Poster session 4 - Friday 8 July

P4.037 Background simulations for the ECHo experiment

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The determination of the absolute neutrino mass m_ν is still an open question in particle physics. The ECHo experiment is going to explore the endpoint of the ^{163}Ho electron capture spectrum which offers great potential to reach sub-eV sensitivity on $m_{\nu e}$. In order to achieve this sensitivity goal, the low energy background contributions to the signal have to be understood and reduced as much as possible. Apart from an indiscriminable pile-up of ^{163}Ho decays, radioactive contaminations in the detectors and the surrounding structures contribute to the background of the experiment. In this presentation we focus on the background contributions of ^{166m}Ho which could be coimplanted with ^{163}Ho into the detector and of the two ubiquitous radioactive contaminants ^{210}Pb and ^{40}K. Assuming their presence on the surfaces close the detector, we have investigated their rate and spectra in the ECHo detectors with Monte-Carlo simulations in the GEANT4 framework. Since the background analysis of the ECHo experiment provides quite special demands on the treatment of the low energy physics in GEANT4, the implementation of these processes must be checked. In particular, atomic shell deexcitations like X-ray emission and Auger electrons must yield the correct branching ratios and energies at least up to the M and N shells. Decay products like electrons and X-rays must be treated as dynamical particles to allow further low energy excitations in the detectors and their surrounding setup. Furthermore, the correct treatment of the decay from the excited metastable isotope of $_{166m}$Ho must be established. While these software requirements have been implemented, experimental test setups of dedicated benchmark measurements are going to be used to determine the validity of the simulations for the ECHo experiment.