

## **abstract**

SPECIAL MATHEMATICAL PHYSICS SEMINAR

Topic:

Speaker:

Affiliation:

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We consider the ground state of the  $XY$  model of an infinite spin chain at zero temperature. Following C. Bennett, H. Bernstein, S. Popescu, and B. Schumacher, we use the von Neumann entropy of a sub-system as a measure of entanglement. G. Vidal, J. Latorre, E. Rico and A. Kitaev conjectured that the entropy of a large block of neighboring spins approaches a constant as the size of the block increases. We are evaluating this limiting entropy as a function of anisotropy and transverse magnetic field. We are using the methods based on the integrable Fredholm operators and the Riemann-Hilbert approach.

A starting point for our calculations is the Bennett-Bernstein-Popescu-Schumacher representation of the entropy in terms the determinant of a certain block Toeplitz matrix. In our analysis of this determinant we use an extension to the block matrix case of the Riemann-Hilbert scheme originally suggested by P. Deift for the scalar Toeplitz determinants. This extension yields a new form of the strong Szegő theorem for the block Toeplitz matrices which, in conjunction with the finite-gap techniques of the Soliton theory, allows the above mentioned explicit characterization of the entanglement in the XY model.