Search for a Backscattering Signal in the MCP-PMT High-B Measurements Data (Summer 2017, 10-μm Planacon)

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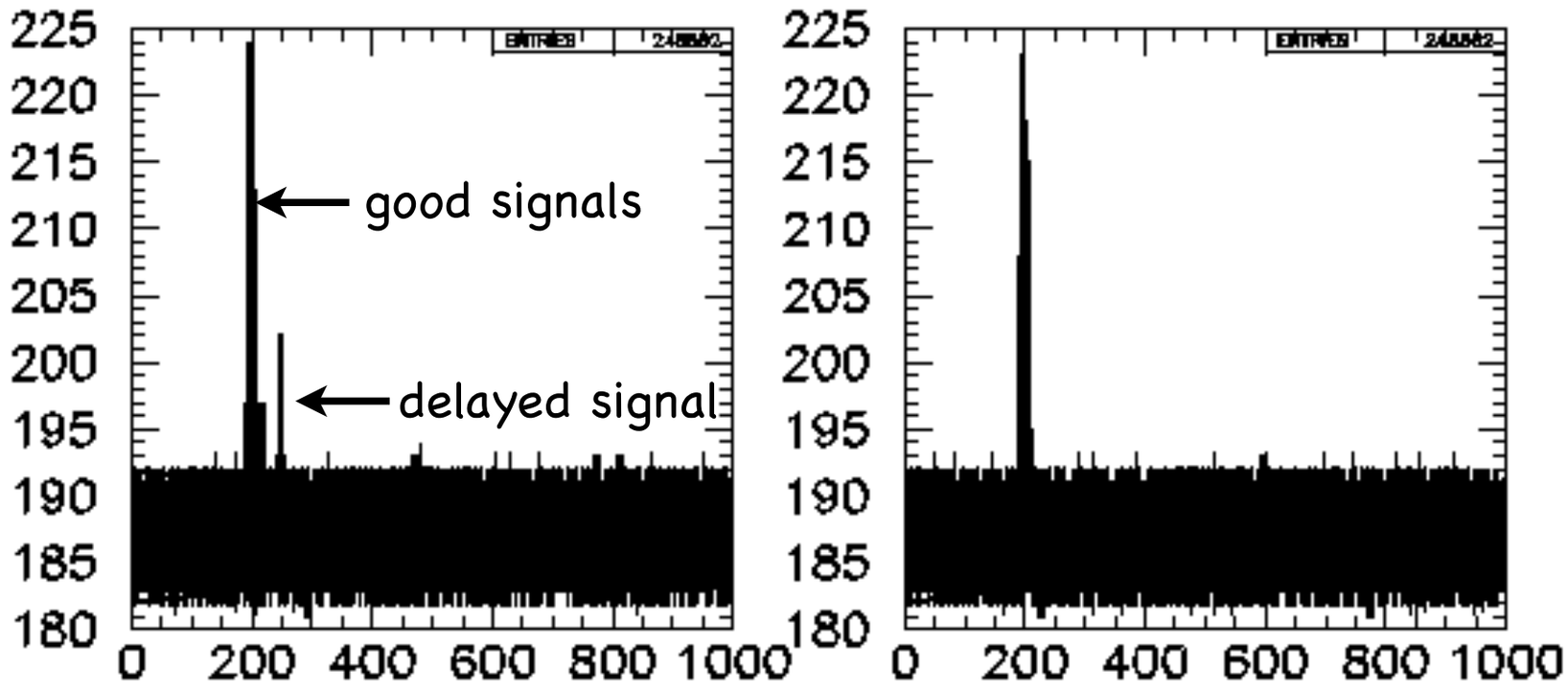
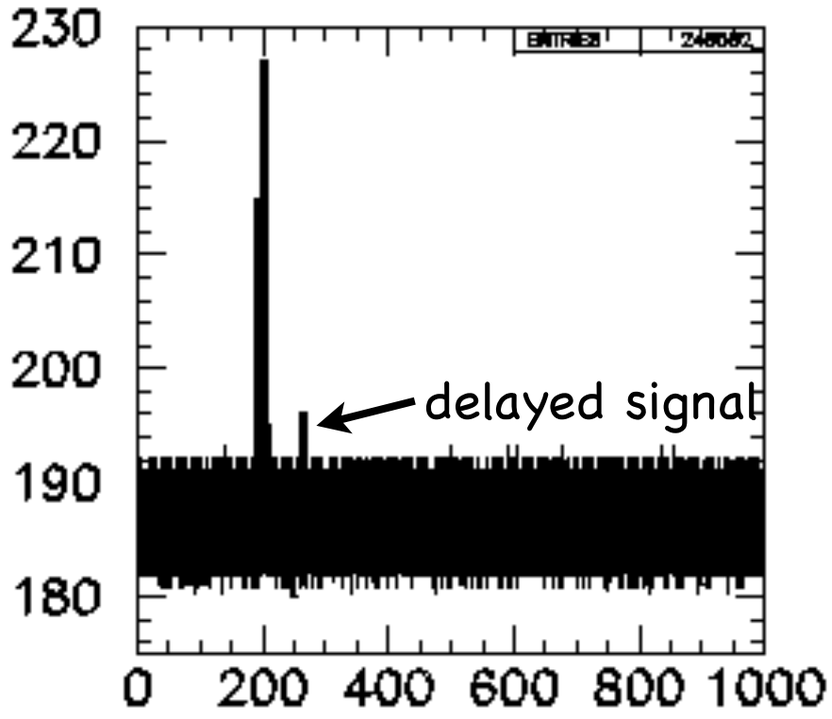
Issue: Operating the PMT at a high voltage close to the maximum allowed value increases the chance for ion back-scattering. Long-time operation in this conditions would damage the photocathode.

