

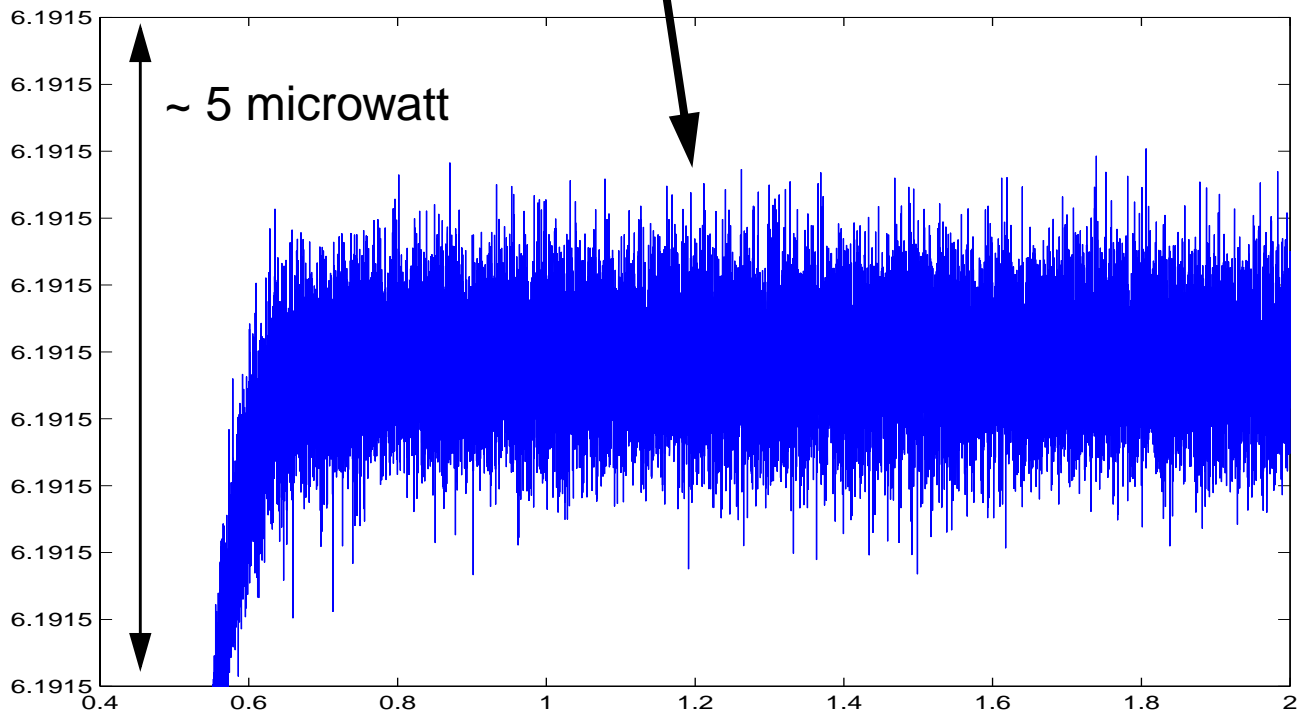
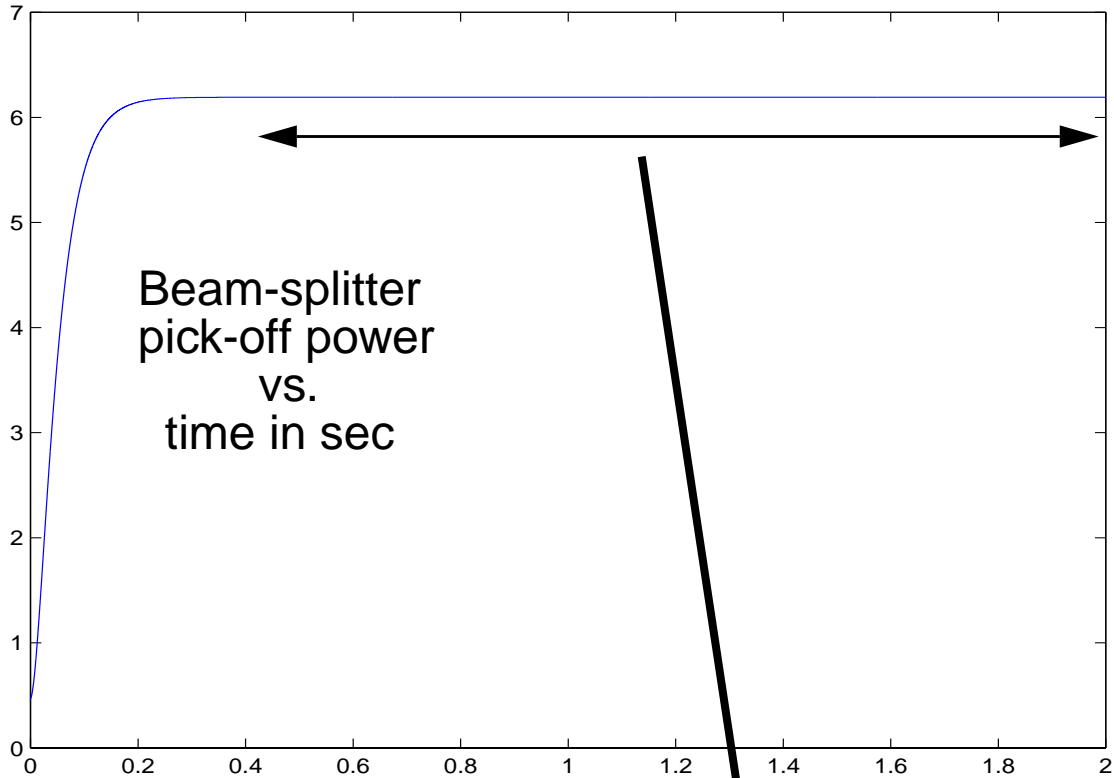
Han2k: In-lock state noise simulation

