

FY27 Funding Request USHFCC Muon Group

- MPGD Effort -

May 1, 2026

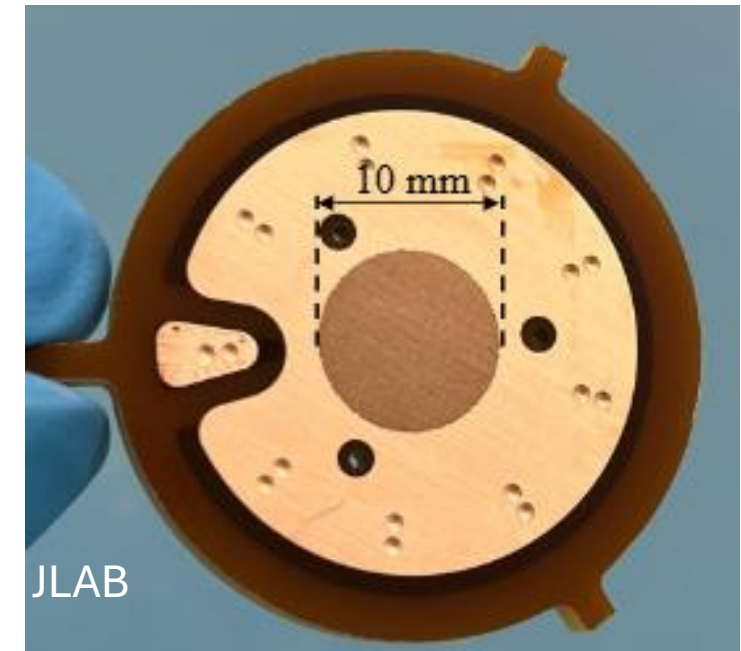
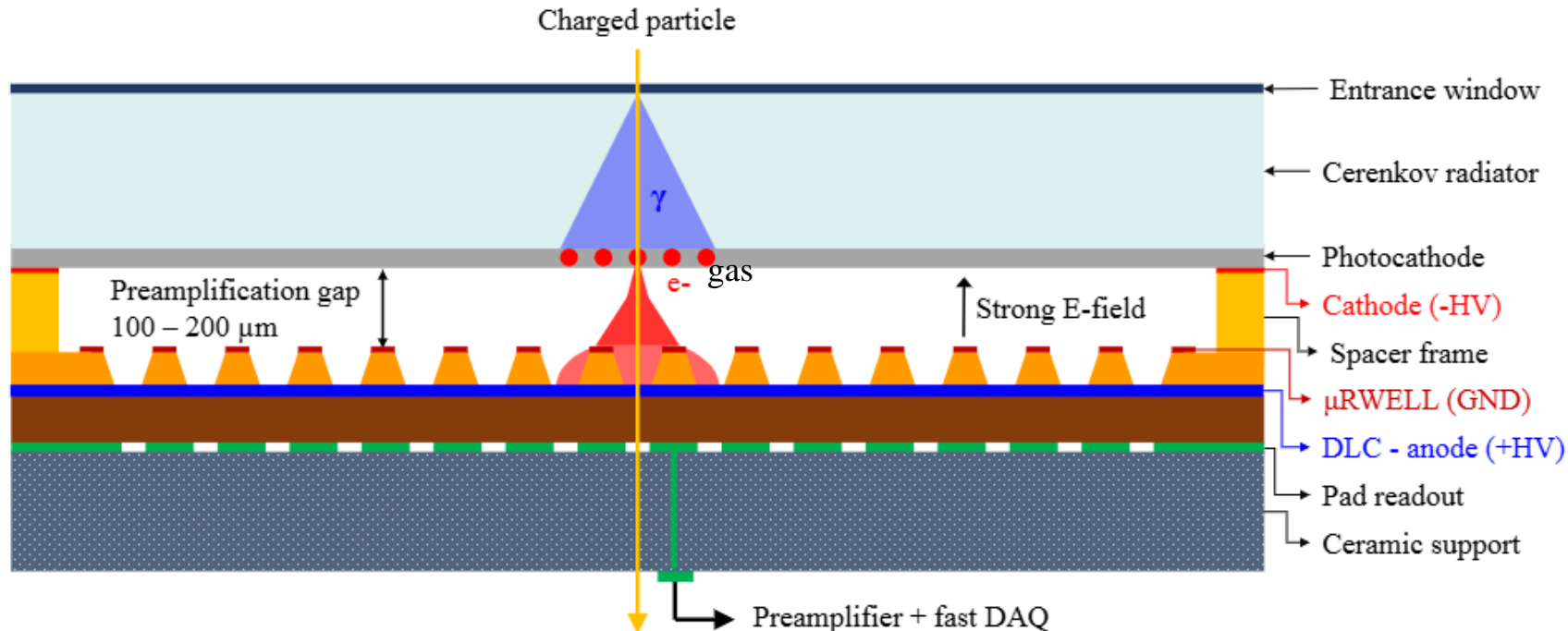
Precision Muon Timing and ToF-based PID with μ RWELL-PICOSEC Technology

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Motivation (dual use):

1. Detection of delayed charged particles from long-lived particle decays in muon system, e.g. $H \rightarrow X_{LLP}^0 X_{LLP}^0 \rightarrow \mu^+ \mu^- \mu^+ \mu^-$
2. Particle identification using time-of-flight (ToF) detector outside central tracker (“barrel timing wrapper”)

Concept: μ RWELL-PICOSEC detector (MPGD with Cherenkov radiator)



FY27 R&D Goals

1. **Analysis of 2026 CERN beam test data from 10 cm × 10 cm μ RWELL-PICOSEC prototype (JLab / FIT)**
 - Improvement of existing analysis code & methodology
 - Prepare publication
2. **Performance optimization with new small single-channel prototypes (JLab / FIT)**
 - New μ RWELL amplification structure (**75 μ m thick**)
 - Optimization of hole parameters of μ RWELL PCB
 - More robust photocathodes (DLC, B4C, and metallic) as alternative to CsI
 - Cost-effective & environmentally friendly gas alternatives to current Ne:CH₄:**CF₄** (80:10:10) mixture
3. **Design of larger (20 cm × 20 cm) μ RWELL-PICOSEC detector with 100-pad readout (JLab)**
 - Large area critical for application in realistic experiment such as a muon system in experiments at the FCC
 - 20 cm × 20 cm area expected to be sweet spot between performance and technical challenges
 - 100-pad, low channel counts & low capacitance readout with **integrated** fast pre-amplifier electronics

FY27 Budget Request - JLAB

- ❖ PI / Scientist support (5% FTE): **\$17k** (fringe & IDC included) – Oversight of project, μ RWELL PCB design
- ❖ Engineer support: **\$24k** (fringe & IDC included) – Mechanical design of 20cm \times 20cm prototype
- ❖ Materials & supplies: **\$ 5.5k** (IDC included) – Lab tests for characterization of small prototypes
- ❖ Domestic travel: **\$ 3.5k** (IDC included) – Travel b/w JLAB and FIT to set up test bench at FIT

Total fully loaded budget request: \$50k

No funds requested by FIT