Effect of EM-Mechanical Back-Action on Noise

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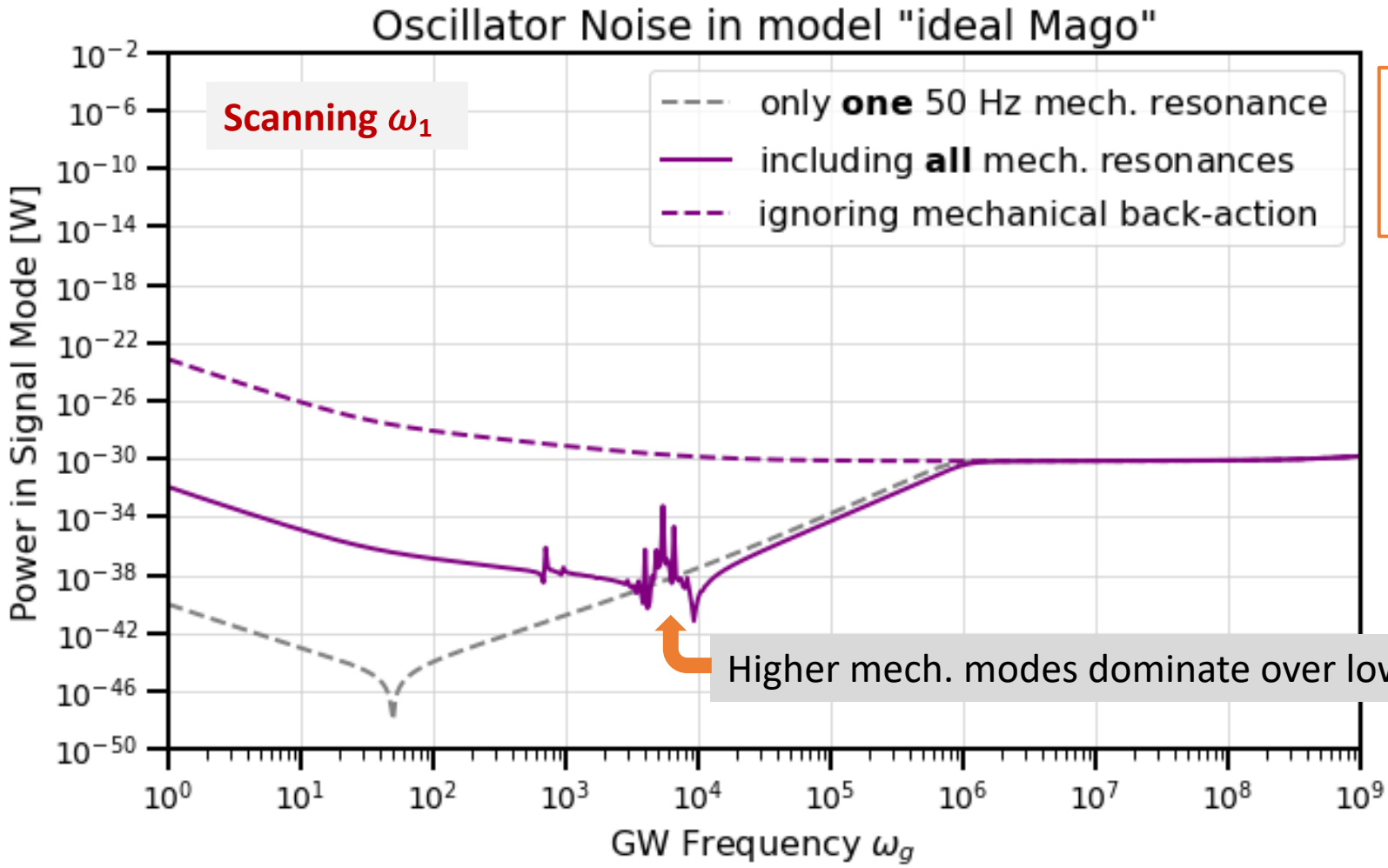
Damping Leads to Strong Noise Suppression