Biplab Bhawal

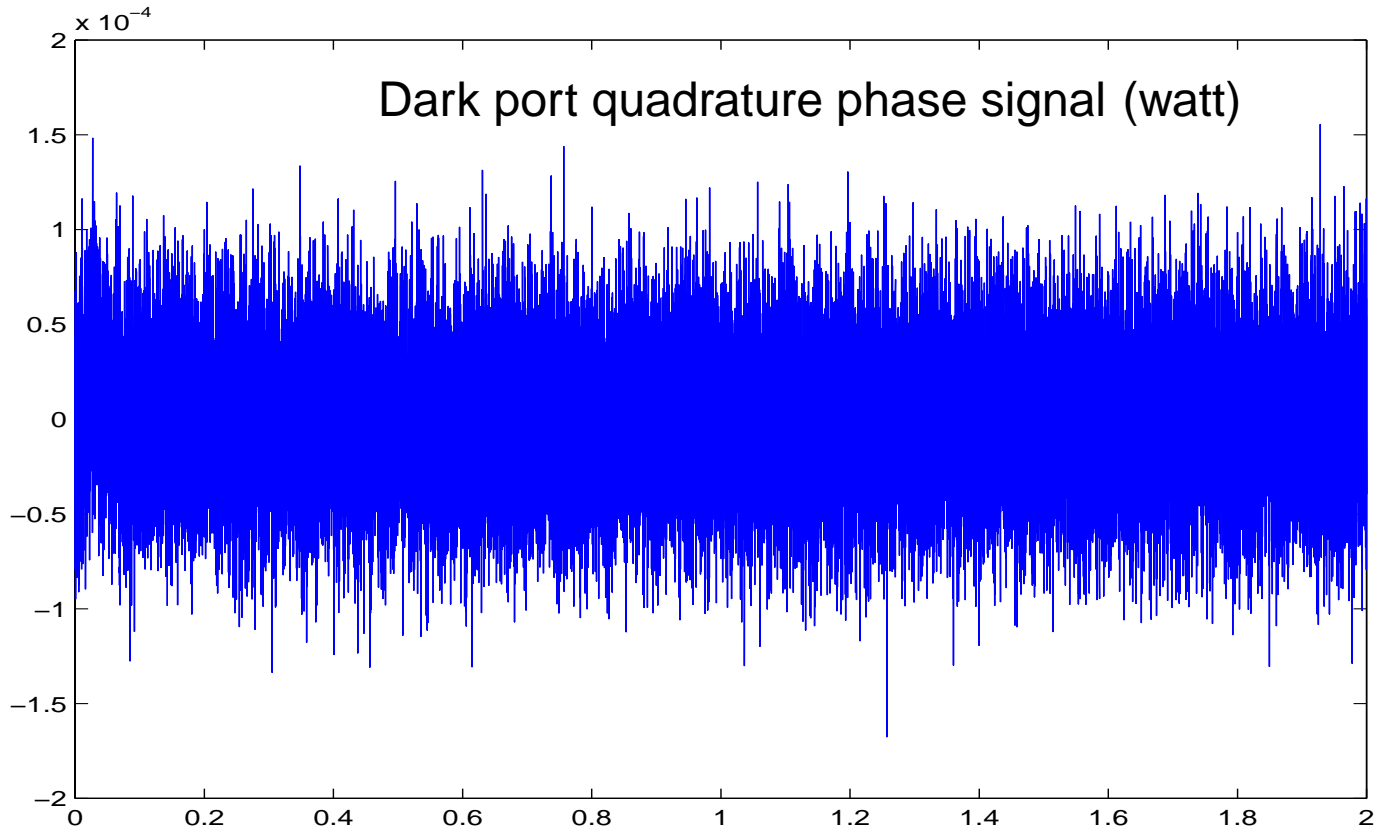
LIGO, Caltech

- LIGO document no.: LIGO-G00312-00-E
- October 18, 2000
- End-to-End meeting, Caltech

In-lock state Noise

