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On some Bounds for the Solutions of the Semi-Discretized Time-Dependent Ginzburg-Landau Equations

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Abstract: We study the two-dimensional system of Time-Dependent Ginzburg-Landau Equations (TDGL) for modeling a thin film of superconductor subject to a uniform magnetic field. We discretize the TDGL for the space variables using bond variables and staggered grid partitioning technique. By investigating the temporal evolution of semi-discrete Helmholtz enery functional and that of Semi-discretized TDGL, we provide bounds for some observable physical quantities of interest such as superelectron density, supercurrent density, charge density, electric field, and induced magnetic field.