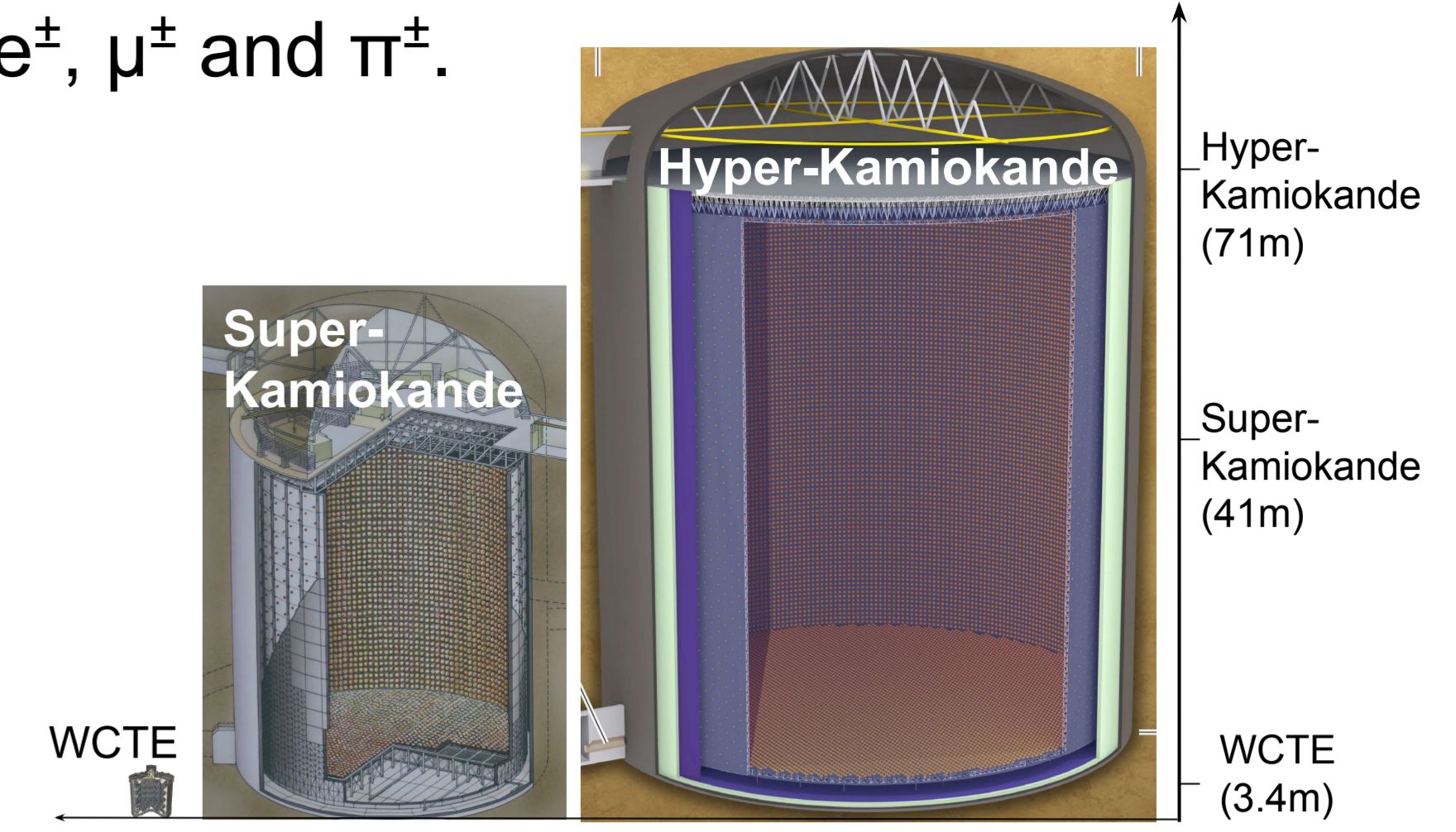
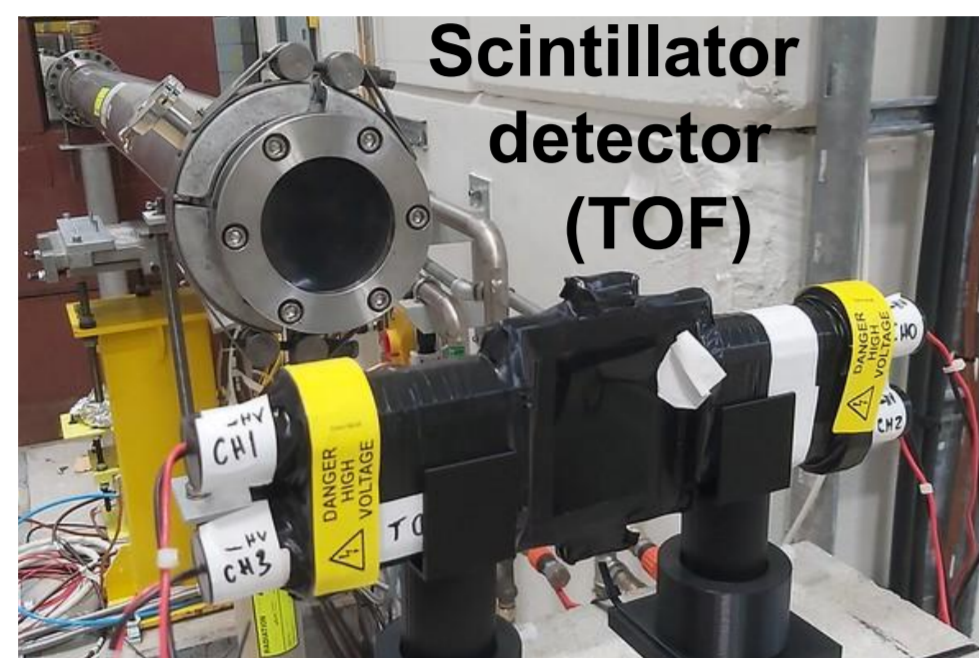
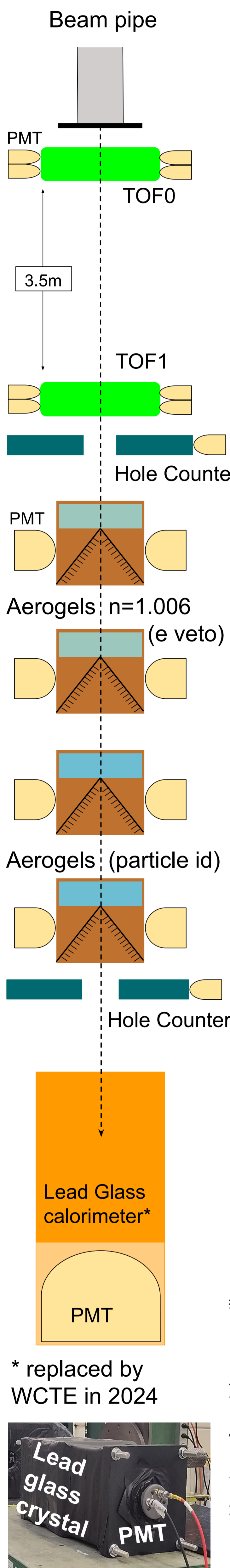


