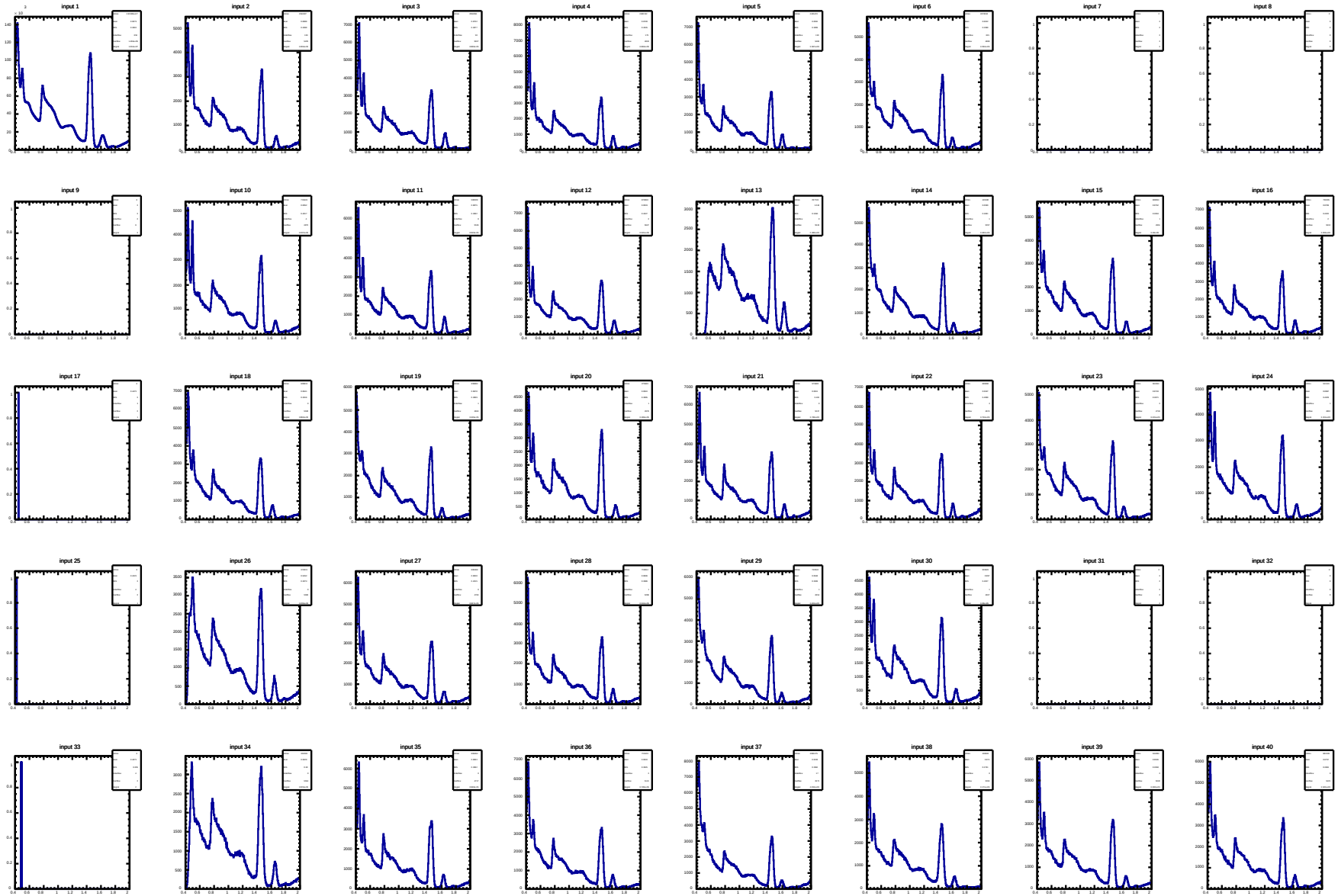
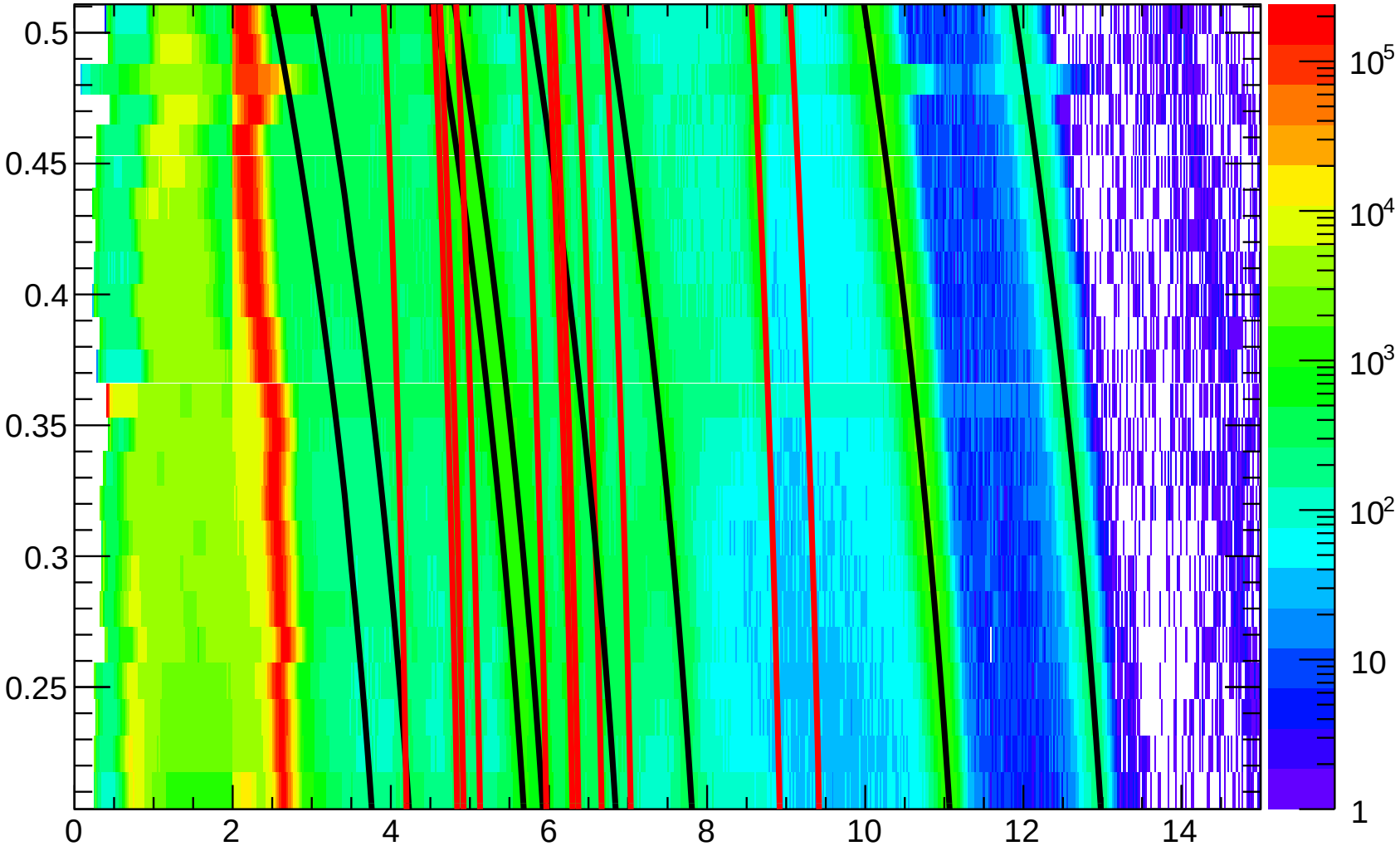
Automated Detector Calibration Routines

