

Calibrating the XENON10 Detector with Activated Xenon

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(for the XENON Collaboration)

APS 2007

Energy Calibration: determine the energy of nuclear recoils

energy of nuclear recoils (NRs)

measured signal in # of pe

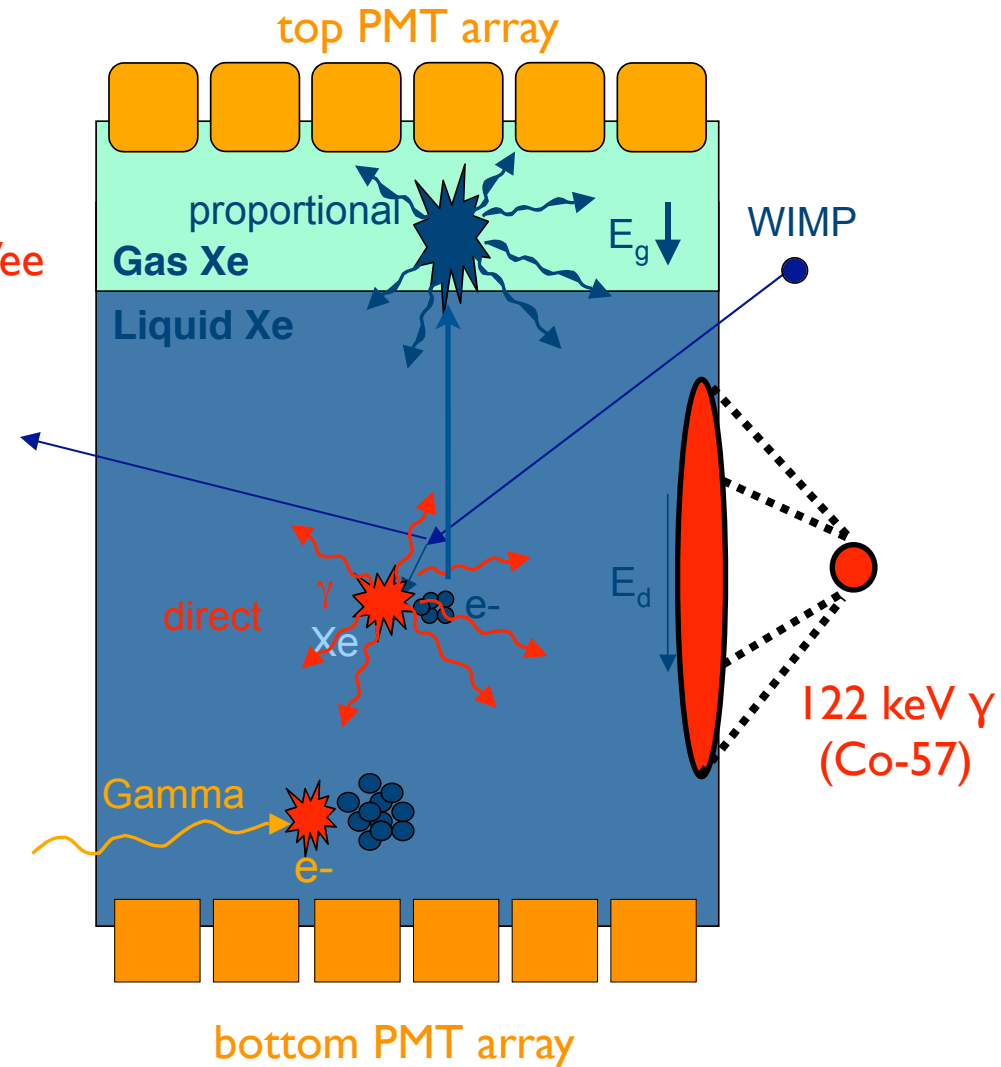
light yield for 122 keV γ in pe/keVee

