DArT data structure and analysis

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Summary of data taking

- Several runs with DArT in LAr. November-December.
- Longer data taking 3 days (December).
- Trigger coincidence both PDMs. Rate ~ 150 Hz
- Data with ^{22}Na source and LED (January).
- Data stored in local lab computer.
- Raw data → binary files (1 file per PDM each 2×10^5 events) → 764 Mb
- Processed data → root file (1 each 2×10^5 events) → 20 Mb

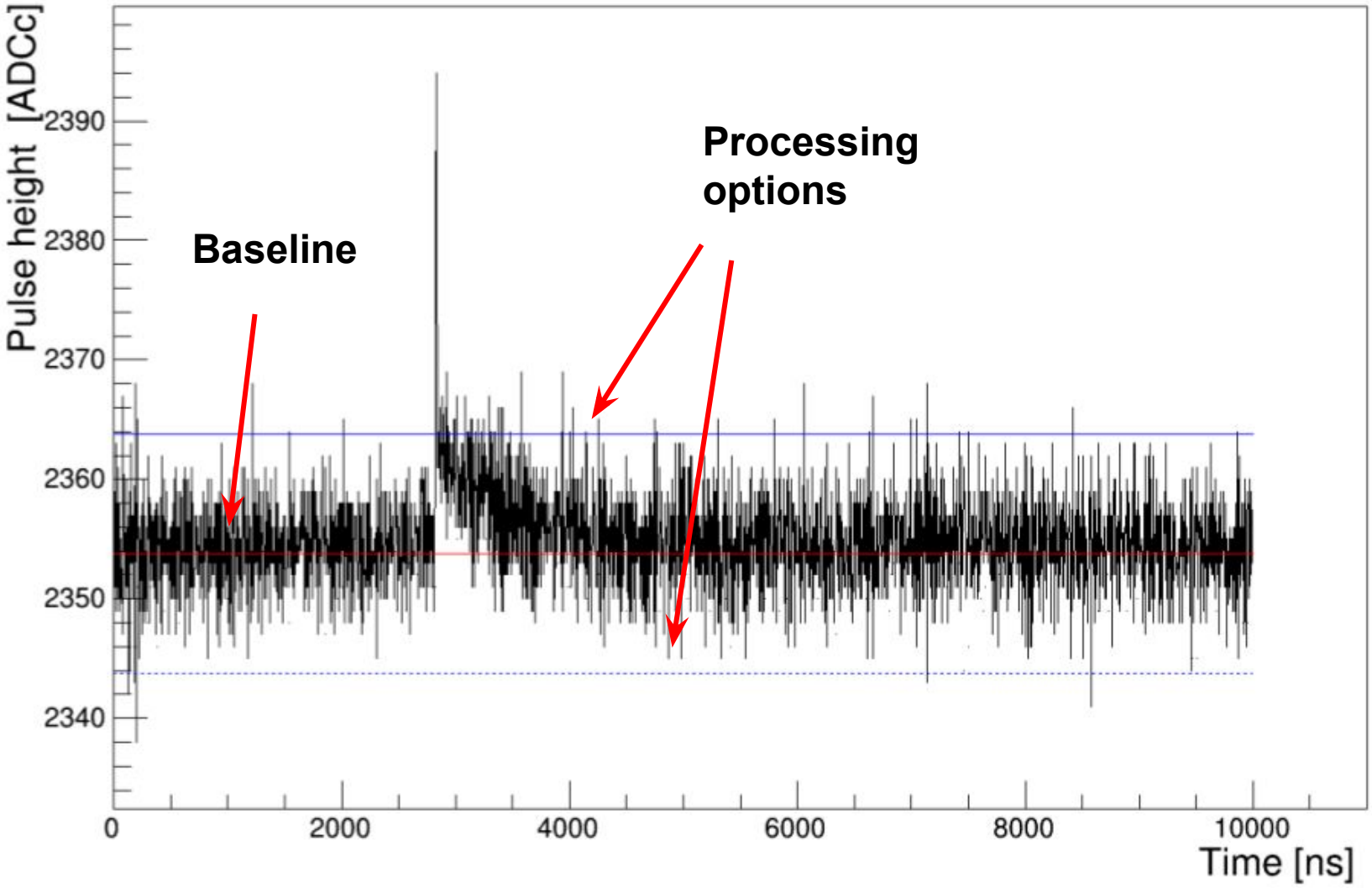
Processing variables

```
  strvar.append("Variables in the tree in this vesrion:\n");
strvar.append("Baseline ntuplas :\n");
strvar.append("  bsl    -> baseline values of the first ba samples  [rawadc counts]\n");
strvar.append("  brms   -> baseline rms of the first ba samples     [adc cts]\n");
strvar.append("  bmax   -> max pulse height of the first ba samples [adc cts]\n");
strvar.append("  bimax  -> integral around max pulse height of the first ba samples [adc cts]\n");
strvar.append("  bmaxp  -> max pulse height of the first ba samples [sample ]\n");
strvar.append("  bslb   -> baseline values of the last bb samples   [rawadc counts]\n");
strvar.append("  brmsb  -> baseline rms of the last bb samples      [adc cts]\n");
strvar.append("  bmaxb  -> max pulse height of the last bb samples  [adc cts]\n");
strvar.append("Event ntuplas    :\n");
strvar.append("  maxadc -> maximum pulse height   after maxst      [adc cts]\n");
strvar.append("  minadc -> minimum pulse height   after maxst      [adc cts] (negative)\n");
strvar.append("  maxp   -> maximum position                        [sample ]\n");
strvar.append("  minp   -> minimum position                        [sample ]\n");
strvar.append("  il     -> integral between limits la and lb       [adc cts]\n");
strvar.append("  itot   -> total pulse integral                    [adc cts]\n");
strvar.append("  ith    -> tot pulse integral with thresold thd cut [adc cts]\n");
strvar.append("  nth    -> number of samples above thd             [#]\n");
strvar.append("  ithM   -> thd integral across the max position    [adc cts]\n");
strvar.append("            between maxp-ma and maxp+mb \n");
strvar.append("            (negative part subtracted) \n");
strvar.append("            for sample after maxst \n");
strvar.append("  ithn   -> pulse integral below -thd               [adc cts] (negative)\n");
strvar.append("  ttm    -> time stamp                              [us]\n");
strvar.append("  dt     -> t diff respect to the previous event    [us] \n");
```

