1023-65-784 **Roden J. A. David*** (rdavid@math.wsu.edu), Mathematics Department, Washington State University, Pullman, WA 99163. *A Cayley transformed Lanczos-Schur algorithm for large unitary eigenproblems.*

We present an algorithm to find a few eigenpairs of large unitary matrices. Suppose U is an $n \times n$ unitary matrix, where n is large. Given a specified target τ on the unit circle, the algorithm seeks k eigenvalues of U nearest τ, where $k \ll n$. The algorithm performs a Cayley transform on U to obtain a Hermitian matrix H. The eigenvalues of U nearest τ are mapped to the eigenvalues of H of largest magnitude. The associated eigenvectors are the same. A Lanczos-Schur algorithm is used to find the eigenvalues of H of largest magnitude. Implicit restarts are performed using the Schur decomposition. Once the eigenvalues of H are approximated, the corresponding eigenvalues of U are computed using an inverse Möbius transform. We present numerical results showing the effectivity of the algorithm. (Received September 21, 2006)