

# XeSAT2023 - International Workshop on Applications of Noble Gas Xenon to Science and Technology



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## PIONEER : a next-generation pion decay experiment at PSI

*Tuesday, June 6, 2023 3:00 PM (25 minutes)*

A next-generation rare pion decay experiment, PIONEER, is motivated by several inconsistencies between Standard Model predictions and data pointing towards the potential violation of lepton flavor universality and tensions in the Cabibbo–Kobayashi–Maskawa matrix unitarity. PIONEER's first phase is focused on the measurement of the charged-pion branching ratio to electrons vs muons ( $R_{\pi}$ ). This quantity is very sensitive to a wide variety of new physics effects - including those at very high mass scales-.  $R_{\pi}$  is theoretically predicted to a precision 15 times better ( $\sim 0.012\%$ ) than current experimental average ( $\sim 0.19\%$ ). In order to match the theoretical precision PIONEER's envisioned detector is based on a combination of new technologies: an LGAD silicon tracking target and a deep liquid xenon calorimeter with high solid angle coverage and high-speed electronics to optimize its energy and time resolution.

I'll discuss recent results from previous measurements of  $R_{\pi}$ , in particular from the PIENU experiment at TRIUMF. In light of those I'll present PIONEER's experimental goals and initial detector designs.

**Primary author:** MALBRUNOT, Chloé (TRIUMF)

**Presenter:** MALBRUNOT, Chloé (TRIUMF)

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