Optimizing Helstrom bound with non-standard coherent states

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In quantum information processing, when one tries to distinguish between two nonorthogonal states through some receiver device, there exists a quantum error probability. The latter is bounded below by a quantum limit named Helstrom bound. We study and compare quantum limits for states which generalize the Glauber-Sudarshan coherent states, like non-linear and (modified) Susskind-Glogower coherent states. We show that for the latter ones the Helstrom bound can be significantly lowered.