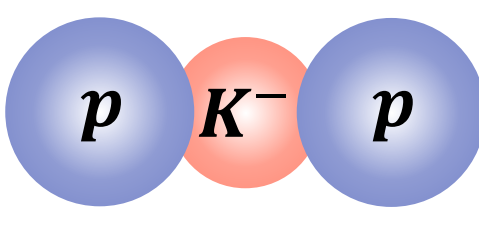


1. “ K^-ppn ” Search: J-PARC E80

Kaonic Nucleus: A strongly bound state of a kaon and a nucleus

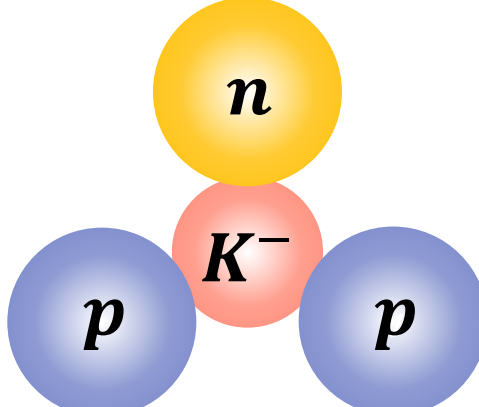
- ◆ $\bar{K}N$ interaction ... A key issue in low-energy QCD
- ◆ High-density system ... Partial restoration of chiral symmetry
- ➔ Systematic investigation @J-PARC K1.8BR Beamline



J-PARC E15 Experiment in-flight ${}^3\text{He}(K^-, N)$

$K^-pp \rightarrow \Lambda + p$

The existence of the “ K^-pp ” state was revealed.

