

Large collaborations

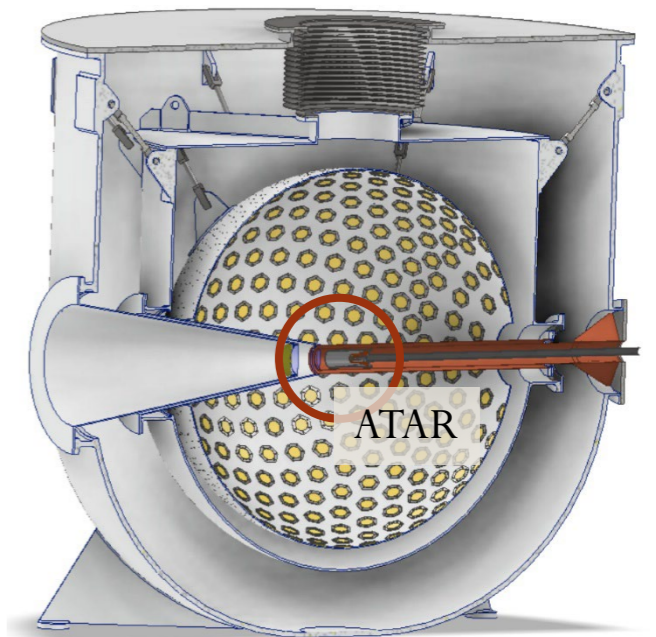
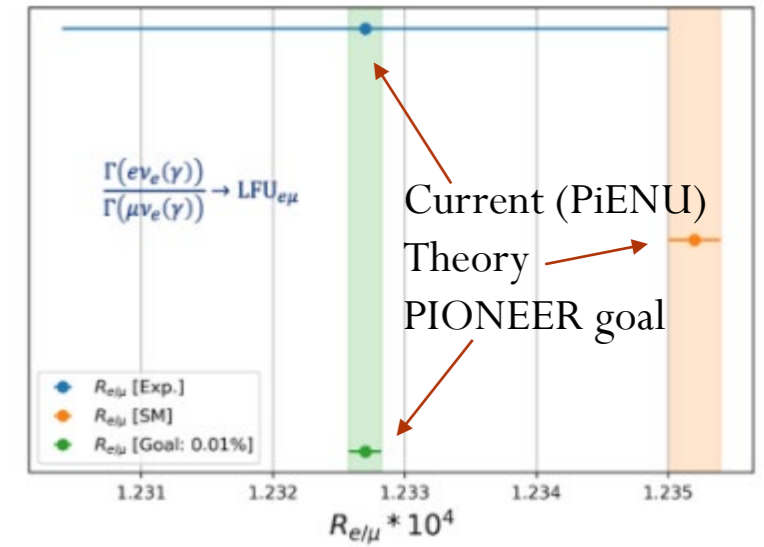
- In the last decades, HEP efforts are mostly driven by very large collaborations
 - E.g.: ATLAS ~5000 collaborators, CMS ~4000 collaborators
- **This is, of course, necessary to answer big questions and crucial for the advancement of the scientific progress**
- However, there could be a downside in engaging only in these large collaborations
 - Long timescale, high expenses and elevated risk
- A fraction of early-career scientists might feel intimidated by the complex dynamics and politics of big modern experiments.
 - **Over-specialization** of the scientific effort might cause one to lose touch with the big picture, especially at the beginning of the career
 - Some prefer to have a connection to every part of the experiment they contribute to and not specialize only in a sub-project
- **Long periods of “analysis” and “hardware” research** driven by the experiment schedule
 - Might cause the community **to lose expertise and interest**
 - Hardware expertise is sometimes not considered “real” research

Small-scale experiments

- **Big experiments are crucial for the community, but the effort needs to be “balanced”**
 - Small-scale experiments are equally important for the scientific advancement and significantly improve community engagement
- **Training of new researchers** involved in all sub-detectors and that know how an experiment is sketched, built, and eventually run
 - Crucial for building the new big experiments!
 - Allow to grow the next generation of leaders without the elevated pressure and politics of big collaborations
- **Development of technology** for specific problems with short turnaround
- **Answer aimed scientific questions** in a reasonable time scale
- Lower risk factor from the funding agencies.

An example: PIONEER experiment

- **PIONEER**: next generation rare Pion decay experiment at PSI
 - Phase I: improve measurement of **charged lepton flavor universality** $R_{e/\mu}$ **by an order of magnitude**, reaching SM calculation precision
 - Phase II: measurement of **pion beta decay branching fraction** with one order of magnitude improvement in precision
- Early career researchers in PIONEER are actively involved in Simulations, Beams, ATAR, and Calos and contributing to the strategy of the experiment
- **New concept: full silicon active target (ATAR):**
 - High granularity in (X, Y, Z), fast full collection time, good energy response, high dynamic range
 - **Very innovative type of detector using latest state-of-the-art technology** → great innovation ongoing



<https://arxiv.org/abs/2203.01981>

Good Balance is key!

