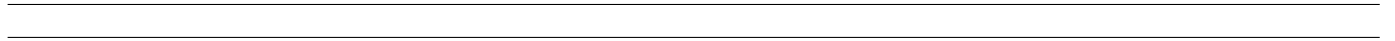


Thesis Outline

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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*