Commun. Math. Phys. 100, 57–81 (1985)

Communications in Mathematical Physics

© Springer-Verlag 1985

The Double-Wedge Algebra for Quantum Fields on Schwarzschild and Minkowski Spacetimes*

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Abstract. We consider the Klein-Gordon equation ($m \geqq 0$) on the double Schwarzschild wedge of the Kruskal spacetime, and construct the Hartle-Hawking state ω_H as a thermal state relative to the Boulware quantization. We prove that, on the double wedge, ω_H is a pure state, and in the corresponding representation, the left- and right-wedge C^* algebras each have the Reeh-Schlieder property, while the corresponding von-Neumann algebras are type III_1 factors which are dual to (i.e. commutants of) each other. We discuss the extent to which these properties may generalize to non-quasi-free field theories.

Pursuing the Rindler-Fulling-Unruh analogy with the Klein-Gordon equation ($m > 0$) in (d-dimensional) flat spacetime, we establish an explicit formula for the Minkowski vacuum on a spacelike double wedge as a thermal state relative to the Fulling quantization. We also treat the case $d = 2$, $m = 0$ of this formula since this is essential input for a paper with Dimock on scattering theory for the quantum Klein-Gordon equation on the Schwarzschild metric.

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* Research supported in part by the Schweizerischer Nationalfonds