Global dynamics of the 3D Zakharov system

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Abstract:
We study global behavior of solutions for the Zakharov system in three space dimensions. It is a coupled system of the wave and the Schrodinger equations, describing the Langmuir turbulence in plasma, whose subsonic limit is the focusing cubic nonlinear Schrodinger equation (NLS). We prove that the energy space with radial symmetry below the ground states splits into two invariant sets, one in which the solution is global and scatters, and the other in which the solution blows up in finite or infinite time. This can be regarded as an extension of the result by Holmer-Roudenko for NLS, following Kenig-Merle's concentration compactness approach. However, the scattering for the Zakharov system was not known previously even for small initial data, where the difficulty is apparent in the non-integrable decay of the wave component acting on the Schrodinger component. Our proof is based on the normal form transform and the radial-improved Strichartz estimate, together with Kenig-Merle's argument. This is joint work with Zihua Guo and Shuxia Wang (Peking University).