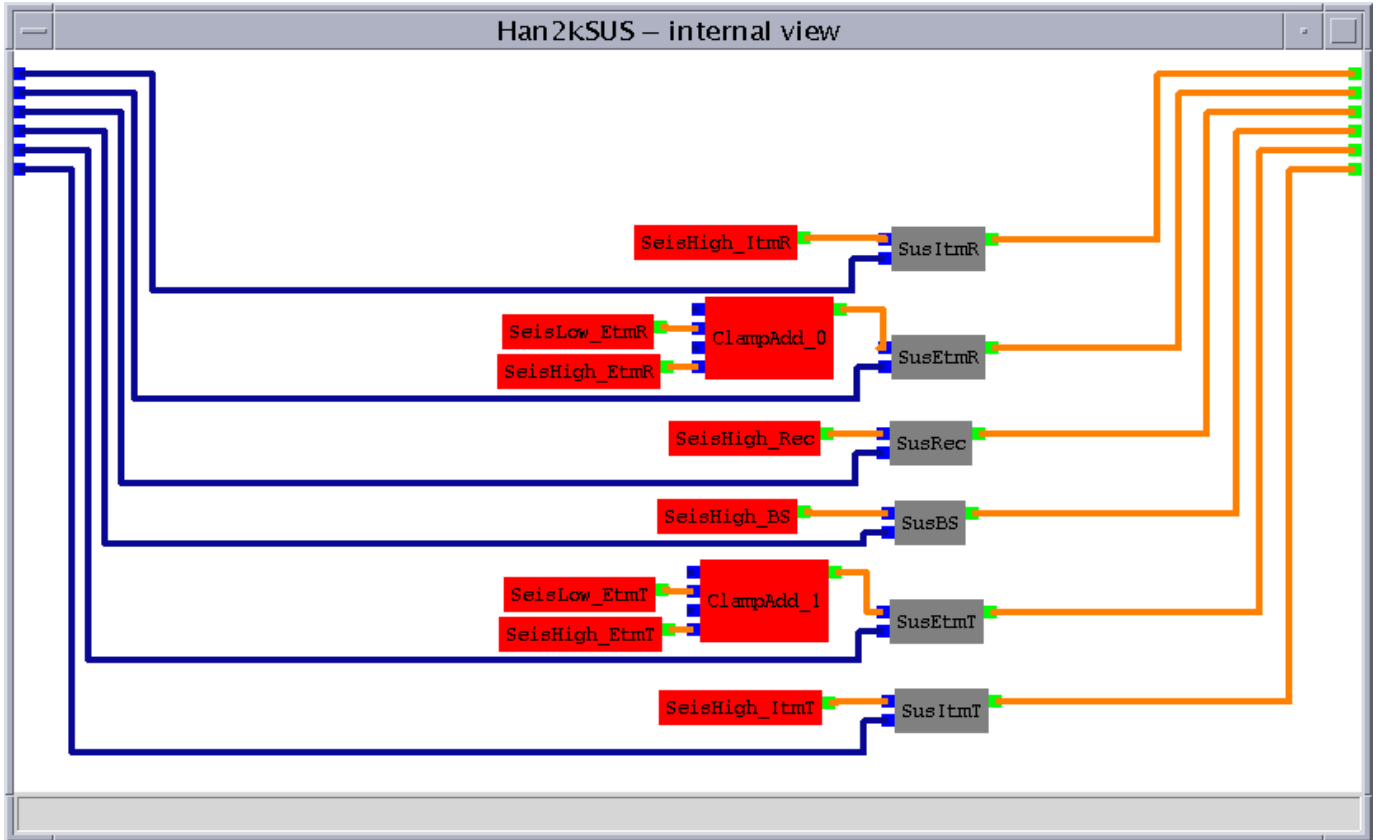


to get noise curve



- ›› Take power-spectral density of the output signal (watt/sqrt(Hz))
- ›› convert it (by transfer function) to m/sqrt(Hz).

