



Present Status from the Experimental Study of Neutral Kaon Photoproduction around Threshold Region at Tohoku-LNS

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for the NKS2 collaboration

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Introduction

Physics Motivation

- Investigation of strangeness production mechanism
 - Threshold region of production
 - No resonance decay
 - Good for comparison with models
 - Give theoreticians base data to address
 - » coupling constant
 - » resonance contribution
 - Small cross-section, i.e. high statistics data is required
 - Neutral channel in strangeness photo-production
 - Past experiments studied by K^+ production until 2002
 - Not enough data of differential cross-section of

$$\gamma+n \rightarrow K^0+\Lambda(\Sigma^0)$$

The Experiment

- The experiment of neutral kaon spectrometer at LNS-Tohoku

- The first generation (NKS)

- Used TAGX spectrometer of INS and successfully done in 2004
 - C target results: nucl-ex/067022 submitted to PLB
 - Liquid D₂ target results: will be submitted soon
- Some weak points were found
 - No coverage on forward region
 - No Stereo wire in Chambers

- The second generation of the experiment, NKS2

- Constructed in 2004-2006 from scratch
- Commissioning run
 - Mar., Jun., and Sep 2006 by Carbon target
- The data taking with LD2 target
 - First data: Nov/2-Nov/11
 - more data taken in Nov/28-Dec/11
 - will be taken in Jan/15-29, Feb/13-26

results from this data set
will be shown today



The NKS2 Collaboration

- **Department of Physics, Tohoku University**

- N. Chiga, T. Fujibayashi, Y. Fujii, K. Futatsukawa, O. Hashimoto, K. Hirose, K. Hosomi, A. Iguchi, H. Kanda, M. Kaneta, T. Kawasaki, D. Kawama, Y. Ma, K. Maeda, N. Maruyama, A. Matsumura, M. Matsuzawa, M. Mimori, K. Miwa, Y. Miyagi, H. Miyase, S.N. Nakamura, K. Nonaka, Y. Okayasu, M. Sumihama, H. Tamura, N. Terada, K. Tsukada

- **Laboratory of Nuclear Science, Tohoku University**

- T. Ishikawa, T. Nakabayashi, H. Shimizu, K. Suzuki, T. Tamae, H. Yamazaki

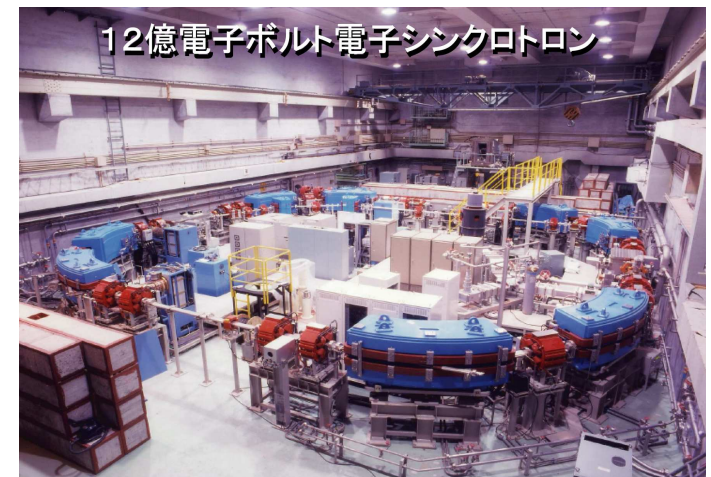
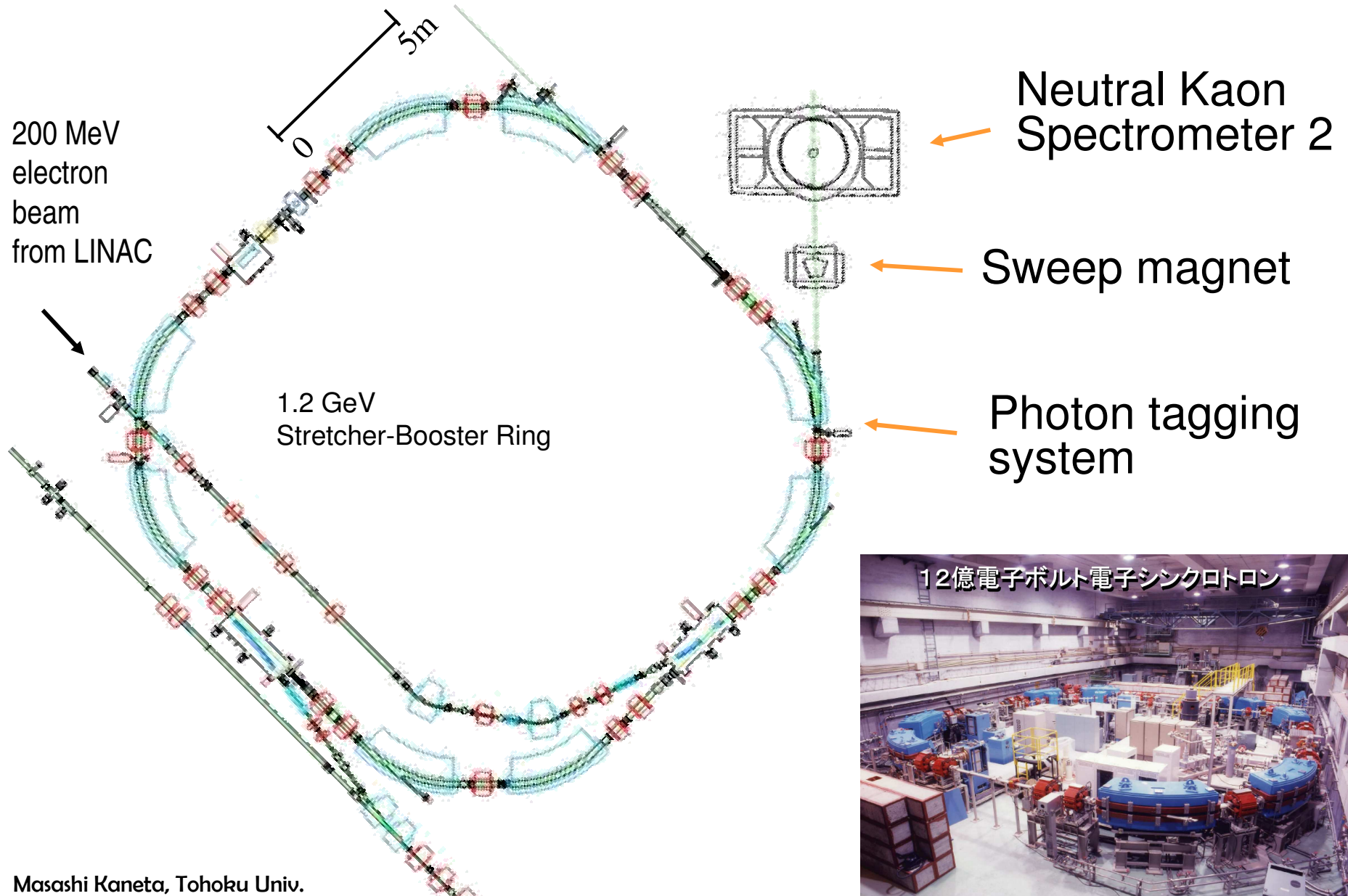
- **Department of Electrical and Electric Engineering, Akita University**

