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Sub-THz Spectroscopy of the Ground State Hyperfine Splitting of Positronium

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Positronium (Ps), a bound state of an electron and a positron, is a purely leptonic system and is a good target to study Quantum Electrodynamics (QED) in bound state. We plan to directly measure the hyperfine structure of the ground-state positronium (Ps-HFS), which is about 203 GHz. Precise measurements of Ps-HFS have been performed in 1970s and 1980s, but all of them are indirect measurements using Zeeman splitting of about 3GHz cause by a static magnetic field of about 1T. In order to measure Ps-HFS with a different method free from systematic uncertainty of the static magnetic field, we develop a new optical system to accumulate about 20 kW power using a gyrotron and high finesse Fabry-Pérot resonator. We report the current status of our experiment.

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