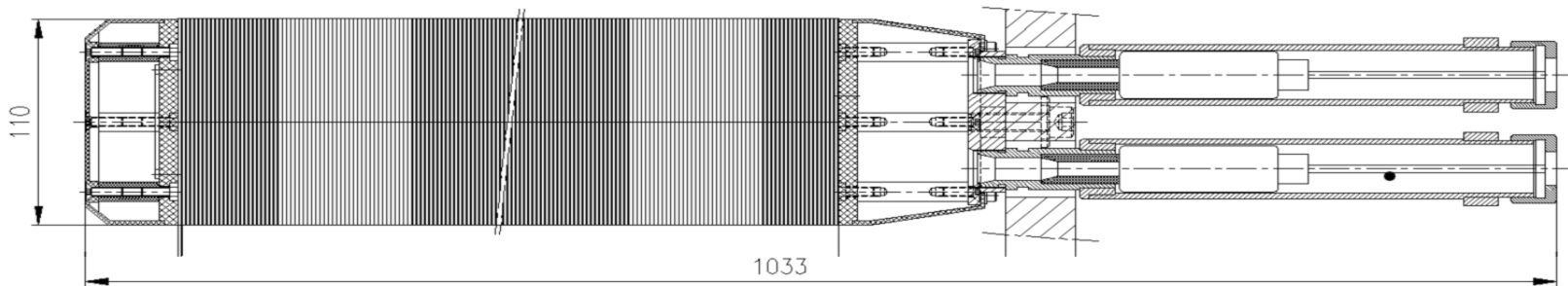
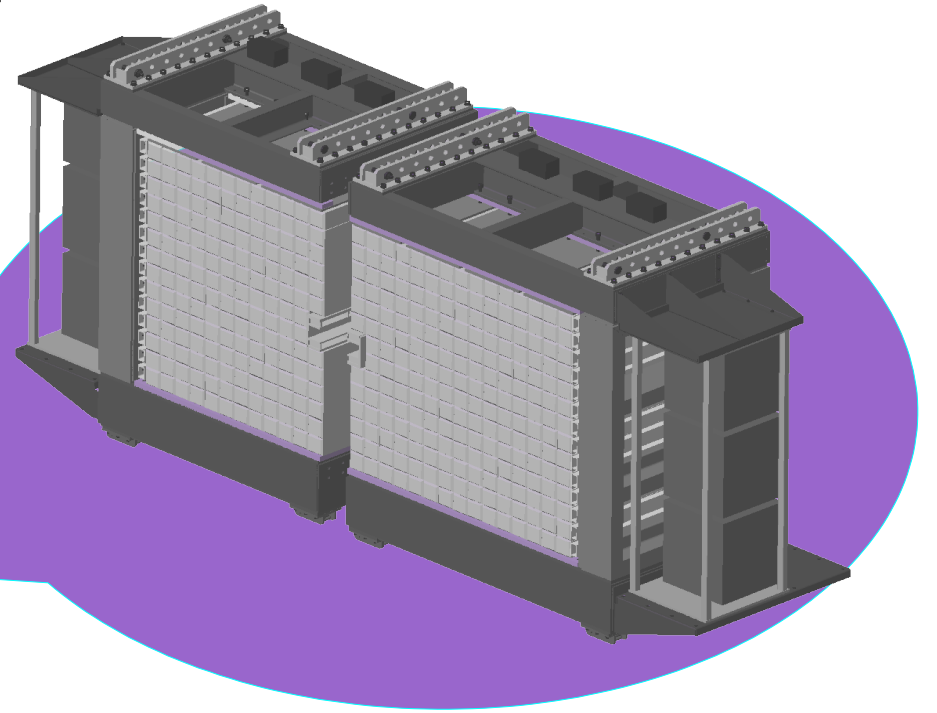
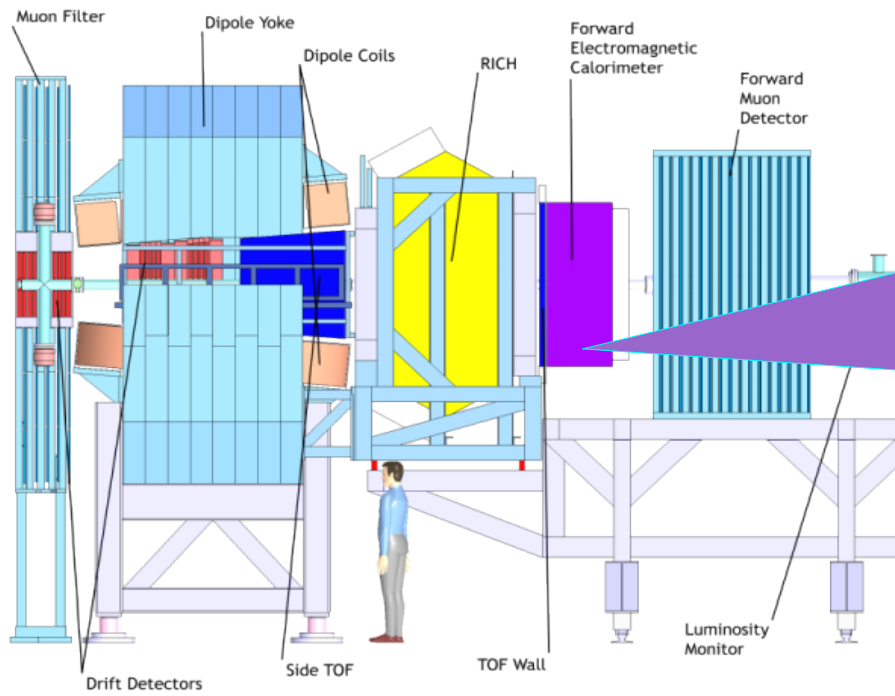