- The Water Cherenkov Test Experiment (WCTE) is a 50 tons water Cherenkov detector installed in summer 2024 in CERN's newly refurbished East Area T9 beamline receiving a beam of p^+ , e^+ , μ^\pm and π^\pm .
- WCTE will study the response of water Cherenkov detectors to charged particles and photons to help Hyper-Kamiokande reach its Physics goals.
- It uses a low-momentum beam telescope (1) for charged particle ID and a novel compact tagged photon facility (2) for photon production and energy measurement.



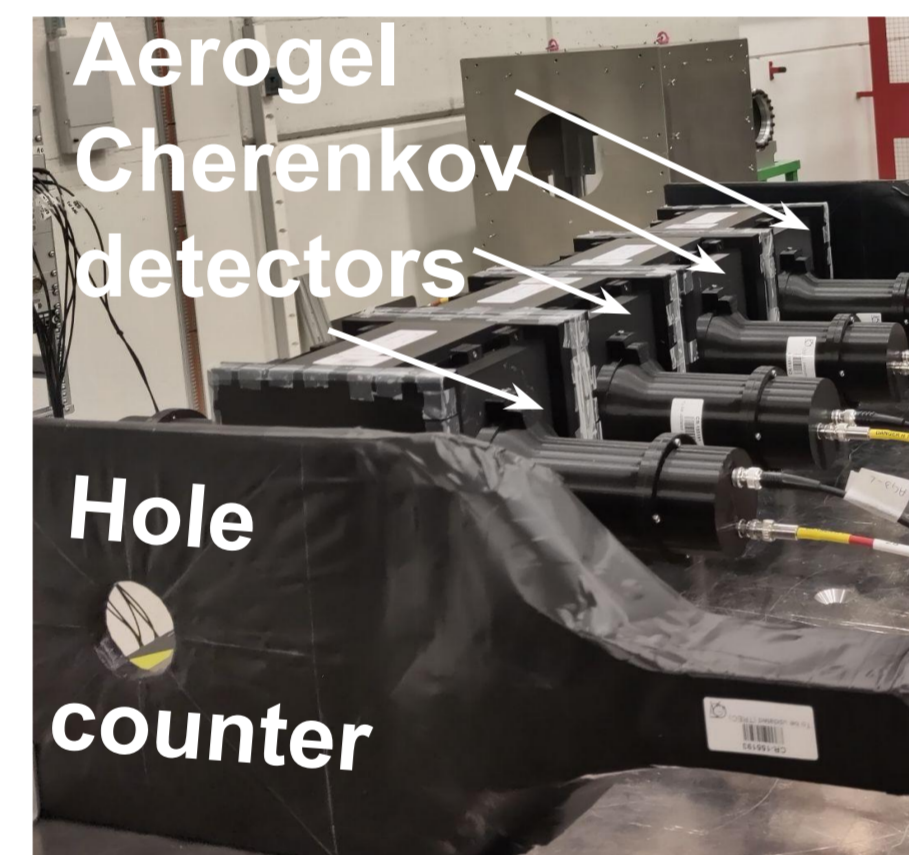
(1) Low momentum beam setup



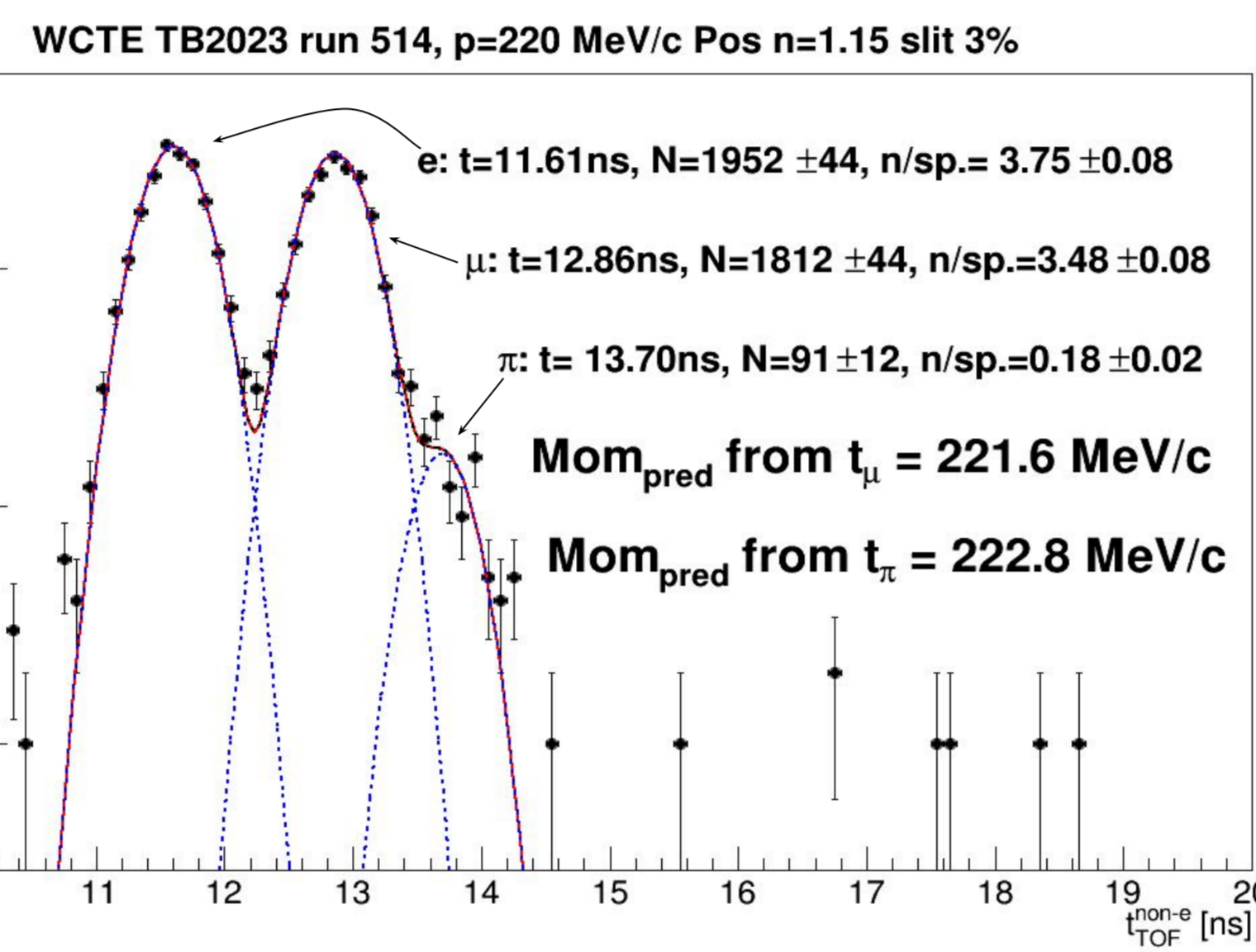
- Negatively and positively charged beam with momenta 200 MeV/c to 2 GeV/c.

