

3.3.3 OMC mirrors

Assuming a 4-mirror cavity, the power transmission and finesse of the OMC cavity are shown in Figure 19.

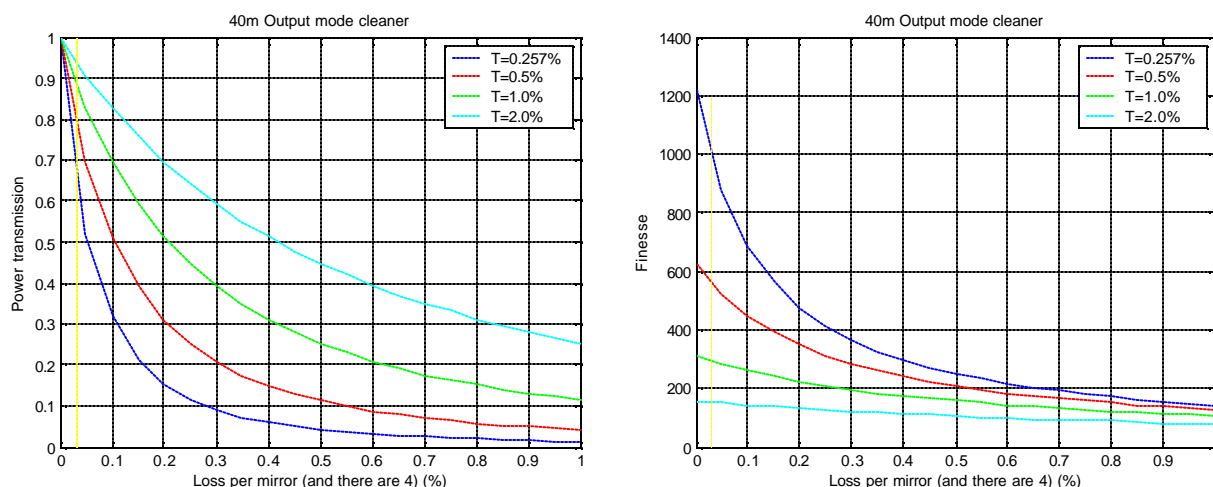


Figure 19: Left: Power transmission of the carrier TEM₀₀ mode-matched beam through the OMC, for different (matched) input/output coupler transmission, as a function of the loss per mirror in percent (assuming each of the 4 mirrors has the same loss; so multiply by 4 to get the total loss per round trip). Right: Finesse, for the same conditions.

The use of relatively poor-quality CVI optics could result in round-trip losses of a few percent, and thus in power transmission of 20% or less. This would be undesirable. Newport makes “super-polished” high-reflectance flats, but declined to quote on super-polished input/output couplers.

From the report of the Review panel for the 40m DC readout experiment (T050168):

It would be prudent to select output optics for low-scatter, although the cost and delivery schedule for low-scatter optics may be require the initial use of lower quality mirrors.

If we go with super-polished, specially-coated REO mirrors, the specs are summarized below. The cost would be ~ \$6700, and delivery would be 6 weeks ARO.

| Mirror | Diameter | Thickness | Side 1 | Side 2 | wedge | Radius of curvature |
|--------|----------|-----------|-------------------------|----------|-----------|---------------------|
| M1 | 7.75 mm | 4 mm | R > 99.9%, 0° inc | R < 0.2% | < 30 amin | 1 m, CC/PL |
| M2 | 1" | 0.25" | R ≥ 99.97%, 0° inc | R < 0.2% | < 30 amin | Flat PL/PL |
| M3 | 1" | 0.25" | T ~ 1% , 45° inc, P-pol | R < 0.2% | 30 amin | Flat PL/PL |
| M4 | 1" | 0.25" | T ~ 1% , 45° inc, P-pol | R < 0.2% | 30 amin | Flat PL/PL |

Table 1: Mirror specs.