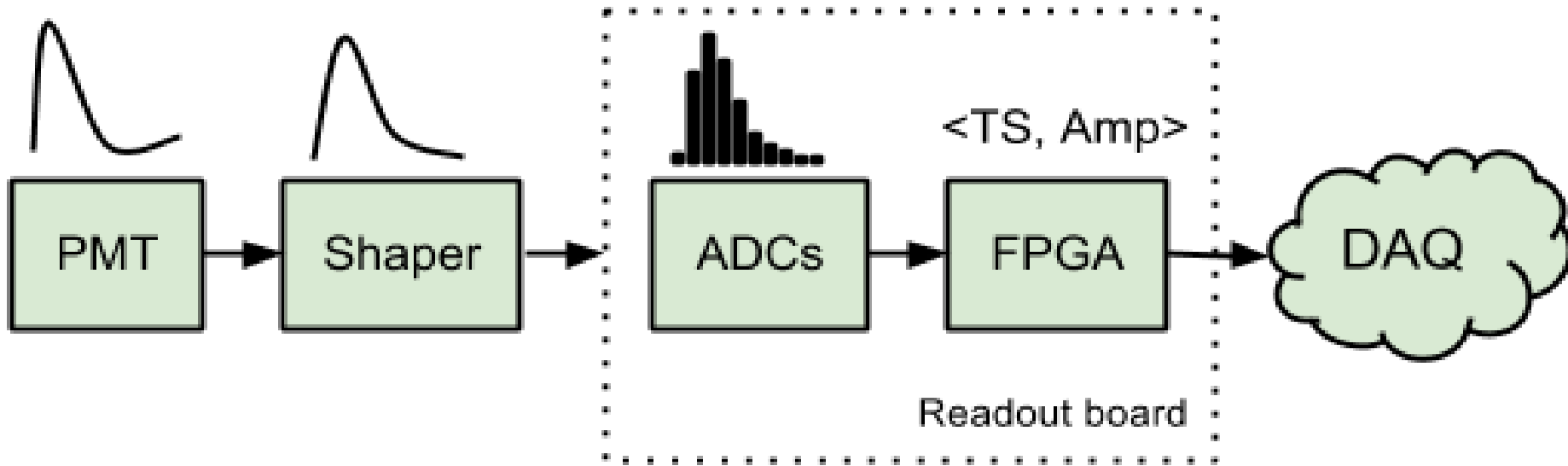
Approach to pile-up resolution in FSC

Sergey Ryzhikov, IHEP@Protvino, Russia

Forward Shashlyk Calorimeter



Shashlyk Readout



Feature Extractor output (message types):

