

Experimental study of vector meson in nuclear medium at J-PARC



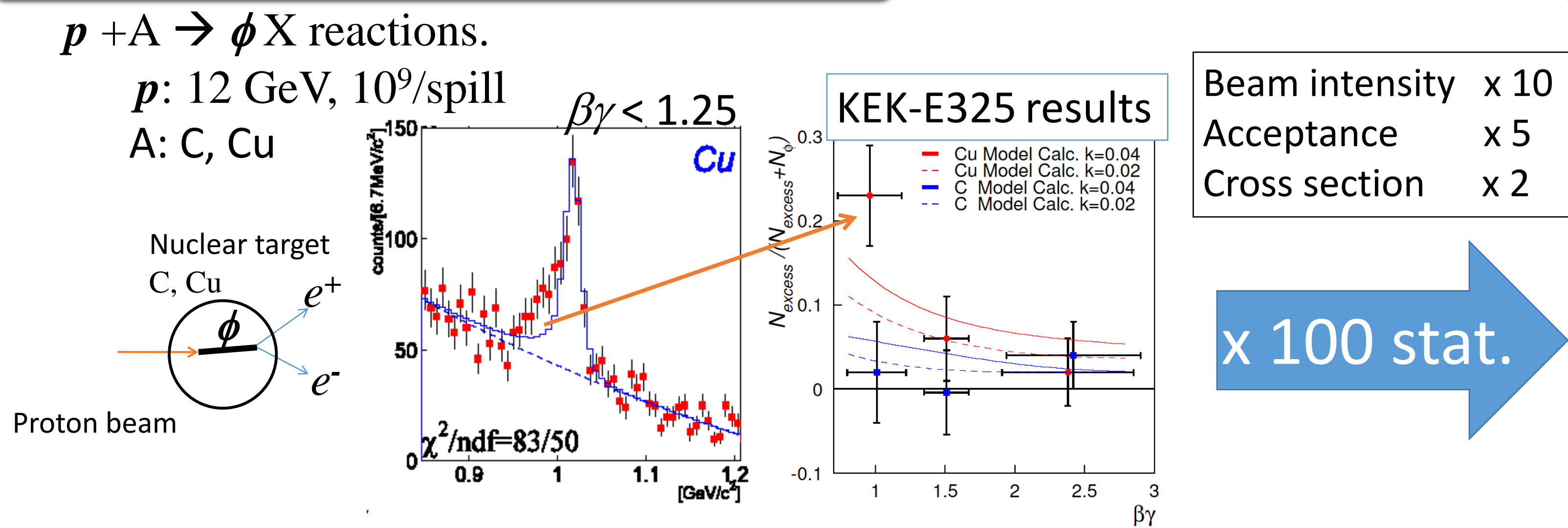
K.Aoki (KEK / J-PARC) for the J-PARC E16 Collaboration
kazuya.aoki_at_kek.jp



