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Adaptive Heating for Thermal Compensation in Advanced LIGO[1] MUZAMMIL A. ARAIN, DAVID H. REITZE, D.B. TANNER, GUIDO MUELLER, University of Florida, PHIL WILLEMS, California Institute of Technology — We present an adaptive technique to produce and control the asphericity in optical systems via controlled heating of optical materials. The proposed system will play a vital role in the thermal compensation system of advanced LIGO. It will use compensation plates and the mode matching telescope mirrors to mitigate the aspheric thermal aberrations in the test masses. These aberrations are caused by absorption of the high power laser radiation in the arm cavities. Although the specific details of the proposed technique are given for Advanced LIGO, the technique can also be used in other optical systems where controlled shaping of modal properties is required. Furthermore, other applications might require one to match spatial laser modes to cavities that have non-spherical mirror shapes. One example is the Mesa cavity where a 'Mexican Hat' mirror profile in the arm cavities is required. Mode matching into such cavities requires non-spherical optics. Thermal adaptive heating can provide the needed profiles.

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