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Instrumentation for Physics Beyond the Standard Model Overview

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The hunt for new physics beyond the standard model has motivated exciting nuclear physics experiments that seek to: uncover new sources of charge-parity violation required for baryogengesis, reveal if neutrinos are their own antiparticle, determine the neutrino mass scale and hierarchy, investigate the properties of antimatter, and discover new interactions that subtly alter measurable properties such as lifetimes, radii, magnetic moments, and decay correlation parameters. These challenging experiments have pushed the demands on instrumentation to unprecedented levels of sensitivity. Common threads that stitch together these diverse experiments include: trapping neutral particles for exceptionally long times with electromagnetic fields or with nuclear potentials; generation of highly homogeneous, large and small electromagnetic fields; understanding the complex motion of charged and uncharged particles; measuring and controlling precession and orbital frequencies using new precision techniques; development of materials with high radio, isotopic, or magnetic purity; and deployment in cryogenic and underground environments. This overview talk will provide an introduction of these experimental principles and requirements for the subsequent talks in this mini-symposium.