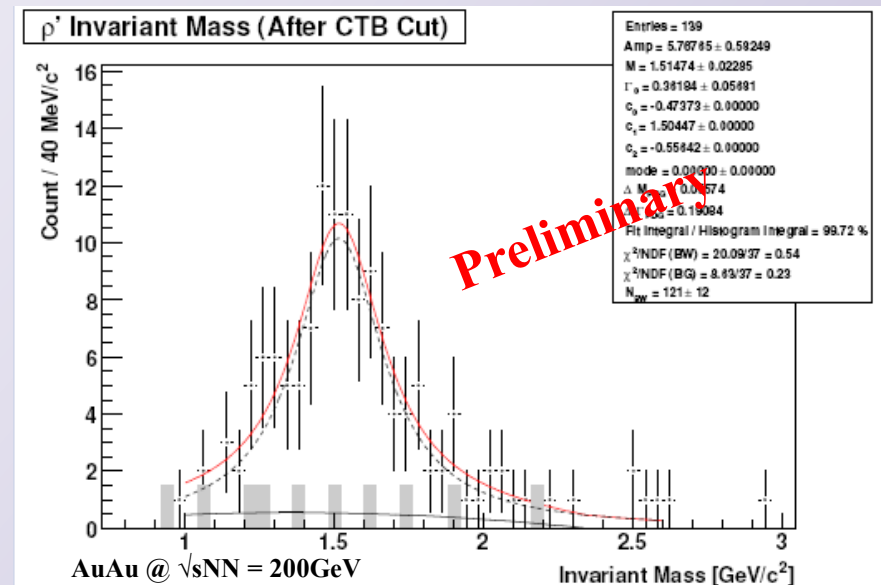
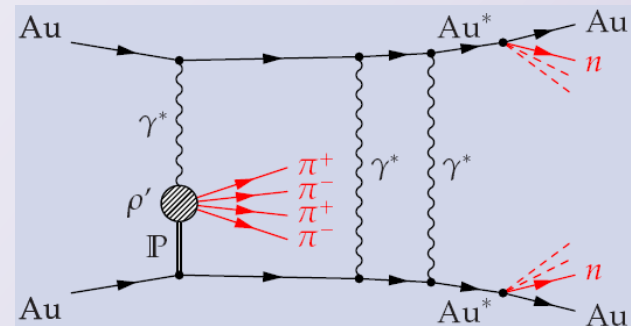
- M.A. course PNU, BICH R&D