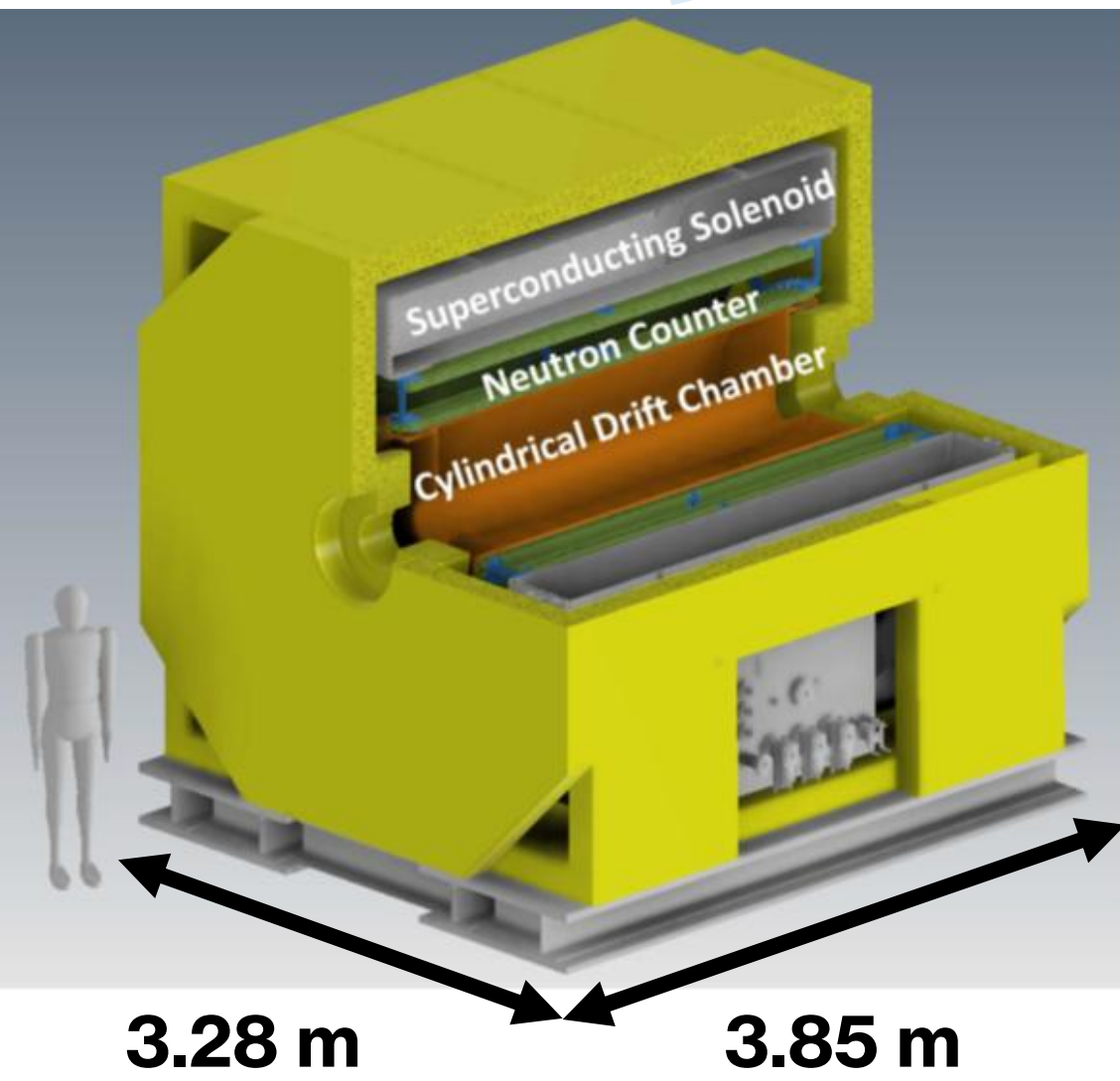
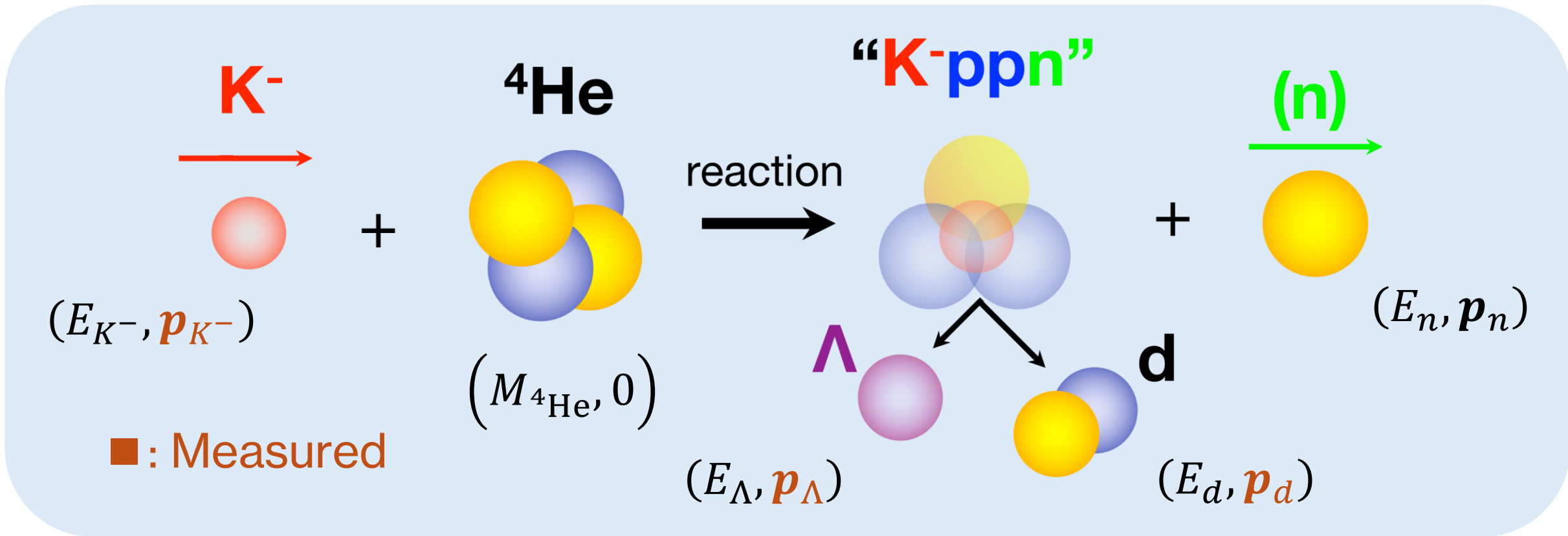


J-PARC E80 Experiment in-flight ${}^4\text{He}(K^-, N)$

$K^-ppn \rightarrow \Lambda + d$ or $\Lambda + p + n$

The existence of the “ K^-ppn ” state will be explored.