- A. Sasaki

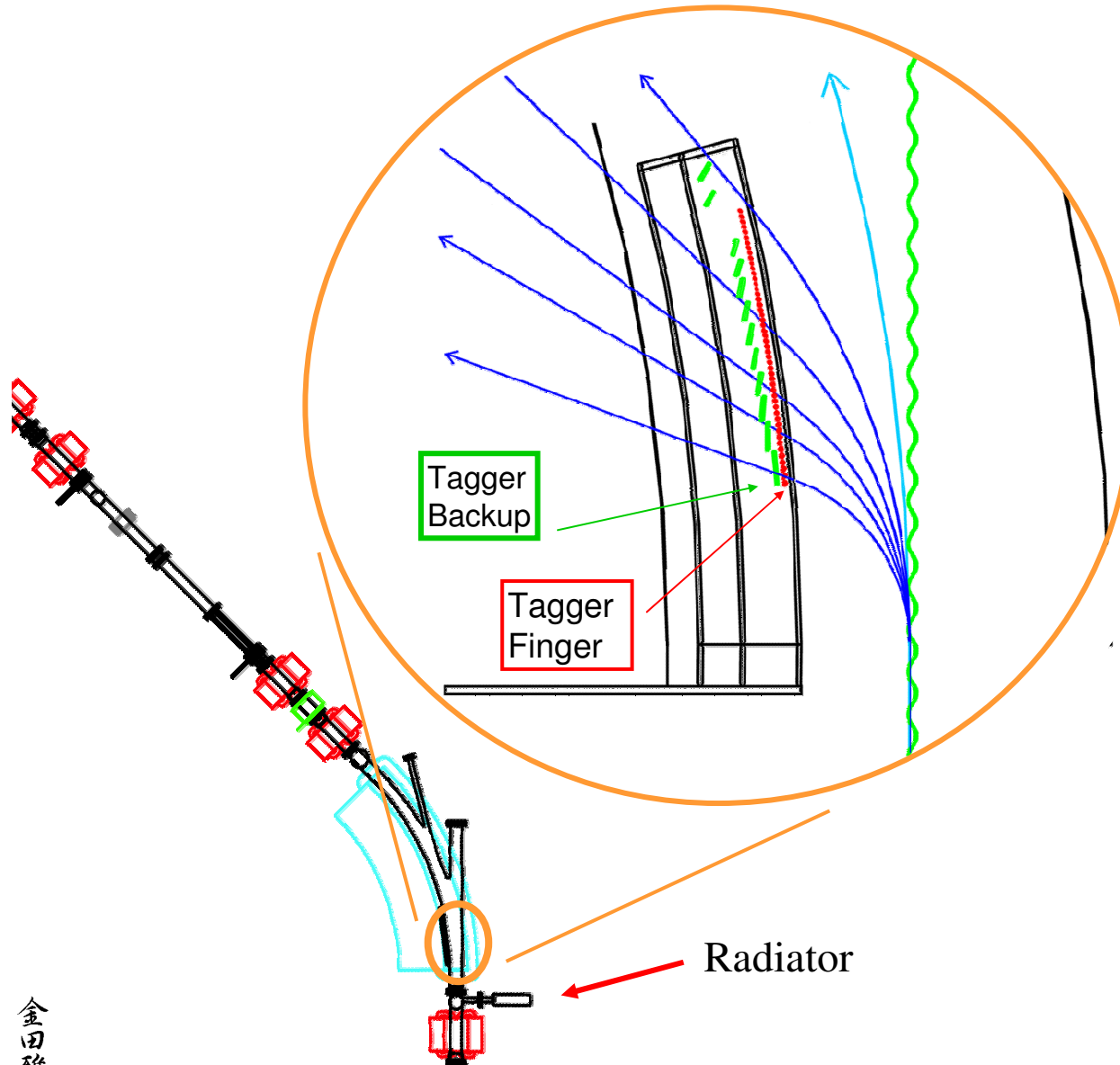
- **Department of Electrical Engineering, Ichinoseki National College of Technology**

