



No. 01

k0-IPEN: a new software for Instrumental Neutron Activation Analysis

Mauro da Silva Dias^{*}, Renato Semmler, Marina Fallone Koskinas, Denise Simões Moreira, Ione Makiko Yamazaki, Franco Brancaccio, Lívia Fernandes Barros, Rafael Vanhoz Ribeiro and Thales Salvador Lima de Moraes

Instituto de Pesquisas Energéticas e Nucleares (IPEN-CNEN/SP), Research Reactor Center (CERPq), Av. Prof. Lineu Prestes, 2242, São Paulo, SP, Brazil

*Corresponding author: msdias@ipen.br

Abstract

A new software package for INAA, developed at the Nuclear Metrology Laboratory (LMN) of the Nuclear and Energy Research Institute (IPEN-CNEN/SP), called k0-IPEN, is described. The package consists of a main program linked to nine subprograms designed to perform automatically all the tasks necessary in order to obtain the mass fractions of the irradiated samples. The goals of these nine routines are: a) to calculate the experimental peak efficiencies and P/T ratios for the standard sources, together with all the corresponding uncertainties; b) to correct the peak efficiencies for coincidence summing; c) to fit the peak efficiencies and P/T ratios with log-log polynomial functions; d) to determine experimentally the α and f parameters by the Triple Bare and by the Cd Ratio Multimonitor Methods; e) to correct for interferences; f) to determine the average mass fractions, taking into account the correlations among all partial uncertainties involved. In the present version, the only data that must be inserted as input parameter, externally from the package, are the self-shielding correction factor, which is calculated by the MATSSF code, and the geometry factor that corrects for the difference between sizes of standard sources and measured samples. The code can deal with different spectrum formats such as CHN, SPE and CNF. The routine designed to calculate the peak areas has a simple algorithm and is not yet capable of separating multiplets. Therefore, it is suitable for analysing separated peaks, such as those found in standard calibration source measurements. However, for complex spectra, the code can read peak list files obtained from other codes, such as HyperMet or HyperLab. External efficiency curves calculated by the Monte Carlo code MCNP6 can be read to extend the calibration curve to regions where there are only a few experimental points available. The code k0-IPEN is being tested and its validation accomplished by means of an intercomparison sponsored by the IAEA, and presented at this conference.