First look at a small sample of waveforms





θ=0°, B=0 T, -2.5 kV (89% of V_{max})

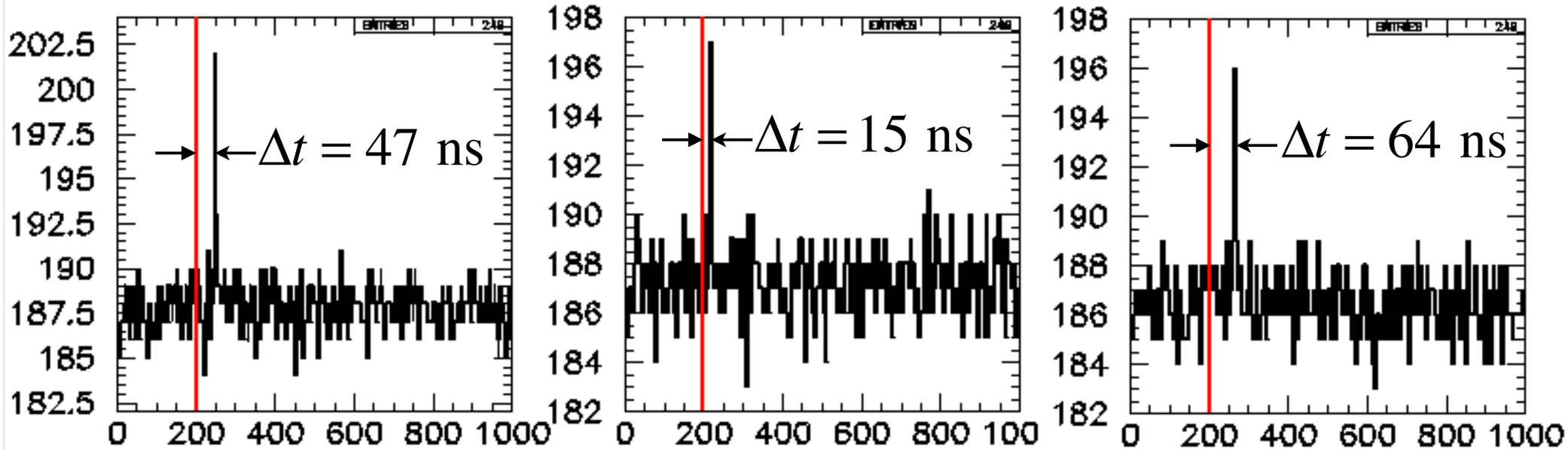
1000 waveforms in each figure

search for delayed signals

ball-park estimate: about 3 delayed signals found (0.1%)

