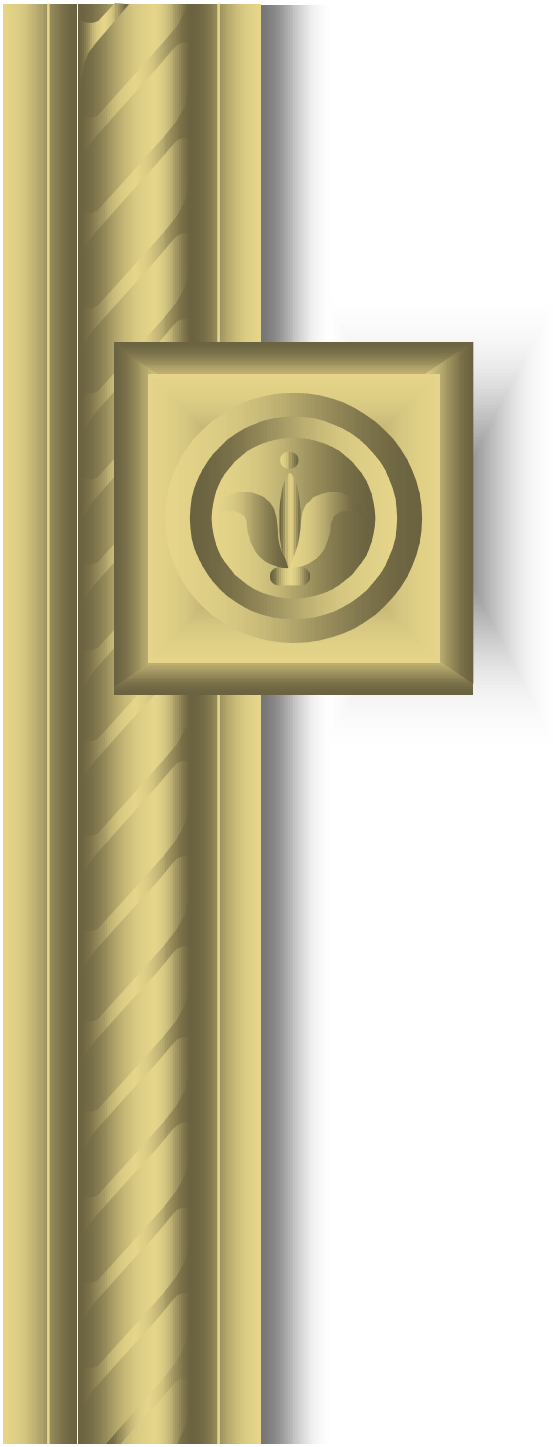


# Data Simulator

**Sam Finn, Ed Daw**

**3/16/00**

LIGO-G000084-00-D

# Summary

- **Simulated time domain IFO h(t)**
  - **Statistical character of detector noise**
  - **Noise transients**
  - **Signals**
- **Purpose**
  - **Testing, calibrating detector characterization, analysis routines**

# Progress: Planned

- **Rev.1 (due 991101)**
  - **Principal normal noise parameterized by physical IFO characteristics**
  - **Matlab code**
- **Rev.2 (due 991215)**
  - **Write data in frames**
  - **Seismic noise, violin lines**
  - **Whitening filters (i.e., whitened output)**
- **Turn-over to E2E group**

