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

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<p>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 <br> submit a short paper <br> for the Conference
 Proceedings (Yes / No)?

No

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