- Trigger scintillators for TOF measurement and proton tagging.

- Hole counters for beam halo veto.



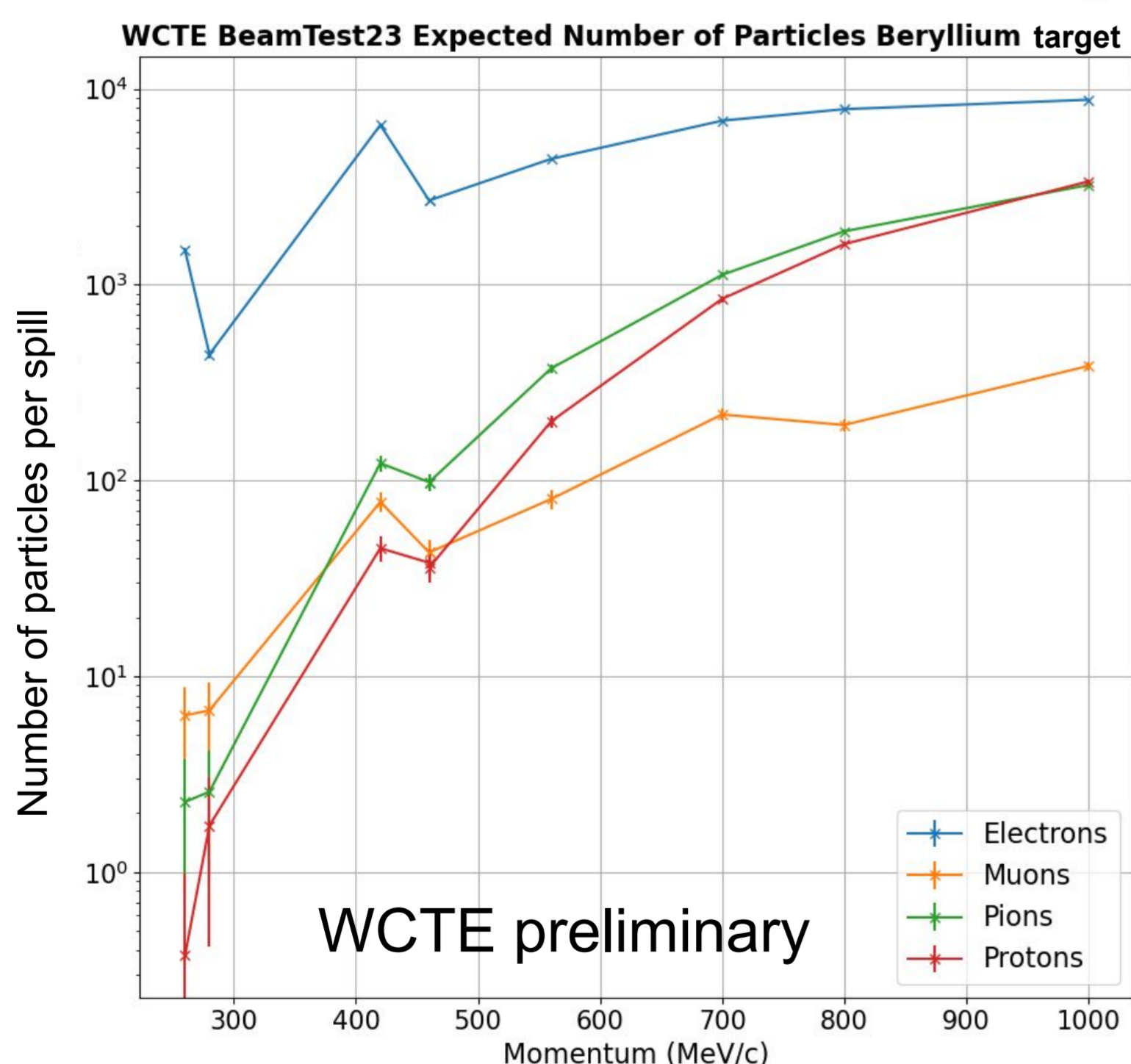
- e^\pm and μ^\pm above, p^+ and π^\pm below Cherenkov Threshold.



