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Journal of Statistical Physics
Volume 171, Issue 6, 1 June 2018, Pages 1000-1034

Periodic p-adic Gibbs Measures of q-State Potts Model on Cayley Trees I: The Chaos Implies the Vastness of the Set of p-Adic Gibbs Measures (Article)

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Abstract

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We study the set of p-adic Gibbs measures of the q-state Potts model on the Cayley tree of order three. We prove the vastness of the set of the periodic p-adic Gibbs measures for such model by showing the chaotic behavior of the corresponding Potts –Bethe mapping over Q_p for the prime numbers p≡1(mod3). In fact, for 0<|θ-1|p<|q|p2<1 where θ= exp $_p$(J) and J is a coupling constant, there exists a subsystem that is isometrically conjugate to the full shift on three symbols. Meanwhile, for 0<|q|p2≤|θ-1|p<|q|p<1, there exists a subsystem that is isometrically conjugate to a subshift of finite type on r symbols where r≥ 4. However, these subshifts on r symbols are all topologically conjugate to the full shift on three symbols. The p-adic Gibbs measures of the same model for the prime numbers p= 2 , 3 and the corresponding Potts –Bethe mapping are also discussed. On the other hand, for 0 < | θ- 1 | $_p$< | q| $_p$< 1 , we remark that the Potts –Bethe mapping is not chaotic when p= 3 and p≡2(mod3) and we could not conclude the vastness of the set of the periodic p-adic Gibbs measures . In a forthcoming paper with the same title, we will treat the case 0 < | q| $_p$≤ | θ- 1 | $_p$< 1 for all prime numbers p. © 2018, Springer Science+Business Media, LLC, part of Springer Nature.

Author keywords

Chaos | p-adic Gibbs measure | p-adic Potts model | Phase transition

Funding details

Funding number	Funding sponsor	Acronym	Funding opportunities
	Labex		
	Abdus Salam International Centre for Theoretical Physics	ICTP	See opportunities by ICTP ↗
FRGS17-027-0593	Ministry of Higher Education, Malaysia	MOHE	

Funding text

Acknowledgements The authors would like to thank Andrei Khrennikov, Arnaud Le Ny, Farrukh Mukhame-dov and Utkir Rozikov for their comments and advices, and to the referees for their clarifying comments and remarks. The first author (M.A.Kh.A) is grateful to Embassy of France in Malaysia and Labex Bézout for the financial support to pursue his Ph.D at LAMA, Université Paris-Est Créteil, France. The third author (M.S.) thanks the Junior Associate Scheme, Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy, for the invitation and hospitality. This work was partially supported by the MOHE Grant FRGS17-027-0593.

ISSN: 00224715
Source Type: Journal
Original language: English
DOI: 10.1007/s10955-018-2053-6
Document Type: Article
Publisher: Springer New York LLC

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