



# Measurement of $K^+ \rightarrow \pi^+ \nu \bar{\nu}$

NA62 operating through 2025:  $B(K^+ \rightarrow \pi^+ \nu \bar{\nu}) \pm 10\%$

Recent results:

$$B(K^+ \rightarrow \pi^+ \nu \bar{\nu}) = (10.6_{-3.6}^{+4.0} \pm 0.9_{\text{Syst}}) \times 10^{-11} \quad (3.4\sigma \text{ significance})$$

$$B(K^+ \rightarrow \pi^- (\pi^0) e^+ e^+) < 8.5 \times 10^{-10}$$

$$B(K^+ \rightarrow \pi^- e^+ e^+) < 5.3 \times 10^{-10}$$

$$B(K^+ \rightarrow \mu \nu_H) < O(10^{-8})$$

$$B(K^+ \rightarrow \mu \nu X) < O(10^{-7})$$

$$B(K^+ \rightarrow \mu \nu \nu \nu) < 10^{-6}$$

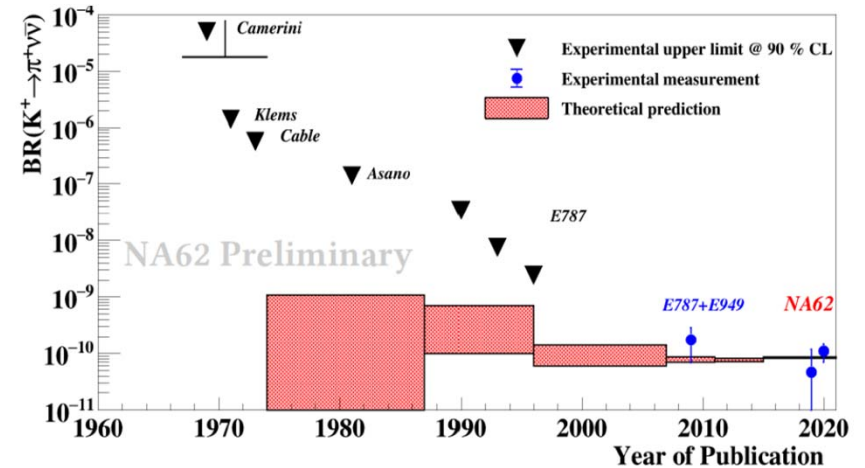
Lepton flavor/number viol. modes:  $< 10^{-12}$

Other Related Work:

\*Testing Lepton Flavor Universality with Pion, Kaon, Tau, and Beta Decays, D. Bryman, V. Cirigliano, A. Crivellin, G. Inguglia, Ann. Rev. Nuc. Part. Sci. 72, 66 (2022).

\*Snowmass contributions: Weak Quark Decays, Sterile Neutrinos, Dark Sectors

$B(K^+ \rightarrow \pi^+ \nu \bar{\nu})$  vs. Year



## Canadian NA62 Projects (Bryman, Numao, Velghe, Wong)

**Particle ID via Machine Learning** with TRIUMF Data Scientist W. Fedorko and UBC Masters in Data Science students:

**Calorimeters:** Achieved 28% improvement in acceptance; implemented in NA62 software (publication in prog.)

**RICH:** initiated improvement program

**Liquid Krypton TPC Purity Monitor:** Installed at CERN; tested calorimeter purity  $< 1\text{ppb}$  (publication in prog.)

**Si Pixel tracker upgrade: developing advanced pixel test station** (with ATLAS group); sensors received; timing detector in test

**Vus/Vud Studies**