Hadron Physics

$\rho(770)$ production in UPC

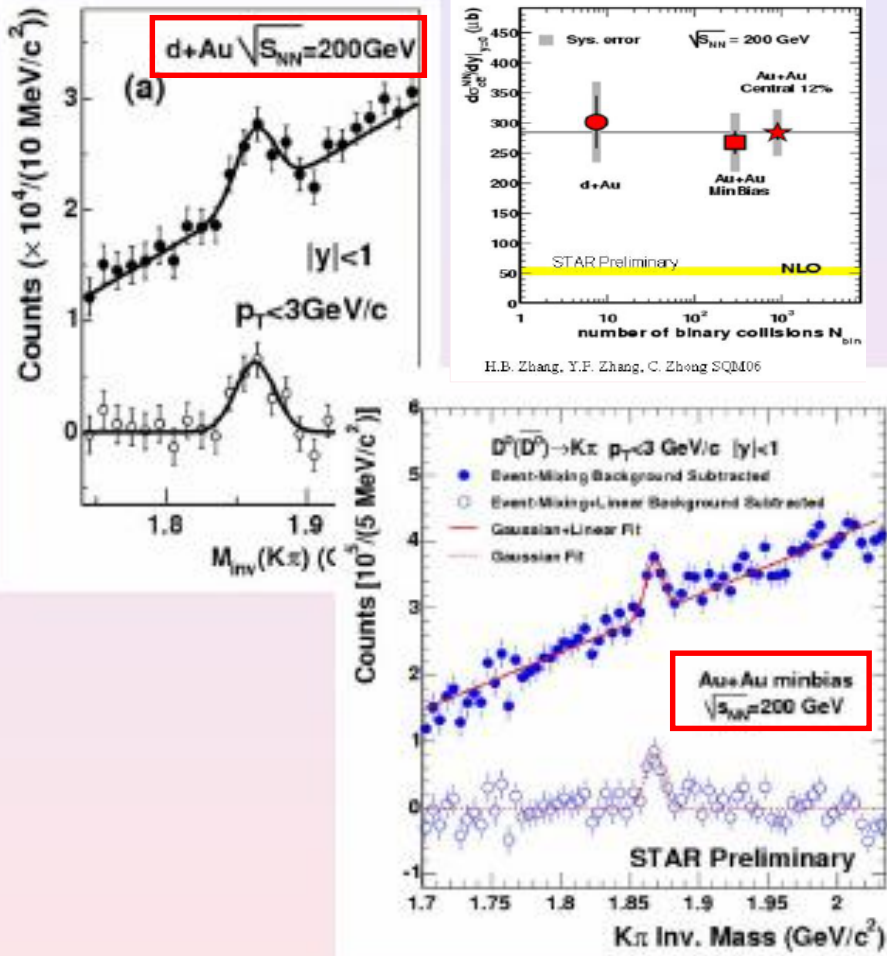


ρ' production in UPC

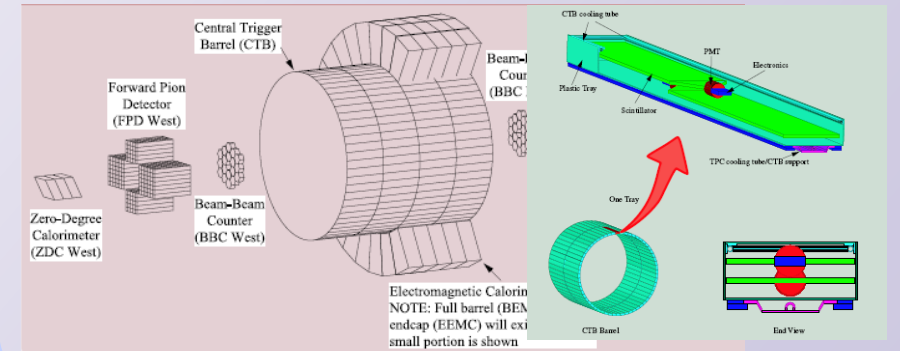
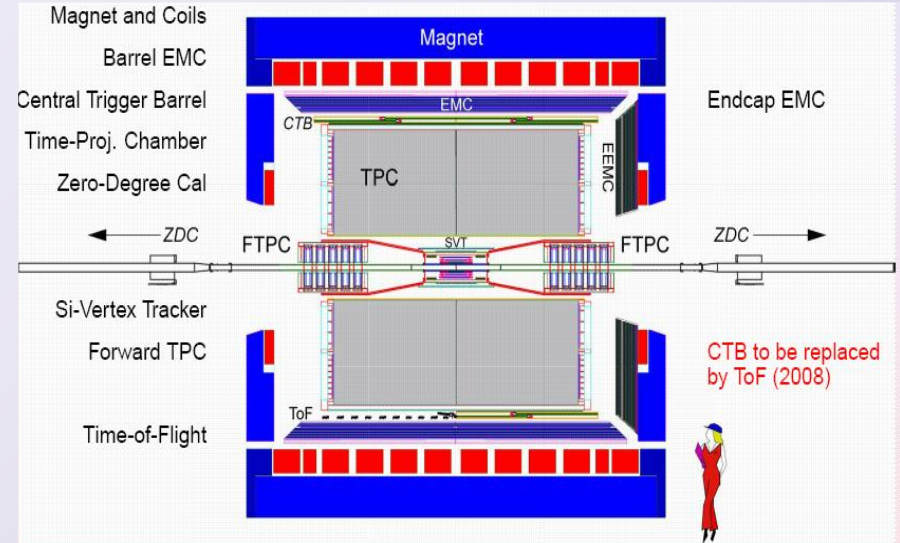


Heavy Ion Physics and..

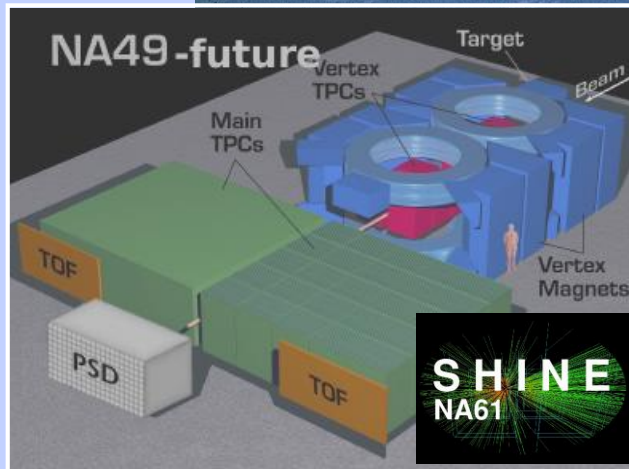
Open Charm production in STAR



TOF installation

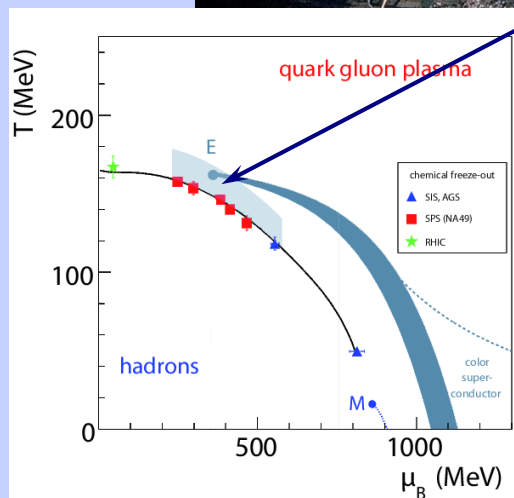


NA49/NA61 @SPS, CERN



Topics

- Data Analysis Infrastructure
- $\Lambda(1520)$ Analysis
- Charge Transfer Fluctuation



Search for Critical point

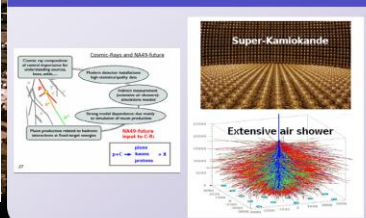
Systematic scan in energy and system size may uncover the structure of the transition line

Exciting possibility:

In particular, it may answer the question:

Does the critical point of SIM exist in nature and, if it does, where is it located?

Neutrino and cosmic ray experiment



Peoples

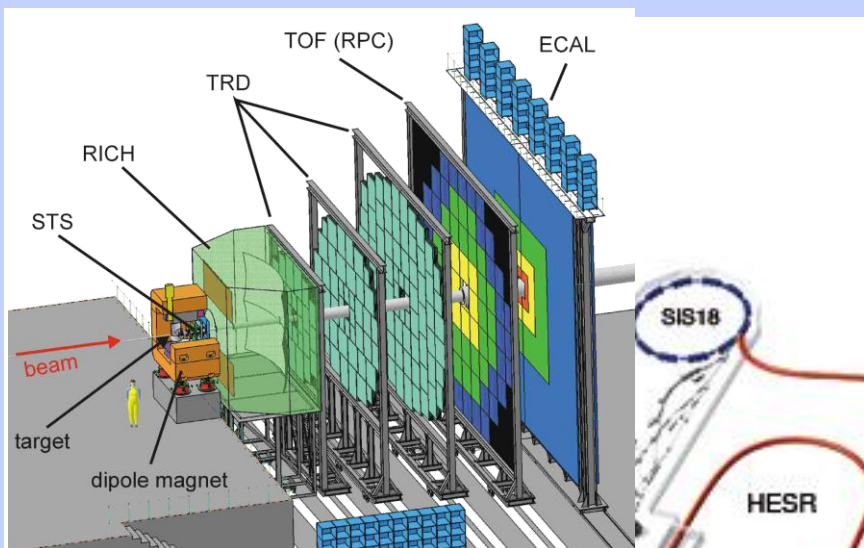
J-H Kim

- MA, PNU
- CERN~PNU computing via KISTI

JG YI

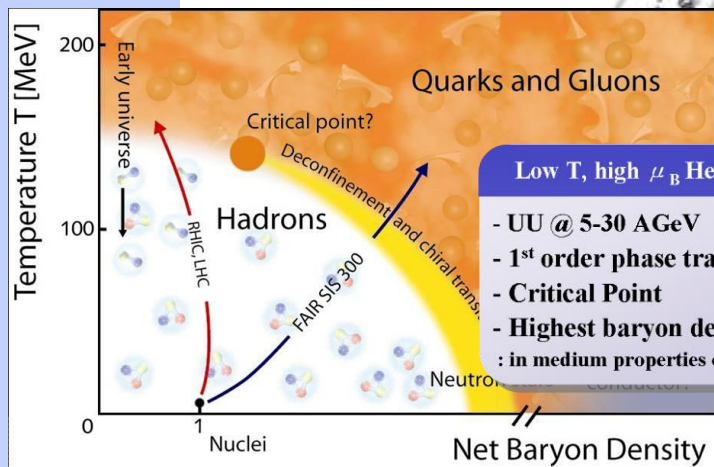
- M.A. course, PNU
- NA61 TPC Gas System

