

Existence and stability of magnetic vortex lattices

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The Ginzburg-Landau equations were first developed to understand macroscopic behaviour of superconductors; later, together with their non-Abelian generalizations – the Yang-Mills-Higgs equations – they became a key part of the standard model in elementary particle physics. They also have found important applications in geometry and topology.

These equations have remarkable solutions – the magnetic vortex lattices. I will review the existence and stability theory of these solutions and how they relate to the modified theta functions appearing in number theory and algebraic geometry. Certain automorphic functions play a key role in the theory described in the talk. I will also describe the existence results for the Ginzburg-Landau equations on Riemann surfaces.

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