$$E_{nr} = S1 / L_y / \mathcal{L}_{eff} \cdot S_{er} / S_{nr}$$

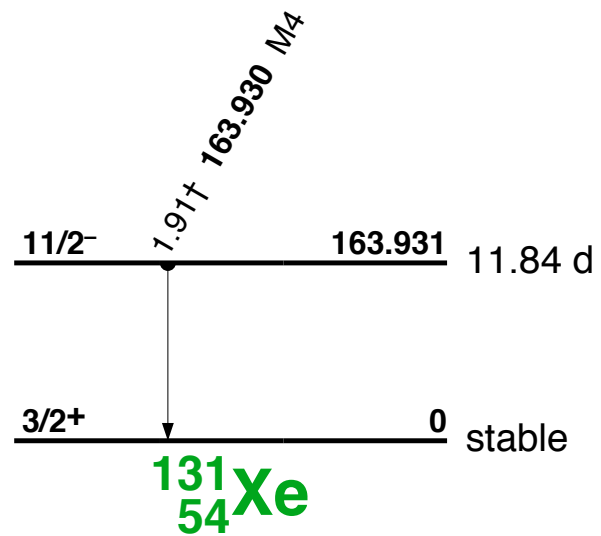
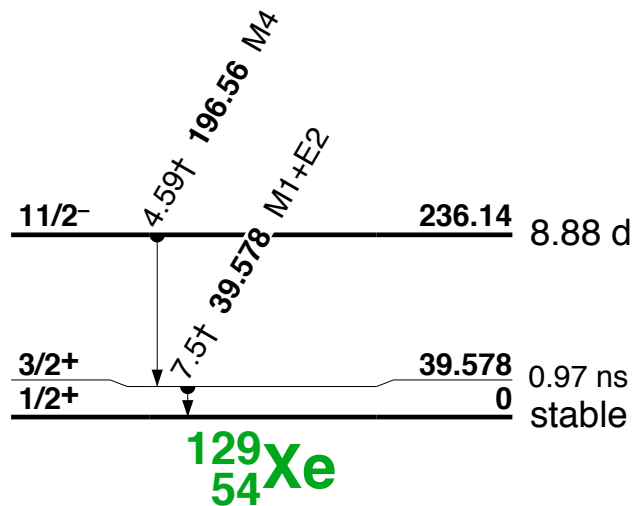
relative scintillation efficiency of NRs to 122 keV γ 's at zero field

quenching of scintillation yield for 122 keV γ 's due to drift field

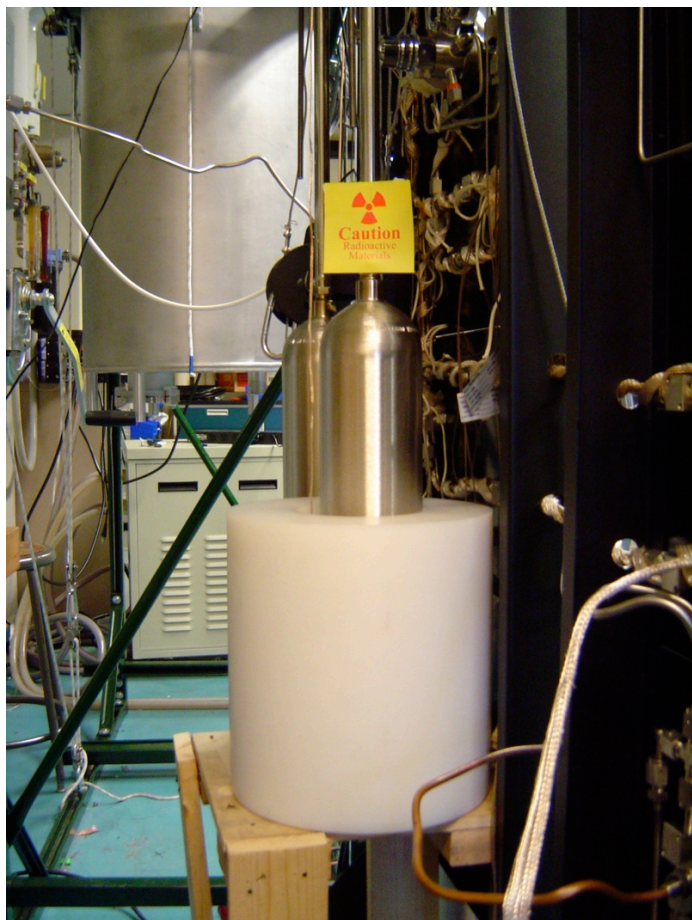
quenching of scintillation yield for NRs due to drift field