➔ Talk by T. Hashimoto on Plenary 2a2, Thursday



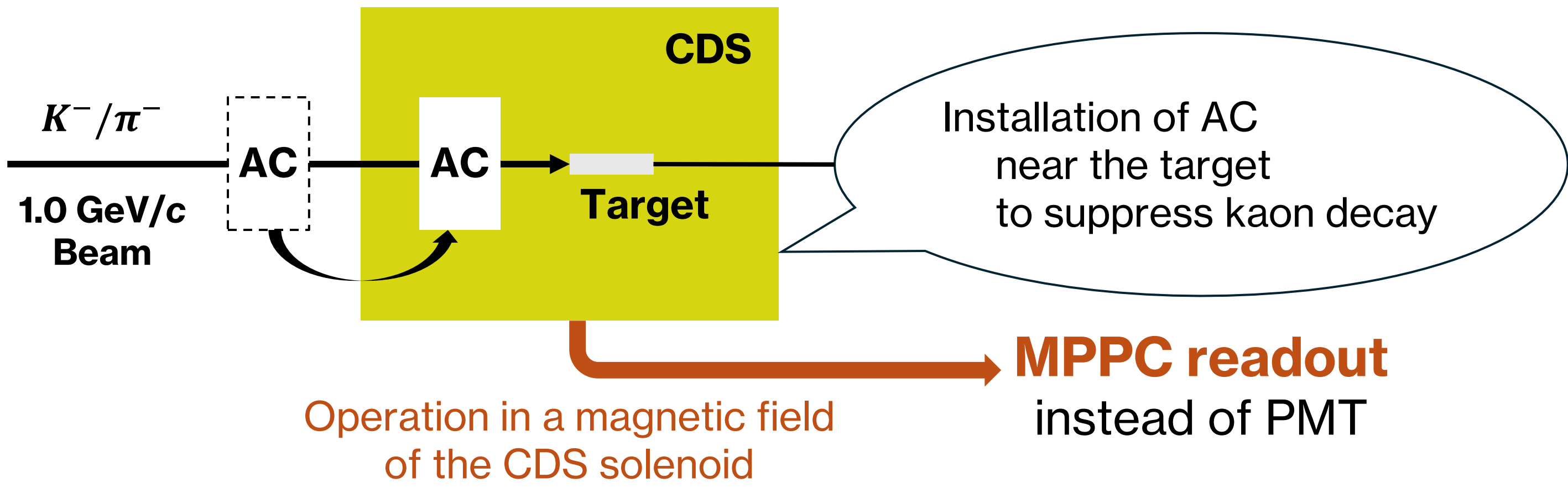
Cylindrical Detector System (CDS)

- ➔ Talk by Y. Kimura on Parallel 29p1C, Monday
- ◆ Superconducting Solenoid
- ◆ Neutron Counter
- ◆ Cylindrical Drift Chamber
- ➔ Invariant mass spectroscopy

$$M_{K^-ppn} = \sqrt{(E_\Lambda + E_d)^2 - (\mathbf{p}_\Lambda + \mathbf{p}_d)^2}$$

2. Aerogel Čerenkov Detector (AC)

- Use of Čerenkov radiation in aerogel ($n = 1.05$) to identify K^-/π^- in a 1.0 GeV/c beam
- ◆ K^- : $\beta = 0.90$
- ◆ π^- : $\beta = 0.99$ ➔ **Light emission**



