Abstract Submitted
for the APR06 Meeting of
The American Physical Society

Reactor Safeguards using Compact Antineutrino Detectors
NATHANIEL BOWDEN, MATTHEW ALLEN, JAMES LUND, Sandia National Laboratories, CA, ADAM BERNSTEIN, CELSETE WINANT, Lawrence Livermore National Laboratory — Fission reactors emit large numbers of antineutrinos and this flux may be useful for the measurement of two quantities of interest for reactor safeguards: the reactor's power and plutonium inventory throughout its cycle. The high antineutrino flux and relatively low background rates means that simple cubic meter scale detectors at tens of meters standoff can record hundreds or thousands of antineutrino events per day. To estimate plutonium content, we exploit the fact that the ingrowth of ∼250 kilograms of plutonium in the core during a typical 1.5 year fuel cycle induces a predictable fall-off in the antineutrino rate in that time. Such antineutrino detectors would add online, quasi-real-time bulk material accountancy to the set of reactor monitoring tools available to the IAEA and other safeguards agencies with minimal impact on reactor operations. Our SNL/LLNL collaboration has deployed a prototype safeguards detector at a reactor in Southern California in order to test both the method and the practicality of its implementation in the field. Here I present results from this prototype detector, discuss further steps needed for practical implementation of this technique, and discuss overlap between these measurements and planned experiments to measure theta13.

Nathaniel Bowden
Sandia National Laboratories, CA

Date submitted: 13 Jan 2006 Electronic form version 1.4