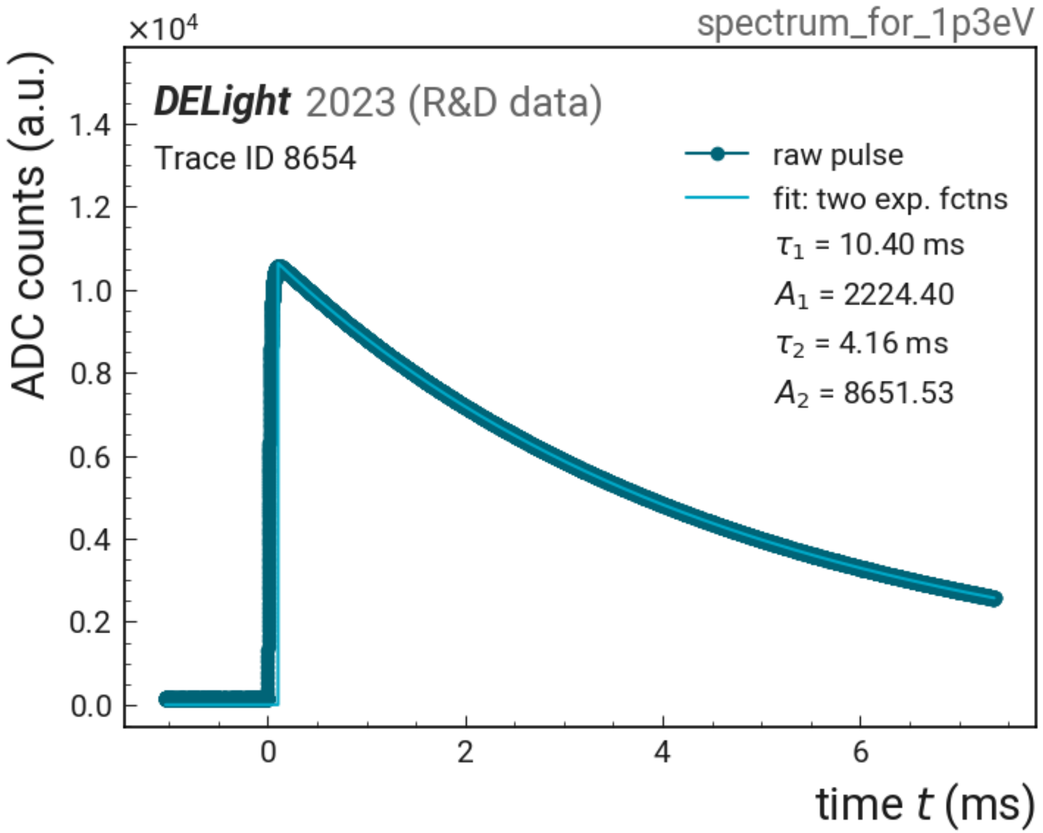
