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Spatiotemporal Dynamics of Driven Josephson Junction Networks

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Spatiotemporal dynamics of phases in Josephson junction networks (JJNs) is studied using a computer simulation based on a phase model which is related to the resistively shunted junction model. We consider JJNs which consist of a two-dimensional array of superconducting grains where each pair of the nearest-neighbor sites is connected by a Josephson junction. The JJNs are driven by external currents with spatiotemporal modulation. We investigate the current-voltage characteristics of the driven JJNs for some types of the spatiotemporal modulation of external currents. The dynamics of JJNs shows complicated behaviors in the current-voltage characteristics. There exist a sort of collective phenomena in the dynamics of JJNs under certain conditions on some controllable parameters of the present system. The collective dynamics is affected significantly by the spatiotemporal modulation of external currents. We clarify the novel collective effects on the dynamics of JJNs.

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