

# **Spin Systems**

T.L. Francavilla,R.A. Hein,D.H. Liebenberg

## **Spin Systems:**

Spin Systems W J Caspers, 1989-05-01 This book is about spin systems as models for magnetic materials especially antiferromagnetic lattices Spin systems are well defined models for which in special cases exact properties may be derived These special cases are for the greater part one dimensional and restricted in their applicability but they may give insight into general properties that also exist in higher dimension This work pays special attention to qualitative differences between spin lattices of different dimensions It also replaces the traditional picture of an ordered antiferromagnetic state of a Heisenberg system by one which makes use of the space of quantum spin states Frustrated Spin Systems H. T. Diep, 2013 This book covers all principal aspects of currently investigated frustrated systems from exactly solved frustrated models to real experimental frustrated systems going through renormalization group treatment Monte Carlo investigation of frustrated classical Ising and vector spin models low dimensional systems spin ice and quantum spin glass The reader can OCo within a single book OCo obtain a global view of the current research development in the field of frustrated systems This new edition is updated with recent theoretical numerical and experimental developments in the field of frustrated spin systems The first edition of the book appeared in 2005 In this edition more recent works until 2012 are reviewed It contains nine chapters written by researchers who have actively contributed to the field Many results are from recent works of the authors The book is intended for postgraduate students as well as researchers in statistical physics magnetism materials science and various domains where real systems can be described with the spin language Explicit demonstrations of formulas and full arguments leading to important results are given where it is possible to do so **Quantum Spin Systems on Infinite Lattices** Pieter Naaijkens, 2017-03-20 This course based primer offers readers a concise introduction to the description of quantum mechanical systems with infinitely many degrees of freedom and quantum spin systems in particular using the operator algebraic approach. Here the observables are modeled using elements of some operator algebra usually a C algebra This text introduces readers to the framework and the necessary mathematical tools without assuming much mathematical background making it more accessible than advanced monographs The book also highlights the usefulness of the so called thermodynamic limit of quantum spin systems which is the limit of infinite system size For example this makes it possible to clearly distinguish between local and global properties without having to keep track of the system size Together with Lieb Robinson bounds which play a similar role in quantum spin systems to that of the speed of light in relativistic theories this approach allows ideas from relativistic field theories to be implemented in a quantum spin system Several related cases are discussed demonstrating the merits of the operator algebraic approach Featuring representative worked out examples and many exercises this text is primarily targeted at graduate students and advanced undergraduates in theoretical physics or mathematics with a keen interest in mathematical physics. The material provides the necessary background and pointers to start exploring the recent literature As such it will also be useful for active researchers seeking a

quick and comparatively self contained introduction to the operator algebraic approach to quantum spin systems <u>Frustrated Spin Systems (2nd Edition)</u> Hung-the Diep, 2013-03-25 This book covers all principal aspects of currently investigated frustrated systems from exactly solved frustrated models to real experimental frustrated systems going through renormalization group treatment Monte Carlo investigation of frustrated classical Ising and vector spin models low dimensional systems spin ice and quantum spin glass The reader can within a single book obtain a global view of the current research development in the field of frustrated systems This new edition is updated with recent theoretical numerical and experimental developments in the field of frustrated spin systems. The first edition of the book appeared in 2005 In this edition more recent works until 2012 are reviewed It contains nine chapters written by researchers who have actively contributed to the field Many results are from recent works of the authors. The book is intended for postgraduate students as well as researchers in statistical physics magnetism materials science and various domains where real systems can be described with the spin language Explicit demonstrations of formulas and full arguments leading to important results are given where it is possible to do so Frustrated Spin Systems (Third Edition) Hung-the Diep, 2020-06-19 Frustrated spin systems have been first investigated five decades ago Well known examples include the Ising model on the antiferromagnetic triangular lattice studied by G H Wannier in 1950 and the Heisenberg helical structure discovered independently by A Yoshimori J Villainn and T A Kaplan in 1959 However extensive investigations on frustrated spin systems have really started with the concept of frustration introduced at the same time by G Toulouse and by J Villain in 1977 in the context of spin glasses The frustration is generated by the competition of different kinds of interaction and or by the lattice geometry As a result in the ground state all bonds are not fully satisfied In frustrated Ising spin systems a number of spins behave as free spins In frustrated vector spin systems the ground state configuration is usually non collinear The ground state of frustrated spin systems is therefore highly degenerate and new induced symmetries give rise to unexpected behaviors at finite temperatures Many properties of frustrated systems are still not well understood at present Theoretically recent studies shown in this book reveal that established theories numerical simulations as well as experimental techniques have encountered many difficulties in dealing with frustrated systems In some sense frustrated systems provide an excellent testing ground for approximations and theories Experimentally more and more frustrated materials are discovered with Crossover-Time in Quantum Boson and Spin Systems Gennady P. interesting properties for applications Berman, Evgeny N. Bulgakov, Darryl D. Holm, 2008-10-04 The authors compare classical and quantum dynamics in the quasiclassical region of parameters and under the condition of unstable chaotic classical behavior They estimate the characteristic time scale at which classical and quantum solutions start to differ significantly The method is based on exact equations for time dependent expectation values in boson and spin coherent states and applies to rather general

