

N -dimensional Heisenberg's uncertainty principle for fractional Fourier transform

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Abstract

A sharper uncertainty inequality which exhibits a lower bound larger than that in the classical N -dimensional Heisenberg's uncertainty principle is obtained, and extended from N -dimensional Fourier transform domain to two N -dimensional fractional Fourier transform domains. The conditions that reach the equality relation of the uncertainty inequalities are deduced. Example and simulation are performed to illustrate that the newly derived uncertainty principles are truly sharper than the existing ones in the literature. The new proposals' applications in time-frequency analysis and optical system analysis are also given.

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