CBM @ FAIR, GSI



Topics

- RICH gas supply+monitoring system
- Cherenkov Detector R&D
 - RICH R&D (Prototype ver.1)
 - BICH R&D
- PNU Lab @PAL



Low T, high μ_B Heavy Ion Collision

- UU @ 5-30 AGeV
- 1st order phase transition
- Critical Point
- Highest baryon density
- : in medium properties of hadrons (ρ, ω, π)

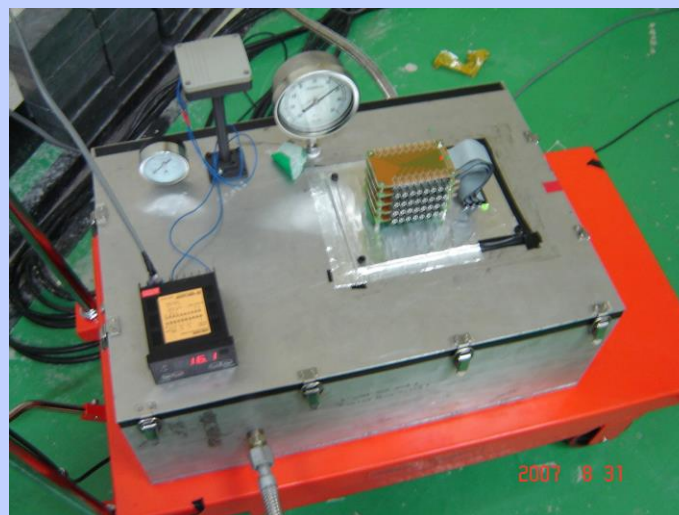
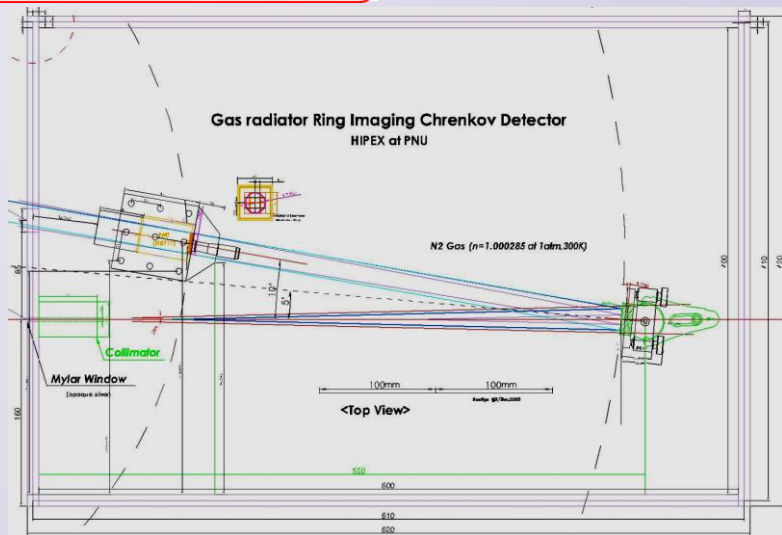
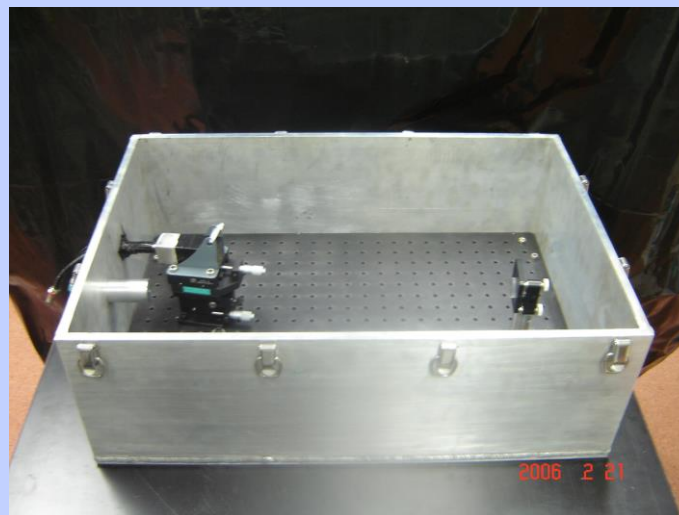
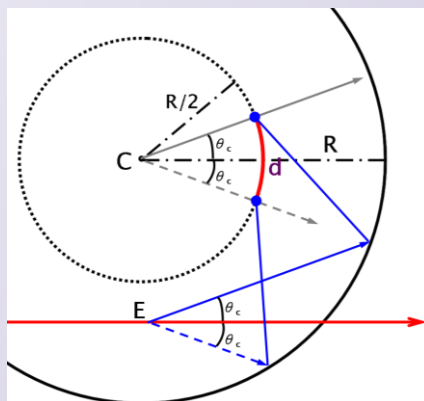
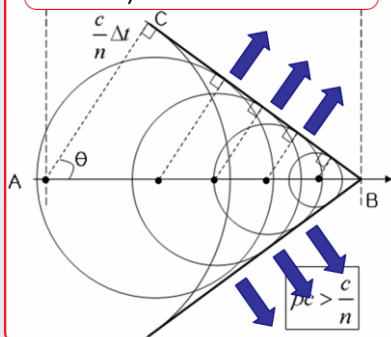
Peoples

- J-H Kim**
 - Test Macro for CBM RICH
- K.E. Choi (Done)**
 - BICH detector R&D
- HY Lee, JG YI**
 - RICH detector R&D