Gamma Lines from Activated Xenon

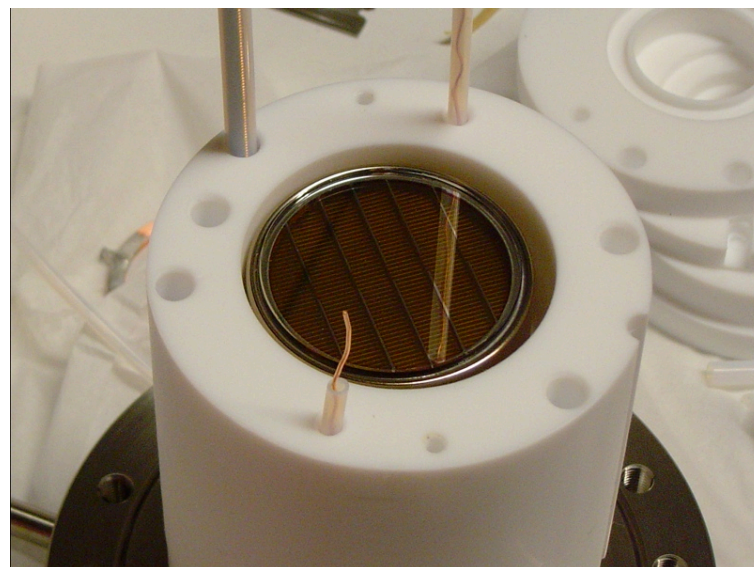


Xenon Activation with Cf-252 at Yale

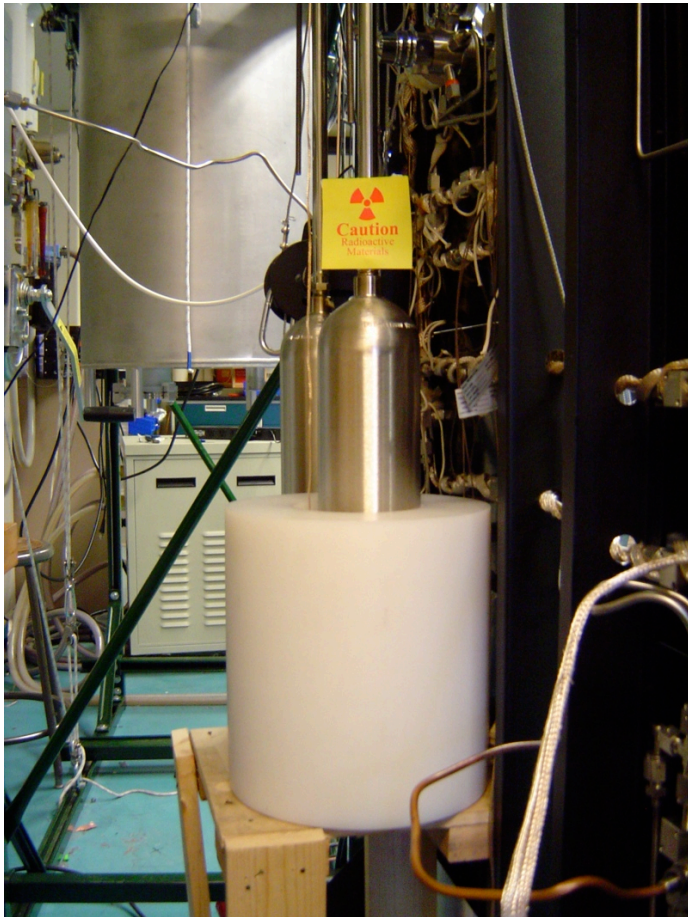


continuous activating Xe
gas with a 5×10^5 n/sec
Cf-252 source for 12 days

measure the scintillation light in
