# **Overview of ENGE System and Commissioning Plan**

The University of Tokyo

Sho Nagao

#### New Experiment at Jefferson Lab.



# Next Session



9:45 AM	Test plan for wire chambers at ESB	
	Speaker: Liguang Tang (Hampton University/JLab)	
	Hall C_Hyp_ESB-wor	
9:57 AM	AM New Water Cherenkov Detector for Proton Rejection	
	Speaker: Mr Kaito Higashimoto (The University of Tokyo)	
10:09 AM	HES-HKS simulation	
	Speaker: Mr Ravindu Kumaragamage (Hampton University)	
10:21 AM	Break	
10 <sup>.</sup> 41 AM	Simulation for Grouping Trigger for HKS	
10.1174	Speaker: Mr Teppei Iwamoto (Kyoto University)	
10:53 AM	HES-HKS simulation	
	Speaker: Mr Tatsu Ishige (Tohoku University)	
11:05 AM	Scintillation Fiber Detector Used for Focal Plane Detection	
	Speaker: Mr Kotaro Nishi (The University of Tokyo)	
11:17 AM	Time-Of-Flight Detector for ENGE and SiPM radiation test	
	Speaker: Mr Ken Nishida (The University of Tokyo)	
11:29 AM	Radiation Simulations By Geant4 and FULKA	
	Speaker: Mr Jin Takahashi (The University of Tokyo)	

11:41 AM A

Alternative plan of Enge Detector

Speaker: Sho Nagao (The University of Tokyo)

# Parameters & Requirements of Enge spectrometer

Туре	Hardware spectrometer
Central Momentum	~ 110 MeV/c
Momentum bite	+/- 30%
Dispersion	1.53 cm/(MeV/c)
Momentum Resolution	10 <sup>-3</sup> (FWHM)
Solid Angle	4 msr

#### $\Delta p/p \sim 10^{-3}$ momentum resolution

Peak separation, Better S/N Measurement from position info. at focal-plane Angular info. as a supplement

#### A few 10 keV/c momentum calibration

With alpha-sources (~ 100 MeV/c/q) @target

Detection of well-known momenta alpha-particles at focalplane in vacuum

#### $\sigma$ ~100 ps target time reconstruction

Suppression of accidental coincidence background Particle identification ( $\pi$  /  $\mu$  / e)

Lifetime measurement

→ Good start time counter ( $\sigma$ ~100 ps)

position ( $\sigma$ ~350 µm) & angle ( $\sigma$ ~6.7 mrad) information

### **Overview of Enge Detector**



- **Particle momentum from Focal Plane Detector** 1x1 mm Sci-Fi in vacuum (832 ch)  $\rightarrow$  80 keV/c LSB Wide Mom. coverage of pions (78 ~140 MeV/c)
- Another tracking device for angular measurement Drift Chamber (spare HKS DC, 640 ch)
- **Timing measurement & Trigger** TOF detector (Scintillator wall, 96 ch)
- a few 10 kHz single rate
- Simple Trigger (TOF Layer1 $\otimes$ Layer2) •

### Momentum Calibration with alpha-sources



## alpha-source

alpha sources available from a vendor "Eckert & Ziegler" Get AF-type 3-nuclide mixed source through RadCon <sup>230</sup>Th, <sup>241</sup>Am, <sup>244</sup>Cm (1~5 kBq each)  $\Phi$  = 5 mm source area, no cover <20 keV resolution (FWHM) **Removable** package \$3,610, 5-6 weeks delivery time Make special holder to mount to target ladder and 1x5 mm<sup>2</sup> slit to make small source point







## Expected alpha-source result



# FP position search



Since simulation has ambiguities, Finding FP position is important to improve resolution Changing detector position and Finding location with the best resolution 1 cm shifts  $\rightarrow$  15% deterioration

#### Summary



#### Ken Nishida

TOF wall with SiPM (MPPC) Radiation tolerance

### Kotaro Nishi

Sci-Fi Detector with SiPM (MPPC)

#### Jin Takahashi

Radiation Budged with Geant4

# Enge Detector (Alternative)

The University of Tokyo Sho Nagao

#### Enge Setup



- Particle momentum from Focal Plane Detector
  1x1 mm Sci-Fi in vacuum (832 ch) → 80 keV/c LSB
  Wide Mom. coverage of pions (78 ~140 MeV/c)
- Another tracking device for angular measurement Drift Chamber (spare HKS DC, 640 ch)
- **Timing measurement & Trigger** TOF detector (Scintillator wall, 96 ch)
- a few 10 kHz single rate
- Simple Trigger (TOF Layer1⊗Layer2)

## Plan B (Scintillator TOF wall)

#### w/ SiPM(MPPC) detector

#### w/ PMT @ESB







Deterioration of MPPC may prevent the achievement of 100 ps time resolution Rearrangement of TOF wall with conventional PMTs w/ 3cm thick is under consideration Acceptance can be fully covered, Saving the time and manpower Performance evaluation will be conducted

### Plan A (Sci-Fi detector)



+60 V for Bias (common bias for 64 ch)

@ SHMS

#### Plan B (Sci-Fi detector)