My Research

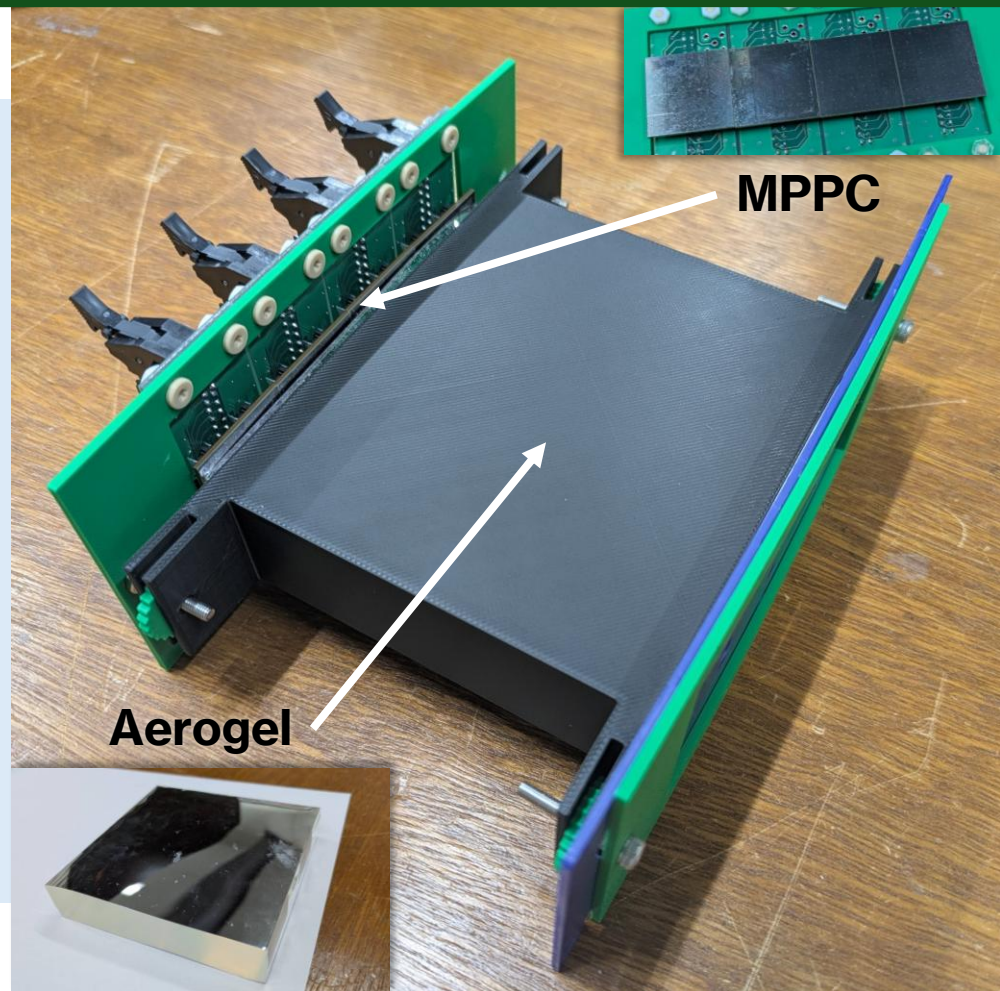
Development of an AC with MPPC Detector

〈Prototype〉

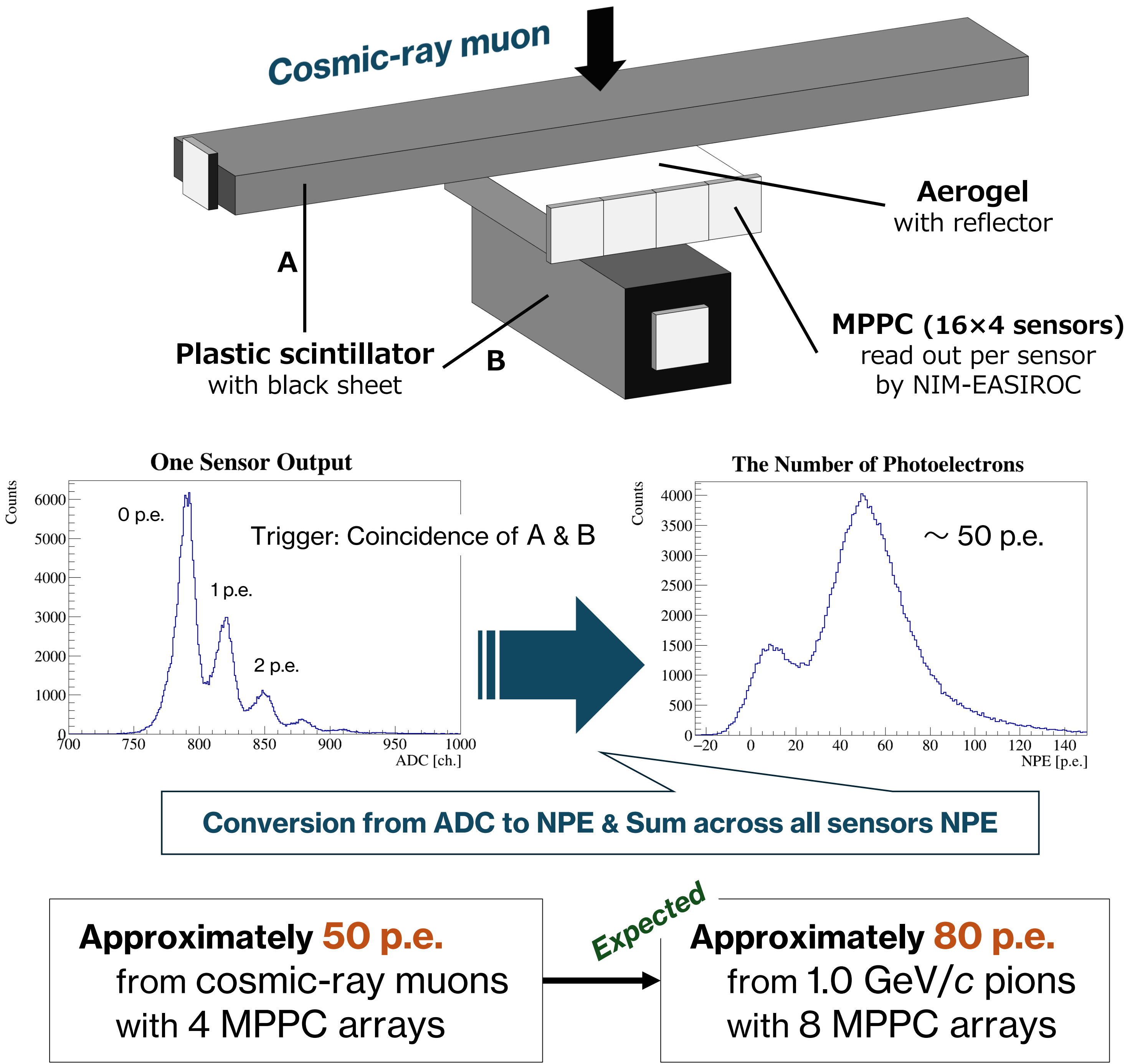
Radiator: **Aerogel** (Aerogel Factory AG22405W)
100 mm × 100 mm × 20 mm

