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Unitary Operators and Pairs of Subalgebras

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A unitary operator u in a C^*-algebra M implements the $*$-automorphism $\mathrm{Ad}u : \mathrm{Ad}u(x) = uxu^*$ for all x in M. For a given subalgebra A of M, the inclusion $A \subset M$ is isomorphic to the inclusion $\theta(A) \subset M$ for all automorphism θ of M. However, relations between two subalgebras A and uAu^* depends on the properties of u connected to A. In this talk, we show some results for unitary operators in connection with subalgebras. First, as one of the most elementary example, we pick up unitary matrices and maximal abelian *-subalgebras of the $n \times n$ complex matrices $M_n(\mathbb{C})$. We discuss them in a relation to states of $M_n(\mathbb{C})$. Next, we extend our discussion on maximal abelian *-subalgebras of $M_n(\mathbb{C})$ to subfactors N of finite factors M, and show relations between N and unitary operators of M.