- $LaBr_3$:
  - simulation of ^{138}La decay
  - convolution with average detector resolution
  1. adjustment of gamma peaks (0.789 MeV and 1.436 MeV)
  2. fit of experimental data to simulation for calibration
  - exponential for low energy part
- S3 DSSSSDs:
  - calculation of alpha and proton scattering kinematics
  1. adjustment of highest energy peaks (S3F: $\alpha_{0/1}$, S3B: $p_{0/1}, \alpha_0$)
  - projection of remaining transitions into spectrum
  - gating (one sigma) with average detector resolution
  - analysis of isolated/overlapping peaks
  2. fit of all single peaks for calibration

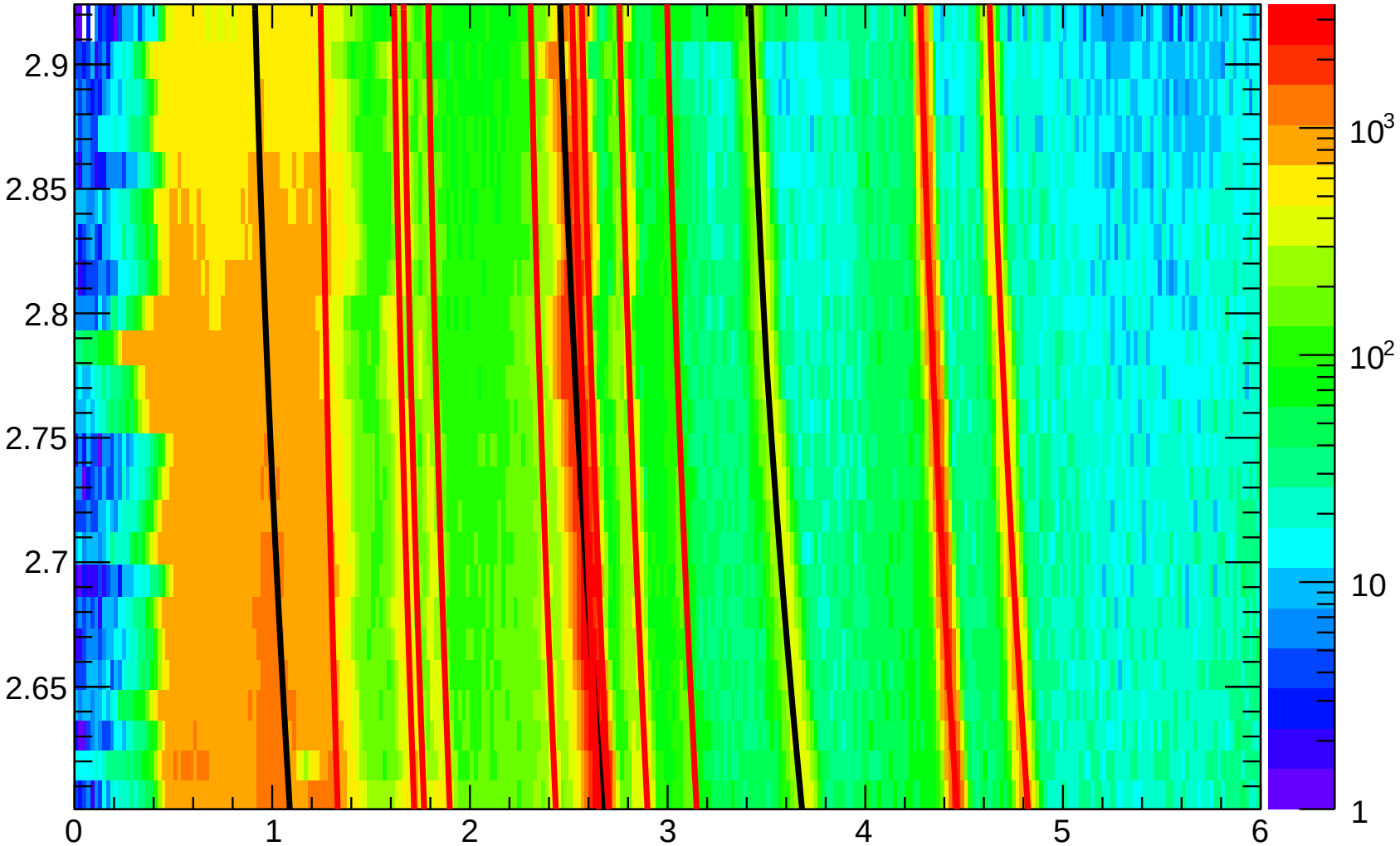
R010: Gamma Detector Calibration



R010: Particle Detector Calibration (S3F)



