An Analysis of the High Frequency Components of Plasma Impedance

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Introduction

- Semiconductor manufacturing
- Etching
  - Wet chemical processes
  - Plasma etch systems
    - Plasma struck by applying RF voltage
    - Collisions between particles create radicals
      - Chemical etching component
    - Positive ions also bombard wafer
      - Physical etching component
- Plasma Impedance Monitor (PIM)

Data

- 50 realizations
- Switching introduces transients
- Need to filter transients out
  - Interested in high frequency components

Polynomial

- Fit a 6th order polynomial
  - Calculated residual
  - Highpass filter

Resampled Data

- Original data was nonuniformly sampled
- Resampled at ~4 Hz

High Pass Filter

- Still a low frequency oscillation in signal
- Filtered with a cutoff frequency of 0.4 Hz
**Average Periodogram**

- Calculated periodogram of 10 sequences
  - Took average of all 10 to estimate PSD
  - Calculated 95% confidence bands

**Blackman-Tukey Method**

- Also used Blackman-Tukey method
  - Averaged 10 PSD estimates
  - Calculated 95% confidence bands