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Determination of reponses of liquid xenon to low energy electron and nuclear recoils using a PandaX-II detector

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I'll present a systematic determination of the responses of PandaX-II, a dual phase xenon time projection chamber detector, to low energy recoils. The electron recoil (ER) and nuclear recoil (NR) responses are calibrated, respectively, with injected tritiated methane or ^{220}Rn source, and with ^{241}Am-Be neutron source, in an energy
range from 1-25 keV (ER) and 4-80 keV (NR), under the two drift fields, 400 and 317 V/cm. An empirical model is
used to fit the light yield and charge yield for both types of recoils. The best fit models can describe the calibration
data significantly. The systematic uncertainties of the fitted models are obtained via statistical comparison to the data.

Summary

We present an ER and NR responses from a PandaX-II detector based on calibration data from operation at two different drift fields (400 and 317 V/cm). The empirical best fits to the data and model uncertainties are obtained, indicating significant consistency between the
data and our models. In comparison to former PandaX-II results, the models in this work cover the entire PandaX-II data taking period, with a signficantly extended energy ranges from 4 to 80 keVnr(NR) and 1 to 25 keV (ER). At the two drift fields, our NR models are
consistent, and our ER models exhibit a relative shift.
Both behaviors are consistent with expectation.

Our models are also compared to some world data.
Our NR models lie in the large global spread. For the ER
response, our model yields a higher (lower) light yield(charge yield) in
comparison to most world data, indicating some unaccounted systematic uncertainties in our or other measurements. These discrepancies encourage continuous calibration effort and further investigations of systematics in the
data. Finally, the analysis approach presented herein is
generalized and can be applied to similar noble liquid TPC experiments.

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