

## Application of the functional Callen identity to the study of the transverse Ising model

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We developed the approach to theoretical investigation of the transverse Ising model on the basis of the functional Callen identities for Matsubara Green functions.

Functional variables were divided into classical (Matsubara frequency equals 0) and quantum parts within our approach. One-site approximation was used and integral equations for distribution functions of effective fields of different coordination spheres were derived. These equations were solved numerically for square and cubic lattices with nearest neighbour interaction. The average values of spin operators  $S^z$ ,  $S^x$ , critical points line, longitudinal  $G^{zz}(\omega, q = 0)$  and transverse  $G^{xx}(\omega, q = 0)$  susceptibilities were calculated. The quantum functional variables are taken into account within the Gaussian approximation. We compared our results of calculations to the corresponding results derived on the basis of the effective field theory for Ising model [1]; to the results derived for transverse Ising model [2,3]; and to the results of simulations.

### References

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