Abstract Submitted
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Fast Neutron Emission Tomography of Used Nuclear Fuel Assemblies[1] PAUL HAUSLADEN, ANAGHA IYENGAR, LORENZO FABRIS, JINAN YANG, JIANWEI HU, MATTHEW BLACKSTON, Oak Ridge National Laboratory — Oak Ridge National Laboratory is developing a new capability to perform passive fast neutron emission tomography of spent nuclear fuel assemblies for the purpose of verifying their integrity for international safeguards applications. Most of the world's plutonium is contained in spent nuclear fuel, so it is desirable to detect the diversion of irradiated fuel rods from an assembly prior to its transfer to "difficult to access" storage, such as a dry cask or permanent repository, where re-verification is practically impossible. Nuclear fuel assemblies typically consist of an array of fuel rods that, depending on exposure in the reactor and consequent ingrowth of ^{244}Cm, are spontaneous sources of as many as 10^9 neutrons s^{-1}. Neutron emission tomography uses collimation to isolate neutron activity along "lines of response" through the assembly and, by combining many collimated views through the object, mathematically extracts the neutron emission from each fuel rod. This technique, by combining the use of fast neutrons−which can penetrate the entire fuel assembly−and computed tomography, is capable of detecting vacancies or substitutions of individual fuel rods. This paper will report on the physics design and component testing of the imaging system.

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