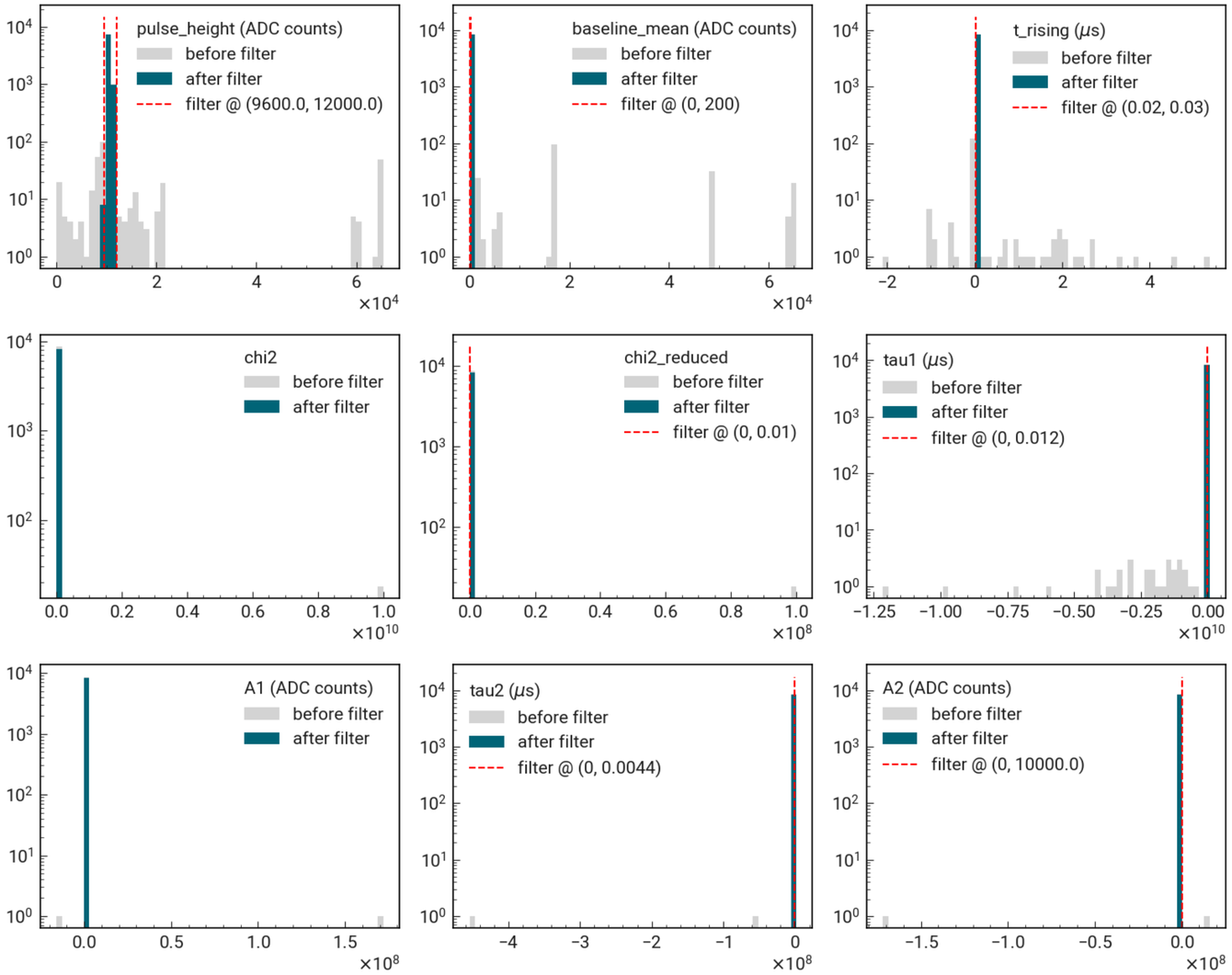
Pulse decay fit

