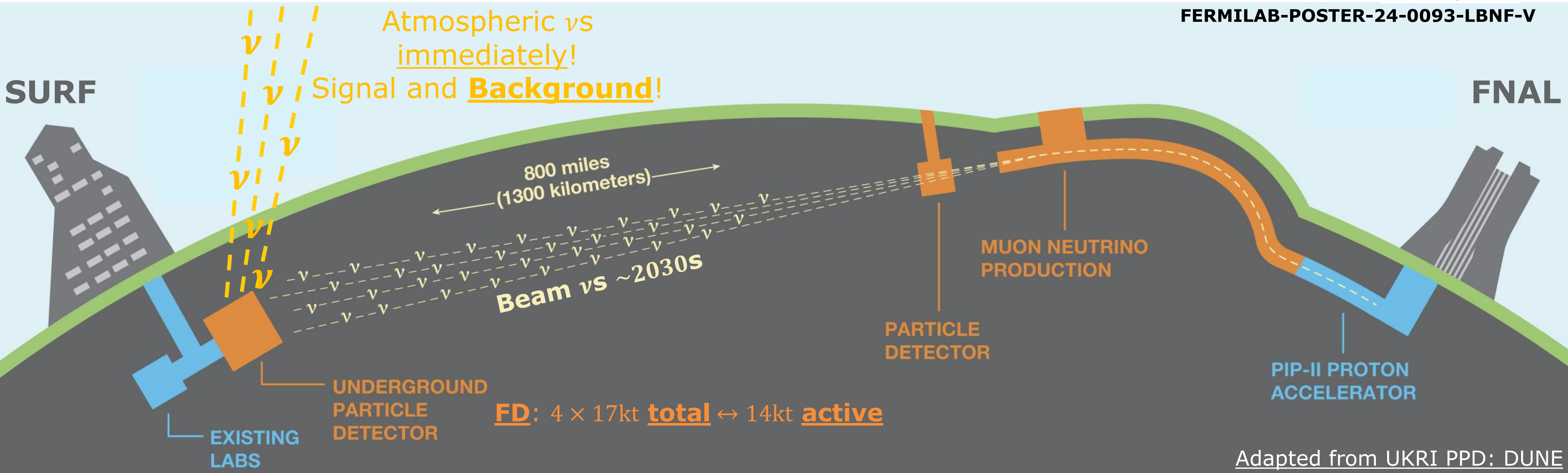


Baryon Number Violation Searches Using the DUNE Far Detectors

Josh Barrow & Tyler Stokes for the Atmospheric & Exotics Working Group on behalf of the **DUNE** Collaboration