- O. Konno

Tagged Photon Beam at LNS-Tohoku



Tagged Photon Beam at LNS-Tohoku



- Photon beam

- Electron beam on carbon wire
- Tagged by electron which has energy loss
- $E_\gamma = 0.8 - 1.1$ GeV
 - from 1.2 GeV electron beam
- 6 MeV coverage per tagging counter

The Spectrometer

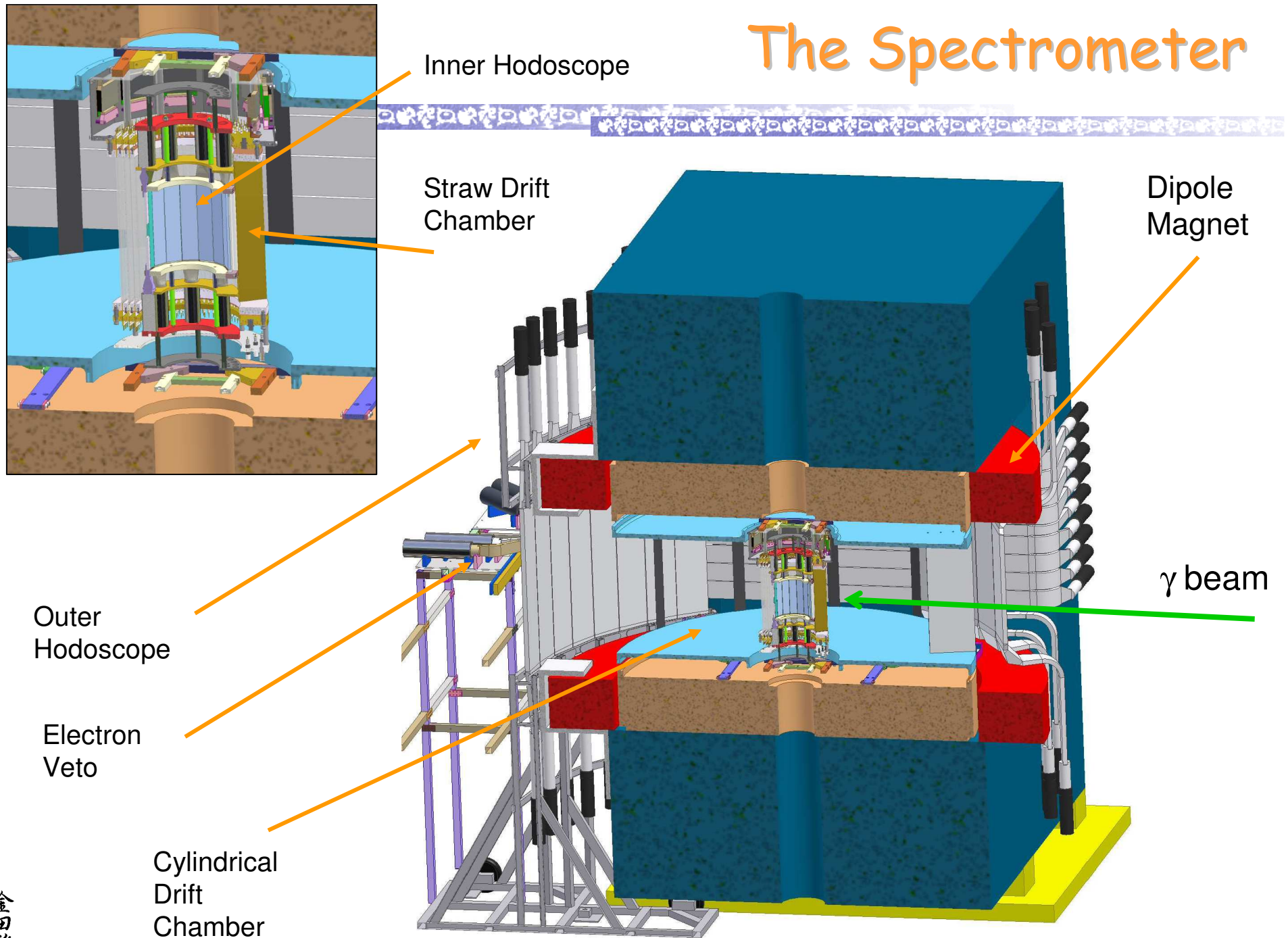
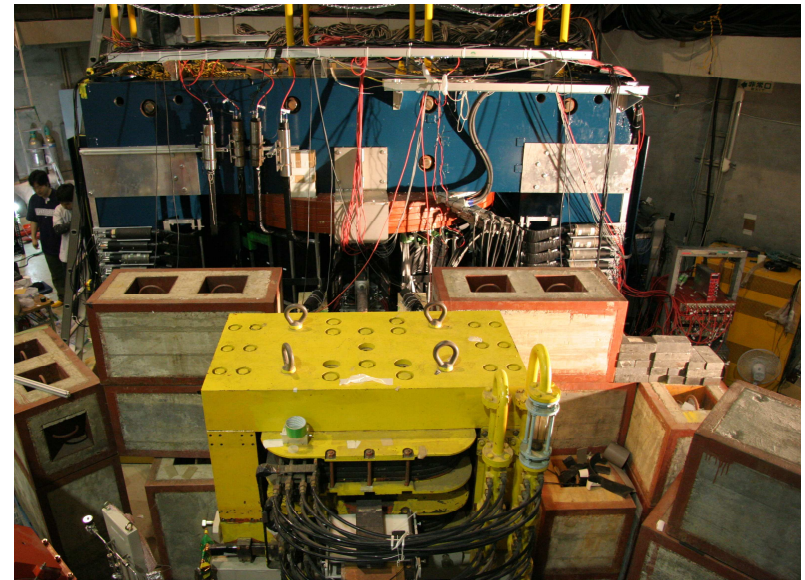
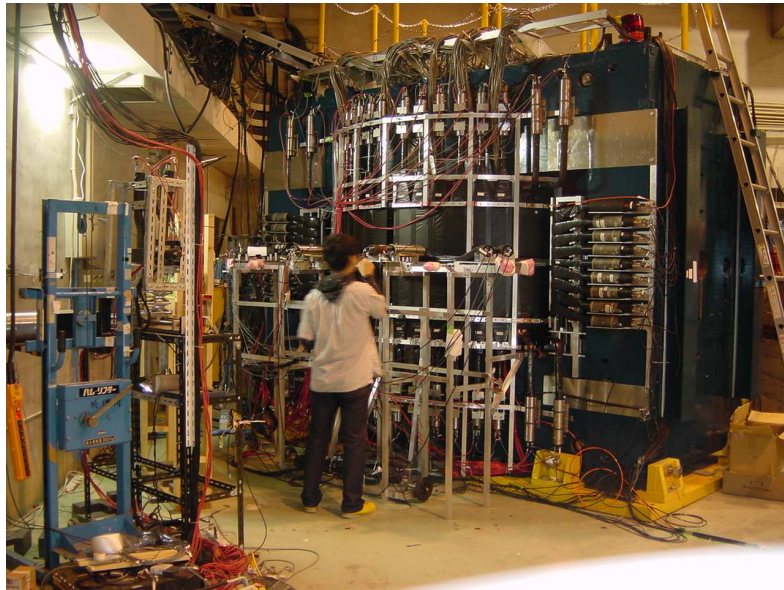
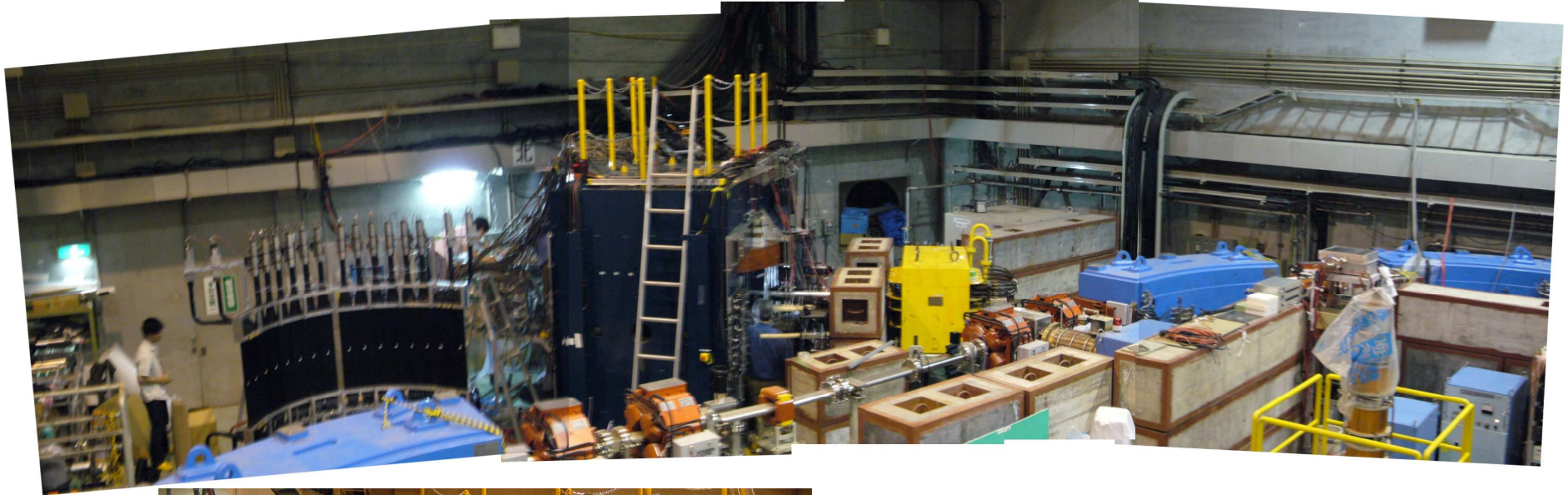


