Thesis Outline

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1. Dark Matter Overview

1.1. Evidence
1.2. WIMPs
1.3. Experiments

2. LUX

2.1. About LUX... goals
2.2. Xenon dual phase TPC
2.3. S1/S2 Pulse areas, timing, XY reconstruction, Energy reconstruction, threshold
2.4. Run03 WIMP limit

3. Sampling

3.1. Introduction
3.2. Purity Requirements
3.3. Methodology
3.4. Purity Figure of Merit and Calibration
3.4.1. RGA Partial Pressure Measurement
3.4.2. Correcting for RGA Gain Drift
3.4.3. Correcting for Flow Rate
3.4.4. Gain and Flow Corrected Figure of Merit
3.4.5. O2 and H2 Figure of merit
3.5. Applications/Results of Gas Purity Analysis (in LUX)
3.5.1. Xenon Inventory Screening
3.5.2. Solubility of Impurities in LXe
3.5.3. 85Kr Monitoring, Ar Monitoring
3.5.4. N2,O2 and getter health monitoring
3.5.5. Gas Run results, Outgassing from Det. components

4. XYZ Corrections, Kr83 calibrations

4.1. Kr83 source, uniformity, drift velocity and electron attachment vs. field ?
4.2. timing separation vs. 9.4 and 32.1 keV LY and QY
4.3. calculating S1 XYZ and S2 XYZ corrections and applying them
4.4. improvement in resolution with XYZ corrections
4.5. trend plots, detector stability

5. Energy calibrations (MonoE sources) and Recombination

5.1. Recombination theory, counting quanta, intrinsic detector resolution, Fano
5.2. Doke plot, finding g1g2 with Xe-activation, Cs, Xray, Kr
5.3. Recombination, S1_stat,S2_stat and sigmaR vs. Energy for mono-E sources.
5.4. Fluctuations in number of exitons for Kr83 and Cs, Xe-act?

6. Tritium calibration. S2/S1 ER band, LY,QY, Recombination, NEST

6.1. Tritium Source, injection and removal, compare with natural methane

6.2. natural methane injection with kr83 data showing no change in LY, QY, lifetime

6.3. Uniformity, using tritium to calculate Run03 fiducial volume, vs Kr83

6.4. Run03 threshold using tritium

6.5. ER band calibration, ER/NR discrimination with DD data. Bin by bin. Band Gaussianity

7. ...maybe a new section. Dealing with a continuous energy source (extension of Ch 5)

7.1. Extending methodology of Section 5 to a continuous source

7.2. How to un-smear the tritium spectrum. Start with NEST

7.3. Extract Recombination, Fluctuations knowing g1,g2,S1_stat, S2_stat

7.4. Fano Factor from high stats tritium

7.5. The standard candle, Kr83 32.1 keV at Zero field

7.6. Tritium LY, QY, Re vs Compton scatter measurements

7.7. Apply same method to Cs137 data 150-662 keV

8. Conclusion, ER band overview

8.1. Patch Tritium + Cs + Dahl's data for ER band, recombination, fluctuations, LY, LQ

8.2. 180 vs 100 V/cm Tritium ER band and its fluctuation

8.3. Discussion on band mean, width and discrimination predictions at low energy