MATHEMATICAL SIMULATION TECHNIQUE FOR THE EFFICIENCY CALIBRATION OF HPGe DETECTOR FOR SAMPLES MEASUREMENTS CONTAINING COAL AND RESIN

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Body of Abstract: One of the most important aspects to the development of the nuclear technology is the safe management of the radioactive waste produced in some stages of the nuclear fuel cycle, as well as the production and use of radioisotopes in medicine, industry and research centers. These radioactive waste must follow the acceptance criteria for its final disposal. To reach the final form for disposal these radioactive waste need to be characterized and to be dealt. The Waste Management Department of the Nuclear Energy Research Institute (IPEN), Brazil, has a waste characterization system, consisting of a High Pure Germanium (HPGe) detector from Canberra and associated electronics, a system for sample positioning and a microcomputer with a commercial software for data analysis. The accurate characterization of these radioactive waste is not a simple task, because of the diversity in its isotope composition and mass density. The mainly difficulty is the attainment of the HPGe detector counting efficiency. For specific geometries the preparation of calibration standard sources is impracticable. This kind of problems are generally solved through mathematical modeling in order to simulate the radiation sources, their geometric distribution and the photon transport and interaction in the way of interest. The Monte Carlo Method is, by far, one of the most used techniques to this kind of study. In this work was calculated the efficiency counting for the HPGe detector of the Characterization Laboratory of IPEN, using the Monte Carlo code MCNP-4C for samples measurements which contain coal or resin from the primary circuit of the IPEN research reactor. The mainly objective is the implementation of a methodology to the characterization of this kind of radioactive waste through the simulation of the detector efficiency calibration.