Decay time analysis of SMBI pulses

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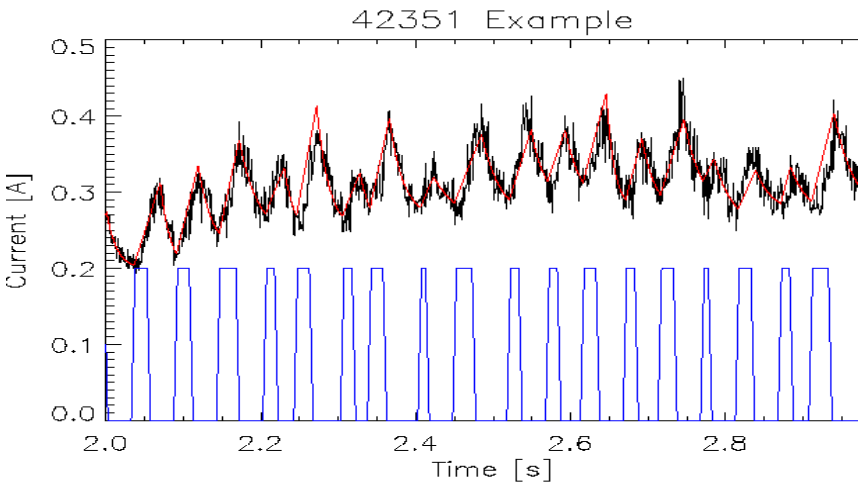
SMBI in density feed-back control observable on probes

- Observed in shot 42211 prior to experiments on Wednesday
- Motivates scheme to use perturbations to measure SOL pump-out time



Simple flux-tube model suggests exponential decay

- Conservation of particles: change in particles related to sources and sinks
- Total flux reduced by recycled quantity
- Simple exponential solution without sources

$$V\frac{dn}{dt} = \Gamma A + S0$$

$$\Gamma = \Gamma_{out} - \Gamma_{in} = (1-R)\Gamma_{out}$$

$$\Gamma_{out} A = Isat \propto nc_s$$

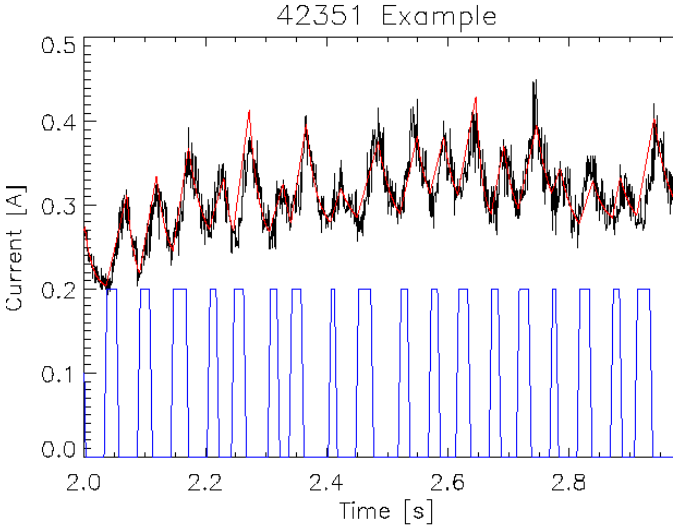
$$\frac{dn}{n} = \frac{(1-R)c_s}{L_{char}} dt$$

$$n(t) = n_0 \exp\left(\frac{(1-R)c_s}{L_{char}} t\right)$$

$$\tau = \frac{L_{char}}{(1-R)c_s}$$

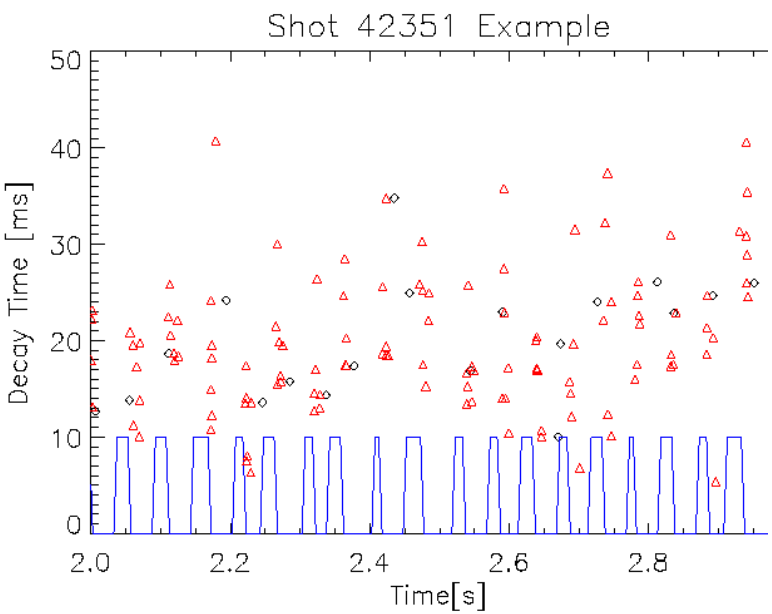
Analysis applied to individual SMBI pulses