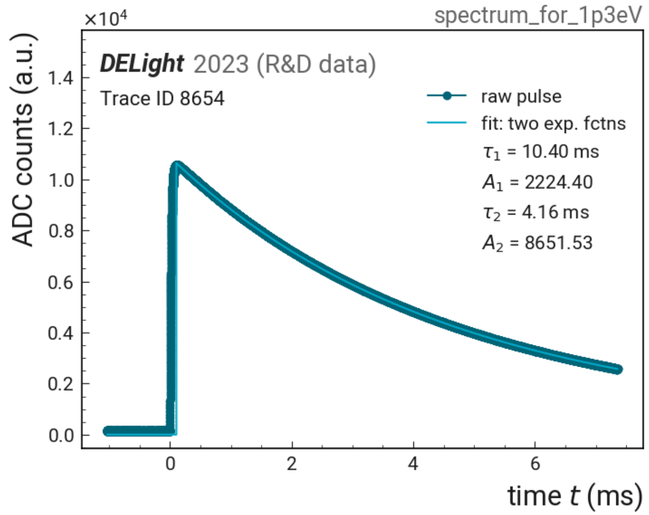


- pulse decay fit using
  $f(t) = A_1 \cdot e^{-t/\tau_1} + A_2 \cdot e^{-t/\tau_2}$
- determination of chi-square χ^2 and chi-square per degree of freedom (ν) χ^2_ν
  with $\nu = n - m$ equals the number of observations n minus the number of fitted parameters m

