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## PIONEER: a next generation pion decay experiment

*Tuesday 28 May 2024 10:30 (30 minutes)*

The PIENU experiment at TRIUMF has provided, to date, the most precise experimental determination of  $R_{e/\mu}^{\pi} = \frac{\pi^+ \rightarrow e^+ (\gamma)}{\pi^+ \rightarrow \mu^+ (\gamma)}$ , the ratio of pions decaying to positrons relative to muons. While  $R_{e/\mu}^{\pi}$  is more than an order of magnitude less precise than the Standard Model (SM) calculation, the PIENU result is a precise test of the universality of charged leptons interaction, a key principle of the Standard Model (SM), constrains a large range of new physics scenarios, and allows dedicated searches for exotics such as sterile neutrinos. I'll go over a short overview of  $R_{e/\mu}^{\pi}$  measurements and introduce the next generation precision pion decay experiment in the making: PIONEER!

This newly proposed experiment aims at pushing the boundaries of precision on  $R_{e/\mu}^{\pi}$  and expanding the physics reach by improving on the measurement of the very rare pion beta decay  $\pi^+ \rightarrow \pi^0 e^+ \nu$ . This will provide a new and competitive input to the determination of  $|V_{ud}|$ , an element of the Cabibbo-Kobayashi-Maskawa (CKM) quark-mixing matrix.

### Keyword-1

pion decay

### Keyword-2

lepton flavour universality

### Keyword-3

CKM

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