

seeding mode two raises the question of the source of the mode two seed light. Its origin is not entirely clear. The weak seed could be created by mechanical vibration of the fiber, particularly at the fiber input where coupling into the fiber is highly position sensitive, or it could be created by oscillations in the pump power or spectra, or by fluorescence from the upper laser level, or it might be present in the injected signal light.

Detailed experimental studies will be necessary to verify our model and to identify sources of the mode two seed light. However, our model for thermal mode coupling appears to agree at least qualitatively with certain reported behaviors of laboratory amplifiers: a sharp pump threshold for mode degradation is predicted and reported; the pump power threshold is in the observed range; the frequency offset of 2-3 kHz for maximum gain agrees with reported fluctuation times; the mode coupling gain occurs primarily in the first half of the amplifier which is consistent with observations that coiling the first half of the amplifier often suppresses mode degradation.

If our model can be more fully validated, it should prove useful in improving amplifier designs in order to raise the mode degradation threshold. For example, we can apply it to bent fiber and to fiber with non-step index profiles or non-step Yb doping profiles. It can be used to compare co-pumped and counter-pumped amplifiers and different pump spectra. We can systematically study trends with core to pump cladding size ratios, and the length variations this implies.

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