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Corrections to Signal Saturation in DEAP-3600

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An analysis algorithm is being developed for the DEAP-3600 dark matter search in order to correct the effects of signal saturation on key observables in the experiment. High energy events, such as alpha decays and some gamma decays, can produce enough scintillation photons to saturate the electronics in the signal-digitization stage. For this reason, a second channel of digitizers operated at lower gain is used for preserving the quality of data. The key feature of this analysis algorithm is a deconvolution on the low-gain readout channels for high energy events. By comparing low-gain channel signals, after deconvolution, with high-gain channel signals, the effect of saturation can be corrected. Once fully implemented into the data acquisition stream, this analysis tool will enable us to fully characterize the linearity of the detector energy response across the full energy spectrum.

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