

IFOSim w/ SIS: Model

We use two SIS models:

- A FP Cavity as long as the LIGO main arm
- A folded coupled cavity

Doing a cavity scan by doing one of the following

- Change the laser source frequency
- Change the length of the cavity

With mirrors being either

- Ideal case mirrors
- Real mirror profiles

And the source having

- 00th HG mode
- HOMs

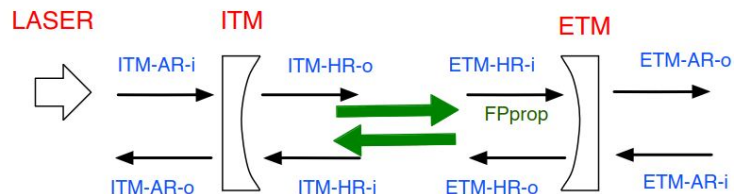
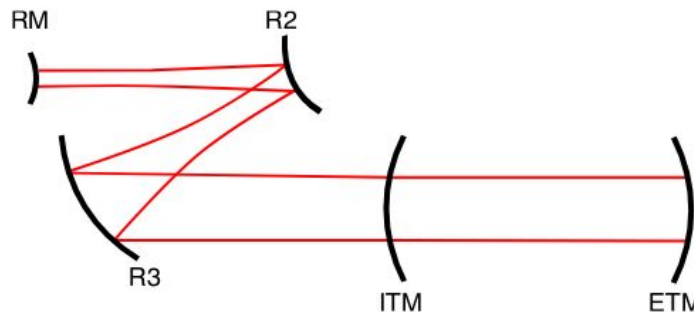


Figure 1: Schematic representation of a Fabry-Pérot cavity with input test mass and end test mass denoted by ITM and ETM, respectively. A representation of all the existing fields interacting with the high reflective (HR) and anti-reflective (AR) sides of the mirrors are indicated. The naming convention of fields is {mirror name}-{side of mirror}-{incoming/outgoing}, where the incoming (outgoing) fields are represented by -i (-o). E.g.: ETM-HR-i is the incoming field into the high reflective side of ETM.



IFOSim w/ SIS: Readout

What we record is the power of the field in the cavity

We use “ITM-HR-i” as the readout field and record its power. We record the total power and also the power of all of the HOMs.

- **Q:** What other parameters should we record? (optical gain? Round Trip Loss?)
- Plotting all of HOMs separately is messy, and plotting total/HOMs is not informative enough.
- X-axis: anything else but the frequency and change in the length?

