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Local quantum physics. Fields, particles, algebras. (English) [Zbl 0777.46037](#)
Texts and Monographs in Physics. Berlin: Springer-Verlag. xiv, 356 p. (1992).

The book is a comprehensive treatise on local quantum physics, by which is understood the synthesis of quantum theory with the principle of locality implemented by the notion of field. The subject is presented in the so-called “algebraic-approach”, in which the basic ingredient of the theory is a net of algebras of local observables being abstract C^* -algebras labelled by open, finitely extended regions of Minkowski space. Concerned with this approach as the fundamental underlying mathematical structure, the author places it, at the same time, in a wider perspective giving a nice account of “more traditional” quantum theories such as e.g. Poincaré invariant quantum theory, quantum electrodynamics or general (axiomatic) quantum field theory (Wightman axioms, Euclidean quantum field theory, S -matrix).

The book is divided into seven chapters: 1. Background, 2. General quantum theory, 3. Algebras of local observables and fields, 4. Charges, global gauge groups and exchange symmetry, 5. Thermal states and modular automorphisms, 6. Particles. Completeness of the particle picture 7. Retrospective and outlook.

The first two chapters, apart from providing the mentioned above perspective, introduce also basic concepts and notation. The third chapter describes the heart of the theory while chapters four to six present its main results. Chapter seven is devoted to a discussion of advantages and drawbacks of the algebraic approach as well as challenges and perspectives facing it.

For full understanding, the book requires rather essential knowledge of physics, also the mathematics involved is sometimes presented in a pretty sketchy way. It contrasts e.g. with the books by *O. Bratteli* and *D. W. Robinson* [Operator algebras and quantum statistical mechanics I (1979; [Zbl 0421.46048](#)) and II (1981; [Zbl 0463.46052](#))], *G. E. Emch* [Algebraic methods in statistical mechanics and quantum field theory (1972; [Zbl 0235.46085](#))] or *S. S. Horuzhy* [Introduction to algebraic quantum field theory (1990; [Zbl 0711.46051](#))] which provide a complete mathematical basis for a physical theory. Nevertheless, apart from physicists from whom this book is primarily intended, the material presented and the nice and clear style of presentation makes it an enjoyable reading to anybody interested in the development of fundamental physical theories of our days.

Reviewer: [A. Łuczak \(Łódź\)](#)

MSC:

- [46L60](#) Applications of selfadjoint operator algebras to physics
- [46N50](#) Applications of functional analysis in quantum physics
- [81-02](#) Research exposition (monographs, survey articles) pertaining to quantum theory
- [46-02](#) Research exposition (monographs, survey articles) pertaining to functional analysis

Cited in **3** Reviews
Cited in **296** Documents

Keywords:

algebraic-approach; Wightman axioms; charges; thermal states; particles; local quantum physics; principle of locality; field; net of algebras of local observables; abstract C^* -algebras; Poincaré invariant quantum theory; quantum electrodynamics; quantum field theory; Euclidean quantum field theory; S -matrix; global gauge groups; exchange symmetry; modular automorphisms