R010: Particle Detector Calibration (S3B)

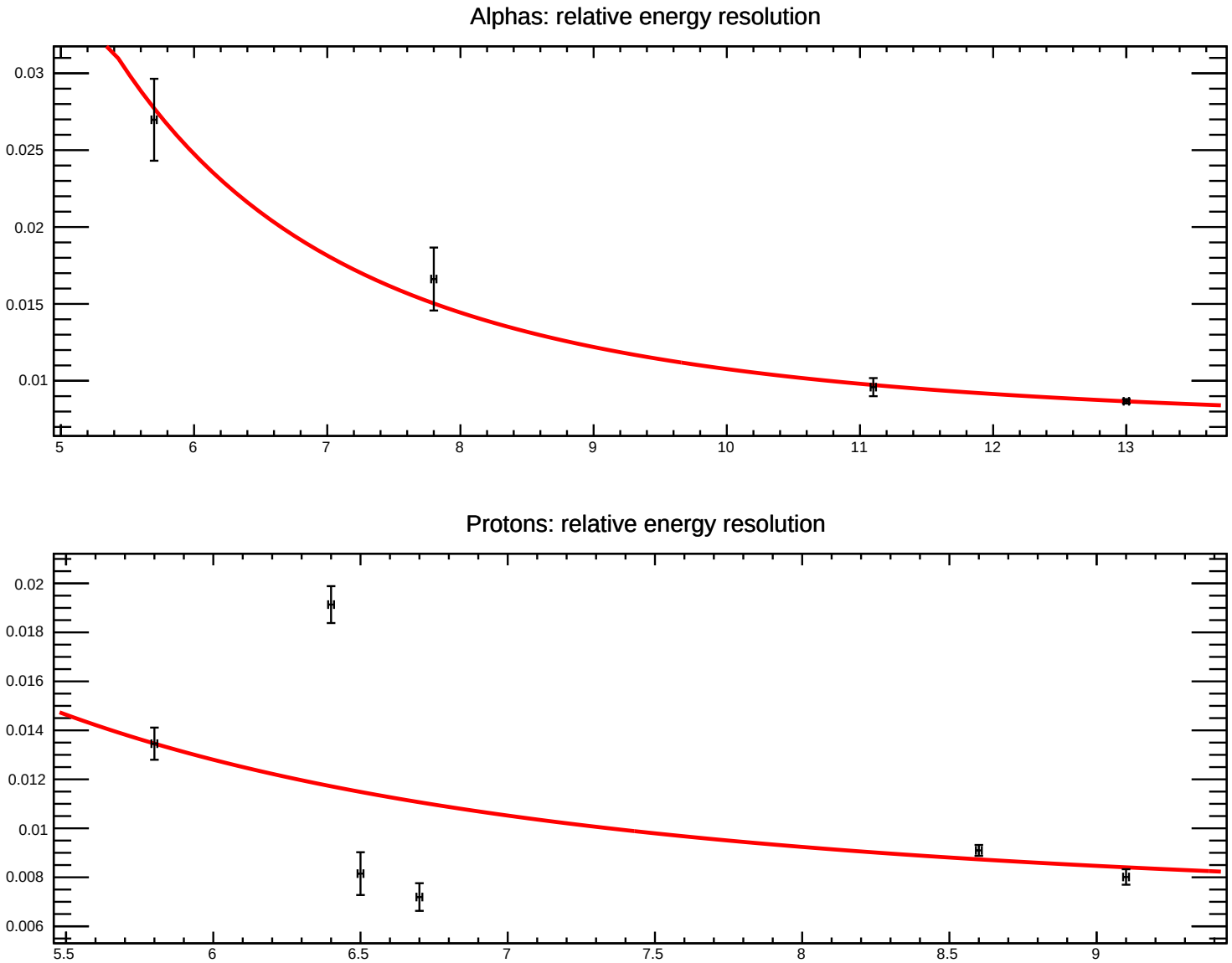


Automated Analysis Routine

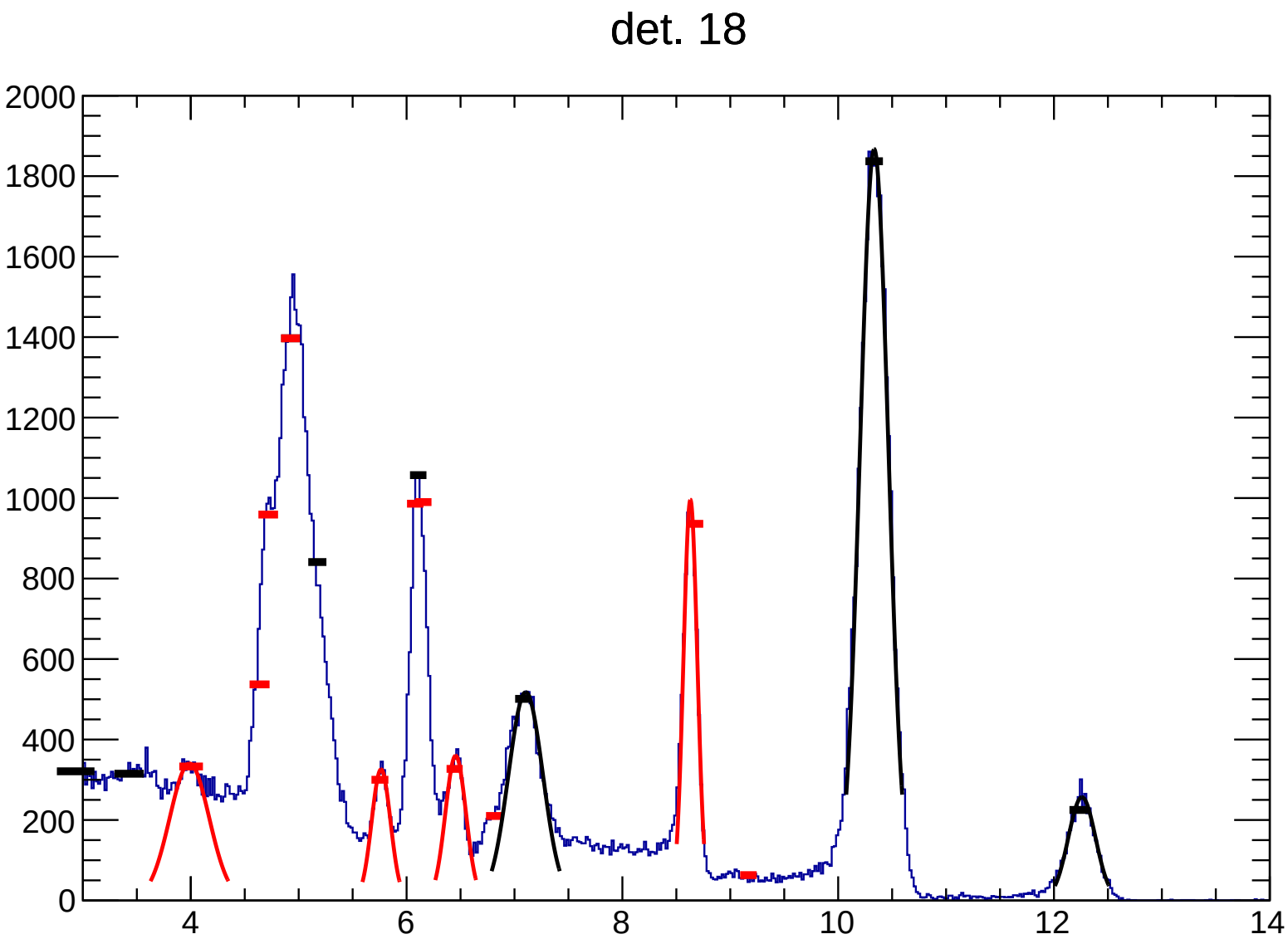
1. data:
   - separately/coincident for gammas and particles
   - ROOT files with raw/calibrated data
   - ROOT scripts for display of data
   - R010: $E_b = 5.07$ MeV, $E_{eff} = 5.02$ MeV

