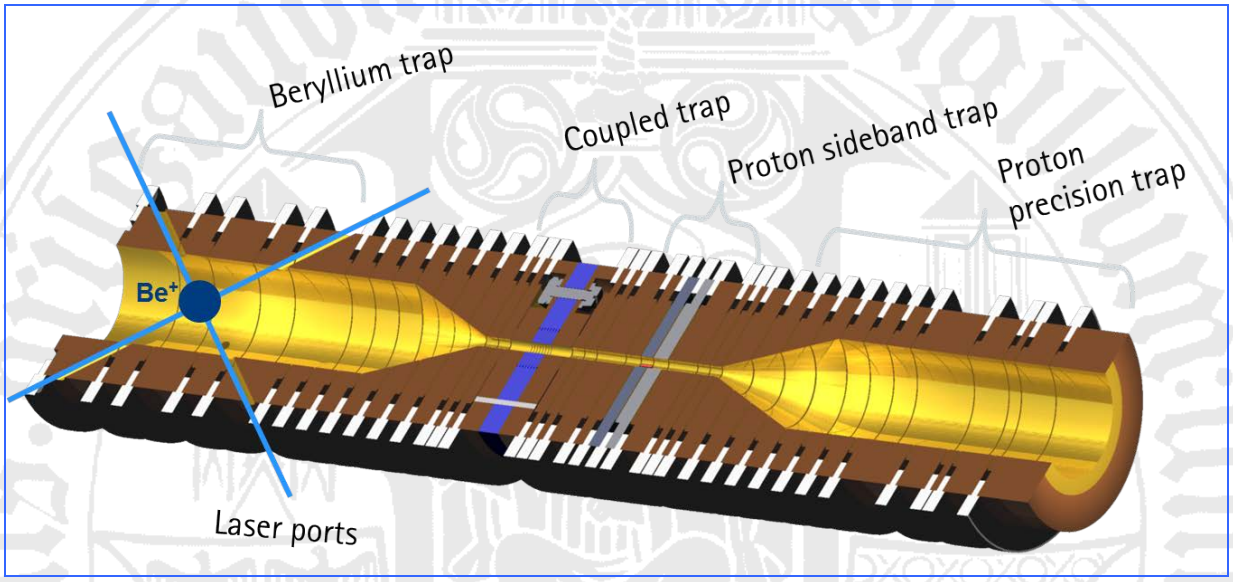
Physikalisches Institut
Fakultät für Mathematik und Physik
Albert-Ludwigs-Universität Freiburg

PHYSIKALISCHES KOLLOQUIUM

AM 24. OKTOBER 2016 UM 17 UHR C.T.

IM GROßEN HÖRSAAL



TOWARDS SYMPATHETIC LASER COOLING AND DETECTION OF SINGLE (ANTI-)PROTONS FOR TESTING CPT SYMMETRY

PROF. DR. CHRISTIAN OSPELKAUS
INSTITUT FÜR QUANTENOPTIK, UNIVERSITÄT HANNOVER

CPT symmetry, closely related to Lorentz symmetry, is a fundamental symmetry within quantum field theory and the standard model. As a result of CPT symmetry, particles and antiparticles must have the same magnetic moment, charge (except for the sign), mass, and lifetime. However, on the scale of the universe, there is a striking asymmetry between matter and antimatter. It therefore makes sense to test CPT symmetry by extremely low energy, high accuracy fundamental tests. Current experimental efforts to test CPT symmetry with single (anti-)protons are progressing at a rapid pace but are hurt by the nonzero temperature of particles and the difficulty of spin state detection. We describe a quantum logic inspired approach to single (anti-)proton cooling and state detection based on the ideas by Heinzen and Wineland, where a single 9Be+ ion will be used to cool and detect a single (anti-)proton in all its internal and external degrees of freedom. This effort is part of the BASE collaboration.