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Relatively additive states on quantum logics

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Abstract: In this paper we carry on the investigation of partially additive states on quantum logics (see [2], [5], [7], [8], [11], [12], [15], [18], etc.). We study a variant of weak states — the states which are additive with respect to a given Boolean subalgebra. In the first result we show that there are many quantum logics which do not possess any 2-additive central states (any logic possesses an abundance of 1-additive central state — see [12]). In the second result we construct a finite 3-homogeneous quantum logic which does not possess any two-valued 1-additive state with respect to a given Boolean subalgebra. This result strengthens Theorem 2 of [5] and presents a rather advanced example in the orthomodular combinatorics (see also [9], [13], [4], [6], [16], etc.). In the rest we show that Greechie logics allow for 2-additive three-valued states, and in case of Greechie lattices we show that one can even construct many 2-additive two-valued states. Some open questions are posed, too.

Keywords: (weak) state on quantum logic, Greechie paste job, Boolean algebra
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