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A comparison of analysis methods of gamma-ray spectra obtained with a LaBr₃ scintillation detector

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The goal of any measurement and data-analysis technique should always be to minimize uncertainties, whether it is statistical or systematic. Although uncertainties are unavoidable, one can find ways to reduce them depending on the circumstances. High-precision measurements play a crucial role in constraining various quantities.

Recently a new inorganic scintillation detector has become available in large cylindrical sizes (e.g. 7.6 cm in diameter and with length over 15 cm). It consists of LaBr₃ and has an energy resolution which is not as good as HPGe, but superior to the energy resolution of NaI and CsI, and does not need to be cooled to LN₂ temperatures. Since La has a naturally radioactive isotope, ¹³⁸La, which emits γ -rays, the detector has an internal calibration source for energy and dead-time corrections. Moreover it produces pulses with fast rise time, which allows setting up the electronics such that measurements can be made with a high count rate and a low dead time. Gamma-ray spectra were collected with a 3"×3" LaBr₃ detector for LaBr₃ intrinsic background, ²²Na and ¹³⁷Cs which exhibit some gain drifts. A set of off-line analysis methods of these spectra is presented to select the procedure that yields the optimal precision and accuracy.

Level (Hons, MSc, PhD, other)?

PhD

Consider for a student award (Yes / No)?

Yes

**Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?**

No

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