# Progress: Actual

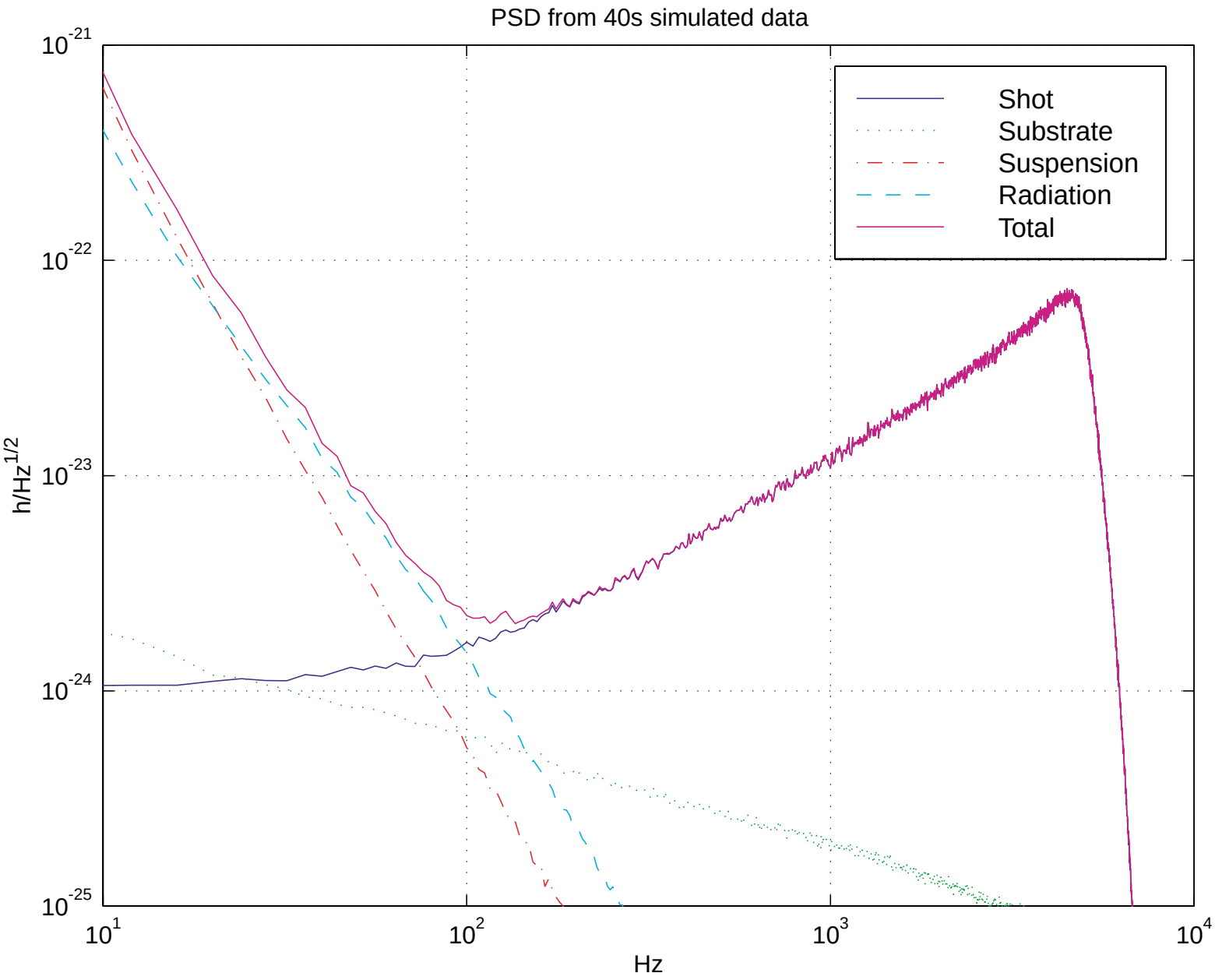
- **Rev.1**
  - **Full capability delivered on schedule**
    - **<http://gravity.phys.psu.edu/~lsf/SimData>**
- **Rev.2**
  - **Missed delivery**
  - **Available functionality (development version)**
    - **Seismic noise, frame writing (using DMT)**
  - **Missing Functionality**
    - **Whitened output, thermal lines**

# Schedule: Revised

- **Note: We Are FTE Limited!**
  - **Have tasks, need people to undertake**
- **Rev.2**
  - **15 May release includes whitening, seismic noise, thermal lines**
- **Turn-over to E2E**
- **Rev.3 (increase scope)**
  - **hooks for injecting transients, signals**
  - **Revised thermal physics**
  - **Frames (this time for sure …)**

# Technology

- **Shot, radiation pressure noise**
  - **Power, power recycling, efficiency**
- **Thermal noise**
  - **Substrate**
    - **mass, dimension, material properties**
  - **Suspension**
    - **wire material properties, geometry, number**
- **Seismic**
  - **LIGO I stack transfer function; measured noise**
- **Performance**
  - **5-10 real time**
    - **16 KHz sample rate**
    - **5x on Ultra 30, 10x modern laptop**
- **Miscellaneous**
  - **Holds state: data sets extensible**


PSD from 40s simulated data
Shot
Substrate
Suspension
Radiation
Total
h/Hz^1/2
Hz
10^-21
10^-22
10^-23
10^-24
10^-25
10^1
10^2
10^3
10^4

3/16/00