Hamiltonians with many degrees of freedom The authors develop a consistent dynamical theory for quantum nonintegrable

Hamiltonians and provide explicit examples of classical quantum crossover time a very common and fundamental phenomenon in quantum nonintegrable systems This book can be recommended to graduate students and to specialists

Magnetoelectric Response in Low-Dimensional Frustrated Spin Systems Shinichiro Seki, 2012-08-27 Electric control of magnetic properties or inversely magnetic control of dielectric properties in solids is called a magnetoelectric effect and has long been investigated from the point of view of both fundamental physics and potential application Magnetic and dielectric properties usually show minimal coupling but it recently has been discovered that magnetically induced ferroelectricity in some spiral magnets enables remarkably large and versatile magnetoelectric responses To stabilize such helimagnetism magnetic frustration competition between different magnetic interactions is considered the key In the present work two of the most typical frustrated spin systems triangular lattice antiferromagnets and edge shared chain magnets have systematically been investigated Despite the crystallographic simplicity of target systems rich magnetoelectric responses are ubiquitously observed The current results published here offer a useful guideline in the search for new materials with unique magnetoelectric functions and also provide an important basis for a deeper understanding of magnetoelectric phenomena in more complex systems Magnetic Susceptibility of Superconductors and Other Spin Systems T.L. Francavilla, R.A. Hein, D.H. Liebenberg, 2013-11-11 The workshop entitled Magnetic Susceptibility of Superconductors and other Spin Systems S4 was held at Coolfont Resort and Health Spa located near Berkley Springs West Virginia on May 20 23 1991 There were over sixty attendees approximately half from the United States the remainder representing over twelve different countries The international character of the workshop may be gleaned form the attendee list included in this volume The intent of the workshop was to bring together those experimentalists and theoreticians whose efforts have resulted in significant recent contributions to the development and use of the ac susceptibility technique as well as to the interpretation of data obtained from these measurements Many spirited discussions occurred during and after the presentations. These are reflected in the manuscripts contained in these proceedings Although camera ready manuscripts were required from all participants at registration all manuscripts were revised and reflect the lively exchanges that followed each presentation The small size of the workshop allowed the participants a high degree of flexibility Consequently when a controversial topic such as the irreversibility line emerged a special session was organized on the spot At the suggestion of Ron Goldfarb participants were invited to contribute a one page summary containing their thoughts on the topic These stand alone contributions were retyped and included as submitted with only minor editorial changes These proceedings are intended for those experienced scientists new to the field and graduate students just beginning their research **Tensor Network States and Effective** Particles for Low-Dimensional Quantum Spin Systems Laurens Vanderstraeten, 2017-08-10 This thesis develops new techniques for simulating the low energy behaviour of quantum spin systems in one and two dimensions Combining these developments it subsequently uses the formalism of tensor network states to derive an effective particle description for one

and two dimensional spin systems that exhibit strong quantum correlations These techniques arise from the combination of two themes in many particle physics i the concept of quasiparticles as the effective low energy degrees of freedom in a condensed matter system and ii entanglement as the characteristic feature for describing quantum phases of matter Whereas the former gave rise to the use of effective field theories for understanding many particle systems the latter led to the development of tensor network states as a description of the entanglement distribution in quantum low energy states **An Introduction to Quantum Spin Systems** John B. Parkinson, Damian J. J. Farnell, 2010-08-26 The topic of lattice quantum spin systems is a fascinating and by now well established branch of theoretical physics Based on a set of lectures this book has a level of detail missing from others and guides the reader through the fundamentals of the field

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