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Simulating cosmic muons in the Crystal Ball - energy calibration possibilities

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Cosmic muons offer good possibilities to calibrate various detectors in the LAND-setup. Moreover, using them does neither require time for calibration runs, nor sources, as data can simply be collected off-spill during measurements. With their help the LAND detector timing offset is already calibrated. Using cosmic muons to calibrate the proton branch of the Crystal Ball is possible as shown by Ref. [1] and [2] and the only reliable opportunity. Muons will be more crucial for detector calibration of R3B. Simulations allow to understand the interactions between detectors and muons.
But as the muon intensity distribution is nontrivial, depending both on energy and incidence angle, it is necessary to extend the proof of principle simulation [2] to a simulation taking the intensity distribution and the location of the single crystals in the Crystal Ball into account.
With the parametrization of the differential muon flux (depending on energy and incidence angle) given by J. Kempa, this simulation is being realized in the framework of GEANT3 / 4. After successful development the simulation can be used for other detectors.
Different muon events correspond to different deposited energies. Applying cuts to single out certain events allows to extract different energy deposits. The necessity of a full-scale simulation of the Crystal Ball and the muon (intensity) spectrum will be illustrated and the present progress presented.

[1] Felix Wamers: Quasi-free Knockout Reactions with the Proton-dripline
Nucleus 17Ne. PhD thesis, TU Darmstadt, 2011.
[2] Rene Reifarth. Re: opposite Simulation. Personal Communication. 12.08.2010.

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