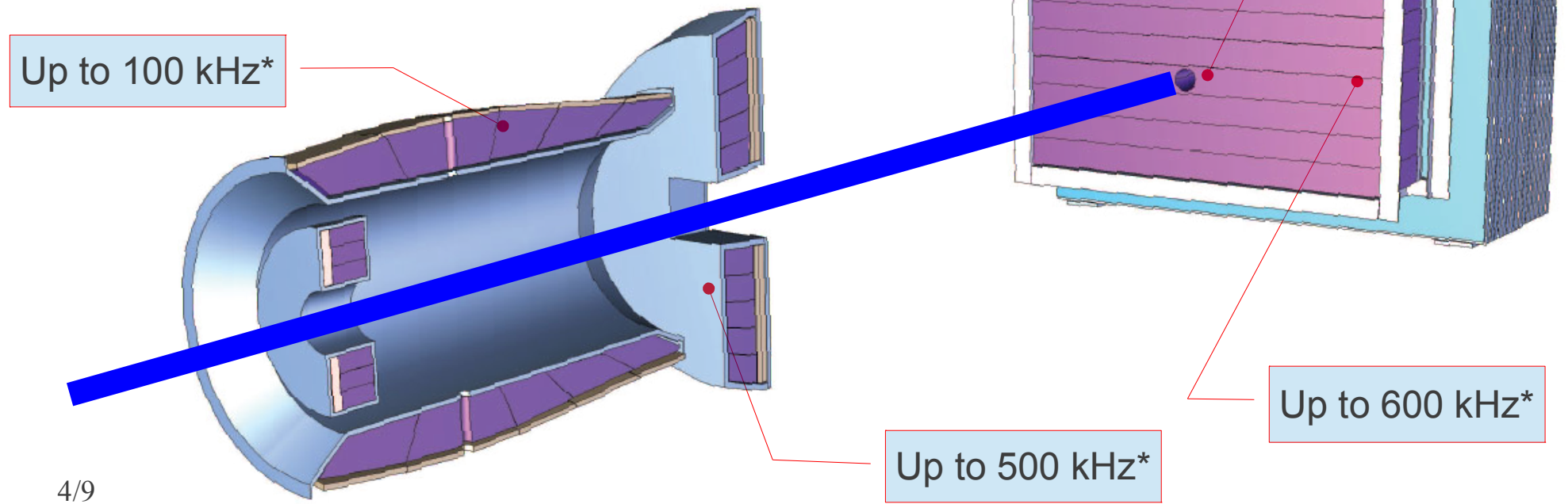
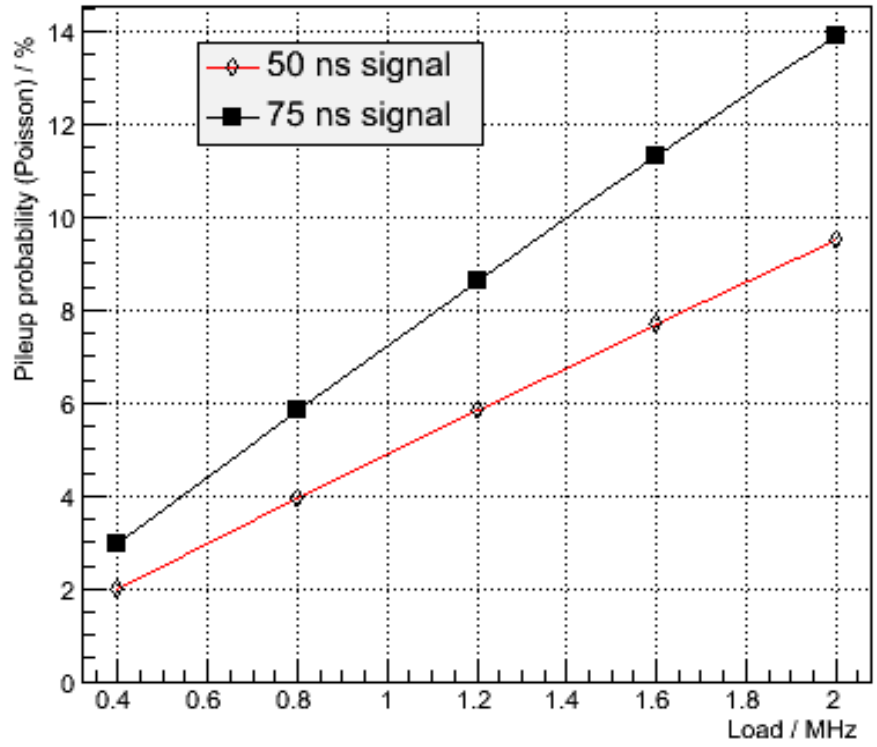
Event: `<type 01><Amplitude 14 bit><Timestamp 14 bit><PileUp 1bit><Reserved 1bit>`

