

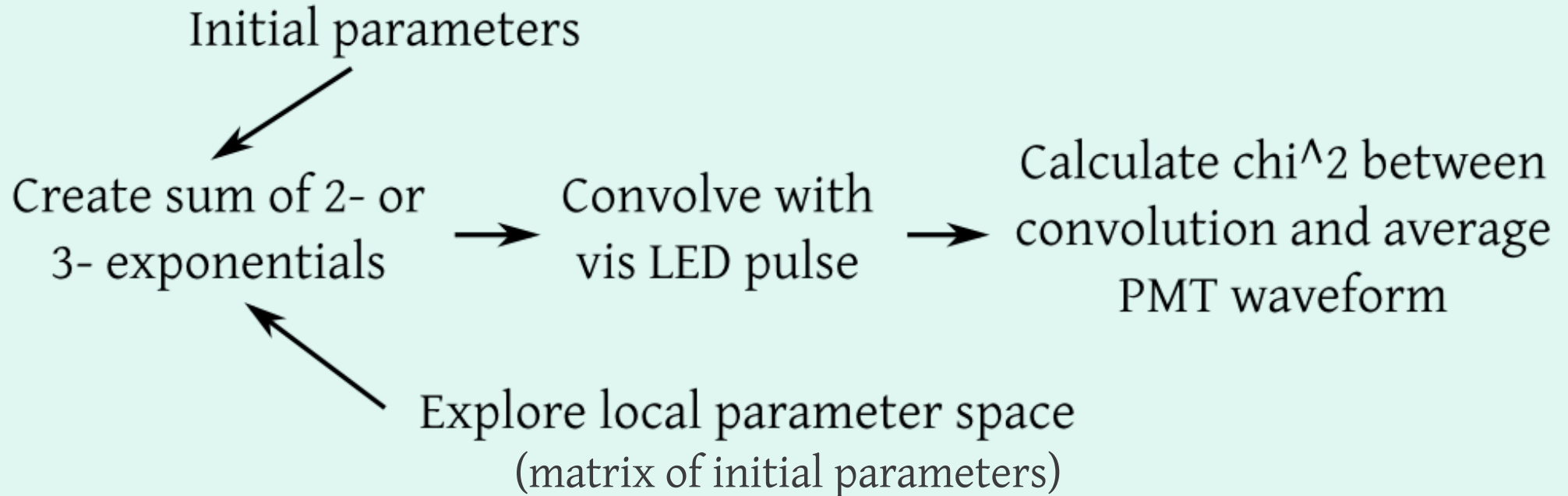
# Template Fit Analysis: Fitting to PMT Waveforms using Convolutions

