

# Towards integrability structure in 3D Ising model

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The Ising model is an amazing area of interaction between algebraic and geometric methods, topology and exactly solved models in statistical physics, describing among others critical phenomena.

The integrability of the 3D system is still hypothetical. In the talk we develop an algebraic interpretation [1] based on the Zamolodchikov tetrahedron equation.

The main part of the work is related to the combinatorics of the  $n$ -simplicial complex [2]. We first construct some recursion procedure on the spaces of solutions for the  $n$ -simplex equation. Then we propose such a weight matrix in 3D Ising model which satisfies an analog of the tetrahedron equation with spectral parameter. Our analog does not provide the same simple integrability property as the original one. The principal goal of this talk is to draw attention of the experts community to this phenomenon.

## References

- [1] D.V. Talalaev *Towards integrability structure in 3D Ising model*, in progress
- [2] I.G. Korepanov, G.I. Sharygin, D.V. Talalaev, *Cohomologies of  $n$ -simplex relations*, Math. Proc. of the Cambridge Phil. Soc. 2016. Vol. 161, no. 2. Pp. 203-222.

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