Sync: `<type 10><Global Timestamp>`

Status: `<type 11><StatusFlags 30 bit>`

Lump: `<type 00><Magic><Length><Data ,,,>`

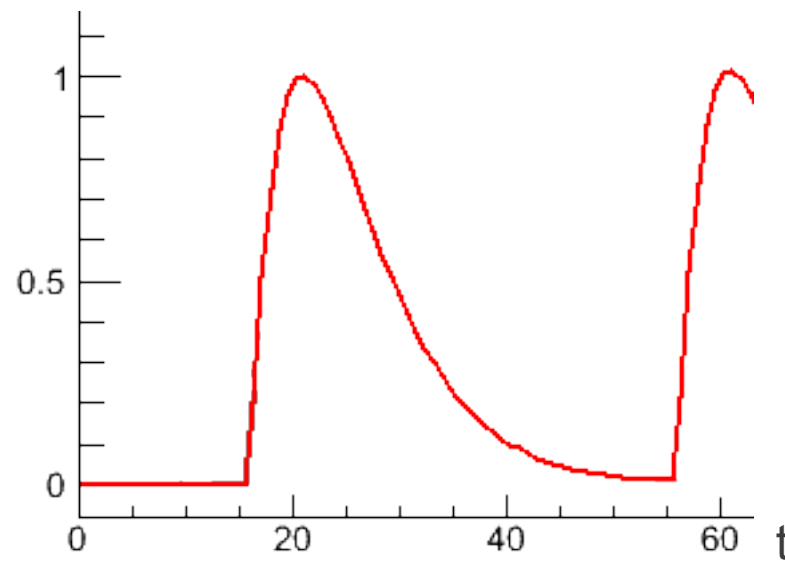
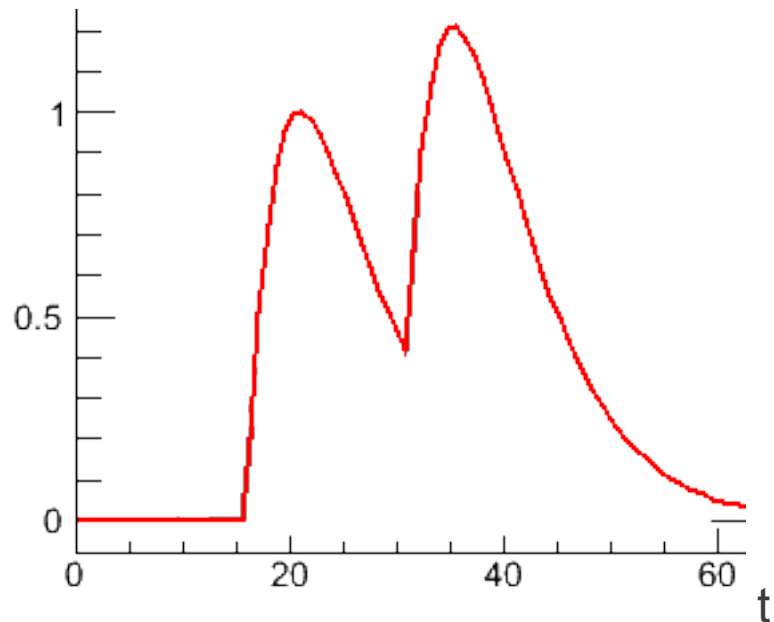
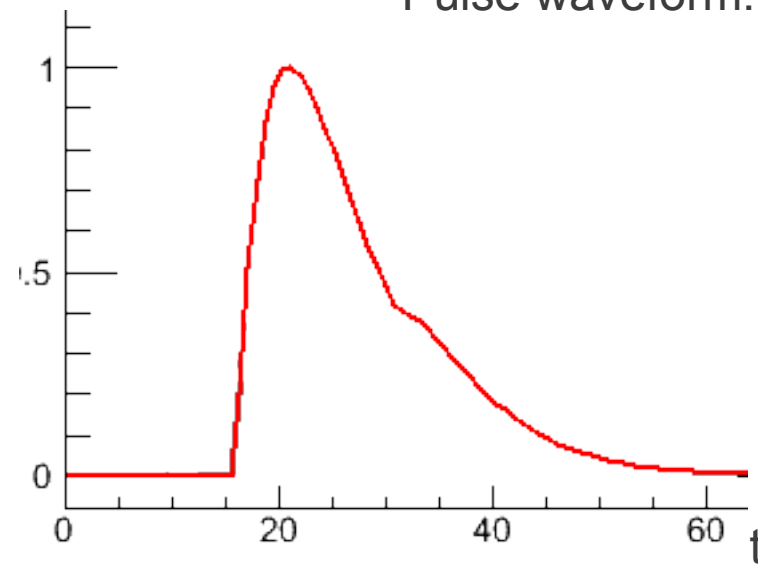
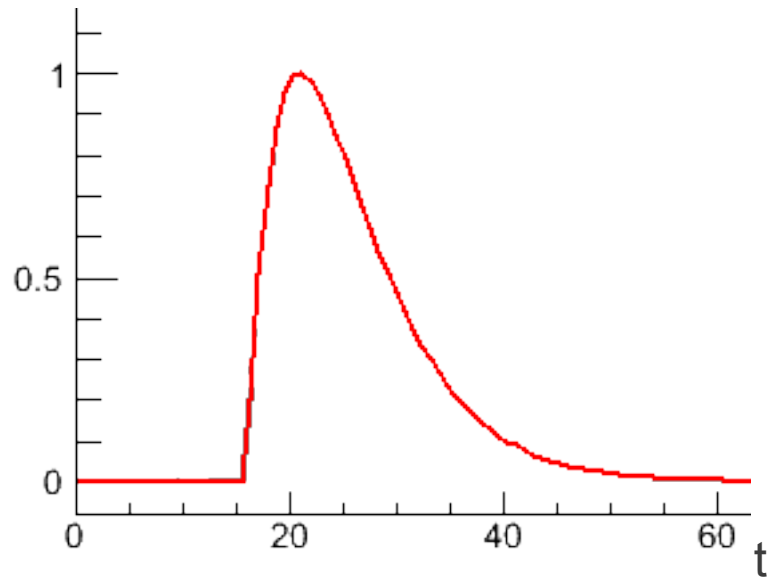
High event rates in central cells