RICH detector R&D

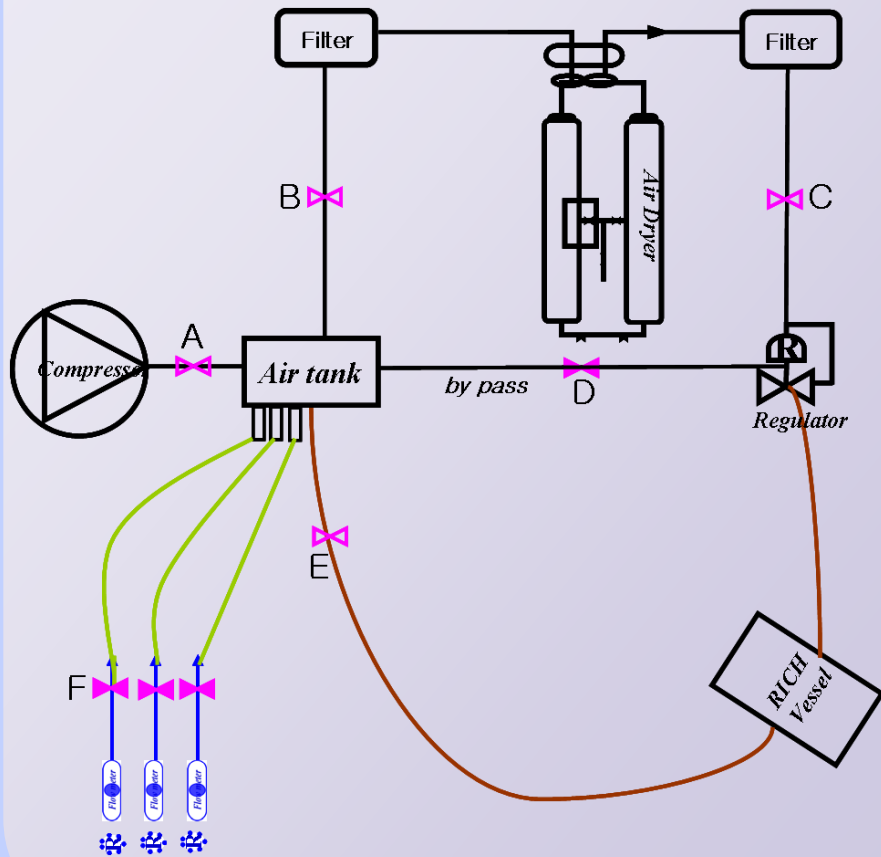
RICH Concept & Design

$$\cos \theta = \frac{1}{n\beta} \quad (\text{Cherenkov Relation})$$



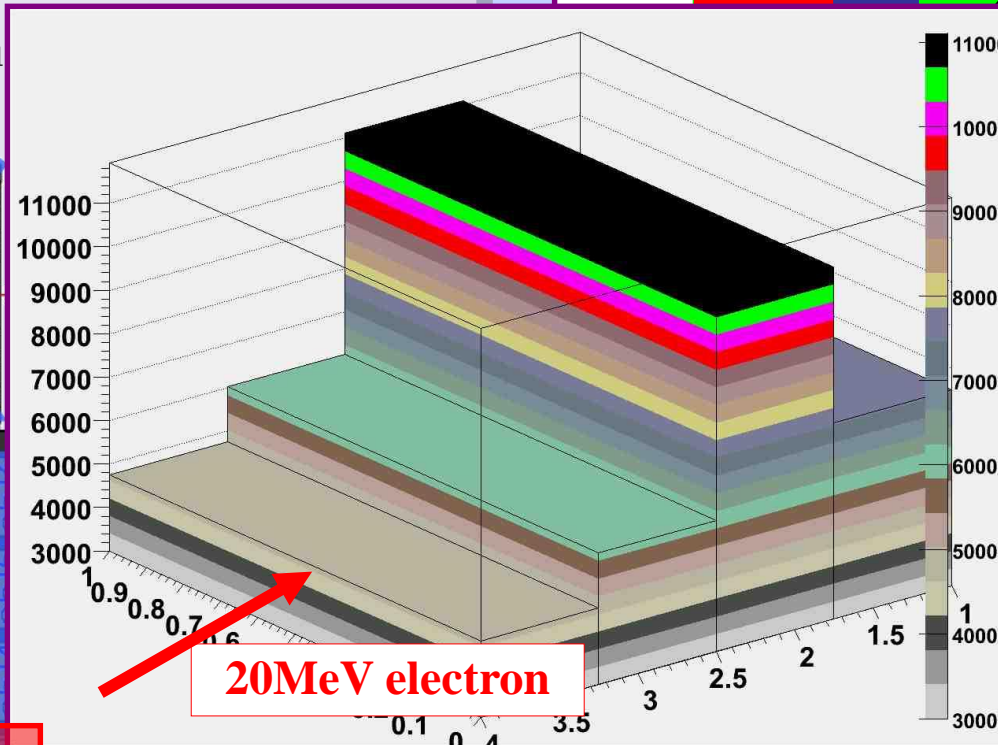
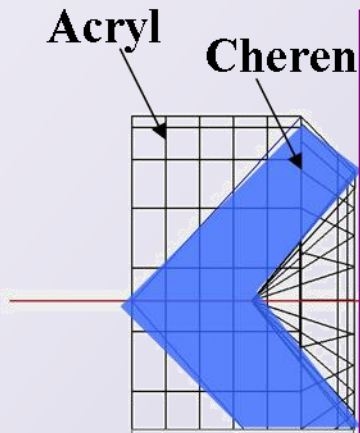
RICH gas radiator R&D