Seismic Noise



Thermal noise

- structurally damped harmonic oscillator

$$\left[-\omega^2 + \omega_0^2(1 + i\phi) \right] = \frac{\tilde{F}}{M}$$

- PSD of thermal noise

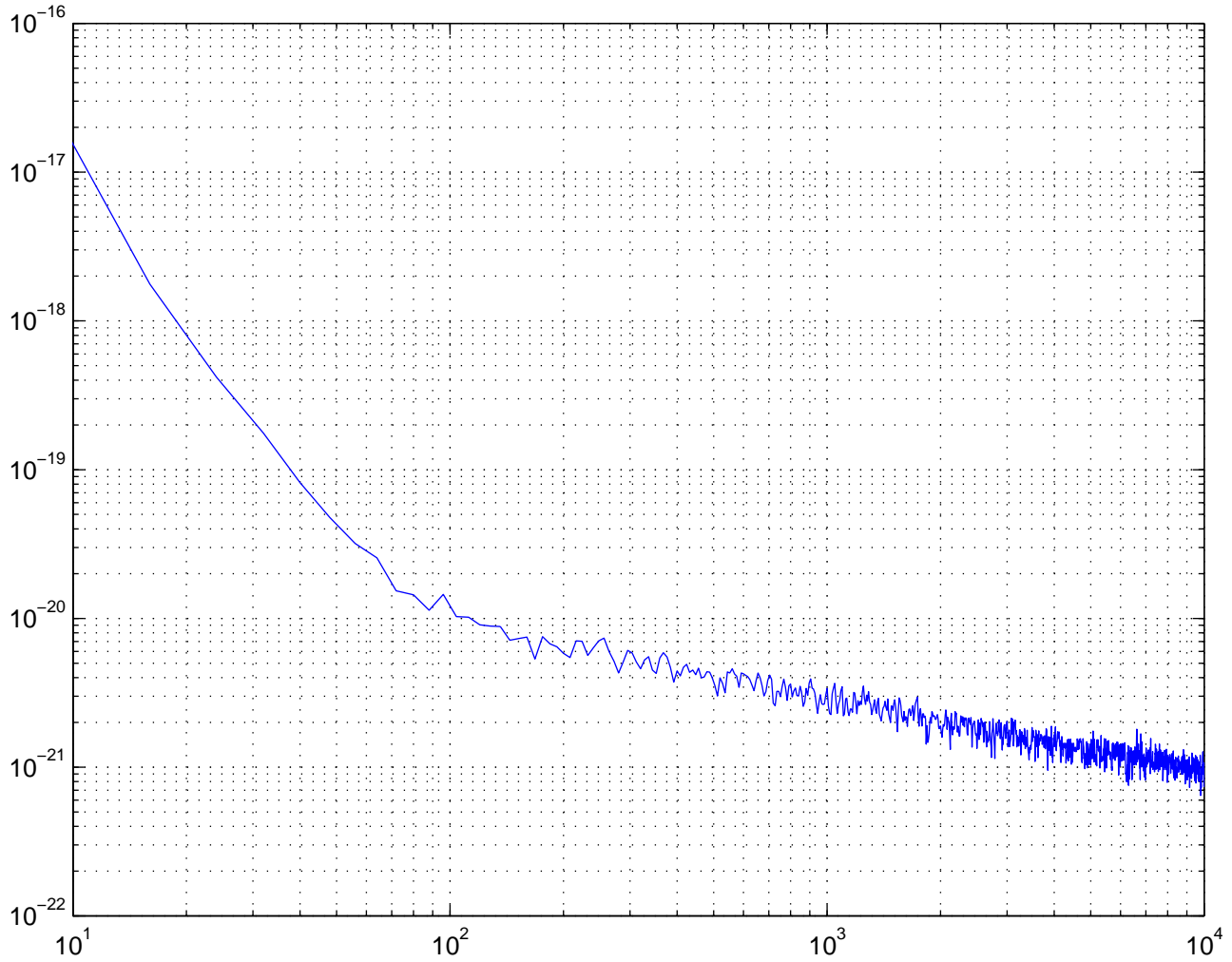
$$S_X(f) = \frac{2k_B T}{M(2\pi)^3} \frac{f_0^2 \phi}{f \left(f_0^2 - f^2 \right)^2 + \left(f_0^2 \phi \right)}$$

