

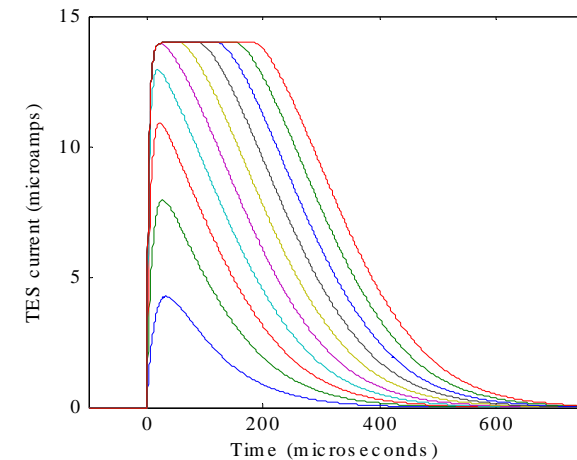
Practical Considerations in Optimal Filtering of Transition Edge Sensor Signals

C H Whitford, W M Bergmann Tiest, A D Holland

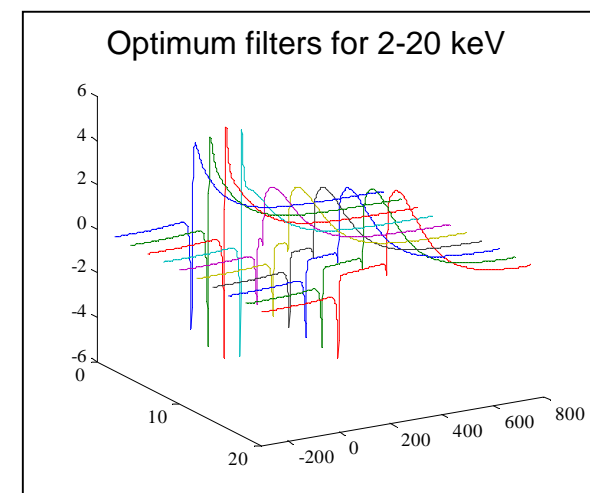


- This is a theoretical analysis of the optimum filtering for TES signals from a microcalorimeter.
- The TES is non-linear, and the noise statistics also vary through the pulse.
- A single filter will not give low noise for all energies - an optimum filter has to be matched to each energy.
- This requires some method for computing the optimum filter - interpolation between a set of pre-computed filters.
- Optimum filters computed from a mathematical model of the TES microcalorimeter.
- They are not well-suited to interpolation! Large spikes and rapid changes with energy.

Simulated TES outputs for 2-20 keV

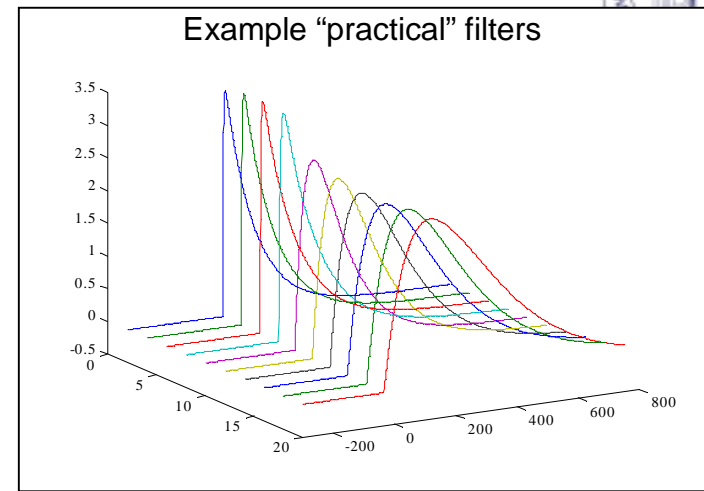


Optimum filters for 2-20 keV





- There are also factors such as pulse pile-up and baseline subtraction which influence the choice of filters.
- We need “better shaped” filters. The top figure is an example. These are the sum of 2 exponentials, with the time-constants optimised for best resolution at each energy.
- Although these are nothing like the optimum filters, the resolution is almost as good.
- Our paper gives the mathematical background, and a practical algorithm for applying these filters.



Noise performance versus energy