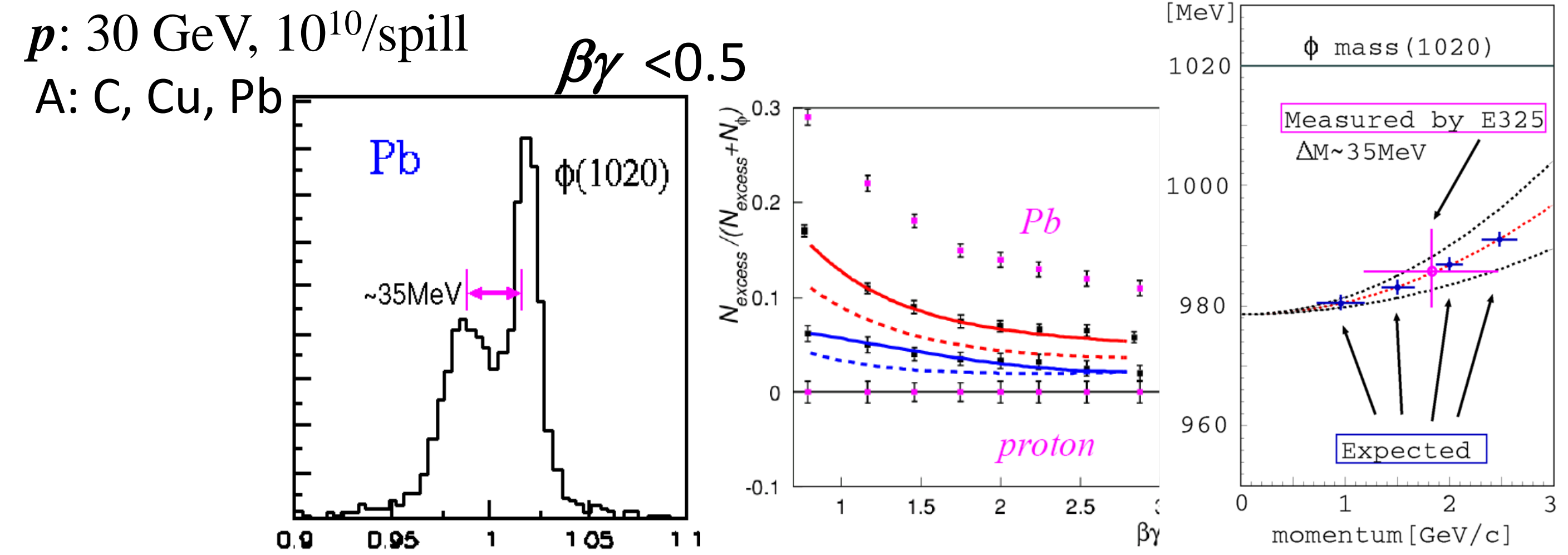
Introduction

J-PARC E16[1] has been proposed to measure the in-medium spectral change of vector mesons which can be related to partial restoration of the spontaneously broken chiral symmetry. Dielectron mass spectra in $p + A$ reactions are obtained. Main focus is on $\phi \rightarrow e^+e^-$ which is free from final state interactions, a peak w/o overlap in contrast to ρ/ω , and sensitive to strange quark condensate[2].

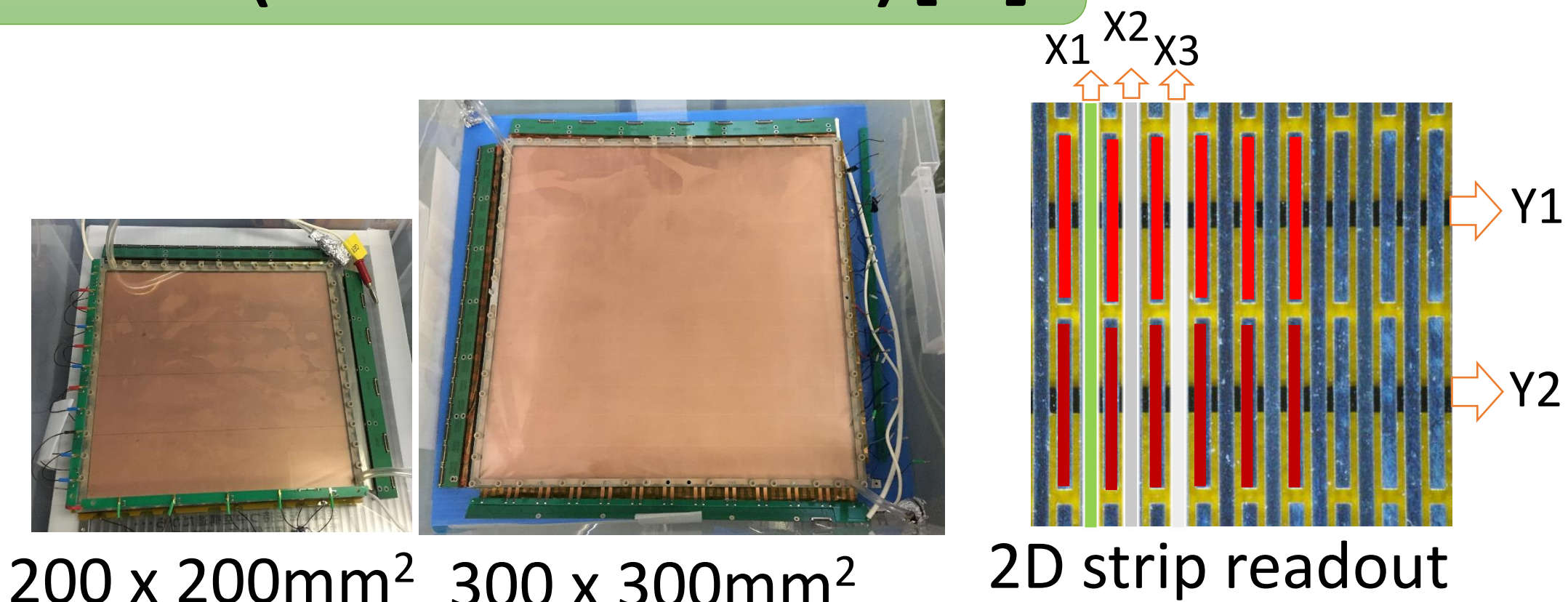
KEK E325 results (-2002)[3]



