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Your manuscript JPhysA-121909 - Major revisions required1 Nachricht

Journal of Physics A: Mathematical and Theoretical <onbehalf@manuscriptcentral.com>17. April 2025 um
11:08

Antwort an: jphysa@iopublishing.org

An: juraj.tekel@fmph.uniba.sk

Cc: benedek.bukor@fmph.uniba.sk, juraj.tekel@fmph.uniba.sk

Dear Dr Tekel,

Re: "Cubic asymmetric multitrace matrix model"

Manuscript reference: JPhysA-121909

The reviewer report(s) for your Paper are now complete. However, they recommend substantial changes before Journal of Physics A: Mathematical and Theoretical can consider your work further.

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We look forward to hearing from you soon.

Yours sincerely,

Natasha Leeper

On behalf of:

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REVIEWER REPORT(S):

Referee: 1

COMMENTS TO THE AUTHOR(S)

This paper studies a cubic multitrace random matrix model, utilizing the saddle point approximation. The authors present a numerical phase diagram showing a stable asymmetric phase and a triple point, while also investigating response functions within the model. This work connects various fields including fuzzy field theory and noncommutative geometry. Technique are only semi rigorous and numerical but this is fine within the current standards of theoretical physics paper. **I think the paper can be accepted as is with very minor corrections.** I could only find two typos which authors should fix: In P. 11 it should be "asymmetric", in P 23 it should be "magnetization".

Referee: 2

COMMENTS TO THE AUTHOR(S)

The manuscript is a valid contribution to the field of matrix models, which provides an in-depth study of the specific model obtained by introducing a cubic multitrace term in an action with a quartic base potential. Broadly, the paper details the phase diagram of the model, identifies the stable one-cut asymmetric phase, details the triple point of the phase diagram, and also investigates response functions and phase transitions of the model. The main interests are the highlighting of the stability of the asymmetric 1-cut solution, the instability of asymmetric 2-cut solutions, as well as the absence of divergence around the phase transitions. **Overall, the work is valuable and increases our shared knowledge on such models.**

One key quality of the paper resides in its pedagogical nature, with a very accessible review of matrix models which makes it a good entry point to the physics of the model and does a good job of helping the reader gain an intuition around the phase diagram. However, given the pedagogical qualities of the paper, more details could be expected about the potential implications of this work in the several application fields listed by the authors.

Another key quality is the richness of results and explored quantities, including several response functions and a detailed study of the phase transitions. We regret however that the authors set the specific value -1 for the parameter t in the response function section, without justifying the interest of this specific choice. The specific values for g in figure

7 are also unjustified.

Given the interest of the work, we recommend its publication.

Here are some minor typos or imprecisions that should be corrected:

- « Such a solution » on line 13 page 2
- « More simple » should be « simpler » on line 37 page 2
- « assumption » should be plural, on line 58 page 4
- For the sake of rigor, «amount » could be made more precise on line 18 page 6
- « With the symmetric 1-cut assumption » on line 51 page 6
- « We thus need to make the the symmetric 2-cut assumption » on line 6 page 7
- « The corresponding comparison » line 21 page 11
- « than » should be « then » line 26 page 15
- « analog » line 46 page 15

Referee: 3

COMMENTS TO THE AUTHOR(S)

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Referee: 4

COMMENTS TO THE AUTHOR(S)

(Board Member's adjudication report)

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Letter reference: DEC:MajRev:S

2 Anhänge



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