

Systematic Sources of Uncertainty in NaI(Tl) Dark Matter Detectors

Despite over a decade of exploring everything from detector systematics to exotic dark matter models, there has yet to be a satisfactory explanation of the DAMA results. Construction is currently underway for an experiment that will be able to determine whether an environmental or operational parameter could be responsible for DAMA's signal. This experiment features a total of 32 three-inch NaI(Tl) detectors in 4 separate locations to monitor the radioactive decay of various isotopes, including ^{40}K . The experiment will feature comprehensive monitoring of environmental and operating conditions and an advanced data acquisition, which will allow for event-by-event analysis and correlation studies. Together with an artificial pulser, this allows a measurement of the absolute rate of each isotope, as opposed to the traditional method of measuring the activity relative to a reference source. We expect that this approach will allow us to accurately determine the impact of various environmental parameters to the apparent decay rate in order to determine the source of DAMA's variations, as well as potential pitfalls to other dark matter experiments.

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