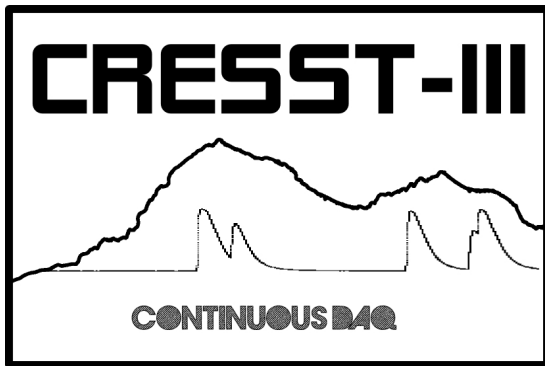


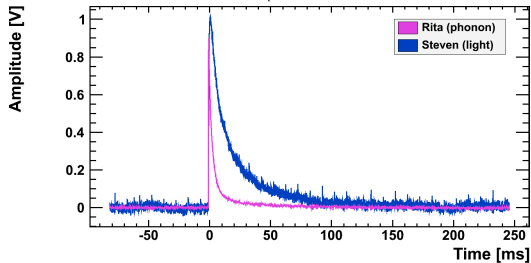
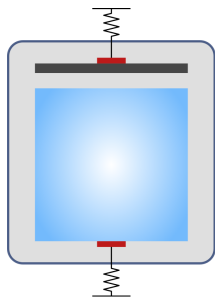
A NEW DAQ FOR CRESST-III



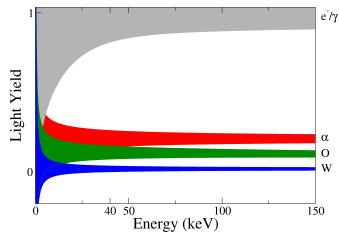
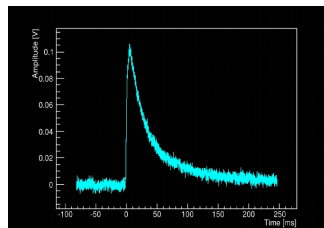
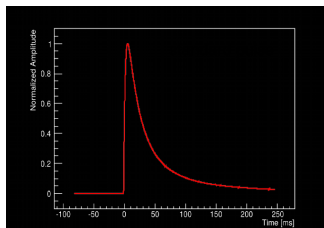
Nahuel Ferreiro Iachellini
IMPRS Workshop Ringberg 2016
June 6, 2016

- 1 In CRESST-II
 - Data readout
 - Data analysis
- 2 In CRESST-III
 - New DAQ
 - Integration in CRESST
 - Example of adaptive algorithm
- 3 First glimpse

What we record from the detector

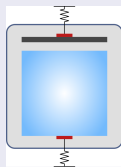


How we look at the data

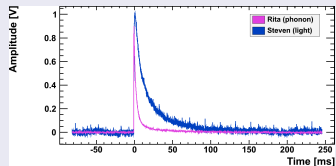


Methodological mismatch

Trigger

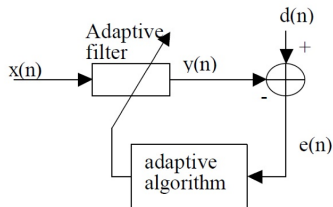


$\otimes H$



\neq

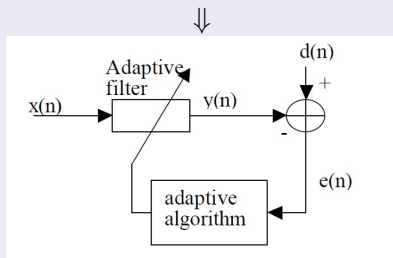
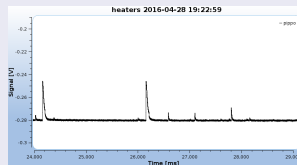
Analysis



Analisis



Continuous read



Complication: Our Cryogenic apparatus is not just a cold box

- Detectors are kept at constant temperature via feedback on artificially injected pulses
- Detectors response is measured over the entire energy range by means of small artificial pulses
- The cryostat is surrounded by plastic scintillator (muon veto)

Everything needs to be properly timestamped!

Synchronization with the existing system:

- The same clock serves the existing control system and the new DAQ
- Control system and data stream are started together
- Time stamps in the control system are equivalent to time position in streamed data

Example of adaptive algorithm

Increase of knowledge after data acquisition (useful for trigger):

- Detector's response (standard pulse)
- Noise Power Spectrum

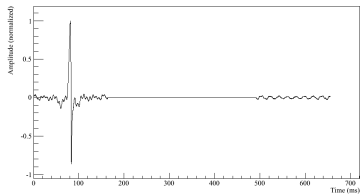
These are the ingredients of a class of filters named optimum filters. For triggering purpose the key quantity is the signal-to-noise ratio, which defines our chances to spot an event over a noisy baseline

Transfert function to maximize S/N:

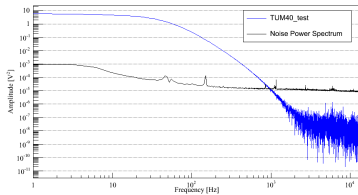
$$H(\omega) = K \frac{S^*(\omega)}{\langle N(\omega)^2 \rangle} e^{-it_M \omega}$$

Example of adaptive algorithm

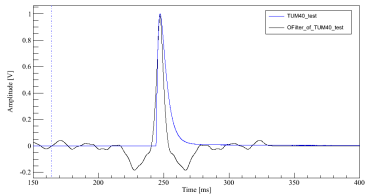
Zero Padded Kernel



Spectral Density

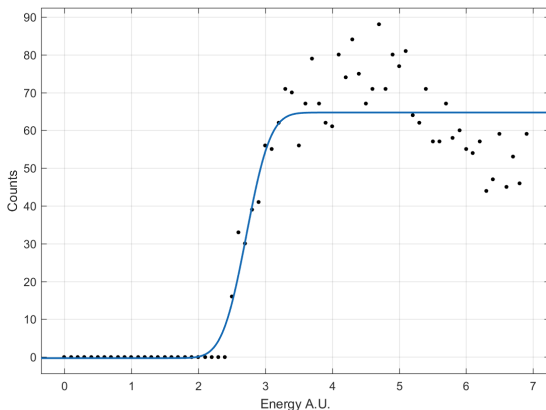


Pulses



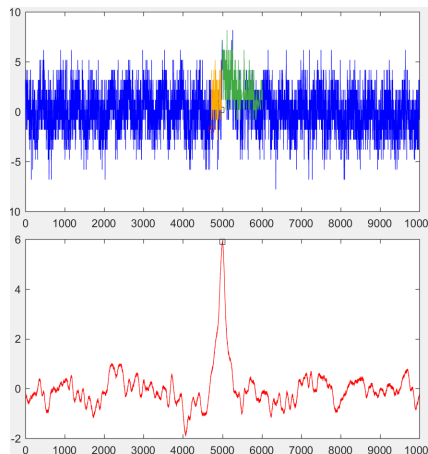
Measurement in Munich

- Small Si chip (iStick-design)
- Artificial pulses only
- Trigger threshold: $\sim \text{erf}(E - E_{th})/\sqrt{2}\sigma \simeq 1.75\text{rms}$ of baseline noise



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Thank you for your attention