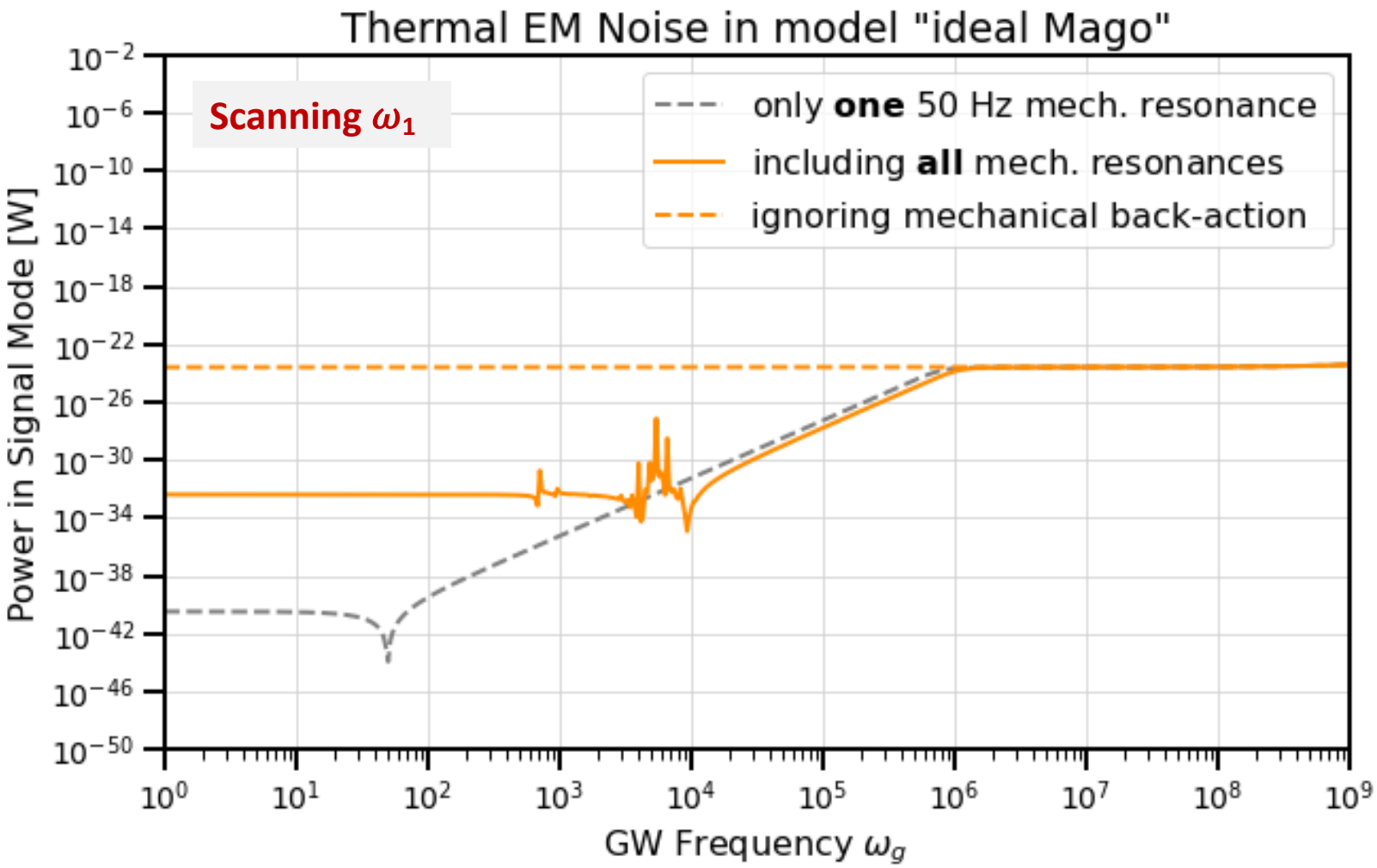


EM fields source strong mechanical vibrations if $\omega_1 - \omega_0 \approx \omega_{mech}$