a liquid Xenon cell

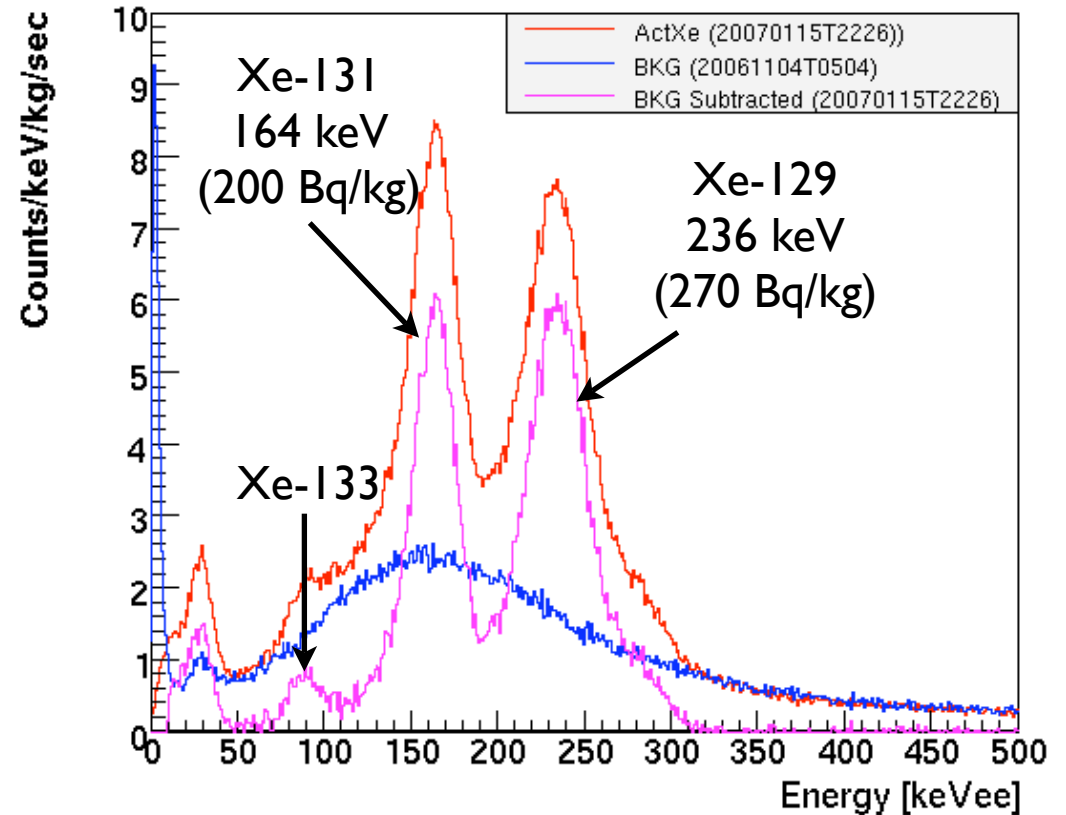


Xenon Activation with Cf-252

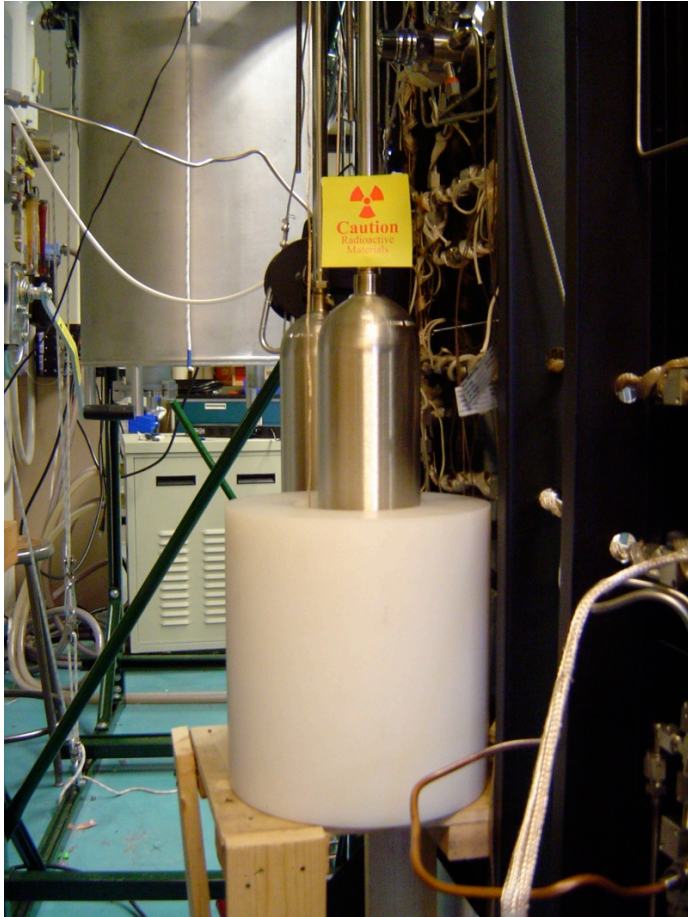


continuous activating Xe
gas with a 5×10^5 n/sec
Cf-252 source for 12 days

after 12-days of activation ...