- Using aerogel Cherenkov threshold detectors (ACTs) with refractive index tailored to beam momentum.

n	Threshold momenta (MeV/c)		
	Thickness (cm)	μ	π
1.006	8+8	962	1 258
1.01	6+6	744	973
1.015	6+6	607	803
1.02	6+6	525	687
1.03	4+6	427	559
1.047	8+8	340	445
1.06	4+6	300	393
1.11	2+2	219	286
1.13	2+2	200	262
1.15	2+2	185	243

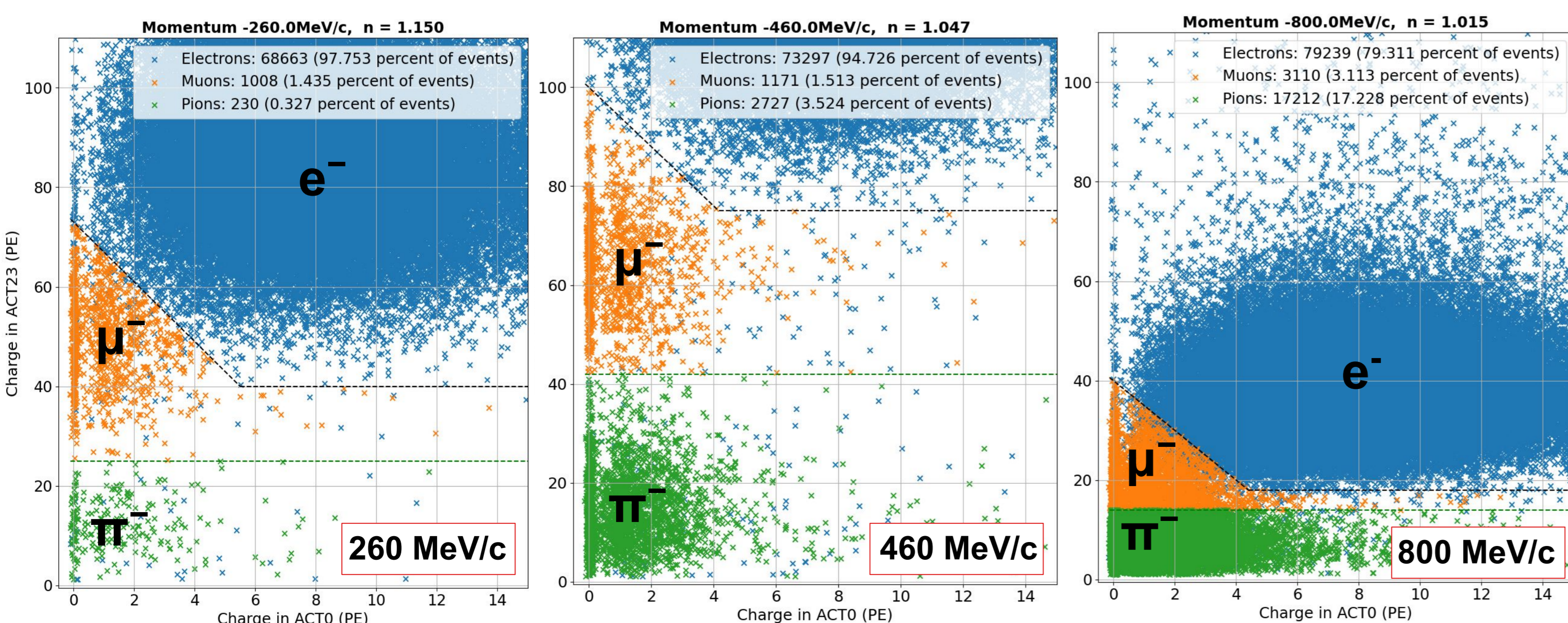
TABLE I: WCTE 2023 beam test Aerogel Cherenkov detectors



- First characterisation of the newly refurbished T9 beam.