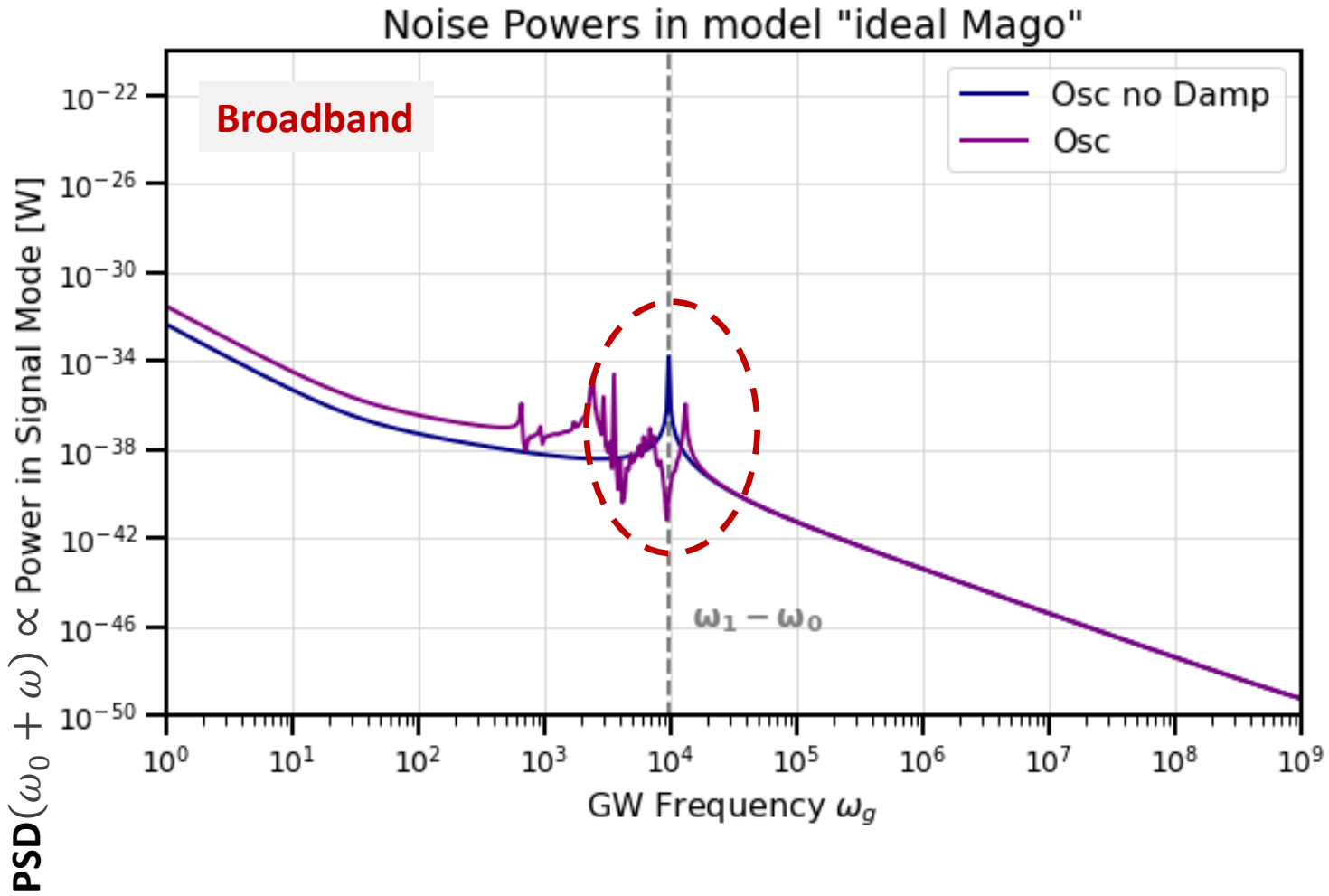
Higher mech. modes dominate over lowest if coupling C_{01} is large

The grey line assumes $C_{01} = 1$ as in Robin's thesis. The purple lines uses values from the simulations.