Photo of NKS2



金田雅司

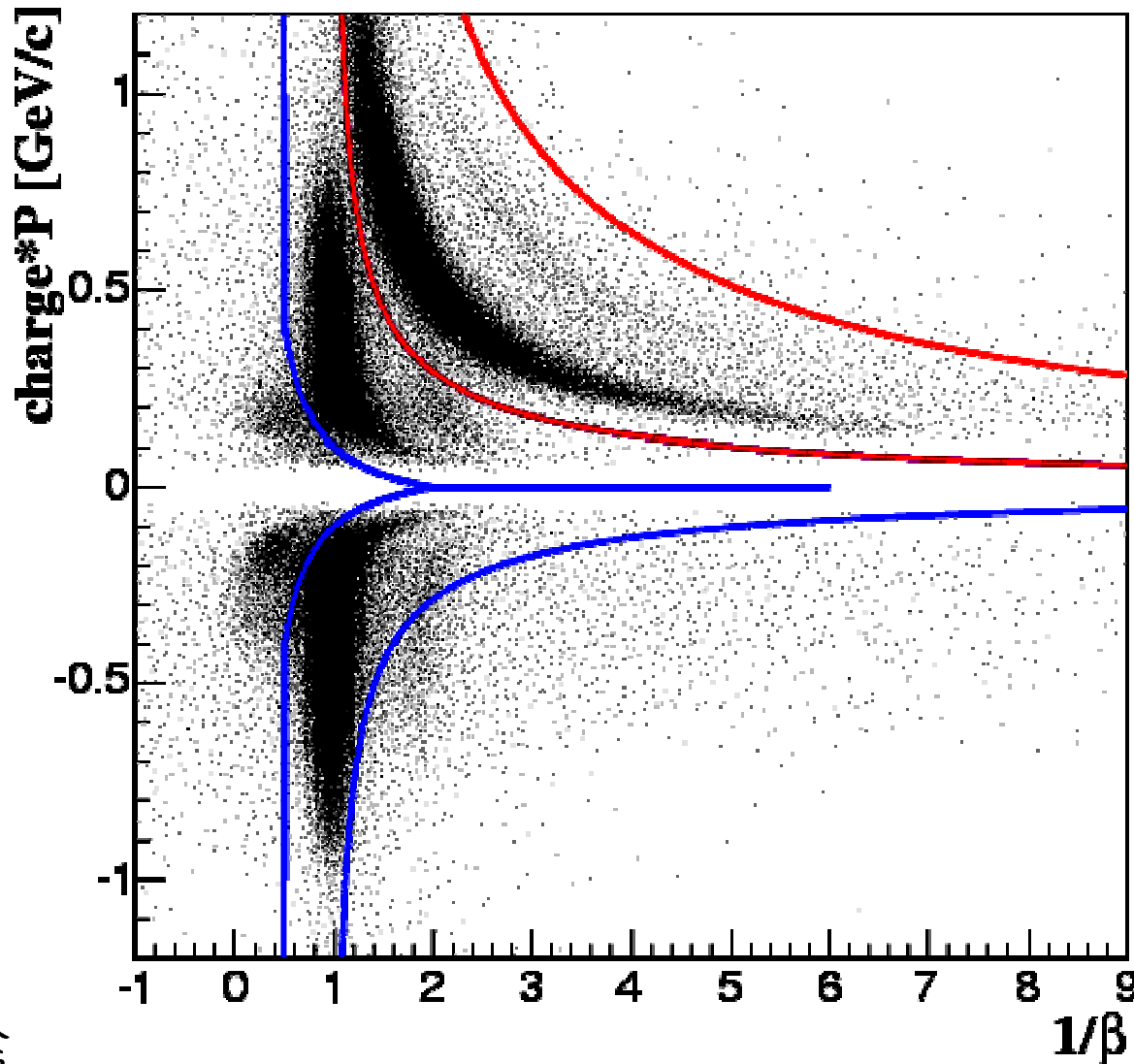
Masashi Kaneta, Tohoku Univ.