J-PARC E16 expectation

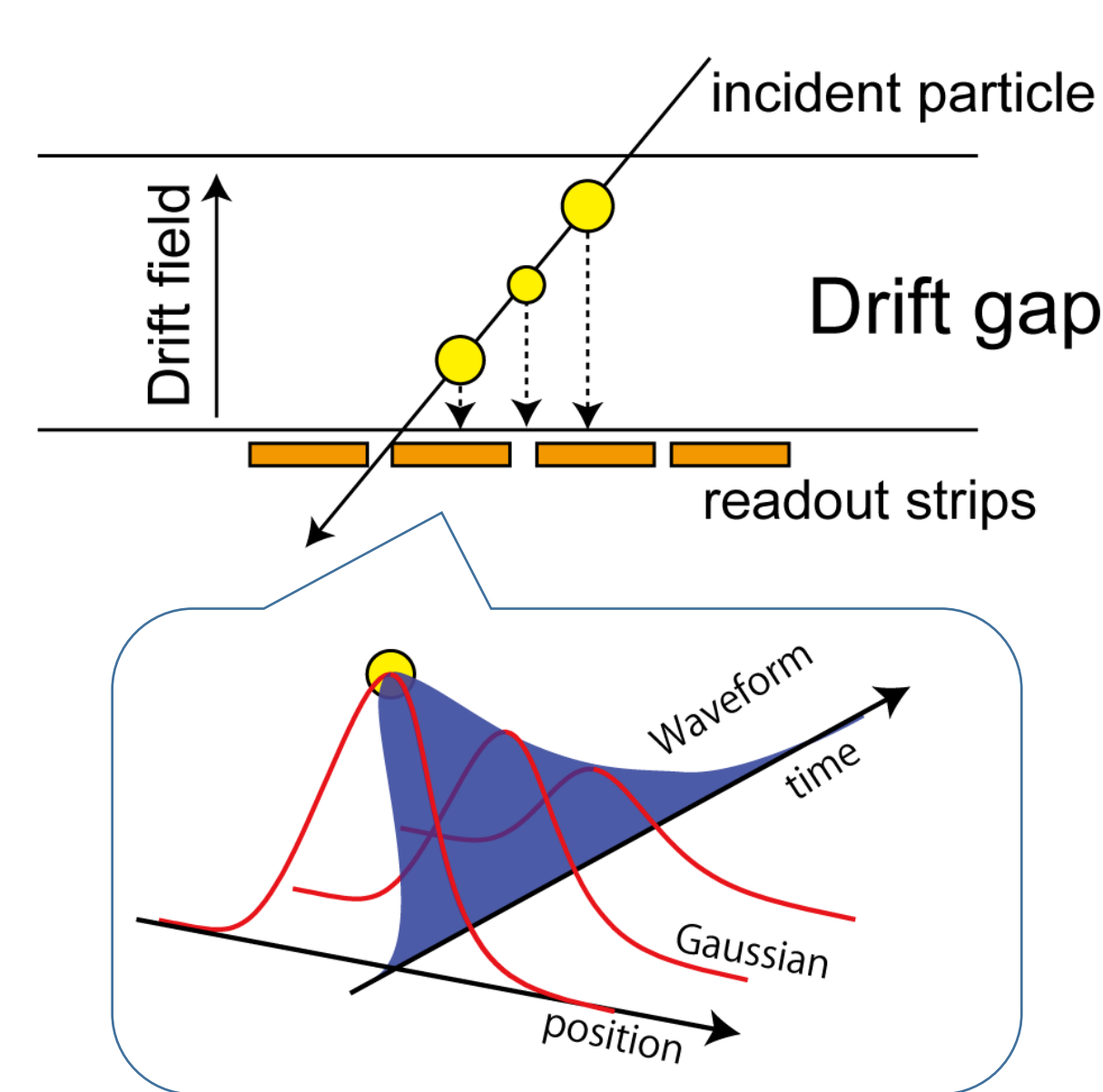
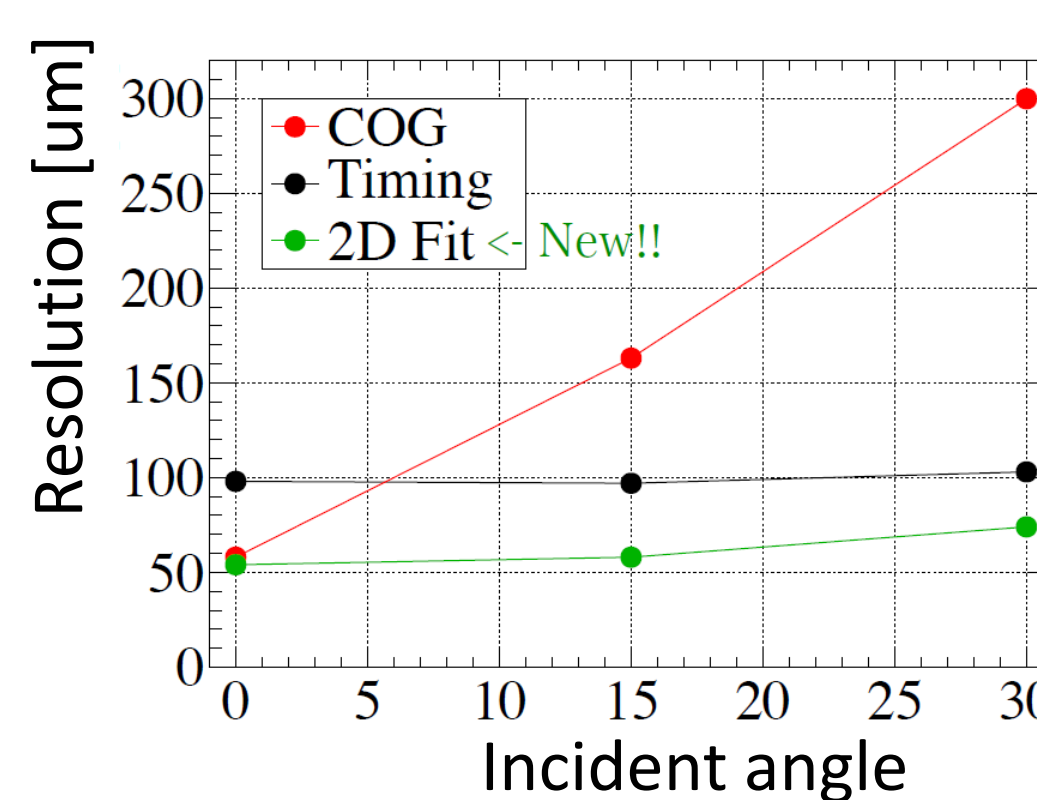