Xenon Activation with Cf-252



Yale (USA)

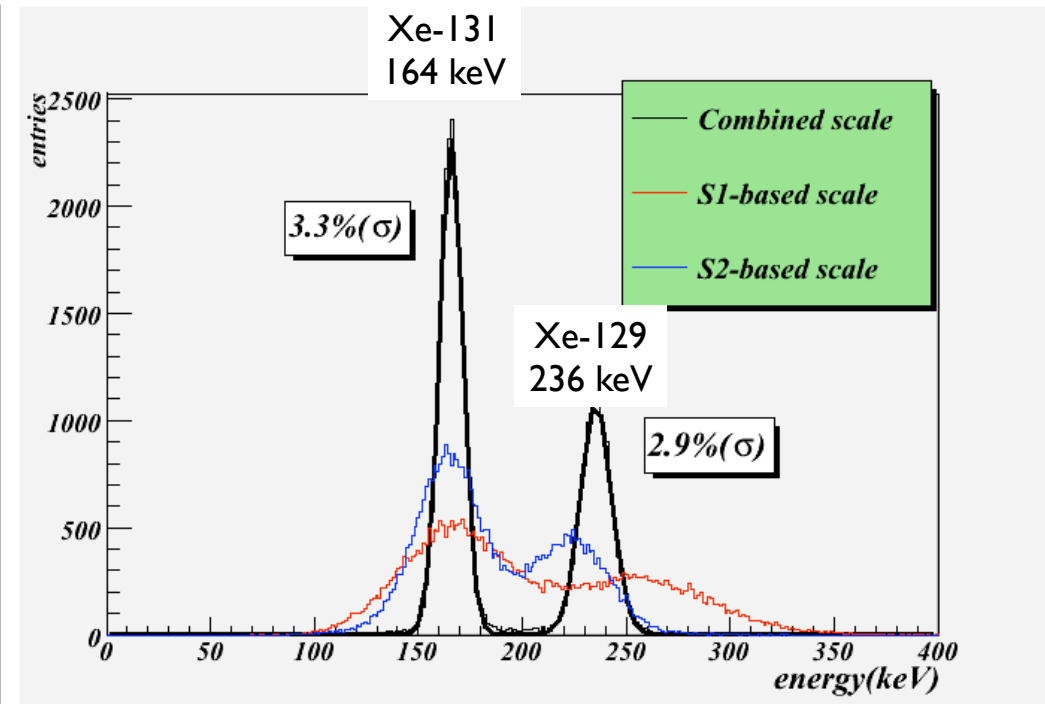
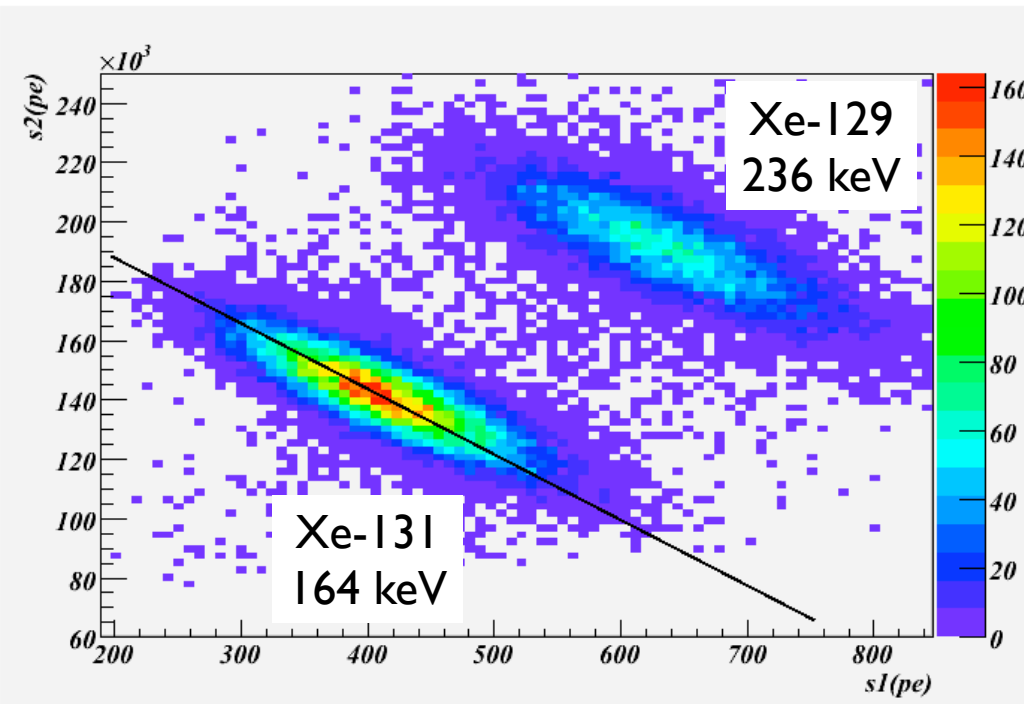