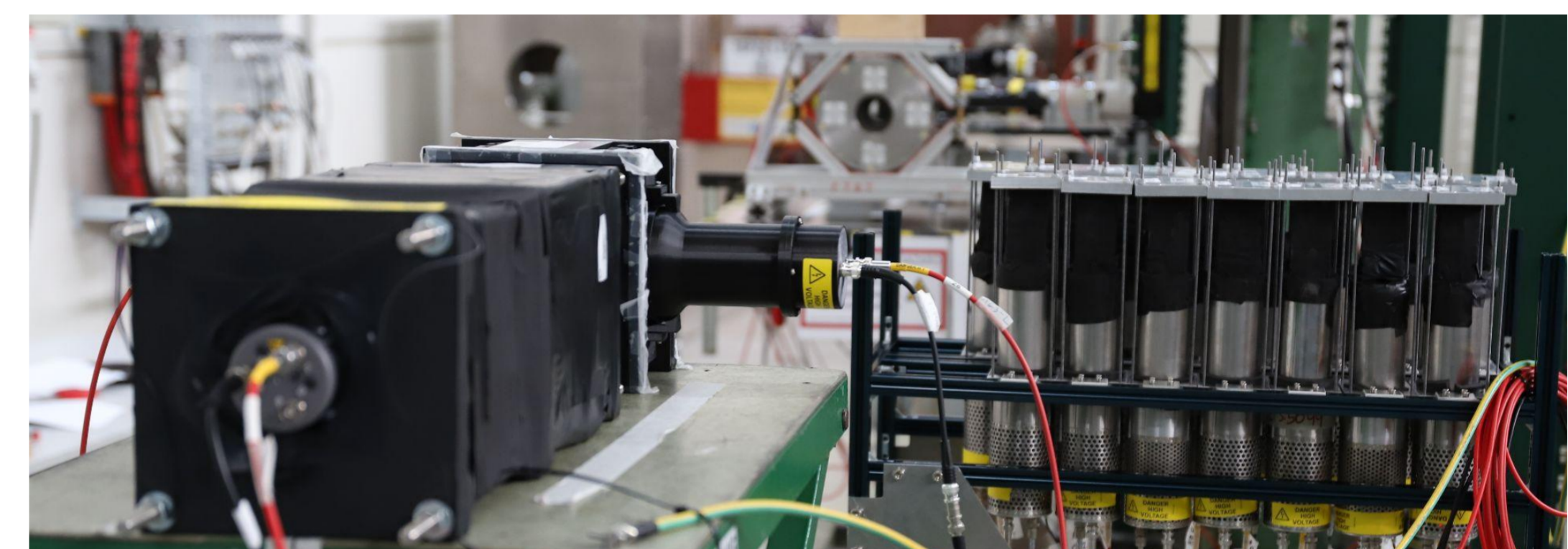
- Good muon/pion separation (15 to 50 PE).

- Expect no much lower (1-2 PE) signals for pions but M3 ESR scintillate, will be swapped for aluminized Mylar reflector in 2024.

