

ANALYTICAL DESCRIPTION
OF THE CRITICAL BEHAVIOR
OF A THREE-DIMENSIONAL UNIAXIAL
MAGNET IN AN EXTERNAL FIELD
BY SINGLING OUT A REFERENCE SYSTEM

M.P. Kozlovskii, I.V. Pylyuk

Institute for Condensed Matter Physics,
Nat. Acad. of Sci. of Ukraine
(1, *Sviatsitskii Str., Lviv 79011, Ukraine;*
e-mail: piv@icmp.lviv.ua)

S u m m a r y

The critical behavior of systems belonging to the universality class of the three-dimensional Ising model has been studied theoretically. A three-dimensional Ising-like system with exponentially decreasing interaction potential and in the presence of a homogeneous external field was considered in the framework of the collective variables method. A specific feature in the calculation of the partition function and the free energy of a uniaxial magnet consists in singling out a reference system. The role of the latter is played by the molecular-field Hamiltonian. A method to describe the critical behavior with the use of a singled out reference system is developed on the basis of a non-Gaussian (quartic) distribution of order-parameter fluctuations (the ρ^4 model).