# Review of: "An Added Proof of the "Trace Anomaly Redefinition": Equivalent Wick Rotation Conditions"

Mushtaq Ahmad[1]

1 FAST - National University of Computer and Emerging Sciences (NUCES)

Potential competing interests: No potential competing interests to declare.

The paper "An Added Proof of the 'Trace Anomaly Redefinition': Equivalent Wick Rotation Conditions" by Hani W. Maalouf addresses the issue of chiral trace anomaly cancellation in gravitationally curved spaces. It presents a more detailed and illustrative proof of the redefinition of the trace anomaly, which was previously treated in a more abstract and concise manner. The core idea revolves around resolving the contributions from both "volume" and "surface" terms, which are explicit functions of time, and bringing them down by one more dimension. This leads to a description through orbits that are close to Euclidean, allowing for a generalization of the Wick rotation and confirming the trace anomaly redefinition.

1. The paper sets a clear objective to provide a more illustrative proof of the trace anomaly redefinition, which is a significant contribution to the field of theoretical physics.
2. The author provides a detailed mathematical framework, working with Pfaffian differential elements and addressing the conditions for integrability and coherence at the periphery of time. This level of detail is essential for the rigorous proof required in such theoretical work.
3. The paper includes examples that illustrate the necessity and sufficiency of the conditions for chiral trace anomaly cancellation. These examples help to clarify the abstract concepts and make the arguments more tangible.
4. By focusing on the surface terms and their role in the cancellation of anomalies, the paper addresses a crucial aspect that is often overlooked but is essential for the completeness of the proof.

**Weaknesses**

1. The paper is highly technical and assumes a deep understanding of advanced concepts in theoretical physics and differential geometry. This makes it less accessible to a broader audience who might be interested in the implications of the work but are not experts in the field.
2. The paper is dense and lengthy, which can make it challenging to follow the arguments and mathematical derivations. A more structured approach with clear subsections and summaries of key points could improve readability.
3. While the mathematical treatment is thorough, the physical interpretation and implications of the results could be elaborated further. This would help in understanding the significance of the work in the broader context of theoretical physics.

**Conclusion**

Overall, the paper makes a significant contribution to the understanding and proof of the trace anomaly redefinition in

gravitationally curved spaces. It provides a detailed and rigorous mathematical framework that supports the proposed redefinition. However, the complexity and technical nature of the paper limit its accessibility to a specialized audience. Improving the structure and providing more physical interpretation of the results could enhance its impact and reach within the scientific community.