Colored planar algebras and applications to Hadamard matrix quantum groups

In this talk we define a colored planar algebra associated to a non-degenerate commuting square and identify the biunitary of the square as an element of the planar algebra. We use the biunitary to construct representations of annular algebras and quantum groups from the commuting square. When the corresponding quantum group is amenable we can compute elements in the spectrum of the adjacency matrix for a generating corepresentation. This leads to two criteria which imply non-flatness of the biunitary and infinite dimension of the corresponding quantum group. Computations with these criteria are performed with a continuous family of biunitaries on the 3311 principal graph, Petrescu's continuous family of complex Hadamard matrices, and type-II Paley Hadamard matrices. We conclude that all of Petrescu's complex Hadamard matrices and all type-II Paley Hadamard matrices yield infinite-dimensional compact matrix quantum groups.