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A new experiment to measure Parity violation in trapped chiral molecular ions

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The weak interaction is predicted to give rise to slightly different structures for left and right-handed chiral molecules, contrary the common conception that enantiomers are perfect mirror images. The consequences range from the nulling of the tunnelling rate in chiral molecules to a possible seed of homo-chirality in the chemistry of life. We are building a new experiment aimed at observing parity violation (PV) in molecules for the first time. We will use charged chiral molecules which can be easily trapped and have unique pathways to prepare internally cold molecules. Toward our goal we have developed a novel method to differentially extract the PV signature from a racemic sample, overcoming the need to synthesize samples of a single handedness to be measured separately. The differential nature of the scheme enables common-mode noise rejection for signal of interest, optimizing the precision and minimizing susceptibility to systematic shifts.

This experiment may turn into a platform to test fundamental physics and search for beyond Standard Model physics.

[1] Itay Erez, Eliana Ruth Wallach and Yuval Shagam arXiv:2206.03699 (2022)

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