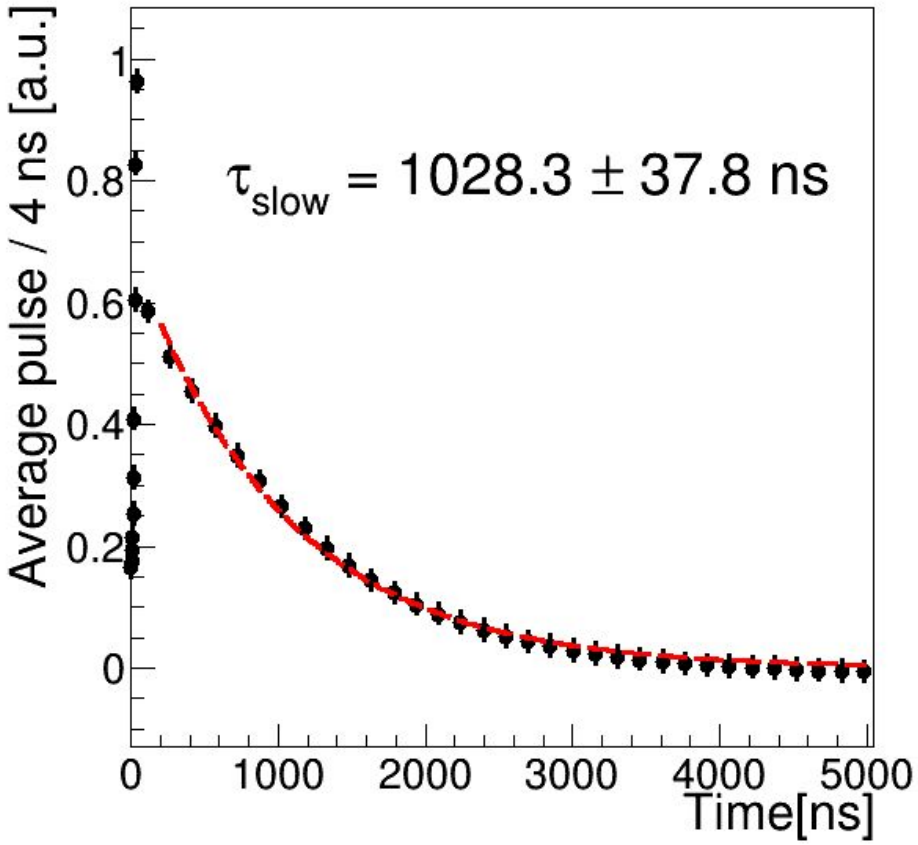
Processing options

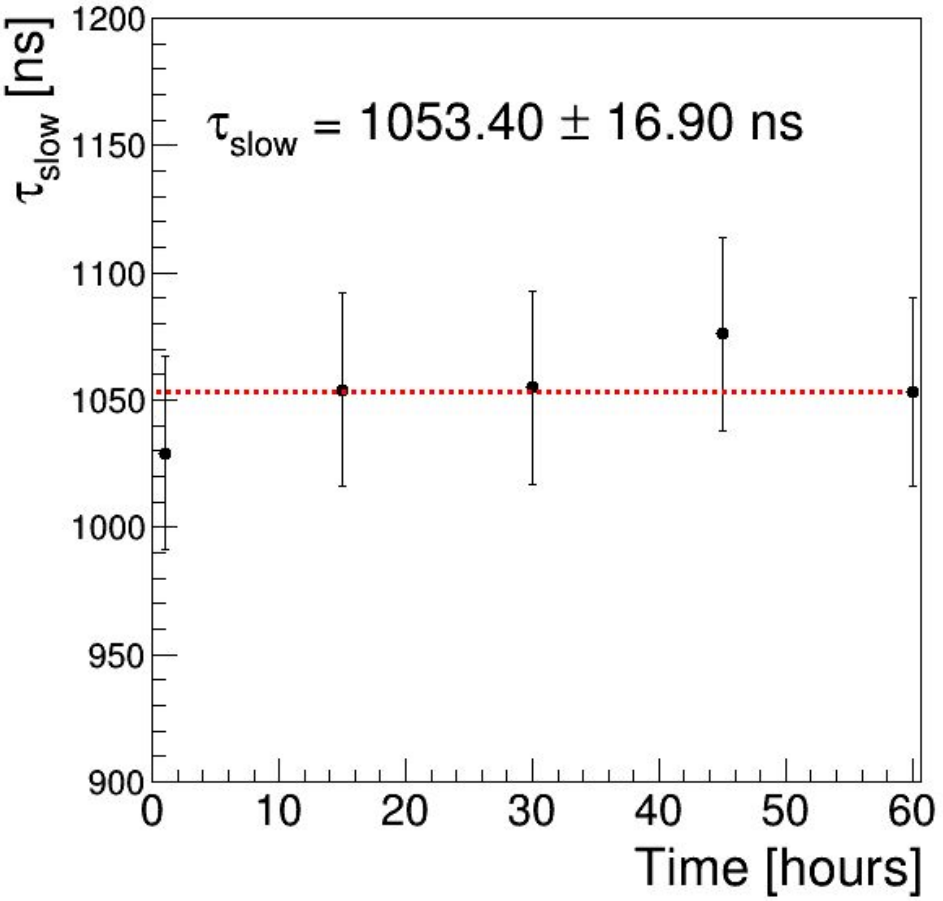
```
cout << endl << "Option Implemented:"<< endl;
cout << "-b [ba] [bb] --> Baseline integration [# ADC samples] " << endl;
cout << "-l [la] [lb] --> Fixed int. limits    [# ADC samples] " << endl;
cout << "-m [ma] [mb] --> Int. samples aroud the maximum pulse height [# ADC samples] " << endl;
cout << "-s [maxst]   --> 1st limit for maximum search [# ADC samples] " << endl;
cout << "-t [thi]     --> Noise thresholds [# ADC counts] for each channels (-T [thd] for all)" << endl;
cout << "-r [trms]    --> Noise threhsold set event by event based on the rms [# rms]" << endl;
cout << "-e [neve]    --> Number of events to be processed per file (0 entire file)" << endl;
cout << "-f [fn1st]   --> 1st File ID to be processed " << endl;
cout << "-c [chd]     --> Channel ID processing (ch id from 0)" << endl;
cout << "-u [dly]     --> Concatenate in time the files of the chain [# s delay] " << endl;
cout << "-------------------------------------------------------------------------" << endl;
cout << strvar<< endl;
cout << "-------------------------------------------------------------------------" << endl;
puts( "...done!" );
```

