Analises & Simulations

A short list for users

IMAGES: Calibration of the data

- Energy and Z Regression down to 260 V
 - Extend the regression to lower energies
 - Take data with different energies induced by 59 keV Am X-rays on different targets
 - Take data at different x's and retrain regression
 - Improve the z regression and study the output on golden data
- Apply regression to bkg
 - Done for spot-like
 - Study the effect on applying it to sub-clusters at reconstruction level
- Cluster efficiency down to 260 V
- Apply Atmospheric pressure correction
 - Study correction pixel-level or offline
- 3D reconstruction with images only
 - Compare with PMT estimate

IMAGES: measurements

- Evaluate the proper event rate in R1 & R2
 - through cluster multiplicity in images
 - Estimate the DAQ & trigger dead time
- Energy distribution studies (with regressed energy):
 - Energy spectrum
 - dE/dx vs E
 - Study the origin for the three dE/dx bands
- ER-NR separation
 - Study the dE/dx with simulation and compare with data
 - Optimization of the separation
 - With simple variables from reconstructed cluster shapes (BDT, DNN, ...)
 - With full pixels information
 - Study on MC and validate on data need AmBe
- Analysis to extract DM signal
 - Model the bkg with MC / data
 - Model the signal with MC AmBe
 - Signal extraction with fit + limits (statistical analysis)



- Evaluate R-invariant light and study energy spectrum
- Tot (time over threshold) » z length distribution
- Effect of diffusion
- Evaluate the proper event rate in R1 & R2
- Measurements with reconstructed data:
 - E/tot vs E
 - ER-NR separation
 - Multiplicity spectrum
- Evaluate the proper event rate in R1 & R2
- Efficiency study (PMT vs images)

Combined

- Reconstruction of PMT signals using images inputs (for z estimate)
- From tot we can evaluate Δz . Then, at the first order we can imagine a linear distribution over z, therefore the min track length $L = \sqrt{\text{length}^2_{\text{CMOS}}} + \Delta z^2$
 - Spectrum of L
 - Spectrum of E/L
 - E/L vs L
- ER-NR separation 2.0
- Comparison of z reconstructed from images

Simulation

- Use NaI data to evaluate the rates of primary decays (U, Th, K) to cross check with the rates used for the current simulation;
- Cross check the attenuation factor evaluated with the simulation;
- Use Win23 reco version;
- 2D and 3D Event maps;
- Evaluate detection efficiency vs E, x, y and z
- Produce distributions of: E, length, angles
- dE/dx vs E(2D, z, 3D)

PMT Simulation

- Add the electron arrival time info to the digitisation
- Produce PMT waveforms
- PMT Efficiency
- Trigger Efficiency

Data-MC comparison

Energy spectra

Cluster shape

Event map

Sensitivity to NR and ER with simulated signal on real background