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Parametric instability in the high power era of Advanced LIGO TERRA HARDWICK, Louisiana State University, CARL BLAIR, University of Western Australia , ROSS KENNEDY, University of Sheffield, MATTHEW EVANS, PETER FRITSCHEL, Massachusetts Institute of Technology, LIGO VIRGO SCIENTIFIC COLLABORATION — After the first direct detections of gravitational waves, Advanced LIGO aims to increase its detection rate during the upcoming science runs through a series of detector improvements, including increased optical power. Higher circulating power increases the likelihood for three-mode parametric instabilities (PIs), in which mechanical modes of the mirrors scatter light into higher-order optical modes in the cavity and the resulting optical modes reinforce the mechanical modes via radiation pressure. Currently, LIGO uses two PI mitigation methods: thermal tuning to change the cavity g-factor and effectively decrease the frequency overlap between mechanical and optical modes, and active damping of mechanical modes with electrostatic actuation. While the combined methods provide stability at the current operating power, there is evidence that these will be insufficient for the next planned power increase; future suppression methods including acoustic mode dampers and dynamic g-factor modulation are discussed.

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