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Two-Variable Hermite Function as Quantum Entanglement of Harmonic Oscillator's Wave Functions

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Abstract: We reveal that the two-variable Hermite function $h_{m,n}$, which is the generalized Bargmann representation of the two-mode Fock state, involves quantum entanglement of harmonic oscillator's wave functions. The Schmidt decomposition of $h_{m,n}$ is derived. It also turns out that $h_{m,n}$ can be generated by windowed Fourier transform of the single-variable Hermite functions. As an application, the wave function of the two-variable Hermite polynomial state $S(r)H_{m,n}(\mu a_1^{\dagger}, \mu a_2^{\dagger})|00\rangle$, which is the minimum uncertainty state for sum squeezing, in $\langle\eta|$ representation is calculated.

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