GTR (GEM Tracker)[4]



Triple-GEM detector with 3mm drift gap.
In 3 different sizes: 100², 200², 300² [mm²].
Charges are collected onto 2D strip readout.
X: 350um pitch : Bending direction.
Y: 1400um pitch

Innovative 2D fit method.
 $\sum \text{Gaus}(x_i) \times \text{Waveform}(t_i)$
 $\rightarrow < 80 \mu\text{m}$ achieved.

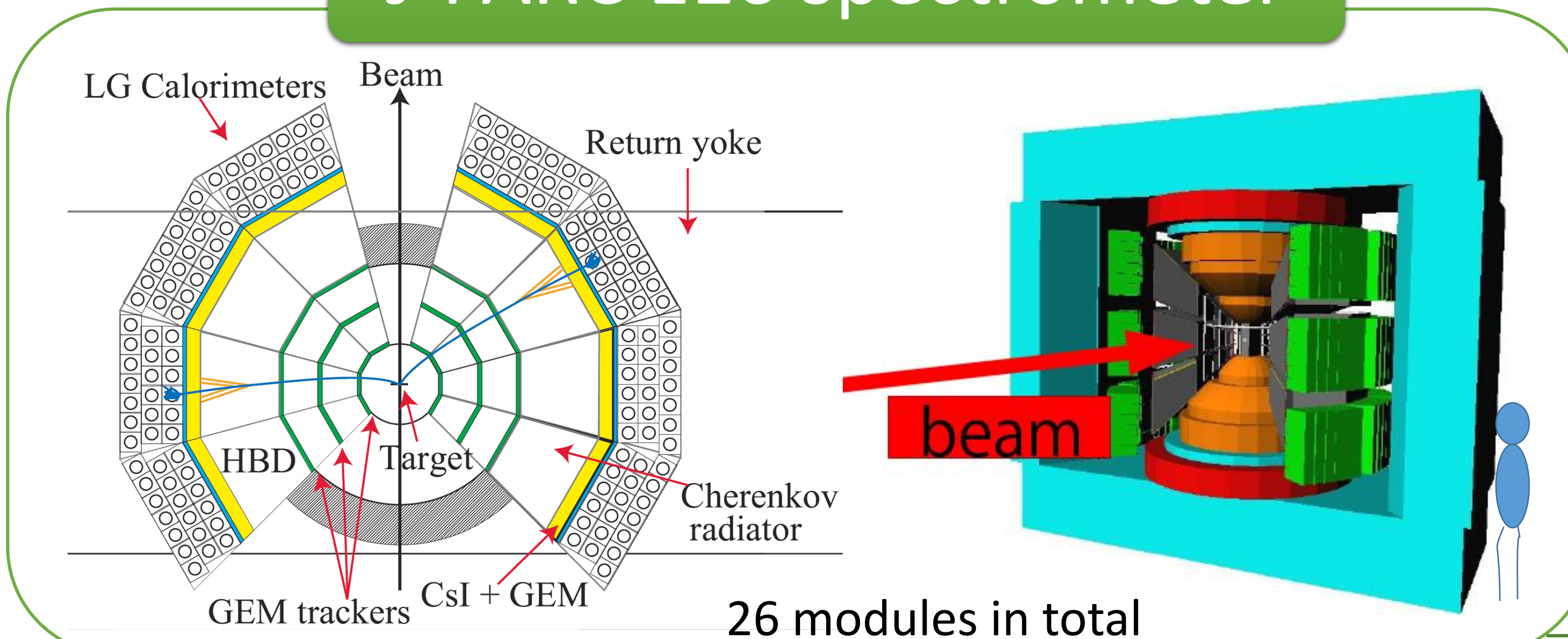


LG (Calorimeter)

