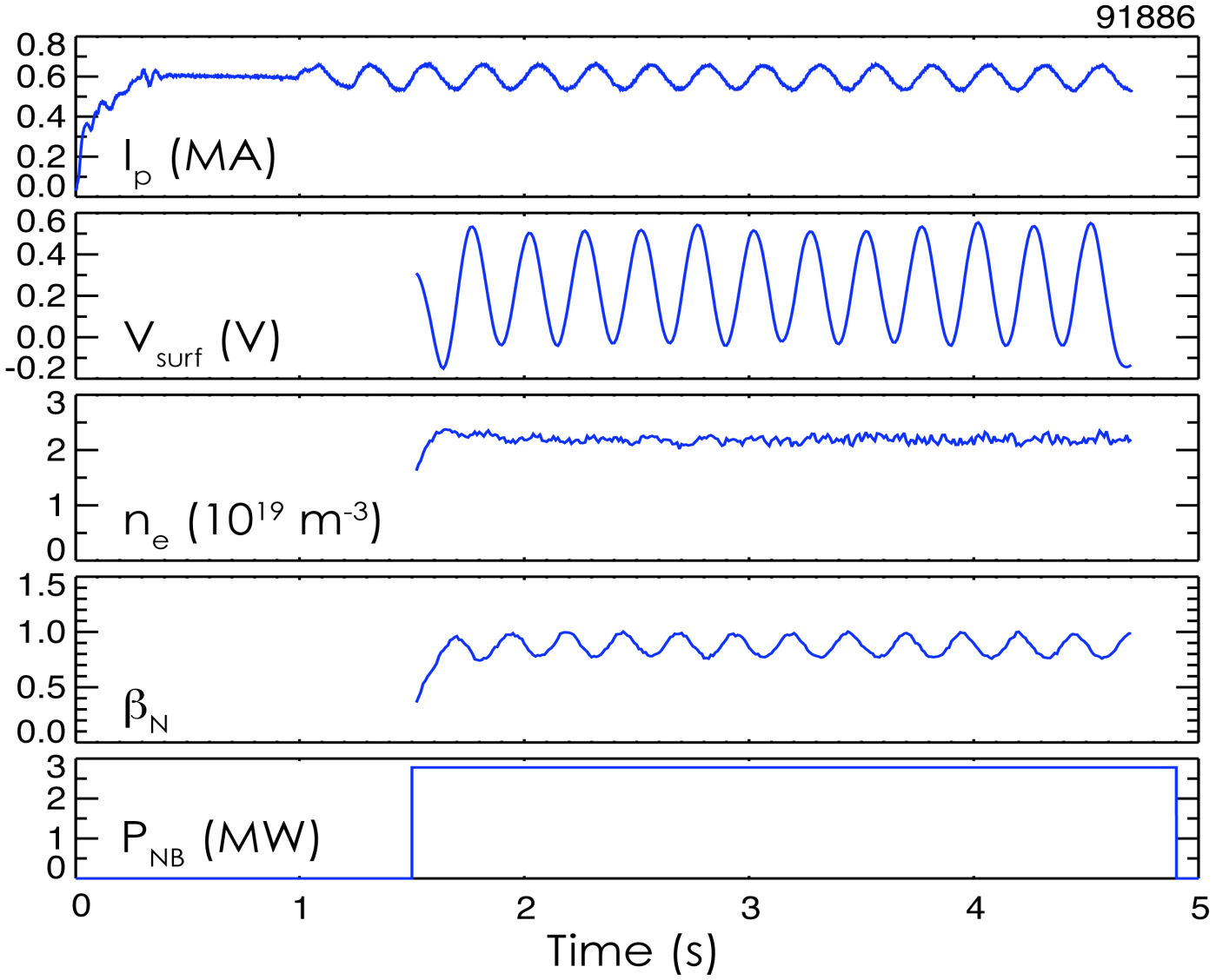
Testing Magnetic Diffusion (Craig Petty)

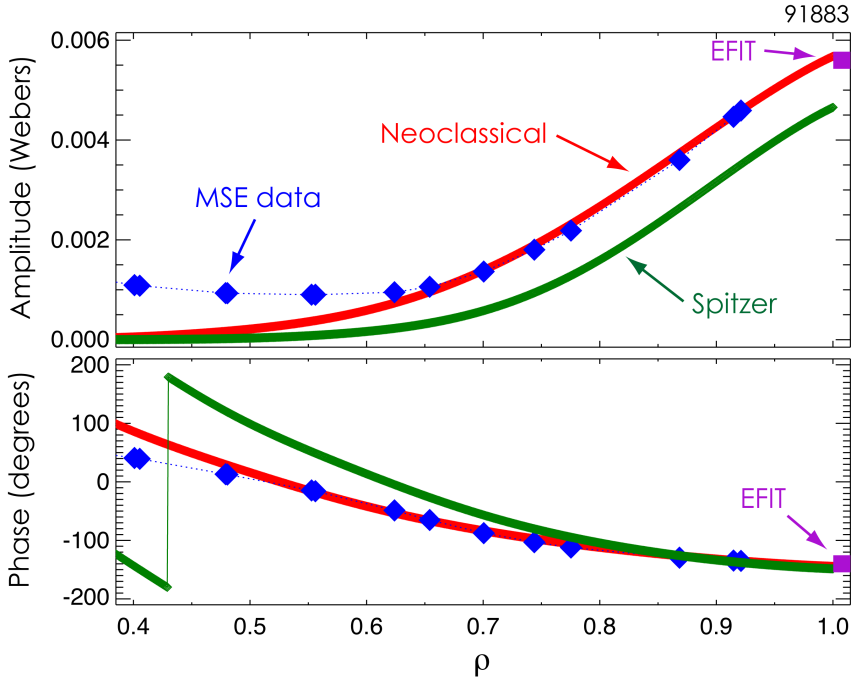
- **Goal**
  - Test neoclassical conductivity by quantitatively measuring the transport of poloidal flux using modulation techniques
  - Purpose is to develop this technique to study cases where the current density evolution may be anomalous, such as in the presence of MHD modes
- **Experimental Approach**
  - Modulate plasma current by 10-20% for ≥10 cycles under stationary conditions and measure amplitude/phase response of MSE pitch angles and surface loop voltage
    - Can either analyze MSE signals directly or by using EFIT
  - Study both high and low conductivity cases
    - L-mode plasmas with ~25 Hz modulation
    - H-mode plasmas with ~12 Hz modulation

Proof-of-Principle Experiment on DIII-D Modulated Plasma Current in L-mode discharges



Amplitude and Phase of $\tilde{\psi}$ Changed With Modulation Frequency as Expected for Neoclassical Conductivity

Modulated ψ at 4 Hz:



Modulated ψ at 8 Hz: