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**A liquid scintillator neutron multiplicity counter for assaying special nuclear material** STEVEN SHEETS, A.M. GLENN, P.L. KERR, K.S. KIM, L.F. NAKAE, R.J. NEWBY, M.K. PRASAD, N.J. SNYDERMAN, J.M. VERBEKE, R.E. WURTZ, Lawrence Livermore National Laboratory — The use of  $^3\text{He}$  detectors to infer the mass of a fissioning source from the statistical properties of the neutron multiplicity distribution is a mature technology. We describe a new neutron multiplicity counter using the fast timing of liquid scintillators for the non-destructive assay of special nuclear materials (SNM). A liquid scintillator multiplicity counter (LSMC) that detects fast fission neutrons makes possible a coincidence gate on the order of nanoseconds (vs. tens of microseconds for thermal counters). This allows a LSMC to assay SNM in high rate environments where the fission chains would overlap for a thermal counter. This includes items such as impure Pu with high  $(\alpha, n)$  rates as well as low mass HEU where an active interrogation source is needed. Furthermore, the time-of-flight of correlated  $n\text{-}\gamma$  pairs allows the LSMC to act as an imager of SNM. We report on the development of a liquid scintillator multiplicity counter at Lawrence Livermore National Laboratory. This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

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