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On a quantum version of Ellis joint continuity theorem. (English) Zbl 1358.81126

Summary: We give a necessary and sufficient condition on a compact semitopological quantum semigroup which turns it into a compact quantum group. We give two applications of our results: a “noncommutative” version of Ellis joint continuity theorem for semitopological groups, a corollary to which is a new C*-algebraic proof of the theorem for classical semitopological semigroup; we also investigate the question of the existence of the Haar state on a compact semitopological quantum semigroup and prove a “noncommutative” version of the converse Haar’s theorem.

MSC:
81R50 Quantum groups and related algebraic methods applied to problems in quantum theory
81R15 Operator algebra methods applied to problems in quantum theory
22A15 Structure of topological semigroups
22A20 Analysis on topological semigroups
42B35 Function spaces arising in harmonic analysis
17B37 Quantum groups (quantized enveloping algebras) and related deformations

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