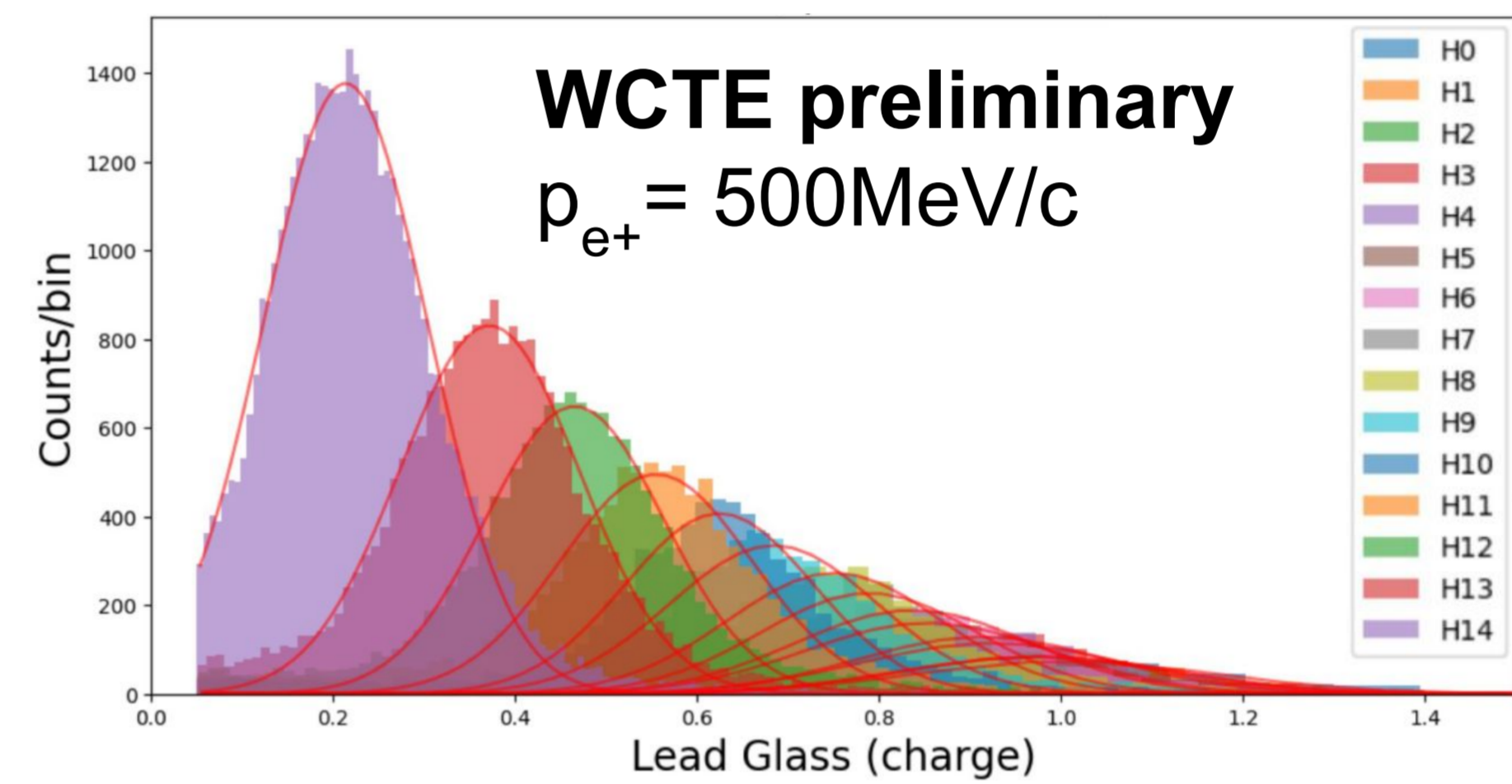


(2) Tagged photon setup

- To test its electron/photon ID capabilities, WCTE needs a beam of photons of known energy.

