On algebras of numerical events

MON/P3
16:00–16:20

*Dietmar Dorninger** (TU Wien), *Helmut Länger* (TU Wien)

The probability $p(s)$ of the occurence of an event pertaining to a physical system which is observed in different states s determines a function p from the set S of states of the system to $[0,1]$. The function p is called a multidimensional probability or *numerical event*.

A set P of numerical events can be partially ordered by the order $\leq$ of functions. Assuming that the constant functions 0 and 1 belong to P, with every $p \in P$ also $p' := 1 - p$ belongs to P and for any triple p,q,r of pairwise orthogonal elements of P (which means $p+q, q+r, r+p \leq 1$) also $p+q+r$ is in P, then $(P, \leq, ')$ becomes an orthomodular poset, called algebra of numerical events, or more precisely, algebra of S-probabilities.

Algebras of S-probabilities allow to distinguish between a classical mechanical behaviour and a quantum mechanical one, namely, a system is classical if and only if P is a Boolean lattice.

Necessary and sufficient conditions for this fact are presented in terms of structural properties, of properties involving sums and products of real-valued functions and under the assumption that the set S of states is small. Moreover, examples are given how to use the obtained results with real world experiments.

[1] E.G. BELTRAMETTI, D. DORNINGER and M. MACZYNSKI: On a cryptographical characterization of classical and nonclassical event systems. *Rep. Math. Phys.* **60** (2007), 117–123.

[2] D. DORNINGER and H. LÄNGER: On a characterization of physical systems by spaces of numerical events. *ARGESIM Report* **35** (2009), 601–607.