Reuse of TOPAZ LG at TRISTAN.
Rejection Factor ~ 25 offline
 ~ 10 online

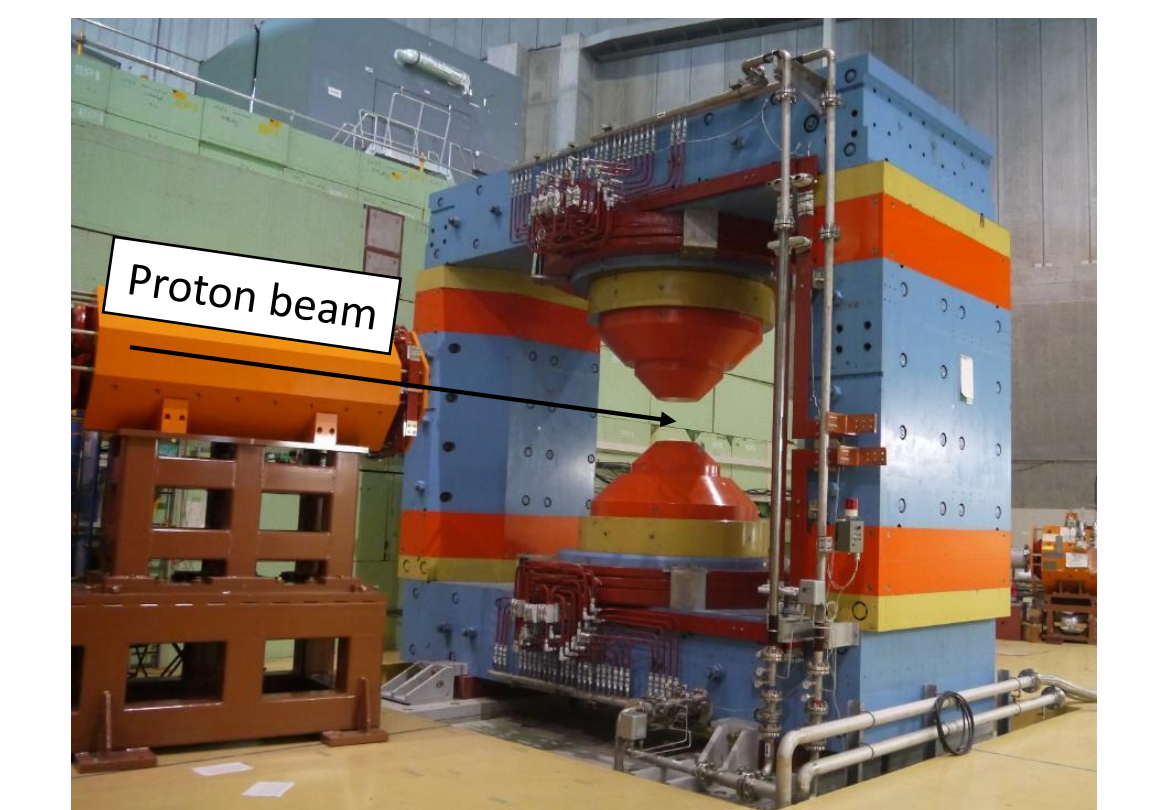


