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CONRAD –A low level germanium test detector for the CONUS experiment

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We describe the development and construction of the high-purity germanium detector setup CONRAD (CONus RADiation) to characterize and monitor background radiation over a wide energy range.
The CONUS experiment is measuring coherent scattering of reactor anti neutrinos on Ge nuclei at the nuclear power plant at Brokdorf, Germany. CONRAD has been used for background studies inside the CONUS shield during the commissioning phase of the experiment at the underground laboratory of the Max-Planck-Institut für Kernphysik. It resulted in a total (40-2700 keV) background count rate of (350±2) $d^{-1}kg^{-1}$. The CONUS shield is adapted to the shallow depth location of the experiment and in the talk it will be shown how this low count rate in combination with CONRAD was achieved.
In its cryostat, the high-purity Ge crystal of 1.9 kg active mass was originally cooled with liquid nitrogen and was upgraded to an electric cryo-cooling system. This enabled to operate CONRAD also at the CONUS experimental site at distance of about 17m from the reactor core of the commercial nuclear power plant. The conversion succeeded without any deterioration either in spectral nor in background quality of CONRAD. The large diode makes the detector especially suitable to study the unshielded background at site and to validate Monte Carlo simulations of gamma radiation and neutron fluence measurements. These measurements along with further application of CONRAD for background studies will be discussed in the talk.

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