~ 1 week

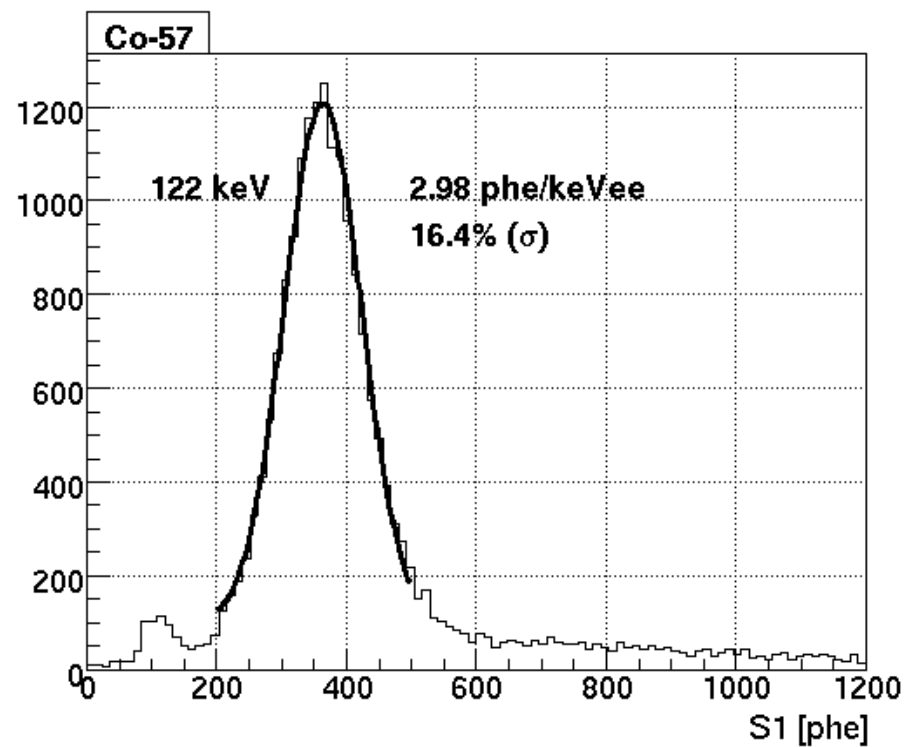
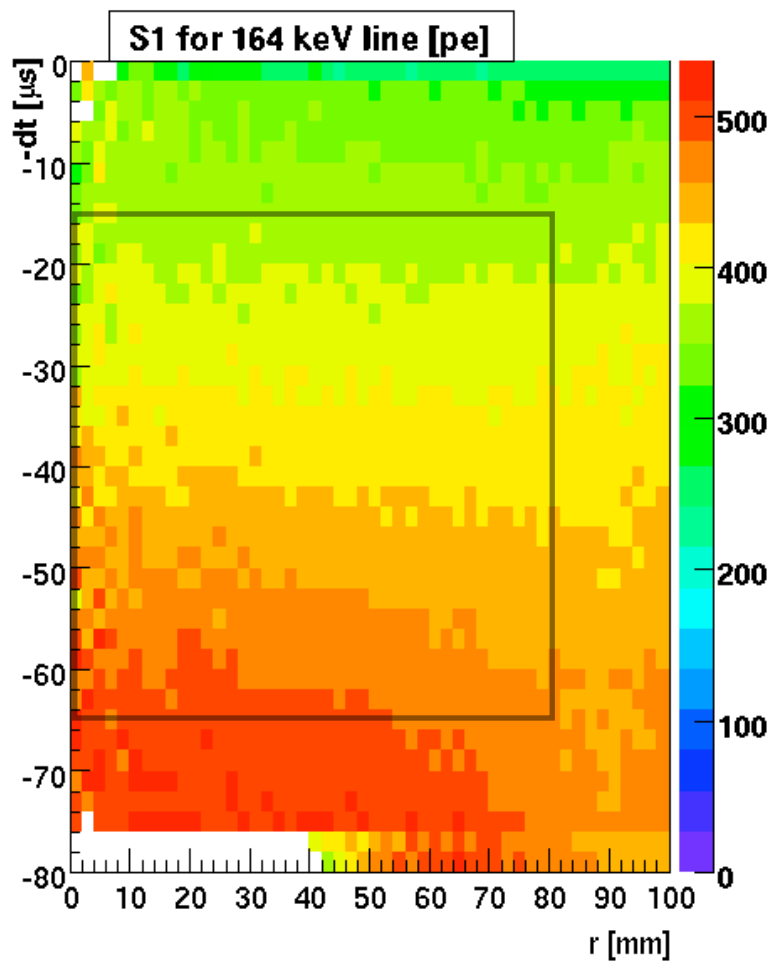