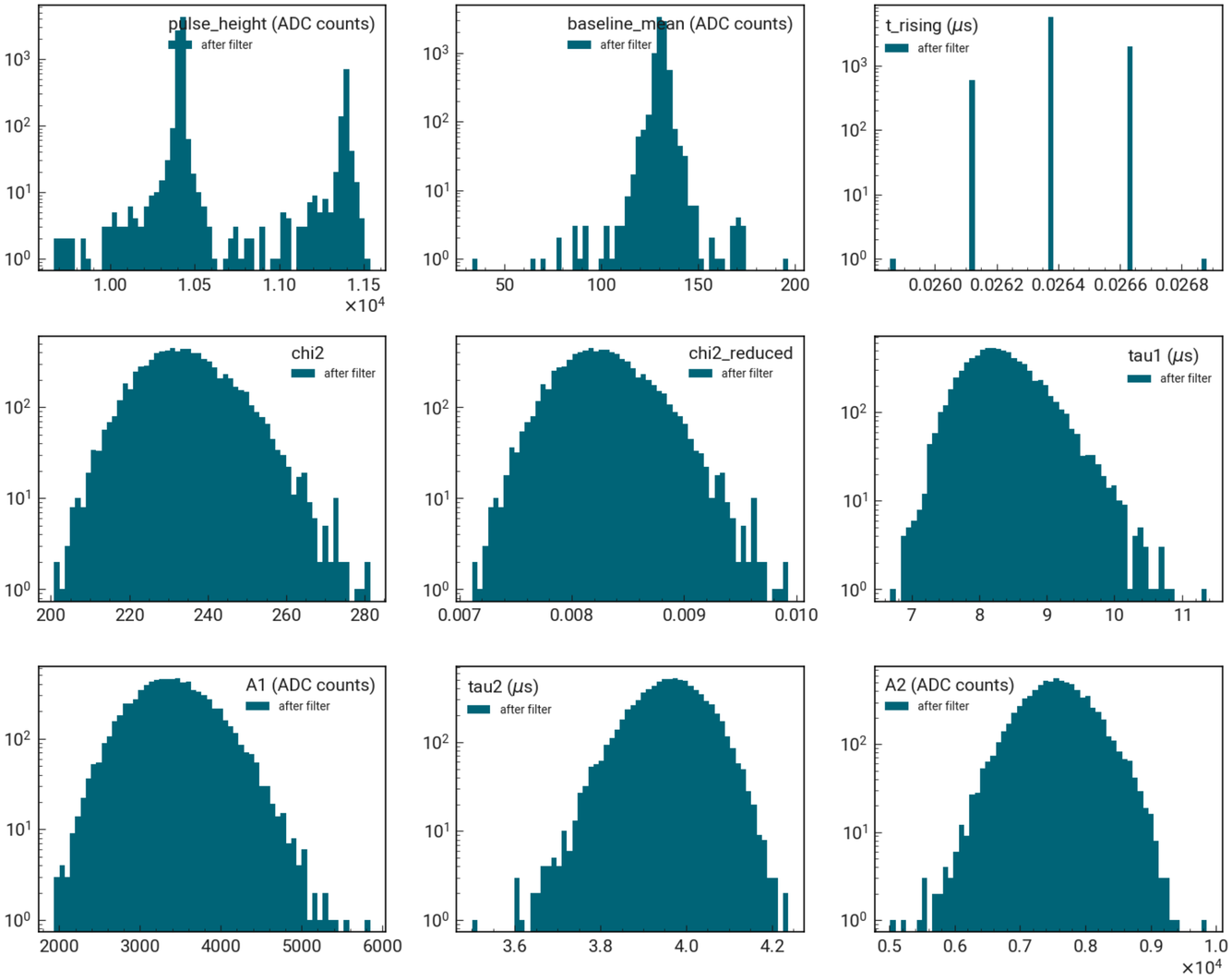
Data filtering: outlier cuts



- remove all events with features outside of expected distribution
- **pulse height:** maximal value - baseline
- **baseline:** mean baseline value
- **pulse rising time:** time between 20-80% of pulse height
- $\chi^2, \chi^2_\nu, \tau_1, A_1, \tau_2, A_2$ from fit



