

A Geometric Approach to Magnetization Plateaus

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The problem of magnetization plateaus is reconsidered from the viewpoint of Berry phases. In 1D, it is well-known that a twist argument a la Lieb-Schultz-Mattis (LSM) leads to the so-called quantization condition of Oshikawa, Yamanaka and Affleck. A similar argument has been applied in higher dimensions to obtain a similar condition. However, it is not clear why (i) LSM argument, which tells about existence/inexistence of particle-hole gap, gives the meaningful statement concerning plateaus and (ii) a similar quantization condition holds in higher dimensions as well. We clarify these points with a combined use of Berry phase theory of crystal momentum and effective field theories. (w/ A. Tanaka)