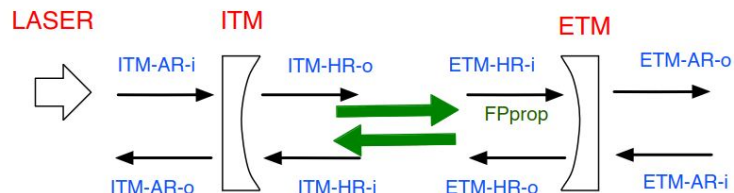
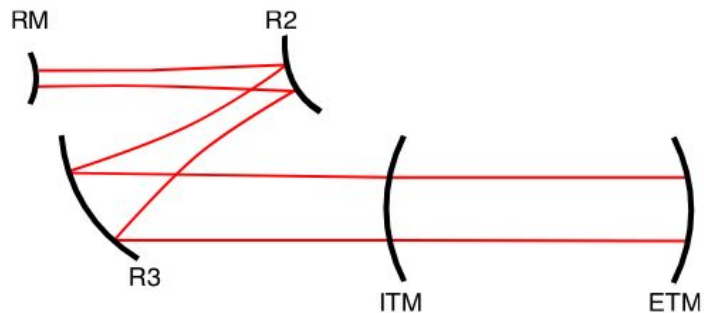
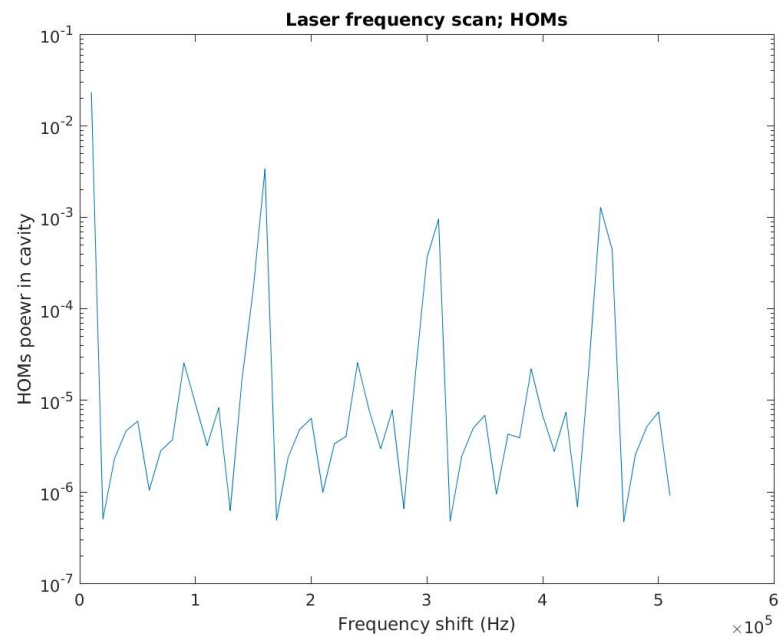
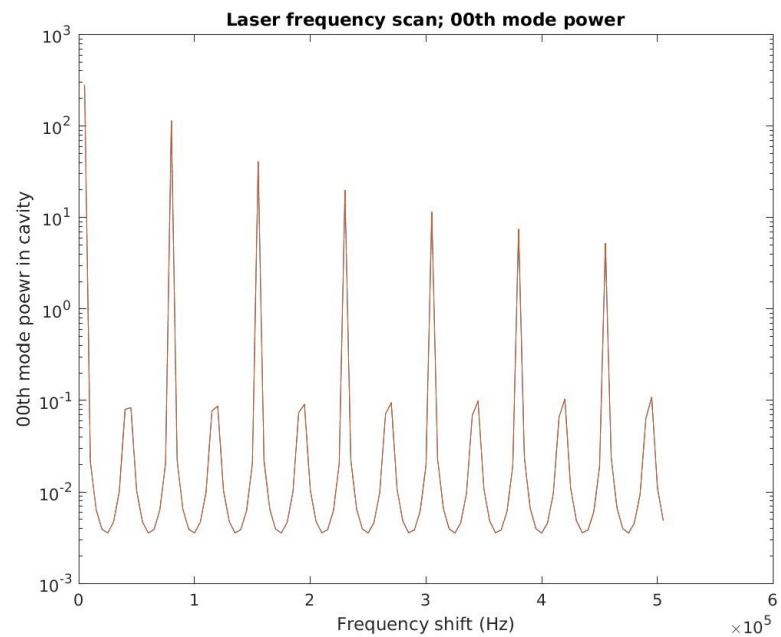