First look at a small sample of waveforms
Delayed signals

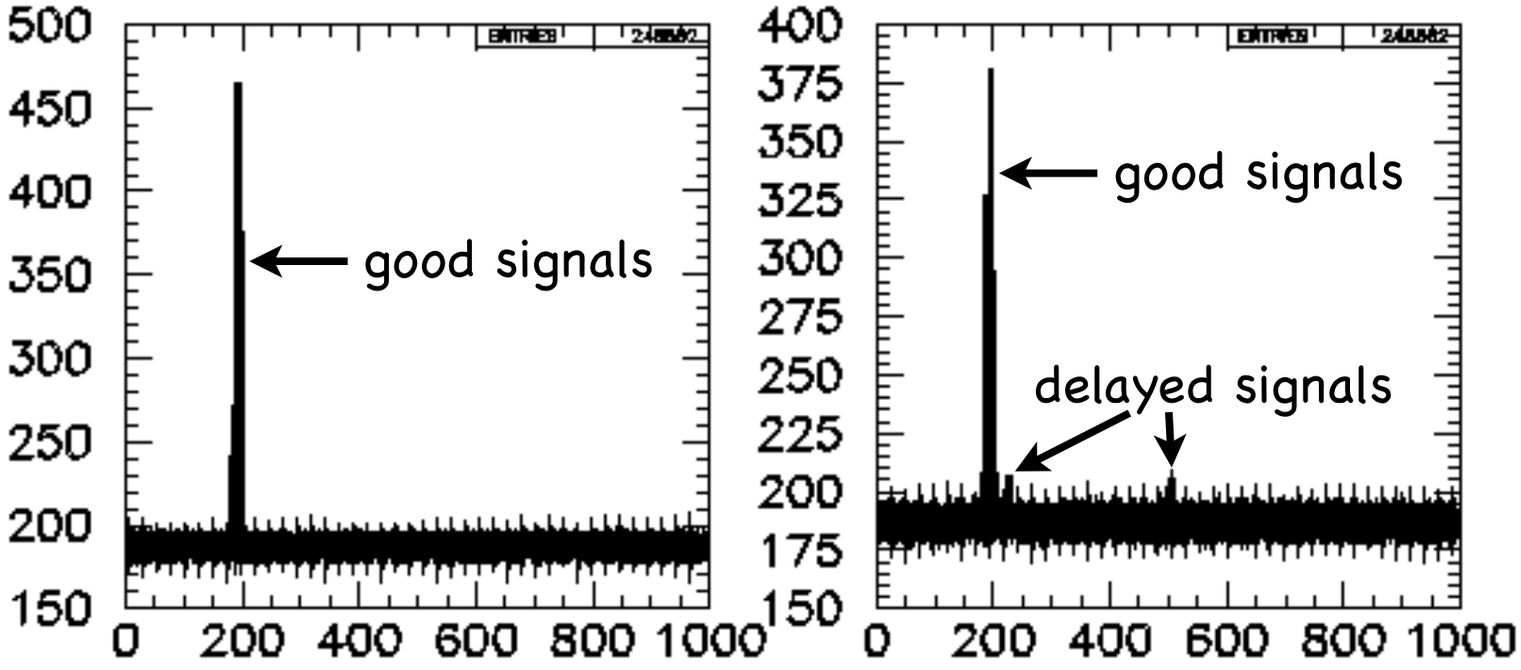
θ=0°, B=0 T, -2.5 kV (89% of V_{max})

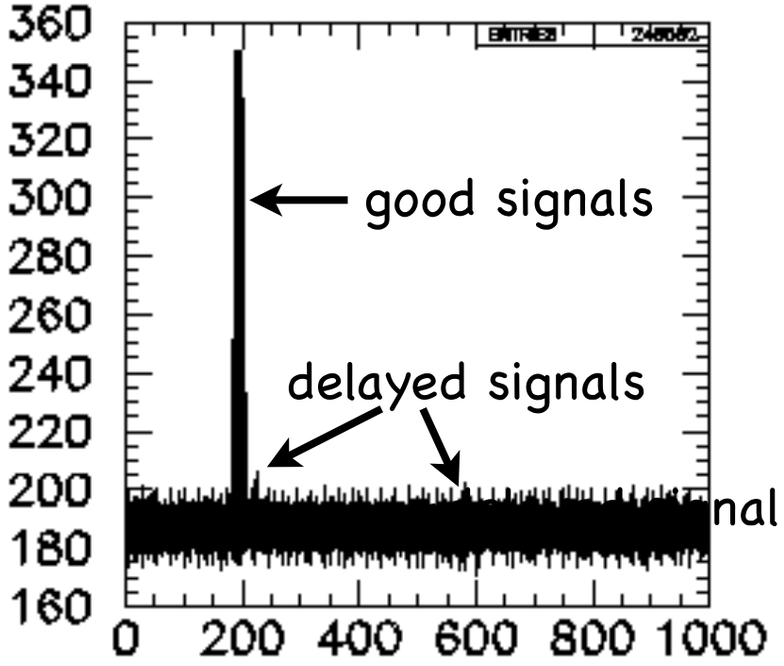


Two of the waveforms look like a regular signal, but delayed - could be due to fADC instability or another electronics problem

The waveform featured in the middle panel seems to have an excess of amplitude with a delay of about 600 ns - backscattering pulse?

