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Stanisław L. Woronowicz, Department of Physics, Warsaw University, 00-681 Warsaw, Poland; (Stanislaw.Woronowicz@fuw.edu.pl)

Unbounded operators in the context of C^* -algebras

ABSTRACT. By definition C^* -algebras contain only bounded elements. However in quantum mechanics the operators describing physical observables are usually unbounded. In a sense they *are affiliated* to the C^* -algebra of compact operators, which is used to describe quantum systems with finite degrees of freedom. Similarly matrix elements of finite-dimensional representations of non-compact quantum groups are unbounded operators affiliated to the C^* -algebra of *continuous functions* on the considered quantum group.

It turns out that affiliated elements affiliated to a C^* -algebra A may be considered as unbounded operators acting on the A with graphs satisfying certain natural condition. An equivalent definition using a special z -transform will also be given. Algebraic, analytical and topological properties of the set A^η of affiliated elements will be discussed. The affiliated elements behaves well with respect to the properly defined morphisms of C^* -algebras. A number of examples will be given.