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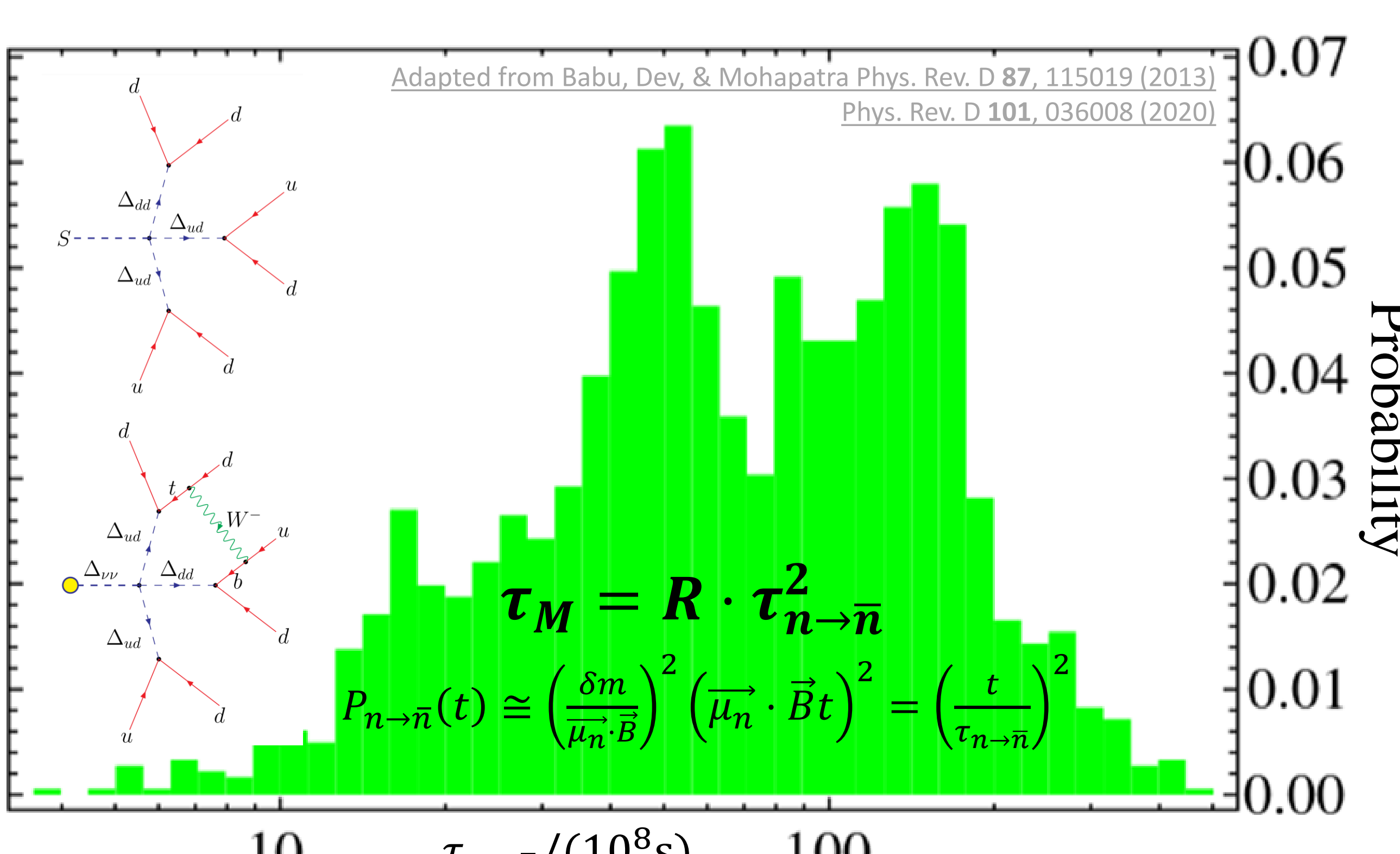
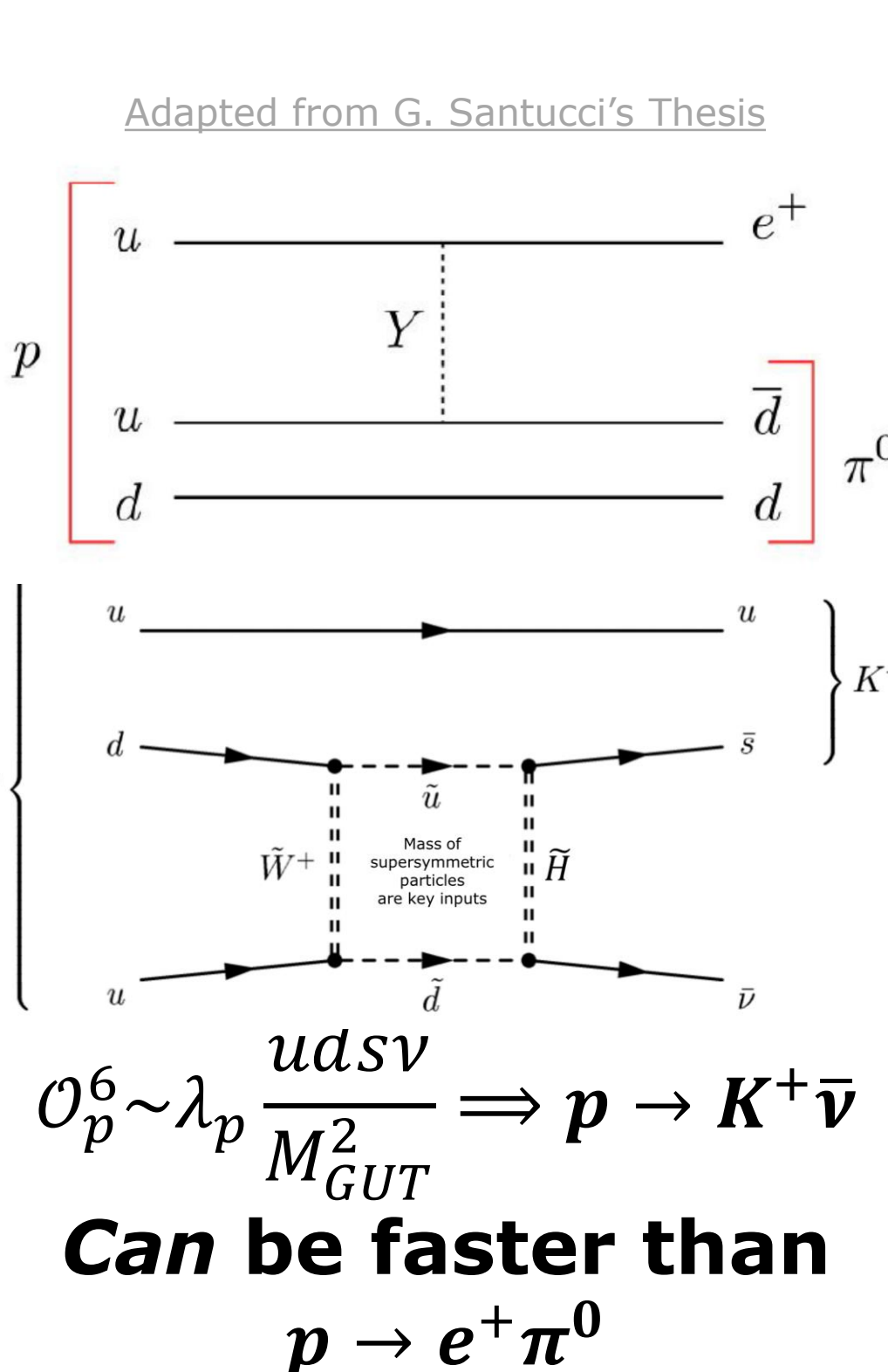
