

# Chaos in a new system with fractional order

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## Abstract

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The dynamics of fractional-order systems have attracted a great deal of attentions in recent years. With fractional order, the dynamics of a system which includes comprehensive dynamical behaviors, such as fixed point, periodic motion, chaotic motion, and transient chaos is studied numerically in this paper. It is known that chaos exists in the fractional-order system with order less than 3. In this study, the lowest order found for this system to yield chaos is 2.43. The results are validated by the existence of a positive Lyapunov exponent. Period doubling routes to chaos in the fractional-order system are also obtained. Moreover, generation of a four-scroll chaotic attractor by the system is observed.

Keyword : fractional-order systems  
electromagnetic waves