Example pulse

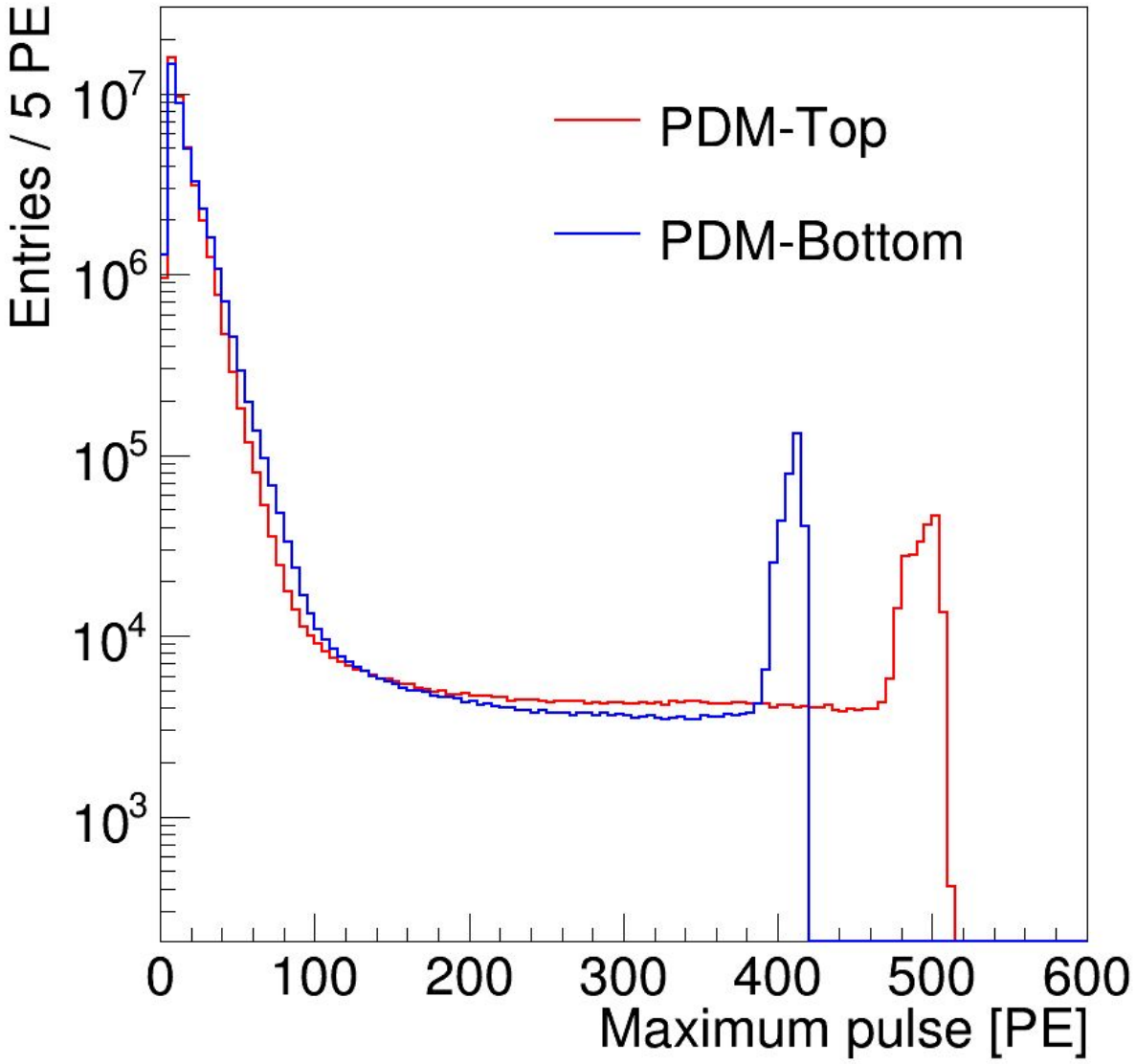


Purity over time

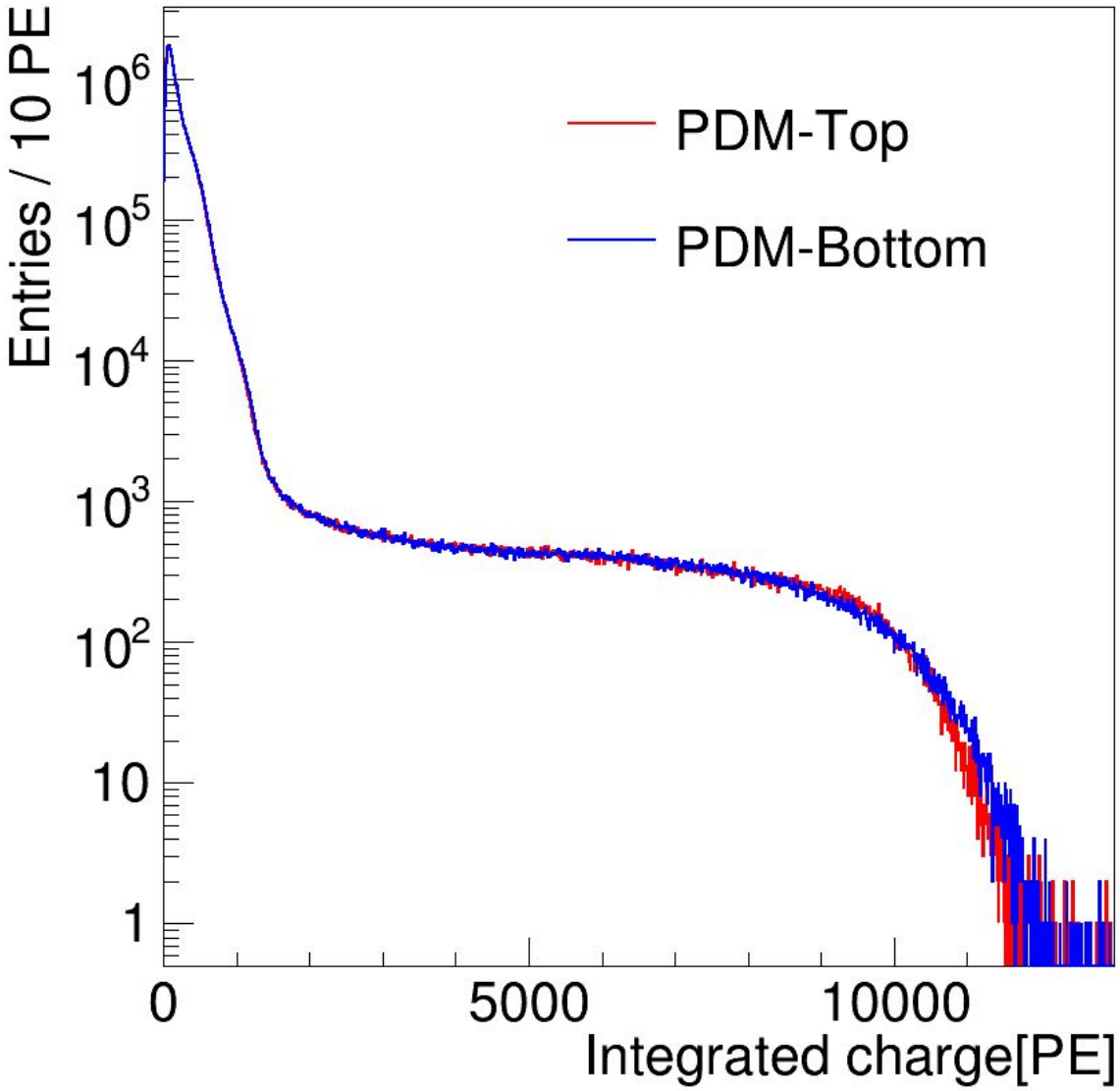