Data filtering: outlier cuts



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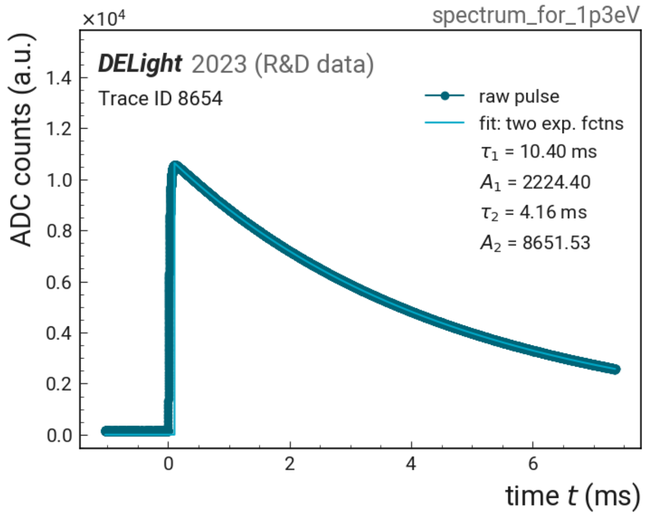
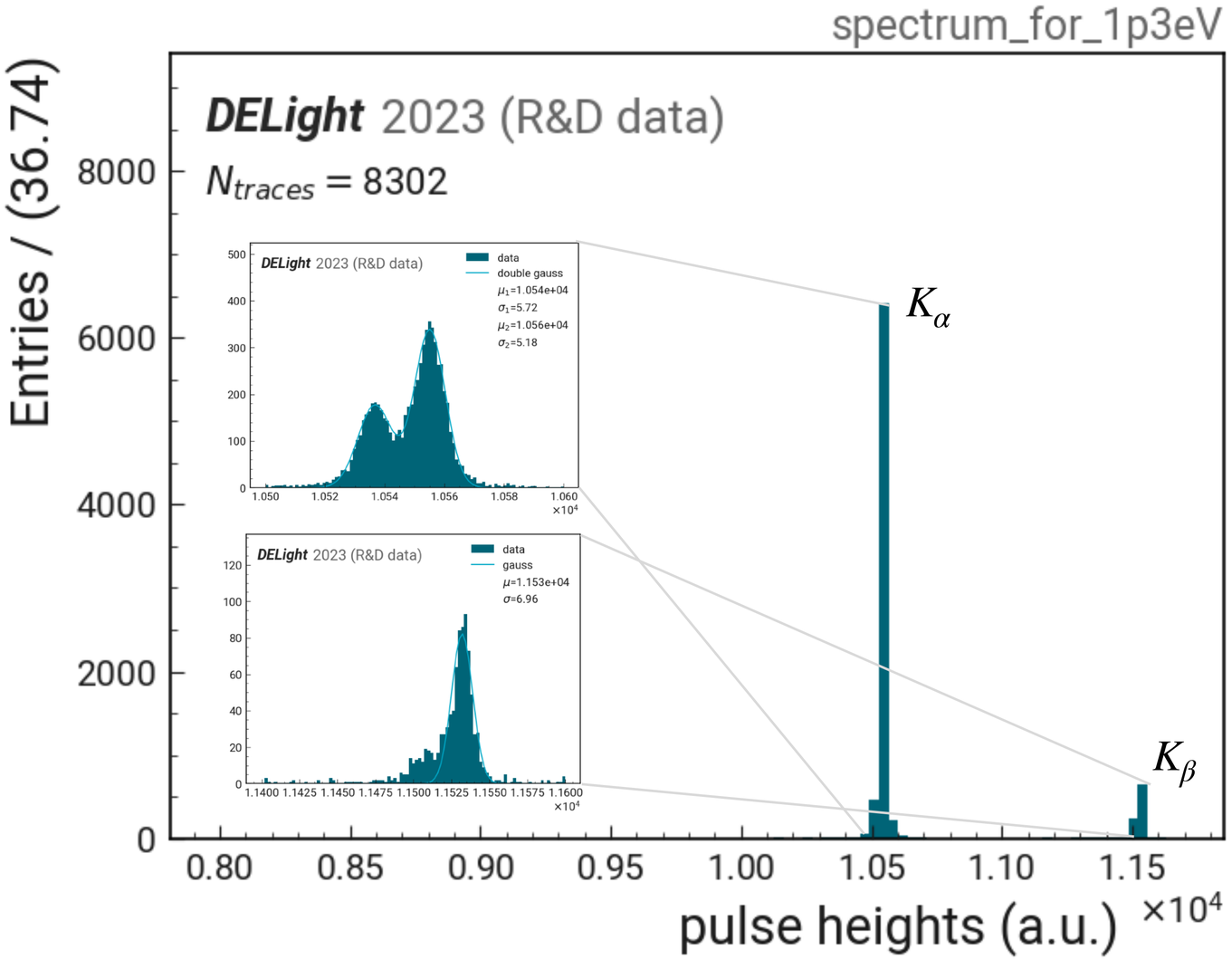
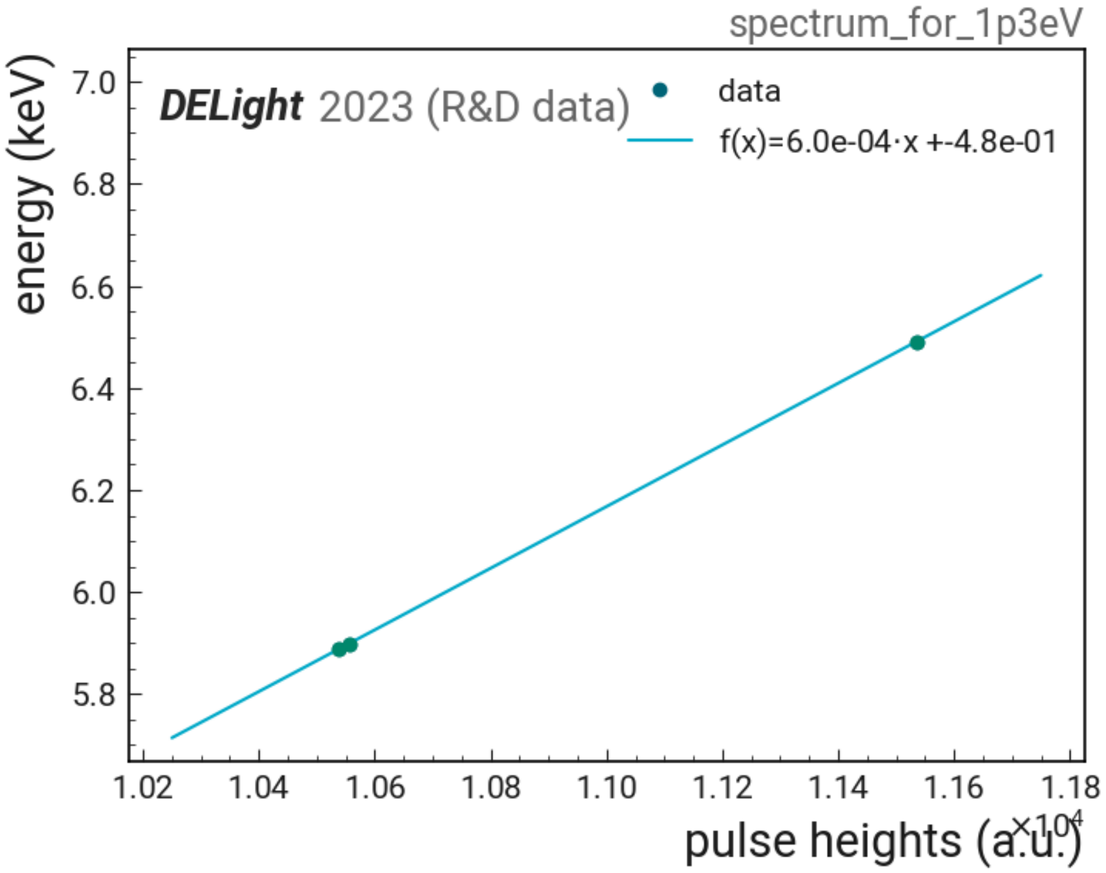


