

Attempt of an Axiomatic Foundation of Quantum Mechanics and More General Theories VI[★]

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Received May 31, 1971

Abstract. This contribution continues the series of papers [2, 4, 5, 12] treated by Ludwig and collaborators. It is based on the generalized frame given in [6]; there Ludwig has set up an “infinite” axiomatic scheme as extension of the “finite” system [4, 5]. The results of [12] are then proved for a “locally finite” case; they lead to an extended representation theorem.

I. Introduction

In his paper “Notes on Axioms for Quantum Mechanics” [10] MacLaren has set up the final axiom:

(C) The set of all atoms of every finite sublattice of the orthomodular lattice G of decision effects is compact in the norm topology.

This axiom guarantees that the division ring which is constructed over G is the real, complex or quaternionic numbers [14].

We base here on Ludwig’s general axiomatic scheme ([6], III.) restricted by [6], III. § 18 condition V_3 (“locally-finite” case!) which is a generalization of the “finite” system given in [4, 5]. Within this frame the purpose of this paper is

1. to prove a slightly weaker form (C) (Lemma 8 in part III), of statement (C),
2. to show that (C) is sufficient to exclude discontinuous and disconnected division rings,
3. to give further topological properties of the lattice G .

II. Preliminaries

In the following largely is used the punctuation and terminology of [12]. We give a somewhat modified summary of Ludwig’s conclusions [6] which are different from those used in [12].

[★] This paper was supported by the Deutsche Forschungsgemeinschaft.