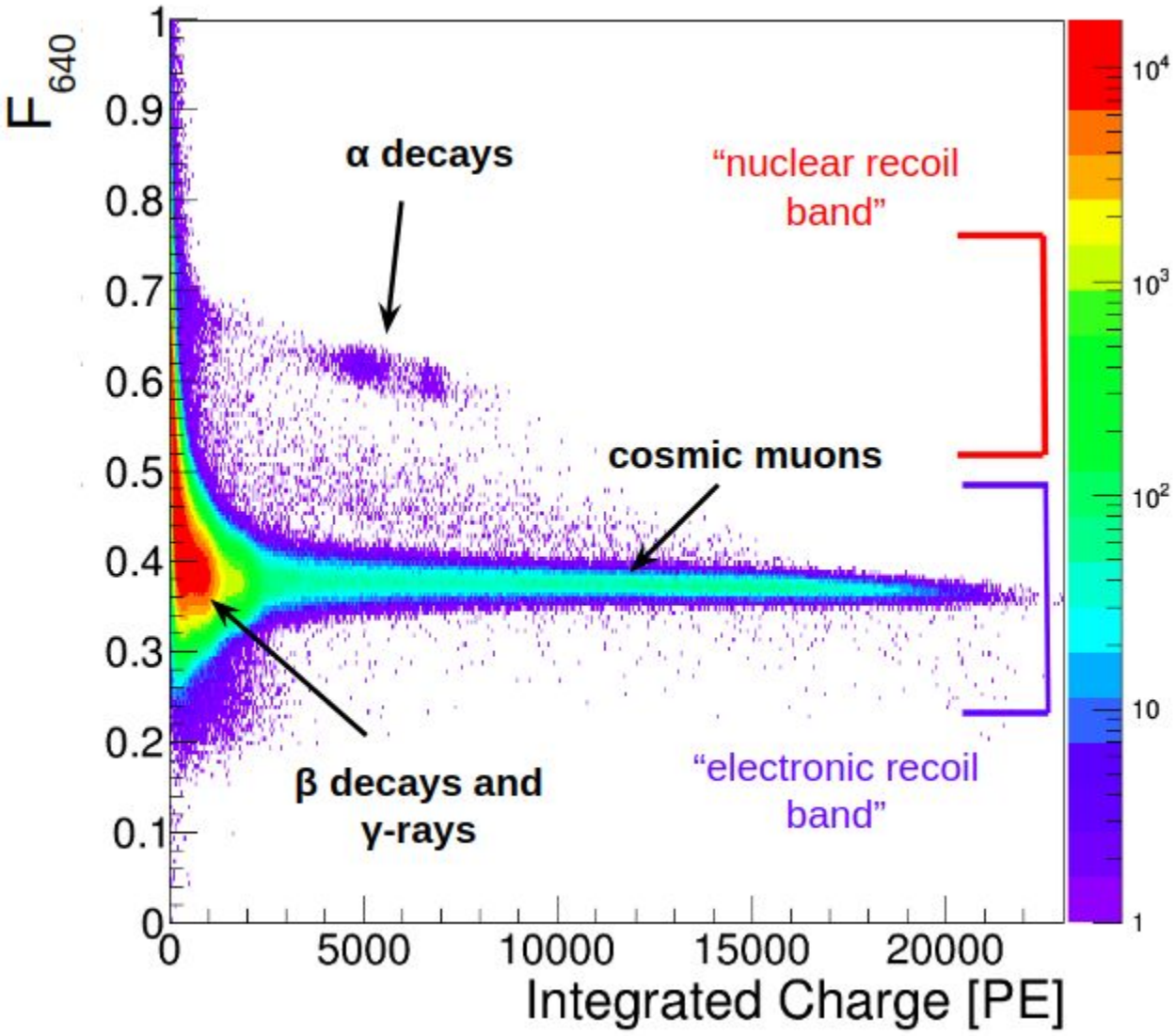
Dynamic range



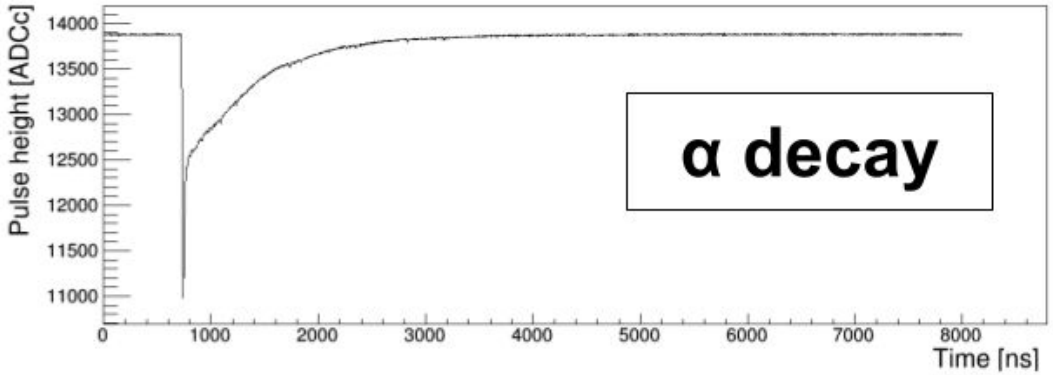
Integrated charge

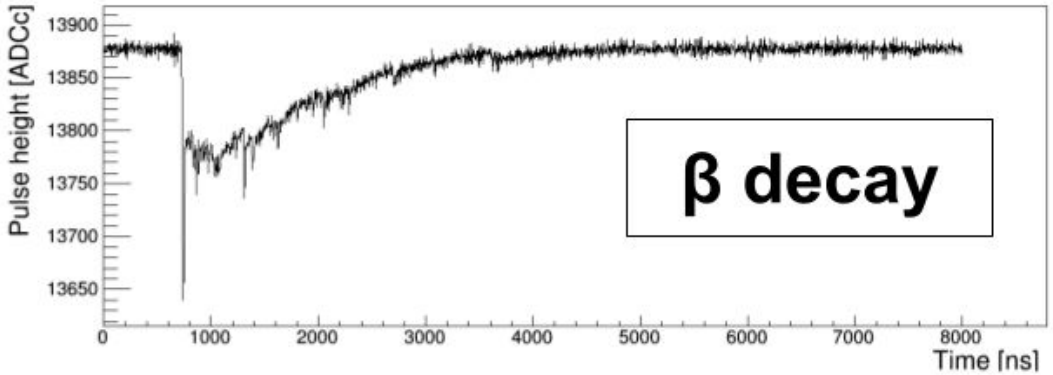