J-PARC E16 spectrometer



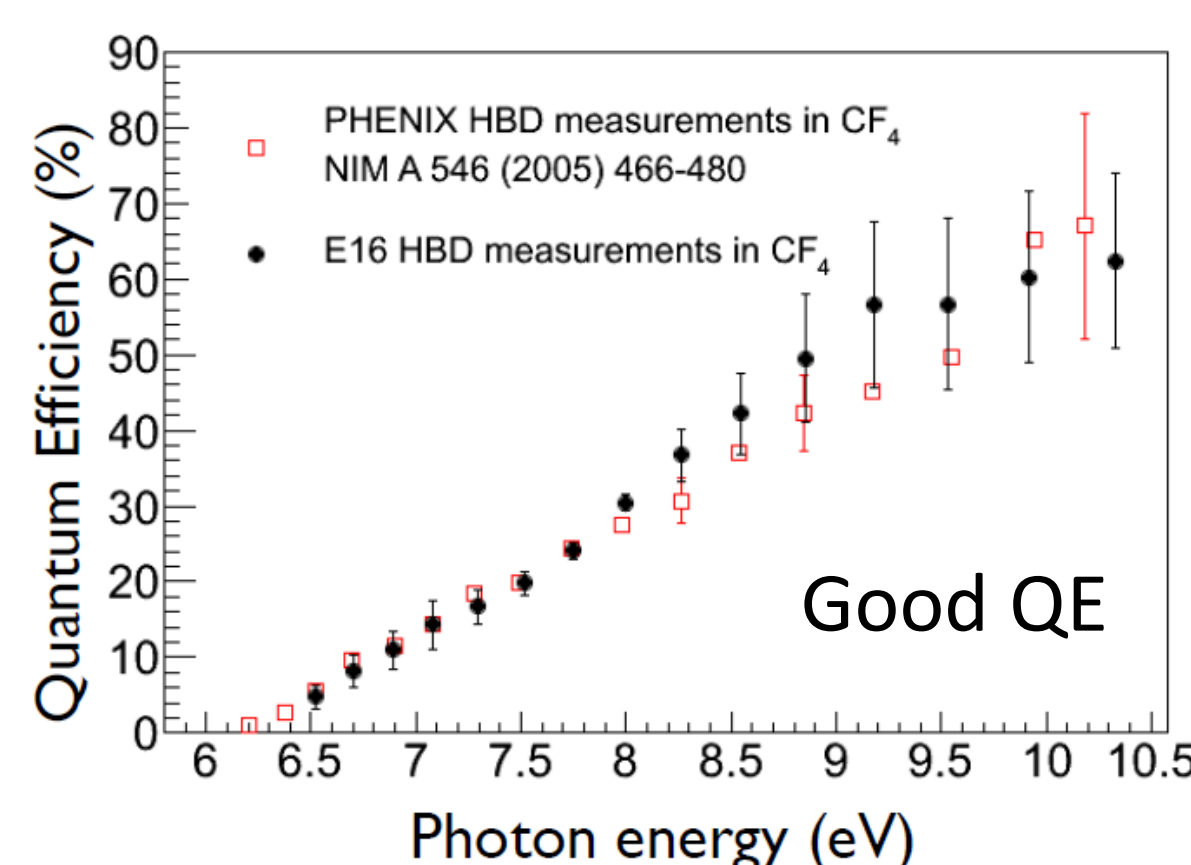
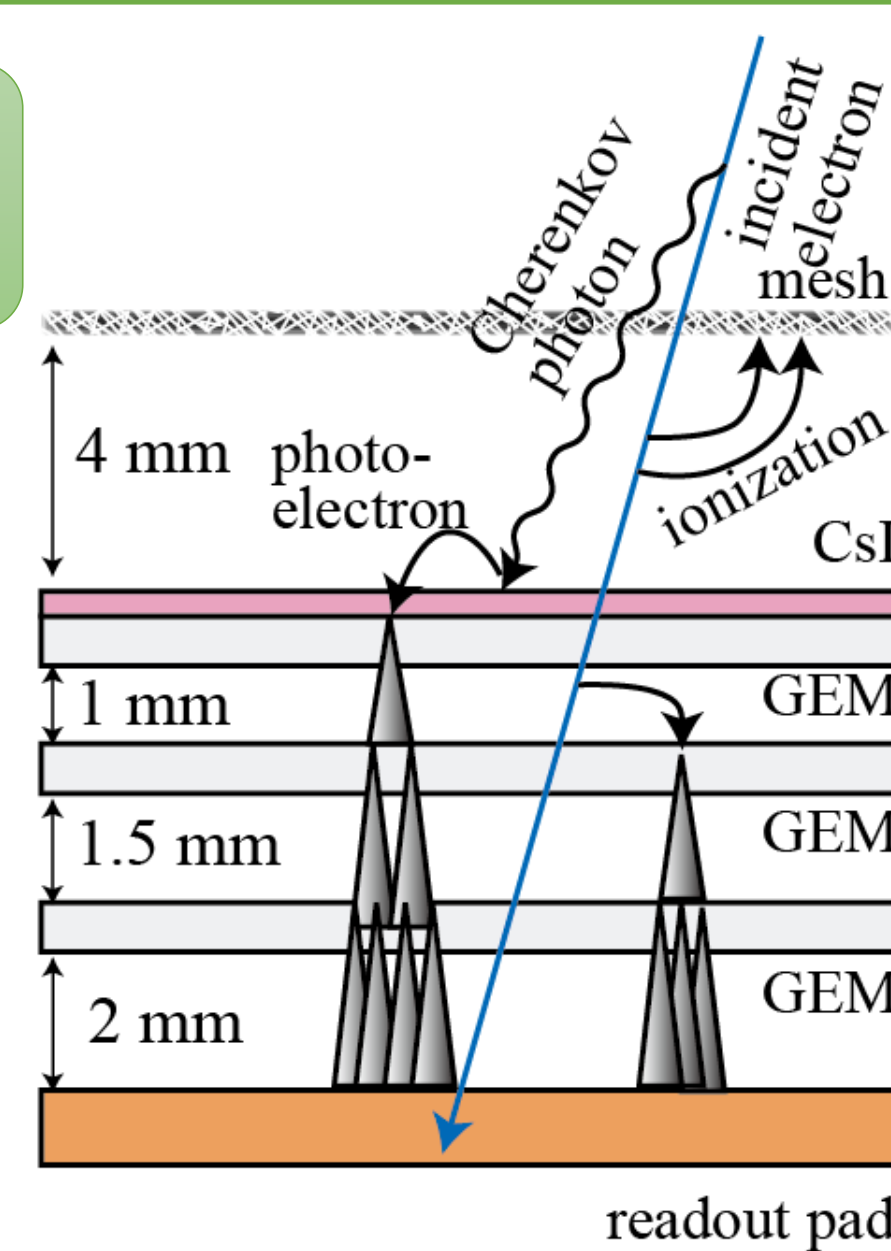
FM magnet

