

Review 2


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Review of “On the Alberti-Uhlmann Condition for Unital Channels”

for *Quantum*, completed on May 4, 2020

Author will not see the reviewer's name or the date completed.

Overview questions

 only editors will see response

Overall rating



For this manuscript I recommend...

accept

Comments to editor

The paper contributes to an important problem. It is closely related to a recent paper [11] and can be seen as a special case of a problem studied there. The obtained conditions are of different nature and the mathematical tools are different (but standard in the context of qubit states and channels).

Open response questions

Note: if you prefer to submit a free-form review instead of filling in this form, simply reply to the invitation email with your report as an attachment. Due to Scholastica's limitations, please make sure that you send it from the same address at which you received the invitation. If that's not possible, you can email the review to info@quantum-journal.org . Otherwise, just write "ok" in the reply to this question and proceed to the rest of the form.

 *only editors will see response*

ok.

Summary: what are the main questions posed by the manuscript and how does it answer them?

 *intended for the author*

The aim of this paper is to find conditions under which a given pair of qubit states can be transformed to another given pair of qubit states by a unital channel. This is a refinement of the Alberti-Uhlmann theorem, where the channel is not necessarily unital. The authors prove a characterization in terms of the L_1 norm, similar to the Alberti-Uhlmann condition, as well as a characterization by three inequalities for the determinants that can be easily checked.

What is your assessment of the paper? If you recommend acceptance, make a case that this work does indeed make a significant technical or conceptual contribution to scholarship (including experimental methods and/or mathematical tools).

 *intended for the author*

The important problem of characterizing the existence of a quantum channel between two given sets of quantum states was studied by many authors in various contexts, e.g. quantum thermodynamics or quantum information theory. The present contribution can be formulated as the problem for families of three states, one of which is maximally mixed. It is closely related to a recent paper [11], which gives a characterization for the case when the source states are all real. Since any family of the above form can be always transformed to a real family by a unitary transformation, this can be seen as a special case of [11]. On the other hand, the conditions derived here are of a different kind, more closely resembling the Alberti-Uhlmann conditions. Moreover, the three

simple inequalities are readily checked, so this characterization seems more convenient.

So this paper makes a nice contribution to an important problem and can be published.

To what extent have you checked the technical correctness of the paper?

 *intended for the author*

I checked all the proofs and found them correct.

Comment on the presentation of the paper. Is it well written? Are the main results clearly laid out? Does the manuscript clearly describe assumptions and limitations? Is the literature review adequate?

 *intended for the author*

The paper is very well written, readable and clear. The main problems, assumptions and results are clearly described and well motivated, the introduction gives a brief but significantly broad overview of the relevant literature.

If the submission includes numerical or physical experiments, does it provide sufficient details such that they could be reproduced by readers? This includes for example source code, documentation, experimental data, experimental setup specifications, etc.

 *intended for the author*

The paper includes no experiments.


Suggested changes, corrections, and general comments.

 *intended for the author*

I suggest that the authors clearly describe the relation to the results of [11], mentioned above. For example, the fact that a positive tp extension exists iff a ctp extension


exists can be also derived from the proof of [11], Thm. 1. It would be good to compare the conditions in these results.

Would you be willing to referee an updated version of this work before a final decision is made?

 *only editors will see response*


yes

If this work is accepted, would you be willing to write a short Perspective (opinion piece similar to a viewpoint or editorial) based on your report? For examples, see: <http://quantum-journal.org/category/Editorial,Perspective/>

 *only editors will see response*

I do not have time at present.

How was your reviewing experience? Is there anything you would like us to improve?

 *only editors will see response*

Very good, I cannot think of anything to improve.

Help