Recent Results

from Nov/2-11 run
(3.2×10^{11} events)

Particle Identify (PID)



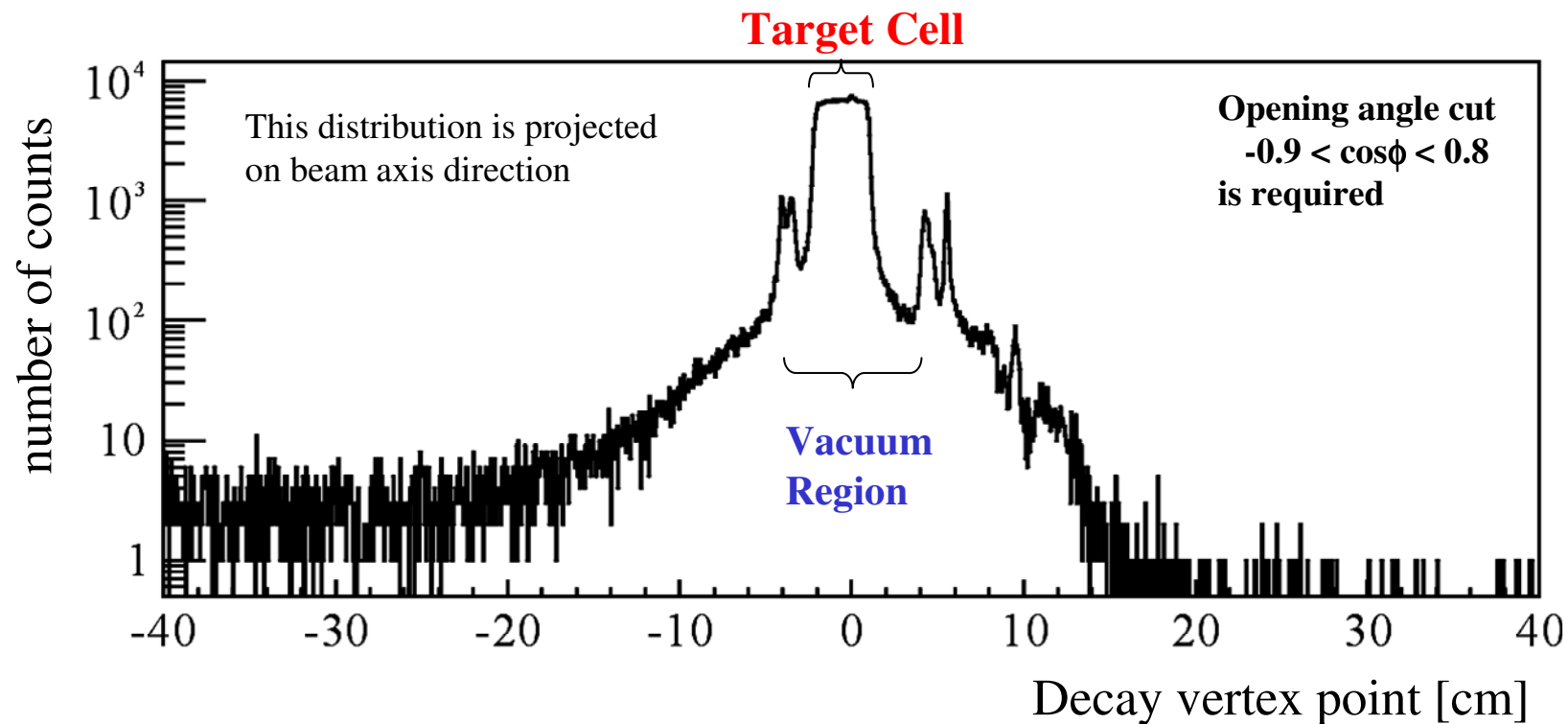
Opening angle cut
 $-0.9 < \cos\phi < 0.8$
is required to
reduce $e^+ e^-$

Red : proton region
Blue : pion region

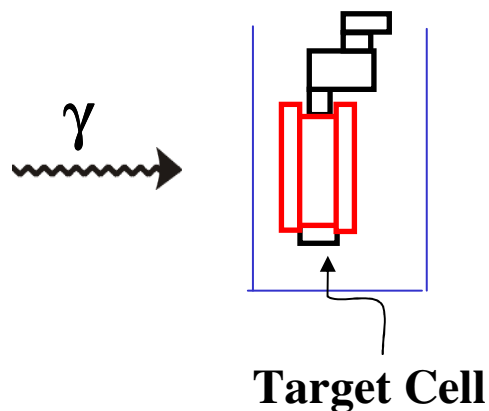
Note:

There is a ghost between pion and proton due to shift of TOF, that is, the calibration is not perfect yet....