Talk 4 of 6

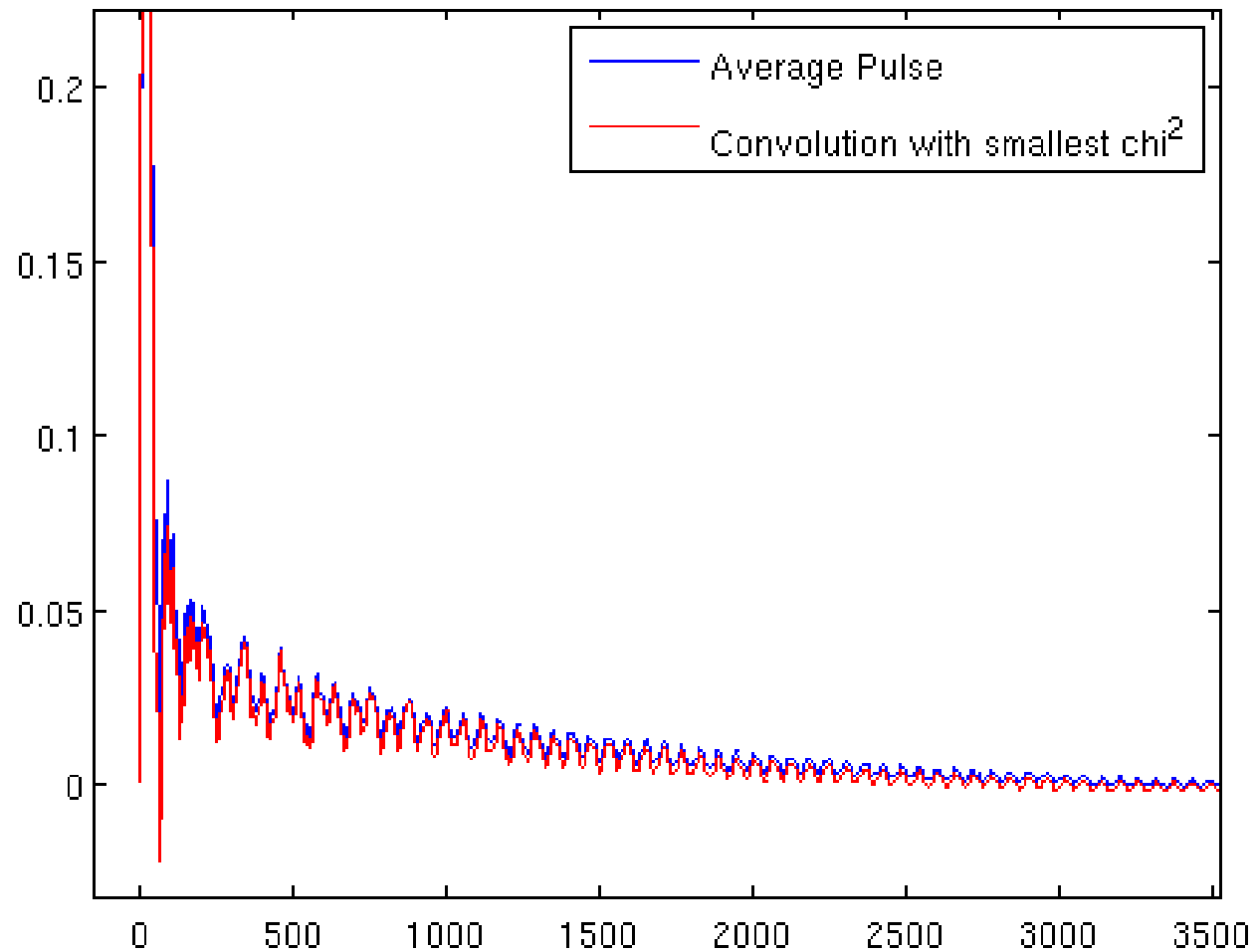
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Bo VST: Feb 1 2013

# Template Fit Method

MATLAB analysis:



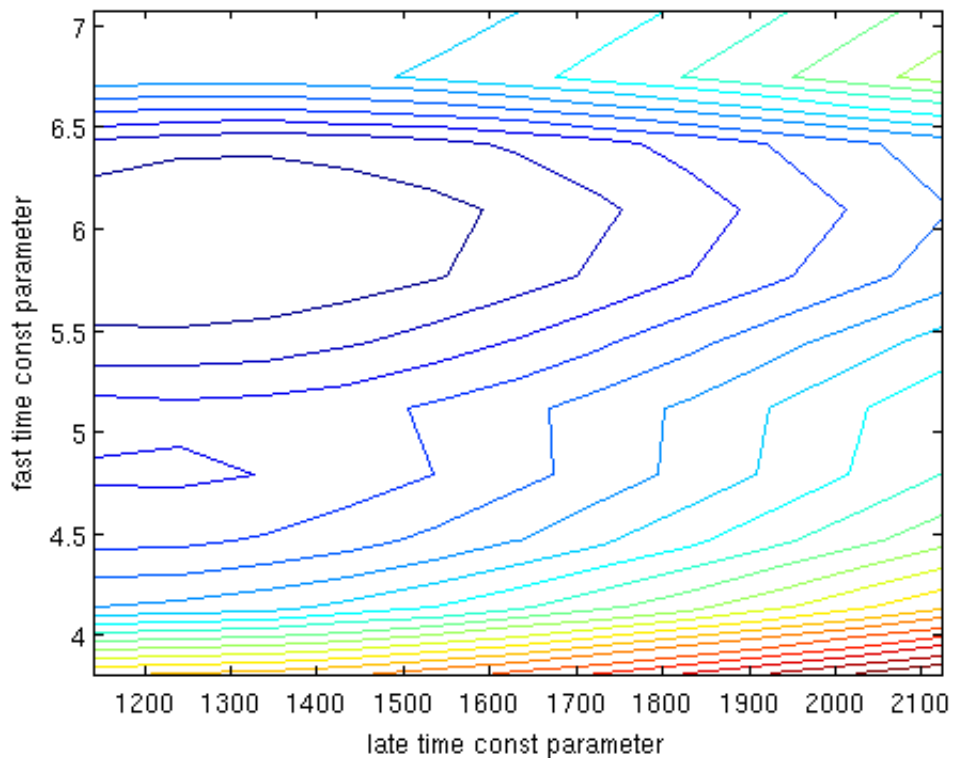
The convolution matches up quite well with the average pulse already, even with just the ROOT fit parameters



