fornecidos a um número grande de usuários. Uma desvantagem deste método é o fato de não representar a radiação de fundo de cada pastilha TLD, que pode variar significativamente de uma para outra, e, portanto, aumentar a incerteza do valor da dose atribuída. O outro método de análise utilizado consiste na utilização de programas de análise das curvas de luminescência desses materiais. Este processo apesar de ser mais lento poderia melhorar o desempenho do sistema dosimétrico. No presente trabalho os dois métodos mencionados foram comparados para uma série de testes de desempenho a que os dosímetros foram submetidos de modo a caracterizá-los para emprego na rotina de um laboratório de dosimetria. Os testes realizados incluíram, entre outros, a determinação da reprodutibilidade da resposta, limites de detectabilidade, inferior e superior, dependência energética e angular, etc. Os resultados obtidos indicam os pontos em que uma análise computacional mais rigorosa pode melhorar o desempenho de um sistema dosimétrico deste tipo.

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RESPONSE FUNCTION OF PHOTON DETECTORS FROM 10 keV UP TO A FEW MeV

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The precise knowledge of the response function of ionizing radiation detectors finds use in many areas of research and routine work, at various energy ranges.The production of a reliable response function may follow a mixed path, where physics is used where convenient, but empirical relations may sometimes substitute cumbersome expressions and integrals, for the sake of reducing the computation times. This work is an extension of a previous one, for lower photon energies (up to 120 keV)[1], where the authors have described the response function of a planar Ge x ray detector. This work provides a response for various types and sizes of Ge detectors and a couple of simple detection geometries.

We have measured the spectra of several calibration sources, ^{56}Co, ^{60}Co, ^{109}Cd, ^{133}Ba, ^{137}Cs, ^{152}Eu, and ^{163}Ho. The detectors used were two coaxial Ge gamma-ray detectors of 45- and 89-cm^3 active volume, two planar Ge x-ray detectors of 8- and 5-cm^3 active volume and a planar Si(Li) detector. Three source-to-detector distances were used, their values depending on the detector type, and the measurements were done for two shielding conditions: no shielding and a 10-cm thick iron shield. The integration constants of the spectroscopy amplifier were also let vary, three values being used: 2, 3 and 6 μs. The response function designed has various important features described: photoelectric effect; Compton effect, single and multiple; scattering in the neighborhood (backscattering); Ge-x ray-, single- and double-escape peaks; incomplete charge collection effects and Compton effect of the escaping annihilation photon(s). These effects are described following the path of the previous work, with a few improvements, *e.g.* the multiple Compton effect is described up to three interactions, and their shapes as a function of the energy, originally given in integral form [2], are exactly solved, producing an analytical expression.

[1] J.Y.Zevallos-Chávez *et al.*, accepted for publication in Nucl. Instr. and Meth., 2000.
[2] C. Lee Myung *et al.*, Nucl. Instr. and Meth. A 262 (1987) 430.

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Data Acquisition System for Resistive Detectors

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Gaseous detectors that use high resistivity materials as electrodes have been studied with significant progress in the last decades as well succeeded resistive plate chambers (RPC) and Microgap Gaseous Chambers. The greatest interest for this kind of detectors is the fact that they allow the use of high tensions without the risk of disruptive discharges, producing excelent temporal and spatial resolutions and the possibility of construction, at low cost, of large detection areas with relative facility of use. With this characteristics, these counters are useful in many high energy physics applications, namely for being indicated in the detection of muons in accelerators such as the future LHC (Large Hadron Collider) at the CERN. Nevertheless, the importance of various parameters in the behavior of these detectors, such as the resistivity, the dielectric constant, the thickness of the parallel plates used and the still undefined operational limits is yet to be understood, being of great interest the fundamental processes involved.

This project is divided in three parts: The study of the phenomena occurring during in the detection process, the development of a data acquisition system and the measurements of the transient behavior resistive cathode detectors. This contribution is focused in the second part. The acquisition system consists of a analogic-digital converter (ADC) wired to a microcomputer through a AT-DIO I/O board. The pulses coming from the detector are converted by the ADC and generate hardware interrupts in the computer which are later read by software. The system generates, during data acquisition, a series of two-dimensional values relative to the data itself and its respective acquisition time. From this register, it's possible to create histograms of a specific time period and two-dimensional graphics to study the peak shift. We have then two kinds of variables: The energy that is converted in digital pulses by the ADC and the time that is obtained from the computer's cycle counter with sufficient precision. On top of this data is possible to make a qualitative analisys of the detector's behavior, observing the peak stride with the flow of time. Two detectors are used in the study. One with metallic cathode and other one with resistive cathode. Both are in the classical cylindrical geometry, with the same size and operate in the same experimental conditions (high tension, gas flow, gas mixture, etc.). Results with 22 keV X-rays from a ^{109}Cd source are used for the test of the data acquisition system will be present. The metallic cathode detector is used to compare the results since its response is well known. It is intended in future to improve the system using a I/O board with a ADC inside the computer. The large scale goal is to have a data acquisition and analysis package to deal with data from resistive cathode detectors.

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Development of a Plastic Scintillator Annular Detector

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A method for measuring stopping power of heavy ions using γ–ray techniques was developed in the Pelletron laboratory many years ago[1]. The method has renewed interest in view of the recent DSAM lifetime and transient field g–factor measurements, which depend on stopping power knowledge to determine the absolute time scale. In this method the ion velocity, after recoil in a thin metallic foil, is measured by the Doppler shifted energy of the γ–ray emitted during the flight in vacuum. The nuclear states are populated by Coulomb excitation using projectiles such as ^{16}O, ^{28}Si and ^{35}Cl. To select the ions recoiling towards the 0° direction coincidence of the γ–rays with the backscattered particles is required. The Si detectors used in these experiments when submitted to a high particle flux ($> 10^3$/s) are damaged after a short period. Due to this fact, the γ–spectroscopy group of the Pelletron Laboratory is developing a plastic scintillator annular detector for use in association with Compton suppressed germanium detectors [2)].

Two protoypes were constructed and tested using 5.4 MeV α particles. The resolution was about 40% but the results indicated the need to construct a thinner detector to reduce the sensitivity to γ rays. The third prototype constructed consists of a 2mm thick plastic scintillator BC444 with 264 *ns* decay time with a diameter of 2.5 cm and a 3 mm internal hole where a tantalum collimator was mounted. A fourth detector was constructed with the same characteristics, but it consists of a 2 mm thick plastic scintillator manufactured at IPEN, with 2 *ns* time decay. The detectors are connected with a long necked light pipe to a photomultiplier tube. An aluminum layer of about 30 μg/cm^2 was evaporated to prevent light losses at the surface of the detector and in the light pipe. The effective detector area is defined by an aluminum mask mounted in front of it. The detectors were tested with α particles of 5.4 MeV and a 40 MeV ^{16}O beam. The energy resolution was about 20% with good time characteristics.

[1] R.V. Ribas, W.A. Seale, W.M. Roney Jr., and E.M. Szanto, *Phys. Rev.* **A21** (1980) 1173.
[2] K.T. Wiedemann et al., *Nucl. Phys. Dep. Annual Rep.* - IFUSP (1999) 64 and references therein.