Reflector: **ESR** (3M ESR140X160S)

Readout: **MPPC** (HAMAMATSU S13361-6050AS-04)
4×4 sensors / array
6 mm × 6 mm / sensor



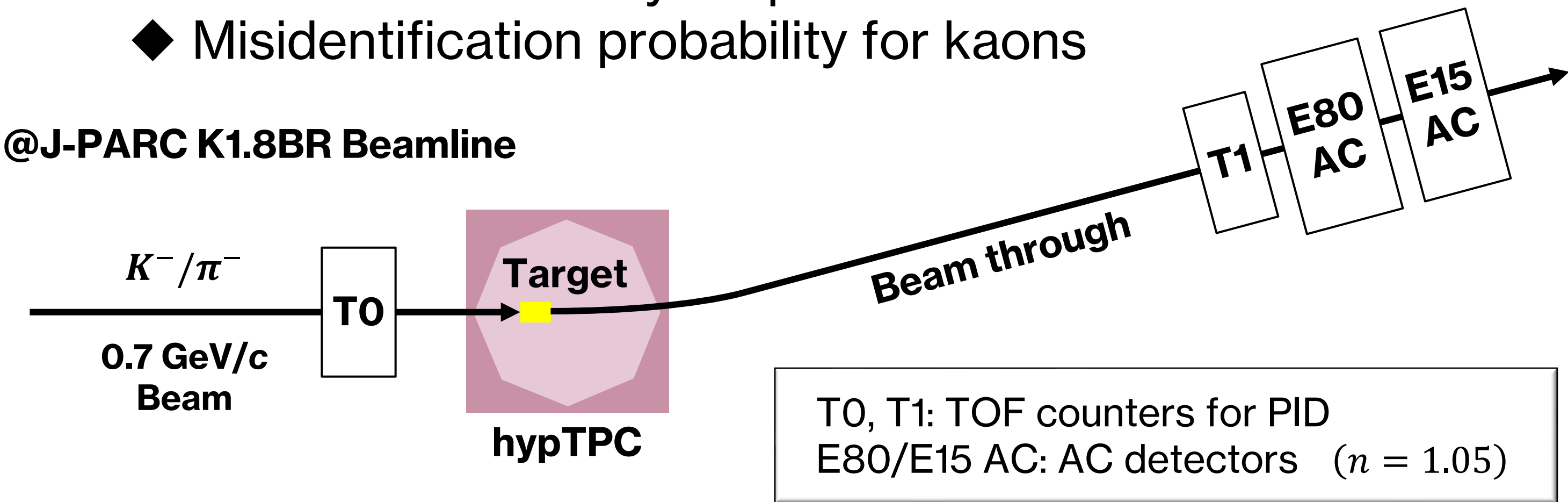
3. AC Evaluation with Cosmic Rays



The light yield is expected to be sufficient for particle identification!

4. Outlook for AC Evaluation

- November 2025: **Parasite Experiment @HypTPC Exp.**
- ➔ Evaluation with K^-/π^- in 0.7 GeV/c beam
 - ◆ Accurate evaluation of the light yield
 - ◆ Detection efficiency for pions
 - ◆ Misidentification probability for kaons



5. Summary

- To investigate the “ K^-ppn ” state, preparations are ongoing for the J-PARC E80 experiment using a newly developed Cylindrical Detector System (CDS).
- MPPC is chosen as a readout device in a new Aerogel Čerenkov Detector (AC) for K^-/π^- identification, which can operate in a magnetic field of the CDS solenoid.
- The light yield from an AC prototype was evaluated using cosmic-ray muons, and a sufficient number of photons were observed.
- To evaluate the performance of the AC, a test experiment using K^-/π^- beam is scheduled in this November at the J-PARC K1.8BR beamline.