

APV25 Shape Time Tuning

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Introduction

- ▶ Goal is to set APV parameters to shorten the preamp pulse
- ▶ Pulse shape is currently a 2 parameter fit. Sample fits shown
- ▶ Analyzed pulse shapes for various fit parameters for shortest pulse width
- ▶ Ran over both parameters from $Isha \in [10, 100]$ and $VFS \in [0, 100]$ in increments of 10 and showed how fit parameters depend on these
- ▶ Ran for Calibration Group 0 and all delays for a single channel 16

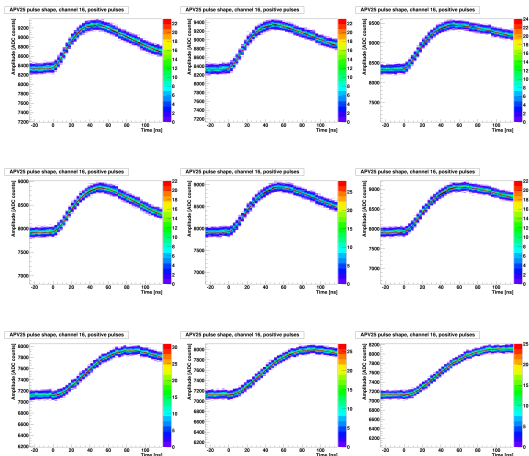
Fit Function

$$f(t) = \frac{\tau_1^2}{(\tau_1 - \tau_2)^3} \left(e^{-\frac{t}{\tau_1}} - \sum_{k=0}^2 \left(\frac{\tau_1 - \tau_2}{\tau_1 \tau_2} t \right)^k \frac{e^{-\frac{t}{\tau_2}}}{k!} \right) \quad (1)$$

- ▶ Pulse shape function is a quadruple RC filter with 3 RC the same (τ_2) and one RC different (τ_1)
- ▶ τ_1 controls the fall time while τ_2 controls the rise time

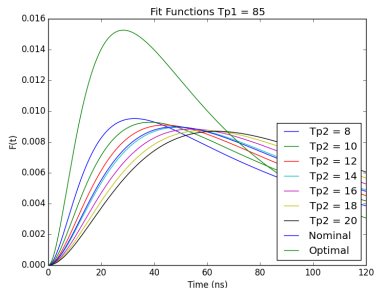
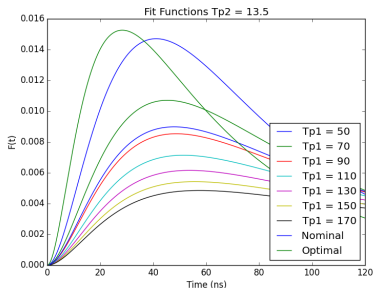
Sample Fits

- ▶ The 2 fit function seems sufficient for ranges $I_{sha} \in [10, 100]$ and $VFS \in [0, 100]$



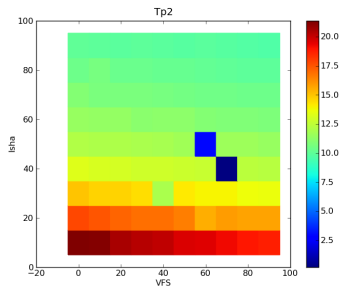
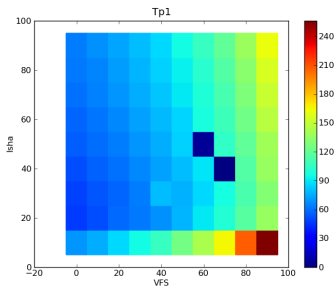
Sample Fits for Various Fit Parameters

- ▶ τ_1 controls the fall time while τ_2 controls the rise time
- ▶ Nominal fit is $Tp1 = 85$ and $Tp2 = 13.5$, which corresponds to $VFS = 60$ and $Isha = 34$
- ▶ Optimal fit is $Tp1 = 50$ and $Tp2 = 8$, (as low as possible)



Fit Parameters for Various Shaping Parameters

- ▶ Tp1 depends more on VFS, and Tp2 depends more on Isha
- ▶ Low VFS and high Isha appear to be optimal
- ▶ Push the boundaries to higher Isha?



Conclusions

- ▶ Two parameter fit function appears to work quite well
- ▶ Successful first steps in minimizing the pulse width based on shaping parameters
- ▶ In the near future:
 - ▶ Obtain the T0 resolution for each shaping setting
 - ▶ Look at pulse shapes and individual pulses
 - ▶ Explore higher values of Isha?
 - ▶ Analyze power consumption for various shaping parameters