Dry Air & Gas System

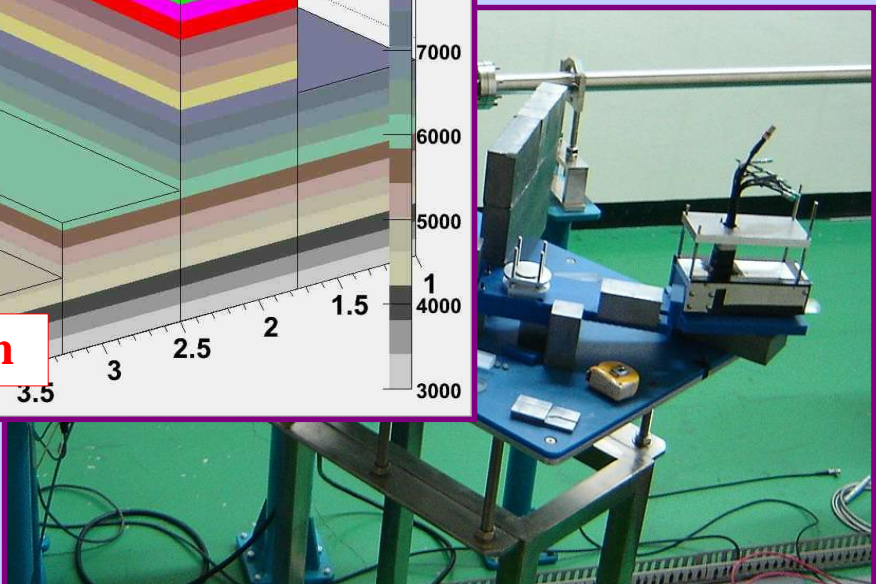
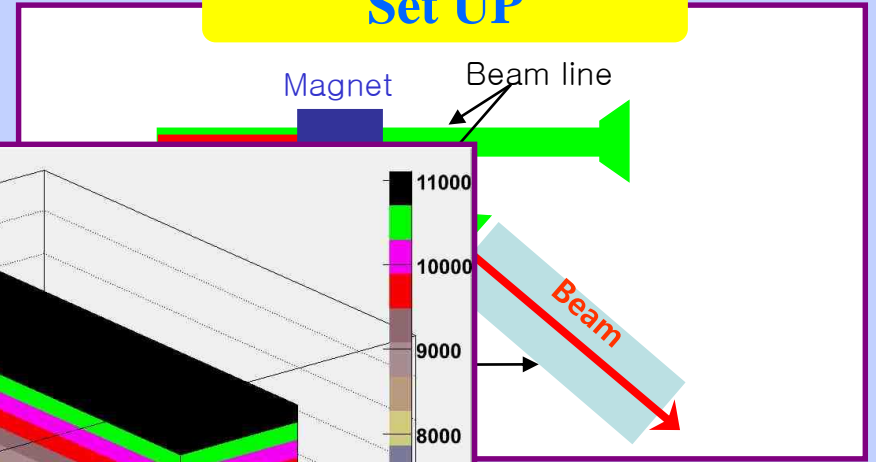


BICH detector R&D

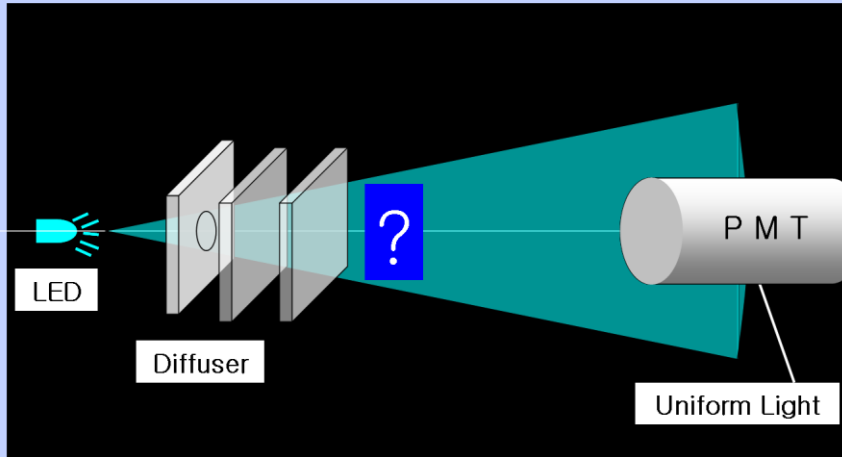
BICH Concept & Design



Set UP

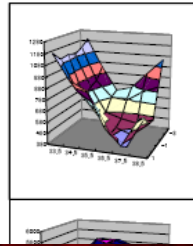


MAPMT Uniformity



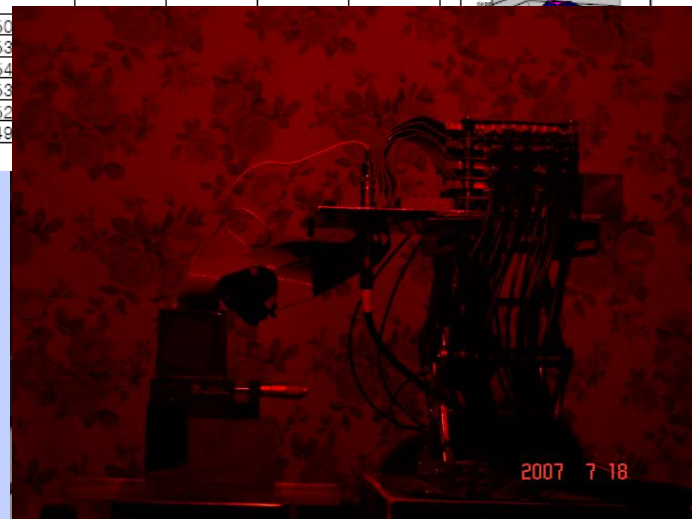
Measure	31.5	32.5	33.5	34.5	35.5	36.5	37.5	38.5	39.5	40.5
3	2443.897	3315.101	2980.299	4250.303	5368.009	5208.172	4665.869	4785.676	5213.811	3814.15
2	3186.09	3818.63	3518.982	4790.217	5566.408	5714.584	5836.109	5705.068	5408.502	3543.896
1	2687.133	5071.481	4438.887	4865.197	6442.918	5594.131	5372.236	5475.705	5015.792	3956.644
0	3837.853	4172.692	4875.679	5711.94	6323.478	5890.191	6432.593	5672.229	5635.387	5772.258
-1	5680.84	4591.296	5426.339	6753.024	5568.264	5451.103	6273.198	5572.286	5854.49	5335.069
-2	3515.592	4674.896	6240.988	6315.098	5864.297	5969.701	6523.515	5440.74	5329.906	4646.343
-3	2751.857	3850.243	5924.059	5747.144	5460.982	5468.137	6152.322	4850.243	5292.261	5036.627
-4	3230.875	3564.179	4769.934	6359.779	5955.572	4651.868	4775.466	5625.651	4957.454	4573.055
-5	2843.296	3724.098	4440.25	5037.599	4442.378	5079.936	4452.146	4324.537	2980.864	3400.855
-6	2435.324	2589.726	4074.187	4461.342	4834.762	4598.162	5525.899	3287.068	3181.151	2238.796

Stdev (5x5)	33.5	34.5	35.5	36.5	37.5	38.5
1	1190.383	969.8714	898.1348	602.9207	455.573	707.2184
0	1111.989	841.7764	742.7091	488.4339	390.4669	664.3105
-1	1124.953	742.5246	567.897	495.2683	447.5941	564.8251
-2	1098.568	804.8359	577.0697	533.472	503.962	556.326
-3	1139.242	831.3379	693.0911	665.5263	760.2321	819.554
-4	1197.681	930.2928	714.1716	751.6452	901.7379	1041.48

