Contribution ID: **311** Type: **Poster**

Aspects of transitivity in quantum field theory and its possible consequences

Tracing out degrees of freedom is a standard technique in quantum field theory to isolate the relevant aspects of a system. In this study, we investigate cases where different approaches to tracing out degrees of freedom lead to non-trivial results and implications. Specifically, we consider the vacuum state of a massless scalar field in Minkowski spacetime, partitioned into two Rindler wedges, labeled Rindler-1 and Rindler-2, separated by a finite distance. From a set-theoretic perspective, this configuration treats Minkowski spacetime as the universal quantum field, with Rindler-1 and Rindler-2 as subsystems. Note: Rindler-2 is also a subset of Rindler-1.
To investigate the transitivity, we have calculated the reduced state of the field in Rindler-2 in two independent ways. The first approach is straightforward: We took the vacuum state in Minkowski and found the reduced state in Rindler-2 by tracing out the degrees of freedom of the left wedge, giving a Planckian spectrum. Similarly, in the second case, we first evaluated the reduced state in Rindler-1 from the vacuum of Minkowski, which yielded a thermal density matrix, and then the reduced density matrix in Rindler-2 from Rindler-1. We found that these independent paths of calculations do not yield the same reduced state in Rindler-2.
This variation in reduced state calculations indicates that there are quantum field theoretic systems in which the reduced quantum state of a subsystem can be path-dependent and, hence, not unique. Therefore, transitivity is violated, but it is still unclear whether this is a desirable property for a quantum field theory

Track type

Cosmology

Author: Mr NAIR, Akhil U (Birla Institute of Technology & Science Pilani, Hyderabad Campus)

Presenter: Mr NAIR, Akhil U (Birla Institute of Technology & Science Pilani, Hyderabad Campus)

Session Classification: Poster Session