Fractional generalization of the Ginzburg–Landau equation: an unconventional approach to critical phenomena in complex media

Equations built on fractional derivatives prove to be a powerful tool in the description of complex systems when the effects of singularity, fractal supports, and long-range dependence play a role. In this Letter, we advocate an application of the fractional derivative formalism to a fairly general class of critical phenomena when the organization of the system near the phase transition point is influenced by a competing nonlocal ordering. Fractional modifications of the free energy functional at criticality and of the widely known Ginzburg-Landau equation central to the classical Landau theory of second-type phase transitions are discussed in some detail. An implication of the fractional Ginzburg-Landau equation is a renormalization of the transition temperature owing to the nonlocality present. (c) 2005 Elsevier B.V. All rights reserved.
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.932 SNIP 1.106
Web of Science (2010): Impact factor 1.963
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.984 SNIP 1.197
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.049 SNIP 1.085
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.888 SNIP 0.992
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.778 SNIP 0.962
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.92 SNIP 1
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.957 SNIP 1.015
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.898 SNIP 1.014
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.938 SNIP 1.076
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.979 SNIP 1.05
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 1.028 SNIP 0.938
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.019 SNIP 0.933
Original language: English
DOIs:
10.1016/j.physleta.2005.01.047
Source: orbit
Source-ID: 307906
Research output: Research - peer-review › Journal article – Annual report year: 2005