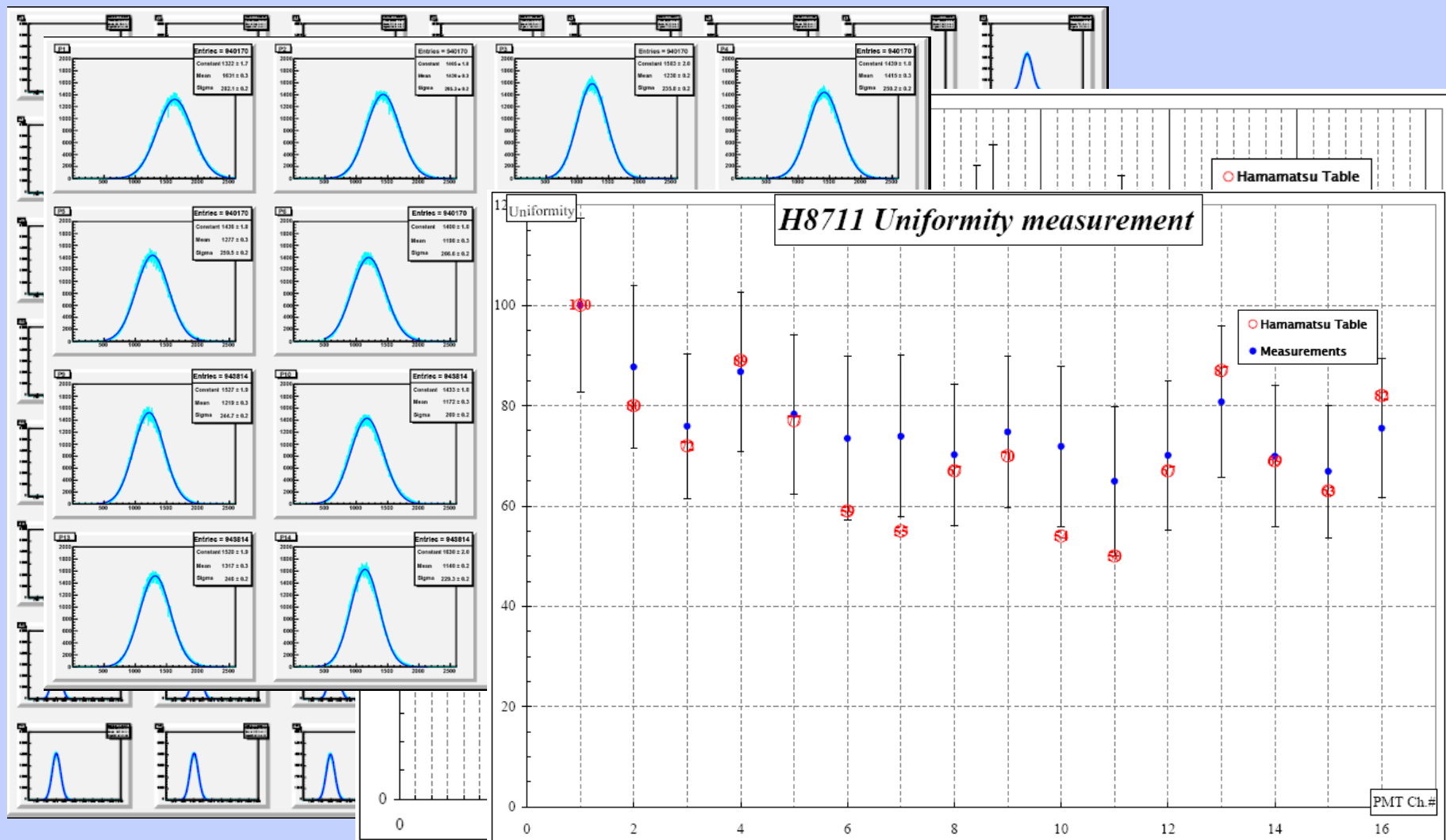


Mean (5x5)	33.5	34.5	35.5	36.5	37.5	38.5
1	4623.398	5000.000	5000.000	5000.000	5000.000	5000.000
0	4953.529	5000.000	5000.000	5000.000	5000.000	5000.000
-1	5067.687	5000.000	5000.000	5000.000	5000.000	5000.000
-2	5042.276	5000.000	5000.000	5000.000	5000.000	5000.000
-3	4864.915	5000.000	5000.000	5000.000	5000.000	5000.000
-4	4483.938	4900.000	5000.000	5000.000	5000.000	5000.000

- chan
 - use t
- (0,0,37.5)