*maximum rate per cell/crystal.

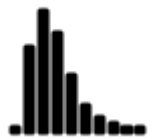
Pile-up variants

Pulse waveform: $t e^{-t/\tau}$

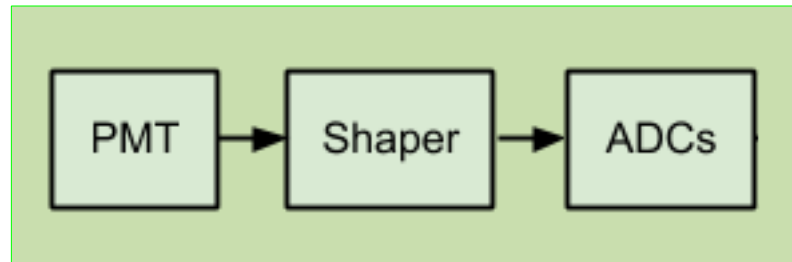


Deconvolution

$$y(t) = p(t) * g(t)$$



= | *



$$P(s) = \frac{1}{G(s)}$$

$$G(s) = L\{g(t)\}$$

$$H(z) = H(s)_{z=e^{sT}}$$

1) $y(t) = t e^{-t/\tau}$

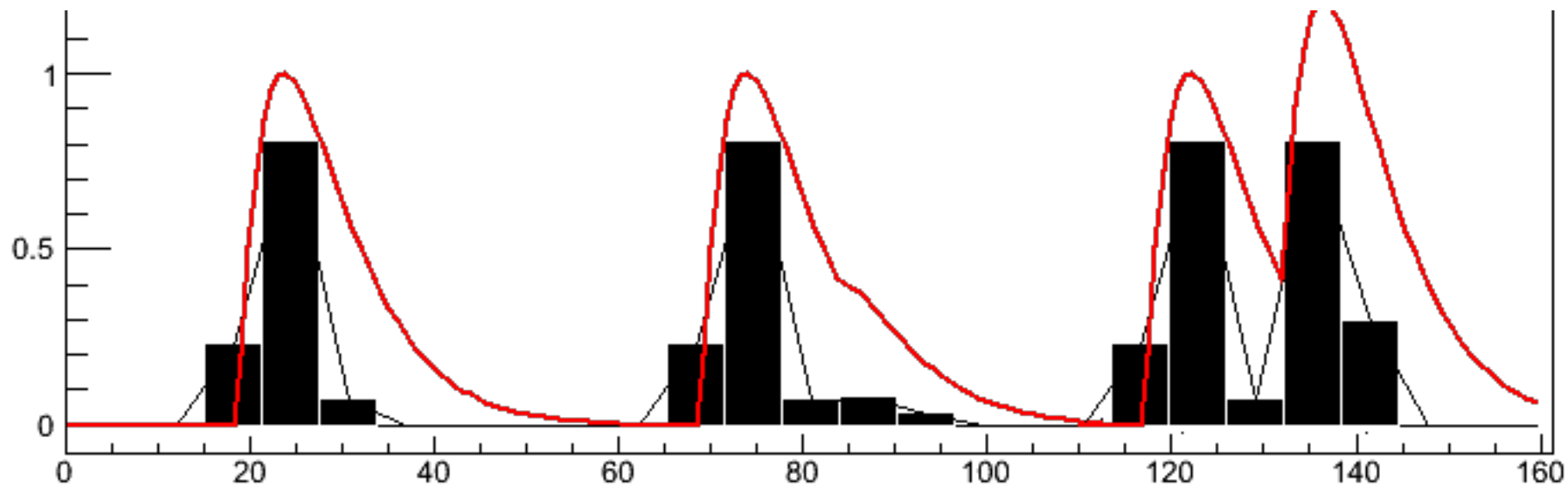
$$p(z) = z^2 - 2ze^{-T/\tau} + e^{-2T/\tau}$$