## 2 exponent fits

- We float the amplitude parameters, to reduce our 4D space to 2D
  - For each pair of time constants, take the smallest  $\chi^2$  value among the different amplitudes
- Look for a  $\chi^2$  local minimum

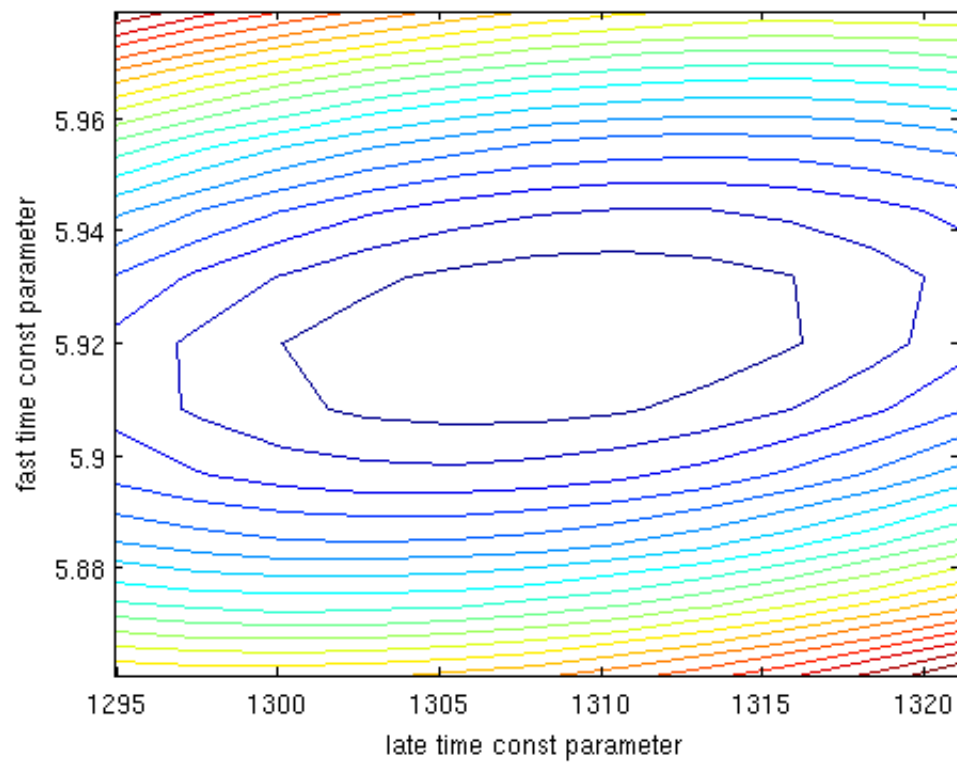
chi<sup>2</sup> values for 2-exp fit



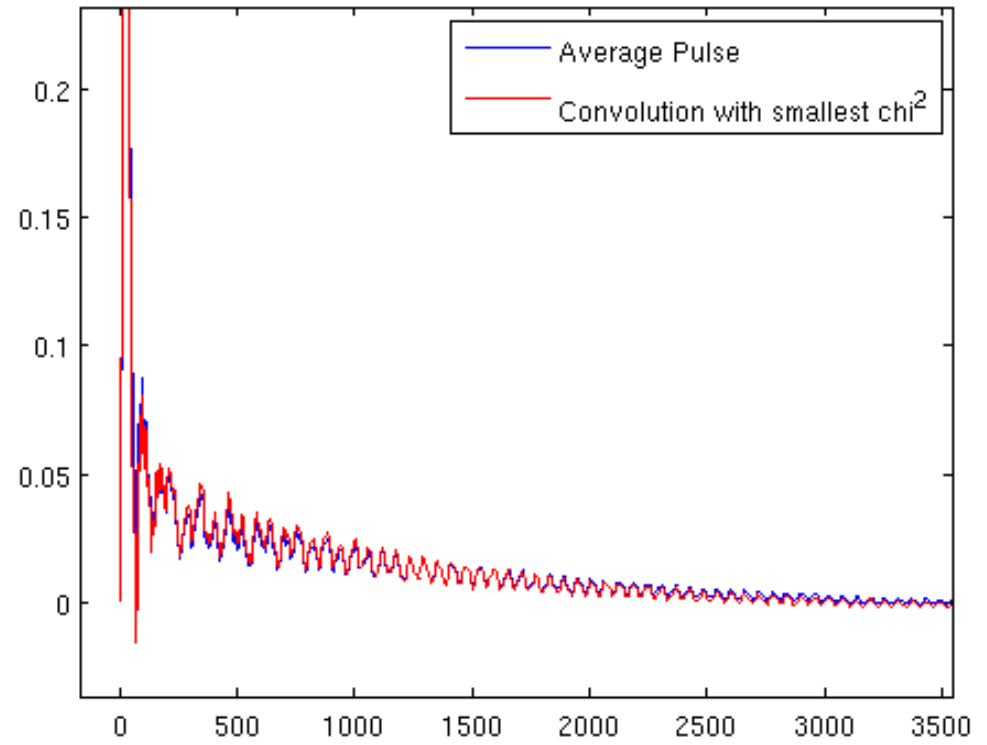
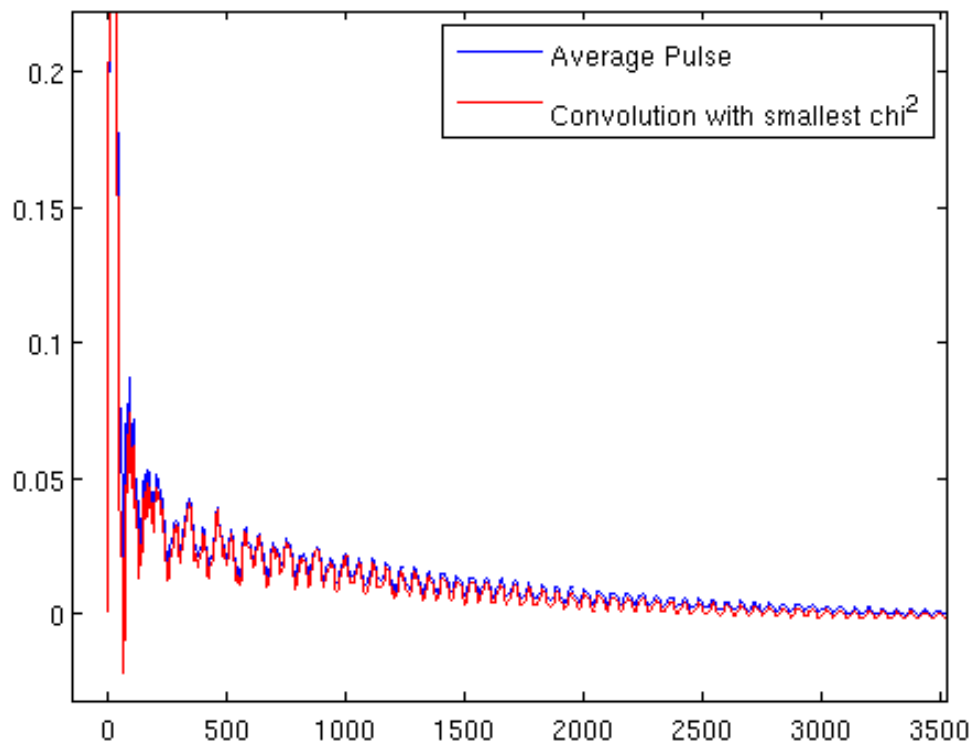
Center at maximum and increase parameter resolution to determine best fit parameters

