PMT pulses - ac coupling, undershooting, time constant

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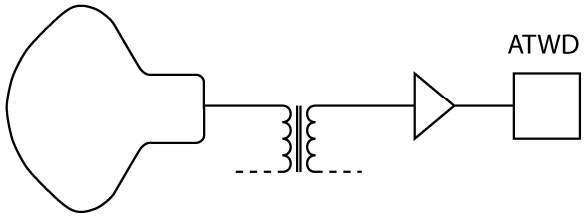
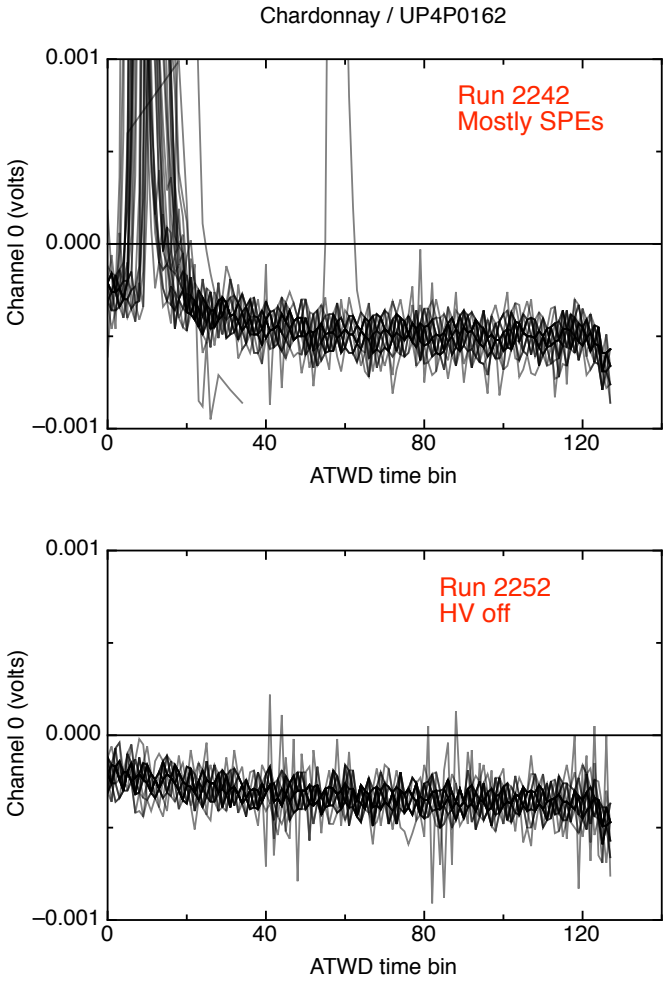
UCBerkeley meeting 3/05

