# Scintillators with high-energy-resolution and low-intrinsic-activity

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Lanthanum halides scintillators, namely $LaBr_3$ and $LaCl_3$, have superior scintillation properties and provide the best energy resolution for gamma-ray detection. However, the presence of natural isotope $^{138}La$ generates an intrinsic activity, well above 1 Bq/cm$^3$, which represents a major shortcoming for their application in low count rate experiments. Among other applications, for space applications it is desired the development of low intrinsic activity scintillators which also maintain the spectroscopic performances of $LaBr_3$, in terms of energy resolution and detection efficiency. At now two scintillators have been developed by our collaboration with capabilities to fulfill this requirement: $CeBr_3$ and $SrI_2$.

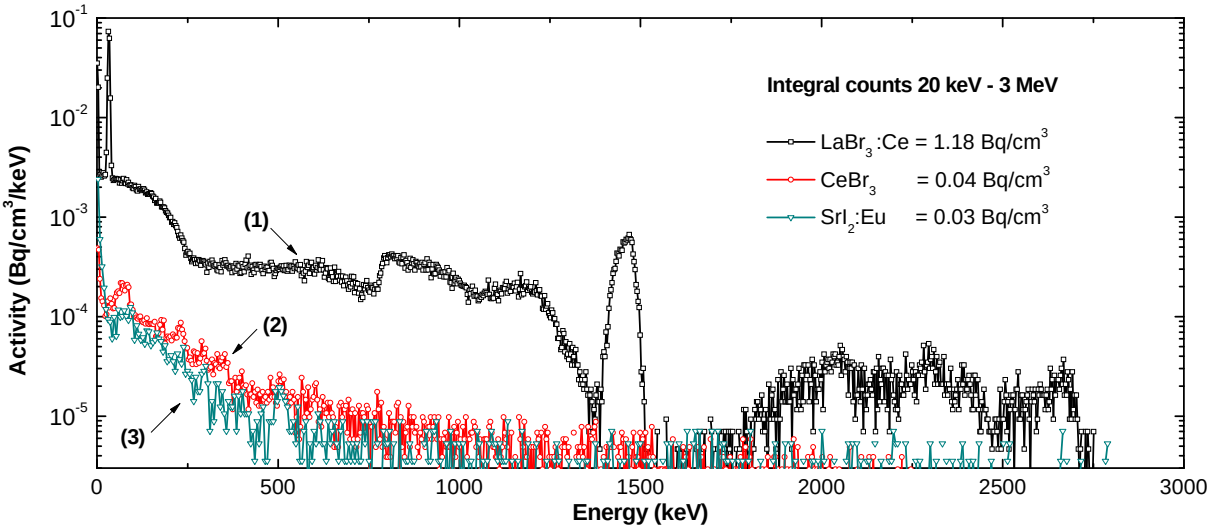


Fig. 1. Comparison of intrinsic activity pulse high spectra collected with $LaBr_3$:Ce (1), $CeBr_3$ (2) and $SrI_2$:Eu (3).

In this communication we briefly summarize the origin of $LaBr_3$ intrinsic activity and quantify the limitation it might pose. Then, we show the results we have already obtained with $CeBr_3$ and $SrI_2$. Nowadays $CeBr_3$ is available in size of 2″×2″ and larger and does not present any detectable intrinsic activity, neither at level of contaminants. Energy resolution achieved so far is less than 4% at 662 keV and its fundamental limit currently under investigation. At the energy of 1.4 MeV, used for the detection of $^{40}K$, which is of interest for gamma-ray remote sensing of planetary surfaces, a $CeBr_3$ spectrometer is about 8 times more sensitive than $LaBr_3$.

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