Curl-free form of time-harmonic Maxwell's equations well-suitable for iterative numerical solving

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A new form of time-harmonic Maxwell's equations is developed and proposed for numerical modeling. It is written for the magnetic field strength **H**, electric displacement **D,** vector potential **A** and the scalar potential Φ. There are several attractive features of this form. The first one is that the differential operator acting on these quantities is positive. This feature could be inherited by the matrix resulted after discretization that opens a possibility to use the standard iteration method for solving the linear problem. The second is absence of *curl* operators among the leading order differential operators. The Laplacian stands for the leading order operator in the equations for **H**, **A** and Φ, while the gradient of divergence stands for **D**. That prevents generation of spurious solutions even when the standard discretization procedures are used. The third feature is absence of space varied coefficients in the leading order differential operators that provides diagonal domination of the resulting matrix of the discretized equations. A simple example is given to demonstrate the applicability of this new form of time-harmonic Maxwell's equations.