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Plastic Scintillator Detection Efficiency for Beta and Gamma Radiations in Function of the Detector Thickness

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Beta detection systems have been developed and tested in several laboratories for application in environmental measures, for which it is necessary low background radiation. The combination of beta and gamma radiation detectors have been used in coincidence systems, having as a goal applications where low level of background radiation are necessary. Plastic scintillators detectors are used in systems of measurements, coupled to other detectors types, or assemblies with detectors of different thicknesses. The plastic scintillators detectors present the advantage of being mechanically resistant, not hygroscope and obtainable in several dimensions. This allows to make detection of different thicknesses and to evaluate their response in the radiation detection. The plastic detector used, in this work, is of the type NE-110. Since the organic elements of this detector contain basically Hydrogen and Carbon, which possess low atomic number, in the interaction with the gamma radiation the Compton effect prevails. Consequently, it presents low energetic resolution. Previous papers report the luminous attenuation in plastic scintillator detectors in function of their thickness, demonstrating that the attenuation can decrease the detection efficiency. In this work, the efficiencies for the detection of beta and gamma radiations were determined in function of the plastic detector thickness. The objective of this work is to determine: (1) the optimized thickness for beta radiation detection with low interference of the gamma radiation (background), and (2)) the optimized thickness for gamma radiation detection. Those responses will be used in the assembly of a coincidence system for beta detection with low background radiation.