



TR0700377

**LASER ENHANCED RADIOACTIVE DECAY AND SELECTIVE TRANSMUTATION
OF NUCLEAR WASTE****Rainer Salomaa, Pertti Aarnio, Jarmo Ala-Heikkilä, Antti Hakola, and Marko Santala**Advanced Energy Systems
Helsinki University of Technology
POBox 4100, FIN-02015 TKK, Finland
E-mail: *Rainer.Salomaa@tkk.fi***ABSTRACT**

We have investigated narrow-band coherent laser radiation - ranging from visible to X- and to gamma-ray wave length region – and their interactions both directly with photon-nuclear couplings and indirectly through the photon-electron and electron-nucleus interactions. In particular we discuss various means of selective excitation of nuclear resonance states by narrow-band lasers. During the relaxation process the active nucleus may return to its initial ground-state or find another final state. In the latter case the nucleus is transmuted into a state which may have beneficial properties for instance concerning radioactivity. One ideal case would be the destruction of long-lived nuclear waste isotopes into faster decaying ones. The essential presumption is that the excitation process is selective and efficient as regards background processes due to unwanted excitation channels of the primary isotope and due to other surrounding nuclides. The paper consists of 1) a short review of generating short-wave length coherent light sources, 2) a survey of potential photon-induced nuclear states and their decay channels, and 3) a determination of the selectivity of the transmutation process.