- SMBI pulses define window for analysis
- Exponential decay function fit within each window
- Obtains τ throughout discharge

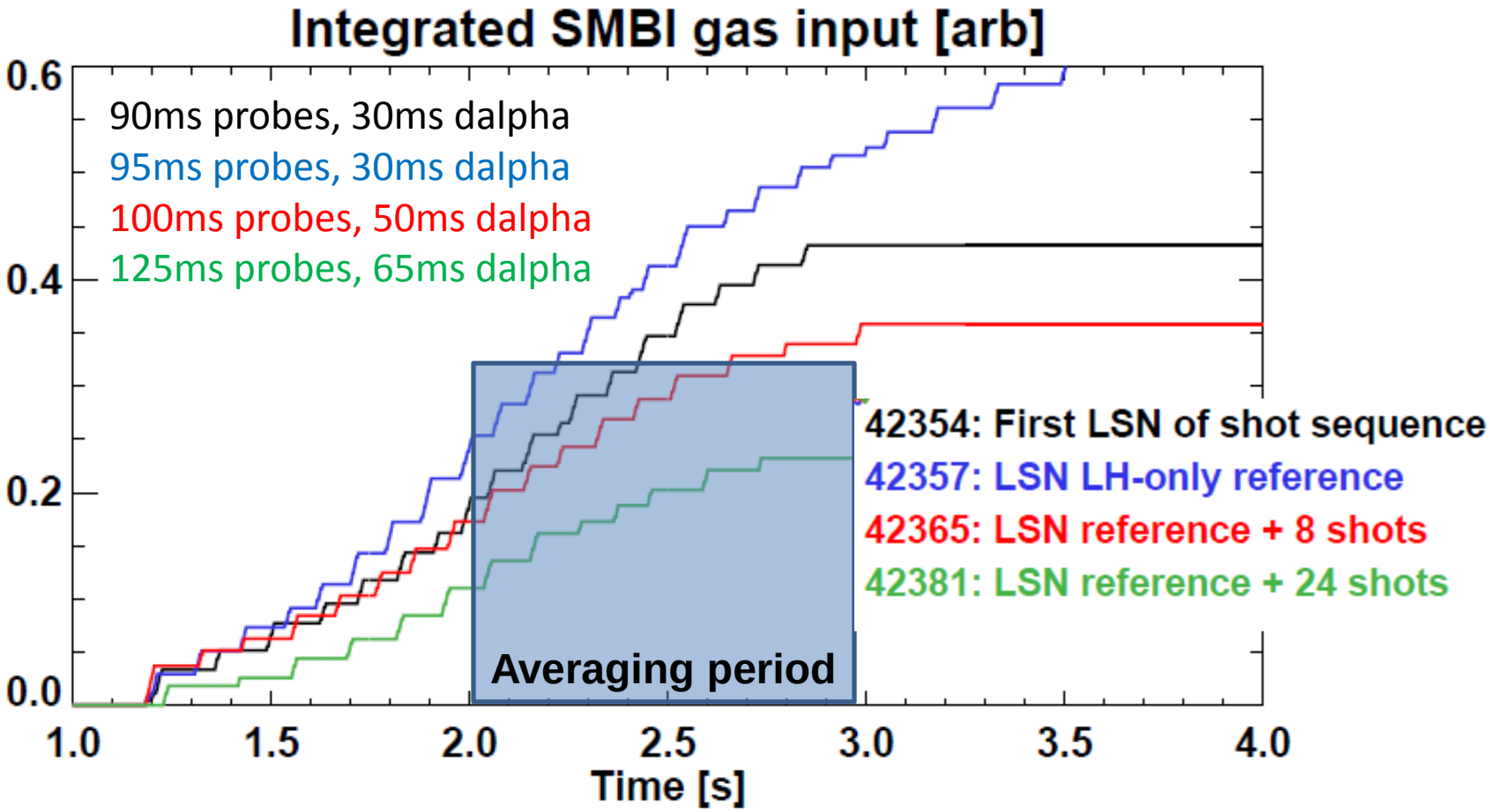


Combine probes to improve statistics

- Subset of 6 Langmuir probes in each outboard target used
- Still scatter in the calculation, but can provide mean and std. deviation for uncertainty estimates
- D-alpha signals also show perturbation and being compiled into database



Time constants consistent with fueling trends in experimental data set



Thank you