- Find a causal linear filter s.t

$$S_X(f) \propto |H(i2\pi f)|^2$$

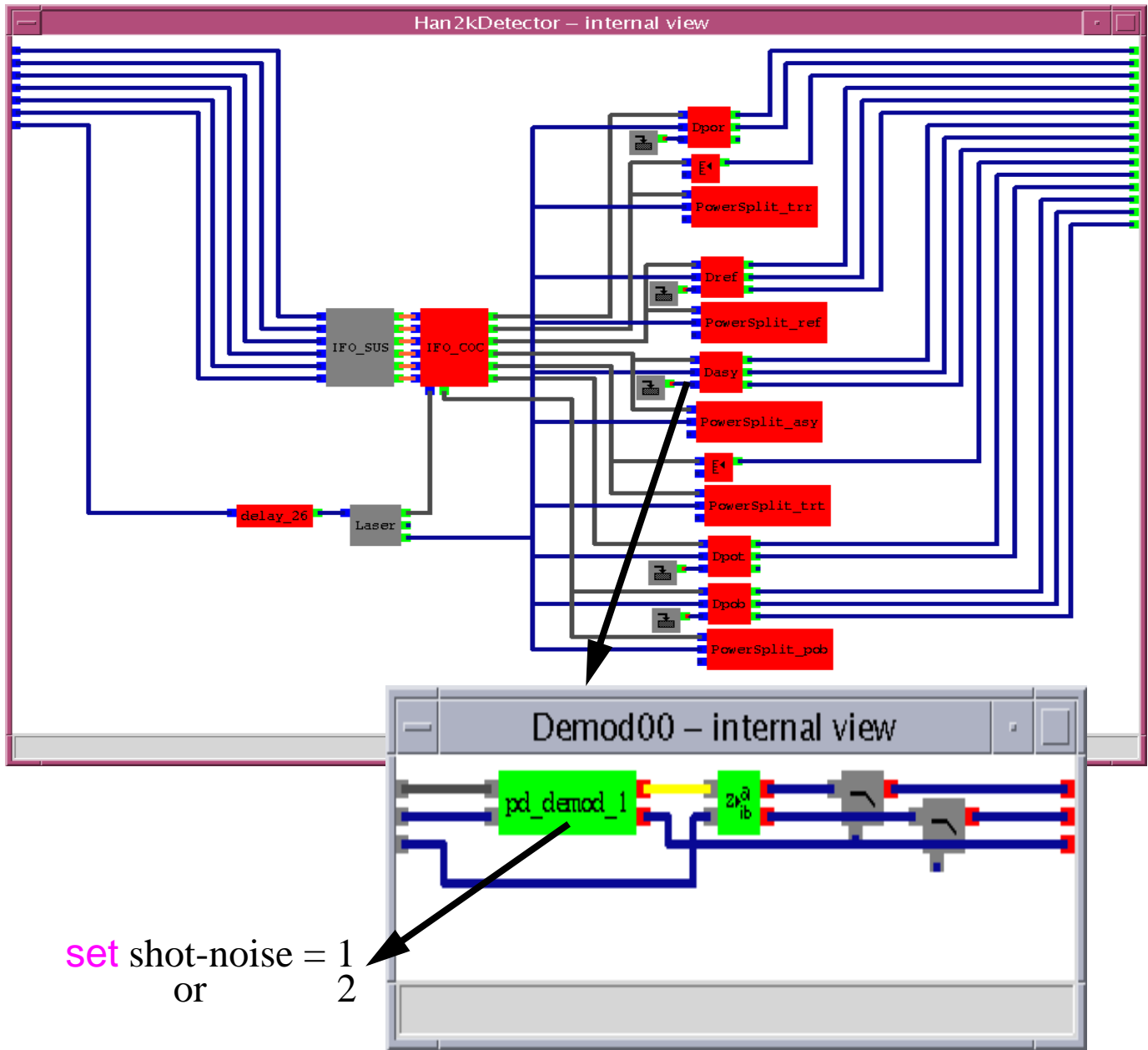
- Loss angle is constant over a finite BW
- Analogous to a Mass M attached to an ideal spring in parallel with a number of Maxwell units

Thermal Noise



Suspension + internal for each mirror

Shot Noise



Han2k Shot Noise