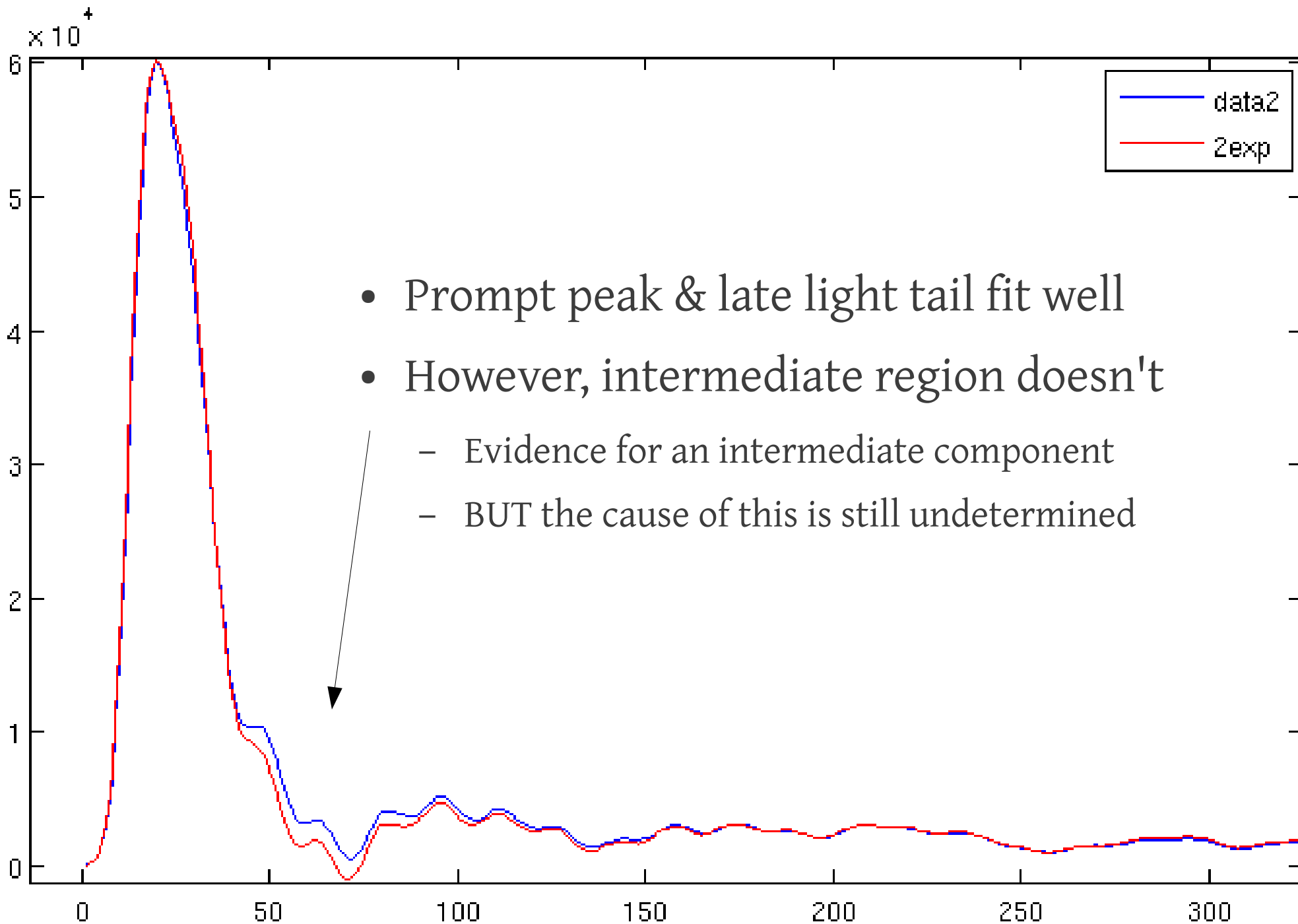
Start with a large parameter space

chi<sup>2</sup> values for 2-exp fit



