Non-idempotency and particle number fluctuations as quantum-kinematical measures of the correlation strength

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In addition to the correlation energy the correlation induced non-idempotency of the one-particle density matrix (Löwdin, Collins) and the as well correlation induced particle-number-distribution narrowing (Fulde) are purely quantum-kinematical measures of the correlation strength. These concepts are studied for the uniform electron gas and for the He isoelectronic series He(Z)and the Hooke's law model HLM(ω) as illustrating examples. They display increasing correlation with increasing r_s (the dimensionless density parameter of the uniform electron gas) and decreasing parameters Z or ω, respectively. The ratio of correlation energy and total energy (= relative correlation energy) shows a similar behavior.