Energy calibration by pulse heights



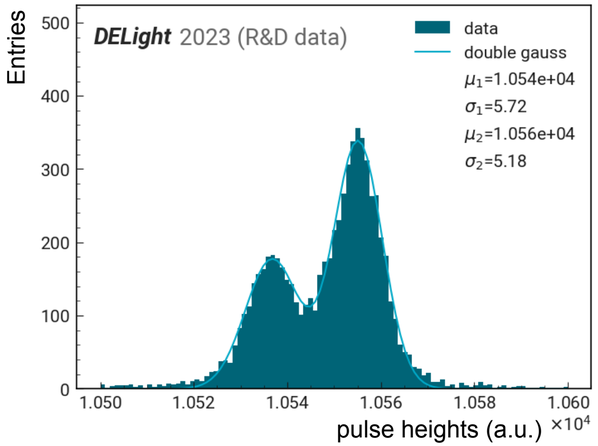
- distribution of pulse heights corresponds to natural line shape of the ^{55}Mn K_α and K_β lines
- line shape can be used to calibrate the energy

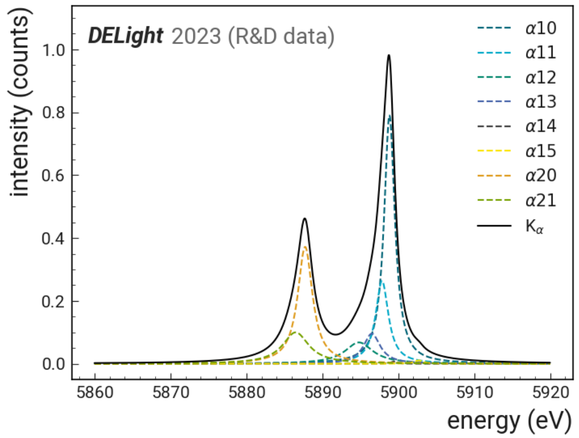
Energy calibration

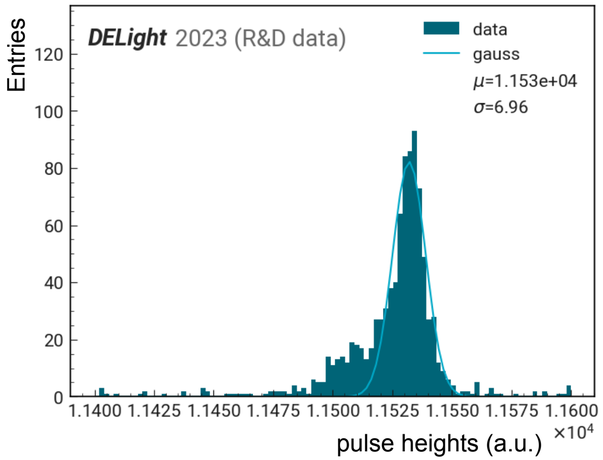


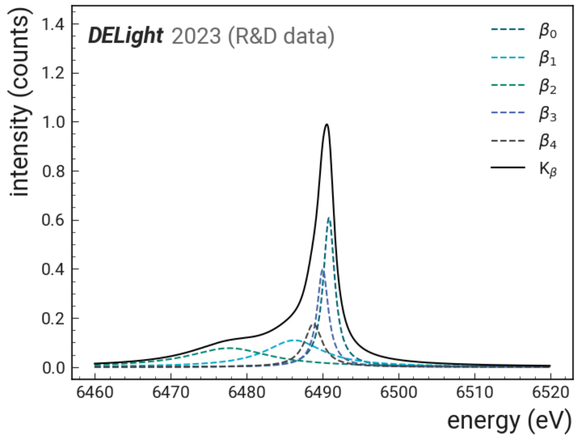
- plot pulse height gauss peak positions over line shape energies and fit

Natural line shape of ^{55}Mn



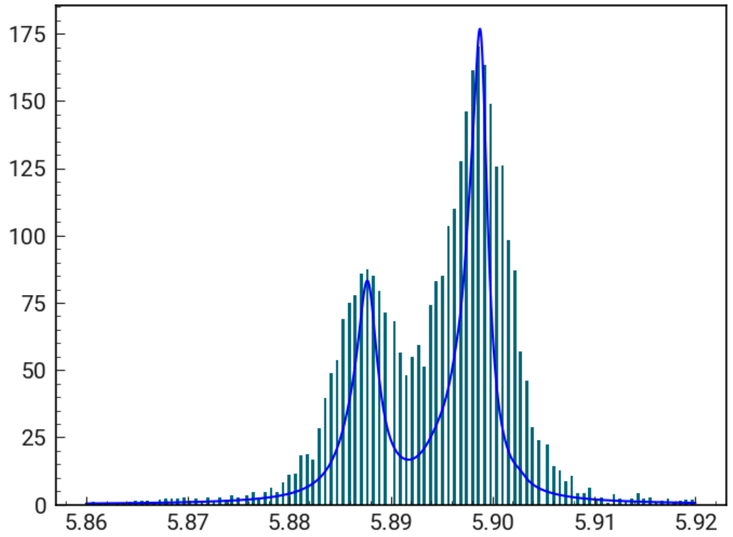


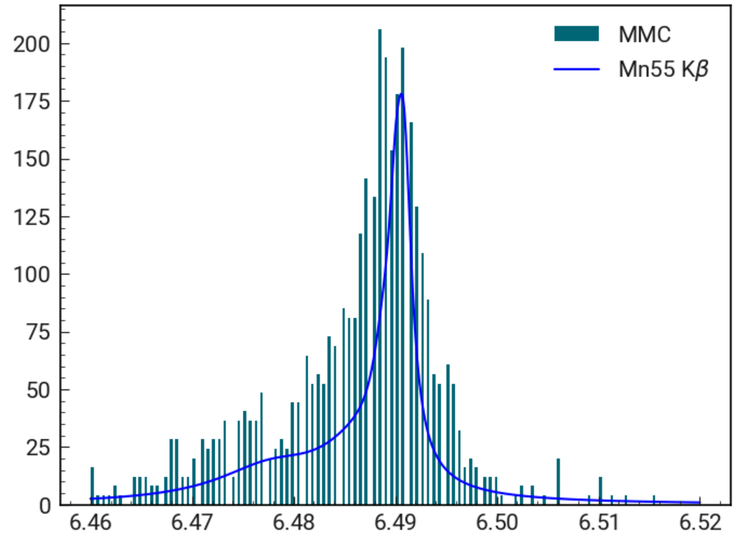




- spectra from [Ka1,2 and Kb1,3 x-ray emission lines of the 3d transition metals](#) (G. Hölzer et.al.)

