Neutron-induced Fission with STEFF

A.G. Smith, D.M. Cullen, J.A. Dare, H. Faust*, B. Maerkisch*,
T. Materna*, A. Pollitt, O.Serot†, A. Robinson,
T. Soldner*, M. Taylor, I. Tsekhanovich‡, W. Urban*

October 5, 2010

The University of Manchester, Manchester, M13 9PL, U.K.
‡Université de Bordeaux 1, Talence Cedex 33405, France
†CEA-Cadarache, DEN/DER/SPRC/LEPh, France
*Institut Laue-Langevin, 6 rue Jules Horowitz, 38042 Grenoble Cedex, France

Fission-fragment spectroscopy is now a well-established methodology for the study of neutron-rich medium mass nuclei in the regions of the chart around $A \sim 100$ and $A \sim 140$. Techniques have been developed that allow measurements of the energies, spins and parities of excited states as well as electromagnetic properties, such as g-factors and quadrupole moments (as deduced from lifetime measurements). In order to go further in these areas it has become desirable to construct a clean and efficient trigger for spectroscopy that works by direct detection of the fission fragments. The SpecTrometer for Exotic Fission Fragments (STEFF) has been recently commissioned at the University of Manchester with a ^{252}Cf source. The device consists of two time-of-flight arms each terminated by a Bragg detector in which the fission-fragments stop. The time-of-flight measurements are made between two types of secondary-electron detectors, one using channel plates, and a large area gas detector. There has been considerable effort put into improving the time resolution of the large-area STOP detectors both in terms of detector configuration and in terms of the use of fast preamplifiers within the gas volume. Currently, the neutron and gamma decay of excited fission fragments is measured using and array of NaI and NE213 scintillators. At the start of 2011 STEFF will be moved to the ILL, Grenoble where it will be used to study thermal neutron-induced fission. The latest data, and prospects for measurements at the ILL, both in terms of pure and applied physics will be discussed.