

PIONEER : A NEXT GENERATION PION DECAY EXPERIMENT

- **Major new experiment** addressing emerging SM anomalies in flavor physics: augmenting the TRIUMF particle physics science program

1st phase: measurement of $R_{SM}^{\pi} = \frac{\pi \rightarrow e\nu(\gamma)}{\pi \rightarrow \mu\nu(\gamma)}$: best e- μ universality test, sensitive to high mass and low mass new physics

2nd and 3rd phases: $R^{\pi\beta} = \frac{\Gamma(\pi^+ \rightarrow \pi^0 e^+ \nu)}{\Gamma(\pi^+ \rightarrow \text{all})}$: $\mathcal{O}(\pm 0.2\% \rightarrow \pm 0.05\%)$ pristine V_{ud} extraction

- Supported by a large, experienced international collaboration (~60 collaborators from ~25 institutes across Asia, Europe & North America).

Canadian leading involvement

TRIUMF: D. Bryman co-spokesperson, C. Malbrunot NSERC PI, K. Pachal

McGill: T. Brunner

- Full experimental proposal submitted to PSI in January 2022 (<https://arxiv.org/pdf/2203.01981.pdf>) → accepted with high priority

- **Snowmass white paper**: <https://arxiv.org/abs/2203.05505>

- **First beamtime at PSI PiE5** in May-June 2022

- **Rare Pion Decay Workshop** in Santa Cruz 04th-08th October 2022. 70 participants. Fantastic event !

- 1y PIONEER **NSERC SAP DG** grant approved last year
Submitting new proposal for R&D support for the next 3 years

- PIONEER employs **emerging technologies** which are **synergistic** with other developments at TRIUMF (Noble liquid calorimetry, VUV SiPM detectors, LGADs) in nEXO, NA62, ATLAS etc

- Canadian group aims at leading calorimeter design & construction for PIONEER

- Time-scale: 10-15 years. Budget ~25 M\$