XENON10
Gran Sasso (Italy)

Activated Xenon Lines in XENON10

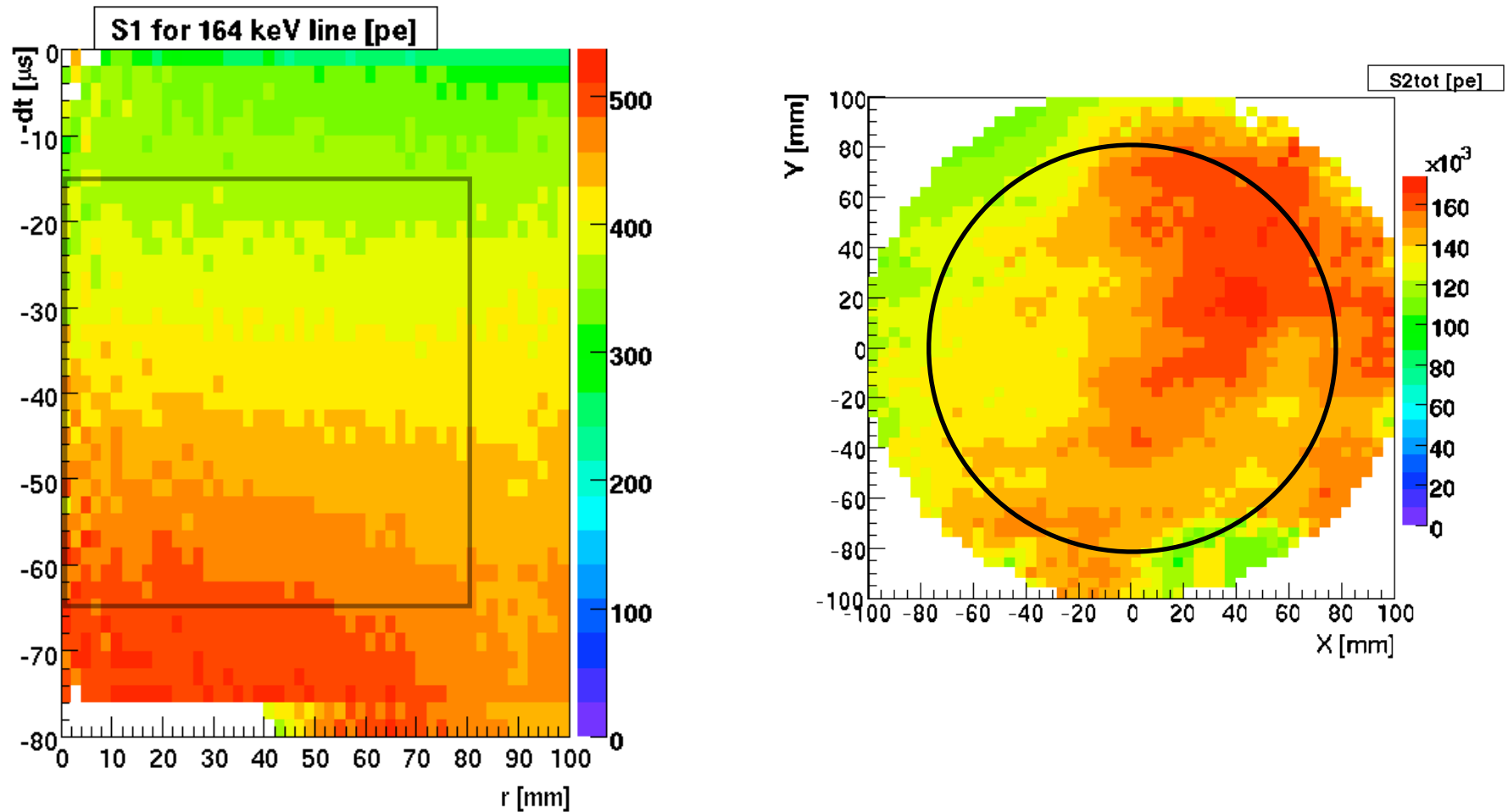


Position dependence of SI signals in XENON10



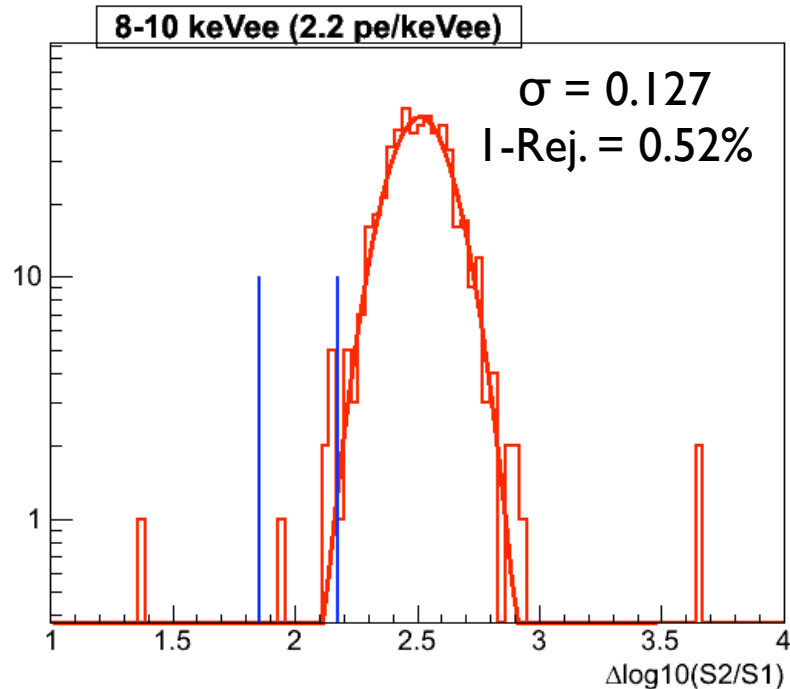
after position-dependent corrections

Position dependence of S1 and S2 signals