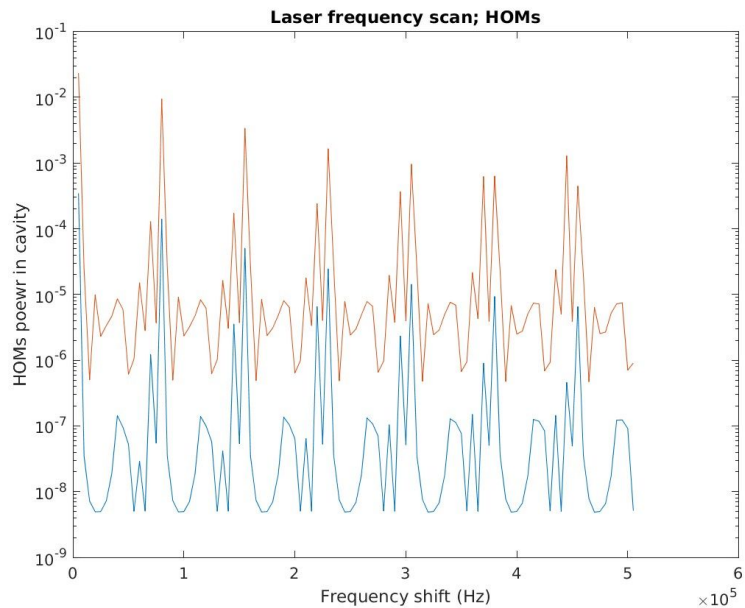
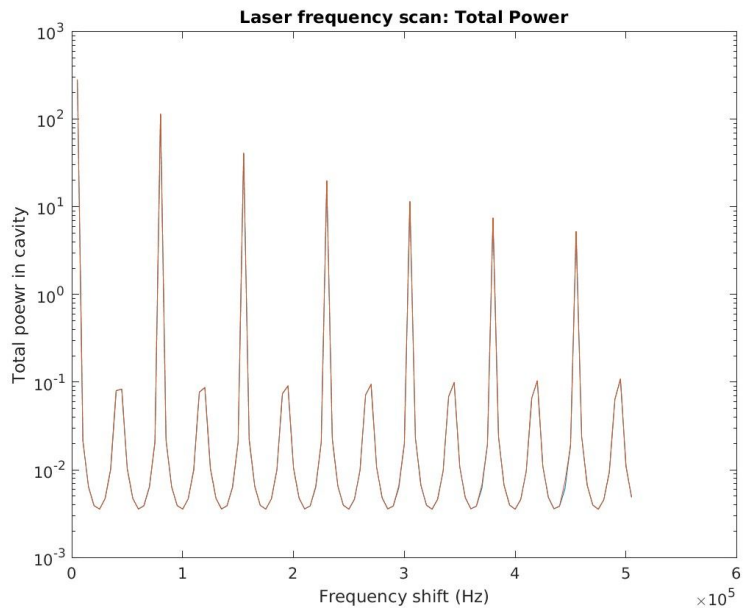
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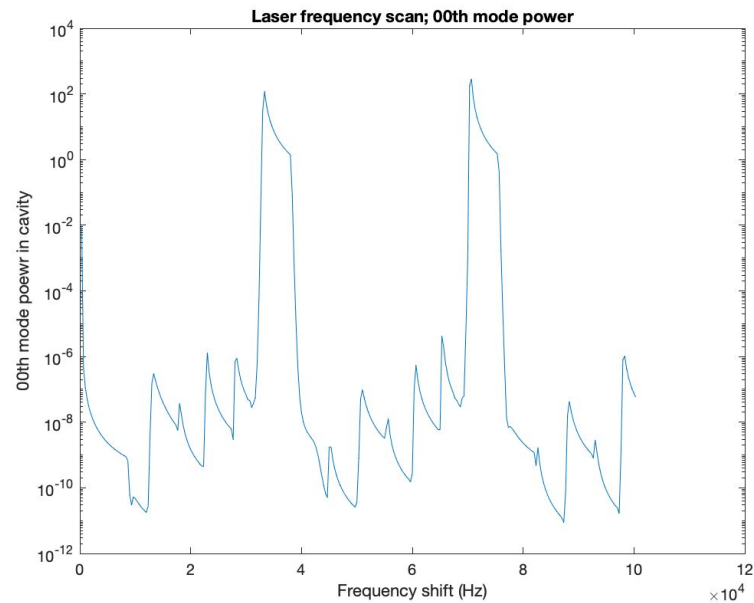
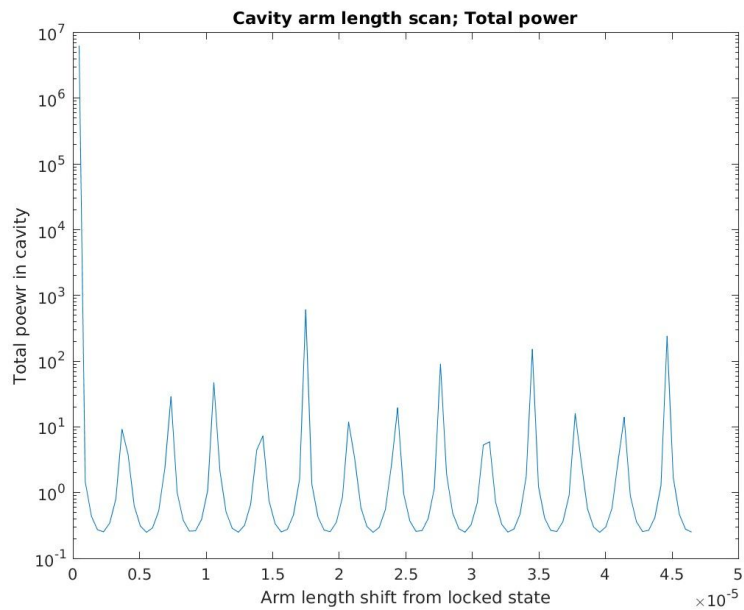
IFOSim w/ SIS: Ideal Single Cavity



IFOSim w/ SIS: Single Cavity with O4 mirror map vs Ideal case



IFOSim w/ SIS: Coupled Cavity



IFOSim w/ SIS: Questions

- Plot readout question. What should we plot?
For example: the 7th order resonance with the 00 mode. What is the best way to see that?
- How can we check our results? Especially for the Coupled Cavities. (Check against Finesse models?)
- Laser injection mode 01 and 10 look different. What is the reason?
- O4 vs A+, How to see the differences