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Laser spectroscopy of metastable antiprotonic and pionic helium atoms

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The ASACUSA collaboration at CERN carries out two-photon laser spectroscopy of metastable antiprotonic helium atoms, which are three-body systems composed of a helium nucleus, an antiproton, and an electron. By measuring the transition frequencies of this atom and comparing the results with three-body QED calculations, the antiproton-to-electron mass ratio was determined to a precision of 1.4 parts per billion. We also describe the PiHe collaboration, which aims to measure the transition frequencies of pionic helium atoms using the 590-MeV ring cyclotron of the Paul Scherrer Institute.

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