| Material | Aluminum | Brass | Stainless Steel | Fused Silica | Invar |
|---|---|---|---|---|---|
| thermal expansion ($10^{-6}$ / K) | 25 | 20 | 11 | 4.8 | 0.6 – 1.3 |
| Sound speed ($10^{3}$ m/s) | 6.4 | 3.7 | 5.8 | 6.0 | |

| Mirror | Diameter | Thickness | Side 1 | Side 2 | wedge | Radius of curvature |
|---|---|---|---|---|---|---|
| M1 | 7.75 mm | 4 mm | R > 99.9%, $0^{\circ}$ inc | R < 0.2% | < 30 amin | Flat PL/PL |
| M2 | 1” | 0.25” | R $\geq$ 99.97%, $0^{\circ}$ inc | R < 0.2% | < 30 amin | Flat PL/PL |
| M3 | 1” | 0.25” | T ~ 1% , $45^{\circ}$ inc, P-pol | R < 0.2% | 30 amin | Flat PL/PL |
| M4 | 1” | 0.25” | T ~ 1% , $45^{\circ}$ inc, P-pol | R < 0.2% | 30 amin | 1 m, CC/PL |

All mirrors are to be super-polished fused silica. Mirrors M3 and M4 are to be matched in transmission as closely as possible. The main beam is P-polarized (parallel to table, piercing the steering mirrors) everywhere from the Faraday Isolator, through the main IFO, and out to the sensing beamlines (it is S-polarized in the input mode cleaner).

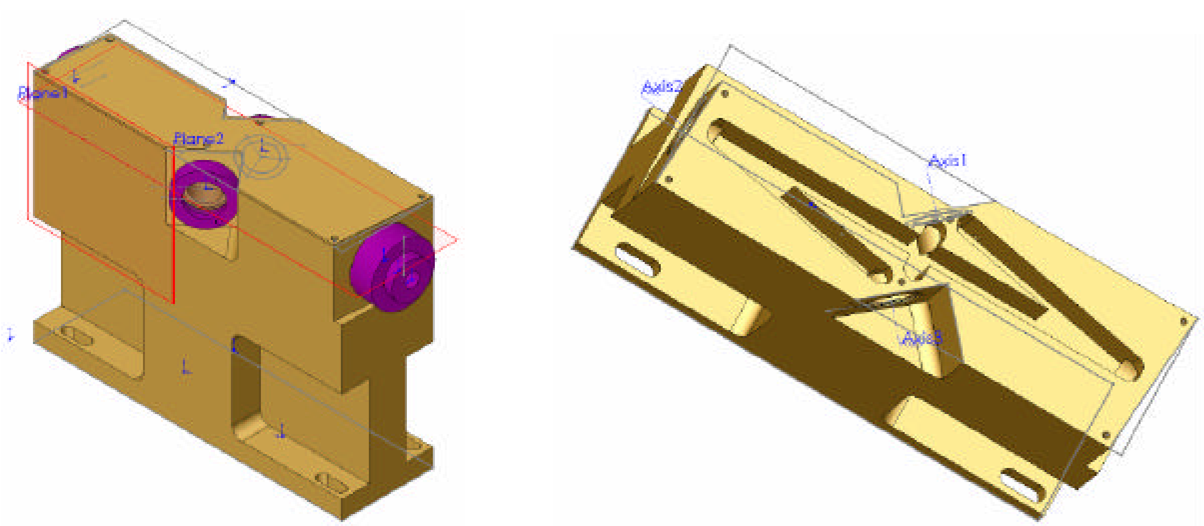


Figure 18: SolidWorks model of a monolithic OMC. Left: Overall view. Right: lifting the lid, here’s the optical path for the 4-mirror design.

### 3.3.3 Controlling the OMC

The OMC needs to be locked to the TEM00 carrier light. A length signal can be derived from dithering, PDH reflection, or tilt-locking. The suitably filtered signal can be fed back to the PZT-mounted mirror to acquire and maintain lock.

Dither-locking is relatively simple; we can try it first. We apply a sinusoidal signal to the PZT-mounted mirror to measure its length, and sense that signal in either the reflected or the transmitted light (with a photodiode on a nearby optical table in air). The servo can be implemented with a signal generator / lock-in amplifier, a filtering amplifier, and a PZT driver. Feedback filters can be easily implemented with an analog