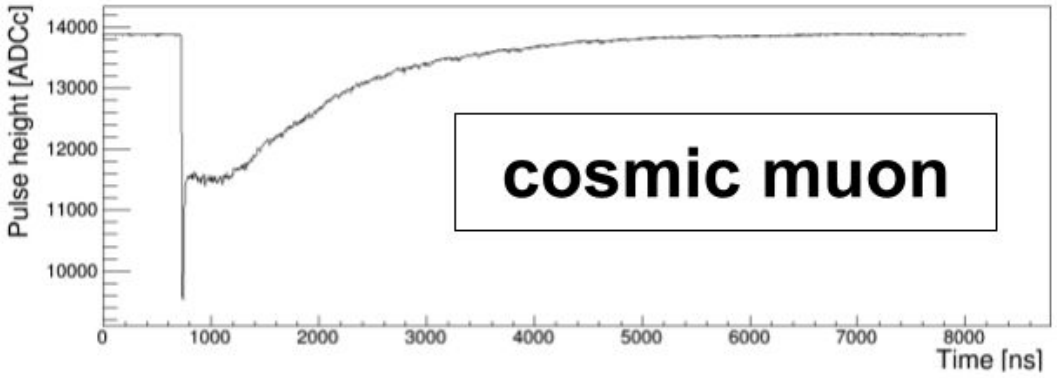
Pulse shape discrimination



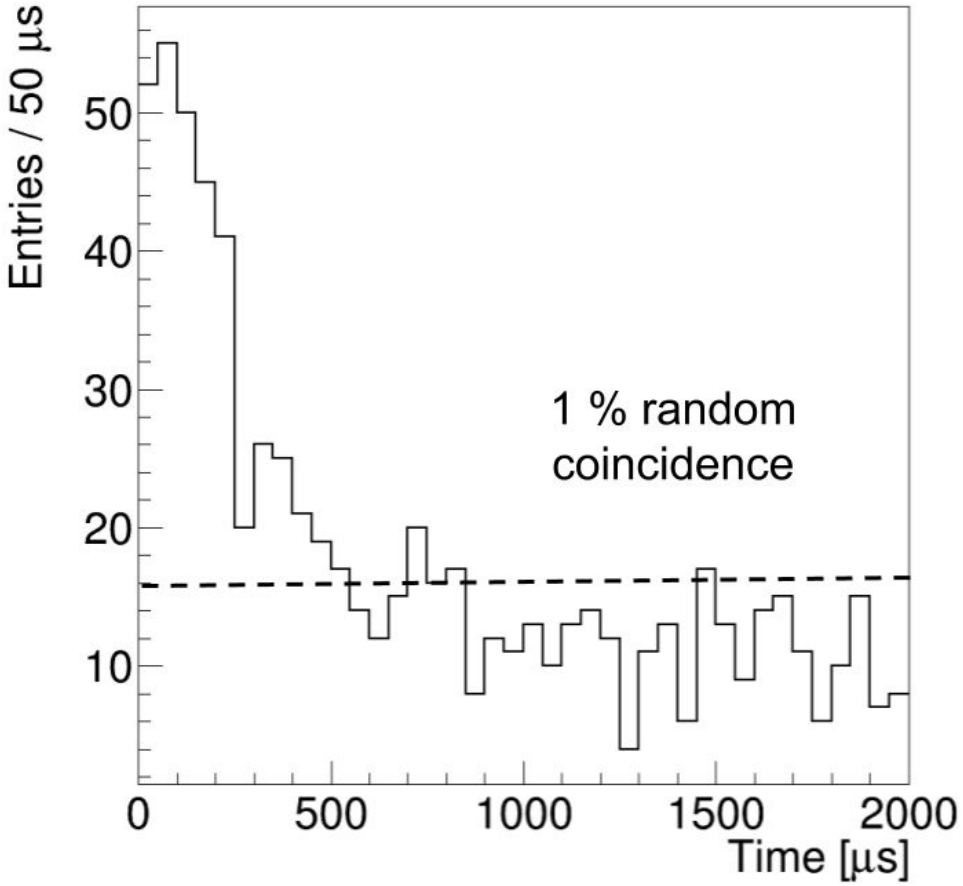
Pulses different regions

