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Positronium and Muonium precision spectroscopy: Measurement of the 1S-2S and excited state hyperfine transitions

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Positronium and Muonium are excellent systems to test bound-state QED theory to high precision. This has motivated numerous precise experiments aimed at measuring the hyperfine splitting and 1S-2S transition of these atoms.

Currently, there is some disagreement with the most recent bound-state QED calculations for the hyperfine splitting in positronium. Our approach to resolve this, PHySES, eliminates several possible sources of systematics present in earlier experiments by a novel experimental design.

Furthermore, measurements of the 1S-2S transition can test bound state QED in the ppb range and determine fundamental constants, e.g., the muon mass. Here we present current efforts to reach this sensitivity.

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