Rigorous construction of Hartle-Hawking type states from a Wick rotation KO SANDERS, University of Chicago — For a large class of black hole spacetimes with a static exterior region we consider a massive scalar quantum field propagating in this spacetime and we give a rigorous mathematical construction of states that extend thermal states in the exterior region, following a strategy proposed by Hartle and Hawking (1976). In particular, we perform a Wick rotation in the exterior region and compactify the imaginary time coordinate to obtain thermal states at any temperature. We show that the initial data of these states can be extended across the bifurcation surface, which yields a state on the entire spacetime. At temperatures other than the Hawking temperature these states are known not to be "regular" (i.e. Hadamard). Our explicit construction allows us to point out several subtleties in the construction, concerning the choice of Euclidean Green's function, analytic continuation of the Green's function and the heat kernel and the expected regularity of the state at the Hawking temperature.

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