

## Determination of Full Energy Peak Efficiency and Resolution of Nai (Tl) Detector Using Gamma-ray Spectroscopy

**Authors :** Jibon Sharma, Alakjyoti Patowary, Moirangthem Nara Singh

**Abstract :** In experimental research it is very much essential to obtain the quality control of the system used for the experiment. NaI (Tl) scintillation detector is the most commonly used in radiation and medical physics for measurement of the gamma ray activity of various samples. In addition, the scintillation detector has a lot of applications in the elemental analysis of various compounds, alloys using activation analysis. In each application for quantitative analysis, it is very much essential to know the detection efficiency and resolution for different gamma energies. In this work, the energy dependence of efficiency and resolution of NaI (Tl) detector using gamma-ray spectroscopy are investigated. Different photon energies of 356.01 keV, 511 keV, 661.60 keV, 1170 keV, 1274.53 keV and 1330 keV are obtained from four radioactive sources ( $^{133}\text{Ba}$ ,  $^{22}\text{Na}$ ,  $^{137}\text{Cs}$  and  $^{60}\text{Co}$ ) used in these studies. Values of full energy peak efficiencies of these gamma energies are found to be respectively 58.46%, 10.15%, 14.39%, 1.4%, 3.27% and 1.31%. The values of percent resolution for above different gamma ray energies are found to be 11.27%, 7.27%, 6.38%, 5.17%, 4.86% and 4.74% respectively. It was found that the efficiency of the detector exponentially decreases with energy and the resolution of the detector is directly proportional to the energy of gamma-ray.

**Keywords :** NaI (Tl) gamma-ray spectrometer, resolution, full energy peak efficiency, radioactive sources

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