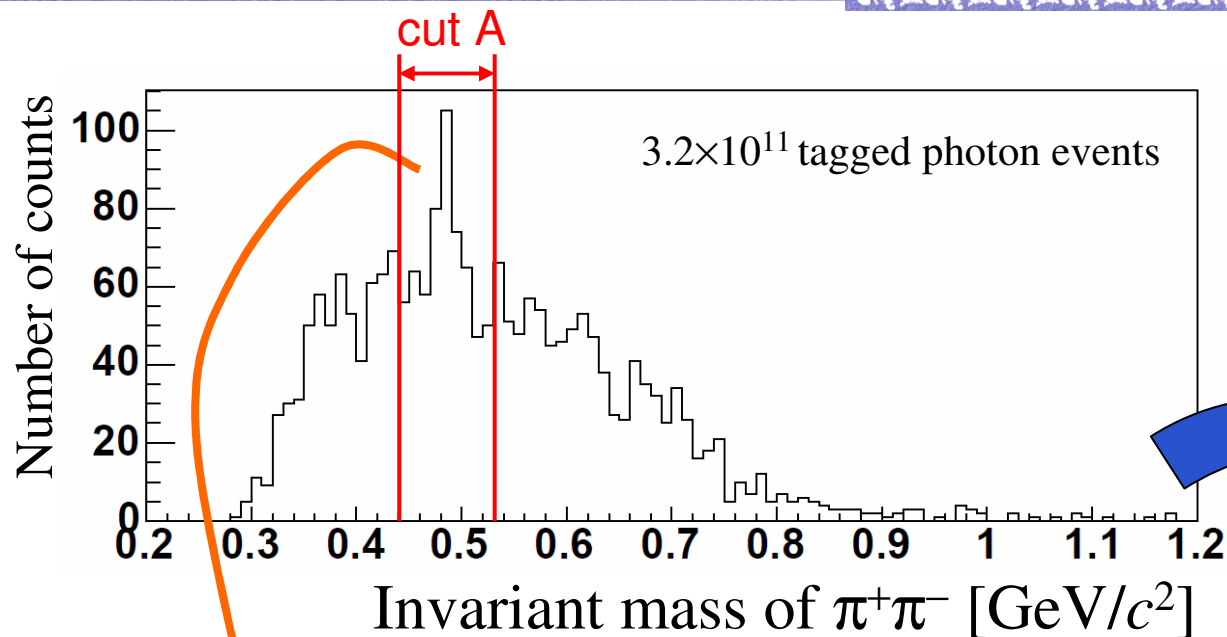
Decay Vertex Distribution



- Decay vertex is reconstructed from trajectories of positive and charged particle pair

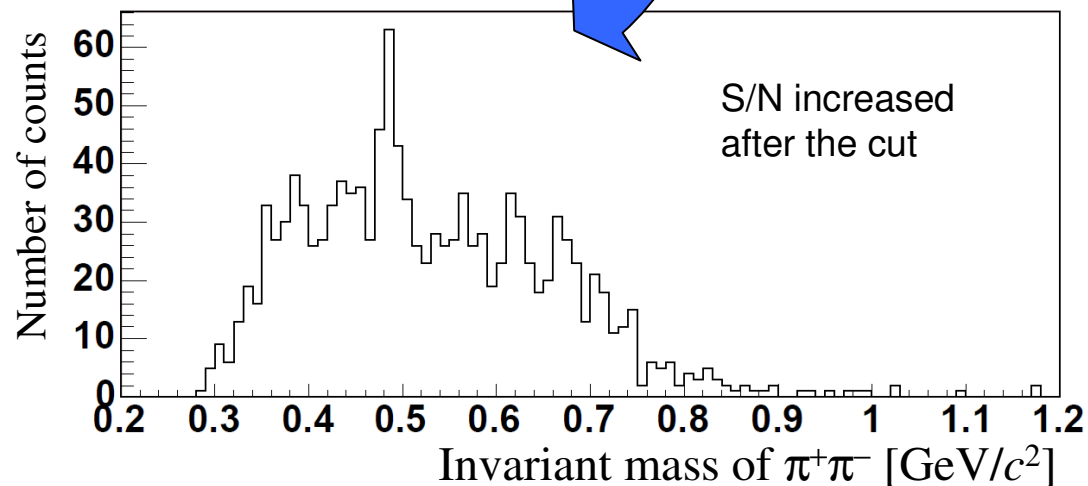
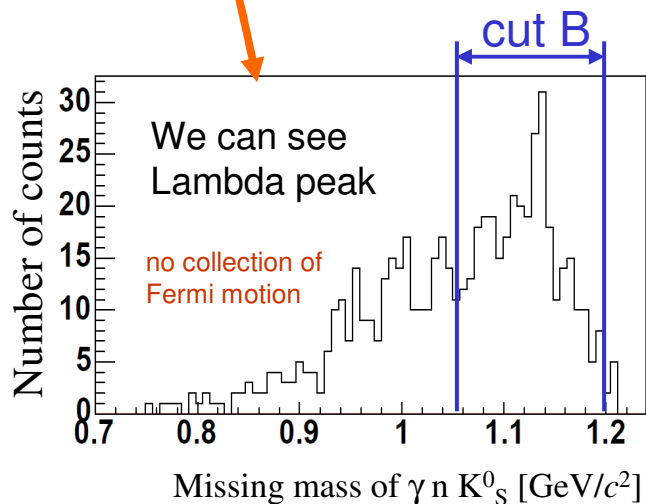
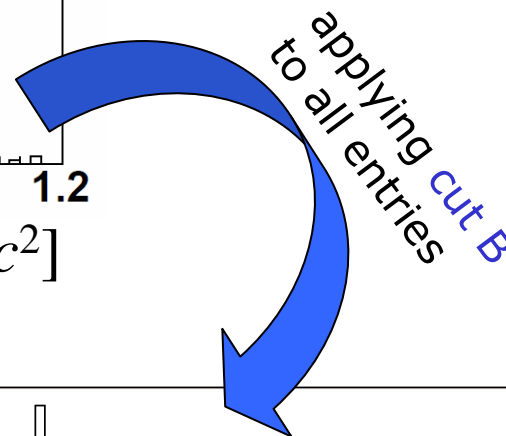


Invariant Mass ($\pi^+\pi^-$)

