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Quantal Density Functional Theory (QDFT): Further Understandings VIRAHT SAHNI, The Graduate Center, CUNY, XIAO-YIN PAN, TAO YANG, Ningbo University — We consider electrons in the following external fields: (a) $\boldsymbol{\mathcal{E}}(\mathbf{r}t) = -\boldsymbol{\nabla} v(\mathbf{r}t)$, $\mathbf{B}(\mathbf{r}t) = \nabla\times\mathbf{A}(\mathbf{r}t)$, and $\mathbf{E}(\mathbf{r}t) = -\nabla\phi(\mathbf{r}t) - (1/c)\partial\mathbf{A}(\mathbf{r}t)/\partial t$, (b) $\boldsymbol{\mathcal{E}}(\mathbf{r}t) = -\boldsymbol{\nabla} v(\mathbf{r}t)$, (c) $\boldsymbol{\mathcal{E}}(\mathbf{r}) = -\boldsymbol{\nabla} v(\mathbf{r})$ and $\mathbf{B}(\mathbf{r}t) = \nabla\times\mathbf{A}(\mathbf{r}t)$, and (d) $\boldsymbol{\mathcal{E}}(\mathbf{r}) = -\boldsymbol{\nabla} v(\mathbf{r})$. The basic variables for these systems are for (a) the density $\rho(\mathbf{r}t)$ and physical current density $\mathbf{j}(\mathbf{r}t)$, (b) $\rho(\mathbf{r}t)$ and (paramagnetic) $\mathbf{j}(\mathbf{r}t)$, (c) $\rho(\mathbf{r})$ and $\mathbf{j}(\mathbf{r})$, (d) $\rho(\mathbf{r})$. In QDFT, the local potential of the model fermions is the work done in a conservative effective field. In each of the above cases the effective field is representative of the *same* correlations, *viz.* due to the Pauli exclusion principle, Coulomb repulsion and Correlation-Kinetic effects.

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