Similar Behaviour for Thermal Radiation



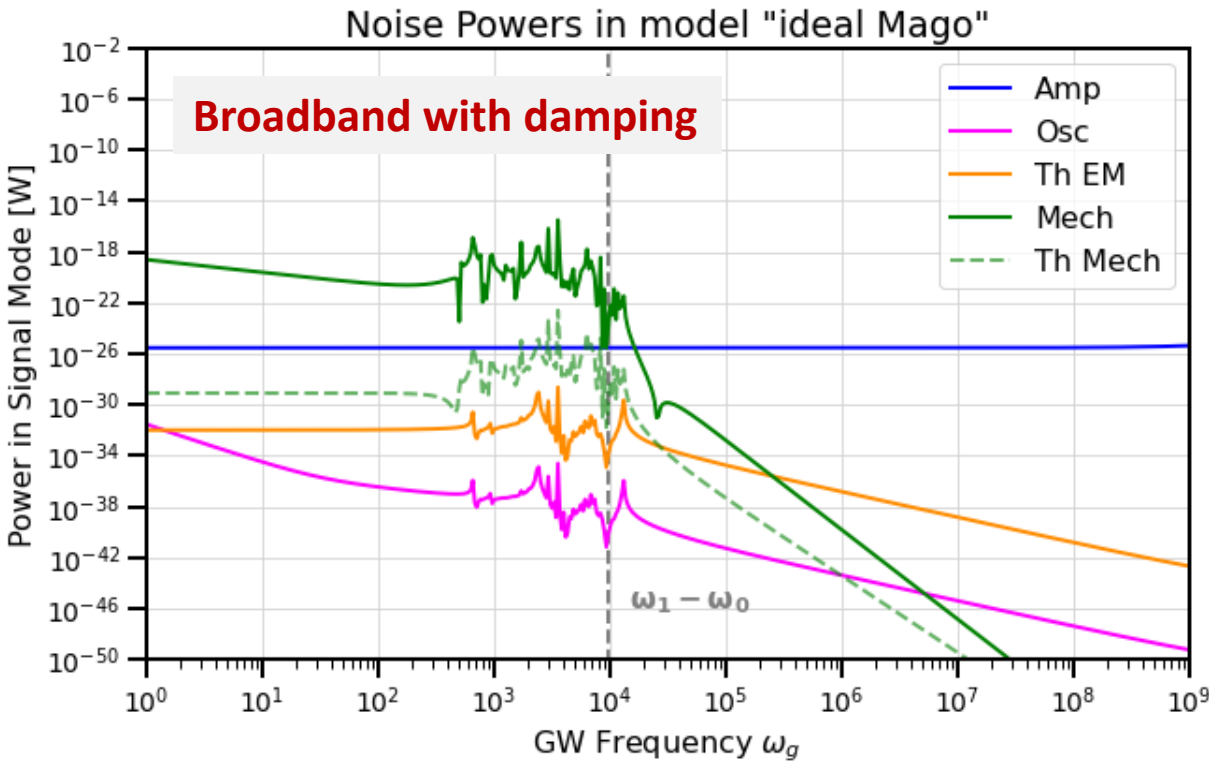
Damping Only Dominates on ω_1 Resonance

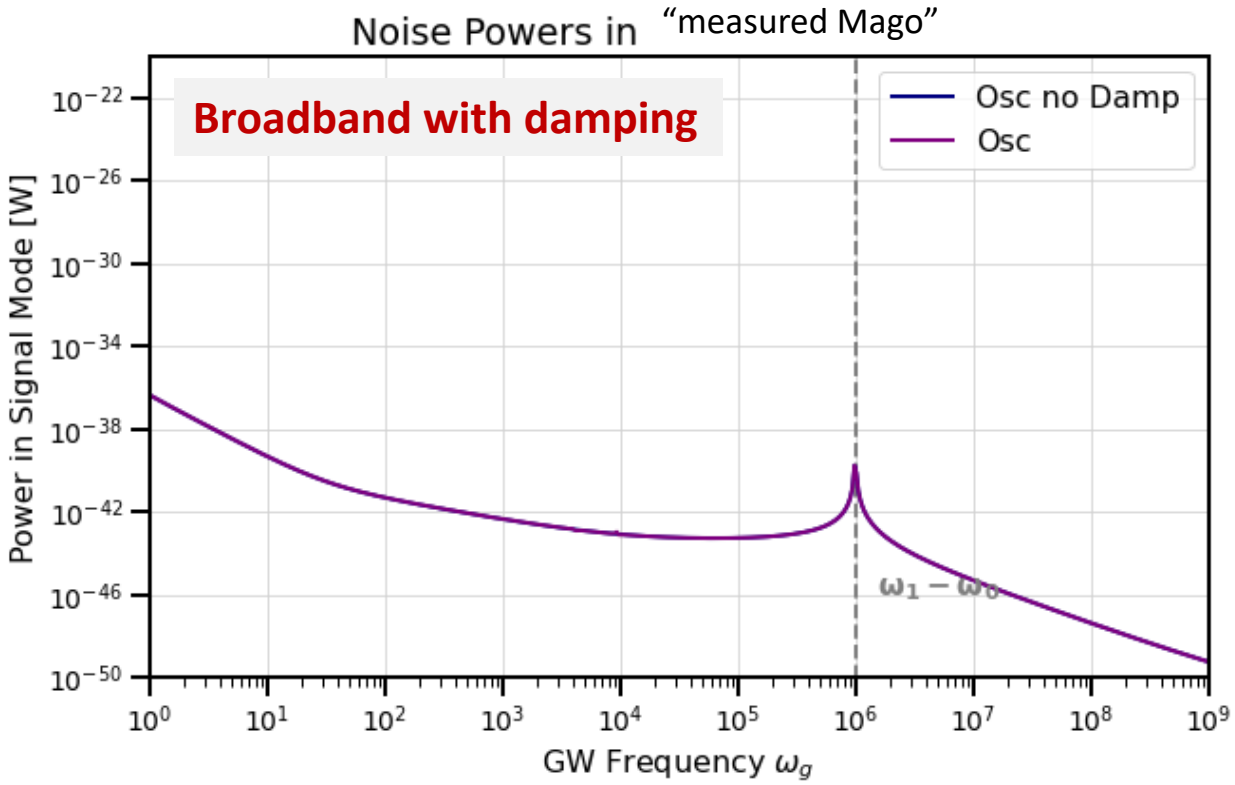


Here: expected spectrum at $\omega_0 + \omega_g$ of the **ideal** MAGO cavity

the **currently** real cavity has has no broadband damping effects anyway since $\omega_1 - \omega_0 \approx$ MHz $\gg \omega_{mech}$He

Can We Measure The Effect with our Cavity?