Sanity check: can tell by eye that fits are getting better as well



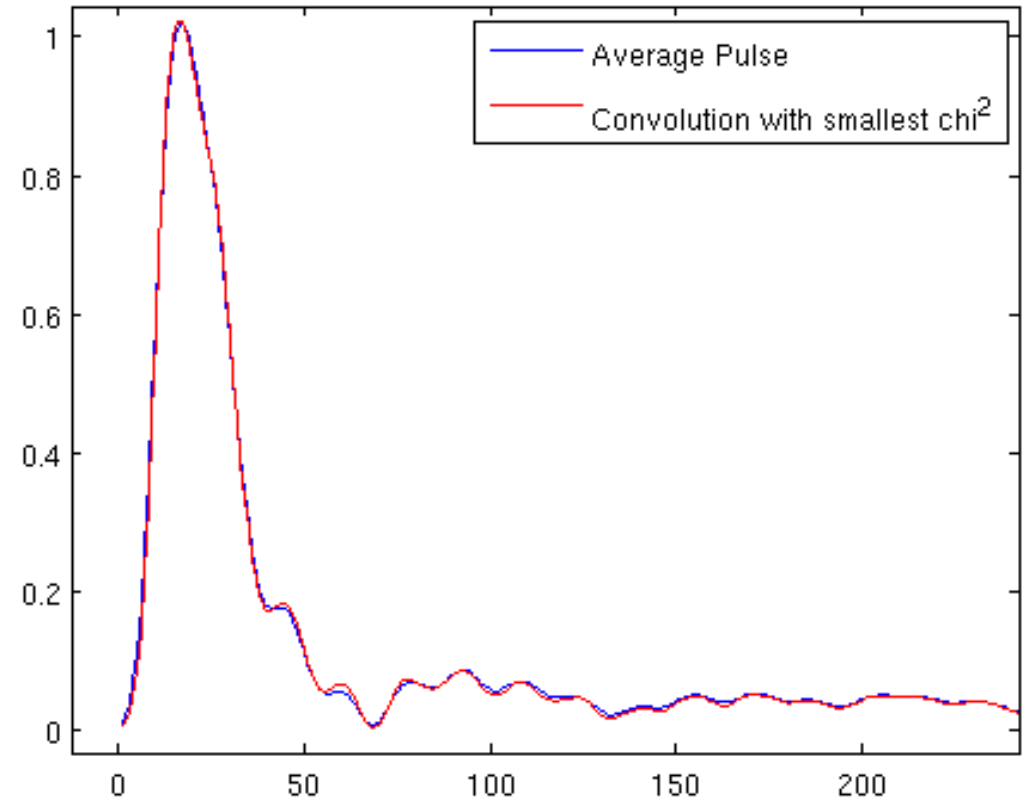
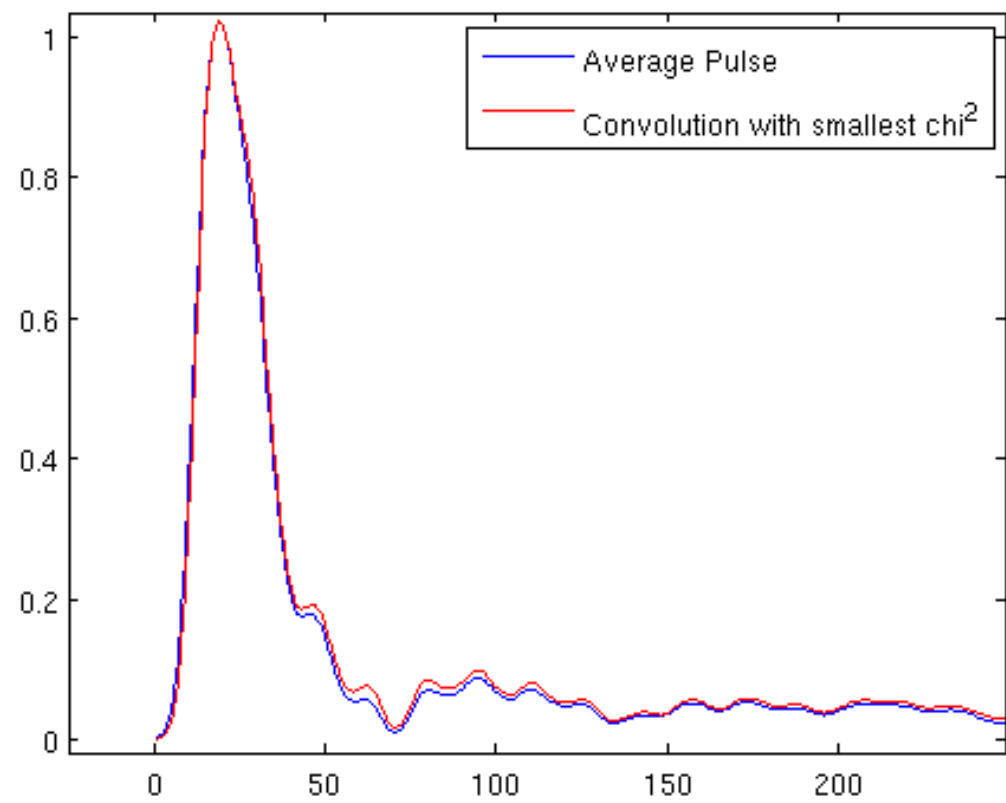


