

# Classification of the Equilibrium State of Magnetic Media with spin $s=3/2$ and $SU(4)$ Symmetry of Exchange Interaction

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The equilibrium states of magnetic condensed media are classified on the basis of statistical mechanics [1]. The equilibrium states of such media are spontaneously broken with respect to magnetic  $SU(4)$  symmetry. In the Weyl basis, magnetic degrees of freedom are introduced, which include fifteen magnetic additive integrals of motion and the same magnetic order parameters. The quantum algebra of the Poisson brackets for the specified degrees of freedom is obtained. The conditions for the residual symmetry of equilibrium states for such media are formulated and the equations for the classification of magnetic order parameters are obtained. Its solutions are given in a number of special cases. As such cases, states that have a lower symmetry of the exchange interaction are considered. These include states with broken  $SO(3)$ ,  $SU(3)$ ,  $SU(2) \times SU(2)$  symmetry. The admissible structure of the order parameters and the type of generators of unbroken symmetry are determined. An analysis of the similarities and differences of the new equilibrium states with the equilibrium states of magnets with spin  $S=1/2$  and  $S=3/2$  [2]-[4] is given.

## References

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