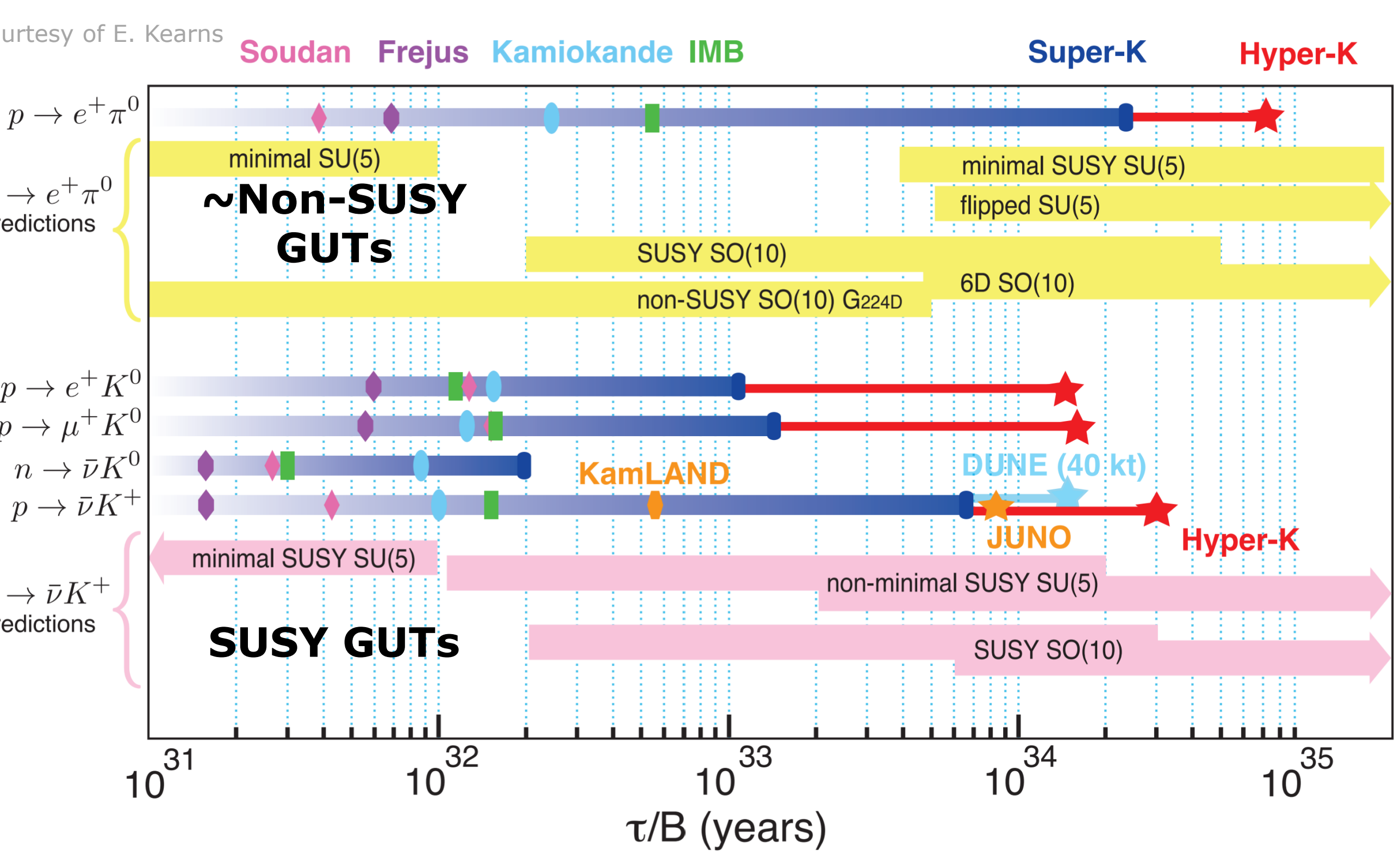
Two Current Flagship Intranuclear Baryon Number Violating Analyses in DUNE