Reuse of cyclotron mag.

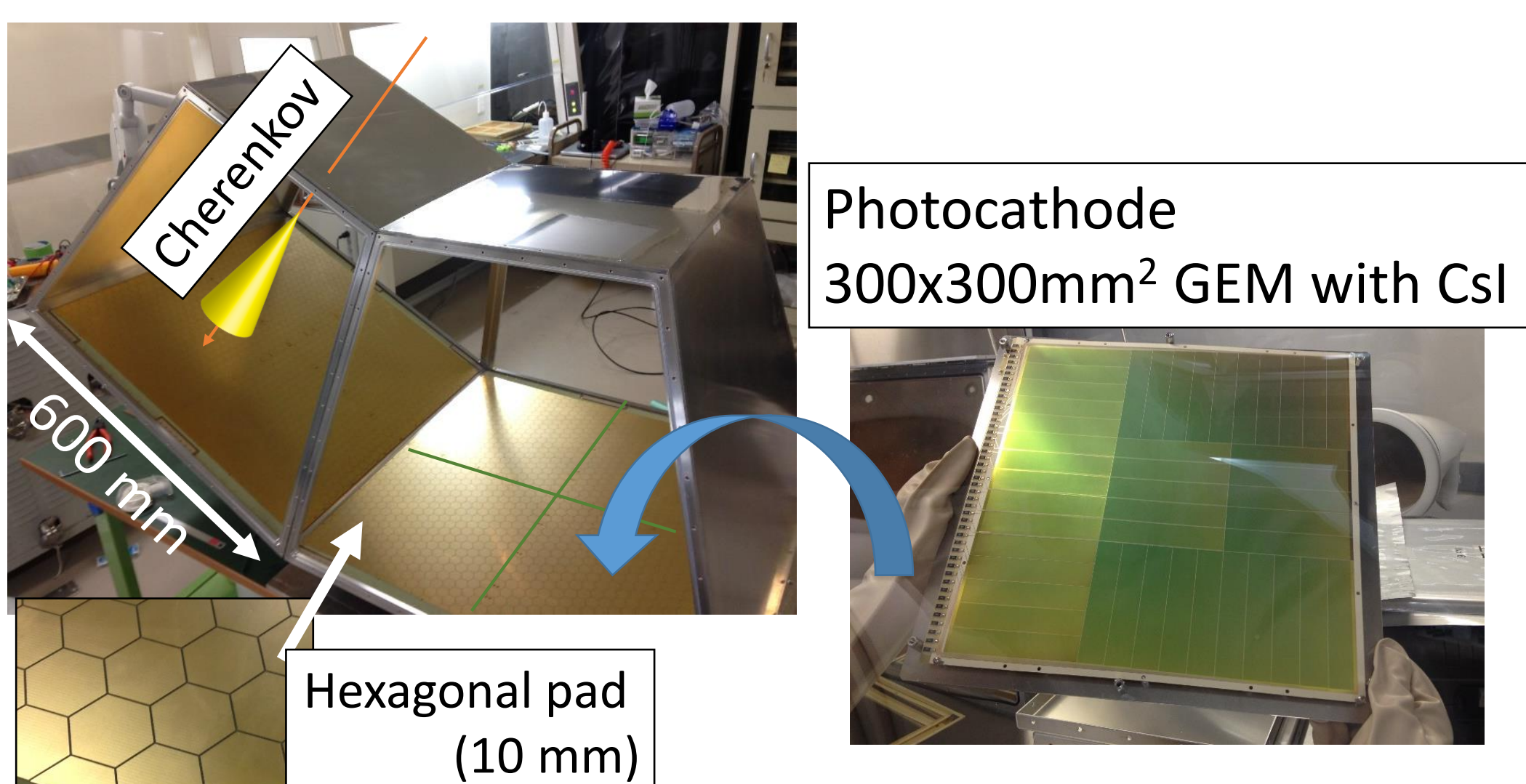
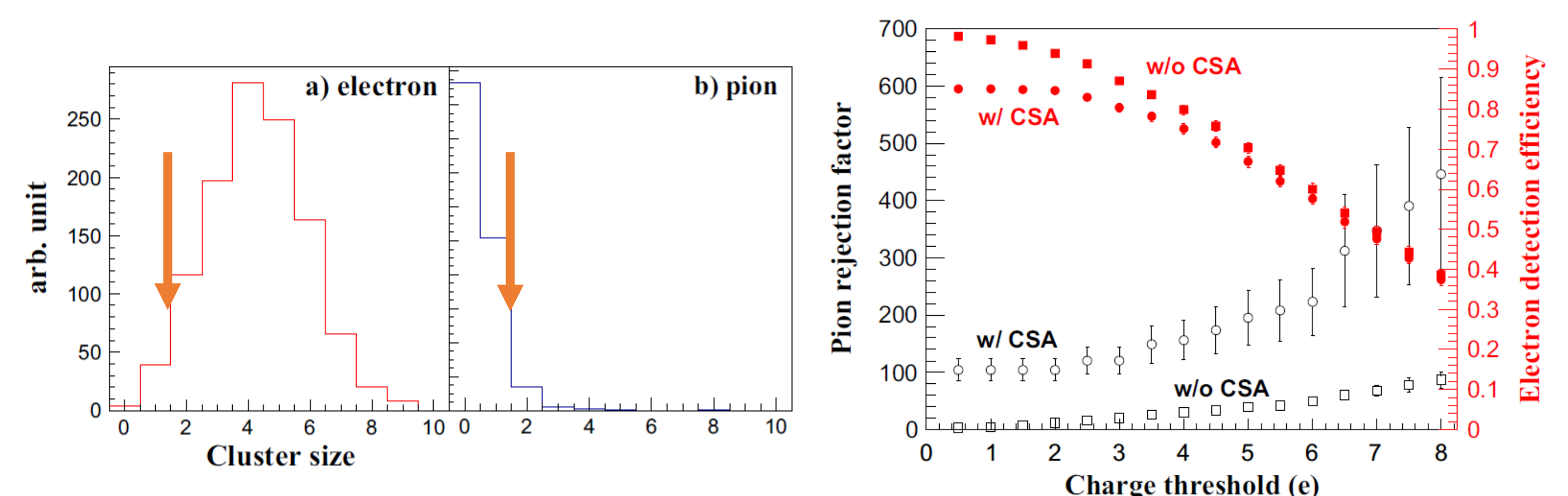