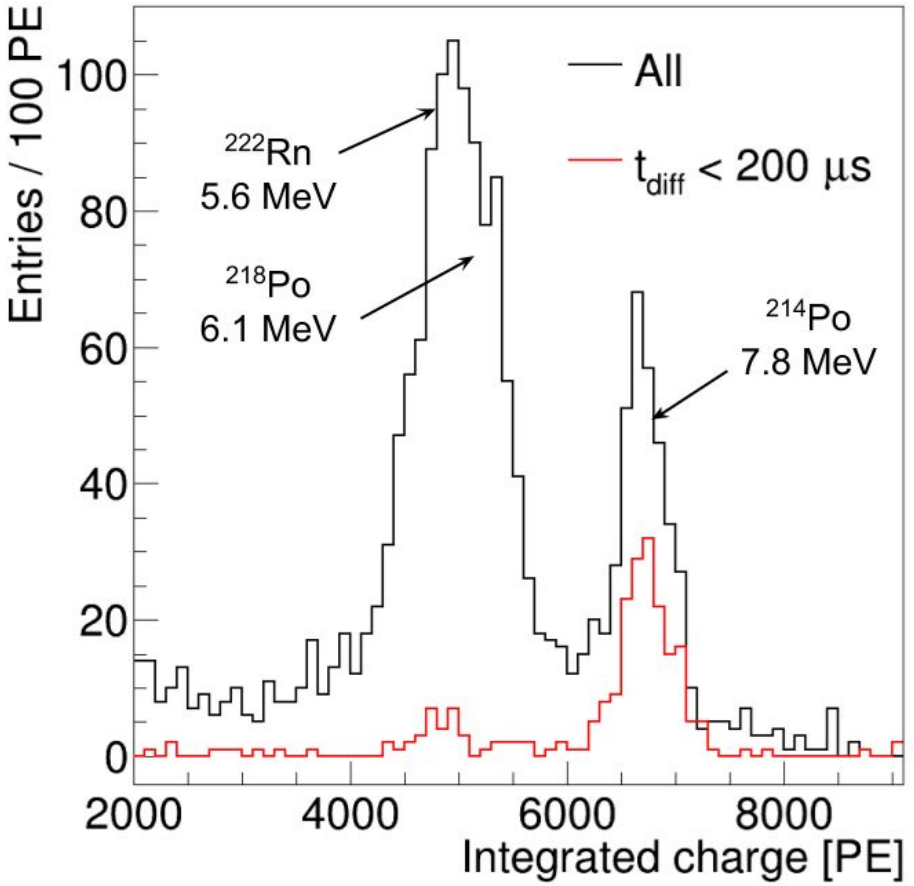




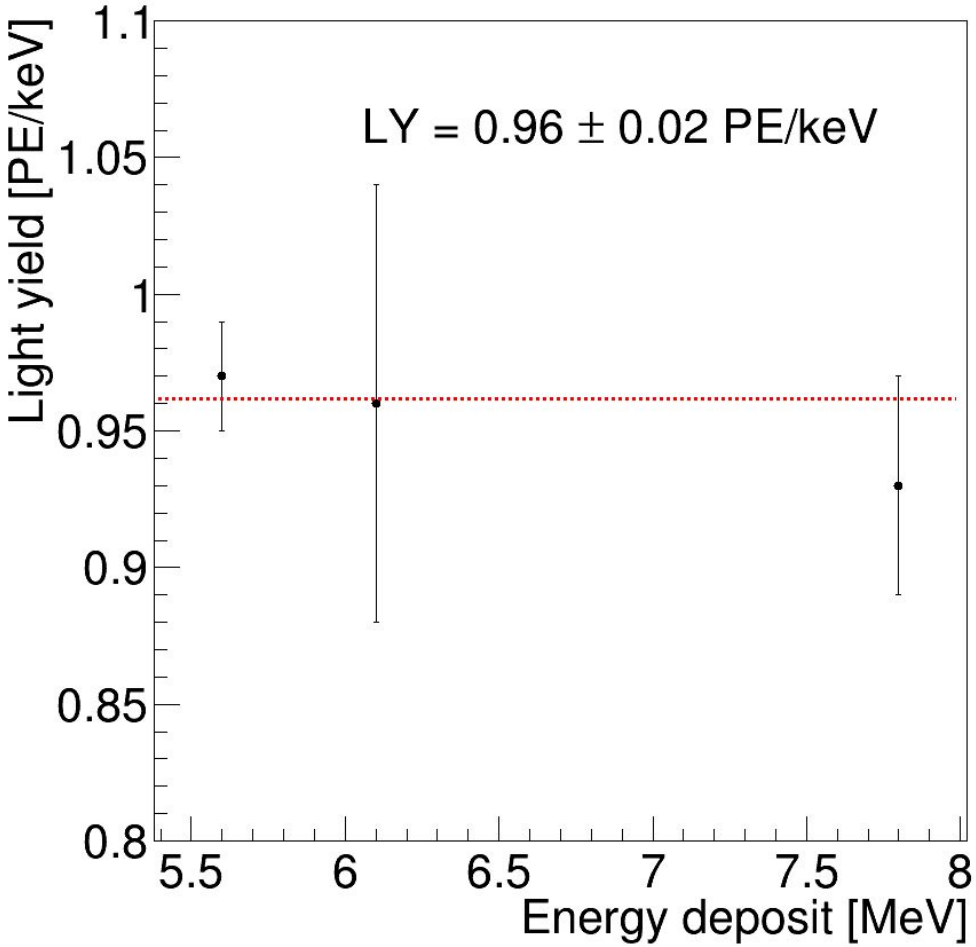


Bi-Po coincidence



