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Noise-Assisted Control of Chaotic Dynamics in the Ikeda Map with Balanced Gain and Loss

In this work, we investigated the temporal evolution of optical power in the Ikeda Map with Balanced Gain and Loss. The system comprises two feedback loops which impart saturation nonlinear phase shift on the propagating fields and interact with each other via a 50:50 directional coupler. The attenuation and amplification are distributed equally in the feedback loops in the configuration. From the bifurcation diagram, it could be inferred that the system exhibits the period-doubling cascade to chaos as a function of the gain/loss parameter. In the chaotic regime, we have found that a static input signal leads to the emergence of chaotic dynamics in the system. But if the input signal is superimposed with Gaussian noise, then the temporal dynamics in the system could be transformed from chaotic to noisy periodic. Furthermore, considering a total of 100 cases, we evaluated the probability of chaos control in the system.

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