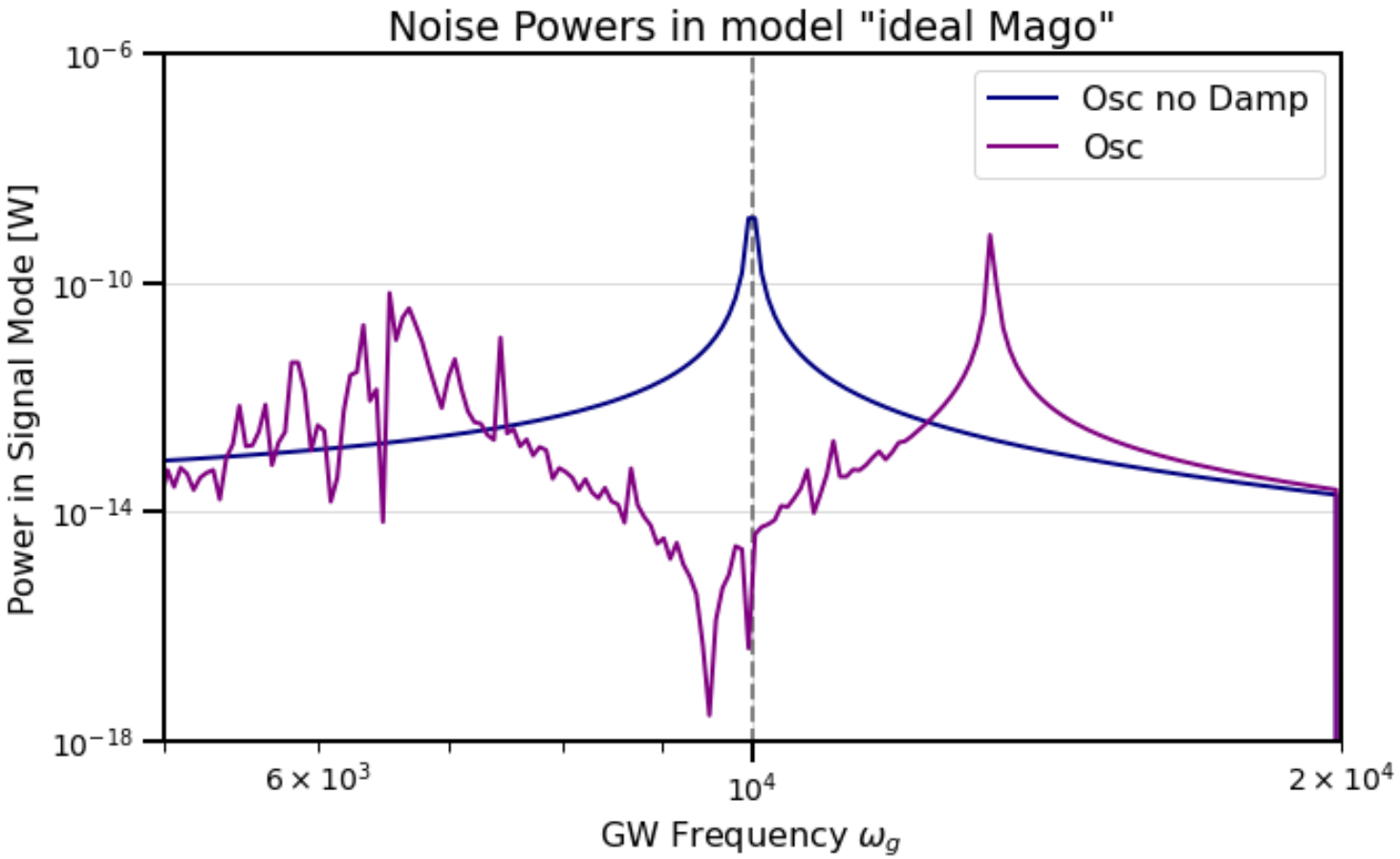


Oscillator Noise Not Dominant

Frequency Splitting Too Far From Mech. Resonances

=> Only if ω_1 is tuned and osc. noise dominates

Possible Measurement: Deliberately Drive ω_1 too



Resonance at $\omega_1 - \omega_0$
⇒ Damping does not happen

Anti-Resonance at $\omega_1 - \omega_0$
⇒ Damping is real

Requires mechanical eigenfrequencies
near $\omega_1 - \omega_0$ with reasonably high coupling C_{01}