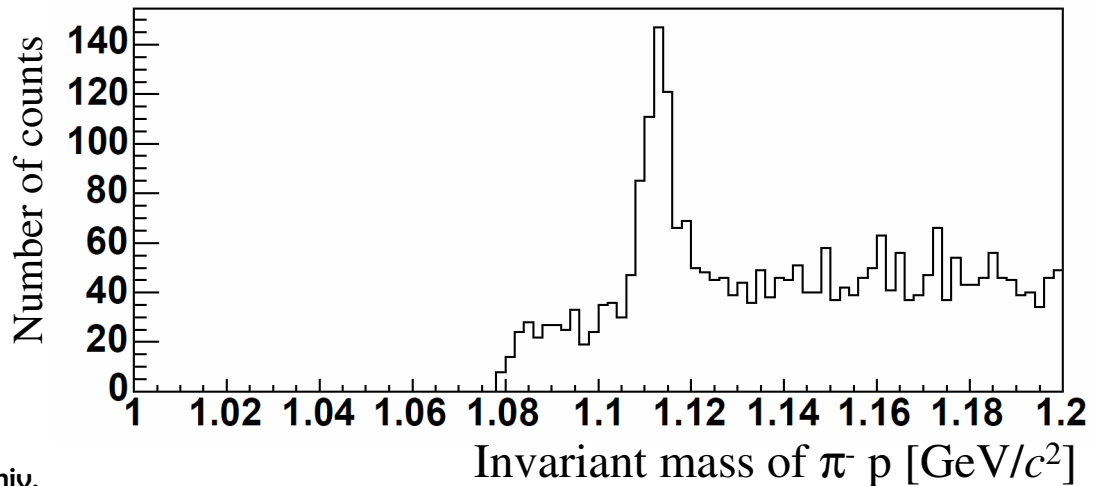
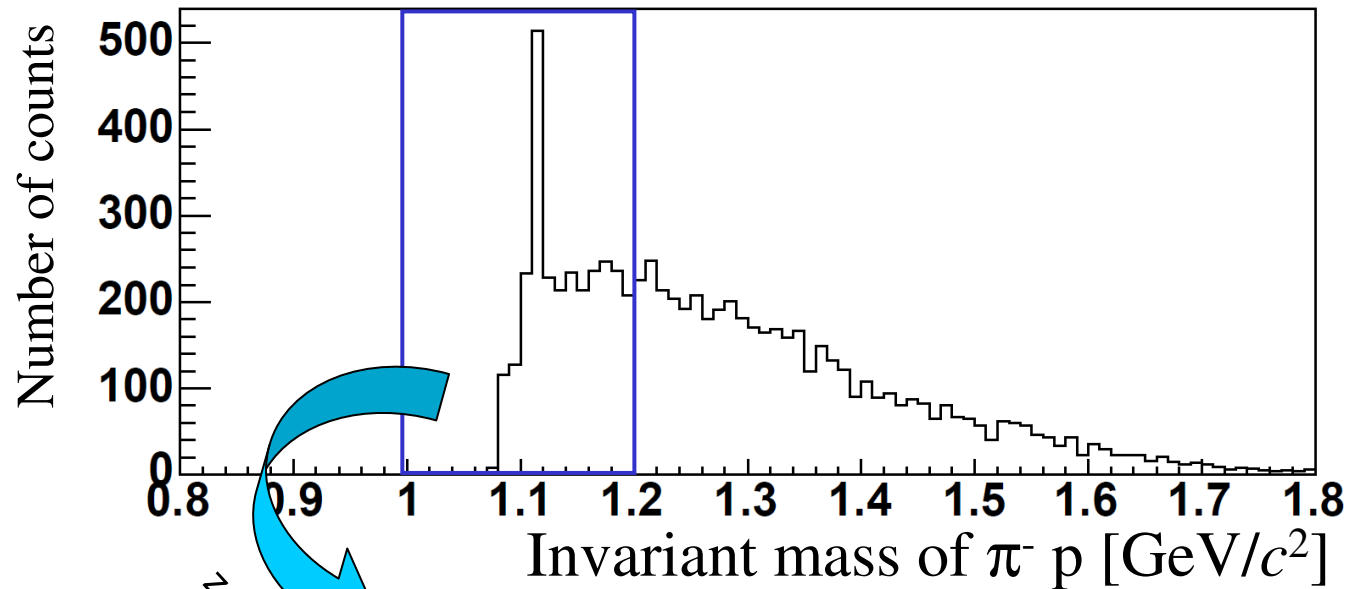


cut A: K^0_S candidate

cut B: Λ candidate



Invariant Mass (π^-p)





Summary

Summary

- The first data taking with liquid D₂ target in new spectrometer NKS2
 - all detectors become to be ready
 - no problem in liquid deuteron target system
 - $\sim 100 K^0_S$ and $\sim 300 \Lambda$ from run of Nov/2-11
- We have and will have more data
 - Nov/28-Dec/11 run have about 3 times data more than Nov/2-11
 - Two sets of the beam time in Jan and Feb.
 - two weeks in each
 - Total statistics will be ten times in this fiscal year
 - Some progresses will be shown in the next JPS meeting
- What is the next?
 - K^0_S and Λ coincidence measurement
 - three tracks requirement on/off-line
 - new vertex chamber to increase acceptance in vertical direction