HBD (Hadron Blind Detector)[5]

Cherenkov detector based on PHENIX HBD.
Radiator / amp. gas : CF₄
Photocathode : Csl evaporated GEM.
GEM hole / pitch : 55um ϕ / 110 um.
2 times larger gain compared to std GEM 70 / 140.
Useful for rejecting ionization in 1st trans. gap.



The charge and the cluster size information together give pion rejection factor of 100 with electron efficiency of better than 80%.



SSD (Newly added subsys.)

Tracking layer added as the most inner layer.
Fine segmented fast readout add redundancy for tracking. Use borrowed SSDs for 1st phys Run with a limited acceptance. Dedicated SSDs will be developed for later runs with wider acceptance.

Status and Prospects

Detector R&D have been done except for SSD.
The beam line and the detector construction is on going and expected to finish in 2019. We start with 8-module configuration for beam line / detector commissioning, and take physics data.
Then prepare 26-modules for later physics run to obtain physics data which we have been dreaming for many years.

References

- http://j-parc.jp/researcher/Hadron/en/pac_0606/pdf/p16-Yokkaichi_2.pdf, S. Yokkaichi, et al. : Lect. Notes Phys. 781, 161-193 (2009).
- P. Gubler, and W. Weise : Nucl. Phys. A954 (2016) 125
- R. Muto, et al. : Phys. Rev. Lett. 98, (2007) 042501
- Y. Komatsu, et al. : NIM A732 (2013) 241, W. Nakai presentation at MPGD13 (2016) W. Nakai to appear in RIKEN Accel. Prog. Rep. 49 (2015)
- K. Kanno, et al. : NIM A819 (2016) 20