MAPMT Uniformity



PNU Lab. @PAL, Pohang



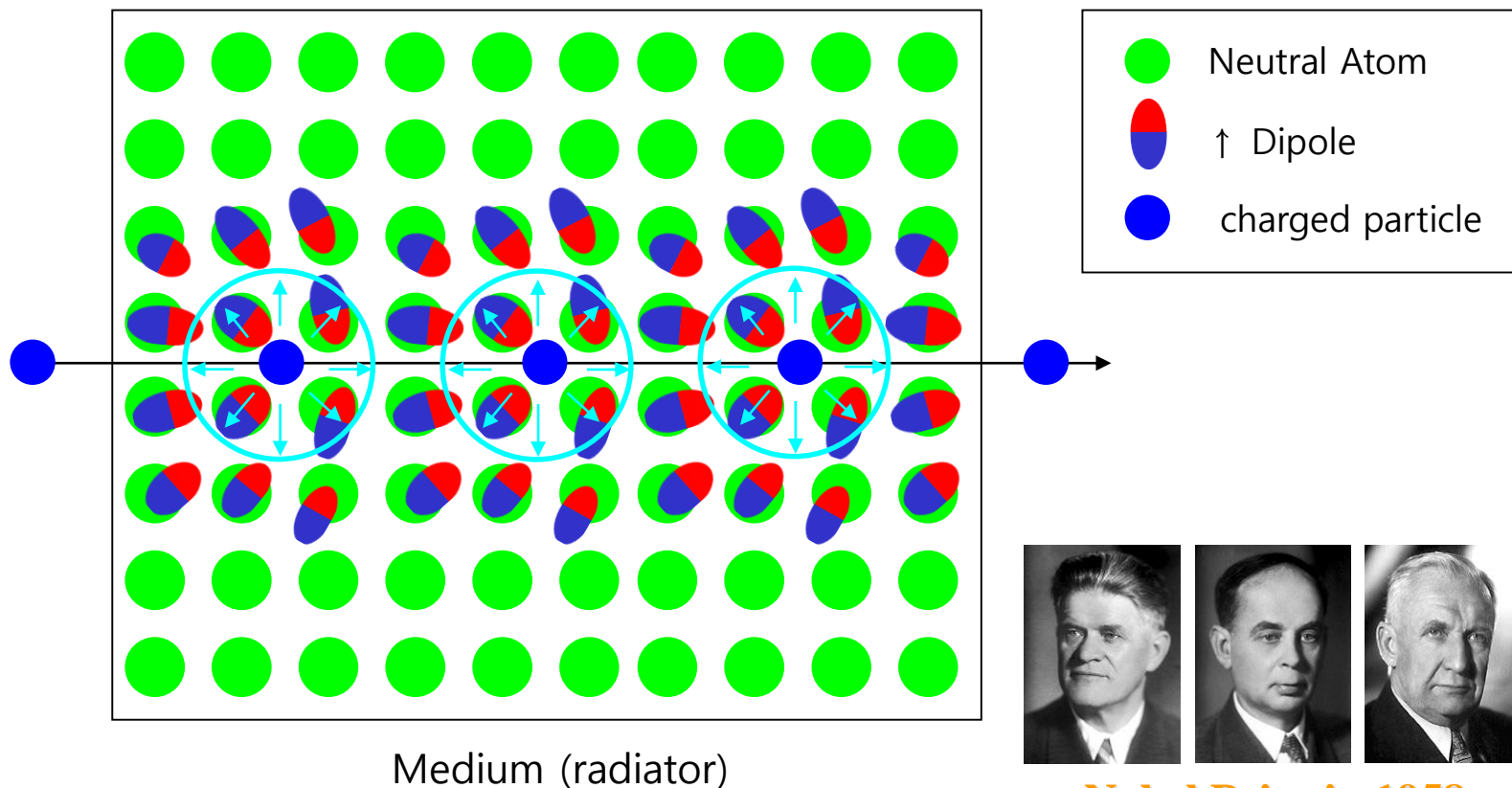


Thank You !!



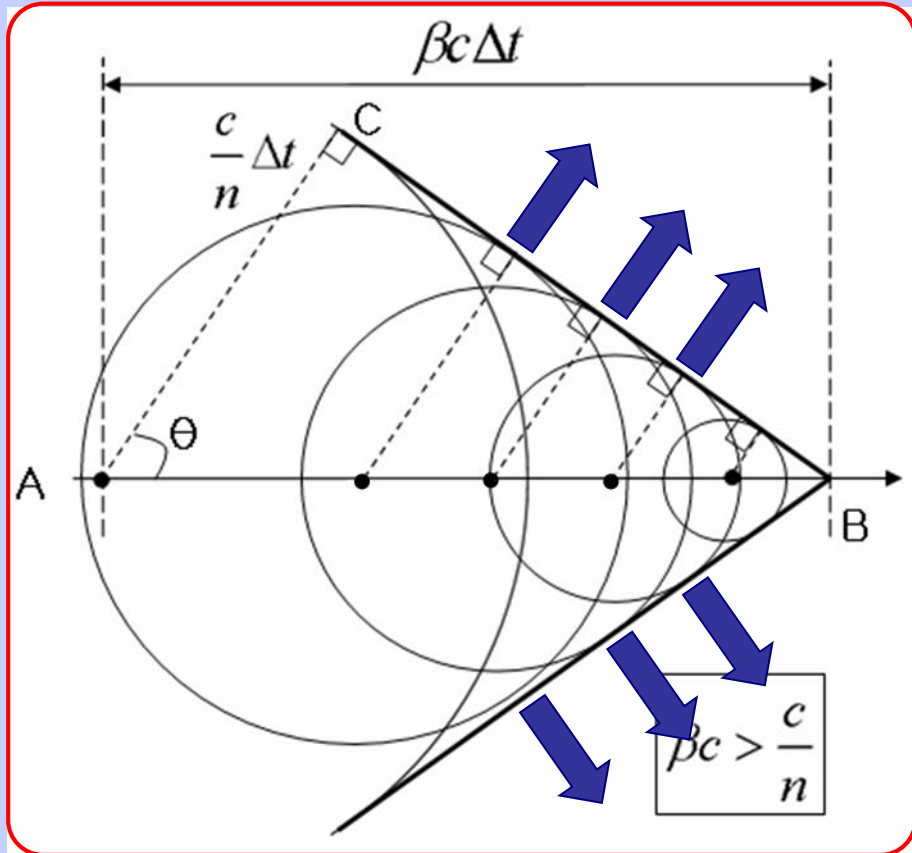
Back up Slides

Cherenkov Radiation



Nobel Prize in 1958

Cherenkov Radiation



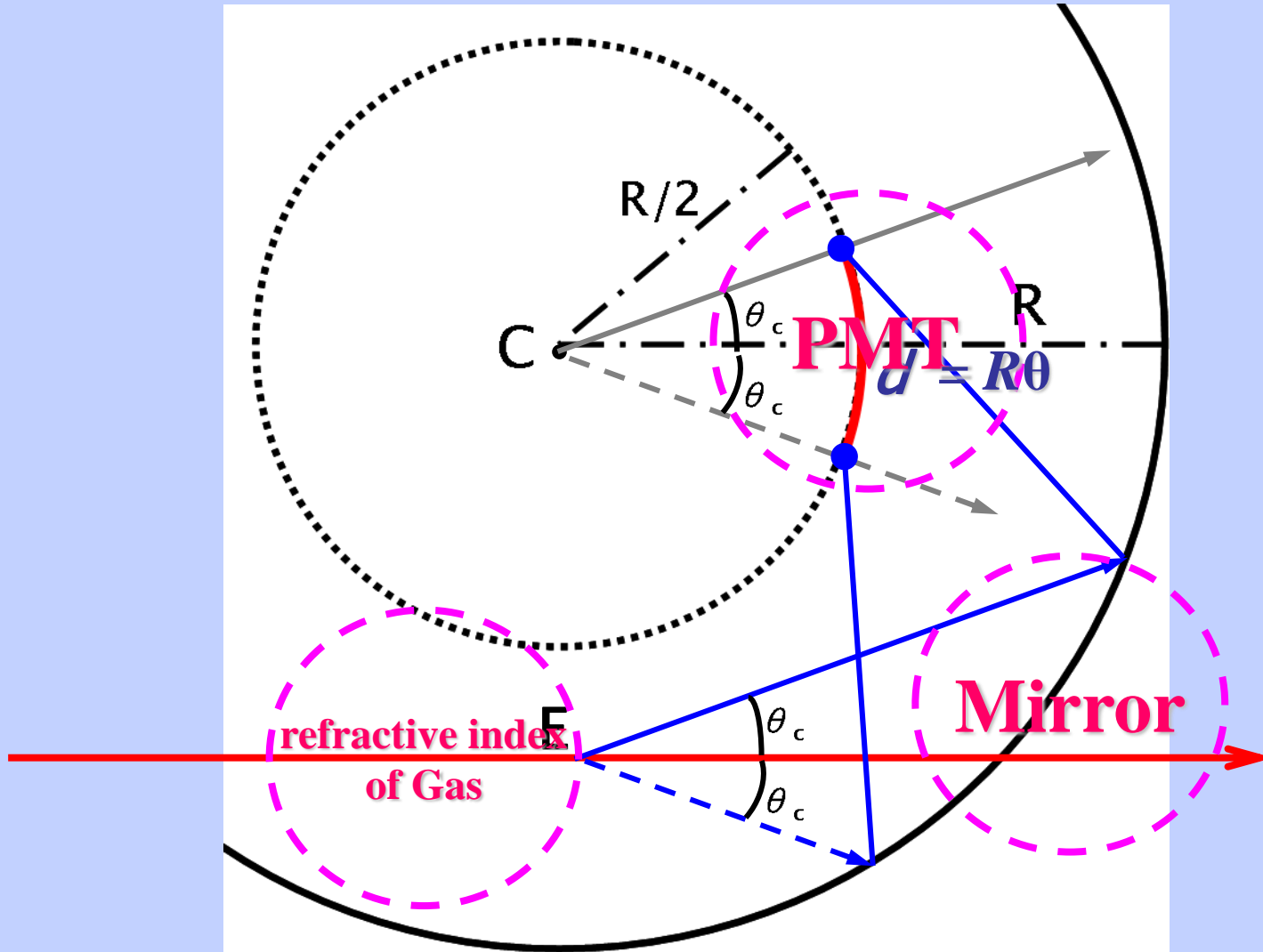
$$\overline{AB} = \beta c \Delta t \quad \overline{AC} = \frac{c}{n} \Delta t$$

