【Mathematics/Physics】

Title of Project	Contribution to fundamental physical constants using exotic-atom spectroscopy
Principal Investigator Name	Ryugo Hayano, The University of Tokyo, Department of Physics, Professor
Abstract of Research Project **Number of Researchers : 1** **Term of Project: 2008-2012**	Exotic atoms denote systems in which a heavy negatively-charged particle (e.g., antiproton) is bound by the Coulomb force to the nucleus. Precision spectroscopy of exotic atoms yields fundamental constants, such as the proton-to-electron mass ratio, which cannot be obtained in the studies of ordinary atoms. Since exotic atoms do not exist in nature, accelerators are necessary for their studies. This project emphasizes precision studies of two kinds of exotic helium atoms, 1) antiprotonic helium (at CERN's antiproton decelerator facility) and 2) kaonic helium (at the hadron-hall of J-PARC accelerator complex in Tokai, Japan). The laser spectroscopy of antiprotonic helium atoms, which has already contributed to the CODATA 2006 values, will improve the precision of the relative atomic mass of the electron, while the X-ray spectroscopy of kaonic helium atoms will experimentally pin down the kaon-nucleus strong-interaction strength, the subject of hot theoretical debate for the past 10 years.