

Seminar (MVSem) on Entanglement and Quantum Phase Transitions

Prof. Dr. Thomas Gasenzer and Prof. Dr. Markus Oberthaler

SS 2015 — Fri, 15:15 - 16:45, Mon 14:15-15:45, INF 227, SB 1.107 (Fri), SR 1.404 N (Mon)

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17.04. **Distribution of Topics. Organisational issues.**

08.06. **Introduction to quantum phase transitions**

Lit.: Introductory/overview texts: [1, 2, 3, 4, 5]; textbooks: [6, 7]; reviews: [8, 9]

Speaker: Thomas Gasenzer

Tutor:

12.06. **Entanglement measures in many-body systems**

Lit.: [16] Sect. II, and Refs. cited therein

Speaker: Kevin Geier

Tutor: Asier Piñeiro Orioli

15.06. **Bipartite entanglement in a quantum phase transition**

Lit.: Overview: [16] Sects. II.A & B, IV; exemplary studies: [17, 18, 19]

Speaker: Halil Cakir

Tutor: Markus Karl

19.06. **Entanglement entropy. Area and volume laws**

Lit.: Overview: [16] Sects. II.A & B, V; [20, 21] for proposals of measuring e.e. with ultra cold atoms; [22], Sects. 4, 5.

Speaker: Jan Hendrik Becher

Tutor: Asier Piñeiro Orioli

26.06. **Thermal entanglement**

Lit.: Overview: [16] Sect. VII; more specifically [23, 24, 18, 25, 26]; experimental results: [16] Sect. VII.D, and [27, 28]

Speaker: Philipp Kunkel

Tutor: Asier Piñeiro Orioli

29.06. **Spin squeezing and entanglement**

Lit.: Overview: [16], Sect. IV.A.2; original work: [29, 30, 31, 32]; experimental measurements: [33, 34, 35]

Speaker: Mathis Brosowsky

Tutor: Thomas Gasenzer

03.07. **Dynamics of entanglement near criticality**

Lit.: Overview: [16] Sect. IX, and Refs. cited therein; [22], Sects. 4,5; Polkovnikov and Gritsev in [5]

Speaker: Christian-Marcel Schmied

Tutor: Markus Karl

Further reading

In addition to the above special literature, more general texts are useful for various topics:

- Textbooks on Quantum Field Theory [36, 37]
- Critical phenomena and Quantum Phase Transitions [38, 8, 39, 40, 7, 41, 5]
- Quantum Entanglement [42, 43]
- Entanglement and Quantum Phase Transitions [16, 44, 15]

Literatur

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Outlines 'Quantum phase transition(QPT)' and the discontinuity of the concurrence. Dicke model " A free PowerPoint PPT presentation (displayed as a Flash slide show) on PowerShow.com - id: 11995b-MTIIN. 93, 086402 (2004) Entanglement and Quantum Phase Transition in the Extended Hubbard Model. L.-A. Wu, M.S. Sarandy, and D. A. Lidar, Phys. Rev. Lett., 93, 250404(2004), Quantum Phase Transitions and Bipartite Entanglement. T. Brandes et al., 92, 073602 (2004), Entanglement and the Phase Transition in the Single-Mode Superradiance. V. Buzek et al., Phys. Rev. 08.06. Introduction to quantum phase transitions Lit.: Introductory/overview texts: [1, 2, 3, 4, 5]; textbooks: [6, 7]; reviews: [8, 9] Speaker: Thomas Gasenzer Tutor: 12.06. Entanglement measures in many-body systems Lit.: [16] Sect. II, and Refs. cited therein Speaker: Kevin Geier Tutor: Asier Pinˆero Orioli. 15.06. Bipartite entanglement in a quantum phase transition Lit.: Overview: [16] Sects. 8. Textbooks on Quantum Field Theory [36, 37] Critical phenomena and Quantum Phase Transitions [38, 8, 39, 40, 7, 41, 5] Quantum Entanglement [42, 43] Entanglement and Quantum Phase Transitions [16, 44, 15]. Literatur. [1] M. Vojta, Quantenphasenubergänge " Schmelzen am Temperaturnullpunkt, Physik Journal 1, 55 (Mar. Seminar of the Department of Theoretical Physics, Steklov Mathematical Institute of RAS November 7, 2018 14:00, Moscow, Steklov Mathematical Institute of RAS, Room 404 (8 Gubkina). Phase transition and entropy of quantum entanglement. I. Ya. Aref'eva. Abstract: A holographic model of QCD will be considered, which makes it possible to describe the experimental dependence of the total multiplicity of particles formed during collisions of heavy ions, as well as to make predictions about the nature of the phase transition confinement/ confinement. The model is based on constructing black holes/branes solutions in 5-dimensional dilaton gravity, interacting with Maxwell fields. A possible experimental check of this type models will be discussed. Thus there is no one-to-one correspondence between quantum phase transitions and the non-analyticity property of the concurrence. Moreover, we show that the von Neumann entropy, as another measure of entanglement, can not reveal quantum phase transition in the present model. Therefore, in order to link with quantum phase transitions, some other measures of entanglement are needed. Addeddate. 2013-09-21 12:03:35. @inproceedings{Koh2016EntanglementAQ, title={Entanglement and quantum phase transition of spin glass : a renormalization group approach}, author={Cheong Yang Koh}, year={2016} }. Cheong Yang Koh. Published 2016. repository.nie.edu.sg. Save to Library. Create Alert. Cite.