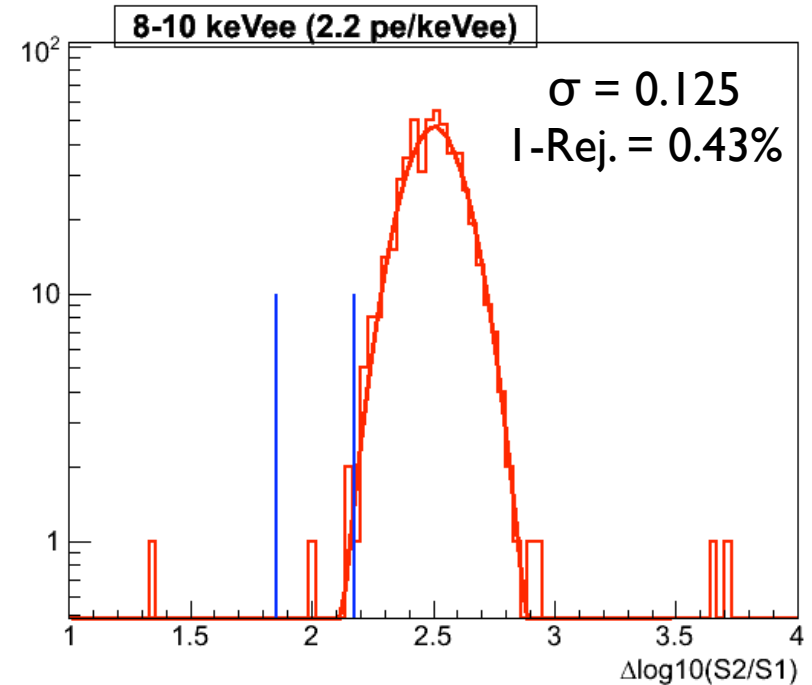


The XENON10 results are from position-dependent corrected signals by using these maps obtained from activated-Xe calibration

Improve the ER Background Rejection Efficiency



before position
dependence corrections



after position
dependence corrections