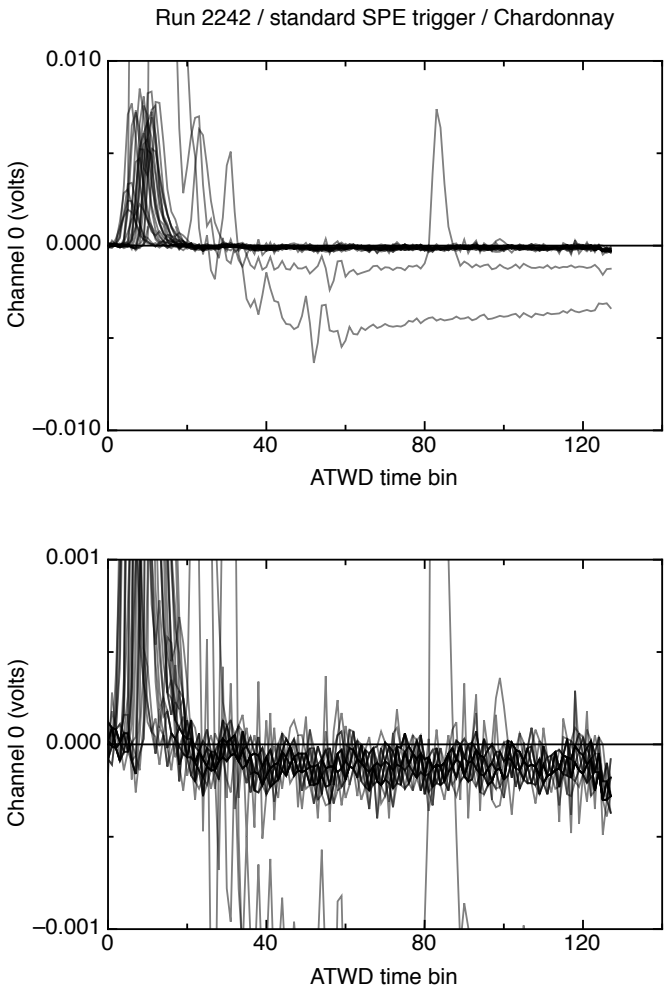
PMT signal is AC coupled



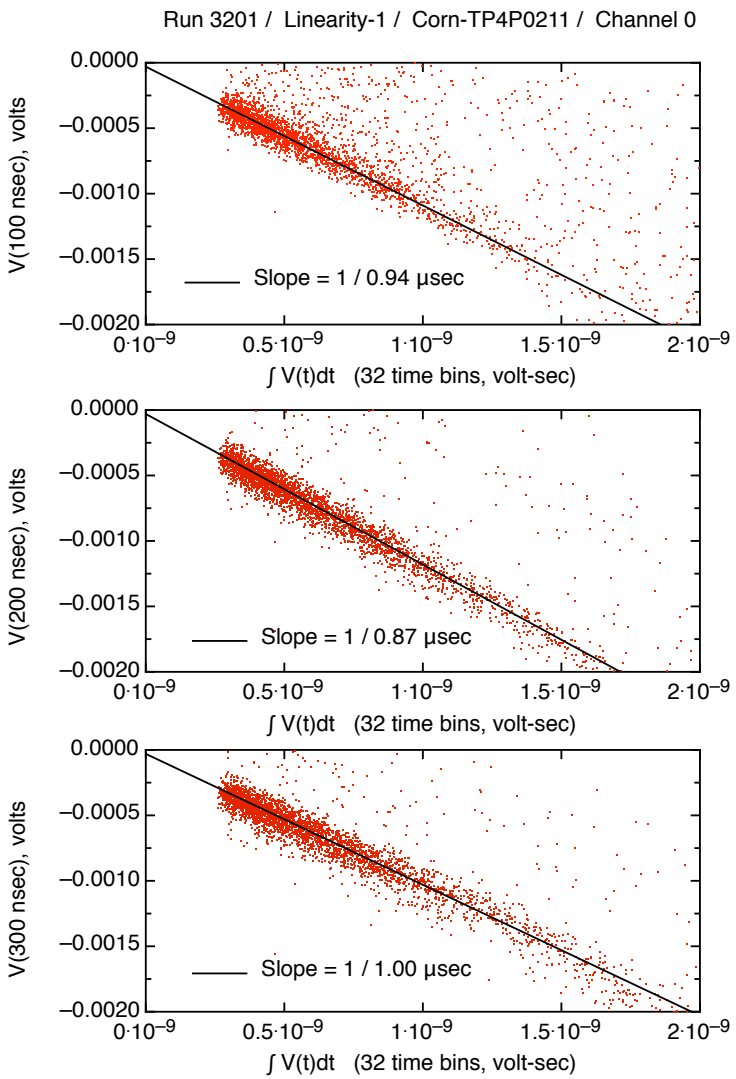
- Pulses should be followed by negative "undershoot" so overall time average = 0
- Some "baseline shift" is seen in SPEs (using full DOMCAL constants), about –0.2mV or –0.3mV
- A similar "shift" is seen even in events with no pulses (pedestal runs, HV off)
- Conclude that pedestals from DOMCAL should not be taken at face value (J. Kelley & J. Braun are correcting this)
- Until DOMCAL is improved, need to subtract off smooth pedestal correction curve.