$$\Rightarrow \cos \theta = \frac{\overline{AC}}{\overline{AB}} = \frac{\frac{c}{n} \Delta t}{\beta c \Delta t}$$

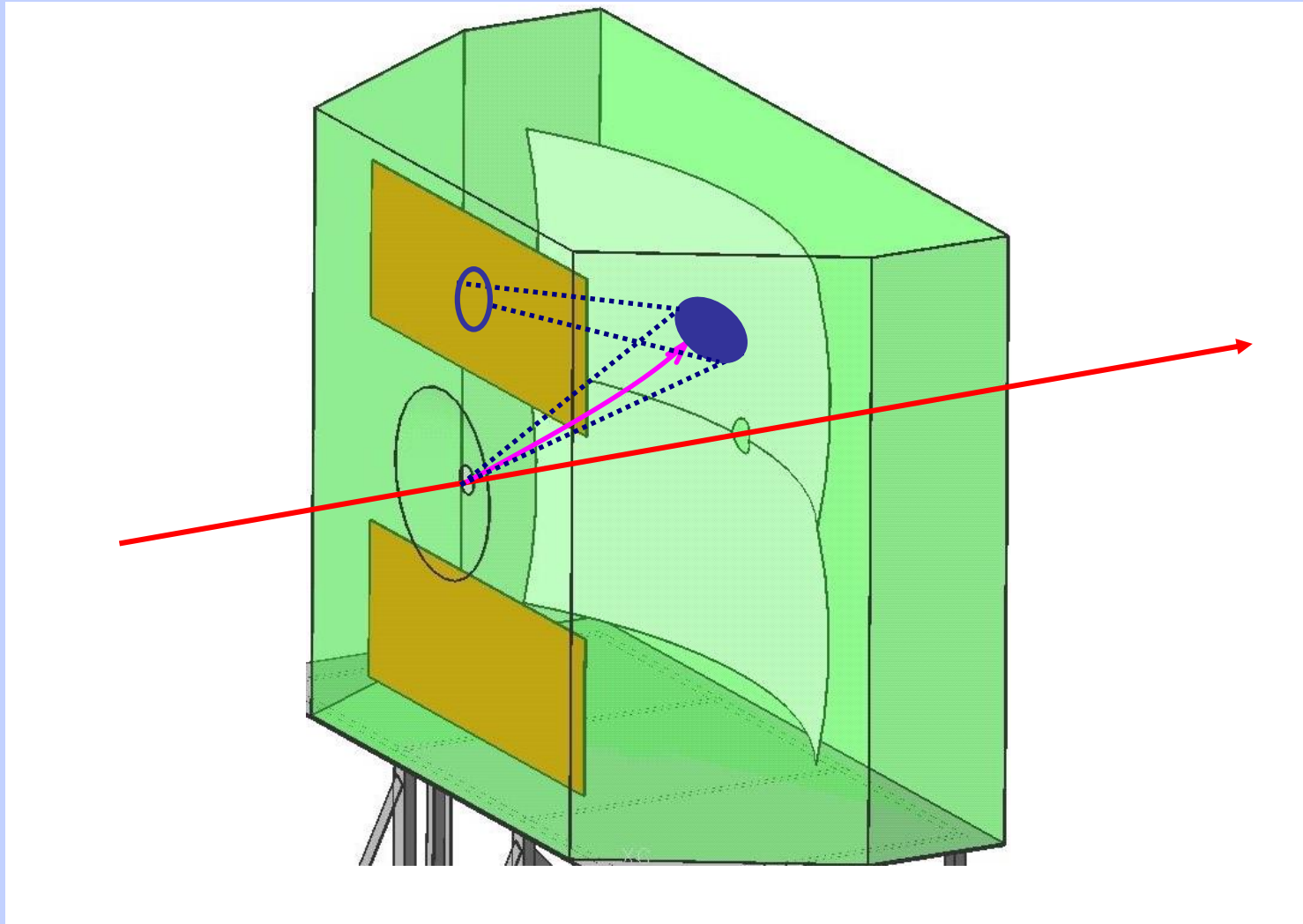
$$\cos \theta = \frac{1}{n\beta} \quad (\text{Cherenkov Relation})$$

1. $\beta_{\min} = \frac{1}{n}$
2. $\theta_{\max} = \cos^{-1} \frac{1}{n}$
3. $\frac{dE}{dl} = \frac{e^2}{c^2} \int_{\beta n > 1} \left(1 - \frac{1}{\beta^2 n(\omega)^2}\right) \omega d\omega$

RICH Geometry



CBM RICH



BICH design

