Colloquium

Precision measurements of weak optical interactions using coherent control—progress towards a new atomic PNC measurement in Cs

Prof. Daniel Elliot
Purdue University

Wednesday, December 11 ◆ 4 P.M.

Room 118 Nieuwland Science Hall

Refreshments @ 3:30 in 202 NSH

The precise measurement of the Weak-force induced parity non-conserving transition amplitude E_{PNC} by the Boulder group in 1997 was a great success, and this measurement, combined with highly-refined theoretical models of the Cs atom, have generated a value of the weak charge Q_W that is in excellent agreement with the prediction of the Standard Model. At the same time, the Boulder measurement has been the source of an anomaly that has defied explanation since the time of its initial report; that is the magnitude of the nuclear spin dependent (NSD) contribution to E_{PNC}. The leading source of this effect is expected to be the magnetic anapole moment of the nucleus. In the years since the Boulder Cs experiment, several groups have launched laboratory programs designed to address the NSD contributions in a variety of atomic systems, but to date there has been little progress. Cs offers several profound advantages over other atomic systems in these investigations: Experimentally, optical pumping techniques and efficient detection techniques have been developed which allow for highly precise measurements in the laboratory. Theoretically, the models of the atomic structure are unparalleled by any other atomic system, save hydrogen. For these reasons, we have recently returned to the atomic Cs system in an effort to shed light on the NSD effects. In this talk, I will discuss recent progress in a measurement of the magnetic dipole transition moment in Cs, and look forward to an extension of the technique for a new, but complementary, measurement of E_{PNC}.

Notre Dame Science
Department of Physics