Proton Decay ($p \rightarrow K^+ \bar{\nu}$) “Golden Channel”

Tests for unification of fundamental forces at highest energy scales via B violation

Neutron-Antineutron Transformation ($n \rightarrow \bar{n}$)

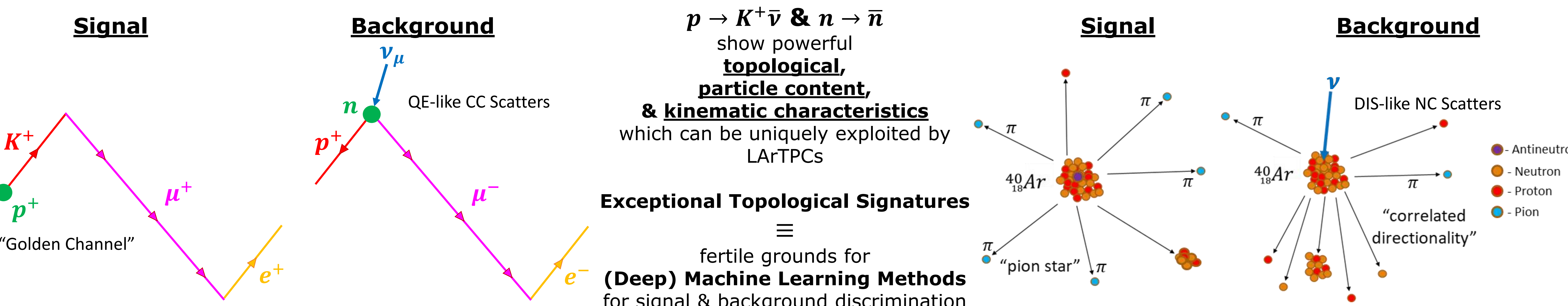
Tests for low energy theories of post-sphaleron baryogenesis via $B - \mathcal{L}$ violation



Both rare process signals will suffer from persistent atmospheric neutrino backgrounds

Signal & backgrounds must be *well modeled* (w/uncertainties) to understand expectations in LArTPCs with low hadron thresholds

See poster from Henrique Souza for more on atmospheric neutrinos in the DUNE Far Detectors!

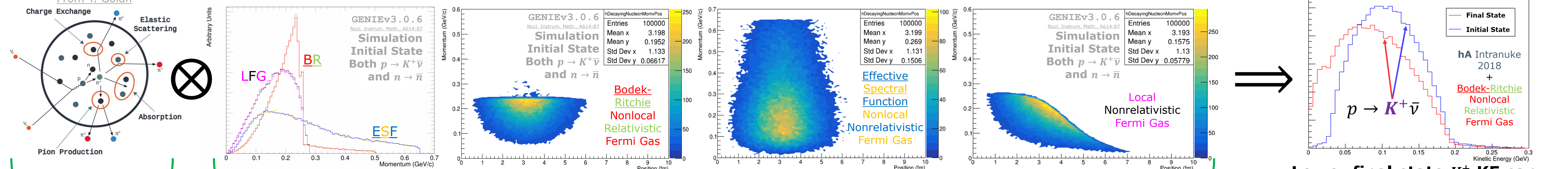


ML analysis methods can be biased by our *models* of Nature—Analysis tools must maintain performance

Need to be especially careful in the context of *unknown* BSM physics, remaining relatively agnostic to a central value model

Can conservatively estimate our ignorance by iterating over many potential *nuclear model configurations* which Nature *might* take

Robust testing requires that any analysis method remains relatively stable across these iterations—hopefully will be able to understand Nature’s behavior



FSI Models: {hA, hN} \otimes **Nuclear models of Fermi motion for intranuclear nucleons in ^{40}Ar :** {BR, ESF, LFG}

$p \rightarrow K^+ \bar{\nu}$ Analysis Update: Current *Boosted Decision Tree* Progress & Future Work in *NuGraph*

New $n \rightarrow \bar{n}$ analysis underway in A&E group—new $\bar{n}N$ branching fractions in GENIE! Stay tuned! *Past* BDT+CNN Work: EPJC 81 (2021) 4, 322