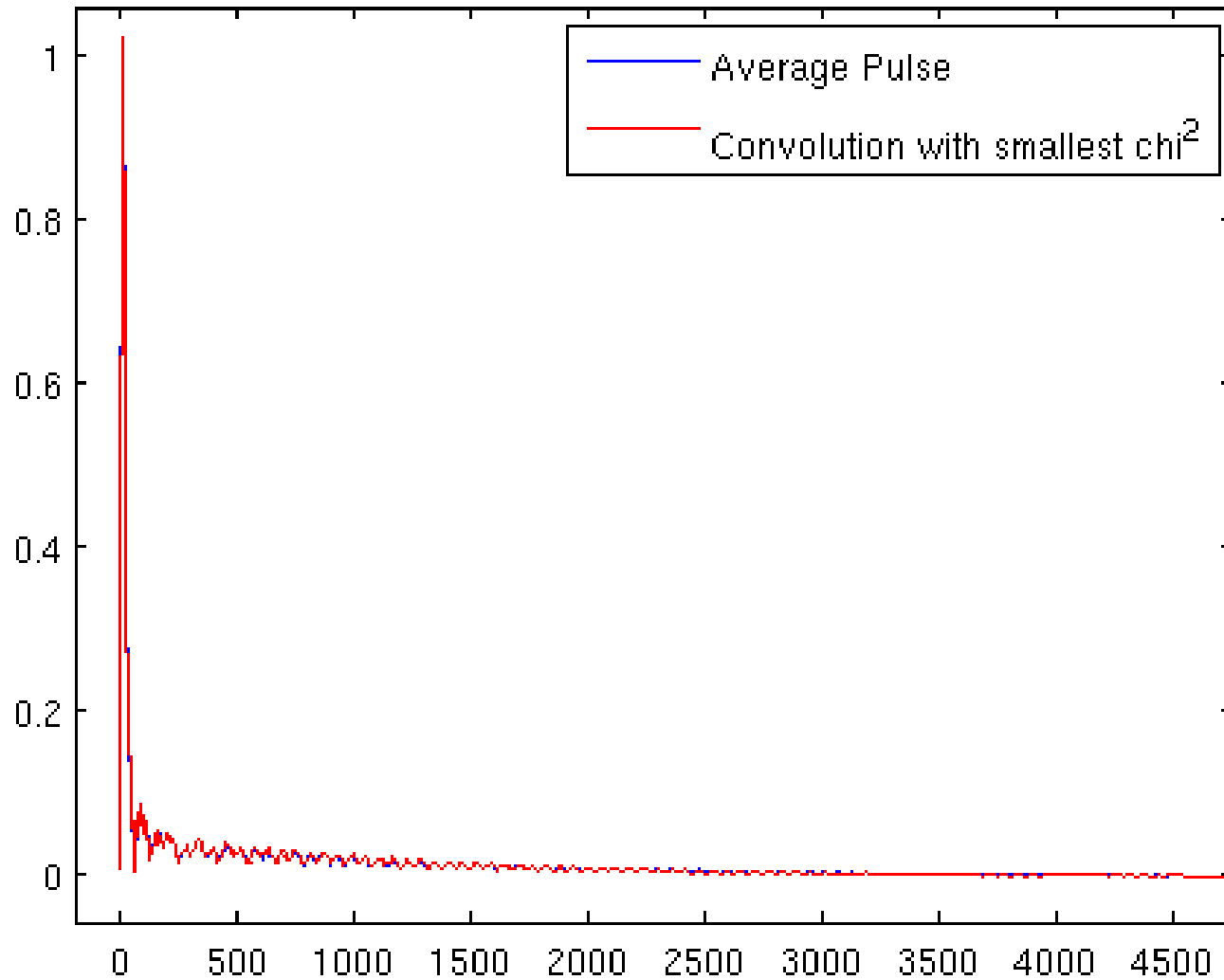
# 3 exponent fits

- Same as before, but with 6 parameters
  - Float amplitudes again to reduce this down to 3D
  - Output local minimum in this parameter space
- Repeat with new parameters & narrow down in parameter space



Here too, can tell by eye that fits are getting better





- Best 3-exp fit so far
- Time Constants:
  - Late: 1391 ns
  - Int: 23.09 ns
  - Prompt: 3.55 ns