- After pedestal fix, there is still a change in baseline from before to after the pulse, but it's smaller.
- The remaining undershoot implies a particular value for the decay time constant... what is it and is it consistent with observations?



- Sample the waveform 100nsec, 200nsec and 300nsec after peak position
- Plot vs. area of pulse
- Undershoot is proportional to area of pulse, as expected for a true undershoot

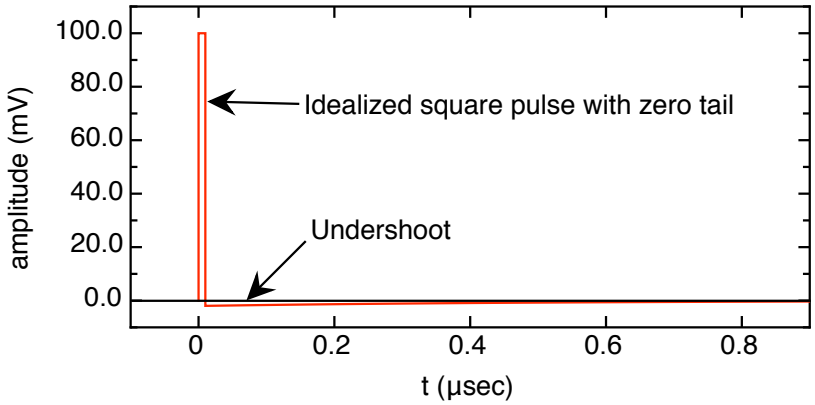


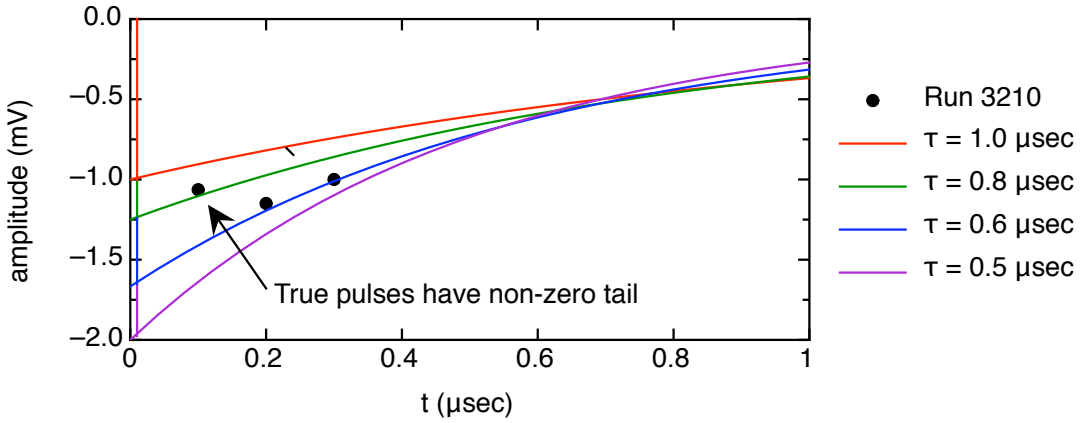
Undershoot after narrow pulse

- Best fit is τ=600 nsec
- For simple AC coupling, this would apply to decay of long PMT pulse, not just tail.
- Seems pretty short, maybe it's wrong?

Suppose pulse area = 1 mV• μsec

$v(t) = -(1/\tau)\exp(-t/\tau)$ (units mV, μsec)





- One sample pulse that's big enough to see the decay rate in the undershoot position...
- We have always planned to measure response to steady 1 microsecond pulse (FAT linearity test)... still to be done