First look at a small sample of waveforms





θ=0°, B=0 T, -2.7 kV (96% of V_{max})

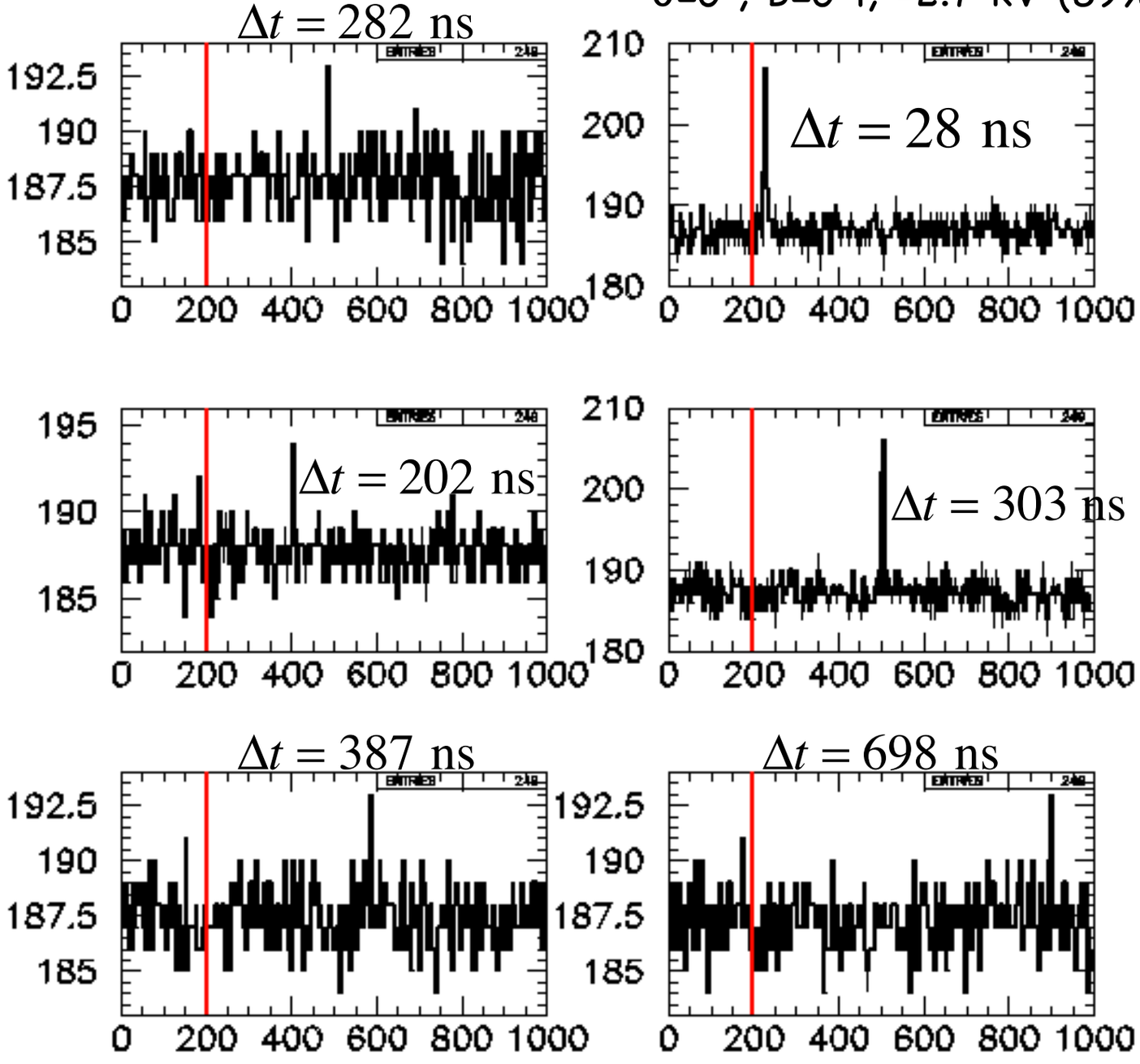
1000 waveforms in each figure

search for delayed signals

ball-park estimate: about 10 delayed signals found (0.3%)

First look at a small sample of waveforms
Delayed signals

θ=0°, B=0 T, -2.7 kV (89% of V_{max})



Future

More sophisticated analysis of the waveforms?

Do we have sufficient resolution?

Should we think of using an oscilloscope instead?