2) $y(t) = t^2 e^{-t/\tau}$

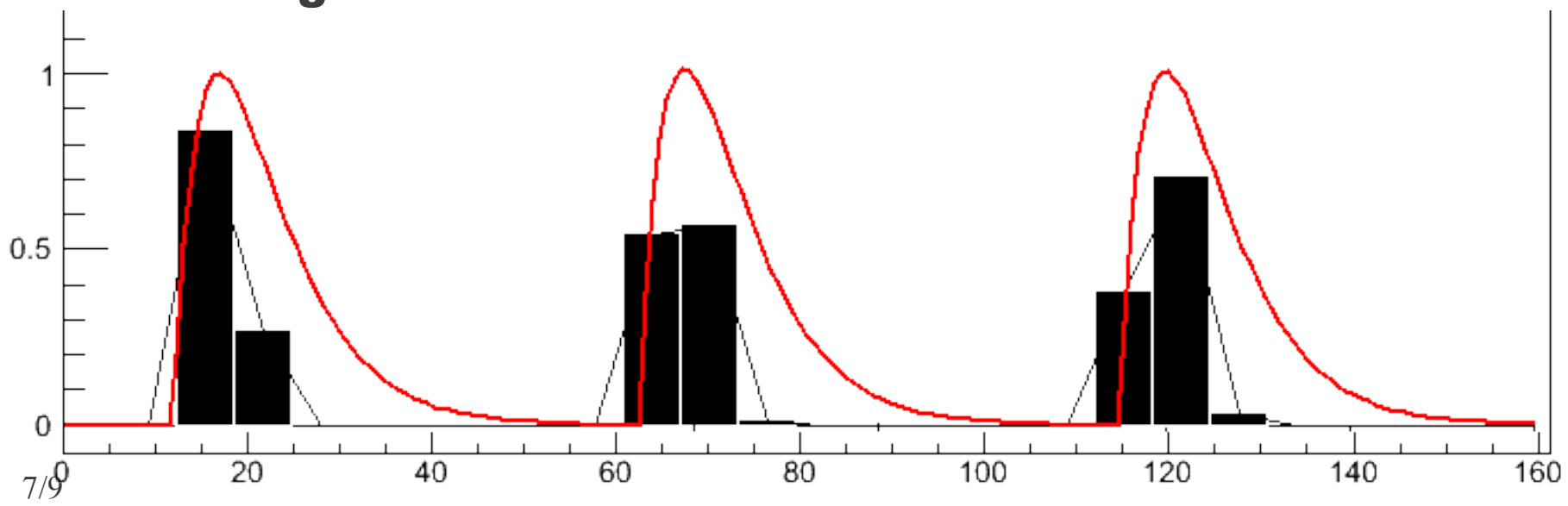
$$p(z) = z^3 - 3z^2 e^{-T/\tau} + 3ze^{-2T/\tau} - e^{-3T/\tau}$$

Pile-up detection and resolution

Pulse waveform: $t e^{-t/\tau}$



Timing



Planned work

- Make the feature extraction algorithm model.
- Implement pile-up detection algorithm in FPGA.
- Make a setup with PMT and pulse generator, check algorithms and ideas with real-world data.

Thanks.