   $\Rightarrow$ compare partial cross sections, angular distribution (α_0) to Becker *et al.*, Z. Phys. A **303**, 305-312 (1981)
2. current status of automated analysis script:
   - routine based on several steps
   - identification of transitions with kinematics and average detector resolution
   - grouping according to (one sigma) overlaps
   - identification of flat contributions
   - fit of single/double/triple peaks
   - definition of error matrix for alphas and protons
     0:flat, ±1: good/bad single, ±1: good/bad double, ...
   - hit rate $\geq 90\%$ expected
   - can develop further together towards framework

R010: Average Detector Resolution (S3F)



R010: Single Detector Analysis (S3F)



R010: Error Matrix Alphas (S3F)

det.	α_0	α_1	α_2	α_3	α_4	α_5	α_6	α_7
0	1	1	1	0	0	1	-2	-1
1	1	1	1	0	0	1	-2	1
2	1	1	1	-2	-2	1	-2	-1
3	1	1	0	-2	-2	1	-2	0
4	1	1	1	-2	-2	-1	-2	0
5	1	1	1	-2	-1	-1	-2	-1
6	1	1	1	-2	-1	-1	-2	0
7	1	1	0	-2	-1	-1	-2	-1
8	1	1	1	-2	-1	-1	-2	0
9	1	1	1	-2	-1	-1	0	1
10	1	1	-1	-2	-1	-1	1	0
11	1	1	1	-2	1	-1	-1	-1
12	1	1	1	-3	-1	-1	0	0
13	0	1	1	-3	-1	-2	-1	-1
14	1	1	1	-3	-1	-2	1	1
15	1	1	1	-3	-1	-2	-1	0
16	1	1	0	-3	-1	-2	0	0
17	1	1	1	-3	-1	-2	0	-1
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

R010: Error Matrix Protons (S3F)

det.	p_0	p_1	p_2	p_3	p_4	p_5	p_6	p_7	p_8	p_9	p_{10}
0	-1	0	-1	1	-2	-2	-2	-1	-2	-2	-2
1	0	0	-1	-2	-2	-2	-2	-1	-2	-2	-2
2	0	-1	-1	-2	-2	-2	-2	-1	-2	-2	-2
3	0	0	-1	-2	-2	-2	-2	-1	-2	-2	0
4	0	0	-1	-2	-2	-2	-2	0	-2	-2	-2
5	0	0	0	-2	-2	-2	-1	1	-2	-2	-2
6	0	0	1	-2	-2	-2	-1	1	-2	-2	-2
7	-1	-1	1	-2	-2	-2	-1	0	-2	-2	0
8	-1	-1	0	-2	-2	-2	-1	0	-2	-2	-2
9	0	-1	1	-2	-2	-2	-1	-1	-2	-2	1
10	0	-1	1	-2	-2	-2	-1	-1	-2	-2	1
11	0	1	1	-2	-2	-2	0	-1	-2	-2	1
12	0	-1	0	-1	-3	-3	0	-1	-2	-2	0
13	0	1	1	-1	-3	-3	-1	-2	-2	-2	1
14	0	1	0	1	-3	-3	1	-2	-2	-2	1
15	0	1	1	1	-3	-3	1	-2	-2	-2	0
16	0	1	-1	1	-3	-3	1	-2	-2	-2	1
17	0	1	-1	1	-3	-3	1	-2	-2	-2	1
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