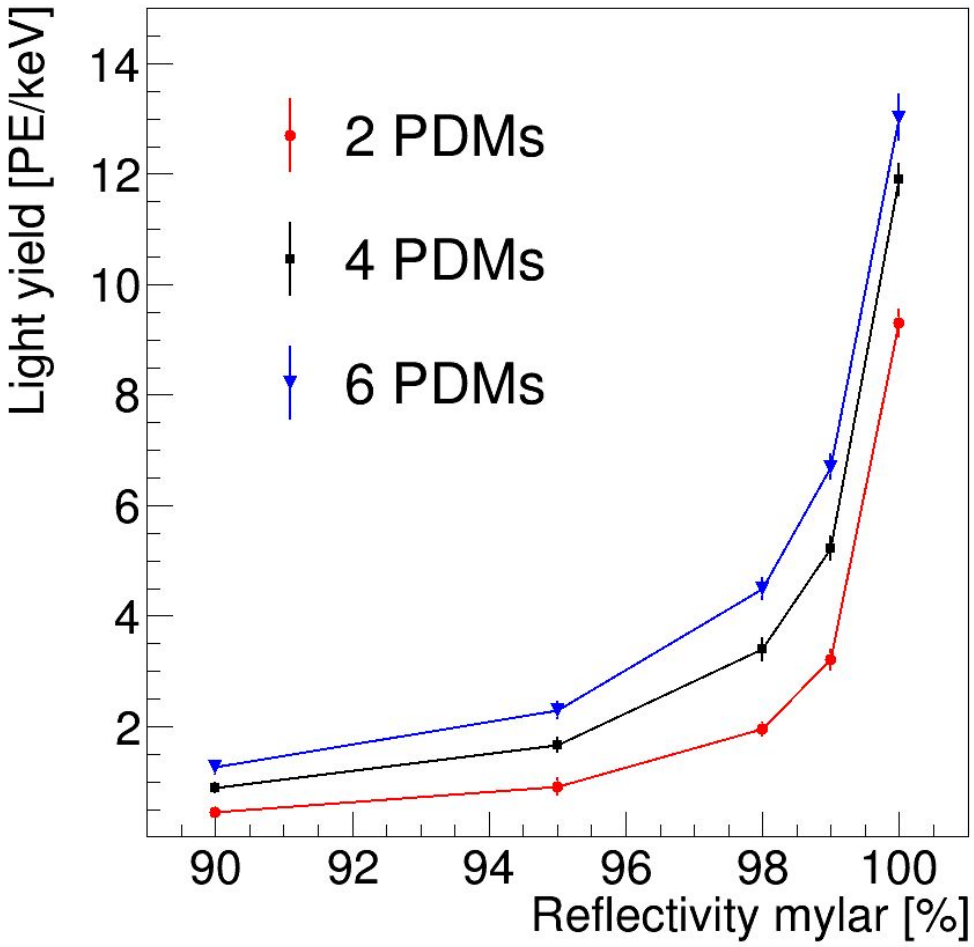


Light yield with ^{222}Rn



- Quenching β for decays → 400 keV ~ 1
- Quenching α for ^{222}Rn → 0.72 → LY ~ 1.35 PE/keV

Light yield with ^{222}Rn



- Reflectivity mylar 98% reasonable estimation from bibliography.
- 2 PDMs → LY = 1.9 PE/keV.