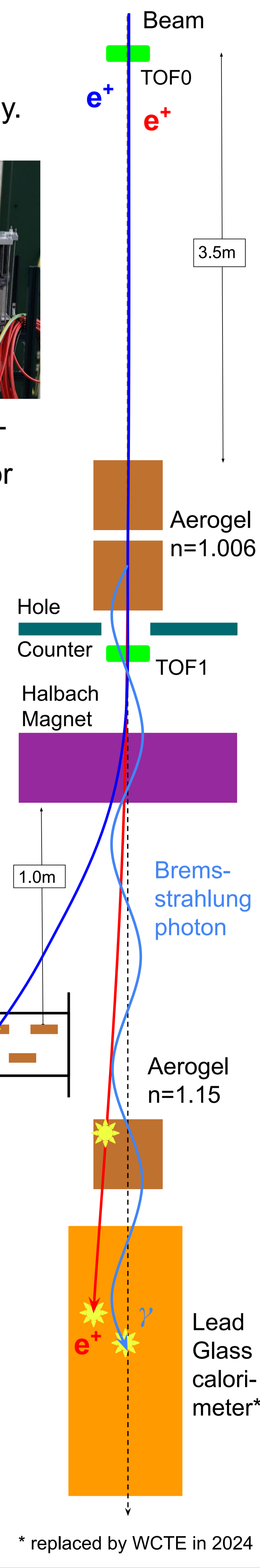
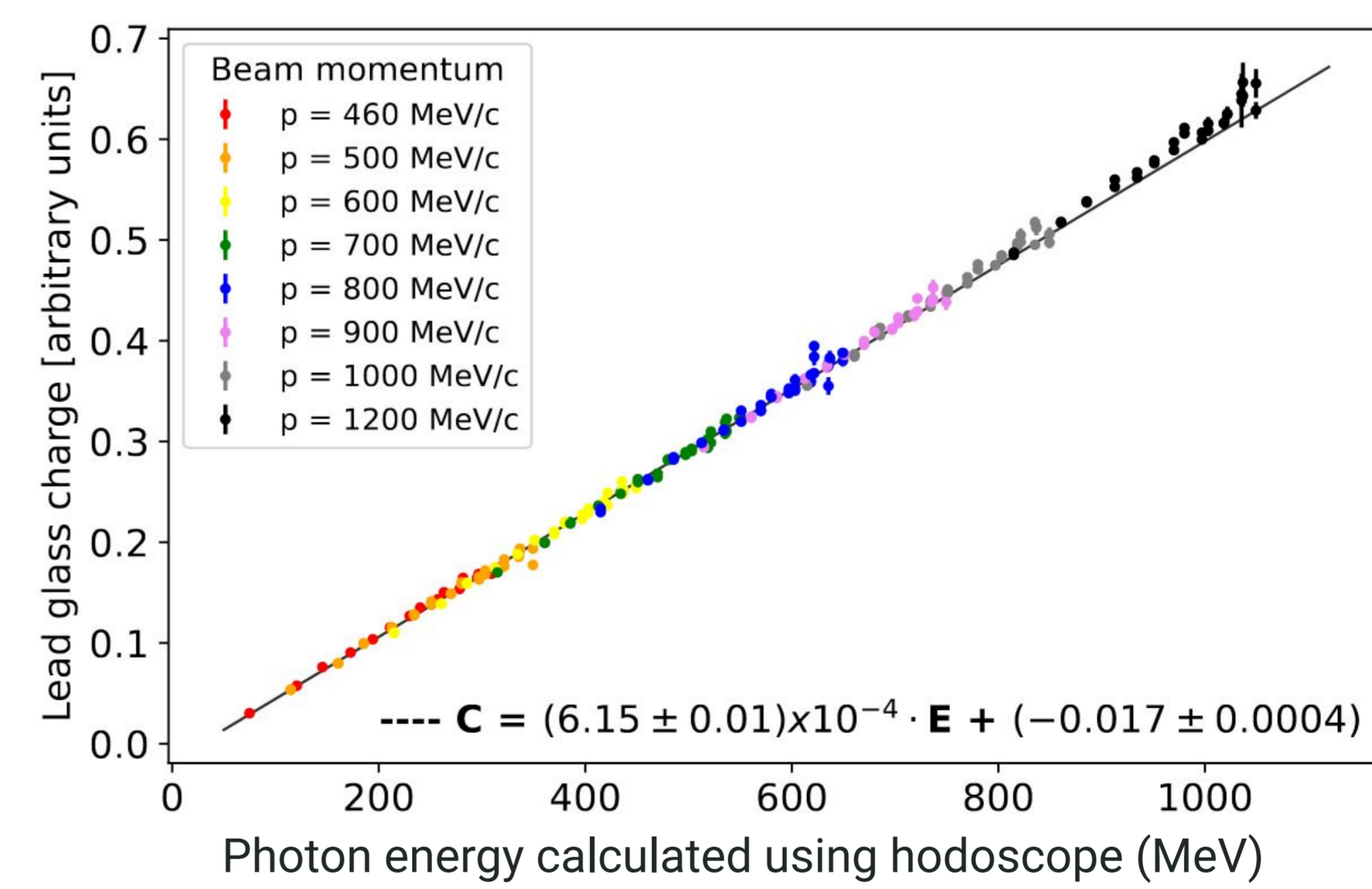


- Use a Halbach array permanent magnet of 1T (0.23Tm) and a hodoscope made of 15 scintillator bars coupled to PMTs.



- e^+ bent by magnet onto hodoscope, proportional to energy lost to the Bremsstrahlung photon.

- 100s of tagged photons per spill.



Next steps

Sept. 2024: Installation in T9

June 2024: Detector assembly starts

Mid 2025: mPMTs sent to Hyper-K

Oct. 2024: data taking starts

Physics studies and hardware tests for Hyper-Kamiokande