Are Rindler Quanta Real? Inequivalent Particle Concepts in Quantum Field Theory

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Abstract

Philosophical reflection on quantum field theory has tended to focus on how it revises our conception of what a particle is. However, there has been relatively little discussion of the threat to the "reality" of particles posed by the possibility of inequivalent quantizations of a classical field theory, i.e., inequivalent representations of the algebra of observables of the field in terms of operators on a Hilbert space. The threat is that each representation embodies its own distinctive conception of what a particle is, and how a "particle" will respond to a suitably operated detector. Our main goal is to clarify the subtle relationship between inequivalent representations of a field theory and their associated particle concepts. We also have a particular interest in the Minkowski versus Rindler quantizations of a free Boson field, because they respectively entail two radically different descriptions of the particle content of the field in the *very same* region of spacetime. We shall defend the idea that these representations provide *complementary descriptions* of the same state of the field against the claim that they embody completely *incommensurable theories* of the field.

Keywords:	quanta, Minkowski, Rindler, Weyl Algebra, Canonical Commutation Relations, Complementarity, Incommensurability
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