

1039-81-176

**Imre Tuba\*** (ituba@mail.sdsu.edu), 720 Heber Ave, Calexico, CA 92231. *On finite braid representations*. Preliminary report.

Topological quantum computing is based on moving quasi-particles called non-abelian anyons around each other in a 2-dimensional electron gas. The mathematical model for such a system is a modular category, in which the anyons correspond to simple objects. The motion of the anyons is described by the braiding on the category. This braiding gives rise to a representation of the braid group  $B_n$ . Indeed, it is exactly this representation which provides the matrices one needs to implement the quantum gates needed for a quantum computation.

Therefore it is of practical concern what kinds of matrices one finds in the image of such a braid representation. The ideal situation is when the image is dense among the unitary matrices. However, this is not always the case, for example when the image is finite. Former results show that low-dimensional representations of  $B_3$  are essentially determined by the eigenvalues of the two generators. Hence the eigenvalues certainly determine the image. I will report on work with Eric Rowell at Texas A&M on finding necessary and sufficient conditions in terms of the eigenvalues under which the image of the representation is finite. This amounts to characterizing finite low-dimensional representations of  $B_3$ . (Received March 11, 2008)