

Time Constants from Johns Hopkins's Frequency Dependent Fit

Randy Johnson and Firoze Haque
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Data taken at IUCF with the Cincinnati Scintillation Detector

Model:
$$f(t, \sigma, \tau) = \int_0^{\infty} \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(t-t_0)^2}{2\sigma^2}} \frac{1}{\tau} e^{-\frac{t_0}{\tau}} dt_0$$

$$s_i = N_i \left(\frac{r_{1,2}}{\tau_{1,2}} f((t-t_i), \sigma_i, \tau_{1,2}) + \frac{r_3}{\tau_3} f((t-t_i), \sigma_i, \tau_3) + \frac{r_4}{\tau_4} f((t-t_i), \sigma_i, \tau_4) + \frac{(1-r_{1,2}-r_3-r_4)}{\tau_5} f((t-t_i), \sigma_i, \tau_5) \right)$$

Johns Hopkins's Frequency Dependent Time Constants

$$\left. \begin{array}{l} \tau_1 = 0.35 \text{ nsec} \\ \tau_2 = 1.16 \text{ nsec} \end{array} \right\} \text{Lumped together as 1.16 nsec}$$

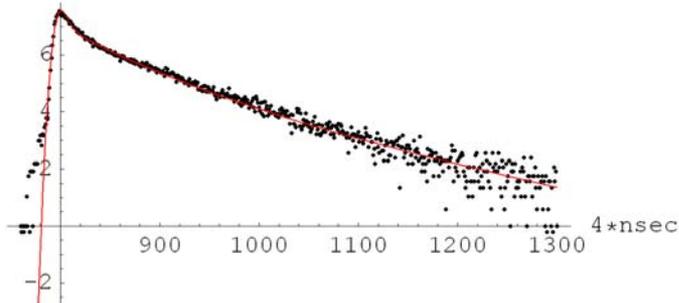
$$\tau_3 = 6.26 \text{ nsec}$$

$$\tau_4 = 14.24 \text{ nsec}$$

$$\tau_5 = 33.03 \text{ nsec}$$

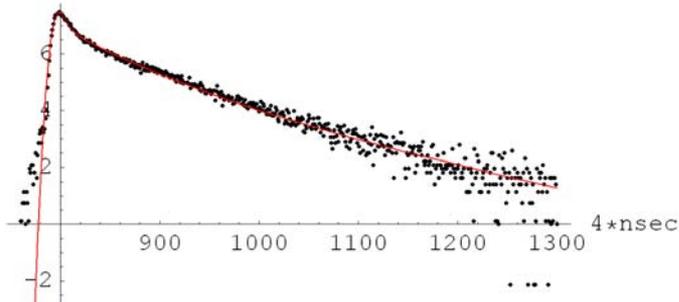
Three PMT Simultaneous Fits

Log[Counts] Data at 4 Hz - JH Exponents



$$\chi^2 / DF = 2577 / 1518$$

Log[Counts] Data at 4 Hz - JH Exponents

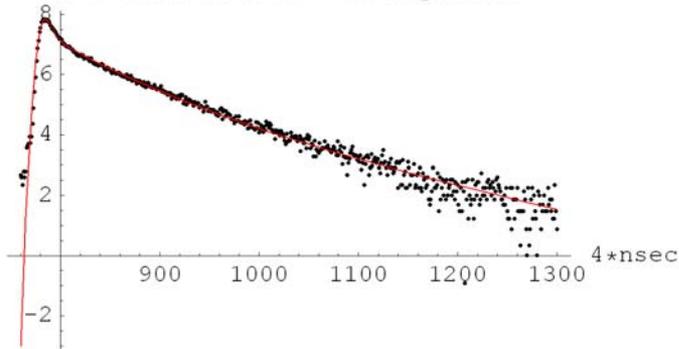


$$r_{1.16} = 0.160 \pm 0.002$$

$$r_{6.26} = 0.068 \pm 0.005$$

$$r_{14.24} = 0.522 \pm 0.004$$

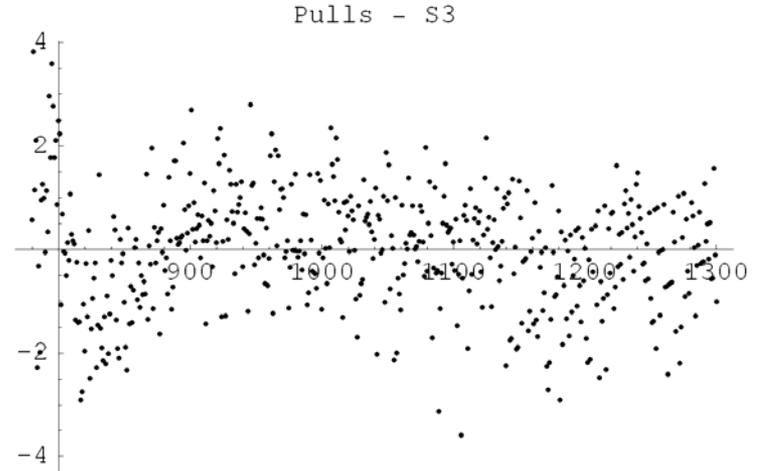
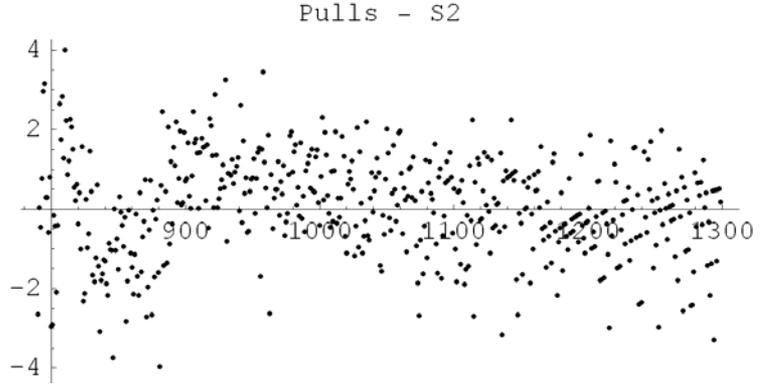
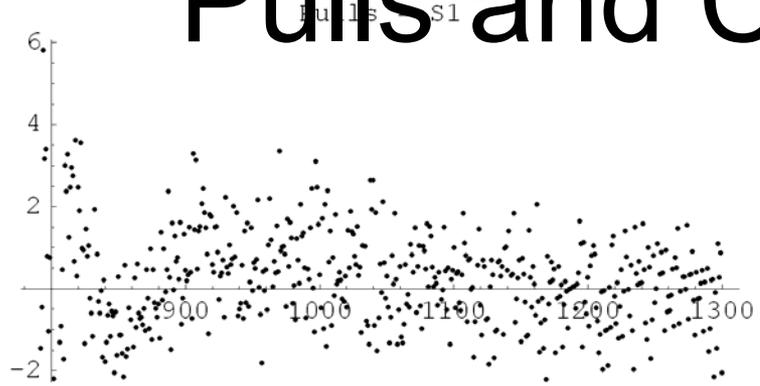
Log[Counts] Data at 4 Hz - JH Exponents



$$r_{33.03} = 0.250 \pm 0.002$$

Red numbers are fit parameters

Pulls and Correlation Matrix



Correlation Matrix

	$r_{1.16}$	$r_{6.26}$	$r_{14.24}$
$r_{1.16}$	1.	-0.817	0.468
$r_{6.26}$	-0.817	1.	-0.844
$r_{14.24}$	0.468	-0.844	1.