

# Snowmass 2021

*RARE PROCESSES AND PRECISION MEASUREMENTS FRONTIER*

## **RF4: Baryon and Lepton Number Violating Processes**

Snowmass Day

Sep 24, 2021

co-Conveners:

[Pavel Fileviez Perez](#) (Case Western Reserve University)

[Andrea Pocar](#) (University of Massachusetts, Amherst)

<https://snowmass21.org/rare/blv>

## RF4: Baryon and Lepton Number Violating Processes

co-Conveners: [Pavel Fileviez Perez](#) (Case Western Reserve Univ.) and [Andrea Pocar](#) (UMass, Amherst)

### Main Physics Topics:

- *Theories for baryon and lepton number violation* — P. Fileviez Perez (CWRU), M.B. Wise (Caltech)
- *Neutrinoless double beta decays* — V. Cirigliano (LANL), A. Pocar (UMass)
- *Baryon and Lepton number violation at colliders* — R. Ruiz (Cracow, INP), E. Thomson (UPenn)
- *Proton decay* — E. Kearns (Boston Univ.), S. Raby (Ohio State Univ)
- *$n$ - $\bar{n}$  oscillations* — K. Babu (OSU), L. Broussard (ORNL)
- *Exotic L and B violating processes* — S. Gardner (Univ. of Kentucky), J. Heeck (Virginia)
- *Connections to Cosmology (Baryogenesis Mechanisms)* — A. Long (Rice Univ.), C. Wagner (Univ. of Chicago/ANL)

**Drivers:** *Explore the unknown, The origin of B and L violation is crucial to understand the nature of neutrinos and the mechanism to explain the matter-antimatter in the Universe. An unique window for physics beyond the SM.*

**P5:** *Strong support for these physics topics*

**Plans:** *Master BL White paper with a summary with all discussions of LOIs, white papers and others.*

**Overlap:** *Overlap with the neutrino frontier (proton decay, neutrinoless double beta decay) and Cosmic Frontier (Baryogenesis)*

# BLV (RF04) White Paper

---

RF4 will write a BLV White Paper that will be handed up to the RF conveners for their report

Each pair of topical leaders will be in charge of their section  
Pavel and Andrea will be the lead editors

LOIs and other white papers will be summarized or linked to, as needed

- Introduction **(2 pages)**
- *Theories for baryon and lepton number violation*: **(2 pages)**
- Neutrinoless double beta decays: **(2 pages)**
- *Baryon and Lepton number violation at colliders*: **(2 pages)**
- *Proton decay*: **(2 pages)**
- *$n$ - $\bar{n}$  oscillations*: **(2 pages)**
- *More exotic  $L$  and  $B$  violating processes*: **(2 pages)**
- *Connections to Cosmology*: **(2 pages)**
- *Summary* **(2 pages)**

A ~10-page summary report, extracted from the White Paper and compiled by Pavel and Andrea, will be handed to the RF conveners for their report

## For discussion

---

- Please let us know about White Papers to insure we do not miss information.
- Neutrinoless double beta decay, especially the experimental side, significantly overlaps with the neutrino frontier, NF05. Several white papers are being written, and ours will amply reference them and avoid overlap and repetition, where possible.
- Reach out to us with any question, suggestion, or offer to help