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Boundary conditions for the Klein-Gordon field on Lifshitz Spacetimes

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Boundary conditions have physical consequences. On Lifshitz spacetimes, the Klein-Gordon equation gives rise to an initial-boundary value problem. This means that for a given suitable initial data, corresponding solutions might not exist. If they exist, then each boundary condition selects a different solution, thus yielding inequivalent dynamics. In this talk I will show that there is a plethora of physically-sensible boundary conditions that generalize Dirichlet quantization. Specifically, I will consider a free, scalar, massive quantum field theory on a four-dimensional Lifshitz spacetime with critical exponent $z = 2$ and I will show that there are two-point functions for ground and thermal states, of local Hadamard form and satisfying the canonical commutation relations, compatible with Robin boundary conditions and with mode-dependent boundary conditions, depending on the value of the effective mass. Each of these generalized boundary conditions determine an inequivalent dynamics, but they are all equivalently physically-sensible—only an experiment could single one out. The results I will present are part of a joint work with C. Dappiaggi and D. Sina, arXiv:hep-th/2103.15391.

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