Comparison energy calibration vs. natural line shape

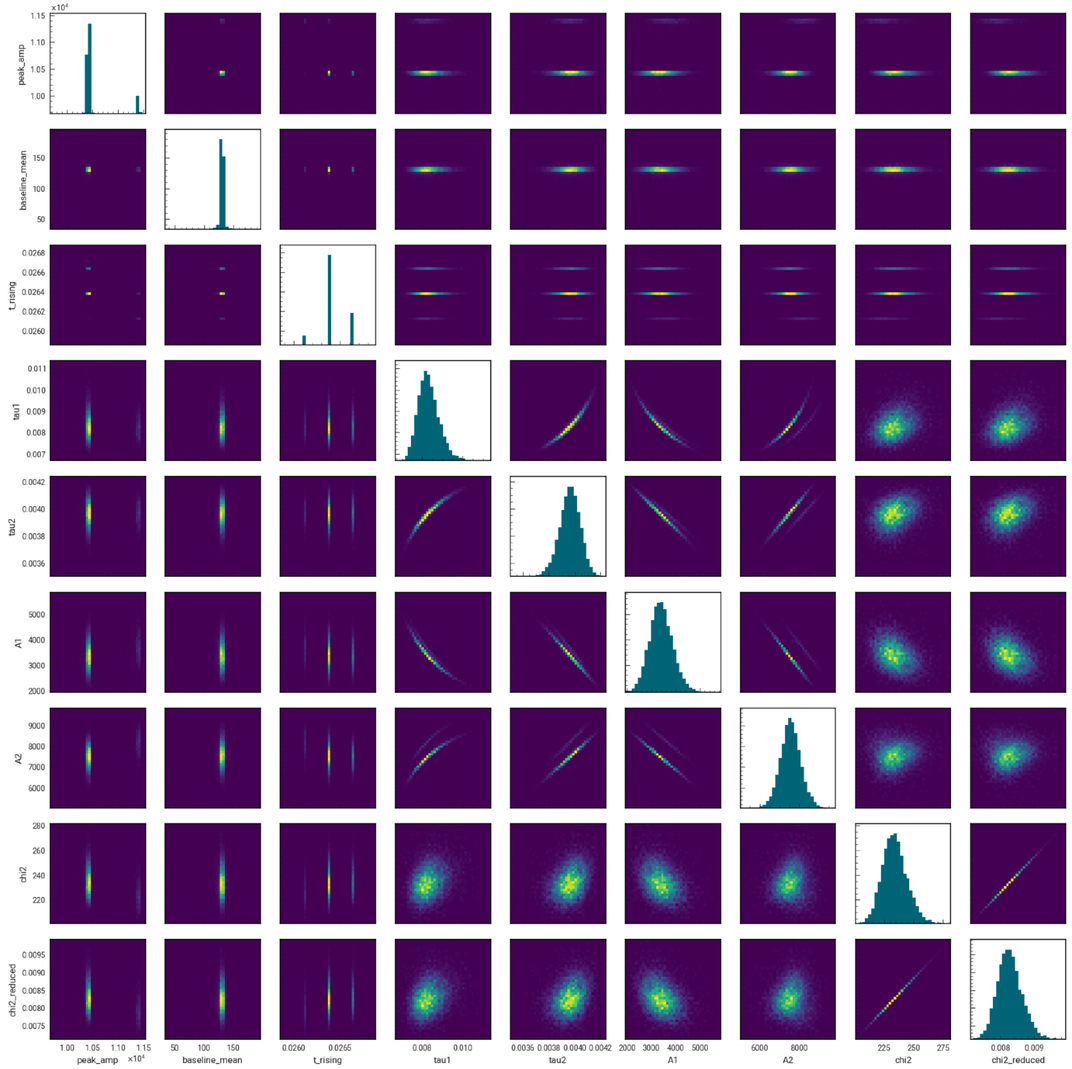




- positions match very well
- width needs to be broadened by convolution with gauss (instrument resolution)

Backup

Feature correlations



- before filtering: correlations hard to identify
- after filtering:
  - features nearly gauss distributed
  - strong correlations between fit parameters $(A_1, A_2, \tau_1, \tau_2)$ and between χ^2 and χ^2_ν
  - baseline mean, pulse amplitude and rising edge time independent from other features